

digital keying modular
interface audio
converters analogue video

FRX HD

Dual channel fibre optic
to HD or SD receiver

USER MANUAL



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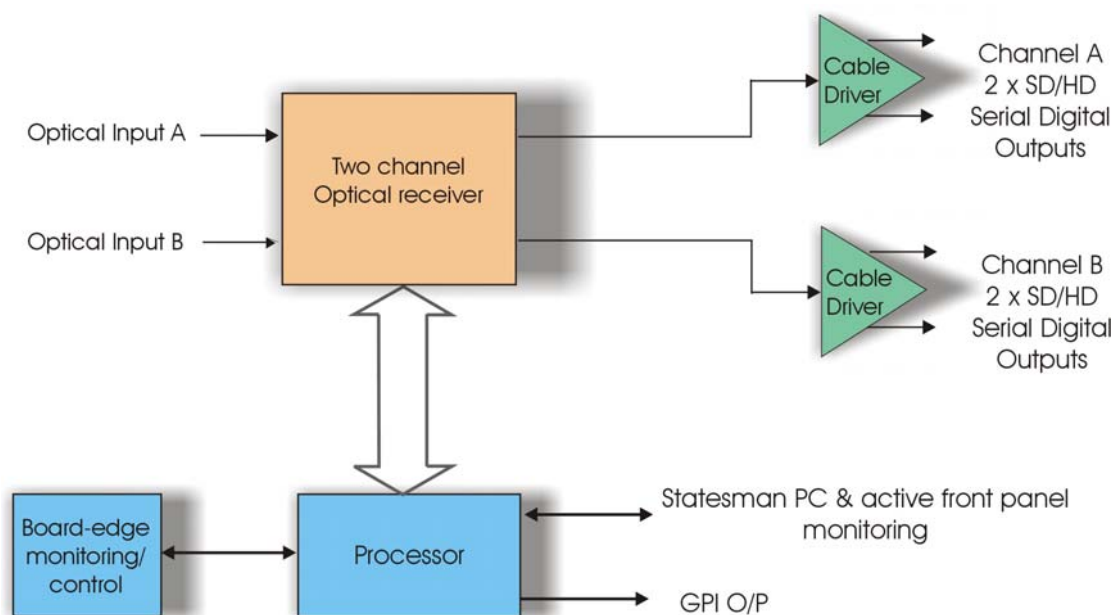
Specification

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1 Introduction

The FRX HD is a two-channel optical serial digital video receiver and distribution amplifier for both High Definition and Standard Definition formats with up to two outputs per channel.

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 rear. Depending on frame design, a hinged or removable front panel reveals LED indication of input and PSU status when opened.



FRX HD two channel optical SDI distribution amplifier

The RM28 single slot rear connector provides two serial digital outputs per channel with up to 24 modules in 4U of rack space.

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 RM28 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 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 FRX HD are as follows:

- Dual 1-in 2-out optical to HD/SD distribution amplifier
- LED optical input presence indication
- Selectable HD/SD slew rate

FRX HD

At the heart of the FRX HD is a two-channel state-of-the-art optical receiver module, each channel consisting of an optical pin diode and signal conditioning circuitry coupled to a two-output cable driver. The two identical channels of the FRX HD optical receiver are completely independent of each other. Both channels are under the control of a CPU, which monitors and reports their status.



FRX HD two-channel HD/SD optical receiver



Note: Caution must be taken when removing the FRX HD card if an optical signal is present due to the possible damaging nature of high intensity light.

Although Crystal Vision optical products contain class 1 devices which are designed to be safe under all circumstances, to avoid possible personal injury you are advised not to look directly into a vacant optical slot where a third party piece of laser transmitting equipment has been remotely connected to the Crystal Vision equipment.

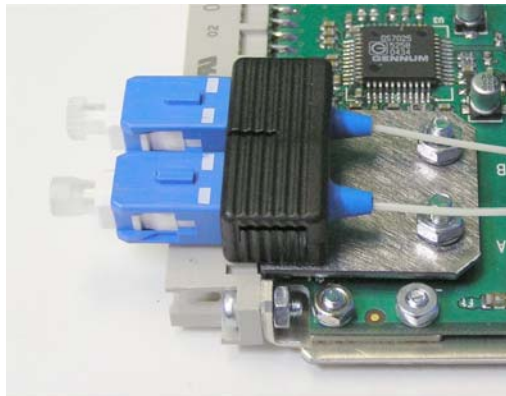
2 Hardware installation

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.

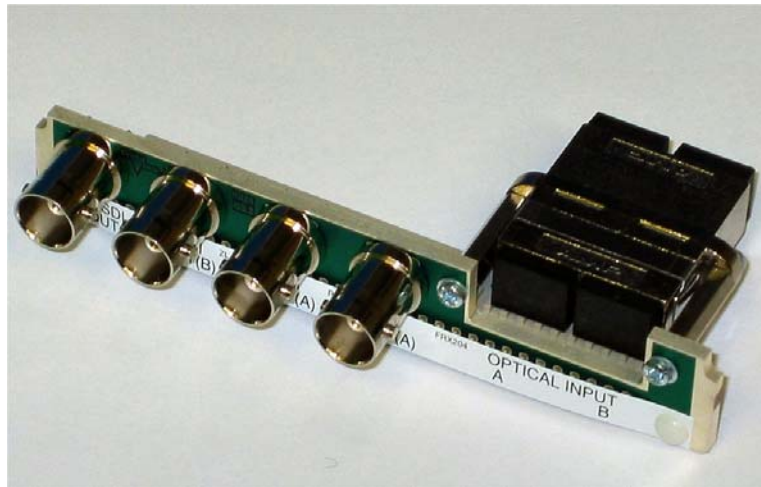
2.1 Handling

Due to its fragile nature, fibre optic equipment must be handled with care. Sharp blows or snagging the fibre pigtailed 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 in place whenever the receiver card or rear module are de-mounted for any reason.



PCB connectors with the dust caps fitted

The RM28 rear module is also fitted with dust caps on both sides of the optical connector. The pair of dust caps that are 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 FRX HD be removed for a while it is recommended that the rear module should also be removed and stored with the dust caps in place.



RM28 rear module with dust caps fitted to both sides of the optical connector

2.2 Universal rear connectors

When using the RM28 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 Indigo DT desk top boxes do 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 interface range modules to be fitted in any position ⁽¹⁾ with the use of pluggable rear modules.

⁽¹⁾ Due to height restraints, some restrictions apply when mixing optical modules with other Crystal Vision modules.

Loading restrictions

The FRX HD can be loaded into any compatible frame's slot but due to the extra height of the FRX HD it is not possible to place cards from the Crystal Vision Standard Definition or audio range directly above in certain positions. High Definition boards do not share this restriction.

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

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

Rear module connections with RM28

RM28 fits in all frames	Description
	RM28 <ul style="list-style-type: none"> • 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 input (B)
Optical Input (A)	Optical serial digital video input (A)
SDI OUT(A)	Channel A HD/SD output
SDI OUT(A)	Channel A HD/SD output
SDI OUT(B)	Channel B HD/SD output
SDI OUT(B)	Channel B HD/SD output

2.3 General purpose interface

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

GPI Connections

	High (+5V)	Low (less than 0.7V)
'a'		no user connection
'b'		no user connection
'c'		no user connection
'd'		no user connection
'e'	Input A present	Input A not present
'f'	Input B present	Input B not present

GPI lines are fitted with 6k8 Ohm pull-up resistors connected to the frame's +5V. There is also an output series resistor of 270 Ohm.

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

3.1 Card edge controls

The front edge of the FRX HD card provides power rail monitoring slew rate selection and signal status.



FRX HD front edge view

LED	Location/colour	Meaning when lit
Input A Present	Green	There is an optical input present on input A.
Input B Present	Green	There is an optical input present on input B.
PSU Ok	Green	Power supply voltage present.

Switch SD/HD	Up	Down
Input A	Rise/fall time to SMPTE 259M	Rise/fall time to SMPTE 292M
Input B	Rise/fall time to SMPTE 259M	Rise/fall time to SMPTE 292M

4 Using the front control panel

4.1 Module selected

This operational guide assumes that the panel has been set up according to the panel set up procedure described in the Crystal Vision Control Panel manual.

Note: It is **ESSENTIAL** that the panel set up 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 key 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 set up 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 – accepts current selection
- Upward arrow – used to move up the menu structure / enters 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.

Selecting an FRX 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.



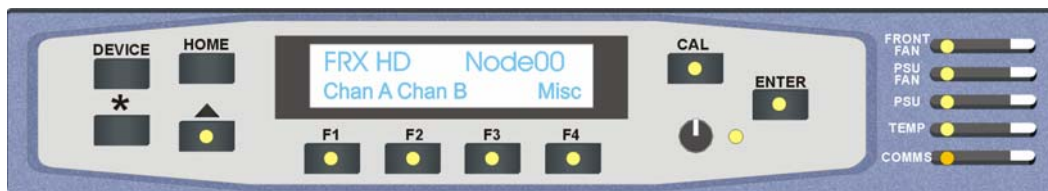
The available cards menu

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 FRX HD has been selected.



The FRX HD home menu

Display Updating

The values displayed on an active front panel are only updated as the FRX HD card is polled. Therefore the display may take a few seconds to update after a change in status.

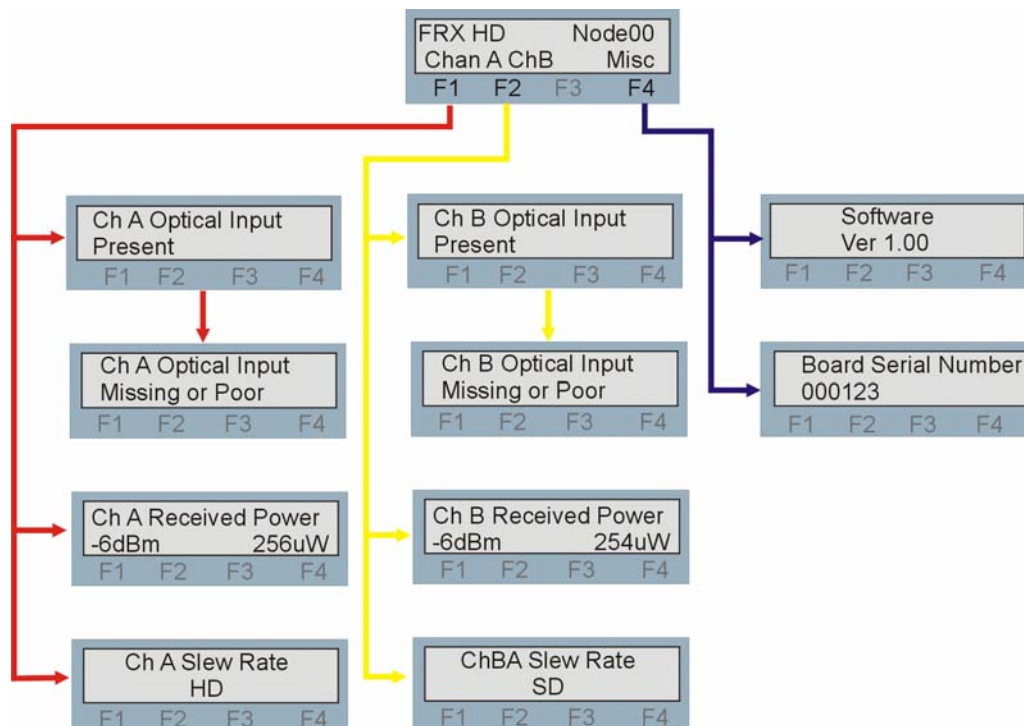
The FRX HD menu structure

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.

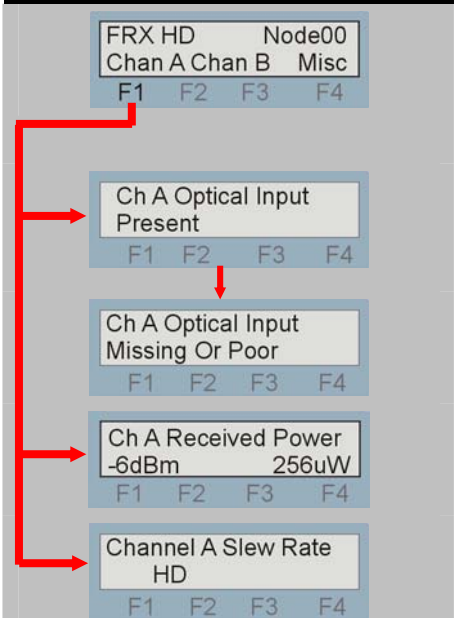
The following chart shows the available FRX HD menus. The actual menus available may vary slightly as software is updated.



Note: Function key LEDs are illuminated when active.

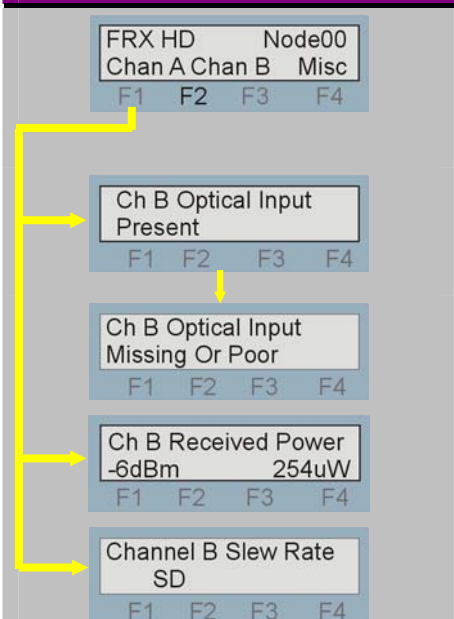
Channel A status

Pressing button F1 from the home menu will show status information for channel A.

FRX HD channel A status menu	Description
 <p>FRX HD Node00 Chan A Chan B Misc F1 F2 F3 F4</p> <p>Ch A Optical Input Present F1 F2 F3 F4</p> <p>Ch A Optical Input Missing Or Poor F1 F2 F3 F4</p> <p>Ch A Received Power -6dBm 256uW F1 F2 F3 F4</p> <p>Channel A Slew Rate HD F1 F2 F3 F4</p>	<p>From the Home menu, press F1 to select the Channel A status menu, which is then traversed by rotating the shaft control.</p> <p>Rotate the shaft control to view the channel A input status.</p> <p>No optical input or level too small.</p> <p>Received power in microwatts and dBm.</p> <p>Rotate the shaft control to view channel A output slew rate selected. HD, SD.</p>

Channel B status

Pressing button F1 from the home menu will show status information for channel A.

FRX HD channel B status menu	Description
 <p>FRX HD Node00 Chan A Chan B Misc F1 F2 F3 F4</p> <p>Ch B Optical Input Present F1 F2 F3 F4</p> <p>Ch B Optical Input Missing Or Poor F1 F2 F3 F4</p> <p>Ch B Received Power -6dBm 254uW F1 F2 F3 F4</p> <p>Channel B Slew Rate SD F1 F2 F3 F4</p>	<p>From the Home menu, press F1 to select the Channel B status menu, which is then traversed by rotating the shaft control.</p> <p>Rotate the shaft control to view the channel B input status.</p> <p>No optical input or level too small.</p> <p>Received power in microwatts and dBm.</p> <p>Rotate the shaft control to view channel B output slew rate selected. HD, SD.</p>

Slew rate

Standard Definition

Rise/fall time to SMPTE 259M


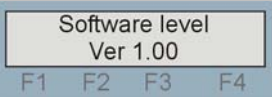
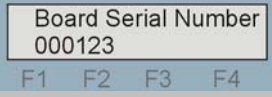
High Definition

Rise/fall time to SMPTE 292M

Received power is given in both microwatts and dBm. dBm are particularly useful for monitoring the optical budget.

Miscellaneous information

Pressing button F4 from the home menu will show miscellaneous information about the FRX HD module.

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

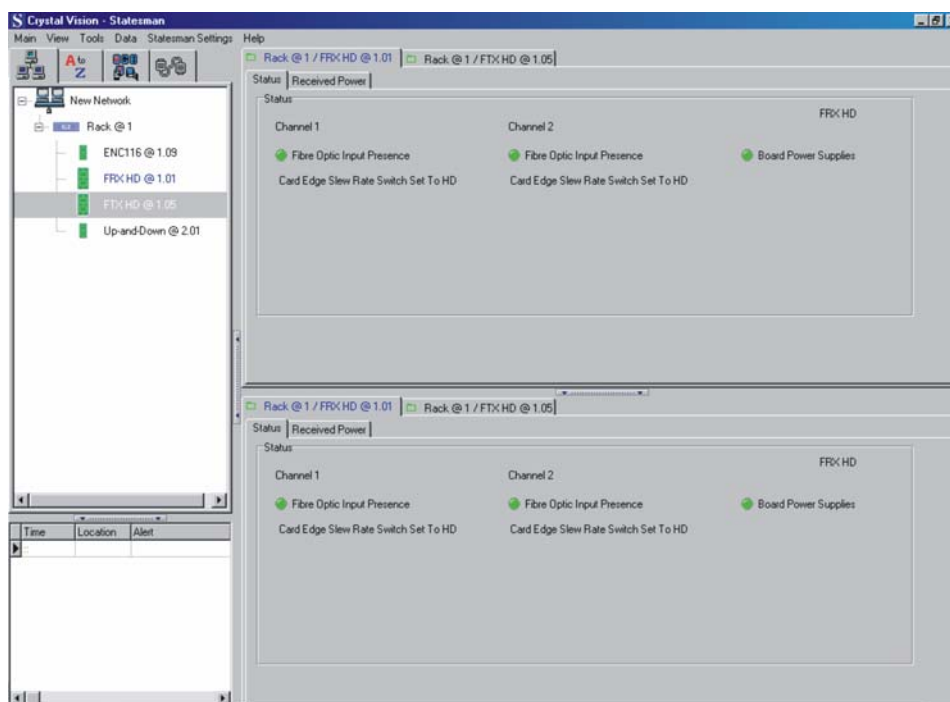
5 Statesman

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.



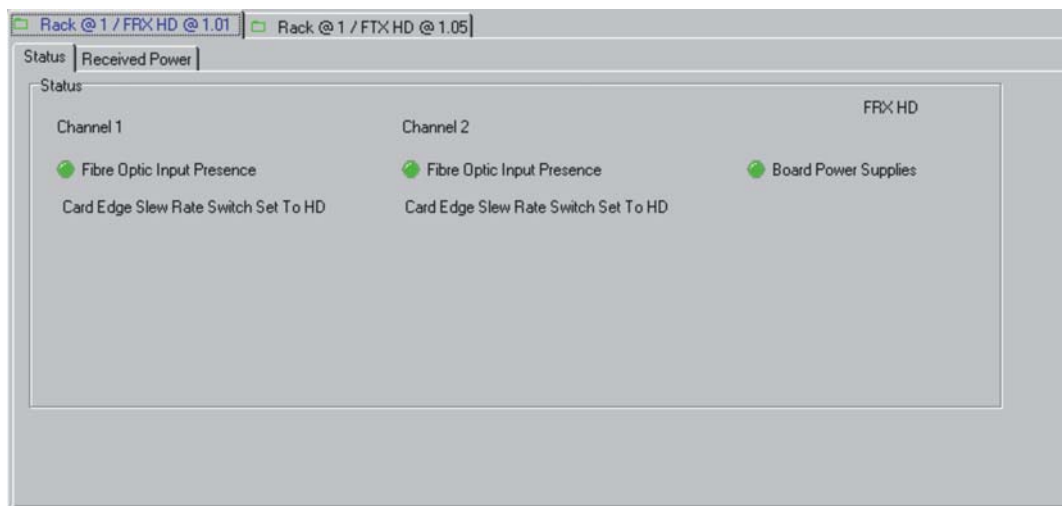
Statesman main application window

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.

Note: For further details of Statesman configuration and operation please refer to the Statesman manual.

Status

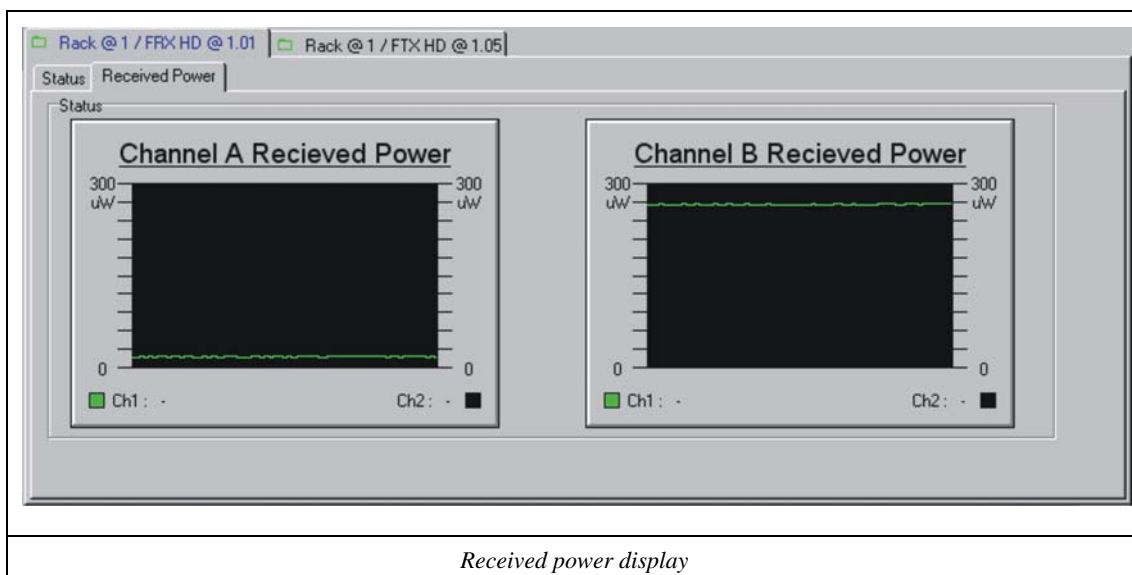
The status panel gives information about input presence and slew rate setting for both channels. Board power rail condition is also shown. When no input is present the green presence LEDs will show red.



Status monitoring

Received power

The received power for each channel is displayed pictorially on a pair of trend graphs with a Y axis of approximately 5 minutes.



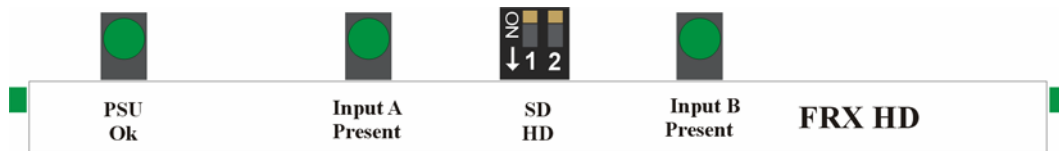
Received power display

The following formula can be used to convert microwatts to dBm:

$$\text{dBm} = 10 \log (\text{microwatts}/1000)$$

6 Trouble shooting

The front edge of the FRX HD card provides power rail monitoring, slew rate selection and signal status.



FRX HD front edge view

LED	Location/colour	Meaning when lit
Input A Present	Green	There is a modulated optical input present on input A.
Input B Present	Green	There is a modulated optical input present on input B.
PSU Ok	Green	Power supply voltage present.

Switch SD/HD	Up	Down
Input A	Rise/fall time to SMPTE 259M	Rise/fall time to SMPTE 292M
Input B	Rise/fall time to SMPTE 259M	Rise/fall time to SMPTE 292M

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 output

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

Optical inputs are present but no video output

Check that the optical signal contains valid serial digital video.

The video output is low quality

Check that the maximum cable length has not been exceeded for both the optical input and video outputs.

Check that the optical connectors have not become contaminated.

Check that the correct slew rate is selected.

Check that the received power is sufficient.

Re-setting the card

If required, the card may be reset by simply removing the frame power and re-applying it after a few seconds or by removing the card from the frame and then re-inserting it.

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

Specification

General

Dimensions	100mm x 266mm module with DIN 41612 connector
Weight	200g
Power consumption	2.5 W

Inputs

Optical wavelength	1270-1610nm, 1300nm nominal
Connector type	SC
Input level maximum	-1dBm
Input level minimum	-20dBm
Fibre	Single mode

Outputs

Number	Two channels with two outputs per channel
Video	HD or SD SDI 270Mb/s to 1.485Gb/s serial digital compliant to EBU 3267-E, 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

Status monitoring

LED display	Front of card edge visual monitoring with LED indicators to indicate: PSU rails within limits, optical input present
GPI output	Input present Channel A and Channel B