

ultimatte - 11

with SR - 4

Operations Manual

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ultimatte CORP.
20945 PLUMMER STREET
CHATSWORTH, CA 91311, U.S.A.

Ultimatte Web Site:
Support:
Phone
Fax

<http://www.ultimatte.com/>
hwsupport@ultimatte.com
818.993.8007
818.993.3726

LIMITED WARRANTY

MODEL _____

SERIAL NO. _____

DATE SOLD _____

Within one year of purchase any repairs necessary to this product due to a defect in materials or workmanship will be made without charge. NO OTHER GUARANTEE, EXPRESSED OR IMPLIED, SHALL BE APPLICABLE TO THIS EQUIPMENT, nor are we responsible for any other expenses or consequential damages occasioned by equipment failure.

In case of unsatisfactory operation, contact your dealer for service. If this is not possible, the unit may be return directly to *ultimatte*® corporation freight prepaid. Return transportation charges are not cover by warranty.

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818.993.8007
818.993.3726

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 réparés 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.

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1. INTRODUCTION

The Ultimatte-11 is a multi-definition digital video image compositing device that produces realistic composites of two images. Its inputs and outputs comply with SMPTE 292M (HD) and SMPTE-259M (SD) Serial Digital Interface standards. Ultimatte-11 can be interfaced with any video system that can provide or accept 10 bit 4:2:2 serial digital video. Ultimatte-11 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-11 Main Unit needs to be connected to a SR-4 via the RS-485 port in order to be functional.

1.1 Natural Edges

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 realistic composite.

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 controls, the Clean Up controls, Matte Correction and Matte Sizing 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.

One of the factors impacting the uniformity of the matte is the evenness of the lighting on the backing (screen). Evenly lit backings reduce the level of Clean Up controls needed, thus maintaining most of the natural edges and fine detail of the FG subject. As for lighting the FG subject, 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.

1.2 Perspective

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.

1.3 Lighting

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 White and Black Level controls, together with FG Contrast (gamma) and Saturation controls in the Ultimatte-11 can help in blending the two images.

Another feature present in the Ultimatte-11 is Ambiance. In the real world the colors of the background will have some effect on the foreground. On the other hand, the lighting of the background scene will have a very direct and strong effect on the FG subject. For example, if a person were to stand in a red colored environment, a certain amount of light reflected from this surrounding would be "splashed" on the person creating a reddish tint. If the level of lighting illuminating this environment changes, the FG subject, illuminated by the same light source, will strongly reflect the lighting change. When using pre-rendered backgrounds in compositing, these effects cannot be achieved by changing the color or the level of lighting on the blue or green set. The Ambiance feature in the Ultimatte-11 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.

1.4 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-11 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-11 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.

2. ULTIMATTE-11 CHARACTERISTICS (Main Unit)

2.1 Dimensions

H = 4.45 cm / 1.75 in (1RU)
 W = 43.18 cm / 17 in
 D = 30.48 cm / 12 in (not including front and rear handles)

2.2 Weight

4.5 Kg / 10 lbs

2.3 Operating Temperature

The Ultimatte-11 maximum ambient temperature must not exceed 35° Celsius (95° Fahrenheit). Care must be taken not to exceed this temperature when installing the unit inside a closed or multi-unit rack assembly.

2.4 Physical Installation

The Ultimatte-11 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-11 requires one unit of rack space 30.48 cm (21 in) deep. 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-11 is equipped with internal temperature sensors. The About System window (from Main Unit Info) on the SR-4 display will display the real-time internal temperature of the Main Unit. If an over-temperature occurs on the Main Unit, one of the following messages will be displayed on the SR-4 status section:

Core (80° C):	Overheat Warning Main Unit Power down Main Unit - Check: Fans failure or airflow -
Main (45° C):	Overheat Warning Main Unit - Check: Airflow... - May need to power down Main Unit -
Fan Warning:	Main Unit - Check: Fans failure or airflow -

2.5 Power requirements

Input 100-240 VAC, 50/60 Hz, 0.30 - 0.15 A.

NOTE: Connect the unit only to a properly rated supply circuit with appropriate over-current protection.

Use power supply cord provided with unit or a listed, detachable, minimum 4.5m (14.76ft) long; rated 125V, 10A, includes No. 18/3 AWG, type SVT flexible cord; one end terminates in parallel-blade (NEMA 5-15P) grounding-type attachment plug, other end in appliance coupler.

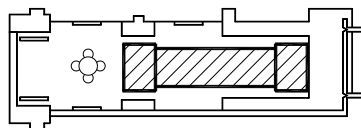
The Blue LEDs in the front of the Ultimatte-11 indicate that power is on. The Ultimatte-11 is equipped with a dual output Universal Switching Power Supply rated at 3.3vdc @ 30A and 12vdc @ 0.5A. No voltage adjustments are required. The power switch of the Ultimatte-11 is part of an integrated AC receptacle and line filter unit mounted on the Rear Panel. Overload protection is provided by fuses (2) rated at 250 VAC @ 1.0 A (slow blow).

To minimize the risk of shock and damage to system, always use a grounded (earth) power cord and grounded (earth) supply circuit.

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

2.6 Fuse Replacement

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



Second fuse on opposite side.

Figure 2.6-1. Main Unit Fuse Replacement

CAUTION: DOUBLE POLE / NEUTRAL FUSING.

2.7 Video Interface

All input and output video signals of the Ultimatte-11 are 75 ohm BNC connectors and conform to SMPTE-259M (SD-SDI) and SMPTE-292M (HD-SDI) specifications.

VERY IMPORTANT:

Reference Video is always derived from the signal connected to Input 1. The Ultimatte-11 will not function without a stable video signal connected to Input 1.

These inputs and outputs are:

- Four (4) video inputs, each with an active loop output. Any one of the four inputs can be software configured as Foreground, Background, Matte In 1 or Matte In 2 inputs.
- Two FG+BG outputs provide identical composite images.
- Matte output
- Monitor output

Video format selection is automatic, based on the video format connected to Input 1 (Reference). Ancillary data present in the H and V Blanking interval of the signal connected to Input 1 is passed to all output signals, while the information present in the H and V Blanking interval of the signals connected to the other three inputs are blanked.

2.8 System Timing

The Ultimatte-11 takes its timing information from the video source connected to Input 1. Inputs 2, 3, and 4 have an adjustable capture range of ± 0.5 H (1/2 line) maximum, with respect to Input 1.

2.9 Communication

Communication between the Ultimatte-11 and the SR-4 is through an RS-485 interface at a data rate of 115 Kbps. A standard DB9 male-female RS-485 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-11 units can be connected to one SR-4.

The SR-4 is software configured to be the Master with up to four (4) Ultimatte-11 units as slaves. Only the Master can initiate a message exchange. The Ultimatte-11 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 (1, 2, 3 and 4) only. Each unit will respond only when it is addressed. The ID number is selected by setting Dip Switch 7 and 8 and indicated by LEDs. The front panel must be removed to access these switches (see Figure 2.10-1).

An RS-485 loop connector (DB9 female) on the back of the Ultimatte-11 permits "daisy chaining" to the next unit (see Figure 2.13-1).

An RS-232 port is also available (DB9 female connector), which allows the Ultimatte-11 to be connected to a computer. This port can be used to access all of the controls on

the Ultimatte-11 through the computer and to upload software updates. See Figure 2.13-2.

2.10 Configuration

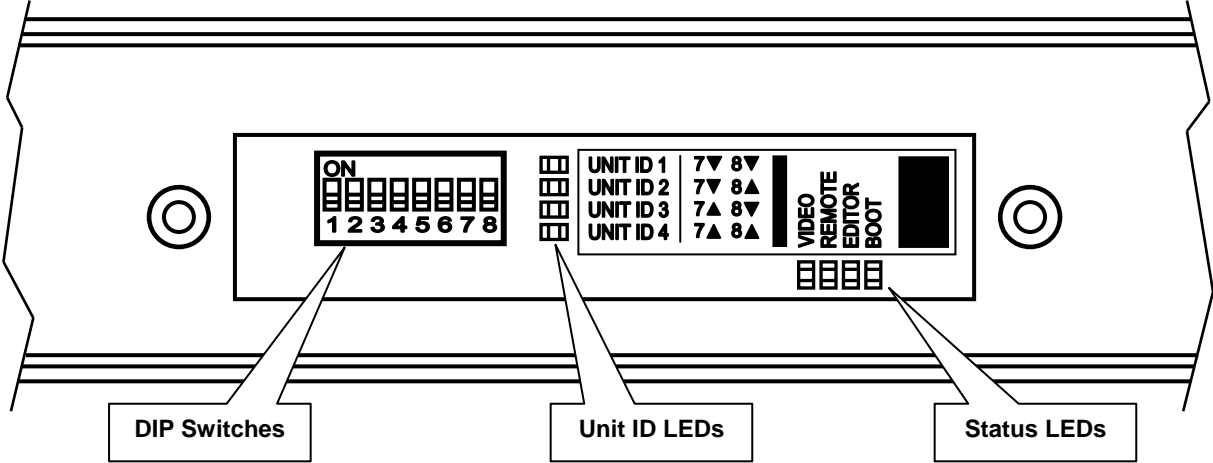


Figure 2.10-1. Main Unit Front View (Front Cover Removed)

NAME	SWITCHES	FACTORY POSITION	FUNCTION
Communication Bypass Enable	1	Off	On: Main Unit ignores all communication from the Smart Remote and Editor ports. Off: Normal operation.
Editor Port Baud Rate Selector	2	Off	On: Editor Port baud rate is 38.4K Baud. Off: Editor Port baud rate is 115.2K Baud.
Reserved	3	Off	Reserved for future use.
Force Reprogram	4	Off	On: Main Unit executes from Boot mode only for reprogramming the Flash Memory. Off: Normal operation.
User Power Up Mode	5	Off	On: Upon power up, Main Unit loads UserPowerUp file. Off: Upon power up, Main Unit loads factory defaults, configures blue backing color, and performs new peak detection.
Erase Memory	6	Off	On: Clears all memory contents and erases all Files, User Files, Custom Menus, Preferences and GPI configurations. Off: Normal Operation
Unit ID Configuration	7 / 8	Off / Off	Off / Off: Main Unit ID = 1 Off / On: Main Unit ID = 2 On / Off: Main Unit ID = 3 On / On: Main Unit ID = 4

Table 2.10-1. Dip Switch Settings

2.11 Unit ID LEDs

There are four Unit ID LEDs corresponding to the Main Unit ID number. The location of the LEDs is in the front of the Main Unit with the front cover removed (see Figure 2.10-1). The Main Unit ID number is configured by setting DIP Switches 7 and 8 (refer to Table 2.10-1)

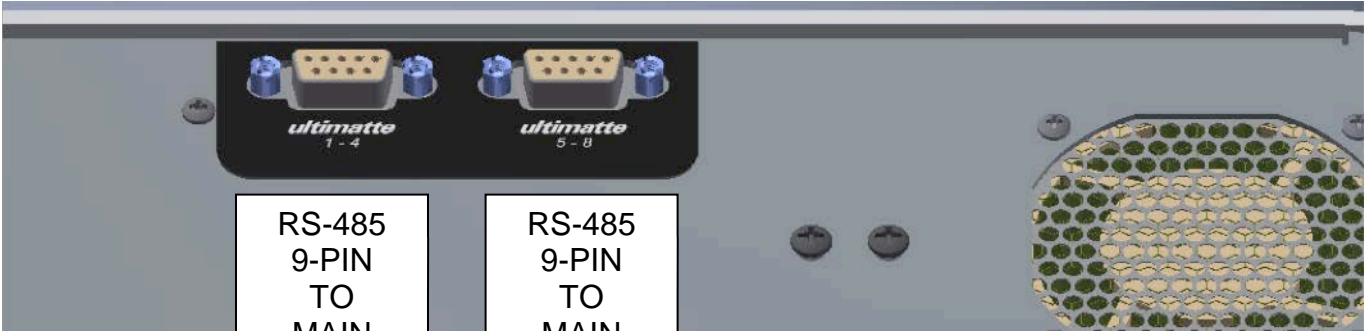
2.12 Status LEDs

There are four Status LEDs that provide status information. The location of the LEDs is in the front of the Main Unit with the front cover removed (see Figure 2.10-1).

Name	LED Status	Function
Video	Toggle	Blinks approximately once every second if Main Unit is locked to Reference input. Blinks once every ½ second if no video is detected in Reference input.
Remote	Off	Lights up when Main Unit communicates with Smart Remote.
Editor	Off	Lights up when Main Unit communicates with Editor.
Boot	Off	Off is normal operation. Lights up if Main Unit is configured for Boot mode (DIP Switch 4 = On). Boot mode is only used for updating and reprogramming the Flash Memory of the Main Unit.

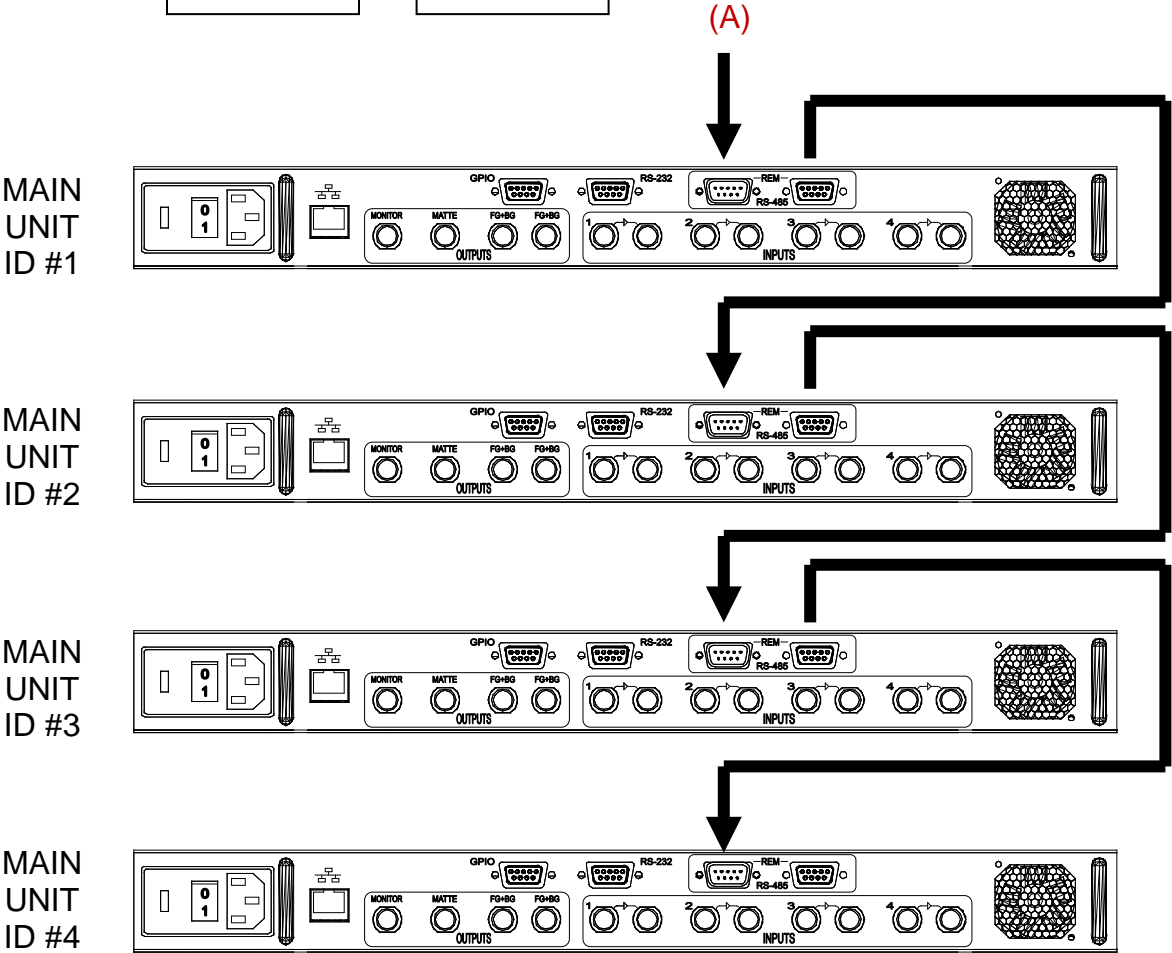
Table 2.12-1. Status LEDs

2.13 Connecting Multiple Units



RS-485
9-PIN
TO
MAIN
UNITS 1-4
(A)

RS-485
9-PIN
TO
MAIN
UNITS 5-8
(B)



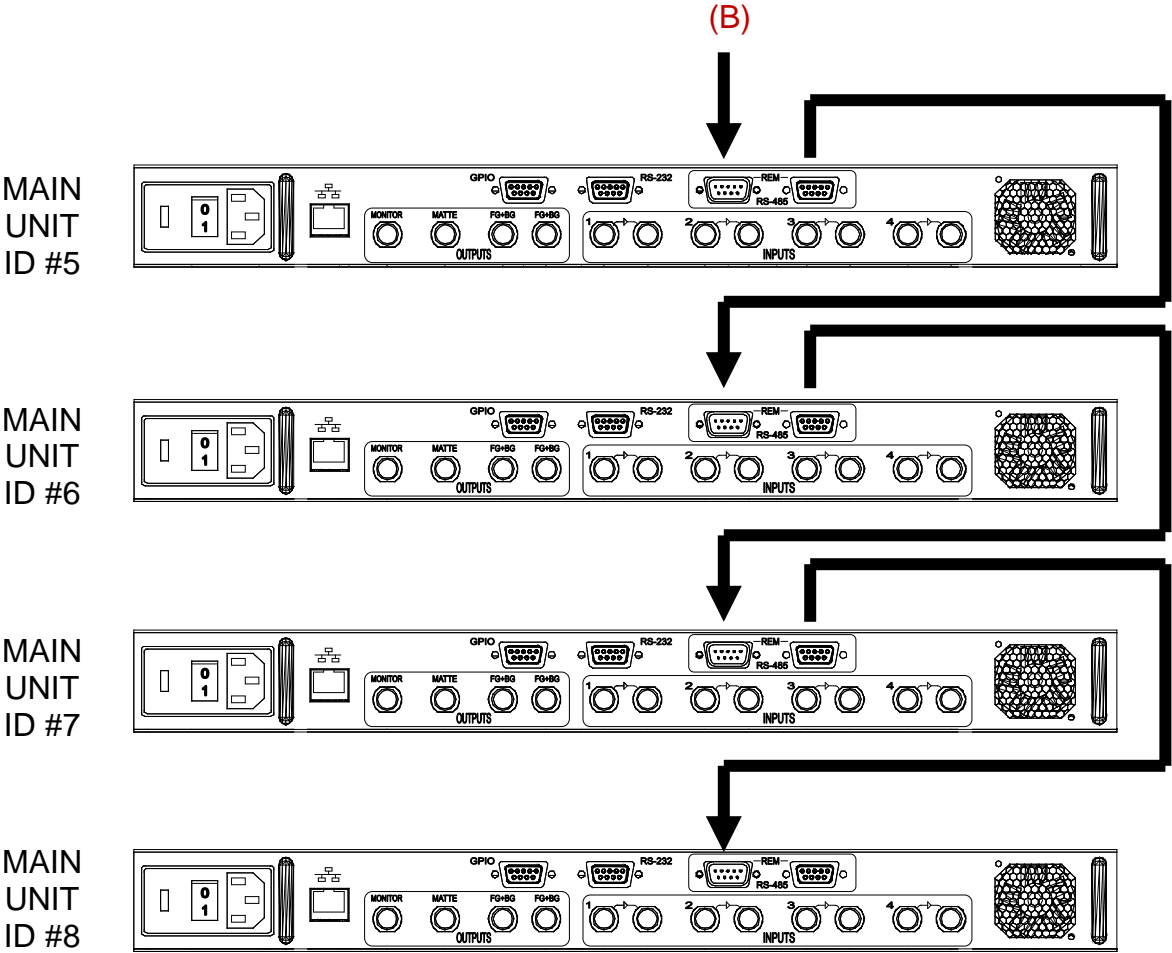


Figure 2.13-1. Connecting Multiple Units

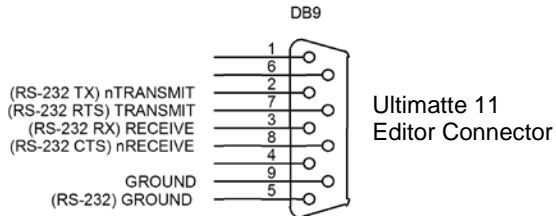
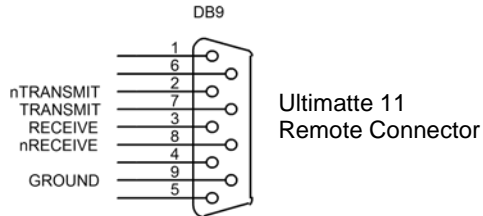
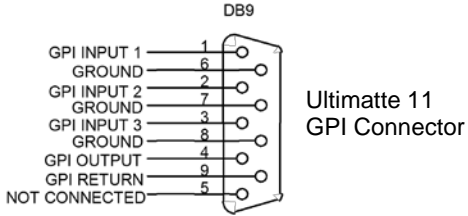
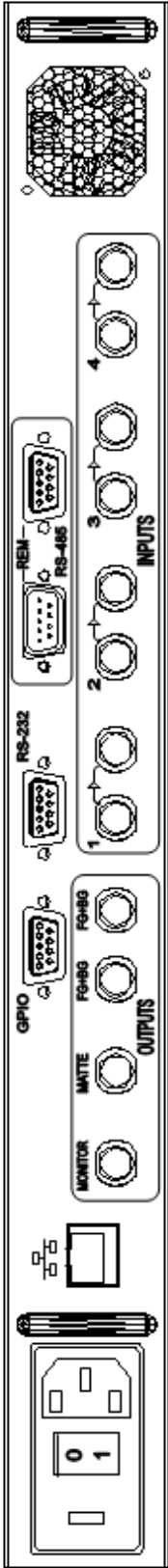


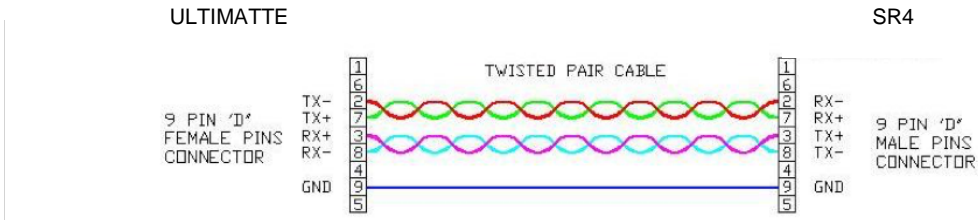
Figure 2.13-2. Rear Panel and Connector Pin Out.

EXTENDING THE COMMUNICATION CABLE

The maximum cable length tested at Ultimatte is 1,000 feet (308.5 meters) for RS-422/RS-485 with the method drawn below.

The RS-422 specification recommends 24AWG twisted pair cable with a shunt capacitance of 16pF per foot of 100 ohm characteristic impedance.

Category 5 cable is available as shielded twisted pair (STP) and generally exceeds the recommendations for RS-422 making it an excellent choice for RS-422 and RS-485 systems.



Caution: Verify that twisted pair wires are properly paired when making connector ends.

Figure 2.13-3. Extending Communications Cable.

3. SMART REMOTE 4 CHARACTERISTICS

The Smart Remote 4 (SR – 4) is the fourth generation of controls panels designed to control several Ultimatte products. The SR – 4 does **NOT** operate with Ultimatte models prior to Ultimatte – 11 and Ultimatte – 500.

The SR – 4 was designed to optimize size and operational similarities with prior Smart Remote systems.

3.1 Overall Dimensions

H = 17.48 cm / 6.88 in (4RU)

W = 43.18 cm / 17.00 in

D = 6.99 cm / 2.75 in (including folded Desktop Stand)

3.2 Physical Installation

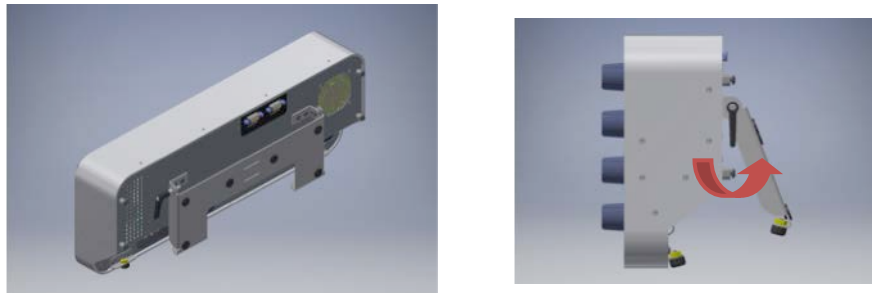


Figure 3.2-1. Desk Mounting Option

The SR – 4 can be used as a desktop unit with its built-in adjustable stand. Alternately, the SR – 4 can be mounted in a standard (19 in) rack using the mounting brackets provided with the unit (requires 4RU rack spacing).

To maintain a proper operating temperature, the SR – 4 has an air intake vent and a fan exhaust vent at the back of the unit. These vents should not be obstructed at any time to maintain adequate airflow. The maximum recommended operating temperature should not exceed 35°C / 95° F.

For desktop operation, the stand at the back of the SR – 4 can be adjusted for optimum viewing angle of the LCD screen. To move the stand from its current position, turn the black handle towards the top of the unit. After making the appropriate adjustment, turn the black handle towards the bottom of the unit to lock the stand into the new position. The position of the black handle can be changed by pulling the handle outward (on its axis), setting it to the new position, and then releasing the handle. See the desktop stand adjustments in Figures below.

To mount the SR – 4 in a rack, attach the power supply to the back of the desktop stand using the provided strap. Fold the stand to its most flat position. Attach the rack mount brackets to the back of the unit. See Figures below.

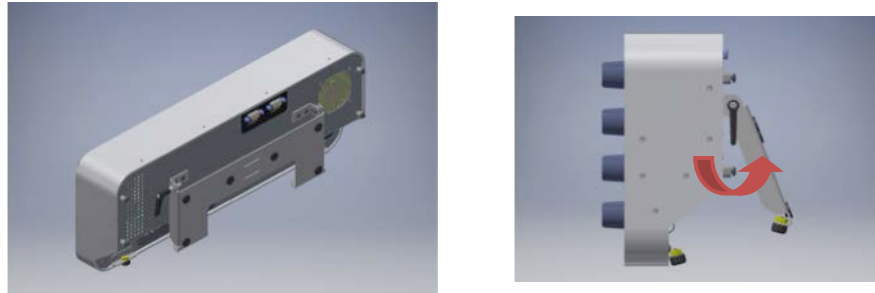


Figure 3.2-2. Rack Mounting Option

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

3.3 Power Requirements

The SR – 4 is powered by an external universal power supply. A secure DC connection is possible by a screw type connector, with the +ve connection at the center and the –ve on the outside. The chassis of the SR – 4 can be connected to GROUND by using the provided screw and terminal lug. See Figure below.

Input 100-240 VAC, 50/60 Hz 0.5-0.25 A. **NOTE: Connect the unit only to a properly rated supply circuit with appropriate over-current protection.**

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

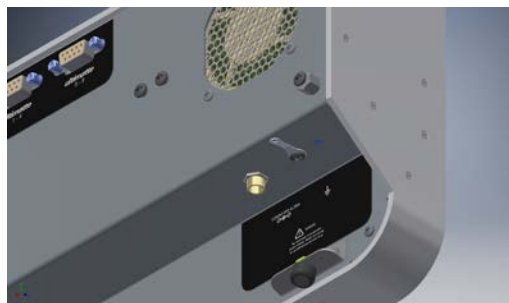


Figure 3.3-1. Power Input



Figure 3.3-2. Smart Remote 4 Input and Output Ports

3.4 Smart Remote 4 Rear View

RS-422 ports: Communications between the Main Unit and the SR-4 is through 2 RS-422 / RS-485 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 eight (8) Ultimatte Main Units of the same or different models can be connected to one SR-4.

The SR-4 is configured to be the Master with up to eight (8) Ultimatte-11 Main Unit combinations as slaves. Only the Master can initiate a message exchange.

USB2.0 port: The SR-4 has one USB2.0 port that can be used to connect a mouse and a keyboard. An external keyboard can be used instead of the “touch screen” keyboard in the “Files” section of the SR-4 for entering alphanumeric File and User names. The USB2 port can also be used to back up these files on USB “memory keys”. Short USB extension cables can be used to make these ports more easily accessible.

USB3.0 port: The SR-4 has one USB3.0 port that can be used to connect a mouse and a keyboard. An external keyboard can be used instead of the “touch screen” keyboard in the “Files” section of the SR-4 for entering alphanumeric File and User names. The USB3 ports can also be used to back up these files on USB “memory keys”. Short USB extension cables can be used to make these ports more easily accessible.

SVGA out: The SVGA output allows The SR-4 display graphics to be viewed on an external VGA monitor.

Display Port: *Inactive*

Ethernet port: The SR-4 is equipped with 2 x 10/100 Mbps Ethernet ports for connecting to LAN networks.

LED Indicators: Green = power is present. Red = drive activity

FRONT SIDE

USB2.0 port: The SR-4 has one USB2.0 port that can be used to connect a mouse and a keyboard. An external keyboard can be used instead of the “touch screen” keyboard in the “Files” section of the SR-4 for entering alphanumeric File and User names. The USB2 port can also be used to back up these files on USB “memory keys”. Short USB extension cables can be used to make these ports more easily accessible.

3.5 Smart Remote 4 Front View

The Ultimatte-11 System consists of a Main Unit, which is controlled by a SR-4.

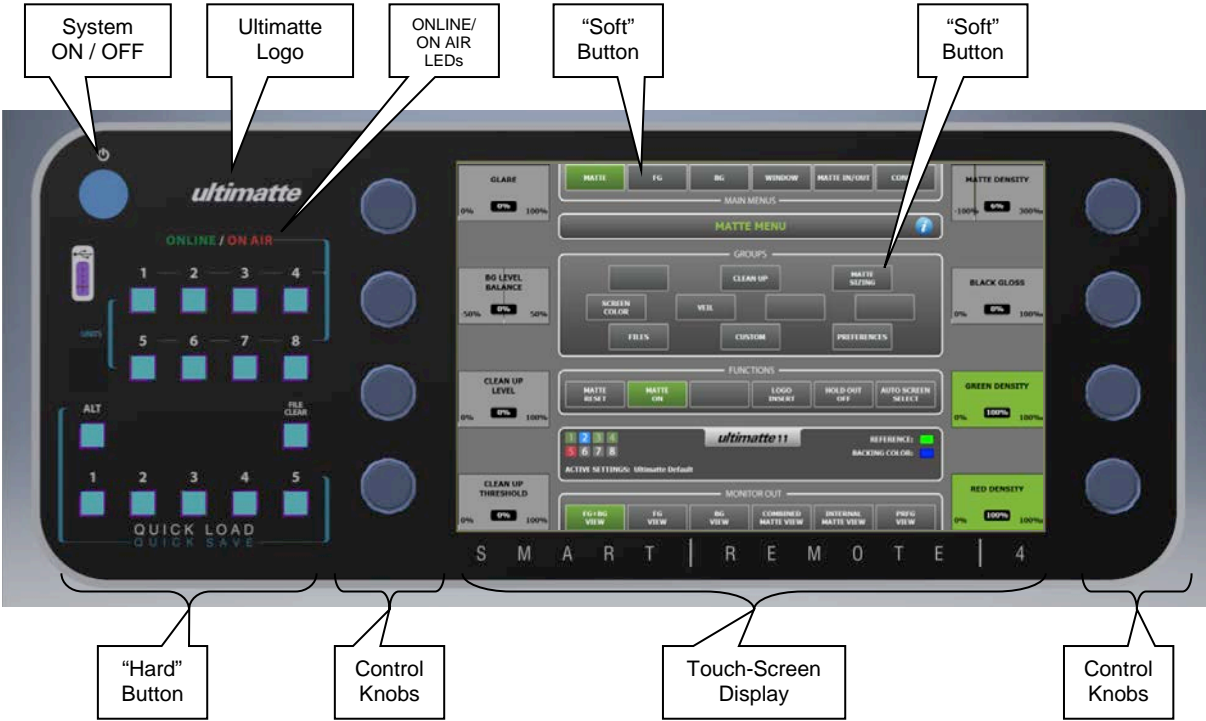


Figure 3.5-1. Smart Remote 4 Front View

The Smart Remote 4 includes:

- System ON / OFF illuminated button
- A color LCD display (resolution) with capacitive touch screen
- Eight control knobs (optical encoders)
- Eight Unit Select buttons (illuminated when selected)
- 1 To 8 Unit On Line (Green) / On Air (Red) indicators
- Five Quick Save / Quick Load buttons
- Alt (Alternate Function) button
- File Clear button
- One USB 2.0 port
- Illuminated Ultimatte logo

Note:

The buttons mentioned above are “hard” buttons. A “hard” button is defined as one with a fixed function as determined by the template.

All “soft” buttons are implemented as “touch screen buttons” on the LCD display. A “soft” button is defined as one with a function indicated by its label on the LCD display. A “soft” button with no displayed label has no associated function.

3.6 System ON / OFF Button



Figure 3.6-1. System ON / OFF Button

This button turns the power ON (LED ON) and OFF (LED OFF) from MOST of the SR – 4 system, with the exception of the illumination of the Ultimatte logo. This button properly powers up and powers down the system.

Note: Avoid removing the power from the system without proper shutdown using the System ON / OFF button.

Screen Save state: When there is no activity detected in the SR-4 for 30 minutes, the system will switch to the Screen Save state and an animated Ultimatte logo will be displayed. To exit the Screen Save state, touch the display.

Power Save state: When there is no activity detected in the SR-4 for 60 minutes, the system will switch to Power Save state and the backlight will be turned OFF. To restore the SR-4 to Active State, touch the display.

3.7 Control Knobs



Figure 3.7-1. Control Knobs

Eight control knobs, four mounted on each side of the display, provide digital increment / decrement data to the Main Unit. The value / status of each control is transmitted to

the Main Unit. 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 detent or 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. Additionally, there is a short vertical white mark where the default position of a control is located. A "double tap" within the area of a control display will restore that control to its default setting.

A control can be an "independent" one. This means that its adjustment does not change the setting of any other control, or the adjustment of any other control does not change the original setting of the "independent" control. On the other hand, a control can be one in a group of "dependent" controls. In this case, the adjustment of one of these controls will change the settings of one or all controls in the group.

3.8 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. **All "soft" buttons in the SR-4 are implemented as "touch-screen buttons" on the LCD display.**

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.

3.9 Display

The SR-4 has a 10.1 in. (25.65 cm) diagonal color TFT LCD (1280 x 800) display panel with "capacitive touch screen" capability. If there is no activity for a period more than 30 minutes, the screen saver will appear. If there is no activity for a period more than 60 minutes, the SR-4 will enter low power mode.

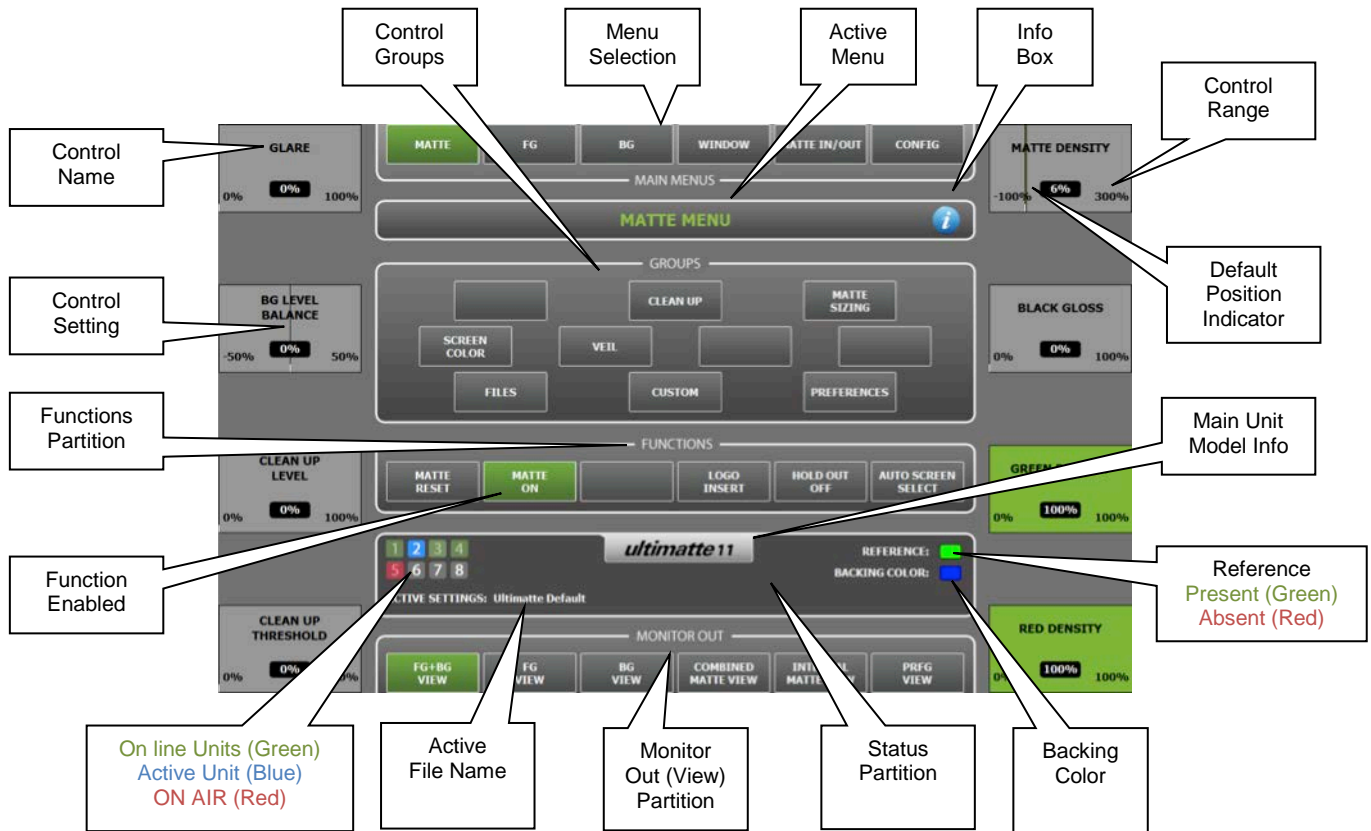


Figure 3.9-1. Smart Remote 4 Display

3.9.1 “Soft Buttons”

The labels on the display define the function of the "soft" buttons. The buttons in the “Control Groups” usually select sub-menus indicated on the display. The buttons in the “Functions” group usually perform a specific function.

Some menus do not make use of all the soft buttons. If there is no text on the “soft” button display, this could mean that:

- a. It performs no function in that menu.
- b. It is performing the assigned function as displayed in the Sub-Menu name near the top center of the display.

A “GREEN soft” button in the “Functions” group indicates that it has been enabled or selected. A “soft” button may toggle a given function ON and OFF, or it may be turned off by the selection of another function. A “soft” button may also select one of several functions every time it is “pressed”, as indicated by its display.

3.9.2 Info

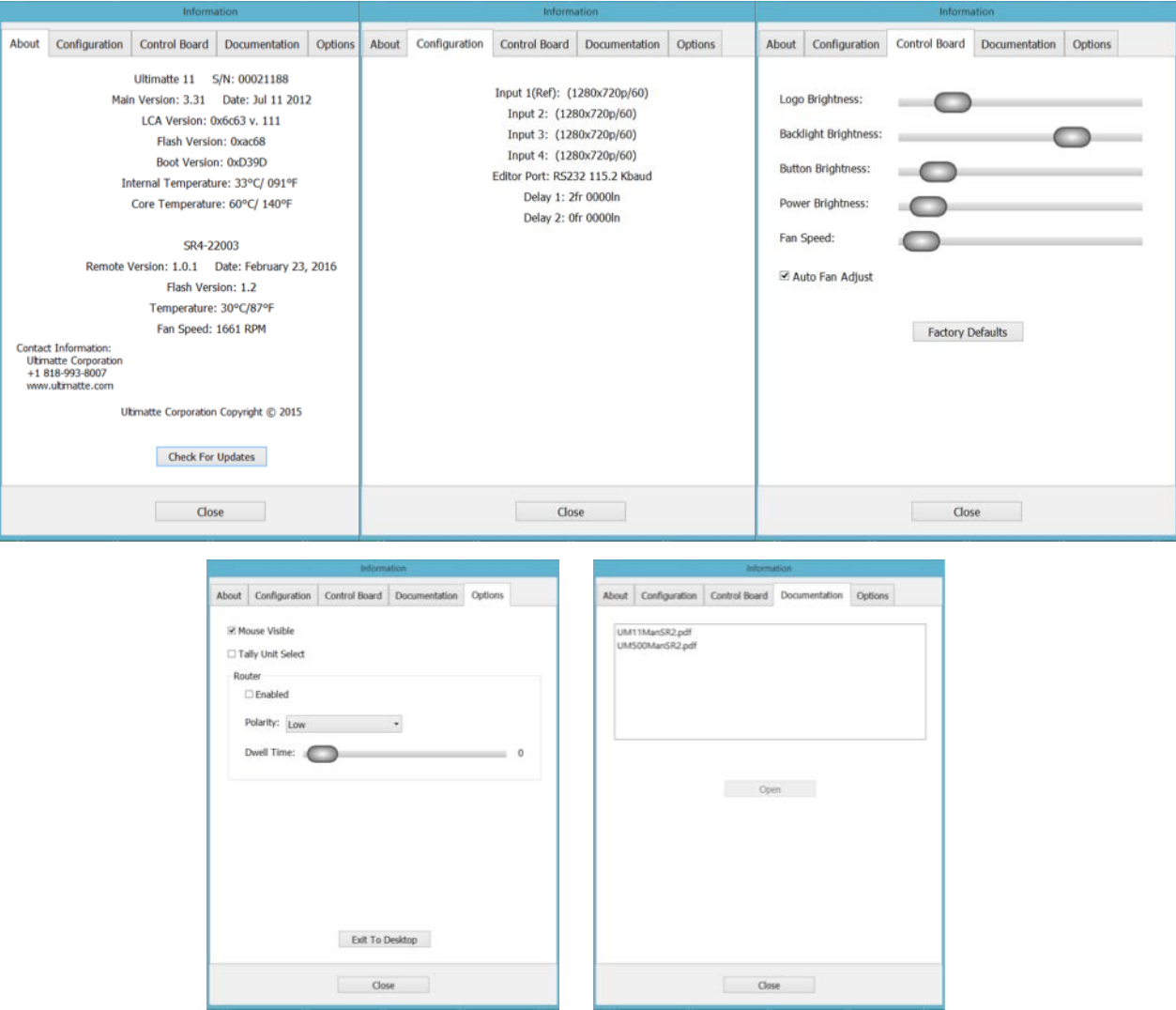


Figure 3.9-2. Information Screens

The “i” symbol will open the INFORMATION window, which will display various settings of the system and will allow the user to make adjustments to the SR – 4 panel illumination settings as shown in each tabbed section.

3.9.3 Status Partition



Figure 3.9-3. Status Box

This partition indicates the status of the system by providing the following:

- The Ultimatte main unit model number currently being controlled by the SR – 4
- The number of Ultimatte main units connected to the SR – 4 (ON LINE UNITS) as indicated by GREEN illuminated squares.
- The unit (address) number of the main unit currently being controlled by the SR – 4 (current active unit), as indicated by BLUE illuminated square.
- The unit (address) number of the main unit currently being ON AIR (if Talley connection is used) as indicated by RED illuminated square.
- The unit (address) number(s) of the ON LINE main unit(s) that are sending CAUTION messages as indicated by AMBER illuminated square(s).
- The presence (GREEN) or the absence (RED) of the REFERENCE VIDEO to the unit currently selected to be controlled.
- The selected BACKING (screen) COLOR (BLUE/GREEN/RED) of the unit currently being controlled.
- Additional messages (temporarily displayed):

This section provides to the user a variety of information about the active main unit. The Status section has three different areas for displaying the information.

This area of the display provides a wide range of information about the performance and the operation of the Active Unit. During normal operation, the Screen Color, Reference Lock and Input Assignments are displayed. Miscellaneous messages about system status will also be displayed.

This partition indicates the status of the system by providing the following:

- The Ultimatte main unit model number currently being controlled by the SR – 4
- The number of Ultimatte main units connected to the SR – 4 (ON LINE UNITS) as indicated by GREEN illuminated squares.

- The unit (address) number of the main unit currently being controlled by the SR – 4 (current active unit), as indicated by BLUE illuminated square.
- The unit (address) number of the main unit currently being ON AIR (if Talley connection is used) as indicated by RED illuminated square.
- The unit (address) number(s) of the ON LINE main unit(s) that are sending CAUTION messages as indicated by AMBER illuminated square(s).
- The presence (GREEN) or the absence (RED) of the REFERECE VIDEO to the unit currently selected to be controlled.
- The selected BACKING (screen) COLOR (BLUE/GREEN/RED) of the unit currently being controlled.
- Additional messages (temporarily displayed):

Upon power up of either SR-4 or Main Unit, a message will display **“Select an Online Main Unit!”**. Upon selecting an Online Main Unit, the message will display **“Retrieving Menus from Main Unit!”**

When the SR-4 fails to communicate with the main unit, the INFO section will display **“Lost communication with Main Unit!”** message.

When the FILE CLEAR button is pressed, **“File Clear In Progress”** message is displayed while the main unit is processing the command.

When any of the VIEW buttons is enabled, some functions and controls will be locked out. When the user tries to enable the locked out function or adjust a locked out control, a message will be displayed for a short period of time indicating the lock out. For example, when the FG VIEW is enabled, turning most of the control knobs will display **“Control is locked in – FG VIEW”** message.

When certain functions are disabled, turning associated control knobs will cause a “locked out” message to be displayed. For example, when the Matte In function is not enabled, turning the Matte In Gain control will display **“Control is locked – Matte In DISABLED”** message.

3.9.4 Main Unit Model Info

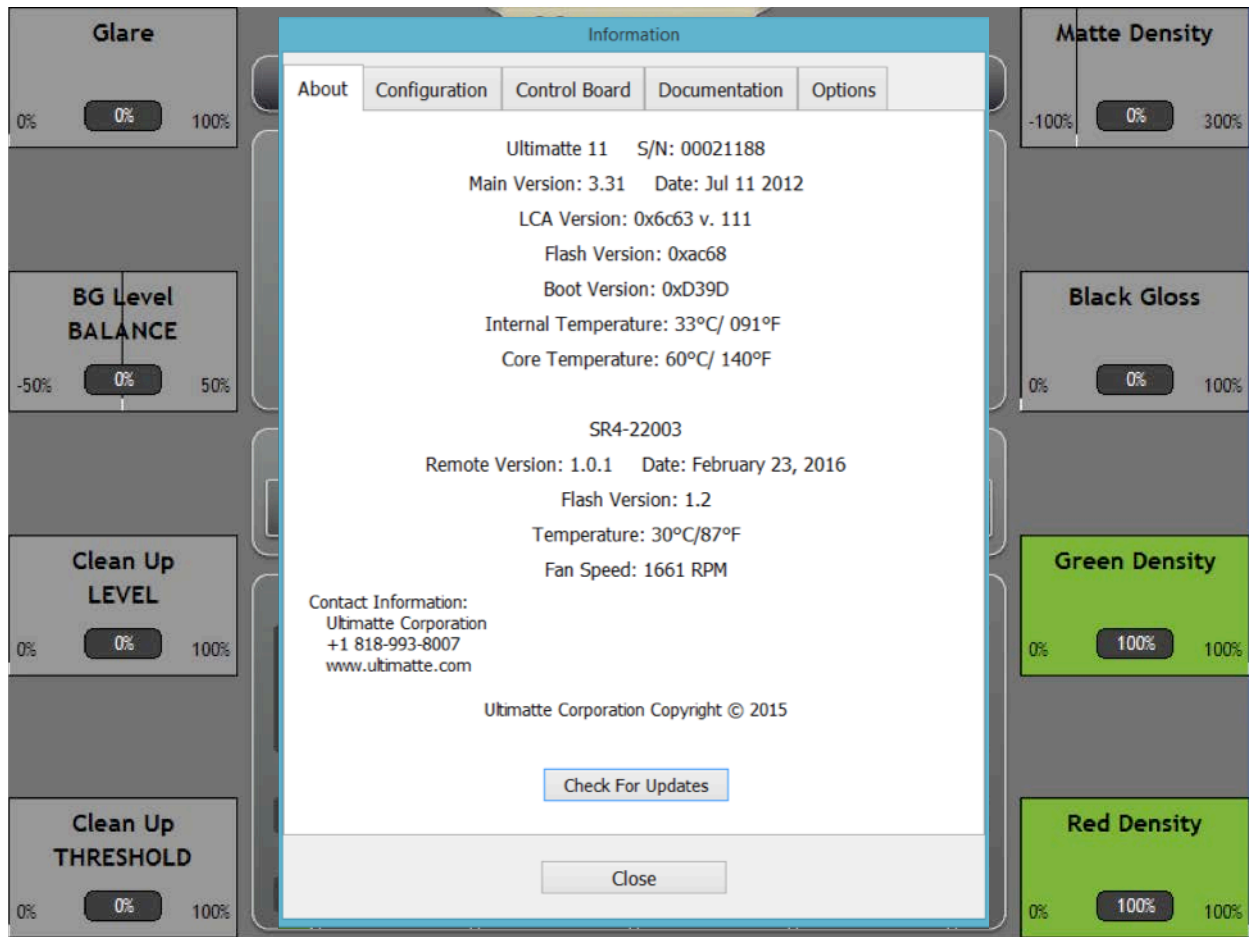


Figure 3.9-4. Information Window

Click on the “*I*” symbol in the Active Menu partition to open a display window showing the software version of the SR-4 and its release date, the software version of the main unit and its release date, Flash and Boot information, and temperatures with fan speed. Additionally, this window will display the serial numbers of the main unit and SR4.

Click on “Close” to return to SR4 application.

Check for Updates: Selecting **Check for Updates** will quit the **SR-4** software (controlling the main unit) and display the SR-4 desktop with the **SR4_Updater** icon. This will allow the user to upgrade the **SR-4** software (not the main unit software and firmware). Refer to Appendix for programming or updating the Main Unit firmware and SR-4 Software.

3.10 MONITOR OUT PARTITION

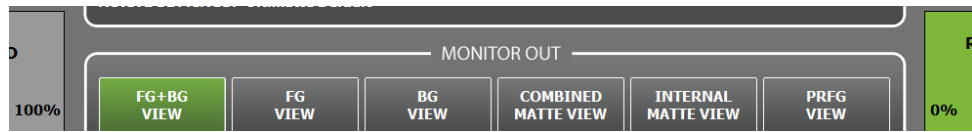


Figure 3.10-1. Monitor Out Partition

The “soft” buttons in this partition will select 1 of 6 images to be displayed on a video monitor connected to the MONITOR OUT of the active main unit.

The six (6) MONITOR OUT selections are:

- FG + BG VIEW (Composite image)
- FG (Foreground image) VIEW
- BG (Background image) VIEW
- COMBINED MATTE VIEW [Screen Matte + Garbage Matte (if used) + Layer Matte (if used) + Holdout Matte (if used)]
- INTERNAL MATTE VIEW [Screen Matte only]
- PRFG (Processed Foreground) VIEW (Backing color and its spill removed)

3.11 ONLINE / ON AIR LEDs

Numbers lit GREEN indicate that the units that are ON LINE and could be selected for control by the UNITS buttons. All ON LINE units will be displayed as GREEN unit “buttons” (squares) in the Status Partition.

A RED lit number indicates that the associated unit is ON AIR. Talley connections to the main units are required for the RED LED to be enabled. See section 11.11 for Talley connection and activation. Only ON LINE Units can indicate a Talley selection. The ON AIR unit “button” (square) will be displayed RED in the Status Partition.

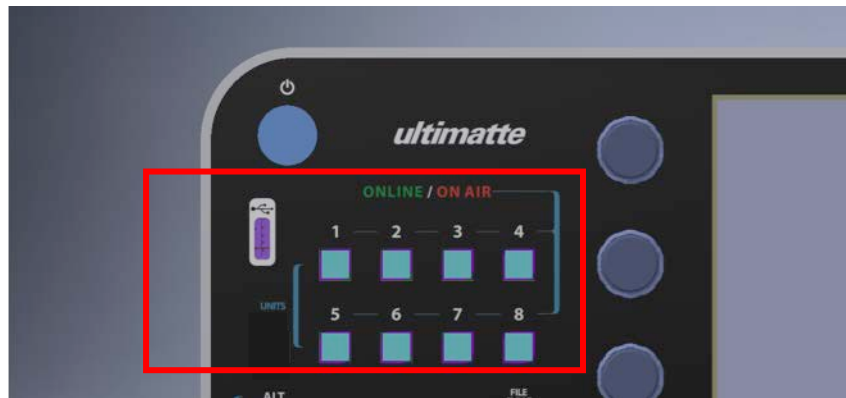


Figure 3.11-1. ONLINE / ON AIR LEDs and UNIT Select Buttons

3.12 UNIT Select Buttons

The SR-4 can access up to 8 Ultimatte-11 Main Units (pushbutton switches are numbered 1-8) and is constantly polling to determine the units available. An available (Online) unit is indicated by the LED(s) in the corresponding switch(es) turned ON at a low intensity level. When the unit is selected (Active) the corresponding LED is turned ON at a higher intensity level. The Online unit numbers and the Active unit number are also displayed in the Status section of the LCD panel. See section 2.10 Configuration, to configure the Ultimatte-11 Main Unit ID addresses.

Note that a failure to communicate with the active Ultimatte-11 units will result in a **"Lost communication with Main Unit!"** message in the Info box under the Status section on the display.

Note:

Unit Select buttons do not control the operation of the ON AIR LEDs.

3.13 QUICK SAVE / QUICK LOAD



Figure 3.13-1. QUICK SAVE / LOAD Buttons

For each main unit, up to five different setups can be quickly saved and recalled in order to make visual comparisons of settings for a given scene. Lit numbers indicate that there are files saved at these locations.

To Save a QUICK file in the current active unit, press ALT (LED will turn ON) then press one of the five QUICK SAVE / QUICK LOAD buttons. The associated number for the selected button will be lit, indicating the presence of a file, while the ALT button LED is turned OFF.

To Load a QUICK file from the current active unit, press one of the QUICK SAVE / QUICK LOAD buttons that has a lit number (a saved file present). The selected button will be lit. Additionally, the ACTIVE SETTINGS in the Status partition will display the selected file number.

For the Ultimatte – 11 models, the QUICK files are saved in the main units as VOLATILE files. Recycling power on a main unit will erase the QUICK files for that unit. If a QUICK file needs to be saved in NON-VOLATILE memory, then that file should be saved under FILES. To restore the saved QUICK file to its original location, the file should be loaded as the current work file (displayed as current ACTIVE SETTINGS in the Status partition), and then saved as a QUICK file

3.14 FILE CLEAR Button



Figure 3.14-1. FILE CLEAR Button

Pressing the FILE CLEAR button will auto-sample the backing color and will restore all functions to **factory defaults** with the exception of the following:

- Backing Color Select
- Input and Output Select or matrix configurations
- Input 1 and Input 2 Delay settings
- Matte In polarity
- Matte Out polarity
- Monitor Output setup
- View Lock ON / OFF setting

3.14.1 ALT FILE CLEAR

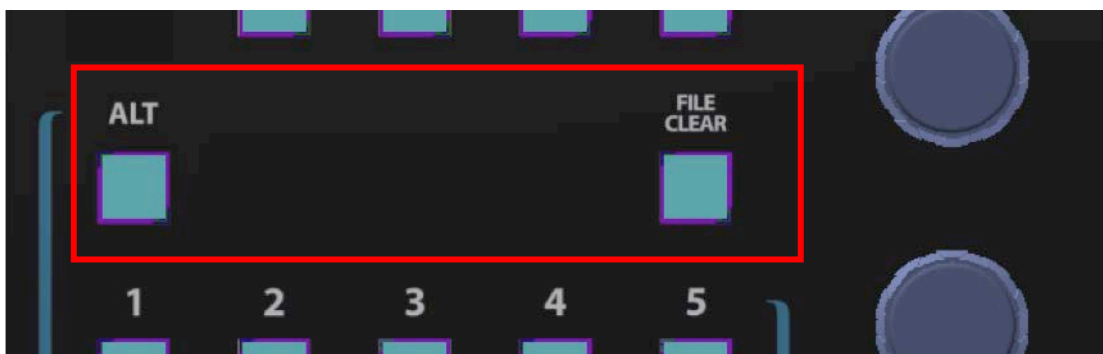


Figure 3.14-2. ALT FILE CLEAR

Note: This function can only be used when a saved **Preference (User Default)** file is loaded as current work file (see section 14 for a description on saving and loading Preferences). If no **Preference** file has been loaded, factory default settings will be used.

Pressing the ALT function (LED ON) **then** pressing the FILE CLEAR button will perform a “USER” FILE CLEAR function. This is similar to a FILE CLEAR function **except** that ALT FILE CLEAR will restore the selected **Preference** file as the default settings (rather than factory defaults).

3.15 Files, Preference (Files) and Custom Sub-Menus

ALL FILES IN ULTIMATTE-11 ARE SAVED IN NON-VOLATILE MEMORY

- Files: Save or Load a (setup) file
Number of files: 90
Number of Quick Files: 5
- Preference: Save or Load a (User default) file
Number of files: 20.
- Custom Create Custom Menus that could be saved with a User File.
Number of Custom Menus: 4 per Preference File.

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.

3.16 Touch Screen Care

Occasionally, the touch screen overlay needs to be cleaned of fingerprints and dirt. Apply isopropyl alcohol on a clean, soft, cloth and wipe the screen gently using a circular motion.

Do not press hard on the touch screen and do not use any sharp objects as a pointer for the screen. However, a stylus specifically designed for touch screens can be used to activate the Soft Buttons and Menus on the display.

4. ULTIMATTE-11 QUICK START

For the purposes of this quick start section, the assumption is being made that the basic connection consists of one Ultimatte-11 (main unit) and one SR-4. A More detailed explanation for each control is given later in this manual.

The Ultimatte-11 contains a router that can accept up to 4 x SDI video inputs that can consist of any combination of Foreground, Background, Matte-In (1 and/or 2) signals. **The Reference video source is fixed and is derived from the signal connected to Input 1.** After connecting the unit, the following steps should be taken in order to produce an acceptable composited image.

4.1 Step 1: System Connection

- A. Connect an uninterrupted **SDI video source** as reference to **Input 1**. This can be its own source or one of your other selections, i.e.: FG, BG, or Matte In (1 and/or 2).
- B. Connect the Foreground source.
- C. Connect the Background source.
- D. Connect, if applicable, the Matte-In (1 and/or 2) source.
- E. Connect the Monitor Output to an appropriate video monitor.
- F. Connect the RS-485 interface of the SR-4 to the Main Unit. A message will appear on the Info Box displaying “**Select an Online Main Unit!**”
- G. Select the Online Main Unit by pressing the appropriate Unit Button. A message will appear on the Info Box displaying “**Retrieving Menus from Main Unit!**”
- H. Press the MENUS “**CONFIG**” hard button on the left hand side of the remote panel to set your inputs, by:
 1. Rotating the upper left knob until the number displayed matches your Foreground input number. Double tap the control to accept the selection.
 2. Rotating the 2nd left knob from the top left until the number displayed matches your Background input number. Double tap the control to accept the selection.
 3. Rotating the 3rd left knob from the top left until the number displayed matches your Matte-In 1 input number, if applicable. Double tap the control to accept the selection.
 4. Rotating the bottom left knob until the number displayed matches your Matte-In 2 input number.
- I. The default backing color is blue. If you are using a red or green backing, select it by pressing the corresponding “soft button” In the Functions section of the display.

J. Press the gray “**FILE CLEAR**” hard button.

4.2 Step 2: Sample the Backing Color

A. Press the MENUS “**MATTE**” hard button.

B. Press the “**AUTO SCREEN SELECT**” soft button in the Functions section of the display to sample the actual values of the backing color being used.

C. There are other methods of sampling your backing color; see sections 5.12, 5.13, and 5.14 in Chapter 5 (UNDERSTANDING BASIC CONTROLS) and Chapter 6.4 (SCREEN COLOR MENU).

4.3 Step 3: Set the Matte Controls

(if necessary)

A. View the Matte by pressing the VIEW “**MATTE**” hard button.

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. Set the Matte controls to affect the black and gray areas of the matte using these guidelines:

1. **Matte Density:** Use this control to stop print-thru in bright foreground objects.
2. *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:

3. **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.*
4. **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.*
5. **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.*
6. **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:

1. These matte controls are used to adjust the white and gray areas of the matte channel.
2. This will dramatically affect the nature of foreground objects' edges, the opacity of transparent objects, and the noise in the background image.
3. 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.

4. **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.*
5. **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 (disabling the Matte view).

4.4 Step 4: Set the Flare Controls (if necessary)

- A. Press the MENUS "**FG**" hard button.
- B. Press the "**FLARE**" soft button in the Control Groups section of the display.

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:

1. **Black Balance:** Use this control to remove excessive spill on dark foreground objects.
2. **Gray Balance:** Use this control to remove excessive spill on midrange foreground objects

3. **White Balance:** Use this control to remove excessive spill on bright foreground objects.
4. **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.
5. **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.*

Your basic composite has now been set. Toggle between the foreground and composite view by pressing/depressing the VIEW "**FG**" hard button 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.

5. UNDERSTANDING BASIC CONTROLS

To generate a composite image using the Ultimatte-11 requires some understanding of the way an Ultimatte-11 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.

5.1 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 on Monitor Out by activating the Matte button in the VIEW Buttons section 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).

5.2 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.

5.3 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.

5.4 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.

5.5 Garbage Matte Clean Up

As part of producing a realistic composite, the background scene is added using a matte that is an exact representation of the backing or the screen, including the shadows cast by the foreground subject. This means that the background scene is added based on the lighting variations of the screen. In many situations, the blue or the

green screen does not extend to all the edges of the foreground frame. Since the background scene will only be added in the areas where the screen color is visible, Garbage Mattes have been used to add the background scene in those areas of the foreground frame where the screen is not present. Since it is impractical to try to obtain an absolutely even lighting on the screen, there will always be some visible difference in the level of the background scene inside and outside the Garbage Matte areas. To minimize this visible background level difference, soft-edge garbage mattes have been used to smooth out the transition between the garbage matte and screen matte. The wider this soft transition area is, the less visible the background level differences will be. Traditionally, the width of this soft transition area of the garbage matte has been limited to maximize the screen area where the foreground subjects can use as they will gradually become semi-transparent as they enter the transition areas of the garbage matte. To compensate for this limited transition width, some amount of Clean Up is also used, which reduces or eliminates shadows cast by the foreground subjects in addition to the loss of fine foreground subject detail.

The Garbage Matte Clean Up feature limits the Clean Up function to be active only in the soft transition region of the Garbage Matte without causing the foreground subjects entering this region to become semi-transparent. Thus garbage mattes with very wide transition regions can be used without restricting the usable screen area while maintaining all the shadows cast by the foreground subjects in the areas outside the garbage matte.

5.6 BG Level Balance

In an Ultimatte-11 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-11 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.

5.7 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-11 can use internally generated rectangular windows with variable edge softness, or two external signals, selected as Matte In 1 and Matte In 2, as external window signals. An external window signal will force ON the BG wherever the window signal is white. The Matte In (1 and 2) 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-11 can be inverted so that they mask off an area within the frame rather than a border of the frame.

5.8 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 most predominant unobstructed backing at its brightest. In Ultimatte-11, the Automatic Screen Color Sampling will achieve this. As the FG is scanned, the values for the predominant 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 Screen Color Sampling mode, the Ultimatte-11 operator can move a "cursor" on the screen through the cursor Horizontal and Vertical controls on the SR-4. 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 SR-4 display.

5.9 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-11 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-11, the Veil controls are overrides of the automated suppression of the backing color. Since the Automatic Screen Color Sampling circuit sets the backing subtraction parameters for the most predominant 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.

5.10 BG Noise

All cameras have certain amount of inherent electronic noise. Any scene viewed by a camera has that noise as part of the image. When the camera is viewing a subject standing in a real set, the subject and the set will have the same noise characteristics. In a "virtual set" environment, the foreground subject is removed from the blue (green) screen environment and placed in this virtual environment. If this virtual environment is computer generated, it will be noise free. When combined with a real foreground, the camera noise characteristics are transferred to the background scene through the matte generated from the screen color, as if the entire scene was viewed by the camera. The foreground and the background will have the same noise characteristics, as long as no Clean Up is applied, or no Garbage Mattes are used. When Clean Up is applied, it gradually removes the camera noise characteristics from the matte and thus the background scene. The garbage matte is a digitally generated signal that has no noise characteristics. In both scenarios, the virtual background will not have the same noise characteristics as the foreground subject, thus reducing the realistic look of the composite image.

By sampling and analyzing a uniform screen area of the foreground image, the camera's noise characteristics are isolated. These noise characteristics are selectively added to the background scene, only in the areas affected by the Clean Up function, or areas inserted by Garbage Mattes. This allows a more realistic looking composite

image, with similar noise characteristics in all parts of the image.

5.11 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-11 has three controls that affect the overall flare suppression: White Balance, Gray Balance, and Black Balance. Each of these three controls mainly influences 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-11'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-11 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 7.4-1, Table 7.4-2, and Table 7.4-3.

5.12 Screen Color Sampling

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-11, this task is accomplished by scanning and analyzing the FG image. Then, based on the determined values, the backing color is properly subtracted and the BG image is added with the correct level. The Ultimatte-11 has two ways of performing Screen Color Sampling, automatic and manual.

5.13 Automatic Screen Select Sampling

Automatic Screen Select Sampling is the default method of scanning, analyzing, and determining reference backing color levels. In this method, the matte signal is analyzed to detect the most predominant highest level, which will correspond to the most predominant 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-11 uses the stored reference values to restore proper processing of the FG image and the level of the BG image.

Automatic Screen Select Sampling is quick, and the operator does not have to take additional steps to perform sampling of the backing. Automatic Screen Select Sampling 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 Select Sampling might 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 Select Sampling will acquire new reference data when the following functions are performed or selected: Main Unit Power Up, System Reset, Backing Color Select, File Clear, and ALT File Clear.

5.14 Manual Screen Color Sampling

Manual Screen Color Sampling allows the operator to select a pixel or kernel area in the backing whose RGB values are displayed on the SR-4 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 through the SR-4. Sampling the Screen Color does not reset the controls to their default values. Sampling a new Screen Color impacts automated settings of FG suppression and BG turn on. When there is the need to reset all controls to their default values (factory or user default), the Ultimatte-11 will calculate all parameters based on Auto Screen Select.

When using Manual Screen Color Sampling, the operator can select an area 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 SR-4 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 sample 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.

5.15 Layering

The layering feature in the Ultimatte-11 allows a third element to be added to the composite output. This third element can maintain full transparency levels and can be positioned in front of the foreground (and background) layer, or can be placed between the foreground and the background layers.

Most virtual sets use digitally generated scenes as the background source, while a real camera provides the foreground source. In the final composite, the foreground always appeared in front of the background scene. To create a more dramatic and layered look, it has been a common practice to bring some elements of the background scene in front of the foreground object. Most background rendering systems provide at least a second output. This output is used to provide an alpha or a matte signal corresponding to the “background” elements that will be brought in front of the foreground objects. These selected elements were always opaque virtual objects, like walls or columns. Semi-transparent virtual objects, like frosted or stained glass panels were not used, even though the alpha associated with this objects could have various transparency levels. The reason for not placing virtual semi-transparent objects in front of foreground objects was that the background scene partially visible through these semi-transparent objects would still be visible when placed in front of opaque foreground objects. There is no simple method for separating these semi-transparent virtual objects from the background scene and maintaining their level of transparency at the same time.

The best solution is to render these virtual elements separately, then add them as an independent layer to the composite image. Recently, the processing power of these background rendering systems has increased substantially, which makes it possible to output two separate layers simultaneously. Additionally, these systems can output an alpha channel associated with the elements in the second layer. In most situations, this alpha output is used to generate a garbage matte, when the foreground camera overshoots the colored backing. This garbage matte artificially extends the backing to the edges of the foreground frame inside the Ultimatte. Rather than using the alpha output either a garbage matte or a layer matte, it is possible to get both mattes independently but simultaneously from this single output.

In a serial video data stream, the Luma (Y) information at full bandwidth is multiplexed with half bandwidth chroma (Cb, Cr) information to become the commonly known format 4:2:2. With a matte signal, the Chroma portion is multiplexed with “0”s to become 4:0:0.

Instead of “0”s, a second full bandwidth (4) matte can be multiplexed with the first matte to form a dual matte signal (4:4). The first matte could be the Garbage Matte, and the second matte could be the Layer Matte.

Rather than multiplexing half bandwidth U (Cb) and V (Cr) with the full bandwidth Luma (Y) in the form of:

U0, Y0, V0, Y1, U2, Y2, V2, Y3, ...

The Dual matte can be multiplexed as:

Y20, Y10, Y21, Y11, Y22, Y12, Y23, Y13, ...

(For more detailed description of the use of dual mattes, please see section 15.6 One Matte Is Not Enough)

The Ultimatte-11 can be configured to add these layer elements. The Ultimatte-11 has four SDI inputs which can assigned to a foreground input, a background input, a layer element input, and a single (4:0:0) or a dual (4:4) input. The default input configuration of the Ultimatte-11 is as follows:

Foreground: Input 1
Background: Input 2
Matte In 1: Input 3 Y
Matte In 2: Input 3 U/V
Layer (elements): Input 4

The default assignment for Matte In 1 is as Garbage Matte.

The default assignment for Matte In 2 is as Layer Matte.

When the “Layer” feature is enabled, the layer elements will be added to the composite image. The operator can control the location of these elements with respect to the foreground objects. With the “Layer Rear/Front” control, the operator can move the layer elements from behind the foreground objects to in front of them, and visa versa. The “Layer Fade” control allows the layer elements to be faded out or in the final composite scene.

6. MATTE CONTROLS

6.1 MATTE MENU

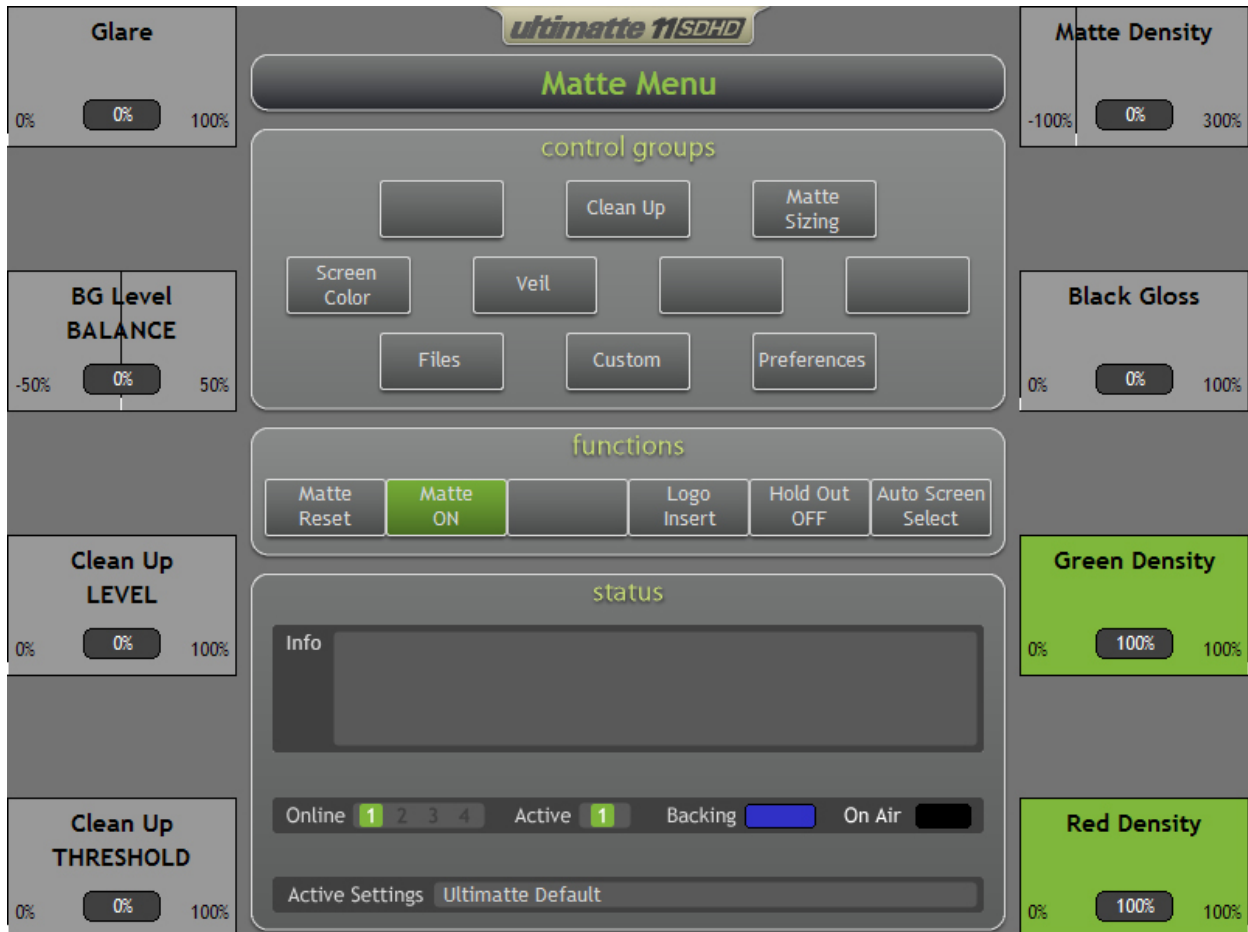


Figure 6.1-1. Matte Menu

6.1.1 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* Section 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.

Note: 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.

6.1.2 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.

6.1.3 Green Density: (Blue Backing or Red 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.

6.1.4 Red Density: (Blue Backing or Green 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

6.1.5 Glare

The Glare control is a manual override for an automated circuit, which can reduce the effect of glare (unwanted "white light" reflections) from floors and other horizontal surfaces, in situations where the backing is extended to cover the floor.

6.1.6 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.

6.1.7 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.

6.1.8 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.

6.1.9 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 section 14 for details on setting and using Preference 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.

6.1.10 Matte On/Off

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

6.1.11 Logo Insert

When enabled, the Holdout Matte will select the "Logo Insert" method of processing of the background image. Additionally, when the Logo Insert mode is enabled, the Holdout Flare settings will default to "No Flare".

6.1.12 Hold Out On/Off

In normal mode of operation, the Holdout Matte will allow the background scene to be enabled in a specific portion of the composite image, even though the background

scene covers the entire frame. In an alternate mode of operation, like in some sporting events, a team logo or an advertisement needs to be “painted” on the green field. In this mode, the “background scene” is a team logo against a black field. This type of background requires a somewhat different method of processing. When Logo Insert mode is enabled, the Ultimatte will select the appropriate mode of operation. The default setting for Holdout Flare is “No Flare” mode.

6.1.13 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 most predominant highest level, which will correspond to the brightest and purest area of the backing.

When Auto Screen Select is enabled, a new reference data (optimum screen color) will be acquired upon Main Unit Power Up, System Reset, Backing Color Select, File Clear, and ALT File Clear.

6.2 CLEAN UP MENU

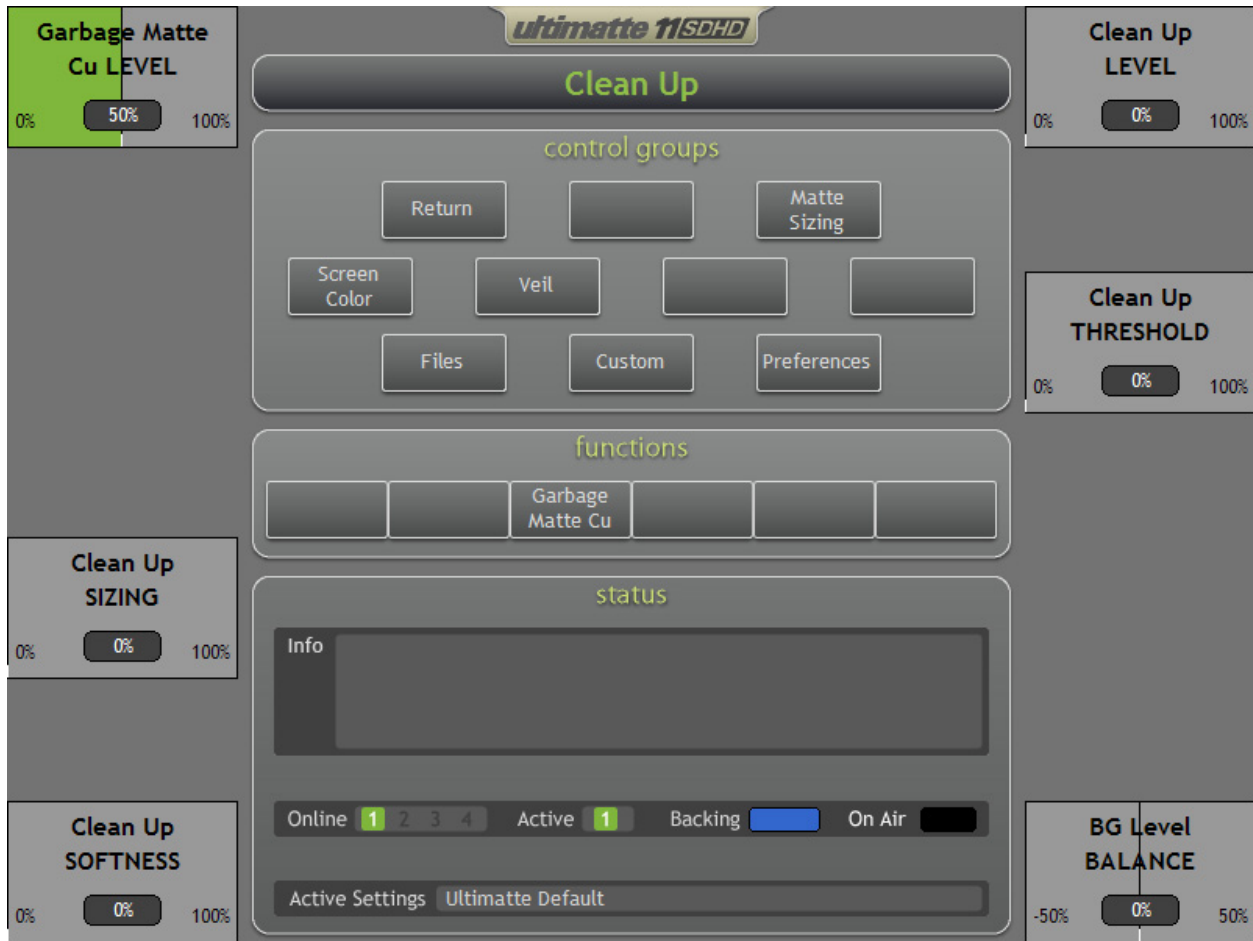


Figure 6.2-1. Clean Up Menu

6.2.1 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.

6.2.2 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.

6.2.3 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 foreground 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.

6.2.4 Garbage Matte Cu Level

The Garbage Matte Clean Up Level sets the threshold level above which the Clean Up function will be applied to the matte in the transition region of the Garbage Matte. The higher the threshold value, the more fine detail of the foreground subjects can be retained. For a description of Garbage Matte Clean Up, refer to section 5.5.

6.2.5 Clean Up Sizing

This control will reduce the size of the matte in the Clean Up stage only.

6.2.6 Clean Up Softness

This control will soften the matte on the Clean Up stage only.

6.2.7 Garbage Matte Cu On/Off

Enabling this button activates the Garbage Matte Clean Up feature. For a description of Garbage Matte Clean Up, refer to section 5.5.

6.3 MATTE SIZING MENU

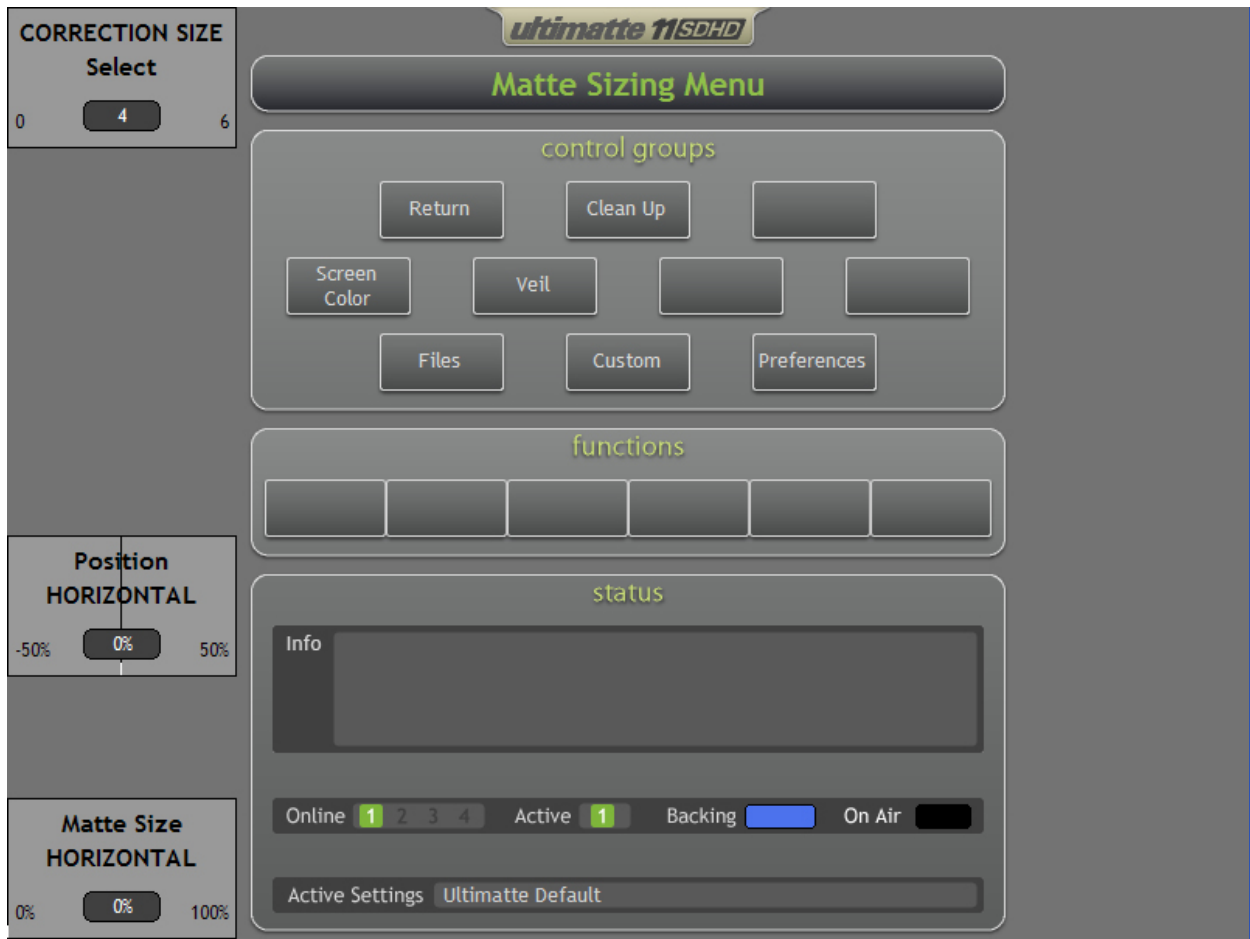


Figure 6.3-1. Matte Sizing Menu

6.3.1 Correction Size Select

Matte Correction analyzes all matte transitions, based on the size selected (number of pixels), and applies the appropriate amount of correction to the transitions which need modification.

Unlike regular Matte Sizing (see below), which “chocks” all transitions of a matte, the matte Correction selectively corrects transitions which are not set correctly.

The Correction Size indicates the number of pixels within which the system will analyze every transition. When the Size is set to 0, no correction is applied.

6.3.2 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.

6.3.3 Matte Size Horizontal

Adjust the size of the matte in the horizontal direction in sub pixel increments up to 3 pixels.

6.4 SCREEN COLOR MENU

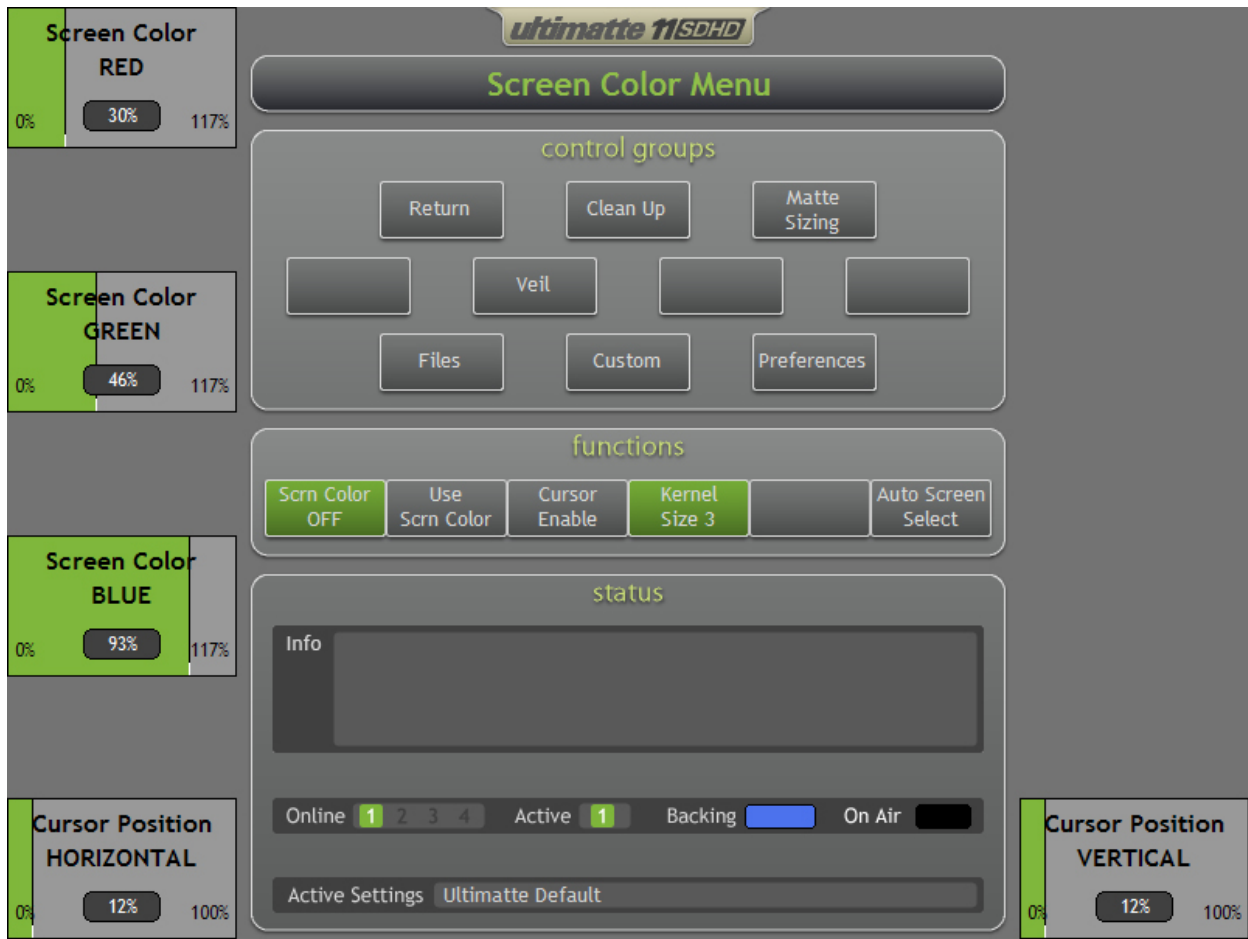


Figure 6.4-1. Screen Color Menu

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 Use Screen Color to save these screen values as reference.
- Deactivate the Screen Color control by pressing the Screen Color Enable button again (LED turns off).

6.4.1 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 Use Screen Color is selected the new value will be used as the RED reference value.

6.4.2 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 Use Screen Color is selected, the new value will be used as the GREEN reference value.

6.4.3 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 Use Screen Color is selected, the new value will be used as the BLUE reference value.

6.4.4 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.

6.4.5 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

6.4.6 Screen Color Enable

This function is disabled for normal sampling and enabled when the sampled Screen Color is manually altered by using Screen Color Red, Screen Color Green, Screen Color Blue controls. After adjusting Screen Color Red, Screen Color Green, Screen Color Blue controls press **Use Screen Color** to keep manual adjustment values. After the selection is made, the Screen Color Enable is turned OFF automatically.

If, after adjusting the Screen Color knobs, the Screen Color Enable feature is turned OFF without selecting Use Screen Color, the system will ignore these adjustments and

use previously saved screen values.

6.4.7 Use Screen Color

Saves the manually selected Screen Color R, G, B values as the new screen values.

6.4.8 Cursor Enable

When this button is enabled, a square cursor is superimposed to the FG View on the Monitor Output, indicating the current cursor horizontal and vertical position.

6.4.9 Kernel Size

Sets the Cursor size used for manual sampling. Each pressing of this button increments the Kernel size by one H and one V pixel.

6.4.10 Auto Screen Sample

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

When Auto Screen Select is enabled, a new reference data (optimum screen color) will be acquired upon Main Unit Power Up, System Reset, Backing Color Select, File Clear, and ALT File Clear.

6.5 VEIL MENU

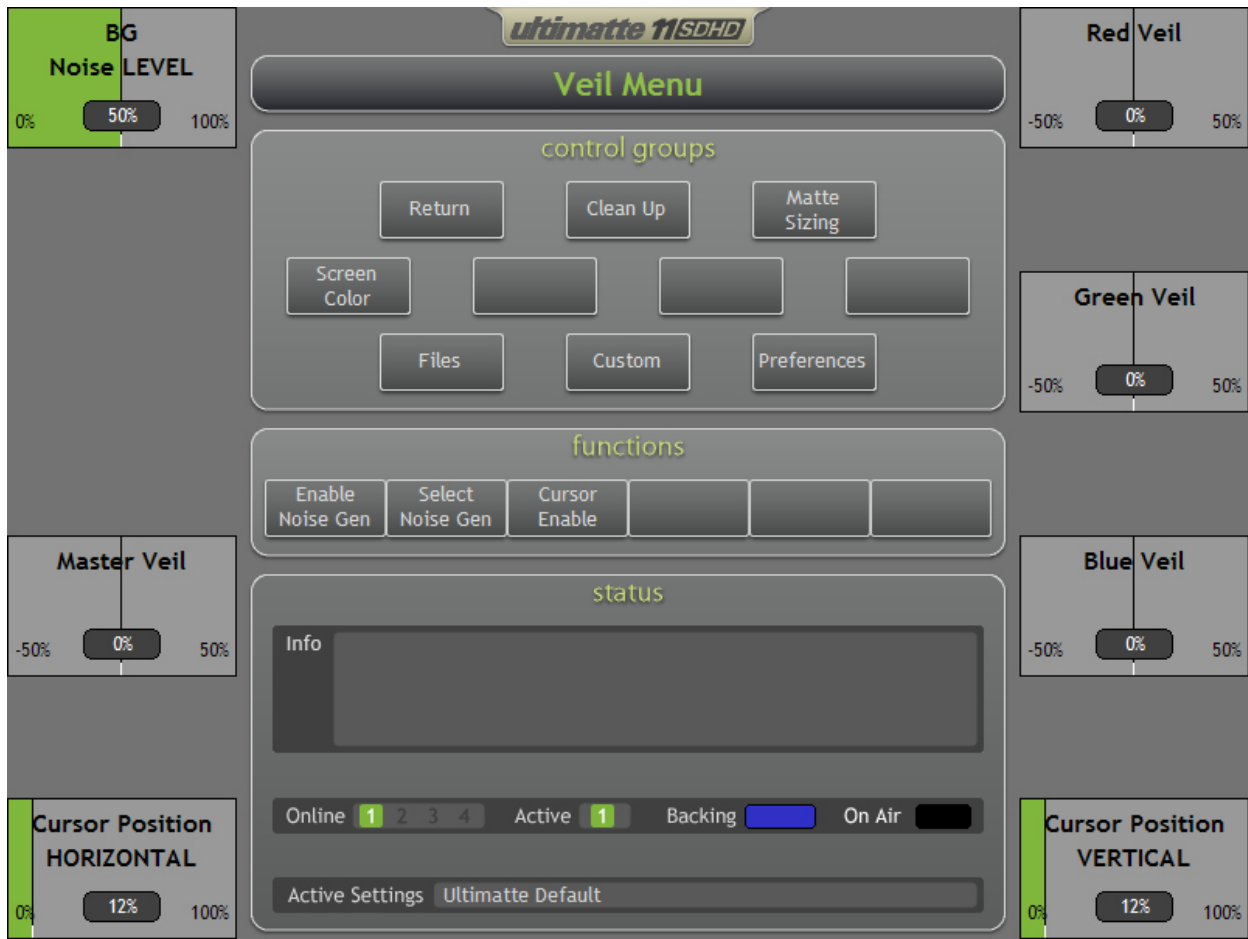


Figure 6.5-1. Veil Menu

6.5.1 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.

6.5.2 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.

6.5.3 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.

6.5.4 Cursor Position Vertical

Moves the position of the noise sampling in the vertical direction.

6.5.5 BG Noise Level

Adjusts the amount of noise that needs to be added to selected areas of the background scene. Refer to section 5.10 for more details.

6.5.6 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. When adjusting the Master Veil, the relative difference between the Red Veil, Green Veil, and Blue Veil components will be maintained.

6.5.7 Cursor Position Horizontal

Moves the position of the noise sampling in the horizontal direction.

6.5.8 Enable Noise Gen

When enabled, this button allows the sampled noise characteristics to be added to selective areas of the background scene.

6.5.9 Select Noise Gen

When the Noise Cursor is enabled and positioned in the appropriate screen area, pressing Select Noise Gen will analyze the foreground camera noise characteristics in the area indicated by the cursor and automatically add the noise to selected areas of the background scene.

6.5.10 Cursor Enable

When enabled, the noise sampling area will appear on the top left quadrant of the foreground image. Disabling this button will return the view to the composite image without sampling the screen.

7. FOREGROUND CONTROLS

7.1 FOREGROUND CONTROLS MENU

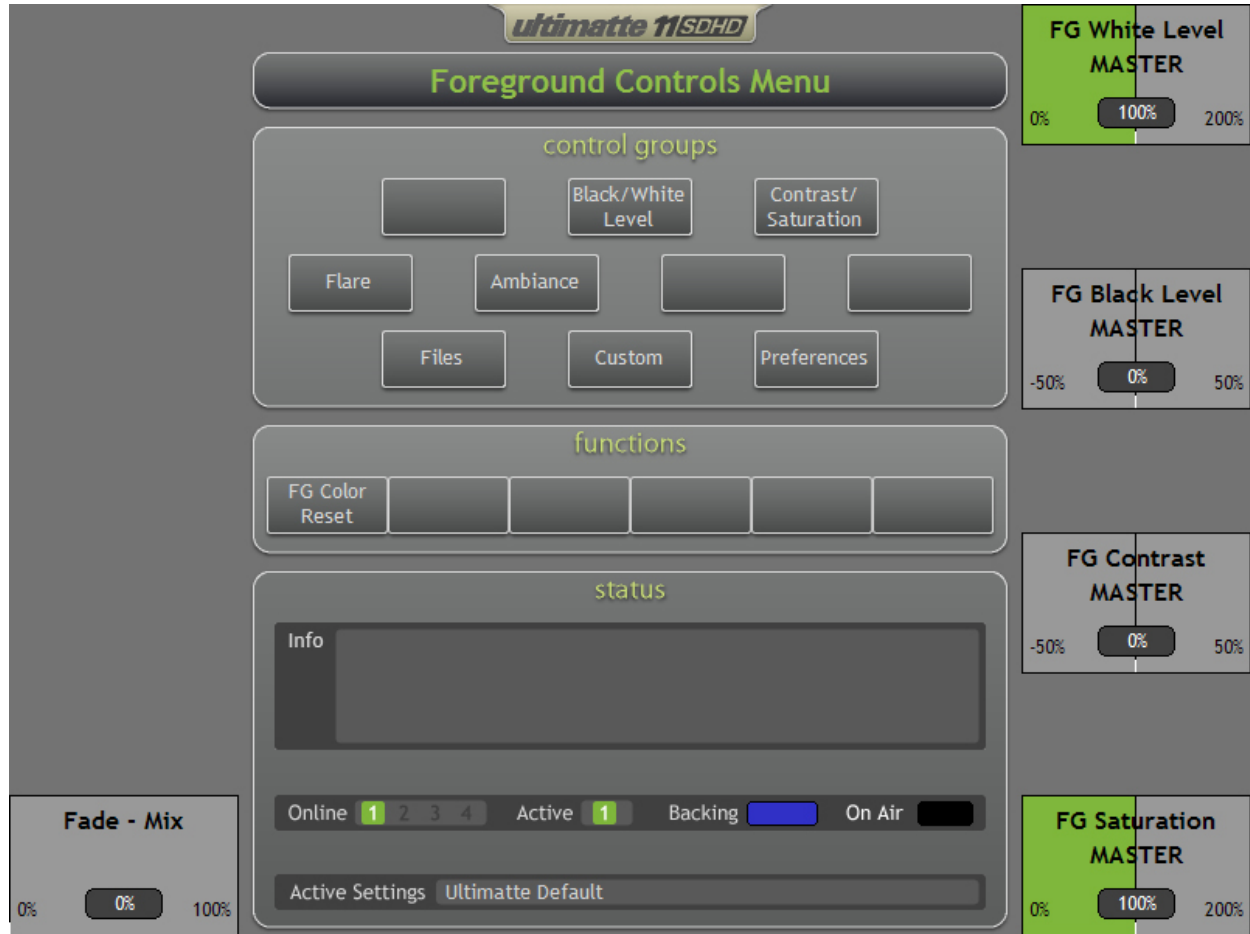


Figure 7.1-1. Foreground Controls Menu

7.1.1 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 200%. Clips at the output of the main unit prevent these levels from exceeding standard limits.

When adjusting the FG White Level Master, the relative difference between the FG White Level RED, GREEN, and BLUE components will be maintained.

7.1.2 FG Black Level 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.

When adjusting the FG Black Level Master, the relative difference between the FG Black Level RED, GREEN, and BLUE components will be maintained. Clips at the output of the color control section will clip negative values to zero.

7.1.3 FG Contrast MASTER

The FG Contrast Master control adjusts the overall contrast (gamma / mid-gain) level 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.

When adjusting the FG Contrast Master, the relative difference between the FG Contrast RED, GREEN, and BLUE components will be maintained.

7.1.4 FG Saturation MASTER

This FG Saturation Master control adjusts the saturation level 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.

When adjusting the FG Saturation Master, the relative difference between the FG Saturation RED, GREEN, and BLUE components will be maintained.

7.1.5 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 on and the FG button LED will turn off.

7.1.6 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.

7.2 FOREGROUND BLACK / WHITE MENU

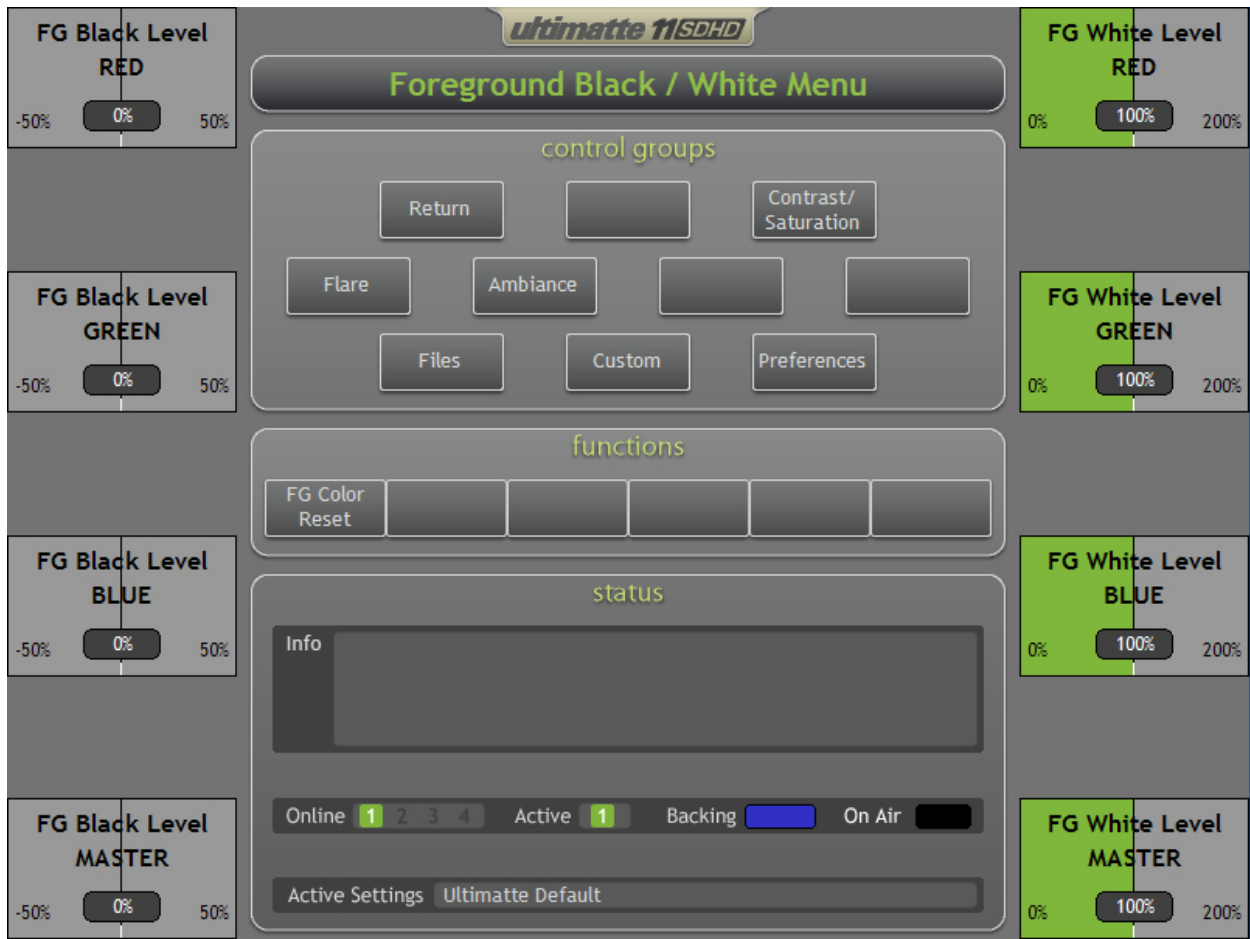


Figure 7.2-1. Foreground Black / White Menu

7.2.1 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.

7.2.2 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.

7.2.3 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.

7.2.4 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.

When adjusting the FG Black Level Master, the relative difference between the FG Black Level RED, GREEN, and BLUE components will be maintained. Clips at the output of the color control section will clip negative values to zero.

7.2.5 FG White Level RED

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

7.2.6 FG White Level GREEN

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

7.2.7 FG White Level BLUE

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

7.2.8 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 White Level Master is unity (100%). The range of the control is from 0% to 200%. Clips at the output of the main unit prevent these levels from exceeding standard limits.

When adjusting the FG White Level Master, the relative difference between the FG White Level RED, GREEN, and BLUE components will be maintained.

7.2.9 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.

7.3 FOREGROUND CONTRAST / SATURATION MENU

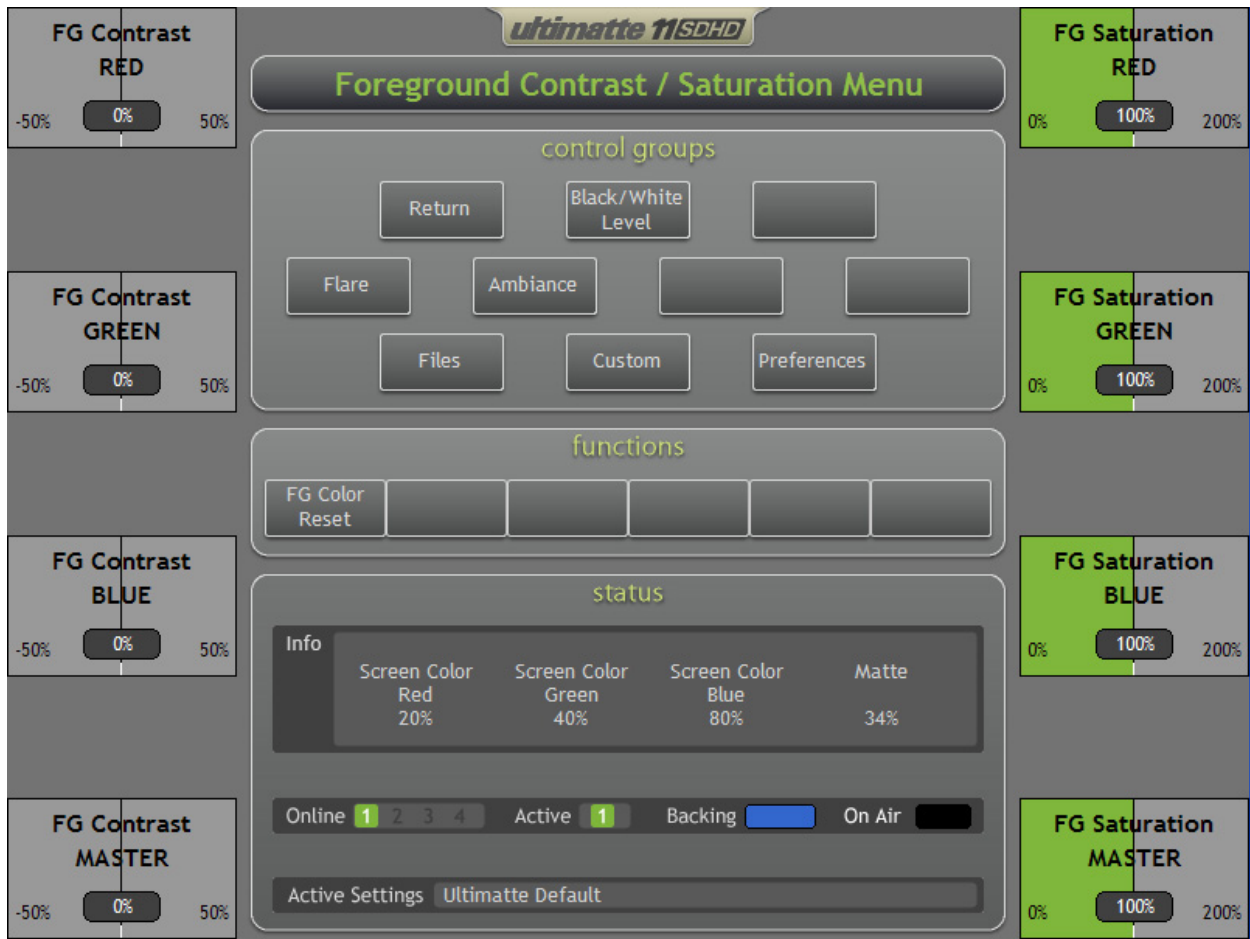


Figure 7.3-1. Foreground Contrast / Saturation Menu

7.3.1 FG Contrast RED

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

7.3.2 FG Contrast GREEN

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

7.3.3 FG Contrast BLUE

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

7.3.4 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.

When adjusting the FG Contrast Master, the relative difference between the FG Contrast RED, GREEN, and BLUE components will be maintained.

7.3.5 FG Saturation RED

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

7.3.6 FG Saturation GREEN

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

7.3.7 FG Saturation BLUE

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

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

When adjusting the FG Saturation Master, the relative difference between the FG Saturation RED, GREEN, and BLUE components will be maintained.

7.3.9 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.

7.4 FOREGROUND FLARE MENU

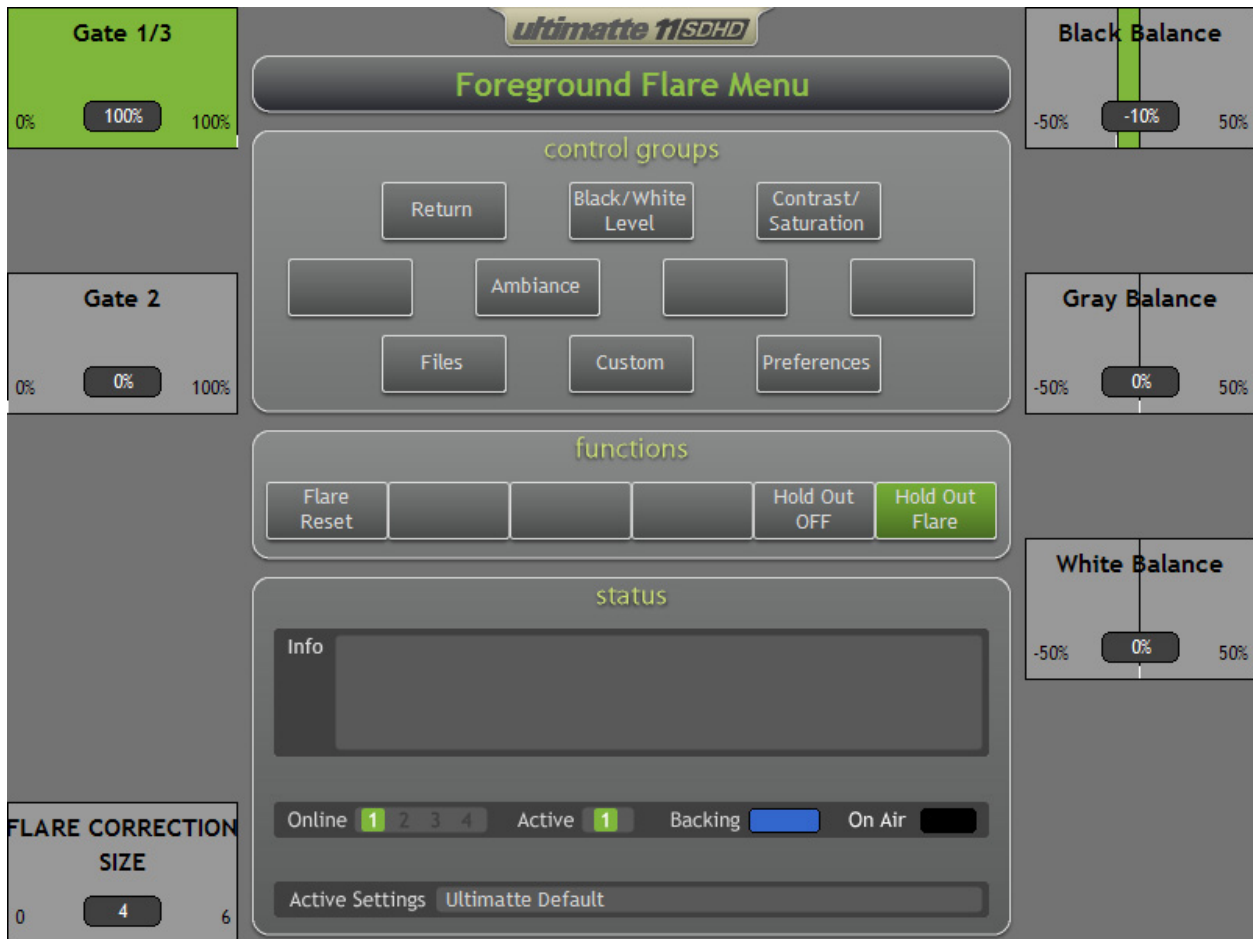


Figure 7.4-1. Foreground Flare Menu

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-11 has three controls that affect the overall flare suppression: White Balance, Gray Balance, and Black Balance. Each of

these three controls mainly influences certain parts of the FG Image, as indicated by the control names.

The Ultimatte-11 logic removes the effects of spill and flare in which the backing discolors the foreground object. The tradeoff 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 foreground. 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).	Will not remove Blue Spill from shades of Red in the foreground. Will not completely remove

GATE 1/3	GATE 2	BENEFITS	TRADE-OFFS
		Allows BLUE to exceed GREEN by the amount RED exceeds GREEN (or by the amount GREEN exceeds RED when RED is lower than GREEN).	Blue Spill from shades of Green in the foreground.
100%	100%	<p>Removes Blue Spill from shades of Green in the foreground.</p> <p>Permits reproduction of Magenta in foreground.</p> <p>BLUE is limited to the level of RED regardless of the level of GREEN.</p>	<p>Cannot reproduce shades of Blue in the foreground.</p> <p>Cyan will become Green.</p> <p>Cannot remove Blue Spill from Red or Yellow. (Blue spill will desaturate Yellows.)</p>

Table 7.4-1. 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 foreground. Permits reproduction of Yellow in foreground. GREEN is limited to the	Cannot reproduce shades of Green in the foreground. Cyan will become Blue. Cannot remove Green Spill from Magenta or Red. (Green Spill will desaturate

GATE 1/3	GATE 2	BENEFITS	TRADE-OFFS
		level of RED regardless of the level of BLUE.	Magentas.)

Table 7.4-2. 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.	Cannot reproduce shades of Red in the foreground. Yellow will become Green. Cannot remove Red Spill from

GATE 1/3	GATE 2	BENEFITS	TRADE-OFFS
		RED is limited to the level of BLUE regardless of the level of GREEN.	Blue or Cyan. (Red Spill will desaturate Cyans.)

Table 7.4-3. Functions (Red Backing)

7.4.1 Flare Correction Size

Flare correction analyzes all flare matte transitions, based on the size selected (number of pixels), and applies the appropriate amount of correction to the transitions which need modification.

The correction size indicates the number of pixels within which the system will analyze every transition. When the Size is set to 0, no correction is applied.

7.4.2 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.

7.4.3 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

The Gray Balance adjustment differs from adjusting the FG Blue Contrast or the FG Green Contrast controls. It is an adjustment in the mid 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 contrast controls will change the overall black gain of corresponding channels

The Gray Balance Control makes mid foreground colors warmer with minimal effects on lighter or darker colors. For example, adjusting this control can eliminate flares from most skin tones.

7.4.4 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. For 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.

7.4.5 Flare Reset

Resets all Flare controls to their default settings, depending on the Backing Color selected.

7.4.6 Holdout OFF / ON

This button enables and disables the Holdout Matte feature.

7.4.7 Holdout All Flare / Holdout Flare / Holdout 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 situation, 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.

7.5 FOREGROUND AMBIANCE MENU

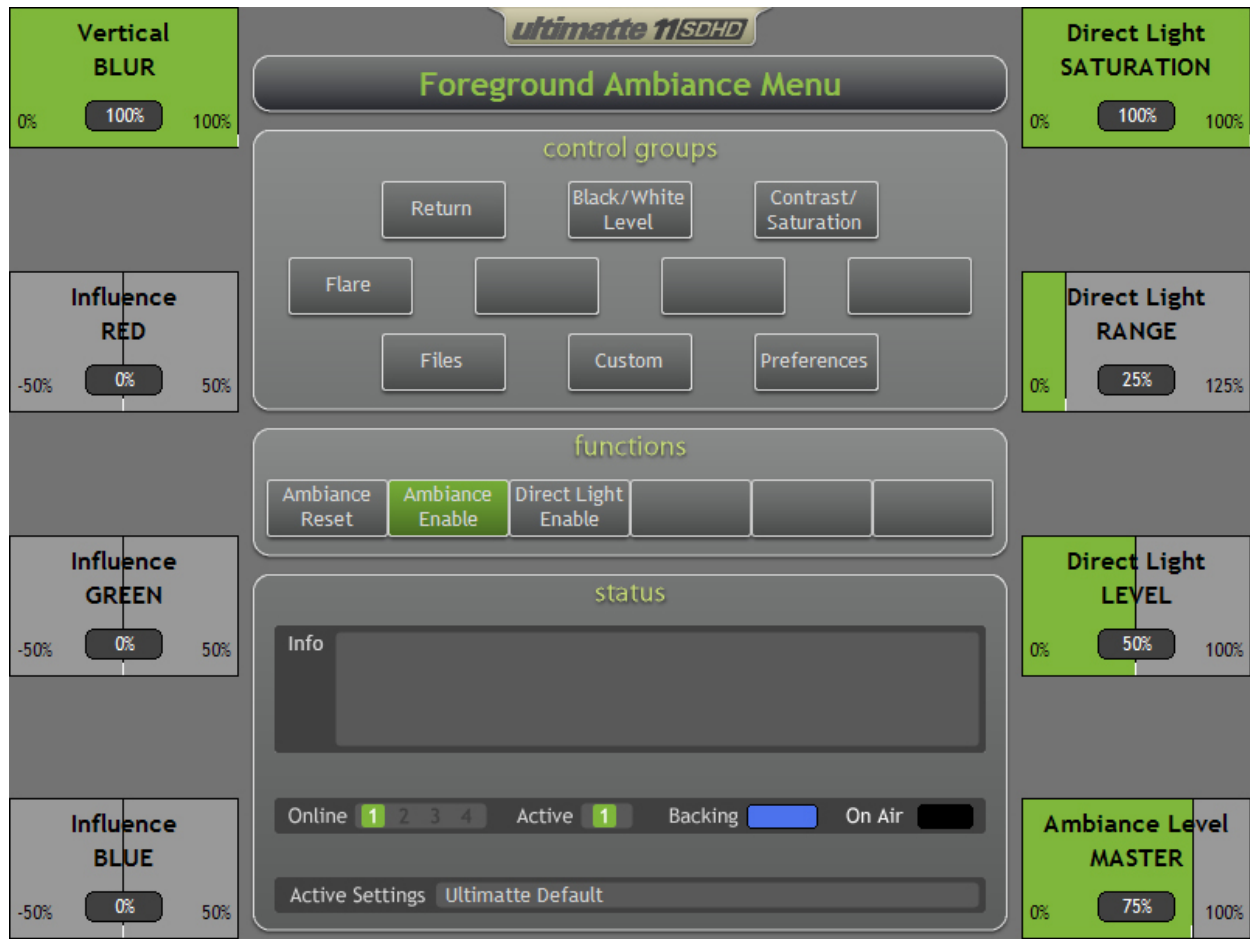


Figure 7.5-1. Foreground Ambiance Menu

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-11 by adjusting the FG color controls manually. 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-11 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 the BG Ambiance Level Master control. The BG scene can have subtle influence on the FG subject by merely reflecting ambient light. On the other hand, the BG scene, with its lighting, can itself act as the source of FG lighting, in which case the influence of the BG scene on the FG subject will be much

stronger. 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 Indirect Light RED, GREEN and BLUE controls set the amount and color of the added influence. For a stronger influence, the FG Color Controls should be used.

7.5.1 Vertical BLUR

This control determines the number averaged lines in the background used in Ambiance calculations. Depending on the background scene, reducing this control could introduce “streaking” on the foreground subject’s Ambiance effect.

7.5.2 Influence RED

This control increases or decreases the impact of the RED component of the indirect lighting on the FG subject.

7.5.3 Influence GREEN

This control increases or decreases the impact of the GREEN component of the indirect lighting on the FG subject.

7.5.4 Influence BLUE

This control increases or decreases the impact of the BLUE component of the indirect lighting on the FG subject.

7.5.5 Direct Light SATURATION

When the lighting of the BG scene is also “lighting” the FG subject, the “color” of this lighting should have a strong effect on the FG subject. If the BG scene is lit by white light, the FG subject is expected to be lit the same white light, and the colors of the BG scene should only have a relatively subtle and indirect impact on the colors of the FG subject. However, if the BG scene is predominantly lit by a specific color, the BG scene and the FG subject placed in this environment should strongly reflect the color of the lights.

The Direct Light SATURATION control sets the amount of the BG scene lighting colors that will impact the colors of the FG lighting. When the control is set to 0%, the color of the BG scene lighting is assumed to be white, and the colors of the BG scene will have minimal impact on the colors of the FG “lighting”. When the control is set to 100%, the color of the BG lighting will have a very strong impact on the colors of the FG “lighting”.

7.5.6 Direct Light RANGE

On a real set, the FG subject could be lit separately than the background. In this case, when the lighting level of the background changes, it will have minimal impact on the subject. Alternately, the level of lighting on the subject and the background could be tied together, so that as the lighting in the background is dimmed, the lighting on the subject is dimmed at the same time. The range of lighting changes on the subject could be set to be the same as that of the background or the two lighting ranges could be different.

A similar overall lighting effect can be achieved on a virtual set. The lighting of the FG subject can be set to have the same range as that of the lighting in the BG scene or the two ranges could be set differently. The Direct Light RANGE control allows the user to set this “tracking” range. When the control is set to 0%, there is NO difference between the two ranges. This means that if the lighting in the BG scene is “turned off”, the lighting on the FG subject will also be “turned off”. When the control is set to 25%, and the BG lighting is “turned off”, the FG subject will maintain some lighting (25%). When the control is set at 100%, the impact of lighting changes in the BG scene will be minimal on the FG subject.

7.5.7 Direct Light LEVEL

This control adjusts the direct lighting level of the FG subject. Since the BG scene lighting is an approximation, it is best to set this control for a BG scene that is considered to be of average brightness. When the FG subject is set to have the appropriate “lighting” level in this environment, and the BG scene becomes brighter, the lighting on the FG subject will be higher. As the lighting in the BG scene is reduced, the lighting on the FG subject will be reduced.

7.5.8 Ambiance Level MASTER

This control adjusts the overall level of estimated direct and indirect light applied to the FG subject.

7.5.9 Ambiance Reset

Resets all Ambiance controls to their default settings.

7.5.10 Ambiance Enable

This button enables and disables the Ambiance (Direct and Indirect) feature.

7.5.11 Direct Light Enable

This button enables and disables the Direct Light feature when Ambiance is ON.

8. BACKGROUND CONTROLS

8.1 BACKGROUND CONTROLS MENU

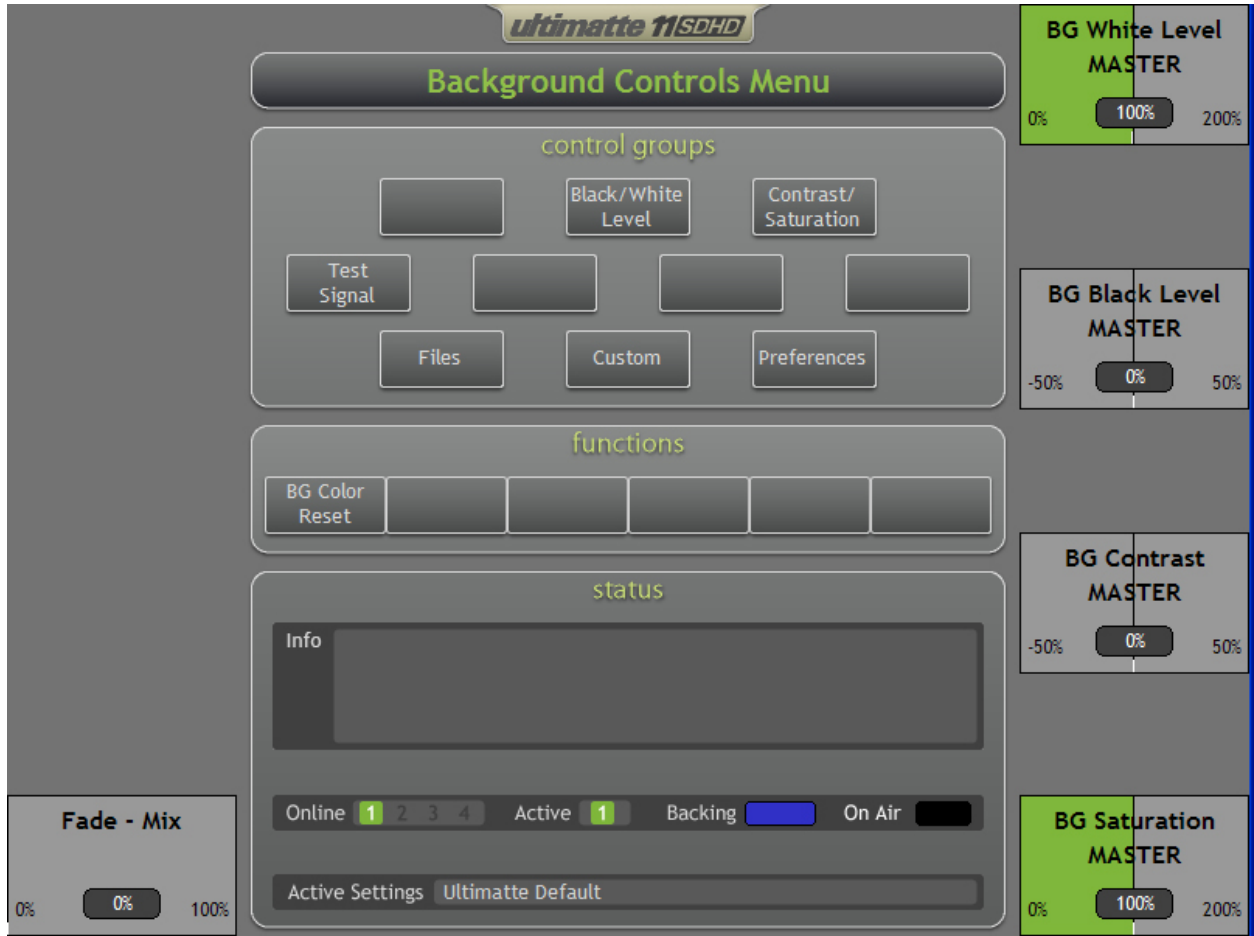


Figure 8.1-1. Background Controls Menu

8.1.1 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 White Level Master range is from 0% (off) to 200% (maximum gain), with 100% being unity gain.

When adjusting the BG White Level Master, the relative difference between the BG White Level RED, GREEN, and BLUE components will be maintained.

8.1.2 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.

When adjusting the BG Black Level Master, the relative difference between the BG Black Level RED, GREEN, and BLUE components will be maintained.

8.1.3 BG Contrast Master

This control adjusts the overall contrast (gamma / 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.

When adjusting the BG Contrast Master, the relative difference between the BG Contrast RED, GREEN, and BLUE components will be maintained.

8.1.4 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.

When adjusting the BG Saturation Master, the relative difference between the BG Saturation RED, GREEN, and BLUE components will be maintained.

8.1.5 Fade - Mix

When 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.

8.1.6 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.

8.2 BACKGROUND BLACK / WHITE MENU

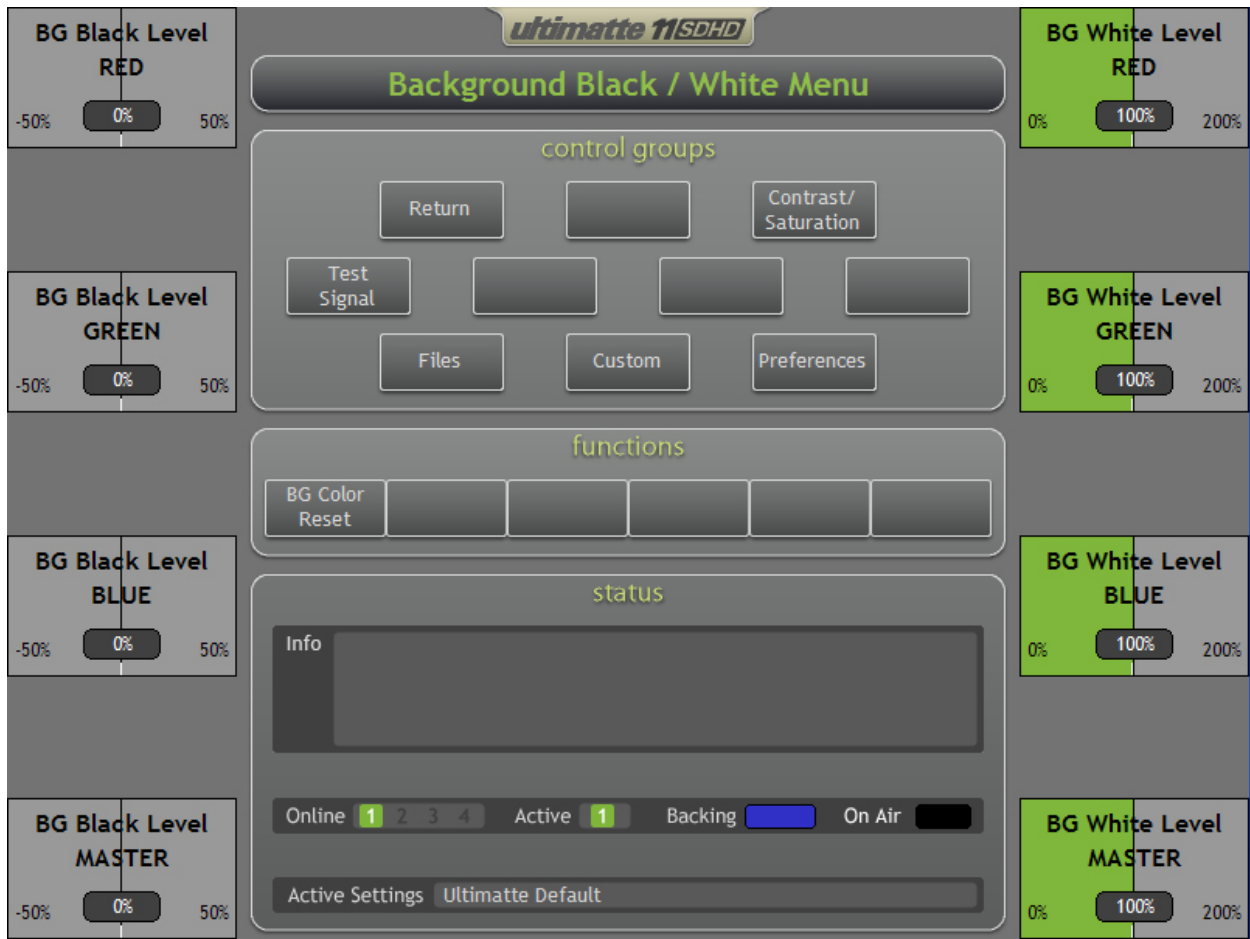


Figure 8.2-1. BACKGROUND BLACK / WHITE MENU

8.2.1 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.

8.2.2 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.

8.2.3 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.

8.2.4 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.

When adjusting the BG Black Level Master, the relative difference between the BG Black Level RED, GREEN, and BLUE components will be maintained.

8.2.5 BG White Level RED

This control adjusts the level of the red component of the BG signal. BG Red Level range is from 0% (off) to 200% (maximum gain), with 100% being unity gain.

8.2.6 BG White Level GREEN

This control adjusts the level of the green component of the BG signal. BG Green Level range is from 0% (off) to 200% (maximum gain), with 100% being unity gain.

8.2.7 BG White Level BLUE

This control adjusts the level of the blue component of the BG signal. BG Blue Level range is from 0% (off) to 200% (maximum gain), with 100% being unity gain.

8.2.8 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 White Level Master range is from 0% (off) to 200% (maximum gain), with 100% being unity gain.

When adjusting the BG White Level Master, the relative difference between the BG White Level RED, GREEN, and BLUE components will be maintained.

8.2.9 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.

8.3 BACKGROUND CONTRAST / SATURATION MENU

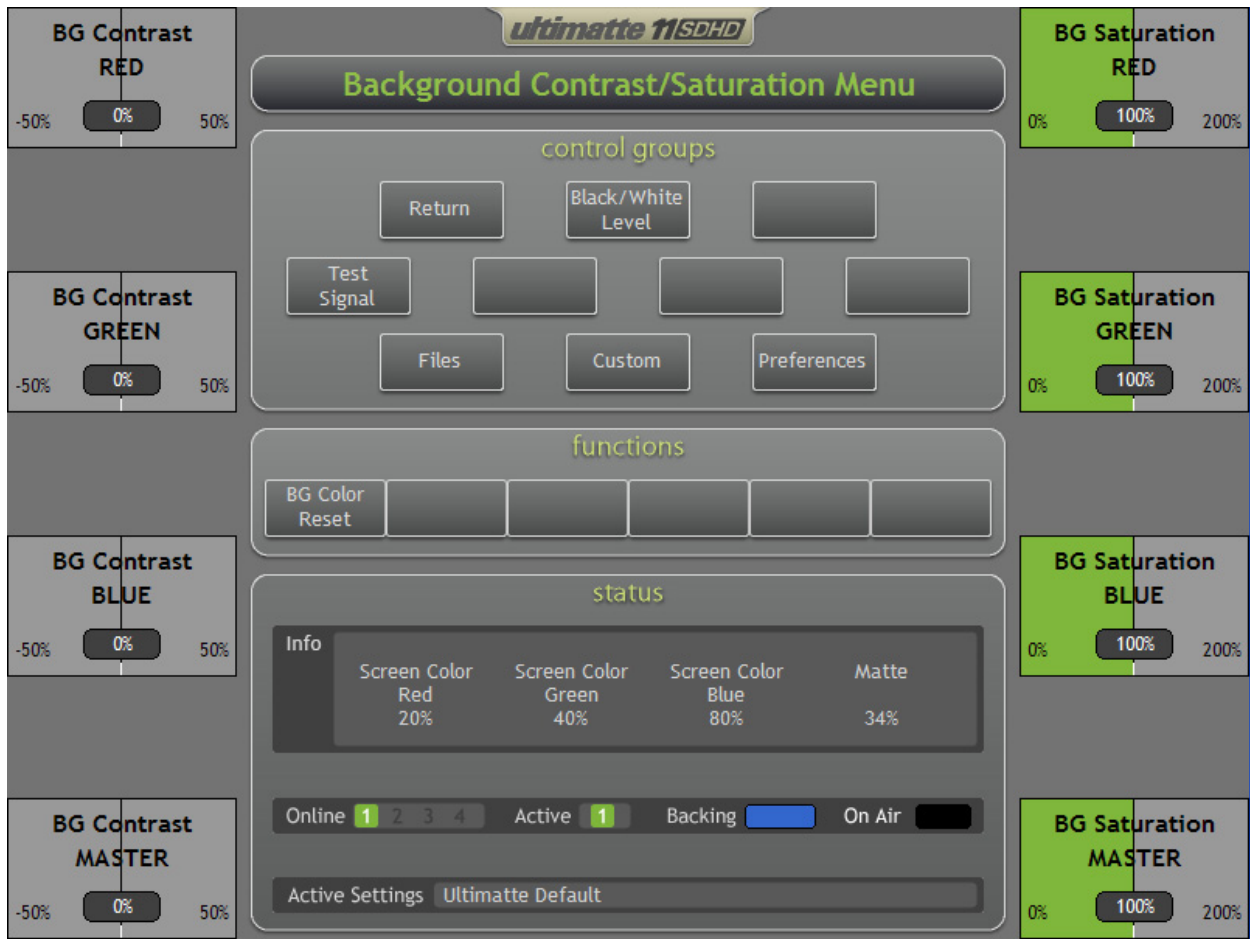


Figure 8.3-1. Background Contrast / Saturation Menu

8.3.1 BG Contrast RED

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

8.3.2 BG Contrast GREEN

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

8.3.3 BG Contrast BLUE

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

8.3.4 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.

When adjusting the BG Contrast Master, the relative difference between the BG Contrast RED, GREEN, and BLUE components will be maintained.

8.3.5 BG Saturation RED

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

8.3.6 BG Saturation GREEN

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

8.3.7 BG Saturation BLUE

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

8.3.8 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.

When adjusting the BG Saturation Master, the relative difference between the BG Saturation RED, GREEN, and BLUE components will be maintained.

8.3.9 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.

8.4 TEST SIGNAL MENU

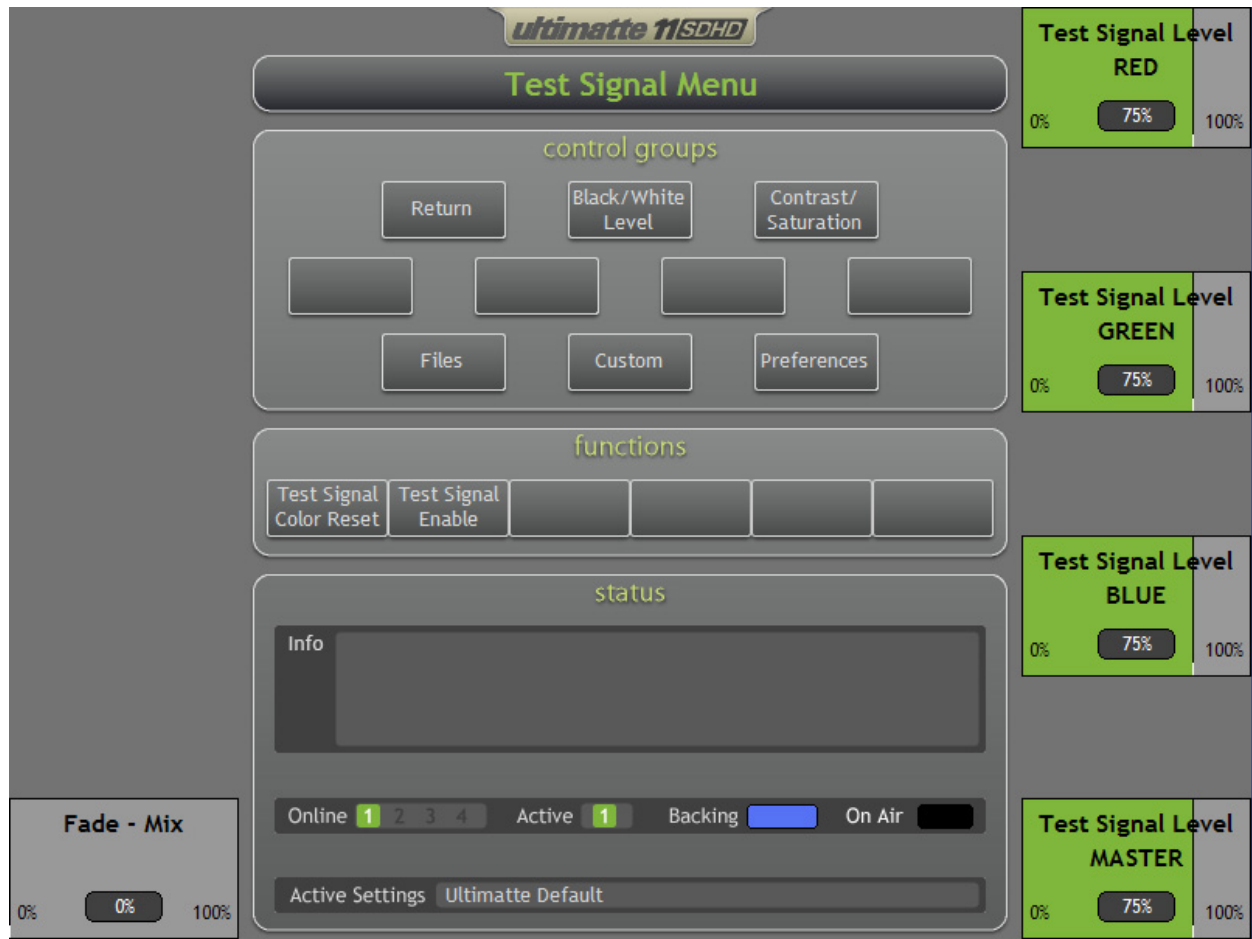


Figure 8.4-1. Test Signal Menu

8.4.1 Test Signal Level RED

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

8.4.2 Test Signal Level GREEN

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

8.4.3 Test Signal Level BLUE

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

8.4.4 Test Signal Level MASTER

Adjusts the overall level of the test signal. When adjusting the Test Signal Level Master,

the relative difference between the Test Signal Level RED, GREEN, and BLUE components will be maintained.

8.4.5 Fade - Mix

When 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.

8.4.6 Test Signal Reset

Resets the levels to the default values.

8.4.7 Test Signal ON / OFF

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.

9. WINDOW CONTROLS

9.1 WINDOWS MENU

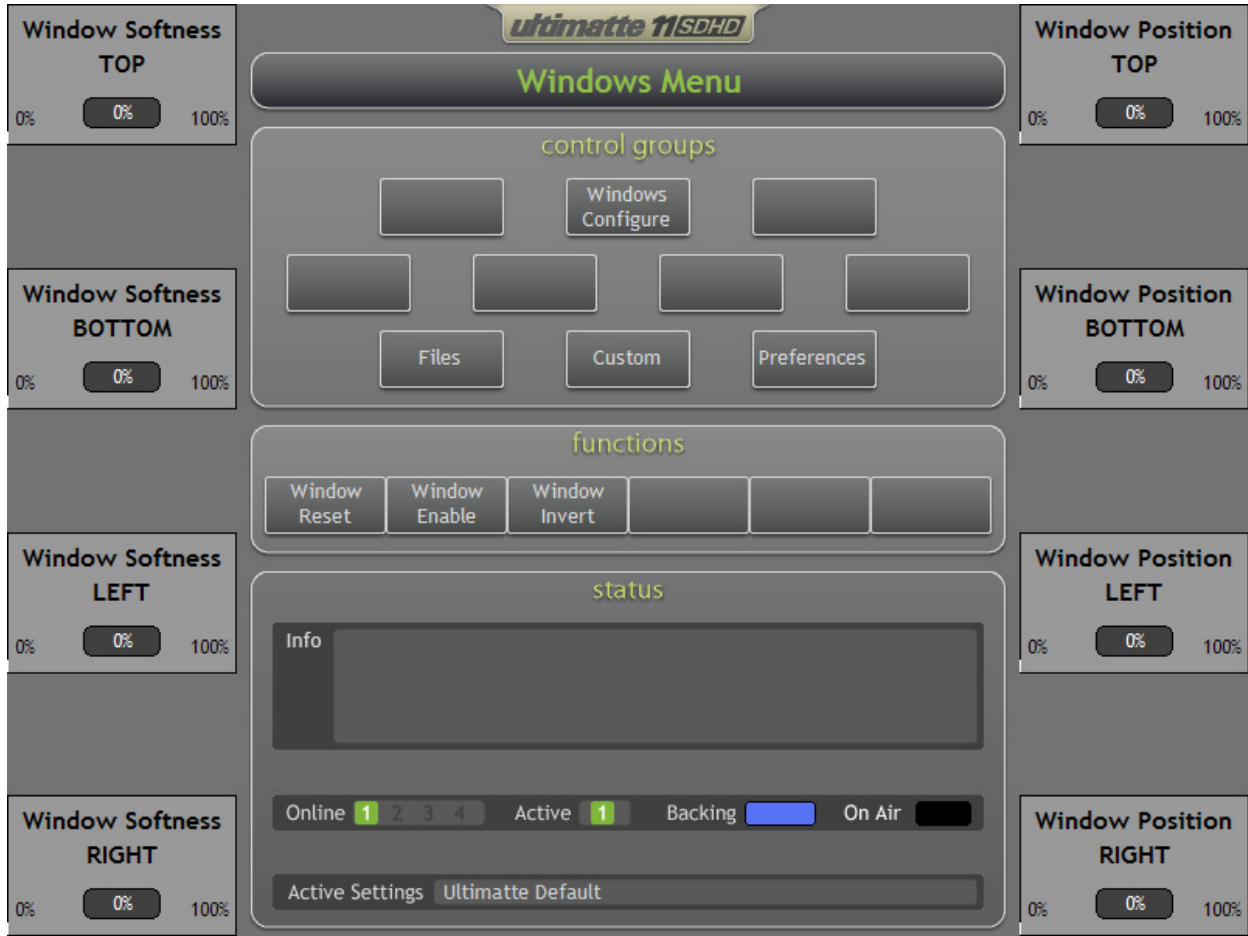


Figure 9.1-1. Windows Menu

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. This mode of masking non-screen or unwanted areas is called **Garbage Matte**.

The internally generated windows can be inverted so that they mask off an area within the frame rather than a border around the frame. Usually this type of a mask is associated with an object in the BG scene (like a column), so that the FG subject will be able to “go” behind it. This mode of masking is called **Layer Matte**.

There are situations where a portion of the FG frame need to be matted and composited, while the rest of the frame should remain intact. The internally generated window can be used to isolate and composite in a specific portion of the FG frame. This mode of masking is called **Holdout Matte**.

The internally generated window in the Ultimatte-11 is rectangular, with individual position and softness controls for each side.

9.1.1 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.

9.1.2 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.

9.1.3 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.

9.1.4 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.

9.1.5 Window Softness Top

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

9.1.6 Window Softness Bottom

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

9.1.7 Window Softness Left

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

9.1.8 Window Softness Right

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

9.1.9 Window Reset

Resets window positions and softness to their default position (0%).

9.1.10 Window Enable

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

9.1.11 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.

9.2 WINDOWS CONFIGURE MENU

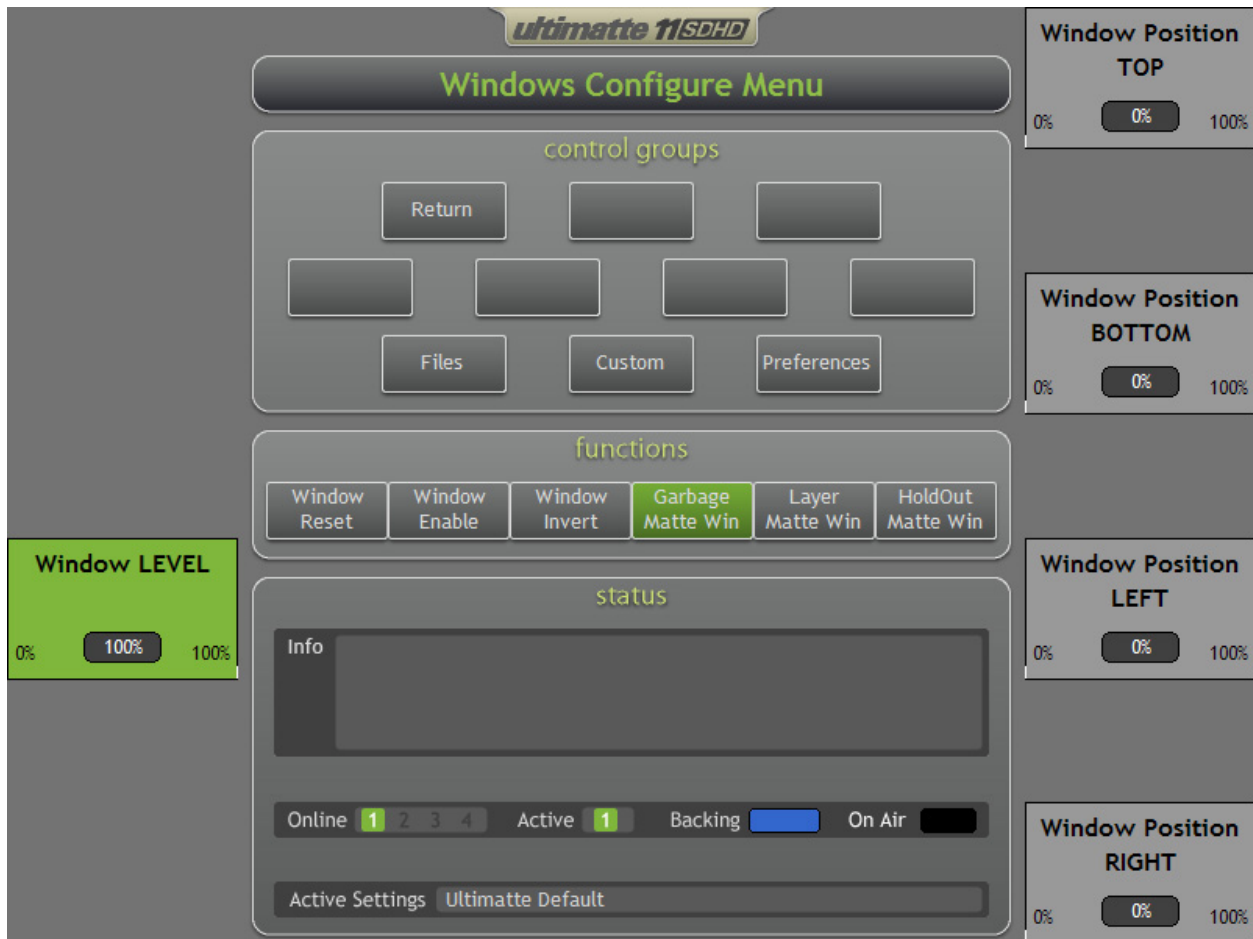


Figure 9.2-1. Windows Configure Menu

9.2.1 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.

9.2.2 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.

9.2.3 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.

9.2.4 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.

9.2.5 Window Level

In a composite image, the level of the matte generated from the backing color determines the BG scene level that replaces the backing color. Slight lighting variations in the matte, for example, are passed to the BG scene. In many situations, these slight variations add to the realistic look of the composite image. However, when a Garbage Matte or a Layer Matte is used, there will be some visible BG level differences in the areas added by these mattes and the BG area added by the matte generated from the backing color. The desired natural look could be compromised if the **BG Level Balance** or the **Clean Up** controls are used to raise the matte level in the screen area to match the level of the Garbage Matte or Layer Matte. Conversely, the Window Level control could be used to adjust the Garbage or Layer Matte areas to match the matte level of the screen area and preserve the natural look of the composite.

9.2.6 Window Reset

Resets window positions to their default position (0%).

9.2.7 Window Enable

Selecting this button will toggle the internal window OFF and ON. The default setting of this button is OFF. 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.

9.2.8 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.

9.2.9 Garbage Matte Win

Selecting this option will use the Internal Window as a Garbage Matte in addition to

Matte In 1 or Matte In 2 if either of both sources are selected as Garbage Mattes.

Selecting Garbage Matte Win will disable the use of Internal Window as a Layer Matte Win or as a Holdout Matte Win.

Garbage Matte Win is the default selection for Internal Window.

9.2.10 Layer Matte Win

Selecting this option will use the Internal Window as a Layer Matte in addition to Matte In 1 or Matte In 2 if either of both sources are selected as Layer Mattes.

Selecting Layer Matte Win will disable the use of Internal Window as a Garbage Matte Win or as a Holdout Matte Win.

9.2.11 Holdout Matte Win

Selecting this option will use the Internal Window as a Holdout Matte in addition to Matte In 1 or Matte In 2 if either of both sources are selected as Holdout Mattes.

Selecting Holdout Matte Win will disable the use of Internal Window as a Garbage Matte Win or as a Layer Matte Win.

10. MATTE IN / OUT CONTROLS

10.1 MATTE IN / OUT CONFIG MENU

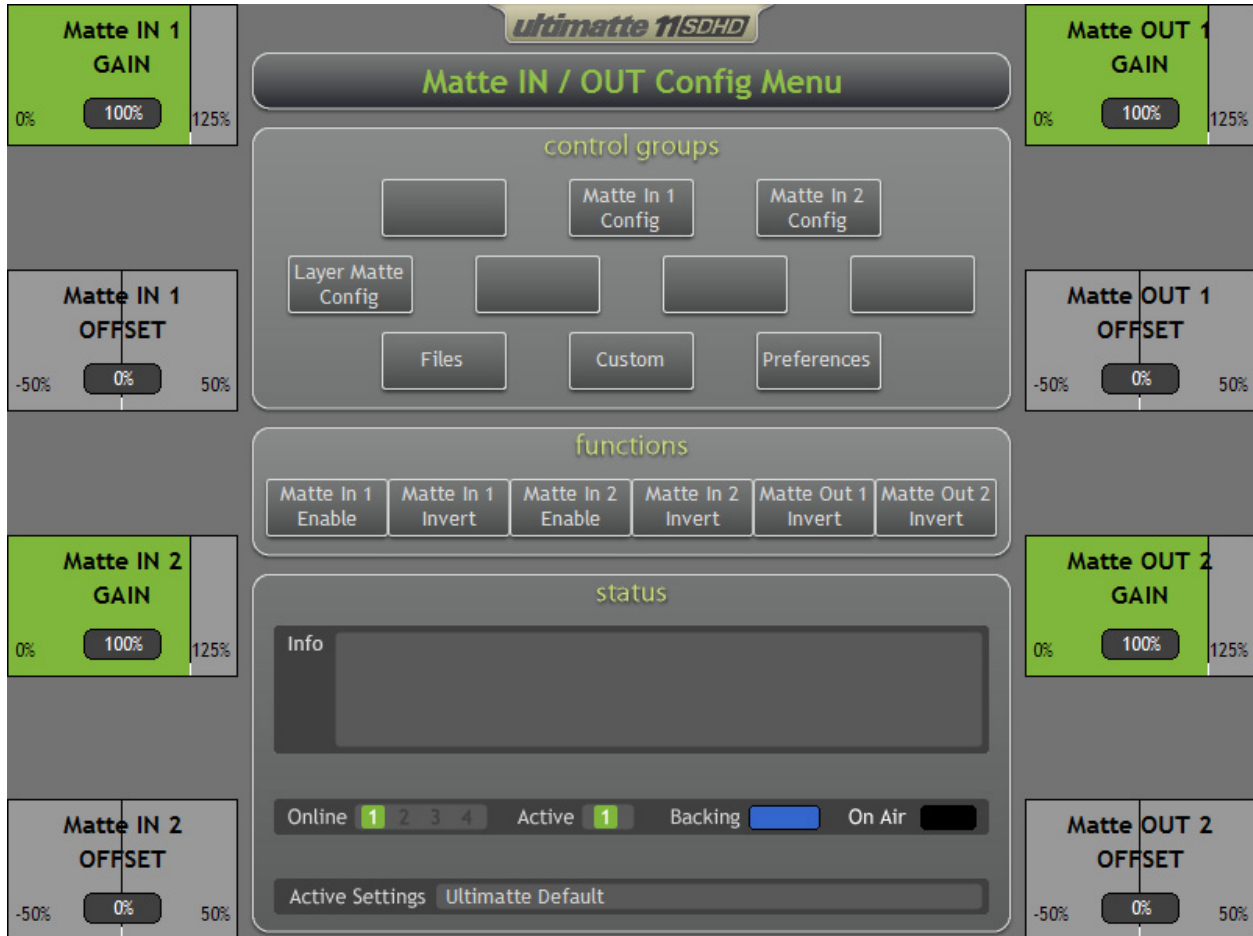


Figure 10.1-1. Matte IN / OUT Config Menu

A Matte In signal is a gray-scale signal, generated by an external source, that is used to turn parts of the FG scene OFF and turn the corresponding parts of the BG scene ON. A 100% white Matte In signal level indicates 100% BG scene and no FG scene, a 0% signal indicates full FG scene and no BG scene, and all gray levels of the matte signal indicate a proportional mix between the FG and the BG scenes.

If the FG scene includes areas that are not covered by the screen (backing), it is necessary to artificially extend the screen in order to cover the entire frame. An external signal, selected as Matte In, could be used to force the BG scene ON (and FG scene OFF) in the areas not covered by the backing. In this mode, the Matte In is used as a **Garbage Matte**.

If the BG scene includes objects that need to appear in front of the FG subject in the final composited image, the Matte In signal associated with this object can be used. 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. In this mode, the Matte In is used as a **Layer Matte**.

If the BG scene is to be inserted in some portion of the FG scene but the rest of the FG scene need to be maintained as FG, then the Matte In signal can be used to isolate the screen area. This Matte In signal can be used to insert the BG in a segregated screen area and also to prevent BG turn-on even though the FG scenes contain objects that have similar color as the blue or green screen. In this mode, the Matte In signal is used as a **Holdout Matte**.

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 and Matte In Level controls. At their default settings, these controls will allow the Matte In signal level to proportionally process the FG and the BG images.

There are some situations, however, where the Matte In signal, used as a **Layer Matte**, 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 is desired. The matte signal associated with the glass should still be 100% white. With the Layer Matte 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.

10.1.1 Matte IN 1 GAIN

This control adjusts the gain of the external matte signal connected to the main unit and selected as a Matte In 1 source from the Configuration Menu.

The default setting for Matte IN 1 GAIN is 100%. After File Clear, any signal selected as Matte In 1 will not have any effect on the composite image until the Matte In 1 Enable button is turned ON.

10.1.2 Matte IN 1 OFFSET

This control adjusts the overall offset of the Matte In 1 signal. If the incoming signal does not have its black level set correctly, adjusting the Matte IN 1 OFFSET control can establish the proper black level. In most situations, the Matte IN 1 OFFSET adjustment would require additional adjustment of the Matte IN 1 GAIN control.

10.1.3 Matte IN 2 GAIN

This control adjusts the gain of the external matte signal connected to the main unit and selected as a Matte In 2 source from the Configuration Menu.

The default setting for Matte IN 2 GAIN is 100%. After File Clear, any signal selected as Matte In 2 will not have any effect on the composite image until the Matte In 2 Enable button is turned ON.

10.1.4 Matte IN 2 OFFSET

This control adjusts the overall offset of the Matte In 2 signal. If the incoming signal does not have its black level set correctly, adjusting the Matte IN 2 OFFSET control can establish the proper black level. In most situations, the Matte IN 2 OFFSET adjustment would require additional adjustment of the Matte IN 2 GAIN control.

10.1.5 Matte OUT 1 GAIN

The Matte OUT 1 GAIN control affects only the primary matte signal (Y location) that is supplied to the Matte OUT connector. This control does not have any effect on the matte signal used internally in the main unit.

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 of 100% white is set at 940 (decimal) for a 10-bit output. Similarly, 0% black is set at 64 (decimal) for a 10-bit output.

The Matte OUT 1 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.

10.1.6 Matte OUT 1 OFFSET

Alters the offset of the Matte Out 1 signal from its default setting.

10.1.7 Matte OUT 2 GAIN

The Matte OUT 2 GAIN control affects only the secondary matte signal (U / V location) that is supplied to the Matte OUT connector. This control does not have any effect on the matte signal used internally in the main unit.

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 of 100% white is set at 940 (decimal) for a 10-bit output. Similarly, 0% black is set at 64 (decimal) for a 10-bit output.

The Matte OUT 2 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.

10.1.8 Matte OUT 2 OFFSET

Alters the offset of the Matte Out 2 signal from its default setting.

10.1.9 Matte In 1 Enable

Enabling this button will toggle the Matte In 1 signal ON and OFF. The default setting of this button is OFF. The Matte In 1 controls will have no effect on the output image until this button is turned ON.

10.1.10 Matte In 1 Invert

The 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. Enabling Matte In 1 Invert will invert the polarity of the incoming matte signal.

10.1.11 Matte In 2 Enable

Enabling this button will toggle the Matte In 2 signal ON and OFF. The default setting of this button is OFF. The Matte In 2 controls will have no effect on the output image until this button is turned ON.

10.1.12 Matte In 2 Invert

The 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. Enabling Matte In 2 Invert will invert the polarity of the incoming matte signal.

10.1.13 Matte Out 1 Invert

Enabling Matte Out 1 Invert will invert the polarity of the primary matte signal (Y location) going to the MATTE OUT connector. It has no effect on the matte signal used internally. A lit button indicates that the Matte Out 1 signal is inverted. (See Matte In 1 / 2 Invert regarding polarity).

10.1.14 Matte Out 2 Invert

Enabling Matte Out 2 Invert will invert the polarity of the secondary matte signal (U / V location) going to the MATTE OUT connector. It has no effect on the matte signal used internally. A lit button indicates that the Matte Out 2 signal is inverted. (See Matte In 1 / 2 Invert regarding polarity).

10.2 MATTE IN 1 CONFIGURATION MENU

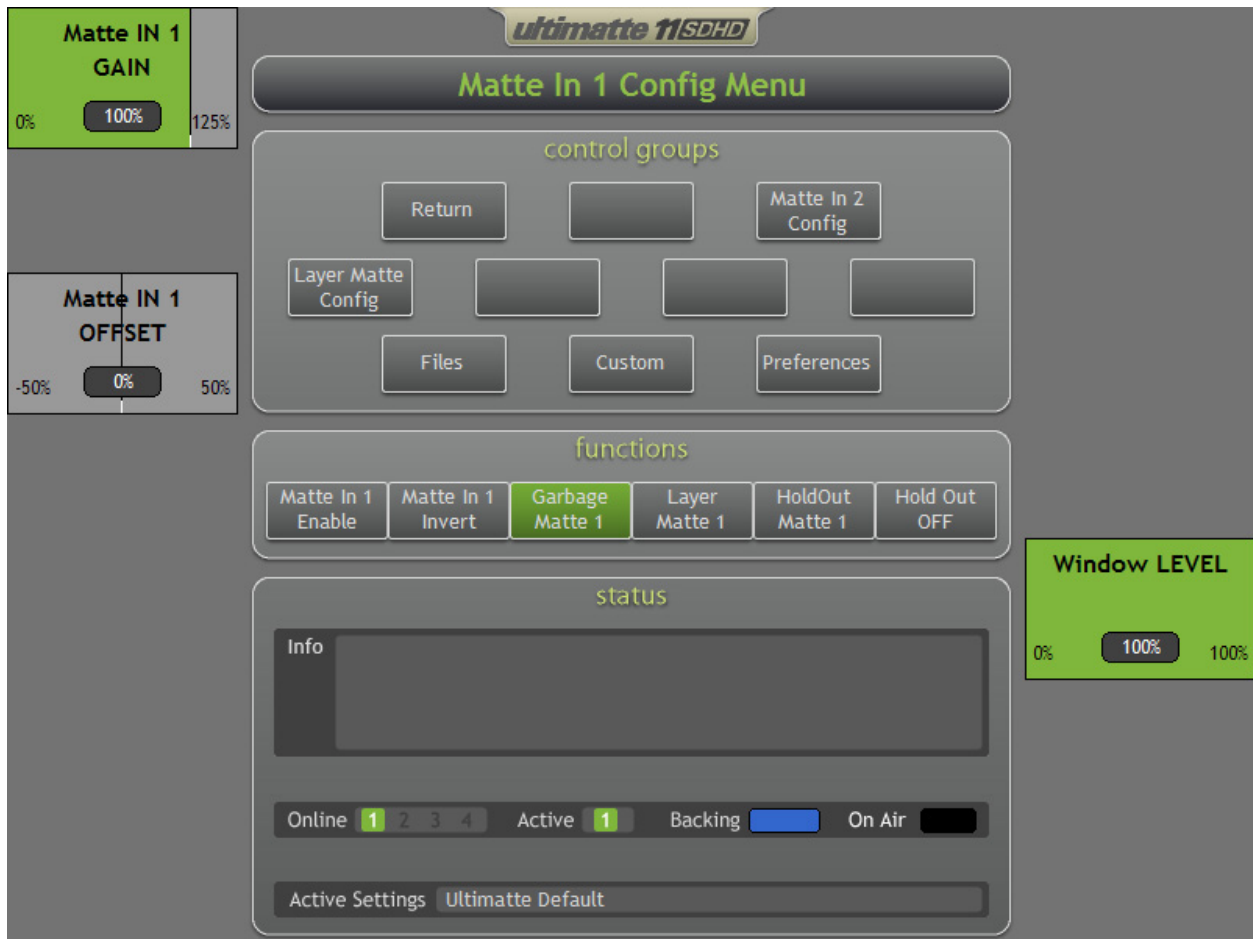


Figure 10.2-1. Matte IN 1 Config Menu

10.2.1 Matte IN 1 GAIN

This control adjusts the gain of the external matte signal connected to the main unit and selected as a Matte In 1 source from the Configuration Menu.

The default setting for Matte IN 1 GAIN is 100%. After File Clear, any signal selected as Matte In 1 will not have any effect on the composite image until the Matte In 1 Enable button is turned ON.

10.2.2 Matte IN 1 OFFSET

This control adjusts the overall offset of the Matte In 1 signal. If the incoming signal does not have its black level set correctly, adjusting the Matte IN 1 OFFSET control can establish the proper black level. In most situations, the Matte IN 1 OFFSET adjustment would require additional adjustment of the Matte IN 1 GAIN control.

10.2.3 Window Level

In a composite image, the level of the matte generated from the backing color determines the BG scene level that replaces the backing color. Slight lighting variations in the matte, for example, are passed to the BG scene. In many situations, these slight variations add to the realistic look of the composite image. However, when a Garbage Matte or a Layer Matte is used, there will be some visible BG level differences in the areas added by these mattes and the BG area added by the matte generated from the backing color. The desired natural look could be compromised if the **BG Level Balance** or the **Clean Up** controls are used to raise the matte level in the screen area to match the level of the Garbage Matte or Layer Matte. Conversely, the Window Level control could be used to adjust the Garbage or Layer Matte areas to match the matte level of the screen area and preserve the natural look of the composite.

10.2.4 Matte In 1 Enable

Enabling this button will toggle the Matte In 1 signal ON and OFF. The default setting of this button is OFF. The Matte In 1 controls will have no effect on the output image until this button is turned ON.

10.2.5 Matte In 1 Invert

The 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. Enabling Matte In 1 Invert will invert the polarity of the incoming matte signal.

10.2.6 Garbage Matte 1

Selecting this option will use the Matte In 1 as a Garbage Matte in addition to Internal Window or Matte In 2, if either of both sources are selected as Garbage Mattes.

Selecting Garbage Matte 1 will disable the use of Matte In 1 as a Layer Matte 1 or as a Holdout Matte 1.

Garbage Matte 1 is the default selection for Matte In 1.

10.2.7 Layer Matte 1

Selecting this option will use the Matte In 1 as a Layer Matte in addition to Internal Window or Matte In 2 if either of both sources are selected as Layer Mattes.

Selecting Layer Matte 1 will disable the use of Matte In 1 as a Garbage Matte 1 or as a Holdout Matte 1.

10.2.8 Hold Out Matte 1

Selecting this option will use the Matte In 1 as a Hold Out Matte in addition to Internal Window or Matte In 2 if either of both sources are selected as Hold Out Mattes.

Selecting Holdout Matte 1 will disable the use of Matte In 1 as a Garbage Matte 1 or as a Layer Matte 1.

10.2.9 Hold Out ON / OFF

When enabled, any matte signal assigned as a Hold Out Matte will be active.

10.3 MATTE IN 2 CONFIGURATION MENU

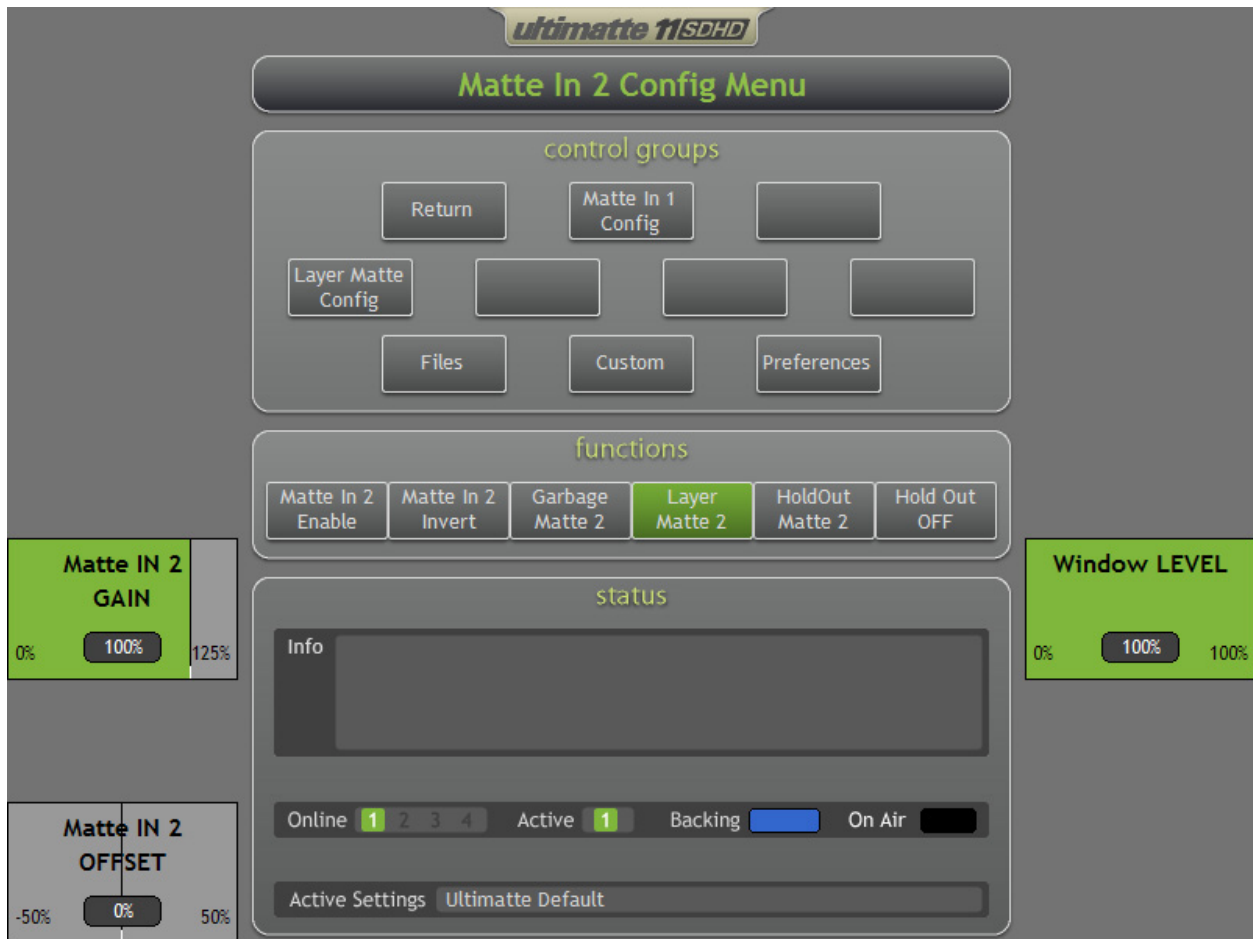


Figure 10.3-1. Matte IN 2 Config Menu

10.3.1 Matte IN 2 GAIN

This control adjusts the gain of the external matte signal connected to the main unit and selected as a Matte In 2 source from the Configuration Menu.

The default setting for Matte IN 2 GAIN is 100%. After File Clear, any signal selected as Matte In 2 will not have any effect on the composite image until the Matte In 2 Enable button is turned ON.

10.3.2 Matte IN 2 OFFSET

This control adjusts the overall offset of the Matte In 2 signal. If the incoming signal does not have its black level set correctly, adjusting the Matte IN 2 OFFSET control can establish the proper black level. In most situations, the Matte IN 2 OFFSET adjustment would require additional adjustment of the Matte IN 2 GAIN control.

10.3.3 Window Level

In a composite image, the level of the matte generated from the backing color determines the BG scene level that replaces the backing color. Slight lighting variations in the matte, for example, are passed to the BG scene. In many situations, these slight variations add to the realistic look of the composite image. However, when a Garbage Matte or a Layer Matte is used, there will be some visible BG level differences in the areas added by these mattes and the BG area added by the matte generated from the backing color. The desired natural look could be compromised if the **BG Level Balance** or the **Clean Up** controls are used to raise the matte level in the screen area to match the level of the Garbage Matte or Layer Matte. Conversely, the Window Level control could be used to adjust the Garbage or Layer Matte areas to match the matte level of the screen area and preserve the natural look of the composite.

10.3.4 Matte In 2 Enable

Enabling this button will toggle the Matte In 2 signal ON and OFF. The default setting of this button is OFF. The Matte In 2 controls will have no effect on the output image until this button is turned ON.

10.3.5 Matte In 2 Invert

The 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. Enabling Matte In 2 Invert will invert the polarity of the incoming matte signal.

10.3.6 Garbage Matte 2

Selecting this option will use the Matte In 2 as a Garbage Matte in addition to Internal Window or Matte In 1, if either of both sources are selected as Garbage Mattes.

Selecting Garbage Matte 2 will disable the use of Matte In 2 as a Layer Matte 2 or as a Holdout Matte 2.

Garbage Matte 2 is the default selection for Matte In 2.

10.3.7 Layer Matte 2

Selecting this option will use the Matte In 2 as a Layer Matte in addition to Internal Window or Matte In 1 if either of both sources are selected as Layer Mattes.

Selecting Layer Matte 2 will disable the use of Matte In 2 as a Garbage Matte 2 or as a Holdout Matte 2.

10.3.8 Hold Out Matte 2

Selecting this option will use the Matte In 2 as a Holdout Matte in addition to Internal Window or Matte In 1 if either of both sources are selected as Holdout Mattes.

Selecting Holdout Matte 2 will disable the use of Matte In 2 as a Garbage Matte 2 or as a Layer Matte 2.

10.3.9 Hold Out ON / OFF

When enabled, any matte signal assigned as a Holdout Matte will be active.

10.4 LAYER MATTE CONFIG MENU

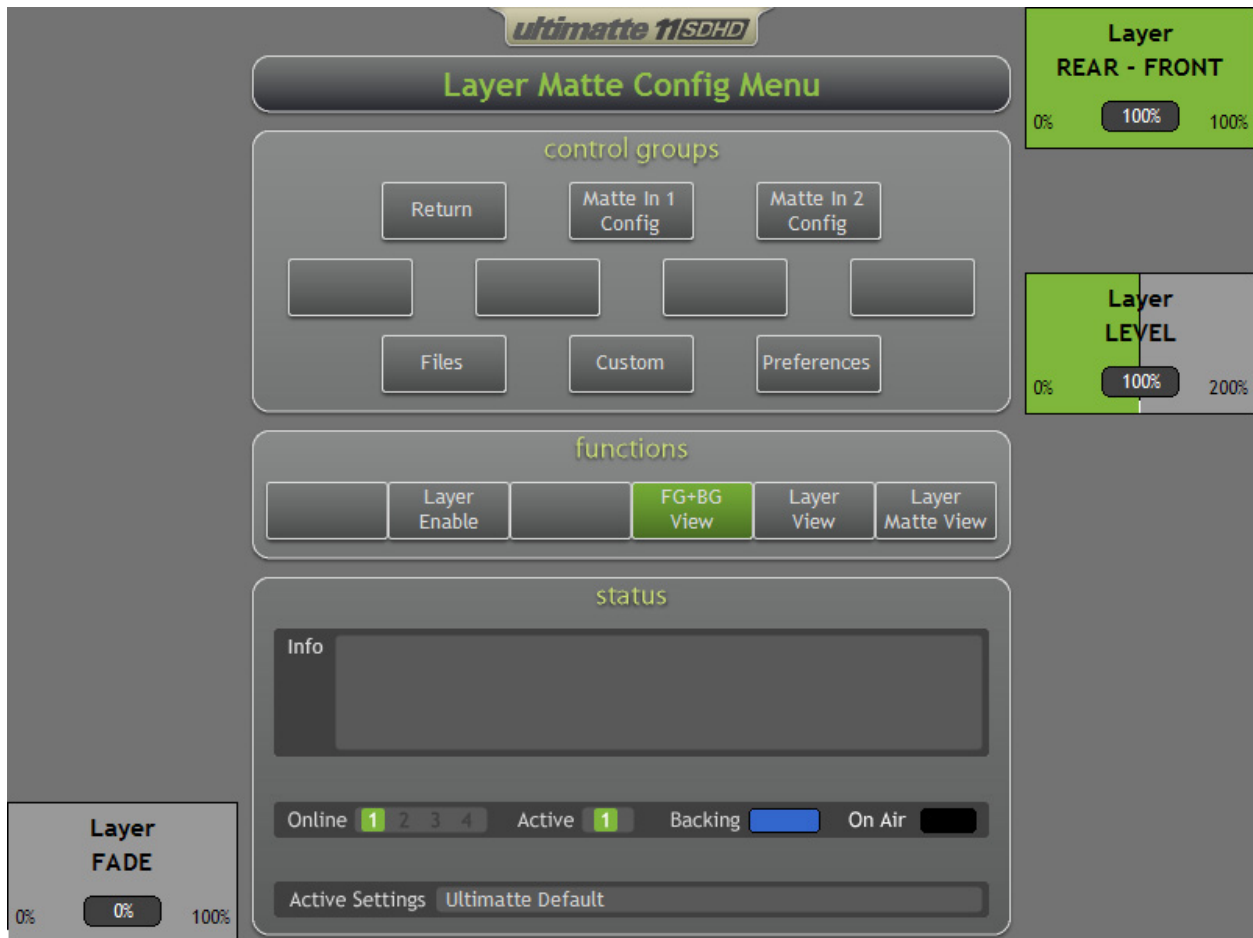


Figure 10.4-1. Layer Matte Config Menu

The layering feature in the Ultimatte-11 allows a third element to be added to the composite output. This third element can maintain full transparency levels and can be positioned in front of the foreground (and background) layer, or can be placed between the foreground and the background layers.

10.4.1 Layer FADE

This control allows the layer elements to be faded out or in the composite scene when Layer feature is enabled.

10.4.2 Layer REAR – FRONT

This control allows the layer elements to be added in front or behind the Foreground objects when the Layer feature is enabled.

10.4.3 Layer LEVEL

This control adjusts the overall level of the Layer elements when these elements are positioned behind the Foreground objects. This adjustment is only needed if there is a significant drop in the level of the Layer elements when they are moved from in front to behind the foreground objects due to lighting level variations on the backing (screen).

10.4.4 Layer Enable

This button enables the Layering feature. Additionally, this button will enable the appropriate Matte In channel that was assigned as the layer matte (see Section 10.2 MATTE IN 1 CONFIGURATION MENU or Section 10.3 MATTE IN 2 CONFIGURATION MENU).

10.4.5 FG + BG View

Selecting this allows the composite scene to be viewed on the Monitor Out.

10.4.6 Layer View

Selecting this allows the layer elements to be viewed on the Monitor Out.

10.4.7 Layer Matte View

Selecting this allows the layer elements to be viewed on the Monitor Out when the Layer feature is enabled.

11. CONFIGURATION CONTROLS

11.1 UNDERSTANDING AUTO TIMING

In Virtual Studio applications where the background scenes are rendered in a computer, there are inherent processing delays. Depending on the rendering power of the computer, the processing delay can vary from one frame to multiple frames. There are also situations, mainly due to the timing of the reference video connected to the computer, where the processing delay is not on an exact frame boundary. The processing delay could be one or more frames and fractions of a frame (number of lines). When compositing with a foreground subject, it is important to compensate for all processing delays in order to match foreground and background signal and image content timing (real and virtual camera movements).

The Ultimatte-11 has two sets of delay timing capabilities connected to Input 1 and Input 2. Depending on system connections, one or both delays can be used to time the foreground and the background signals and image content. It is assumed that the matte (Key or Alpha) signal associated with the background scene, if used, is timed correctly with the background signal (within a few pixels).

In a typical system, the foreground signal is timed to the background signal. There are two parts in this timing process. The first is to time the foreground signal on the same frame boundary as the background signal so that the active portions and blanking portions of both signals match exactly. If the timing between the foreground and the background signals is within 0.5H (0.5 line), the **Auto Timing** function will automatically time the two signals without delaying the foreground. If the timing difference between the foreground and the background signals is more than 0.5H, the **Auto Timing** function will delay the foreground signal by the appropriate number of lines in order to time it correctly on the next frame boundary with the background signal.

Once the two signals are timed correctly on the frame boundary, the second part of the timing is to compensate for the rendering delay of the “virtual” camera. This part of the timing is visual, and requires an object (e.g. a box) to be placed in front of the foreground camera, and a matching object placed in the same location in the background scene. The Ultimatte can be in the composite mode, or it can be in **Matte Off** (NOT FG DIRECT) mode with the **Fade** control turned to 50%, or the **Top Window** splitting the scene. This will allow the foreground and the background objects to be seen at the same time. When the foreground camera is panned slowly back and forth, the foreground and the background objects should start and stop at the same time, without “splitting”. If the foreground object starts moving before the corresponding background object, the foreground signal needs to be delayed (by one or more frames) until it matches the movement of the background object. If the foreground frame delay is advanced beyond the correct value, the foreground object will start moving later than the background object.

There are several ways of utilizing the delays inside the Ultimatte. The method selected will depend on the entire system in which the Ultimatte will be a part.

Method 1: Using Input 1 Delay

1. Foreground signal is connected to Input 1.
2. Background signal is connected to Input 2 (or Input 3 or Input 4).
3. Matte (Alpha or Key) signal, if used, is connected to Input 3 (or Input 4 or Input 2).
4. From the CONFIG Menu, select the I/O Config Menu and select the I/O Setup window.
5. Select Input 1 to be the Foreground.
6. Select Input 2 (or Input 3 or Input 4) to be the Background.
7. Select Input 3 (or Input 4 or Input 2) to be the Matte In 1.
8. From the Input Delay Timing section, select Input 1: Time to Input 2 (or Input 3 or Input 4).
9. Select "Apply". The remote display will exit to the I/O Config Menu, while the main unit will automatically time the Foreground (to the nearest frame boundary) to the Background.
10. Adjust, if needed, Input 1 Delay to time the Foreground movement to the Background movement (see above).

Warning:

Upon exiting the **I/O Setup Window** (after changing the Input Delay Timing selection), or pressing **Auto Timing**, or adjusting the **Input Delay controls**, the Ultimatte will re-adjust its internal timing, which will cause the output signals to glitch.

Method 2: Using Input 2 Delay

1. Foreground signal is connected to Input 2.
2. Background signal connected to Input 1. If the Background signal is connected to Input 3 or Input 4, a Reference signal in time with the Background **MUST** be connected to Input 1.
3. Matte (Alpha or Key) signal, if used, is connected to Input 3 (or Input 4 or Input 1 – also used as Reference signal).
4. From the CONFIG Menu, select the I/O Config Menu and select the I/O Setup window.
5. Select Input 2 to be the Foreground.
6. Select Input 1 (or Input 3 or Input 4) to be the Background.
7. Select Input 3 (or Input 4 or Input 1) to be the Matte In 1.
8. From the Input Delay Timing section, select Input 2: Time to Input 1 (or Input 3 or Input 4).
9. Select "Apply". The remote display will exit to the I/O Config Menu, while the main unit will automatically time the Foreground (to the nearest frame boundary) to the Background.
10. Adjust, if needed, Input 2 Delay to time the Foreground movement to the

Background movement (see above).

Warning:

Upon exiting the **I/O Setup Window** (after changing the Input Delay Timing selection), or pressing **Auto Timing**, or adjusting the **Input Delay controls**, the Ultimatte will re-adjust its internal timing, which will cause the output signals to glitch.

Method 3: Using Input 1 and Input 2 Delays

1. Reference signal is connected to Input 1.
2. Foreground signal is connected to Input 2.
3. Background signal connected to Input 3 (or Input 4).
4. Matte (Alpha or Key) signal, if used, is connected to Input 4 (or Input 3).
5. From the CONFIG. Menu, select the I/O Config Menu and select the I/O Setup window.
6. Select Input 2 to be the Foreground.
7. Select Input 3 (or Input 4) to be the Background.
8. Select Input 4 (or Input 3) to be the Matte In 1.
9. From the Input Delay Timing section, select Input 1 & Input 2: Time to Input 3 (or Input 4).
10. Select "Apply". The remote display will exit to the I/O Config Menu, while the main unit will automatically time the Foreground (to the nearest frame boundary) to the Background.
11. Adjust, if needed, Input 2 Delay to time the Foreground movement to the Background movement (see above).

Warning:

Upon exiting the **I/O Setup Window** (after changing the Input Delay Timing selection), or pressing **Auto Timing**, or adjusting the **Input Delay controls**, the Ultimatte will re-adjust its internal timing, which will cause the output signals to glitch.

Method 4: Using Input 1 and Input 2 Delays

1. Foreground1 signal is connected to Input 1.
2. Foreground 2 signal is connected to Input 2.
3. Background signal connected to Input 3 (or Input 4).
4. Matte (Alpha or Key) signal, if used, is connected to Input 4 (or Input 3).
5. From the CONFIG Menu, select the I/O Config Menu and select the I/O Setup window.
6. Select Input 1 to be the Foreground.
7. Select Input 3 (or Input 4) to be the Background.
8. Select Input 4 (or Input 3) to be the Matte In 1.
9. From the Input Delay Timing section, select Input 1 & Input 2: Time to Input 3 (or Input 4).

10. Select "Apply". The remote display will exit to the I/O Config Menu, while the main unit will automatically time the Foreground (to the nearest frame boundary) to the Background.
11. Adjust, if needed, Input 1 Delay to time the Foreground 1 movement to the Background movement (see above).
12. Select Input 2 to be the Foreground.
13. Adjust, if needed, Input 2 Delay to time the Foreground 2 movement to the Background movement (see above).

Warning:

Upon exiting the **I/O Setup Window** (after changing the Input Delay Timing selection), or pressing **Auto Timing**, or adjusting the **Input Delay controls**, the Ultimatte will re-adjust its internal timing, which will cause the output signals to glitch.

11.2 CONFIGURE MENU

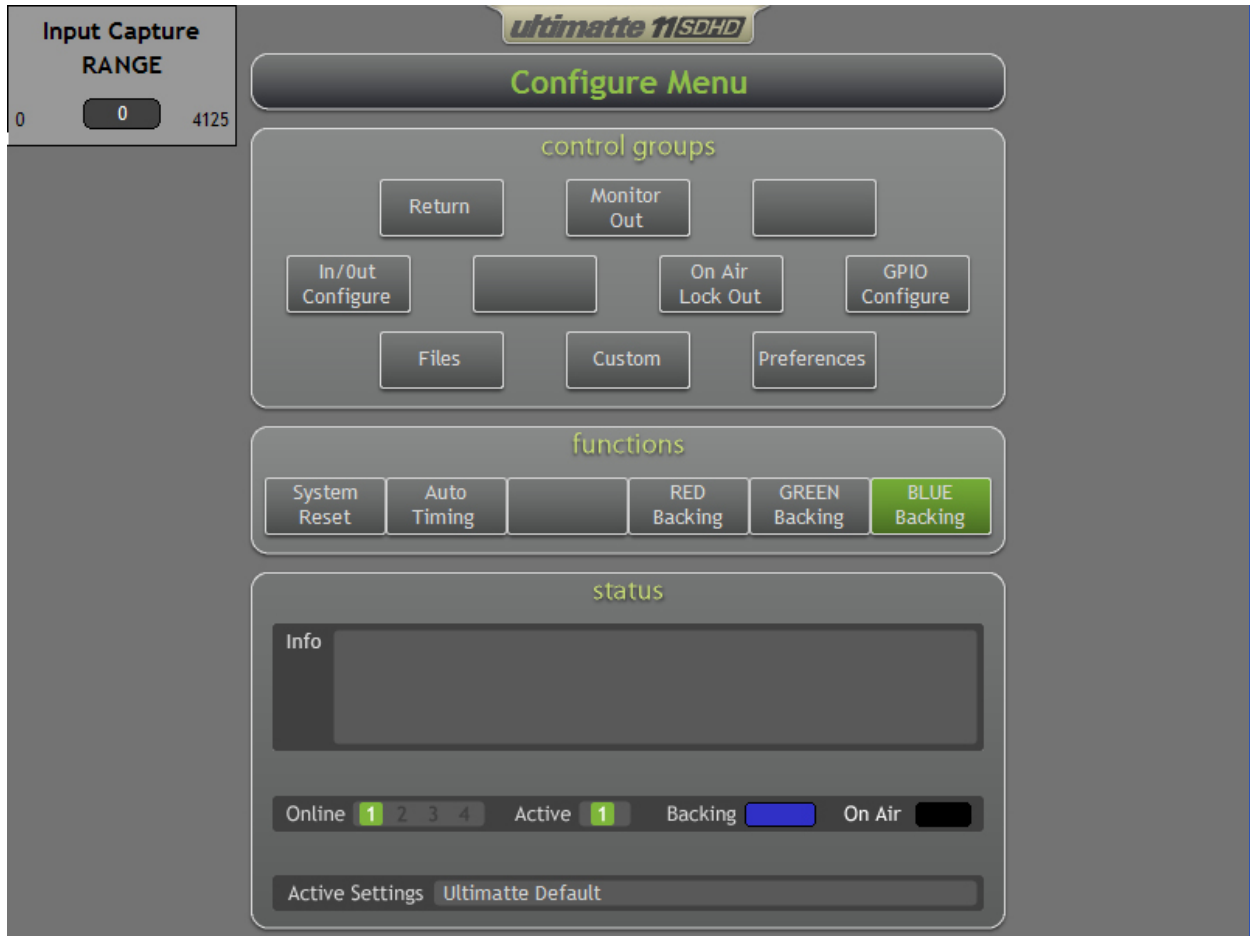


Figure 11.2-1. Configure Menu

11.2.1 Input Capture RANGE

All input and output timing within the Ultimatte-11 is referenced to the video signal connected to Input 1. If this signal timing is changed, the output timing will change with it. The Ultimatte-11 has a variable throughput delay, which can be set by the operator using the Input Capture Range control. If the Capture Range is set for 0% (Minimum), the Ultimatte-11 will have the smallest throughput (Latency) delay. In this configuration, the capture window is at minimum and all inputs are assumed to be close in time. If the Capture Range is set for 100% (Maximum), the Ultimatte-11 will have the largest throughput (Latency) delay. In this configuration, the unit has more than ± 0.5 H (1/2 line) capture range, which means that the inputs can be \pm half a line apart, and the unit will automatically time them to the reference source. Refer to Table 11.2-1 for timing of the Ultimatte-11 throughput delay based on the setting of the Capture Range.

	Clock Latency (# Clocks)		Throughput Delay (uSec.)	
	Capture Range = 0%	Capture Range = 100%	Capture Range = 0%	Capture Range = 100%
720p (50)	286	1,565	3.85 uSec	21.08 uSec
720p (59.94)	286	1,565	3.86 uSec	21.10 uSec
1080i (50)	286	2,200	3.85 uSec	29.63 uSec
1080i (59.94)	286	2,200	3.86 uSec	29.66 uSec
625 (50)	268	985	19.85 uSec	72.96 uSec
525 (59.94)	268	985	19.87 uSec	73.04 uSec

Table 11.2-1. Capture Range vs. Throughput Delay

11.2.2 System Reset

Resets the Ultimatte-11 to the factory default settings. The backing color will default to Blue.

11.2.3 Auto Timing

When the Input Delay Timing in the I/O Setup window is set to “No Input (frame) Delay”, pressing the Auto Timing button will adjust the Input Capture Range to time the signals on Inputs 2, 3, and 4 to the signal on Input 1 (Reference). If the input signals are within $+ / - 0.5H$ (1/2 line) with respect to the signal on Input 1, all the signals will be timed on the correct pixel boundary within the same video line. Any input signals that are beyond the maximum capture range will be timed on the correct pixel boundary on the next video line. For example, if the timing difference between Input 2 and Input 1 is $+3.75$ video lines, Input 2 will be delayed to the 4th video line with respect to Input 1.

When the Input Delay Timing in the I/O Setup window is set to any selection other than “No Input Delay”, pressing the Auto Timing button will perform the same function as above in setting the Input Capture Range. Additionally, pressing Auto Timing will adjust the selected input delay to time its signal on the nearest frame boundary to the associated input signal (e.g.: Input 2 to Input 1). For more detailed description of Input Delay settings, see section 11.1 Understanding Auto Timing.

11.2.4 Red Backing

Selects RED as the Backing color.

11.2.5 Green Backing

Selects GREEN as the Backing color.

11.2.6 Blue Backing

Selects BLUE as the Backing color.

11.3 MONITOR OUT CONFIGURE MENU

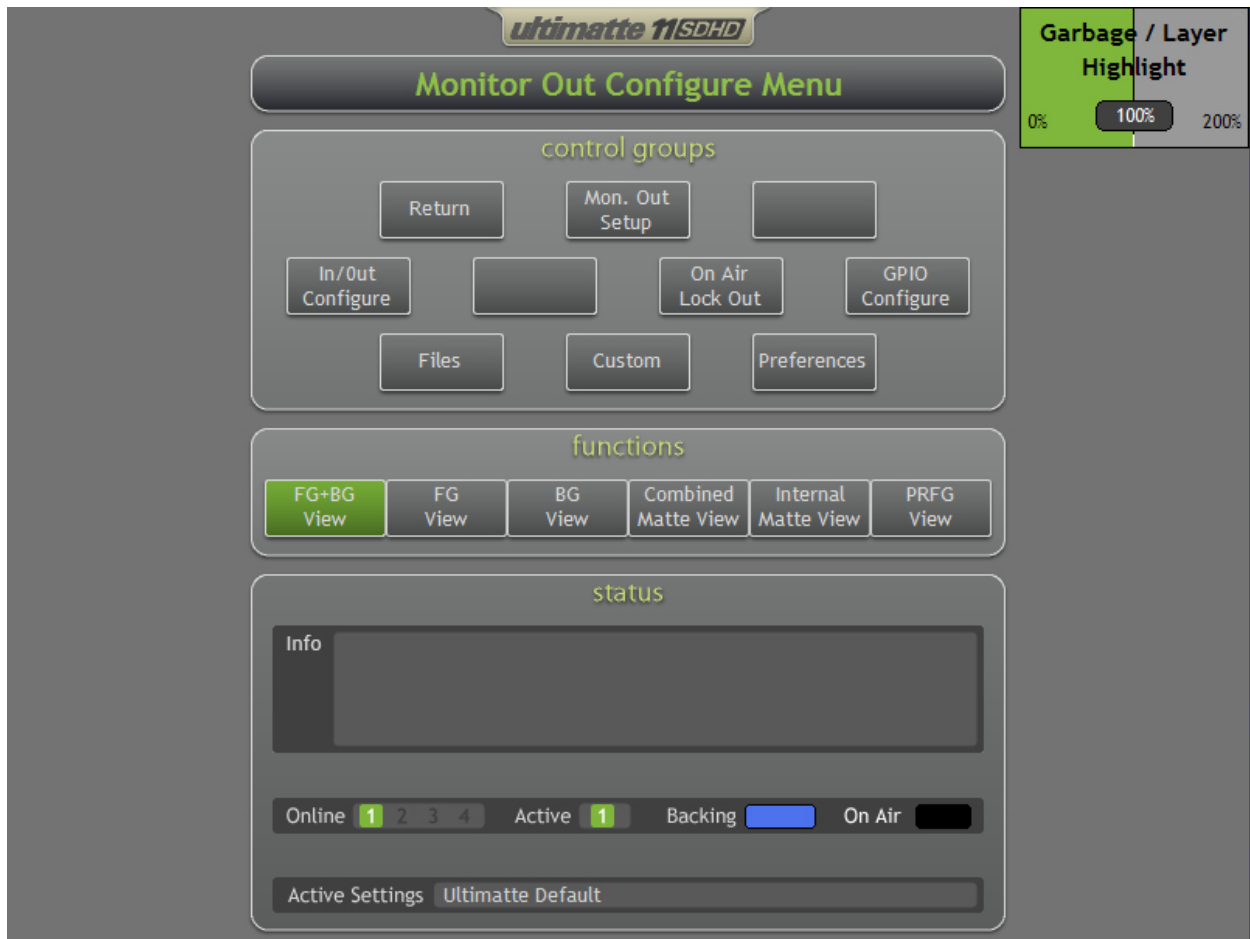


Figure 11.3-1. Monitor Out Configure Menu

The monitor output can be used by the operator to view different processing stages of the main unit without interfering with the image viewed on the FG + BG Output.

The Monitor Output can also be used as a Talent Monitor output so that the FG subjects can see themselves inserted in the new BG scene. The Monitor Output provides the capability to horizontally mirror the viewed image so that the FG subjects can have a more “natural” feedback when seeing themselves on the monitor. When using Garbage Mattes or Layer Mattes, the BG scene areas associated with these mattes can be highlighted to make them more visible, so that the FG subjects can see them more easily and react accordingly.

11.3.1 Garbage / Layer Highlight

This control adjusts the amount of highlight applied to the image viewed on the Monitor Output.

11.3.2 FG + BG View

This will select the Composite (FG + BG) view on the Monitor Output. The same view can be selected by using the “hard” buttons in the VIEW section of the Smart Remote-2.

11.3.3 FG View

This will select the FG image view on the Monitor Output. The same view can be selected by pressing the FG “hard” button in the VIEW section of the Smart Remote-2.

11.3.4 BG View

This will select the BG image view on the Monitor Output. The same view can be selected by pressing the BG “hard” button in the VIEW section of the Smart Remote-2.

11.3.5 Combined Matte View

This will select the Combined Matte (primary matte + garbage/ layer/ holdout mattes) image view on the Monitor Output. The same view can be selected by pressing the Matte “hard” button in the VIEW section of the Smart Remote-2.

11.3.6 Internal Matte View

This will select the Internal Matte (primary matte without garbage/ layer/ holdout mattes) image view on the Monitor Output.

11.3.7 PRFG View

This will select the PRFG (Processed FG without BG scene) image view on the Monitor Output.

11.4 MONITOR OUT SETUP MENU

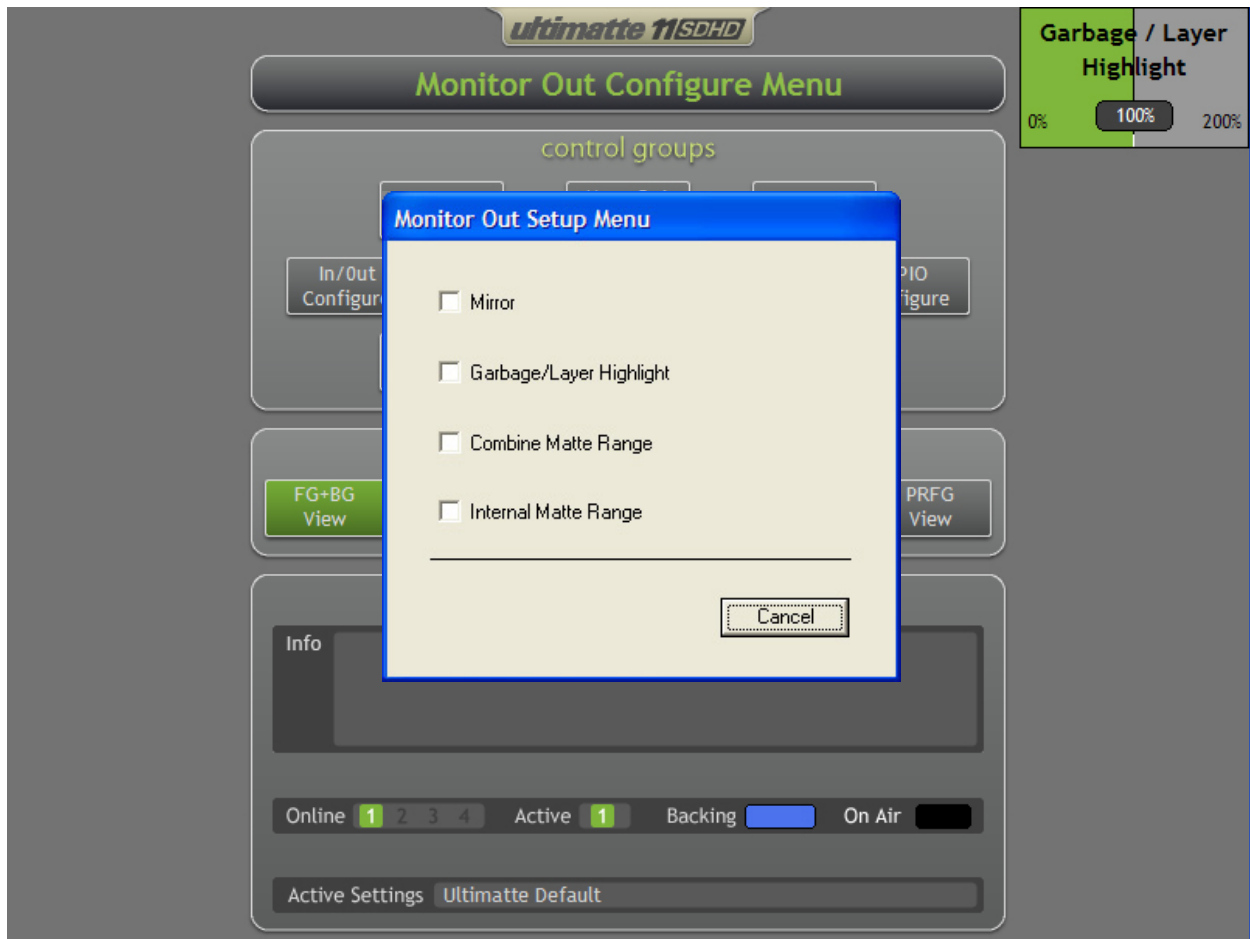


Figure 11.4-1. Monitor Out Setup Menu

This Menu allows the user to select different setups for the Monitor Output view.

11.4.1 Mirror

Selecting this option will horizontally mirror the image viewed on the Monitor Output.

Note: The mirrored output will be vertically delayed by ONE line per Field / Frame.

11.4.2 Garbage / Layer Highlight

When Garbage Matte or Layer Matte features are enabled, selecting this option will highlight the associated areas with these mattes in the image viewed on the Monitor Output.

11.4.3 Combined Matte Range

The quality of images viewed on video monitors depends on the monitor's brightness and contrast setup. In many situations, the detail information in the very dark and very bright portions of an image is sacrificed so that the rest of the image can have a more pleasant look. The levels in a matte image cover the whole brightness gamut and most of the Matte controls are adjusted while observing matte levels near the darkest or the brightest end. For this reason, it is difficult to adjust the matte accurately while looking at a monitor and observing the darkest and brightest portions of the images.

Turning on Combined Matte Range will raise the black level and reduce the (white) gain of the Combined Matte signal so that detail information in the black and white "ends" of the matte can be viewed accurately on a monitor.

Reducing the range of the Combined Matte on the Monitor Out has no effect on any internal processing, FG + BG Outputs, or the Matte Output.

11.4.4 Internal Matte Range

When set, this function will raise the black level and reduce the (white) gain of the Internal Matte signal (without Garbage / Layer / Holdout mattes) so that detail information in the black and white "ends" of the matte can be viewed accurately on a monitor.

Reducing the range of the Internal Matte on the Monitor Out has no effect on any internal processing, FG + BG Outputs, or the Matte Output.

11.5 INPUT / OUTPUT CONFIGURE MENU

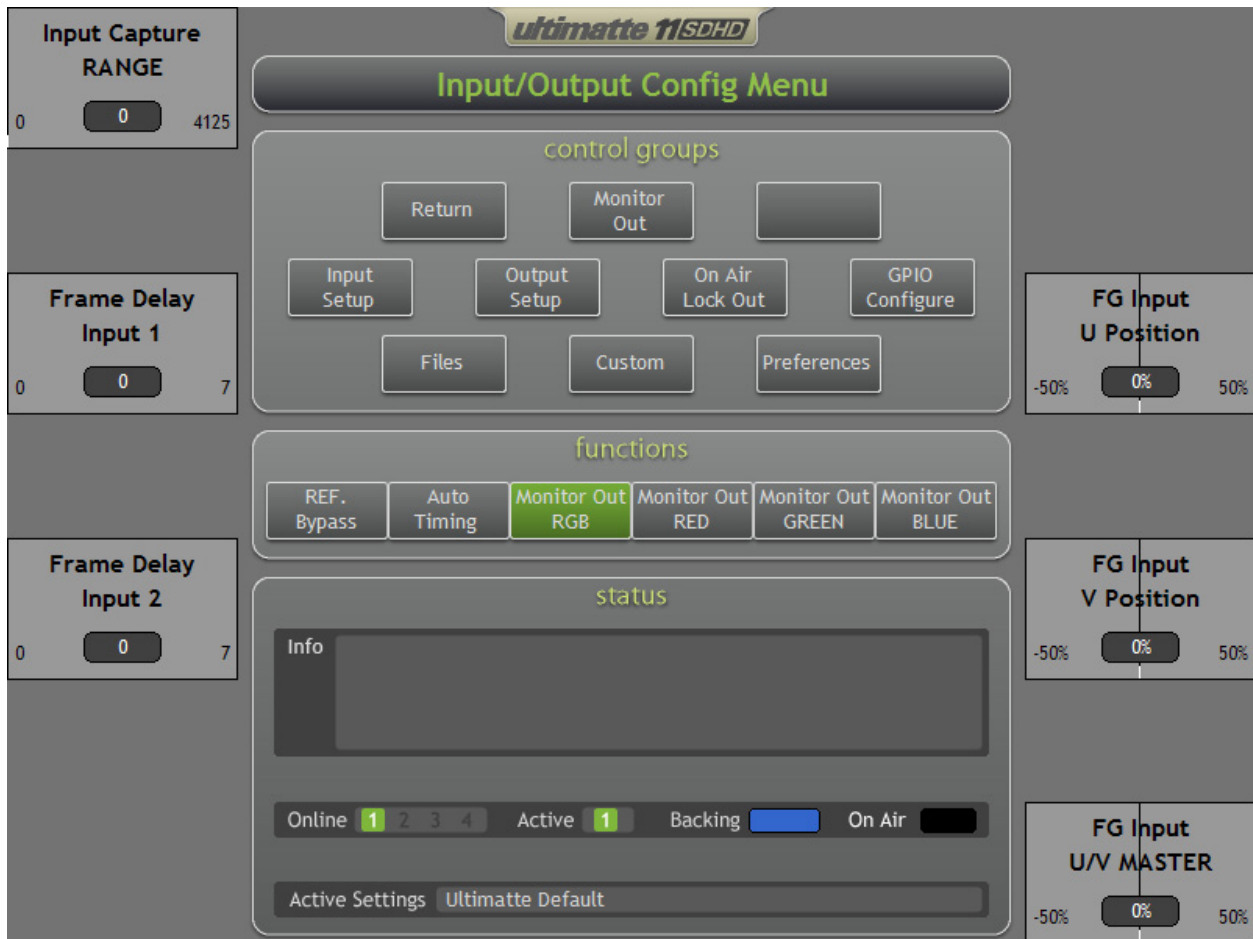


Figure 11.5-1. Input / Output Configuration Menu

11.5.1 Input Capture RANGE

All input and output timing within the Ultimatte-11 is referenced to the video signal connected to Input 1. If this signal timing is changed, the output timing will change with it. The Ultimatte-11 has a variable throughput delay, which can be set by the operator using the Input Capture Range control. If the Capture Range is set for 0% (Minimum), the Ultimatte-11 will have the smallest throughput (Latency) delay. In this configuration, the capture window is at minimum, and all inputs are assumed to be close in time. If the Capture Range is set for 100% (Maximum), the Ultimatte-11 will have the largest throughput (Latency) delay. In this configuration, the unit has more than ± 0.5 H (1/2 line) capture range, which means that the inputs can be \pm half a line apart, and the unit will automatically time them to the reference source. Refer to Table 11.2-1 for timing of the Ultimatte-11 throughput delay based on the setting of the Capture Range.

11.5.2 Frame Delay Input 1

This control will adjust the frame delay associated with Input 1. The control range is from 0 frames to 7 frames, on a full frame boundary. All sub-frame (lines and pixels) timing is automatically adjusted by pressing the **Auto Timing** button. For more detailed description of Input Delay settings, see section 11.1 Understanding Auto Timing.

11.5.3 Frame Delay Input 2

This control will adjust the frame delay associated with Input 2. The control range is from 0 frames to 7 frames, on a full frame boundary. All sub-frame (lines and pixels) timing is automatically adjusted by pressing the **Auto Timing** button. For more detailed description of Input Delay settings, see section 11.1 Understanding Auto Timing.

11.5.4 FG Input U Position

This control will only adjust the U timing relative to Y in sub-pixel values. The maximum range of adjustment is +/- 2 pixels.

11.5.5 FG Input V Position

This control will only adjust the V timing relative to Y in sub-pixel values. The maximum range of adjustment is +/- 2 pixels.

11.5.6 FG Input U / V MASTER

In a 4:2:2 signal, the relative timing between Luma (Y) and the Chroma (U / V) samples are well defined. However, some cameras might have some amount of relative Luma / Chroma timing error due to A/D and D/A conversions. When viewed on a monitor as R or G or B only, the image will look like an “embossed” picture. This timing error will cause un-natural transitions and miss-colored edges.

If there are no adjustments in the camera to correct this timing problem, the FG Input U V Master control can adjust both U and V timing with respect to Y timing in sub-pixel values to compensate for the timing difference. The maximum range of adjustment is +/- 2 pixels.

11.5.7 REF Bypass

Enabling this function will route the signal connected to Input 1 (Reference) to all outputs of the Ultimatte-11 regardless of the main unit settings.

11.5.8 Auto Timing

When the Input Delay Timing in the I/O Setup window is set to “No Input (frame) Delay”,

pressing the Auto Timing button will adjust the Input Capture Range to time the signals on Inputs 2, 3, and 4 to the signal on Input 1 (Reference). If the input signals are within $+ / - 0.5H$ (1/2 line) with respect to the signal on Input 1, all the signals will be timed on the correct pixel boundary within the same video line. Any input signals that are beyond the maximum capture range will be timed on the correct pixel boundary on the next video line. For example, if the timing difference between Input 2 and Input 1 is $+3.75$ video lines, Input 2 will be delayed to the 4th video line with respect to Input 1.

When the Input Delay Timing in the I/O Setup window is set to any selection other than “No Input Delay”, pressing the Auto Timing button will perform the same function as above in setting the Input Capture Range. Additionally, pressing Auto Timing will adjust the selected input delay to time its signal on the nearest frame boundary to the associated input signal (e.g.: Input 2 to Input 1). For more detailed description of Input Delay settings, see section 11.1 Understanding Auto Timing.

11.5.9 Monitor Out RGB

When selected, the Monitor Output will show all three channels (RGB) of the image viewed (Default setting).

When selected, Monitor Out RGB will disable Monitor Out RED or Monitor Out GREEN or Monitor Out BLUE selections.

11.5.10 Monitor Out RED

When selected, the Monitor Output will show the RED channel of the image viewed (as Y).

When selected, Monitor Out RED will disable Monitor Out RGB or Monitor Out GREEN or Monitor Out BLUE selections.

11.5.11 Monitor Out GREEN

When selected, the Monitor Output will show the GREEN channel of the image viewed (as Y).

When selected, Monitor Out GREEN will disable Monitor Out RGB or Monitor Out RED or Monitor Out BLUE selections.

11.5.12 Monitor Out BLUE

When selected, the Monitor Output will show the BLUE channel of the image viewed (as Y).

When selected, Monitor Out BLUE will disable Monitor Out RGB or Monitor Out RED or Monitor Out GREEN selections.

11.6 INPUT SETUP MENU

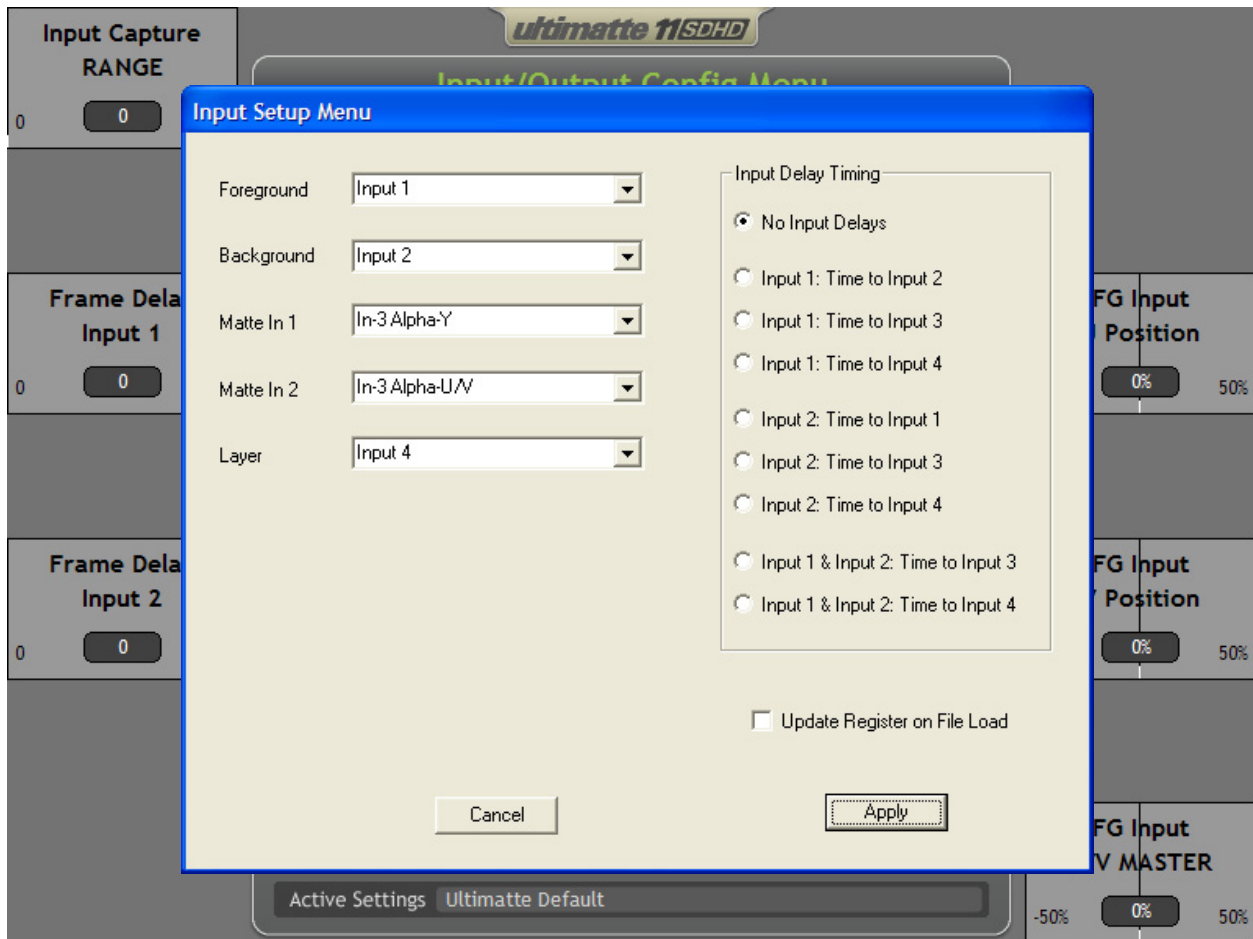


Figure 11.6-1. Input Setup Menu

11.6.1 Foreground

Selects which input connectors (1-4) is assigned as the Foreground video source.

11.6.2 Background

Selects which input connectors (1-4) is assigned as the Background video source.

11.6.3 Matte In 1

Each input connector can contain two alpha channels. Alpha 1 is the standard Y channel (4:0:0 position) and Alpha 2 is the combination of the U and V channels (0:2:2 position). This control selects which input connector (1-4) and which Alpha (1-2) is assigned as the Matte In 1 video source.

11.6.4 Matte In 2

Each input connector can contain two alpha channels. Alpha 1 is the standard Y channel (4:0:0 position) and Alpha 2 is the combination of the U and V channels (0:2:2 position). This control selects which input connector (1-4) and which Alpha (1-2) is assigned as the Matte In 2 video source.

11.6.5 Layer

Selects which inputs are used as the Layer (Inputs 1-4).

11.6.6 Input Timing Delay

This portion of the **I/O Setup** window allows the selection and activation of one or both of the input frame delays. After making the selection, pressing **Apply** will exit the window and automatically adjust the selected delay or delays, to the nearest frame boundary, to the associated input signal. Pressing **Apply** without making a change in the **Input Delay Timing** will not change the main unit timing.

Warning:

When exiting the **I/O Setup** window *after* changing the **Input Delay Timing**, the main unit will re-adjust its internal timing, which will cause the output signals to glitch.

When exiting the **I/O Setup** window *without* changing the **Input Delay Timing**, the main unit will not adjust its internal timing, and the output signals will not glitch.

For more detailed description of Input Delay settings, see section 11.1 Understanding Auto Timing.

11.6.7 Update Register on File Load

Input Delay Timing values, similar to all other setup values, are saved as part of a File. When loading a File, all internal registers are updated with the values of the loaded file. In a typical studio setup, once the entire system timing is adjusted, it remains unchanged thereafter. Therefore, when loading saved Files after system timing is performed, it is not necessary to load **Input Delay Timing** information. Since all saved Files will have the same timing information, loading this information with every File is redundant. By default, **Update Register on File Load** check box is unmarked, which means *no* timing information will be updated with each file load operation.

To load saved timing information from a File, the **Update Register on File Load** check box *must* be marked. Typically, the timing information needs to be loaded once, after cycling power to the main unit, for example. When loading timing information from a file, the main unit will re-adjust its internal timing, which will cause the output signals to glitch. After loading the first file, the mark in the check box should be removed to

prevent loading of timing information with subsequent File Loads.

An alternate method for automatically loading timing information after main unit power up is to use “User Power Up”. After the main unit delay timing is adjusted, this timing information, together with other custom power up settings, is saved as a “User Power Up” file under the Preferences Menu. When **DIP Switch # 5**, inside the front cover of the main unit is moved from the DOWN (OFF) position to the UP (ON) position, the unit will use the User Power Up file as the default settings every time it is powered up (see section 2.10 for setting DIP Switches).

11.7 OUTPUT SETUP MENU

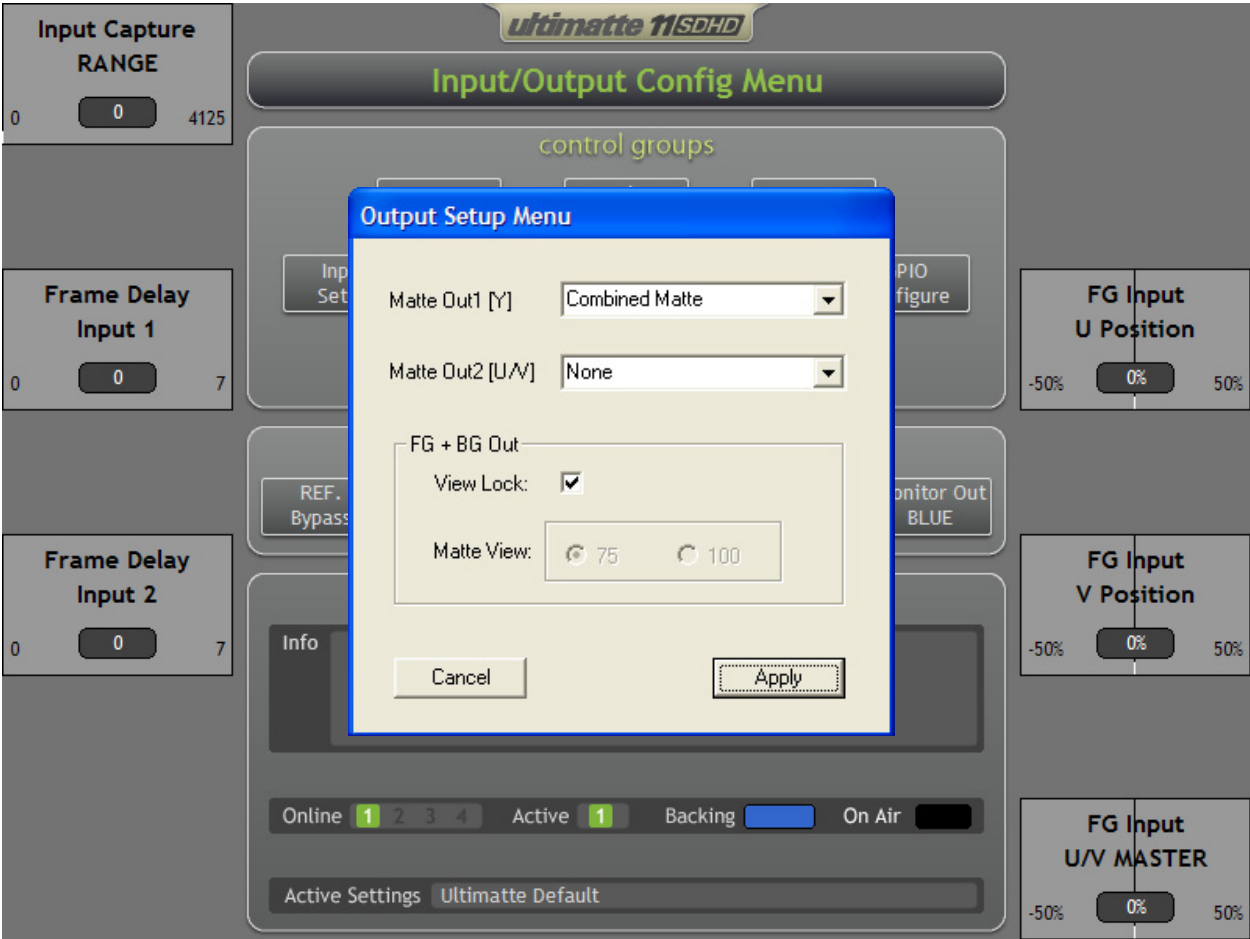


Figure 11.7-1. Output Setup Menu

11.7.1 Matte Out1 [Y]

This control assigns the location of the Matte Out channel for the Y position of the serial video stream. The possible combinations are as follows:

- Matte Out 1 (Y): Combined Matte (default)
- Matte In 1
- Matte In 2
- Internal Window

11.7.2 Matte Out2 [U/V]

This control assigns the location of the Matte Out channel for the U/V position of the serial video stream. The possible combinations are as follows:

Matte Out 2 (U/V): None (default)
Combined Matte
Matte In 1
Matte In 2
Internal Window

11.7.3 View Lock ON / OFF

When the View Lock function is ON, the VEW buttons on the Smart Remote-2 will only change the image viewed on the Monitor Output. The FG + BG Outputs will always have the composite (FG + BG) image, regardless of what VIEW modes are selected on the Smart remote-2.

When the View Lock function is OFF, the VIEW buttons on the Smart Remote-2 will change the image viewed on the FG + BG Outputs as well as the image viewed on the Monitor Output.

The state of View Lock function will NOT change after FILE CLEAR.

11.7.4 Matte View 75 / 100

In View Lock OFF mode, when MATTE is selected from the VIEW Buttons, the FG + BG Outputs will change to the Combined Matte view. In this view, the white level in the backing area is defaulted to 75% white. Selecting Matte View 75 / 100 will change the white level of the observed matte to 100%. This function will have no impact on internal processing stages.

The Matte View 75 / 100 function will have no effect on the FG + BG Outputs when the View Lock mode is ON.

11.8 ON AIR LOCK OUT MENU

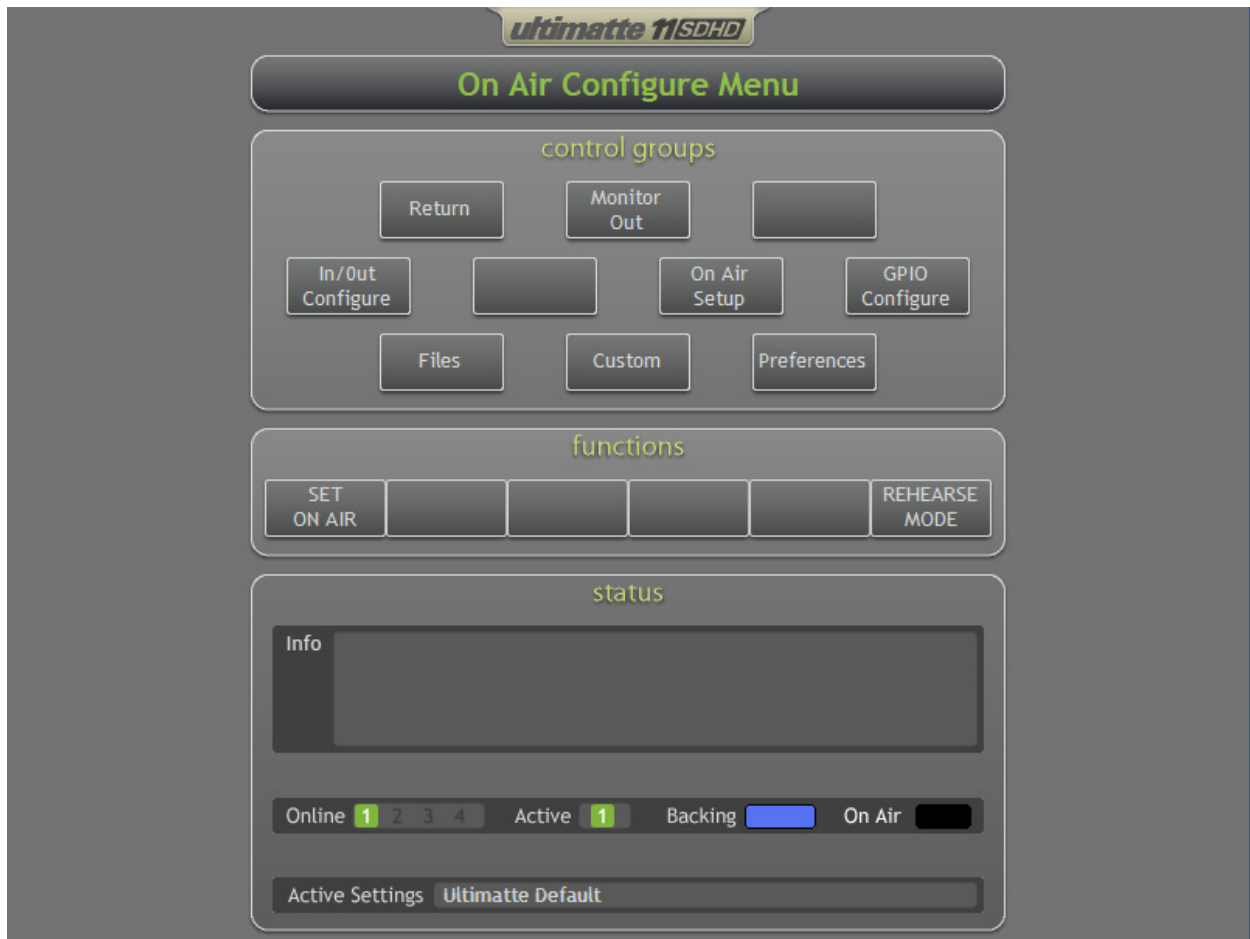


Figure 11.8-1. On Air Configure Menu

When a unit is selected to be ON AIR (through TALLEY connection – see section 11.11 GPI SETUP MENU), it is important to prevent accidental adjustments of certain Control Knobs or pressing of certain Buttons. Through ON AIR Setup menu, the operator can designate certain controls and buttons to be locked out when the unit is on air. When the SET ON AIR button is enabled, the designated controls and buttons will be disabled as the Main Unit is selected to be 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.

Individual Control Knobs and Buttons can be added to or removed from the ON AIR lockout list by:

- Selecting ULT button (LED ON).
- Double tapping (in the display) on the Control Knob or the Button of interest to open a display window.
- From the display window, selecting or de-selecting the Lockout function.

- Selecting Close to Exit the display window.

11.8.1 SET ON AIR

When this function is enabled, the Control Knobs and the Buttons designated through the ON AIR Setup Menu will be disabled when the active main unit is selected to be ON AIR through the TALLEY connection.

The ON AIR unit ID number will be lit (RED LED) when the corresponding main unit is selected through TALLEY connection to be ON AIR. When ON AIR feature is active, the indicator next to the On Air in the Status Section of the LCD panel will display RED any time the Active main unit is selected to be ON AIR.

11.8.2 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 disabling SET ON AIR function, enabling the REHEARSE MODE will bypass the lockout while maintaining the ON AIR LED indicators. When rehearsing is over and the unit will actually go on air, disable the REHEARSE MODE function to restore all designated lockout functions.

11.9 ON AIR SETUP MENU

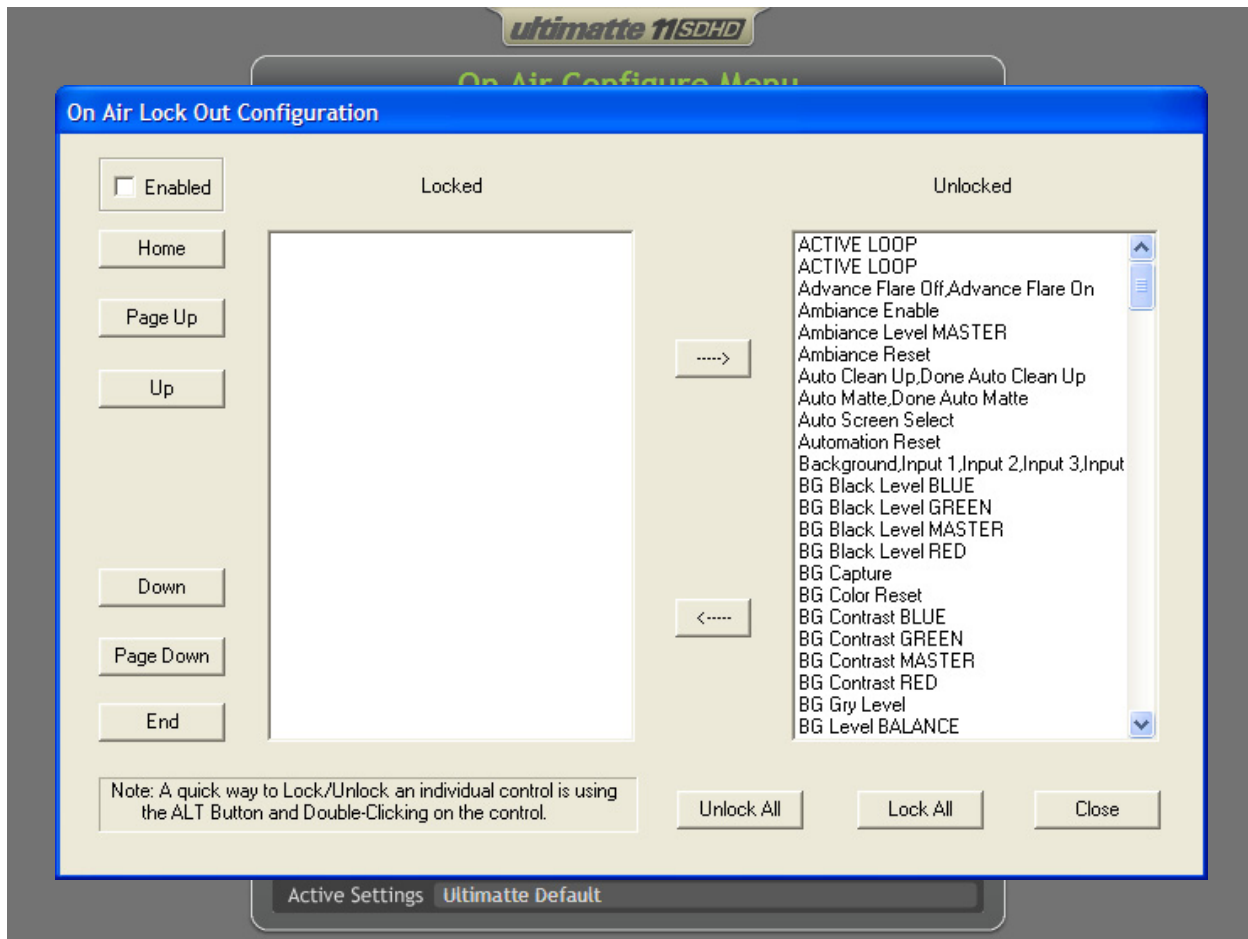


Figure 11.9-1. On Air Lock Out Configuration

Most Control Knobs and Buttons are designated as LOCKED by default. The ON AIR Setup window allows the user to designate which Control Knobs and Buttons need to remain unlocked (active) when the main unit is selected to be the active ON AIR unit.

The display window contains two lists. On the left side is the list of all **Locked** Control Knobs and Buttons, while on the right side is the list of all **Unlocked** Control Knobs and Buttons.

To **Unlock** a Control Knob or a Button:

1. Find the Control or Button name in the **Locked** functions list
2. Touch the name to highlight it
3. Touch the **Right** arrow (→) to move the selected name to the **Unlocked** functions list
4. The selected name will move from the **Locked** to the **Unlocked** list
5. Repeat this process to move all the functions needed to the **Unlocked** list

To **Lock** a Control Knob or a Button:

1. Find the Control or Button name in the **Unlocked** functions list
2. Touch the name to highlight it
3. Touch the **Left** arrow (←) to move the selected name to the **Locked** functions list
4. The selected name will move from the **Unlocked** to the **Locked** list
5. Repeat this process to move all the functions needed to the **Locked** list

11.9.1 Enabled (SET ON AIR)

When this function is enabled, the Control Knobs and the Buttons designated through the ON AIR Setup Menu will be disabled when the active main unit is selected to be ON AIR through the TALLEY connection.

The ON AIR unit ID number will be lit (RED LED) when the corresponding main unit is selected through TALLEY connection to be ON AIR. When the ON AIR feature is active, the indicator next to the On Air in the Status Section of the LCD panel will display RED any time the Active main unit is selected to be ON AIR.

11.9.2 Home

This will highlight the **first** item on the **Locked** list.

11.9.3 Page Up

With each pressing, this will move the displayed **Locked** list **UP** by one “Page”.

11.9.4 Up

With each pressing, this will move **UP** the highlighted item on the **Locked** list by ONE.

11.9.5 Down

With each pressing, this will move **DOWN** the highlighted item on the **Locked** list by ONE.

11.9.6 Page Down

With each pressing, this will move the displayed **Locked** list **DOWN** by one “Page”.

11.9.7 End

This will highlight the **Last** item on the **Locked** list.

11.9.8 Unlock All

Selecting this will **UNLOCK** the entire list of Control Knobs and Buttons.

11.9.9 Lock All

Selecting this will **LOCK** the entire list of Control Knobs and Buttons.

11.9.10 Close

Selecting this will close and exit the ON AIR Setup display window.

11.10 GPIO CONFIGURE MENU

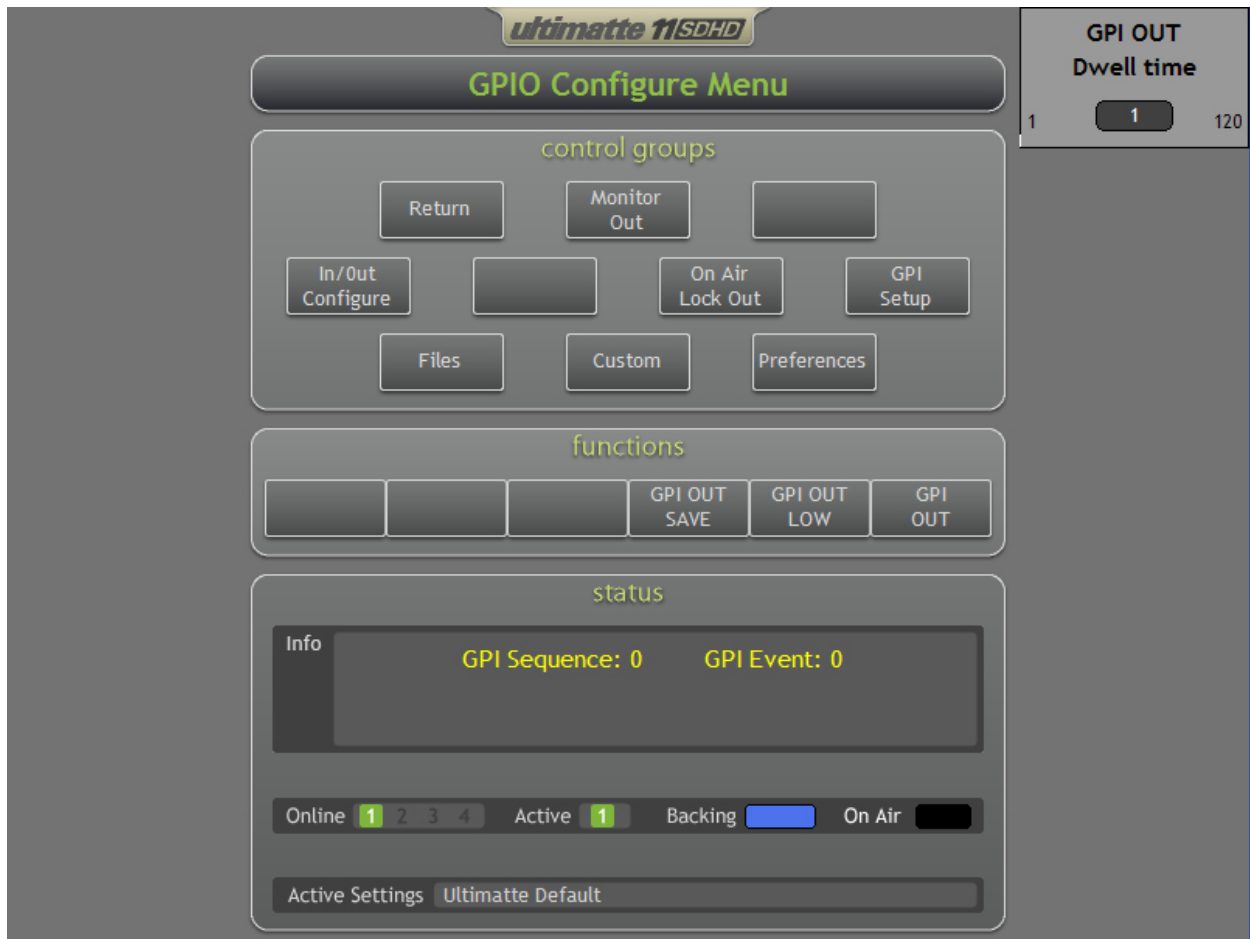


Figure 11.10-1. GPIO Configure Menu

The GPI Inputs allow external devices, like computers, to load saved setup files in a pre-determined order into the current work space. **The maximum number of Events (number file in GPI Files List) per GPI Input is 16.**

It is also possible for the main unit to trigger events in other devices using the GPI Output. This triggering can be done manually, or upon loading a file if the GPI Out was saved as part of that file.

11.10.1 GPI OUT Dwell Time

The period depends on the frame time and the number of frames (1-120). This is the delay between the triggering event and the execution of the GPI Out switch closure.

11.10.2 GPI OUT SAVE

In order to initiate a GPI Output upon loading a file, the appropriate instructions must be saved as part of that file. When GPI Out Save is selected, the instructions to trigger a GPI Out will become part of the current workspace settings. When the current workspace settings are saved as a setup File, the instructions to trigger the GPI Out are saved with this File.

When the saved file, which includes the triggering instructions, is loaded into the current workspace, the triggering instructions will initiate the proper GPI Output sequence.

11.10.3 GPI OUT HIGH / LOW

Pressing this button toggles the default GPI Output state between High and Low.

11.10.4 GPI OUT

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

11.11 GPI SETUP MENU

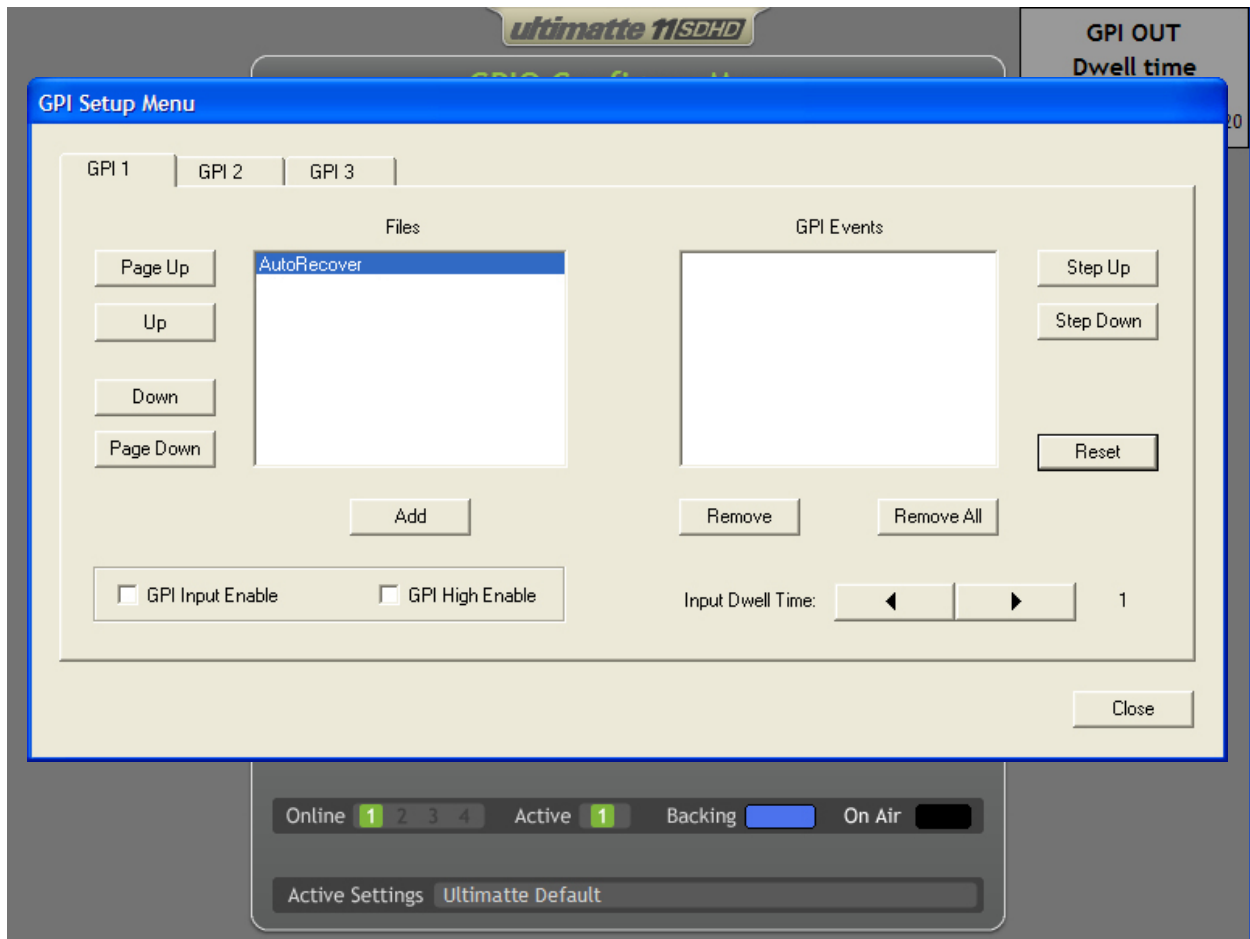


Figure 11.11-1. GPI Setup Menu

From the GPI Setup Menu, the user can separate GPI Files List from previously saved setup Files for each GPI Input. The user can step through each GPI Files List to verify that the selected files were the correct ones, and that the sequence by which these files were listed was correct. If needed, the user can edit each GPI List by removing, adding or inserting any number of files.

11.11.1 GPI 1 (Tab)

This window allows the user to set up the Files in the order by which they will be loaded when triggered by the signal connected to GPI 1 Input.

11.11.2 GPI 2 (Tab)

This window allows the user to set up the Files in the order by which they will be loaded when triggered by the signal connected to GPI 2 Input.

11.11.3 GPI 3 (Tab)

This window allows the user to set up the Files in the order by which they will be loaded when triggered by the signal connected to GPI 3 Input.

11.11.4 Page Up

With each pressing, this will move the displayed Files list UP by one "Page".

11.11.5 Up

With each pressing, this will move UP the highlighted item on the Files list by ONE.

11.11.6 Down

With each pressing, this will move DOWN the highlighted item on the Files list by ONE.

11.11.7 Page Down

With each pressing, this will move the displayed Files list DOWN by one "Page".

11.11.8 Add

With each pressing, this button will add the highlighted file in the Files list to the selected GPI Events list.

11.11.9 Remove

With each pressing, this button will remove the highlighted file from the selected GPI Events list.

11.11.10 Remove All

This button will remove all the files from the selected GPI Events list.

11.11.11 Step Up

With each pressing, this button will move the highlighted file selection UP by ONE position and automatically load the selected file into the current work space.

Any file on the GPI Events list can be highlighted and loaded in the current work space by touching the corresponding file name on the SR-4 display.

11.11.12 Step Down

With each pressing, this button will move the highlighted file selection DOWN by ONE position and automatically load the selected file into the current work space.

Any file on the GPI Events list can be highlighted and loaded in the current work space by touching the corresponding file name on the SR-4 display.

11.11.13 Reset

Pressing this button will move the “pointer” to the top of the GPI Files list without loading the first file (no highlighting). The first file will be loaded when the first GPI pulse is detected.

11.11.14 GPI Input Enable

This function enables / disables individual GPI Inputs separately based on the setting of GPI Input Select control. 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.

11.11.15 GPI High Enable

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

The GPI Inputs are triggered by the logic level of the input signal, not by the transition edges. If GPI High Enable is checked, the selected input will be triggered by a High logic state. If GPI High is not checked, the selected input will be triggered by a Low logic state.

11.11.16 Input Dwell Time

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

The GPI Input Dwell Time can be set at different values for each input.

11.11.17 Close

Selecting this button will close the window and exit the GPI Setup Menu.

11.11.18 Setting Up a GPI Events List

1. Files must be previously created and saved.
2. Press the CONFIG button to go to Configuration Menu and select GPIO

Configure in the Control Groups. Select GPI Setup button. GPI Setup window will be displayed.

3. From the tabs, select the GPI Event number (GPI 1 to GPI 3) to be used. If the selected GPI number was used before, the Events list will show the previously selected files. The existing Events List can be edited by removing, adding or inserting files (see section 11.11.8 and 11.11.9 above). Alternately, select Remove All to remove all the files from the Events List.
4. Select the File to be added to the Events list (Selected File name is highlighted).
5. Press **Add**: the File name will be added to the Events list.
6. To add more files to the Events list, repeat steps 4 and 5.
7. When the Events list is complete, press **Reset** to move the pointer to the beginning of the Events List.
8. Adjust Dwell Time to delay (number of frames) the loading of Files from the time the GPI pulse is received if necessary.
9. Select the appropriate GPI input logic state using the GPI INPUT HIGH / LOW button.
10. Enable GPI by pressing GPI INPUT ENABLE / OFF button.
11. Repeat steps 2 to 11 for each GPI input (1-3).
12. Select **Close** to exit the dialog box. The GPIO Configure Menu will be displayed.
13. If the selected GPI input is also used as a Tally input, enabling the ON AIR button will override the GPI enable function. If both functions are needed, select two different GPI inputs for each function.
14. To edit an existing Events list, press the CONFIG button to go to Configuration Menu and select GPIO Configure in the Control Groups. Select GPI Setup. GPI Setup window will be displayed.
15. From the tabs, select the GPI Event number to be edited.
16. To **delete** a file from the Events List, select the file to be deleted by touching the file name on the display (selected File name is highlighted), or by using Step Up or Step Down buttons to move the highlighted file name.
17. Press **Delete**: the File name will be removed from the Events list.

18. To **delete** more Files from the Events list, repeat steps 16 and 17.
19. To **add** a file to the Events List, use Page Up, Up, Down, or Page Down buttons to highlight the file name.
20. Press **Add**: the File name will be added to the bottom of the Events List.
21. To **add** more Files to the Events List, repeat steps 19 and 20.
22. To **insert** a file in a specific location in the Events List, select (highlight) the File name on the Events List **above** where the new file needs to be inserted. The selection can be done either by touching the file name on the display (selected File name is highlighted), or by using Step Up or Step Down buttons to move the highlighted file name.
23. From the Files List, select the file to be inserted in the Events List by either touching the file name on the display, or by using Page Up, Up, Down, or Page Down buttons to highlight the file name.
24. Press **Add** to insert the new file **above** the highlighted File name in the Events List.
25. To **insert** more files in the existing Events List, repeat steps 22 to 24.
26. When the editing is completed, select **Reset** to move the pointer to the beginning of the Events List, then select **Close** to exit the GPI Setup window.

12. FILES

The following controls appear in all menu selections.

12.1 FILES MENU

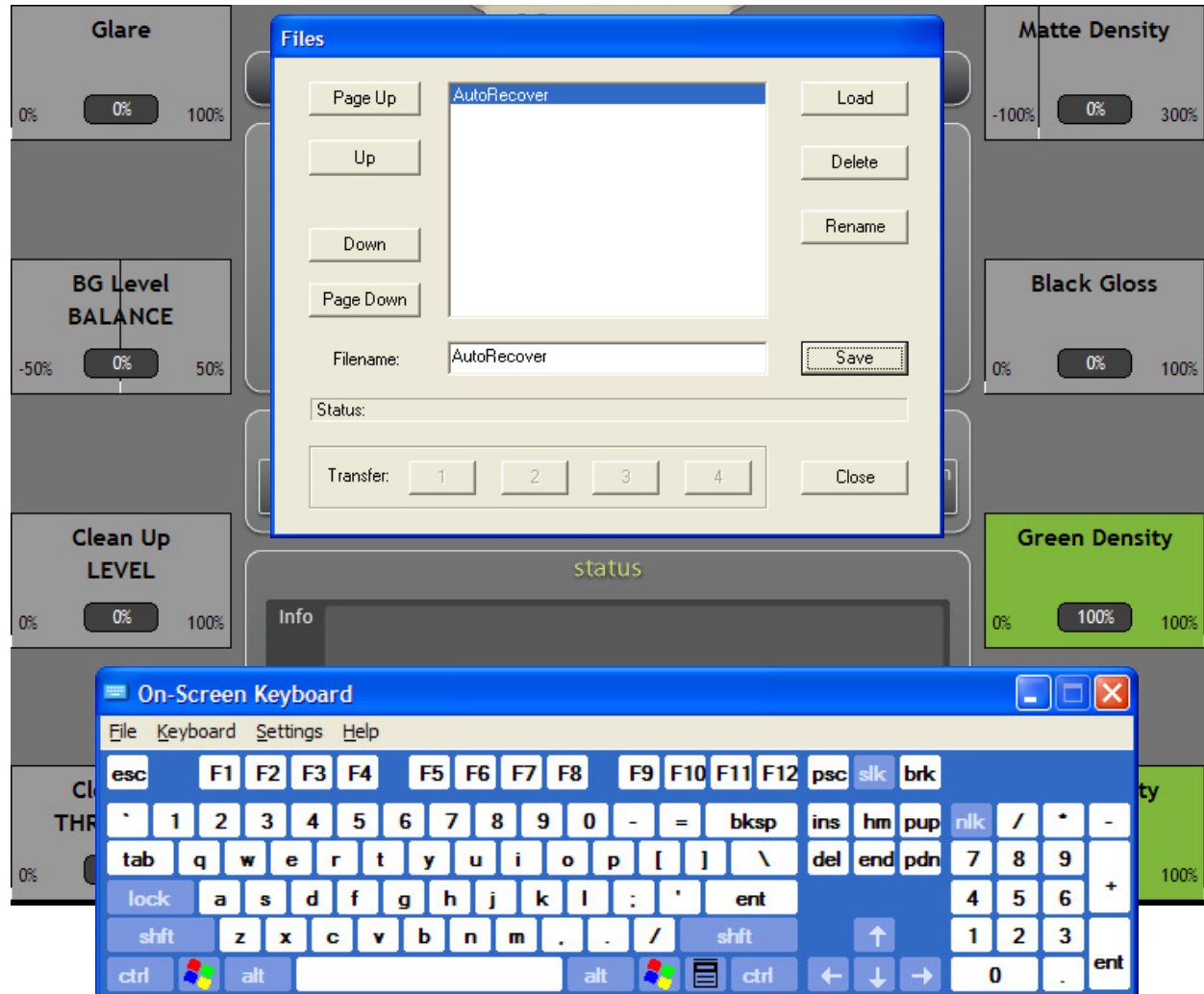


Figure 12.1-1. Files Menu

Selecting FILES from the Controls Group section will display the Files window and an On Screen Keyboard. An external keyboard (connected to one of the USB ports) can also be used. The user can save up to 90 setup files in the main unit. **It can take up to 5 seconds to save or delete a file as these files are stored in flash memory.** Loading a file has a fixed delay of ONE FRAME, after the load instruction is detected.

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

When the FILES window is displayed, the Filename box will always show the name of the first file on the Files list. Usually, this is the AutoRecover file.

12.1.1 To Save a File

1. If the new file name is a modification of an existing one, select that file name from the list by highlighting it.
2. Touch the display in the Filename box inside the Files window. The prompter will appear.
3. Using the On Screen Keyboard (or an external keyboard), make the desired File name changes.
4. If a completely new name will be added, press the Backspace key on the keyboard to erase the existing file name. Alternately, touching and moving a finger or a stylus across the file name will highlight the name so that it can be over-written.
5. Using the On Screen Keyboard (or an external keyboard), type the desired File name.
6. Press the **Save** button inside the Files window. The button will display "**Saving**", until the process is completed. The new name will appear in the saved Files list.
7. Press the **Close** button to exit the Files window

12.1.2 To Load a File

1. From the saved Files list, select (by touching) the File name to be loaded. The name will be highlighted. Alternately, use the Page Up, Up, Down, or Page Down buttons to select (highlight) the File name to be loaded.
2. Press the **Load** button to load the selected File into the current settings and exit the Files window.
3. The selected file name will appear in the Active Settings box of the Status section of the display.

12.1.3 To Delete a File

1. From the saved Files list, select (by touching) the File name to be deleted. The name will be highlighted. Alternately, use the Page Up, Up, Down, or Page Down buttons to select (highlight) the File name to be deleted.

2. Press the **Delete** button to remove the selected file from the Files list.
3. Repeat the process to delete other Files.

12.1.4 To Rename a File

1. If the new file name is a modification of an existing one, select that file name from the list by highlighting it.
2. Touch the display in the Filename box inside the Files window. The prompter will appear.
3. Using the On Screen Keyboard (or an external keyboard), make the desired File name changes.
4. If a completely new name will be added, press the Backspace key on the keyboard to erase the existing file name. Alternately, touching and moving a finger or a stylus across the file name will highlight the name so that it can be over-written.
5. Using the On Screen Keyboard (or an external keyboard), type the desired File name.
6. Press the **Rename** button inside the Files window. The button will display **“Renaming”**, until the process is completed. The new name will replace the old one in the saved Files list.
7. Press the **Close** button to exit the Files window.

12.1.5 To Transfer a File

It is possible to transfer files from one main unit to another. More than one main unit must be connected to use this feature. Files saved in a main unit can **ONLY** be transferred to other main units **OF THE SAME MODEL**.

1. From the saved Files list, select (by touching) the File name to be transferred. The name will be highlighted. Alternately, use the Page Up, Up, Down, or Page Down buttons to select (highlight) the File name to be transferred.
2. From the **Transfer** section select the main unit number to which the file is to be transferred.
3. Repeat the process to transfer more files to other main units, or select Close to exit the Files window.

Note: In the main unit to which the file was transferred, the File name will appear in the saved files list with the "TR" (addition at the end of the name).

13. CUSTOM MENU

The following controls appear in all menu selections.

13.1 CUSTOM MENU (1 – 4)

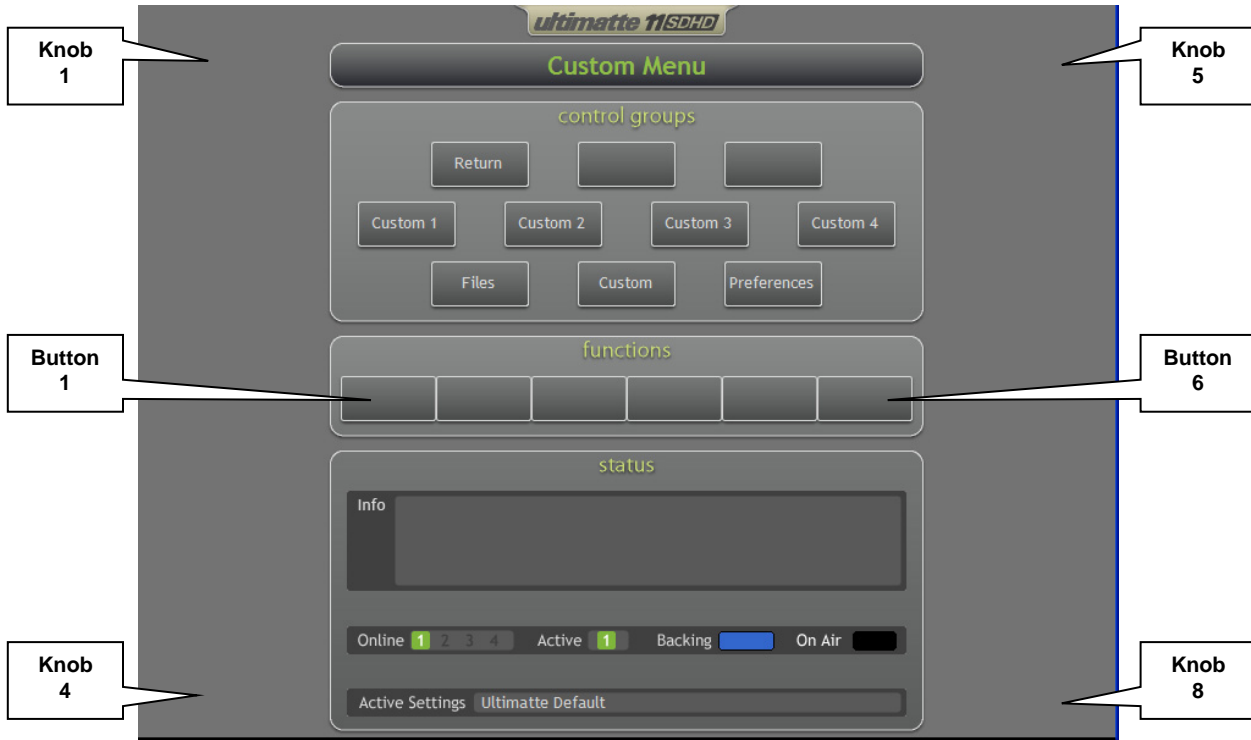


Figure 13.1-1. Custom Menu

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 Preference, these four Custom Menus will become part of the operator's preference file. Each unit can store up to four (4) Custom Menus for each of the 20 Preference Files.

13.1.1 Knob 1 to Knob 8:

Control Knob positions to be assigned specific functions.

13.1.2 Button 1 to Button 6:

“Soft Button” positions to be assigned **specific functions**.

13.2 CUSTOM (1 – 4) MENU CONFIGURATION

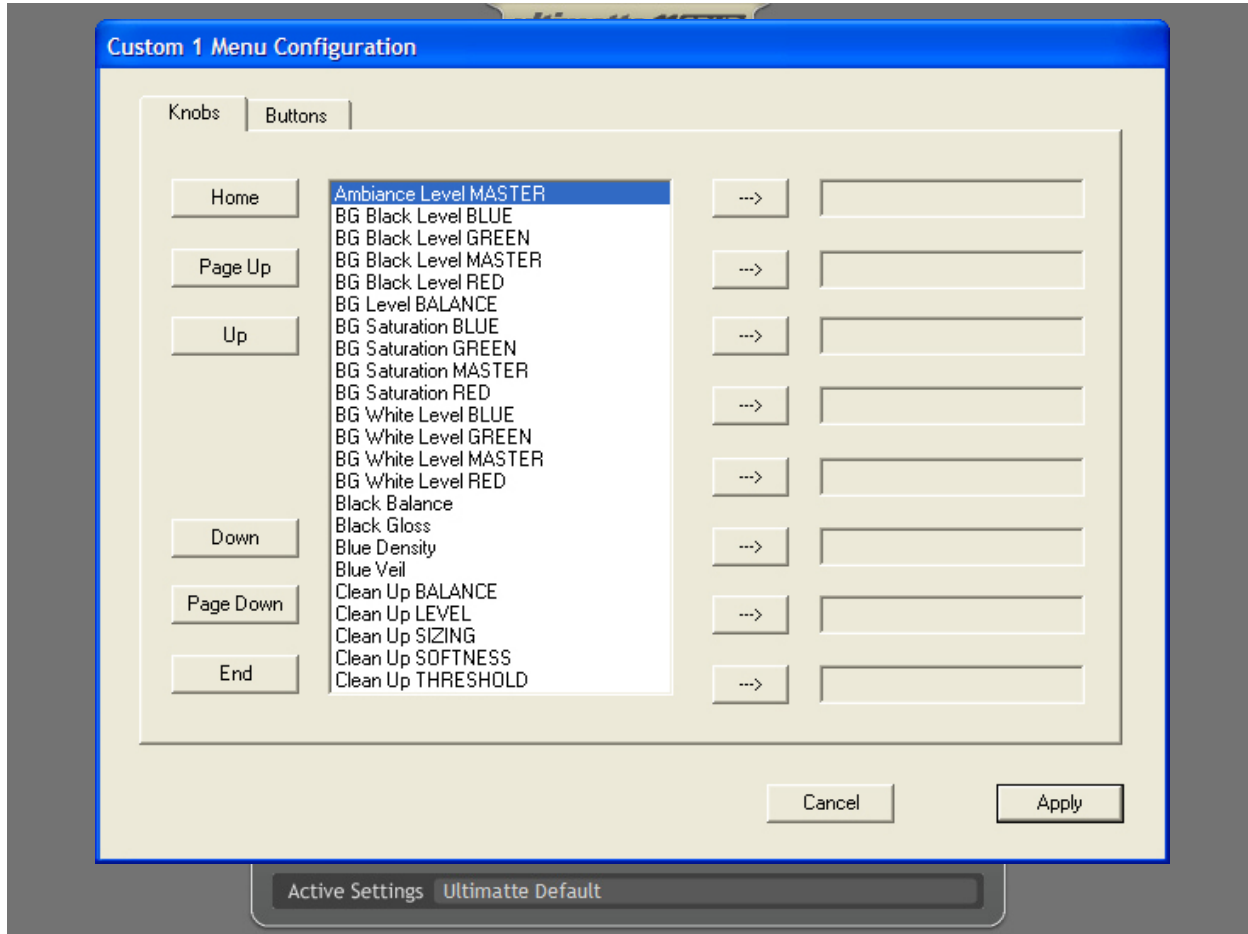


Figure 13.2-1. Custom (1-4) Menu Configuration

The assignment of the Control Knobs and Buttons in the custom menu is done through the Custom Menu Configuration window. In the Control Groups section, press the desired Custom button (1-4) to be modified. Next, press the Configure button and the Custom Menu Configuration dialog box will appear (see Figure 13.2-1).

13.2.1 Knobs (Tab)

Displays the Control Knobs list from which up to eight (8) buttons can be assigned.

13.2.2 Buttons (Tab)

Displays the Buttons list from which up to six (6) buttons can be assigned.

13.2.3 Home

Pressing this button will move the highlighted pointer to the first Control or Button name on the selection list.

13.2.4 Page Up

With each pressing, this will move the displayed list UP by one "Page".

13.2.5 Up

With each pressing, this will move UP the highlighted name on the list by ONE.

13.2.6 Down

With each pressing, this will move DOWN the highlighted name on the list by ONE.

13.2.7 Page Down

With each pressing, this will move the displayed list DOWN by one "Page".

13.2.8 End

Pressing this button will move the highlighted pointer to the last Control or Button name on the selected list.

13.2.9 →

Pressing this arrow will assign the selected (highlighted) Control Knob or Button to the designated location. The direction of the arrow will reverse when the location has been assigned.

13.2.10 ←

Pressing this arrow will remove the Control Knob or Button from the designated location. The direction of the arrow will reverse when the location has been cleared.

13.2.11 Cancel

When selected, the Custom Menu Configuration window will be closed, and the assigned custom Control Knob and Button locations will NOT be applied to the designated Custom Menu (1 – 4).

13.2.12 Apply

When selected, the Custom Menu Configuration window will be closed, and the assigned custom Control Knob and Button locations will be applied to the designated Custom Menu (1 – 4).

The following is an example to assign three (3) Control Knobs and one (1) Button in the Custom 1 Menu.

1. From Custom Menu, select Custom 1 Menu in the Control Groups section.
2. Select Configure button in the Control Groups section. The Custom Menu Configuration window will be displayed.
3. Select the Knobs tab to assign custom Control Knobs.

4. From the Knobs list, use the Page Up, Up, Down, or Page Down buttons and select (highlight) the Matte Density function to be assigned to Control Knob 1. Press → to assign the selected function to that location.
5. Repeat step 4 to assign the Black Gloss function to Control Knob 2 and assign the Green Density function to Control Knob 3.
6. Select the Buttons tab and use the Page Up, Up, Down, or Page Down buttons to select (highlight) the Matte On function to be assigned to Button 1. Press → to assign the selected function to that location.
7. Select Apply to accept the assignments and exit the Custom Menu Configuration window, or select Cancel to exit the Custom Menu Configuration window without accepting the assignments.
8. Follow the same process to assign Control Knob and Button functions for Custom Menus 2, 3, and 4 if desired.

If the following above steps were followed properly, the Custom Menu 1 on the SR-4 should be similar to Figure 13.2-2.

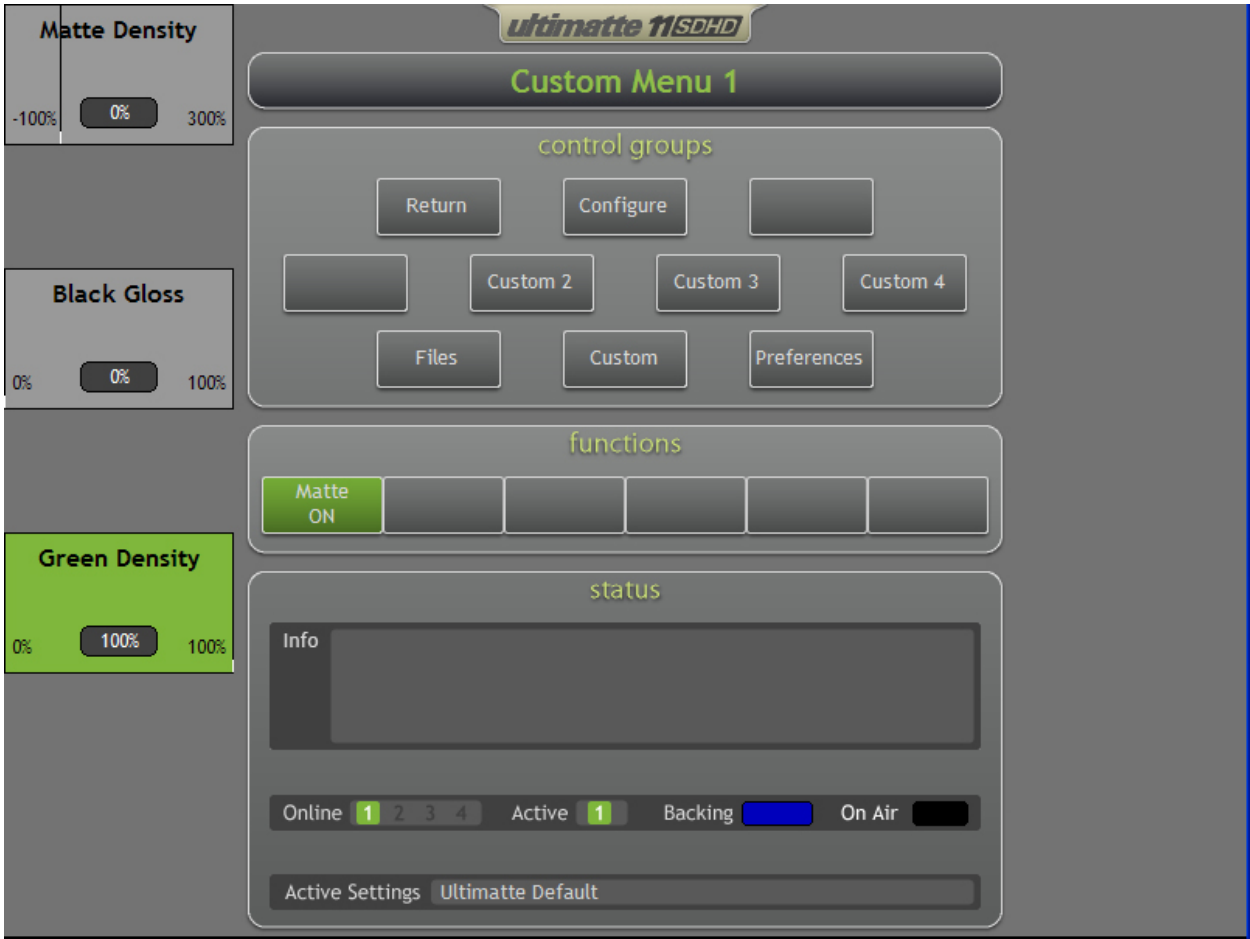


Figure 13.2-2. Custom Menu 1 Example

14. PREFERENCES

The following controls appear in all menu selections.

14.1 PREFERENCES MENU

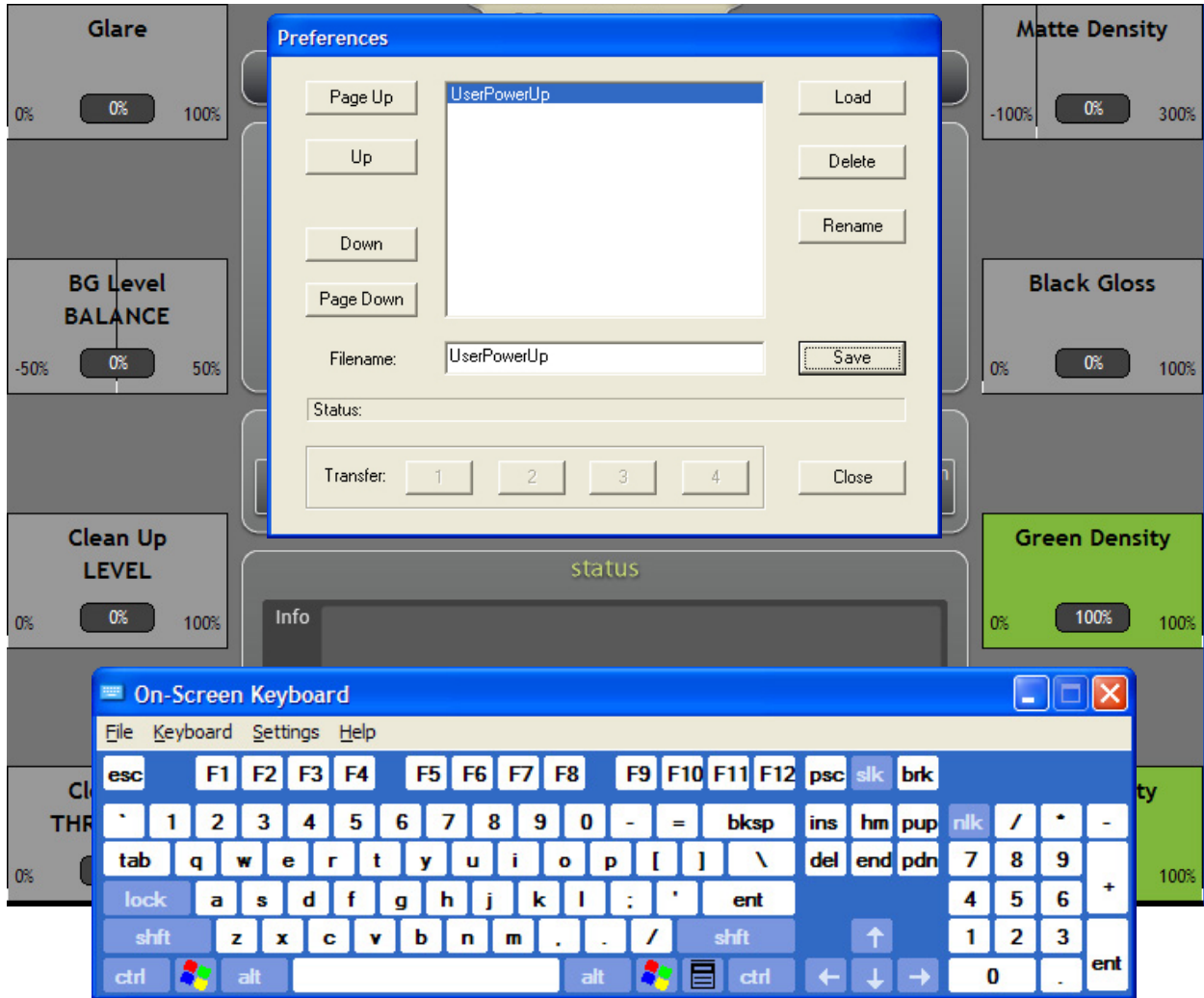


Figure 14.1-1. Preferences Menu

Selecting PREFERENCES from the Controls Group section will display the Preference files window and an On Screen Keyboard. An external keyboard (connected to one of the USB ports) can also be used. The user can save up to 20 Preference files in the main unit. **It can take up to 5 seconds to save or delete a Preference file, as these files are stored in flash memory.** Loading a Preference file has a fixed delay of ONE FRAME, after the load instruction is detected.

Pressing the ALT function (LED ON) **then** pressing the FILE CLEAR button will perform a **“Custom File Clear”** function. This is similar to the FILE CLEAR function **except** that

ALT FILE CLEAR will restore the selected **Preference** file as the default settings (rather than factory defaults as is the case with FILE CLEAR).

When the Preference files window is displayed, the Filename box will always show the name of the first file on the Preference files list. This is the UserPowerUp file.

In its standard operating mode, the main unit will always power up with **factory default** settings. Subsequently, the user can load a setup File or a Preference file from previously saved files. However, there are situations where different power up default settings would be more suitable. The user can make changes to the settings that are needed for “custom” power up defaults, and save these settings as the UserPowerUp file. When **DIP Switch # 5**, inside the front cover of the main unit, is moved from the DOWN (OFF) position to the UP (ON) position, the unit will use the UserPowerUp file as the default settings every time it is powered up (see section 2.10 for setting DIP Switches).

The UserPowerUp file can not be deleted or renamed. When no file is saved as UserPowerUp file, its settings are the same as factory default settings.

14.1.1 To Save a File

1. If the new file name is a modification of an existing one, select that file name from the list by highlighting it.
2. Touch the display in the Filename box inside the Preference files window. The prompter will appear.
3. Using the On Screen Keyboard (or an external keyboard), make the desired file name changes.
4. If a completely new name will be added, use the Backspace key on the keyboard to erase the existing file name. Alternately, touching and moving a finger or a stylus across the file name will highlight the name so that it can be over-written.
5. Using the On Screen Keyboard (or an external keyboard), type the desired file name.
6. Press the **Save** button inside the Files window. The button will display “**Saving**”, until the process is completed. The new name will appear in the saved Preference files list.
7. Press the **Close** button to exit the Preferences window.

14.1.2 To Load a File

1. From the saved Preference files list, select (by touching) the file name to be

loaded. The name will be highlighted. Alternately, use the Page Up, Up, Down, or Page Down buttons to select (highlight) the file name to be loaded.

2. Press the **Load** button to load the selected Preference file into the current settings and exit the Preferences window.
3. The selected file name will appear in the Active Settings box of the Status section of the display.

14.1.3 To Delete a File

1. From the saved Preferences list, select (by touching) the file name to be deleted. The name will be highlighted. Alternately, use the Page Up, Up, Down, or Page Down buttons to select (highlight) the file name to be deleted.
2. Press the **Delete** button to remove the selected file from the Preferences list.
3. Repeat the process to delete other files.

Note: The UserPowerUp file can not be deleted.

14.1.4 To Rename a File

1. If the new file name is a modification of an existing one, select that file name from the list by highlighting it.
2. Touch the display in the Filename box inside the Preferences window. The prompter will appear.
3. Using the On Screen Keyboard (or an external keyboard), make the desired file name changes.
4. If a completely new name will be added, use the Backspace key on the keyboard to erase the existing file name. Alternately, touching and moving a finger or a stylus across the file name will highlight the name, so that it can be over-written.
5. Using the On Screen Keyboard (or an external keyboard), type the desired file name.
6. Press the **Rename** button inside the Preferences window. The button will display **“Renaming”**, until the process is completed. The new name will replace the old one in the saved Preferences list.
7. Press the **Close** button to exit the Preferences window.

Note: The UserPowerUp file can not be renamed.

14.1.5 To Transfer a File

It is possible to transfer files from one main unit to another. More than one main unit must be connected to use this feature. Files saved in a main unit can **ONLY** be transferred to other main units **OF THE SAME MODEL**.

1. From the saved Preferences list, select (by touching) the file name to be transferred. The name will be highlighted. Alternately, use the Page Up, Up, Down, or Page Down buttons to select (highlight) the file name to be transferred.
2. From the **Transfer** section select the main unit number to which the file is to be transferred.
3. Repeat the process to transfer more files to other main units, or select **Close** to exit the Preferences window.

Note: In the main unit to which the file was transferred, the Preference file name will appear in the saved Preference files list with the "TR" (addition at the end of the name).

15. Appendix

15.1 Software Communications Protocol

The Ultimatte-11 functions as a slave to the SR-4. Up to four (4) Ultimatte-11 units can communicate with the SR-4 with each having a unique address. The Ultimatte 9 Main Unit will immediately respond to commands from the host.

SR-4 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 SR-4 will communicate with the Ultimatte-11 via a modified Ultimate protocol. Control signals are initiated by the SR-4, 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-11 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
// Control.h
// Button.h
```

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 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:

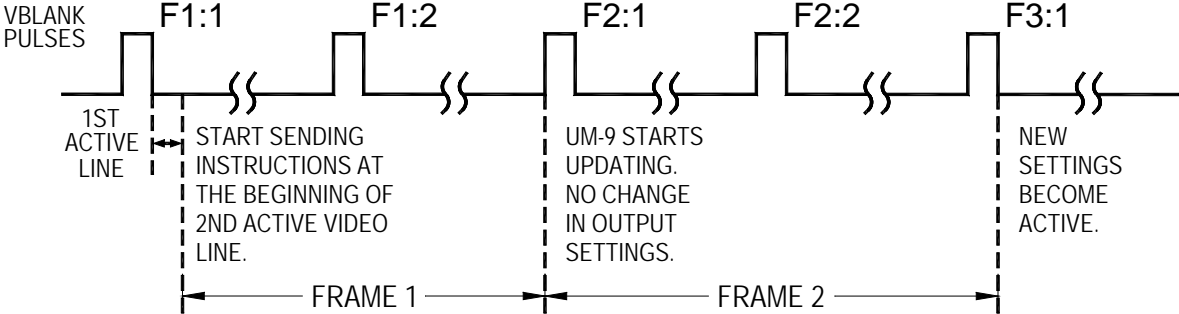
02 03 A8 8F 01 FF

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

15.1.1 Software Protocol Timing Diagram



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

Ultimatte-11 takes two frames to respond to received instructions.

Figure 15.1-1. Software Protocol Timing Diagram

15.2 Ultimatte-11 Main Unit Firmware Programming

1. Remove the front cover from the Main Unit. Move dipswitch #4 to the ON position (Boot Mode).

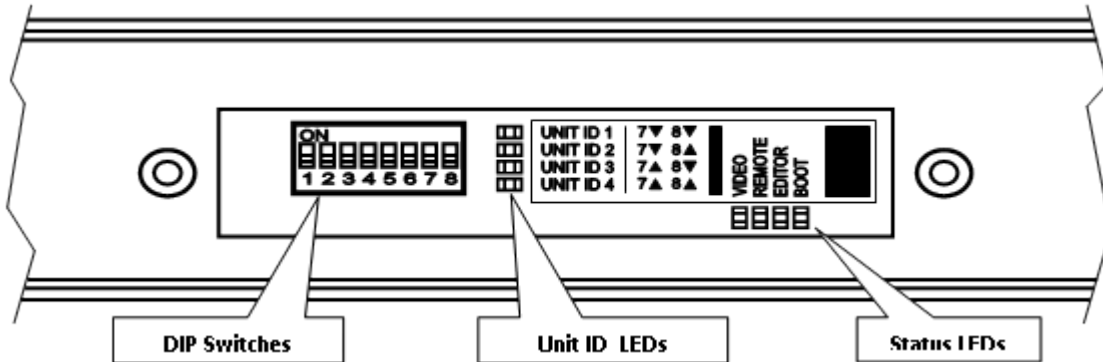


Figure 15.2-1. Main Unit Front View (Front Cover Removed)

2. Disconnect the RS-485 cable between the Main Unit and Smart Remote.
3. Connect the PC serial port (RS-232) to the Main Unit RS-232 port located on the back of the chassis.
4. Cycle the power of the Main Unit.
5. With front cover still removed, view the **Boot** Status LED and wait until it blinks rapidly.
6. From the PC, Open the program "Ultimatte_11_Updater_XXX.exe".

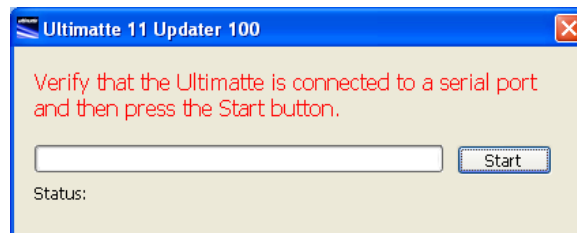


Figure 15.2-2. Ultimatte 11 Firmware Updater

7. Click on the "Start" button.
8. The window will display "Erasing Software Flash Memory!" then "Downloading Software to Flash Memory!" and a progress bar will update the programming process.
9. After a short pause, "Erasing Firmware Flash Memory!" and "Downloading Firmware to Flash Memory!" will be displayed. The firmware is now being programmed. This phase will take approximately 15 minutes.
10. If any time-outs or errors occur during programming, check cable connections

and repeat programming. There is no need to cycle power before reprogramming.

11. When programming is complete, return dipswitch #4 to the OFF position.
12. Cycle power to the main unit.
13. Reconnect the RS-485 cable between the Main Unit and the Smart Remote. Log on to the Main Unit from the "SR-4" and tap on the ULTIMATTE-11 logo to verify the new software version.

Note: For additional information, refer to Readme File contained in the Firmware Updater package.

15.3 SR-4 Software Update

IMPORTANT: This process will update the SR-4 software only.

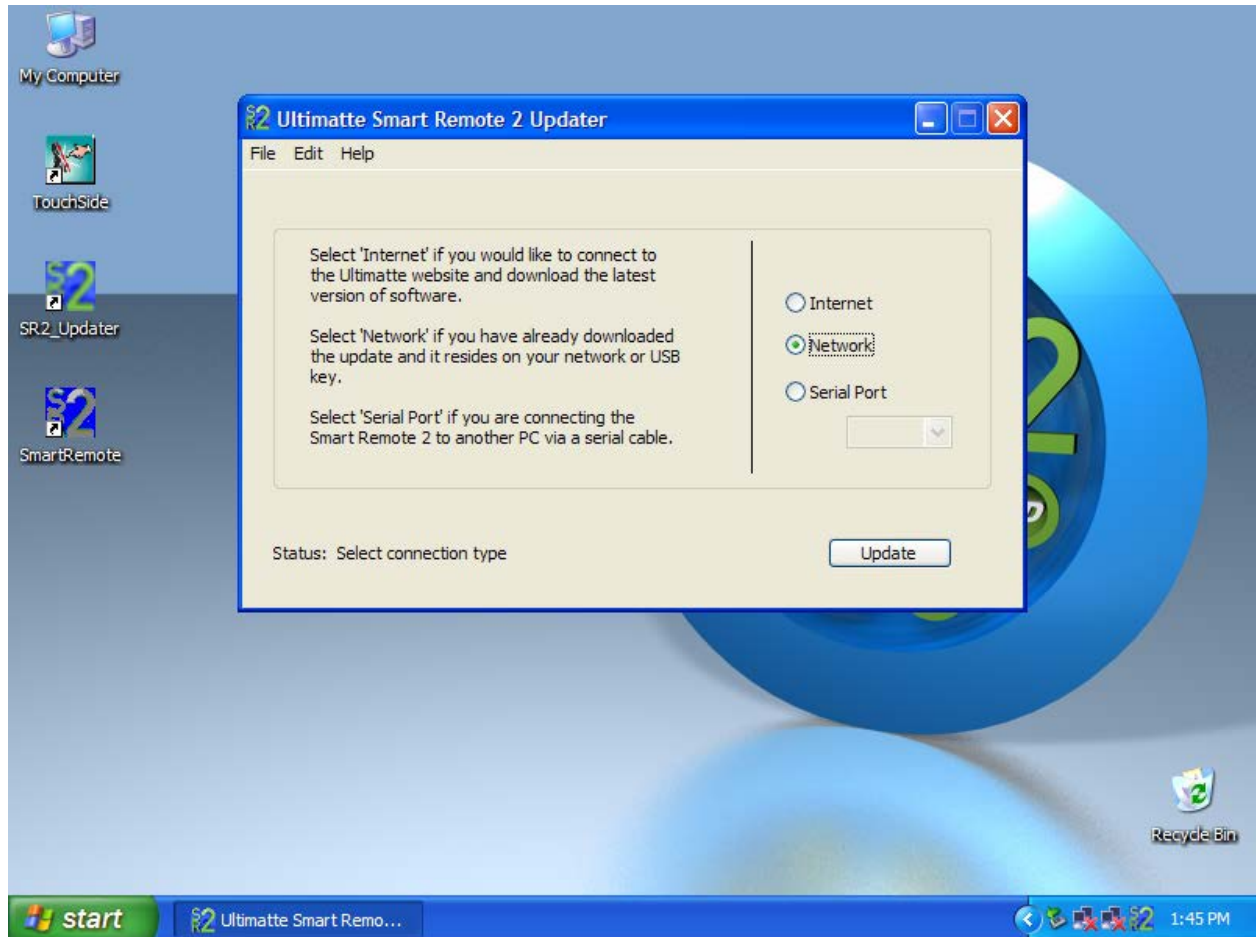


Figure 15.3-1. SR-4 Updater Window.

From the SR-4 desktop select **SR2_Updater**. The SR-4 Updater dialog box offers the user three different methods of updating the SR-4 software (only): Internet, Network and Serial Port.

For the Internet and Network options, the SR-4's Ethernet interface must be connected to the facility's Local Area Network (LAN). Contact your System Administrator for help.

Internet: If the Ethernet port on the back of the SR-4 is connected and there is access to the internet, selecting "Internet" will automatically download and install the latest version of the software from the Ultimatte website. *(For this option to operate, the Updater software must be version 1.0.2 or newer.)*

Network: If the Ethernet port on the back of the SR-4 is connected to the local network

and the latest version of the software has been downloaded and resides on the network, selecting “**Network**” will allow the user to access the software and update the system.

This option is also used if the downloaded update is saved on a USB key and connected to the USB port on the back of the SR-4. The downloaded update is in compressed (Zip) format and must be unzipped prior installation.

Serial Port: If the serial port (RS-232) is connected to another computer which has the downloaded update, selecting “**Serial Port**” will allow the user to access the computer and update the system. The downloaded update is in compressed (Zip) format and must be unzipped prior installation.

Note: Connecting the SR-4 RS-232 port to another computer requires a null modem cable.

After selecting the updating method, touch Update to start the process of installing the new software.

To return to normal SR-4 operations, double click the Smart Remote icon on the desktop.

15.4 SR-4 Initialization (.ini) File

The **SR2.ini** file is located in the *C:\ultimatte\SR2* directory of the SR-4. The SR2.ini file contains the configuration settings of the SR-4. Use a text editor to change the settings of the SR2.ini file. A description of valid configuration settings is indicated below:

C:\ultimatte\SR2\SR2.ini

This is a text file used to set up initial conditions related to the SR-4.

[DISPLAY]

STATUS=ON (OFF)

ON = Information will be shown in the Status section of the SR-2 display (default).

OFF = Information will not be shown in the Status section of the SR-2 display.

[MOUSE]

VISIBLE=FALSE (TRUE)

FALSE = The mouse cursor will not be visible in the display area of the SR-2 (Default)

TRUE = The mouse cursor will be visible in the display area of the SR-2.

[ROUTER]

ENABLED=FALSE (TRUE)

FALSE = GP output will not be controlled by the Unit Select Buttons (Default).

TRUE = GP output will be controlled by the Unit Select Buttons.

[ROUTER]

POLARITY=LOW (HIGH)

LOW = The GP output will close for the duration specified by Dwell setting (Normally Open – Default).

HIGH = The GP output will open for the duration specified by Dwell setting (Normally Closed).

[ROUTER]

DWELL_FRAMES=30

Adjusts the GP output pulse width in increments of 1 Frame.

15.5 Routing Switcher Control with GPI

As video standards and formats changed from Analog to Digital to Digital HD, so did the viewing monitors. In a system where multiple Ultimatte units were used with Standard Definition Video (SD), it was common practice to have one middle sized CRT monitor per Ultimatte unit. The analog nature of the CRT monitor displayed the image in full resolution, regardless whether the incoming signal was analog or digital. This setup allowed the Ultimatte operator to view the images clearly and make all necessary adjustments to the Ultimatte units from the control panel. As CRT monitors were gradually replaced by LCD monitors, “native resolution” became a very important factor in viewing and judging the quality of the displayed image. Since most LCD monitors had much higher native pixel resolution than the SD video standards, it was possible to replace the four CRT monitors with one large LCD. With digitally tiling up to four images into a single high resolution image, it was possible to view each SD video image at its native resolution. Also, a large LCD monitor occupied approximately the same space on a control desk as did four middle CRT monitors.

With the industry moving from SD video to HD video formats, monitoring the high resolution images accurately became a new challenge. Not all LCD monitors have high enough resolution to display all HD format images in their native resolution. Usually, larger LCD monitors have the native resolution to display all HD formats accurately. Unfortunately, these larger monitors need significantly more space on the control desk. The solution to this dilemma was to use multiple smaller size LCD monitors, each connected to the output of one Ultimatte unit. The same outputs were also connected to a routing switcher, and its output was connected to a large LCD monitor. This configuration allowed the Ultimatte operator to “monitor” all the outputs from the Ultimatte units simultaneously on the smaller monitors, while making all critical adjustments by selecting and viewing the corresponding output on the large monitor. There was one drawback for this setup. The operator selected the Ultimatte unit that needed adjustments from the Ultimatte control panel, then selected the corresponding output on the routing switcher in order to display the image in native resolution on the large monitor. A mismatch between the two selections can lead to making wrong or excessive adjustments to the Ultimatte settings.

To overcome this drawback, the Ultimatte system can be set up so that the control panel will control the routing switcher if it has a GPI port. The Ultimatte units have a GPIO port, with three inputs and one output (see Figure 2.13-2 for pin assignments). The Ultimatte control panel can be set to a mode where the Unit Select buttons will be used to trigger the GP Out relay in the unit selected. This feature is enabled by editing the SR2.ini file on the SR-4 hard drive (**see Section 15.4 SR-4 Initialization (.ini) File**). For example, the GP output of Ultimatte unit 1 can be connected to Router GP input 1, the GP output of Ultimatte unit 2 to Router GP input 2, and so on (see Figure 15.5-1 for connecting the Ultimatte units' GP output to the Router GP inputs). When the operator selects from the control panel an Ultimatte unit to make adjustments to its settings, the selected Ultimatte unit will activate its GP output for the routing switcher. The routing switcher will then route the selected Ultimatte unit's video output for display on the large

monitor. Thus, the large monitor will always display the output image of the selected Ultimatte unit.

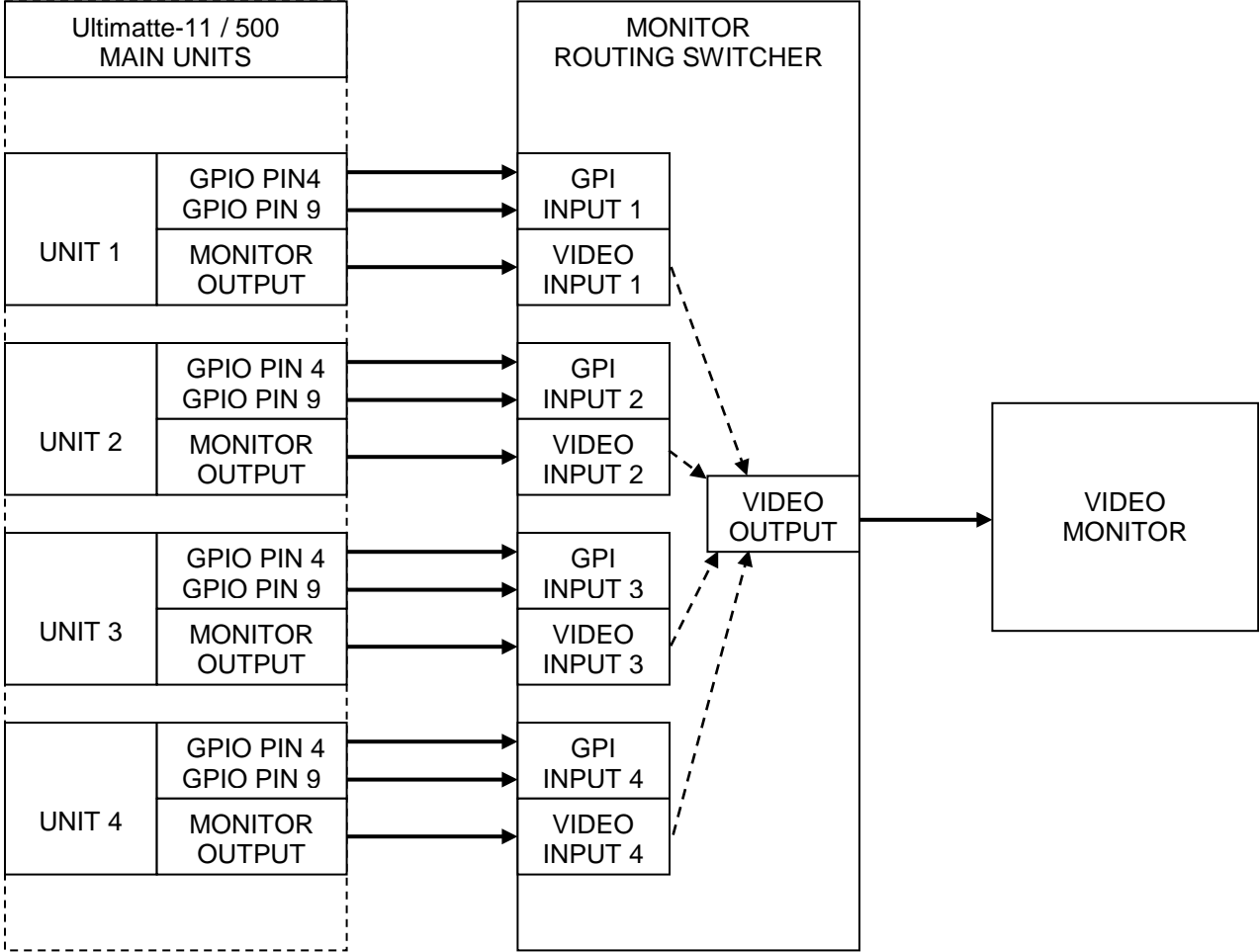


Figure 15.5-1. Main Unit GP Output Connection with Routing Switcher

15.6 One Matte Is Not Enough

In “Virtual Studio” applications, the background scenes are rendered in real time in a background processing system (usually a computer). Based on information received from tracking systems, background scenes are processed to match their movements and perspectives match those of the foreground cameras. These rendered background scenes and their corresponding foreground images are used in Ultimatte systems to produce very realistic composites.

Traditionally, these background rendering systems provide a second output in addition to the main background output. This second output is the matte (or the key or the alpha) output. The matte signal from this output is used to perform several functions inside the Ultimatte unit.

15.6.1 Screen Matte

The blue or green screen used behind the subjects in front of the camera creates an internal or **Screen Matte**.

15.6.2 Garbage Matte:-

If the foreground (FG) scene includes areas that are not covered by the screen (backing), it is necessary to artificially extend the screen in order to cover the entire frame. With the proper tracking of the edges of the screen, the matte signal provided by the background (BG) rendering system can be used to force the BG scene ON (and FG scene OFF) in the areas of the frame not covered by the screen. In this case, the external matte from the BG rendering system is used as a **Garbage Matte**.

15.6.3 Layer Matte

If the BG scene includes objects that need to appear in front of the FG subject in the final composited image, it is necessary to turn OFF the FG subject in these areas and turn ON the BG scene instead. With the proper tracking of the selected BG object, the matte signal provided by the BG rendering system can be used to force this selected BG to appear in front of the FG subject. In this case, the external matte from the BG rendering system is used as a **Layer Matte**.

15.6.4 Holdout Matte

If the BG scene needs to be added in specific portions of the FG scene (preventing compositing inside a REAL monitor in front of a backing or inserting a logo in a grass field behind an athlete), it is necessary to turn OFF the compositing process in all parts of the FG scene except in those specific areas. With the proper tracking of the FG scene, the matte signal provided by the BG rendering system can be used to force the

BG scene to be composited in a specified portion of the FG scene. In this case, the external matte from the BG rendering system is used as a **Holdout Matte**.

Depending on the specified mode of operation inside the Ultimatte, the matte signal provided by the BG rendering system will perform its function properly.

15.6.5 Dual Mattes

What if there is the need for the matte from the BG rendering system to perform TWO functions AT THE SAME TIME on different portions of a scene (to be used as a Garbage Matte AND a Holdout Matte). With a single matte signal, there is no simple method of defining separate zones that specify different modes of operation, without sacrificing the dynamic range of this matte signal (e.g. level slicing).

It is ironic, that as technology is changing and more data is transferred at higher rates, as in HD video, the matte signal waists half its data rate by sending useless "0"s (4:0:0). Since the matte is a gray-scale signal (luma or Y) with no color information (chroma) associated with it, the locations reserved for the color information (U and V or C_b and C_r respectively) are set to 0. What useful data could be sent in the unused portion of the matte signal?

As shown in the simple example above, there are many situations where having a second matte becomes a necessity. What if the unused portion of the matte signal is used to send a second matte channel.

In a serial video data stream, the Luma (Y) information at full bandwidth is multiplexed with half bandwidth chroma (C_b , C_r) information to become the commonly known format 4:2:2. With a matte signal, the Chroma portion is multiplexed with "0"s to become 4:0:0. Instead of "0"s, a second full bandwidth (4) matte can be multiplexed with the first matte to form a dual matte signal (4:4). The first matte could be the Garbage Matte, and the second matte could be the Holdout Matte.

Rather than multiplexing half bandwidth U (C_b) and V (C_r) with the full bandwidth Luma (Y) in the form of:

U0, Y0, V0, Y1, U2, Y2, V2, Y3, ...

The Dual matte can be multiplexed as:

Y₂₀, Y₁₀, Y₂₁, Y₁₁, Y₂₂, Y₁₂, Y₂₃, Y₁₃, ...

The latest Ultimatte products, the Ultimatte-11 HD/SD and the Ultimatte-500 DLX are designed to accept dual matte signals. The two matte signals can be connected by **two separate SDI cables** from the BG rendering system, if a second matte (Alpha) output is available. In this case, each cable is carrying a single matte signal (4:0:0). Within the

Ultimatte unit, each of these two matte signals can be routed as a:

- Garbage Matte
- Layer Matte
- Holdout Matte

These same Ultimatte products can also accept two matte signals from a **single SDI cable**, if the BG rendering system is equipped to output such a signal (4:4). Within the Ultimatte unit, each of these two matte signals can be routed as a:

- Garbage Matte
- Layer Matte
- Holdout Matte

With multiple matte signals, there are more elegant solutions for creating very realistic looking composites.

Using two matte signals provides for creator creativity in the design and use of virtual sets.

The Ultimatte-11 and the Ultimatte-500 DLX also provide a novel method of using a Garbage Matte to improve the realistic look of the composited image.

15.6.6 Garbage Matte Clean Up

As part of producing a realistic composite, the background scene is added using a matte that is an exact representation of the backing or the screen, including the shadows cast by the foreground subject, this is the Screen Matte. This means that the background scene is added based on the lighting variations of the screen. In many situations, the blue or the green screen does not extend to all the edges of the virtual set. Since the background scene will only be added in the areas where the screen color is visible, Garbage Mattes have been used to extend the background scene to those areas of the virtual set where the screen is not present. Since it is often impractical to try to obtain an absolutely even lighting over the complete screen, there will always be some visible difference in the level of the background scene inside and outside the Garbage Matte areas due to the shadows reproduced by the Screen Matte.

To minimize this visible background level difference, soft-edge Garbage Mattes have been used to smooth out the transition between the Garbage Matte and Screen Matte. The wider this soft transition area is, the less visible the background level differences between the screen matte and the garbage matte will be. Traditionally, the width of this soft transition area of the garbage matte has been limited to maximize the screen area where the foreground subjects can use, as they will gradually become semi-transparent as they enter the transition areas of the Garbage Matte. To compensate for this limited transition width, some amount of Clean Up is also used, which reduces or eliminates shadows cast by the foreground subjects, in addition to the loss of fine foreground subject detail.

The **Garbage Matte Clean Up** feature limits the Clean Up function to be active only in the soft transition region of the Garbage Matte, without causing the foreground subjects

entering this region to become semi-transparent. Thus, Garbage Mattes with very wide transition regions can be used without restricting the usable screen area, while maintaining all the shadows cast by the foreground subjects in the areas outside the Garbage Matte.

16. Ultimatte-11 DLX

16.1 Ultimatte-11 DLX Features

There are three features that separate the new UM-11 DLX from the regular UM-11. These features are:

- 1- Bandwidth limitation artifacts correction for 4:2:2 (Y,Cb,Cr) signals
- 2- Noise reduction for the Blue and/or Red channels of images
- 3- Dual Link 4:4:4:4 GBRA input and/or output (FG In, BG In and FG+BG Out) for best quality compositing

16.1.1 4:2:2 Correction:

In a Y,Cb,Cr (4:2:2) video image, objects with high contrast and sharp transitions exhibit a “ringing” artifact, even with the camera’s detail (contour) generating function turned off. This is due to the reduced bandwidth of the Cb and Cr channels. While this phenomenon may not be objectionable in general, it can cause unwanted artifacts in Blue/Green screen compositing. For example, a dark colored FG object with sharp transitions shot against a bright green screen will show an overshoot and an undershoot (ringing) at the transitions. These ringing artifacts are black and white (gray levels) in nature, and will be treated as FG objects when processed through an Ultimatte, similar to gray strands of hair. When the green screen color is removed and is replaced by a dark BG scene, the dark FG object will show bright gray lines at the transitions. Attempting to solve this problem by using Matte sizing and Clean Up functions in the Ultimatte will result in the loss of fine FG objects, like hair, and other semitransparent objects in the final composite image.

The 4:2:2 Correction feature will eliminate or reduce the ringing artifacts in the transition region of FG objects to the backing (the screen), while maintaining the original image within the opaque FG object. No FG object detail is lost in this process. Only the ringing element is removed from the transition regions while maintaining every strand of hair or semitransparent object.

16.1.2 Noise Reduction:

Imagers (CCD or CMOS) are inherently noisy and don’t exhibit uniform sensitivity to all wavelengths of the visible spectrum. This results in higher noise levels in the Red and the Blue channels of an RGB image, compared to the Green channel. In Blue or Green screen image compositing, all three channels of the FG contribute equally to the processing of the original image. Therefore, the most noisy channel (B) will have an impact on the least noisy channel (G).

The Noise Reduction feature can significantly reduce the noise levels in the FG Red and Blue channels, with no visible reduction in the fine detail information of the image (all controls at default settings). The Green channel will retain its inherent noise level (e.g.:

based on camera gain settings), as no noise reduction is applied to this channel. The Noise Reduction feature is applicable in 4:2:2 mode of operation only.

16.1.3 Dual Link 4:4:4:4 Input / Output:

Almost all professional cameras internally generate images in full bandwidth (4:4:4) RGB color space. In a similar manner, video monitors display images in RGB color space. The 4:2:2 Y, Cb, Cr format was developed and adopted mainly because of its reduced bandwidth requirements and simplicity of connectivity. Unfortunately, this reduced bandwidth (and dynamic range) caused some compromises in Blue or Green image compositing (see 4:2:2 Correction for details). For best compositing results, there is no alternative to full bandwidth and dynamic range RGB image.

The 4:4:4:4 GBRA Input option bypasses several pre-processing stages and delivers the unaltered image to the main processing stages. The full bandwidth processing can apply equally to the FG and the BG channels. To maintain the optimum results, the output can be set to 4:4:4:4 GBRA mode. To maintain maximum flexibility, it is possible to individually select the FG Input, the BG Input or the FG+BG Output to be 4:4:4:4 or 4:2:2. Depending on the configuration, the Alpha (Matte or Key) Input could be delivered as part of the Dual Link signal, or could be a separate input. Similarly, the Alpha out could be part of the Dual Link signal, or as a separate output.

16.2 Ultimatte-11 DLX Operating Instructions

16.2.1 Noise Reduction (and 4:2:2 Correction):

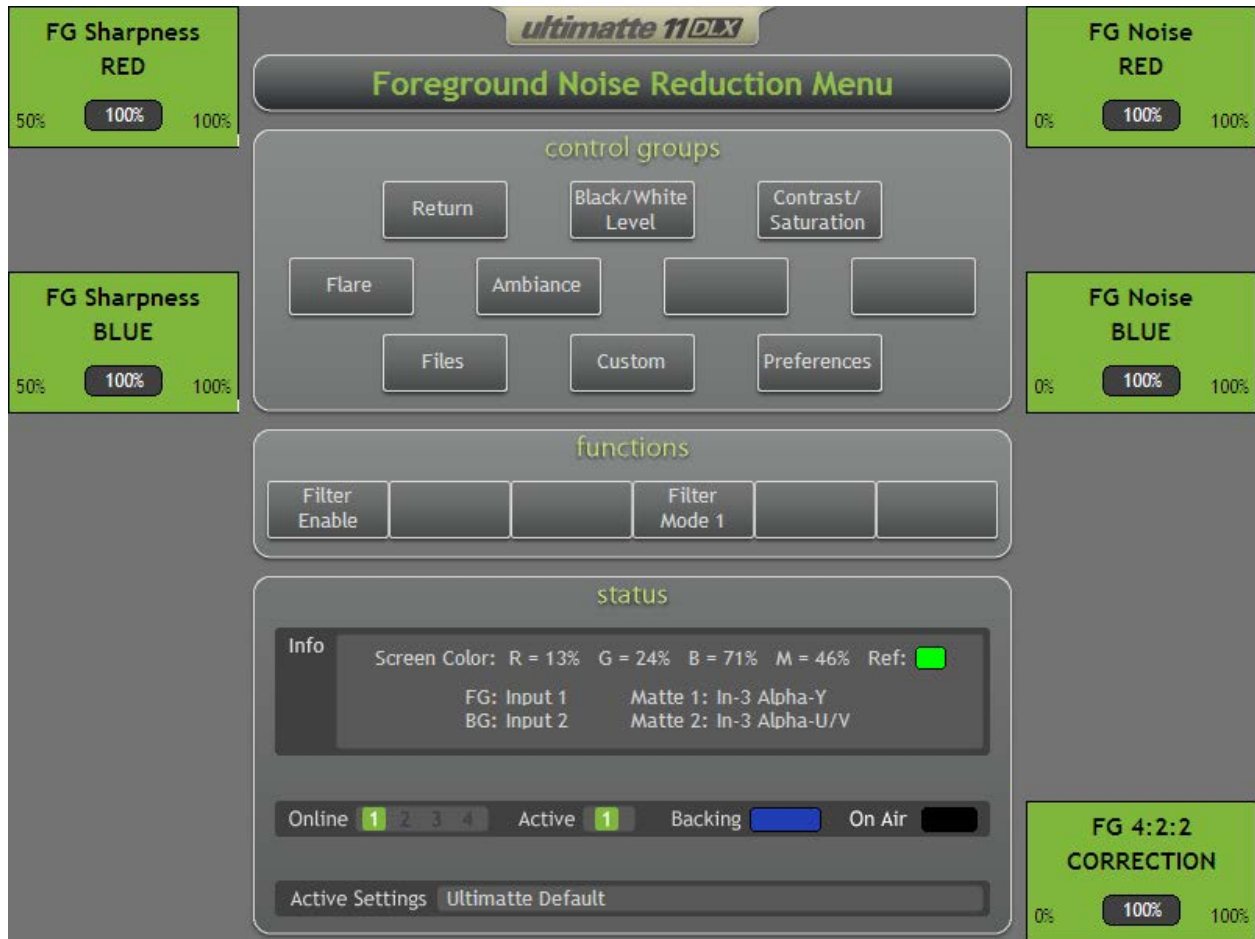


Figure 16.2-1. Foreground Noise Reduction Menu

The **Noise Reduction** sub-menu can be accessed from the **FG** menu.

The **Noise Reduction** feature is defaulted in the **OFF** mode. The impact of this feature is visually more apparent when camera gain settings of 0dB or +3dB are used. In general, using camera gain settings higher than 0dB is not recommended for Blue/Green screen compositing. The 4:2:2 Correction feature is always active.

Knobs:

FG Sharpness RED:

This control adjusts the amount of detail information that is added to the filtered RED channel. The default setting of this control is 100%. This control is active when **Filter Enable** button is ON.

FG Sharpness BLUE:

This control adjusts the amount of detail information that is added to the filtered BLUE channel. The default setting of this control is 100%. This control is active when **Filter Enable** button is ON.

FG Noise RED:

This control adjusts the amount of filtering applied to the RED channel. The default setting of this control is 100%. This control is active when **Filter Enable** button is ON.

FG Noise BLUE:

This control adjusts the amount of filtering applied to the BLUE channel. The default setting of this control is 100%. This control is active when **Filter Enable** button is ON.

FG 4:2:2 Correction:

This control adjusts the amount of correction applied to the FG Subject-to-backing (screen) transition regions. The default setting for this control is 100% (maximum correction).

Buttons:

Filter Enable:

This button enables noise filtering (Mode 1 or Mode 2) to be applied to the RED and BLUE channels. The default state of this button is **OFF**.

Filter Mode 1 / Mode 2:

This button selects between two different types of filter that is applied to the RED and BLUE channels of the FG image when **Filter Enable** button is **ON**.

16.2.2 4:4:4:4 Config.:

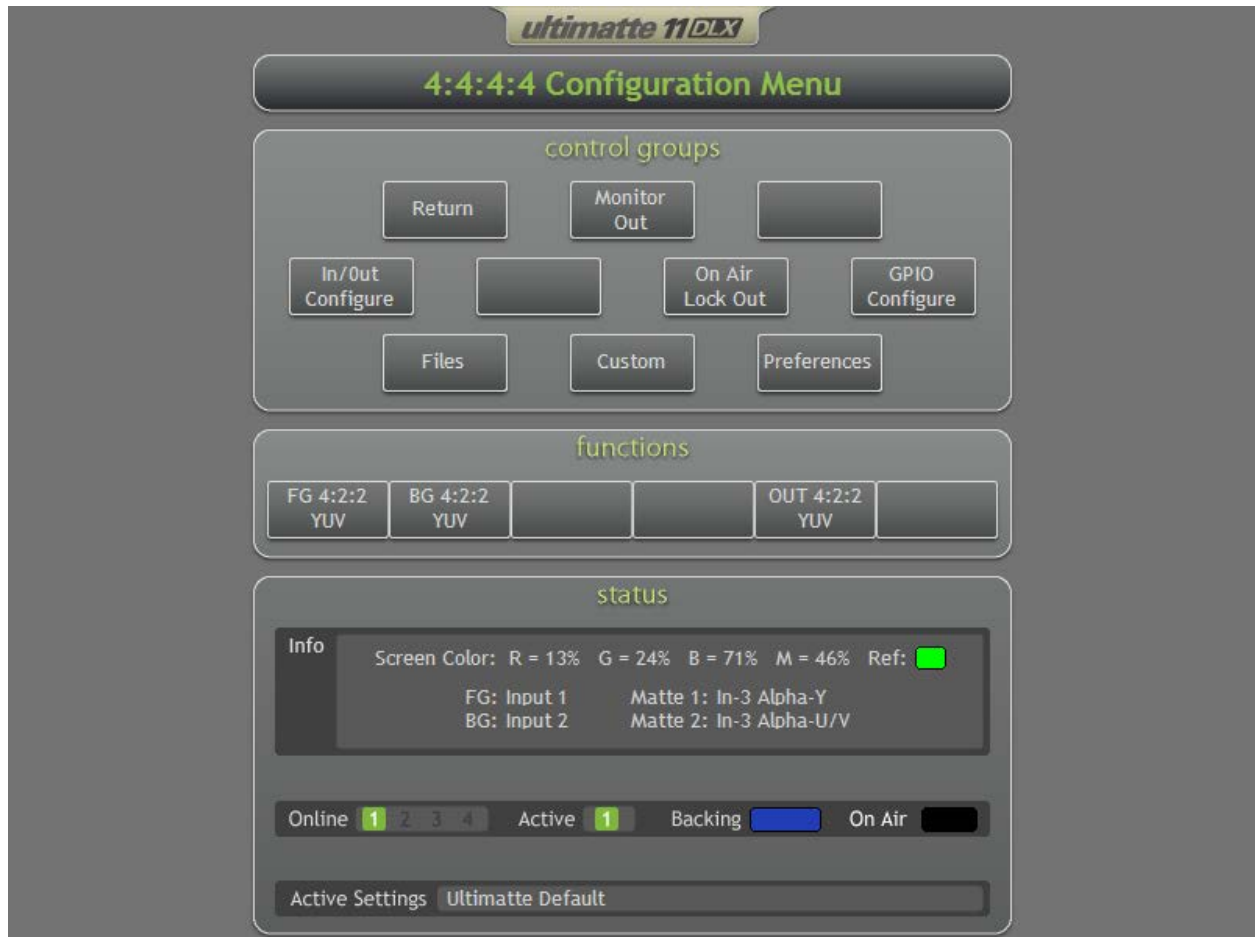


Figure 16.2-2. 4:4:4:4 Configuration Menu

The **4:4:4:4 Configuration**. Sub-menu can be accessed from **Config.** Menu.

Buttons:

FG 4:2:2 YUV / FG 4:4:4:4 RGB:

This button selects the FG Input to be a Single Link 4:2:2 Y Cb (U) Cr (V) or a Dual Link 4:4:4:4 GBRA format. In Single Link 4:2:2 mode, the FG input assignments are accessed from Input Setup menu. In Dual Link 4:4:4:4 mode, the FG inputs are assigned to Input 1 (link A) and Input 2 (Link B). If an Alpha channel is part of the FG input (Link B), Matte In 1 is assigned to this Alpha signal. The selection of FG Input 4:2:2 / 4:4:4:4 is independent from BG and OUTPUT 4:2:2 / 4:4:4:4 settings.

In FG 4:4:4:4 Dual Link mode of operation, if Input Frame Delays need to be used, Delay 1 and Delay 2 must be set to the same value. The timing of Input 1 and Input to

must be set to match the timing of Input 3 or Input 4. These delay settings and timing adjustments can be accessed from Input Setup menu.

BG 4:2:2 YUV / FG 4:4:4:4 RGB:

This button selects the BG Input to be a Single Link 4:2:2 Y Cb (U) Cr (V) or a Dual Link 4:4:4:4 GBRA format. In Single Link 4:2:2 mode, the BG input assignments are accessed from Input Setup menu. In Dual Link 4:4:4:4 mode, the BG inputs are assigned to Input 3 (link A) and Input 4 (Link B). If an Alpha channel is part of the BG input (Link B), Matte In 2 is assigned to this Alpha signal. The selection of BG Input 4:2:2 / 4:4:4:4 is independent from FG and OUTPUT 4:2:2 / 4:4:4:4 settings.

OUT 4:2:2 YUV / FG 4:4:4:4 RGB:

This button selects the FG+BG Output to be a Single Link 4:2:2 Y Cb (U) Cr (V) or a Dual Link 4:4:4:4 GBRA format. In Single Link 4:2:2 mode, the two FG+BG are the same. In Dual Link 4:4:4:4 mode, the two FG+BG outputs are assigned to be link A and the Matte Output is assigned to be Link B (includes the imbedded Matte Out). If there is a need to output a separate Matte channel, the Monitor Output can be used (set to Combined Matte). The Monitor Out is always a Single Link 4:2:2 output.

16.2.3 BACKGROUND CONTROLS (BG FILTER)

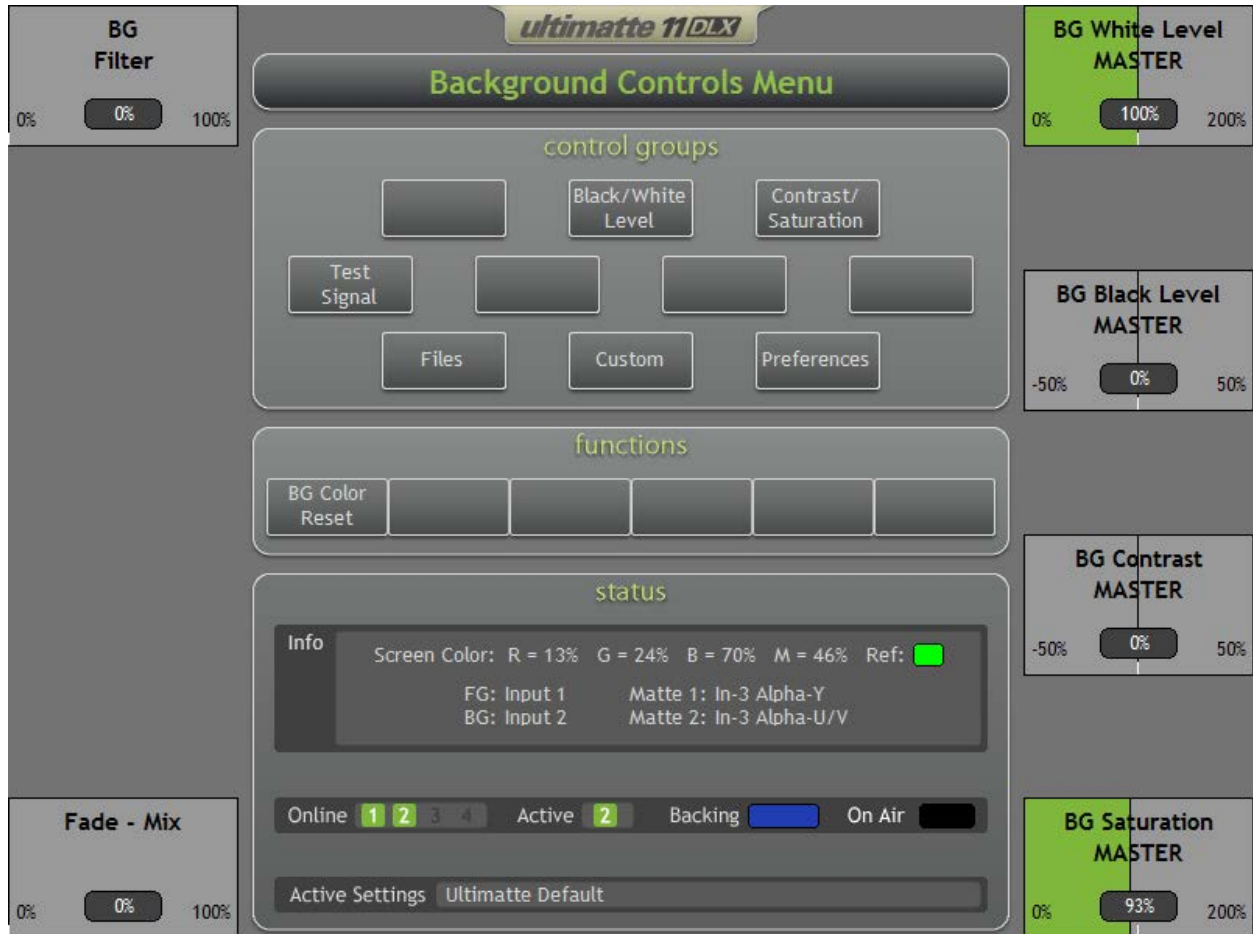


Figure 16.2-3. Background Controls Menu

Knob:

BG Filter

This knob will smooth out small amounts of aliasing on the horizontal plane of the background.

16.2.4 Matte Filter Config Menu.

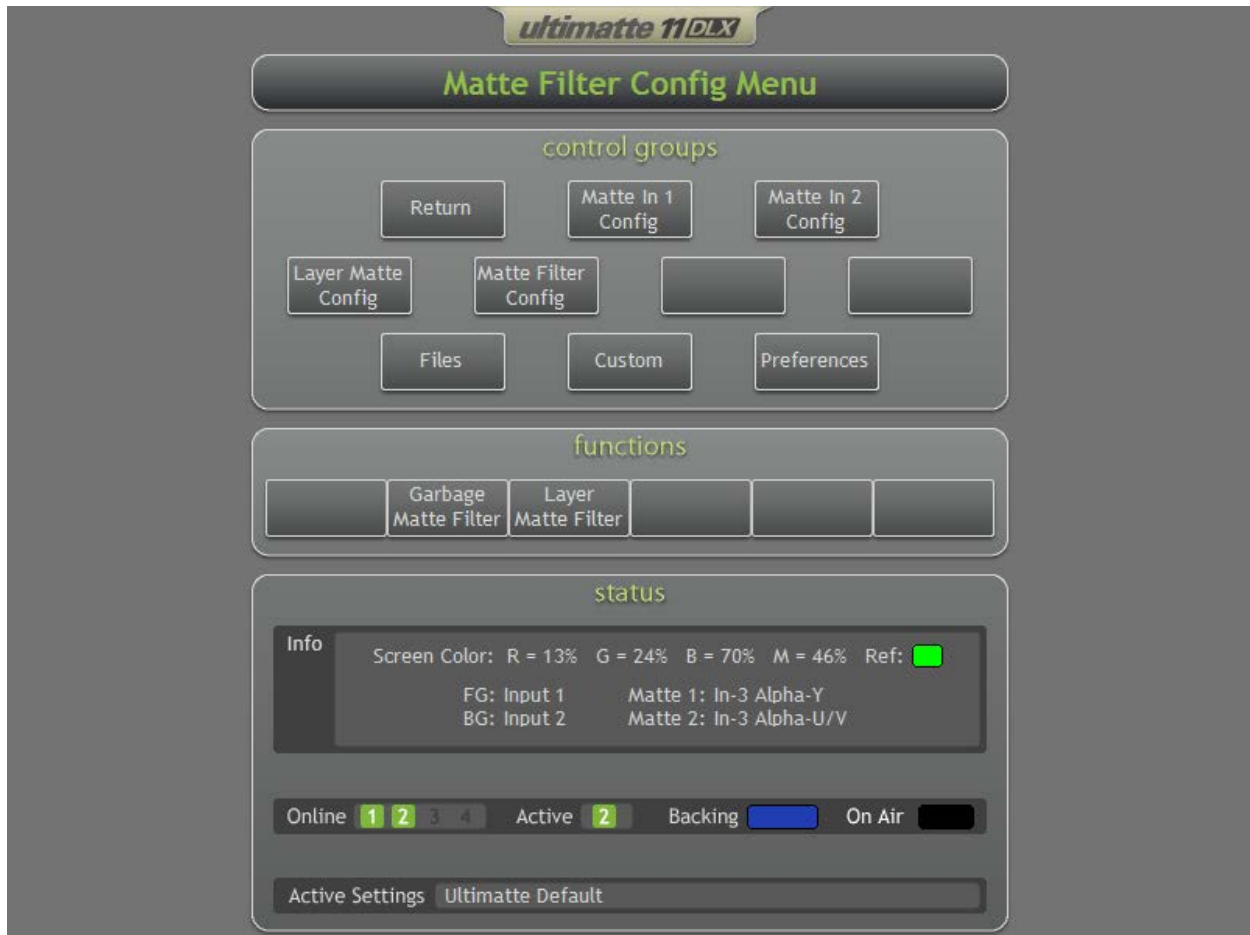


Figure 16.2-4. Matte Filter Config Menu

Buttons:

Garbage Matte Filter

This button enables the Garbage Matte Filter. The Garbage Matte Filter will smooth out small amounts of aliasing on the horizontal plane of external matte in.

Layer Matte Filter

This button enables the Layer Matte Filter. The Layer Matte Filter will smooth out small amounts of aliasing on the horizontal plane of the external layer matte in.