Film-Tech

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ULTRA★STEREO™

35/70MM PROCESSORS

MODELS CS 110/200

TABLE OF CONTENTS

1. INTRODUCTION

The ULTRA-STEREO CS Series of sound processors have been designed for flexibility, reliability, and excellent performance. Modular construction allows the user to expand and update the capabilities of the unit. Each processor contains a dual power supply, backup optical preamp, and an emergency bypass button to keep the show going. Each plug-in module is fused to prevent a shutdown of the entire processor due to the failure of a single module.

The alignment of the processor has been considerably simplified. No extender cards or special modules are required to make adjustments. The built-in meters and test jacks give the technician immediate information and access to all inputs and outputs of the individual plug-in modules in the processor.

All controls necessary for daily operation of the processor are easily accessible on the front panel. In addition the front cover is made of a transparent plastic to permit visual monitoring of all internal meters and indicator lamps.

The components are of computer grade for reliability; many have precision tolerances to insure long-term stability of the processor.

SECTION 2

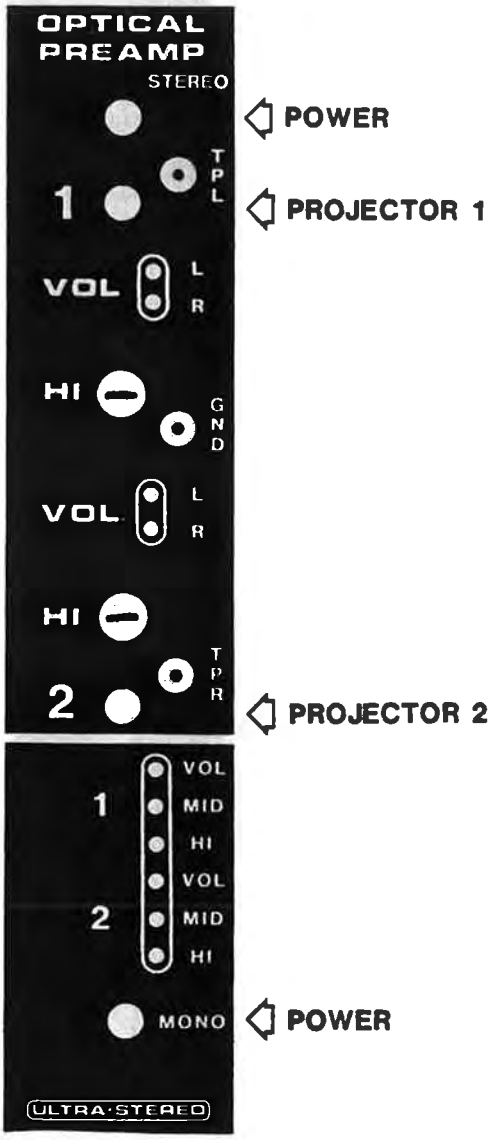
SPECIFICATIONS

SECTION 3

DESCRIPTION OF MODULES

3.2 OPTICAL PREAMP CARD

This module is divided into two separate sections, each indivually fused so that a failure in one section will not disable the other. Input transformers are used to isolate the sensitive input circuitry and prevent hum pickup from ground loops. The preamp accepts stereo cell inputs from two projectors and will switch from machine "1" to "2" when the change-over circuitry is grounded.

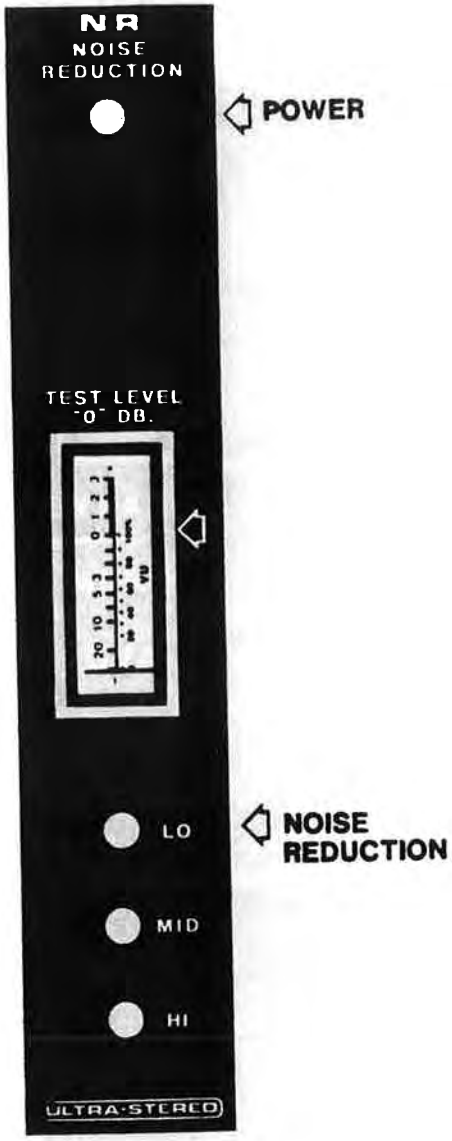


The top section is the stereo preamp. L.E.D. lamps indicate power and "1" or "2" (the projector in use). Test jacks are included for aligning left and right channels. Adjustments are provided for each projector to set volume levels and high frequency response. The single "HI" slit loss compensation control raises 6 KHZ to 12 KHZ frequencies of both channels equally without introducing any phase shifts which would produce distortion in the center (dialog) channel.

The bottom section is the mono preamp. Controls are provided to adjust volume and mid and high frequency equalization for each projector to match the Academy playback standard.

3.3 NR CARD

The ULTRA-STEREO noise reduction card is a special circuit that accurately decodes the information on the soundtrack. It is an open loop, three band expander unlike the closed loop, four band compressor circuit used by Dolby Laboratories.



L.E.D. lamps indicate power and operation of the low, mid and high frequency bands of noise reduction. When the signal in a particular band is sufficiently strong the lamp will light, indicating that the signal is in the expander range. A steadily lit lamp means the signal is expanded a full 10 DB and that there is NO NOISE REDUCTION. A VU meter indicates the exact reference level (50% modulation) for calibration.

There are four slots for these modules, corresponding to left, center, right, and surround channels. The left and right channel modules are used for 35mm optical and all four are used for 35/70MM magnetic films.

3.4C 70MM FORMAT CARD-Standard

All inputs and outputs are routed through the FORMAT card. Pushbutton switches select the mode of operation ("MONO", "SVA", etc.) and a master fader controls the processor output. Six integrated circuit line amplifiers are included to drive 600 ohm loads to +23 DB.

An L.E.D. lamp indicates the circuit is operational. A VU meter, test jack, and rotary switch comprise the built-in test and alignment facility. The rotary switch positions are as follows: 1, 2, 3, 4, 5, 6 (corresponding to MAGNETIC INPUTS, NOISE REDUCTION card outputs, MONO OPTICAL PREAMP outputs, and SVA outputs depending upon pushbutton selection). The remaining switch positions (L, Le, C, Re, R, S) correspond to the line outputs of the processor.

The emergency "BYPASS" button is used with either "MONO" or "MAG" buttons. Pressing "BYPASS" AND "MONO" routes the mono output of the OPTICAL PREAMP through the master fader and directly to the center channel output terminal.

3.4C Continued

Pressing "BYPASS and "MAG" routes the L, C, R, S magnetic preamp inputs through the master fader and directly to the output terminals.

MONO" routes the mono output of the OPTICAL PREAMP through the HOUSE EQ CARD, master fader, center channel line amp, and finally to the center channel output terminal.

"SVA" routes the output of the OPTICAL PREAMP through the left and right channel NOISE REDUCTION to the SVA card and from the SVA card to the HOUSE EQ card, master fader, and line amplifiers to the left, center, and right channel output terminals.

The "SURR" pushbutton switches on the surround channel only in "SVA" mode.

"MAG" routes the six external magnetic preamp inputs through the HOUSE EQ card, master fader, and line amplifiers to the L, Le, C, Re, R, and S channel output terminals.

"MAG NR" routes four of the six external magnetic preamp inputs through the L, C, R, S channel NOISE REDUCTION cards to the HOUSE EQ card, master fader, and line amplifiers to the L, C, R, S channel output terminals. The Le and Re inputs are routed to the 70MM EQ/FILTER card which normally rolls off audio information above 200 HZ and sends the signals to the on card four band equalizer, to the master fader and line amps to the Le and Re channel output terminals. It is possible to route Le and Re to external NOISE REDUCTION cards and back to the FILTER/EQ card.

Stereo N/SYNC (music) inputs are fed through a VCA fade-in circuit to four line outputs L, C, R, S. The non-sync level is NOT affected by the master fader and can be adjusted by the trimpot on the front of the FORMAT card.

3.4C Continued

(Note the sensitivity of these inputs is high so that some digital disc players will overload it. In this case add a 15k to 20K resistor in series with each input to lower the sensitivity.) The music fade-in is accomplished by connecting the "N/S FADE" terminal on the rear of the unit to an "E" terminal.

The master fader is a five gang control. The volume knob adjusts the electronic fader plus the four emergency "BYPASS" channels. There is also a subwoofer circuit which adds the five front channels and passes information between 20 and 50HZ to a terminal on the rear of the unit..

On the FORMAT 70 card there is a small DIP switch which sets the range of the remote fader. It is located on the rear edge of the piggy-back card. The switch settings are as follows:

SWITCH 1	SWITCH 2	REMOTE FADER RANGE
OFF	OFF	12DB
ON	OFF	24DB
OFF	ON	60DB
ON	ON	75DB

3.5B HOUSE EQ CARD-Octave

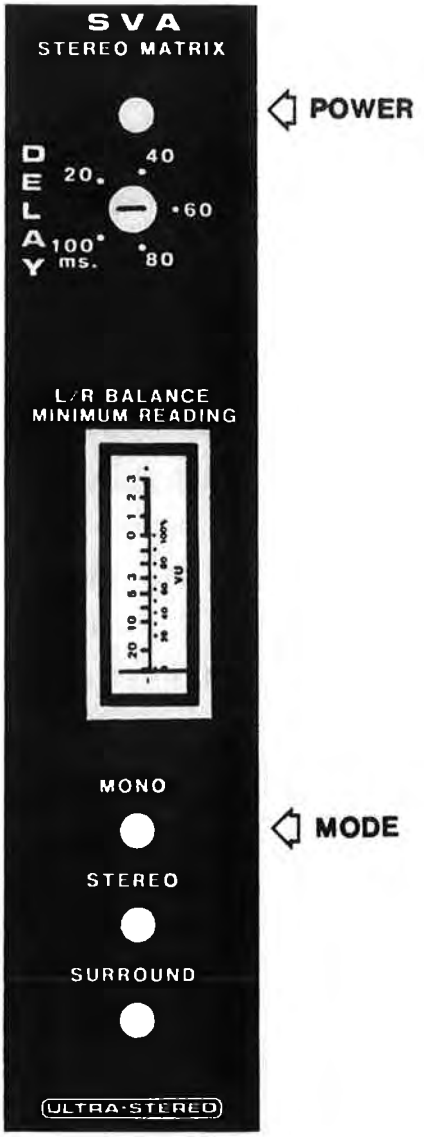
This module is a four channel room equalizer. Each front channel contains eight bands of adjustment. The rear channel has four bands of adjustment.

An L.E.D. lamp indicates the circuit is operational. The "LO" control boosts or cuts the low frequency response below 63HZ. The "HI" control boosts or cuts high frequencies above 4KHZ and compensates for screen losses and adjusts the high frequency response to match the standard room characteristic. The range of these controls is plus or minus 12 db.

There are six other controls for each of the front channels corresponding to standard octave band frequencies of 125, 250, 500, 1K, 2K, 4KHZ. The range of these controls is plus or minus 6 db.

3.6 SVA CARD

The SVA matrix card is designed to accurately decode the four channels of information (left, center, right, surround) from the two stereo optical tracks on the film. The module contains DC control circuitry, audio steering circuitry, and an adjustable delay line for the surround channel.



L.E.D. lamps indicate power, mono, stereo, and surround information. A VU meter is used to exactly balance the left and right optical preamp outputs. When the channels are exactly matched the meter will be at its lowest point, and the leakage of front dialog into the surround channel will be at a minimum.

The operation of the matrix is illustrated below.

INPUTS	MATRIX OUTPUTS(DB)			
	L	C	R	S
Left Only	0	-16	-40	-40
Center(L+R)	-12	+3	-12	-40
Right Only	-40	-16	0	-40
Surround(L-R)	-20	-40	-20	+3

3.7A 70MM EQ/FILTER (BOOM) CARD

The "Boom" card processes channels 2 and 4 otherwise known as Le and Re. It does the switching of filters in and out and permits connection of external noise reduction cards for DOLBY encoded 6 channel discrete prints. The boom card also contains four band house equalizers for these channels after they are processed through low pass filters or external noise reduction.

The modes of operation of this card are as follows:

OPTICAL-Takes a sum signal of left and right optical channel outputs through a 200 HZ filter with a 24db/octave cutoff to a dynamic expander to the on-card four band equalizers.

MAG-Feeds channels 2(Le) and 4(Re) from the external magnetic preamp inputs directly to the on-card four band equalizers.

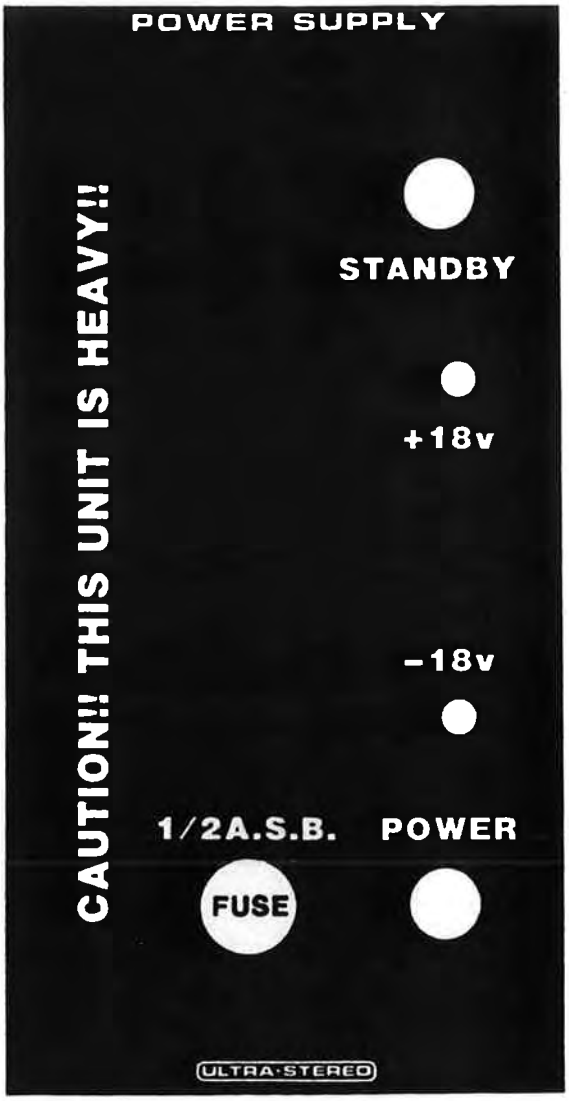
MAG 4-Feeds channels 2 and 4 from the external magnetic preamp inputs through 200HZ filters with 18db/octave rolloffs to the on-card four band equalizers.

MAG 6-Feeds channels 2 and 4 from the external magnetic preamp inputs to a rear terminal block for external noise reduction cards and back into the on-card four band equalizers.

Four volume pots allow setting of boom levels for magnetic and optical prints. These do not affect old 6 track discrete or DOLBY encoded 6 channel discrete prints. The two switches turn boom channels on and off in case there is a problem with a specific print, especially optical prints with a lot of low frequency noise. Please advise the projectionist to use the switches rather than turn down the boom level pots.

3.8 POWER SUPPLY

The power supply is a dual, heavy duty unit. There are no turn-on pops and thumps because the supply ramps up gently to +/-18 VDC in about five seconds. If the main supply fails, pressing the standby button will activate the backup circuitry. L.E.D. lamps indicate the +/-18 VDC power output. Internal fuses protect the power transformer in case one of the power supplies fail. The circuit has both short circuit and thermal protection as well.



SECTION 4

INSTALLATION AND ALIGNMENT

4.1 PRELIMINARY ALIGNMENT

(A) Clean the soundhead optics thoroughly. If the film guide rollers are worn replace them. Excessive side to side film weave will cause insurrmountable problems for the SVA circuitry.

(B) If the exciter lamp is old or blackened inside, replace it. Make sure the lamp is operating at a voltage greater than 60% of its rating.

(C) With a mono solar cell in the projector run the SMPTE BUZZ TRACK film and align the guide rollers.

(D) For stereo installations remove the mono solar cell and place a white card about an inch away from the sound lens. The image of the exciter lamp filament should look like figure 1. If necessary, raise or lower the lamp and move it in and out until the filament is centered in the spot of light.

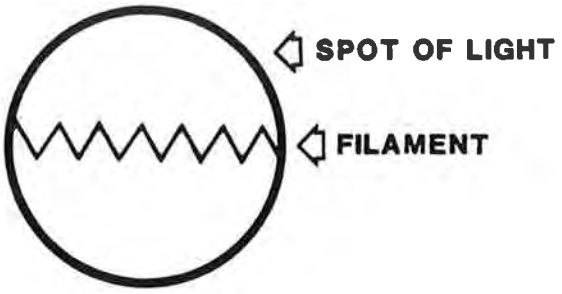


figure 1

4.2 ALIGNMENT OF SOLAR CELL AND PREAMP

(A) Mount the stereo solar cell on the projector and position the bracket so that the slit image hits the upper part of the cell. The cell should be approximately .040 inch behind the film such that the slit image just fills the cell width but DOES NOT SPILL OVER (figures 2 and 3).

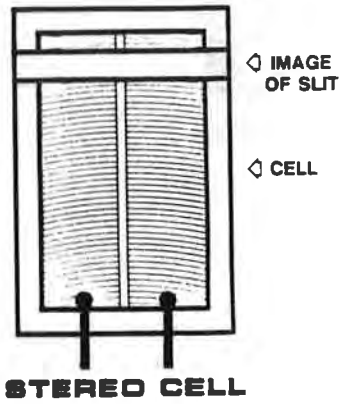


figure 2

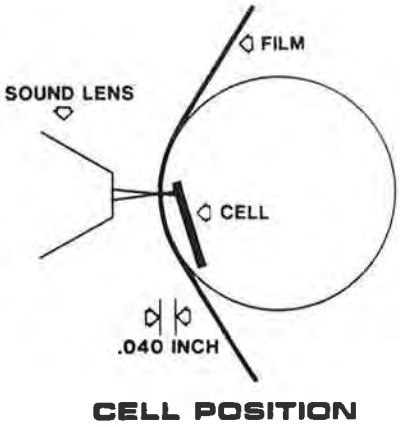


figure 3

(B) Connect a dual trace oscilloscope to the cell output leads(DO NOT connect these leads to the preamp yet). Thread and run the STEREO ALIGNMENT film #97. Move the cell in and out until the crosstalk is at a minimum on both channels (figure 4).

4.2 Continued

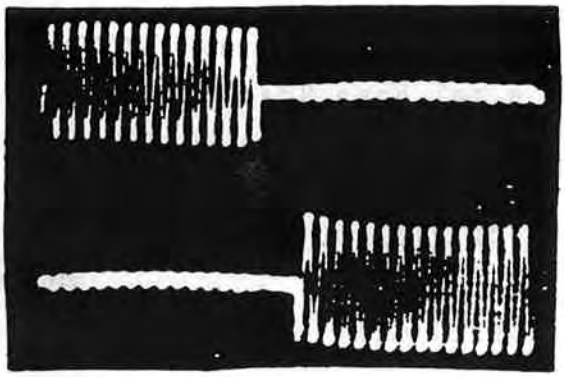


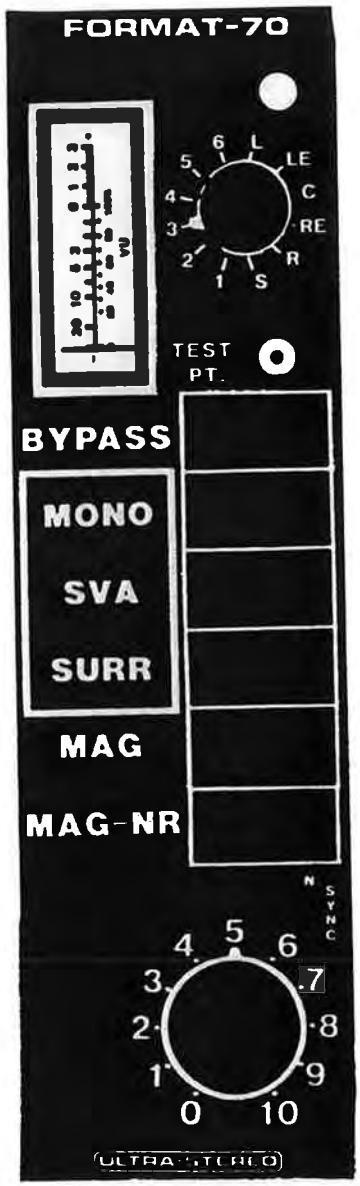
figure 4

(C) Install the audio line from the cell to the OPTICAL PREAMP. Use Belden #8404 four conductor cable or two 2 conductor cables. (A single two conductor shielded cable is not recommended.) Connect the lines to the terminal blocks marked OPT at the rear of the processor. Be sure the RED lead of the cell is connected to the left "L" and high "H" terminal and the GREEN cell lead is connected to the right "R" and high "H" terminal. The BLACK cell lead connects to the low (small "L") terminals of BOTH left and right channels.

If there are two projectors the changeover is accomplished by grounding the "X-OVER" terminal. Connect a latching relay so that one coil is powered by the 120 VAC dowser circuit of projector #1 and the other coil is powered by the dowser circuit of projector #2. The relay contacts must be connected to the "X-OVER" and "E" terminals so that the contacts are closed when projector #2 is operational.

4.2 Continued

(D) Run the DOLBY* TONE film #69. Press "SVA" and "SURR" switches on the FORMAT card. Adjust the left volume trimpot on the OPTICAL PREAMP card for a "0" VU reading on the left NOISE REDUCTION card meter.



Watch the right NOISE REDUCTION card meter and adjust the right trimpot on the OPTICAL PREAMP card for a "0" VU reading. Press the "MONO" button on the FORMAT card and move the rotary switch to "3" and adjust the volume trimpot on the mono (lower) section of the OPTICAL PREAMP for a "0" VU reading.

(E) Connect a dual trace oscilloscope to "TPL" and "TPR" the left and right channel test jacks on the OPTICAL PREAMP card. Thread the STEREO ALIGNMENT test film #97 again and double check the cell alignment.

4.2 Continued

(F) Connect a REAL TIME ANALYZER to the test jack on the FORMAT card and move the rotary switch to "L" (the left channel output of the OPTICAL PREAMP). Run the PINK NOISE side of the DOLBY* TONE film #69. With the "HI" control on the OPTICAL PREAMP fully counterclockwise, adjust the soundhead optics for the best high frequency focus and azimuth on the REAL TIME ANALYZER (figure 6) and the thinnest display on the oscilloscope (figure 7). Adjust the "HI" control on the OPTICAL PREAMP for flat response to 9 KHZ. Move the rotary switch on the FORMAT card to "R" and check the high frequency response of the right channel on the REAL TIME ANALYZER.

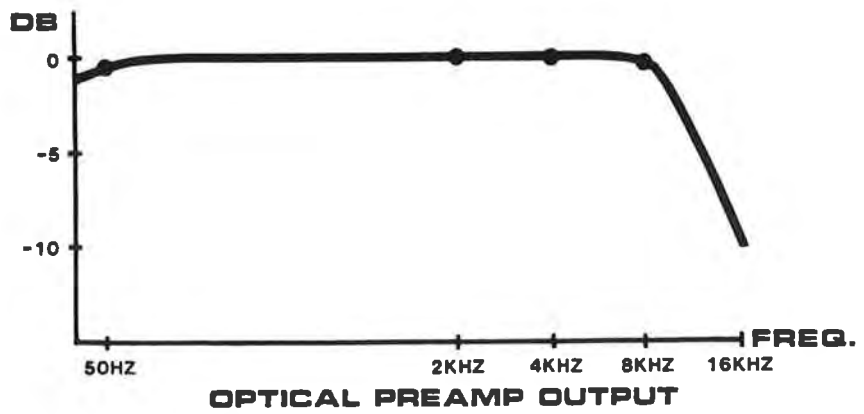


figure 6

* DOLBY is a trademark of Dolby Laboratories.

4.2 Continued

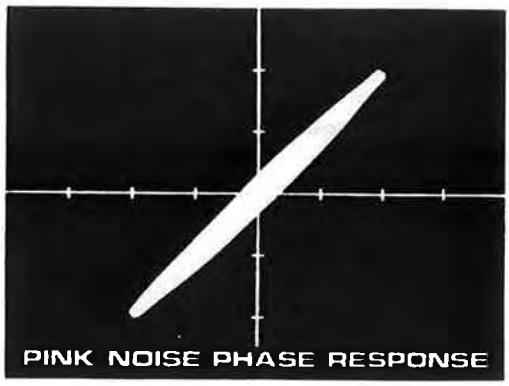


figure 7

If there is more than +/- 1 DB. level difference at 8 KHZ. check the azimuth again. Some old soundheads had the azimuth setting of the sound lens locked in the WRONG position, others used sound lenses whose slit varied in width from the left to the right side. If there is a radical difference in high frequency response between channels it may be necessary to replace the sound lens. The ULTRA-STEREO OPTICAL PREAMP has been designed for minimal phase shifts between channels so there are not individual high frequency controls on each channel.

(G) Move the rotary switch on the FORMAT card to "M" (the mono output of the OPTICAL PREAMP). Adjust the "HI" control in the lower mono section of the OPTICAL PREAMP for an -8 to -10 DB. reading at 8 KHZ. on the REAL TIME ANALYZER. Adjust the "MID" control and fine tune the "HI" control for the response in figure 8.

4.2 Continued

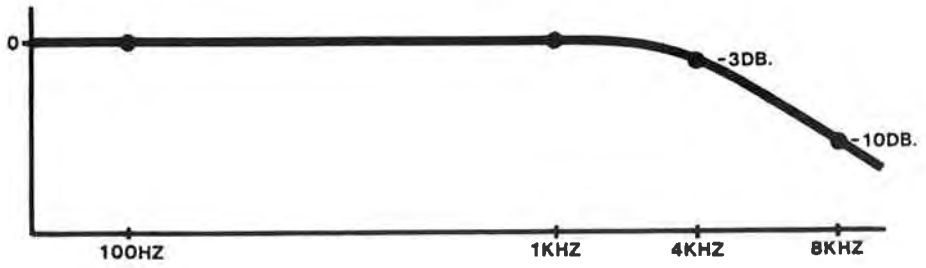


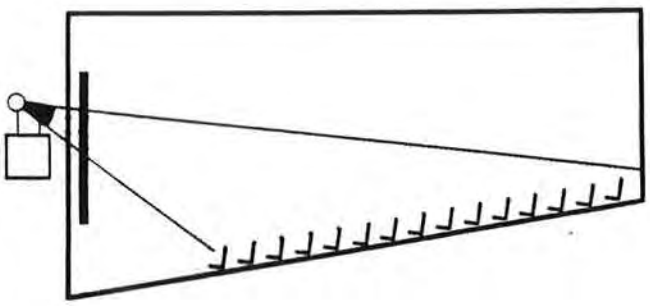
figure 8

This curve plus the auditorium rolloff approximately equals the standard Academy Curve.

4.3 SPEAKER PHASING AND HORN TILT

(A) In any multi-channel sound system the proper phasing of speakers is crucial. They must all work together to produce a total sound field. If one of the three front speakers is reversed in phase relative to the others some strange abberations will result. Also the low and high frequency drivers in each speaker system must be in proper phase. It is a good practice to feed PINK NOISE simultaneously to all front channel power amplifiers. Set all the amplifier gains about the same and walk around the theatre auditorium. A phase error will create a strange tunnel effect at the mid-point between front speakers. Reversing leads on one speaker should eliminate the problem.

(B) The crossover network is another potential problem area. The primary function of the adjustment on this network is to match the low frequency and high frequency horn outputs. Feed PINK NOISE into the power amplifier and use a REAL TIME ANALYZER to adjust the crossover control or tap for flat response in the mid band from 250 HZ to 2 KHZ.



(C) Check the tilt of the high frequency horn. If necessary, adjust it for good sound coverage throughout the theatre (figure 9).

figure 9

4.4 AUDITORIUM EQUALIZATION

(A) Connect the outputs of the processor to the power amplifiers. Make sure the volume controls on the power amplifiers are set at minimum.

(B) Lightly depress the buttons on the FORMAT card so that all of them release. When all the buttons are in the "OFF" position, test signals can be fed into the processor, through the HOUSE EQ card, master fader, line outputs, and out to the power amplifiers and speakers. Connect a PINK NOISE generator to the TEST JACK on the FORMAT card and move the rotary switch to "1". Adjust the PINK NOISE generator to "0" DB. output. Raise the master fader control on the FORMAT card to "7" on the scale. Increase the volume on the left channel power amplifier until an "85" DB. pressure level is reached in the center of the auditorium or mount the OUTPUT TRIMMER CARD on the back of the processor and adjust levels there with power amps at full volume.

(C) Adjust the controls on the HOUSE EQ card for the response in figure 10. Check that the response is similar (plus or minus 3 DB.) elsewhere in the auditorium. Reset the "85" DB. pressure level at the center of the auditorium. Move the rotary switch on the FORMAT card to "3" and repeat the equalization procedure for the center speaker. Follow the same procedure for channels "5" and "6". To adjust channels 2 & 4 you must TEMPORARILY connect the "MAG" automation terminal to "E". This removes the 200 HZ filters. Room equalization is done with the four band equalizer on the 70MM EQ/FILTER card; set for 85 db. Remove the automation jumper and set boom levels with the pots on the EQ/FILTER card.

4.4 Continued

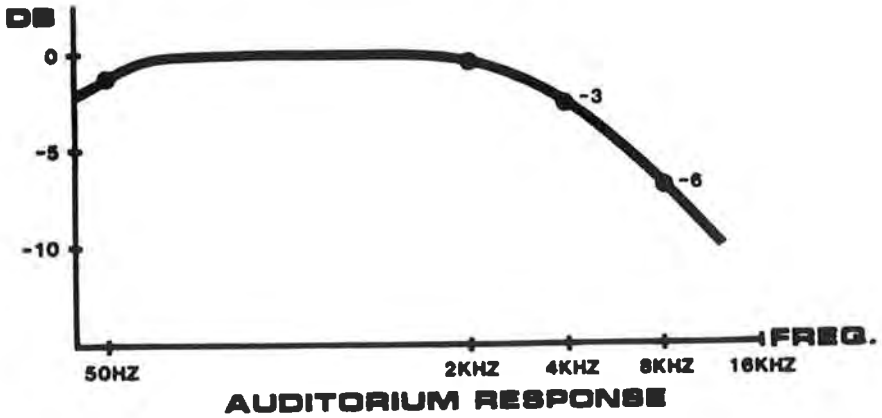


figure 10

4.5 ADJUSTMENT OF SVA CARD

(A) Run the DOLBY* TONE film and check the meter levels on the left and right NOISE REDUCTION cards with "SVA" and "SURR" pressed. They should be "O" VU. Fine adjust the right channel volume control on the OPTICAL PREAMP while watching the VU meter on the SVA card. Set the right channel volume control for a MINIMUM reading on the SVA meter. This procedure insures a perfect match between stereo channels and the MINIMUM leakage of front channel dialog into the surround channel.

(B) Set the DELAY according to the following formula:

LENGTH OF THEATRE - (WIDTH OF THEATRE/2) + 20 = DELAY

Note: All measurements are in feet.

* DOLBY is a trademark of Dolby Laboratories.

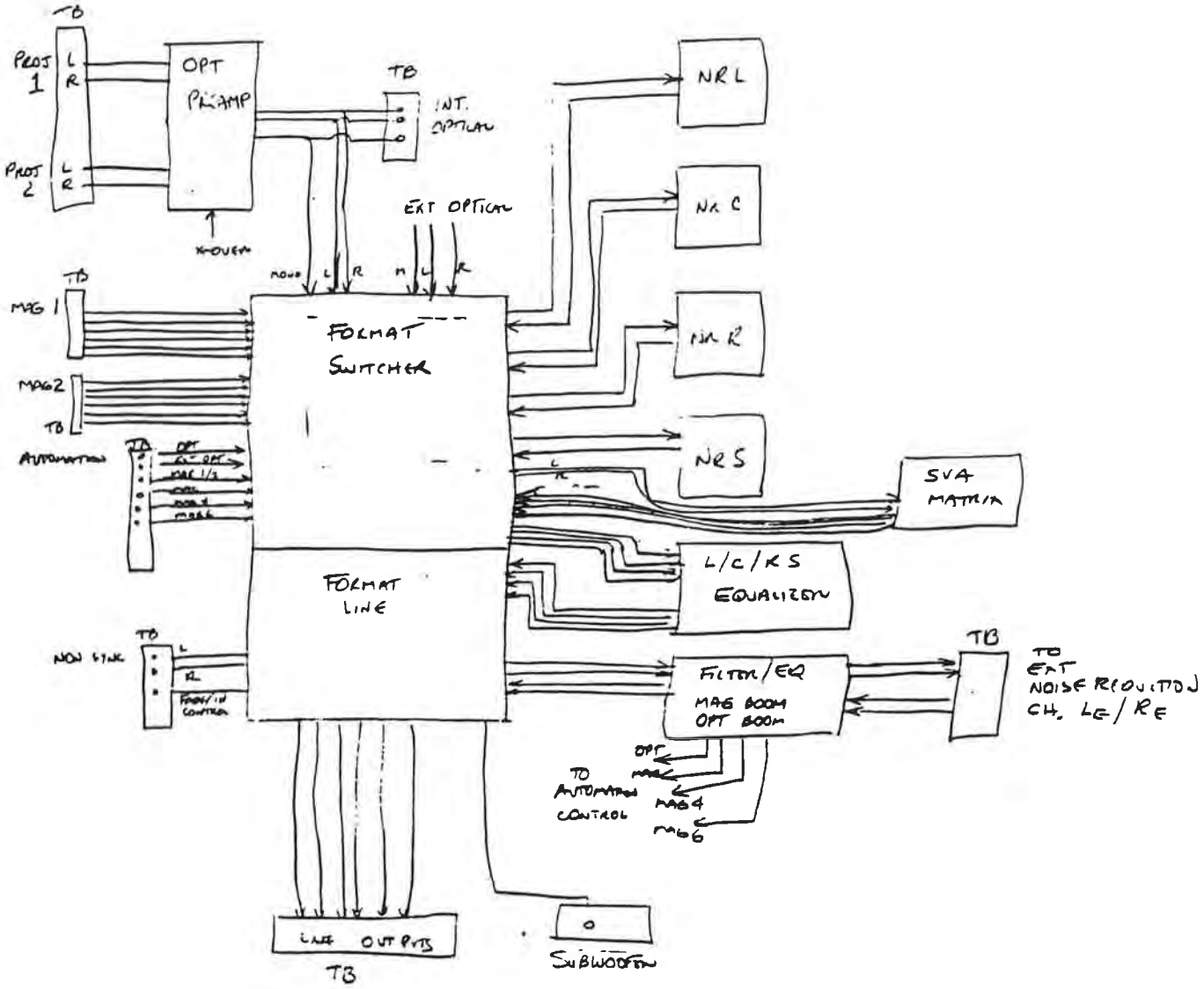
4.6 ADJUSTMENT OF 70MM MAG SYSTEM

With the external magnetic preamps connected to the "MAG 1" input terminal block on the rear of the unit press the "MAG" button on the FORMAT card. Move the rotary switch to "1". Set the preamp level for a "0" db. reading on the meter on the FORMAT card with a 70MM DOLBY TONE LOOP. Move the rotary switch to "2" and adjust level; repeat this procedure for the other channels.

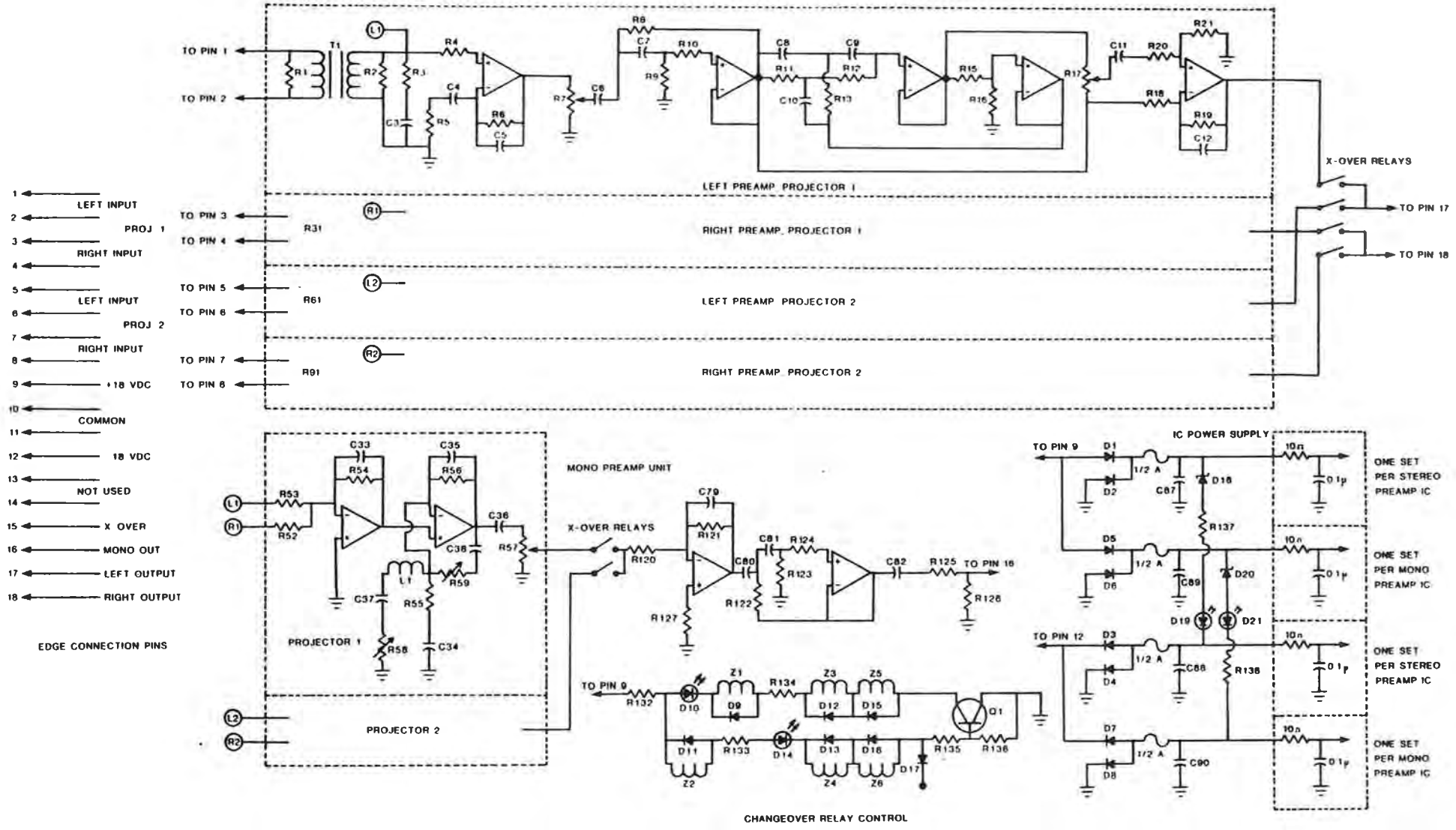
Move the rotary switch to "1" again and connect a REAL TIME ANALZER to the TEST JACK on the FORMAT card and adjust the preamp controls for a flat response with PINK NOISE FILM. Repeat this procedure, moving the rotary switch to "2" then "3" and so on.

4.7 NON/SYNC CONNECTION

The ULTRA-STEREO processors are set up for stereo non/sync (music) inputs. There is a level control on the front of the FORMAT card next to the master fader. The input impedance of the non/sync inputs is 15 K ohms and the sensitivity is 100 millivolts. Left and right channel non/sync information is mixed and fed to the center and surround channel outputs. The master fader DOES NOT affect the non/sync volume in the theatre. Every system contains a VCA FADE-IN circuit which is activated by connecting the N/S FADE terminal on the rear of the unit to an "E" terminal. Grounding the terminal fades in the music; disconnecting the terminal causes a fade out. Certain digital disc players have a high output so that it may overload the VCA. In this case it may be necessary to put 15K to 20K resistors in series with each of the Non/Sync inputs to reduce the sensitivity.



BLOCK DIAGRAM

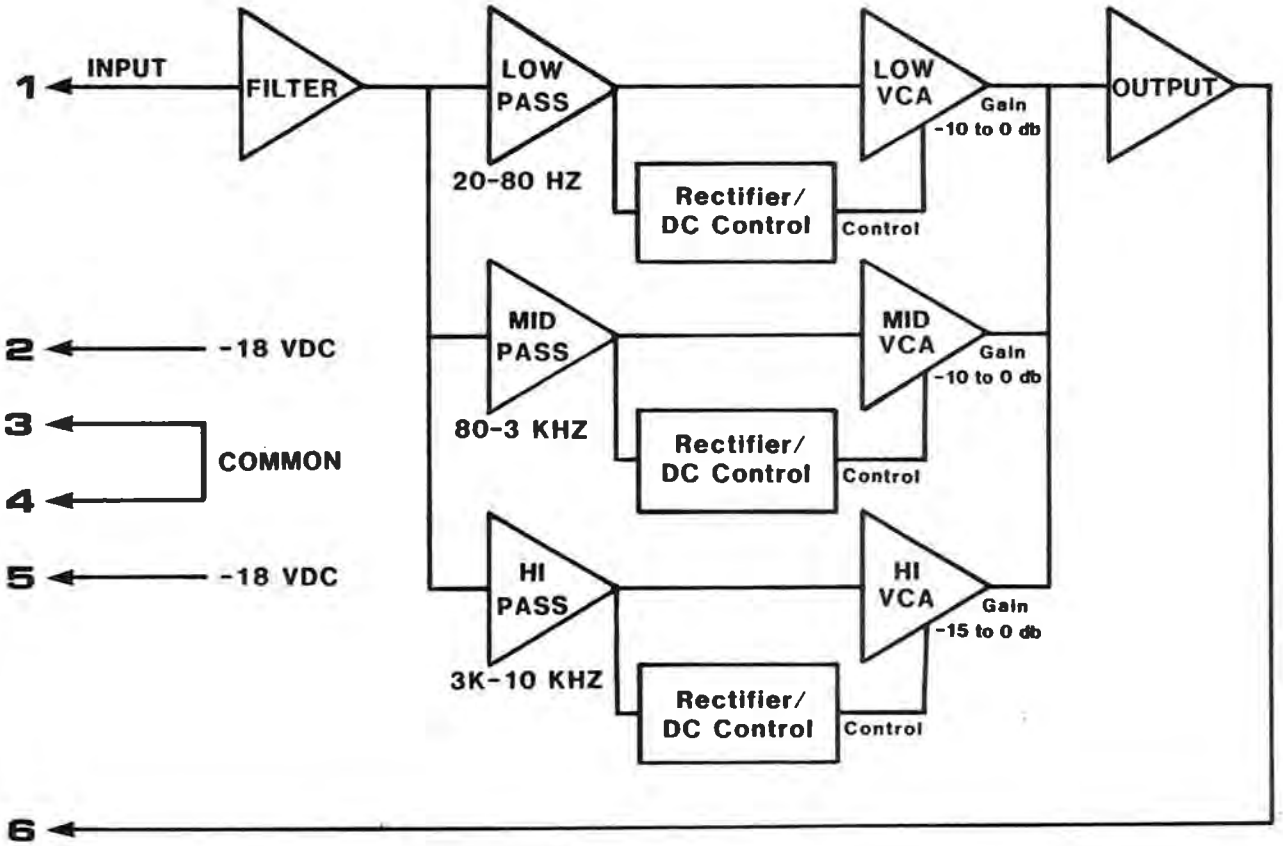


SCHEMATIC DIAGRAM

ULTRA★STEREO™ OPTICAL PREAMP OPT-02

ULTRA-STEREO LABS, INC.
N. HOLLYWOOD, CA.

7/23/83

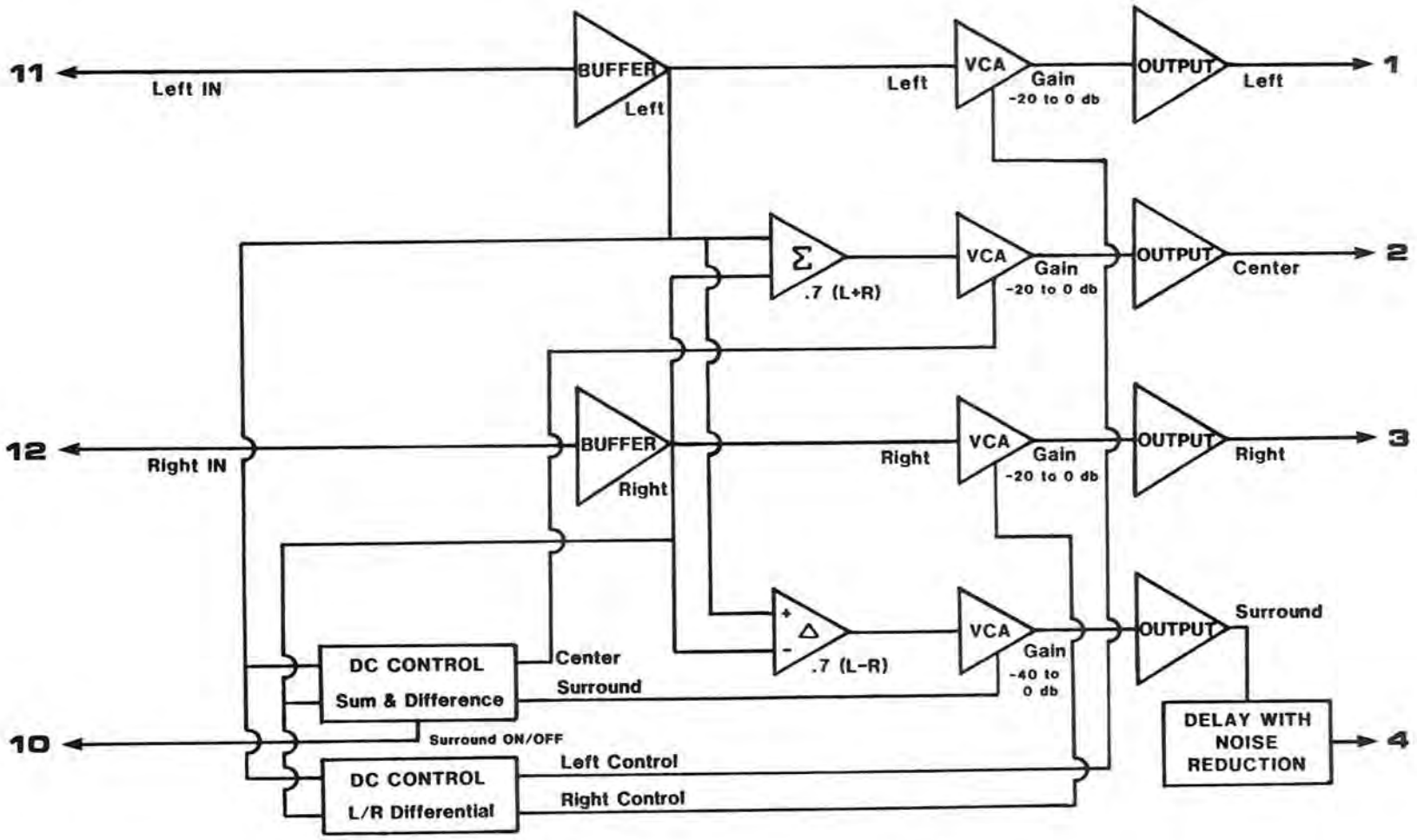


This circuit is PRECISELY calibrated at the factory and should NOT be field serviced. Replacement modules are immediately available from the factory.

ULTRA-STEREO LABS, INC.
N. HOLLYWOOD, CA.
6/9/83

BLOCK DIAGRAM

NOISE REDUCTION



6 ← +18 VDC

7 ← COMMON

8 ←

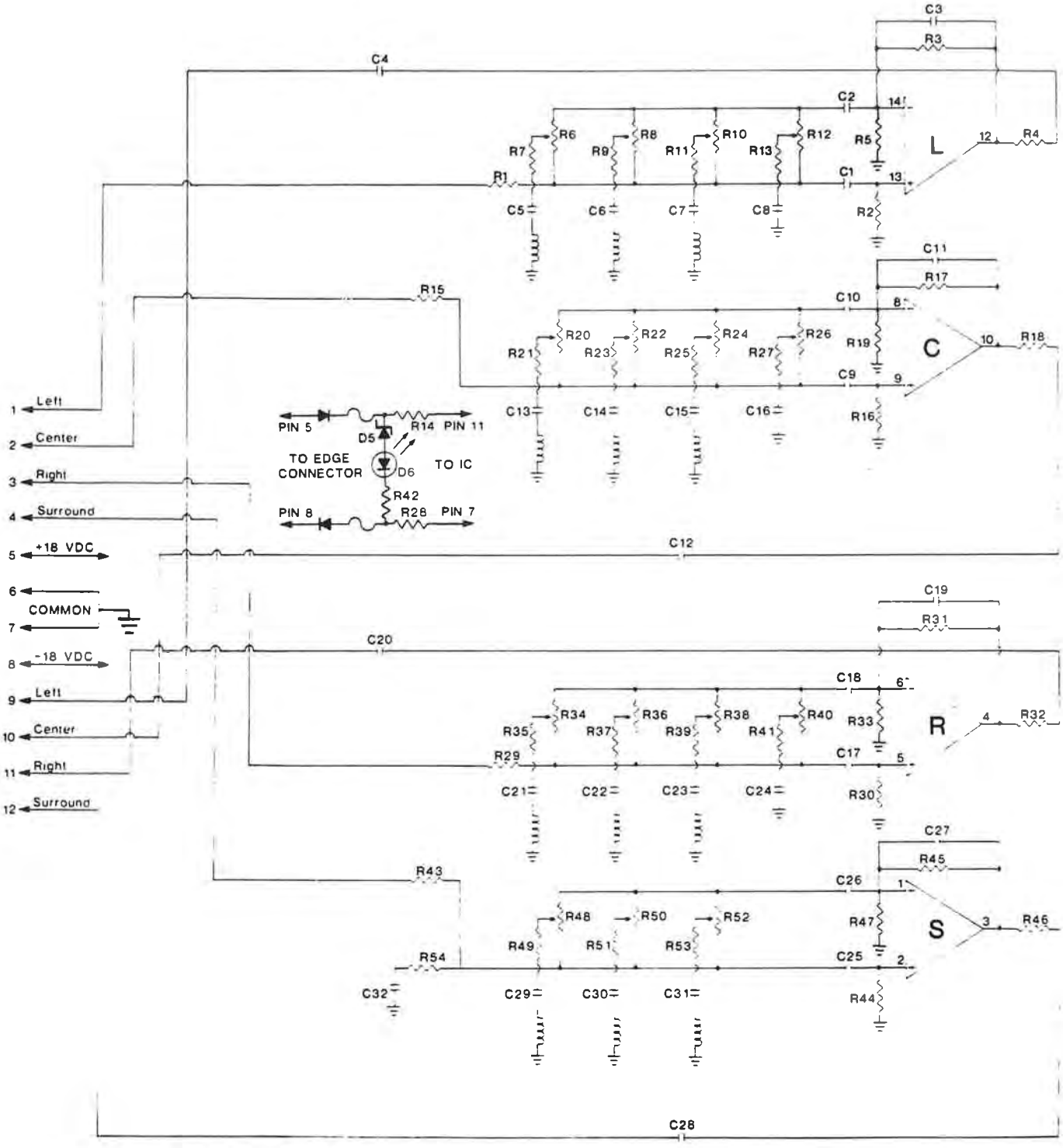
9 ← -18 VDC

BLOCK DIAGRAM

SVA MATRIX

This circuit is PRECISELY calibrated at the factory and should NOT be field serviced. Replacement modules are immediately available from the factory.

ULTRA-STEREO LABS, INC.
N. HOLLYWOOD, CA.
6/9/83

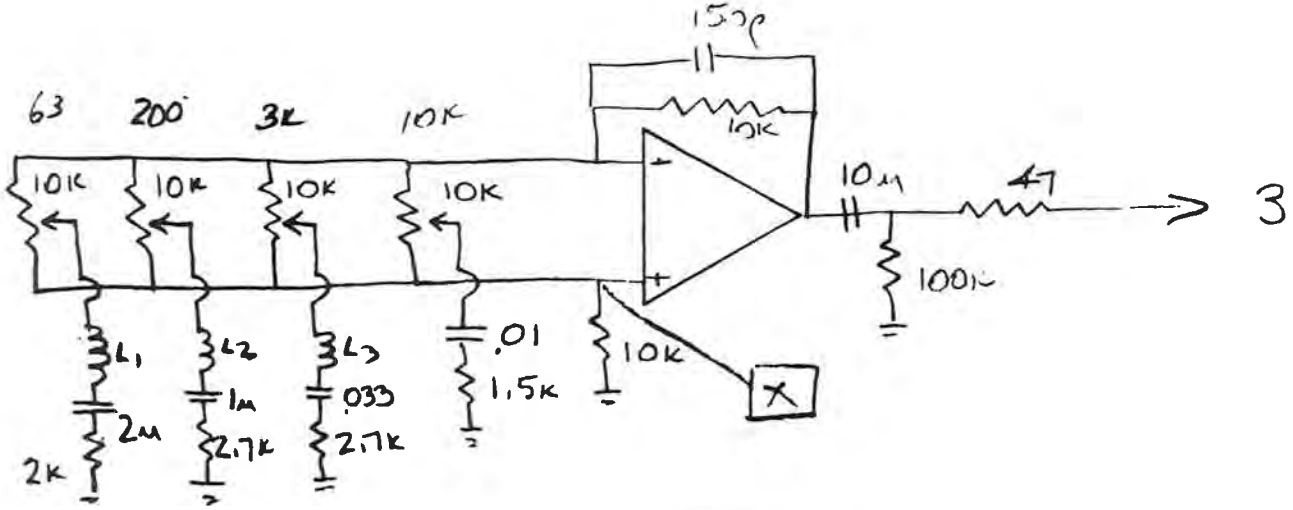


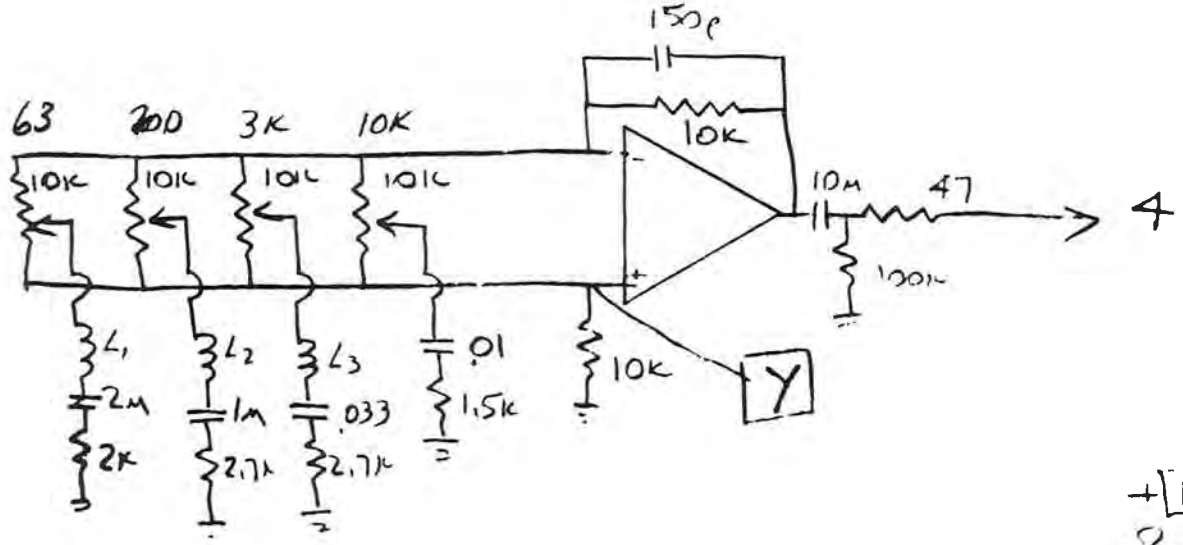
SCHEMATIC DIAGRAM

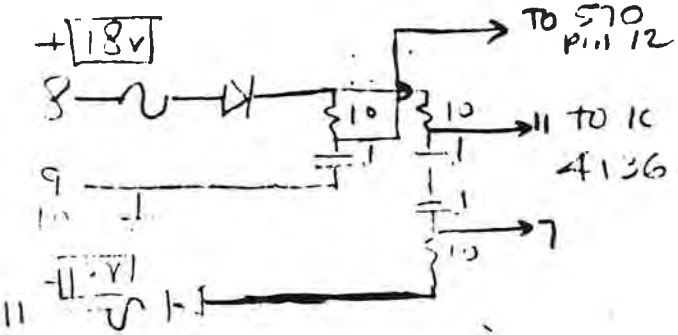
ULTRA*STEREO™ HOUSE EQUALIZER

ULTRA-STEREO LABS, INC.
N. HOLLYWOOD, CA.

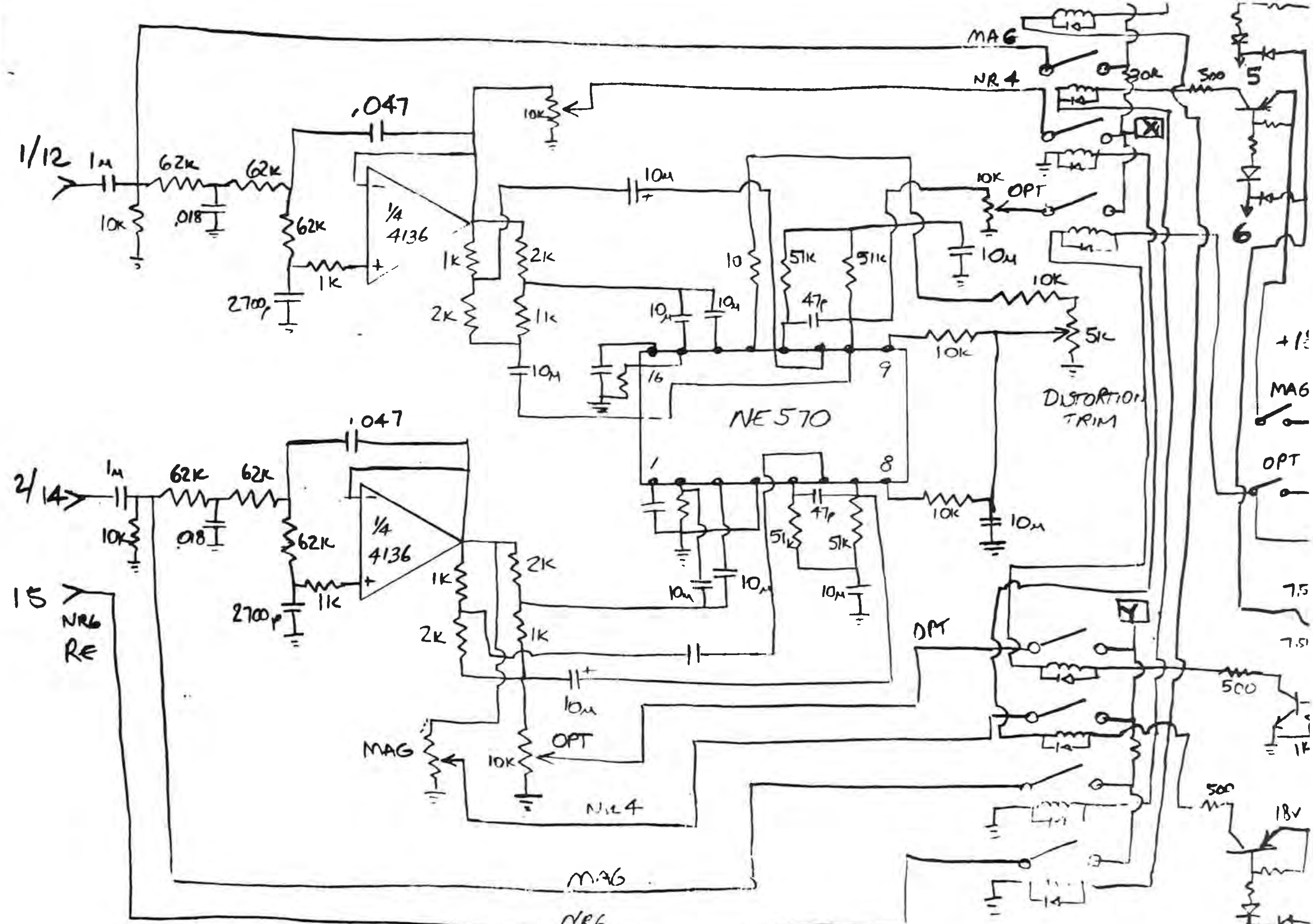
7/8/83

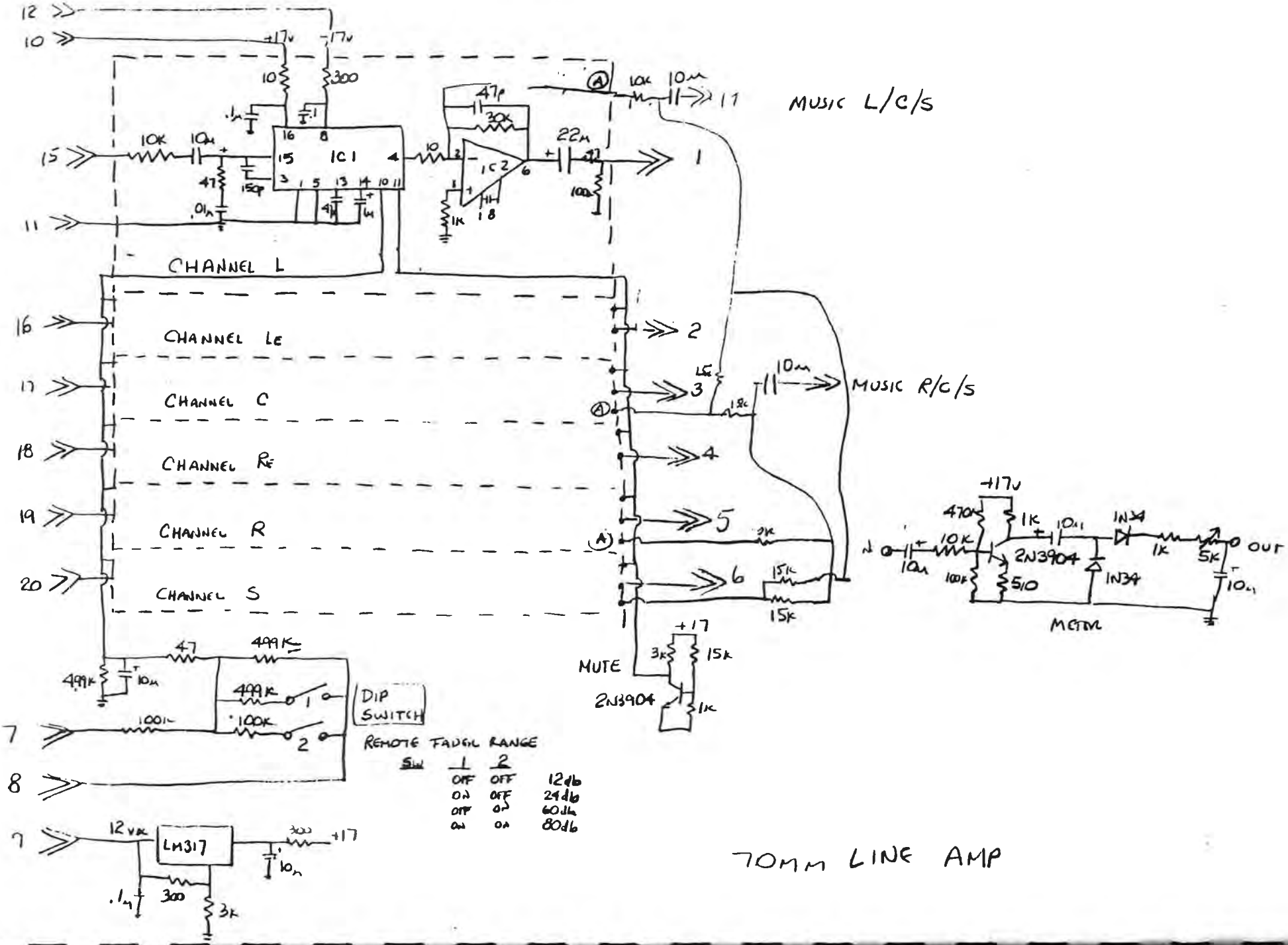


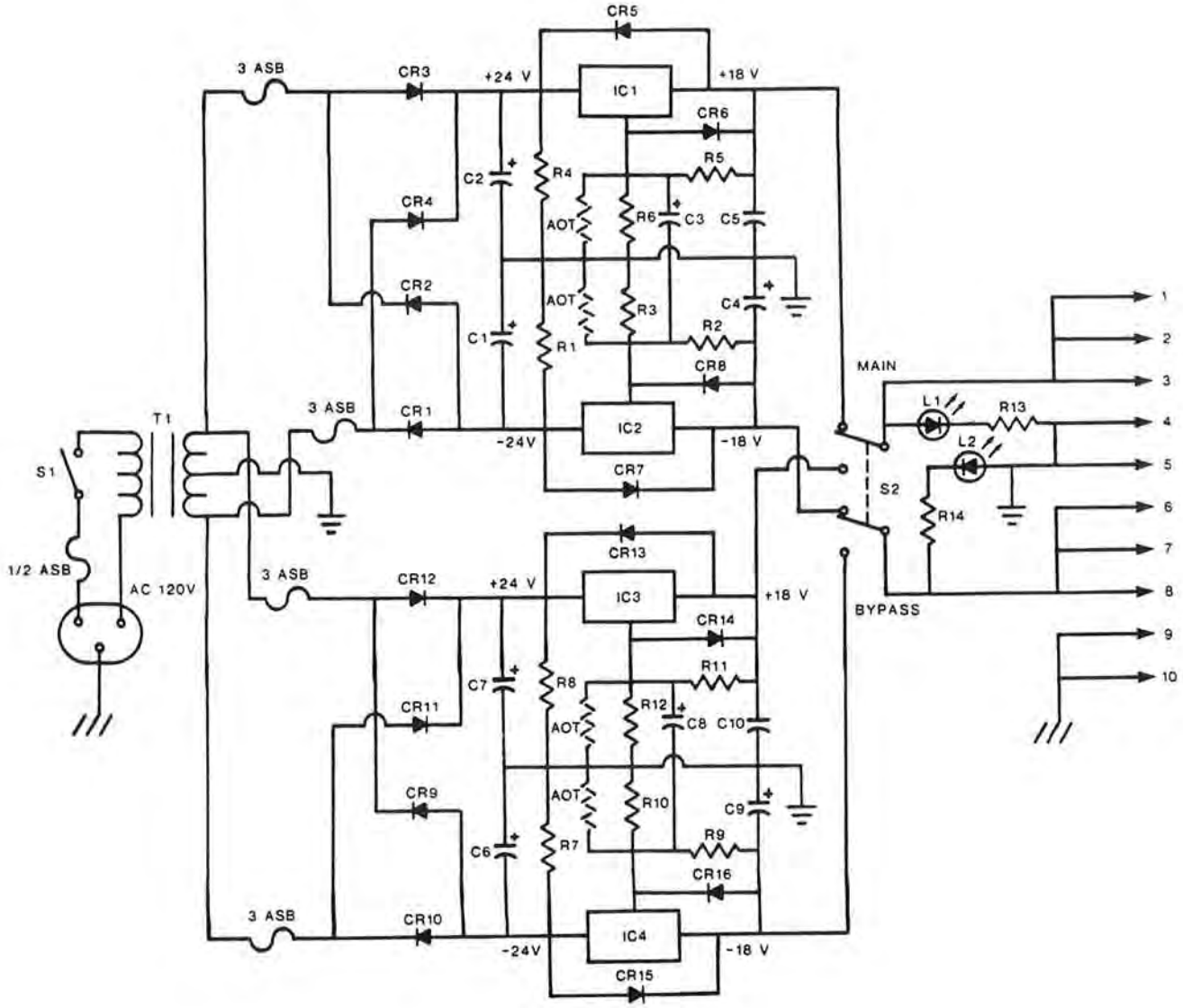




70MM EQ/FILTER CARD


1/12
2/14
15
NR6
RE
1M
10K
62K
.018
2700p
1K
.047
1/4
4136
2K
10M
10
51K
47p
NE570
16
9
1
8
10K
5K
DISTORTION
TRIM
OPT
MAG
NR4
NR6
MAG
30R
500
5
6
7
X
Y
+15
7.5
18V


MUSIC L/C/S
MUSIC R/C/S
CHANNEL L
CHANNEL LE
CHANNEL C
CHANNEL RE
CHANNEL R
CHANNEL S
IC1
IC2
MUTE
2N3904
DIP SWITCH
REMOTE FADER RANGE
Sw 1 2
OFF OFF 12db
ON OFF 24db
OFF ON 60db
ON ON 80db
LM317
12 VAC
+17
-17
METER
OUT
70MM LINE AMP



SCHEMATIC DIAGRAM

ULTRA*STEREO™ PS-03 POWER SUPPLY

ULTRA-STEREO LABS, INC.
N. HOLLYWOOD, CA.
7/8/83