

Head OnTM 2

PART NO.
420-0311

MANUFACTURED BY

 Gremlin[®]
Industries, Inc.

OWNER'S MANUAL

HEAD ON 2

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INTRODUCTION

This is an electronic game that makes extensive use of digital integrated circuitry and television monitor circuitry. This manual assumes the maintenance technician possesses a general knowledge of solid state circuitry, microprocessor, TTL digital integrated circuitry and T.V. monitor concepts. Any individual NOT knowledgeable in these areas SHOULD NOT attempt repair of the electronic portion of this game. IT SHOULD BE NOTED THAT ANY ATTEMPT TO REPAIR THE GAME IN THE FIELD WITHOUT EXPRESS CONSENT OF THE FACTORY WILL IMMEDIATELY VOID THE WARRANTY!!!

IMPORTANT NOTES:

- NEVER replace any components with anything other than exact replacement parts. (See Parts List located on Service Schematics.)
- NEVER remove circuit boards/connections while power is on.
- DO NOT replace the fuse with anything other than the proper value. A blown fuse indicates an overload condition within the game. Replacing the fuse with a higher value can cause severe damage to internal components if an overload occurs.
- ALWAYS consult the manual before attempting repairs.
- CORRESPONDENCE regarding this game should be addressed to:

GREMLIN INDUSTRIES, INC.

8401 Aero Drive

San Diego, California 92123

(714) 277-8700

IMPORTANT NOTE

An important service note is posted in this game and is repeated here for emphasis:

IF AT ANY TIME THE T. V. SCREEN SHOWS A MEANINGLESS DISPLAY
OR THE GAME OTHERWISE MALFUNCTIONS, SIMPLY DROP A COIN INTO
THE COIN MECHANISM. THIS SHOULD CORRECT THE PROBLEM. IF
NOT, THE GAME REQUIRES SERVICE.

The circuitry in this game has been arranged so that the insertion of a quarter through the coin mechanism will reset the system. This clears up temporary problems caused by power line disturbances, static, etc.

SERVICE TECHNICIAN NOTE:

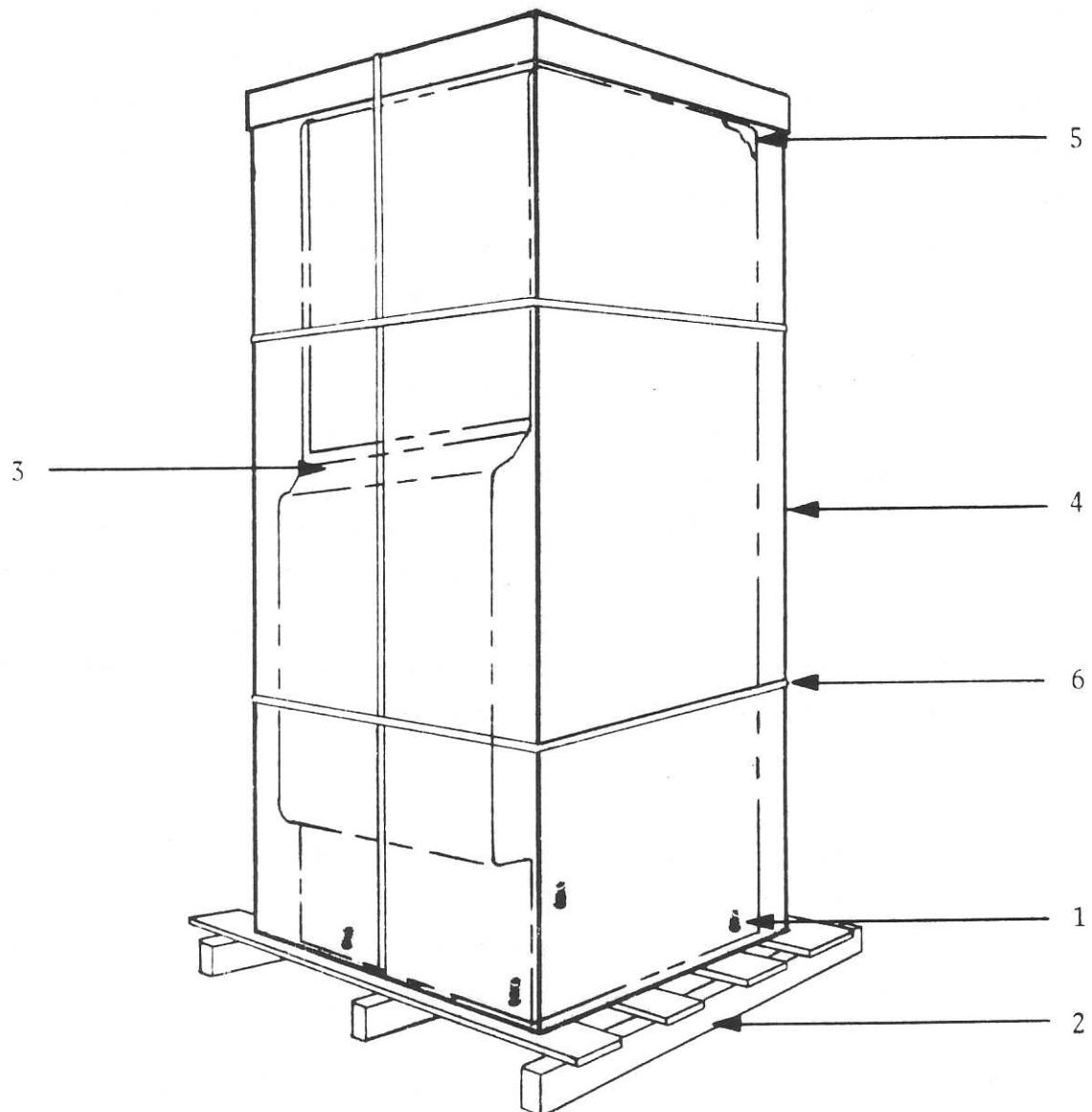
The system reset circuitry described above requires that the coin counter is attached to the system. If there is a coin counter problem and no replacement is available, the game will function properly if a 10K Ohm resistor is connected across the coin counter input pins to the video logic board.

REPACKAGING INSTRUCTIONS

Should it be necessary to ship this game, follow the instructions below for game recrating:

- A) If the original shipping bolts have been discarded (Ref.1), obtain four 5/16-18x1 3/4" hex head bolts with 5/16" flat washers. Carefully lay the game on its side and attach skid (Ref.2).
- B) Place game upright. Tape game keys to upper flange of operator's panel (Ref.3). Crate the game using appropriate shock-absorbent packing material (Ref.4). Include padding on all four corners of the game (Ref.5). After crating is completed, secure package with strapping (Ref.6).

NOTE: If the game is to be shipped to GREMLIN for service or repair, attach a tag identifying the distributor and indicate the service or repair to be made; include the full serial number of the game. GAME MUST BE SHIPPED PREPAID.



HEAD ON 2-GAME CONCEPT

The most noticeable change on Gremlin's new HEAD ON 2 game, is the addition of two turn-around lanes on either side of the screen. With these turn-around lanes, HEAD ON 2 becomes a different game, even more challenging and exciting.

The game begins by displaying the following information on the screen:

BONUS
200
POINTS PER ... = 5
POINTS PER ♦♦ = 10

The computer's car and the player's car start at the bottom of the screen. When the player clears all lane markers against one computer car, he is awarded the 200 BONUS points and then is pitted against 2 computer cars. After clearing the lane markers again, 3 computer cars appear. Finally, 4 computer cars are the maximum amount that drive against the player. Each time a player clears all lane markers, the BONUS POINTS value is increased, so that more bonus points are awarded for beating 2 computer cars than for beating 1. In addition, the POINTS PER dot/diamonds values increase each time the bonus is awarded.

In HEAD ON 2, the player now has a few more lane options open to him in order to gain the most points and avoid a collision with the computer car. For example, if the player reverses his car's direction by passing through a turn-around lane, he then becomes either the pursuer or the pursued. If he is pursued by the computer car, the player must be careful to avoid a rear-end collision. If the player is following a computer car, he must again watch for a possible rear-end collision into the computer car. The different possibilities are what makes HEAD ON 2 an even more challenging and strategy-demanding game.

Also, each game is different from the next. While it is tempting to find a winning pattern, the game will not necessarily respond the same way every time. Because of the varied combination of action, a working pattern for one game may not work for the next. This feature will keep them playing game after game; and, each time, new video excitement is there for all players.

Refer to the OPTIONS section of this manual for instructions on changing the number of player cars.

MAINTENANCE PROCEDURES- HEAD ON 2

I. POWER SUPPLY (refer to drawing #815-0020, sheet 4)

1. Remove output connectors from power supply.
2. Make these initial tests: (GND to BLACK lead on c18, 9000 mfd capacitor)
 - a) +9 V DC on POSITIVE terminal of C18
 - b) +17-19 V on C6 (4700 mfd. cap.)
 - c) -17-19 V on C5 (4700 mfd. cap.)
 - d) -12 V at pin 11 (adjustable by trim pot R42)
 - e) +12 V at pin 12 (adjustable by trim pot R8)
 - f) +5 V at pins 18-20 (adjustable by trim pot R9)
 - g) GND (ground, 0 V) at pins 14-16
 - h) 2-3 V AC at pin 13 (Don't forget to change meter scale to AC)
3. Check these voltages again with the logic board connected. If any are wrong, a loading problem exists in the logic board, most likely.
Possible causes of a short on the logic board could be: U73, C21, C25, or C26.

II. SOUND BOARD (refer to drawing #822-0002, sheet 6)

1. If no sounds are produced:

- a) check connections between logic board (labelled "Sound Out") and Sound board (pins 1 through 14) and between the Sound board and the Power Supply.
- b) If they are good, check IC U16 on the logic board, pins 2,5,6,9,12, 15,16, and 19 for outputs when each sound is produced.
- c) If the outputs are present, check the output of the sound board, pin 5. If the signals are present here (use an oscilloscope for best results) check the amplifier circuit on the power supply, specifically, U4, Q8, and Q9.

2. If some sounds are produced, but not all:

- a) repeat steps a and b, above.
- b) If these prove OK, check the specific circuit for each sound:

SOUND TYPE:	SOUND BOARD PIN #:	CHECK THESE PARTS:
Crash	Pin 1	Q2, U2, U1, U13
High Speed (computer car)	Pin 2	Q8, U9, U8, U7
Car on	Pin 3	Q9, Q6, U9, U12, Q10, U6, U5

MAINTENANCE PROCEDURES- cont'd.

High Speed (player car)	Pin 4	Q12, Q10, U12, U6, U5
Screech #1	Pin 6	Q14, U10, D7
Screech #2	Pin 7	Q13, U10, D6
Bonus	Pin 8	Q5, U4, U10, D8, C19

III. LOGIC BOARD (refer to drawing #822-0001, sheets 4,5, and 6)

1. Game does not reset at power on: (see sheet 5)
 - a) check connector pin 3 on logic board for 3 V AC signal. Also, check Q10, Q11, U55, U54, and U71.
2. No video: (see sheet 5)
 - a) check U48 (part #315-0042) for video signals. Also, check U41, Q6 and Q7 for the video signals.
3. Game does not coin: (see sheet 5)
 - a) Check coin switch connections to the logic board; make sure the coin switch is wired correctly.
 - b) Check U12, pins 3 and 11 for a pulse each time the coin switch is activated. Also, check U11 and U13.
 - c) Check also for the 4 msec. pulses at pin 7 of U10. These pulses serve as timing for the video circuit. Check also pin 5 of U11; pin6, U13.
 - d) If a game is started only occasionally when a coin is deposited, the coin switch wire may need to be adjusted for a lighter, or heavier, tension.
 - e) If the coin counter does not activate, check U12, pin 3 for a pulse each time the coin switch is activated; also, check Q1 and Q2. (see sheet 5)
4. No Ø1 clock pulses to the microprocessor: (see sheet 4)
 - a) check for pulses at the crystal, Y1.
 - b) check for pulses at pin 6 of U68; at pin 6 of U49; and at pin 4 of U54.
5. No player control: (see sheet 5)
 - a) make sure the player control connections from the switches to the

MAINTENANCE PROCEDURES- cont'd.

logic board are intact. Ensure that each switch is connected.

- b) If these are good, check for an output from U1 as you push each switch.

6. Random display on the screen:

- a) If the screen shows what appears to be a meaningless display, and it cannot be cleared by activating the coin switch, several different parts of the circuit should be considered:

One or more RAM's, U56 through U63 (sheet 5)

One of the programmed IC's, or EPROM's (sheet 6) Check their sockets.

The reset circuit is not working. (see #1, above)

The microprocessor is bad. (sheet 4)

Data or address bus problem (e.g. U33 or U34, sheet 4, could be bad)

TRANSFORMER VOLTAGE CONVERSION INSTRUCTIONS:

To convert the game transformer to 100, 115, or 230 VAC, refer to the following chart:

For 100 Volts: Connect the voltage INPUT lines to terminals 1 and 2 on the transformer.

For 115 Volts: Connect the voltage INPUT lines to terminals 1 and 3.

For 230 Volts: Connect the voltage INPUT lines to terminals 1 and 4, with terminal 3 connected to the LAMP circuit.

Also, the TV monitor must be converted to the same voltage input as the game transformer. Refer to the monitor manual included in the game.

OPTIONS SELECTION CHART: To select the desired number of player cars. (Locate logic board connector labelled 'P3').

# of Cars	Pin 1	Pin 2
4	HI	HI
5	LO	HI
5	HI	LO
6	LO	LO

Gremlin Industries, Inc.		PARTS LIST	TITLE	TOP ASS'Y HEADON 2	722-0013	SH / OF 9	A REV
			DRAWN	S. MAGNOLIA	ENG R		
		CHECK	<i>John J. Foy</i>	10-2-79	APPR		
LTR	DATE	REVISION DESCRIPTION			DRAFT	CHECK	APPR
A	9-27-79	RELEASED			10-2-79	MAGNOLIA	<i>JF</i>

Gremlin Industries, Inc. San Diego, California 92123		PARTS LIST	TITLE MELT DOWN ASSY	722-00013	SH 2 OF 9	A REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION	REF DES		
1	200-0054	1	SPEAKER GAME BOX			
2	130-0002	1	SPEAKER COVER BOX			
3	140-0021	1	COVER JUNCTION BOX			
4	140-0033	1	CABINET HEAD ON 19"			
5						
6	200-0011	1	MONITOR COLOR 19" ALGOL			
7	252-0075	1	MONITOR BOARD			
8						
9	822-0035	1	ASSY COIN MECHANISM			
10	210-0011	2	CONN INSUL BUTT SPLICE			
11	250-0032	1	FRAME BEZEL			
12	250-0034	1	SPRING RETAINER			
13	250-0038	1	MOLDING STRIP			
14	250-0048	1	CLIP SWITCH			
15						
16	250-0356	2	BRACKET MONITOR SUPP.			
17	181-0031	1	CHOKE 250W 2.5A			
18	156-0001	1	CAD 0.474, 100V			
19	253-0105	1	PANEL LOGO GRAPHIC			
20	253-0104	1	MONITOR PLEXIGLASS			
21						
22						
23	390-0011	1	LAMP FLOR.			
24	280-0004	25	CLIP WIRE HOLD DOWN			
25						

Gremlin Industries, Inc. San Diego, California 92123		PARTS LIST	TITLE TOP ASS'Y HEAD ON 2	722-0013	SH 3 OF 9	A REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION	REF DES		
26	280-0005	1	CABLE TIES			
27	280-0010	4	WIRE NUT			
28						
29						
30	800-0052	1	ASS'Y FLOR LAMP 18"			
31						
32	420-0028	1	S/N DECAL			
33	420-0030	1	DECAL CAUTION 115 V			
34	420-0038	2	IMPORTANT NOTE			
35	420-0040	1	DECAL RE-CYCLE			
36	420-0041	1	DECAL S/N SMALL			
37	420-0060	1	DECAL TIP-N-TELL			
38	420-0071	1	UNCRATING INSTRUCTIONS			
39	420-0110	1	WRAPAROUND SIDE			
40	420 0117		TOP COVER			
41	420-0124	4	CORNER STRIP			
42	420-0294	1	MANUAL ALSO 19" COLOR			
43	420-0307		GRAPHIC LEFT SIDE			
44	420-0308		GRAPHIC RIGHT SIDE			
45	420-0309		GRAPHIC INTERIOR			
46	420-0310	1	DECAL CARTON			
47	420-0311	1	MANUAL HEAD ON			
50	807-0009	1	JUNCTION BOX			

Gremlin Industries, Inc. San Diego, California 92113		PARTS LIST		TITLE <i>TOP ASSY HEAD ON 2</i>		722-0013 DWG NO		SH 4 OF 9	A REV
ITEM NO	PART NO	QTY PER ASSY		DESCRIPTION				REF DES	
51	800-0029	1		HARN ASSY GROUND CABLE					
52									
53	815-0020	1		ASSY GAME PWR SUPPLY					
54									
55									
56									
57	822-0002	1		ASSY SOUND BOARD					
58	822-0034	1		CONTROL PNL ASSY COMP.					
59	822-0031	1		LOGIC BOARD					
60									
61									
62									
63									
64	822-0021	1		ASSY HARN MONITOR JUMPER					
65	822-0022	1		ASSY HARN GROUND CABLE					
66									
67		1		PALET HEAD-ON					
68		6		MACH SCR #8-32 X 2 SLOT HD					
69		4		PHL PAN HD SCR #6-X 3/8 SHT MTL					
70		7		SCR #6 X 1/2 PHL PAN HD SHT MTL					
71		4		SCR #8-32 X 1 1/2 SLOT HD					
72		2		NUT HEX #10-32					
73		4		SCR #8-32 X 1 1/2 SLOT HD					
74		14		BOLT C DRILL 1/16E 10-24 X 1 3/4					
75		6		SCR 10-32 X 1.0 PHL PNU HD					

Gremlin Industries, Inc. San Diego, California 92113		PARTS LIST	TITLE TOP ASSY HEAD ON 2	722-0013 DWG NO	SH 5 OF 9	A REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION			REF DES
76	6					WASHER LOCK SPLIT #10
77	10					WASHER FLAT #8
78	10					WASHER LOCK SPLIT #8
79	12					WASHER FLAT #10
80	6					NUT HEX 10-24
81	10					NUT 1-4EX 8-32
82	8					NUT WING 10-24
83						
84						
85	24					ZIP CORD

Crownhill Industries, Inc. See Price, Current on page		PARTS LIST	TITLE POWER	QTY PER ASSY - SUPPLY	ASSY - SUPPLY	DWG NO	SH 1 OF	B REV
ITEM NO	PART NO	DESCRIPTION			REF DES			
1	170-00082	1	PCB - POWER SUPPLY					
2	150-00019	2	CAP E 4700 μ F, 25V		C5, C6			
3	151-00001	1	CAP. CER .05UF, 50V		C11			
4	151-00002	2	CAP. CER 100PF, 50V		C17, C19			
5	151-00008	1	CAP. CER .001 μ F, 50V		C10			
6	151-00111	3	CAP. CER .01 μ F, 50V		C12, C14, C16			
7	151-00112	1	CAP. CER. .1 μ F, 50V		C3			
8	153-00001	5	CAP. TANT 10 μ F, 25V		C1, C2, C7, C13, C15			
9								
10	212-00003	2	CONN M 10 PIN					
11	212-00004	2	CONN M 4 PIN					
12								
13	313-00001	1	IC LM1713		U3			
14	313-00004	3	IC LM741EN		U1, U2, U4			
15								
16	471-0101	1	RES 100 Ω , 1/2W, 5%		R15			
17	471-0102	10	RES 1K Ω , 1/2W, 5%		R5, 17, 20, 22-24, 35, 36, 38, 39			
18	471-0103	4	RES 10K Ω , 1/2W, 5%		R1, R14, R21, R37			
19	471-0104	1	RES 100K Ω , 1/2W, 5%		R33			
20	471-0122	1	RES 1.2K Ω , 1/2W, 5%		R18			
21	471-0152	2	RES 1.5K Ω , 1/2W, 5%		R13, R16			
22	471-0272	5	RES 2.7K Ω , 1/2W, 5%		R7, R25, R26, R43, R46			
23	471-0332	1	RES 3.3K Ω , 1/2W, 5%		R32			
24	471-0471	2	RES 470 Ω , 1/2W, 5%		R34, 40			
25	471-0473	2	RES 47K Ω , 1/2W, 5%		R44, R45			

Creative Instruments, Inc. Am. Stage, Camera & Sound		PARTS LIST	TITLE PC ASSY - POWER SUPPLY	815-0021 DWG NO	SH 3 OF	B REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION		REF DES	
26	471-0562	1	RES 5.6K Ω , $1/2W, 5\%$		R12	
27	472-0025	4	RES 0.5, 1W, 5%		R4, R29-R31	
28	473-0021	1	RES 0.1, 5W, 3%		R28	
29						
30	475-0004	1	POT 1K TRIMMER	R9		
31	475-0005	2	POT 2K TRIMMER	R8, R42		
32						
33	481-0004	4	DIODE MPSO1		D1-D4	
34	481-0006	2	DIODE IN914		D7, D8	
35	481-0008	1	DIODE ZENER 1N5231		D10	
36						
37	482-0006	3	TRANSISTOR 2N4403	Q1, Q3, Q4		
38	482-0013	1	TRANSISTOR TIP110	Q6		
39	482-0014	2	TRANSISTOR 2N4401	Q2, Q5		
40	482-0015	1	TRANSISTOR TIP115	Q7		
41	482-0016	2	TRANSISTOR TIP29	Q8, Q9		
42						
43	471-0133	1	RES 13K OHMS $1/2W 5\%$	R41		
44						
45	815-0020		REF SCHEMATIC			
46						
47						
48						
49						
50						

GREMLIN IND INC SAN DIEGO CA. 92123		PARTS LIST	TITLE ASSY,POWER SUPPLY		815-0020 DWG NO	SH 1 OF 4	A REV								
RELEASED DESIGN		DRAWN	LEE J. LIPTAK		ENGR										
		CHECK	<i>Ken H. Liptak</i>		APPR										
LTR	AUTH	REVISION DESCRIPTION		DRAFT	CHECK	APPR									
A		RELEASED		<i>Lee J. Liptak</i>	2/1/78	END.									
SHT. 3 IS "D" SIZE SHT 4 IS 'C' SIZE															

GREMLIN IND. INC. SAN DIEGO CA. 92123		PARTS LIST		TITLE ASSY, POWER SUPPLY		815-0020 DWG NO		SH 2 OF 3	A REV
ITEM NO	PART NO	QTY PER ASSY		DESCRIPTION				REF DES	
1	140 - 0015			1	CHASSIS, POWER SUPPLY				
2	150 - 0022			1	CAP, E, 9000 μ F 12V				
3	211 - 0005			9	CONN CRIMP LOCK				
4	211 - 0007			1	CONN, KEY, POLARIZING				
5	211 - 0017			4	CONN, QUICK, 1/4" FEM				
6	211 - 0019			2	CONN, SPADE LUG 1/4"				
7	212 - 0016			1	CONN FEM 10 PIN				
8	213 - 0006			1	SOCKET, TO-3				
9	280 - 0014			4	STAND-OFFS, CLIPS				
10	280 - 0056			1	CLAMP, CAP. VRA 1 1/2"				
11	481 - 0009			1	DIODE, MDA 3500				
12	482 - 0007			1	IXISTOR, 2N3055				
13	560 - 0003			1	XFMR, MODEL 9-10345B				
14	815 - 0021			1	POWER SUPPLY ASSY (PCB)				
					SCHEM. ASSY. PWR. SUPP.	(REFERENCE)			
15				5	SCREW-MACH P.HD #6-32 X .5				
16				4	NUT HEX #6-32				
17				4	SCREW-MACH RD, HD #4-40 X .37				
18				4	NUT HEX #4 - 40				
19				4	RIVET, POP 3/16				
20				4	SCR, MACH, HEX, WAS, HD 1/4-20 X 5/8"				
21				1	SCR, MACH, P.HD. #6-32 X 1.0"				

Greenline Industries, Inc. San Diego, California 92103		PARTS LIST	TITLE HEAD ON SOUND IND	822-0002	SH / OF C	B REV
SHT 5 & 6 "D" SIZE			DRAWN <i>W. J. B.</i> CHECK <i>J. W. B.</i>	11-9-78	ENGR	
LTR	DATE	REVISION DESCRIPTION		DRAFT	CHECK	APPR
A	1-8-79	RELEASED		<i>WJB</i>	<i>WJB</i>	
B	1-25-79	ECN 273 ADDENDUM 273 2-12-79		<i>WJB</i>	<i>WJB</i>	

Gretsch Industries, Inc. San Diego, California 92111		PARTS LIST	TITLE HEAD ON SOUND	822-0002 DWG NO	SH 2 OF 6	B REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION	REF DES		
1						
2	151-0011	6	CAP CER .01 μf 50V	C8, C17, C22, C21, C22		
3	151-0012	4	CAP CER .1 μf 50V	C5, C12, C26, C27		
4	152-0001	3	CAP FILM .1 μf 100V	C31, C20, C25		
5						
6	152-0012	3	CAP FILM .047 μf 200V	C2, C23, C24		
7	152-0018	3	CAP FILM .01 μf 250V	C3, C6, C19		
8	152-0020	3	CAP FILM .47 μf 100V	C1, C18, C16		
9	153-0001	7	CAP TANT 10 μf 25V	C10, C11, C28-C30, C33, C34		
10	153-0002	2	CAP TANT 1 μf 25V	C4, C9		
11	153-0003	2	CAP TANT 2.2 μf 25V	C14, C15		
12	153-0004	1	CAP TANT 4.7 μf 25V	C7		
13	170-0154	1	PCB HEAD ON SOUND			
14	212-0031	1	CONN M 12 PIN	P1		
15	313-0004	1	IC LM741 EN DIP	U3		
16	313-0008	1	IC LM348 DIP	U1		
17	314-0001	5	IC NE555 DIP	U2, U4, U9, U12, U14		
18	315-0005	4	IC 4013	U5-U8		
19	315-0009	1	IC 4081	U11		
20	315-0035	1	IC MM5837	U13		
21	315-0043	1	IC 4069	U10		

Gremlin Industries, Inc. San Diego, California 92123		PARTS LIST	TITLE HEAD ON SOUND	DWG NO	SH 3 OF 6	B REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION	REF DES		
22	471-0101	2	RES 100 OHM 1/2 VN 5%	R23	R32	
23	471-0102	10	RES 1K OHM 1/2 W 5%	R4,R5,R8,R14,R22,R35		
24	471-0103	16	RES 10K OHM 1/2 W 5%	R45,R55,R72,R48		
25	471-0104	17	RES 100K OHM 1/2 W 5%	R10,R12,R13,R25,R43,R46,R50,R56-R60		
26	471-0105	3	RES 1 MEG OHM 1/2 W 5%	R64,R67,R68,R75		
27	471-0124	4	RES 120K OHM 1/2 W 5%	R47,R51,R63,R66		
28	471-0153	2	RES 15K OHM 1/2 W 5%	R1,R2		
29	471-0154	1	RES 150K OHM 1/2 W 5%	R39		
30	471-0220	1	RES 22 OHM 1/2 W 5%	R49		
31	471-0224	1	RES 220K OHM 1/2 W 5%	R40		
32	471-0394	8	RES 390K OHM 1/2 W 5%	R26-R31,R44,R73		
33	471-0472	3	RES 4.7K OHM 1/2 W 5%	R36,R52,R74		
34	471-0473	1	RES 47K OHM 1/2 W 5%	R33		
35	471-0474	2	RES 470K OHM 1/2 W 5%	R9,R11		
36	471-0682	2	RES 6.8K OHM 1/2 W 5%	R53,R54		
37	475-0006	2	POT 100K	R6,R7		
38	481-0006	8	DIODE IN914/IN4148	DI-D8		

Creative Industries, Inc. 2000, 2001, 2002		TITLE ASSY BASE/C V.I.C. BD.		800-0031		SH / OF B	REV C
5HIT 5,6,7,8 "D" S/ZE		DRAWN W. J. FAY	11-20-78	DWG NO ENGR			
CHECK W. J. FAY		12-22-78	APPR				
LTR	DATE	REVISION DESCRIPTION		DRAFT	CHECK	APPR	
A	12-22-79	RELEASED		WJB	WJB		
B	5-10-79	CHG'D PER ECN 310		SB	SB		
C	7-5-79	CHG'D PER ECN 318 & 321		8-8-79	WJB		

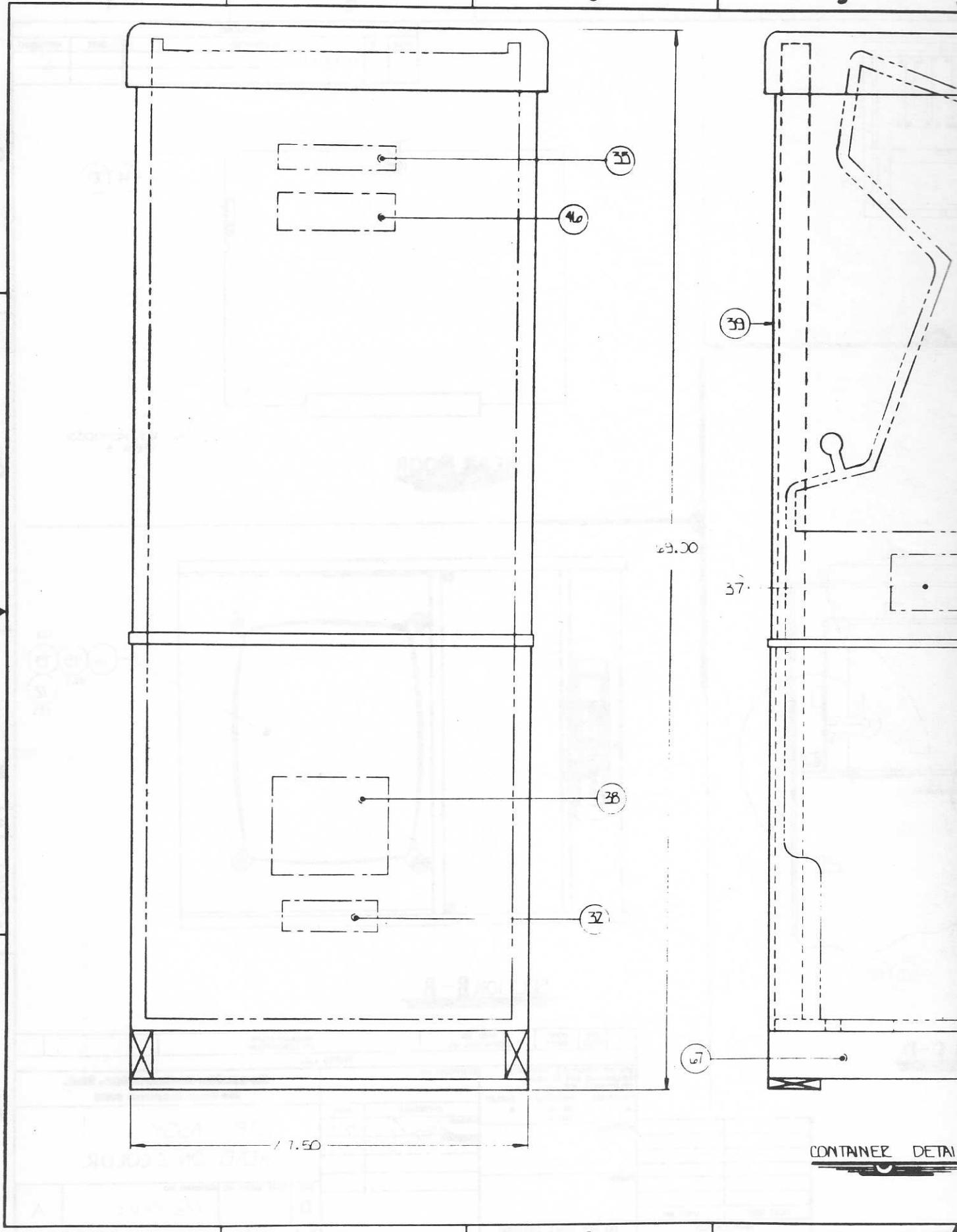
Crownline Industries, Inc.
San Diego, California 92103

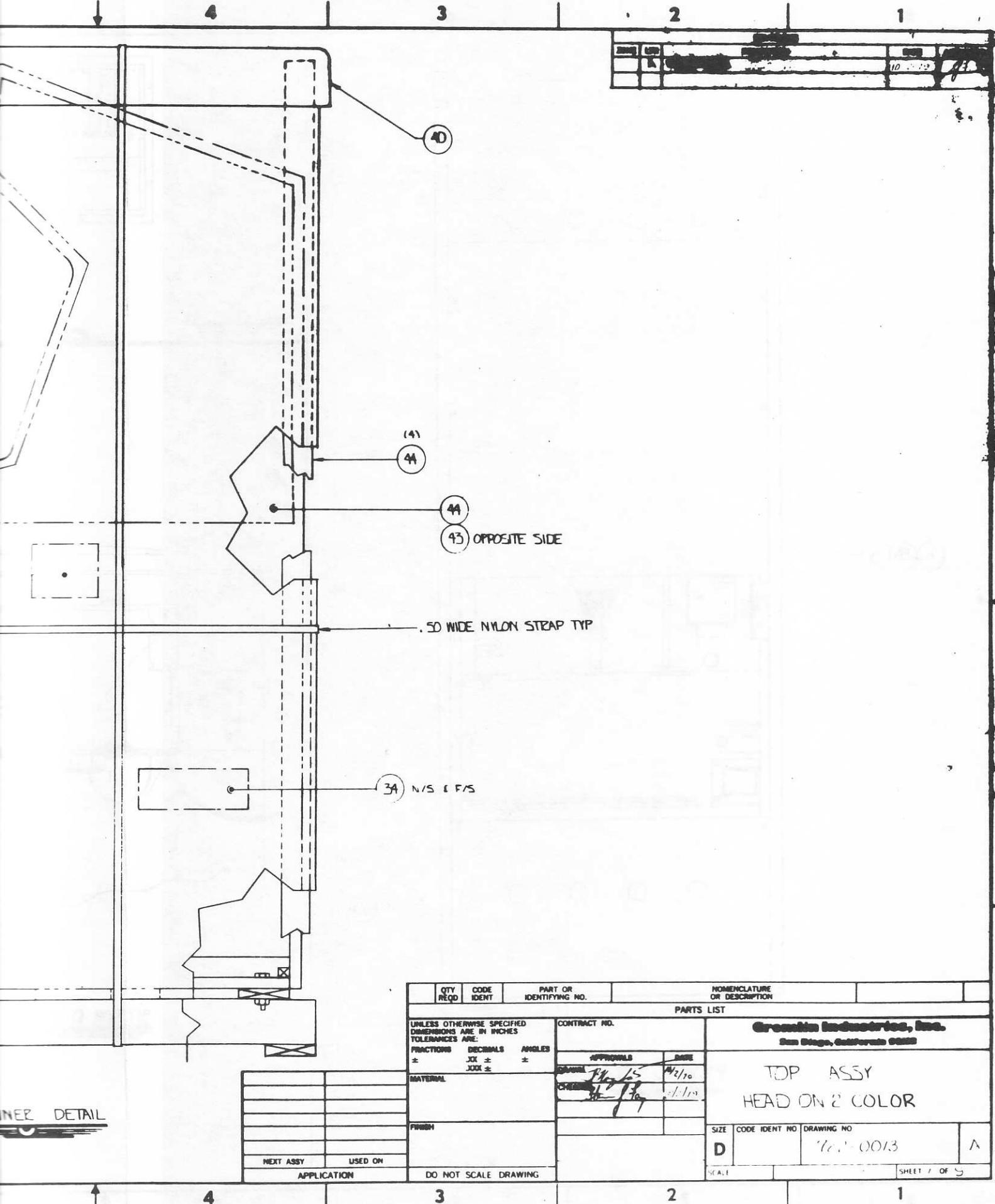
PARTS LIST	PART NO	QTY PER ASSY	TITLE ASSY BASIC U.I.C.B.D.	DWG NO	SH 2 OF 8	REV C
1 151-00005	1		CAP CER 680pf 50V	C39		
2 151-00122	54		CAP CER .1 μf 50V	C35,7-11,13-17,22,25,		
3				C27-38, C40-67		
4 152-00001	1		CAP FILM .1 μf 100V	C4		
5 152-00117	1		CAP FILM .33μf 100V	C24		
6 153-00001	6		CAP TANT 10 μf 25V	C12,20,21,23,26,68		
7 153-00002	1		CAP TANT 1 μf 25V	C19		
8 151-00111	2		CAP CER .01μf 50V	C69, C70		
9 170-01500	1		PCB C.V. LOGIC			
10						
11 211-00004	7		CONN PIN TEST PT	TP1-TP4, IND		
12 212-00063	4		CONN M 4 PIN PLZD			
13 212-00221	7		CONN M 10 PIN			
14 212-00231	2		CONN M 12 PIN			
15 213-00003	4		SKT 14 PIN DIP	XU14, 30, 69, 70		
16 213-00001	8		SKT 24 PIN DUAL INLN	XU20-XU27		
17 213-00004	18		SKT 16 PIN DUAL INLN	XRP2, XU5-8, 33, 34, 44,		
18				XU56-63, 65, 66		
19 213-00005	2		SKT 40 PIN DUAL INLN	XU48, XU53		
20 213-00008	7		SKT 20 PIN DUAL INLN	XU-3, 15, 16, 19, 28		
21 213-00111	2		SKT 22 PIN DUAL INLN	XU17, XU18		
22 213-00100	1		SKT 8 PIN DIP	XU9		
23 230-00009	1		XTAL CLK 15.46848	Y1		
24 313-00233	1		IC 320T-5.0	U73		
25 314-00001	2		IC NE 555	U10, U55		

Circutronics, Inc.
Sun Stage, California 90290

PARTS LIST		TITLE ASSY BASIC V.I.C.BD.		DWG NO	SH 3 OF 8	C REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION	REF DES		
26	314-0015	1	1C 7404	U54		
27	314-0018	3	1C 74LS00	U4, U12, U32		
28	314-0019	2	1C 74LS04	U35, U64		
29	314-0040	3	1C 74LS125	U13, U46, U47		
30	314-0046	1	1C 74LS04	U68		
31	314-0073	3	1C 74LS175	U45, U49, U50		
32	314-0055	2	1C 74LS244	U1, U19		
33	314-0058	6	1C 74LS08	U29, 37-39, 41, 71		
34	314-0059	1	1C 74LS10	U52		
35	314-0061	1	1C 74LS42	U40		
36	314-0062	4	1C 74LS74	U11, U31, U67, U72		
37	314-0078	1	1C 74LS02	U36		
38	314-0092	2	1C 8216	U33, U34		
39	315-0039	8	1C 4K RAM 12V	U56 - U63		
40	315-0031	1	1C 280 MK 3880	U53		
41	314-0086	1	1C 74LS163	U66		
42	314-0093	1	1C 74LS374	U16		
43						
44	316-0206	1	1C PROM 32X8 CTL	U65		
45	316-0138	1	1C PROM 32x8	U44		
46	390-0003	1	LED RED	D4		
47	471-0220	3	RES 22 OHM 5%	R26-28		
48	471-0011	5	RES 10 OHM 1/2W 5%	R50-53, R29		
49	471-0102	10	RES 1K OHM 1/2W 5%	R7-11, 32, 37, 56-58		
50	471-0103	1	RES 10K OHM 1/2W 5%	R6		

Gretsch Industries, Inc. San Bruno, California 94066		PARTS LIST	TITLE ASSY BASIC V.I.C.B.D.	DWG NO	800-0031	SH 4 OF 8	C REV
ITEM NO	PART NO	QTY PER ASSY	DESCRIPTION			REF DES	
51	471-0104	3	RES	100K OHM	1/2W 5%	R42-R44	
52	471-0222	8	RES	2.2K OHM	1/2W 5%	R18-R25	
53	471-0223	1	RES	22K OHM	1/2W 5%	R3	
54	471-0331	8	RES	330 OHM	1/2W 5%	R30,31,33,34,45,46,59,60	
55	471-0221	1	RES	220 OHM	5%	R55	
56	471-0471	1	RES	470 OHM	1/2W 5%	R49	
57	471-0472	3	RES	4.7K OHM	1/2W 5%	R5,R47,R48	
58	471-0750	1	RES	75 OHM	1/2W 5%	R41	
59			POT	10K PC MTV	R4		
60	475-0001	1					
61			RES	PACK 15 X 2.2K	RPI,RP3		
62	477-0002	2					
63			DIODE	IN914/IN4148	D1,D2,D5,D6		
64	481-0006	4					
65			XSTR	ZN4403	Q6		
66	482-0006	1	XSTR	PE8050	Q2		
67	482-0010	1	XSTR	2N4401	Q1,Q7,Q10,Q11		
68	482-0014	4	SWITCH	8 POS DIP SPST	SWI		
69	510-0049	1	HEAT SINK	295-1			
70	530-0006	1					
71							
72							
73	314-0072	1	IC	74LS174	U43		
74							
75	314-0076	1	IC	74LS157	U42		





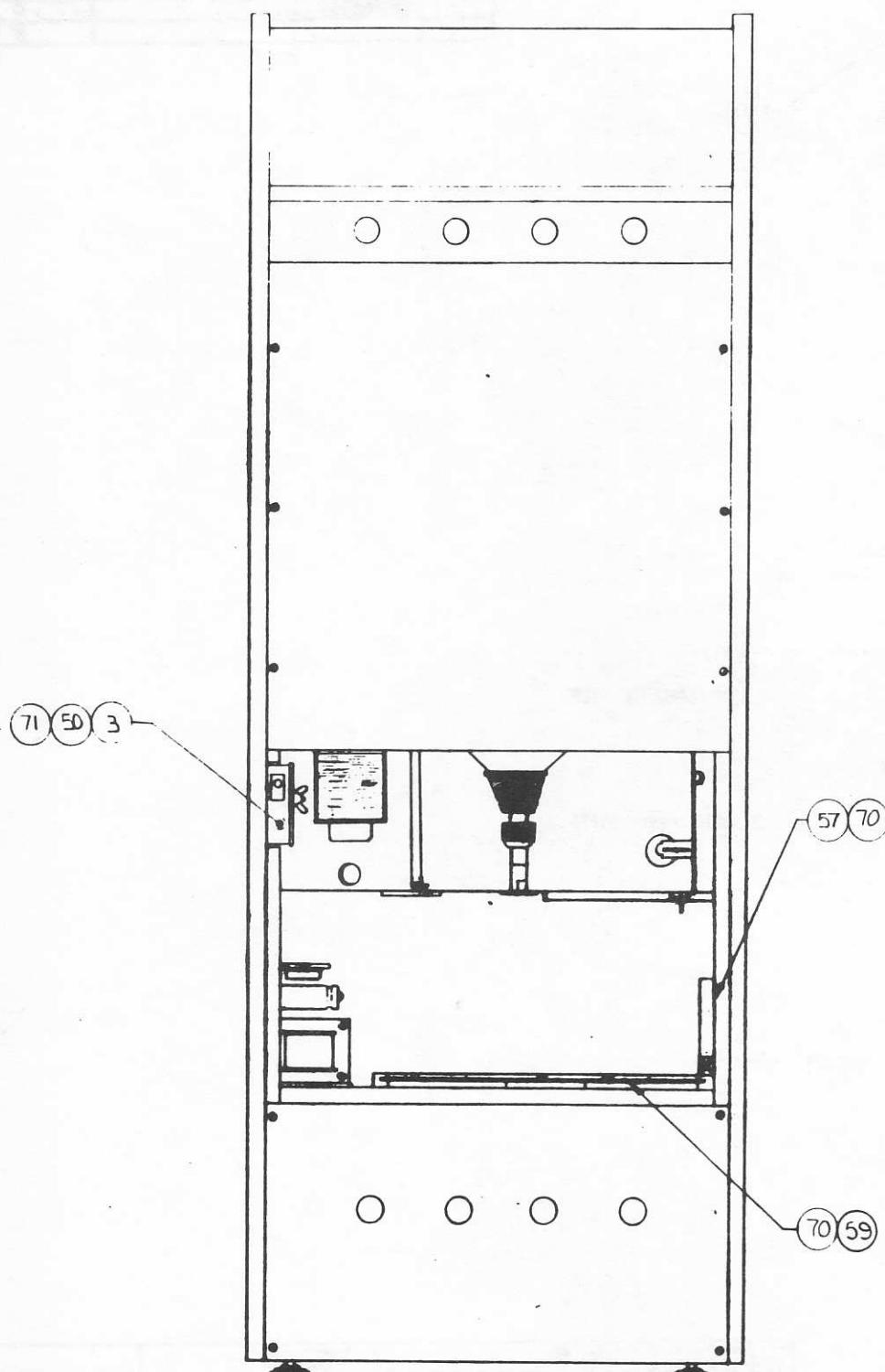
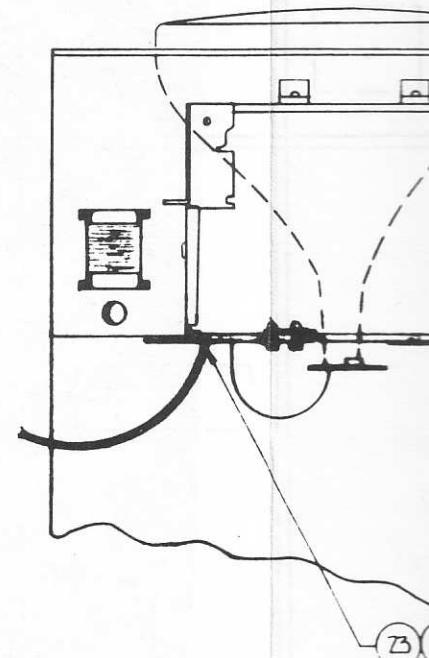
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**VIEW C-C****SECTION E-E****SECTION D-D**

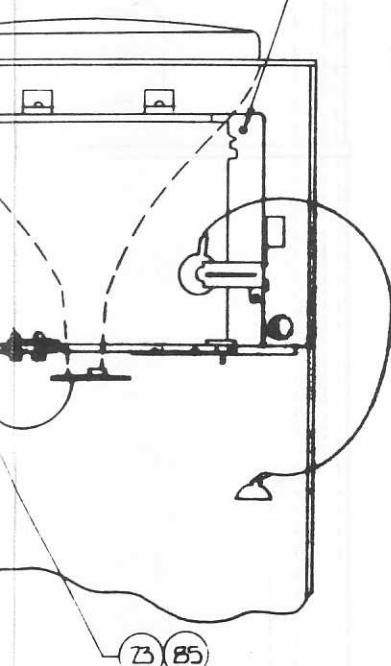
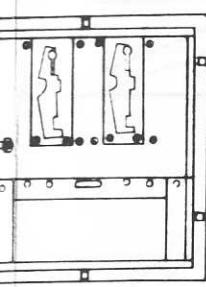
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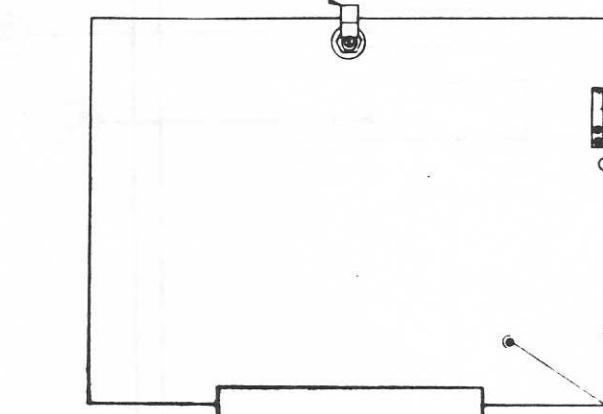
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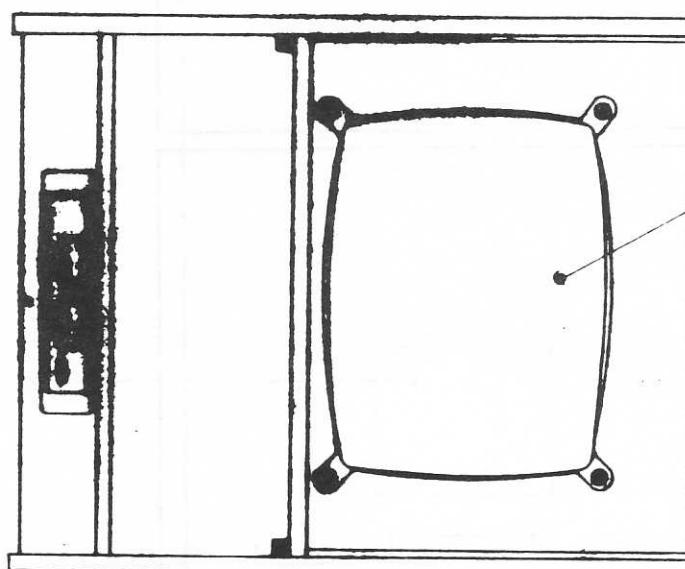


SECTION D-D



REAR DOOR

REF. 140-0033
ITEM 4

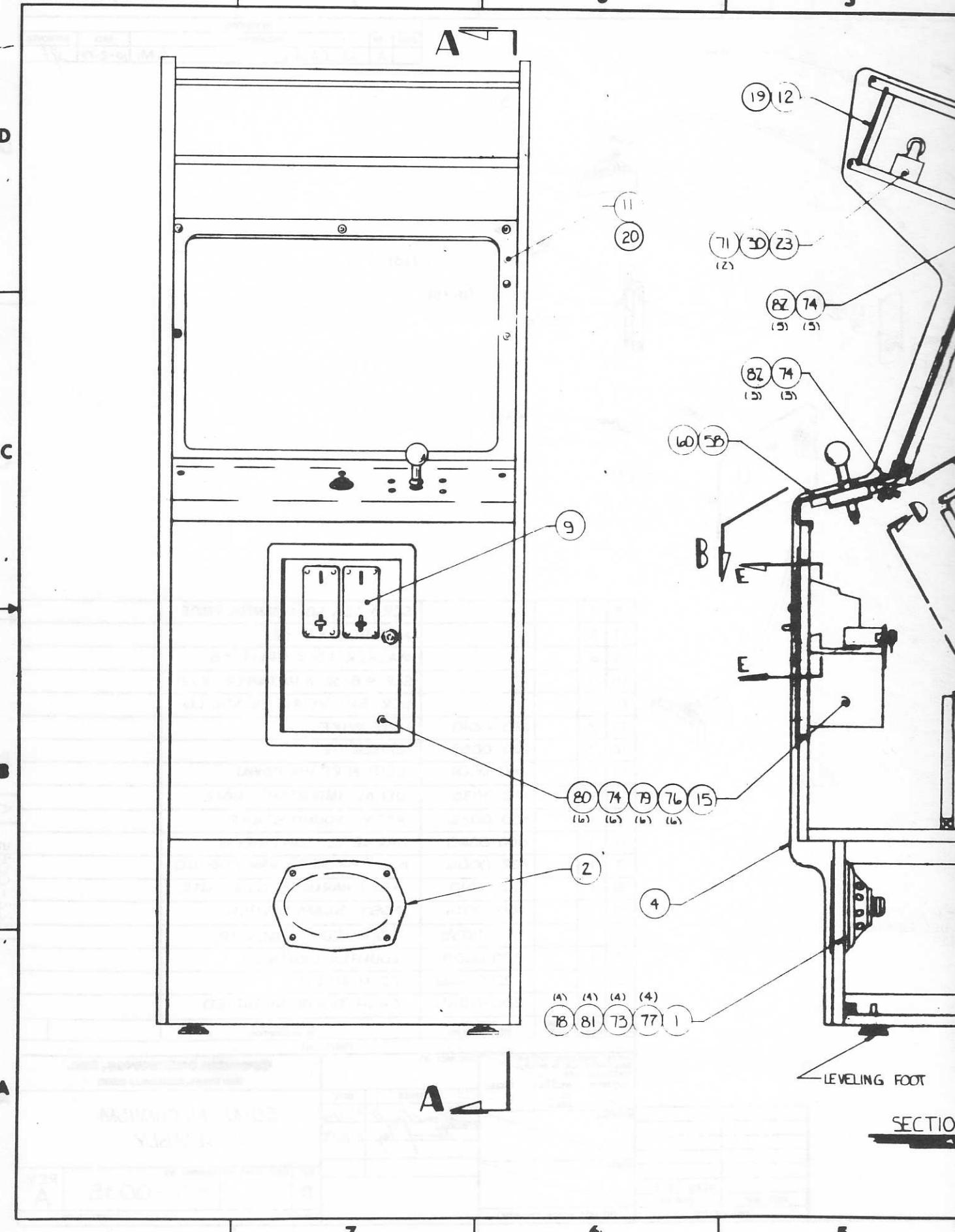


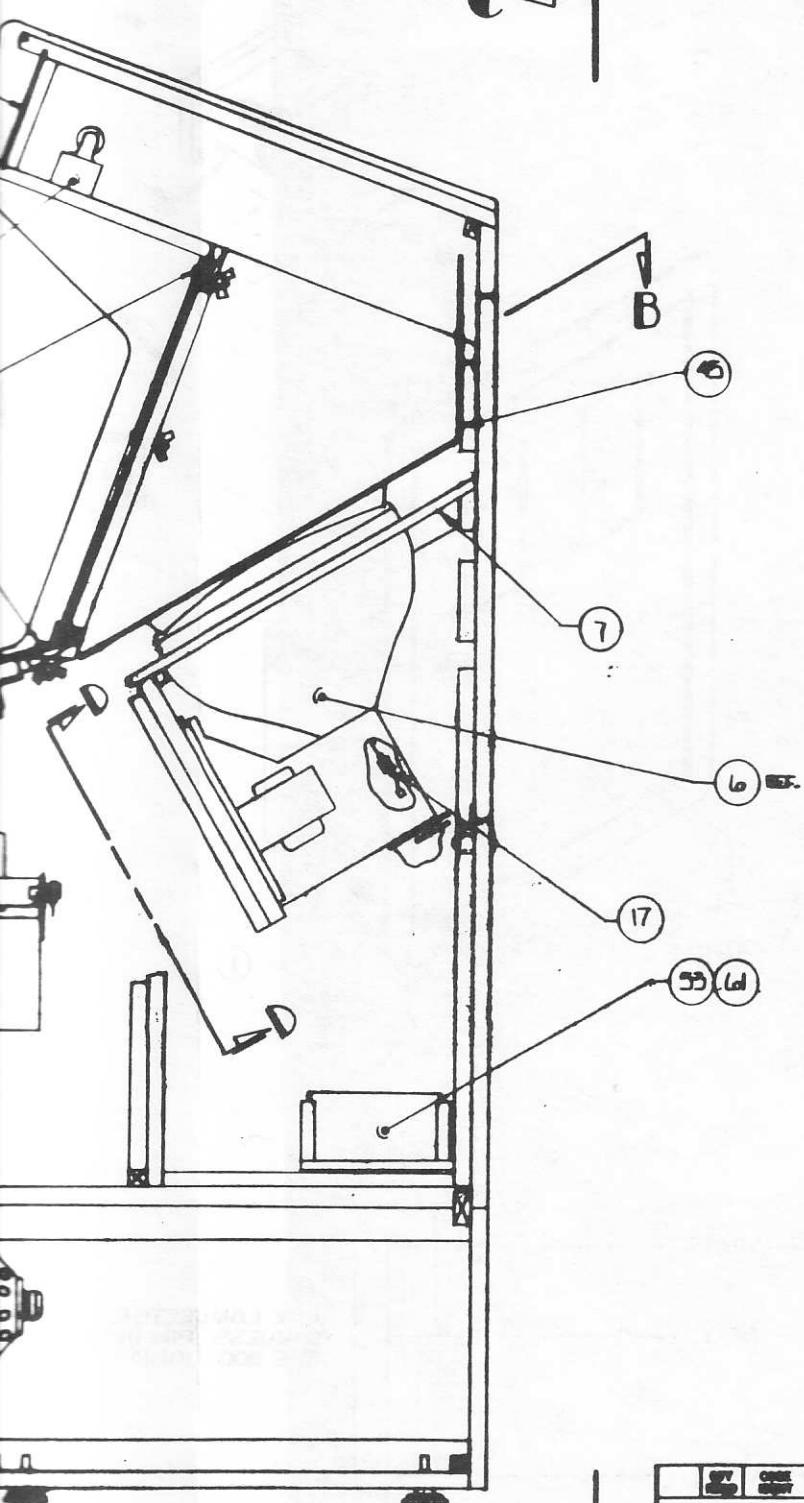
SECTION B-B

QTY NED	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				CONTRACT NO.
FRACTION	DECIMALS	ANGLES	APPROVALS	DATE
±	JEW ±	±	INITIALS	1/19
MATERIAL				CHIEF
FINISH				1/19
NEXT ASSY	USED ON			
APPLICATION	DO NOT SCALE DRAWING			
SIZE			CODE IDENT NO.	DRAWING NO.
D			722-0013	
SCALE			A	
SHEET 8 OF 9				

Groton Industries, Inc.
San Diego, California 92108

TOP ASSY
HEAD ON 2 COLOR





REVISIONS		
DATE	REV.	DESCRIPTION
11/12/75	A	REVISION

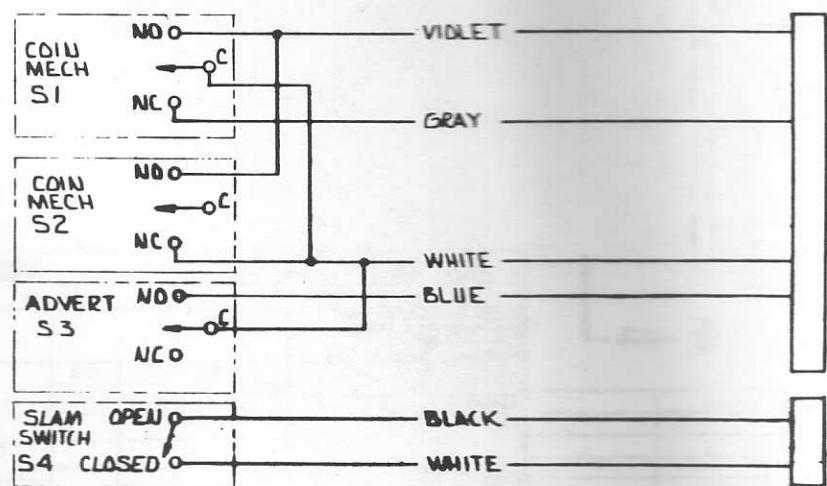
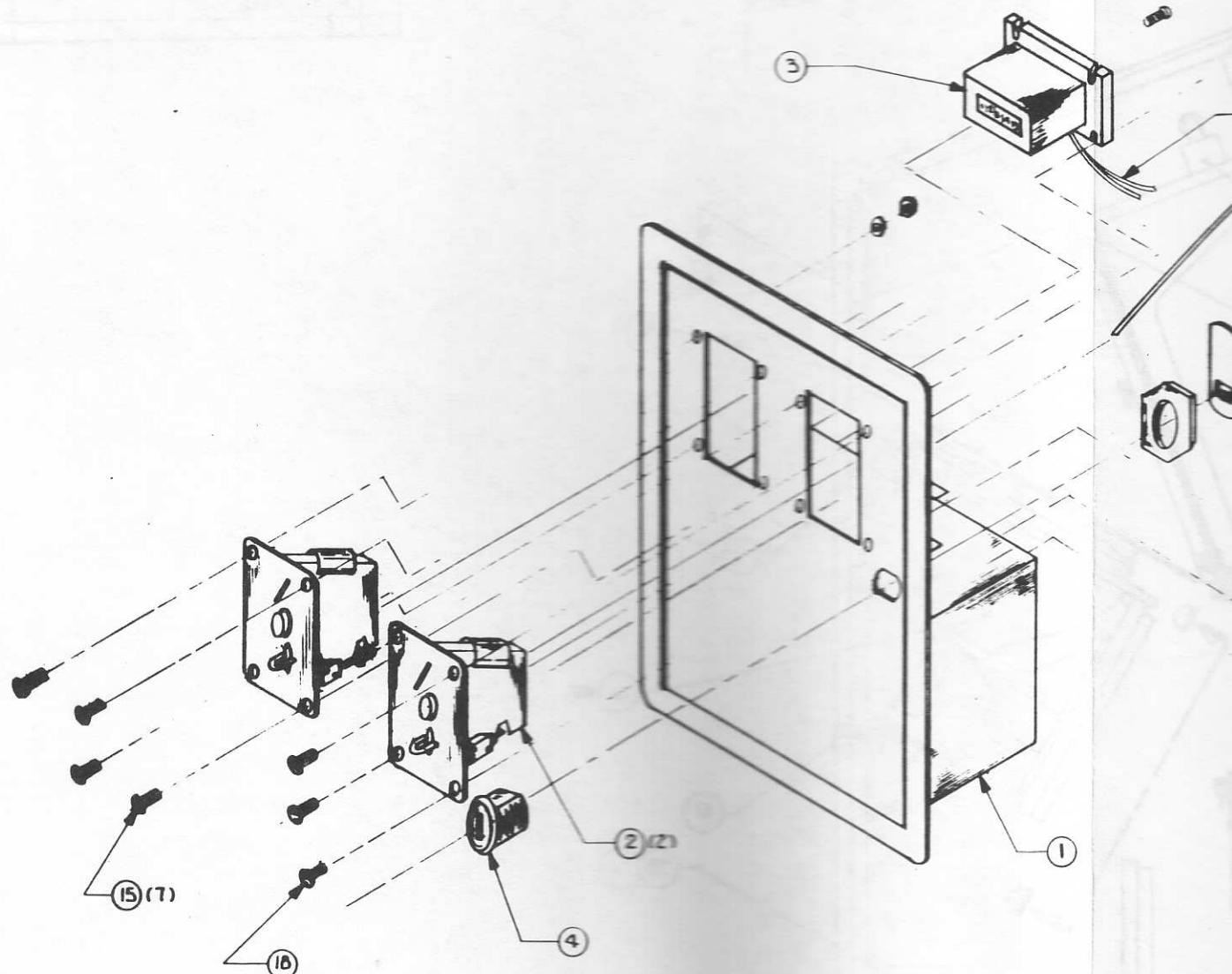
SIZE	CODE IDENT NO	DRAWING NO
D	766 0013	A
SCALE		SHEET OF
TOP ASSY HEAD ON 2 COLOR		
PART OR DESCRIPTION NO. INNOCULATURE PARTS LIST		
DRAWING SPECIFICATIONS DIMENSIONS ARE IN INCHES TOLERANCES ARE FUNCTIONS: DIMENSIONS: ANGLES: MATERIAL: FINISH: NEXT ASSY USED ON APPLICATION DO NOT SCALE DRAWING		
Gromin Industries, Inc. San Diego, California 92108		

8

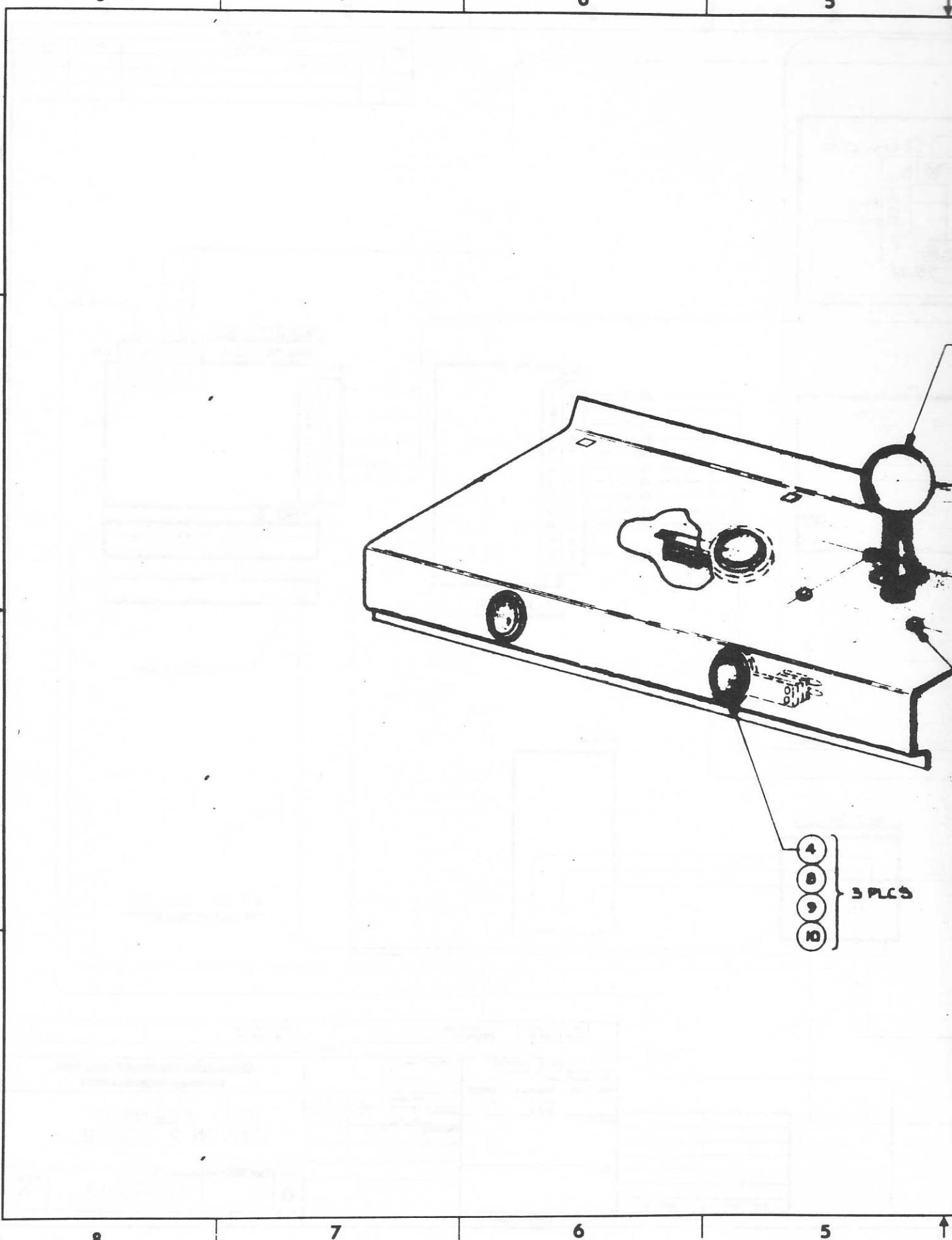
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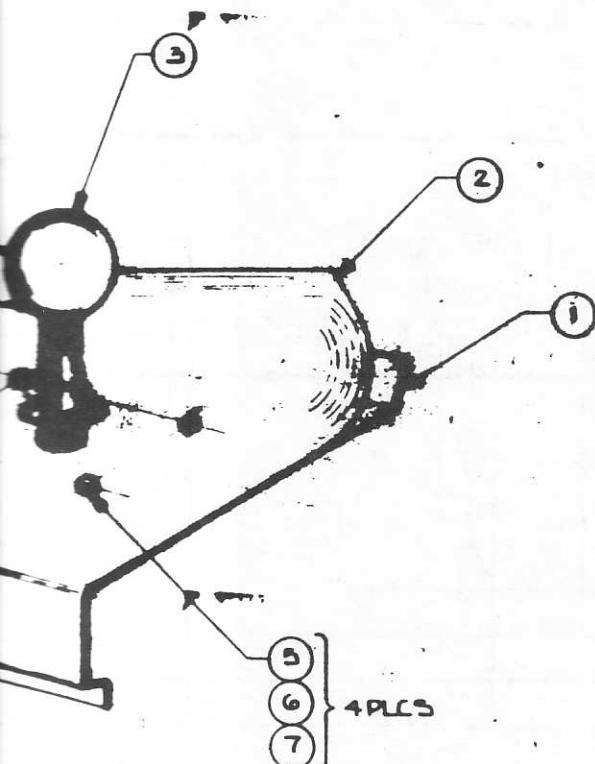
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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:			CONTRACT NO.		Growth Industries, Inc. San Diego, California 92120																																																					
FRACTIONS DECIMALS ANGLES \pm $J0 \pm$ \pm $XXX \pm$			APPROVALS DATE DRAWN 5 MAGNOLIA 10-2-79 CHECKED <i>10-2-79</i>																																																							
MATERIAL: 722-0013 HEAD ON II NEXT ASSY USED ON			FINISH: DO NOT SCALE DRAWING		SIZE CODE IDENT NO DRAWING NO D 822-0036 A																																																					
4	3	2	1																																																							

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VIDEO LOGIC BD

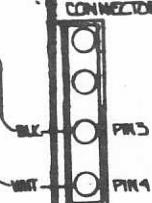
J1B-3 J1B-1 J1A-8
GND +5V GND

1	1	J1B-1
2	2	J1A-1
3	3	J1A-5
4	4	J1A-3
5	5	J1B-2
6	6	
7	7	
8	8	
9	9	
10	10	J1A-7

J1 CONTROL PLN // BZ2-0005

1	1	S2-2
2	2	S3-2
3	3	
4	4	S1-2
5	5	
6	6	S2C-NO
7	7	S2D-NO
8	8	S2A-NO
9	9	S2B-NO
10	10	S1-1, S2-1 S3-1, S2-2

ANR VIDEO CONNECTOR



VHS PWS

J3 COIN CNTL HARN // BZ2-0010
1 1 FX1-1
2 2 FX1-2
3 3
4 4

J4 COIN MECH // BZ5-0028
1 1 S4-NO
2 2 S5-C
3 3 S5-NC
4 4 S3-1
5 5
6 6 S3-2
7 7
8 8
9 9
10 10

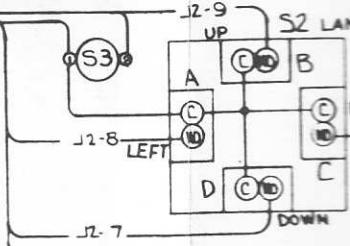
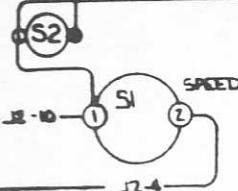
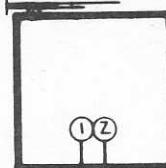
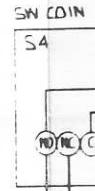
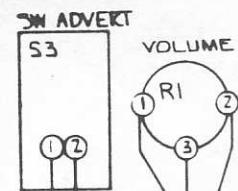
J5 SOUND // BZ2-0001

PLAYER CAR
PLAYER SKID
CRASH
CMTR CAR
CMTR SKID
BONUS
SOUND ON/OFF

+12V -12V GND
JSA-4 JSA-6 JSA-1
JSA-2 JSA-7 JSA-8
JSA-3 JSA-9 JSA-10
JSA-5 JSA-11 JSA-12

J6 JUMPER HARN // BZ2-0007

-12V +12V AC
AC +5V GND
J6A-1 J6A-2 J6A-3
J6A-4 J6A-5 J6A-6
J6A-7 J6A-8 J6A-9
J6A-10 J6A-11 J6A-12

CONTROL PANELSPEAKERCOIN ACCEPTOR

SOUND



J7 SK1-1 SK1-2
J7 1 2 3 4 J5B
J7 1 2 3 4 J5B

J6A-1 J6A-2 J6A-3
J6A-4 J6A-5 J6A-6
J6A-7 J6A-8 J6A-9
J6A-10 J6A-11 J6A-12

POWER SUPPLY

T1 1 2 3 4
T1 1 2 3 4
T1 1 2 3 4
T1 1 2 3 4

JB-1
JB-2
JB-GND

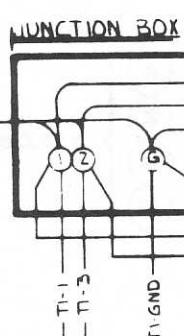
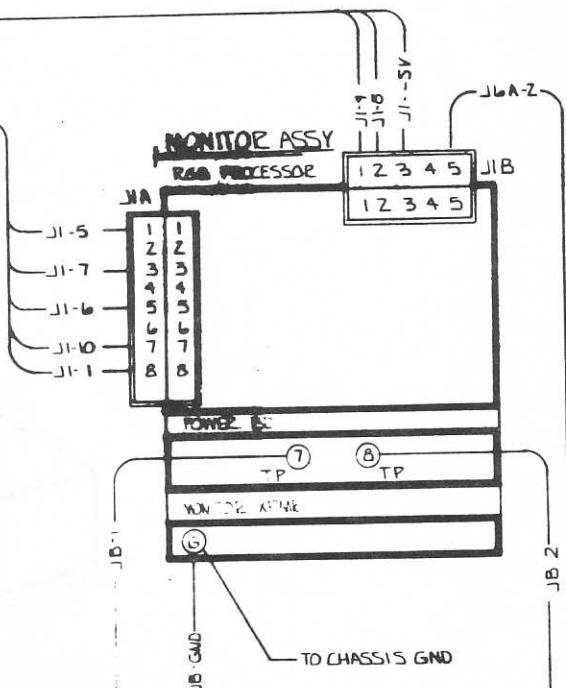
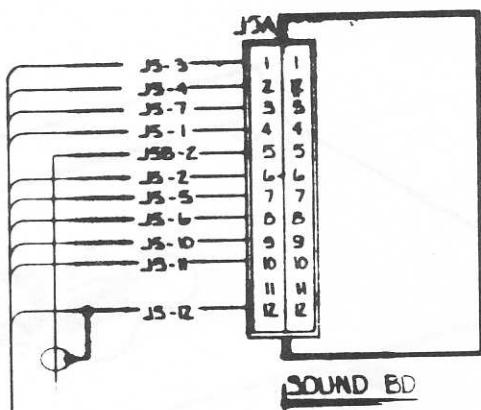
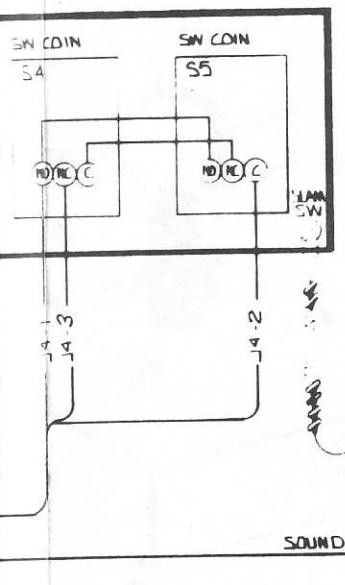
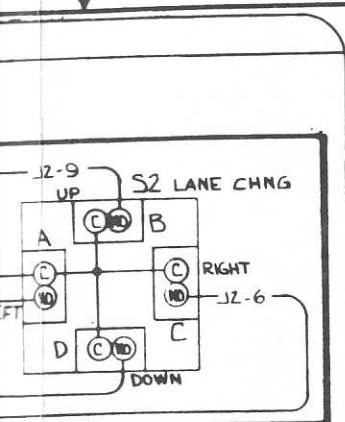
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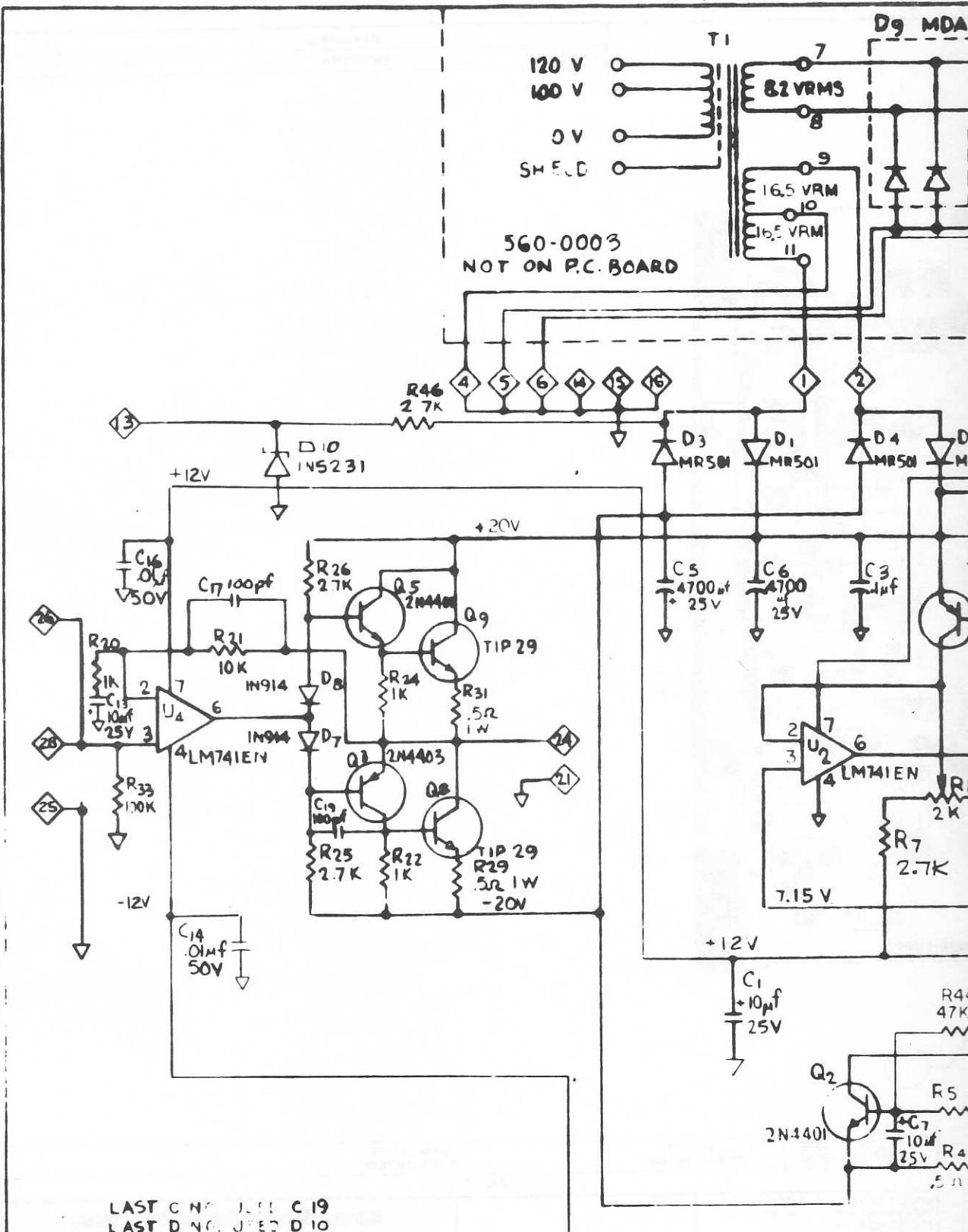
WIRING DIAGRAM

QTY REQ'D	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES \pm $JX \pm$ \pm $XXX \pm$		CONTRACT NO.	
MATERIAL		APPROVALS	DATE
FINISH		DRAWN BY <i>[Signature]</i>	9/24/74
NEXT ASSY USED ON		CHECKED BY <i>[Signature]</i>	1/11
APPLICATION		DO NOT SCALE DRAWING	

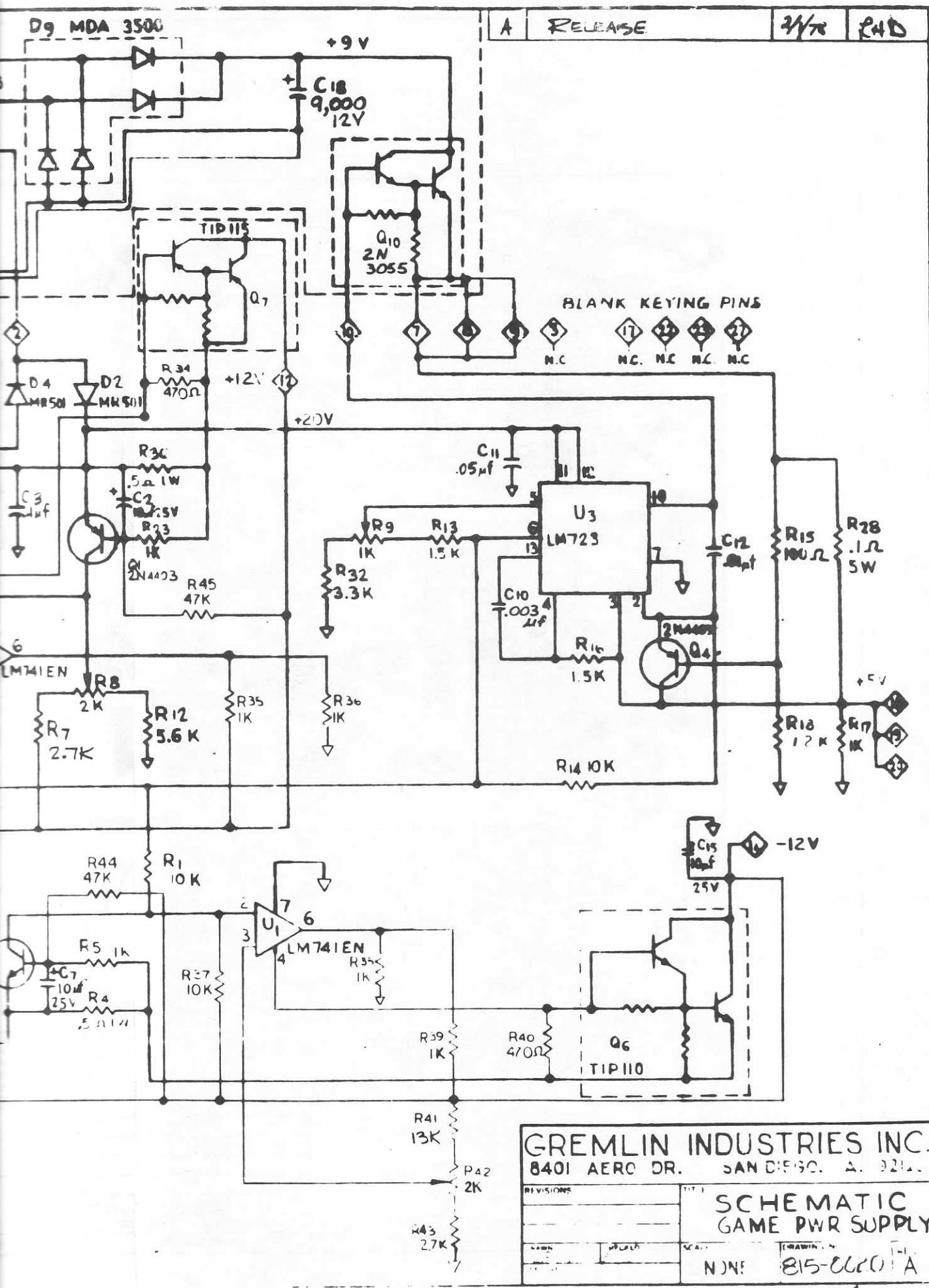
Grenada Industries, Inc.
San Diego, California 92120

TOP ASSEMBLY
HEAD ON 2 COLOR

SIZE	CODE IDENT NO.	DRAWING NO.
D		722-0013
SCALE	REV A	
SHEET 1 OF 9		



LAST C NC J1E1 C 19
 LAST D NC J1E2 D 10
 LAST Q NC U1E1 Q 10
 LAST R NC USED H 46
 LAST U NC USED U 4



D

(10)

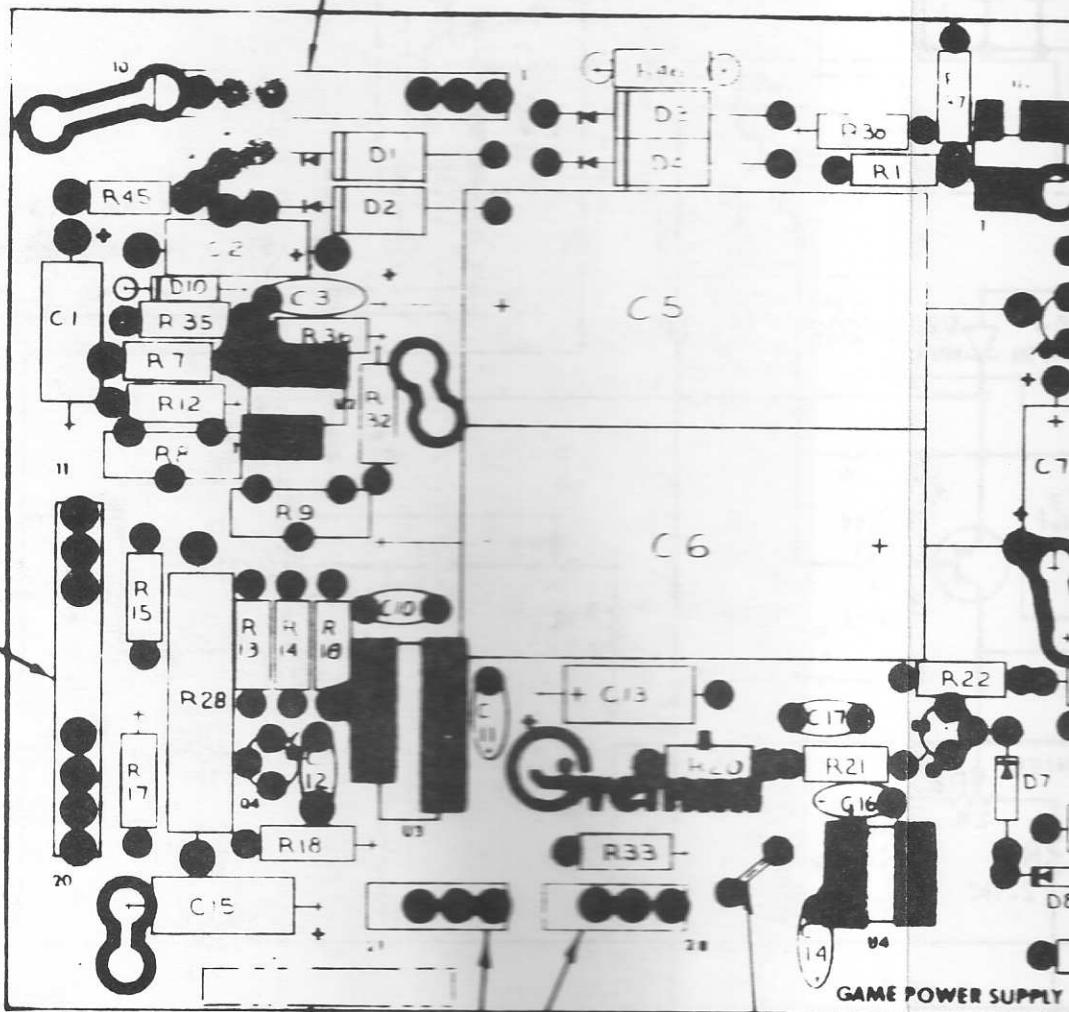
C

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REIDENTIFY ASSY
WITH NO. 815-0021
LATEST REV

A

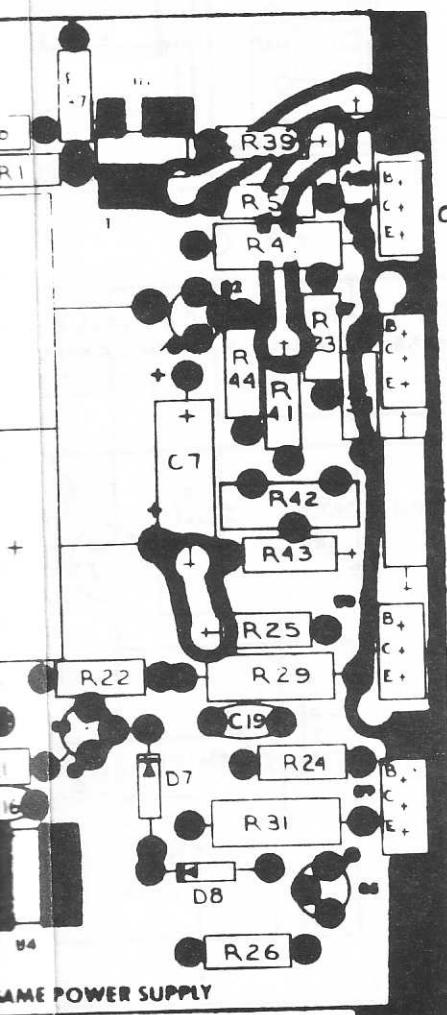


QTY	REF
UNLESS O	
DIMENSION	
TOLERANCE	
FRACTIONS	
±	
MATERIAL	
FINISH	

815-0020	PWR SUPPLY ASSY
NEXT ASSY	USED ON
APPLICATION	DO N

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
			2/1/78	



PER

(1)

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION		
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES \pm .XX \pm .XXX \pm		CONTRACT NO.		Crownline Industries, Inc. San Diego, California 92120	
		APPROVALS	DATE	PC ASSY -	
		DRAWN K. LE BLANC	1/1/78	POWER SUPPLY	
		CHECKED			
MATERIAL					
FINISH				SIZE CODE IDENT NO. DRAWING NO.	
USED ON				C 815-0021 A REV	
TION		DO NOT SCALE DRAWING		SCALE	SHEET 4 OF

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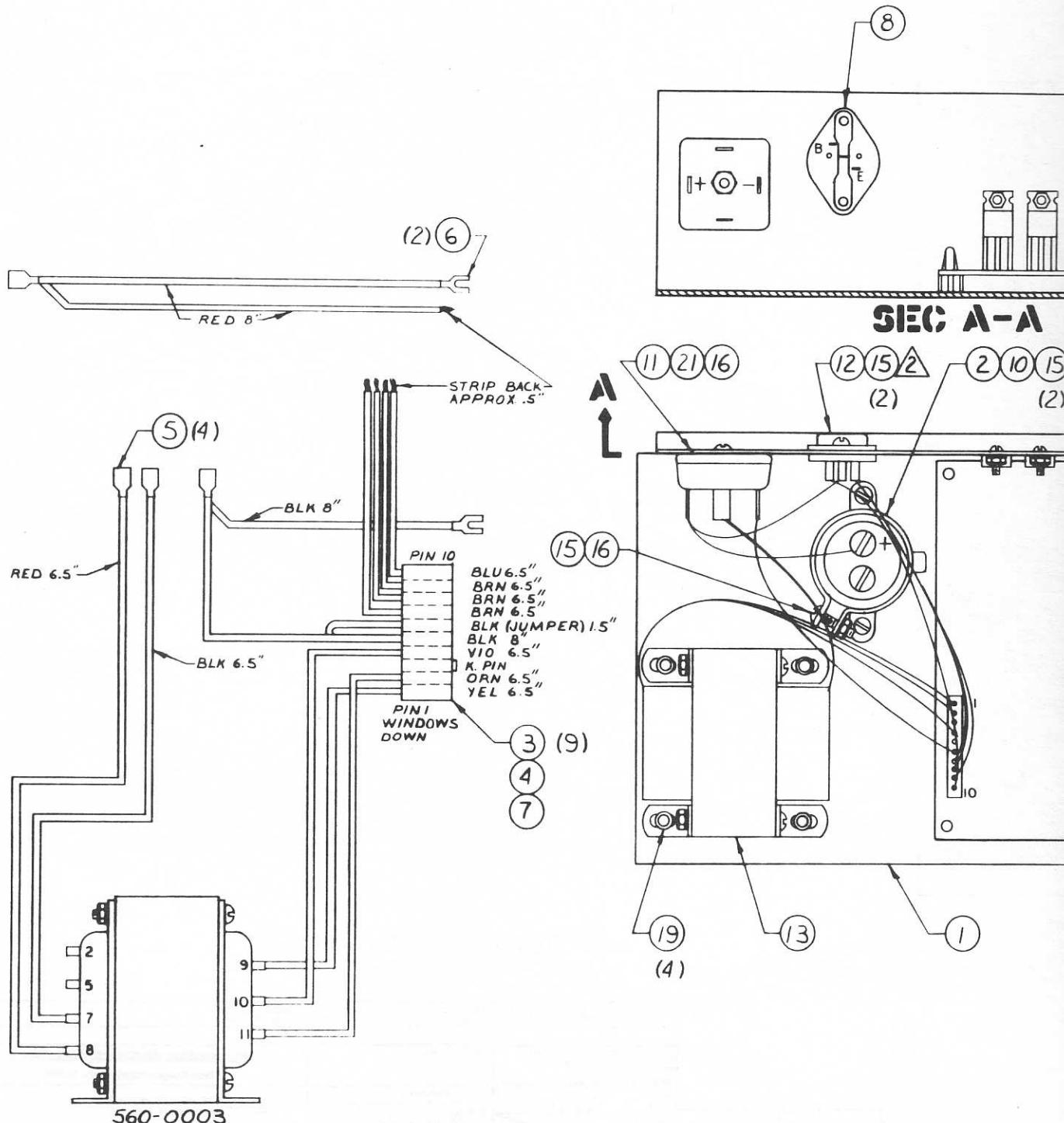
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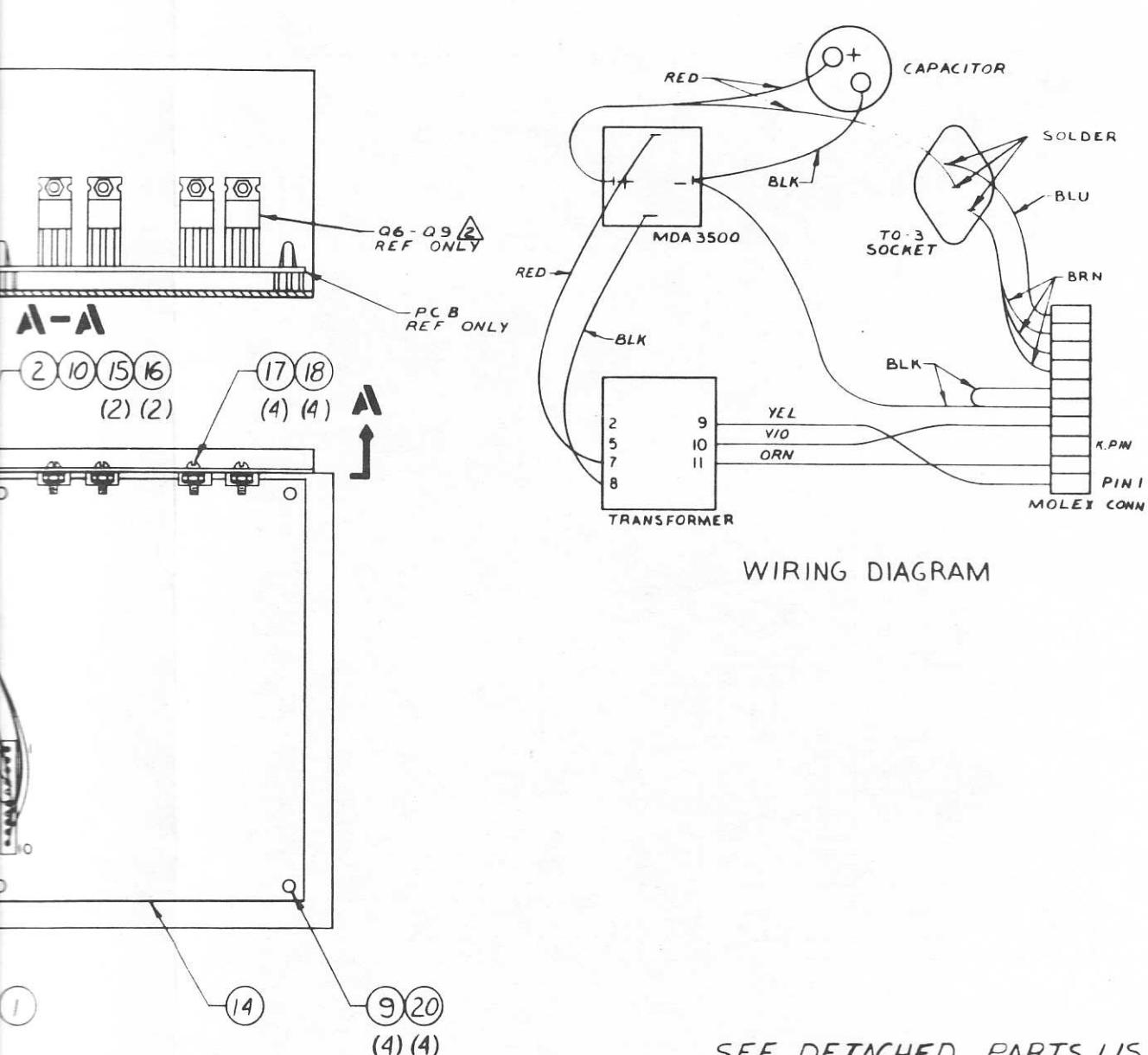
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REVISIONS

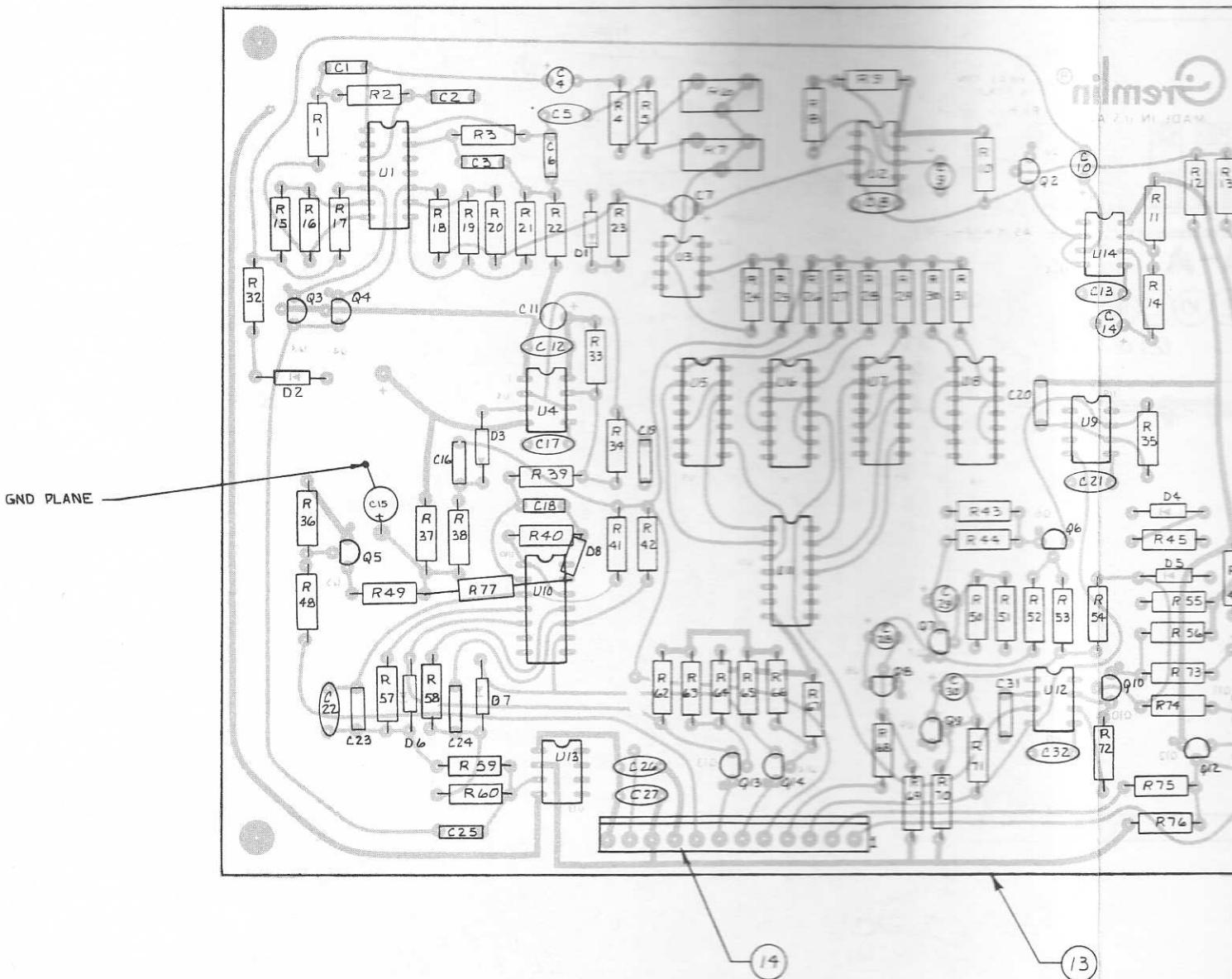
ZONE	LTR	DESCRIPTION	DATE	APPROVED
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SEE DETACHED PARTS LIST 815-0020

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	
PARTS LIST				
<small>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± ± ± JIG ± ± JOG ±</small>			CONTRACT NO.	Groton Industries, Inc. San Diego, California 92126
<small>MATERIAL</small>			APPROVALS	DATE
<small>715-0001 SAFARI NEXT REVN USED ON</small>			DRIVEN Lee J Lipak	
<small>APPLICATION</small>			CHECKED	
<small>DO NOT SCALE DRAWING</small>				
D		815-0020	REV A	
SCALE FULL		SHEET 3 OF 4		

ASSY
POWER SUPPLY



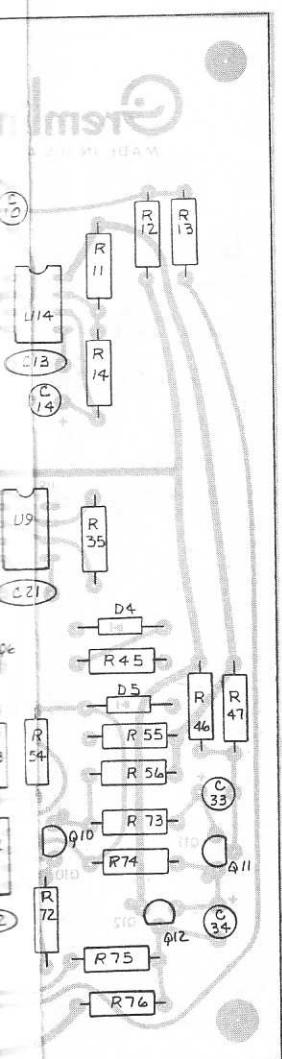
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		REVISIONS	
ZONE	LTR	DESCRIPTION	DATE
	A	RELEASED	1-8-79
	B	ECN 273 1-25-79 APPENDUM 273	1-25-79



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B | 2000-228

SEE DETACHED PARTS LIST

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES \pm .XX \pm \pm \pm .XXX \pm			CONTRACT NO.	Gremlin Industries, Inc. San Diego, California 92123
MATERIAL			APPROVALS	DATE
FINISH			DRAWN <i>Wynona</i>	11-10-78
			CHECKED <i>Jew F. Fay</i>	12-22-78
DO NOT SCALE DRAWING			PC ASSEMBLY HEAD ON SOUND	
D		SIZE	CODE IDENT NO.	DRAWING NO.
D				822-0002
SCALE 2/1		REV B		
SHEET 5 OF 6				

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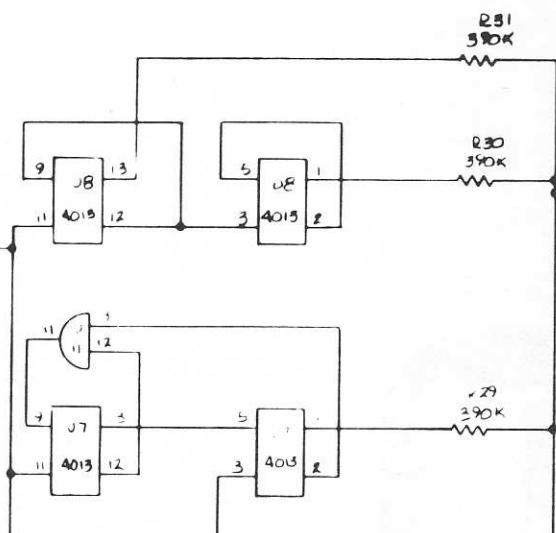
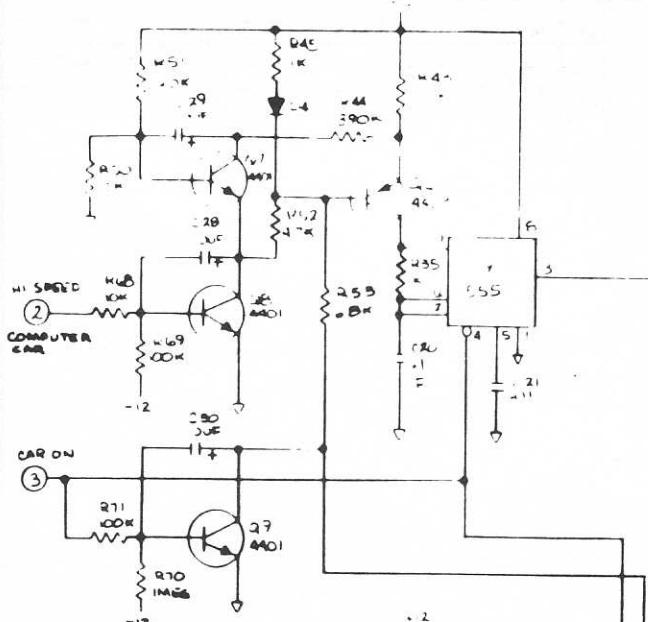
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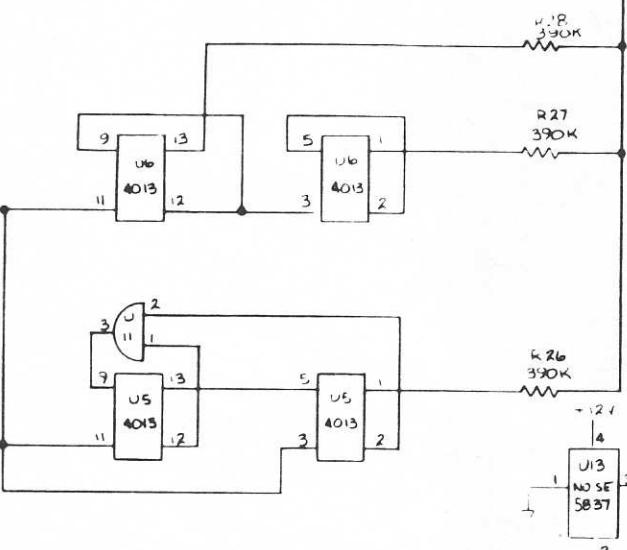
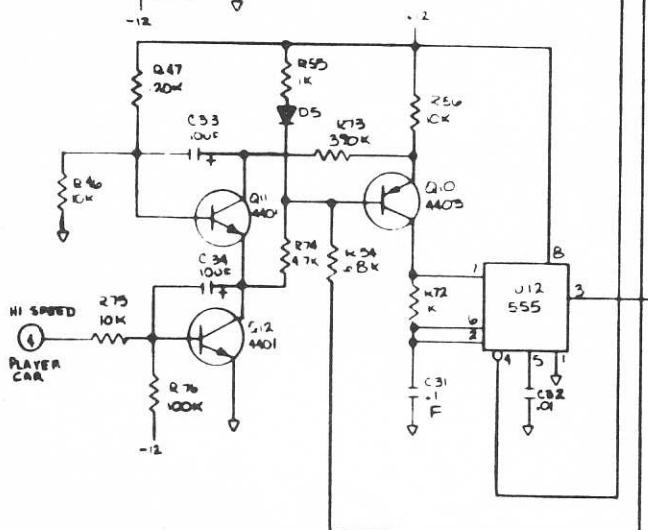
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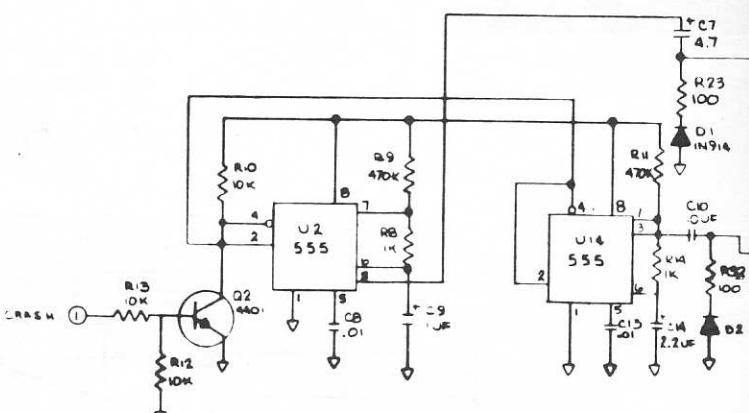
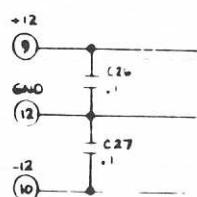
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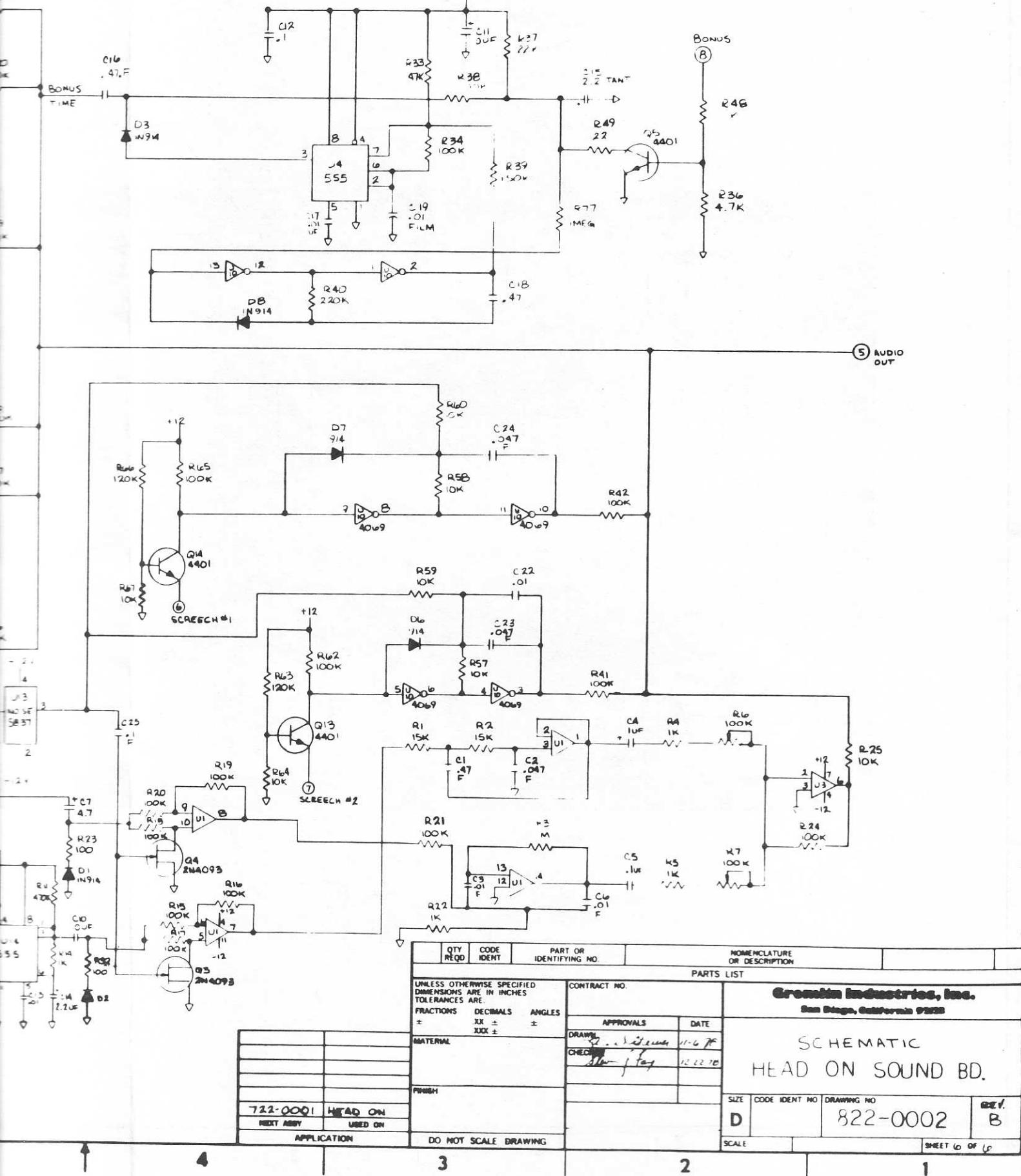
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REVISIONS

ZONE	LTR	DESCRIPTION	DATE APPROVED



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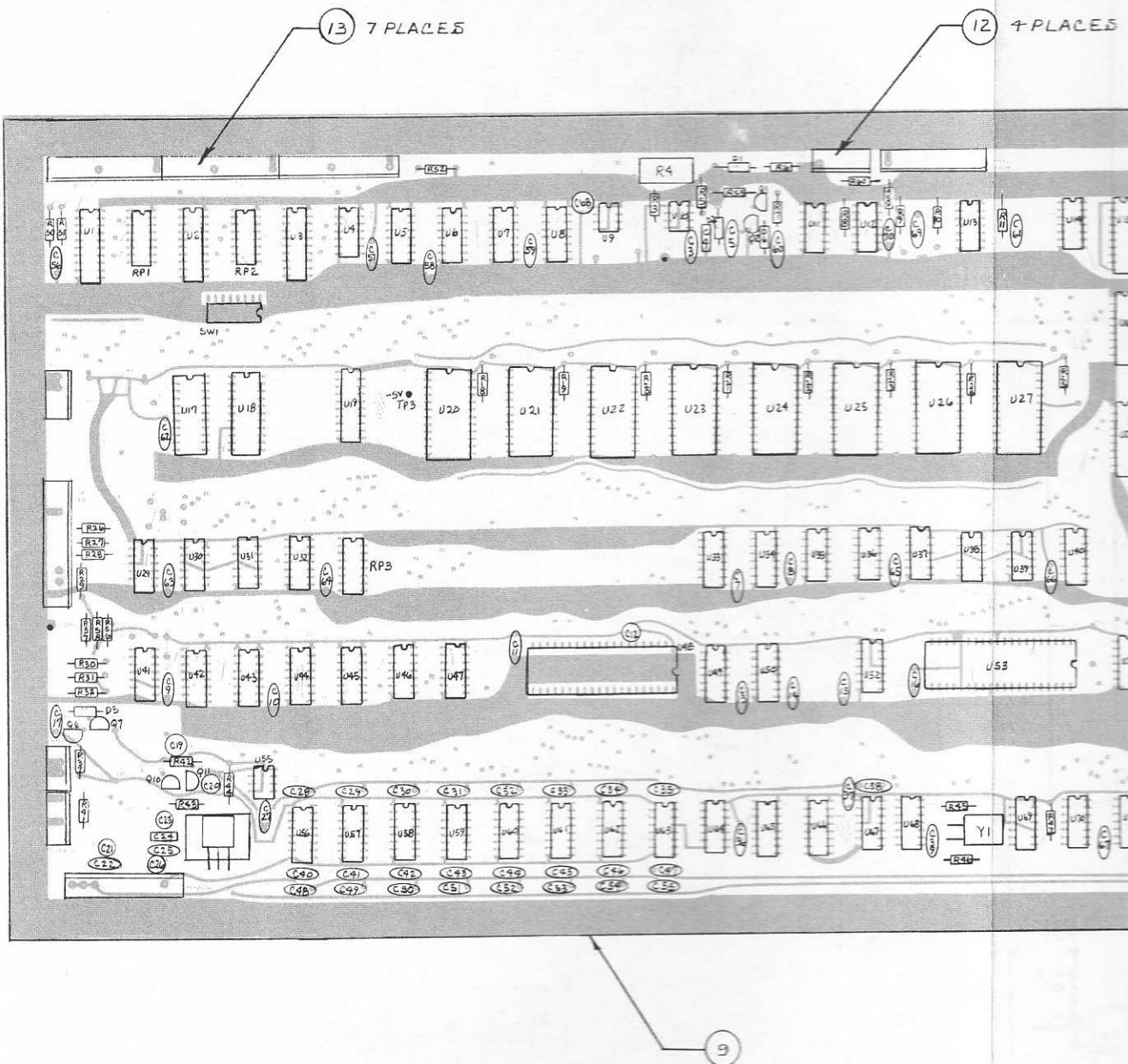
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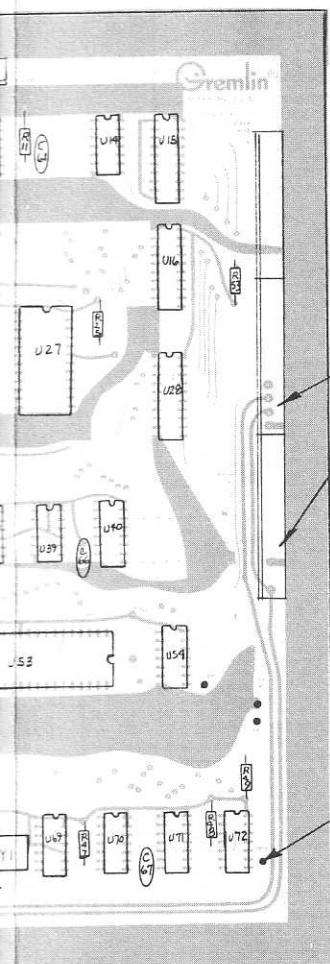
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REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
A	RELEASED	12-22-73	PF
B	PER ECN 310	3-28-74	PF
C	PER ECN 318 & 321	8-8-74	PF

2) 4 PLACES



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800-0031 | C

SEE DETACTED PARTS LIST

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION					
PARTS LIST								
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± .XX ± ± XXX ±	CONTRACT NO.							
MATERIAL	APPROVALS		DATE					
FINISH	DRAWN W.W. Wunuma		11-20-73					
	CHECKED		12-22-73					
NEXT ASSY		USED ON		ASSEMBLY — BASIC V.I.C. BOARD				
APPLICATION		DO NOT SCALE DRAWING		SIZE CODE IDENT NO. DRAWING NO. D 800-0031 REV C				
				SCALE 1/1 SHEET 5 OF 3				

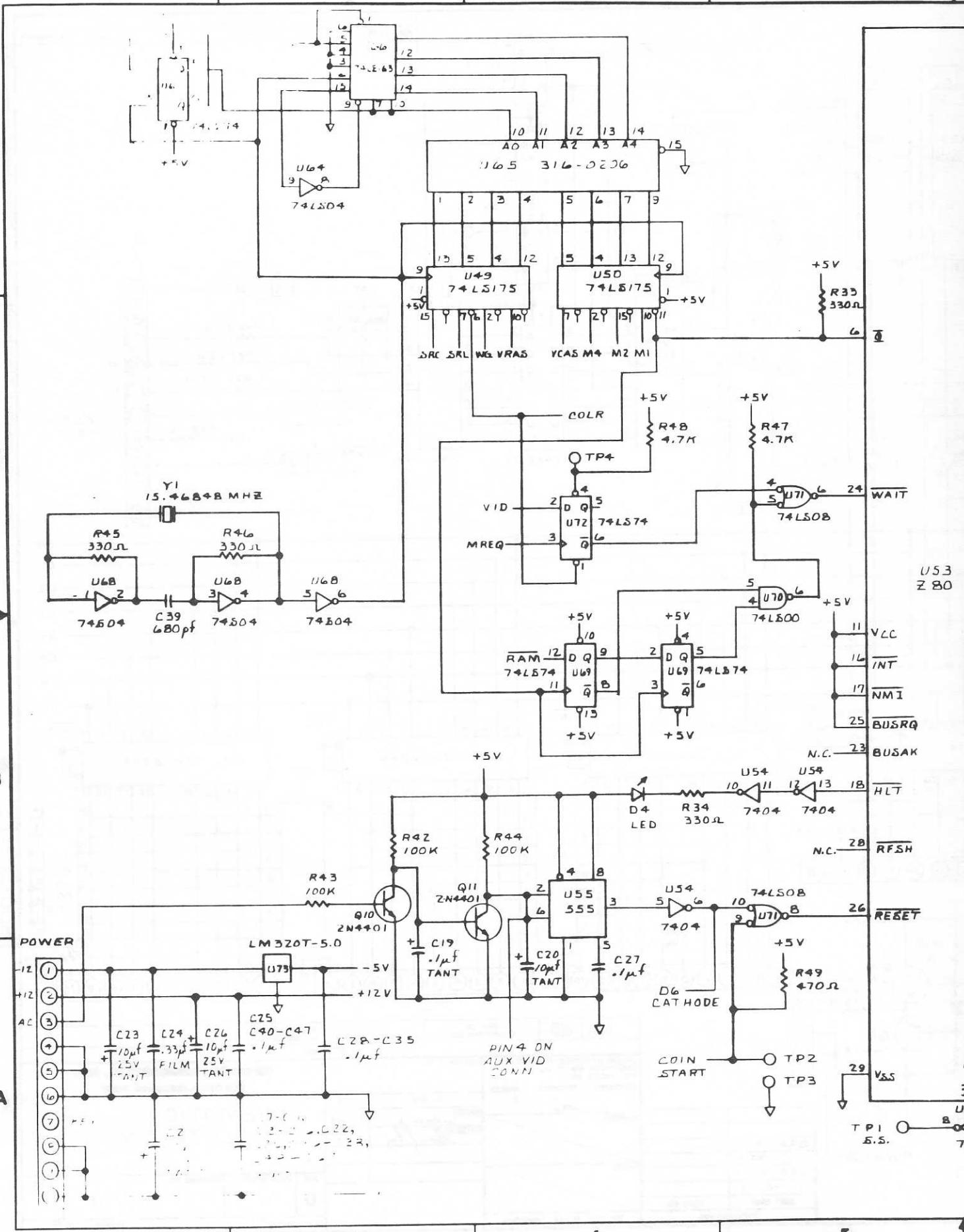
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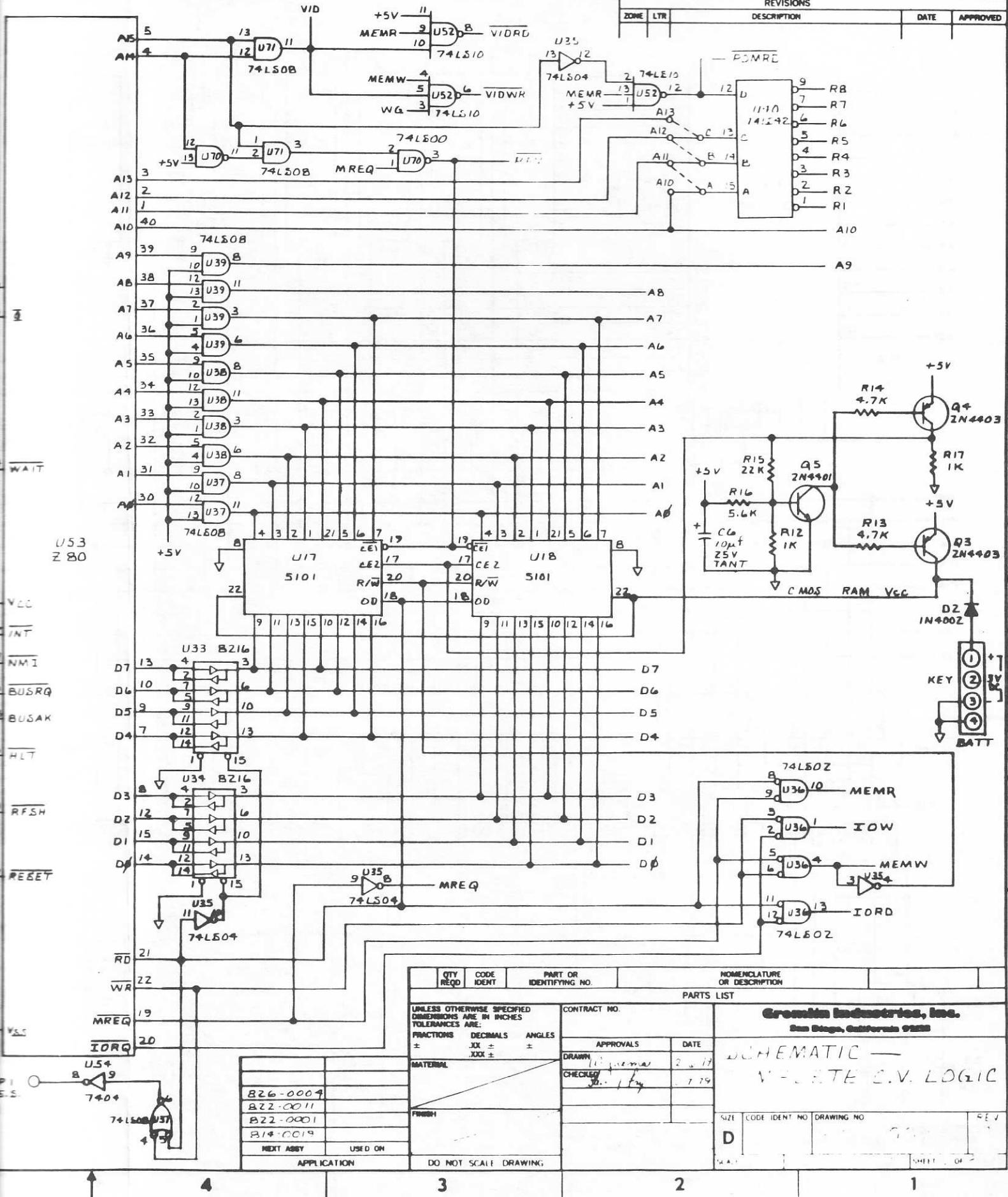
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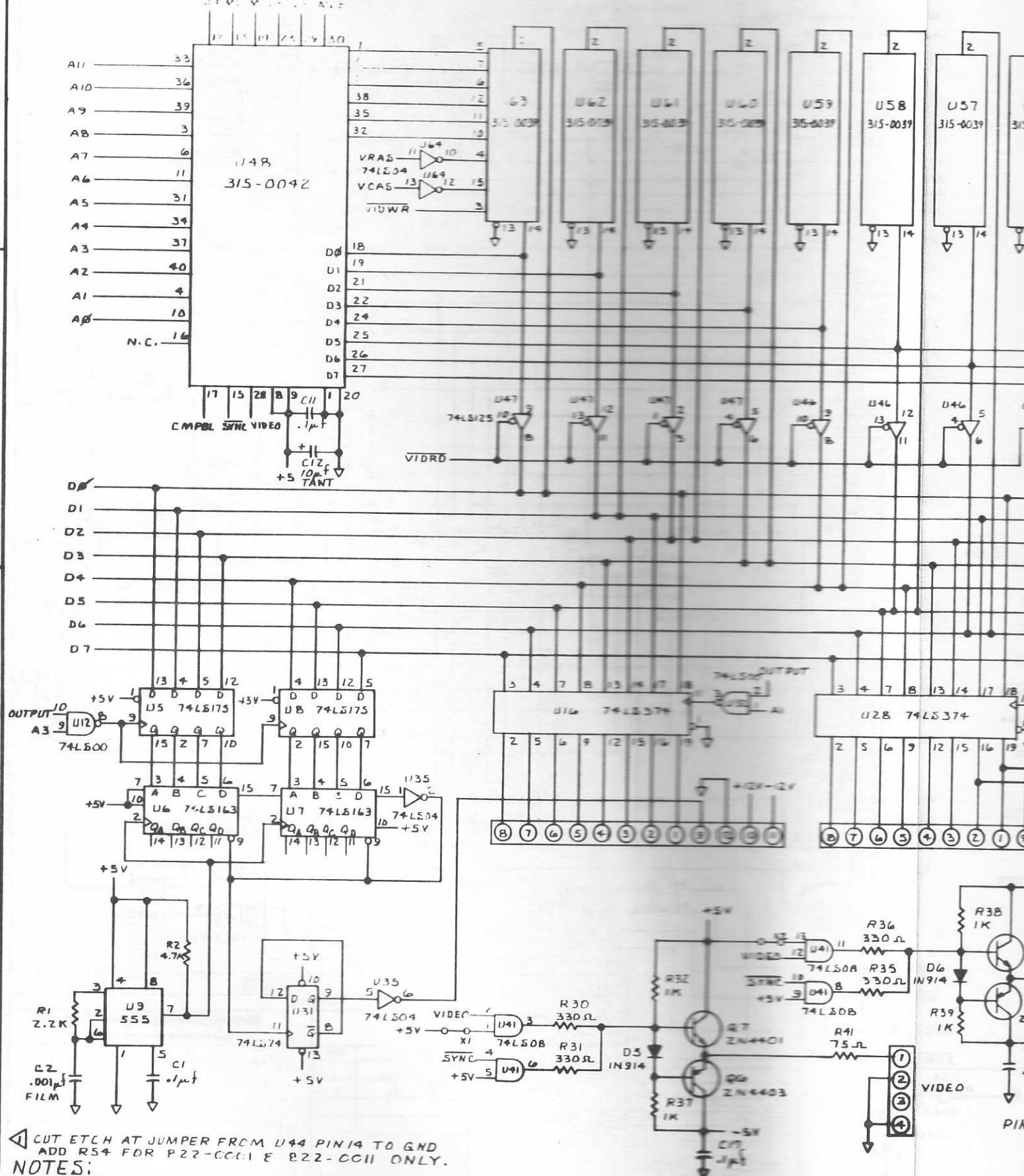
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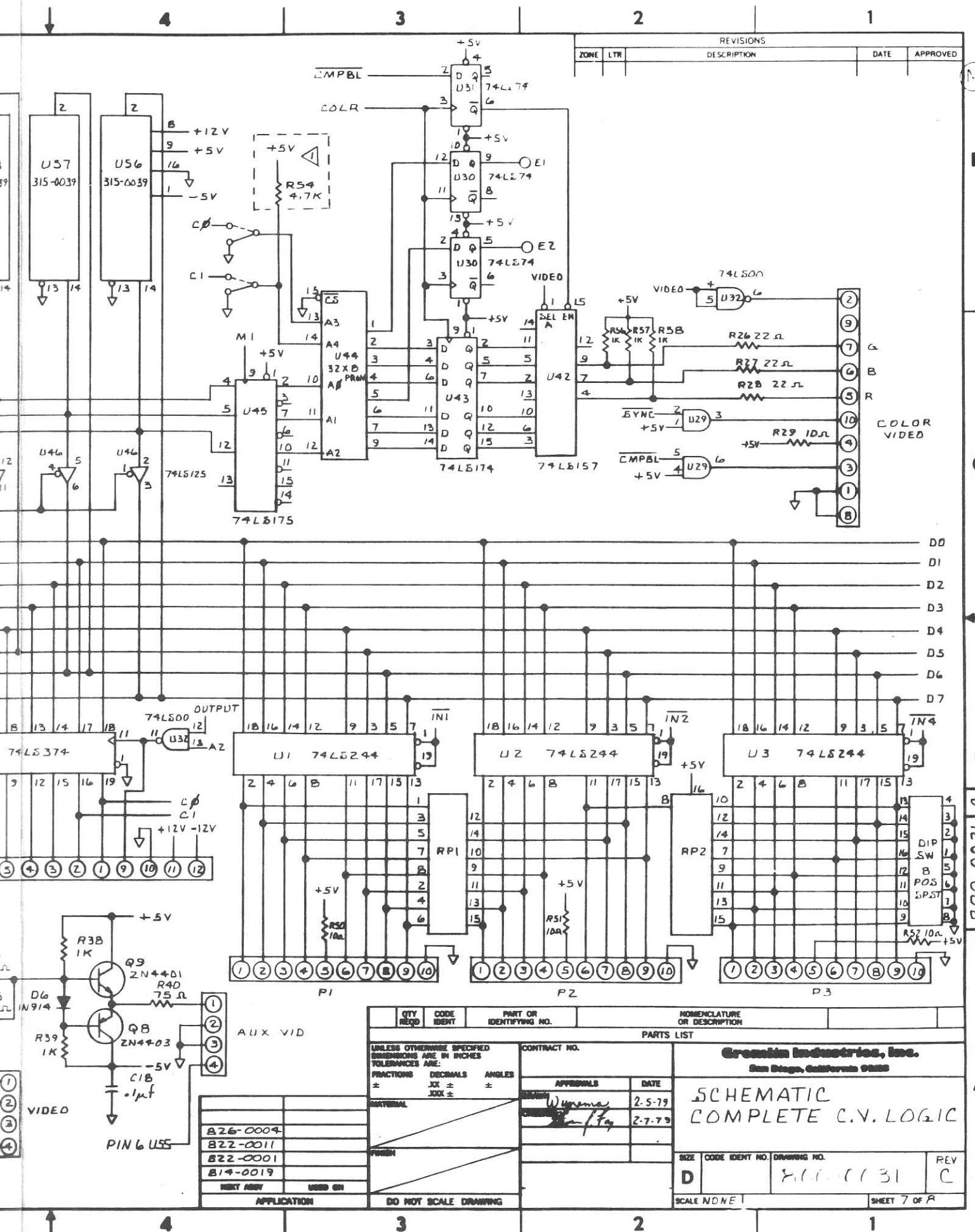


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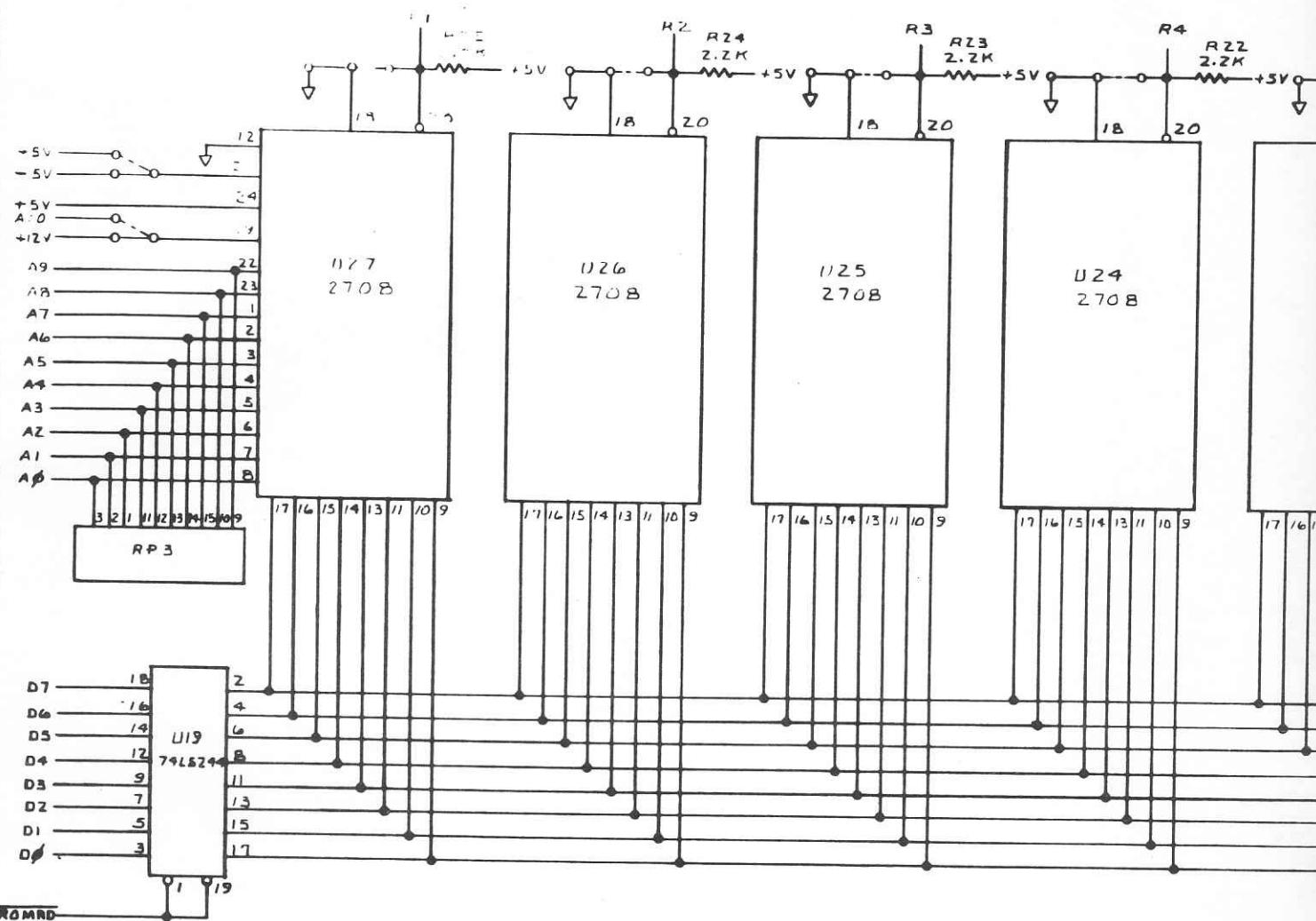
ZONE	LTR	DESCRIPTION	DATE	APPROVED
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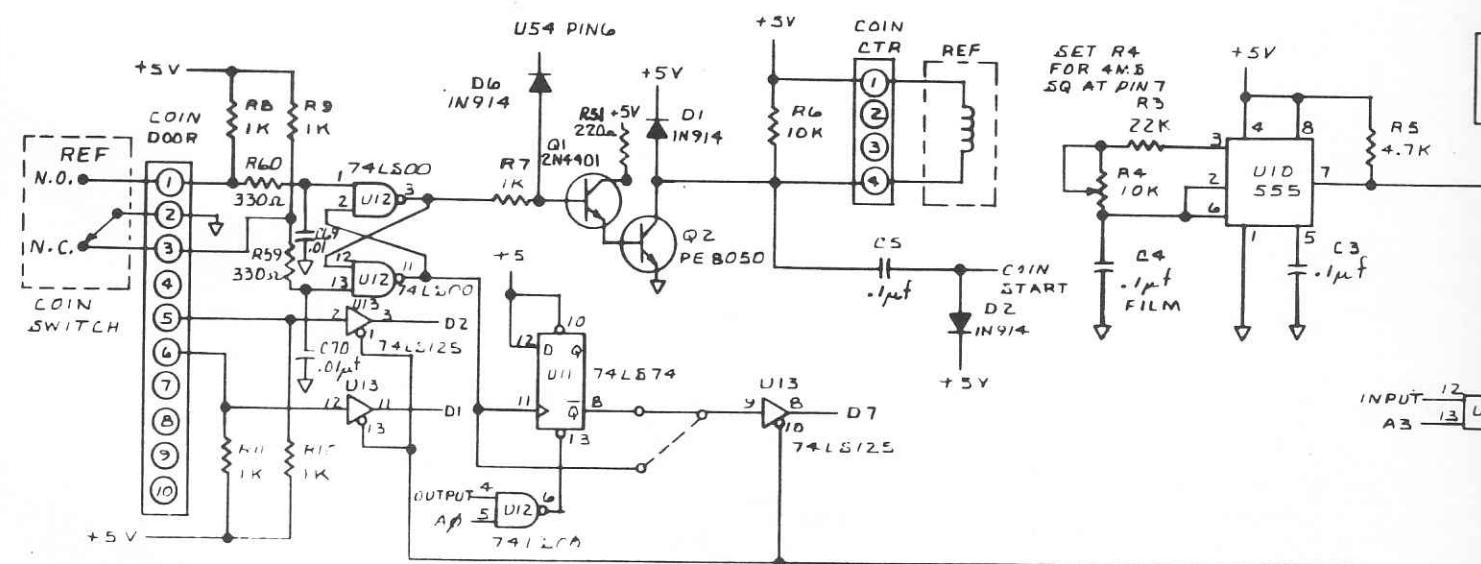




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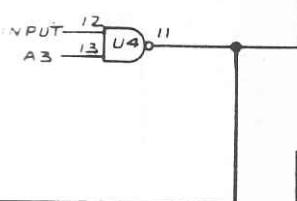
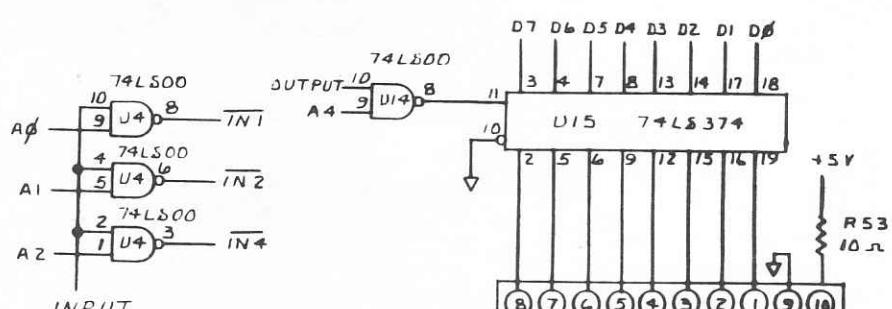
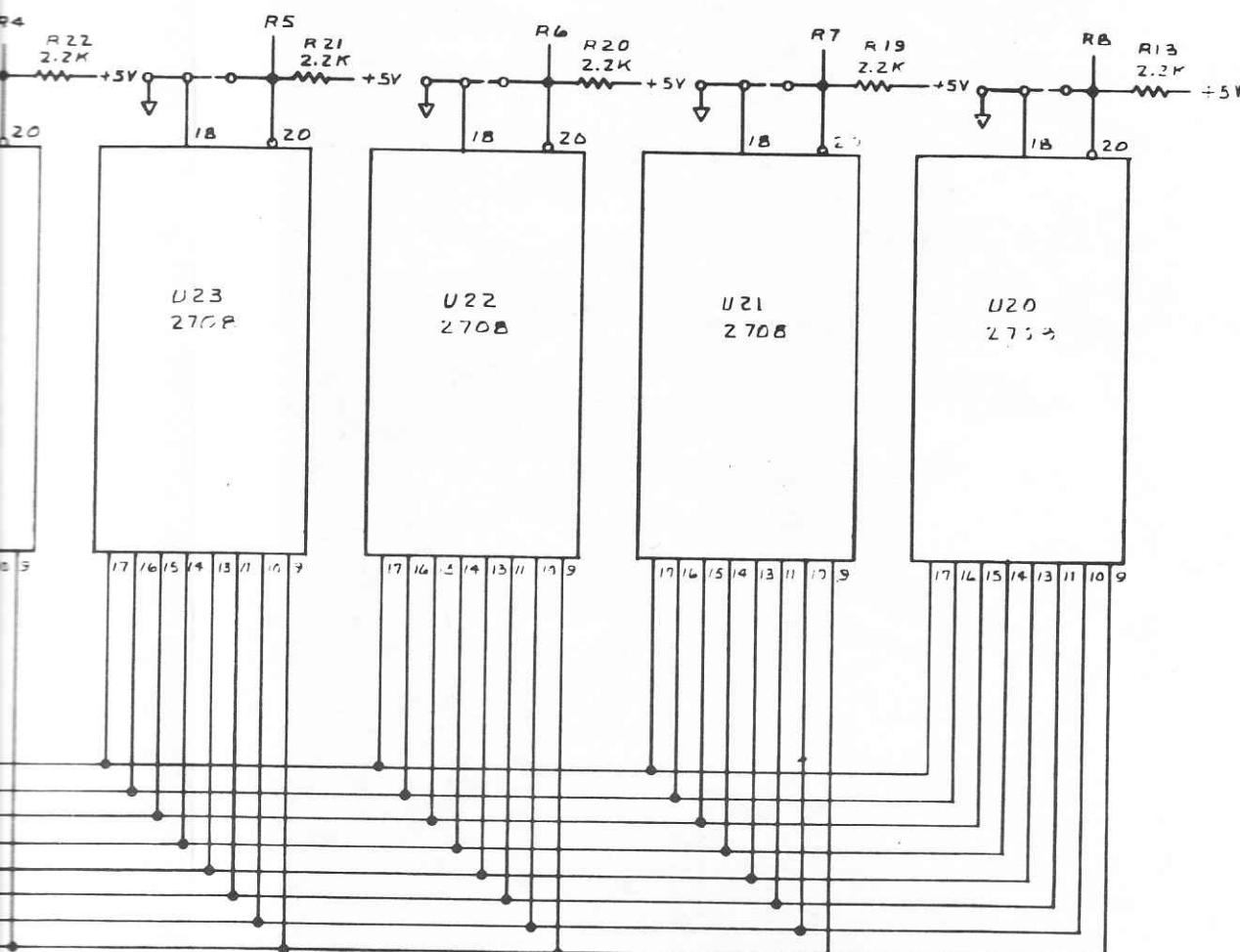


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**LCT ETCHE MELTWIJFEN VAN 17.8 / 113-5
JUMPER BIETWEN U12, U13, U14, U15, U16, U17, U18, U19, U20 EN 17.8 / 113-5 ONLY
NCTED.**

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
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APPLICATION	USED ON
B26-0004	
B22-0011	
B22-0001	
B14-0019	
MKT ASSTY	

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± XX ± ± XXX ± ±				
CONTRACT NO. W. W. Williams 2-7-79				
APPROVALS DATE				
MATERIAL				
FINISH				
DRAWN BY CHECKED BY DESIGNED BY REV C				
SIZE	CODE IDENT NO.	DRAWING NO.		
D		800-0031		
SCALE 1:10 E				
SHEET 2 OF 2				

Ground Industries, Inc.
San Diego, California 92120

SCHEMATIC —
COMPLETE CV LOGIC