

digital keying modular
interface audio
converters analogue video

X-KEY

Digital effects keyer

USER MANUAL

Crystal  **Vision**

X-KEY Digital Effects Keyer

USERS MANUAL

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Panel S/W 1.4.2 onwards
XKEY S/W 1.8.0 onwards

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X-KEY Digital Effects Keyer USERS MANUAL

INTRODUCTION

The Crystal Vision X-KEY Digital Effects Keyer has simple mix, wipe and key functions, together with a high quality linear chroma-keyer. Its small size and low cost makes it suitable for multi-channel keying in live applications. It is especially useful in virtual studios where a chroma-key function can be provided for each camera so that the studio mixer inputs are already combined with the "set" allowing full preview of the virtual images. Two modules can be fitted into a 1U frame, and are controlled by a remote panel. A single remote panel can be used to control up to ten units.

The keyer has 2 picture inputs, an external key input, a combined picture output, and a processed key output (all serial digital). The combined picture output can be used to preview inputs, or processed background or foreground. Modes of Operation are: MIX, WIPE, KEY and CHROMA-KEY.

MIX OR WIPE

In these modes the unit will perform a mix or wipe between 2 video sources, or between one video source and an internal colour matte. The mix or wipe is either controlled manually or by setting an auto-transition triggered from the control panel or from remote control. The internal wipe pattern generator has a number of simple wipes including horizontal, vertical, horizontal blind, vertical blind, cross or box.

LINEAR KEY

In this mode the unit will cut a hole in a video picture in the shape of the external key signal and fill it with either another video picture or a colour from the internal matte generator. The key signal can be amplified, offset and inverted. This is used to add captions, graphics or logos to a video source. The key processing can be used to fade the "logo" in and out either manually or as a timed transition.

The keying process can either be multiplicative, or additive depending on the sources to be combined. Additive keying is used when the foreground is already shaped onto a black background as in some caption generators, or when the foreground and key signals are the same, (self keying). Additive keying prevents aliasing effects of shaping a signal that is already shaped ready for keying (often seen as a black outline to the character).

CHROMA-KEY MODE

The X-KEY effects keyer has a complete chroma-key system that generates the key signal from the foreground input and produces a combined output. The key and foreground processing allow many fine adjustments that help eliminate the difficulties of the process and make it easier to create a realistic effect. The linear keying allow sophisticated effects with transparent and reflective elements in the foreground (water, glass, mirrors etc). Both additive keying (with blue suppressed to

black) and conventional keying are available together with external key input for graphics in the foreground, and a garbage matte generator.

ORDERING INFORMATION	
X-KEY	Effects Keyer Module (Includes Chroma Keyer)
FR1-2XKEY	1U Frame for up to 2 XKEY modules. Includes all rear connections and PSU
PAN-KEY	Remote Control panel for up to 10 XKEY modules.

SPECIFICATION

MECHANICAL

1U frame holds up to two XKEY modules.
525mm deep. Board and PSU removable from front.

POWER SUPPLY 85 to 264Volt, 75 watts.
Weight with 2 modules 8 Kg

Remote Control Panel for up to 10 modules
19" 2U high 60mm deep, bench or panel mounting.
Weight 2 Kg

Remote RS232/422 control. With some GPI functions.

Power for the remote panel is 6 volts and either comes from the main frame on the control cable (up to 15 meters) or from external dc supply. (A suitable low voltage converter is supplied with the control panel, and has IEC input 100 to 250 volts)
A short remote control lead with internal power connection is supplied with the control panel

INPUTS

I/P A/ Foreground (SDI)
I/P B/ Background (SDI)
Inputs A & B have serial LOOP outputs
Key/Alpha Key (SDI)
Analogue Syncs Reference with loop output

OUTPUTS (SDI)

MAIN x 2
Main can be combined output, or select preview from inputs, or processed foreground or background, or key.

KEY x 2 (after processing).

CONTROL

RS232 or RS422 multi-drop
19,200 baud, 8 bit no parity

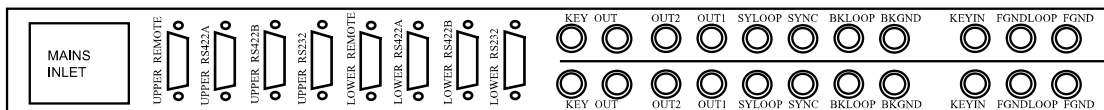
INSTALLATION INFORMATION

The X-KEY module plugs into the FR1-2XKEY 1U frame. This will hold one or two modules. The two modules have entirely independent connections on the rear panel for video inputs outputs and control.

The X-KEY module is controlled by the PAN-XKEY remote control panel. If more than one X-KEY module is intended to be controlled from the same remote control panel then it is necessary to connect the RS422 ports of all the X-KEY modules together with external wiring and also to set the DIP switches on the front of each X-KEY module to give them a separate address.

TIMING CONSIDERATIONS

- 1 Analogue reference is required for each XKEY module
- 2 Inputs must be within a 64us timing window.
- 3 Delay of the unit is no more than 1 line depending on the relative delay of syncs to SDI input.



VIDEO CONNECTIONS FOR FR1-2XKEY

There are identical video connections for the upper and lower modules in the frame.

Connections from right hand side are:

FGND:	SDI Foreground input.
FGND LOOP	SDI Foreground active loop output
KEYIN	SDI Key input (optional alpha key for chroma key mode)
BCKGND	SDI Background input
BCKGND LOOP	SDI Background active loop output
SYNC	Analogue mixed sync input or black and burst
SYNC LOOP	Passive loop of analogue sync input.
OUT1/OUT2	SDI main output
KEY OUT (x2)	SDI combined key output

REMOTE CONNECTIONS FOR FR1-2XKEY

UPPER REMOTE

15 way D type plug.
For future use only

UPPER RS422A

15 way D type socket

This is the main control port. Use this or the RS232 port to control the upper keyer.

Pin	Function	Comment	Pin	Function	Comment
1	GND		10	NC	
2	TX-		11	NC	
3	RX+		12	NC	
4	GND		13	NC	
5	NC		14	NC	
6	GND		15	+5V out	See note
7	TX+				
8	RX-				
9	GND				

UPPER RS422B

15 way D type socket

This is the secondary control port, for future use.

Pin	Function	Comment	Pin	Function	Comment
1	GND		10	NC	
2	TX-		11	NC	
3	RX+		12	NC	
4	GND		13	NC	
5	NC		14	NC	
6	GND		15	+5V out	See note
7	TX+				
8	RX-				
9	GND				

UPPER RS232

15 way D type socket

This has both serial control ports. Use this or the RS422A port to control the upper keyer. Use RX1 and TX1 as RX2 and TX2 are for future use only.

Pin	Function	Comment	Pin	Function	Comment
1	GND		10	NC	
2	TX1		11	NC	
3	RX1		12	NC	
4	NC		13	NC	
5	NC		14	NC	
6	NC		15	+5V out	See note
7	TX2	Future use			
8	RX2	Future use			
9	GND				

LOWER REMOTE, LOWER RS422A, LOWER RS422B and LOWER RS232 are connected the same as the upper controls but for the lower X-KEY module.

REMOTE CONNECTIONS FOR PAN-XKEY

RS422 (Main control connection)

9 way D type plug

Pin	Function	Comment
1	GND	
2	RX-	
3	TX+	
4	GND	
5	+5V in	Use this or DC power connector
6	GND	
7	RX+	
8	TX-	
9	GND	

RS232

9 way D type plug

Pin	Function	Comment
1	GND	
2	RX1	
3	TX1	
4	NC	
5	+5V in	Use this or DC power connector
6	NC	
7	RX2	Future use only
8	TX2	Future use only
9	GND	

REMOTE (Future use only)

9 way D type socket

Pin	Function	Comment
1	GPI1	Inputs. Active connect to ground
2	GPI2	
3	GPI3	
4	GPI4	
5	GPI5	
6	GPI6	
7	GPI7	
8	GPI8	
9	GND	

+6VDC INPUT CONNECTOR FOR PAN-XKEY

Latching 3-pin DIN socket for power input.

Use if power not connected via remote cables. Low voltage supply, with IEC mains input and a lead with the correct plug on is supplied with the control panel.

Pin	Function	Comment
1	+6V DC	Regulated to +5V on CPU
2	Gnd	
3	No connect	

CONTROL CABLE FOR RS422 CONTROL OF A SINGLE X-KEY

15 way D plug for FR1-2XKEY			9 way D socket for PANXKEY		
Pin	Function	Comment	Pin	Function	Comment
1	GND		1	GND	
2	TX-		2	RX-	
3	RX+		3	TX+	
4	GND		4	GND	
6	GND		6	GND	
7	TX+		7	RX+	
8	RX-		8	TX-	
9	GND		9	GND	
15	+5V out	See note	5	+5V in	Use this or DC power connector

CONTROL CABLE FOR RS232 CONTROL OF A SINGLE XKEY

15 way D plug for FR1-2XKEY			9 way D socket for PANXKEY		
Pin	Function	Comment	Pin	Function	Comment
1	GND		1	GND	
2	TX1		2	RX1	
3	RX1		3	TX1	
15	+5V out	See note	5	+5V in	Use this or DC power connector

CONTROL CABLE FOR RS422 CONTROL OF MULTIPLE X-KEY MODULES

If more than one module is controlled from the same remote control panel, the remote control must be externally looped through to all the XKEY modules, even if they are in the same frame. (The upper and lower RS422 connection in a frame are NOT connected together internally.)

The +Vout MUST ONLY BE CONNECTED TO A SINGLE FR1-2XKEY PORT. This should be the nearest connector to the PANXKEY remote panel. If it is not convenient to take power in this way, a low voltage supply is supplied with the control panel, and then +5v need not be connected in the control cable.

Each XKEY module must be set to a different device address, by using the DIP switch on the edge of the board. This can be accessed from the front panel of the frame.

DIP SWITCHES ON X-KEY BOARD

SW1

8 way DIP switch on left-hand edge of board.

Switch No.	Normally	Up	Down
S1	Always Up	Enable system clock	Disable system clock
S2	Down	Channel A baud = 19200	Channel A baud = 9600
S3	Down	Channel B baud = 19200	Channel B baud = 9600
S4	Up	Future use	
S5	See below	Remote address	
S6	See below	Remote address	
S7	See below	Remote address	
S8	See below	Remote address	

SW1 S5-8

S8	S7	S6	S5	Remote Address
Down	Down	Down	Down	1
Down	Down	Down	Up	2
Down	Down	Up	Down	3
Down	Down	Up	Up	4
Down	Up	Down	Down	5
Down	Up	Down	Up	6
Down	Up	Up	Down	7
Down	Up	Up	Up	8
Up	Down	Down	Down	9
Up	Down	Down	Up	10
Up	Down	Up	Down	11
Up	Down	Up	Up	12
Up	Up	Down	Down	13
Up	Up	Down	Up	14
Up	Up	Up	Down	15
Up	Up	Up	Up	16

SW2

Unused 8 way piano switch

LINK POSITIONS ON X-KEY MODULE

JP2	3 way link	towards front of board Towards rear of board	RS422 control RS232 control
JP1	3 way link	towards front of board Towards rear of board	RS422 control (2 nd port) RS232 control (2 nd port)
LK7	3 way link	towards R197 away from R197	enable battery back-up disable battery back-up
LK6	2 way link	momentary close	reset board
LK4 and LK5		See Below	625/525

LK4	LK5	Use
Open	Open	Force 625 Line operation
Closed	Open	Force 525 Line operation
Open	Closed	Auto standard on Analogue Reference Input

LED indication on X-KEY module

LEDs from left to right

Yellow	On during configuration of board. Should switch on for about 10 seconds at power-up or reset.
Green	No function
Green	SDI key input present
Green	SDI background present
Green	SDI foreground present
Green	Analogue reference syncs present

SOFTWARE UPGRADES ON X-KEY MODULE

The software for the X-KKEY module is contained in a single EPROM IC72. To change this remove the board from the frame, using the X-KEY board removing tool. This attaches to the board stiffener at the front of the board between the LEDs and the DIP switch at the centre of the board.

GETTING ACCESS TO THE PAN-XKEY CPU

The front panel of the control panel can be removed by first removing the six screws along the top of the long face of the box.

Link Positions

LK1	3 way link	away from U3 MAX232 towards U3 MAX232	disable battery (default) enable battery back-up
J3	3 way link	away from U3 MAX232 (J3 next to LK1) towards U3 MAX232	RS422 control (default) RS232 control
J2	3 way link	towards front of board (J2 next to J3) Towards rear of board	RS422 control (2 nd port) RS232 control (default)
SW2		8 way piano switch	Future use only.

SOFTWARE UPGRADES ON PAN-XKEY CONTROL PANEL

The software for the PAN-XKEY module is contained in a single EPROM U10. To change this, remove the front panel from the box as described above. Do NOT remove any cables from the CPU or remove the CPU from the frame. Carefully replace the EPROM with the new version ensuring the correct orientation and reassemble the panel.

OPERATION INSTRUCTIONS

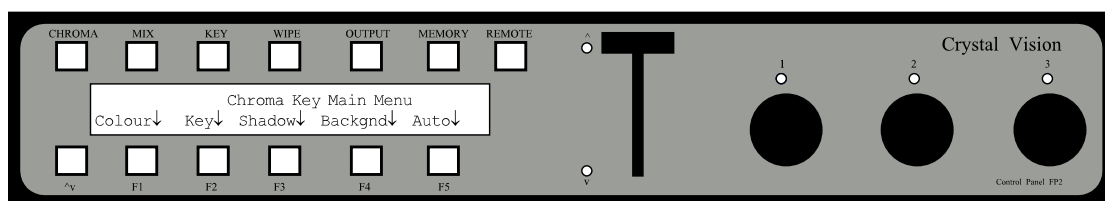
GETTING STARTED

Ensure the system is correctly installed. Each keyer should have analogue syncs connected, a foreground and a background source, and the main output should be viewed on a picture monitor. The timing of the input sources should be within 20us of the input reference. At power-up the unit will take 10 seconds to configure. During this period the video output will be invalid.

The top row of buttons are quick access keys to the main menus, or functions.

Press REMOTE on the top right of the button area and select remote 1 by pressing F1 to control the keyer with an address of 1. Pressing REMOTE toggles between keyers 1 to 5 and 6 to 10.

Press MIX on the top row of buttons. Move the T-bar back and forwards to mix between the 2 sources. The system is now working!



MODES OF OPERATION

There are 4 mode buttons, which define the configuration of the keyer and are mutually exclusive. These are CHROMA, MIX, KEY and WIPE. Selecting one of the buttons initialises the keyer, and sets some default values. The function buttons F1 to F5, knobs and T bar set the adjustments. There is an LED next to each knob and two by the T bar to show when they are active. When there are lower levels of menu control these are selected by the function buttons F1 to F5. The ▲▼ “up menu” button next to F1 is used to return to higher level menus.

The OUTPUT button on the top menu can be used to look at suppressed foreground and keyed background in additive Chroma key mode to assist setting these up of the key. The actual key can also be viewed on the main output.

The MEMORY key allows storing and restoring of up to 10 set ups within the battery backed-up memory of the X-KEY module. REMOTE allows the selection of 1 of up to 10 X-KEY modules for control.

USING THE X-KEY AS A CHROMA KEYSER

The X-KEY module has a very powerful chroma keyer, which with an understanding of the various parameters can give excellent results. The following strategy should ensure correct set up.

1 ADDITIVE CHROMA KEY MODE

Press CHROMA to select chroma key mode. Press F1 for COLOUR and then F5 to select ADD mode if not already in this mode.

2 DO AN AUTO SETUP

Press CHROMA to select chroma key mode. Press F5 for AUTO and then F2 for CURSOR ON. Use H POS and V POS on knob 1 and knob 2 to move the cursor to a typical foreground key colour (blue/green etc). Press GRAB to get an auto set up.

3 CHECK FOREGROUND ADJUSTMENT

Press OUTPUT in the top-level buttons and F2 for foreground to output suppressed foreground. Press CHROMA once only to allow the output to stay with the suppressed foreground and to access CHROMA adjustments. Then press F1 for colour adjustments. Adjust the hue on knob 1 and acceptance angle on knob 2 to get the background colour suppressed. Adjust Y suppression on knob 3 to adjust the background to black instead of grey. The suppression angle will not require much adjustment. This control may help later to improve the transition between foreground and background.

4 CHECK BACKGROUND ADJUSTMENT

Press OUTPUT and then F3 KeyBack to output the keyed background. Press CHROMA once to get back to CHROMA adjustments, then F2 for key adjustments. Adjust gain on knob 2 to get full amplitude background and lift on knob 1 to remove transparency in the foreground. Lift should be zero, or slightly negative to get rid of any transparency on black objects. Transparency on white or light blue foreground objects can be removed by increasing Y correction on knob 3. If transparency persists then this can be countered by pressing the ▲▼ UP MENU button, then COLOUR to make adjustments to the acceptance angle, and the hue. Now press OUTPUT then the F4 key summed to give the combine output.

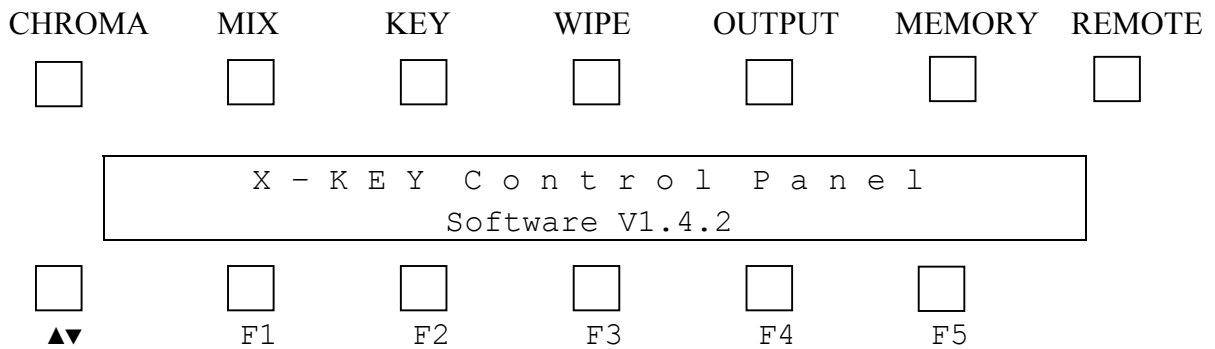
5 SHADOW and FORCE

Refer to the instructions for these sections to get shadow background and mask\alpha key force settings. Note that the key gain and lift can be used to change shadow effects and that studio lighting is critical. To get shadow to work correctly there must be even lighting on the colour background so that the reduced lighting of shadow can be used to reduce the gain of the background without effecting the rest of the background. Shadows work well with additive keying as the keying colour in the foreground is fully suppressed even when the key is not full amplitude. In multiplicative keying there will be a blue tinge to the shadow area. Normally, multiplicative keying should only be used when shadows are not required and when the foreground signal is too poor to get a good effect with additive keying.

DETAILED DESCRIPTION OF MENUS

Switch On menu

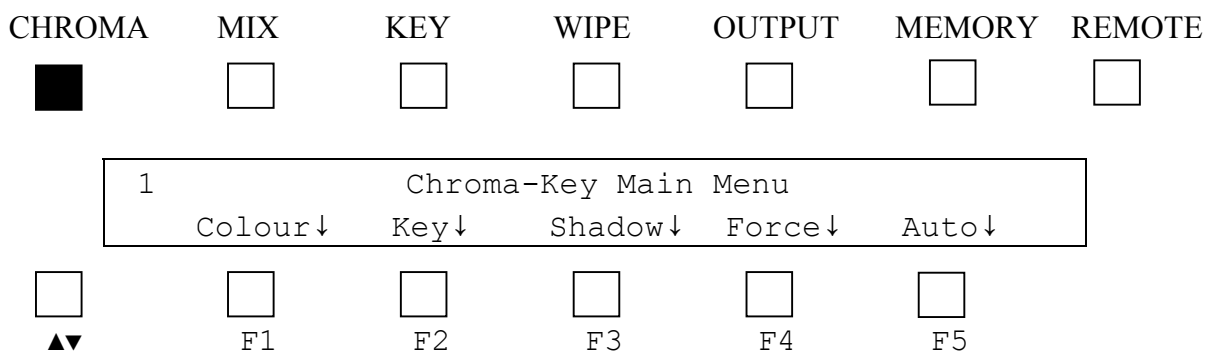
A welcome message is first displayed. Press one of the top-level keys to start operation. X-KEY modules will return to last used set-up at power-up.



CHROMA Top Menu

Select Colour, Key, Shadow, Force or Auto set-up menus. Select the Auto menu first to get a quick set-up then use the Colour and Key menus for fine adjustments. The shadow menu allows enhanced shadow effects in either all, or the lower section of the picture. The force menu allows a background force mask and a foreground force mask to be created that can be combined with an external alpha key.

The force menu allows the operator to make use of the key input to create sophisticated foreground and background masks. This feature can be used with the internal foreground and background masks. The internal masks can also be prioritised as to which one generates the force when the masks overlap. This allows more complex shapes to be created. The masks can be used to hide physical imperfections in a virtual set or permit chroma keying in a limited area only. Also, the background force can be used to mask out areas of the foreground that should be the chroma keying colour but are at the edge of the set, or badly lit.



CHROMA/Colour Sub-menu

This menu allows adjustment of Hue on knob 1, Acceptance Angle on knob 2 and Y Suppression on knob 3. Pressing F4 allows adjustment of the Suppression Angle on knob 3. Pressing F3 returns Y Suppression control back to knob 3. Pressing F5 toggles the type of Chroma Keying between additive and multiplicative keying.

Hue sets the colour to key onto and its value is displayed in degrees from zero to 360 with wraparound.

Acceptance Angle adjusts the range of colours that will be accepted as key-colour. The value displayed goes from 32 to 255 and represents a hue angle from about 30 degrees to 120 degrees.

Y Suppression is used in additive chroma keying. The key-colour is subtracted from the foreground picture to produce suppressed foreground. Y Suppression is used to ensure that the background, where the key colour was, is black and not grey. It works by subtracting luminance from the foreground in the area of the key signal.

Suppression Angle has a minor effect on the edges of the suppressed foreground depending on picture content. Adjust it to try and visually improve the effect when other adjustments have been set. Within the suppression angle, foreground colours are suppressed to the centre of the vector scope (black or grey). Outside the suppression angle the colours are suppressed in a direction on the vector scope in parallel with the key colour. This changes the transitions from key colour to foreground colour.

Both additive keying (with key-colour suppressed to black) and conventional keying are available for chroma keying. Additive keying normally produces better results as it allows linear effects such as shadow and transparency. In multiplicative keying there can be a tinge of key-colour to the shadow and transparent areas due to insufficient suppression of the key colour. Multiplicative keying should normally only be used when shadows are not required and the foreground signal is too poor to get a good effect with additive keying.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE												
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>												
<table border="1"> <tr> <td>1</td> <td>333</td> <td>140</td> <td>100</td> <td>50</td> <td>Add</td> </tr> <tr> <td></td> <td>Hue</td> <td>Accept θ</td> <td>Y Supp</td> <td>Supp θ</td> <td>Key Mode</td> </tr> </table>							1	333	140	100	50	Add		Hue	Accept θ	Y Supp	Supp θ	Key Mode
1	333	140	100	50	Add													
	Hue	Accept θ	Y Supp	Supp θ	Key Mode													
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>													
▲▼	F1	F2	F3	F4	F5													

CHROMA/Key Sub-menu

This menu allows adjustments to be made to Key Lift on knob 1, Key Gain on knob 2 and Y correction on knob 3. Pressing F4 adjusts Clean Up on knob 3 and pressing F3 returns Y Correction control to knob 3.

Adjust gain on knob 2 to get full amplitude background and lift on knob 1 to get the foreground area to black. Lift should normally be zero, or slightly negative to get rid of any transparency on black objects. It can be adjusted from -128 to +127. Gain can be set from zero to 255. The value required depends on the amplitude of the key-colour. Typical values are from 35 to 70. The lower the key gain value the cleaner linear effects such as shadow and transparency will appear.

Transparency on white or light key-colour foreground objects can be removed by increasing Y correction on knob 3. This reduces the value of the key signal in areas of high foreground luminance.

Clean-Up can be used in some cases to stop the amplitude of the background being reduced in areas of noisy background key-colour. This has a range of zero to 255 with 255 having no effect and zero maximum effect. As the value is reduced, key levels above a certain threshold are forced to full amplitude. Care must be taken with this adjustment as it can give a contouring effect of the key. Sometimes a better effect can be obtained by increasing Key Gain.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE														
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>														
<table border="0" style="width: 100%; text-align: center;"> <tr> <td style="width: 15%;">1</td> <td style="width: 15%;">-5</td> <td style="width: 15%;">50</td> <td style="width: 15%;">0</td> <td style="width: 15%;">255</td> <td colspan="2"></td> </tr> <tr> <td></td> <td>Lift</td> <td>Gain</td> <td>Y Corr</td> <td>Clean Up</td> <td colspan="2"></td> </tr> </table>							1	-5	50	0	255				Lift	Gain	Y Corr	Clean Up		
1	-5	50	0	255																
	Lift	Gain	Y Corr	Clean Up																
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>															
▲▼	F1	F2	F3	F4	F5															

CHROMA/Shadow Sub-menu

This menu allows Shadow enhancement to be turned on and off using F1 and to vary the gain of enhancement using F3. Knob 1 sets the vertical range of the picture that is enhanced. A value of zero performs no shadow enhancement and increasing the value gradually enhances the lower part of the picture up to a value of 72 which effects the whole picture.

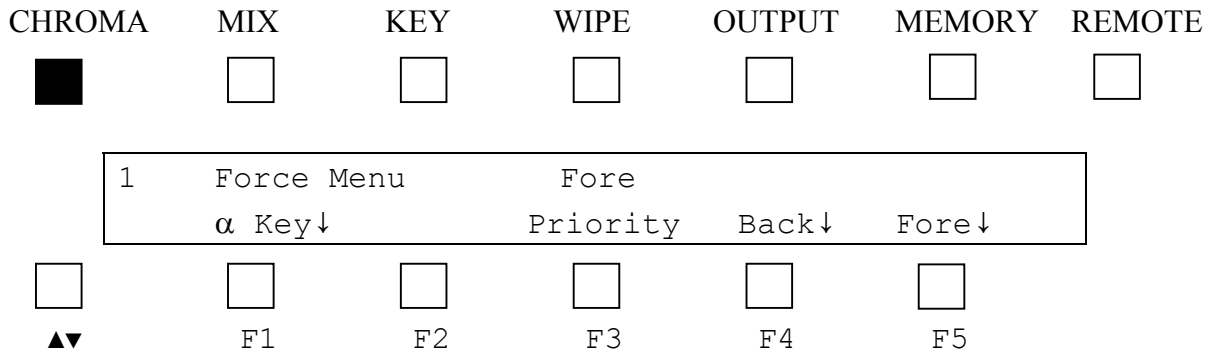
CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE														
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>														
<table border="0" style="width: 100%; text-align: center;"> <tr> <td style="width: 15%;">1</td> <td style="width: 15%;">Off</td> <td style="width: 15%;">50</td> <td style="width: 15%;">128</td> <td colspan="3">Shadow Menu</td> </tr> <tr> <td></td> <td>On/Off</td> <td>V Pos</td> <td>Gain</td> <td colspan="3"></td> </tr> </table>							1	Off	50	128	Shadow Menu				On/Off	V Pos	Gain			
1	Off	50	128	Shadow Menu																
	On/Off	V Pos	Gain																	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>															
▲▼	F1	F2	F3	F4	F5															

CHROMA/Force Sub-menu

Pressing the F1 key selects the alpha key force processing sub-menu. Pressing F4 or F5 selects the Background and Foreground force function respectively. F3 selects foreground or background force priority.

When a back ground force mask and a foreground mask are both defined and set to on there needs to be some control over which mask has the most significance when they interact with each other. When the priority is set to foreground, the foreground mask will over run the background mask. When the priority is set to background then the background mask will over run the foreground mask.

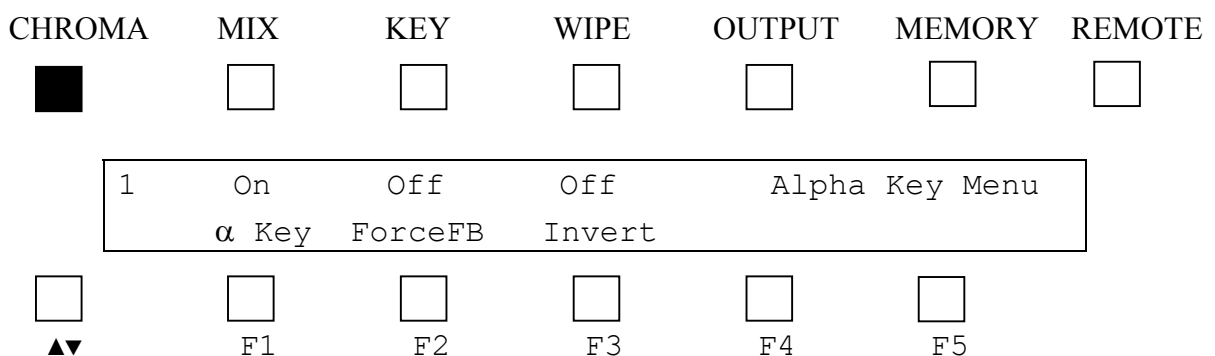
If an external alpha key and force masks are enabled they are combined with a non-additive mix.



CHROMA/Force/Alpha Key Sub-menu

The Alpha Key is used to force the key signal in areas that may not be the key-colour in the foreground. It is an external SDI signal that forces the background into the foreground allowing the use of three-dimensional objects in the virtual set. By switching this effect on and off people can be made to walk in front of or behind virtual objects. There are no gain adjustments on this input, so it must be provided at the correct levels from black to white. It can also be inverted.

ForceFB allows the alpha key input to be used as a background and/or foreground force and can be turned on and off. ForceFB analyses the key signal on the alpha key input. Firstly, the signal needs to be within certain bounds. If the signal is below digital black (8-bit value 16) it is clipped to digital black (8-bit value decimal 16). If the signal is above digital peak white (8-bit value decimal 235) it is clipped to digital peak white (8-bit value 235). Secondly, the signal is split into three ranges. Background force is extracted from a range of pixel values from 16 to 48 where 16 represents full background force and 48 represents no background force. Foreground force is extracted from a range of pixel values from 203 to 235 where 235 represents full foreground force and 203 represents no foreground force. Values between 48 and 203 permit the normal CSO key to pass through unaffected. In this mode, 128 linear levels of background and foreground force can be achieved using a single 10-bit alpha key.



CHROMA/Force/Background Sub-menu

Pressing F5 shows the background force mask on screen. Pressing F4 to invert the mask forces the area around the defined mask to become background. In this way the mask acts as a garbage matte. Pressing F1 selects the window adjustment menu to set the size and position of the background force mask.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	Background Force	Off	Off
	Window↓	Invert	Force

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

CHROMA/Force/Background/Window Sub-menu

Knob 1 and 2 adjusts the Horizontal and Vertical position of the background force window. Knob 3 adjusts the width. Pressing F4 allows the height of the window to be adjusted with knob 3. Pressing F3 allows knob 3 to control the window width again.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	100	100	100	100	Backgnd
	H Pos	V Pos	Width	Height	

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

CHROMA/Force/Foreground Sub-menu

Pressing F5 shows the foreground force mask on screen. In this way the mask prevents the defined area from being chroma keyed. Pressing F4 to invert the mask forces the area around the defined mask to become foreground. In this way the mask defines only a limited area to be chroma keyed. Pressing F1 selects the window adjustment menu to set the size and position of the foreground force mask.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE								
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
<table border="0" style="width: 100%; text-align: left;"> <tr> <td style="width: 5%;">1</td> <td style="width: 40%;">Foreground Force</td> <td style="width: 20%;">Off</td> <td style="width: 20%;">Off</td> </tr> <tr> <td></td> <td>Window↓</td> <td>Invert</td> <td>Force</td> </tr> </table>							1	Foreground Force	Off	Off		Window↓	Invert	Force
1	Foreground Force	Off	Off											
	Window↓	Invert	Force											
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>									
▲▼	F1	F2	F3	F4	F5									

CHROMA/Force/Foreground/Window Sub-menu

Knob 1 and 2 adjusts the Horizontal and Vertical position of the foreground force window. Knob 3 adjusts the width. Pressing F4 allows the height of the window to be adjusted with knob 3. Pressing F3 allows knob 3 to control the window width again.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE												
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>												
<table border="0" style="width: 100%; text-align: left;"> <tr> <td style="width: 5%;">1</td> <td style="width: 15%;">100</td> <td style="width: 15%;">100</td> <td style="width: 15%;">100</td> <td style="width: 15%;">100</td> <td style="width: 20%;">Foregnd</td> </tr> <tr> <td></td> <td>H Pos</td> <td>V Pos</td> <td>Width</td> <td>Height</td> <td></td> </tr> </table>							1	100	100	100	100	Foregnd		H Pos	V Pos	Width	Height	
1	100	100	100	100	Foregnd													
	H Pos	V Pos	Width	Height														
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>													
▲▼	F1	F2	F3	F4	F5													

CHROMA/Auto Sub-menu

Pressing F1 installs factory default values for the X-Key.

To select the colour for chroma keying press F2 to set the cursor to on. Move the cursor to a typical foreground key colour (blue/green etc) using H Pos and V Pos on knob 1 and knob 2 respectively. Press the F5 Grab key once to get an auto set-up for usable chroma keying. This works best when there is good lighting and strong key colour present.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE															
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>															
<table border="0" style="width: 100%; text-align: left;"> <tr> <td style="width: 5%;">1</td> <td style="width: 20%;">On</td> <td style="width: 15%;">200</td> <td style="width: 15%;">198</td> <td style="width: 20%;">Done</td> </tr> <tr> <td></td> <td>Default</td> <td>Cursor</td> <td>H Pos</td> <td>V Pos</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>Grab</td> </tr> </table>							1	On	200	198	Done		Default	Cursor	H Pos	V Pos					Grab
1	On	200	198	Done																	
	Default	Cursor	H Pos	V Pos																	
				Grab																	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>																
▲▼	F1	F2	F3	F4	F5																

MIX Top Menu

This mode allows manual mixing with the T bar or automatic mixing from foreground to background or background to foreground. For automatic mixing the transition direction can be specified using F3 Dirn. The time for the transition in fields is set by knob 1. Pressing F5 Go starts an automatic transition. Pressing Go during a transition forces it to start at the beginning again.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	Mix Menu	To Fore	100	Mixing
		Dirn	Time	Go

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

KEY Top Menu

This mode uses an external key to do linear keying between foreground and background. F2 toggles between Self-Keying and standard Keying. In self-key, the key input is still from the external key input but the foreground is now routed using this signal as well. This can be used with the output from a character generator that does not supply a mask output.

Pressing F3 toggles the key fill between foreground, black, background and an internal matte generator.

A transition can be done from key gain of zero to the value selected in Key Set-up (see below) manually using the T bar.

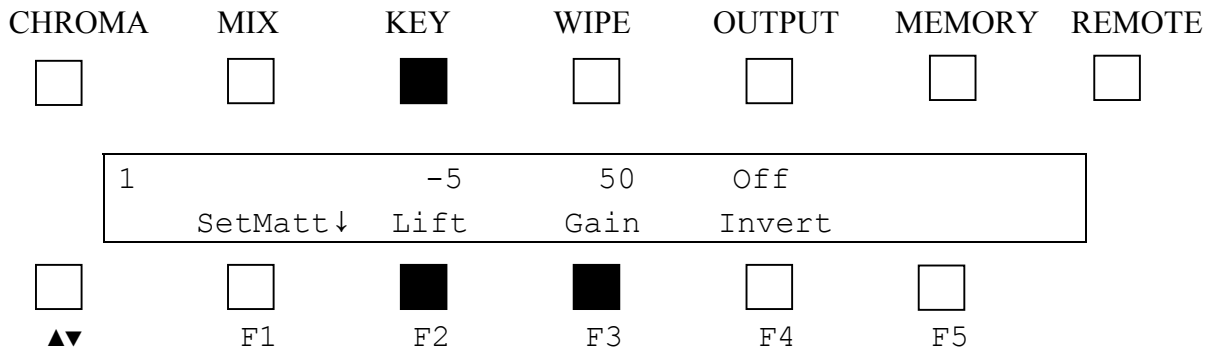
CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	Key	Black	Key Menu
	Setup↓	Fill	Force↓ α Key↓
	Key Mode		

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

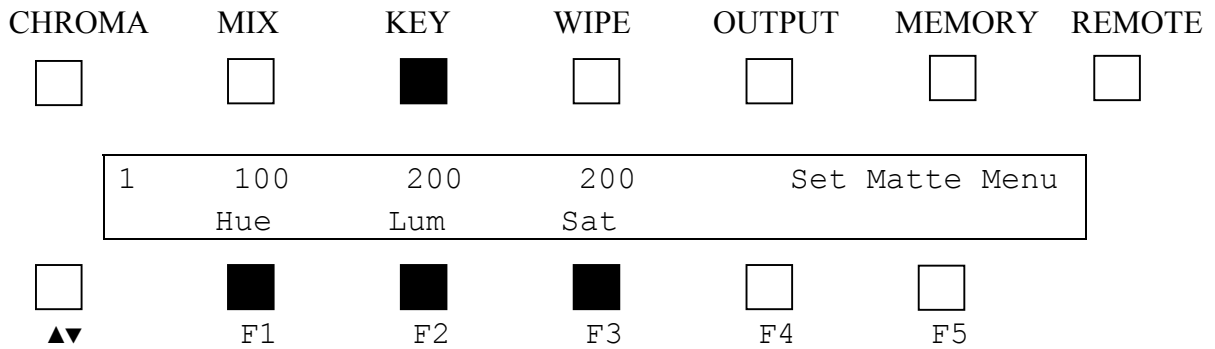
KEY/Setup Sub-menu

This sub-menu allows the lift and gain of the key signal to be set with F2 and F3. The entire final key including the internal masks can be inverted using F4. Pressing F1 accesses the internal matte generator sub-menu.



KEY/Setup/SetMatt Sub-menu

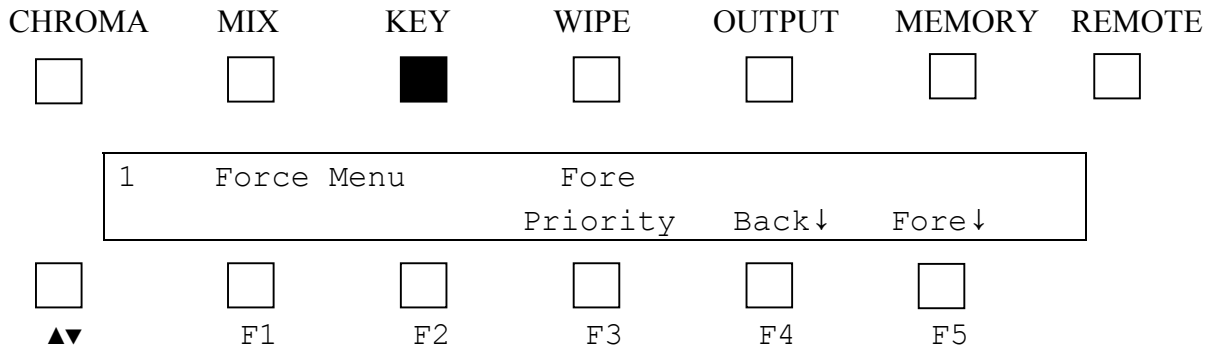
The internal matte generator Hue, Luminance and Saturation can be set by Knobs 1, 2 and 3. The matte should have been selected as the key fill in the main KEY menu.



KEY/Force Sub-menu

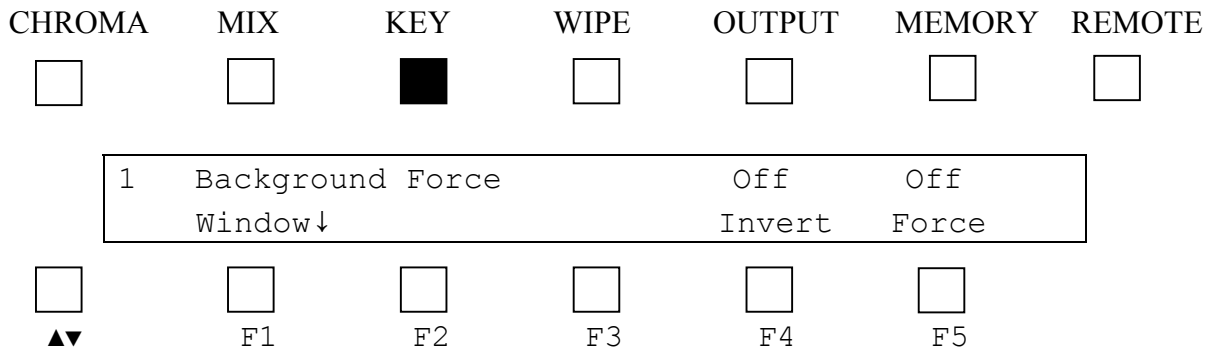
F4 and F5 select Background and Foreground force function respectively.
 F3 selects foreground or background force priority. If an external alpha key and force masks are enabled they are combined with a non-additive mix.

When a back ground force mask and a foreground mask are both defined and set to on there needs to be some control over which mask has the most significance when they interact with each other. When the priority is set to foreground, the foreground mask will over run the background mask. When the priority is set to background then the background mask will over run the foreground mask.



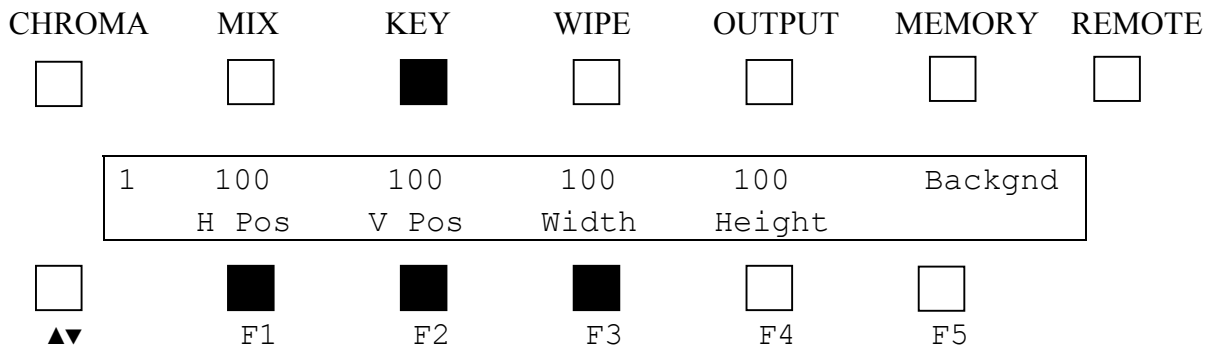
KEY/Force/Background Sub-menu

Pressing F5 shows the background force mask on screen. Pressing F4 to invert the mask forces the area around the defined mask to become background. In this way the mask acts as a garbage matte. Pressing F1 selects the window adjustment menu to set the size and position of the background force mask.



KEY/Force/Background/Window Sub-menu

Knob 1 and 2 adjusts the Horizontal and Vertical position of the background force window. Knob 3 adjusts the width. Pressing F4 allows the height of the window to be adjusted with knob 3. Pressing F3 allows knob 3 to control the window width again.



KEY/Force/Foreground Sub-menu

Pressing F5 shows the foreground force mask on screen. In this way the mask prevents the defined area from being chroma keyed. Pressing F4 to invert the mask forces the area around the defined mask to become foreground. In this way the mask defines only a limited area to be chroma keyed. Pressing F1 selects the window adjustment menu to set the size and position of the foreground force mask.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	Foreground Force	Off	Off
	Window↓	Invert	Force

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

KEY/Force/Foreground/Window Sub-menu

Knob 1 and 2 adjusts the Horizontal and Vertical position of the foreground force window. Knob 3 adjusts the width. Pressing F4 allows the height of the window to be adjusted with knob 3. Pressing F3 allows knob 3 to control the window width again.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	100	100	100	100	Foregnd
	H Pos	V Pos	Width	Height	

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

KEY/Alpha Key Sub-menu

This sub-menu allows the alpha key to be turned on and off by pressing F5. When turned off the internal masks can be used solely as the keying source. When turned on both the alpha key and the internal masks can be used. Pressing F4 allows the input alpha key to be inverted or non-inverted.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	Alpha Key Menu	Off	Off
		Invert	α Key

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

WIPE Top Menu

This mode allows manual wiping with the T bar or automatic wiping from foreground to background or background to foreground. For automatic wiping the transition direction can be specified using F3 Dirn. The time for the transition in fields is set by knob 1. Pressing F5 Go starts an automatic transition. Pressing Go during a transition forces it to start at the beginning again.

Pressing F2 toggles wipe patterns between Horizontal, Vertical, Horizontal Blinds, Vertical Blinds, Left Corner, Right Corner, Square and Cross.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1	Wipes	Horiz	To Fore	50	Wiping
		Pattern	Dirn	Time	Go

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

OUTPUT Top Menu

In all X-Key modes apart from additive chroma keying the following applies. Pressing F1 shows the foreground being used, pressing F2 shows the background being used an pressing F5 shows the key currently being used.

In additive mode extra outputs are active for use in chroma key set up.

OUTPUT\Other Modes Sub-menu

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 Output Menu
 ForeGnd BackGnd Key

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

OUTPUT\ADD Mode Sub-menu

The OUTPUT button can be used to look at suppressed foreground and keyed background in additive chroma key mode only to assist in chroma key set up. Pressing F2 selects suppressed foreground output and pressing F3 selects keyed background output. Pressing F4 selects the combined chroma key signal and pressing F5 shows the key. Pressing F1 accesses the inputs sub-menu.

Use the suppressed foreground output to make adjustments to chroma key colour, and keyed background to make adjustments to the key.

CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 Output Menu
 Inputs↓ SupFore KeyBack Summed Key

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

OUTPUT\ADD Mode\Inputs Sub-menu

Pressing F1 shows the foreground being used and pressing F2 shows the background being used.

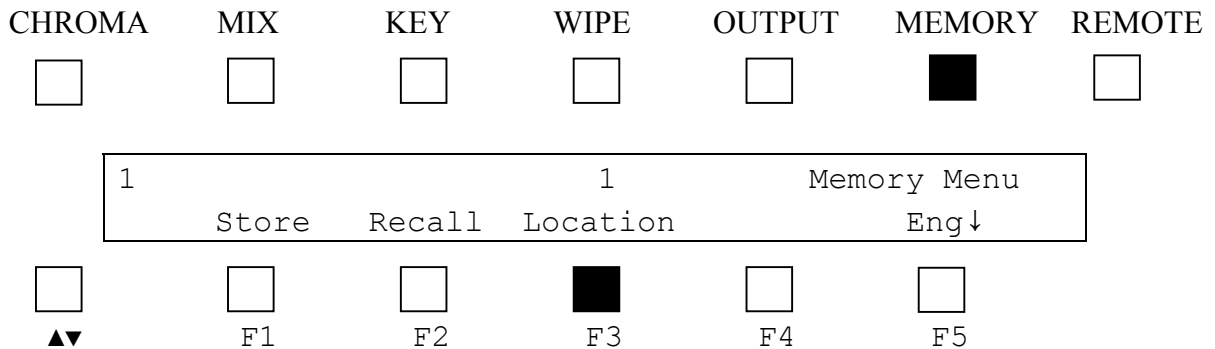
CHROMA	MIX	KEY	WIPE	OUTPUT	MEMORY	REMOTE
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 Set
 ForeGnd BackGnd

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▲▼	F1	F2	F3	F4	F5

MEMORY Top Menu

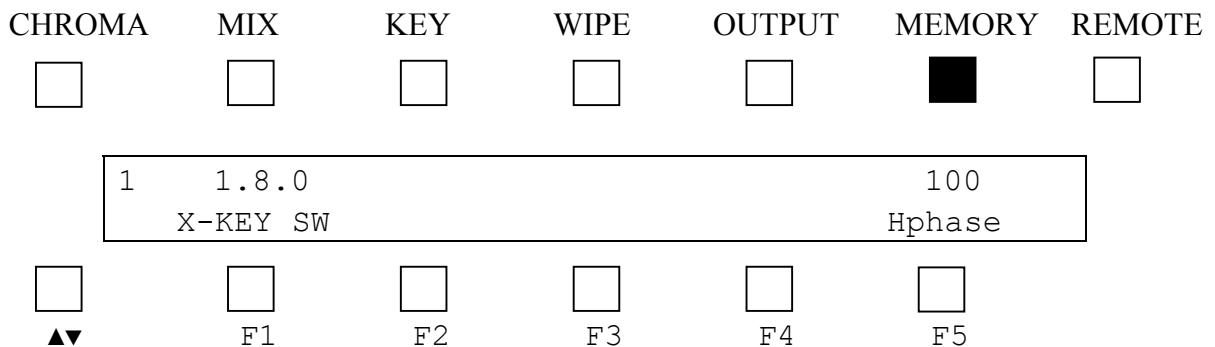
The MEMORY key allows storing and restoring of set-ups within the battery backed- up memory of the X-KEY module. Pressing F1 Store saves the current set up within the current memory location, and pressing F2 Recall restores from the current memory location. Knob 1 is used to increment and decrement the 10 memory location pointer. If there is more than one X-KEY module controlled from the control panel the set-ups of each one must be saved separately. Select the module from the REMOTE button and then save its set-up.



MEMORY/Eng

Knob 1 adjusts the output relative to input analogue sync and hence the capture range of the inputs. The delay of the unit changes by about 54us from about 10us to 64us. The horizontal phase adjustment value is shown in multiples of 100ns from the reference sync. A value of 200 corresponds to a delay from the reference of 20.0us.

The software version number of the X-Key currently being controlled by the remote control panel is show by F1.



REMOTE Top Menu

REMOTE allows the selection of 1 of up to 10 X-KEY modules for control. The REMOTE button itself is used to toggle the selection from 1 to 5 and 6 to 10. Pressing F1 to F5 selects modules 1 to 5. By pressing REMOTE again and then pressing F1 to F5 allows modules 6 to 10 to be selected.

CHROMA MIX KEY WIPE OUTPUT MEMORY REMOTE

1	Select Remote Menu				
	1	2	3	4	5

▲▼ F1 F2 F3 F4 F5

CHROMA MIX KEY WIPE OUTPUT MEMORY REMOTE

1	Select Remote Menu				
	6	7	8	9	10

▲▼ F1 F2 F3 F4 F5