ADC104

Analogue to digital converters

USER MANUAL

Crystal Vision

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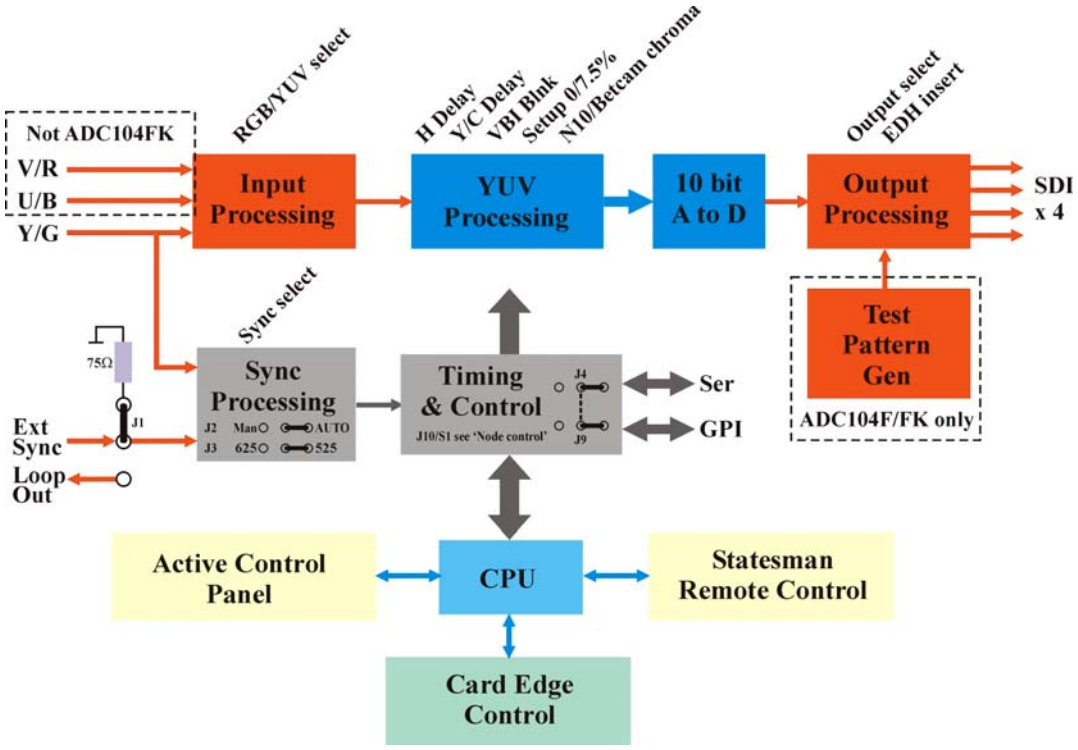
Contents

1 Introduction

The ADC104 series of 10-bit analogue to digital converters are designed to convert RGBS/YUVS signals to SDI serial digital video.

The range consists of the ADC104F which fully meets ITU 601 specifications for component video filtering, the ADC104N which nearly meets the ITU 601 specification and the ADC104FK, designed for use with graphics keys and which accepts only a Y and sync input. The ADC104F and ADC104FK also provide eight test patterns.



The ADC104 10-bit analogue to digital converters

The common features are as follows:

- Timing from external analogue reference or syncs on Y or Green
- Horizontal position adjustment
- Enable or disable vertical blanking
- Enable or disable 525 line setup on Y
- Select normal N10 or 'Betacam' chrominance levels
- High quality digital clamp
- Manual or automatic 525/625 line standard selection (jumper selection.)
- GPI, Active Remote Panel, Statesman and board edge control
- Fine horizontal picture position (+/- 100 ns) adjustment available in either local or remote mode.

Using chroma levels

The ADC104F supports 'normal' EBU/SMPTE N10 levels, which have been selected as the analogue equivalent of SDI levels, and 'Betacam' levels, which may be met with early recordings and/or equipment.

The N10 levels are based on 100% bars as its maximum signal, whilst Betacam levels were based on 75% bars.

The following table describes expected input levels for 100% bars for the available settings:

Input	SMPTE/EBU N10	'Betacam'
RGB	625: 3x700mV video, 300mV sync	Not applicable
Y U V	625/525: 700mV Lum, 2x350mV UV, 300mV sync	625/525: 700mV Lum, 2x350mV UV, 300mV sync
Y U V + setup 525	714.3mV (max) 53.55mV (min) Luma, 2 x 350mV UV, 285.7mV sync	714.3mV (max) 53.55mV (min) Lum, 2 x 467mV UV, 285.7mV sync.

Note: The Betacam chroma levels control has no effect on RGB inputs.
The facility to apply setup compensation in 525 is provided to cater for situations where NTSC has been decoded with from a source that has had +7.5% setup applied to the luminance.

Rear connector options

The ADC104 is a single height module and will fit into all Crystal Vision rack frames. Three rear connectors are available, the RM01 providing two outputs, the RM02 providing three outputs plus a sync loop-through output and the RM18 which provides four outputs and a sync loop-through output.

For frame packing density with the available rear connectors, refer to the Specification chapter.

2 Using 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 an active control panel. An active panel must be fitted to allow for Statesman control.

2.1 Installation

Minimum pre-requisites:

- Windows 98, NT4 with SP 5 or higher, Windows 2000, or Windows XP
- A parallel port dongle supplied with the Statesman software package
- An RS422 serial connection from the host PC to the Remote 2 connector of an FR2AV Crystal Vision frame and at least one Statesman compatible module
- An active control panel MUST be fitted to the frame with version 1.5 or above firmware
- An optional RS422 to RS232 converter if the PC has no RS422 ports

Installing Statesman

- To view all application windows, set graphics resolution to at least 1024 x 768
- Remove any previous version of the Statesman software using the Add/Remove Programs application in the Windows Control Panel
- Ensure that the Statesman dongle is fitted to the parallel port of the host PC
- Insert the Statesman CD and the installation should start immediately – if it does not, run the setup.exe file on the CD
- Obey any installation program prompts and restart the PC when prompted

Running Statesman for the first time

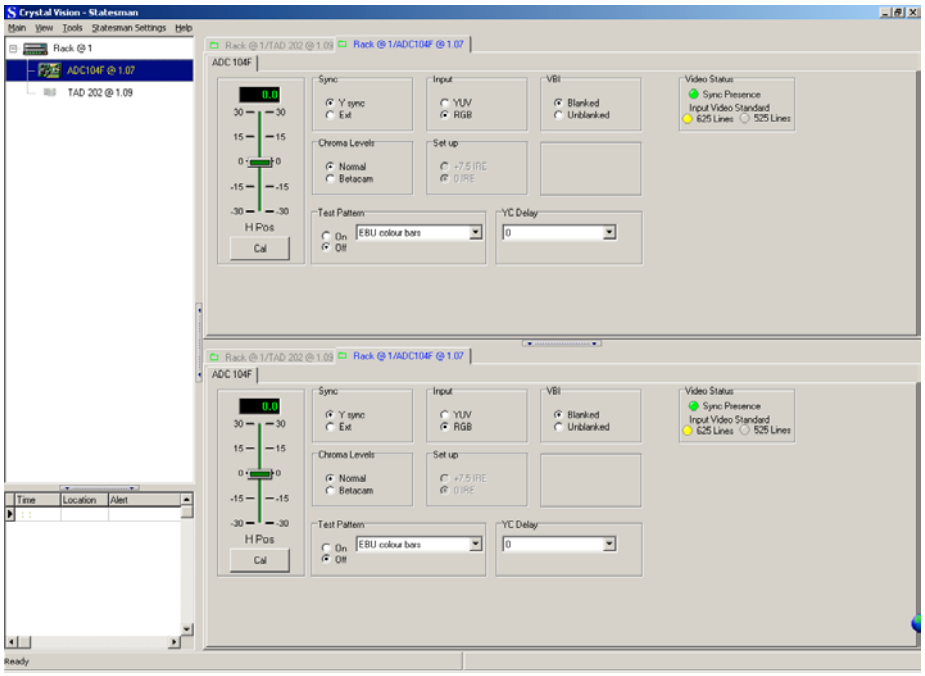
Statesman may be run from the Crystal Vision programs folder via the Start menu or by double-clicking on the Statesman.exe file in the installed program directory (default is C:\Program Files\CrystalVision).

When the program runs it should automatically detect any Statesman compatible modules in the connected frame or frames and display them in the main application left hand explorer-style window.

2.2 Statesman operation

The initial view will show an explorer style view of the connected frames and modules. Open any frame by clicking on the '+' sign or by double clicking on a frame. Installed modules should be shown with module icons. Frame and module icons can be named as desired by right-clicking or using the edit menu.

Double-clicking on a module will enable the display of the main application menu.



The Statesman ADC104F main application window

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

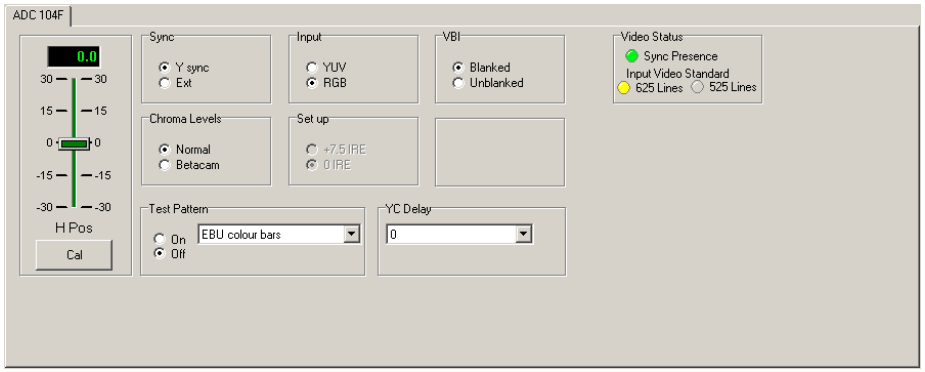
Note: Features and controls that are inappropriate in certain modes or mutually exclusive with other controls will be automatically 'greyed out' to indicate that they are currently unavailable.

Warning: Ensure that DIL lever 10 is set for in the DOWN position for Statesman control. A message will appear to indicate that Statesman controls may be overridden by the card edge if the ADC104 is set to local mode (DIL lever 10 UP)

ADC104F controls

The following controls are available:

- H Pos slider: adjust horizontal position of SDI output picture from 30 pixels to –30 pixels (+/- 2µs)
- Sync: Y sync/Ext – use syncs on green/luminance or external analogue syncs
- Input: YUV/RGB – use YUV or RGB analogue component inputs
- VBI: Blanked/Unblanked – blank or pass the VBI content of the component input
- Chroma Levels: Normal N10 or Betacam
- Set up: +7.5%/0% IRE – pass or remove 525 line setup or pedestal on luminance
- Test Pattern: display one of a range of full or split-screen test signals
- Y/C Delay: luminance/chrominance delay from -111ns to 111ns in 9.25ns steps
- Video status: sync presence and either selected or detected video standard



ADC104F menu

Note: Beta chroma levels are intended for use with 625/525 YUV inputs only

Adjusting picture position

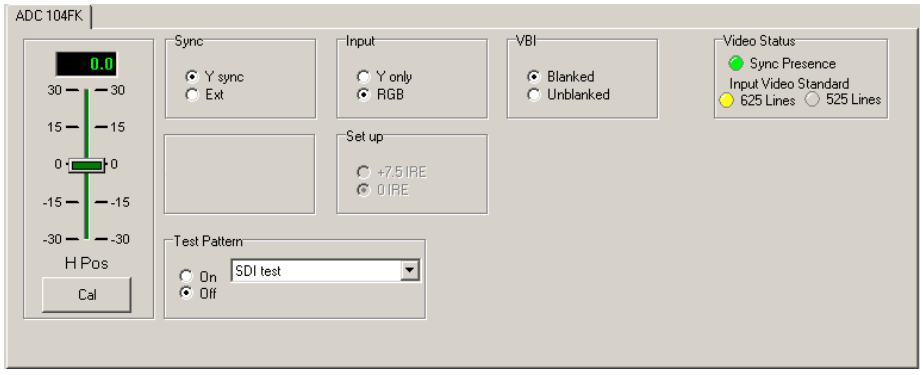
The H Pos slider may be used to the adjust horizontal position of the SDI output picture from 30 pixels to –30 pixels (+/- 2µs) in conjunction with the card-edge Hpos Fine potentiometer which has a range of +/- 100ns and is always active.

Tip: It may be useful to enable a split-screen test signal to facilitate horizontal picture position adjustment.

ADC104FK controls

The following controls are available:

- H Pos slider: adjust horizontal position of SDI output picture from 30 pixels to –30 pixels (+/- 2µs)
- Sync: Y sync/Ext – use syncs on green/luminance or external analogue syncs
- Input: derive luminance from Y or RGB analogue component input
- VBI: Blanked/Unblanked – blank or pass the VBI content of the component input
- Set up: +7.5%/0% IRE – pass or remove 525 line setup or pedestal on luminance
- Test Pattern: display one of a range of full or split-screen test signals
- Video status: sync presence and either selected or detected video standard



ADC104FK menu

Note: The Y/RGB menu derives luminance from Y or RGB inputs. The ADC104FK does not provide chroma processing.

Adjusting picture position

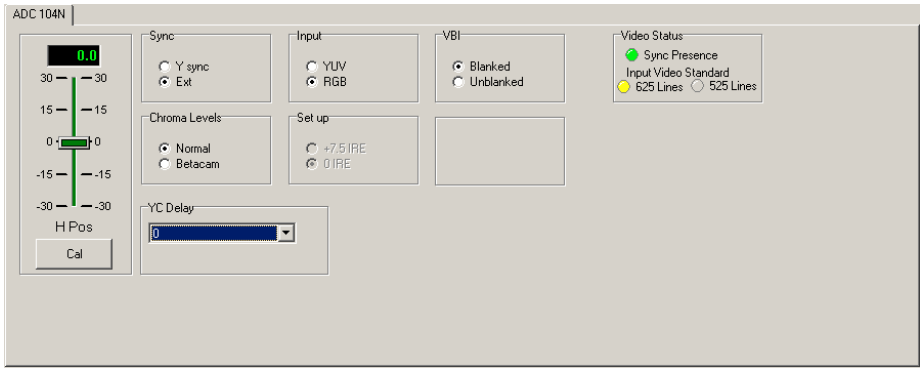
The H Pos slider may be used to the adjust horizontal position of the SDI output picture from 30 pixels to –30 pixels (+/- 2µs) in conjunction with the card-edge Hpos Fine potentiometer which has a range of +/- 100ns and is always active.

Tip: It may be useful to enable a split-screen test signal to facilitate horizontal picture position adjustment.

ADC104N controls

The following controls are available:

- H Pos slider: adjust horizontal position of SDI output picture from 30 pixels to –30 pixels (+/- 2µs)
- Sync: Y sync/Ext – use syncs on green/luminance or external analogue syncs
- Input: YUV/RGB – use YUV or RGB analogue component inputs
- VBI: Blanked/Unblanked – blank or pass the VBI content of the component input
- Chroma Levels: Normal N10 or Betacam
- Set up: +7.5%/0% IRE – pass or remove 525 line setup or pedestal on luminance
- Y/C Delay: luminance/chrominance delay from -111ns to 111ns in 9.25ns steps
- Video status: sync presence and either selected or detected video standard

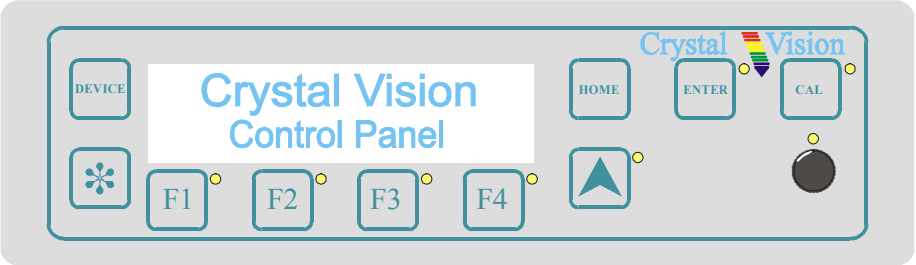


ADC104N menu

Note: Beta chroma levels are intended for use with 625/525 YUV inputs only
Test signals are not available with the ADC104N.

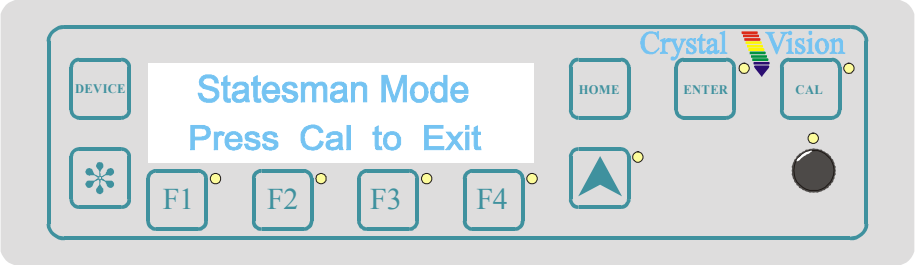
3 Using the active control panel

The Crystal Vision active control panel is available as an integral part of the FP2-LF front door for the FR2AV 2U frame, the FR1AV frame, and the DTBAV desktop box or as a remote panel. Only one control panel can be connected to any frame, although one panel can control two frames.



The Crystal Vision control panel

At power up, the two line 20-character screen will display 'Crystal Vision' followed by the firmware version number for the control panel. If the control panel firmware has been updated for Statesman control, Statesman Mode will be entered and the message, 'Press CAL to Exit' will be displayed.



Statesman mode is entered by default

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

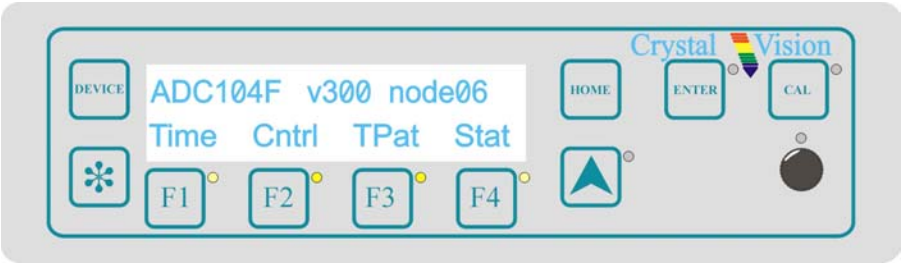
Each module in a frame is polled during control panel initialisation. Modules that have completed their own initialisation will respond with a node address.

Please refer to the Installation chapter and the appropriate Frame manual for further information on node addresses.

Control panel showing available cards

To list the available modules in a frame, press the DEVICE key. The top line of the display will change to show 'Available Cards X', where X is the number of cards that have responded so far to the polling request. Rotating the shaft encoder will cause the bottom row of the display to cycle through the successfully polled cards by name and node number.

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



The ADC104 home menu

Note: Ensure that DIL lever 10 is set for remote control (DOWN) to use the front control panel.

3.1 Navigating the display

The control panel keys are assigned the following functions when controlling the ADC104:

- DEVICE – lists available modules in a frame
- Asterisk – no function assigned
- F1 to F4 – soft keys, function assigned within each menu
- HOME – moves the display to the home menu
- ENTER – selects module to control
- CAL – enter or leave statesman mode
- Upward arrow – used to move up the menu structure
- Rotary control – shaft encoder used to select options or variable data

Updating the display

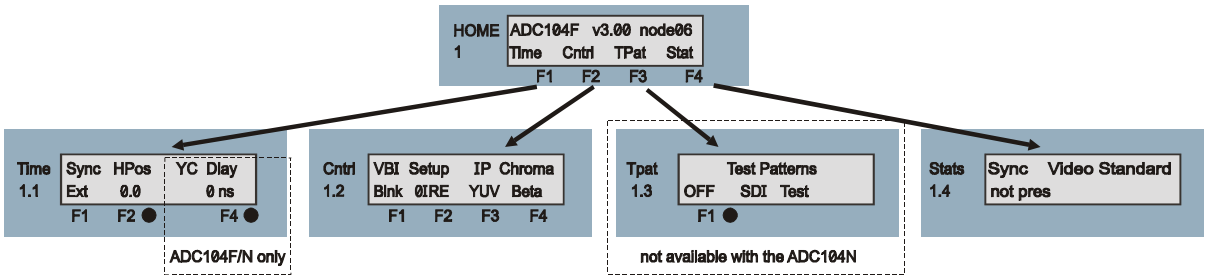
The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If mode changes occur through the use of card edge controls or through automatic response to the input video signal, the text displayed on the active front panel will not be updated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

3.2 The ADC104 menu structure

The main top-level menus for a module are obtained by pressing the F1, F2, F3 and F4 keys from that module's HOME menu. Menu keys are illuminated when active and when further menus are available. The four top-level menus are:

- Time – press F1
- Cntrl – press F2
- Tpat (Test patterns – not ADC104N) – press F3
- Stat – press F4

The following chart shows the available menus.



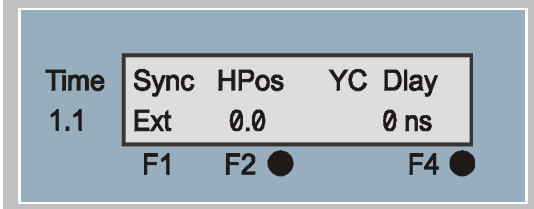
The ADC104 menu tree

Note: Function keys and shaft encoder LEDs are illuminated when active.
Menus or function keys associated with the shaft encoder are shown with a black circle.

Selecting time options

The Time menu provides access to the following options:

- Adjust horizontal position of SDI output picture from 30 pixels to –30 pixels (+/- 2µs)
- Use syncs on green/luminance or external analogue syncs
- Luminance/chrominance delay from -111ns to 111ns in 9.25ns steps (not ADC104FK)

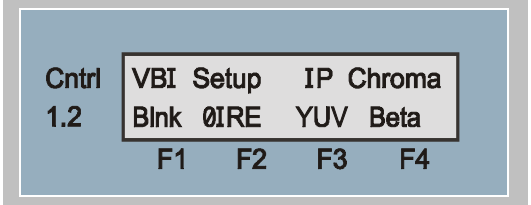
The time menu	Description
	Press F1 to toggle between external sync or sync on Y/G Press F2 to enable the shaft encoder to control the horizontal position from 30 to –30 pixels Press F4 to enable the shaft encoder to control the Y/C delay from -111ns to 111ns in 9.25ns steps

Note: The YC Dlay menu is not available with ADC104FK (luminance only) converters.

Selecting control options

The CNTRL menu provides access to the following configuration options:

- Blank or pass the VBI content of the component input
- Use YUV or RGB analogue component inputs
- Normal N10 or Betacam chroma levels (not ADC104FK)
- Pass or remove 525 line setup or pedestal on luminance

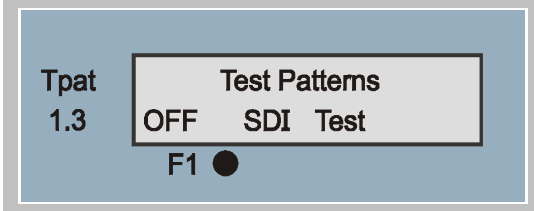
The control menu	Description
	Press F1 to toggle VBI blanking On/Off Press F2 to toggle 525 setup between 0% or +7.5% Press F3 to select between Y or G input Press F4 to toggle between normal N10 or Betacam levels (not ADC104FK)

Notes:

Beta chroma levels are intended for use with 625/525 YUV inputs only
The Chroma level menu is not available with the ADC104FK
The YUV/RGB menu only selects between Y and G with the ADC104FK

Selecting test patterns

The Test Pattern menu allows one of eight test patterns to be selected:

The test pattern menu	Description
	Press F1 to toggle between test patterns On/Off Then rotate the shaft encoder to select the desired full-screen or split-screen pattern:- SDI Test, Grey, EBU Bars, Frequency Sweep, 100% Bars, Frame Markers, Multi-Frequency, Ramp, Black.

Note: The Tpat menu is not available with ADC104N converter.

Using the status display

The status display provides the following information:

The status menu	Description
	The ADC104 status display shows the presence of the selected reference sync along with the video input standard which may be 525L or 625L. The input standard will only be auto-detected if Jumper J2 is in the AUTO position – see the Installation chapter for more information.

Note: The status display is available with all ADC104 versions.

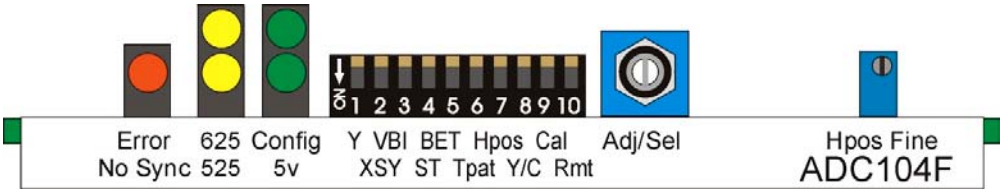
4 Card edge operation

Although, the ADC104 may be operated through a remote interface such as the Active Control Panel or Statesman, all functions can be accessed using card edge controls.

4.1 Card edge controls

The front edge of the card provides LED status and power rail monitoring, menu selection, rotary set-up control and a ten-way DIL menu selector.

Card-edge menu selection is only available when DIL lever 10 is in the UP position.



The ten-way DIL switch selects available menus, whilst the Adjust/Select control is used to select the required value or parameter.

Hpos fine

This is a multiturn potentiometer which allows fine adjustment of horizontal picture position relative to in incoming syncs.. The adjustment range of this potentiometer is approximately +/- 100 ns.

Shaft Encoder

The shaft Encoder is a rotary control labelled Adj/Sel and is used in combination with the 10 way DIL switch to adjust various parameters when setting up the board. It is only used in local mode. It should be noted that the same parameters can also be adjusted from Statesman or by the shaft encoder on an active remote control panel while in remote mode.

In all cases the values set are retained through power down, and restored when the unit is powered up.

Note: Selections made with levers 1 to 9 only apply when lever 10 (Rmt) is in the up position. When lever 10 is down, the sections for levers 1 to 9 are determined by Statesman or the settings from the active control panel.

Setting control options

Select the control method with the DIL switch as follows:

Lever	Label	Description
1	Y	Up selects an RGB input, down selects a YUV input
2	XSY	Up selects sync input on Y/Green, down selects sync on the external input
3	VBI	Up for normal blanking, down unblanks lines 6 to 22 and 319 to 335 in 625 standard and lines 10 to 20 and 273 to 282 in 525 standard
4	ST	Down compensates for setup on incoming Y signal. Only applies to 525 standard. Removes 7.5 IRE of setup on Y input, and increases the Y gain as required
5	BET	Up selects normal chrominance input levels, down selects 'Betacam' levels
6	Tpat	Up selects incoming video, down selects internal pattern or incoming video/internal pattern split-screen. Select pattern with Adj/Sel rotary control
7	Hpos*	Down allows adjustment of horizontal picture position up to +/- 2uS from reference sync input. Adjusted by Adj/Sel control. Note: Hpos fine rotary control is always active and can adjust hozizontal picture position by +/- 100 ns
8	Y/C	Down allows adjustment of Y to Cb/Cr delay timing. Adjust luminance to chrominance delay using Adl/Sel. Range is +/- 100ns in approximately 9ns steps. Switch Cal (lever 9) down then up again to recall factory default setting of 0ns.
9	Cal	Normally Up. Switch down then up again to force horizontal picture position and Y to Cb/Cr delay to their default factory settings. Only applies in local mode and when Hpos and Y/C levers are down.
10	Rmt	Up local board edge control (local mode) Down remote control by active front panel (remote mode)

Notes:
The Hpos fine (+/- 100 ns) adjustment is available in either local or remote mode.
Betacam chroma levels are intended for use with 625/525 YUV inputs only
Chroma level adjustment is not available with the ADC104FK
The Y control selects between Y and G with the ADC104FK
The Tpat patterns are not available with ADC104N converter.

Using split screen test signals

The eight test signals (not ADC104N) may be displayed in split-screen mode (TPat DOWN) whilst adjusting the horizontal picture position (Hpos DOWN).

Function	Notes	Tpat	Hpos
Normal		Up	Up
Eight full-screen and split-screen test signals	Split-screen has incoming video in bottom half, test signal in upper half	Down	Up
Adjust horizontal position of incoming video by +/- 2µ using Adj/Sel	Hpos fine is always active irrespective of and control surface setting	Up	Down
Adjust horizontal position of incoming video by +/- 2µ using Adj/Sel, whilst viewing a test signal	Use a split-screen test signal to view both incoming video in the lower half on the screen and an internally generated test signal in the upper half of the screen.	Down	Down

The available internally generated digital test patterns are:

- Ramps
- Edge of frame markers
- Frequency sweep
- Grey
- Multi frequency burst
- 100% Colour Bars
- EBU Colour Bars
- SDI test

Card-edge LED assignments:

LED		Meaning	Notes
Error (red)	On	No valid syncs on selected sync input	Input syncs can be extracted from the Y/Green input or the external sync input.
	Off	Valid syncs selected.	
625/525 (amber)	Upper On	625 input set or detected	Card jumpers set Auto or Manual standard selection
	Lower On	525 input set or detected	
Config (green)	Upper On	Power on configuration has finished	Usually lasts 2-3 seconds
	Upper Off	Power on configuration is taking place	
5V (green)	Lower On	The onboard +5V and –6V power rails are OK	5V LED illuminates for both +5V and –6V power rails
	Lower Off	One or both of the onboard +5V and –6V power rails has a problem (low value) or is not present.	

5 Installation

The ADC104 series of analogue component to SDI converters are single height modules, which will fit into all Crystal Vision rack frames. The FR2AV 2U frame will accommodate up to 12 single height Crystal Vision modules and six single height modules will fit in the FR1AV 1U frame. The 1U high Desk Top Box DTB-AV will house up to 2 modules and has a built-in power supply. All modules can be plugged in and removed while the frame is powered without damage.

5.1 Rear modules and signal I/O

FR2AV FR1AV and DTB-AV frame rear connectors

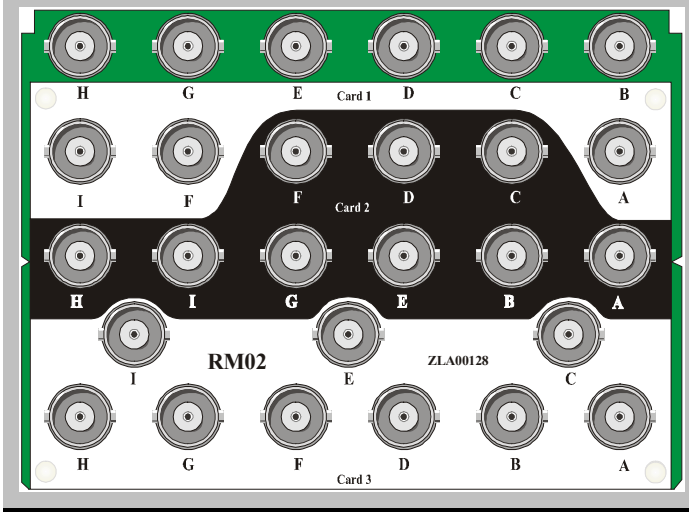
Up to twelve single height modules may be fitted in a FR2AV frame depending on the choice of rear connector. The two types of rear connector available provide system flexibility by allowing a mix between access to all connections and maximum module packing density. The available rear connectors are as follows:

RM01

FR2AV RM01 rear connectors	Description
	**RM01** • 12 modules per FR2AV frame • All frame slots can be used

General Label Name (ZLA00073)	Special Label Name (ZLA00089)	Description
SYNC/OPD	SYNC IN	Reference analogue sync in
U/B/OPB	U/B IN	U or Blue component input
Y/G/OPA	Y/G IN	Luminance or Green component input
SDI2	SDI OUT (2)	Serial Digital Output
SDI/1	SDI OUT (1)	Second Serial Digital Output
V/R/OPC	V/R IN	V or Red component input

RM02

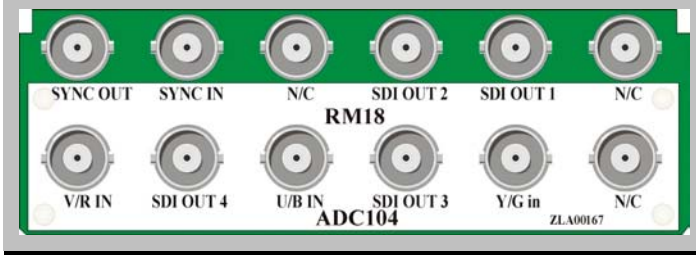
FR2AV RM02 rear connectors	Description
	**RM02 (ZLA00128 artwork)** • 9 modules per FR2AV frame • 3 modules per rear connector • 9 connections available • Card 1 fits in slots 1, 5 and 9 • Card 2 fits in slots 2, 6 and 10 • Card 3 fits in slots 4, 8 and 12 No card fits in 3, 7 or 11

Note: ZLA00128 is the current generic artwork shown for RM02.
ZLA00110 is the previous artwork and labelling is shown only in the pin-out tables.

General Label Names (ZLA00110)	General Label Names (ZLA00128)	Special Label Name (not available)	Description
IN	**A**	SDI Output (1)	Serial Digital Output
1	**B**	SDI Output (2)	Second Serial Digital Output
2	**C**	Y/G input	Luminance or Green component input
3	**D**	SDI Output (3)	Third Serial Digital Output
4	**E**	U/B Input	U or Blue component input
5	**F**	V/R in	V or Red component input
6	**G**	N/C	N/C
7	**H**	Sync out	External Sync loop out (see jumper setting J1)
8/IN2	**I**	Sync in	External analogue reference sync in

For details of fitting rear connectors please refer to the FR2AV frame manual.

RM18

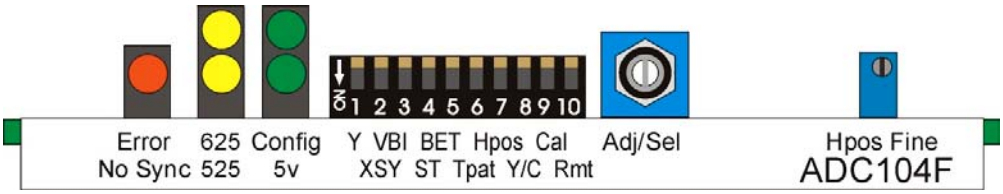
RM18 fits in FR2AV, FR1AV & DTBAV frames	Description
	**RM18 (ZLA00175 artwork)** • 6 modules per FR2AV frame, 3 per FR1AV, 1 per DTBAV • 1 module per rear connector • 10 connections available • Card fits in upper slot • No card fits in lower slot

BNC	Signal – pinout to be checked
Sync out	External Sync loop out (see jumper setting J1)
Sync in	External analogue reference sync in
N/C	No connection
SDI Output (2)	Second Serial Digital Output
SDI Output (1)	First Serial Digital Output
N/C	No connection
V/R in	V or Red component input
SDI Output (4)	Fourth Serial Digital Output
U/B Input	U or Blue component input
SDI Output (3)	Third Serial Digital Output
Y/G input	Luminance or Green component input
N/C	No connection

5.2 Configuring external controls

There are three external control methods for the ADC104, serial (including the Crystal Vision Active Control Panel), by GPI inputs and from Statesman.

Each control method requires configuration of the front card edge DIL switch and unique card jumper settings may be required.



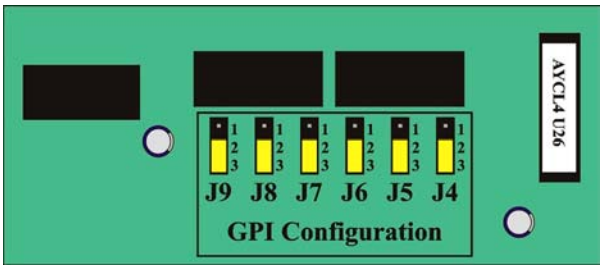
The ADC104 front view

Control	DIL switch lever 10
Board Edge	UP
Remote	DOWN

GPI control assignment

The ADC104 provides 6 GPI lines ‘a’ to ‘f’ which are assigned functions similar to some of the levers on the 10 way piano switch.

GPI configuration jumpers J4 to J9 control the function of the available GPIs.



ADC104 GPI jumper locations

Note: For the GPIs to be effective the corresponding lever switches must be in the up position.

The function of GPIs are as follows:

Links on jumpers J4 to J9 in 1-2 position:

GPI	Direction	Description
'a'	Input	Active low, selects current Test Pattern
'b'	Input	Active low, selects Betacam chrominance levels
'c'	Input	Active low unblanks lines 6 to 22 and 319 to 335 in 625 standard and unblanks lines 10 to 12 and 273 to 282 in 525 standard. Open circuit enables normal blanking.
'd'	Input	Active low, compensates for setup on incoming Y signal. Only applies to 525 standard.
'e'	Input	Active low, selects sync input on External input.
'f'	Input	Active low, configures the ADC104 for YUV input.

Note: GPI input settings are active in local mode only.

Link on jumper J8 in 2-3 position:

GPI	Direction	Description
'e'	Output	Active low, indicates sync input is not valid.

Note: If this output is used to drive an LED then a 330 ohm resistor must be added in series with the LED.

Configuring a second serial port

Four of the 6 GPI lines may be configured to provide a second RS422 communications port by moving jumpers J4 to J7 to the 2-3 position.

Links on jumpers J4 to J7 in 2-3 position.

GPI	Number	Direction	Description
'a'	J6	Input	RS422 Rx-
'b'	J7	Input	RS422 Rx+
'c'	J8	Output	RS422 Tx+
'd'	J9	Output	RS422 Tx-

The RS422 connections to the ADC104 card is accessed via the Remote 1 connector on FR1-6 or FR1AV frame, Remote 1 or Remote 3 connector on a FR2-12 or FR2AV frame and by the 15way Remote connector of the DTB-2 or DTB-AV frame.

The connector pin numbers are dependant on which slot number the ADC104 card is installed in (see FR2AV, FR1AV &DTBAV GPI CONNECTIONS) An active front panel control on the front of the Crystal Vision REM1U remote control panel would typically be used on this second RS422 port.

Note: An ADC104 card cannot be controlled by 2 active front control panels (one on each RS422 communications port) at the same time.

5.3 GPI connections

Each slot has an associated set of connections on the frame rear-panel remote connectors. For convenience, GPI lines are associated with reference codes ‘a’ to ‘f’ in the connector pin-out tables for each frame.

FR2AV GPI Connections

GPI lines ‘a’ to ‘f’ of each card are brought to one of the four remote connectors at the rear of the FR2AV frame 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)

Note: Remote 1 and Remote 3 are 26 way high density ‘D’ type female sockets and frame ground is pin 2 in each case. Remote 2 and Remote 4 are 26 way high density ‘D’ type male plugs and frame ground is pin 6 in each case.
Table shows Pin number (Remote number).

FR1-6 GPI Connections

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)

Note: 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).

FR2-12 GPI Connections

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)

Note: 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).

FR2-8 GPI Connections

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

Note: 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).

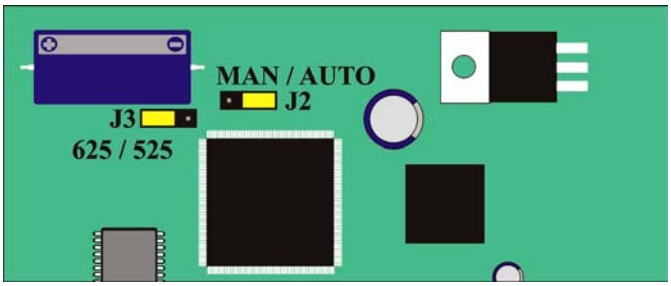
DTBAV and DTB-2 GPI connections

Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	1	2	2	4	5	6
2	9	10	11	12	13	14

Note: Remote 1 15 way high density D-type socket. Frame ground is pin 15.
Table shows Pin number.

5.4 Setting the line standard selection

The 625 / 525 line selection is controlled by jumper links J2 and J3 at the top right of the module.



ADC104 line standard jumpers

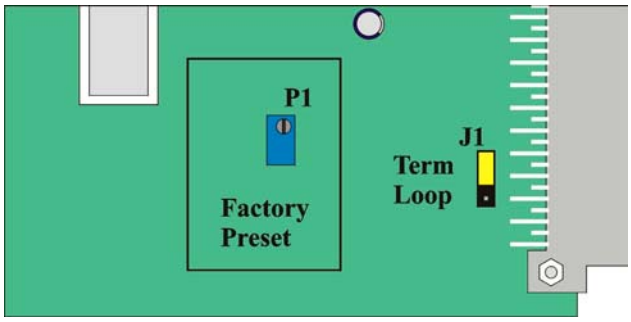
The following table describes the jumper positions required:

Setting	J2	J3	Notes
Auto	AUTO	Don't care	ADC104 auto-selects line standard
625	625	MAN	625 line standard forced
525	525	MAN	525 line standard forced

5.5 Setting Ext sync options

The external sync input may be configured as a single input terminated in 75 Ohms, or as a loop-through facility without termination (high impedance)

The selection is controlled by jumper link J1 at the bottom right of the module.



ADC104 Sync Input jumper

The following table describes the jumper positions required:

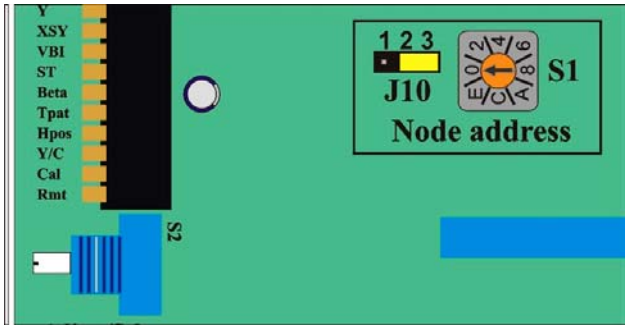
Setting	J1	Notes
Term	Term (upper position)	Sync input is terminated with 75Ω, and loop-out not connected
Loop	Loop (lower position)	Sync input unterminated and routed to loop-out connector

5.6 Setting node addresses

In the FR2AV, 2RU frame the node address is calculated in one of two ways:

- slot number minus 1 – giving a range of 0 - 11 in frame #1, ***OR***
- slot number plus fifteen – giving a range of 16 – 27 in frame #2

The two ranges are provided to allow one control panel to control two frames.



ADC104 Node Address jumper/selector

S1 is normally set to position 0 (factory default). If the ADC104 card is used in older frames such as FR2-12 or FR1-6 and these frames are being used with an active front panel then the Hex switch S1 can be used to set the node number (0 to 15) of the card. Note no two cards in a frame should have the same node number.

Frame	Node address setting
FR2AV, FR1AV, DTB2-AV	Set node switch, S1 to '0' and set link J10 in position 2-3. Altering J10 may cause incorrect node addressing on this and other boards in an FR2AV frame.
FR1-6 FR2-12 FR2-8	Set the remote node address in conjunction with link J10 as follows: J10 2-3 – set node addresses from 0 to 15 with S1 J10 1-2 – set node addresses from 16 to 31 with S1 (16 is added to switch setting) The node address setting is only read on power up.

5.7 Software upgrades

The software for the ADC104 module is contained in a single EPROM U32. To change this, remove the board from the frame and lever out the EPROM using an IC extraction tool or small flat bladed screwdriver. Replace the EPROM making sure that the notch on the IC faces away from the rear connector.

5.8 Jumper setting summary

The following table summarises the board jumper settings.

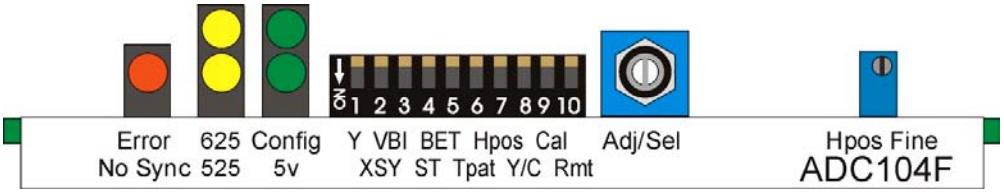
Jumper	Function
J1	Term (upper position): Sync input is terminated with 75Ω, and loop-out not connected Loop (lower position): Sync input unterminated and routed to loop-out connector
J2	AUTO: ADC104 auto-selects line standard (default) MAN: J3 selects line standard
J3	625: 625 line standard forced 525: 525 line standard forced
J4 – J9	Position 1-2: GPI inputs selected (default)
J8	Position 2-3: GPI output (sync input non-valid) selected on GPI line 'e'
J4 – J7	Position 2-3: 2nd serial port enabled using GPI lines 'a' to 'd'
J10	Used to select node address in older frames (default position 2-3)

WARNING! On no account should factory set jumpers be moved from their default positions, unless guided to do so in this manual or by Crystal Vision support personnel.

6 Problem solving

6.1 Card edge LEDs

The front edge of the card provides LED status and power rail monitoring, rotary set-up controls and a ten-way DIL menu selection switch.



The ADC104F front view

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

Card-edge LED assignments:

LED		Meaning	Notes
Error (red)	On	No valid syncs on selected sync input	Input syncs can be extracted from the Y/Green input or the external sync input
	Off	Valid syncs selected	
625/525 (amber)	Upper On	625 input set or detected	Card jumpers set Auto or Manual standard selection
	Lower On	525 input set or detected	
Config (green)	Upper On	Power on configuration has finished	Usually lasts 2-3 seconds
	Upper Off	Power on configuration is taking place	
5V (green)	Lower On	The onboard +5V and –6V power rails are OK	5V LED illuminates for both +5V and –6V power rails
	Lower Off	One or both of the onboard +5V and –6V power rails has a problem (low value) or is not present	

Signal presence and input signal line standard status are also displayed within Statesman and the Stat menu of the active front panel display.

Basic fault finding guide

The Power OK LEDs are not illuminated

Check that the frame PSU is powered and that the frame PSU is functioning – refer to the appropriate frame manual for detailed information.

There is no video output

Check that valid component inputs are present and that any cabling is intact.

The video output is horizontally mistimed

Check that the selected external sync signal is valid for the source is use.
Check that Hpos horizontal delay is set correctly. The adjustment range is +/- 2uS from reference sync input.
Note: The card-edge Hpos fine rotary control is always active and can adjust horizontal picture position by +/- 100 ns.

Active control panel settings change unexpectedly

Statesman settings may have overridden card settings if they were accessed more recently.

Active control panel does not work as expected

Check that a unique node address is being used in the frame the module is fitted into.
Check that the card edge DIL switch is set for remote control.

Statesman settings change unexpectedly

Other control settings may have overridden card settings if they were accessed more recently.

Statesman control is disabled

Check that DIL lever 10 is in the DOWN position.
If necessary re-boot Statesman
Carry out checks suggested in the Statesman manual.

GPI control does not work as expected

Check that a unique node address is being used in the frame the module is fitted into.
Check that the card edge is set for local control.
Check the GPI cabling.
Check jumper settings J4 to J9 on the card itself.

Chroma levels appear to be incorrect with some YUV sources

Check that the Chroma Levels setting (Normal/Betacam) is correct for the YUV source is use (ADC104F/N only).

Chrominance/Luminance delay is incorrect with some sources

Check that the Y/C delay is set appropriately for the source in use (ADC104F/N only) and that any input error is not greater than -111ns to 111ns.

Re-setting the card

If required, the card may be reset by simply removing the rack power and re-applying power after a few seconds or by removing the card from the rack re-inserting the card.
It is safe to reinsert the card whilst the rack is powered.

7 Specification

General

Dimensions	100mm x 266 mm module with DIN 41612 connector
Weight	220g
Power consumption	5.0 W

Inputs

Analogue Input	YUV and syncs or RGB and syncs 700mV into 75ohm. (Y and Green 1 volt with syncs)
	External syncs input can be composite Black & Burst or 2 volt mixed H & V syncs into 75ohm
	Link on PCB selects 75ohm termination or high impedance with loop-through (via PCB)
	DIL switch selection of YUV/RGB, Setup levels and (ADC104F/N only) Betacam chrominance levels
	Auto or manual 625/525 line selection (jumper selectable)
	+/- 2µs adjustment of picture position from syncs
	+/- 100nS adjustment in approximately 9nS steps of timing of Y to UV delay (ADC104F/N)

Outputs

SDI	4 x 270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M with EDH (on some frames and rear modules only 2 or 3 SDI outputs are available)
	<500ps 1KHz jitter and <800ps broadband jitter from stable 300mV Black and Burst reference or mixed sync reference.

Analogue performance

Luminance Frequency Response:	+/- 0.1dB 0 to 5.75MHz (ADC104F/FK)
	+/- 0.2dB 0 to 5.75MHz (ADC104N)
Chrominance Frequency Response:	+/- 0.1dB 0 to 2.75MHz (ADC104F)
	+/- 0.2dB 0 to 2.75MHz (ADC104N)

Noise	<-60dB weighted luminance or chrominance (ADC104F/N);
	<-60dB weighted (ADC104FK)
Gain Error	<1%
RGB matrix error	<1%
Chroma/Luma delay inequality	<5ns (applies to ADC104F/N only)
Sampling	Sampled to 10 bit precision at 13.5MHz on Y and (ADC104F/N only) 6.75MHz on U and V
Blanking	To 601 specification vertically, with selectable VBI blanking PAL lines 6 to 22 and 319 to 335 and NTSC lines 10 to 20 and 273 to 282

Test Patterns

Full screen/Split screen	SDI Test, Grey, EBU Bars, Frequency Sweep, 100% Bars, Frame Markers, Multi-Frequency, Ramp, Black.

Control options

Remote control	RS422/485
	19200 baud, 8 bits, 1 stop no parity
	2 serial ports – 1 connected to frame front panel, 1 can be linked to rear of frame instead of GPI input signals.
	Front panel control from frame active panel and remote panel.
	Statesman allows control from any PC on a network.
GPI Inputs	YUV/RGB input select
	Syncs on Y/G or external select
	VBI blanking ON/OFF select
	Setup ON/OFF select (applies to 525 Standard only)
	Betacam chrominance levels ON/OFF select (ADC104F/N)
	Test pattern ON/OFF select (ADC104F/FK)
	Contact- closure inputs to 0v from +5V to +30V
GPI Status Output	Invalid input syncs
	Current-sink outputs can drive LED with 330 Ohm resistor in series from +5V or 12/24V bulb, 50mA max.
Board Edge	YUV/RGB input select
	Syncs on Y/G or external select

VBI blanking ON/OFF select

Setup ON/OFF select (applies to 525 Standard only)

Betacam chrominance levels ON/OFF select (ADC104F/N)

Test pattern ON/OFF select (ADC104F/FK)

Set Horizontal picture position parameter to factory default values (ADC104FK)

Set Horizontal picture position and/or Y to UV delay parameters to factory default values (ADC104F/N)

Remote/local mode select

Shaft encoder adjustment of Horizontal picture position, Y to UV delay and (ADC104F/FK) test pattern section

Ordering information

ADC104F	10 bit RGBS/YUVS to SDI converter with full 601 specification filtering
ADC104N	10 bit RGBS/YUVS to SDI converter with near 601 specification filtering
ADC104FK	10 bit Y to SDI converter with full 601 specification filtering
FR2AV	2U frame for up to 12 Crystal Vision modules
FR1AV	1U frame for up to 6 Crystal Vision modules
DTB-AV	Desk top box for up to 2 Crystal Vision modules
RM01	Single slot frame rear module. Allows maximum number of ADCs in frame (12 in 2U, six in 1U, two in desk top box). Gives access to two SDI outputs
RM02	Four slot frame rear module. One rear module used for three ADCs, allowing nine ADCs in 2U (fits in 2U frame only). Gives access to three SDI outputs and syncs loop
RM18	Two slot frame rear module. Allows six ADCs in 2U, three in 1U and one in desk top box. Gives access to all four SDI outputs and syncs loop
FP1-S, FP1-L, FP2-L, FP2-LF	Active panels for FR2AV, FR1AV and DTB-AV
REM1U	19” remote control panel
REM1US	Narrow 1U remote control panel
Statesman	PC control system