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ultimatte – 9

OPERATING MANUAL

Revised March 1, 2000

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ultimatte **CORP.**
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SAFETY AND HANDLING PRECAUTIONS

1. CAUTION: Earth connection is essential before connecting power supply.

ATTENTION: Une raccordement à la terre est indispensable avant le raccordement au réseau.

2. CAUTION: There are no customer serviceable parts within this unit. Refer servicing to qualified personnel only.

ATTENTION: Cet appareil ne contiens pas des pieces qui peuvent être reparés le client. À ne pas ouvrir que par un technicien qualifié.

3. CAUTION: Disconnect power before opening the chassis.

ATTENTION: Coupez le courant avant d'ouvrir le châssis.

4. CAUTION: Grounding circuit continuity is vital for the safe operation of this equipment. Never operate this equipment with the grounding conductor disconnected.

ATTENTION: Un circuit de terre continu est essentiel en vue du fonctionnement sécuritaire de l'appareil. Ne metre jamais d'appareil en marche lorsque le conducteur de mise à la terre est débranché.

5. CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

ATTENTION: IL y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type Ou d'un type équivalent recommandé par le constructeur. Mettre au rebut les batteries usagées Conformément aux instructions du fabricant.

WARNING: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Changes or modifications not expressly approved by Ultimatte Corporation could void the user's authority to operate the equipment.

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I. INTRODUCTION

The Ultimatte-9 is a "digital video image" compositing device that produces realistic composites of two images. Its inputs and outputs comply with CCIR-601 and SMPTE-259M-C Serial Component Digital standard. Ultimatte-9 can be interfaced with any video system that can provide or accept 8 or 10 bit 4:2:2:4 serial digital video, such as video cameras, video recorders, telecine, video switchers, paint and graphic systems, etc. Ultimatte-9 is a real time digital device, which differs from all other keyers in the degree of realism it can achieve in a composite under various non-ideal conditions.

There are a number of factors that can affect the realism of a composite image. Some of them depend on the sophistication of the compositing device and others are determined by production techniques including art direction and lighting. The following section describes some of the factors that affect the natural and realistic look of a composite.

The Ultimatte-9 Main Unit needs to be connected to a Smart Remote via the RS-422 port in order to be functional.

Note: Operating the Ultimatte-9 Main Unit with an Ultimatte GUI interface (future)

1. Natural Edges and AdvantEdge

The appearance of the outer edges of the foreground (FG) subject in the composite image is perhaps the primary factor affecting the believability of the composite. Nothing will undermine the illusion faster than colored fringing, dark lines or loss of detail on the edge of the foreground. A cut-and-paste look may be desirable in certain styles of graphics, but it cannot be accepted in a composite, that is intended to be a realistic image intercut with conventional images.

A large segment of this manual is devoted to explaining the controls and techniques used to preserve the natural appearance of the FG subject. The Matte Density, Green Density, Red Density, Black Gloss, BG Level Balance, Clean Up Level, Clean Up Balance and Clean Up Threshold controls can all affect the appearance of the edges of the FG subjects. Edges can also be affected by two other important factors: lighting and edge enhancement.

If there is no side lighting on the FG subject, the edges can appear inappropriately dark in the composite image. It is important to remember that bounce light from the backing (screen) that is falling on the edges of the FG subject will be suppressed by the Flare Suppression circuitry in the Ultimatte-9. To the eye, the edges of the FG subject may appear to be illuminated because of the bounce from the backing, but this light is contaminating the colors of the FG subject, and will be removed by the Flare Suppression circuitry. A certain amount of side lighting is always recommended.

Detail edges generated in the video camera will be treated as part of the FG subject. If the background (BG) scene is such that a detail edge around the FG will seem inappropriate, steps must be taken to minimize or eliminate the detail edge. Depending on the camera, there are a variety of ways to reduce or eliminate such a detail edge. The choice of the color used for the backing can also affect the detail edges in the FG. These arguments are also true for images shot on film, then transferred to video through telecine.

Detail Generators in cameras, chromatic lens aberration etc. can create distracting edge effects. Using traditional methods tend to soften or feather the edges reduce fine detail, hair detail, motion blur and shadows. A new Ultimatte-9 process called AdvantEdge produces a flawless edge without the detail loss associated with typical choking and softening techniques.

2. Perspective, Background Defocus

Matching the perspective of the FG with BG is another critical factor in creating a realistic composite image. The best way to achieve this is through pre-production art direction and by thoroughly

documenting and then matching each camera set up. Perspective is primarily a function of lens focal length, camera height, camera tilt angle and camera-to-subject distance.

One of the new features introduced in the Ultimatte-9 is Background defocus. Normally as the FG camera zooms in, the background should realistically and gradually go into a “soft” focus. When using pre-rendered backgrounds, as the FG camera zooms in on the subject the background remains in focus presenting an unrealistic composite image. With the Ultimatte-9, a gradual background defocus occurs as the camera zooms in towards the subject and as it zooms out the background gradually returns to focus.

With the Ultimatte-9, not only can the start and end points of defocus be specified but also the rate at which defocus changes. There may be certain areas of the background that do not require defocusing. Masking of the defocusing area can be done through the matte in signal.

3. Lighting and Ambiance

Matching the lighting of the FG and BG is equally important in creating a realistic composite image. Even the most technically perfect blend of two images will look unreal if the lighting on the FG is totally at odds with the lighting in the BG scene. The FG subject should be lit to match the look of the BG scene, but without compromising the quality of the matte. FG Level, FG Black, and FG Contrast controls in the Ultimatte-9 can help in blending the two images.

Another new feature added to the Ultimatte-9 is Ambiance. In the real world the colors of the background will have some effect on the foreground. For example, if a person were to stand in front of a blue background a certain amount of this background light would be "splashed" on the person creating a bluish tint. When using pre-rendered backgrounds, this effect cannot be achieved using previously available compositing techniques. The Ambiance feature in the Ultimatte-9 automatically analyzes the foreground and the background to create a real image that "matches" the foreground with the background. In other words, when this feature is enabled the foreground will automatically adjust to any background changes.

4. Colorimetry

A mismatch in colorimetry between the FG and BG can also undermine the realism of a composite image. White balancing the camera or the telecine, for example, is an important step in shooting or transferring a FG because of the effect it can have on the matte signal generation. The FG should not be further colorized or painted with the camera or other color correction systems prior to compositing, as these adjustments influence the integrity of the backing color and backing-to-subject transition edges. The FG color controls of the Ultimatte-9 should be used instead. These controls do not interfere with the matte generation process. With these FG color controls, it is possible to match the colorimetry of FG elements to BG elements in the composite, even though these elements were shot under different conditions.

5. Image Stability

The relative stability of FG and BG images in a composite is also an important factor in achieving a seamless blend of the two. Generally, image stability is a consideration when one or both elements are originally photographed on film and transferred on a telecine. It is possible to create steady images on a telecine transfer either by using a pin-registered gate in the telecine, or by using some form of electronic registration.

Many forms of repeatable pan-tilt heads do not have the accuracy necessary to prevent any movement discrepancies between FG and BG. Even if the start and stop positions are identical, slight differences in the rate can cause the FG to appear to be sliding relative to the BG, and the illusion of the composite will be destroyed.

6. FG/BG Interaction

In addition to the planning and care required to produce a technically good composite, imagination plays a role in creating an image that encourages the viewer to believe it is real. Having the FG subject appear to interact with the BG scene in some way will increase the believability of the composite.

Allowing the FG subject cast a shadow on to the BG is one form of apparent interaction. A set piece in the FG that matches the background color can be used to cast a shadow conforming to an object in the BG. A combination of real props and set pieces in the FG can be magical, even to an experienced eye.

Letting the reflection of the FG object appear on a surface in the BG scene is another form of apparent interaction that can convince a viewer that the image is real. Unlike other systems, an Ultimatte-9 will composite a reflection just like any other FG object. It is only necessary to add a reflective surface to the backing. Glossy paint or Plexiglas can be used to create reflections that will appear to be on marble floors, shiny metal objects or windows in the final composite.

Finally, the External Matte input on the Ultimatte-9 provides a powerful tool for creating apparent interaction with the BG, especially if the BG is a computer generated environment or a piece of art. An External Matte signal conforming to the shape of an object in the BG will override the internally generated matte signal and force that object to obscure the FG. The External Matte signal can be turned ON and OFF allowing the FG subject to appear to go both in front of and behind an object in the BG.

II. ULTIMATTE-9 MAIN UNIT CHARACTERISTICS

1. Overall Dimensions

17”(43.18cm) W x 21”(53.34cm) D x 1.75"(4.45cm) H.

2. Physical Installation

The Ultimatte-9 Main Unit comes equipped with slides for mounting in a 19” rack. Do not attempt to mount the unit without the slides. The mounting ears cannot support the weight of the unit. The Ultimatte-9 requires one unit of rack space 53.34cm (21”) deep. It is equipped with redundant dual fans in the rear and the ventilation is from front to rear. There is no need to leave space above or below the unit in the rack. Ensure that there is no blockage of airflow prior to applying power.

NOTE: When installing equipment into a rack, distribute the units evenly. Otherwise, hazardous conditions may be created by an uneven weight distribution.

The Ultimatte-9 Main Unit is equipped with an internal temperature sensor. The status menu on the Smart Remote panel will display the real-time internal temperature of the Main Unit. A warning will be displayed on the Smart Remote panel if the temperature exceeds 50 degrees Celsius to inform the user that the unit has exceeded recommended operating temperatures. The Ultimatte-9 Main Unit will perform a low power sleep mode if temperatures exceed 52 degrees Celsius. The only way to reset the Ultimatte-9 Main Unit is to cycle the power. Check to see if there is a blockage of airflow or whether the fans are operating properly.

3. Power Requirements

Input 100-240 VAC, 50/60 Hz 45mA.

NOTE: Connect the unit only to a properly rated supply circuit.

The Blue LEDs in the front of the Ultimatte-9 Main Unit indicate that power is on. The Ultimatte-9 Main Unit is equipped with a dual output Universal Switching Power Supply rated at 3.3vdc @ 10A and 5vdc @ 10A. No voltage adjustments are required. The power switch of the Main Unit is part of an integrated AC receptacle and line filter unit mounted on the Rear Panel. Overload protection is provided by fuses (2) rated at 250 VAC @ 4A (slow blow).

To minimize the risk of shock, always use a grounded (earth) power cord.

It is recommended that the AC cord be disconnected from the unit when the unit is being serviced

4. Video Interface

All input and output video signals of the Ultimatte-9 are 8 / 10 bit serial digital component (single link), using 75 ohm BNC connectors in accordance with CCIR-601 and SMPTE-259M-C specifications.

These include:

- Eight (8) video inputs, any one of which can be software configured for Foreground, Background, Matte inputs and Reference In, providing significant versatility.
- Two Active Loop Outputs through which any two inputs can be selected and routed.
- The two outputs assigned to FG+BG provide identical digital composite images, one of which could be used as a preview source.
- Matte output.

The outputs are in 4:2:2:4 format though all internal processing is done in 4:4:4:4 format. Scan line rate (525 / 625) selection is automatic, and there are no adjustments for H and V blanking. Ancillary data present in the H and V Blanking interval of the Reference signal is passed to the output, while the information present in the H and V Blanking interval of BG and External Matte signals are blanked.

5. Communications

Communication between the Main Unit and the Smart Remote is through an RS-422 interface at a data rate of 115 Kbps. A standard DB9 male-male RS-422 cable is needed, with a maximum length not exceeding 1 Km (pins 3,8 and 7,2 are used). A maximum of four (4) Ultimatte-9 Main Units can be connected to one Smart Remote.

The Smart Remote is software configured to be the Master with up to four (4) Ultimatte-9 Main Units as slaves. Only the Master can initiate a message exchange. The Ultimatte-9 Main Unit is shipped with a factory default ID of number 1. When more than one unit needs to be connected, each should be assigned a different number. Each Main Unit will respond only when it is addressed. The ID number is selected through the rotary switch (the selected number should be aligned to the 9 o'clock position).

NOTE: It is necessary to re-cycle power for ID settings to take effect.

An RS-422 loop connector on the back of the Ultimatte-9 permits "daisy chaining" to the next unit. It is important to terminate the last unit in the chain by setting switches 7 and 8 to the ON (down) position on the main board. The front panel will need to be removed to access these switches. See Figure 1.

An RS-232/RS422 port is also available (DB9 female connector), which allows the Ultimatte-9 to be connected to a computer. This port can be used to access all of the controls on the Ultimatte-9 Main Unit through the computer and to upload software updates. See Figure 2.

6. Configuration

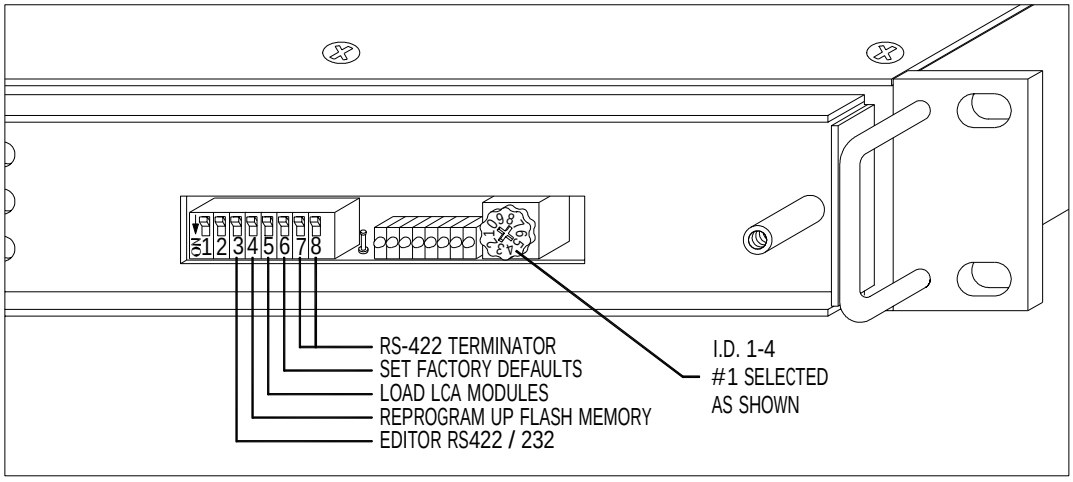


Figure 1: Configuration Settings

NAME	SWITCHES	POSITION	FUNCTION
RS-422 Terminator	7-8	Up	Disconnects termination network to the RS-422 receive lines
		Down (Normal/Default)	Connects termination network to the RS-422 receive lines
Set Factory Defaults	6	Up (Normal/Default)	On power up sets the Ultimatte-9 to operate with the last Automatic Backup file
		Down	On power up sets the Ultimatte-9 to operate with factory defaults
Load LCA modules	5	Down (Normal/Default)	Initialize LCA files (Factory use only)
Reprogram P Flash	4	Up (Normal/Default)	Normal Operation
		Down	Reprogram P Flash Memory
Editor RS422 / RS232	3	Up (Normal/Default)	RS-232 mode
		Down	RS-422 mode

Table 1: Dip Switch Settings

Note: When connecting multiple Ultimatte-9 Main Units to one Smart Remote, ensure that the last Main Unit at the end of the chain has the only connected terminator.

7. Status Display LEDs

There are 7 green LEDs and one red LED that provide status information.

- On power up all LEDs blink on and then off followed by being turned on one at a time starting with G1 and shifted left through G7 and R
- On the successful completion of internal diagnostics the following information is displayed on the LEDs as shown in the table below where:
- '1' indicates the led ON condition.
- '0' indicates the led OFF condition.
- 'T' indicates the led is toggling.

R	G7	G6	G5	G4	G3	G2	G1	COMMENTS
1	0	0	0	0	0	0	1	Boot Mode
T	0	0	0	0	0	0	1	Blinks when Unit ID select does not match ID (1-4)
0	0	0	0	0	0	1	0	Programming Flash
0	0	0	0	0	0	1	1	Programming LCA
0 /1**	0	0	0	0	1	0	1	Loading LCA number 1 : IOFT
0 /1**	0	0	0	0	1	1	0	Loading LCA number 2 : UIC
0 /1**	0	0	0	0	1	1	1	Loading LCA number 3 : COLORIZER
0 /1**	0	0	0	1	0	0	0	Loading LCA number 4 : AMBIANCE
0 /1**	0	0	0	1	0	0	1	Loading LCA number 5 : DEFOCUS
0 /1**	0	0	0	1	0	1	0	Loading LCA number 6 : ADVANTEDGE
0	0	1	0	0	0	0	0	Processing a command as a result of a serial transfer from the Smart Remote
0	0	0	1	0	0	0	0	Processing a command as a result of a serial transfer from the Editor port
0	T	0	0	0	0	0	0	Blinks every 4 seconds = Reference Video present Blinks every 6 seconds = No Reference video present

Table 2: LED Status

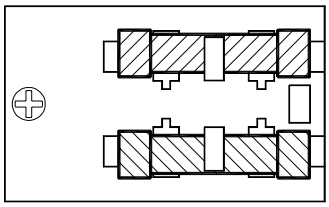
** An "ON" condition indicates a failure in loading the LCA.

8. Fuse Replacement

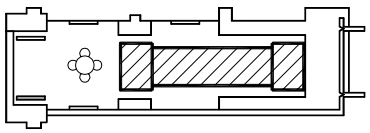
Two (2) 5mm X 20mm fuses must be installed on both the Main Unit and Smart Remote. Fuses are positioned as shown below.

FUSE POSITIONING

REMOTE



MAIN UNIT



Second fuse on opposite side.

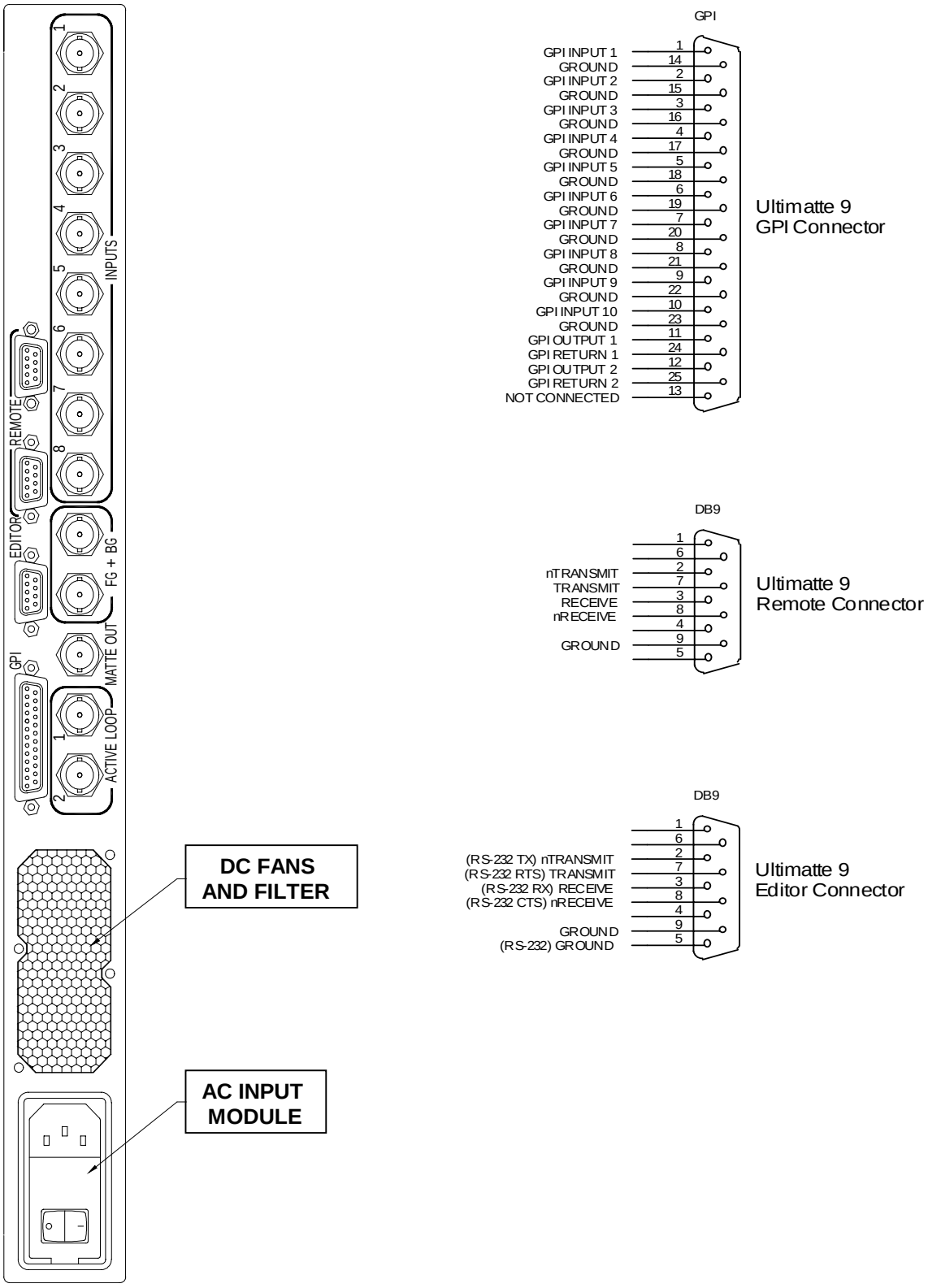


Figure 2: Ultimatte-9 Rear Panel and Connector Pin Out

III. SMART REMOTE CHARACTERISTICS

1. Overall Dimensions

17”(43.18cm) W x 7”(17.78cm) H x 1.75"(4.45cm) D.

2. Physical Installation

The Smart Remote can be used as a desktop unit with brackets or mounted in a 19" rack or cutout. Cutout dimensions are 17" (43.18cm) W x 7” (17.78cm) D. Brackets for both configurations are supplied with the unit. Remove two screws from each side of the unit and mount the appropriate brackets with those screws.

Since no fans exist for the Smart Remote, there are no special provisions required for airflow. The maximum recommended operating temperatures should not exceed 50 degrees Celsius. Relocate the Smart Remote if this maximum operating temperature is reached.

NOTE: When installing equipment into a rack, distribute the units evenly. Otherwise, hazardous conditions may be created by an uneven weight distribution.

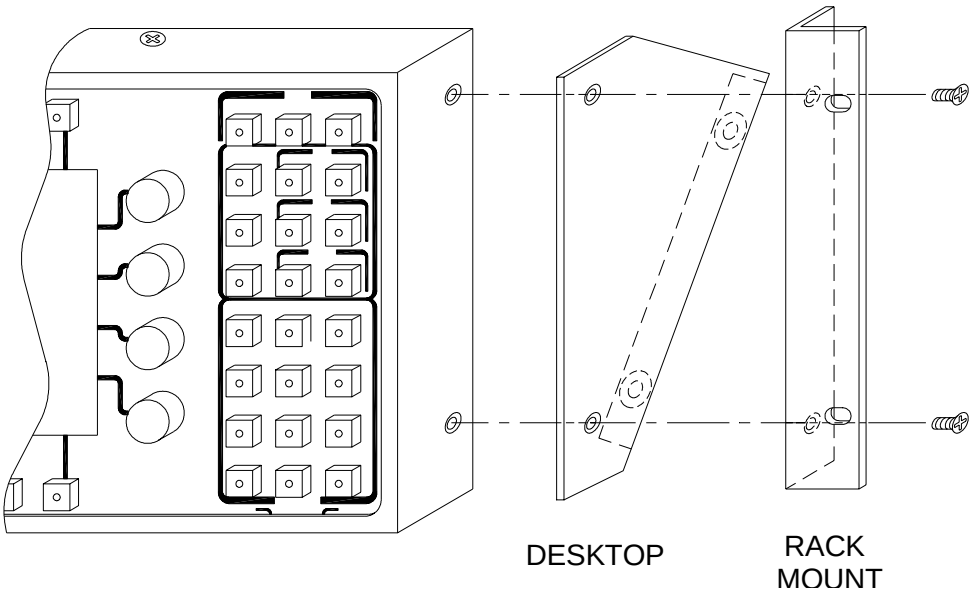


Figure 3: Mounting Options

3. Power Requirements

Input 100-240 VAC, 50/60 Hz 15mA.

The Smart Remote is equipped with a triple output Universal Switching Power Supply rated at 5vdc @ 4A, +12dc @ 2A, -12vdc @ 0.2A. The last output is not used. No voltage adjustments are required. The power switch of the Main Unit is part of an integrated AC receptacle. A separate line filter unit is mounted internally. Overload protection is provided by fuses (2) rated at 250 VAC @ 500mA (slow blow).

NOTE: Connect the unit only to a properly rated supply circuit.

To minimize the risk of shock, always use a grounded (earth) power cord.

It is recommended that the AC cord be disconnected from the unit when the unit is being serviced

4. Communications

Communications between the Main Unit and the Smart Remote is through an RS-422 interface at a data rate of 115 Kbps. A standard DB9 male-male RS-422 cable is needed, with a maximum length not exceeding 1 Km (pins 3,8 and 7,2 are used). A maximum of four (4) Ultimatte-9 and/or Ultimatte-400 Main Units can be connected to one Smart Remote.

The Smart Remote is software configured to be the Master with up to four (4) Ultimatte-9/ Ultimatte-400 Main Unit combinations as slaves. Only the Master can initiate a message exchange.

An RS-232 port is also available (DB9 female connector), which allows the Smart Remote to be connected to a computer. When connected to a computer, this port is used for upgrading the unit's operating software and saving and recalling setup parameters.

Upgrades can be downloaded from an external computer directly into Flash memory through the RS-232 port.

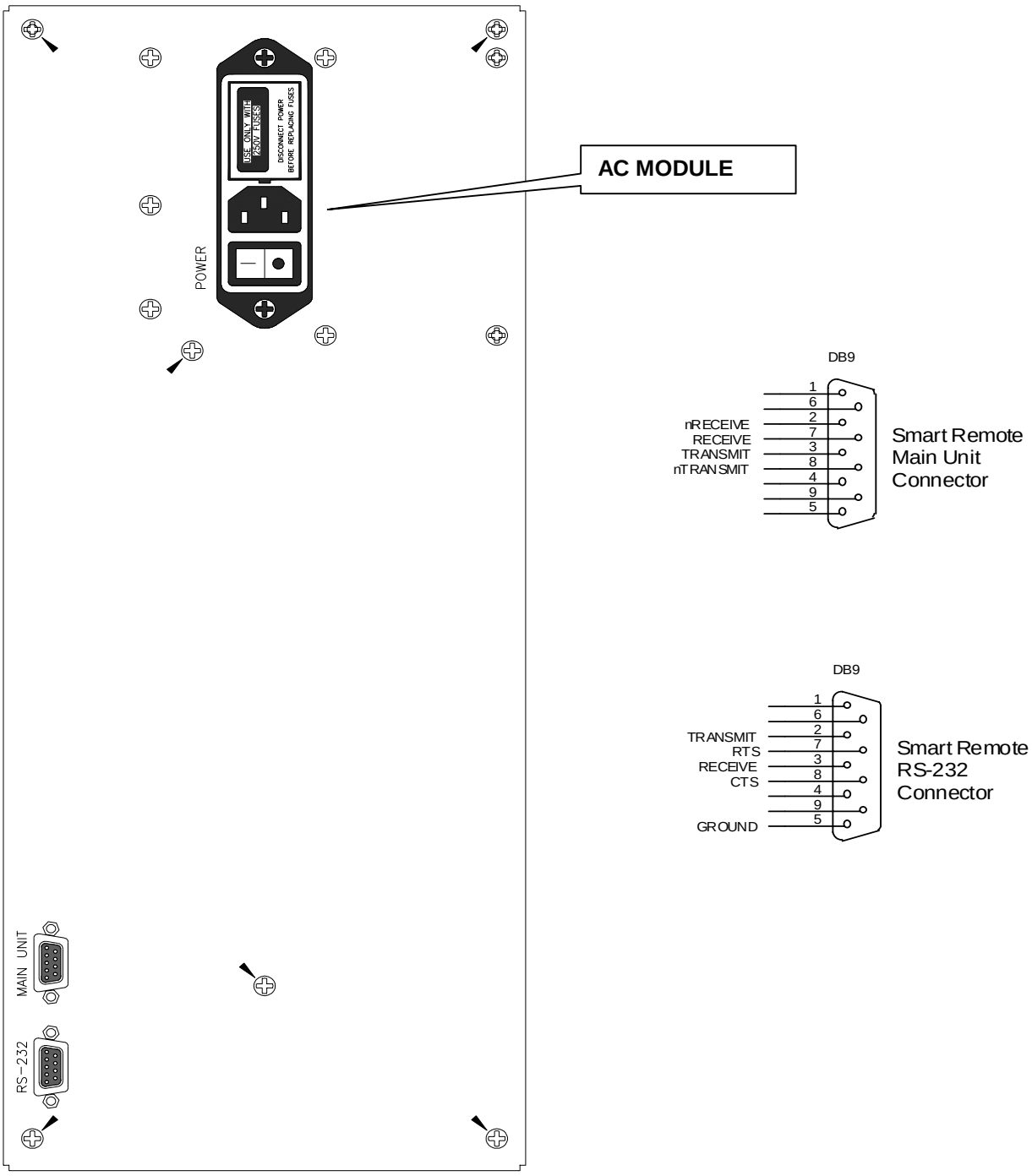


Figure 4: Smart Remote Rear Panel and Connector Pin Out

IV. SMART REMOTE HARDWARE OVERVIEW

The Ultimatte-9 System consists of a Main Unit, which is controlled by a Smart Remote. Fig. 5 shows the top view of the Smart Remote.

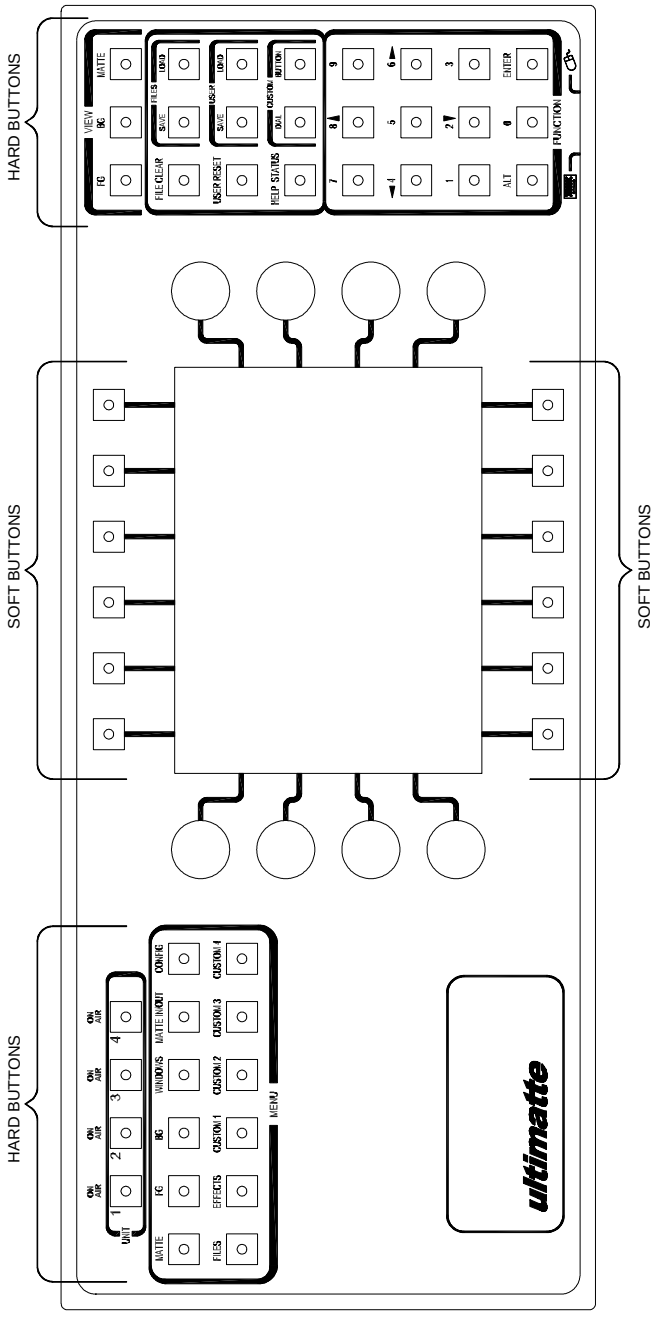


Figure 5: Smart Remote Front Panel

The Smart Remote includes

- A monochrome VGA (640 x 480) electroluminescent display panel
- Connectors for an IBM PS2 mouse and keyboard.
- Arrays of lighted push button switches with fixed functions are silk-screened on the panel template.

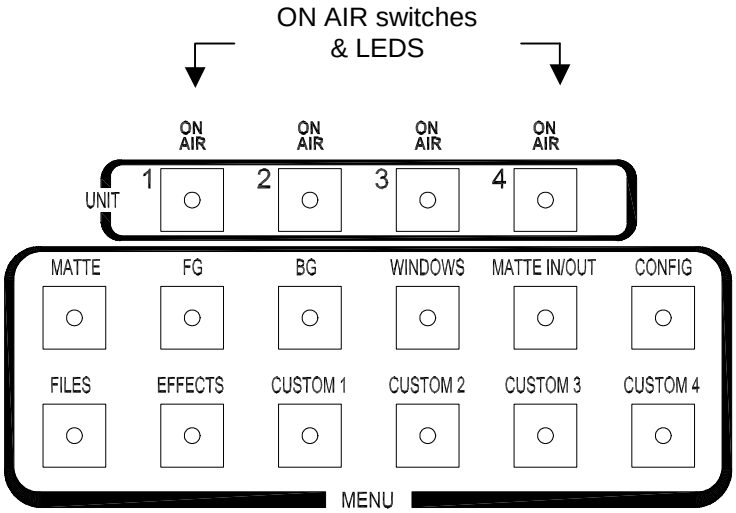
1. Hard and Soft Buttons

A "hard" button is defined as one with a fixed function as determined by the template. A "soft" button is defined as one with a function dependent on software implementation i.e., selection of sub-menus or functions indicated by a label on the display. If the label corresponding to a "soft" button is blank, then the corresponding button has no effect.

The functions of the Main Unit are selected and controlled through a series of menus. The "soft" buttons and knobs select or control different functions in each menu. The menu tree is designed to follow the logic of operation and certain functions that are used more often than others can be accessed through more than one menu.

2. Display

The Smart Remote has a 6.4" Electroluminescent flat panel VGA (640 x 480) pixel display using Planar Icebrite technology. The active viewing area, which is amber on a black background is 5.1"(129.3mm) x 3.8"(97mm) with a wide viewing angle of 160 degrees. There are no external adjustments to control brightness. This is achieved through the software by changing the scan rate. If there is no activity for a period more than 15 minutes, the Ultimatte logo is displayed and scrolls to prevent the possibility of "burning" the screen. *Avoid touching the screen to minimize possibility of scratching surface.*



3. Primary Menus

Figure 6: ON AIR and Main Menu Select Buttons.

The Smart Remote can access up to 4 Ultimatte-9/Ultimatte-400 Main Units (pushbutton switches are numbered 1-4) and is constantly polling to determine the units available. An available unit is indicated by the led(s) in the corresponding switch (es) turned on at a low intensity level. When the unit is selected the corresponding led is turned on at a higher intensity level.

Note that a failure to communicate with any of the Ultimatte-9 units will result in a "Failure to Communicate with unit xx." message on the display.

The menu selection is done by selecting one of the Menu pushbuttons to the left of the display. Anytime one of these buttons is pressed, the appropriate menu will be displayed. Figure 5 shows the general

layout of the display and the locations of auxiliary menus, controls, status (or error message), and functions.
The following are the main menu names, selected by the switches shown above in figure 6.
Please refer to the appropriate sections for a more detailed description and view of each menu.

- Matte
- FG
- BG
- Windows
- Matte IN/Out
- Configuration
- Files
- Effects
- Custom1
- Custom2
- Custom3
- Custom4

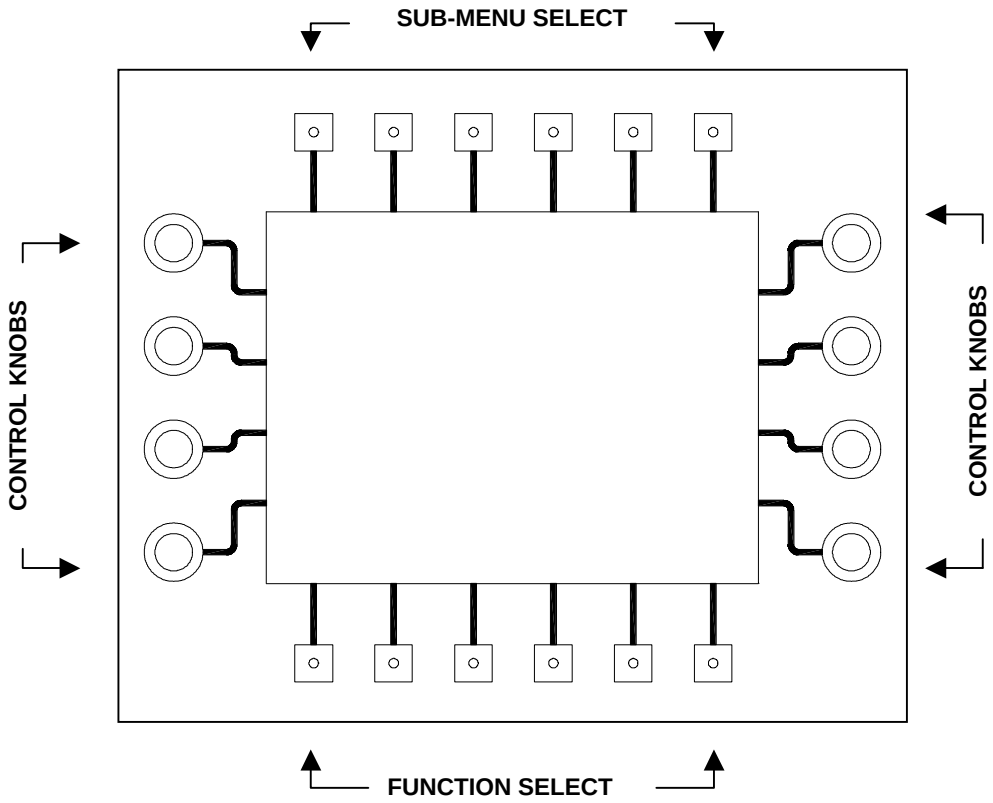


Figure 7: Sub-Menus, Function Selects and Controls

The menu tree is based on the logic of operation. When the leftmost button on a Sub-Menu is indicated as a Return function, then the previous menu will be displayed.

In addition to the labels for the knobs and buttons, each menu provides a graphic and numeric display of the status of each of the functions controlled by the knobs.

4. Switches

The labels on the display define the function of the "soft" switches, i.e. the six above and the six below the display is defined by the. The switches above usually select sub-menus indicated on the display. The switches below usually perform a function.

Some menus do not make use of all the soft buttons. If there is no text on the display directly above or below the button:
a) It performs no function in that menu.
b) It is performing the assigned function as displayed in the Sub-Menu status bar.

An LED in the button indicates whether it has been selected. A button may toggle a given function ON and OFF, or it may be turned off by the selection of another function.

5. Control Knobs

Eight control knobs, four mounted on each side or the display, provide digital increment / decrement data to the Main Unit. The value / status of each control is transmitted to the Main Unit through the RS-422 port. The corresponding response data from the Main Unit is displayed both graphically and numerically.

Once a control reaches the end of its range, continuing to turn the knob has no effect. When the default setting for a control is not at one end of its range, there is a "dead spot" in the control at the point corresponding to the default setting. When the control reaches its default setting, turning the knob further momentarily has no effect. This facilitates setting an individual function to its default value.

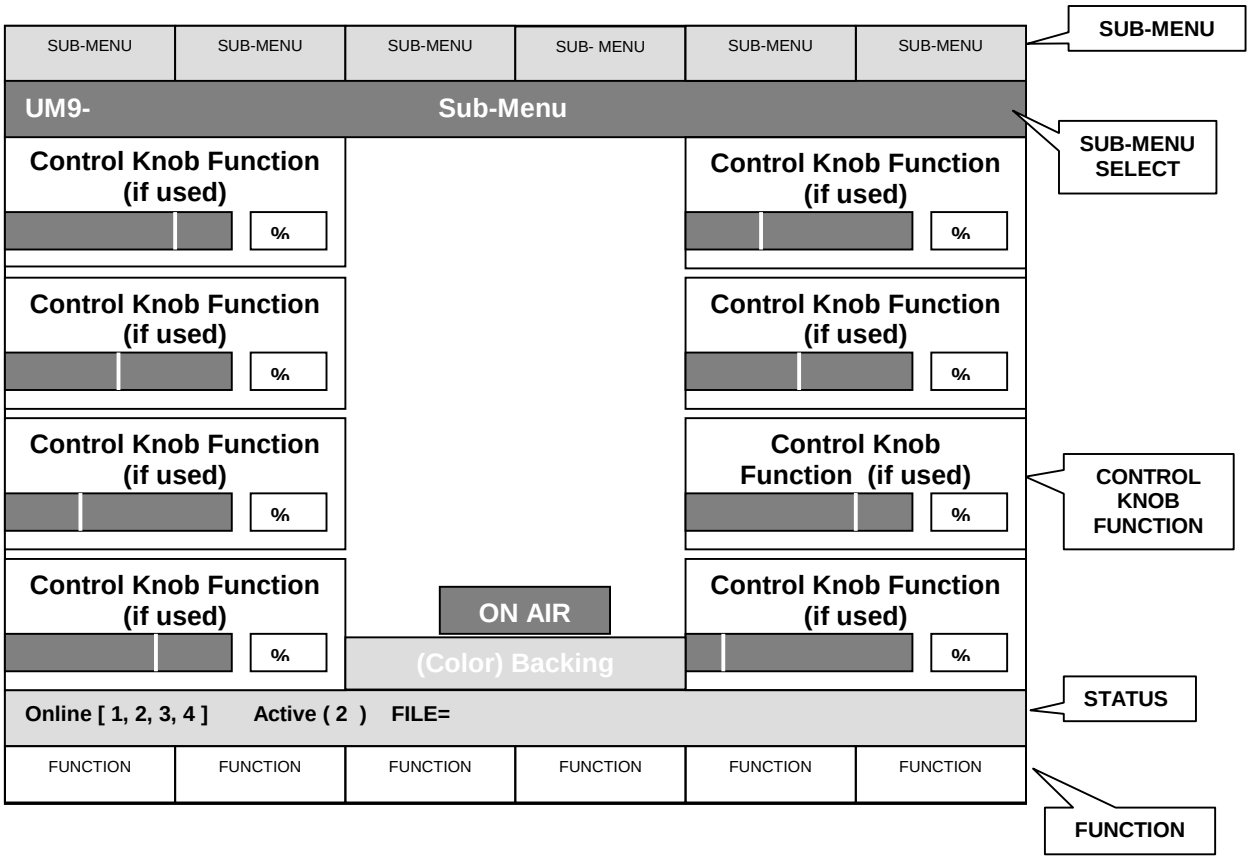


Figure 8: Main to Sub-Menu Selections

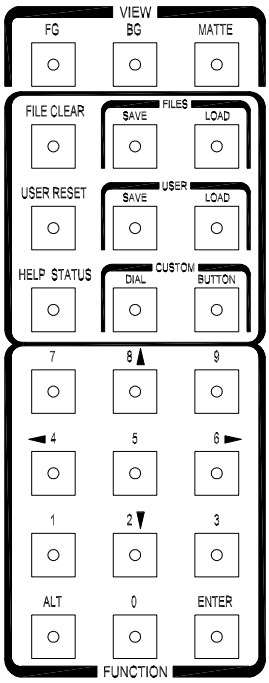


Figure 9: View, File and Function Menu Switches

6. View Menu

- FG: View unprocessed Foreground.
- BG: View unprocessed Background.
- Matte: View Matte (Key Signal)

7. Files Menu

ALL FILES IN ULTIMATTE-9 ARE SAVED IN NON-VOLATILE MEMORY

- Files: Save or Load a file
  Number of files: 90
  Number of Quick files: 5
  Number of Effects Files: 16.

- User: Save or Load a file
  Number of files: 20.

- Custom Create Custom Menus that could be saved with a User File.
  Number of Custom Menus: 4 per User File.

- File Clear: Restores all functions to factory defaults with the exception of the following:

  1. Backing Color select
  2. Input Selection
  3. Matte In polarity
  4. Matte Out polarity
  5. Input and output selection or matrix configuration

- User Reset: Sets all parameters to previously loaded files. If no user file had been loaded, factory default settings will be used.
- Help Status: Displays on-line help file.
  Press “ALT+HELP” to display Main Unit operational status.

The current workspace is automatically saved as a backup file every 15 minutes. It can be loaded at any time by pressing the Files – Load button.

8. Function Menu

- Keys 0 through 9
- ALT.
- ENTER
- ALT + ENTER recalls previous Menu

The operator can save five different control setups in order to make quick visual comparisons for selecting the optimum settings for a given scene. Saving any one of these settings is done through the File Menu by selecting one of the five Quick Save switches. Selecting one of the five Quick Load switches will recall any one of these settings.

At any time, the current settings of all the functions can be stored in memory as a file. It is recommended that settings be saved periodically to prevent possible loss in the event of power interruption or other problems. The internal memory in the Ultimatte-9 can hold a large number of files in non-volatile memory; see **7. Files Menu** on previous page. User default settings are also stored in this memory. Alternately, files from the Ultimatte-9 can be stored on a computer, and reloaded when needed.

9. System Timing

Any one of the input video signals Ultimatte-9 can be selected as the Reference input. If the reference source timing is changed, the output timing will change with it. There is no user adjustment for differences in input timing. The Ultimatte-9 has a capture range of $\pm 1/2$ line and a processing time delay of ONE frame, i.e. one frame delay from input to output, relative to the Reference Input.

10. Communications

The Smart Remote incorporates an RS-422 port and an RS-232 port, both having bit rates of 115.2 Kbps or 38.4 Kbps. The RS-422 port serves as an interface to the Main Unit and the RS-232 port interfaces with an external computer.

11. Keyboard and Mouse

The Smart Remote has two 6-pin DIN connectors to interface with a PS2 (serial) mouse and keyboard. Connect an optional mouse and keyboard to the proper ports, and then apply power to the Smart Remote. If the mouse fails to operate, press CTRL-C on the keyboard to initialize the keyboard/mouse interface.

*(Note: See the Ultimatte web site (**www.ultimatte.com**) for the latest documentation and software revisions).*

A keyboard can be used to complement the functions of the Smart Remote. One of the benefits to the keyboard is entering alphanumeric File and User names.

A mouse can also be used to control knob and button functions on the Smart Remote. Move the cursor over a control knob bar graph area, then click and drag the left mouse button. This has the same effect as turning a knob associated with a control. Dragging the mouse to the right will increment the control and dragging left will decrement the control. Pressing the right mouse click will graphically display the Primary Menus and View buttons. Move the cursor over a particular graphic button and pressing the left mouse button will activate that graphic button. If the graphic button is a Primary Menu, then the Smart Remote will immediately jump to that Menu.

V. ULTIMATTE-9 QUICK START

For the purposes of this quick start section, the assumption is being made that the basic connection consists of one main unit (Ultimatte-9) and one Smart Remote. A More detailed explanation for each control is given later in this manual.

The Ultimatte-9 contains a router that can accept up to 8 x CCIR 601 video inputs that can consist of any combination of foreground, background, matte-in, or reference signals. After connecting the unit, the following steps should be taken in order to produce an acceptable composited image.

Step 1: Configure the System

A) Press the MENUS "**CONFIG**" hard button on the left hand side of the remote panel to set your inputs, by:
   i) Rotating the upper left knob until the number displayed matches your foreground input
   ii) Rotating the 2nd left knob from the top until the number displayed matches your background input
   iii) Rotating the 3rd left knob from the top until the number displayed matches your matte-in input, if applicable
   iv) Rotating the bottom left knob until the number displayed matches your reference input. This can be its own source or one of your other selections, i.e.: FG, BG, or Matte In.
   v) Set any active loop-throughs using the knobs on the right side of the remote panel.
   vi) Press the "**ENTER**" hard button on the bottom right side of the remote panel

B) The default backing color is blue. If you are using a red or green backing, select it by pressing the corresponding soft button below the display panel.

C) Press the gray "**FILE CLEAR**" hard button on the right hand side of the remote panel.

Step 2: Sample the Backing Color

A) Press the MENUS "**MATTE**" hard button on the left hand side of the remote panel.

B) Press the "**AUTO SCREEN SELECT**" soft button below the display panel to sample the actual values of the backing color being used.

C) There are other methods of sampling your backing color; see 11, 12, and 13 in this section (Quick Start) and Section X elsewhere in the manual.

Step 3: Set the Matte Controls

(if necessary)

A) View the Matte by pressing the VIEW "**MATTE**" hard button in the upper right hand corner of the remote panel.

In the Matte view, the black areas represent opaque foreground subject matter, the white areas represent the backing area which will be replaced by the new background image, and the gray areas represent partially transparent or transition areas, such as shadows, fine hair detail, smoke, reflections, motion blur, and edges.

B) Press the MENUS "**MATTE**" hard button on the left side of the remote panel. Set the Matte controls to affect the black and gray areas of the matte using these guidelines:

i) **Matte Density:** Use this control to stop print-thru in bright foreground objects.
ii) *Warning: Advancing this control too far can cause hard, dark edges around foreground subjects.*

The following controls are used for finessing or fine-tuning. These adjustments are best seen while viewing the composited image or toggling back and forth between the matte view and the composite view by pressing/depressing the VIEW "**MATTE**" hard button on the right side of the remote panel:

iii) **Red Density:** (not available for red backing): Use this control to reduce dark edges from reddish objects (flesh-tones). *Warning: Reducing this control too much can cause print-thru in reddish foreground objects.*
iv) **Green Density:** (not available for green backing): Use this control to reduce dark edges from greenish objects (plants). *Warning: Reducing this control too much can cause print-thru in greenish foreground objects.*
v) **Blue Density:** (not available for blue backing): Use this control to reduce dark edges from bluish objects. (Blue jeans*) Warning: Reducing this control too much can cause print-thru in bluish foreground objects.*
vi) **Black Gloss:** Use this control to stop print-thru in black glossy or dark foreground objects. *Warning: Advancing this control too far can cause dark edges around the foreground subject and shadows will darken and become opaque.*

C) Set the Clean-Up controls to affect the white and gray areas of the matte using the following guidelines:

These matte controls are used to adjust the white and gray areas of the matte channel. This will dramatically affect the nature of foreground objects' edges, the opacity of transparent objects, and the noise in the background image. Use these controls sparingly, as they *WILL* result in the loss of foreground detail.

As above, these controls are also used for finessing or fine-tuning, and are best seen while viewing the composited image.

i. **Shadow Noise:** Use this control to reduce noise in shadows and glare areas*. Warning: Decreasing the control too much will reduce fine detail.*
ii. **BG Level Balance:** Use this control to override the automatic setting of the Background level as turned on by the matte, which is based on where the backing color was selected. Decreasing this control can enhance the appearance of fine foreground detail, but will darken the background image and increase "visual noise". Increasing this control can remove "visual noise" and brighten dark edges*. Warning: Advancing this control too far can cause foreground objects' edges to glow.*
iii. **Clean Up LEVEL:** Used to reduce imperfections or small amounts of noise in the backing*. Warning: Advancing this control too far will result in a "cut and paste" look. Background noise will be reduced, but foreground detail will also be reduced*.
iv. **Clean Up THRESHOLD:** Used only when the Clean Up LEVEL control has been adjusted. The Clean Up Threshold control sets the threshold level above which the Clean Up Level control is applied to the matte signal. In certain cases it can eliminate small screen imperfections without affecting the density of most shadows, and minimizes the effect of Clean Up Level on FG edges.

D) View the Composite by pressing the VIEW "**MATTE**" hard button in the upper right hand corner of the remote panel (disabling the Matte view).

Step 4: Set the Flare Controls
(if necessary)

A) Press the MENUS "**FG**" hard button on the left side of the remote panel.

B) Press the "**FLARE**" soft button in the area above the display panel.

The Ultimatte algorithms will automatically suppress flare caused from the backing onto foreground subject matter. The flare controls are used to suppress excessive spill using the following guidelines:

i) **Black Balance:** Use this control to remove excessive spill on dark foreground objects.
ii) **Gray Balance:** Use this control to remove excessive spill on midrange foreground objects
iii) **White Balance:** Use this control to remove excessive spill on bright foreground objects.
iv) **Gate 1/3**: ("Gate one three") Use this control to reproduce blues, greens, or cyans.

a) For blue screen: At 100%, blues will be reproduced. At 50%, blues will become cyan. At 0%, greens will be reproduced and blues/cyans will turn green.
b) For green screen: At 100%, greens will be reproduced. At 50%, greens will become cyan. At 0%, blues will be reproduced, greens will become grayish, and cyans will turn blue.

v) **Gate 2**: Use this control to reproduce the following colors:

a) For blue screen: used to reproduce pinks, purples, and magentas that will turn red when blue is subtracted. *Warning: Since skin tones are pinkish, advancing this control too far may add blue to the skin tones.*
b) For green screen: used to reproduce yellows and oranges that will turn red when green is subtracted. *Warning: Since skin tones are pinkish, advancing this control too far may add green to the skin tones.*

Step 5: Set the AdvantEdge Controls
(If necessary)

In order to increase the "sharpness" of an image, video cameras add artificial edge enhancements to the original picture. These edge enhancements to the foreground image can give the subject an unrealistic (harsh) appearance when composited with the background. AdvantEdge will smooth the "harsh" edges. This results in a more natural appearance in the composite without the loss of sharpness/detail or softening of the edges.

Warning: Adjusting this control too much will reduce fine detail.

A) Press the MENUS "**MATTE**" hard button on the left side of the remote panel.

B) Press the "**ADVANTEDGE**" soft button above the display panel.

C) Press the "**CORRECTION ENABLE**" soft button below the display panel.

D) Adjust the "**Overlay Width**" knob until you see the edges reduce.

Your basic composite has now been set. Toggle between the foreground and composite view by pressing/depressing the VIEW "**FG**" hard button in the upper right hand corner of the remote panel to check the integrity of your composite.

Most of the other adjustments that may be set at this time are to help create a more aesthetically pleasing composite by adding certain types of special effects, such as color balancing or matching, and background defocusing.

Step 6: Set the BG Defocus Controls
(if necessary)

A) Press the MENUS "**BG**" hard button on the left side of the remote panel.

B) Press the "**BG DEFOCUS**" soft button above the display panel.

C) Press the "**DEFOCUS ENABLE**" soft button below the display panel.

D) Position your talent and/or camera to the point where you would like the background defocusing to begin.

E) Verify that the "**BG Defocus**" knob is set to "0". Defocusing will begin when the foreground subject is this size in the frame.

F) Press the "**SET MIN**" soft button below the display panel.

G) Position your talent and/or camera to the point where you would like the greatest amount of defocusing to occur.

H) Adjust the "**BG Defocus**" knob to the greatest amount of defocus you would like to see.

I) Press the "**SET MAX**" soft button below the display panel.

J) Adjust the "**Defocus Transition Rate**" knob to set the abruptness/smoothness of the starting and stopping of defocus.

K) Press the "**DEFOCUS TRACKING**" soft button below the display panel to automatically track the amount of defocus based on the parameters previously set and proportional to the size of the foreground subject in the frame.

VI. UNDERSTANDING BASIC CONTROLS

To generate a composite image using the Ultimatte-9 requires some understanding of the way an Ultimatte-9 matte signal is generated and how it functions in compositing the FG and BG images. It is also important to have some understanding of FG processing methods, including Flare Suppression techniques.

1. Matte Density

The matte signal, in its most general form, is a function of the difference in level between the main backing color and the higher of the other two colors in the FG signal. With a blue backing, normally the green content is higher than the red. For illustration purposes, one can start by thinking of the matte signal in the backing area as the difference between blue and green. With an Ultimatte Blue backing, the separation between the blue and the green at peak intensity of the backing should be around 40 video units (viewed on an RGB waveform monitor).

The object of the circuits which create the matte signal from this difference signal is to generate a signal which will be 100 units at peak intensity of the backing where the BG is to be fully turned on, and 0 units wherever the FG is supposed to be completely opaque. In other words, the matte signal, when viewed on a picture monitor, will be a silhouette of the FG subject against a white field.

The most important step in generating the matte signal is controlling the density of the matte. The Matte Density setting determines what level of separation will correspond to the point at which the FG is opaque. The default setting for the Matte Density is such that a neutral area in the FG will be opaque, i.e. when both green and red are equal to blue.

The effect of the Matte Density control is easily seen by activating the Matte button in the View Menu to view the matte signal on a video monitor. As Matte Density is decreased, black areas of the matte corresponding to opaque FG objects will become gray in the matte signal. Increasing the Matte Density above its default setting causes pastel blue areas of the FG to become black in the matte signal.

Advancing the Matte Density control too far will cause dark edges on the FG subject in the composite image. Any edge on the FG subject is a transition area during which the image consists of a mix of FG subject and backing, and the composite image should consist of a mix of the FG subject and the BG scene.

The object in setting the Matte Density is to keep it as low as possible in order to prevent darkening of the edges. Keeping the Matte Density setting as low as possible is achieved by setting the control right at the threshold where the FG becomes opaque. In addition, there are three controls, which can help in setting the density of the matte properly: the Black Gloss control, the Green Density control, and the Red Density control (for blue backing).

2. Black Gloss

If there is a black glossy object in the FG that is reflecting color from the backing, the camera may see it as a dark area of the backing, and no amount of Matte Density adjustment will make it possible to distinguish it from the backing. The Black Gloss control introduces a negative offset to the main backing color channel in the matte generation circuitry so that the difference between this main channel and the other two channels will be zero, thus interpreting the object as an FG object.

3. Green Density / Red Density (for blue backing)

If the edges of some FG objects are green (G > B, R) while others are red (R > B, G), yet others are neutral in color (white, gray, R = G = B), it may be possible to improve the look of all edges in the composite with Green Density and Red Density controls. Reducing Green Density and Red Density settings improves the edges of green and red objects respectively, without compromising the edges of neutral colored objects, which are set by the Matte Density control.

4. Clean Up

If the backing contains imperfections such as smudges, seams, or unwanted shadows, the matte signal will interpret them as FG objects or shadows cast by FG objects, which should be reproduced in the composite image. One method of compensating for such defects is the Clean Up Level control.

Clean Up Level functions more or less like the gain control on a keyer, except that it is introduced at the output stage after processing of the FG image. The net effect of Clean Up Level is to push the matte signal into a clip, so that it forces ON the BG scene and turns OFF the FG scene in areas where there is only slight or very subtle FG detail. The problem with Clean Up Level, of course, is that there is no way to distinguish between imperfections in the backing and subtle detail on FG edges or transparent areas, including shadows.

The Clean Up Threshold control sets the threshold level above which the Clean Up Level control is applied to the matte signal. In certain cases it can eliminate small screen imperfections without affecting the density of most shadows, and minimizes the effect of Clean Up Level on FG edges.

5. Shadow Noise

Noise in the shadow areas of the backing is multiplied in the matte signal and can become noticeable in the composite image. The Shadow Noise control in the Ultimatte-9 is a manual override for an automated function that substitutes the quieter blue FG signal (for blue backing) for the matte signal, whenever the blue is lower than the matte signal.

The manual override on the Shadow Noise control can improve the noise reduction, while simultaneously increasing the density of shadows.

6. BG Level Balance

In an Ultimatte-9 composite, the level of the BG scene depends on the level of the matte signal. In areas occupied by opaque FG objects, the matte level is zero; therefore, no BG scene exists. In bright and unobstructed backing areas, the matte level is high; therefore, the BG scene exists at a high level. In the reference backing areas, the BG scene is at 100% of its original value (see Peak Detection section later in this chapter). If the backing is unevenly lit, there will be areas where the matte signal generated by the unobstructed backing is less than the peak level of the matte signal. In these areas, the BG scene will be darker.

If the backing material has a texture, the differences in the level caused by the texture can cause a slight variation in the matte signal. The result will appear to be fixed pattern noise in the BG scene.

If gain is applied to the matte signal, but clipped at the level corresponding to 100% BG level, the differences in the level in the BG scene can be ironed out. This is essentially what is accomplished by turning up the BG Level Balance control.

Because an Ultimatte-9 is processing the FG separately by subtraction, however, applying gain and clip to the matte signal used to multiply the BG signal may cause an anomaly. If the FG subject passes in front of an area where the matte signal is being pushed into clip by BG Level Balance control, its edges can appear to glow slightly. This is because the amount of BG being added to the FG is greater than the

amount of backing color that was subtracted from it. If only a minimal amount of gain is applied through the BG Level Balance control, this anomaly may not be noticeable, but it can be observed as the control is advanced too far.

7. Windows

A window is a means of masking off an area of the FG image so that the BG scene is forced ON in that area of the composite image. It is primarily used in situations where the backing is not large enough to fill the entire frame. As long as the backing surrounds the FG subject, a window can be used to insert the BG scene beyond the edges of the backing.

The Ultimatte-9 can use internally generated rectangular windows with variable edge softness, or an external signal connected to Matte In as an external window signal. An external window signal will force ON the BG wherever the window signal is white. The Matte In circuitry is fully linear, and will mix the BG with the processed FG whenever the external window signal is gray. The Matte In circuitry can invert the polarity of the incoming signal if it does not have the proper polarity (white wherever the BG needs to be forced ON). In addition, where the background scene is uneven such that a straight edge window cannot cover that portion of the background without obscuring the foreground object, the window could be skewed.

The internally generated windows in the Ultimatte-9 can be inverted so that they mask off an area within the frame rather than a border of the frame.

8. FG Processing

The processing of the FG in an Ultimatte consists of two phases: the subtraction of the backing color, and the suppression of flare or spill from the backing. It is important to notice that subtraction rather than multiplication processes the FG. It enables an Ultimatte to composite elements like transparent objects, soft edges, smoke, etc. without any loss of information or color fringing. The matte signal determines how much the backing color needs to be suppressed in the FG at any given point.

If the color components of the backing are not completely suppressed in the processing of the FG, the net effect will be "veiling" of the BG scene in the composite. The processed FG is simply summed with the modulated BG. If the areas corresponding to the backing are not completely black in the processed FG, the level or the color of the BG scene will be altered in those areas.

In order to suppress the color of the backing, it is necessary to determine the levels of R, G, and B which correspond to the unobstructed backing at its brightest. In Ultimatte-9, the Automatic Peak Detection will achieve this. As the FG is scanned, the values for the peak backing area are stored in memory and used to control the subtraction of the backing color from the FG in conjunction with the matte signal.

In Manual Peak Detection mode, the Ultimatte-9 operator can move a "cursor" on the screen either through the cursor Horizontal and Vertical controls on the Smart Remote or by positioning the mouse. This sampled pixel value is now used, when selected, as the peak backing value to control the subtraction of the backing color. Besides the position, the operator can also monitor the sampled backing R, G, B, and matte values on the Smart Remote EL screen.

9. BG Veil Levels

Veiling is the term used to describe the discoloration of the BG scene in a composite image caused by traces of the backing color in the processed FG. If the backing is a consistent color (R, G, B ratios track from bright to dark parts of the backing), the automated circuits of the Ultimatte-9 will remove all traces of the backing color in the processed FG. The Veil Controls menu provides a means for overriding this automated function in order to compensate for slight inconsistencies in the color of the backing.

In the Ultimatte-9, the Veil controls are overrides of the automated suppression of the backing color. Since the Automatic Peak Detection circuit sets the backing subtraction parameters for the purest and brightest backing area, any variation in the purity of the backing color can cause veiling in the composite. It may be possible to correct for this by using the Veil controls to override the automated functions. However, if the FG subject passes in front of the purest areas of the backing, the edges of this subject will darken. This is because more information is being subtracted from those edges than is necessary.

10. Flare Suppression

The suppression of flare or spill from the backing onto the FG subject is achieved by a set of algorithms which analyze the colorimetry of the FG subject and set limits for the main backing color level as a function of the levels of the other two colors. This kind of dynamic flare suppression is one of the most distinctive features of an Ultimatte compositing process. Since matting requires a bright and highly pure color for the backing, this intense color can cause discoloration of the FG subject in several ways. Flare in the lens or internal camera optics may give the FG subject a colorcast. Bounce light or spill from the backing will also discolor the edges of the FG subject. Flare suppression may affect the reproduction of certain colors in the FG image, but has no effect on the generation of the matte signal.

In the flare suppression process, the level of one or both of the other two colors limits the main backing color level. This limiting factor is variable to allow a certain amount of adjustment to the flare suppression. The Ultimatte-9 has three controls that affect the overall flare suppression: White Balance, Gray Balance, and Black Balance. Each of these three controls mainly influence certain parts of the FG Image, as indicated by the control names.

As mentioned earlier, flare suppression may alter certain FG colors. In most cases, it is this alteration in color that makes the FG to appear as if it was placed in front of a neutral (black) backing and not a colored one. It is this alteration in FG color that makes the composite more realistic, free of any influence from the backing color. In some cases, however, alteration of FG colors may not be acceptable. Rather than completely disabling flare suppression, which will bring back all flare and spill from the backing, Ultimatte-9's Flare Suppression algorithms allow selective and controlled disabling of the flare limiting factor. This selective and controlled reduction of flare suppression allows these few "problematic" colors to be reproduced; with addition of some flare on certain colors, yet maintaining full suppression on the rest. Because of the selective nature of these flare controls they are called Color Gates. The Ultimatte-9 has three Color Gates: a combined GATE 1 / 3 (GATE 1 OR GATE 3), and GATE 2. For a detailed description of these Color Gates on certain colors when used with Blue, Green or Red backing, see Tables 3, 4, and 5.

11. Screen Color Selection

In order to suppress the color of the backing, it is necessary to determine the levels of R, G, and B, which correspond to the unobstructed backing. Additionally, it is necessary to set the level of matte signal in this area in order to obtain 100% BG level. In the Ultimatte-9, this task is accomplished by scanning and analyzing the FG image is scanned and analyzed. Then based on the determined values, the backing color is properly subtracted and the BG image is added with the correct level. The Ultimatte-9 has two ways of performing Screen Color Selection, automatic and manual.

12. Automatic Screen Color Selection

Automatic Screen Color Selection is the default method of scanning, analyzing, and determining reference backing color levels. In this method, the matte signal is analyzed to detect the highest level, which will correspond to the brightest and purest area of the backing. Sporadic pixels of high brightness and purity are excluded, as they might not be an accurate representation of the backing color. An average of the sampled values is stored in memory as reference backing color. These reference values are used to suppress the backing color from the FG and to add the BG at 100% level in those corresponding areas. When an adjustment is made to a control that affects the generation of the matte signal or the suppression of the backing color, the Ultimatte-9 uses the stored reference values to restore proper processing of the FG image and the level of the BG image.

Automatic Screen Color Selection is quick, and the operator does not have to take additional steps to perform sampling of the backing. Automatic Screen Color Selection is most useful when the backing is uniform in color purity and evenly lit, and the averaged backing value is virtually constant everywhere in the frame. If the backing is not evenly lit for example, and has its brightest spot at the top of the frame away from the FG subject, the Automatic Screen Color Selection will select this area as reference backing, and will set the BG level at 100%, while the area around the FG subject will have a lower BG level. This will require additional adjustment of the BG Level Balance control to compensate for the BG Level Difference.

The Automatic Screen Color Selection will acquire new peak data when the following functions are performed or selected: Main Unit Power Up, System Reset, Backing Color Select, File Clear, and User Reset.

13. Manual Screen Color Selection

Manual Screen Color Selection allows the operator to select a pixel in the backing whose RGB values are displayed on the Smart Remote and can be stored as the new reference values by the operator. The operator has full control on the H and V positions of the sample pixel either through the Smart Remote or the optional mouse. Selecting Screen Color does not reset the controls to their default values, FG suppression, and BG turn on based on the new sampled values. When there is the need to reset all controls to their default values (factory or user default), the Ultimatte-9 will calculate all parameters based on Auto Peak Detection. The operator can then select to perform Manual Screen Color Selection, FG suppression, and BG turn on values based on the new sampled values.

When using Manual Screen Color Selection, the operator can select a pixel close to critical FG objects such as fine hair, smoke, transparent objects, etc. to sample the reference backing values. This sets FG suppression adjustments very accurately in those critical areas, thus obtaining excellent composites. The Smart Remote display will show averaged and weighted R, G, B values of the backing as well as the corresponding matte signal level. These displayed values are percentage rather than actual values, where 100 represents 100% white.

With an unevenly lit backing, the operator can position the cursor next to the FG subject and select reference values close to fine detail areas of the FG, thus ignoring the brightest backing area at the top of the frame. There is no need to adjust the BG Level Balance control to correct BG level variations, as BG level is set at 100% in the sampled area.

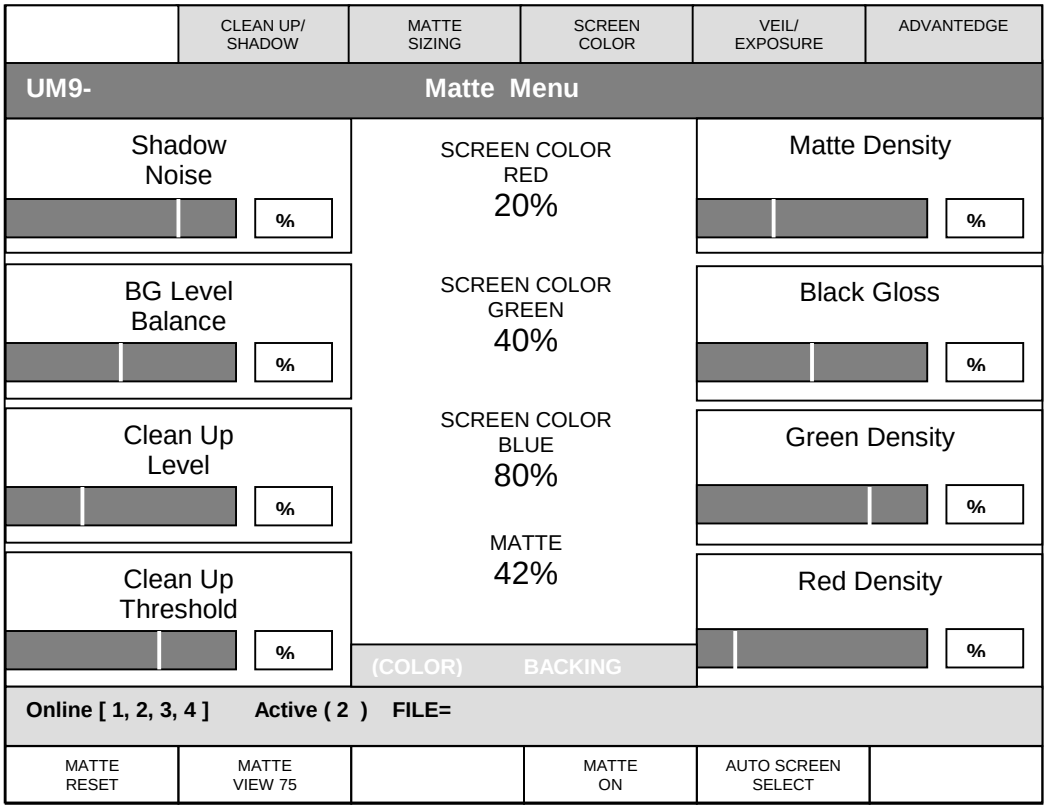


Figure 10: Matte Menu

VII. MATTE MENU

1. Matte Density

This control must always be set in order to achieve the best possible composite image. This control sets the opacity of the FG subject. Its default setting is one in which neutral colored (white, gray) FG objects will be opaque, but any color which is a shade of the backing color will be at least partially transparent. Increasing the level of the Matte Density will permit FG objects that are the same shade as the backing color to be made opaque in the composite image.

To adjust the Matte Density, select "Matte " in the *View Menu* so that the matte signal can be viewed on the output picture monitor. The FG subject will appear as a black silhouette on a white field. Lower the Matte Density control until some portion of the FG subject that should be opaque in the final composite starts to become gray in the matte signal. Increase the Matte Density until any area, which should be opaque, has just become black in the matte signal.

Use this control to stop print-through in bright foreground objects.
Warning: Advancing this control too far can cause hard, dark edges around foreground subjects.

2. Black Gloss

The Black Gloss control is (mainly) used when the FG subject contains blacks or dark colored glossy surfaces, which reflect enough of the backing color to become transparent in the composite image.

Select Matte Set and adjust the Black Gloss control while viewing the matte signal on the picture monitor. Increase the level of the Black Gloss control only enough to make the black glossy area of the FG subject appear solid black in the matte signal.

Using the Black Gloss control may permit the Matte Density control to be set to a lower level. Readjust Matte Density control after you adjust Black Gloss control to insure that both controls are set as low as possible, without permitting print-through in the FG subject.

Warning: Advancing this control too far can cause hard, dark edges around foreground subjects.

3. Green Density: (Blue Backing)

This control is a "fine tuning" control for the density of *green colored FG objects* (G > B, R) in the generation of the matte signal. It can help eliminate dark edges on green objects without affecting the edges of neutral colored objects (white, gray).

The Green Density control may be interactive with the Matte Density control, depending on the colors of FG objects. In some cases, readjusting this control might be necessary.

Warning: Reducing this control too much can cause print-through in green foreground objects.

4. Red Density: (Blue Backing)

This control is a "fine tuning" control for the density of red colored FG objects (R > B, G) in the generation of the matte signal. It can help eliminate dark edges on red objects without affecting the edges of neutral colored objects (white, gray).

The Red Density control may be interactive with the Matte Density control, depending on the colors of the FG objects. In some cases readjusting the Matte Density control might be necessary**.**

Warning: Reducing this control too much can cause print-through in reddish foreground objects

NOTE:

For Green backing the last two controls become:

7. Blue Density
8. Red Density

For Red Backing the last two controls become:

7. Green Density
8. Blue Density

5. Shadow Noise

The Shadow Noise control is a manual override for an automated circuit, which reduces noise in the matte signal that processes both FG and BG images. This noise is particularly noticeable in the shadow areas of the matte signal.

Turning the Shadow Noise control to below the default setting of 75% can improve the noise reduction while simultaneously increasing the density of the shadows cast by FG objects. In most situations, the Shadow Noise control is left at its default setting. In addition to noise reduction, the Shadow Noise control can minimize the effect of glare on the floor, in situations where the backing is extended to cover the floor.

Use this control to reduce noise in shadows and glare areas.

6. BG Level Balance

Use this control to override the automatic setting of the Background level as turned on by the matte, based on where the backing color was selected. Decreasing this control can enhance the appearance of fine foreground detail but will darken the background image and increase "visual noise". Increasing the control can remove "visual noise" and brighten dark edges.

Setting the BG Level Balance slightly below normal can, in certain instances, enhance the reproduction of extremely fine edge detail in the FG subject. Setting it slightly above normal can sometimes be used to eliminate noise in the BG area caused by imperfections in the backing. It provides, in certain cases, an alternative to the Clean Up control.

Warning: Advancing this control too far can cause foreground object edges to glow.

7. Clean Up Level

The Clean Up Level can be used to remove evidence of imperfections in the backing such as scuffmarks, seams, or unwanted shadows. The Clean Up Level solves these problems at the expense of fine detail on the edges of the FG subject. Use Clean Up Level sparingly as it can produce a hard-edged, cutout look to the composite image. The Clean Up Level can also be used to reduce noise in the BG area of the matte signal, in addition to the residual noise left in the backing area of the processed FG image. Clean Up Level could be, in some cases, an alternative to increasing the BG Level Balance control setting. Either adjustment involves a compromise in the overall look of the image.

The problem with Clean Up Level is that there is no way to distinguish between imperfections in the backing and subtle detail on FG edges or transparent areas, including shadows. Final adjustments of this control should be made while viewing the composited image.

8. Clean Up Threshold

The Clean Up Threshold control is used in conjunction with the Clean Up Level control. It sets a reference level in the matte signal, above which the Clean Up Level control will be effective, but below this threshold the matte signal will not be affected. In certain cases it can eliminate small screen imperfections e.g. scuff marks and noise from the composite image, with no effect on shadows and edge detail that exists below this threshold level. When the Clean Up Threshold control is set to 0%, Clean Up Level is applied to the entire matte signal.

9. Matte Reset

Activating the Matte Reset button restores all matte-setting controls (Matte Density, Black Gloss, Red Density, Green Density, Blue Density and Shadow Noise) to their default settings. These default settings could be factory set or user set values. See sec. XLVI for details of setting and using User Files.

Matte Reset does not sample the backing for new reference color values; it uses the current values to recalculate backing color suppression and BG 'turn on' parameters. In addition, its activation has no influence on the rest of the controls, which might have been set by the operator to values other than their default settings.

10. Matte View 75/100

Changes the backing area of the signal from 75% white (default) to 100% white

11. Matte On/Off

Toggles the matte generation and flare suppression circuits ON and OFF.

12. Auto Screen Select

Auto Screen Select is the default method of scanning, analyzing, and determining reference backing color levels. In this method, the matte signal is analyzed to detect the highest level, which will correspond to the brightest and purest area of the backing.

The Auto Screen Select will acquire new reference data when this function is enabled, on the Main Unit Power Up, System Reset, Backing Color Select, File Clear, and User Reset.

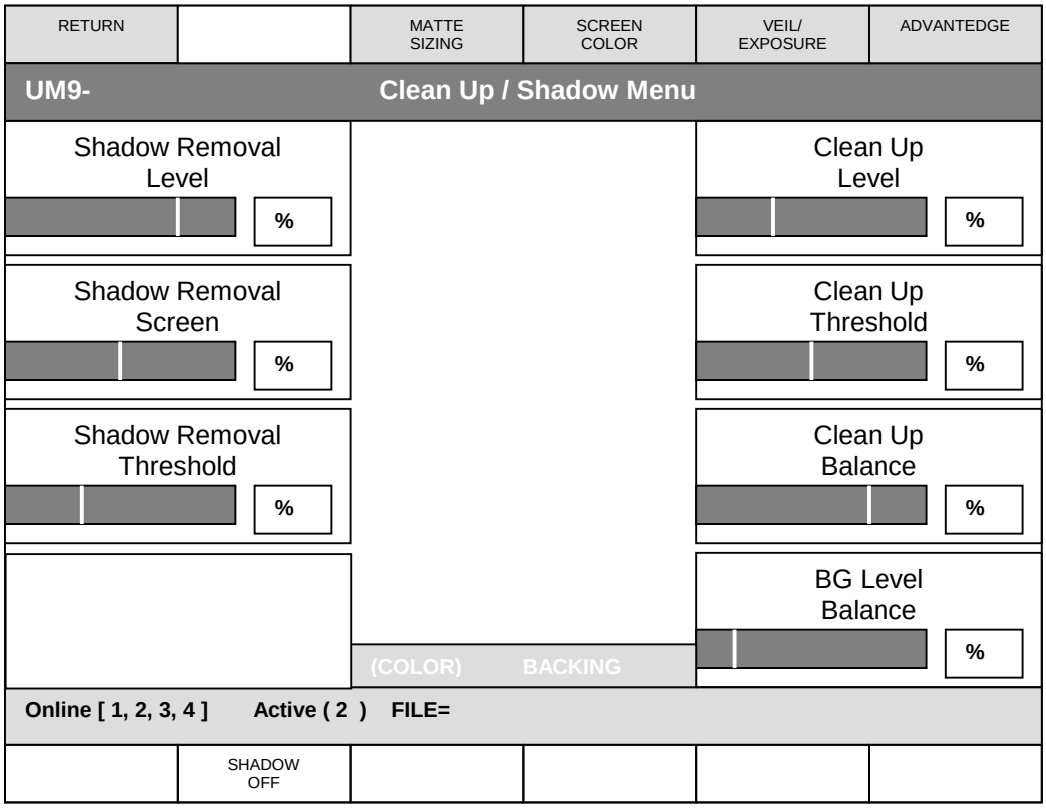


Figure 11: Clean Up / Shadow Menu

VIII. CLEAN UP / SHADOW MENU

1. Shadow Removal Level

The Shadow Removal function is a more “selective” clean up that adjusts the density of the shadow portion of the matte with minimum influence on the fine detail portions of the foreground subject. The Shadow Removal LEVEL control, when enabled by Shadow On / Off button, adjusts the shadow density as defined by Shadow Removal SCREEN and Shadow Removal THRESHOLD controls. At its default setting of 50%, the Shadow Removal LEVEL maintains the original shadow density. At 0% setting, shadows are totally eliminated from the matte. At 100% setting, the density of the shadow is doubled (darker shadows).

The Shadow Removal function works best with bright foreground colors. As foreground subject colors get very dark, the distinction between shadow and subject becomes less apparent, and the Shadow Removal Level starts to influence fine foreground detail.

2. Shadow Removal Screen

The Shadow Removal SCREEN control allows the user to separate foreground objects from the screen area, including shadows. If the screen, particularly the floor area, is relatively clean with minimal amount of glare, the separation of the foreground objects from the screen area is quite accurate. With the Shadow Removal SCREEN control the operator can maintain fine details of foreground objects and separate them from their shadows on the screen. When the amount of glare from the floor increases, it becomes difficult to distinguish and separate those areas from fine details of foreground objects of similar color.

The Shadow Removal SCREEN control is adjusted while viewing the composited image. Usually it is best to adjust The Shadow Removal THRESHOLD control first, followed by the Shadow Removal SCREEN control.

3. Shadow Removal Threshold

The Shadow Removal THRESHOLD control allows the user to separate shadow areas from non-shadow screen areas. Evenly lit screens allow best separation of shadows. As lighting unevenness increases, only shadows that are darker than the darkest area of the screen can be separated.

The Shadow Removal THRESHOLD control is best adjusted while viewing the matte. At its default setting, the Shadow Removal THRESHOLD control considers the entire matte signal range to be shadow. As the control is turned higher, only matte values below the threshold are considered shadows.

4. Clean Up Level

The Clean Up Level can be used to remove evidence of imperfections in the backing such as scuffmarks, seams, or unwanted shadows. The Clean Up Level solves these problems at the expense of fine detail on the edges of the FG subject. Use Clean Up Level sparingly as it can produce a hard-edged, cutout look to the composite image. Clean Up Level can also be used to reduce noise in the BG area of the matte signal, in addition to the residue noise left in the backing area of the processed FG image. Clean Up Level could be, in some cases, an alternative to increasing the BG Level Balance control setting. Either adjustment involves a compromise in the overall look of the image.

The problem with Clean Up Level is that there is no way to distinguish between imperfections in the backing and subtle detail on FG edges or transparent areas, including shadows.

The final adjustments of this control should be made while viewing the composited image. The detrimental effect that the Clean Up Level has on the edges of FG subjects cannot be properly evaluated except by viewing the composite.

5. Clean Up Threshold

The Clean Up Threshold control is used in conjunction with the Clean Up Level control. It sets a reference level in the matte signal, above which the Clean Up Level control will be effective, but below this threshold the matte signal will not be affected. In certain cases it can eliminate small screen imperfections e.g. scuff marks and noise from the composite image, with no effect on shadows and edge detail that exists below this threshold level.

When the Clean Up Threshold control is set to 0%, Clean Up Level is applied to the entire matte signal.

6. Clean Up Balance

This control shoud be used only when the Clean Up control has been adjusted. It determines how much influence the Clean Up control will have on the foreground and background images. View both the matte and the composite when adjusting this control. If, using the Clean Up control caused glowing on dark edges, Clean Up Balance *control can be used to reduce the problem.*

The Clean Up Balance control is a fine-tuning adjustment of the Clean Up Level control. It normally does not need to be used, but it might help optimize the look of the edges of the FG subject after Clean Up Level has been advanced. It has no effect when Clean Up Level control is off (at minimum setting). The Clean Up Balance control applies less clean up on FG or BG depending on the direction the knob is turned.

Adjust the Clean Up Balance control while viewing the composite image on a video monitor. Take it off its default setting only if it appears to restore some of the softness or fine detail to edges on the FG subject.

7. BG Level Balance

Use this control to override the automatic setting of the Background level as turned on by the matte, based upon where the backing color was selected. Decreasing this control can enhance the appearance of the forefround detail, but will darken the background image and increase "visual noise". Increasing the control can remove "visual noise" and brighten dark edges.

Warning: *Advancing this control too far can cause foreground object edges to glow*.

8. Matte Reset

Activating the Matte Reset button restores all matte-setting controls (Matte Density, Black Gloss, Red Density, Green Density, Blue Density and Shadow Noise) to their default settings. These default settings could be factory set or user set values. See sec. XLVI for details of setting and using User Files.

Matte Reset does not sample the backing for new reference color values; it uses the current values to recalculate backing color suppression and BG 'turn on' parameters. In addition, its activation has no influence on the rest of the controls, which might have been set by the operator to values other than their default settings.

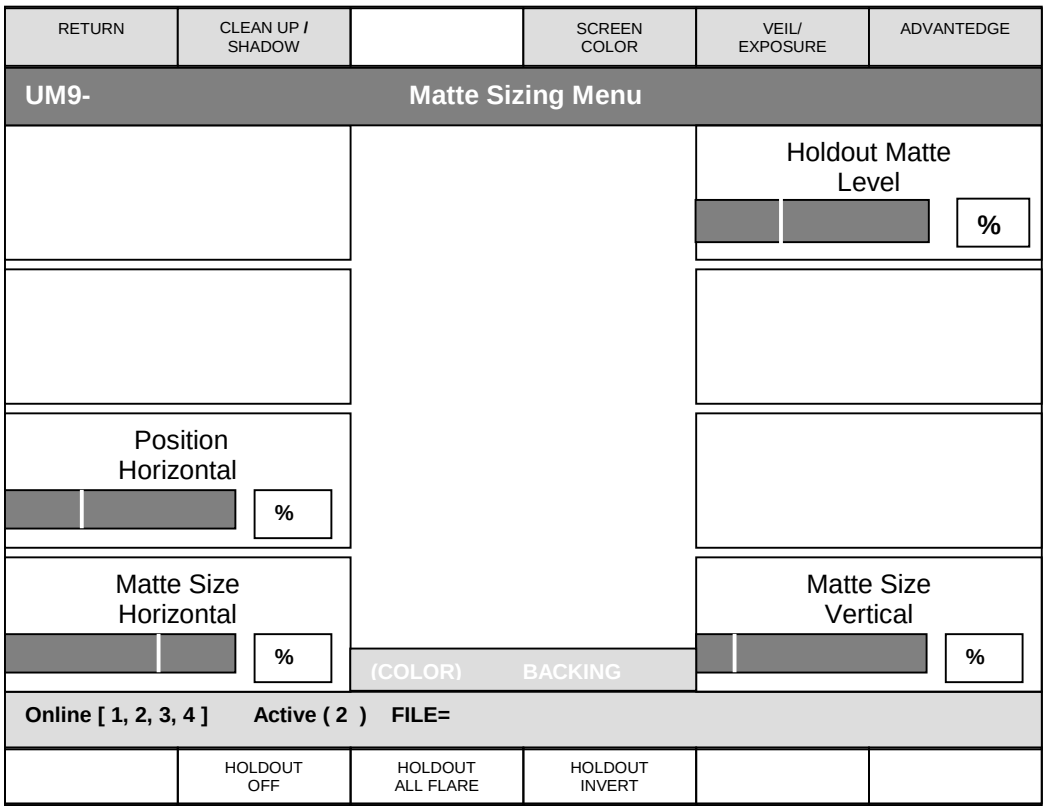


Figure 12: Matte Sizing Menu

IX. MATTE SIZING MENU

An alternate method to 'AdvantEdge' for removing undesired edges from the foreground subject caused by:

- Detail edges (caused by camera)
- Lens Aberrations.

Used mainly to decrease the size of the matte. In most cases using AdvantEdge will yield better results.

1. Position Horizontal

Placement of the matte signal horizontally. Adjusts the position (timing) of the Matte signal with respect to the FG in subpixel increments up to 3 pixels.

2. Matte Size Horizontal

Adjusts the size of the matte in the horizontal direction in subpixel increments up to 3 pixels.

3. Matte Size Vertical

Adjusts the size of the matte in the vertical direction in subpixel increments up to one line.

Warning: Loss of detail on subject.

4. Holdout Matte LEVEL

When Holdout feature is enabled, the Matte In signal is used as a holdout matte to prevent portions of the foreground scene to be processed by the internally generated matte and / or by the flare functions. The Holdout Matte LEVEL control sets a threshold level, and Matte In signal levels higher than this threshold will be used as a holdout matte.

5. Holdout Off/On

This button enables and disables the Holdout Matte feature.

6. Holdout All Flare

(Holdout Flare – No Flare)

When a holdout matte is used to stop the compositing process in portions of the foreground scene, flare (spill) removal from the foreground becomes somewhat more complicated. In some situations, removing flare from the entire scene would result in a more convincing look. In other situations removing the flare from composited areas only will look best, yet in a third situations no flare suppression would be the best choice.

The Holdout Flare button selects one of the three possible flare suppression choices. At default, flare is removed from the entire foreground scene. In the second button selection, the flare is removed from areas excluded by the holdout matte, and in the third button selection, flare is not suppressed from the foreground scene.

7. Holdout Invert

When enabled, this button inverts the polarity of the Matte In signal ONLY for the Holdout Matte function. HOLDOUT INVERT button does not alter the polarity of the Matte In signal as a “Garbage Matte” function.

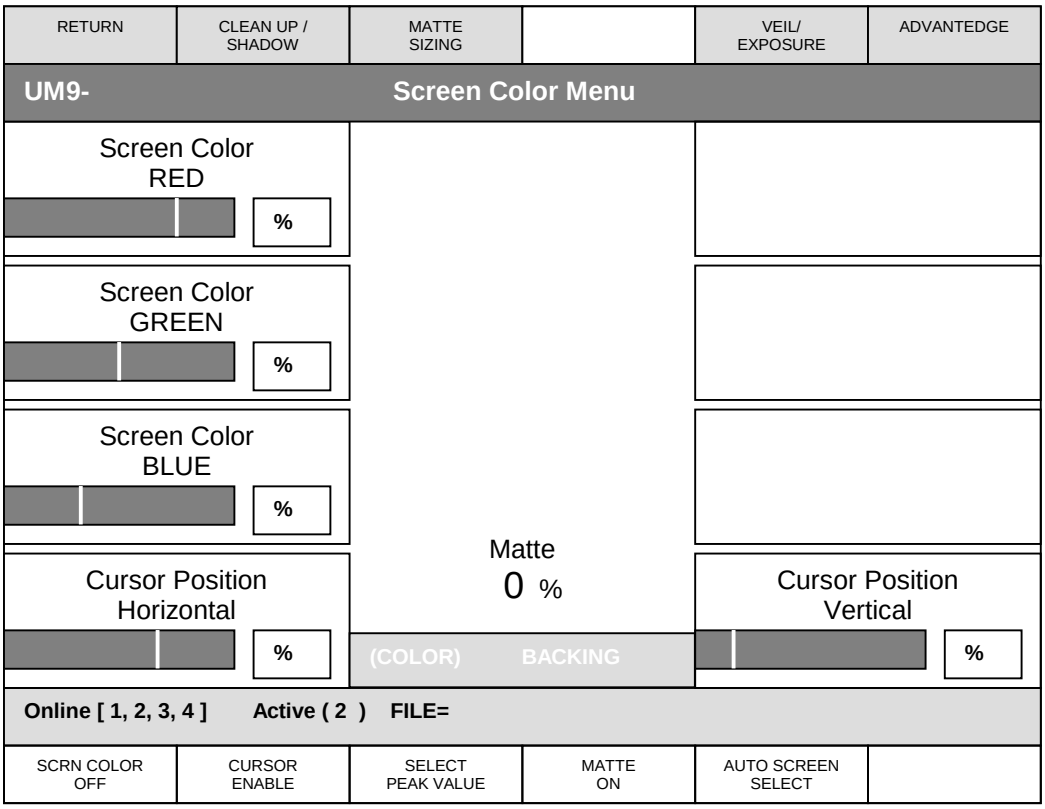


Figure 13: Screen Color Menu

X. SCREEN COLOR MENU

In most situations, automatic or manual sampling of the backing color will provide accurate reference screen color information needed in calculating various parameters. There are situations however, where automatically or manually sampled values will not be accurate enough. An example of this is a situation where the backing is visible through a glass window, which has reflections of people or objects on it. If the screen color is sampled through the glass either automatically or manually, there is a good chance that those reflections will be lost or diminished. Ideally, the glass should be removed from the window, the backing color sampled, then the glass reinstalled. Of course this is probably not a practical or possible solution. Estimating the color of the screen behind the glass is an alternate way.

Sample the backing through the glass, manually or automatically. The three Screen Color display bars will indicate the R G B values of the sampled screen color.

- Press the Screen Color Enable button (LED turns on) to activate the Screen Color control knobs.
- Adjust the Screen Color controls to obtain the best reflections on the glass.
- Press Select Peak Value to save these screen values as reference.
- Deactivate the Screen Color control by pressing the Screen Color Enable button again (LED turns off).

1. Screen Color Red

Displays the Red component of the pixel at the cursor location on the screen when Cursor Enable is on. When Screen Color is enabled, this control alters the value of the RED component of the

sampled backing color. When Select Peak Value is selected the new value will be used as the RED reference value.

2. Screen Color Green

Displays the Green component of the pixel at the cursor location on the screen when Cursor Enable is on. When Screen Color is enabled, this control alters the value of the GREEN component of the sampled backing color. When Select Peak Value is selected, the new value will be used as the GREEN reference value.

3. Screen Color Blue

Displays the Blue component of the pixel at the cursor location on the screen when Cursor Enable is on. When Screen Color is enabled, this control alters the value of the BLUE component of the sampled backing color. When Select Peak Value is selected, the new value will be used as the BLUE reference value.

4. Cursor Position Horizontal

This control moves the cursor in the horizontal direction in the frame. A mouse can also control the cursor if the optional keyboard and mouse are installed.

5. Cursor Position Vertical

This control moves the cursor in the vertical direction in the frame. A mouse can also control the cursor if the optional keyboard and mouse are installed.

6. Screen Color Enable

This switch is disabled for normal sampling and enabled when sampled Screen Color is manually altered by using Screen Color Red, Screen Color Green, Screen Color Blue controls.

7. Cursor Enable

When this switch is enabled, a cross-hair cursor is displayed on the video monitor indicating the current cursor horizontal and vertical position.

8. Select Peak Value

Writes the manually selected Screen Color R, G, B values and cursor position into memory.

9. Auto Screen Select

Auto Screen Select is the default method of scanning, analyzing, and determining reference backing color levels. In this method, the matte signal is analyzed to detect the highest level that will correspond to the brightest and purest area of the backing.

The Auto Screen Select will acquire new reference data when this function is enabled, on the Main Unit Power Up, System Reset, Backing Color Select, File Clear, and User Reset.

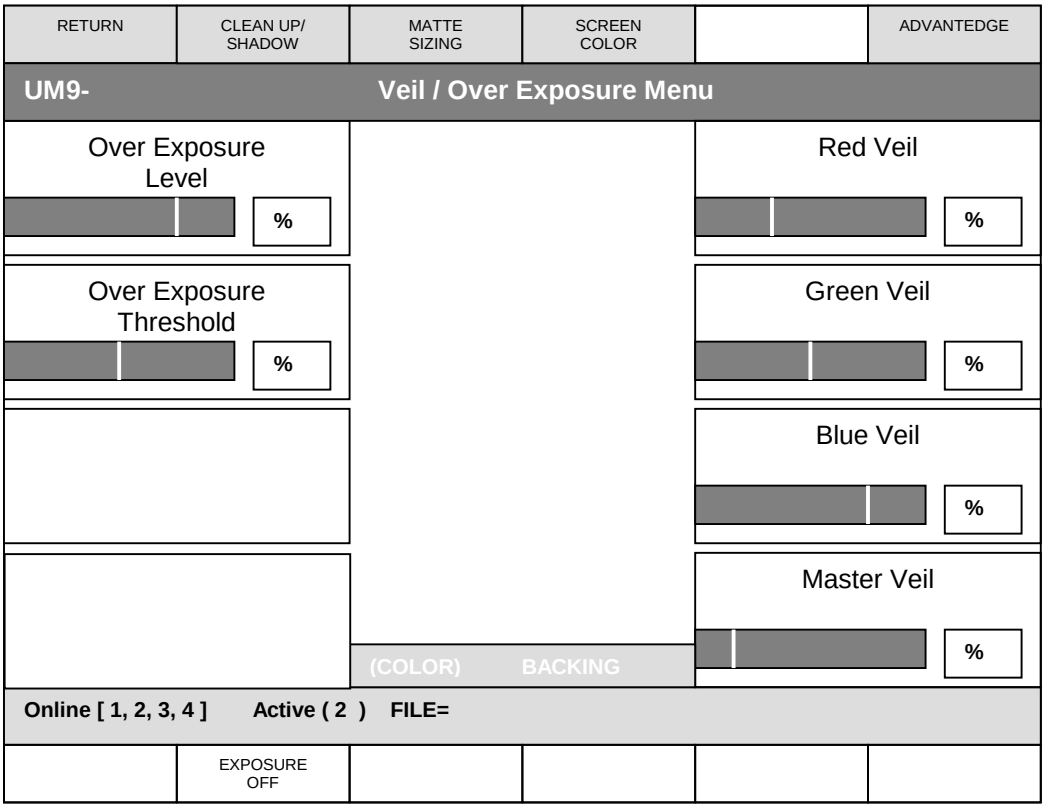


Figure 14: Veil / Over Exposure Menu

XI. VEIL / OVER EXPOSURE MENU

When the lighting on a set is not even, usually the top portion of the backing gets overexposed as the camera iris is adjusted to get proper exposure on the foreground subject. As the backing color (the primary color of the backing) reaches overexposure level, its color begins to change. This change in backing color results in matte values that are lower than those obtained from the well lit portions of the screen. As a result, the top portion of the screen will look darker and discolored in the final composited image. The only solution was to use Clean Up, which resulted in loss of fine FG detail and loss of shadows.

The Over Exposure correction feature in the Ultimatte-9 is an alternate way of solving the above-described problem without losing fine FG detail or shadows. The Over Exposure correction feature work best when the white clip of the camera has a sharp knee.

1. Over Exposure Level

This control sets a threshold in the matte signal above which the screen is considered overexposed. Adjust this control while viewing the matte.

2. Over Exposure Threshold

This control sets a threshold in the backing color beyond which it will be considered overexposed. Adjust the Over Exposure THRESHOLD control while viewing the composited image.

3. Red Veil

This control is a manual override of the red component of the automated circuit that suppresses the color of the backing in the BG area of the composite image.

4. Green Veil

This control is a manual override of the green component of the automated circuit that suppresses the color of the backing in the BG area of the composite image.

5. Blue Veil

This control is a manual override of the blue component of the automated circuit that suppresses the color of the backing in the BG area of the composite image.

6. Master Veil

This control is a manual override of the entire automated circuit that suppresses the color of the backing in the BG area of the composite image and increases or decreases the Red, Green, and Blue Veil levels equally. If one color has been adjusted independently, the Master Veil control will maintain the same relationships with the other two as all are adjusted.

7. Exposure Off / On

This button enables the Over Exposure feature.

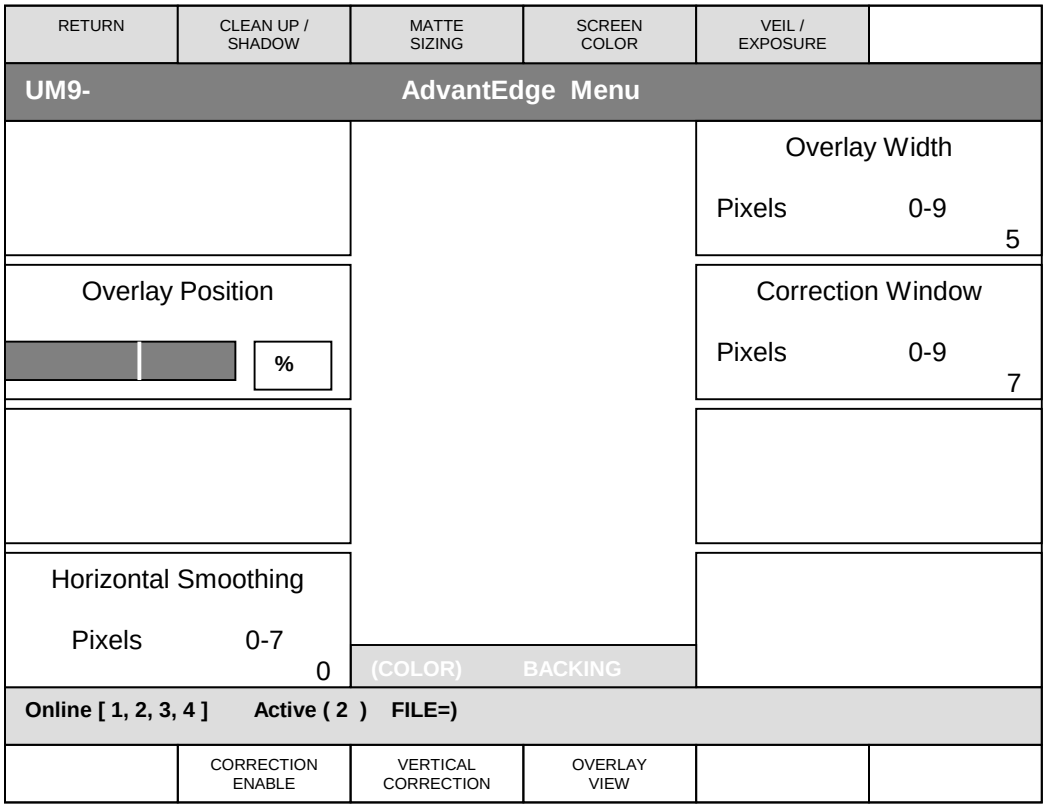


Figure 15: AdvantEdge Menu

XII. ADVANTEDGE MENU

In order to increase the "sharpness" of an image, video cameras add artificial edge enhancements to the original picture. These edge enhancements to the foreground image can give the subject an unrealistic (harsh) appearance when composited with the background. AdvantEdge will smooth the “harsh” edges. This results in a more natural appearance in the composite without the loss of sharpness/detail or softening of the edges.

1. Overlay Width

Overlay width determines the two ends of a variable window around the edge of the subject within which pixels will be processed. The range indicates the number of pixels that specifies the width. This control influences horizontal correction only and is best adjusted with the overlay view enabled. Vertical Overlay width is fixed to three lines.

2. Correction Window

Correction Width specifies the distance in number of pixels from the overlay pixels that the system will examine to determine the values that will be used to correct the artifacts of the edge enhancement. This control influences the horizontal correction only. Vertical correction window is not adjustable.

3. Overlay Position

The visual effect of this control is seen when the Overlay View is enabled. A magenta overlay appears around the subject whereby the user can fine-tune the area (outline) to be processed by AdvantEdge.

4. Overlay View

When pressed, will enable AdvantEdge and produce a magenta colored overlay showing the Overlay Width and Position on the monitor.

5. Correction Enable

Enables or disables the Correction features.
When enabled without Vertical Correction only Horizontal Correction is employed.
When enabled with Vertical Correction both Horizontal and Vertical Correction are employed.

6. Vertical Correction

Selects whether Vertical Correction is desired. The combination of both horizontal and vertical correction provides a smoother overlay outline.

7. Horizontal Smoothing

Smoothes out correction variations within the defined edge width in the horizontal direction.

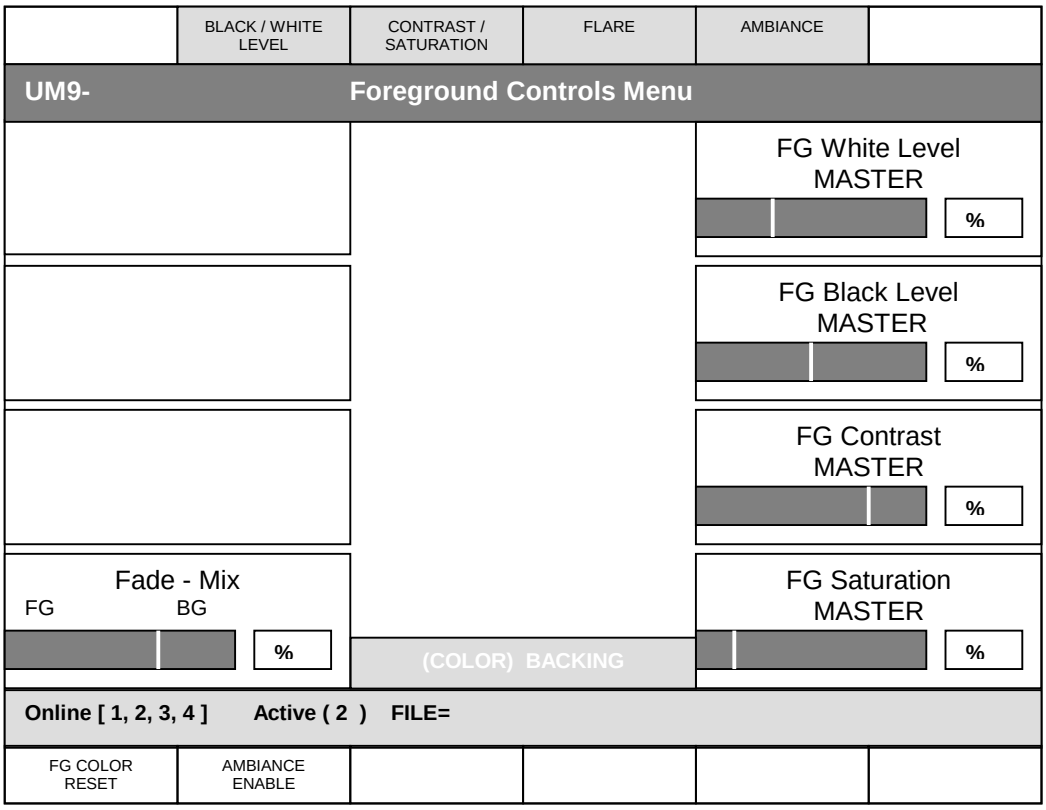


Figure 16: Foreground Controls Menu

XIII. FOREGROUND CONTROLS MENU

1. FG White Level MASTER

The FG White Level control adjusts the gain of the FG image without compromising the quality of the composite. If the FG seems too bright or too dark for the BG scene in the composite, use the FG White Level control to alter the level of the FG subject rather than adjusting the FG source level. Altering the level at the FG source can adversely affect the generation of the matte signal.

The default setting of FG White Level control is unity (100%). The range of the control is from 0% to 125%. Clips at the output of the Ultimatte-9 prevent these levels from exceeding standard limits.

Any offsets in the FG RED, GREEN and BLUE LEVEL controls added from the FG LEVEL menu will be preserved as the FG Level Master control is adjusted.

2. FG Master Black MASTER

The FG Master Black control adjusts the level of 'black' in the FG image without altering the gain of a 100% white FG object. Adjusting the black level can often produce a more convincing composite image, if the black levels in the BG scene differ from those in the FG.

Any offsets in the FG Black Level Red, Green and Blue Black controls added from the FG Black / White menu will be preserved as the FG Black Level Master control is adjusted. Clips at the output of the color control section will clip negative values to zero.

3. FG Contrast MASTER

The FG Contrast Master control adjusts the overall contrast (mid-gain) of the FG subject in the composite without affecting the quality of the composite. If the lighting contrast in the FG scene does not match that of the BG scene, adjusting this control may produce a more convincing composite image.

Any offsets in the FG Contrast Red, Green and Blue controls added from the FG Contrast / Saturation menu would be preserved as the FG Contrast Master control is adjusted.

4. FG Saturation MASTER

This FG Saturation Master control adjusts the saturation of the colors in the FG subject without affecting the generation of the matte signal. If the saturation of the colors in the BG scene does not appear to match the saturation of the FG colors, adjusting this control may produce a more convincing composite.

The FG Saturation Master control can completely remove all color from the FG subject and produce a monochrome (black-and-white) FG composited with a color BG image.

Any offsets in the FG Saturation Red, Green and Blue controls added from the FG Contrast / Saturation menu will be preserved as the FG Saturation Master is adjusted.

5. Fade / Mix

When turning the Fade / Mix control from 0% to 100%, the FG object will gradually start fading and will be substituted by the BG scene instead.

When in matte off or in View FG modes, turning the MIX control from 0% to 100% will gradually mix the FG image with the BG image, proportional to the MIX % setting.

The Fade _ Mix function allows blending of FG and BG images in order to match edges of set pieces in the FG scene to their corresponding objects in the BG scene.

When the MIX control is turned until it reaches 100%, the LED on the BG button will turn and the FG button LED will turn off.

6. FG Color Reset

This button will reset the FG color controls (white, black, contrast and saturation) to their default values without affecting the settings of other controls. The default setting can be either factory default or user default values.

7. Ambiance Enable

Enables the BG colors to influence the FG colors, based on ambiance control settings.

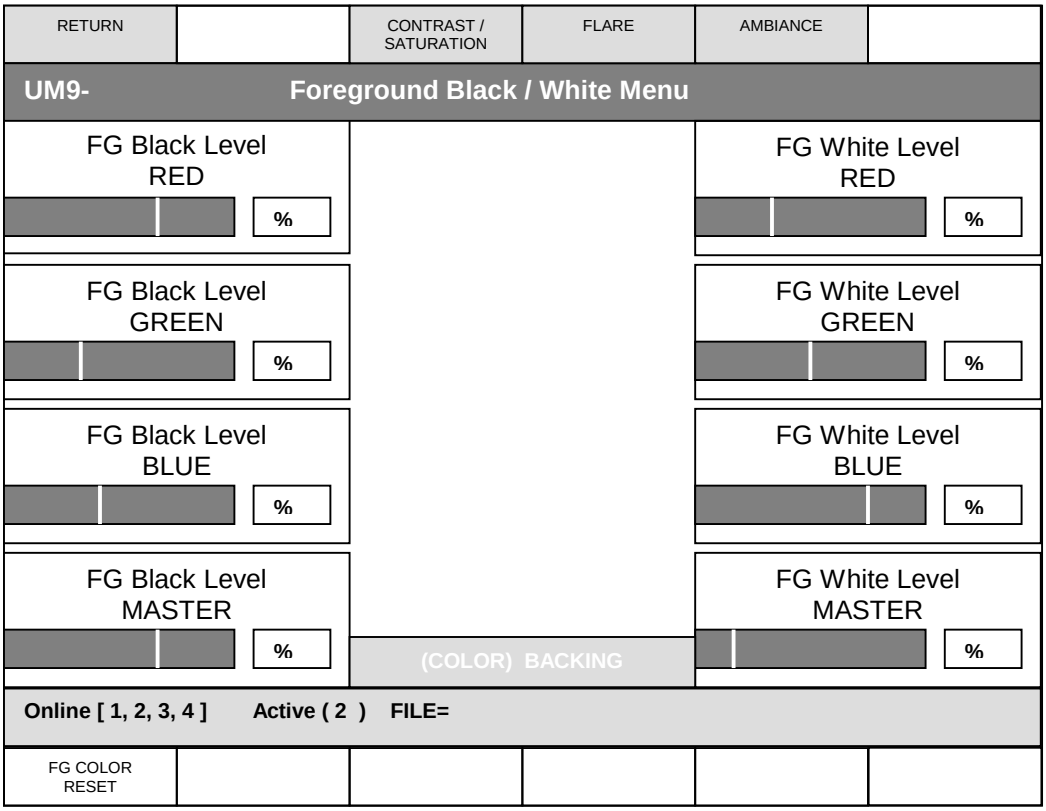


Figure 17: Foreground Black / White Menu

XIV. FOREGROUND BLACK / WHITE MENU

1. FG Black Level RED

This control adjusts the black level of the red component of the FG signal without altering its gain at 100% level**.**

2. FG Black Level GREEN

This control adjusts the black level of the green component of the FG signal without altering its gain at 100% level.

3. FG Black Level BLUE

This control adjusts the black level of the blue component of the FG signal without altering its gain at 100% level.

4. FG Black Level MASTER

The FG Black Master adjusts the level of the blacks in the FG image without altering the gain of a 100% white FG object. Adjusting the black level can often produce a more convincing composite image, if the black levels in the BG scene differ from those in the FG.

Any offsets in the FG Black Level RED, GREEN and BLUE added from the FG Black / White menu will be preserved as the FG Black Master control is adjusted.

5. FG White Level RED

This control adjusts the level of the red component of the FG signal without affecting the matte signal generation.

6. FG White Level GREEN

This control adjusts the level of the green component of the FG signal without affecting the matte signal generation**.**

7. FG White Level BLUE

This control adjusts the level of the blue component of the FG signal without affecting the matte signal generation.

8. FG White Level MASTER

This control adjusts the gain of the FG image without compromising the quality of the composite. If the FG seems too bright or too dark for the BG scene in the composite, use the FG Level Master control to alter the level of the FG subject rather than adjusting the FG source level. Altering the level at the FG source can adversely affect the generation of the matte signal.

The default setting of FG Level Master is unity (100%). The range of the control is from 0% to 125%. Clips at the output of the Ultimatte-9 prevent these levels from exceeding standard limits.

Any offsets in the FG White Level Red, Green and Blue controls added from the FG Black / White menu will be preserved as the FG White Level Master is adjusted.

9. FG Color Reset

This button will reset the FG color controls (white, black, contrast and saturation) to their default values without affecting the settings of other controls. The default setting can be either factory default or user default values.

10. Ambiance Enable

Enables the BG colors to influence the FG colors based upon the Ambiance control settings.

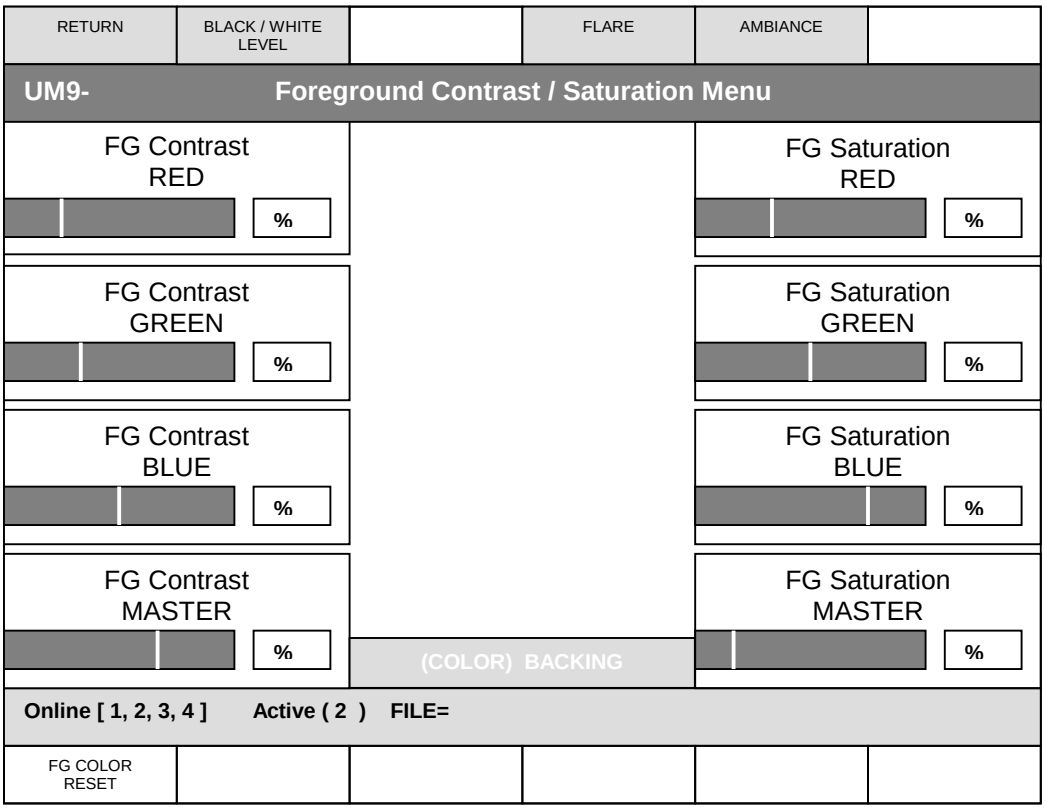


Figure 18: Foreground Contrast / Saturation Menu

XV. FOREGROUND CONTRAST / SATURATION MENU

1. FG Contrast RED

This control adjusts the contrast (mid gain) of the red component of the FG signal without affecting the matte signal generation.

2. FG Contrast GREEN

This control adjusts the contrast (mid gain) of the green component of the FG signal without affecting the matte signal generation

3. FG Contrast BLUE

This control adjusts the contrast (mid gain) of the blue component of the FG signal without affecting the matte signal generation.

4. FG Contrast MASTER

This control adjusts the overall contrast of the FG subject in the composite without affecting the quality of the composite. If the lighting contrast in the FG scene does not match that of the BG scene, adjusting the FG Contrast Master control may produce a more convincing composite image.

Any offsets in the contrast of the red, green and blue FG signals set by the individual FG Contrast R, G, and B Contrast controls will be preserved when the FG Master Contrast control is adjusted.

5. FG Saturation RED

This control adjusts the saturation of the red component of the FG signal without affecting the matte signal generation

6. FG Saturation GREEN

This control adjusts the saturation of the green component of the FG signal without affecting the matte signal generation**.**

7. FG Saturation BLUE

This control adjusts the saturation of the blue component of the FG signal without affecting the matte signal generation

8. FG Saturation MASTER

This control adjusts the saturation of the colors in the FG subject without affecting the generation of the matte signal. If the saturation of the colors in the BG scene does not appear to match the saturation of the FG colors, adjusting the FG Master Saturation control may produce a more convincing composite.

The FG Master Saturation control can completely remove all color from the FG subject and produce a monochrome (black-and-white) FG composite with a color BG image.

Any offsets added in the FG Saturation Red, Green and Blue controls would be preserved as the FG Saturation Master is adjusted.

9. FG Color Reset

This button will reset the FG color controls (white, black, contrast and saturation) to their default values without affecting the settings of other controls. The default setting can be either factory default or user default values.

10. Ambiance Enable

Enables the BG color to influence the FG colors, based on ambiance control settings.

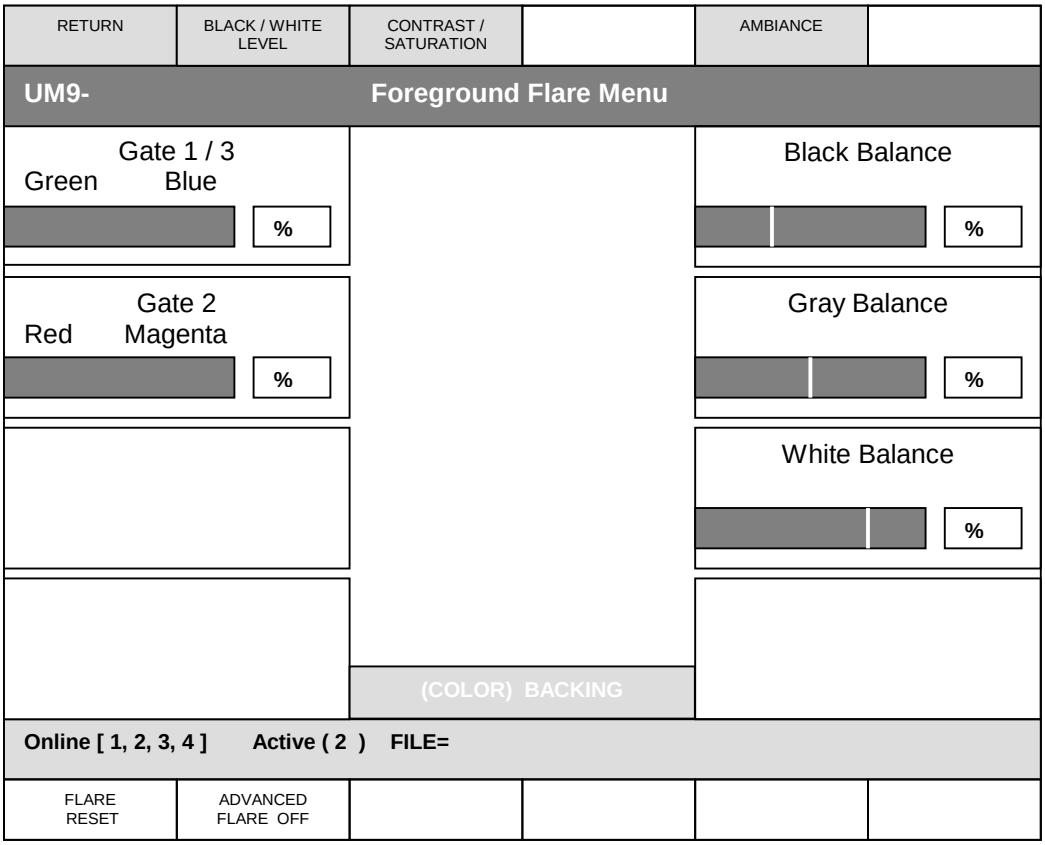


Figure 19: Foreground Flare Menu

XVI. FOREGROUND FLARE MENU

The suppression of flare or spill from the backing onto the FG subject is achieved by special algorithms, which analyze the colorimetry of the FG subject and set a limit for the main backing color level as a function of the levels of the other two colors. This kind of dynamic flare suppression is one of the most distinctive features of the Ultimatte compositing process. Since matting requires a bright and highly pure color for the backing, this intense color can cause discoloration of the FG subject in several ways. Flare in the lens or internal camera optics may give the FG subject a colorcast. Bounce light or spill from the backing will also discolor the edges of the FG subject. Flare suppression may affect the reproduction of certain colors in the FG image, but has no effect on the generation of the matte signal.

In the flare suppression process, the level of one or both of the other two colors limits the main backing color level. This limiting factor is variable, to allow a certain amount of adjustment to the flare suppression. The Ultimatte-9 has three controls, which affect the overall flare suppression: White Balance, Gray Balance, and Black Balance. These three controls mainly influence certain parts of the FG image, as indicated by the control names.

The Ultimatte-9 logic removes the effects of spill and flare in which the backing discolors the foreground object. The trade off is that certain colors in the foreground cannot be accurately reproduced --- the logic assumes they are actually different colors that are being tinted by the backing and “corrects” them.

Gate 1/3 and Gate 2 allows the operator to override the suppression logic so that those colors can be used in the foreground. The effects of the controls vary depending on the backing color.

The following tables relate the appropriate settings of the 3 gates and their corresponding effects on the composite.

BACKING COLOR: BLUE

DEFAULTS: GATE 1/3 = 0%, GATE 2 = 0%

GATE 1/3	GATE 2	BENEFITS	TRADE-OFFS
0%	0%	Removes Blue Spill while permitting some shades of blue to be reproduced in the fore-ground. Allows BLUE to exceed GREEN by the amount GREEN exceeds RED.	Unable to reproduce Magenta in foreground (or any shade of pink in which the Blue should exceed Green.) Magenta will be reproduced as Red. Unable to remove blue spill from green foreground objects.
100%	0%	Removes Blue Spill from Green foreground objects as well as all other foreground colors. Limits BLUE to the LOWER of RED or GREEN.	Unable to reproduce Cyan or Magenta in foreground. Cyan will be reproduced as Green. Magenta will be reproduced as Red.
0%	100%	Permits reproduction of Magenta in foreground (and any shade of Pink in which Blue exceeds Green). Allows BLUE to exceed GREEN by the amount RED exceeds GREEN (or by the amount GREEN exceeds RED when RED is lower than GREEN).	Will not remove Blue Spill from shades of Red in the foreground. Will not completely remove Blue Spill from shades of Green in the foreground.
100%	100%	Removes Blue Spill from shades of Green in the foreground. Permits reproduction of Magenta in foreground. BLUE is limited to the level of RED regardless of the level of GREEN.	Cannot reproduce shades of Blue in the foreground. Cyan will become Green. Cannot remove Blue Spill from Red or Yellow. (Blue spill will desaturate Yellows.)

Table 3: Gate Functions (Blue Backing)

BACKING COLOR: GREEN
DEFAULTS: GATE 1/3 = 0%, GATE 2 = 50%

GATE 1/3	GATE 2	BENEFITS	TRADE-OFFS
0%	0%	Removes Green Spill while permitting some shades of Green to be reproduced in the foreground. Allows GREEN to exceed BLUE by the amount BLUE exceeds RED.	Unable to reproduce Yellow in foreground (or any shade of Brown in which the Green should exceed Blue.) Yellow will be reproduced as Red. Unable to remove Green Spill from Blue foreground objects.
100%	0%	Removes Green Spill from Blue foreground objects as well as all other foreground colors. Limits GREEN to the LOWER of RED or BLUE.	Unable to reproduce Cyan or Yellow in foreground. Cyan will be reproduced as Blue. Yellow will be reproduced as Red.
0%	100%	Permits reproduction of Yellow in foreground (and any shade of Brown which Green exceeds Blue). Allows GREEN to exceed BLUE by the amount RED exceeds BLUE (or by the amount BLUE exceeds RED when RED is lower than BLUE).	Will not remove Green Spill from shades of Red in the foreground. Will not completely remove Green Spill from shades of Purple in the foreground.
100%	100%	Removes Green Spill from shades of Blue in the fore-ground. Permits reproduction of Yellow in foreground. GREEN is limited to the level of RED regardless of the level of BLUE.	Cannot reproduce shades of Green in the foreground. Cyan will become Blue. Cannot remove Green Spill from Magenta or Red. (Green Spill will desaturate Magentas.)

Table 4: Gate Functions (Green Backing)

BACKING COLOR: RED
DEFAULTS: GATE 1/3 = 0%, GATE 2 = 0%

GATE 1/3	GATE 2	BENEFITS	TRADE-OFFS
0%	0%	Removes Red Spill while permitting some shades of Red to be reproduced in the foreground. Allows RED to exceed GREEN by the amount GREEN exceeds BLUE.	Unable to reproduce Magenta in foreground (or any shade of pink in which the Red should exceed Green.) Magenta will be reproduced as Blue. Unable to remove Red spill from Green foreground objects.
100%	0%	Removes Red Spill from Green foreground objects as well as all other foreground colors. Limits RED to the LOWER of BLUE or GREEN.	Unable to reproduce Magenta or Yellow in foreground. Magenta will be reproduced as Blue. Yellow will be reproduced as Green.
0%	100%	Permits reproduction of Magenta in foreground (and any shade of Pink in which Red exceeds Green). Allows RED to exceed GREEN by the amount BLUE exceeds GREEN (or by the amount GREEN exceeds BLUE when BLUE is lower than GREEN).	Will not remove Red Spill from shades of Blue in the foreground. Will not completely remove Red Spill from shades of Green in the foreground.
100%	100%	Removes Red Spill from shades of Green in the foreground. Permits reproduction of Magenta in foreground. RED is limited to the level of BLUE regardless of the level of GREEN.	Cannot reproduce shades of Red in the foreground. Yellow will become Green. Cannot remove Red Spill from Blue or Cyan. (Red Spill will desaturate Cyans.)

Table 5: Gate Functions (Red Backing)

1. Black Balance

The Black Balance controls the overall flare suppression process from the "black" end. This control allows, for example, black FG colors to have equal amounts of red, green and blue, or to be slightly warmer (B<G, R), or slightly cooler (B>G, R) (for a blue backing).

The Black Balance adjustment differs from adjusting the FG Blue Black or the FG Green Black controls. It is an adjustment in the black level of the main channel (e.g. blue channel for blue backing) controlled by one or both secondary channels (green and red, for blue backing). Altering individual FG Black controls will change the overall black gain of corresponding channels

The Black Balance Control makes dark foreground colors warmer with minimal effects on lighter colors. For example, adjusting this control can eliminate flares from most hair colors (blacks, browns and some blondes) with minimal effects on lighter colors.

2. White Balance

The White Balance controls the overall flare suppression process from the "white" end. This control allows, for example, white FG colors to have equal amounts of red, green and blue, or to be slightly warmer (B<G, R), or slightly cooler (B>G, R) (for a blue backing**).**

The White Balance adjustment differs from adjusting the FG Blue Level or the FG Green Level controls. The White Balance is an adjustment in the level of the main channel (e.g. blue channel for blue backing) controlled by one or both secondary channels (green and red, for blue backing). Altering individual FG LEVEL controls will change the overall gain of corresponding channels**.**

The White Balance Control makes light foreground colors warmer or cooler with minimal effect on darker colors. Fo**r** example, when using a blue backing, the flare suppression logic can cause blond hair to look white around the edges. Adjusting this control can restore a warmer more natural color to the hair without significantly altering other colors.

3. Gray Balance

Gray Balance control makes mid-range foreground colors warmer or cooler with minimal effects on lighter and darker colors. It controls flare suppression at mid-level values of the FG signal without affecting white and black levels**.** This control also provides the operator an added degree of flexibility in suppressing flare and contamination from the backing onto the FG subject

As mentioned earlier, flare suppression may alter certain FG colors. In most cases, it is this alteration in color that makes the FG to appear as if it was placed in front of a neutral (black) backing and not a colored one. It is this alteration in FG color that makes the composite more realistic, free of any influence from the backing color. In some cases, however, alteration of FG colors may not be acceptable. Rather than completely disabling flare suppression, which will bring back all flare and spill from the backing, the flare suppression algorithms of the Ultimatte-9 allow selective and controlled disabling of the flare limiting factor. This selective and controlled reduction of flare suppression allows these few "problematic" colors to be reproduced; with addition of some flare on certain colors, yet maintaining full suppression on the rest. Because of the selective nature of these flare controls they are called Color Gates. The Ultimatte-9 has three Color Gates: a combined GATE 1 / 3 (GATE 1 OR GATE 3), and GATE 2. For a detailed description of these Color Gates on certain colors when used with Blue, Green or Red backing, see Table 3, Table 4, and Table 5 respectively.

4. Advanced Flare Off/On

When this button is enabled, additional flare suppression calculations are performed on the foreground image to compensate for secondary reflections. Some adjustment of BLACK Balance or Gray Balance controls might be needed to achieve the desired look. Advanced Flare is best used with the Ambiance feature.

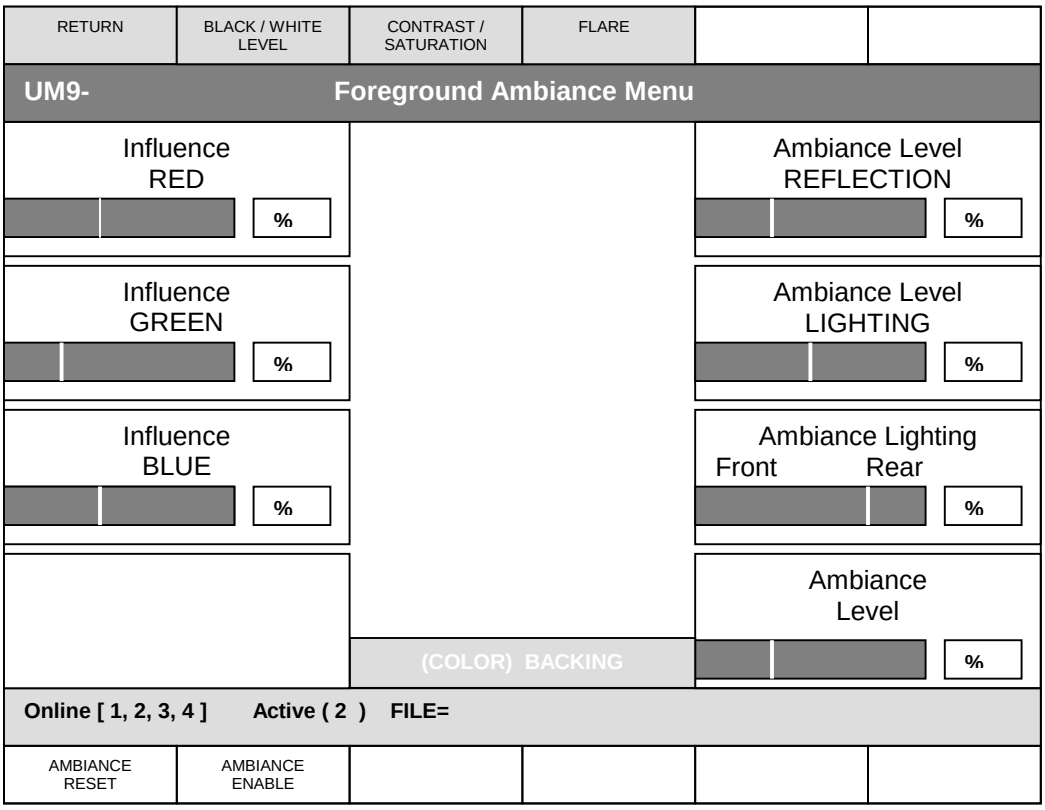


Figure 20: Foreground Ambiance Menu

XVII. FOREGROUND AMBIANCE MENU

In order to generate a good composite image it is important to generate an accurate matte to process the FG image, add the new BG scene, and remove the contamination of the backing color from the FG subject. Additionally, to make this composite more convincing and accurate, it is important to make sure that the FG subject fits in its new BG environment. This means adjusting the colors of the FG subject to match those of the BG scene. This is done in the Ultimatte-9 by adjusting the FG color controls manually, or by using color conformance. In a virtual set, where colors of the BG scene are changing dynamically, the colors of the FG subject need to track those changes in order to maintain a convincing look. The Ambiance feature in the Ultimatte-9 analyzes both FG and BG colors and adjusts FG colors to reflect changes in the BG colors.

The amount of the BG influence can be set by BG Ambiance Level control. The BG scene can have subtle influence on the FG subject by merely reflecting ambient light, or the BG scene can itself act as a source of light, in which case its influence on FG subject will be much stronger. Ambiance Level Reflection and Ambiance Level Lighting controls adjust the amount of reflected or direct influence the BG will have on the FG respectively. In the second case where the BG acts as a light source, its “direction” can be controlled by Ambiance Lighting Direction control. There will be situations, where a specific color in the BG scene should have a significant influence on the colors of the FG subject, yet that part of the BG might not even be visible in the frame. An example of this will be a person standing in a room with red carpeting. If the camera is seeing the FG subject from the waist up, most probably the carpet on the floor will not be visible in the composite scene, viewed from the same angle. Despite being out of the frame, the red carpet should have a significant influence on the colors of the FG subject. The RED, GREEN and BLUE Influence controls set the amount and color of influence.

For best adjustments of AMBIANCE controls, select the darkest BG scene. Adjust FG level and, if necessary, other FG controls to set FG colors to match (approximately) those of the BG scene. This establishes the darkest level the FG subject will have. Change the BG scene to the brightest one. Enable the AMBIANCE controls and adjust them (mainly Level, Reflection and Lighting) so that the FG subject has the most convincing amount of influence from the BG scene. From this point on, any changes in the BG colors will automatically reflect on the FG subject.

1. Influence Red

This control adds an overall red cast on the amount of the influence the BG scene has on the FG subject.

2. Influence Green

This control adds an overall green cast on the amount of the influence the BG scene has on the FG subject.

3. Influence Blue

This control adds an overall blue cast on the amount of the influence the BG scene has on the FG subject.

4. BG Ambiance Level

This control adjusts the overall level of influence the BG scene will have on the FG subject.

5. Ambiance Level Reflection

This control adjusts the amount of reflection from the BG scene that is added to the FG subject, where the BG itself is reflecting ambient light. The influence of this control is relatively subtle.

6. Ambiance Level Lighting

This control adjusts the amount of reflection from the BG scene that is added to the FG subject, where the BG itself acts as a source of lighting. The influence of this control is relatively strong.

7. Ambiance Lighting Direction

When the BG scene acts as an ambient light source, it can be reflecting on the FG subject from the front (overall reflection), or from the rear e.g., a door opening behind the FG subject and light coming in. The Ambiance Lighting Direction control proportions the influence of the ambient light to be 100% from the rear, or fully from the front, or in between.

8. Ambiance Reset

Resets AMBIANCE controls to their default settings. These could be factory or USER defaults.

9. Ambiance Enable

Enables and disables AMBIANCE controls.

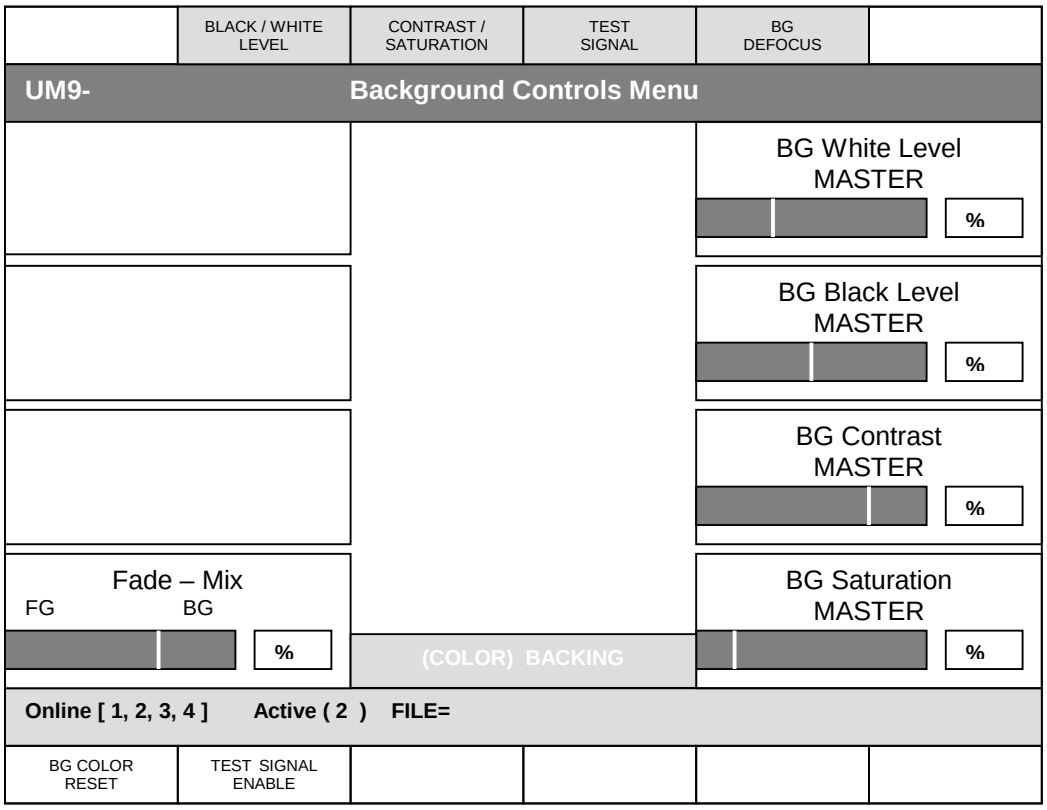


Figure 21: Background Controls Menu

XVIII. BACKGROUND CONTROLS MENU

1. BG White Level MASTER

Adjusts the overall gain for the BG signal in the composite image, and is used to achieve a better match in the FG and BG levels. BG Level Master range is from 125% (maximum gain) to 0% (off), with 100% being unity gain.

2. BG MASTER

Adjusts the level of the blacks in the BG image without altering the gain at 100% white level. Adjusting the black level can often produce a more convincing composite image, if the black levels in the BG scene differ from those in the FG.

Any offsets in the Black Level red, green and blue black controls which have been added will be preserved as the BG Black Level Master control is adjusted.

3. BG Contrast Master

This control adjusts the overall contrast (mid gain) of the BG subject in the composite. If the lighting contrast in the BG scene does not match that of the BG View, adjusting BG Contrast Master may produce a more convincing composite image.

Any offsets in the BG Contrast red, green and blue controls added from BG Contrast / Saturation menu will be preserved as the BG Contrast Master is adjusted.

4. BG Saturation Master

This control adjusts the saturation of the colors in the BG scene. If the saturation of the colors in the BG scene does not appear to match the saturation of the BG View colors, adjusting BG Saturation Master may produce a more convincing composite.

The BG Saturation Master control can completely remove all color from the BG scene and produce composites with the FG subject in full color against a monochrome (black and white) BG scene.

Any offset in the BG Saturation Red, Green or Blue controls added from the BG Contrast / Saturation menu will be preserved as BG Saturation Master is adjusted.

5. Fade / Mix

Turning the FADE control from 100% to 0%, the FG object will gradually start fading, and will be substituted by the BG scene instead.

When in MATTE OFF or in View FG modes, turning the MIX control from 0% to 100% will gradually mix the FG image with the BG image, proportional to the MIX % setting. Also when the MIX control is at 100%, the View BG LED will be on. When the MIX control is turned to 0%, the View FG led will be on.

The Fade-Mix function allows blending of FG and BG images in order to match edges of set pieces in the FG scene to their corresponding objects in the BG scene.

6. BG Color Reset

This switch returns the BG color controls (white, black, contrast and saturation) to their default values (factory or user) without affecting the settings of the other controls.

7. Test Signal Enable

When enabled, the incoming BG signal is substituted with an internally generated test field. This is useful in situations when the BG signal is not available.

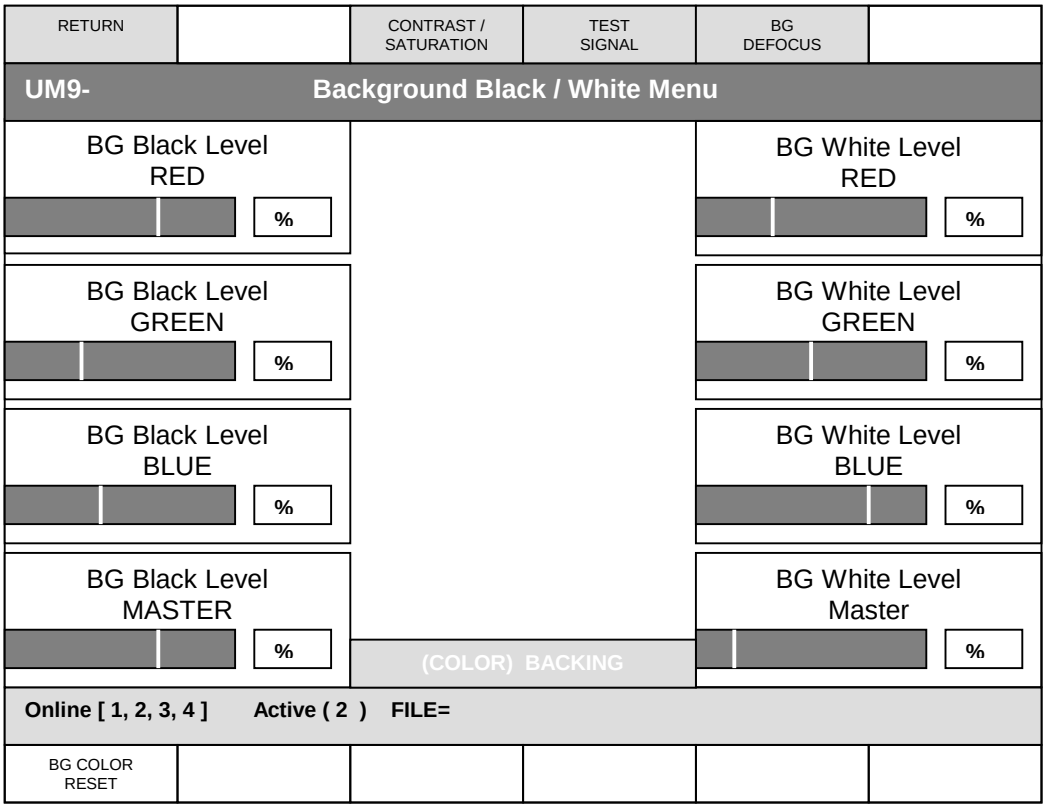


Figure 22: Background Black / White Menu

XIX. BACKGROUND BLACK / WHITE MENU

1. BG Black Level RED

This control adjusts the black level of the red component of the BG signal without altering its gain at 100% level.

2. BG Black Level GREEN

This control adjusts the black level of the green component of the BG signal without altering its gain at 100% level.

3. BG Black Level BLUE

This control adjusts the black level of the blue component of the BG signal without altering its gain at 100% level.

4. BG Black Level MASTER

Adjusts the level of the blacks in the BG image without altering the gain at 100% white level. Adjusting the black level can often produce a more convincing composite image, if the black levels in the BG scene differ from those in the FG.

Any offsets in the red, green and blue black levels that have been added with the BG Black Level controls will be preserved as the BG Black Level MASTER control is adjusted.

5. BG White Level RED

This control adjusts the level of the red component of the BG signal. BG Red Level range is from 125% (maximum gain) to 0% (off), with 100% being unity gain.

6. BG White Level GREEN

This control adjusts the level of the green component of the BG signal. BG Green Level range is from 125% (maximum gain) to 0% (off), with 100% being unity gain.

7. BG White Level BLUE

This control adjusts the level of the blue component of the BG signal. BG Blue Level range is from 125% (maximum gain) to 0% (off), with 100% being unity gain.

8. BG White Level MASTER

Adjusts the overall gain for the BG signal in the composite image, and is used to achieve a better match in the FG and BG levels. BG Level Master range is from 125% (maximum gain) to 0% (off), with 100% being unity gain.

Any offsets added in the BG White Level Red, Green and Blue controls added from the BG Black/White Level menus would be preserved as the BG White Level MASTER is adjusted.

9. BG Color Reset

This switch returns the BG color controls (white, black, contrast and saturation) to their default values (factory or user) without affecting the settings of the other controls.

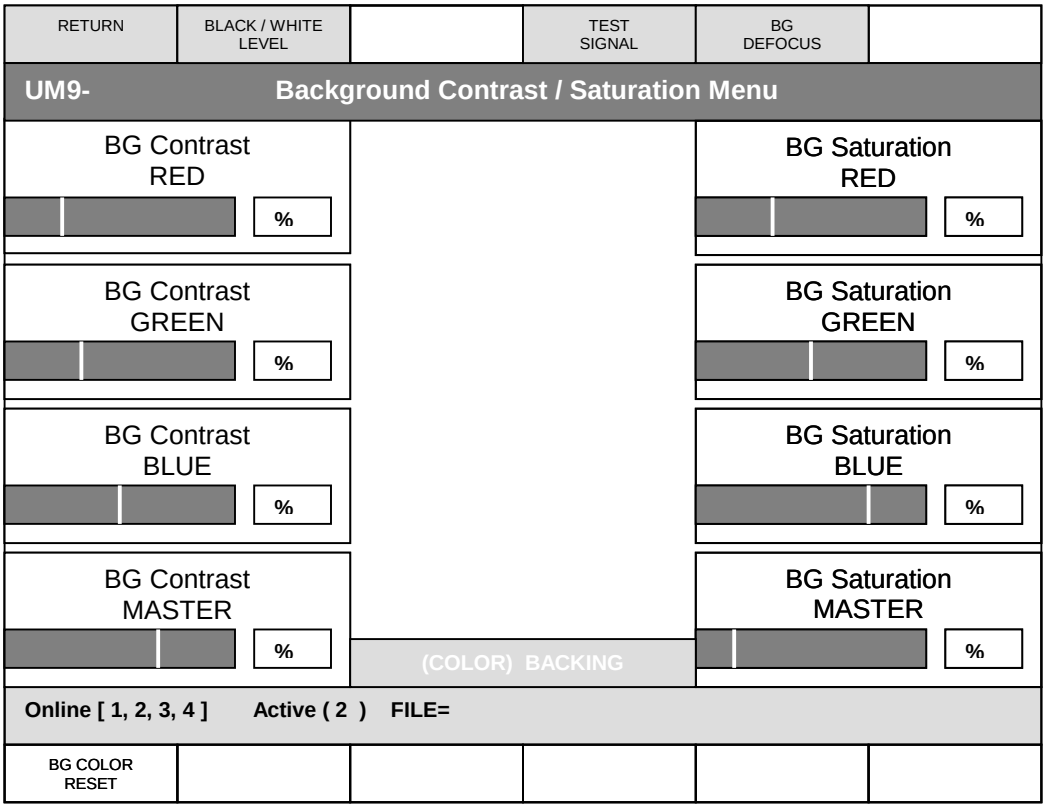


Figure 23: Background Contrast / Saturation Menu

XX. BACKGROUND CONTRAST / SATURATION MENU

1. BG Contrast RED

This control adjusts the contrast (mid gain) of the red component of the BG signal.

2. BG Contrast GREEN

This control adjusts the contrast (mid gain) of the green component of the BG signal.

3. BG Contrast BLUE

This control adjusts the contrast (mid gain) of the blue component of the BG signal.

4. BG Contrast MASTER

This control adjusts the overall contrast of the BG scene in the composite. If the lighting contrast in the BG scene does not match that of the FG scene, adjusting BG Master Contrast may produce a more convincing composite image.

Any offsets in the contrast of the red, green and blue BG signals set by the individual BG (R, G, B) Contrast controls will be preserved when the BG Master Contrast is adjusted.

5. BG Saturation RED

This control adjusts the saturation of the red component of the BG signal.

6. BG Saturation GREEN

This control adjusts the saturation of the green component of the BG signal.

7. BG Saturation BLUE

This control adjusts the saturation of the blue component of the BG signal.

8. BG Saturation MASTER

This control adjusts the saturation of the colors of the BG scene. If the saturation of the colors in the BG scene does not appear to match the saturation of the FG scene, adjusting BG Saturation Master may produce a more convincing composite.

9. BG Color Reset

This switch returns the BG color controls (white, black, contrast and saturation) to their default values (factory or user) without affecting the settings of the other controls.

Any offsets added in the BG Saturation Red, Green and Blue controls would be preserved as the BG Saturation MASTER is adjusted.

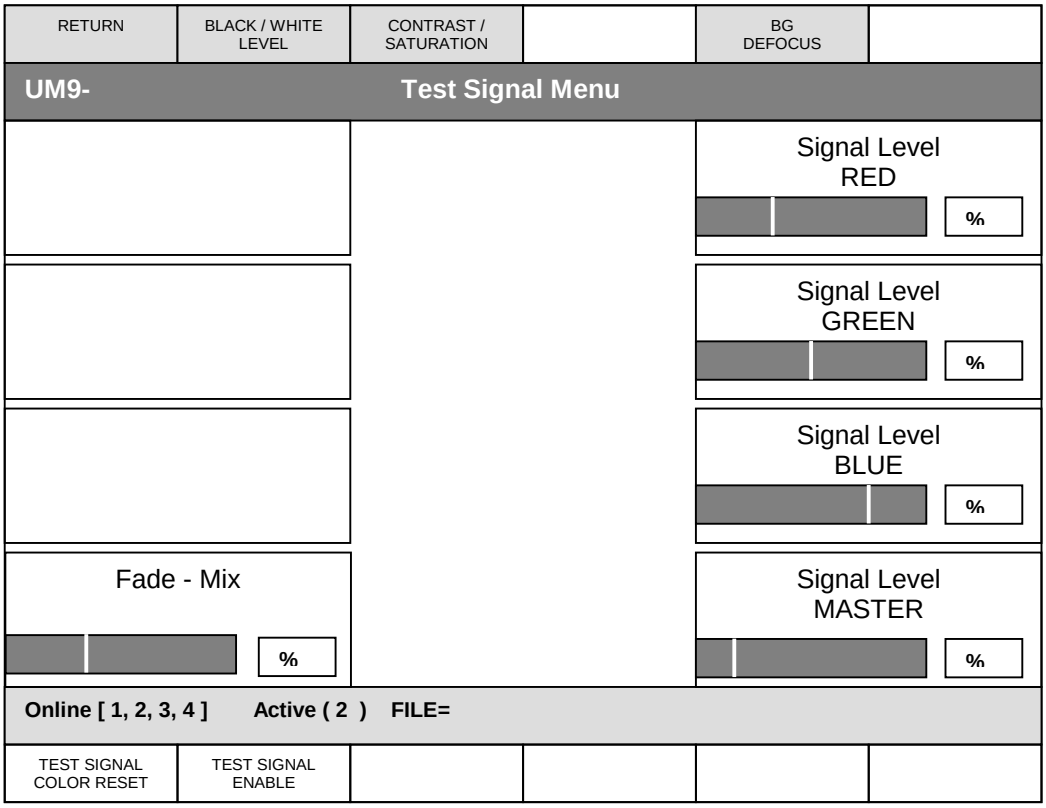


Figure 24: Test Signal Menu

XXI. BACKGROUND SIGNAL TEST MENU

1. Signal Level RED

Adjusts the level of the RED component of the test signal.

2. Signal Level GREEN

Adjusts the level of the GREEN component of the test signal.

3. Signal Level BLUE

Adjusts the level of the BLUE component of the test signal.

4. Signal Level MASTER

Adjusts the overall level of the test signal. Any offsets in the RED, GREEN or BLUE level adjustments will be preserved when Test Signal Level MASTER is adjusted.

5. Test Signal Color Reset

Resets the levels to the default values.

6. Test Signal Enable

When enabled, the incoming BG signal is substituted with an internally generated test field. This is useful in situations when the BG signal is not available.

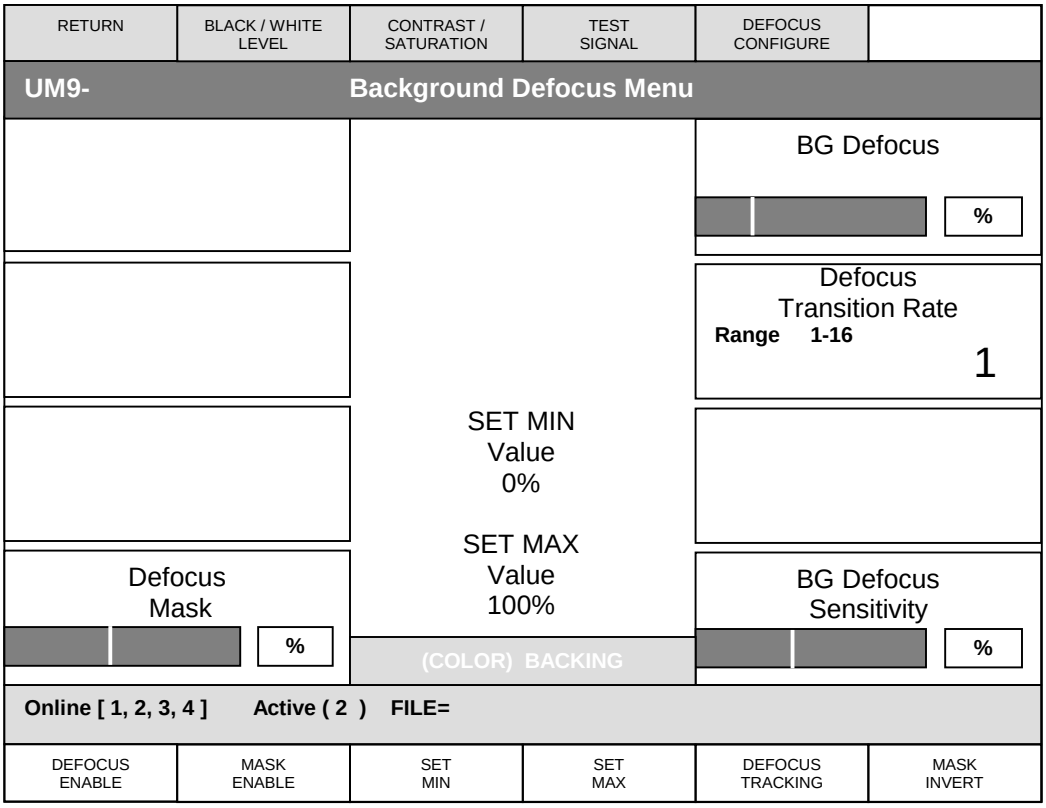


Figure 25: Background Defocus Menu

XXII. BACKGROUND DEFOCUS MENU

A scene viewed through a camera will show various objects at different levels of focus, depending on the focal length of the lens, the zoom level, the iris setting and camera gain setting. Iris and camera settings are directly related to the lighting level of the scene. When the lens is focused on an object at a specific distance, this object, and other objects at similar distance from the lens, will look sharp. Objects that are closer or farther away from the lens will have a softer and out of focus look. When compositing a FG object into a BG scene, maintaining appropriate depth of field will yield very convincing images, particularly when the FG is a close up of the subject.

In virtual sets, most BG scenes are computer generated and their viewing angle is changing in real time to match that of the FG camera. These computer-generated images are very sharp and crisp. When composited, these images will look natural when the FG subject is at a distance where both FG and BG would be in focus. But when the FG subject gets closer to the lens, or the camera is zoomed in tighter and sharp focus is maintained on the FG subject, the BG scene should gradually go out of focus. Some virtual set systems provide means of “defocusing” the computer-generated images to simulate depth of field by tracking the zoom function of the camera lens. While this can track defocusing while zooming, it cannot track if the FG subject or the camera moves toward or away from each other. Other systems avoid BG defocusing to conserve computational power of the computer for rendering more realistic BG scenes.

The Ultimatte-9 provides an alternate technique of tracking the depth of field. The Ultimatte-9 compares the size of the FG subject to that of the video frame and, if the size falls between a minimum and a maximum size set by the operator, alters the sharpness of the BG scene to simulate depth of field. The operator also sets the amount of BG defocus at both ends of the automatic tracking range. Alternatively, the amount of BG defocus can be controlled from an external computer, or manually from the control on the Smart Remote.

There are situations where parts of the BG scene need to stay in focus with the FG subject when the rest of the scene is defocused. These portions of the BG scene could be video inserts or scoreboards or titles that need to maintain their original sharpness, as they are being placed on the same “focal plane” as the FG subject. If an alpha channel (key signal), generated by the virtual set computer and representing those BG elements that need to stay in focus, is connected to the MATTE IN (selected) of the Ultimatte-9, it will stop the defocusing action in the areas defined by the alpha (key) signal.

As mentioned earlier, the amount of defocusing applied to the BG scene is proportional to the size of the FG subject: the larger the area occupied by the FG subject, the larger the amount of defocus applied to the BG scene. There are situations where certain FG subjects should be excluded from BG defocusing calculation. A scene where the bluescreen does not extend to the edges of the frame is a very common situation. All objects outside the scene are considered as FG subjects, and therefore contribute to the FG subject size in the frame. In the final composited image, these unwanted areas are masked out either by the internal windows or by an external matte signal. These same sources can be used to mask out unwanted objects from contributing to the size of the FG subject in the frame. Enabling WINDOW MASK or MATTE IN MASK will allow the operator to exclude these unwanted FG objects from affecting the amount of defocusing.

1. Defocus Mask: (Level Slicing))

Certain areas in the BG scene, defined by a matte (key or alpha) signal connected to MATTE IN, can be masked from being defocused by the Ultimatte-9. The Defocus Mask selects a threshold level to define the areas of the BG scene that should be masked from the defocus function. MATTE IN signal levels above this threshold level will be Defocus Mask areas that will force the BG scene in the corresponding areas to stay in focus.

In many situations, the MATTE IN signal is needed to perform its original function: to force parts of the BG scene in front of the FG subject, as well as to provide a defocus mask to parts of the BG scene. This can be done by a bilevel matte (key or alpha) signal provided by the BG scene generator source. Instead of generating a matte signal that represents full transparency at 100% (0%) level and full opacity at 0% (100%) level, a modified matte can be generated where 90% (10%) represents full transparency, 91% to 100% (9% to 0%) represents Defocus Mask, and 0% (100%) indicates full opacity. See Table 6.

Important: When using a bilevel Matte signal as MATTE IN, the BILEVEL MATTE button (Matte IN / Matte Out Menu) should be enabled. When enabled, this function automatically compensates for the 10% difference in the Matte In signal level, so that the BG scene will be fully ON and FG fully off in areas of 90% Matte In signal. There is no need to adjust the Matte In GAIN control to compensate for the 10% signal level difference.

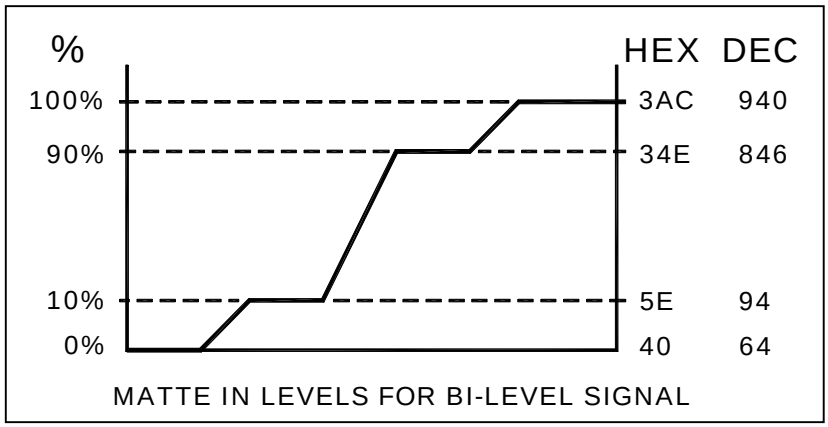


Table 6: Matte In Levels For Bi-Level Signal

2. BG Defocus

This control adjusts the amount of "defocusing" done to the BG scene when Defocus Enable is set. At 0% the sharpness of the original image is left intact.

When setting the limits of the automatic BG defocusing, adjust BG Defocus to the appropriate amount for a distant FG subject, and then press SET MIN. Adjust BG Defocus to the appropriate amount for a closer FG subject (by moving the subject and camera closer together, or by zooming in), and then press SET MAX. After setting these two parameters and when Defocus Tracking is enabled, the amount of BG Defocus is automatically adjusted (between the two limits) based on the size of the FG subject in the frame.

3. Defocus Transition Rate

When Defocus Tracking is enabled this control sets the rate at which the BG defocus starts and ends. At minimum setting (Fast: F/1), the amount of defocusing starts and ends abruptly. At maximum setting (Slow: S/16), the amount of defocusing starts and ends smoothly.

4. BG Defocus Sensitivity

This control sets the amount of change in size of the FG subject (compared to the size of the frame) to occur before it is interpreted as a change in defocus amount. This control eliminates "jitter" in the defocusing process as the FG subject size changes. This control is only active when the Defocus Tracking switch is enabled.

5. Defocus Enable

Enables all defocus functions**.**

6. Mask Enable

When enabled, areas in the BG scene defined by the key (alpha) signal connected to MATTE IN will be masked from the defocus function.

7. SET MIN

Sets the minimum size of the FG subject (farthest position) in the frame at which point the process of automatic defocusing of the BG scene starts. The MIN value must be *less* than the MAX value**.**

8. SET MAX

Sets the maximum size of the FG subject (closest position) in the frame beyond which there would be no more change in the automatic defocusing of the BG scene. The MAX value must be *greater* than the MIN value.

9. Defocus (Mask) Invert

When enabled, this button inverts the polarity of the Matte In signal ONLY as used as Defocus Mask. DEFOCUS (MASK) INVERT button does not alter the polarity of the Matte In signal as a "Garbage Matte" function.

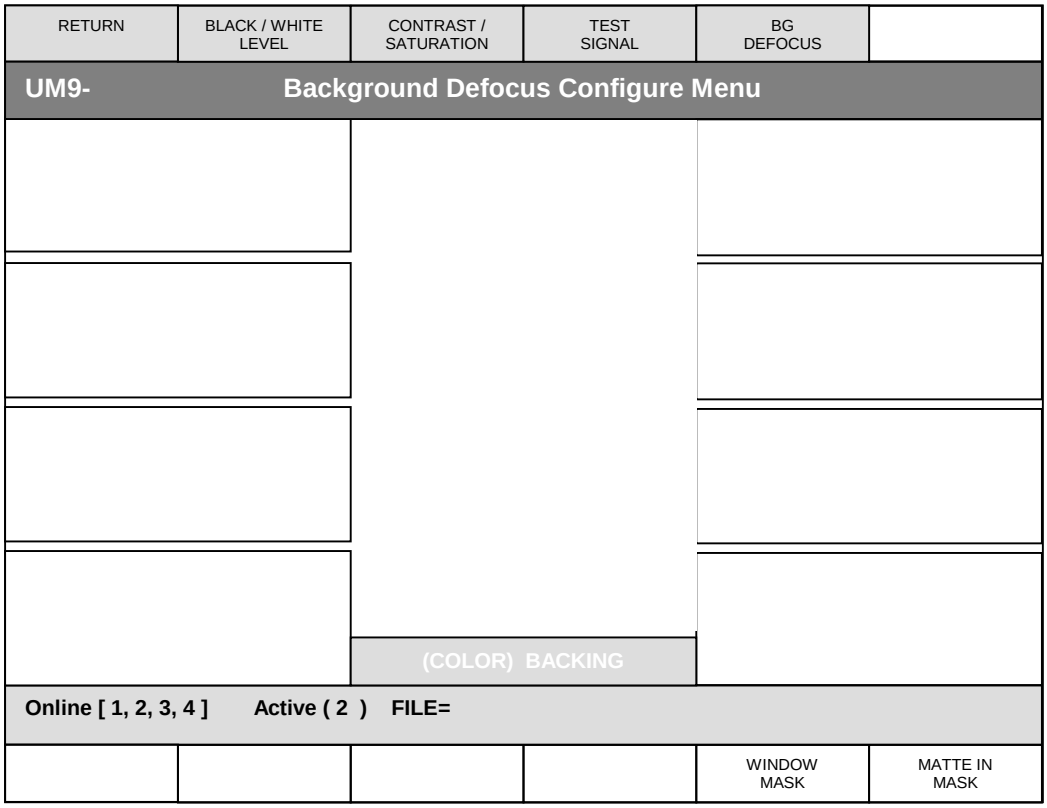


Figure 26: Background Defocus Configure Menu

XXIII. BACKGROUND DEFOCUS CONFIGURE MENU

1. Window Mask

When enabled, the internal windows can be used to mask out unwanted FG subjects from the amount of BG defocusing calculation.

2. Matte In Mask

When enabled, the MATTE IN signal can be used to mask out unwanted FG subjects from the amount of BG defocusing calculation.

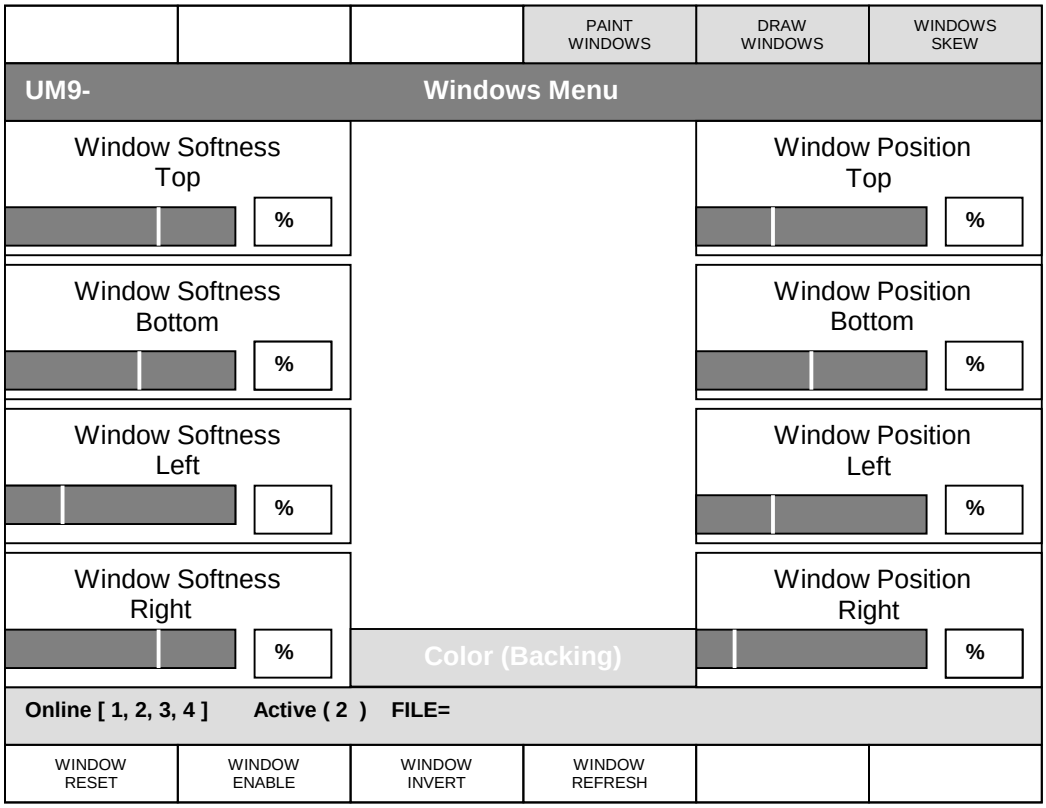


Figure 27: Windows Menu

XXIV. WINDOWS MENU

A window is a means of masking off an area of the FG image so that the BG scene is forced ON in that area of the composite image. It is primarily used in situations where the backing is not large enough to fill the entire frame. So long as the backing surrounds the FG subject, a window can be used to insert the BG scene beyond the edges of the backing.

The Ultimatte-9 can use internally generated rectangular windows with variable edge softness, or an external signal connected to Matte In as an external window signal. An external window signal will force ON the BG wherever the window signal is white. The Matte In circuitry is fully linear, and will mix the BG with the processed FG whenever the external window signal is gray. The Matte In circuitry can invert the polarity of the incoming signal if it does not have the proper polarity (white wherever the BG needs to be forced ON).

The internally generated windows in the Ultimatte-9 can be inverted so that they mask off an area within the frame rather than a border of the frame.

The default setting for each edge is a hard edge window. Advancing the control gradually softens each edge individually**.** Softening the edge of a window can help blend the masked off area with the rest of the image in a composite.

1. Window Softness Top

This knob adjusts the softness of the top edge of the window independently of the other three edges.

2. Window Softness Bottom

This knob adjusts the softness of the bottom edge of the window independently of the other edges.

3. Window Softness Left

This knob adjusts the softness of the left edge of the window independently of the other edges.

4. Window Softness Right

This knob adjusts the softness of the right edge of the window independently of the other edges

5. Window Position Top

This knob adjusts the position of the top edge of the window. The default position is beyond the top of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the bottom of the frame.

6. Window Position Bottom

This knob adjusts the position of the bottom edge of the window. The default position is beyond the bottom of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the top of the frame.

7. Window Position Left

This knob adjusts the position of the left edge of the window. The default position is beyond the left side of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the right side of the frame.

8. Window Position Right

This knob adjusts the position of the right edge of the window. The default position is beyond the right side of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the left side of the frame**.**

9. Window Enable

Selecting this button will toggle the internal window OFF and ON. The default setting of this button is ON. The Window controls will have no effect on the output image when this button is turned OFF.

When the Window Enable button is turned OFF, all position parameters set with the Window Controls and Window Edge Softness controls are stored. They are re-activated when the Window Enable is turned back ON unless File Clear has been pressed.

10. Window Invert

Selecting this button will invert the polarity of the internal window. When the button is OFF, the window masks a rectangular area starting from the edge of the frame. When the button is ON, the window masks a rectangular area within the frame.

11. Window Reset

Clears “normal” windows; those created in Windows Menu or Windows Skew Menu.

12. Window Refresh

Clears windows created with Draw Windows Menu or Paint Windows Menu.

VERY IMPORTANT:

1- Window Draw and Paint information can ONLY be saved as Quick Save Files. If saved as regular or User File, Draw and Paint information will be lost.
2- Regular Internal Windows can be saved to all files.
3- All files are loaded 2 frames after receiving a Load command EXCEPT if Internal Windows were enabled when these files were saved.
4- Files saved with Internal Windows enabled do NOT have a fixed Load time.
5- Files with Internal Windows enabled should be saved as Quick Save files to guarantee 2-frame load time.

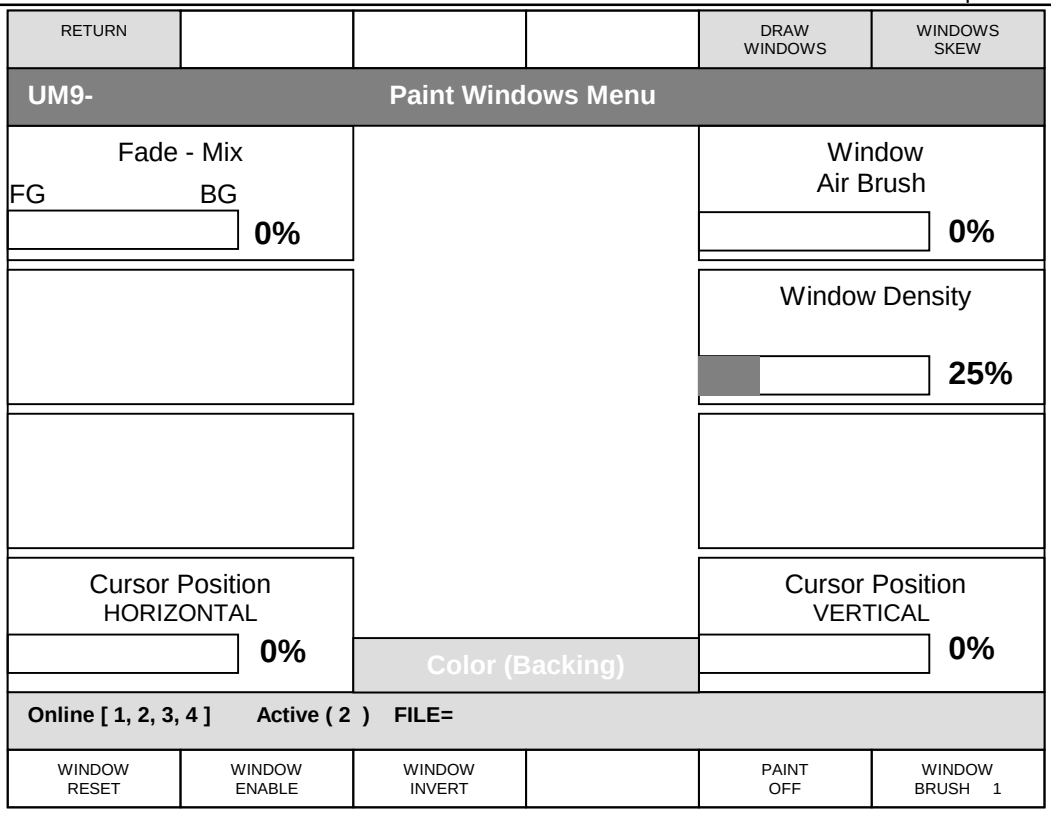


Figure 28: Paint Windows Menu

XXV. PAINT WINDOWS MENU

A mouse is required to use the Paint feature. To paint, hold down the left mouse button. To erase, hold down the right mouse button.

1. Cursor Position Horizontal
Shows the cursor position as a percent of the horizontal screen. Cursor is positioned with mouse.

2. Cursor Position Vertical
Shows the cursor position as a percent of the vertical screen. Cursor is positioned with mouse.

3. Window Air Brush
Adjusts the flow rate of the airbrush.

4. Window Density
Adjusts the transparency of the brush.

5. Paint On / Off
Enables or disables paint mode.

6. Window Brush
Selects the size of the brush as a value of 1-8.

VERY IMPORTANT:

Window Draw and Paint information can ONLY be saved as Quick Save Files. If saved as regular or User File, Draw and Paint information will be lost.
Regular Internal Windows can be saved to all files.
All files are loaded 2 frames after receiving a Load command EXCEPT if Internal Windows were enabled when these files were saved.
Files saved with Internal Windows enabled do NOT have a fixed Load time.
Files with Internal Windows enabled should be saved as Quick Save files to guarantee 2-frame load time.

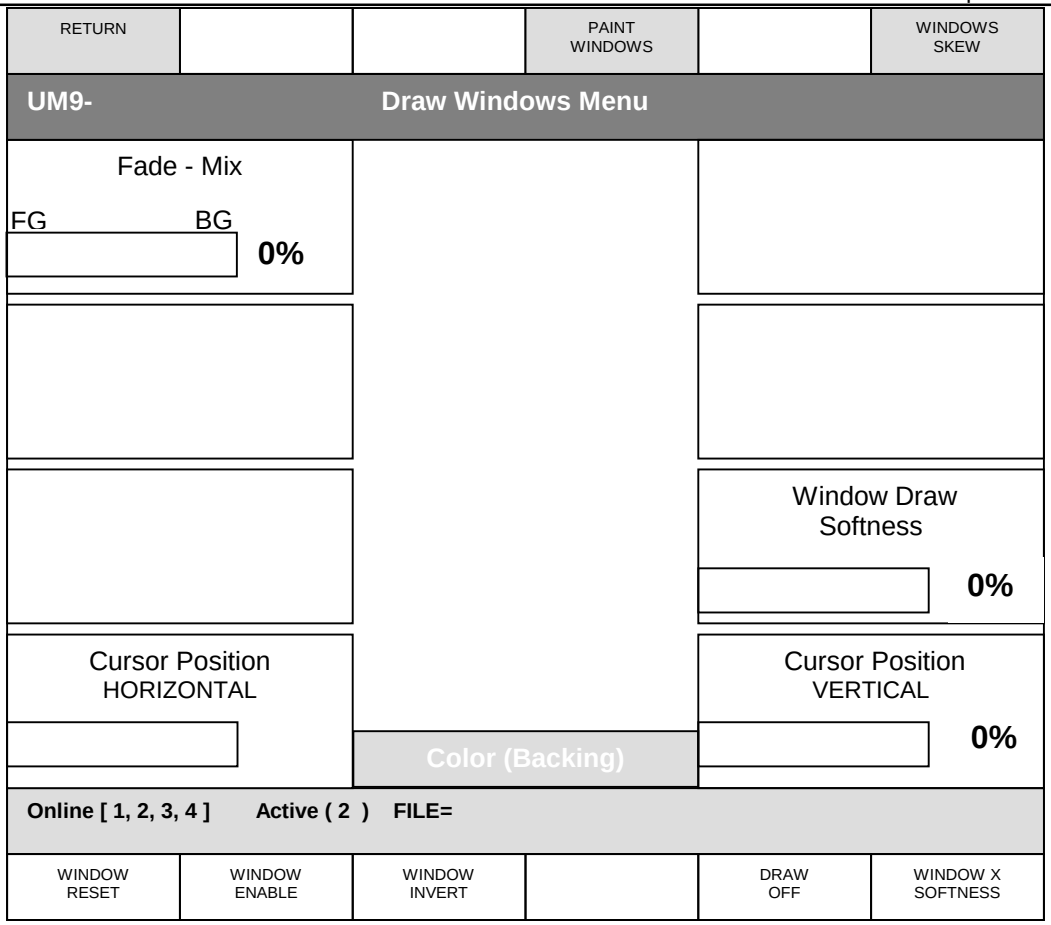


Figure 29: Draw Windows Menu

XXVI. DRAW WINDOWS MENU

A mouse is required to use the Draw feature. To draw, hold down the left mouse button. To erase, hold down the right mouse button.

1. Window Softness

Adjusts the softness of Horizontal or Vertical edges of Window Draw as selected by WINDOW X SOFTNESS or WINDOW Y SOFTNESS button (toggle function). The response of adjusting this control is not immediate as it takes a few seconds for the system to calculate the softness rate.

2. Cursor Position Horizontal

Shows the cursor position as a percent of the horizontal screen. Cursor is positioned with mouse.

3. Cursor Position Vertical

Shows the cursor position as a percent of the vertical screen. Cursor is positioned with mouse.

4. Windows X (Y) Softness

This button selects the direction (horizontal or vertical) of the DRAWN window edges that will be softened by the Window Softness control.

VERY IMPORTANT:

Window Draw and Paint information can ONLY be saved as Quick Save Files. If saved as regular or User File, Draw and Paint information will be lost.
Regular Internal Windows can be saved to all files.
All files are loaded 2 frames after receiving a Load command EXCEPT if Internal Windows were enabled when these files were saved.
Files saved with Internal Windows enabled do NOT have a fixed Load time.
Files with Internal Windows enabled should be saved as Quick Save files to guarantee 2-frame load time.

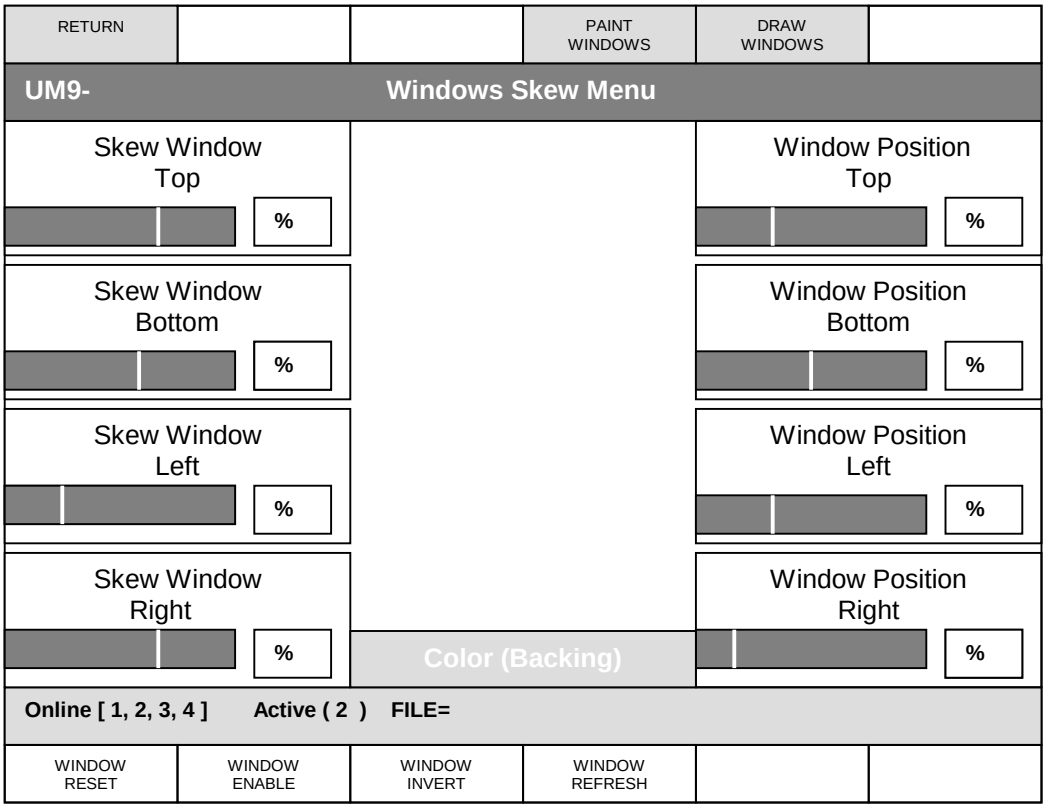


Figure 30: Windows Skew Menu

XXVII. WINDOWS SKEW MENU

1. Skew Window Top

This control pivots the top edge of the window from its midpoint.

2. Skew Window Bottom

This control pivots the bottom edge of the window from its midpoint.

3. Skew Window Left

This control pivots the left edge of the window from its midpoint.

4. Skew Window Right

This control pivots the right edge of the window from its midpoint.

5. Window Position Top

This knob adjusts the position of the top edge of the window. The default position is beyond the top of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the bottom of the frame.

6. Window Position Bottom

This knob adjusts the position of the bottom edge of the window. The default position is beyond the bottom of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the top of the frame.

7. Window Position Left

This knob adjusts the position of the left edge of the window. The default position is beyond the left side of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the right side of the frame.

8. Window Position Right

This knob adjusts the position of the right edge of the window. The default position is beyond the right side of the frame. As it is dialed in, the edge moves into the frame and goes all the way to the left side of the frame**.**

9. Window Enable

Selecting this button will toggle the internal window OFF and ON. The default setting of this button is ON. The Window controls will have no effect on the output image when this button is turned OFF.

When the Window Enable button is turned OFF, all positional parameters set with the Window Controls and Window Edge Softness controls are stored. They are re-activated when the Window Enable is turned back ON, unless File Clear has been selected in the meantime.

10. Window Invert

Selecting this button will invert the polarity of the internal window. When the button is OFF, the window masks a rectangular area starting from the edge of the frame. When the button is ON, the window masks a rectangular area within the frame.

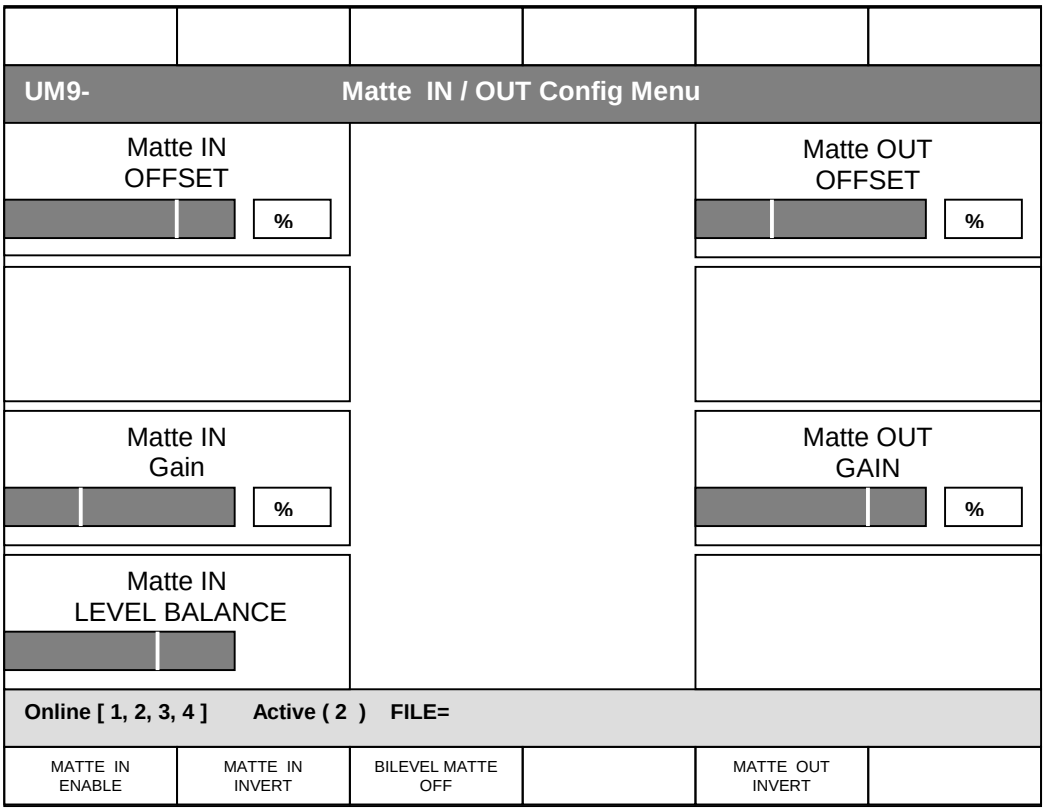


Figure 31: Matte In / Out Configuration Menu

XXVIII. MATTE IN / OUT CONFIGURATION MENU

A Matte In signal is a monochrome signal, generated by an external source to Ultimatte-9, that is used to force parts of the BG scene to appear in front of the FG subject in the final composited image. This is done by turning off the FG subject in the areas specified by the Matte In signal and turning on the BG scene instead. A 100% white Matte In signal level indicates 100% BG scene and no FG subject, a 0% signal indicates full FG subject and no BG scene, and all gray levels of the matte signal indicate a proportional mix between the FG subject and the BG scene.

In most situations, if the incoming matte signal has the appropriate black and white levels, there is no need to make any adjustments to Matte In Offset, Matte In Gain, and Matte In Level Balance controls. At their default settings, these controls will allow the Matte In signal level to proportionally turn off the FG subject and turn on the BG scene.

There are some situations, however, where the Matte In signal should influence the FG and BG elements at different rates. An example is a semitransparent sheet of glass in the BG scene. If the FG subject needs to be behind the glass, the level of the FG subject should be reduced by the amount of transparency of the glass, without reducing the level of the glass itself. If the level of the matte signal is reduced less than 100%, both FG and BG will have a reduced level. This will give a mixed look, which is not what was desired. The matte signal associated with the glass should still be 100% white. With Matte In Level Balance control centered, the glass will be 100% opaque in front of the FG subject. By adjusting this control towards the BG, the Matte In signal will force the glass 100% in front of the FG, but will only partially reduce the level of the FG subject. This will produce the desired look.

1. Matte IN Offset

This control adjusts the overall offset of the Matte In signal. If the incoming signal does not have its black level set correctly, adjusting the Matte In Offset control can establish the proper black level. In most situations, the Matte In Offset adjustment would require additional adjustment of the Matte In Gain control.

2. Matte IN Gain

This control adjusts the gain of the external matte signal connected to the Ultimatte-9 and selected as a Matte IN source from the Configuration Menu. If the Matte In signal is not 100% white in the area where you want the BG image to be completely on, adjusting Matte In White Level will have the same effect as adjusting the signal level at its source.

The default setting for Matte In Gain is 100%. After File Clear, any signal selected as Matte In will not have any effect on the composite image until the Matte In Enable button is turned ON.

3. Matte IN Level Balance

In most situations, this control remains at its default position in the center, where it will allow the Matte In signal to equally influence the FG and the BG elements. Turning this control towards the BG direction will gradually reduce the influence of the Matte In signal on the FG, while maintaining full influence on the BG. Turning this control towards the FG will have the reverse effect.

4. Matte OUT Offset

Alters the offset of the Matte Out signal from its default setting.

5. Matte OUT Gain

The Matte Out Gain control affects only the matte signal that is supplied to the Matte OUT connector. This control does not have any effect on the matte signal used internally in the Ultimatte-9.

Internal to the unit, the matte signal is set so that fully opaque FG objects are at 0% black and peak backing areas are at 100% white. The Matte Out output complies to specifications set by CCIR-601 with 100% white is set at 234 for 8-bit output and 940 for 10-bit output. Similarly, 0% black is set at 16 for 8-bit and 64 for 10-bit output.

The Matte Out Gain adjusts the level of the Matte OUT from the white end. This control can lower the Matte OUT gain to 0% or push it into the legal ceiling.

6. Matte IN Enable

Selecting this button will toggle the MATTE IN signal ON and OFF. The default setting of this button is OFF. The MATTE IN SETUP controls will have no effect on the output image until this button is turned ON**.**

7. Matte IN Invert

An Ultimatte matte signal polarity is the inverse of the type of key signal normally used in a keyer. An Ultimatte matte signal has a black silhouette corresponding to the FG subject against a white field corresponding to the backing, where the BG scene will be added. Selecting MATTE IN INVERT will invert the polarity of the incoming Matte signal.

8. Bilevel Matte Off

See Section XXII-1: Defocus Mask.

9. Matte OUT Invert

Selecting MATTE OUT INVERT will invert the polarity of the matte signal going to the MATTE OUT connector. It has no effect on the matte signal used internally. A lit button indicates that the MATTE OUT signal is inverted. See MATTE IN INVERT regarding polarity.

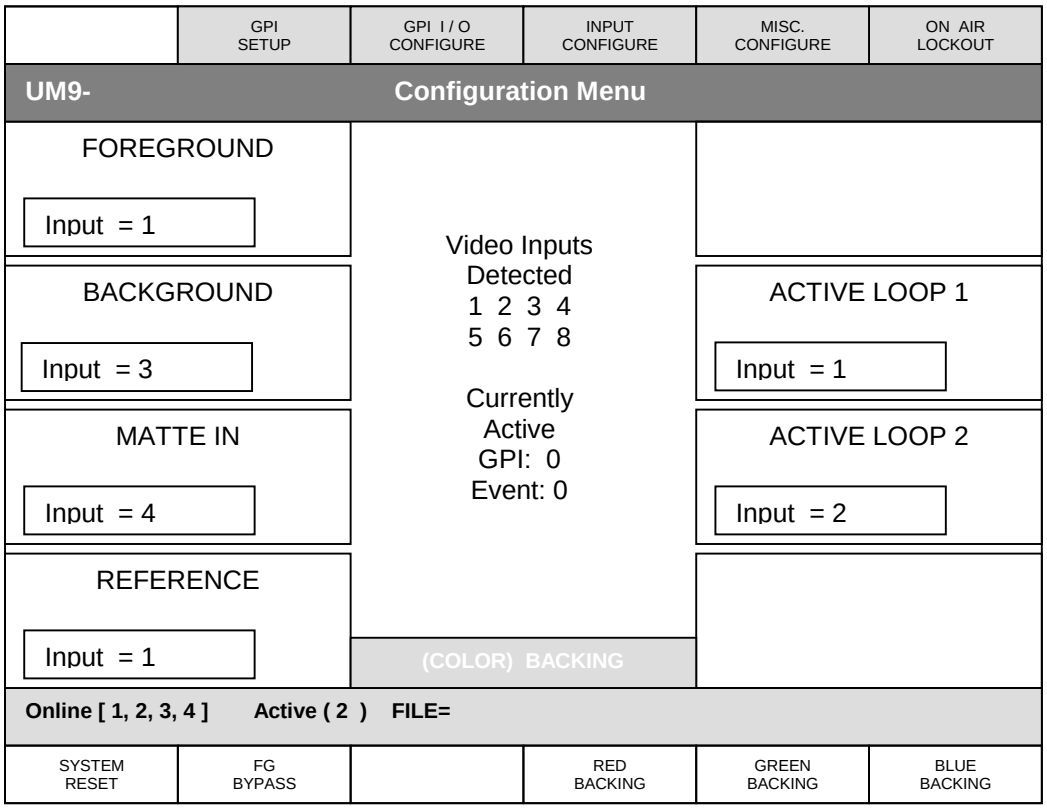


Figure 32: Configuration Menu

XXIX. CONFIGURATION MENU

1. Foreground

Selects any one of the eight input sources to be the FG input. Press ENTER in the FUNCTION block to accept the selection.

2. Background

Selects any one of the eight input sources to be the BG input. Press ENTER in the FUNCTION block to accept the selection.

3. Matte In

Selects any one of the eight input sources to be the 'Matte IN' input. Press ENTER in the FUNCTION block to accept the selection.

4. Reference

Selects any one of the eight input sources to be the Reference input. Press ENTER in the FUNCTION block to accept the selection.

5. Loop Through 1

Selects any one of the eight input sources to be connected to this output. Press ENTER in the FUNCTION block to accept the selection.

6. Loop Through 2

Selects any one of the eight input sources to be connected to this output. Press ENTER in the FUNCTION block to accept the selection.

7. System Reset

Resets the Ultimatte-9 to the factory default settings. The backing color will default to blue.

8. FG Bypass

Puts the system in bypass mode with the FG signal connected to the output.

9. Red Backing

Selects RED as the Backing color

10. Green Backing

Selects GREEN as the Backing color

11. Blue Backing

Selects BLUE as the Backing color.

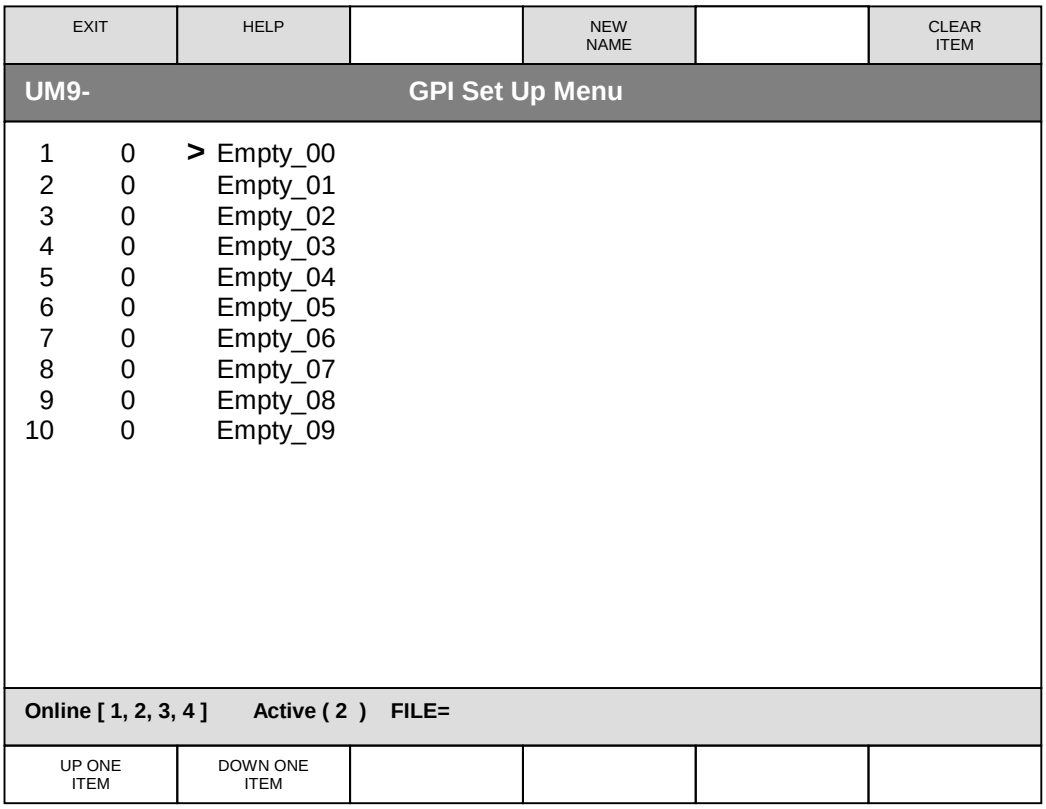


Figure 33: GPI Setup Menu

XXX. GPI SETUP MENU

(Refer to page 7 for the connector pin out of the GPI port on the back of the Main Unit).

1. Up One Item

Moves the selection bar up one item

2. Down One Item

Moves the selection bar down one item

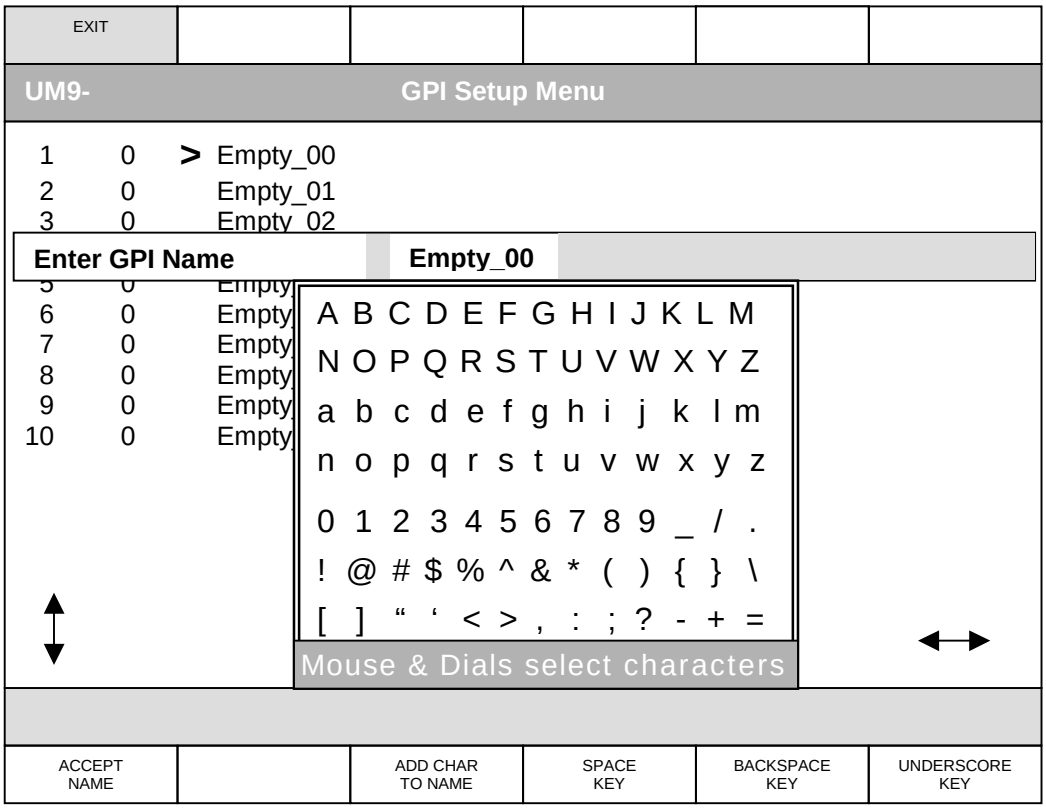


Figure 34: GPI File Name Menu

XXXI. GPI FILE NAME MENU

Move cursor to desired name letter/character using mouse or knobs. Left knobs move cursor vertically, right knobs horizontally. Press ADD CHAR TO NAME to add letter/character.

1. Accept Name

Accepts file name and returns to GPI Setup Menu.

2. Add Char To Name

Adds selected letter/character to file name.

3. Space Key

Adds a space to file name.

4. Backspace Key

Deletes last letter or character in file name.

5. Underscore Key

Adds an underscore to file name.

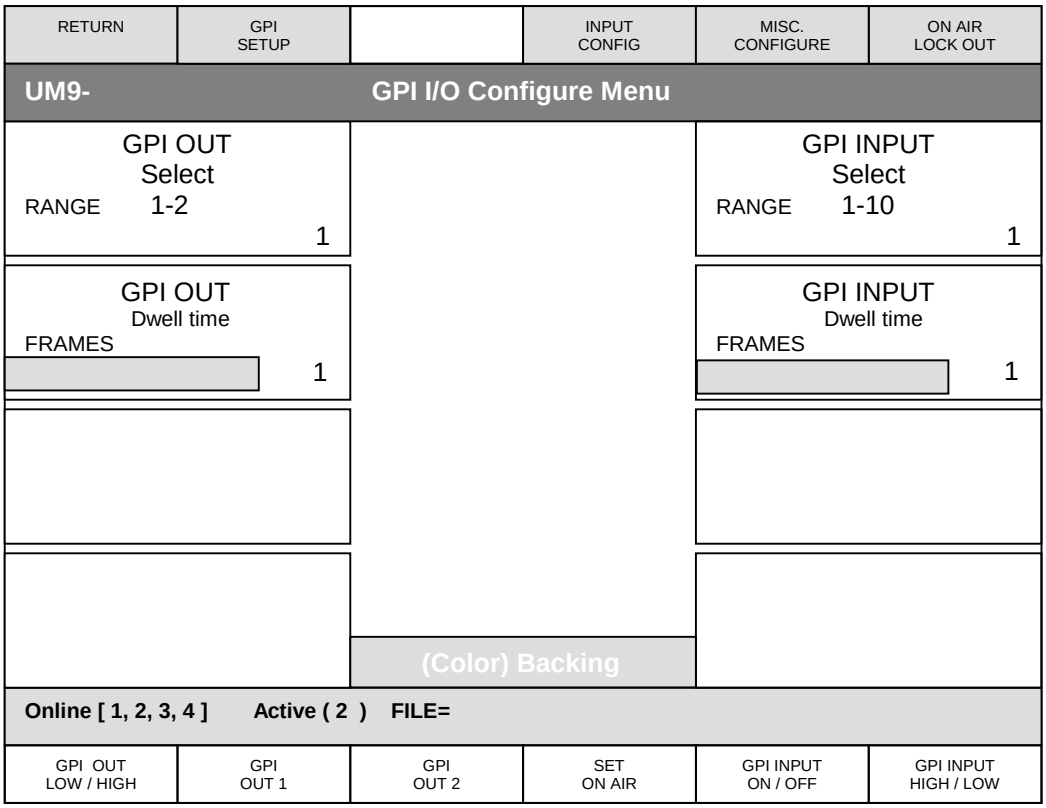


Figure 35: GPI I/O Configure Menu

XXXII. GPI I/O CONFIGURE MENU

1. GPI OUT Select

Selects the GPI output (1 or 2).

2. GPI OUT Dwell Time

The period depends on the frame time and the number of frames (1-120).

3. GPI INPUT Select

Selects the GPI Input (1 to 10).

4. GPI INPUT Dwell Time

The period depends on the frame time and the number of frames (1-120). This is a delay between actually detecting a GPI Input and that of actual execution of the GPI list.

5. GPI OUT HI/LOW

Determines whether the output level should be high or low. Pressing the switch toggles the level.

6. GPI OUT 1

This provides a programmable pulse output, whose width and level is dependent on GPI OUT HI/LOW and GPI OUT Dwell Time.

7. GPI OUT 2

This provides a programmable pulse output, whose width and level is dependent on GPI OUT HI/LOW and GPI OUT Dwell Time.

8. Set On Air

This is a signal from a camera signifying that it is active (ON AIR) and comes in as a GPI Input bit.

9. GPI Input ON/OFF

This function enables / disables GPI Inputs, however if SET ON AIR is enabled, the GPI Input bits that have been assigned to the ON AIR function will override the same bits assigned to the normal GPI input bits.

10. GPI Input HIGH /LOW

Enables the software to detect either low to high or high to low transitions of the GPI inputs.

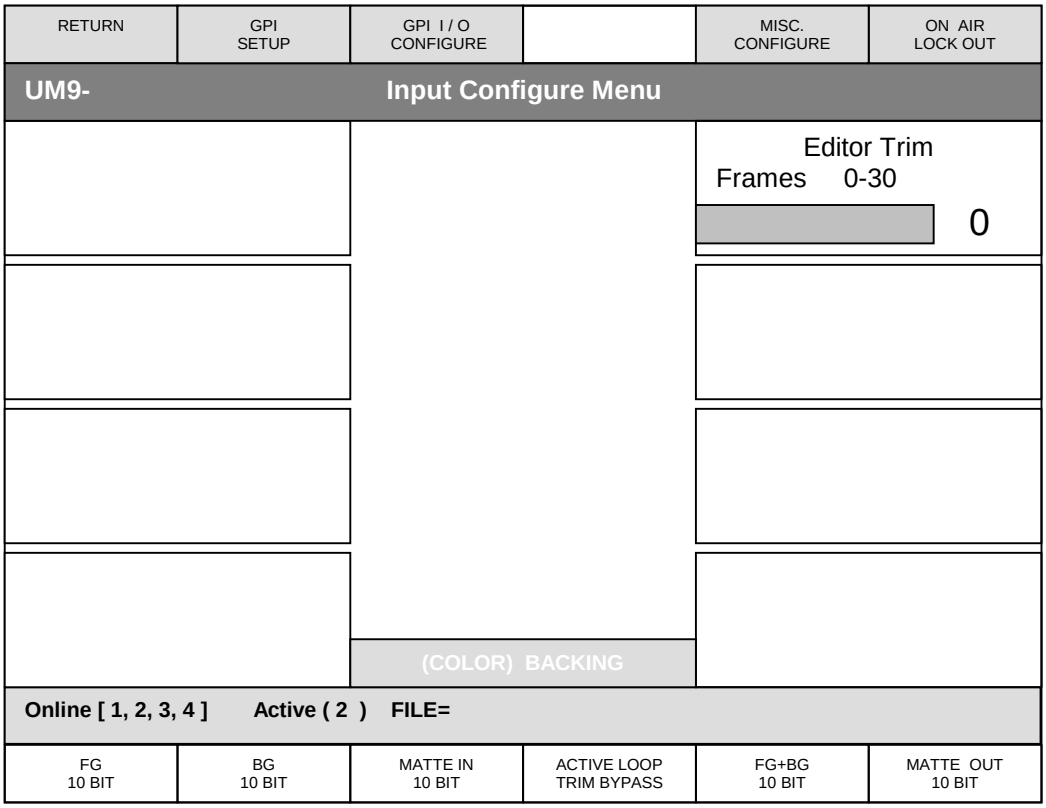


Figure 36: Input Configure Menu

XXXIII. INPUT CONFIGURE MENU

1. Editor Trim

Delays the execution of commands from the Editor, GPI inputs, or Files Loads (including Quick Loads) by the number of frames selected (1 – 30). If ACTIVE LOOP TRIM BYPASS button is enabled, the active Loop Out changes will be excluded from the selected delay. This configuration allows the user to change the Loop Out configuration a selected number of frames earlier than the rest of the internal configuration.

Warning: The Loop Out configuration switching is not a "clean" switch. The output signal may glitch randomly.

2. FG 10/8 bit

Selects 10/8 bit format.

3. BG 10/8 bit

Selects 10/8 bit format

4. Matte In 10/8 bit

Selects 10/8 bit format

5. Active Loop Trim Bypass

When enabled, this function will allow the Loop Out configuration to be excluded from the selected Editor Trim delay.

6. FG+BG 10/8 bit

Selects 10/8 bit format

7. Matte Out 10/8 bit

Selects 10/8 bit format

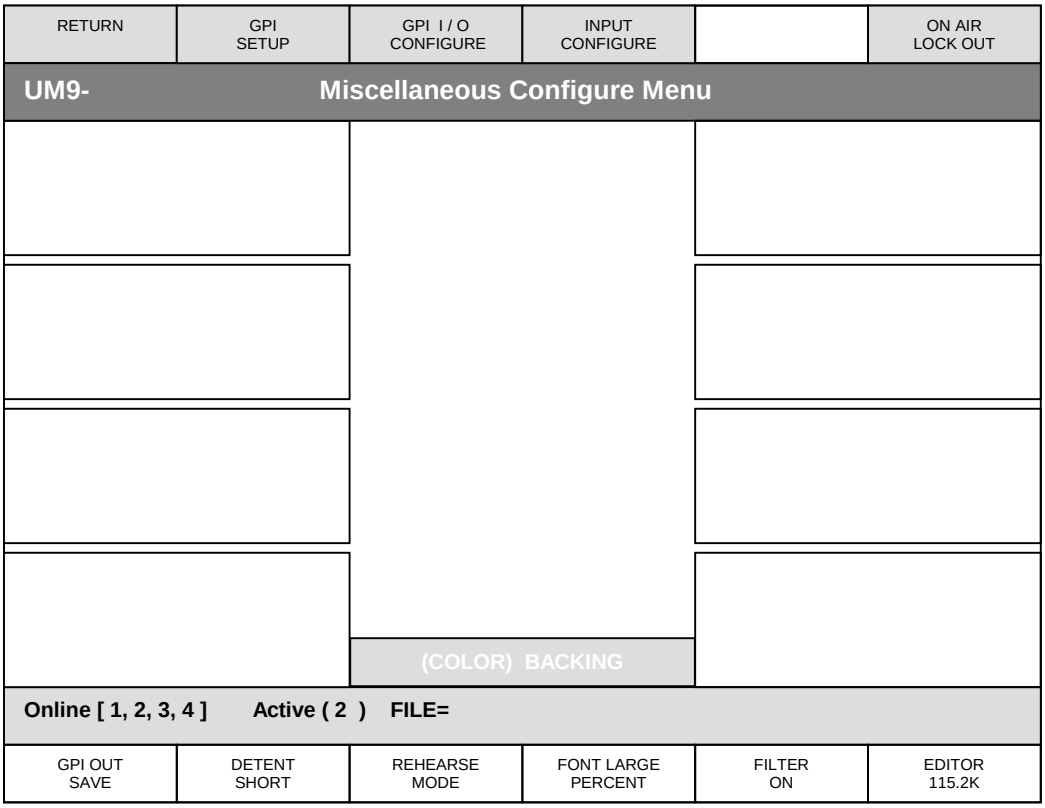


Figure 37: Miscellaneous Configure Menu

XXXIV. MISCELLANEOUS CONFIGURE MENU

1. GPI Out Save

When selected, saves GPI Output (1 or 2) settings with the file.

2. Control Knob Detents

Adjusts software detent, or dead spot, at default position on Control Knobs.
Detent Short sets a short detent.
Detent Long sets a longer detent.
Detent Off disables detent.
Note: Master Control Knobs will not be affected by detent selection.

3. Rehearse Mode

When a unit is selected to be ON AIR, all functions that were designated as ON AIR LOCKOUT will not be available to the user. During rehearsal times, the user may choose not to lockout the designated functions, in order to make adjustments to the units. In this situation, instead of removing individual ON AIR LOCKOUT restrictions from individual controls and buttons, enabling the REHEARSE MODE will bypass the lockout. When rehearsing is over and the unit will actually go on air, the REHEARSE MODE is disabled to restore all designated lockout functions.

4. Font Percent

Changes size of percent display text, large or small.

5. Filter On

Enables or disables the use of the FIR filters in the Color Space Converters**.**

6. Editor 115.2K

Select Editor baud rate between 38.4K and 115.2K

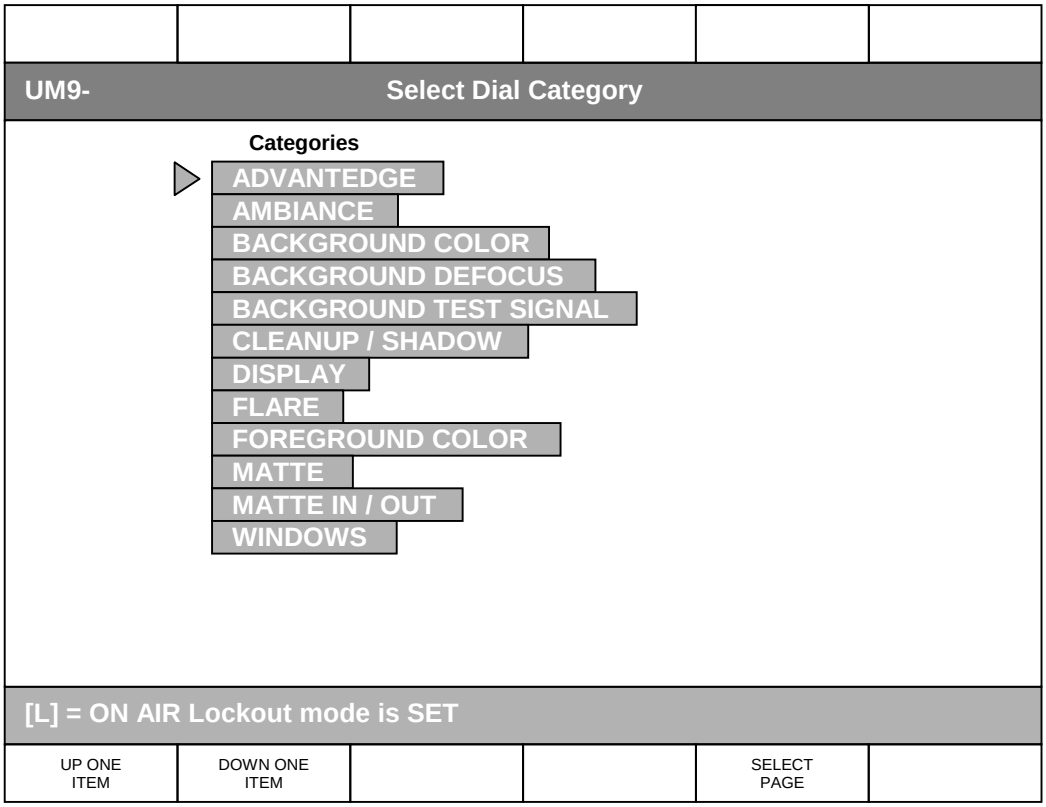


Figure 38: Select Dial Category Menu

XXXV. ON AIR LOCKOUT MENU
(SELECT DIAL CATEGORY PAGE SELECT MENU)

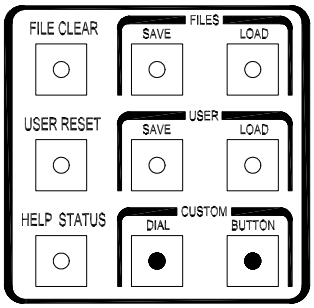
Selects Controls that can be locked out, or disabled, when Unit is ON AIR.

1. On Air Lockout
When a unit is selected to be ON AIR, it is important to prevent accidental adjustments of certain dials or pressing of certain buttons. Through ON AIR LOCKOUT menus, the operator can designate certain controls and buttons to be locked out when the unit is on air. At any time, like during rehearsal times, these locked out functions can be bypassed, without losing the selections. Enabling the REHEARSE MODE button can do this.

2. Up One Item
Moves the selection bar up one item

3. Down One Item
Moves the selection bar down one item

4. Select Page
Press this button to exit to the Select Dial Controls Menu.



Note: This Menu and the Select Buttons Menu may be accessed with the DIAL and BUTTON buttons, (when lighted), in the Custom section on the right side of the Smart Remote.

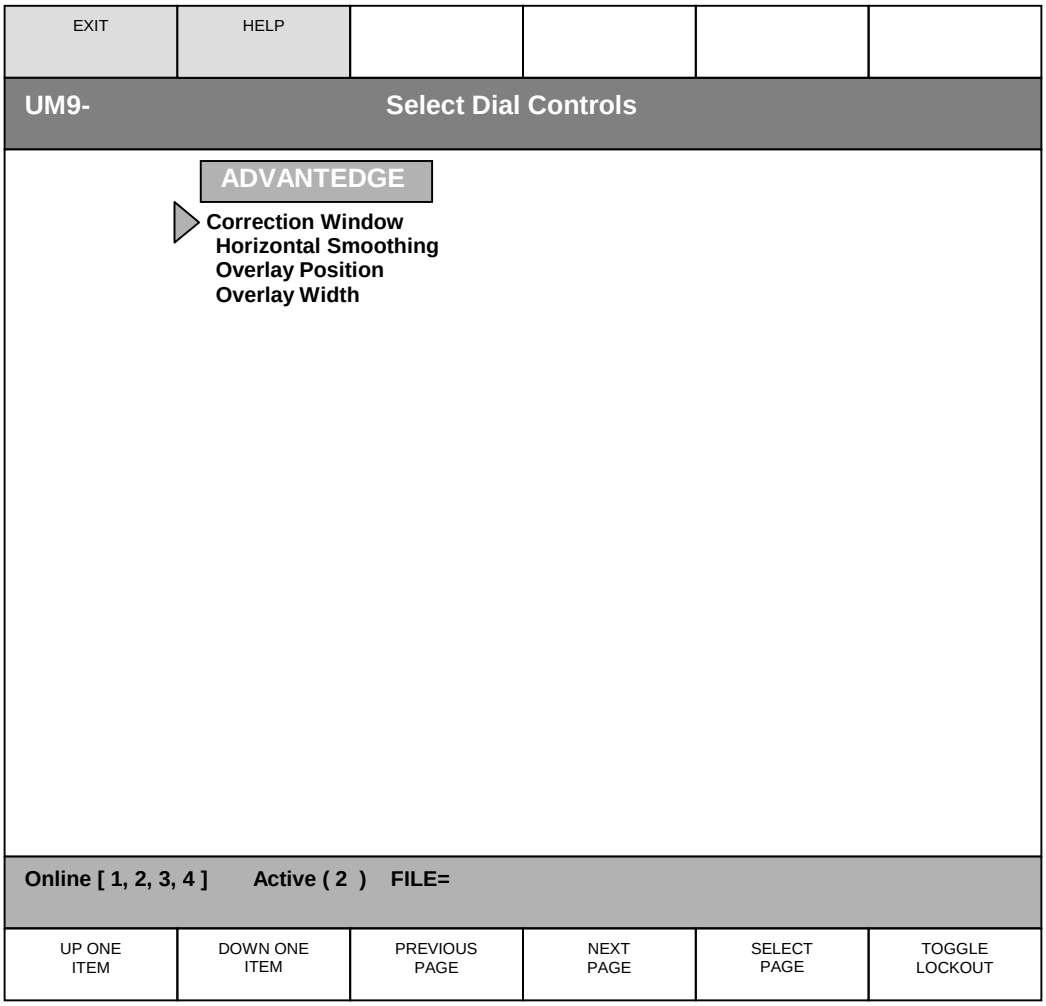


Figure 39: Select Dial Controls Menu

XXXVI. ON AIR LOCKOUT DIAL CATEGORY MENU

1. Up One Item

Moves the selection bar up one item

2. Down One Item

Moves the selection bar down one item

3. Previous Page

Returns to previous Dial Control Category.

4. Next Page

Goes to next Dial Control Category.

5. Select Page

Press this button to exit to the Select Dial Category Menu.

6. Toggle Lockout

Locks or unlocks selected Dial. [L] indicates selected Dial is locked out.

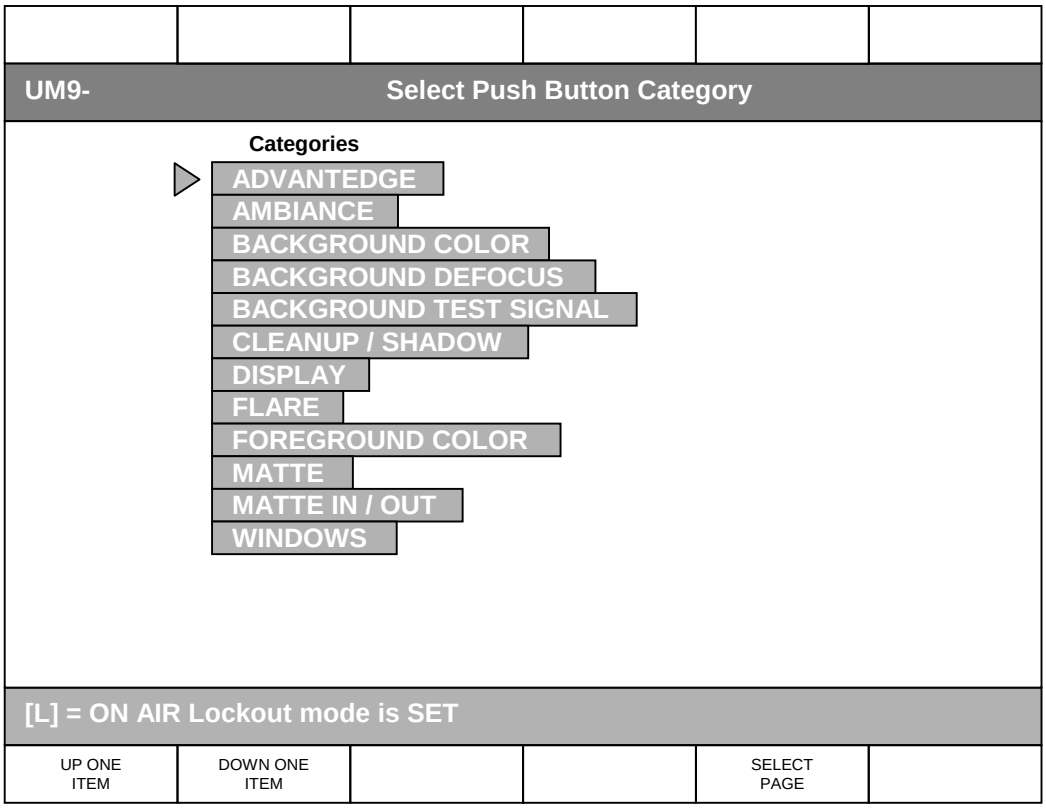


Figure 40: Select Push Button Category Menu

XXXVII. ON AIR LOCKOUT PUSH BUTTON PAGE SELECT MENU

1. Up One Item

Moves the selection bar up one item

2. Down One Item

Moves the selection bar down one item

3. Select Page

Press this button to exit to the Select Push Buttons Menu.

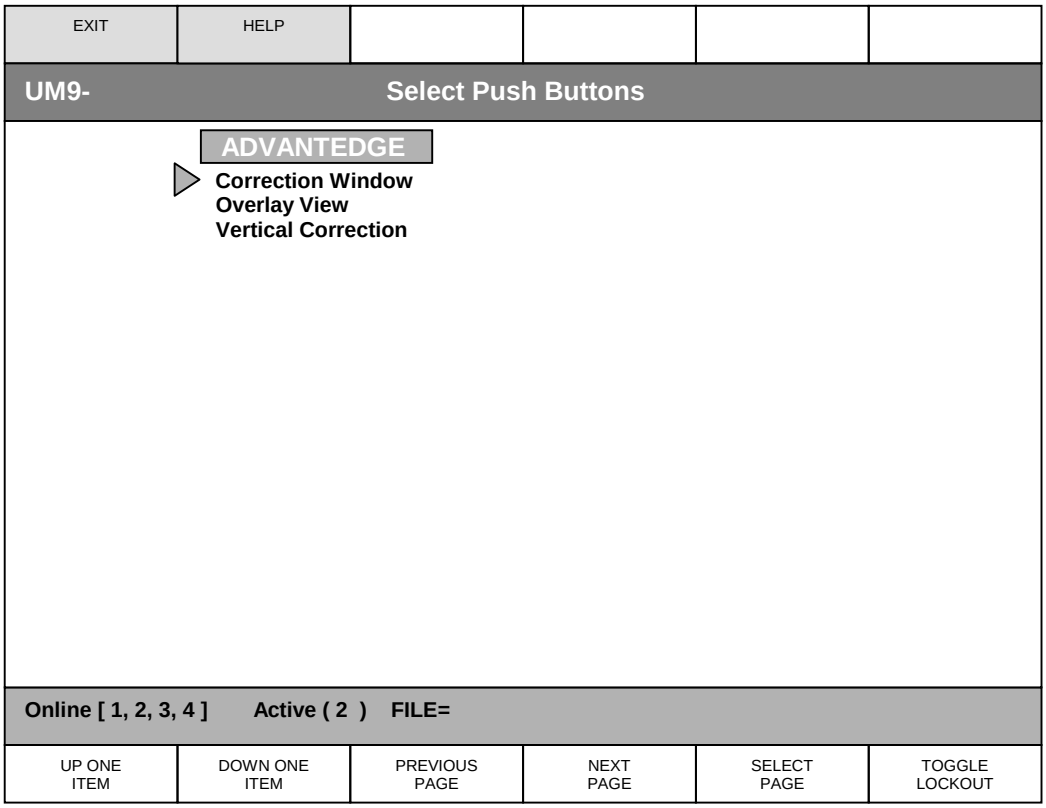


Figure 41: Select Push Buttons Menu

XXXVIII. ON AIR LOCKOUT SELECT PUSH BUTTONS MENU

1. Up One Item

Moves the selection bar up one item

2. Down One Item

Moves the selection bar down one item

3. Previous Page

Returns to previous Push Button Select Category.

4. Next Page

Goes to next Push Button Select Category.

5. Select Page

Press this button to exit to the Select Push Button Category Menu.

6. Toggle Lockout

Locks or unlocks selected Push Button. . [L] indicates selected Push Button is locked out.

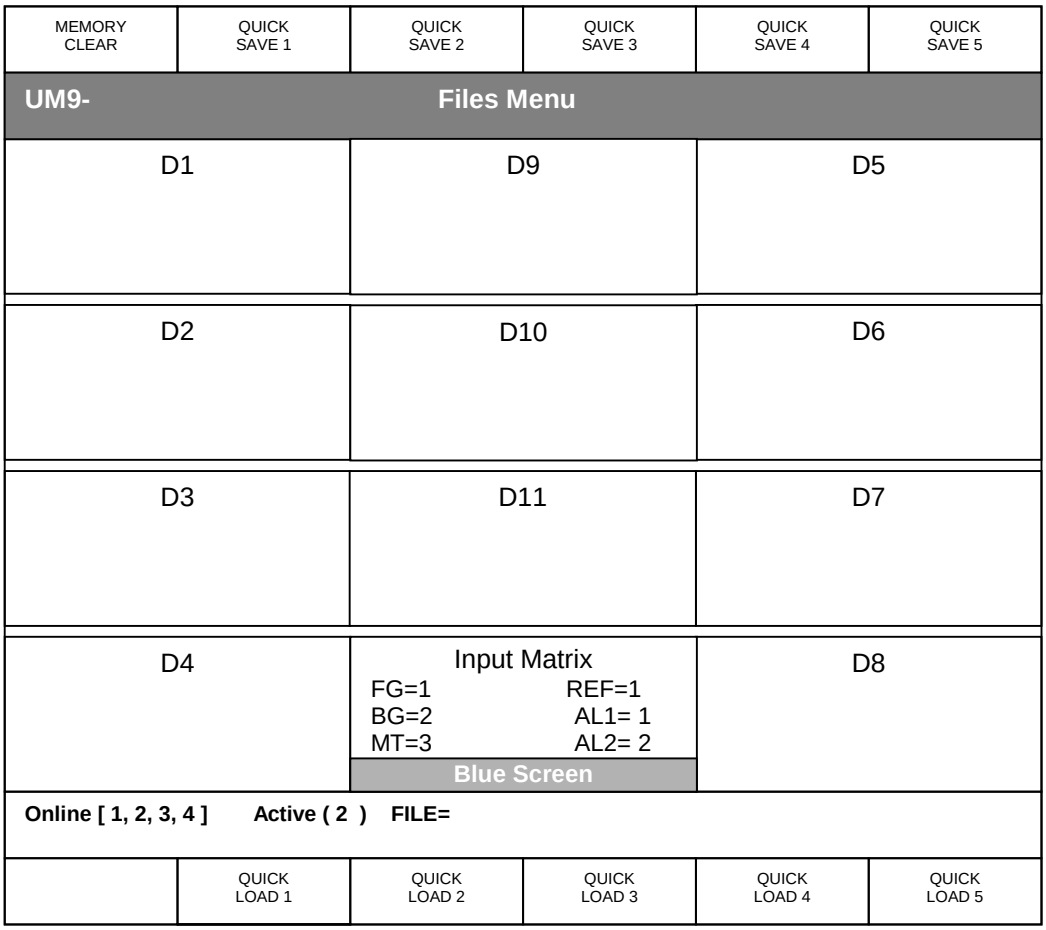


Figure 42: Files Menu

XXXIX. FILES MENU

This menu allows the user to save up to five (5) setups and recall them quickly. These setups could be current workspace files, or any file loaded from the FILES SAVE/LOAD section on the right side of the Smart Remote. The operator can also assign up to eight (8) control knob functions to the D1 – D8 locations, in order to make adjustments and save the parameters without leaving the FILES menu.

1. Quick save

Saves the control settings of five different setups.

2. Quick Load

Recalls the control settings of five different setups.

3. Memory Clear

Clears the contents of non-volatile memory corresponding to: Files, Effects, Quick Saves, and GPIs.

VERY IMPORTANT:

1. Window Draw and Paint information can ONLY be saved as Quick Save Files. If saved as regular or User File, Draw and Paint information will be lost.
2. Regular Internal Windows can be saved to all files.
3. All files are loaded 2 frames after receiving a Load command EXCEPT if Internal Windows were enabled when these files were saved.
4. Files saved with Internal Windows enabled do NOT have a fixed Load time.
5. Files with Internal Windows enabled should be saved as Quick Save files to guarantee a load time of 2 frames.

It is possible to create a temporary custom menu for dials (knobs) only in the Files Menu, to allow the user to change up to eight parameters and save a new file without leaving the Menu. This custom menu will not be saved as part of a file.

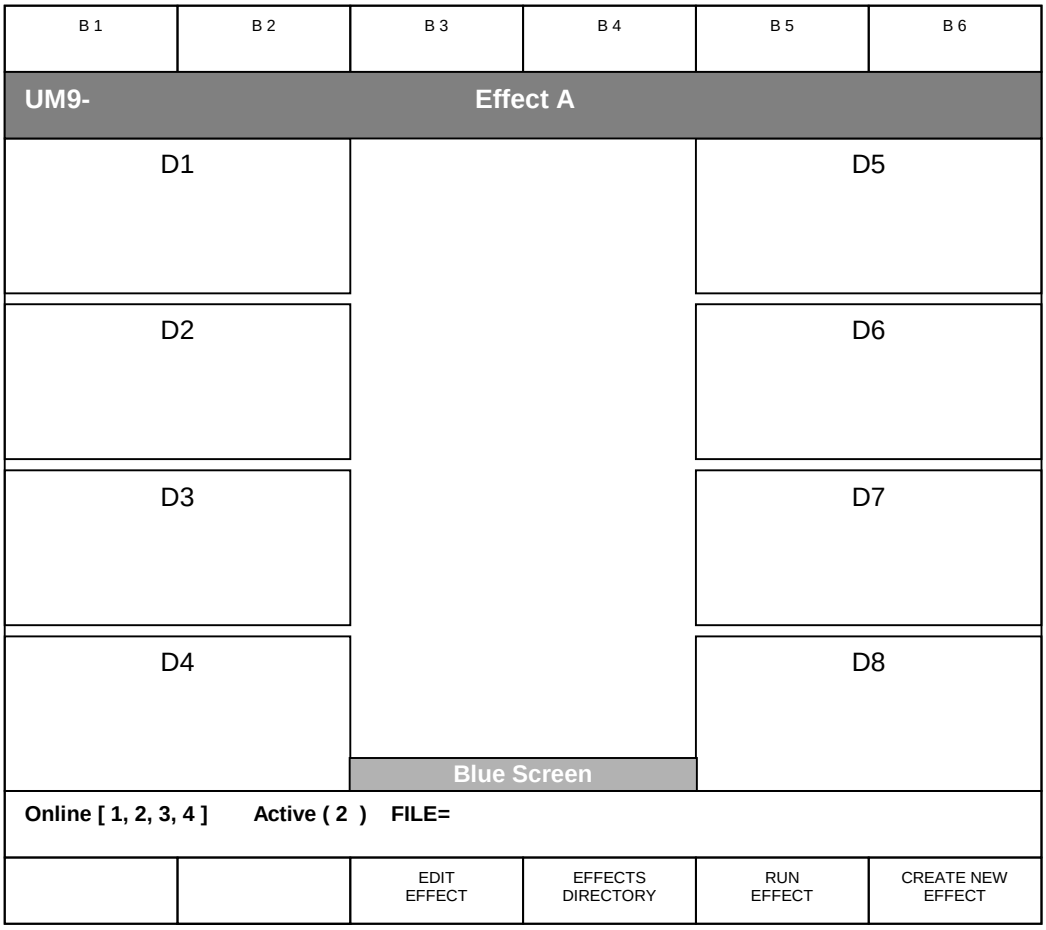


Figure 43: Effects Menu

XL. EFFECTS MENU

1. Edit Effect

Allows the editing of key frames in previously saved and loaded files.

2. Effects Directory

Shows a list of available saved files that can be loaded.

3. Run Effect

Runs the selected effect file.

4. Create New Effect

Accesses Create New Effects Menu where knobs and dials and file name can be assigned.

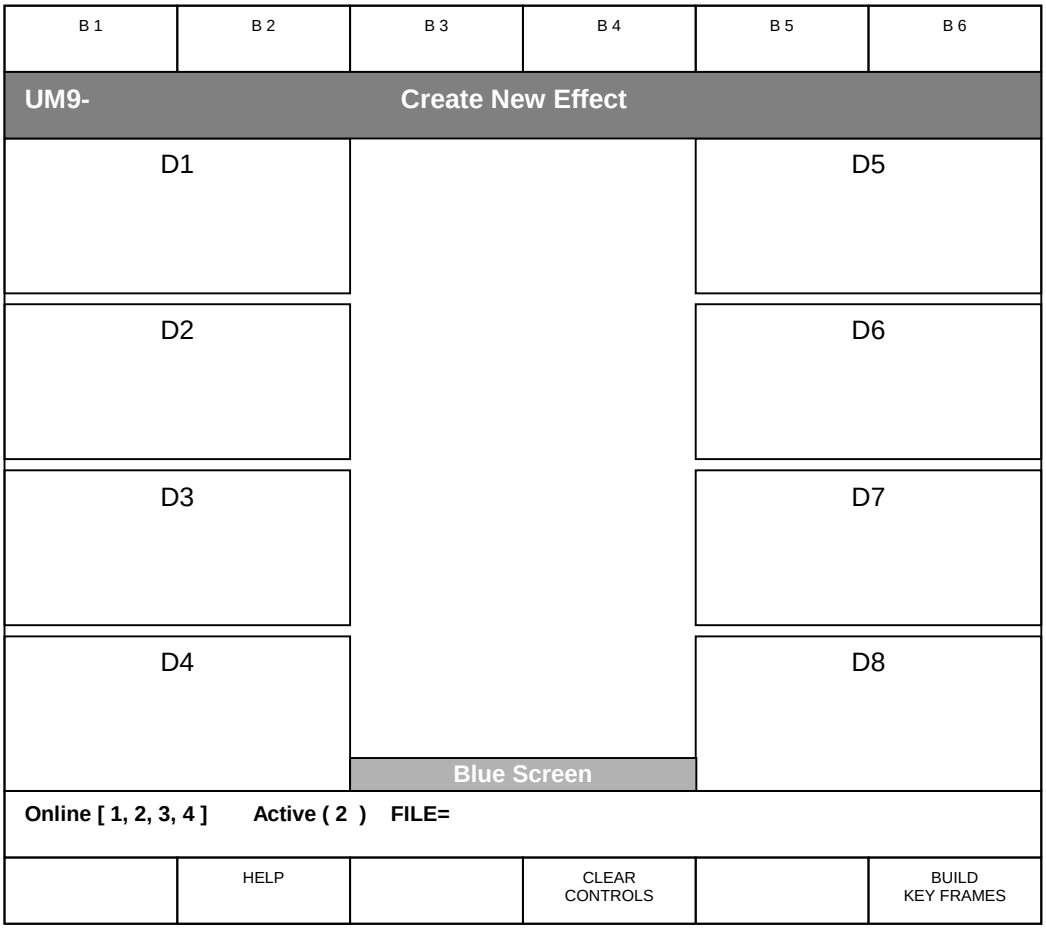
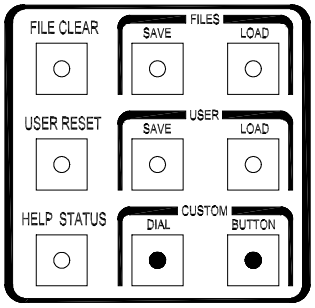


Figure 44: Create New Effect Menu



XLI. CREATE NEW EFFECT MENU

NOTE: Use DIAL and BUTTON buttons under CUSTOM on right side of Smart Remote to select functions for the Dials (D1-D8) and Buttons (B1-B6). See Figure 38, 39, 40 and 41.

1. Clear Controls

Clears Selection of controls and buttons (D1-D8; B1-B6).

2. Build Key Frames

Press this button to exit to Effect File Name Menu.

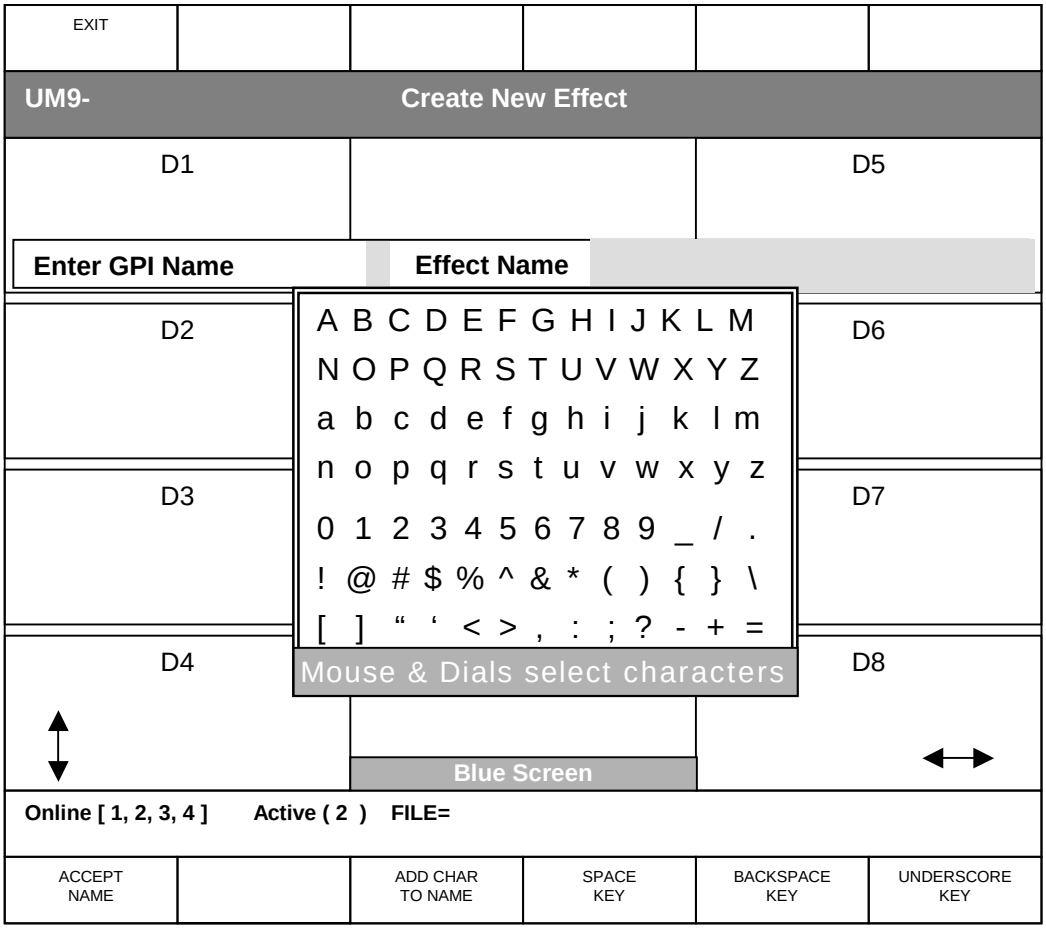


Figure 45: Effect File Name Menu

XLVII. EFFECT FILE NAME MENU

Use left knobs to move cursor vertically, right knobs to move horizontally or use mouse.

1. Accept Name

Accepts file name and returns to Build Effect Key Frame Menu. If file name exists, a confirmation screen will come up to confirm replacing of existing file.

2. Add Char To Name

Adds selected letter/character to file name.

3. Space Key

Adds a space to file name.

4. Backspace Key

Deletes last letter or character in file name.

5. Underscore Key

Adds an underscore to file name.

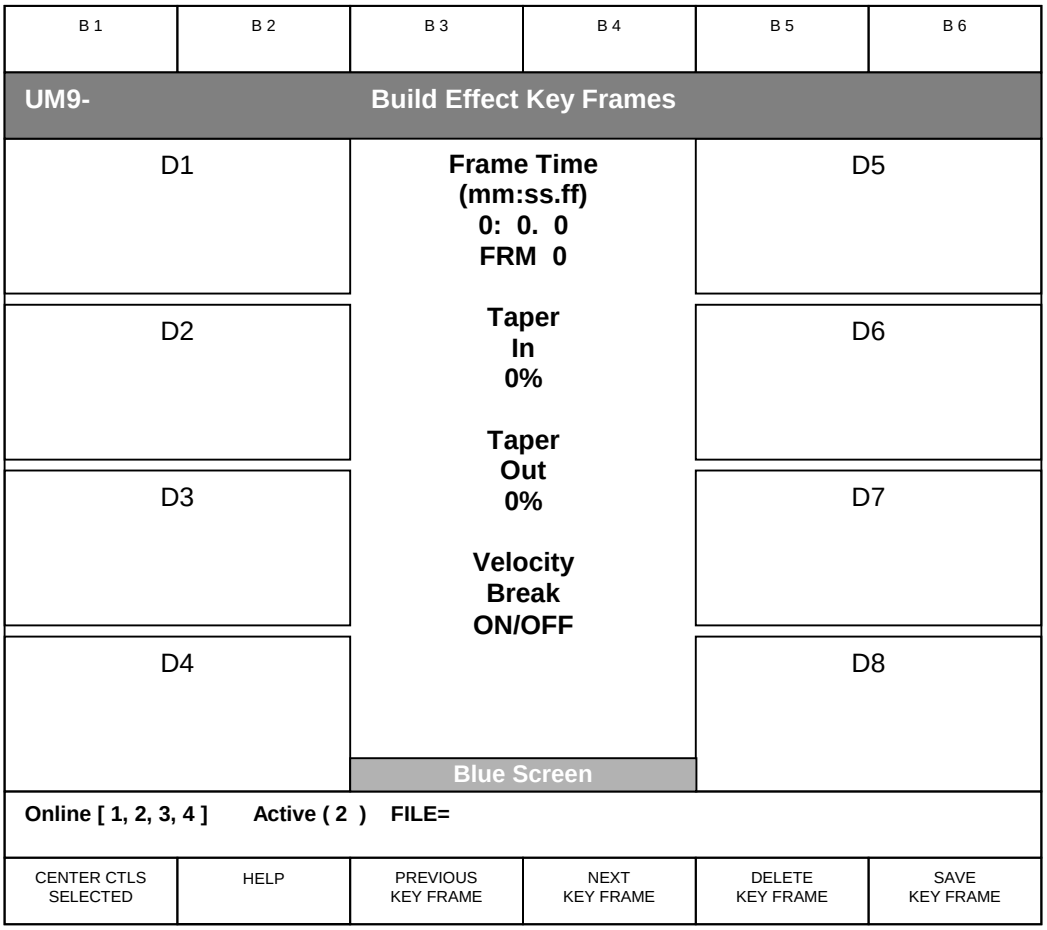


Figure 46: Build Effect Key Frame Menu

XLIII. BUILD EFFECT KEY FRAME MENU

1. Center/Right Controls Selected

Selects either the Right Hand Screen (D5-D8) or Center Screen (D9-D12) to be adjusted by the right hand control knobs.

2. Previous Key Frame

Displays previous key frame and settings.

3. Next Key Frame

Shows next key frame settings or allows them to be set.

4. Delete Key Frame

Removes current key frame from effect.

5. Save Key Frame

Saves settings for that key frame to the effect file.

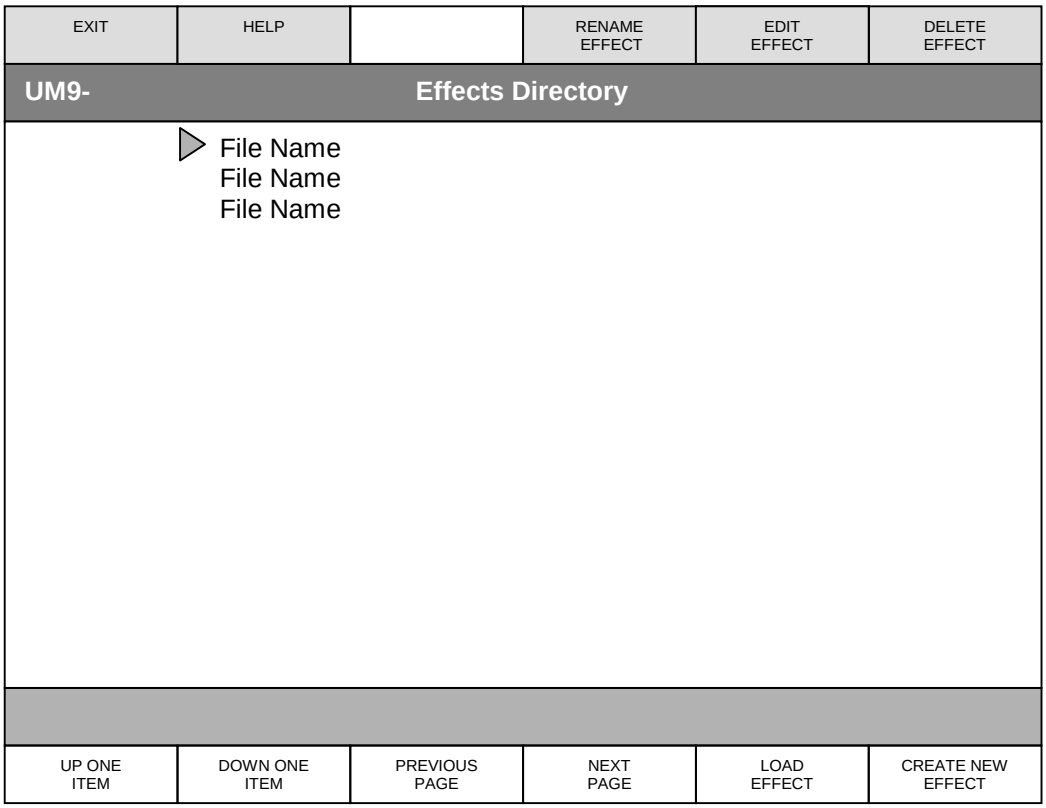


Figure 47: Effects Directory

XLIV. EFFECTS DIRECTORY

1. Up One Item
Moves the selection bar up one item.

2. Down One Item
Moves the selection bar down one item.

3. Previous Page
Returns to previous page list of File Names.

4. Next Page
Goes to next page of File Names.

5. Load Effect
Loads selected Effects File.

6. Create New Effect
Press this button to exit to Create New Effect Menu.

7. Rename Effect
Brings up Effect File Name Menu character selection map to choose new File Name.

8. Edit Effect
Press this button to exit to Build Effects Key Frames Menu to modify Effect File.

9. Delete Effect
Shows list of Files that may be selected and deleted; press DELETE EFFECT to delete.

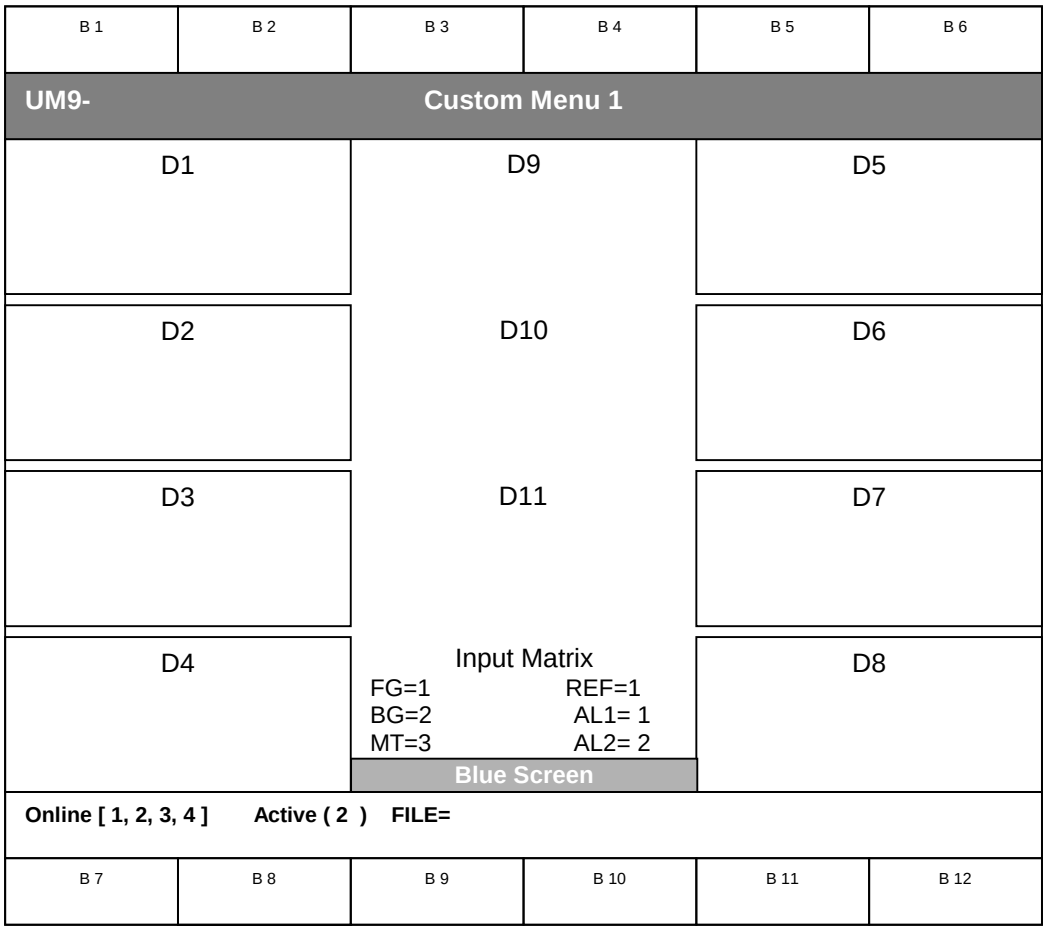


Figure 48: Custom Menus

XLV. CUSTOM MENUS 1-4

In day-to-day operation, an operator uses a relatively limited number of controls and buttons. These controls and buttons are probably located in different menus. The CUSTOM MENUS allow an operator to set up his / her own menus, combining the various controls and buttons from different menus into four (4) menus. If saved as a USER FILE, these four CUSTOM MENUS become part of the operator's user file. Each unit can store up to four (4) CUSTOM MENUS for each of the 20 USER FILES.

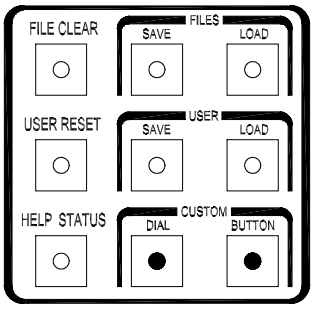
1. D1-D11

Control knob positions to be assigned specific functions. D9-D11 are for displaying control status. There are no actual knobs assigned to them.

2. B1-B12

Button positions to be assigned specific functions.

Use BUTTON and DIAL buttons under CUSTOM on right side of Smart Remote to select dial and button functions. Refer to Figure 38, 39, 40 and 41.



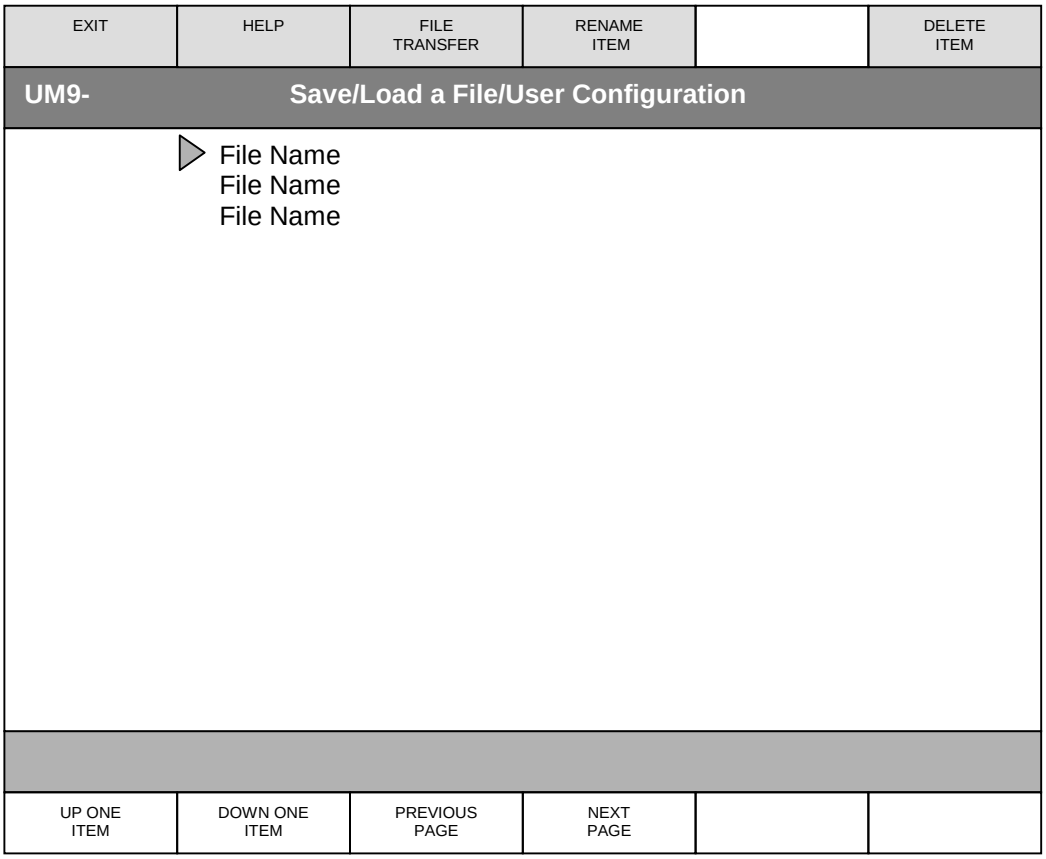
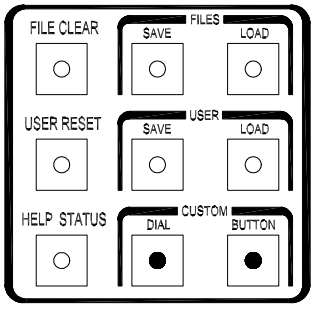


Figure 49: Save/Load a File/User Configuration

XLVI. SAVING AND LOADING FILES

Use FILES and USER Save and Load buttons on right side of Smart Remote to SAVE or LOAD a file at any time. Press SAVE twice or SAVE plus ENTER to access File naming screen. See Figure 34 or 45. Press LOAD twice or LOAD plus ENTER to load a file.



NOTE: The Ultimatte 9 saves the AutoRecover file every fifteen minutes. Loading this file will restore last saved settings.

1. Up One Item

Moves the selection bar up one item.

2. Down One Item

Moves the selection bar down one item.

3. Previous Page

Returns to previous page list of File Names.

4. Next Page

Goes to next page of File Names.

5. File Transfer

Allows transfer of files from one Main Unit to another. More than one Main Unit must be connected to use this feature. Files from one Ultimatte-9 can *only* be transferred to another Ultimatte-9, *not* to an Ultimatte-400 or vice versa.

6. Rename Item

Brings up Effect File Name Menu character selection map to choose new File Name.

7. Delete Item

Shows list of Files that may be selected and deleted; press DELETE ITEM to delete.

APPENDIX

1. Software Communications Protocol

The Ultimatte -9 functions as a slave to the Smart Remote. Up to four (4) Ultimatte-9 units can communicate with the Smart Remote with each having a unique address. The Ultimatte 9 Main Unit will immediately respond to commands from the host.

Smart Remote communication shall be through a RS-422 interface at a baud rate of 115.2K with 8 data bits, odd parity bit and 1 stop bit.

The Smart Remote will communicate with the Ultimatte-9 via a modified Ultimate protocol. Control signals are initiated by the Smart Remote, which in turn gets its display update messages as well as system status.

When communicating through the Editor Port on the main unit, the Ultimatte 9 Editor Port must be configured for either RS-422 or RS-232 (see DIP switch setting on Main Unit) at a baud rate of 115.2K with 8 data bits, odd parity bit and 1 stop bit.

The message block structure is as follows:

Byte	Description
0	Start of Message Bits 0 - 3 Start ID 0010 Bits 4 – 7 (unit ID 1-4)
1	byte count of 2 thru n (256 bytes max) Bytes that follow excluding the End of Message character
2	block type (command)
3 - n	block data (if required)
n + 1	End of Message character Bits 0 - 7 (Checksum, always 0xFF)

```
// command.h
// March 1999
//
#ifndef _command_
#define _command_
//
// message block id's - main to remote
//
#define      returnList_id              0x0000 // return list
#define      addressList_id             0x0001 // address list
#define      currentList_id             0x0002 // current value list
#define      defaultList_id             0x0003 // default value list
#define      changeList_id              0x0004 // change value list
#define      messageList_id             0x0005 // message list
#define      remoteFlashList_id         0x0006 // remote code upload list
#define      remoteFlashOkList_id       0x0007 // remote flash ok
#define      programList_id             0x0008 // main needs program list
#define      flashErrorList_id          0x0009 // flash prog error
#define      flashCheckList_id          0x000a // flash prog ok
#define      resetRemoteList_id         0x000b // reset the remote
#define      remoteEraseFlashList_id    0x000c // erase remote flash
#define      VdSourceCheckList_id       0x000d // return video source input state 0 -7
#define      upLoadUserBlock_id         0x000e // user memory block
#define      upLoadMemoryBlock_id       0x000f // file memory block
#define      userErrorList_id           0x0010 // user download error
#define      userCheckList_id           0x0011 // user download ok
#define      userFinishedList_id        0x0012 // user upload finished
#define      memoryErrorList_id         0x0013 // mem download error
#define      memoryCheckList_id         0x0014 // mem download ok
#define      memoryFinishedList_id      0x0015 // mem upload finished
```

```
#define      upLoadProgramBlock_id      0x0016 // program code block
#define      programFinishedList_id     0x0017 // program upload finished
#define      upLoadSetupBlock_id        0x0018 // setup Block
#define      setupFinishedList_id       0x0019 // setup upload finished
#define      setupErrorList_id          0x001a // setup download Error
#define      setupCheckList_id          0x001b // setup download ok
#define      execSetupErrorList_id      0x001c // setup execute Error
#define      execSetupCheckList_id      0x001d // setup execute ok
#define      upLoadDefaultBlock_id      0x001e // default Block
#define      defaultFinishedList_id     0x001f // default upload finished
#define      defaultErrorList_id        0x0020 // default download Error

#define      defaultCheckList_id        0x0022 // default download ok
#define      execDefaultErrorList_id    0x0023 // default execute Error
#define      execDefaultCheckList_id    0x0024 // default execute ok
#define      currentStateList_id        0x0025 // current state list
#define      defaultStateList_id        0x0026 // default state list
#define      versionBlock_id            0x0027 // current unit version
#define      upLoadEffectBlock_id       0x0028 // Effect block
#define      effectErrorList_id         0x0029 // effect download error
#define      effectCheckList_id         0x002a // effect download ok
#define      effectFinishedList_id      0x002b // effect upload finished
#define      trimFieldsCheckList_id     0x002c // trim fields set ok
#define      trimFieldsErrorList_id     0x002d // trim fields error

#define      upLoadEfxBlock_id          0x0030 // Efx Block
#define      efxFinishedList_id         0x0031 // efx upload finished
#define      efxErrorList_id            0x0032 // efx download Error
#define      efxCheckList_id            0x0033 // efx download ok
#define      execEfxErrorList_id        0x0034 // efx execute Error
#define      execEfxCheckList_id        0x0035 // efx execute ok
#define      gpiCheckList_id            0x0036 // gpi download ok
#define      execGpiErrorList_id        0x0037 // gpi execute Error
#define      execGpiCheckList_id        0x0038 // gpi execute ok
#define      gpiErrorList_id            0x0039 // gpi download error

#define      pollResponseList_id        0x0040 // u9 poll response
#define      upLoadMenuList_id          0x0041 // menu upload block
#define      menuFinishedList_id        0x0042 // menu upload finished
#define      upLoadFileDirList_id       0x0043 // u9 file dir block
#define      fileDirFinishedList_id     0x0044 // u9 file dir upload finished
#define      upLoadUserDirList_id       0x0045 // u9 user dir block
#define      userDirFinishedList_id     0x0046 // u9 user dir upload finished
#define      upLoadEfxDirList_id        0x0047 // u9 efx dir block
#define      efxDirFinishedList_id      0x0048 // u9 efx dir upload finished
#define      upLoadGpiDirList_id        0x0049 // u9 gpi dir block
#define      gpiDirFinishedList_id      0x004a // u9 gpi dir upload finished

#define      bootErrorList_id           0x0050 // boot prog error
#define      bootCheckList_id           0x0051 // boot prog ok
#define      upLoadBootBlock_id         0x0052 // boot code block
#define      bootFinishedList_id        0x0053 // boot upload finished
#define      LCAErrorList_id            0x0054 // LCA prog error
#define      LCACheckList_id            0x0055 // LCA prog ok
#define      upLoadLCABlock_id          0x0056 // LCA code block
#define      LCAFinishedList_id         0x0057 // LCA upload finished

#define      gpiEventBlock_id           0x005b // u9 gpi event block
#define      efxInfoBlock_id            0x005c // u9 efx information block
#define      efxControlsBlock_id        0x005d // u9 efx controls block
#define      efxKeyframeBlock_id        0x005e // u9 efx keyframe block
#define      gpiInfoBlock_id            0x005f // u9 gpi information block


//
// message block id's - main to computer
//
#define      currentSetupList_id        0x0070 // current setup data OEM
#define      currentSetupCheckList_id   0x0071 // current setup data received ok OEM
#define      currentSetupErrorList_id   0x0072 // current setup data receive error OEM

//
```

```
// message block id's - remote to main
//
#define      adjustList_id              0x0081 // adjust list controls relative
#define      versionList_id             0x0082 // remote version list
#define      resetFlashList_id          0x0085 // reset flash flash memory
#define      downLoadUserList_id        0x0086 // PC memory to User Memory
#define      downLoadMemoryList_id      0x0087 // PC Memory to File Memory
#define      upLoadUserList_id          0x0088 // user memory to PC
#define      upLoadMemoryList_id        0x0089 // file memory to PC
#define      resetUserList_id           0x008a // reset user default ptr
#define      resetMemoryList_id         0x008b // reset memory file ptr
#define      upLoadProgramList_id       0x008c // program memory to PC
#define      resetProgramList_id        0x008d // reset program pointer
#define      upLoadSetupList_id         0x008e // setup[n] to PC
#define      downLoadSetupList_id       0x008f // PC memory to setup
#define      resetSetupList_id          0x0090 // reset setup pointer
#define      downLoadSetupSelect_id     0x0091 // download select
#define      upLoadSetupSelect_id       0x0092 // upload select
#define      executeSetupList_id        0x0093 // execute setup user
#define      upLoadDefaultList_id       0x0094 // user[n] to PC
#define      downLoadDefaultList_id     0x0095 // PC memory to user
#define      resetDefaultList_id        0x0096 // reset default pointer
#define      downLoadDefaultSelect_id   0x0097 // download select
#define      upLoadDefaultSelect_id     0x0098 // upload select
#define      executeDefaultList_id      0x0099 // execute default
#define      downLoadEffectList_id      0x009a // PC Memory to Effect
#define      upLoadEffectList_id        0x009b // Effect to PC
#define      resetEffectList_id         0x009c // reset Effect ptr
#define      setTrimFieldsList_id       0x009d // set editor trim fields
#define      getVdSourceCheckList_id    0x009f // return video source input state 0 –7

#define      upLoadEfxList_id           0x00a0 // efx[n] to PC
#define      downLoadEfxList_id         0x00a1 // PC memory to efx
#define      resetEfxList_id            0x00a2 // reset efx pointer
#define      downLoadEfxSelect_id       0x00a3 // download select
#define      upLoadEfxSelect_id         0x00a4 // upload select
#define      executeEfxList_id          0x00a5 // execute efx
#define      executeGpiList_id          0x00a6 // execute gpi
#define      activeEfxList_id           0x00a7 // check for efx active
#define      setControlsList_id         0x00a8 // set Controls Absolute
#define      sendCurrentControls_id     0x00a9 // send current control values to remote
#define      sendAllControls_id         0x00aa // send current and default
#define      getStatusList_id           0x00ab // get the status menu from main

#define      getCurrentControls_id      0x00ac // get Current controls (returns
                                                   CurrentList_id block 0x02)
#define      getDefaultControls_id      0x00ad // get Default controls (returns
                                                   DefaultList_id block 0x03)
#define      getCurrentStates_id        0x00ae // get Current states (returns
                                                   CurrentStateList_id block 0x25)
#define      getDefaultStates_id        0x00af // get Default states (returns
                                                   DefaultStateList_id block 0x26)
#define      efxInfoList_id             0x00b0 // effect information
#define      efxControlsList_id         0x00b1 // effect Controls
#define      efxKeyframeList_id         0x00b2 // effect keyframe
#define      gpiInfoList_id             0x00b3 // gpi information
#define      gpiEventList_id            0x00b4 // gpi event info

#define      setGpiNameList_id          0x00bb // set gpi name on mains
#define      resetGpiDirList_id         0x00bc // reset gpi dir pointer
#define      requestGpiDirList_id       0x00bd // request gpi dir from mains
#define      deleteFileList_id          0x00be // clear file on mains
#define      deleteUserList_id          0x00bf // clear user on mains
#define      requestMenuList_id         0x00c1 // request menu from mains
#define      resetFileDirList_id        0x00c2 // reset file dir pointer
#define      resetUserDirList_id        0x00c3 // reset user dir pointer
#define      resetEfxDirList_id         0x00c4 // reset efx dir pointer
#define      resetMenuList_id           0x00c5 // reset menu pointer
#define      requestFileDirList_id      0x00c6 // request file dir from mains
#define      requestUserDirList_id      0x00c7 // request user dir from mains
#define      requestEfxDirList_id       0x00c8 // request efx dir from mains
#define      setFileNameList_id         0x00c9 // set file name on mains
```

```
#define      setUserNameList_id         0x00ca // set user name on mains
#define      setEfxNameList_id          0x00cb // set efx name on mains
#define      saveFileList_id            0x00cc // save file on mains
#define      saveUserList_id            0x00cd // save user on mains
#define      clearFileList_id           0x00ce // clear file on mains =
                                                   fileclear button
#define      clearUserList_id           0x00cf // clear user on mains =
                                                   userreset button
//
// message block id's - computer to main
//
#define      requestCurrentList_id      0x00d8 // request current data OEM
#define      currentOKList_id           0x00d9 // current received ok OEM
#define      currentErrorList_id        0x00da // current received error OEM
#define      setCurrentList_id          0x00db // set current ultimatte values OEM
//
```

```
 // Control.h
//
#ifndef _control_
#define _control_

#define      NumberControls            128

//
// Control Equates
//

#define      MatteDensity_id           0
#define      RedDensity_id             1
#define      GreenDensity_id           2
#define      BlueDensity_id            3
#define      BlackGloss_id             4
#define      ShadowNoise_id            5
#define      RedVeil_id                6
#define      GreenVeil_id              7
#define      BlueVeil_id               8
#define      VeilMaster_id             9

#define      FlareGate1_id             10
#define      FlareGate2_id             11
#define      FlareBlackBalance_id      12
#define      FlareGrayBalance_id       13
#define      FlareWhiteBalance_id      14
#define      BgLevelBalance_id         15
#define      CuLevel_id                16
#define      CuBalance_id              17
#define      CuThreshold_id            18
#define      FadeMix_id                19

#define      FgSaturationRed_id        20
#define      FgSaturationGreen_id      21
#define      FgSaturationBlue_id       22
#define      FgMasterSaturation_id     23
#define      FgContrastRed_id          24
#define      FgContrastGreen_id        25
#define      FgContrastBlue_id         26
#define      FgMasterContrast_id       27
#define      FgBlackRed_id             28
#define      FgBlackGreen_id           29

#define      FgBlackBlue_id            30
#define      FgMasterBlack_id          31
#define      FgLevelRed_id             32
#define      FgLevelGreen_id           33
#define      FgLevelBlue_id            34
#define      FgMasterLevel_id          35
#define      BgContrastRed_id          36
#define      BgContrastGreen_id        37
#define      BgContrastBlue_id         38
#define      BgMasterContrast_id       39

#define      BgBlackRed_id             40
#define      BgBlackGreen_id           41
#define      BgBlackBlue_id            42
#define      BgMasterBlack_id          43
#define      BgLevelRed_id             44
#define      BgLevelGreen_id           45
#define      BgLevelBlue_id            46
#define      BgMasterLevel_id          47
#define      TsLevelRed_id             48
#define      TsLevelGreen_id           49

#define      TsLevelBlue_id            50
#define      TsMasterLevel_id          51
#define      AmbianceReflection_id     52
#define      AmbianceLighting_id       53
#define      AmbianceFrontRear_id      54
#define      DetailWidth_id            55     // NOT USED
```

```
#define      SampleX_id               56
#define      SampleY_id               57
#define      EfxFrameCount_id         58
#define      SampleRed_id             59

#define      SampleGreen_id           60
#define      SampleBlue_id            61
#define      WnTop_id                 62
#define      WnBottom_id              63
#define      WnLeft_id                64
#define      WnRight_id               65
#define      WnSoftTop_id             66
#define      WnSoftBottom_id          67
#define      WnSoftLeft_id            68
#define      WnSoftRight_id           69

#define      WnLevelBalance_id        70     // NOT USED
#define      BgDefocusSetMin_id       71
#define      BgDefocusSetMax_id       72
#define      MiWhiteLevel_id          73
#define      MiBlackLevel_id          74
#define      MoWhiteLevel_id          75
#define      MoGrayLevel_id           76     // NOT USED
#define      MoBlackLevel_id          77
#define      AmbianceRed_id           78
#define      AmbianceGreen_id         79

#define      AmbianceBlue_id          80
#define      AmbianceGain_id          81
#define      MiLevelBalance_id        82
#define      WnDensity_id             83
#define      TrimFields_id            84
#define      EdgePosition_id          85
#define      WnSoftnessX_id           86
#define      WnSoftnessY_id           87
#define      MoDelay_id               88     // NOT USED
#define      HPosition_id             89

#define      OverExposure_id          90
#define      MatteSizeX_id            91
#define      MatteSizeY_id            92
#define      Fgsignal_id              93
#define      Bgsignal_id              94
#define      Mattesignal_id           95
#define      Refsignal_id             96
#define      Loop1signal_id           97
#define      Loop2signal_id           98
#define      BgDefocus_id             99

#define      BgDefocusWin_id         100
#define      ShowECValue_id          101
#define      BgSaturationRed_id      102
#define      BgSaturationGreen_id    103
#define      BgSaturationBlue_id     104
#define      BgMasterSaturation_id   105
#define      EdgeWidth_id            106
#define      FlipWidth_id            107
#define      CorrectWidth_id         108
#define      Smooth_H_id             109

#define      Smooth_V_id             110
#define      GpiInput_id             111
#define      GpiDwellIn_id           112
#define      GpiOut_id               113
#define      GpiDwellTime_id         114
#define      BgDefocusFilter_id      115
#define      FgSampleRed_id          116
#define      FgSampleGreen_id        117
#define      FgSampleBlue_id         118
#define      BgSampleRed_id          119

#define      BgSampleGreen_id        120
```

```
#define      BgSampleBlue_id          121
#define      WnSkewTop_id             122
#define      WnSkewBottom_id          123
#define      WnSkewLeft_id            124
#define      WnSkewRight_id           125
#define      BgDefocusRate_id         126
#define      BgDefocusBits_id         127


#endif
```

```
// Button.h
//
#ifndef _button_
#define _button_

#define      BaseButton          128
#define      NumberButtons       132

////////////////////////////////////////////////////////////////////////////
//
//     Button Equates
//
#define      DiagnoseAll_id      (BaseButton + 0)
#define      FgDirect_id         (BaseButton + 1)
#define      BgDirect_id         (BaseButton + 2)
#define      MatteOff_id         (BaseButton + 3)
#define      MatteSet_id         (BaseButton + 4)
#define      HVInvert_id         (BaseButton + 5)    // NOT USED
#define      OverExpCorrect_id   (BaseButton + 6)
#define      ChangePeak_id       (BaseButton + 7)
#define      BgPreview_id        (BaseButton + 8)    // NOT USED
#define      FgBg_id             (BaseButton + 9)    // NOT USED

#define      MiEnable_id         (BaseButton + 10)
#define      MiInvert_id         (BaseButton + 11)
#define      WnEnable_id         (BaseButton + 12)
#define      WnInvert_id         (BaseButton + 13)
#define      MoInvert_id         (BaseButton + 14)
#define      ErrorFlag_id        (BaseButton + 15)
#define      FgBits_id           (BaseButton + 16)
#define      BgBits_id           (BaseButton + 17)
#define      MiBits_id           (BaseButton + 18)
#define      OutputBits_id       (BaseButton + 19)

#define      MUXVideoIn_id       (BaseButton + 20)
#define      MoFullScale_id      (BaseButton + 21)
#define      FlareReset_id       (BaseButton + 22)
#define      AmbianceReset_id    (BaseButton + 23)
#define      AmbianceEnable_id   (BaseButton + 24)
#define      HVEnable_id         (BaseButton + 25)
#define      BgGryLevelOn_id     (BaseButton + 26)
#define      ScreenPeak_id       (BaseButton + 27)
#define      VeilEnable_id       (BaseButton + 28)
#define      ManualPeakEnable_id (BaseButton + 29)

#define      ShowPeak_id         (BaseButton + 30)
#define      SetPeak_id          (BaseButton + 31)
#define      ManualPeak_id       (BaseButton + 32)
#define      TsEnable_id         (BaseButton + 33)
#define      SystemReset_id      (BaseButton + 34)
#define      FileClear_id        (BaseButton + 35)
#define      MatteReset_id       (BaseButton + 36)
#define      FgColorReset_id     (BaseButton + 37)
#define      BgColorReset_id     (BaseButton + 38)
#define      TsColorReset_id     (BaseButton + 39)

#define      Tally_id            (BaseButton + 40)
#define      BackingRed_id       (BaseButton + 41)
#define      BackingGreen_id     (BaseButton + 42)
#define      BackingBlue_id      (BaseButton + 43)
#define      MUXVideoOut_id      (BaseButton + 44)
#define      TRSInsertOut_id     (BaseButton + 45)
#define      UserReset_id        (BaseButton + 46)
#define      RsFromRs_id         (BaseButton + 47)   // NOT USED
#define      MatteSizY_Enable_id (BaseButton + 48)

#define      FgSampleEnable_id   (BaseButton + 50)
#define      FgSampleTake_id     (BaseButton + 51)
#define      FgBgComform_id      (BaseButton + 52)
#define      AdvOverlay_id       (BaseButton + 53)
#define      FilterOFF_id        (BaseButton + 54)
#define      BgSampleTake_id     (BaseButton + 55)
```

```
#define      BgFgComform_id      (BaseButton + 56)
#define      HoldOutMatte_id     (BaseButton + 57)
#define      AdvHcorrect_id      (BaseButton + 58)
#define      AdvVcorrect_id      (BaseButton + 59)

#define      EditorSerialType_id (BaseButton + 60)
#define      EditorSerialRate_id (BaseButton + 61)
#define      EditorEnable_id     (BaseButton + 62)
#define      DiagLoop_id         (BaseButton + 63)
#define      DiagErrorResponse_id(BaseButton + 64)
#define      GpiInputsEnable_id  (BaseButton + 65)
#define      ShowVersion_id      (BaseButton + 66)
#define      Confirm_id          (BaseButton + 67)
#define      Cancel_id           (BaseButton + 68)
#define      UserSave_id         (BaseButton + 69)

#define      UserLoad_id         (BaseButton + 70)
#define      MouseLeft_id        (BaseButton + 71)
#define      MouseRight_id       (BaseButton + 72)
#define      MemoryClear_id      (BaseButton + 73)
#define      DiagSelect1_id      (BaseButton + 74)
#define      Diagnose1_id        (BaseButton + 75)
#define      BgDefocusEnable_id  (BaseButton + 76)
#define      BgDefocusFreeze_id  (BaseButton + 77)
#define      BgDefocusOn_id      (BaseButton + 78)
#define      BgDefocusMask_id    (BaseButton + 79)

#define      BgDefocusStart_id   (BaseButton + 80)
#define      BgDefocusEnd_id     (BaseButton + 81)
#define      MatteView100_id     (BaseButton + 82)
#define      GpiOutA_id          (BaseButton + 83)
#define      GpiOutB_id          (BaseButton + 84)
#define      FileMenu_id         (BaseButton + 85)
#define      GpiOutState_id      (BaseButton + 86)
#define      GpiInputState_id    (BaseButton + 87)
#define      QuickLoad1_id       (BaseButton + 88)
#define      QuickLoad2_id       (BaseButton + 89)

#define      QuickLoad3_id       (BaseButton + 90)
#define      QuickLoad4_id       (BaseButton + 91)
#define      QuickLoad5_id       (BaseButton + 92)
#define      QuickSave1_id       (BaseButton + 93)
#define      QuickSave2_id       (BaseButton + 94)
#define      QuickSave3_id       (BaseButton + 95)
#define      FgBypass_id         (BaseButton + 96)
#define      QuickSave4_id       (BaseButton + 97)
#define      MoBits_id           (BaseButton + 98)
#define      QuickSave5_id       (BaseButton + 99)

#define      RehearseMode_id     (BaseButton + 100)
#define      WnPaintDraw_id      (BaseButton + 101)
#define      WnBrushSize_id      (BaseButton + 102)
#define      EfxAvailControl_id  (BaseButton + 103)
#define      EfxAvailButton_id   (BaseButton + 104)
#define      VideoRateCount_id   (BaseButton + 105)
#define      EfxSelectButton_id  (BaseButton + 106)
#define      EfxSetKeyframe_id   (BaseButton + 107)
#define      EfxClearKeyframes_id(BaseButton + 108)
#define      EfxKeyframeBreak_id (BaseButton + 109)

#define      EfxNextKeyframe_id  (BaseButton + 110)
#define      EfxNextControl_id   (BaseButton + 111)
#define      EfxNextButton_id    (BaseButton + 112)
#define      MatrixIn1_id        (BaseButton + 113)
#define      MatrixIn2_id        (BaseButton + 114)
#define      MatrixIn3_id        (BaseButton + 115)
#define      MatrixIn4_id        (BaseButton + 116)
#define      MatrixIn5_id        (BaseButton + 117)
#define      MatrixIn6_id        (BaseButton + 118)

#define      FontPercent_id      (BaseButton + 126)
#define      Bempty_id           (BaseButton + 127)
```

```
#define       ReturnKey_id        (BaseButton + 129)
#endif
```

Updating controls:

The host sends either of the following blocks:

Relative Change

byte	Description
0	Start of Message character with unit selection bit set
1	n (byte count)
2	genericChangeList_id(command)
3 - n+1	generic change data
	data structure
	3 Control_id[1] (if Continuous Control)
	4 Relative Control_Adjustment[1] high 8 bits
	5 Relative Control_Adjustment[1] low 8 bits
	-or-
	3 Control_id[1] (if State Control)
	. .
	. .
	. .
	. Control_id[N] (if Continuous Control)
	. Relative Control_Adjustment[N] high 8 bits
	. Relative Control_Adjustment[N] low 8 bits
	-or-
	. Control_id[N] (if State Control)
n+2	End of Message character always 0xFF

Absolute Change

byte	Description
0	Start of Message character with unit selection bit set
1	n (byte count)
2	genericSetList_id(command)
3 - n+1	generic set data
	data structure
	3 Control_id[1] (if Continuous Control)
	4 Absolute Control_Value[1] high 8 bits
	5 Absolute Control_Value[1] low 8 bits
	-or-
	3 Control_id[1] (if State Control)
	4 Absolute Control_Value[1]
	. .
	. .
	. .
	. Control_id[N] (if Continuous Control)
	. Absolute Control_Value[N] high 8 bits
	. Absolute Control_Value[N] low 8 bits
	-or-
	. Control_id[N] (if State Control)
	. Absolute Control_Value[N]
n+2	End of Message character always 0xFF

The unit will respond with:

byte	Description
0	Start of Message character with unit selection bit set
1	n (byte count)
2	genericReplyList_id (command)
3 - n+1	reply data (Control ID, absolute value, checksum)
	(If error pending - control ID, absolute value, 0x8F,
	error code, checksum)
n+2	End of Message character (can be ignored)

COMMAND ID example:

02 01 82 FF // Returns the version information of the Ultimatte-9 Main Unit

02 = Start of Message
01 = Byte count
82 = Command ID
FF = End of Message Character

Reply: (long byte stream of ASCII Data)

CONTROL ID example:

02 04 A8 00 01 FF FF // Change Matte Density to 0x01FFn absolute mode

02 = Start of Message
04 = Byte count
A8 = Command ID absolute
00 = Control ID
01 FF = Absolute change
FF = Checksum

Reply: 02 04 04 00 01 FF 08

02 = Start of Message
04 = Byte count
04 = Change list
00 = Control ID
01 FF = Absolute change
08 = Checksum

CONTROL ID example:

02 04 81 00 00 28 FF // Increment Matte Density by 0x0028 in relative mode

02 = Start of Message
04 = Byte count
81 = Command ID relative
00 = Control ID
00 28 = Relative change
FF = End of Message Character

Reply: 02 04 04 00 02 27 31

02 = Start of Message
04 = Byte count
04 = Change list
00 = Control ID
02 27 = Absolute change
31 = Checksum

BUTTON ID example:

02 03 A8 A3 01 FF // Execute File Clear

02 = Start of Message
03 = Byte count
A8 = Command ID absolute
A3 = Control ID
01 = Absolute change
FF = End of Message Character

Reply: 02, [affected control/button id, value] list, checksum

02 = Start of Message
. . .

ERROR CODE RETURN example:

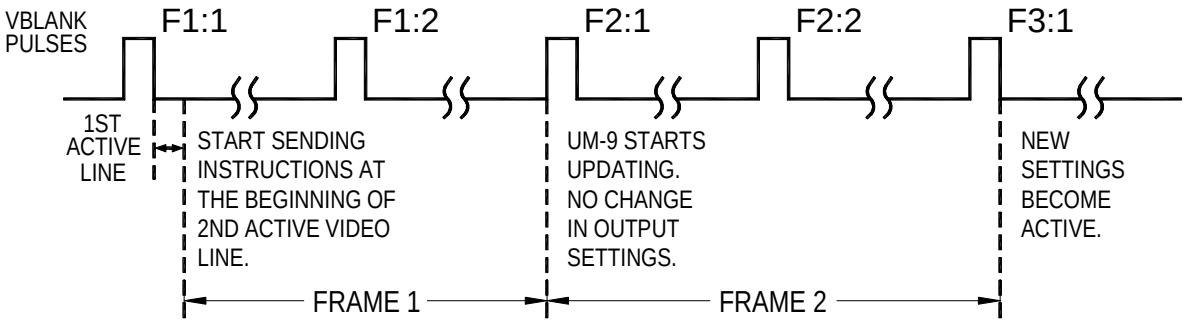
02 03 A8 8F 01 FF

02 = Start of Message
03 = Byte count
A8 = Command ID absolute
8F = Control ID
01 =(Irrelevant)
FF = End of Message Character

Reply: 02 03 04 8f 00 96

02 = Start of Message
03 = Byte count
04 = Return list
8F = Command ID
00 = Error flag code
96 = Checksum

2. Software Protocol Timing Diagram



UM-9 TAKES TWO FRAMES TO RESPOND TO RECEIVED INSTRUCTIONS.

3. Software/Firmware Update

Both the Smart Remote and Main Unit can be field programmed by a qualified user. An IBM PC compatible computer (Pentium 90 minimum) running WIN95/98/NT with an Ultimatte provided Tools interface software is all that is required. The Tools software and the latest Ultimatte-9 application software can be downloaded at the Ultimatte web site (**www.ultimatte.com)**. The latest Operations Manual in PDF format can also be downloaded. Follow the updating instructions included with the downloaded file.

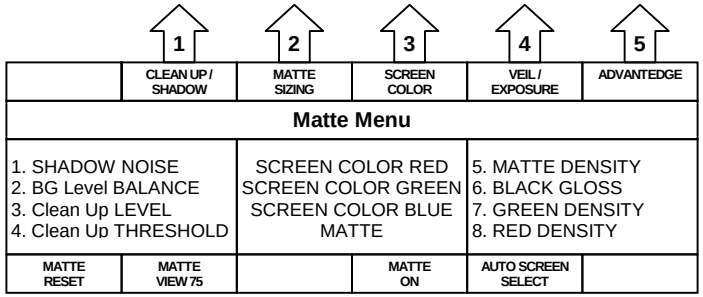
4. Battery Replacement

Replace batteries with Dallas Semiconductor part #DS9034PC Power Cap only.
Available as Ultimatte part #01-DS9034PDIP.

5. Menu Tree

MENU TREE

MATTE MENU



ULTIMATTE 9 VER. 2.02

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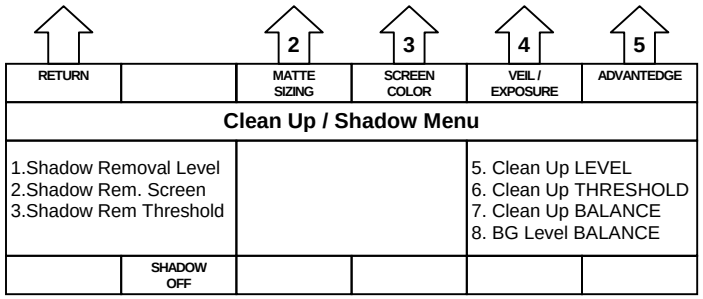

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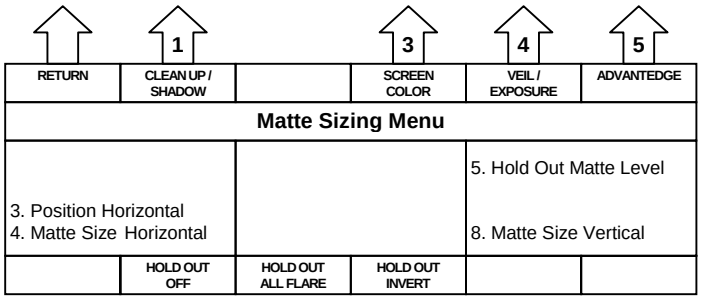

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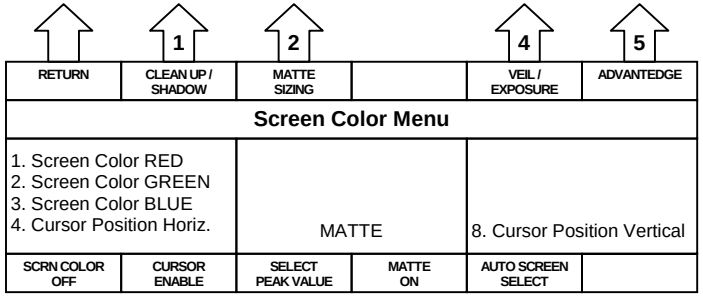

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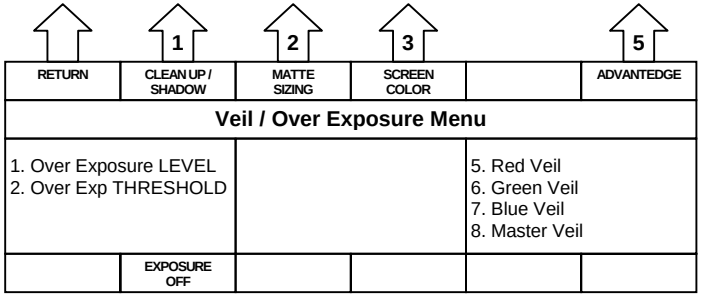

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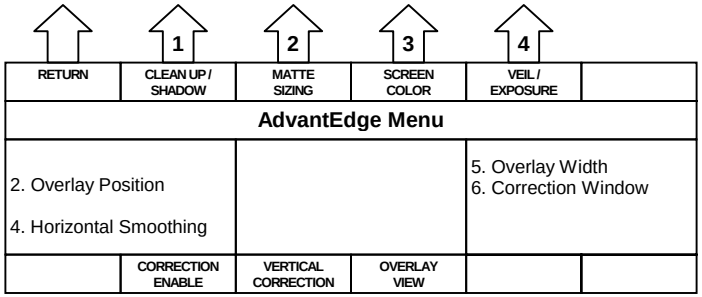
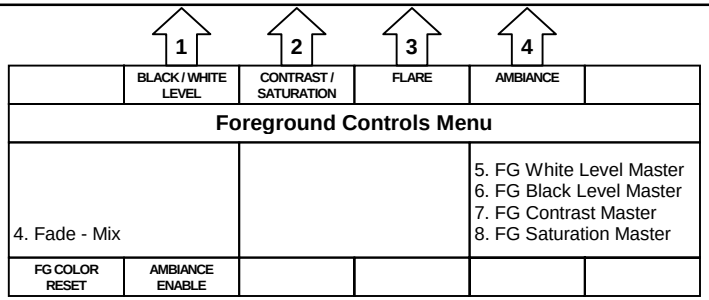
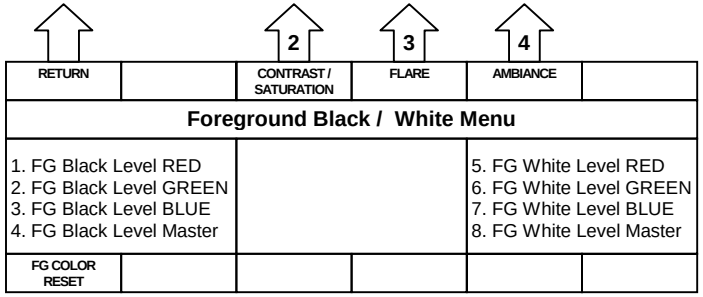


FOREGROUND MENU



ULTIMATTE 9 VER. 2.02

1



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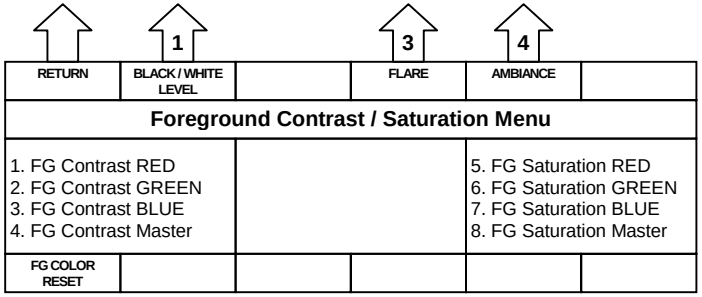

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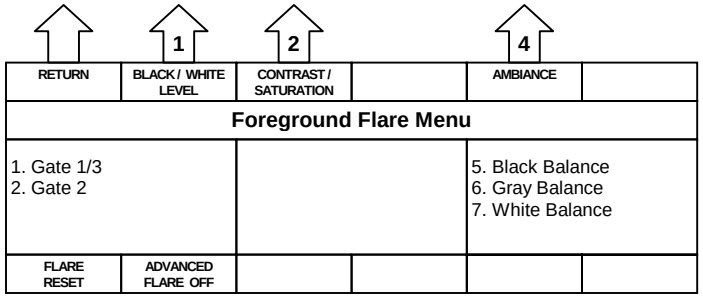

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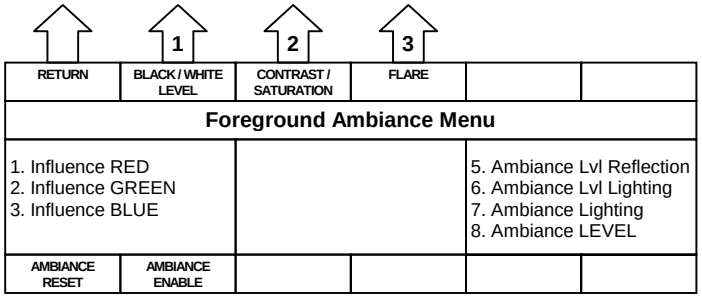
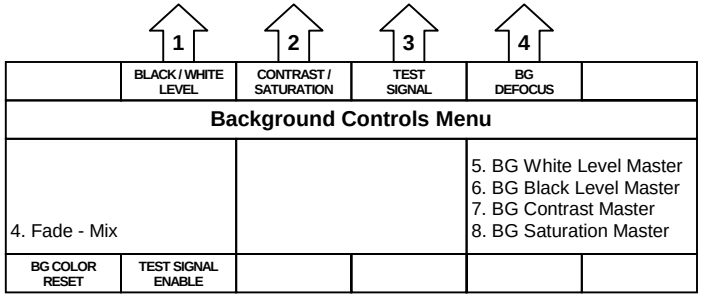
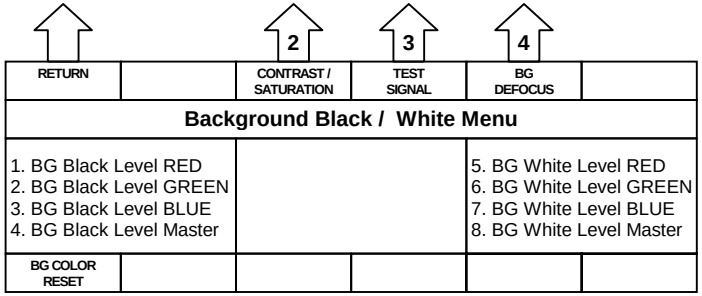


BACKGROUND MENU



ULTIMATTE 9 VER. 2.02

1



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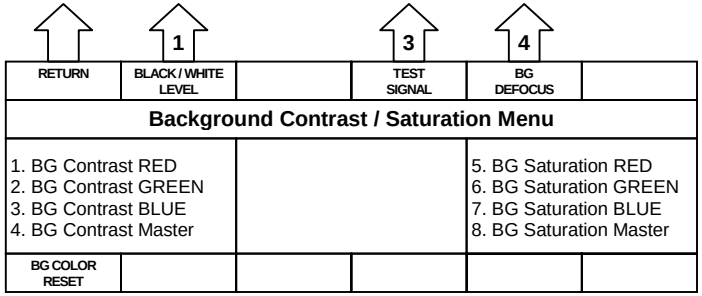

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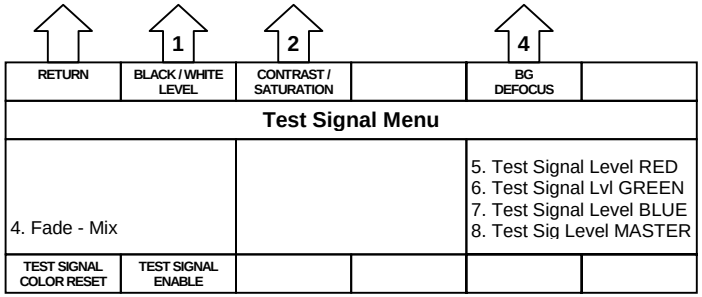

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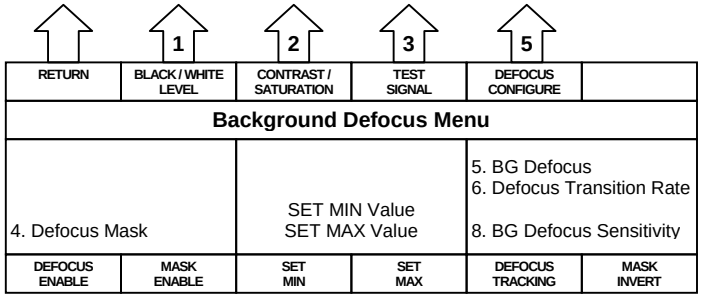

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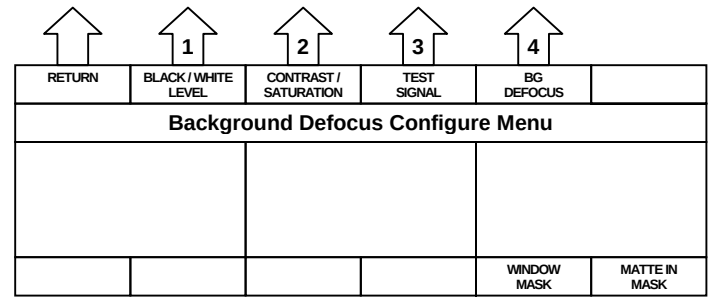
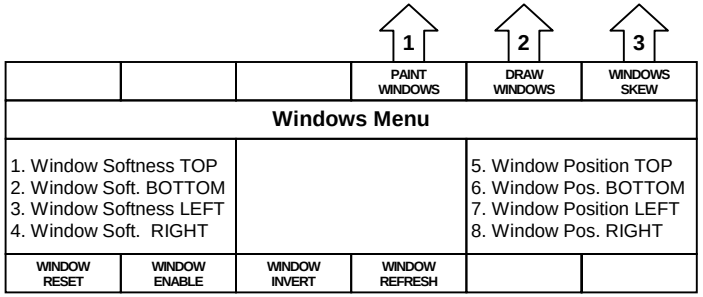


WINDOWS MENU



ULTIMATTE 9 VER. 2.02

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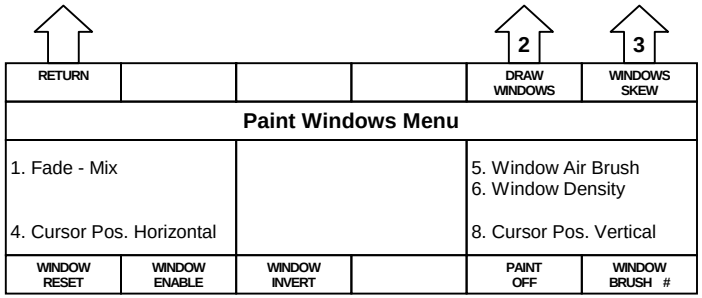

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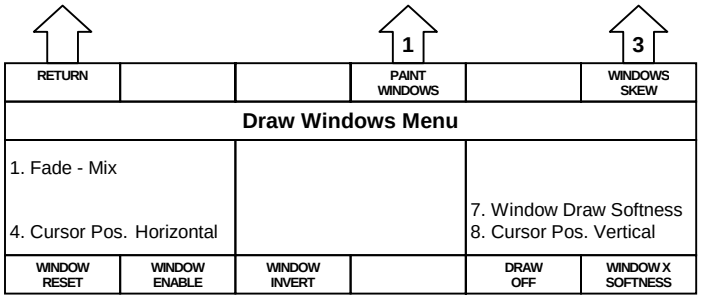

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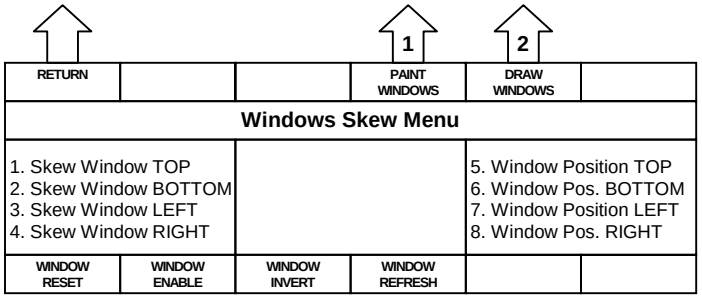


MATTE IN / OUT CONFIG MENU

Matte IN / OUT Config Menu					
1. Matte IN OFFSET 3. Matte IN GAIN 4. Matte IN LVL BALANCE				5. Matte OUT OFFSET 7. Matte OUT GAIN	
MATTE IN ENABLE	MATTE IN INVERT	BILEVEL MATTE OFF		MATTE OUT INVERT	

ULTIMATTE 9 VER. 2.02

FILES MENU

MEMORY CLEAR	QUICK SAVE 1	QUICK SAVE 2	QUICK SAVE 3	QUICK SAVE 4	QUICK SAVE 5
Files Menu					
D1 D2 D3 D4		D9 D10 D11 Input Matrix FG= 1 REF= 1 BG= 2 AL1= 1 MT= 3 AL2= 2		D5 D6 D7 D8	
	QUICK LOAD 1	QUICK LOAD 2	QUICK LOAD 3	QUICK LOAD 4	QUICK LOAD 5

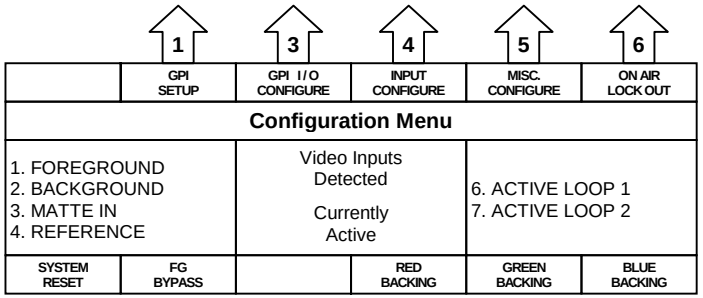
ULTIMATTE 9 VER. 2.0

CUSTOM MENUS

B 1	B 2	B 3	B 4	B 5	B 6
Custom Menu 1- 4					
D1 D2 D3 D4		D9 D10 D11 Input Matrix FG= 1 REF= 1 BG= 2 AL1= 1 MT= 3 AL2= 2		D5 D6 D7 D8	
B 7	B 8	B 9	B 10	B 11	B 12

ULTIMATTE 9 VER. 2.0

CONFIGURATION MENU



ULTIMATTE 9 VER. 2.02

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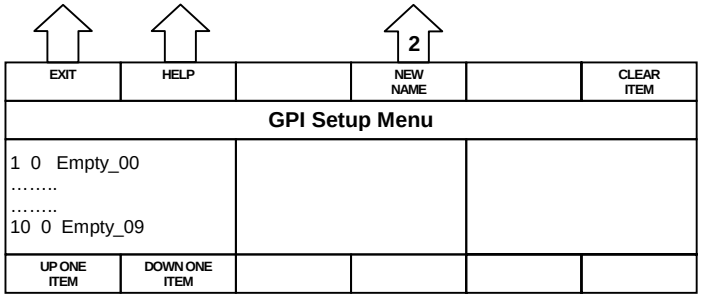

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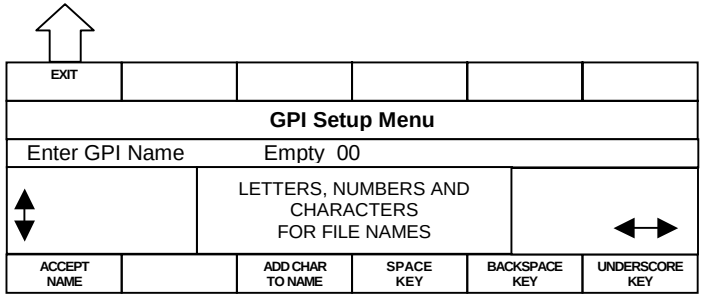

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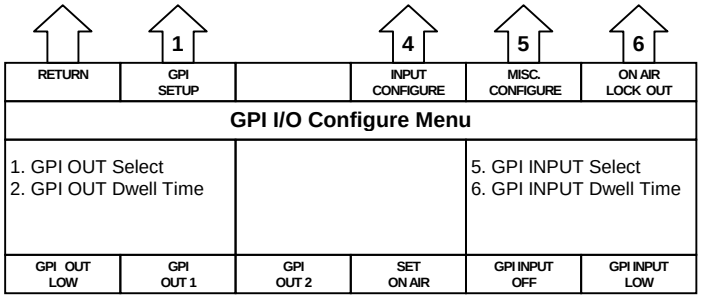

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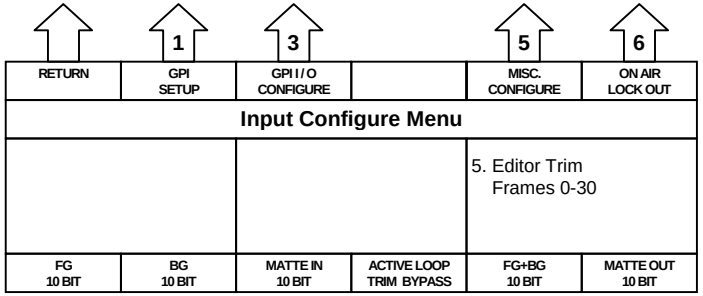

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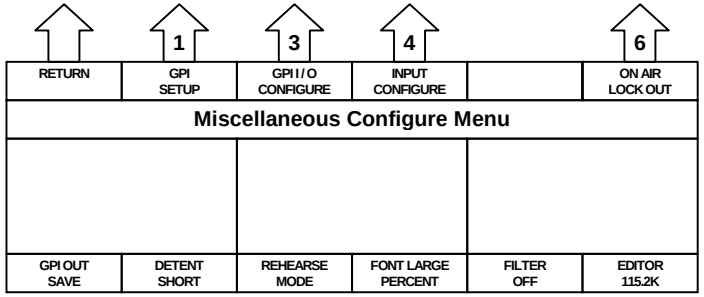

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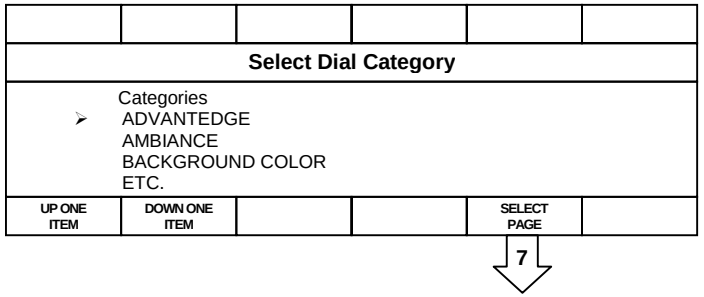

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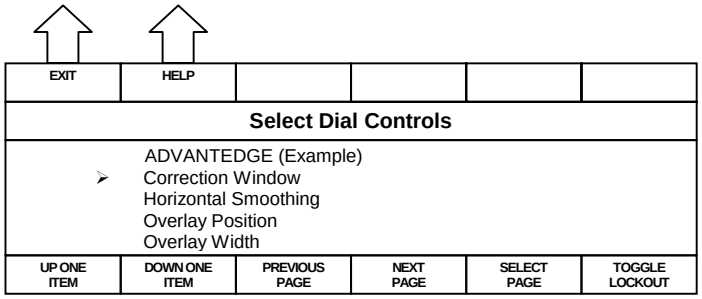
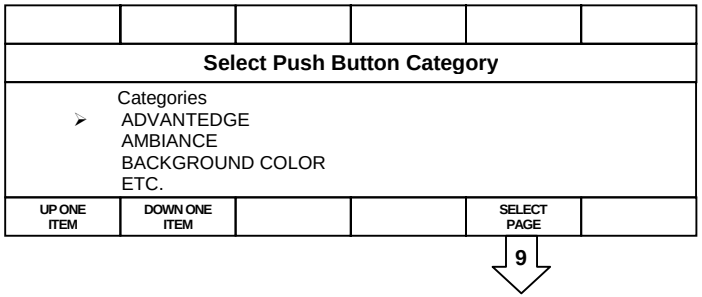
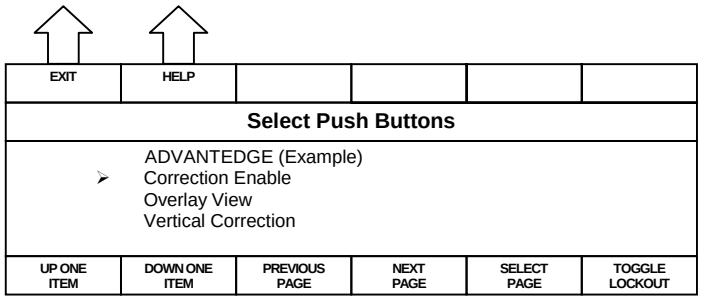

EXIT
HELP
Select Dial Controls
ADVANTEDGE (Example)
Correction Window
Horizontal Smoothing
Overlay Position
Overlay Width
UP ONE ITEM
DOWN ONE ITEM
PREVIOUS PAGE
NEXT PAGE
SELECT PAGE
TOGGLE LOCKOUT

8


Select Push Button Category
Categories
ADVANTEDGE
AMBIANCE
BACKGROUND COLOR
ETC.
UP ONE ITEM
DOWN ONE ITEM
SELECT PAGE
9

9


EXIT
HELP
Select Push Buttons
ADVANTEDGE (Example)
Correction Enable
Overlay View
Vertical Correction
UP ONE ITEM
DOWN ONE ITEM
PREVIOUS PAGE
NEXT PAGE
SELECT PAGE
TOGGLE LOCKOUT

EFFECTS MENU

ULTIMATTE 9 VER. 2.02

1

B1	B2	B3	B4	B5	B6
Effect A					
D1 D2 D3 D4				D5 D6 D7 D8	
		EDIT EFFECT	EFFECTS DIRECTORY	RUN EFFECT	CREATE NEW EFFECT
		4	5		2

2

B1	B2	B3	B4	B5	B6
Create New Effect					
D1 D2 D3 D4		ASSIGN BUTTON AND DIAL FUNCTIONS		D5 D6 D7 D8	
	HELP		CLEAR CONTROLS		BUILD KEY FRAMES
					3

3

EXIT					
Effects Directory					
Enter Effect Name	Effect Name				
↕	LETTERS, NUMBERS AND CHARACTERS FOR FILE NAMES				↔
ACCEPT NAME		ADD CHAR TO NAME	SPACE KEY	BACKSPACE KEY	UNDERSCORE KEY
4					

4

B1	B2	B3	B4	B5	B6
Build Effect Key Frames					
(Examples} Horizontal Smoothing Correction Window Overlay Width		Frame Time (mm:ss.ff} 0: 0. 0 FRM 0 Taper In 0% Taper Out 0% Velocity Break ON/OFF		D5 D6 D7 D8	
CENTER CTLS SELECTED	HELP	PREVIOUS KEY FRAME	NEXT KEY FRAME	DELETE KEY FRAME	SAVE KEY FRAME

5

		6	3	
EXIT	HELP	RENAME EFFECT	EDIT EFFECT	DELETE EFFECT
Effects Directory				
➢ File Names				
UP ONE ITEM	DOWN ONE ITEM	PREVIOUS PAGE	NEXT PAGE	LOAD EFFECT	CREATE NEW EFFECT
				1	2