MODEL CLASSIC 60

STEREO POWER AMPLIFIER

SCHEMATIC

1-1-89

audio research
HIGH DEFINITION®

5740 GREEN CIRCLE DRIVE / MINNETONKA, MINNESOTA 55343-4424
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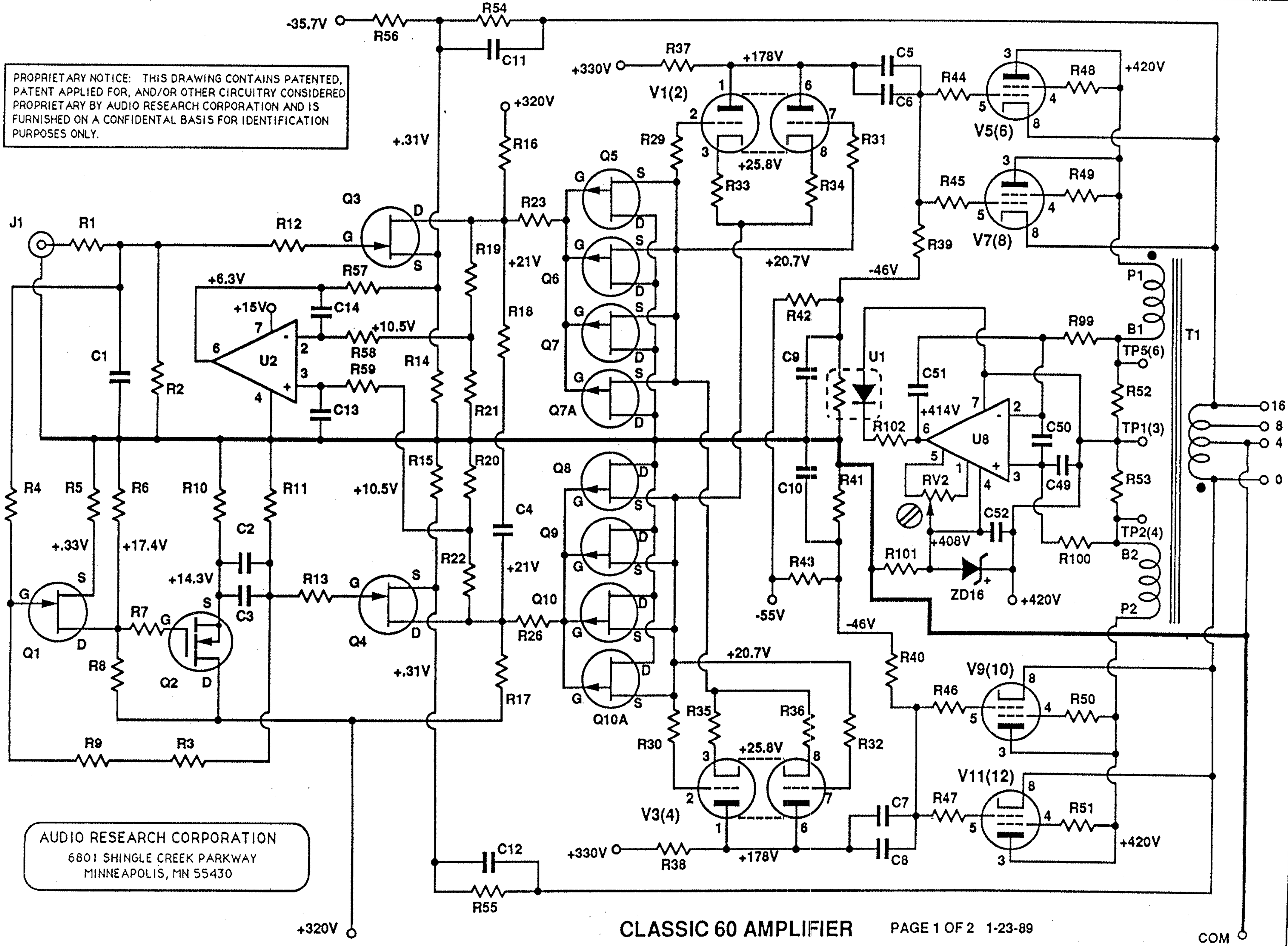

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CLASSIC 60 AMPLIFIER

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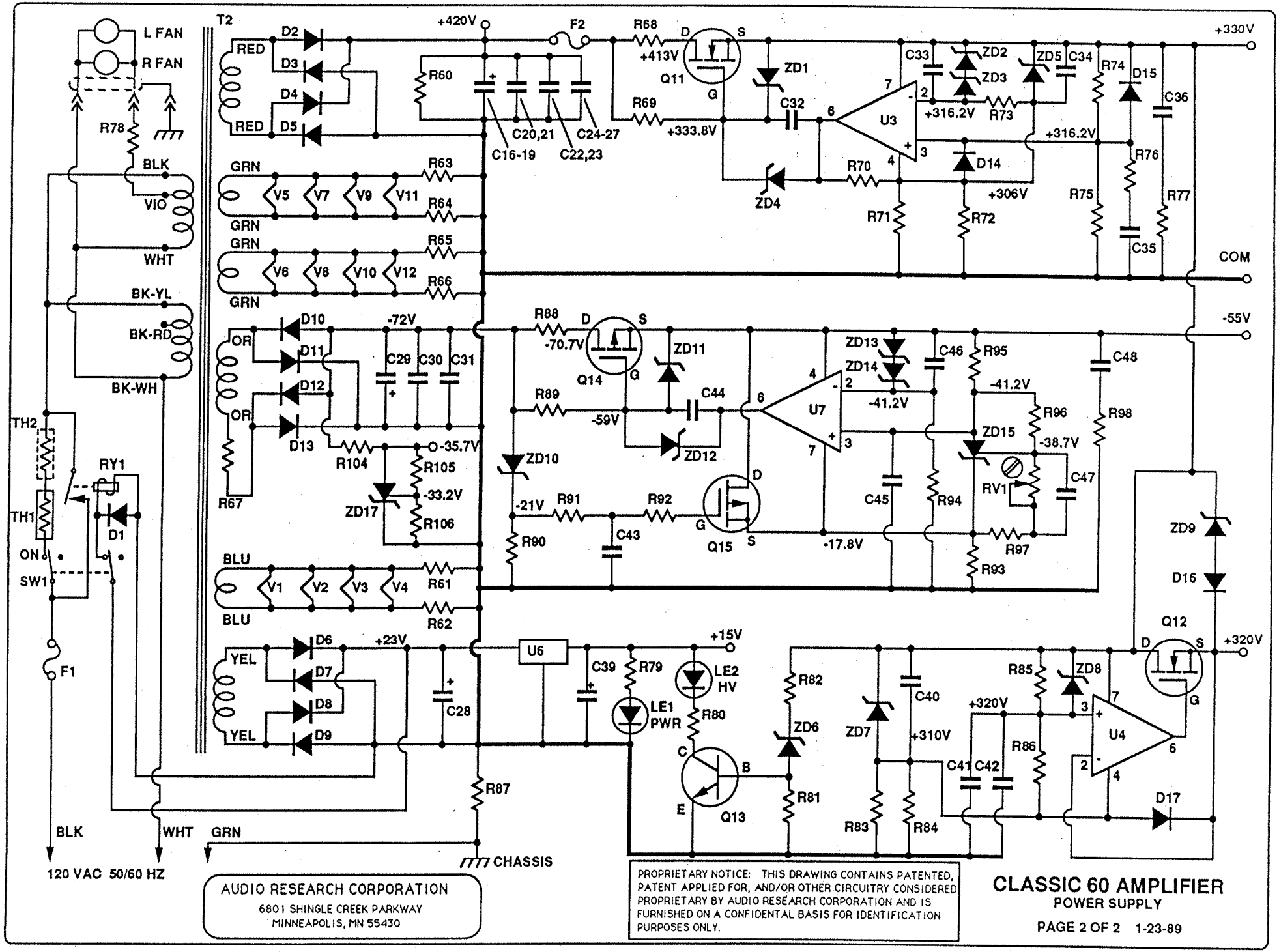

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6801 SHINGLE CREEK PARKWAY
MINNEAPOLIS, MN 55430

CLASSIC 60 AMPLIFIER

POWER SUPPLY

PARTS LIST

As of JAN 24 89

PRODUCT: CL60 CL60

NOTES:

Schematic Symbol	Quantity	ARC Part#	Description
CAPACITORS			
C 1,1A,11,12	8	53150202	CAP. 150 PF 2 1/2% 630V PPN
C 2,5,8,24,25,26,27,31,35,41	13	53100406	CAP. .01 MFD +/- 10% 630 V
C 3	2	53100606	CAP. 1 MFD +/- 10% 250V
C 4	2	53330200	CAP. 330 PF 2 1/2% 160V
C 6,7	4	53100800	CAP. 1 MFD 450V
C 9,10,47,52	7	53100408	CAP. .01 MF 10% 63V PPN
C 13,14,32,33,34,40,43,44,46,49,51	15	53220507	CAP. .22 MF 10% 160V
C 16,17,18,19	4	50800801	CAP. 800MF 450V GRAY
C 20,21,36,42	4	53200602	CAP. 2 MFD+/-10% 450V
C 28	1	50680800	CAP. 680 MFD 35V
C 29	1	50470802	CAP. 470 MF 100V LYTIC
C 30	1	53470511	CAP. .47MF +/-20% 250V
C 39	1	51220601	CAP. 2.2 MF+/-10% 25V
C 45	2	53100505	CAP. .1 MF 10% 63V MPCN
C 48	1	53200603	CAP. 2 MFD +/- 10% 250V
C 50	2	53220306	CAP. 2200 PF 10% 100VDC
DIODES			
D 1,6,7,8,9,10,11,12,13	9	30500400	IN4005 GENERAL INSTRUMENT
D 2,3,4,5	4	30503310	EDAL #M4G5
D 14,15,16,17	4	30500910	FAIRCHILD IN916B
FUSES			
F 1 (100V)	1	34500703	FUSE, MDX7
F 1 (220/240V)	1	34500704	FUSE, MDA-4
F 1 (120V)	1	34501000	FUSE, 6-1/4 MDX
F 2	3	34500102	FUSE, BUSSMAN AGC 1/4 250V
CONNECTORS			
J 1(R)	1	23201501	GOLD PHONO JK.,W/RD.BND.SP11
J 1(L)	1	23201502	GOLD PHONO JK.,W/WH.BD.SP11
PANEL INDICATOR			
LE 1,2	2	34300102	LED,COLLAR & RETAINING RING
TRANSISTORS			
Q 1	2	30006503	FET, WHITE ORANGE
Q 2	2	30006724	FET, ORANGE RED YELLOW
Q 3,4	4	30006527	FET, WHITE RED VIOLET
Q 5,6,7,7A,8,9,10,10A	16	30006461	FET, BLUE, ORG, BRN
Q 11	1	30006836	FET, GREEN BLUE
Q 12	1	30007102	FET, YELLOW RED
Q 13	1	30002800	TRANSISTOR,2N4401
Q 14	1	30006200	MTP 2P45
Q 15	1	30007029	FET, GRAY WHITE
RESISTORS			
R 78 (FAN GRADE C)	1	43500100	RES. 50 OHM +/-5% 4 1/2W
R 78 (FAN GRADE E)	1	43100202	RES. 100 OHM 2W 5%
R 78 (FAN GRADE L)	1	43150201	RES. 150 OHM 2W 5%
R 78 (FAN GRADE R)	1	43270200	RES. 270 OHM 2-3W +/-1%
R 1	2	42100314	RES. 1K 1% MK-5 50PPM
R 2	2	42432503	RES. 432K 1% MK-3 50PPM
R 3,73	3	42499303	RES. 4.99K 1% MK-3 50PPM
R 4,9	4	42127503	RES. 127K 1% MK-3 50PPM
R 5,12,13,14,15	10	42150203	RES. 150 OHM 1% MK-3 50PPM
R 6,57	4	42215403	RES. 21.5K 1% MK-3 50PPM
R 7,67,87	4	42100103	RES. 10 OHM 1% MK-3 50PPM
R 8,37,37A,37B,	22	42100505	RES. 100 1% MK-8 50PPM
R 10,33A,34A,35A,36A,42,42A,43,43A	18	42392303	RES. 3.92K 1% MK-3 50PPM

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NOTES:

Schematic Symbol	Quantity	ARC Part#	Description
R 11,97A	3	42100603	RES. 1 MEG 1% MK-3 50PPM
R 16,17	4	42825405	RES. 82.5K 1% MK-8 50PPM
R 18,41,41A,74,90,94	9	42150403	RES. 15K 1% MK-3 50PPM
R 19,20,21,22,95	9	42750303	RES. 7.5K 1% MK-3 50PPM
R 23,26,88	5	42549103	RES. 54.9 OHM 1% MK-3 50PPM
R 29,30,31,32	8	42499203	RES. 499 OHM 1% MK-3 50PPM
R 33,34,35,36	8	42301303	RES. 3.01K 1% MK-3 50PPM
R 44,45,46,47,79,80	10	42100303	RES. 1K 1% MK-3 50PPM
R 48,49 50,51	8	43100200	RES. 100 OHM 5% 2W
R 52,53	4	43050004	RES. 0.5 OHM+/-2% 3W W.W.
R 54,55	4	42511313	RES. 5.11K 1% MK-4 50PPM
R 56,82	3	42121503	RES. 121K 1% MK-350PPM
R 58,59,99,100	8	42464603	RES. 4.64 MEG. 1% MK-3 50PPM
R 60,101	3	42300514	RES. 300K 1% MK-5 50PPM
R 61,62,63,64,65,66	6	42100203	RES. 100 OHM 1% MK-3 50PPM
R 68	1	46100201	RES. POWER OX.100 OHM 5% 3W
R 69,91	2	42301503	RES. 301K 1% MK-3 50PPM
R 70	1	42392403	RES. 39.2K 1% MK-3 50PPM
R 74A,104	2	42178403	RES. 17.8K 1% MK-3 50PPM
R 75	1	42280513	RES. 280K1% MK-4 50PPM
R 75	1	42562513	RES. 562K 1% MK-4 50PPM
R 76	1	42332203	RES. 332 OHM 1% MK-3 50PPM
R 77,98	2	43100002	RES. 1 OHM 2W 5% W.W.
R 81,105	2	42100403	RES. 10K+/-1% MK-3 50PPM
R 85,86	2	42100703	RES. 10 MEG 1% MK-3 50PPM
R 92	1	42432103	RES. 43.2 OHM 1% MK-3 50PPM
R 93	1	42121303	RES. 1.21K 1% MK-3 50PPM
R 96	1	42274403	RES. 27.4K 1% MK-3 50PPM
R 97	1	42162503	RES. 162K 1% MK-3 50PPM
R 102	2	42357403	RES. 35.7K 1% MK-3 50PPM
R 106	1	42133503	RES. 133K 1% MK-3 50PPM
CONTROLS			
RV 1	1	45100527	POT. 100 K 10%
RV 2	2	45500301	TRIM POT, 5K 10% 15 TURN
RELAYS			
RY 1	1	64101200	RELAY, 24V T90 POWER ON
TRANSFORMERS			
T 1	2	60008100	XFR. CL60 OUTPUT,REV.A
T 2	1	60006001	XFR. D115 ALL VOLT. REV.E
THERMISTORS			
TH 1,2	2	47000300	THERMISTOR 30 OHM +/-20%
INTEGRATED CIRCUITS			
U 1	2	34400120	PHOTO COUPLER
U 2,4	3	31001900	TL071CP
U 3,7	2	31002200	MC 34071 P MOTOROLA
U 6	1	31002000	D70/D115/D250 MC7815CT
U 8	2	31002401	LF 441 CN TESTED-ACCEPT
VACUUM TUBES			
V 1,2,3,4	4	32000201	VAC.TUBE, 6CG7/6FQ7
V 5,6,7,8,9,10,11,12	8	32000501	VAC.TUBE, 6550 [TESTED]
ZENER DIODES			
ZD 1,11	2	30500300	IN 4740A
ZD 2,3,13,14	4	31000705	LM329DZ
ZD 4	1	30504200	IN5535A
ZD 5	1	30503500	IN5359 B

PARTS LIST

As of JAN 24 89

PRODUCT: CL60 CL60

NOTES:

Schematic Symbol	Quantity	ARC Part#	Description
ZD 6	1	30503600	TZB 250A TRANSIENT SUPPRESSOR
ZD 7,8,9	3	30503700	DIODE, Z20 10%
ZD 10	1	30504700	DIODE,1N5262B
ZD 12	1	30501800	IN5245B
ZD 15,17	2	31002600	ZENER DIODE, TL431CLP ADJ
ZD 16	2	30502700	IN4742-A

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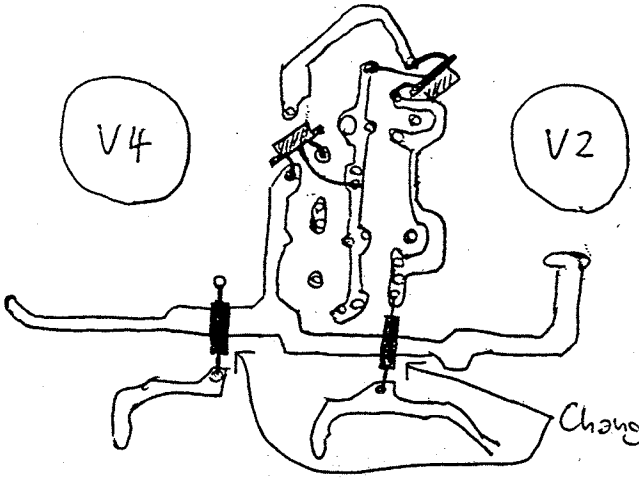
FET Substitution
Cross Coupler CL-60

Should fets Q_5, Q_6, Q_7, Q_{7A}, Q_8, Q_9, Q_{10}, Q_{10A} need to be changed, follow directions below. Change necessary due to unavailability of 30006461 fets.

Remove 6 fets 30006461 (Blue/Orange/Brown) from PCB top and 2 fets same type from bottom. Install 2 fets in positions shown. Acceptable substitutes are 30008104-9 grades. Then change R23 and R26 from 54.9oz to 27.4oz resistors.



Change from 54.9oz MK3 resistors to 27.4oz MK3.

Right Channel
top view

(Left channel is identical)

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CL-60 /V-70 BIASING INSTRUCTIONS

NOTE: This supplement is not intended to replace the owner's manual instructions included with these models. Please familiarize yourself with that information before attempting the following.

1. Ensure unit is turned off and unplugged.

2. Remove tube cage top on CL60 or V70. Unplug fan cord to remove cage.

3. If replacing tubes, remove old tubes. Note any tube that looks different from the others. For example, a tube with a whitish crust inside the glass envelope (which should appear clear with silver spots) may have lost vacuum. Or a tube that has a brownish cast inside the envelope may have overheated. These clues should be noted in case the amplifier does not function properly when retubed, as component damage may have occured due to a tube failure.

4. If the amplifier had a tube failure evidenced by an arcing (flashing) tube or has blown either fuse, you should inspect the 100 ohm screen resistors for damage. These act as a "fuse" in the event of severe output tube failure and may be burned, cracked apart or low in value. The 100 ohm resistor is a brown 9/16" long resistor with brown, black, brown, gold identifying bands. These will be mounted on the top of the circuit board near each output tube socket on the CL60, or on the underside of the circuit board beneath each output tube socket on the V70. Use ARC #43100200 (2W 5% wire wound) replacements. Refer to illustration A.

5. Should you be installing Russian 6550s into a CL60 which previously used either Philips or Chinese 6550s or KT88's, no change is necessary. See Step 6. If you are replacing KT90 or KT91 tubes in a V70 with Russian 6550's, you will likely need to change bias trim resistor R97 (49.9K ohm) to a higher value such as 76.8K ohm or 100K ohm in order to properly bias the tubes within the range allowed by the bias pot. Refer to illustration B for part location.

6. Install tubes. Note that matched pairs should be installed as follows: V12 and V8; V10 and V6; V7 and V11; V5 and V9.

7. Locate black .5 ohm resistors at front edge of circuit board. Using a digital volt meter capable of accuracy to .1mVDC, connect negative probe to TP-4 and positive probe to TP-3. Note that test points are the "legs" of the resistor.

   VERY IMPORTANT: You must use insulated test leads that do not contact the chassis. Do not attempt this adjustment if using typical pin-type probes as you could slip and touch the chassis which will damage the unit or your meter and probably necessitate a factory repair! A fully insulated probe with a retractable hook that may be securely attached to the test points will

prevent mishaps. Most electronic supply stores carry such a probe.

Ensure correct fuses installed: MDX 6-1/4A line fuse; AGC 1/4A high voltage fuse.

With your DVM set to mV DC scale 200mVDC or less (if not auto ranging), turn on amp.

After a few seconds, bias reading should start to rise. Check across other channel's test points TP-2 and TP-1 to ensure proper operation also. Initially set RV-1 bias pot to about 55mVDC reading. This will rise as tubes warm up.

8. After full warmup of approximately 20 minutes, set RV-1 to final reading of 65mVDC across TP-1 and TP-2, TP-3 and TP-4. Bias readings from channel to channel may vary up to 4mV due to minor tube variations. If greater than 4mV difference, you may need to swap tubes from channel to channel to reduce the variation.

9. After at least 30 minutes warmup, recheck bias. If correct, proceed to check servo balance.

10. Move positive probe from TP-1 to TP-5. Leave negative probe connected to TP-2. Reading should be plus or minus .2mVDC. If out of calibraion, insert plastic probe into hole in side rail of that channel to engage trimmer. With probes connected as above, turn probe clockwise to make reading positive, counter-clockwise to make negative. Adjust trimmer no more than 1/4 turn at a time to prevent over-adjustment. Allow 5 minutes for servo to stabilize. Observe result. Readjust as necessary.

11. Repeat step 10 with other channel. Connect negative probe to TP-4, positive to TP-6.

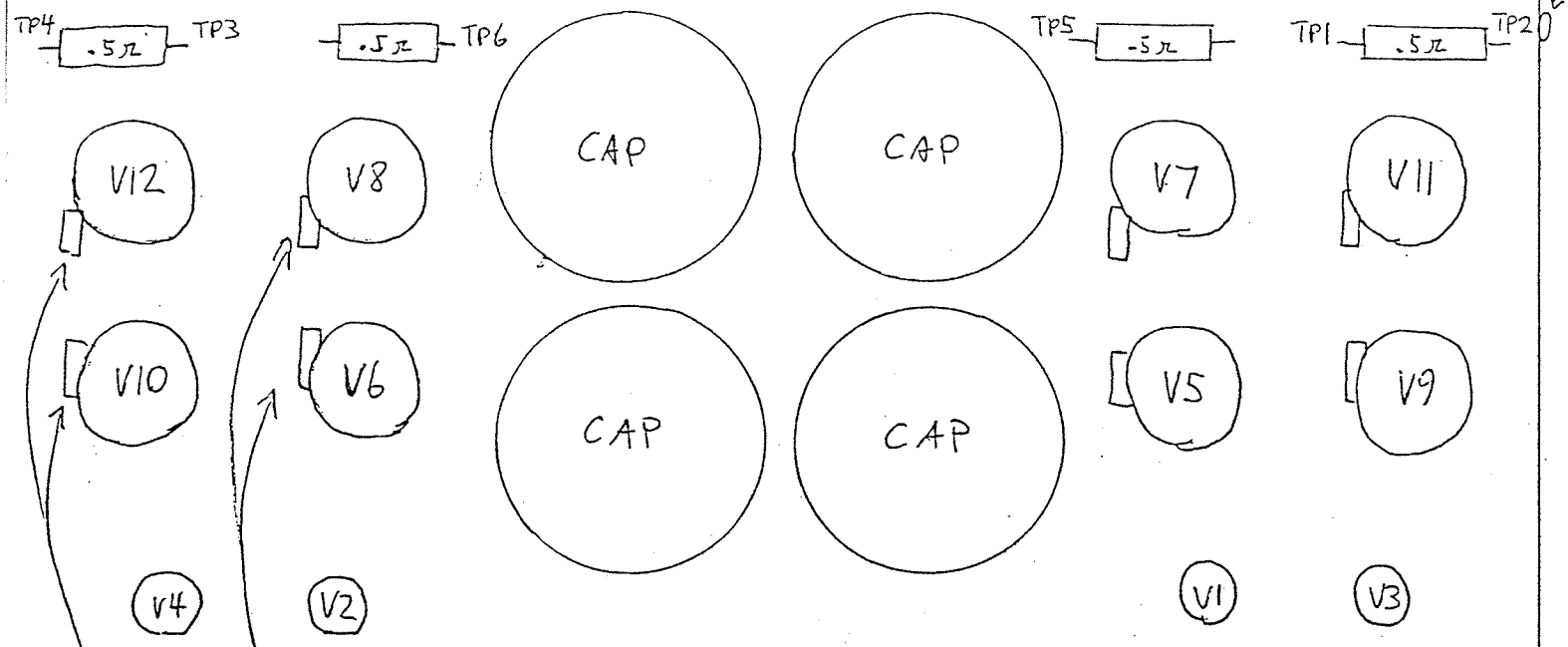
12. Should you experience difficulty, Audio Research Field Service Department may be reached at (612) 939-0600 8:00 am - 4:00 pm Monday through Friday.

Servo-hole in chassis side

Illustration A

CL-60, V-70 Top Front

Servo-hole in chassis side



Screen resistors: Top-mounted CL-60, bottom-mounted V70

Bias Adjustment

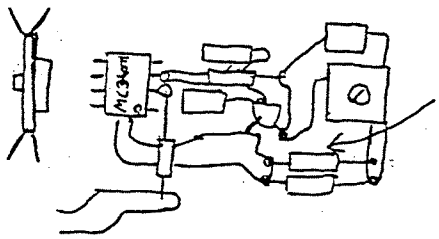
RV-1

(See V70 detail below)

V70 Only

Illustration B

Detail of area of RV-1 and Bias trim resistor R97.



R97 49.9KΩ

(Yellow/White/White/Red/Brown/Red)

Rear edge of circuit board, top view.