ENC101

SDI to composite or Y/C encoder

USER MANUAL

Crystal Vision

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ENC101 Encoder
USERS MANUAL

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INTRODUCTION

The ENC101 is a 10-bit broadcast-quality Serial Digital to Analogue Composite converter. It is very compact with 6 modules fitting in a 1U frame. It accepts either 625 or 525 line input, with automatic detection. Default outputs are one reclocked serial digital and three analogue PAL/NTSC. An extra three analogue outputs and one analogue reference loop-through are available in a FR2-8 frame. The unit plugs into the front of the rack frame, and the universal connection system allows a mixture of Crystal Vision modules, without the use of extra rear panels, in both the 1U and 2U frames.

The hinged front panel of the case reveals user control of the card, and also LED indication of status. There are two rotary switches, an 8 way piano switch & a shaft encoder. These allow the user to select modes of operation and adjust delay from reference to output, phase offset, NTSC setup & video gains. Calibrated values can also be used as a basis for user set-up. User values are stored in non-volatile memory.

Further configuration is possible using movable links. Remote control is possible using RS-422, RS-232 or GPI.

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

MODES OF OPERATION

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. With no inputs, the encoder outputs either black & burst or test patterns.

If the reference is removed, the encoder switches to freerun mode and reference to output timing continues as if the reference were still present. If the reference returns, the encoder genlocks after 15 fields. There may be some picture disturbance as the encoder switches modes. If the serial input is removed, the encoder outputs black & burst.

PAL/NTSC standard select is fully automatic. There may be some picture disturbance for several seconds after a change of standard as the encoder reacquires genlock.

SPECIFICATION

MECHANICAL

Dimensions	100mm x 266mm module with DIN 41612 connector. User adjustments and indication at end of board to allow access from hinged front panel.
Weight	200g

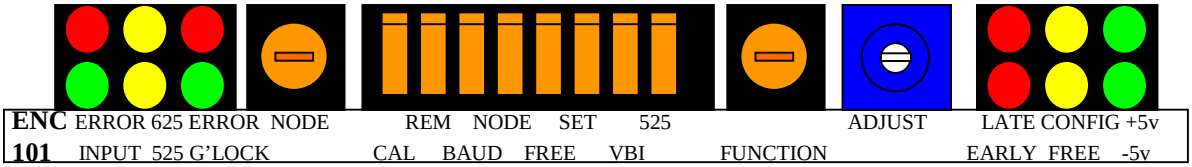
ELECTRICAL

Input	SDI: 270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M.
	SYNC: Composite Black & Burst plus 300mV syncs to EBU N14-1988.
Outputs	Reclocked Serial Loop through. Will drive >200m Belden 8281 or equivalent.
	Composite Reference Loop through.
	6 analogue outputs: selectable using movable links as 6 composite; 4 composite & Y plus sync, C; 2 composite & 2 each of Y plus sync, C.
	Composite or Y plus sync are 1V into 75Ω, C 300mV into 75Ω.
Frame Outputs	Serial digital loop through and 3 composite (or composite, Y + sync, C). The remaining outputs can be accessed only in an FR2-8 frame.
Power Consumption	1.3A @ +5V, -0.4A @ -5V.

ANALOGUE OUTPUT

Frequency Response	± 0.1dB 0 to 5.5MHz.
Differential Phase	$< 1^{o}$
Differential Gain	< 1%
Noise	< -60dB weighted.
Blanking	To PAL/NTSC specification horizontally and vertically with selectable VBI blanking - PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282. Active PAL lines 6-22 & 319-335 is available as an option – contact factory for details.
Delay	Reference input to composite output: -4μs to 4.9 lines. **For zero delay, serial video input must be 4.3μs before output.**

OPTIONS AVAILABLE FROM FRONT PANEL



FUNCTION SELECT SWITCH

0	OUTPUT	Selects video output from incoming serial video or modulated ramp, 75% colour bars, 100% colour bars.
1	V DELAY	Adds a line by line reference to output delay from 0 to 5 lines.
2	H COARSE	Adds delay from -4μs to 1 line in approx. 0.5μs steps.
3	H FINE	Adds delay from -4μs to 1 line in 74ns steps.
4	H SUBPIX	Varies reference to output timing in approx. 2ns steps.
5	SCH PHASE	Adds SCH phase offset from zero to 360^o in ½ ^{o} steps
6	SCH FINE	Adds SCH phase offset in 1/16^o steps.
7	C PHASE	Adds a Burst to Chroma phase offset in 1/16^o steps.
8	COMP GAIN	Varies YUV gains simultaneously from 0 to 130%.
9	BURST GAIN	Varies Burst gain from 80% to 120% in approx. 1% steps.
A	Y GAIN	Varies Y gain from 0 to 130%
B	C GAIN	Varies U & V gains simultaneously.
C	U GAIN	Varies Cb gain from 0 to 180%
D	V GAIN	Varies Cr gain from 0 to 130%
E	SETUP	When Setup switch is down, varies NTSC setup level from –22 IRE to +22 IRE. Calibration value of +7.5 IRE
F	NOT USED	

DIL SWITCH

		Up	Down
1	CAL	Rotate ADJUST to alter the selected parameter.	Rotate ADJUST to calibrate the selected parameter.
2	REMOTE	Front-panel control.	Serial remote control.
3	COMMS	19k2 Baud remote speed. Read only at power-up.	9k6 Baud remote speed. Read only at power-up.
4	NODE 4	Node address 0 to 15. Read only at power-up.	Node address 16 to 31. Read only at power-up.
5	FREERUN	Genlock mode (output is phase-locked to reference).	Free-run mode (output is sync-locked to serial input).
6	SETUP	No Setup	NTSC Setup.
7	VBI	PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282 blanked.	PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282 active.
8	525	PAL output with no inputs.	NTSC output with no inputs.

NODE SWITCH — Sets the remote node address in conjunction with NODE4 at power-up.

FRONT PANEL LEDs

INPUT	Green	Valid serial digital input detected.
ERROR	Red	Serial digital input lock error.
625	Yellow	PAL output.
525	Yellow	NTSC output.
GENLOCK	Green	Reference input detected.
ERROR	Red	Reference input lock error or mis-terminated reference.
REF LATE	Red	See table below.
REF EARLY	Red	See table below.
CONFIG	Yellow	Board undergoing configuration.
FREERUN	Yellow	Output not phase-locked to reference.
+5V	Green	Supply voltage present.
-5V	Green	Supply voltage present.

Time Base Corrector range LEDs

REF 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.
LATE	0	Sync input is 5 to 10 lines after serial digital input. Make Sync 5 lines earlier or SDI 5 lines later.
LATE	5	Composite output is 5 to 10 lines after serial digital input. Decrease V delay or make SDI 5 lines later.
EARLY	0	Sync input is up to 5 lines before serial digital input. Make SDI 5 lines earlier or increase V delay.
EARLY	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.

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

GAIN & LIFT

There are 5 potentiometers on the board. These are factory set and should not need adjustment.

REMOTE CONTROL

ACTIVE FRONT PANEL

Remote control of the ENC101 is possible with any of the Crystal Vision active front panels FR1-S, FP1L or FP2-LF.

Links J9 & J10 on the ENC101 must be set to '422' to enable active front panel control in a Crystal Vision frame (see page 12 REMOTE CONTROL LINK POSITIONS). DIL switch 2 'Remote' must be down (see page 5 DIL SWITCH).

All of the functions available from the card-edge are replicated as menus.

HOME MENU

The Home menu displays card type (ie ENC101), software version number (v540), remote control node number (0 to 31).
Text above the F-keys displays the menu selections Time (F1), Phase (F2), Gain (F3) & Misc (F4).
Pressing the HOME key within any menu returns to the Home menu.

SELECTION MENUS

These menus do not adjust any parameters but enable selection of the appropriate user menu by F-key presses.

Time sub-menu
A selection menu for V delay Lines (F1), H delay Fast (F2), H delay Fine (F3), Sub-Pixel delay (F4).

Phase sub-menu
A selection menu for ScH Phase Fast (F1), ScH Phase Fine (F2), Chroma Phase Offset (F3).

Gain sub-menu
A selection menu for Composite Gain (F1), Burst Gain (F2), NTSC Setup Gain & Enable (F3), Individual YC&UV Gains (F4).

Misc sub-menu
A selection menu for Test Patterns (F1), VBI Blanking (F2), Sync Mode (F3), More Misc (F4).

YC&UV Gain sub-menu
A selection menu for Y Gain (F1), C Gain (F2), U Gain (F3), V Gain (F4).

More sub-menu
A selection menu for Input Check (F1), Calibrate Gains (F2), Calibrate All (F3), PAL Line 6 Blanking (F4).

USER ADJUSTMENT MENUS

Vertical delay menu
Adds line delay from Sync to Output from 0 to 5 lines. CAL button press zeros the current setting.

Horizontal delay Fast menu
Adds delay from Sync to Output from –4μs to 1 line in approx. 0.5 sec steps. CAL button press zeros the current setting.

Horizontal delay Fine menu
Adds delay from Sync to Output from –4μs to 1 line in pixel steps. CAL button press zeros the current setting.

Sub-pixel delay menu
Adds delay from Sync to Output from –1 to +1 pixels in approx 2ns steps. CAL button press zeros the current setting.

ScH Phase Fast menu
Adds ScH phase offset from 0 to 360^{o} in ½^{o} steps. CAL button press zeros the current setting.

ScH Phase Fine menu
Adds ScH phase offset from 0 to 360^{o} in 1/16^{o}. CAL button press zeros the current setting.

Chroma Phase (NTSC Hue) Offset menu
Adds ScH to Chroma phase offset from 0 to 360^{o} (±2^{o} in PAL) in 1/16^{o} steps. CAL button press zeros the current setting.

Composite Gain menu
Varies YU&V gains simultaneously in 0.1% steps from 0 to 130% of nominal. CAL button press clears the current setting to 100%.

Burst Gain menu
Varies burst gain in 0.1% steps from 80 to 120% of nominal. CAL button press clears the current setting to 100%.

Setup Gain menu
When NTSC Setup is enabled (F4 to enable/disable), varies NTSC Setup in 0.1 IRE steps from –21.5 IRE to +21.5 IRE. CAL button press clears the current setting to +7.5 IRE.

Y Gain menu
Varies Y gain in 0.1% steps from 0 to 130% of nominal. CAL button press clears the current setting to 100%.

C Gain menu
Varies U&V gains simultaneously in 0.1% steps from 0 to 130% of nominal. CAL button press clears the current settings to 100%.

U Gain menu
Varies U gain in 0.1% steps from 0 to 180% of nominal. CAL button press clears the current setting to 100%.

V Gain menu
Varies V gain in 0.1% steps from 0 to 130% of nominal. CAL button press clears the current setting to 100%.

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

VBI menu
Blanks or unblanks the vertical blanking interval (PAL lines 7 to 22 & 320 to 335, NTSC lines 10 to 20 & 273-282). F1 button press changes VBI blanking.

Sync menu
Changes encoder between Genlock mode (output phase locked to Sync input) and Freerun mode (output sync locked to Serial Digital Input). F1 button press changes sync mode.

Input Check menu
Displays status of SDI & Sync inputs. F4 button press updates the screen with current status.

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	No Sync input connected.
Ref mis-term	Sync input is not terminated to 75Ω.
Ref bad burst	Sync input either has no burst or excessive phase jitter.

Cal Gains menu
F4 button press sets current values of Y, U, V, Burst & NTSC Setup gains to 100% of their nominal value.

Cal All menu
F4 button press clears all user adjustments & sets the board back to factory default settings.

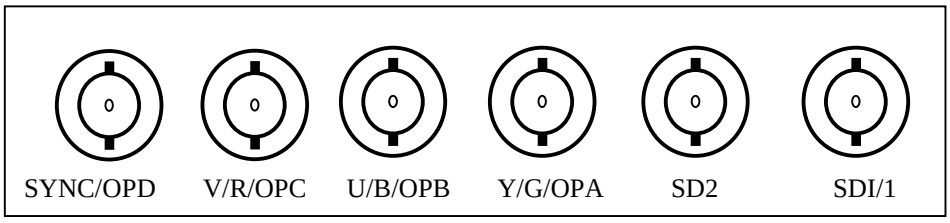
PAL Line 6 menu
F1 button press blanks or unblanks PAL lines 6 & 319 when VBI lines are unblanked. This is not adjustable from the ENC101 board. Customers without remote control requiring PAL line 6 unblanked, contact factory for details.

INSTALLATION INFORMATION

FR1-6 1U FRAME FOR 6 MODULES

The 1U FR1-6 frame for 6 modules includes rear panel BNC connections and plug-in power supply. A hinged front panel gives access to the PSU and all modules. The universal frame wiring system allows any of the interface range of modules to be fitted in any position. 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 CONNECTIONS



FR1-6 & FR2-12 Connections

SDI/1	Serial Digital Input.
SD2	Reclocked Serial Digital Output.
Y/G/OPA	Composite Video or Y plus sync (set by J4).
U/B/OPB	Composite Video or C (set by J5).
V/R/OPC	Composite Video.
SYNC/OPD	Composite Sync (B & B) input.

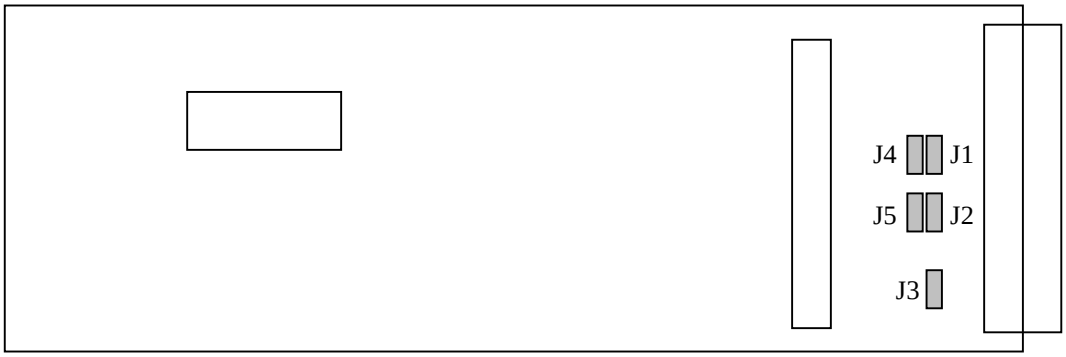
FR2-8 Connections

SDI/1	Serial Digital Input.
SD2	Reclocked Serial Digital Output.
Y/G/OPA	Composite Video or Y plus sync (set by J4).
Y/G/OPA(2)	Composite Video or Y plus sync (set by J1).
U/B/OPB	Composite Video or C (set by J5).
U/B/OPB(2)	Composite Video or C (set by J2).
V/R/OPC	Composite Video.
V/R/OPC(2)	Composite Video.
SYNC/OPD	Composite Sync (B & B) input.
SYNC/OPD(2)	Composite Sync Loop through (set by J3).

REAR CONNECTION LINK POSITIONS

Frame Connection	Link No.	Link Position	Signal
SDI/1			Serial Digital Input.
SD2			Reclocked Serial Digital Output.
Y/G/OPA	J4	COMPO	Composite Video.
		Y	Y plus sync.
Y/G/OPA(2)	J1	COMPO	Composite Video.
		Y	Y plus sync.
U/B/OPB	J5	COMPO	Composite Video.
		C	C.
U/B/OPB(2)	J2	COMPO	Composite Video.
		C	C.
V/R/OPC			Composite Video.
V/R/OPC(2)			Composite Video.
SYNC/OPD	J3	TERM	Composite sync 75Ω input.
		LOOP	Composite sync 1MΩ input.
SYNC/OPD(2)	J3	TERM	No connection.
		LOOP	Composite sync Loop through.

The positions of the rear connection jumper links are shown below.



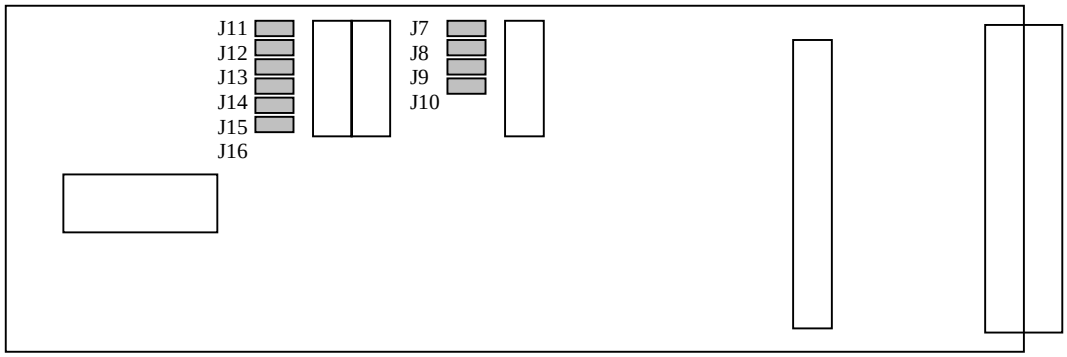
GENERAL PURPOSE INTERFACE

Remote control is possible by either RS232 or RS422 serial remote protocols or by GPI. In GPI configuration, remote switches can be used to emulate some of the front panel switches.

REMOTE CONTROL LINK POSITIONS

J11-16	J7-8	J9-10	'a'	'b'	'c'	'd'	'e'	'f'
RS	422	232	Remote 1 RS422 communication				Remote 2 RS232	
GPI			Remote 1 GPI connections				Remote 2 GPI	

The positions of the remote control jumper links are shown below.



REMOTE CONTROL PROTOCOL

Baud Rate	9k6 or 19k2 depending on DIL switch 3 position
Parity	None
Data Bits	8
Stop Bits	1
Hand shaking	None

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

The NODE rotary switch and DIL switch 4 position select one of 32 different remote protocol addresses for the board.

GPI CONNECTIONS (Remote 1)

	OPEN	CONNECT TO GROUND
'a'	Genlock mode	Free-run mode
'b'	No Setup	NTSC Setup (defalut 7.5 IRE)
'c'	PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282 blanked.	PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282 active.
'd'	PAL output with no inputs.	NTSC output with no inputs.

GPI CONNECTIONS (Remote 2)

	OPEN	CONNECT TO GROUND
'e'	Not Used.	Not Used.
'f'	Not Used.	Not Used.

REMOTE CONNECTIONS

Each slot has an associated set of connections on the frame rear-panel remote connectors. The tables below show the GPI connections described above.

FR1-6 FRAME
Remote 1: 26 way high density D-type **socket**. Frame ground is pin 2.
Remote 2: 26 way high density D-type **plug**. Frame ground is pin 6.
Table shows Pin number (Remote number)

Slot no.	'a' pin no.	'b' pin no.	'c' pin no.	'd' pin no.	'e' pin no.	'f' pin no.
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)

FR2-12 FRAME
Remote 1 and **Remote 3**: 26 way high density D-type **sockets**. Frame ground is pin 2.
Remote 2 and **Remote 4**: 26 way high density D-type **plugs**. Frame ground is pin 6.
Table shows Pin number (Remote number)

Slot no.	'a' pin no.	'b' pin no.	'c' pin no.	'd' pin no.	'e' pin no.	'f' pin no.
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)	19 (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)

FR2-8 FRAME
Remote 1 and **Remote 2**: 26 way high density D-type **sockets**. Frame ground is pin 1.
PSU Relay connection on pin 10.
Table shows Pin number (Remote number)

Slot no.	'a' pin no.	'b' pin no.	'c' pin no.	'd' pin no.	'e' pin no.	'f' pin no.
1	8 (1)	9 (1)	17 (1)	18 (1)	25 (1)	26 (1)
2	6 (1)	7 (1)	15 (1)	16 (1)	23 (1)	24 (1)
3	8 (2)	9 (2)	17 (2)	18 (2)	25 (2)	26 (2)
4	6 (2)	7 (2)	15 (2)	16 (2)	23 (2)	24 (2)
5	4 (1)	5 (1)	13 (1)	14 (1)	21 (1)	22 (1)
6	2 (1)	3 (1)	11 (1)	12 (1)	19 (1)	20 (1)
7	4 (2)	5 (2)	13 (2)	14 (2)	21 (2)	22 (2)
8	2 (2)	3 (2)	11 (2)	12 (2)	19 (2)	20 (2)

SOFTWARE RELEASE NOTES

Issue 5.40 Standard issue.

Issue 5.41 PAL lines 6-22 & 319-335 active.