

NEWSMATTE™-2

OPERATING I NSTRUCTIONS

N T S C

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INSTALLATION INSTRUCTIONS

CAUTION: With the exception of delay lines A and B, all internal adjustments and all front panel controls are pre-set at the factory and should not be touched during the initial installation and set-up.

Adjustment of delay lines A and B is described in this section.

Front panel adjustments, when necessary, are described in the "Operations" section.

Most of the internal adjustments, if changed, cannot be returned to their proper setting without a test-signal generator, vectorscope, dual trace oscilloscope and the Shop Maintenance Manual. Those few adjustments that may be required during installation are described in this manual.

CONTENTS : The following items are packed with the NEWSMATTE:

- 1) These Installation and operating instructions
- 2) Power Cord
- 3) Blue and Green test cards
- 4) Warranty card

- MECHANICAL
1. The Newsmatte- is provided with rack mount slides to facilitate accessibility. The front panel will not, by itself, support the Newsmatte-2. The front panel mounting holes are provided to secure the front panel in a rack for mobile applications. Remove the slide shells and secure with the provided hardware to the rack as illustrated in the slide diagram.
 2. The top cover is secured with quarter turn fasteners. After installing the Newsmatte- in the rack remove the top cover to gain access to the delay line jumpers.

- ELECTRICAL
3. The Newsmatte- is generally used as an upstream device with respect to a switcher. The device must mix the foreground and background to produce the proper effect. Make the following connections to the Newsmatte-2:
 - 1) FG camera composite video
 - 2) FG RGB video
 - 3) BG composite video
 - 4) FG + BG output to a switcher primary.

Note: All inputs should be either looped or terminated. Terminate the key-in input.

- FOREGROUND TIMING
4. The Newsmatte-2 foreground delay time is about 35 ns in either "MATTE ON" or "MATTE OFF". This requires adjusting the subcarrier phase of the foreground camera to maintain proper timing at the switcher. With the device in the "MATTE OFF" mode the primary connected to the NEWS-MATTE-2 simply becomes the camera direct. To check foreground timing, switch the foreground camera to color bars and adjust the camera to match the output of the Newsmatte- to the other

FOREGROUND
TIMING CONT'D

4. switcher inputs

BACKGROUND
TIMING

5. The NEWSMATTE- background delay time is about 18 ns. The sync and burst is always taken from the foreground video so it is necessary to color time the background video. This may be accomplished by placing the internal jumper S-4 (near U 14) to the BG position. With the jumper in this position and the device in the "MATTE OFF" mode the background will be observed with the sync and burst of the foreground at the NEWSMATTE- output. Either a switchable delay or a measured cable must be used to time the background. If the background is from a switcher mix effects amplifier it will already be almost one subcarrier rotation late so only a small delay will be necessary. Place S-4 back in the FG position after making this adjustment.

CAMERA
ADJUSTMENT

6. The NEWSMATTE- does not operate like a Chroma-key. Instead, it becomes a portion of the camera system itself. For this reason it is necessary to completely adjust the camera before adjusting the NEWSMATTE- to match it. With the camera aimed at a grey scale adjust it for white balance, black balance, gamma tracking, flare compensation, registration, etc. At this point check to be sure that the video at the input of the NEWSMATTE- is nominally 100 IRE (about 700mV) peak white for the composite and the RGB inputs.
7. Place a vertical white strip of paper against the supplied blue card and evenly light the card. Aim the camera at the card and center the vertical white strip in the raster.

DELAY A 8. Set S-5 near U16 in the test position and depress the "MATTE " button observing that the LED is lighted. The output of the NEWSMATTE- should be the white vertical strip matted over a 75% white field. Depress the "MEMORY" button to assure that the device will not try to adjust itself as the delay lines are adjusted.

9. Turn off the detail generator and aperture corrector of the camera and remove one of the 400 ns jumpers of delay B to defeat chroma adjustment at this time. While looking at the output of the NEWSMATTE- with a scope or waveform monitor move delay line A jumpers in or out to equalize any lines which may be observed on the left and right edges of the vertical white strip.

DELAY B 10. Install the delay B jumpers to match the delay A just completed. Any yellow or blue edges visible on the vertical white strip **could indicate camera** misregistration or chrominance, to luminance timing errors in the camera encoder.

ANTI PRINT THROUGH 11. With the NEWSMATTE- in the "MATTE OFF" mode set S-5 back to the normal position. Cap the camera and supply a high contrast background such as a grid or convergence pattern. Adjust the "ANTI PRINT THROUGH" on the front panel while looking at the output on the waveform monitor. Set the control for a null of the background.

NOTE: This adjustment should be done with the device at its normal operating temperature.

FRONT 12.
PANEL
ADJUSTMENTS

The following is a brief description of the front panel adjustments. The remainder of this manual provides a detailed theory of operation and more detailed explanation of these controls.

- a) FLARE: This control removes blue reflections from the **subject**. It is normally set counter-clockwise for maximum suppression.
- b) WHITE BALANCE: Allows for adjusting foreground whites to match background whites, normally set to the center position. This control must be adjusted with the "MEMORY" in the off mode.
- c) MATTE DENSITY: When this control is set to the center position foreground whites will appear opaque. To cause light blues to appear opaque advance this control with the memory off.
- d) BLACK GLOSS: Used to darken shadows and to permit black glossy objects and dark blue objects to appear opaque.
- e) CLEAN-UP: Activated by the clean-up button and adjusted to eliminate shadows, backing seams, and support wires, etc. In general best results are obtained without using clean-up.
- f) BALANCE: Allows apportionment of the clean-up effect to the background or the foreground to improve edge appearance when clean-up must be used.
- g) ANTI PRINT THROUGH: As explained in paragraph 11 sets a null for the background multiplier.
- h) MATTE BUTTON: When the LED is ~~ON~~ the output FG + BG is the composite effect. When the button is depressed the LED is ~~OFF~~ and the FG + BG output is the FG camera NTSC.

- i) CLEAN-UP BUTTON: Alternate depressions activate and deactivate the clean-up effect explained in (e).
- j) MEMORY: Can be activated or deactivated only in the "MATTE ON" mode: allows for retention of scene parameters if the blue backing will be obscured or removed from the camera view.
- k) HUE: When activated a green LED will be ON indicating the selected backing color is green. When deactivated the selected backing color is blue.

CORRECTED
FG

- 13. The second output is provided because the NEWSMATTE- removes the blue flare from FG subject. This output provides a flare suppressed camera direct video in both "MATTE ON" or OFF.

EXIST-
ING
CONDIT-
IONS

- 14. The preceeding installation instructions are primarily concerned with the physical installation and adjustments related to system timing. Other adjustments both internal and on the front panel are made in conjunction with an operating system. These adjustments were pre-set at the factory using a new and relatively quiet camera, a high purity blue (and green) backing, and uniform lighting.

A quiet camera, high purity backing and uniform lighting are the system parameters that permit the NEWSMATTE-2 to function as a linear, wide-bandwidth matting device that holds every subtle shadow, every strand of hair seen by the camera, blue eyes and a wide range of bluish wardrobe colors. At the same time NEWSMATTE- eliminates all evidence that a blue backing was ever present.

(Similar results are obtained with a green backing.)

One may be required to use a noisy camera, but there is little reason to compromise performance for the lack of a gallon of proper paint, or an hour spent in getting

EXIST-
ING
CONDIT-
IONS
CONT'D

14. uniform lighting. (See section on lighting.)
Blue and Green test cards are included with the
NEWSMATTE- to permit an evaluation of existing
backings.

Because of less than ideal conditions existing in many video facilities, NEWSMATTE- incorporates a number of adjustments to accomodate these conditions while minimizing performance degradation.

It is difficult to explain the adjustment of many of the front panel controls, as well as certain internal adjustments, without some understanding of the principles of the operation of the NEWSMATTE-2.

These principles, as well as the remainder of the adjustments, are described in the following section and in conjunction with the block diagram (Fig. 1).

PRIN-
CIPLES
OF
OPERAT-
ION

15. The NEWSMATTE- operates on a unique set of principles unlike any other compositing or keying device. These principles are:

- 1) The colored backing is removed by a subtraction process, not by switching-off the FG (Foreground) scene.
- 2) The BG (Background) scene level is variable and is continuously controlled as a linear function of the brightness and visibility of the backing.
- 3) The composite picture is the simple sum of the processed FG and BG video signals.
- 4) Colorimetry is controlled to eliminate all effects of the blue backing on the subject and to eliminate blue flare in the camera lens.

NOTE: These are the primary features covered by the NEWSMATTE patents.

FG
CHANNEL

16. The FG composite video is routed thru the Chroma Subtraction amplifier, thru the Luminance Subtraction amplifier and to the summing input of the output driver amplifier. The delay time, input to output, is 35 ns. (See Fig. 1) It should be noted that Chroma Subtraction and Luminance Subtraction utilize one of the differential inputs while the other input carries the video. The FG video channel is therefore always open and has a bandwidth exceeding 10 MHz. (The FG channel is reduced in level, or shut-off, only when subjected to control by an external window or wipe signal fed to the Key-in jack.)

Since the FG video channel is not switched, all detail seen by the FG camera is retained in the composite. Any "switching-off" of the FG video in the switcher will degrade the performance of the NEWSMATTE-2. For this reason, mix-effects amplifiers found in switchers cannot be directly substituted for NEWSMATTE- summing amplifier.

COLOR
LOGIC

17. It is a property of the color logic to examine the colors in the FG scene and to eliminate from the scene the chroma of the backing, as well as the discoloration of the subject caused by secondary illumination of the subject by the backing, and the overall blue cast caused by internal reflections in the camera lens. This is done by phase-locking a 3.58 MHz oscillator to the chroma of the correct phase and amplitude so as to remove from the entire FG scene that chroma introduced by the colored backing. Chroma is also removed from the subject to the extent it was induced by secondary illumination or lens flare.

COLOR
LOGIC
CONT'D

17. An adjustable delay (B-delay) delays the chroma signal E_{ϕ} to occur in-time with FG video.

The auto-null circuit automatically holds the backing chroma to zero level even though the hue, lighting level, or the backing itself is changed.

SCENE
MISS-
MATCH

18. It should be noted that a "direct" view shows the blue backing behind the subject. The influence of that backing on the subject (bluish coloration) is normal and is to be expected. However, in the "Matted" view, the blue backing is not seen. For this reason NEWSMATTE- was designed to remove the bluish coloration from the subject as well as the blue flare in the lens, when the NEWSMATTE- is matting. The "direct" view, therefore, will not match the "MATTED" view, nor should it. The degree of color shift depends upon the amount of blue illumination on the subject and is a function of backing size, distance between subject and backing, amount of wrap-around, lens coating efficiency: and upon the setting of NEWSMATTE-FLARE and WHITE BAL controls as described in the following section.

WHITE
BAL

19. A white (or grey) subject is defined as equal levels of R,G and B. A white subject flooded with blue or green light (from the backing and from internal flare in the camera lens) will no longer be white. It will take on a tint from being flooded with the backing color. To remove a blue tint, the blue channel is limited by the green channel in such a way that the blue level (at any given instant) can be less than, but cannot exceed a **settable** limit equal to 0.9. to 1.1 of the green level at that instant. The WHITE BAL control sets this limit. It is usually set to 1.0 (near its

WHITE
BAL
CONT'D

19. midpoint) as follows:

- 1) Use an illuminated white target. Avoid secondary illumination by light reflected from the backing.
- 2) Set matte switch to "direct".
- 3) Adjust camera for zero chroma.
- 4) Switch to "matte"
- 5) Starting from fully clockwise, move WHITE BAL control CCW until blue just begins to drop, as seen on a vectorscope.

This 5-step procedure is also used for a green backing.

When a blue backing is used and the subject has yellow-blond hair, the transparent portions of the hair will shift toward white because of the blue backlight. The yellow tint can be retained by slightly reducing (CCW) the WHITE BAL setting.

BLUE
FLARE
CONTROL

20. The FLARE control is normally set in a fully CCW position when using a blue backing. In this position the blue content of grey-scale objects (and flesh tones) cannot exceed a green value established by the WHITE BAL control described in the previous section. This means that all secondary illumination and chroma-flare in the lens is eliminated.

This flare control circuit, however, perceives magenta to be a red color flooded with blue light. It will remove the blue, turning magenta to red. To permit the reproduction of Magenta (When using a blue backing) the flare control must be turned clockwise to permit blue to exceed green by just enough to produce an acceptable magenta. Since blue flare is not fully suppressed when reproducing magenta, flesh tones will show the normal magenta tint caused by secondary illumination and lens flare.

A magenta subject-color should be avoided if possible when using a blue backing so as to permit full flare suppression.

GREEN
FLARE
CONTROL

21. In the case of a green screen, the flare control circuit perceives yellow to be a red color flooded with green light. It will remove the green component, turning yellow to red. To permit reproduction of yellow, the flare control must be advanced (CW) just enough to produce an acceptable yellow.

When using a green backing, bright yellow wardrobe should be avoided if possible so as to permit full flare suppression.

The only occasion one may be required to change the setting of the flare control is when it is necessary to reproduce a highly saturated magenta or yellow.

MATTE
DENSITY
CONTROL

22. Control signal E_c is fed to the Y-input of the four-quadrant multiplier which controls the level of the BG scene. (Fig. 1) It should be remembered that E_c is proportional to the backing brightness and visibility. Visibility, for example, may be reduced by a semi-transparent FG subject such as smoke, an out-of-focus object, rapidly moving objects or glassware.

Since the NEWSMATTE is a linear system, the background scene is fully matted (**suppressed**) in those areas of the foreground occupied by fully opaque objects, but is not fully suppressed in those areas where foreground objects are not fully opaque. Thus a full transparency range is maintained. To maintain full linearity, the matte density control is adjusted just to the point where the background scene is no longer visible through opaque foreground subjects. Cooler colors, such as blue eyes and pastel blue wardrobe, will require further advancing of the "Matte Density" control to

maintain full opacity for these colors. Do not attempt to prevent print-thru in black glossy areas with the Matte Density control. This is the function of the BLACK GLOSS control described next. The density of the matte may be observed by viewing the Matte-Out signal on a monitor.

BLACK
GLOSS

23. Black glossy objects, such as black hair, will reflect the color of the backing and may result in a print-thru of the background scene in these dark glossy areas. The black gloss control is to be advanced (CW) only as much as is necessary to prevent print-thru for black subjects. The black gloss control also causes shadows to darken.

CLEAN-UP

24. The clean-up control generates a progressively increasing shut-off of the foreground and turn-on of the background. Its purpose is to eliminate the logos painted onto the blue backing located behind the newscaster. The clean-up control eliminates these logos so they are no longer visible in the composite scene. Clean-up should be adjusted together with the BAL Control.

The use of clean-up should be avoided if possible since it represents a progressive departure from linearity as clean-up is increased. When one uses clean-up to remove the logo, backing smudges, wrinkles, uneven illumination and other defects, one is also throwing away useful information such as shadows and the finer individual strands of hair. A modest amount of clean-up is set-in on the front panel control at the factory so that a visible effect will be seen when the clean-up switch is first tried. If clean-up is not needed, turn this control fully CCW.

BAL 25. The balance control proportions the clean-up function between the FG and BG video. In cleaning up a painted logo for example, the lighter areas generally show up as a **chroma** change in the FG scene, while the darker areas are seen as a shadow and appear in the BG scene.

The BAL control proportions the clean-up processing between FG and BG so as to eliminate the logo with the minimum possible use of clean-up, and therefore with the least loss of picture information.

When the same camera is panned to a second backing with no logo (e.g. Weather Map), shadows are desired. The clean-up is removed by touching the clean-up button. When the light is out, clean-up is off, and all levels of shadow are retained

REMOTE CONTROL 26. A 15 pin subminiature D connector on the rear panel of the NEWSMATTE- permits remote control of the "MATTE Density" control, the "Matte" switch and indicator light, the "HUE" switch and indicator light, the "MEMORY" switch and indicator light, and the "Clean-Up" switch and indicator light.

The one control (Matte Density) and four switches are all that are necessary for routine operation from a remote location.

REMOTE OPERATION 27. A remote control schematic is provided with the enclosed drawings.

KEY-IN 28. This is a convenient means for inserting a signal from the effects generator of the switcher. A partial wipe, box or window, for example, permits the camera to overshoot the backing. A 0.7 signal at the Key-In jack turns "on" the background scene and turns "off" the FG scene, when the BAL control is centered.

MATTE OUT

29. This jack provides a 0.7 v. "Matte" signal (Iv. p-p) in the blue screen area and includes sync, burst, and set up. This signal is useful for certain special effects. The "Matte" signal is similar to a key signal, but is linear, of variable level, and has full video bandwidth. It may be observed on a monitor to aid in adjusting the the Matte Denssity control.

BACKING
COLOR
QUALITY

30. NEWSMATTE- operates over a continuous range of backing illumination from full illumination down to a very dark shadow, as well as thru varying levels of transparency. It must provide a clean, noise-free picture at all levels of backing illumination on a scale from zero to 100. (A switching keyer operates at only one level on this space) In order to provide this high level of performance, NEWSMATTE- requires a high purity color having high reflectance in its dominant color, and relatively low reflectance in the other two colors. Most chroma key backings are unsatisfactory for use with NEWSMATTE-2.

A good blue paint, for example, will have a high blue-red difference and also a high Blue-Green difference as observed on an RGB waveform monitor. (Excellent Blue and Green paint is available from Ultimatte Corp. The test cards provided with NEWSMATTE- are coated with these paints.)

BACKING
EVALUATION

31. An existing backing can be evaluated using the color test cards furnished with the NEWSMATTE-2. For a blue backing, place the blue test card against the backing and illuminate both equally. Place the camera so that the test card fills about 20% of the frame.

BACKING
EVALUATION
CONT'D

31. With the Memory mode off, the NEWSMATTE- auto-level circuit will lock on to the best blue (or green) area in the scene and set the background level at full-on (unity) in this area.
(Use bars for the BG scene.)

If the existing backing is of good quality, it will also turn the background full-on in those areas adjacent to the test card. The amount of BG turn-on by the existing backing is a measure of its quality for matting. If it is not essentially equal to the test card, it should be re-painted with the Ultimatte paint.

BACKING
COLORS

32. High saturation, high reflectance primary colors (Red, Green and Blue) are the best choice for the backing color. The use of such a primary permits every color of wardrobe to be used including lighter shades of the primary itself. The only colors excluded are the deeper shades of the primary color.

Since Blue and Green are the most often used colors, a switch is included on the front panel for selection of the proper color logic for these two colors.

The use of a Red backing requires an interchange of the Blue and Red video cables into the NEWSMATTE-2 and a resetting of S1 and S2 on the board.

LIGHTING

33. The NEWSMATTE- utilizes the brightness of the colored backing to generate a control signal (E_C). The background level is proportional to E_C . A clip level adjustment (R32) sets the E_C clip point and is the means for setting BG level (to unity) in areas of full illumination.

LIGHTING
CONT'D

33. An auto-level circuit sets the brightest area of the backing at the clip point.

It is important to understand that lighting the backing is exactly like lighting the background scene as if it were a large photograph in place of the backing. The best way to evaluate the flatness of the lighting is with a waveform monitor looking at both the horizontal and vertical blue or green luminance values for the whole backing.

While there is no substitute for even lighting the "Memory" switch can be used in some circumstances to produce an acceptable picture in less than perfect conditions. When the "Memory" function is OFF the E_C will adjust itself for background unity level at the brightest blue (or green) peak. When the "Memory" function is ON the background brightness will follow the blue (or green) level as it is adjusted with the camera iris. The clip limit is always in place, however, regardless of the memory mode.

As an example, if the top of the backing is brighter because it is closer to some lights, zoom the camera to a backing area close to the subject avoiding the "hot spot" and lock the memory. When the camera is zoomed back the hot spot will be pushed into clip and will not be visible. It would also be possible to iris down slightly, lock the memory, then set for a normal iris again. Both of these methods will force the E_C beyond a clip producing the appearance of more even illumination. Avoid "hot spots" behind the talent, however, because pushing the background into clip in this area will cause transparent hair to glow and transparent objects to be abnormally bright.

NOISY
BACKGROUND

34. The control signal E_c will be into clip at the brightest areas of the backing, but will be out of clip in shadow areas and may be out of clip in the corners. When E_c is in clip, any noise on E_c is eliminated because the clip level is substituted for E_c .

However, when E_c is out of clip, any noise on E_c will appear in the shadow areas or any underlit areas of the backing.

With a proper blue or green backing (using ULTIMATTE paint) and a proper level of illumination, the newer cameras are sufficiently quiet so that no noise is visible in shadow areas.

On older cameras, noise levels are generally higher. The noise of the blue and green channels is summed in control signal E_c . Part of the noise can be eliminated by setting delay lines A and B to include the 2.5 mHz filter.

A second noise source is by way of E_ϕ in the chroma-null circuit. This noise is also reduced when the 2.5 mhz filters are used. When using the 2.5 mHz filters, A and B delay lines must both use the filters.

Another technique which will reduce noise utilizes the memory. First, switch the memory OFF then raise the master black of the camera about 20IRE, then switch the memory ON and set the master black to a normal level. This has the effect of clipping the whites and blacks of the E_c while not affecting the middle grays.

FINAL
PERFORMANCE

35. When using a good paint, uniform lighting, and a quiet camera, one should not be able to detect

FINAL
PERFORMANCE
CONT'D

35. that he is observing a composite scene. Such items as shadows, smoke, glasswork, out-of-focus objects, individual strands of hair, or any item within the resolution limits of the camera should appear in the composite image without loss.

If your system is not producing this level of performance, it is suggested that all steps of the installation procedure be repeated before calling your dealer for assistance.

