

DISTRIBUTION RELIGION

THE IMAGE PROCESSOR MAY BE COPIED BY INDIVIDUALS AND NOT-FOR-PROFIT INSTITUTIONS WITHOUT CHARGE. FOR-PROFIT INSTITUTIONS WILL HAVE TO NEGOTIATE FOR PERMISSION TO COPY. I THINK CULTURE HAS TO LEARN TO USE HIGH-TEK MACHINES FOR PERSONAL AESTHETIC, RELIGIOUS, INTUITIVE, COMPREHENSIVE, EXPLORATORY GROWTH. THE DEVELOPMENT OF MACHINES LIKE THE IMAGE PROCESSOR IS PART OF THIS EVOLUTION. I AM PAID BY THE STATE, AT LEAST IN PART, TO DO AND DISSEMINATE THIS INFORMATION; SO I DO.

As I am sure you (who are you) understand a work like developing and expanding the Image Processor requires much money and time. The 'U' does not have much money for evolutionary work and getting of grants are almost as much work as holding down a job. Therefore, I have the feeling that if considerable monies were to be made with a copy of the Image Processor, I would like some of it.

Put in your own method of returning energy to me here: _____

Of course enforcing such a request is too difficult to be bothered with. But let it be known that I consider it to be morally binding.

I DECIDED THAT I
WOULD LIKE 1 good.

Much Love,

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Chicago, Illinois 60680
Office phone: 312-996-8689
Lab phone: 312-996-2312
Messages: 312-996-3337 (Department of Art)

TAPE FROM
EACH COPY
OF THE

I. P.

NOTES ON THE AESTHETICS OF 'copying-an-Image Processor':

Being a 'copier of many things, in this case the first copier of an Image Processor, I trust the following notes to find meaning to future copiers of Image Processors:

First, it's okay to copy! Believe in the process of copying as much as you can; with all your heart is a good place to start - get into it as straight and honestly as possible. Copying is as good (I think better from this vector-view) as any other way of getting 'there.'

The more you 'buy' the 'copying' of Sandin's encoded intelligence in the I-P, the more you will learn about the man-and-machines. Don't try to make improvements; you'll make it only worse if you modify what already is best, even if it doesn't appear to be the 'best' to your mind's eye. It bothers me very much to see 'folk' laying onto Dan, suggestions of improvement (supposedly) without a thorough giving-in-to understanding of the I-P design. Please realize, that if you 'had-it' to do it you would not be building (copying) an I-P to begin with; you would have done it yourself along time ago...so get to work copying-as-usual.

Dan's evolutionary design of the I-P comes from a very high and thorough CONSCIOUS systems--design-intelligence-level. If you deviate in the process of 'copying' and then Dan makes an improvement on his I-P, you will most likely find it quite frustrating in updating your instrument due to your I-P being incompatible in detail to the original. If you get yourself in a jam, then you have to go to Dan and "\$PEND" his time getting you out of it.

So...after all this: the Art of 'copying' is a good form to try on for a year or so while you get into building your Image Processor...enjoy.

PEACE/ASCESIS (love):

Phil Morton

OCT 78

FEBRUARY 20, 1976

This edition of the documentation was paid for by a grant from the Illinois Arts Council. Thank you, Ill. Arts!

HI:

A bunch of miscelaneous notes -

If you didn't send postage, send it in stamps, money or check, or any thing else of comparable value (surprise has intrinsic value); postage costs me \$2.00.

AND COPIES OF CORRECTIONS COST ME 1\$

IN FORMATION AND

The master parts list contains the minimum order to complete the Image Processor. It is necessary to order more than the minimum of nearly everything. Parts may be damaged in assembly or may be defective. Although the Image Processor is very reliable, replacement parts are necessary for maintence. Furthermore, I attempt to design with a minimum of different parts, therefore new modules or modifications of modules are likely to use the same parts. With the exception of the hardware and the most expensive components, I reccommend ordering many extra.

If you need clarification on details; CALL (or send video tape).
Don't write; I hate to write.

STILL TRUE IN

New corrections and additions are forth-coming in a few months. When ready to build, send self addressed stamped envelope ~~(for should do)~~. 78
Mention the last date of corrections you have. *? 78*

CORRECTION OF ERRORS IN DOCUMENTATION

Master Parts List:

The following-

1000 FT	36F 1800WM RG 59/U	CO-AXIAL CABLE	81.28	81.28	N
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SHOULD BE CHANGED TO

1000 ft	RG 59/U CO-AXIAL CABLE	70.85	5085	N
36F 110WM	(BELDEN # 8241-1000)			

PAGES FOLLOWING DOCUMENTATION ERRORS SHOULD REPLACE
CORRESPONDING PAGES IN THE DOCUMENTATION

BRIEF SYSTEMS LEVEL DESCRIPTION:

The IP physically is an array of a minimum of approximately 24 modules (aluminum boxes), representing approximately 40 electrical modules.

The documentation that follows is simply a description of how to build the aluminum boxes; the system is considerably more powerful than the sum of the boxes.

On paper a description of how the IP works is more difficult than I am prepared to do. It is best communicated on video-tape; send me a video tape of you best stuff and I will send you a video tape on the IP, and/or send blank tape and \$5/hr. (2 hours should do it.)

But in brief, the Image Processor accepts signals = + .5 volts 75 ohm including video signals. These signals (images) are distributed into (usually) a number of processing modules and then (usually) mixed out into a standard color encoder (output module). Since most of the processing modules are voltage controllable and control voltages and images are interchangeable, fantastic combinatorial power is possible.

The 'classic' Image Processor contains 8 adder-multipliers, 3 function generators, 3 comparators, 3 amplitude classifiers, 4 oscillators, 3 differentiators, 9 references, 1 sync strip and camera input, 3 inputs, 1 sync generator, 1 color encoder and power supplies. These refer to electrical modules and not aluminum boxes. This constitutes a very powerful processing instrument and because of systems power level (inter-connect-ability), I recommend building approximately this much.

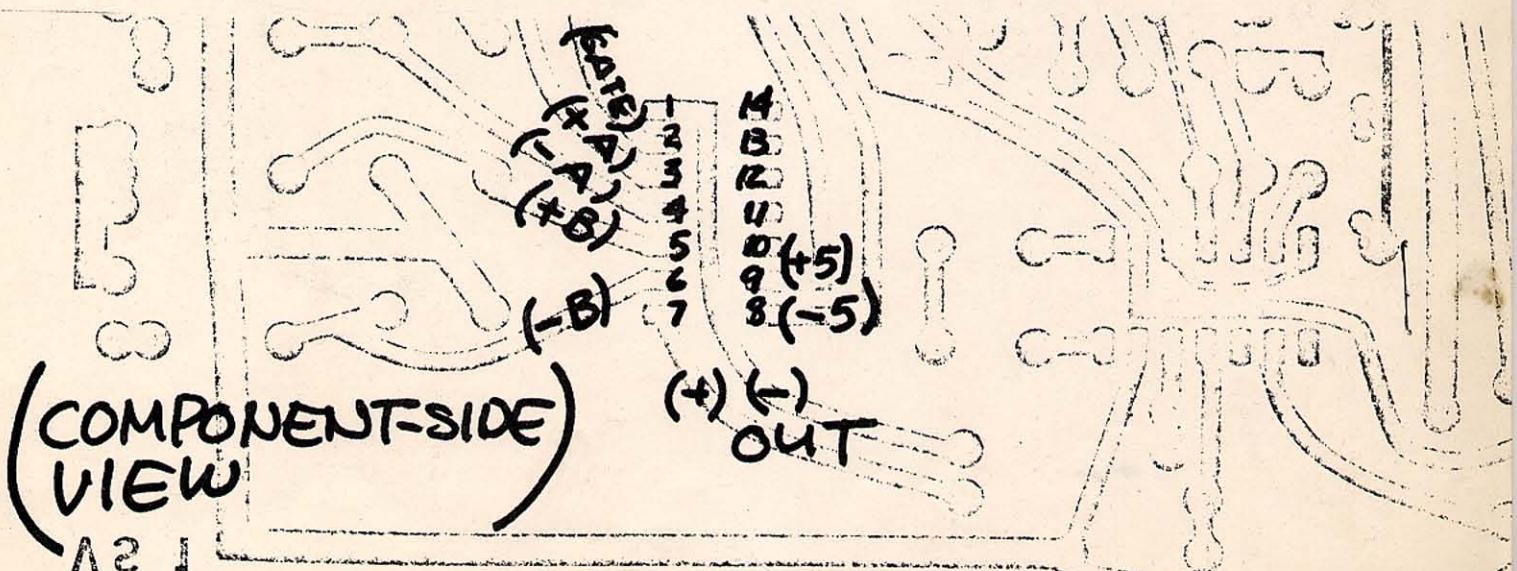
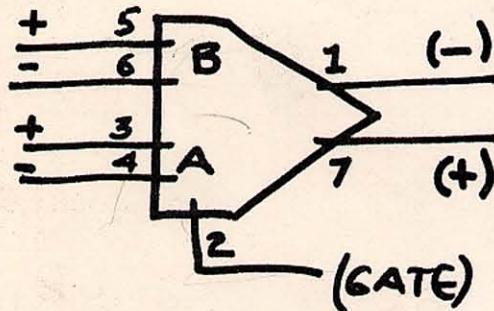
MC 1445 Gain Controlled Amplifier (multiplier):

Detailed information on this integrated circuit is available from Motorola Linear Integrated Circuits Manual, available from Motorola or some Motorola distributors.

This I.C. is a four input gain controlled amplifier and is used throughout the IP. Pin (4) is the inverting input to channel A. Pin (3) is the non-inverting input to channel A. Pin (5) is the non-inverting input to channel B; pin (6) is the inverting input to channel B. Non-inverting output is available at pin (7); and the inverting output is available at pin (1).

Which input channel is connected to the output is controlled by the gate voltage at pin (2). If this voltage is high (greater than 1 volt) channel B is on; if the gate voltage is low (0 volts) channel A is connected to the output. The gate voltage produces continuous control over the gains of the channels such that .5 volts causes both channel A and B to be connected to the output with 1/2 gain each. Full gain is approximately 10.

Power supply voltage (+5 volts) is connected to pin (9) and (-5 volts) is connected to pin (8). No other pins are used.



CA 3030 operational amplifier:

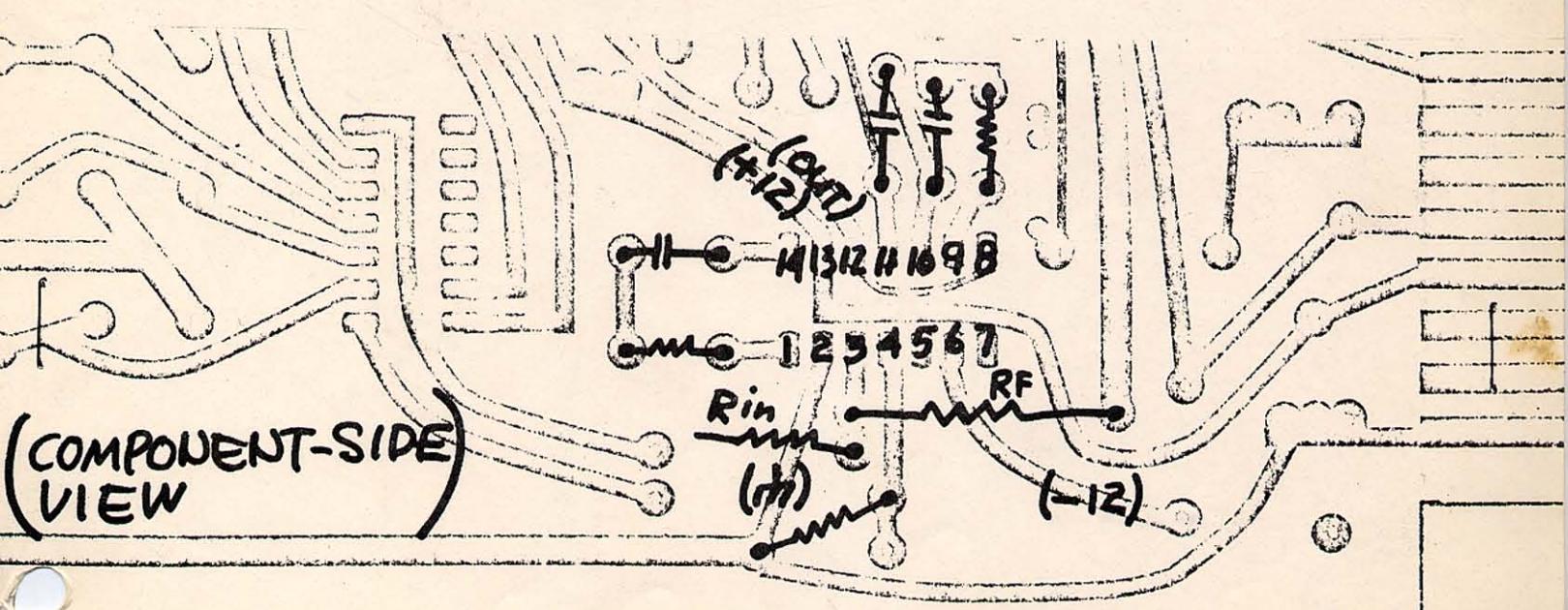
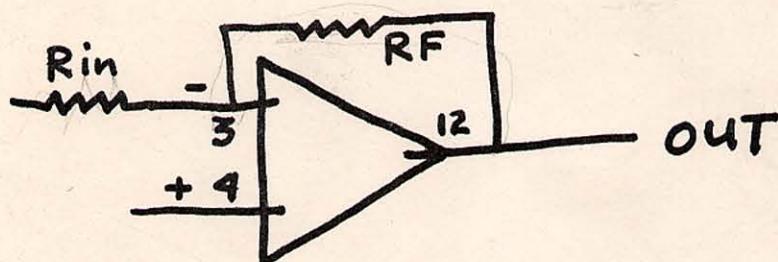
The CA 3030 op amp is used through out the IP. Detailed descriptions of the device are available in the RCA Linear Integrated Circuits Manual. The book can be gotten from RCA or some distributors of RCA integrated circuits.

What follows is a brief description of the I.C.

The Op Amp has a very large gain (4000). Except in the comparator circuit, this gain is reduced by feedback of a percentage of the output signal pin (12) to the inverting input signal pin (3). A signal to be amplified is applied to pin (3) and will be inverted in the output, or it is applied to pin (4) and is not inverted. Pin (2) is grounded always. Pins (1,14,9,10,11) have to do with compensation for the amplifier which controls the tendency of the amplifier to oscillate (put out a signal of its own). The positive supply voltage (+12v.) is applied to pin (13); negative supply voltage (-12v.) is applied to pin (6). Pin (8) is sometimes connected to the output pin (12) to increase the power available from the I.C.

In simple inverting amplifier circuits, the voltage gain of the amplifier is the ratio of the feedback resistor between pin (12) and pin (3) to the input resistor connected from the input signal to pin (3).

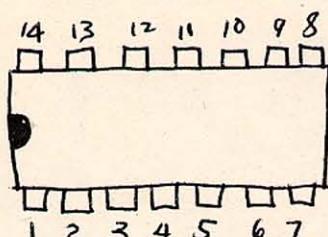
RF/R in



INTEGRATED CIRCUITS

Dual Inline Packages (DIP)

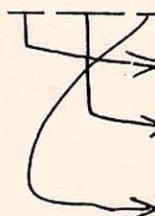
TOP VIEW:



Knotch or dot indicates installation direction.

IDENTIFICATION NO. (example):

MC 1445 L



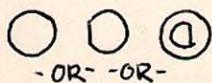
Prefix indicates manufacturer.

Type.

Suffix indicates case or temperature range or detail specifications.

TRANSISTORS

TOP VIEW:



Physical cases will vary with the manufacturer.

Check and match carefully the emitter, base, collector (EBC) leads with the NPN & PNP character of each transistor type.

Leads typically have to be bent for proper and convenient insertion into PC Board.

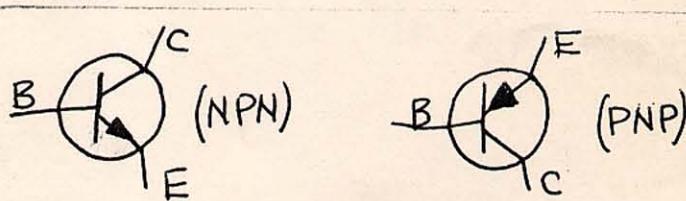
IDENTIFICATION NO.:

(only two transistors used in entire system)

2N 4123 (NPN)

2N 4125 (PNP)

SYMBOL:

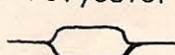


CAPACITORS

Ceramic Mica

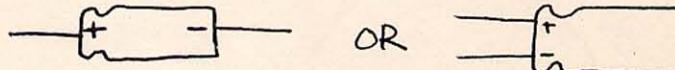


Polyester



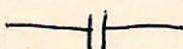
Installation direction makes no difference.

Electrolytic

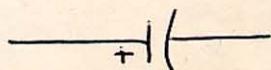


Installation must have correct (+) and (-) orientation.

SYMBOL:

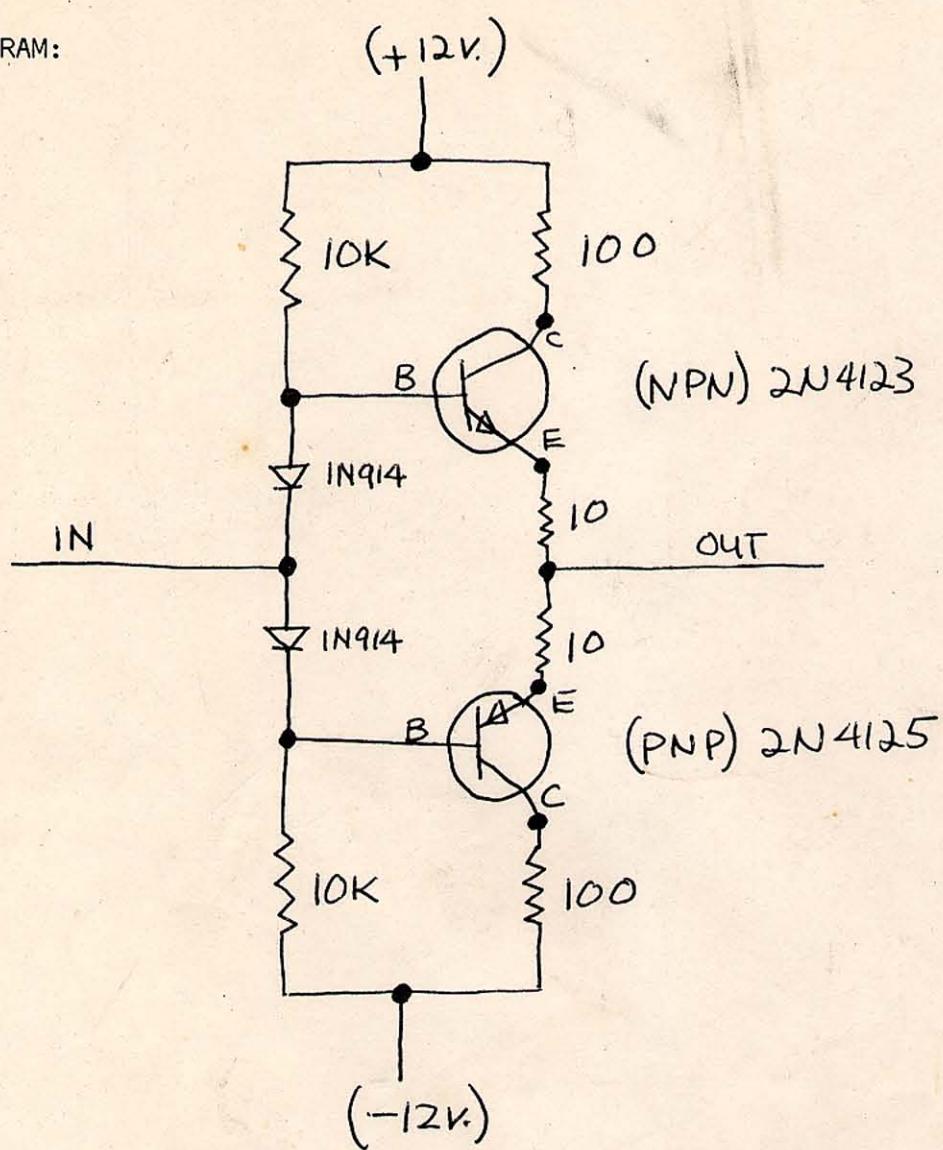


SYMBOL:



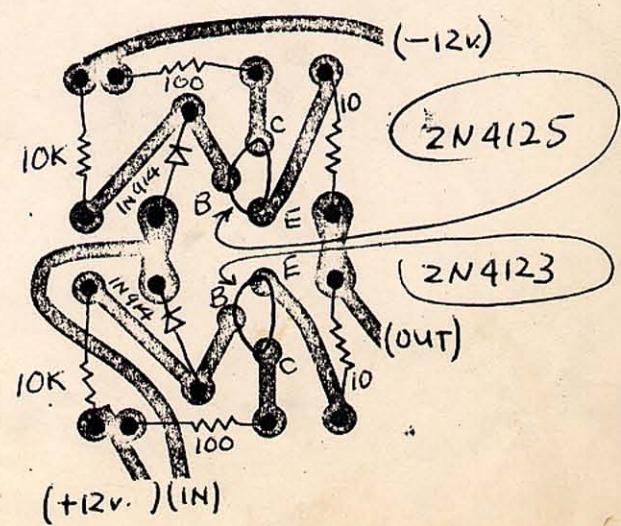
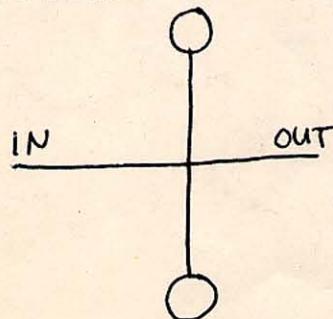
The STANDARD DRIVER is a complimentary current amplifier with voltage gain less than 1. It is used so many times in the I-P that it is abbreviated:

DIAGRAM:



COMPONENT SIDE VIEW:

ABREVIATION:



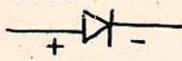
DIODES

COMPONENT:



Band or dot indicates the cathode (-).

SYMBOL:



Direction of current flow is from (-) to (+).

IDENTIFICATION NO.:

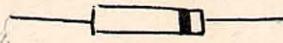
(only two signal diodes used in

1N 914 entire system)

1N 270

ZENER DIODES

COMPONENT:



Band or dot indicates the cathode (-).

SYMBOL:



In normal application (+) supply voltage is supplied to cathode and (-) supply voltage is supplied to anode.

IDENTIFICATION NO. (example):

1N 5338 B

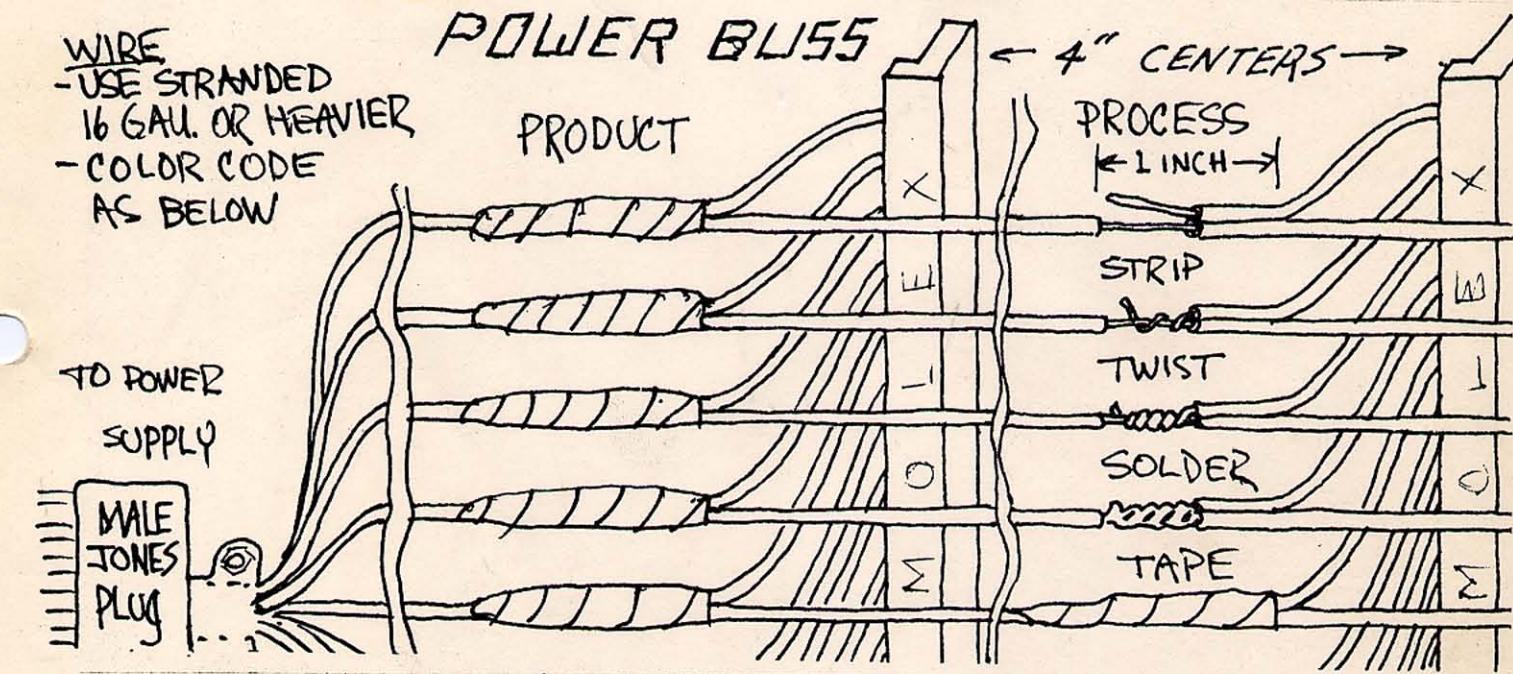
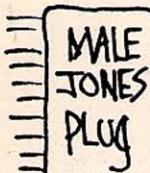
Indicates tolerance.
Type.

WIRE
- USE STRANDED
16 GAU. OR HEAVIER
- COLOR CODE
AS BELOW

POWER BLISS

PRODUCT

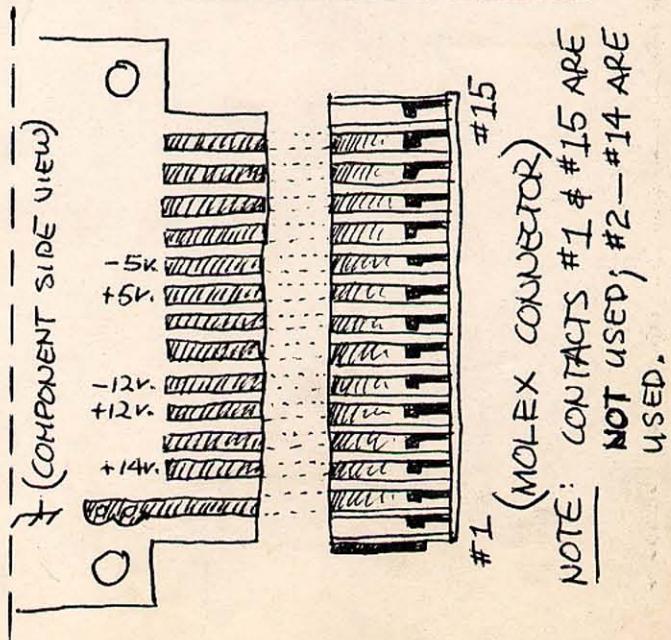
TO POWER
SUPPLY



COLOR CODE FOR POWER BUSSING

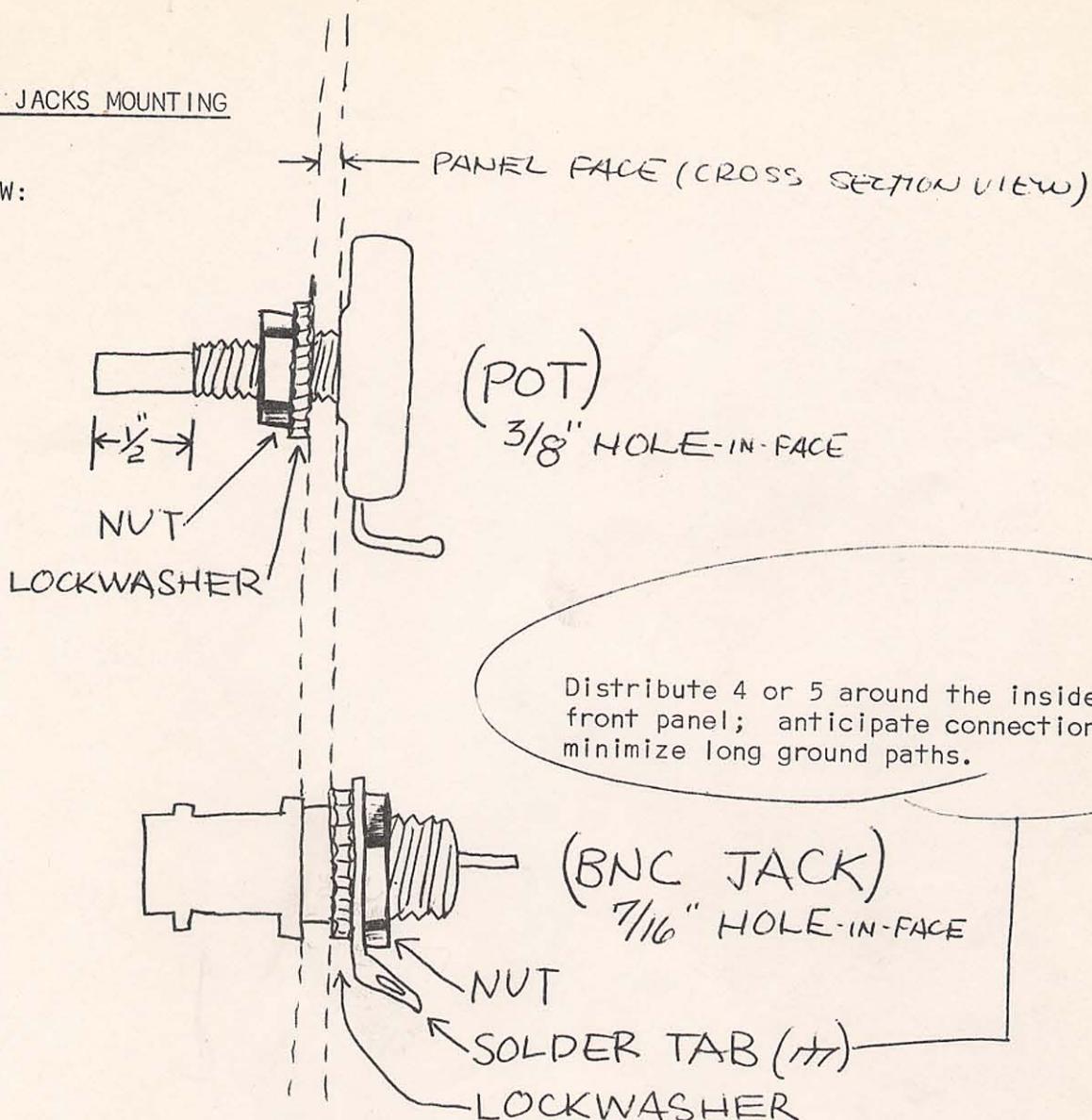
BLACK (+)	(+)	(+)	(+)	(+14v)
ORANGE ()	(+)	(+)	(+)	(+12v)
WHITE ()	()	()	()	()
RED (+12v)	()	()	()	(+12v)
BLUE (-12v)	(-12v)	(-12v)	(-12v)	(-12v)
GREEN (+6v)	(+6v)	(+6v)	(+6v)	(+6v)
GRAY ()	()	()	()	()
YELLOW (+5v)	(+5v)	(+5v)	(+5v)	(+5v)
VIOLET (-5v)	(-5v)	(-5v)	(-5v)	(-5v)
BROWN ()	()	()	()	()

NOTE: All power supply lines into PC board are by-passed to ground (+) with a $100\mu F$ 25wvdc electrolytic capacitor (indicated in pictorials only).



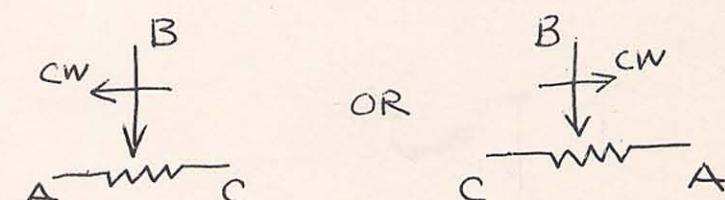
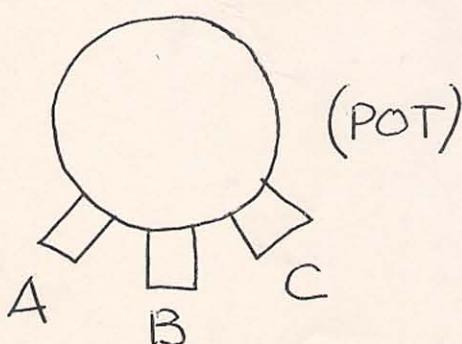
POTS and JACKS MOUNTING

SIDE VIEW:



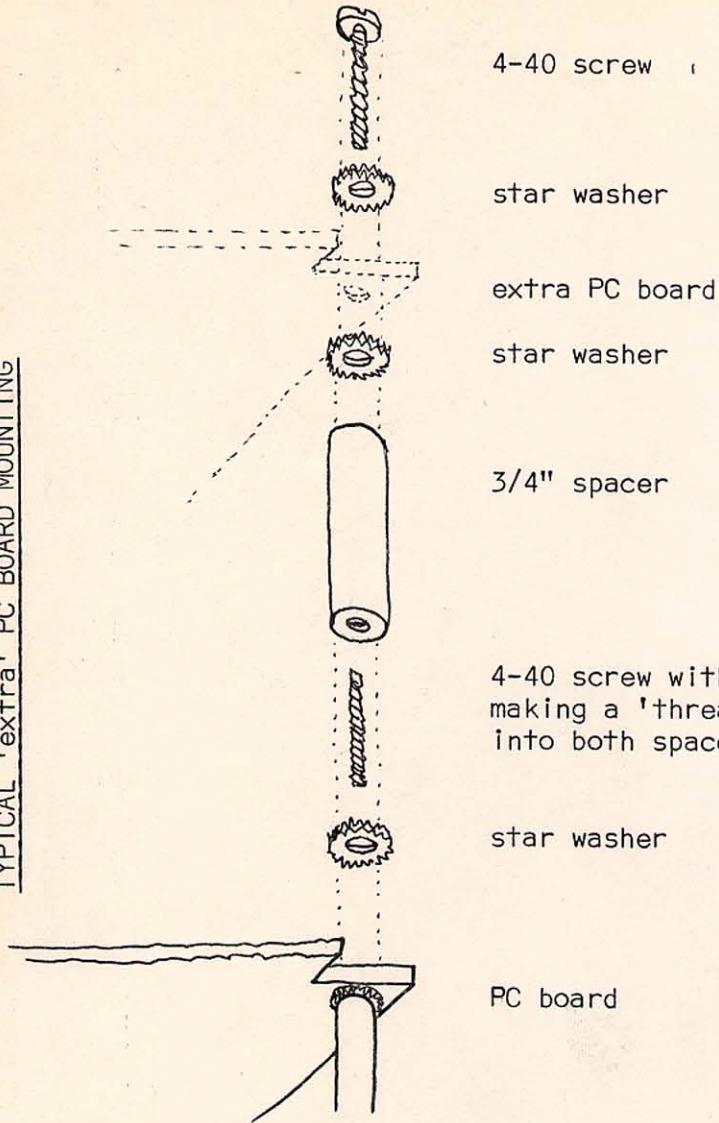
BACK VIEW:

SYMBOL:

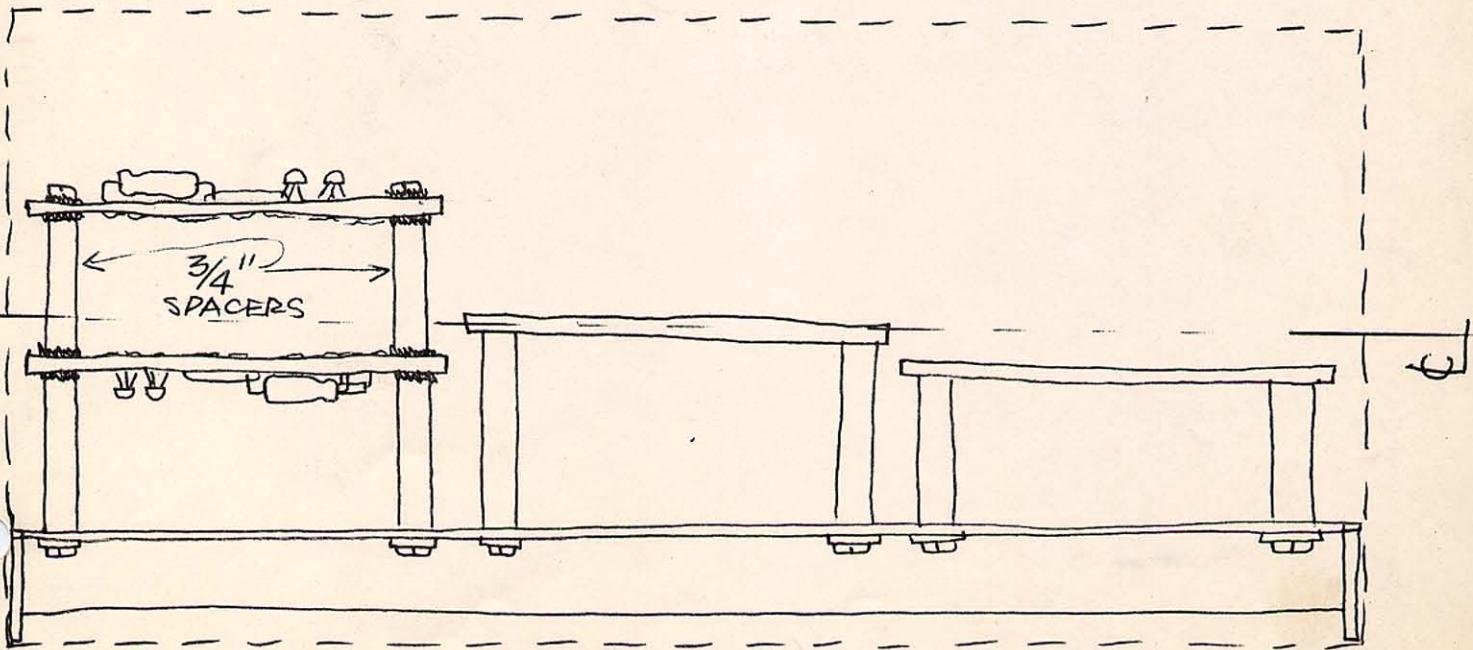


CW = clockwise

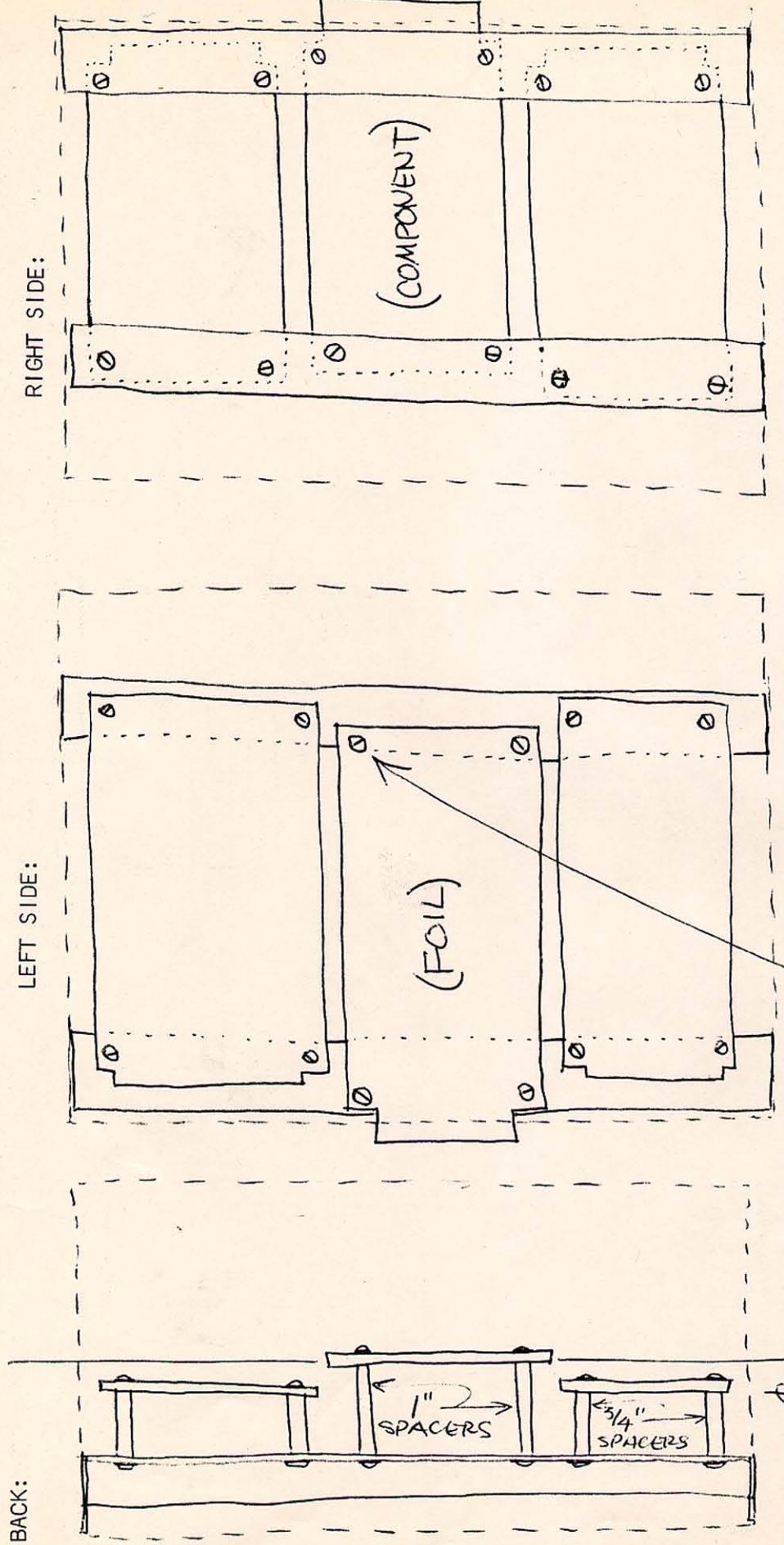
TYPICAL 'extra' PC BOARD MOUNTING



NOTE: Use additional washers for proper spacing when necessary; make sure that middle board is dead-on with center line of module.



PRINTED CIRCUIT BOARD MOUNTING



Crucial screw; circuits all run to ground (↔) at this point.

Adjust middle board so as to be dead-on with center line of module; use washers for additional spacing if necessary.

On top and bottom boards it is necessary to hacksaw off 3/8" on power buss end for clearance of back panel.

Star washer all 4-40 screws which hold boards to supports.

Use #6 x 3/8" panhead self threading screws for mounting supports to chassis box (no washers).

ADDER MULTIPLIER:

The adder multiplier is used to add (superimpose), fade and gain control (multiply) signals.

JI1, JI2, JI3 and the inverted signal of JI7 are added together to form input channel A.

JI4, JI5, JI6 and the inverted signal of JI8 are added together to form input channel B.

The knobs above the connectors control the gain (contrast) of each individual input.

The amount of channel A and B mixed into the output, J01 through J04, is dependent on the position of R9 and the voltage inputted to JI9.

The effect of the knob position and the voltage are additive; the knob to the left and/or a maximum negative voltage on JI9 will cause channel B to be outputted only, similarly, the knob to the right and/or a maximum positive voltage will cause channel A to be outputted only.

The knob at approximately the center with no voltage applied to JI9 will cause half-of channel A and half-of channel B to be added together and outputted.

TEST STUFF:

The adder multiplier should have a net gain of slightly greater than 1. That is, a (+) or (-) .5 volt signal into the module should result in an undistorted output of approximately the same magnitude into a 75 ohm load.

With no input the output should be approximately 0 volts (+ or - .05 volts).

Adjust 20k trimmer pot so with R9 in center position and no input to JI9 channel A and channel B have equal gain.

C1* STUFF:

The capacitor, C1, is used to filter the bias control, R9. One may choose a value which will vary the 'feel' of the knob.

20uF is a minimum value which will remove some noise...

50uF is the minimum value that I use; it doesn't affect the feel of the knob...

100uF removes some shakiness of the hand (included in the parts list)...

500uF is Phil's recommendation (very slushy feeling)...

R

R₂

R₃

J_{I1}

J_{I2}

J_{I3}

R₄

R₅

R₆

J_{I4}

J_{I5}

J_{I6}

FRONT
FACE

R₇

R₈

J_{I7}

J_{I8}

R₁₀

J_{O1}

ADDER
MULTIPLIER

J_{I9}

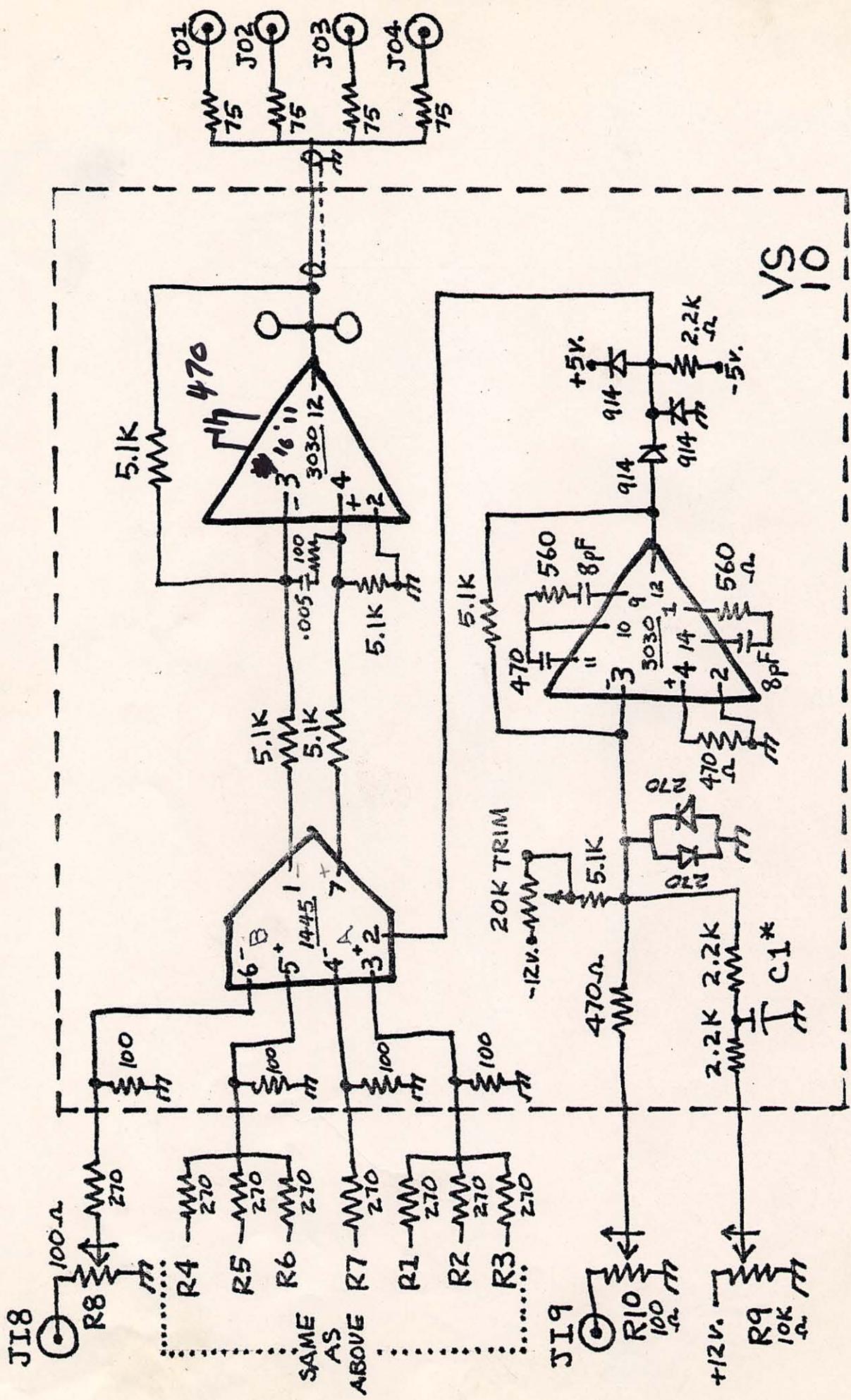
J_{O3}

J_{O4}

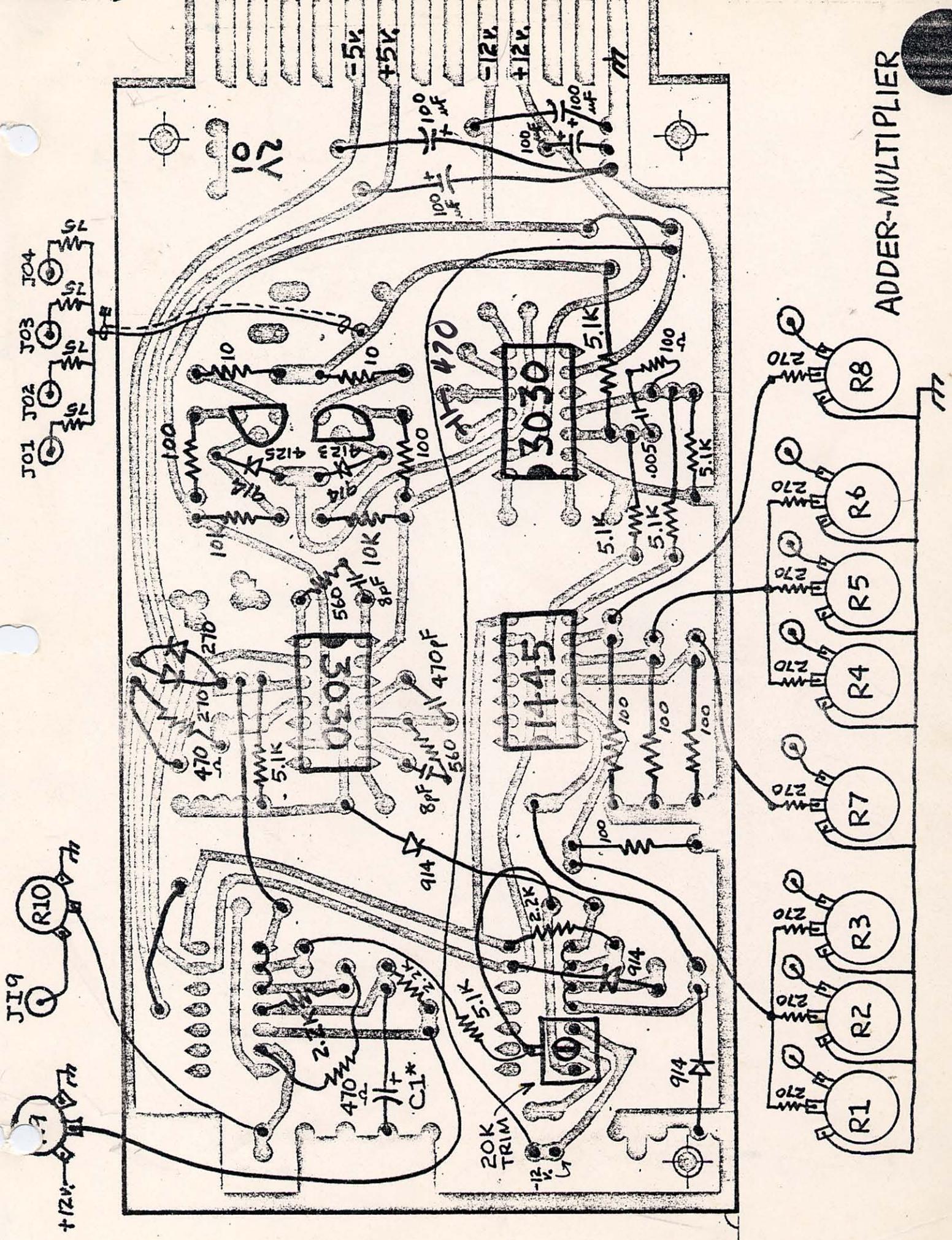
J_{O5}

1-76

ADDER-MULTIPLIER



ADDER-MULTIPLIER



2	525-1060	10	OHM, 1/4 W RES	.06	A	AM
4	525-1165	75	OHM, 1/4 W RES	.06	A	AM
6	525-1202	100	OHM, 1/4 W RES	.06	A	AM
7	525-1218	220	OHM, 1/4 W RES	.06	A	AM
6	525-1263	270	OHM, 1/4 W RES	.06	A	AM
8	525-1308	510	OHM, 1/4 W RES	.06	A	AM
1	525-1356	1K0	OHM, 1/4 W RES	.06	A	AM
3	525-1467	5.1K0MM	OHM, 1/4 W RES	.06	A	AM
2	525-1522	10K	OHM, 1/4 W RES	.06	A	AM
3	525-1302	470	OHM, 1/4 W RES	.06	A	AM
1	525-1405	2.2K0MM	OHM, 1/4 W RES	.06	A	AM
1	525-1550	15K	OHM, 1/4 W RES	.06	A	AM
5	525-1603	27K	OHM, 1/4 W RES	.06	A	AM
8	10F454	101UA	100 OHM POT 1/4SFAB	1.71	N	AM
1	9F689	U20	10K OHM POT 1/4SFT	1.45	N	AM
1	12F9800	3389P	20K TRIM BD-MT	.65	N	AM
2	14F592	UM15-417J	470 PF,DIP-MICA CAP.	.32	N	AM
6	14F1269	UM5-0600	8 PF,DIP-MICA CAP.	.36	N	AM
6	710-1260	7-G-1000	100 MF,25VLC,ELEC.	.24	A	AM
1			.005			
5	553-6914	1N914E	SIL-DIODE	.19	ASS	AM
2		1N270	GERM-D100E	.22	ASS	AM
1		2N4123	NPN TRANS	.22	ASS	AM
1		2N4125	PNP TRANS	.27	ASS	AM
2		CA3030	DIP UP-AMP,RCA	1.32	ASS	AM
1		MC1445L	DIP GAIN-COUNT,AMP	1.90	S	AM
1			VS10 PC BOARD			AM
1			101UA			AM
1			101UA			AM
13	39F1337	13-236	BNC,FM-CHS.MT.	.72	NDG	AM
1			CHASSIS,AM-FACE	8.25		
4	RE-67-1-DC-M-L-9		KNOB,BLACK/INLAY299	1.00	R	AM
4	RE-67-1-DC-M-L-9		KNOB,BLACK/INLAYSIL	1.00	R	AM
1	RE-67-1-DC-M-L-9		KNOB,BLACK/INLAY120	1.00	R	AM
1	RE-67-0-DC-M-0-9		KNOB,BLK/INLAY 299	1.00	R	AM

J11

R1

J02

J12

J01

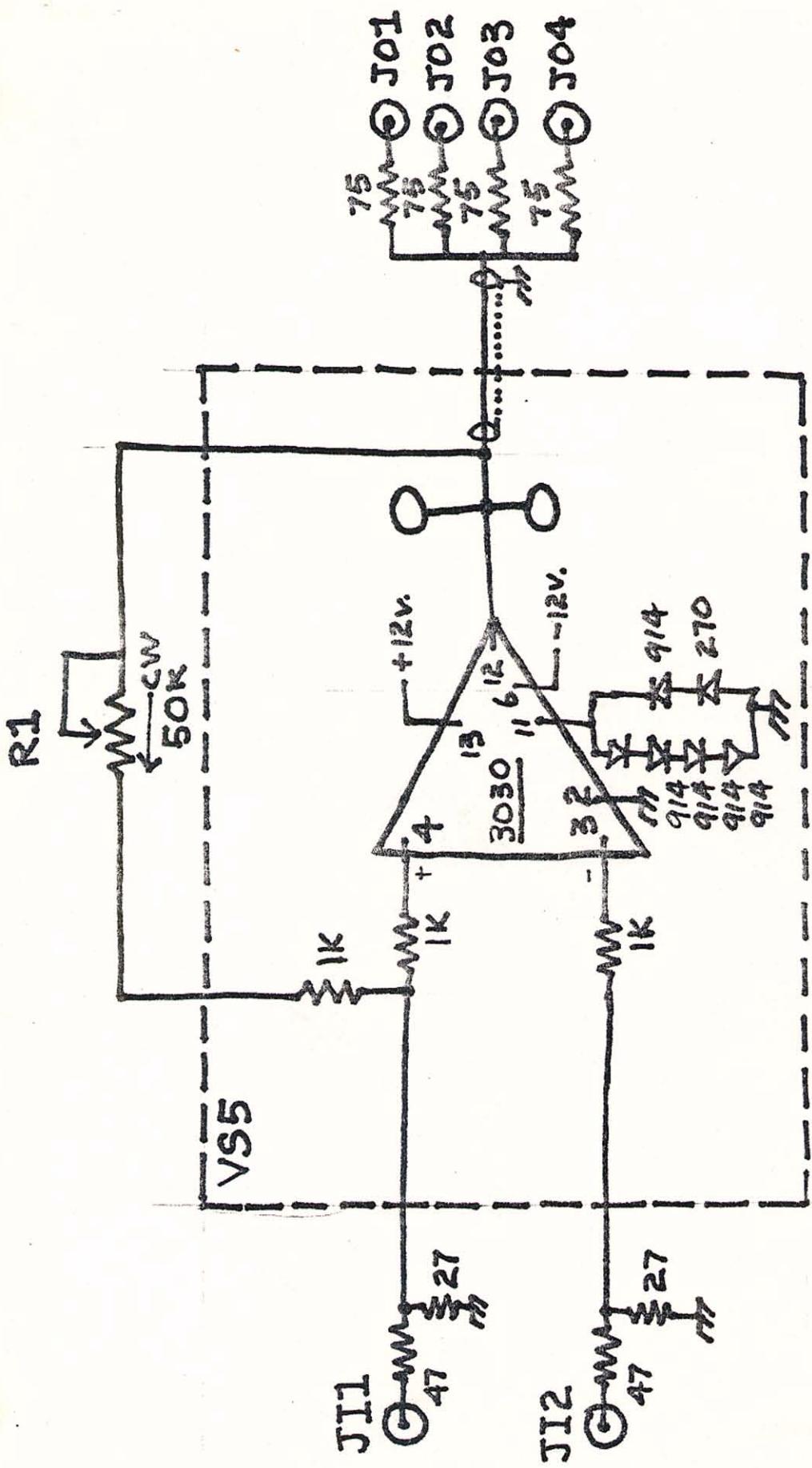
J04

J03

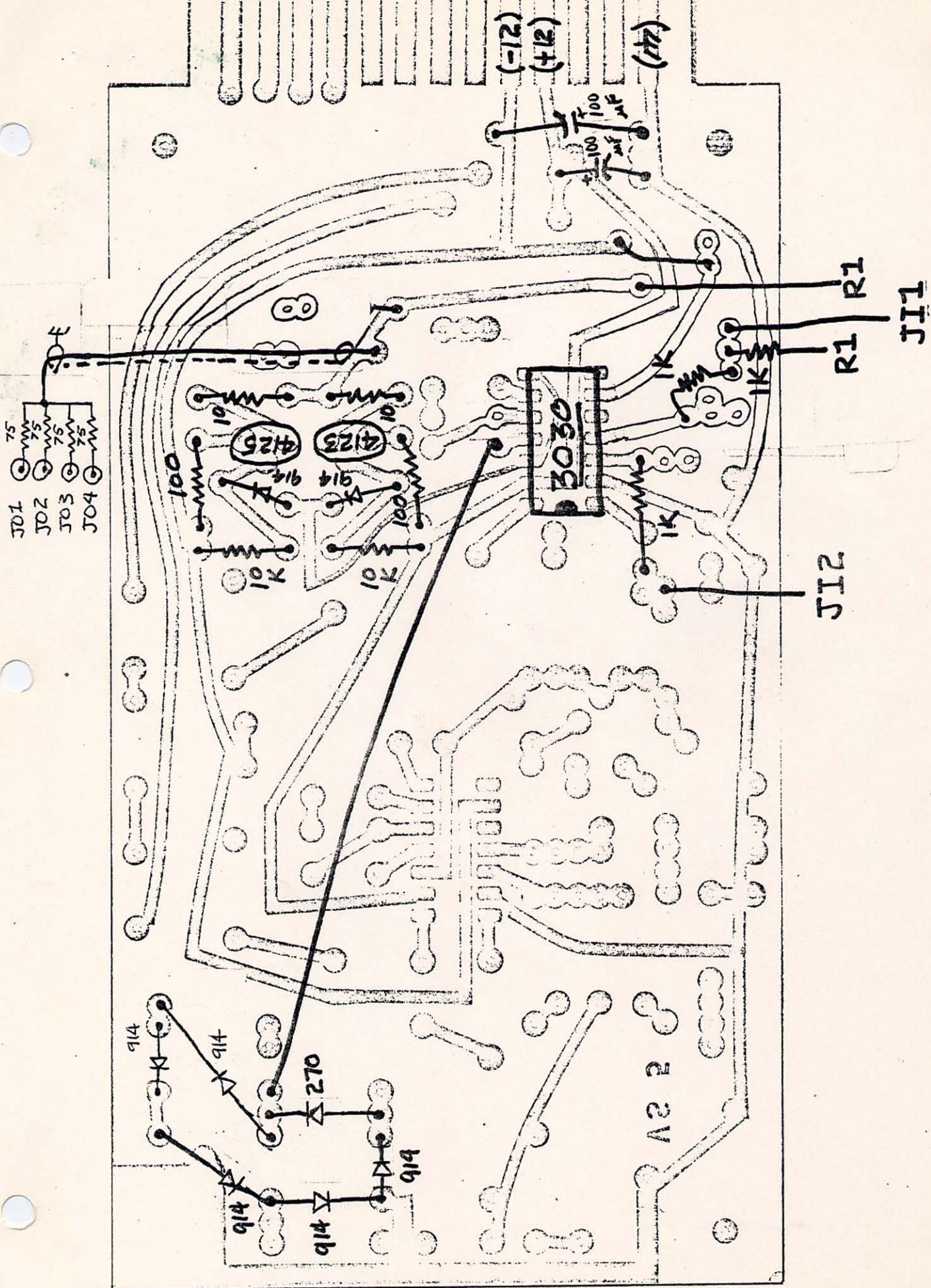
FRONT
FACE

COMPARATOR

COMPARATOR



COMPARATOR 975



		525-1060	10 OHM, 1/4 W RES	.06	A	COM
		525-1117	20 OHM, 1/4 W RES	.06	A	COM
		525-1155	40 OHM, 1/4 W RES	.06	A	COM
		525-1165	75 OHM, 1/4 W RES	.06	A	COM
		525-1202	100 OHM, 1/4 W RES	.06	A	COM
		525-1356	1K OHM, 1/4 W RES	.06	A	COM
		525-1522	10K OHM, 1/4 W RES	.06	A	COM
3	10F473	503UA	50K OHM POT 1/4SFAB	2.21	N	COM
8	716-1260	7-6-1060	100 MF, 25VDC, ELEC.	.24	A	COM
21	553-0914	1N914B	SIL-9100E	.19	A	COM
3		1N4128	GERM-9100E	.22	S	COM
3		2N4123	NPN TRANS	.22	S	COM
3		2N4125	PNP TRANS	.27	S	COM
3		CA3030	DIP OP-AMP, RCA	1.32	S	COM
5			V.S. S. P-C BOARD			COM
18	553-1537	13-236	54C, FM-CHS. MT.	.72	N	COM
1			CHASSIS, COMP-FACE	8.25	OG	COM
3	RB-67-1-DC-M-L-9		KNOB, GRAY/LINE, 9-BL	1.00	R	COM

FUNCTION GENERATOR

The function generator generates an output which is an arbitrary function (with up to two points of inflection) of the input at J11. This results in an effect that is similiar to but more complex and controllable than photographic solerization.

The function is controlled by R1, R2, and R3.

R1 controls the slope of the function for large negative inputs.

R2 controls the slope of the function for inputs near 0 voltages.

R3 controls the slope of the function for inputs of large positive voltage.

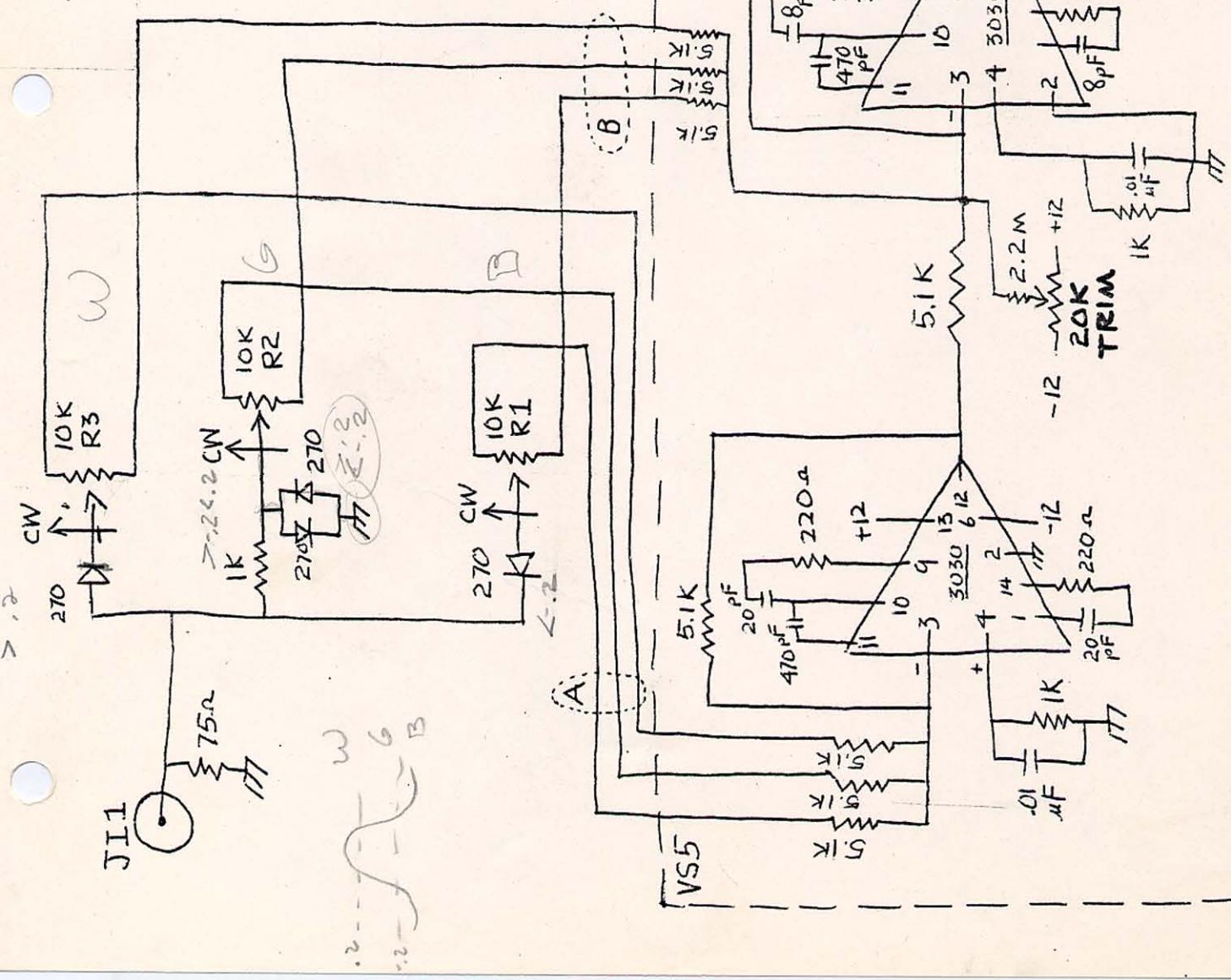
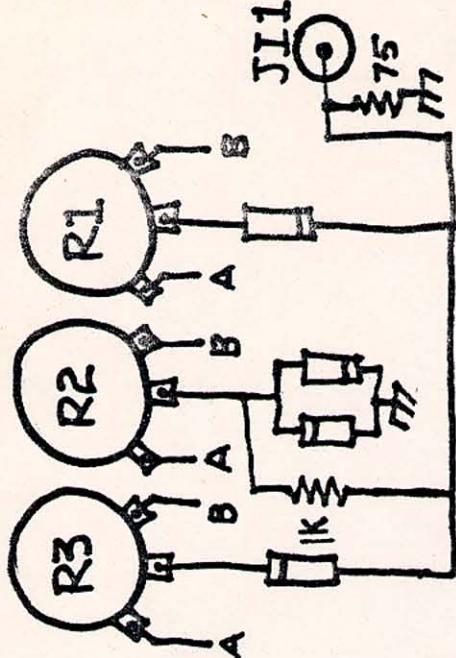
Clockwise is positive slope; counterclockwise is negative slope.

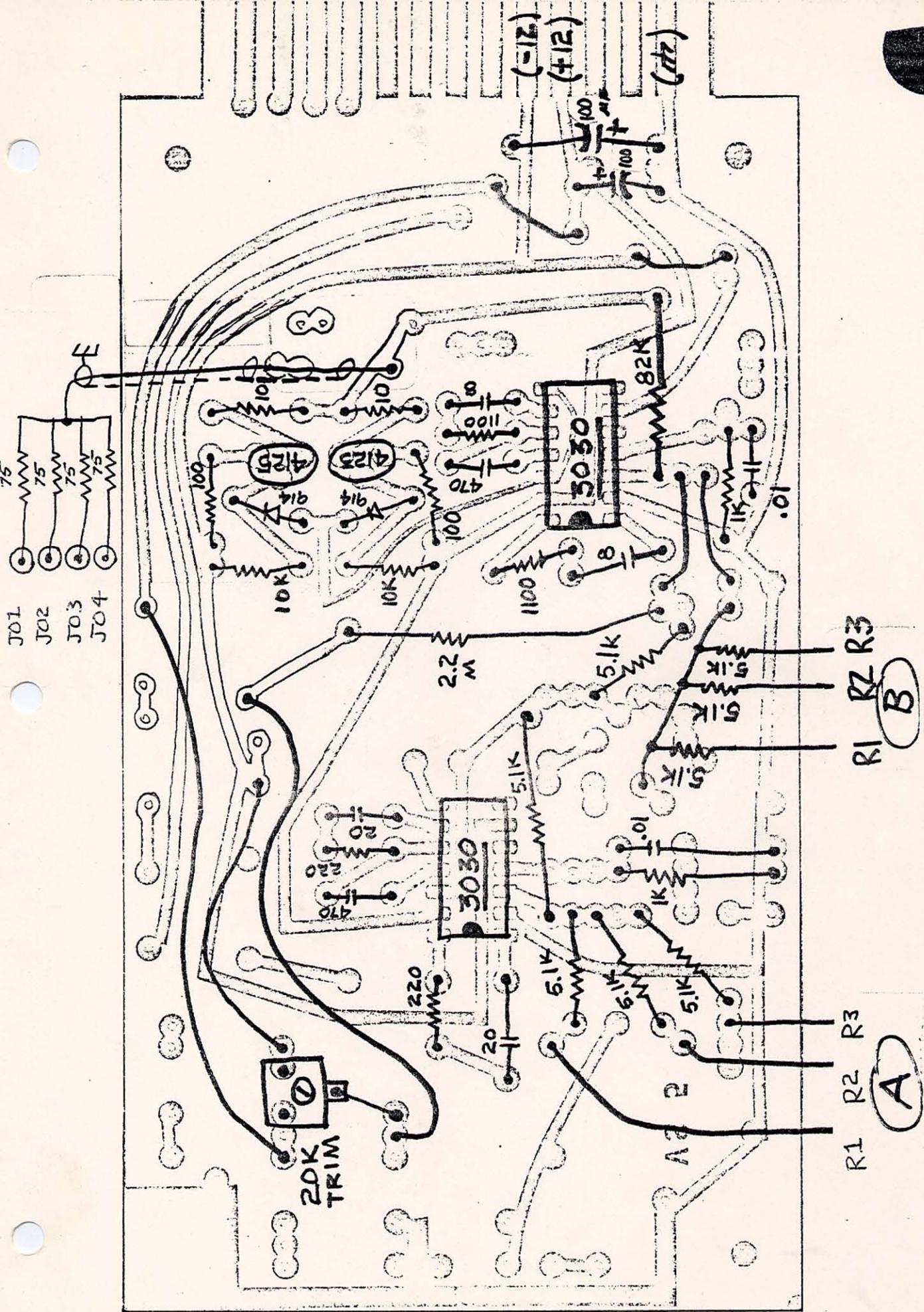
There are three electrical modules in one chassis box, so replicate work three times. Remember to buss (connect) +12 and -12 and ground wires from middle board to top and bottom board. Soldering directly to the foil is convenient.

TEST STUFF:

The 20K trimming resister on the VS5 board is adjusted such that no input results in 0 output voltage + or - .05 volts.

PICTORIAL:





	525-1050	10 OHM, 1/4 W RES	.06	A	FGN
	525-1105	75 OHM, 1/4 W RES	.06	A	FGN
	525-1202	100 OHM, 1/4 W RES	.06	A	FGN
	525-1248	220 OHM, 1/4 W RES	.06	A	FGN
	525-1356	1K0 OHM, 1/4 W RES	.06	A	FGN
	525-1361	1.1KOHM, 1/4 W RES	.06	A	FGN
	525-1467	5.1KOHM, 1/4 W RES	.06	A	FGN
	525-1522	10KKOHM, 1/4 W RES	.06	A	FGN
	525-1703	52KKOHM, 1/4 W RES	.06	A	FGN
	525-1907	2.2MOHM, 1/4 W RES	.06	A	FGN
	12F428	10K OHM POT 1/4SFAB	2.21	N	FGN
	12F9300	20K TRIM BD-MT	.65	N	FGN
	14F1269	DMS-6800 8 PF,DIP-MICA CAP.36		N	FGN
	14F557	DM15-200J 20 PF,DIP-MICA CAP.18		N	FGN
	14F572	DM15-417J 470 PF,DIP-MICA CAP.32		N	FGN
	17F557	TCC-103Z .01 MF,OSC-CER CAP. .05		N	FGN
	710-1260	7-G-1040 100 MF,25VDC,ELEC.	.24	A	FGN
	553-2914	1N914B SIL-DIODE	.19	A	FGN
	1N270	GERM-D100E			FGN
	2N4123	NPN TRANS	.22	S	FGN
	2N4125	PNP TRANS	.27	S	FGN
	CA3030	DIP OP-AMP,RCA	1.32	S	FGN
		VIS S P-C BOARD			FGN
	39F1537	13-236 BNC,FM-CHS.MT.	.72	N	FGN
		CHASSIS,F.G. FACE	8.25	DG	FGN
	RB-67-1-DC-M-L-9	KNOB;#299,MAT-BLACK INLAY,IND.ZWHITE			
		-9 /WHITE	1.00	R	FGN

DIFFERENTIATOR

The differentiator produces an output which is proportional to the rate of change of the input signal. Fast rates of change correspond to edges in a picture and are preferentially amplified by the module.

JI6 amplifies only the sharpest edges...

JI5 amplifies the sharpest edges and slightly softer edges...

JI4, JI3 and JI2 amplify progressively softer and softer edges until by JI1 almost all of the whole picture is amplified.

There are three electrical modules in one chassis box. One diagram is supplied, so replicate work three times. Remember to buss (connect) +12, -12 and ground from the center board to the upper and lower boards; soldering directly to the foil or connecting corresponding bypass capacitors is convenient.

TEST STUFF:

The module should amplify high frequency (greater than 20 kHz) sine waves with greater gain than lower frequency sine waves. The sine waves should be undistorted.

Square waves should be differentiated; that is, there should be a positive spike associated with the rising edge of the square wave, and a negative spike associated with the falling edge of the square wave.

No input should result in 0 volts output + or - .05 volts.

JI1

JI2

JO2

JI3

JI4

JO1

JO4

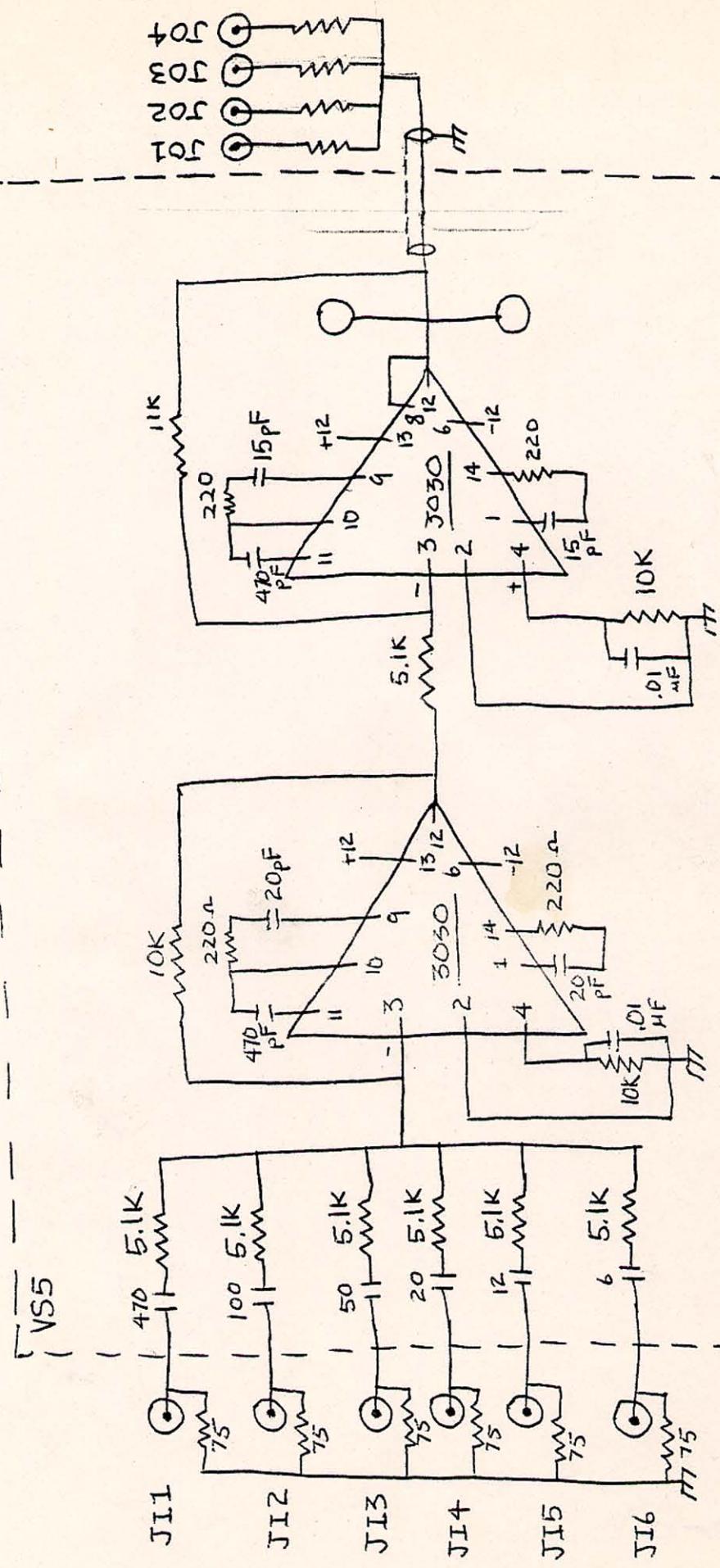
JI5

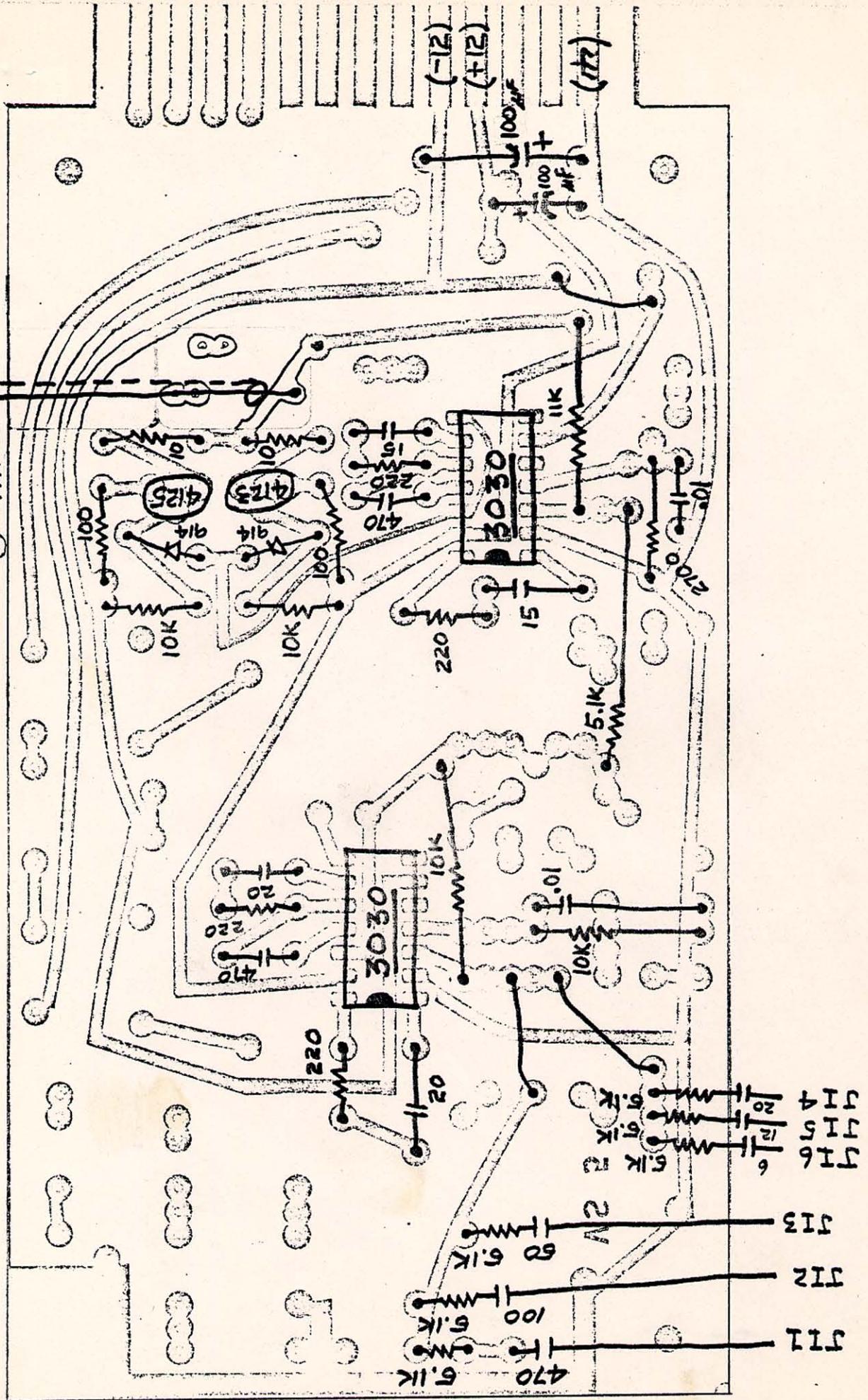
JI6

JO3

FRONT
FACE

DIFFERENTIATOR





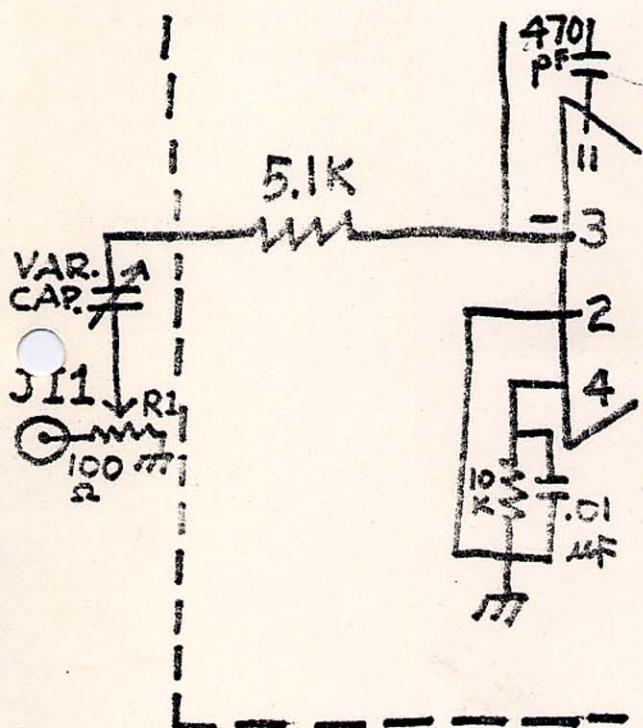
ADDENDUM

This addendum provides brief data for an optional differentiator (opt. diff.). The opt. diff. has some trade-offs compared to the original differentiator (orig. diff.). Consider the following and evaluate for yourself:

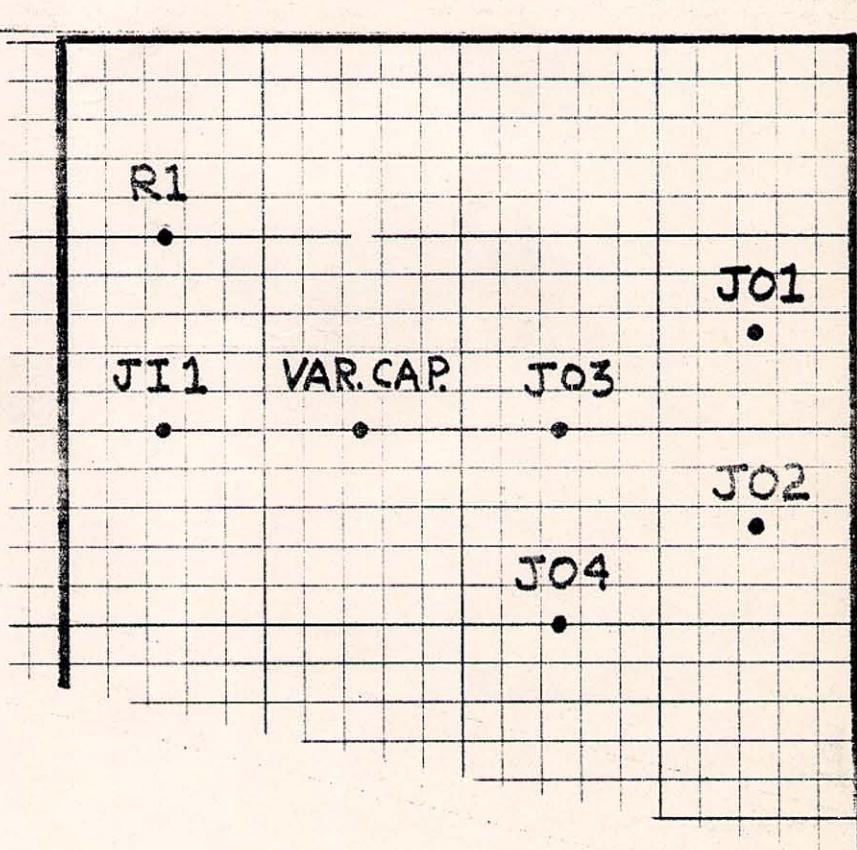
In the orig. diff. you input a signal via any 6 BNC inputs (JI1-thru-JI6); and, in the opt. diff. you input a signal to 1 BNC input (JI1), control its gain with R1, and its differentiation constant via a variable capacitor (VAR. CAP.). The VAR. CAP. will give you the same approximate differentiation constants as JI2-thru-JI6 in the orig. diff.; but, will not give you the largest differentiation constant available at JI1 in the orig. diff.

PART NUMBER FOR THE VAR. CAP. IS: ALLIED #695-2300 (7.2pf-151pf) \$9.00/ea.

SCHEMATIC for opt. diff. -



FRONT FACE for opt. diff. -



24		525-1060	10 OHM, 1/4 W RES	.06	A	DIF
9		525-1165	75 OHM, 1/4 W RES	.06	A	DIF
12		525-1202	100 OHM, 1/4 W RES	.06	A	DIF
21		525-1248	220 OHM, 1/4 W RES	.06	A	DIF
15		525-1467	5.1KOHM, 1/4 W RES	.06	A	DIF
3		525-1522	10KKOHM, 1/4 W RES	.06	A	DIF
5	14F1267	DM5-4600	6 PF, DIP-MICA CAP	.36	N	DIF
3	14F554	DM15-120J	12 PF, DIP-MICA CAP	.20	N	DIF
9	14F555	DM15-150J	15 PF, DIP-MICA CAP	.20	N	DIF
9	14F557	DM15-200J	20 PF, DIP-MICA CAP	.18	N	DIF
3	14F557	DM15-500J	50 PF, DIP-MICA CAP	.19	N	DIF
3	14F557	DM15-101J	100 PF, DIP-MICA CAP	.18	N	DIF
9	14F592	DM15-417J	470 PF, DIP-MICA CAP	.32	N	DIF
5	17F347	T0C-103Z	.01 MF, DSC-CER CAP	.05	N	DIF
3	719-1260	7-5-1000	100 MF, 25VDC, ELEC.	.24	A	DIF
6	555-2914	1N9146	SIL-DIODE	.19	A	DIF
3		2N4123	NPN TRANS	.22	S	DIF
3		2N4125	PNP TRANS	.27	S	DIF
5		CA3030	DIP OP-AMP, RCA	1.32	S	DIF
30	59F1337	13-236	BNC, FM-CHS.MT.	.72	N	DIF
3			VS 5 P-C BOARD			DIF
1			CHASSIS, DIF-FACE	8.25	OG	DIF

3 (see ADDENDUM) 695-2300 7.2-151 pf, var. cap. 9.00

A DIF

SYNC STRIPPER and CAMERA INPUT

This module performs several related utility functions.

A video signal is inputted to J11; this signal is clamped and sync suppressed and is available at J01, J02, J03 and J04. This part is identical to one-third of the INPUT module except the composite sync is generated internally (consult INPUT module documentation for explanation).

In addition, the video signal inputted at J11 is separated from the sync information by the sync strip card. The vertical sync is filtered and amplified by the vertical filter-amp and distributed to output jacks.

Similarly, the horizontal sync information is filtered and amplified and distributed to output jacks.

Burst flag and blanking information is regenerated from the horizontal and vertical sync and distributed to output jacks.

Vertical sync (-4v.) is available at J013, J014 and at pin#2 of the EIAJ (6-pin) camera connectors.

Horizontal sync (-4v.) is available at J09, J010 and at pin#5 of the EIAJ (6-pin) camera connectors.

Blanking is available at J011 and J012. Burst is available at J05 and J06

The video signal (from the camera) with composite sync is made available at the BNC connector above the corresponding EIAJ (6-pin) camera connectors.

When this module is used, the sync for the IP is stripped from the video signal inputted to J11. If a camera is used for this purpose it should of course not be sunk to the IP; but must be internally sunk or sunk from a non-IP source.

TEST STUFF:

R2 and R3 should be adjusted the same as R1 and R2 in the INPUT module.

The trimmer on the vertical filter amp should be adjusted so the vertical signal out is the same length as the vertical sync present in the original signal.

The trimmer on the horizontal filter amp should be adjusted so the horizontal signal out is the same as the horizontal sync in the original signal. (NOTE: these adjustments are hard to make, but are not very critical in timing).

R4, front panel associated with the sync stripper, should be adjusted to minimize any jitter in output picture.

The blanking and burst amp is a set of three identical circuits except for the timing capacitors. Referring to the schematic diagram, the first half of the 9602 sets a delay time to the pulse and the second half times the pulse.

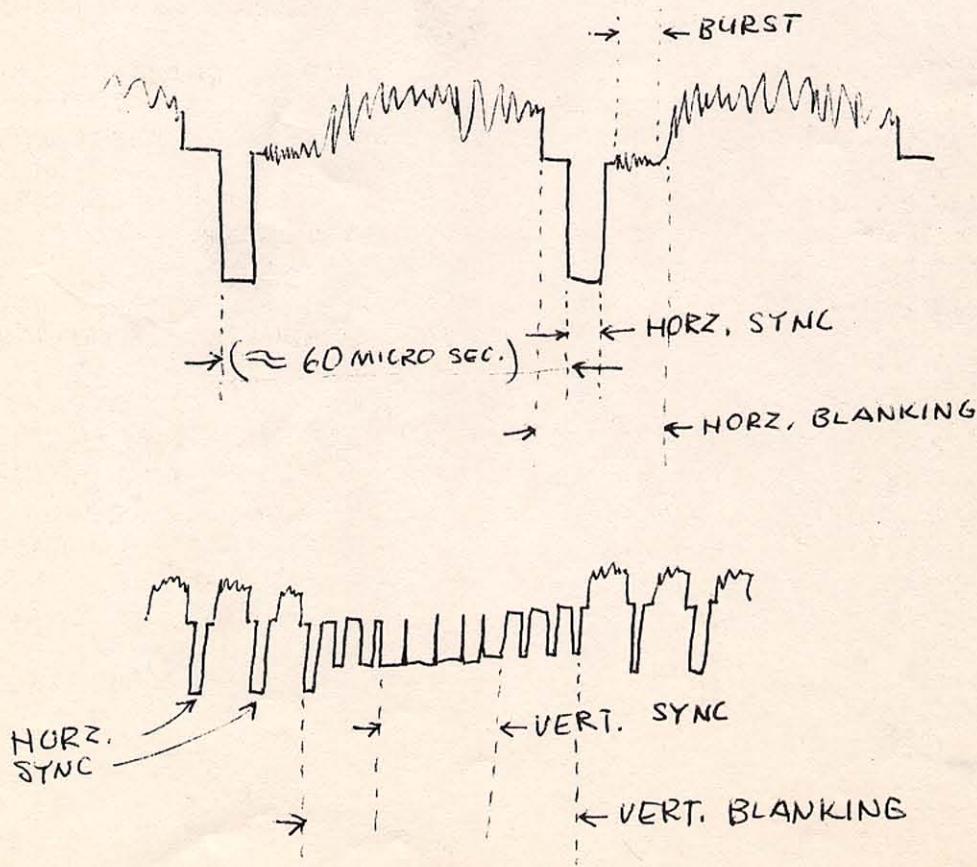
In the case of the burst flag R1T sets the delay from the beginning of the horizontal sync pulse to the beginning of the burst flag, and R2T determines the length of the burst flag.

In blanking, R3T sets the delay from the beginning of the horizontal sync pulse to the beginning of the blanking pulse for the next horizontal line. This period is slightly less than on horizontal line. R4T sets the length of the blanking pulse.

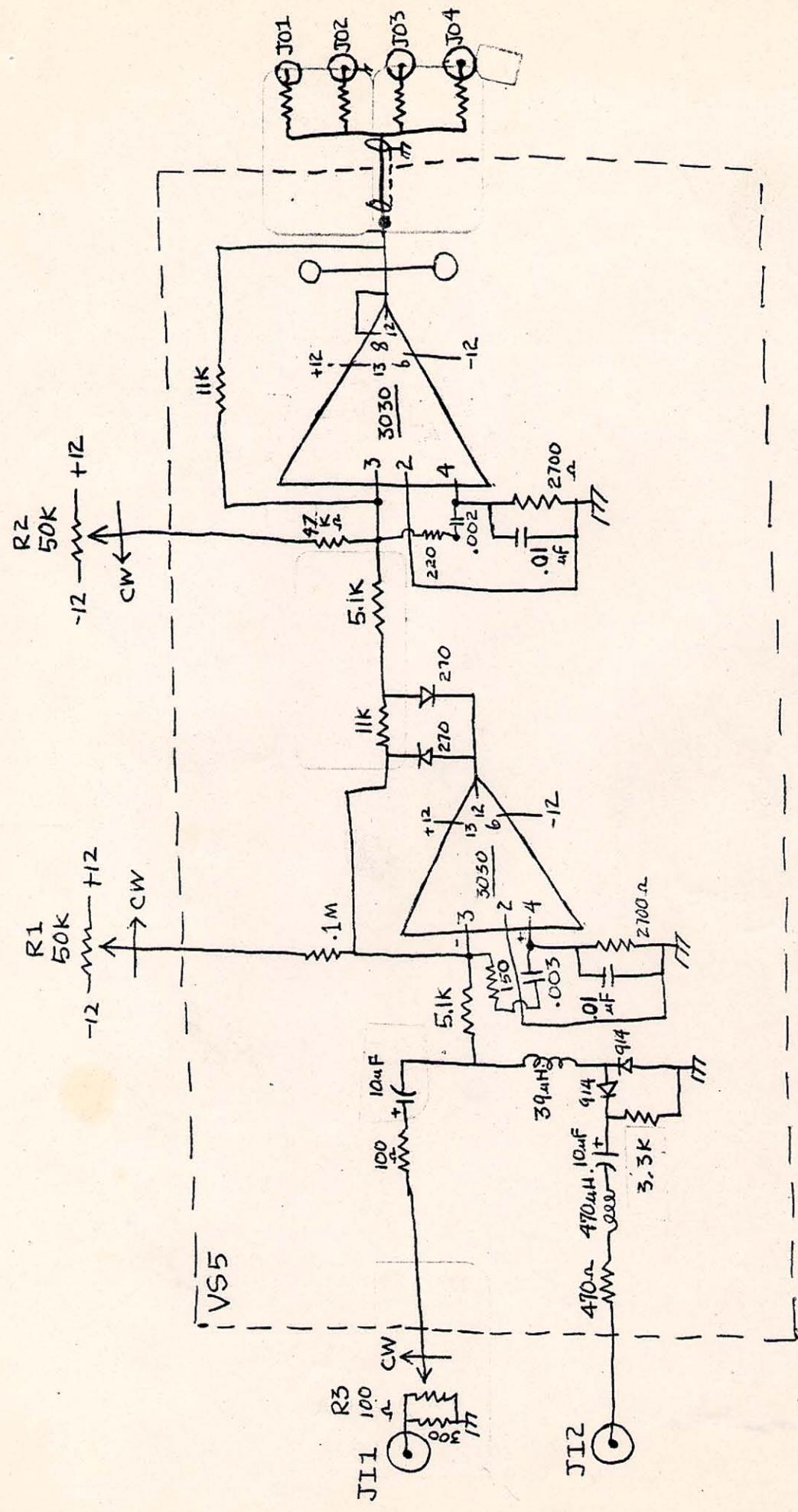
Vertical blanking is similiar with R5T setting the delay from the beginning of the vertical sync pulse to the beginning of the vertical blanking interval. R6T sets the length of the blanking interval.

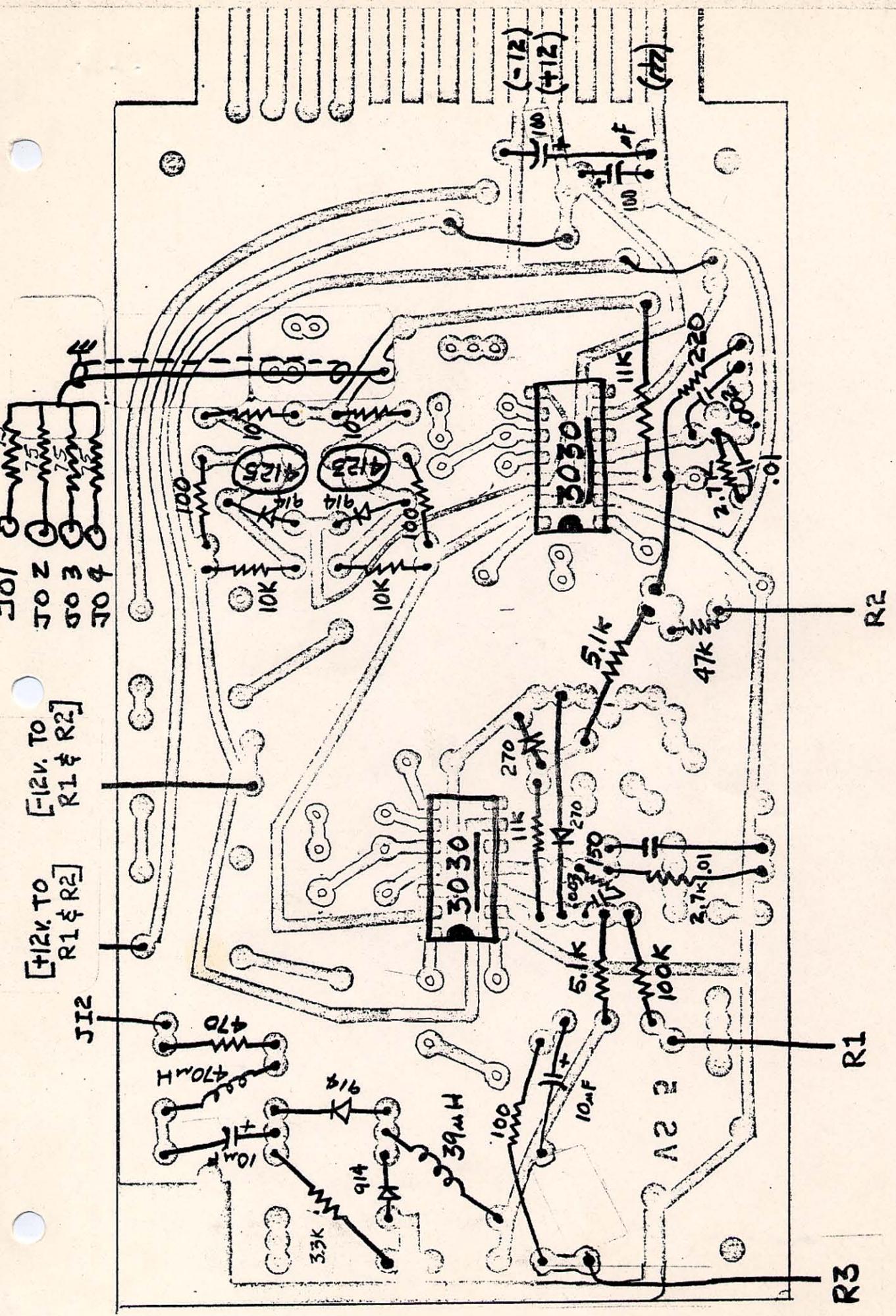
To adjust all of these, feed into the module a high quality video signal (from a clearly received broadcast station or from the color encoder in the IP driven by a high quality sync generator). Adjust the output pulses from the sync strip to be identical with the pulses from the standard source.

HINT: start with all pots turned nearly full clockwise (minimum resistance). If the resistance is too high the device stays on all the time and if the resistance is too small, pulse may be too short to be seen on an inexpensive oscilloscope. A dual-trace triggered oscilloscope is preferred but a single trace scope can be used.



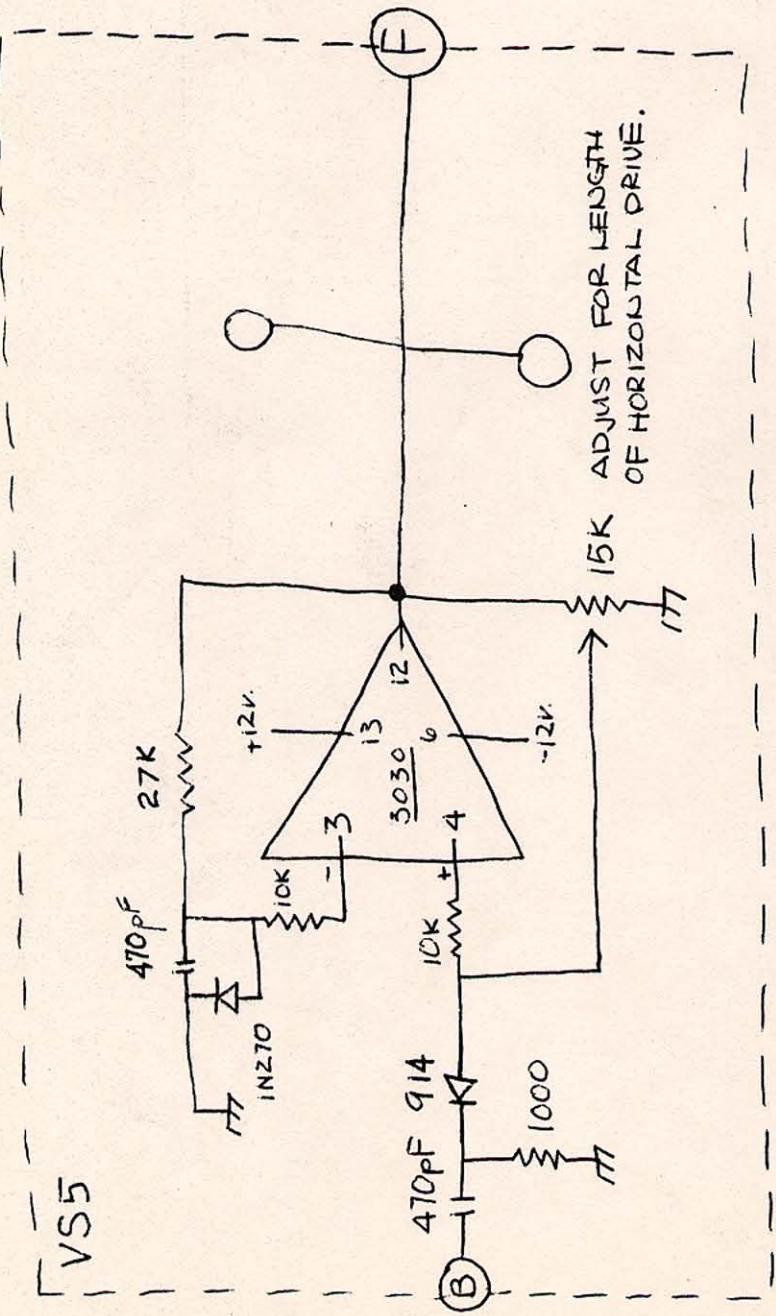
R1	R2	JO1	JO2	
JI1	R3	JO3	JO4	OK 9-95
R4	BURST FLAG	JO5	JO6	
RIT	COMP. SYNC	JO7	JO8	
RST	- R2T HORZ. DRIVE - RST	JO9	JO10	FRONT FACE
RST	COMP. BLANK: RGT	JO11	JO12	
	VERT. DRIVE	JO13	JO14	
JO19	JO20	JO21	JO22	
JO15	JO16	JO17	JO18	SYNC STRIPPER CAMERA INPUT
				5/8" 1/8"





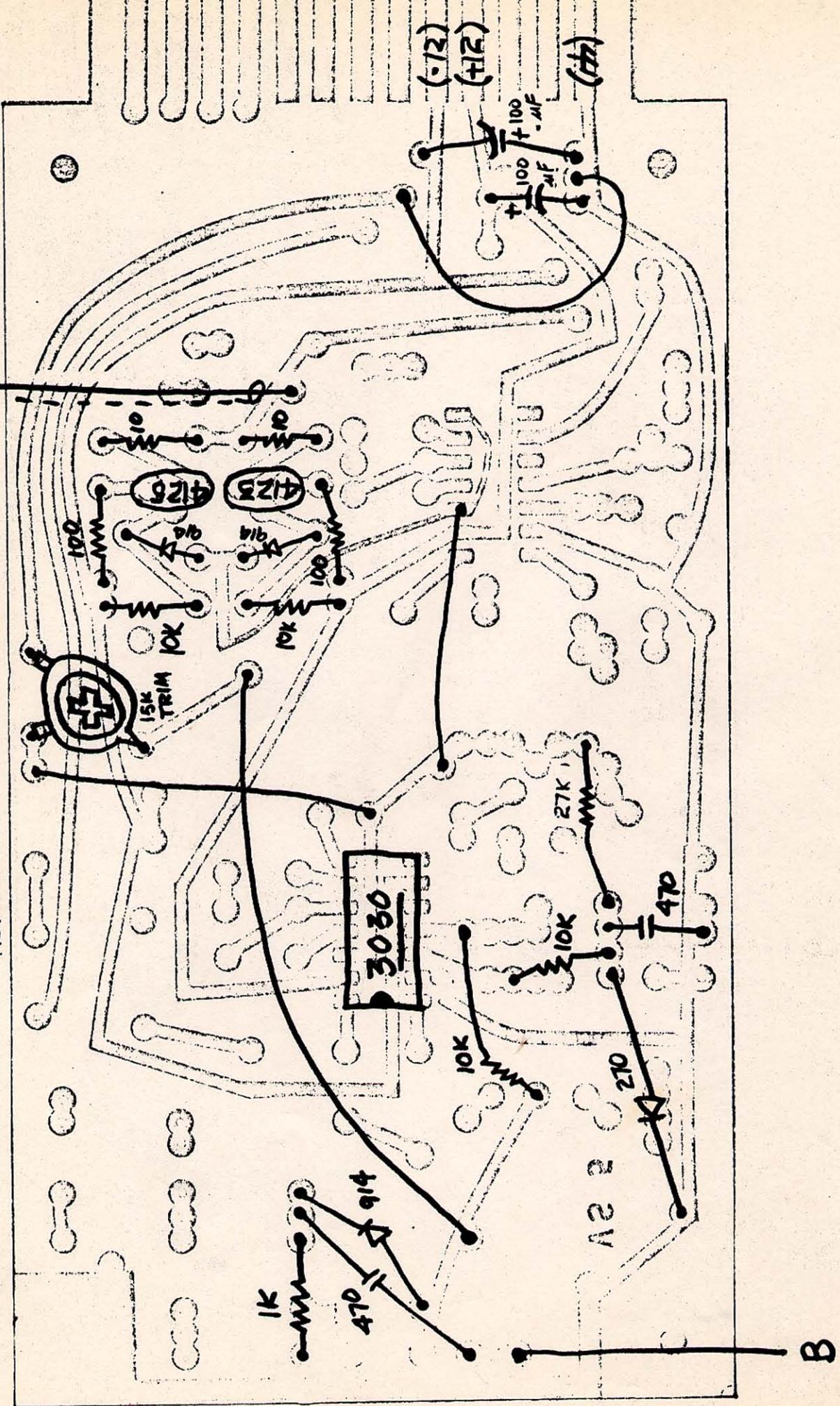
9-15
INPUT

HORIZONTAL FILTER AMP



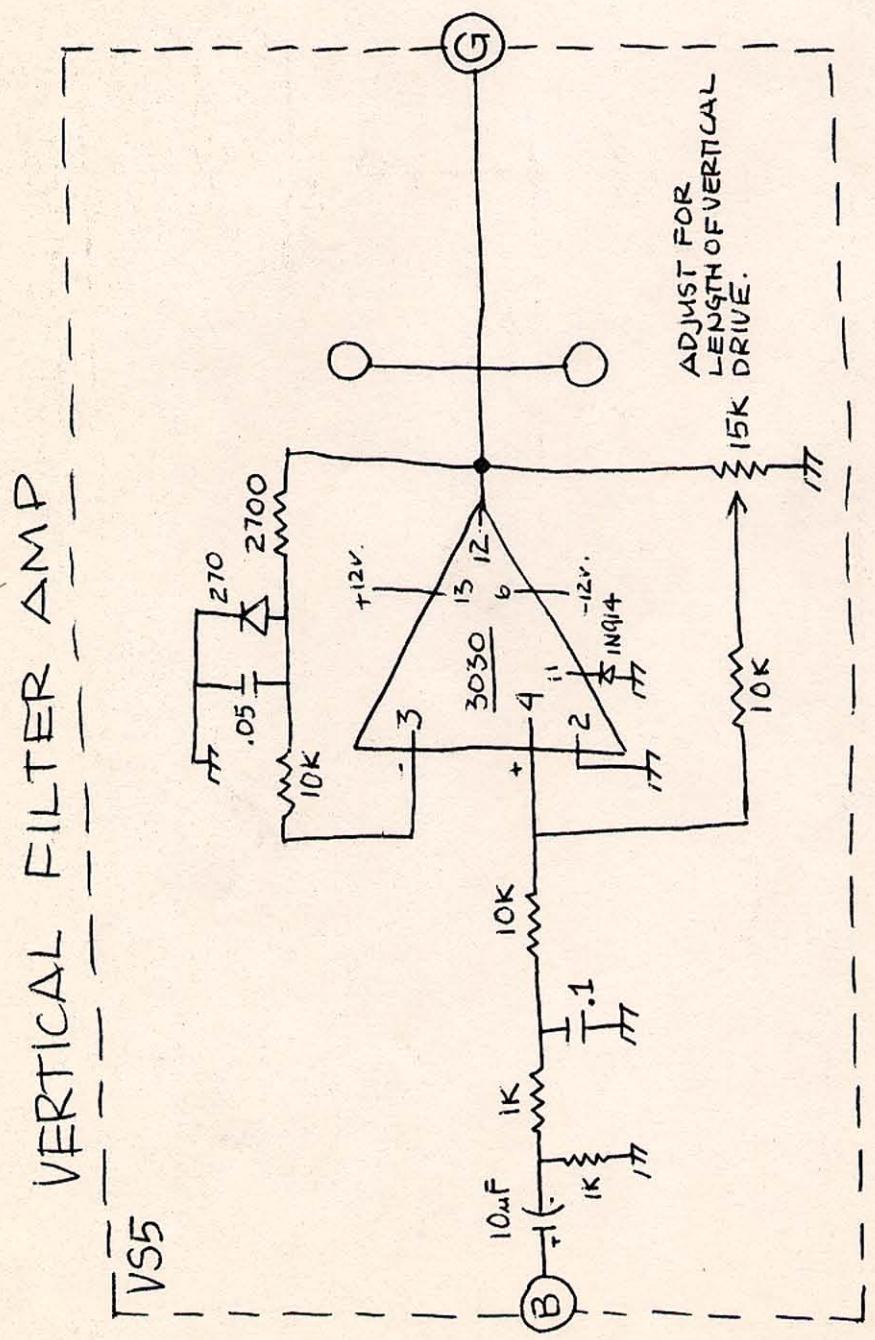
SYNC STRIPPER & CAMERA INPUT

HORIZONTAL FILTER AMP



SYNC STRIPPER & CAMERA INPUT

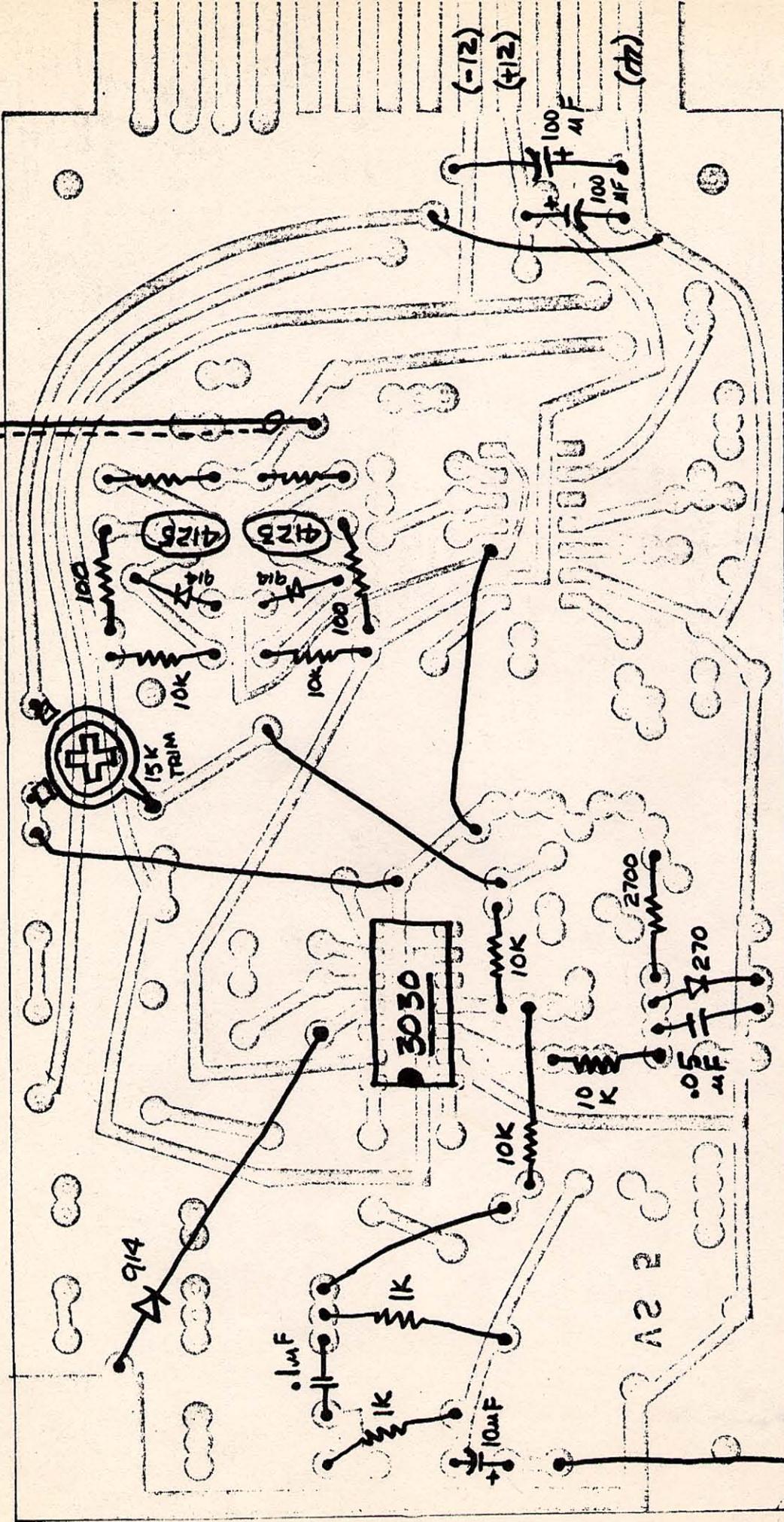
VERTICAL FILTER AMP



SYNC STRIPPER & CAMERA INPUT

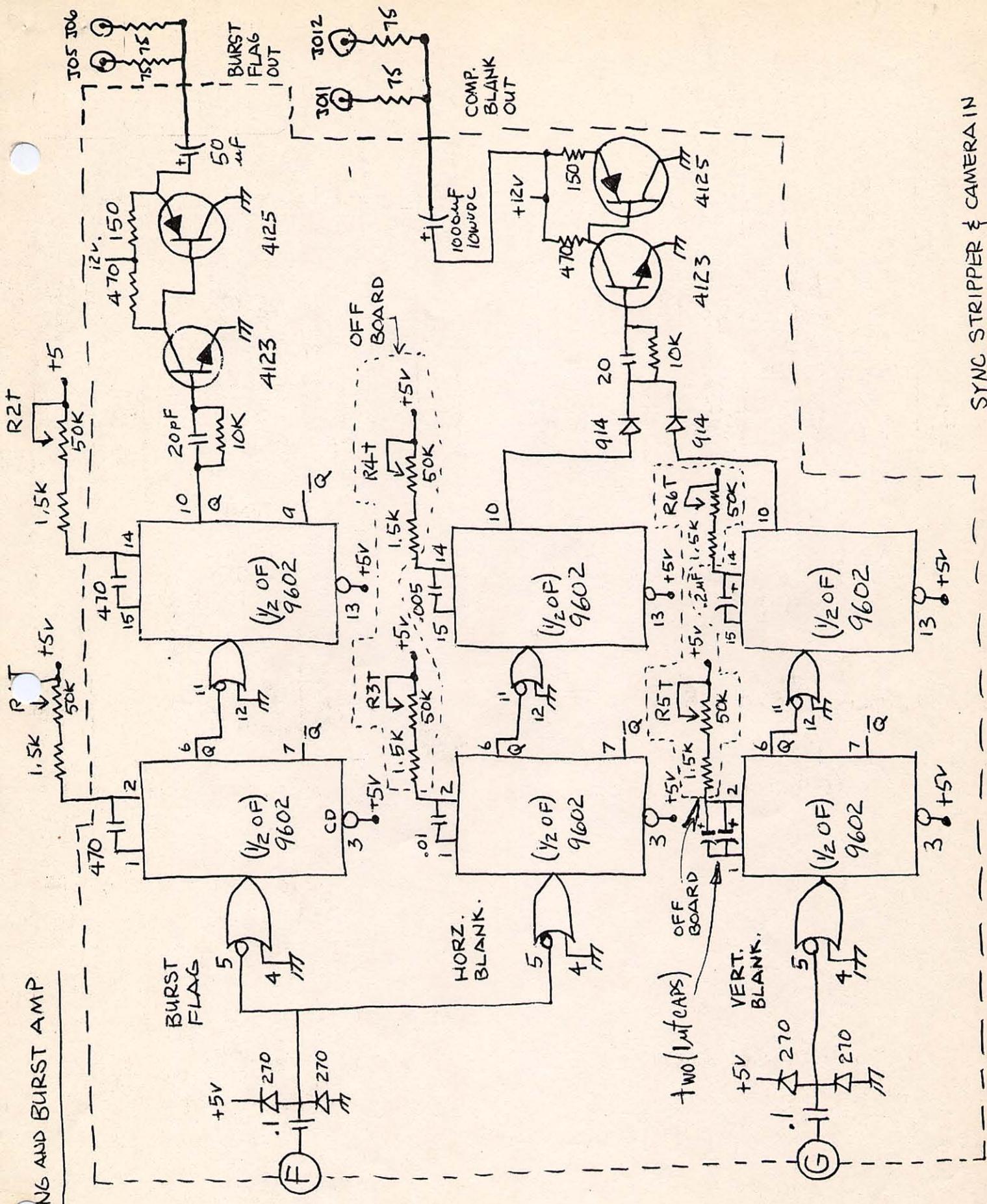
VERTICAL FILTER AMP

G



SYNCH STRIPPER & CAMERA INPUT

BLANKING AND BURST AMP



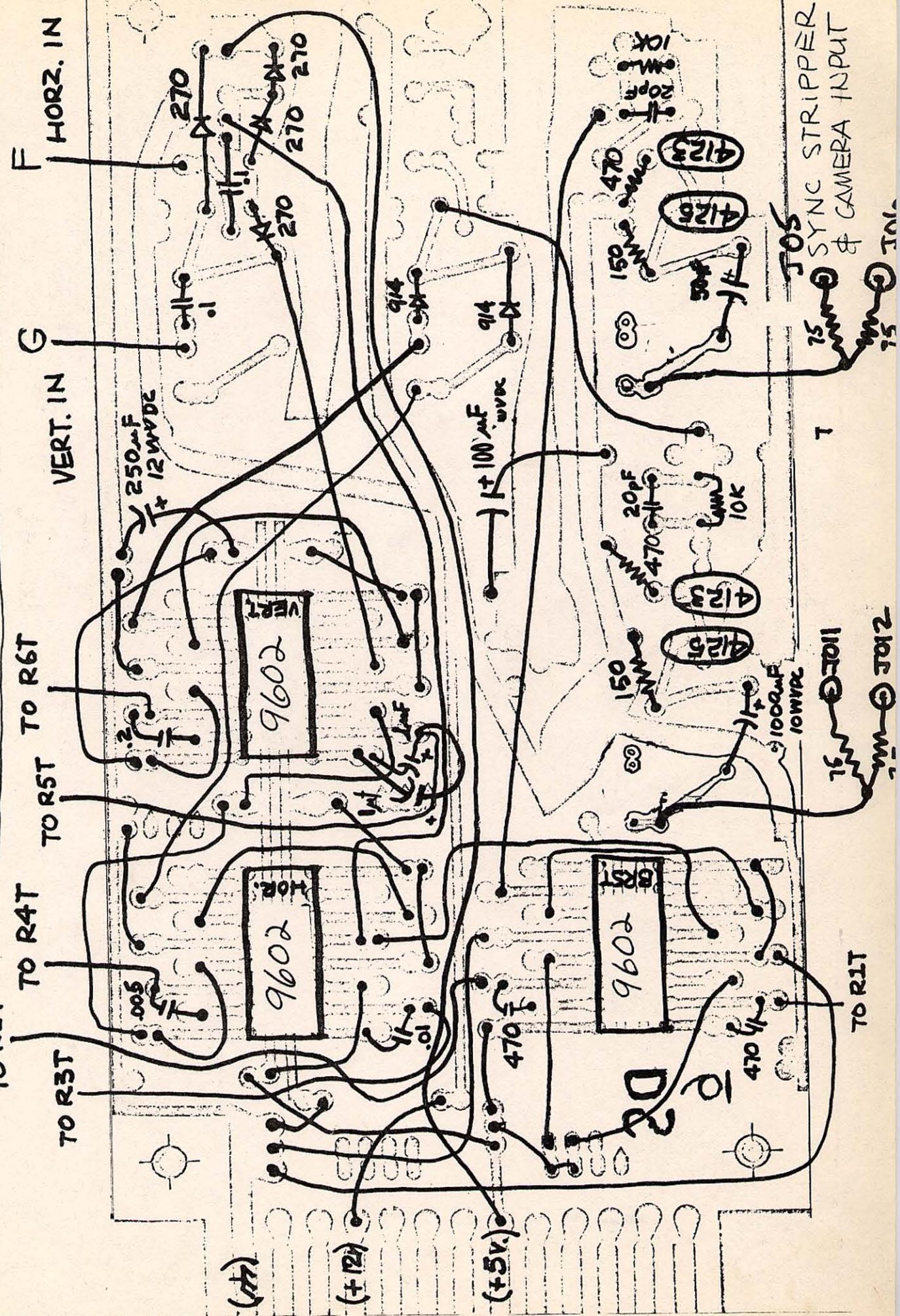
SYNC STRIPPER & CAMERA IN

R1T THROUGH R6T (TRIM POTS) SHOULD BE MOUNTED ON A
HOME-MADE PLASTIC MASONITE BOARD PUT IN THE LEFT SIDE
(FROM FRONT VIEW) OF MODULE, SHOULD BE SCREW DRIVER ADJUSTABLE
THROUGH SIDE PANEL, SO PHILLIPS HOLES APPROPRIATELY.

BLANKING & BURST AMP

EXAMPLE:
(R1T-R6T)

$\frac{1}{2} \text{WATT}$
1.5K
 V_{CW}
 V_{CC}
50K
TRIM
POTS
(IN) +5V.



6	525-1050	10 OHM, 1/4 W RES	.06	A	IP
12	525-1185	75 OHM, 1/4 W RES	.06	A	IP
9	525-1202	100 OHM, 1/4 W RES	.06	A	IP
3	525-1248	220 OHM, 1/4 W RES	.06	A	IP
3	525-1270	300 OHM, 1/4 W RES	.06	A	IP
2	525-1467	5.1KOHM, 1/4 W RES	.06	A	IP
6	525-1522	10KKOHM, 1/4 W RES	.06	A	IP
6	525-1526	11KKOHM, 1/4 W RES	.06	A	IP
6	525-1717	100KOHM, 1/4 W RES	.06	A	IP
6	525-1302	470 OHM, 1/4 W RES	.06	A	IP
5	525-1421	2.7KOHM, 1/4 W RES	.06	A	IP
3	525-1433	3.3KOHM, 1/4 W RES	.06	A	IP
3	525-1650	47KKOHM, 1/4 W RES 150 OHM 1/4 W RES	.06	A	IP
3					
6	10F655	SOK TRIM, LOK, PNL-MT	3.00	N	IP
3	9F673	U1 100 OHM POT 1/4SFT	1.45	N	IP
3					
1		.002 pF			
5	14F592	145 1500 15 PF, DIP-MICA CAP.	.20	N	IP
6	67F307	DM15-417J 470 PF, DIP-MICA CAP.	.32	N	IP
5	712-1251	.01 MF, OSC-CER CAP.	.05	N	IP
5	712-1260	2-6-101 10 MF, 25VDC, ELEC.	.44	A	IP
3		7-6-1000 100 MF, 25VDC, ELEC.	.24	A	IP
3		.003 pF			
3					
5	553-0914	1N914B SIL-DIODE	.19	A	IP
3		1N270 GERM-DIODE	.22	S	IP
3		2N4123 NPN TRANS	.22	S	IP
3		2N4125 PNP TRANS	.27	S	IP
0		CA3030 DIP OP-AMP, RCA	1.32	S	IP
3					
3	55F1955	SWU 59 59 MICROHENRY CHOKES	2.91	N	IP
3	55F1969	SWU470 470 MICROHENRY CHOKES	2.91	N	IP
3					
3	59F1337	13-236 VSS P-C BOARDS BNC, FM-CHS. MT.	.72	N	IP
12		CHASSIS, INPUT-FACE	8.25	DG	IPM
1	R3-67-1-UC-N-L-9	KNOB, BLACK/INLAY	2991.00	R	IP
3					

REFERENCE MODULE:

The Reference module produces a constant voltage proportional to front panel knob position. It uses 2 $\frac{1}{4}$ #217 printed circuit boards; save other 3/4 of board for making 3-D Joystick later...

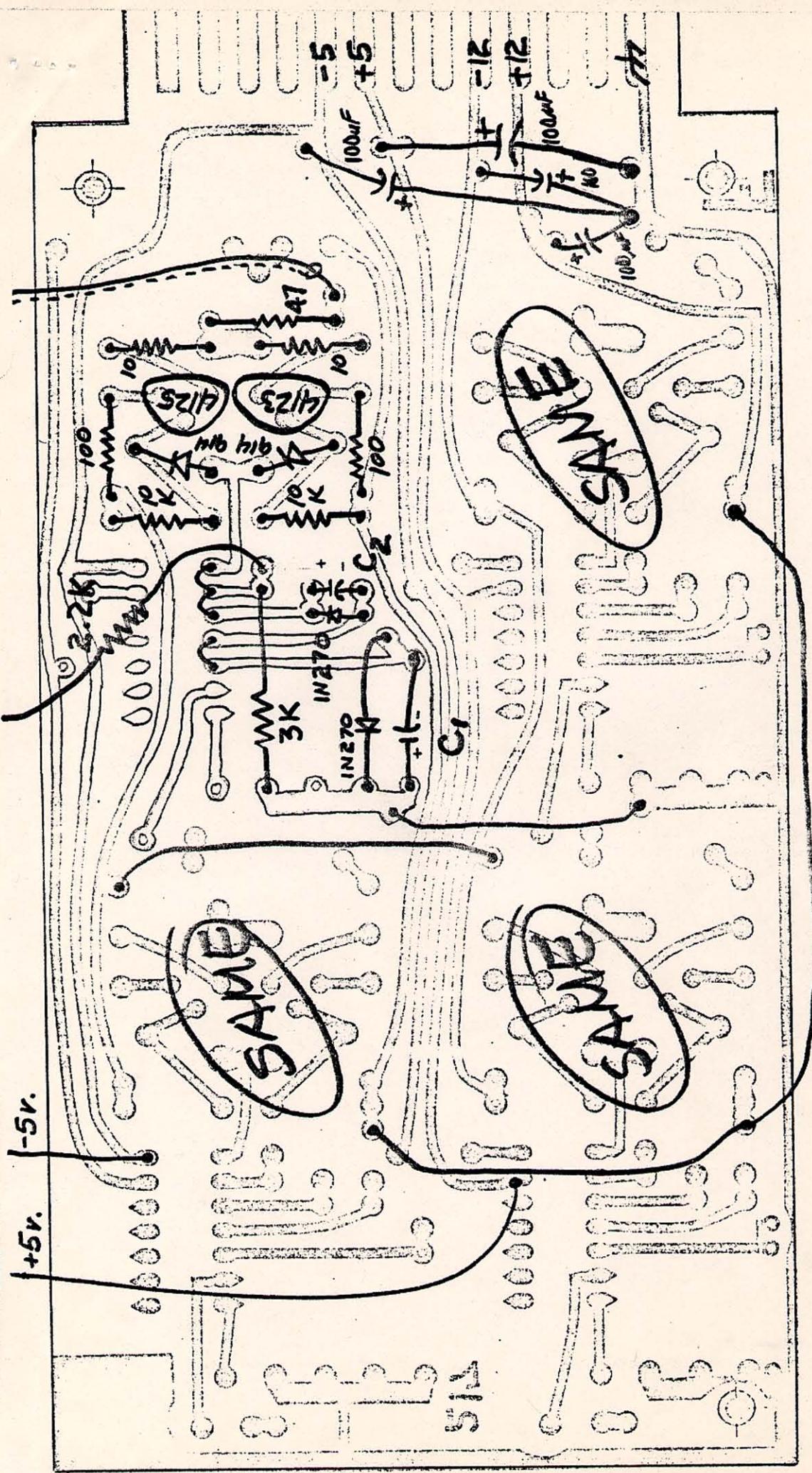
Joystick and slide pot inputs could be created in analogous manner. The value of input resistor, R1 through R9, is not critical; for instance if 5K ohm pots in joysticks are available, use them.

Capacitors C₁, C₂, are used to filter out noise. 100uF is the minimum and does not affect the feel much. Dan chose 250uF and Phil chose 1000uF; 1000uF is very 'slushy'.

[TO R1-THRU-R9]

R1

J501



CAPACITORS C₁, C₂ MAY BE ANY VALUE
BETWEEN 100μF \pm 1000μF.

REFERENCE

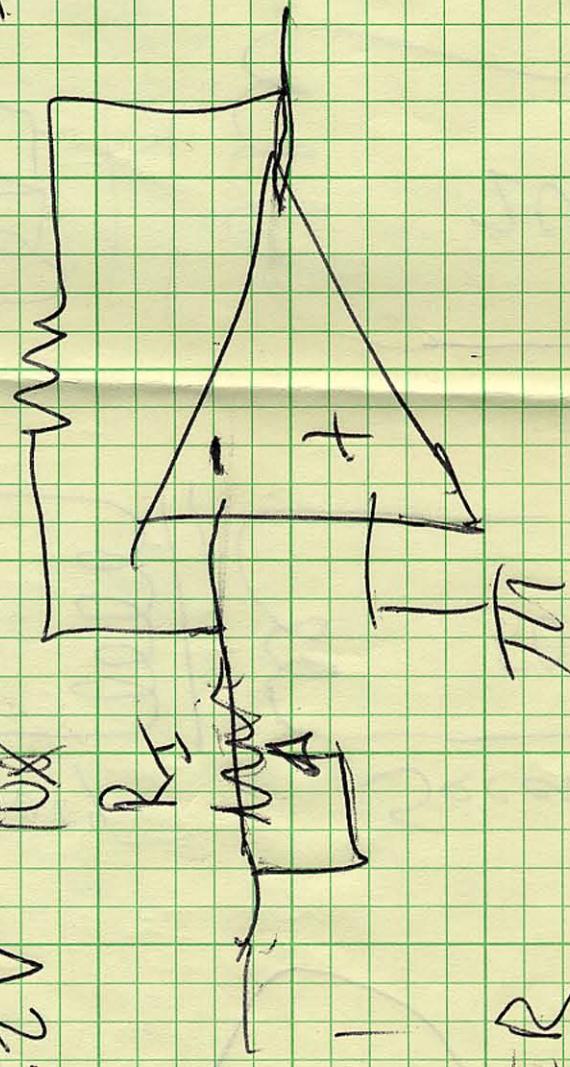
$$T = -0.0009615 \approx .001 \text{ m/s}$$

$$E = -1.001 \times 2200$$

$$E = -2.2 \sqrt{100}$$

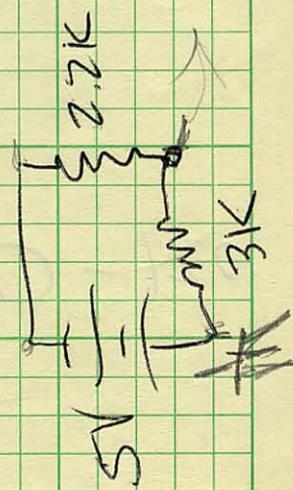
$$R_F / R_T = V_{out}$$

$$\sqrt{R_X} / R_T$$



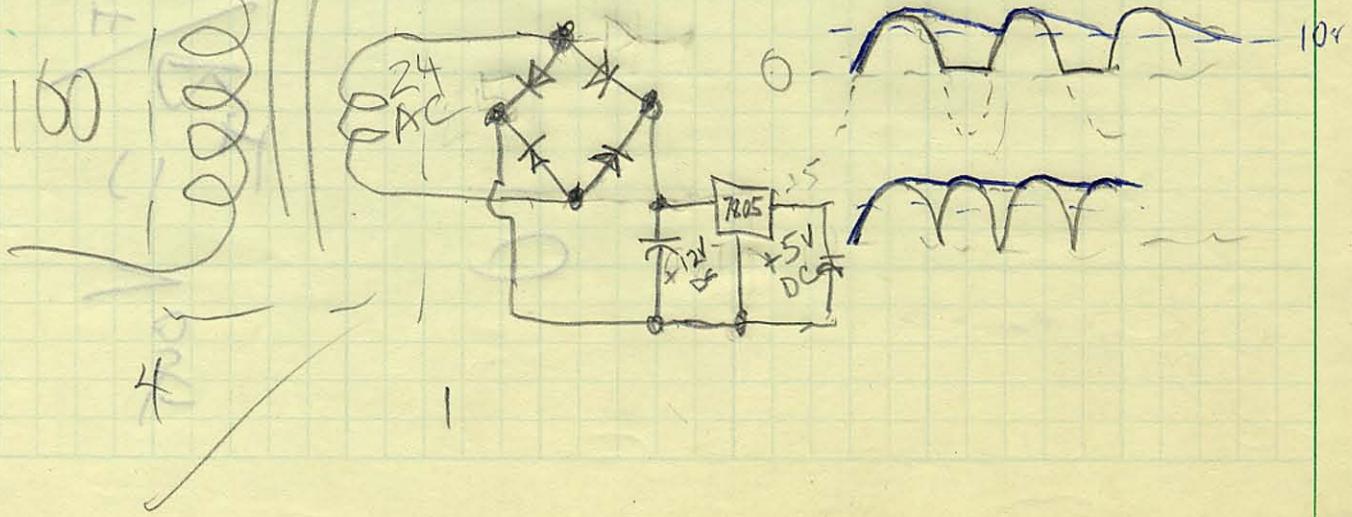
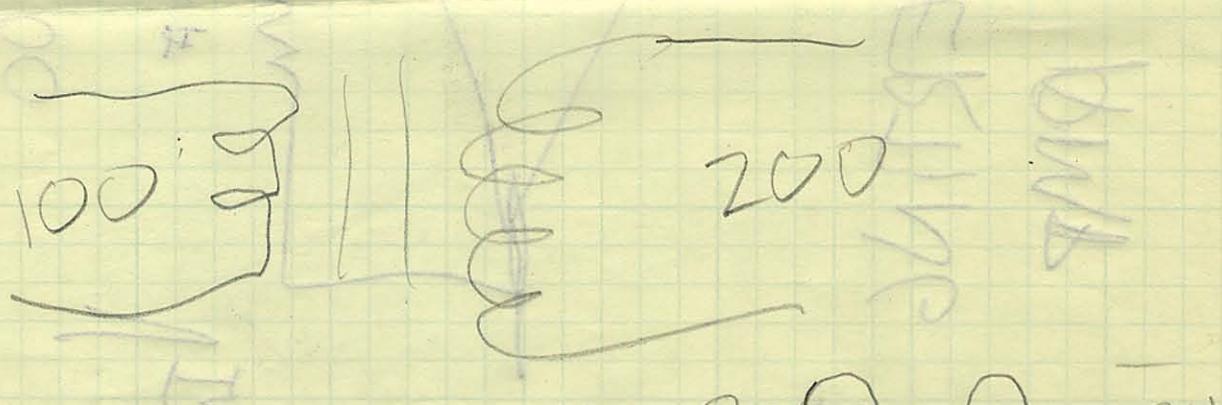
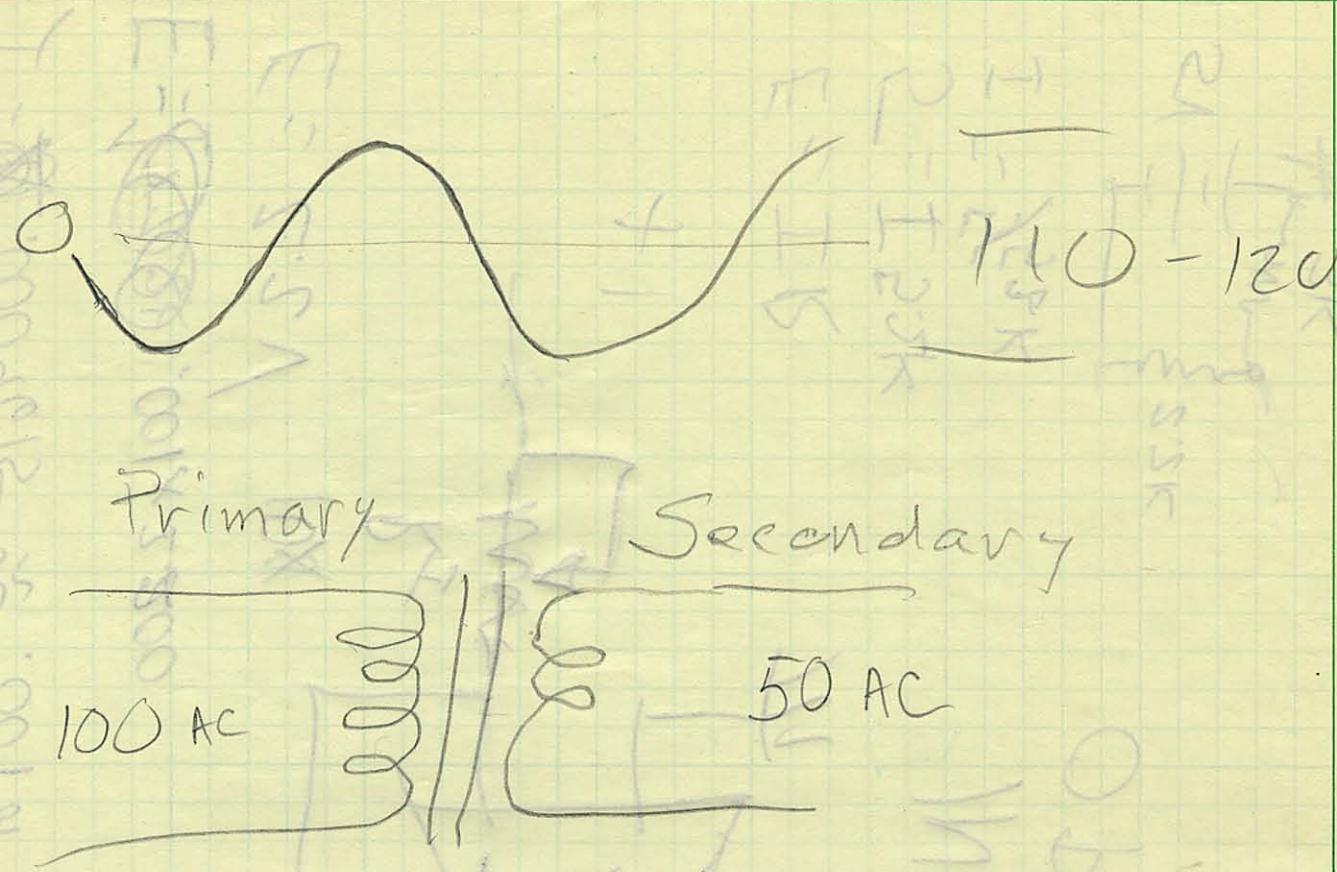
$$E = IR$$

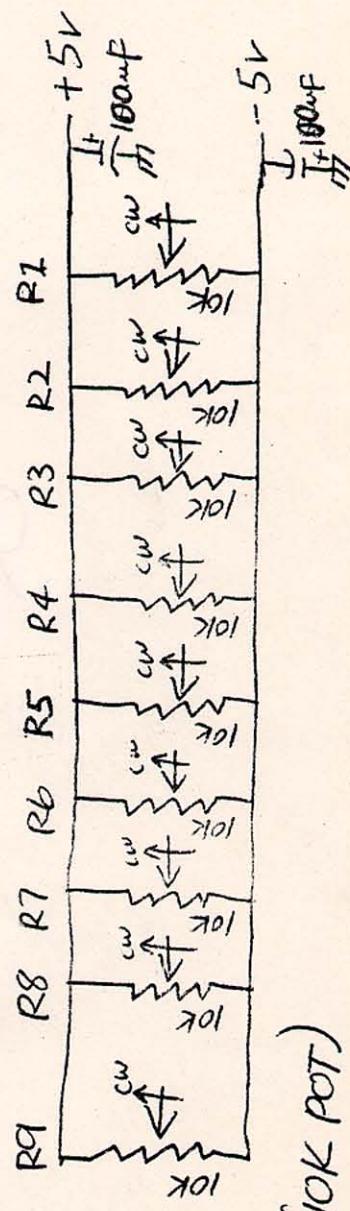
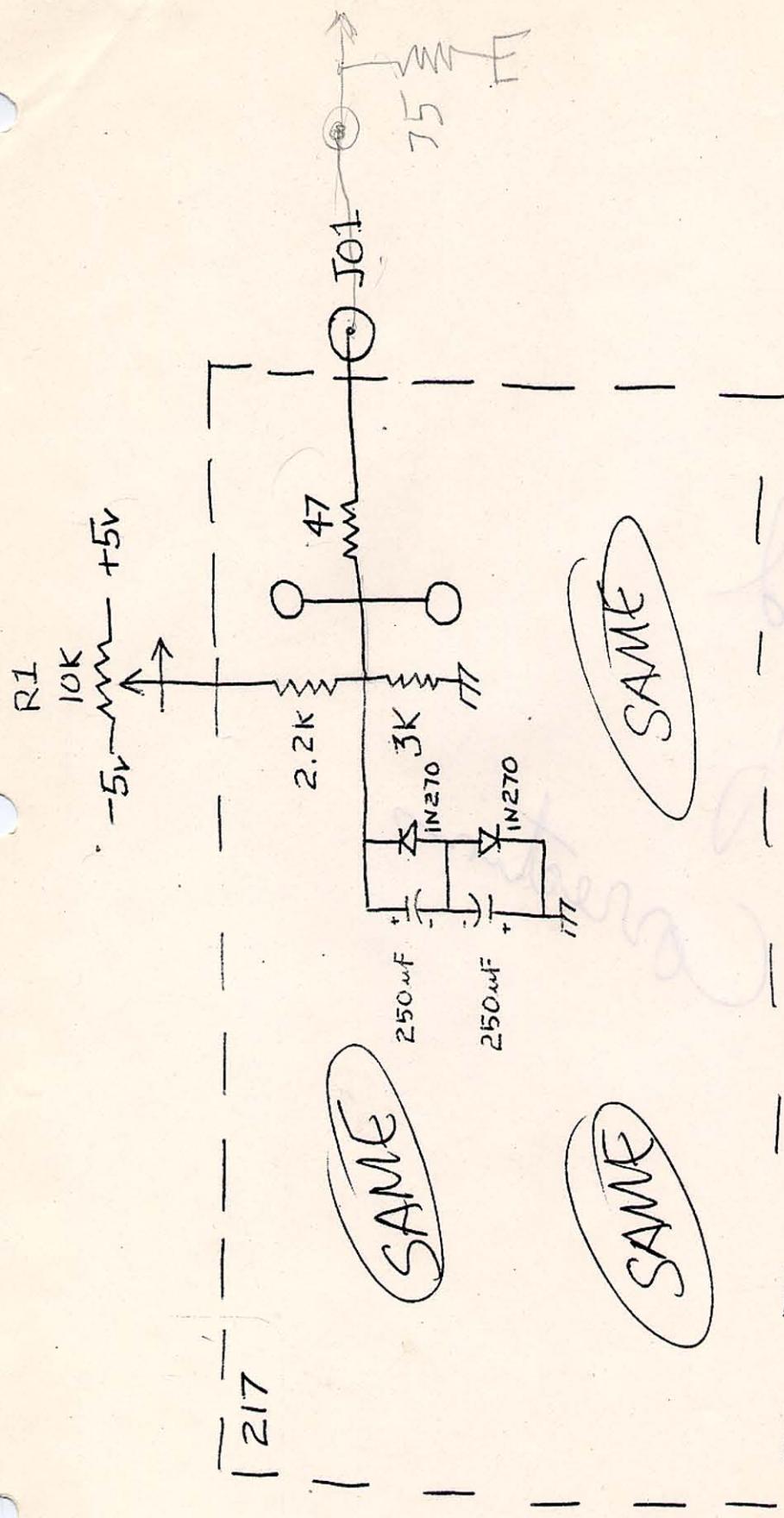
$$I = 55.2K$$



INVERTING

OP AMP





FRONT FACE (10K POT)
WIRING

REFERENCE

9		525-1060 10 OHM, 1/4 W RES	.06	A	REF	
9		525-1153 47 OHM, 1/4 W RES	.06	A	REF	
10		525-1202 100 OHM, 1/4 W RES	.06	A	REF	
9		525-1405 2.2KOHM, 1/4 W RES	.06	A	REF	
9		525-3427 3K OHM, 1/4 W RES	.06	A	REF	
10		525-1522 10KKOHM, 1/4 W RES	.06	A	REF	
9	10F453	105UA 10K OHM POT 1/4SFAB	2.21	N	REF	
4	710-1250	7-6-1040 100 MF, 25VDC, ELEC.	.24	A	REF	
10	555-0914	1N914B SIL-DIODE	.19	A	REF	
9		2N4123 NPN TRANS	.22	S	REF	
9		2N4125 PNP TRANS	.27	S	REF	
3		217 P-C BOARD			REF	
2	59F1337	13-236 BNC, FM-CHS. MT.	.72	N	REF	
1		CHASSISREFERENCE-FACB	.25	DG	REF	
9	623-67-1-00-M-0-9	SNOB, BLACK/INLAY	2991.00	R	REF	

18	TN270	GERM-DIODE	.22	S	REF
18	710-1260	100uF, 25v, ELECT.		A	REF
18	710-1218	250uF, 12v, ELECT.		A	REF
18	623-0701	470uF, 16v, ELECT.		A	REF
18	623-0703	1000uF ELECT.		A	REF

AMPLITUDE CLASSIFIER

The amplitude classifier takes an input signal at JI 11 and separates it into 8 contiguous regions varying from black to white. The value put out by each region is controlled by R 1 through R 8 and by signals inputed to JI 1 through JI 8. The output signals are available for each region separately, JO 1 through JO 8. The sum of these signals is available at JO 21 through JO 24. The effect of JI 1, JI 2, R 2, etc., is additive in each region. R 11 controls the gain of the signal inputed at JI 11, and R 14 generates a bias (constant gray level proportional to knob position) which is added to the input signal. In general, R 11 and R 14 are used to match the incoming signal to the lightest, or 'top' and 'darkest' or 'bottom' of the 8 regions.

TEST INFORMATION

These tests are best performed with a 1 volt, peak to peak triangle wave inputed to JI 11, and a calibrated dual trace oscilloscope connected to the input and output of the amplitude classifier. R 13 is adjusted so that a +.4 volt signal activates channel 8 (bottom). R 12 is adjusted so that a +.4 volt signal activates channel 1 (top). R 11 should be full clockwise and R 14 should be in the exact center of rotation. R 12 and R 13 interact greatly, so, repeat adjustments until both conditions can be met simultaneously. R 16 should be adjusted so that with R 1 through R 8 in their centers the individual output are near 0 volts when not activated. R 15 should be adjusted so the summed output appearing at JO 21 through JO 24 is 0 volts for the non-activated channels.

BASIC CIRCUIT DESCRIPTION AND TEST INFORMATION--AMPLITUDE CLASSIFIER

A signal at JI 11 is sent to all comparators. The resistor string of 100 ohm resistors combined with voltage sources at R 13 and R 12 bias so that IC 1 switches on at a higher (+) voltage than IC 2, IC 2 switches on at a higher voltage than IC 3, etc.. For example; with 0 volts at JI 11, IC 5, 6, 7 might be on and IC 1, 2, 3, 4 would be off. The transistors connected to the outputs of the comparators decode the comparator string output such that only the highest comparator on is outputed. In this example, channel 5 would be on, all others off. This signal is sent to the multiplier associated with channel 5, turning it on. All other multipliers would be off.

	J1!	R1	J01	
	J12 •	R2 •	J02 •	
R11 •	J13 •	R3 •	J03 •	
J11 •	J14 •	R4 •	J04 •	
R14	J15 •	R5 •	J05 •	AMPLITUDE CLASSIFIER
	J16 •	R6 •	J06 •	FACE 1-75
	J17 •	R7	J07	
	J18 •	R8 •	J08 •	
			J022 •	
		J021 •		
			J024 •	
		J023 •		

J1 100
 J2 100
 J3 100
 J4 100
 R1 100
 R2 100
 R3 100
 R4 100
 R11 100
 R12 100
 R13 100
 R14 300
 -5
 R15 100
 R16 100
 R17 100
 R18 100

N
T
E

R1 to R8
All 10k Ω

$\frac{1}{2}$ CW
 $\frac{1}{2}$ CCW

217

MULT.

BOARD

216

COMP.
BOARD

(middle)

(top)

217

MULT.

BOARD

R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18

(bottom)

J05 J06 J07 J08
J01 J02 J03 J04

V55

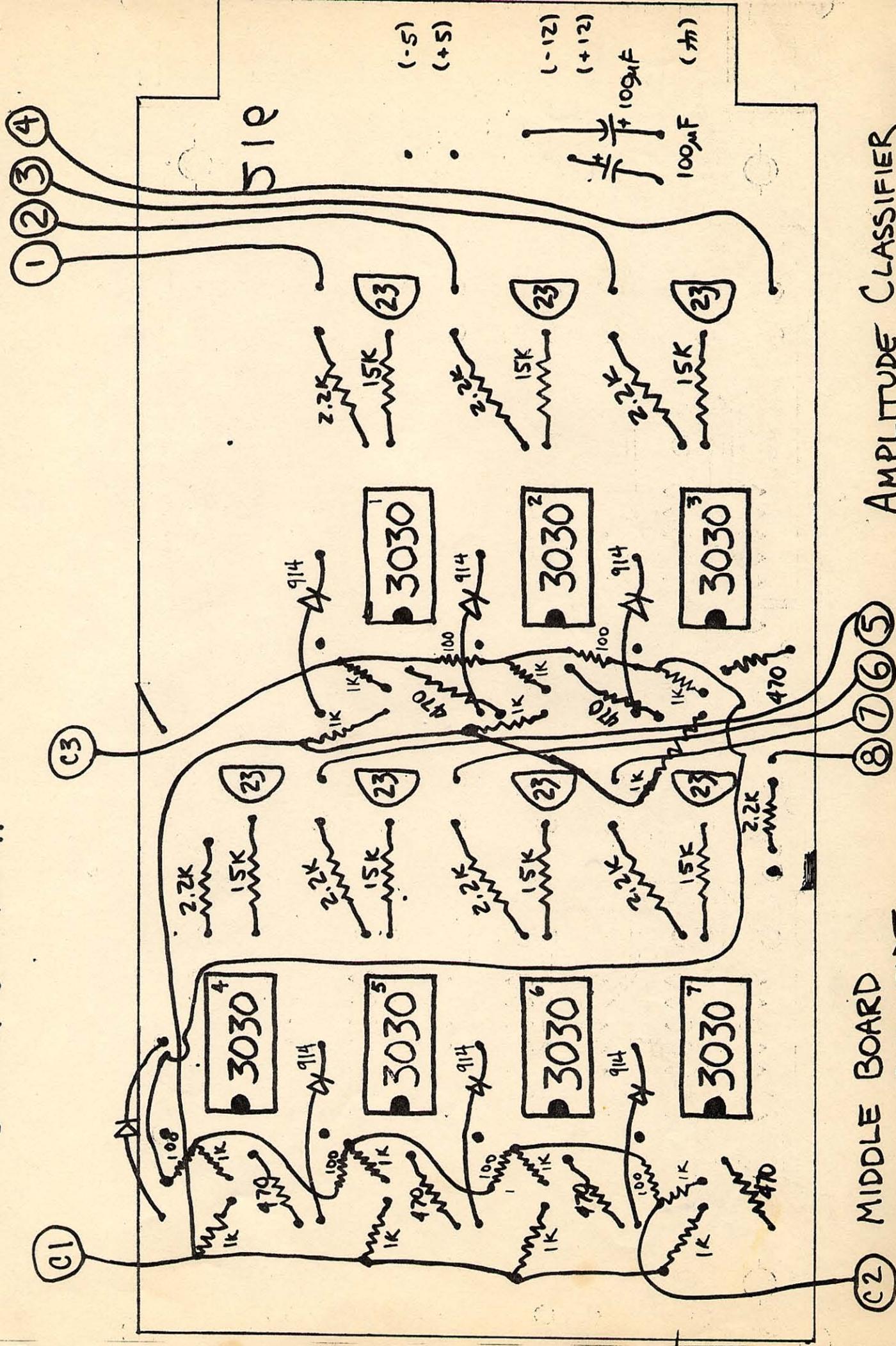
ADDER
BOARD

V55

ADDER
BOARD

AMPLITUDE CLASSIFIER 1.76

NOTE: BUS POWER TO ALL OTHER BOARDS !!

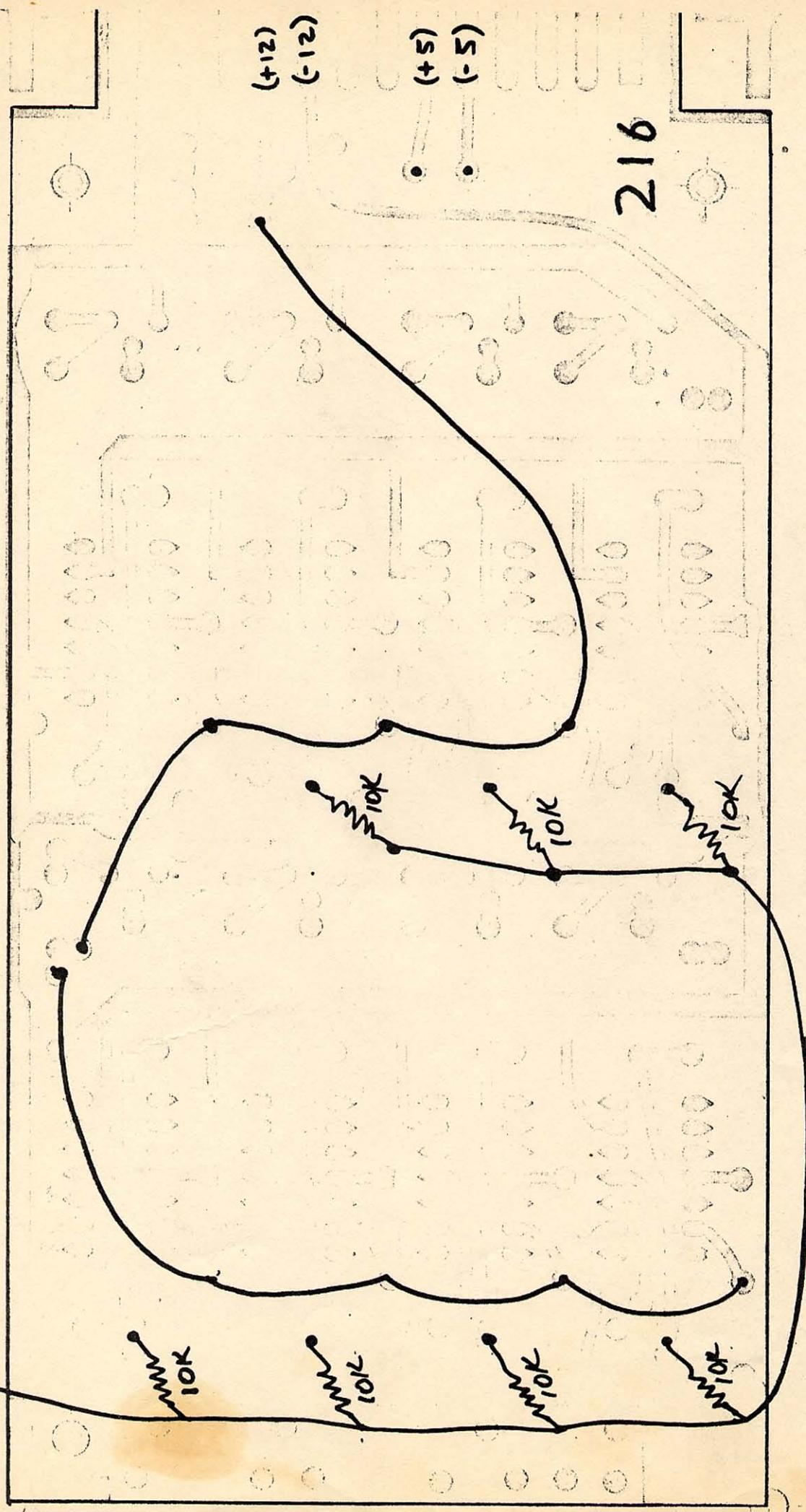


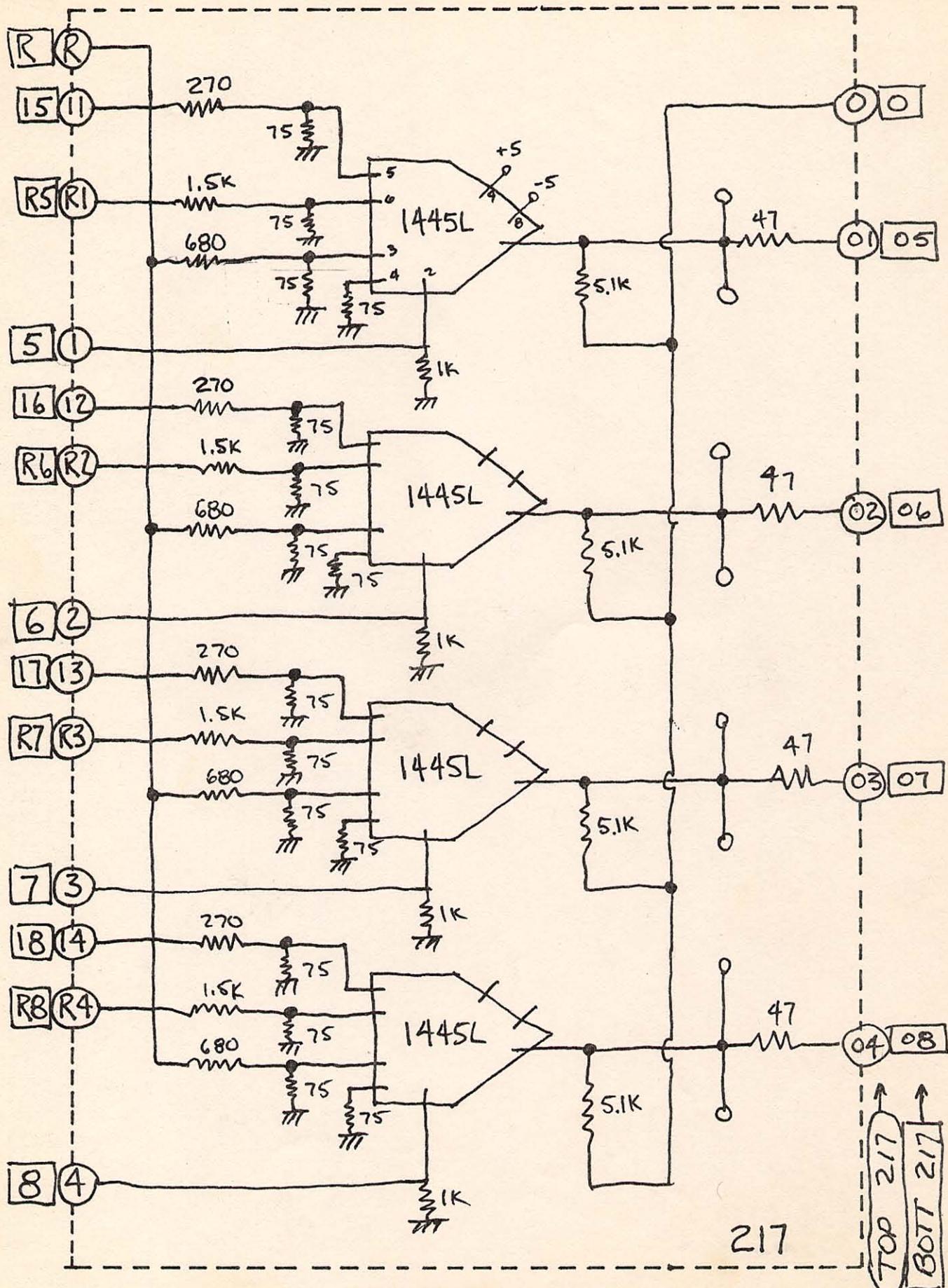
AMPLITUDE CLASSIFIER

AMPLITUDE CLASSIFIER

9-75

MIDDLE BOARD
FOIL SIDE





MULTIPLIER BOARD
TOP OR BOTT.

AMP. CLASS,
1-76

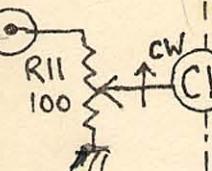
217

TOP 217
BOTT 217

COMPARATOR
BOARD

216

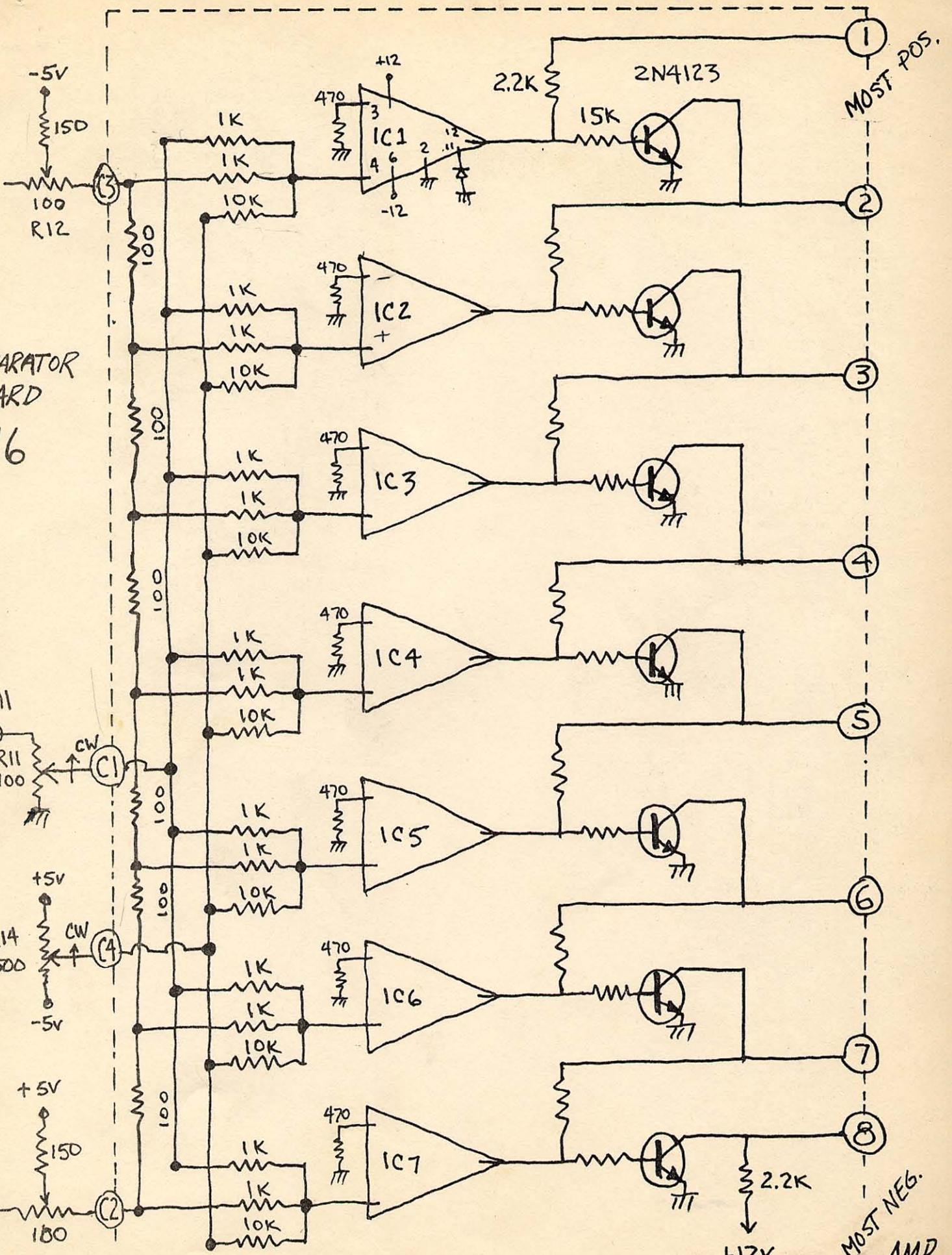
JIII

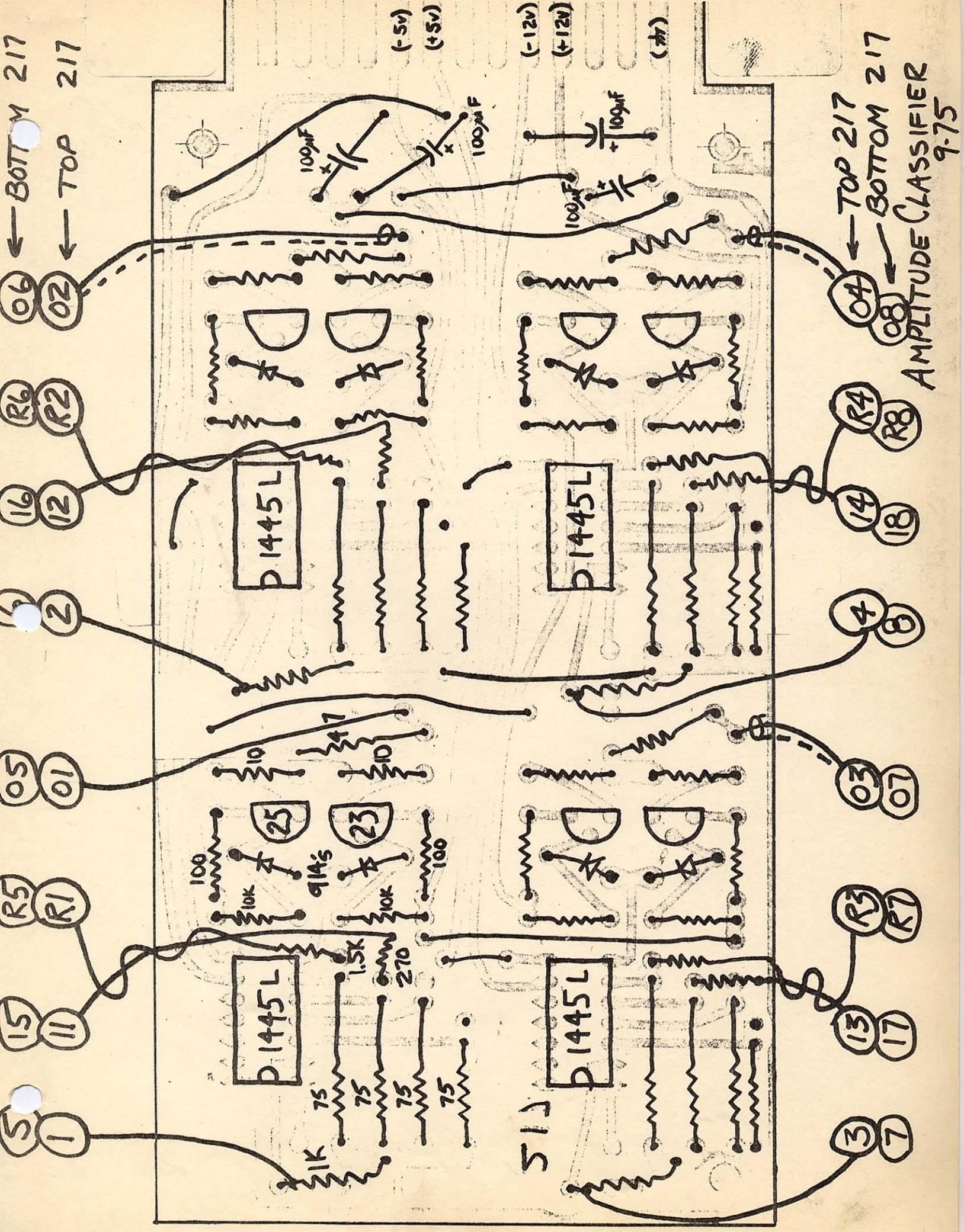


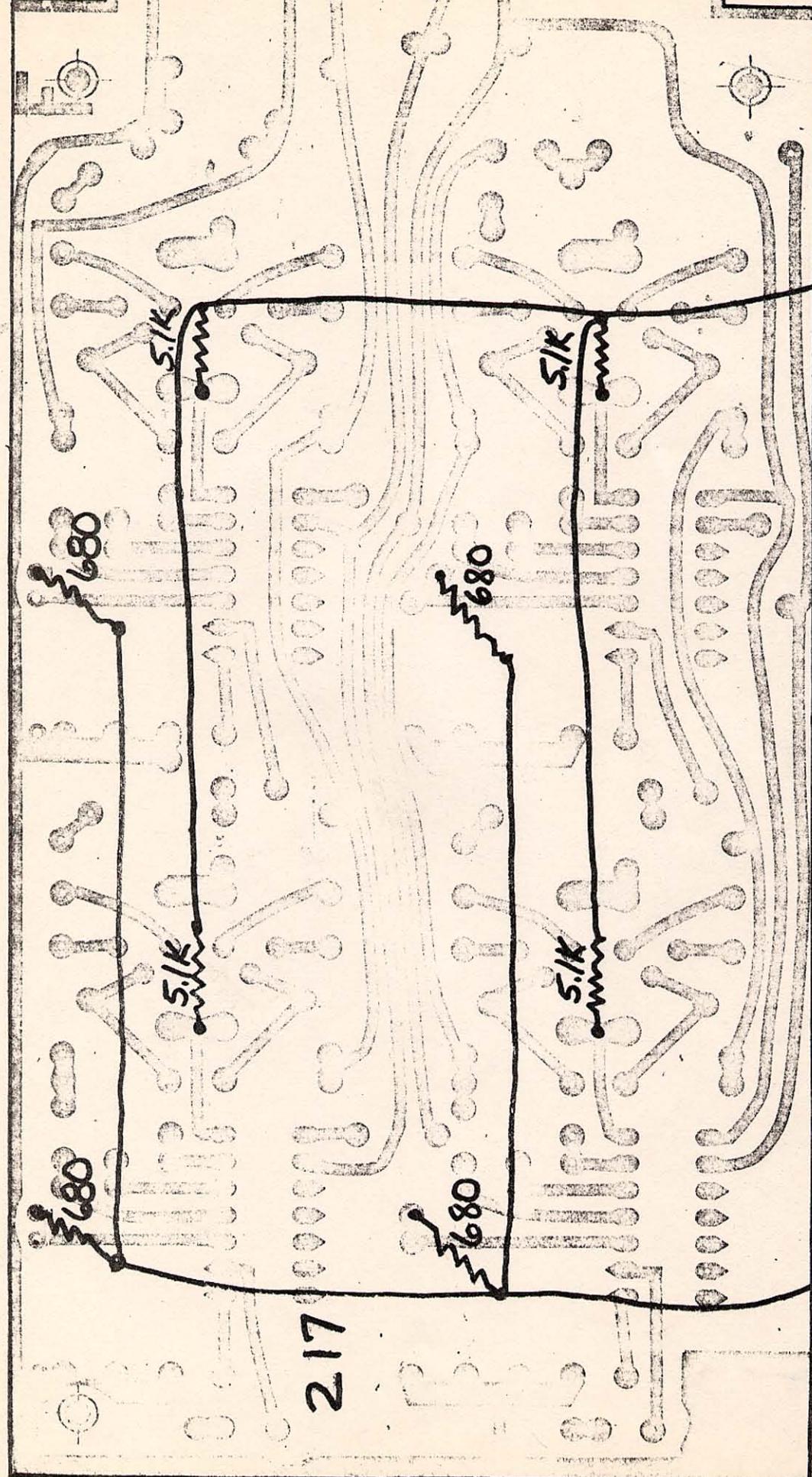
+5V
R14
500
-5V

+5V
Σ150
100
R13

(2)







FOIL SIDE

- 217 -

TOP BOARD

BOTTOM BOARD

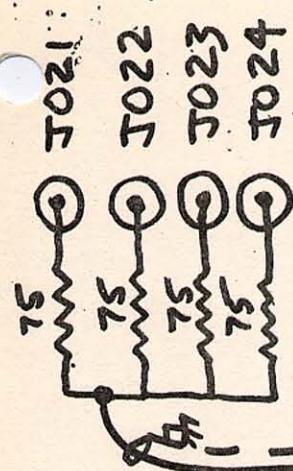
AMPLITUDE CLASSIFIER

9-15

9-75

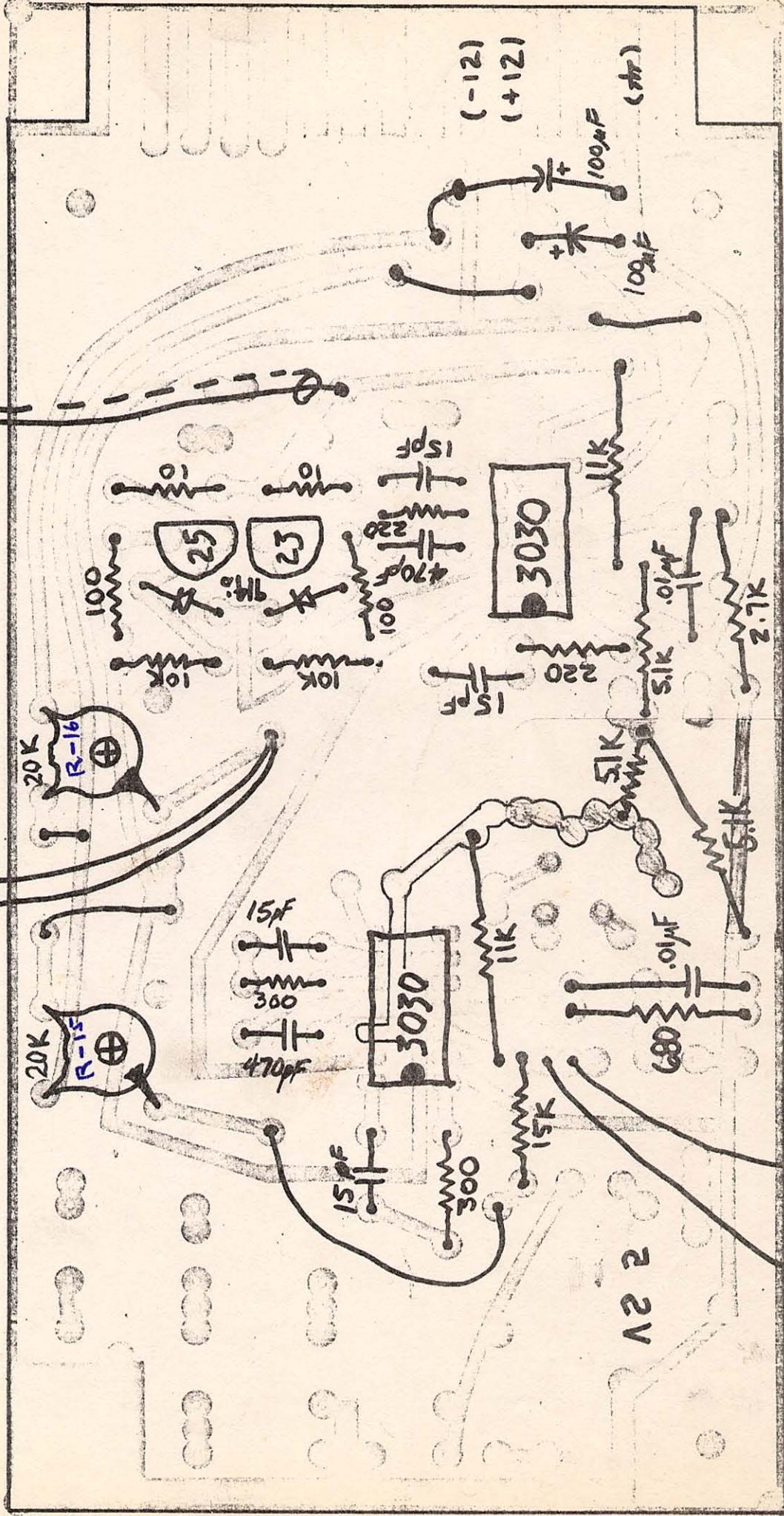
AMPLITUDE CLASSIFIER

ONE "O" TO EACH 217 BOARD

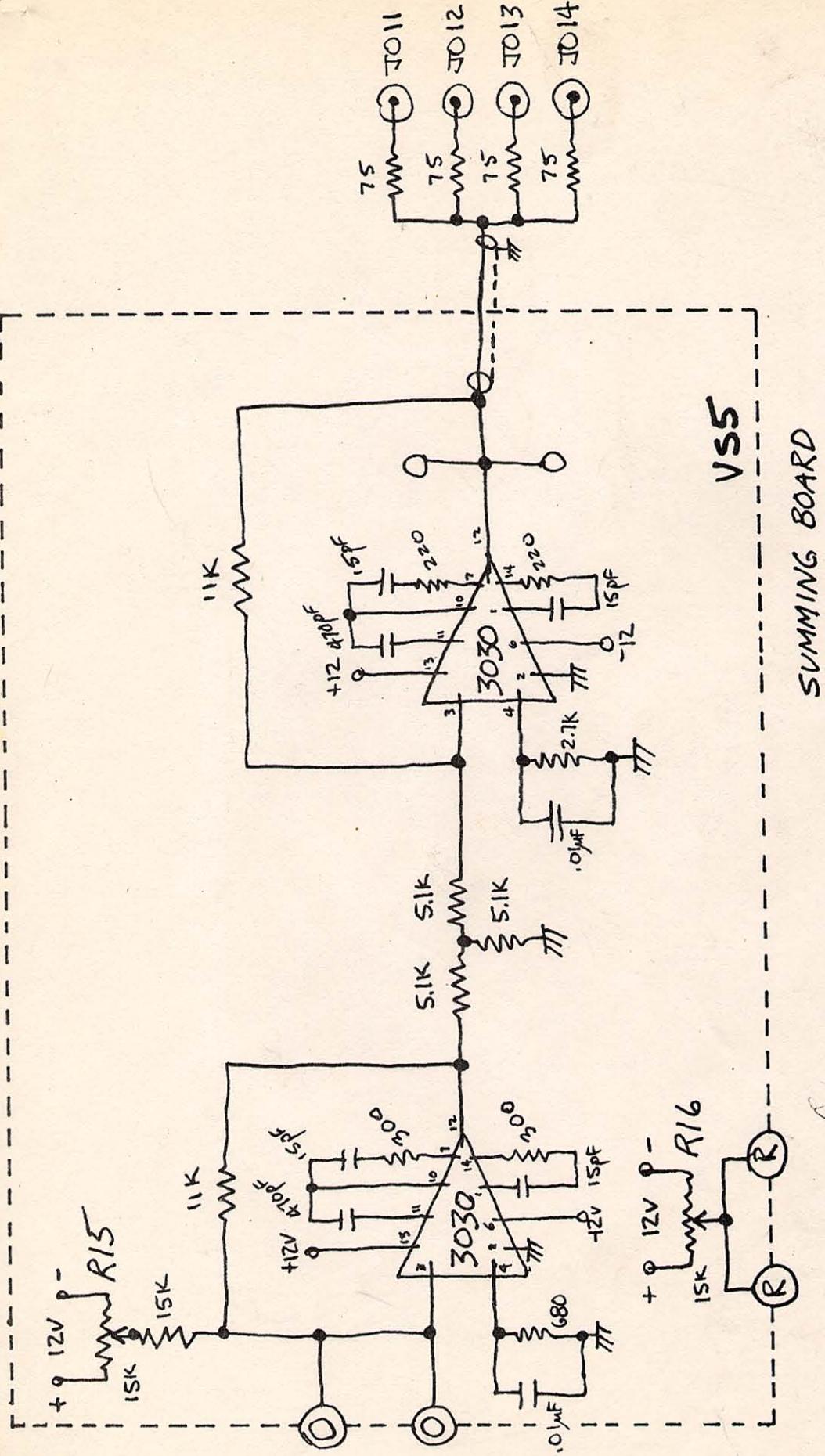


ONE "R" TO EACH 217

R



A2 2



AMP. CLASS.

1-76

18		525-1060	10 OHM, 1/4 W RES	.06	A	AC
8		525-1153	47 OHM, 1/4 W RES	.06	A	AC
36		525-1185	75 OHM, 1/4 W RES	.06	A	AC
32		525-1202	100 OHM, 1/4 W RES	.06	A	AC
2		525-1226	150 OHM, 1/4 W RES	.06	A	AC
2		525-1248	220 OHM, 1/4 W RES	.06	A	AC
8		525-1263	270 OHM, 1/4 W RES	.06	A	AC
2		525-1270	300 OHM, 1/4 W RES	.06	A	AC
7		525-1302	470 OHM, 1/4 W RES	.06	A	AC
9		525-1330	680 OHM, 1/4 W RES	.06	A	AC
24		525-1356	1K OHM, 1/4 W RES	.06	A	AC
8		525-1380	1.5KOHM, 1/4 W RES	.06	A	AC
1		525-1405	2.2KOHM, 1/4 W RES	.06	A	AC
11		525-1421	2.7KOHM, 1/4 W RES	.06	A	AC
25		525-1467	5.1KOHM, 1/4 W RES	.06	A	AC
2		525-1522	10K OHM, 1/4 W RES	.06	A	AC
7		525-1528	11K OHM, 1/4 W RES	.06	A	AC
		525-1550	15K OHM, 1/4 W RES	.06	A	AC
3	10F454	101UA	100 OHM POT 1/4SFAB	1.71	N	AC
1	10F459	501UA	500 OHM POT 1/4SFT	1.71	N	AC
8	9F089	U20	10K OHM POT 1/4SFT	1.45	N	AC
2	12F9800	3389P	20K TRIM BD-MT	.65	N	AC
4	14F555	DM15-150J	15 PF,DIP=MICA CAP.	.20	N	AC
2	14F592	DM15-417J	470 PF,DIP=MICA CAP.	.32	N	AC
2	67F307	TOL-103Z	.01 MF,DSC-CER CAP.	.05	N	AC
12	710-1260	7-G-1000	100 MF,25VDC,ELEC.	.24	A	AC
25	553-0914	1N914B	SIL-DIODE	.19	A	AC
24		2N4123	NPN TRANS	.22	S	AC
9		2N4125	PNP TRANS	.27	S	AC
9		CA3030	DIP OP-AMP,RCA	1.32	S	AC
8		MC1445L	DIP GAIN-CONT. AMP	1.90	S	AC
21	39F1337	13-236	BNC,FM=CHS,MT. CHAS,A=CFACE VSS P=C BOARD 216 P=C BOARD 217 P=C BOARD	.72 8.25	N DG	AC AC
1		RB-67-1-DC-M-L-9	KNOB, AMBER GAIN	1.00	R	AC
1		RB-67-0-DC-M-D-4	299 IN/MBL,D/WHT	1.00	R	AC
1		RB-67-1-DC-M-D-9	KNOB,SILVER BIAS	1.00	R	AC

SYNC GENERATOR

This module generates full NTSC color sync conforming to RS 170 EIA after trimming the master oscillator. The sync generator should stay well within the broadcast standard.

All outputs are -4v. into 75 ohm except the 14 MHZ. (J013) which is an open collector TTL. J013 is not used except for work with digital computers.

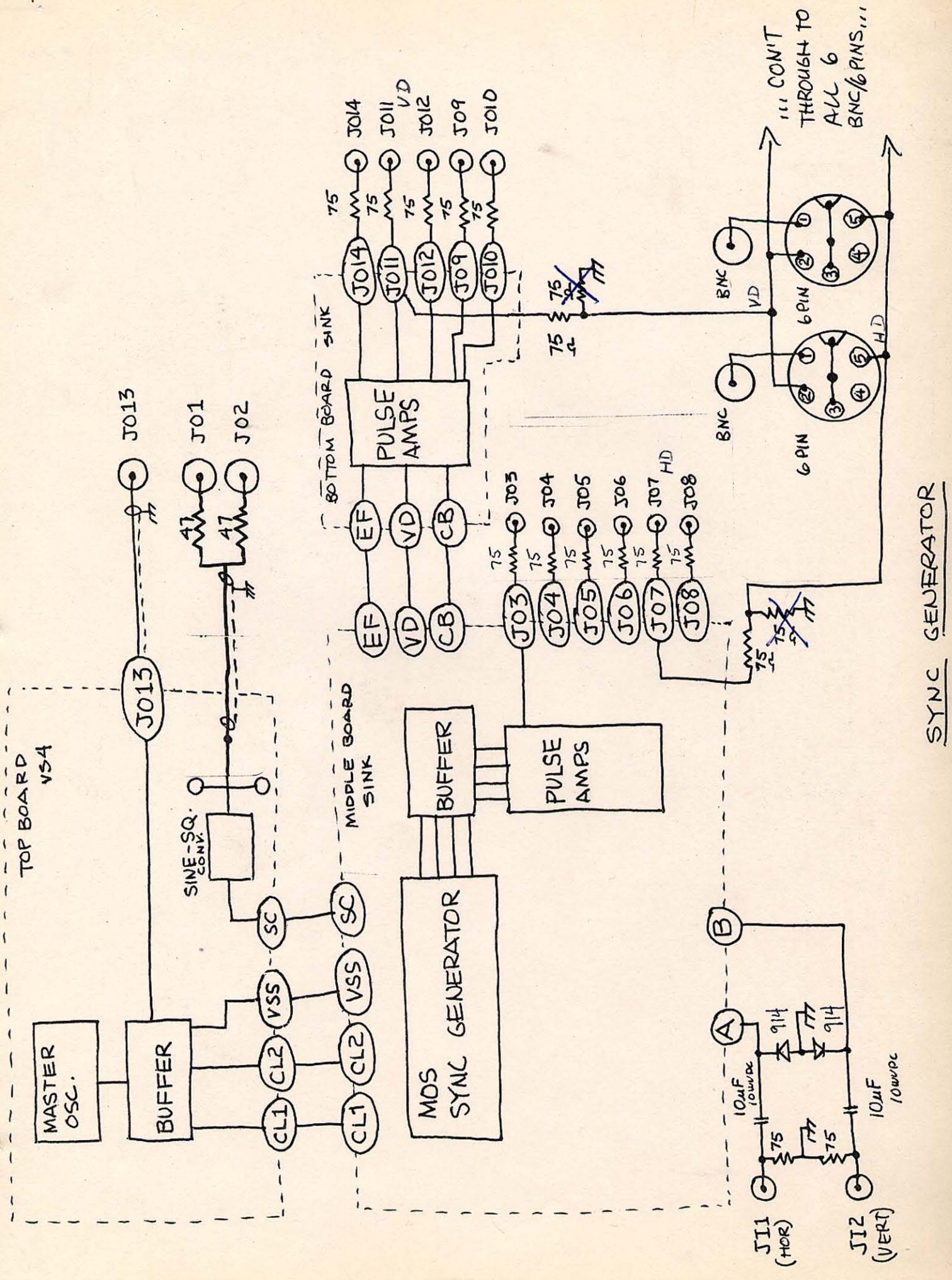
J11 horizontal reset and J12 vertical reset are not implemented in full.

The sync generator requires starting pulses which are provided by capacitors associated with J11 and J12. Time must be allotted after power-down before power-up (at least 30 seconds) to assure proper starting of sync generator.

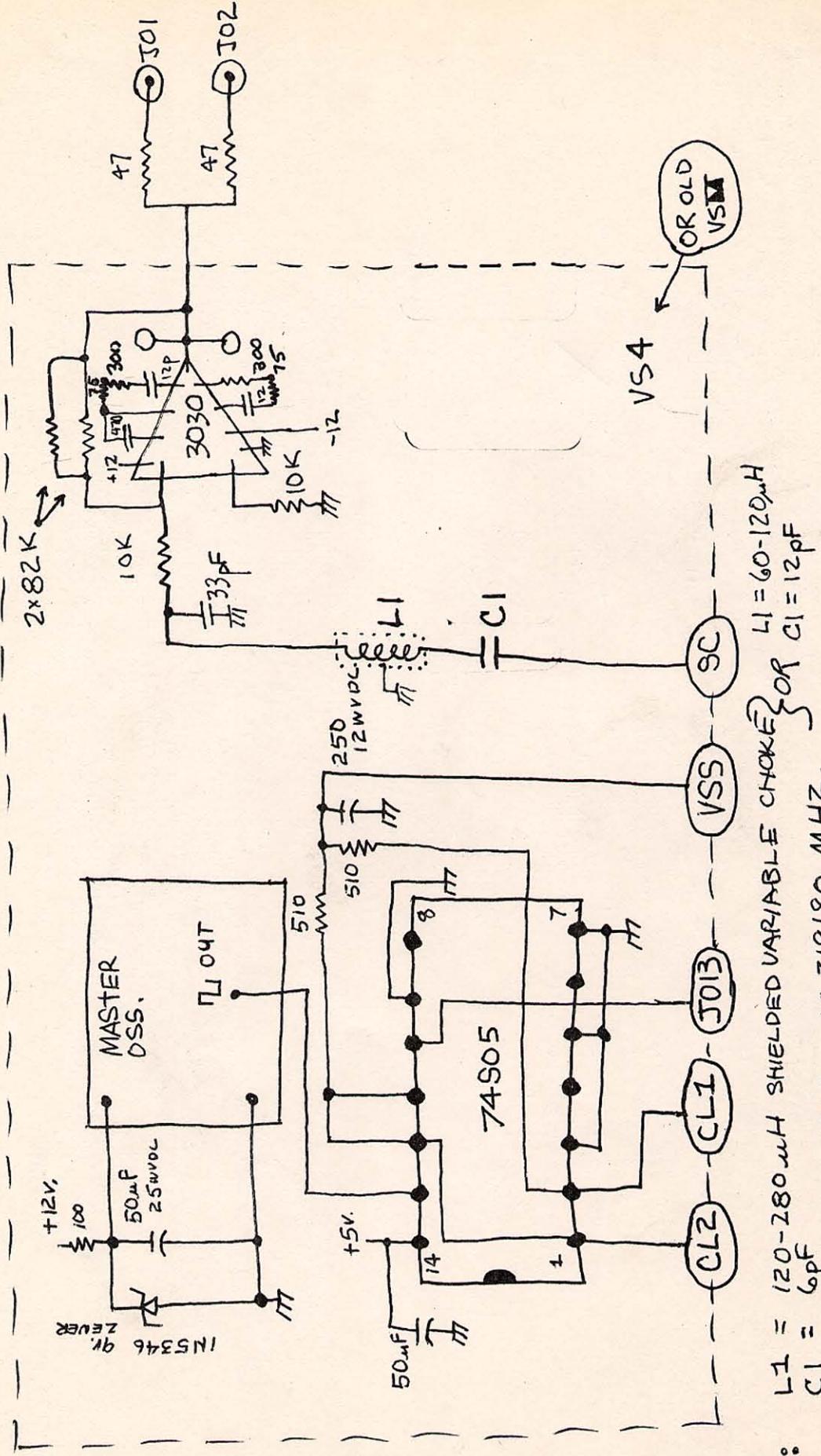
Master oscillator trim:

Adjust the master oscillator frequency to 14.318180 MHZ. A convenient way to do this is to run a lead from horizontal drive and wrap it (still fully insulated) around the antennae of a TV receiver. Tune the receiver to a station on feed from a major network (in color). You will notice two vertical lines or one vertical bar drifting across the screen. Adjust the master oscillator with a long insulated screwdriver through the access hole in the front panel of module until vertical lines do not drift.

(HOR)	J11	J01	J02	(3.58) COLOR CARRIER
(VERT)	J12	J03	J04	(BF) BURST FLAG
		J05	J06	(CS) COMPOSITE SYNC
		J07	J08	(HD) HORIZONTAL DRIVE
		J09	J010	(CB) COMPOSITE BLANK
		J011	J012	(VD) VERTICAL DRIVE
		J013	J014	(J013 - 14 MHZ. J014 - EVEN FRAME)
				<u>SYNC GEN.</u>
				BNC
				6 PIN



TOP BOARD (VS4)



NOTE: $L_1 = 120 - 280 \mu H$ SHIELDED VARIABLE CHOKES } OR $L_1 = 60 - 120 \mu H$
 $C_1 = 60 pF$ MASTER OSCILLATOR 14.318180 MHZ.

K1087A-2T1B (MICROSONICS)

DO NOT SUBSTITUTE 74S05 (FAIRCHILD)

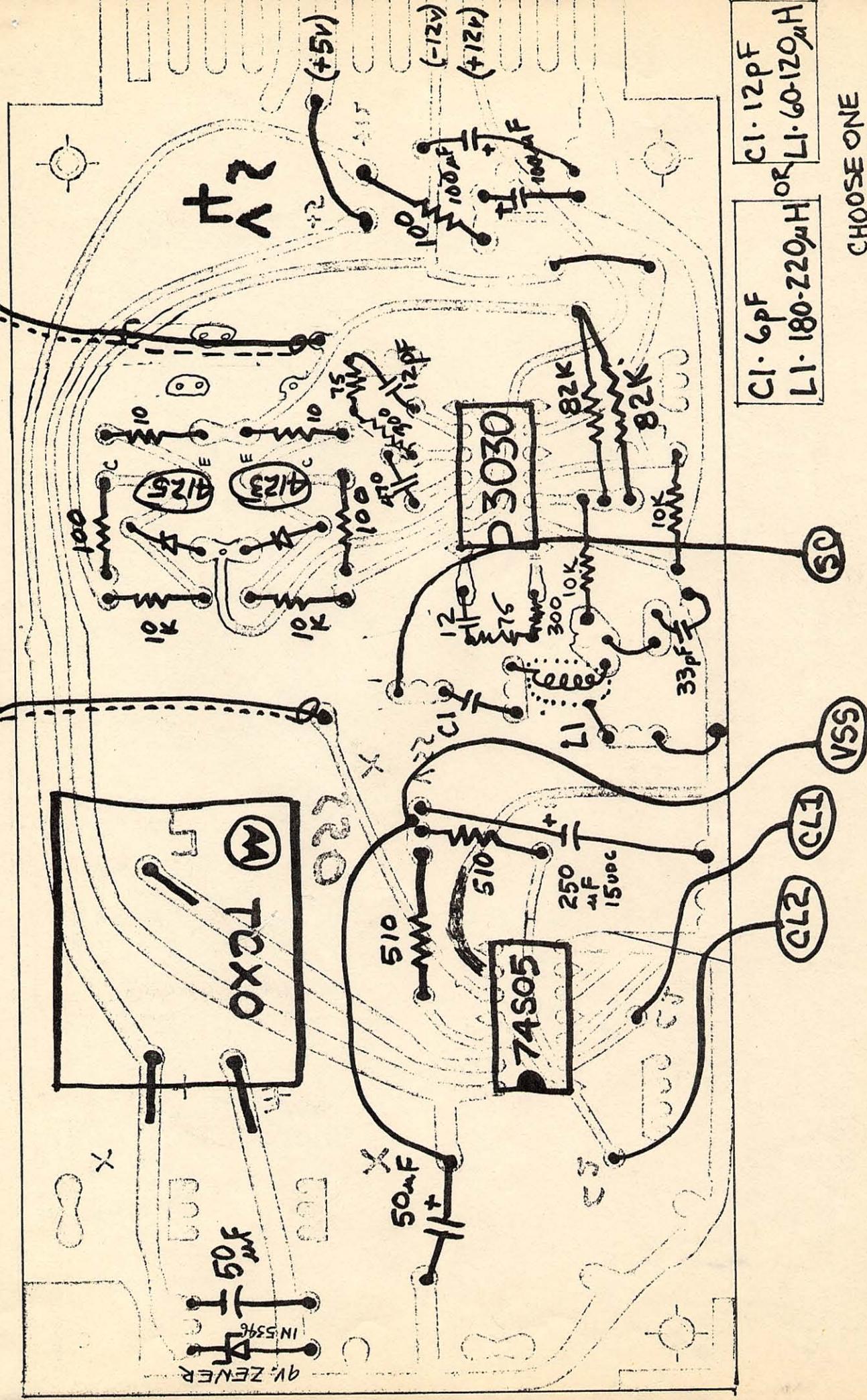
SYNC GENERATOR

update 10-75

TOP BOARD (VS-4)

3013 (14 MHz.)

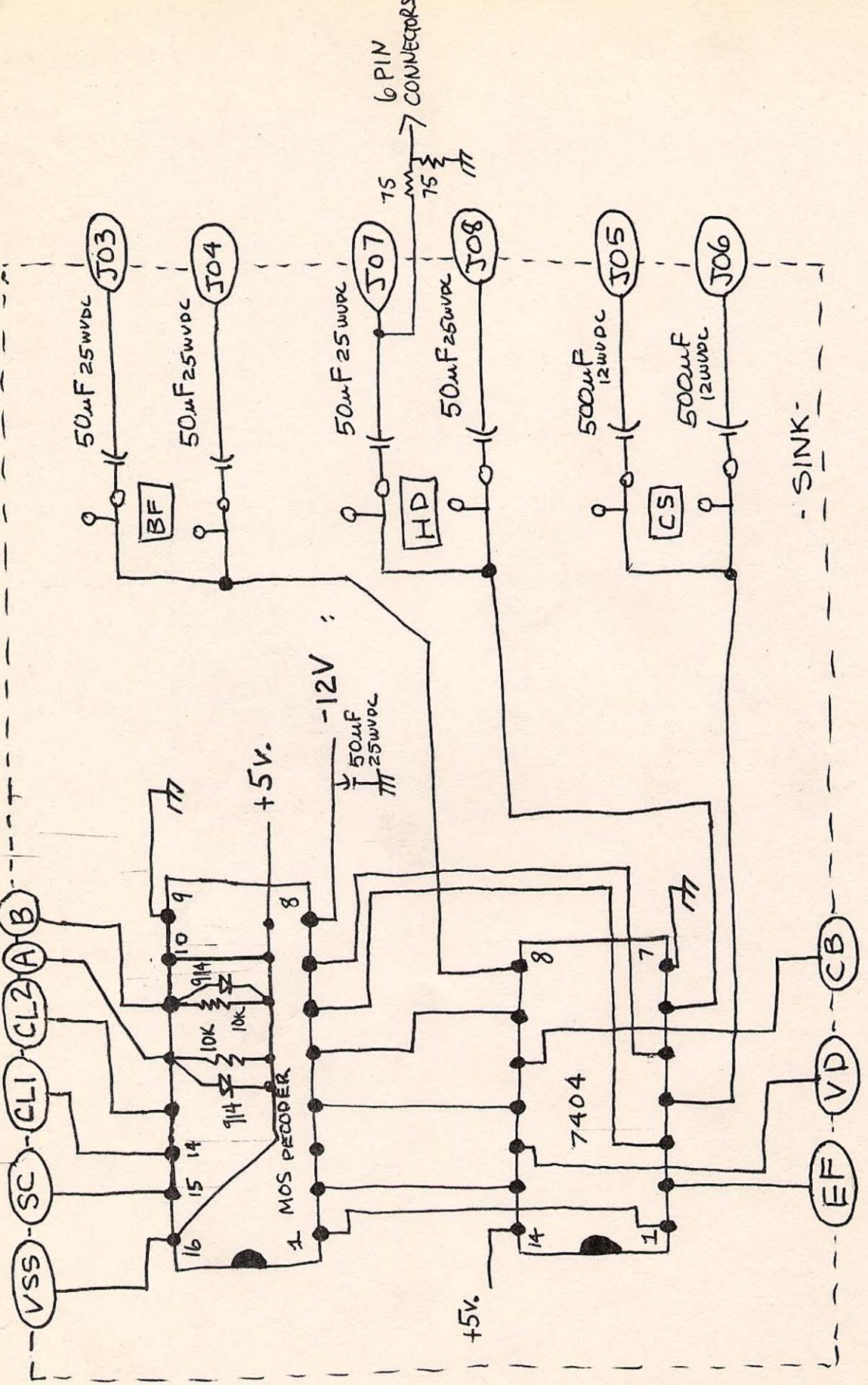
(3.58) \oplus \ominus TO2



CHOOSE ONE
COMBO
ONLY
SYNC GENERATOR

update 10-75

MIDDLE
BOARD (SINK)



NOTE:

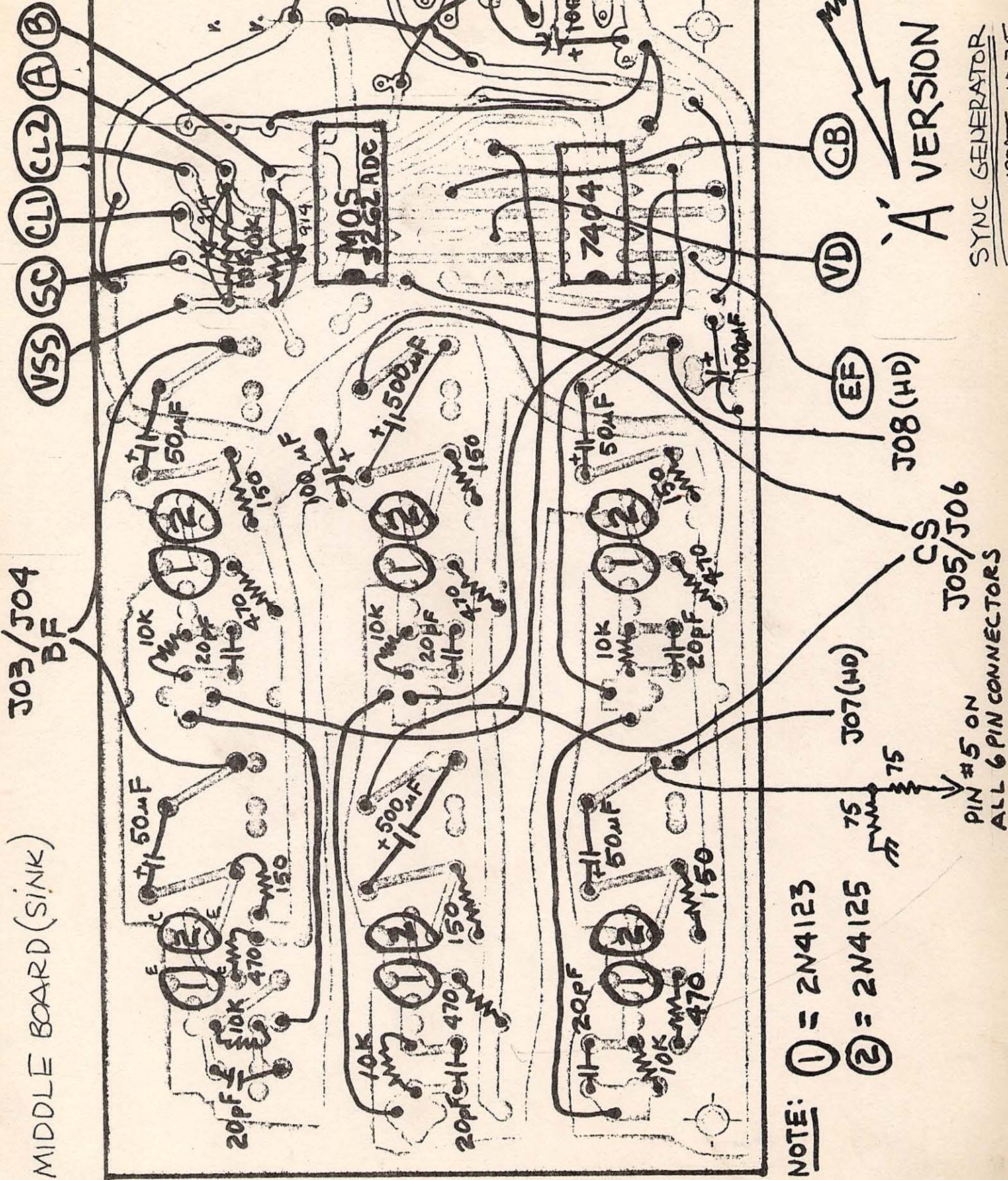
VSE

3262 ADC DECODER

SYNC GENERATOR

MIDDLE BOARD (SINK)

J03/J04
BF



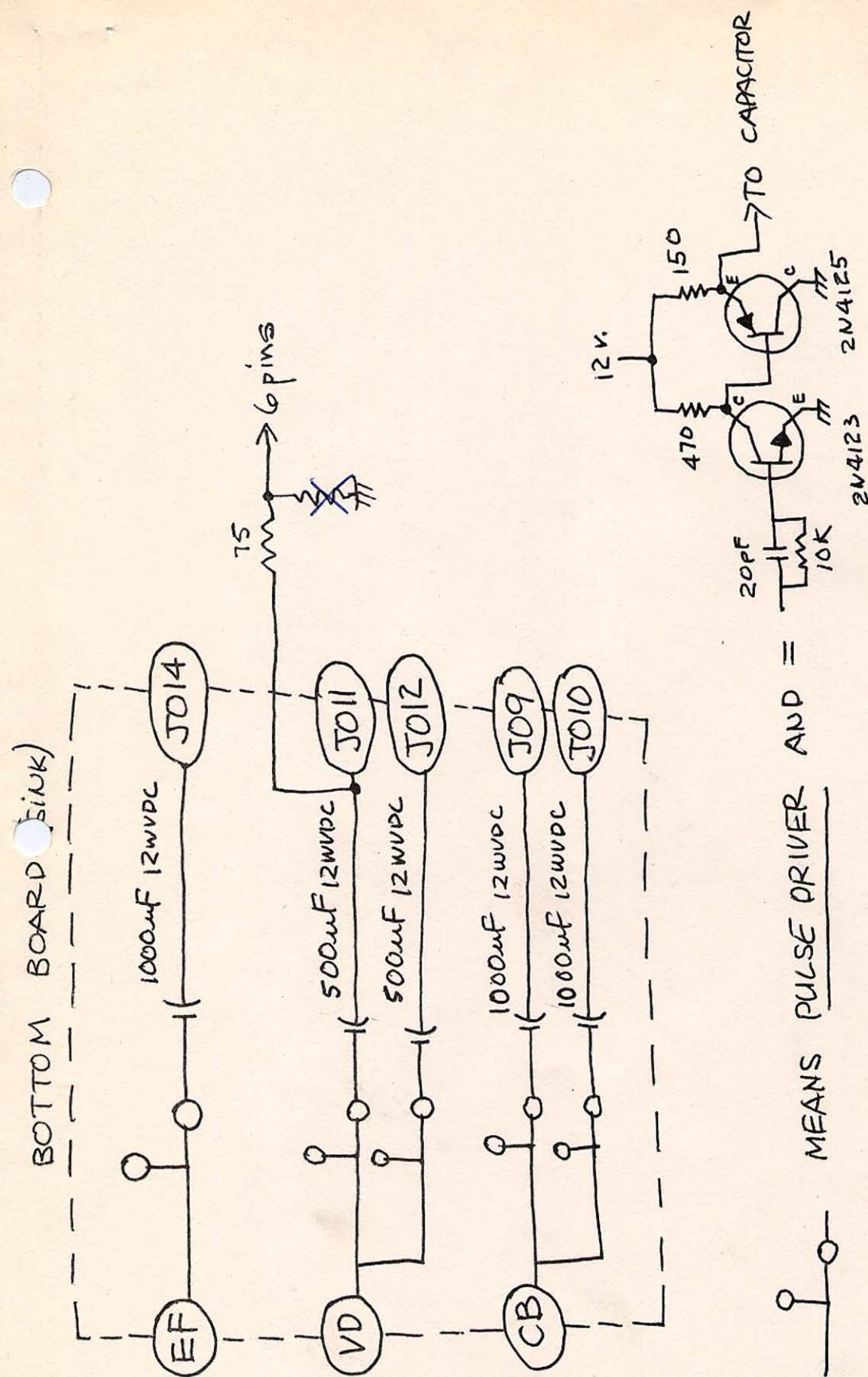
SYNC GENERATOR
UPDATE 10-75

A' VERSION

J08 (HD)

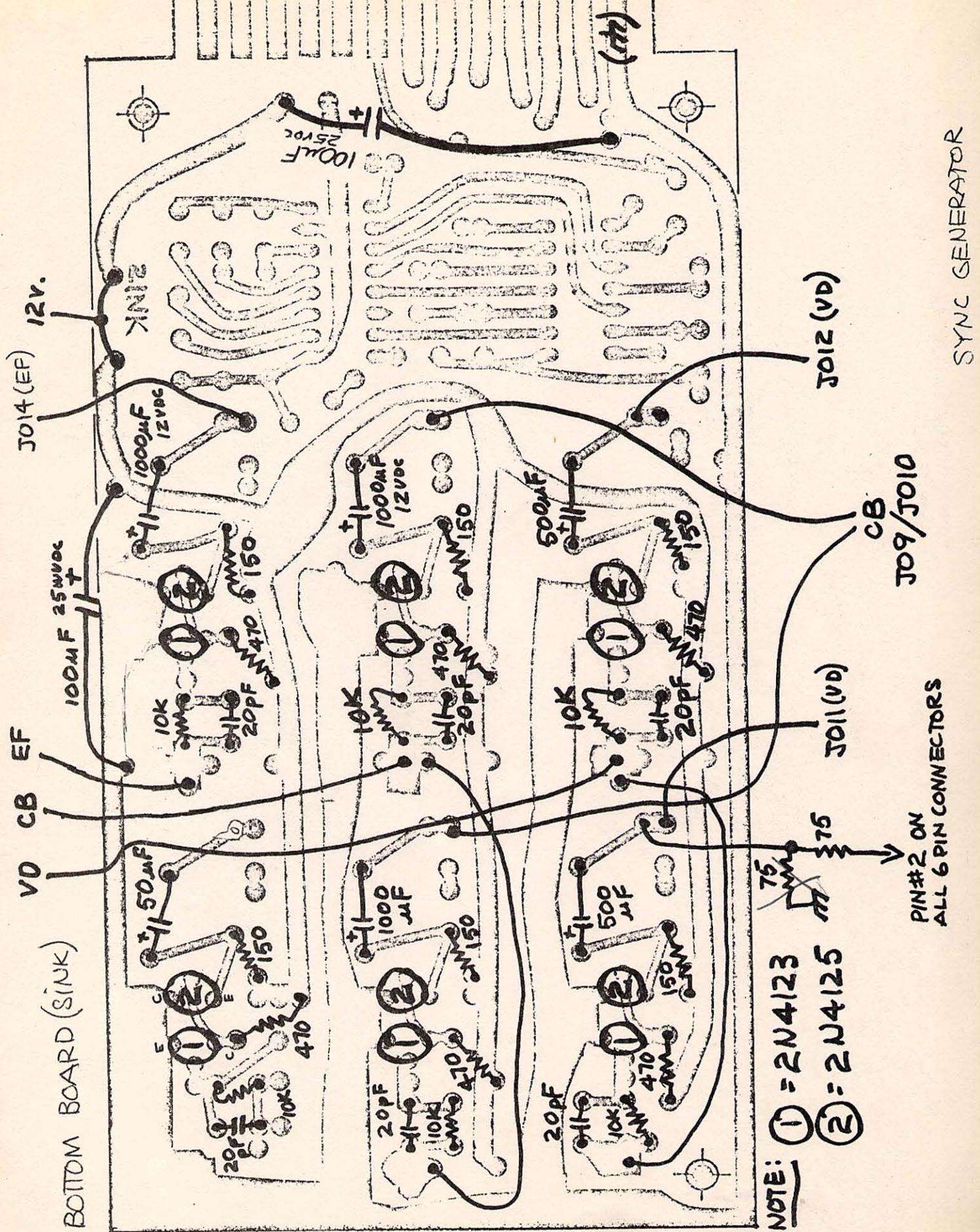
CS
J05/J06

**PIN #5 ON
ALL 6 PIN CONNECTORS**



MEANS PULSE DRIVER AND =

NOTE:



SYNC GENERATOR

2		525-1060	10	OHM, 1/4 W RES	.06	A	SG
2		525-1153	47	OHM, 1/4 W RES	.06	A	SG
19		525-1185	75	OHM, 1/4 W RES	.06	A	SG
3		525-1262	100	OHM, 1/4 W RES	.06	A	SG
11		525-1226	150	OHM, 1/4 W RES	.06	A	SG
2		525-1270	300	OHM, 1/4 W RES	.06	A	SG
11		525-1302	470	OHM, 1/4 W RES	.06	A	SG
2		525-1308	510	OHM, 1/4 W RES	.06	A	SG
17		525-1522	10K	OHM, 1/4 W RES	.06	A	SG
2		525-1703	82K	OHM, 1/4 W RES	.06	A	SG
1	14F1267	DMS-0600	6	PF,DIP-MICA CAP.	.36	N	SG
4	14F554	DM15-120J	12	PF,DIP-MICA CAP.	.20	N	SG
11	14F557	DM15-200J	20	PF,DIP-MICA CAP.	.18	N	SG
1	14F562	DM15-330J	33	PF,DIP-MICA CAP.	.24	N	SG
1	14F566	DM15-470J	47	PF,DIP-MICA CAP.	.24	N	SG
2	710-1251	2-G-101	10	MF,25VDC,ELEC.	.44	A	SG
6	710-1258	4-G-050	50	MF,25VDC,ELEC.	.46	A	SG
7	710-1260	7-G-1000	100	MF,25VDC,ELEC.	.24	A	SG
1	710-1218	8-U-2500	250	MF,21VDC,ELEC.	.58	A	SG
4	710-1339	L-E-500	500	MF,16VDC,ELEC.	.45	A	SG
3	710-1340	N-E-1000	1000MF	,16VDC,ELEC.	.67	A	SG
1	15F2317	9056	120-280	VARI. CHOKE	3.39	N	SG
6	555-0914	1N914B	SIL-DIODE		.19	A	SG
12		2N4125	PNP TRANS		.27	S	SG
12		2N4123	NPN TRANS		.22	S	SG
1		1N5346B	9.1V ZENER SW		2.50	N	SG
1		74805	DIP BUFF,FAIRCHILD		1.04	S	SG
1		CA3030	DIP OP-AMP,RCA		1.32	S	SG
1		3262ADC	DIP MOS DECODER.		18.56	S	SG
1		7404	DIP BUF		.70	S	SG
22	39F1337	13-236	BNC,FM-CHS.MT.		.72	N	SG
1			V54 P-CBOARD			S	SG
2			SINK P-CBOARD			S	SG
60	1-526-063-11		6-PIN FEMALE CHS MT		.90	AP	SG
1			CHASSIS,S.GEN-FACE		8.25	DG	SG
1	K1067A2T18		XTAL-14.318180MHZ		140.00	M	SG

OSCILLATOR

This module contains two oscillators that generates a sine wave output available at J03, J04 and a triangle wave output at J01 and J02. If the sawtooth switch is down instead of up, the triangle wave becomes a sawtooth and the sine wave becomes an "s" wave. The rotary switch sets the gross frequency range from 1/100 Hz. to $\frac{1}{2}$ MHz. R2 is the continuous frequency adjustment. If the voltage control switch is up, a signal inputed to J12 will control the frequency of the oscillator in combination with R2. With the switch down the voltage control is disabled but the oscillator is more stable. A sync. level (4 volt) signal into J11 will trigger the oscillator to stabilize patterns.

CIRCUIT DESCRIPTION

The 8038 is a complete voltage controlled oscillator whose frequency is controlled by resistance R2 and the voltage at pin 8. The 715 is a 10x amplifier and- in combination with the zener diode produces a control voltage at pin 8.

The trimmer associated with the input of the 715 should be adjusted so that the control voltage is centered within its range with 0 volts in. To do this, input a triangle wave to the voltage control input and adjust the trimmer until the voltage that makes the maximum frequency is as positive as the voltage that quenches the oscillator is negative.

The two transistors and zeners are used to trigger the oscillator. When a fast-falling signal is presented at the sync. input this turns the first transistor off which turns the second transistor on. This clamps the oscillator to the bottom of its output wave form.

OSC
#1

OSC
#2

J1.2

IV = 10X
10K - 100K
OV = 50K

VOLTAGE
CONTROL
SWITCH

R!

J1.1

10K 100K

ROTARY
SWITCH

J0.1

SAW
SWITCH

J0.3

R2

10TURN

10K - 100K
8K - 80K

J0.4

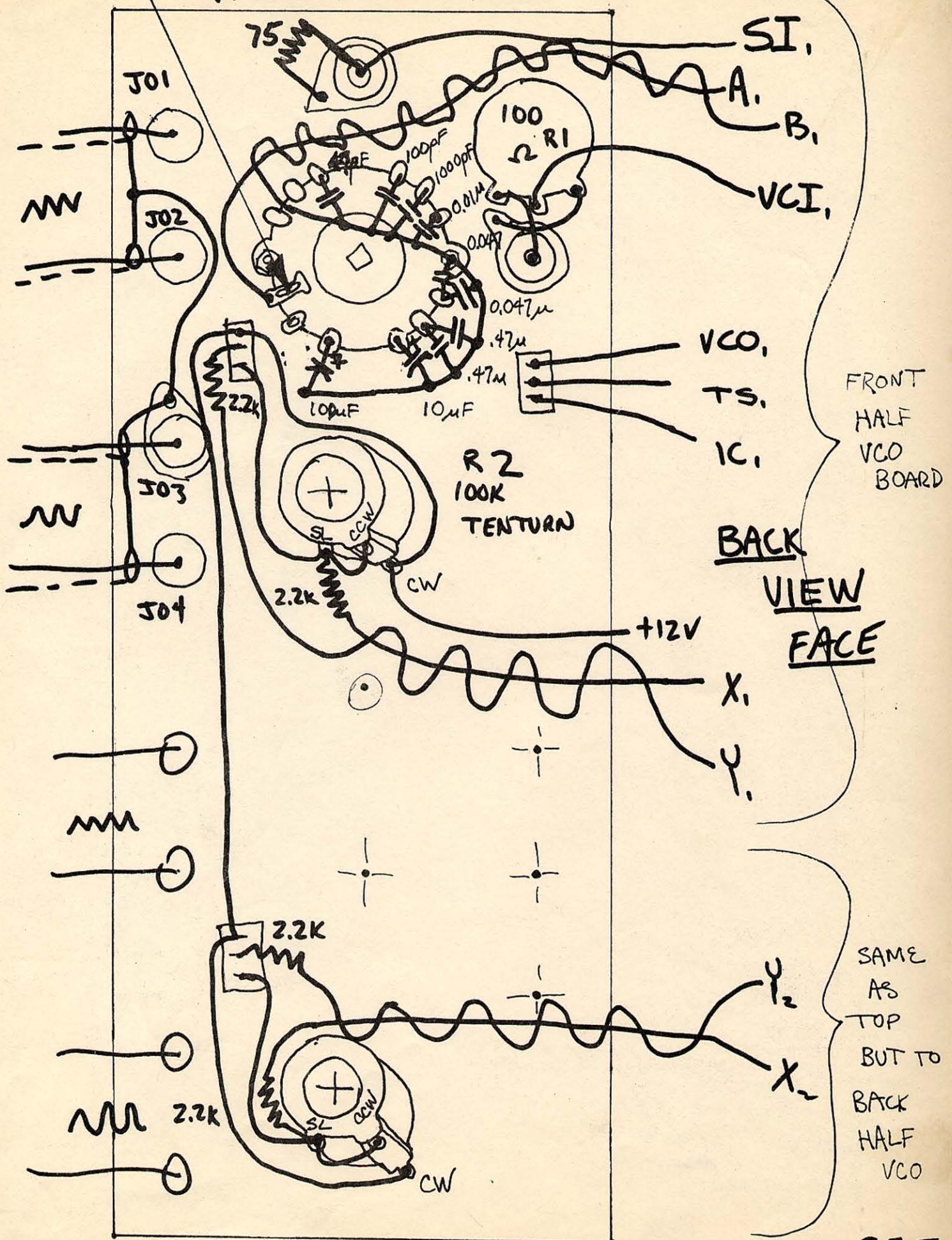
FRONT
FACE

OSCILLATOR

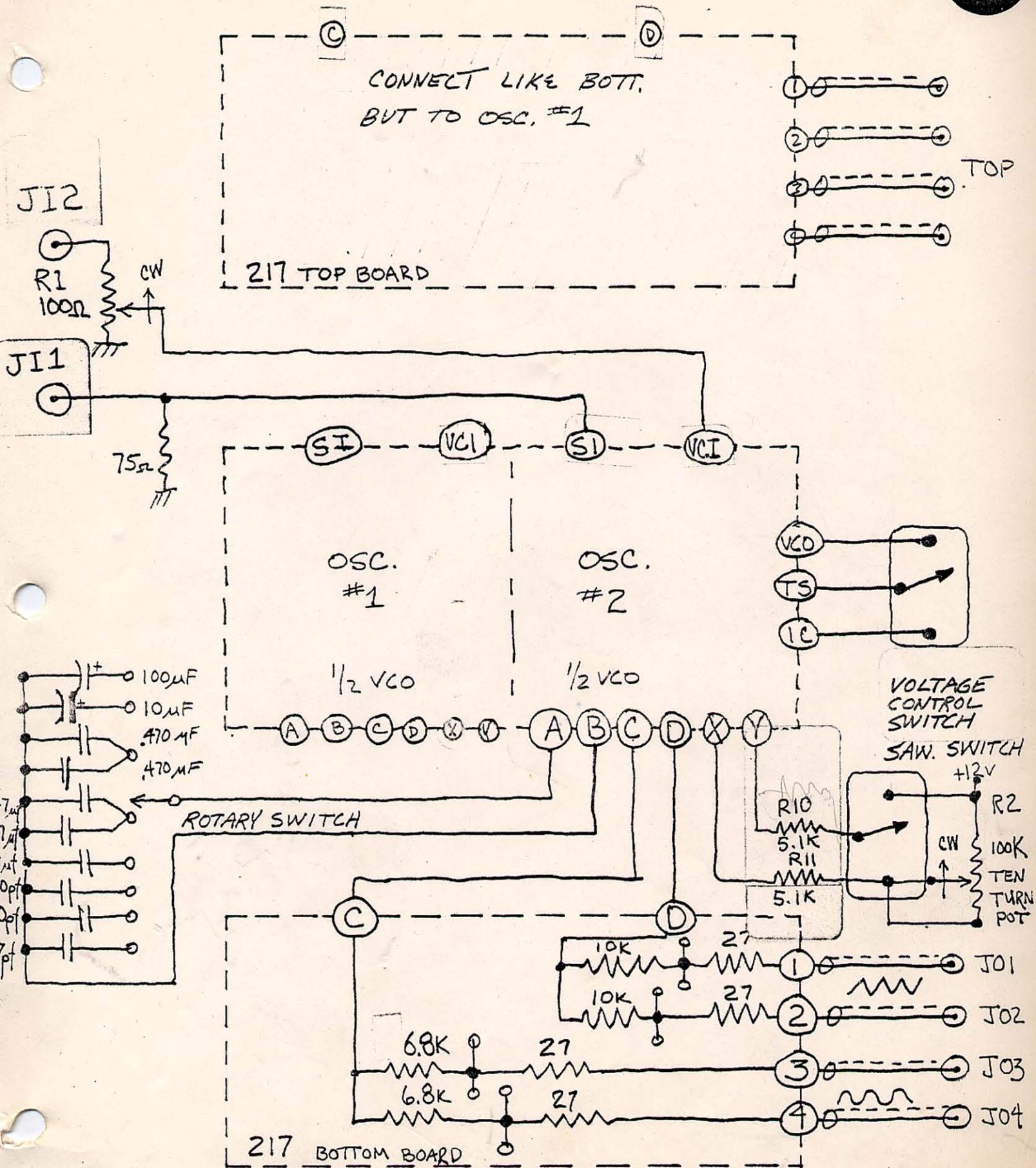
9.75

NOTE POSITION

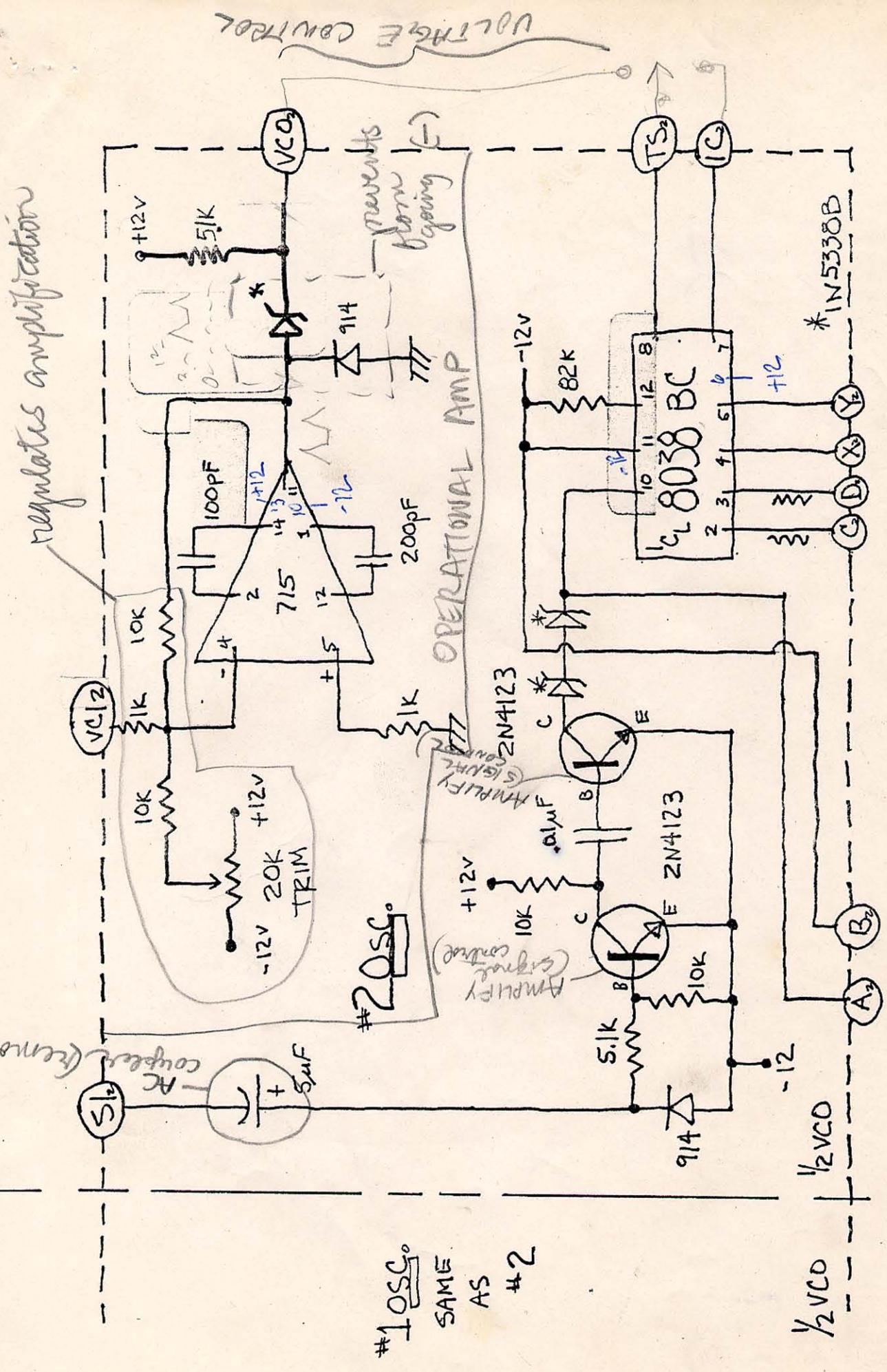
TOP BOARD



OSSCILLATOR 9-75



OSCILLATOR 9/75



Oscillator-75

MIDDLE BOARD VCO

ALL 2 ENVERS - Df N5338B

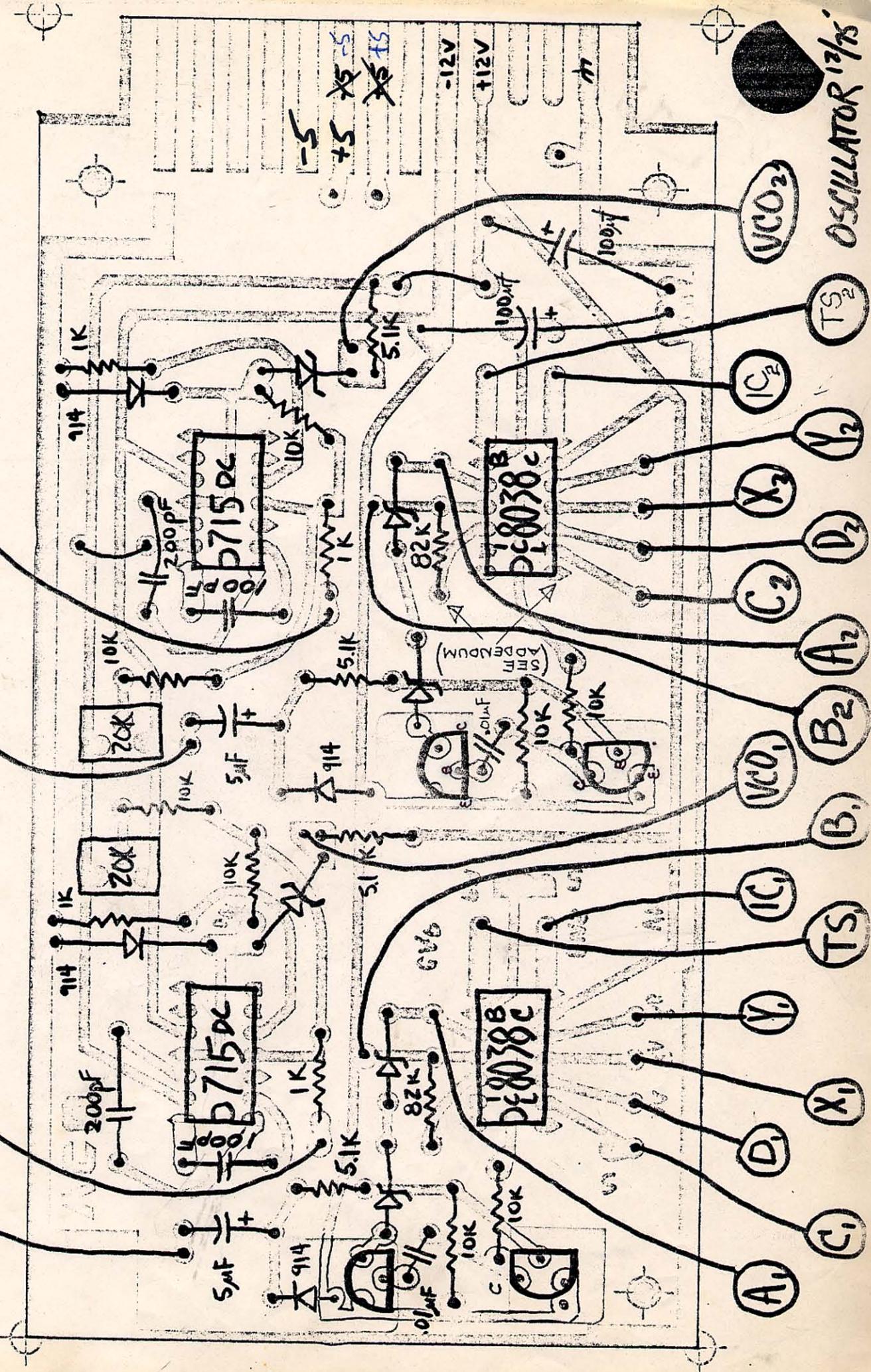
" TRANSISTORS: 2N4123

MIDDLE BOARD

SL₁

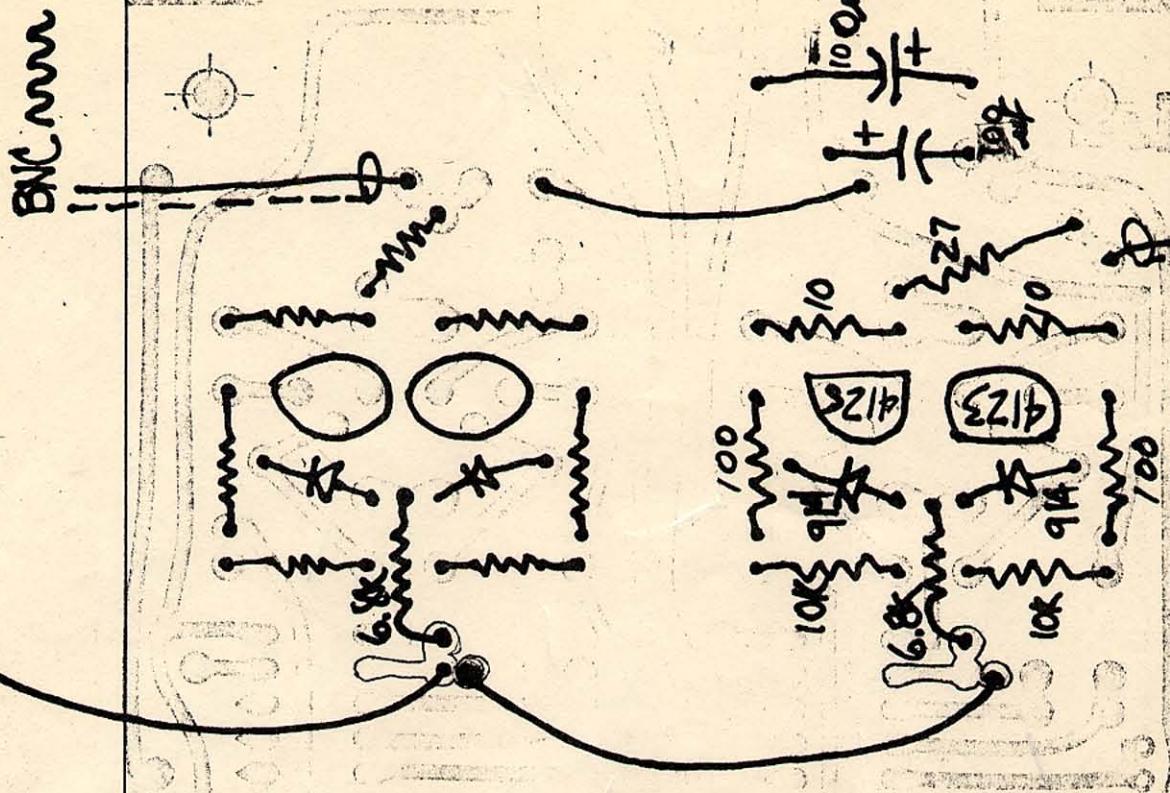
VCl₁

SL₂

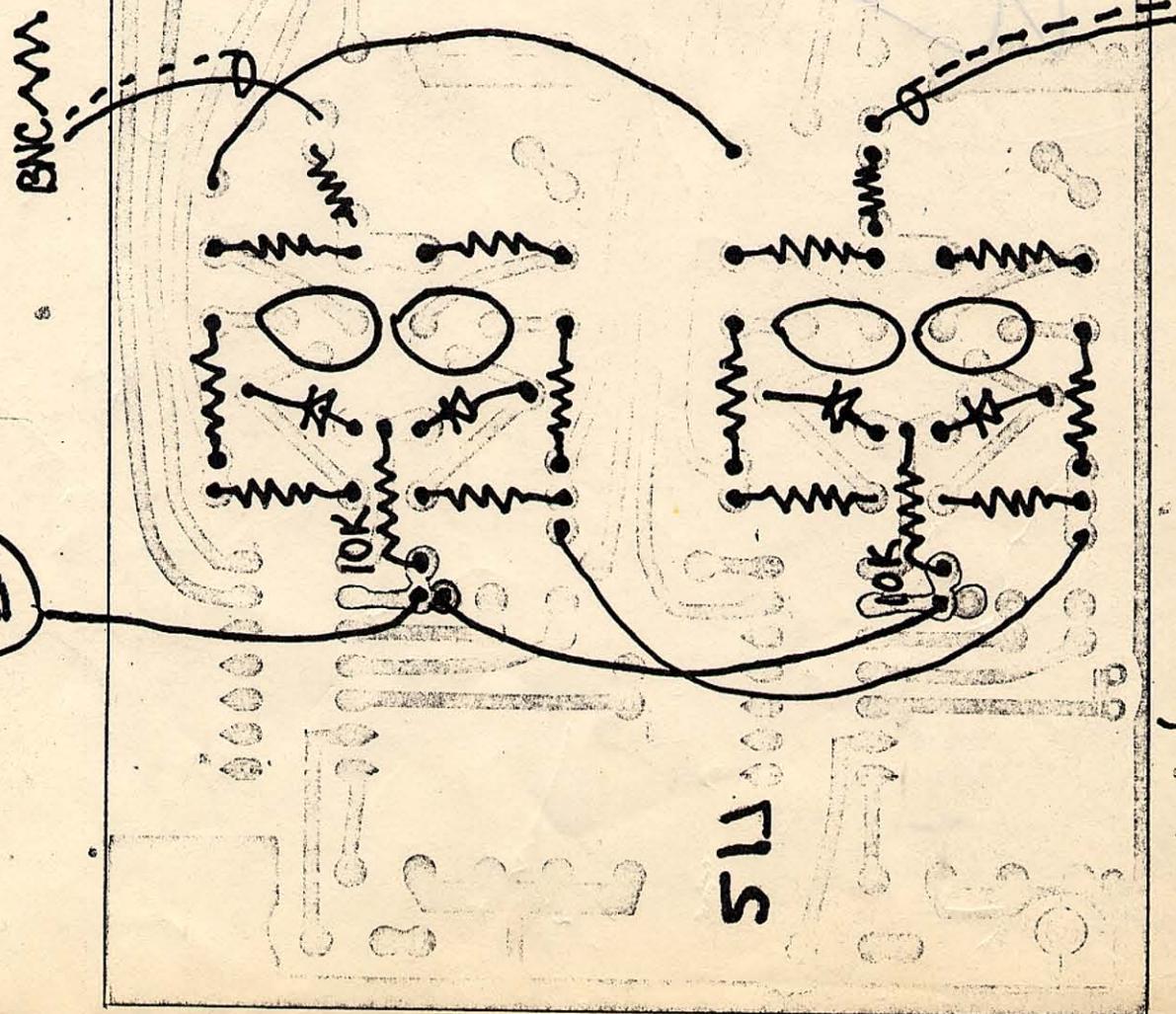


Oscillator 1/2/3

C



D



511

TOP & BOTTOM
BOARD

BNC MM

BNC MM

9/75

BNC MM

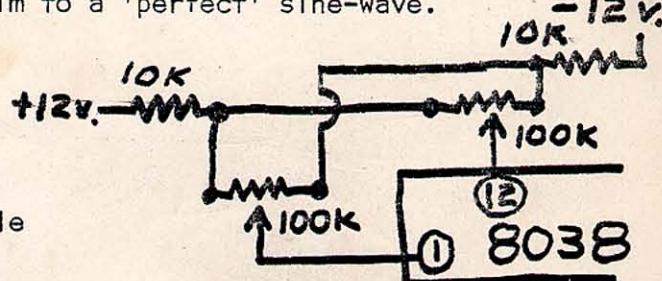
OSCILLATOR

1.) SINE-WAVE PURITY CONTROL:

Remove 82K resistor; and, add 100K trim-pots as shown in diagram. These 100K trim-pots correct sine-wave purity. You should be able to trim to a 'perfect' sine-wave.

PROCEDURE-

- Before supplying power to the module, center all trim-pots.
- Set the oscillator at a middle frequency range, and display sine-wave on scope.
- Tweak the trim-pots for highest amplitude possible (± 1 volt) without creating any flats or peaks in the waveform; i.e. 'perfect' sine-wave.

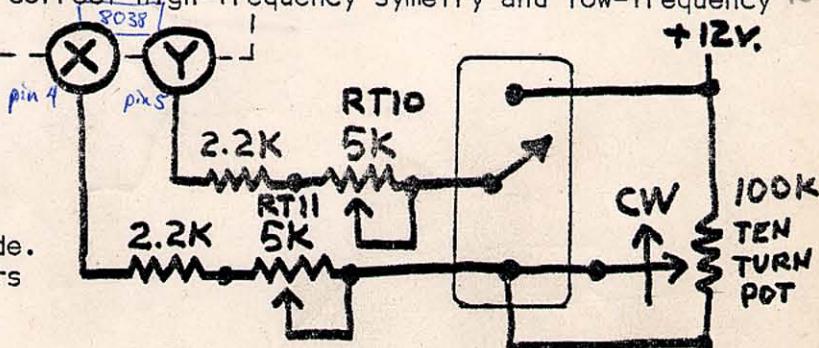
2.) HIGH-FREQUENCY SYMETRY CONTROL:

R10 and R11 maybe replaced by a series combination of 2.2K resistor and a 5K trim-pot. This series combination (RT10 and RT11) correct high-frequency symmetry and low-frequency quenching of waveform; see diagram.

If both trim-pots are too large, the high-frequency end of each range will be lower than optimum.

If both trim-pots are too small, the low-frequency end in some ranges may quench, particularly in SAWTOOTH mode.

The difference between the trim-pots determines the high-frequency symmetry.

PROCEDURE-

- Turn 10-turn pot to extreme left (lowest freq.); check to make sure that no range quenches in sawtooth mode. If quenching happens in any range, tweak trim-pot to get rid of it...
- Turn 10-turn pot to extreme right (highest-freq.); check to make sure that in a higher frequency range you still have good symmetry in triangle mode. If you don't have good triangle symmetry, tweak trim-pot to get it...

GO BACK AND CHECK FOR SAWTOOTH QUENCHING...

- To maximize high-frequency in ranges, decrease both trim-pots equally and go-to-step B). If oscillator quenches at low-frequencies, back up some; i.e. increase resistance, go-to-step C). Stop.

NOTE:

These trim-pots will have to be outboarded on a perf-board and attached to card support frame of the module. Leave enough lead length on the trim-pots so it can be gotten out of the way for servicing the cards...!

Some 8038 integrated circuits appear to behave better than others; you may want to try various 8038's, choosing the best behaved ones...!

16
8
2
15
2
2
6
4
33
22
2
22
2
4
2
4
4
2
2
2
62
5
1c
8
2
22
1
2
4
12
2
2
12
2
2
2

525-1060	10 OHM, 1/4 W RES	.06	A	OSS
525-1117	27 OHM, 1/4 W RES	.06	A	OSS
525-1165	75 OHM, 1/4 W RES	.06	A	OSS
525-1242	100 OHM, 1/4 W RES	.06	A	OSS
525-1356	1K OHM, 1/4 W RES	.06	A	OSS
525-1405	2.2KOHM, 1/4 W RES	.06	A	OSS
525-1467	5.1KOHM, 1/4 W RES	.06	A	OSS
525-1489	6.8KOHM, 1/4 W RES	.06	A	OSS
525-1522	10K OHM, 1/4 W RES	.06	A	OSS
525-1703	82K OHM, 1/4 W RES	.06	A	OSS

10F454	101UA	100 OHM POT 1/4SFAB	1.71	N	OSS
12F9800	3389P	20K TRIM BD-MT	.65	N	OSS
9F1660		100KOHM 10-TURN POT	5.30	N	OSS

852-0019		47PF, POLY CAP	.13	A	OSS
852-0026		100PF, POLY CAP	.13	A	OSS
852-0050		1000PF, POLY CAP	.13	A	OSS
852-0110		.01 MFD, POLY CAP	.13	A	OSS
852-0900		.047 MFD, POLY CAP	.13	A	OSS
852-0104		.47 MFD, POLY CAP	.13	A	OSS
852-4601		10 MFD, ELEC CAP, 35V	.48	A	OSS
852-5256		100 MFD, ELEC CAP, 150V	2.41	A	OSS
14F582	LM15-201J	200 PF, DIP-MICA CAP	.20	N	OSS
710-1248	1-G-005	5 MF, 25VDC, ELEC.	.42	A	OSS
710-1260	1-G-1000	100 MF, 25VDC, ELEC.	.24	A	OSS

555-0914	1N914B	SIL-VIODE	.19	A	OSS
	1N5336C	5.1V ZENER SW	2.50	N	OSS
	2N4123	NPN TRANS	.22	S	OSS
	2N4125	PNP TRANS	.27	S	OSS
	1CL8036BC	DIP OSC(V-CONT)	8.40	S	OSS
	MA715	DIP SINK	8.25	S	OSS

		217 P-C BOARD			OSS
		VCO P-C BOARDS			OSS
22F423	1402	SW. 8-POS.	3.00	N	OSS
652-0507	205N	SW. SPDT	2.13	A	OSS
39F1337	13-236	BNC, FM-CHS. MT.	.72	N	OSS
KD-67-1-CC-H-L-9		299 IN/MYL, LG-9/WHT	1.20	R	OSS
KD-67-1-CC-H-L-9		3501GRY, LG-9/BL	1.00	R	OSS
		CHASSIS, OSC-FACE	8.25	DG	OSS

61F1175	KO-1250A-1/4" ALUM. KNOB	1.75	N	OSS	
12F6045	DFA-N	COUNTING DIAL	4.75	N	OSS
12F9800	3389P	5K TRIM. BD. MT.	.65	N	OSS
12F9800	3389P	100K TRIM. BD. MT.	.65	N	OSS

COMPLETE PARTS LIST

for
Classical I-P

***** QUANTITY

		SUPPLIER'S STOCK NUMBER	MANUFACTURER'S TYPE NUMBER	PART DESCRIPTION	UNIT PRICE	QUANTITY PRICE	CODE/SUPPLIER
5(PKG100)	67F4065	8325	3/4"	SPACER	11.00	55.00	
2(PKG100)	67F4067	8327	1"	SPACER	14.00	24000	
1	29F263	1900		BOLT CUTTERS(CRIMP)4/37		4.37	
1000 FT	36F1800WM	RG 59/U		CO-AXIAL CABLE	81.28	81.28	
100	39F029	68175		BNC,M-CABLE MT KRMP	.79	.79	
500 FT	36F053WF	RG 174/U		CO-AXIAL CABLE	25.25	25.25	
1	36F650WA1	8529		WIRE,SOLID-20AWG BRN2.19		2.19	
1	36F650WA2	8529		WIRE,SOLID-20AWG RED2.19		2.19	
1	36F650WA3	8529		WIRE,SOLID-20AWG ORG2.19		2.19	
1	36F650WA4	8529		WIRE,SOLID-20AWG YEL2.19		2.19	
1	36F650WA5	8529		WIRE,SOLID-20AWG GRN2.19		2.19	
1	36F650WA6	8529		WIRE,SOLID-20AWG BLU2.19		2.19	
1	36F650WA7	8529		WIRE,SOLID-20AWG VIO2.19		2.19	
1	36F650WA8	8529		WIRE,SOLID-20AWG GRY2.19		2.19	
1	36F650WA9	8529		WIRE,SOLID-20AWG WHT2.19		2.19	
1	36F650WA10	8529		WIRE,SOLID-20AWG BLK2.19		2.19	
1(100FT)	36F590WA1	8500		WIRE,STR-16AWG BRN	2.96	2.96	
1(100FT)	36F590WA2	8500		WIRE,STR-16AWG RED	2.96	2.96	
1(100FT)	36F590WA3	8500		WIRE,STR-16AWG ORG	2.96	2.96	
1(100FT)	36F590WA4	8500		WIRE,STR-16AWG YEL	2.96	2.96	
1(100FT)	36F590WA5	8500		WIRE,STR-16AWG GRN	2.96	2.96	
1(100FT)	36F590WA6	8500		WIRE,STR-16AWG BLU	2.96	2.96	
1(100FT)	36F590WA7	8500		WIRE,STR-16AWG VIO	2.96	2.96	
1(100FT)	36F590WA8	8500		WIRE,STR-16AWG GRY	2.96	2.96	
1(100FT)	36F590WA9	8500		WIRE,STR-16AWG WHT	2.96	2.96	
1(100FT)	36F590WA10	8500		WIRE,STR-16AWG BLK	2.96	2.96	
2	36F1260	17656		POWER CORDS 14 AWG.	2.73	5.46	N
1	60F2408	15-15		FUZED AC OUTLET BOX	12.85	12.85	N
1	27F692	31-3001		FUZE,1 A,-3AG,SB	1.50	1.50	N
8(BOX100)	31F2245			INTER.LOCKWASH#4	.95	7.60	N
4(BOX100)	30F698			BINDHEAD4-40*1/4	1.84	7.36	N
1(BOX100)	30F699			BINDHEAD4-40*1/2	1.95	1.95	N
1	35F2521	W-TCP		SOLDERING STATION	37.00	37.00	N
1	35F2526	PTA		1/16 TIP (W-TCP)	1.00	1.00	N
1	58F587	45-121		WIRE STRIPPER	2.65	2.65	N
1	34F093	0257-4C		CUTTERS	3.15	3.15	N

SUB-TOTAL = 400.92

NEWARK ELECTRONICS
500 N. PULASKI RD.
CHICAGO, ILL. 60624

****NEWARK ELECTRONICS****

78	10F454	101UA	100 OHM POT 1/4SFAB	1.7	133.38	N
3	10F459	501UA	500 OHM POT 1/4SFT	1.7	5.13	N
6	9F073	U1	100 OHM POT 1/4SFT 1.45		8.70	N
1	10F588		500 OHM POT 1/4SFTB5.02		5.02	N
3	9F078	U4	1K OHM POT 1/4SF 1.45		4.35	N
1	9F081	U6	2K OHM POT 1/4SFT 1.45		1.45	N
19	10F468	103UA	10K OHM POT 1/4SFAB2.21		41.99	N
32	9F089	U20	10K OHM POT 1/4SFT 1.4		46.40	N
3	10F473	503UA	50K OHM POT 1/4SFAB2.21		9.00	N
4	9F1860		100KOHM 10-TURN POT 5.3		21.20	N
3	10F683	501UC	500 TRIM,LOK,PNL=MT3.00		9.00	N
15	10F555		50K TRIM,LOK,PNL=MT3.00		45.00	N
28	12F9800	5389P	20K TRIM BD-MT .6		18.20	N
4	14F1267	UM5-0500	PF,DIP=MICA CAP.36		1.44	N
22	14F1269	UM5-0800	PF,DIP=MICA CAP.36		7.92	N
7	14F554	UM15-120J	12 PF,DIP=MICA CAP.20		1.40	N
34	14F555	UM15-150J	15 PF,DIP=MICA CAP.20		6.80	N
45	14F557	UM15-200J	20 PF,DIP=MICA CAP.18		8.10	N
1	14F562	UM15-330J	33 PF,DIP=MICA CAP. .24		.24	N
1	14F566	UM15-470J	47 PF,DIP=MICA CAP. .24		.24	N
3	14F567	UM15-500J	50 PF,DIP=MICA CAP.19		.57	N
3	14F557	UM15-101J	100 PF,DIP=MICA CAP.18		.54	N
4	14F562	UM15-201J	200 PF,DIP=MICA CAP.20		.80	N
51	14F592	UM15-417J	470 PF,DIP=MICA CAP.32		16.32	N
1	19F1700	835-000	.005 MF,DSC=CER CAP. .12		.12	N
27	67F307	TOL-103Z	.01 MF,DSC=CER CAP. .05		1.35	N
1	67F305	TOL-503M	.05 MF,DSC=CER CAP. .37		.37	N
7	67F313	TOL-104Z	.1 MF,DSC=CER CAP. .16		1.12	N
4	35F1955	SWU 39	39 MICROHENRY CHOKE2.91		11.64	N
4	35F1969	SWD470	470 MICROHENRY CHOK2.91		11.64	N
1	15F2317	9050	120-280 VARI.CHOKE 3.39		3.39	N
1		1N5345B	9.1V ZENER 5W 2.50		2.50	N
15		1N5338B	5.1V ZENER 5W 2.50		37.50	N
4	22F423	1402	SW. 6-POS. 3.00		12.00	N
1	59F1740	182090	POWER SWITCH,AMBER 3.97		3.97	N
2	27F734	344125A	110V LAMP-FUZE KNOB4.06		8.12	N
1	39F1232	160-4-N	AC RECP.FM*2POLE=GD1.58		1.58	N
2	39F1233	160-5-N	AC RECP.M*2POLE=GRD2.06		4.12	N
11	39-F-255	S-310-FP	JONES FM*CHS.MT. 1.21		13.31	N
2	39F1547	111-0103-001	POST BLACK 10 .52		1.04	N
2	39F1552	111-0108-001	POST BROWN 1 .52		1.04	N
2	39F1546	111-0102-001	POST RED 2 .52		1.04	N
2	39F1550	111-0106-001	POST ORANGE 3 .52		1.04	N
2	39F1551	111-0107-001	POST YELLOW 4 .52		1.04	N
2	39F1548	111-0104-001	POST GREEN 5 .52		1.04	N
2	39F1554	111-0110-001	POST BLUE 6 .52		1.04	N
2	39F1556	111-0112-001	POST VOLET 7 .52		1.04	N
2	39F1557	111-0113-001	POST GRAY 8 .52		1.04	N
2	39F1545	111-0101-001	POST WHITE 9 .52		1.04	N
314	39F1331	13-235	BNC,FM-CHS.MT. .72		226.08	N
7	61F1175	KD-1250A-4"	ALUM. KNOB(TIMING) 1.75		12.25	
4	12F6045	DFA-N	COUNTING DIAL 4.75		19.00	

SUB-TOTAL: 772.95
SUB-TOTAL: 400.92

NEWARK TOTAL 1173.81

****ALLIED ELECTRONICS****

154		525-1060	10 OHM, 1/4 W RES	.06	10.78	A
10		525-1081	15 OHM, 1/4 W RES	.06	1.00	A
30		525-1117	27 OHM, 1/4 W RES	.06	3.00	A
41		525-1153	47 OHM, 1/4 W RES	.06	4.10	A
243		525-1185	75 OHM, 1/4 W RES	.06	17.01	A
235		525-1202	100 OHM, 1/4 W RES	.06	16.45	A
19		525-1226	150 OHM, 1/4 W RES	.06	1.90	A
48		525-1248	220 OHM, 1/4 W RES	.06	4.80	A
79		525-1263	270 OHM, 1/4 W RES	.06	7.00	A
21		525-1270	300 OHM, 1/4 W RES	.06	2.10	A
10		525-1276	330 OHM, 1/4 W RES	.06	1.00	A
58		525-1302	470 OHM, 1/4 W RES	.06	5.80	A
66		525-1308	510 OHM, 1/4 W RES	.06	6.60	A
27		525-1330	680 OHM, 1/4 W RES	.06	2.70	A
107		525-1356	1K OHM, 1/4 W RES	.06	7.49	A
10		525-1361	1.1KOHM, 1/4 W RES	.06	1.00	A
30		525-1380	1.5KOHM, 1/4 W RES	.06	3.00	A
65		525-1405	2.2KOHM, 1/4 W RES	.06	6.50	A
13		525-1421	2.7KOHM, 1/4 W RES	.06	1.30	A
10		525-1427	3K OHM, 1/4 W RES	.06	1.00	A
10		525-1433	3.3KOHM, 1/4 W RES	.06	1.00	A
10		525-1461	4.7KOHM, 1/4 W RES	.06	1.00	A
134		525-1467	5.1KOHM, 1/4 W RES	.06	9.38	A
10		525-1489	6.8KOHM, 1/4 W RES	.06	1.00	A
227		525-1522	10K OHM, 1/4 W RES	.06	15.89	A
17		525-1528	11K OHM, 1/4 W RES	.06	1.70	A
32		525-1550	15K OHM, 1/4 W RES	.06	3.30	A
10		525-1603	27K OHM, 1/4 W RES	.06	1.00	A
10		525-1650	47K OHM, 1/4 W RES	.06	1.00	A
10		525-1703	82K OHM, 1/4 W RES	.06	1.00	A
10		525-1717	100KOHM, 1/4 W RES	.06	1.00	A
10		525-1907	2.2MOHM, 1/4 W RES	.06	1.00	A
241	553-0914	1N914B	SIL-DIODE	.19	45.79	A
4	852-0019		47PF, POLY CAP	.13	.52	A
4	852-0026		100PF, POLY CAP	.13	.52	A
8	852-0050		1000PF, POLY CAP	.13	1.04	A
4	852-0110		.01 MFD, POLY CAP	.13	.52	A
8	852-0900		.047 MFD, POLY CAP	.13	1.04	A
8	852-0104		.47 MFD, POLY CAP	.13	1.04	A
4	852-4601		10 MFD, ELEC CAP, 35V	.48	1.92	A
4	852-5256		100 MFD, ELEC CAP, 150V	2.41	9.64	A
4	710-1248	1-G-005	5 MF, 25VDC, ELEC.	.42	1.68	A
11	710-1251	2-G-101	10 MF, 25VDC, ELEC.	.44	4.84	A
1	710-1253	3-G-020	20 MF, 10VDC, ELEC.	.20	.20	A
2	710-1254	3-G-025	25 MF, 25VDC, ELEC.	.46	.92	A
7	710-1258	4-G-050	50 MF, 25VDC, ELEC.	.46	3.22	A
142	710-1260	7-G-1000	100 MF, 25VDC, ELEC.	.24	34.08	A
2	710-1218	8-U-2500	250 MF, 2120DC, ELEC.	.58	11.16	A
4	710-1339	L-E-500	500 MF, 16VDC, ELEC.	.45	1.80	A
4	710-1340	N-E-1000	1000MF, 16VDC, ELEC.	.67	2.68	A
4 (BOX 100)	920-1803	1803	TAP SCREWS #6*3/8	1.78	7.12	A
4 (BOX 100)	920-1365	1365	NUTS 4-40*1/4 HEX	1.62	6.48	A
1 (BOX 100)	920-1397	1497	SOLDER LUGS 3/8 HOLE 2.25		2.25	A
1 #SPPOOL	707-5060		SOLDER, 60/40*.025	6.38	6.38	A
1	707X3036	3036	36 DRAWER CABINET	10.00	10.00	A
1	548Z0240	CC40	40 BIN RACK	22.50	22.50	A
8	652-0507	205N	SW, SPDT	2.13	18.48	A

TOTAL=338.62

ALLIED ELECTRONICS
1355 SLEEPY HOLLOW RD.
ELGIN, ILL. 60120

MICROSONICS
WEYMOUTH, MASS. 02188

K108/A2T1B XTAL-14.318180MHZ 140.00 140.00 M
TOTAL 140.00

OHM ELECTRONICS
649 VERMONT AVE.
PALANTINE, ILL. 60067

2000	1938-4	05-30-0001	IC DIP SOCKETS	.036	25.50	O
1000	1875-2L	02-04-1112	TRANS. SOCKETS	.245	24.50	O
			TOTAL		50.00	

ADVENT ELECTRONICS
7110-16 N. LINCOLN AVE
ROSEMONT, ILL. 60018

10	1-526-063-11	6-PIN FEMALE CHS MT .90	9.00	AP
30		09-02-1152 MOLEX P-C BOARD CON. .58	17.50	AP
300	8-50110	MOLEX INSERTS .036	10.70	AP
* 1		CEN-4092-5COLOR ENCODER BRD 400.00	400.00	AF
* 1	713-6140	225-2222-401 44CONTACT CON 5.89	5.89	A
		TOTAL	437.20	

LAMBDA ELECTRONICS
2420 E. OAKTON ST.
ARLINGTON HEIGHTS, ILL.

1	LDS-Z-15	15V1.4AMP POW SUP 32.00	32.00	L
2	LDS-Z-5	5V,3AMP POWER SUP.32.00	64.00	L
1	L-12-0V-15	NON-ADJ. OVP 8.00	8.00	L
2	L-12-0V-5	NON-ADJ. OVP 8.00	16.00	L
1	LOD-W-152	12V,3AMP POWER SUP 87.00	87.00	L
2	L-12-0V-12	NON-ADJ. OVP 8.00	16.00	L
		TOTAL	207.00	

	SEMI CONDUCTOR SPECIALISTS P.O. BOX 66125 OHARA AIRPORT CHICAGO, ILL. 60666				
53		1N270	GERM-DIODE	.22	S
144		2N4123	NPN TRANS	.28	SS
90		2N4125	PNP TRANS	.27	SS
70		CA3030	DIP OP-AMP, RCA	1.32	SS
35		MC1445L	DIP GAIN-CONT. AMP	1.90	S
3		MC9602P	DIP MONOSTBL.VIB.	8.10	S
2		MC74121P	DIP MONO.VIB.	1.18	S
4		ICL8038BC	DIP OSC(V-CONT)	8.40	S
4		MA715	DIP SINK	8.25	S
1		74S05	DIP BUFF,FAIRCHILD	1.04	S
1		3262ADC	DIP MOS DECODER	18.56	S
1		7404	DIP BUF	.70	S
			TOTAL	347.30	

NOTICE: THE SONY COLOR ENCODER BOARD(FROM ADVENT) HAS BEEN DISCONTINUED.
WHEN A REPLACEMENT IS FOUND AN ADDENDUM WILL FOLLOW....
-NOTE ALSO THE 44-PIN CONNECTOR(USED W/ SONY ENCODER) NEITHER ONE
SHOULD BE ORDERED!!

1142.62	NEWARK
338.62	ALLIED
140.00	MICRO.
50.00	OHM
207.00	LLAMBDA
347.00	SEMI CON.
437.00	ADVENT
198.00	D&G
+ 140.58	ROGAN

\$ 3000.82 TOTAL

BOX & P.C. BOARD DATA

for

classical I-P

QUANTITY / BOXES / I-P	MODULE NAME	P-C BOARD NAME	QUANTITY / BOXES / BOARDS
1	POWER SUPPLY-1 POWER SUPPLY-2	NONE NONE	0 0
1	INPUT	VS5	3
1	COMPARATOR	VS5	3
1	DIFFERENTIATOR	VS5	3
1	FUNTION GENERATOR	VS5	3
1	REFERENCE	217	3
8	ADDER-MULT.	VS1 VS5	1 1
2	OSCILLATOR	VCO 217	1 2
1	SYNC. GENERATOR	VS4 (vs v)* SINK	1 2
1	SYNC. STRIPPER	VS5 DS6(f)*	4 1
3	AMPL. CLASSIFIER	VS5 216 217	1 1 2
1	COLOR ENCODER	DS6(f)* 217 VS1	1 1 1

*old name in parenthesis

FOR CLASSICAL I-P TOTAL		HOLE COUNT
P-C BOARD	TALLY	
VS1	9	157
VS4	1	144
VS5	27	202
DS6	2	333
216	3	290
217	14	256
VCO	2	182
SINK	2	258
VS10		213

TO ORDER P-C BOARDS @ E.D.I.

- * 1-XEROX EDI ORDER FORM(10)COPIES
- * 2-FILL OUT ONE COPY FOR EACH TYPE BOARD
 - (A)-PUT BOARD NAME IN UPPER LEFT
 - (B)-PUT QUANTITY IN UPPER RIGHT
- * 3-TO CALCULATE PRICE:
 - (A)-BASE PRICE = BASE COST(\$1.746)XQUANTITY
 - (B)-SERVICE=ETCHING COST(varies w/ hurry&quantity)XQUANTITY
 - (C)-MISC.CHARGES:DRILLING HOLES COSTS 1 CENT EACH.....
-MISC.CHARGE=HOLE COST per BOARD X QUANTITY
 - *note*hole cost=(hole count)X(\$0.01)
- * 4-TOTAL COST= (3A)+(3B)+(3C)x20%

SANDIN IMAGE PROCESSER

BOARD

ORDER FORM

QUANTITY=_____

 ORDER FORM (Use one form for each type board) 967 QUOTATION REQUEST SEND ____ FORMS #

PRICE CHART

foil wt./oz	foil sides	PLATING (dip process)	XXXP PAPER PHENOLIC				G10 GLASS EPOXY				CUSTOMER SUPPLIED	
			THICKNESS				THICKNESS				Non sens.	Photo sens.
			1/32	1/16	3/32	1/8	1/32	1/16	3/32	1/8		
1	1	None	.040	.044	.051	.056	.072	.087	.122	.144	.050	.000
		Water dip lacquer	.045	.049	.056	.061	.077	.092	.127	.149	.055	.005
		Silver	.048	.052	.059	.064	.080	.095	.130	.152	.058	.008
		Tin	.047	.051	.058	.063	.079	.094	.129	.151	.057	.007
1	2	None	.058	.062	.069	.075	.088	.105	.134	.164	.050	.000
		Water dip lacquer	.063	.067	.074	.080	.093	.110	.139	.169	.055	.005
		Silver	.069	.073	.080	.086	.099	.116	.145	.175	.061	.011
		Tin	.067	.071	.078	.084	.097	.114	.143	.173	.059	.009
2	1	None	.042	.046	.053	.059	.074	.090	.123	.145	.050	.000
		Water dip lacquer	.047	.051	.058	.064	.079	.095	.128	.150	.055	.005
		Silver	.050	.054	.061	.067	.083	.098	.131	.153	.058	.008
		Tin	.049	.053	.060	.066	.081	.097	.130	.152	.057	.007
2	2	None	.063	.067	.075	.081	.091	.107	.137	.169	.050	.000
		Water dip lacquer	.068	.072	.080	.086	.096	.112	.142	.174	.055	.005
		Silver	.074	.078	.086	.092	.102	.118	.148	.180	.061	.011
		Tin	.072	.076	.084	.090	.100	.116	.146	.178	.059	.009

CHART INSTRUCTIONS:

From left side of chart, select in order, foil weight, number of foil sides, and type of PLATING.

From top of chart, select type of base material and THICKNESS.

The figure, at intersection of PLATING and THICKNESS, is base cost per square inch.
Use letter at bottom of column and number at right of row for order number.Enter E.D.I. order number here. F12

SERVICE SCHEDULE	Price/ board: Delivery required					
	quantity	1 DAY	2 DAYS	3 DAYS	1 WEEK	2 WEEKS
1	5.00	4.50	4.05	3.65	3.28	
2	3.50	3.15	2.75	2.48	2.23	
3	3.00	2.70	2.43	2.19	1.86	
4	2.75	2.48	2.24	2.02	1.62	
5	2.50	2.25	2.03	1.83	1.38	
6 to 9	2.25	2.03	1.83	1.65	1.32	
10 to 25	2.00*	1.80	1.62	1.46	1.10	
25 to 50	1.90*	1.71*	1.54	1.31	.98	
50 to 100	1.82*	1.64*	1.48	1.18	.83	
100 & Up	1.77*	1.59*	1.43	1.06	.77	

* Call to confirm delivery on these quantities.

$$\$1.746 \times \text{base quantity} = \text{base price} = \$ \text{ A}$$

$$\$ \times \text{etching quantity} = \text{service} = \$ \text{ B}$$

$$\$ \times \text{hole quantity} = \text{misc. charg} = \$ \text{ C}$$

$$(A+B+C) \times 20\% = \text{TOTAL COST} = \$ \text{ D}$$

We are selling service. You will be notified by phone of any failure to fill order. Payment refunded.

Be sure to enclose artwork and payment or P.O. Number.

If desired, send blank check (With limit) and we figure cost.

Sign here _____

Phone Number _____

P.O. Number _____

E.D.I.

2615 PARK AVE.

P.O. BOX 66

CAIRO, ILL. 62914

Phone 618 734-1694 (Office)

Customer Name & Address. Correct if necessary.

ALSO, IP

14-JAN-75

PAGE 1

1	55R1600	1/020	POWER CORDS 14 AWG.	2.73	N	MISC
1	55R2400	15-15	FUSED AC OUTLET BOX	12.85	N	MISC
1	57R092	31-5001	FUZE, 1 A.-5AG, SB	1.50	N	MISC
50		09-02-1152MOLEX P-C BOARD CON.	.58	AP	MISC	
500	0-30110		MOLEX INSERTS	.036	AP	MISC
2000	1425-4	65-30-00001	IC DIP SOCKETS	.036	O	MISC
1000	1875-2L	02-04-1112	TRANS. SOCKETS	.245	O	MISC
1000 FT	SOF1000WM	RG 5470	CO-AXIAL CABLE	81.28	N	MISC
100	547029	00175	BNC, M-CABLE MT KRMP	.79	N	MISC
500 FT	55F156WF	RG 174/U	CO-AXIAL CABLE	25.25	N	MI>"
1	55R550WAA1	0529	WIKE, SOLID-20AWG BRN	2.19	N	MISC
1	55R550WAC2	0529	WIKE, SOLID-20AWG RED	2.19	N	MISC
1	55R550WAS3	0529	WIKE, SOLID-20AWG ORG	2.19	N	MISC
1	55R550WA4	0529	WIKE, SOLID-20AWG YEL	2.19	N	MISC
1	55R550WA5	0529	WIKE, SOLID-20AWG GRN	2.19	N	MISC
1	55R550WA6	0529	WIKE, SOLID-20AWG BLU	2.19	N	MISC
1	55R550WA7	0529	WIKE, SOLID-20AWG VIO	2.19	N	MISC
1	55R550WA8	0529	WIKE, SOLID-20AWG GRY	2.19	N	MISC
1	55R550WA9	0529	WIKE, SOLID-20AWG WHT	2.19	N	MISC
1	55R550WAA10	0529	WIKE, SOLID-20AWG BLK	2.19	N	MISC
1(100FT)	SOF091WA1	0500	WIKE, STR-16AWG BRN	2.96	N	MISC
1(100FT)	55F580WAC2	0500	WIKE, STR-16AWG RED	2.96	N	MISC
1(100FT)	55F580WAS3	0500	WIKE, STR-16AWG ORG	2.96	N	MISC
1(100FT)	55F580WA4	0500	WIKE, STR-16AWG YEL	2.96	N	MISC
1(100FT)	55F580WA5	0500	WIKE, STR-16AWG GRN	2.96	N	MISC
1(100FT)	55F580WA6	0500	WIKE, STR-16AWG BLU	2.96	N	MISC
1(100FT)	55F580WA7	0500	WIKE, STR-16AWG VIO	2.96	N	MISC
1(100FT)	55F580WA8	0500	WIKE, STR-16AWG GRY	2.96	N	MISC
1(100FT)	55F580WA9	0500	WIKE, STR-16AWG WHT	2.96	N	MISC
1(100FT)	55F580WAA10	0500	WIKE, STR-16AWG BLK	2.96	N	MISC
3(BOX100)	51R2245		INTER.LOCKWASH#4	.95	N	MI>"
4(BOX100)	55R540		DINUMHEAD4-40*1/4	1.84	N	MISC
1(BOX100)	55R549		DINUMHEAD4-40*1/2	1.95	N	MISC
4(BOX100)	920-1803	1803	TAP SCREWS #6*3/8	1.78	A	MISC
4(BOX100)	920-1305	1305	NUTS 4-40*1/4 HEX	1.62	A	MISC
1(BOX100)	920-1347	1497	SOLDER LUGS 5/8 HOLE	2.25	A	MISC
1#SPUUL	727-5260		SOLDER, 60/40*.025	6.38	A	MISC
1	55R2521	W-TCP	SOLDERING STATION	37.00	N	MISC.
1	55R2520	PTA	1/16 TIP (W-TCP)	1.00	N	MISC
1	55R251	45-121	WIKE STRIPPER	2.65	N	MISC
1	547093	0257-40	CUTTERS	3.15	N	MISC
1	101X5050	5050	56 DRAWER CABINET	10.00	A	MISC
1	5+020249	UC40	40 BIN RACK	22.50	A	MISC

I-P KNOBS

quantity	stock #		cost
32	RB-67-1-DC-M-L-9	BLACK KNOBS (GAIN) #299-INLAY/MATT BLACK LINE/WHITE -9 /WHITE @\$.86each	27.52
32		INLAY/SILVER (GAIN) LINE/BLACK -9 /WHITE @\$.86each	27.52
33		#120-INLAY/AMBER (GAIN) LINE/BLACK -9 /WHITE @\$.88each	29.04
25	RB-67-1-DC-M-D-9	BLACK KNOBS (BIAS) #299-INLAY/MATTE BLACK DOT /WHITE -9 /WHITE @\$.86each	21.50
25	RB-67-0-DC-M-D-9	BLACK KNOBS (BIAS) #299-INLAY/MATTE BLACK DOT /WHITE -9 /WHITE @\$1.40each	35.00
deliver to:		TOTAL \$ 140.58	

*****mail original*****cut here*****keep a copy*****

I-P BOXES
(chassis)

mail w/
check to:

- ... POWER SUPPLY #1 -1 ✓
- ... POWER SUPPLY #2 -1 ✓
- ... INPUT -1 ✓
- ... COMPARATOR -1 ✓
- ... DIFFERENTIATOR -1 ✓
- ... FUNCTION GENERATOR -1 2
- ... REFERENCE -1 2
- ... ADDER-MULTIPLIER -8 9 2 m ✓
- ... OSCILLATOR -2 3
- ... SYNC. GENERATOR -1 ✓
- ... SYNC. STRIPPER -1 ✓
- ... AMPLITUDE CLASSIFIER-3 ✓
- ... COLOR ENCODER -1 ✓
- ... BOX(blank) -1 ✓

deliver to:

name _____

address _____

city _____

phone _____

signature _____

date _____

t
o
t
a
l
boxes

total for
for classical I-P= 24
x\$8.25 = t
t
o
a
l price

To: D&G ENTERPRISES

1820 S. HALSTED ST.
CHICAGO, ILL. 60608

To: ROGAN KNOBS

3455 WOODHEAD DR.
NORTHBROOK, ILL.

Barber Post

Attn:

1.50

mail w/
check to:

498 2300
60067

JI 1			
JI 2	JI 7	R 1	R 11
JI 3	JI 8	R 2	R 12
JI 4	JI 9	R 3	R 13
JI 5			<u>FRONT FACE</u>
JI 6			
R 5		R 6	
R 7		R 8	J 02
R 9		R 10	J 03
			J 04

COLOR
ENCODER
9.15

COLOR ENCODER

The Color Encoder module is a N.T.S.C. standard color encoder based around the color encoder board of a Sony DXC-5000B color camera. A summary of inputs, outputs and controls follows:

JI1 COLOR CARRIER (3.58)
JI2 BURST FLAG
JI3 COMPOSITE SYNC
JI4 HORIZONTAL DRIVE
JI5 COMPOSITE BLANKING

lv.p-p 75ohm
4v.p-p 75ohm
"
"
"

Supplied from Sync Generator,
Sync Strip or 'House-Sync' in
any TV studio...

JI6 (reserved for future expansion)
JI7 RED INPUT
JI8 GREEN INPUT
JI9 BLUE INPUT
JI10 (not implemented yet)

(+ and -).5v. 75ohm
"
"
"

All inputs supplied from
Image Processor with associated
gain controls...

JO1 LUMINANCE OUT ONLY
JO2 N.T.S.C. OUT COMPOSITE
JO3 "
JO4 "

non-comp. lv.p-p

R1 through R4 are normally left
at $\frac{1}{2}$ gain...

R5 (chromance control) and R6 (hue control) act like adjustments on a color TV.
Adjust using a vectorscope or adjust (visually) to a monitor tuned to a standard
TV station.

R7 is adjusted to produce no chromance (color) out when there is no signal coming
into the red, green, blue inputs of the encoder.

R9 (burst height), R8 (pedistal) and R10 (sync height) are adjusted to standard; if
in doubt use signal from local TV station for reference (oscilloscope is necessary).

The function of the Blanking and Pedistal Board (top) is to insert blanking and
pedistal to each of the monochrome input signals and route signals to the encoder board.
The luminance component of the signal (red, green, and blue) is taken from the encoder
and amplified by the Luminance Board (middle) and fed to the luminance output and
back to the encoder. The Horizontal Clamp Board (bottom) receives horizontal sync
and generates a clamping pulse which is sent to the encoder board. (pulse is positive)
Adjust RT1 for a delay of 1.7 micro-seconds after horz. sync falling-edge, and
adjust RT2 for a pulse length of 3 micro-seconds.

Presently, the Color Encoder Module has some 'funkiness' from a stringent point of view.
It is quite adequate for all small format recording; however, in a 2" quad broadcast
context, a proc-amp is recommended on its output to prevent oversaturation of chromance
information.

MODIFICATIONS on the SONY ENCODER BOARD:

Remove the white delay line (DL2); it has four leads to be de-soldered...

NOTE WELL

THIS DOCUMENTATION OF COLOR ENCODER

IS OUT OF DATE

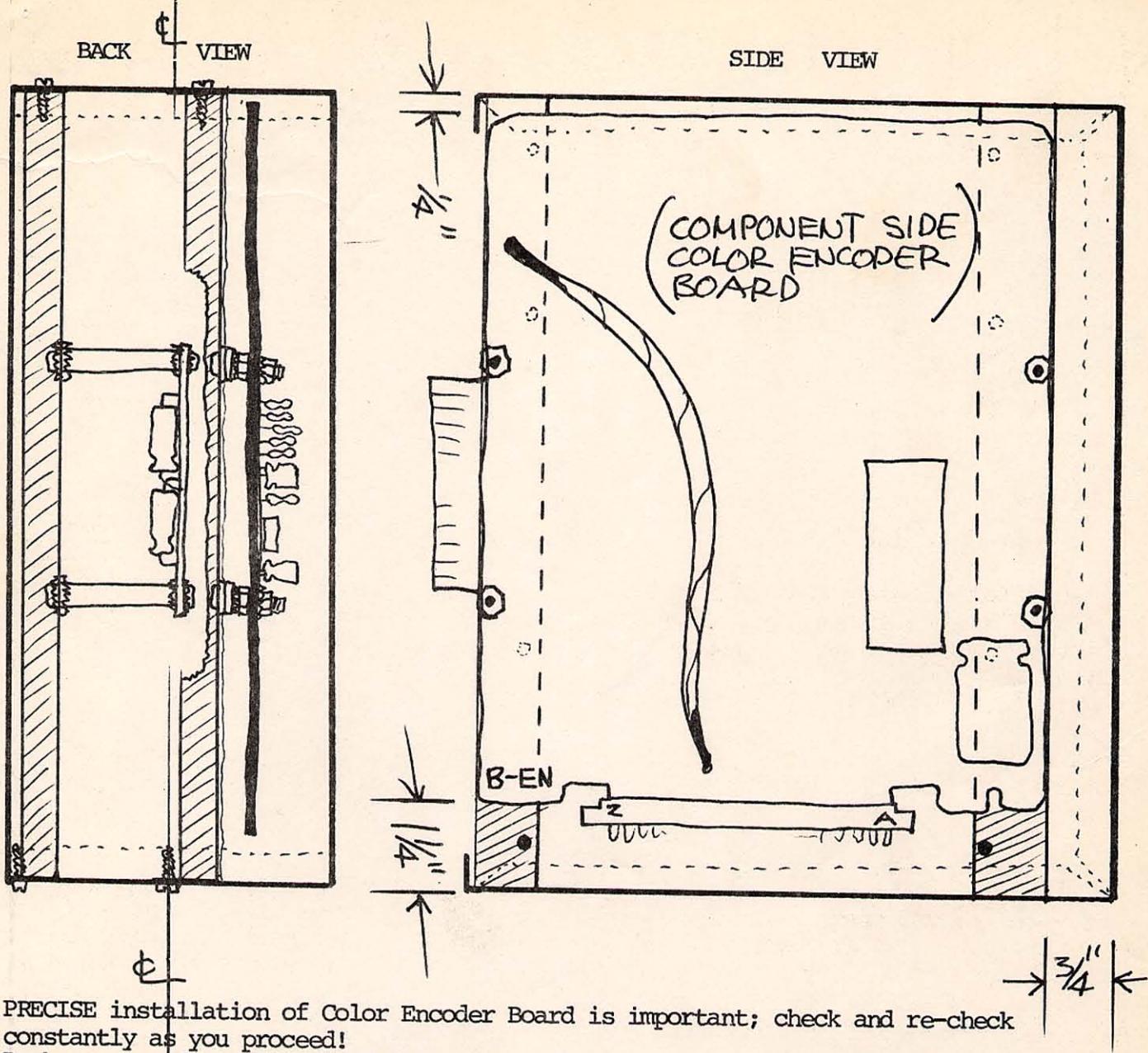
THE SONY ENCODER BOARD

IS NO LONGER AVAILABLE

THE NEW DESIGN IN

PROGRESS IS LIKELY???

TO BE VERY SIMILAR
USE FOR GENERAL REFERENCE
ONLY??



PRECISE installation of Color Encoder Board is important; check and re-check constantly as you proceed!

Back support for color encoder board is installed identical in position and orientation as is back support for the three printed circuit boards; see BACK VIEW pictorial. NOTE the position of bottom screw is on center-line of module and the top screw is abit shifted to right as usual. Be sure to cut plenty of clearance in the support bracket for the middle printed circuit board to clear; see BACK VIEW pictorial.

Check for plenty of clearance, made up of flat washers, star washer and nut, between encoder board and support bracket. As a 'safety measure' against board ever touching the supports due to bending etc, insulate the supports with a couple layers of super-tape or very thin rubber...

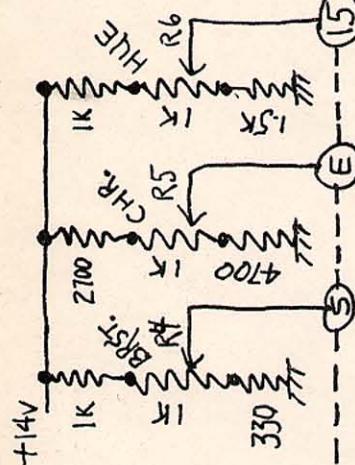
Front support bracket for color encoder board is installed upside-down and backwards to all other support brackets in module. This will put the screws for top-mounting of the bracket on center-line of module (not shown in pictorials). It is not necessary to cut away the lip of this front support bracket as done for the back support bracket.

NOTE the top 1/4", bottom 1 1/4" and front 3/4" clearances for encoder board from the module chassis; see SIDE VIEW pictorial.

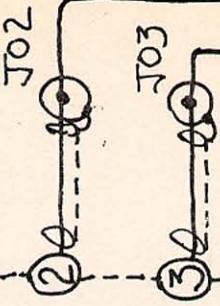
You must drill 4 holes in encoder board for mounting it to the support brackets; be absolutley sure of correct alignment and positioning prior to drilling board.

COLOR ENCODER

9.75

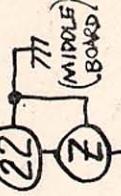
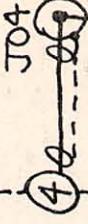
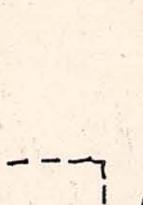


SONY

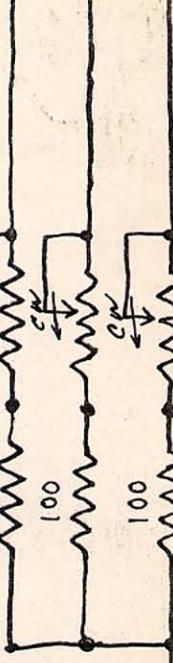


ENCODER BOARD

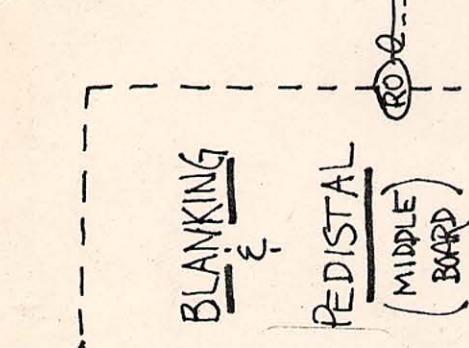
w/ MODIFICATIONS



77 (MIDDLE BOARD)

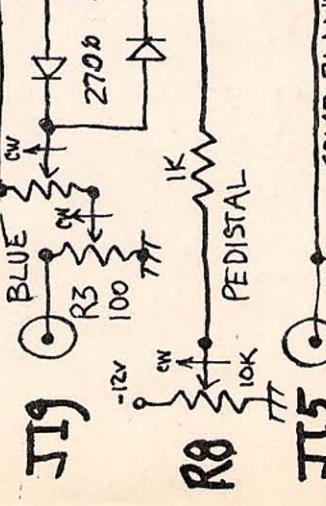
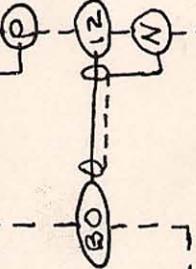


R10 500Ω TRIPLE



PEDISTAL
(MIDDLE BOARD)

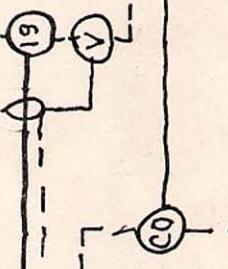
#217



COMP. BLANK

16

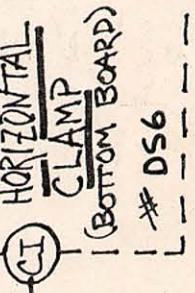
BURST FLAG



COLOR CARRIER

17

V



HORIZONTAL CLAMP
(Bottom Board)

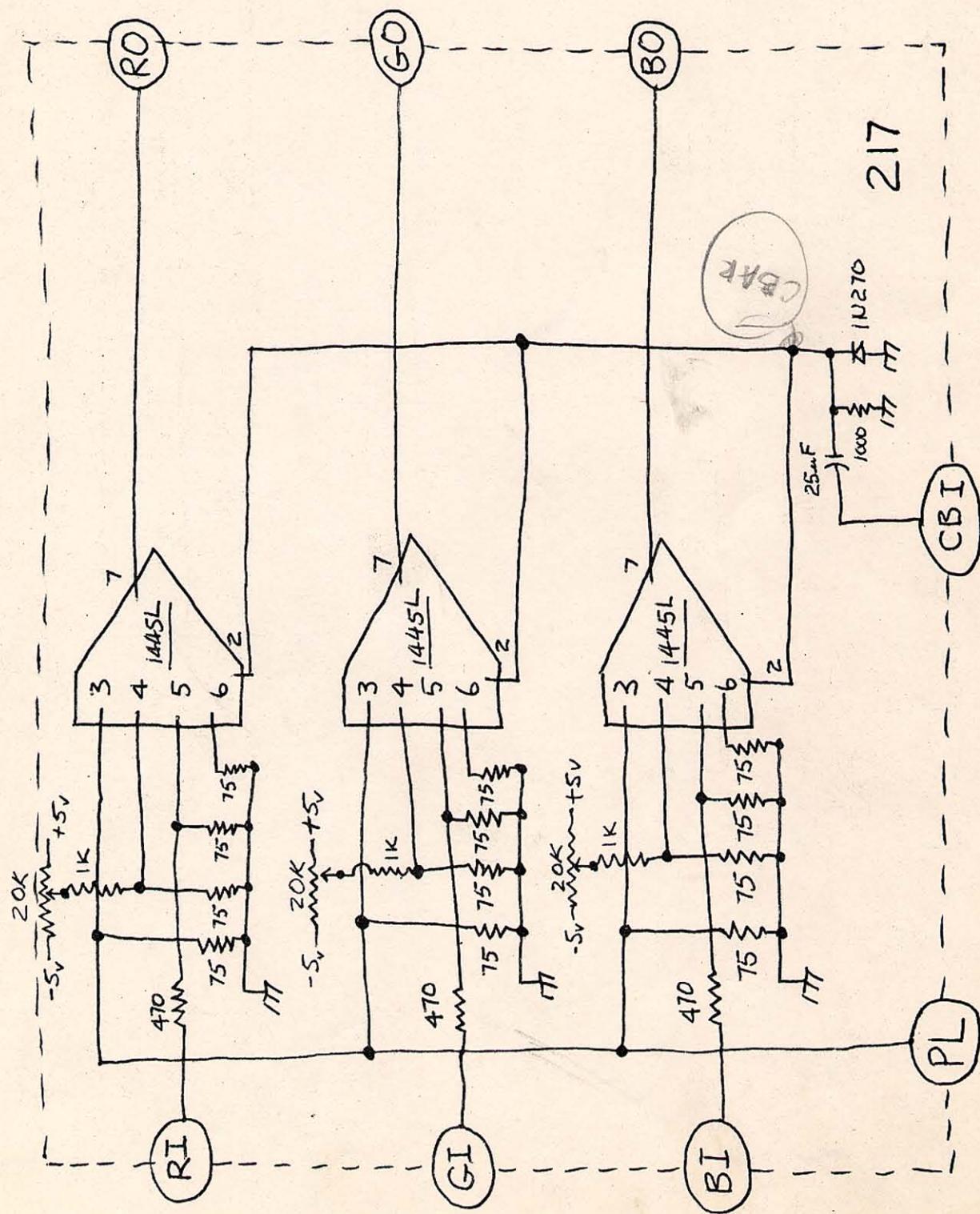
DS6

FUTURE
75 EXPANSION

75

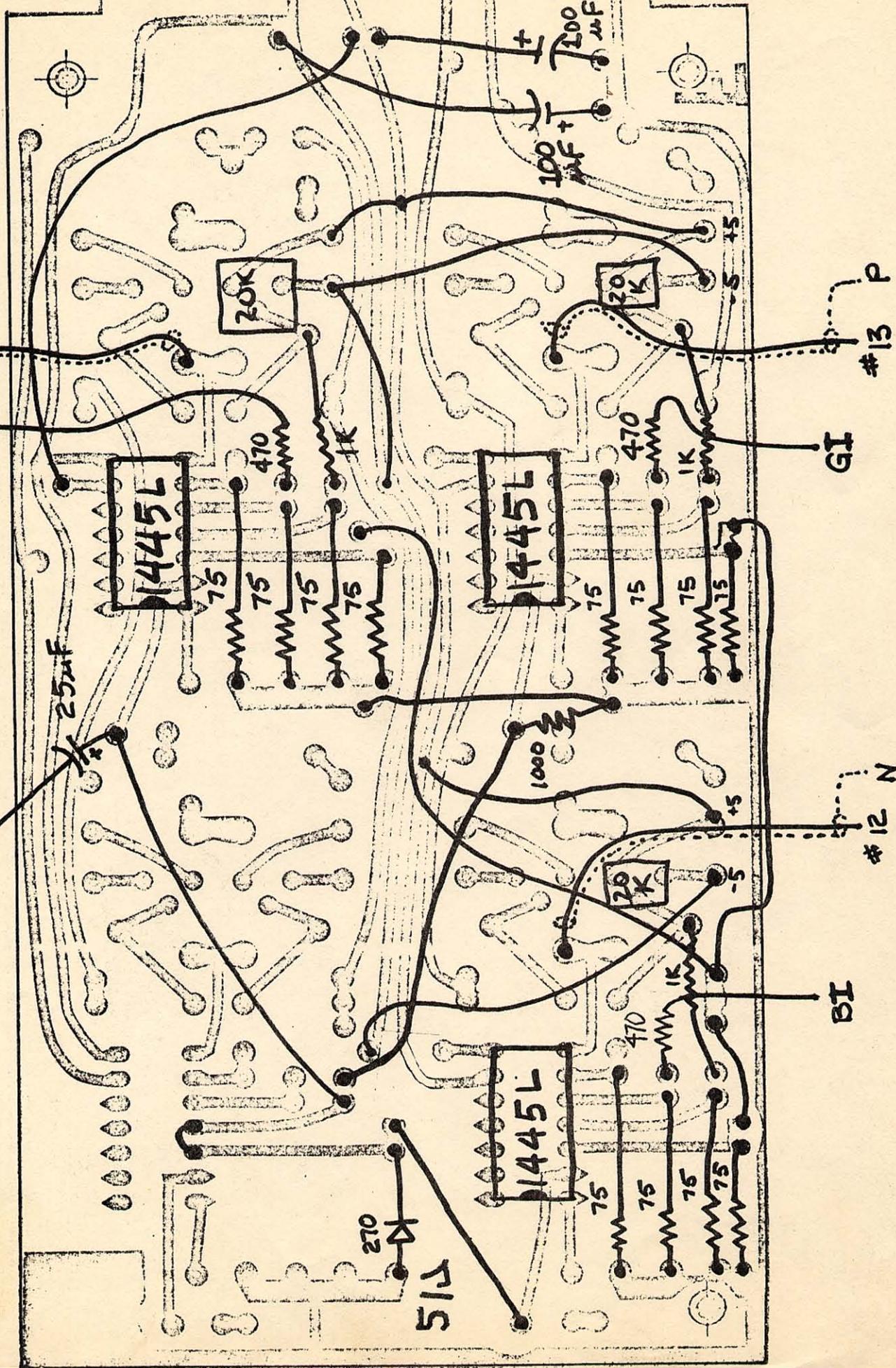
COMPOSITE SYNC.

BLANKING & PEDISTAL BOARD
(MIDDLE BOARD)



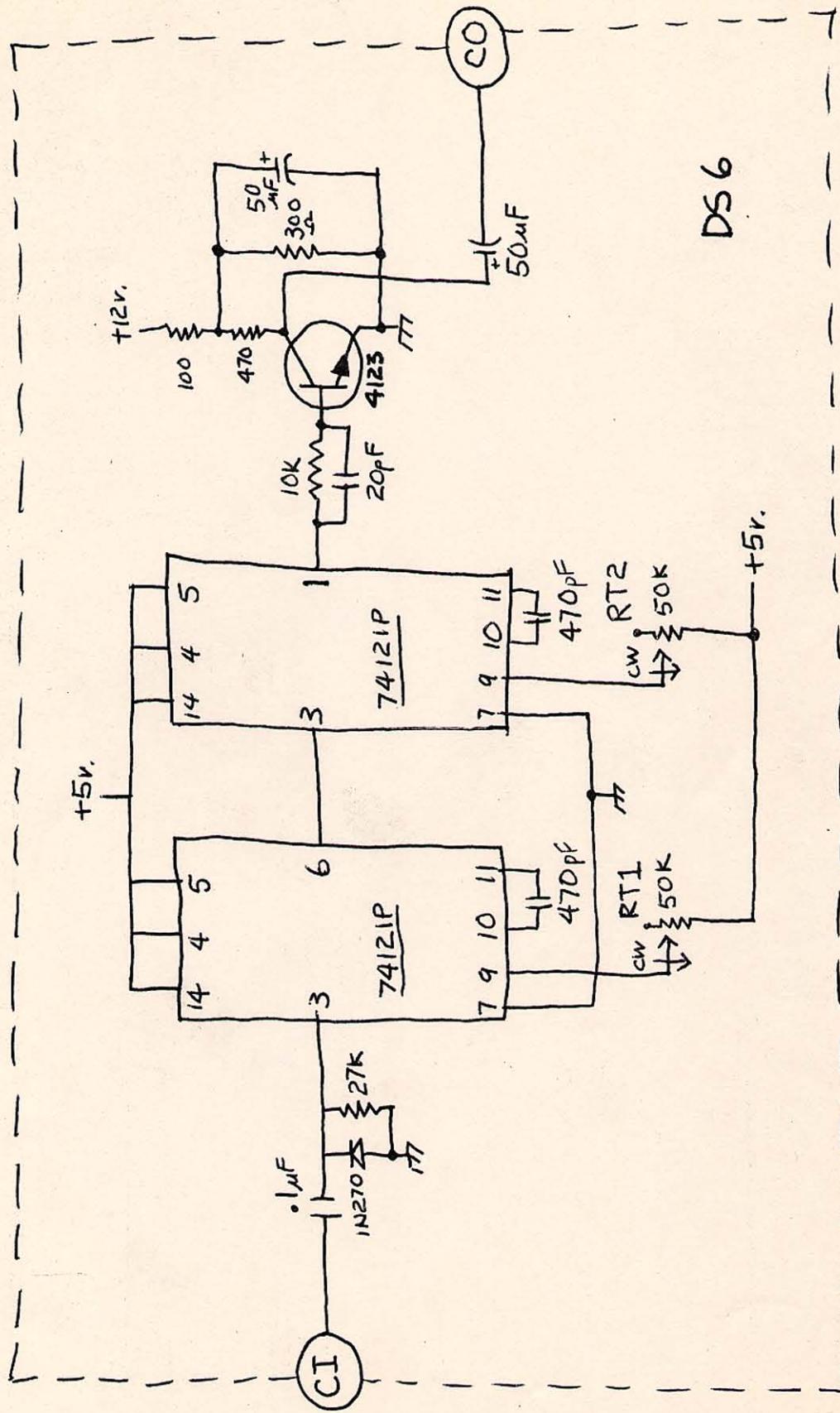
COLOR ENCODER

BLANKIN # EDISTAL
(MIDDLE BOARD)



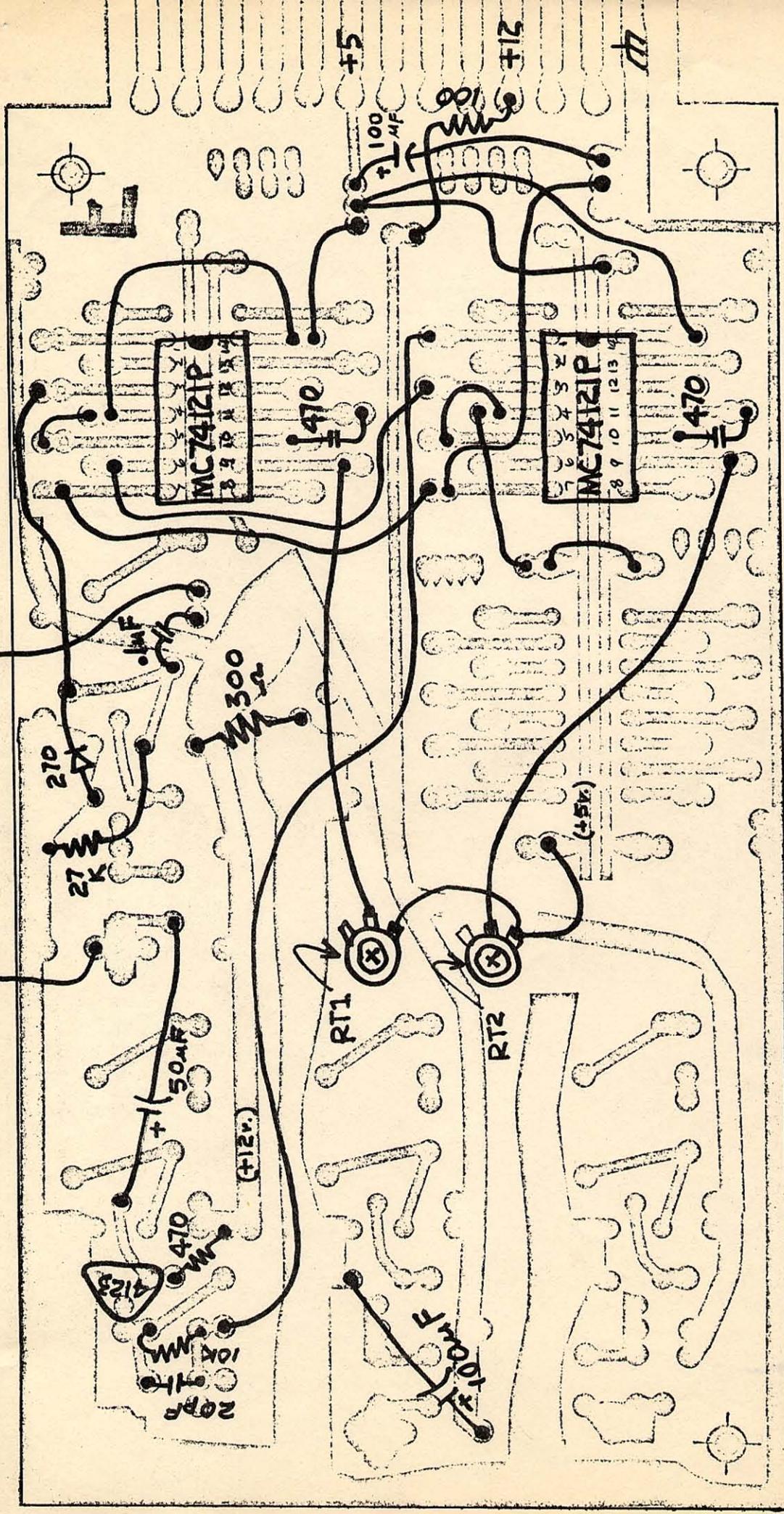
COLOR ENCODER

HORIZONTAL CLAMP BOARD
(BOTTOM BOARD)



COLOR ENCODER

HORIZONTAL CLAMP
(BOTTOM BOARD) CI
CO



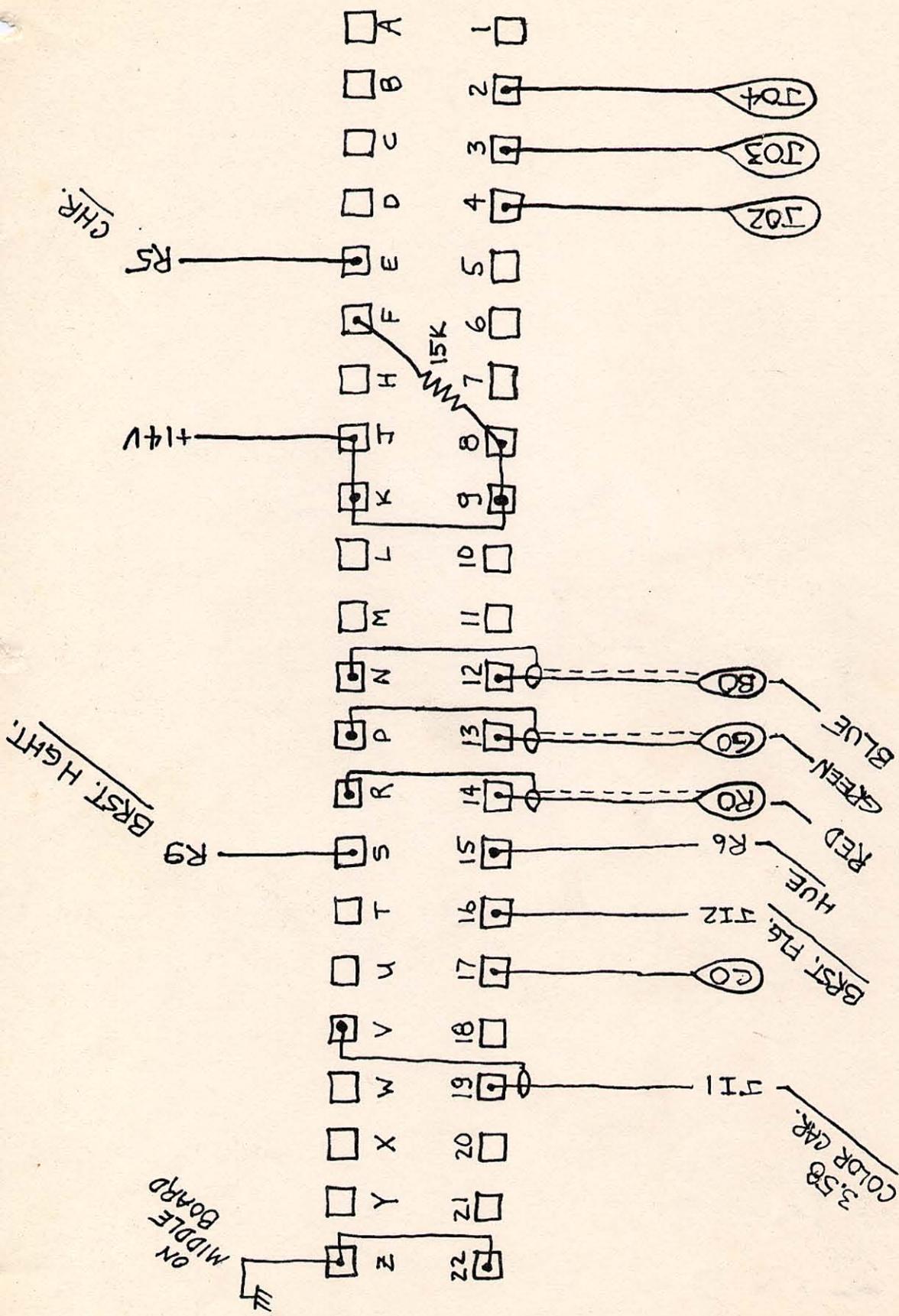
NOTE: "KNOTCH" ON MC74121P (IC's); THEY ARE ATYPICAL TO OTHER IC INSTALLATIONS...
RT1 & RT2 SHOULD NOT NOT TOUCH ANY PATHS...
COLOR ENCODER

update 9-15

44 PIN - CONNECTOR DIAGRAM

22 thru 1 = FOIL SIDE
2 thru A = COMPONENT SIDE

COLOR ENCODER
BOARD



21		525-1185	75 OHM, 1/4 W RES	.06	A	COL	
1		525-1202	100 OHM, 1/4 W RES	.06	A	COL	
1		525-1263	270 OHM, 1/4 W RES	.06	A	COL	
2		525-1270	300 OHM, 1/4 W RES	.06	A	COL	
1		525-1276	330 OHM, 1/4 W RES	.06	A	COL	
4		525-1302	470 OHM, 1/4 W RES	.06	A	COL	
7		525-1356	1K OHM, 1/4 W RES	.06	A	COL	
1		525-1421	2.7KOHM, 1/4 W RES	.06	A	COL	
1		525-1461	4.7KOHM, 1/4 W RES	.06	A	COL	
3		525-1522	10KKOHM, 1/4 W RES	.06	A	COL	
1		525-1550	15KKOHM, 1/4 W RES	.06	A	COL	
1		525-1603	27KKOHM, 1/4 W RES	.06	A	COL	
3		9F073	U1	100 OHM POT 1/4SFT	1.45	N	COL
3		10F683	501UC	500 TRIM,LOK,PNL-MT	3.00	N	COL
3		9F078	U4	1K OHM POT 1/4SF	1.45	N	COL
1		9F081	U6	2K OHM POT 1/4SFT	1.45	N	COL
1		10F468	103UA	10K OHM POT 1/4SFAB	2.21	N	COL
1		10F588		500 OHM POT 1/4SFTB	5.02	N	COL
2				50K TRIM		N	COL
3		12F9800	3389P	20K TRIM BD-MT	.65	N	COL
1		14F557	DM15-200J	20 PF,DIP-MICA CAP.	.18	N	COL
2		14F592	DM15-417J	470 PF,DIP-MICA CAP.	.32	N	COL
1		67F313	TDC-104Z	.1 MF,DSC-CER CAP.	.16	N	COL
1		710-1254	3-G-025	25 MF,25VDC,ELEC.	.46	A	COL
3		710-1260	7-G-1000	100 MF,25VDC,ELEC.	.24	A	COL
6		553-0914	1N914B	SIL-DIODE	.19	A	COL
8			1N270	GERM-DIODE	.22	S	COL
1			2N4123	NPN TRANS	.22	S	COL
3			MC1445L	DIP GAIN=CONT.AMP	1.90	S	COL
2			MC74121P	DIP MONO,VIB.	1.18	S	COL
1				217 P-C BOARD			COL
1				P-C BOARD, DSE			COL
1			CEN-4092-5COLOR ENCODER	BRD400	0.00		
1		713-6140	225-2222-401	44CONTACT CON	5.89	AP	COL
12		39F1337	13-236	BNC,FM-CHS.MT.	.72	A	COL
1				CHASSIS,COL,ENC-FAC	.25	DG	COL
6		R8-67-1-DC-M-L-9		KNOB,BLACK/INLAY2991	0.00	R	COL
1		R8-67-1-DC-M-L-9		KNOB,BLACK/INLAY1091	0.00	R	COL
1		R8-67-1-DC-M-L-9		KNOB,BLACK/INLAY1221	0.00	R	COL
1		R8-67-1-DC-M-L-9		KNOB,BLACK/INLAY1171	0.00	R	COL

NOTE WELL

THESE PARTS ARE INCLUDED IN
MASTER PARTS LIST

POWER SUPPLY

The power supplies are purchased modules and should come with complete documentation; if not request from LAMDA.

In the IP, power supply regulation and high frequency transient response are critical. Substitution of other power supply modules is NOT recommended.

In each box all corresponding terminals of the 10 pin Jones connector are connected together.

The output of the power supplies are connected to the appropriate pin of one of the connectors.

In both power supplies (Box one and Box two), the binding post terminals are connected to the appropriate 10 pin Jones.

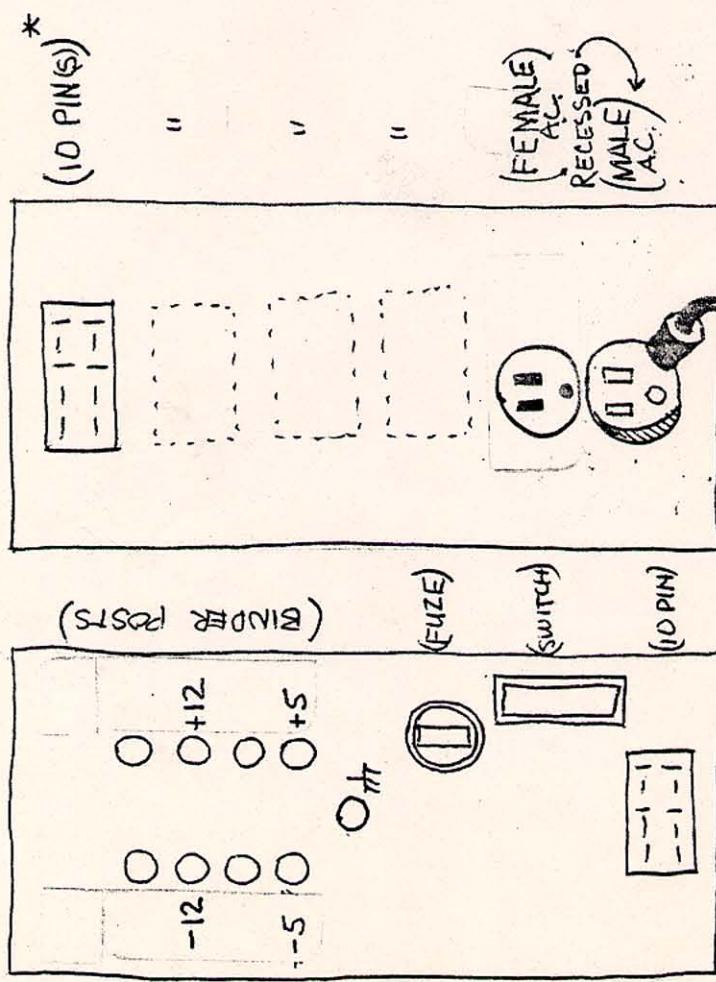
A cable with two male Jones plugs and corresponding pins connected together is used to communicate power between the boxes.

One side of each box should be covered with perforated metal or screen to allow for ventilation. This side should never be blocked to prevent ventilation. DO NOT let transistors touch screen.

The 110 v. AC which powers the power supplies is the only potentially lethal voltage in the IP. BE CAREFUL AND WATCH YOUR FINGERS.

- Box one contains +12, -12 power supplies.
- Box two contains +5, -5 power supplies.

BOX ONE

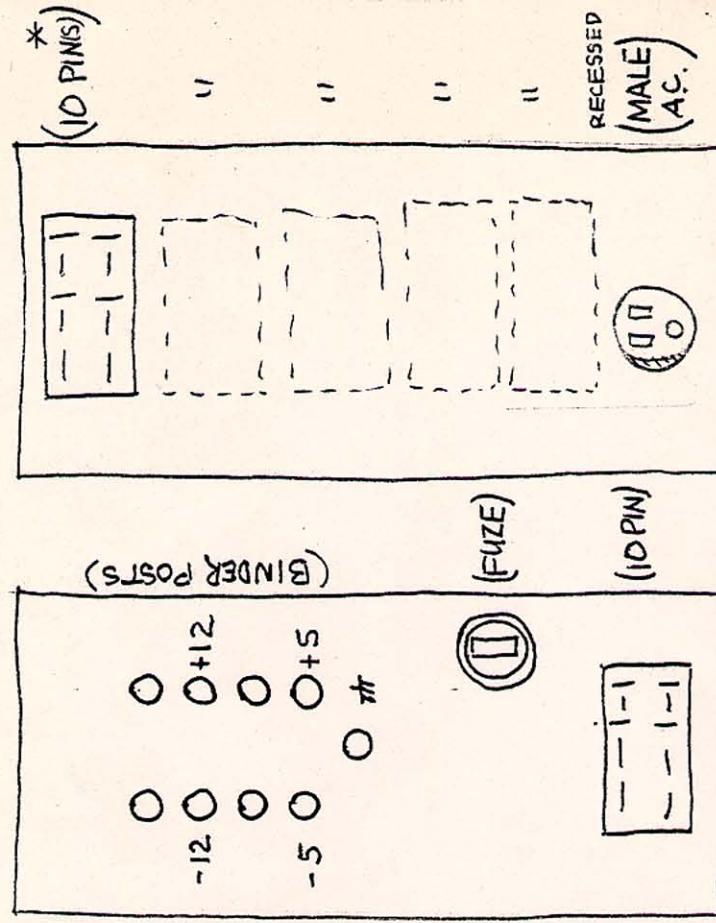


FRONT BACK

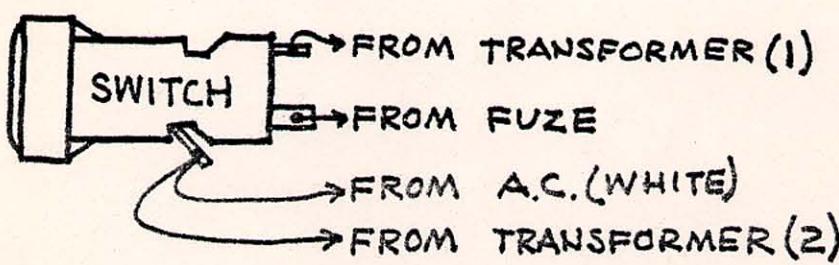
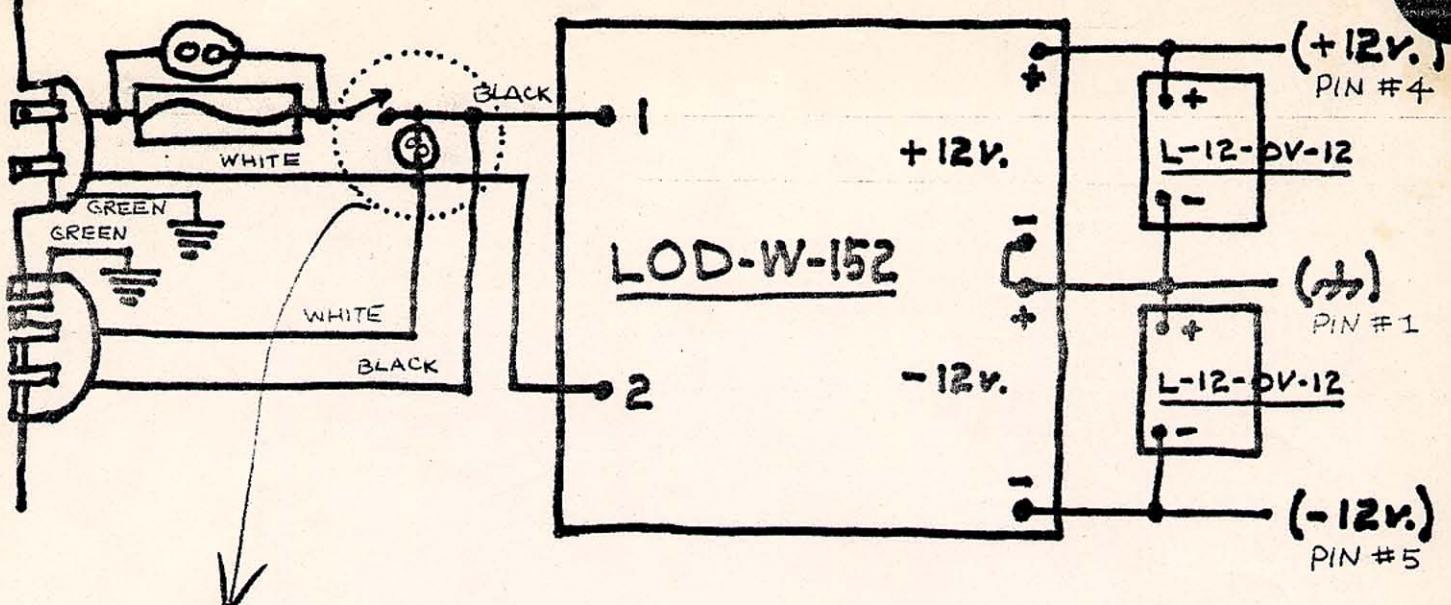
* TRY TO MOUNT AS MANY 10 PIN CLOCH-JONES (FEMALES) AS POSSIBLE.

- A.C. POWER IS JUMPED FROM "BOX ONE" TO "BOX TWO" BY MALE-FEMALE AC. CORD SO AS TO BE SWITCHED ON/OFF BY COMMON SWITCH ON 'POWER I'.
- "BOX ONE" AND "BOX TWO" ARE ALWAYS CONNECTED BY ONE MALE-MALE 10 PIN CABLE SO AS TO MAKE ALL 10 PIN CONNECTORS HAVE ALL POWER SUPPLY VOLTAGES.

BOX TWO

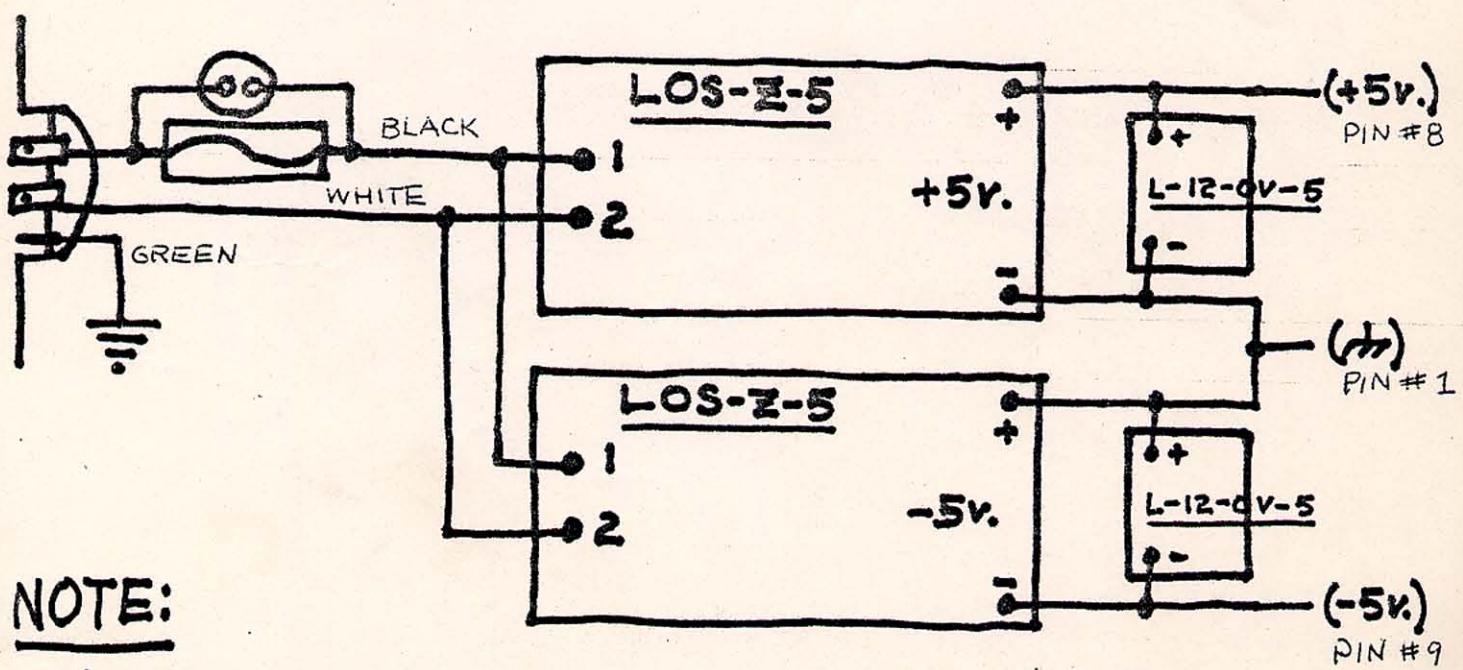


FRONT BACK



BOX ONE

BOX TWO



NOTE:

$\frac{1}{\text{---}}$ - MEANS GROUND TO METAL BOX

$\frac{1}{\text{---}}$ - MEANS GROUND TO PIN #1

POWER1.IP

(L)OD-W-152
L-12-09-12

59F1740

162090 344125A

27F784 160-4-N

39F1232 160-5-N

39F1233 160-S-N

39-F-255 S-310-FP

59F1547 111-0103-001

59F1552 111-0106-001

39F1548 111-0102-001

39F1550 111-0106-001

39F1551 111-0107-001

39F1548 111-0104-001

39F1554 111-0110-001

39F1555 111-0112-001

39F1537 111-0113-001

39F1545 111-0101-001

17-DEC-75

12V, 5AMP POWER SUP 87.00

NON-ADJ. OVP 8.00

POWER SWITCH, AMBER 3.97

110V LAMP-FUZE KNOB 4.06

AC RECP, M★2POLE-GND 1.58

AC RECP, M★2POLE-GND 2.06

JONES FM★CHS.MT. 1.21

POST BLACK 10 .52

POST BROWN 1 .52

POST RED 2 .52

POST ORANGE 3 .52

POST YELLOW 4 .52

POST GREEN 5 .52

POST BLUE 6 .52

POST VOILET 7 .52

POST GRAY 8 .52

POST WHITE 9 .52

CHASSIS, POWER 1-FACE 8.25

PAGE 1

L

L

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N

N

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N

N

N

N

N

N

N

DG

PS1

POWER2.IP

(L)OD-Z-5

L-12-09-5

39F1547

59F1552

39F1546

39F1550

39F1551

39F1548

39F1554

39F1555

39F1537

39F1545

39F1233

27F784

39-F-255

17-DEC-75

12V, 5AMP POWER SUP 32.00

NON-ADJ. OVP 8.00

POST BLACK 10 .52

POST BROWN 1 .52

POST RED 2 .52

POST ORANGE 3 .52

POST YELLOW 4 .52

POST GREEN 5 .52

POST BLUE 6 .52

POST VOILET 7 .52

POST GRAY 8 .52

POST WHITE 9 .52

CHASSIS, POWER 2-FACE 2.25

PAGE 1

L

L

N

N

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N

N

N

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N

N

N

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DG

PS2

Electronic
Visualization
Laboratory

Department of
Information Engineering
and
School of Art and Design

University of Illinois
at Chicago Circle
Box 4348
Chicago, Ill. 60680

Telephone:
312 996 4621

HI Z* LOW PASS INPUT MODUAL

This modual allows high impedance sources such as audio, and audio synthesizer control voltages to be inputed to the I.P.

It is based on the input modual so use its part list etc.

The controls r_1, r_2 work in the same way as the camera input modual. except the idea is to suppress some of the incoming signal. switch #s1 either ac couples input (up) or dc couples(down). switch #s2 selects lowpass filter. center is no filter up is maximum filtration down is less filtration(averaging).

thanks to Mi Mi Shavitz for help documenting.

The tripil through ~~xxxx~~ double pole switch

newark # 61f867
or 61f1251
or 29f2284

J1 1

R1 H

J0 2

J0 1

R2 H

J0 4

J0 3

HORIZONTAL

FRONT
FACE

J1 2

R1 V

VERTICAL

J0 2

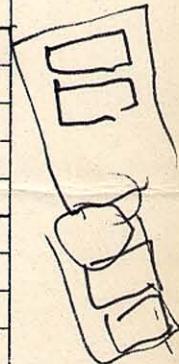
J0 1

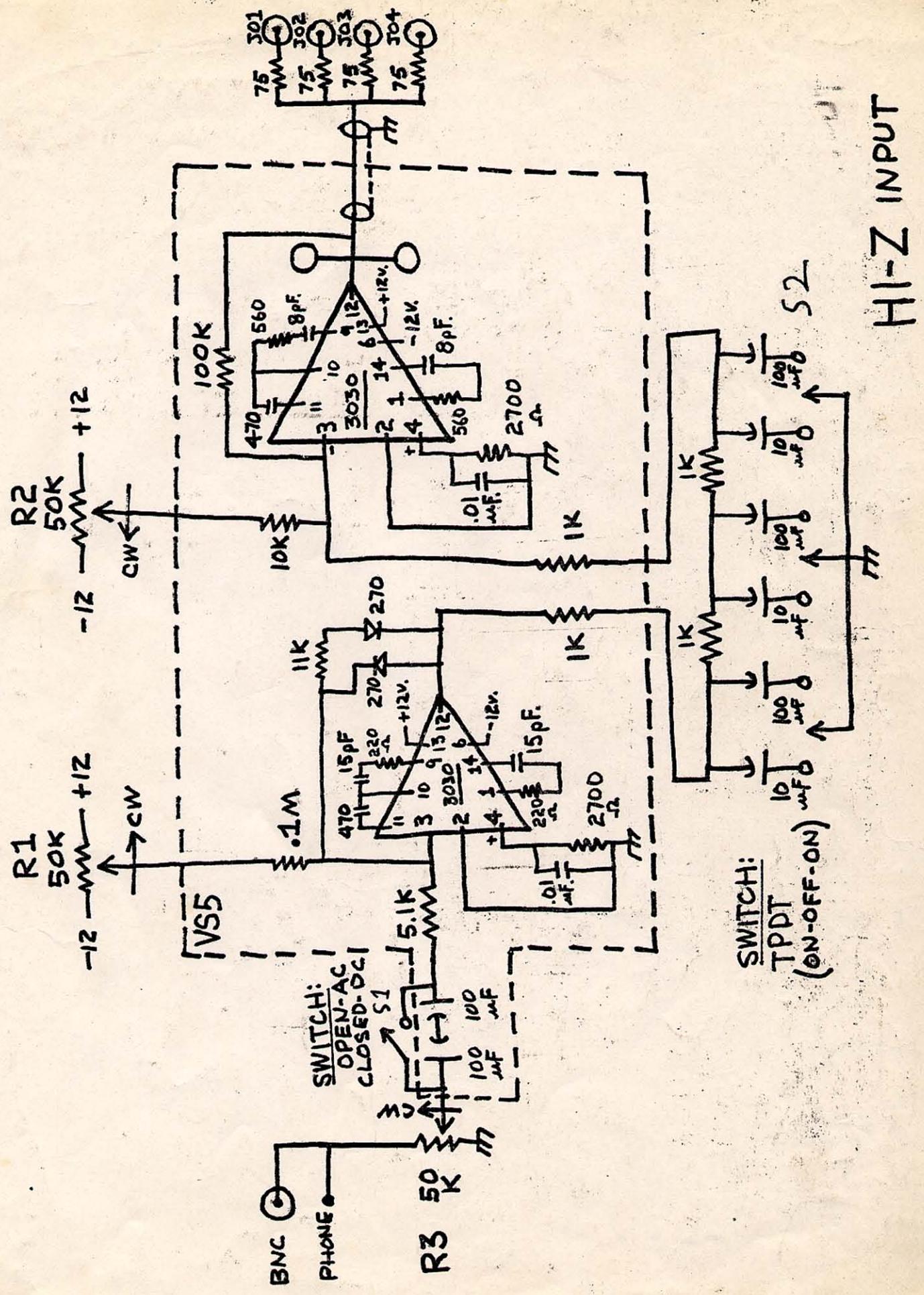
R2 V

J0 4

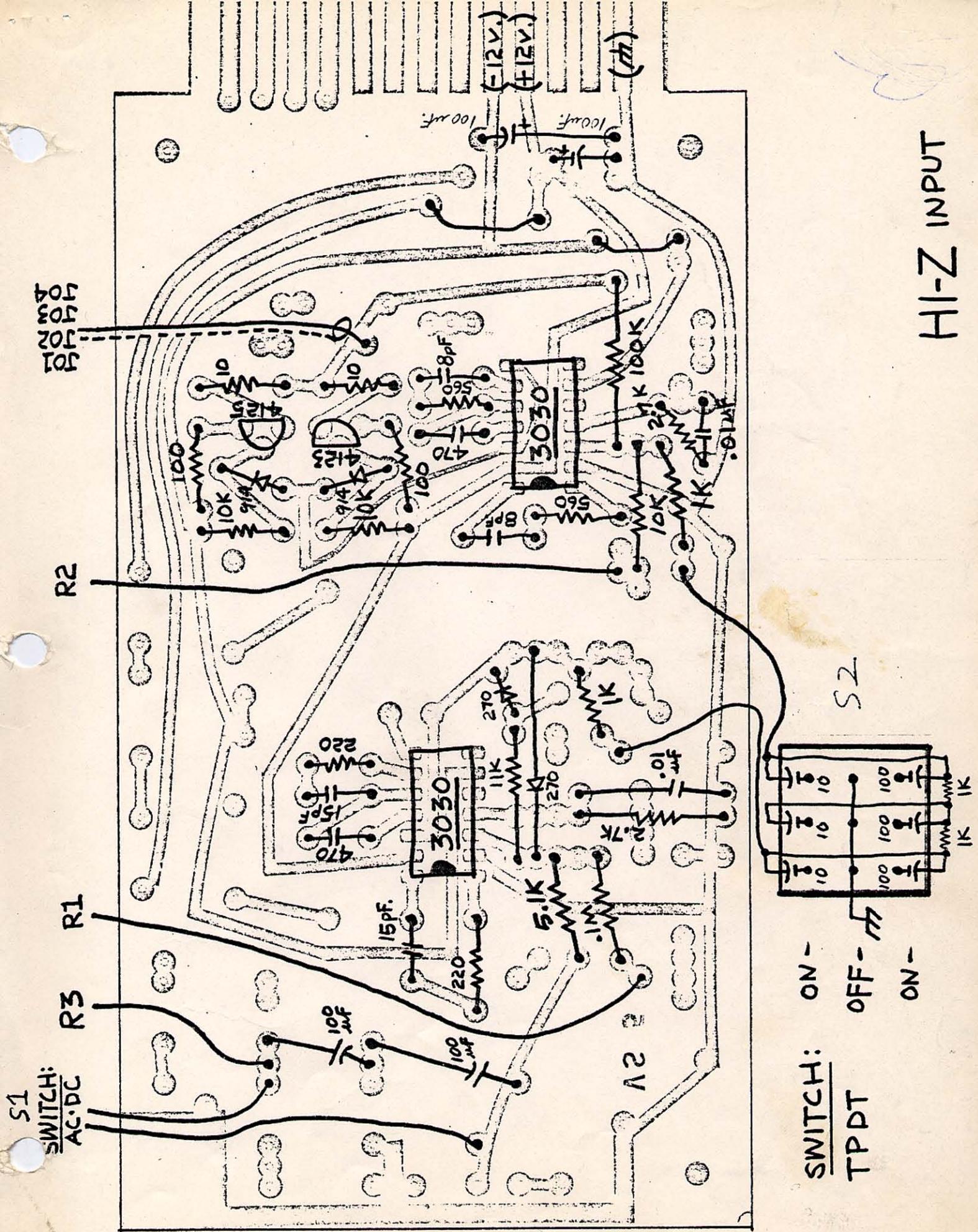
J0 3

SWEEP
GENERATOR





HI-Z INPUT



HORIZONTAL
SYNC/DRIVE INPUT
BNC

BNC
OUTPUTS

J01	J02	J03	J04
75Ω	75Ω	75Ω	75Ω

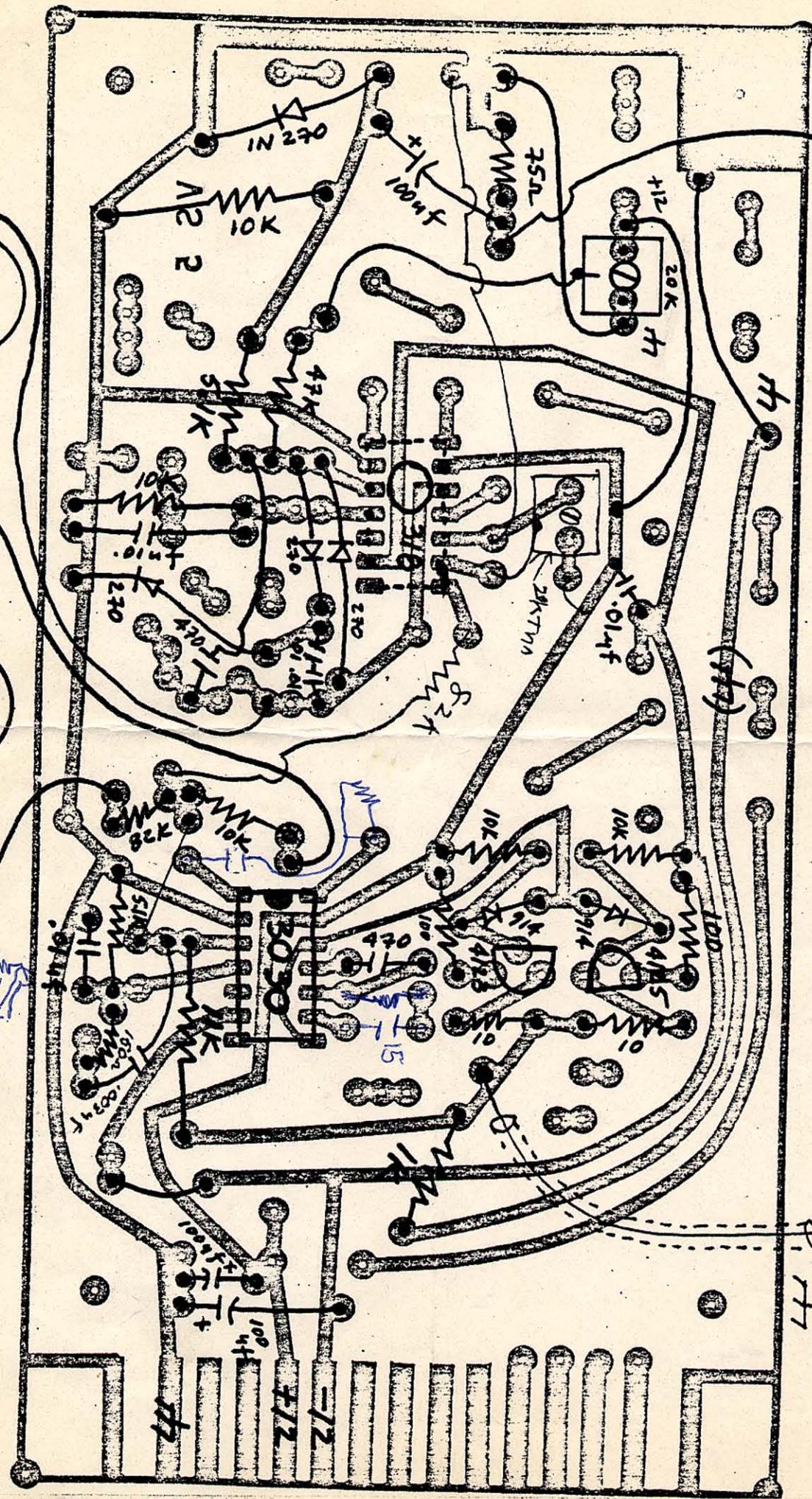
10K GAIN
LOWER
POT

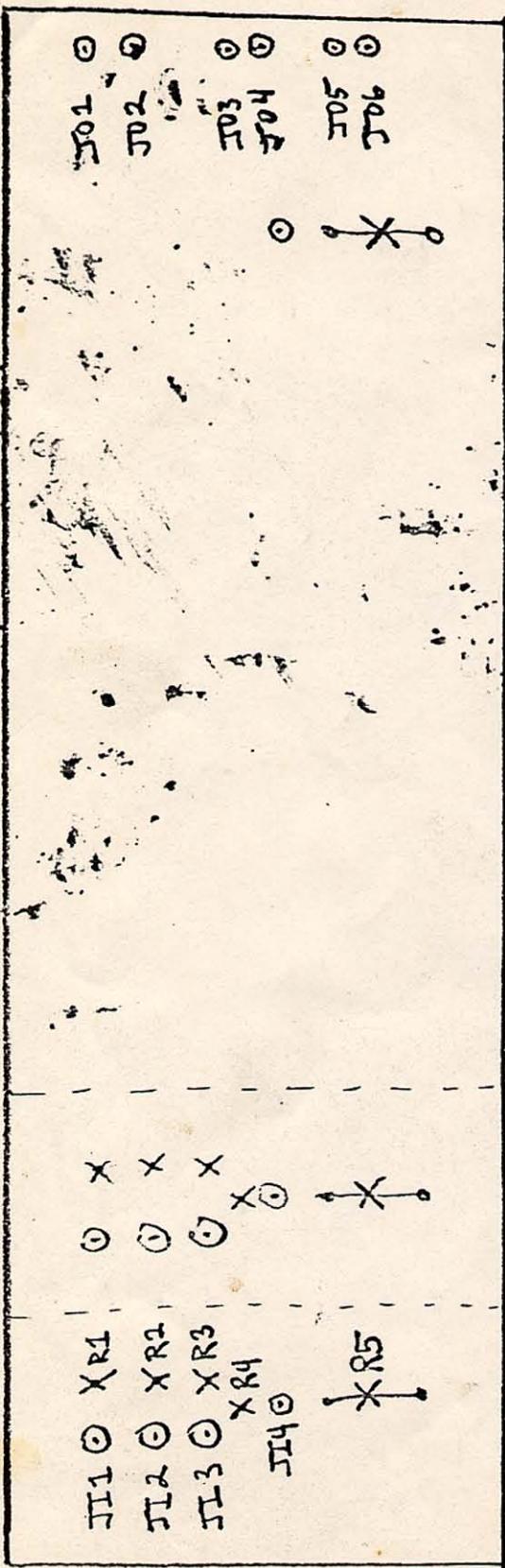
-12V.

10K BIAS
 R_3

+12V.

HORIZONTAL
SWEEP GENERATOR
(TOP P.C. BOARD)
11-79 ✓
MF





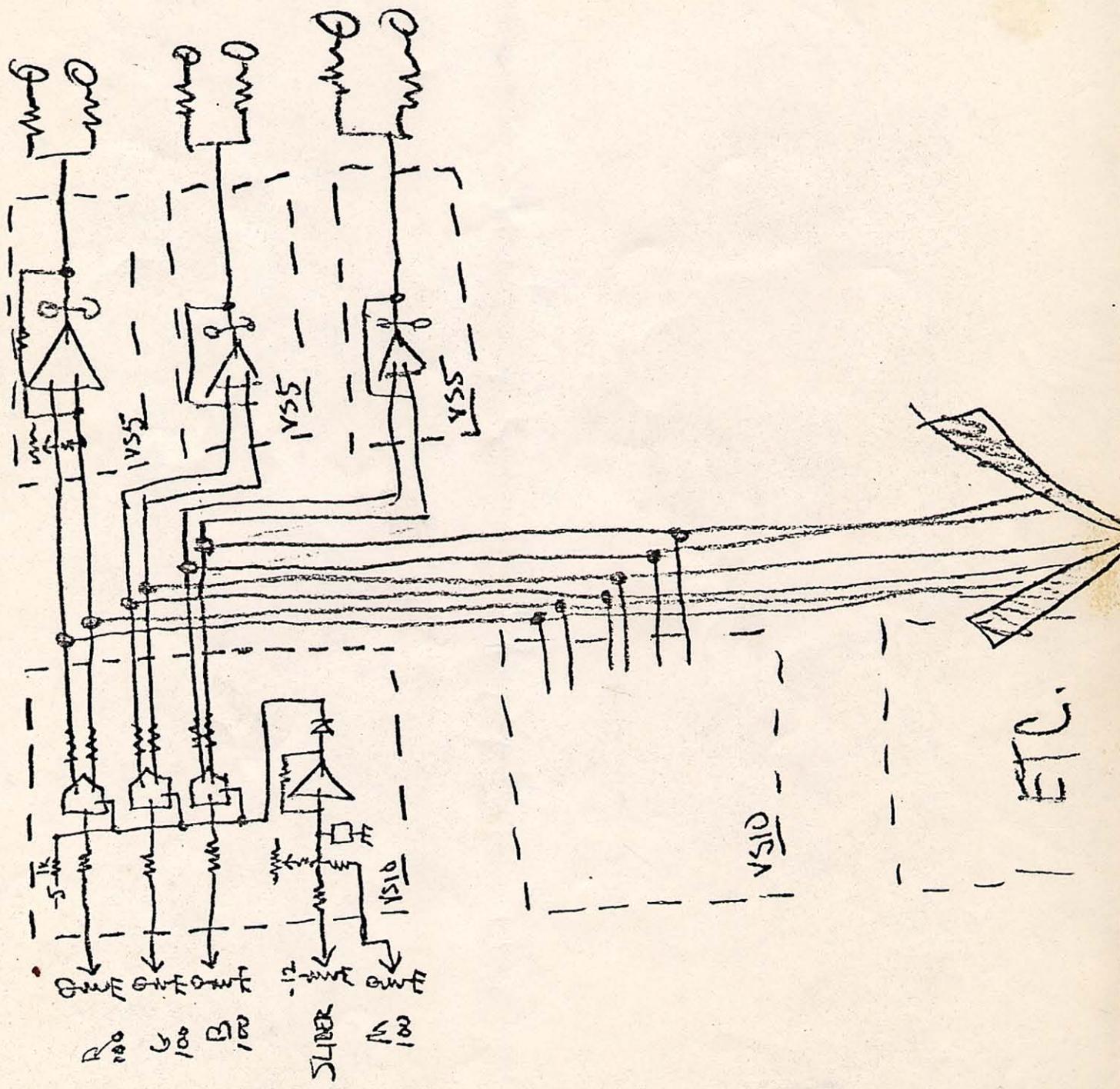
~~FOR
GREG →~~

FRONT
FACE

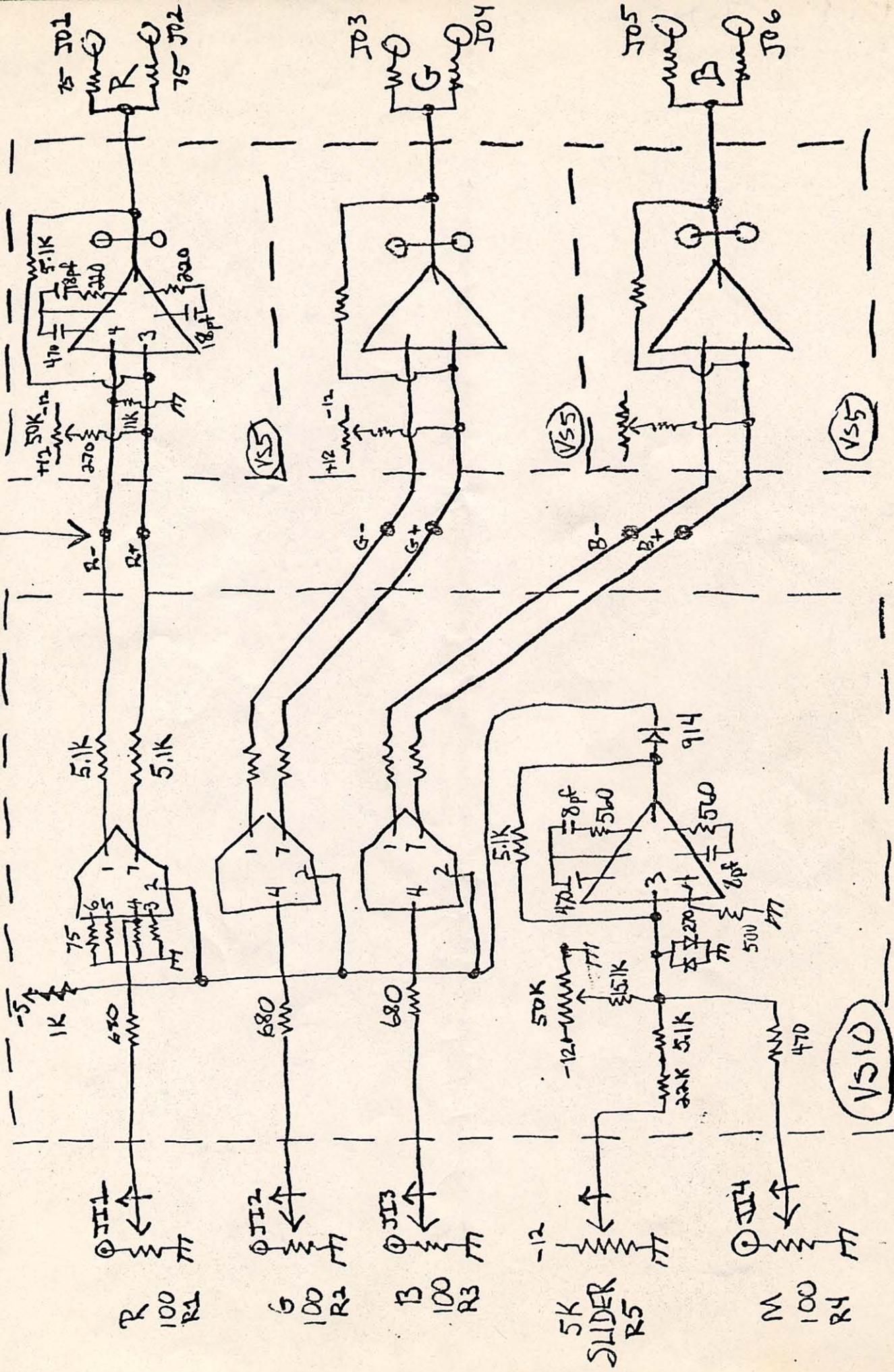
+5	186.8 mA
-5	174.2 mA
+12	211 mA
-12	269 mA

OUTPUT
MIXER

12/75



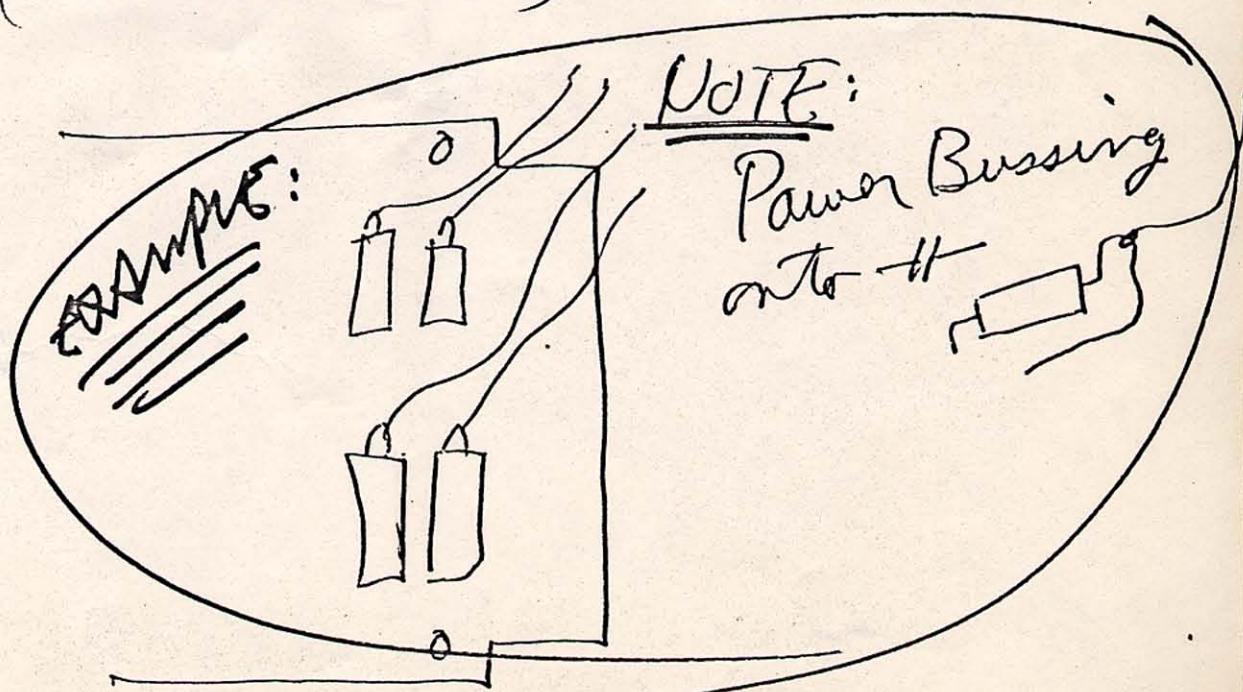
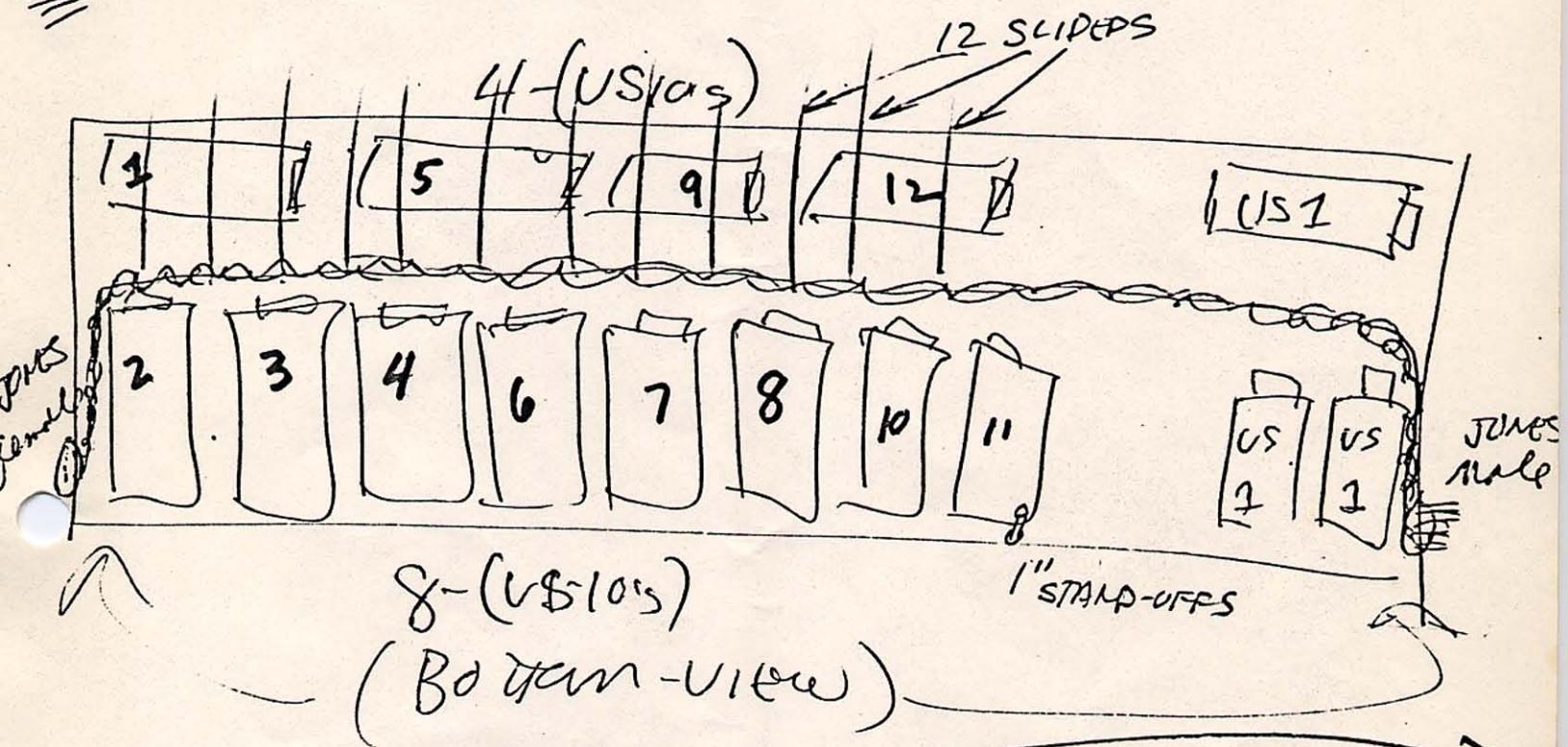
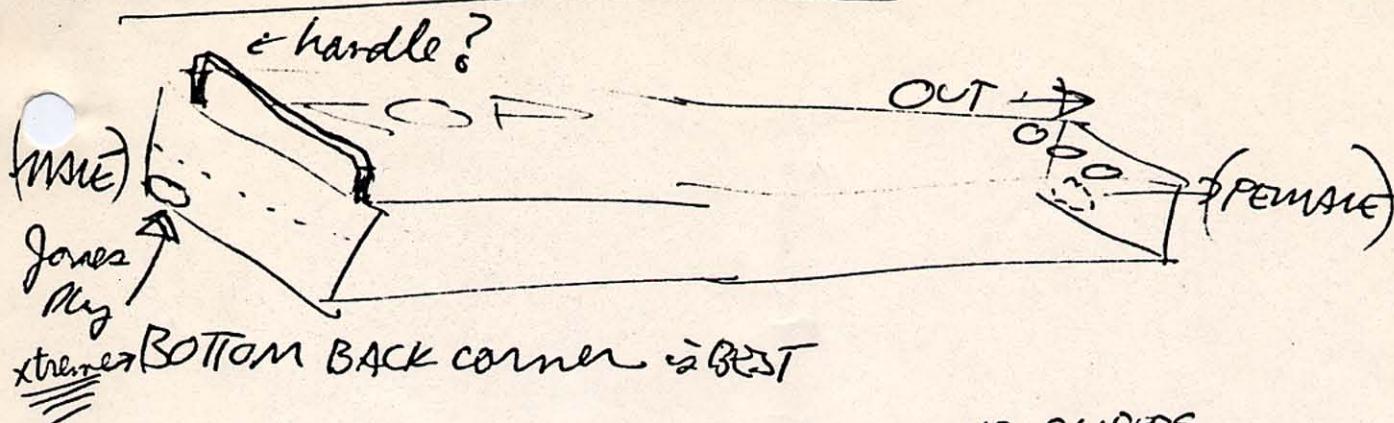
NOTE: BUSS VS10's
HERE

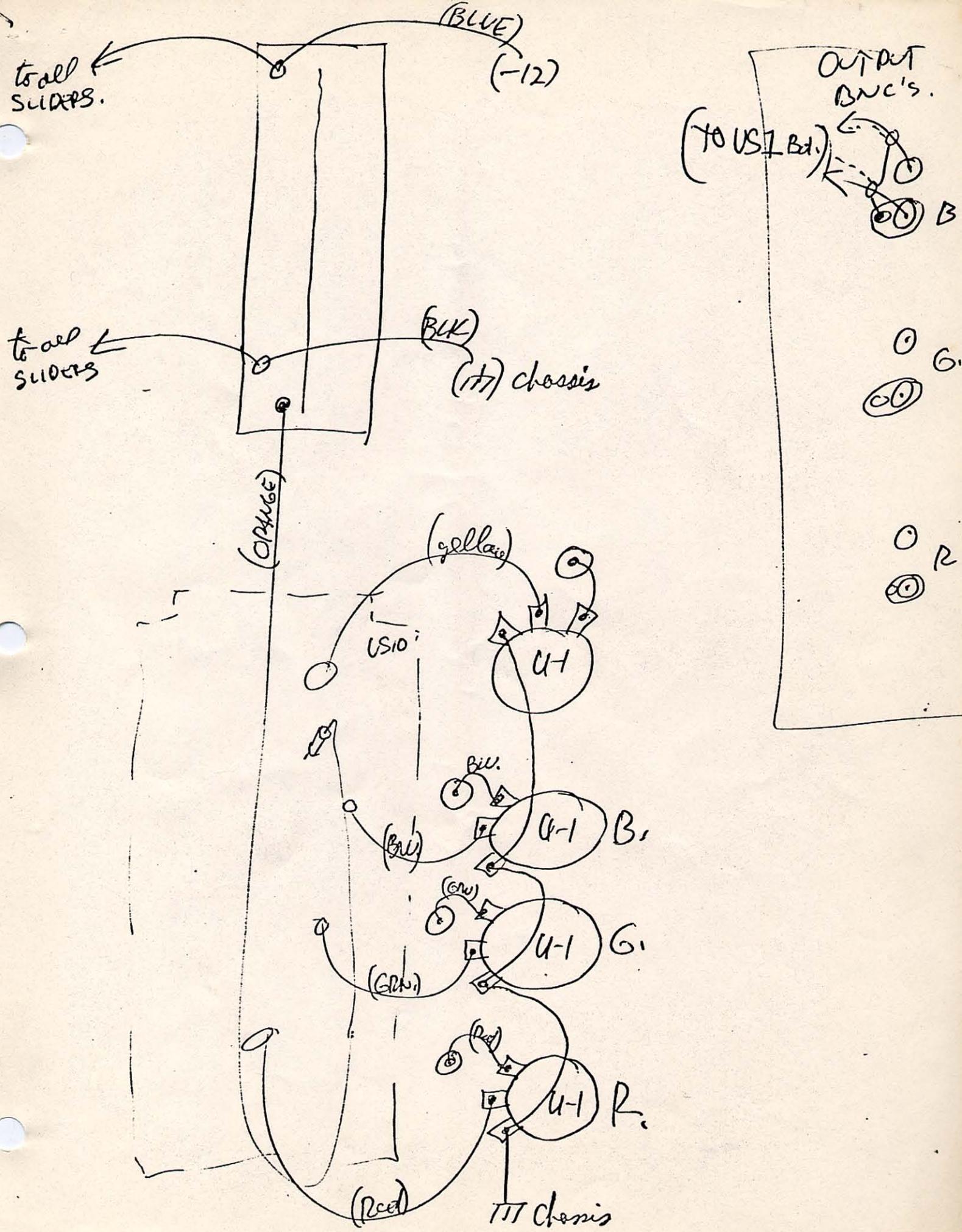


MIXTR

BUILD PROCEDURE NOTES:

OUTPUT MIX.





Prew/PSA:

~~Documented on project mix
blocks of DX BOARD~~

- no final ^{slide} part?
- OK TRIM; #3 goes to \rightarrow a float...?
 \downarrow ^{DSW's}
- US1 (SS) board; 270 Ω or 270,000 Ω ?
 \downarrow ^{DSW's}
- multiply input $\frac{AVC}{part}$ reason for not moving?

BNC-to-D

QUADRUPLE MIXER

Use V51
for 3 output

REPEAT 12 times

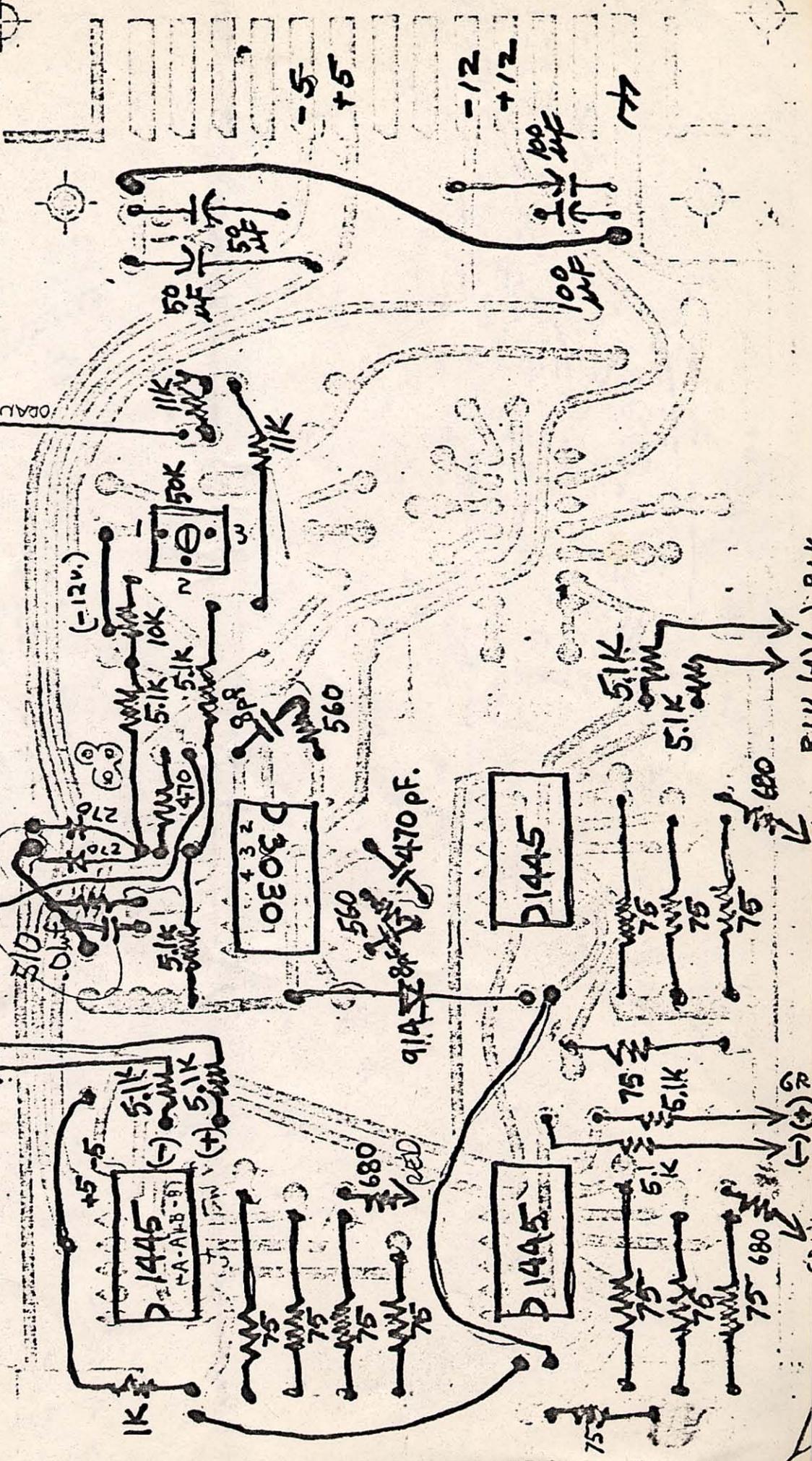
MULT. IN

R.

(+) R.
BLK.

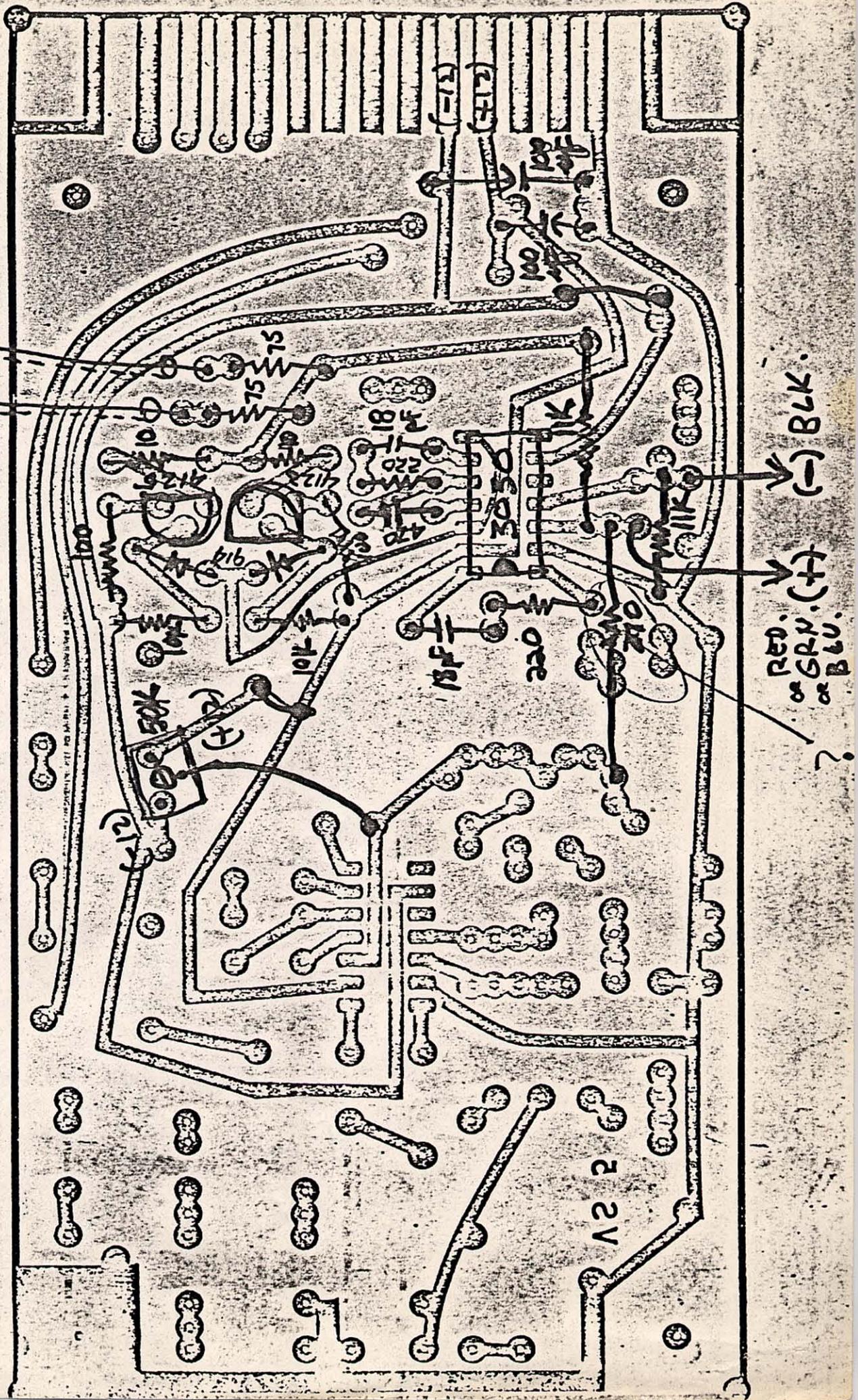
SLIDER

DPAUGE



OUTPUT AMPLIFIERS

BNC (out)



APROX. SUMMARY of TOTAL PARTS for

OUTPUT
MIX
MODULE

~50 - 100 μ A POTS

12 - SLIDE POT'S (many new 77102) 3 MORE

70 - BNC.

HARDWARE STAND-OFFS for 15 CARDS

12 - OUTPUT MIX CARDS ~~VSI0's~~

10 MORE FOR
X+

3 - VS 5

1 ~~digital card~~ DIGITAL CARD

~~25 1445L~~

~~15 CA 3030~~

D)

2) 7493P

2) 8601

10PF 8PF 570 μ A
2 1N270 C75A Digital
1 1N914

150-75 μ A RESISTORS

