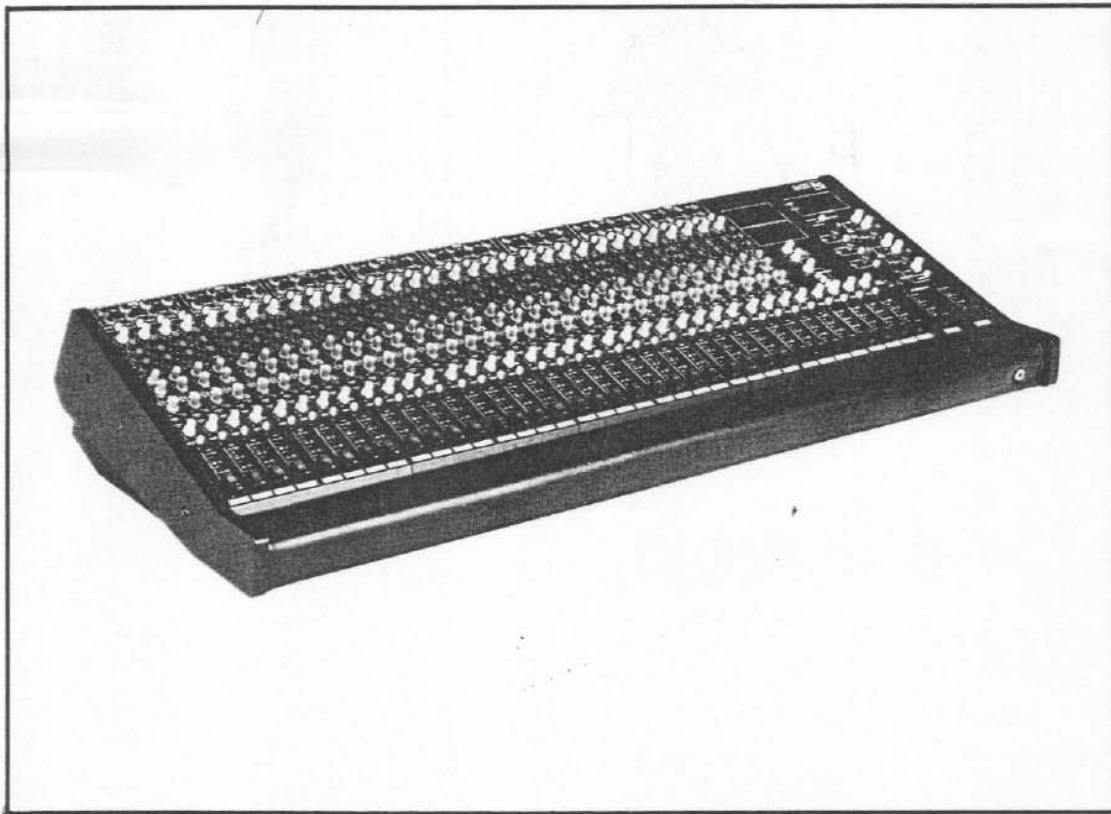




Electro-Voice®
SERIES 8200/8400

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

Subgroup Returns (8400 Series) 5,000 ohms

Effects Return A and B 8,000 ohms

Tape In Right, Left (8400 Series) 20,000 ohms

Talkback Mic In (8400 Series) 24,000 ohms

Stacking, 10,000 ohms

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, -2 dBu

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 dB

Tape In Right, Left (8400 Series) +30 dB

Talkback Mic In (8400 Series) +6 dB

Stacking, +36 dBu

Left, Right; Subgroup 1-4 (8400 Series) +18 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.

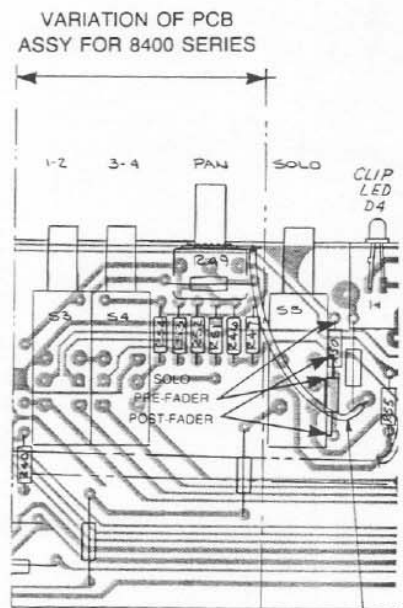
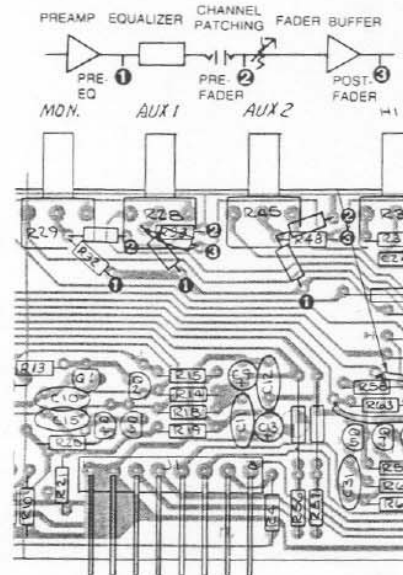
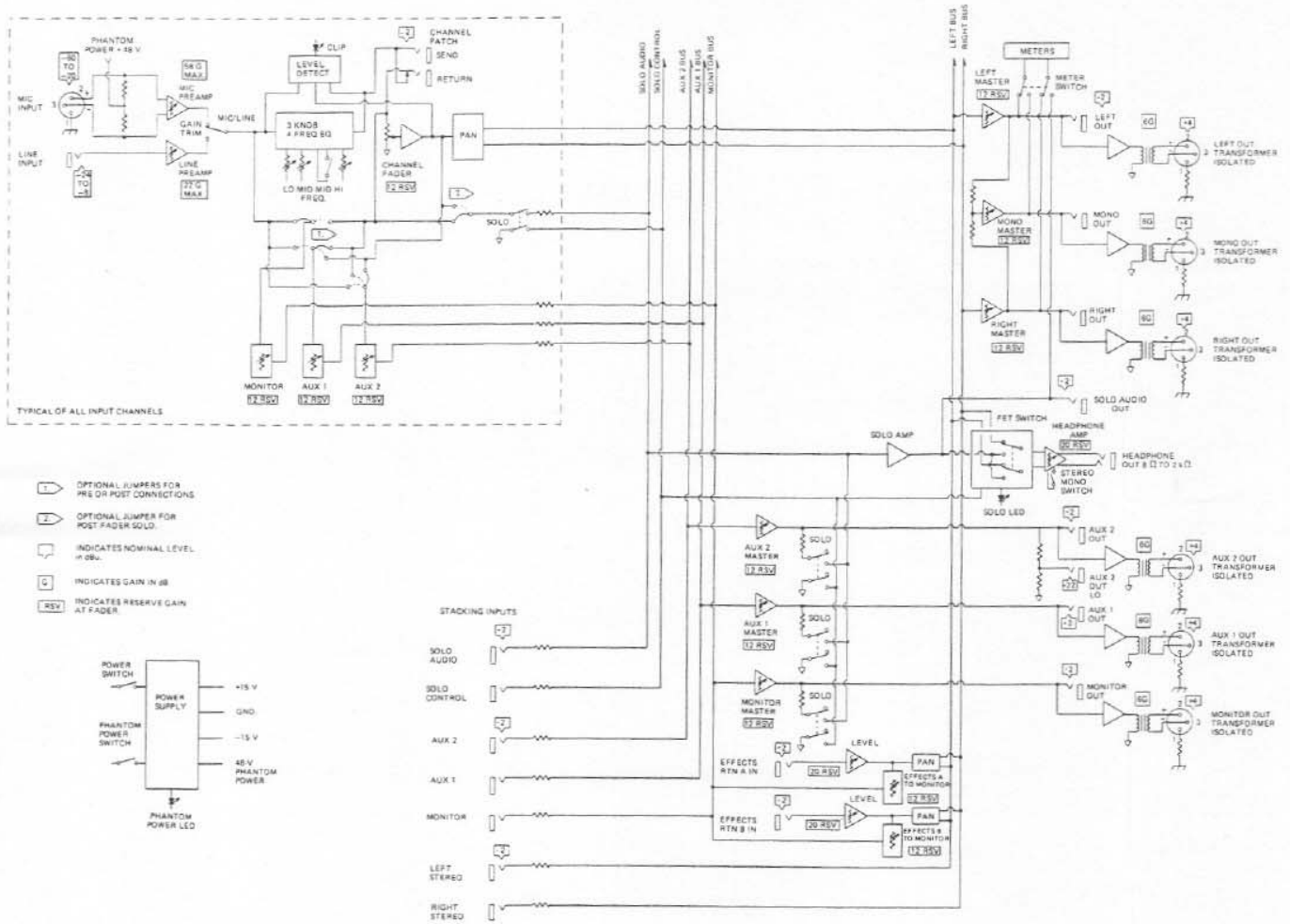
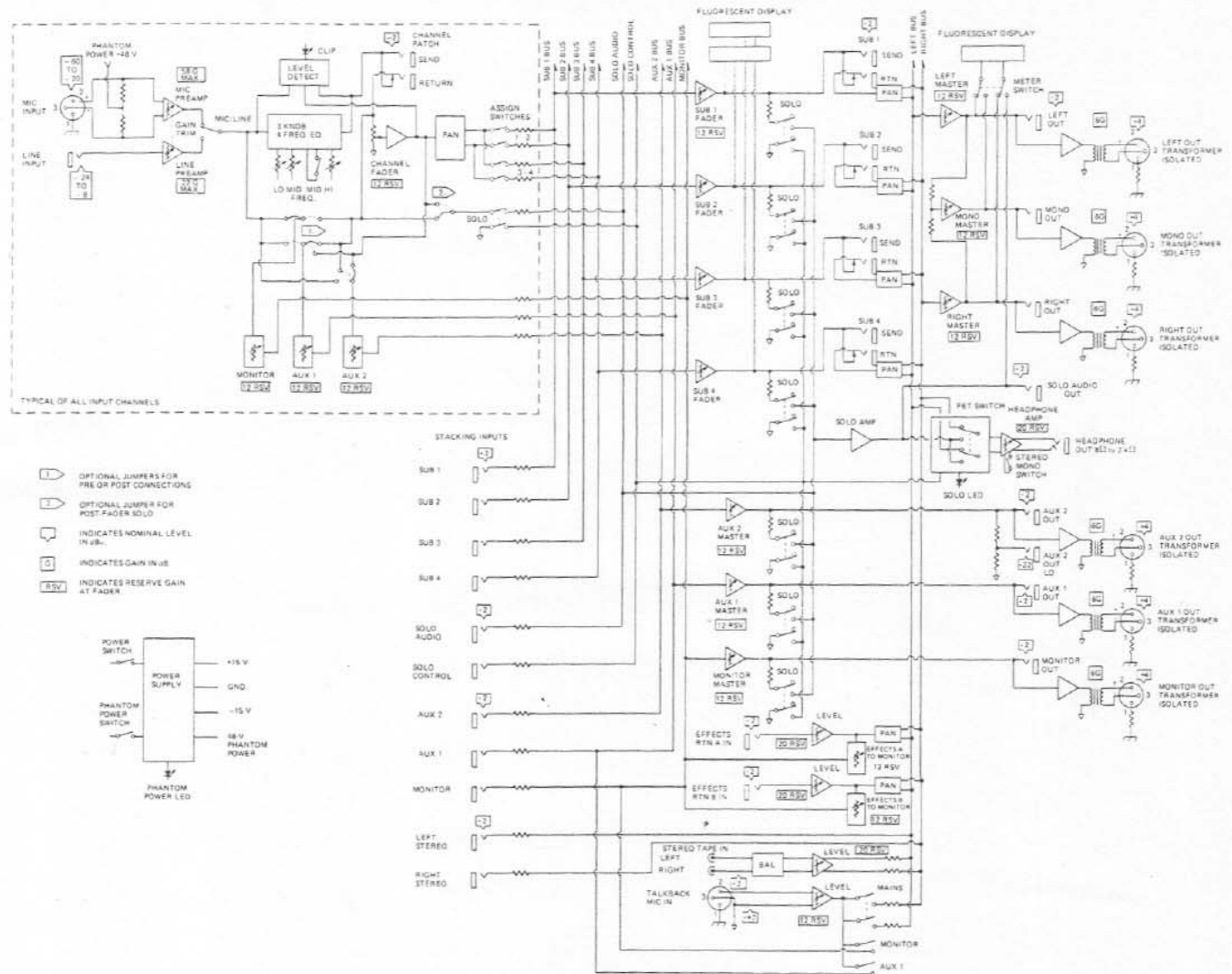
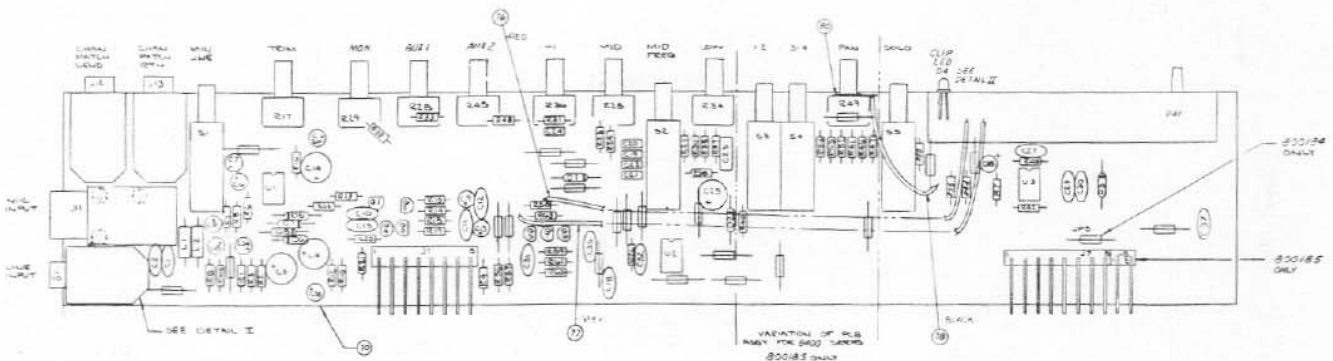


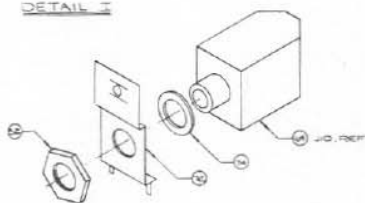
FIGURE 1 — Location of Input Channel Board Modifications



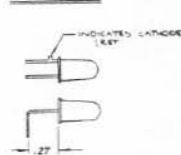




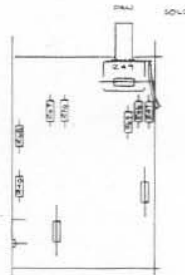
DETAIL I



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		82
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
5	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	D5,6,7,8	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 DNP 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

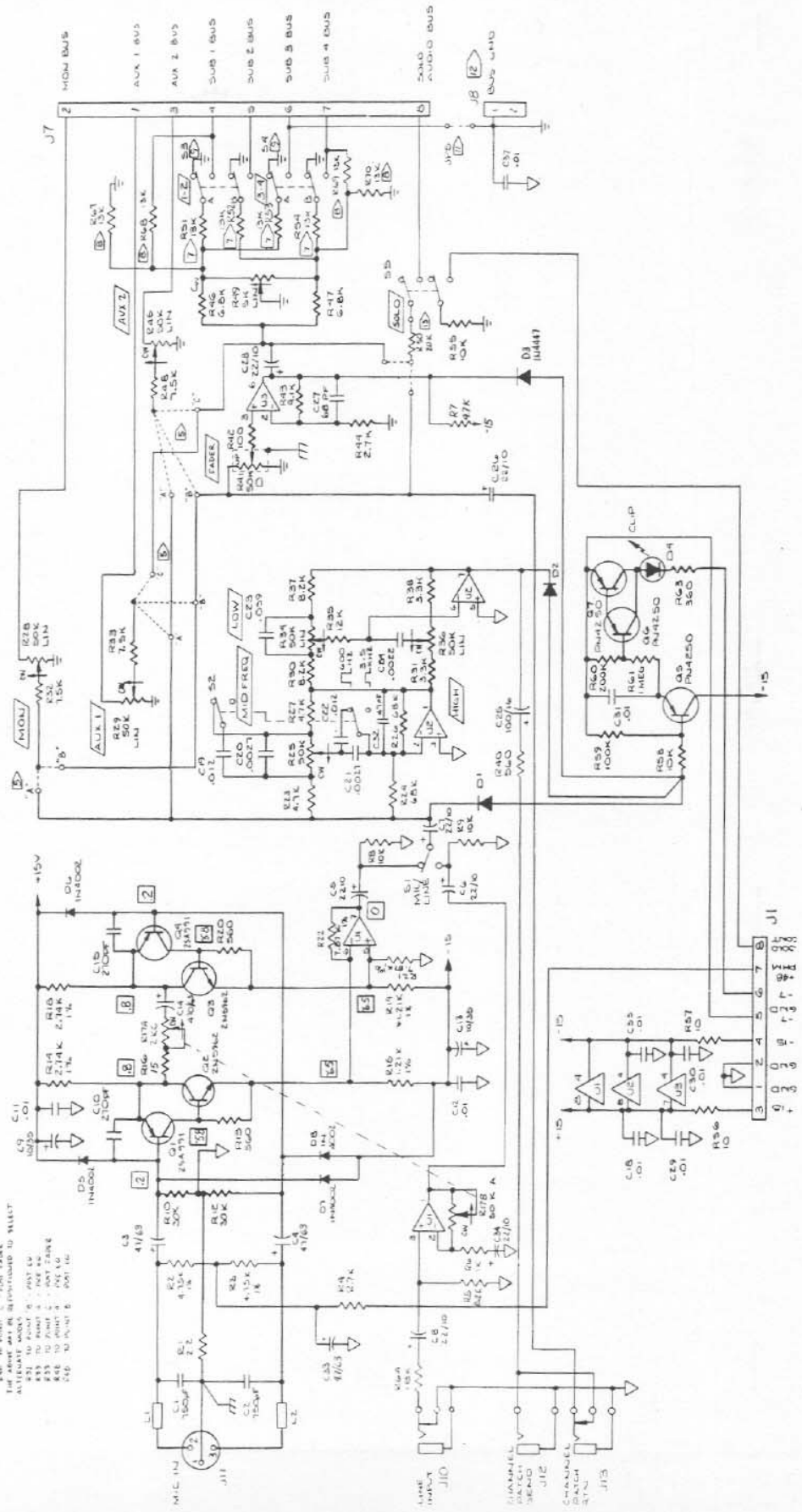
QTY	PART NO	DESCRIPTION	REF DES	REV
4	005905	RES CF 1/4W 5% 18K	R61,62,63,64	59
1	005877	RES CF 1/4W 5% 1K	R6	38
2	005889	RES CF 1/4W 5% 3.3K	R3,36	37
2	005887	RES CF 1/4W 5% 2.7K	R4,44	36
3	005871	RES CF 1/4W 5% 560	R13,20,40	35
1	005866	RES CF 1/4W 5% 360	R63	34
1	005853	RES CF 1/4W 5% 100	R42	33
1	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	" " " " 50K 50 CD	R25,34,35	20
3	005419	POT 60MM VERT PCB 50K LIN 30K	R28,29,45	19
1	004025	CAP CER 10% 47PF/50	C32	17
8	004087	CAP, CER 10% .01/50	R1	16
2	004080	" " " " 750PF/50	C42,	15
2	004044	" " " " 270PF/100	C10,15	14
1	004030	CAP CER 10% 68PF/50V	C27	13
1	003058	CAP, MYLAR 10% .039/50	C23	11
2	003040	" " " " .012/50	C19,22	10
2	003014	" " " " .0027/50	C20,21	9
1	003013	CAP, MYLAR 10% .0022/50	C24	8
1	001700	CAP, ELECT AL RAD 47/63	C33	7
1	001351	CAP, ELECT AL RAD 100/16	C25	6
2	001711	" " " " 47/63	C5,4	5
2	001505	" " " " 10/35	C9,13	4
7	001209	" " " " 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

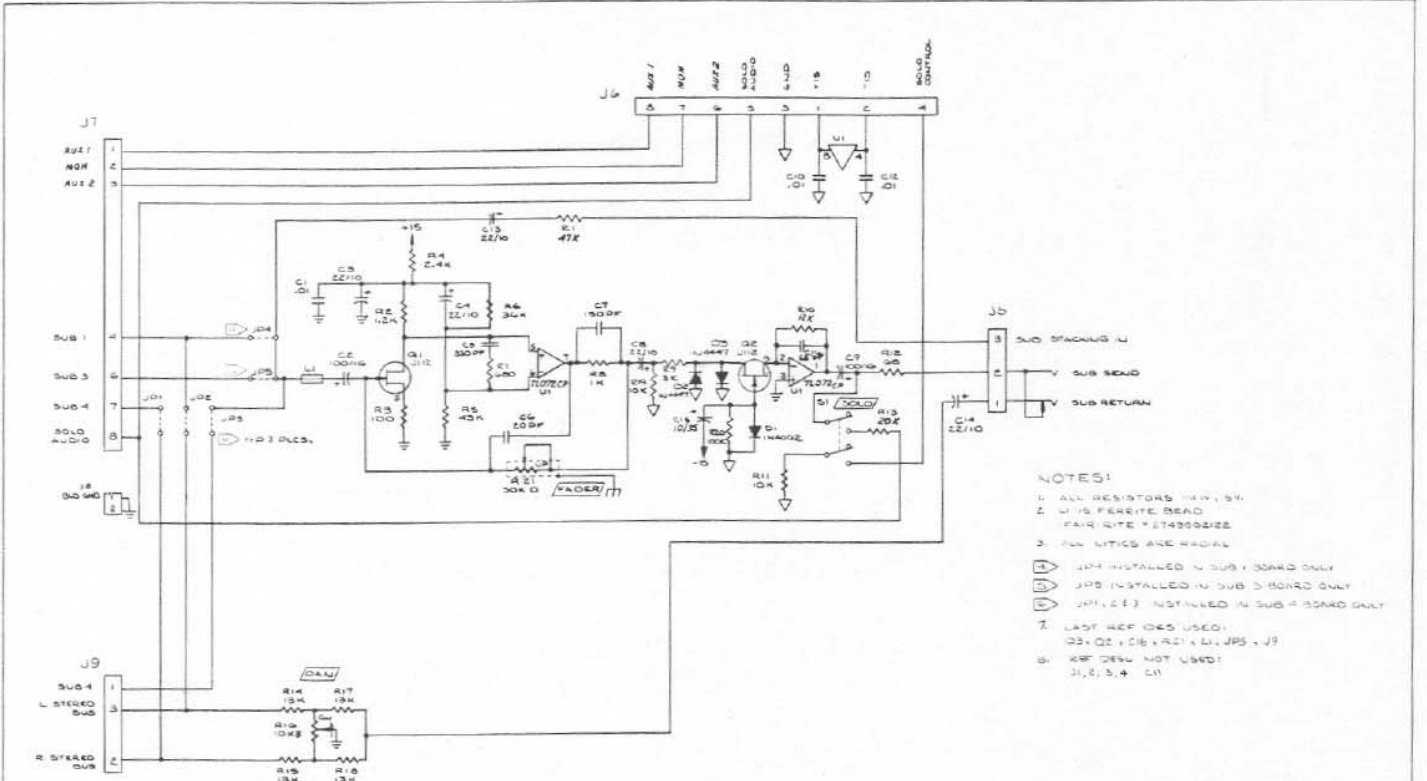
NOTES

1. 1/4 W. 1% RES. U.F. 500, J5, 5, U.F. 501
2. ALL RESISTORS ARE CARBON FILM, 1/4 W. 5%, EXCEPT AS NOTED
3. 1/4 W. 5% FERRITE BEADS (PAIR HTS = 2M 100G122)
4. ALL OPTICS ARE RADIAL
5. C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, 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

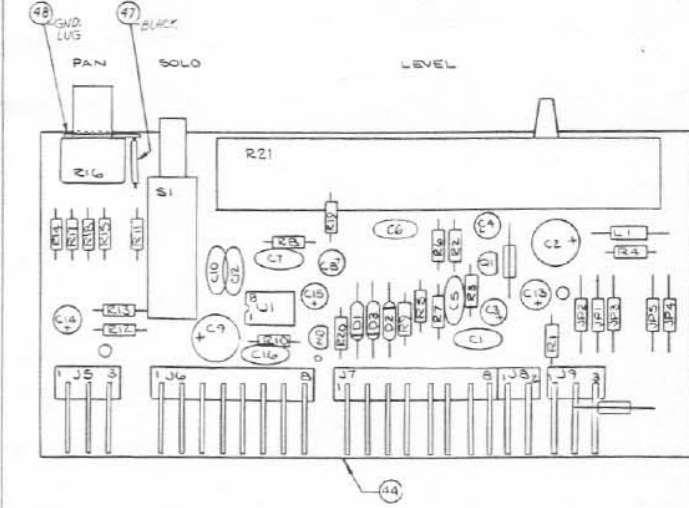
6. LAST REF DES USED: C37, C61, R70, U3, L2, J5, C17, C51, C55, J5
- REF DES NOT USED: J11, C1, C16, C17
7. H21, 52, 53, 54, 60088 ONLY
8. K1, L1, U5, U7, TO 80084 ONLY
9. 53, 1-4 80085 ONLY
10. 1% RESISTORS ARE 1/4 W. MF

11. JPS 800184 ONLY
12. 800185 ONLY
13. 82012 FACTORY INSTALLED, FOR FABRICATION BY FIELD INSTALLED, TO PROVIDE A POST CABLE SOLD BY WITH ALTERNATE CONNECTIONS.





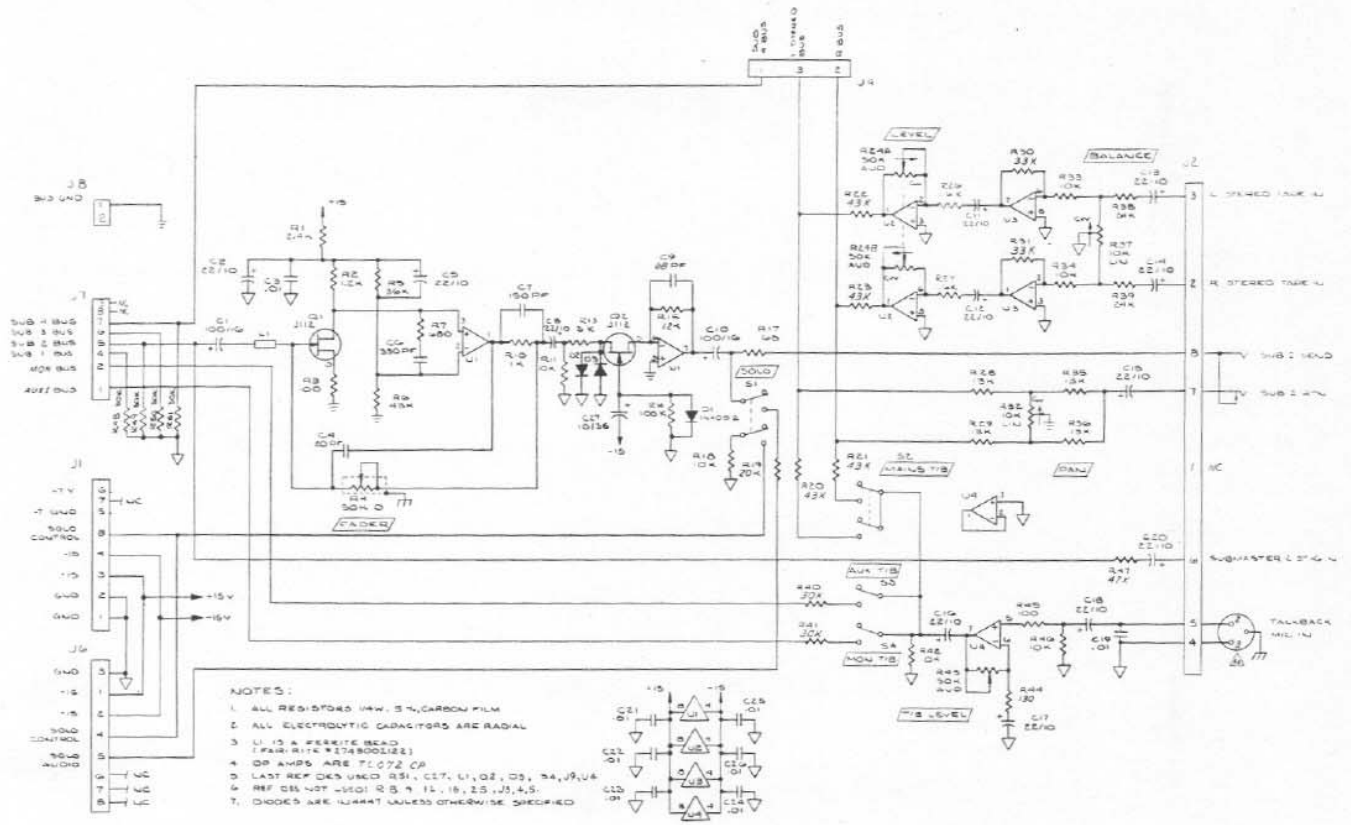
- NOTES:
 1. ALL RESISTORS 1/4W, 5%
 2. J5 FERRITE BEAD
 FAIR SITE # 27430022E
 3. ALL WTCES ARE RADIAL
 (I) J14 INSTALLED IN SUB 1 BOARD ONLY
 (II) INSTALLED IN SUB 3 BOARD ONLY
 (III) INSTALLED IN SUB 4 BOARD ONLY
 7. LAST REF ICES USED:
 Q1, Q2, C16, R21, C1, JPS, J9
 8. REF DES'S NOT USED:
 R1, R2, R4, C11



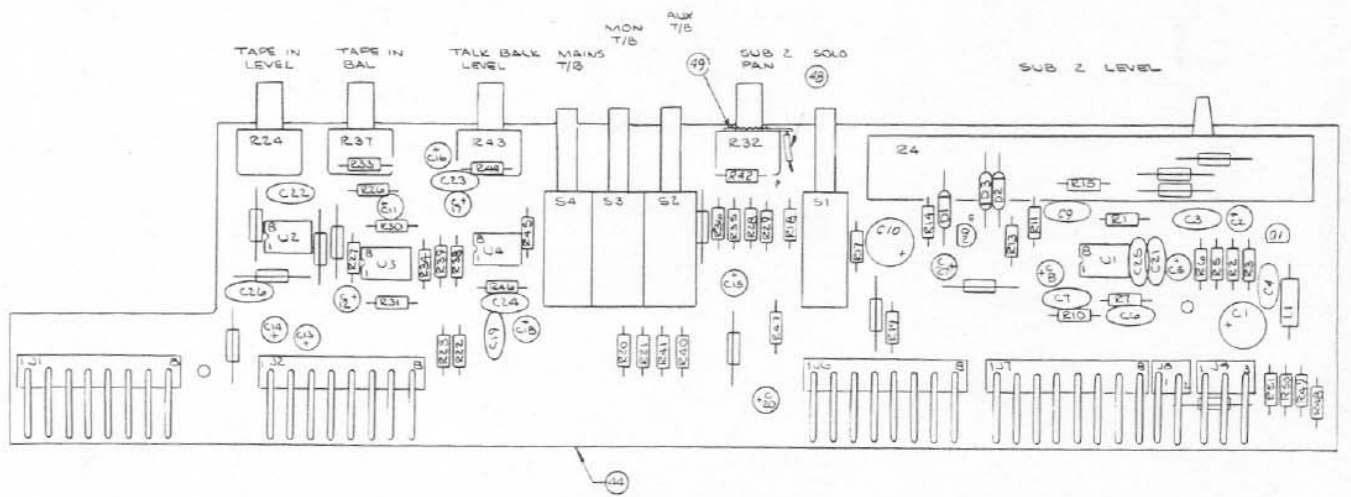
- NOTES:
 (I) R14, 15, 17, 18

PARTS LIST					
QTY	PART NO.	DESCRIPTION	REF DES	REV	REV
1	100036	WIRE, #22 AWG, BLACK, 3/4" LG.	47		
1	005453	POT SLIDE 60 MM 50KΩ	R21		
7	431303	JUMPER ZERO ΩHM	JP, 2,3,4,5		
1	451138	PCB, SUB 1,2,3			
1	301023	SWITCH PUSHBUTTON DPDT	S1		
2	300048	HDR 045 SQ DST RTANG 3-PIN	J5,9		
2	300090	HDR 045 SQ DST RTANG 8-PIN	J6,7		
1	300048	HDR 045 SQ PST RTANG 2-PIN	J8		
1	004902	FERRITE SHLD BEAD	L1		
1	005022	DIODE, PWR 1A/100V IN4002	D1		
3	008049	DIODE SIGNAL 1N4447	D2,3		
1	007010	IC, DUAL OP-AMP, TL072 CP	U1		
2	004040	JTET	Q1, 2		

QTY	PART NO.	DESCRIPTION	REF DES	REV	REV
					30
					24
					26
1	005926	RES CF 1/4W 5% 100K	R20		27
1	005904		R10		28
					29
1	005918		R1		25
1	005917		R5		28
1	005915		R6		29
4	005905		R7		22
2	005902		R11,19		21
1	005888		R3		20
1	005886		R4		19
1	005879		R2		18
1	005877		R8		17
1	005873		R9		16
1	005909		R13		15
1	005853		R3		14
1	005849	RES CF 1/4W 5% 20	R2		13
1	004030	CAP CER 10% 68 PF/50	C16		2
					11
1	005489	POT 10MM VERT 30K 10K Ω C.D	R6		10
1	001508	CAP ELECT AL RAD 10185	C18		9
3	004087	CAP CER 0T, .01/50	C10,12,1		8
1	004080	CAP CER 10%, .50PF/50	C7		7
1	004013	CAP CER 10%, 50PF/50	C4		6
1	004046	CAP CER 10%, 330PF	C5		5
2	001351	CAP, ELECT AL RAD 100/16	C2,9		4
					3
5	001209	CAP, ELECT AL RAD 22/10	C3,8,15,14		1
800186	800186	PCB ASSY, SUBMASTER 1,3,4			1
PART NO.	QTY NO.	DESCRIPTION	REF DES	REV	REV



- 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, J9, U4
 6. REF DES NOT USED: R 8, 9, 11, 16, 25, J5, 4, 5
 7. DIODES ARE 1N4447 UNLESS OTHERWISE SPECIFIED



- NOTES:
- ① C2, 5, 8, 11, 12, 13, 14, 15, 16, 17, 18, 20
 - ② R11, 15, 33, 34, 42, 46
 - ③ R40, 41, 48, 49, 50, 51

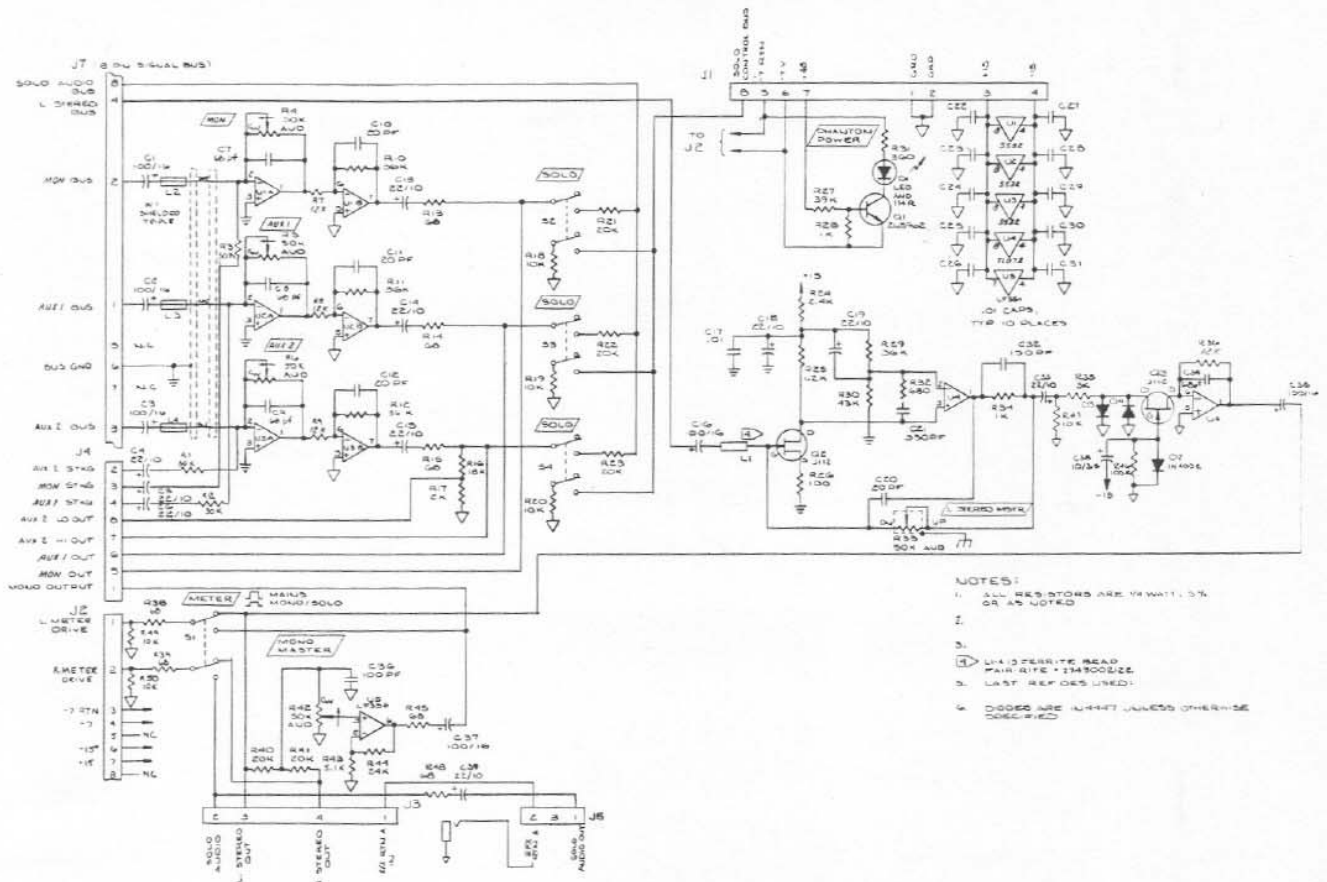
QTY	PART NO.	QWG NO.	DESCRIPTION	REF DES	ITEM NO	REV
1	303099		LUG, GROUND		49	
1	100036		WIRE, #22 AWG, BLACK, 3.6" LG.		48	
1	005023		DIODE PWR 1A/100V 1N4002	01	47	D
1	300008		HDR .045 SQ PST RTANG 2-PIN	J0	46	D
13	452503		JUMPER ZERO OHMS		45	
	45139		PCB SUB 2		44	
					43	D
					42	D
1	301023		SWITCH PUSH ON-OFF DPOPT	S1	41	
3	301031	24B78	SW PB DPOPT MOMENTARY	S2, 3, 4	40	
4	300050		HDR .045 SQ PST RTANG 3-PIN	J1, 2, 6, 7	39	
	300046		HDR .045 SQ PST RTANG 3-PIN	J9	38	D
2	008049		DIODE SIGNAL 1N4447	D2, 3	37	D
1	007102		FERRITE SHLD BEAD	L1	36	
2	006040		J-FET J-112	Q1, 2	35	
4	001010		IC DUAL OP AMP TL072 CP	U1, 2, 3, 4	34	
6	005913		RES CF 1/4W 5% 30K	[3]	33	
1	005926		RES CF 1/4W 5% 100K	R14	32	
1	005909		RES CF 1/4W 3% 20K	R19	31	
1	005918		RES CF 1/4W 5% 47K	R47	30	
2	005914		RES CF 1/4W 5% 33K	R30, 31	29	
3	005917		RES CF 1/4W 5% 43K	R6, 20, 22, 28	28	
1	005915		RES CF 1/4W 5% 36K	R5	27	
2	005911		RES CF 1/4W 5% 24K	R38, 39	26	
1	005904		RES CF 1/4W 5% 12K	R5	25	
4	005905		RES CF 1/4W 5% 13K	R28, 29, 35, 36	24	B
1	005902		RES CF 1/4W 5% 10K	[2]	23	
800187	PART NO.	QWG NO.	DESCRIPTION	REF DES	ITEM NO	REV
PARTS LIST						

2	005886		RES CF 1/4W 5% 10K	R26, 27	22	
1	005888		RES CF 1/4W 5% 3K	R13	21	
1	005886		RES CF 1/4W 5% 2.4K	R1	20	
	005879		RES CF 1/4W 5% 2K	R2	19	
1	005877		RES CF 1/4W 5% 1.2K	R10	18	
1	005873		RES CF 1/4W 5% 820	R7	17	
	005856		RES CF 1/4W 5% 130	R44	16	
2	005853		RES CF 1/4W 5% 100	R3, 45	15	
1	005249		RES CF 1/4W 5% 50	R7	14	
1	001508		CAP ELECT AL RAD 10/35	C27	13	
1	005153		POT 10MM SLDR RTANG 200K	R4	12	E
2	005489		POT 16MM VERT PCB 50K AHD 20%	R34, 37	11	
	005418		POT 16MM VERT PCB 50K AHD 20%	R12	10	
1	008431		DUAL POT 16MM VERT 50K	R14	9	
6	004087		CAP, CERM 10% .01UF/50	C19, 21, 22, 23, 24, 25	8	
	004030		CAP, CERM 10% .01UF/50	C9	7	
1	004046		CAP, CERM 10% .01UF/50	C6	6	
1	004080		CAP, CERM 10% .01UF/50	C17	5	
1	004013		CAP, CERM 10% .01UF/50	C4	4	
2	001351		CAP, ELECT AL RAD 10/16	C10	3	
12	001209		CAP, ELECT AL RAD 22/10	[1]	2	
800187	800187		PCB ASSY, SUBMASTER 2			
800187	PART NO.	QWG NO.	DESCRIPTION	REF DES	ITEM NO	REV
PARTS LIST						

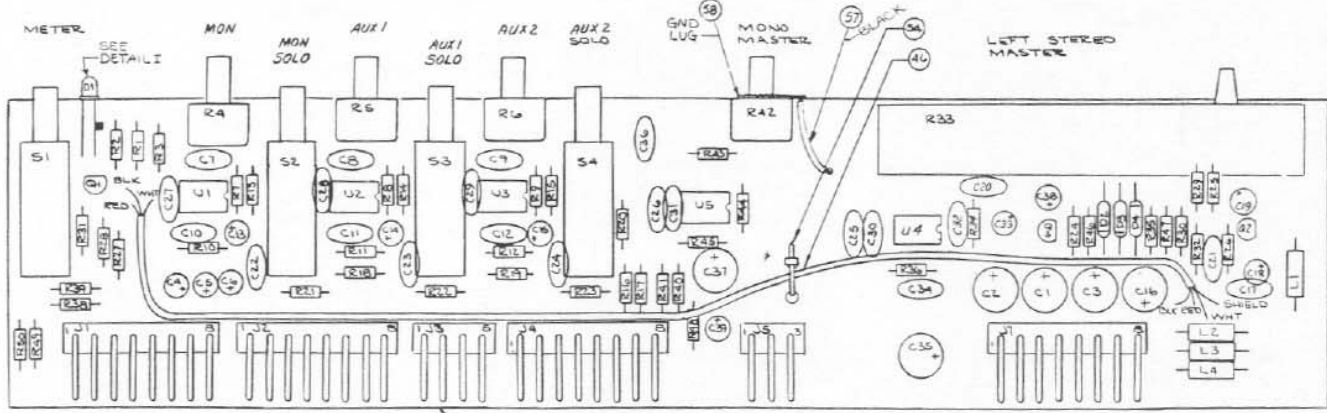
Output 1 (8000 Series)

1	303099		LUG, GROUND		58	
1	100036		WIRE, #22 AWG, BLACK, 3.6" LG.		57	
1	005453		POT SLIDE 50MM 500K R33		56	E
1	451140		PCB OUTPUT 1 1000		55	
1	600850		CABLE TIE		54	D
					53	
4	300050		HDR .045 SQ PST RTANG 3-PIN	J1, 2, 4, 7	52	
					51	
1	300047		HDR .045 SQ PST RTANG 4-PIN	J3	50	
1	300046		HDR .045 SQ PST RTANG 3-PIN	J5	49	
4	301023		SW PUSH ON-OFF VERT PCB	S1, 2, 3, 4	48	
4	009902		FERRITE SHIELD BEAD	L1, 2, 31	47	D
1	454109	24580	CABLE SHIELDED OUTPUT 1	W1	46	D
1	008064		DIODE LED ROUND RED	D1	45	
2	008049		DIODE SIGNAL 1N4447	D3, 4	44	D
1	007010		IC DUAL OP AMP TL072 CP	U4	43	
1	007012		IC OP AMP, LF356N	U5	42	
1	008022		DIODE PWR 1A/100V 1N4002	D2	41	D
3	007013		IC OP AMP NE5532	U1, 2, 3	40	
					39	
					38	
2	006040		J-FET J112	Q2, Q3	37	
1	006035		RESISTOR 51K NPN 45V 2W5962	Q1	36	
1	005926		RES CF 1/4W 5% 100K	R46	35	
					34	
3	005913		RES CF 1/4W 5% 30K	R1, 2, 3	33	
1	005917		RES CF 1/4W 5% 43K	R30	32	
1	005916		RES CF 1/4W 5% 39K	R27	31	
800187	PART NO.	QWG NO.	DESCRIPTION	REF DES	ITEM NO	REV
PARTS LIST						

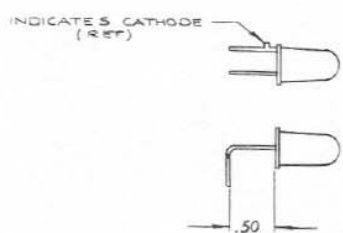
4	005915		RES CF 1/4W 5% 36K	R14, 11, 12, 29	30	B
1	005911		RES CF 1/4W 5% 24K	R44	29	
					28	
5	005909		RES CF 1/4W 5% 20K	[7]	27	B
1	005908		RES CF 1/4W 5% 18K	R16	26	
4	005904		RES CF 1/4W 5% 12K	R7, 9, 36	25	
6	005902		RES CF 1/4W 5% 10K	[6]	24	
1	005888		RES CF 1/4W 5% 5K	R35	23	
1	005886		RES CF 1/4W 5% 2.4K	R24	22	
1	005884		RES CF 1/4W 5% 2K	R17	21	D
1	005879		RES CF 1/4W 5% 1.2K	R25	20	
2	005877		RES CF 1/4W 5% 1K	R28, 34	19	
1	005873		RES CF 1/4W 5% 820	R32	18	
1	005874		RES CF 1/4W 5% 5.1K	R43	17	
1	005866		RES CF 1/4W 5% 360	R31	16	
1	005853		RES CF 1/4W 5% 100	R26	15	
7	005849		RES CF 1/4W 5% 50	[5]	14	D
					13	
4	005418		POT 16MM VERT PCB 50K AHD 20%	[4]	12	
					11	D
11	004087		CAP, CERM 20% .01UF/50	[3]	10	
1	004080		CAP, CERM 10% .01UF/50	C32	9	D
1	004046		CAP, CERM 10% .01UF/50	C21	8	
1	004037		CAP, CERM 10% .01UF/50	C36	7	
4	004030		CAP, CERM 10% .01UF/50	C34, 38, 9	6	
1	004013		CAP, CERM 10% .01UF/50	C10, 11, 22, 25	5	D
1	001505		CAP, ELECT AL RAD 10/35	C38	4	
6	001351		CAP, ELECT AL RAD 10/16	[2]	3	
10	001209		CAP, ELECT AL RAD 22/10	[1]	2	
800187	800187		PCB ASSY, OUTPUT 1			
800187	PART NO.	QWG NO.	DESCRIPTION	REF DES	ITEM NO	REV
PARTS LIST						

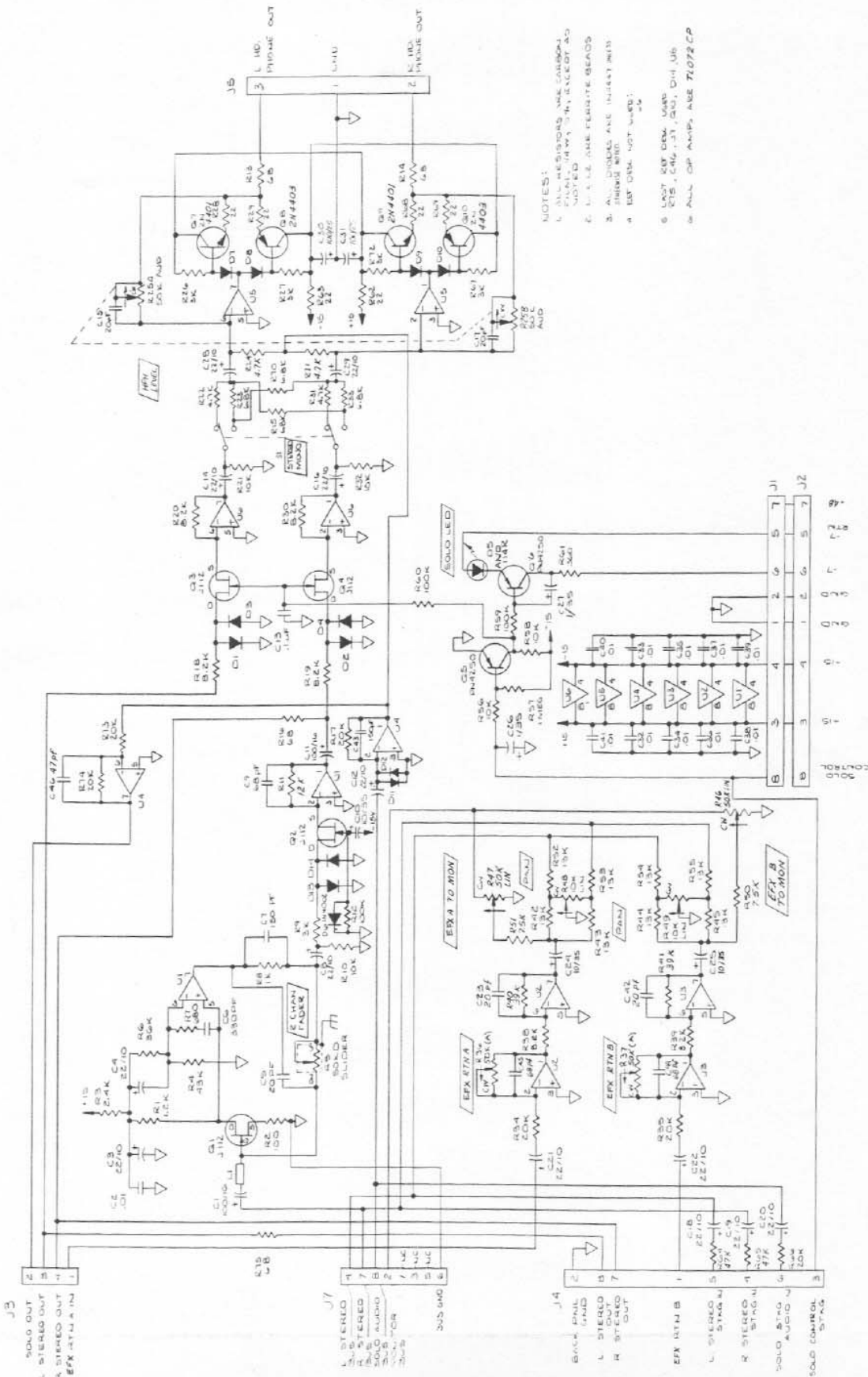


- NOTES:
1. ALL RESISTORS ARE 1/4 WATT, 5% OR AS NOTED
 - 2.
 - 3.
 4. L1 IS FERRITE BEAD PAIR TYPE + THROUGH
 5. LAST REFS USED
 6. DODGES ARE IN 4477 UNLESS OTHERWISE SPECIFIED

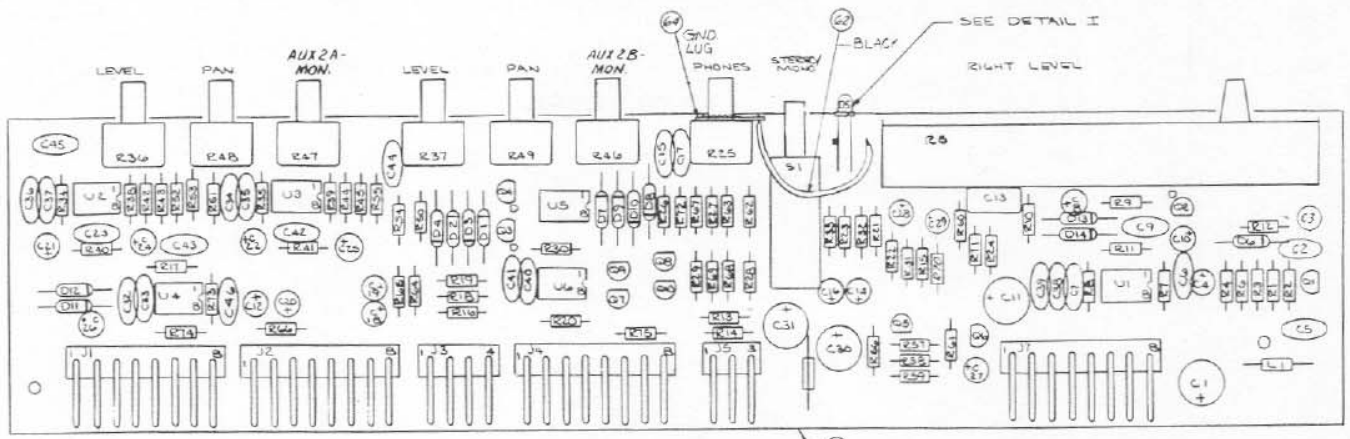


- NOTES:
- 1 C4, 5, 6, 13, 14, 15, 18, 19, 33, 39
 - 2 C1, 2, 3, 16, 35, 37
 - 3 C17, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31
 - 4 R4, 5, 6, 442
 - 5 R13, 14, 15, 45, 46, 38, 39
 - 6 R18, 19, 20, 47, 49, 50
 - 7 R40, 41, 21, 22 & 23
 - 8 REF DES NOT USED - R57, J6



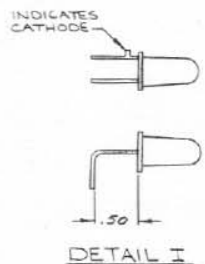


- NOTES:
1. ALL RESISTORS ARE CARBON-FILM UNLESS NOTED OTHERWISE.
 2. ALL CAPS ARE FERROELECTRIC.
 3. ALL DIODES ARE INDIUM-ANTIMONY UNLESS NOTED OTHERWISE.
 4. BEST OPERATING TEMPERATURE: 25°C.
 5. LAST 20% OF EACH BOARD IS RESERVED FOR SERVICE PARTS.
 6. ALL OP AMPS ARE TI072CP.



NOTES:

- U 1, 3, 4, 5, 12, 14, 16, 18, 19, 20, 21, 22, 28, 29
- U 2, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41
- R 42, 43, 44, 45, 52, 53, 54, 55
- R 17, 59, 53, 66, 73, 74
- R 12, 59, 60
- C 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14
- P 18, 19, 20, 30, 38, 39

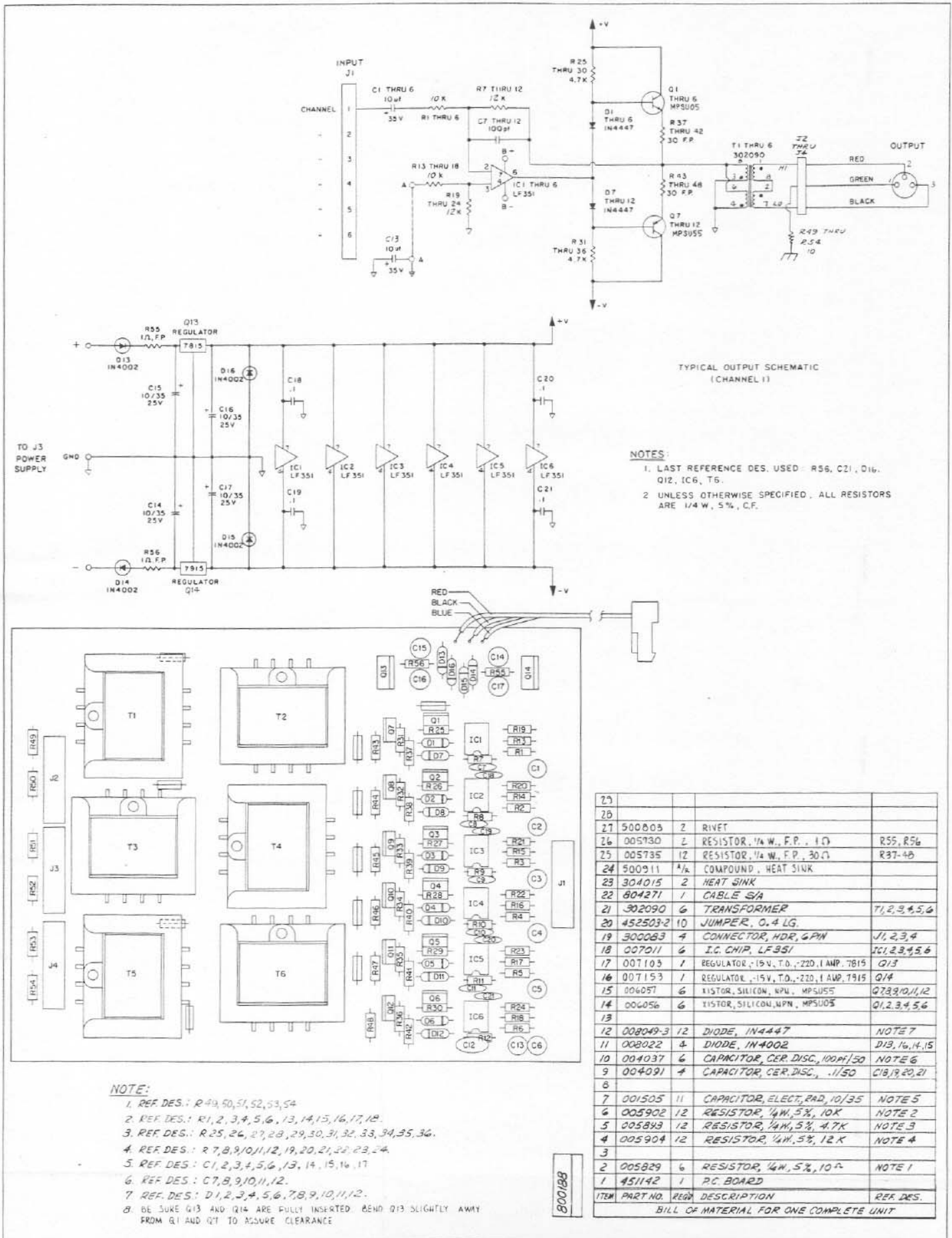


800182	PART NO	QTY	DESCRIPTION	REF DES	QTY	REV
	451141	1	PCB OUTPUT 2		67	
	452203	1	JUMPER ZERO OHM		46	D
	005453	1	POT SLIDE 5MM 50K	R5	45	E
	303099	1	LUG, GROUND		64	D
	301023	1	SW PUSH-ON/OFF VERT PCB 0.007	S1	63	
	100036	1	WIRE, #26 AWG, BLACK, 3.6' LG		62	
	300050	4	HDR 045 30 POT RTANG 8-DIN	J1, 2, 4, 7	61	
	300047	1	HDR 045 30 POT RTANG 4-DIN	J3	60	
	300046	1	HDR 045 30 POT RTANG 3-DIN	J5	59	
	007902	1	FERRITE SHLD BEAD	L1	57	
	008064	1	DIODE, LED ROUND RED	D5	55	
	008049	12	DIODE, SIGNAL IN4447	D1	54	D
	008022	1	DIODE, PWR 1A/100V IN4002	D6	53	D
	007010	6	IC DUAL OP AMP TL072 CP	U1, 2, 3, 4, 5, 6	52	
	006040	4	J-PET J-112	G1, 2, 3, 4	50	
	006041	2	XISTOR SIG NPN 2N4401	Q1, 2	49	
	006042	2	XISTOR SIG PNP 2N4403	Q3, 4	48	
	006002	2	XISTOR SIG PWR 40V 2N4250	Q5, 6	47	
	005951	1	RES CF 1/4W 5% 1MEG	R27	45	
	005926	3	RES CF 100K	R24	43	
	005917	1	RES CF 43K	R24	42	
	005915	1	RES CF 36K	R26	41	
	005918	2	RES CF 47K	R24, 65	40	
	005909	6	RES CF 20K	R24	39	C
	005903	8	RES CF 13K	R24	38	
	005893	4	RES CF 4.7K	R22, 24, 31, 37	37	
	005897	4	RES CF 6.8K	R23, 25, 33, 39	36	C
	005902	5	RES CF 10K	R26, 21, 32, 36, 38	35	D
	005849	6	RES CF 8.2K	R24	34	D
	005916	2	RES CF 39K	R20, 41	33	
	005858	3	RES CF 1/4W 5% 3K	R29, 26, 27, 47, 32	32	D
800182	PART NO	QTY	DESCRIPTION	REF DES	QTY	REV

PARTS LIST

	005856	1	RES CF 1/4W 5% 2.4K	R3	31	
	005819	1	RES CF 1.2K	R1	30	
	005877	1	RES CF 1K	R6	29	
	005873	1	RES CF 680	R7	28	
	005904	1	RES CF 12K	R11	27	
	005866	1	RES CF 360	R41	26	
	005853	1	RES CF 100	R2	25	
	005849	4	RES CF 68	R3, 14, 16, 15	24	C
	005898	2	RES CF 7.5K	R50, 51	23	
	005837	6	RES CF 1/4W 5% 22	R15, 19, 42, 43, 48, 49	22	
					21	
					20	
	005431	1	DUAL POT 6MM VERT PCB AUD 20% 50K	R25A, 25B	19	
	005416	2	POT 6MM VERT PCB AUDIO 20% 50K	R36, 37	18	D
	005489	2	POT 16MM VERT PCB 10K B C D	R48, 49	17	
	005419	2	POT 6MM VERT PCB UN 20% 50K	R46, 47	16	
	004087	11	CAP, CERAMIC 20% 01/50	C2	14	
	004080	2	CAP, CERAMIC 10% 150PF/100	C7, 43	13	D
	004046	1	CAP, CERAMIC 10% 330PF/50	C6	12	
					11	
	004030	3	CAP, CERAMIC 10% 68PF/50	C9, 44, 45	10	C
	004013	5	CAP, CERAMIC 10% 20PF/50	C5, 15, 17, 23, 42	9	
	004025	1	CAP, CERAMIC 10% 47PF/50	C46	8	
	003075	1	CAP, MYLAR 10% .1/50	C18	7	
	001506	3	CAP, ELECT AL RAD 10/35	C10, 21, 25	6	
	002019	2	CAP, TANT 20% 1/35	C26, 27	5	D
	001413	2	CAP, ELECT AL RAD 100/25	C20, 31	4	
	001351	2	CAP, ELECT AL RAD 100/16	C41, 42	3	
	001209	13	CAP, ELECT AL RAD 22/10	C11	2	
800182	PART NO	QTY	DESCRIPTION	REF DES	QTY	REV

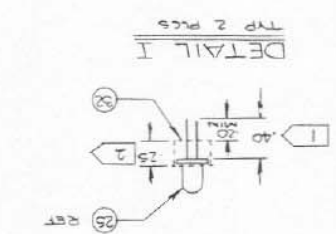
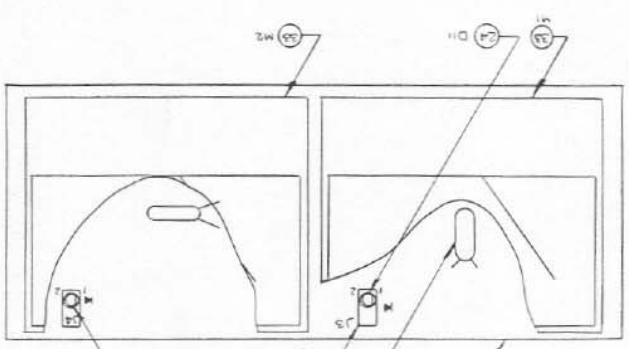
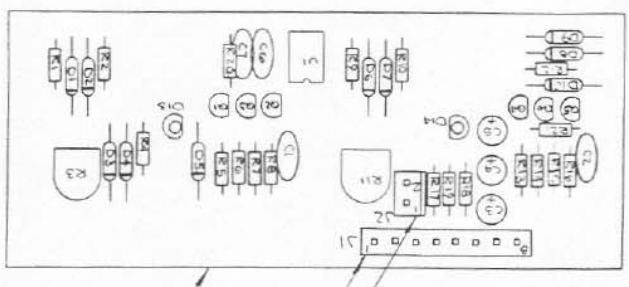
PARTS LIST



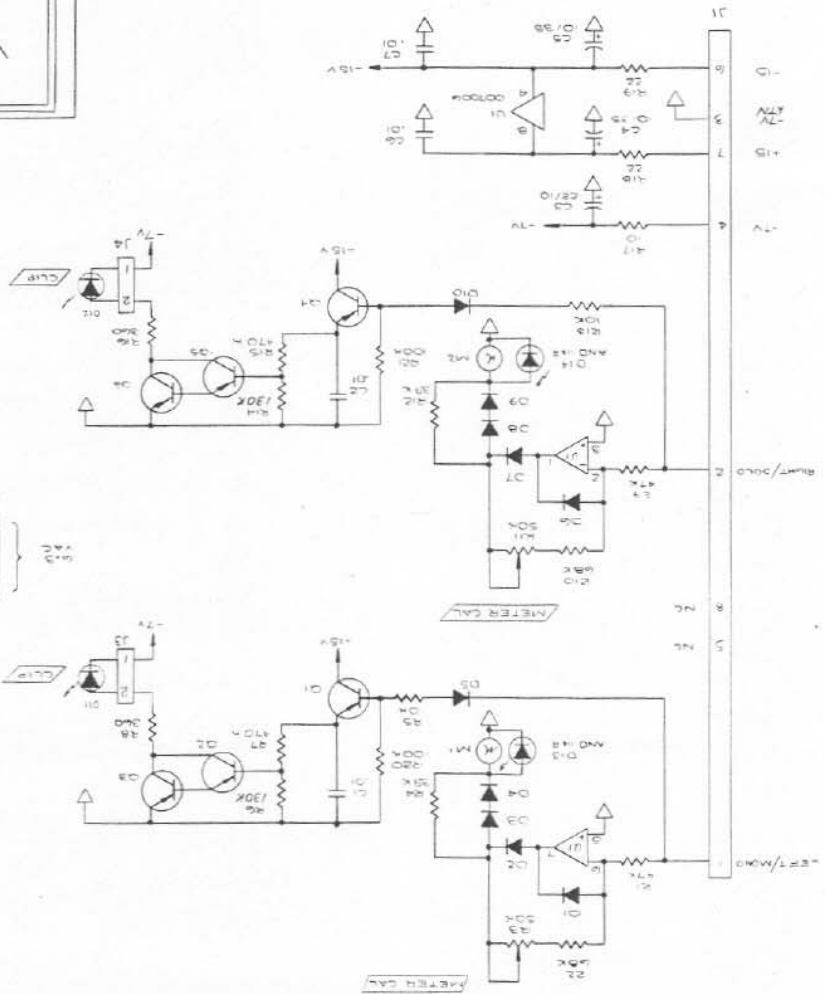
ITEM	PART NO.	REQD	DESCRIPTION	REF. DES.
23				
20				
27	500803	2	RIVET	
26	005730	2	RESISTOR, 1/4 W, F.P., 10	R55, R56
25	005735	12	RESISTOR, 1/4 W, F.P., 30Ω	R37-46
24	900911	1/2	COMPOUND, HEAT SINK	
23	304015	2	HEAT SINK	
22	804271	1	CABLE S/A	
21	302090	6	TRANSFORMER	T1, 2, 3, 4, 5, 6
20	452503-2	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, 7915	Q13
16	007153	1	REGULATOR, 15V, T.O., 220.1 AMP, 7915	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, 16, 14, 15
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%, 10Ω	NOTE 1
1	451142	1	P.C. BOARD	
ITEM	PART NO.	REQD	DESCRIPTION	REF. DES.
BILL OF MATERIAL FOR ONE COMPLETE UNIT				

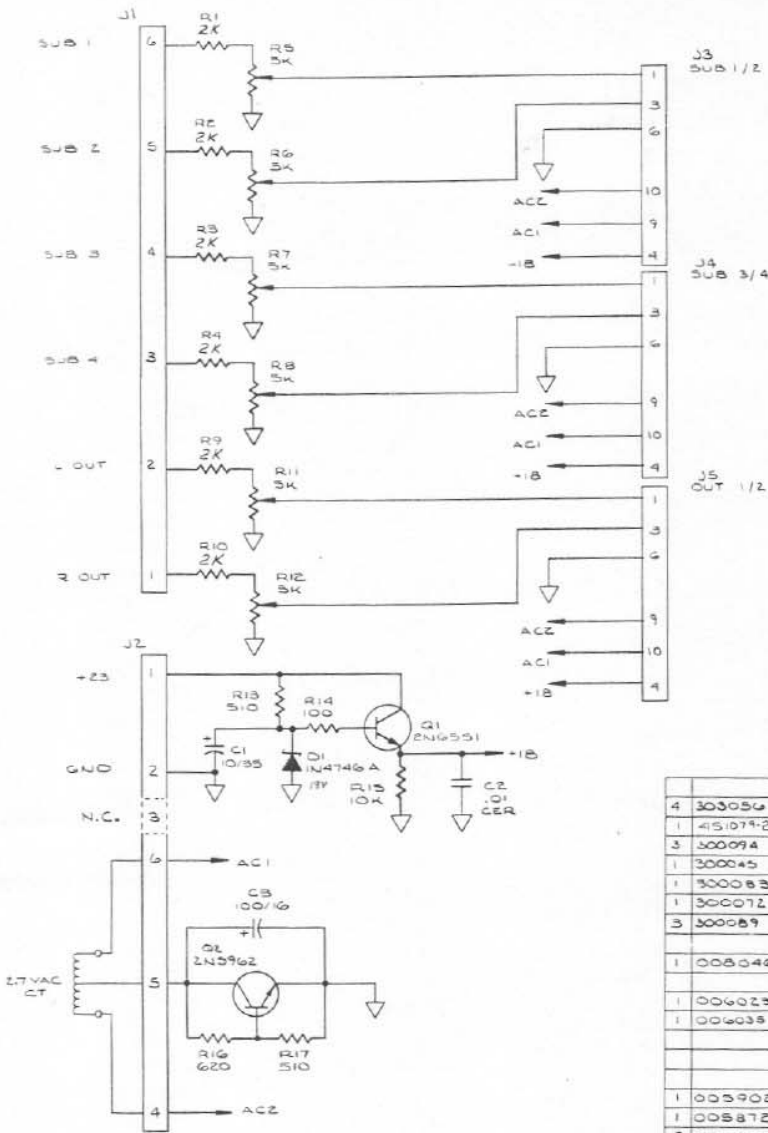
QTY	PART NO	DESCR/PTN	QTY DESG	QTY
1	800183	PCB ASSY METER BD		1
1	001209	CAP ELEC 24D	22/10	2
2	001905	CAP ELEC 24D	10/36	3
4	004081	CAP CER 10%	01/50	5
2	005442	POT PCB HOR TRIM	50K	7
1	005829	RES CF 25W 5%	10	9
2	005831	RES CF 25W 5%	22	10
2	005856	RES CF 25W 5%	360	11
2	005891	RES CF 25W 5%	39K	12
2	005902	RES CF 25W 5%	10K	13
2	005922	RES CF 25W 5%	68K	14
2	005926	RES CF 25W 5%	100K	15
2	005929	RES CF 25W 5%	130K	16
2	005942	RES CF 25W 5%	470K	17
2	005948	RES CF 25W 5%	47K	18
4	006002	TRANSISTOR 516 PNP 40V PNP250	Q1-Q4	20
1	007006	I.C. DUAL OP AMP (8 PIN DFP) TESTED U1		21
10	008049	DIODE SIGNAL	1N447	23
2	008044	DIODE LED ROUND RED T-1	D1,D2	24
2	008050	DIODE LED ROUND RED T-1 1/2	D3,D4	25
1	300059	HEADER .048 50 PFT STR 2 PIN J1		27
2	300076	CONN RECP TOP ENT .100 CTR	J2,J3	28
2	301043	LAMP INCAND 6V	D5,D2	30
1	451072	PCB METER 1200		31
2	455004	LEVEL/PEAK METER	M1,M2	33

NOTE:
 1. CUT LEADS TO DIMENSIONS SHOWN.
 2. INSTALL .25 LONG PIECE OF HEAT SHRINK OVER LED (DO NOT SHRINK) INSURE TUBING COVERS SHOULDER OF LED WHEN INSTALLED ON PCB.



NOTE:
 1. ALL TRANSISTORS ARE PNP250.
 2. ALL DIODES ARE 1N447.
 3. LAMPS ARE DL-2-81 (5011-032)
 4. LAST REF DES USED:
 C1, R21, D14, Q4, U1, J4, D52, M2



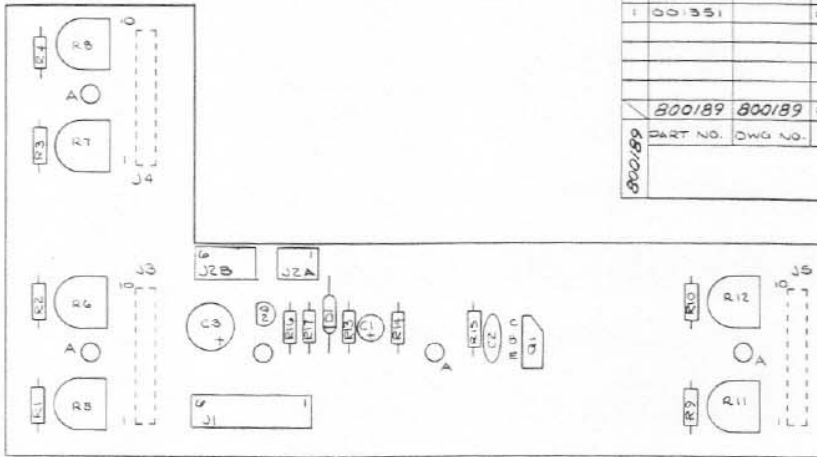


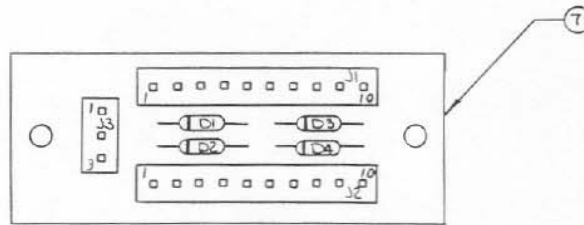
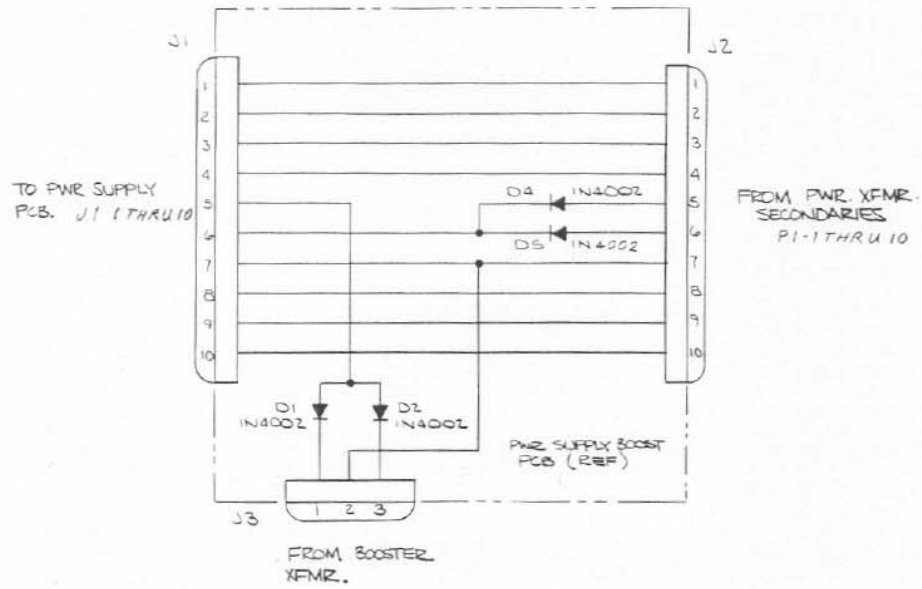
NOTES:

1. ALL RESISTORS ARE OF 1/4W, 5%.
2. LAST REF DES USED: R17, C3, Q2, Q1, J5

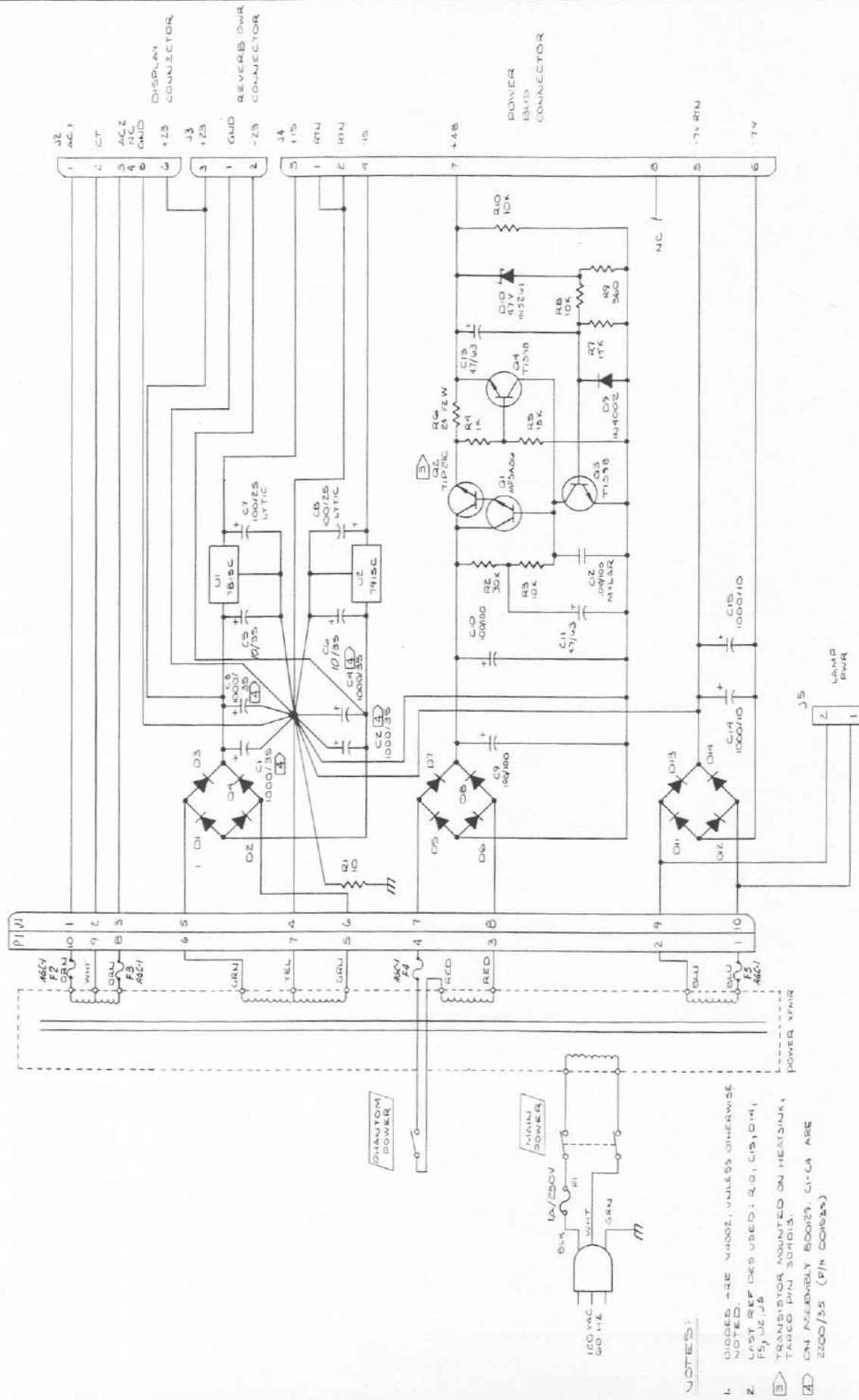
4	303056	SPACER SWAGE .125 LL		28
1	451074-2	73 C PCB, DISPLAY		26 C
3	300094	PLUG KEYING CONNECTOR		25
1	300045	HDR .045 SQ PST STR 2 PIN J2 A		24 C
1	300083	HDR .045 SQ PST STR 6 PIN J1		23 C
1	300072	HDR .045 SQ PST STR 3 PIN J2 B		22 D
3	300089	CONN, RECP PCB .00CR 0 P05 J3, 4, 5		21
				20
1	008046	DIODE, ZENER 16V 1N4746 A Q1		19
				18
1	006023	XISTOR SIL NPN MPWR 2N6551 Q1		17
1	006035	XISTOR SIG NPN 45V 2N5962 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	R1,2,3,4,9,10	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	TD/ 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, C1, D1, F1, F5, U1, J5
- TRANSISTOR MOUNTED ON HEATSINK, TAPPED P/N 304013.
 ON ASSEMBLY BOARDS, C1-CA ARE 2200/35 (P/N 001933)

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