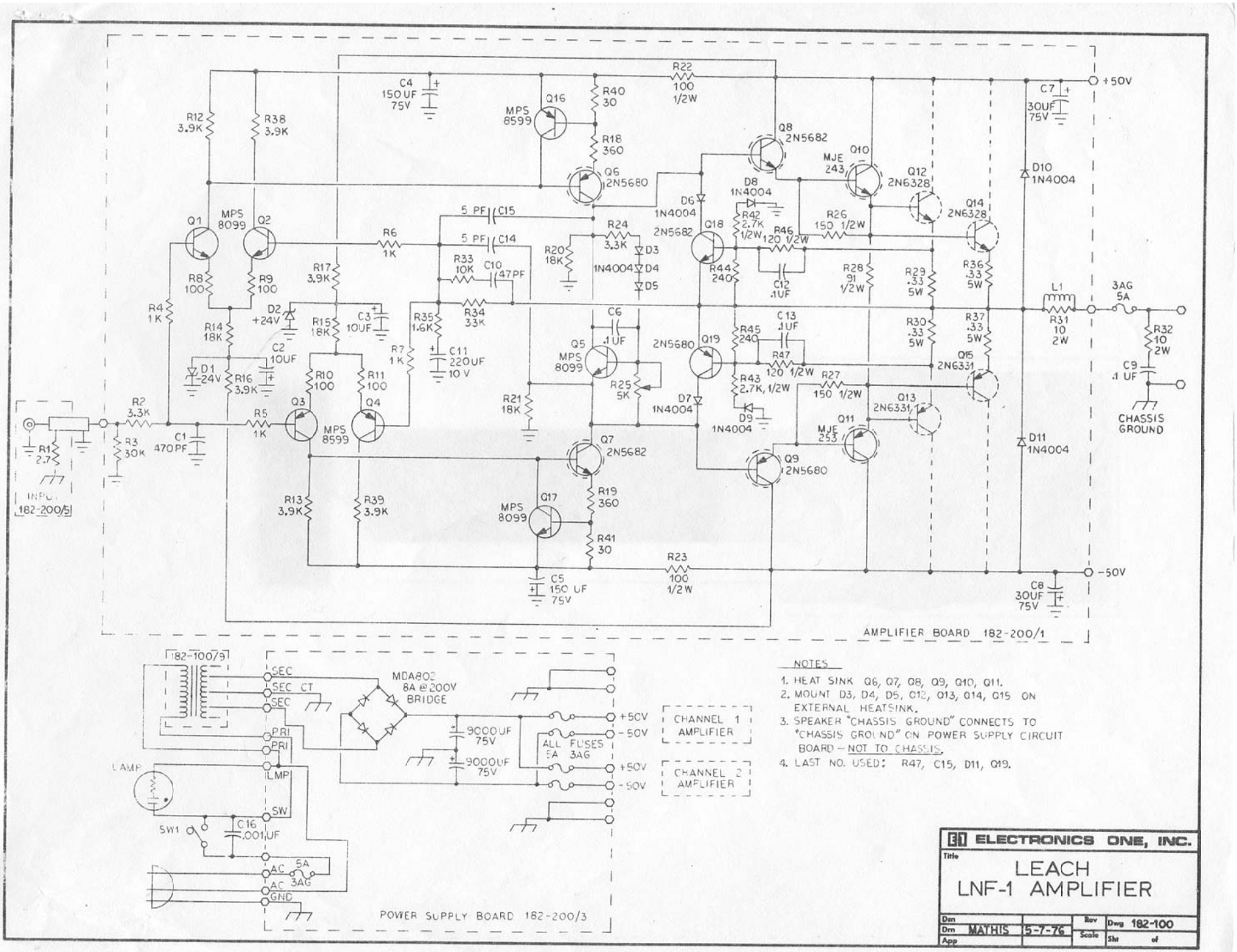


NOTES

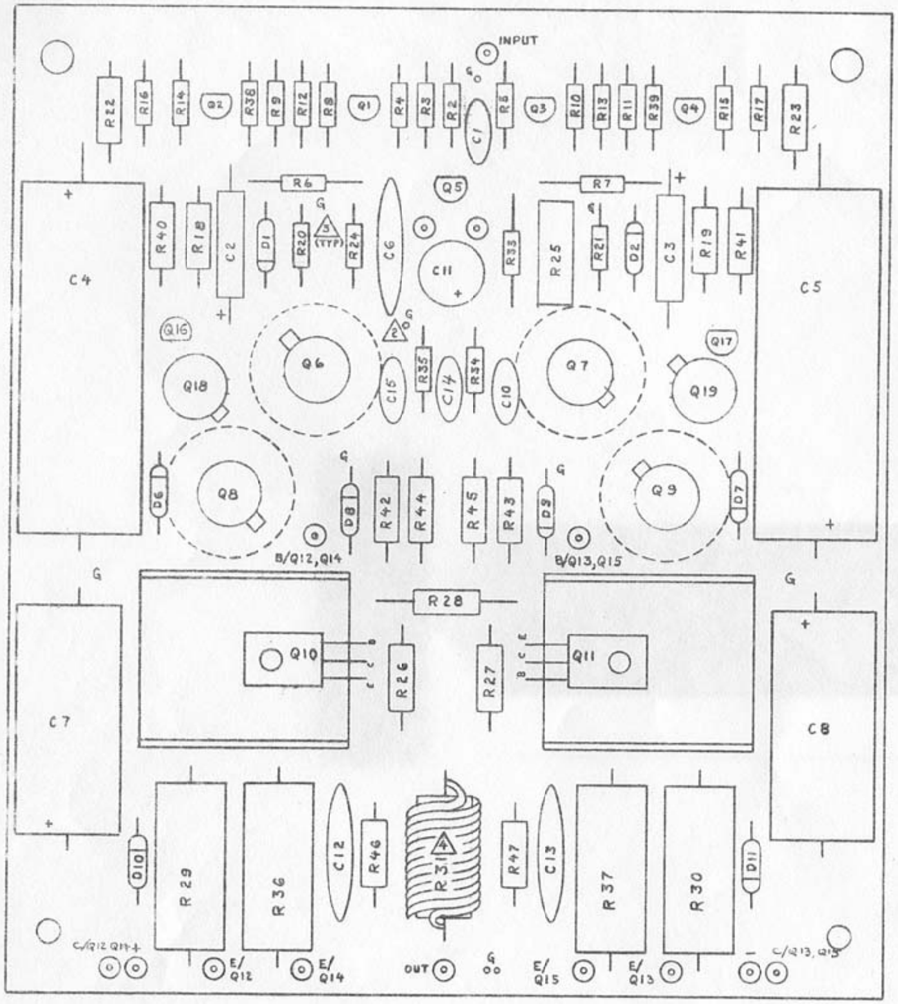
1. HEAT SINK Q6, Q7, Q8, Q9, Q10, Q11.
2. MOUNT D3, D4, D5, Q12, Q13, Q14, Q15 ON EXTERNAL HEATSINK.
3. SPEAKER "CHASSIS GROUND" CONNECTS TO "CHASSIS GROUND" ON POWER SUPPLY CIRCUIT BOARD – NOT TO CHASSIS.
4. LAST NO. USED: R47, C15, D11, Q19.

ELECTRONICS ONE, INC.

Title

LEACH LNF-1 AMPLIFIER

Dsn		Rev	Dwg 182-100
Drn MATHIS	5-7-76	Scale	Sht of
App			



NOTES:

1. ALL RESISTORS ARE 1/4W 5% TOLERANCE UNLESS OTHERWISE SPECIFIED.
2. INSTALL Q10, Q11, HEATSINKS AND SWAGE SPACERS AFTER WAVESOLDERING.
3. ALL COMPONENTS NEAR THE IDENTIFIER "G" ARE TO BE SOLDERED TO THE GROUND PLANE ON THE COMPONENT SIDE OF THE BOARD.
4. A COIL OF 7 TURNS OF #18 GAUGE SOLID WIRE IS TO BE FORMED ON R31 PRIOR TO ASSEMBLY.
5. C9 AND R48 ARE WIRED TO SPEAKER TERMINALS
6. D3,4,5 ARE WIRED IN SERIES ON HEAT SINK
7. Q12,13,14,15 (OUTPUT TRANSISTORS) ARE MOUNTED ON HEAT SINK.

QTY	REFERENCE	PART NO.	DESCRIPTION
4	Q1, Q2, Q5, Q17	MPS 8099	NPN TRANSISTOR
3	Q3, Q4, Q16	MPS 8599	PNP TRANSISTOR
3	Q6, Q9, Q19	2N5680	PNP TRANSISTOR
3	Q8, Q7, Q18	2N5682	NPN TRANSISTOR
1	Q10	MJE 243	NPN 15W XSTR
1	Q11	MJE 253	PNP 15W XSTR
2	D1, D2	IN 970 A	24V, 1/4W ZENER
6	D6, 7, 8, 9, 10, 11	IN4004	SILICON DIODE
2	C2, C3		10μF 100V
1	C1		470 PF 1KV DISK
2	C6 C9		0.1μF 100V CAP
2	C4, C5		150μF 75V
2	C7, C8		30μF 75V
1	C10		47pF 1KV DISK
1	C11		220μF 25V
2	C12, C13		0.1 μF 50V DISK
2	C14, C15		5PF 1KV DISK
1	R1	2.7Ω	5% 1/4W
1	R2	3.3 K	5% 1/4W RESISTOR
1	R3	30 K	
4	R4, R5, R6, R7	1K	
4	R8, 9, 10, 11	100Ω	
6	R12, 13, 16, 17, 38, 39	3.9K	
4	R14, 15, 20, 21	18K	
2	R18, R19	360Ω	↓
2	R22, R23	100Ω	5% 1/2W
1	R24	3.3K	5% 1/4W
1	R25		5K POT
2	R26, R27	150Ω	5% 1/2W
4	R29, 30, 36, 37	0.33Ω	5W
2	R31, 32	10Ω	2W
1	R33	10K	5% 1/4W
1	R35	1.6K	↓
2	R40, R41	30Ω	
2	R42, R43	2.7K	5% 1/2W
2	R44, R45	240Ω	5% 1/4W
2	R46, R47	120Ω	5% 1/2W
1	R34	33K	5% 1/4W
1	R28	91Ω	5% 1/2W

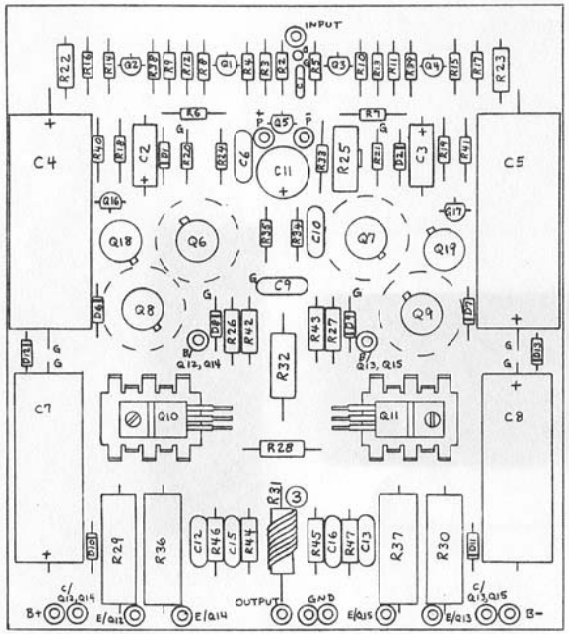
QTY	REFERENCE	PART NO.	DESCRIPTION
4	HEAT SINK	WAKE 207CB	TO-5
2	HEAT SINK	THERM G106	1" x 1.2"
		182-100/8	
2	MTG HDWR	4-40 x 3/8	PHILLIPS HEAD MS
2		0.27 x 0.12	COMPRESSION WSHR
2		0.5"	MICA INSULATOR
2		#4	LOCKWASHER
2		4-40	HEX NUT
2	SWAGE STANDOFF	1/4 x #6	CAMBION 350-1247-11-07
		OR	KEYSTONE 3464
2	SWIVEL	KEYSTONE	6-32 x 3/4 HINGED
	STANDOFF	CAT# 363	STANDOFF
4	SCREW	6-32 x 1/4	PAN HEAD MS
4		#6	LOCKWASHER
8	SCREW	#6 - 5/8"	PAN HEAD TS
2	Q12, 14	2N6328	
2	Q13, 15	2N6331	
3	D2, 3, 4	IN4004	
1	C16		.001 μF

REV	CHANGE
C	CHANGE Q16, C14, C15 4-6-76
B	CHANGE 2-24-76 C11, 2, 3, 5, 7, 8, 9, 10, 12, 13, 14 R: 2, 3, 28, 31, 42, 43, 48
A	CHANGE RESISTOR TABS & NOTES 1-5-76

ELECTRONICS ONE INC.

AMPLIFIER CIRCUIT BOARD ASSEMBLY FOR LEACH LNF-1

DESIGNED		REV. A	DWG. 182 - 200
DRAWN C. RAINES		SCALE 2:1	SHT. 1 OF
APPROVED			



NOTES:

1. INSTALL Q10, Q11, AND ASSOCIATED HEAT SINKS AFTER WAVE SOLDERING.
2. COMPONENT LEADS INSERTED THROUGH A "G" HOLE ARE TO BE SOLDERED BOTH ON THE BOTTOM AND TOP (GROUND PLANE) SIDE OF THE BOARD.
3. A COIL OF 7 TURNS OF 18 GAUGE WIRE IS TO BE FORMED ON R31 BEFORE ASSEMBLY.

HARDWARE	
QTY	DESCRIPTION
2	# 6 x 1/4 SWAGE STANDOFF
2	6-32 x 3/8 SWIVEL STANDOFF
2	4-40 X 1/4 P.H. MACH. SCREW
2	#4 LOCKWASHER
2	#4 NUT
2	6-32 X 1/4 P.H. MACH. SCREW
2	# 6 LOCKWASHER

C	CHANGE C14 ADD C17	
B	CHANGE R32 TO 10 Ω	
A	CHANGE R42, 43 TO 1 W	23 NOV 76

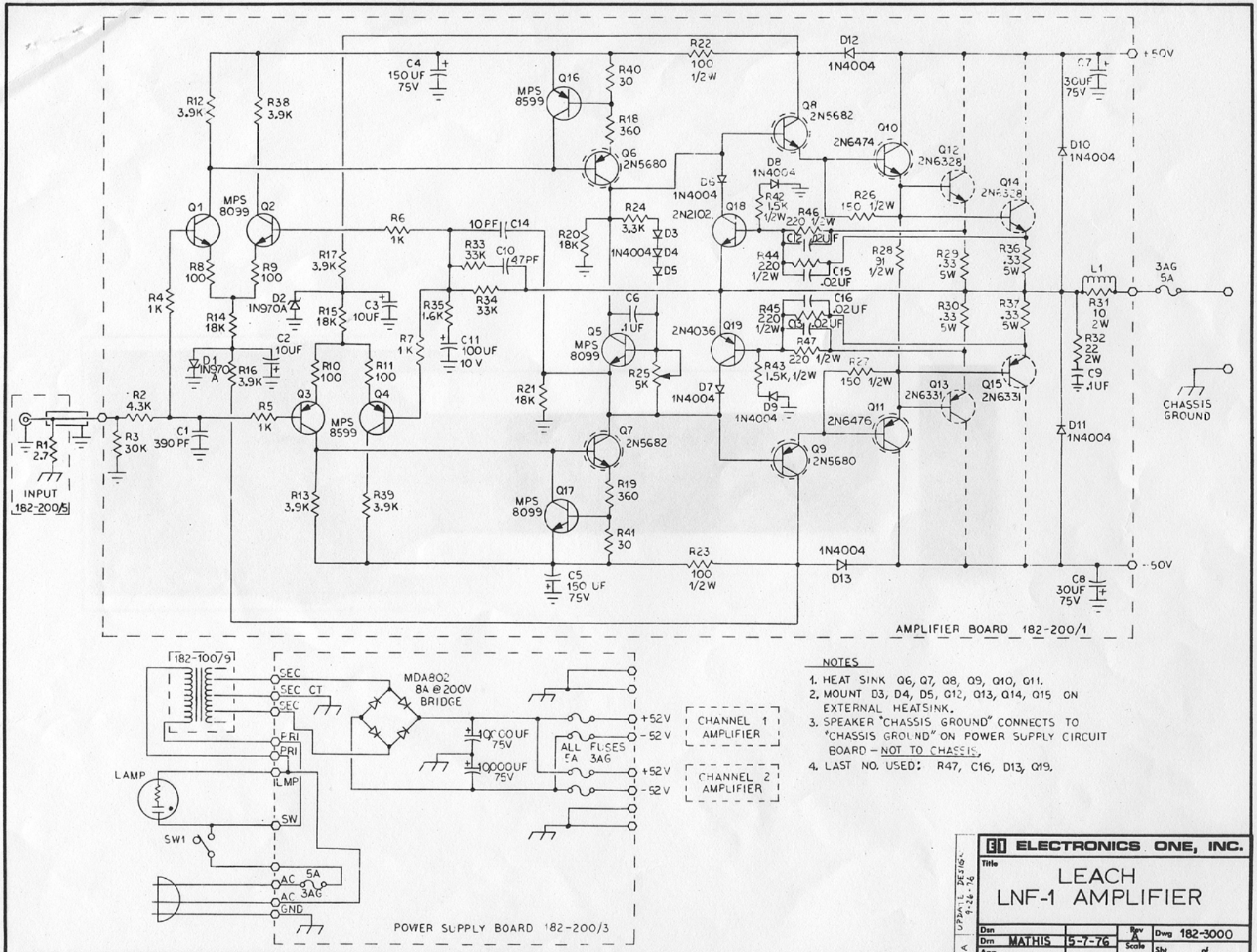
PARTS LIST

QTY.	DESIG.	DESCRIPTION
		RESISTORS
		1/4 W, 5%, CARBON FILM:
1	R1	2.7 Ω (ON INPUT BOARD)
1	R2	4.3K
1	R3	30K
4	R4, 5, 6, 7	1K
4	R8, 9, 10, 11	100 Ω
6	R12, 13, 14, 17, 38, 39	3.9 K
4	R14, 15, 20, 21	18 K
2	R18, 19	360 Ω
1	R 24	3.3K
2	R33, 34	33K
1	R35	1.6K
2	R40, 41	30 Ω
		1/2 W, 5%, CARBON FILM:
2	R22, 23	100 Ω
2	R26, 27	150 Ω
1	R29	91 Ω
4	R44, 45, 46, 47	220 Ω
		OTHER:
1	R25	5K POT (BOURNES 3389H)
4	R29, 30, 36, 37	.33 Ω, 5W, 10%
1	R31, 32	10 Ω, 2W, 5%
1		
2	R42, 43	1.5K, 1W, 5%
		CAPACITORS
		DISC CERAMIC:
1	C1	390 PF
2	C6, 9	.1 UF
1	C10	47 PF
1	C14, 17	.001 UF (ON BACK OF BOARD)
4	C12, 13, 15, 16	.02 UF
		ELECTROLYTIC:
2	C2, 3	10 UF, 75V
2	C4, 5	150UF, 75V
2	C7, 8	30 UF, 75V
1	C11	100 UF, 25V
		TRANSISTORS
4	Q1, 2, 5, 17	MPS8099
3	Q3, 4, 16	MPS8599
2	Q6, 9	2N5680
2	Q7, 8	2N5682
1	Q10	2N6474
1	Q11	2N6476
2	Q12, 14	2N6328 (ON HEAT SINK)
2	Q13, 15	2N6331 (ON HEAT SINK)
1	Q18	2N2102
1	Q19	2N4036
		DIODES
2	D1, 2	1N970A
3	D3, 4, 5	1N4004 (ON HEAT SINK)
8	D6→13	1N4004
		HEAT SINKS
2		TO-220 (IERC PB2-2CB)
4		TO-5 (IERC TXBF-032-025K)
2		TO-3 (WAKEFIELD 1025-5.3-VVVV-BA)

ELECTRONICS ONE, INC.

Title: LEACH LNF-1 DRIVER BOARD ASSEMBLY

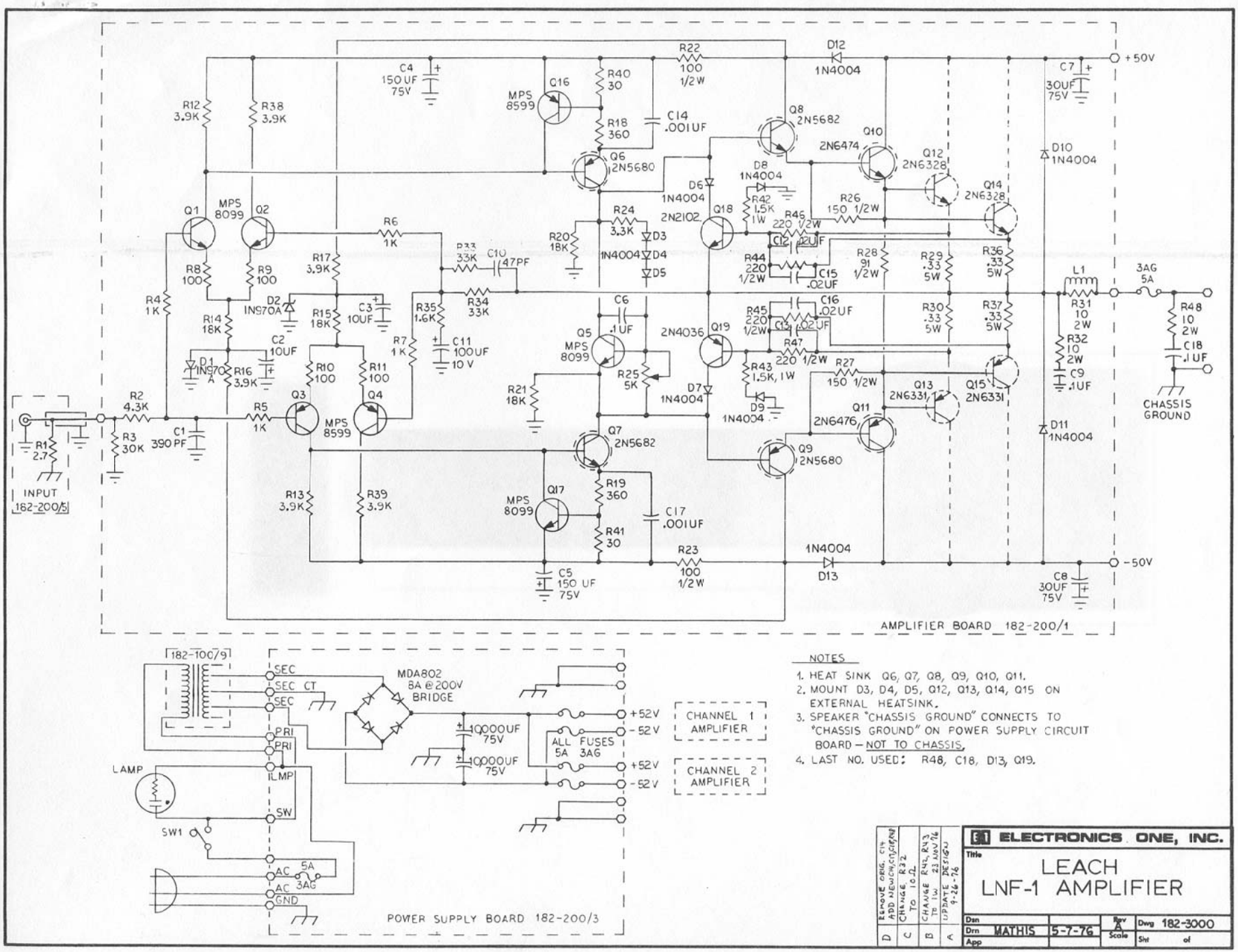
Dsn			Rev	Dwg 182-1001
Drn MATHIS	21 OCT 76		Scale	Sht of
App				



NOTES

1. HEAT SINK Q6, Q7, Q8, Q9, Q10, Q11.
2. MOUNT D3, D4, D5, Q12, Q13, Q14, Q15 ON EXTERNAL HEATSINK.
3. SPEAKER "CHASSIS GROUND" CONNECTS TO "CHASSIS GROUND" ON POWER SUPPLY CIRCUIT BOARD – NOT TO CHASSIS.
4. LAST NO. USED: R47, C16, D13, Q19.

ELECTRONICS ONE, INC.				
Title: LEACH LNF-1 AMPLIFIER				
A UPDATE DESIGN 4-26-76	Dsn		Rev A	Dwg 182-3000
	Drn MATHIS	5-7-76	Scale	Sht of
	App			



NOTES

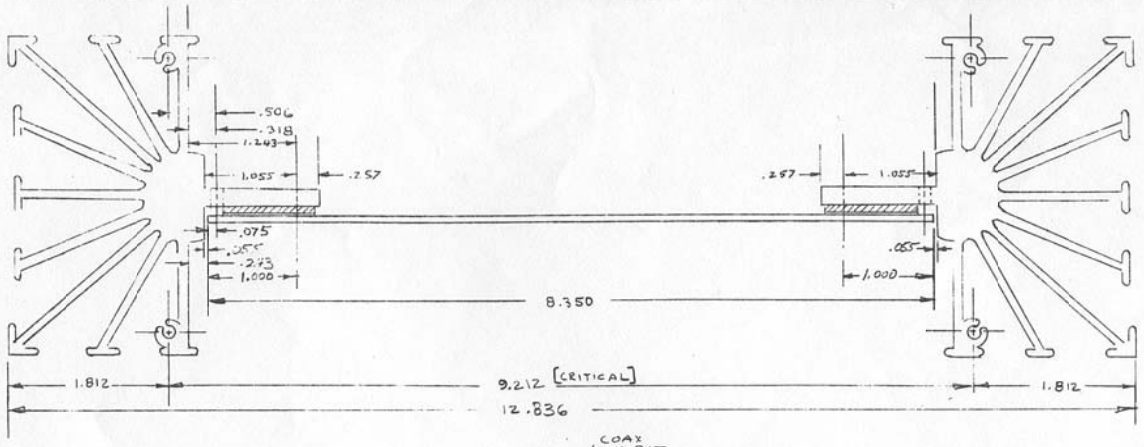
1. HEAT SINK Q6, Q7, Q8, Q9, Q10, Q11.
2. MOUNT D3, D4, D5, Q12, Q13, Q14, Q15 ON EXTERNAL HEATSINK.
3. SPEAKER "CHASSIS GROUND" CONNECTS TO "CHASSIS GROUND" ON POWER SUPPLY CIRCUIT BOARD — NOT TO CHASSIS.
4. LAST NO. USED: R48, C18, D13, Q19.

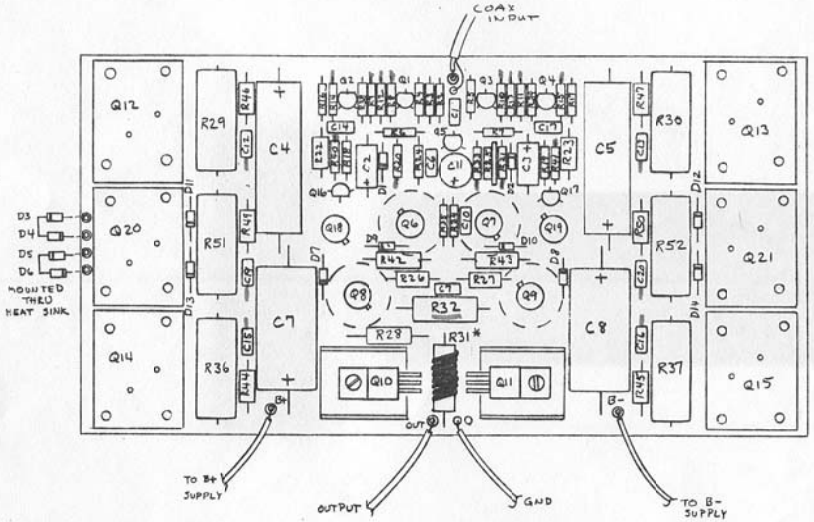
D	REMOVE ORIG. C14 ADD NEW C14 (.001UF)	
C	CHANGE R32 TO 10 2W	
B	CHANGE R44, R43 TO 1W 23 NOV 76	
A	UPDATE DESIGN 9-26-76	

ELECTRONICS ONE, INC.

Title: LEACH LNF-1 AMPLIFIER

Dsn			Rev A	Dwg 182-3000
Drn	MATHIS	5-7-76	Scale	Sht of
App				





* R31 IS A 10Ω, 2W, 5% RESISTOR WITH 7 TURNS OF 18 GAUGE INSULATED WIRE CLOSE-WOUND ON THE RESISTOR BODY.

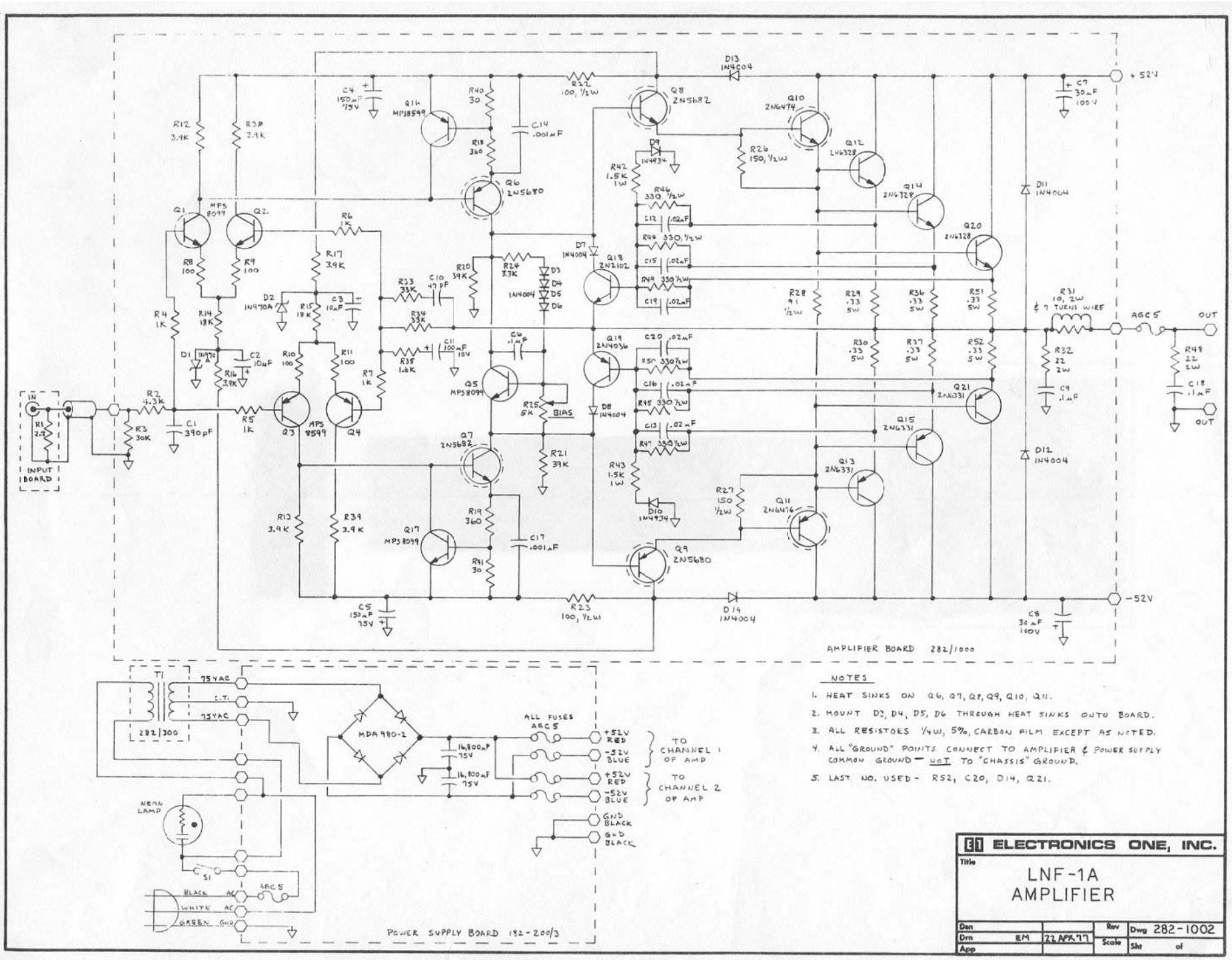
ALL RESISTORS ARE ¼W, 5%, CARBON FILM UNLESS OTHERWISE NOTED.

Rotate bias pot up for min bias

MISCELLANEOUS PARTS	
QTY	DESCRIPTION
6	TO3 SOCKETS (KEYSTONE 4608)
2	TO220 HEAT SINKS (IERC PB2-2CB)
2	TO220 MICA INSULATORS (MOT B-08853A01)
4	TO5 HEAT SINKS (IERC TXBF-032-0258)
2	TO3 HEAT SINKS (CUSTOM)
2'	RG174U COAX
1½'	#18 RED WIRE
1½'	#18 BLUE WIRE
2'	#18 YELLOW WIRE
1½'	#18 BLACK WIRE
14"	#18 SOLID CONDUCTOR INSULATED WIRE

PARTS LIST		
DESIG.	QTY	DESCRIPTION
RESISTORS		
R1	1	2.7Ω (OFF BOARD)
R2	1	4.3K
R3	1	30K
R4,5,6,7	4	1K
R8,9,10,11	4	100Ω ALL THESE ARE
R12,13,14,17,38,39	6	3.9K ¼W, 5%, CARBON FILM
R14,15	2	18K
R18,19	2	360Ω
R20,21	2	39K
R24	1	3.3K
R33,34	2	33K
R35	1	1.6K
R40,41	2	30Ω
R22,23	2	100Ω, ½W, 5%, CARBON FILM
R26,27	2	150Ω
R28	1	91Ω
R44,45,46,47,49,50	6	330Ω
R42,43	2	1.5K, 1W, 5%
R31*	1	10Ω, 2W, 5%
R32,48	2	22Ω (R48 OFF BOARD)
R29,30,36,37,51,52	6	.33Ω, 5W, 10% WIREWOUND
R25	1	5K, ½W TRIMMER (BOURNS 3389-H-5K)
CAPACITORS		
C1	1	390 PF, 20% CERAMIC (KEMET CK05BX391K)
C6,9,18	3	.1 UF (C18 OFF BOARD) (CK06BX104K)
C10	1	47 PF (CK05BX470K)
C12,13,15,16,19,20	6	.018 UF (CK06BX183K)
C14,17	2	.001 UF (CK05BX102K)
C2,3	2	10 UF, 25V ELECTROLYTIC (CDE ULW-10-25)
C4,5	2	150UF, 75V (SPRAGUE 60D157F075G3V)
C7,8	2	30 UF, 100V (SPRAGUE 60D336P100DJ4)
C11	1	100 UF, 25V (SPRAGUE 502D107G025CG)
SEMICONDUCTORS		
D1,2	2	1N970A (GLASS)
D3-8, 11-14	9	1N4004 (GLASS)
D9,10	2	1N4134
Q1,2,5,17	4	MPS8099
Q3,4,16	3	MPS8599
Q6,9	2	2N5680
Q7,8	2	2N5682
Q10	1	2N6474
Q11	1	2N6476
Q18	1	2N2102
Q19	1	2N4036
Q12,14,20	3	2N6328
Q13,15,21	3	2N6331

ELECTRONICS ONE, INC.			
Title: LNF-1A DRIVER BOARD			
Dsn		A Rev	Dwg 282-1001
Drn EM	12 APR 77	A Scale	Sht of
App			
A Adj Assy Dims.			



NOTES

1. HEAT SINKS ON Q6, Q7, Q8, Q9, Q10, Q11.
2. MOUNT D3, D4, D5, D6 THROUGH HEAT SINKS ONTO BOARD.
3. ALL RESISTORS 1/4W, 5%, CARBON FILM EXCEPT AS NOTED.
4. ALL "GROUND" POINTS CONNECT TO AMPLIFIER & POWER SUPPLY COMMON GROUND — NOT TO "CHASSIS" GROUND.
5. LAST NO. USED - R52, C20, D14, Q21.

ELECTRONICS ONE, INC.

Title: LNF-1A AMPLIFIER

Dsn			Rev	Dwg 282-1002
Drn	EM	22 APR 77	Scale	Sht of
App				

LNF1-A Amplifier Modifications

Dated March 17, 2009

These amplifiers were manufactured in the late 1970s by Electronics One, Inc., Atlanta, Georgia. Electronics One was a firm which manufactured products under contract for customers. It did not have any specific product line. I remember a major project they had was the manufacture of electronic circuits for the upgrade of gasoline pumps. An assistant there was a student of mine at Georgia Tech. He knew that I was playing around with the design of audio power amplifiers. He came by my office one day and asked if I would be interested in going in with a partner to manufacture and sell the amplifiers. The first amplifiers were in a grey "shoebox like" chassis. The grey color was soon replaced with black. Because the shoebox chassis had a lot of wiring between the circuit boards and the power transistors, a rack-mount version was developed. The power transistors mounted directly on the circuit boards in this version. It also had a clipping indicator. I have no idea how many amplifiers were made. After the company went out of business around 1980, I found out from a former employer that he was ordered not to talk to me. The company was closed and the owner left town before I found out what had happened. I have the prototype grey shoebox amplifier and the prototype black rack-mount amplifier. Neither have given any problems and both still work. The shoebox amp was used for several years by a restaurant in their audio system. I have included all of the circuit diagrams and layout diagrams that were given to me back when the amplifiers were being made. There are several modifications that I would recommend if anyone has one of the amplifiers. If you attempt any of the modifications, you should have a "solder sucker" (I prefer the Paladin brand) and a roll of solder wick. This stuff tends to become oxidized and I recommend putting a small amount of solder flux on it before using it. A temperature controlled solder iron should be used. I recommend a $700\,^\circ$F temperature tip. Some or all of the circuit boards were plated through the holes. It is tricky to remove the solder from the holes when replacing a part. I have found the flux coated solder wick to be useful in doing this.

Below are the modifications. Some of them reference particular drawings. It may be that these also apply to other drawings because changes may have been made to some amplifiers before a new drawing was made.

1. Clip out R_{20} and R_{21}.
2. Clip out R_{33} and C_{10}.
3. On drawing $182-100$, clip out C_{14}. and C_{15}.
4. On drawing $182-3000$, clip out C_{14} if present.
5. On drawing $282-1002$, clip out C_{15}, C_{16}, C_{19}, and C_{20}.
6. On drawing $182-3000$, clip out C_{15} and C_{16}.
7. On drawings $182-3000$ and $282-1002$, clip out capacitors C_{14} and C_{17}

8. Drawing $182-100$ shows resistors R_{44} and R_{45} (both $240\,\Omega$, $1/4\,\mathrm{W}$) near transistors Q_{18} and Q_{19}. These resistors should be replaced if they are missing. If there are no holes for them on the circuit board, they can be soldered to the backs of the circuit board.

9. Add a $10\,\mathrm{pF}$ silver mica capacitor from the collector to base of transistors Q_6 and Q_7. These must be soldered to the backs of the circuit boards.

10. As shown on drawing $182-100$, C_9 ($0.1\,\mathrm{F}$, $100\,\mathrm{V}$) and R_{32} ($10\,\Omega$, $2\,\mathrm{W}$) are connected in series across the loudspeaker output binding posts on the rear of the chassis. On some models, this network was moved to the circuit board. If it is on the circuit board, it should be moved to the output binding posts. This is important, for the circuit can oscillate with the network on the circuit board. On drawing $282-1002$, there is a C_9 (incorrectly labeled C_7) and R_{32} on the circuit board and a R_{48} and C_{18} on the output binding posts. Remove the network on the circuit board and change the values on the output binding post to the correct values. This RC network is to suppress parasitic oscillations. Although I prefer a $10\,\Omega$ resistor, I believe that a $22\,\Omega$ resistor is sufficient. But it and the $0.1\,\mu\mathrm{F}$ capacitor must be on the output binding posts.

After the modifications are made, it is probably a good idea to check the bias current if you have the equipment. Although it is optional, you can do this as follows:

1. The power should be turned off and the power supply capacitors discharged.

2. Adjust the bias potentiometer for maximum resistance. This is important. Use an ohmmeter to verify that the resistance is a maximum and not a minimum. You can blow the output transistors if it is set for minimum.

3. Remove the dc fuse in series with either the positive or negative power supply lead to the circuit board for one channel and clip an ammeter across the fuse terminals.

4. Power the amp up with no input signal or load. Adjust the bias potentiometer for a current of $100\,\mathrm{mA}$. Be careful. Once I accidentally blew the output transistors in one channel of an amplifier I was building when I mistakenly tried to adjust P1 for the wrong channel.

5. As the amp warms up, the current will drift. Readjust P1 until the drift stops. This will take about 10 minutes.

6. Turn the amp off. Wait until the power supply discharges, then install F2.

7. Remove F3 and repeat this procedure for the other channel.

8. You can seal the bias potentiometers with a dab of clear silicon seal.