FTX HD

Dual channel HD or SD to fibre optic transmitter

USER MANUAL

Crystal Vision

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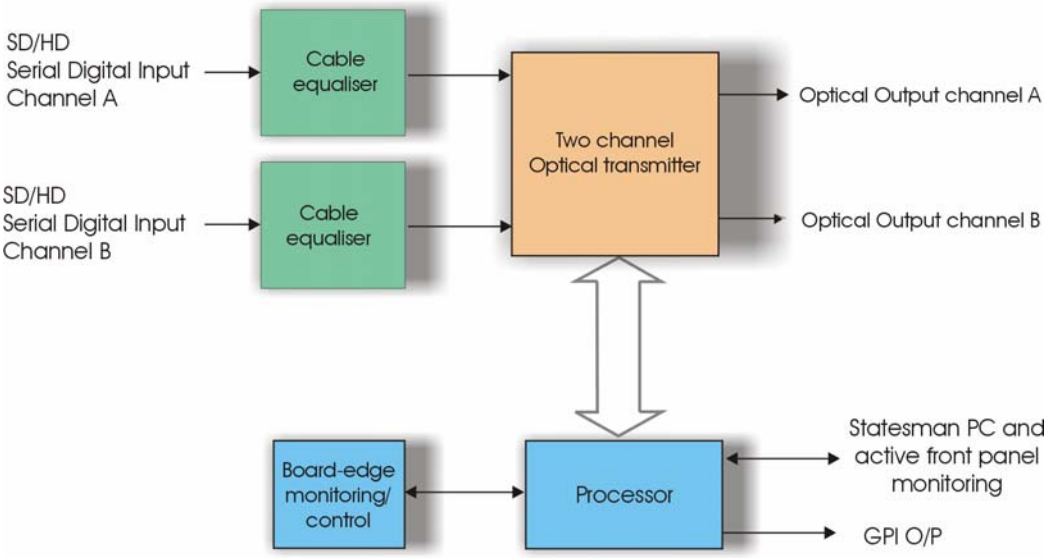
Contents

1 Introduction

The FTX HD is a two-channel serial digital video optical transmitter that will accept both High Definition and Standard Definition video.

The universal connection system allows a mixture of Crystal Vision modules in the frame. The modules plug in the front and the rear connectors plug in the back. A removable front panel reveals LED indication of input and PSU status when opened.



FTX HD two channel SDI optical transmitter

The range of Crystal Vision optical boards has been designed to work in conjunction with the Indigo 4 and the Indigo 2 and Indigo 1 frames of issue 2 and above. The board may be plugged into any of the PCB slots, the only proviso being where it needs to be placed below a Standard Definition board. The rules governing frame configuration are explained in the installation chapter.

The RM31 single slot rear connector provides two serial digital inputs and two optical outputs with up to 24 modules in 4U of rack space.

Note: You can find the issue number of a frame inside at the front.

The Indigo frames have been designed to accept any selection of boards from our range of Standard Definition, High Definition, audio, video and optical products. The high packing density allows up to six modules in 1U, up to 12 modules in 2U and up to 24 modules in 4U.

The main features of the FTX HD are as follows:

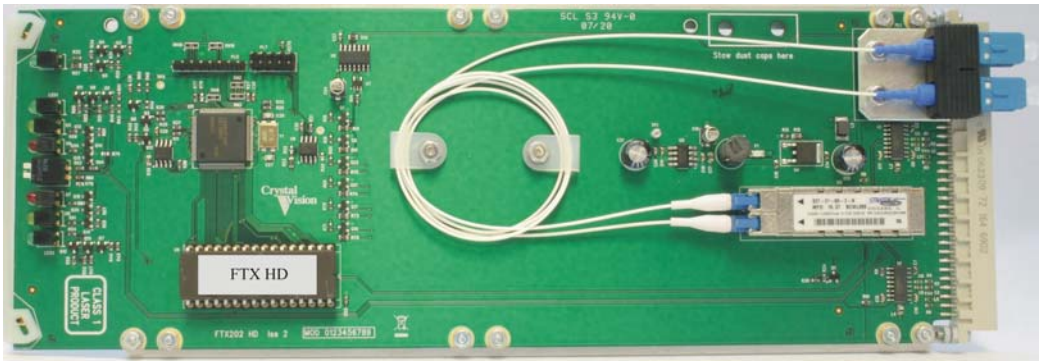
- 2 channel HD/SD serial digital optical transmitter SMPTE 292M/297M compliant
- Handles pathological test pattern
- 1310nm class 1 compliant two channel laser module
- LED SDI input presence indication

- Indication of laser near end of life and shutdown
- Automatic and manual laser shutdown
- Single-mode fibre system

FTX HD

The two identical channels of the FTX HD optical transmitter are completely independent of each other. Each channel consists of a serial digital input section, which equalises the input signal for cable length, a driver module and laser diode. Both channels are under the control of a CPU, which monitors and reports their status.

At the heart of the FTX HD is a two-channel state-of-the-art laser driver module incorporating automatic power control, which gives the laser diode emitters a stable performance throughout their lifetime. Safety circuitry within the laser module monitors the operation of the laser driver and forces a shutdown should any critical parameters be exceeded. Warning is also given once the laser is considered to have reached near to the end of its expected lifetime. This warning is triggered after approximately 85% of its expected lifetime has expired.



FTX HD dual channel HD/SD optical transmitter

The FTX HD is designed to work into single-mode optical cable and is capable of achieving distances in excess of 30km depending on cable quality and number of connectors and splices. The FTX HD will also work into multi-mode optical cable in some circumstances and distances of approximately 1km are achievable with a Standard Definition video input. Distances of 200-300m may be achievable with a High Definition video input but performance with multi-mode fibre is not guaranteed.

Note: Caution this product emits high intensity light. Suitable precautions must be taken when servicing the rear of a frame containing this product due to the possible damaging nature of high intensity light.

2 Hardware installation

The Crystal Vision optical boards have been designed to work in conjunction with the Indigo 4 frames, or Indigo 1 and 2 frames of issue 2 or higher. All modules can be plugged in and removed while the frame is powered without damage.

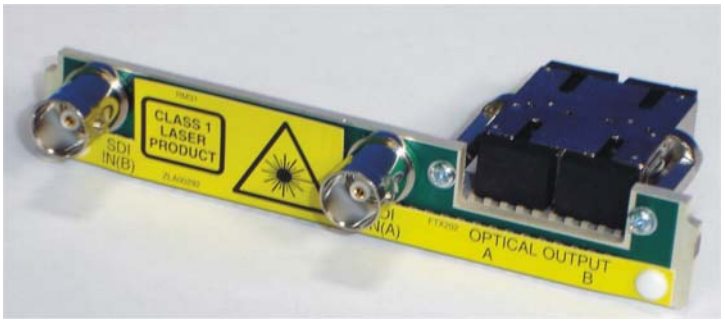
Note: You can find the issue number of a frame inside at the front.

Handling

Due to its fragile nature fibre optic equipment must be handled with care. Sharp blows or snagging the fibre pigtails will fracture the internal glass filament and destroy its light carrying ability. A degraded performance will also result if a build-up of dust and dirt film on the connector ferrules is allowed to occur. It is strongly recommended that the supplied dust caps are replaced whenever the transmitter card or rear modules are de-mounted for any reason.

PCB connectors with the dust caps fitted

The RM31 rear module is fitted with dust caps on both sides of the optical connector. The pair of dust caps that will be internal to the frame must be removed before the rear module is fitted. The external pair can then be removed when the fibre tails are connected. It is also recommended that dust caps should be re-fitted if the fibre tails are to be removed for any length of time. Should the FTX HD be removed for any length of time it is recommended that the rear module should also be removed and stored with the dust caps in place.



RM31 rear module with dust caps fitted to both sides of the optical connector

2.1 Universal rear connectors

When using the RM31 single height rear connector, the 4U Indigo 4 frame will house up to 24 modules and three power supplies, the 2U Indigo 2 frame will house up to 12 modules and dual power supplies, while the 1U Indigo 1 frame will house six modules and a single or dual power supply. The 1U desktop box will not currently accept the Crystal Vision optical modules.

The Indigo frames have hinged front panels giving access to the PSU and all modules. The universal frame wiring system allows any of the interface modules to be fitted in [(1)] all positions with the use of removable rear modules.

[(1)] Due to height restraints, there are restrictions when mixing optical modules with other Crystal Vision modules.

Loading restrictions

The FTX HD can be loaded into any slot position of compatible frames but due to its extra height it is not possible to place cards from the Crystal Vision Standard Definition video or audio range directly above it in certain positions. HD cards do not share this restriction.

Frame type			
Indigo 4	xxxxxxxx	xxxxxxxx	xxxxxxxx
	Optical module	Optical module	Optical module
	xxxxxxxx	xxxxxxxx	xxxxxxxx
	Optical module	Optical module	Optical module
Indigo 2	xxxxxxxx	xxxxxxxx	xxxxxxxx
	Optical module	Optical module	Optical module
Indigo 1	xxxxxxxx	xxxxxxxx	xxxxxxxx
	Optical module	Optical module	Optical module

Optical cards loaded in these slots will not allow Standard Definition or audio cards to be fitted in the slots immediately above.

Rear module connections with RM31

RM31 fits in all frames	Description
	**RM31** • 24 modules in 4U, 12 modules in 2U & six in 1U • All frame slots can be used

BNC	I/O assignment
Optical Input (B)	Optical serial digital video output (B)
Optical Input (A)	Optical serial digital video output (A)
SDI IN(A)	Channel A HD/SD Serial digital input
SDI IN(B)	Channel B HD/SD Serial digital input

2.2 General purpose interface

The external GPI control lines 'a' to 'f' at the frame remote connectors are provided to allow remote control and/or remote status indication. The FTX HD has six GPI output lines assigned for status reporting.

GPI Connections

	High (+5V)	Low (less than 1V)
'a'	Serial digital input present on Input A	No serial digital input present on Input A
'b'	Serial digital input present on Input B	No serial digital input present on Input A
'c'	Channel A laser functioning within normal tolerances	Channel A laser has reached its near end of life point
'd'	Channel B laser functioning within normal tolerances	Channel B laser has reached its near end of life point
'e'	Channel A laser operating	Channel A laser shut down
'f'	Channel B laser operating	Channel B laser shut down

Each GPI output line is pulled up to the frame +5V with a 6k8 Ohm resistor; they are also protected by a 270 Ohm current limiting series resistor.

4U frame GPI Connections

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

Slot no.		‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	Upper	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)
		‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	Lower	8 (5)	9 (5)	18 (5)	26 (5)	19 (6)	20 (6)
2		7 (5)	16 (5)	17 (5)	25 (5)	10 (6)	11 (6)
3		8 (7)	9 (7)	18 (7)	26 (7)	19 (8)	20 (8)
4		7 (7)	16 (7)	17 (7)	25 (7)	10 (8)	11 (8)
5		5 (5)	6 (5)	15 (5)	24 (5)	1 (6)	2 (6)
6		4 (5)	14 (5)	13 (5)	23 (5)	3 (6)	4 (6)
7		5 (7)	6 (7)	15 (7)	24 (7)	1 (8)	2 (8)
8		4 (7)	14 (7)	13 (7)	23 (7)	3 (8)	4 (8)
9		3 (5)	12 (5)	22 (5)	21 (5)	12 (6)	13 (6)
10		10 (5)	11 (5)	19 (5)	20 (5)	21 (6)	22 (6)
11		3 (7)	12 (7)	22 (7)	21 (7)	12 (8)	13 (8)
12		10 (7)	11 (7)	19 (7)	20 (7)	21 (8)	22 (8)

Table shows pin number (Remote number)

Note: Remote 1, Remote 3, Remote 5 and Remote 7 are 26-way high density D-Type female sockets. Frame ground is pin 2 and +5V @500mA is pin 1 in each case.
Remote 2, Remote 4, Remote 6 and Remote 8 are 26-way high density D-Type male plugs. Frame ground is pin 6 and +5V @500mA is pin 15 in each case.

2U frame GPI Connections

GPI lines ‘a’ to ‘f’ of each card connect to two 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. 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. Frame ground is pin 6 and +5V @500mA is pin 15 in each case.

1U frame GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to the 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)

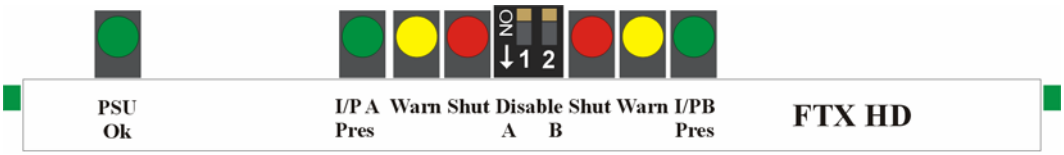
Table shows pin number (Remote number)

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.

3 Card edge operation

Card edge controls and indicators

The front edge of the FRX HD card provides power rail monitoring and status.



FTX HD front edge view

LED	Location/colour	Meaning when lit
PSU Ok	Green	All PSU voltages are within range.
Input A Present	Green	There is a serial digital video input on Channel A.
Warning	Amber	Channel A laser has reached its near end of life.
Shutdown	Red	Channel A laser is not emitting light or has been disabled.
Shutdown	Red	Channel B laser is not emitting light or has been disabled.
Warning	Amber	Channel B laser has reached its near end of life.
Input B Present	Green	There is a serial digital video input on Channel B.

Switch	Up	Down
A shutdown	Laser shutdown is under auto control	The Channel A laser is manually shutdown preventing light emission.
B shutdown	Laser shutdown is under auto control	The Channel B laser is manually shutdown preventing light emission.

Note: A laser module is considered to be near end of life when its bias current has reached approximately 85% of its maximum.

4 Using the active front panel

4.1 Module selected

This operational guide assumes that the panel has been set up according to the Panel setup procedure described in the Crystal Vision Control 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 (version 1.5.0 or higher), Statesman Mode will be entered and the message, ‘Press CAL to Exit’ will be displayed and the CAL LED will light.

Statesman mode is entered by default

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

The control panel will display the name of the card that first responds to the polling request together with its location number.

The location number consists of the frame number plus the card position in the frame.

Navigating the display

The functions assigned to control panel keys are:

- DEVICE – enters Device menu to select a card or show cards available / enters Panel setup when held down during power up / shows frame status when pressed from Statesman mode
- CAL – enters or leaves Statesman mode / enters panel diagnostics mode when held down during power up / updates the display
- Asterisk – enters board rename menu from the Device menu
- F1 to F4 – soft keys, function assigned within each menu
- HOME – moves the display to the home menu
- ENTER – accept current selection
- Upward arrow – used to move up the menu structure / enter lock panel menu from the Device menu
- Rotary control – shaft encoder used to select options or variable data

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.

Note: Please refer to the Crystal Vision Control Panel manual for details of the Panel Setup, Lock Panel and Diagnostic menus.

Selecting an FTX HD

To select a particular card in a frame, press the DEVICE key to go to the Device menu. The top line of the display will show ‘Available Cards X’, where X is the number of cards that have responded so far to the polling request.

The available cards menu

Rotate the shaft encoder and the bottom row will display the successfully polled cards by name and location or slot number.

In the example above, the card displayed is located in the first frame in slot number 3.

When the desired card is selected press the ENTER key to access that card's HOME menu.

The message shows that an FTX HD has been selected.

The FTX HD home menu

Updating the display

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

The FTX HD menu structure

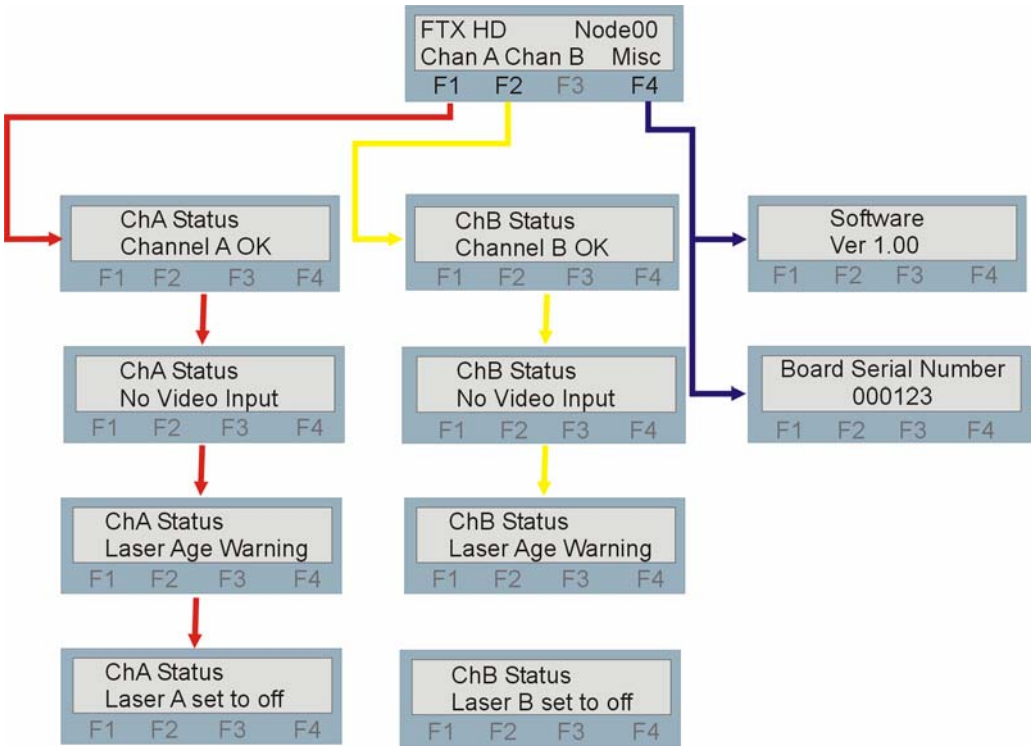
The main top-level menu is obtained by pressing the HOME button. Menu keys are illuminated when active and when further menus are available. There are three menu selections available:

- Channel A – press F1
- Channel B – press F2
- Miscellaneous – press F4

When a sub menu has been selected, further options may be obtained by using the Shaft control to scroll through them.

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

Active control panel menu tree



Note: Function key LEDs are illuminated when active.

Channel Status

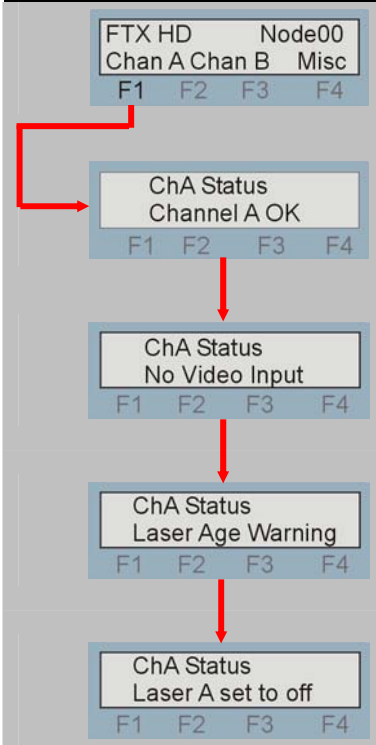
The FTX HD will display the presence of a Serial Digital input signal and whether that particular channel laser is emitting light. The absence of SDI input is also indicated along with a laser shutdown.

Note: There can be several reasons for the laser to shut down, apart from it being manually disabled for maintenance purposes or through a lack of video input. An automatic shutdown will result if the laser's working parameters become out of specification. For example, reaching the end of its working life or for a transitory transgression of design limits. Once the laser been has shut down, as a safety feature it will latch in this condition. If it is suspected that the shutdown has been the result of a transitory condition this latched shutdown condition may be reversed by moving the channel shutdown switch to down then up again.

Both channel A and Channel B are independent in operation of each other.

Channel A status

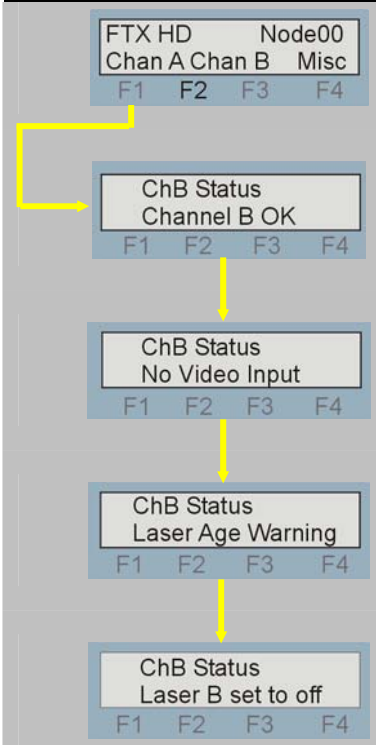
Press button F1 from the home menu to show channel A status information. The message present will be dependent on the condition of the input video and laser status.

FTX HD channel A status menu	Description
	From the Home menu, press F1 to select Channel A status menu. Channel A input status. Video Input present and Laser active. Channel A video input not present and Laser disabled. Channel A laser has reached 85% of expected life. Channel A laser is shut down either by the board edge piano switch being set to down or by an internal fault condition.

Note: If the Laser has shutdown due to a transitory fault condition reset by toggling the board edge shutdown piano switch.

Channel B status

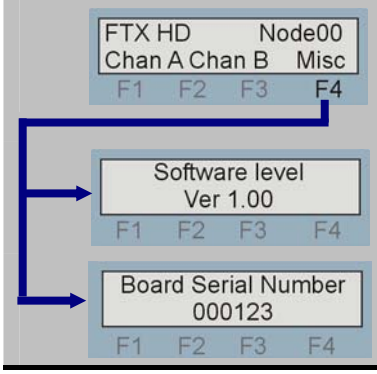
Press button F1 from the home menu to show channel A status information. The message present will be dependent on the condition of the input video and laser status.

FTX HD channel B status menu	Description
	From the Home menu, press F1 to select Channel B status menu. Channel B input status. Video Input present and Laser active. Channel B video input not present and Laser disabled. Channel B laser has reached 85% of expected life. Channel B laser is shut down either by the board edge piano switch being set to down or by an internal fault condition.

Note: If the Laser has shutdown due to a transitory fault condition reset by toggling the board edge shutdown piano switch.

Miscellaneous information

Pressing button F4 (miscellaneous) from the home menu will show the board serial number and software version fitted.

FTX HD Miscellaneous menu	Description
	From the Home menu, press F4 to select the miscellaneous menu, which is then traversed by rotating the shaft control. Rotate the shaft control to view the currently fitted software version. Rotate the shaft control to view the electronically stored board serial number.

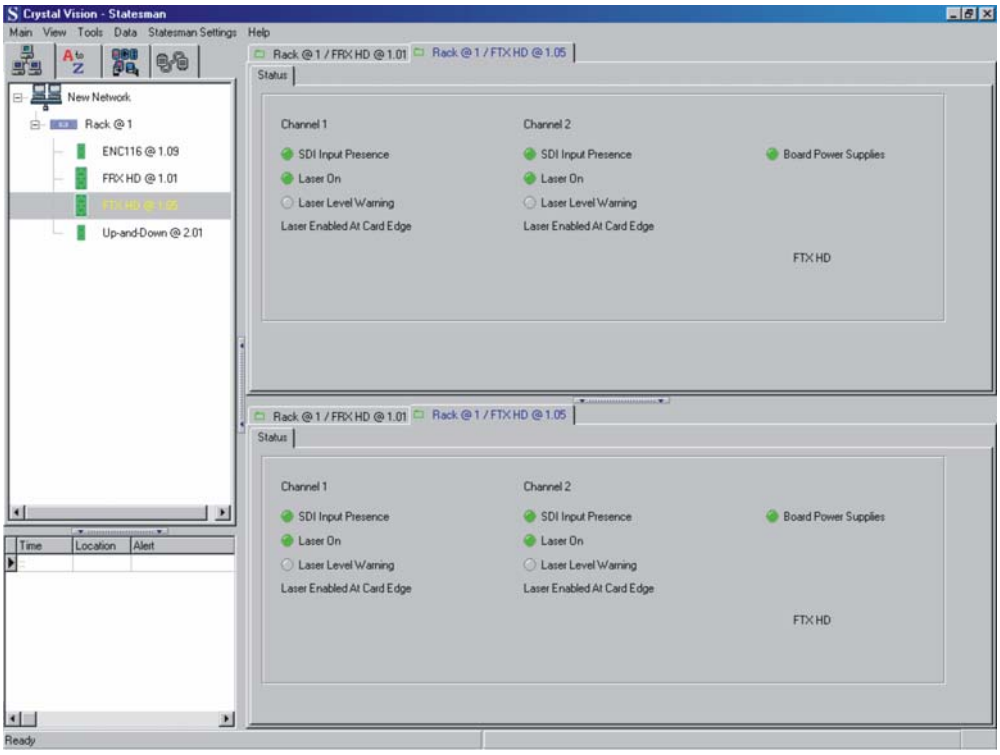
5 Statesman

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.

The main Statesman application communicates with each module in a frame through a Statesman capable or active control panel. An active panel or REMIND remote control panel must be fitted to allow for Statesman control.

5.1 Statesman operation

The initial view will show an Explorer style view of the connected frames and modules. Double clicking on a module will enable the display of the main application menus.



The Statesman main application window

The menu display is repeated for convenience to allow dual-control display of modules with duplicate signal paths or to allow two functions to be viewed at the same time.

FTX HD has only one Statesman menu tab that provides status information by way of simulated LEDs and text information.

Status

The Status tab provides access to the following:

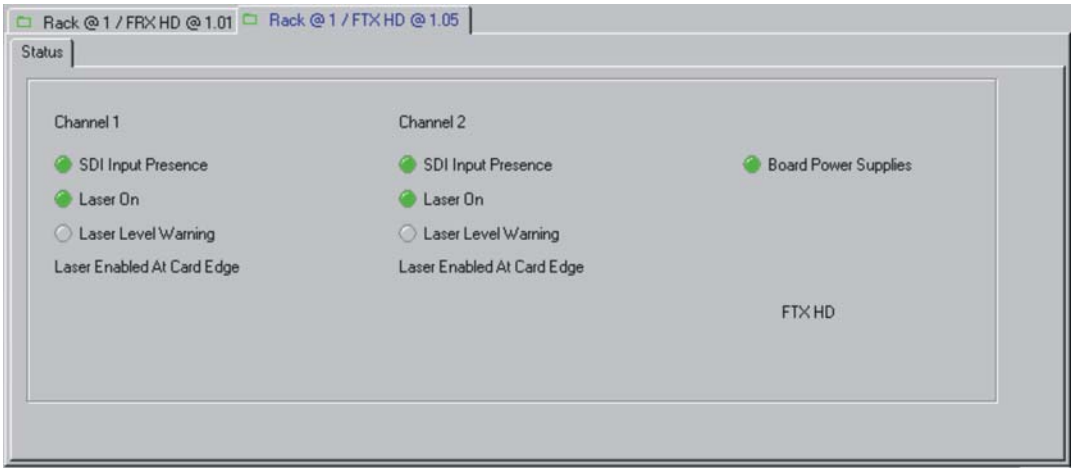
Channel A

- HD/SD SDI input present
- Laser On
- Laser Level Warning (Near end of life)
- Card edge shutdown status

Channel B

- HD/SD SDI input present
- Laser On
- Laser Level Warning (Near end of life)
- Card edge shutdown status

Board power supply status



Status monitoring

Channel Status

Status indication is as follows:

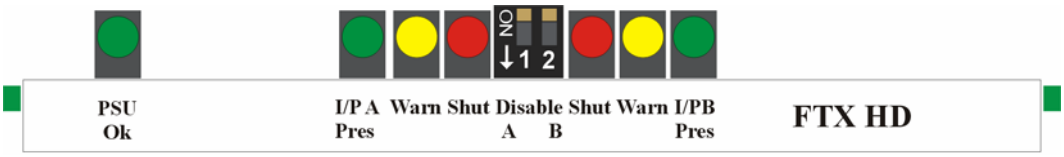
Input setting	Description
SDI Input Present	Green when input detected. Red when no input detected.
Laser On	Green indicates that the laser is emitting light. Greyed out indicates that the laser is not emitting light.
Laser Level Warning	Greyed out, no warning. Amber, the laser has reached its near end of life point.
Card edge switch status	Indicates the status of the card edge shutdown switch.

6 Trouble shooting

Simple trouble shooting can be performed by using either the card edge or a remote status panel display.

6.1 Card edge status LEDs

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



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

LED	Location/colour	Meaning when lit
PSU Ok	Green	All PSU voltages are within range.
Input A Present	Green	There is a serial digital video input on Channel A.
Warning	Amber	Channel A laser has reached its near end of life.
Shutdown	Red	Channel A laser is not emitting light or has been disabled.
Shutdown	Red	Channel B laser is not emitting light or has been disabled.
Warning	Amber	Channel B laser has reached its near end of life.
Input B Present	Green	There is a serial digital video input on Channel B.

Switch	Up	Down
A shutdown	Laser shutdown is under auto control	The Channel A laser is manually shutdown preventing light emission.
B shutdown	Laser shutdown is under auto control	The Channel B laser is manually shutdown preventing light emission.

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.

Check that the card is seated correctly in the frame.

There is no video input present

Check that valid video input is present and that any cabling is intact.

There is no optical output

Check that the laser disabled/error LED is not illuminated.

Laser disable/error LED illuminated

Check that SDI input is present.

Check that the card edge shutdown switch is not in the down position.

Toggle the shutdown switch to reset the laser driver. If reset is not successful there is likely to have been a catastrophic fault.

Laser level warning LED illuminated

Near End Of Life. The laser emitter is reaching its life expectancy and will require replacement.

The video output is low quality

Check that the maximum cable length has not been exceeded for both the video input or optical output

Check that the optical connectors have not become contaminated.

Re-setting the card

If required the card may be reset by simply removing the card from the frame and then re-inserting it or if practical, briefly remove the power to the frame.

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

7 Specification

General

Dimensions	100mm x 266mm module with DIN 41612 connector
Weight	200g
Power consumption	3 W

Inputs

Video	HD or SD SDI 270Mb/s to 1.485Gb/s serial digital compliant to SMPTE 259M and SMPTE 292M
Cable equalisation	HD. Up to 140m with Belden 1694 or equivalent (Belden 8281 or equivalent up to 100m)
	SD (270Mb/s) >250 metres

Outputs

Number and type:	2 Optical Outputs to SMPTE 297M / SMPTE 292M
Optical power	max -3.0dBm, min -9.0dBm (typical -5.0dBm or 300uW)
Fibre pigtail	Single mode 8/125uM
Optical wavelength	1290-1330nm, 1310 typical
Extinction Ratio	9dB
Connector type	SC/PC

GPI Outputs

Number and type:	6 off indicating for both channels: input present, laser ageing and laser shutdown

Status monitoring

LED display	Front of card edge visual monitoring with LED indicators to indicate:
	PSU rail present, SDI input present, laser near end of life, laser error/disabled
2-way piano level switch	Manual laser shutdown