mark levinson audio systems inc.

55 circular avenue hamden connecticut 06514 u.s.a.

telephone (203) 281-6333

your ref.
our ref.
date November 14, 1977

100 K TRIMPOT ADJUSTMENT

1. Before applying power, set pot in middle of rotation.
2. Apply power.
3. Using D.C. Voltmeter, adjust pot for 0 VDC $\pm$ 50 mV at speaker output.
4. This completes the adjustment.

ML-2 FRONT PLATE REPLACEMENT

A. BEFORE PROCEEDING, DISCONNECT ALL CABLES FROM ML-2.

I. Removal of left and right front heat sinks:

a. Remove thumb screws which will release transistor covers,

b. remove hex standoffs (3/8" nut driver),

c. remove heat sink by gently pulling away from chassis, keeping heat sink square at all times,

d. place heat sink out of the way so it will not be damaged.

II. Removal of handles and front plate:

a. Handles and front plate are released from the chassis by removing four (4) hex bolts located behind the front plate.

CAUTION: Each handle consists of three (3) parts. These parts will detach from each other when hex bolts are removed. (EXTREME CARE SHOULD BE TAKEN TO KEEP THESE PARTS FROM FALLING AGAINST THE FRONT PLATE.)

b. "Removed" front plate should be packaged as soon as possible to prevent any damage.

III. Reassembly:

a. To reassemble with the new face plate, simply reverse removal procedure (II).

IV. Installation of heat sink:

a. Key pin must fit into key way ("slot") in motherboard,

b. align heat sink connectors so they lock securely into motherboard connectors while making sure steel studs pass through holes in heat sink,

c. replace hex standoffs. Tighten standoffs alternately (top and bottom) so that heat sink will secure evenly.

mark levinson audio systems ltd.

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hamden connecticut 06517 u.s.a.
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hamden connecticut 06517 u.s.a.
telephone (203) 281-6333
telex 96 6405 lvnsnaudo hadn

ML-2 ANTI-BUZZ CIRCUIT REMOVAL (ORIGINAL TYPE)
(Refer to diagram)

1) Disconnect all cables from the amplifier.

2) Remove the top and bottom plate (5/64 hex).

3) Remove wire A from the "line" terminal of the circuit breaker. Disconnect wire B from wire C.

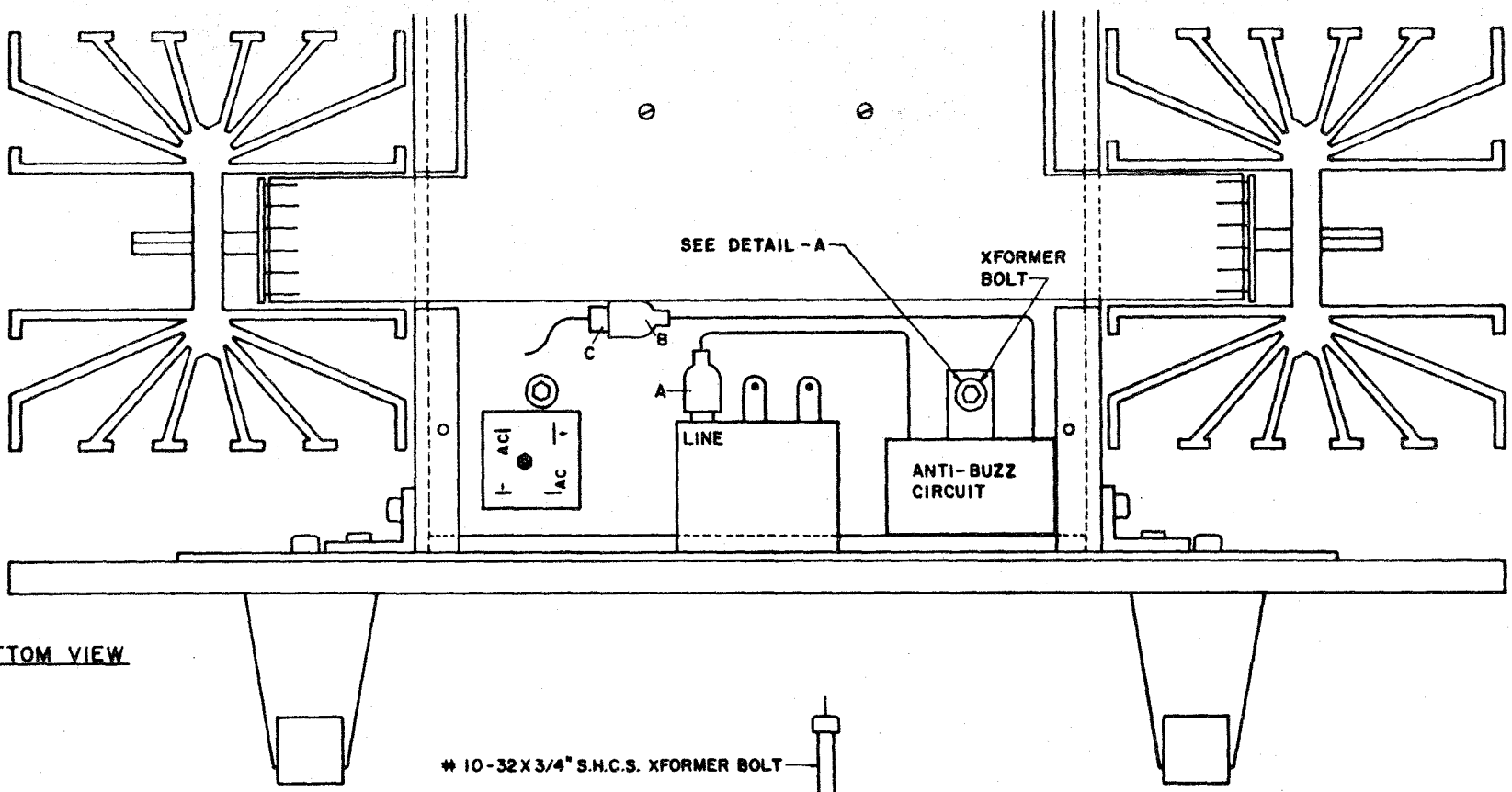
4) Remove lower right hand transformer bolt securing present anti-buzz circuit. Do not reuse this bolt.

5) Remove present anti-buzz circuit.

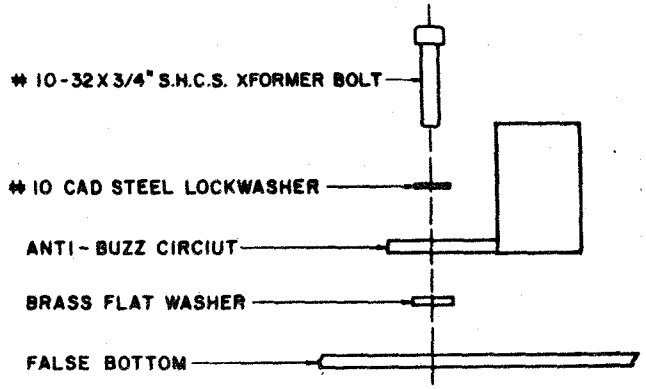
6) Replace transformer bolt with 10-32 x 5/8" bolt supplied, in conjunction with the #10 cad steel lockwasher and brass flat washer.

MARK LEVINSON AUDIO SYSTEMS

TECHNICAL SERVICES
March 19, 1982



BOTTOM VIEW



DETAIL - A

ISSUE	REVISION	DATE	SCALE
			TOLERANCES UNLESS SPECIFIED FRACTION ±.010 DECIMAL ±.005 ANGLE ±1/2°
			DR. DATE 12-9-81 CH. DATE

mark levinson audio systems, ltd
35 crusader avenue hamden connecticut 06514 u.s.a.

MATERIAL	SHEET OF
USED IN ML-2	A B C D E R
NAME Anti-Buzz Circuit Retro Fit	NO.

MEMO

TO : Myer
Sid
Dave
Paul
Judd
Sandy

FROM: Phil

DATE: March 16, 1982

RE : Buzz Circuits

Due to complaints raised by Harman U.K. about transformer buzz, we must change the buzz circuits to alleviate their problems and avoid any further problems in other European countries.

We must stop building the current ML-3, ML-9, and ML-2 buzz circuits. All completed and in-process buzz circuits should be put only in 120V units. ML-3 and ML-9 buzz circuits should be built with the 10,000uf caps in place of the 4700uf caps for use in amps of voltages other than 120V. (ML-9 buzz circuit will be on SL-2 pc bd. as soon as we start using Swiss bds. in all units.) ML-2 buzz circuits will have four 10,000uf caps instead of two. A sample of this will be released to Production shortly.

Amplifiers in the cage with old buzz circuits should be shipped as is, with the exception of Harman U.K. If we get an order from them, the amplifiers shipped must have new style buzz circuits.

Please do not overbuild these new type buzz circuits until we've had enough time to receive any further field reaction. Build only what you need for the production schedule.

An ECN for these subassemblies will follow shortly. If you have any questions or comments, please contact Tom or myself.

PM/srw

ENGINEERING CHANGE NOTICE

ENO 31682 T1

UNIT	ML-3, ML-9	PRIORITY	P3
		START DATE	3/16/82
SUB-ASSY	75-1910-00-00-00 – ML-3 ANTI-BUZZ 75 1909-00-00-00 – ML-9 ANTI BUZZ	STOP DATE	—

ENG

DUE TO CONTINUED TRANSFORMER BUZZ IN U.K. AND OTHER ASIAN AND EVROPEAN COUNTRIES, WE MUST INCREASE THE CAPACITANCE OF THE BUZZ CIRCUITS

PROD

ON ML-9 AND ML-3 ANTI BUZZ CIRCUIT P.C.B.O., DELETE TWO PCS. OF 4700 uf/16V CAPS (14-0472-00-EC-00). REPLACE WITH TWO PCS. OF 10,000 uf/16V CAPS (14-0103-00-EC-00). OBSERVE SAME POLARITY AND SAME PLACEMENT OF ELECTRICAL TAPE.

Q A

—

PURCH

ON SA# 75-1910-00-00-00, DELETE 2pcs. OF QUAN 2, 14-0472-00-EC-00
ADD 2pcs. 14-0103-00-EC-00.

ON SA# 75-1909-00-00-00, DELETE 2pcs. OF QUAN 2, 14-0472-00-EC-00
ADD 2pcs. 14-0103-00-EC-00

INV

See PURCH.

COMPUTER

SEE PURCH.

ACKNOWLEDGEMENT

INVENTORY	PURCHASING	COMPUTER	PRODUCTION
MFG. COORDIN.	ACCOUNTING	TECH. SERVICES	ENGINEERING P. Mayer
Q.A.			

MEMO

TO: Manufacturing

FROM: Sid Chatterjee

DATE: January 26, 1982

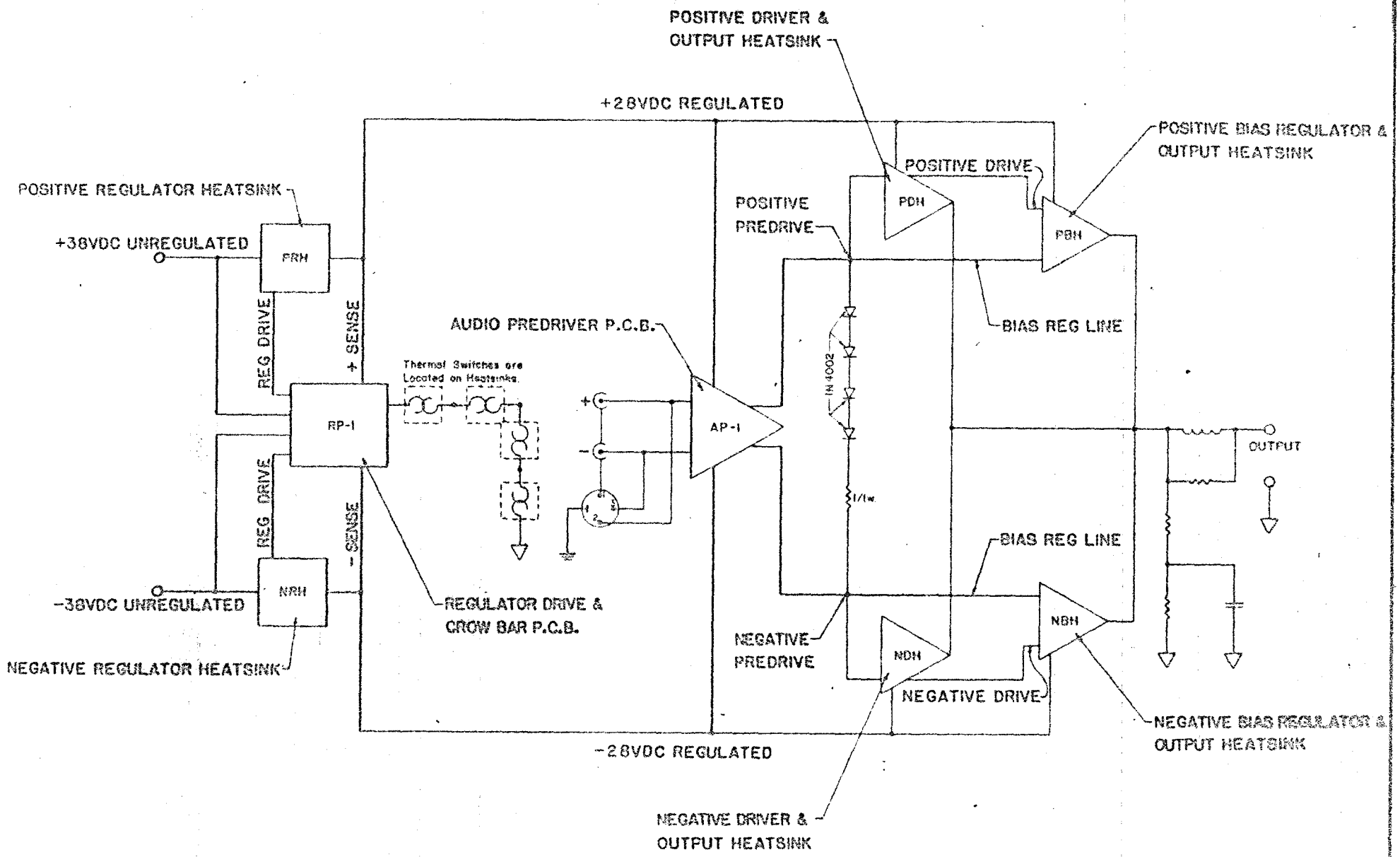
RE: Buzz Circuits

Presently we are building two types of anti-buzz circuits. First type uses 4,700uF capacitors; second type uses 10,000uF capacitors. In the near future, we will stop using the 4,700uF and build anti-buzz with only the 10,000uF capacitors.

It should be noted:
a) ML-2 can only use the 10,000uF
b) ML-3 and ML-9
    1) 100VAC units can only use the 10,000uF
    2) all other voltages can use up our present supply of 4,700uf capacitors.

Since it is nearly impossible to tell which capacitor is used inside of the potted shell, I suggest:
a) all 4,700uF units use 16 ga. black PVC insulated wire
b) all 10,000uF units use 16 ga. white PVC insulated wire

I hope that this will simplify the confusing situation.



ML-2 BLOCK DIAGRAM

ML-2

CHASSIS WIRING

1. Square chassis.

   a. Insure fitting of Top & Bottom Plate.
      1. Bolt down both plates, then tighten sides.
      2. Remove plates.

2. Brackets flush with sides.

3. Install bracket with spacer post on aluminum cap. side.

4. Make sure capacitors will fit into centered clamps.

5. Transformer Inspection:

   a. Tighten bolts.
   b. Check wires for damage.
   c. Check for body damage, straighten corners if necessary.

6. Motherboard

   a. Inspect completely, and clean if necessary.

7. Inspect Audio card and Reg. and Pro. Card. Note pins! Clean cards.

8. Adjust card guides and install cards.

9. Install Transformer:

   a. Large group of transformer wire on bridge side.
   b. Twisted 3 wire on opposite side.
   c. Square transformer and bolt down.
      1. Lockwasher on top and bottom.

10. Turn chassis over and locktight transformer nuts and clamp nuts, and corner bracket.

11. Install Motherboard. (22½")

    a. Add white wire and blue wire to transformer wrap and tie wrap.
    b. Orange stripe and two red wires go around post.
        1. Orange striped wire in small hole - middle motherboard.
        2. Red twisted wires in both small center back holes.
        3. Solder all 3 wires.
    c. No pinched wire.
    d. Neatly tie wrap and push wrap down along side.
    e. Motherboard should slide into clamps easily.
        * Make sure no wires are in the way.
    f. If motherboard won't slide down, readjust the clamps.

12. Line up spacer posts with holes.

13. 440 screw into posts with lockwasher.
    * DO NOT overtighten.*

14. ~~Turn chassis over and~~ add green ground wire.

15. ~~Tie wrap yellow and blue wires; tie remainder of yellow wire and blue wire into transformer wrap.~~ *

16. Tie wrap red and green wires (~~Must go over post bracket.~~)

17. ~~#22 twisted wires must approach holes from front.~~

18. Connect rear panel (See diagram.) Inspect for damage.
    *Make sure that black, ~~green~~ red, white wires are neat ~~and tightly twisted~~.

19. Install handles. Inspect handles.

20. Install Front Panel.

    a. Inspect ON/OFF switch.
        1. Should switch on and off fairly easily.
        2. Inspect lettering.
    b. Connect breaker and bridge.

21. Final Inpection

mark levinson audio systems ltd.

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telephone (203) 281-6333
telex 96 6405 lvnsnaudo hadn

ML-2 CIRCUIT BREAKER REPLACEMENT

1) Remove all electrical cables from amplifier.

2) Place amplifier on front handles.

3) Remove covers from forward-most heat sink assemblies (left and right) (thumb screws).

4) Remove forward heat sink assemblies (left and right) 3/8" hex standoff). Pull heat sink away from chassis to remove.

5) Remove eight 5/32" hex cap screws holding frontplate and handles to amplifier chassis.

6) Lift chassis vertically leaving frontplate and handles behind.

7) Place amplifier in a comfortable position for circuit breaker replacement.

   CAUTION: Do not place amplifier down on false front or circuit breaker will be crushed.

8) Remove circuit breaker from chassis by loosening the two screws holding it to the false front.

9) Disconnect wires, ONE AT A TIME, from defective circuit breaker and connect to the new circuit breaker.

   CAUTION: Do not alter wire locations. Miswiring circuit breaker may cause destruction of the amplifier.

10) Mount new circuit breaker and tighten screws.

11) Bolt frontplate and handles to chassis.

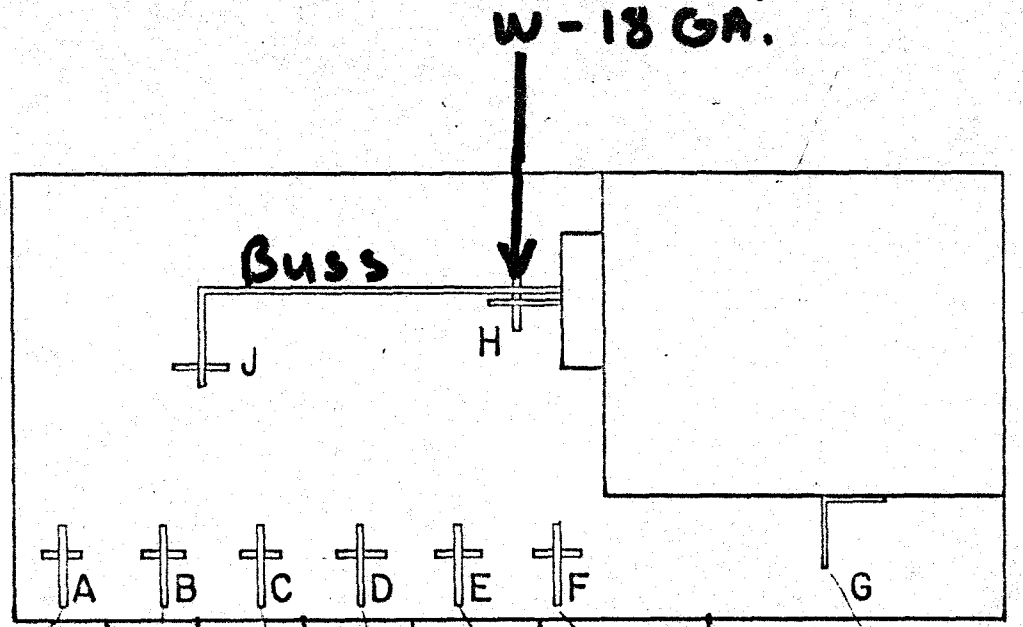
12) Install forward heat sinks (left and right) being sure that gold contacts mate properly.

13) Replace heat sink bolts and snug. Do not over tighten.

14) Replace heat sink covers.

PLEASE FORWARD QUESTIONS TO MARK LEVINSON AUDIO SYSTEMS, LTD., TECHNICAL SERVICES.

ML-2 CORCOM WIRING



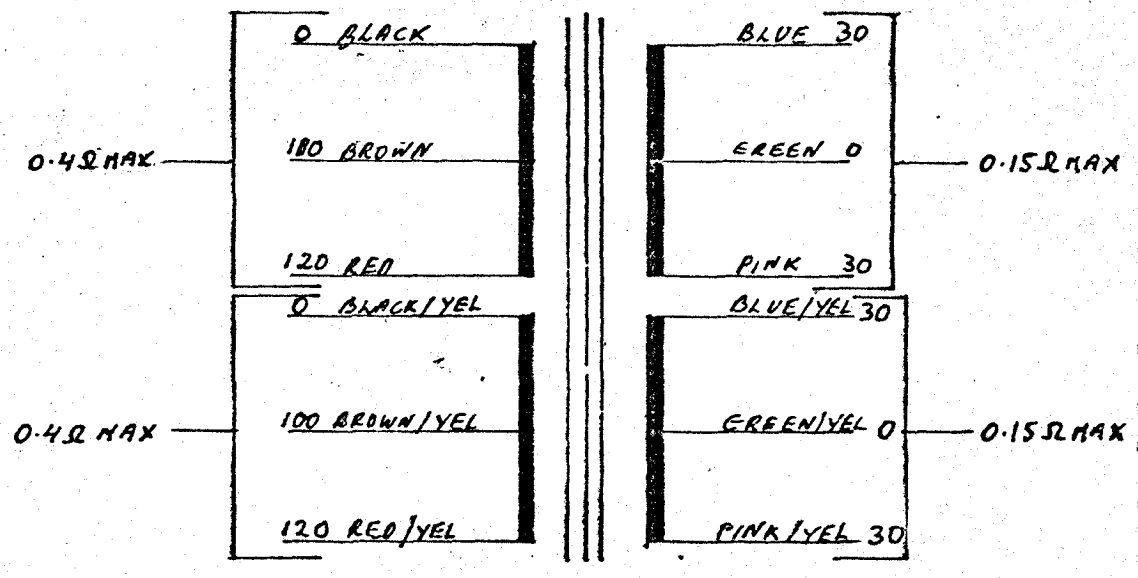
	A	B	C	D	E	F	G
E-CORE	Y BLK	Y	R BLK	BLK W	BLK	W	16GA BUSS TO BINDING POST & SWITCHCRAFT
AVEL LINDBERG TOROIDAL	BR	Y	R	R Y	BLK	BLK Y	

SHEET / OF / SHEETS		
PT.No. COD 822		
ISSUE		
No.	REF.	DATE
1		
2		
3		
4		
5		
6		
7		

A

VC 24/0·2 WIRES 20" LONG.

0-32 UNF



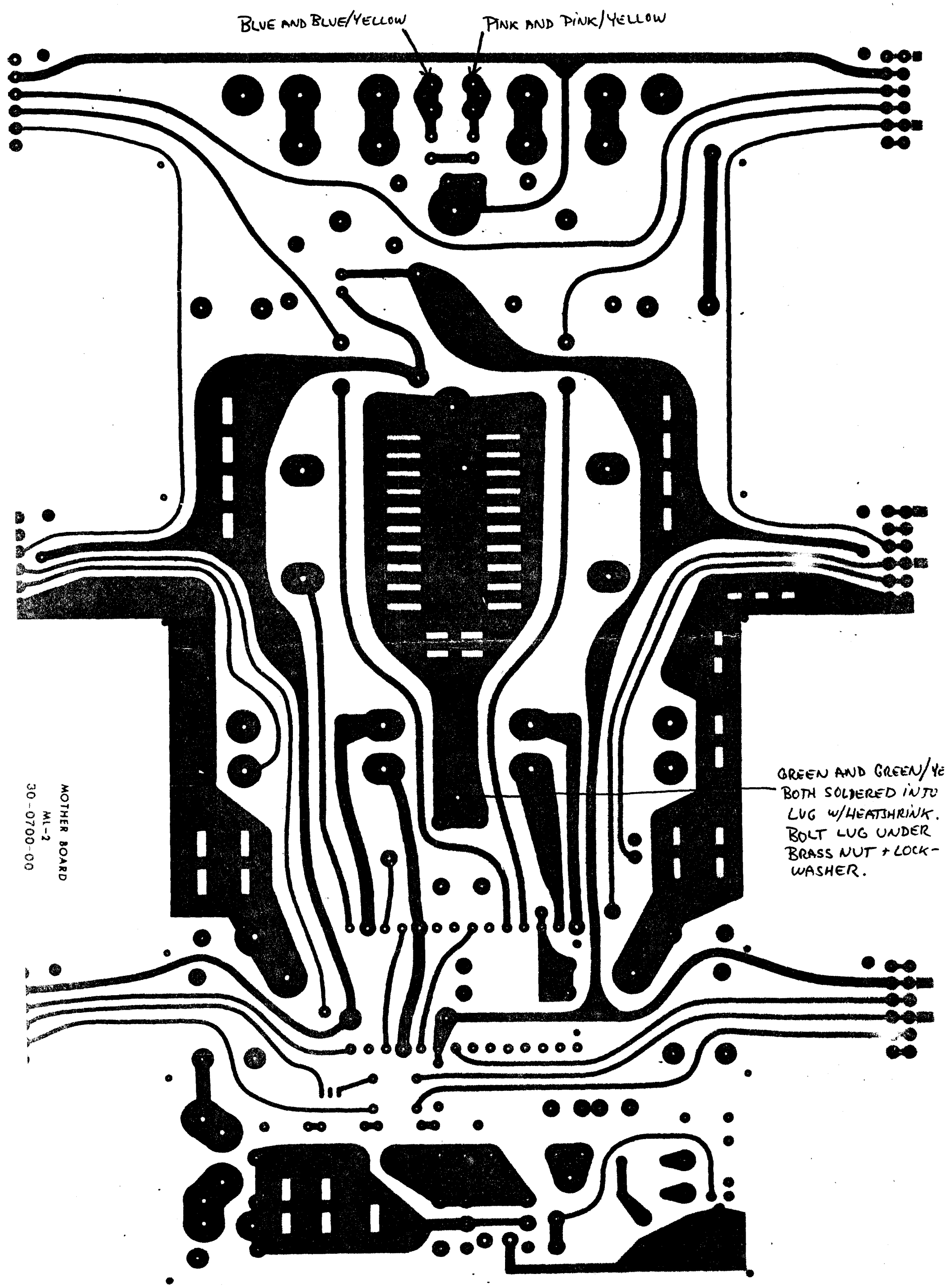
Electrical
1) Imag at 240v 60Hz 30mA nom.
2) Flash Test Primary to Secondary 2Kv AC 60Hz 1 min.
3) Insulation 10 Meg ohm at 500v DC at 25°C.
4) Rated at 120v rms at 8 amp rms. Temperature rise at 25°C ambient 35°C. (i.e. Surface 60°C).
5) Transformer wound for minimum stray magnetic field.

AVEL LINDBERG LIMITED South Ockendon Essex			DRAWN P.W.J	DATE 11-5-78
DIMENSIONS IN:- M M	FINISH		CHECKED	
3RD ANGLE PROJECTION	MATERIAL	NAME	METHODS	
METRIC DIMENSIONS FRACTIONAL DIMENSIONS ± 1/64" DECIMAL DIMENSIONS ± .005" SPECIAL LIMITS AS STATED		SPEC.	MFR. APP. R. Daniels 12.5.78	
		SIZE		
SCREW THREAD DIMENSIONS. BRITISH STD. AFTER PLATING.	DESCRIPTION 1200 WATT POWER TRANSFORMER 40/3488		PART No. COD 822	
SCALE 1:2 HALF FULL SIZE			SHEET 1 OF 1	

HARDWARE FOR TOROIDAL TRANSFORMER MOUNTING IN ML-2

4pcs.	52-0029-00-50-00	10-32 x 5/8" SHCS
4pcs.	52-0011-00-LW-00	#10 ITLW
4pcs.	52-0037-00-WO-00	BRASS FLAT WASHER
1pc.	47-3180-10-HS-00	HEATSHRINK BLACK 1"
1pc.	50-0600-00-HE-00	RING TERMINAL

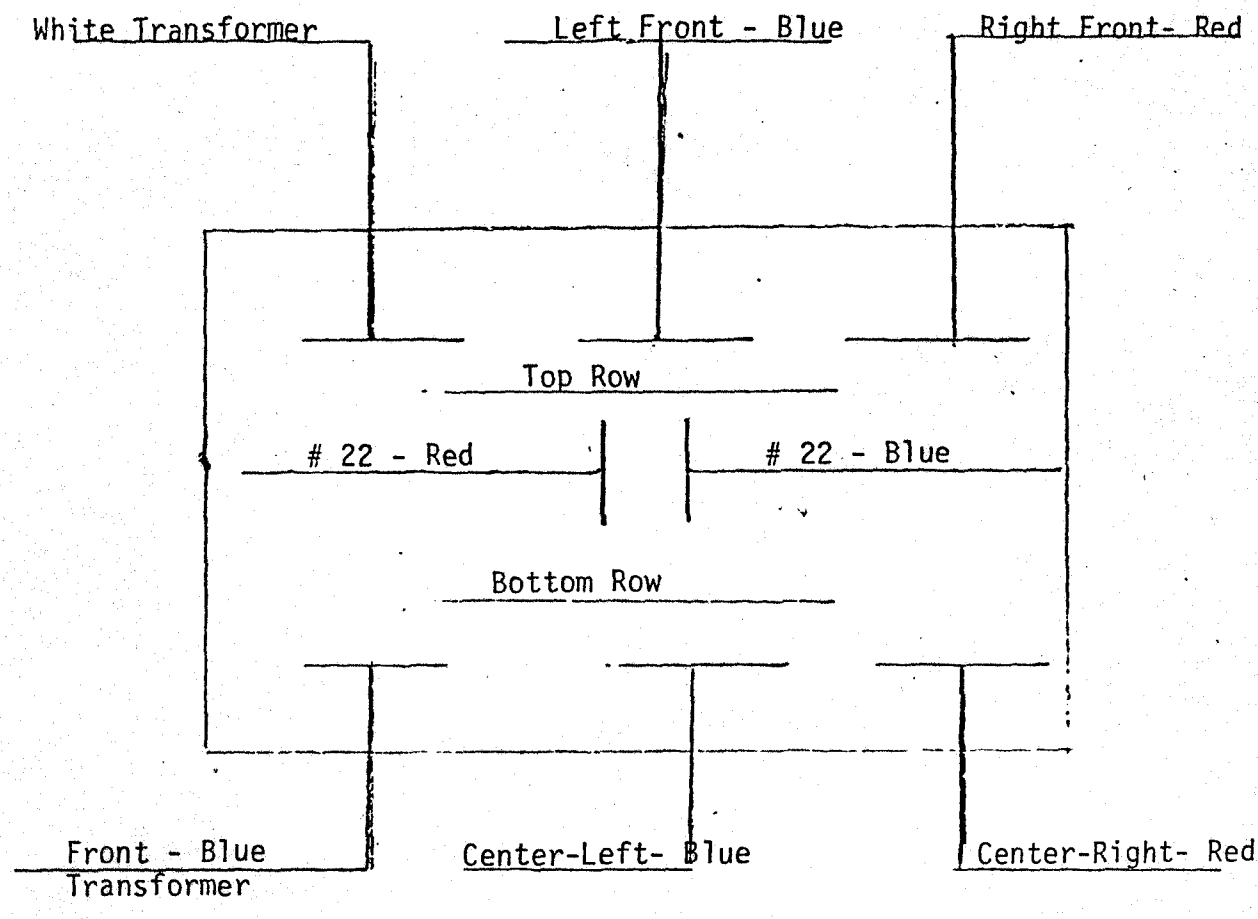
TOROIDAL TRANSFORMER SECONDARY WIRING - ML-2 MOTHERBOARD, TOP VIEW



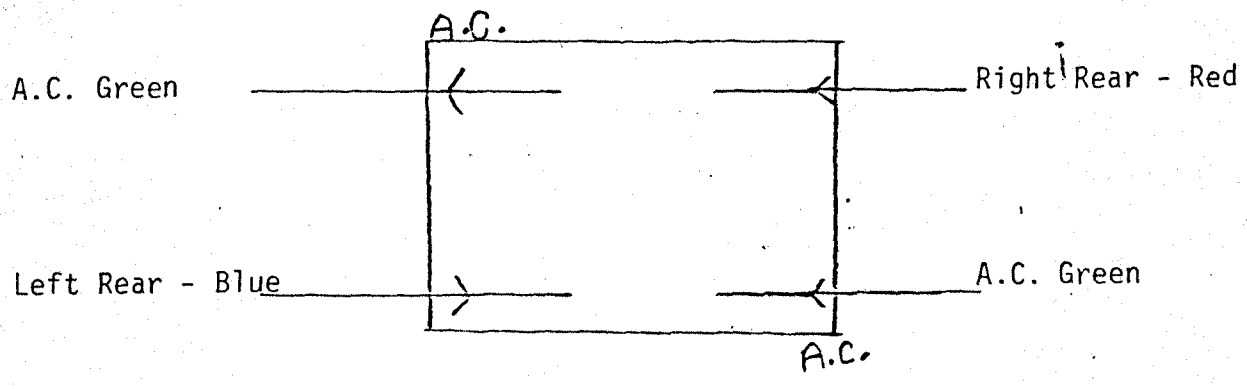
9/23/77 ME.

FRONT PANEL

BREAKER

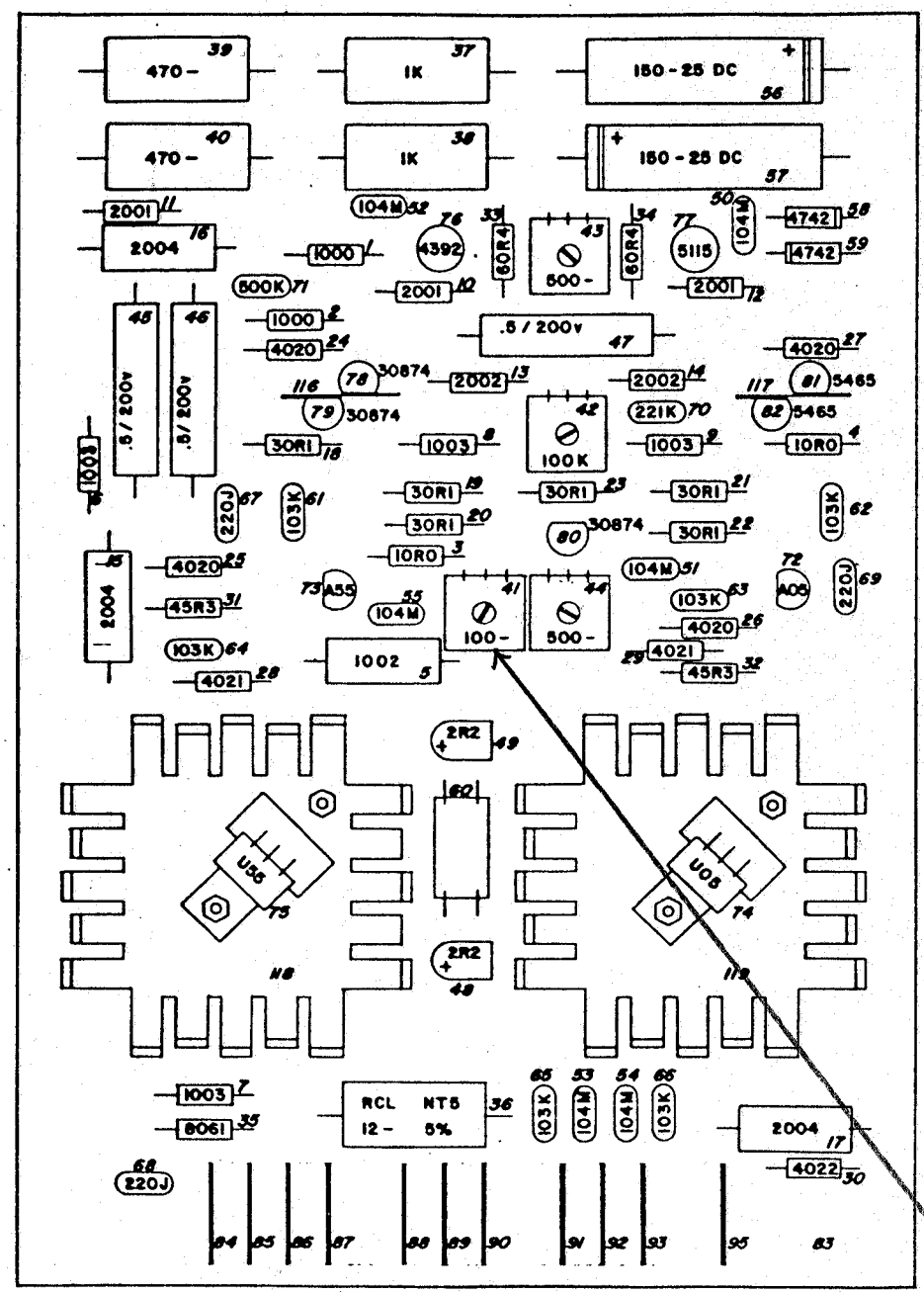


BRIDGE



IM Balance (Noninverting input)

8Ω load
1000Hz Sinewave input
20 watts output

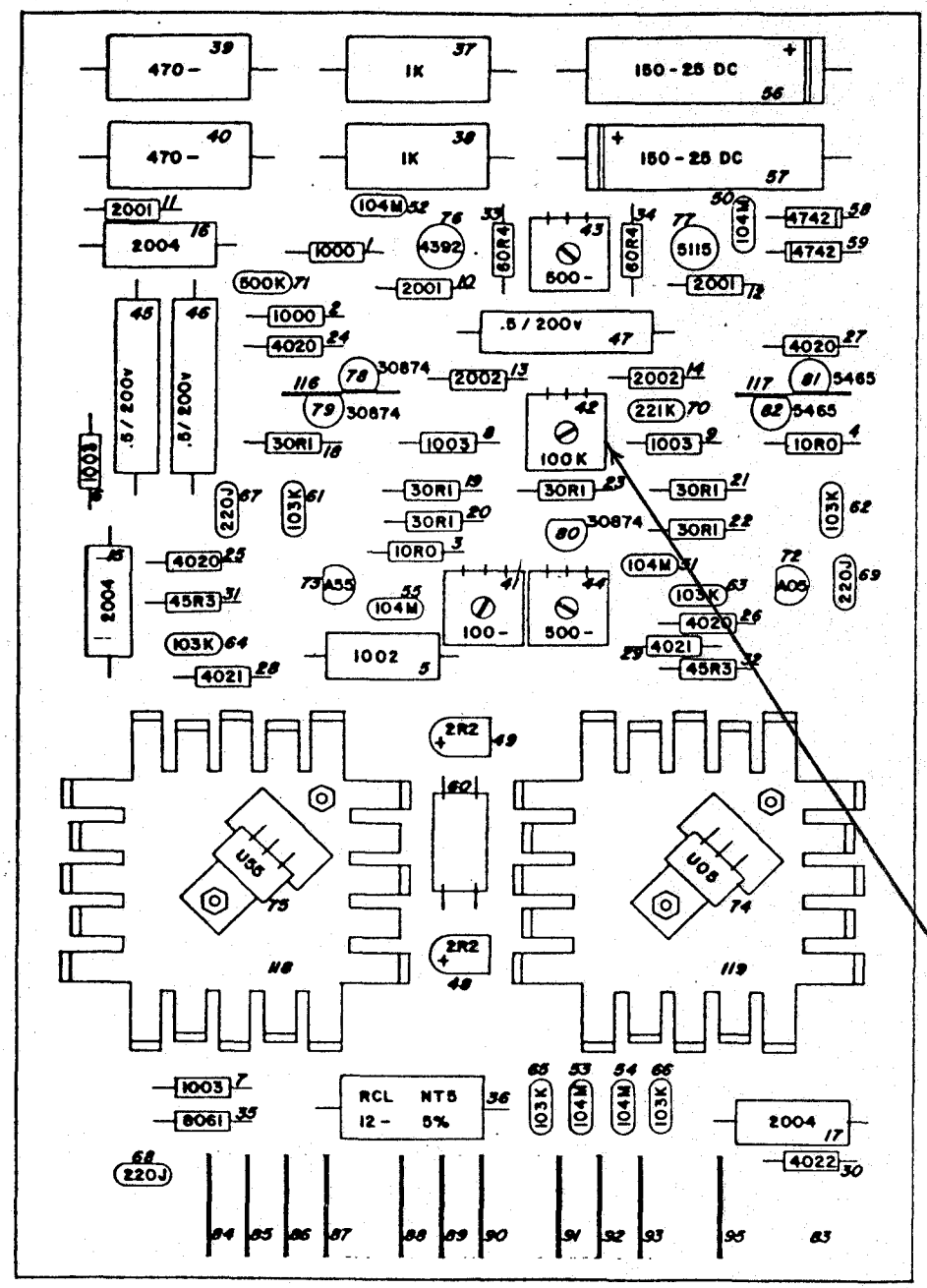


Adjust for minimum distortion

AP-1 A-2

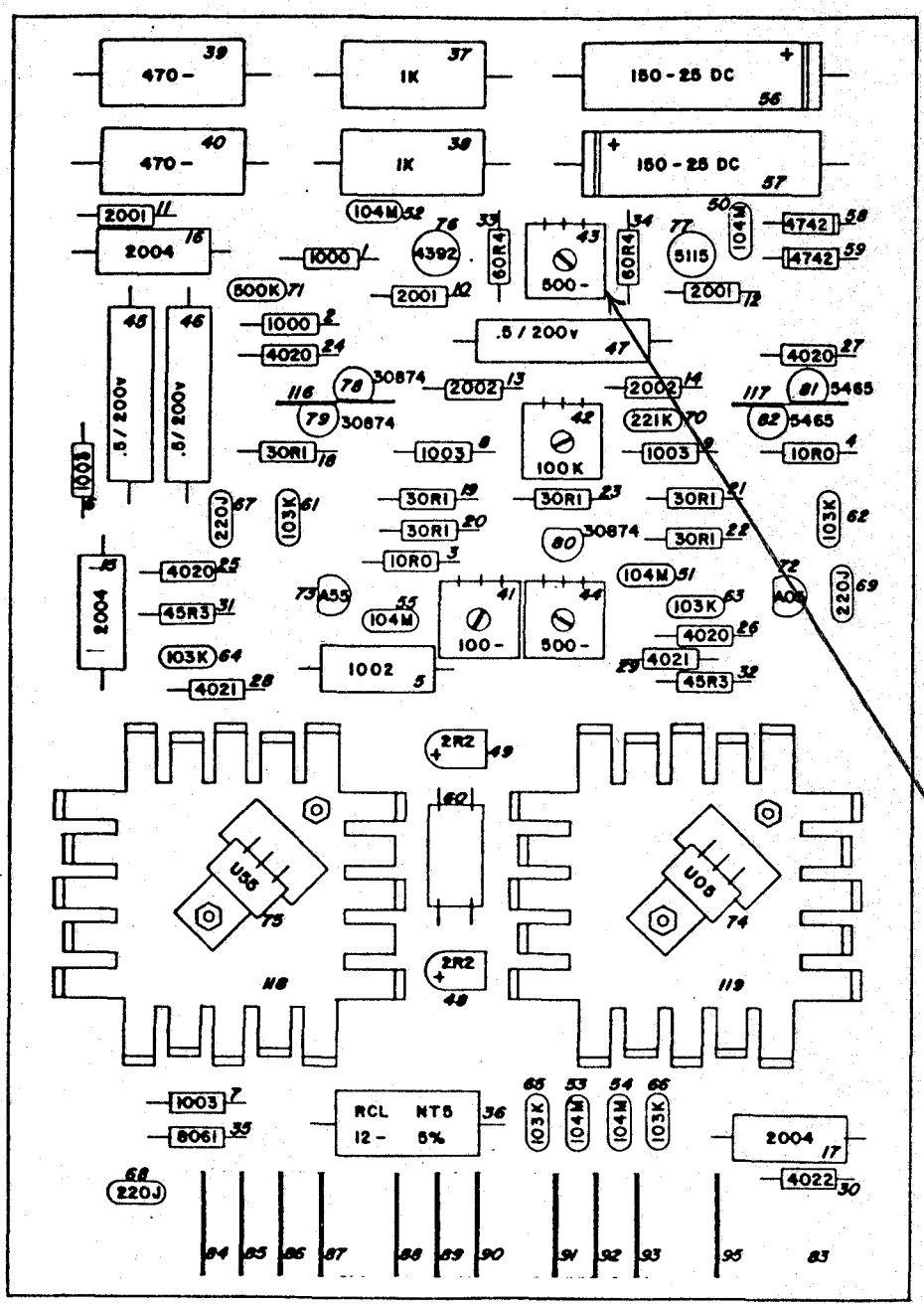
DC offset Adjustment

Measure Across Output terminals



IM Balance (inverting input)

8Ω load
1000Hz Sinewave input
20watts output

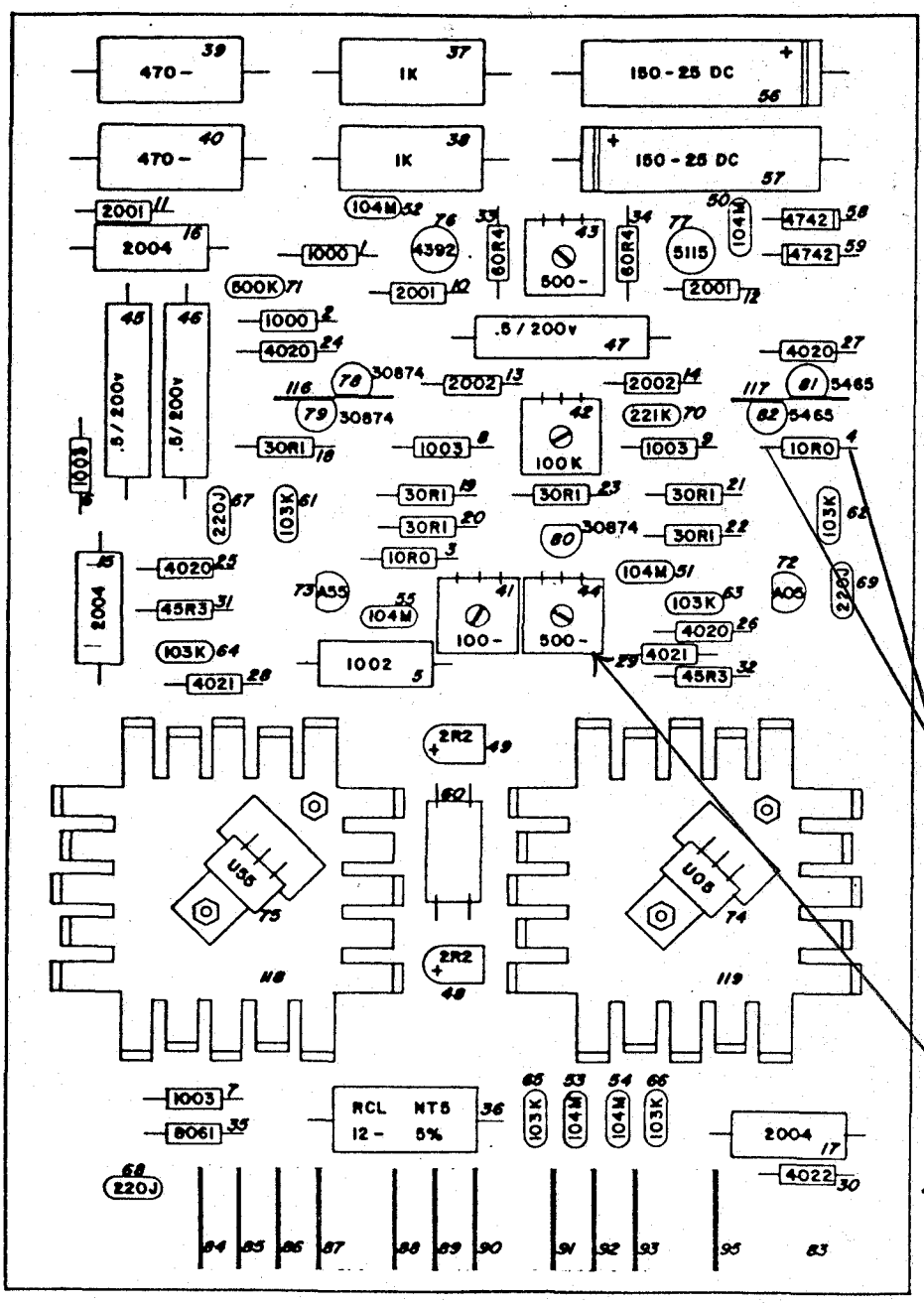


Adjust for minimun distortion

AP-1 A-2

Card Current Adjustment

(All Adjustments made simultaneously)

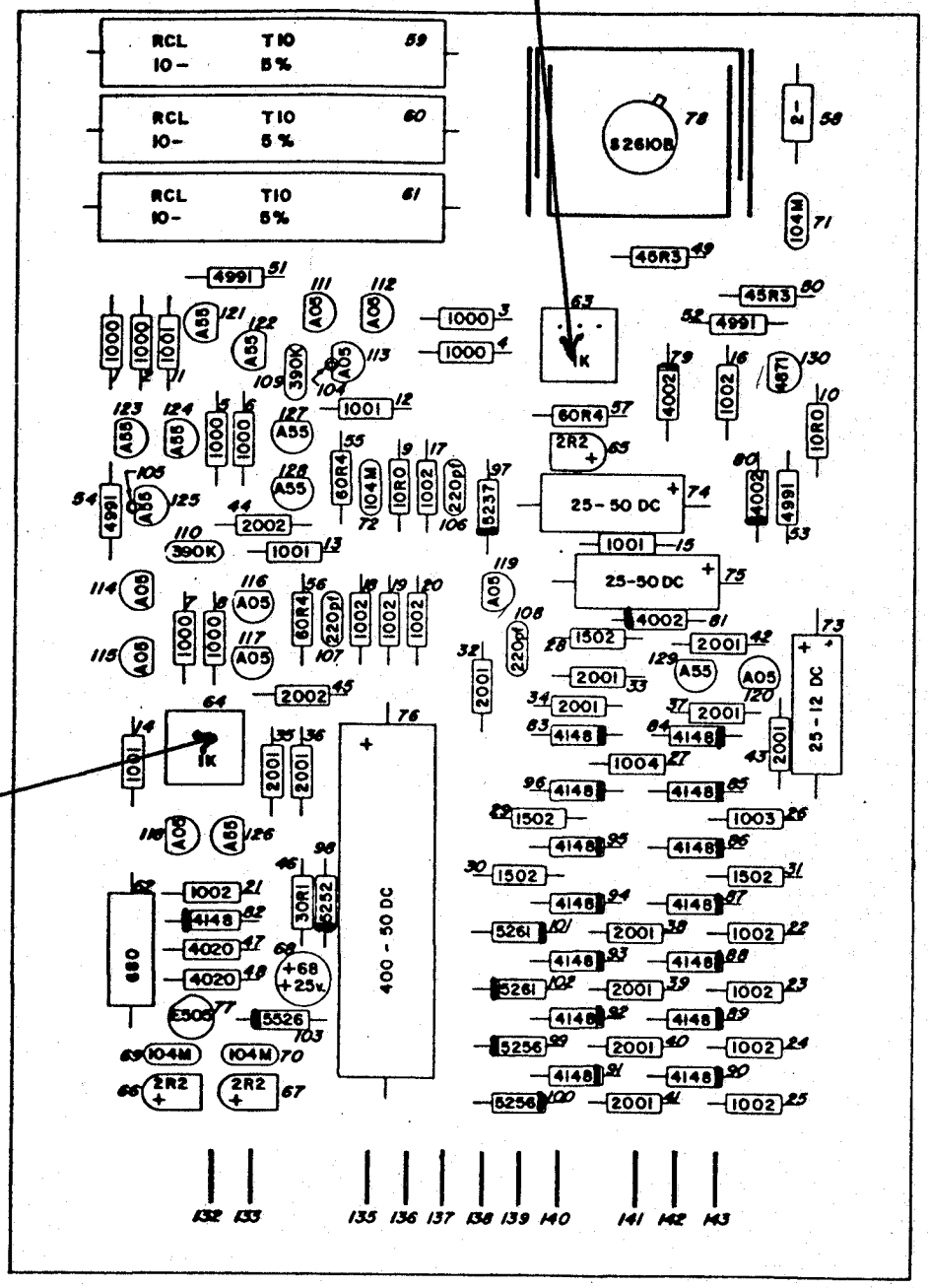


Measure across this resistor

Adjust for 500mV

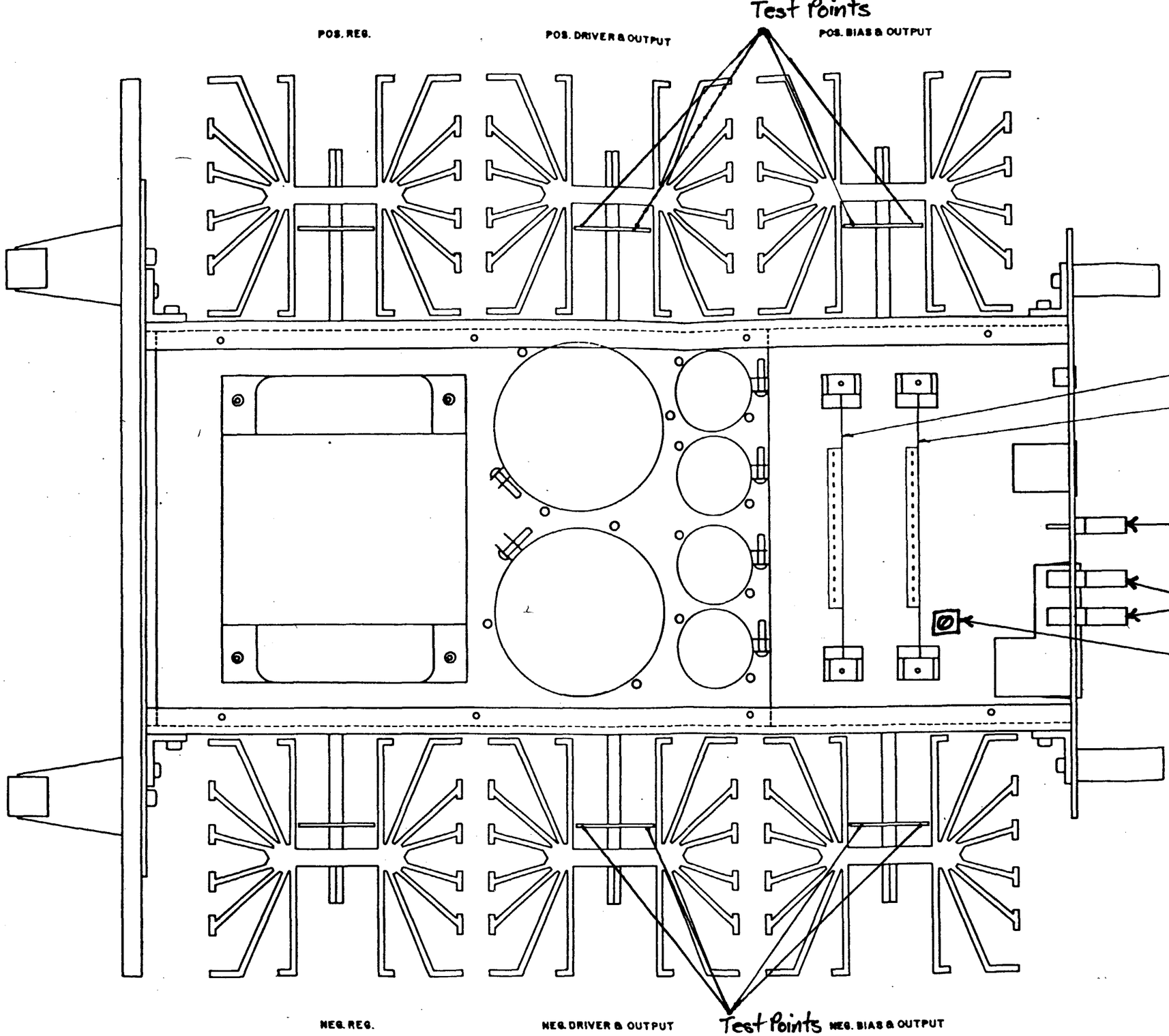
AP-1 A-2

Neg reg Adjust



Pos reg Adjust

RP-1 A-3



Regulator Adjust

Put one lead of DVM on GND lug and the other lead on case of Bias output transistors (Refer to diagram RP-1 A-3) Adjust regulators for ± 28.00V

Bias Adjust

Put one lead of DVM on Pos speaker term and with other lead check each Test point for Lowest Bias reading and adjust that for 550mV using Bias adjust Pot.

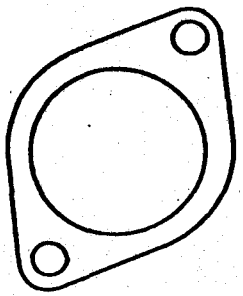
ML-2 TOP VIEW

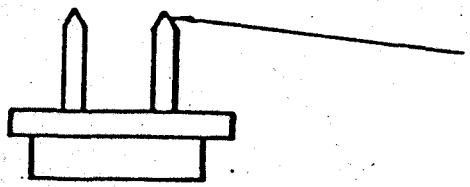
A-10

ML-2 TRANSISTOR REPLACEMENT

When 2N5684 and 2N5686 transistors are supplied, it will be necessary to trim the leads (as shown in diagram below) and to enlarge the socket openings in the heatsink.

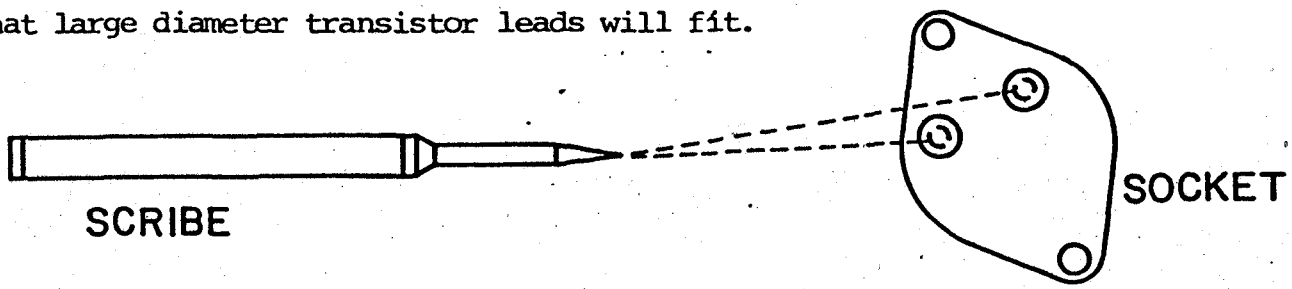
(TO3) Power Transistor





Snipping the leads with a diagonal cutter will create a bevel on the end of the lead.

Using scribe like tool, spread transistor socket contacts so that large diameter transistor leads will fit.



Replace insulators and then mount replacement transistors. Before tightening transistor nuts, tighten all screws from printed circuit side of heatsink. Now snug transistor nuts. Over tightening transistors will destroy insulators. Check all other nuts on outer side of heatsink.

ML-2 RELIABILITY TEST

1) Adjust the variac for 115V.

2) Adjust the DC supplies for + & - 32V and idle current for 4A (.56V). Use + & - 27V and 5A (.7V) for Ecore type. (See diagrm 1)

3) Defeat the crowbar circuit, (see diagram 1) and bypass two .5uf capacitors as shown in diagram 2.

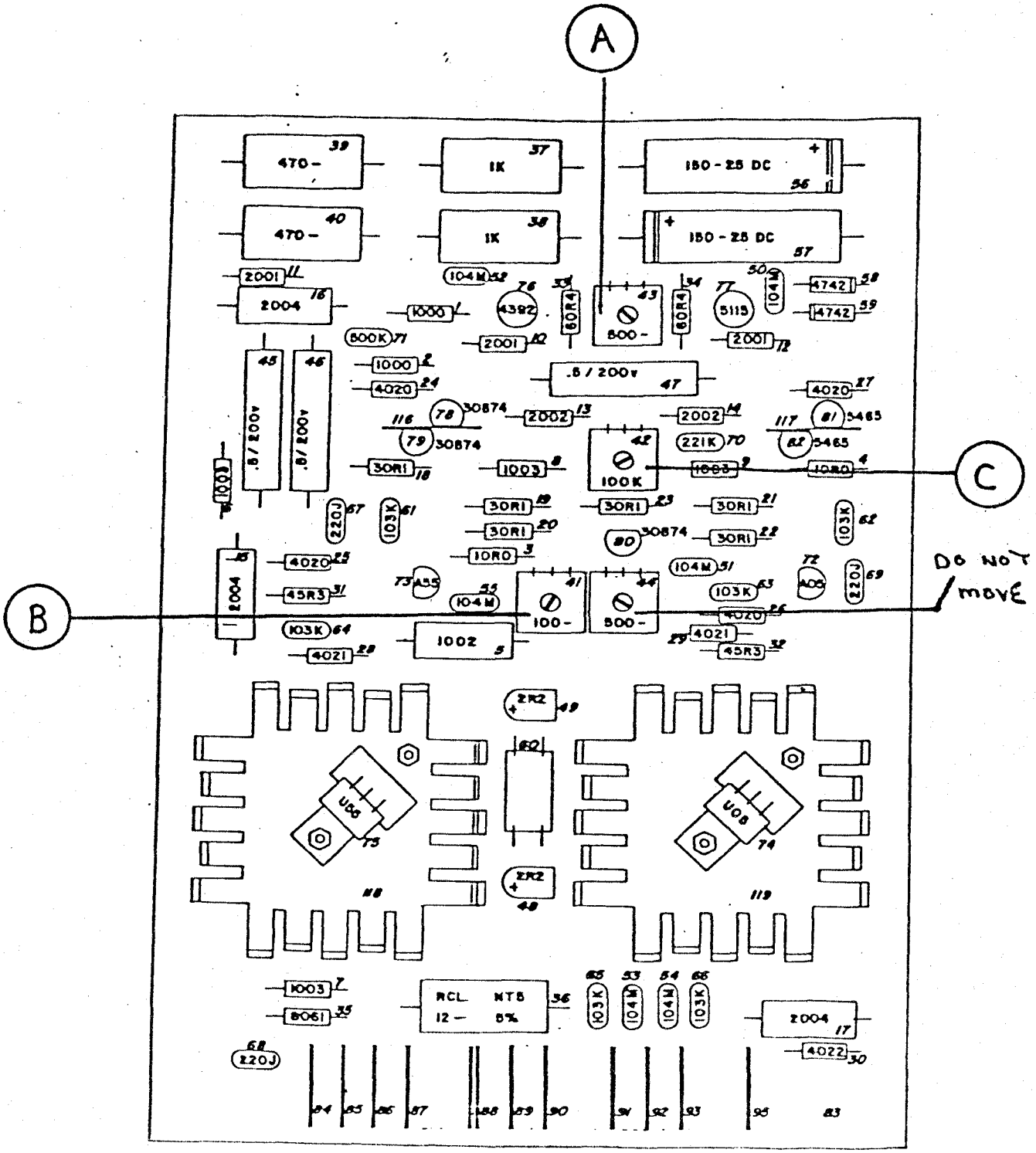
4) Adjust the inverting distortion control for minimum DC at the output. (See diagrm 2).

5) Connect the noninverting input to a square wave generator, set for .5Hz. Increase the generator level until the AC watt meter begins to fluxuate (approximately + & - 20V output). Run for 30 minutes minimum then readjust the generator for .3Hz and run for 5 minutes.

6) Readjust the generator for 20kHz. Connect 4uF polycarbonate capacitor to the output. The circuit breaker will trip. Repeat 5 to 10 times.

ML-2 Predriver Adjustment

1) Place card on extender and insert into the amplifier.
2) Apply power to amplifier and allow to heat for about 30 minutes.
3) Set trimpot A for center of rotation.
4) Adjust trimpot B for minimum IMD (less than .1% @ 14 V).
5) Adjust trimpot C for minimum D.C. offset (+- 25mv).
6) Check IMD; readjust if necessary.
7) Check D.C. offset; readjust if necessary.
8) Remove extender card and insert predriver directly into the amplifier.



MARK LEVINSON AUDIO SYSTEMS, LTD.
TECHNICAL SERVICES 8/14/80

ML-2 REBUILD INSTRUCTIONS SC 11/07/85 REV.C

RA No._____ SN:_____ Date Rcvd._____

1.) All units should have Motorola bridge rectifier P/N 17-9905-00-BR-00.

2.) All circuit breaker and bridge rectifier crimp connections should be of the new type.

3.) Motherboard fuse should be 8A slo-blo P/N 62-0012-00-FO-00.

4.) All driver turn-off resistor should be 33 OHM/5W wirewound P/N 06-3300-80-00-00 when MJE 15030/31 drivers are used.

5.) Replace or tighten speaker binding post Red - P/N 65-0102-00-BP-00, Black - P/N 65-0103-00-BP-00.

6.) Add bias modification - 05-8060-00-RN-55, 17-4003-00-DO-00.

7.) Add surge delay timing - 12-0225-50-TC-00, 17-4003-00-DO-00.

8.) Motherboard should have buss wire added to the plated thru holes, as per ECN 0005.

9.) Driver and bias heat sinks should be rebuilt using current Motorola matched outputs with new insulators. However, to-66 drivers - 2N6466/68 - do not have to be changed.

____ 20-5030-01-00-00 - Driver NPN
____ 20-5031-01-00-00 - Driver PNP
____ 20-5684-01-00-00 - Output PNP
____ 20-5686-01-00-00 - Output NPN
____ 69-0004-00-IN-00 - Insulator TO-220
____ 69-9030-00-00-00 - Insulator TO-3
____ 70-0018-70-00 - Heat sink, as needed

10.) Elmwood sensors, TO-3 sockets and other parts on the heatsink PCB should be installed and soldered to present day workmanship standards.

11.) All heatsinks should have TO-3 insulators changed to P/N 69-9030-00-00-00.

12.) All screws and nuts used on the chassis, faceplate, handles, heatsink stand offs, etc. should be retightened.

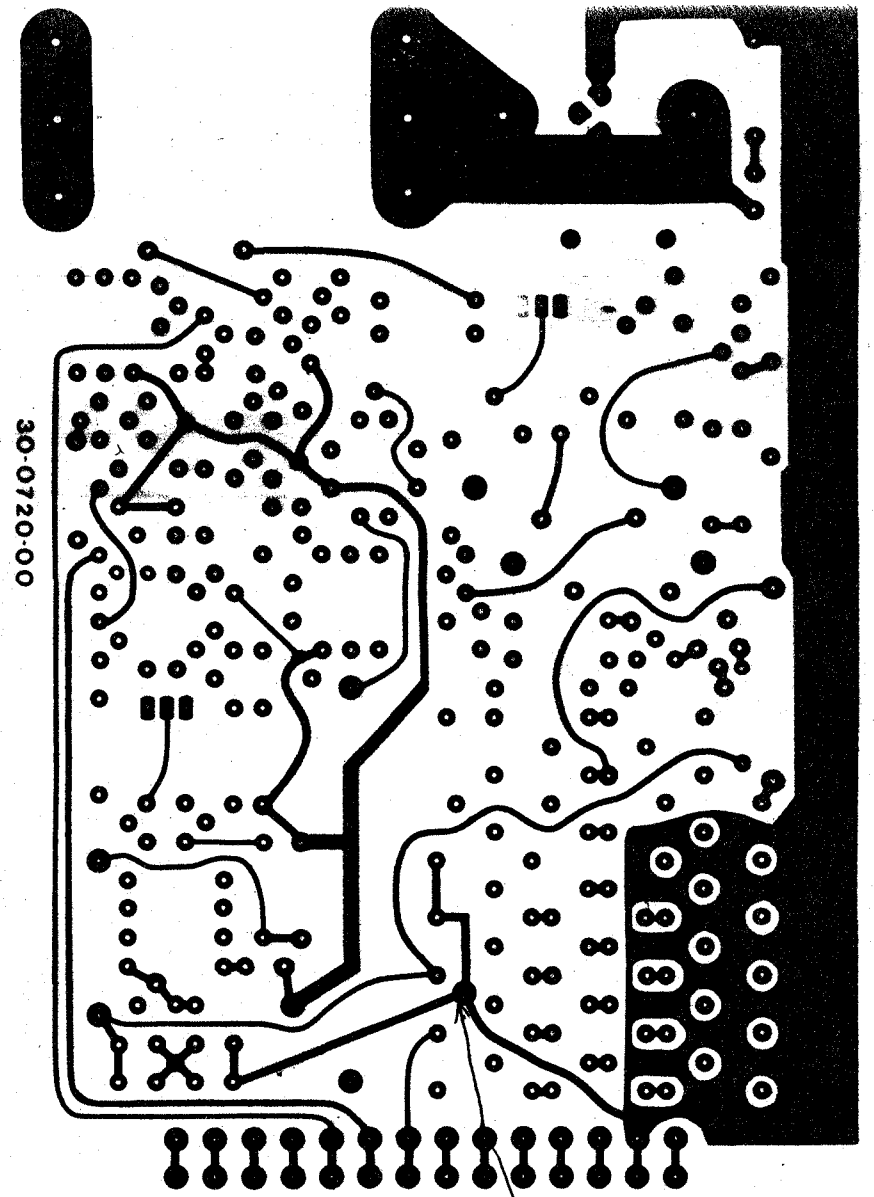
13.) Transformer bolts should be retightened wherever possible.

14.) Install new rubber feet pads onto all six heatsinks - (24) 85-2184-00-00-00.

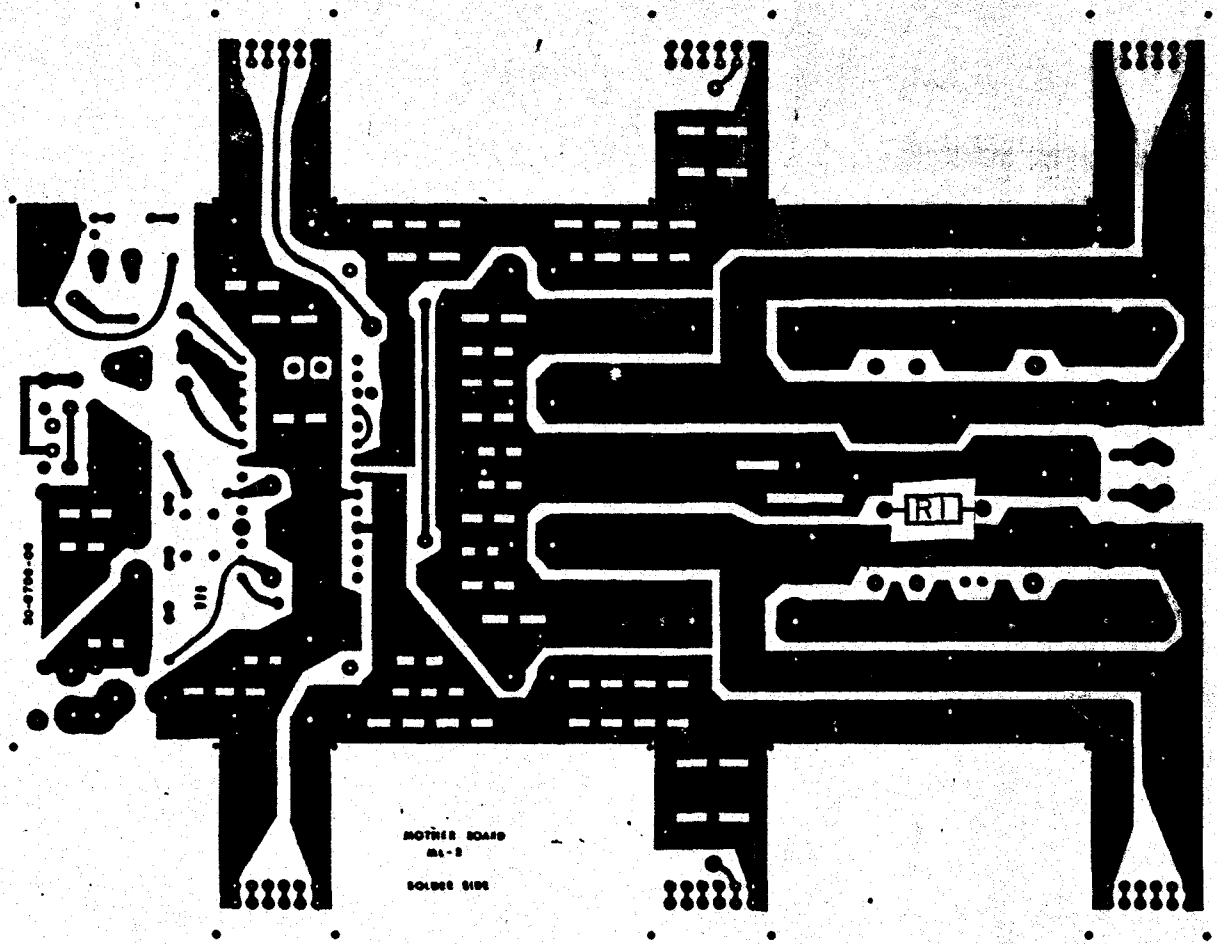
15.) Re-install all six heatsinks, observing for proper alignment of the Elco connectors and proper torque of the hex standoffs.

Check Reverse Side for Additional Information.

Return this sheet with the RA paperwork.



Check clad with your IRon for hole under the clad.



R1 SHOULD BE CHANGED TO 30 ohms or 33 ohm / 5W WHEN DRIVER TRANSISTORS MJE15030/MJE15031 MATCHED PAIR IS USED.

FRONT OF AMP.

ISSUE	REVISION	DATE

ORIGINAL IF RED

Property of

Madrigal Audio Laboratories Inc.

TOLERANCES UNLESS SPECIFIED

FRACTION ±.010

DECIMAL ±.005

ANGLE ±1/2°

DR. J.M. DATE 4-28-86

CH. DATE

SCALE

MADRIGAL audio laboratories, inc.

2081 south main street middletown connecticut 06457 u.s.a.

MATERIAL

USED IN ML-2

NAME RESISTOR REPLACEMENT

SHEET OF

A | B | C | D | E | R

NO. 75-1701-03-00-00

N28752