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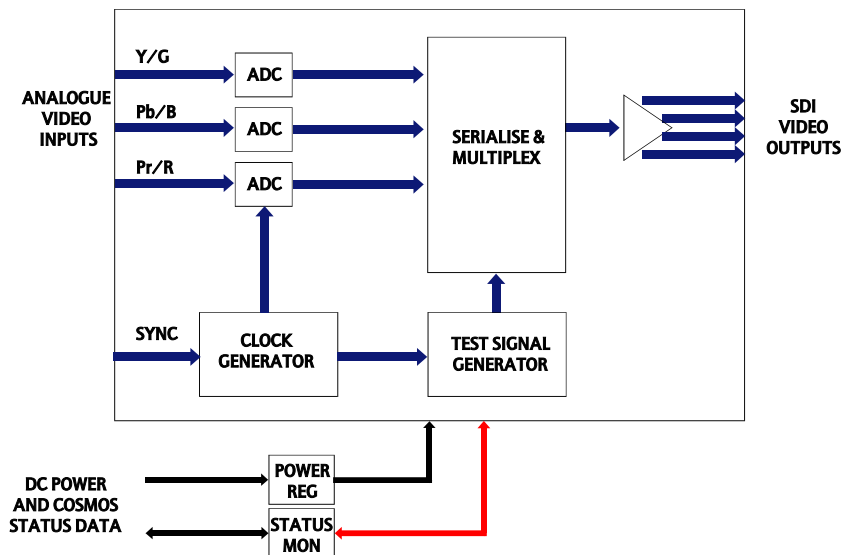
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1 Introduction

The 3410 is a precision 10 bit 270Mb/s component analogue to digital video converter with full ITU-R 601 filtering. Inputs may be configured for GBR or Y, Pb, Pr. External syncs can be accepted on a separate input or as 'sync on green' or 'sync on luminance'. A variety of test patterns may be generated and remote configuration and monitoring via COSMOS is provided.

The features available are:

- three GBR or Y Pb Pr analogue video inputs
- syncs on Y/G or separate external sync
- four SDI outputs with the K3410-3 30mm rear connector or two with the K3410-2 20 mm rear connector
- 10 bit 270Mbit/s processing
- automatic 525/625 operation
- set-up (pedestal) removal on/off in 525
- VANC (Vertical Ancillary Data) deletion on/off
- variable/calibrated (N10) gain settings
- internal test signals
- COSMOS equipped

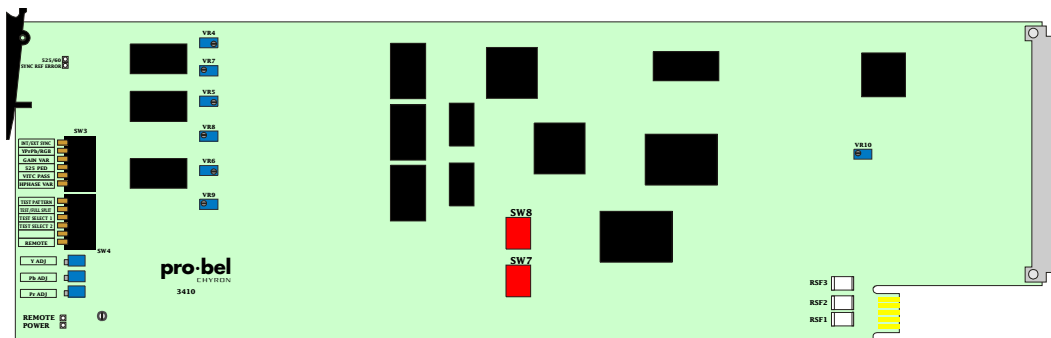
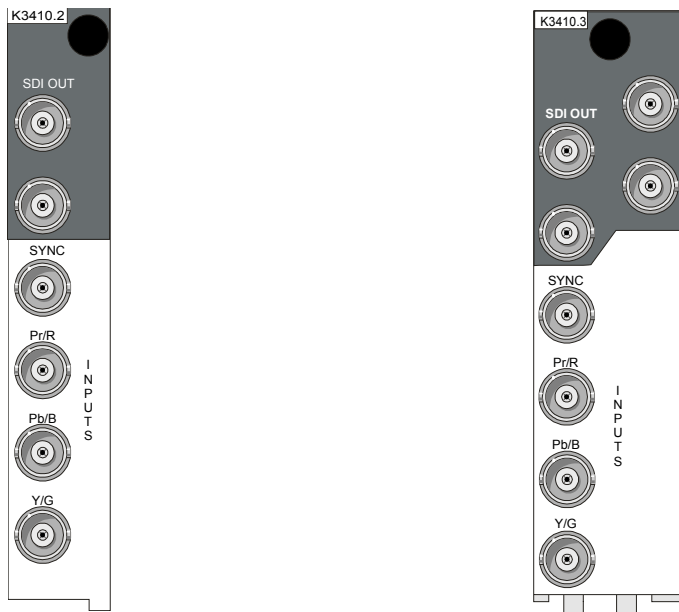


The 3410 Component video analogue to digital converter

2 Configuration and operation

2.1 Selecting the rear connector

The 3410 may be used with either the 20mm K3410-2 rear connector or the 30mm K3410-3 rear connector which provides two additional SDI outputs.



The 3410 Component video digital to analogue converter

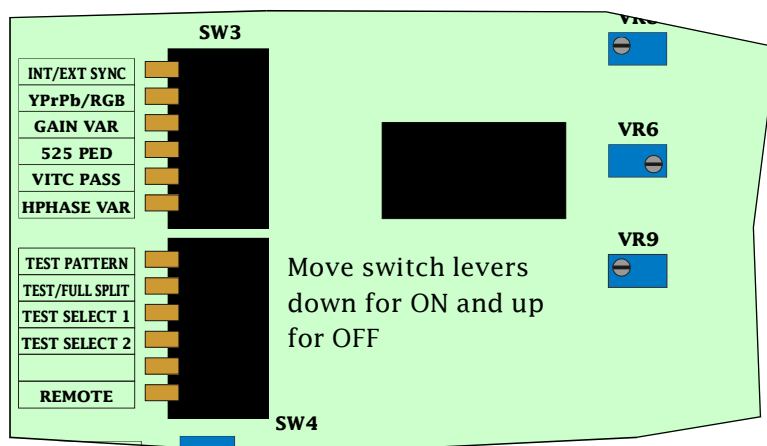
Please refer to the installation chapter for help with installing modules and rear connectors into the ICON frame.

2.2 Setting input and reference options

The analogue component input may be set for Y, Pb, Pr or GBR formats. Syncs may be accepted with the luminance (Y) or green (G) signal or as a separate external input.

Horizontal phase is provided and a 525 set-up removal mode is also available. The analogue input gain may be manually adjusted from front controls or left calibrated according to SMPTE/EBU N10. In addition the converter may be set to pass or delete VANC (vertical ancillary data). COSMOS allows many of these functions to be controlled remotely.

The front control dip switch settings are shown in the following diagram. The table below summarises the functions of the first switch bank.

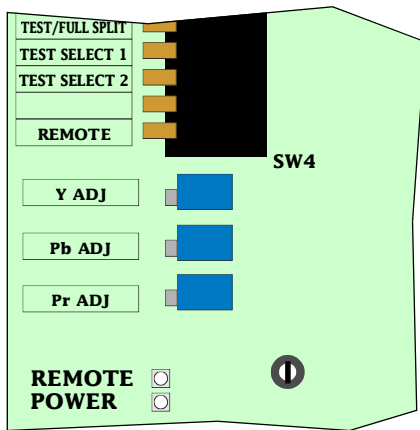


Front switch controls - SW3

SW3 lever name	OFF function	ON function
INT/EXT SYNC	Input sync from Y/G	Input sync from ext sync input
YPrPb/RGB	Y Pr Pb mode	RGB mode
GAIN VAR	Pre-set gain	Variable gain (see 2-3)
525 PED	Set-up (pedestal) on input passed to digital output	Set-up (pedestal) on input deleted
VITC PASS	VANC (Vertical Ancillary Data) on input deleted	VANC (Vertical Ancillary Data) on input passed to output
HPHASE VAR	Pre-set horizontal phase	Variable horizontal phase (see 2.4)

2.3 Component level adjustment

Gain adjustment is provided for the module analogue inputs for compatibility with both Betacam and M-II formats. Adjustment ranges are shown relative to SMPTE/EBU N10 levels.



Front gain controls

Name	Description
Y ADJ	Luminance gain ± 1 dB
Pb / Pr ADJ	Pb/B or Pr/R gain +1 dB to -3dB

NOTES:

Signal gain adjustable in Gain Var mode only.

Other module adjustments are factory preset only and should not require re-adjustment.

Standard component levels

The following tables summarise standard analogue component levels for SMPTE/EBU with and without set-up in 525.

GBR					
	Max	Min	Video	Sync	P-P
SMPTE/EBU N10	700mV	0mV	700mV	-300mV	1V
525 no set-up	714mV	0mV	714mV	-286V	1V
525 with set-up	714mV	54mV	660mV	-286V	1V

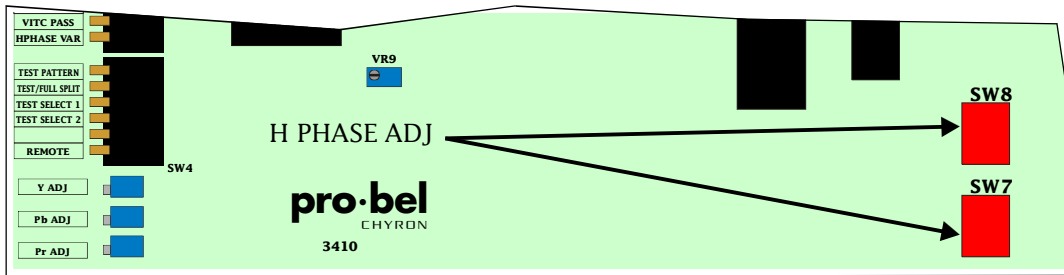
Y Pb Pr SMPTE/EBU N10 - no set-up					
	Max	Min	Video	Sync	P-P
Y (100% bars)	700mV	0mV	700mV	-300mV	1V
Pb, Pr (100% bars)	350mV	-350mV	700mV		700mV
Y (75% bars)	525mV	0mV	525mV	-300mV	825mV
Pb, Pr (75% bars)	262.5mV	-262.5mV	525mV		525mV

Y Pb Pr 525 with set-up (Betacam®)					
	Max	Min	Video	Sync	P-P
Y (100% bars)	714mV	54mV	660mV	-286mV	1V
Pb, Pr (100% bars)	467mV	-467mV	934mV		934mV
Y (75% bars)	549mV	54mV	495mV	-286mV	835mV
Pb, Pr (75% bars)	350mV	-350mV	700mV		700mV

Y Pb Pr 525 with set-up (MII®)					
	Max	Min	Video	Sync	P-P
Y (100% bars)	700mV	53mV	647mV	-300mV	1V
Pb, Pr (100% bars)	324mV	-324mV	648mV		648mV
Y (75% bars)	548mV	53mV	495mV	-300mV	848mV
Pb, Pr (75% bars)	243mV	-243mV	486mV		486mV

2.4 Setting horizontal phase

With SW 3 HPHASE VAR ON, it is possible to vary the timing of the TRS (timing reference signal) with respect to video by approximately $\pm 2.35 \mu\text{s}$. The timing is controlled by two rotary controls, SW7 and SW8 placed in the lower middle of the module. A long flat bladed screw driver will be needed to make adjustments.

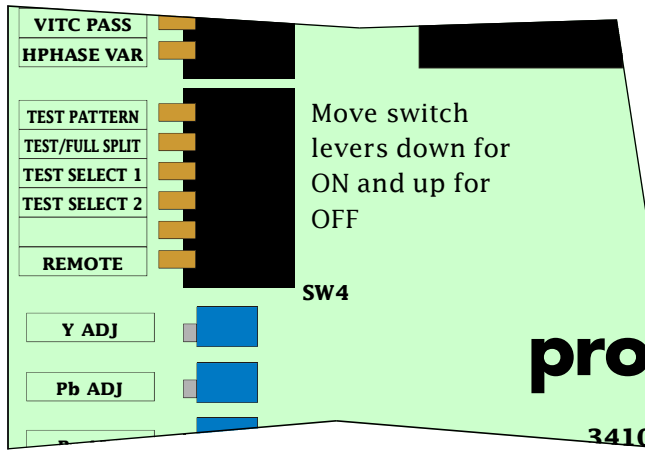


Horizontal phase range		
HEX No.	SW8 - Coarse .296 μs steps	SW7 - Fine 37ns steps
0	-2.368 μs	0.0ns
1	-2.072 μs	0.0ns
2	-1.776 μs	37ns
3	-1.48 μs	37ns
4	-1.184 μs	74ns
5	-.888 μs	74ns
6	-.592 μs	111ns
7	-.296 μs	111ns
8	0.0 μs	148ns
9	.296 μs	148ns
A	.592 μs	185ns
B	.888 μs	185ns
C	1.184 μs	222ns
D	1.48 μs	222ns
E	1.776 μs	259ns
F	2.072 μs	259ns

Note: Zero offset is found by setting 80Hex (SW8=8, SW7=0) or by setting HPHASE VAR to off.

2.5 Internal test patterns

The 3410 is equipped with internal black and colour bar test patterns which may be split or full screen. Test patterns are enabled by setting the Test Pattern switch on the front of the module to ON and then selecting the appropriate test signal with SELECT 1 and SELECT 2.



Internal test signals	
SW4 lever	
TEST PATTERN	Set this lever ON to enable test signals
TEST FULL/SPLIT	Set this lever ON to enable split screen mode
TEST SELECT 1/2	Selects test signal - see further table

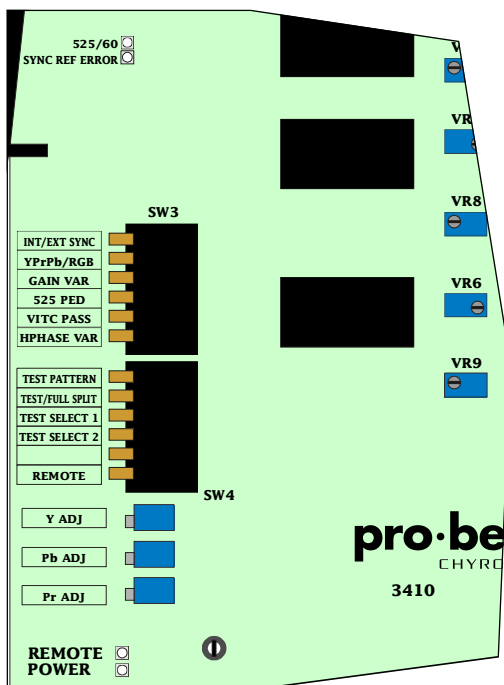
Test signal selection		
SELECT 1	SELECT 2	Test pattern
OFF	OFF	75% colour bars
OFF	ON	100% colour bars
ON	OFF	Black
ON	ON	Black

2.6 Remote mode

To allow remote configuration of the module by COSMOS set SW3 REMOTE switch to ON. The yellow remote LED will illuminate to indicate that the module is now under COSMOS control.

2.7 Status LEDs

The module is equipped with the following LEDs to provide a means of monitoring operation:



Indicators		
LED	Colour	Function
SYNC REF ERROR	Red	Internal PLL not locked/ref absent
525/60	Yellow	Automatic line standard selection - illuminated in 525 mode
REMOTE	Yellow	Remote COSMOS configuration operation selected
POWER	Green	Power OK

Note: In local operation and 625/50 mode only the green POWER LED should be lit.

3 **Trouble shooting**

The Sync Error LED is lit

- check that either a valid analogue reference serial or valid sync on luminance or green is provided and that the position of the INT/EXT SYNC switch is correct.

Video black level is raised in 525 mode

- check that the 525 PED switch is not on if 7.5 IRE set-up is not required

Output levels are incorrect

- for calibrated N10 levels check that the GAIN VAR switch is off

The Power LED is not lit

- check mains power to the frame is turned on
- if necessary check the PSU as explained in the power supply section
- check the card is plugged in securely
- check to see if one of the re-settable fuses has operated. To do this turn the power off, wait for thirty seconds and then restore the power.

4 COSMOS status monitoring

The 3410 module will provide the following information to the COSMOS status monitoring controller (if fitted):

- standard selection (automatic)
- input sync error
- pass VANC on/off
- 525 set-up on/off
- Var/Fixed gain
- YPbPr/GBR selection
- internal/external sync
- H phase var/cal
- Test select 1 and 2
- Power OK
- local/remote control select switch status

In remote mode, the following may also be controlled through COSMOS

- pass VANC on/off
- 525 set-up on/off
- Var/Fixed gain
- YPbPr/GBR selection
- internal/external sync
- H phase var/cal
- Test select 1 and 2

In addition, the module is programmed with the following information, which can be read by the status monitoring controller:

- module present
- module type
- module bar code
- module issue no

For further details of the Pro-Bel status monitoring system please refer to the COSMOS status monitoring manual.

5 Specification

Inputs

Number and type:	Three analogue component video, 1Vpp nominal, Y/G, Pb/B, Pr/R One analogue reference, mixed sync or composite video, terminated
Impedance:	75Ω unbalanced

Outputs

Number and type:	Four 270Mb/s serial digital video input to EBU Tech 3267E, SMPTE 259M - C (two with 20mm rear panel)
Impedance:	75Ω unbalanced

Performance

Input return loss:	> 40dB to 4.43MHz
Gain:	Error (cal mode) <1% any component Stability 1 hour <1% any component
Pulse and bar response:	Luminance 2T <0.3%K Chrominance 4T <0.3%K
Sweep response:	Luminance 0.1dB to 5.5MHz Chrominance 0.1dB to 2.75MHz
Delay:	Delay inequality <10ns between any components
Group delay ripple:	Luminance ±3ns to 5.75MHz Chrominance ±6ns to 2.75MHz
Noise:	<-62dB rms 100Hz to 5MHz
Crosstalk:	<-50dB between any component
Amplitude non-linearity:	<1%

On-card controls

Internal/external sync
YPbPr/GBR
Horizontal phase (TRS wrt video)
Set-up on/off (525)
SMPTE/EBU N10 levels/variable
Vertical blanking on/off
Test pattern/video/split screen
Test pattern: black, 75% bars, 100% bars
Luminance/Green gain
Pb/Blue gain
Pr/Red gain

LED indicators

525/60 - yellow
Sync ref error - red
Remote control mode - yellow
Power OK - green

6 **Ordering information**

Part number**Description**

ICO-3410-2000

Component video ADC with two SDI outputs,
20mm

ICO-3410-3000

Component video ADC with four SDI outputs,
30mm