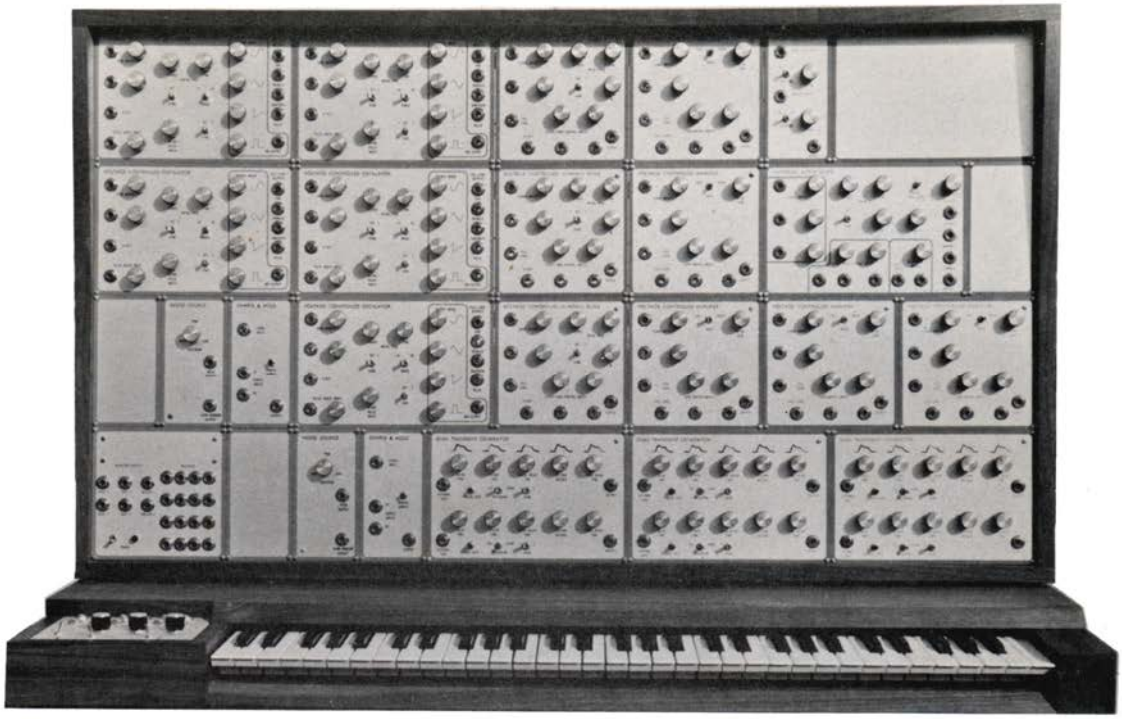


Eμ Systems Modular Synthesizer

Module and Sub-Module
Technical Information

1972 - 1980

Copyright Eμ Systems

INTRODUCTION

Overview
This manual contains detailed technical information on the Eμ Modular Synthesizer that was manufactured between 1972 and 1980 by Eμ Systems of California, USA. Copies of schematics, PCB layouts, part lists, debugging guides are included for modules and sub-modules.

The documentation is ordered by sub-module then module. Not all documentation has been located, so this manual will be updated when further documentation is uncovered.

The technical documentation was original drawn by either Paula Butler or Ed Rudnick, with Dave Rossum doing the final checks.

References
For an explanation of module functionality and sub-module specifications and connections, refer to the Eμ Systems Modular Technical Catalogs, particularly the 1974 and 1978 editions.

Source Material
The information has been scanned in from original or copied Eμ Systems documents that were held at the Synthesizer Museum. Many of the scans are from original documents at 300dpi.

Naming Convention
The Eμ Systems documentation follows a naming convention:

aaaa-bbb-ccc

aaaa = module or sub-module number
bbb = type of document
ccc = revision number starting with 001

aaa options:
Modules are numbered 2nnnn
Sub-Modules are numbered 1nnn

bbb options:
001 = schematic
005 = circuit description
011 = assembly diagram (component placement and PCB layout)
014 = wiring harness (power supplies)
016 = connections (power supplies)
031 = parts list
051 = debugging guide (PCB layout with test points)
061 = module or sub-module description (see Technical Catalog)

INDEX OF SUB-MODULES AND MODULES

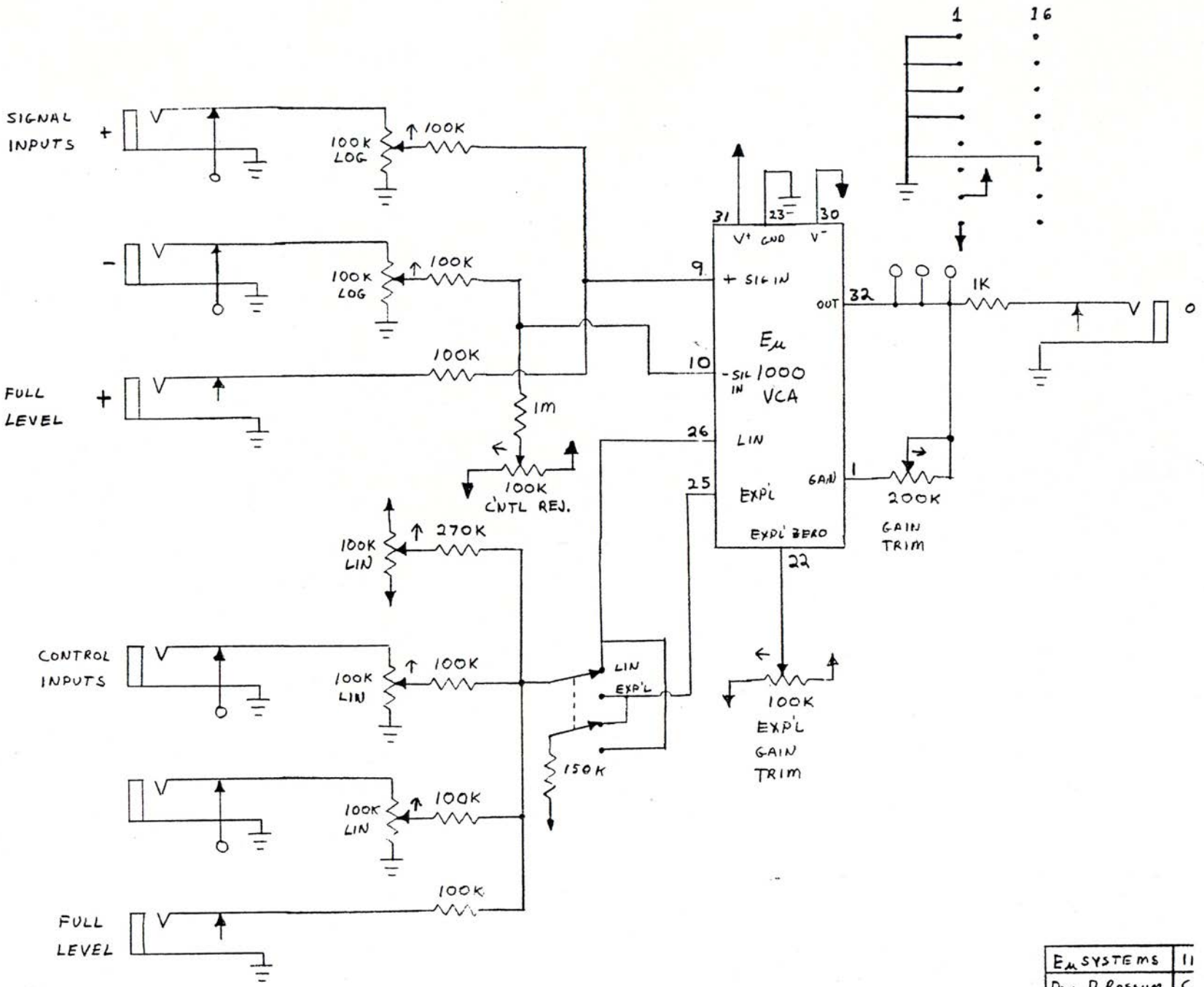
Sub Modules Module	Description
1000 VCA 2000 VCA	This design was introduced in early 1973 and it is based around the CA3080 chip. It was superseded by the 1001.
1001 VCA 2000 VCA	This design was introduced probably in 1978, although the documentation is from 1980. The circuit is based around the SSM2010 VCA chip.
1010 QVCA 2010 QVCA	This design was introduced in January 1973 and was probably based around the CA3080 chip. The circuit was updated in 1978 using the SSM2020 VCA chip.
1100 LPF 2100 LPF	The Low Pass Filter dates back to late 1972 and it went through a number of revisions. It is a Moog style 24dB filter based on a transistor ladder. This sub-module never seems to have been updated to use the SSM2040 chip.
1111 HPF 2110 HPF	The High Pass Filter was introduced in December 1973 probably based around a transistor ladder. The sub-module was updated in 1978 to use the SSM2040 chip.
1120 UAF 2120 UAF	The initial UAF design dates back to the Fall of 1972 using the SG3821 transistor array. It lasted just a few months. The UAF is the most sensitive circuit of the Modular range and Dave revised it a number of times in 1973.
1122 UAF 2120 UAF	This design was introduced in early 1973 and is based around the CA3086 transistor array. It replaced the 1120 module.
1140 AUAF 2140 RF	The Resonant Filter was introduced in December 1973, probably based on the CA3080 chip. It was revised in 1978 using the SSM2020 VCA chip.

Sub Modules Module	Description
2145 RFC	The Resonant Filter Controller was introduced in the spring of 1976. It is based around 558 Op Amps.
1200 VCO 2200 VCO	The original VCO was introduced back in early 1973, no documentation has been located yet.
1201 VCO 2200 VCO	The 1201 VCO sub-module replaced the 1200 in August 1976. The new design added linear FM and strong sync.
1210 WC 2200 VCO	The Wave Converter sub-module converts the sawtooth output of the VCO sub-module into triangle, pulse and sine waves. It was introduced in February 1973.
1210 VCO 2210 SPVCO	Cut down VCO, launched in August 1974 using the 1210 sub-module.
1340 Lag 2340 Lag	The Voltage Controlled Lag was introduced in May 1973.
2310 TG	Very early TG module of 1972. No documentation is available.
2320 TG	Very early TG module of 1972. No documentation is available.
1350 TG 2350 TG	This 5 stage Transient Generator was introduced in December 1973, replacing the 2310 and 2320. DADSR controls. No documentation is available.
1351 TG 2351 TG	This 4 stage Transient Generator was based on the 1350 circuit, but with no initial Delay control to save costs. No documentation is available.
1352 TG 2350 TG	The 1352 was introduced in 1978 and it replaced the 1350/1351. It is based around a SSM2055 chip.
2355 VCTGI	Voltage Controller for TG. No documentation available.

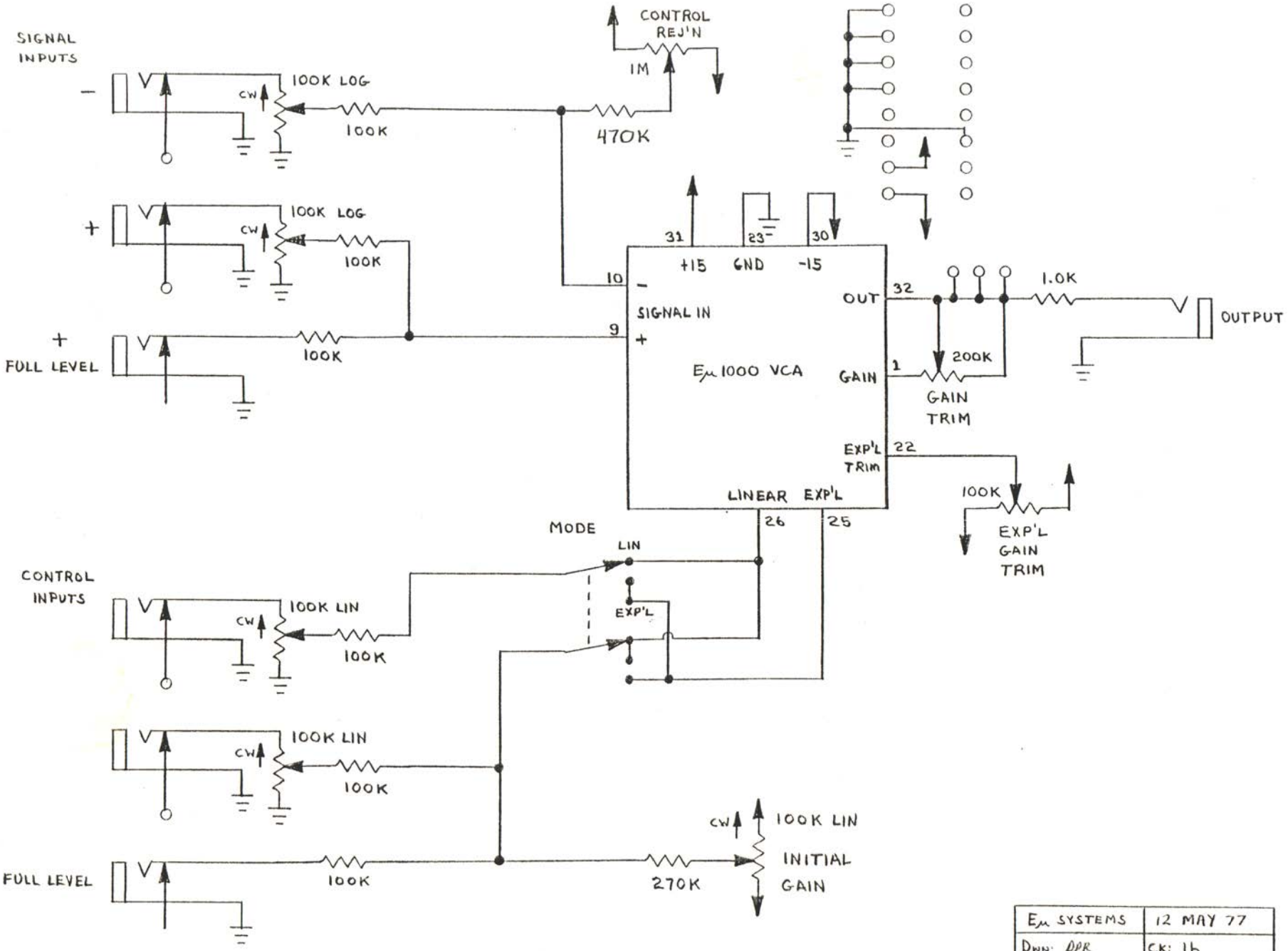
Sub Modules Module	Description
1400 NS 2400 NS	The Noise Source was introduced in early 1973. The circuit was revised three times. The documentation is from the later digital version.
1410 SH 2410 SH	The Sample and Hold design dates back to February 1973.
1420 HGA 2420 DP	The High Gain Amplifier was introduced in May 1973. No documentation is available.
1430 RM 2430 RM	The Ring Modulator was introduced in February 1973. It is based on matched transistors rather than a modulator chip.
1440 EF 2440 EF	The Envelope Follower was introduced in May 1973.
2450 QI	Quad Inverter from January 1974. No documentation available.
2451 PotPourri	One of the last modules to be launched, in August 1976. Based around 556 Op Amps.
2455 Mixer	Simple Mixer. No documentation available.
2460 Dual Reverb	No documentation available.
1500 VCC 2500	Voltage Controlled clock. No documentation available.
2510 8AG	8 position generator No documentation available.
2520 VSOU	Voltage Source Output Unit. No documentation available.
2530 AS	Analog Switch. No documentation available.
1540 MAG 2540	Memory Address Generator. No documentation available.

Sub Modules Module	Description
1545 MEM256/MEM512 2545	Memory, either 256 or 512 bytes. No documentation available.
1546 PROG 2546	Programmer. No documentation available.
1547 TI 2547	Tape Interface. No documentation available.
2550 HDI	No documentation available.
2551 TO	No documentation available.
2552 TL	No documentation available.
2553 DOS	No documentation available.
1900 PSS 2900	The original 2900/2910 power supplies were introduced in 1973. They were replaced in March 1975 by the 2905 and 2908. 2900 3A Power Supply with 6A +5V 2905 1.5A Power Supply with 1.5A +5V 2908 1.5A Power Supply with 3A +5V 2910 1.5A Power Supply with 6A +5V
4000 KYBD 4003	Monophonic Keyboard released in 1973
4910 FWPC	Firmware cables.
4920 ICCN	Keyboard cabling.

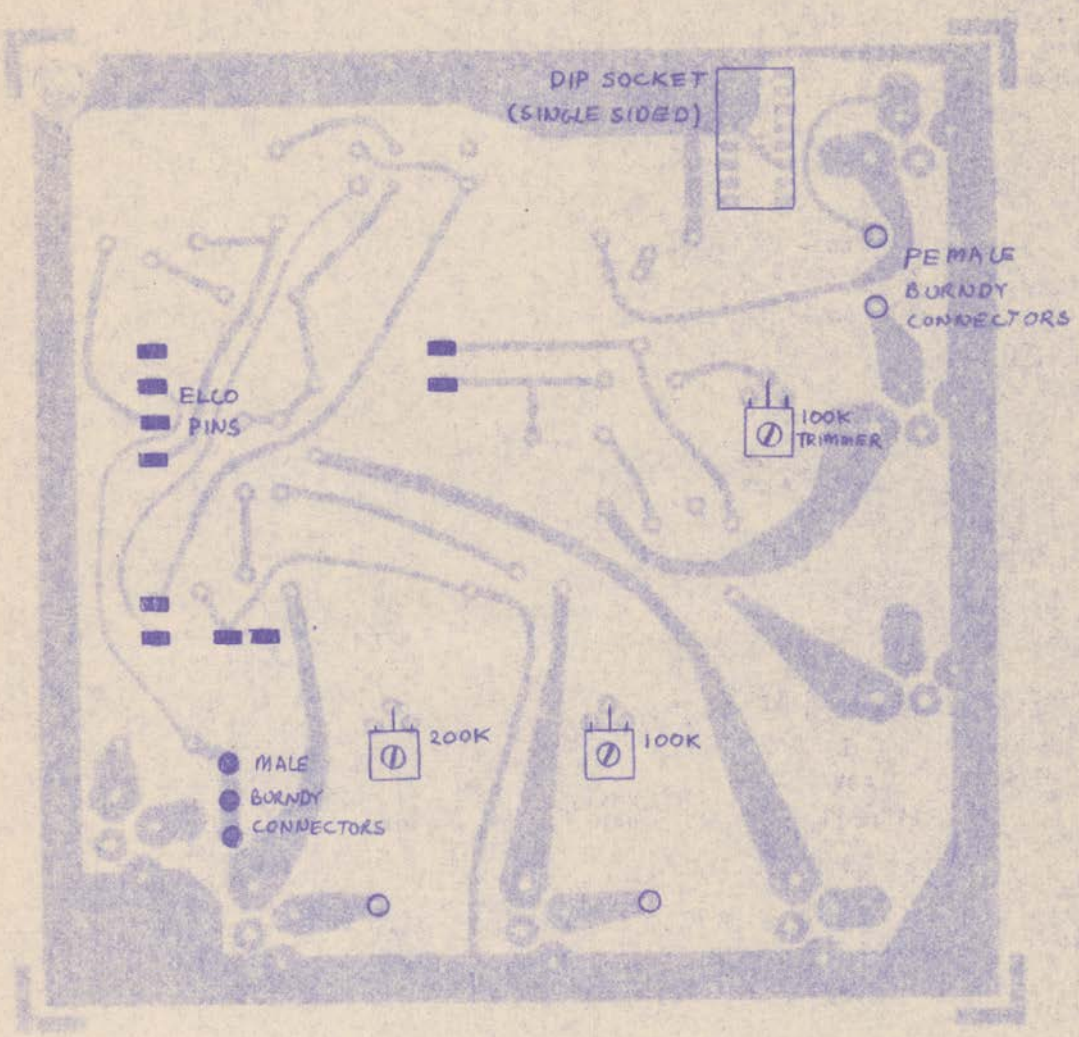
2000 VCA MODULE
1000/1001 VCA SUB-MODULE



E_μ SYSTEMS	11
DRN D. ROSSUM	C
DOC # 2000-0	
SCHEMATIC - 1	

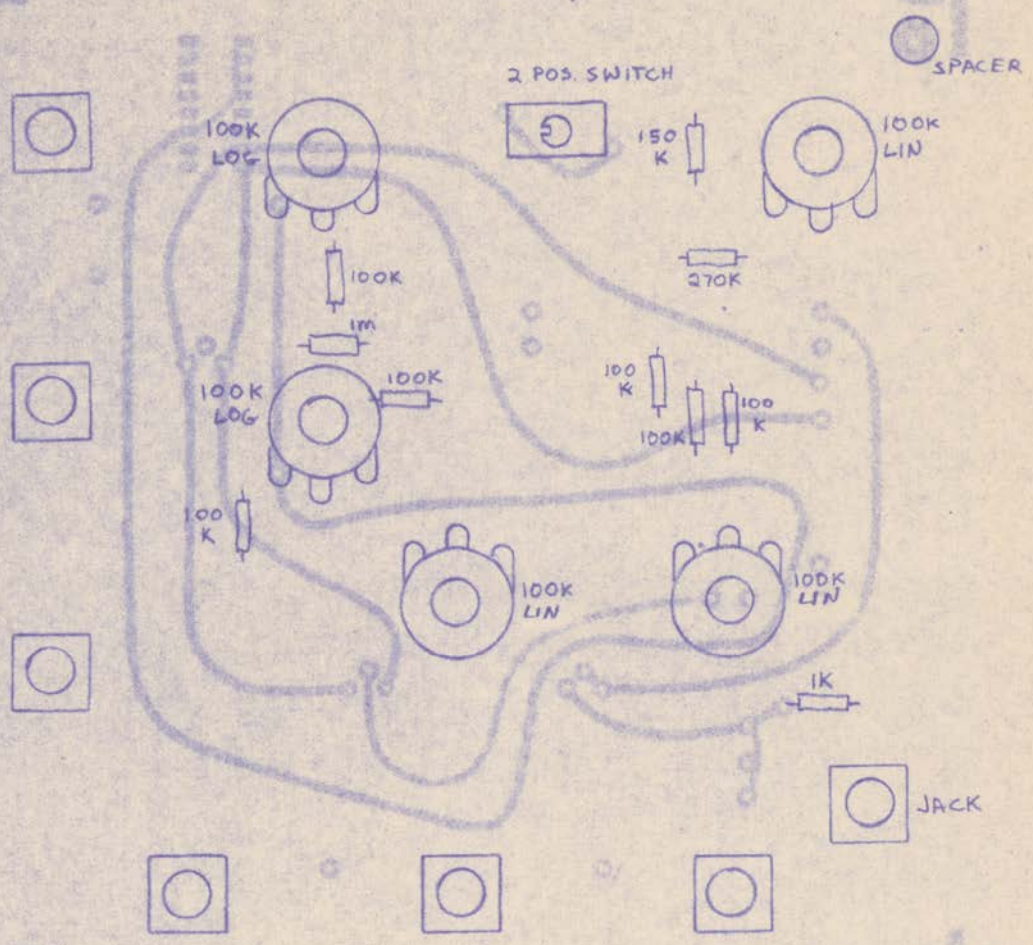


Em SYSTEMS	12 MAY 77
DWN: DPR	CK: 16
DOC # 2000-001-002	
SCHEMATIC – VOLTAGE CNTL'D AMP MODULE	

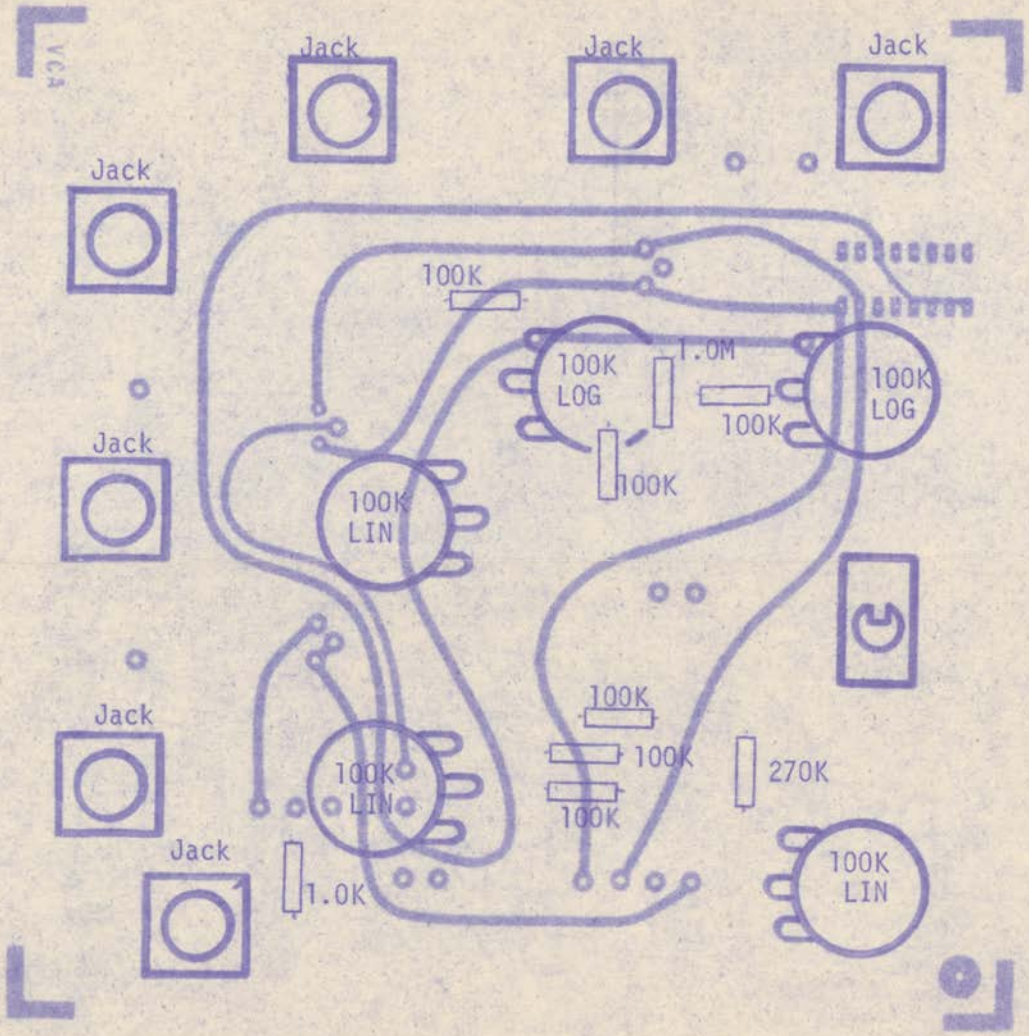


BOTTOM

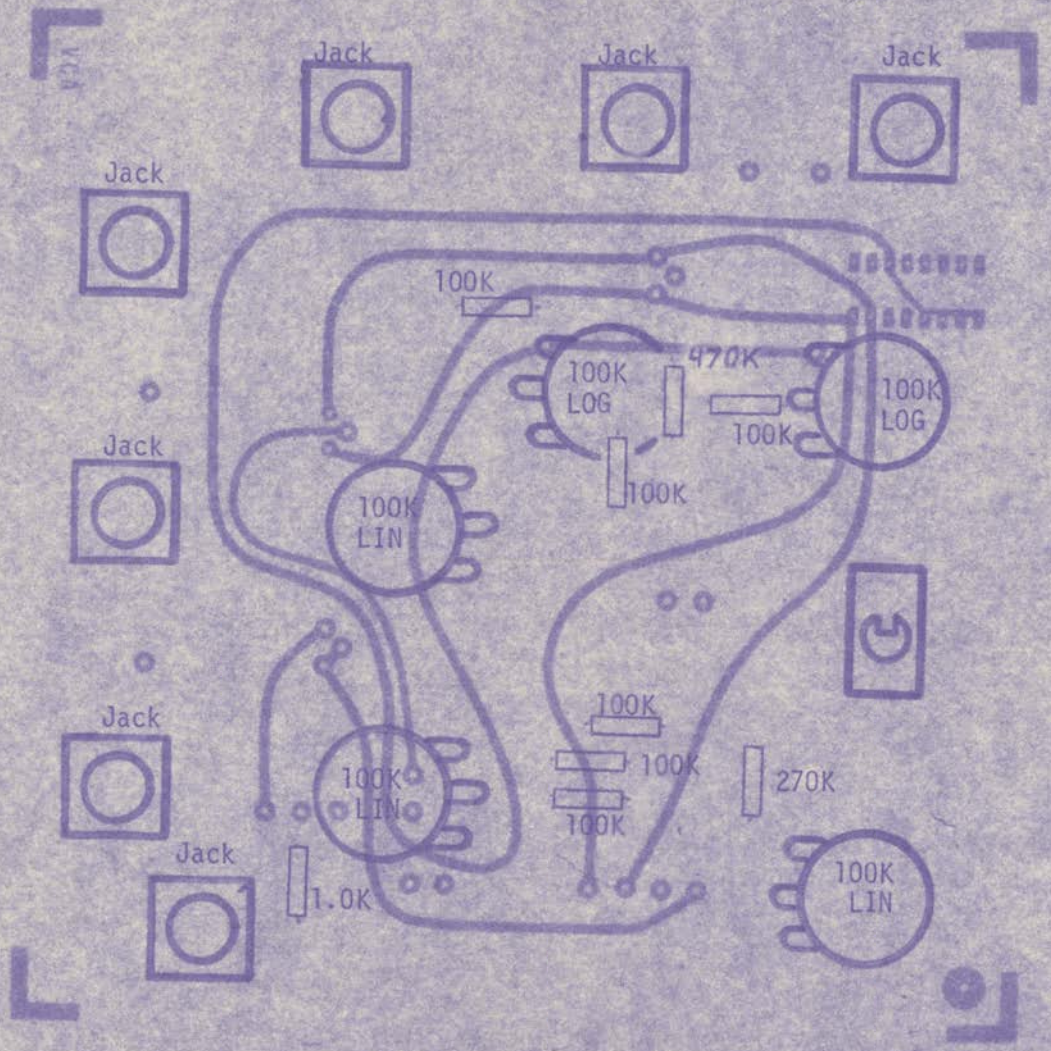
EM SYSTEMS	19 FEB 73
DR BY DPR	CK BY
DOC # 2000-011-001	
ASSEMBLY - VOLTAGE CNTL'D AMP. MODULE	


2 POS. SWITCH
SPACER
100K LOG
150 K
100K LIN
100K
270K
1m
100K LOG
100K
100 K
100K
100 K
100 K
100K LIN
100K LIN
1K
JACK

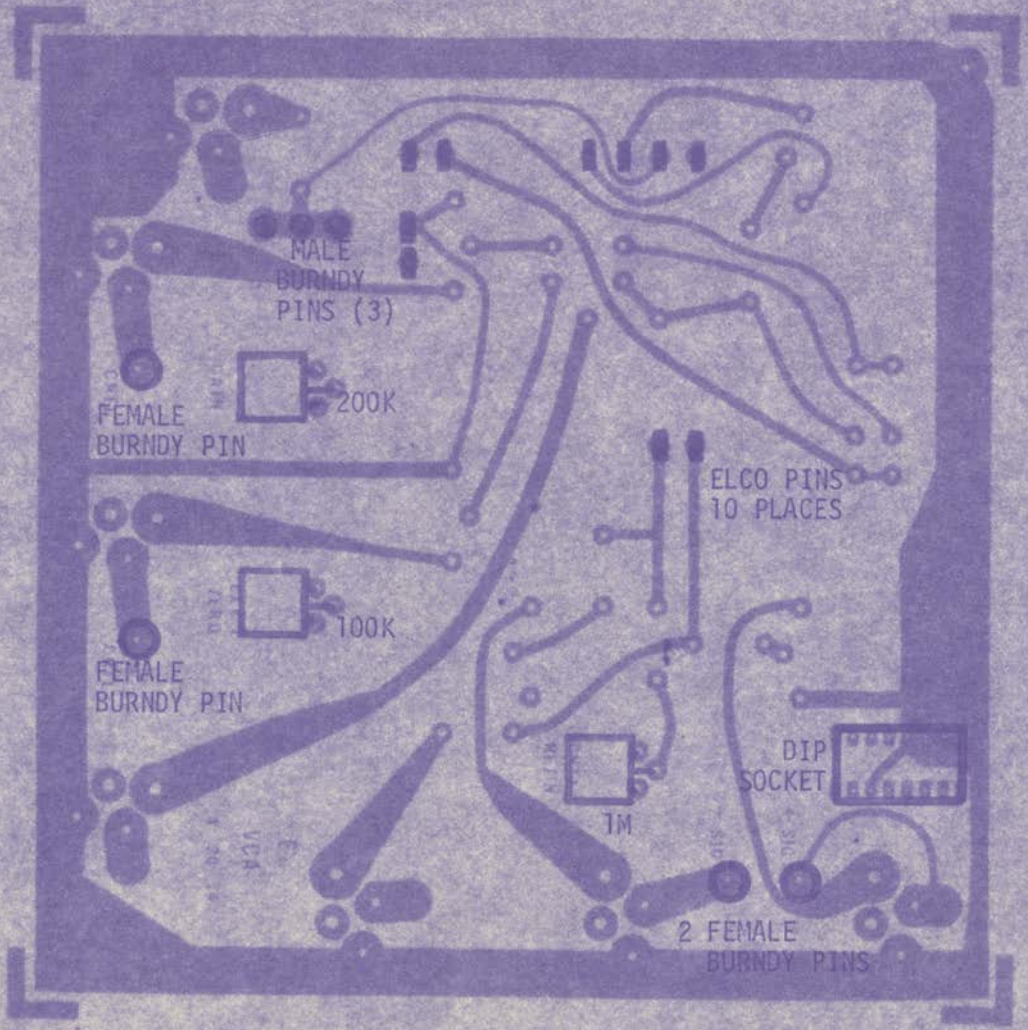
TOP



Eμ SYSTEMS 31 MAY 74
Dwn: DPR Ck:
DOC.# 2000-011-002
Assy: Voltage Controlled
Amplifier Module

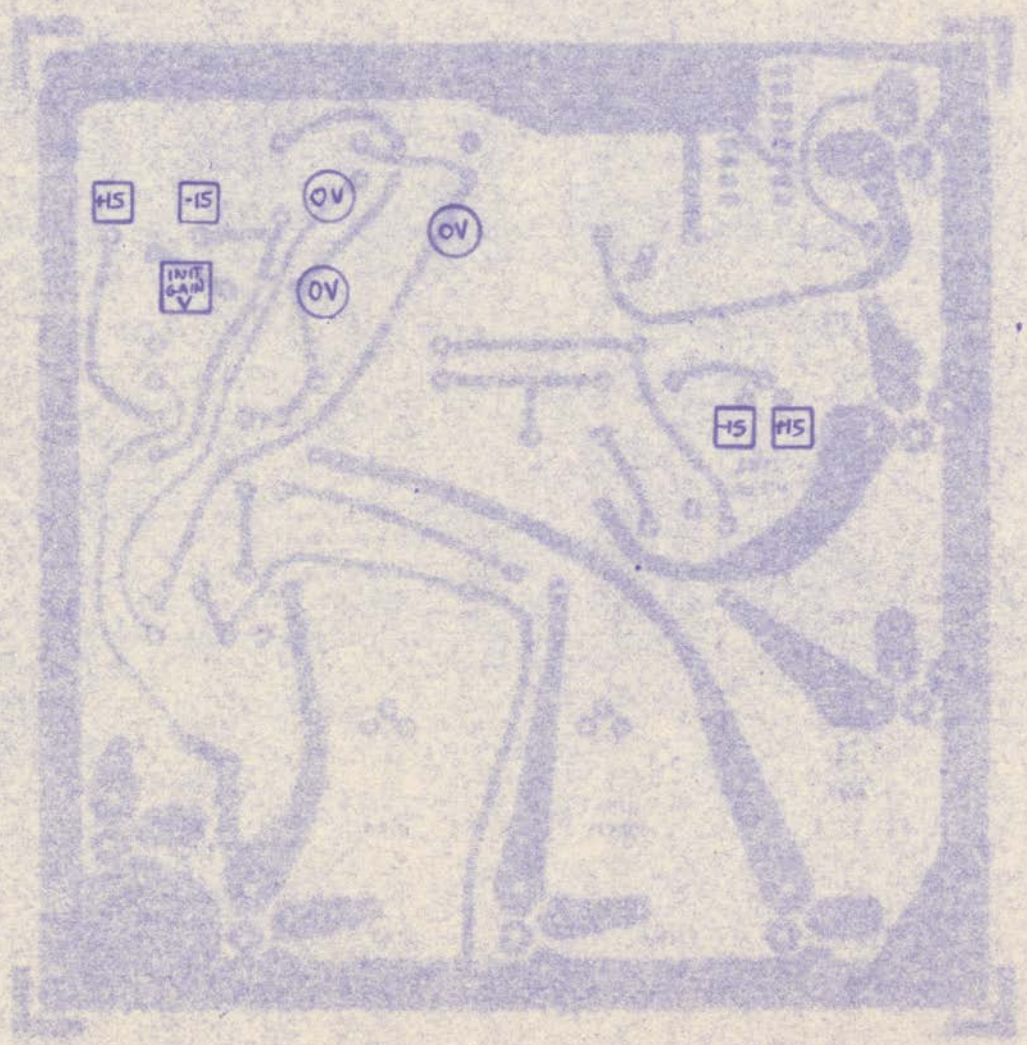


Eμ SYSTEMS 12 MAY 77
Dwn: DPR Ck:
DOC.# 2000-011-002
Assy: Voltage Controlled
Amplifier Module

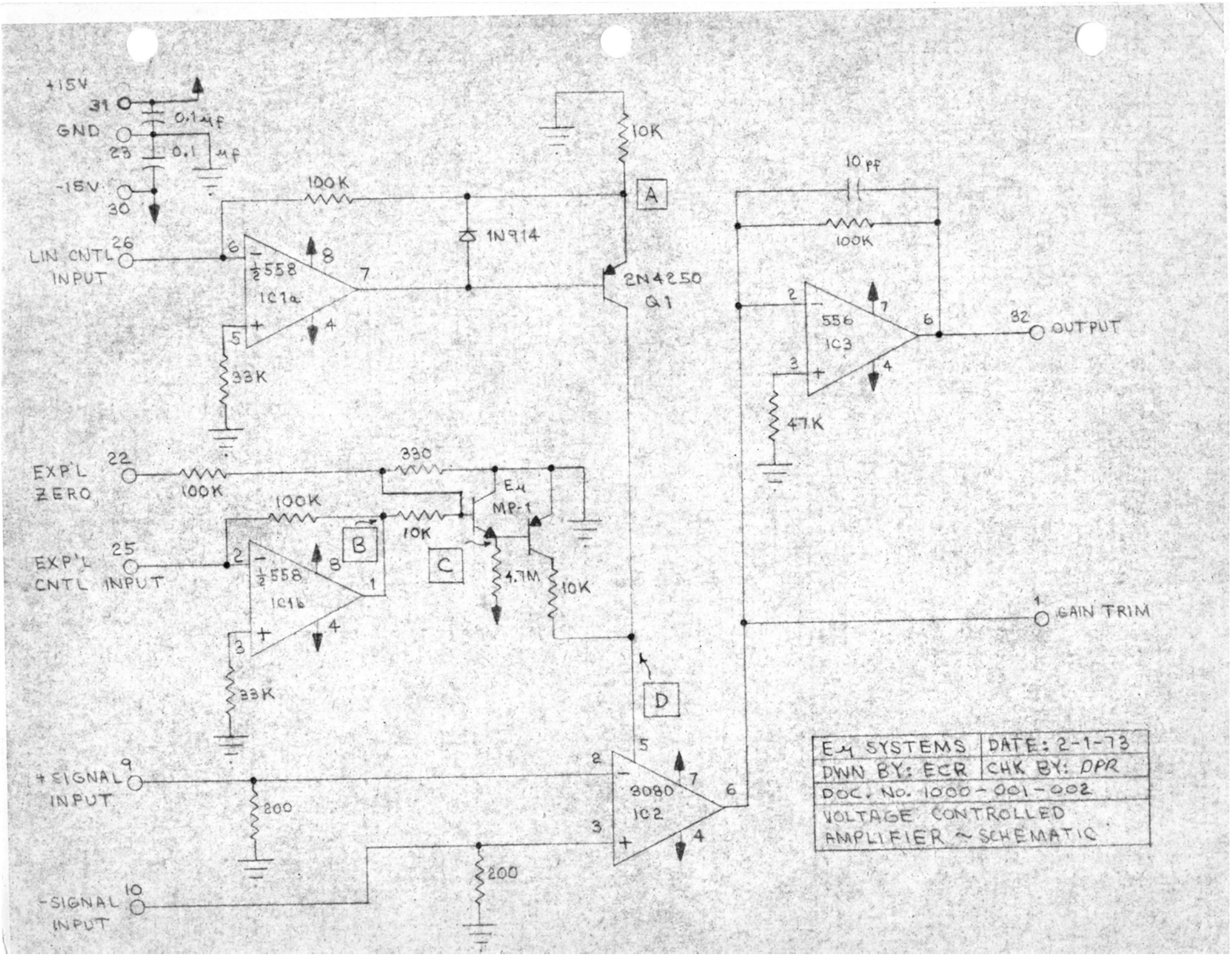

MALE
BURNDY
PINS (3)
200K
FEMALE
BURNDY PIN
ELCO PINS
10 PLACES
100K
FEMALE
BURNDY PIN
DIP
SOCKET
1M
2 FEMALE
BURNDY PINS

PARTS LIST - 2000 VCA MODULE

QTY	PART#	DESCRIPTION	NOTES
1	R 9	1.0K OHM	
6	R 33	100K OHM	
1	R 39	270K OHM	
1	R 42	470K OHM	
1	TR 5	100K TRIMMER	
1	TR 6	200K TRIMMER	
1	TR 7	1M TRIMMER	
3	P 1	100K LIN POT	
2	P 2	50K LOG POT	
1	SW 4	DT ON-ON-ON	
7	CN 2	PHONE JACK	
1	CN 5	DIP SOCKET	
1	CN 9	DIP PLUG	
3	CN 12	ML BURN WIRE	
4	CN 13	FM BURN WIRE	
5	H 1	KNOB	
1	H 2	SPACER	
2	H 11	4-40X1/4 BH	
4	H 13	4-40X3/4 BH	
4	H 14	#4 LKWSHR	
4	H 15	4-40 NUT	
1	CB 25	VCA MOD CB	
1	PN 1	VCA PANEL	
1	1000	VCA SUBM	



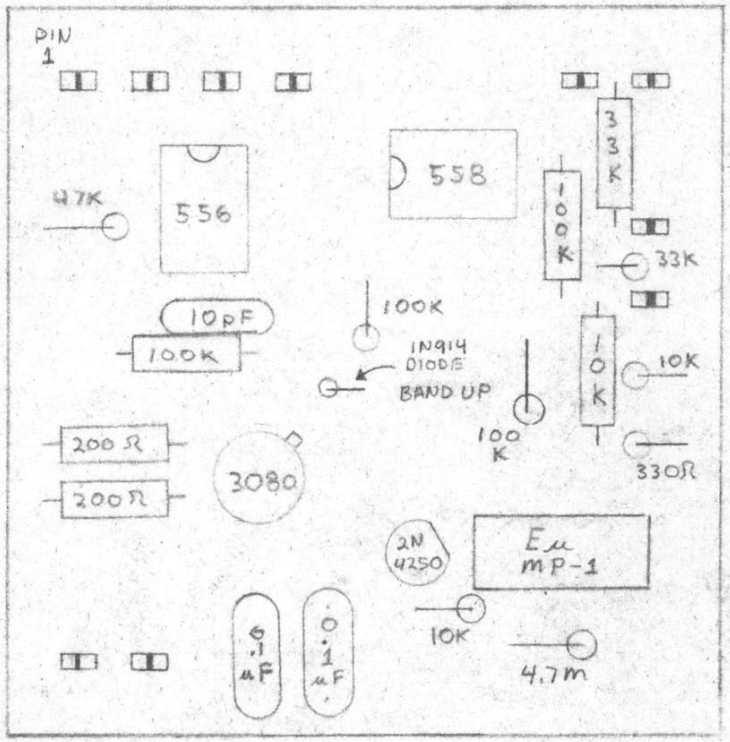
E-M SYSTEMS	15 APR 73
DR BY DPR	CK BY
DOC # 2000-051-001	
DEBUGGING GUIDE - VOLT. CNTL'D AMP MODULE	

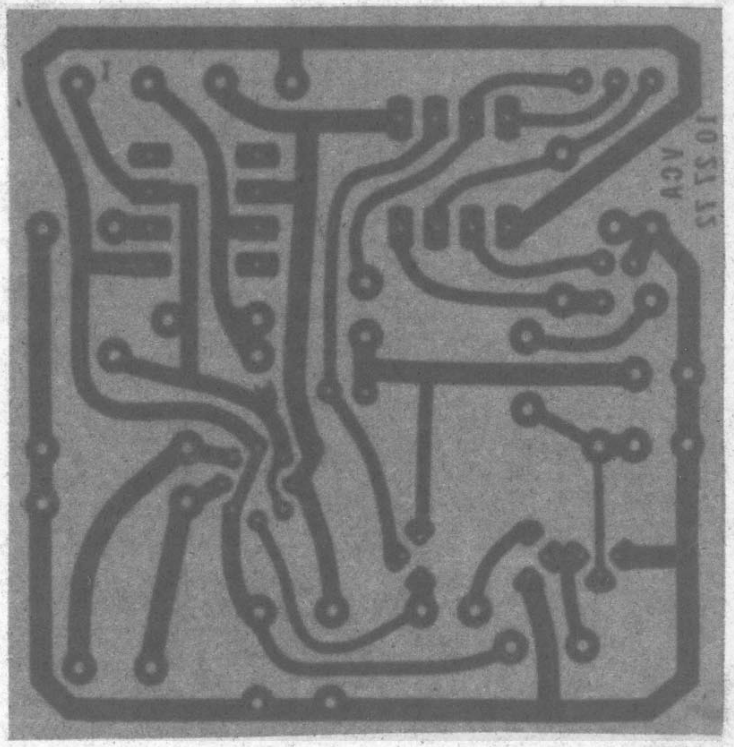

+15V
31
0.1 μf
GND
23
0.1 μf
-15V
30
LIN CNTL INPUT
26
100K
10K
A
1N914
2N4250
Q1
½558
IC1a
33K
EXP'L ZERO
22
330
100K
MP-1
B
C
10K
EXP'L CNTL INPUT
25
4.7M
10K
½558
IC1b
33K
D
+SIGNAL INPUT
9
200
-SIGNAL INPUT
10
200
3080
IC2
10 pf
100K
556
IC3
47K
32
OUTPUT
1
GAIN TRIM
EM SYSTEMS
DATE: 2-1-73
DWN BY: ECR
CHK BY: DPR
DOC. No. 1000-001-002
VOLTAGE CONTROLLED AMPLIFIER ~ SCHEMATIC

SUBMODULE 1000 VOLTAGE CONTROLLED AMPLIFIER - CIRCUIT DESCRIPTION

IC 1a together with transistor Q 1 act as a linear voltage-to-current converter, whose output appears on the collector of Q 1. IC 1b is an inverting buffer, whose output is attenuated and applied to the base of the NPN portion of the matched pair, which acts as an emitter follower. The PNP portion actually generates the exponential current by means of its base-emitter voltage to collector current relation. The linear and exponential control currents are fed into the OTA, which acts as a linear current controlled amplifier with a current source output. IC 3 is a high speed op amp that converts this current to a voltage, and the gain of this stage is controlled by the feedback resistance. Since IC 3 is in the inverting mode, the inverting pin of IC 2 is actually non-inverting with respect to the final output.

COMPONENT SIDE VIEWS





ELCO PIN

ALL DIODES BAND UP

CHECK DIODE & IC'S FOR ORIENTATION

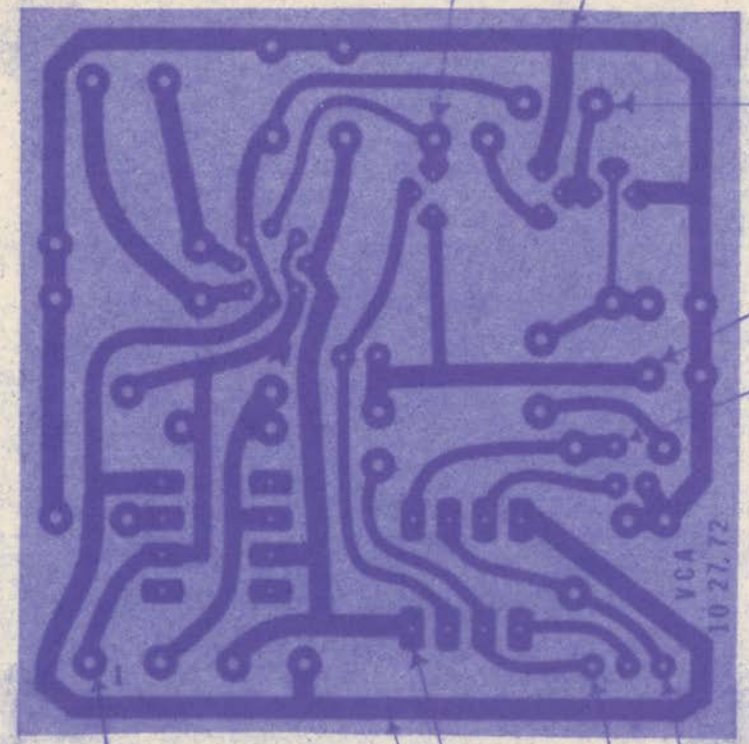
Em SYSTEMS	DATE 10-9-72
DWN D ROSSUM	CK DR
DOC# 1000-011-001	
VOLTAGE CONTROLLED AMP ASSEMBLY DIAG.	

SUBMODULE 1000 VOLTAGE CONTROLLED AMPLIFIER - PARTS LIST

Quantity	Description	Replacement Price
1	Instruction Packet	$ 1.00*
1	Circuit Board	6.00*
1	556 Op Amp (N5556V)	3.50
1	558 Dual Op Amp (N5558V)	3.00
1	3080 OTA (CA3080)	2.00
1	Eu MP - 1 Matched Pair	3.00
1	2N4250 PNP Transistor	.50
1	1N914 Diode	.25
14	Resistors 1/4 Watt 5% as follows:	.10
2	200 ohm (red black brown gold)	
1	330 ohm (orange orange brown gold)	
3	10K ohm (brown black orange gold)	
2	33K ohm (orange orange orange gold)	
1	47K ohm (yellow violet orange gold)	
4	100K ohm (brown black yellow gold)	
1	4.7M ohm (yellow violet green gold)	
1	10pF ceramic disc capacitor	.30
2	0.1 mfd decoupling capacitors	.80
10 pair	Elco Pin Connectors	.16/pair

* Available only to those who have previously purchased this module.

Eu Systems 9 Mar 1973
1000 - 031 - 001
Parts List - Voltage
Controlled Amplifier



-14.3V DO NOT SHORT TO GND OR +15V [D]

GROUND*

APPROX -0.5V [C]

$-V_{LIN}$ [A]

$-V_{EXP}$ [B]

0V (GAIN TRIM)

+15V*

-15V*

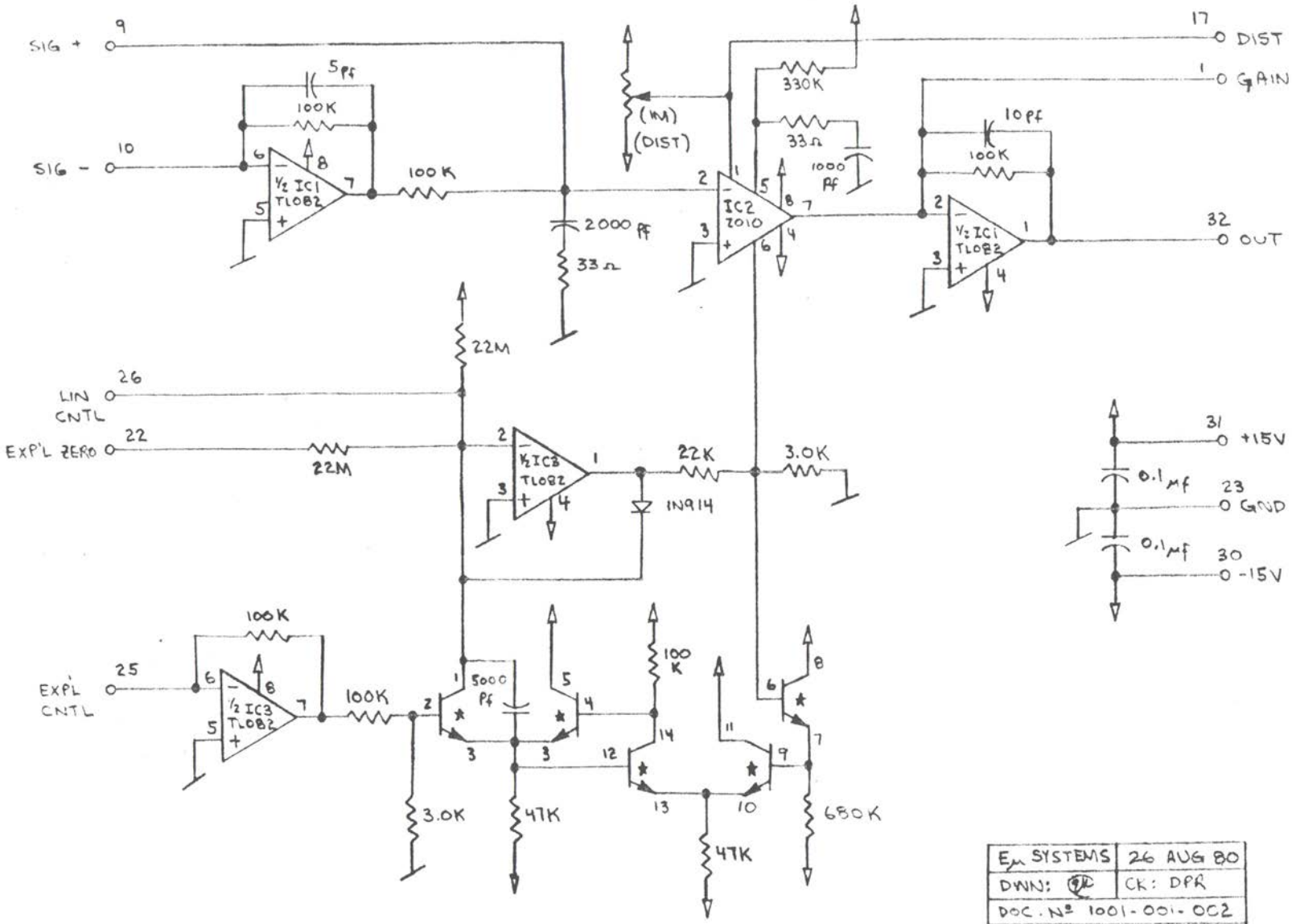
0V (EXP INPUT NODE)

0V (LIN INPUT NODE)

FOIL SIDE VIEW

*LOW IMPEDANCE

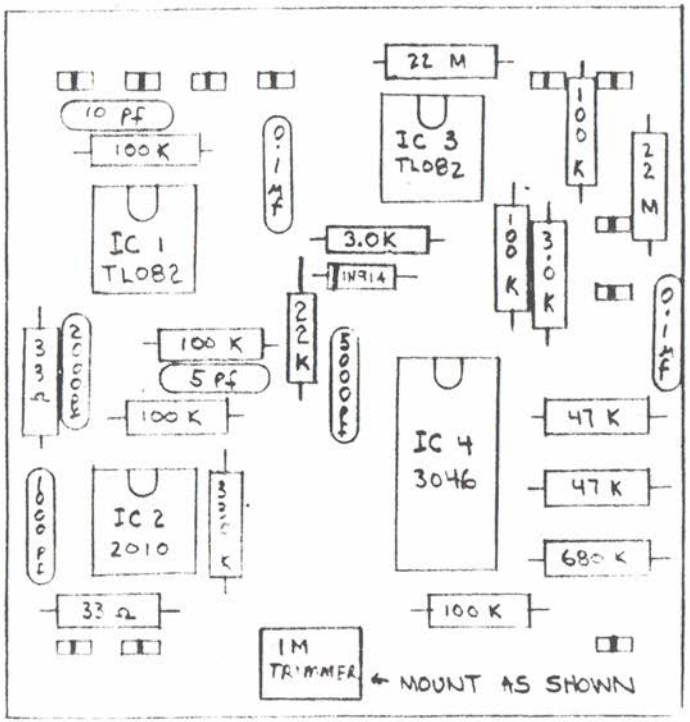
E.M. SYSTEMS	30 OCT 72
DR. D. ROSSUM	CR MK
DOC #1000-061-001	
DEBUGGING GUIDE - VCA	



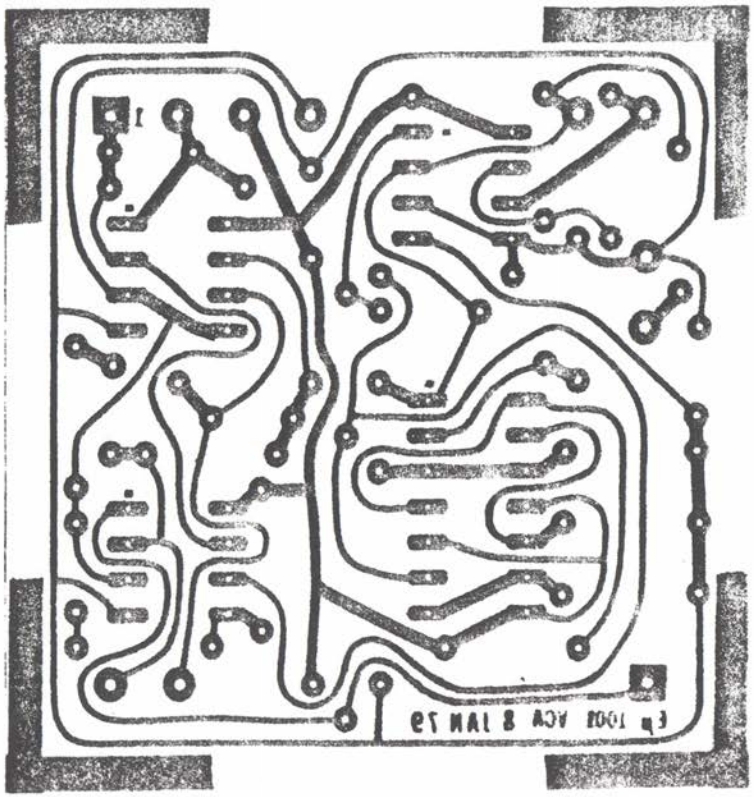
★ = IC 4 · CA3046

E$_M$ SYSTEMS	26 AUG 80
DWN: [illegible]	CK: DPR
DOC. Nº 1001-001-002	
SCHEMATIC ~ VC AMPLIFIER SUBMODULE	

COMPONENT SIDE VIEWS



ELCO PIN

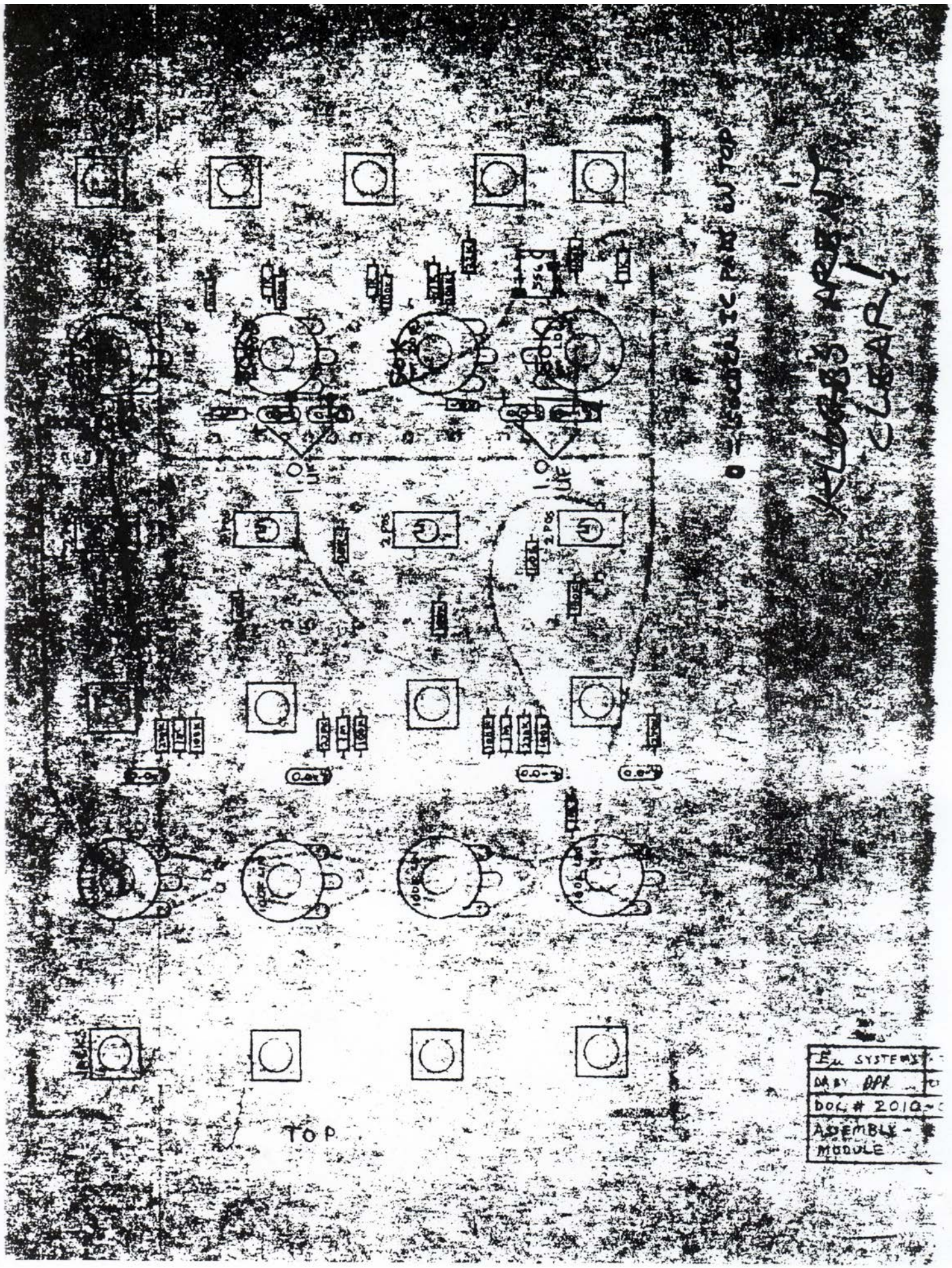


E_M SYSTEMS	26 AUG 80
DWN:	CK:
DOC # 1001-011-002	
ASSEMBLY DIAGRAM ~ VCA SUBMODULE	

PARTS LIST - 1001 VCA SUBM

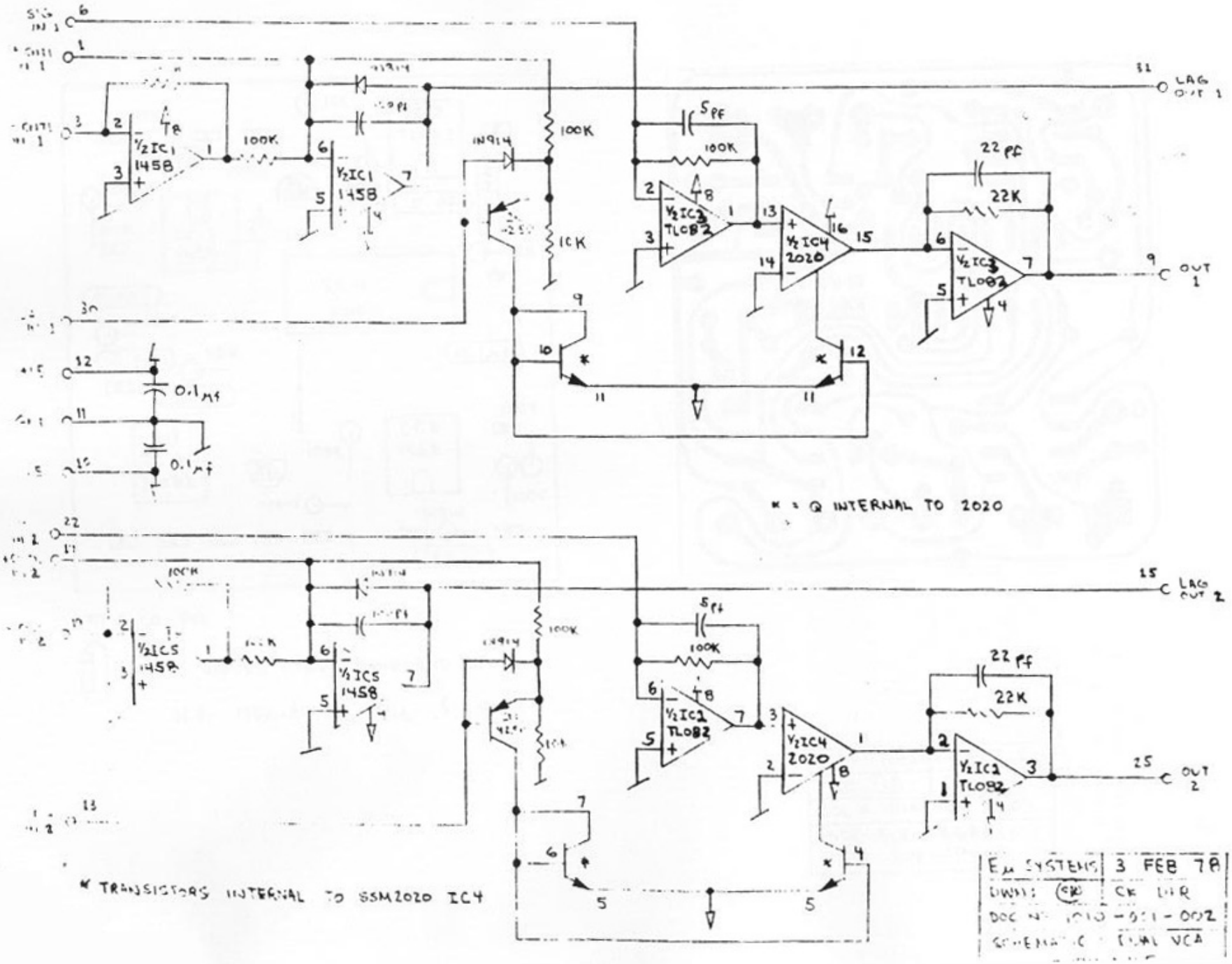
QTY	PART#	DESCRIPTION	NOTES
1	IL 4	2010 VCA	
1	IL 7	3046 T ARRAY	
2	IL 17	TL082 OPAMP	
1	D 1	1N914 SIG	
1	C 2	5 PF CER	
1	C 3	10 PF CER	
1	C 9	1000 PF CER	
1	C 10	2000 PF CER	
1	C 11	5000 PF CER	
2	C 15	0.1 UF CER	
2	R 1	33 OHM 5%	
2	R 14	3.0K OHM	
1	R 25	22K OHM	
2	R 30	47K OHM	
6	R 33	100K OHM	
1	R 41	330K OHM	
1	R 44	680K OHM	
2	R 55	22M OHM	
1	TR 7	1M TRIMMER	
22	CN 1	ELCO PIN	
1	CB 1	VCA SUBM CB	

2010 VCA MODULE
1010 VCA SUB-MODULE

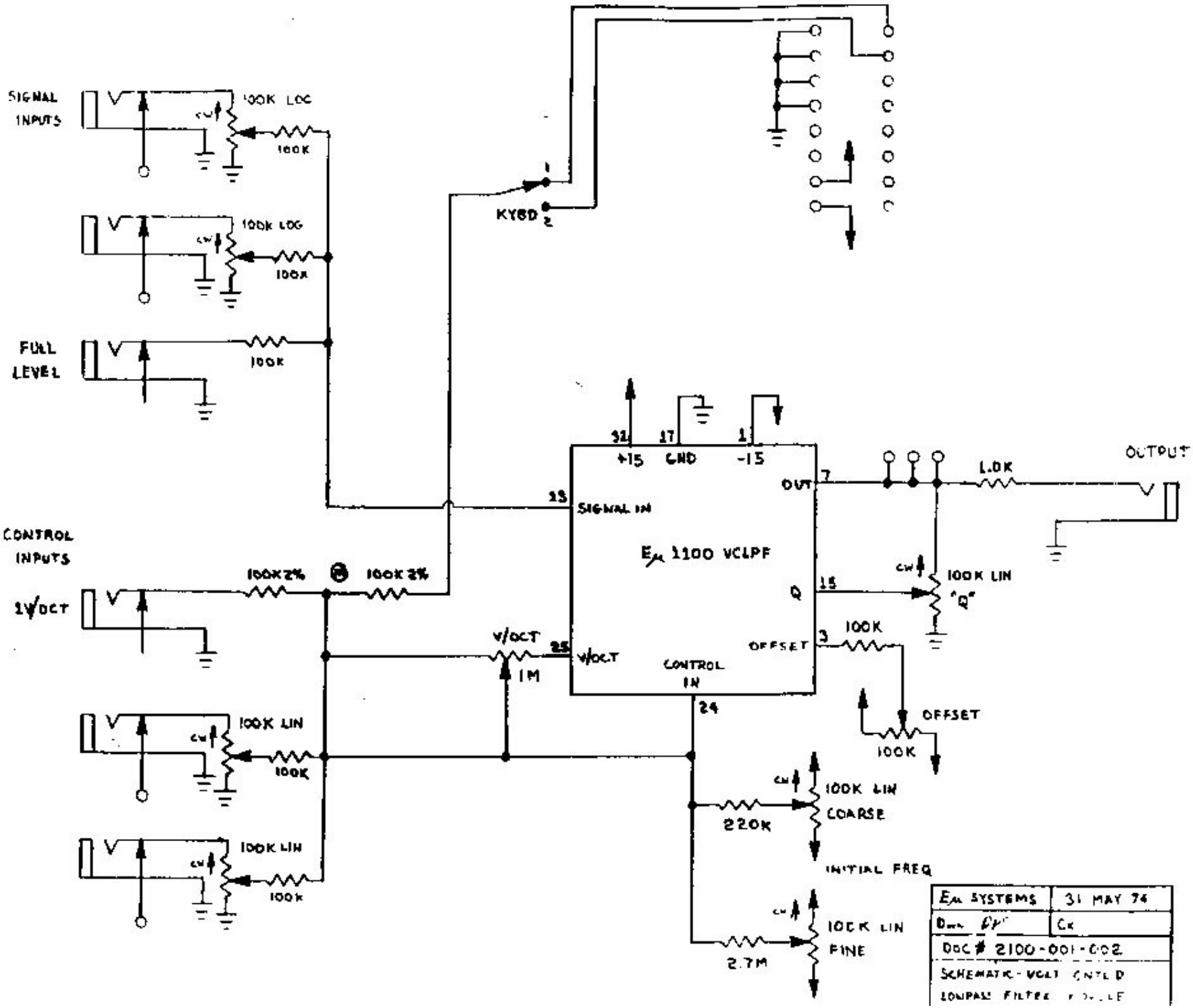

TOP
SYSTEMS
DRAWN BY
DOC # 2010
ASSEMBLY
MODULE

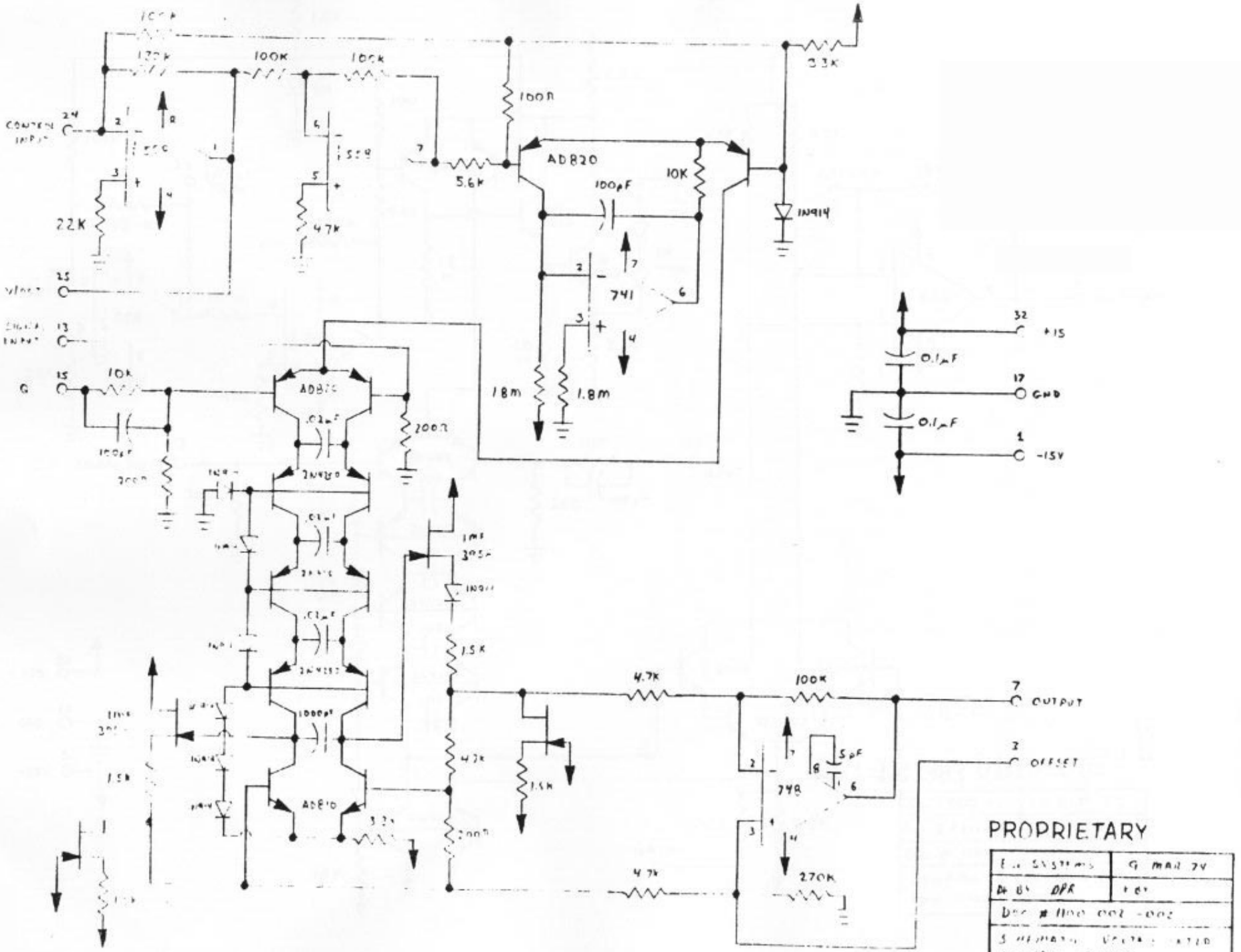
PARTS LIST - 2010 QVCA MODULE

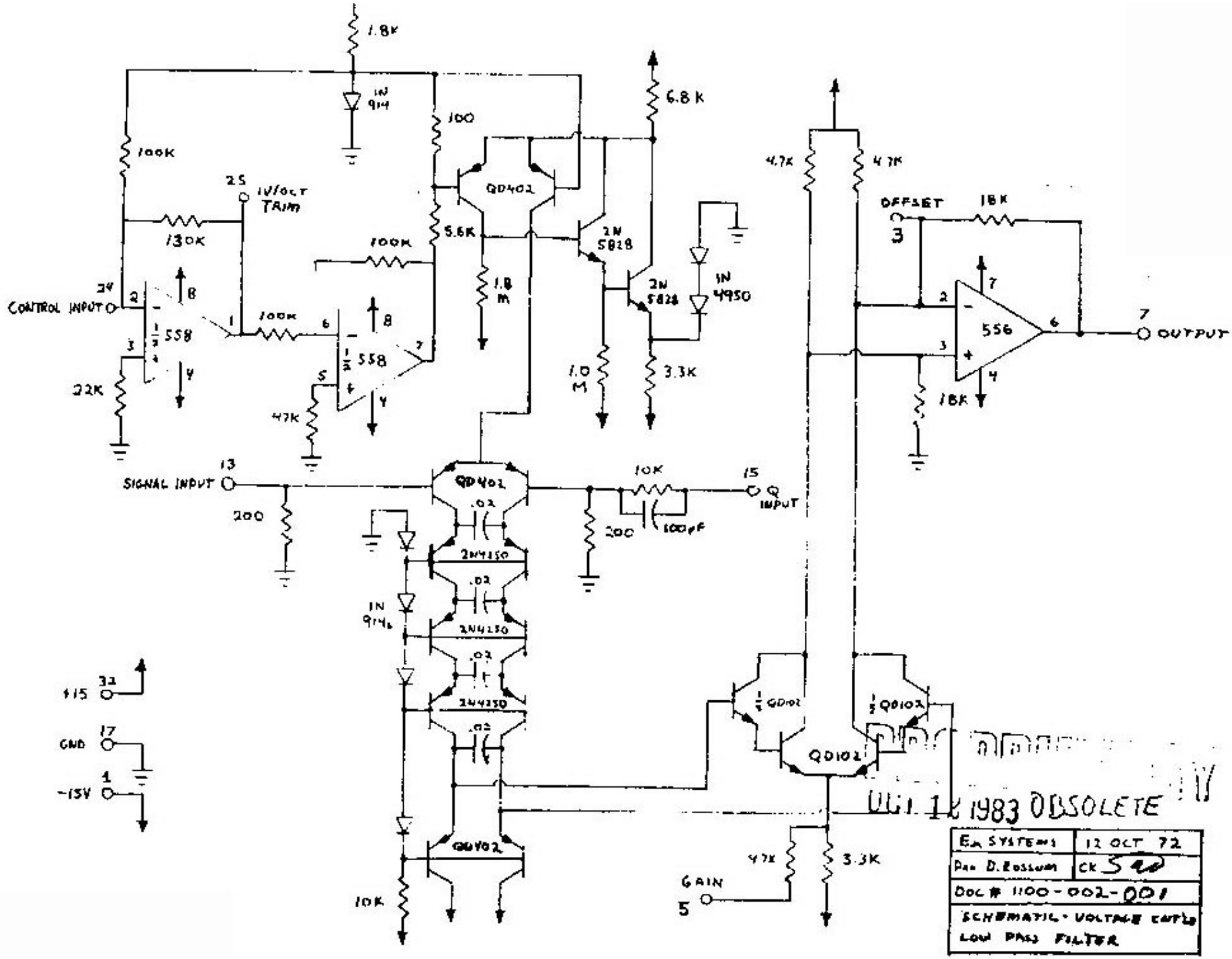
QTY	PART#	DESCRIPTION	NOTES
1	IL 3	356 BIFETAMP	
4	C 12	0.01UF CER S	
4	C 21	1.0 UF TANT	
9	R 9	1.0K OHM	
1	R 25	22K OHM	
13	R 33	100K OHM	
4	R 39	270K OHM	
4	R 45	1.0M OHM	
4	TR 7	1M TRIMMER	
4	P 1	100K LIN POT	
4	P 2	50K LOG POT	
4	SW 1	SPDT 2 POS	
13	CN 2	PHONE JACK	
1	CN 5	DIP SOCKET	
1	CN 9	DIP PLUG	
15	CN 12	ML BURN WIRE	
8	H 1	KNOB	
4	H 13	4-40X3/4 BH	
4	H 14	#4 LKWSHR	
4	H 15	4-40 KEPFNUT	
1	CB 26	QVCA MOD CB	
1	PN 2	QVCA PANEL	
2	1010	DUAL VCA SBM	


100K
½IC1 1458
½IC1 1458
IN914
100K
10K
5pf
100K
22 pf
22K
½IC3 TL082
½IC4 2020
½IC3 TL082
LAG OUT 1
OUT 1
0.1 µf
0.1 µf
* = Q INTERNAL TO 2020
100K
½IC5 1458
½IC5 1458
IN914
100K
5pf
100K
22 pf
22K
½IC2 TL082
½IC4 2020
½IC2 TL082
LAG OUT 2
OUT 2
* TRANSISTORS INTERNAL TO SSM2020 IC4
E.M. SYSTEMS
3 FEB 78
DWN: EK
CK'D:
DOC NO: 1010-021-002
SCHEMATIC DUAL VCA

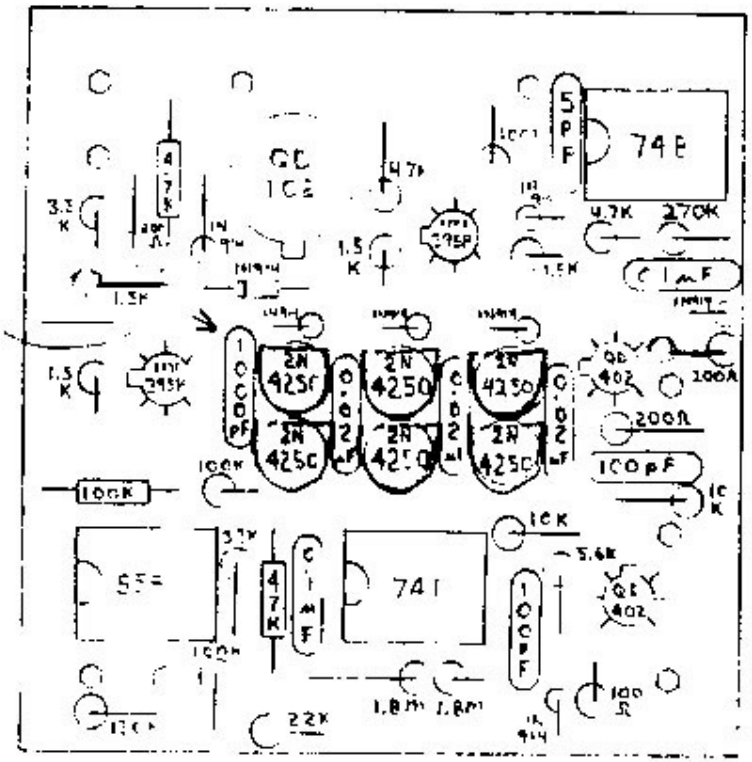
2100 LPF MODULE
1100 LPF SUB-MODULE

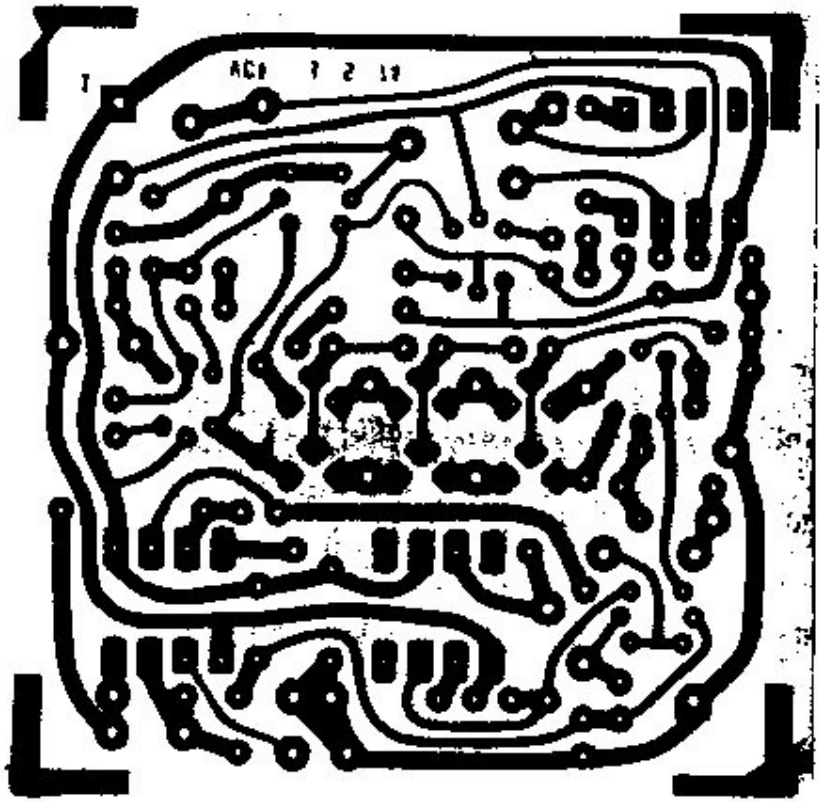

SIGNAL INPUTS
100K LOG
100K
100K LOG
100K
FULL LEVEL
100K
KYBD
32
+15
17
GND
1
-15
OUTPUT
OUT
7
1.0K
SIGNAL IN
13
E-mu 1100 VCLPF
CONTROL INPUTS
100K 2%
100K 2%
1V/OCT
Q
15
100K LIN
"Q"
V/OCT
25
V/OCT
1M
OFFSET
3
100K
CONTROL IN
24
OFFSET
100K
100K LIN
100K
100K LIN
COARSE
220K
INITIAL FREQ
100K LIN
100K
100K LIN
FINE
2.7M
E-mu SYSTEMS
31 MAY 74
DOC # 2100-001-002
SCHEMATIC - VOLT CNTLD
LOWPASS FILTER


100K
100K
100K
3.3K
100Ω
AD820
10K
5.6K
100pF
1N914
741
22K
4.7K
1.8M
1.8M
+15
0.1μF
GND
0.1μF
-15V
10K
100Ω
100pF
200Ω
2N930
1.5K
4.7K
100K
OUTPUT
OFFSET
1000pF
AD810
3.3K
1.5K
4.7K
5pF
748
270K
PROPRIETARY


1.8K
IN 914
100
6.8 K
100K
25
1V/OCT TRIM
130K
QD402
5.6K
2N 5828
100K
1.8 M
IN 4950
24
CONTROL INPUT
2
1/4 558
8
100K
6
1/2 558
7
1.0 M
3.3K
3
22K
4
5
47K
4.7K
4.7K
OFFSET
3
18K
7
2
556
6
7
OUTPUT
3
4
18K
13
SIGNAL INPUT
200
QD402
.02
2N4250
10K
15
Q INPUT
200
100pF
IN 914
+15
32
GND
17
-15V
1
QD102
1/2 QD102
1/2 QD102
10K
47K
3.3K
GAIN
5
DEC 1982 OBSOLETE
E.M. SYSTEMS
12 OCT 72
Des D. Rossum
CK
Doc # 1100-002-001
SCHEMATIC - VOLTAGE CNTLD LOW PASS FILTER

THESE ARE MODEL ONLY TO FIT
INTO ECP — LEAVE LEADS LONG ENOUGH.





○ ARE ELCO PINS - ORIENTATION

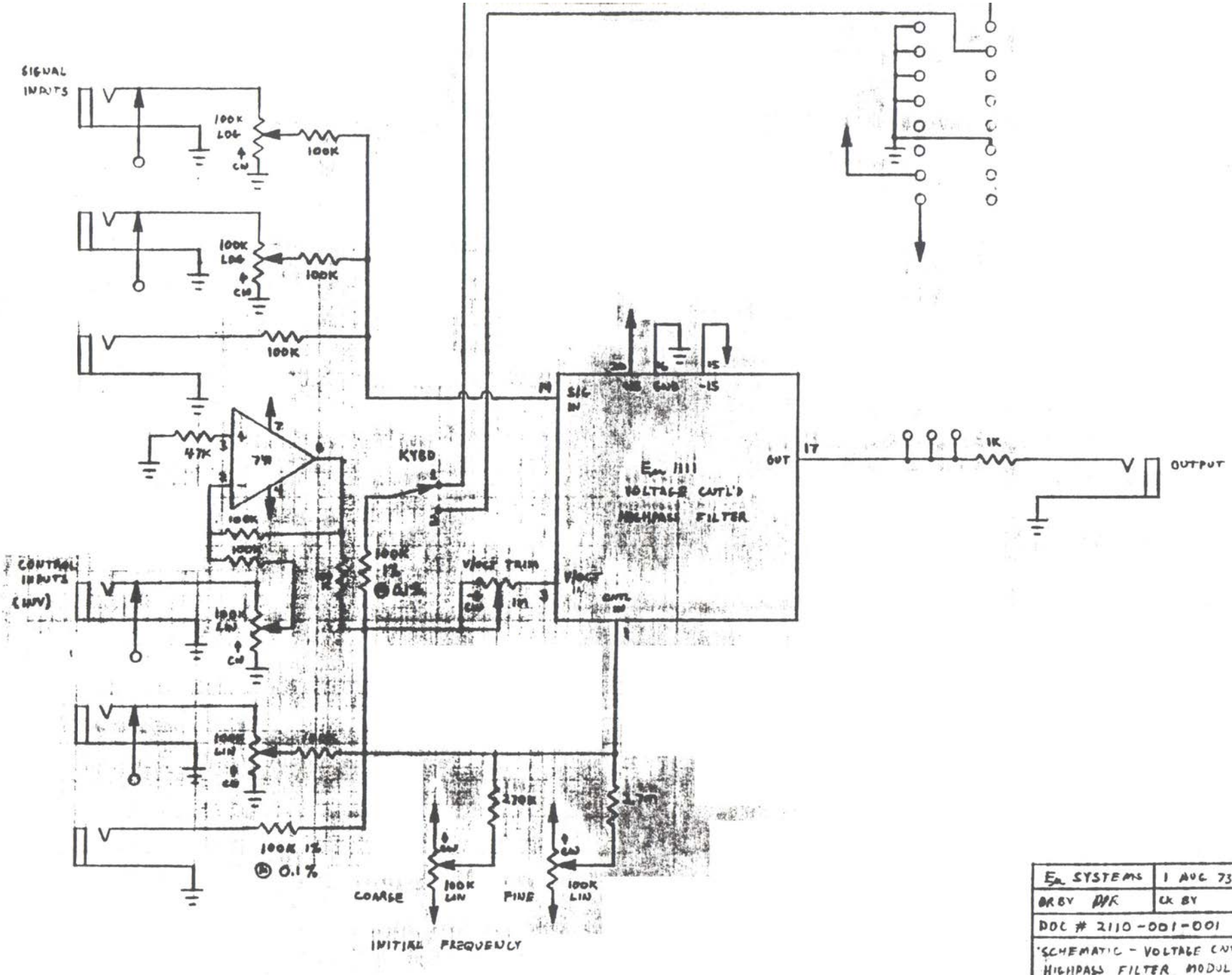
ALL DIODES BAND UP

CHECK ORIENTATION ON IC'S, DIODES AND TRANSISTORS

PROPRIETARY

E. SYSTEMS	25 MAR 74
DWN JM	CK III
DOC # 100-012-002	
AC EMBLY - VOLTAGE CNTLD	
LOW PASS FILTER SUBASSY	

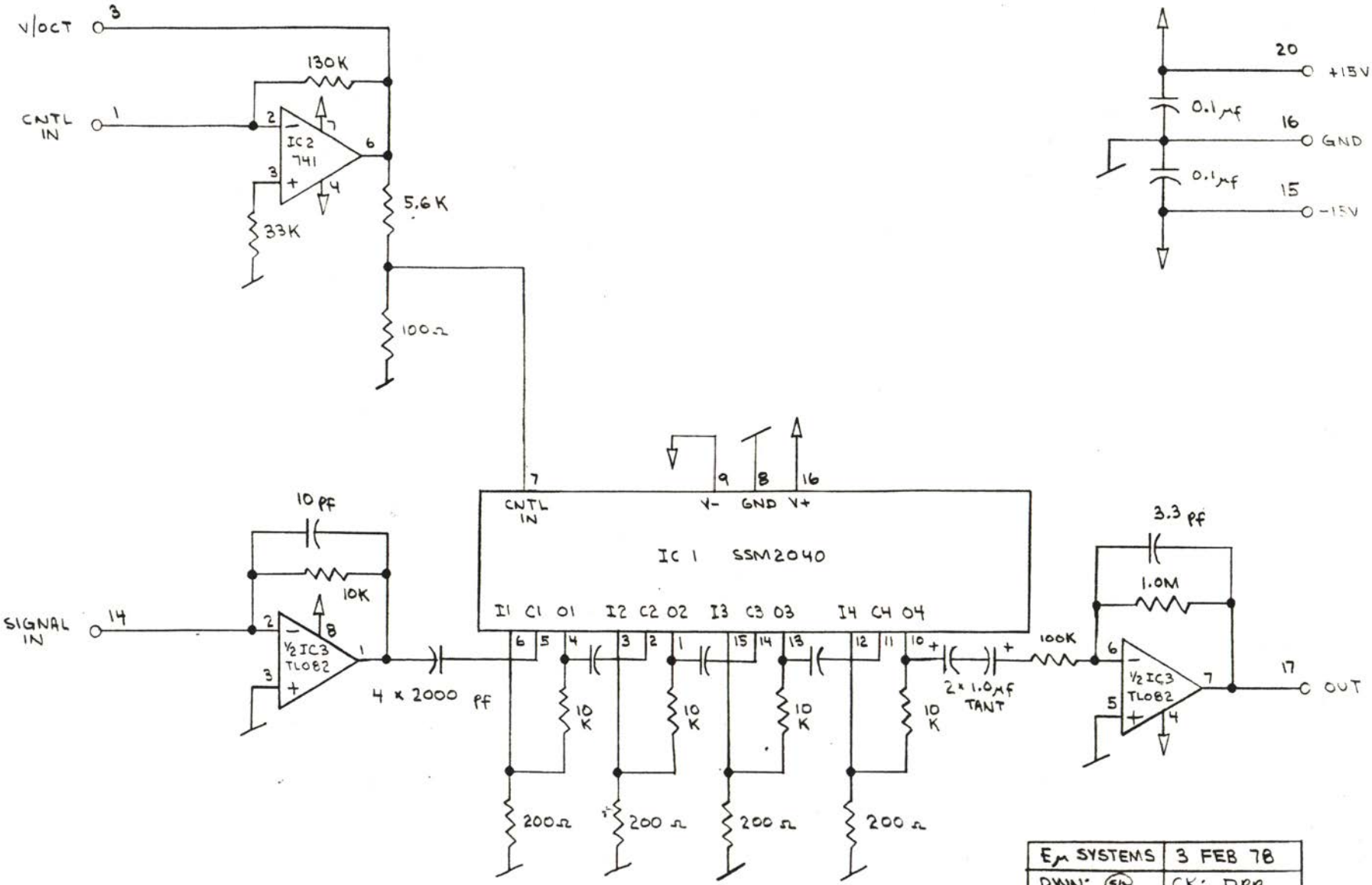
2110 HPF MODULE
1111 HPF SUB-MODULE



E SYSTEMS	1 AUG 73
DR BY DJK	CK BY
DOC # 2110-001-001	
SCHEMATIC - VOLTAGE CNTL'D HIGHPASS FILTER MODULE	

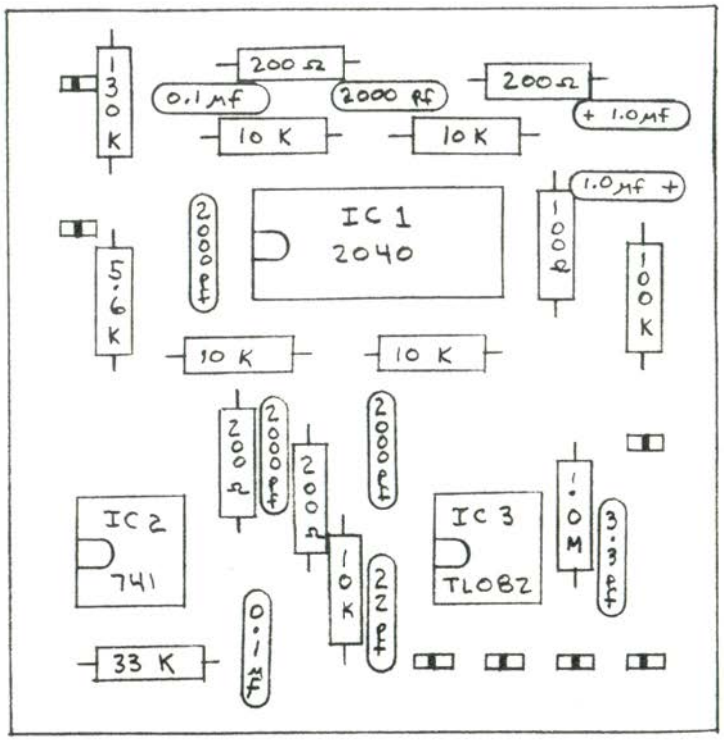
PARTS LIST - 2110 VCHPF MODULE

QTY	PART#	DESCRIPTION	NOTES
1	IL 1	741 GP OPAMP	
1	R 9	1.0K OHM	
1	R 30	47K OHM	
7	R 33	100K OHM	
1	R 39	270K OHM	
1	R 49	2.7M OHM	
2	RP 6	100K 1%	Matched
1	TR 7	1M TRIMMER	
4	P 1	100K LIN POT	
2	P 2	50K LOG POT	
1	SW 2	SPDT 3 POS	
7	CN 2	PHONE JACK	
1	CN 5	DIP SOCKET	
1	CN 9	DIP PLUG	
3	CN 12	ML BURN WIRE	
4	CN 13	FM BURN WIRE	
6	H 1	KNOB	
1	H 2	SPACER	
2	H 11	4-40X1/4 BH	
4	H 13	4-40X3/4 BH	
4	H 14	#4 LKWSHR	
4	H 15	4-40 NUT	
1	CB 28	VCHPF MOD CB	
1	PN 4	VCHPF PANEL	
1	1111	VCHPF SUBM	



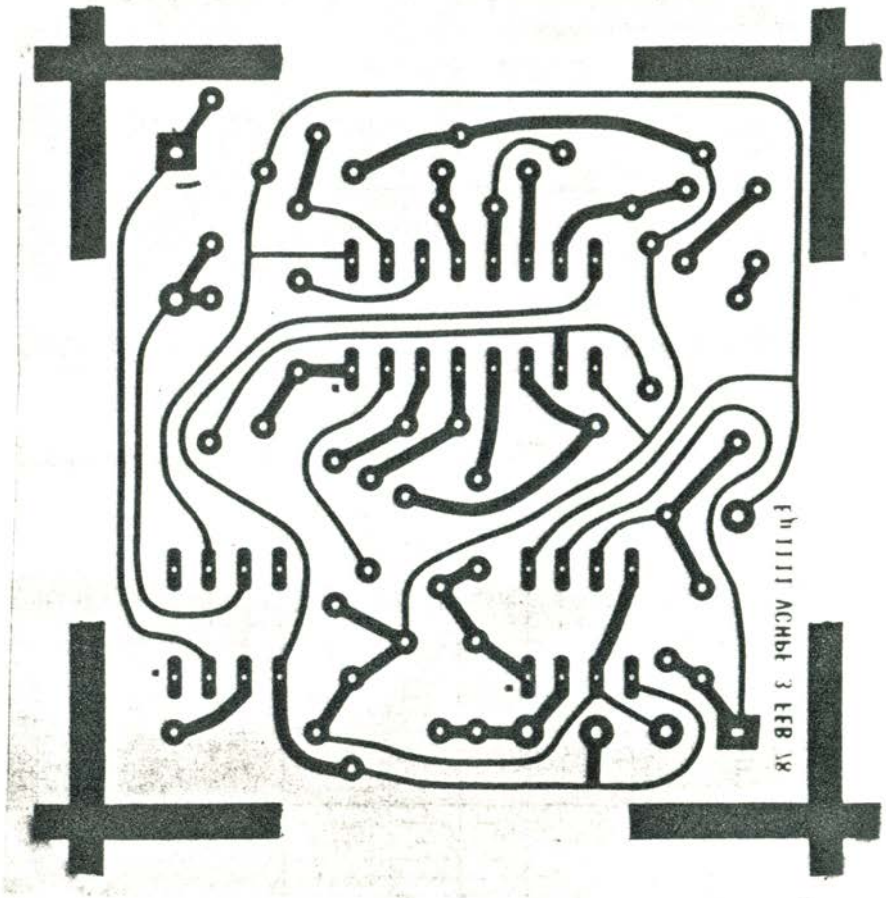
E♪ SYSTEMS	3 FEB 78
DWN: (ED)	CK: DPR
DOC Nº 1111-001-002	
SCHEMATIC ~ VC HIGHPASS FILTER SUBMODULE	

COMPONENT SIDE VIEWS



ELCO PIN

OBSERSE POLARITY ON 1.0 μf TANTALUM CAPS

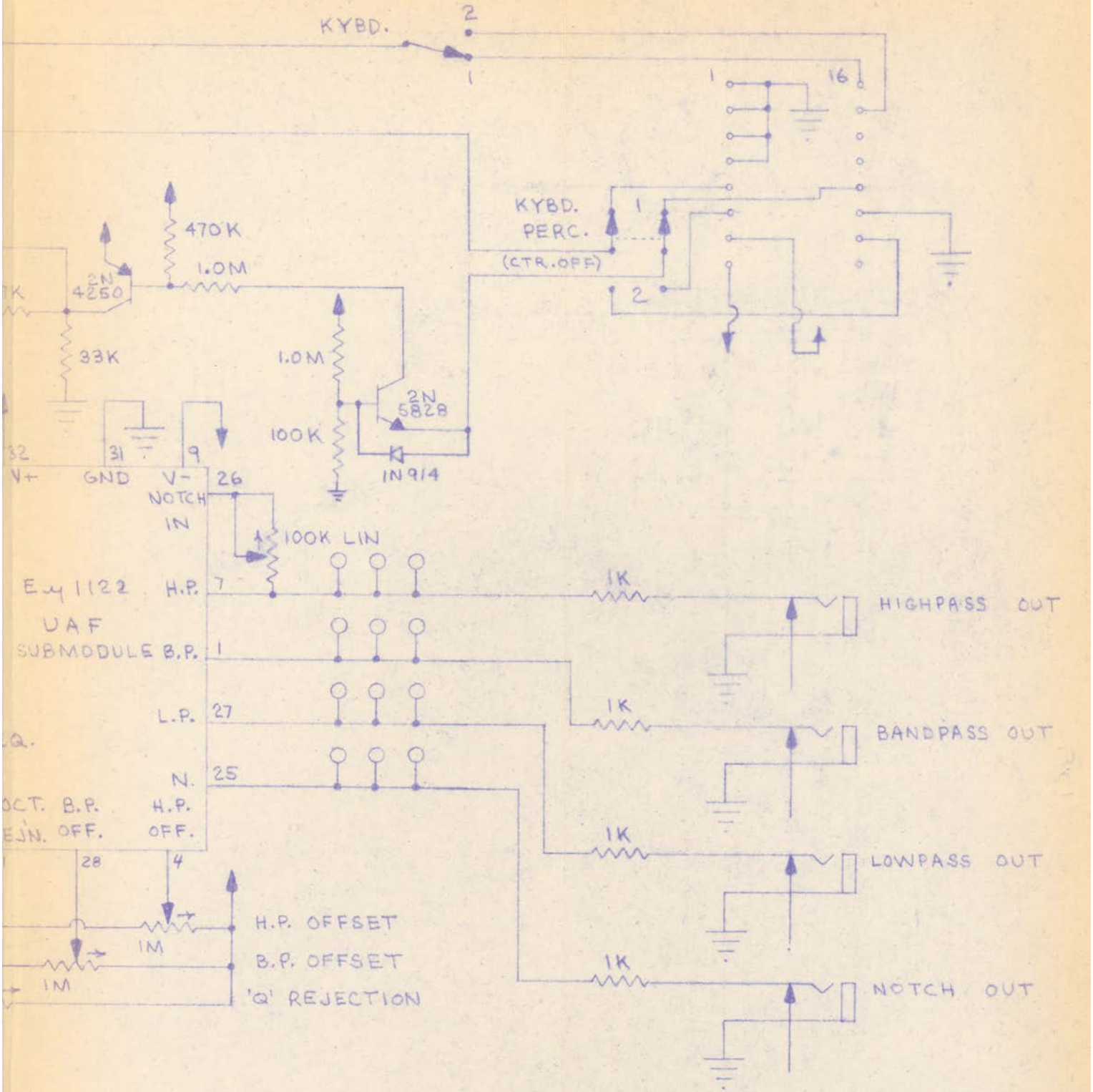


EM SYSTEMS	3 FEB 78
DWN: (GK)	CK: M
DOC # 1111 - 011 - 002	
ASSEMBLY DIAGRAM ~ VCHPF SUBMODULE	

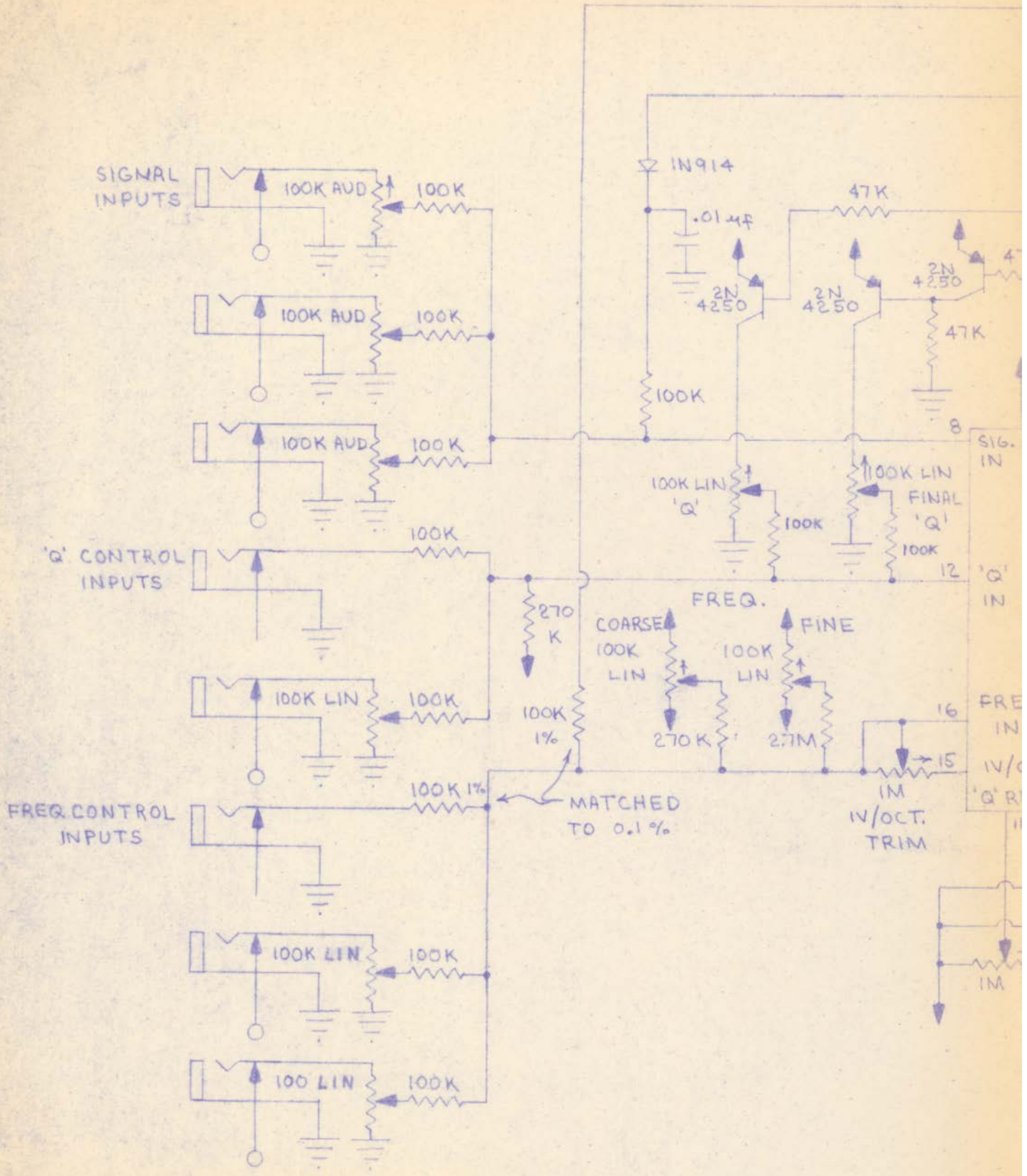
PARTS LIST - 1111 VCHPF SUBM

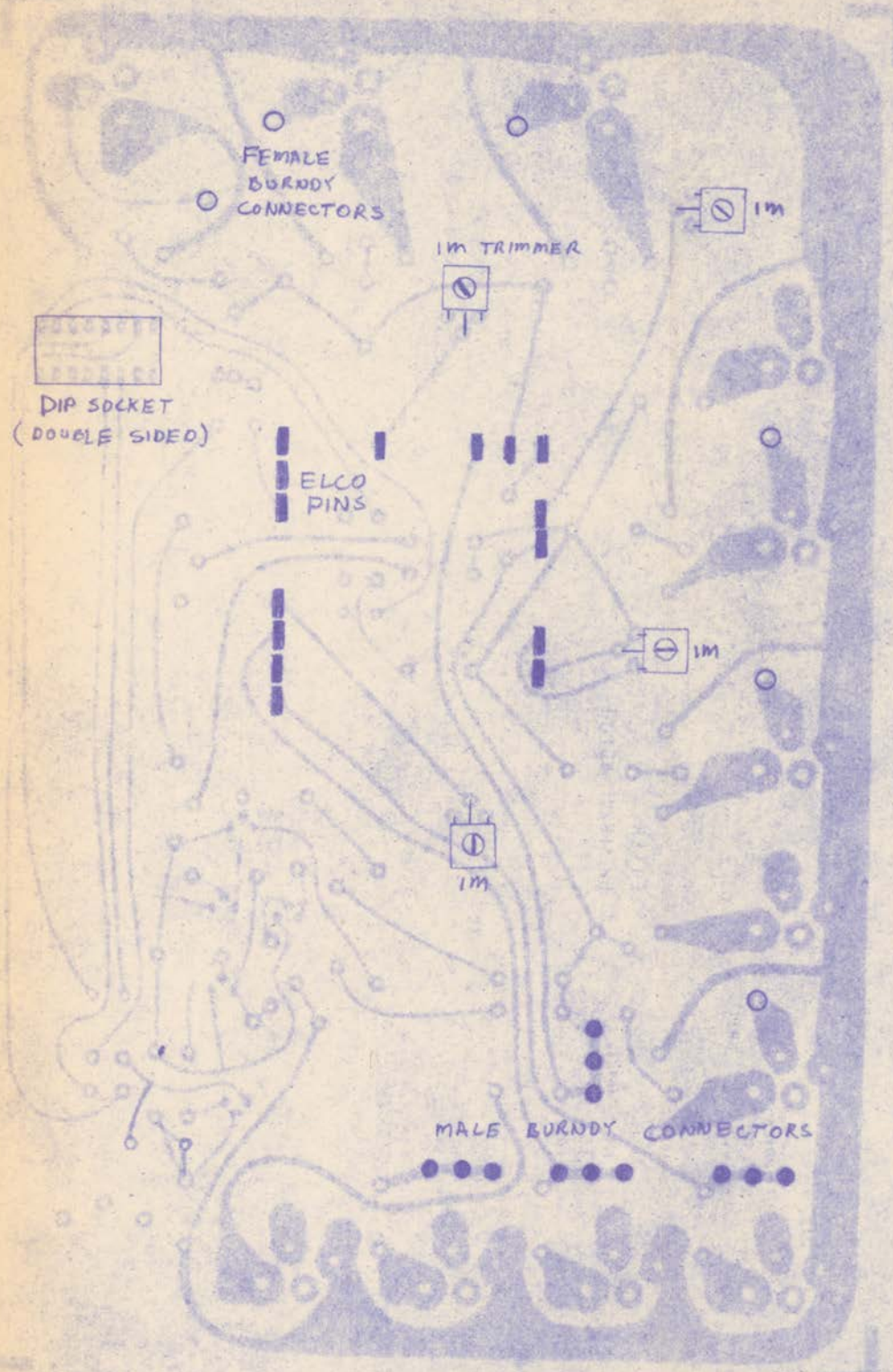
QTY	PART#	DESCRIPTION	NOTES
1	IL 1	741 GP OPAMP	
1	IL 15	2040 VCF	
1	IL 17	TL082 OPAMP	
1	C 1	3.3 PF CER	
1	C 4	22 PF CER	
4	C 10	2000 PF CER	
2	C 15	0.1 UF CER	
2	C 21	1.0 UF TANT	
1	R 2	100 OHM	
4	R 4	200 OHM	
1	R 18	5.6K OHM	
5	R 22	10K OHM	
1	R 28	33K OHM	
1	R 33	100K OHM	
1	R 35	130K OHM	
1	R 45	1.0M OHM	
14	CN 1	ELCO PIN	
1	CB 4	VCHPF SUBM C	

2120 UAF MODULE
1120/1122 UAF SUB-MODULE

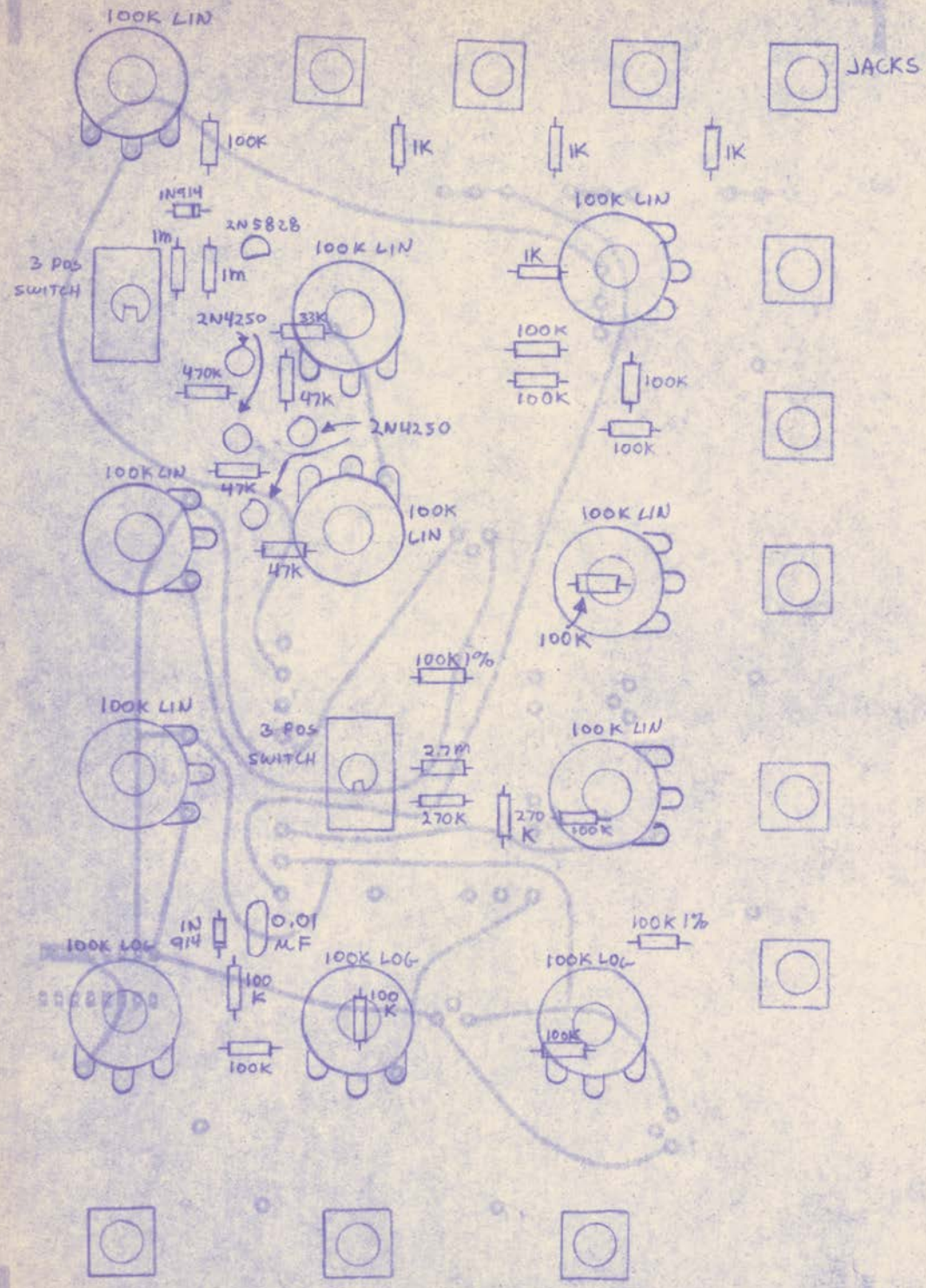


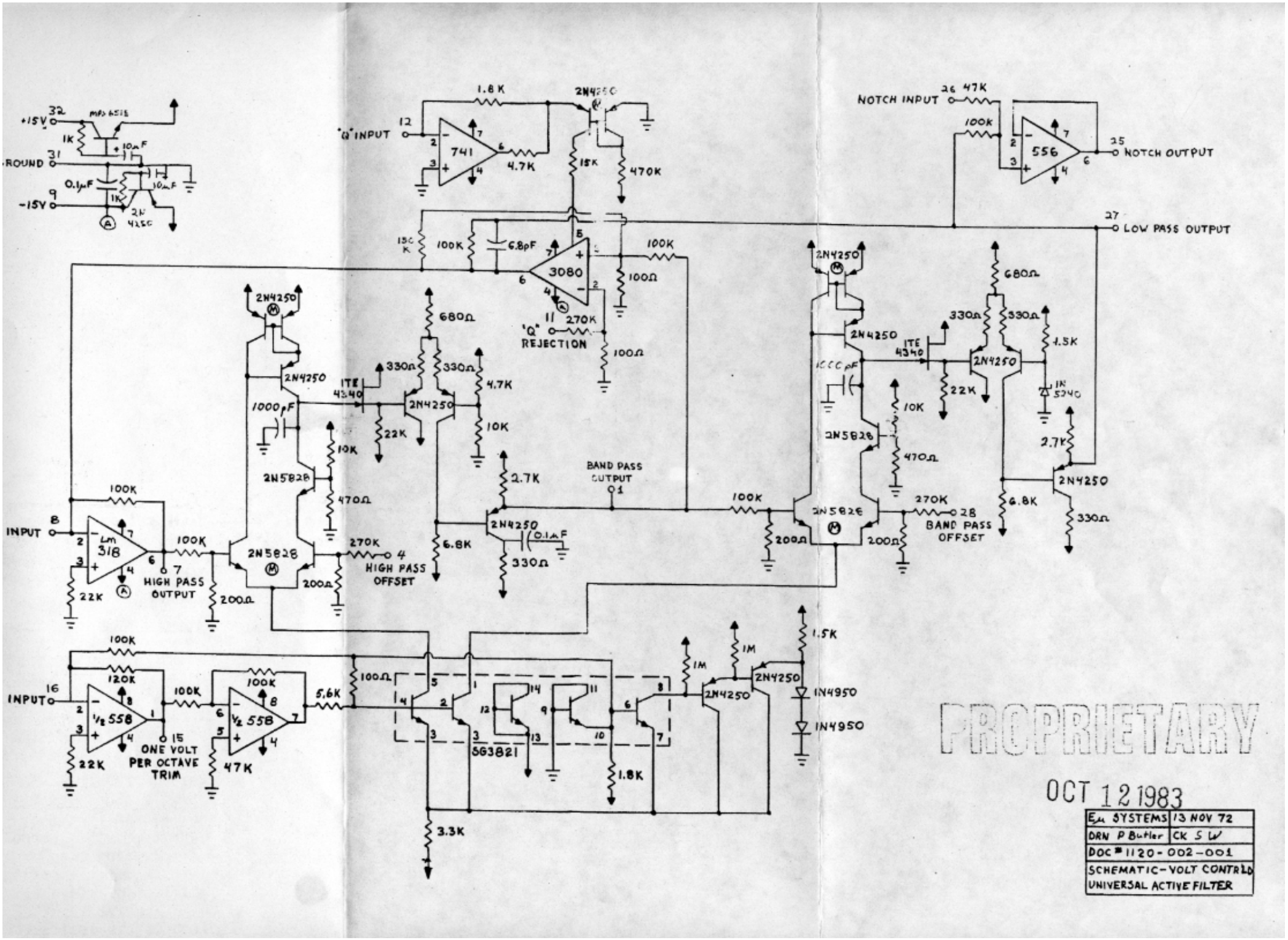
Ey SYSTEMS	DATE: 6-10-73
DWN. BY: ECR	CHK. BY: DPR
DOC. NO. 2120-001-003	
SCHEMATIC ~ UAF MODULE	

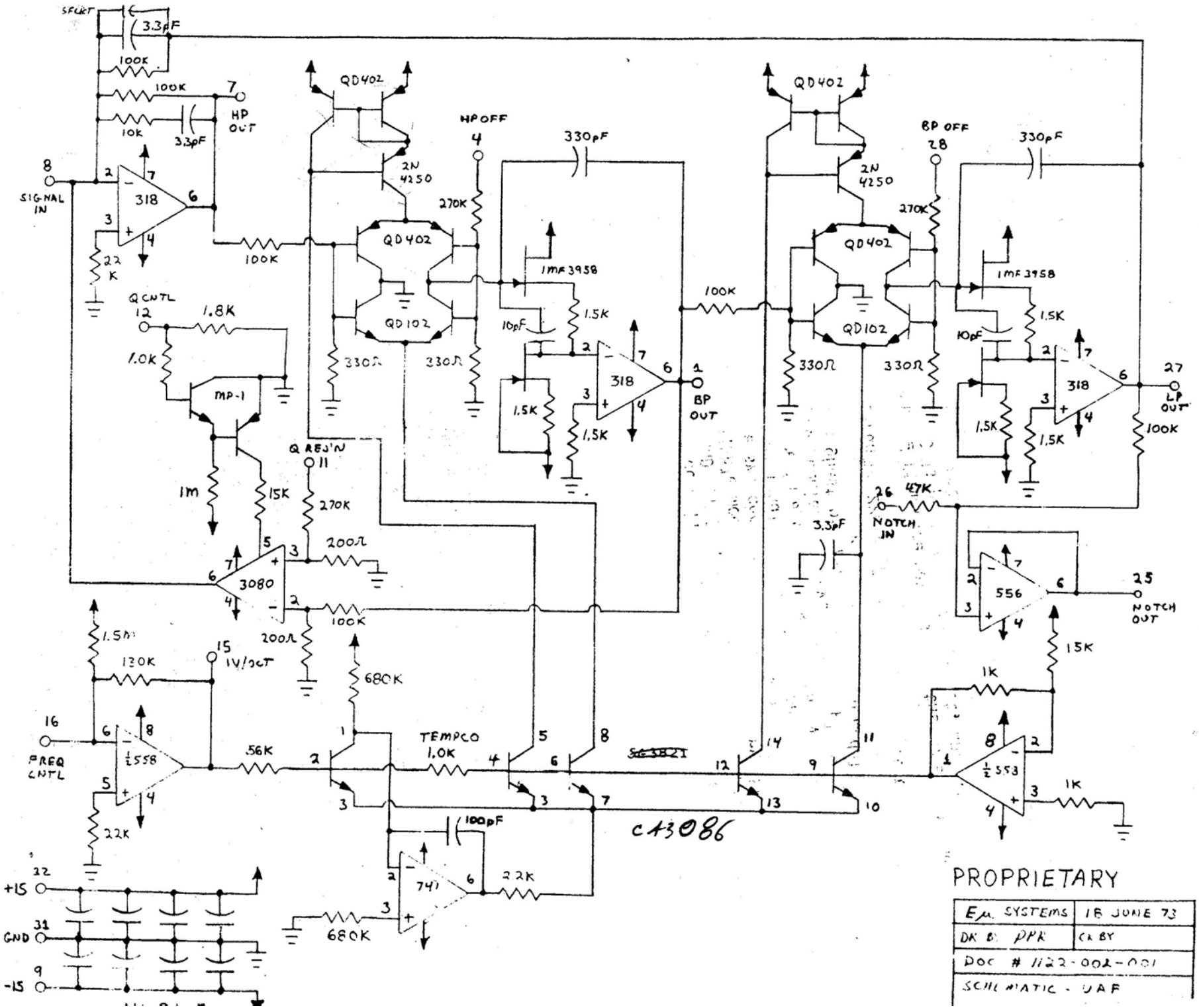

SIGNAL INPUTS
100K AUD
100K
100K AUD
100K
100K AUD
100K
'Q' CONTROL INPUTS
100K
100K LIN
100K
FREQ CONTROL INPUTS
100K 1%
100K LIN
100K
100 LIN
100K
IN914
.01 μf
47K
2N 4250
2N 4250
2N 4250
47K
100K
8
SIG. IN
100K LIN 'Q'
100K
100K LIN FINAL 'Q'
100K
12
'Q' IN
FREQ.
270 K
COARSE
100K LIN
FINE
100K LIN
100K 1%
270 K
2.7M
16
15
1M
IV/OCT. TRIM
MATCHED TO 0.1 %
1M



E.M. SYSTEMS	10 JUNE 75
DR BY DPR	CK BY
DOC # 2120-011-003	
ASSEMBLY - UNIVERSAL ACTIVE FILTER MODULE	


100K LIN
JACKS
100K
1K
1K
1K
1N914
2N5828
1m
1m
3 POS SWITCH
100K LIN
2N4250
33K
470K
47K
100K LIN
1K
100K
100K
100K
100K
2N4250
100K LIN
47K
100K LIN
47K
100K LIN
100K
100K 1%
100K LIN
3 POS SWITCH
27M
270K
100K LIN
270K
100K
1N914
0.01 MF
100K LOG
100K
100K
100K LOG
100K
100K 1%
100K LOG
100K

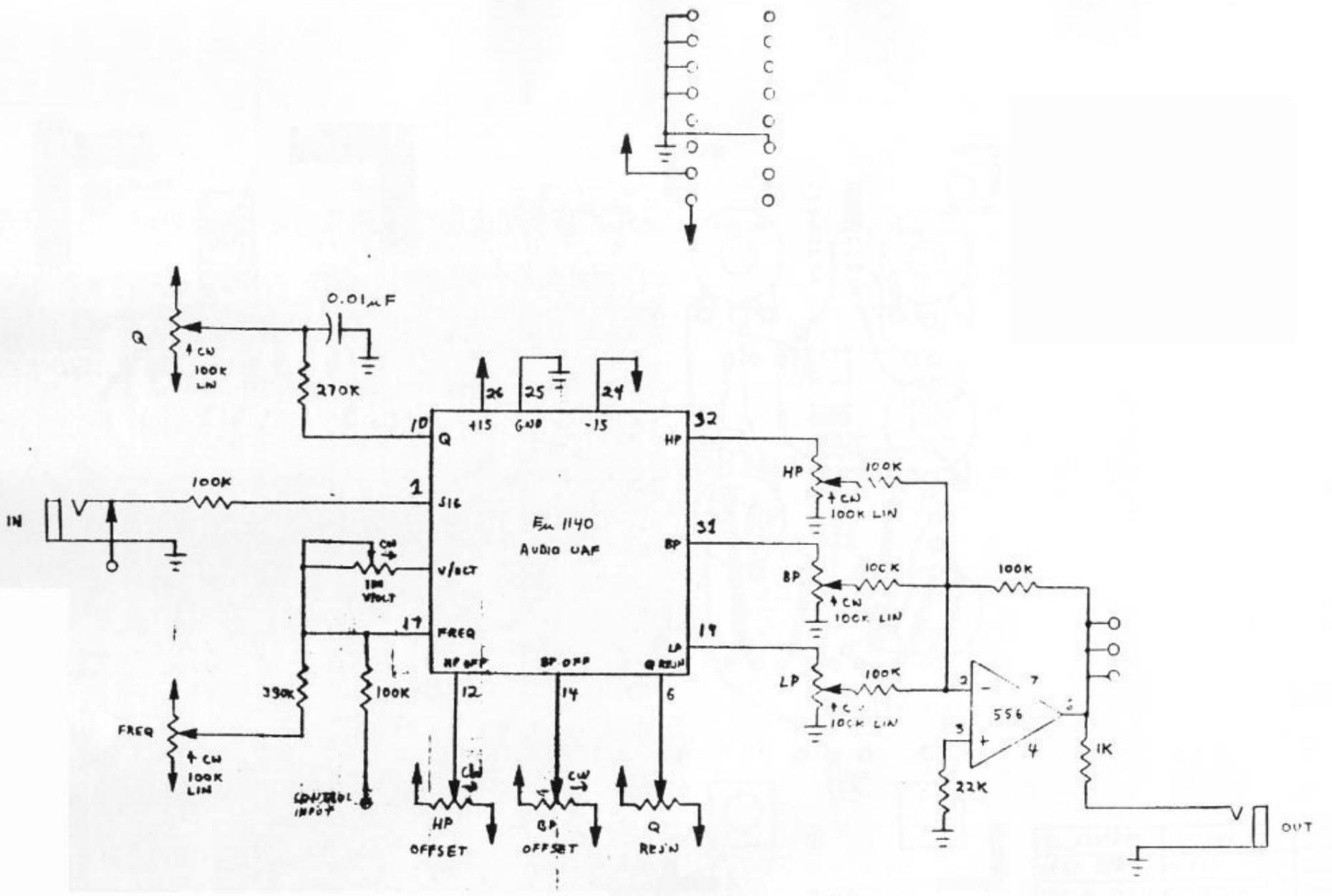

+15V
32
MPS A51S
1K
10μF
GROUND
31
0.1μF
1K
10μF
-15V
9
2N 4250
A
1.8K
2N4250
"Q" INPUT
12
741
4.7K
15K
470K
NOTCH INPUT
26
47K
100K
556
25
NOTCH OUTPUT
27
LOW PASS OUTPUT
150 K
100K
6.8pF
3080
100K
100Ω
11
270K
"Q" REJECTION
680Ω
330Ω
330Ω
4.7K
ITE 4340
2N4250
1000pF
22K
10K
2N5828
470Ω
2.7K
BAND PASS OUTPUT
1
100K
INPUT
8
LM 318
22K
100K
HIGH PASS OUTPUT
7
200Ω
270K
HIGH PASS OFFSET
4
6.8K
0.1μF
330Ω
2N4250
2N5828
100K
200Ω
270K
28
BAND PASS OFFSET
2N4250
680Ω
330Ω
330Ω
1.5K
ITE 4340
2N4250
1000 pF
22K
IN 5240
10K
2N5828
470Ω
2.7K
2N4250
6.8K
330Ω
100K
INPUT
16
120K
100K
1/2 558
22K
15
ONE VOLT PER OCTAVE TRIM
100K
1/2 558
47K
5.6K
100Ω
SG3821
1.8K
3.3K
1M
1M
2N4250
1.5K
IN4950
IN4950
PROPRIETARY
OCT 12 1983
Em SYSTEMS
13 NOV 72
DRN P Butler
CK S W
DOC # 1120-002-001
SCHEMATIC-VOLT CONTRLD
UNIVERSAL ACTIVE FILTER

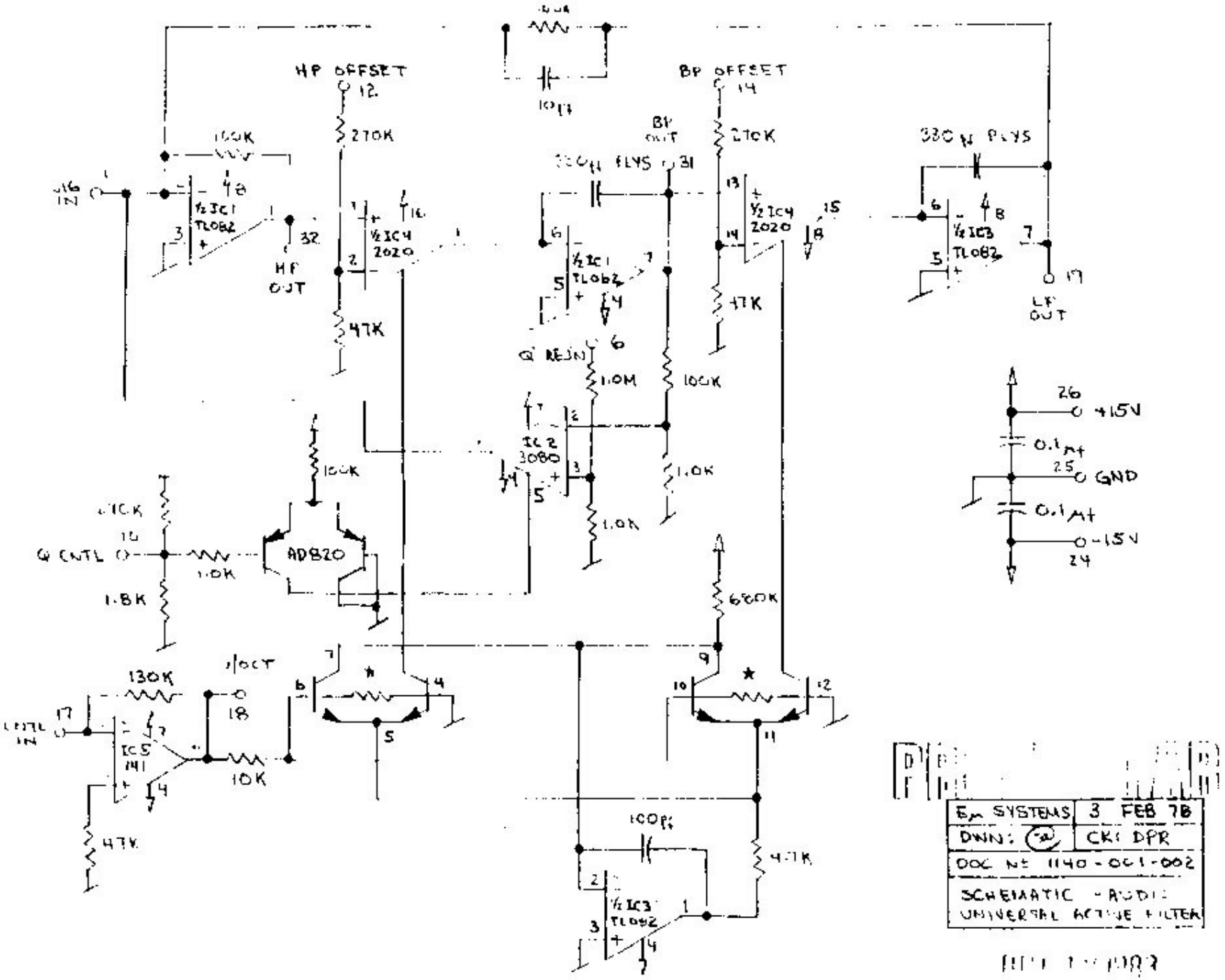


PROPRIETARY

Em. SYSTEMS	18 JUNE 73
DR BY PPR	CK BY
DOC # 1122-002-001	
SCHEMATIC - VAF	

2140 RF MODULE
1140 AUAF SUB-MODULE


0.01μF
Q
4 CW
100K
LIN
270K
10
Q
26
+15
25
GND
24
-15
32
HP
1
SIG
IN
100K
Em 1140
AUDIO UAF
31
BP
CW
1M
V/OCT
17
FREQ
19
LP
REJN
HP OFF
BP OFF
390K
100K
12
14
6
FREQ
4 CW
100K
LIN
CONTROL
INPUT
CW
HP
OFFSET
BP
OFFSET
Q
REJN
HP
100K
4 CW
100K LIN
BP
100K
4 CW
100K LIN
100K
LP
100K
4 CW
100K LIN
2
3
556
7
4
1K
22K
OUT
Em SYSTEMS
14 NOV 73
DOC # 2140-001-00

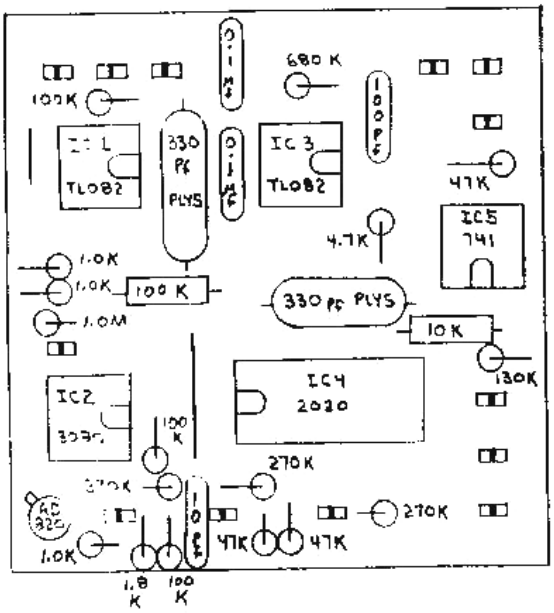


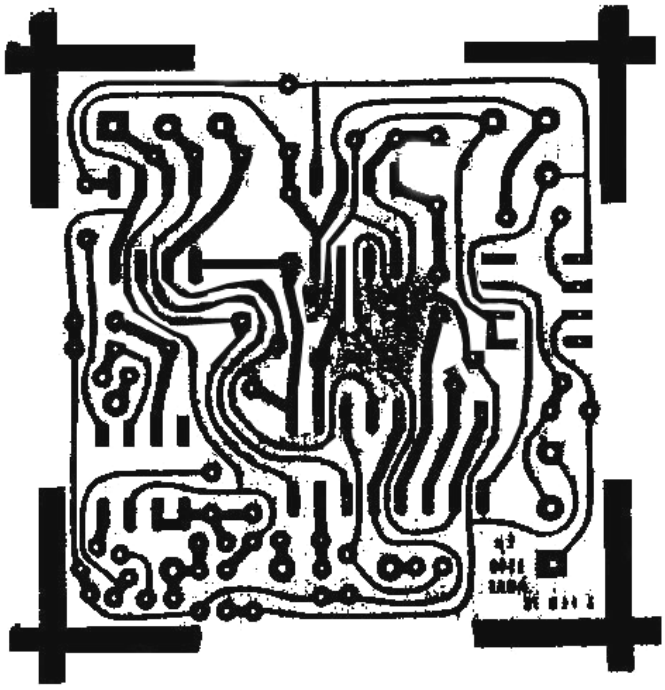
E-M SYSTEMS	3 FEB 78
DWN: [illegible]	CK: DPR
DOC NO 1140-001-002	
SCHEMATIC - AUDIO UNIVERSAL ACTIVE FILTER	

[illegible]

★ [illegible] SSM2020 (IC 4)

COMPONENT SIDE VIEWS



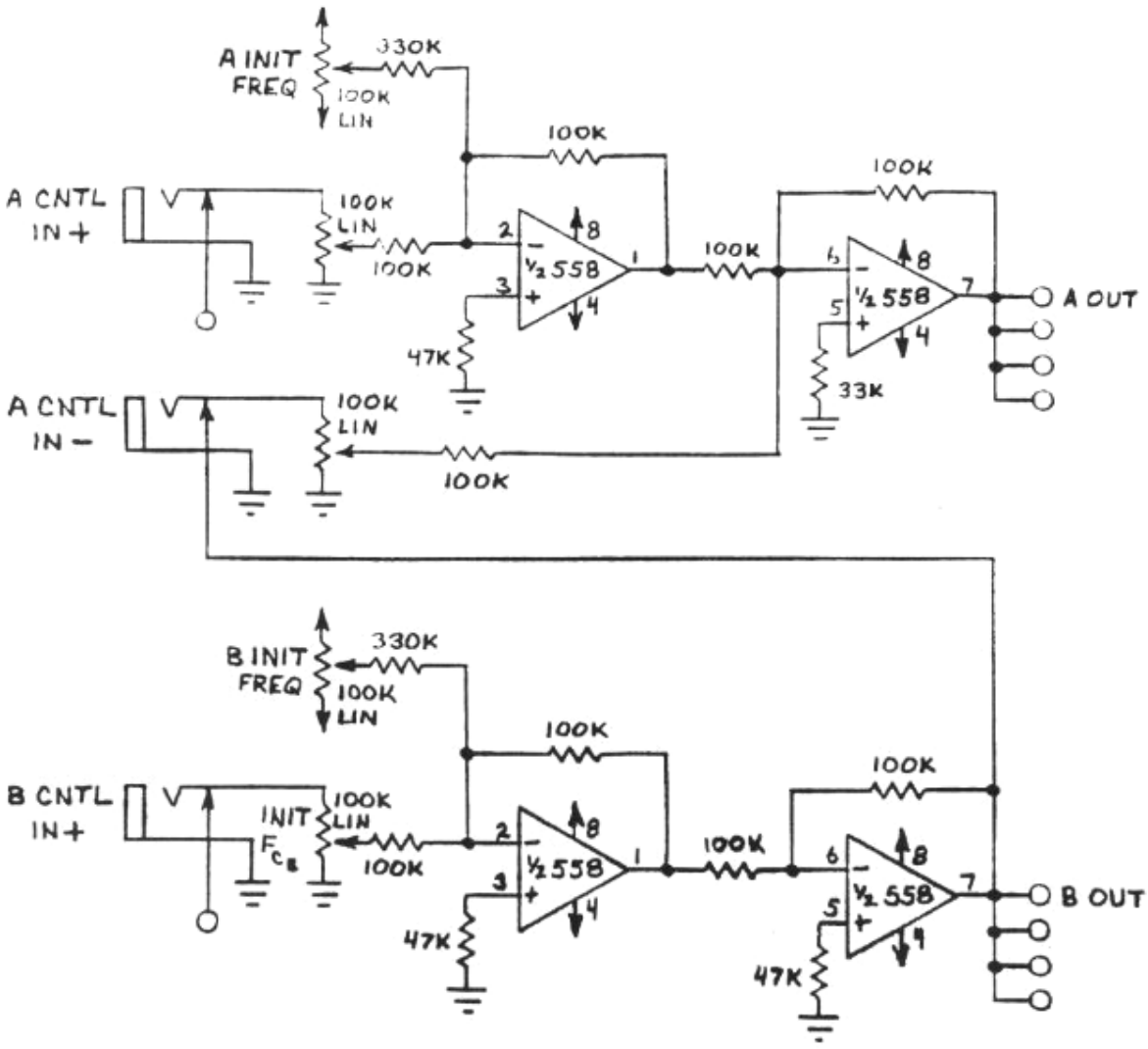


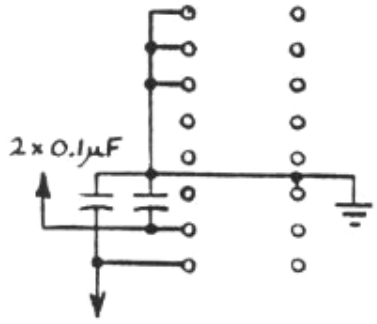
ELCO PIN

DO NOT INSTALL 330 PF PLYS CAPS UNTIL AFTER DEGREASE

EM SYSTEMS	3 FEB 78
DWN:	CK:
DOC # 1145-211-002	
ASSEMBLY DIAGRAM — AUAP SUBMODULE	

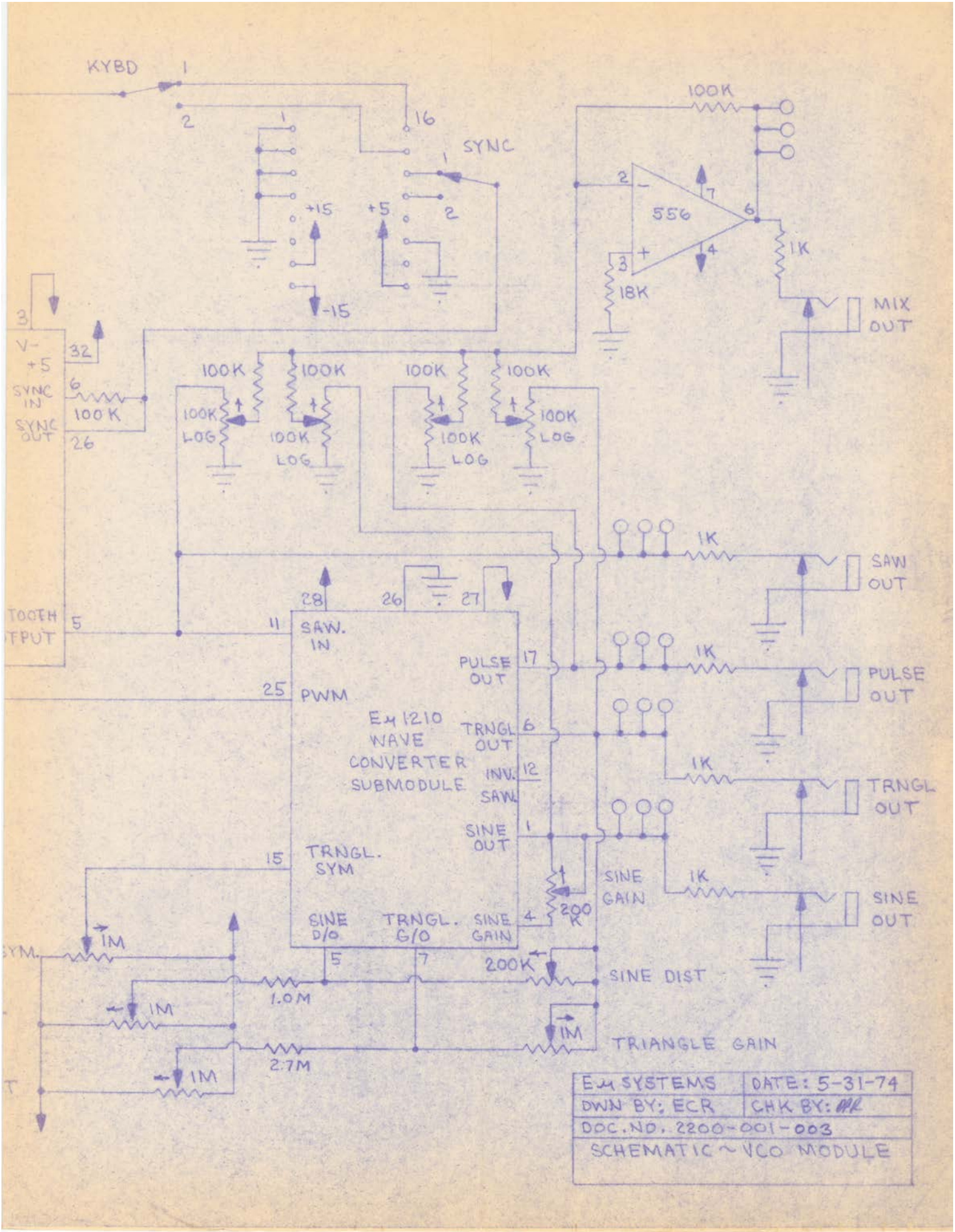
2145 RFC MODULE



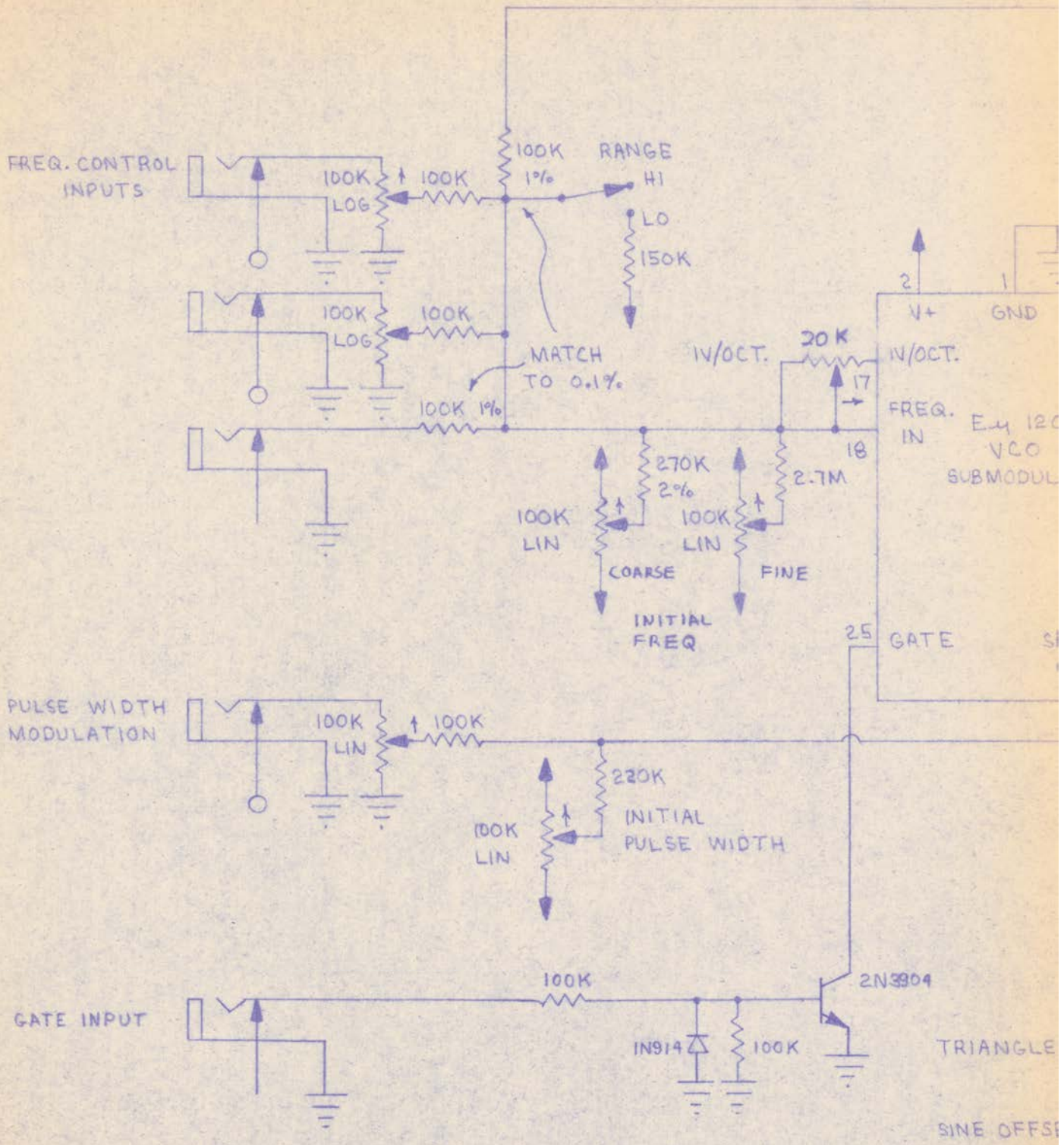


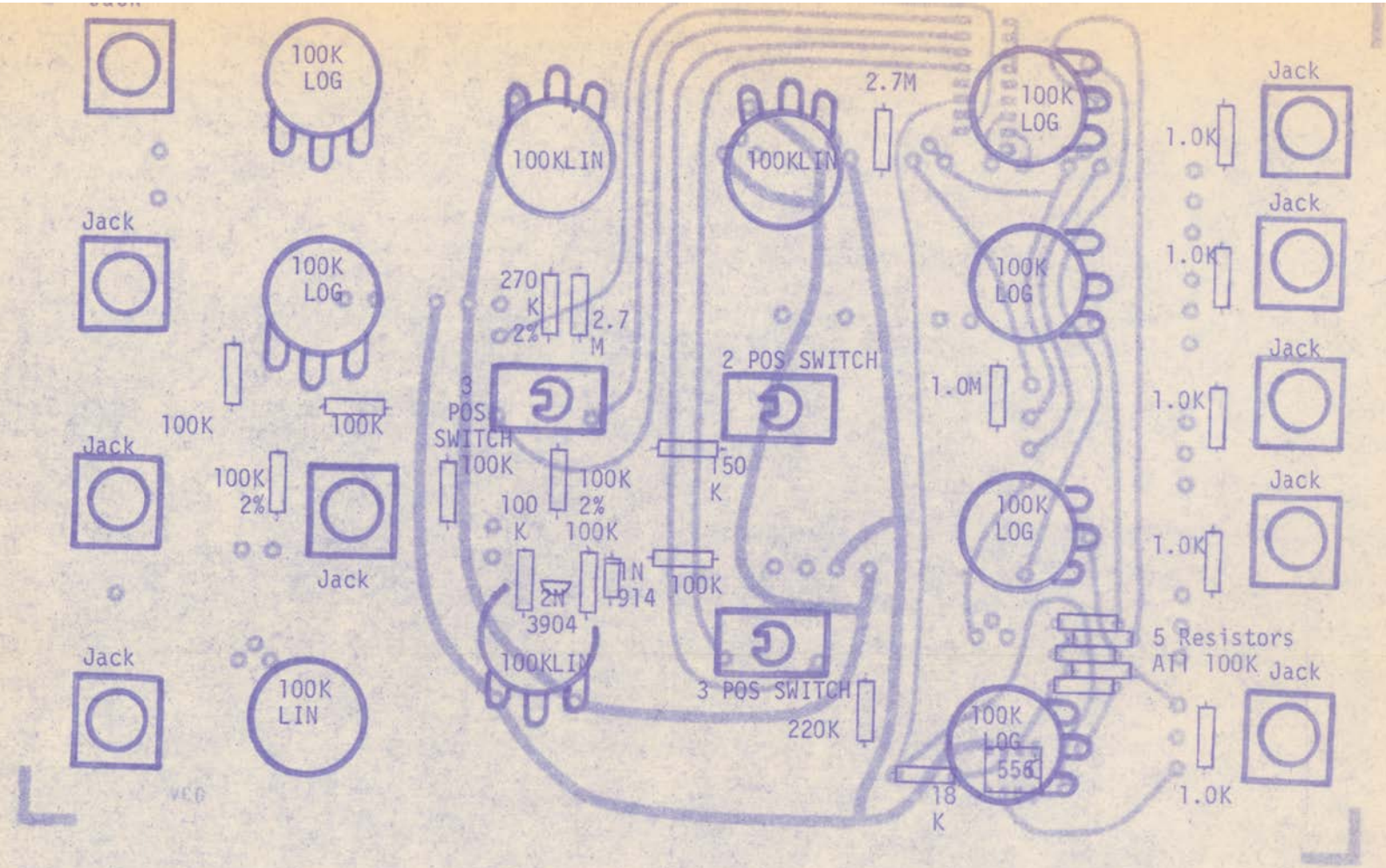
Em SYSTEMS	23 MAR 76
DWN PJB	
DOC # 2145-001-001	
SCHEMATIC – FILTER CONTROLLER MODULE	

2200 VCO MODULE
1201 VCO SUB-MODULE
1210 WAVE CONVERTER



EM SYSTEMS	DATE: 5-31-74
DWN BY: ECR	CHK BY: AR
DOC. NO. 2200-001-003	
SCHEMATIC ~ VCO MODULE	


FREQ. CONTROL INPUTS
100K LOG
100K
100K
1%
RANGE
HI
LO
150K
100K LOG
100K
MATCH TO 0.1%
100K 1%
1V/OCT.
20 K
1V/OCT.
17
FREQ. IN
18
2
V+
1
GND
270K 2%
2.7M
100K LIN
100K LIN
COARSE
FINE
INITIAL FREQ
25
GATE
PULSE WIDTH MODULATION
100K LIN
100K
220K
100K LIN
INITIAL PULSE WIDTH
GATE INPUT
100K
2N3904
IN914
100K
TRIANGLE
SINE OFFS
TRIANGLE OFFS

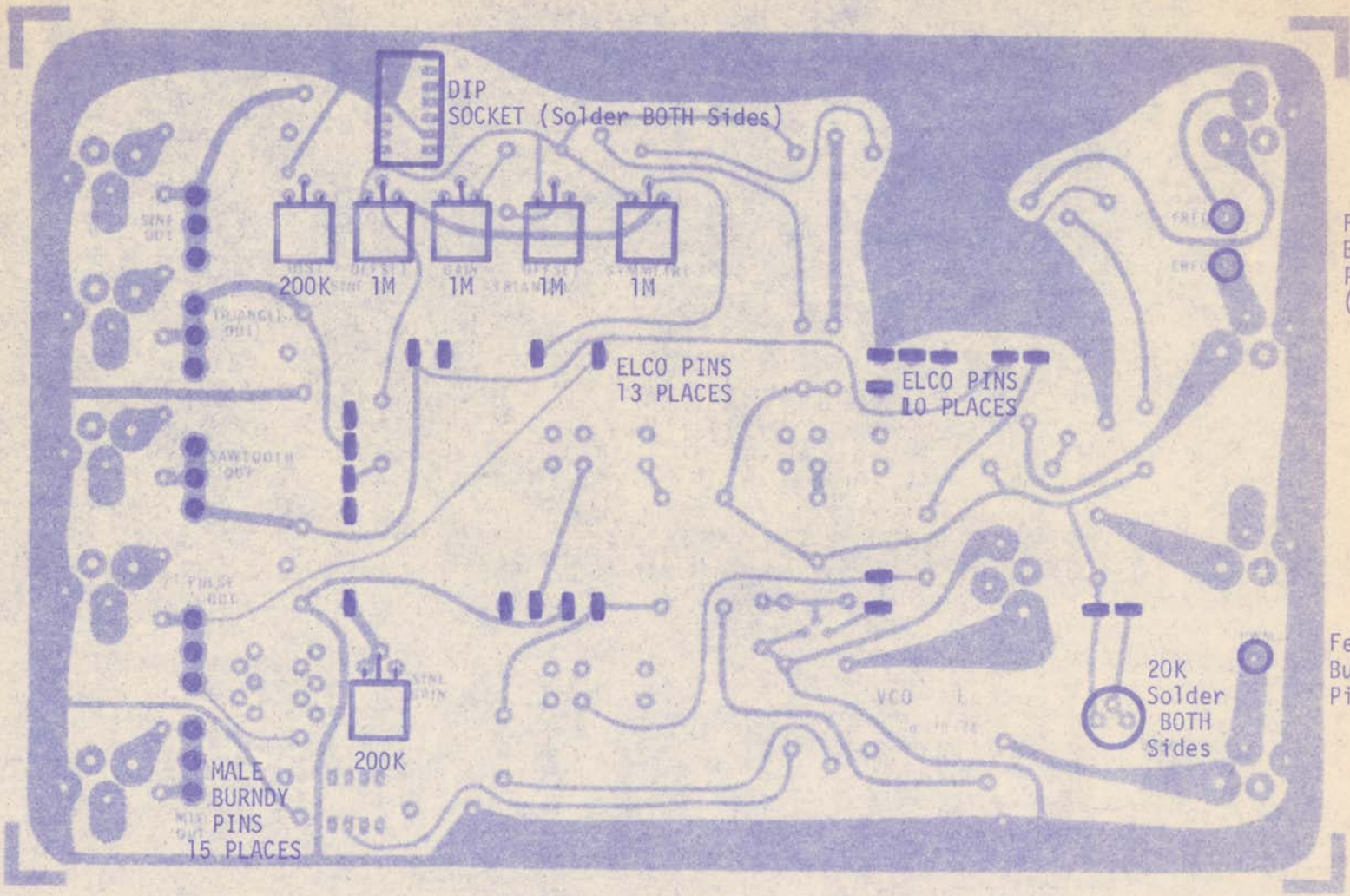


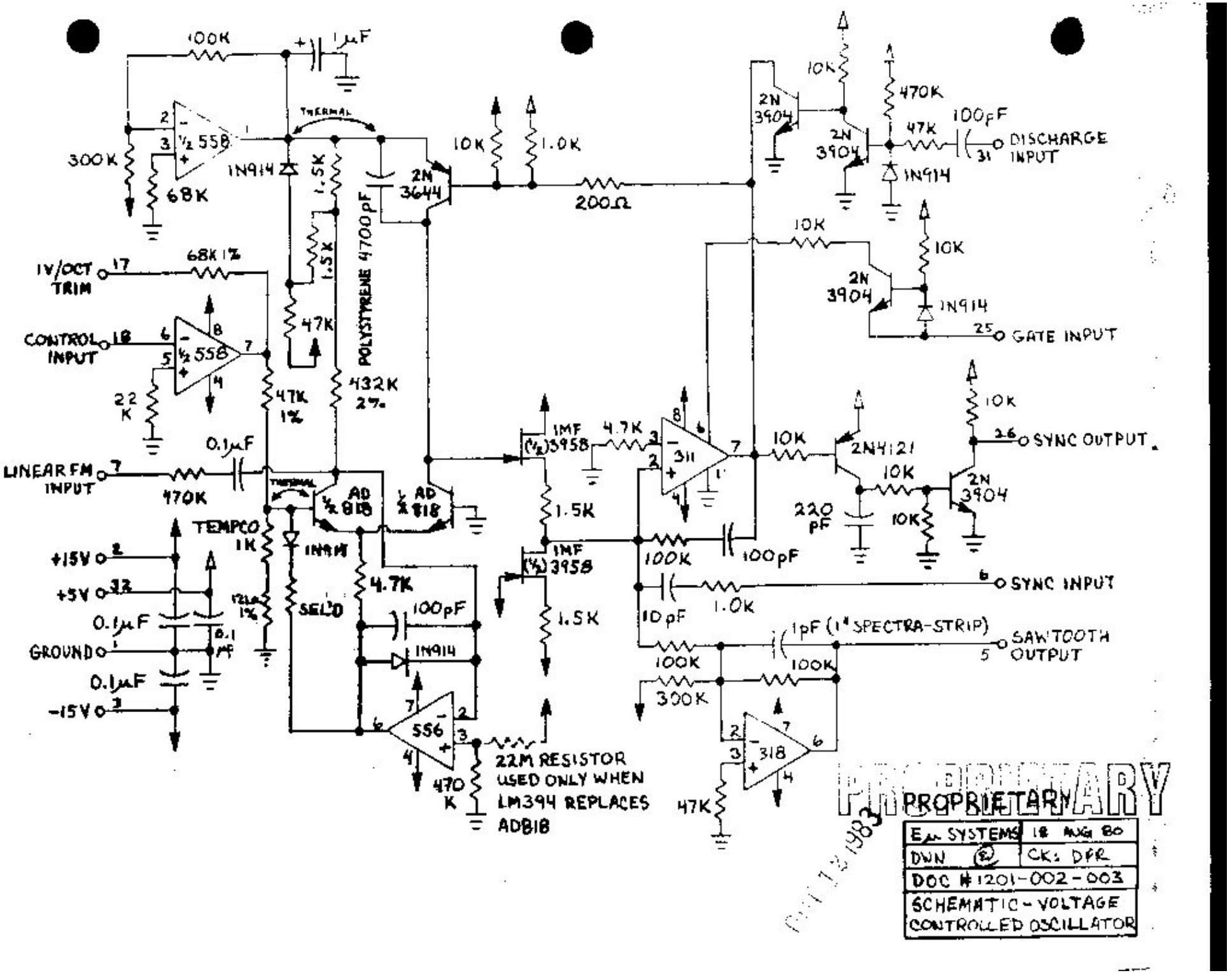
Eμ SYSTEMS 31 MAY 74

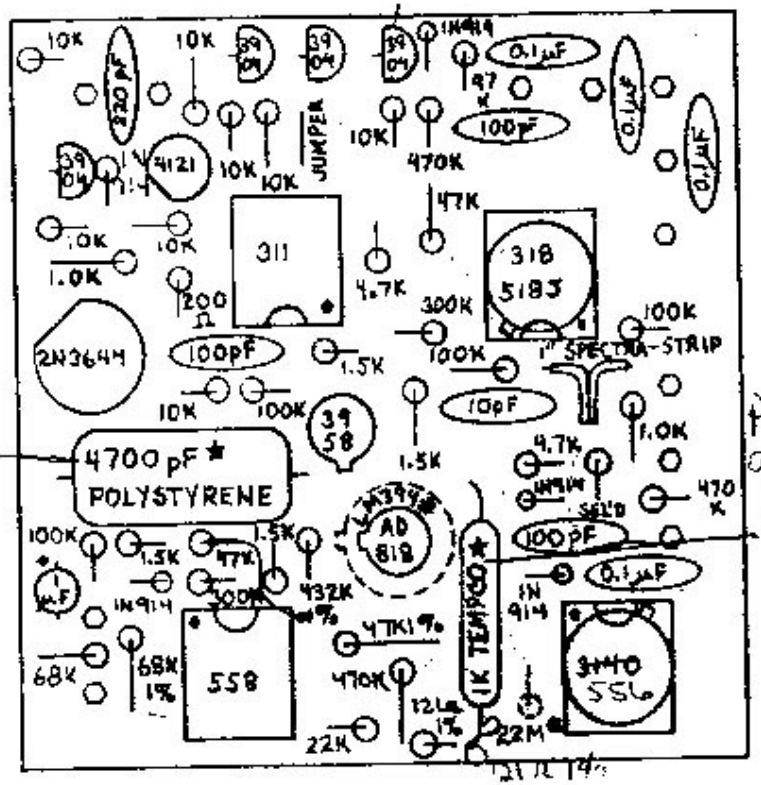
Dwn: DPR Ck:

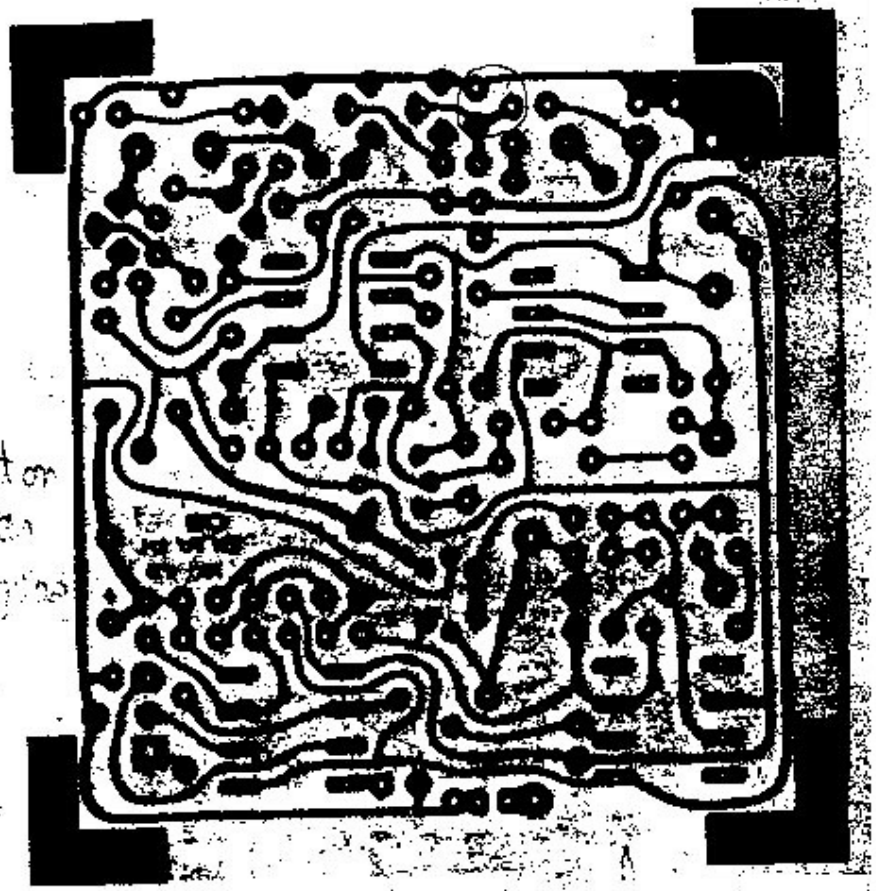
Doc.# 2200-011-002

Assy: Voltage Controlled Oscillator Module


DIP
SOCKET (Solder BOTH Sides)
200K
1M
1M
1M
1M
ELCO PINS
13 PLACES
ELCO PINS
10 PLACES
Female
Burndy
Pins
(2)
20K
Solder
BOTH
Sides
Female
Burndy
Pin
200K
MALE
BURNDY
PINS
15 PLACES


100K
1μF
300K
68K
½ 558
1N914
1.5K
1.5K
47K
POLYSTYRENE 4700pF
2N 3644
10K
1.0K
200Ω
2N 3904
10K
470K
47K
100pF
DISCHARGE INPUT
31
1N914
10K
10K
2N 3904
1N914
25
GATE INPUT
1V/OCT TRIM
17
68K 1%
CONTROL INPUT
18
½ 558
22 K
47K 1%
432K 2%
0.1μF
LINEAR FM INPUT
7
470K
THERMAL
½ AD 818
½ AD 818
TEMPCO 1K
1N914
SELD
12.4K 1%
+15V
2
+5V
32
0.1μF
0.1 μF
GROUND
1
0.1μF
-15V
3
1MF (½)3958
4.7K
311
10K
2N4121
10K
2N 3904
26
SYNC OUTPUT
220 pF
10K
1.5K
100K
100pF
1MF (½)3958
1.5K
6
SYNC INPUT
1.0K
10 pF
1pF (1" SPECTRA-STRIP)
5
SAWTOOTH OUTPUT
4.7K
100pF
1N914
556
470 K
22M RESISTOR USED ONLY WHEN LM394 REPLACES AD818
100K
300K
100K
318
47K
PROPRIETARY
E.M. SYSTEMS
18 AUG 80
DWN
CK: DFR
DOC # 1201-002-003
SCHEMATIC - VOLTAGE CONTROLLED OSCILLATOR





○ ARE ELCO PINS MOUNTED ↔ mount last

ALL DIODES MOUNT BAND UP (IN914)

★ INSTALL POLYSTYRENE CAP AND TEMPCO RES. AFTER DEGREASING.

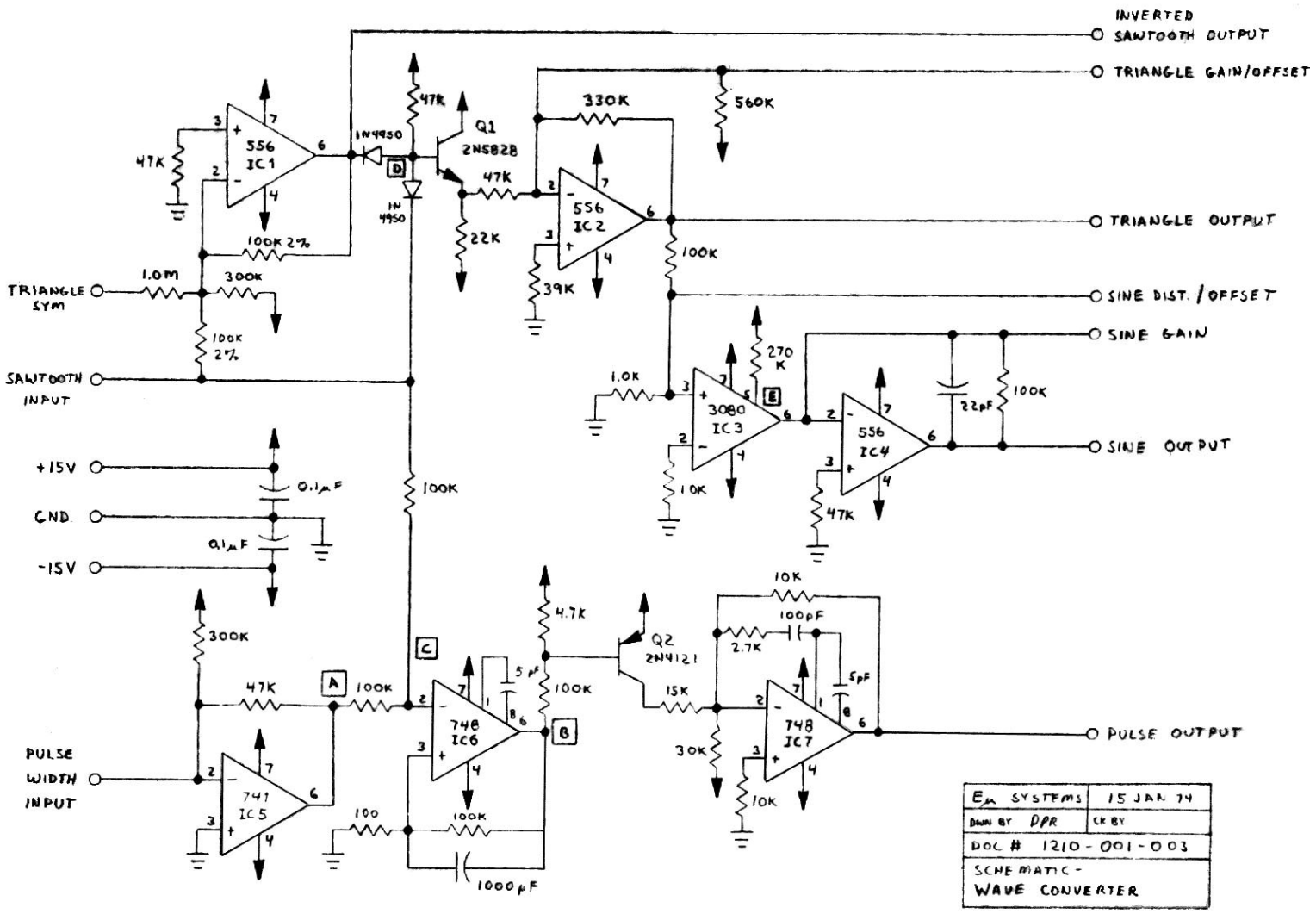
* 22M USED ONLY IF LM399 REPLACES AD818. IF 22M NOT USED, FILL HOLES WITH SOLDER.

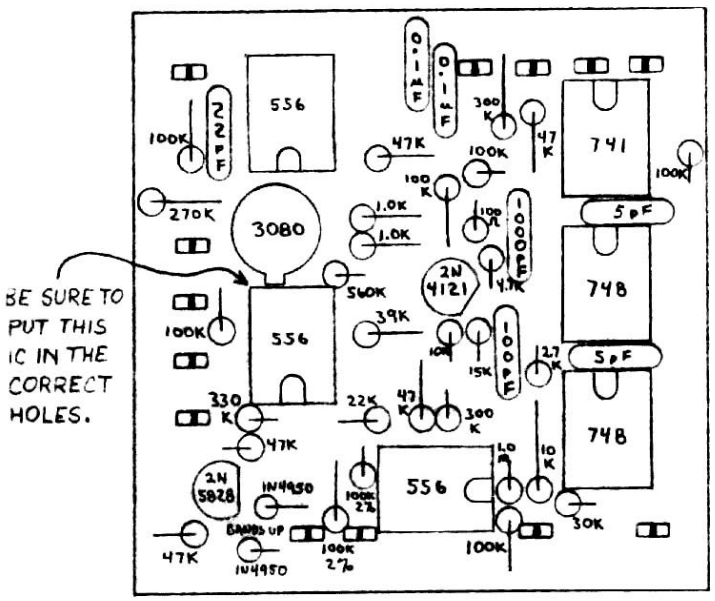
CHECK ORIENTATION OF IC'S, DIODES, TRANSISTORS.

PROPRIETARY

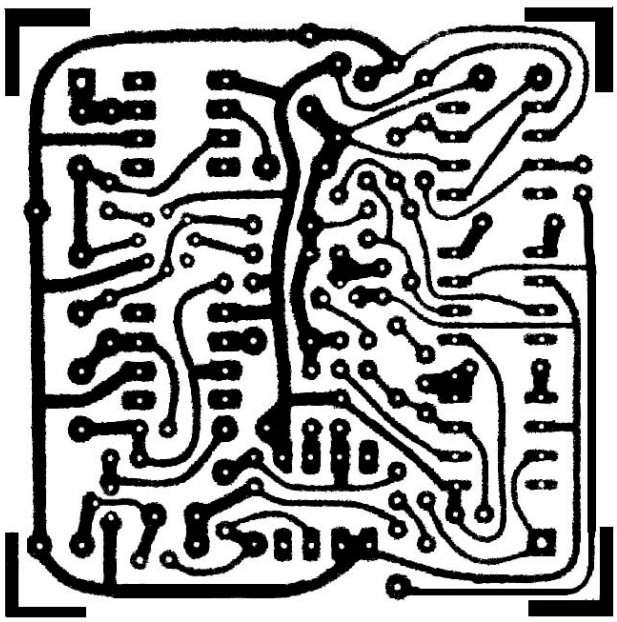
TO BE USED FOR BOARDS NUMBERED 857 AND UP

E.M. SYSTEMS	28 AUG 80
DWN (S)	CK: DPR
DOC #1201-012-003	
ASSEMBLY DIAGRAM V.C. OSCILLATOR	





BE SURE TO PUT THIS IC IN THE CORRECT HOLES.

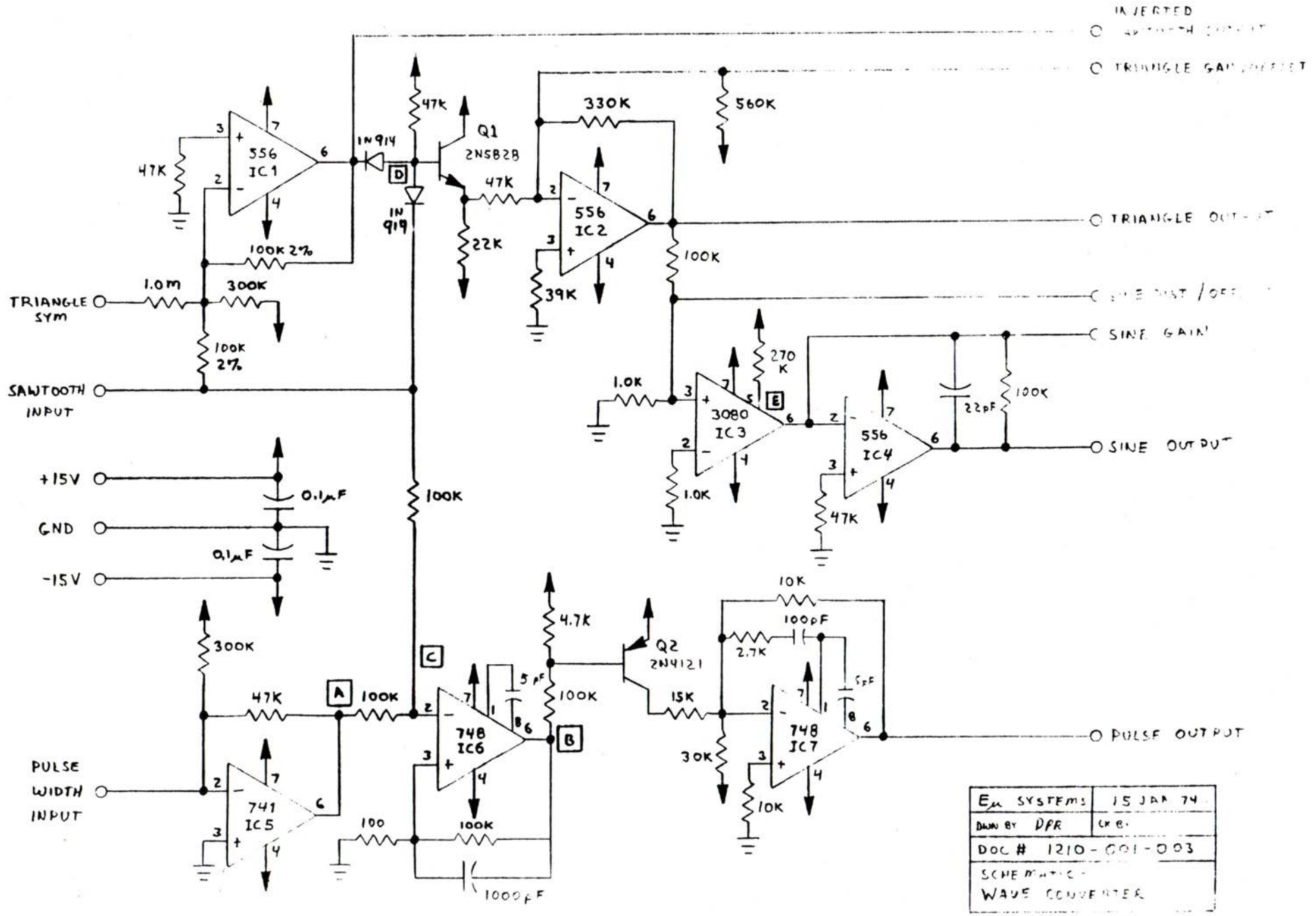


ELCO PIN

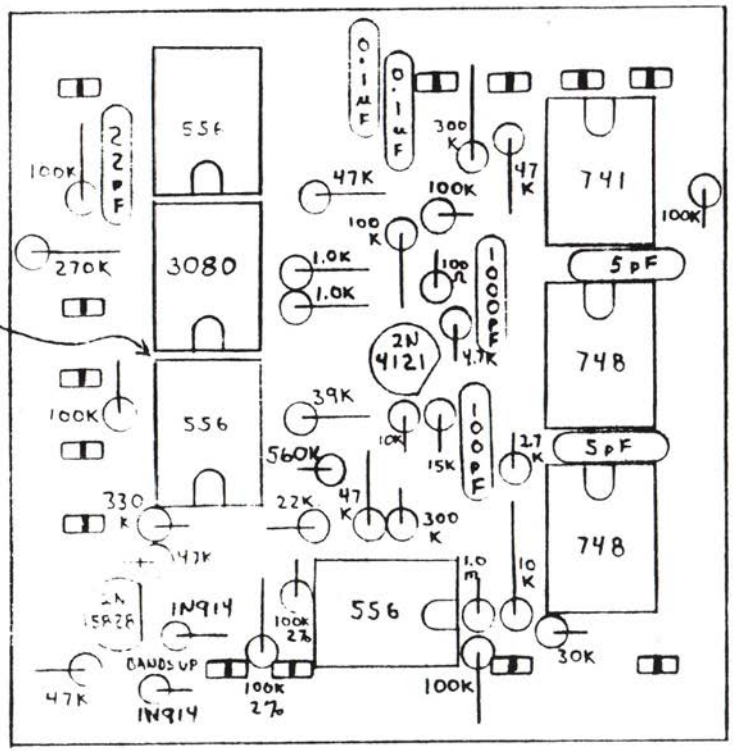
ALL DIODES MOUNTED BAND UP:

CHECK ORIENTATION ON IC'S AND DIODES

COMPONENT SIDE VIEWS


INVERTED
TRIANGLE GAIN
TRIANGLE OUTPUT
SINE GAIN
SINE OUTPUT
PULSE OUTPUT
TRIANGLE SYM
SAWTOOTH INPUT
PULSE WIDTH INPUT
+15V
GND
-15V
556 IC1
556 IC2
3080 IC3
556 IC4
741 IC5
748 IC6
748 IC7
Q1 2N5828
Q2 2N4121
IN914
IN 919
47K
330K
560K
100K 2%
1.0m
300K
100K 2%
22K
39K
100K
1.0K
270 K
22pF
0.1μF
0.1μF
4.7K
5 pF
10K
100pF
2.7K
15K
30K
10K
5pF
100
1000pF
A
B
C
D
E
Em SYSTEMS
15 JAN 74
DRAWN BY DFR
DOC # 1210-001-003
SCHEMATIC - WAVE CONVERTER

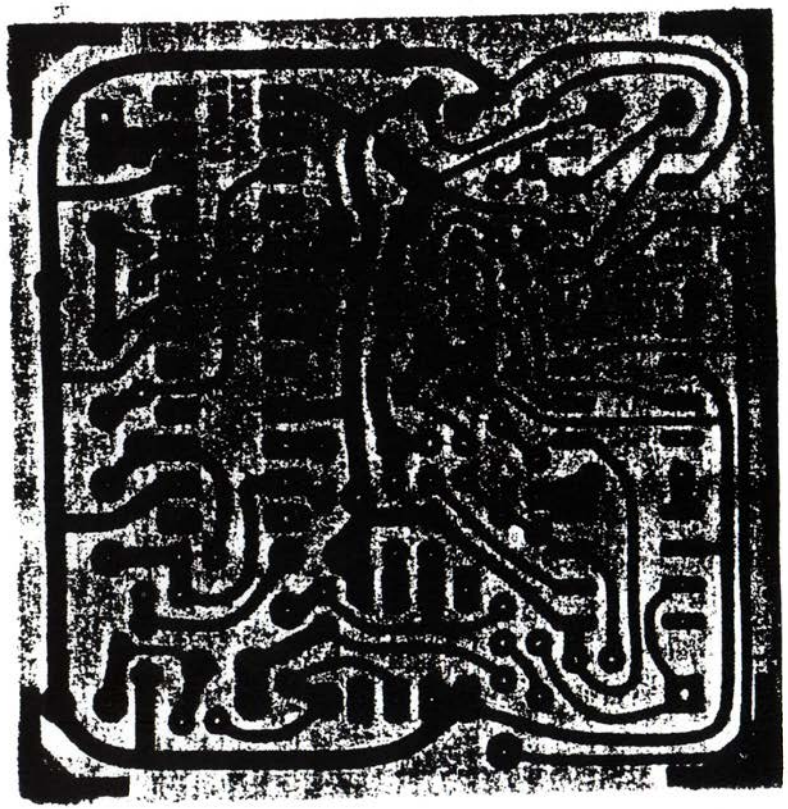
COMPONENT SIDE VIEWS



ELCO PIN

ALL DIODES MOUNTED BAND UP:

CHECK ORIENTATION OF IC'S AND DIODES

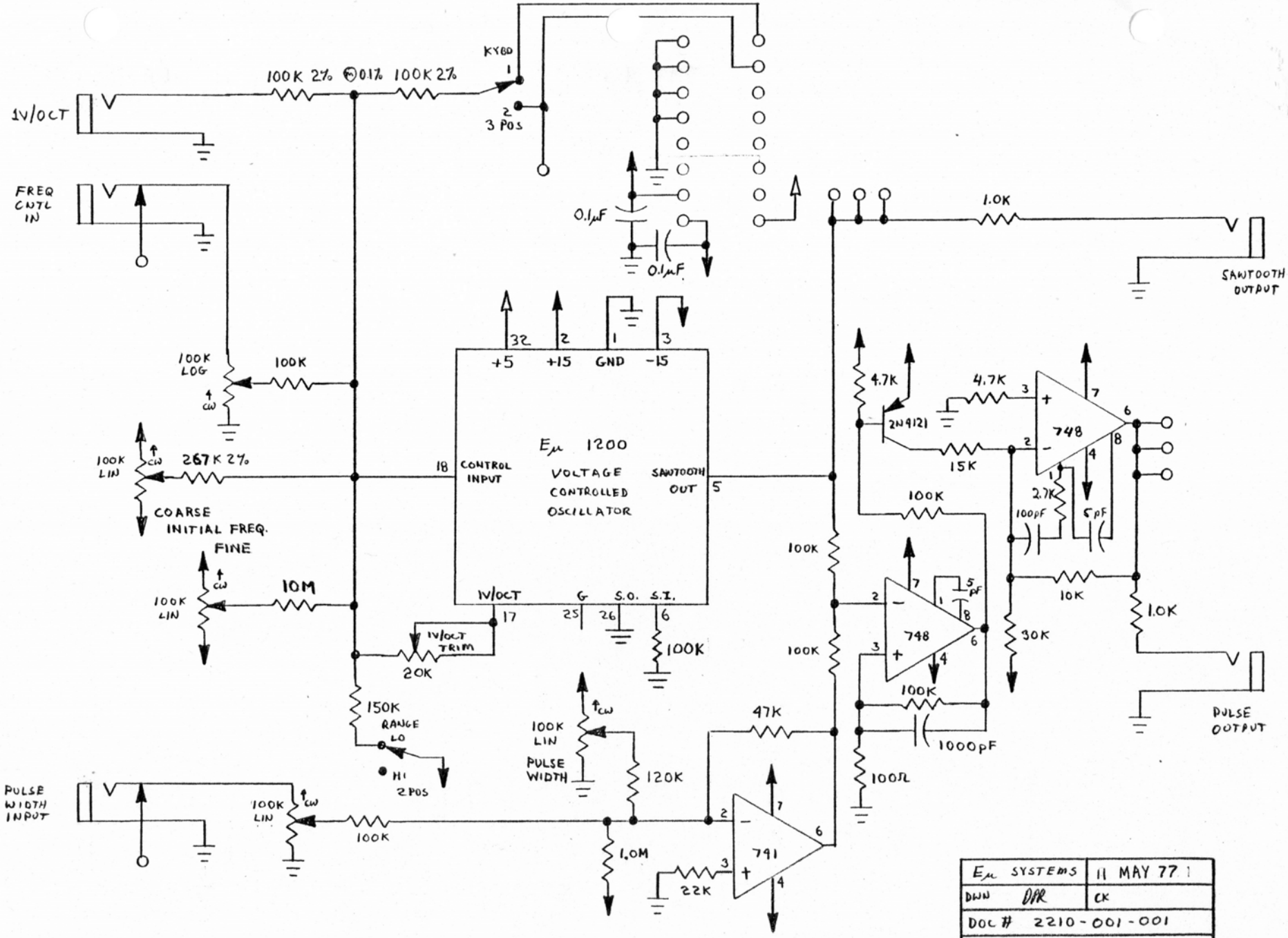


Em SYSTEMS	6 MAY 76
DWN BY DPR	CK BY
DOC. # 1210-011-002	
ASSEMBLY - WAVE CONVERTER	

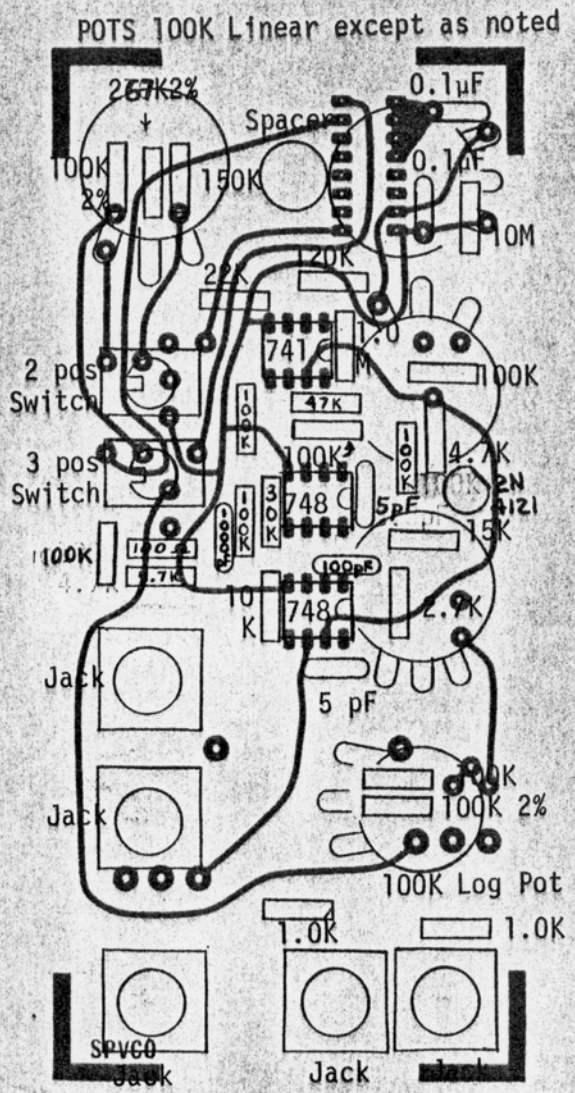
PARTS LIST - 1210 WC SUBM

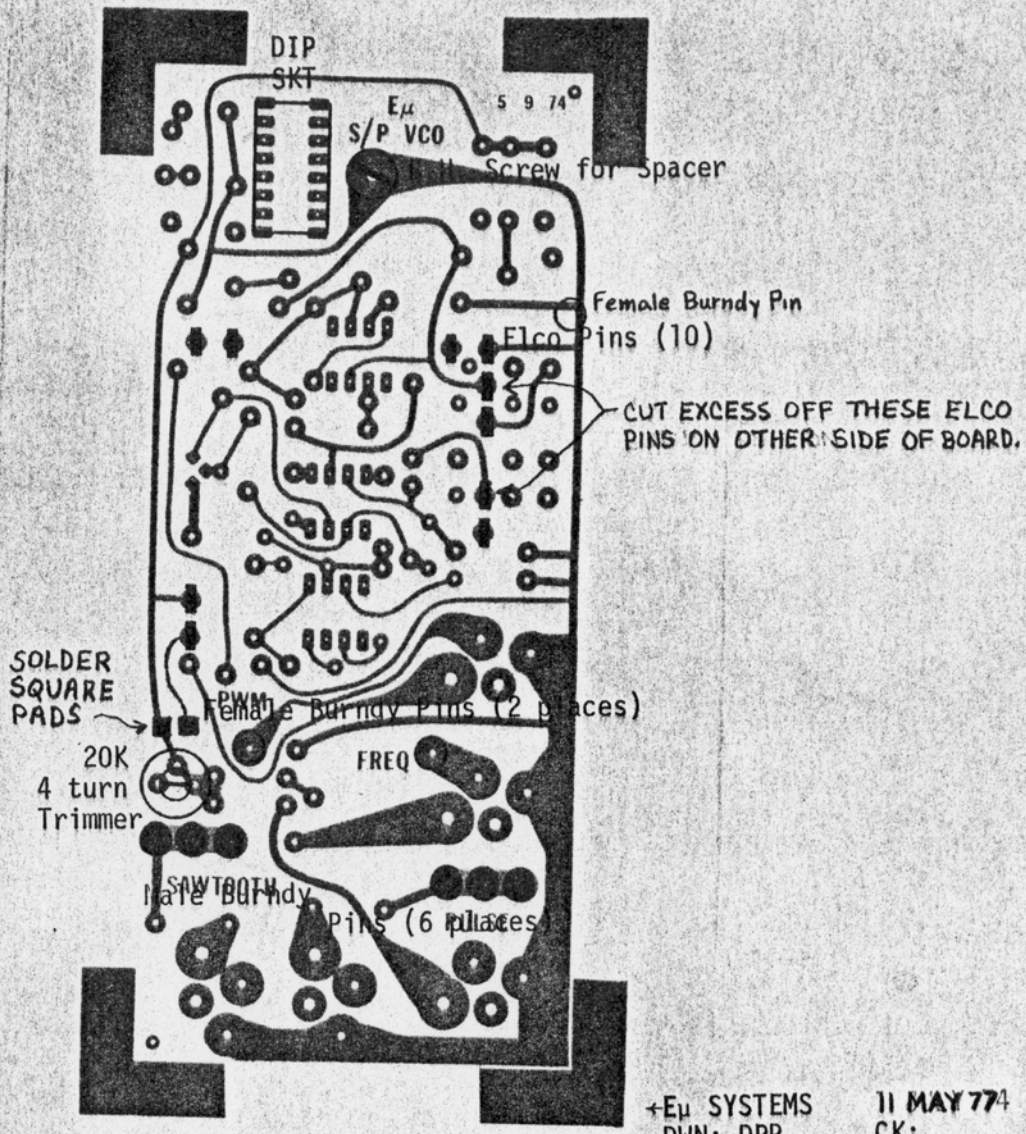
QTY	PART#	DESCRIPTION	NOTES
1	IL 1	741 GP OPAMP	
3	IL 3	356 BIFETAMP	
1	IL 5	3080 OTA G D	
2	IL 8	748/301 AMP	
1	Q 5	2N5828 NPN	
1	Q 7	2N4121 PNP	
2	D 1	1N914 SIG	
2	C 2	5 PF CER	
1	C 4	22 PF CER	
1	C 5	100 PF CER	
1	C 9	1000 PF CER	
2	C 15	0.1 UF CER	
1	R 2	100 OHM	
2	R 9	1.0K OHM	
1	R 13	2.7K OHM	
1	R 17	4.7K OHM	
2	R 22	10K OHM	
1	R 23	15K OHM	
1	R 25	22K OHM	
1	R 27	30K OHM	
1	R 29	39K OHM	
5	R 30	47K OHM	
6	R 33	100K OHM	
1	R 39	270K OHM	
2	R 40	300K OHM	
1	R 41	330K OHM	
1	R 43	560K OHM	
1	R 45	1.0M OHM	
2	RP 6	100K 1%	
26	CN 1	ELCO PIN	
1	CB 8	WC SUBM CB	

2210 VCO MODULE



Eμ SYSTEMS	11 MAY 77
DWN DAR	CK
DOC # 2210-001-001	
SCHEMATIC - PULSE/SAWTOOTH VCO MODULE	



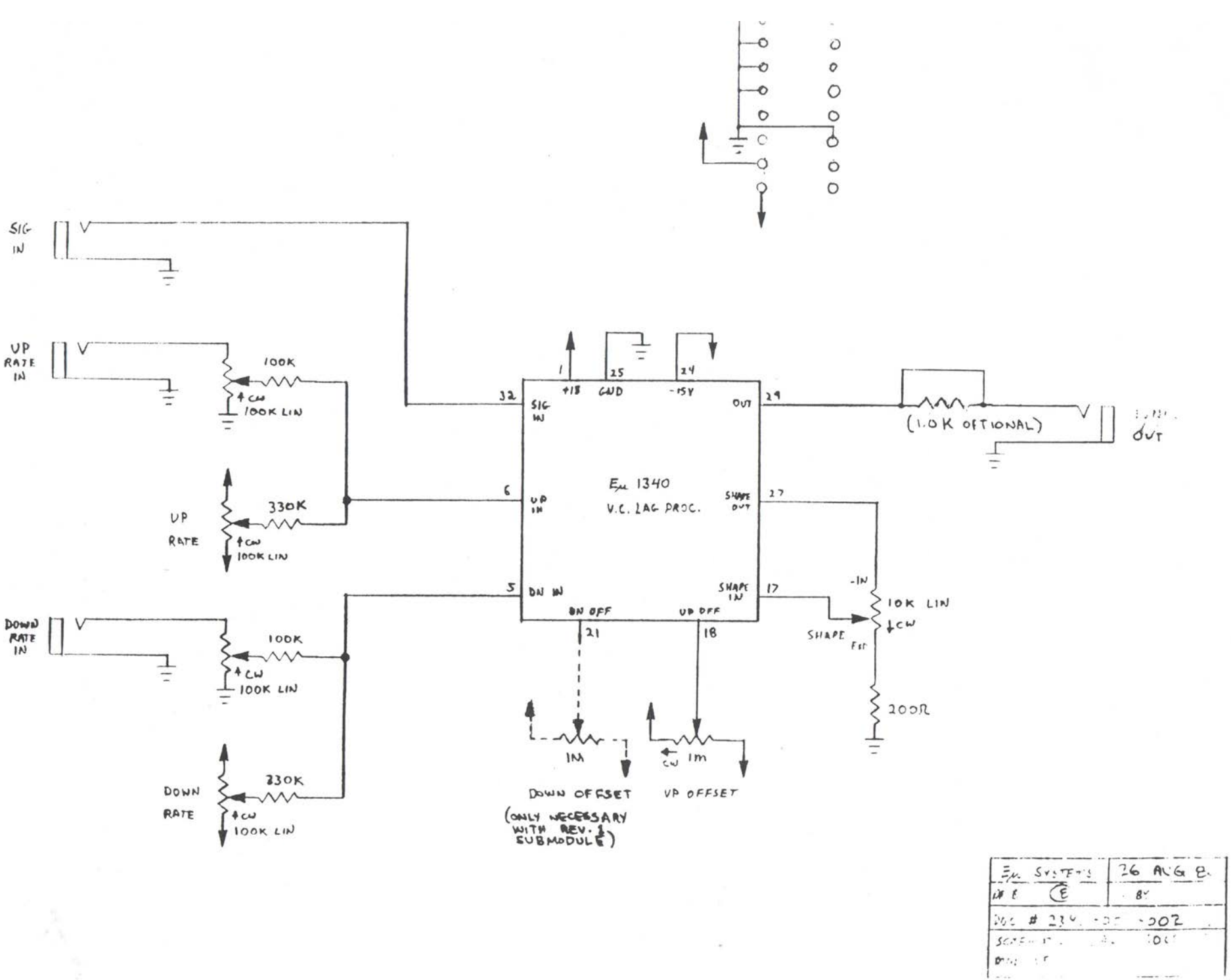


+Eµ SYSTEMS 11 MAY 774
DWN: DPR CK:
Doc.# 2210-011-001
Assy: Sawtooth/Pulse Voltage Cntl'd Osc.

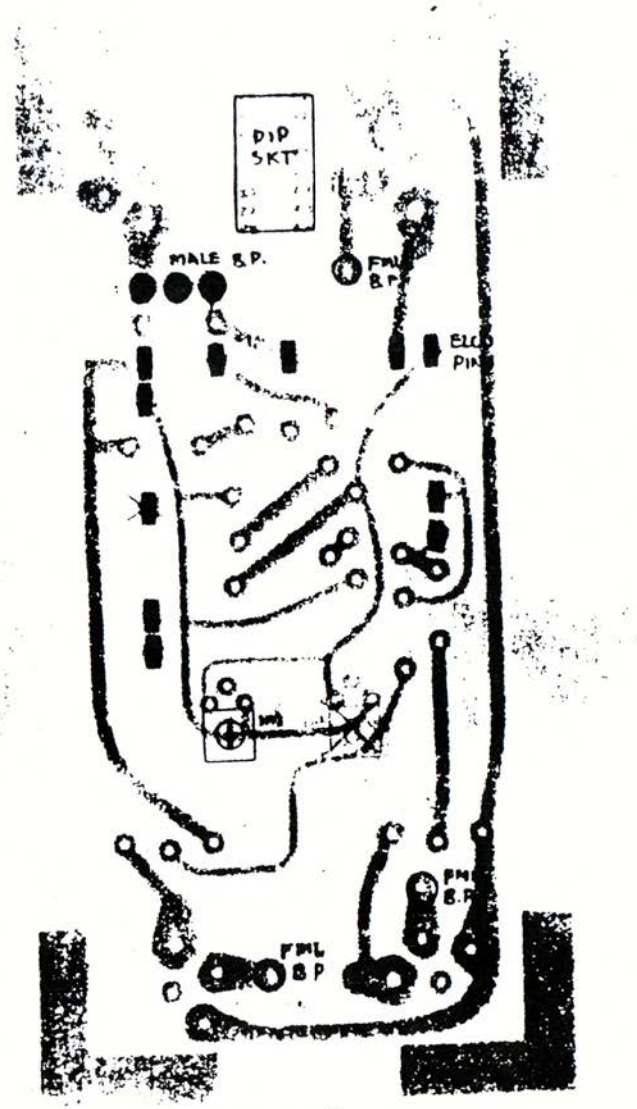
PARTS LIST - 2210 SPVCO MODULE

QTY	PART#	DESCRIPTION	NOTES
1	IL 1	741 GP OPAMP	
2	IL 8	748/301 AMP	
1	Q 7	2N4121 PNP	
2	C 2	5 PF CER	
1	C 5	100 PF CER	
1	C 9	1000 PF CER	
2	C 15	0.1 UF CER	
1	R 2	100 OHM	
2	R 9	1.0K OHM	
1	R 13	2.7K OHM	
2	R 17	4.7K OHM	
1	R 22	10K OHM	
1	R 23	15K OHM	
1	R 25	22K OHM	
1	R 27	30K OHM	
1	R 30	47K OHM	
7	R 33	100K OHM	
1	R 34	120K OHM	
1	R 36	150K OHM	
1	R 48	2.2M OHM	
1	R 54	10M OHM	
1	RP 2	267K 1%	
2	RP 6	100K 1%	
1	TR 4	20K 12 TURN	
4	P 1	100K LIN POT	
1	P 2	50K LOG POT	
1	SW 1	SPDT 2 POS	
1	SW 2	SPDT 3 POS	
5	CN 2	PHONE JACK	
1	CN 5	DIP SOCKET	
1	CN 9	DIP PLUG	
6	CN 12	ML BURN WIRE	
3	CN 13	FM BURN WIRE	
5	H 1	KNOB	
1	H 2	SPACER	
2	H 11	4-40X1/4 BH	
4	H 13	4-40X3/4 BH	
4	H 14	#4 LKWSHR	
4	H 15	4-40 NUT	
1	CB 32	SPVCO MOD CB	
1	PN 8	SPVCO PANEL	
1	1201	VCO SUBM	

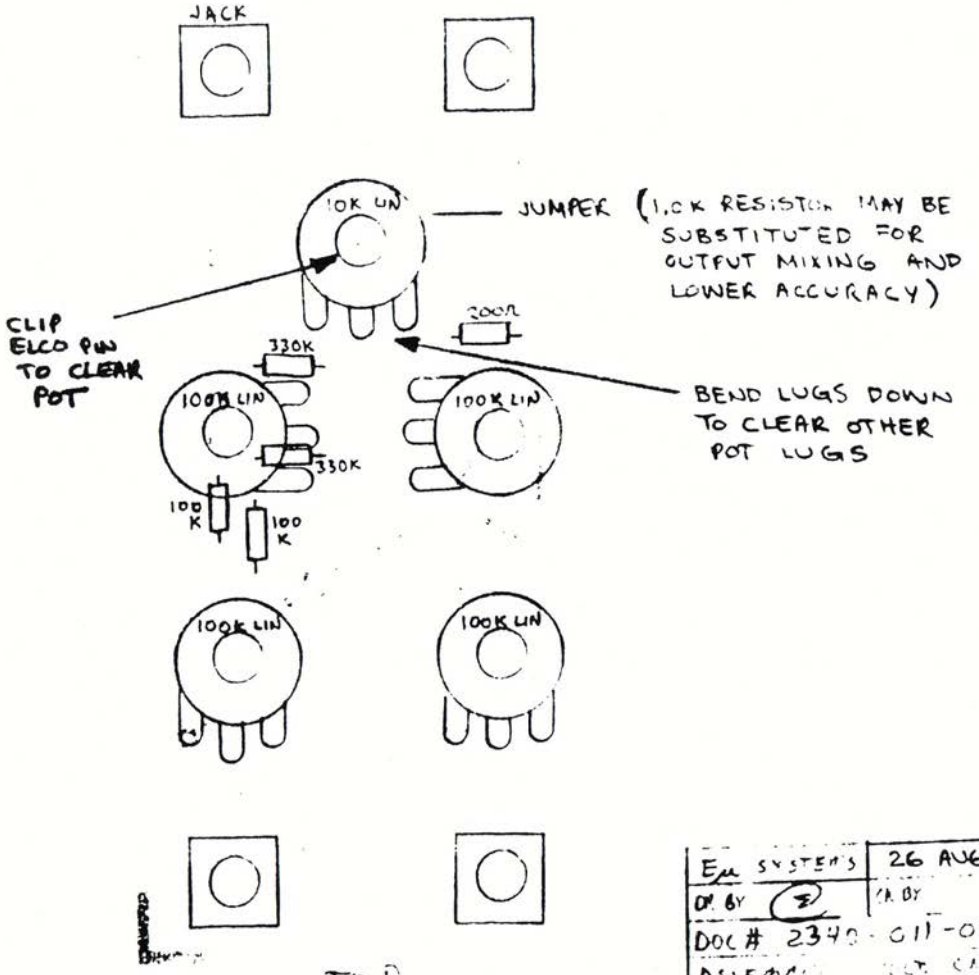
2340 VC LAG MODULE
1340 VC LAG SUB-MODULE



Em SYSTEMS	26 AUG 8[illegible]
[illegible] E	BY
DOC # 23[illegible]	-207
SCALE [illegible]	DOC
DWG [illegible]	



BOTTOM

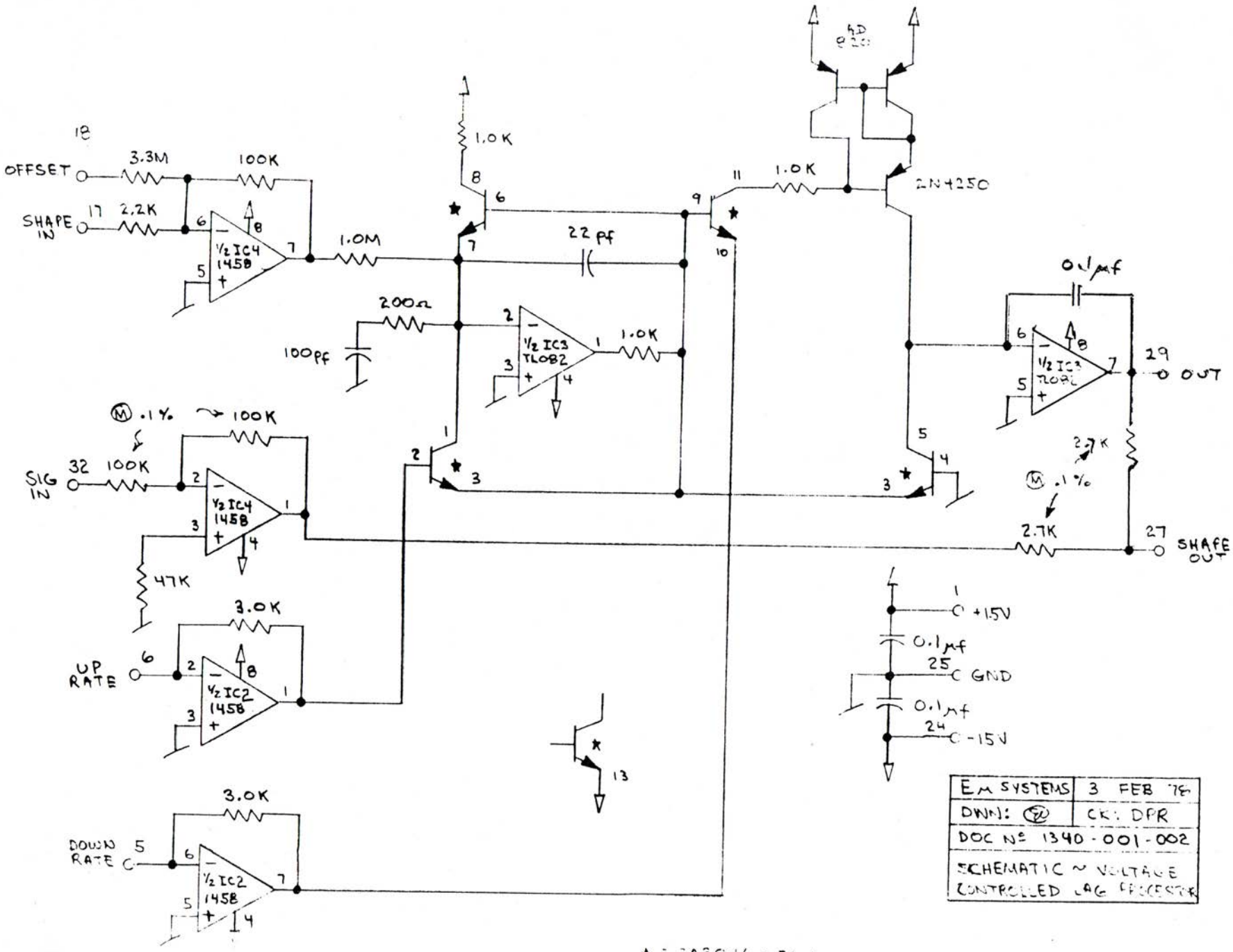


TOP

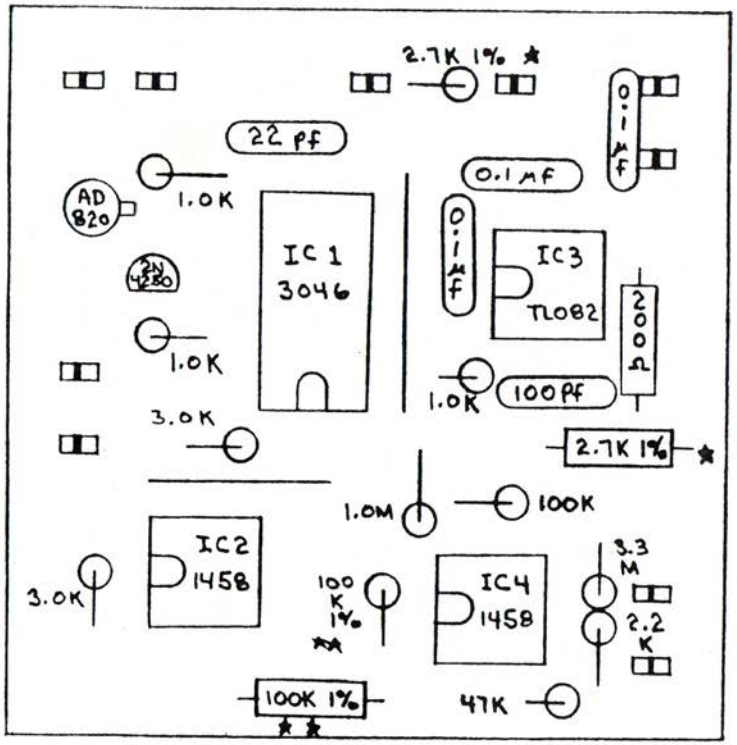
E-mu SYSTEMS	26 AUG 80
DR. BY	CH. BY
DOC # 2340-011-002	
ASSEMBLY	
LAST PRINTED	MODULE

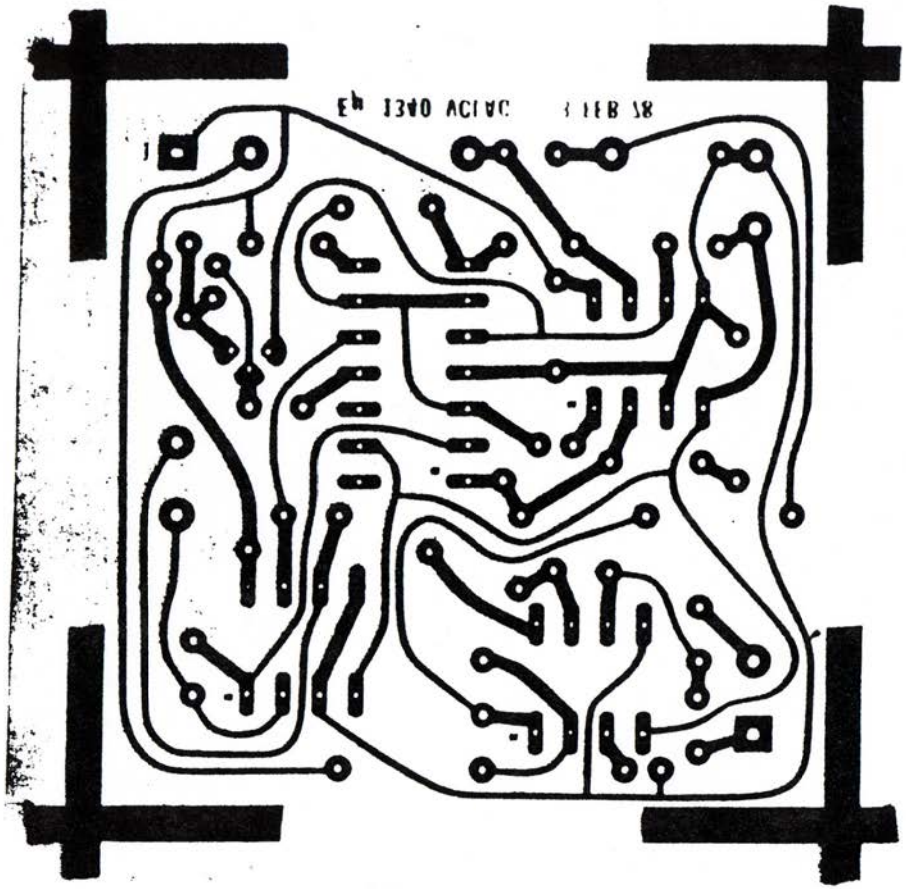
PARTS LIST - 1340 LAG MODULE

QTY	PART#	DESCRIPTION	NOTES
1	R 4	33Ω 1/4W	
2	R 33	10K 1/4W	
2	R 41	680K 1/4W	
1	TR 7	1M TRIMMER	
4	P 1	100K LIN POT	
1	P 5	10K LIN POT	
4	CN 2	PHONE JACK	
1	CN 5	DIP SOCKET	
1	CN 6	DIP PLUG	
3	CN 12	ML BURN WIRE	
2	CN 13	SM BURN WIRE	
2	K 1	KNOB	
4	H 13	4-40X3/4 BH	
4	H 18	4-40 KEPNUT	
1	CB 33	LAG MOD CB	
1	PN 9	LAG PANEL	
1	1340	LAG BURN	


18
OFFSET
3.3M
100K
SHAPE IN
17
2.2K
½ IC4 1458
1.0M
1.0K
8
6
7
22 pf
200Ω
100pf
½ IC3 TL082
1.0K
11
1.0K
2N4250
9
10
0.1μf
29
OUT
27
SHAPE OUT
2.7K
.1%
2.7K
SIG IN
32
100K
47K
3.0K
UP RATE
½ IC2 1458
DOWN RATE
5
13
+15V
0.1μf
25
GND
0.1μf
24
-15V
EM SYSTEMS
3 FEB 76
DWN: JV
CK: DPR
DOC Nº 1340-001-002
SCHEMATIC ~ VOLTAGE CONTROLLED LAG PROCESSOR
★ = CA3046 = IC 1

COMPONENT SIDE VIEWS





□□ ELCO PIN

★ 2.7K 1% (M)ATCHED TO 0.1%

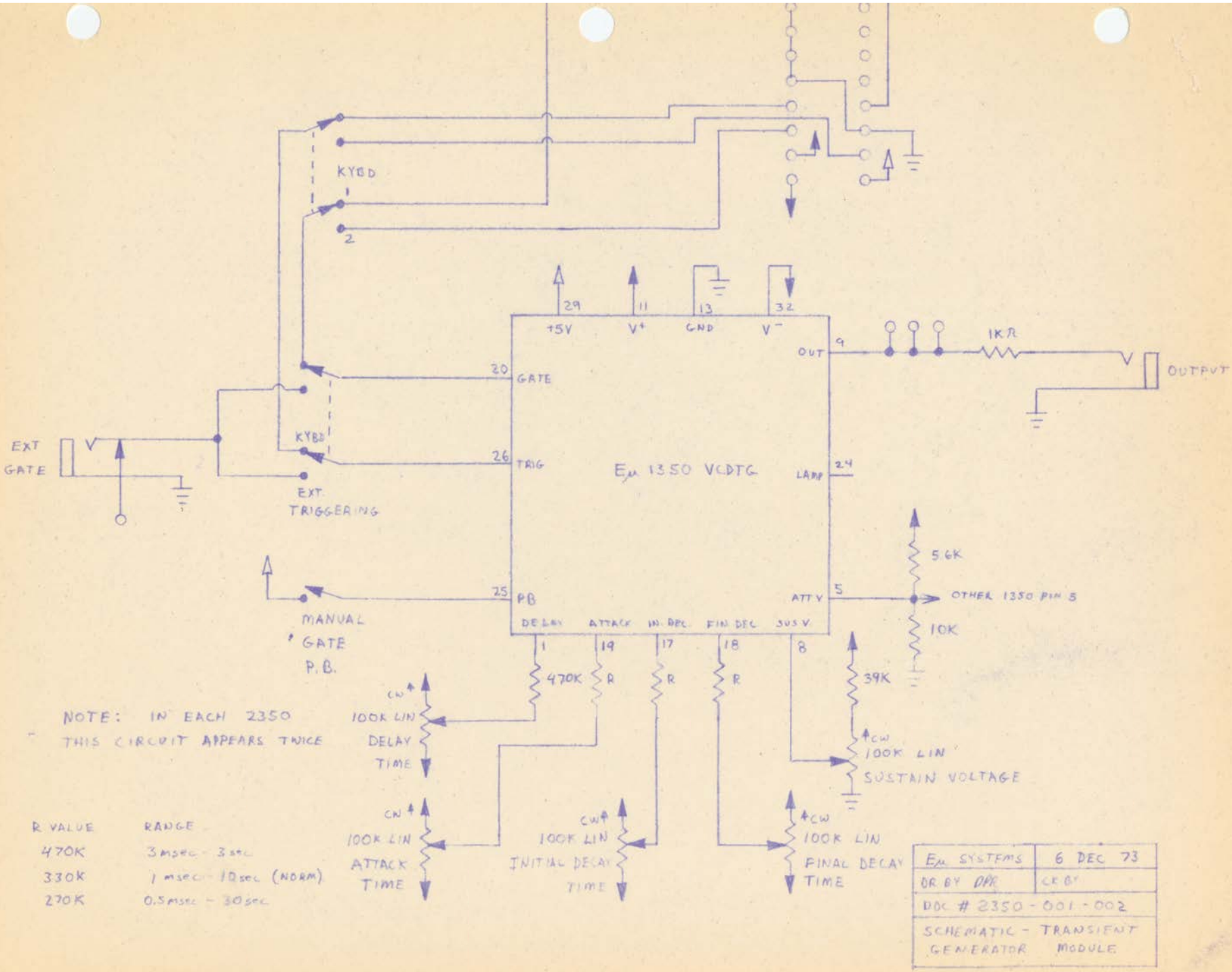
★★ 100K 1% (M)ATCHED TO 0.1%

E-SYSTEMS	3 FEB 78
DWN: (12)	CK:
DOC # 1340-011-002	
ASSEMBLY DIAGRAM - VCLAG SUBMODULE	

PARTS LIST - 1340 LAG SUBM

QTY	PART#	DESCRIPTION	NOTES
2	IL 2	1458 D OPAMP	
1	IL 7	3046 T ARRAY	
1	IL 17	TL082 OPAMP	
1	Q 4	2N4250 PNP	
1	Q 9	AD820 DL PNP	
1	C 4	22 PF CER	
1	C 5	100 PF CER	
3	C 15	0.1 UF CER	
1	R 4	200 OHM	
3	R 9	1.0K OHM	
1	R 12	2.2K OHM	
2	R 14	3.0K OHM	
1	R 30	47K OHM	
1	R 33	100K OHM	
1	R 45	1.0M OHM	
1	R 50	3.3M OHM	
2	RP 6	100K 1%	
2	RP 13	2.7K 1%	
20	CN 1	ELCO PIN	
1	CB 9	LAG SUBM CB	

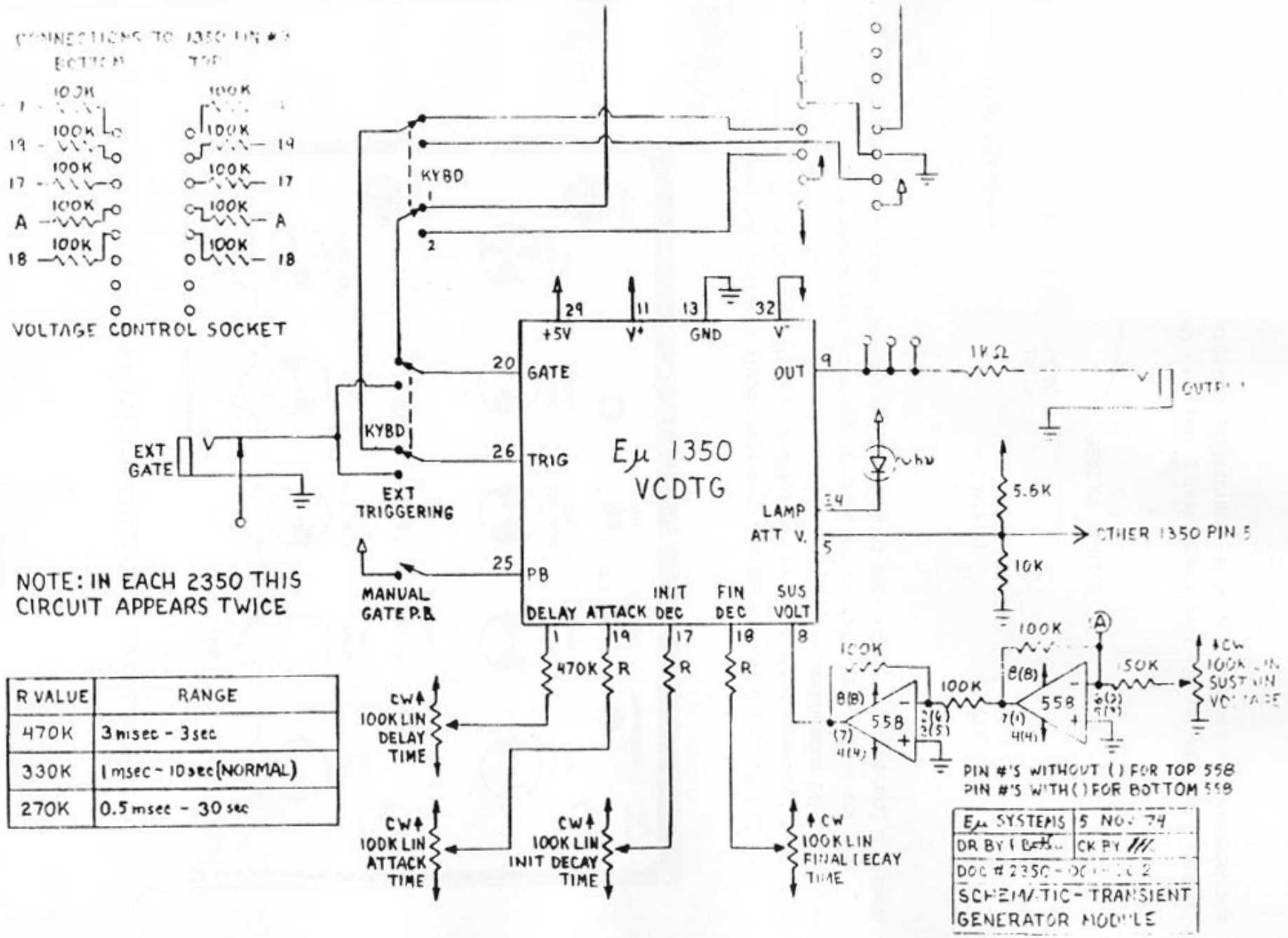
2350 TG MODULE
1352 TG SUB-MODULE



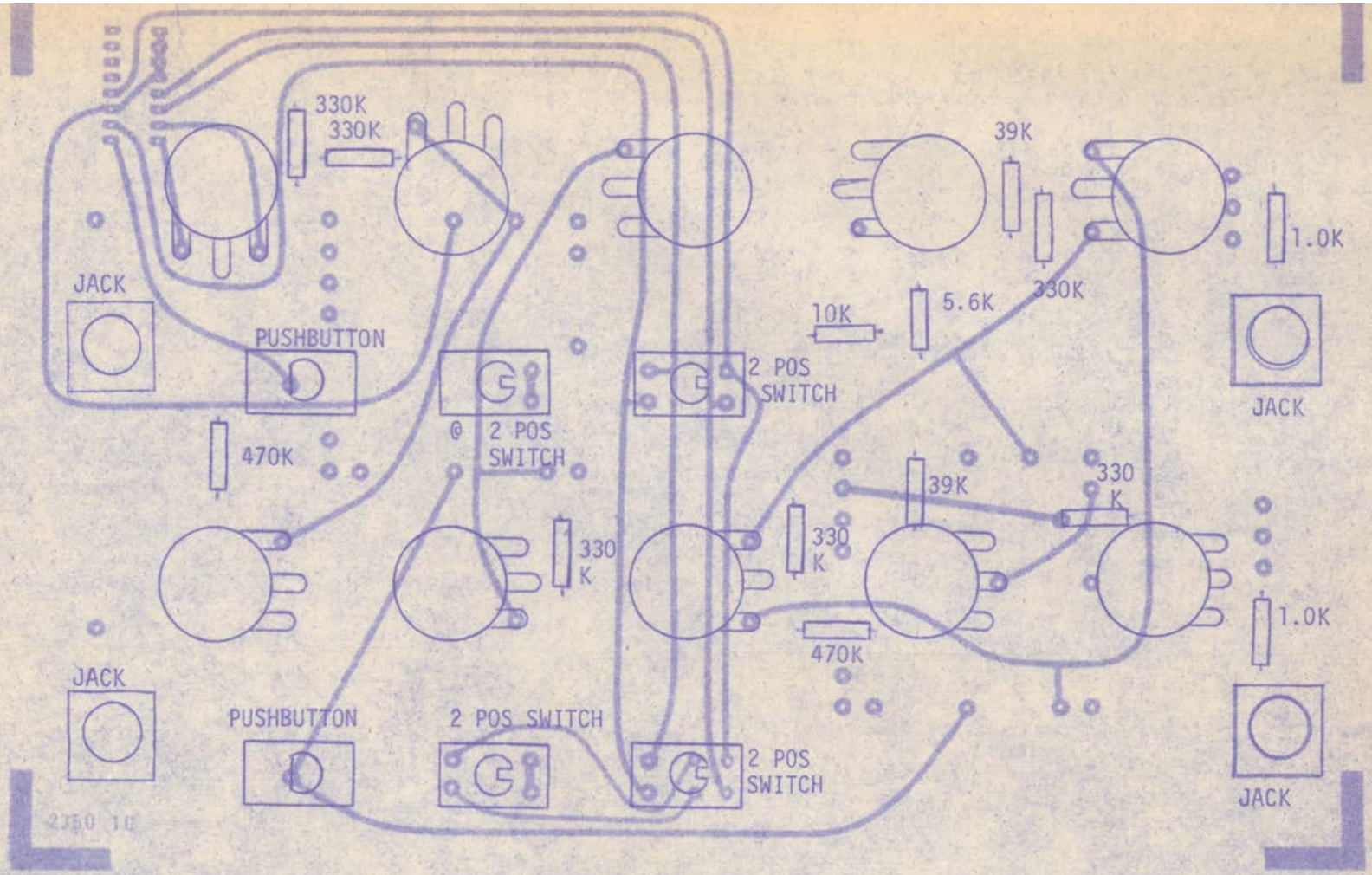
NOTE: IN EACH 2350 THIS CIRCUIT APPEARS TWICE

R VALUE	RANGE
470K	3msec - 3sec
330K	1 msec - 10sec (NORM)
270K	0.5msec - 30sec

Em SYSTEMS	6 DEC 73
DR BY DPR	CK BY
DOC # 2350-001-002	
SCHEMATIC - TRANSIENT GENERATOR MODULE	



R VALUE	RANGE
470K	3 msec - 3 sec
330K	1 msec - 10 sec (NORMAL)
270K	0.5 msec - 30 sec



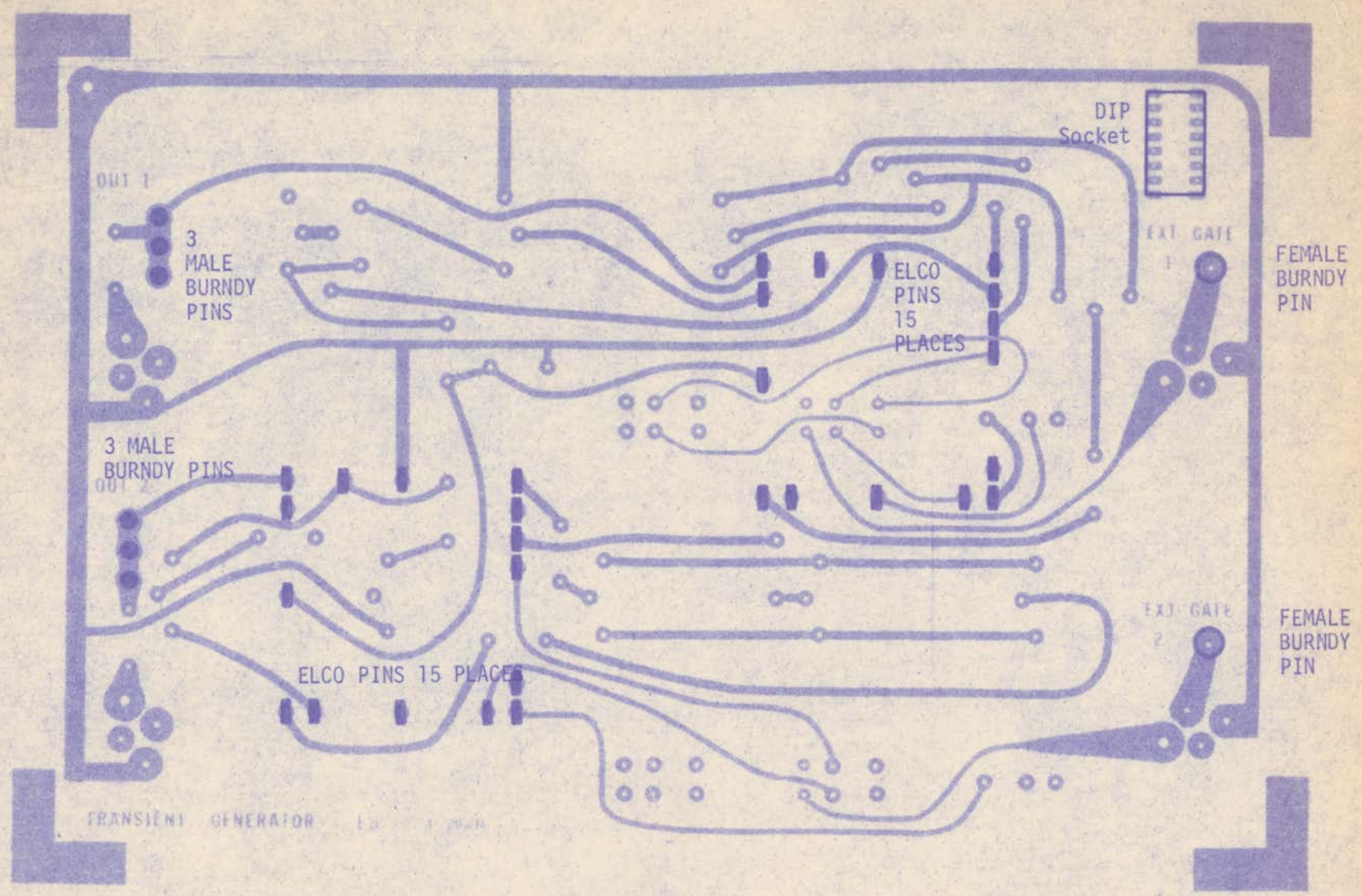
2350 1E

Eμ SYSTEMS 31 MAY 74

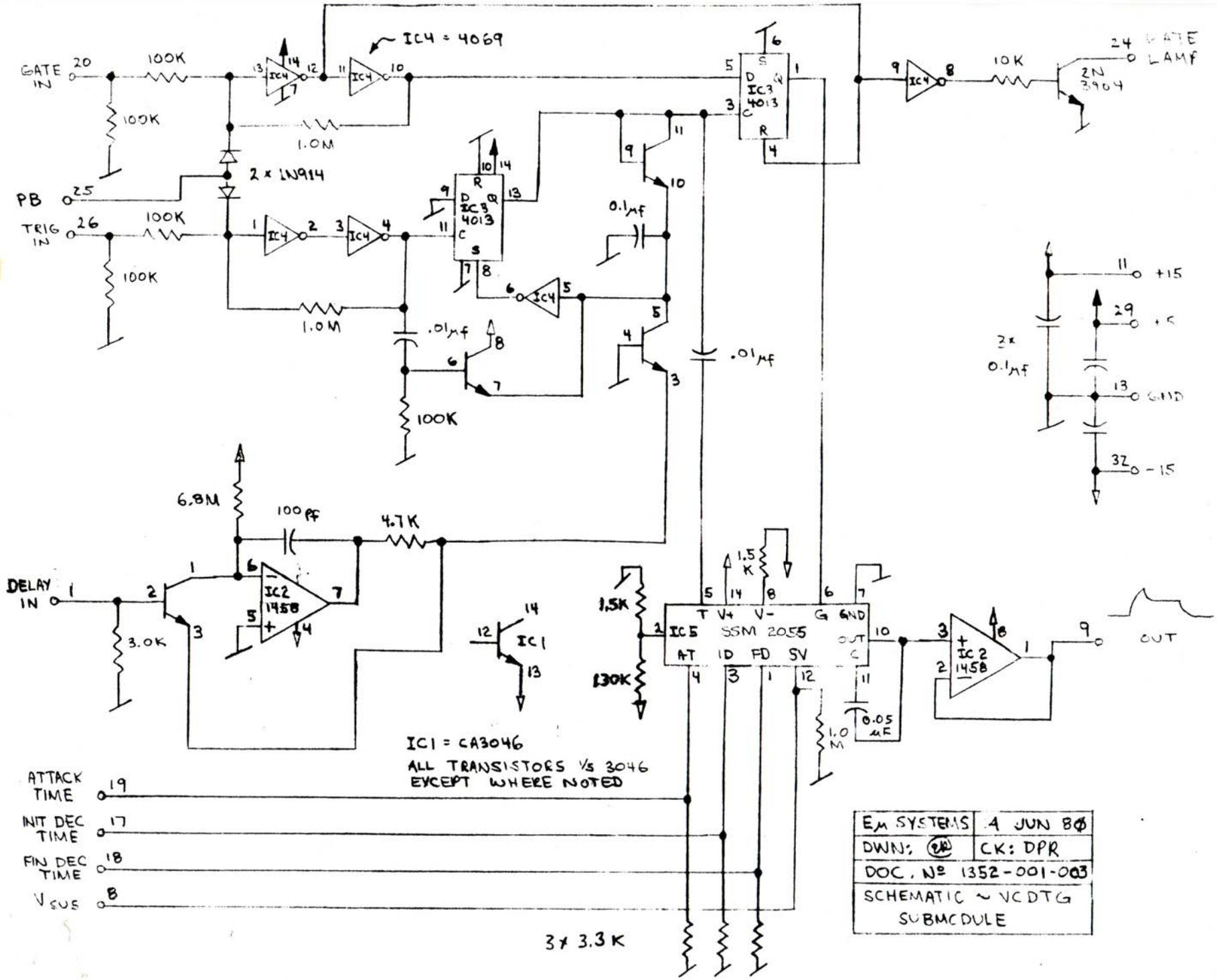
Dwn: DPR Ck:

DOC.# 2350-011-001

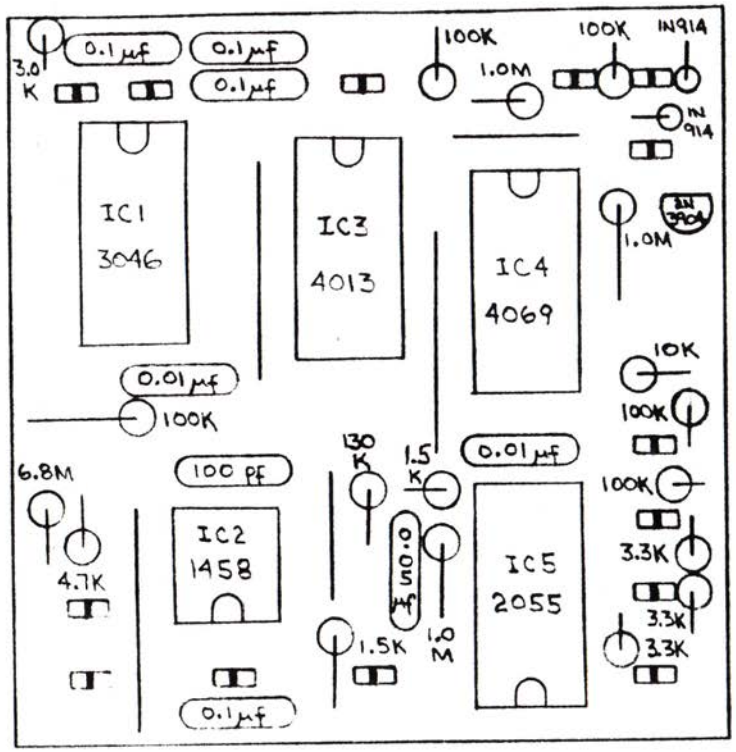
Assy: DUAL DELAYED TRANSIENT GENERATOR MODULE

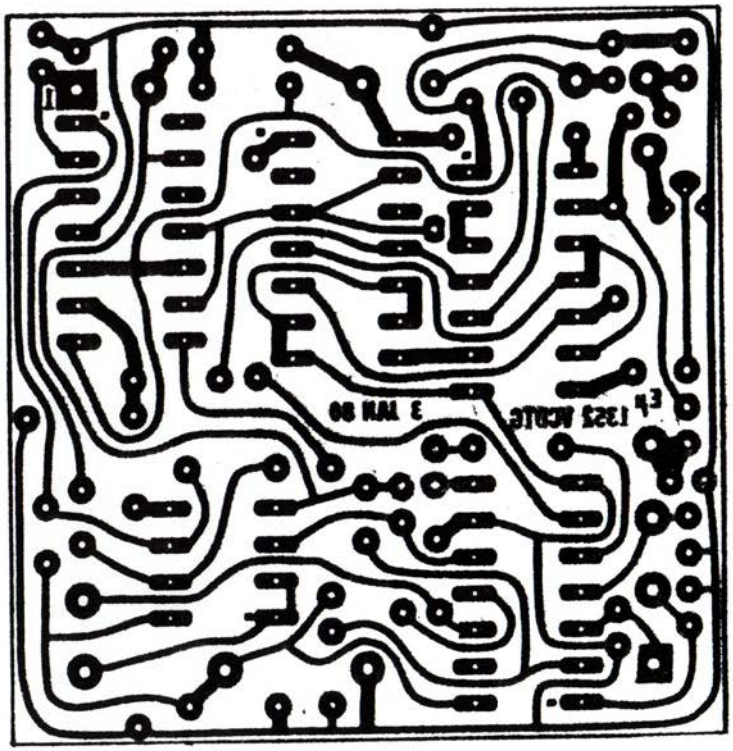


ALL POTENTIOMETERS 100K LINEAR (10 PLACES)



EM SYSTEMS	4 JUN 80
DWN: PW	CK: DPR
DOC. Nº 1352-001-003	
SCHEMATIC ~ VCDTG SUBMODULE	





ELCO PIN

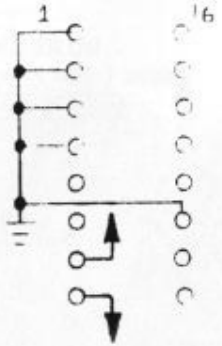
DIODES MOUNT BAND END UP

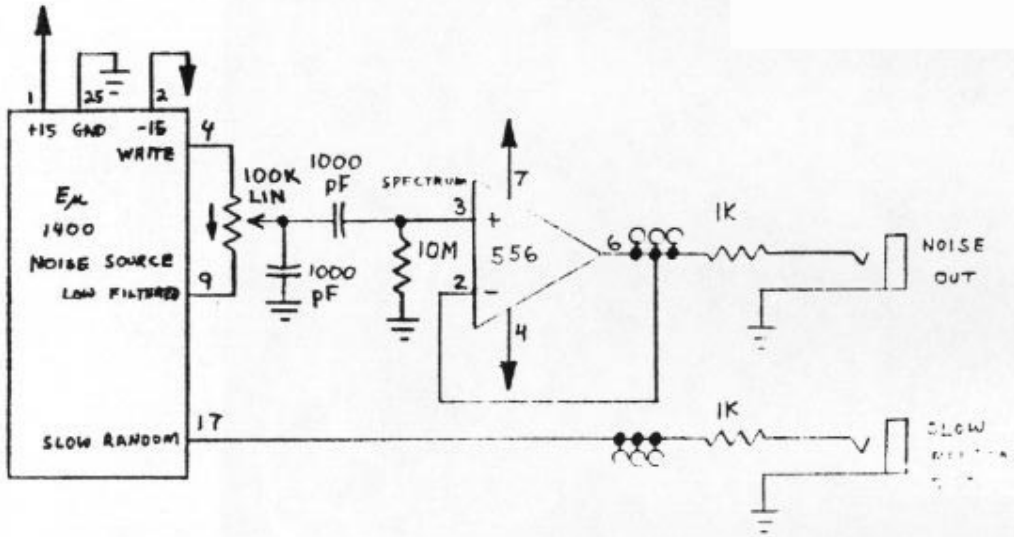
E_μ SYSTEMS	4 JUN 80
DWN:	CK:
DOC. Nº 1352-011-003	
ASSEMBLY DIAGRAM - VCDTG SUBMODULE	

PARTS LIST - 1852 VCDTG SUBM

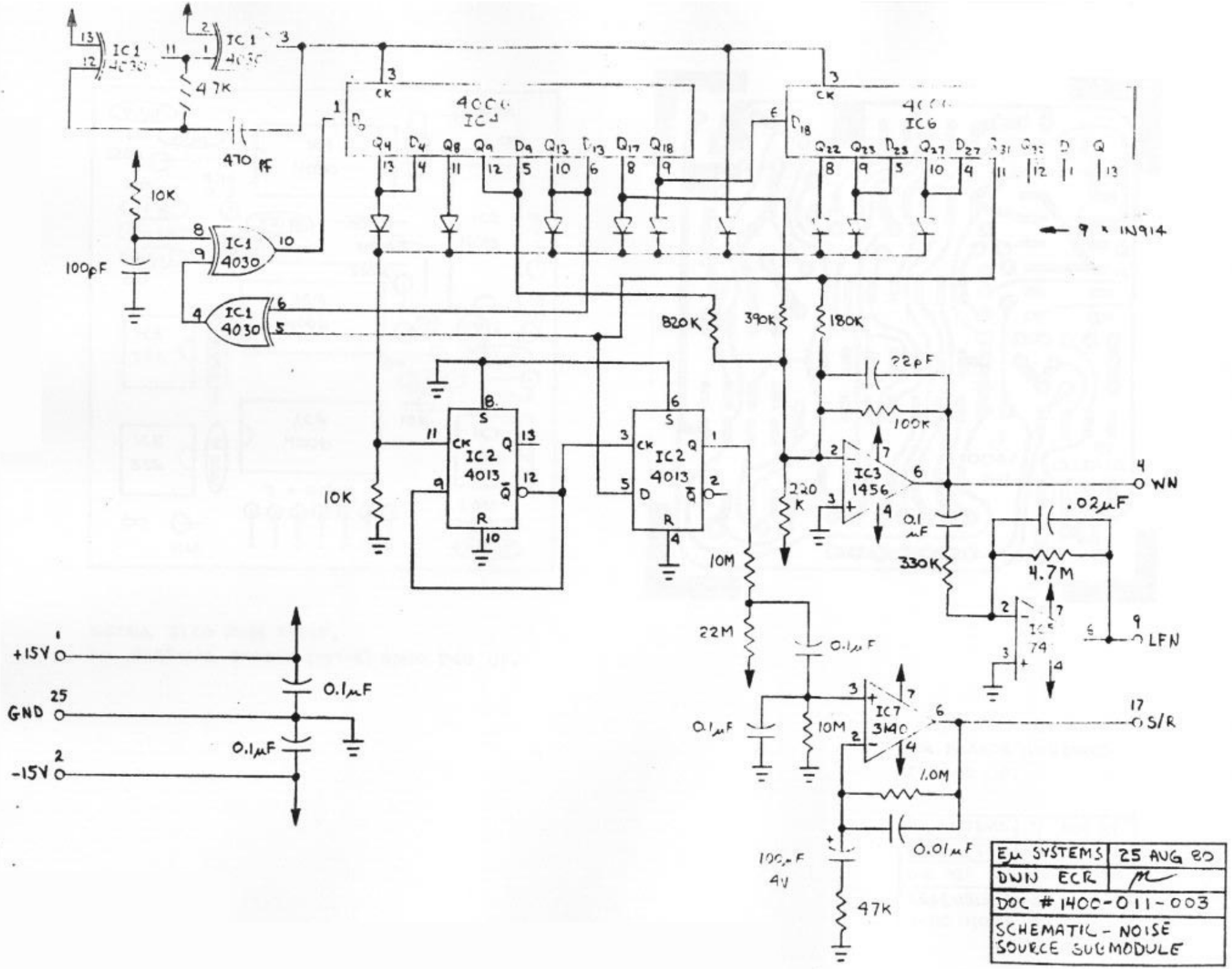
QTY	PART#	DESCRIPTION	NOTES
1	IL 2	14[illegible] D CLAMP	
1	IL 7	3041 T ARRAY	
1	IL 20	2085 VCTG	
1	ID 18	4013 DL F/F	
1	ID 20	4069 HEX INV	
1	Q 2	2N3904 NPN	
2	D 1	1N914 SIG	
1	C 5	100 PF CER	
2	C 12	0.01UF CER S	
4	C 15	0.1 UF CER	
1	C 27	0.05 UF CER	
2	R 10	1.5K OHM	
1	R 14	3.0K OHM	
3	R 15	3.3K OHM	
1	R 17	4.7K OHM	
1	R 22	10K OHM	
5	R 33	100K OHM	
1	R 35	133K OHM	
3	R 45	1.0M OHM	
1	R 52	6.8M OHM	
28	CN 1	ELCO PIN	
1	CB 10	VCDTG SUB CB	

2400 NS MODULE
1400 NS SUB-MODULE

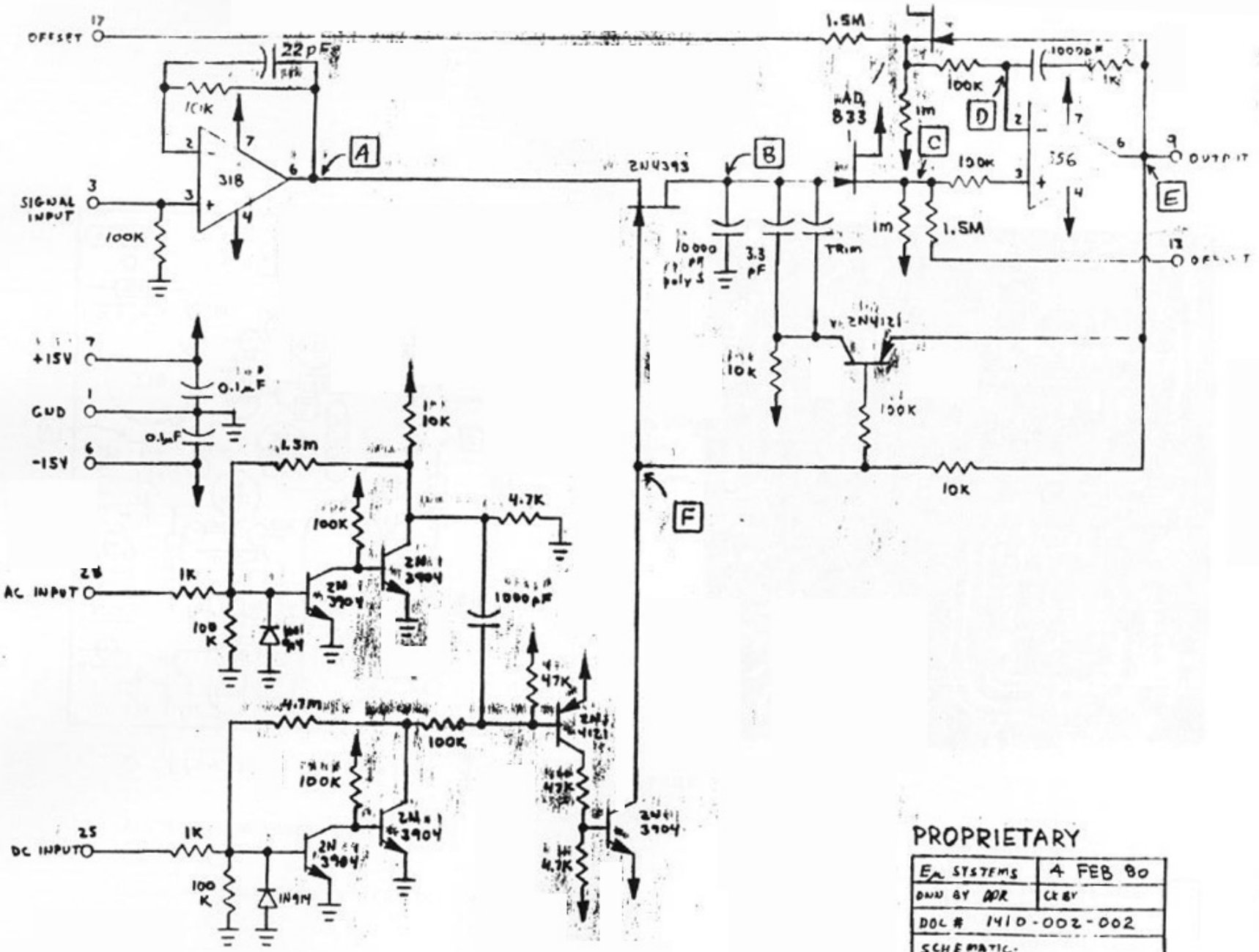




EM SYST. INC.	19 MAR 76
DR BY: LFI	SW
	2


IC1 4030
IC1 4030
47K
470 pF
10K
100pF
IC1 4030
IC1 4030
IC4
IC6
9 x IN914
820K
390K
180K
22pF
100K
IC2 4013
IC2 4013
10K
IC3 1456
220 K
0.1 µF
.02µF
330K
4.7M
10M
22M
0.1µF
IC7 3140
1.0M
0.01µF
100µF 4V
47K
+15V
GND
-15V
0.1µF
0.1µF
WN
LFN
S/R
E-µ SYSTEMS
25 AUG 80
DWN ECR
DOC # 1400-011-003
SCHEMATIC - NOISE SOURCE SUBMODULE

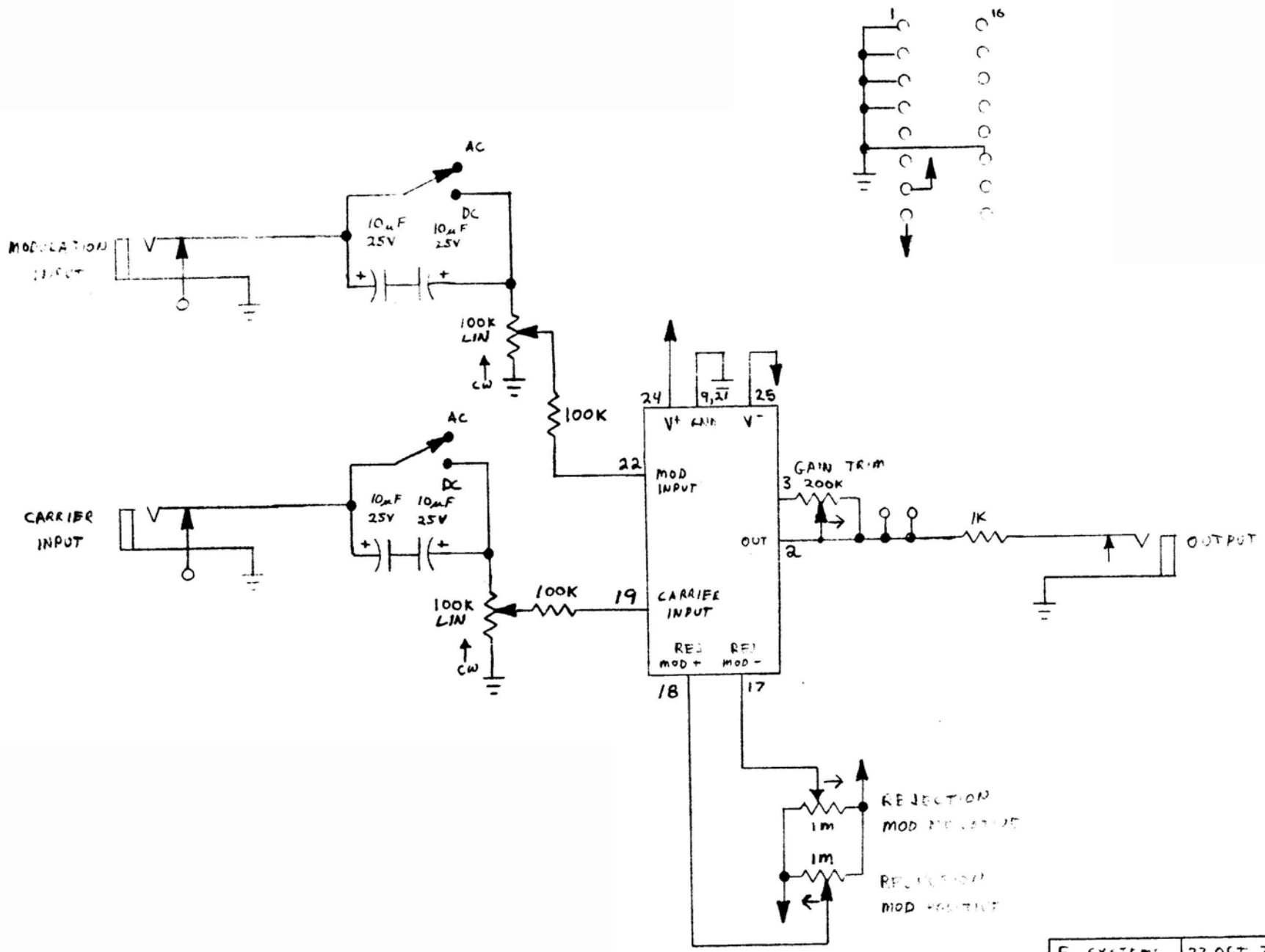
2410 S&H MODULE
1410 S&H SUB-MODULE



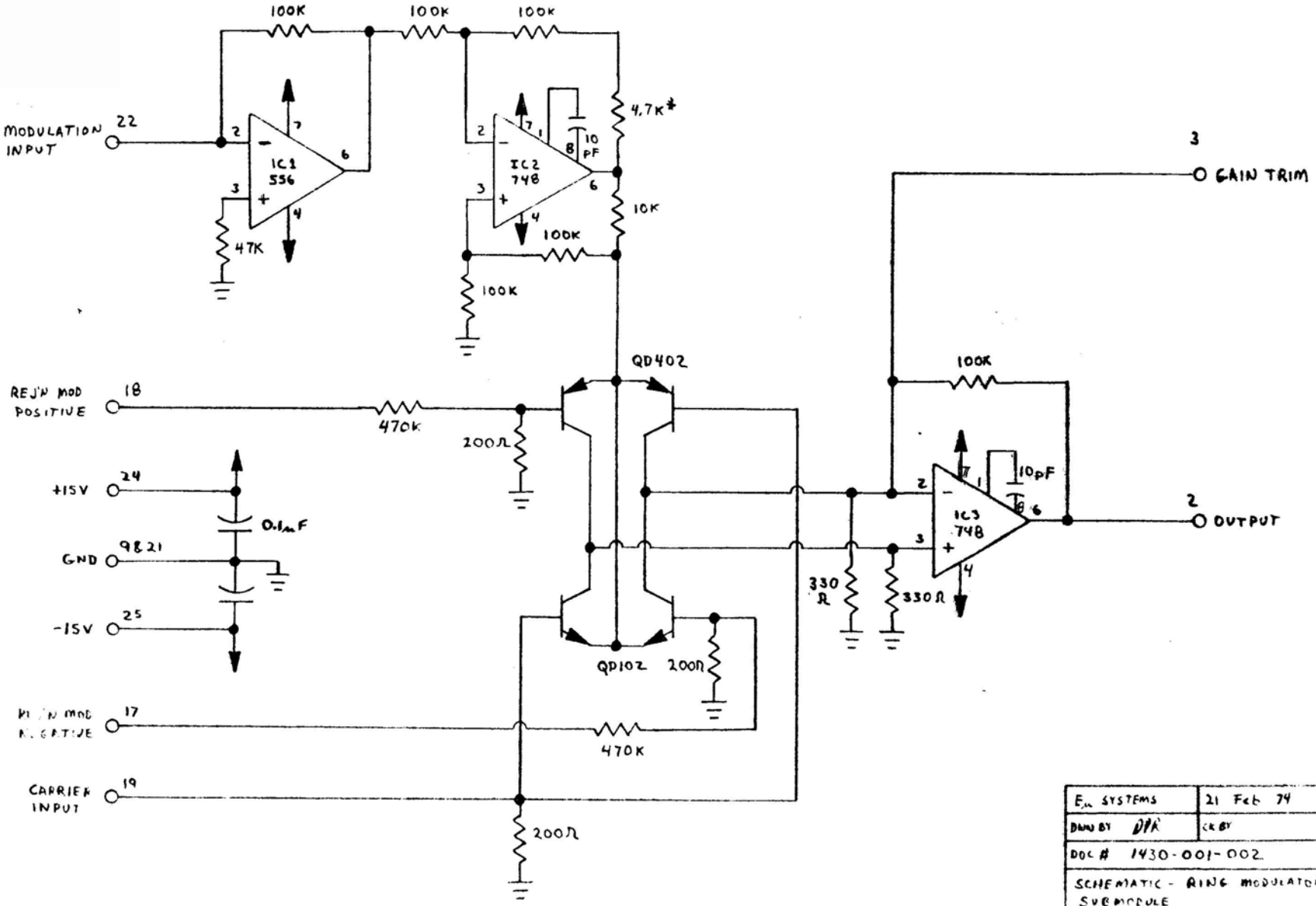
PROPRIETARY

E-A SYSTEMS	4 FEB 80
DWN BY ADR	CK BY
DOC # 1410-002-002	
SCHEMATIC- SAMPLE AND HOLD	

2430 RM MODULE
1430 RM SUB-MODULE



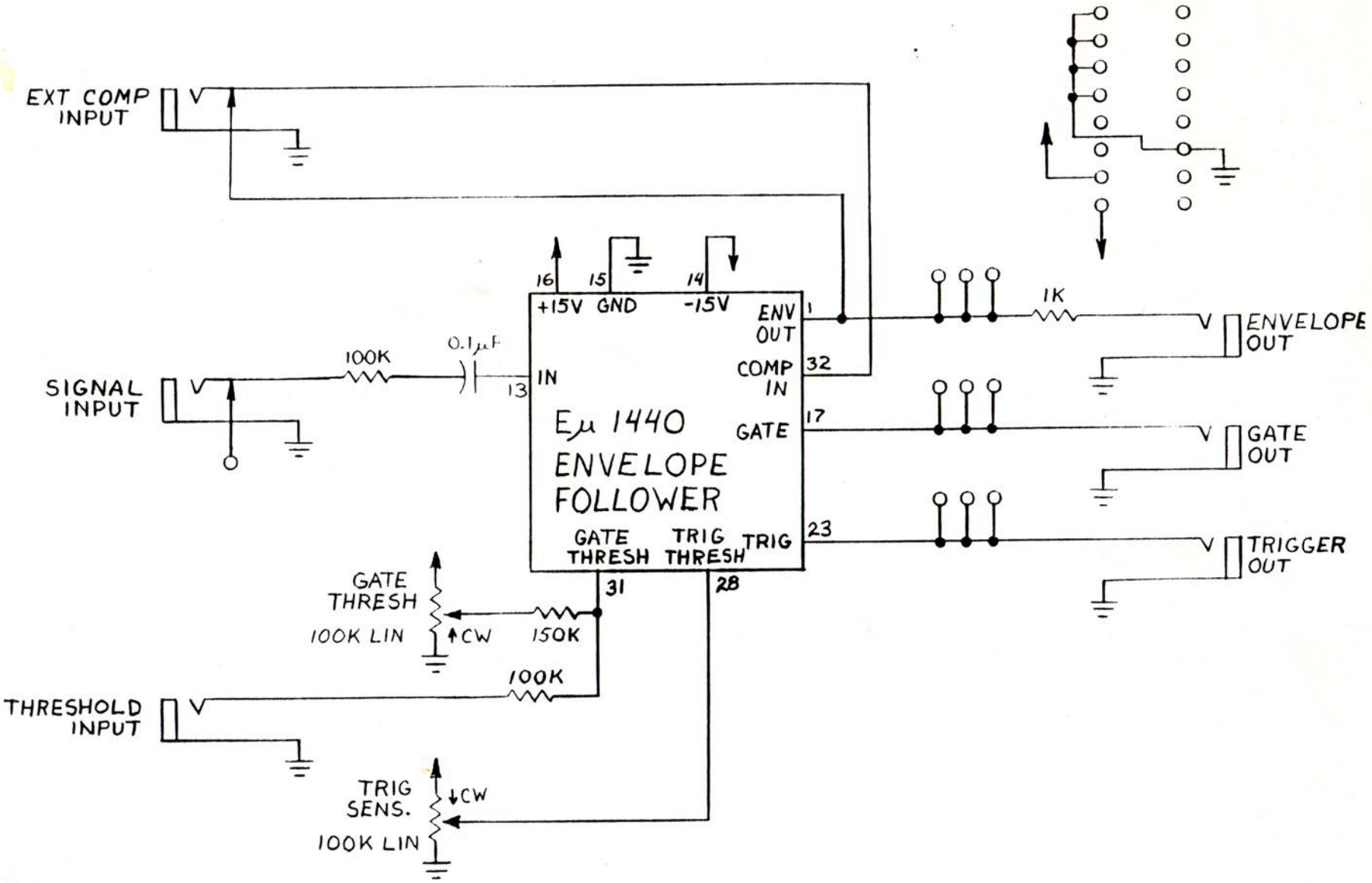
Em SYSTEMS	23 OCT 72
by D Rossum	CK
DOC # 2430-001-001	
SCHEMATIC - RING MODULATOR MODULE	



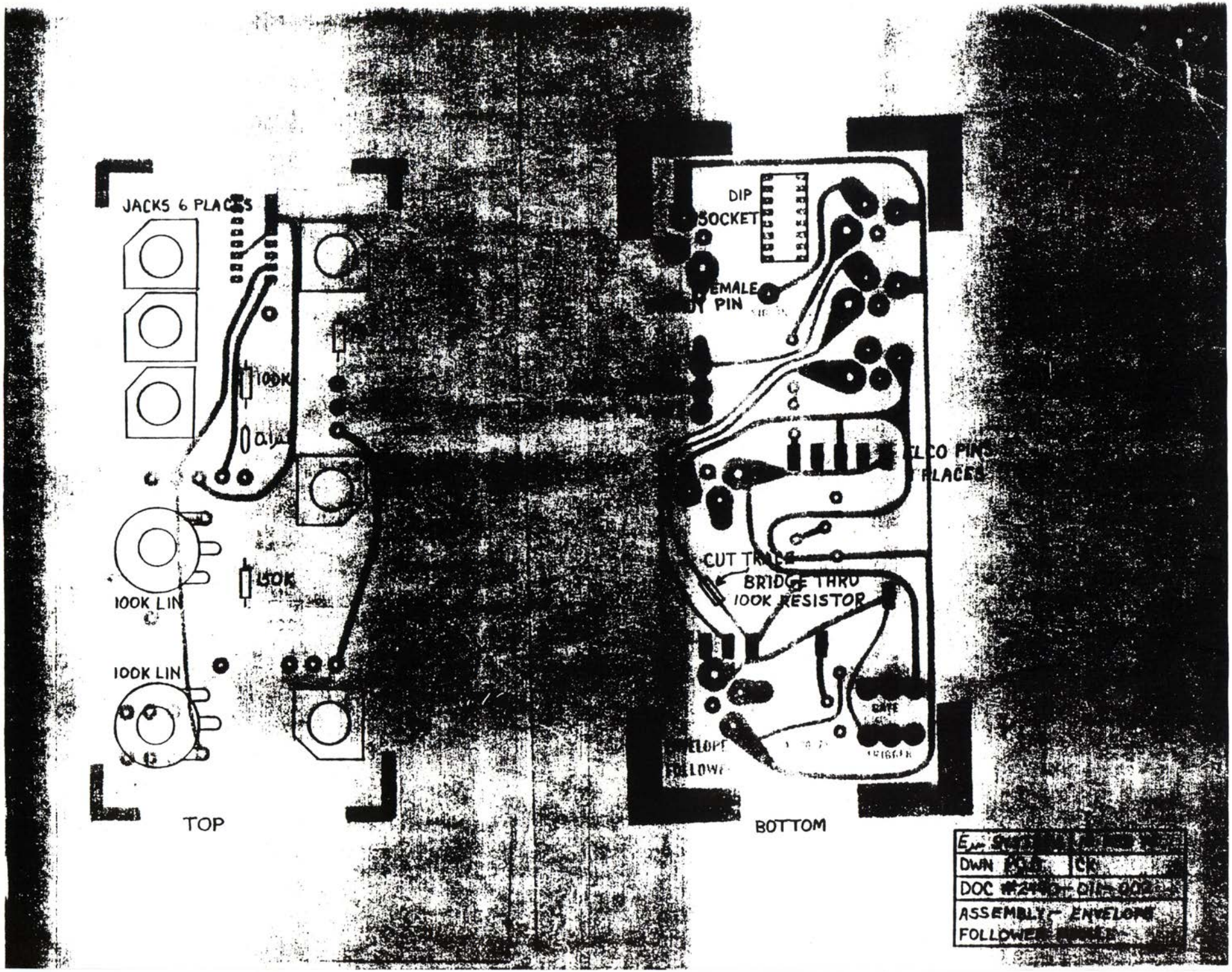
E$_m$ SYSTEMS	21 Feb 74
DWN BY DPK	CK BY
DOC # 1430-001-002	
SCHEMATIC - RING MODULATOR SUBMODULE	

* MAY BE SELECTED TO MINIMIZE DISTORTION

2440 EF MODULE
1440 EF SUB-MODULE



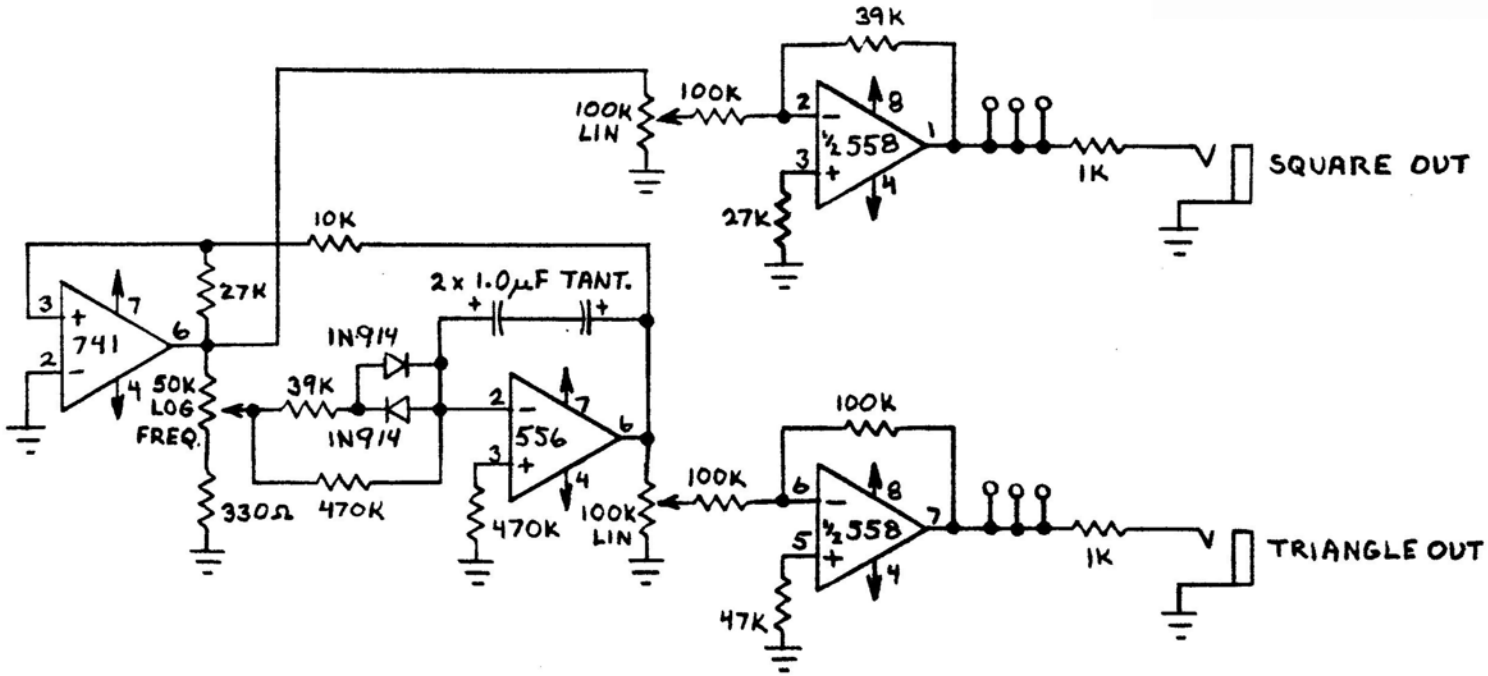
Eμ SYSTEMS	6 FEB 75
DWN PJB	CK
DOC # 2440-001-002	
SCHEMATIC- ENVELOPE FOLLOWER MODULE	


JACKS 6 PLACES
100K
50K
100K LIN
100K LIN
TOP
DIP
SOCKET
EMALE
PIN
CUT TRACE
BRIDGE THRU
100K RESISTOR
BOTTOM
DWN
CK
ASSEMBLY - ENVELOPE
FOLLOWER

PARTS LIST - 2440 EF MODULE

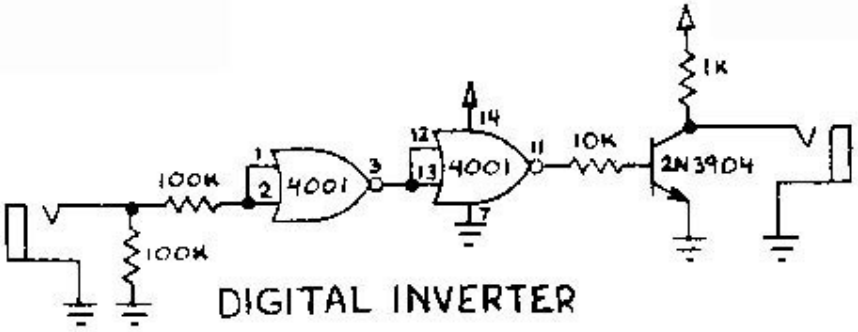
QTY	PART#	DESCRIPTION	NOTES
1	C 15	0.1 UF CER	
1	R 9	1.0K OHM	
2	R 33	100K OHM	
1	R 36	150K OHM	
2	P 1	100K LIN POT	
6	CN 2	PHONE JACK	
1	CN 5	DIP SOCKET	
1	CN 9	DIP PLUG	
9	CN 12	ML BURN WIRE	
1	CN 13	FM BURN WIRE	
2	H 1	KNOB	
4	H 13	4-40X3/4 BH	
4	H 14	#4 LKWSHR	
4	H 15	4-40 NUT	
1	CB 49	EF MOD CB	
1	PN 15	EF PANEL	
1	1440	EF SUBA	

2451 PP MODULE

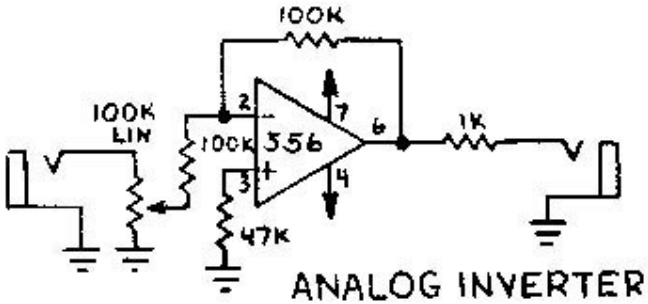


LOW FREQUENCY OSCILLATOR

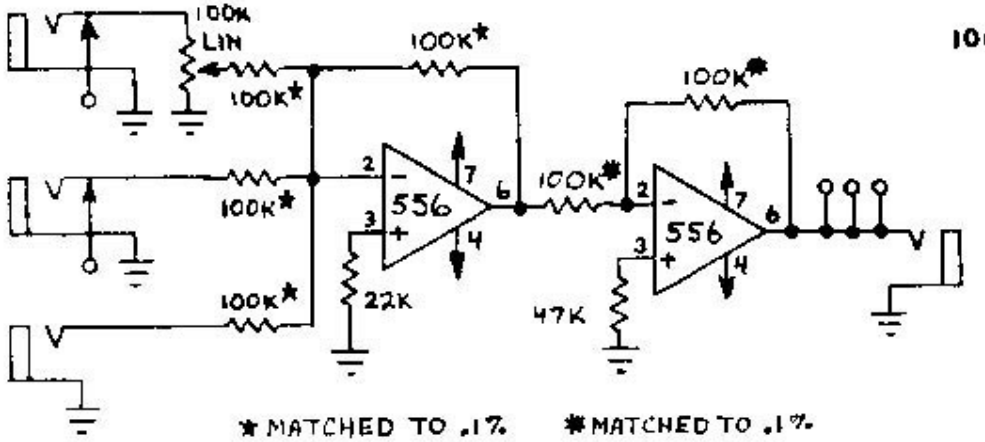
Eu SYSTEMS	25 MAR 76
DWN PJB	
DOC #2451-001-001	
SCHEMATIC – POTPOURRI MODULE	



DIGITAL INVERTER

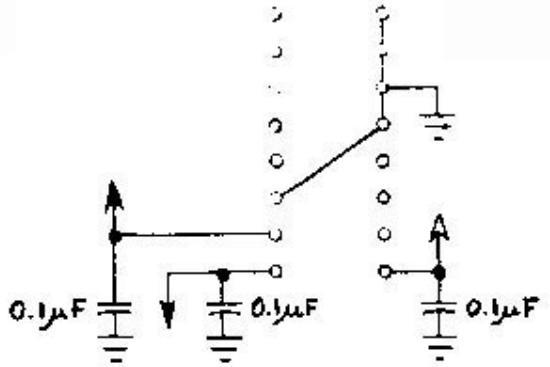


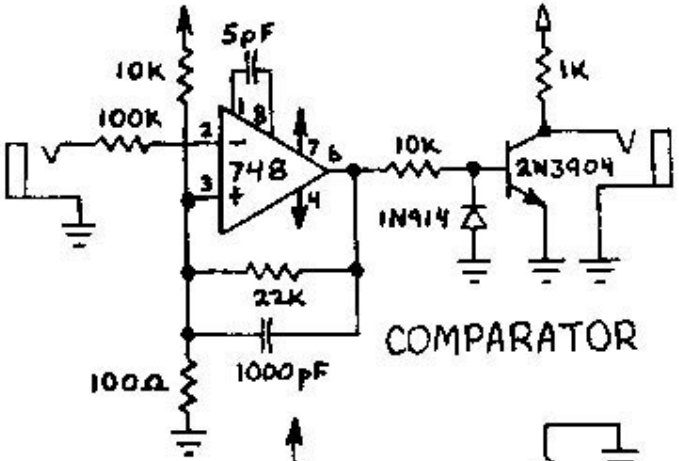
ANALOG INVERTER



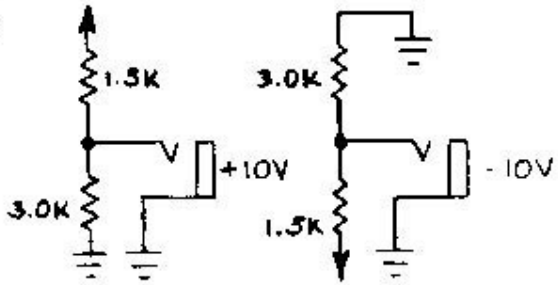
* MATCHED TO .1% ✱ MATCHED TO .1%

PRECISION SUMMING AMP (NON-INVERTING)





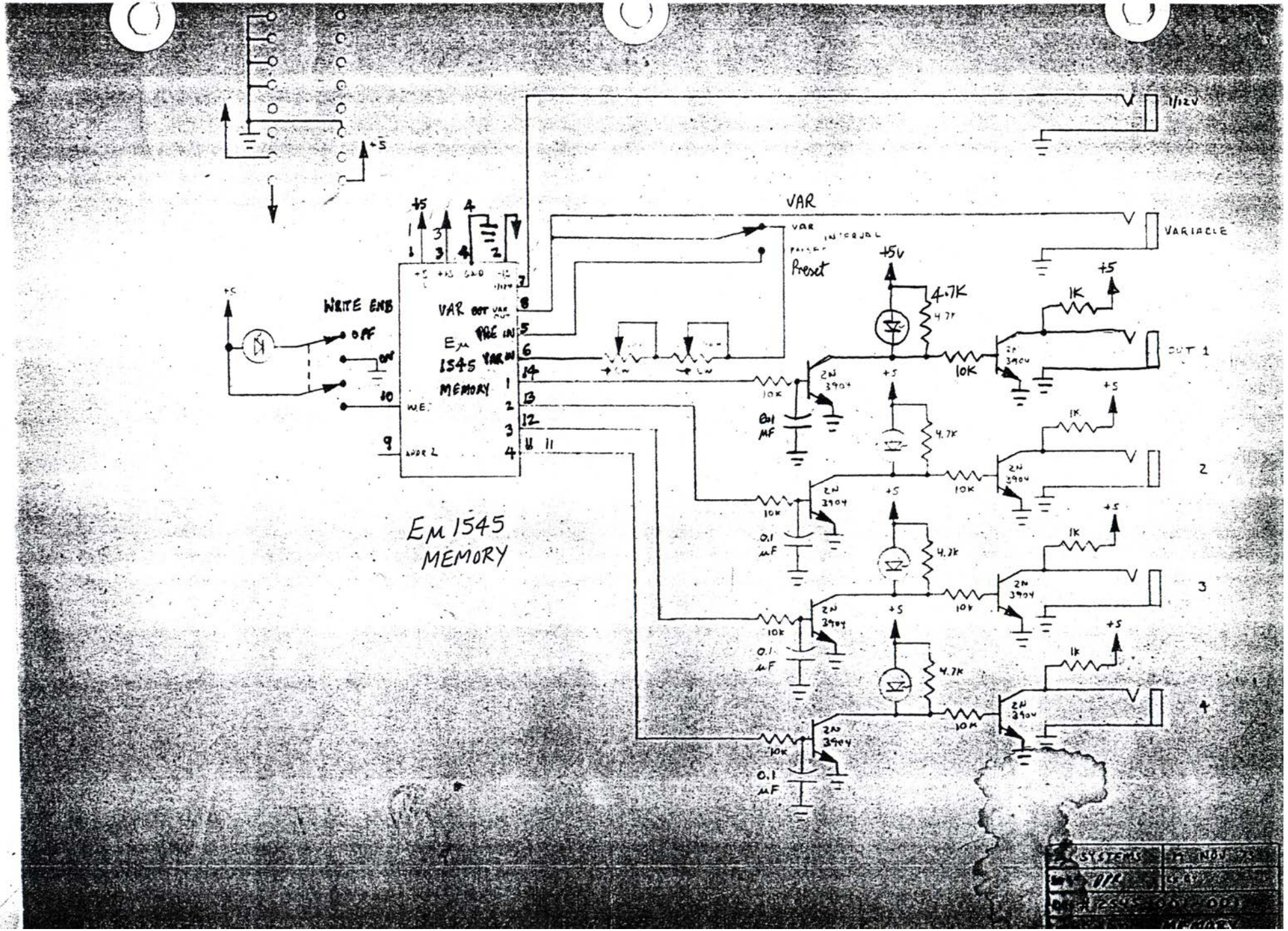
COMPARATOR

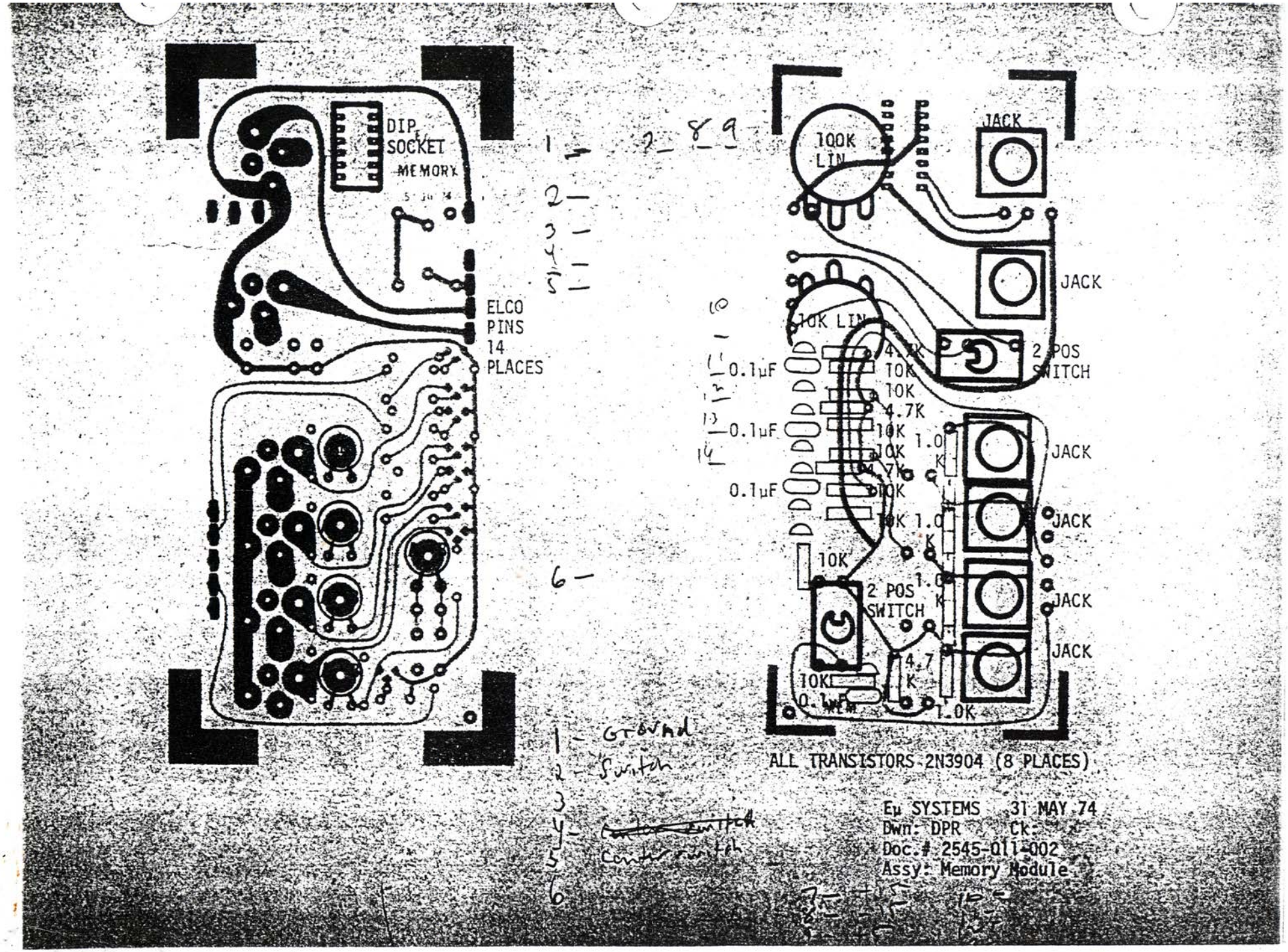


VOLTAGE SOURCES

E-m SYSTEMS	25 MAR 76
DWN RJB	
DOC # 2451-001-001	
SCHEMATIC - POTPOURRI MODULE	

2545 MEMORY MODULE
1545 MEMORY SUB-MODULE


VAR
Preset
WRITE ENB
OFF
ON
VAR OUT
PRE IN
VAR IN
W.E.
ADDR 2
EM 1545
MEMORY
+5
+5V
1/12V
VARIABLE
OUT 1
2
3
4
4.7K
1K
10K
0.1 MF
2N 3904


DIP SOCKET MEMORY
ELCO PINS 14 PLACES
JACK
100K LIN
JACK
10K LIN
2 POS SWITCH
0.1µF
10K
10K
4.7K
10K
1.0 K
JACK
0.1µF
10K
10K 1.0 K
JACK
10K
2 POS SWITCH
1.0 K
JACK
JACK
4.7 K
10K
0.1µF
1.0K
1 - Ground
2 - Switch
3
4 - Center switch
5
6
ALL TRANSISTORS 2N3904 (8 PLACES)
Eμ SYSTEMS 31 MAY 74
Dwn: DPR Ck:
Doc.# 2545-011-002
Assy: Memory Module

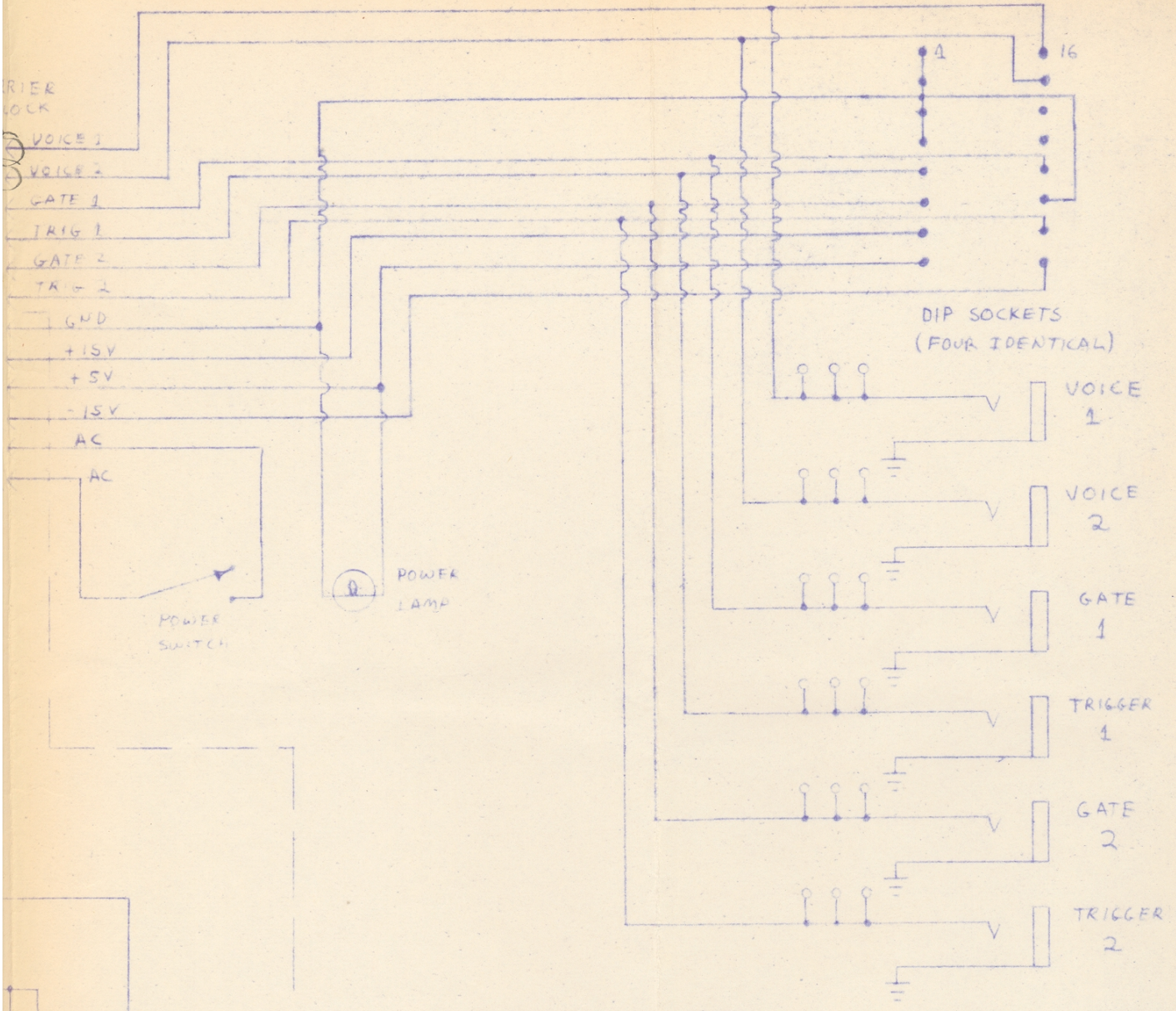
MODULE 2545 MEMORY - PARTS LIST

Qty.	Description
1	Instruction Packet
1	Eμ 1545 Memory Submodule
1	Circuit Board
1	Front Panel
2	Knobs
6	Phone Jacks
1	100K Linear Pot
1	10K Linear Pot
5	Lamps with clips, sockets and washers
1	16 pin DIP Socket with DIP Clip
1	16 pin DIP Plug
2	DPDT 2 Position Switches
8	2N3904 NPN Transistors
4	0.1 μF Decoupling Capacitors
16	1/4 Watt 5% Resistors as follows:
4	1.0KΩ (Brown Black Red Gold)
4	4.7KΩ (Yellow Violet Red Gold)
8	10KΩ (Brown Black Orange Gold)
28	Leads
4	4-40x3/4" Binder head screws with washers & nuts

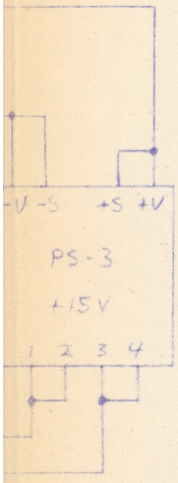
2900 POWER SUPPLIES

PARTS LIST - 1905 PWR SPLY SBM

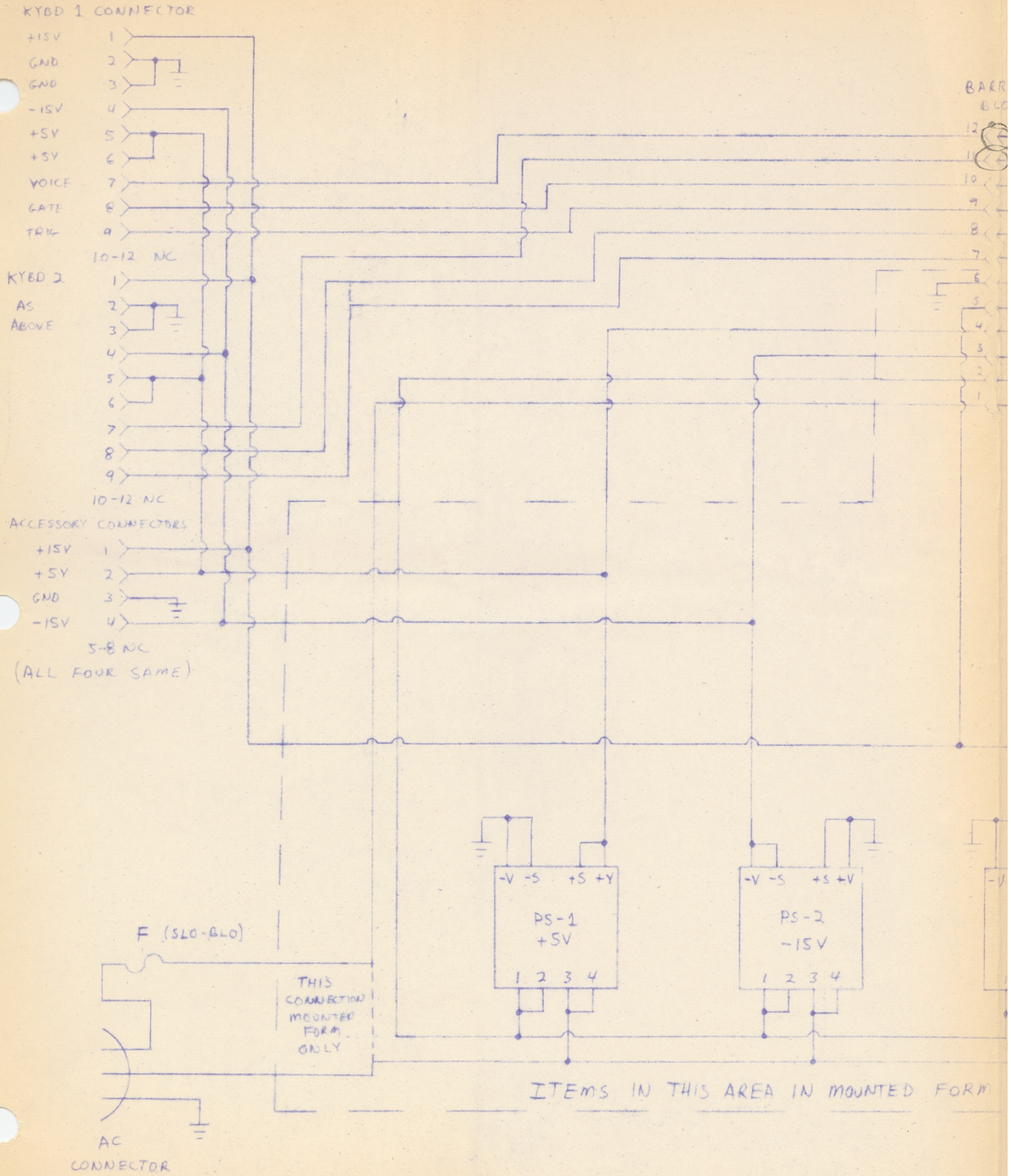
QTY	PART#	DESCRIPTION	NOTES
1	IL 1	741 CP OPAMP	
3	IL 13	723 REGLTR	
1	IL 14	309K REGLTR	
2	IL 16	395 PWR XSTR	
1	Q 4	2N4250 PNP	
3	Q 13	2N6236 SCR	
1	D 1	1N914 SIG	
9	D 5	MR501 RECT	
1	D 6	1N5232	
1	C 8	470 PF CER	
1	C 13	0.01UF CER L	
3	C 22	10 UF TANT	
2	C 25	2000 UF 40V	
1	C 26	5000 UF 15V	
3	R 2	100 OHM	
6	R 9	1.0K OHM	
1	R 10	1.5K OHM	
1	R 22	10K OHM	
1	R 33	100K OHM	
6	RP 14	3.01K 1%	
1	RP 15	3.32K 1%	
1	RP 16	9.09K 1%	
2	RP 17	4.02K 1%	
1	TR 5	100K TRIMMER	
1	TR 8	1K TRIMMER	
6	H 13	4-40X3/4 BH	
9	H 15	4-40 KEPNUT	
6	H 19	6-32X3/4 RH	
6	H 20	#6 LKWSHR	
12	H 21	6-32 NUT	
3	H 26	SML HEATSINK	
1	H 27	LGE HEATSINK	
2	H 28	MICA WASHER	
6	H 29	NYLON WASHER	
5	H 31	SOLDER LUG	
1	M 12	16V CT XFMR	
1	M 13	36V CT XFMR	
1	CB 54	1905 PS CB	

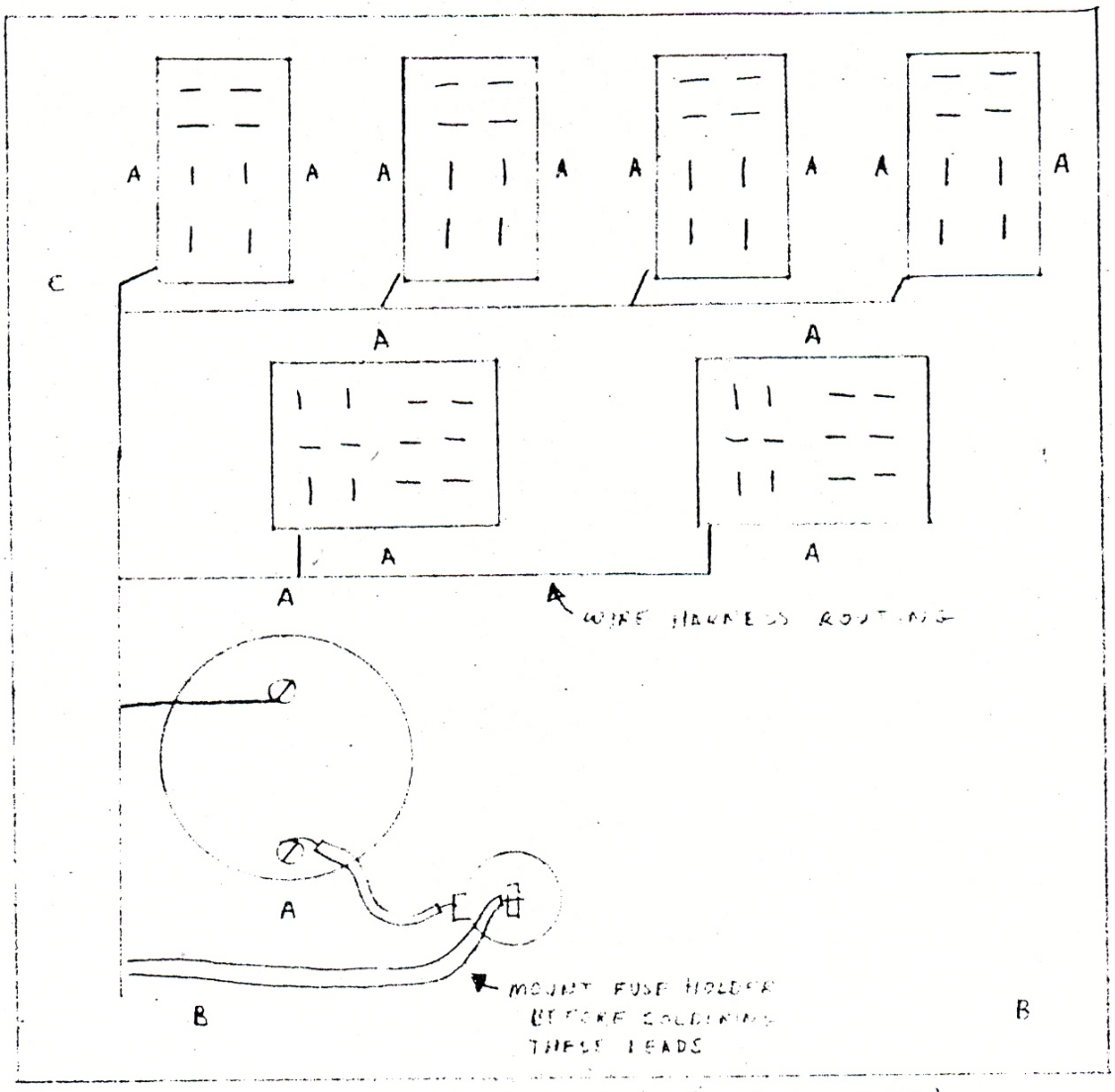


SUPPLY	PS-1	PS-2	PS-3	F
2900	30-5	30-15	30-15	3A
2910	30-5	15-15	15-15	2A
2920	15-5	½ MIL-15	½ MIL-15	1A



Eμ SYSTEMS	22 APR 73
DR BY BPP	CK BY
DOC # 2900-001-001	
SCHEMATIC - POWER SUPPLY MODULE	


KYBD 1 CONNECTOR
+15V 1
GND 2
GND 3
-15V 4
+5V 5
+5V 6
VOICE 7
GATE 8
TRIG 9
10-12 NC
KYBD 2
AS ABOVE
1
2
3
4
5
6
7
8
9
10-12 NC
ACCESSORY CONNECTORS
+15V 1
+5V 2
GND 3
-15V 4
5-8 NC
(ALL FOUR SAME)
BARR
B LO
12
11
10
9
8
7
6
5
4
3
2
1
-V -S +S +V
PS-1
+5V
1 2 3 4
-V -S +S +V
PS-2
-15V
1 2 3 4
F (SLO-BLO)
THIS CONNECTION MOUNTED FORM ONLY
AC CONNECTOR
ITEMS IN THIS AREA IN MOUNTED FORM



REAR VIEW (WIRING SIDE)

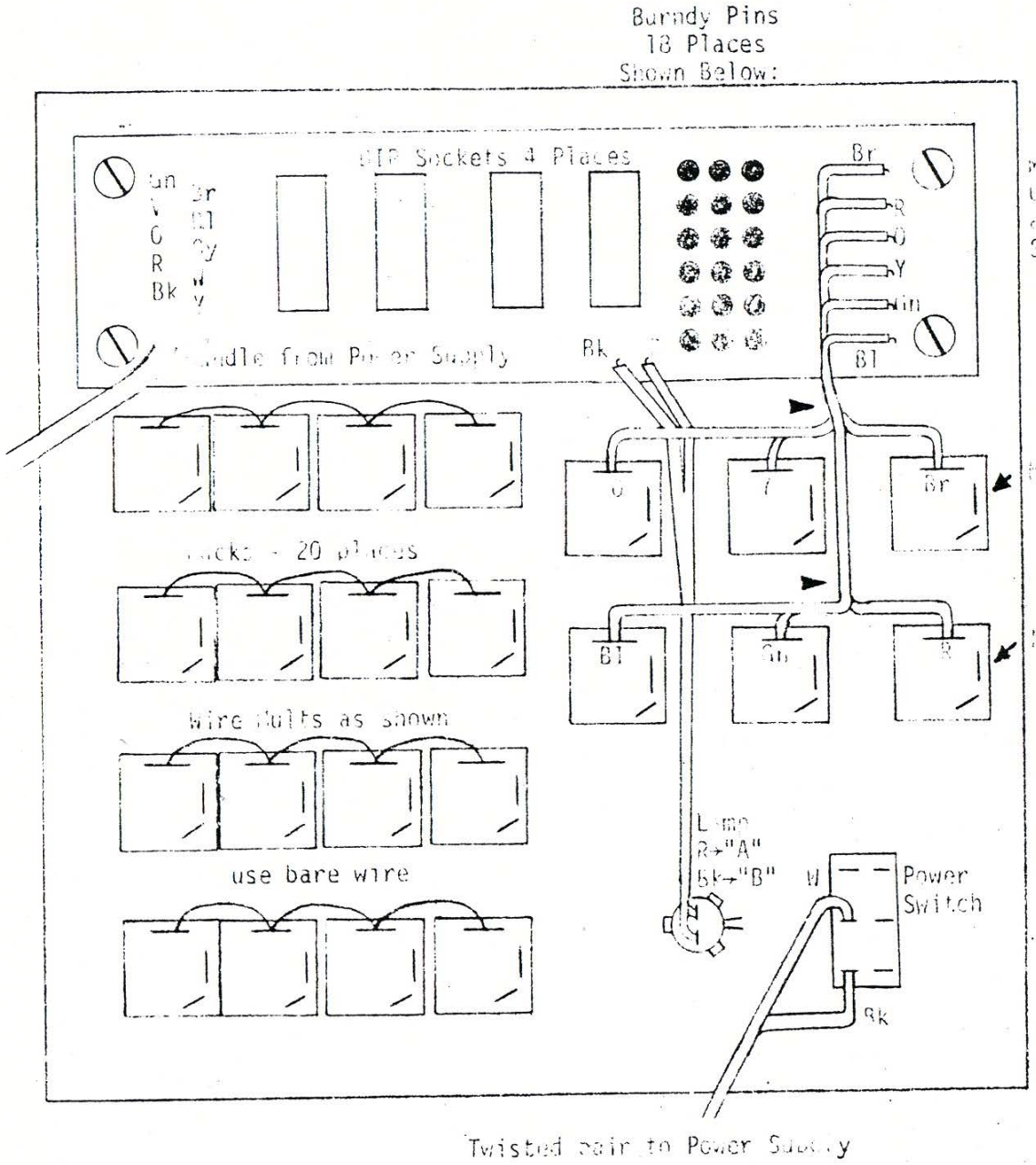
HARDWARE NOTATION

A - 6-32 x 1/2 R.H.
PANEL
CONNECTOR BRACKET
#6 LOCKWASHER
6-32 NUT

B - FOR MOUNTING TO BOTTOM PLATE VIA BRACKETS - 6-32 x 1/2 R

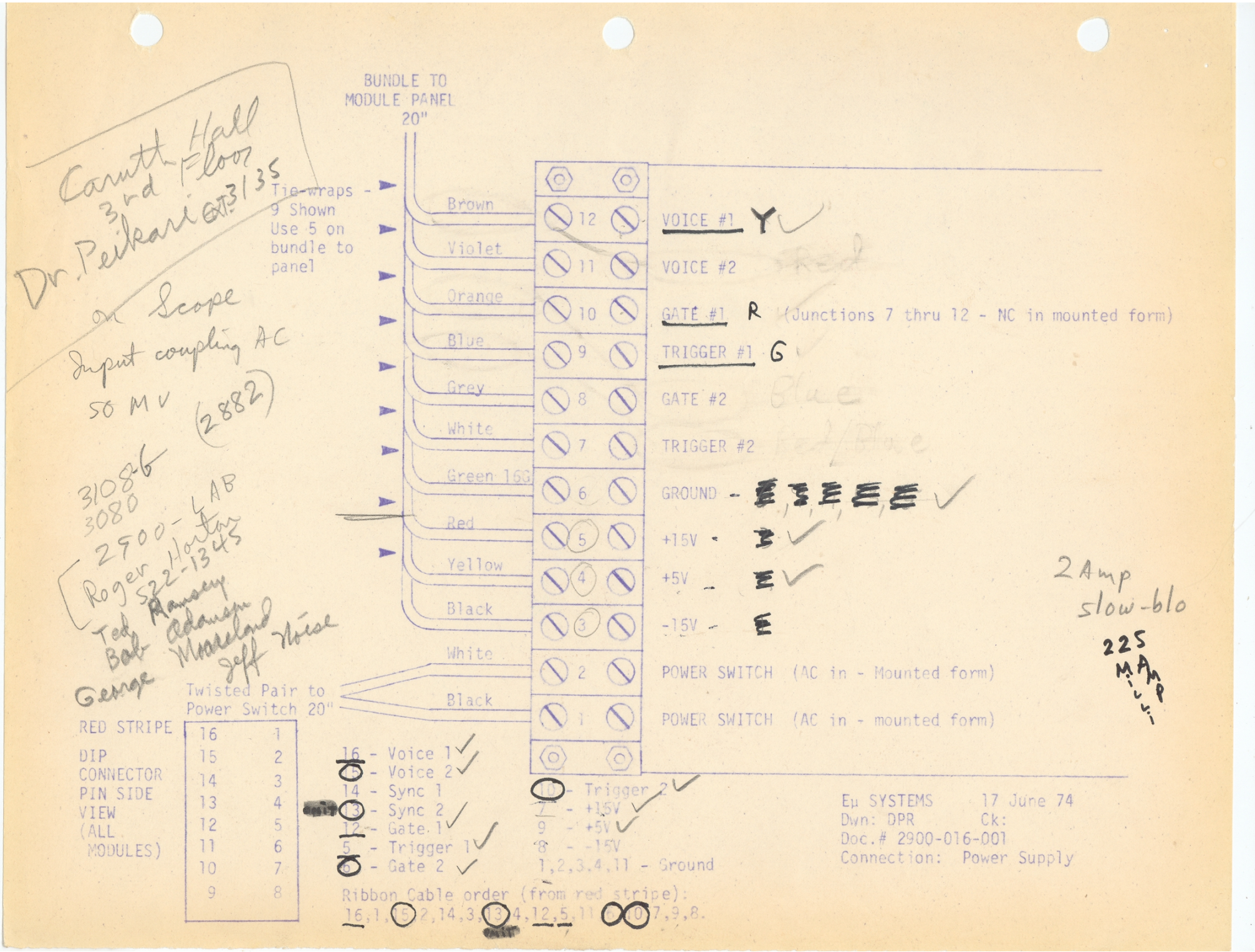
C - FOR MOUNTING TO CABINET VIA BRACKET - 6-32 x 1/2 RH, SUPPL
WITH CABINET.

Em SYSTEMS	22 APR 75
DR BY DPR	CK BY
DOC # 2900-011-001 A2	
ASSEMBLY - INTERFACE PANEL	



Mount Power Distribution
Circuit Board using 4 spac
and 8 4-40 x 1/4" Binder H
Screws.

Eu SYSTEMS 17 June
Dwn: DPR Ck:
Doc.# 2900-011-002
Assy: Power Supply Mo
Panel

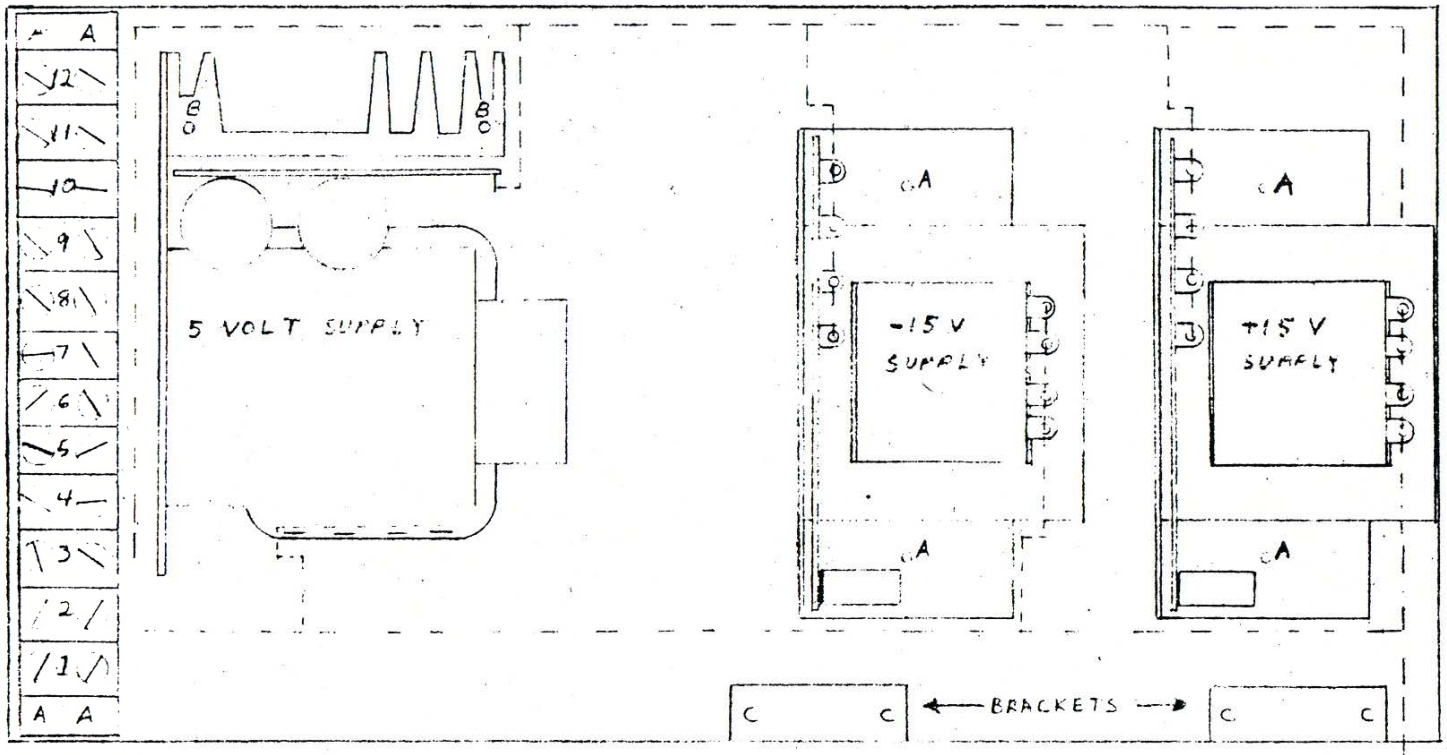


Carruth Hall
3rd Floor
Dr. Peikari ext 3135

or Scope
Input coupling AC
50 MV (2882)

3108-6
3080
2900-LAB
Roger Horton 522-1345
[Ted Ramsey
Bob Adamson
George Moreland
Jeff Noise

2 Amp
slow-blo
225 MAMP



HARDWARE CODE:

A #6-32 X 1/2 FLAT HEAD FROM BOTTOM
#6 LOCK WASHER & HEX NUT ON TOP

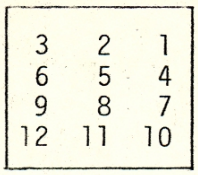
B #6-32 X 1/2 FLAT HEAD FROM BOTTOM
INTO THREADED HOLE IN HEAT SINK

C #6-32 X 3/4 F.H FROM BOT.
THRU BRACKET
#6 LOCKWASHER & HEX NUT

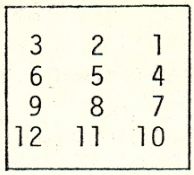
DOTTED LINE INDICATES WIRE HARNESS
LOCATION.

EM SYSTEMS	17 APRIL '73
CKBJ	CKBJ
DOC # 2901-011 001	(pag
ASSY DIAG: 1.5A	
PWR SUPPLY - MODULE FORM	

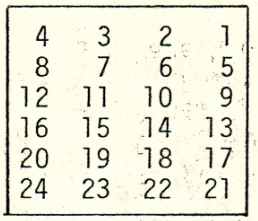
2905/2908 Power Supply - Connector Pinouts



KEYBOARD 1



KEYBOARD 2



AUX. CONNS. (4)

ORIENTATION FROM REAR OF CABINET

KEYBOARD CONNECTOR PIN ASSIGNMENTS

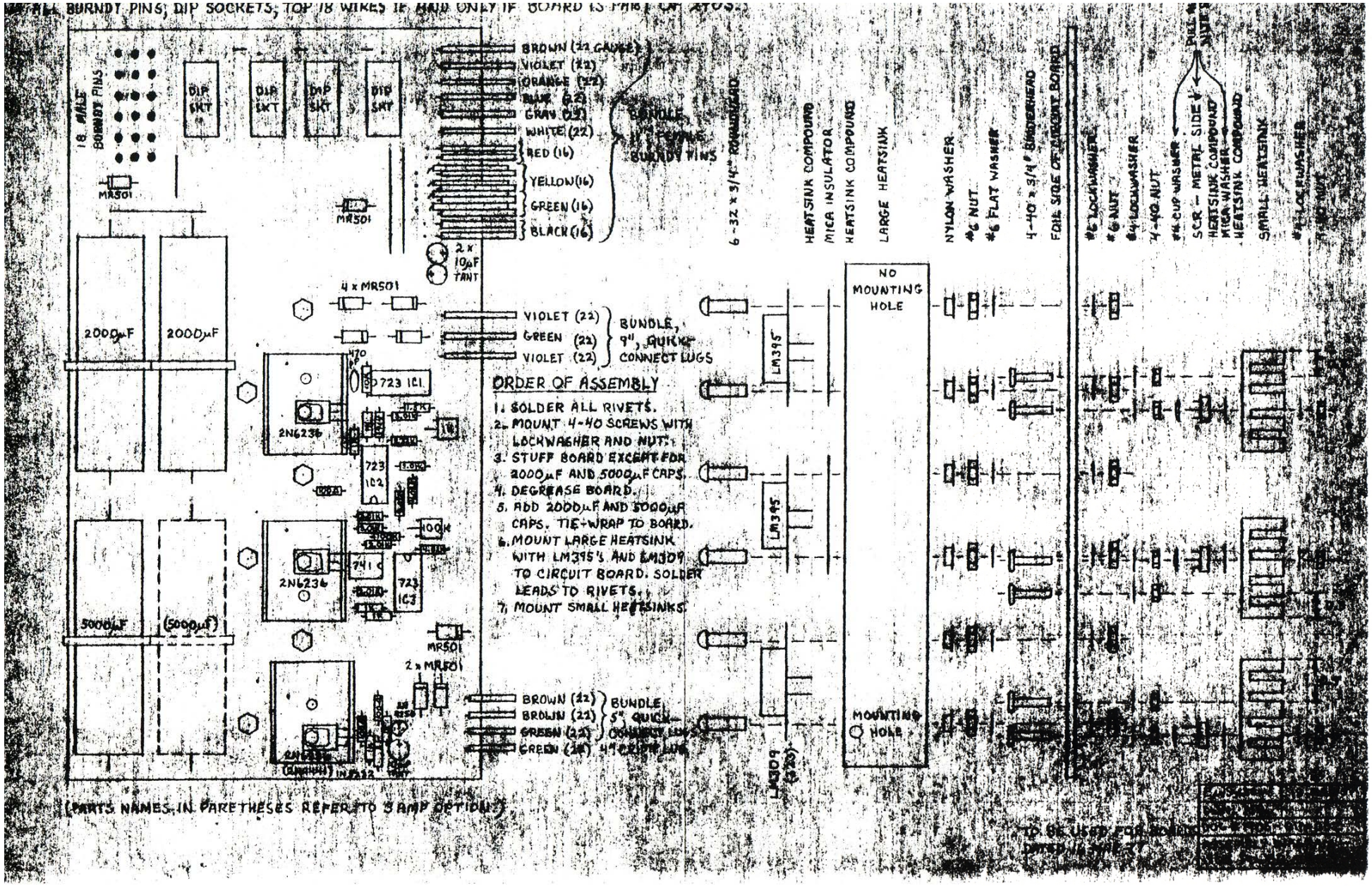
PIN	SIGNAL	COLOR #1	COLOR #2
1	+15V	RED 16G	RED 16G
2	Ground	GREEN	GREEN
3	Ground	GREEN	GREEN
4	-15V	BLACK	BLACK
5	+5V	YELLOW	YELLOW
6	+5V	YELLOW	YELLOW
7	CONTROL VOLTAGE	BROWN	VIOLET
8	GATE	ORANGE	GRAY
9	TRIGGER	BLUE	WHITE
10	RES'D FOR 4050 "TEMP'D"	--	--
11	RES'D FOR 4050 "P1"	--	--
12	RES'D FOR 4050 "P2"	--	--

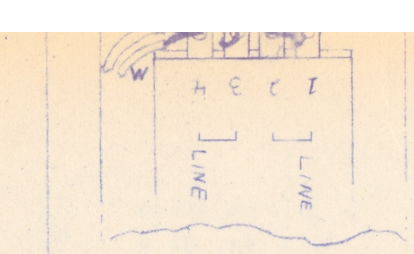
AUX. CONNS. ASSIGNMENT FOR 4050 KEYBOARD

PIN	SIGNAL
1	+5V RETURN
2	+UNIQUE
3	+NEVER
4	+ALWAYS
4N+1	CONTROL VOLTAGE VOICE N
4N+2	GATE VOICE N
4N+3	LAMP VOICE N
4N+4	+OFF VOICE N

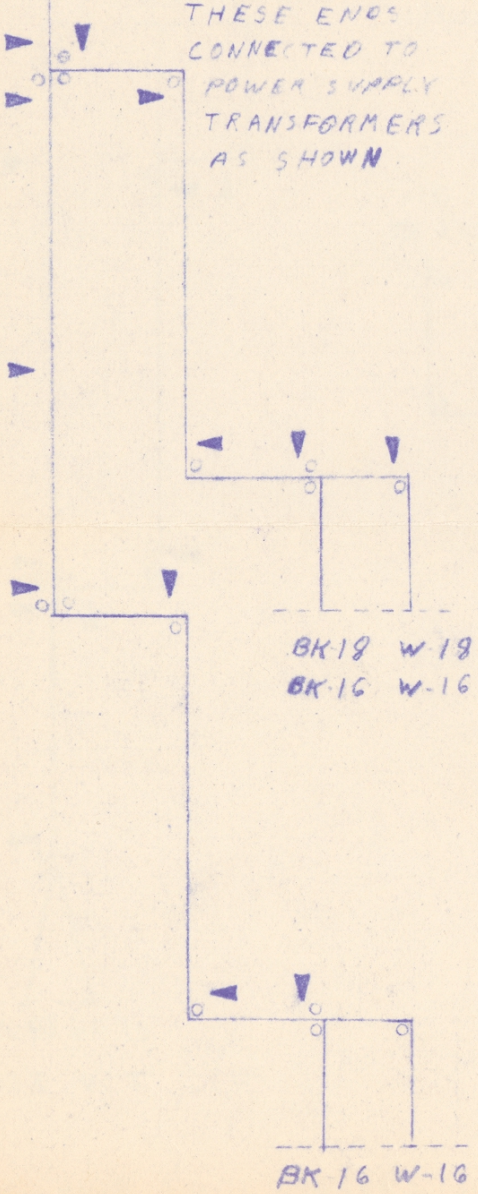
CONTINUE SAME ORDER INTO SECOND CONNECTOR, SKIPPING PINS 1-4. RIGHTMOST CONNECTOR IS LOW ORDER VOICES, NEXT TO RIGHTMOST IS HIGH ORDER.

AUX. CONNS. ALSO USED FOR INTERCABINET FIRM-WIRE. ALL PINS UNCOMMITTED.


ALL BURNDY PINS, DIP SOCKETS, TOP 18 WIRES IF BARE ONLY IF BOARD IS PAINTED OR ANODIZED
18 MALE BURNDY PINS
DIP SKT
MR501
BROWN (22 GAUGE)
VIOLET (22)
ORANGE (22)
BLUE (22)
GRAY (22)
WHITE (22)
RED (16)
YELLOW (16)
GREEN (16)
BLACK (16)
BUNDLE, 9" LONG, BURNDY PINS
2 x 10μF TANT
4 x MR501
2000μF
2000μF
VIOLET (22)
GREEN (22)
VIOLET (22)
BUNDLE, 9", QUICK-CONNECT LUGS
470
723 IC1
2N6236
723 IC2
100K
741 IC
723 IC3
5000μF
(5000μF)
2 x MR501
BROWN (22)
BROWN (22)
GREEN (22)
GREEN (22)
BUNDLE, 5" QUICK-CONNECT LUGS
6-32 x 3/4" ROUNDHEAD
HEATSINK COMPOUND
MICA INSULATOR
HEATSINK COMPOUND
LARGE HEATSINK
NYLON WASHER
#6 NUT
#6 FLAT WASHER
4-40 x 3/4" SCREWHEAD
FOIL SIDE OF CIRCUIT BOARD
#6 LOCKWASHER
#6 NUT
#4 LOCKWASHER
4-40 NUT
#4 CUP WASHER
SCR — METAL SIDE UP
HEATSINK COMPOUND
MICA WASHER
HEATSINK COMPOUND
SMALL HEATSINK
#4 LOCKWASHER
4-40 NUT
LM395
LM395
LM309 (7824)
NO MOUNTING HOLE
MOUNTING HOLE
ORDER OF ASSEMBLY
1. SOLDER ALL RIVETS.
2. MOUNT 4-40 SCREWS WITH LOCKWASHER AND NUT.
3. STUFF BOARD EXCEPT FOR 2000μF AND 5000μF CAPS.
4. DEGREASE BOARD.
5. ADD 2000μF AND 5000μF CAPS. TIE-WRAP TO BOARD.
6. MOUNT LARGE HEATSINK WITH LM395'S AND LM309 TO CIRCUIT BOARD. SOLDER LEADS TO RIVETS.
7. MOUNT SMALL HEATSINKS
(PARTS NAMES IN PARETHESES REFER TO 3 AMP OPTION)
TO BE USED FOR



THESE ENDS CONNECTED TO POWER SUPPLY TRANSFORMERS AS SHOWN

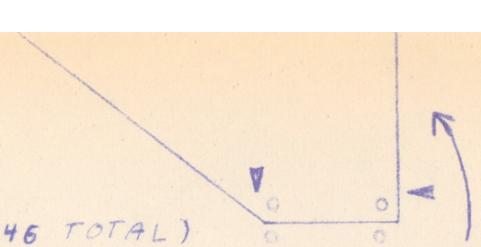


BK 18 W 18
BK 16 W 16

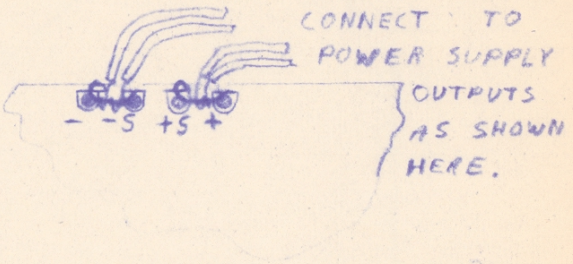
BK 16 W 16

O = NAIL

➡ = TIE WRAP (46 TOTAL)



THESE WIRES CONNECT TO POWER SUPPLY OUTPUTS AS SHOWN HERE.



WIRES

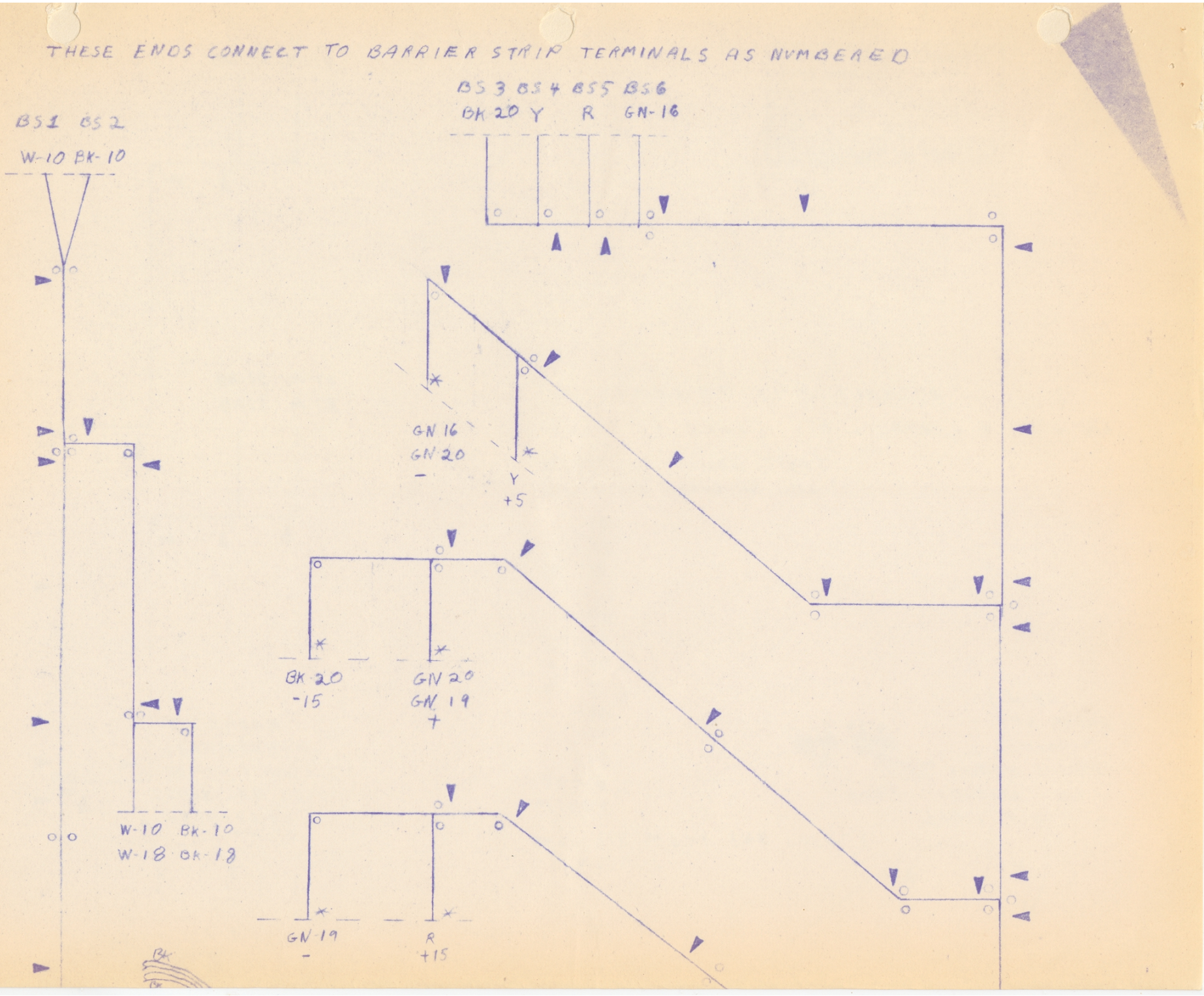
BK - 10"
- 18"
- 16"
- 20"
R - 21"
Y - 16"
GN - 16"
- 20"
- 19"
W - 10"
- 18"
- 16"

AFTER TIE WRAPPING, CUT WIRES AT DOTTED LINES

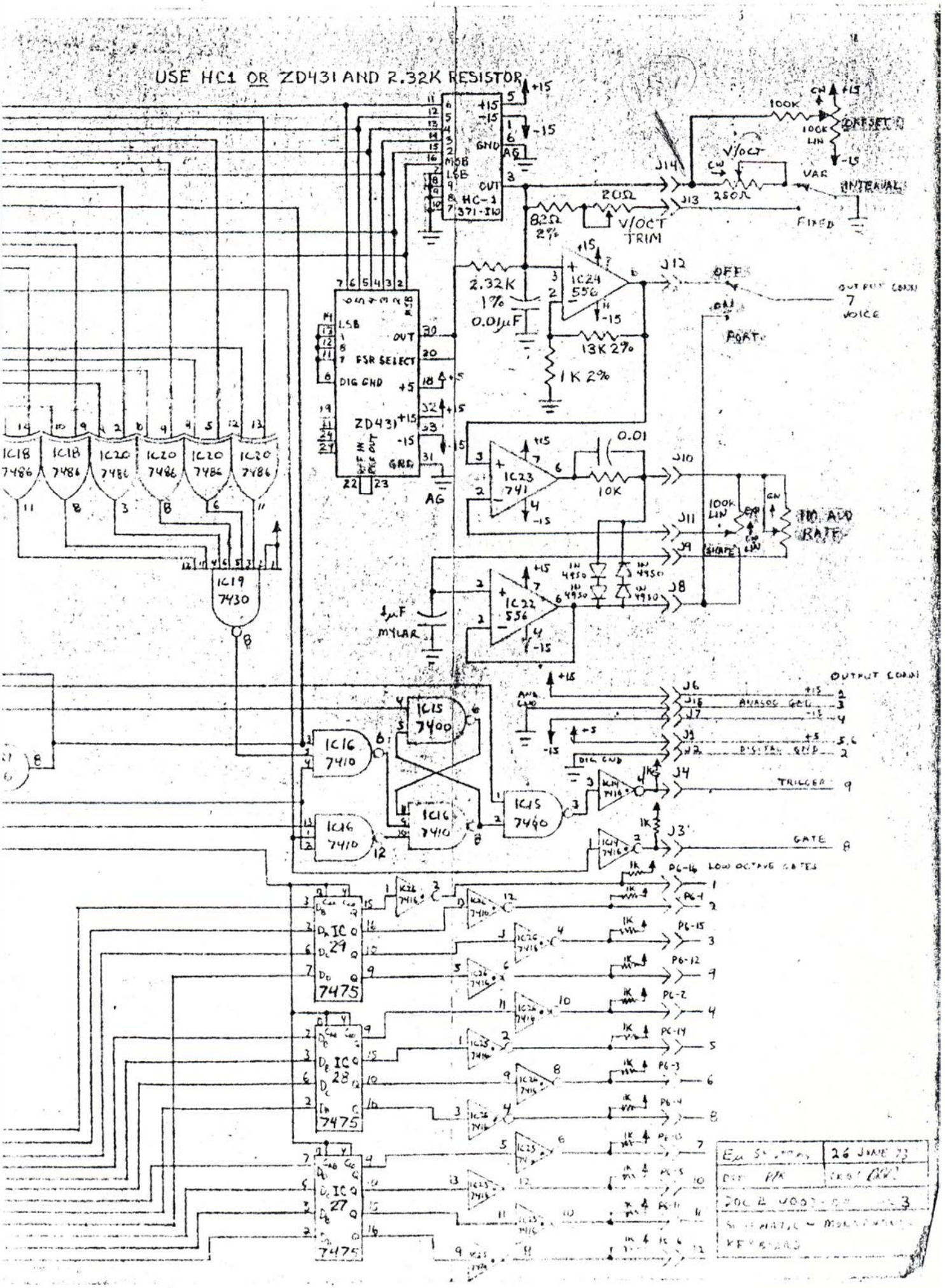
STRIP ALL WIRES 1/2" EXCEPT * STRIP 3/4

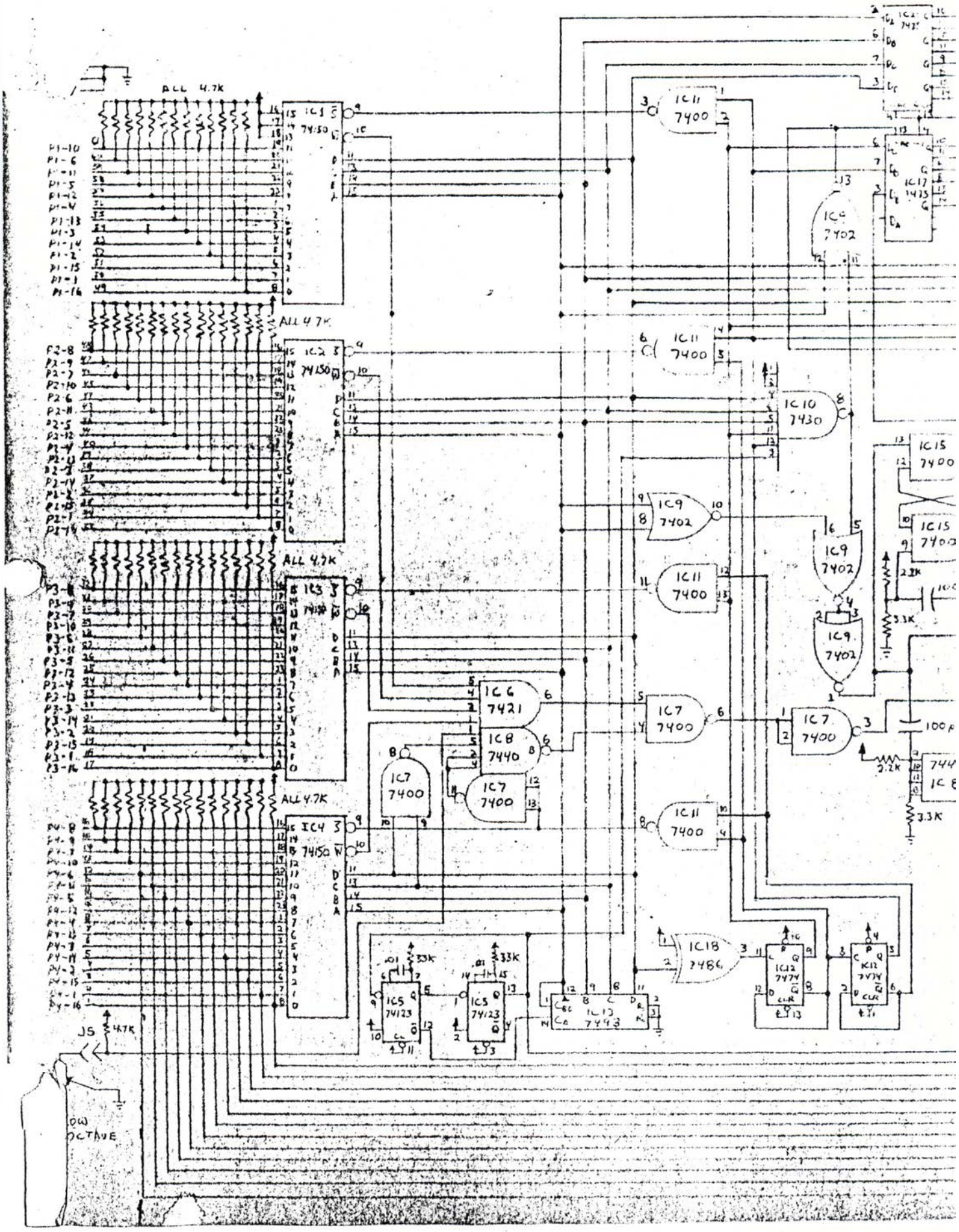
TIN STRIPPED ENDS LIGHTLY

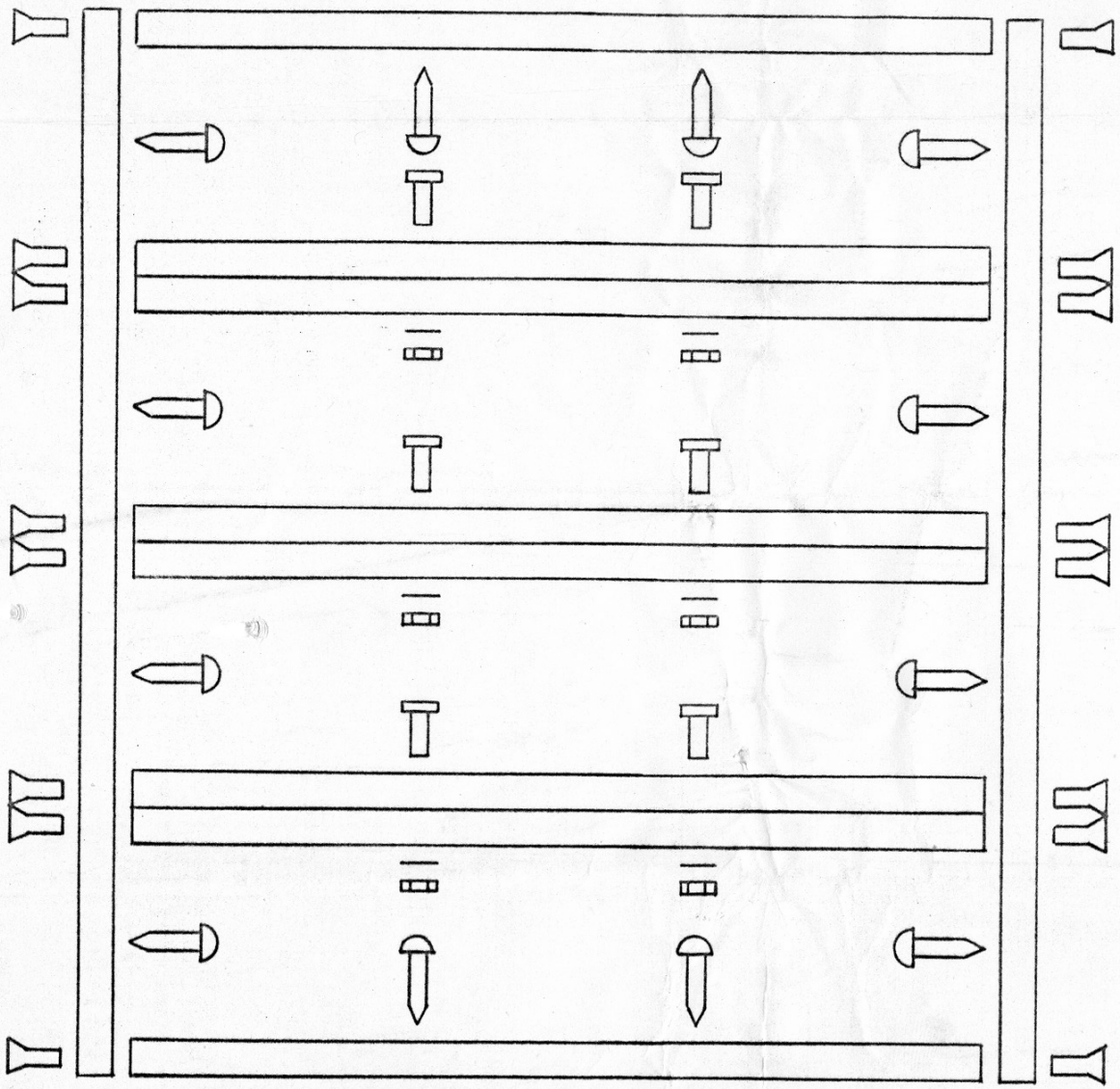
E μ SYSTEMS	19 APRIL 73
Dr By SW	Ck By
DOC # 2911-014-001	
WIRE HARNESS DIAG 1.5 A POWER SUPPLY	


THESE ENDS CONNECT TO BARRIER STRIP TERMINALS AS NUMBERED
BS 3 BS 4 BS 5 BS 6
BK 20 Y R GN-16
BS 1 BS 2
W-10 BK-10
GN 16
GN 20
-
Y
+5
BK 20
-15
GN 20
GN 19
+
W-10 BK-10
W-18 BK-18
GN-19
-
R
+15
BK
BK

4000 KEYBOARD


USE HC1 OR ZD431 AND 2.32K RESISTOR
+15
-15
GND
AG
MSB
LSB
OUT
HC-1
371-110
100K
OFFSET
100K LIN
V/OCT
CW
VAR
INTERVAL
J14
250Ω
20Ω
J13
V/OCT TRIM
820Ω 2%
FIXED
2.32K 1%
0.01μF
IC24 556
J12
OFF
13K 2%
1K 2%
PORT
7 VOICE
ZD431
LSB
OUT
FSR SELECT
DIG GND
+5
GRD
IC23 741
0.01
10K
J10
J11
J9
100K LIN
RATE
IC22 556
1N 4150
J8
1μF MYLAR
IC18 7486
IC19 7430
IC15 7400
IC16 7410
IC15 7460
J6
J7
J5
J4
TRIGGER
J3
GATE
PG-16 LOW OCTAVE GATES
IC29 7475
IC28 7475
IC27 7475
PG-1
PG-15
PG-12
PG-2
PG-14
PG-3
PG-4
26 JUNE 73
KEYBOARD


ALL 4.7K
IC1 74150
IC2 74150
IC3 74150
IC4 74150
IC5 74123
IC6 7421
IC7 7400
IC8 7440
IC9 7402
IC10 7430
IC11 7400
IC12 7474
IC13 7493
IC15 7400
IC17 7435
IC18 7486
.01
33K
2.2K
3.3K
100P
JS 47K
OCTAVE

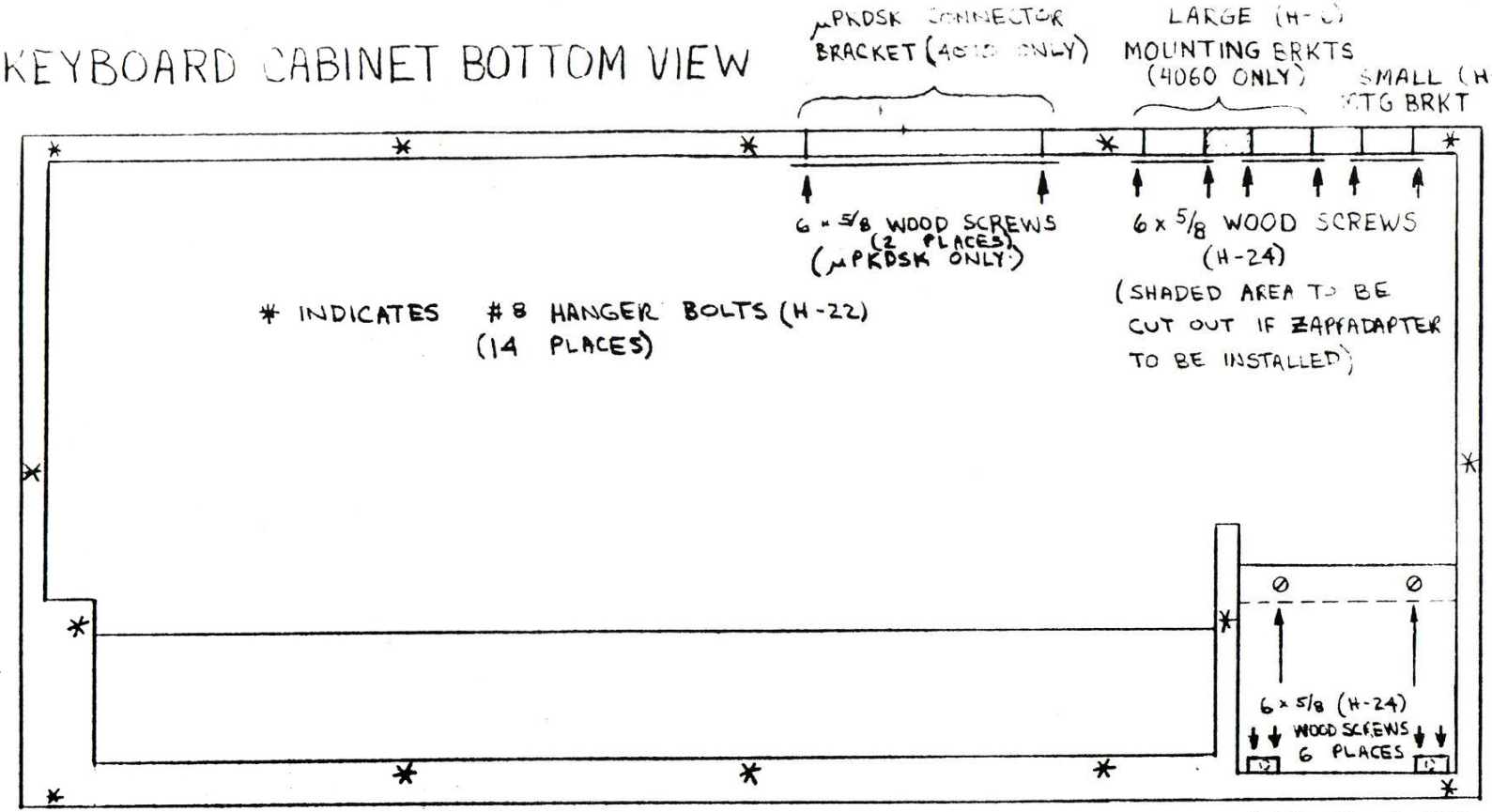


IMPORTANT: ORIENT HORIZONTAL AND VERTICAL RAILS SUCH THAT THE SCREW HOLES FOR ATTACHMENT OF VERT. RAILS TO HORIZ. RAILS ARE TOWARD BACK OF SYSTEM.

- 6-32 x 5/8
- #6 LOCKWASHER
- 6-32 NUT
- 4-40 x 1/2 FLATHEAD
- #6 x 3/4 WOODSCREW

Eμ SYSTEMS	15 JAN 76
DWN RJB	
DOC # 4100-011-001	
ASSEMBLY DIAGRAM MAIN CABINET RAILS	

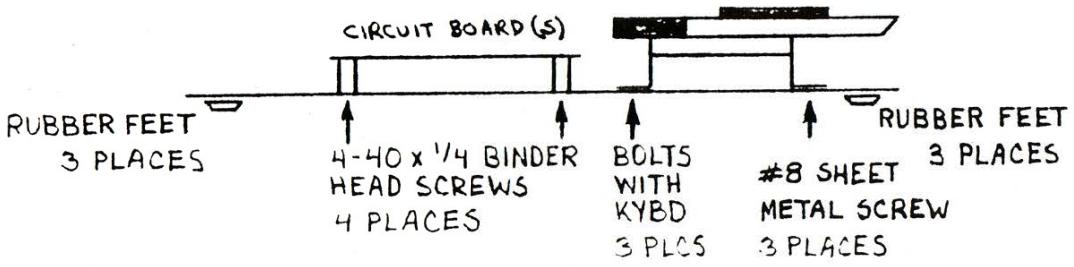
KEYBOARD CABINET BOTTOM VIEW



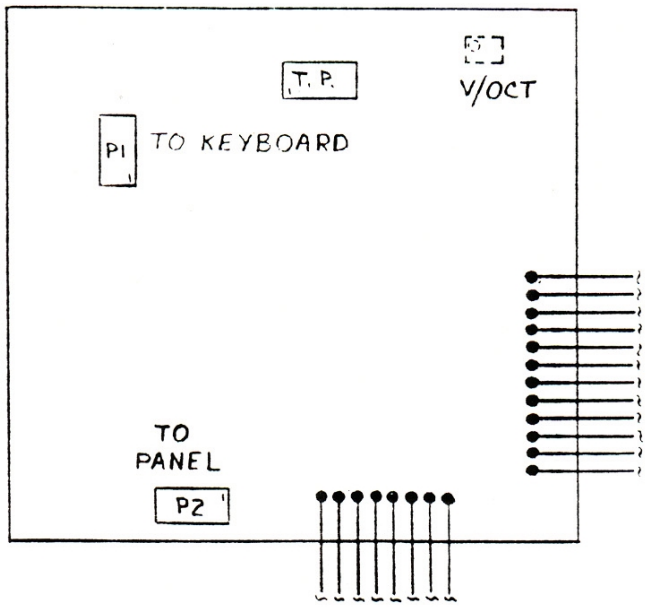
LOCATE HOLES WITH BOTTOM PANEL AND KEYBOARD PANEL (WITH ITS MOUNTING BRACKET) IN PLACE.

6-32 x 1/2 BINDER HEAD SCREWS ATTACH PANEL TO MOUNTING BRACKETS (2 PLACES)

BOTTOM PANEL WITH CIRCUIT BOARD AND MANUAL



E SYSTEMS	28 JUL 80
DWN	
DOC # 4000-011-00F	
ASSEMBLY - KEYBOARD CABINET	



13 WIRES 16" SOLDERED TO CIRCUIT BOARD.

13 MALE BURNDY PINS IN 24 PIN BURNDY PLUG B2 (TO PANEL) PER NUMBERS BELOW.

8 WIRES 16" SOLDERED TO CIRCUIT BOARD.
8 FEMALE BURNDY PINS IN BURNDY SOCKET B1 (12 PIN) (TO MOUNTING BRACKET) PER NUMBERS BELOW.

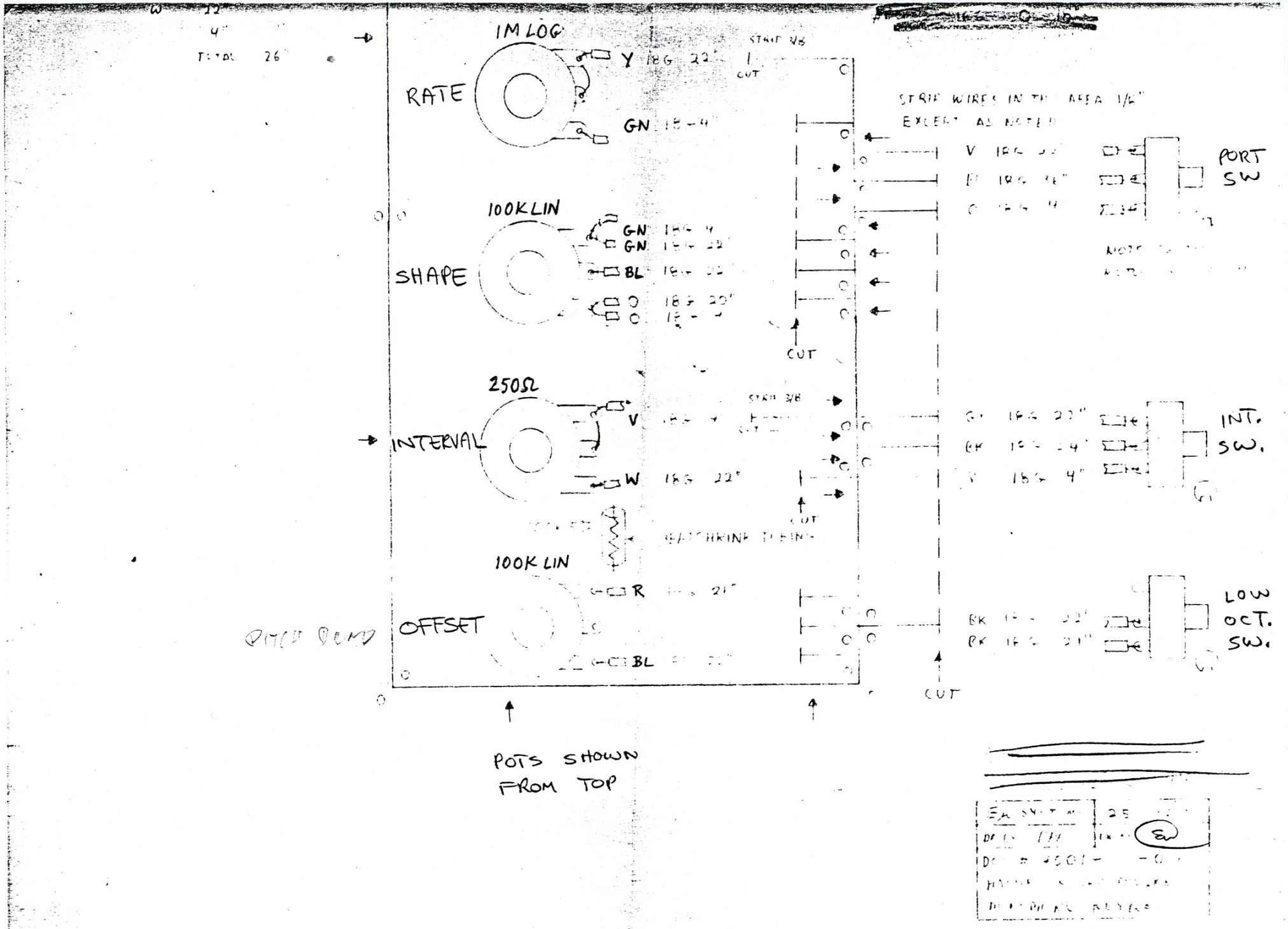
B1 PIN	SOCKET NAME	22 GAUGE
1	+15	RED
2	D GND	GRN
3	A GND	GRN
4	-15	
5	+5	
6	—	—
7	CV	
8	GATE	
9	TRIG	

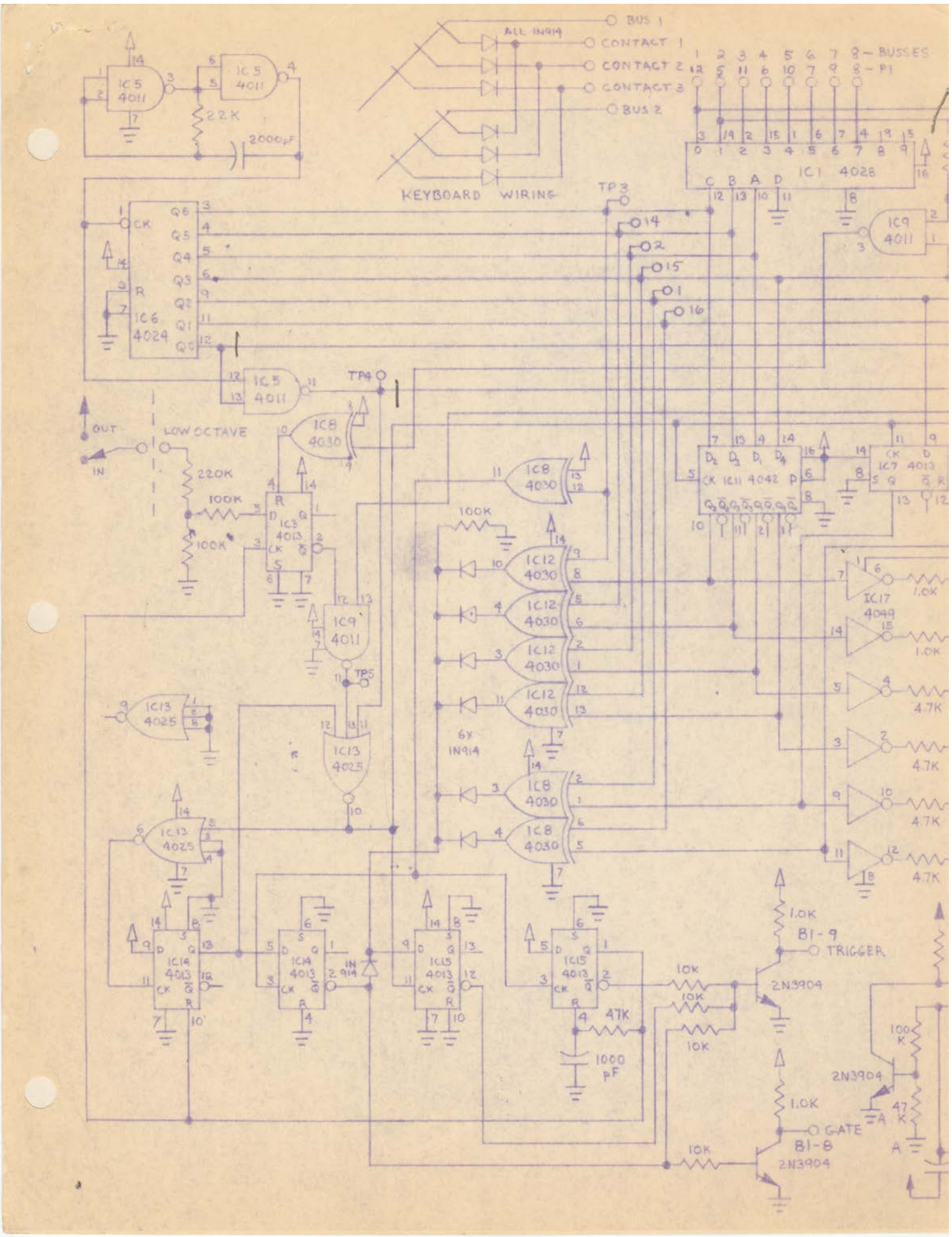
B2 PIN	PLUG NAME	22 GAUGE
1	LOW OCT	BLK
2	RATE	
3	PORT	
4	S/R	
5	+	
6	-	GRN
7	SHAPE WIPER	
8	SHAPE	
9	P/V	GRY
10	VAR	
11	PRESET	BLK
12	OFFSET	
13	MOD	

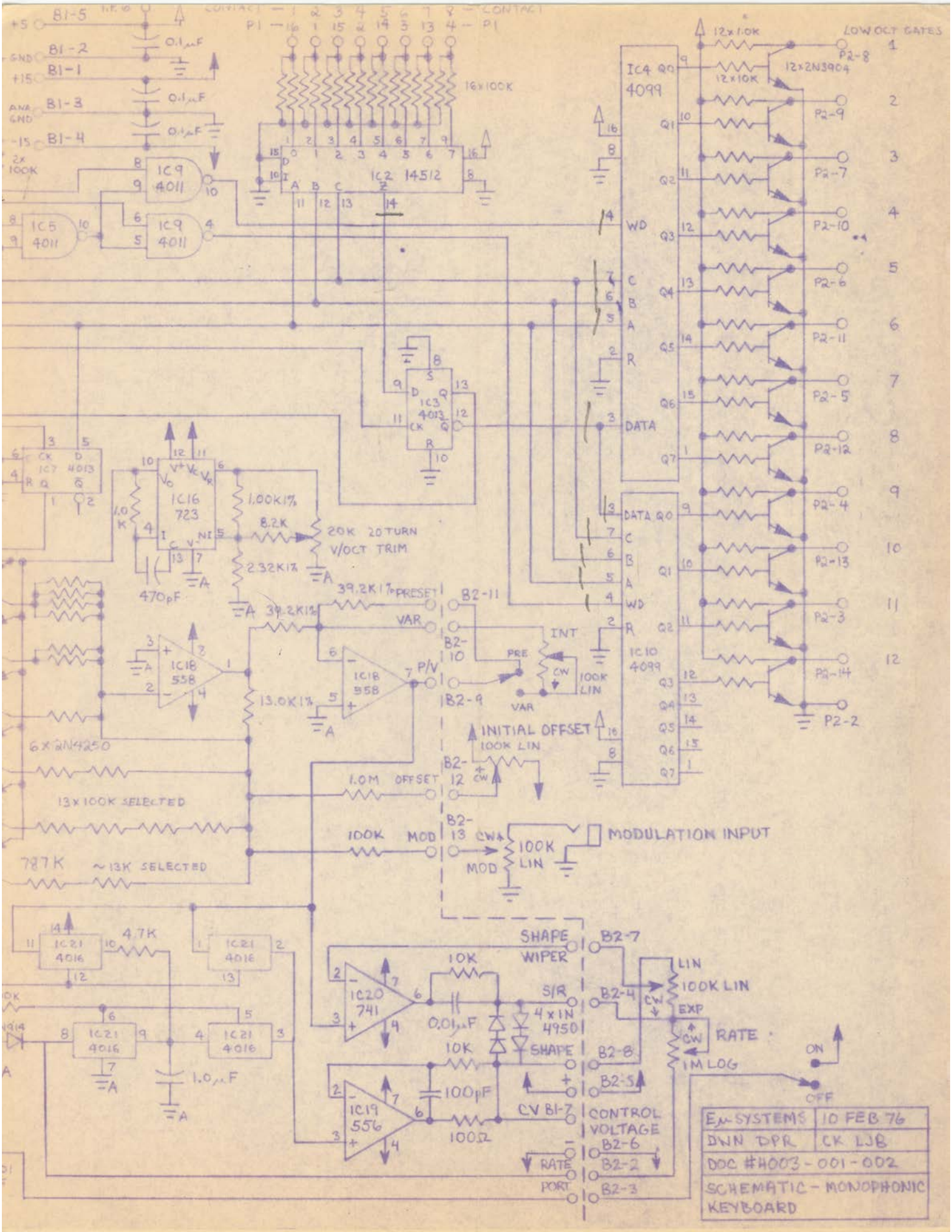
Em SYSTEMS	10 FEB 76
DWN PJB	
DOC #4000-011-006	
ASSEMBLY - MONO KEYBOARD CONNECTIONS	

PARTS LIST - 4000 MONO KYBD

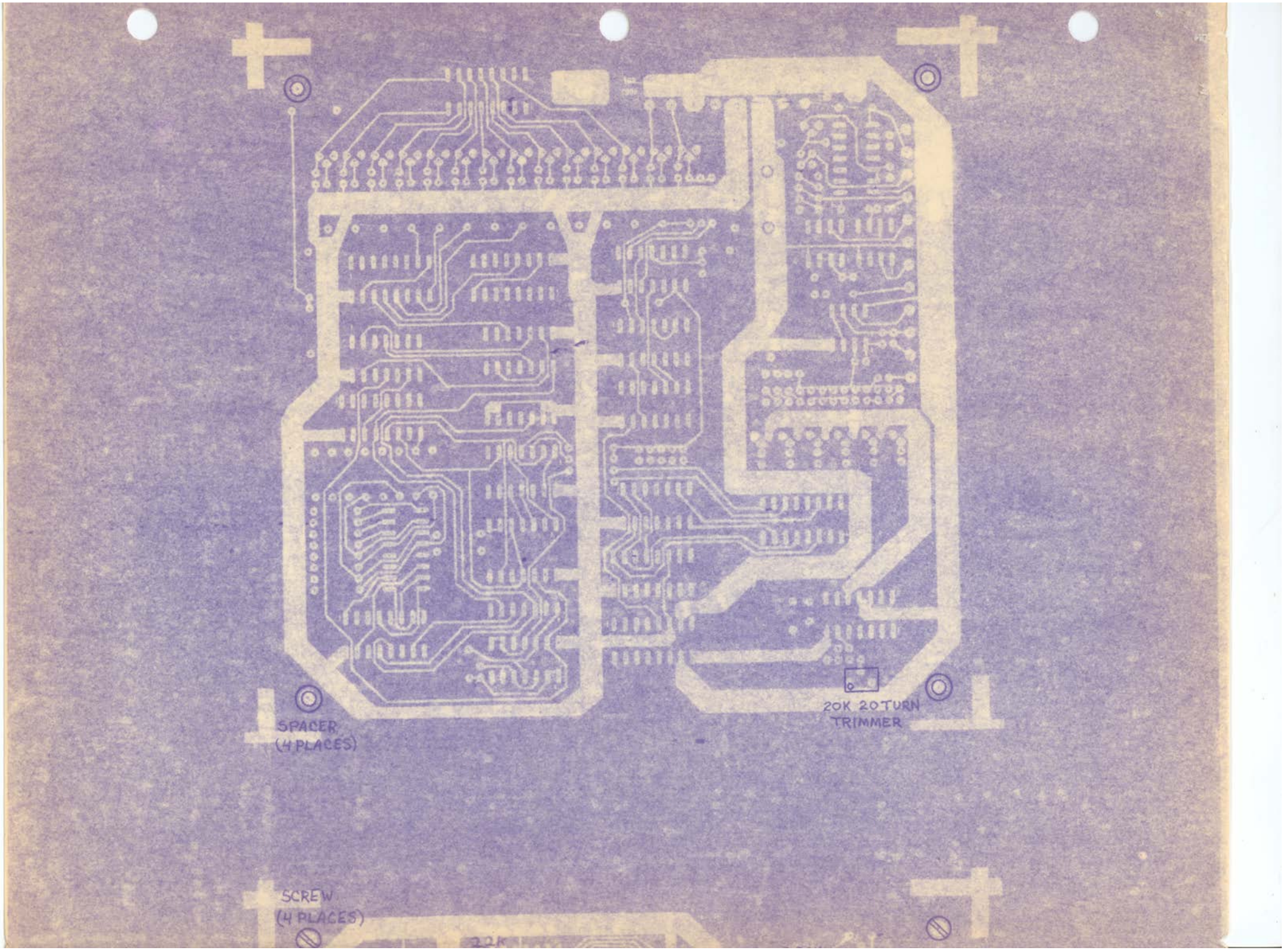
QTY	PART#	DESCRIPTION	NOTES
4	P 1	100K LIN POT	
1	P 3	1M LOG POT	
3	SW 1	SPDT 2 POS	
13	CN 2	PHONE JACK	
3	CN 9	DIP PLUG	
37	CN 12	ML BURN WIRE	
21	CN 13	FM BURN WIRE	
1	CN 18	12P BURN PNL	
1	CN 19	24P BURN PNL	
2	CN 20	12P BURN CBL	
1	CN 21	24P BURN CBL	
2	CN 22	12 PIN HOOD	
5	H 1	KNOB	
2	H 3	MTG BRACKET	
1	H 5	KYBD CN BKT	
2	H 18	6-32X1/4 RH	
14	H 22	#8 BRDBD SCR	
14	H 23	8-32 NUT	
6	H 24	#6X5/8 WDSCR	
2	H 25	#6X3/4 WDSCR	
4	W 6	12 COND CBL	
1	M 2	61 NOTE KYBD	
1	M 5	KYBD CABINET	
6	M 11	RUBBER FEET	
1	PN 37	KYBD PANEL	
1	PN 41	KYBD BOT PNL	
1	4003	KYBD SUBM	

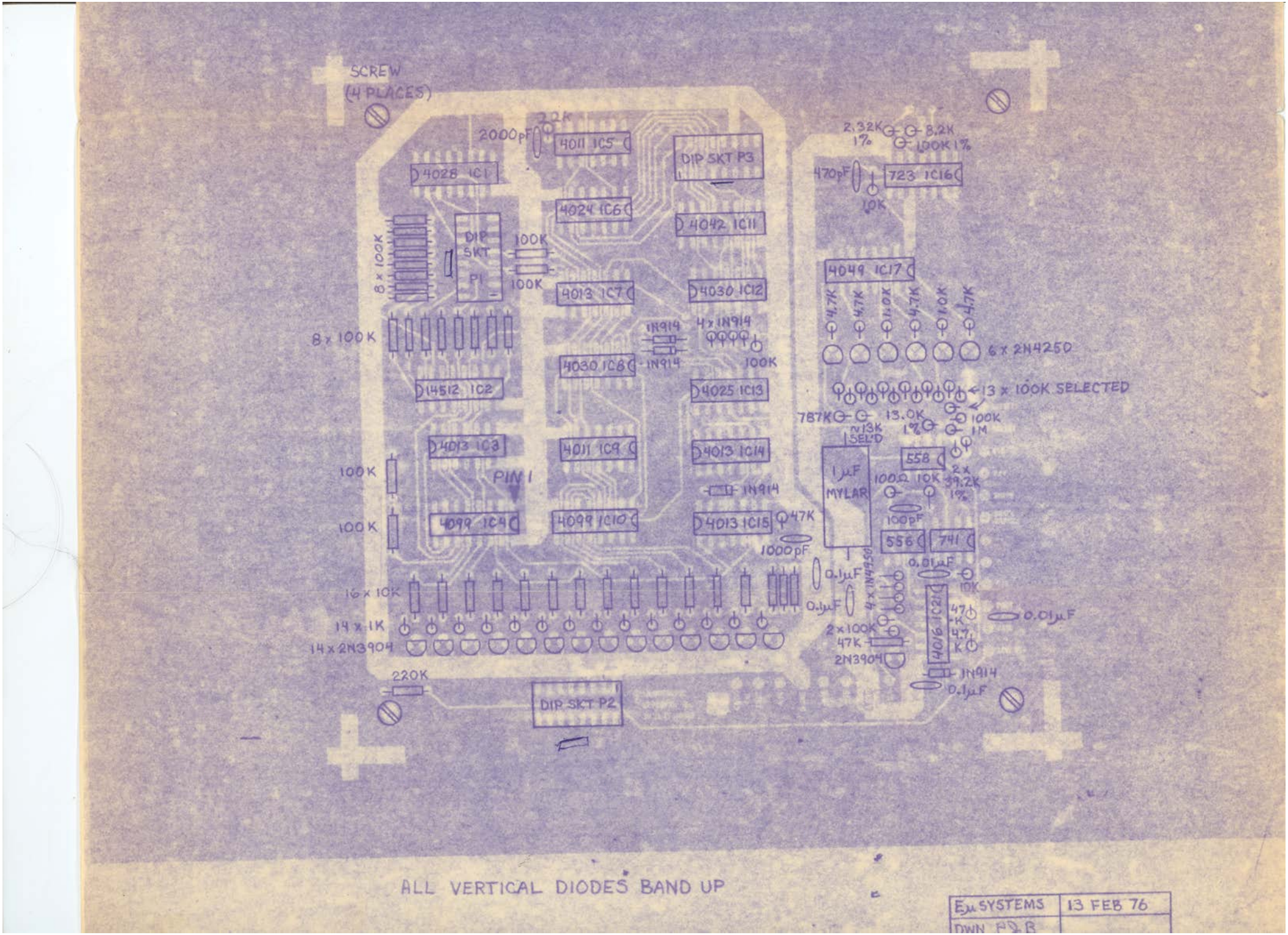

IM LOG
RATE
Y
GN
100K LIN
SHAPE
GN
GN
BL
250Ω
INTERVAL
V
W
100K LIN
OFFSET
R
BL
CUT
STRIP WIRES IN THIS AREA 1/2" EXCEPT AS NOTED
PORT SW
INT. SW.
LOW OCT. SW.
POTS SHOWN FROM TOP


KEYBOARD WIRING
ALL IN914
BUS 1
CONTACT 1
CONTACT 2
CONTACT 3
BUS 2
8 - BUSSES
8 - P1
IC1 4028
IC5 4011
22K
2000pF
IC6 4024
TP3
TP4
TP5
OUT
IN
LOW OCTAVE
220K
100K
IC3 4013
IC8 4030
IC9 4011
IC11 4042
IC7 4013
IC12 4030
6X IN914
IC13 4025
IC14 4013
IC15 4013
IC17 4049
1.0K
4.7K
47K
1000 pF
10K
B1-9
TRIGGER
B1-8
GATE
2N3904



EM-SYSTEMS	10 FEB 76
DWN DPR	CK LJB
DOC #H003-001-002	
SCHEMATIC - MONOPHONIC KEYBOARD	


SPACER
(4 PLACES)
20K 20 TURN
TRIMMER
SCREW
(4 PLACES)


SCREW
(4 PLACES)
2.2K
2000pF
4011 IC5
DIP SKT P3
4028 IC1
4024 IC6
4042 IC11
DIP SKT P1
8 x 100K
100K
100K
4013 IC7
4030 IC12
8 x 100K
1N914
4 x 1N914
100K
1N914
4030 IC8
14512 IC2
4025 IC13
4013 IC3
4011 IC9
4013 IC14
PIN 1
100K
100K
1N914
4099 IC4
4099 IC10
4013 IC15
47K
1000pF
16 x 10K
14 x 1K
14 x 2N3904
220K
DIP SKT P2
2.32K 1%
8.2K
100K 1%
470pF
10K
723 IC16
4049 IC17
4.7K
4.7K
1.0K
4.7K
1.0K
4.7K
6 x 2N4250
13 x 100K SELECTED
787K
13.0K 1%
100K
1M
NV13K SEL'D
1μF MYLAR
558
100Ω
10K
2 x 39.2K 1%
100pF
556
741
4 x 1N4150
0.1μF
0.1μF
0.01μF
10K
2 x 100K
47K
2N3904
4016 IC21
47K
4.7K
0.01μF
1N914
0.1μF
ALL VERTICAL DIODES BAND UP
EμSYSTEMS
13 FEB 76
DWN PD-B

PARTS LIST - 4003 KYBD SUBA 11 MAR 76

QTY.	PART NO.	DESCRIPTION
1	IL 1	741 OPAMP
1	IL 2	556 DL OPAMP
1	IL 3	556 OPAMP
1	IL 13	723 REGLTR
1	ID 2	4042
2	ID 3	4099
1	ID 4	14512
1	ID 5	4028
2	ID 16	4011
1	ID 17	4016
4	ID 18	4013
1	ID 19	4025
1	ID 30	4049/4009
1	ID 33	4024
2	ID 34	4030/14507
15	Q 2	2N3904
6	Q 4	2N4250
6	D 1	1N914
4	D 2	1N4950
1	C 5	100 PF CER
1	C 6	470 PF CER
1	C 9	1000 PF CER
1	C 10	2000 PF CER
2	C 12	0.01UF CER S
3	C 15	0.1 UF CER
1	C 20	1.0 UF MYLAR
1	R 2	100 OHM
17	R 9	1.0K OHM
5	R 17	4.7K OHM
1	R 21	8.2K OHM
16	R 22	10K OHM
1	R 25	22K OHM
3	R 30	47K OHM
24	R 33	100K OHM
1	R 36	220K OHM
1	R 45	1.0M OHM
1	RP 3	1.00K 1%
1	RP 4	13.0K 1%
13	RP 6	100K 1%
2	RP 8	39.2K 1%
1	RP 18	2.32K 1%
1	RP 19	787K 1%
1	TR 4	20K 12 TURN
3	CN 5	DIP SOCKET
4	H 2	SPACER
8	H 11	4-40X1/4 BH
1	CB 19	4003 KYBD CB

49XX WIRING

4910-K Firm-wire Patch Cord Assembly Instructions

4910 Firm-wire Patch Cords are designed for interconnecting the firm-wire ("Burndy-pin") connections on the rear of Eμ 2000 series modules. Each 4910-K kit consists of:

1	Male Burndy pin Connector
1	Female Burndy pin Connector
2	≈3/4" segments Heat-shrink Tubing
1	Length of wire (an assortment is generally provided)

Note that each patch cord has a male end and a female end. We recommend you solder the male connector to all patch cords before beginning on the female ends, to prevent making cords with two male ends.

We have standardized on the following color coding convention:

Brown - 6" Red - 12" Orange - 18" Yellow - 24" Green - 30" Blue - 36"

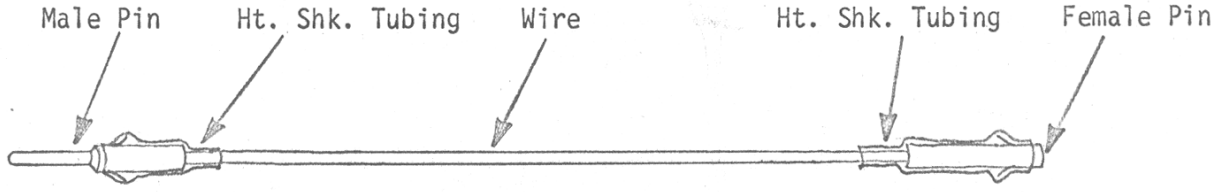
In general, we have found the shorter lengths to be more commonly used.

To assemble patch cords, begin by selecting wire colors and lengths, and cutting the appropriate wires. Strip each end 1/4". The make a pin-holder from a pair of pliers and a rubber band (wrap the rubber band around the handles to hold the jaws firmly shut). Place a male pin, pin end down, into the pliers, and heat the pin with the soldering iron. Fill the wire cavity with solder. Continue heating the pin, and place the striped wire end into the cavity. Remove the soldering iron, and insure the wire does not move as the solder solidifies. A few drops of water applied to the pin speeds cooling.

After completing the male ends, follow a similar proceedure for the female pins. Be sure not to solder wires into the connector portion of the pin!

Place a 3/4" segment of heat shrink tubing around each pin, and shrink the tubing. This can be done with any source of flameless heat. A heat gun is ideal, and we have found a candle to work well if the tubing is kept out of the flame. A soldering iron also works. Take care not to shrink the tubing onto the male pin connector portion.

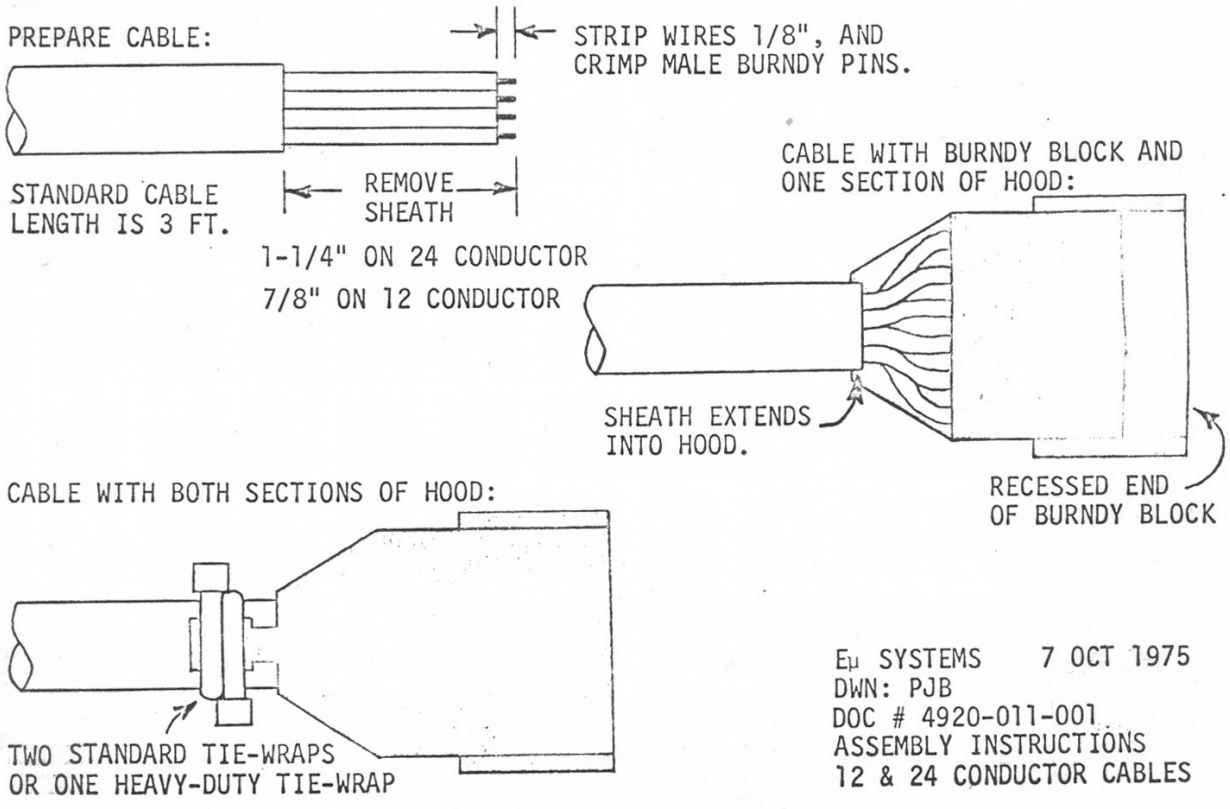
Your finished patch cord should look like this:



STANDARD CABLE ASSEMBLY

12 CONDUCTOR			24 CONDUCTOR					
PIN #	BACKGROUND COLOR	STRIPE COLOR	PIN #	BACKGROUND COLOR	STRIPE COLORS	PIN #	BACKGROUND COLOR	STRIPE COLORS
1	BLACK		1	BLACK		13	BLACK	RED
2	RED		2	RED		14	ORANGE	RED
3	ORANGE		3	ORANGE		15	BLUE	RED
4	GREEN		4	GREEN		16	WHITE	RED
5	BLUE		5	BLUE		17	RED	GREEN
6	WHITE		6	WHITE		18	BLACK	RED,WHITE
7	BLACK	WHITE	7	BLACK	WHITE	19	RED	WHITE
8	RED	BLACK	8	RED	BLACK	20	GREEN	WHITE
9	ORANGE	BLACK	9	ORANGE	BLACK	21	BLUE	WHITE
10	GREEN	BLACK	10	GREEN	BLACK	22	WHITE	BLACK,RED
11	BLUE	BLACK	11	BLUE	BLACK	23	RED	BLACK,WHITE
12	WHITE	BLACK	12	WHITE	BLACK	24	GREEN	BLACK,WHITE

CUT EXTRA WIRE (ORANGE BACKGROUND, GREEN STRIPE)



Eμ SYSTEMS 7 OCT 1975
DWN: PJB
DOC # 4920-011-001
ASSEMBLY INSTRUCTIONS
12 & 24 CONDUCTOR CABLES