



HIGH DEFINITION CHROMA KEYER

# SAFIRE HD

## HIGH DEFINITION CHROMA KEYER



Never before has High Definition chroma keying been so affordable.

**SAFIRE HD** works with all the common High Definition formats and is ideal for any live chroma keying production. News, weather, sports, current affairs, election broadcasts, chat and games shows and drama can all benefit from the razor sharp virtual images this High Definition chroma keyer can create. **SAFIRE HD** is equally at home on the film set, where it is perfect for previewing the chroma keying. It can also be used with Standard Definition sources, making it suitable for multi-standard environments. All inputs must be the same format.

**SAFIRE HD** forms part of a modular system resulting in easy integration with Crystal Vision's interface products. The 'double decker' board is just 266mm x 100mm and takes two slots in any of the company's standard frames, allowing 12 modules in 4U, six in 2U, three in 1U or one in a desk top box. The Foreground, Background and Key inputs and two main and two auxiliary outputs are accessed by using the RM32 frame rear module. **SAFIRE HD** can be operated by a stylish and instinctively easy-to-use control panel, or from any PC on a network using the Statesman software.

**SAFIRE HD** : start creating.

### CHROMA KEY

Safire HD offers excellent digital linear chroma keying for the creation of realistic virtual images.

Chroma keying is used to combine a virtual object (Background) with a real image (Foreground) by replacing a real colour - usually blue or green - with a virtual input. While blue and green are the traditional chroma keying colours, Safire HD offers the flexibility to key on any colour just by selecting it with a cursor.



*Virtual studio created in Paris for ITV Sport's 1998 football World Cup coverage using Crystal Vision keyers*

Linear chroma keying allows areas of the final picture to be a mixture of both Foreground and Background, permitting the use of transparent and reflective objects (such as spectacles, a glass of water and smoke) and resulting in more convincing edges. The quality of a chroma key can be judged by looking at the edges, and these are optimised by using all of Safire HD's fine adjustments. The sophisticated shadow processing allows the intensity of shadows to be precisely adjusted which also helps to create that realistic final effect.

Safire HD features both additive and multiplicative keying. Additive keying relies on a good, well-lit backdrop, but produces the best results for shadows and transparent objects.



*Foreground*



*Background*



*Composite picture*

Safire HD also includes a useful feature called Key Shrink. The realism of a chroma key is largely determined by how the keyer handles the boundary surrounding the Foreground image. As a result of the processing involved in extracting a key signal from the Foreground chrominance, there is a tendency for the key to 'spread', leaving a dark line at the edges of non-keyed Foreground objects such as a presenter. Key Shrink corrects this problem by allowing the user to move the edges of the key signal by the required fraction of a pixel, eliminating the dark band around Foreground objects.

It's so easy to set up a chroma key using Safire HD. It can be auto-configured with the help of a cursor, which is used to point at a typical area of Foreground.

Sophisticated downstream processing of the combined picture is available, allowing fades to the Foreground or Background and a final fade to black.

Two auxiliary outputs give you ultimate control by allowing you to look at the various internal signals - such as Suppressed Foreground and Combined Key - individually. The main outputs can also be used for this purpose if only using a single picture monitor.

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### EXTERNAL KEY

There are two internal rectangular masks - Foreground and Background - and an External Key. These are used to overrule the chroma keying process, as any area can be forced to show Background or Foreground. The flexible External Key should be used when a customised non-rectangular or moving shape is required and can be assigned as Force Foreground, Force Background or can be used for both at once (Force FB).

Sport is one of the areas which really benefits from being shot in HD as it allows the viewer to see more of the action, and the flexibility of the External Key makes Safire HD ideal for inserting graphics on to



sporting surfaces during live events. In a virtual studio the External Key signal is often used to force Background - for example, to allow the presenter to go behind a virtual pillar or desk. With sports graphics the External Key is used to restrict chroma keying to the area that contains the graphics by forcing Foreground everywhere else in the picture.

Safire HD additionally offers Force FB which uses different levels of a single key input to force Foreground and Background in different areas of the same picture. This means that a single Safire HD can be used to chroma key a graphic on to the pitch behind the players, and linear key a graphic in front of the crowd at the same time.

### LUMINANCE KEY (SELF-KEY)

Safire HD can key on the Foreground luminance level instead of the colour, allowing 'colours' of black, white or grey.

When keying on black or white you can set the Min and Max Key level. Keying on grey will ignore both black and white areas of the Foreground picture, with you selecting the shade of grey and the range you want to key on.

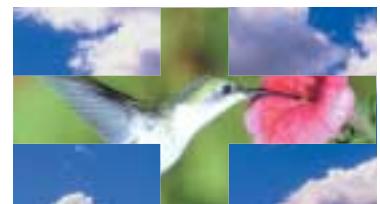
The key generated from the luminance can be combined with an External Key and also with the internal masks, making this type of keying as flexible as chroma keying.

Luminance keying allows the easy insertion of graphics on to snow or ice for winter sports programming. It also allows Safire HD to be used as an extremely flexible High Definition linear keyer for adding graphics, captions or logos to a video source.



### MIX AND WIPE MODES

Safire HD can perform a mix or wipe between two video sources, or between one video source and a colour produced by the internal matte generator. The internal wipe pattern generator features a



number of simple wipes: horizontal, vertical, horizontal blind, vertical blind, left corner, right corner, cross and box.

### CONTROLLING SAFIRE HD

The Safire Controller is a state-of-the-art control panel providing the ultimate in appearance and usability. The large, clear display provides extensive information on one screen,

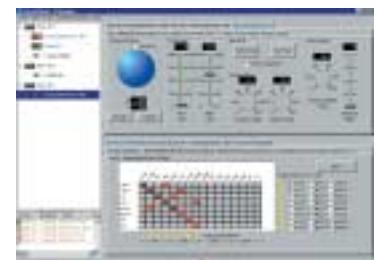


*Safire Controller remote control panel*

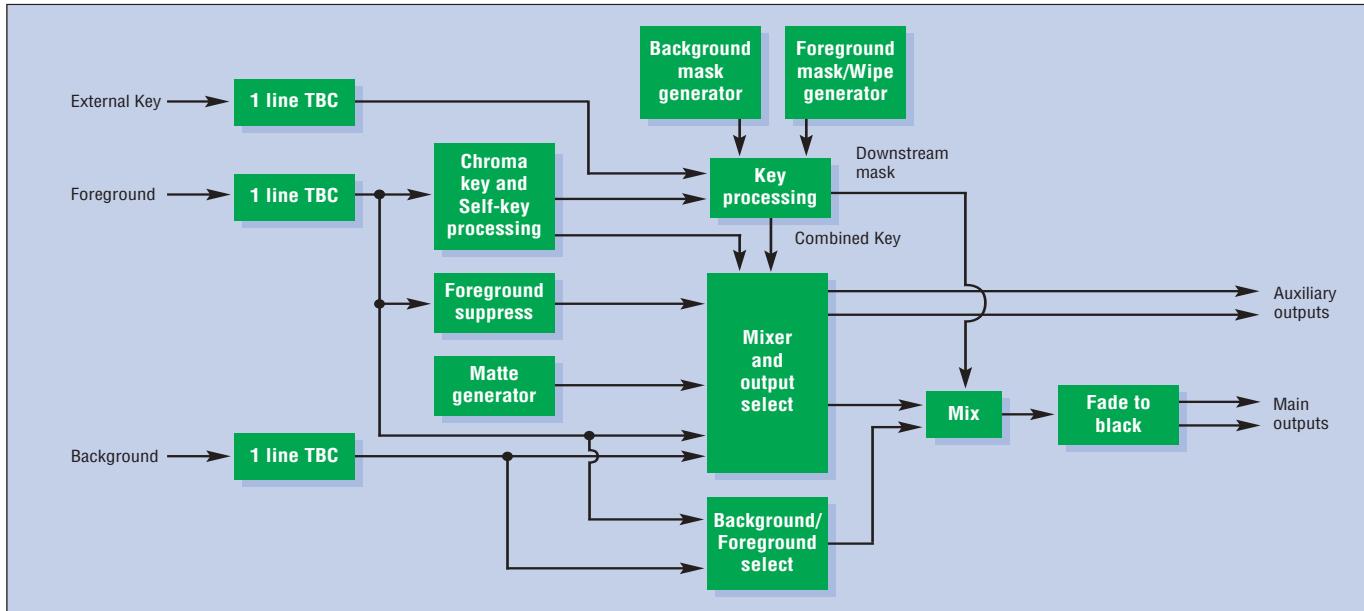
including a full set of selections for most controls. The menu structure is very simple to use with all the menus reached by a single button press, while all the 'live use' fades are permanently available on dedicated buttons. LEDs indicate the state of the main keyer settings, independent of the current menu. Up to seven Safire HD modules can be controlled, with the panel allowing a complete set up to be easily transferred from one Safire HD to another. The RM32 rear module includes an RJ45 connector for easy wiring of the Safire Controller.

Alternatively you can choose to operate Safire HD from a PC using Crystal Vision's Statesman software. All features are available and PC control is ideal if you do not expect to adjust the unit live on air, for which the physical controls of the Safire Controller are better suited.

Both the Safire Controller and Statesman allow recall of setups from GPIs. In addition the Safire Controller has a GPI input which can be used to choose which Safire HD is being controlled. Instant memory recall of setups by GPI in all modes allows switching between cameras with their own individual settings and makes Safire HD ideal for live use.



*Statesman PC Control System*



## S P E C I F I C A T I O N

### MECHANICAL

'Double decker' module 266mm x 100mm (uses two frame slots)  
Weight: 300g  
Power consumption: 14 Watts

### INPUTS

HD or SDI inputs (Foreground, Background and Key)  
270Mbit to 1.485Gbit compliant to SMPTE 259M and SMPTE 292M  
All common HD formats supported. All inputs must be same format  
Reference timing can be selected to come from Foreground, Background or Key input  
Minimum input to output delay approx. 5μs  
Max input buffer length one line (selectable)

### OUTPUTS

HD or SDI outputs - outputs follow inputs format  
Two main and two auxiliary outputs accessed by using RM32 frame rear module  
270Mbit to 1.485Gbit compliant to SMPTE 259M and SMPTE 292M  
Both main and auxiliary outputs can be used to show main output, keyed Background, suppressed Foreground, Foreground input, Background input, chroma key, processed key or matte generator

### CONTROL

RS485 multi-drop 19200 baud, 8 bits, no parity  
Safire Controller control panel operates up to seven Safire HD modules  
Statesman software allows control from any PC on a network  
GPI input

### CHROMA KEY

Cursor based auto setup will set all variables and be suitable for most applications. Fine improvements can be made by adjusting the following:

- Hue Colour for chroma key
- Acceptance Angle Range of hue to generate key
- Max Clip and Min Clip Set chroma level for full chroma key and zero chroma key
- Y Correction Luminance alteration of keying to remove key spill

- Suppression Angle Range of hue to completely suppress in Foreground
- Y Suppression Amount of luminance to be suppressed in coloured keying area of Foreground
- Shadow Enhance Fine adjustment of shadow effect
- Key Shrink On/Off. Key shrink reduces the size of the chroma key by a fraction of a clock. Reduces the possibility of a black line round the presenter in some lighting conditions.

Use additive keying to get best results for shadows and transparent objects. (Relies on a good, well-lit backdrop.)  
Chroma key can be inverted or turned off leaving the External Key and Background/Foreground masks. When chroma keying is switched off keying can be from Foreground luminance level (See Luminance Key)

Downstream processing:

- Keyed Background is combined with Foreground or suppressed Foreground
- Fade to Foreground or Background, followed by a fade to black (on main outputs only)

### EXTERNAL KEY

External Key and two internal masks (Background and Foreground) can be combined with the chroma key for additional effects. Controls here include:

- External Key: On/Off, Invert, Max Clip and Min Clip
- Background and Foreground masks: On/Off, Invert, Window Adjust (horizontal and vertical position, horizontal and vertical size)
- Key Fade function, to fade Foreground or Background in and out

### LUMINANCE KEY (SELF-KEY)

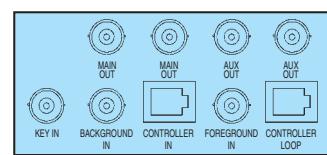
Self-key is available from Foreground input  
Adjustable Key Max, Key Min and Inversion or grey level and range  
Internal colour matte generator can be used as fill for keying (also available with chroma key)

### MIX AND WIPE

Foreground and Background can be mixed or wiped  
Wipes include: horizontal, vertical, horizontal blind, vertical blind, left corner, right corner, box and cross

### ANCILLARY DATA/EMBEDDED AUDIO

Ancillary data and embedded audio is taken from the selected timing reference



RM32



## O R D E R I N G I N F O R M A T I O N

Safire HD	HD/SDI chroma keyer
Indigo 4	4U frame with passive front panel for up to 24 Crystal Vision modules
Indigo 4S	4U frame with passive front panel fitted with Statesman CPU for up to 24 Crystal Vision modules
Indigo 2	2U frame with passive front panel for up to 12 Crystal Vision modules
Indigo 2A	2U frame with active front panel for up to 12 Crystal Vision modules
Indigo 2S	2U frame with passive front panel fitted with Statesman CPU for up to 12 Crystal Vision modules
Indigo 1	1U frame with passive front panel for up to six Crystal Vision modules
Indigo 1A	1U frame with active front panel for up to six Crystal Vision modules
Indigo 1S	1U frame with passive front panel fitted with Statesman CPU for up to six Crystal Vision modules
Indigo DT	Desk top box with passive front panel for up to two Crystal Vision modules
Indigo DTA	Desk top box with active front panel for up to two Crystal Vision modules
Indigo DTS	Desk top box with passive front panel fitted with Statesman CPU for up to two Crystal Vision modules
RM32	Two slot frame rear module. Allows 12 Safire HDs in 4U, six in 2U, three in 1U and one in desk top box. Gives access to the Foreground, Background and Key inputs and the two main and two auxiliary outputs
Safire Controller Statesman	Remote control panel for up to seven Safire HD modules PC Control System

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