

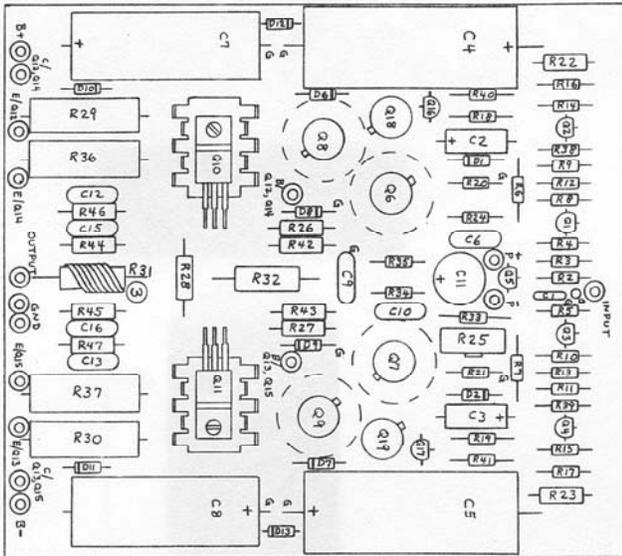
- NOTES:
1. ALL RESISTORS ARE 1/4W 5% TOLERANCE UNLESS OTHERWISE SPECIFIED.
 2. INSTALL Q10, Q11, HEAT SINKS AND SWAGE SPACERS AFTER WAVE SOLDERING.
 3. ALL COMPONENTS NEAR THE IDENTIFIER "G" ARE TO BE GOLDERED TO THE GROUND PLANE ON THE COMPONENT SIDE OF THE BOARD.
 4. A COIL OF 7 TURNS OF #18 GAUGE SOLID WIRE IS TO BE FORMED ON R31 PRIOR TO ASSEMBLY.
 5. C7 AND R46 ARE WIRED TO SPEAKER TERMINALS.
 6. C3,4,5 ARE WIRED IN SERIES ON HEAT SINK.
 7. Q10, Q11 (OUTPUT TRANSISTORS) ARE MOUNTED ON HEAT SINK.

QTY	REFERENCE	PART NO.	DESCRIPTION
4	Q1, Q2, Q5, Q17	MPS 8089	NPN TRANSISTOR
3	Q3, Q4, Q16	MPS 8599	PNP TRANSISTOR
3	Q6, Q9, Q19	Z45680	PNP TRANSISTOR
3	Q8, Q7, Q18	2N5682	PNP TRANSISTOR
1	Q10	MJE 243	NPN 15W ASTR
1	Q11	MJE 253	PNP 15W ASTR
2	D1, D2	IN 970 A	24V 1/4W ZENER
6	D6, 7, 8, 9, 10, 11	1N4004	SILICON DIODE
2	C2, C3		10µF 100V
1	C1		470 PF 1KV DISK
2	C6, C9		0.1µF 100V CAP
2	C4, C5		50µF 75V
2	C7, C8		30µF 75V
1	C10		17PF 1KV DISK
1	C11		220µF 25V
2	C12, C13		0.1 µF 50V DISK
E	C14, C15		5PF 1KV DISK
1	R1	27Ω	5% 1/4W
1	R2	33K	5% 1/4W RESISTOR
1	R3	50K	
4	R4, R5, R6, R7	1K	
4	R8, 9, 10, 11	100Ω	
6	R12, 13, 16, 17, 18	5.9K	
2	R1, 39		
4	R14, 15, 20, 21	18K	
2	R18, R19	360Ω	
1	R22, R23	100Ω	5% 1/4W
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	MAKE 20728	TO-5
2	HEAT SINK	FRESH 606	1"x1.1"
		182-180/8	
2	MFG HDWR	4-40 x 5/8	PHILLIPS HEAD H S
2		0.27 x 0.12	COMPRESSION WASR
2		0.5"	MICA INSULATOR
2		#4	LOCK WASHER
2		#40	HEX NUT
2	SWAGE STANDOFF	1/4" x 3/8"	CAMBION 320-187-1-07
2	SWIVEL	OR	ERTYONE 3464
2	STANDOFF	KEYSTONE	6-32 x 1/4 HINGED
4	SCREW	CAT# 383	STANDOFF
4	SCREW	6-32 x 1/4	PAN HEAD NS
4	SCREW	M6	LOCWASHER
8	SCREW	4-4 - 5/8"	PAN HEAD TS
2	Q12, 14	2H6328	
2	Q15, 15	2N6331	
3	D2, 3, 4	1N4004	
1	C16		001 µF

CHANGE 4-676
C 1A, C15

CHANGE 2-2476
C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100, C101, C102, C103, C104, C105, C106, C107, C108, C109, C110, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C124, C125, C126, C127, C128, C129, C130, C131, C132, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C168, C169, C170, C171, C172, C173, C174, C175, C176, C177, C178, C179, C180, C181, C182, C183, C184, C185, C186, C187, C188, C189, C190, C191, C192, 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- 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.

QTY	HARDWARE	DESCRIPTION
2	# 6 X 1/4" STAKE STRAPOFF	
2	6-12X 3/8" SURVEY STRAPOFF	
2	4-10X 1/4" PH. MKN. SCREW	
2	# 4 LOCKWASHER	
2	# 4 NUT	
2	6-12X 1/4" PH. MKN. SCREW	
2	# 6 LOCKWASHER	

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

Des	DATE	BY	DWG
App	12 OCT 76	SM	182-1001
Scale		Sh	
of			

LEACH LNF-1
DRIVER BOARD
ASSEMBLY

LEACH ELECTRONICS ONE, INC.

TO-220 (LEAC P03-12B)
TO-5 (LEAC T18F-031-0258)
TO-3 (WARRANTED) (DCS-53-110000)

HEAT SINKS

DIODES

TRANSISTORS

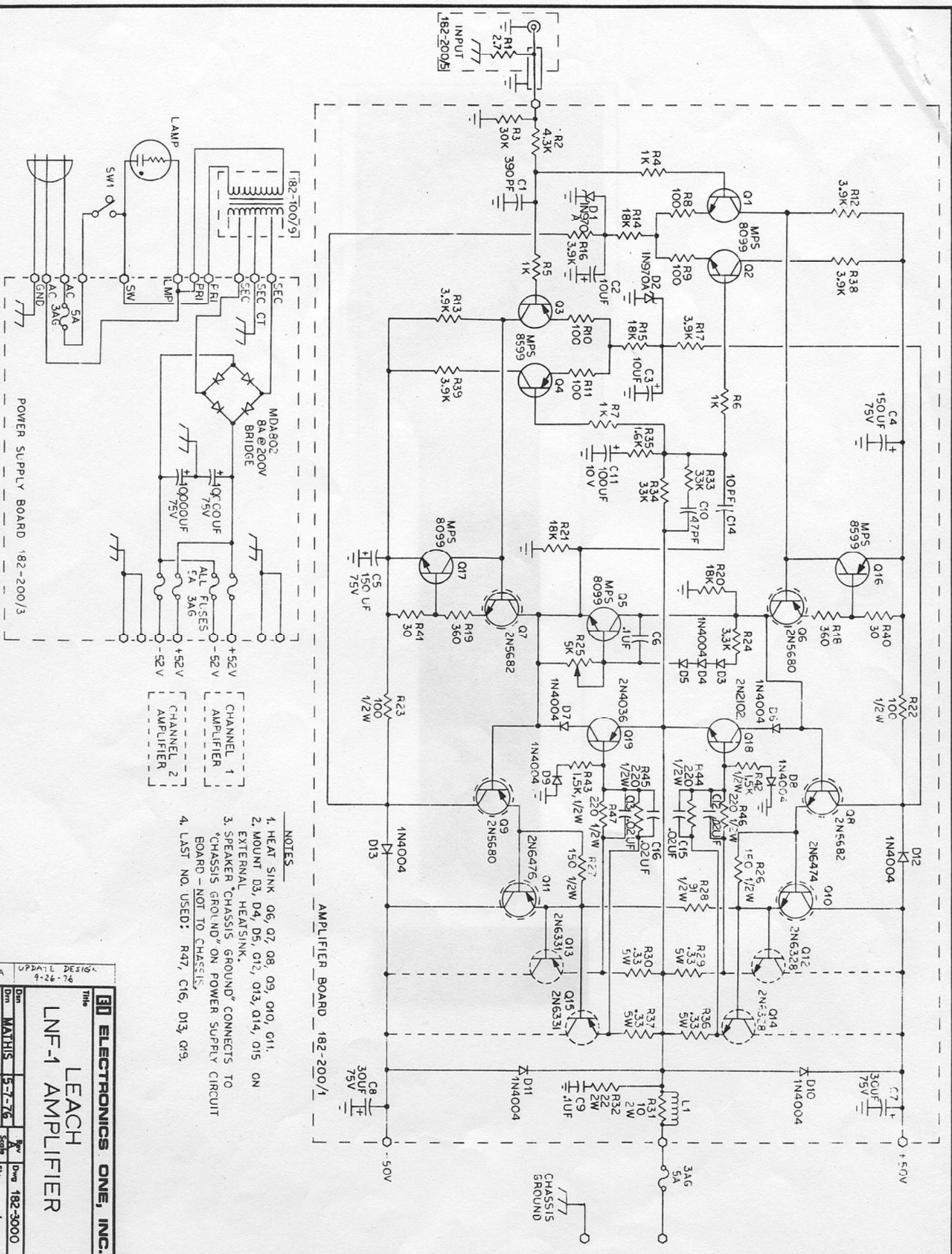
ELECTROLYTICS

CAPACITORS

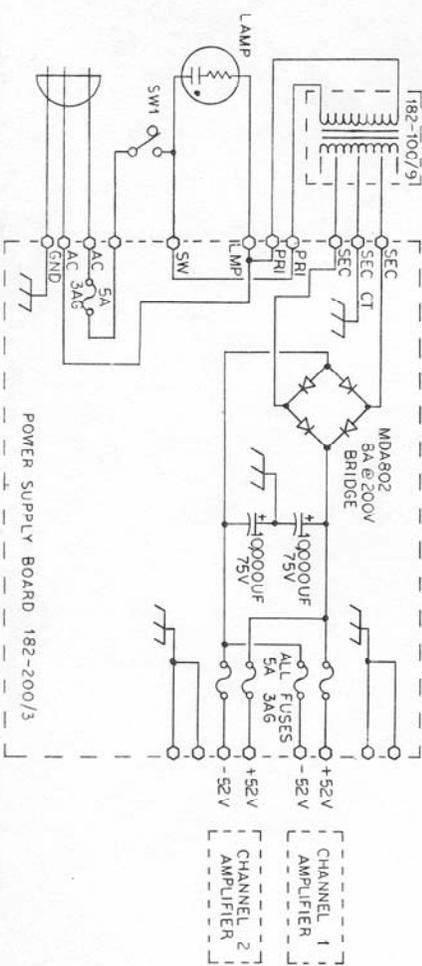
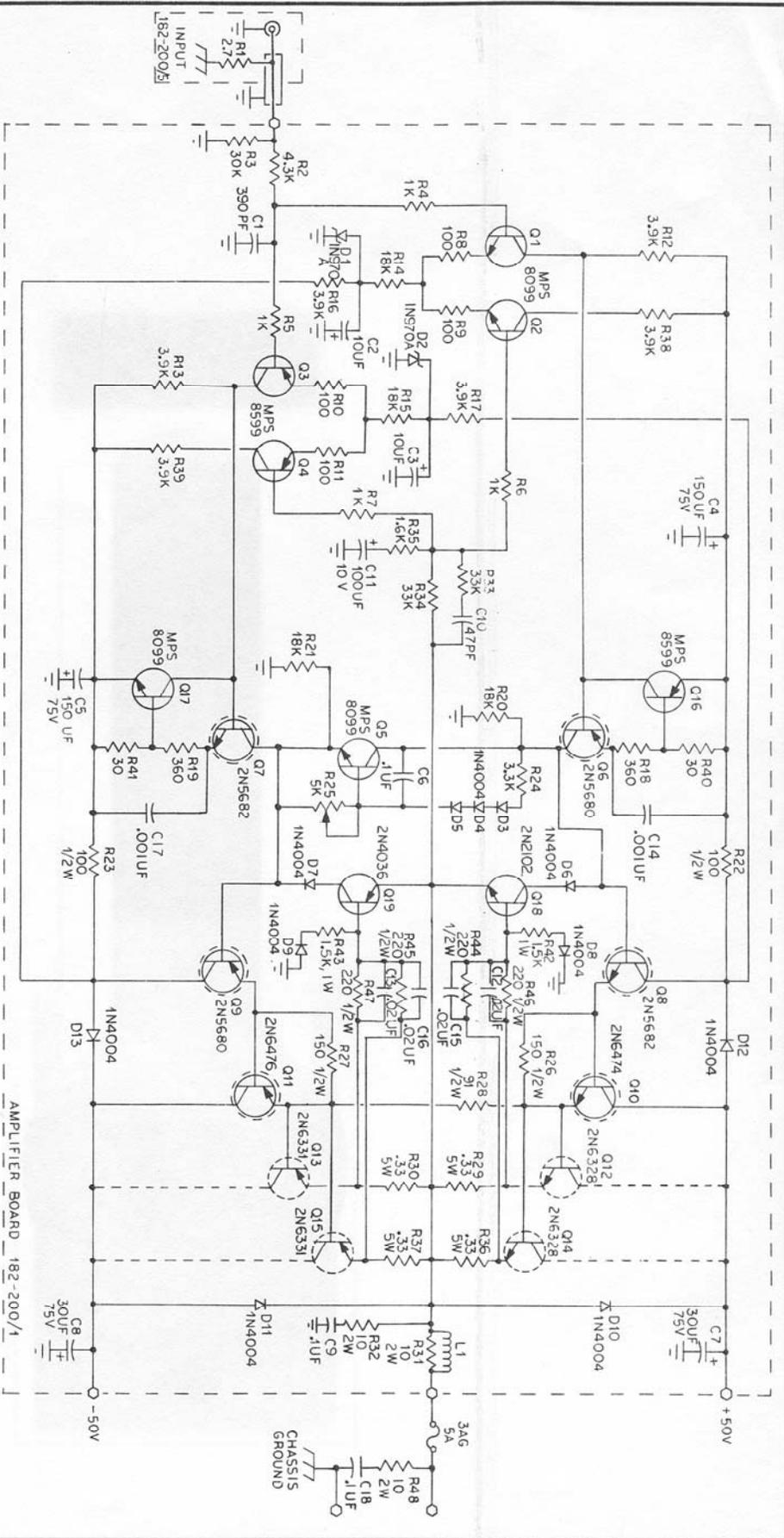
DISC CERAMIC

OTHER:

RESISTORS



UPDALL DESIGN		9-26-76	
LEACH ELECTRONICS ONE, INC.			
LEACH LNF-1 AMPLIFIER			
App	Des	App	Des
MATHIS	5-7-76	SH	182-3000
Scale		SH	



- 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.

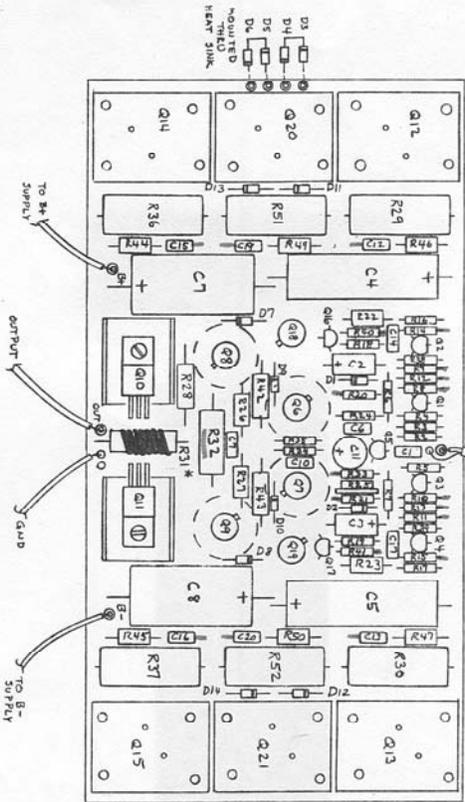
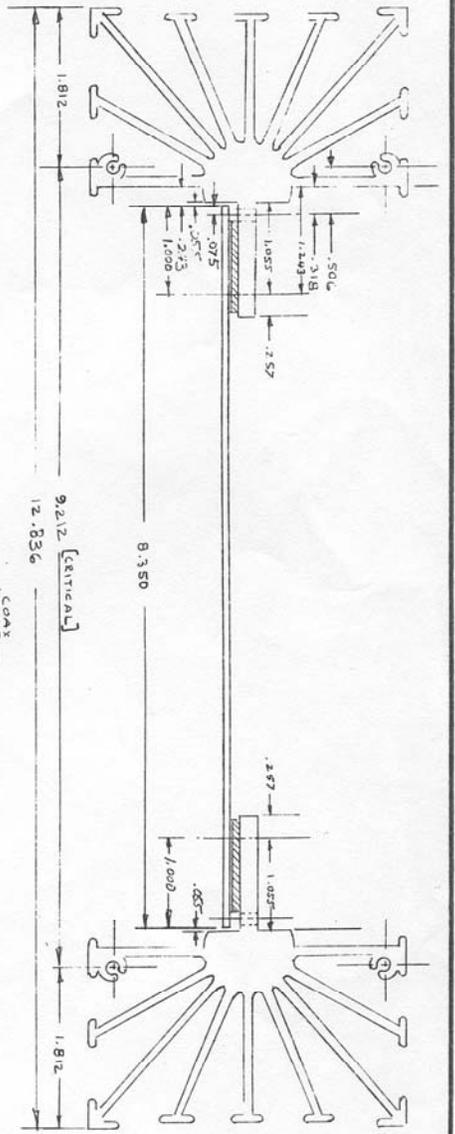
AMPLIFIER BOARD 182-200/1

D	REMOVE ORIG. C18 ADD NEW C18, C19, C20
C	CHANGE R32 TO 10.2
B	CHANGE R42, R43 TO 1W 23 NOV 76
A	UPDATE DESIGN 9-26-76

DATE	DESIGN	APP	DATE	DESIGN	APP
182-2000	MATHIS	5-7-76	182-2000	MATHIS	5-7-76

ELECTRONICS ONE, INC.

LEACH
LNF-1 AMPLIFIER



Rotata bias pot up
for min bias

QTY	DESCRIPTION
6	MISCELLANEOUS PARTS
6	TOL. SOCKETS (KEYTONE 4402)
2	TOL. HEAT SINKS (TERR. PR2-2ED)
2	TOL. MGA INSULATORS (MGT B-08853A0)
4	TOS HEAT SINKS (MGT TR08-031-025)
2	TOS HEAT SINKS (CUSTOM)
2	RG174V COAX
1/2	#18 RED WIRE
2	#18 BLUE WIRE
1/2	#18 YELLOW WIRE
1/2	#18 BLACK WIRE
1/4	#18 SOLID CONDUCTOR INSULATED WIRE

DESIG.	QTY	DESCRIPTION
R1	1	RESISTORS
R2	1	2.7K (OFF BOARD)
R3	1	30K
R4, 5, 6, 7	4	1K
R9, 10, 11	4	100Ω
R12, 13, 14, 15	6	3.9K 1/4W, 5% CARBON FILM
R16, 17	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, 1/4W, 5% CARBON FILM
R26, 27	2	150Ω
R28	1	91Ω
R42, 43, 44, 45, 46, 47, 48, 49, 50	6	330Ω
R42, 43	2	15K, 1W, 5%
R31*	1	10Ω, 2W, 5%
R32, 48	2	2.2Ω (R48 OFF BOARD)
R25	1	5K, 1/2W TRIMMER (BOURNS 3391H-5K)

DESIG.	QTY	DESCRIPTION
C1	1	370 PF, 20V, CERAMIC (MKT C060B370)
C6, 9, 18	3	.1 μF (C18 OFF BOARD) (COMALCON)
C10	1	47 PF (C058K4705)
C11, 12, 13, 14, 15, 16, 17, 18	6	.001 μF (C050B102K)
C19, 17	2	.001 μF
C2, 3	2	10 μF, 15V ELECTROLYTIC (CDE 15W-10-25)
C4, 5	2	100 μF, 10V (SILICON VALLEY 100D100V)
C7, 8	2	35 μF, 100V (SILICON VALLEY 35D35100V)
C11	1	100 μF, 15V (PRELITE 50D100V50)

DESIG.	QTY	DESCRIPTION
D1, 2	2	1A70A (6X5)
D3, 4, 5, 6, 7, 8, 9	9	1N4004 (6A12)
D10	2	1N4734

SEMICONDUCTORS

RESISTORS

CAPACITORS

DIODES

TRANSISTORS

RELAYS

CONNECTORS

COILS

INDUCTORS

OTHER

TOTAL

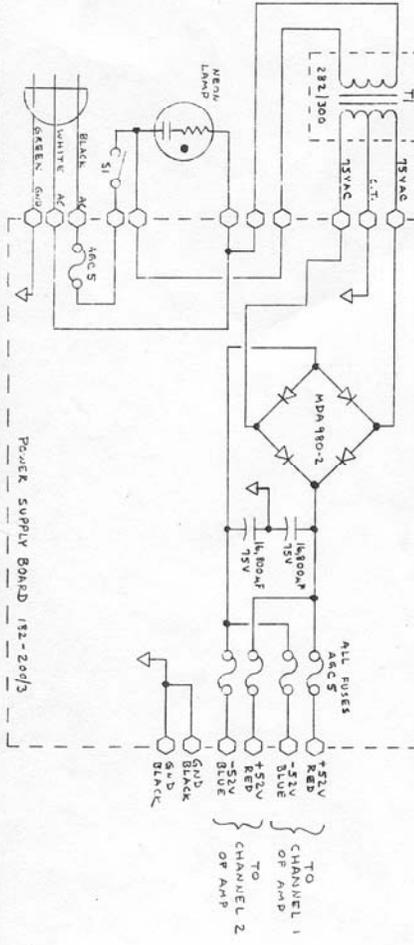
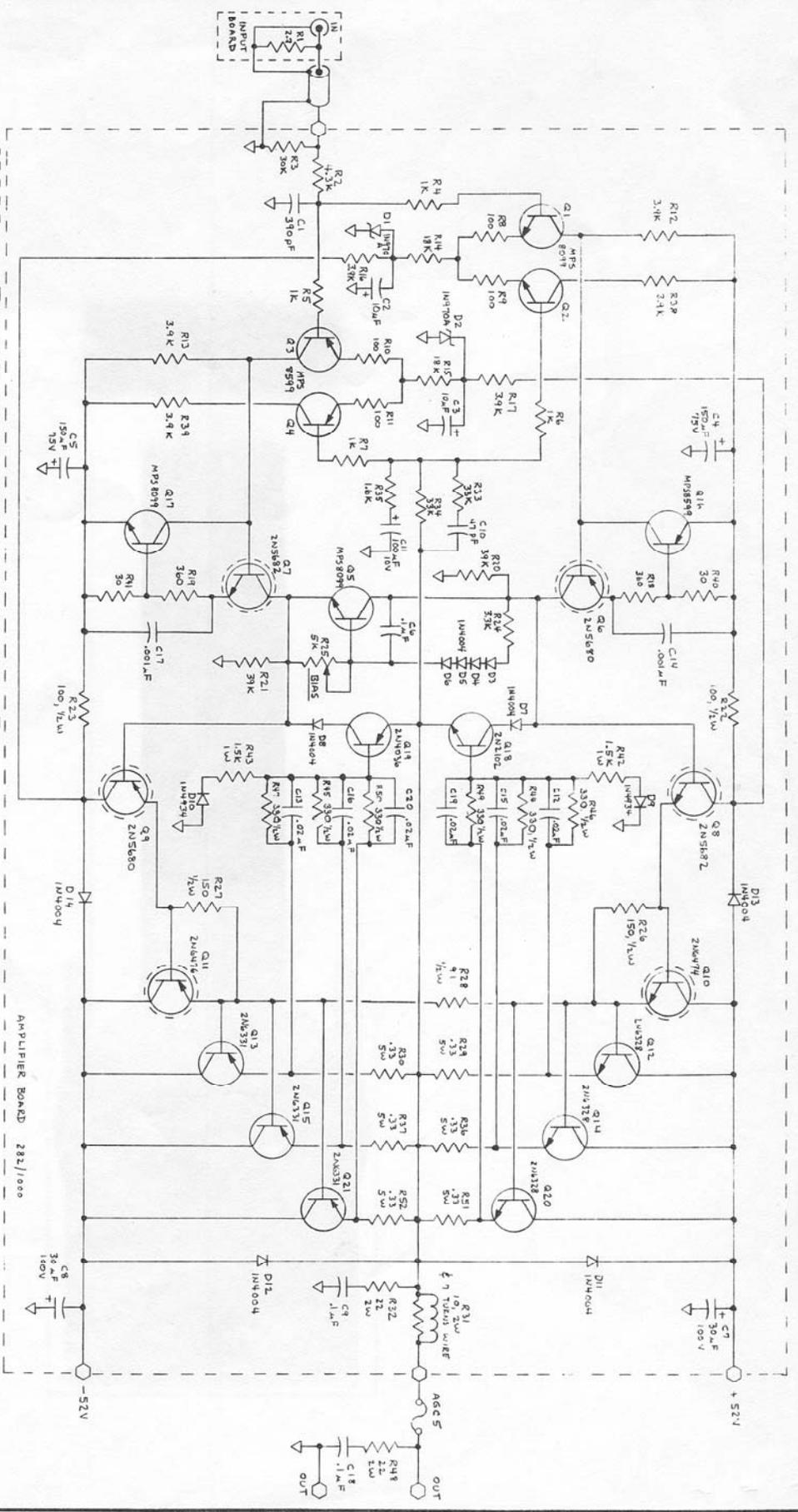
REVISIONS

DATE

BY

CHKD

APP'D



- NOTES
1. HEAT SINKS ON Q6, Q7, Q8, Q9, Q10, Q11.
 2. MOUNT D1, D4, D5, D6 THROUGH HEAT SINKS OUTO BOARD.
 3. ALL RESISTORS 1/4W, 5%, CARBON FILM EXCEPT AS NOTED.
 4. ALL "GROUND" POINTS CONNECT TO AMPLIFIER & POWER SUPPLY COMMON GROUND - GND TO "CHASSIS" GROUND.
 5. LAST WD. USED - R52, C20, D14, Q21.

AMPLIFIER BOARD 282/1000

**LNF-1A
AMPLIFIER**

EO ELECTRONICS ONE, INC.

Time				
Drawn	EM	JZ	APR 71	Scale
Dim				3IN
App				of

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° 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 $240\ \Omega$, $1/4\ \text{W}$) 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 $10\ \text{pF}$ 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 ($0.1\ \text{F}$, $100\ \text{V}$) and R_{32} ($10\ \Omega$, $2\ \text{W}$) 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 $0.1\ \mu\text{F}$ 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 $100\ \text{mA}$. 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.