LKEY HD

High Definition linear keyer

USER MANUAL

Crystal Vision

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1.   Introduction

LKEY HD is a 10 bit High Definition linear keyer with additional features including mixing and wipes. LKEY HD can also be used with Standard Definition sources, making it suitable for multi-standard environments.

LKEY HD can be used for the downstream keying of logos, captions, scoreboards and other graphics, or used upstream before the mixer.

Two keying options are available: External Key mode uses the luminance of a key signal to cut a hole in the Background programme, while in Self-key mode the luminance of the Foreground graphic is used to generate the key – useful if you don't want to use a dedicated key input. Fill video is then inserted, usually the Foreground signal or a colour produced by the internal matte generator.

Self-key over background using linear keyer

LKEY HD offers both additive and multiplicative linear keying, giving a choice of methods to suit the graphics being worked with.

In addition, a variable Background and a variable Foreground mask have been provided. The masks may be used independently or combined with priority control to select which mask has precedence in areas of overlap.

The Background mask can be used to modify keys or clean up imperfect keys. The Foreground mask has been specially designed to allow down-stream masking to force selected areas of the Foreground irrespective of the main keyer, but prior to the fade to black of the main output.

The external input may be used to generate custom or moving mask shapes instead of (or in addition to) the internal masks.

LKEY HD provides both additive and multiplicative keying. Although linear multiplicative keying achieves good results even with transparent and reflective objects, additive keying is recommended for shadows, smoke and transparent objects.

A flexible output bus allows both main and preview outputs to monitor each stage of the keying process such as the Foreground, Background, External Key and Final Key.
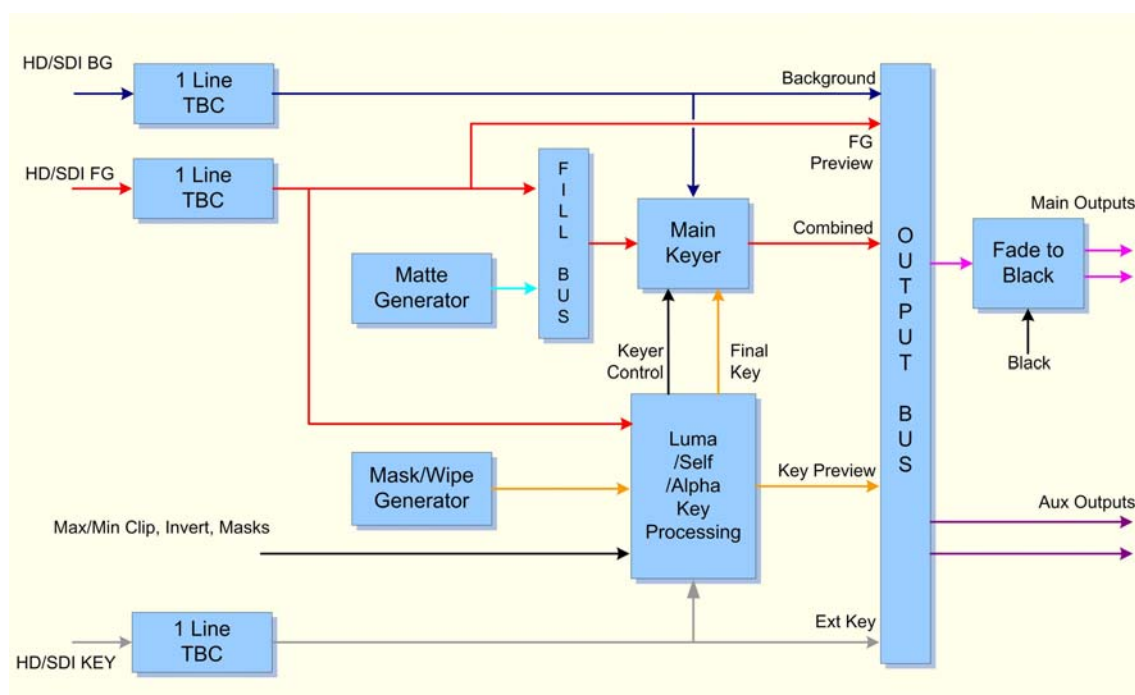
The LKEY HD linear keyer

The keyed signal may be amplified, offset, inverted and faded in and out either manually or as a timed transition. The fade direction may be selected from fade to background and fade to foreground.

LKEY HD accepts all common HD formats as well as either 625 or 525-line input and configures itself automatically for the incoming video standard. It should be noted that all inputs must be of the same format.

The unit may also be placed in mix or wipe mode and a range of simple wipe patterns are available.

Main features

- Additive and multiplicative keying

- Linear key from External Key and/or Self-key from foreground

- Dual force mask generation – special downstream Foreground force mask

- Mix & Wipe with eight simple wipe patterns

- Fade to black on main output

- Manual and automatic transitions

- Key offset, gain and inversion

- Main and preview outputs with EDH insertion

- Dedicated direct access Safire Controller panel (LKEY Mode)

- Passes ancillary data and embedded audio from background input

- HD/SD operation

- Transfer settings to another LKEY HD for real preview keying

- Dedicated frame GPI inputs for remote preset memory recall

- Dedicated panel GPI inputs for remote LKEY controller assignment to LKEY modules

- Unreserved panel GPI outputs for flexible system integration

LKEY HD is controlled using a dedicated Safire Controller panel with its T-Bar, direct entry function keys, assignable 'soft' buttons/rotary controls and clear matrix display.

The Safire Controller Panel - one panel controls up to 7 LKEY HD or Safire keyers

2. Installation

LKEY HD is a dual-height module, used with the Safire Controller panel. The module will fit into all Crystal Vision rack frames. The Indigo 4 frame will accommodate up to 12 LKEY HD cards. The Indigo 2 frame will accommodate up to six and three cards will fit in the Indigo 1U frame. A single card will fit into the Indigo DT desktop box.

2.1. LKEY HD board level controls

LKEY HD can only be controlled from the Safire Controller panel active control panel or Statesman PC control system. For Safire control panel operation ensure that DIL1 and DIL4 are set for 'Control Panel'.

LKEY HD front view

Control	DIL 1	DIL 4
Not assigned	UP	UP
Not assigned	UP	DOWN
GPI control	DOWN	UP
Control panel	DOWN	DOWN

2.1.1. Selecting latch or pulse GPI control

With V4.25 software onwards the GPIs can activate on latch to ground or pulse to ground depending on the position of DIL 3:

	DIL 3	Notes
Latch GPI	UP	Latch to ground to activate GPI
Pulse GPI	DOWN	Pulse to ground to activate GPI

Note: DIL 2 has no function.
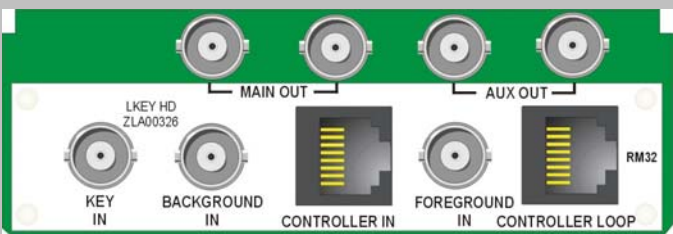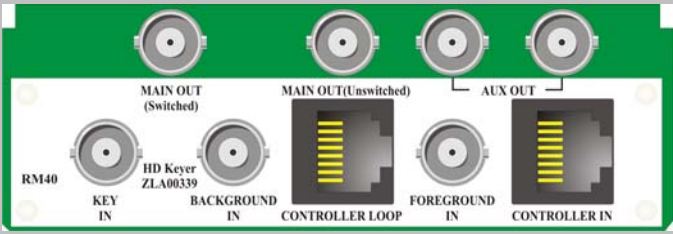
2.1.2. Software and firmware upgrades

The software for the LKEY HD module is contained in a single EPROM. The firmware is contained in the removable module adjacent to the EPROM. To change either of these, remove the board from the frame and carefully remove the EPROM or firmware module taking great care not to bend any of their pins. When refitting the EPROM and firmware module take great care that all pins are located correctly and that device has been orientated correctly.

Note: Incorrect orientation will result in permanent damage to the device.

2.2. Indigo frame rear connectors

There are two single height rear connectors available. All modules can be plugged in and removed while the frame is powered without damage. Available rear connectors are as follows:

RM32 and RM40 rear connectors	Description
	RM32 12 Safire modules per 4U frame All frame slots can be used RM40 12 Safire modules per 4U frame All frame slots can be used

RM32	Description
MAIN OUT(1)	Serial Digital Main output 1
MAIN OUT(2)	Serial Digital Main output 2
AUX OUT (1)	Serial Digital Preview/Auxiliary output
AUX OUT (2)	Serial Digital Preview/Auxiliary output
KEY IN	Serial Digital External Key input
BACKGROUND IN	Serial Digital Background input
CONTROLLER IN	RJ45 connection for Safire controller remote panel
FOREGROUND IN	Serial Digital Foreground input
CONTROLLER LOOP	RJ45 Loop-through connection for Safire controller remote panel. To daisy-change further Safire HD modules

RM40	Description
MAIN OUT(Switched)	Serial Digital Main output with manual/auto bypass
MAIN OUT(Unswitched)	Serial Digital Main output without bypass
AUX OUT (1)	Serial Digital Preview/Auxiliary output
AUX OUT (2)	Serial Digital Preview/Auxiliary output
KEY IN	Serial Digital External Key input
BACKGROUND IN	Serial Digital Background input
CONTROLLER IN	RJ45 connection for Safire controller remote panel
FOREGROUND IN	Serial Digital Foreground input
CONTROLLER LOOP	RJ45 Loop-through connection for Safire controller remote panel. To daisy-change further Safire HD modules

Note: The switched output is bypassed to the BACKGROUND input automatically on loss of power or by user control via GPI 'f' (pulled low) on the main board slot.

2.3. Control panel connectors

The control panel requires a cable from the "RS422" connector on the panel to one or more of the "Remote" connectors on the rear of the frame or dedicated RJ45 connector on the RM32 rear module.

Rear of Safire Controller panel showing connector side view

Safire Controller panel connectors

A dedicated external power supply provided with the control panel, screws into the three-pin power socket.

The RS422 connector is used to connect the control panel to frames containing LKEY HD modules. If more than one LKEY HD is to be controlled, a daisy-chain configuration will be required.

The GPI 1 connector is used to allow remote assignment of the Safire panel to a particular LKEY HD module according to its node address in connected frames.

The GPI 2 connector provides access to unassigned Panel GPI outputs whose state is stored in the LKEY HD module preset memory but output from an assigned Safire controller panel.

Safire Controller panel to frame wiring details is provided in the Frame-panel interconnect wiring section

Frame and Panel GPI I/O pin out is given in the GPI section.

2.4. Frame-panel interconnect wiring

The connection from the control panel to the appropriate frame remote connector has a cable with a D-type plug at one end and an RJ45 connector at the other.

It is suggested that a short adaptor cable be made with a standard RJ45 patch lead and an in-line coupler used. The required cable length can then be added to connect between the controller and frame containing the LKEY HD. Further LKEY HD modules may then be daisy-chained from the RM32/40 loop-through.
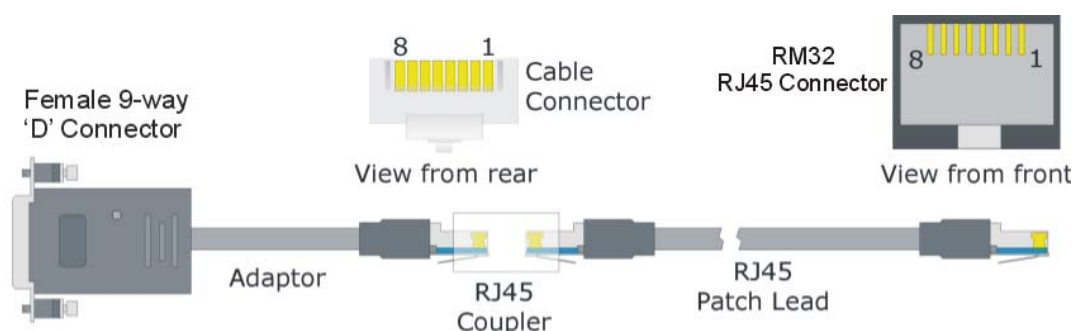
Controller panel to RJ45 adapter and CAT5 patch lead

CAT5 Colour	RJ45 plug			9-way 'D' connector
Brown	8			8
W/Brown	7			3
Blue	4			7
W/Blue	5			2

Note: For reliable communications both the Safire controller and all frames containing Safire HD cards must share a common ground return.

Existing Safire/LKEY wiring

It is possible to use existing SD Safire and LKEY wiring to control a LKEY HD as the comms connections via the GPI ports has been retained.

Note: Link selection of comms via GPI lines is no longer necessary as the LKEY HD reserves these connections solely for control via the GPIs. Also note, as the LKEY HD is a dual height (2 slot) card the GPI control wiring must only be connected to the lower of the two slots occupied by the LKEY HD.

2.5. GPI connections

There are two types of GPI interface available for each LKEY HD, these are - frame GPIs accessible at the frame rear connectors and panel GPIs, which are accessible at the rear of an assigned Safire Controller.

There are 12 GPIs available from the LKEY HD. The first four frame lower-slot GPIs 'a' to 'd' are serial communication lines, which are reserved for serial control for Safire Controller panels. The next two frame lower-slot GPIs are reserved as outputs and have no function at present. Of the six frame upper-slot GPIs, four are assigned to mix and fade functions. The final two are assigned for remote preset memory recall.

There are currently five panel GPI inputs reserved for remote Safire Controller assignment to LKEY HD modules and four unreserved panel GPI outputs whose states are stored in each LKEY HD, but only output from an assigned panel.

2.5.1. Frame GPI pinout

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.

Lower Slot GPI	
'a'	**Tx-**
'b'	**Tx+**
'c'	**Rx+**
'd'	**Rx-**
'e'	**Not used**
'f'	**Bypass Main Switched to Background (RM40 only)**
Upper Slot GPI	
'a'	**Auto fade to black (toggles)**
'b'	**Not used**
'c'	**Auto fade EXT-key (toggles)**
'd'	**Auto mix (toggles)**
'e'	**Preset recall**
'f'	**Preset recall**

Preset	'e'	'f'
0	open	open
1	closed	open
2	open	closed
3	closed	closed

4U frame GPI connections

GPI lines 'a' to 'f' of each card connect to one of eight rear remote connectors as follows:

Slot no. Upper Frame		'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)
Slot no. Lower Frame		**'a' pin**	**'b' pin**	**'c' pin**	**'d' pin**	**'e' pin**	**'f' pin**
1		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 and Remote 4 are 26-way high-density D-Type male plugs and 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 one 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 and 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 one of 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 is a 26-way high-density D-type socket. Frame ground is pin 2 and +5V @500mA is pin 1.

Remote 2 is a 26-way high-density D-Type plug. Frame ground is pin 6 and +5V @500mA is pin 15.

DTB-AV desk top box GPI connections

GPI lines 'a' to 'f' of each card connect to the rear remote connector as follows:

Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	1	2	3	4	5	6
2 }	9	10	11	12	13	14

Note: Remote connector is 15 way normal density D-Type socket. Frame ground is pin 15.

Indigo DT desk top box GPI connections

GPI lines 'a' to 'f' of each card connect to the rear remote connector 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)

Table shows pin number (remote number)

Note: Remote 1 is a 26-way high-density D-type socket. Frame ground is pin 2 and +5V @500mA is pin 1.
Remote 2 is a 26-way high-density D-Type plug. Frame ground is pin 6 and +5V @500mA is pin 15.

2.5.2. Safire controller panel GPI pinout

There are currently five panel GPI inputs reserved for remote Safire Controller assignment to LKEY HD modules and four unreserved panel GPI outputs whose states are stored in each LKEY HD, but only output from an assigned panel.
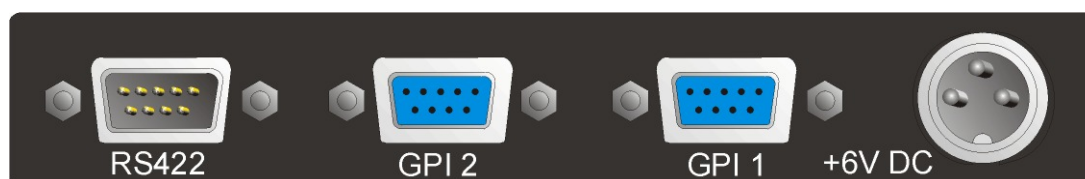
Safire Controller panel connectors

GPI 1 pinout is as follows:

Pin No	Panel GPI IN
1	GPI in 1
2	GPI in 2
3	GPI in 3
4	GPI in 4
5	GPI in 5
6	GPI - not used
7	GPI - not used
8	GPI - not used
9	GND

GPI 2 pinout is as follows:

Pin No	Panel GPI OUT
1	GPI 5 – not used
2	GPI 6 – not used
3	GPI 7 – not used
4	GPI 8 – not used
5	GPI op 1
6	GPI op 2
7	GPI op 3
8	GPI op 4
9	GND

Refer to section, 4.4.8 'Configuring GPIs' for details of remote LKEY HD assignment and using Panel GPI outputs.

3. Key concepts

This chapter explains some of the concepts and terminology used in Self-keying, Chroma keying, mixing and wiping.

3.1. Using the keyer

The LKEY HD Digital Linear Keyer can be used to add captions graphics or logos to a video source. Both External and Self-key modes are supported.

In the External Key mode it uses the luminance of a key signal to cut a hole in the background into which 'fill' video, usually the Foreground signal, is inserted. In Self-key mode the luminance of the Foreground is used to generate the key.

In fact, the fill video may be selected from three video sources: a single colour from a matte generator, the Foreground video or the Background video. The key signal may be amplified, offset, inverted, combined with variable masks and faded in and out either manually or as a timed transition.

The variable mask output can be used as the key for sources that don't provide their own key or alpha channel output and where Self-keying is not appropriate.

The main output and preview outputs can independently show the video sources, the key, the final or composite video output or a preview of the Matte generator output.

3.2. Additive and multiplicative keying

Keying works by superimposing fill (usually Foreground) video over the top of Background video. To prevent 'double images' where the fill and Background are added, the Background video is usually prepared by being 'faded to black' or 'cut out' wherever the fill video is to appear.

The signal that controls the 'hole cutting' or 'fade to black' is known as the key signal and the device that performs the operation is a multiplier. The rise and fall time of the key signal must be bandwidth controlled in the same way as normal video.

Such high quality keys are sometimes described as possessing 'shaped edges' and should never be larger than any Foreground graphical elements.

Where a Foreground signal consists of graphic elements with properly shaped edges against a black background, it may be selected as fill and simply added to the prepared Background. This is known as 'Additive keying' and is typically used with devices such as logo or character generators that provide a high quality key output which is also used to key their graphic output against a black background.

Additive keying is usually preferred in this case since it often ensures the best image quality at the boundary between Foreground graphic edges and Background video.

If the fill video has graphics elements without 'shaped edges' or if it is full frame video and only the key signal defines the required foreground subject(s), the fill must also be

multiplied by the key signal prior to being added to the background. This process is commonly (but inaccurately) referred to as multiplicative keying.
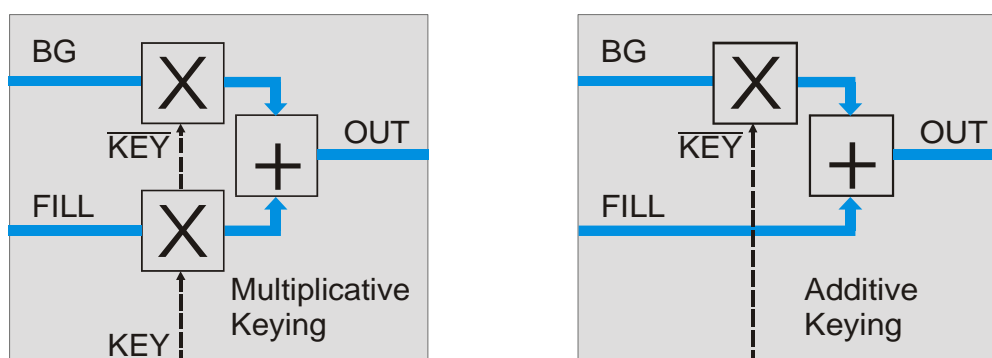
Multiplicative versus additive keying

Note: The key is inverted when used to prepare the background video before the fill video is added, but is not inverted when defining required areas of the fill in 'multiplicative' keying.

Additive keying avoids 'double shaping' graphic or text image outlines, which might otherwise appear to have a black outline when the key signal provided has already been used to prepare the edges of graphic elements of the selected fill video.
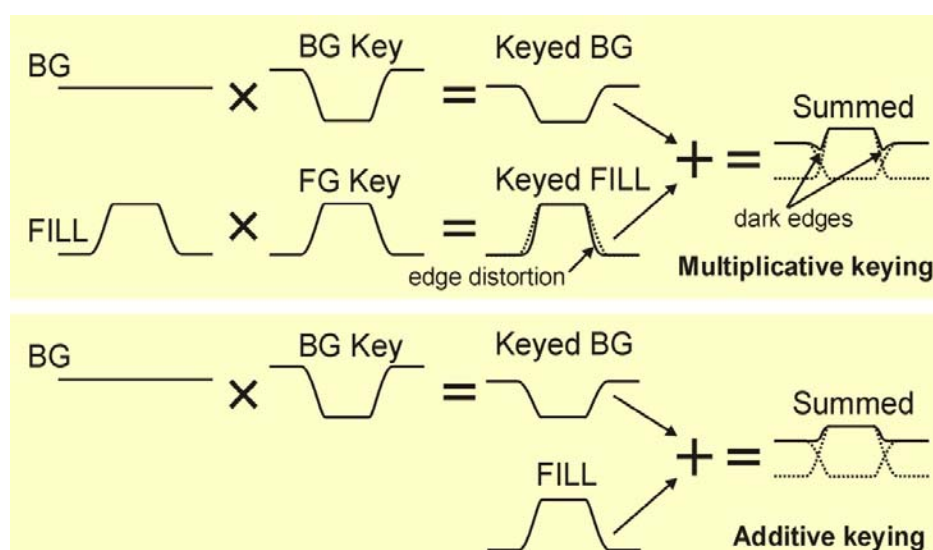
Additive keying may avoid edge distortion caused by an unnecessary multiplier stage

A typical application for additive keying is for character generators that supply a high quality key and also use this key to prepare their own video text output against a black background.

3.3. Using a Self-key

LKEY HD can be used as a standard digital linear keyer to add captions, graphics or logos to an HD/SD video source. The key may be derived from an External Key input or a Self-key can be produced using the luminance or black and white information of the Foreground video.

Foreground and Background masks may also be used in conjunction with the key signal.

Foreground input to be used as Self-key

Composite output – Foreground input used as fill

3.4. Using an External Key

The External Key may be used where external graphics are available with a separate key signal. An example would be a character generator output where only the key signal itself has accurate and correctly formed edges. In this case, the External Key signal is normally preferred to a Self-key, to avoid the edge distortion discussed in Section 2.2.

3.5. Using masks

Sometimes the key source may contain imperfections or incorrect detail, which may key undesirable fill detail. These unwanted areas of the fill video can usually be easily removed by 'forcing' the Background with a Foreground mask. Similarly, wanted areas of the Foreground can be forced with a Background mask. A special downstream Background mask ensures that the Foreground can always be forced over the final keyer output.

Adjustments to the mask can be seen by viewing any signal on the Output Bus, which is downstream of the keyer, and the Final Key.

The following mask facilities are provided:

- Background, Foreground and External Key masks may be used together or independently
- Masks may be turned on or off and inverted and adjusted in position and size


*External Key*

Foreground graphics

Mask + Ext key = Total key

3.6. Mixing and wiping

In these modes the unit will perform a mix or wipe between the Foreground and Background video sources. The mix or wipe can be controlled manually with the T-Bar, or by setting an auto-transition triggered from the EFFECT button on the control panel, or from remote control.

The internal wipe pattern generator has eight wipe patterns available as shown in the following table:

	Vertical		Left Corner
	Horizontal		Right Corner
	Vertical Blind		Box
	Horizontal Blind		Cross

LKEY HD Wipe Patterns

4.The Safire Controller

The Safire Controller panel provides convenient access to keyer and mixer functions with a combination of direct access keys and assignable or 'soft' controls. A bright seven-line dot-matrix display ensures high visibility and both manual and timed transitions have dedicated controls.

4.1. Using the controller panel

Besides a T-Bar to perform transitions, direct access keys include dedicated buttons for chroma key on/off, menu entry keys, and timed functions such as chroma/black fades and effects. Four soft rotary controls allow numeric data to be easily assigned to variables.

Use of the Safire Controller panel requires setting the board edge DIL switch levers 1 and 4 both DOWN.

Safire Controller panel showing rack mount ears

The left-most group of buttons under the heading Chroma Key are only used when controlling a Safire Chroma keyer. When controlling an LKEY HD these buttons bring up a status display.
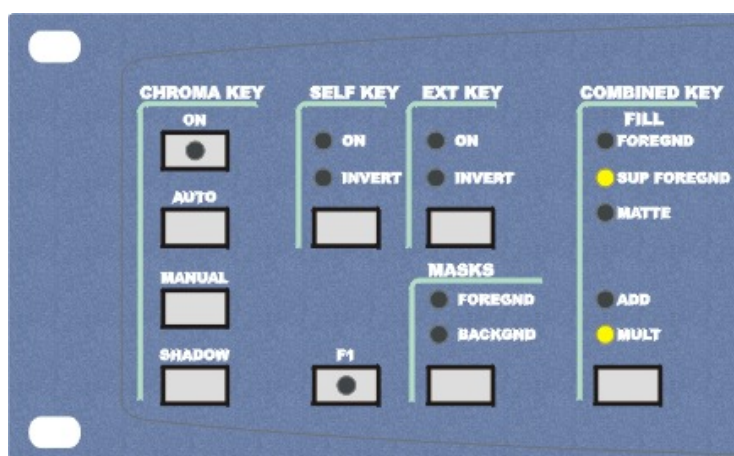
Keying, Masks, Fill Source and panel lock/unlock controls

The F1 button provides access to a special menu used only by a Safire chroma keyer. The remaining buttons in this group provide direct access to LKEY HD menus such as Self-Key, Ext Key, Masks and Combined Key (key fill).

Available functions are summarised in the following tables:

Chroma Key selection buttons

Button	Function	Notes
ON	Enters Status screen	Gives current status,

Note: For the LKEY HD the Auto, Manual and Shadow keys have no function

Self-key

Button	Function	Notes
Self-key	Enters Self-key menu	Self-key LED illuminates when Self-key is on Invert LED illuminates when Self-key is inverted

Ext Key

Button	Function	Notes
Ext Key	Enters Ext Key menu	Ext Key LED illuminates when External Key is on Invert LED illuminates when External Key is inverted

Combined Key

Button	Function	Notes
Com Key	Enters Combined Key menu Select Fill Source	Foregnd or Matte fill source LED illuminates when selected (suppressed foreground Chroma key mode only)
	Select Add/Mult keyer type	Add or Mult key type LED illuminates when selected
	Shrink [Key]	Shrink is only active in Chroma key mode
	Invert Final Key	Invert the final or combined key

Masks

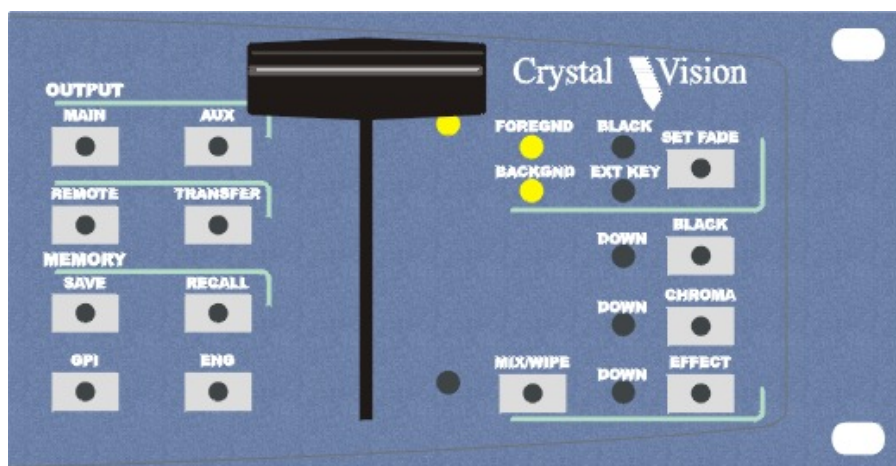| Button	Function	Notes
Masks	Enters Masks menu	Foregnd Mask LED illuminates when foreground mask is on Backgnd LED illuminates when background mask is on

F1

Button	Function	Notes
F1	Not used on a LKEYHD	

The button groups to the right of the T-Bar are the Set Fade enter-menu buttons and the Black, Chroma, Effect and Mix/Wipe direct action transition buttons. The groups to the immediate left of the T-Bar comprise the Output, Remote, Transfer, GPI, ENG and Memory enter-menu buttons.

Live controls, fader/output assignments and engineering menus

The available functions are summarised in the following tables:

Output Selection Buttons

Button	Function	Notes
Main	Enters Main Output source select menu	Choose from Fg, Bg, Ext Key, Combined, or Final Key,
Aux	Enters Auxiliary Output (Preview) menu	As Main
Remote	Enters Remote menu	Select to assign Safire Controller to available modules
Transfer	Enters Transfer menu	Copy Setup between LKEY HD

Memory Selection Buttons

Button	Function	Notes
Save	Enters Save Configuration menu	Ten named presets available
Recall	Enters Recall Memory menu	As Save
GPI	Currently not implemented	Shows status
ENG	Enters Engineering menu	Status of inputs, Ref Select, H Phase and Display brightness

Set Fade

Button	Function	Notes
Set Fade	Enters Set Fade menu	Assign signal T-Bar fades to – Fg, Black or Fade Key. Select transition time for transition buttons. LED confirms fade-to source selected.

Transition buttons

Button	Function	Notes
Black	Initiates a Fade to Black	Transition time set in Set Fade menu
Chroma	No function, Chroma keyer only.	
Mix/Wipe	Enters Mix/Wipe mode and Mix/Wipe menu	Transition time set in Set Fade menu Mix or Wipe and wipe effect selected in Mix/Wipe menu. Down LED illuminates when transition is fully active.
Effect	Initiates a Mix or a Wipe when in Mix/Wipe mode Initiates External Key fade in any other mode	Transition time set in Set Fade menu Mix or Wipe and wipe effect selected in Mix/Wipe menu. Down LED illuminates when transition is fully active.

If a transition button is pressed during a timed transition, its effect will be reversed.

T-Bar

Control	Function	Notes
T-Bar	Manually controls Mix/Wipe/Key/Fade	Fade up or Fade down LED illuminates at end stops.

Selecting one of the BLACK, MIX or WIPE buttons initialises LKEY HD and sets some default values.

The T-bar 'end-stop' LEDs always show the electronic state of the assigned fade function. If an end-stop LED shows that the T-bar is 'at the wrong end', it can be moved to the lit position, *without affecting the program output*.

The video faded in or out by the T-bar is dependent on which keys are currently active. It is possible to have both Self-key and External Key active at any one time;

4.2. Using the display and soft controls

The display is used together with eight soft buttons and four soft rotary controls. The function assigned to each is entirely dependent on the currently active menu.

Safire Controller assignable controls

An LED within the soft buttons or just to the left of the rotary controls always indicates the active controls.

If there are more than four variables to be controlled, buttons will be used to assign displayed variables to rotary controls. Rotate the appropriate rotary control to change the variable, it will be active immediately and the effect in most menus can be seen immediately on the affected output.

If there are more variables than can be displayed on one menu, a MORE button is used to access additional menu(s).

Example of more function

The next section will show how to assign a Safire Controller to a LKEY HD module. Some of the manual controls used to 'fine-tune' a linear key are also introduced. A full discussion of available LKEY HD menus and controls follows.

4.3. Getting started

Ensure that the Safire Controller is connected to the appropriate remote connector of a Crystal Vision rack containing one or more LKEY HD or Safire units and apply power to both controller and rack. Refer to sections 2.2 and 2.3 of the Installation chapter for cable connection details.

For these examples, at least two synchronous video inputs will be needed, a background image connected to the BG IN connector, a foreground input connected to the foreground input or an SDI input connected to the External Key input. Connect a suitable monitor to the Main output.

Tip: An External Key will be mandatory if the Ext Ref is set to use the Ext Key input as a reference (refer to the ENG menu).

Controller Polling for controllable module (power on default)

At power-up all LEDs illuminate for a few seconds whilst the Safire controller polls for available LKEY (or Safire) modules. If one or more module(s) respond during this time it (they) will be listed.

LKEY module found in slot 1

If necessary press Start poll to search for modules in connected frames.

Tip: The LKEY-HD module may take longer to initialise from power up than the panel's polling time-out. Select Poll All if necessary.

Select the desired module to control. The Poll All command can be found by pressing the REMOTE button at any time.

4.4. Safire Controller menus

This chapter describes LKEY HD's operational, engineering and status menus.

Assigning Output sources

The MAIN and AUX (Preview) output assignment functions allow a number of internal video signals to be monitored in addition to the COMBINED output. For example, inspection of the FINAL KEY is a good way to spot imperfections within the key setup.

Main output assignment – combined output selected   *Aux output assignment – final key selected*

Enter the Main Output source-select menu with the OUTPUT button, or the Aux Output source-select menu with the AUX button. Select the desired signal with the appropriate soft button. The chosen signals will be highlighted in CAPITAL letters and the appropriate soft-button LED will illuminate.

Function	Notes
Fg Input	Selects the Foreground input.
Bg Input	Selects the Background input
Ext Key	Selects the External Key input
Combined	Selects the combined video image.
Final Key	Selects the combined key. This will be a combination of some or all of External Key input, Self-Key, Foreground mask and Background mask.

Assigning T-BAR/EFFECT functions

The type and duration of timed effects can be selected using the SET FADE menu. The menu displayed depends on the keyer mode.

T-bar/Effect function menu in keyer mode   *T-bar/Effect function menu in Mix mode*

Select the appropriate source to be FADED TO by the T-Bar/Effect button in Self/Ext key mode (or select the appropriate function to perform in Mix/Wipe mode). Then set the desired Go button (i.e. auto-transition) time (default 20 fields).

The T-bar or Effect button performs the selected function. A keying operation will fade between the keyed signal and the signal selected in the SET FADE menu. This has a lower priority than Foreground and Background masks.

Tip: Selecting Fade Key in this menu will allow the External Key to be faded down using the T-bar or timed transition (Effect).

Inverting the final key will change the fade-to source. If the active key is also inverted, the effect is the same as selecting fade to foreground.

The effect can be initiated manually with the T-Bar or automatically by pressing the Effect button when the effect will occur at a rate set by the 'Go' button time.

4.4.1. Mix/Wipe mode

The Mix/Wipe mode, entered by pressing the MIX/WIPE key, enables mixing or wiping from Foreground to Background or Background to Foreground with the following controls:

- Manual with the T-bar
- Automatic or 'timed' with the EFFECTS key

Select MIX or WIPE transition   *Select pattern for wipe*

Function	Notes
Mix	Select mix transition
Wipe	Select wipe transition
Mix/Wipe on	Mix/Wipe status
Select wipe pattern	Use next menu to select wipe pattern

The available wipe patterns are as shown in the following table:

	Vertical		Left Corner
	Horizontal		Right Corner
	Vertical Blind		Box
	Horizontal Blind		Cross

LKEY HD Wipe Patterns

Pressing the EFFECTS key again during a transition reverses the direction of the transition.

MIX/WIPE mode will prevent any keys or masks that may have been set from contributing to the output, but will not erase any settings.

Note: To exit MIX/WIPE mode select another button

Selecting the transition time

The time for the transition in fields is set using the SET FADE menu in Mix or Wipe mode.

Set the Mix or FTB transition times   *Set the Wipe or FTB transition times*

Assign either Mix/Wipe or Black (for Fade to Black) to the T-Bar.

Note: Mix will be available when mix is active and Wipe if wipe is active.

Use the appropriate soft rotary control to set the transition time in fields (1 to 100) for the Fade to Black or the Mix/Wipe transition.

4.4.2. Self-key

A Self-key is produced using the luminance or black and white information of the Foreground video. This mode is often used with the output from a character generator that does not supply a key output.

Self-key Off/On

Self-key has two options: Off – inactive and On - active

Function	Notes
Min/Max Clip.	Max Clip defines a Luma level above which the key will be full amplitude. Min Clip defines a Luma level below which the key will be zero. The applied gain is always inversely proportional to the difference between Min Clip and Max Clip.

Luminance Self-keys can be combined with an External Key and Foreground and Background masks.

See section 3.3 for a description of Self-key operation.

4.4.3. External Key

The External Key is produced using the luminance or black and white information of the external video. External Keys can be combined with Foreground and Background masks.

External Key defaults

Function	Notes
On/Off	Enable or disable the External Key
Min/Max Clip	Max Clip defines a Luma level above which the key will be full amplitude or 100%. Min Clip defines a Luma level below which the key will be zero. The minimum difference between Min Clip and Max Clip is 12%.
Invert	Invert the External Key signal

4.4.4. Mask setup

Both Foreground and Background masks are provided which can be used with any of the valid key combinations to force or censor elements of both the Background and Foreground. The priority of each mask can be changed.

Foreground Mask Setup   *Background Mask Setup*

Masks	
Fg Off/On/Invert	Enables, disables invert Foreground mask. When the mask is on, the area it occupies is forced to Background
Bg Off/On/Invert	Enables, disables invert Background mask. When the mask is on, the area it occupies is forced to unsuppressed Foreground.
Priority F/B	Selects which mask window that has control in areas where they overlap. A selection of 'F' results in unsuppressed Foreground in the area of overlap. A selection of 'B' results in Background in the area of overlap.
Adjust Fg/Bg	Mask controls alter Fgnd or Bgnd
Hpos	Adjusts the position of the left-hand edge of the window. Value is the digital pixel number of the edge.
Vpos	Adjusts the position of the top edge of the window. The displayed value is in lines.
Width	Adjusts the mask width in pixels.
Height	Adjusts the mask height in lines.

It may help to slightly misadjust Max/Min Clip to make a mask window more visible during mask adjustment.

If an External Key and force masks are enabled they are combined with a non-additive mix. This means that if a mask and the External Key are both forcing Background, where they overlap the signal that forces Background most strongly will take priority.

The priority setting determines whether the Background or Foreground force mask takes precedence when they overlap. When the priority is set to 'F' the Foreground mask remains unmodified by the Background mask (if the masks overlap, the Foreground mask will control the area of overlap). When the priority is set to 'B' then the Background mask remains unmodified by the Foreground mask.

When External and Self-keys are turned off, internal masks can be used as the only keying source. When turned on, either the External Key or the Self-key can be combined with internal masks.

4.4.5. Combined key

This menu provides access to Fill Source selection, Set Matte, Add/Mult mode change and invert/normal the Combined Key.

Combined Key

Function	Notes
Foreground	Select foreground as Fill Source. Capitalised when selected.
Matte	Select matte as Fill Source. Capitalised when selected.
MULT/Add	Select additive or multiplicative keying
Invert	Invert the Final Key signal
Set Matte	Select Matte colour – see next menu

Set matte

The matte colour can be viewed by selecting it as the fill with a key active whilst monitoring the Main or Aux output or simply by assigning Matte to either output.

Combined Key – Set Matte

Function	Notes
Hue	Select Hue 0 to 360degrees
Luminance	Select luminance value 0 to 100
Saturation	Select saturation 0 to 100

Matte processing limits the matte output based on RGB values to generate only legal colours in the YCrCb colour space.

Note: One effect of the built in colour-space legaliser is that luminance and chrominance values are cross-linked. For example, luminance is reduced as saturation is increased and saturation has to be manually reduced if a higher luminance value is required.
The displayed numerical values reflect the limited range of values legal in broadcast television colour-space.

4.4.6. Remote

This menu is entered with the REMOTE button and upon initial panel power-up.

Controller Polling for LKEY HD module

(power on default)

Safire found at frame slot 4

(LKEYs are found in even slots only)

At power-up, or when the Poll All soft button is pressed, the Safire controller polls for available modules. If one or more module(s) respond during this time it (they) will be listed. Select the required module with the appropriate soft button. Pressing the soft button will then capitalise the name of the selected module to show that the selection has been actioned.

The card-edge RxA LED on each LKEY HD connected to a control panel will illuminate when menu access is attempted. The TxA LED will only illuminate on the LKEY assigned using the remote menu.

4.4.7. Engineering

This menu is entered with the ENG button.

Engineering menu

Function	Notes
Eng Vers	Displays software version
Fgnd	Shows presence or absence of Foreground input
Bgnd	Shows presence or absence of Background input
Ext Key	Shows presence or absence of selected output timing reference or External Key input
Ref	Toggles through the inputs to select the output timing reference
1920x1080i/6 25/525	Shows input standard
Bright	Adjust brightness over 0 (half) to 3 (full) range
Defaults	Recall factory defaults
H Phase	Adjusts output delay relative to selected reference over a range of approximately 40µs in HD or in SD a 124µs range from about 5µs to 128µs. Acceptable range depends on relative timing of input signals and standard.

On power up LKEY HD restores all the settings, including H Phase, to the value they were when a set-up was last stored. If the value of H Phase is subsequently adjusted the new value will not be overwritten when a set-up is recalled unless the recalled set-up was the last one to be saved. This allows the user to recover a previous H Phase value if required and to recall set-ups without overwriting an H Phase adjustment that has changed to cope with different input signal timing. If the H Phase value is changed to accommodate external timing then storing a set-up after the adjustment will prevent an unexpected reversion to the old value.

Note: Output timing is selectable with 0-1 line delay from the assigned reference input. The other inputs must be 0-1 lines earlier than the output. Inputs outside the timing range will be horizontally aligned but vertically offset.

4.4.8. Configuring GPIs

The GPI menu, accessed with the GPI button, provides access to the following functions:

- PCB GPI EN/Recall off - enable or disable preset recall from frame GPIs

- LKEYHD SEL/Select off – remote assignment of panel to LKEY HD module from panel GPIs

- Output configure – set panel GPI output states for each GPI and/or LKEY HD

- Panel GPI monitoring – see panel GPI I/O status at a glance

Configure GPI response for selected Safire

There are two types of GPI interfaces available.

1) PCB GPIs for preset recall available for each module and accessible at the frame rear connectors.

2) Panel GPIs accessible at the rear of an assigned Safire Controller.

The first four PCB/Frame GPIs are serial communication lines that are reserved for serial control for Safire Controller panels. The next two PCBFrame GPIs are reserved for remote preset memory recall.

There are currently five Panel GPI inputs reserved for remote Safire Controller assignment to LKEY HD modules and four unreserved Panel GPI outputs whose states are stored in each LKEY HD, but only output from an assigned panel.

The unreserved Panel GPI outputs are available for any use for which they may be suitable – such as indicating which module is assigned to a panel on a dedicated status display.

Mem recall/On/Off

It is recommended to disable PCB GPI preset recall when storing or recalling setups via the **MEM**ory menu.

Frame GPI lines 'e' and 'f' (refer to Installation section for pinout) form a binary number, in which 'e' has the weight '1' and 'f' has the weight '2'. The following table illustrates the Frame GPI states required:

Set-up recalled	Frame GPI 'e'	Frame GPI 'f'
1	Open	Open
2	Low	Open
3	Open	Low
4	Low	Low

When GPI control is on (MEMORY RECALL) the memory indicated by the above table will be recalled automatically when the GPI lines change state. Adjustment of system parameters is possible when the GPI lines are stable, but storage of changes is not automatic.

If there is more than one module controlled from the control panel, the set-ups of each one must be saved separately. Select the module from the REMOTE menu and then save its set-up.

Module select

The Safire controller may be assigned to controller compatible modules directly via the REMOTE menu, or remotely using the first five panel GPI inputs available at the GPI 1 9-way 'D' type at the rear of the control panel.

To activate the remote LKEY HD select function press the Safire Off soft-select button until (in this case) LKEYHD SEL is shown. The panel GPI inputs will now assign the Safire controller to a LKEY HD according to its node address as follows:

Module node (slot address)	GPI '1'	GPI '2'	GPI '3'	GPI '4'	GPI '5'
1.02	Low	Open	Open	Open	Open
1.04	Low	Low	Open	Open	Open
1.06	Low	Open	Low	Open	Open
1.08	Low	Low	Low	Open	Open
1.10	Low	Open	Open	Low	Open
1.12	Low	Low	Open	Low	Open
2.02	Low	Open	Open	Open	Low
2.04	Low	Low	Open	Open	Low
2.06	Low	Open	Low	Open	Low
2.08	Low	Low	Low	Open	Low
2.10	Low	Open	Open	Low	Low
2.12	Low	Low	Open	Low	Low

Note: Addresses 1.02 to 1.12 are for the six available double-height positions in the first 2U frame of a frame pair and 2.02 to 2.12 are for available double-height positions in the second 2U frame of a frame pair.

Configuring panel GPI outputs

The panel GPI output configure sub-menu allows GPI action for each GPI output to be configured for the currently assigned LKEY HD module.

Three actions are available:

- Open – high impedance, may be pulled high by external resistor connected to 5V

- Stet – when recalled as part of a preset output remains in the same state prior to recall

- Gnd – output sinks up to 16ma of current to drive an external pull-up low

Configure GPI action

The 'Stet' action type is useful since it allows each of the four GPI outputs to be assigned to a different function. For example, suppose in a transmission suite one Safire Controller is used to control four separate graphic suites, each with a dedicated LKEY HD module.

A hardware selection panel could be built which assigns the panel and turns on a preset channel logo or graphic. Panel GPI 1 is associated with the logo for suite 1; Panel GPI 2 is associated with the logo for suite 2 and so on. When configuring Panel GPIs for suite 1, GPIs 2, 3 and 4 would be set to 'Stet' to ensure that they remain in the same state as previously set.

Note: Panel GPI outputs are output from the panel although their state is stored with Safire presets.

Panel GPI monitoring

The 'gpi in' and 'gpi op' data are hexadecimal representation of the status of the Panel GPI inputs and the Panel GPI outputs respectively. This status information may be useful when selecting the appropriate action type for panel GPIs.

4.4.9. Memory - save

The SAVE key allows access to the Save Configuration menu for storing and naming of setups within LKEY HD's non-volatile memory.

Select named setup   *Select named setup continued*
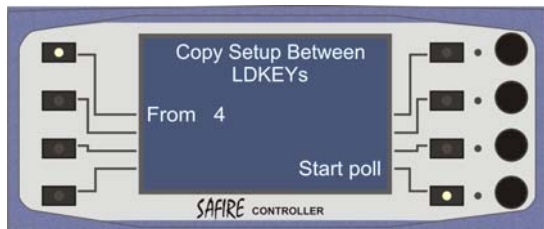
Function	Notes
(1-10) name	Select preset memory to save current configuration
more	Select named presets 8 to 10, numbered presets 11 (continue to press more) to 40

Saving and naming presets

Pressing any of the presets in the SAVE menu will enter this menu.

Set name and confirm

To save the current LKEY HD configuration in the named memory location or setup, press the *Confirm* soft button at the bottom right of the display.

To re-name a setup proceed as follows:

- Use the Left and Right soft-select buttons to choose a character
- Rotate the top right rotary control to change the character
- Press the Confirm soft-select button when ready

Setup names may consist of up to ten alphanumeric characters. Cancel returns to the previous menu.

Pressing any of the *numbered* presets in the Save menu will enter this menu.

Set name and confirm

To save the current LKEY HD configuration in the numbered preset memory location press the *Save preset Confirm* soft button at the bottom right of the display.

Note: Save and recall may fail unless GPI memory recall is disabled.
Although presets are stored in the LKEY HD board, preset names are stored in the panel and each panel may use different names for the same presets.

4.4.10. Memory - recall

The RECALL key allows access to the Recall Memory menu for loading set-ups stored in LKEY HD's non-volatile memory.

Select named setup

Select named setup continued

Function	Notes
(1-10) name	Select preset memory to recall current configuration.
more	Select *named* presets 8 to 10, *numbered* presets 11 (continue to press more) to 40

To recall a setup simply select the desired setup with the appropriate soft-select button and the settings stored for that preset will be instantly recalled.

Note: Save and recall may fail unless GPI memory recall is disabled.
Although presets are stored in the LKEY HD board, preset names are stored in the panel and each panel may use different names for the same presets.

4.4.11. Transfer

The TRANSFER key allows access to the Copy Setup menu for copying configuration from one LKEY HD to another.

Select the FROM LKEY HD   *Select the TO LKEY HD*

Function	Notes
Start Poll	If necessary allow the panel to poll for LKEY HD modules
From	Select the source LKEY HD
To	Select the target LKEY HD
Copy Now	Transfer configuration between LKEY HD

It is recommended to disable GPI memory recall when transferring setup.

5.　Using Indigo frame controls

5.1. Module selected

This operational guide assumes that the Indigo front control panel has been set up according to the 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 frame's two line 20-character screen will display 'Crystal Vision' followed by the firmware version number. All the LEDs will light, 'Control Panel' briefly replaces the version number and finally, Statesman Mode will be entered.

The message, 'Press CAL to Exit' will be displayed and the CAL LED will light.

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 – 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

Selecting LKEY HD

Press CAL to enter the Available Cards 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.
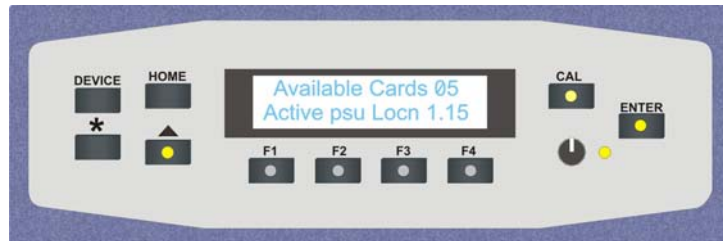
Rotate the shaft encoder and the bottom row will display the successfully polled cards by name and location or slot number.

In the example above, the card displayed is located in the first frame in slot number 11. When the desired card is selected, press the ENTER key to access that card's Home menu. The message shows that an LKEY HD has been selected.
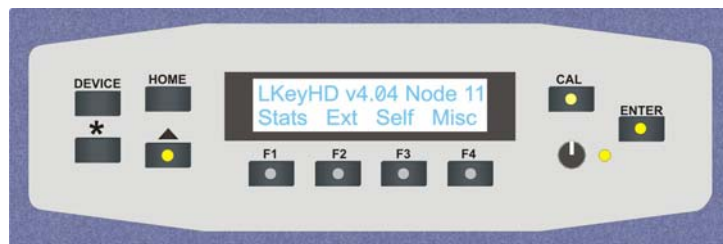
5.1.1. Updating the display

The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If changes occur through the use of card edge controls or other remote control, 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. Press the HOME key to return to the Home menu.

5.2. The LKEY HD active panel menu structure

The main top-level menus for the LKEY HD module are obtained by pressing the F1- F4 keys from the Home menu. Menu keys are illuminated when active and when further menus are available. The top-level menus are:

- Stats (Status) – press F1
- Ext (External Key) – press F2
- Self (Self-key) – press F3
- Misc (Output sources, presets and engineering) – press F4

When a sub menu has been selected, further options may be obtained by using the Shaft control to scroll through them. Once the desired option has been located a selection or value change can be made by either toggling the appropriate function key or by selecting and using the shaft control to alter a numerical value. A configuration change or value will be activated as the shaft control is rotated or function button is toggled. The variable being adjusted will appear in brackets. Pressing Enter will save the new value.
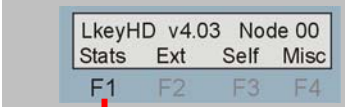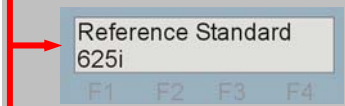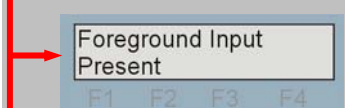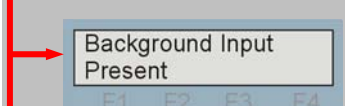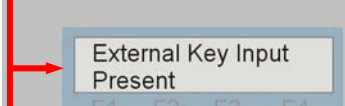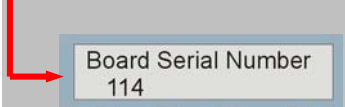
The following chart shows the available LKEY HD menus. The actual menus available may vary slightly as software is updated.

5.2.1. LKEY HD control panel menu

```
LkeyHD  v4.03   Node 00
Stats    Ext   Self   Misc
 F1      F2    F3     F4
```

| Reference Standard PAL | Extern Key Enable [On] | Self Key Enable [On] | Main Output Source [Combined] |
| F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 |

| Foreground Input Present | Extern Key Invert [Off] | Self Key Invert [Off] | Preview Op Source [Background] |
| F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 |

| Background Input Present | Extern Key Max Clip [100] | Self Key Max Clip [100] | Presets [1][Store][Recall] |
| F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 |

| External Key Input Present | Extern Key Min Clip [0] | Self Key Min Clip [0] | Reference Source [Background] |
| F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 |

| Board Serial Number 114 | Extern Key Fade Crtl [Go] From Up | Self Key Fade Crtl [Go] From Up | H Phase [3.9] |
| F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 |

| | Extern Key Fade Time [75] | Self Key Fade Time [75] | Fade To Black Ctrl [Go] From Up |
| | F1 F2 F3 F4 | F1 F2 F3 F4 | F1 F2 F3 F4 |

| | | | Fade To Black Time [35] |
| | | | F1 F2 F3 F4 |

| | | | Defaults Restore |
| | | | F1 F2 F3 F4 |

5.2.2. Status menu

Pressing F1 from the Home menu will bring up the Status menu. The Status menu gives a quick overview of the LKEY HD inputs and reference status. Rotate the shaft encoder to select each sub-menu.

LKEY HD Status menu	Description
LkeyHD v4.03 Node 00 Stats Ext Self Misc F1 F2 F3 F4	From the Home menu, press F1 to select the Stats menu, which is then traversed by rotating the shaft control.
Reference Standard 625i F1 F2 F3 F4	Rotate shaft encoder to select the Reference Standard. *see following table*
Foreground Input Present F1 F2 F3 F4	Rotate shaft encoder to select the Foreground Input. *Present, Absent*
Background Input Present F1 F2 F3 F4	Rotate shaft encoder to select the Background Input. *Present, Absent*
External Key Input Present F1 F2 F3 F4	Rotate shaft encoder to select the External Key Input. *Present, Absent*
Board Serial Number 114 F1 F2 F3 F4	Electronically stored board serial number
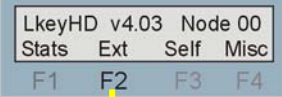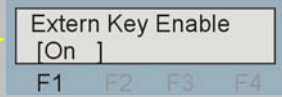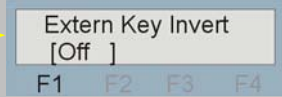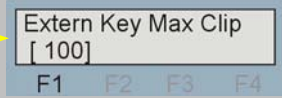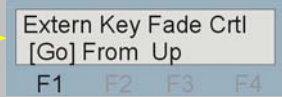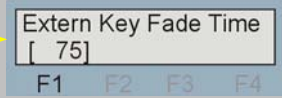
Frame rates

Standard	Frame Rate/Hz
625i	50
525i	59.94
720p	50, 59.94, 60
1035i	59.94, 60
1080sF	23.98, 24
1080i	50, 59.94, 60
1080p	23.98, 24, 25, 29.97, 30

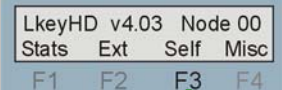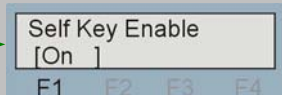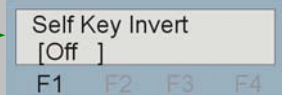**Note:**   At all times the output line rate will follow the input line rate, i.e. 50Hz, 59.94Hz etc.
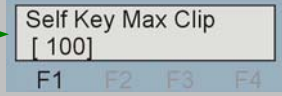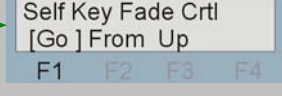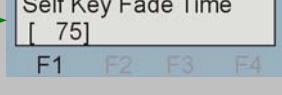
5.2.3. External Key

Pressing F2 from the Home menu will bring up the External Key menu. This menu gives access to the External Key and key fade controls. Rotate the shaft encoder to select each sub-menu and also change parameters.

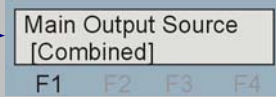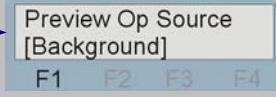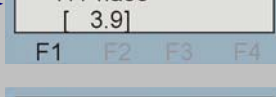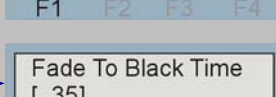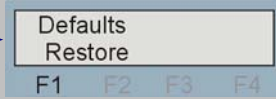| LKEY HD External Key menu	Description
LkeyHD v4.03 Node 00 Stats Ext Self Misc F1 F2 F3 F4	From the Home menu, press F2 to select the External Key menu, which is then traversed by rotating the shaft control.
Extern Key Enable [On] F1 F2 F3 F4	Rotate shaft encoder to select External Key enable. Press F1 to select to change the selection. Rotate shaft encoder to select new option. *On, Off* Press the enter button to accept the new option.
Extern Key Invert [Off] F1 F2 F3 F4	Rotate shaft encoder to select External Key Invert. Press F1 to select to change the selection. Rotate shaft encoder to select new option. *On, Off* Press the enter button to accept the new option.
Extern Key Max Clip [100] F1 F2 F3 F4	Rotate shaft encoder to select External Key Maximum Clip. Press F1 to select to change the value. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new value.
Extern Key Min Clip [0] F1 F2 F3 F4	Rotate shaft encoder to select External Key Minimum Clip. Press F1 to select to change the value. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new value.
Extern Key Fade Crtl [Go] From Up F1 F2 F3 F4	Rotate shaft encoder to select External Key Fade Control. Press F1 to select to change the option. Rotate shaft encoder to select new option. *Go From Up, Go from Down* Press the enter button to accept the new option
Extern Key Fade Time [75] F1 F2 F3 F4	Rotate shaft encoder to select External Key Fade Time. Press F1 to select to change the value. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new option
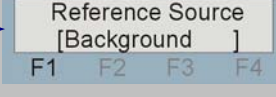
5.2.4. Self-key menu

Pressing F3 from the home menu will bring up the Self-key menu. This menu gives access to the Self-key and key fade controls. Rotate the shaft encoder to select each sub-menu and also change parameters.

LKEY HD External Key menu	Description
LkeyHD v4.03 Node 00 Stats Ext Self Misc F1 F2 F3 F4	From the Home menu, press F2 to select the Self-key menu, which is then traversed by rotating the shaft control.
Self Key Enable [On] F1 F2 F3 F4	Rotate shaft encoder to select Self-key enable. Press F1 to select to change the selection. Rotate shaft encoder to select new option. *On, Off* Press the enter button to accept the new option.
Self Key Invert [Off] F1 F2 F3 F4	Rotate shaft encoder to select Self-key Invert. Press F1 to select to change the selection. Rotate shaft encoder to select new option. *On, Off* Press the enter button to accept the new option.
Self Key Max Clip [100] F1 F2 F3 F4	Rotate shaft encoder to select Self-key Maximum Clip. Press F1 to select to change the value. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new value.
Self Key Min Clip [0] F1 F2 F3 F4	Rotate shaft encoder to select Self-key Minimum Clip. Press F1 to select to change the value. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new value.
Self Key Fade Crtl [Go] From Up F1 F2 F3 F4	Rotate shaft encoder to select Self-key Fade Control. Press F1 to select to change the option. Rotate shaft encoder to select new option. *Go From Up, Go from Down* Press the enter button to accept the new option
Self Key Fade Time [75] F1 F2 F3 F4	Rotate shaft encoder to select Self-key Fade Time. Press F1 to select to change the value. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new option

5.2.5. Misc menu

Pressing F4 from the Home menu will bring up the Miscellaneous menu. This menu gives access to the output and engineering controls. Rotate the shaft encoder to select each sub-menu and also change parameters.

LKEY HD External Key	Description
LkeyHD v4.03 Node 00 Stats Ext Self Misc F1 F2 F3 F4	From the Home menu, press F4 to select the Miscellaneous menu, which is then traversed by rotating the shaft control.
Main Output Source [Combined] F1 F2 F3 F4	Rotate the shaft control to view the Main output selection. Press F1 to select to change the selection. Rotate shaft encoder to make new selection. ***Composite, Foreground Input, Background Input, External Key, Final Key, and Matte.*** Press the enter button to accept the new option
Preview Op Source [Background] F1 F2 F3 F4	Rotate the shaft control to view the Preview output selection. Press F1 to select to change the selection. Rotate shaft encoder to make new selection. ***Composite, Foreground Input, Background Input, External Key and Final Key.*** Press the enter button to accept the new option.
Presets [1][Store][Recall] F1 F2 F3 F4	Rotate the shaft control to view the Presets menu. Press F 1 to select to make a selection. Rotate shaft encoder to select location *(1-40)* Press F3 to save present configuration. Press F4 to recall a previously saved configuration
Reference Source [Background] F1 F2 F3 F4	Rotate the shaft control to view the Reference source input selection. Press F1 to select to change the selection. Rotate shaft encoder to make new selection. ***Foreground Input, Background Input or External Key.*** Press the enter button to accept the new option.
H Phase [3.9] F1 F2 F3 F4	Rotate shaft encoder to select H Phase. Press F1 to select to change the value. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new value.
Fade To Black Ctrl [Go] From Up F1 F2 F3 F4	Rotate shaft encoder to select Fade To Black. Press F1 to fade. F1 action will toggle between up and down.
Fade To Black Time [35] F1 F2 F3 F4	Rotate shaft encoder to select Fade To Black Time. Press F1 to select. Rotate shaft encoder to select new value. *(0-100)* Press the enter button to accept the new value.
Defaults Restore F1 F2 F3 F4	Rotate shaft encoder to select Defaults. Press F1 to select. Press F4 to action.

6. 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.

6.1. 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 click on a module to display its control panels.
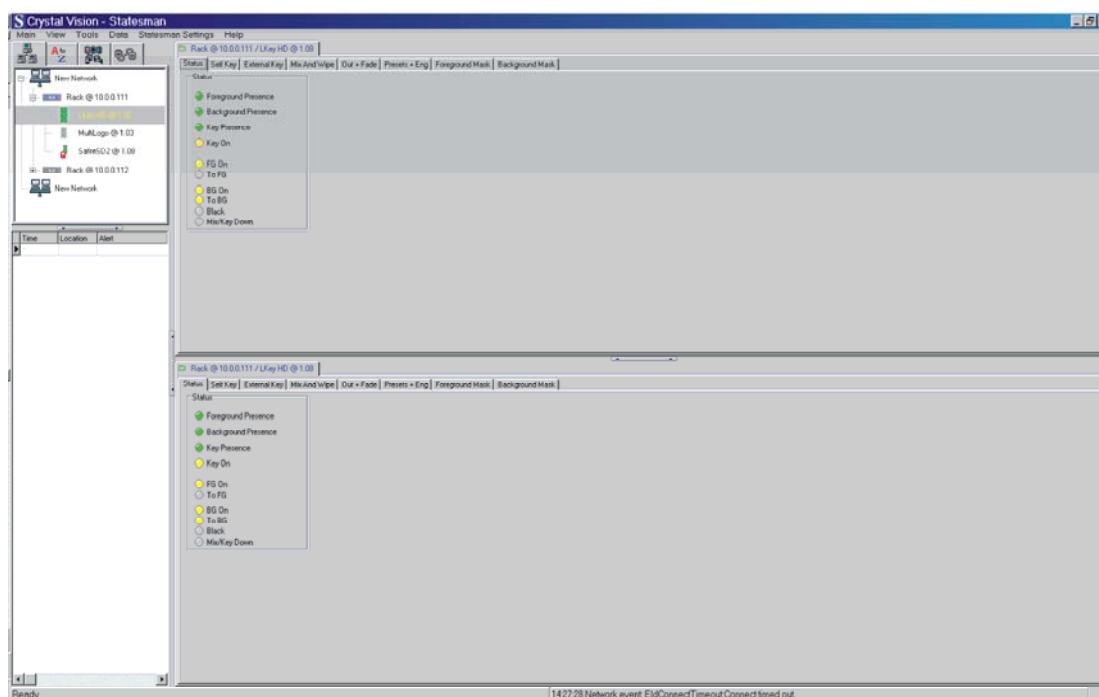
*The Statesman main application window (LKEY HD)*

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 are usually 'greyed out' to indicate that they are currently unavailable.

Status

Of the seven tabs (pages) available, the first gives a quick overview of the LKEY HD status. Statesman uses simulated LEDs to give a visual indication of various parameters. Green is used to indicate a presence, red to indicate an absence or error with amber indicating a selection or warning. The not selected condition will result in the simulated LED being greyed out.

The LKEY HD status group box has indication of the presence of Foreground, Background and key, key on and output status.
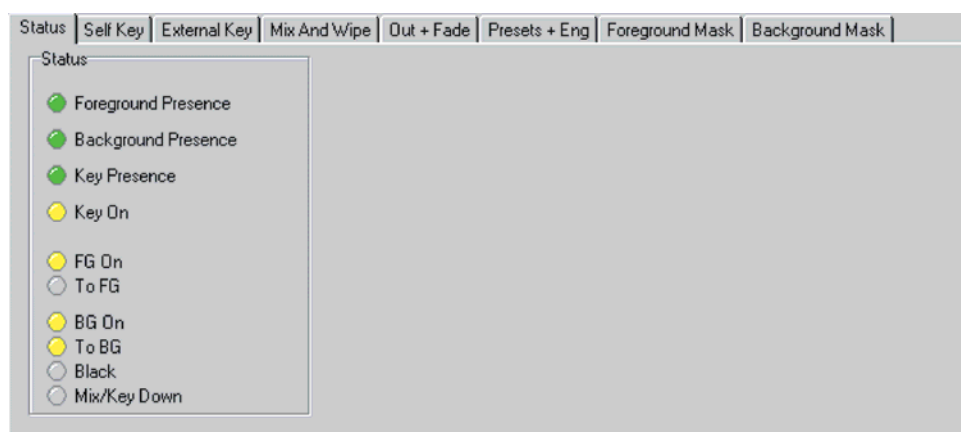

LKEY HD Status tab

The following table describes the status LEDs.

Function	Colour On/present	Colour Off/absent	State when on/present/active
Foreground Presence	Green	Red	Foreground input present
Background Presence	Green	Red	Background input present
Key Presence	Green	Red	External key input present
Key On	Yellow	Greyed out	External key in use
FG On	Yellow	Greyed out	Foreground contributing to output
BG On	Yellow	Greyed out	Background contributing to output
To FG	Yellow	Greyed out	Fade to source is foreground
To BG	Yellow	Greyed out	Fade to source is background
Black	Yellow	Greyed out	Fade To Black active and faded down
Mix/Key Down	Yellow	Greyed out	Mix or Key is active and faded down

6.1.1. Selecting Self-key mode options

The Self-key Mode menu gives control over the various functions associated with the Self-key operation.

A Self-key is produced using the luminance or black and white information of the Foreground video. This mode is often used with the output from a character generator that does not supply a key output.
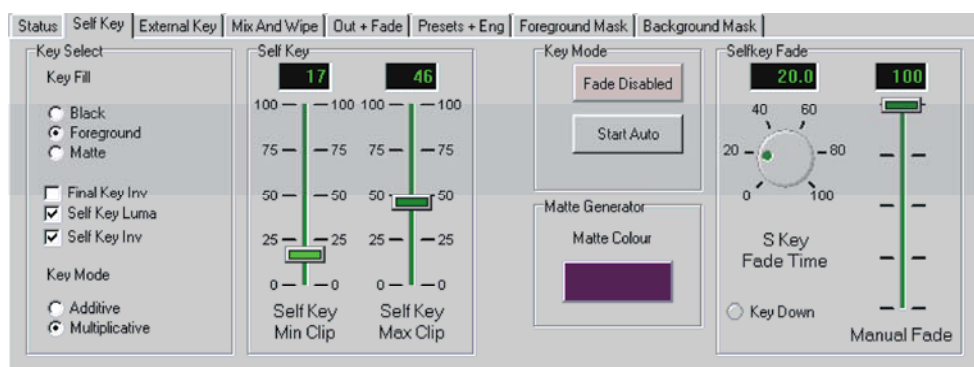
LKEY HD Self-key tab

Luminance Self-keys can be combined with an External Key and Foreground and Background masks.

See section 3.3 for further description of Self-key operation

The available keying operations are described in the following table:

Function	Notes
Key fill	Black, Foreground, Suppressed Foreground or Matte
Final key	Invert/normal
Self-Key Luma	Enable or disable the Self-key
Self-Key Invert	Invert the self-key
Additive	Additive key mode selected
Multiplicative	Multiplicative key mode selected

See section 3.2 for further information regarding additive and multiplicative keying

6.1.2. Adjusting Self-key

With the Self-key mode enabled in the Key Select menu group the Luma range over which the key is effective can be defined.

Max Clip defines a Luma level above which the key will be full amplitude. Min Clip defines a Luma level below which the key will be zero. The difference between Min Clip and Max Clip defines the gain applied. The smaller the difference, the larger the gain.

6.1.3. Using fade controls

The fade controls consist of an on-screen-manual fade slider that acts like a 'T-bar', a Fade Disable/Enable button, a Start Auto button and Fade Time control to set the automatic fade duration.

A fade may be initiated by using the Manual fade slider or by pressing the Start Auto button, when the fade will occur at a rate set by the Fade Time control. If the Auto button is pressed during a timed transition, its effect will be reversed.

To enable the Self-key fade function click on the Fade Disabled button in the Key Mode group box. When disabled, the button will have a faint purple background, when enabled the background will turn green. The operator is now able to select either an auto fade or manually click and drag the manual fade control.

Rotating the *S Key Fade Time* control will set the automatic fade time between 0 to 100 fields. There is also the option of typing the required value directly into the time display box.

The Key Down indicator always shows the fully off state of the assigned fade function.

The default effect of the fade function (manual or automatic fade down) is to fade the active keyed video off the screen leaving the background signal.

Tip: Invert the final key and active key for External Keys and Self-keys to change between Foreground and Background fade-to sources.

Enabling an External Key fade or enabling a fade to black button will disable the fade function in this menu.
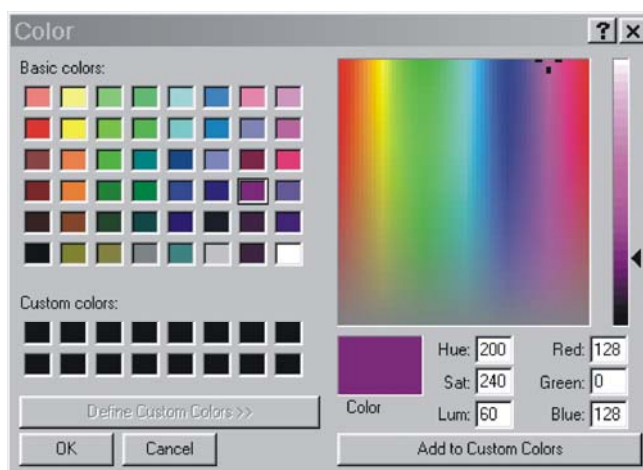
6.1.4. Selecting the matte colour

The select Matte colour menu is located on the Self-key tab.
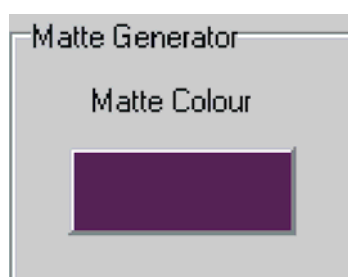
Matte Generator

Click on the Matte Colour button to display the Matte Colour selector.

LKEY HD Matte colour select sub-menu

Matte processing limits the matte output based on RGB or HLS values to generate only legal colours in the YCrCb colour space.

Note: One effect of the built-in colour-space legaliser (matte processing) is that luminance and chrominance values are cross-linked. For example, displayed luminance is reduced as saturation is increased and saturation is reduced if a higher luminance value is required. The displayed numerical values of the standard windows colour selector may not reflect the limited range of values legal in broadcast television colour-space.
However, LKEY HD's matte processor will NOT output illegal colours.

6.1.5. Selecting an External Key

The External Key Mode menu gives control over the various functions associated to the External Key operation. External Key is selected by ticking the Ext Key On tick box.
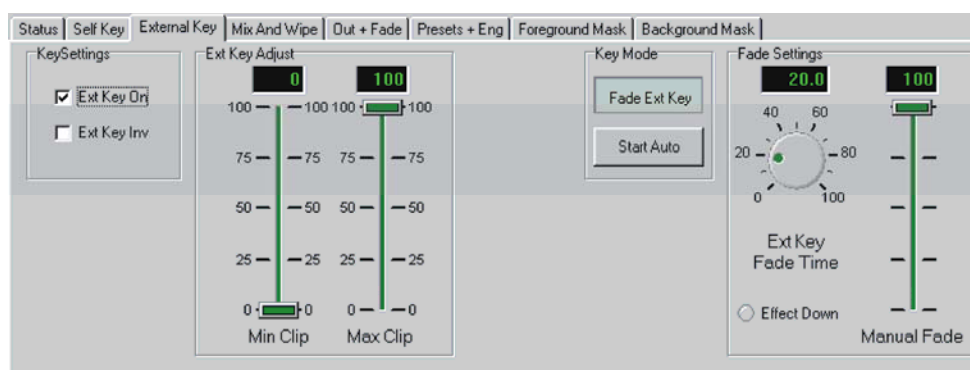
LKEY HD external key tab

The External Key uses the luminance of a key signal to cut a hole in the Background into which 'fill' video, usually the Foreground signal, is inserted. The range of luminance signal used to produce a key can be adjusted.

External keys can be combined with a Luma Self-key and Foreground and Background masks.

6.1.6. Adjusting External Key

With the External Key mode enabled in the Key Settings menu group the Luma range over which the key is effective can be defined.

Min Clip defines a Luma level below which the key will be zero. Max Clip defines a Luma level above which the key will be full amplitude or 100%. The difference between Min Clip and Max Clip defines the gain applied. The smaller the difference, the larger the gain.

Pressing the Start Auto key during a transition reverses the direction of the transition.

6.1.7. Using fade controls

The fade controls consist of an on-screen-manual fade slider that acts like a 'T-bar', a Fade Disable/Enable button, a Start Auto button and Fade Time control to set the automatic fade duration.

A fade may be initiated by using the Manual fade slider or by pressing the Start Auto button, when the fade will occur at a rate set by the Fade Time control. If the Auto button is pressed during a timed transition, its effect will be reversed

To enable the External Key fade function click on the Fade Disabled button in the Key Mode group box. When disabled, the button will have a faint purple background, when enabled the background will turn green. The operator is now able to select either an auto fade or manually click and drag the manual fade control.

Rotating the Ext Key Fade Time control will set the automatic fade time between 0 to 100 fields. There is also the option of typing the required value directly into the time display box.

The Key Down indicator always shows the fully off state of the assigned fade function.

The default effect of the fade function (manual or automatic fade down) is to fade the active keyed video off the screen leaving the background signal.

Tip:　Invert the final key and active key for External Keys and Self-keys to change between Foreground and Background fade-to sources.

Enabling a Self-key fade or enabling a fade to black button will disable the fade function in this menu.

6.1.8. Using Masks

Both Foreground and Background masks are provided which can be used with any of the valid key combinations to force or censor elements of both the Background and Foreground. The priority of each mask can be changed.
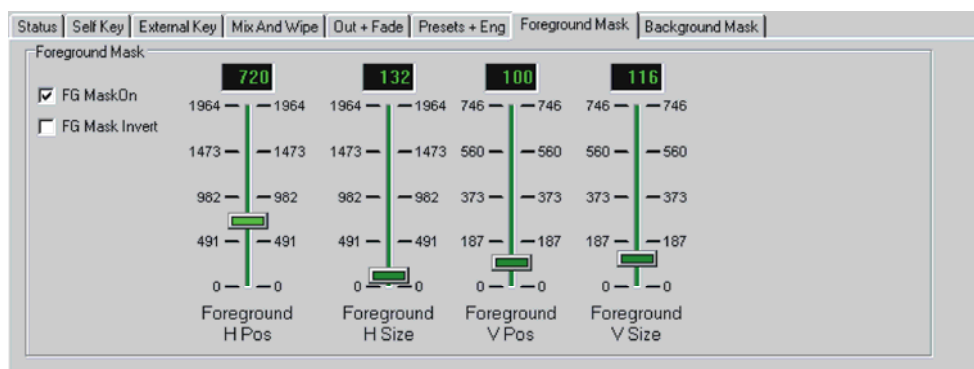
LKEY HD Key Foreground Masks tab

Masks	
FG Mask On	Enables Foreground mask. When the mask is on, the area it occupies is forced to Background.
FG Mask Invert	Inverts Foreground mask.
Foreground Hpos	Adjusts the position of the left-hand edge of the window. Value is the digital pixel number of the edge.
Foreground H Size	Adjusts the mask width in pixels.
Foreground Vpos	Adjusts the position of the top edge of the window. The displayed value is in lines.
Foreground V Size	Adjusts the mask height in lines.
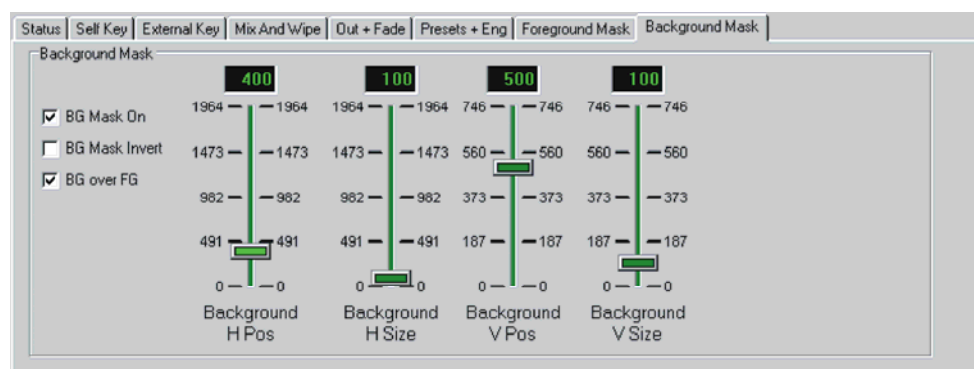
LKEY HD Key Background Masks tab

Masks	
BG Mask On	Enables Background mask. When the mask is on, the area it occupies is forced to Unsuppressed Foreground.
BG Mask Invert	Inverts Background mask.
BG over FG	Selects which mask window have control in areas where they overlap. Leaving BG over FG unchecked results in Unsuppressed Foreground in the area of overlap. Checking BG over FG results in Background in the area of overlap.
Background Hpos	Adjusts the position of the left-hand edge of the window. Value is the digital pixel number of the edge.
Background Vpos	Adjusts the position of the top edge of the window. The displayed value is in lines.
Background H Size	Adjusts the mask width in pixels.
Background V Size	Adjusts the mask height in lines.

It may help to slightly misadjust Key Max (multiplicative mode) or Y Suppression (additive mode) to make a mask window more visible during mask adjustment.

If an External Key and force masks are enabled they are combined with a non-additive mix. This means that if a mask and the External Key are both forcing Backgrounds, where they overlap the signal that forces Background most strongly will take priority.

When External and Chroma keys are turned off internal masks can be used as the only keying source. When turned on the External Key and/or the Chroma key and the internal masks can be used.

6.1.9. Using mixes and wipes

The Mix/Wipe mode is selected by enabling either mix or wipe mode buttons. The operator can mix and wipe from Foreground to Background or Background to Foreground with the following controls:

- Manual with the T-bar

- Automatic or 'timed' with the Auto key
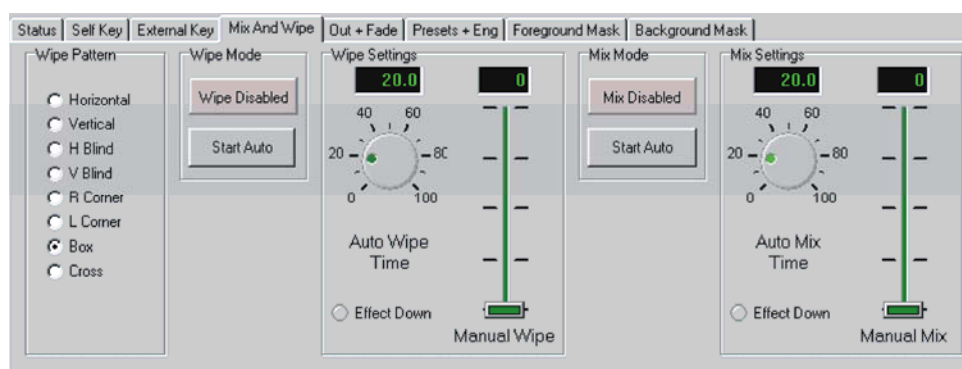
LKEY HD Mix and Wipe tab

6.1.10. Using mix

To enable Mix mode click on the Mix Disabled button to toggle it to Mix. When disabled, the button will have a faint purple background, when enabled the background will turn green.
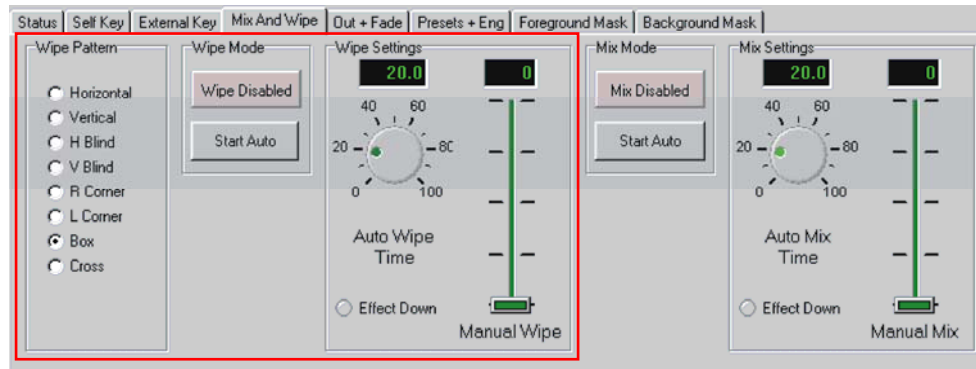
Once enabled a mix between Foreground or Background can be carried out either manually with the T-bar or automatically in timed mode. A manual mix is implemented by simply placing the cursor on the T-bar handle with the mouse, left click and hold whilst dragging. To carry out an automatic mix set the required transition with the Auto mix time control then push the Start Auto button.

The Effect Down indicator always shows the fully off state of the mix. Pressing the start auto key during a transition reverses the direction of the transition.

Note: The wipe and mix manual T-bar are a common control and will move in tandem whenever a manual mix or wipe is carried out.

6.1.11. Using wipes

To enable Wipe mode click on the Wipe Disabled button to toggle it to Wipe. When disabled, the button will have a faint purple background, when enabled the background will turn green. Eight wipe patterns are available.

LKEY HD Wipe panels

Once enabled a wipe between Foreground or Background can be carried out either manually with the T-bar or automatically in timed mode. A manual wipe is implemented by simply placing the cursor on the T-bar handle with the mouse, left click and hold whilst dragging. To carry out an automatic mix set the required transition with the Auto Wipe Time control then push the Start Auto button.

The Effect Down indicator always shows the fully off state of the mix. Pressing the start auto key during a transition reverses the direction of the transition.

Note: The wipe and mix manual T-bar are a common control and will move in tandem whenever a manual mix or wipe is carried out.

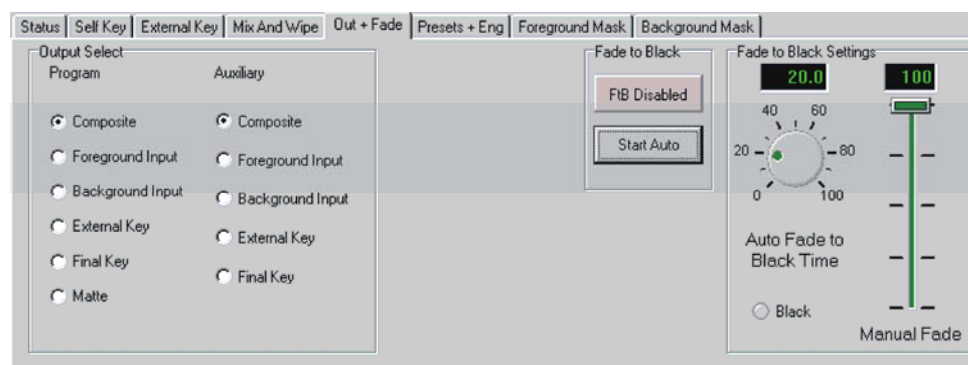The available wipe patterns are as shown in the following table:

LDKEY HD Wipe Patterns

6.1.12. Selecting the main and aux output source

There are a number of sources that may be assigned to the Main and Aux outputs to assist with the construction and operation of keying, mix/wipe operations.

Use the Out + Fade menu to select the source for the Main and Aux outputs.

LKEY HD Out + Fade tab

The Main and Auxiliary outputs may be assigned to sources as follows:

Function	Notes
Composite	Selects the final combined video image
Fg Input	Selects the foreground input
Bg Input	Selects the background input
Ext Key	Selects the external key input
Final Key	Selects the combined key. This will be a combination of some or all of external key input, foreground mask and background mask.
Matte	Shows matte generator output

Tip: The matte colour may also be observed by using it as a fill and viewing the combined output.

6.1.13. Performing a Fade to Black

To enable the Fade to Black function, enter the Out + Fade menu and click on the FtB Disabled button to toggle it to Fade to Black. When disabled, the button will have a faint purple background, when enabled the background will turn green.
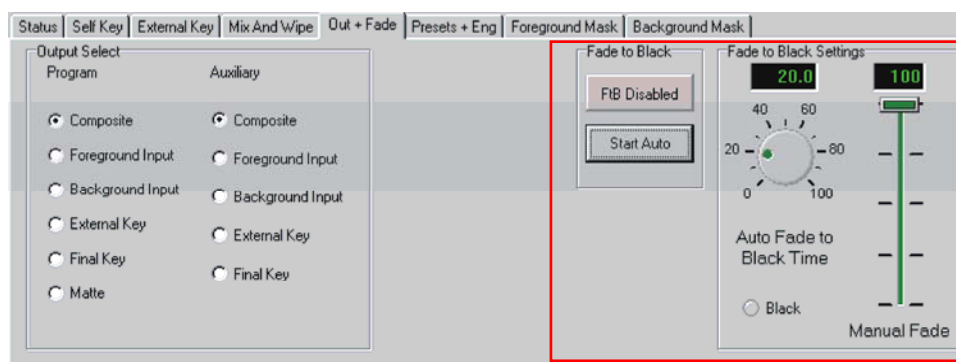
LKEY HD Fade to Black panels

Once enabled, a Fade to Black can be carried out either manually with the T-bar or automatically in timed mode. A manual wipe is implemented by simply placing the cursor on the T-bar handle with the mouse, left click and hold whilst dragging. To carry out an automatic Fade to Black set the required transition with the Auto Fade to Black Time control then push the Start Auto button.

The Black indicator shows the fully off state of the Main output i.e. black. Pressing the Start Auto key during a Fade to Black transition reverses the direction of the transition.

Note: Fade to Black is only available on the main output.

## 6.1.14. Preset and Engineering menu

The final menu tab opens the Preset and Engineering menu. Here user configurations can be stored and recalled, horizontal delay and time source set, EHD insertion selected and input standard displayed.
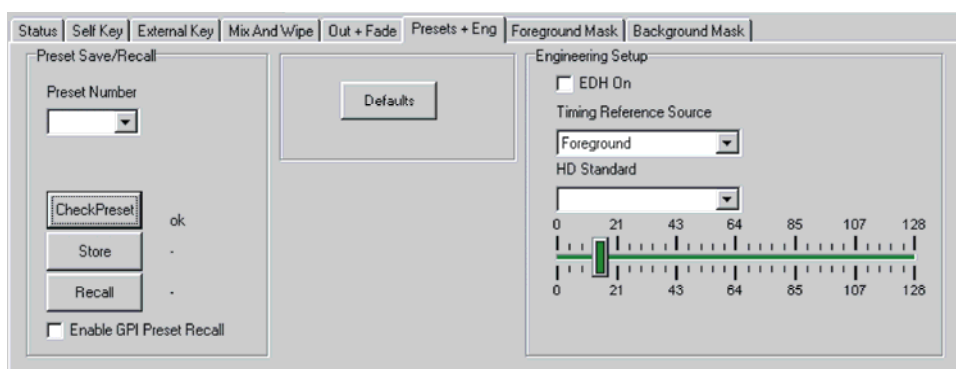
LKEY HD Preset and Engineering menu

6.1.15. Using presets

Up to ten setups may be stored and recalled from Statesman, the Safire Controller or by external GPIs.
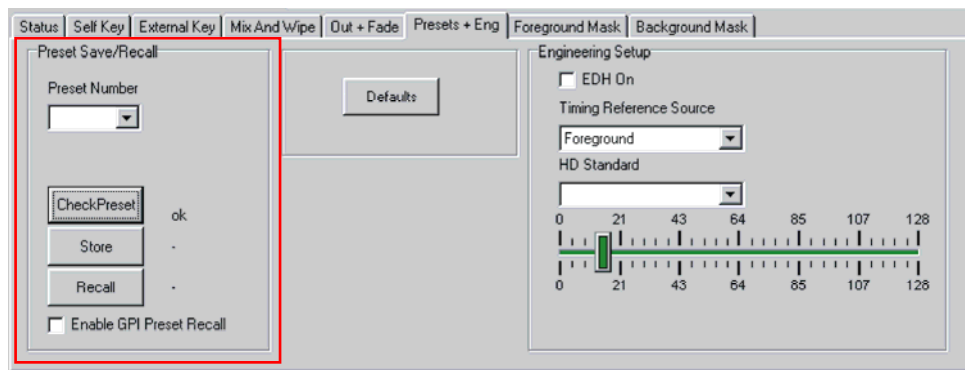
LKEY HD Preset Save/Recall

Presets store LKEY HD configuration data, but not names, which may have been set via the Safire controller panel. Statesman presets are numbered 1-10.

To store a preset proceed as follows:

- Ensure 'Enable GPI Preset Recall' is unchecked
- Select appropriate preset with the Preset Number drop-down menu
- Click on 'CheckPreset' to find an empty preset
- Click on 'Store' to save setup data into the selected preset

To recall a preset proceed as follows

- Ensure 'Enable GPI Preset Recall' is unchecked
- Select appropriate preset with the Preset Number drop-down menu
- Click on 'Recall' to recall setup data from the selected preset

'Enable GPI Preset Recall' should not be checked whilst presets are being created or recalled by this menu, to prevent inadvertent GPI operation. Enable 'GPI Preset Recall' when finished if required.

6.1.16. Reset

Click on Defaults to return the LKEY HD card to its default values.

6.1.17. Configuring Engineering Setup

The Engineering Setup menu, which is co-located with the Presets menu, provides access to, Horizontal Delay, EDH on/off and Timing Reference Source select.
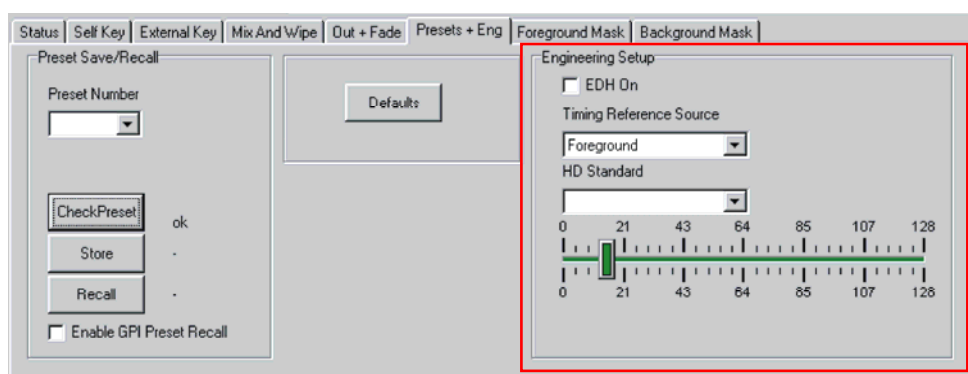
LKEY HD Engineering Setup menu

Function	Notes
Timing reference source	Click on the pull-down list to select the output timing reference from Foreground, Background or External Key.
EDH	Turn EDH checking on/off
HD Standard	Indicates the line standard of the current input
H Phase	Adjusts output delay relative to selected reference over a range of approximately 40µs in HD or in SD a 124µs range from about 5µs to 128µs. Acceptable range depends on relative timing of input signals and standard.

On power up LKEY HD restores all the settings, including H Phase, to the value they were when a set-up was last stored. If the value of H Phase is subsequently adjusted the new value will not be overwritten when a set-up is recalled unless the recalled set-up was the last one to be saved.

This allows the user to recover a previous H Phase value if required and to recall set-ups without overwriting an H Phase adjustment that has changed to cope with different input signal timing.

If the H Phase value is changed to accommodate external timing then storing a set-up after the adjustment will prevent an unexpected reversion to the old value.

Note: Output timing is selectable with 0-2-line delay from the assigned reference input. The other inputs must be 0-2 lines earlier than the output. Inputs outside the timing range will be horizontally aligned but vertically offset.

7. Default parameter settings

SELF-KEY parameters

Max Clip 100
Min Clip 0

Self-key off EXT KEY parameters

Ext key off, not inverted
Max Clip 52
Min Clip 2
Force BG off
Force FG off
Force FB off

COMBINED KEY

Final combined key not inverted
Fill = suppressed foreground
Mode = multiplicative
Key shrink = On
Matte hue set to 0 (blue)
Matte luminance set 0%
Matte saturation set 0%

MASKS

Mask priority set to Back
Foreground mask set off
Background mask set off
Foreground mask set to a box (invert off) of size 25X50 at Hpos = 25, Vpos = 50
Background mask set to a box (invert off) of size 25X50 at position Hpos = 25, Vpos = 50

MIX parameters

Mix time set to 20 fields

WIPE parameters

Wipe pattern set to cross
Wipe time set to 20 fields

SET FADE parameters

Wipe time set to 20 fields
Mix time set to 20 fields
Foreground time set to 20 fields
Background time set to 20 fields
Black time set to 20 fields
Ext Key time set to 20 fields

OUTPUT parameters

Main output set to combined video image
Aux output set to combined video image
Key fade time set to 20 fields
All signals faded up to maximum

ENG parameters

EDH insertion on
Hphase not affected
Bright = 0
Ref = Key

GPI parameters

Recall off
Select off

8. Trouble shooting

Card edge status LEDs

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

LKEY HD status LEDs

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

LED label	Colour	Status when on
OnA	Green (top)	Front panel to LKEY transmission
OnB	Green (bottom)	Control panel to LKEY transmission
TxA	Amber (top)	LKEY to front panel transmission
TxB	Amber (bottom)	LKEY to control panel transmission
RxA	Amber (top)	Front panel to LKEY comms request
RxB	Amber (bottom)	Control panel to LKEY comms request
HD	Amber (top)	High Definition input detected.
SD	Amber (bottom)	Standard Definition 625/525 lines input detected.
FG	Green	Valid Foreground input detected.
BG	Green	Valid Background input detected.
Key	Green	Valid External Key input detected.
PSU	Green	All PSU rails are within tolerance

Card Status from Safire control panel

This menu is entered with the ENG button and gives a brief overview of the card status- Inputs present, input standard etc.

Poled LKEY HD module status

Function	Notes
Eng Vers	Displays software version
Fgnd	Shows presence or absence of Foreground input
Bgnd	Shows presence or absence of Background input
Ext Key	Shows presence or absence of selected output timing reference or External Key input
Ref	Toggles through the inputs to select the output timing reference
SD PAL 50	Shows input standard - 1920x1080i/SD PAL/NTSC 50/60
Bright	Adjust Safire controller display brightness over 0 (half) to 3 (full) range
Defaults	Recall factory defaults
H Phase	Adjusts output delay relative to selected reference over a 124 microsecond (µs) range from about 5µs (5) to 128µs (128). Acceptable range depends on relative timing of input signals.

Card status from Statesman status menu

Statesman provides basic status information within the Presets + ENG menu

LKEY HD status display

LED indication of signal presence and configuration is given. This information may be of use when problem solving.

Summary of status LEDs and the meaning of their different states.

Function	Colour On/present	Colour Off/absent	State when on/present/active
Foreground Presence	Green	Red	Foreground input present
Background Presence	Green	Red	Background input present
Key Presence	Green	Red	External key input present
FG On	Yellow	Greyed out	Foreground contributing to output
BG On	Yellow	Greyed out	Background contributing to output
To FG	Yellow	Greyed out	Fade to source is foreground
To BG	Yellow	Greyed out	Fade to source is background
Black	Yellow	Greyed out	Output is faded to black – FTB active and faded down
Mix/Key Down	Yellow	Greyed out	Mix or Key is active and faded down

8.1.1. Basic fault finding guide

The Power OK LEDs are not illuminated

Check that the unit is correctly powered and that any fuses are intact

Check that the frame PSU is functioning

Refer to the appropriate frame manual for detailed information

There is no video output

Check that valid HD/SD inputs are present and of the same standard, also that any cabling is intact

The video output is corrupted or shows digital noise

Check that the required signal inputs are present for the current effect

The video output is not synchronous with other sources

Check that inputs are co-timed within two lines of each other and are synchronous with downstream equipment and that the correct video standard is selected

Check that horizontal delay is set correctly. Output timing is selectable up to approximately 40us in HD or in SD 0-2-line delay from the assigned reference input. The other inputs must be 0-1 lines earlier than the output. Inputs outside the timing range will be horizontally aligned but vertically offset.

The Safire Controller 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 panel control (1 and 4 down).

To check LKEY HD card and Safire Controller communications proceed as follows:

1) Attempt to adjust a parameter while viewing the card edge LED's:-

The RxB LED does not illuminate – the board is not receiving any signals. Check the serial cabling. Check that the card is in the correct slot for the cable being used. Check that PL& jumpers are set for serial control (default)

Only the RxB LED illuminates – the board is receiving instructions but not responding. Check that the correct remote is selected on the control panel. If the node select switch is not set to zero when the board is in an AV frame the node address will not correspond to the slot number.

2) If necessary try re-setting the LKEY HD card and/or Safire Controller.

Some Statesman features or controls are greyed out

Features and controls are automatically 'greyed out' if they are rendered inappropriate or invalid due to the selection of other controls. For example, if Ext Key On is deselected then the Ext Key Inv control and its Min Clip/Max Clip sliders are greyed out, as they have no useful function.

How much gain is available for a particular keyer?

The easiest method to calculate the maximum gain is to compare the minimum difference between Min Clip and Max Clip for that keyer to the available range.

For example, the Self-keyer has a range of 0 to 100 and a minimum difference of about 6 (when seen from the Safire controller). This is a gain of over 16.

8.1.2. Re-setting the card

If required, the card may be reset by simply removing the rack power if safe to do so and re-applying power after a few seconds or by removing the card from the rack and re-inserting the card.

It is safe to reinsert the card whilst the rack is powered.

9. Specification

General

Dimensions	100mm x 266 mm dual height module with DIN 41612 connectors
Weight	250g
Power consumption	14.5W

Inputs

Foreground, Background and Key Video SDI	HD or SD SDI 270Mb/s to 1.485Gb/s serial digital compliant to SMPTE-259M and SMPTE-292M
	Cable equalisation >250m Belden 8281 or equivalent
	HD (1.485Gb/s) – 100 metres
	SD (270Mb/s) >250 metres 270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M
	(Auto selection)

Outputs

Main Video SDI	2 reclocked SDI outputs 270Mb/s - 1.485Gb/s to SMPTE-259M and SMPTE-292M
	Belden 8281 or equivalent
	HD (1.485Gb/s) – 100 meters
	SD (270Mb/s) >250 meters 2 x 270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M.
Preview Video SDI	2 reclocked SDI outputs 270Mb/s - 1.485Gb/s to SMPTE-259M and SMPTE-292M
	Belden 8281 or equivalent
	HD (1.485Gb/s) – 100 metres
	SD (270Mb/s) >250 metres 2 x 270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M.
Blanking (selected reference channel)	All data in the vertical and horizontal blanking interval is passed through unprocessed with full 10-bits. Therefore, the unit will pass through embedded audio and any ancillary data with a delay as set by the horizontal phase adjustment.

Timing

Timebase range	Maximum input buffer length 1 line plus up to 3000 pixels
Minimum input to output delay	approximately 5µs
Reference timing	Selectable from Foreground, Background or key