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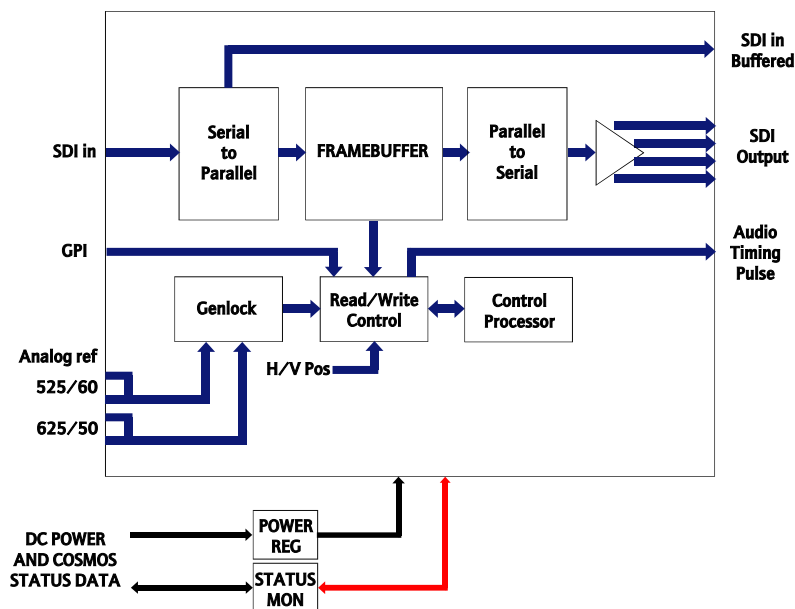
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1 Introduction

The 3403 is an advanced SDI frame store synchroniser capable of synchronising asynchronous feeds or providing a fixed delay. In the synchronising mode, it takes its reference from one of two analogue video inputs, automatically selecting 525 or 625. A 5 volt tracking pulse passes phasing information to an accompanying audio delay unit such as the Pro-Bel 4423. Configuration settings can be remotely controlled or monitored via the COSMOS interface.

The main features available are:

- local control of output phasing in 1/16 line steps within ± 8 lines of reference
- COSMOS control provides full phasing with single pixel resolution
- four SDI outputs
- dual analogue 525/625 references
- auto standard sensing
- passes all HANC and VANC data
- audio tracking pulse output
- frame and field freeze mode
- flexible panic freeze when input fails
- local controls or full COSMOS remote control



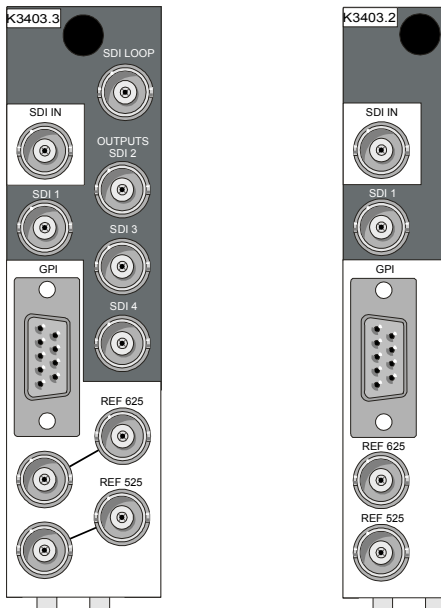
The 3403 SDI frame synchroniser



2 Installation

2.1 Selecting the rear connector

The 3403 can be used with either the 30mm K3403-3 or the 20mm K3403-2 rear connector. The 20mm rear connector allows higher packing densities to be achieved when populating frames, but only one SDI output is provided and reference loop through outputs are not available.

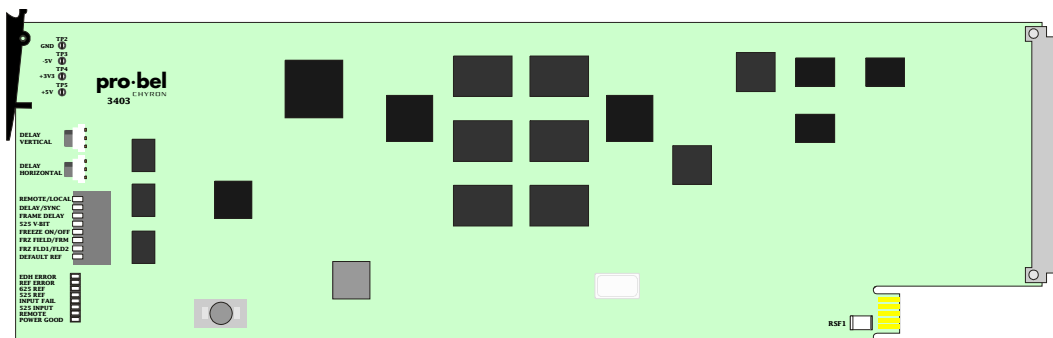


Note:

The 20mm rear connector supplies 75Ω termination to all signal inputs.

External termination arrangements must be made when using the 30mm rear connector.

There are no termination arrangements on the module itself



The 3403 SDI frame store synchroniser

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

2.2 Rear connector pin-out

Both 20mm and 30mm rear connector have a 9 way female 'D' connector for GPI inputs and the audio delay tracking pulse output.

Control pin-out		
Pin	Name	Description
1	GND	Ground
2	GPI 1	See table below
3	GPI 2	See table below
4	GPI 3	See table below
5	GPI 4	Not assigned
6	Audio T Out	Tracking pulse to audio delay
7	GND	Ground
8	N/C	Not connected
9	GND	Ground

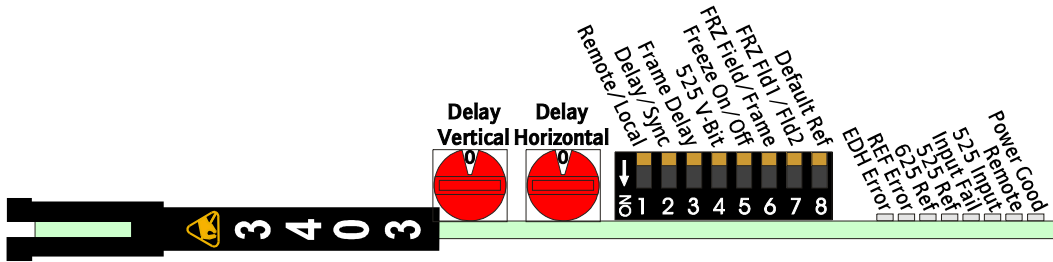
2.3 GPI assignment

GPI assignment		
GPI	Function when low	Function when high
1	Freeze	Normal (Live)
2	Field Freeze	Frame Freeze
3	Field 1	Field 2

Note: When GPI-1 (Freeze On/Off) is low, freeze is active. The type of freeze is determined by GPI-2 and GPI-3. These GPI lines override any COSMOS or DIP switch settings, but COSMOS will always show the correct status. Please refer to the Status monitoring chapter for more information of COSMOS control of this module.

3 Configuration and operation

Ensure that the Remote/Local lever is in the UP position to enable local control.



Card edge controls

Card edge controls consist of two rotary switches to change delay and an 8-way DIP switch to set operating mode and options.

3.1 DIP switch functions

DIP switch allocation is shown in the following table:

DIP switch functions		
Lever	Lever Down (ON)	Lever UP (OFF)
1	Remote (COSMOS)	Local
2	Delay mode	Synchroniser mode
3	Whole frame(Delay mode only)	Adjustable delay
4	525 V bit early	V bit as input
5	Freeze on	Pass video (live)
6	Field Freeze	Frame freeze
7	Field 1 freeze	Field 2 freeze
8	Default ref 525	Default ref 625

3.2 Using delay/offset controls

In Delay mode (DIP lever 2 ON) the rotary controls alter the delay with respect to the input, in Synchroniser mode the rotary controls alter the output timing offset with respect to the external reference.

The 'Delay Vertical' switch changes output timing over a fifteen line range, whilst the 'Delay Horizontal.' switch changes output timing over a 60µs range. The total possible range is 15 and 15/16 lines.

The output timing switch assignment is as shown in the following tables:

Delay vertical				
Switch No	625	525	Function	Comment
0	0	0	No offset	Output co-timed with reference in synchroniser mode, or with input in delay mode
1	1	1	1 line delay	
2	2	2	2 line delay	
3	3	3	3 line delay	
4	4	4	4 line delay	
5	5	5	5 line delay	
6	6	6	6 line delay	
7	7	7	7 line delay	
8	617	517	8 line advance	In practice, the module can only supply delay. The delay is described as advance for convenience only.
9	618	518	7 line advance	
A	619	519	6 line advance	
B	620	520	5 line advance	
C	621	521	4 line advance	
D	622	522	3 line advance	
E	623	523	2 line advance	
F	624	524	1 line advance	

Delay horizontal		
Switch No	Offset/delay (luma samples)	Comment
0	No offset	If Delay vertical is also '0', output will align with reference in synchroniser mode, or with input in delay mode
1	54	1/16 of a line
2	108	2/16 of a line
3	162	3/16 of a line
4	216	4/16 of a line
5	270	5/16 of a line
6	324	6/16 of a line
7	378	7/16 of a line
8	432	8/16 of a line - half a line delay
9	486	9/16 of a line
A	540	10/16 of a line
B	594	11/16 of a line
C	648	12/16 of a line
D	702	13/16 of a line
E	756	14/16 of a line
F	810	15/16 of a line - near 1 line delay

Notes:

One line has 864 luminance samples (in 625). Each increment in the above table is in 1/16 of a line or approximately 4µs.

COSMOS control provides full frame adjustment with single pixel resolution and separate settings for 525 and 625 line sources. Please refer to the Status monitoring chapter for more information of COSMOS control of this module.

3.3 Synchroniser and delay modes

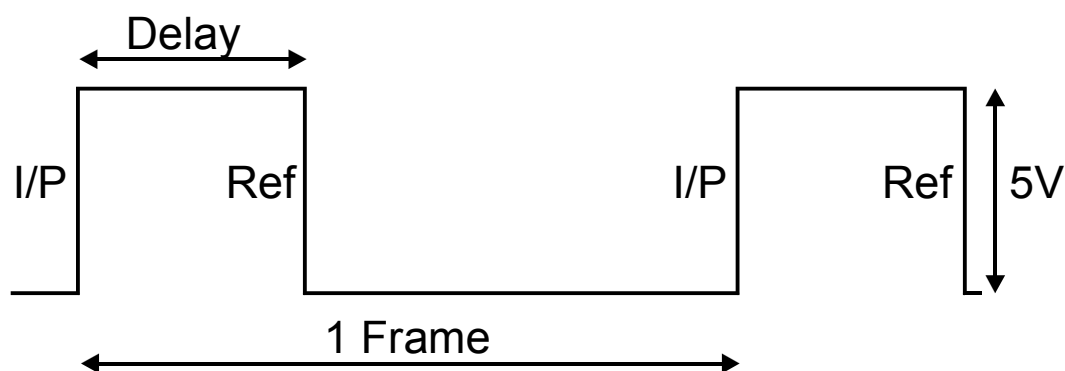
The module is set to synchronise the input with respect to one of the reference inputs or simply delay the input with DIP lever 2. The synchroniser mode is used to bring asynchronous sources such as satellite or OB feeds in line with station references whilst the delay mode is typically used to match video and audio for lip sync purposes or to compensate for video delay in frame based processors.

The rotary delay/offset controls are active in local mode for either Delay or Synchroniser modes. However, in Delay mode DIP switch 3 may be moved to the DOWN position to override the delay controls and provide a fixed full frame delay through the module.

A tracking pulse is available to allow an external audio delay to be kept in sync with the video delay when the unit is in synchroniser mode.

3.4 Using the tracking pulse

The tracking pulse is a 5 volt signal where, the positive going edge aligns with the input signal and the negative going edge aligns with the reference. The time difference between the two indicates the delay through the synchroniser.



Audio tracking pulse

3.5 Reference handling

In synchroniser mode, the module takes its reference from one of two analogue video inputs, automatically selecting 525 or 625 lines as required. The switch-on power-up choice may be accelerated by using DIP lever 8 to select the default reference as 525 or 625. This default setting will be maintained until a valid input is detected.

The reference selected will always follow the input. However, if the input is lost momentarily, the reference selection does not change, irrespective of the Default setting, if an input of the same standard is restored.

Although the module does not terminate any signal, the 20mm rear connector has termination built in. If the 30mm rear connector is used, reference termination may be applied to the looping inputs if required.

3.6 Using freeze mode

The GPI inputs are always active irrespective of the position of the Local/Remote lever. If card edge control of the freeze functions is required, ensure that the GPI inputs are inactive (not grounded or high).

To freeze an input signal from the card edge controls move DIP lever 5 to the ON position (DOWN). The type of freeze may now be pre-set with the Frame/Field control. Move DIP lever 6 DOWN for a field freeze and UP for a frame freeze. If a field freeze is selected, the field shown may now be chosen. Move DIP lever 7 DOWN to display field 1 and UP to display field 2. Unfreeze the input by moving DIP switch 5 UP.

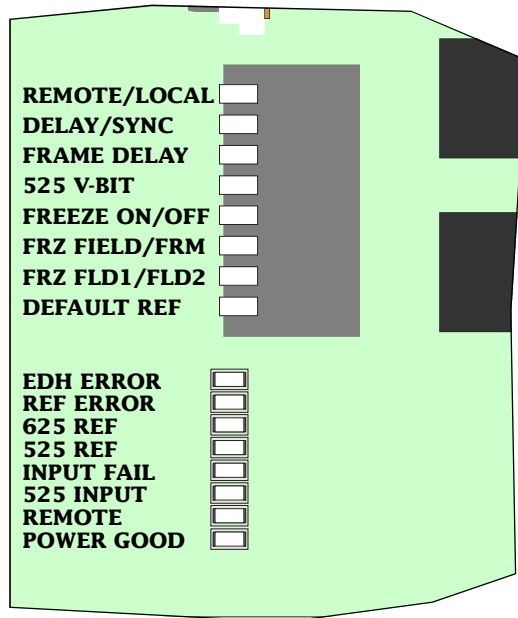
3.7 Panic freeze

If the input signal is lost during synchroniser mode, a field freeze is automatically asserted. If no input signal is present for five seconds, the output will automatically cut to black. The cut to black 'colour' and time delay may be changed to blue via the COSMOS interface.

The field displayed is always the field previous to the field being written to the frame store when the input was lost.

3.8 Status LEDs

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



Indicators		
LED	Colour	Function
EDH Error	Red	Illuminates if EDH error occurs
Ref Error	Red	Illuminates if reference absent or oscillator not locked
625 Ref	Yellow	625 reference selected
525 Ref	Yellow	525 reference selected
Input Fail	Red	Illuminates when input PLL not locked
Remote	Yellow	Illuminates in Remote (COSMOS) mode
Power Good	Green	Power OK

Notes:

Ensure that the REMOTE/LOCAL lever is UP for local operation.

4 **Trouble shooting**

The Input Error LED is lit

- check that a valid SDI signal is connected to the rear connector input BNC

Local or COSMOS freeze controls do not work as expected

- check that the external GPIs are not active

The EDH Error LED is lit

- check the EDH status of the input signal
- ensure that the input cabling is intact and that recommended lengths are not exceeded

The Ref Error LED is lit

- check that a valid 525 or 625 SDI reference signal is connected as required to the appropriate rear connector input BNC

The output is not synchronised in downstream equipment

- check that the 525 V bit is set as required- the recommended state is 'as input', but older equipment may require an 'early' setting
- check the syncs requirement of the downstream equipment
- check module is in synchronising mode and reference is same as downstream equipment

The Power LED is not lit

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



5 COSMOS status monitoring

The 3403 module will provide the following read only status information to the COSMOS status monitoring controller (if fitted):

- input 525/625
- input present
- reference present
- power OK
- local/remote configuration select switch status

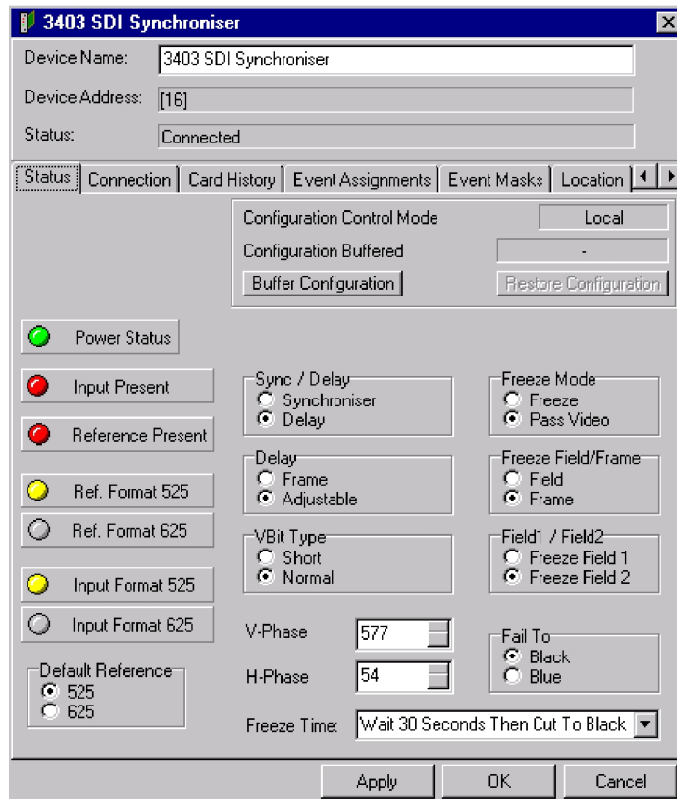
The following status information is sent to COSMOS when the data changes and may also be controlled in remote mode:

- synchronise/delay
- fixed one frame delay/adjustable
- modify V bit (525)
- freeze
- freeze frame/field
- freeze field 1/2
- default reference 525/625
- vertical phase
- horizontal phase
- delay before cut to colour
- cut to black/blue

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.



The 3403 COSMOS interface

COSMOS provides status reporting and full configuration of the 3403 including full phasing control with single pixel resolution.

6 Specification

Input

Number and type:	One SDI to SMPTE 259M-C, 270Mbit/s
Connector/Impedance:	BNC/75 Ω
Equalisation:	Automatic up to 300m Belden 8281

Reference

Type:	Two, analogue 1Vpp black & burst for 525 lines and 625 lines, auto sensing.
Connector/Impedance:	Looping on 30mm panel, 75 Ω terminated on 30mm panel.

Outputs

Programme:	Four x SDI to SMPTE 259-C 270Mb/s. Synchronised or delayed.
Connector/Impedance:	Four x BNC/75 Ω unbalanced
Buffered input:	One x SDI to SMPTE 259-C 270Mb/s.
Connector/Impedance:	One x BNC/75 Ω unbalanced
Auto Tacking Pulse:	Frame rate positive pulse, width equal to current video delay.
Connector:	BNC

Performance - SDI

Input/Output return loss:	> 15dB 5MHz to 270MHz
Output amplitude:	800mV pp \pm 10% into 75 Ω
Overshoot:	<10%
Jitter:	<0.2 UI pp
Rise/fall time:	>0.4ns, <1.5ns

Local control

Eight position DIP switch and 2 x miniature rotary switches controlling the following functions:

- Enable COSMOS control
- Synchronise/Delay
- Fixed one frame delay
- Freeze
- Freeze frame or field
- Freeze field 1 or 2
- Default reference
- H phase (16 position)
- V phase (16 position)

LED indicators

- Input fail
- Reference error
- Reference selected (2)
- Power status
- Remote control (COSMOS) enabled

7 **Ordering information**

Part number

ICO-3403-2000

ICO-3403-3000

Description

SDI frame store synchroniser, 20mm

SDI frame store synchroniser, 30mm