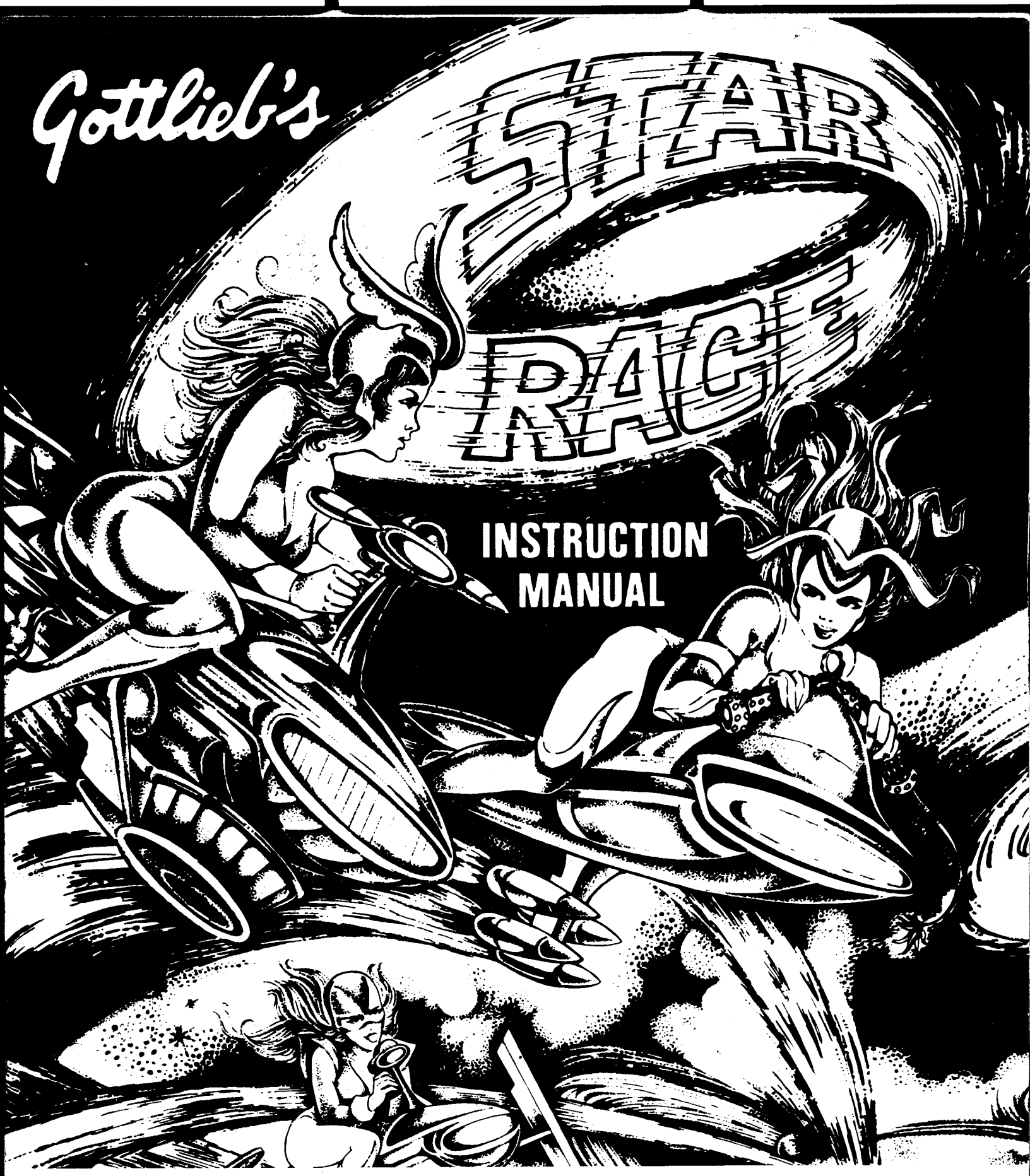


D. Gottlieb & Co.
A Columbia Pictures Industries Company
165 W. Lake Street - Northlake, Illinois 60164
Phone: 312/562-7400 Telex: 72-8463

Price $3.00

STAR RACE PROMS
GAME #657

ARE MARKED AS FOLLOWS:

GAME PROM 1 IS 657/1
GAME PROM 2 IS 657/2
SOUND PROM IS 657

INSERT PROMS WITH
INDENT NOTCH UP

STAR RACE

INSTRUCTION MANUAL

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STAR RACE

SWITCH NUMBER	SWITCH ASSIGNMENT	SCORING	FUNCTION
00	#1 ROLLOVER BUTTON	1500 POINTS	—
01	LEFT VARI-TARGET "R"	1000 POINTS	SPOTS "R"
02	#1 TOP DROP TARGET	3 BALL—5000 POINTS 5 BALL—3000 POINTS	ADD BONUS
03	LEFT RETURN ROLLOVER	3 BALL—5000 POINTS 5 BALL—3000 POINTS	ADD BONUS. SPOTS ADVANCE MULTIPLIER WHEN LIT
04	10 POINT CONTACTS (5)	10 POINTS	—
10	#2 ROLLOVER BUTTON	1500 POINTS	—
11	LEFT VARI-TARGET "A"	2000 POINTS	SPOTS "A"
12	#2 TOP DROP TARGET	SAME AS SW. 02	ADD BONUS
13	LEFT RETURN ROLLOVER	SAME AS SW. 03	SAME AS SW. 03
14	KICKING RUBBER (2)	10 POINTS	—
20	#1 TOP ROLLOVER	500 OR 5000 W/L	ADD BONUS. LIGHTS LEFT RETURN ROLLOVER
21	LEFT VARI-TARGET "T"	3000 POINTS	SPOTS "T"
22	#3 TOP DROP TARGET	SAME AS SW. 02	ADD BONUS
23	RIGHT RETURN ROLLOVER	SAME AS SW. 03	SAME AS SW. 03
30	#2 TOP ROLLOVER	SAME AS SW. 20	ADD BONUS. LIGHTS LEFT RETURN ROLLOVER & SPOTS CENTER ADVANCE MULTIPLIER
31	LEFT VARI-TARGET "S"	5000 POINTS	SPOTS "S" & CENTER ADVANCE MULTIPLIER
32	#1 CENTER DROP TARGET	SAME AS SW. 02	ADD BONUS
33	RIGHT OUTSIDE ROLLOVER	SAME AS SW. 03	SAME AS SW. 03
40	#3 TOP ROLLOVER	SAME AS SW. 20	ADD BONUS. LIGHTS RIGHT RETURN ROLLOVER & SPOTS CENTER ADVANCE MULTIPLIER
41	RIGHT VARI-TARGET "E"	1000 POINTS	SPOTS "E"
42	#2 CENTER DROP TARGET	SAME AS SW. 02	ADD BONUS
43	RIGHT TARGET SW.	3 BALL—5000 POINTS 5 BALL—3000 POINTS	ADD 3 BONUS WHEN LIT
50	#4 TOP ROLLOVER	SAME AS SW. 20	ADD BONUS. LIGHTS RIGHT OUTSIDE ROLLOVER & HOLE
51	RIGHT VARI-TARGET "C"	2000 POINTS	SPOTS "C"
52	#3 CENTER DROP TARGET	SAME AS SW. 02	ADD BONUS
53	#3, 4, 5 ROLLOVER BUTTONS	3 BALL—1000 POINTS 5 BALL—100 POINTS	—
57	TILT	—	TILT
60	LEFT SIDE ROLLOVER	3 BALL—5000 POINTS 5 BALL—3000 POINTS	ADD 3 POINTS WHEN LIT
61	RIGHT VARI-TARGET "A"	3000 POINTS	SPOTS "A"
62	#4 CENTER DROP TARGET	SAME AS SW. 02	ADD BONUS
67	OUTHOLE	—	SCORE BONUS
70	LEFT OUTSIDE ROLLOVER	5000 POINTS	ADD BONUS
71	RIGHT VARI-TARGET "R"	5000 POINTS	SPOTS "R" & CENTER ADVANCE MULTIPLIER
72	HOLE SW.	5000 POINTS	SCORE BONUS WHEN LIT
73	POP BUMPERS (2)	3 BALL—1000 POINTS 5 BALL—100 POINTS	

I. INSTALLATION

To assemble the game, first bolt the legs to the cabinet. Feed the line cord through the slot provided in the pedestal. Place the lightbox atop the pedestal and engage the holding brackets.

To remove glass, insert key and unlock. Lift glass up and swing bottom out. Loosen and lower the shipping bracket at top center of lightbox insert panel. Lift panel up and then swing out. Secure lightbox to cabinet with the four bolts and washers provided.

Connect all cables and secure with cable clamps provided. Inspect the following **before** plugging in line cord:

1. Check that cables are clear of moving parts.
2. Look for any disconnected wires.
3. Check switches for loose solder or other foreign matter.
4. Be certain all fuses are firmly seated.
5. Check the transformers for foreign matter across the terminals.
6. Be sure that the transformer wiring corresponds to the supply voltage.
7. Check the setting of the tilt switch on the underside of the playfield. One blade of this switch is free-floating with a weight on the end.

   After levelling the machine, adjust the plum-bob tilt (on left side of cabinet near front door) to the sensitivity desired.

II. GAME ADJUSTMENTS

A. PLAYFIELD ADJUSTMENTS

The game is shipped with adjustable posts in the position found to be suitable for the greatest number of players. Therefore the posts should not be changed unless the need is clearly evident.

The "conservative" (easier entry) position decreases playing time and scoring while the "liberal" position has the opposite effect.

B. LIGHTBOX ADJUSTMENTS

There are 32 switches on the control board which permit adjustment of the game parameters. These switches are contained in four packages of eight switches each, as shown below:

S1 - S8	S9 - S16	S17 - S24	S25 - S32

SWITCHES				COIN CHUTE ADJUSTMENTS
S1	S2	S3	S4	Left Chute
S5	S6	S7	S8	Right Chute
S9	S10	S11	S12	Center Chute

NOTE: FOR GERMAN GAMES ONLY, switches S5-S8 adjust the center chute and switches S9-S12 adjust the right chute.

				COINS/CREDITS
OFF	OFF	OFF	OFF	1/1
OFF	OFF	OFF	ON	1/2
OFF	OFF	ON	OFF	1/3
OFF	OFF	ON	ON	1/4
OFF	ON	OFF	OFF	1/5
OFF	ON	OFF	ON	1/6
OFF	ON	ON	OFF	1/7
OFF	ON	ON	ON	1/8
ON	OFF	OFF	OFF	1/9
ON	OFF	OFF	ON	2/1*
ON	OFF	ON	OFF	2/2*
ON	OFF	ON	ON	2/3*
ON	ON	OFF	OFF	2/4*
ON	ON	OFF	ON	2/5*
ON	ON	ON	OFF	1/1 and 2/3
ON	ON	ON	ON	3/1*

*NO CREDITS UNTIL LAST COIN IS INSERTED

SWITCH 13 — **EXTRA CREDITS**

ON	Adds 9 credits to center coin chute setting
OFF	No effect

NOTE: FOR GERMAN GAMES ONLY, Switch 13 adds 9 credits to the **right** coin chute setting, when ON.

SWITCH 14 — **COIN CHUTE CONTROL**

ON	Left and Right Chutes Same
OFF	Left and Right Chutes Separate

NOTE: FOR GERMAN GAMES ONLY, Switch 14 controls the **left** and **center** coin chutes.

SWITCHES 15 16 — **MAXIMUM CREDITS**

OFF	OFF	8
OFF	ON	10
ON	OFF	15
ON	ON	25

SWITCH 17 — **BALLS PER GAME**

ON	3
OFF	5

SWITCH 18 — **MATCH FEATURE**

ON	ON
OFF	OFF

SWITCH 19 — **REPLAY LIMIT**

ON	Limits each player to one replay per game
OFF	No replay limit

SWITCH 20 — **NOVELTY MODE**

ON	Playfield SPECIAL and EXTRA BALL features award 50,000 points and 5 knocks. High score, high game to date, and match features disabled.
OFF	Normal game mode.

NOTE: SWITCH 20 overrides SWITCH 21

SWITCH 21 — **GAME MODE**

ON	Extra Ball
OFF	Replay

NOTE: IF SWITCH 21 is ON, the high game to date and match awards are disabled.

SWITCH 22 — **PLAYFIELD SPECIAL**

ON	Awards Extra Ball
OFF	Awards Special

SWITCHES 23 24 — **HIGH GAME TO DATE**

OFF	OFF	Not displayed — no award
OFF	ON	Displayed — No award
ON	OFF	Displayed — awards 2 replays
ON	ON	Displayed — awards 3 replays

SWITCH 25 — **SOUND WHEN SCORING?**

ON	Yes
OFF	No

SWITCH 26 — **REPLAY BUTTON TUNE?**

ON	Yes
OFF	No

SWITCH 27 — **COIN SWITCH TUNE?**

ON	Yes
OFF	No

SWITCH 28 — **CREDITS DISPLAYED?**

ON	Yes
OFF	No

SWITCH 29 — **TILT PENALTY**

ON	Ball in play only
OFF	Game over

SWITCH 30 — **ATTRACT FEATURES**

ON	ON
OFF	OFF

SWITCH 31 — **NOT USED**

SWITCH 32 — **NOT USED**

C. ELECTRONIC SOUND ADJUSTMENTS

There are two switches on the SOUND BOARD which allow variation:

SWITCH S1

OFF ..... CONTINUOUS SOUND
ON ..... SCORING SOUNDS ONLY

SWITCH S2

OFF ..... NO ATTRACT TUNE
ON ..... ATTRACT TUNE PLAYED EVERY 6 MINUTES

The volume control is on the bottom panel in the cabinet and is accessible from the front door opening.

Switch S3 is a test switch. Pushing S3 will generate a short tune if switches S1 and S2 are in opposite states. No tune will be played if switches S1 and S2 are in the same state. This enables the operator to test the condition of both switches and to verify that the audio-output portion of the sound board is functional.

III. GAME OPERATION

With the line cord unplugged drop a coin into one of the chutes. It should be rejected. Plug the line cord ONLY into a properly grounded 3-wire receptacle of the correct voltage. Turn on the game by pressing the main switch located on the cabinet bottom near the front right corner.

After a five second delay the relays will pulse and the score displays will light and show all zeros. The credit display will show the number of credits remaining and the ball in play display will be blank. If the credits fail to light, turn off the game and inspect the front door slam switch. It is normally closed.

Five seconds after the score displays light, they will flash the High Game to Date score for one second. This cycle continues until the game is started. A number of playfield lights controlled by the MPU will be flashed to create an attract mode.

Insert coins into each chute and note that the correct number of credits are added on the credit display according to the information on the coin entrance plate. Press the replay button to reset the game; the ball should now be at the shooter. The first player score reads zero and flashes, indicating that that player is now scoring. The other player displays are blank and a one appears on the ball in play display. Additional players are indicated by a zero showing in each corresponding player display. After the maximum number of players has been added, or when the credit display reads zero, the replay button has no effect.

When the ball enters the outhole the bonus is scored, the ball is kicked to the shooter, and the display of the player now scoring begins to flash and continues to flash until a score is made. When the Shoot Again light is lit neither the player designation (flashing display) nor the ball in play display changes when the ball enters the outhole. Only one extra ball per ball in play can be given.

The number of balls per game is adjustable. When the last ball enters the outhole, the Game Over and Number to Match lights come on. A random number appears in the ball in play display and if this number matches the last two digits in any player's score a replay is awarded. At this time a High Game to Date score is periodically flashed in all player displays. When a score higher than this is achieved, an award dependent on switches 23 and 24 is given.

Tilting the game results in a penalty depending on the setting of switch 29. There is a normally closed switch on the front door. If this switch opens from pounding the front door, the entire game is ended. The Game Over light comes on and for three seconds the entire switch matrix is inactive.

Additional players can be added at any time the first ball is still in play.

IV. BOOKKEEPING AND SELF-TEST

The circuitry in this game helps the operator perform many bookkeeping functions. The information is shown one step at a time on the first player score display while the step number is shown in the credit display. Pressing the play/test button on the front door begins the bookkeeping and advances it to the next step each time the button is pressed. If the button is not pressed within sixty seconds of each step, the game returns to the attract mode.

STEP NUMBER	INFORMATION SHOWN
00	NONE
01	TOTAL COINS THROUGH LEFT COIN CHUTE
02	TOTAL COINS THROUGH RIGHT COIN CHUTE

NOTE: IF CONTROL BOARD SWITCH 14 IS ON, STEPS 01 AND 02 ARE ADDED TOGETHER AND DISPLAYED IN STEP 01.

03	TOTAL COINS THROUGH CENTER COIN CHUTE

NOTE: FOR GERMAN GAMES ONLY, STEP 02 DISPLAYS TOTAL COINS THROUGH CENTER COIN CHUTE AND STEP 03 DISPLAYS TOTAL COINS THROUGH RIGHT COIN CHUTE.

04	TOTAL PLAYS
05	TOTAL REPLAYS
06	GAME PERCENTAGE (Replays ÷ total plays)

NOTE: IF STEP 06 IS RESET, STEPS 04 AND 05 MUST ALSO BE RESET.

07	EXTRA BALLS
08	TILTS
09	SLAMS
10	Number of times High Game to Date has been incremented to reach its present value.
11	First High Score level
12	Second High Score level
13	Third High Score level
14	High Game to Date score
15	Average playing time per game PLAYER 1 shows minutes PLAYER 2 shows seconds

NOTE: IF STEP 15 IS RESET, STEP 04 MUST ALSO BE RESET.

All bookkeeping information is checked against itself to insure that it is correct. If the data changes for any reason, such as a dead battery, that information will be flashing while it is displayed.

The data in any bookkeeping step may be reset to zero while it is displayed by pressing the replay button on the front door. The play/test button must then be pressed to enter the zero into memory.

TO CHANGE HIGH SCORE LEVELS OR HIGH GAME TO DATE SCORE:

1. Press the play/test button on the front door to advance to step 11. (1st high score level).
2. Reset the score by pressing the replay button on the front door.
3. Release the replay button then hold it in again. This causes the score to advance by 10,000's. Hold in the replay button until the desired score is shown.

   Enter the new score into memory by pressing the play/test button and advancing to the next step.

To return to the attract mode at any time, actuate the slam switches, tilt switches, on-off power switch, or wait sixty seconds.

SELF-TEST FEATURES:

The self-test routine begins with STEP 16. To bypass the bookkeeping functions and advance directly to self-test, press the Replay button in STEP 00.

STEP NUMBER

16 **LAMP TEST**

Relays and coin lockout coil are pulsed, then all controlled lamps are turned on in sequence.

17 **SOLENOID TEST**

Each controlled solenoid is pulsed while its number appears on the status display.

SOLENOID ASSIGNMENTS

NUMBER	FUNCTION
1	Left and Right Vari-Target
2	Hole Kicker
3	Left Coin Chute counter*
4	Right Coin Chute counter*
5	Top Target Bank
6	Center Target Bank
7	Center Coin Chute counter*
8	Knocker
9	Outhole

*Coin counters are optional and are **NOT** pulsed during SOLENOID TEST.

NOTE: FOR GERMAN GAMES ONLY, SOLENOID #4 is assigned to the **center** coin chute counter and SOLENOID #7 is assigned to the **right** coin chute counter.

18 **SWITCH TEST**

All switches on the switch matrix are inspected. If all switches are open, 99 is displayed on the status display. If one or more switches are closed, their numbers will appear on the status displays.

CAUTION: TURN POWER OFF BEFORE MAKING ANY SWITCH ADJUSTMENTS!

19 **DISPLAY TEST**

Each digit of each display is turned on individually and all numbers 0-9 are sequenced.

20 **MEMORY TEST**

Each control board memory device is inspected. Any defective devices are indicated by part number on the PLAYER 1 score display. If all memory devices are okay, 99 is displayed on the status display.

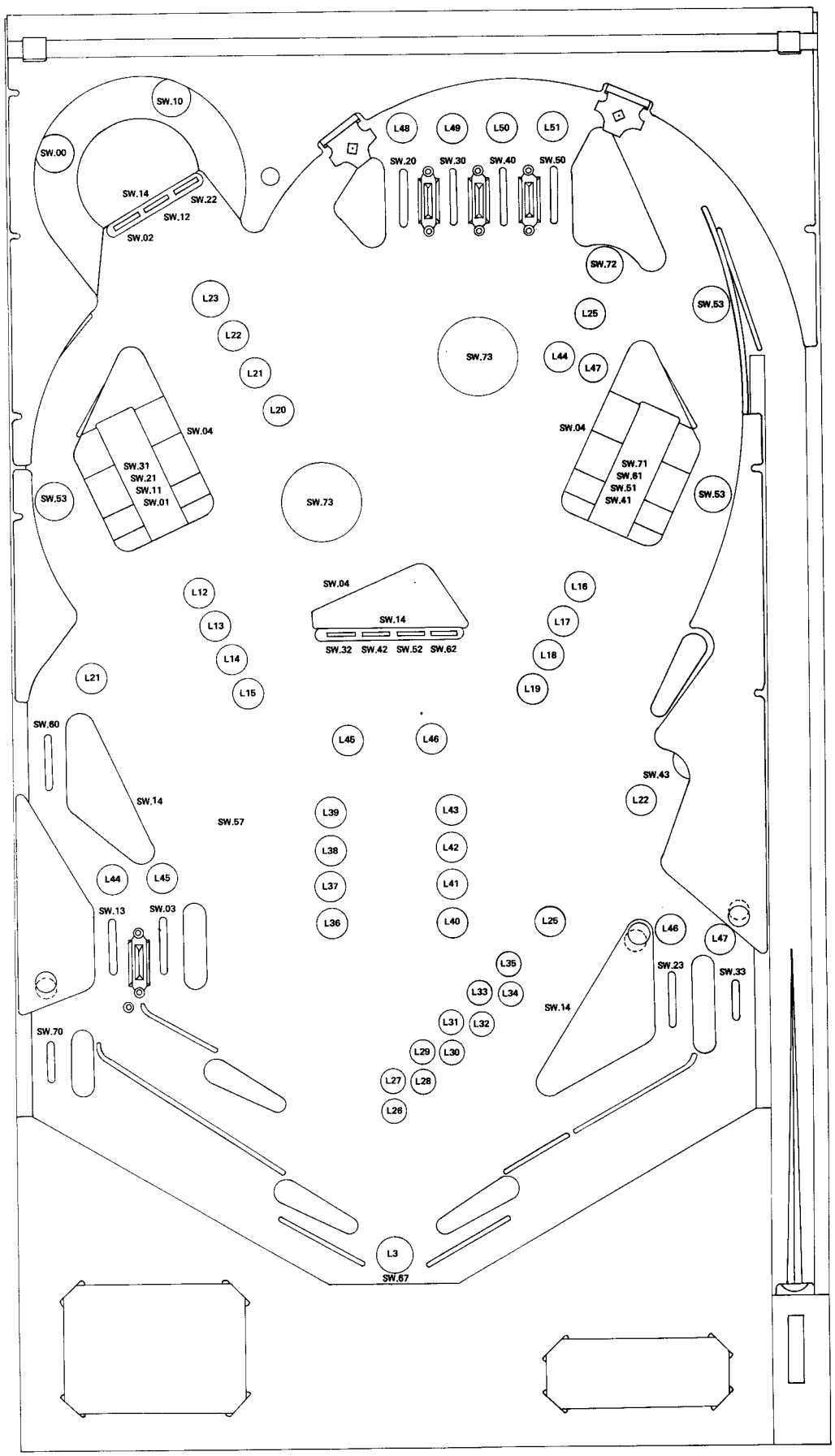
Any of the tests in steps 16 through 20 may be repeated any number of times by pressing the replay button immediately after the test is completed.

V. OPTIONAL ELECTRO-MECHANICAL COIN COUNTERS

Electro-mechanical coin counters may be installed on the bottom board, if desired. Directly behind the seven position fuse block, solder lugs are provided which will connect the counters to the electronic circuitry.

1. Position the counter and secure it to the bottom board. Mounting holes are spotted in the bottom board for most standard 24 volt counters.
2. **CAUTION:** A 1N4004 diode must be connected across each counter with the cathode end connected to the solder lug with the RED-BLACK-BLACK wire.
3. Connect one counter lead to each of the two solder lugs provided for each counter.
4. The counter should increment once when the respective coin chute switch is closed.

VI. SWITCH MATRIX AND LAMP LOCATION ASSIGNMENT



SWITCH MATRIX AND LAMP LOCATION

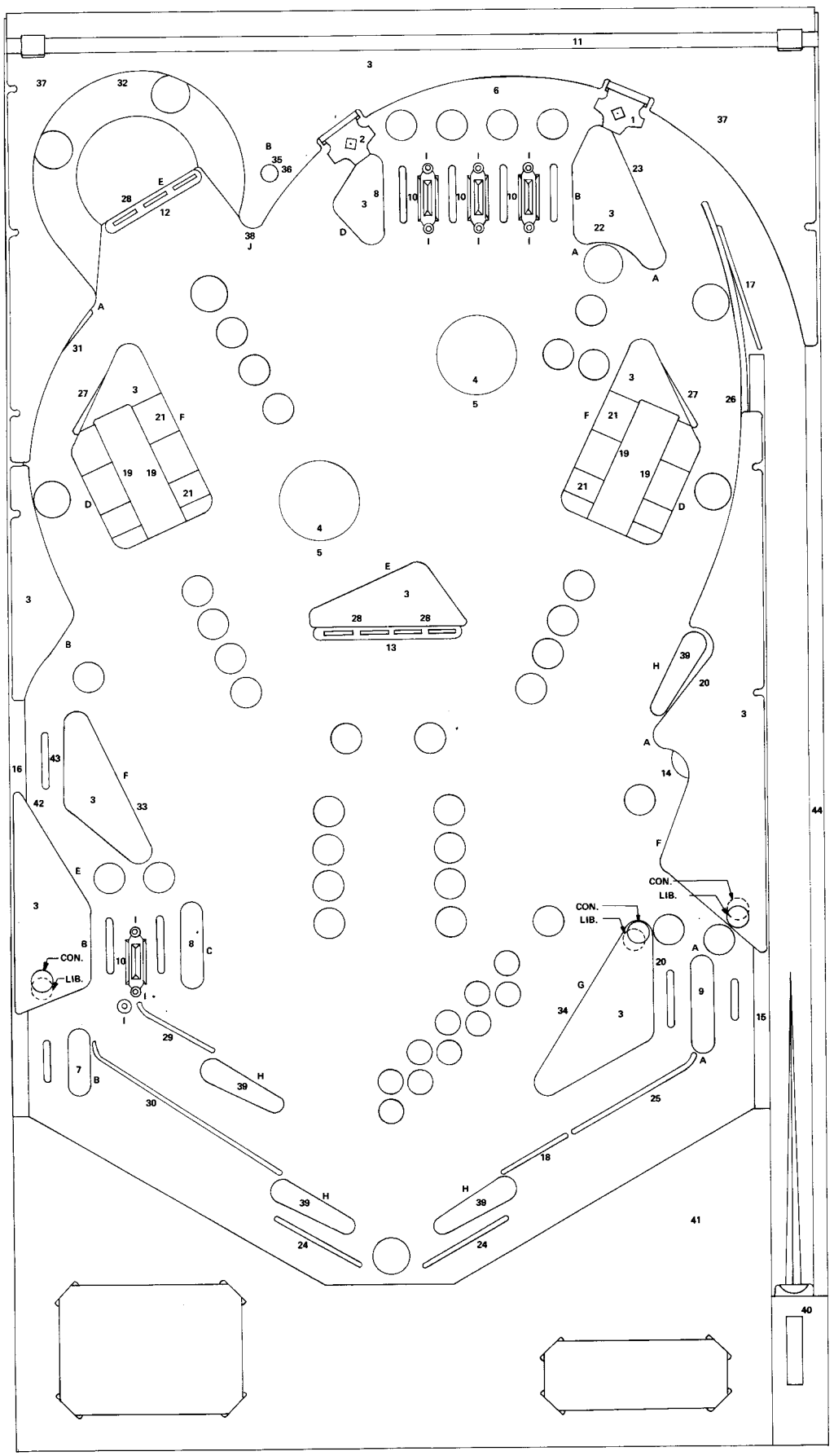
SWITCHES ON MATRIX

SW. MATRIX NUMBER	SWITCH FUNCTION
00	#1 Rollover Button.
01	"R" Left Vari-Target.
02	#1 Top Drop Target.
03	Left Return Rollover.
04	10 Point. (5)
10	#2 Rollover Button.
11	"A" Left Vari-Target.
12	#2 Top Drop Target.
13	Left Return Rollover.
14	10 Point Contact Kicker. (2)
20	#1 Top Rollover.
21	"T" Left Vari-Target.
22	#3 Top Drop Target.
23	Right Return Rollover.
30	#2 Top Rollover.
31	"S" Left Vari-Target.
32	#1 Center Drop Target.
33	Right Outside Rollover.
40	#3 Top Rollover.
41	"E" Right Vari-Target.
42	#2 Center Drop Target.
43	Right Target.
50	#4 Top Rollover.
51	"C" Right Vari-Target.
52	#3 Center Drop Target.
53	#3, #4, #5 Rollover Buttons. (3)
57	Tilt.
60	Left Side Rollover.
61	"A" Right Vari-Target.
62	#4 Center Drop Target.
67	Outhole.
70	Left Outside Rollover.
71	"R" Right Vari-Target.
72	Hole Kicker.
73	Pop Bumper. (2)

CPU CONTROLLED LAMPS

LAMP NUMBER	LAMP FUNCTION	
0	Game Over Relay.	
1	Tilt Relay.	
2	Coin Lockout Relay.	
3	Same Player Shoots Again. (Lightbox and Playfield)	
4	1st Player.	Lamps in Lightbox
5	2nd Player.	
6	3rd Player.	
7	4th Player.	
10	High Game To Date.	
11	Game Over.	
12	"S" Left Vari-Target.	
13	"T" Left Vari-Target.	
14	"A" Left Vari-Target.	
15	"R" Left Vari-Target.	
16	"R" Right Vari-Target.	
17	"A" Right Vari-Target.	
18	"C" Right Vari-Target.	
19	"E" Right Vari-Target.	
20	5000	
21	10,000 and Left Side Rollover.	
22	15,000 and Right Target.	
23	Extra Ball.	
25	20,000 and Scores Bonus.	
26	1000	
27	2000	
28	3000	
29	4000	
30	5000	
31	6000	
32	7000	
33	8000	
34	9000	
35	10,000	
36	Yellow 2X.	
37	Yellow 3X.	
38	Yellow 4X.	
39	Yellow 5X.	
40	Green 2X.	
41	Green 3X.	
42	Green 4X.	
43	Green 5X.	
44	Yellow Advance Multiplier and Left Return Rollover.	
45	Yellow Advance Multiplier and Left Return Rollover.	
46	Green Advance Multiplier and Right Return Rollover.	
47	Green Advance Multiplier and Right Outside Rollover.	
48	#1 Top Rollover.	
49	#2 Top Rollover.	
50	#3 Top Rollover.	
51	#4 Top Rollover.	

VII. PLAYBOARD INFORMATION



PLAYBOARD INFORMATION

RUBBER RINGS

A—A-10217 (6)
B—A-10218 (4)
C—A-10219 (1)
D—A-10220 (3)
E—A-10221 (3)
F—A-10222 (4)
G—A-10223 (1)
H—A-13151 (4)
I —A-15705 (9)
J—A-17493 (1)

PARTS LIST

1. A-19645 Ball Gate Right.
2. A-19646 Ball Gate Left.
3. D-20125 Plastic Shield Set.
4. Yellow Pop Bumpers A-13904 and A-16838 in Black. (2)
5. Yellow Pop Bumper Skirt. (2)
6. D-20018 Top Arch Rod.
7. A-9393 White Plastic Guide Rail.
8. A-9395 Yellow Plastic Guide Rail. (4)
9. A-9398 Green Plastic Guide Rail.
10. C-15647 Yellow Rollover Guide. (4)
11. D-19939 Arch Shield Retainer.
12. Green Drop Target Bank A-13179 in Gold. (3 Pos.)
13. Yellow Drop Target Bank A-13179 in Black. (4 Pos.)
14. A-14787 White Target with Black.
15. B-19880 Center Wood Rail.
16. B-19881 Left Wood Rail.
17. A-1914 Ball Guide Rail.
18. A-3722 Ball Guide Rail.
19. A-4832 Ball Guide Rail. (4)
20. A-6612 Ball Guide Rail. (2)
21. A-6931 Ball Guide Rail. (4)
22. A-17650 Ball Guide Rail.
23. A-13782 Ball Guide Rail.
24. A-13798 Ball Snubber Rail. (2)
25. A-14505 Ball Guide Rail.
26. B-16992 Ball Guide Rail.
27. A-17106 Ball Guide Rail. (2)
28. A-18070 Ball Guide Rail. (3)
29. A-20028 Ball Guide Rail.
30. B-20029 Ball Guide Rail.
31. C-20030 Ball Guide Rail.
32. C-20031 Ball Guide Rail.
33. A-15636 Left Kicking Rubber.
34. A-15638 Right Kicking Rubber.
35. B-19873 Arch Rod End Post.
36. B-19874 Arch Rod End Post Cap.
37. B-19875 Arch Rod Support Post. (2)
38. C-17492 Siamese Post.
39. C-13150 White Jumbo Flipper. (4)
40. C-9767 Ball Shooter Gage.
41. E-18940 Card Holder.
42. A-13101 Metal Flat Rail.
43. A-9397 Yellow Plastic Guide Rail.
44. C-19882 Right Wood Rail.

C-11561 Clear 1" High Post. (43)
A-14487 Split Post Base. (3)
A-14488 Split Post Cap. (3)

CON. = CONSERVATIVE.
LIB. = LIBERAL.

VIII. CABLE PLUG WIRE ASSIGNMENTS

The following lists provide wire color and function information for each wire of each connector in the game.

Wire colors are shown as numbers. Use the chart below to convert to colors.

0 Black
1 Brown
2 Red
3 Orange
4 Yellow
5 Green
6 Blue
7 Purple
8 Slate
9 White

For example, 688 is a BLUE-SLATE-SLATE striped wire.

Printed Circuit Board connectors are shown as AX-JX.

Use the following chart to determine which printed circuit board applies:

A1 Control Board
A2 Power Supply
A3 Driver Board
A4 Score Displays (4)
A5 Status Display
A6 Sound Board
A8 Pop Bumper Driver Board

For example, A3-J3 is connector J3 on the driver board.

There are eight male/female cable connectors in the game. These are shown as A7-JX/PX.

A1-J1

PIN	WIRE COLOR	FUNCTION
1	*688	+5VDC
2	*688	+5VDC
3	—	SPARE
4	*54	GROUND
5	*54	GROUND

A1-J2

PIN	WIRE COLOR	FUNCTION
1	300	aA
2	311	bA
3	322	cA
4	333	dA
5	344	eA
6	355	fA
7	366	gA
8	377	hA
9	600	aB
10	611	bB
11	622	cB
12	633	dB
13	644	eB
14	655	fB
15	666	gB
16	677	hB
17	800	aC
18	811	bC
19	822	cC
20	833	dC
21	844	eC
22	855	fC
23	866	gC
24	877	hC

A1-J3

PIN	WIRE COLOR	FUNCTION
1	400	D1
2	411	D2
3	422	D3
4	433	D4
5	444	D5
6	455	D6
7	466	D7
8	477	D8
9	700	D9
10	711	D10
11	722	D11
12	733	D12
13	744	D13
14	755	D14
15	766	D15
16	777	D16
17	—	SPARE

A1-J4

PIN	WIRE COLOR	FUNCTION
1	*54	GROUND
2	*688	+5VDC
3	9	DS2
4	9	LD3
5	9	LD4
6	9	LD2
7	9	LD1
8	—	SPARE
9	—	SPARE
10	—	SPARE
11	—	SPARE
12	—	SPARE
13	—	SPARE
14	—	SPARE
15	—	SPARE
16	—	SPARE
17	—	SPARE
18	—	KEY
19	—	SPARE
20	—	SPARE
21	9	KNOCKER
22	9	3RD COUNTER
23	9	2ND COUNTER
24	9	1ST COUNTER
A	*54	GROUND (SPARE)
B	*688	+5VDC (SPARE)
C	9	DS1
D	9	DS4
E	9	DS3
F	9	DS6
H	9	DS5
J	9	DS8
K	9	DS7
L	9	DS10
M	9	DS9
N	9	DS11
P	9	DS12
R	9	SOLENOID 5
S	9	SOLENOID 1
T	9	OUTHOLE
U	9	SOLENOID 6
V	—	(KEY)
W	—	SPARE
X	9	SOLENOID 2
Y	9	SOUND 8
Z	9	SOUND 4
A	9	SOUND 2
B	9	SOUND 1

ALL WIRES #22 GAUGE UNLESS SPECIFIED* (18 GA.)

A1-J5

PIN	WIRE COLOR	FUNCTION
1	677	RETURN 7
2	400	STROBE 0
3	411	STROBE 1
4	422	STROBE 2
5	433	STROBE 3
6	*444	STROBE 4
7	455	STROBE 5
8	666	RETURN 6
9	477	STROBE 7
10	700	SLAM SW.

A1-J6

PIN	WIRE COLOR	FUNCTION
1	400	STROBE 0
2	411	STROBE 1
3	422	STROBE 2
4	433	STROBE 3
5	444	STROBE 4
6	455	STROBE 5
7	466	STROBE 6
8	477	STROBE 7
9	9	GROUND
10	600	RETURN 0
11	611	RETURN 1
12	622	RETURN 2
13	633	RETURN 3
14	644	RETURN 4
15	655	RETURN 5
16	666	RETURN 6
17	677	RETURN 7
18	688	+5VDC
19	—	SPARE

A2-J1

PIN	WIRE COLOR	FUNCTION
1	(#16GA) 200	12VDC
2	(#16GA) 54	GROUND
3	—	SPARE
4	—	(KEY)
5	688	+5VDC
6	166	+5VDC offset
7	100	60V
8	111	60V RETURN
9	133	+8VDC offset

A2-J2

PIN	WIRE COLOR	FUNCTION
1	*688	+5VDC
2	*688	+5VDC
3	*54	GROUND
4	*54	GROUND
5	—	(KEY)
6	—	SPARE

A2-J3

PIN	WIRE COLOR	FUNCTION
1	044	+60VDC
2	—	(KEY)
3	055	+42VDC
4	54	GROUND
5	54	GROUND
6	688	+5VDC (SPARE)
7	688	+5VDC

A3-J1

PIN	WIRE COLOR	FUNCTION
1	*54	GROUND
2	*688	+5VDC
3	9	DS2
4	9	LD3
5	9	LD4
6	9	LD2
7	9	LD1
8	—	SPARE
9	—	SPARE
10	—	SPARE
11	—	SPARE
12	—	SPARE
13	—	SPARE
14	—	SPARE
15	—	SPARE
16	—	SPARE
17	—	SPARE
18	—	SPARE
19	—	(KEY)
20	—	SPARE
21	9	KNOCKER
22	9	3RD COUNTER
23	9	2ND COUNTER
24	9	1ST COUNTER
A	*54	GROUND (SPARE)
B	*688	+5VDC (SPARE)
C	9	DS1
D	9	DS4
E	9	DS3
F	9	DS6
H	9	DS5
J	9	DS8
K	9	DS7
L	9	DS10
M	9	DS9
N	9	DS11
P	9	DS12
R	9	SOLENOID 5
S	9	SOLENOID 1
T	9	OUTHOLE
U	9	SOLENOID 6
V	—	SPARE
W	—	(KEY)
X	9	SOLENOID 2
Y	9	SOUND 8
Z	9	SOUND 4
$\overline{A}$	9	SOUND 2
$\overline{B}$	9	SOUND 1

ALL WIRES #22 GAUGE UNLESS SPECIFIED* (18 GA.)

A3-J2

PIN	WIRE COLOR	FUNCTION
1	588	SHOOT AGAIN LAMP
2	500	PLAYER 1 LAMP
3	511	PLAYER 2 LAMP
4	533	PLAYER 4 LAMP
5	522	PLAYER 3 LAMP
6	*54	GROUND
7	577	HIGH GAME TO DATE LAMP
8	566	GAME OVER LAMP
9		SPARE
10		SPARE

A3-J3

PIN	WIRE COLOR	FUNCTION
1	*54	SPARE GROUND
2	777	L43
3	755	L41
4	744	L40
5	544	L32
6	555	L33
7	577	L35
8	—	KEY
9	344	L24
10	355	L25
11	377	L27
12	366	L26
13	144	L16
14	155	L17
15	177	L19
16	166	L18
17	(16GA) 54	GROUND (L20-L27)
18	322	L22
19	333	L23
20	311	L21
21	300	L20
22	122	L14
23	133	L15
24	111	L13
25	100	L12
A	*54	SPARE GROUND
B	*688	+5VDC (SPARE)
C	*54	GROUND (L44-L51)
D	800	L44
E	844	L48
F	811	L45
H	855	L49
J	—	KEY
K	566	L34
L	—	SPARE
M	833	L47
N	877	L51
P	822	L46
R	866	L50

A3-J3 continued

PIN	WIRE COLOR	FUNCTION
S	*54	GROUND (L40-L43)
T	766	L42
U	(16GA) 54	GROUND (L28-L35)
V	522	L30
W	533	L31
X	511	L29
Y	500	L28
Z	(16GA) 54	GROUND (L12-L19)
A	288	GAME OVER RELAY
B	277	TILT RELAY
C	588	SHOOT AGAIN LAMP

A3-J4

PIN	WIRE COLOR	FUNCTION
1	700	L36
2	711	L37
3	733	L39
4	722	L38
5	*54	GROUND (L36-L39)
6	*211	SOLENOID 5
7	*266	SOLENOID 1
8	*244	OUTHOLE (SOL. 9)
9	*54	GROUND (SOL. 1, 9)
10	*54	GROUND (SOL. 2)
11	*54	GROUND (SOL. 6)
12	*233	SOLENOID 6
13	*200	SOLENOID 2
14	*54	GROUND (SOL. 5)
15	*54	SPARE GROUND

A3-J5

PIN	WIRE COLOR	FUNCTION
1	733	SOUND 4
2	877	COIN LOCKOUT COIL
3	54	GROUND (KNOCKER)
4	688	+5VDC (SPARE)
5	722	SOUND 2
6	711	SOUND 1
7	744	SOUND 8
8	888	KNOCKER

A3-J6

PIN	WIRE COLOR	FUNCTION
1	633	2ND COUNTER
2	644	3RD COUNTER
3	655	1ST COUNTER
4	54	GROUND

ALL WIRES #22 GAUGE UNLESS SPECIFIED* (18 GA.)

1A4-J1

PIN	WIRE COLOR	FUNCTION
1	455	D6
2	444	D5
3	433	D4
4	422	D3
5	411	D2
6	400	D1
7	377	hA
8	366	gA
9	355	fA
10	344	eA
11	333	dA
12	322	cA
13	311	bA
14	300	aA
15	122	5VAC
16	144	5VAC RETURN
17	044	+60VDC
18	—	SPARE
19	54	GROUND

2A4-J1

PIN	WIRE COLOR	FUNCTION
1	733	D12
2	722	D11
3	711	D10
4	700	D9
5	477	D8
6	466	D7
7	377	hA
8	366	gA
9	355	fA
10	344	eA
11	333	dA
12	322	cA
13	311	bA
14	300	aA
15	122	5VAC
16	144	5VAC RETURN
17	044	+60VDC
18	—	SPARE
19	54	GROUND

3A4-J1

PIN	WIRE COLOR	FUNCTION
1	455	D6
2	444	D5
3	433	D4
4	422	D3
5	411	D2
6	400	D1
7	677	hB
8	666	gB
9	655	fB
10	644	eB
11	633	dB
12	622	cB
13	611	bB
14	600	aB
15	122	5VAC
16	144	5VAC RETURN
17	044	+60VDC
18	—	SPARE
19	54	GROUND

4A4-J1

PIN	WIRE COLOR	FUNCTION
1	733	D12
2	722	D11
3	711	D10
4	700	D9
5	477	D8
6	466	d7
7	677	hB
8	666	gB
9	655	fB
10	644	eB
11	633	dB
12	622	cB
13	611	bB
14	600	aB
15	122	5VAC
16	144	5VAC RETURN
17	044	+60VDC
18	—	SPARE
19	54	GROUND

ALL WIRES #22 GAUGE UNLESS SPECIFIED* (18 GA.)

A5-J1

PIN	WIRE COLOR	FUNCTION
1	—	SPARE
2	777	D16
3	766	D15
4	—	SPARE
5	755	D14
6	744	D13
7	822	cC
8	811	bC
9	877	hC
10	866	gC
11	855	fC
12	844	eC
13	833	dC
14	800	aC
15	155	3vAC
16	177	3vAC RETURN
17	055	+42vDC
18	688	+5vDC
19	54	GROUND

A6-J1

PIN	WIRE COLOR	FUNCTION
1	200	+12vDC
2	—	SPARE
3	333	AC
4	344	AC RETURN
5	688	+5vDC
6	54	GROUND
7	011	SPEAKER OUTPUT
8	711	SOUND 1
9	722	SOUND 2
10	—	SPARE
11	733	SOUND 4
12	744	SOUND 8

A7-J1/P1

PIN	WIRE COLOR	FUNCTION
1	677	RETURN 7
2	500	STROBE 0
3	511	STROBE 1
4	533	STROBE 3
5	522	STROBE 2
6	544	STROBE 4
7	555	STROBE 5
8	—	SPARE
9	—	SPARE
10	700	ANTI-CHEAT SW.
11	9	ANTI-CHEAT SW. (GND)
12	*54	EARTH GROUND

A7-J2/P2

PIN	WIRE COLOR	FUNCTION
1	*066	COIN CHUTE LIGHTS
2	*000	COIN CHUTE LIGHTS RETURN
3	*055	LEFT FLIPPER SWITCH
4	*388	FLIPPER SWITCH RETURN
5	222	+24vDC
6	877	COIN LOCKOUT

A7-J3/P3

PIN	WIRE COLOR	FUNCTION
1	*122	5VAC
2	*144	5VAC RETURN
3	155	3VAC
4	177	3VAC RETURN
5	*54	LAMP GROUND
6		SPARE
7	(16GA) 077	6.3 VAC
8	(16GA) 000	6.3 VAC RETURN
9	*255	+6vDC

A7-J4/P4

PIN	WIRE COLOR	FUNCTION
1	*54	GROUND
2	*54	GROUND
3	*54	GROUND
4	*54	GROUND
5	*54	GROUND
6	*54	GROUND
7	*54	GROUND
8	*54	GROUND
9	*54	GROUND
10	*54	GROUND
11	*54	GROUND
12	—	SPARE

A7-J5/P5

PIN	WIRE COLOR	FUNCTION
1	(16GA) 255	+6 VDC
2	(16GA) 54	GROUND
3	(16GA) 54	GROUND
4	(16GA) 54	GROUND
5	(16GA) 54	GROUND
6	(16GA) 222	+24VDC
7	*388	FLIPPER SW. RETURN
8	*388	FLIPPER SW. RETURN
9	*055	LEFT FLIPPER SWITCH
10	*044	RIGHT FLIPPER SWITCH
11	(16GA) 066	6.3VAC
12	(16GA) 000	6.3VAC RETURN
13	*277	25VAC
14	*288	25VAC RETURN
15	—	SPARE

ALL WIRES #22 GAUGE UNLESS SPECIFIED* (18 GA.)

A7-J6/P6

PIN	WIRE COLOR	FUNCTION
1	011	MATCH LIGHT
2	022	TILT LIGHT
3	033	BALL IN PLAY LIGHT
4	—	SPARE

A7-J7/P7

PIN	WIRE COLOR	FUNCTION
1	400	STROBE 0
2	433	STROBE 3
3	477	STROBE 7
4	666	RETURN 6
5	677	RETURN 7
6	(#16GA) 54	GROUND
7	—	SPARE
8	777	AC INPUT
9	788	AC INPUT

A7-J8/P8

PIN	WIRE COLOR	FUNCTION
1	022	SPEAKER
2	*54	GROUND
3	*54	EARTH GROUND
4	—	SPARE

1A8-J1

PIN	WIRE COLOR	FUNCTION
1	*188	COIL #1
2	*54	GROUND
3	—	KEY
4	077	SWITCH #1
5	688	+5VDC
6	9	DC GROUND

2 A8-J1

PIN	WIRE COLOR	FUNCTION
1	*488	COIL #2
2	*54	GROUND
3	—	KEY
4	011	SWITCH #2
5	688	+5VDC
6	9	DC GROUND

ALL WIRES #22 GAUGE UNLESS SPECIFIED* (18 GA.)

IX. PARTS LIST

CONTROL BOARD

PART NUMBER	DESCRIPTION
R6502-13	CPU—(U1)
R6532-18	RIOT—(U4, U5, U6)
R3273-12	ROM—(U2)
R3272-12	ROM—(U3)
P5101L-1	RAM/CMOS—(Z5)
640361-3	SOCKET—DIP, 24 PIN
SN7402N	IC—2 INPUT—"NOR"—(Z8)
SN7400N	IC—2 INPUT—"NAND"—(Z9, Z13, Z14)
SN7432N	IC—2 INPUT—"OR"—(Z15)
SN7404N	IC—HEX INVERTER—(*)
SN7416N	IC—HEX INVERTER—OC/HV—(Z29, Z30)
SN7417N	IC—HEX BUFFER—OC—(Z32)
SN74LS139N	IC—2 TO 4 DECODER—(Z28)
SN74175N	IC—"D" FLIP FLOP—(Z18, Z20, Z22)
SN7448N	IC—4 TO 7 DECODER—(Z19, Z21, Z23)
SN74154N	IC—4 TO 16 DECODER—(Z25, Z33)
SN7474N	IC—DUAL FLIP FLOP—(Z2)
SCL4528B	CMOS IC—DUAL 1 SHOT—(Z1)
SCL4081B	CMOS IC—QUAD 2 INPUT "AND"—(Z4)
1N4148	DIODE—GP—(CR1-CR35)
1N5225B or 1N5987B	ZENER DIODE—3.0V, 5%—(VR1)
326R10-002	BATTERY—3.6V—(BAT. 1)
333R08-001	CRYSTAL—3.579545 MHZ—(Y1)
131R06-001	SPACER, CORK
MPS A70	TRANSISTOR—PNP—(Q1, Q4)
341R31-005	DIP SWITCH PACK—8 POS.—(SW1-SW4)
	RESISTOR—62Ω, ¼W, 5%—(R7)
	CAPACITOR—.01 MICROFARAD, 50V—(C2, C4-C13, C15-C24, C26-C29, C31-C35)
	CAPACITOR—.1 MICROFARAD, 50V—(C3, C14, C25, C30)
	CAPACITOR—100 MICROFARAD, 10V—(C1)
	RESISTOR—3.0KΩ, ¼W, 5%—(R1, R6, R11-24, R42, R45, R46, R48, R51-R57)
	RESISTOR—2.0KΩ, ¼W, 5%—(R4, R5, R44)
	RESISTOR—180Ω, ¼W, 5%—(R8, R50)
	RESISTOR—1KΩ, ¼W, 5%—(R9)
	RESISTOR—2.7MΩ, ¼W, 5%—(R10)
	RESISTOR—620Ω, ¼W, 5%—(R25-R33)
	RESISTOR—4.7KΩ, ¼W, 5%—(R2, R34-R41)
	RESISTOR—5.6KΩ, ¼W, 5%—(R3, R43, R49)
	RESISTOR—24KΩ, ¼W, 5%—(R47)
	CAPACITOR—10 MICROFARAD, 10V—(C36)
2N4400	TRANSISTOR—MOTOROLA—(Q2, Q3)
SN74LS05N	IC—OPEN COLLECTOR INVERTER—(Z10)
SN74LS04N	IC—HEX INVERTER—(Z7)
MM74C04 or SCL 4069B	IC—CMOS—(Z36)
640379-3	SOCKET—40 PIN—(TC1)

*(Z3, Z11, Z12, Z16, Z17, Z24, Z26, Z27, Z34, Z35)

MASTER DRIVER BOARD

PART NUMBER	DESCRIPTION
43-03-4	INSULATOR—THERMALLOY
2N6043	TRANSISTOR—NPN—(Q53, Q59, Q60)
2N3055	TRANSISTOR—NPN—(Q58, Q62, Q64)
MPS-U45	TRANSISTOR—NPN—(Q1-Q4, Q13-Q32, Q45-Q52, Q54-Q57, Q63)
MPS-A13	TRANSISTOR—NPN—(Q5-Q12, Q33-Q44)
SN74175N	IC—QUAD "D" FLIP-FLOP—(Z1-Z12)
SN7404N	IC—HEX INVERTER—(Z13)
1N4148	DIODE—SILICON—(CR1-CR6)
	CAPACITOR—.01 MICROFARAD, 50V—(C2-C19)
	CAPACITOR—10 MICROFARAD, 10V—TANTALUM—(C1)
	RESISTOR—1000Ω, ¼W, 5%—(R1-R53, R61, R55, R56, R58, R59)
	RESISTOR—9.1Ω, 1W, 5%—(R54, R57, R60)

POWER SUPPLY

PART NUMBER	DESCRIPTION
	HEATSINK MOUNTING PLATE
	SPACER—6—32 THREAD X 5/32
	SPACER—6—32 THREAD X ⅛
1N4004	DIODE—(CR1-CR4)
1N4759A	ZENER DIODE—62V, 1W, 5%—(CR5)
1N4746A	ZENER DIODE—18V, 1W, 5%—(CR6)
1N3445	ZENER DIODE—8.2V, 2W, 10%—(CR7)
1N4734A	ZENER DIODE—5.6V, 1W, 5%—(CR8)
SW4F013	TRANSISTOR—NPN—NATIONAL—(Q1)
2N5550	TRANSISTOR—NPN—(Q2)
PMD10K40	TRANSISTOR—LAMBDA—(Q3)
S107Y1	SILICON CONTROLLED RECTIFIER—(SCR1)
UA723CN	IC—14 PIN DIP—(IC1)
CM4-22	DIODE—LIGHT EMITTING—(LED1, LED2)
115R501A	POTENTIOMETER—500Ω—CTS—(POT1)
	RESISTOR—1.3KΩ, 5W, 10%—(R1)
	RESISTOR—1KΩ, ¼W, 5%—(R2, R9)
	RESISTOR—12KΩ, ½W, 5%—(R3)
	RESISTOR—33Ω, 1W, 5%—(R4)
	RESISTOR—510Ω, ¼W, 5%—(R6, R13)
	RESISTOR—3.9KΩ, ¼W, 5%—(C7)
	RESISTOR—10KΩ, ¼W, 5%—(R8)
	RESISTOR—30Ω, 2W, 5%—(R10)
	RESISTOR—2.2KΩ, ¼W, 5%—(R11)
	RESISTOR—.33Ω, 5W, 10%—(WIRE WOUND)—(R12)
	RESISTOR—10KΩ, ½W, 5%—(R5)
	RESISTOR—2KΩ, ¼W, 5%—(R14)
	RESISTOR—100Ω, ¼W, 5%—(R15)
	RESISTOR—20Ω, ¼W, 5%—(R16)
	RESISTOR—620Ω, ½W, 5%—(R17)
	RESISTOR—180Ω, ¼W, 5%—(R18)
	CAPACITOR—470 MICROFARAD, 100V—(C1)
	CAPACITOR—47 MICROFARAD, 100V—(C2)
	CAPACITOR—1000 PICOFARAD, 50V—(C3)
	CAPACITOR—470 MICROFARAD, 10V—(C4)
	CAPACITOR—.2 MICROFARAD, 16V, $^{+80\%}_{-20\%}$—(C5)
	TURRET TERMINAL—(E1-E6)
	TURRET TERMINAL—(TP1-TP5, CP5)
1NS-3	INSULATOR
DM111	INSULATOR
G52-3	EYELET
	CONNECTOR—6 PIN—MOLEX—(J2)
	CONNECTOR—7 PIN—MOLEX—(J3)
	CONNECTOR—9 PIN—MOLEX—(J1)
	HEAT SINK—THERMALLOY

SOUND BOARD

PART NUMBER	DESCRIPTION
	RESISTOR—2.7KΩ, ¼W, 5%—(R1, R2, R7)
	RESISTOR—2.7Ω, ¼W, 5%—(R9)
	RESISTOR—6.8KΩ, ¼W, 5%—(R10)
	RESISTOR—430Ω, ½W, 5%—(R11)
	RESISTOR—2.7MΩ, ¼W, 5%—(R3)
	RESISTOR—1.8MΩ, ¼W, 5%—(R4)
	RESISTOR—22.1KΩ, ¼W, 1%—(R12)
	RESISTOR—10KΩ, ¼W, 5%—(R6)
	RESISTOR—5.6KΩ, ¼W, 5%—(R8)
	RESISTOR—270KΩ, ¼W, 5%—(R5)
	RESISTOR—47KΩ, ¼W, 5%—(R13)
	CAPACITOR—0.01 MICROFARAD, 100V, 20%—KEMET—(C1-C5)
	CAPACITOR—47 MICROFARAD, 25V—(C7, C9)
	CAPACITOR—470 MICROFARAD, 25V—(C8)
	CAPACITOR—0.1 MICROFARAD, 100V, 20%—KEMET—(C6, C10, C13, C17)
	CAPACITOR—10 PICOFARAD, 1000V, 5%—(C11)
	CAPACITOR—100 PICOFARAD, 250V, 20%—(C12)
	CAPACITOR—0.047 MICROFARAD, 25V, 20%—(C15)
	CAPACITOR—0.0033 MICROFARAD, 50V, 20%—(C16)
	CAPACITOR—10 MICROFARAD, 25V—(C14)
R6503	IC—CPU—(U1)
R6530C:R3016-14	IC—ROM/RAM/I/O—(U2)
SSS1408-6P	IC—DAC—(U3)
HM7643-5	IC—PROM—(U4)
NE555P	IC—TIMER—(U8)
SN7404N	IC—INVERTER—(U6, U7)
LM380N	IC—AMPLIFIER—(U5)
1N4004	DIODE—(CR1-CR4)
1N4742A	ZENER DIODE—12V, 1W, 5%—(CR5)
1N270	DIODE—(CR6)
76SB02	2 POSITION DIP SWITCH—(S1, S2)
EVQ-PAR-11K	PUSH BUTTON SWITCH—(S3)
640359-1	SOCKET, 18 PIN (PROM SOCKET)

POP BUMPER DRIVER BOARD

PART NUMBER	DESCRIPTION
	CAPACITOR—47 MICROFARAD, 10V—(C4)
	CAPACITOR—0.01 MICROFARAD, 100V, 20%—(C1, C2)
	CAPACITOR—4.7 MICROFARAD, 10V, 10%—(C3)
	RESISTOR—1.5KΩ, ¼W, 5%—(R1)
	RESISTOR—12KΩ, ¼W, 5%—(R2)
	RESISTOR—220Ω, ¼W, 5%—(R3)
1N4148	DIODE—(CR1, CR2)
SN74121N	IC—(Z1)
SN7416N	IC—(Z2)
PMD10K60	TRANSISTOR—LAMBDA—(Q1)
09-65-1061	CONNECTOR—(J1)

6-DIGIT DISPLAY (SPRAGUE DRIVERS)

QUANTITY	NUMBER	DESCRIPTION
1	**RC20GF103**	Resistor—10KΩ, ½W, 5% (R1)
1	**TE1400**	Capacitor—1 Microfarad, 100V (C3)
2	**C320C103MIR5CA**	Capacitor—0.1 Microfarad, 100V—Kemet (C1, C2)
2	**UDN6118A**	IC—Fluorescent Display Driver—Sprague (Z1, Z2)
1	**6-JS-01**	6-digit Display Tube—Futaba (DS1)

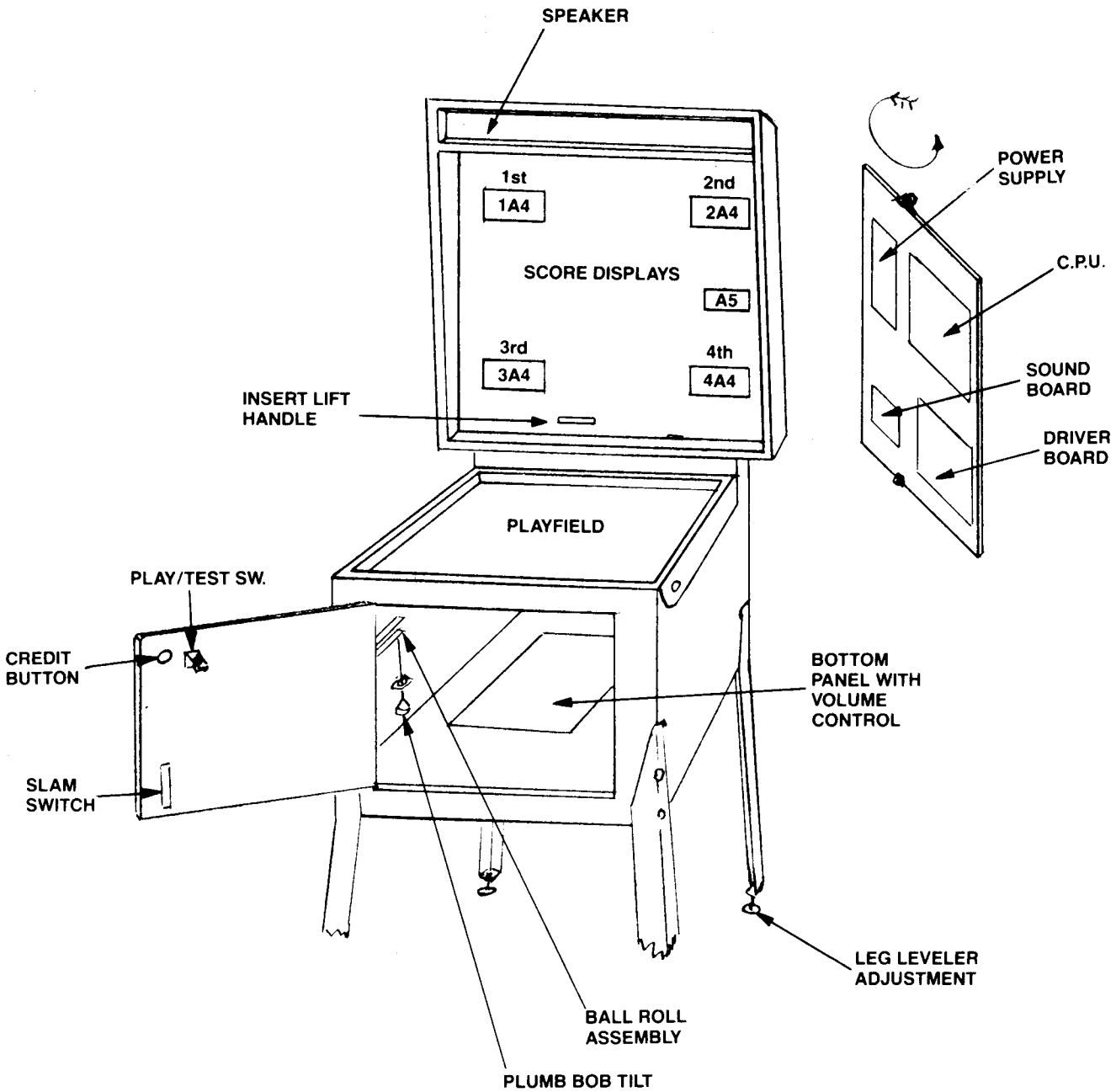
4-DIGIT DISPLAY

QUANTITY	NUMBER	DESCRIPTION
1	**TE1400**	Capacitor—1 Microfarad, 100V—Sprague (C-1)
2	**C320C103MIR5CA**	Capacitor—0.01 Microfarad, 100V—Kemet (C2, C3)
2	**UDN6118A**	IC—Fluorescent Display Driver—Sprague (Z2, Z3)
1	**SN7432N**	IC—Quad OR Gate—T.I. (Z1)
1	**4-LT-11**	4-digit Display Tube—Futaba (DS1)
2	**721R01-113**	Resistor—4.7KΩ, ¼W, 5% (R1, R2)

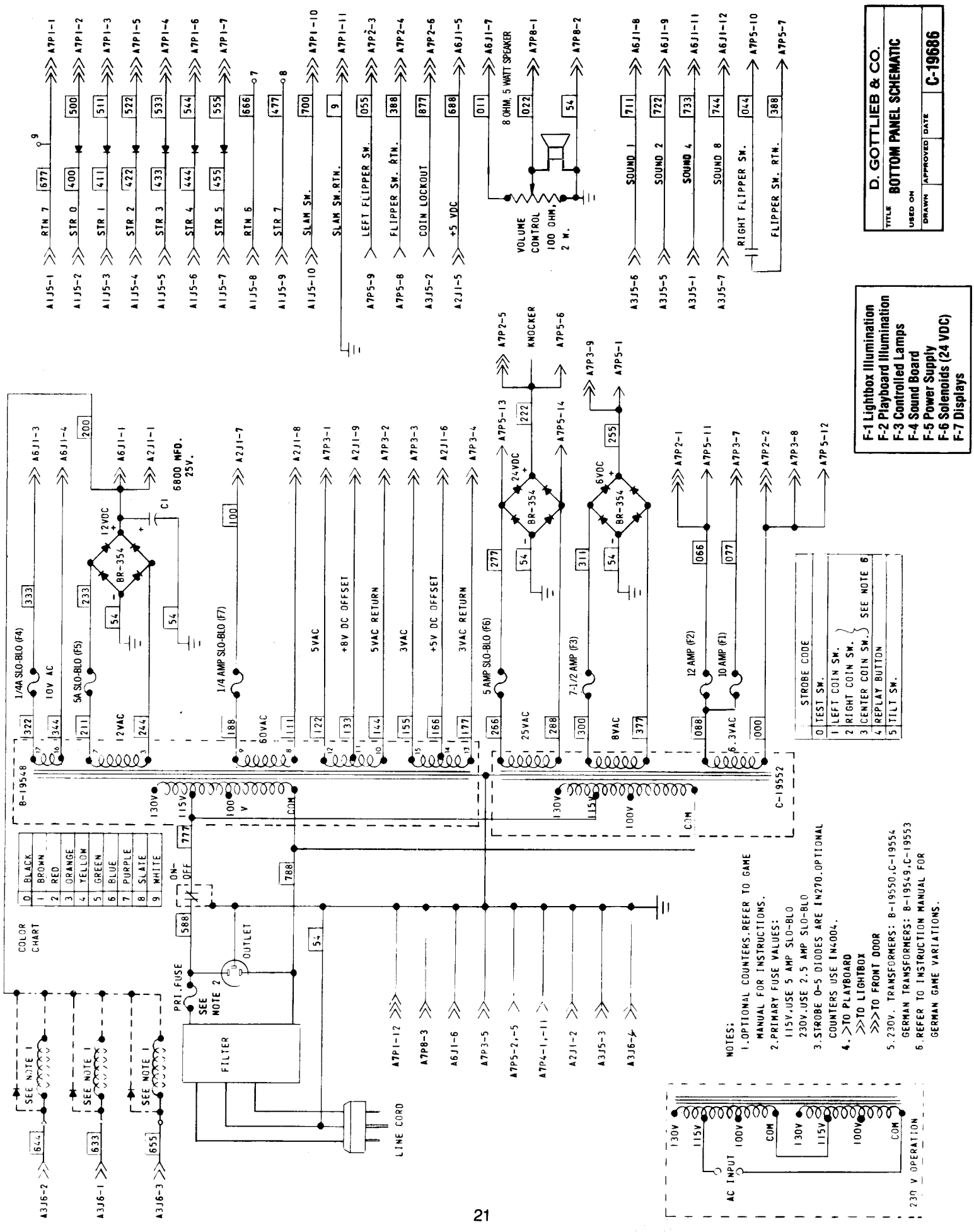
X. WIRING AND SCHEMATIC DIAGRAMS

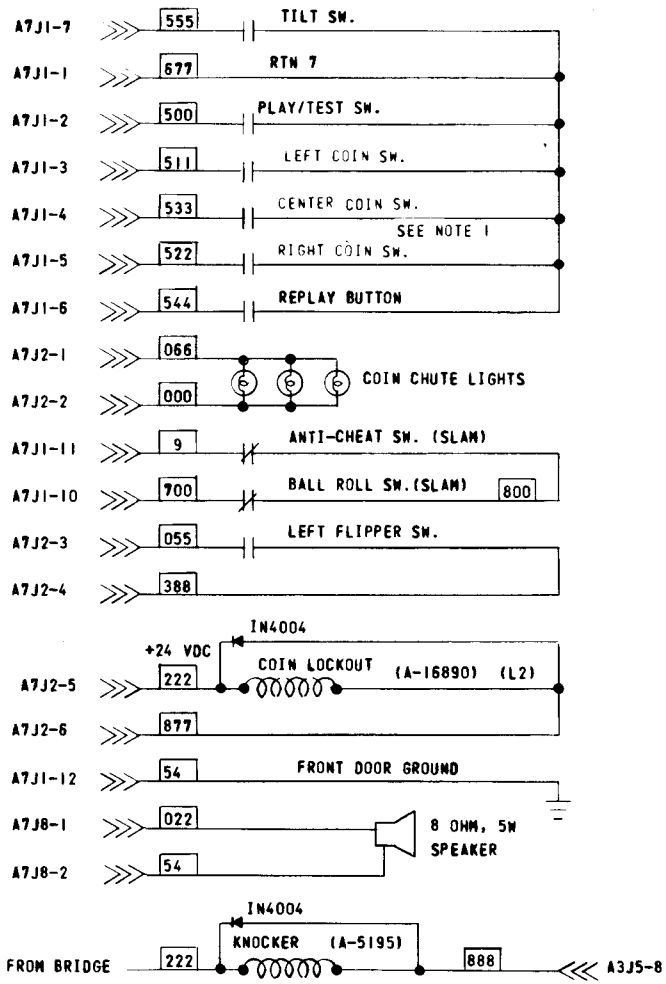
A. COMPONENT LOCATION DIAGRAM
B. BOTTOM BOARD SCHEMATIC
C. BOTTOM BOARD AND LIGHTBOX SCHEMATIC
D. SWITCH MATRIX ASSIGNMENT DIAGRAM
E. PLAYBOARD SOLENOID SCHEMATIC DIAGRAM
F. PLAYBOARD ILLUMINATION SCHEMATIC DIAGRAM
G. LIGHTBOX CABLE SCHEMATIC DIAGRAM
H. CONTROL BOARD COMPONENT LOCATION DIAGRAM
I. CONTROL BOARD SCHEMATIC DIAGRAM 1 OF 2
J. CONTROL BOARD SCHEMATIC DIAGRAM 2 OF 2
K. DRIVER BOARD COMPONENT LOCATION DIAGRAM
L. DRIVER BOARD SCHEMATIC DIAGRAM
M. 6 DIGIT DISPLAY SCHEMATIC AND COMPONENT LOCATION DIAGRAM
N. 4 DIGIT DISPLAY SCHEMATIC AND COMPONENT LOCATION DIAGRAM
O. POWER SUPPLY SCHEMATIC DIAGRAM
P. SOUND BOARD SCHEMATIC DIAGRAM
Q. SOUND BOARD COMPONENT LOCATION DIAGRAM
R. POP BUMPER DRIVER BOARD SCHEMATIC DIAGRAM

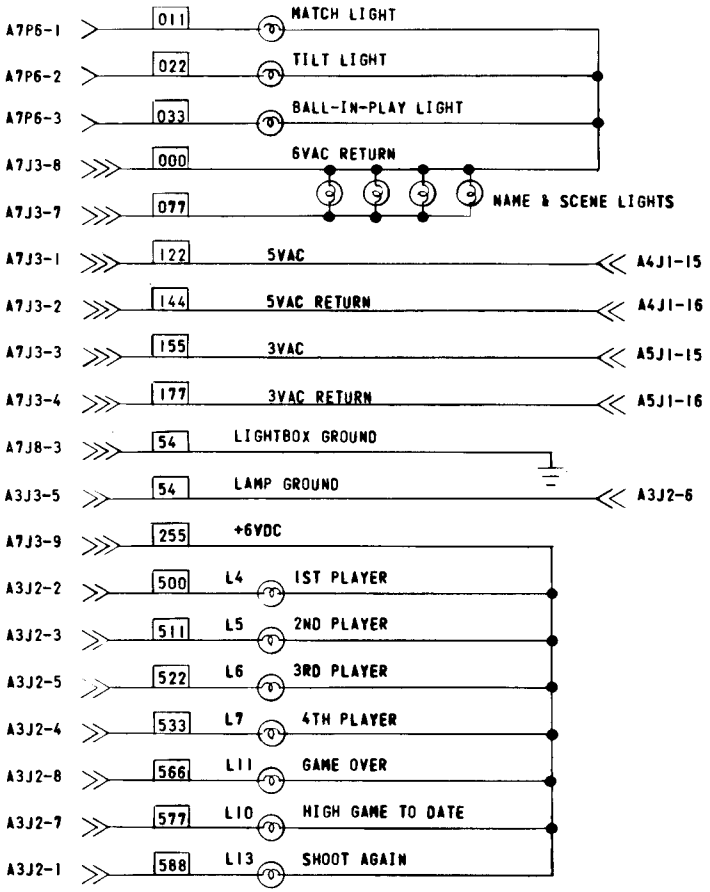
X. A. COMPONENT LOCATION DIAGRAM



X. B. BOTTOM BOARD PANEL SCHEMATIC







NOTE 1: REFER TO INSTRUCTION MANUAL FOR GERMAN GAME VARIATIONS.

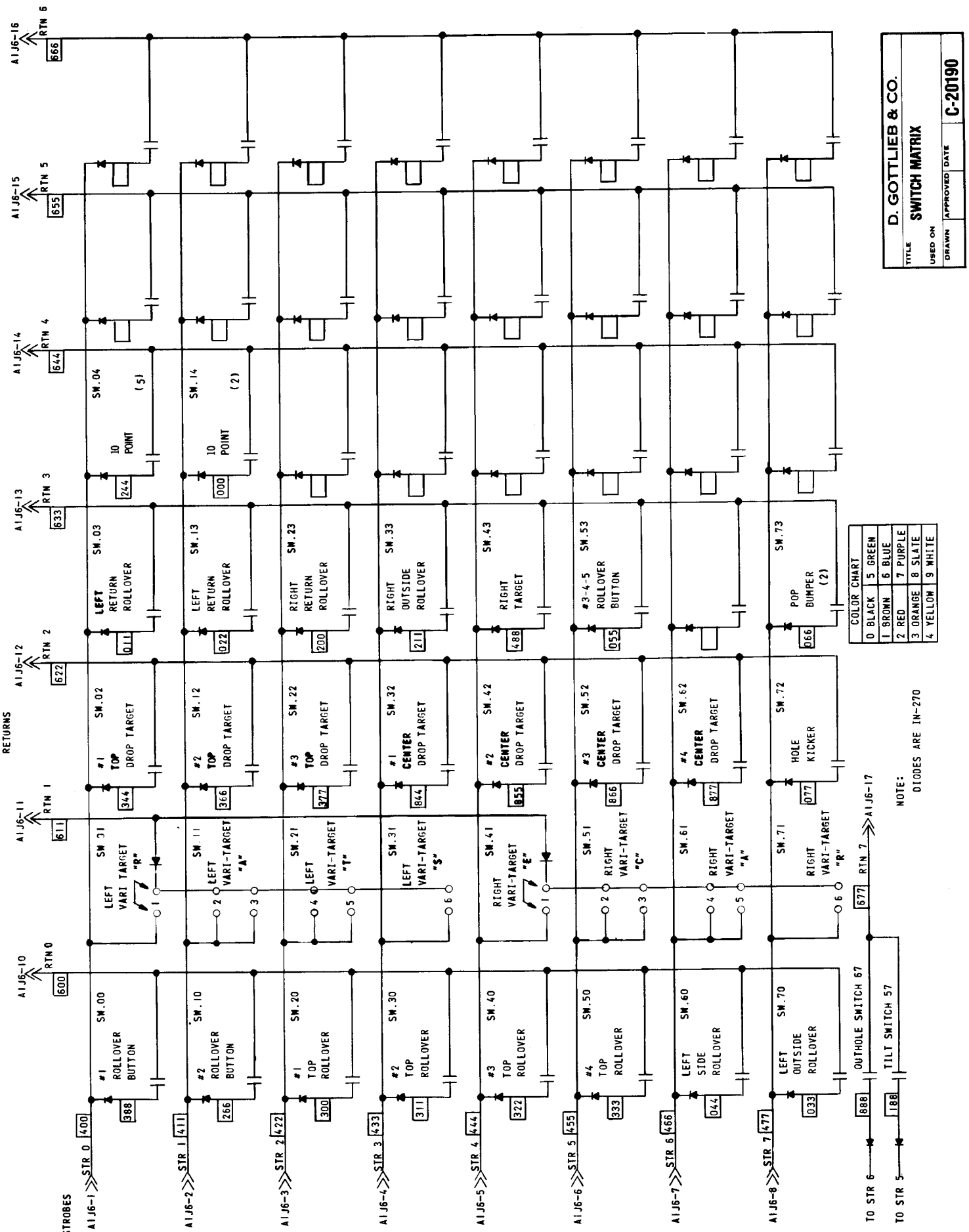
> FROM PLAYBOARD

>> FROM LIGHTBOX

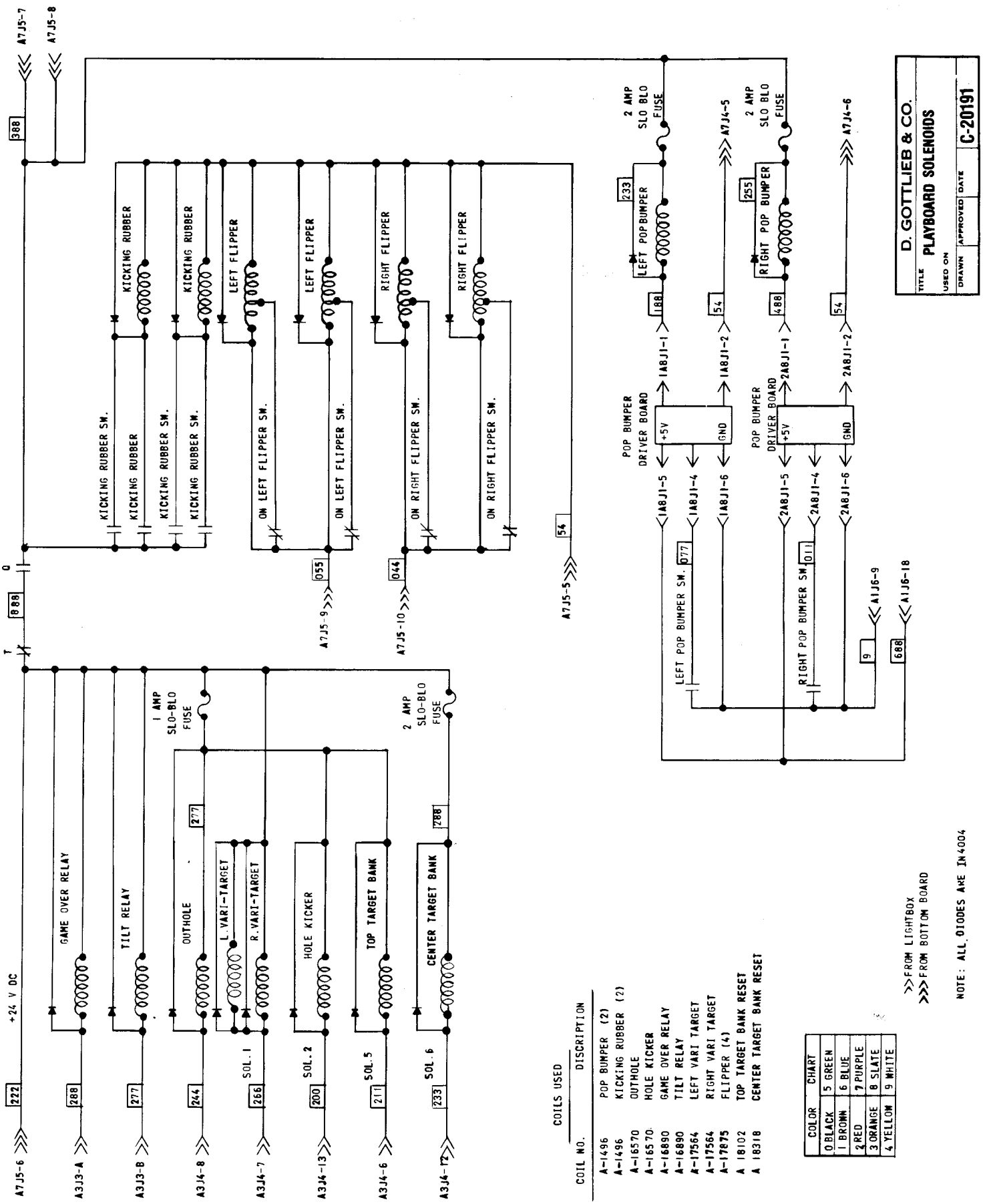
>>> FROM BOTTOM BOARD

D. GOTTLIEB & CO.			
TITLE / USED ON	BOTTOM BOARD & LIGHTBOX SCHEMATIC		
DRAWN	APPROVED	DATE	C-19690

X. D. SWITCH MATRIX



X. E. PLAYBOARD SOLENOIDS



COILS USED

COIL NO.	DISCRIPTION
A-1496	POP BUMPER (2)
A-1496	KICKING RUBBER (2)
A-16570	OUTHOLE
A-16570	HOLE KICKER
A-16890	GAME OVER RELAY
A-16890	TILT RELAY
A-17564	LEFT VARI TARGET
A-17564	RIGHT VARI TARGET
A-17875	FLIPPER (4)
A 18102	TOP TARGET BANK RESET
A 18318	CENTER TARGET BANK RESET

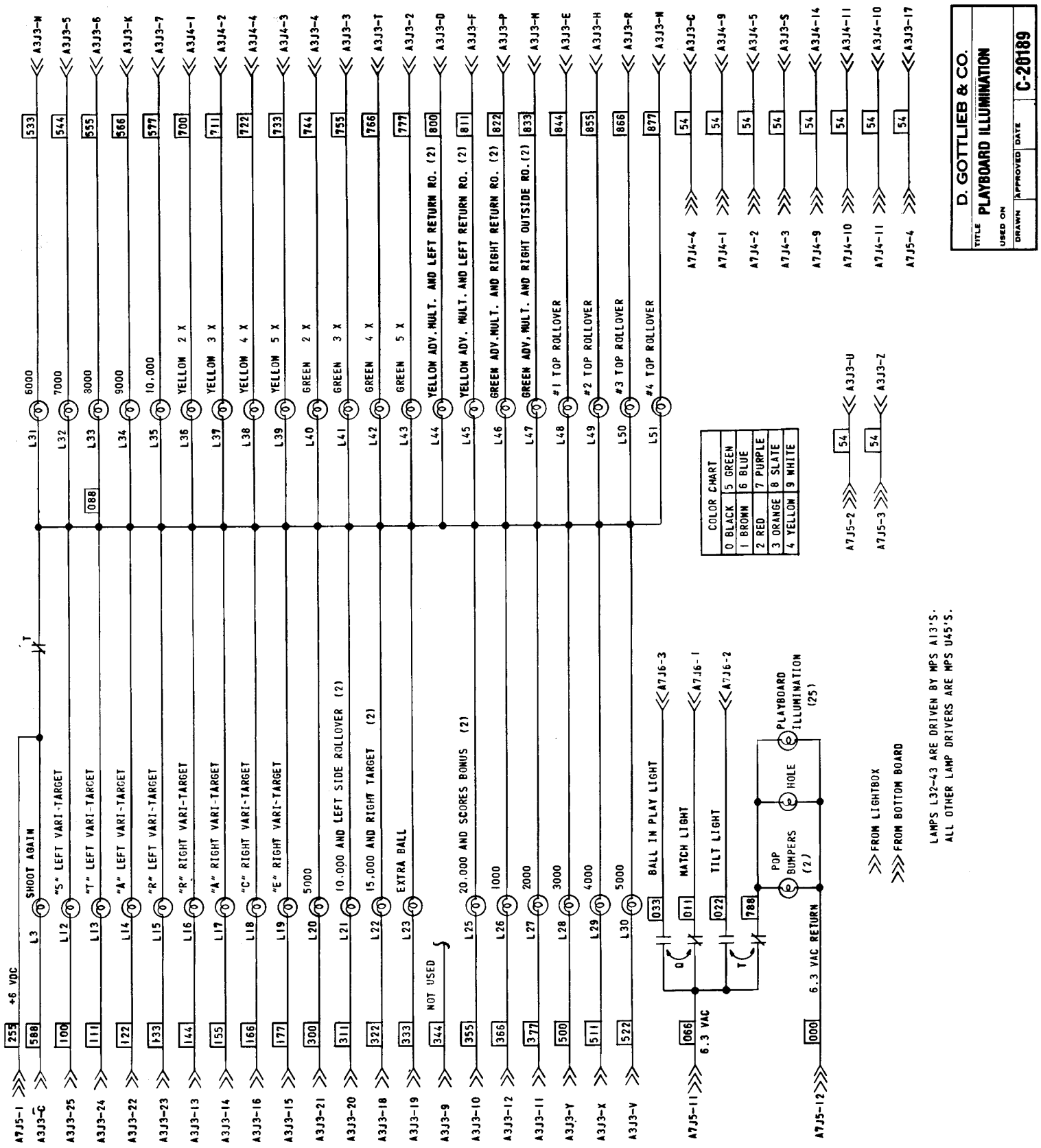
COLOR	CHART
0 BLACK	5 GREEN
1 BROWN	6 BLUE
2 RED	7 PURPLE
3 ORANGE	8 SLATE
4 YELLOW	9 WHITE

>>FROM LIGHTBOX
>>>FROM BOTTOM BOARD

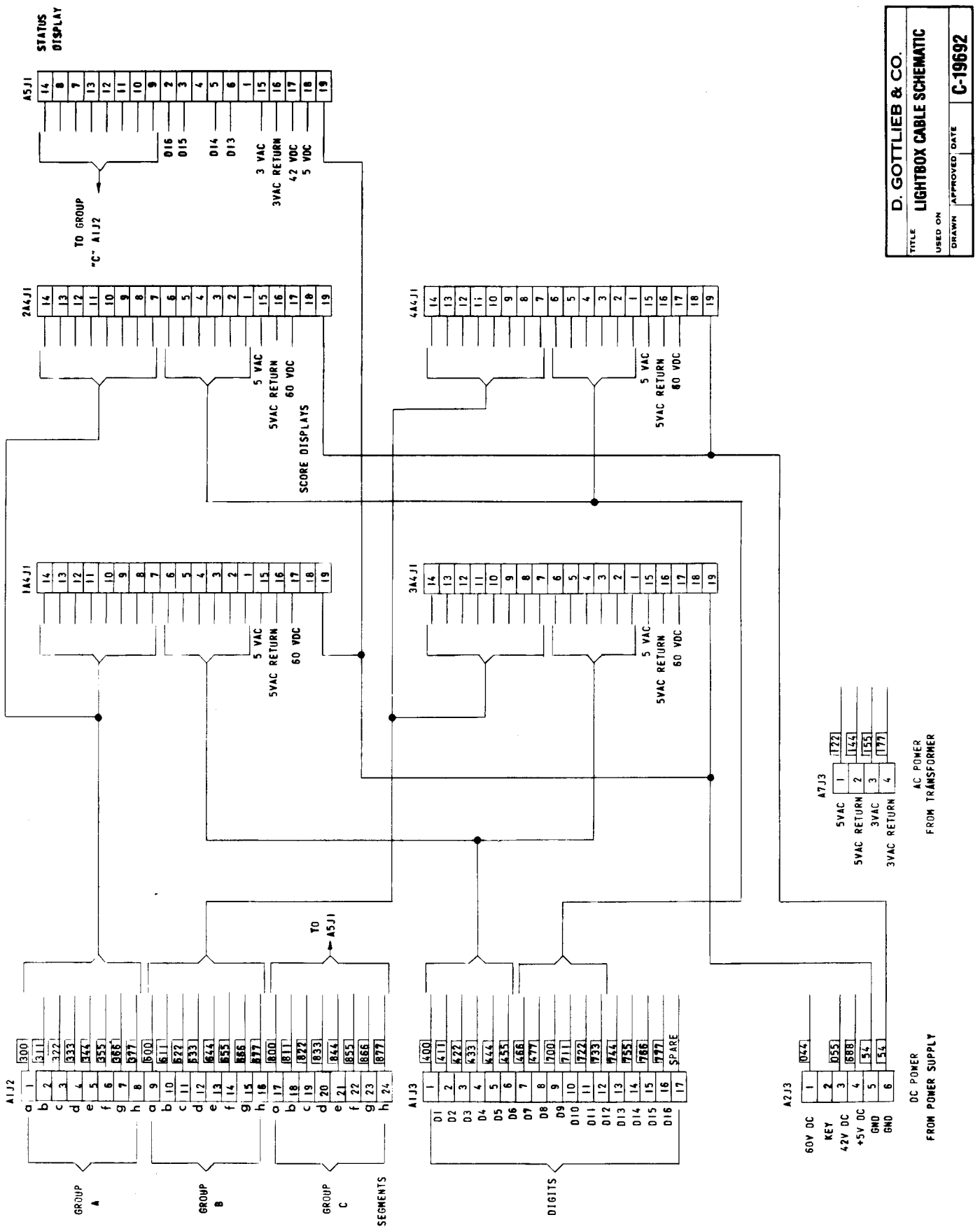
NOTE: ALL DIODES ARE IN4004

D. GOTTLIEB & CO.			
TITLE	PLAYBOARD SOLENOIDS		
USED ON			
DRAWN	APPROVED	DATE	C-20191

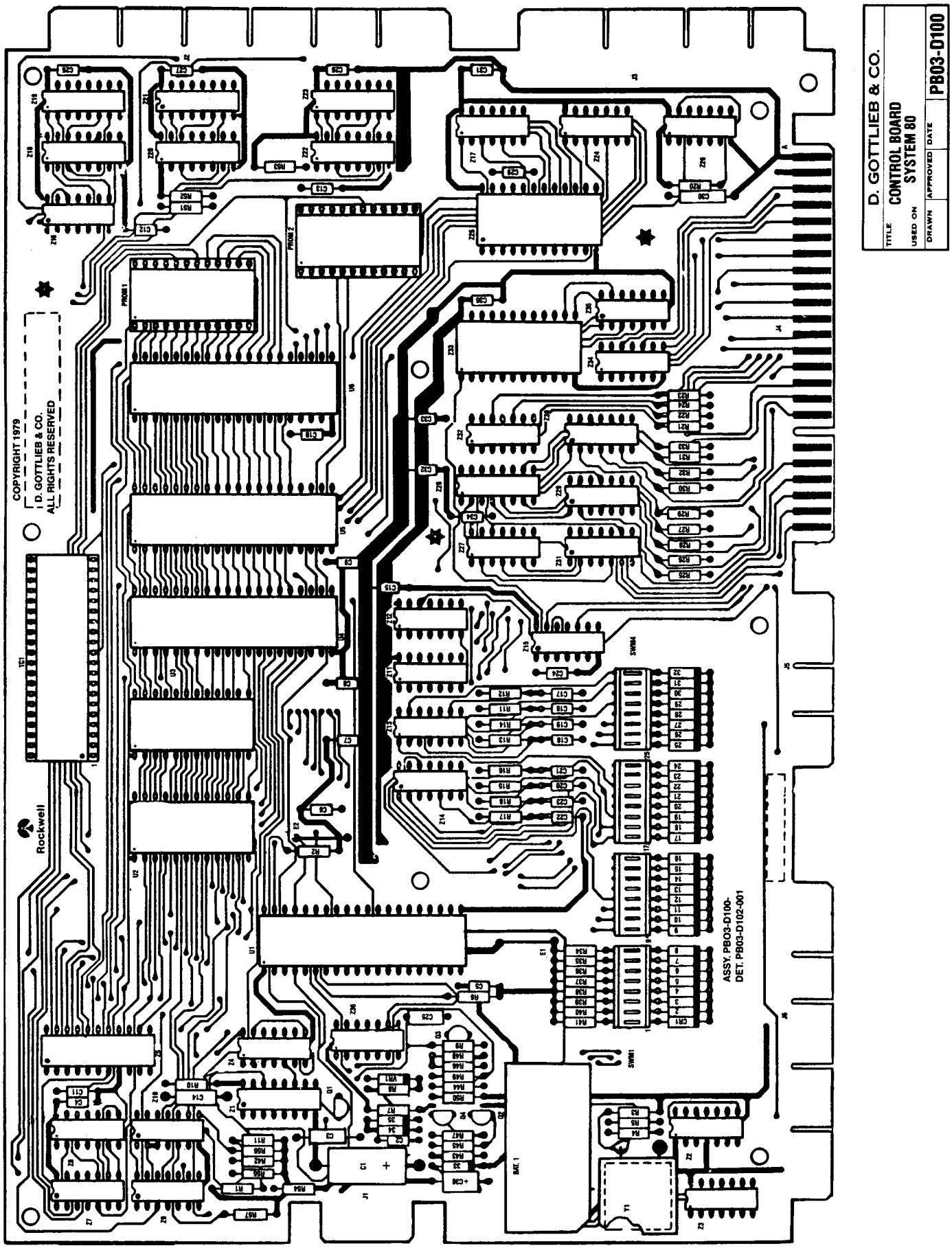
X. F. PLAYBOARD ILLUMINATION



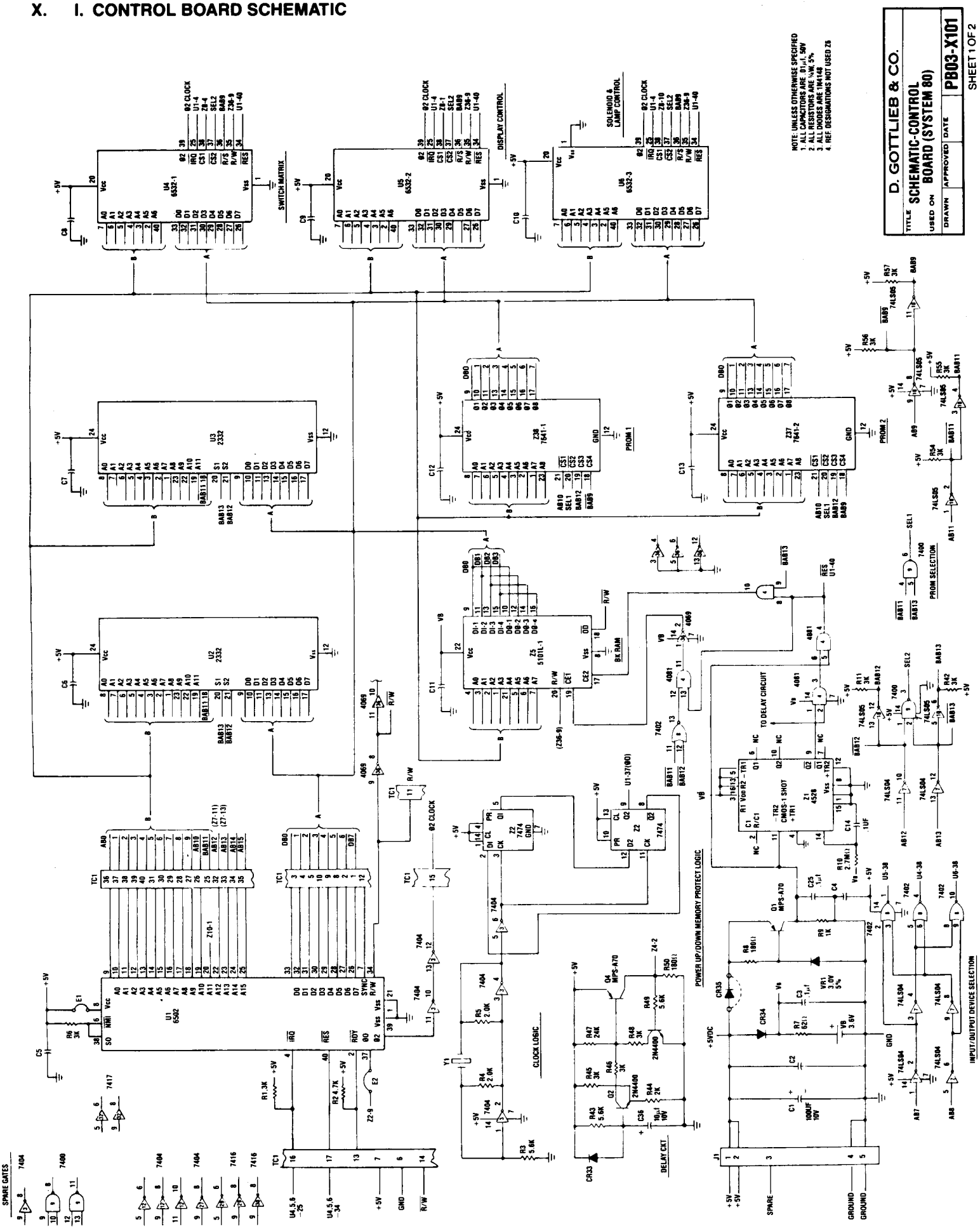
X. G. LIGHTBOX CABLE SCHEMATIC



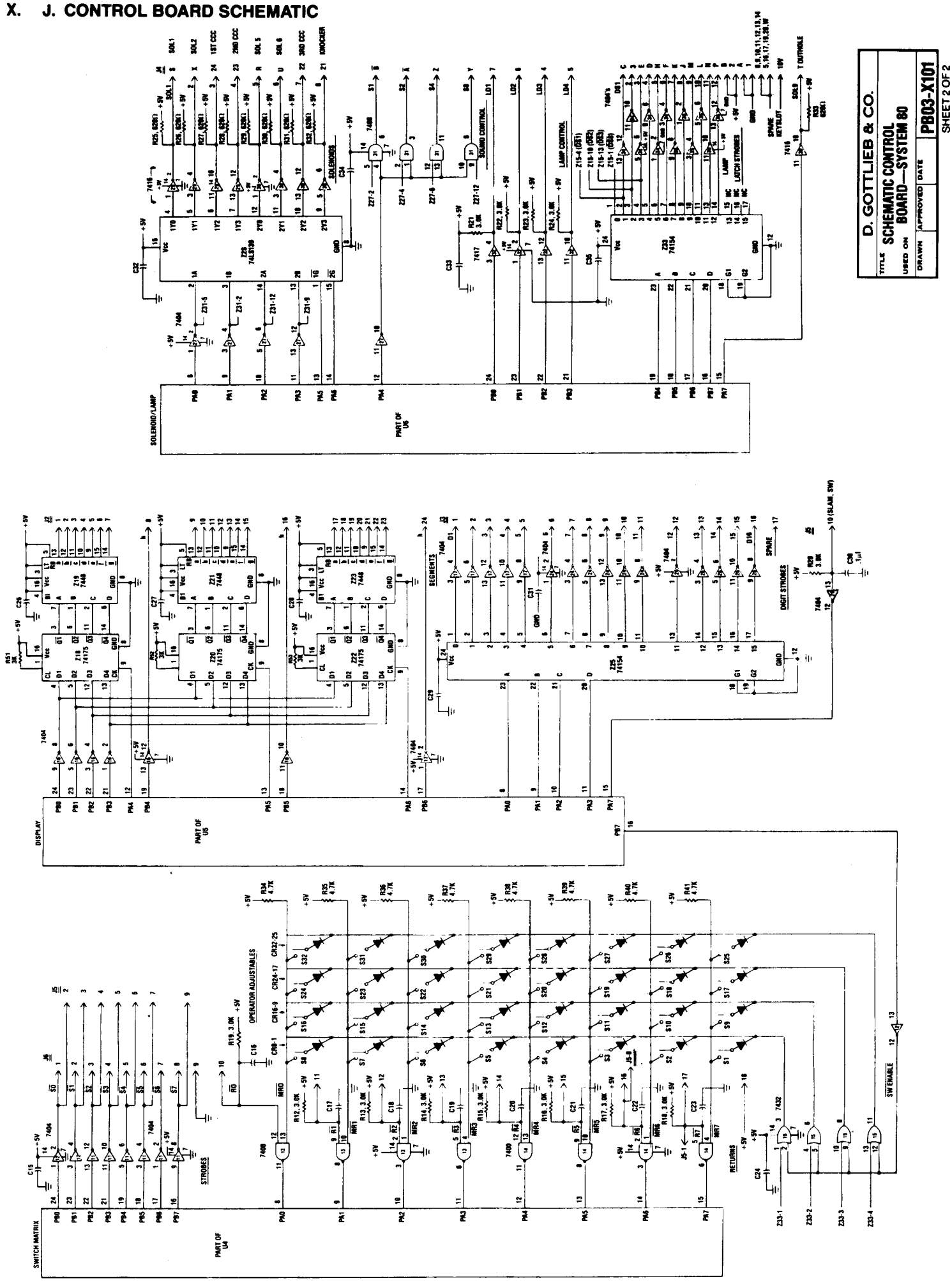
X. H. CONTROL BOARD COMPONENT LOCATION



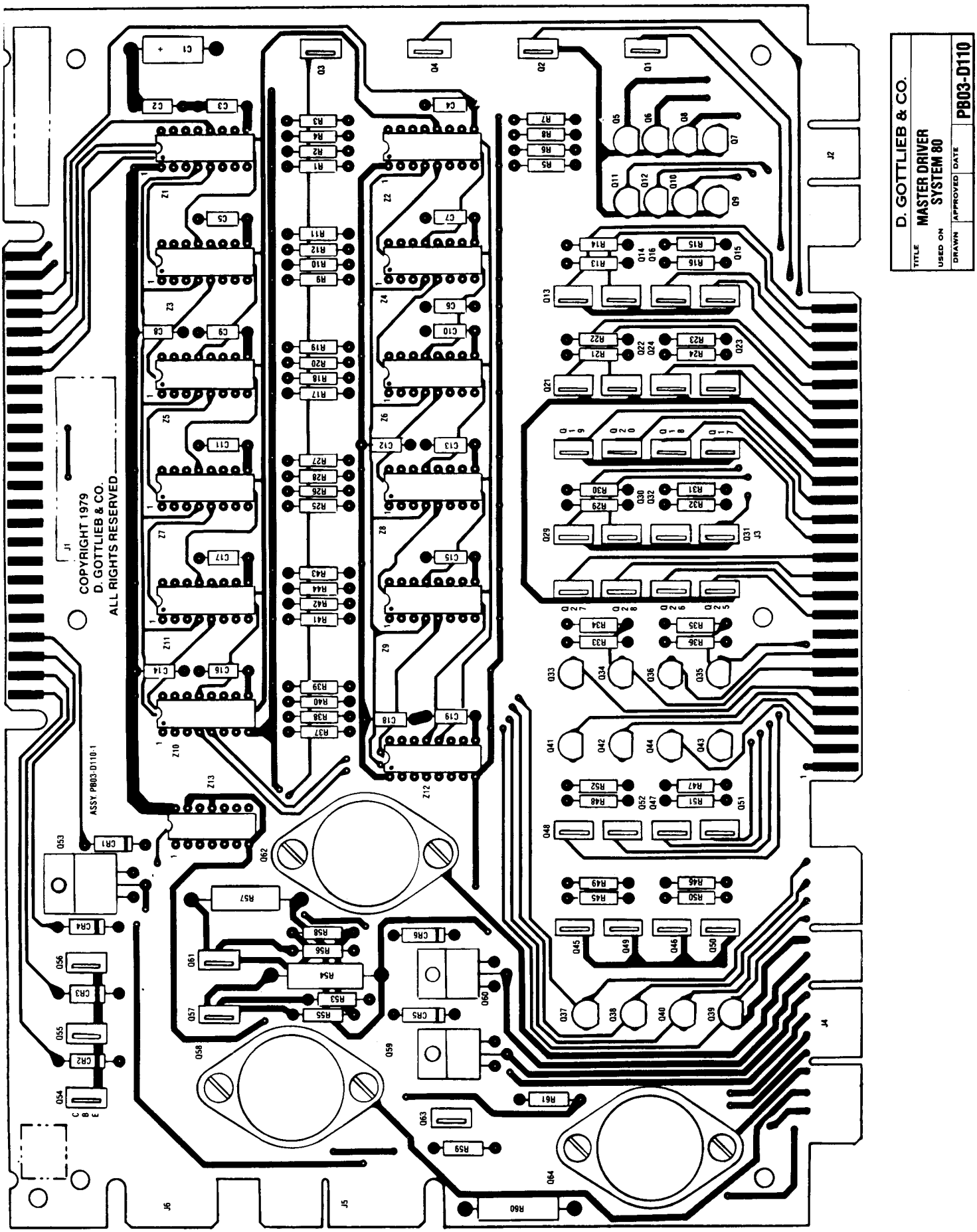
X. I. CONTROL BOARD SCHEMATIC



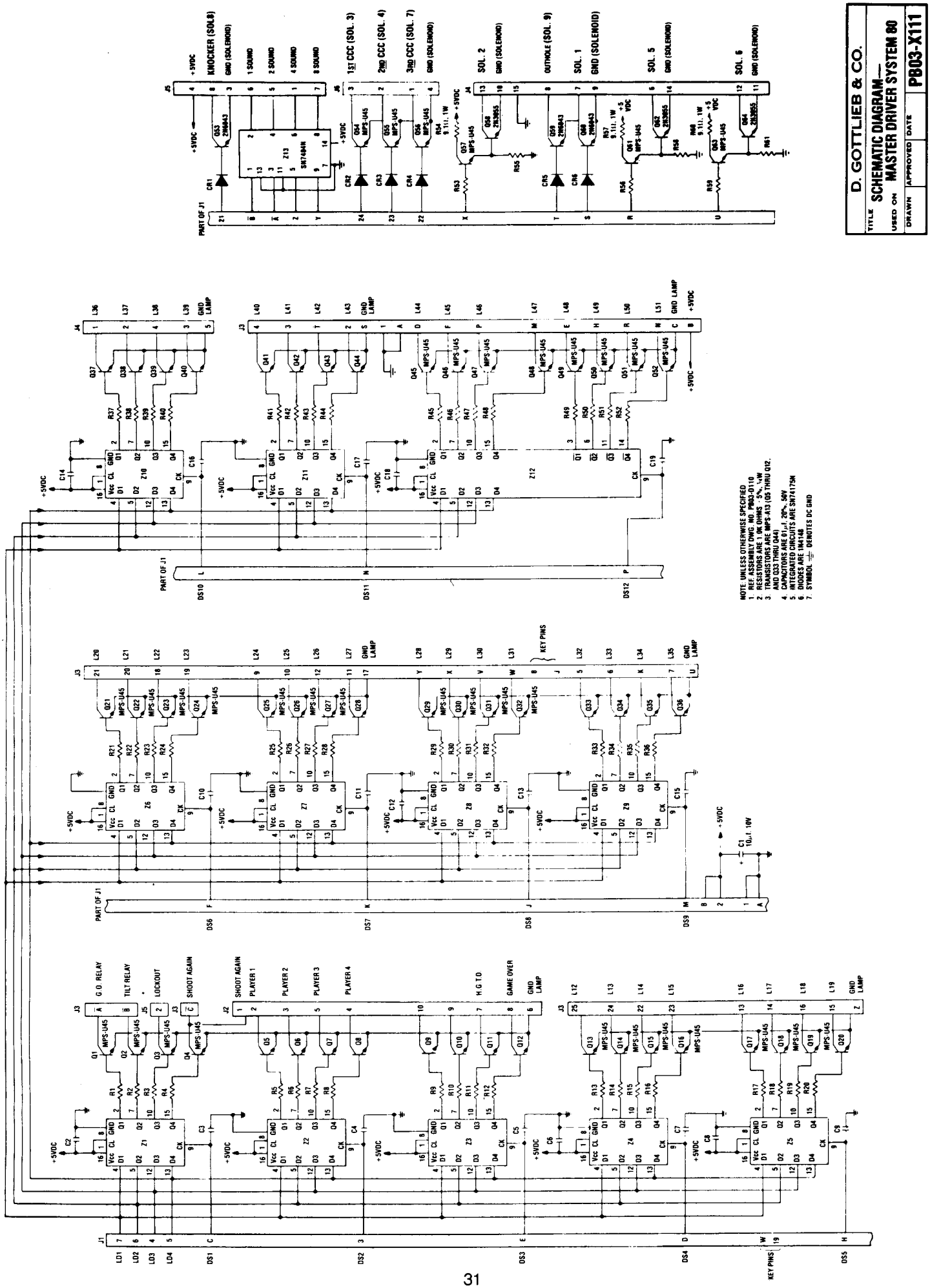
X. J. CONTROL BOARD SCHEMATIC



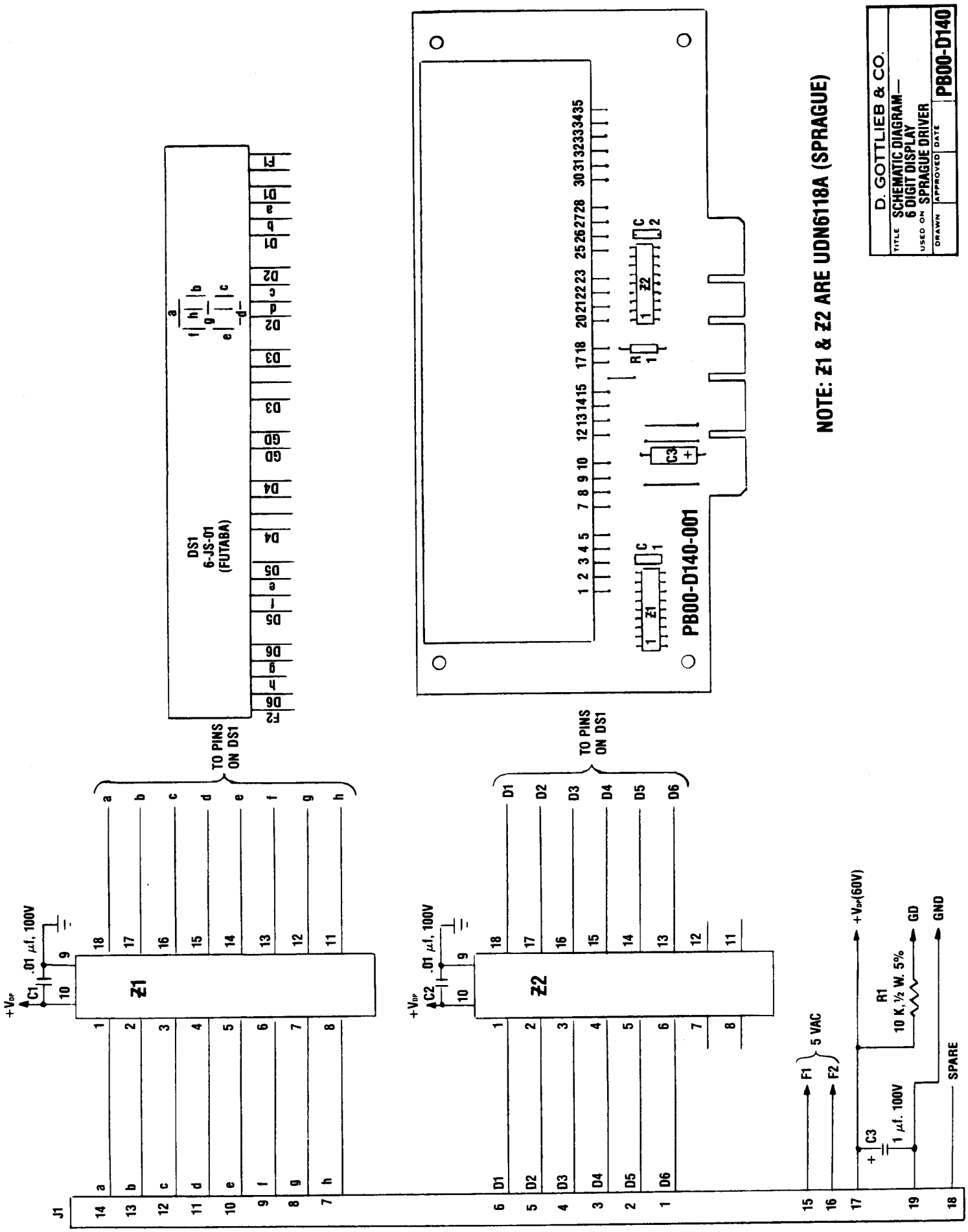
X. K. DRIVER BOARD COMPONENT LOCATION



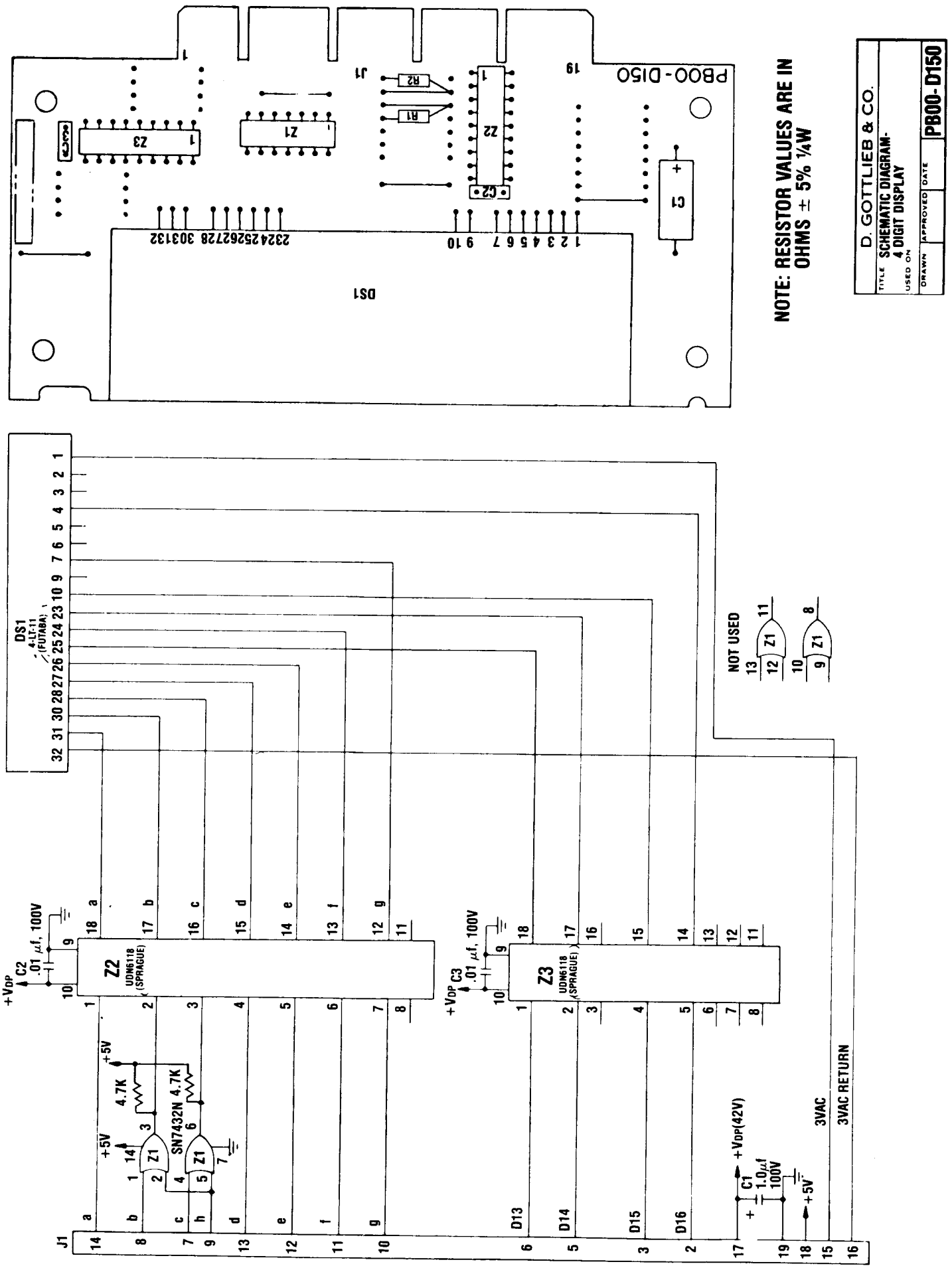
X. L. DRIVER BOARD SCHEMATIC



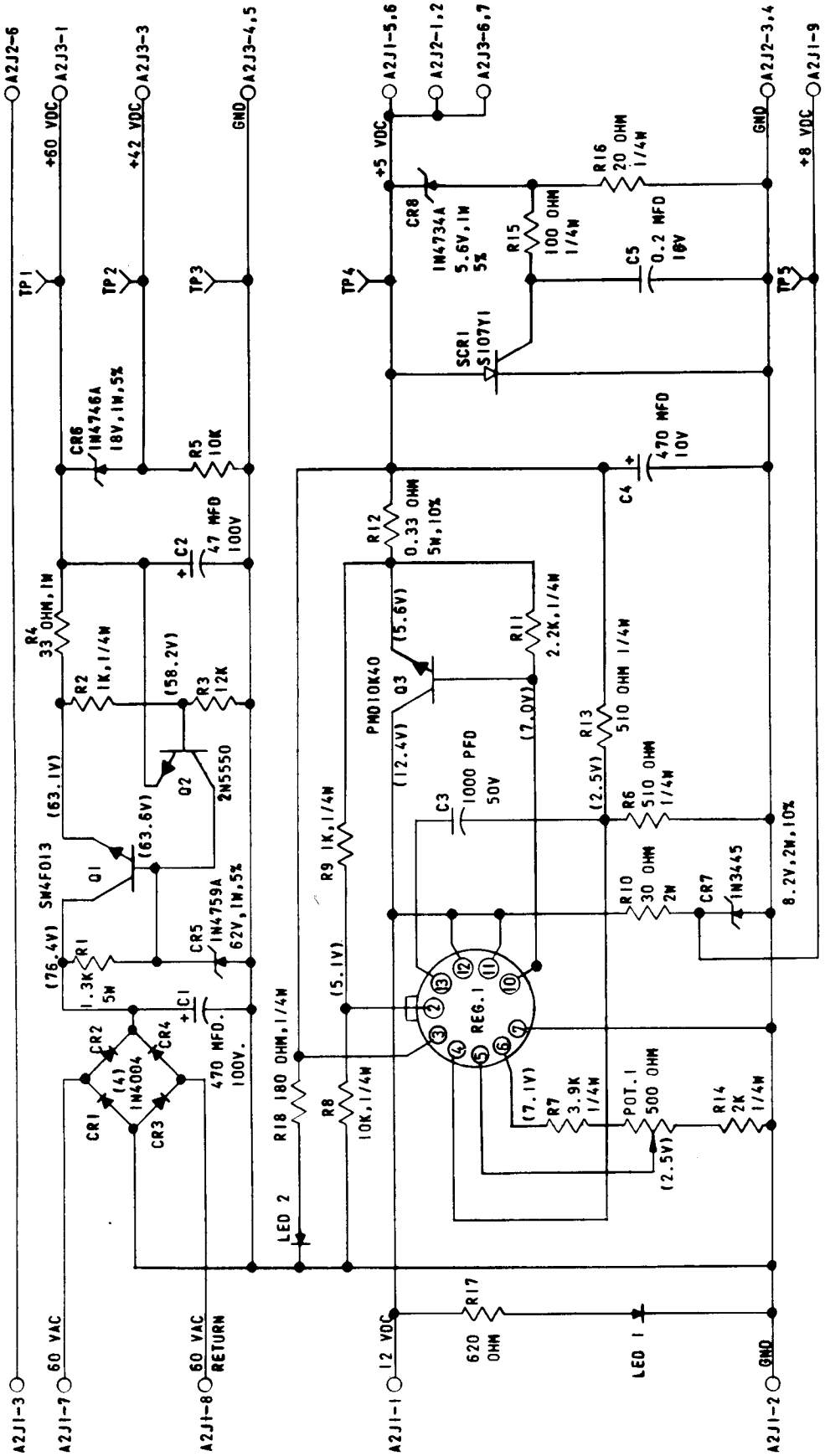
X. M. 6 DIGIT DISPLAY



X. N. 4 DIGIT DISPLAY



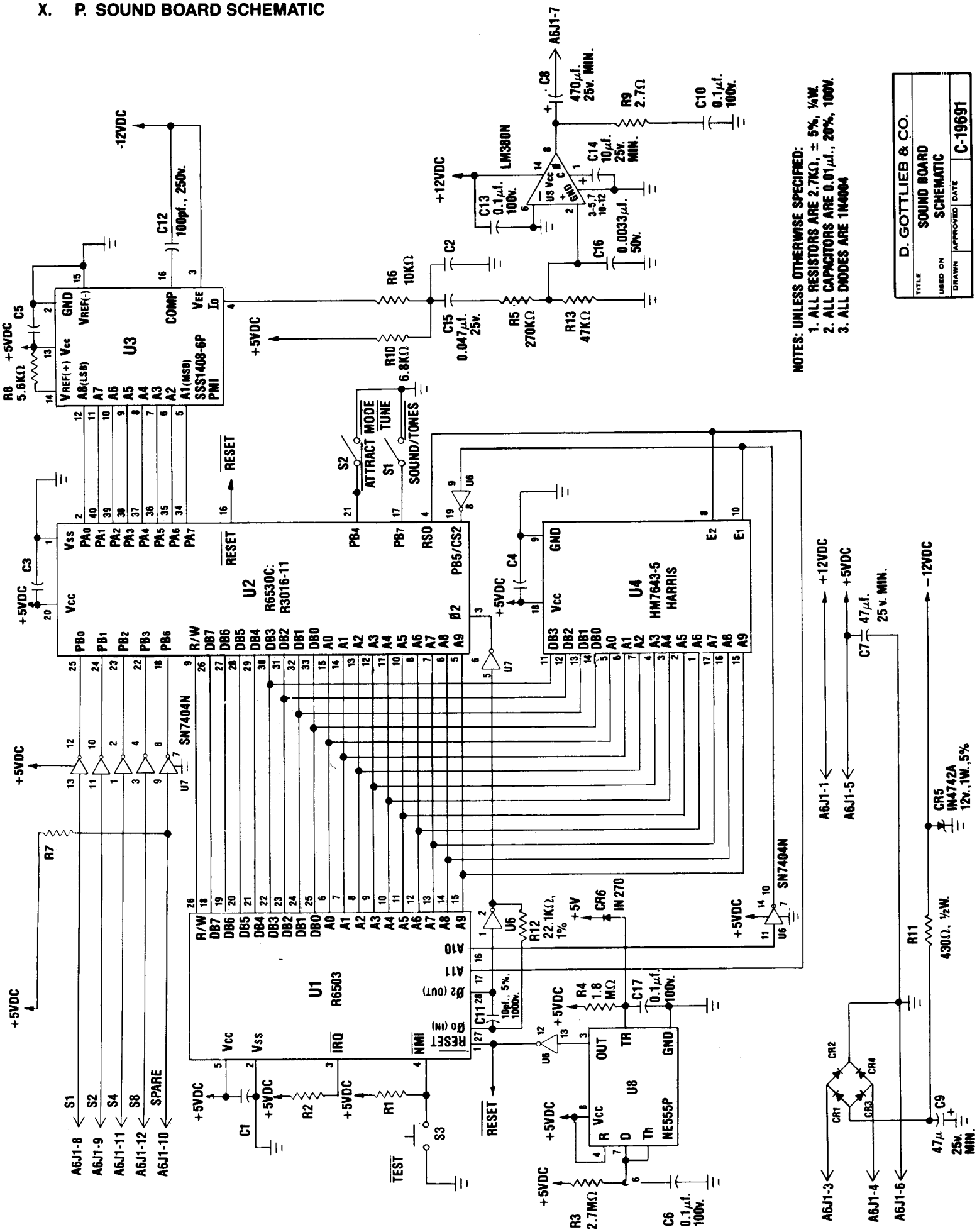
X. O. POWER SUPPLY SCHEMATIC



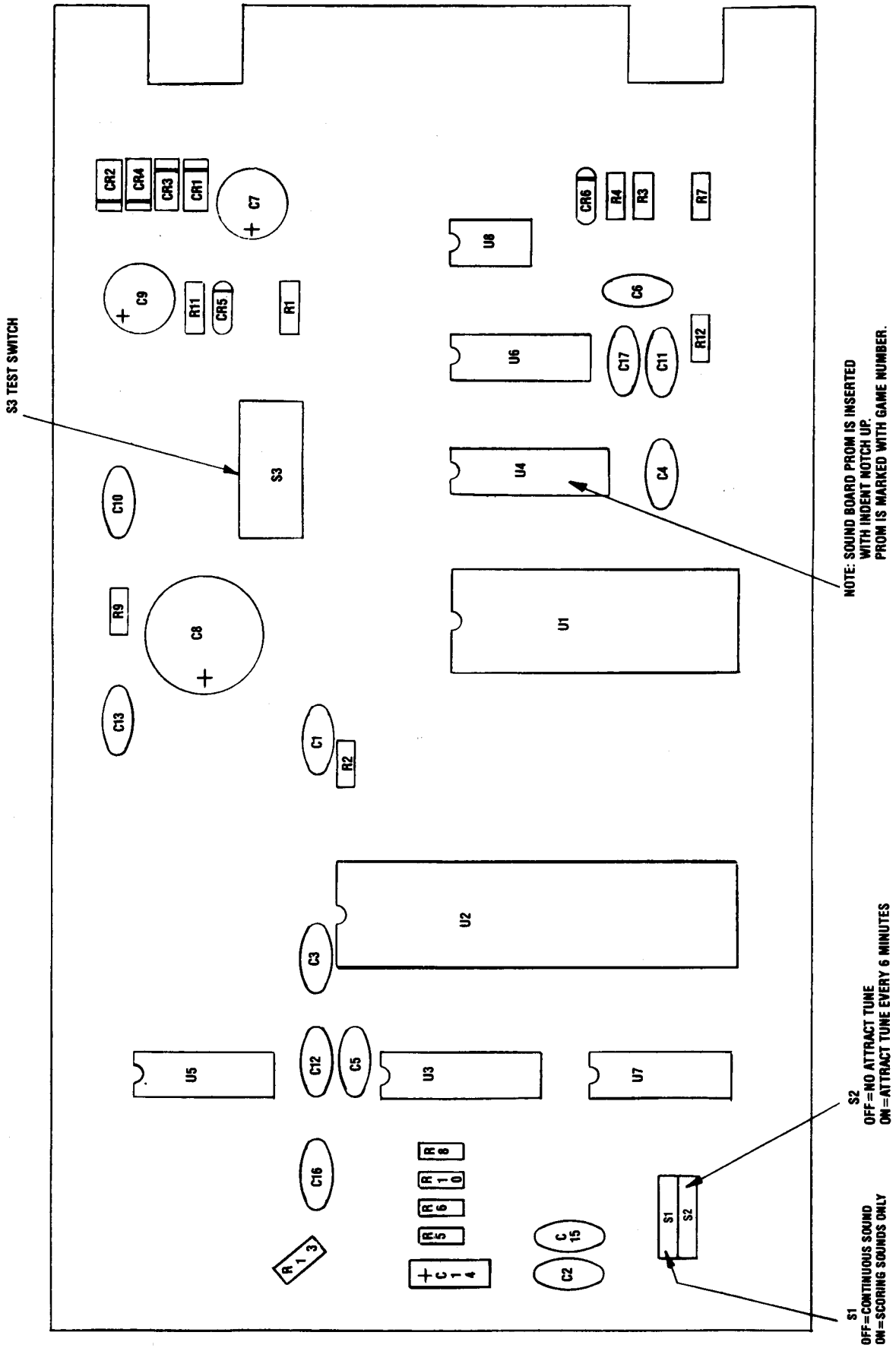
NOTE: UNLESS OTHERWISE SPECIFIED,
1. RESISTORS ARE ½W, 5%
2. VOLTAGES ARE DC WITH RESPECT TO CIRCUIT GROUND
3. ALL VOLTAGES ARE AT NOMINAL LINE VOLTAGE (115VAC)
4. REG. 1 IS TYPE 723 14 PIN DIP
5. LEDS ARE RL4850
6. ASSEMBLY NUMBER PX2600

D. GOTTLIEB & CO.			
TITLE	POWER SUPPLY SCHEMATIC		
USED ON	SYSTEM 80		
DRAWN	APPROVED	DATE	B-19694

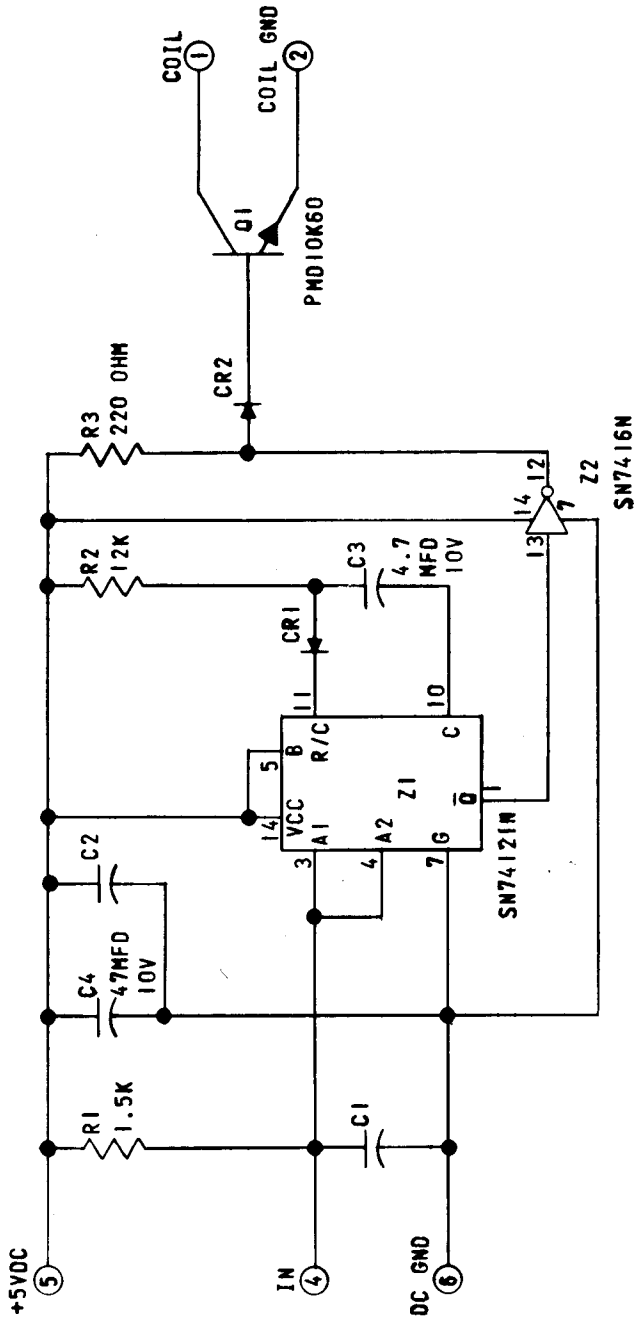
X. P. SOUND BOARD SCHEMATIC



X. Q. SOUND BOARD COMPONENT LOCATION



X. R. POP BUMPER DRIVER BOARD SCHEMATIC



NOTE: UNLESS OTHERWISE SPECIFIED,
1. RESISTORS ARE 1/4W,5%
2. CAPACITORS ARE 0.01,MFD.100V,20%
3. DIODES ARE IN4148

D. GOTTLIEB & CO.			
TITLE	POP BUMPER DRIVER BOARD		
USED ON	SYSTEM 80		A-19602
DRAWN	APPROVED	DATE	