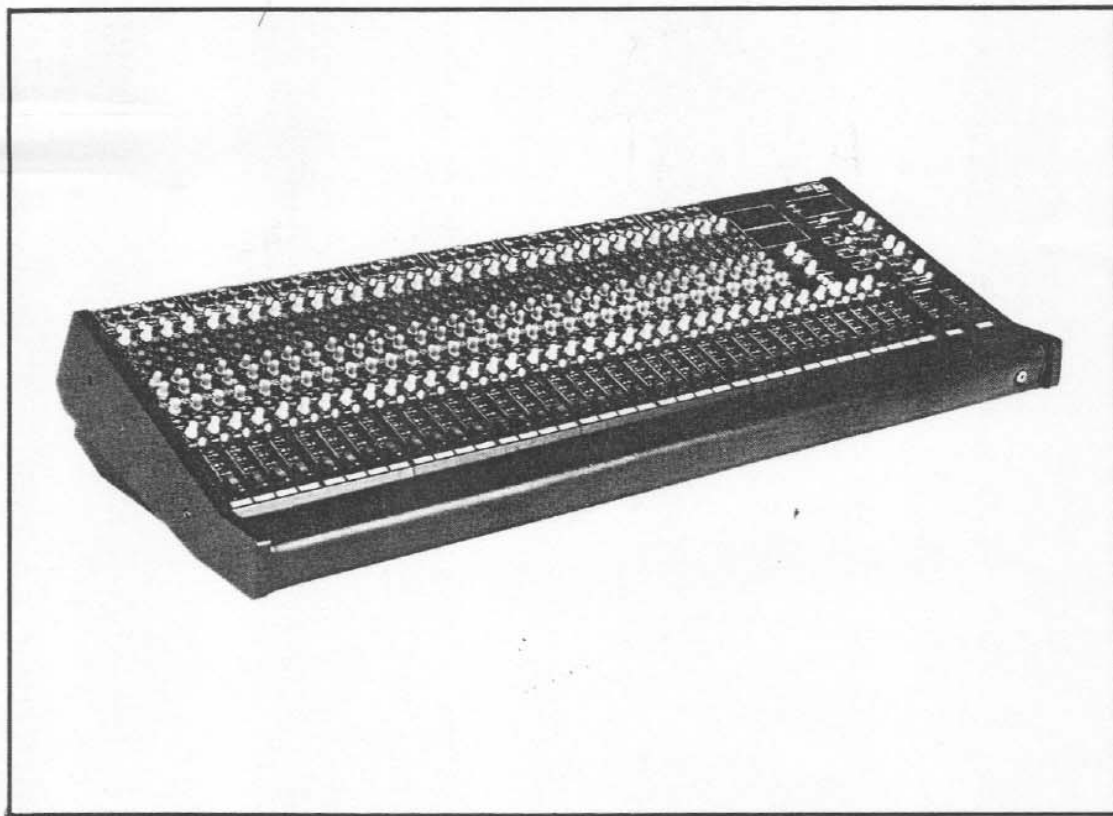




Electro-Voice®
SERIES 8200/8400

HIGH-PERFORMANCE MIXING CONSOLES



MODEL 8432 CONSOLE

SERVICE MANUAL

a **gulton** company

FREQUENCY RESPONSE

Mic Input at Maximum Gain or Line Input at Unity Gain to Any Output: ± 2 dB 20-20,000 Hz
 ± 1 dB 50-20,000 dB
 Any other input (except talkback) to any output ± 0.5 dB 20-20,000 Hz

DISTORTION

Total Harmonic Distortion
 THD 20-20,000 Hz at +4 dBu¹ less than 0.1%
 THD 20-20,000 Hz at +24 dBu less than 0.1%

HUM and NOISE*

EIN - equivalent input noise (150-ohm source)² -129 dBu typical

Output Noise at Transformer Isolated Left and Right Outputs, all faders down except as indicated,

Stereo Masters and Subgroups at nominal ("0")³ -76 dBu maximum

One Input, Stereo Masters and Subgroups at nominal (64-dB gain)³ -65 dBu typical

Output Noise at Transformer Isolated Monitor or Auxiliary Outputs, Masters at nominal ("0"), all faders down³ -80 dBu maximum

INPUT CHANNEL EQUALIZATION

Input Impedance, Mic 8,300 ohms
 Line 26,000 ohms

Channel Returns 5,000 ohms

Subgroup Returns (8400 Series) 8,000 ohms

Effects Return A and B 20,000 ohms

Tape In Right, Left (8400 Series) 24,000 ohms

Talkback Mic In (8400 Series) 10,000 ohms

Stacking, Left, Right; Subgroup 1-4 47,000 ohms

Solo Audio 20,000 ohms

Mon, Aux 1 and Aux 2 30,000 ohms

Nominal Level, Mic, Gain Control at "60" -60 dBu
 Gain Control at "20" -20 dBu

Line, Gain Control Maximum -24 dBu
 Gain Control Minimum +8 dBu

Channel Returns -2 dBu
 Subgroup Returns (8400 Series) -2 dBu
 Effects Return A and B -2 dBu

Stacking, Left, Right; Subgroup 1-4, (8400 Series) -2 dBu
 Solo Audio -2 dBu
 Mon, Aux 1, and Aux 2 -2 dBu

Maximum Level, Mic, Gain Control at "60" -40 dBu
 Gain Control at "20" 0 dBu

Line, Gain Control Maximum -4 dBu
 Gain Control Minimum +28 dBu

Channel Returns +18 dBu
 Subgroup Returns (8400 Series) +36 dBu
 Tape In Right, Left (8400 Series) +30 dBu
 Talkback Mic In (8400 Series) +6 dBu

Stacking, Left, Right; Subgroup 1-4 (8400 Series) +36 dBu
 Solo Audio +18 dBu

Maximum Voltage Gain, Mic Input to Channel 58 dB typical
 Send Output 22 dB typical

Line Input to Channel Send Output 22 dB typical

Effects Returns (and Tape Input) to Transformer Isolated Left and Right Outputs 38 dB typical

Talkback Input to Transformer Isolated Left and Right Output (8400 Series) 68 dB typical

Mic Input to Transformer Isolated Left and Right Outputs 88 dB typical

Slide Fader Reserve Gain 12 dB

Pan Control Center Attenuation 3 dB

CROSSTALK
 Adjacent Channel at 1,000 Hz -68 dB

POWER REQUIREMENTS
 95-125 volts, 60 Hz, 90 watts maximum

MATERIALS

Chassis
 Black painted metal with light grey graphics
 Knobs and Switches
 Black and grey (3 shades)
 End Caps
 Black painted wood
 Arm Rest
 Black textured vinyl, padded

DIMENSIONS

	Model 8208		Model 8212		Model 8216	
	cm	in	cm	in	cm	in
Height	22	8.5	22	8.5	22	8.5
Depth	46.7	18.4	46.7	18.4	46.7	18.4
Width	41.9	16.5	54.6	21.5	67.3	26.5
Net Weight	kg	lb	kg	lb	kg	lb
	14.0	30.0	17.0	37.0	20.0	45.0

	Model 8408		Model 8416		Model 8424		Model 8432	
	cm	in.	cm	in.	cm	in.	cm	in.
Height	22.0	8.5	22.0	8.5	22.0	8.5	22.0	8.5
Depth	46.7	18.4	46.7	18.4	46.7	18.4	46.7	18.4
Width	54.6	21.5	80.0	31.5	105.0	41.5	131.0	51.5
Net Weight	kg	lb	kg	lb	kg	lb	kg	lb
	17.0	37.0	24.0	52.0	30.0	67.0	37.0	82.0

OUTPUTS

Output Impedance,
 Channel Sends 560 ohms
 Unbalanced Mains, Mon, Aux, Solo (Subgroup Sends)⁵ 68 ohms
 Transformer Isolated Mains, Mon, Aux, Solo 100 ohms
 Headphone 68 ohms

Load Impedance,
 Channel Sends $\geq 10,000$ ohms
 Unbalanced Mains, Mon, Aux, Solo (Subgroup Sends)⁵ $\geq 2,000$ ohms
 Transformer Isolated Mains, Mon, Aux, Solo 600 ohms
 Headphone Any impedance

Nominal Output,
 Channel Sends -2 dBu
 Unbalanced Mains, Mon, Aux, Solo (Subgroup Sends)⁵ -2 dBu
 Transformer Isolated Mains, Mon, Aux, Solo +4 dBu
 Headphone,
 8-ohm Load -22 dBu
 600-ohm Load -2 dBu

Maximum Output,
 Channel Sends +18 dBu
 Unbalanced Mains, Mon, Aux, Solo (Subgroup Sends)⁵ +18 dBu
 Transformer Isolated Mains, Mon, Aux, Solo +24 dBu
 Headphone,
 8-ohm Load -2 dBu
 600-ohm Load +18 dBu

1. 0 dBu is 0.775 volts RMS sine wave. Since the load is specified at 600 ohms, dBu figures may also be read as dBm, a power measure where 0 dBm is 1 mW into 600 ohms.
 2. 20-20,000-Hz bandwidth, input gain at "60."
 3. Input gain at "60," 20-20,000-Hz bandwidth, 150-ohm source.
 4. On special order, models for 100, 120, 220 and 240 volts, 50-60 Hz, are available.
 5. The auxiliary 2 low output is preceded by a 20 dB pad. Output impedance is 1,800 ohms.

GENERAL SERVICING INFORMATION

Most EV circuitry is built around commonly available IC operational amplifiers. A certain amount of familiarity with operational amplifier theory and operation will facilitate servicing this unit. Throughout this manual, the following convention will be used when discussing the various amplifier stages: U1 (1). This is to be interpreted as follows: Chip designation U1, output pin = 1.

The output pin of the op-amp is particularly significant because all of the unit's stages are referenced to ground. Thus, the normal quiescent voltage at any op-amp output is 0 volts DC, give or take a few millivolts. Any op-amp output that is not at 0 volts DC is suspect, especially if it is at or near one of the direct supply rails. Beware, however, as much of the circuitry is direct coupled. Thus, it is important to look backward towards the input to localize the exact cause of trouble.

DISASSEMBLY INSTRUCTIONS AND CIRCUIT BOARD MODIFICATIONS

These modifications are for changing the signal takeoff point for the monitor, auxiliary 1 and auxiliary 2 send controls, and the solo push button. Any combination of these modifications can be performed on any number of the inputs.

To remove circuit boards:

1. Set the mixer on its right end (with the power cord at the bottom). Sixteen-channel and larger mixers should be supported so that they won't fall.
2. Remove the bottom cover held by #6 Phillips screws.
3. Unfasten the bottom pan held by #8 Phillips screws. There are two at each end of the bottom pan and the rest are along the front and back edges. Then swing the bottom pan open around the back edge so that the wiring connections are maintained.
4. Starting at channel one, remove the bus connectors down to the highest-number channel to be modified. Pull off the knobs from each channel and remove the nuts from the pots and the send and return jacks. Remove the hex screws at each end of the slide fader and then the #6 screw next to the line input jack. A slight push on the microphone connector will loosen the circuit board for removal.
5. To reinstall the boards, reverse this procedure. Be sure all pots have lockwashers on the inside, the slide fader spacer is properly installed, and the clip LED is fitted into its hole.

To modify circuit board (refer to Figure 1):

1. The monitor-send control is set at the factory for pre-equalizer operation. To change it to post-equalizer, pre-fader, move one lead of R32 from the pre-equalizer position ① to the pre-fader position ②. Do not move the other lead.
2. The auxiliary 1 send control is set at the factory for post-equalizer ②, pre-fader operation. To change this, move one lead of R33 to the pre-equalizer ① or post-fader position ③. Do not move the other lead.
3. The auxiliary 2 send control is set at the factory for post-fader operation. To change this, move one lead of R48 from the post-fader position ③ to the pre-fader ① or pre-equalizer ② position. Do not move the other lead.
4. The solo switch is set at the factory for pre-fader operation. To change it to post-fader, move R50 — both leads — to the position marked "post-fader" in Figure 1.

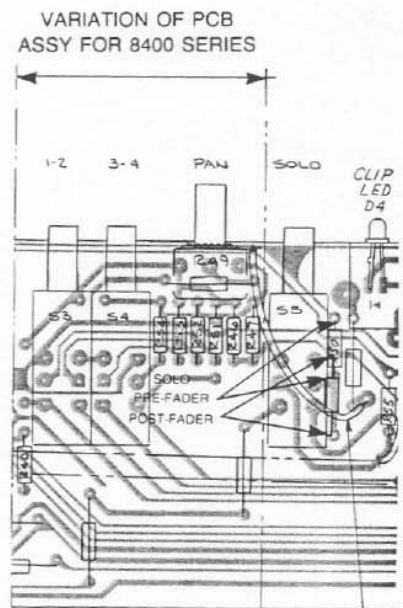
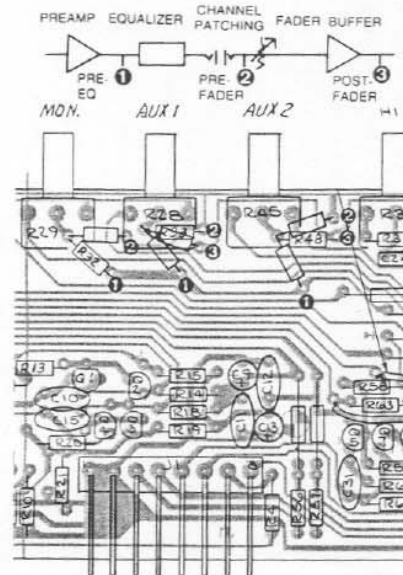
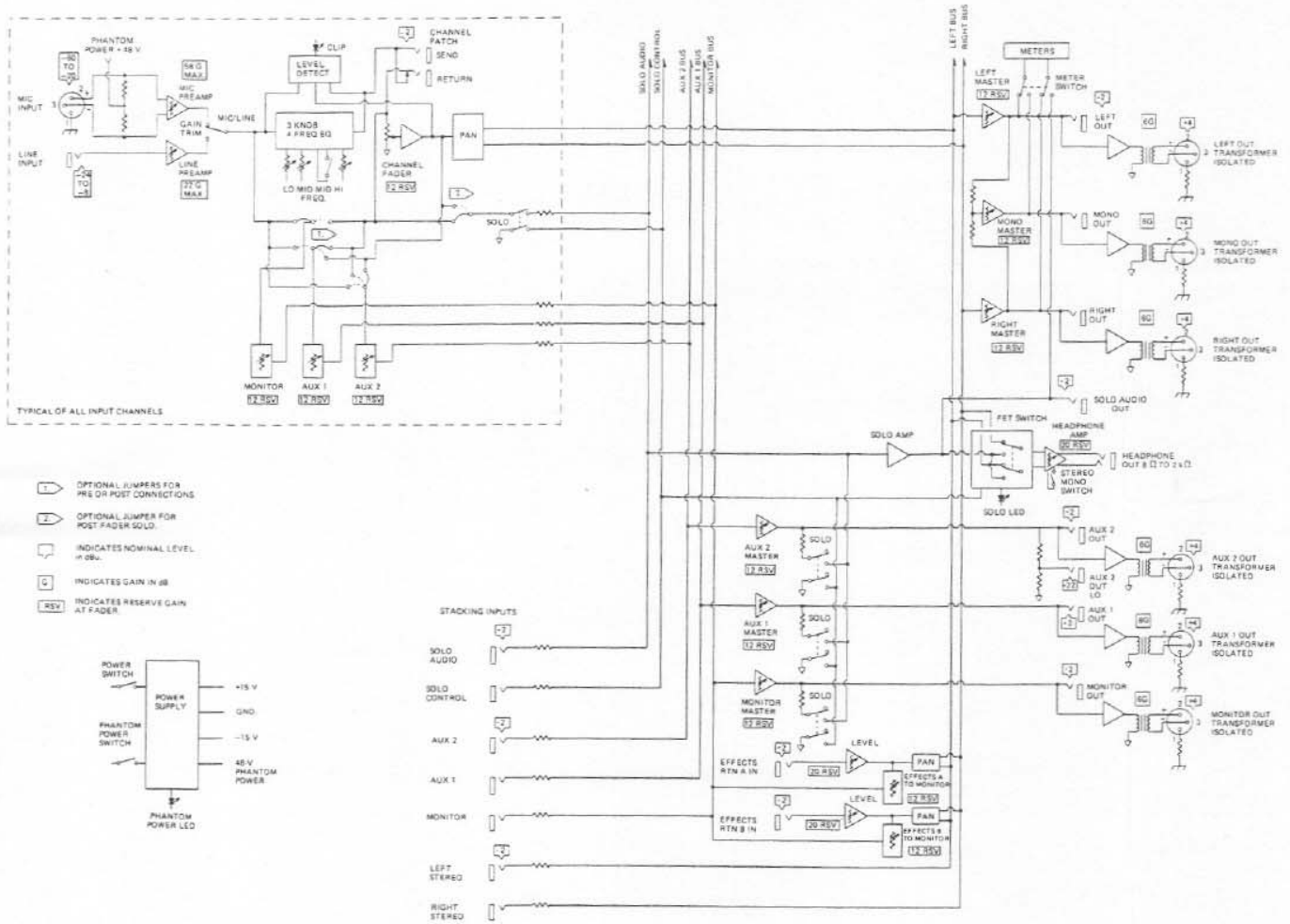
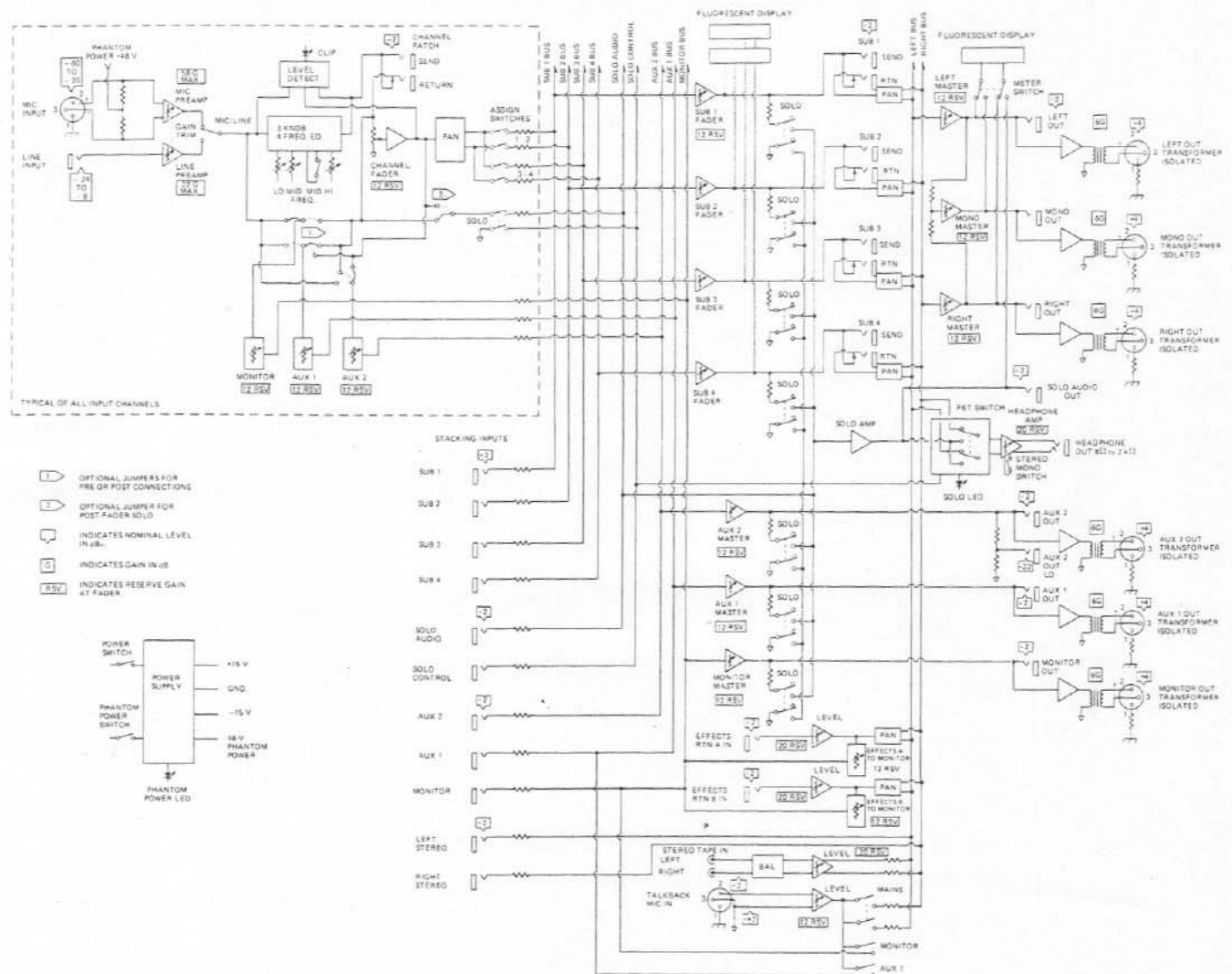
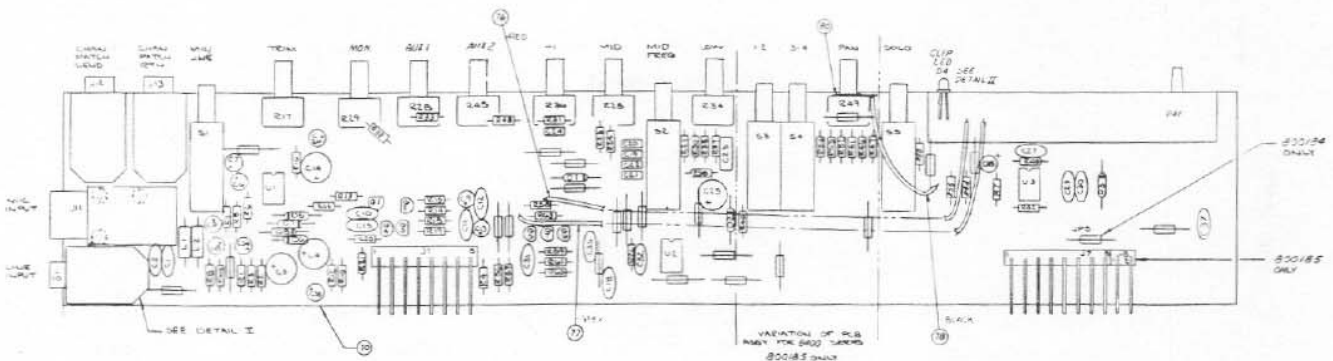


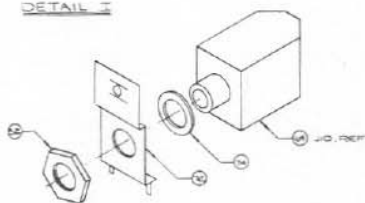
FIGURE 1 — Location of Input Channel Board Modifications



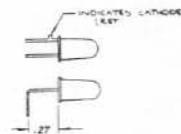




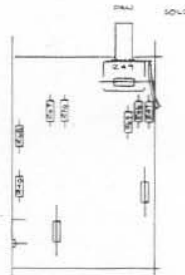
DETAIL I



DETAIL II



DETAIL III



NOTES:

- 1 C5, 6, 7, 8, 24, 28, 34
- 2 C11, 12, 18, 29, 30, 31, 35, 37

QTY	PART NO	DESCRIPTION	REF DES	REV
22	452503	JUMPER, ZERO OHM	JP5	84
1	500391	NUT, HEX 3/8-32		83
1	303099	GROUND LUG		81
1	100036	WIRE, #22 AWG, BLACK, 3.6" LG.		80
1	188075	WIRE, #22 AWG, GREY, 7.5" LG.		79
1	122075	WIRE, #22 AWG, RED, 7.5" LG.		78
1	500683	WSHR, FIBER FLAT 3/8 ID		77
1	460130 24769	BRACKET, SUPPORT		76
1	451137	PCB, INPUT		75
3	301033	SW PUSH ON-OFF VERT PCB DPDT	S1,2,3,4,5	74
3	301023	SW PUSH ON-OFF VERT PCB DPDT	S1,2,5	73
4	008022	DIODE PWR 1N4002	D5,4,7,8	72
1	300118	CONN RTANG PCB MIC JACK ADC	J11	71
2	300090	HDR 045 SQ POT RTANG 8 DIN	J1,7	70
3	300093	CONN RTANG PCB PHONE JACK	J10,13,12	69
2	009902	FERRITE SHIELD BEAD	L1,2	68
1	300068	HDR 045 SQ PST RTANG 2-PIN	J8	67
1	008064	DIODE, LED ROUND RED, T1	D4	66
3	008049	DIODE, SIGNAL 1N4447	D1,2,3	65
1	007011	IC OP AMP LF351N	U3	64
2	007010	IC DUAL OP AMP TL072CP	U1,2	63
2	006038	XISTOR SIL NPN 45V 2N5962	Q2,3	62
2	006054	XISTOR SM SIG PNP 258737	Q1,4	61
3	006002	XISTOR SIG PNP 40V DN4250	Q5,6,7	60
2	005913	RES CF 1/4W 5% 30K	R10,12	59
1	005908	RES CF 1/4W 5% 18K	R64	58
1	005931	RES CF 1/4W 5% 1 MEG	R61	57
1	005933	RES CF 1/4W 5% 200K	R60	56
1	005926	RES CF 1/4W 5% 100K	R59	55
2	005922	RES CF 1/4W 5% 68K	R24,26	54
1	005901	RES CF 1/4W 5% 20K	R50	53
4	005905	RES CF 1/4W 5% 18K	R57,58,59	52
1	005904	RES CF 1/4W 5% 12K	R35	51
4	005902	RES CF 1/4W 5% 10K	R37,38,39	50
1	005900	RES CF 1/4W 5% 9.1K	R43	49
3	005899	RES CF 1/4W 5% 8.2K	R5,30,37	48
3	005898	RES CF 1/4W 5% 7.5K	R32,33,34	47
2	005897	RES CF 1/4W 5% 6.8K	R46,47	46
3	005893	RES CF 1/4W 5% 4.7K	R23,27,40	45

QTY	PART NO	DESCRIPTION	REF DES	REV
4	005905	RES CF 1/4W 5% 4.7K	R23,27,40	59
1	005877	RES CF 1/4W 5% 1K	R6	38
2	005889	RES CF 1/4W 5% 3.3K	R3,38	37
2	005887	RES CF 1/4W 5% 2.7K	R4,44	36
3	005871	RES CF 1/4W 5% 560	R13,20,40	35
1	005866	RES CF 1/4W 5% 360	R63	34
1	005853	RES CF 1/4W 5% 100	R42	33
1	005832	RES CF 1/4W 5% 15	R14	32
2	005829	RES CF 1/4W 5% 10	R56,57	31
1	005813	RES CF 1/4W 5% 2.2	R1	28
2	005617	RES MF 1/4W 1% 7.87K	R21,22	27
2	005603	RES MF 1/4W 1% 4.21K	R15,19	26
2	005602	RES MF 1/4W 1% 4.75K	R23	25
2	005608	RES MF 1/4W 1% 2.74K	R14,18	24
1	005487	DUAL POT 10MM VERT PCB 50KA/100 # DET.	R17	23
1	005453	POT 60MM SLIDE RTANGLE 30K D	R41	22
1	005488	POT, 16MM VPCB	R45	21
3	005484	POT, 16MM VPCB	R25,34,36	20
3	005419	POT 60MM VERT PCB 50K LIN 30K	R28,29,45	19
1	004025	CAP CER 10% 47PF/50	C32	18
8	004087	CAP, CER 10% .01/50	R1	16
2	004080	CAP, CER 10% 750PF/50	C42	15
2	004044	CAP, CER 10% 270PF/100	C10,15	14
1	004030	CAP CER 10% 68PF/50V	C27	13
1	003058	CAP, MYLAR 10% .039/50	C23	12
2	003040	CAP, MYLAR 10% .012/50	C19,22	11
2	003014	CAP, MYLAR 10% .0027/50	C20,21	10
1	003013	CAP, MYLAR 10% .0022/50	C24	9
1	001700	CAP, ELECT AL RAD 47/63	C33	7
1	001351	CAP, ELECT AL RAD 100/16	C25	6
2	001711	CAP, ELECT AL RAD 47/63	C5,4	5
2	001505	CAP, ELECT AL RAD 10/35	C9,13	4
7	001209	CAP, ELECT AL RAD 22/10	C7	3
1	001121	CAP, ELECT AL RAD 470/6.3	C14	2
		800185 800184 PCB ASSY, INPUT 8400 SERIES		1
		800184 800184 PCB ASSY, INPUT 8200 SERIES		1

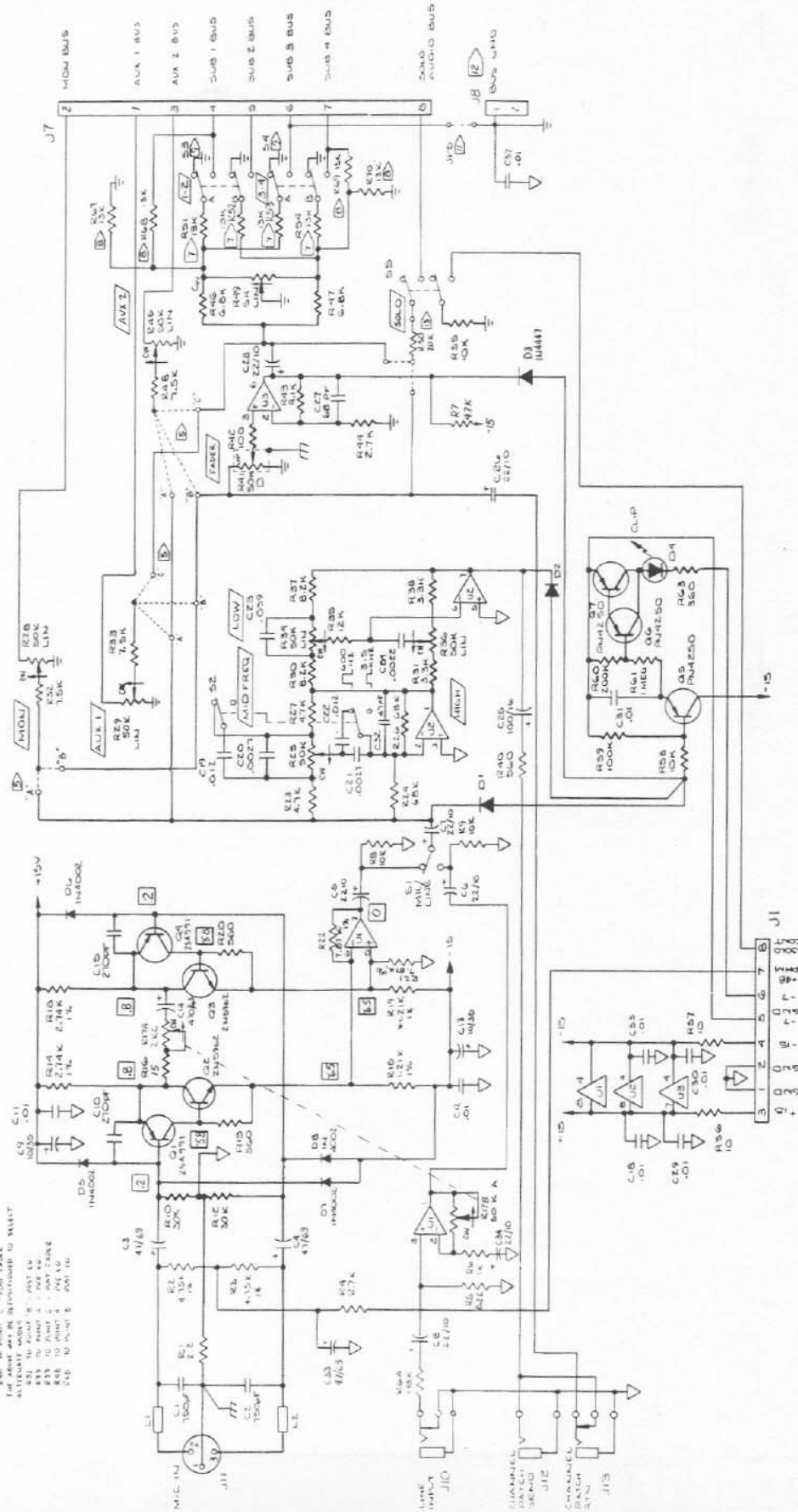
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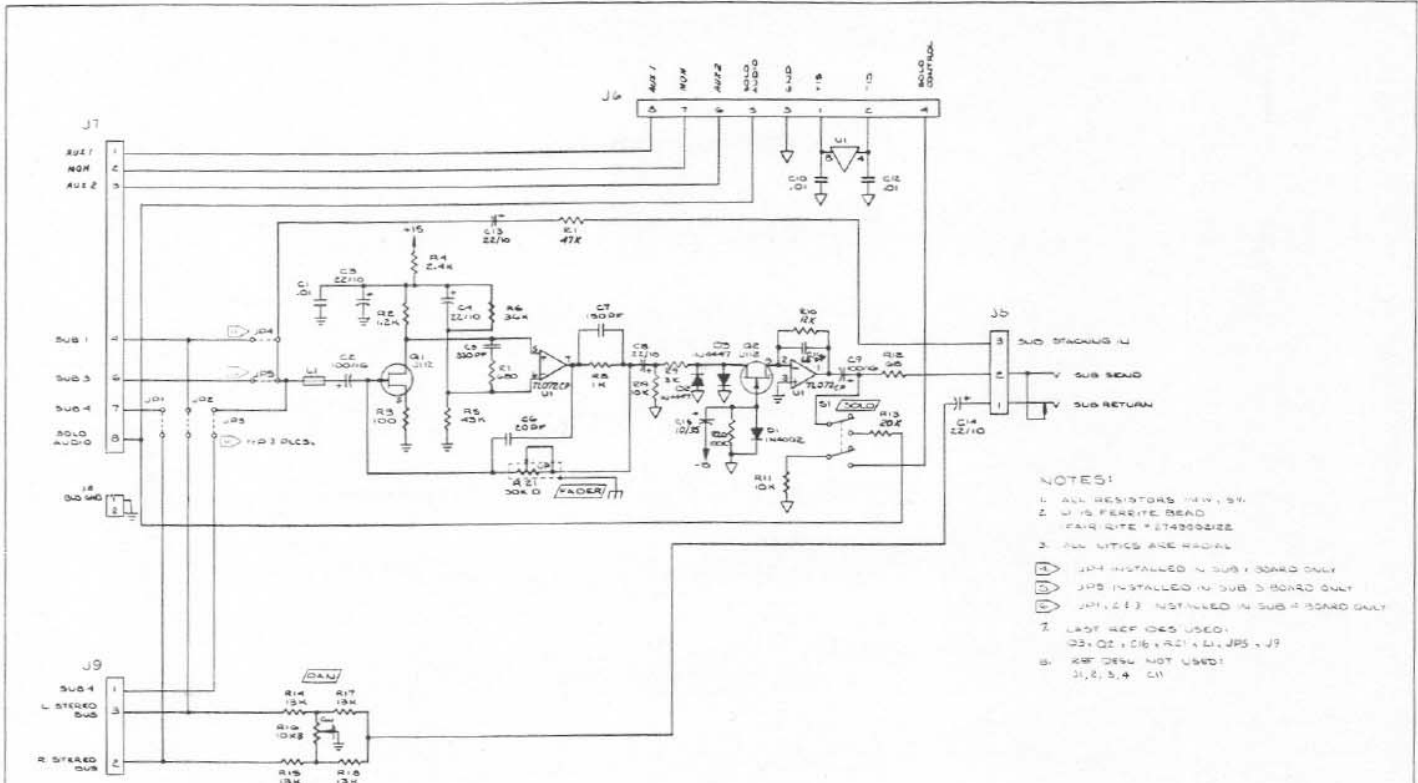
1. 1/4 W. 1% RES. UJ208, J5, UJ209
2. ALL RESISTORS ARE CARBON FILM, 1/4 W. 5%, EXCEPT AS NOTED
3. 1/4 W. 1% RES. EXCEPT AS NOTED
4. ALL CAPS ARE FERRITE BEADS (PAIR MKT = 2M 100G022)
5. ALL CAPS ARE RADIAL
6. ALL OPTICS ARE RADIAL
7. 1/4 W. 1% RES. UJ208, J5, UJ209
8. 1/4 W. 1% RES. UJ208, J5, UJ209
9. 1/4 W. 1% RES. UJ208, J5, UJ209
10. 1% RESISTORS ARE 1/4 W. MF

11. LAST REF DES USED: C37, C61, R70, UJ, LC, J5, UJ208, J5, UJ209
12. REF DES NOT USED: J11, J12, J13, J14, J15, J16, J17, J18, J19, J20, J21, J22, J23, J24, J25, J26, J27, J28, J29, J30, J31, J32, J33, J34, J35, J36, J37, J38, J39, J40, J41, J42, J43, J44, J45, J46, J47, J48, J49, J50, J51, J52, J53, J54, J55, J56, J57, J58, J59, J60, J61, J62, J63, J64, J65, J66, J67, J68, J69, J70, J71, J72, J73, J74, J75, J76, J77, J78, J79, J80, J81, J82, J83, J84, J85, J86, J87, J88, J89, J90, J91, J92, J93, J94, J95, J96, J97, J98, J99, J100

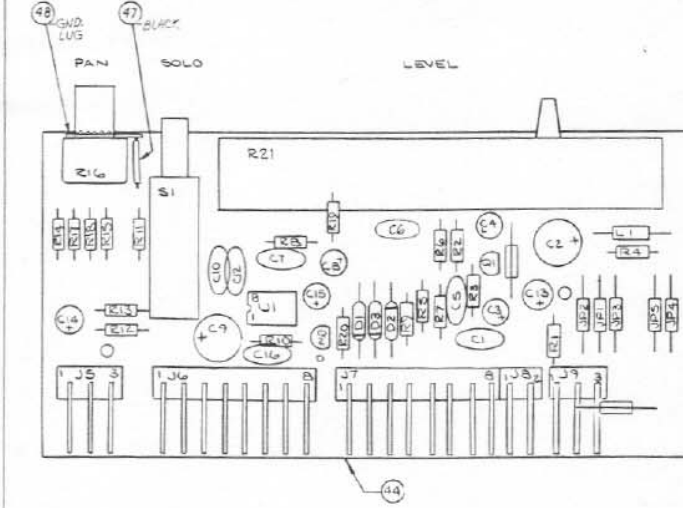
13. 1/4 W. 1% RES. UJ208, J5, UJ209
14. 1/4 W. 1% RES. UJ208, J5, UJ209
15. 1% RESISTORS ARE 1/4 W. MF

16. JPS 800104 ONLY
17. J5 800105 ONLY
18. J20 IS FACTORY INSTALLED. FOR ASSEMBLY BY FIELD INSTALLED, TO PROVIDE A POST CABLE SOLID BY WIRE ALTERNATE CONNECTIONS.





- NOTES:
- ALL RESISTORS 1/4W, 5%
 - U1 IS FERRITE BEAD
FAIR SITE # 27430022E
 - ALL LINES ARE RADIAL
 - U14 INSTALLED IN SUB 1 BOARD ONLY
 - U15 INSTALLED IN SUB 3 BOARD ONLY
 - U11, U13 INSTALLED IN SUB 4 BOARD ONLY
 - LAST REF ICES USED:
U2, U3, U6, U7, U1, U5, U9
 - REF DESX NOT USED:
U1, U3, U4, U11



- NOTES:
- R14, 15, 17, 18

PART NO.	QTY	DESCRIPTION	REF DES	REV
1	100036	WIRE, #22 AWG, BLACK, 3/6" LG.	47	
1	005453	POT SLIDE 60 MM 50KΩ	R21	46 E
7	451503	JUMPER ZERO OHM	J1, 2, 3, 4, 5	45 D
1	451138	PCB, SUB 1, 2, 3		44
1	301023	SWITCH PUSHBUTTON DPDT	S1	43
2	300046	HDR 045 SQ DST RTANG 3-PIN	J5, 9	41 C
2	300090	HDR 045 SQ DST RTANG 8-PIN	J6, 7	40
1	300048	HDR 045 SQ PST RTANG 2-PIN	J8	39 C
1	004902	FERRITE SHLD BEAD	L1	38
1	008022	DIODE, PWR 1A/100V 1N4002	D1	36 C
2	008049	DIODE SIGNAL 1N4447	D2, 3	35 C
1	007010	IC, DUAL OP-AMP, TL072 CP	U1	34
2	006040	JTET	Q1, 2	33
				32
				31

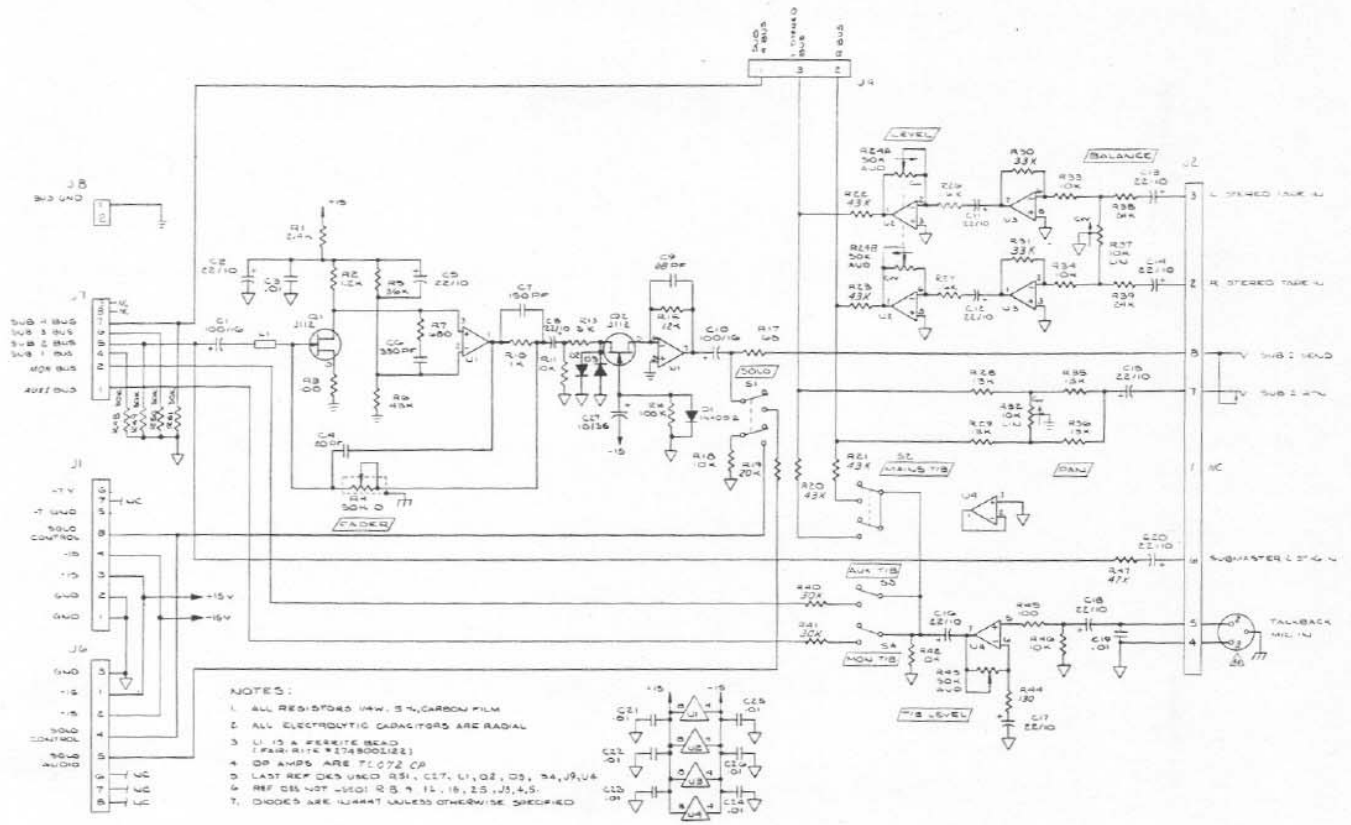
PARTS LIST

PART NO.	QTY	DESCRIPTION	REF DES	REV
1	005926	RES CF 1/4 W 5% 100K	R20	27
1	005904	RES CF 1/4 W 5% 12K	R10	26
1	005918	RES CF 1/4 W 5% 47K	R1	25
1	005917	RES CF 1/4 W 5% 43K	R5	24
1	005915	RES CF 1/4 W 5% 30K	R26	23
4	005905	RES CF 1/4 W 5% 3K	R1	22
2	005902	RES CF 1/4 W 5% 10K	R11, 19	21
1	005888	RES CF 1/4 W 5% 3K	R9	20
1	005886	RES CF 1/4 W 5% 2.4K	R4	19
1	005879	RES CF 1/4 W 5% 1.2K	R2	18
1	005877	RES CF 1/4 W 5% 1K	R8	17
1	005873	RES CF 1/4 W 5% 680	R7	16
1	005909	RES CF 1/4 W 5% 20K	R13	15
1	005853	RES CF 1/4 W 5% 100	R3	14
1	005849	RES CF 1/4 W 5% 68	R12	13
1	004030	CAP CER 10% 68 PF/50	C16	2
1	005489	POT 16MM VERT 30K 10K'S C.D	3/6	10
1	001508	CAP ELECT AL RAD 10/35	C18	9
3	004087	CAP CER 01% .01/50	C10, 12, 14	8
1	004080	CAP CER 10% .50PF/50	C7	7
1	004013	CAP CER 10% .001/50	C6	6
1	004046	CAP CER 10% .330PF	C5	5
2	001951	CAP, ELECT AL RAD 100/16	C2, 9	4
3	001209	CAP, ELECT AL RAD 22/10	C3, 4, 8, 13, 14	3
				2

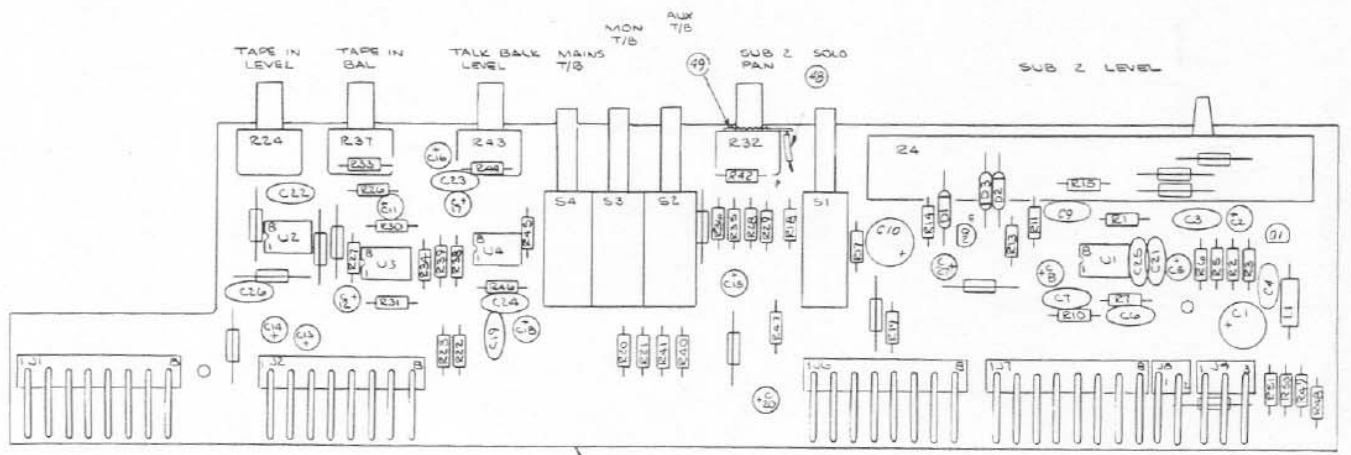
PARTS LIST

PART NO.	QTY	DESCRIPTION	REF DES	REV
800186	800186	PCB ASSY, SUBMASTER 1, 3, 4		1

800186



- NOTES:
1. ALL RESISTORS 1/4W. 5%, CARBON FILM
 2. ALL ELECTROLYTIC CAPACITORS ARE RADIAL
 3. U1 IS A PERKITE BEAD (PART #174800122)
 4. OP AMPS ARE 71C72 CP
 5. LAST REF DES UNED Q51, C17, U1, Q2, Q3, Q4, Q9, U4
 6. REF DES NOT USED: R 8, 9, 11, 18, 25, J5, 4, 5
 7. DIODES ARE 1N4447 UNLESS OTHERWISE SPECIFIED



- NOTES:
- ① C2, 8, 8, 11, 12, 13, 14, 15, 16, 17, 18, 20
 - ② R11, 18, 33, 34, 42, 46
 - ③ R40, 41, 48, 49, 50, 51

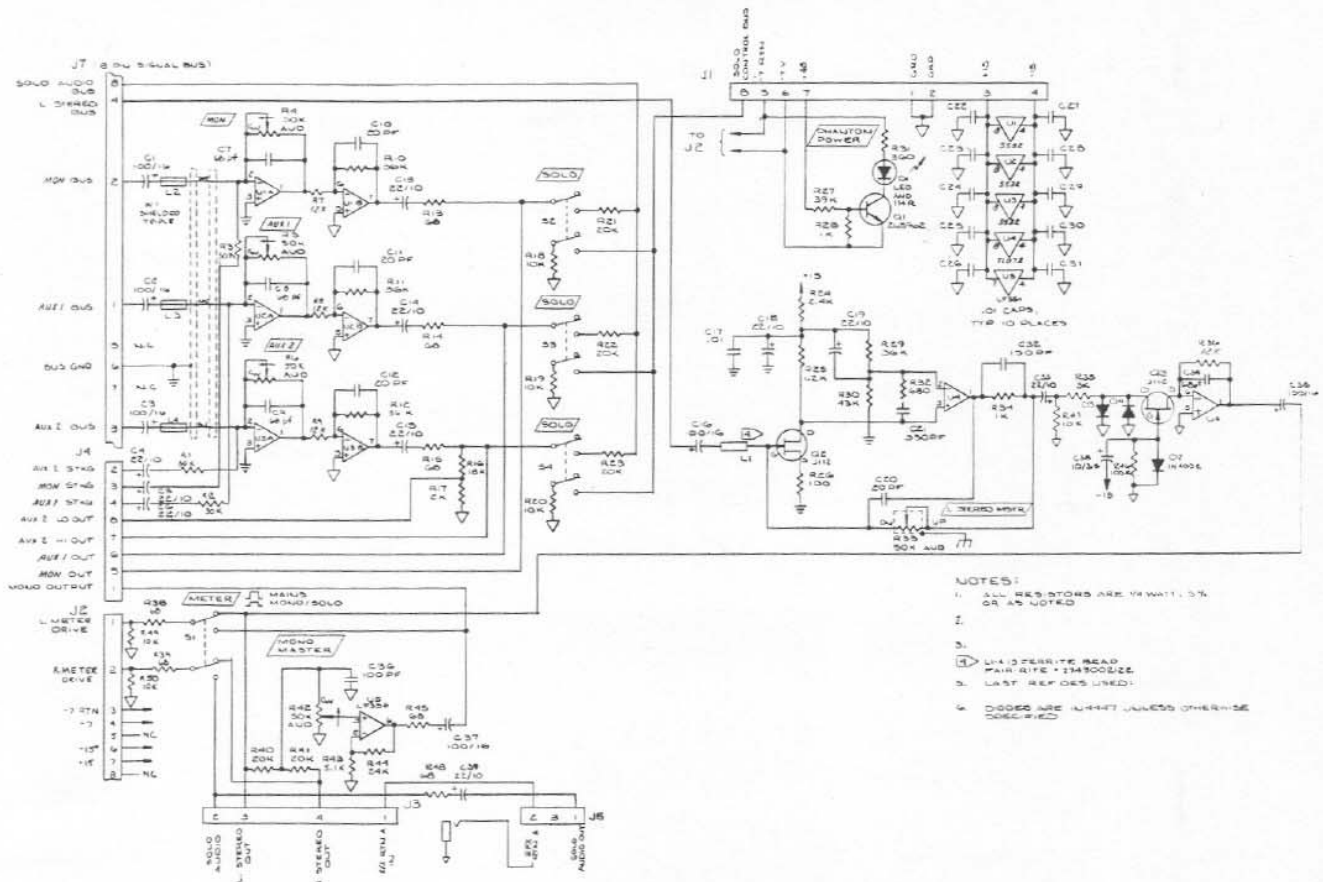
ITEM NO.	QTY	DESCRIPTION	REF DES	ITEM NO.	REV
1		LUG, GROUND			49
100036		WIRE, #22 AWG, BLACK, 3.6" LG.			48
1		DIODE PWR 1A/100V 1N4002	01		47 D
1		HDR .045 SQ PST RTANG 2-PIN	J0		46 D
13		JUMPER ZERO OHMS			45
45		PCB SUB 2			44
					43 D
					42 D
1		SWITCH PUSH ON-OFF DROT	51		41
3	24B78	SW PB DROT MOMENTARY	52, 3, 4		-0
4		HDR .045 SQ PST RTANG 3-PIN	J1, 2, 6, 7		39
300046		HDR .045 SQ PST RTANG 3-PIN	J9		38 D
2		DIODE SIGNAL 1N4447	02, 3		37 D
1		FERRITE SHLD BEAD	L1		36
2		J-FET J-112	Q1, 2		35
4		IC DUAL OP AMP TL072 CP	U1, 2, 3, 4		34
6		RES CF 1/4W 5% 30K	3		33
1		RES CF 1/4W 5% 100K	R14		32
1		RES CF 1/4W 3% 20K	R19		31
1		RES CF 1/4W 5% 47K	R47		30
2		RES CF 1/4W 5% 33K	R30, 31		29
3		RES CF 1/4W 5% 43K	R6, 20, 22, 23		28
1		RES CF 1/4W 5% 36K	R5		27
2		RES CF 1/4W 5% 24K	R38, 39		26
1		RES CF 1/4W 5% 12K	R5		25
4		RES CF 1/4W 5% 13K	R28, 29, 35, 36		24 B
1		RES CF 1/4W 5% 10K	2		23
820187		PCB ASSY, SUBMASTER 2			1

ITEM NO.	QTY	DESCRIPTION	REF DES	ITEM NO.	REV
2		RES CF 1/4W 5% 10K	R26, 27		22
1		RES CF 1/4W 5% 3K	R13		21
1		RES CF 1/4W 5% 2.4K	R1		20
1		RES CF 1/4W 5% 2K	R2		9
1		RES CF 1/4W 5% 1.2K	R10		8
1		RES CF 1/4W 5% 800	R7		7
1		RES CF 1/4W 5% 500	R44		6
2		RES CF 1/4W 5% 100	R3, 45		5
1		RES CF 1/4W 5% 50	R7		4
1		CAP ELECT AL KAD 10/35	C17		13
1		POT 16MM SUBD RTANG 200K	R4		2 E
2		POT 16MM VERT PCB 50K AHD 20% 50K	R34, 37		
1		POT 16MM VERT PCB 50K AHD 20% 50K	R15		0
1		DUAL POT 16MM VERT 50K	R14		9
8		CAP, CERM 10% .01UF/50	C1, 11, 12, 24, 25, 26, 27		8
1		CAP, CERM 10% 20PF/50	C9		7
1		CAP, CERM 10% 100PF/50	C6		6
1		CAP, CERM 10% 100PF/50	C7		5
1		CAP, CERM 10% 20PF/50	C4		4
2		CAP, ELECT AL RAD 100/16	C10		3
12		CAP, ELECT AL RAD 22/10	1		2
800187		PCB ASSY, SUBMASTER 2			1

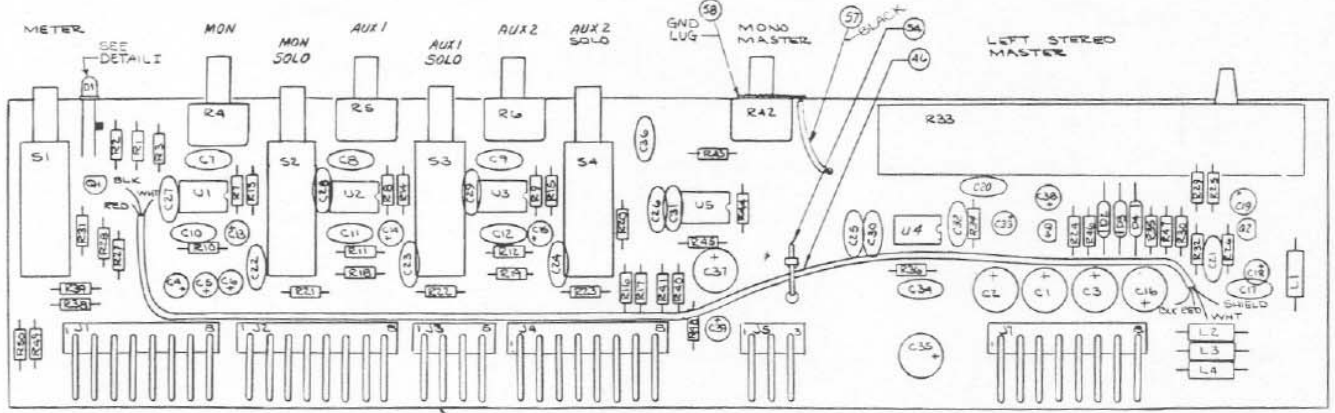
Output 1 (8000 Series)

ITEM NO.	QTY	DESCRIPTION	REF DES	ITEM NO.	REV
1		LUG, GROUND			58
100036		WIRE, #22 AWG, BLACK, 3.6" LG.			57
1		POT SLIDE 10MM 50K D R33			56 E
1		PCB OUTPUT 1 1000			55
1		CABLE TIE			54 D
					53
4		HDR .045 SQ PST RTANG 3-PIN	J1, 2, 4, 7		52
					51
1		HDR .045 SQ PST RTANG 4-PIN	J3		50
1		HDR .045 SQ PST RTANG 3-PIN	J5		49
4		SW PUSH ON-OFF VERT PCB	51, 2, 3, 4		48
4		FERRITE SHIELD BEAD	L1, 2, 31		47 D
1		CABLE SHIELDED OUTPUT 1	W1		46 D
1		DIODE LED ROUND RED	01		45
2		DIODE SIGNAL 1N4447	03, 4		44 D
1		IC DUAL OP AMP TL072 CP	U4		43
1		IC OP AMP, LF356N	U5		42
1		DIODE PWR 1A/100V 1N4002	02		41 D
3		IC OP AMP NE5532	U1, 2, 3		40
					39
					38
2		J-FET J112	Q2, 23		37
1		RESISTOR 51K NPN 45V 2W596Z	Q1		36
1		RES CF 1/4W 5% 100K	R46		35
					34
3		RES CF 1/4W 5% 30K	R1, 2, 3		33
1		RES CF 1/4W 5% 43K	R36		32
1		RES CF 1/4W 5% 39K	R27		31
800187		PCB ASSY, OUTPUT 1			1

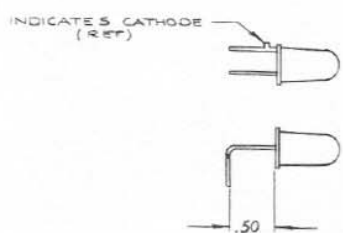
ITEM NO.	QTY	DESCRIPTION	REF DES	ITEM NO.	REV
4		RES CF 1/4W 5% 36K	R14, 11, 12, 29		30 B
1		RES CF 1/4W 5% 24K	R44		29
					28
5		RES CF 1/4W 5% 20K	7		27 B
1		RES CF 1/4W 5% 13K	R16		26
4		RES CF 1/4W 5% 12K	R7, 8, 9, 36		25
6		RES CF 1/4W 5% 10K	16		24
1		RES CF 1/4W 5% 5K	R35		23
1		RES CF 1/4W 5% 2.4K	R24		22
1		RES CF 1/4W 5% 2K	R17		21 D
1		RES CF 1/4W 5% 1.2K	R25		20
2		RES CF 1/4W 5% 800	R28, 34		19
1		RES CF 1/4W 5% 500	R32		18
1		RES CF 1/4W 5% 360	R31		17
1		RES CF 1/4W 5% 300	R31		16
1		RES CF 1/4W 5% 100	R26		15
7		RES CF 1/4W 5% 50	15		14 D
					13
4		POT 16MM VERT PCB 50K AHD 20%	4		12
					11 D
11		CAP, CERM 20% .01UF/50	3		0
1		CAP, CERM 20% 100PF/50	C32		9 D
1		CAP, CERM 20% 330PF/50	C21		8
1		CAP, CERM 20% 100PF/50	C36		7
4		CAP, CERM 20% 68PF/50	C34, 38, 9		6
1		CAP, CERM 10% 20PF/50	C10, 11, 22, 25		5 D
1		CAP, ELECT AL RAD 10/35	C38		4
6		CAP, ELECT AL RAD 100/16	2		3
10		CAP, ELECT AL RAD 22/10	1		2
800187		PCB ASSY, OUTPUT 1			1

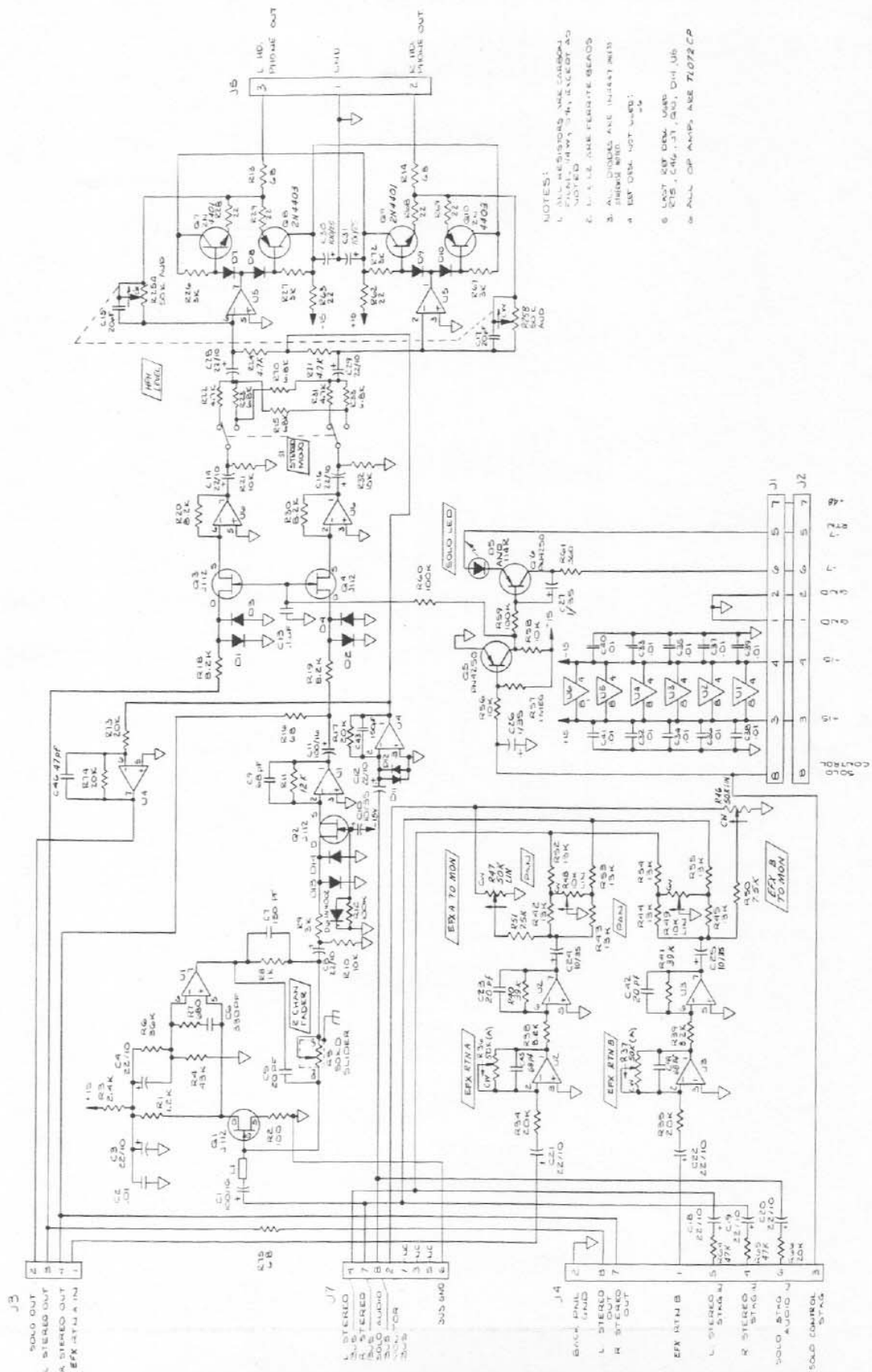


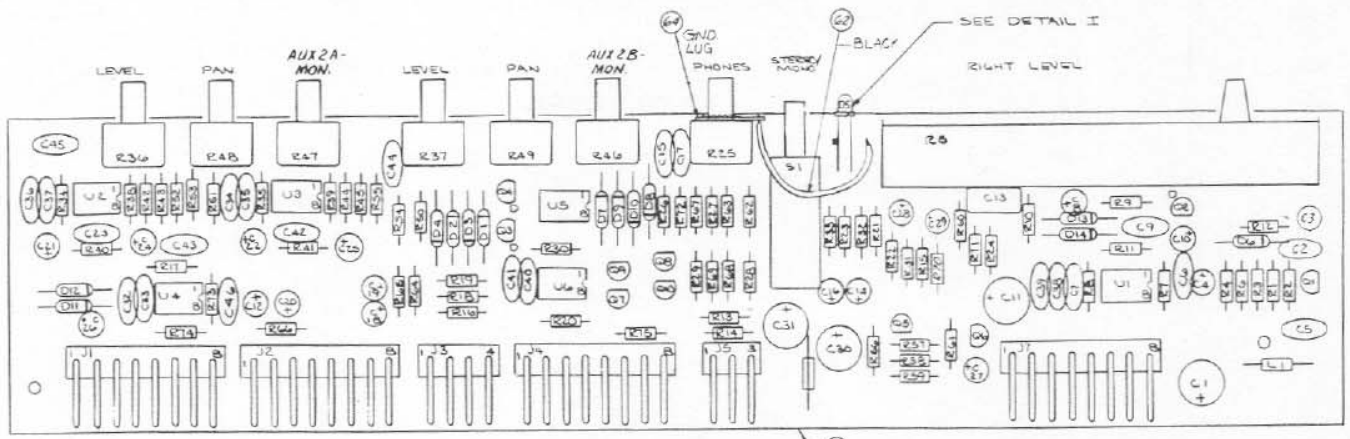
- NOTES:
1. ALL RESISTORS ARE 1/4 WATT, 5% OR AS NOTED
 - 2.
 - 3.
 4. L1 IS FERRITE BEAD PAIR SIZE 1 THROUGH 22
 5. LAST REF'S USED
 6. DIODES ARE 1N4147 UNLESS OTHERWISE SPECIFIED



- NOTES:
- 1 C4, 5, 6, 13, 14, 15, 18, 19, 33, 39
 - 2 C1, 2, 3, 16, 35, 37
 - 3 C17, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31
 - 4 R4, 5, 6, 442
 - 5 R13, 14, 15, 45, 46, 38, 39
 - 6 R18, 19, 20, 47, 49, 50
 - 7 R40, 41, 21, 22 & 23
 - 8 REF DES NOT USED - R57, J6

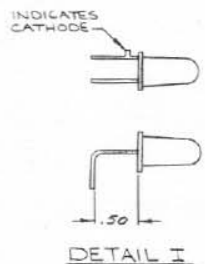






NOTES:

- 1 1, 3, 4, 8, 12, 14, 16, 18, 19, 20, 21, 22, 28, 29
- 2 2, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41
- 3 R42, 43, 44, 45, 52, 53, 54, 55
- 4 R17, 59, 55, 66, 73, 74
- 5 R12, 59, 60
- 6 D1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14
- 7 R 18, 19, 20, 30, 38, 39

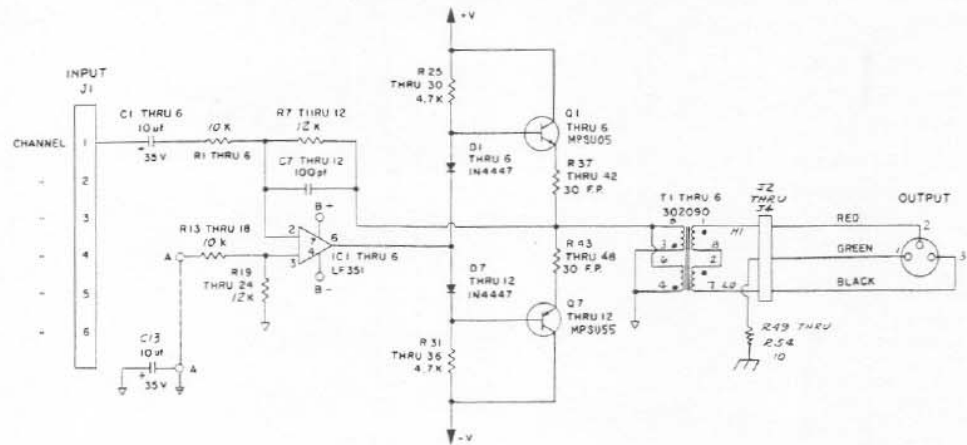


800182	PART NO	ENG NO	DESCRIPTION	REF DES	QTY	REV
	451141		PCB OUTPUT 2		67	
	452703		JUMPER ZERO OHM		66	D
	005453		POT SLIDE 5MM 50K	R5	65	E
	303099		LUG, GROUND		64	D
	301023		SW PUSH-ON/OFF VERT PCB 0.007	S1	63	
	100036		WIRE, #26 AWG, BLACK, 3.6' LG		62	
	300050		HDR 045 30 POT RTANG 8-DIN	J1, 2, 4, 7	61	
	300047		HDR 045 30 POT RTANG 4-DIN	J3	60	
	300046		HDR 045 30 POT RTANG 3-DIN	J5	59	
					58	
	007902		FERRITE SHLD BEAD	L1	57	
					56	
	008064		DIODE, LED ROUND RED	D5	55	
	008049		DIODE, SIGNAL IN4447	D1	54	D
	008022		DIODE, PWR IN4007 IN4002	D6	53	D
	007010		IC DUAL OP AMP TL072 CP	U1, 2, 3, 4, 5, 6	52	
					51	
	006040		J-PET J-112	G1, 2, 3, 4	50	
	006041		XISTOR SIG NPN 2N4401	Q1, 9	49	
	006042		XISTOR SIG PNP 2N4403	Q1, 10	48	
	006002		XISTOR SIG PWR 40V 2N4250	Q5, 6	47	
					46	
	005951		RES CF 1/4W 5% 1MEG	R27	45	
					44	
	005926				43	
	005917		100K		42	
	005915		43K		41	
	005915		36K		40	
	005918		47K	R24, 65	39	C
	005909		20K		38	
	005905		13K		37	
	005895		4.7K	R22, 24, 31, 7	36	
	005897		6.8K	Q5, 23, 33, 10	35	C
	005902		10K	R16, 21, 32, 36, 38	34	D
	005849		8.2K		33	D
	005916		39K	R40, 41	32	
	005858		RES CF 1/4W 5% .5K	R9, 26, 27, 47, 32	31	D

PARTS LIST

800182	PART NO	ENG NO	DESCRIPTION	REF DES	QTY	REV
	005856		RES CF 1/4W 5% 2.4K	R3	31	
	005879			R1	30	
	005877			R6	29	
	005873			R7	28	
	005904			R11	27	
	005866			R61	26	
	005853			R2	25	
	005849			R3, 14, 16, 15	24	C
	005898			R50, 51	23	
	005837		RES CF 1/4W 5% .22	R15, 19, 67, 63, 68, 69	22	
					21	
					20	
	005431		DUAL POT 6MM VERT PCB AUDIO 20% 50K	R25A, 25B	19	
	005416		POT 6MM VERT PCB AUDIO 20% 50K	R36, 37	18	D
	005489		POT 16MM VERT PCB 10K B C D	R48, 49	17	
	005419		POT 6MM VERT PCB UN 20% 50K	R46, 47	16	
					15	
	004087		CAP CERAMIC 20% .01/50		14	
	004080		10% 150PF/100	C7, 43	13	D
	004046		330PF/50	C6	12	
					11	
	004030		68PF/50	C9, 44, 45	10	C
	004013		CAP CERAMIC 10% 20PF/50	C5, 15, 17, 23, 42	9	
	004025		CAP CERAMIC 10% 47PF/50	C46	8	
	003075		CAP MYLAR 10%	C18	7	
	001506		CAP ELECT AL RAD 10/35	C10, 21, 25	6	
	002019		CAP TANT 20%	1/35	5	D
	001413		CAP ELECT AL RAD 100/25	C20, 31	4	
	001351		CAP ELECT AL RAD 100/16	C41	3	
	001209		CAP ELECT AL RAD 22/10		2	

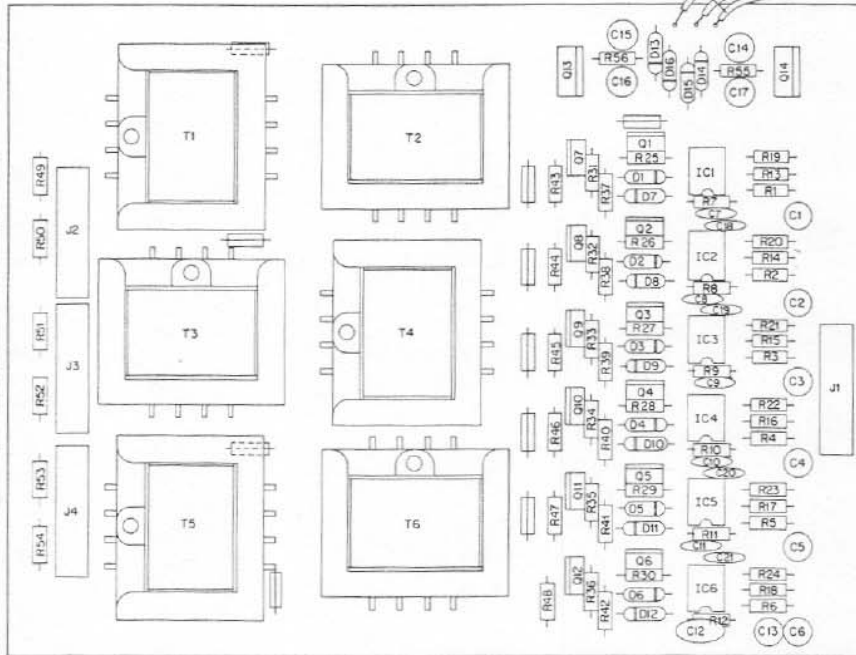
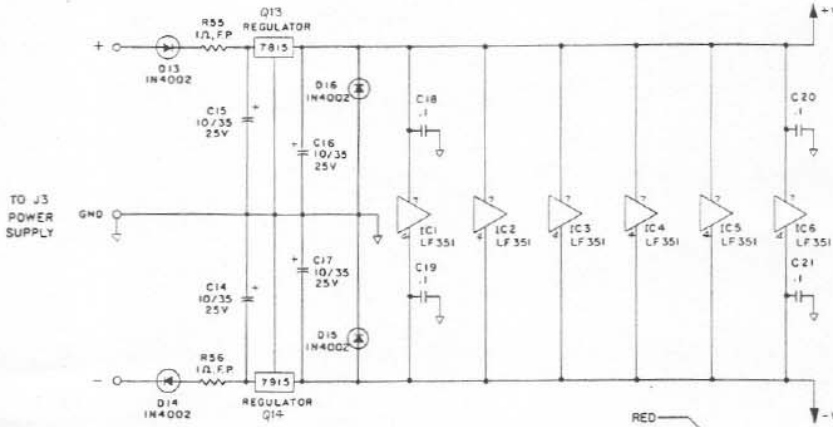
PARTS LIST



TYPICAL OUTPUT SCHEMATIC (CHANNEL 1)

NOTES:

1. LAST REFERENCE DES. USED: R56, C21, D16, Q12, IC6, T5.
2. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE 1/4 W, 5%, C.F.



NOTE:

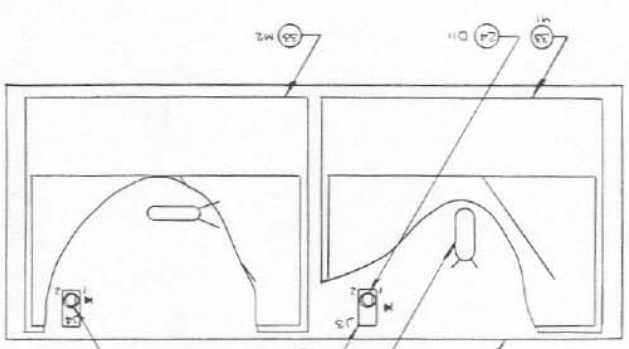
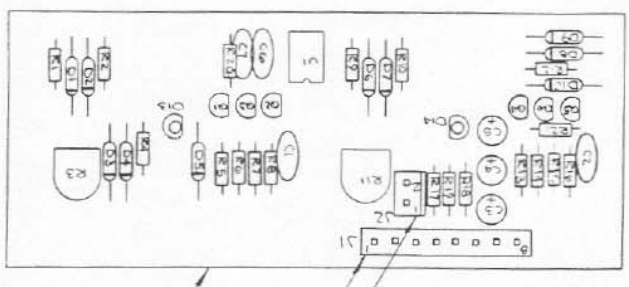
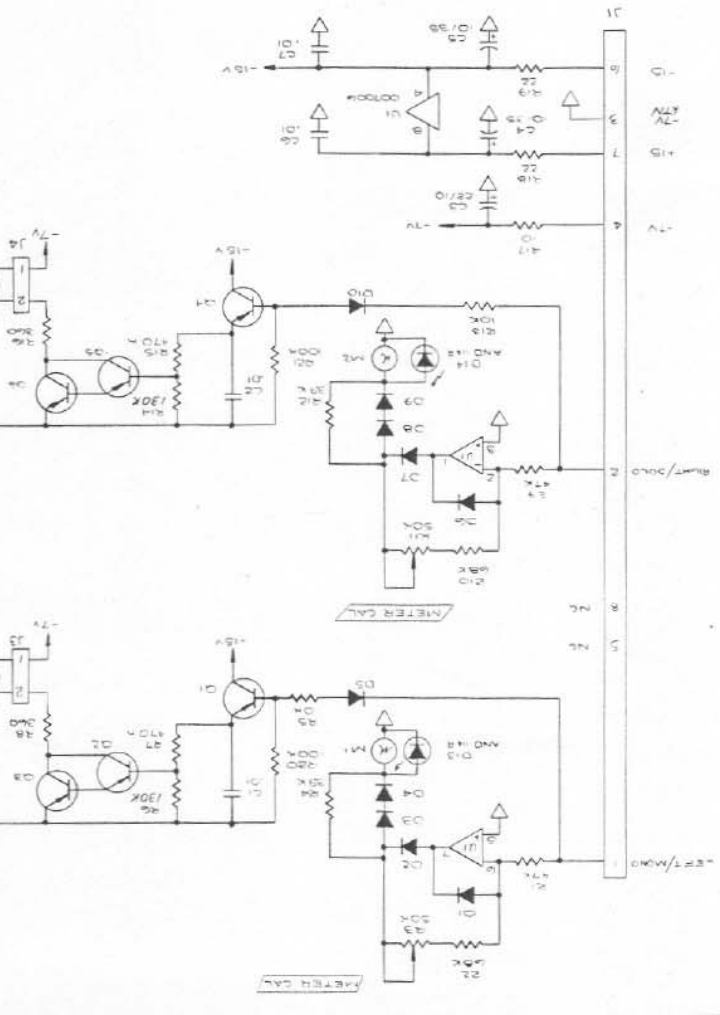
1. REF. DES.: R 49, 50, 51, 52, 53, 54
2. REF. DES.: R 1, 2, 3, 4, 5, 6, 13, 14, 15, 16, 17, 18.
3. REF. DES.: R 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36.
4. REF. DES.: R 7, 8, 9, 10, 11, 12, 19, 20, 21, 22, 23, 24.
5. REF. DES.: C 1, 2, 3, 4, 5, 6, 13, 14, 15, 16, 17.
6. REF. DES.: C 7, 8, 9, 10, 11, 12.
7. REF. DES.: D 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.
8. BE SURE Q13 AND Q14 ARE FULLY INSERTED. BEND Q13 SLIGHTLY AWAY FROM Q1 AND Q7 TO ASSURE CLEARANCE.

800188

ITEM	PART NO.	REG.	DESCRIPTION	REF. DES.
23				
20				
27	500803	2	RIVET	
26	005730	2	RESISTOR, 1/4 W., F.P., 10	R55, R56
25	005735	12	RESISTOR, 1/4 W., F.P., 30 Ω	R37-46
24	900911	1/2	COMPOUND, HEAT SINK	
23	304015	2	HEAT SINK	
22	804271	1	CABLE S/A	
21	302090	6	TRANSFORMER	T1, 2, 3, 4, 5, 6
20	452503-2	10	JUMPER, 0.4 LG.	
19	300083	4	CONNECTOR, HDR, 6PIN	J1, 2, 3, 4
18	007011	6	I.C. CHIP, LF351	IC1, 2, 3, 4, 5, 6
17	007103	1	REGULATOR, 15V., T.O., 220.1 AMP. 7815	Q13
16	007153	1	REGULATOR, 15V., T.O., 220.1 AMP. 7815	Q14
15	006057	6	DIODE, SILICON, NPN, MPS105	Q1, 2, 3, 4, 5, 6
14	006056	6	DIODE, SILICON, NPN, MPS105	Q1, 2, 3, 4, 5, 6
13				
12	008049-3	12	DIODE, IN4447	NOTE 7
11	008022	4	DIODE, IN4002	D13, 14, 15, 16
10	004037	6	CAPACITOR, CER. DISC., 100PF/50	NOTE 6
9	004091	4	CAPACITOR, CER. DISC., .1/50	C18, 19, 20, 21
8				
7	001505	11	CAPACITOR, ELECT, RAD, 10/35	NOTE 5
6	005902	12	RESISTOR, 1/4 W., 5%, 10K	NOTE 2
5	005843	12	RESISTOR, 1/4 W., 5%, 4.7K	NOTE 3
4	005904	12	RESISTOR, 1/4 W., 5%, 12K	NOTE 4
3				
2	005829	6	RESISTOR, 1/4 W., 5%, 10 Ω	NOTE 1
1	451142	1	P.C. BOARD	
ITEM	PART NO.	REG.	DESCRIPTION	REF. DES.

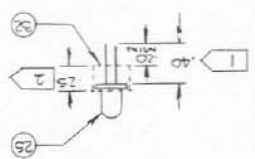
BILL OF MATERIAL FOR ONE COMPLETE UNIT

QTY	PART NO	DESCRIPTION	REF DESG
1	800183	PCB ASSY METER BD	
1	001209	CAP ELEC 24D	22/10 C9
2	001905	CAP ELEC 24D	10156 C4, B
4	004081	CAP CER 10%	01/50 C1, 2, 5, 7
2	005442	POT PCB HOR TRIM	50K R2, 11
1	005829	RES CF 25W 5%	10 R17
2	005831	RES CF 25W 5%	22 R18, 19
2	005856	RES CF 25W 5%	360 R8, 16
2	005891	RES CF 25W 5%	39K R4, 12
2	005902	RES CF 25W 5%	10K R5, 13
2	005922	RES CF 25W 5%	68K R2, 10
2	005926	RES CF 25W 5%	100K R20, 21
2	005929	RES CF 25W 5%	130K R14, 15
2	005942	RES CF 25W 5%	470K R7, 16
2	005948	RES CF 25W 5%	47K R14
4	006002	TRANSISTOR 516 PNP 40V PNP250	Q1-Q4
1	007006	I.C. DUAL OP AMP (8 PIN DFP) TESTED U1	
10	008049	DIODE SIGNAL	IN4447 D1-10
2	008049	DIODE LED ROUND RED T-1	D11, 12
2	008050	DIODE LED ROUND RED T-1 1/2	D13, 14
1	300059	HEADER .048 50 PFT STR 2 PIN J1	
2	300076	CONN RECP TOP ENT. 100 CTR	J2, 4
2	301043	LAMP INCAND 6V	D5, 1, 2
1	451072	PCB METER 1200	
2	455004	LEVEL/PEAK METER	M1, 2

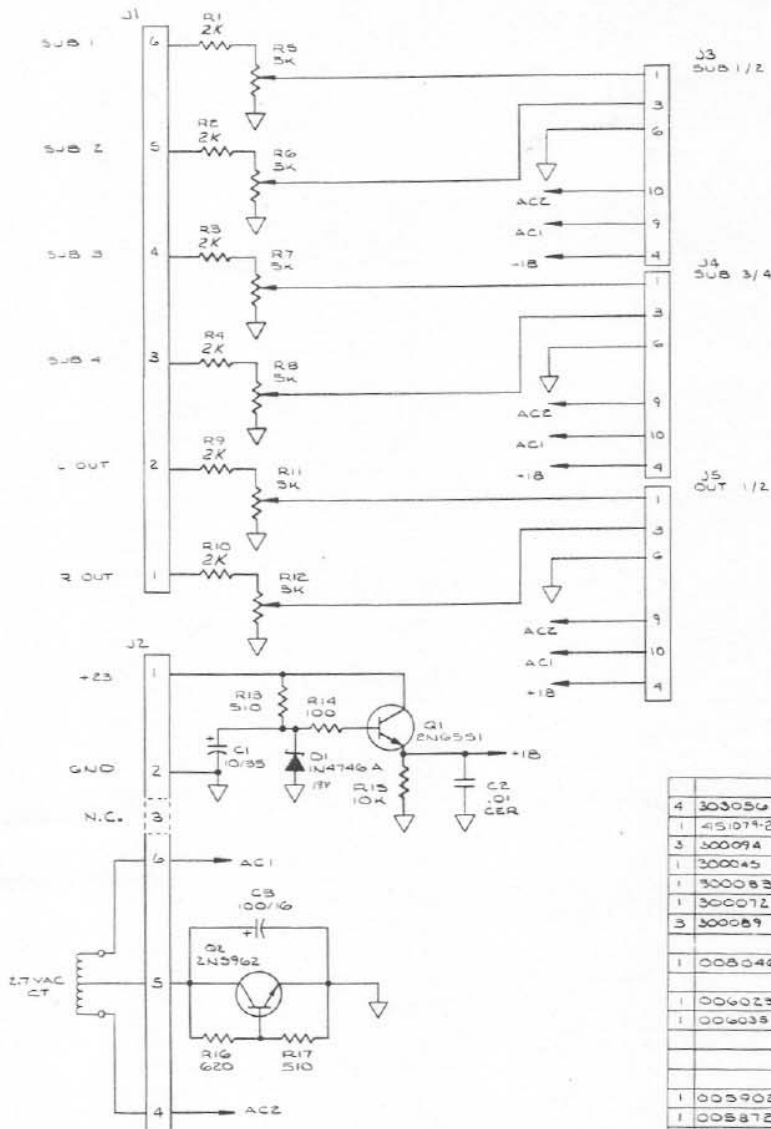


NOTE:
 1. ALL TRANSISTORS ARE PNP250.
 2. ALL DIODES ARE IN4447.
 3. LAMPS ARE DL-2-81 (0.51 x 0.52).
 4. LAST REF DES USED:
 C1, R21, D14, Q4, U1, J4, D52, M2

DETAIL I
 TYP 2 PCS



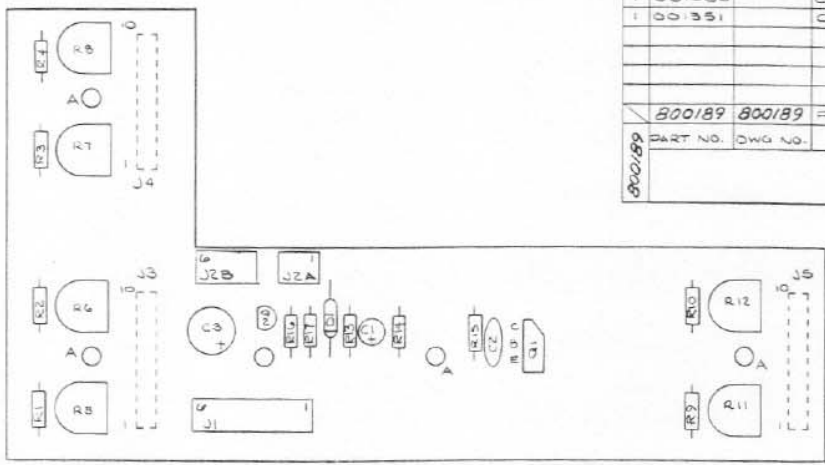
NOTE:
 1. LT LEADS TO DIMENSIONS SHOWN.
 2. NSTALL 25 TONAL REEF OF HEAT SHRNK
 OVER LED (DO NOT SHRNK) INSURE TUBING
 COVERS SHOULDER OF LED WHEN INSTALLED
 ON PCB.

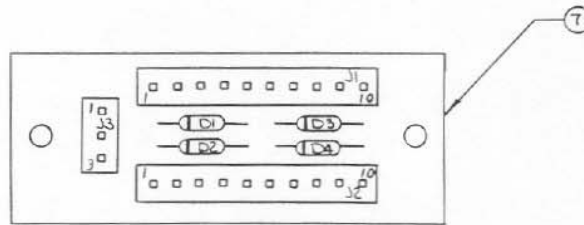
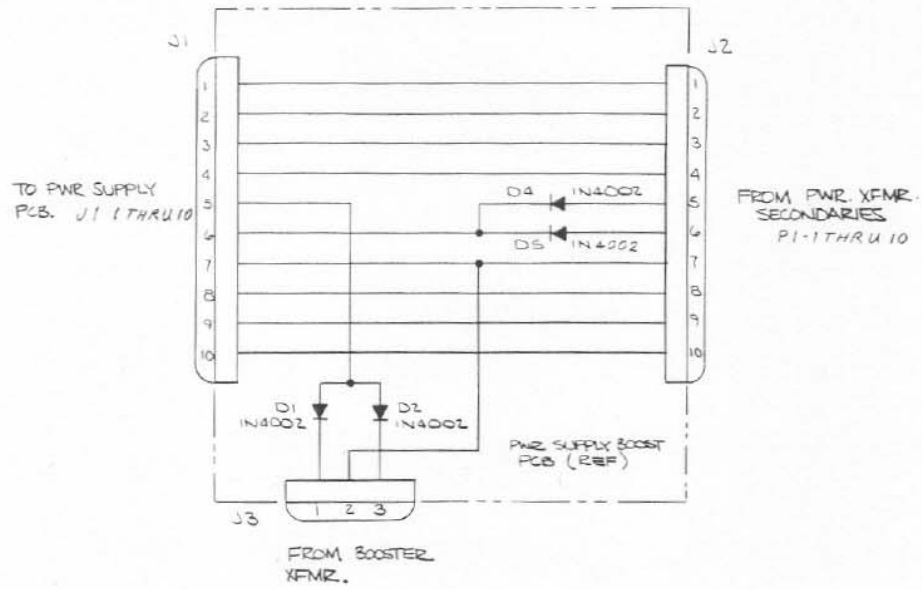


NOTES:
 1. ALL RESISTORS ARE OF 1/4W, 5%
 2. LAST REF DES USED:
 R17, C3, Q2, D1, J5

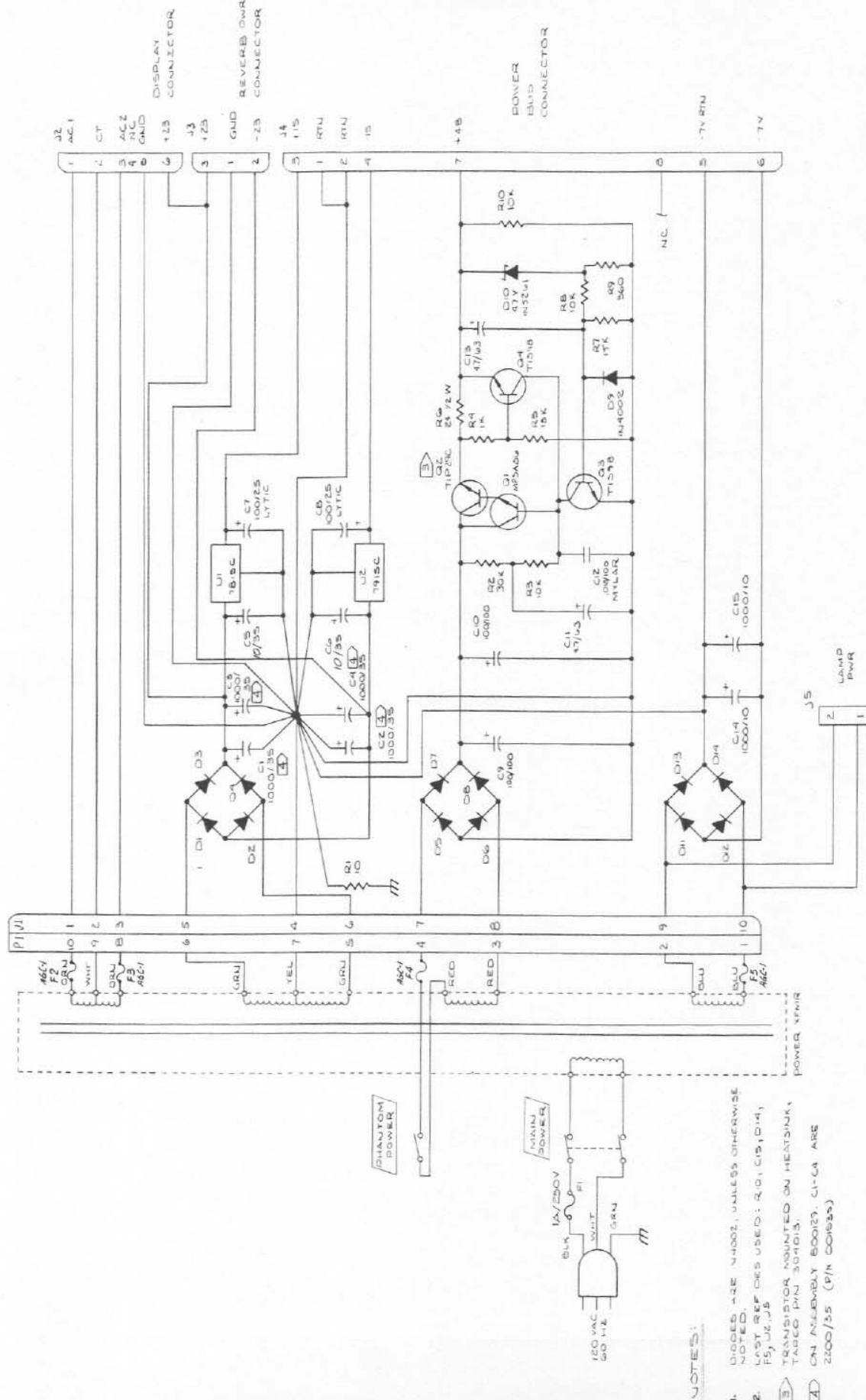
4	303056	SPACER SWAGE .125 LL		28	
1	451079-2	73 C PCB, DISPLAY		26 C	
3	300094	PLUG KEYING CONNECTOR		25	
1	300045	HDR .045 SQ PST STR 2 PIN	J2 A	24 C	
1	300083	HDR .045 SQ PST STR 6 PIN	J1	23 C	
1	300072	HDR .045 SQ PST STR 3 PIN	J2 B	22 D	
3	300089	CONN, RECP PCB .00CR 0 P05	J3, 4, 5	21	
				20	
1	008046	DIODE, ZENER 16V 1N4746 A D1		19	
				18	
1	006023	XISTOR SIL NPN MPWR 2N6551 Q1		17	
1	006035	XISTOR SIG NPN 45V 2N3962 Q2		16	
				15	
				14 C	
				13	
1	003902	RES, CF 1/4W, 5% 10K	R15	12	
1	005872		620	R16	
2	005870		510	R13, 7	
1	005853	RES CF 1/4W 5% 100	R14	9	
6	005884	RES CF 1/4W 5% 2K	R1, 2, 3, 9, 10	8	
6	005472	POT PCB-HDRZ TRIM 5K	R5-B, 11, 12	7	
				6	
1	004087	CAP CERM 10% .01/50	C2	5	
				4	
1	001505	CAP ELECT AL RAD 10/35	C1	3	
1	001351	CAP ELECT AL RAD 100/16	C3	2	
				1	
	800189	800189 PCB ASSY, DISPLAY		1	
	PART NO.	DWG NO.	DESCRIPTIONS	REF DES	TDY LG REV

PARTS LIST



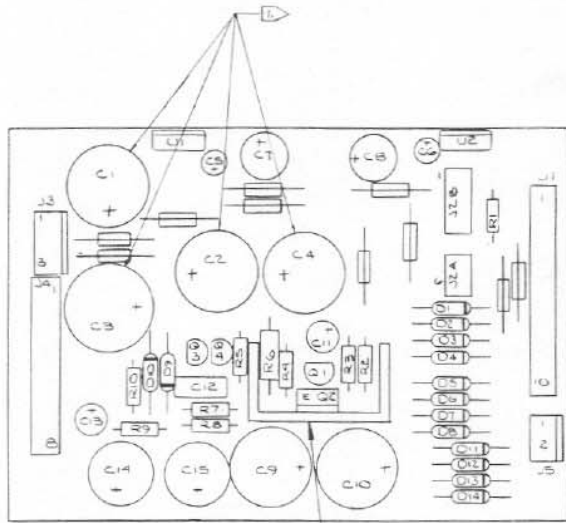


1	451090	451090	PCB PWR SUPPLY BOOSTER		7
2	800092	---	HDR 50 PST STR 10 PIN	J1, 2	5
1	800072	---	HDR 50 PST STR 3 PIN	J3	4
					3
4	808022	---	DIODE PWR	1N4002	2
	800130	800130	PCB ASSY PWR SUPPLY BOOST		1
800130	PART NO	QMG NO	DESCRIPTION	REF DESG	FORM NO
					REV



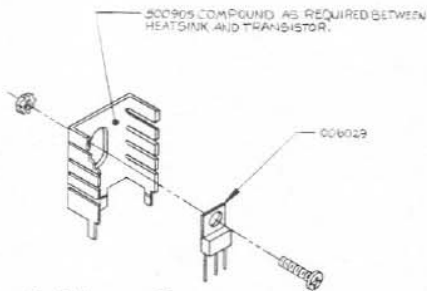
NOTES:

1. DIODES ARE 1N4002, UNLESS OTHERWISE NOTED.
 2. LAST REF DES USED: R1, C15, D14, F5, U2, J5
- T TRANSISTOR MOUNTED ON HEATSINK, TAPPED P/N 304013.
A ON ASSEMBLY BOARDS, C1-C4 ARE 2200/35 (P/N 001933)



PART NO.	DWG NO.	DESCRIPTION	REF DES	QTY	REV
-	-	500070	SCREW MACH PHENHO 4-40x3/8	44	
-	-	500592	NUT, HEX., ZEP 4-40	43	
-	10	452563	JUMPER, ZERO OHM	42	D
-	-	309013	HEATSINK TO-220	41	
-	-	300012	HDR 045 50 PST STR 3-PIN	40	E
-	-	451074-2	TO F PCB, DWR SUPPLY	39	E
-	W/R	500905	THERMAL JOINT COMPOUND	38	
-	-	300097	HDR 045 30 PST STR LOCK 3-PIN	37	F
-	-	300092	HDR 045 50 PST STR 10-PIN	36	
-	-	300069	" " " " " 8-PIN	35	
-	-	300098	HDR 045 50 PST STR LOCK 2-PIN	34	C
-	-	300045	HDR 045 30 PST STR 2-PIN	33	E
800129	800128	PART NO. DWG NO.	DESCRIPTION	REF DES	QTY REV

PARTS LIST



DETAIL I
SCALE: NONE

NOTES:

FOR 800129 ASSY, REMOVE C12, 3, 4 (P/N 001529) AND REPLACE WITH 4 2200/35 CAPS (P/N 001535)

-	-	-	-	-	31	E
-	-	-	-	-	30	E
-	13	005022	DIODE PWR A 60V IN4002	D19, D11, D4	29	
-	-	006029	DIODE ZENER 47V 1% IN5241B	D10	28	F
-	-	007153	IC VOLT REG 7815C	U2	27	
-	-	007103	IC VOLT REG 7815C	U1	26	
-	-	-	-	-	25	
-	-	006029	XISTOR SIG NPN PWR TIP12C	Q2	24	
-	2	006051	XISTOR SIG NPN 60V 2N6590	Q3, 4	23	G
-	-	006035	XISTOR SIG NPN 80V MPS400	Q1	22	F
-	-	-	-	-	21	
-	-	005913	RES CF 1/4W 5% 30K	R2	20	E
-	-	005904	" " " " " 15K	R7	19	F
-	3	005902	" " " " " 10K	R3, R10, X8	18	E
-	-	-	-	-	17	E
-	-	005908	" " " " " 15K	R5	16	E
-	-	005877	" " " " " 1K	R4	15	E
-	-	005866	" " " " " 360	R9	14	
-	-	-	-	-	13	E
-	-	005829	RES CF 1/4W 5% 10	R1	12	
-	-	005029	RES CF 1/2W 5% 24	R0	11	E
-	-	-	-	-	10	B
4	-	001535	CAP ELECT AL RAD 2200/35	C12, 3, 4	9	
-	-	003044	CAP MYLAR 10% 100/100	C12	8	F
-	2	001700	CAP ELECT AL RAD 47/23	C11, 3	7	E
-	2	001751	CAP ELECT AL RAD 100/100	C9, 10	6	E
-	4	001529	" " " " " 1000/35	C1, 2, 3, 4	5	
-	2	001505	" " " " " 10/35	C5, 6	4	E
-	2	001413	" " " " " 100/25	C7, 8	3	
-	2	001229	CAP ELECT AL RAD 1000/10	C14, 15	2	
-	-	-	-	-	-	-
-	-	800129	800128 PCB ASSY, PWR SUPPLY, H POWER	-	1A	
-	-	800128	800128 PCB ASSY, POWER SUPPLY	-	1	
800129	800128	PART NO. DWG NO.	DESCRIPTION	REF DES	QTY REV	

PARTS LIST

MISCELLANEOUS PARTS LIST

PART NO.	DESCRIPTION
400087	Knob, rotary, light grey
400088	Knob, rotary, medium grey
400089	Knob, rotary, dark grey
400042	Knob, rotary, black (Mono. Master)
400093	Push button, light grey
400094	Push button, red
400053	Knob, fader, black
400091	Knob, fader, red
400096	Spacer, potentiometer
500708	Screw
500706	Hex nut, panel
500703	Washer, appearance
500591	Hex nut, $\frac{3}{8}$ -32
500681	Washer, thin appearance
500683	Washer, fiber flat $\frac{3}{8}$ "
500712	Lockwasher, internal tooth
500125	Screw, #6 x $\frac{1}{2}$
452016	Insulator, fish paper
500680	Washer $\frac{3}{8}$ I.T. CAD
452017	Insulator, fish paper
460164	Shield, electrostatic
500073	Screw #4 x $\frac{1}{2}$ SM, PHP
460128	Meter clip
400056	Display lens
455005	Fluorescent display
500291	Nut, Kep #8-32
500687	Washer, appearance — headphone jack
400085	Retainer, headphone jack
300126	Phone jack — headphone
500107	Screw #6 x $\frac{1}{2}$, SM

PART NO.	DESCRIPTION
500407	Nut $\frac{1}{4}$ -2, "U" type
500286	Nut #8, J-clip
500405	Screw, $\frac{1}{4}$ -20 x 1", socket head
500130	Screw, #6 x $\frac{3}{8}$ PHP, SEMS
500202	Screw, #8 x $\frac{1}{2}$ PHP, SEMS
500069	Screw, #4-40 x $\frac{3}{8}$ SEMS
500707	Washer internal tooth lock
500209	Screw #8-32 x $\frac{1}{2}$ PHP
500117	Screw #6-32 x $\frac{1}{4}$ SEMS
303120	Fuse holder
500290	Nut, Hex #8-32
500280	Lockwasher #8
303066	Line cord
500203	Screw #8-32 x $\frac{3}{4}$
303317	Fuse block
303115	Fuse
500593	Nut, hex #4-40 self lock
500190	Nut, Kep #6-32
500102	Screw #6-32 x $\frac{3}{8}$ SEMS
500070	Screw #4-40 x $\frac{3}{8}$ PHP
303213	Insulator, Mica
500113	Screw, #6-32 x $\frac{1}{4}$ PHP, SEMS
500182	Washer internal tooth lock, #6
302087	Power transformer
801089	Handrest - Model 8208
801090	Handrest - Model 8408, 8212
801091	Handrest - Model 8216
801092	Handrest - Model 8416
801093	Handrest - Model 8424
801094	Handrest - Model 8432