OUTPUT MODULE

Manual Number: A90-066338-01/10/20 TP No.: 06-053 Issue No.: 2

INTRODUCTION

This module exists in three versions, for use in NTSC, PAL, and PAL-M systems. A -01 suffix on the assembly number of the module indicates NTSC, -10 indicates PAL and -20 indicates PAL-M.

Basically, the Output Module interfaces the local and remote controls, and combines the subcarrier signal (from the Color Lock Module) and the blanking, sync, and burst flag signals (from the Sync Generator Module) with the chrominance and luminance signals from the Input Module. This provides the desired video output(s) having regenerated blanking, sync and burst signals. Specific functions performed by the Output Module are listed below and discussed in the circuit description.

Luminance amplifier	Hard clipping	Sync Shaper
Variable setup generator	Blanking switch	Burst flag shaper
Feedback clamp	Output amplifier	Color black lever
Soft clipper	Subcarrier regenerator	Burst phase control
Chroma gain amplifier	Burst phase shifting	Toothed blanking shaper
Combining amplifier	Blanking shaper	Fade-to-black

CIRCUIT OVERVIEW

The luminance signal from the Input Module, the variable Remote Setup voltage signal, and an error-correction voltage from the Feedback Clamp are applied to the Luminance Amplifier. These inputs are summed so that blanking is clamped to 0 volts at the output of the Luminance Amplifier, TP1.

The Feedback Clamp consists of two samplers and integrators which produce the required error voltage.

The Soft Clipper consists of a soft black clipper and the soft white clipper. The soft black clipper serves to force setup on a signal by clipping any luminance levels below a preset value. The soft white clipper removes any luminance levels above a preset value. In the DIRECT mode, both clippers are moved more negative and positive as required to prevent clipping. Also, the soft black clipper is moved negative during vertical blanking to prevent clipping on the base line of vertical interval test signals. The Soft Clipper may be controlled externally.

The Variable Gain amplifier provides a means for remotely controlling the amplitude of the color portion of the video signal.

In the combining amplifier the clipped luminance signal and the gain- controlled chroma signal are summed to produce a composite video output.

The Hard Clipper consists of a hard white clipper and a hard black clipper. The Hard Clipper removes any signal component, chroma or luminance, which falls above or below the respective clip points. The Hard Clipper cannot overlap the action of the Soft Clipper. In addition, the Hard Clippers may be controlled externally.

When operating in the NORMAL Mode, the Blanking Switch replaces incoming sync, blanking, and burst with locally-generated sync, burst, and blanking. This is accomplished by switching between two inputs at blanking times.

The Output Amplifier is a feedback circuit capable of driving six 75 ohm loads.

The Color Black generator produces a color black signal from the inputs shown in the block diagram. The phase of burst is set in the Variable Delay circuit before being made available to the Blanking Switch.

CIRCUIT DESCRIPTION

Refer to Figure 1 (later in this section) and to the schematic diagram, sheet 1.

Luminance Amplifier

The luminance signal from the Input Module is sent to feedback amplifier Q1, Q2, and Q3. Also sent to this amplifier is a variable setup signal from Q4 and an error correction voltage from the feedback clamp at IC2C, pin 8. These inputs are summed to provide a non- inverted luminance signal of 2 V p-p at TP-1. The blanking level should be clamped rigidly to 0 V at this point.

Variable Setup Generator

IC1, IC2-A, and Q4 are used to generate a current keyed on during picture time or not-blanking. Amplifier IC2-A receives a dc current of up to ± 500 microamperes, and produces a control voltage at the multiplier upper port, IC1 pin 10. The voltage at pin 10 (relative to pin 8) determines the polarity and magnitude of the setup current injected into the luminance amplifier inverting input Q3-E. The ramp-shaped blanking pulses at IC1-4, in combination with the differential pair in the lower port of the multiplier, causes the setup voltage to have sine-squared edges with appropriate rise times. Q4/R19 is a current mirror (of D3/R17) which provides about 150 microamperes when the SETUP control is centered, but may switch from 20 to 280 microamperes at either end of the control. The variable setup is turned off when the processor is operating in the DIRECT mode. This is done by turning off the current sources in IC1 as a result of switching R15 and D43 toward the negative supply at IC7-1. Setup during vertical interval is determined by jumpers A, B and C (schematic, sheet 2, B/5).

Feedback Clamp (sheet 1 of schematic, D/6-7)

The feedback clamp consists of two samplers and two integrators which feed an error voltage to the luminance amplifier. The first sampler, Q6, is keyed every line on back porch except during the vertical serration pulses (7.5H PAL, 9H PAL-M and NTSC). The clamp pulses are derived on the Input Module from incoming video. The second sampler, Q8, is keyed on back porch only during 7.5H (9H, PAL-M and NTSC). This action obtains a sample of the video signal free from

burst axis shifts, since there is no burst present during the vertical interval (7.5H PAL, 9H PAL-M and NTSC). The second sampler feeds a fast integrator, IC2-C, which uses integrator IC3 as a reference voltage. The clamp may be disabled with S2, to aid in troubleshooting.

Soft Clipper

The soft clipper consists of a soft black clipper IC5-A, IC5-B, and Q11, and a soft white clipper Q12, Q13, and IC5-C. The soft black clipper serves to force setup on a signal by clipping any luminance below a preset value. The soft white clipper removes any luminance above a given value. In the DIRECT mode, both clippers are moved more negative and positive respectively to prevent clipping. Also, the soft black clipper is moved negative during vertical blanking to prevent clipping on the base line of vertical interval test signals. The soft black clip voltage is derived in summing amplifier IC8-A. It sums all control currents at the inverting node, IC8-2. Each control function (SOFT CLIP, NORMAL/DIRECT, FORCED SETUP, etc.) provides a weighted current into the summing node IC8-2, resulting in the desired clip voltage at the output (IC8-1). The soft white clipper functions in a similar manner with weighted current inputs into IC8-B. An offset voltage is provided by IC5-D to compensate for the offset voltage of the signal through IC5-A. The resonant trap (L3, C20) is used to block any residual chroma from the clipping action. The SOFT CLIP control at the local and/or remote location produces a current into the node at IC7-9. This current results in the output (IC7-8) swinging from -8.5 V to +8.5 V. IC7-D inverts the control voltage in exact proportion from +8.5 V to -8.5 V. The control voltages at IC7-8 and IC7-14 are used to induce weighted currents into clipper summing amplifiers IC8-A and IC8-B.

Switch S1 and control R78 are used to set the level of forced setup (by adjusting the input to the black clipper). If desired, the black clipper may be set below the blanking level.

Chroma Gain Amplifier

IC10, Q24, and Q25 form a variable-gain feedback amplifier (sheet 1, G/5). The gain is determined by the voltage at IC10-10 relative to pin 8. When the voltage at pin 10 is 100 mV lower than that at pin 8, the gain is determined by the ratio of R148 (1K) to R153 (2.2K), so the gain is 2.2. When the voltage at pin 10 is 100 mV higher than that at pin 8, the gain is the ratio of R147 (4.7K) to R152 (2.2K), so the gain is 0.47. As the voltage at pin 10 is varied, the gain varies between these two extremes (more than ± 6 dB).

The remote and/or local CHROMA GAIN control injects a current into the node at IC2-6 and produces a corresponding voltage out of operational amplifier IC2-7. Voltage divider R143 and R144 cause the appropriate voltage swing at IC10-10 for gain control.

Combining Amplifier

A feedback amplifier is formed by Q14, Q15, Q16, and Q18 for combining the chroma and luminance signals. The two signals are summed as currents at the nodal input at Q14-E. The output is inverted, and may be measured at TP-4. R54 is used to trim the dc offset.

Hard Clipper

The hard clipper consists of a hard white clipper (IC6-A, IC6-B, and Q19), and a black clipper (Q20, Q21, and IC6-C). The hard clippers remove any signal component, chrominance or luminance, which falls above or below the range determined by the clip points. The clip threshholds are determined by operational amplifiers IC8-C and IC8-D in a similar manner to those in the soft clippers.

The hard clippers can never overlap the action of the soft clippers (luminance only), due to the diode gating of D6, D7, and D8 for white, and IC6-D and IC6-E for black. Amplifiers IC9-C and IC9-D determine the minimum separation of the soft and hard clippers. IC9-A and IC9-B provide the remote control input for the hard clippers. The action is very similar to that of the soft clippers. For adjustment procedure refer to the Output Module adjustments, in this data package.

For the following, refer to Figure 1 and schematic sheet 2.

Blanking Switch

When operating in the NORMAL mode, the blanking switch IC16, (sheet 2, E/6) replaces the incoming sync and burst with locally-generated sync and burst. This is accomplished by switching between two inputs at blanking times. The program video from Q10-E is fed to the node at IC16-2 through R229. The locally-generated color black signal sends current into IC16-3. The control voltage at IC16-10 determines which input is active; that is, which signal will appear at the output. For example, when pin 10 is high (relative to pin 8), pin 2 is the active node and the signal current entering that point causes the amplifier voltage output at Q59-E to swing in proportion to the resistance of feedback resistor R248 and the signal current entering the node.

Output Amplifier

The output amplifier, Q63-Q68, is a feedback amplifier capable of driving six video loads. It is operated non-inverting with unity gain. Feedback is provided by R263. R259 is used to set the no-signal emitter current in the output transistors, Q67 and Q68. It is normally set for best differential phase and differential gain, and is typically 15 milliamperes in each transistor.

When operated dc coupled (wire jumper at C53 sheet 2, E/5), the dc voltage at the output may be set to zero with R244. When operated ac coupled (R264, R265, R266, and C53 used), the dc voltage at the output may be adjusted by selecting the value of R266.

Subcarrier Regenerator

Q40 and Q41 form a differential pair which switches at the zero crossings of incoming subcarrier. A square-wave current is sent from Q41-C to R183, and low-pass filter L5,L6 and associated capacitors. The magnitude of the square-wave current is determined by the voltage across R186, which is a function of the burst-level control and the gain of IC14-C. The low-pass filter removes harmonics of the color subcarrier and routes a sinusoidal current into the node at IC13-2.

Burst Phase Shifter (PAL only)

The burst phase shifter (Q32, Q27, and Q28), when used with the color black keyer (IC13), produces a 90-degree phase shift of burst at an H/2 rate. R165 is used to set the amount of phase shift. R169 is used to set the gain balance between the two states. The absolute phase is set using C40, with the burst phase control in the center of its range. Phase shifting is accomplished by saturating Q27 at an H/2 rate. When Q27 is saturated, R166 is effectively tied to ground. The subcarrier phase at Q28-B changes 45 degrees as the ac resistance to ground changes with the state change of Q27. The vector addition of the incident subcarrier current (from R194) and the phase-shifted subcarrier current (from Q28-C) into the node at IC13-2 causes the subcarrier burst phase to change 90 degrees at an H/2 rate (observable at TP-6).

Toothed Blanking Shaper

"Toothed" composite blanking is sent to pin 38 (sheet 2, H/5-6) from the Sync Generator module. It is termed toothed blanking because selected vertical interval lines may not be blanked in order to preserve test signals. The sharp TTL edges at pin 38 are converted to ramp-shaped edges at Q60-E by the integrating action of C66. The dual differential pair in the upper port of multiplier IC16 converts the ramp-shaped edges to sine-squared edges on blanking transitions. In the DIRECT mode, the voltage at IC16-10 is held high due to the current supplied from R318 to the integrating capacitor, C66. When IC16-10 is held high, the program signal is passed through the blanking switch all the time, thus retaining original sync and burst.

Sync Shaper

Q47, Q48, and Q49 produce ramp-shaped edges on sync similarly to the blanking shaper. The ramp-shaped edges are sent to the differential pair in IC15 (sheet 2, A/2) to produce sine squared edges on the current waveform injected into the node at IC13-3. This current produces the sync portion of the signal (observable at TP-6).

The sync amplitude is adjusted by the current fed into the differential pair at IC15-3 through R290. Amplifier IC2-D receives a ± 500 microampere control current from the local and/or remote sync level control. This current produces a corresponding voltage at IC2-14 for level control of the locally-generated sync.

Burst Flag Shaper

Burst flag pulses from the Sync Generator Module are given ramp-shaped edges in the same manner as sync and blanking.

Color Black Keyer

IC13 (sheet 2, C/4) and associated components form the color black keyer circuit. IC13-8 is high (relative to pin 10) except during burst time, when it goes low. When pin 8 is high, pin 3 (sync) is the active node, and the voltage at TP-6 is proportional to the current entering the node due to feedback from R207. Pin 3 receives setup current from R209 and sync current from IC15-5. When pin 8 is low, pin 2 (sub carrier) becomes the active node, and burst appears at TP-6. Burst axis is adjusted by a dc current injected into the node (pin 2) from R191 and R192.

Burst Phase Control

Q54, Q55, and IC14-B with associated parts (sheet 2, B-C/1-2) form a variable delay network. The delay network is used to retain the sync-to-subcarrier phase relationship as produced in the color black keyer. The incident current from R228, in vector addition to a phase-shifted current from Q54-C, enters the node at IC16-3. This results in a delayed signal which can be observed at TP-7. The amount of phase shift is determined by the values of C48, L7, and the shunt resistance at Q55-6. The phase-shifted voltage applied to Q54-B results in a current which is injected into the node at IC16-3, via C52.

Q55 is a dual FET, with B used as a variable resistance to the signal and A used to sense the approximate resistance of B. The resistance of Q55-A is "measured" and fed back to IC14-S to maintain stability. The local and/or remote burst phase control, causes a voltage to appear at IC14-6. Feedback via Q55-A causes the resistance from source to drain of both FET's (Q55-A and B) to be established at the desired value.

Fade to Black (sheet 2, G-H/6-7-8)

When the remote lever is actuated at the fade-to-black control panel, the control voltage to IC16-10 is held low (through the action of IC14 and D48). This causes the processor to present the locally-generated color black signal at its output. IC14-A receives the voltage from the control panel and produces a control voltage, varying between -1 V and +1 V, at pin 1. This control voltage is then sent through shaping circuit IC14-D (to compensate for the control characteristic of the blanking switch, IC16).

Fade-to-Black Tally

IC17-A and IC17-B (sheet 2, G/3) are used to sense the fade-to-black lever position. IC17-A activates Q70, which in turn lights the local and remote LED's when the control lever begins the fade. IC17-B activates Q69, which actuates relay K1 when the control lever nears the end of the fade. Camera tally or warning lights may be activated or deactivated by using tally connector J32 on the rear of the frame. Pin B is common, pin A is normally open, and pin C is normally closed. The relay and associated contacts may switch resistive loads up to 60 W, with not more than 50 V ac, 30 V dc, or 2 A in any combination. If higher load ratings are needed, an interface relay must be used to prevent damage to the Processing Amplifier module or danger to personnel.

± 10 Volt Regulator Refer to schematic C10-058030.

The regulator for the 3400/3200 Series modules receives ± 12 to 18 volts unregulated dc from the 3200A power supply and provides regulated ± 10 volts to the module. The incoming positive dc voltage is decoupled by L500 and C500. Further decoupling and current limiting is provided by C501 and RN501R. At startup, the regulator output is at zero, and series pass transistor Q502 is held off by RN501S. During startup, current flows through R500, RN501T, and R502, resulting in a small positive dc voltage at the output. This voltage is applied to the inverting input of IC500A through RN501K and RN501L. Network RN501N, R504, and RN501H divides this voltage in half and applies it to the noninverting input of IC500A. The resulting input imbalance causes the output of IC500A to swing negative. The voltage developed across RN501P causes current to flow in Q503 and Q502. When Q502 is conducting, the output of the regulator rises until the voltage at the wiper arm of R504 is equal to the breakdown voltage of Q506 (6.45 V ± 4%). At this point, the IC inputs are balanced, and the loop stabilizes.

Operation of the negative regulator is similar to that of the positive regulator, except that IC500B is referenced to ground and connected to the output of the positive regulator. IC500B senses the difference between the positive and negative outputs through RN501D and RN501M. Thus, during normal operation, the negative regulator tracks the positive regulator. However, if the negative output voltage is pulled toward ground due to the current limiting of Q501, the base of Q507 will be pulled positive. Q507 will then begin to conduct, reducing the reference to the positive regulator. Thus, the positive regulator tracks the negative regulator during an overload condition. The regulator comes in two versions. One is intended to supply less than 100 mA. This version has 4.7 ohm resistors for R500 and R501 and uses an MPSU51 transistor for Q502 and an MPSU01 for Q505. The second version supplies more than 100 mA. This version uses 2.7 ohm resistors for R500 and R501 and an MJE371 and MJE521 for Q502 and Q505, respectively.

ADJUSTMENTS

NOTE

The following adjustment procedure must be performed correctly before the Output Module is included in a system alignment.

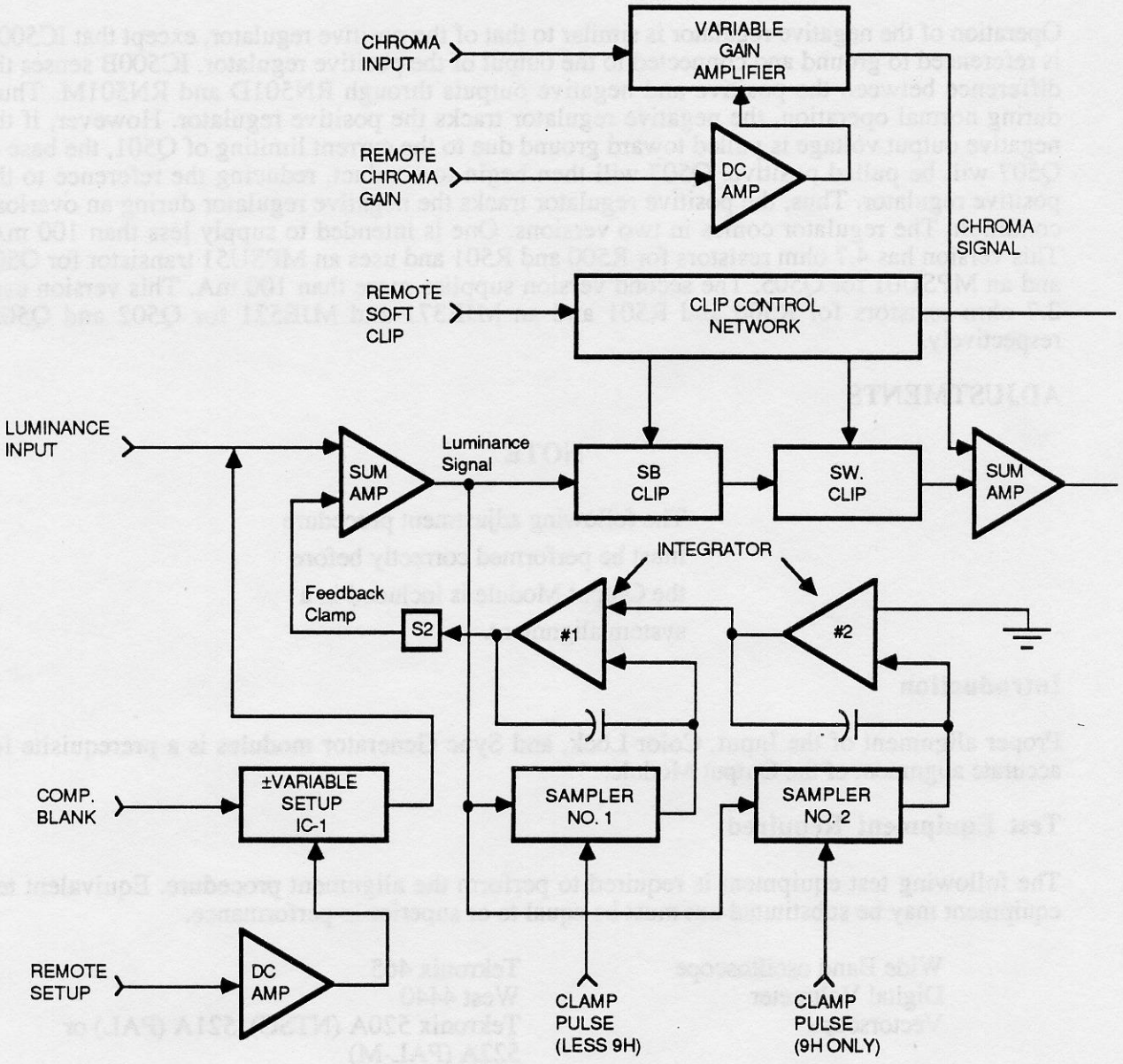
Introduction

Proper alignment of the Input, Color Lock, and Sync Generator modules is a prerequisite for accurate alignment of the Output Module.

Test Equipment Required

The following test equipment is required to perform the alignment procedure. Equivalent test equipment may be substituted but must be equal to or superior in performance.

Wide Band oscilloscope	Tekronix 465
Digital Voltmeter	West 4440
Vectorscope	Tekronix 520A (NTSC), 521A (PAL) or 522A (PAL-M)
TV Test Generator (with 1V p-p linearity ramp, color bars, and black picture signals)	Tektronix 1410 (NTSC) or 1411 (PAL) or 1412 (PAL-M)


CHROMA INPUT
VARIABLE GAIN AMPLIFIER
REMOTE CHROMA GAIN
DC AMP
CHROMA SIGNAL
REMOTE SOFT CLIP
CLIP CONTROL NETWORK
LUMINANCE INPUT
SUM AMP
Luminance Signal
SB CLIP
SW. CLIP
SUM AMP
INTEGRATOR
Feedback Clamp
S2
#1
#2
COMP. BLANK
±VARIABLE SETUP IC-1
SAMPLER NO. 1
SAMPLER NO. 2
REMOTE SETUP
DC AMP
CLAMP PULSE (LESS 9H)
CLAMP PULSE (9H ONLY)

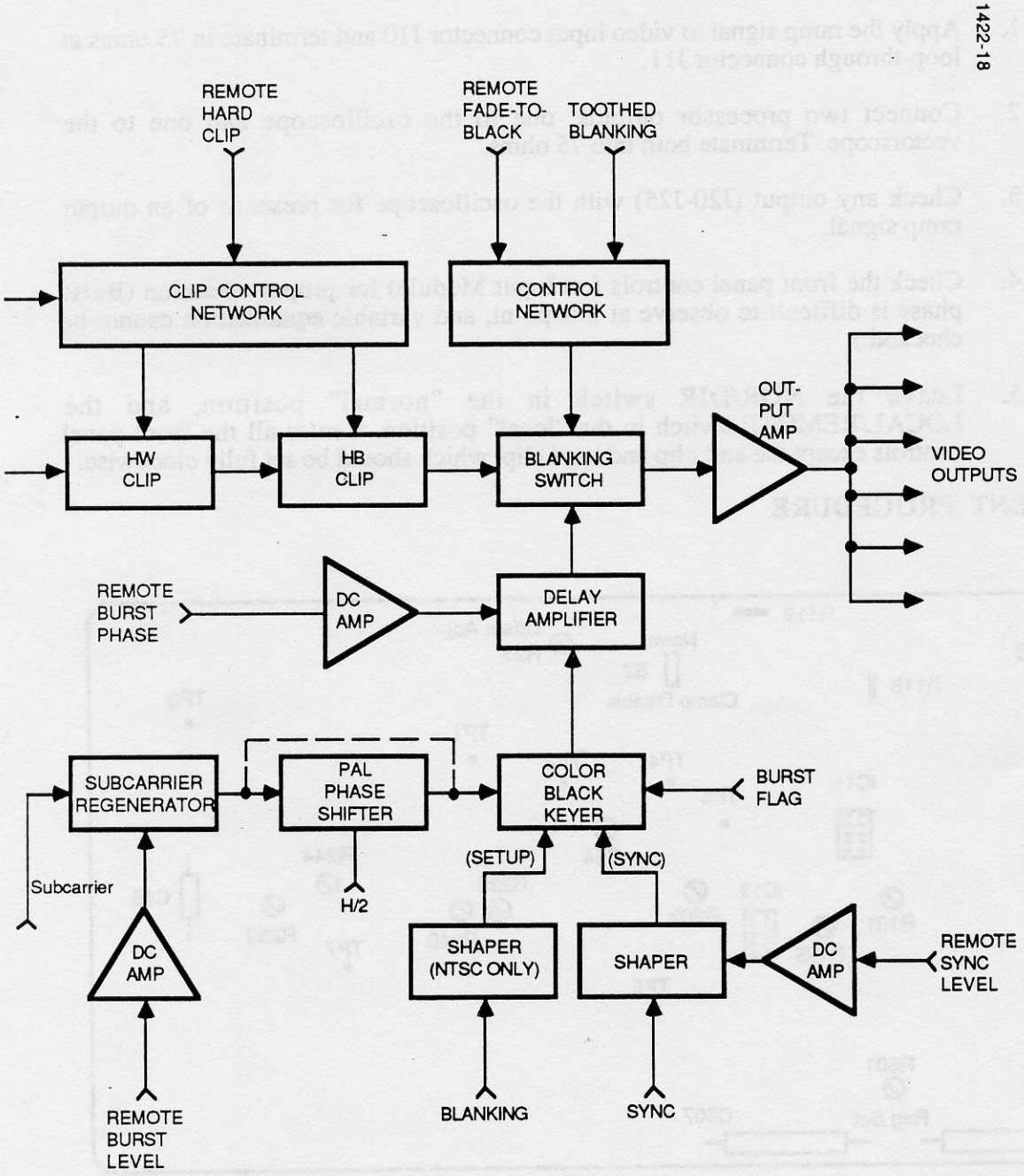


Figure 1. Output Module Block Diagram

Preliminary Conditions

Step 1. Apply the ramp signal to video input connector J10 and terminate in 75 ohms at loop-through connector J11.

Step 2. Connect two processor outputs, one to the oscilloscope and one to the vectorscope. Terminate both into 75 ohms.

Step 3. Check any output (J20-J25) with the oscilloscope for presence of an output ramp signal.

Step 4. Check the front panel controls (on Input Module) for proper operation (Burst phase is difficult to observe at this point, and variable equalization cannot be checked.)

Step 5. Leave the NOR/DIR switch in the "normal" position, and the LOCAL/REMOTE switch in the "local" position. Center all the front panel controls except the soft clip and hard clip, which should be set fully clockwise.

ALIGNMENT PROCEDURE

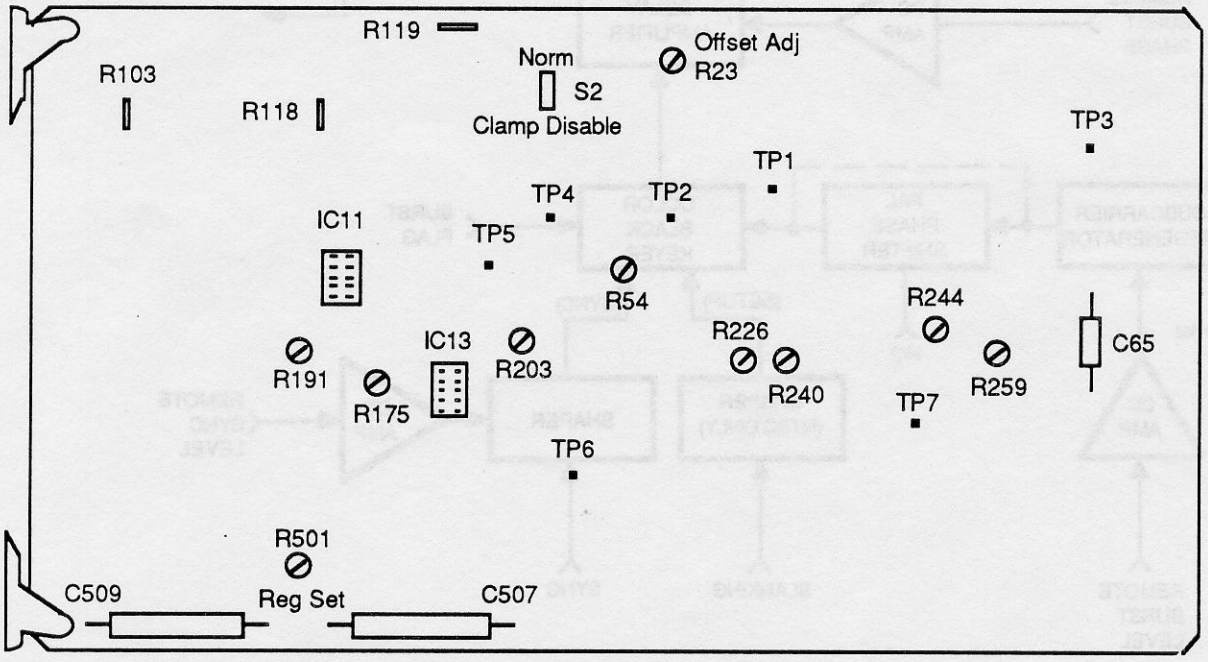


Figure 2. 3240 Output Module Component Location

Step 1. Connect a digital voltmeter to the +10 volt test point. Adjust trimpot R501, REG SET, to +10 volts.

Step 2. Check the -10 volt test point. It should be -10 V ± 0.05 V.

Step 3. Temporarily connect a 10 ohm resistor across C507. The +10 volt supply should drop to 1 V to 2 V, and the -10 volt supply should drop to -1 V to -2 V. Remove the resistor.

Step 4. Temporarily connect the 10 ohm resistor across C509. The +10 volt supply should drop to 1 V to 2 V, and the -10 volt supply should drop to -2 V to -3 V. Remove the resistor. Perform the following internal voltage regulator checks:

Step 5. Check the voltage at IC11, pin 1. It should be +0.7 volts ± 0.1 volts.

Step 6. Check the voltage at IC11, pin 7. It should be +5 volts ± 0.05 volts.

Step 7. Check the voltage at IC11, pin 8. It should be +1.3 volts ± 0.1 volts.

Step 8. Check the voltage at IC11, pin 14. It should be -3 volts ± 0.05 volts.

Perform the following test point 1 measurements:

Step 9. Apply a modulated ramp input signal to the processor, and check the waveform at test point 1. Set the NORMAL/DIRECT switch on the Input Module's front panel to DIRECT mode.

Step 10. Adjust the Input Module's front panel VIDEO GAIN to +2 V p-p. Blanking and sync levels should be approximately 0 V and -0.6 V, respectively.

Step 11. Change the input test signal to a black picture. Set the CLAMP DISABLE switch, S2, to NORM mode. Expand the vertical sensitivity to 0.1 V/cm. Adjust R23, OFFSET ADJ, for 0 V at blanking level.

Step 12. Set S2 to CLAMP DISABLE. The blanking level should be 0 V ± 0.2 V. Return S2 to NORM mode.

Step 13. Set the Input Module's front panel processor to NORMAL mode . Rotate the SETUP control from minimum to maximum. The setup voltage should vary approximately ± 0.3 volts. Return the Input Module's front panel SETUP control to the blanking level.

Perform the following test point 2 measurements:

Step 14. Set S1 (Forced Set Up) to "-". Apply a modulated ramp test signal (without setup of its own) to test point 2. The video level should be 1.4 V p-p.

Step 15. Scope test point 2 and adjust the Input Module's front panel SOFT CLIP control (Input Module) to the point where clipping on white just begins. Clipping should occur at approximately the one o'clock position.

Step 16. Set the Output Module's front panel FORCED SETUP switch, S1, to + for NTSC and PAL-M or - for PAL, and adjust the Output Module's front panel FORCED SETUP ADJ, R78, to +0.107 volt for NTSC and PAL-M (-0.107 volt for PAL) on black peaks.

Perform the following test point 3 measurements:

Step 17. Measure the voltage at test point 3. The burst amplitude should be 0.6 V p-p with the Input Module's front panel Input Module's front panel CHROMA GAIN control near mid setting. This CHROMA GAIN control setting should cause the burst level to be approximately 0.3 to 1.0 V p-p. Set the burst level to 0.6 V p-p. The dc voltage should be 0 V ± 0.5 V.

Perform the following test point 4 measurements:

Step 18. Measure the voltage at test point 4. The voltage should be the summation of test points 2 and 3, inverted.

Step 19. Set the Input Module's front panel processor to DIRECT mode and adjust R54 to 0 volts at blanking level.

Perform the following test point 5 measurements:

Step 20. At test point 5, the blanking level should be 0 V ± 0.05 V (DIRECT mode).

Step 21. Readjust R54 for 0 volts. Set the Input Module's front panel processor to NORMAL mode. Insert a 100% saturated color bar waveform. Set the Input Module's front panel HARD CLIP control fully clockwise. The chroma should pass unclipped.

Step 22. Turn the Input Module's front panel HARD CLIP control counter-clockwise and note that the hard white clipper will not overtake the soft white clipper. The hard black clipper may continue down to approximately +0.2 volts p-p.

Step 23. Note that vertical sync is allowed to pass at approximately half amplitude; however, horizontal sync is completely removed.

Step 24. Turn the Input Module's front panel SOFT CLIP and HARD CLIP controls fully clockwise. Perform the following test point 6 measurements:

Step 25. Measure the voltage at test point 6. Adjust R203 to set blanking at 0 volts.

Step 26. Remove the plug-in oscillator from the Color Lock Module. Display the back porch area where burst should be. Adjust R191 so the dc axis of burst is the same as blanking. Adjust R175 for a minimum glitch at the burst start and stop areas. The peak of the glitch should not exceed 14 millivolts. Replace IC13, if necessary, to reduce the glitch amplitude.

Step 27. Replace the oscillator on the Color Lock Module. Rotate the Input Module's front panel BURST LEVEL control on the Input Module. The burst level should vary from about 0.3 to 0.9 volts p-p. Set the level to 0.6 volts p-p.

Step 28. Rotate the Input Module's front panel SYNC LEVEL control. The sync level should vary from about 0.3 to 0.9 volts p-p. Set the level to 0.6 volts p-p.

Step 29. PAL: Note that the black clip level is -0.107 volts at test point 6 by looking at clip level on sync. NTSC and PAL-M: Note that the setup level is 0.107 volts.

Step 30. Check the sync rise time. It should be 140 ns ± 20 ns for NTSC and PAL-M or 250 ns ± 20 ns for PAL.

Step 31. Check the burst envelope rise time (with unlocked subcarrier). It should be 300 ns ± 50 ns. Perform the following test point 7 measurements:

Step 32. Set the Input Module's front panel processor to the DIRECT mode. Monitor the waveform at test point 7. Adjust R244 to place blanking at 0 volts.

Step 33. Set the Input Module's front panel processor to the NORMAL mode . Adjust R226 to place blanking at 0 volts.

Step 34. PAL: Set the input signal to a black picture. Adjust R240 for the smallest glitch at the end of blanking. NTSC and PAL-M: Set the input signal to a black picture. Set the Output Module's front panel FORCED SETUP (S1) to -. Adjust R240 for the smallest glitch at end of blanking.

Perform the following output signal measurements:

Step 35. Display the output signal on a waveform monitor.

Step 36. Set the input test signal to a modulated ramp. Turn the Input Module's front panel SOFT CLIP and HARD CLIP controls fully clockwise. Remove the Input Module and Sync Generator Module. Temporarily adjust R244 for a dc output voltage of 0 volts. Adjust R259 for 100 millivolts across C65 (19.2 milliamps idle current).

Step 37. Replace the Input Module and Sync Generator Module. Adjust R244 for 0 volts at blanking on the output signal.

Step 38. Measure the differential phase and gain with all outputs loaded. These must be less than 0.25 degree and 0.5%, respectively. Typically they will be 0.1 degree and 0.1%, respectively.

Step 39. Remove all loads except one. Repeat the measurement. It should still be within the above limits.

Step 40. On NTSC and PAL-M systems, return the Output Module's front panel FORCED SETUP (S1) to the + position. (On PAL systems leave the FORCED SETUP on the - position, and continue with the following steps.)

Step 41. Jumper the +10V test point to the cathode of D35 (just left of +10V). The fade-to-black LED on the Output Module's front panel should light, the relay should click, and the output should fade-to-black. Remove jumper.

Step 42. On the Input Module's front panel switch to NORMAL mode. Viewing the vectorscope, center the burst phase control range on the Input Module.

Step 43. On the Input Module's front panel switch to DIRECT mode. Adjust the phase on the vectorscope to zero, and switch to NORMAL. Adjust C40 on the Output Module to re-zero (normal burst phase.)

(NOTE: This should be done only if different ratio from factory is desired.)

Step 44. Set the white soft clip, using the SOFT CLIP front edge control on the Input Module, to the value it will normally be set to.

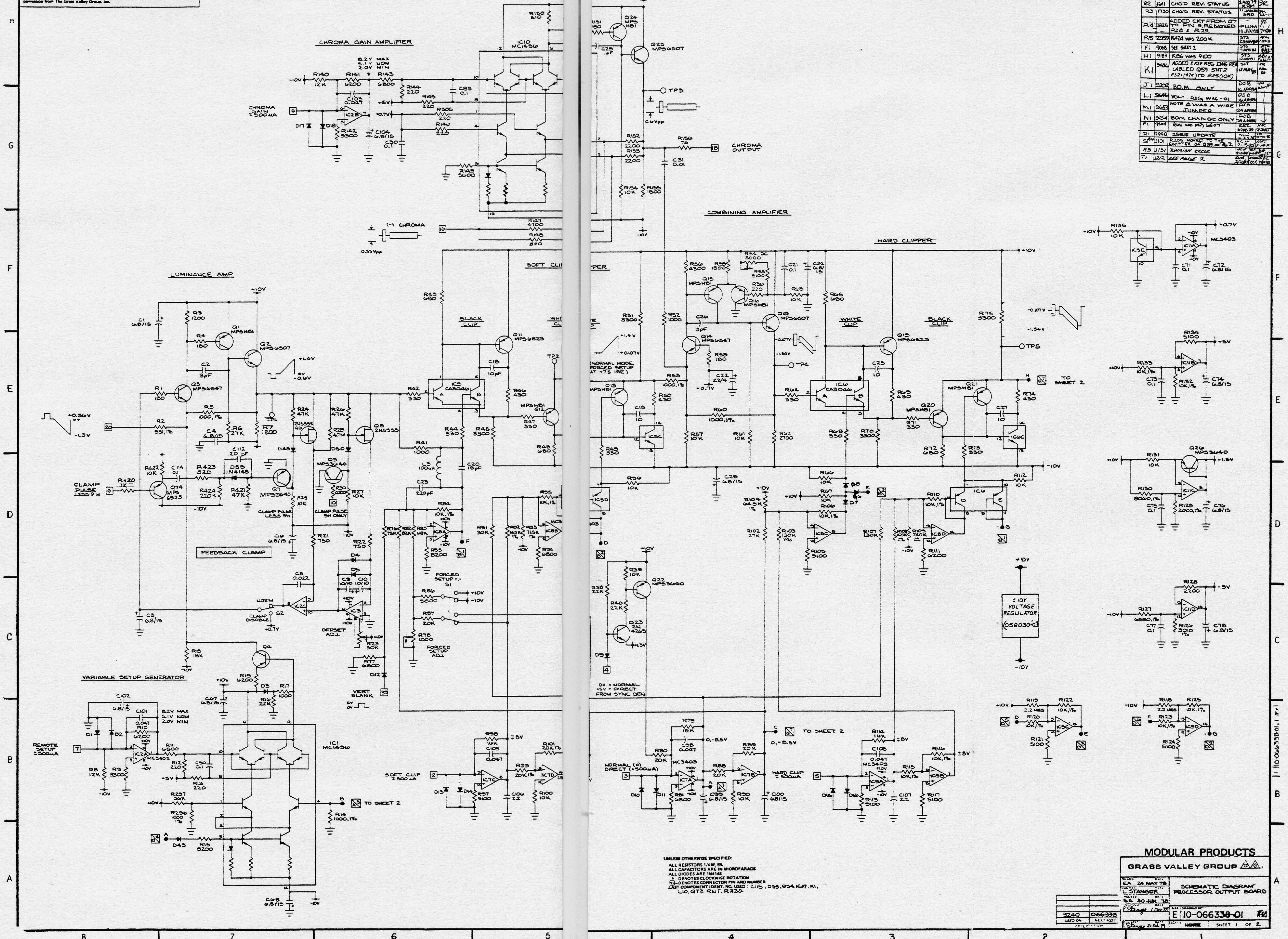
Step 45. Adjust the Output Module's front panel FORCED SETUP (S1) and FORCED SETUP ADJ (R78) controls to produce the desired black luminance clip.

Step 46. Adjustment of hard white or black clip closer to soft clip, than 70 millivolts (approximately), is made by R119 for white and R118 for black. To reduce separation, increase the resistance value R119 or R118.

Step 47. To have the hard clip overtake the soft clip, connect R118 or R119 to the opposite 10 volt supply.

Step 48. After adjustment of hard and soft clip separation has been made, adjust the Input Module's front panel hard clip control until desired black hard clip value is reached.

Step 49. Without changing the hard clip adjustment change the value of R103 to produce the desired white hardclip.



REVISIONS NOT LISTED DO NOT APPLY TO THIS SHEET. SEE SHEET 1 FOR REVISION STATUS OF SHEETS.

SYM	ECO	DESCRIPTION	BY/DATE	APP.
R1	1581	ADDED R29 & R30	[illegible]	[illegible]
R2	1641	CHG'D REV. STATUS	1 AUG 79 KRM	[illegible]
R3	1730	CHG'D REV. STATUS	11 JAN 80 SRD	[illegible]
R4	1825	ADDED CKT FROM Q7 TO PIN 9. REMOVED R28 & R29.	PLUM 10 JULY 80	[illegible]
R5	2059	R424 was 200K	STS [illegible]	[illegible]
F1	9068	SEE SHEET 2	STS [illegible]	[illegible]
H1	9183	R86 WAS 9100	STS 10 NOV 81	[illegible]
K1	9486	ADDED ±10V REG DWG REF LABLED Q59 SHT 2 R521(47K) TO R25(10K)	SJT 12 MAY 85	[illegible]
J1	9202	B.O.M. ONLY	DJB [illegible]	[illegible]
L1	9646	VOLT REG WAS -01	DJB [illegible]	
M1	9653	NOTE △ WAS A WIRE JUMPER	DJB 24 APR 84	
N1	9254	BOM CHANGE ONLY	DJB 24 APR 84	
P1	[illegible]	Q66 was MPS6507	[illegible]	[illegible]
R1	9990	ISSUE UPDATE	NCW [illegible]	[illegible]
S1	J101	R209 MOVED TO THE EMITTER OF Q39 ON PG. 2	N.C.W. 8-19-95	[illegible]
R3	J131	REVISION ERROR	[illegible]	[illegible]
T1	J212	SEE PAGE 2	[illegible]	[illegible]

UNLESS OTHERWISE SPECIFIED:

- ALL RESISTORS 1/4 W, 5%
- ALL CAPACITORS ARE IN MICROFARADS
- ALL DIODES ARE 1N4148
- ↑ DENOTES CLOCKWISE ROTATION
- [21] — DENOTES CONNECTOR PIN AND NUMBER
- LAST COMPONENT IDENT. NO. USED: C115, D55, Q54, IC87, K1, L10, Q73, RN1, R430

MODULAR PRODUCTS

GRASS VALLEY GROUP

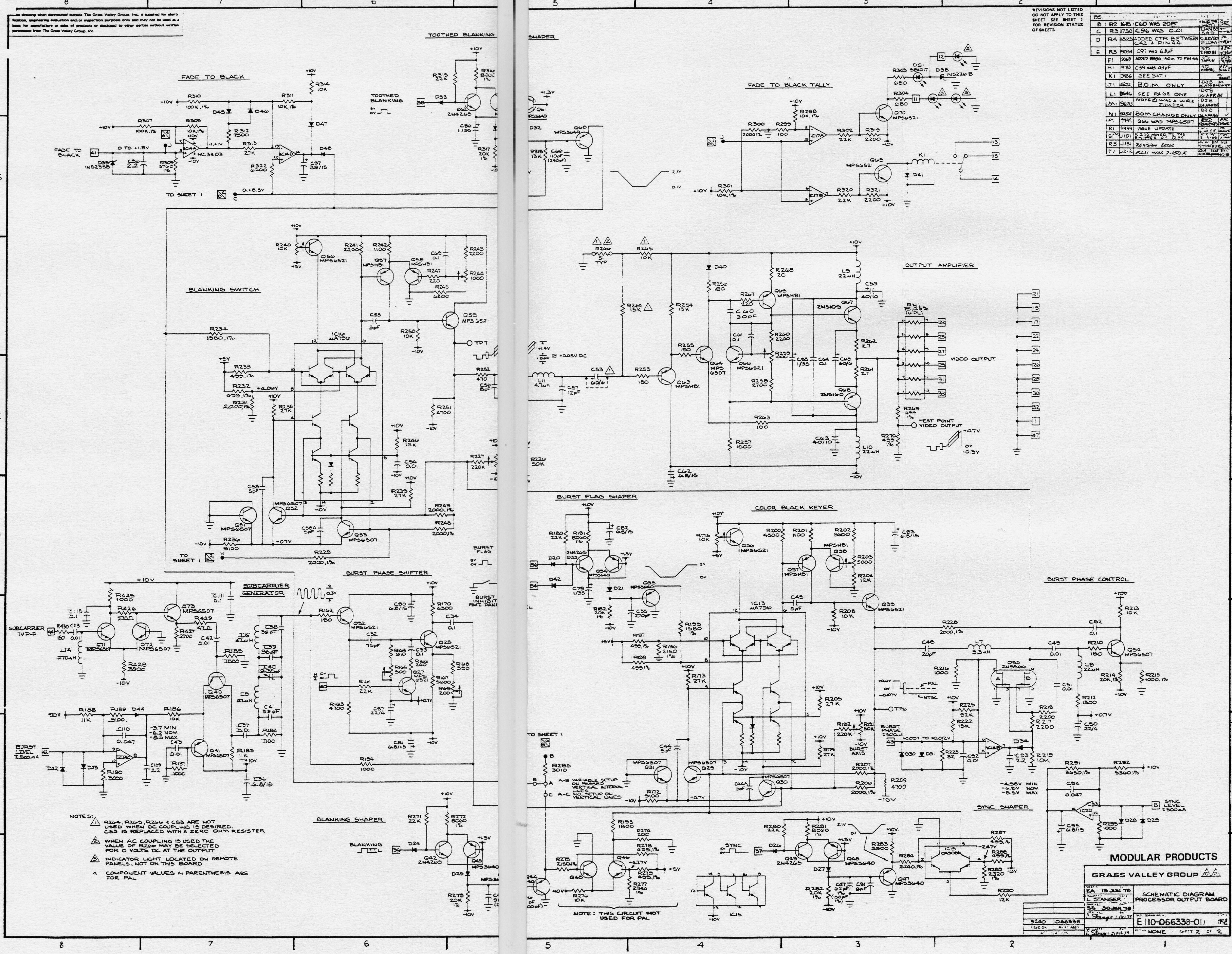
SCHEMATIC DIAGRAM PROCESSOR OUTPUT BOARD

DRAWN: EA 24 MAY 78
ENGINEER: L STANGER
CHECKED: SS 30 JUN 78

3240 | 066338
USED ON | NEXT ASSY

SIZE E DRAWING NO. 10-066338-01

SCALE NONE SHEET 1 OF 2



FADE TO BLACK
TOOTHED BLANKING
SHAPER
FADE TO BLACK TALLY
BLANKING SWITCH
OUTPUT AMPLIFIER
VIDEO OUTPUT
TEST POINT VIDEO OUTPUT
BURST FLAG SHAPER
COLOR BLACK KEYER
BURST PHASE SHIFTER
SUBCARRIER GENERATOR
BURST PHASE CONTROL
BLANKING SHAPER
SYNC SHAPER
TO SHEET 1
SUBCARRIER 1VP-P
BURST LEVEL
SYNC LEVEL
NOTES:
1. R264, R265, R266 & C53 ARE NOT USED WHEN DC COUPLING IS DESIRED. C53 IS REPLACED WITH A ZERO OHM RESISTER
2. WHEN AC COUPLING IS USED THE VALUE OF R266 MAY BE SELECTED FOR 0 VOLTS DC AT THE OUTPUT
3. INDICATOR LIGHT LOCATED ON REMOTE PANELS, NOT ON THIS BOARD
4. COMPONENT VALUES IN PARENTHESIS ARE FOR PAL
NOTE: THIS CIRCUIT NOT USED FOR PAL
REVISIONS NOT LISTED DO NOT APPLY TO THIS SHEET. SEE SHEET 1 FOR REVISION STATUS OF SHEETS.
B R2 1615 C60 WAS 20PF
C R3 1730 C96 WAS 0.01
D R4 1825 ADDED CTR BETWEEN C42 & PIN 44
E R5 9034 C97 WAS 6.8pF
F1 9068 ADDED R430, 150Ω TO PIN 44
H1 9183 C39 WAS 43pF
K1 9486 SEE SHT 1
J1 9202 B.O.M. ONLY
L1 9646 SEE PAGE ONE
M1 9653 NOTE 1 WAS A WIRE JUMPER
N1 9254 BOM CHANGE ONLY
P1 9949 Q66 WAS MPS6507
R1 9999 ISSUE UPDATE
S1 J101 R200 MOVED TO THE EMITTER OF Q39
R3 J151 REVISION ERROR
T1 J212 R231 WAS 2.150K
MODULAR PRODUCTS
GRASS VALLEY GROUP
EA 13 JUN 78
L STANGER
SS 30 JUN 78
SCHEMATIC DIAGRAM
PROCESSOR OUTPUT BOARD
3240
066338
USED ON
NEXT ASSY
APPLICATION
E 110-066338-01
NONE
SHEET 2 OF 2