PHIL'S UPDATE
REC'd. from DAN
OCT. 1979

~~OCT 78~~ OCT 79
~~FEBRUARY 28, 1976~~

CORRECTION OF ERRORS IN DOCUMENTATION

Master Parts List:

The following-

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	8-30110	MOLEX INSERTS	.036	10.70	AP
* 1	CEN-4092-5	COLOR ENCODER BRD	400.00	400.00	AP
* 1	713-6140	225-2222-401 44CONTACT CON	5.89	5.89	A
			TOTAL	437.20	

should be changed to-

ADVENT ELECTRONICS
7110-16 N. Lincoln Ave.
Rosemont, Ill. 60018

30	09-02-1152 Molex P-C Board Con.	.58	17.50
300	8-30110 Molex Inserts	.036	10.70

ADVANCED PHOTO SOUND PRODUCTS
49 So. Washington St.
Hinsdale, Ill. 60521

10	1-526-063-11	6-Pin Female Chassis Mt.	.90	9.00

(also, Color Encoder Board when design is finished)

COLOR ENCODER:

The Sony board that was used in the color encoder is no longer available. I am redesigning the encoder based on another card. The new design will be very similar to the old one. With the exception of the encoder board itself and its P-C Board connector, it would be fairly safe to order the parts (this is a prediction not a promise).

NO NEW ENCODER DESIGN, NO TOUT OF DATE DOCUON DXC5000 OK USE IF YOU CAN FIND 5000 CARD

VS5 BOARD:

The VS5 board is used to route power into the Sync Strip, Input Mod, Comparator, Function Gen. modules. Due to a drafting error on the card, the tongue that sticks out to receive the power connector may be too large for the Molex connector on the power buss. File the tongue equally on both sides so that the connector will fit if necessary.

→ NEW DESIGN DUE BY FEB 80

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→ NEW DESIGN DUE BY FEB 80

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 $2.00. AND COPPYS OF INFORMATION AND CORRECTIONS COST ME 1$

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 78

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

CORRECTION OF ERRORS IN DOCUMENTATION

Master Parts List:

The following-

1000 Ft [illegible] RG 59/U	COAXIAL CABLE	81.28	81.28	N

SHOULD BE CHANGED TO

1000 ft 36F110WM	RG 59/U COAXIAL CABLE (BELDEN # 8241-1000)	BOST	5959	N

PAGES FOLLOWING DOCUMENTATION ERRORS SHOULD REPLACE

SANDIN IMAGE PROCESSER

QUANTITY=_____

_____BOARD

ORDER FORM

☒ 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 THICKNESS 1/32	1/16	3/32	1/8	G10 GLASS EPOXY THICKNESS 1/32	1/16	3/32	1/8	CUSTOMER SUPPLIED Non sens.	Photo sens.	
1	1	None	.040	.044	.051	.056	.072	.087	.122	.144	.050	.000	1
		Water dip lacquer	.045	.049	.056	.061	.077	.092	.127	.149	.055	.005	2
		Silver	.048	.052	.059	.064	.080	.095	.130	.152	.058	.008	3
		Tin	.047	.051	.058	.063	.079	.094	.129	.151	.057	.007	4
1	2	None	.058	.062	.069	.075	.088	.105	.134	.164	.050	.000	5
		Water dip lacquer	.063	.067	.074	.080	.093	.110	.139	.169	.055	.005	6
		Silver	.069	.073	.080	.086	.099	.116	.145	.175	.061	.011	7
		Tin	.067	.071	.078	.084	.097	.114	.143	.173	.059	.009	8
2	1	None	.042	.046	.053	.059	.074	.090	.123	.145	.050	.000	9
		Water dip lacquer	.047	.051	.058	.064	.079	.095	.128	.150	.055	.005	10
		Silver	.050	.054	.061	.067	.083	[illegible]	.131	.153	.058	.008	11
		Tin	.049	.053	.060	.066	.081	.097	.130	.152	.057	.007	12
2	2	None	.063	.067	.075	.081	.091	[illegible]	.137	.169	.050	.000	13
		Water dip lacquer	.068	.072	.080	.086	.096	.112	.142	.174	.055	.005	14
		Silver	.074	.078	.086	.092	.102	.118	.148	.180	.061	.011	15
		Tin	.072	.076	.084	.090	.00	.116	.146	.178	.059	.009	16
			A	B	C	D	E	F	G	H	I	J	

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 quantity	Price/ board Delivery requi- 1DAY	2D[illegible]	
1	5.00	4.	
2	3.50	3.	
3	3.00	2.[illegible]	
4	2.75	2.4[illegible]	
5	2.50	2.25	[illegible] 1.83 1.38
6 to 9	2.25	2.03	1.83 [illegible]
10 to 25	2.00*	1.80	1
25 to 50	1.90*	1.71*	1.
50 to 100	1.82*	1.64*	1.[illegible]
100 & Up	1.77*	1.59*	1.4

* Call to confirm delivery on these quantities.

E.D.I. has Changed It's Name and Moved TO [illegible]ching [illegible]

E.C.I., Inc
811 Hulman st.
Terre Haut, Ind
47802

_____=base price=$_____ A

_____x_____ __=service =$_____ B

=misc.charg=$_____ C

(A+B+C)Y[illegible] =$_____ D

Call 812-232-4442 To find out new prices and delivery.

We are selling service. You will be notifi[illegible] failure to fill order. Payment refunded.

Be sure to enclose artwork and payment or P.

If desired, send blank check(With limit) and

[illegible]mber_____

P.O. Number_____

Customer Name & Address. Correct if necessary.

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 DISEMINATE 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.

Much Love,

I DECIDED THAT I WOULD LIKE 1 good TAPE FROM EACH COPY of THE I.P.

Daniel J. Sandin
Department of Art
University of Illinois at Chicago Circle
Box 4348
Chicago, Illinois 60680
Office phone: 312-996-8689
Lab phone: 312-996-2312
Messages: 312-996-3337 (Department of Art)

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, JO1 through JO4, 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, similiarly, 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:

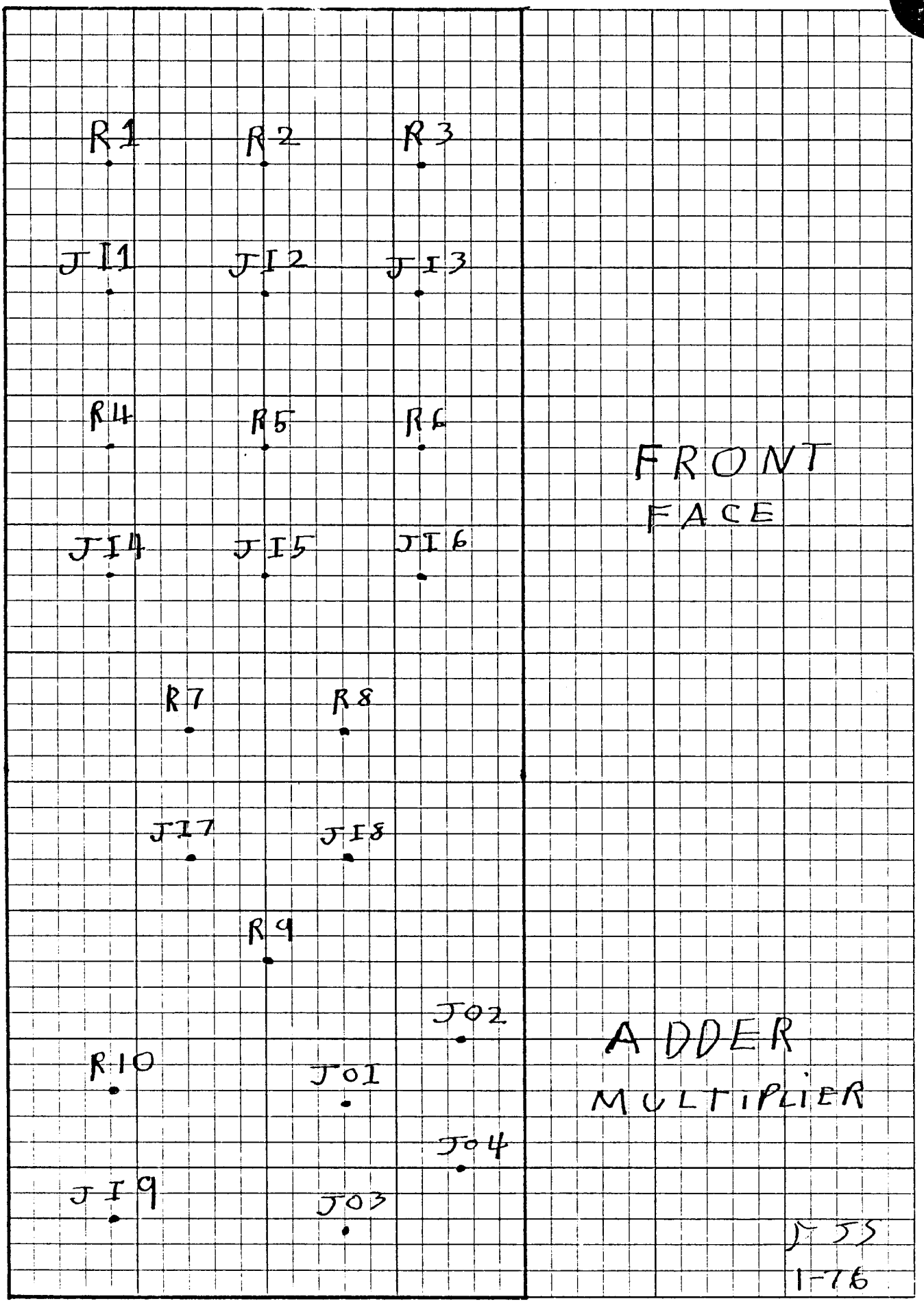
The adder multiplier should have a net gain of slightly greater than 1.
That is, a (+) or (-) .5 volt signal into the module should result in an undistorted output of approximately the same magnitude into a 75 ohm load.

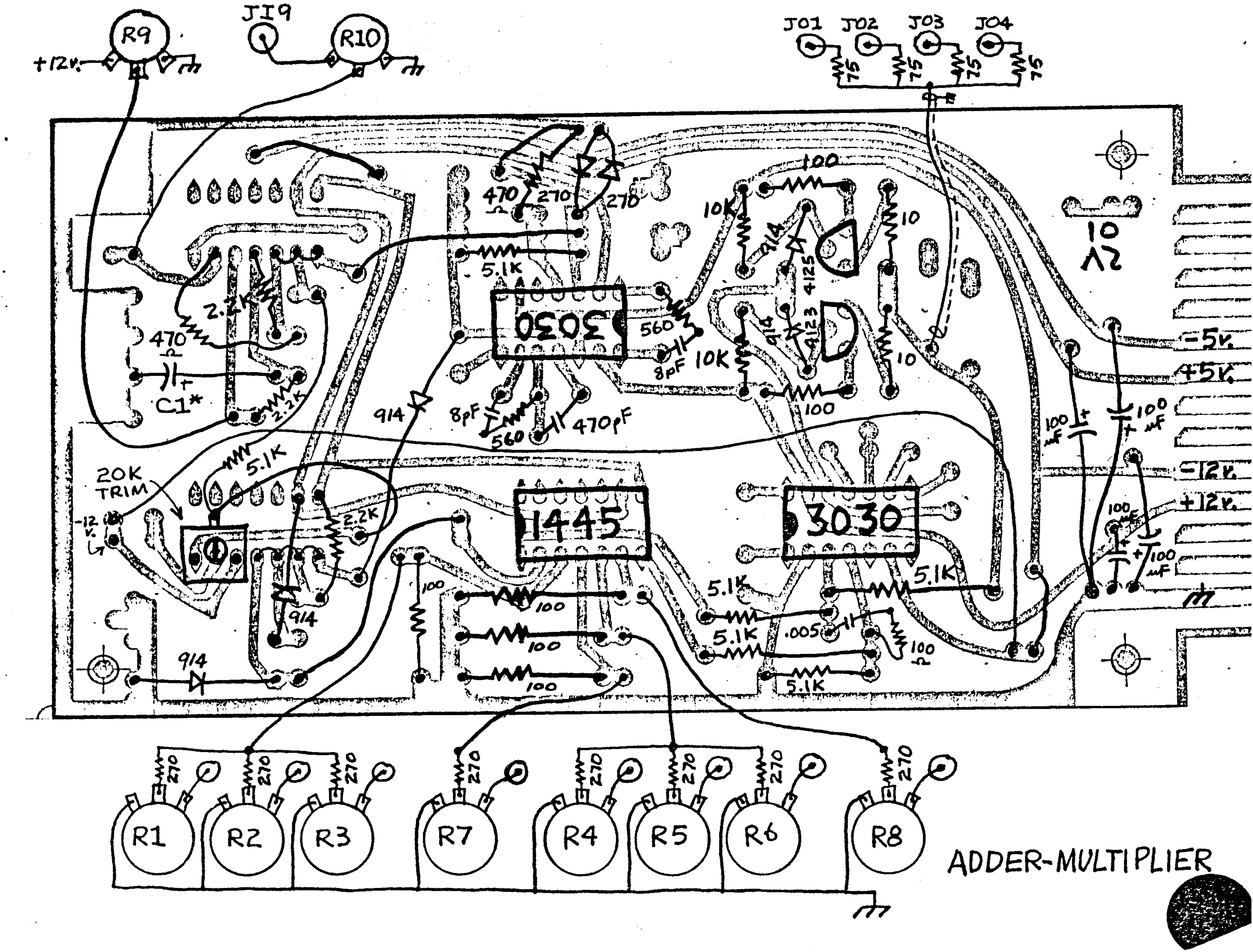
With no input the output should be approximately 0 volts (+ or - .05 volts).
Adjust 20k trimmer pot so with R9 in center position and no input to JI9 channel A and channel B have equal gain.

C1* STUFF:

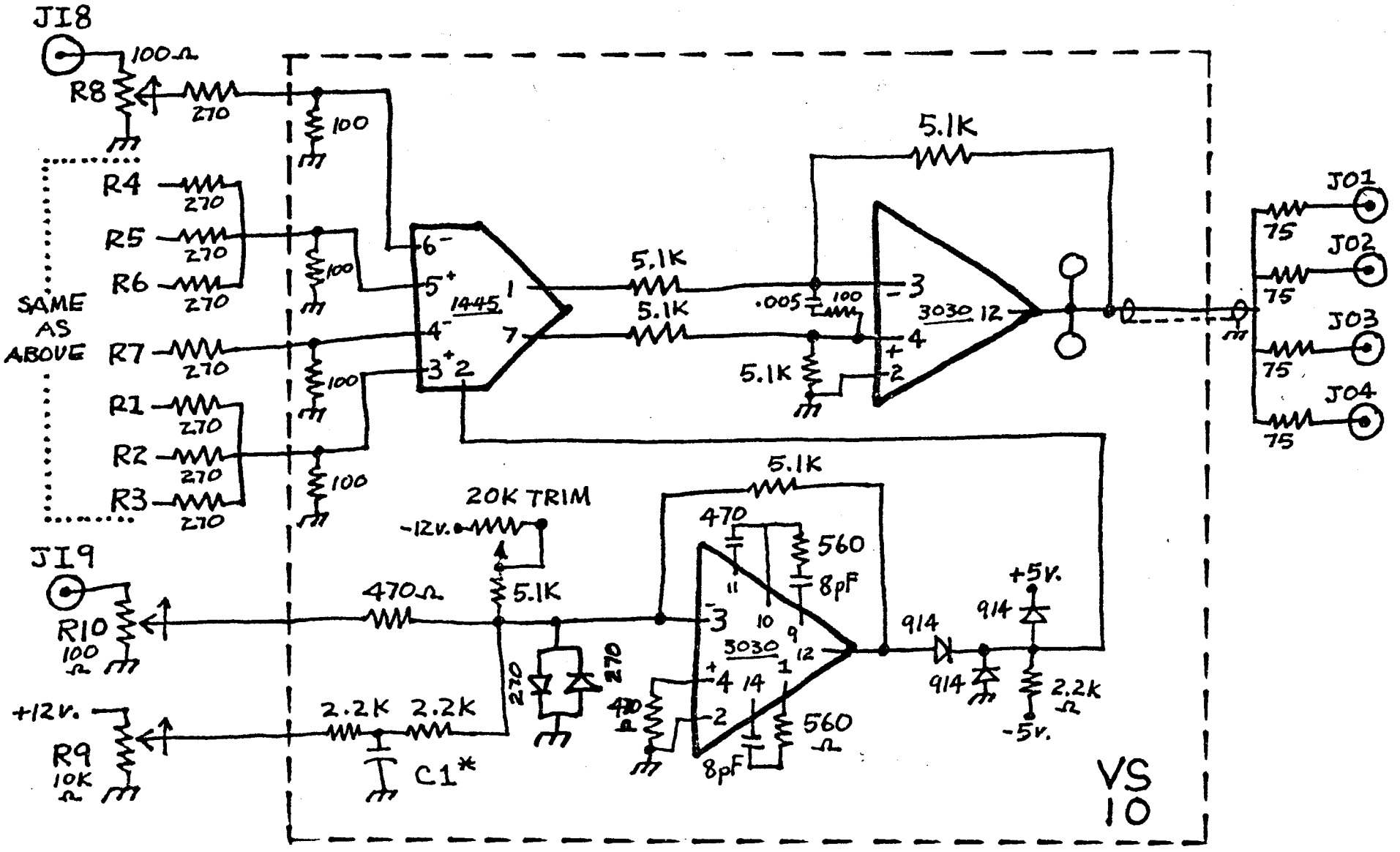
The capacitor, C1, is used to filter the bias control, R9. One may choose a value which will vary the 'feel' of the knob.

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)...


R1
R2
R3
JI1
JI2
JI3
R4
R5
R6
JI4
JI5
JI6
R7
R8
JI7
JI8
R9
JO2
R10
JO1
JO4
JI9
JO3
FRONT
FACE
ADDER
MULTIPLIER
J55
1-76



ADDER-MULTIPLIER



ADDER-MULTIPLIER

2		525-1000	1M OHM, 1/4 W RES	.06	A	AM
4		525-1105	75 OHM, 1/4 W RES	.06	A	AM
0		525-1222	100 OHM, 1/4 W RES	.06	A	AM
0		525-1283	270 OHM, 1/4 W RES	.06	A	AM
1		525-1336	1K OHM, 1/4 W RES	.06	A	AM
5		525-1407	3.1K OHM, 1/4 W RES	.06	A	AM
2		525-1522	10K OHM, 1/4 W RES	.06	A	AM
2		525-1302	470 OHM, 1/4 W RES	.06	A	AM
5		525-1403	2.2K OHM, 1/4 W RES	.06	A	AM
1		525-1533	15K OHM, 1/4 W RES	.06	A	AM
1		525-1003	27K OHM, 1/4 W RES	.06	A	AM
0	10F454	1010M	100 OHM POT 1/4SFA06	1.71	N	AM
1	9F609	620	10K OHM POT 1/4SFT	1.45	N	AM
1	12F9800	3309P	20K TRIM 80-MT	.65	N	AM
2	14F592	CM15-471J	470 PF,DIP-MICA CAP	.32	N	AM
2	14F1269	CM5-0622	0 PF,DIP-MICA CAP	.36	N	AM
0	710-1200	T-U-1122	100 MF,25VDC,ELEC.	.24	A	AM
1			.005			
5	555-0914	1N914B	SIL-DIODE	.19	A	AM
2		1N270	GERM-DIODE	.22	S	AM
1		2N4123	NPN TRANS	.22	S	AM
1		2N4125	PNP TRANS	.27	S	AM
2		LA3030	DIP OP-AMP,RCA	1.32	S	AM
1		MC1445L	DIP GAIN-CONT.AMP	1.90	S	AM
1			VS10 PC BOARD			A.M
15	59F1337	13-236	BNC,PN-CHS.MT.	.72	N	AM
1			CHASSIS,AM-FACE	3.25	DG	AM
4	KB-67-1-DC-P-L-9		KNOB,BLACK/INLAY299	1.00	R	AM
4	KB-67-1-DC-M-L-9		KNOB,BLACK/INLAYSIL	1.00	R	AM
1	KB-67-1-DC-M-L-9		KNOB,BLACK/INLAY120	1.00	R	AM
1	KB-67-2-DC-M-C-9		KNOB,BLK/INLAY 299	1.00	R	AM

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.

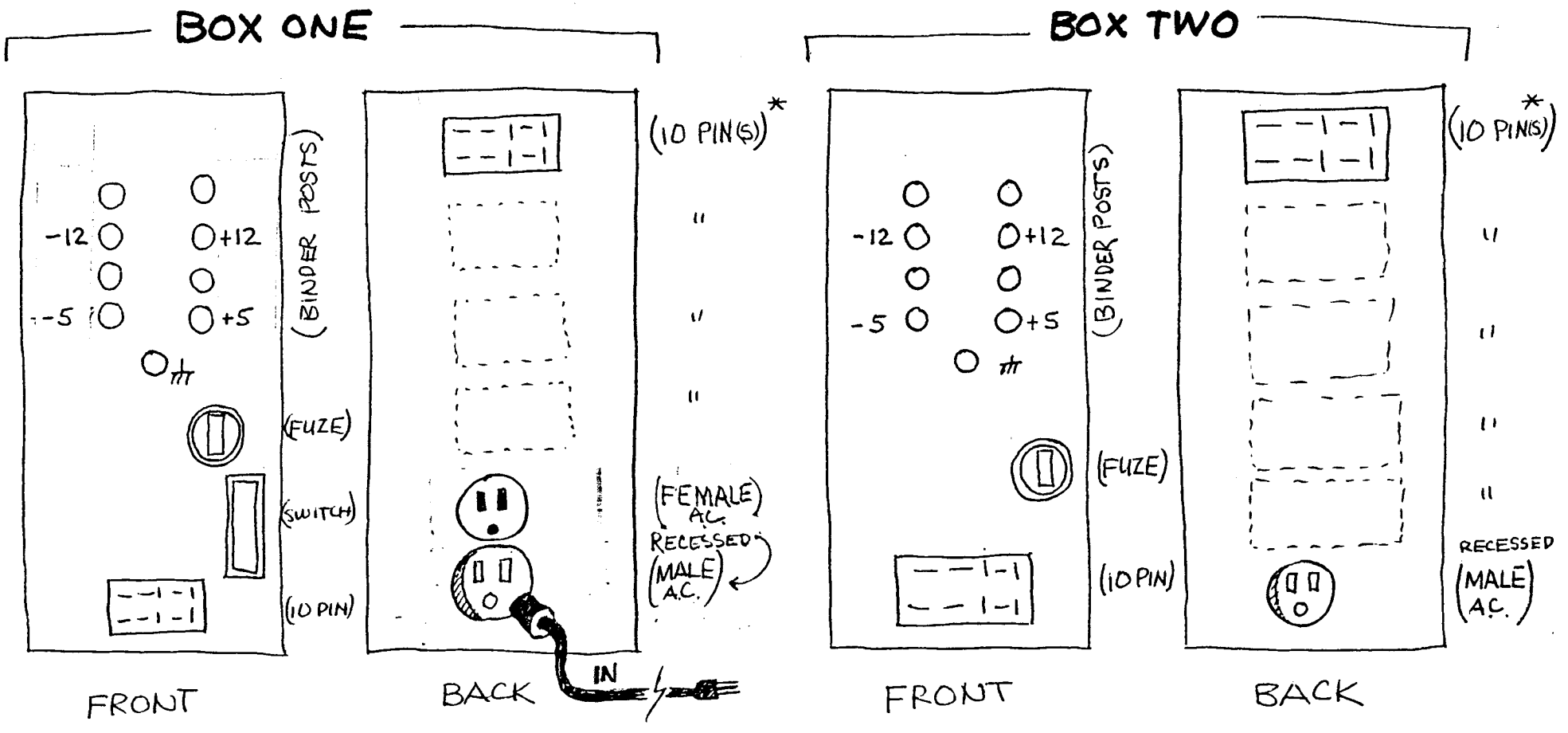
In both power supplies (Box one and Box two), the binding post terminals are connected to the appropriate 10 pin Jones.

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 perferated 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.

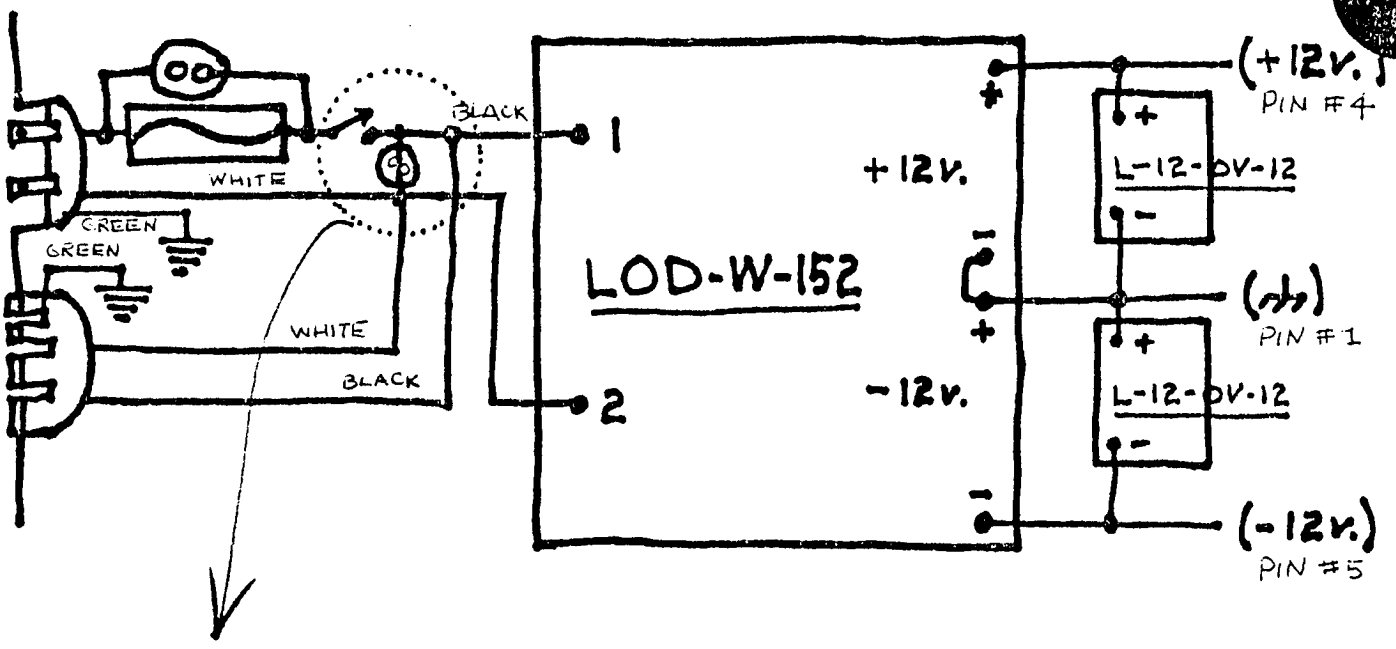
--Box one contains +12, -12 power supplies.
--Box two contains +5, -5 power supplies.

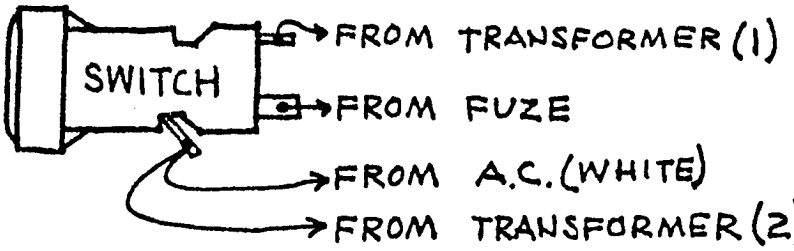


* TRY TO MOUNT AS MANY 10 PIN CINCH-JONES (FEMALES) AS POSSIBLE.

- A.C. POWER IS JUMPED FROM "BOX ONE" TO "BOX TWO" BY MALE-FEMALE A.C. 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.

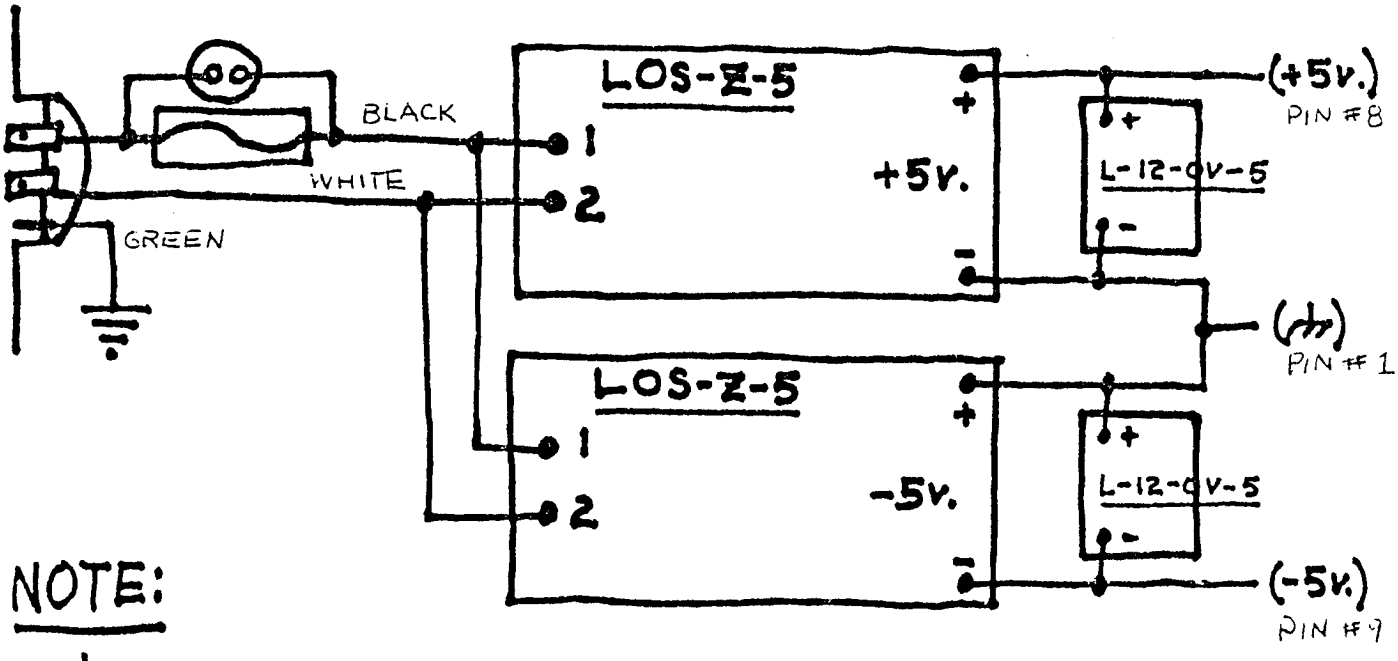
POWER SUPPLY 9-75





BOX ONE

BOX TWO



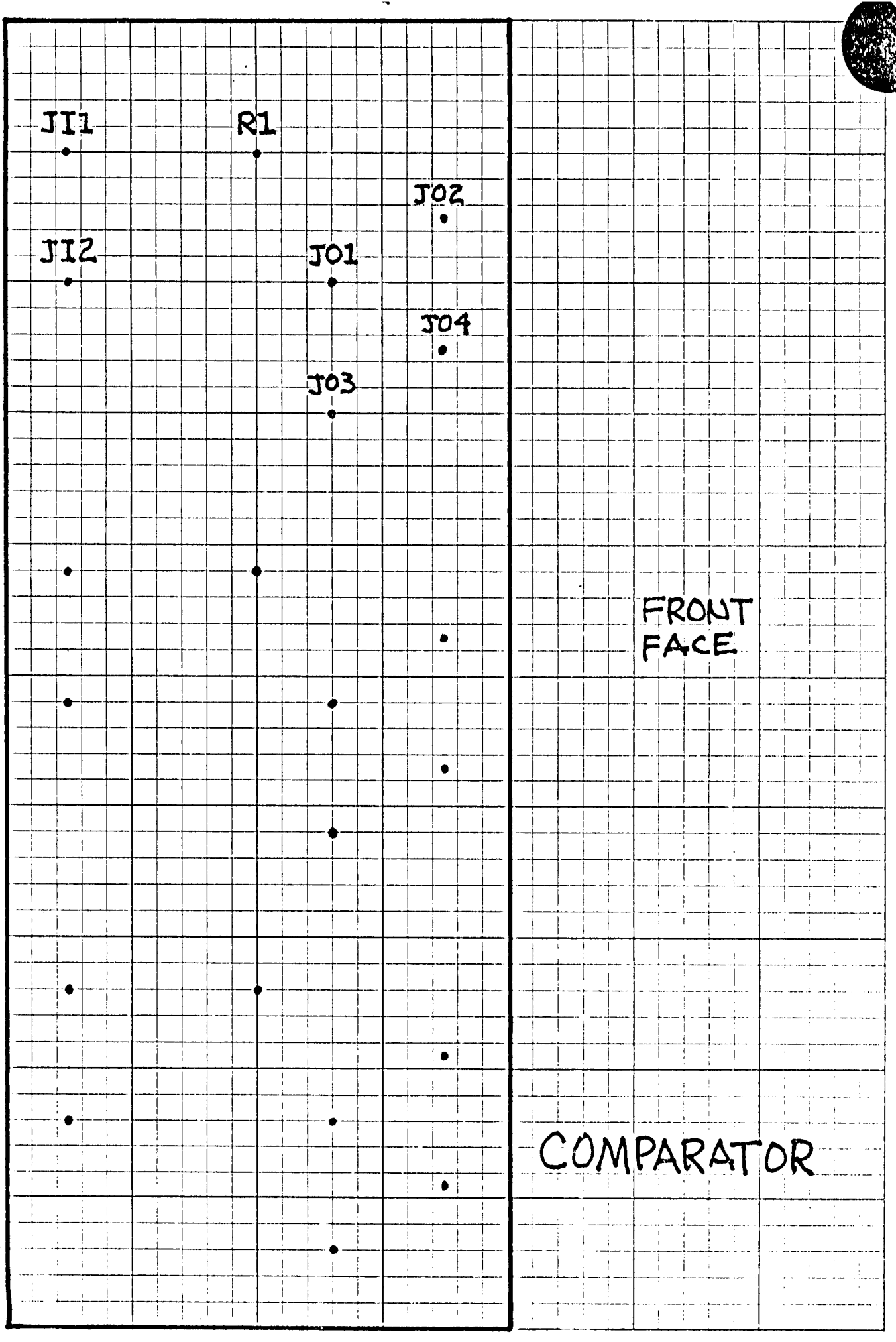
NOTE:

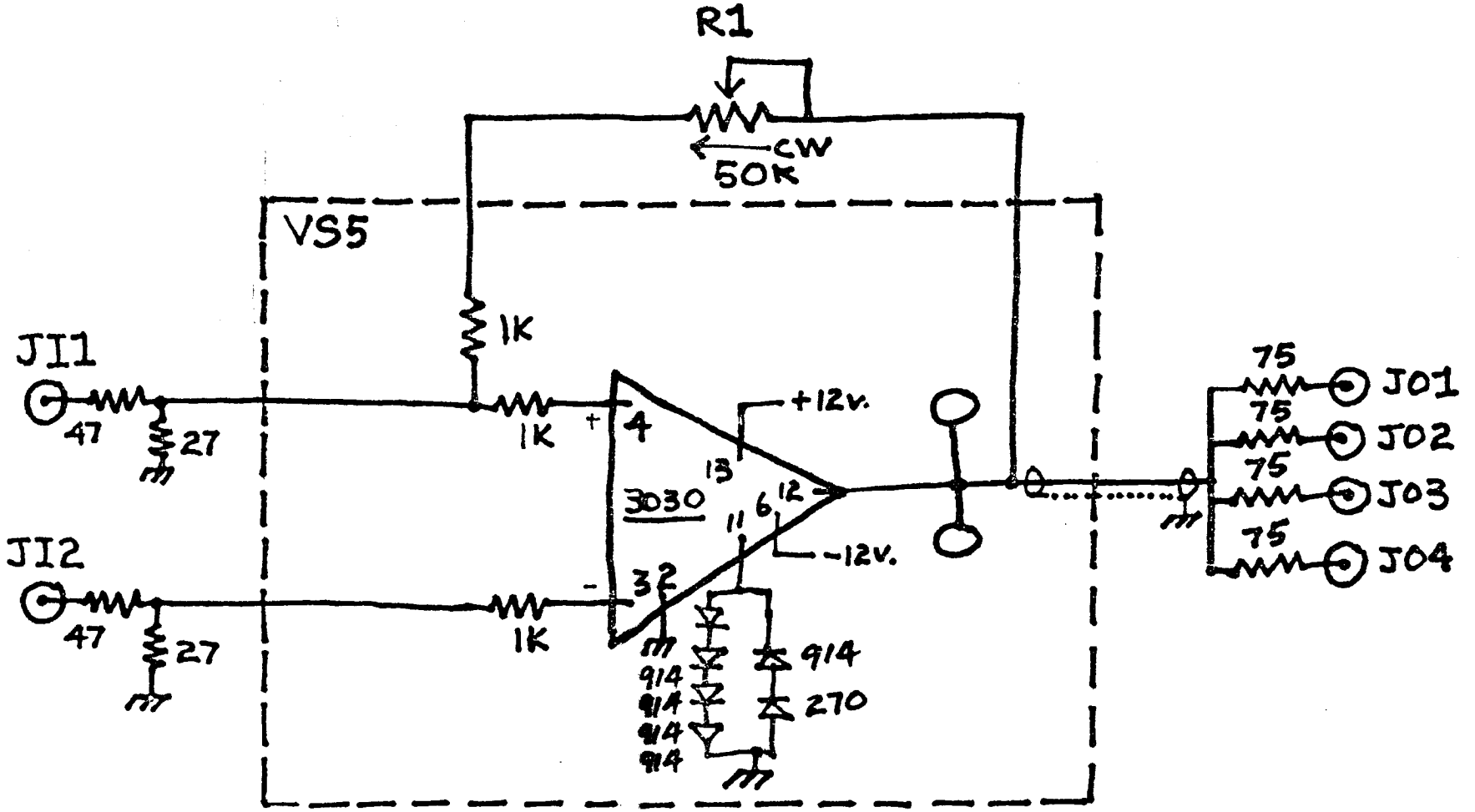
⏚ - MEANS GROUND TO METAL BOX

⏚ - MEANS GROUND TO PIN #1

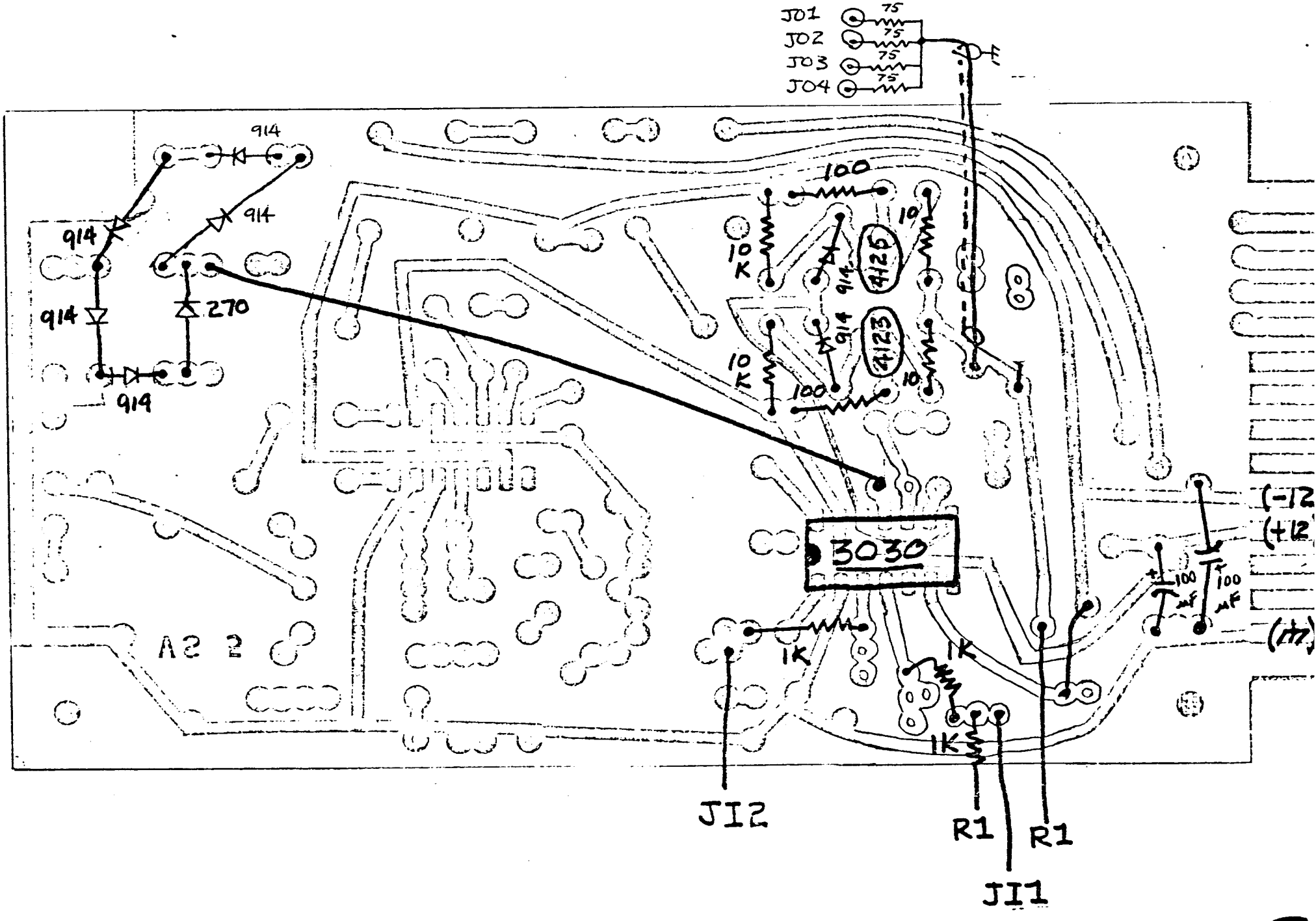
1	[illegible]		12V,3AMP POWER SUP	87.00	L	PS1
1	[illegible]		MOD-ADJ. OVP	4.30	L	PS1
1	[illegible]	1600[illegible]	POWER SWITCH,AMBER	3.97	N	PS1
1	[illegible]	344125A	11?V LAMP-FUZE KNOB	[illegible]	N	PS1
1	[illegible]	162-4-[illegible]	AC RECP.FM*2POLE-GL	1.50	N	PS1
1	[illegible]	162-5-[illegible]	AC RECP.M*2POLE-GR	2.06	N	PS1
1	34F-255	S-31?-FF	JONES FM*CRS.MT.	1.21	N	PS1
1	[illegible]	111-[illegible]-001	POST BLACK 10	.52	N	PS1
1	[illegible]	111-[illegible]-001	POST BROWN 1	.52	N	PS1
1	34F1546	111-[illegible]-001	POST RED 2	.52	N	PS1
1	34F155?	111-[illegible]-001	POST ORANGE 3	.52	N	PS1
1	34F1551	111-[illegible]-001	POST YELLOW 4	.52	N	PS1
1	34F154?	111-[illegible]-001	POST GREEN 5	.52	N	PS1
1	34F1554	111-0110-001	POST BLUE 6	.52	N	PS1
1	34F1555	111-0112-001	POST VOILET 7	.52	N	PS1
	34F1557	111-0113-001	POST GRAY 8	.52	N	PS1
	34F1545	111-0101-001	POST WHITE 9	.52	N	PS1
1			CHASSIS,POWER 1-PAC	4.25	UG	PS1

~~[illegible]~~	~~[illegible]~~		~~[illegible]~~	~~[illegible]~~	~~L~~	~~PS2~~
1	[illegible]		5V,3AMP POWER SUP	58.?0	L	PS2
~~[illegible]~~	~~[illegible]~~		~~[illegible]~~	~~[illegible]~~	~~L~~	~~PS2~~
1	[illegible]		MOD-ADJ. OVP	4.??	L	PS2
1	34F1547	111-0105-001	POST BLACK 10	.52	N	PS2
1	34F1552	111-0106-001	POST BROWN 1	.52	N	PS2
1	34F1546	111-0102-001	POST RED 2	.52	N	PS2
1	34F1550	111-0103-001	POST ORANGE 3	.52	N	PS2
1	34F1551	111-0107-001	POST YELLOW 4	.52	N	PS2
1	34F1545	111-0104-001	POST GREEN 5	.52	N	PS2
1	34F1554	111-0110-001	POST BLUE 6	.52	N	PS2
	34F1555	111-0112-001	POST VOILET 7	.52	N	PS2
	34F1557	111-0113-001	POST GRAY 8	.52	N	PS2
1	34F1545	111-0101-001	POST WHITE 9	.52	N	PS2
1	34F1255	162-5-[illegible]	AC RECP.M*2POLE-GRL	2.06	N	PS2
1	27-734	344125A	11?V LAMP-FUZE KNOB	4.06	N	PS2
1	34F-255	S-312-FF	JONES FM*CRS.MT.	1.21	N	PS2
1			CHASSIS,POWER 2-PAC	?.25	UG	PS2


JI1
R1
JO2
JI2
JO1
JO4
JO3
FRONT FACE
COMPARATOR


R1
CW
50K
VS5
1K
JI1
47
27
1K
+
4
+12v.
13
3030
12
6
11
-12v.
JI2
47
27
1K
-
32
914
914
914
914
914
270
75
75
75
75
J01
J02
J03
J04

COMPARATOR



COMPARATOR 9-75

[illegible]		[illegible]	[illegible] OHM, 1/4 W RES	.20	A	COM
[illegible]		[illegible]	[illegible] OHM, 1/4 W RES	.20	A	COM
[illegible]		[illegible]	[illegible] OHM, 1/4 W RES	.20	A	COM
[illegible]		[illegible]	[illegible] OHM, 1/4 W RES	.20	A	COM
[illegible]		[illegible]	[illegible] OHM, 1/4 W RES	.20	A	COM
[illegible]		[illegible]	[illegible] OHM, 1/4 W RES	.20	A	COM
[illegible]		[illegible]	[illegible] OHM, 1/4 W RES	.20	A	COM
3	10F473	503UA	50K OHM POT 1/4SFAB	2.21	N	COM
[illegible]	[illegible]	[illegible]	100 PF,25VDC,ELEC.	.24	A	COM
[illegible]	[illegible]	[illegible]	SIL-J1306	.19	A	COM
[illegible]		[illegible]	[illegible]-J1306	.20	S	COM
[illegible]		[illegible]	[illegible] TRANS	.20	S	COM
[illegible]		[illegible]	[illegible] TRANS	.27	S	COM
[illegible]		[illegible]	DIP SOCKET,PCA	1.32	S	COM
[illegible]			[illegible] P-C BOARD			COM
18	[illegible]	[illegible]	[illegible],PC-CMS.MT.	.70	N	COM
[illegible]			[illegible],COMP-FACE	.25	UG	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 arbitary function (with up to two points of inflection) of the input at JI1. This results in an effect that is similiar to but more complex and controllable than photographic solerization.

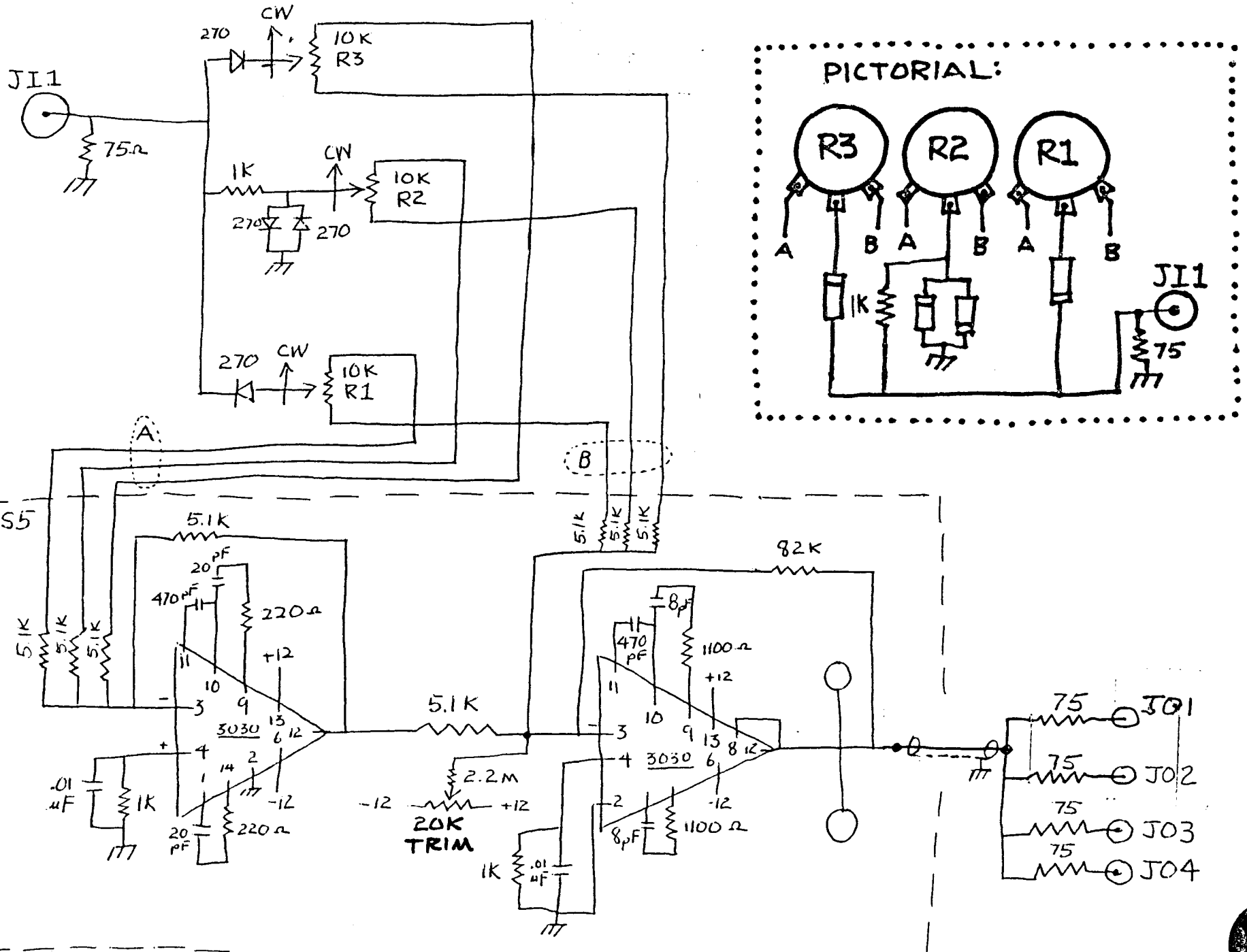
The function is controlled by R1, R2, and R3.
R1 controls the slope of the function for large negative inputs.
R2 controls the slope of the function for inputs near 0 voltages.
R3 controls the slope of the function for inputs of large positive voltage.

Clockwise is positive slope; counterclockwise is negative slope.

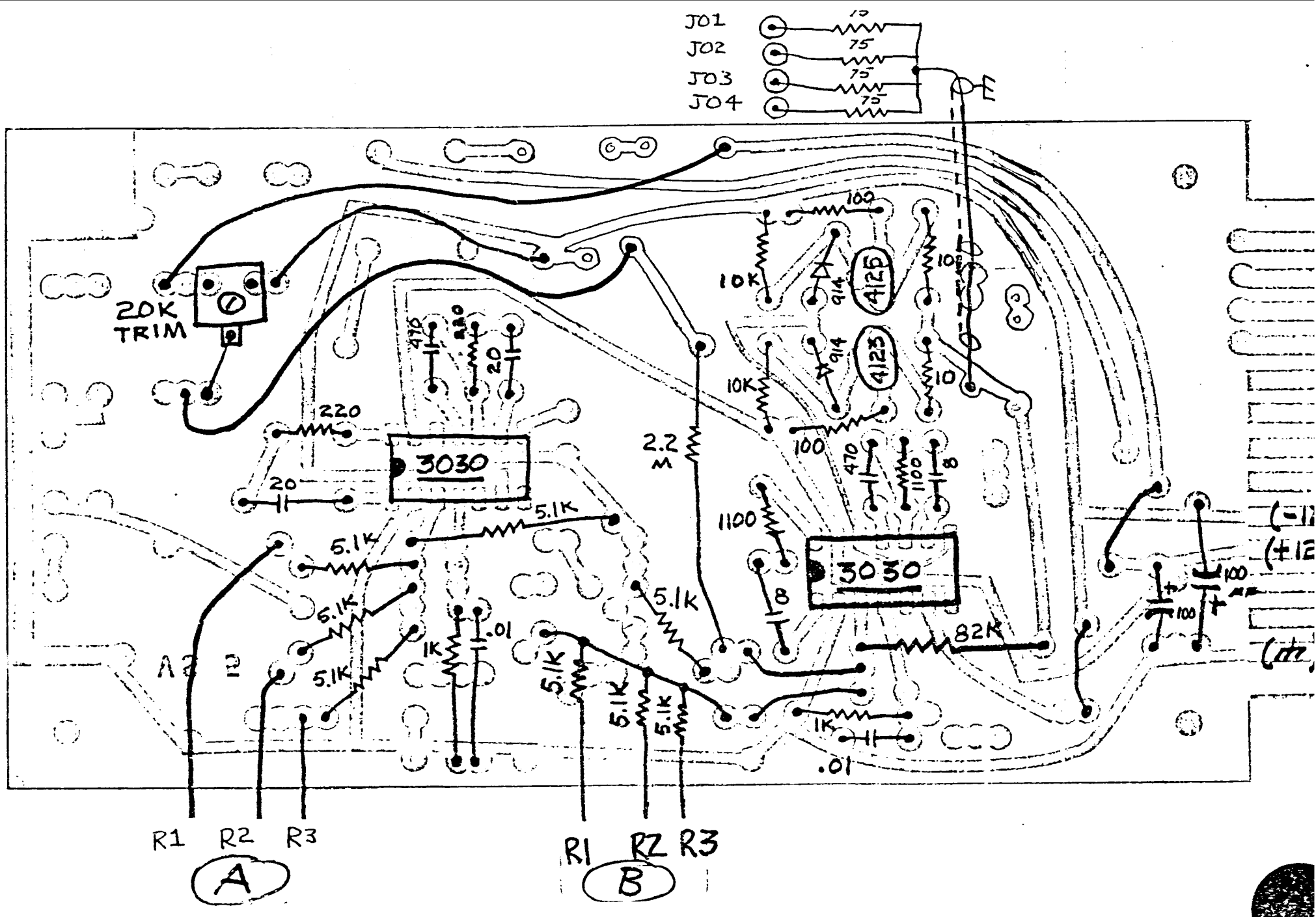
There are three electrical modules in one chassis box, so replicate work three times. Remember to buss (connect) +12 and -12 and ground wires from middle board to top and bottom board. Soldering directly to the foil is convenient.

TEST STUFF:

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



FUNCTION GENERATOR 9-75



FUNCTION GENERATOR 9-75

FHAGEN11P   FUNCTION GENERATOR PARTS LIST   10-DEC-75

		523-1002	12 OHM, 1/4 W RES	.06	A	FGN
		523-1135	75 OHM, 1/4 W RES	.06	A	FGN
		523-1202	100 OHM, 1/4 W RES	.06	A	FGN
		523-1246	220 OHM, 1/4 W RES	.06	A	FGN
		523-1356	1K0 OHM, 1/4 W RES	.06	A	FGN
		523-1361	1.1K OHM, 1/4 W RES	.06	A	FGN
		523-1467	5.1KOHM, 1/4 W RES	.06	A	FGN
		523-1522	10KKOHM, 1/4 W RES	.06	A	FGN
		523-1703	52KKOHM, 1/4 W RES	.06	A	FGN
		523-1927	2.2MOHM, 1/4 W RES	.05	A	FGN
	10[illegible]	1050[illegible]	10K OHM POT 1/4SHAFT	2.21	N	FGN
	1[illegible]	3389P	20K TRIM [illegible]-MT	.65	N	FGN
	14[illegible]	DM5-[illegible]	5 PF,DIP-MICA CAP	.36	N	FGN
	14[illegible]7	DM15-200J	20 PF,DIP-MICA CAP	.18	N	FGN
	14[illegible]	DM15-470J	470 PF,DIP-MICA CAP	.32	N	FGN
	[illegible]7	TCC-1032	.01 MF,DSC-CER CAP.	.05	N	FGN
	71[illegible]-12[illegible]	7-6-1020	100 MF,25VDC,ELEC.	.24	A	FGN
	555-2914	1N914-[illegible]	SIL-DIODE	.19	A	FGN
		1N27[illegible]	ZENER-DIODE			FGN
		2N4123	NPN TRANS	.22	S	FGN
		2N4125	PNP TRANS	.27	S	FGN
		CA3030	DIP OP-AMP,RCA	1.32	S	FGN
			VS 5 P-C BOARD			FGN
15	[illegible]1557	15-256	[illegible],PM-CHS,MT.	.72	N	FGN
1			CHASSIS,F.G. FACE	3.25	DG	FGN
9	RB-67-1-DC-M-L-9		KNOB;#299,MAT-BLACK INLAY ,IND.WHITE -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.

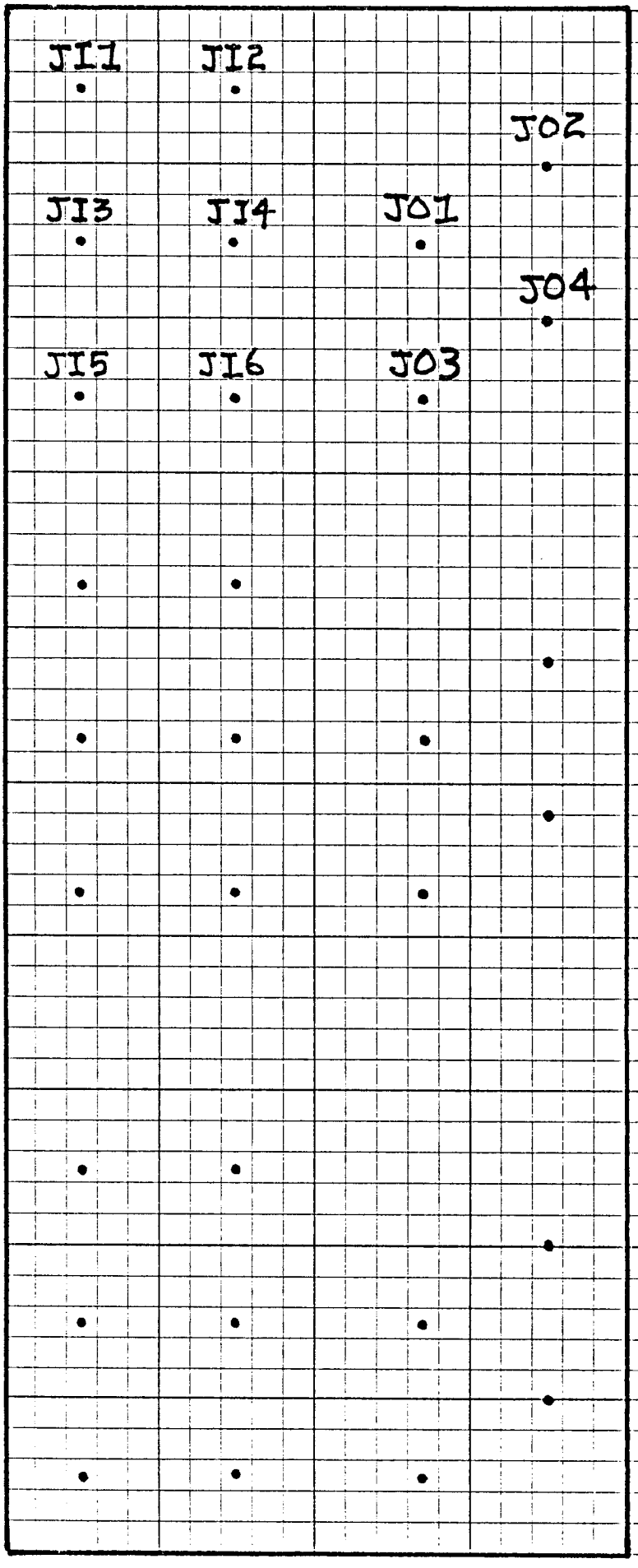
There are three electrical modules in one chassis box. One diagram is supplied, so replicate work three times. Remember to buss (connect) +12, -12 and ground from the center board to the upper and lower boards; soldering directly to the foil or connecting corresponding bypass capacitors is convenient.

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.

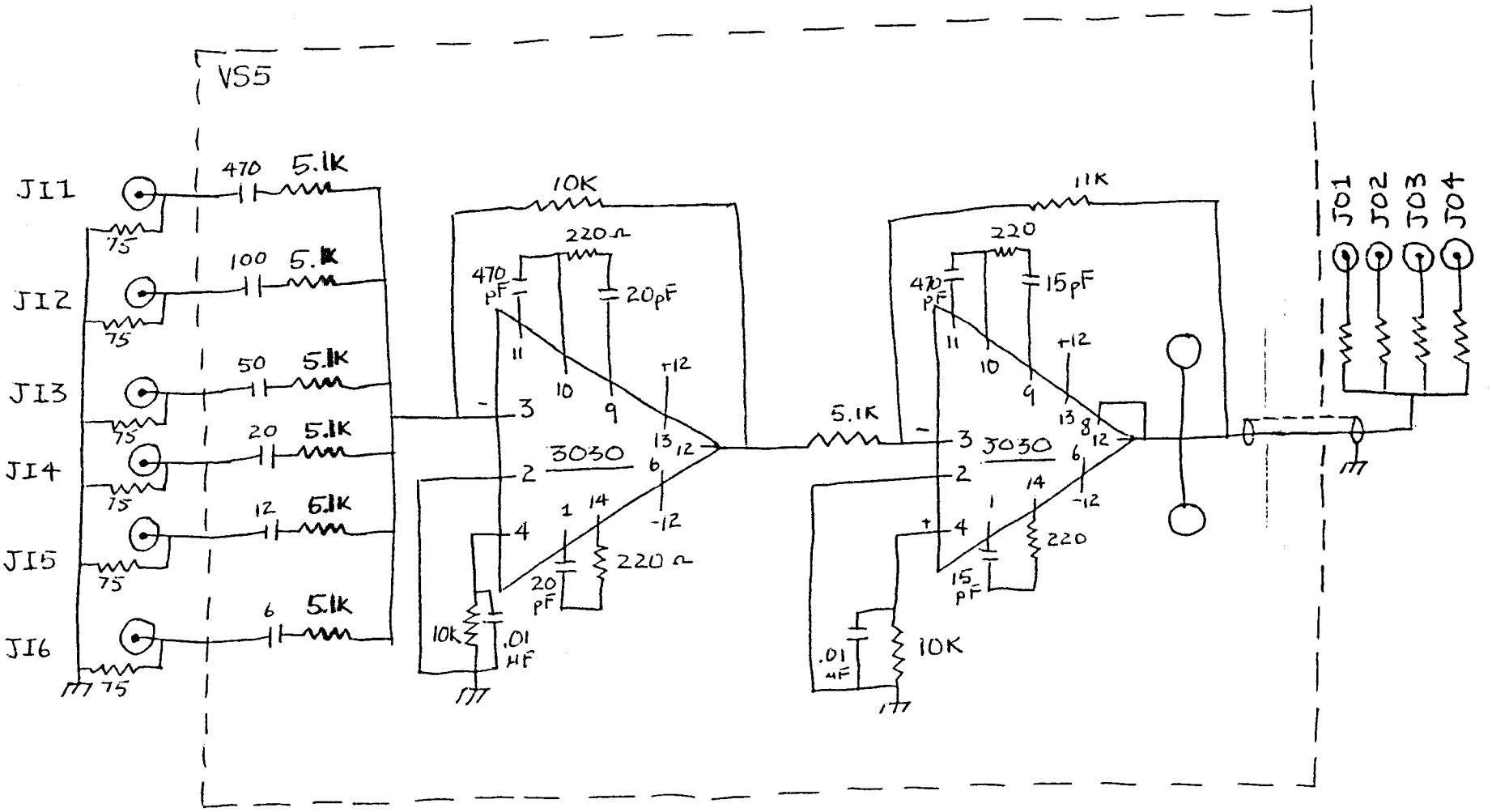
Square waves should be differentiated; that is, there should be a positive spike associated with the rising edge of the square wave, and a negative spike associated with the falling edge of the square wave.

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

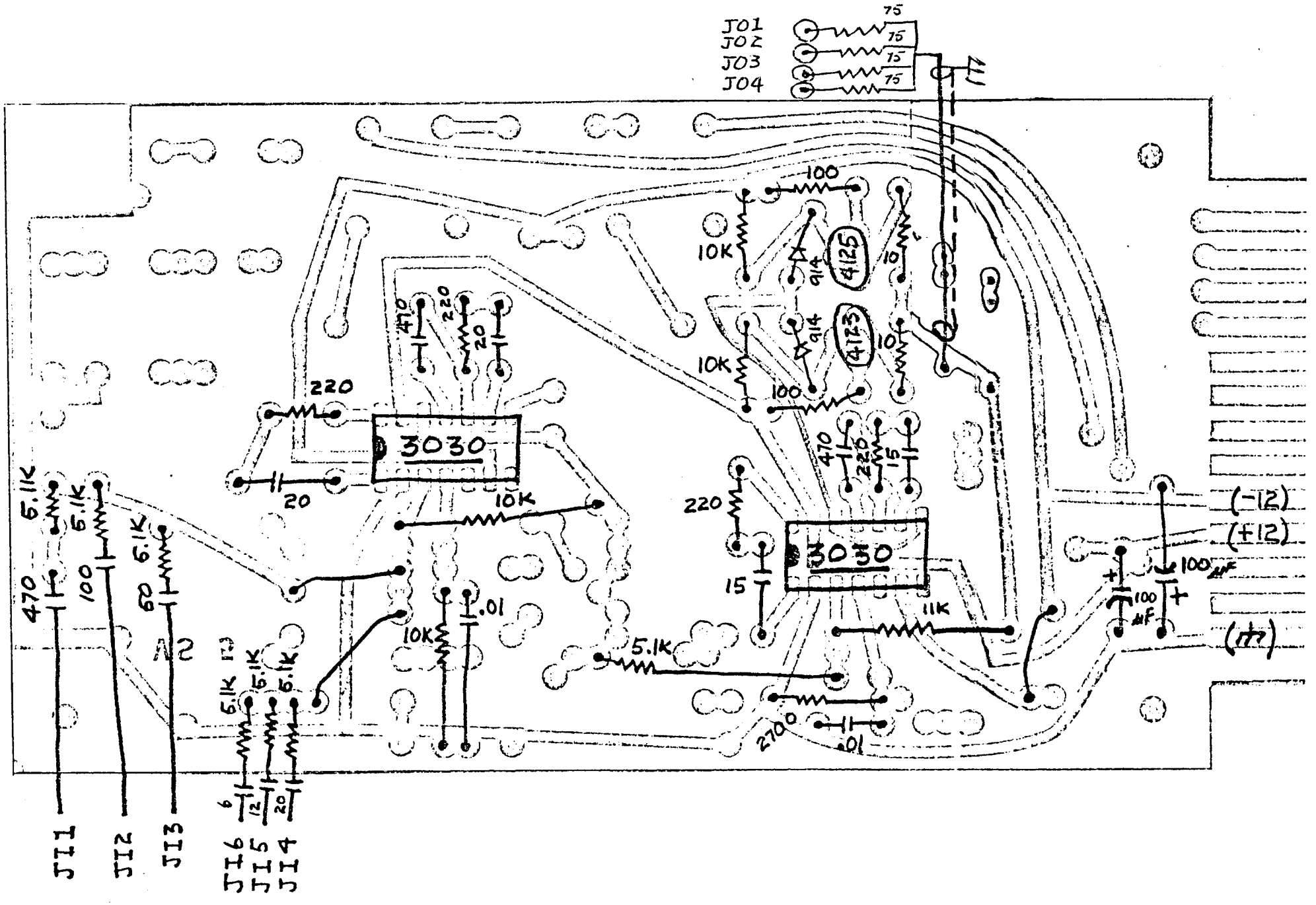


FRONT FACE

DIFFERENTIATOR



DIFFERENTIATOR 9-15



DIFFERENTIATOR 9-15

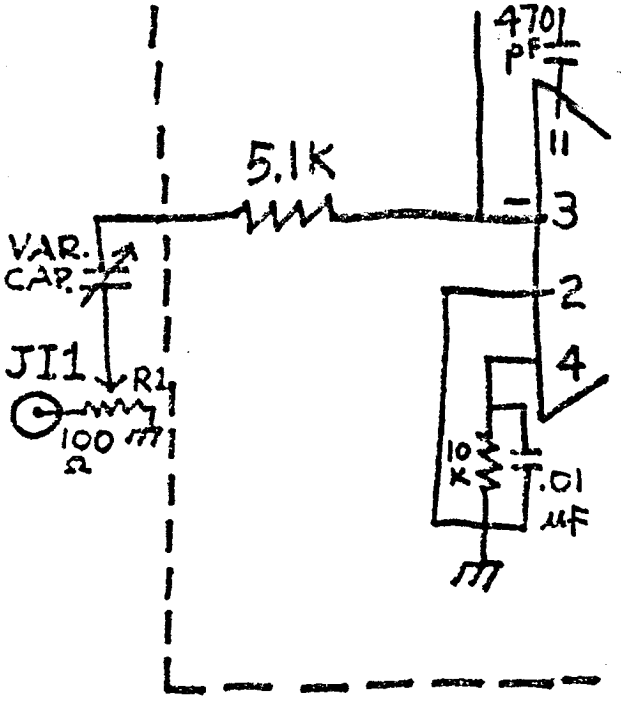
ADDENDUM

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:

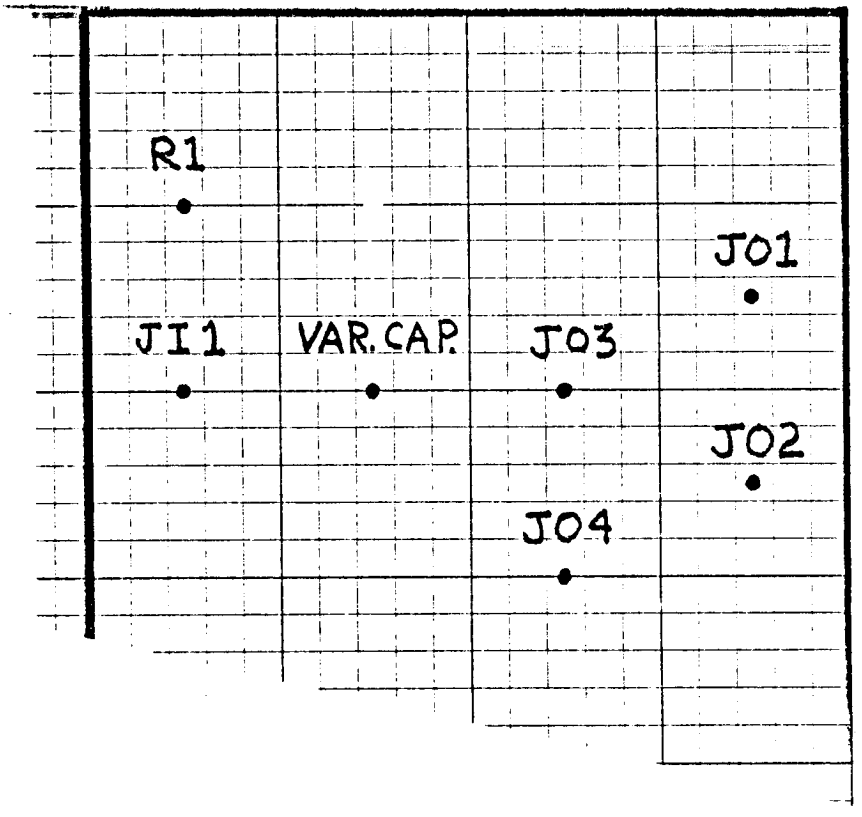
In the orig. diff. you input a signal via any 6 BNC inputs (JI1-thru-JI6); and, in the opt. diff. you input a signal to 1 BNC input (JI1), control its gain with R1, and its differentiation constant via a variable capacitor (VAR. CAP.). The VAR. CAP. will give you the same approximate differentiation 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. -

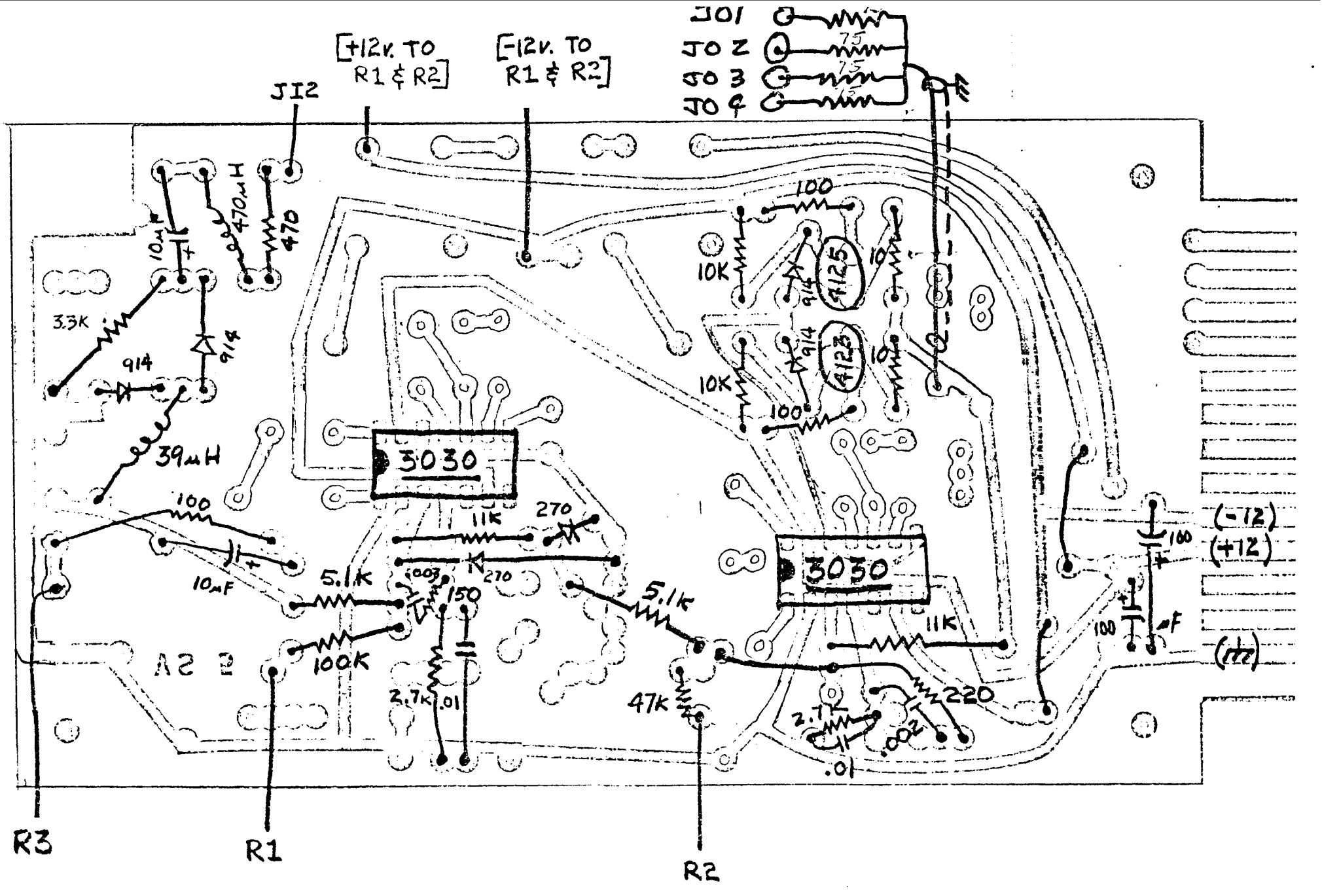


FRONT FACE for opt. diff. -

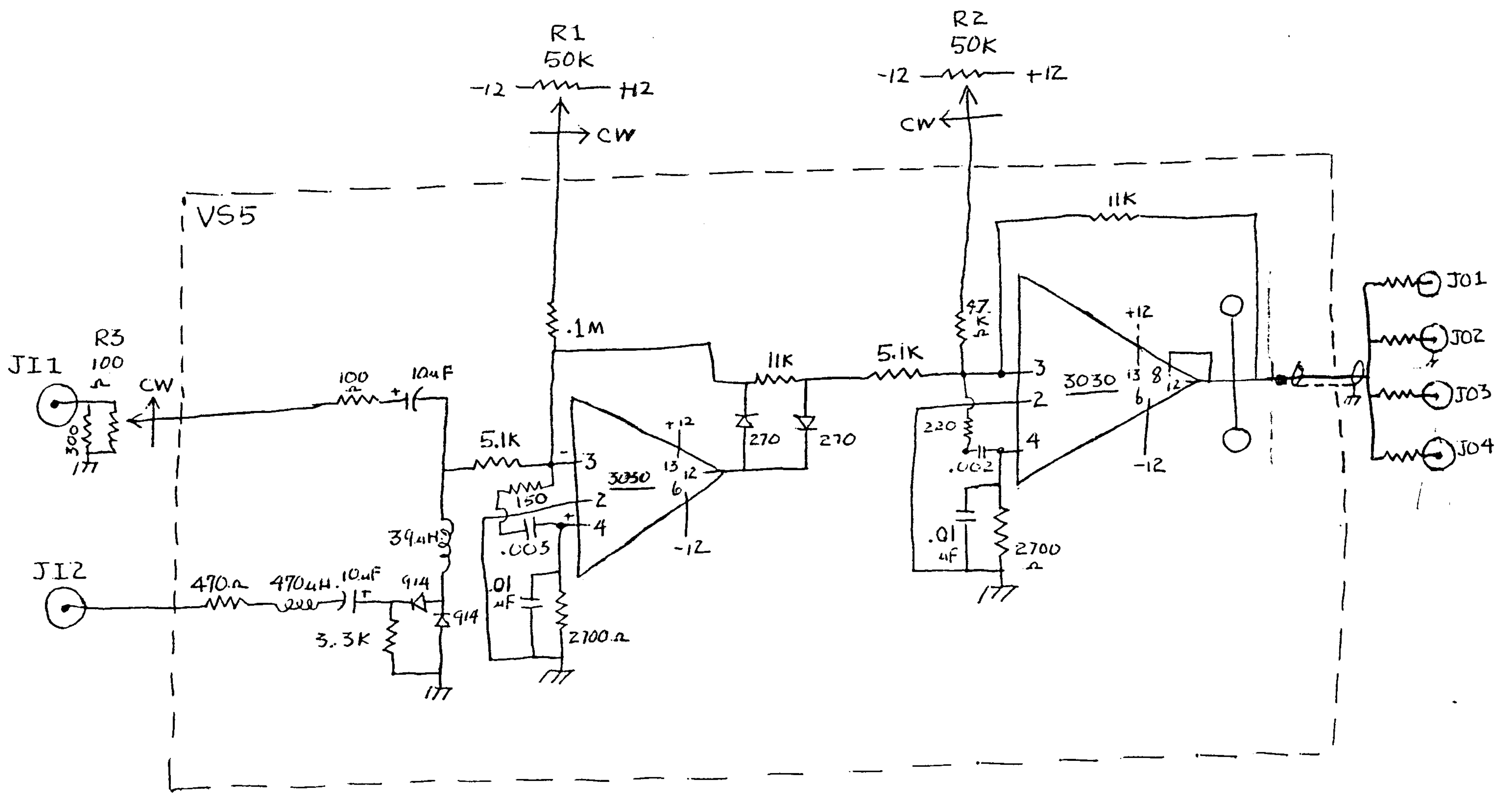


5		323-10[illegible]	10 OHM, 1/4 W RES	.26	A	DIF
24		323-1103	75 OHM, 1/4 W RES	.26	A	DIF
[illegible]		323-12[illegible]	100 OHM, 1/4 W RES	.26	A	DIF
16		323-1244	220 OHM, 1/4 W RES	.26	A	DIF
21		323-1467	5.1[illegible]OHM, 1/4 W RES	.26	A	DIF
12		323-1522	1[illegible]OHM, 1/4 W RES	.26	A	DIF
5		323-1523	11[illegible]OHM, 1/4 W RES	.26	A	DIF
[illegible]	[illegible]1237	[illegible]	5 PF,DIP-MICA CAP	.30	N	DIF
5	[illegible]334	015-1200	12 PF,DIP-MICA CAP	.26	N	DIF
5	[illegible]335	015-1500	15 PF,DIP-MICA CAP	.26	N	DIF
[illegible]	[illegible]337	015-2[illegible]	2[illegible] PF,DIP-MICA CAP	.16	N	DIF
5	[illegible]337	015-5[illegible]	5[illegible] PF,DIP-MICA CAP	.19	N	DIF
5	[illegible]337	015-1010	1[illegible] PF,DIP-MICA CAP	.18	N	DIF
[illegible]	[illegible]372	015-47[illegible]	.7[illegible] PF,DIP-MICA CAP	.32	N	DIF
[illegible]	[illegible]7-5[illegible]7	100-1[illegible]52	.01 PF,25C-CER CAP.	.25	N	DIF
5	71-[illegible]	7-5-1[illegible]	1[illegible] PF,25VDC,ELEC.	.24	A	DIF
[illegible]	[illegible]	1[illegible]914[illegible]	SIL-DIODE	.19	A	DIF
5		2N-123	[illegible] TRANS	.26	S	DIF
5		2N-125	[illegible] TRANS	.27	S	DIF
[illegible]		[illegible]	DIF [illegible]AMP,[illegible]	1.32	S	DIF
30	[illegible]	13-22[illegible]	[illegible],PC-CHS,MT.	.72	N	DIF
[illegible]			[illegible] P-C BOARD			DIF
[illegible]			CHASSIS,DIF-RACK	8.25	DG	DIF

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


JO1
JO2
JO3
JO4
75
75
75
75
JI2
[+12V. TO R1 & R2]
[-12V. TO R1 & R2]
470μH
470
10μF
3.3K
914
914
39μH
100
10μF
5.1K
100K
100
3030
11K
270
270
5.1K
150
.01
3.7K
47K
100
10K
914
4125
914
4123
10K
100
3030
11K
220
2.7
.002
.01
100
μF
100
(-12)
(+12)
(+12)
A2 B
R3
R1
R2

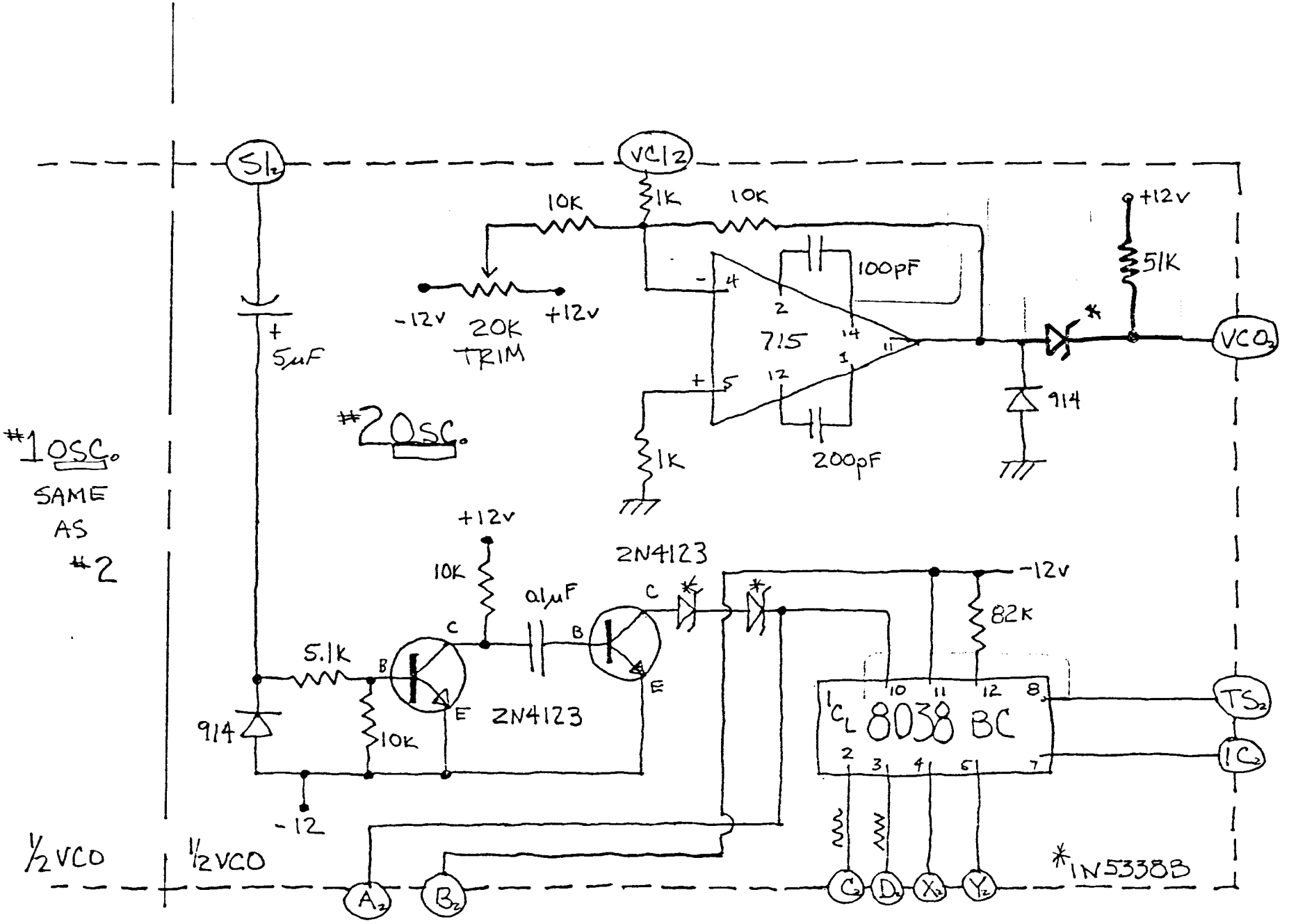
INPUT 9-75


R1
50K
-12
+12
CW
R2
50K
-12
+12
CW
VS5
11K
JI1
R3
100
Ω
300
Ω
CW
100
Ω
10uF
.1M
11K
5.1K
47
K
Ω
3030
+12
-12
JO1
JO2
JO3
JO4
5.1K
3030
150
.003
.01
uF
2700 Ω
39uH
270
270
220
.002
.01
uF
2700
Ω
JI2
470 Ω
470uH
10uF
914
914
3.3K

INPUT

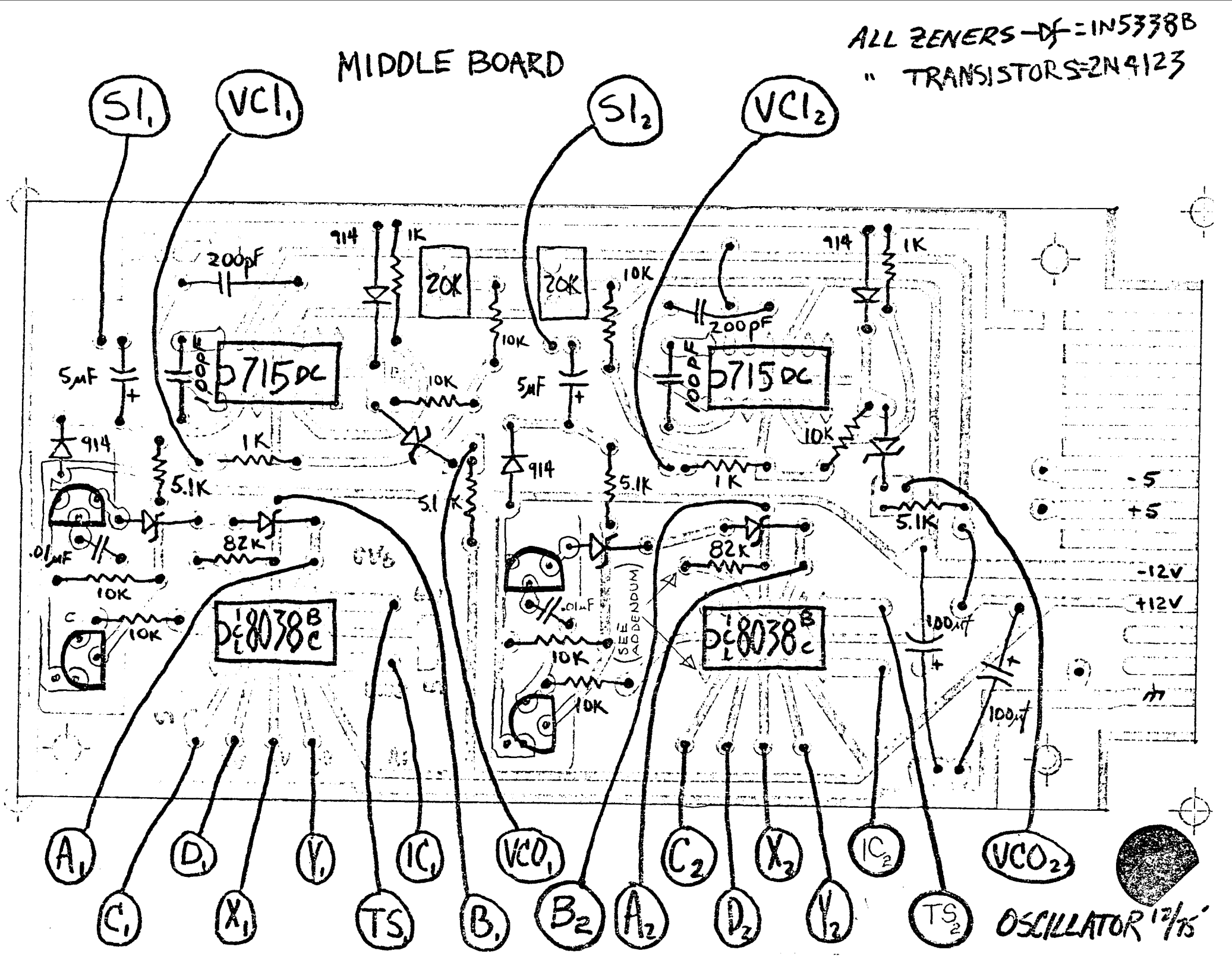
[illegible]		325-[illegible]	1[illegible] OHM, 1/4 W RES	.06	A	IP
1[illegible]		325-1155	75 OHM, 1/4 W RES	.06	A	IP
[illegible]		325-1[illegible]	100 OHM, 1/4 W RES	.06	A	IP
3		325-1241	220 OHM, 1/4 W RES	.05	A	IP
3		325-1270	510 OHM, 1/4 W RES	.06	A	IP
[illegible]		325-1[illegible]	5.1KOHM, 1/4 W RES	.06	A	IP
[illegible]		325-1[illegible]	10KOHM, 1/4 W RES	.06	A	IP
[illegible]		325-1320	[illegible]KOHM, 1/4 W RES	.06	A	IP
[illegible]		325-1717	100KOHM, 1/4 W RES	.06	A	IP
[illegible]		325-1302	470 OHM, 1/4 W RES	.06	A	IP
[illegible]		325-1421	4.7KOHM, 1/4 W RES	.06	A	IP
[illegible]		325-1455	3.3KOHM, 1/4 W RES	.06	A	IP
[illegible]		325-1500	47KOHM, 1/4 W RES	.06	A	IP
3			150 OHM 1/4 W RES	.06	A	IP
[illegible]	[illegible]		[illegible] TRIM,[illegible],PNL-MT	3.0[illegible]	N	IP.
[illegible]	[illegible]	01	1[illegible] OHM POT 1/4SFT	1.45	N	IP
3			.002 pF			
~~1~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~		~~[illegible]~~	~~[illegible]~~
[illegible]	[illegible]	[illegible]	470 PF,DIP-MICA CAP	.3[illegible]	N	IP
[illegible]	[illegible]	[illegible]	.01 MF,DSC-CER CAP,	.05	N	IP
[illegible]	[illegible]	[illegible]	10 MF,25VDC,ELEC.	.44	A	IP
[illegible]	[illegible]	[illegible]	100 MF,25VDC,ELEC.	.24	A	IP
3			.003 pF			
[illegible]	[illegible]	1N914	SIG-DIODE	.1[illegible]	A	IP
[illegible]		[illegible]	[illegible]-DIODE	.22	S	IP
[illegible]		2N4123	NPN TRANS	.22	S	IP
[illegible]		2N4125	PNP TRANS	.27	S	IP
[illegible]		CA3059	DIF OP-AMP,RCA	1.32	S	IP
[illegible]	[illegible]	[illegible]	[illegible] MICROHENRY CHOKE	2.91	N	IP
[illegible]	[illegible]	[illegible]	470 MICROHENRY CHOK	2.91	N	IP
[illegible]			[illegible] P-C BOARDS			IP
1[illegible]	[illegible]	13-[illegible]	[illegible],PH-CMS,[illegible].	.72	N	IP
1			CHASSIS,[illegible]	[illegible].25	DG	IPM
[illegible]	[illegible]		[illegible],BLACK/[illegible]	1.20	R	IP

OSCILLATOR 9/75



1/2 Middle Board VCO

Oscillator 9-75


MIDDLE BOARD
ALL ZENERS = IN5338B
" TRANSISTORS = 2N4123
SI1
VCI1
SI2
VCI2
200pF
914
1K
20K
10K
5MF
100pF
D715DC
5.1K
82K
.01MF
8038BC
(SEE ADDENDUM)
-5
+5
-12V
+12V
100MF
A1
C1
D1
X1
Y1
TS1
IC1
B1
VCO1
B2
A2
C2
D2
X2
Y2
TS2
IC2
VCO2
OSCILLATOR 12/15

16		525-1000	10 OHM, 1/4 W RES	.06	A	OSS
2		525-1117	27 OHM, 1/4 W RES	.06	A	OSS
2		525-1165	75 OHM, 1/4 W RES	.06	A	OSS
16		525-1222	100 OHM, 1/4 W RES	.06	A	OSS
2		525-1356	1K OHM, 1/4 W RES	.06	A	OSS
2		525-1445	2.2KOHM, 1/4 W RES	.06	A	OSS
6		525-1457	5.1KOHM, 1/4 W RES	.06	A	OSS
4		525-1469	6.8KOHM, 1/4 W RES	.06	A	OSS
33		525-1522	10K OHM, 1/4 W RES	.06	A	OSS
2		525-1763	82K OHM, 1/4 W RES	.06	A	OSS
2	10F454	1010A	100 OHM POT 1/4WPAU	1.71	N	OSS
2	12F9800	3389P	20K TRIM BD-MT	.65	N	OSS
2	9F1060		100KOHM 10-TURN POT	5.30	N	OSS
2	052-0219		47PF, POLY CAP	.13	A	OSS
2	052-0226		100PF, POLY CAP	.13	A	OSS
4	052-0250		1000PF, POLY CAP	.13	A	OSS
2	052-0118		.01 MFD, POLY CAP	.13	A	OSS
4	052-0940		.047 MFD, POLY CAP	.13	A	OSS
4	052-0104		.47 MFD, POLY CAP	.13	A	OSS
2	052-4001		10 MFD, ELEC CAP, 35V	.46	A	OSS
2	052-5250		100 MFD, ELEC CAP, 150V	2.41	A	OSS
2	14F522	DM15-220J	220 PF, DIP-MICA CAP	.20	N	OSS
2	71?-1246	1-6-005	5 MF, 25VDC, ELEC.	.42	A	OSS
6	71?-1200	7-6-100	100 MF, 25VDC, ELEC.	.24	A	OSS
20	552-0914	1N914B	SIL-DIODE	.19	A	OSS
8		1N5338B	5.1V ZENER 5W	2.50	N	OSS
12		2N4123	NPN TRANS	.22	S	OSS
6		2N4125	PNP TRANS	.27	S	OSS
2		ICL8038CC	DIP OSC(V-CONT)	8.40	S	OSS
2		MA715	DIP SINK	8.25	S	OSS
2			217 P-C BOARD			OSS
1			VCO P-C BOARDS			OSS
2	22F223	1462	SW. 6-POS.	3.06	N	OSS
4	052-0507	2039N	SW. SPDT	2.13	A	OSS
12	34F1327	13-236	BNC, PN-CHS.MT.	.72	N	OSS
~~2~~	~~[illegible]~~		~~[illegible]~~	~~1.26~~	~~N~~	~~OSS~~
~~2~~	~~[illegible]~~		~~[illegible]~~	~~1.72~~	~~N~~	~~OSS~~
1			CHASSIS, OSC-FACE	8.25	DG	OSS
2	61F1175	KD-1250A-1/4"	ALUM. KNOB	1.75	N	OSS
2	12F6045	DFA-N	COUNTING DIAL	4.75	N	OSS
2	12F9800	3389P	5K TRIM BD. MT.	.65	N	OSS
2	12F9800	3389P	100K TRIM. BD. MT.	.65	N	OSS

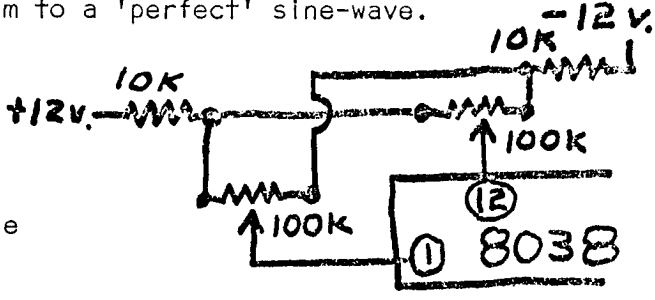
OSCILLATOR

ADDENDUM

MARCH, 1977

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.

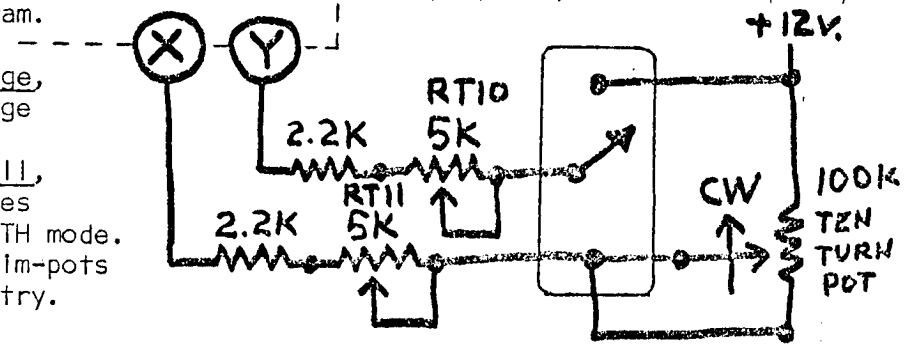


PROCEDURE-

A) Before supplying power to the module, center all trim-pots.
B) Set the oscillator at a middle freguency range, and display sine-wave on scope.
C) Tweek 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 symetry 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 symetry.

PROCEDURE-

B) 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, tweek trim-pot to get rid of it...
C) Turn 10-turn pot to extreme right (highest-freq.); check to make sure that in a higher frequency range you still have good symetry in triangle mode. If you don't have good triangle symetry, tweek trim-pot to get it...

GO BACK AND CHECK FOR SAWTOOTH QUENCHING...

D) 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...!

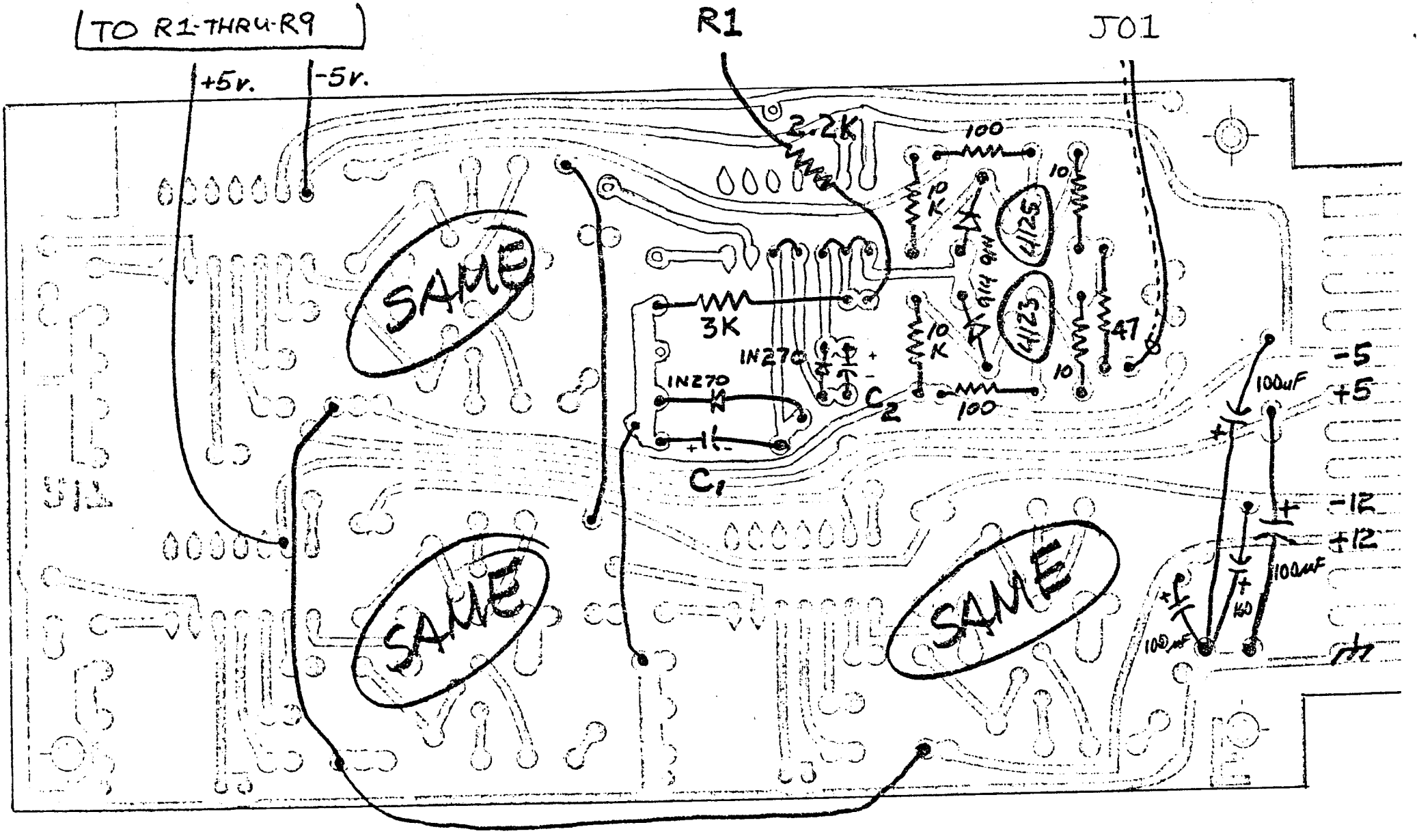
REFERENCE MODULE:

The Reference module produces a constant voltage proportional to front panel knob position. It uses 2¼ #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.

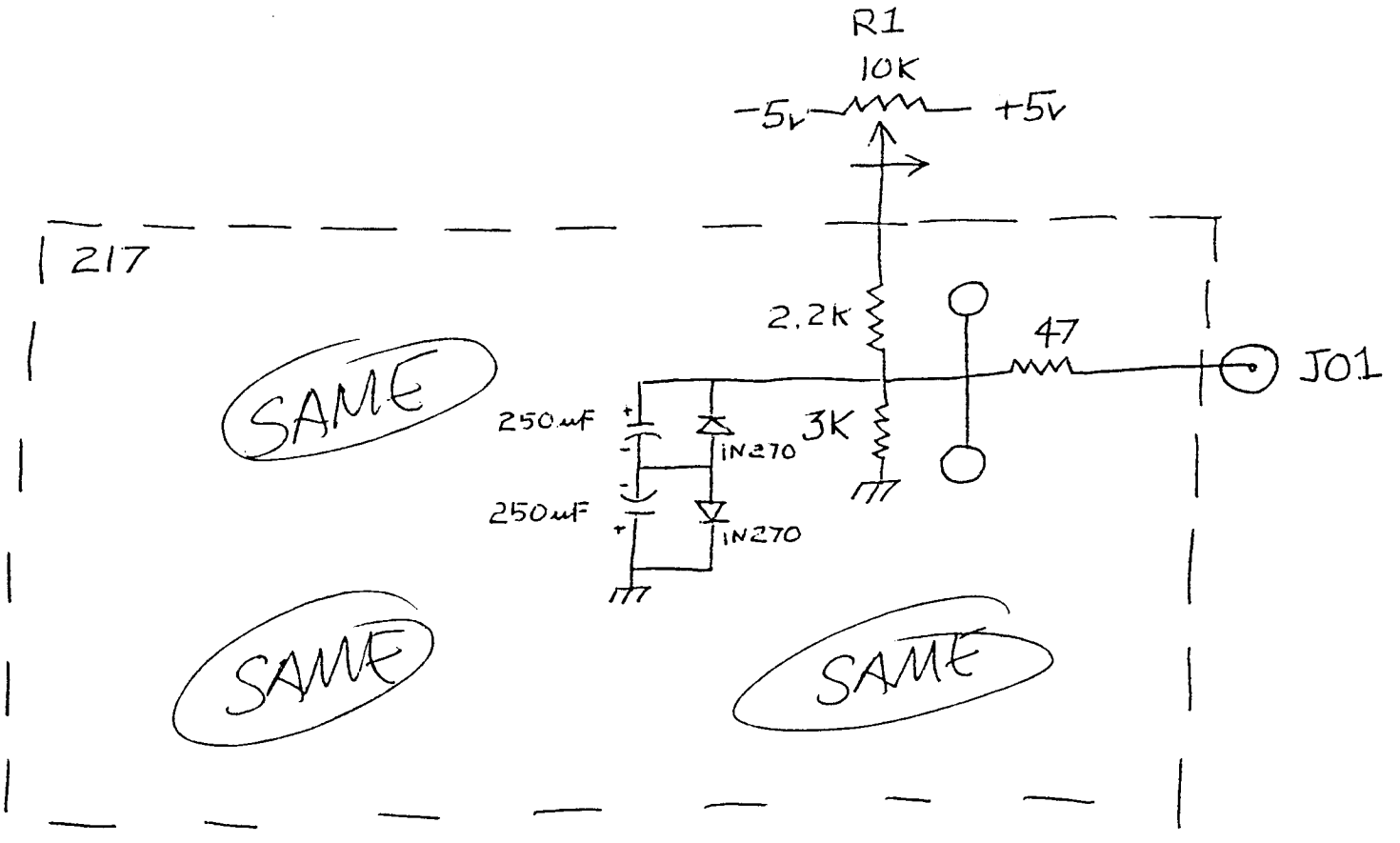
Capacitors C_1, C_2, are used to filter out noise. 100uF is the minimum and does not affect the feel much. Dan chose 250uF and Phil chose 1000uF; 1000uF is very 'slushy'.

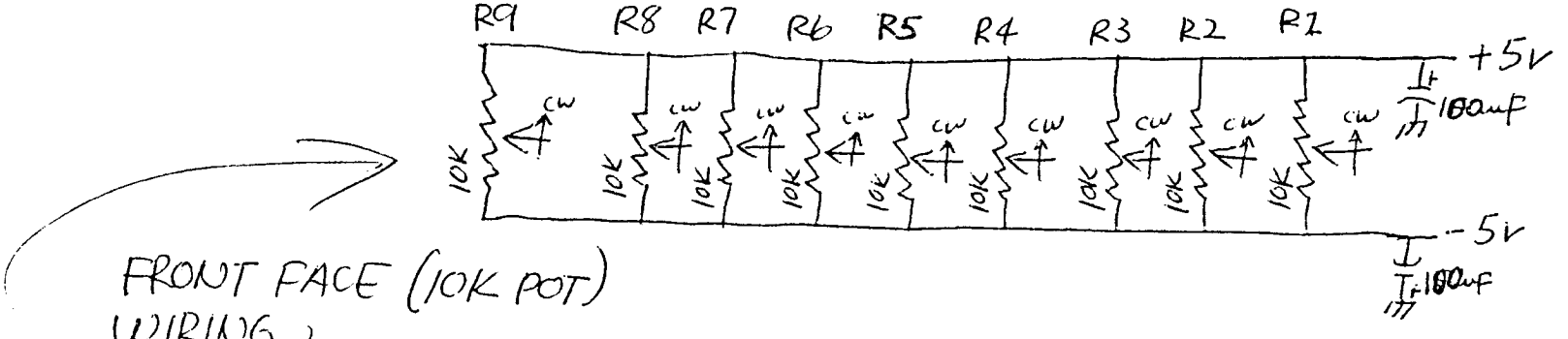
18		1N270	GERM-DIODE	.22	S	REF
18		710-1260	100uF, 25v, ELECT.		A	REF
-or-						
18		710-1218	250uF, 12v, ELECT.		A	REF
-or-						
18		623-0701	470uF, 16v, ELECT.		A	REF
-or-						
18		623-0703	1000uF ELECT.		A	REF



CAPACITORS C_1, C_2, MAY BE ANY VALUE BETWEEN 100uf — 1000uf.

REFERENCE





FRONT FACE (10K POT) WIRING

REFERENCE