

Gottlieb's

TIME LEADER

INSTRUCTION
MANUAL

 **Gottlieb**
AMUSEMENT GAMES

165 W. Lake Street • Northlake, Illinois 60164
Phone: 312/562-7400 Telex: 72-8463

Price **\$3.00**

TIME LINE PROMS GAME #659

ARE MARKED AS FOLLOWS:

GAME PROM 1 IS 659/1
GAME PROM 2 IS NOT USED
SOUND PROM IS 659

INSERT PROMS WITH
INDENT NOTCH UP

CONTROL BOARD
#PB03-D107-001

TIME LINE

INSTRUCTION MANUAL

TABLE OF CONTENTS

- I. INSTALLATION**
- II. GAME ADJUSTMENTS**
- III. GAME OPERATION**
- IV. BOOKKEEPING AND SELF-TEST**
- V. OPTIONAL ELECTRO-MECHANICAL COIN COUNTERS**
- VI. SWITCH AND LAMP ASSIGNMENT**
- VII. PLAYBOARD INFORMATION**
- VIII. CABLE PLUG WIRE ASSIGNMENTS**
- IX. PARTS LIST**
- X. WIRING AND SCHEMATIC DIAGRAMS**

TIME LINE

SWITCH NUMBER	SWITCH ASSIGNMENT	SCORING	FUNCTION
01	#1 TOP TARGET	500	ADD BONUS
02	#1 RED DROP TARGET	500 OR 5000 WHEN LIT. 2 HIT AT ONCE SCORE 20,000	ADD BONUS
03	#1 YELLOW DROP TARGET	SAME AS SW. 02	ADD BONUS
04	#1 BLACK DROP TARGET	—	ADD BONUS & START TIME
12	#2 RED DROP TARGET	SAME AS SW. 02	ADD BONUS
13	#2 YELLOW DROP TARGET	SAME AS SW. 02	ADD BONUS
14	#2 BLACK DROP TARGET	—	SAME AS SW. 04
21	#2 TOP TARGET	500	ADD BONUS
22	#3 RED DROP TARGET	SAME AS SW. 02	ADD BONUS
23	#3 YELLOW DROP TARGET	SAME AS SW. 02	ADD BONUS
24	#3 BLACK DROP TARGET	—	SAME AS SW. 04
32	#4 RED DROP TARGET	SAME AS SW. 02	ADD BONUS
33	#4 YELLOW DROP TARGET	SAME AS SW. 02	ADD BONUS
34	#4 BLACK DROP TARGET	—	SAME AS SW. 04
41	#3 TOP TARGET	500	ADD BONUS
42	#5 RED DROP TARGET	SAME AS SW. 02	ADD BONUS
43	LEFT LANE TARGET	15,000	ADD BONUS. GIVES "X" IN CIRCLE 3. GIVES EXTRA BALL WHEN LIT
44	#5 BLACK DROP TARGET	—	SAME AS SW. 04
51	RIGHT SIDE ROLLOVER	500	ADD BONUS. GIVE "X" IN FIRST AVAILABLE CIRCLE, 2, 6, 8 IN THAT ORDER SPECIAL WHEN LIT
52	RUNWAY	15,000 WHEN LIT	—
53	COLLECT BONUS ROLLOVER	1000 X BONUS X MULTIPLIER	LIGHT RUNWAY ROLLOVER
61	RIGHT SIDE TARGET	5000	ADD BONUS & GIVE "X" IN CIRCLE 3
62	CENTER, LEFT & RIGHT RETURN ROLLOVERS	500	SAME AS SW. 51 EXCEPT NO SPECIAL
63	BALL KICKER	10,000	ADD BONUS. GIVES "X" IN CIRCLE 4
67	OUTHOLE	—	SCORE BONUS
71	10 POINT CONTACTS (8)	10	—
72	LEFT & RIGHT OUTSIDE ROLLOVERS	5000	ADD BONUS
73	POP BUMPERS (3)	100 5 BALL 1000 3 BALL	—

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. 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
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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.

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

LIBERAL-CONSERVATIVE ADJUSTMENT

Switch 32 in the Conservative position disables replay when score exceeds one million.
Switch 32 in the Liberal position allows one replay every time score reaches a million points.

B. ELECTRONIC SOUND ADJUSTMENTS

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

SWITCH S1

OFF
ON **MUST BE OFF**

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.

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

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.

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	Yellow Drop Target Bank Reset
2	Red Drop Target Bank Reset
3	Left Coin Chute counter*
4	Right Coin Chute counter*
5	Ball Kicker
6	Black Drop Target Bank Reset
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.

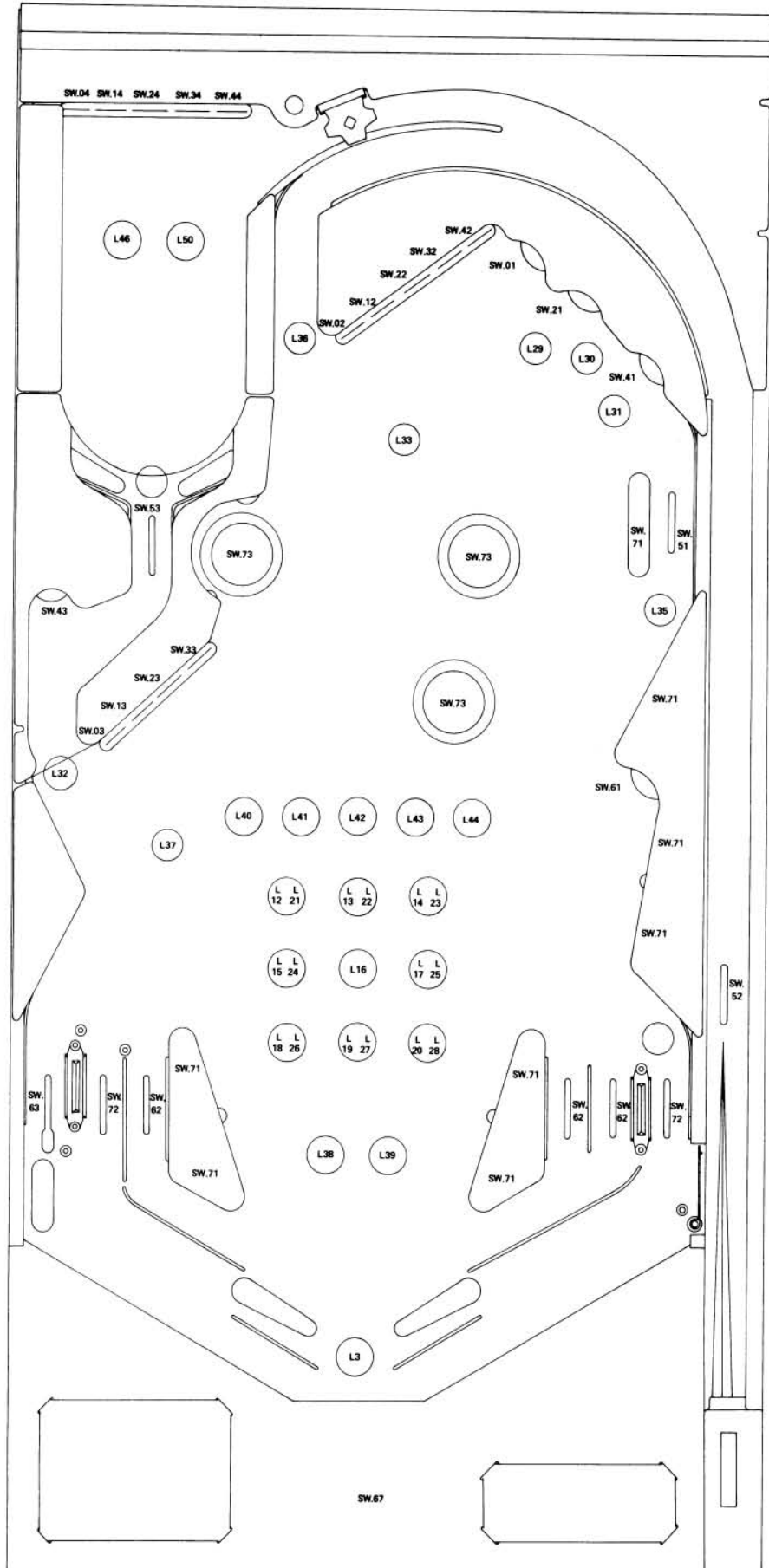
VI. SWITCH MATRIX AND LAMP LOCATION ASSIGNMENT

SWITCH MATRIX AND LAMP LOCATION SWITCHES ON MATRIX

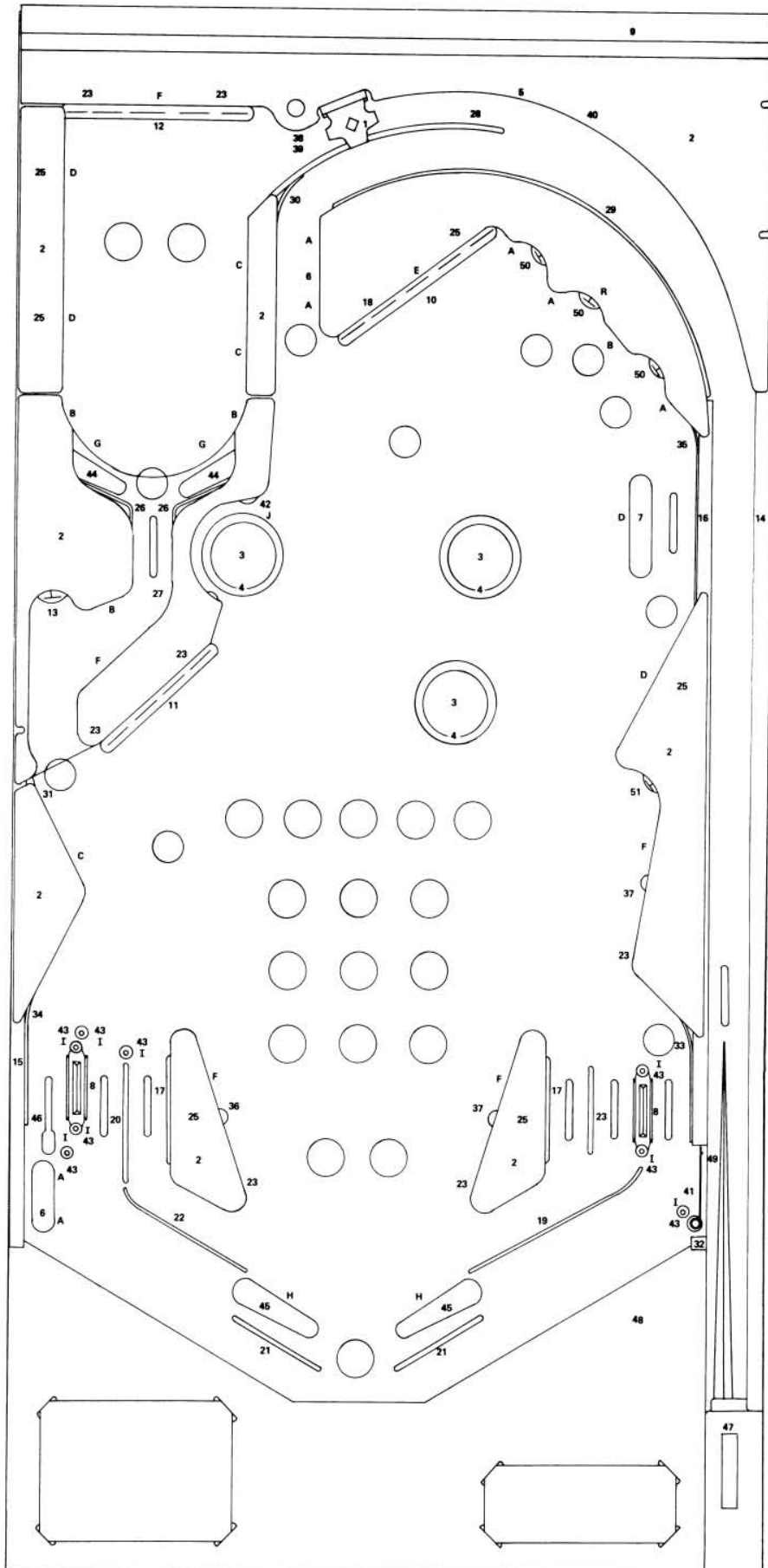
SW. MATRIX NUMBER	SWITCH ASSIGNMENT
01	#1 Top Target.
02	#1 Red Drop Target.
03	#1 Yellow Drop Target.
04	#1 Black Drop Target.
12	#2 Red Drop Target.
13	#2 Yellow Drop Target.
14	#2 Black Drop Target.
21	#2 Top Target.
22	#3 Red Drop Target.
23	#3 Yellow Drop Target.
24	#3 Black Drop Target.
32	#4 Red Drop Target.
33	#4 Yellow Drop Target.
34	#4 Black Drop Target.
41	#3 Top Target.
42	#5 Red Drop Target.
43	Left Lane Target.
44	#5 Black Drop Target.
51	Right Side Rollover.
52	Runway.
53	Collect Bonus Rollover.
57	Tilt. (Located under Playfield)
61	Right Side Target.
62	Left Return Rollover.
63	Center Return Rollover.
67	Right Return Rollover.
63	Ball Kicker.
67	Outhole. (Located under Card Holder)
71	10 Point Contacts. (8)
72	Left Outside Rollover.
73	Right Outside Rollover.
73	Pop Bumpers. (3)

CPU CONTROLLED LAMPS

LAMP NUMBER	LAMP ASSIGNMENT
0	Game Over Relay. (Located under Playfield)
1	Tilt Relay. (Located under Playfield)
2	Coin Lockout Coil. (Located on Front Door)
3	Same Player Shoots Again. (Lightbox and Playfield)
4	1st Player.
5	2nd Player.
6	3rd Player.
7	4th Player.
10	High Game To Date.
11	Game Over.
12	X—1st Circle.
13	X—2nd Circle.
14	X—3rd Circle.
15	X—4th Circle.
16	X—Center Circle.
17	X—6th Circle.
18	X—7th Circle.
19	X—8th Circle.
20	X—9th Circle.
21	O—1st Circle.
22	O—2nd Circle.
23	O—3rd Circle.
24	O—4th Circle.
25	O—6th Circle.
26	O—7th Circle.
27	O—8th Circle.
28	O—9th Circle.
29	#1 Top Target.
30	#2 Top Target.
31	#3 Top Target.
32	Left Lane Extra Ball.
33	Red Drop Target. 5,000 When Lit.
34	Special.
36	15,000 When Lit Plunger Return.
37	Yellow Drop Target. 5,000 When Lit.
38	Win.
39	Lose.
40	5,000/1X.
41	20,000/2X.
42	Extra/3X.
43	50,000/4X.
44	Special/5X.
46	Gives Center "X".
48	Spare.
49	Spare.
50	Gives "X" in Circle 7.
51	Spare.



VII. PLAYBOARD INFORMATION



PLAYBOARD INFORMATION

RUBBER RINGS

- A—A-10217 (7)
- B—A-10218 (4)
- C—A-10219 (3)
- D—A-10220 (4)
- E—A-10222 (1)
- F—A-10223 (5)
- G—A-13149 (2)
- H—A-13151 (2)
- I—A-15705 (8)
- J—A-17493 (1)

PARTS LIST

1. A-19646 Ball Gate Left.
 2. D-20152 Plastic Shield Set.
 3. Red Pop Bumper A-15980 and A-20533 in Red. (3)
 4. Red Pop Bumper Skirt. (3)
 5. C-20103 Top Arch Rod.
 6. A-9393 Yellow Plastic Guide Rail. (2)
 7. A-9397 Yellow Plastic Guide Rail.
 8. C-15648 Yellow Plastic Rollover Guide. (2)
 9. D-19651 Arch Shield Retainer.
 10. Red Drop Target Bank with A-13179 in Gold. (5 Pos.)
 11. Yellow Drop Target Bank with A-13179 in Gold. (4 Pos.)
 12. Black Drop Target Bank with A-13179 in Gold. (5 Pos.)
 13. A-14787 Purple Target with A-13179 in Gold.
 14. C-19648 Wood Rail Right.
 15. C-19881 Wood Rail Left.
 16. B-20264 Wood Rail Center.
 17. A-4832 Ball Guide Rail. (2)
 18. A-6931 Ball Guide Rail.
 19. A-12570 Ball Guide Rail
 20. A-13782 Ball Guide Rail.
 21. A-13798 Ball Snubber Rail. (2)
 22. A-14572 Ball Guide Rail. (8)
 23. A-17106 Ball Guide Rail. (3)
 24. A-17650 Ball Guide Rail. (2)
 25. A-18070 Ball Guide Rail. (6)
 26. A-20099 Ball Guide Rail. (2)
 27. A-20100 Ball Guide Rail.
 28. B-20101 Ball Guide Rail.
 29. C-20102 Ball Guide Rail.
 30. A-20182 Ball Guide Rail.
 31. A-6509 Metal Flat Rail.
 32. A-20104 Short Metal Rail.
 33. A-20105 Metal Flat Rail.
 34. B-20106 Metal Flat Rail.
 35. B-20107 Metal Flat Rail.
 36. B-15636 Left Kicking Rubber.
 37. B-15638 Right Kicking Rubber.
 38. B-19873 Arch Rod End Post.
 39. B-19874 Arch Rod End Post Cap.
 40. B-19875 Arch Rod Support Post.
 41. A-14099 Ball Return Gate.
 42. C-17492 Siamese Post.
 43. A-14792 Mini Post Screw. (8)
 44. C-11241 Small White Flipper. (2)
 45. C-13150 Jumbo White Flipper. (2)
 46. A-16700 Ball Kicker.
 47. C-9767 Ball Shooter Gage.
 48. D-20187 Card Holder.
 49. A-10542 Steel Pin.
 50. A-14787 Red Target with A-13179 in Gold. (3)
 51. A-14787 White Target with A-13179 in Gold.
- C-11561 Clear 1" High Post. (45)
 C-11562 Clear 1³/₁₆" High Post. (2)

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
- A11 Auxiliary Lamp 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.

There are three male/female cable connectors to interconnect the status display on the playboard to the control board in the lightbox. They are listed on page 14 as A10-JX/PX.

A1-J1			A1-J4		
PIN	WIRE COLOR	FUNCTION	PIN	WIRE COLOR	FUNCTION
1	*688	+5VDC	1	*54	GROUND
2	*688	+5VDC	2	*688	+5VDC
3	—	SPARE	3	9	DS2
4	*54	GROUND	4	9	LD3
5	*54	GROUND	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	—	SPARE
			B	—	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
			<u>A</u>	9	SOUND 2
			<u>B</u>	9	SOUND 1

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

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.

A2-J3		
PIN	WIRE COLOR	FUNCTION
1	044	+60VDC
2	—	(KEY)
3	055	+42VDC
4	54	GROUND
5	54	GROUND
6	—	SPARE
7	688	+5VDC

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	—	RETURN 0
11	611	RETURN 1
12	622	RETURN 2
13	633	RETURN 3
14	644	RETURN 4
15	—	SPARE
16	—	SPARE
17	677	RETURN 7
18	688	+5VDC
19	—	SPARE

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	—	SPARE
B	—	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
<u>A</u>	9	SOUND 2
<u>B</u>	9	SOUND 1

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	60VAC
8	111	60VAC 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

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	—	SPARE
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	—	SPARE
B	—	SPARE
C	*54	GROUND (L44-L51)
D	800	L44
E	—	SPARE
F	811	L45
H	—	SPARE
J	—	KEY
K	566	L34
L	—	SPARE
M	833	L47
N	—	SPARE
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)
<u>A</u>	288	GAME OVER RELAY
<u>B</u>	277	TILT RELAY
<u>C</u>	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	—	SPARE

A3-J5		
PIN	WIRE COLOR	FUNCTION
1	733	SOUND 4
2	877	COIN LOCKOUT COIL
3	54	GROUND (KNOCKER)
4	—	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.)

THIS IS A CORRECTION SHEET FOR TIME LINE. SHADED AREA TO BE CORRECTED IN YOUR MANUAL. (SEE BOTH SIDES OF THIS SHEET.)

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

3A4-J1 continued		
PIN	WIRE COLOR	FUNCTION
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

5A4-J1		
PIN	WIRE COLOR	FUNCTION
1	—	SPARE
2	—	SPARE
3	—	SPARE
4	—	SPARE
5	455	D6
6	444	D5
7	822	C
8	811	b
9	877	h
10	866	g
11	855	f
12	844	e
13	833	d
14	800	aC
15	155	3VAC
16	177	3VAC RETURN
17	055	+42VDC
18	688	+5VDC
19	54	GROUND

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

A5-J1		
PIN	WIRE COLOR	FUNCTION
1	—	SPARE
2	—	SPARE
3	—	SPARE
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

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

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-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-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. (SLAM)
11	9	ANTI-CHEAT SW. (GND)
12	*54	EARTH GROUND

A7-J5/P5		
PIN	WIRE COLOR	FUNCTION
1	(16GA)255	+6VDC
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	—	SPARE
14	—	SPARE
15	—	SPARE

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

A7-J6/P6		
PIN	WIRE COLOR	FUNCTION
1	022	TILT LIGHT

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

3A8-J1		
PIN	WIRE COLOR	FUNCTION
1	*888	COIL #3
2	*54	GROUND
3	—	KEY
4	022	SWITCH #3
5	688	+5VDC
6	9	DC GROUND

A10-J1/P1		
PIN	WIRE COLOR	FUNCTION
1	122	5VAC
2	144	5VAC RETURN
3	155	3VAC
4	177	3VAC RETURN

A10-J2/P2		
PIN	WIRE COLOR	FUNCTION
1	777	D16
2	766	D15
3	755	D14
4	744	D13
5	822	cC
6	811	bC
7	877	hC
8	866	gC
9	855	fC
10	844	eC
11	833	dC
12	800	aC

A10-J3/P3		
PIN	WIRE COLOR	FUNCTION
1	155	3VAC
2	177	3VAC RETURN
3	055	+42VDC
4	688	+5VDC
5	54	GROUND
6	—	SPARE

A11-J1		
PIN	WIRE COLOR	FUNCTION
1	—	SPARE
2	54	GROUND
3	—	SPARE
4	688	+5VDC

A11-J2		
PIN	WIRE COLOR	FUNCTION
1	600	LAMP #1
2	611	LAMP #2
3	622	LAMP #3
4	633	LAMP #4
5	644	LAMP #5
6	655	LAMP #6
7	666	LAMP #7
8	677	LAMP #8
9	700	LAMP #9
10	711	LAMP #10

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—62 Ω , 1/4W, 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—3.0K Ω , 1/4W, 5%—(R1, R6, R11-24, R42, R45, R46, R48, R51-R57)
	RESISTOR—2.0K Ω , 1/4W, 5%—(R4, R5, R44)
	RESISTOR—180 Ω , 1/4W, 5%—(R8, R50)
	RESISTOR—1K Ω , 1/4W, 5%—(R9)
	RESISTOR—2.7M Ω , 1/4W, 5%—(R10)
	RESISTOR—620 Ω , 1/4W, 5%—(R25-R33)
	RESISTOR—4.7K Ω , 1/4W, 5%—(R2, R34-R41)
	RESISTOR—5.6K Ω , 1/4W, 5%—(R3, R43, R49)
	RESISTOR—24K Ω , 1/4W, 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—1000 Ω , 1/4W, 5%—(R1-R53, R61, R55, R56, R58, R59)
	RESISTOR—9.1 Ω , 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 1/8
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—500 Ω —CTS—(POT1)
	RESISTOR—1.3K Ω , 5W, 10%—(R1)
	RESISTOR—1K Ω , 1/4W, 5%—(R2, R9)
	RESISTOR—12K Ω , 1/2W, 5%—(R3)
	RESISTOR—33 Ω , 1W, 5%—(R4)
	RESISTOR—510 Ω , 1/4W, 5%—(R6, R13)
	RESISTOR—3.9K Ω , 1/4W, 5%—(C7)
	RESISTOR—10K Ω , 1/4W, 5%—(R8)
	RESISTOR—30 Ω , 2W, 5%—(R10)
	RESISTOR—2.2K Ω , 1/4W, 5%—(R11)
	RESISTOR—.33 Ω , 5W, 10%—(WIRE WOUND)—(R12)
	RESISTOR—10K Ω , 1/2W, 5%—(R5)
	RESISTOR—2K Ω , 1/4W, 5%—(R14)
	RESISTOR—100 Ω , 1/4W, 5%—(R15)
	RESISTOR—20 Ω , 1/4W, 5%—(R16)
	RESISTOR—620 Ω , 1/2W, 5%—(R17)
	RESISTOR—180 Ω , 1/4W, 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, $\begin{matrix} +80\% \\ -20\% \end{matrix}$ —(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—2.7K Ω , 1/4W, 5%—(R1, R2, R7)
	RESISTOR—2.7 Ω , 1/4W, 5%—(R9)
	RESISTOR—6.8K Ω , 1/4W, 5%—(R10)
	RESISTOR—430 Ω , 1/2W, 5%—(R11)
	RESISTOR—2.7M Ω , 1/4W, 5%—(R3)
	RESISTOR—1.8M Ω , 1/4W, 5%—(R4)
	RESISTOR—22.1K Ω , 1/4W, 1%—(R12)
	RESISTOR—10K Ω , 1/4W, 5%—(R6)
	RESISTOR—5.6K Ω , 1/4W, 5%—(R8)
	RESISTOR—270K Ω , 1/4W, 5%—(R5)
	RESISTOR—47K Ω , 1/4W, 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 PICO FARAD, 1000V, 5%—(C11)
	CAPACITOR—100 PICO FARAD, 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—1.5K Ω , 1/4W, 5%—(R1)
	RESISTOR—12K Ω , 1/4W, 5%—(R2)
	RESISTOR—220 Ω , 1/4W, 5%—(R3)
	DIODE—(CR1, CR2)
1N4148	IC—(Z1)
SN74121N	IC—(Z2)
SN7416N	TRANSISTOR—LAMBDA—(Q1)
PMD10K60	CONNECTOR—(J1)
09-65-1061	

**6-DIGIT DISPLAY
(SPRAGUE DRIVERS)**

QUANTITY	NUMBER	DESCRIPTION
1	RC20GF103	Resistor—10K Ω , 1/2W, 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)

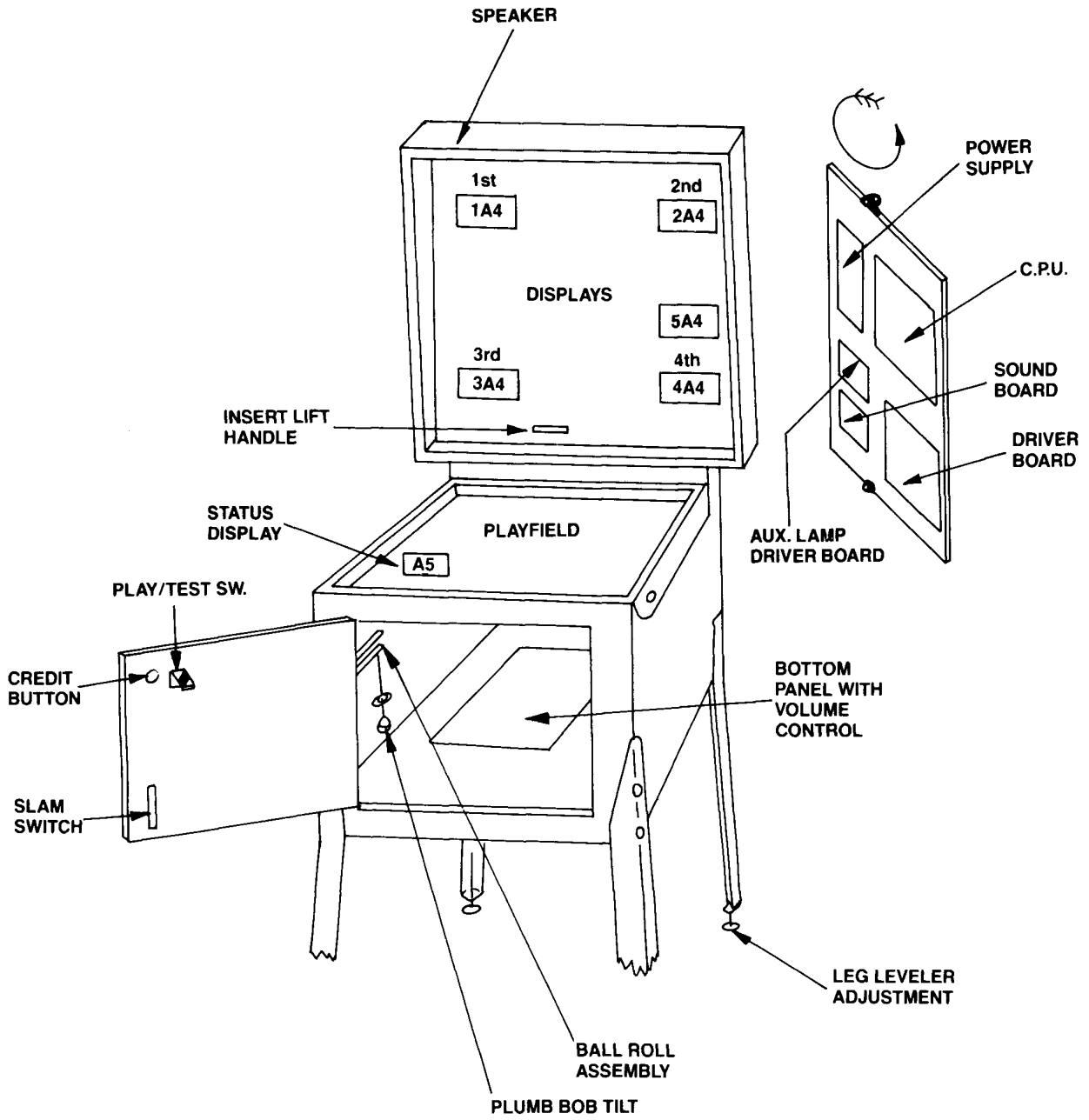
AUXILIARY LAMP DRIVER BOARD

QUANTITY	NUMBER	DESCRIPTION
10	MPS-U345	Transistor
1		Resistor 820K, 1/4W, 5%
10		Resistor 12K, 1/4W, 5%
2		Resistor 3K, 1/4W, 5%
1		Capacitor .1 μ fd. Microfarad 100v Ceramic Radial Lead
2		Capacitor, .02 μ fd. Microfarad 100v Radial Lead
1		Capacitor 47 μ fd. Microfarad 10v Electrolytic Radial Lead
1	LM555N	IC—Timer—(U5)
1	SN7400N	IC—2 Input—"NAND"—(U1)
1	SN7490N	IC—Decade Counter—(U3)
1	SN7442N	IC—Decoder—(U4)
2	SN7405N	IC—Inverter—(U2, U6)
1		10 Pos. Square Wire Friction Lock Connector
1		4 Pos. Square Wire Friction Lock Connector

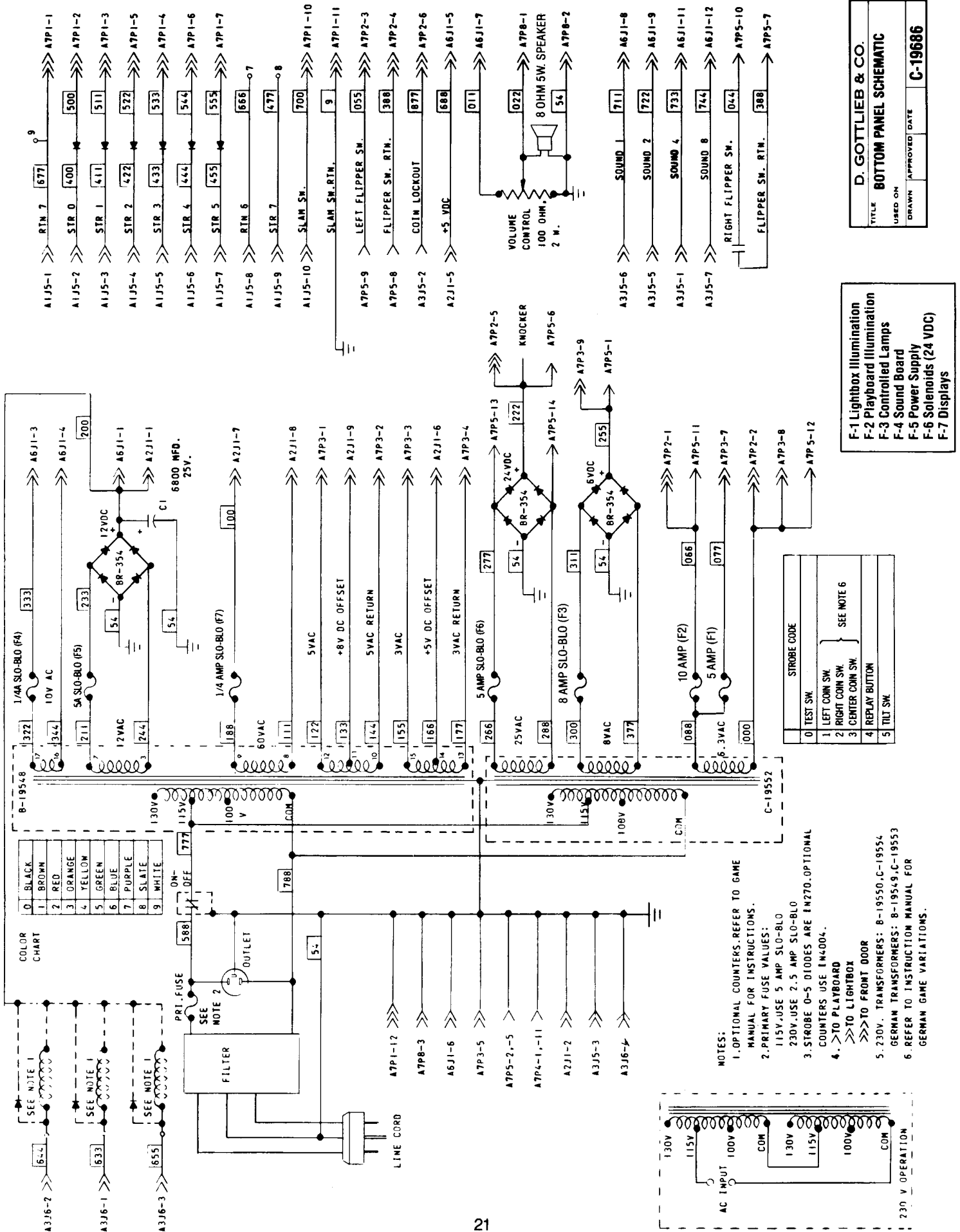
X. WIRING AND SCHEMATIC DIAGRAMS

- 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; AUXILIARY LAMP DRIVER BOARD SCHEMATIC DIAGRAMS**
- S. CONTROL BOARD CONVERSION INSTRUCTIONS

X. A. COMPONENT LOCATION DIAGRAM



X. B. BOTTOM BOARD PANEL SCHEMATIC

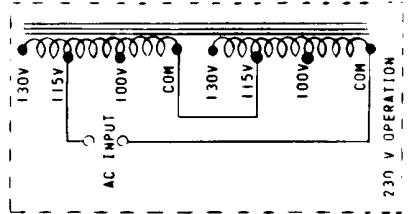


D. GOTTLIEB & CO.
BOTTOM PANEL SCHEMATIC
 USED ON
 DRAWN APPROVED DATE
C-19686

F-1 Lightbox Illumination
 F-2 Playboard Illumination
 F-3 Controlled Lamps
 F-4 Sound Board
 F-5 Power Supply
 F-6 Solenoids (24 VDC)
 F-7 Displays

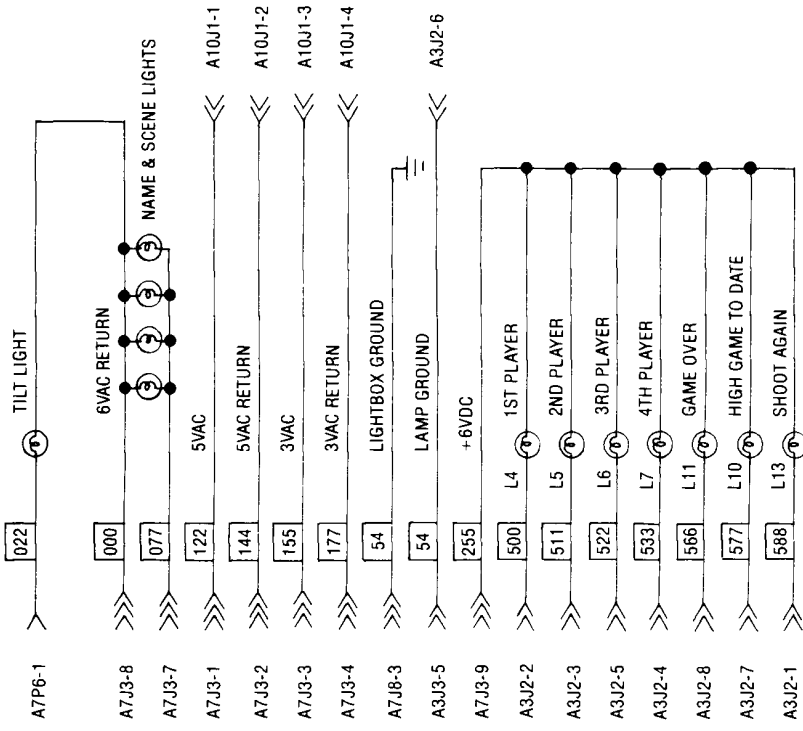
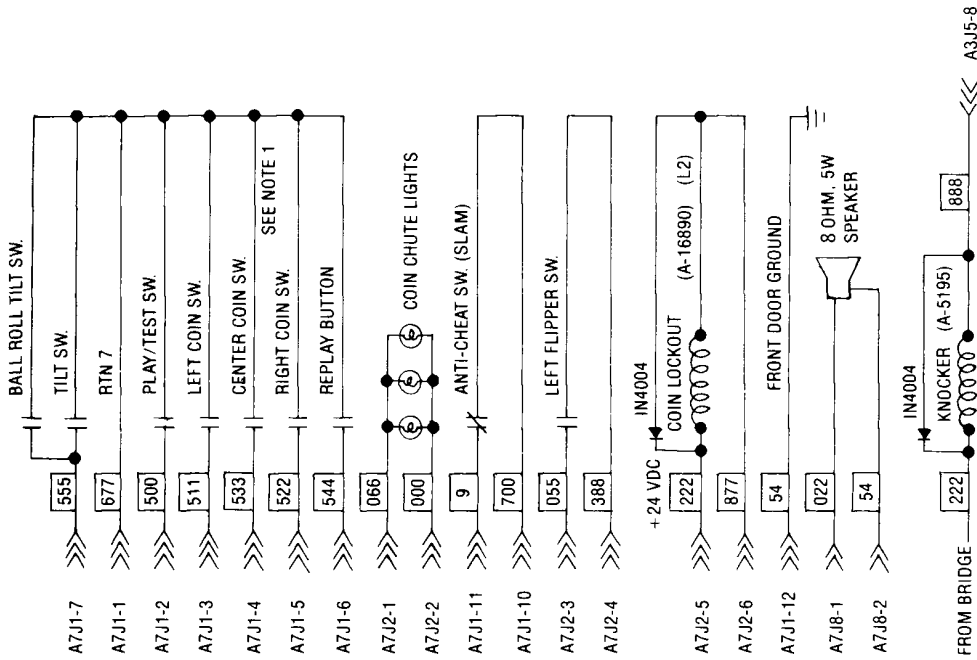
STROBE CODE	
0	TEST SW.
1	LEFT COIN SW.
2	RIGHT COIN SW.
3	CENTER COIN SW.
4	REPLAY BUTTON
5	TILT SW.

- NOTES:
 1. OPTIONAL COUNTERS REFER TO GAME MANUAL FOR INSTRUCTIONS.
 2. PRIMARY FUSE VALUES:
 115V USE 5 AMP SLO-BLO
 230V USE 2.5 AMP SLO-BLO
 3. STROBE 0-5 DIODES ARE 1N270. OPTIONAL COUNTERS USE 1N4004.
 4. >>> TO PLAYBOARD
 >>> TO LIGHTBOX
 >>> TO FRONT DOOR
 5. 230V TRANSFORMERS: 8-19550, C-19554
 GERMAN TRANSFORMERS: 8-19549, C-19553
 6. REFER TO INSTRUCTION MANUAL FOR GERMAN GAME VARIATIONS.



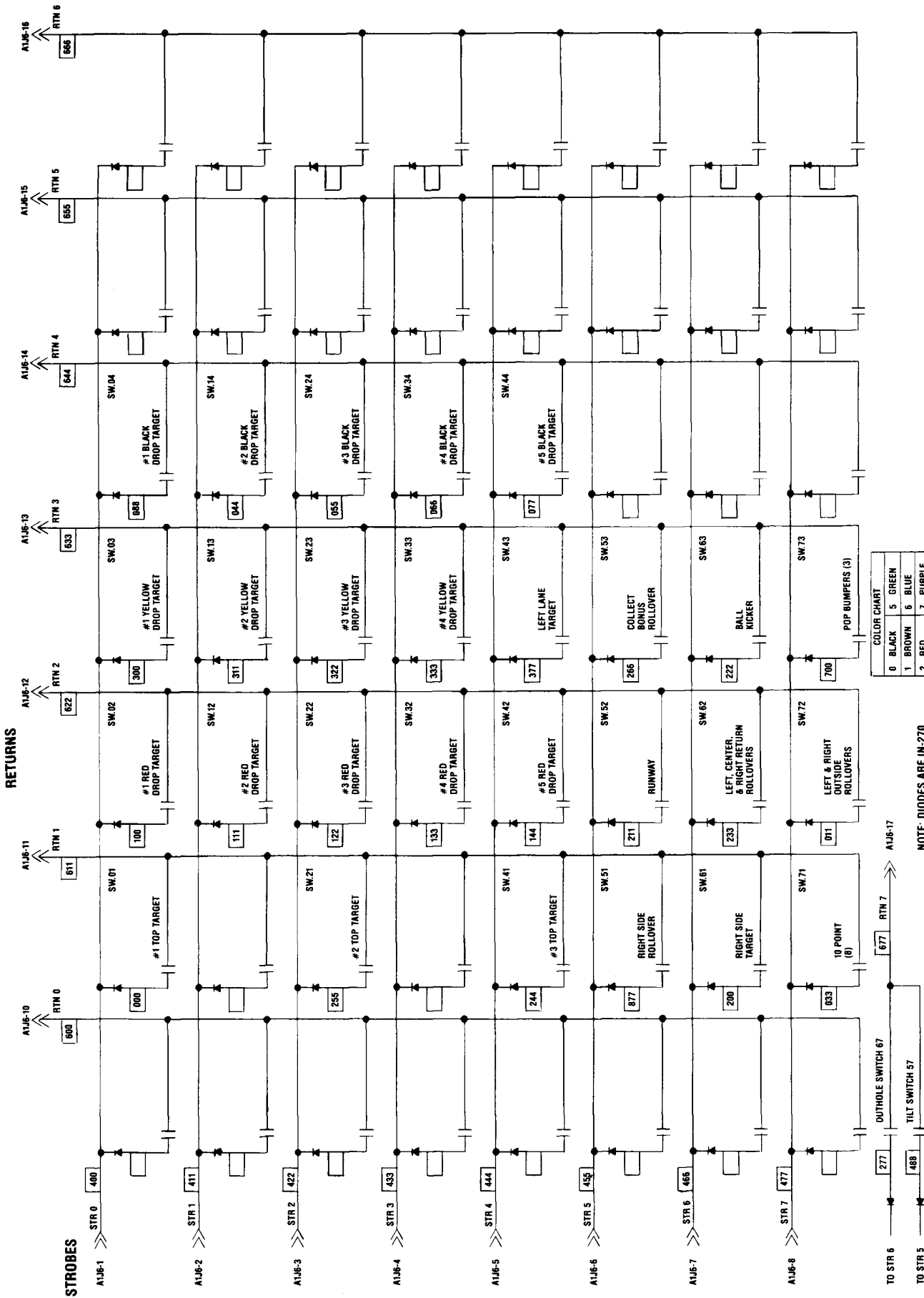
X. C. BOTTOM BOARD & LIGHTBOX SCHEMATIC

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



NOTE 1: REFER TO INSTRUCTION MANUAL FOR GERMAN GAME VARIATIONS

X. D. SWITCH MATRIX

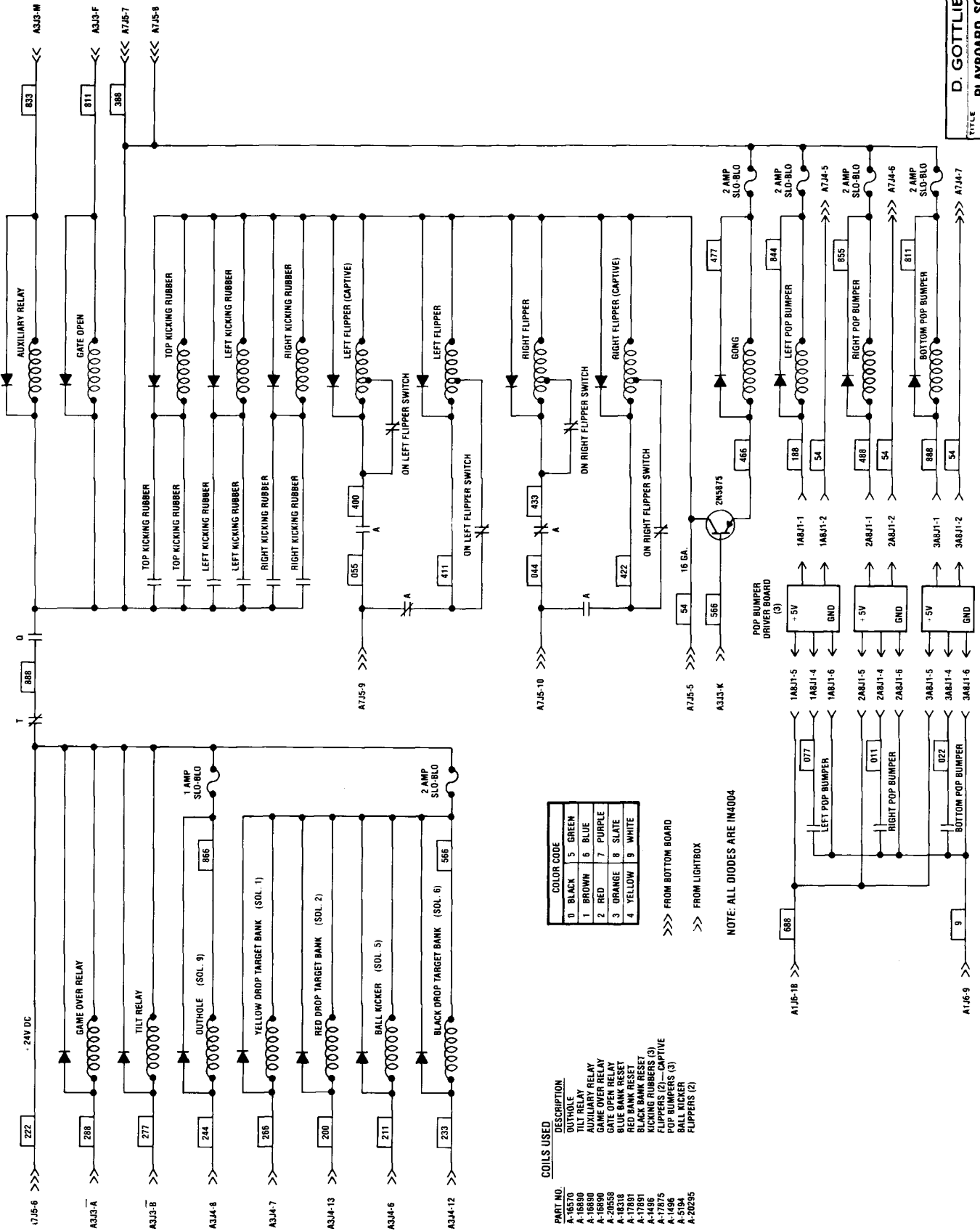


COLOR CHART	
0	BLACK
1	BROWN
2	RED
3	ORANGE
4	YELLOW
5	GREEN
6	BLUE
7	PURPLE
8	SLATE
9	WHITE

NOTE: DIODES ARE IN-270

D. GOTTLIEB & CO.	
TITLE SWITCH MATRIX	
USED ON	APPROVED DATE
DRAWN	C-20266

X. E. PLAYBOARD SOLENOIDS



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

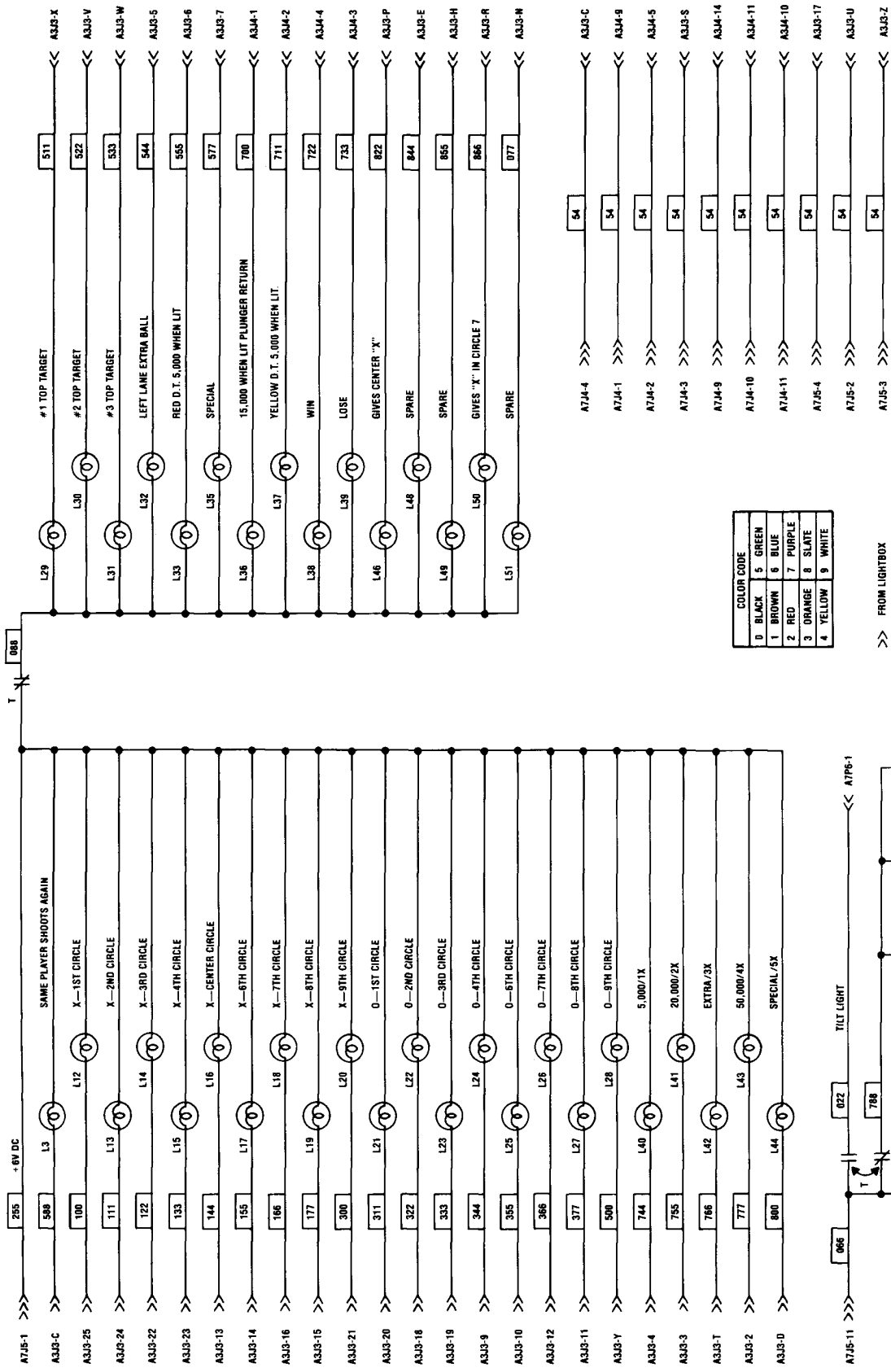
PART NO.	DESCRIPTION
A-14570	OUTHOLE
A-16890	TILT RELAY
A-16890	AUXILIARY RELAY
A-16890	GAME OVER RELAY
A-20558	GATE OPEN RELAY
A-8338	BLUE BANK RESET
A-17891	RED BANK RESET
A-1481	KICKING RUBBER (3)
A-1481	KICKING RUBBER (2) - CAPTIVE
A-1496	POP BUMPER (3)
A-5194	BALL KICKER
A-20295	FLIPPERS (2)

>>> FROM BOTTOM BOARD
>> FROM LIGHTBOX

D. GOTTLIEB & CO.
PLAYBOARD SOLENOIDS

USED ON _____
DRAWN _____
APPROVED DATE _____
C-20265

X. F. PLAYBOARD ILLUMINATION

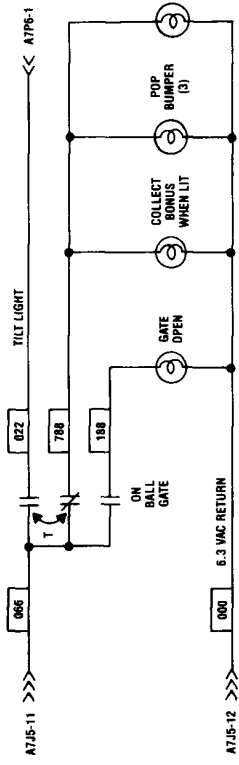


COLOR CODE	
0	BLACK
1	BROWN
2	RED
3	ORANGE
4	YELLOW
5	GREEN
6	BLUE
7	PURPLE
8	SLATE
9	WHITE

>>> FROM LIGHTBOX

>>> FROM BOTTOM BOARD

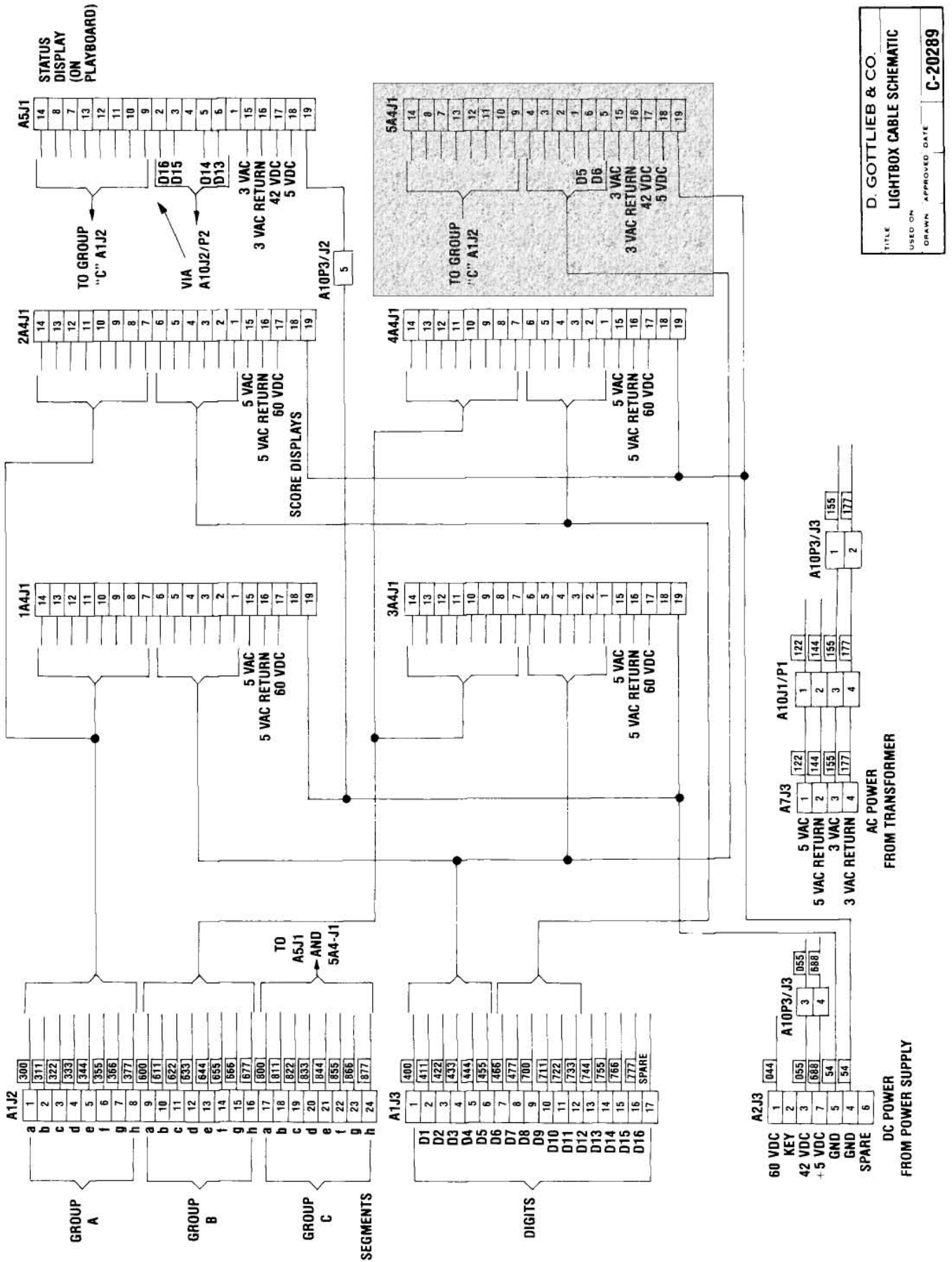
NOTE: LAMPS L32-L43 ARE DRIVEN BY MPS A33'S. ALL OTHER LAMP DRIVERS ARE MPS U45'S.



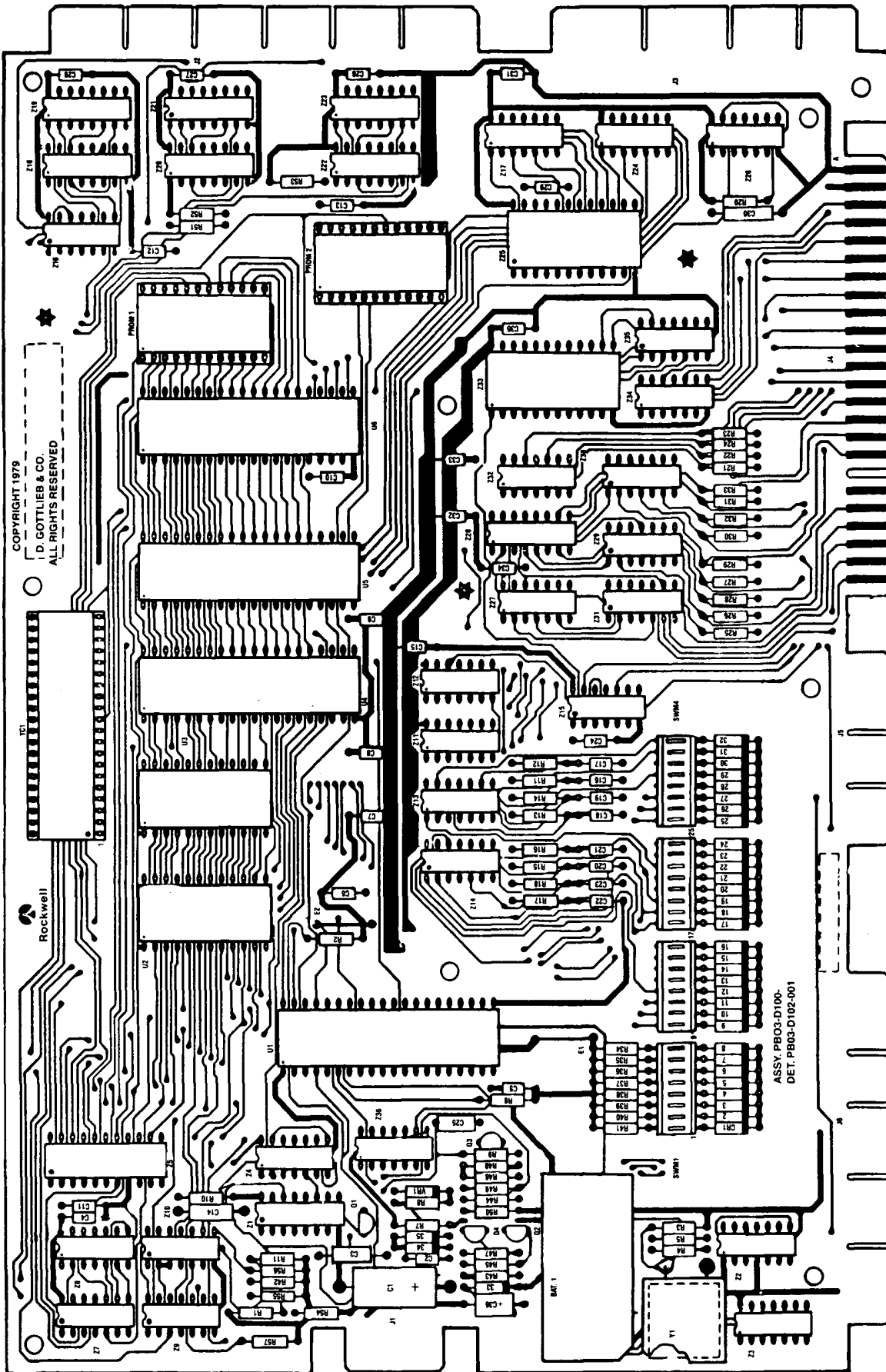
D. GOTTLIEB & CO.	
TITLE PLAYBOARD ILLUMINATION	
USED ON	DATE
DRAWN	APPROVED
	C-20267

X. G. LIGHTBOX CABLE SCHEMATIC DIAGRAM

THIS IS A CORRECTION SHEET FOR TIME LINE. SHADED AREA TO BE CORRECTED IN YOUR MANUAL. (SEE BOTH SIDES OF THIS SHEET.)



X. H. CONTROL BOARD COMPONENT LOCATION



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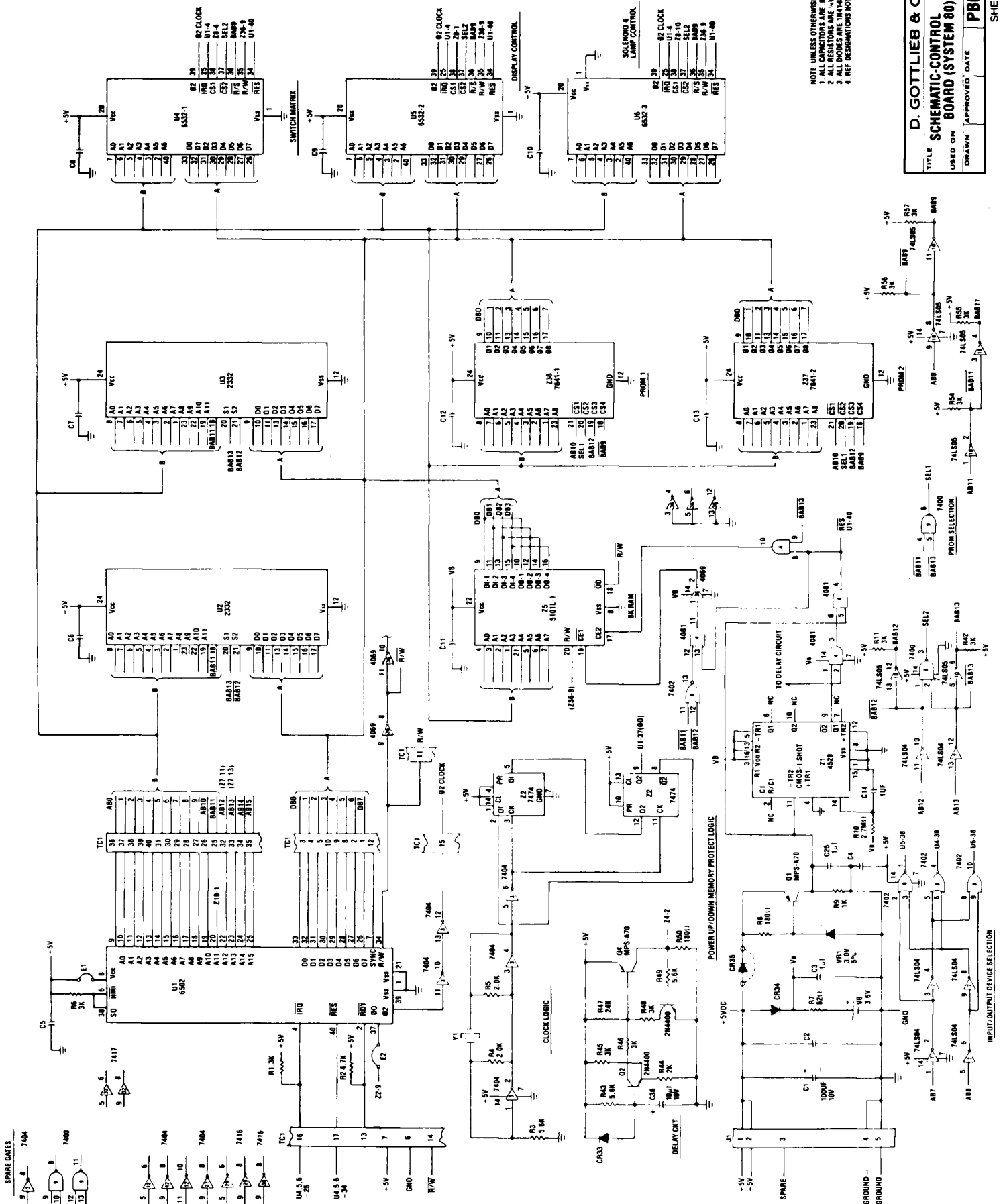
Rockwell

ASSY. PB03-D100-
 DET. PB03-D102-001

D. GOTTLIEB & CO.	
TITLE	CONTROL BOARD
USED ON	SYSTEM 80
DRAWN	APPROVED DATE
	PB03-D100

X. I. CONTROL BOARD SCHEMATIC (DET. PB03-D102-001)

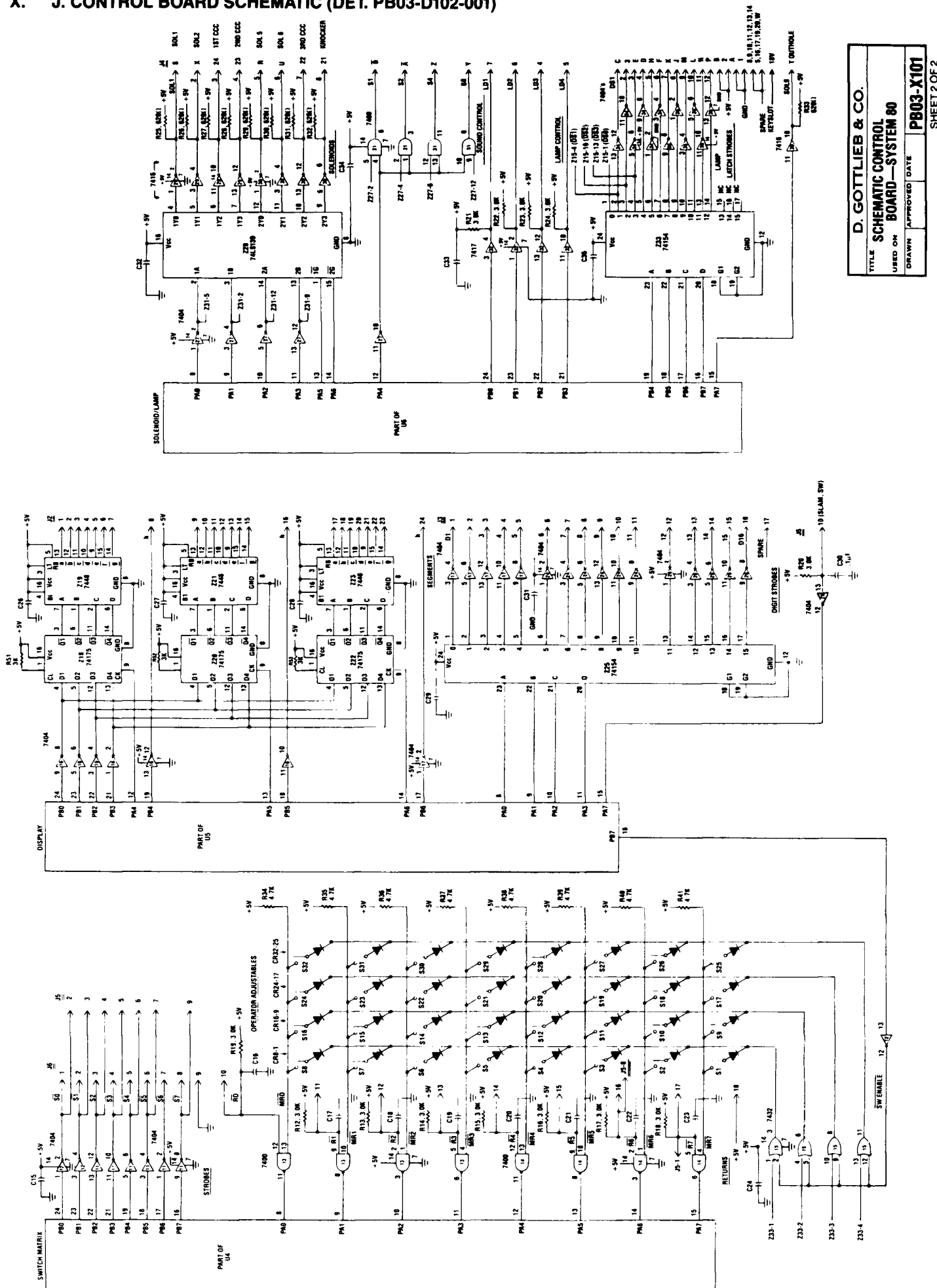
NOTE: SEE PAGE 38 FOR CONTROL BOARD CONVERSION INSTRUCTIONS



NOTE UNLESS OTHERWISE SPECIFIED
 1 ALL CAPACITORS ARE 0.1µF 50V
 2 ALL RESISTORS ARE 1/4W 5%
 3 ALL DIMENSIONS ARE IN INCHES
 4 REF DESIGNATIONS NOT USED 78

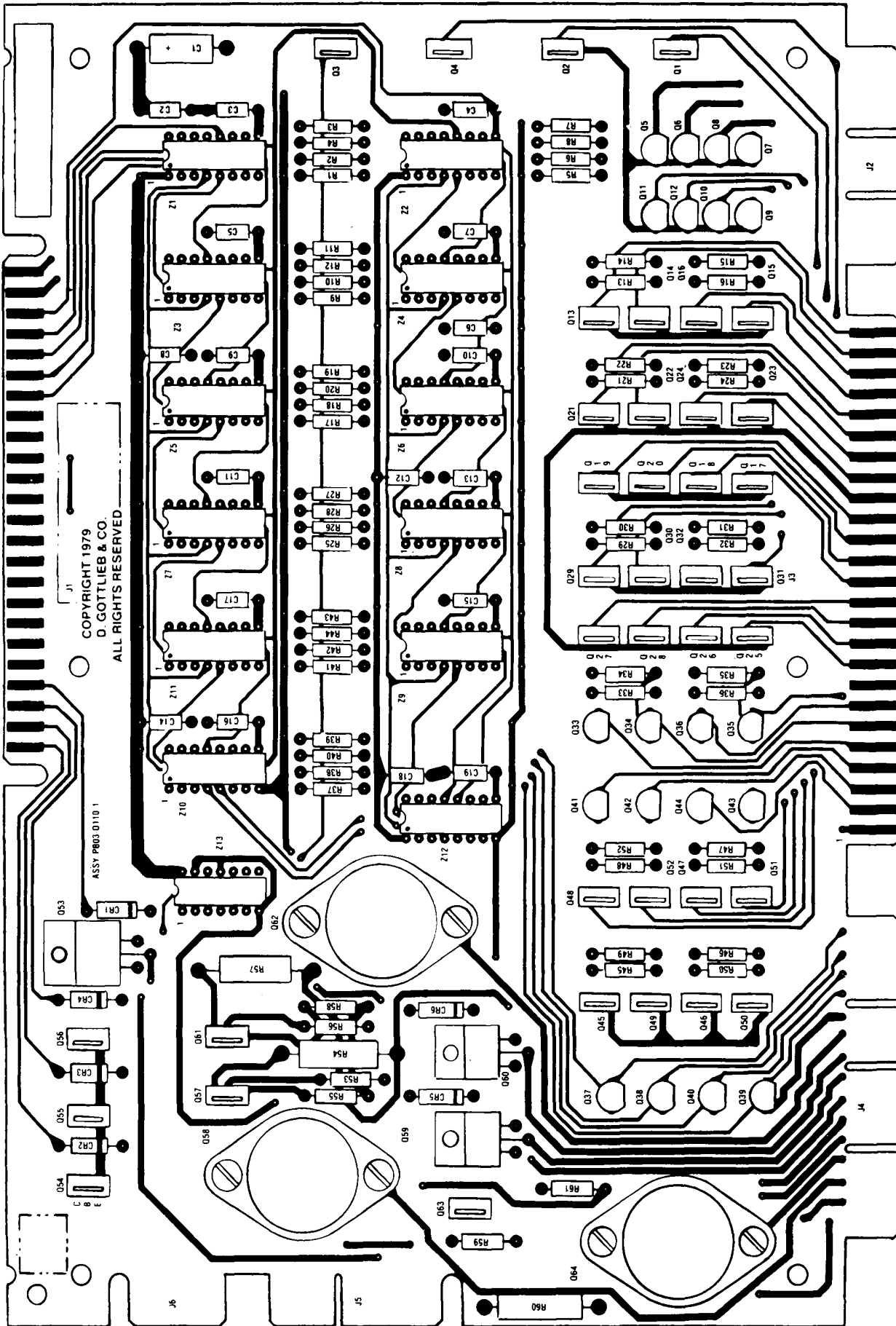
D. GOTTlieb & CO.	
TITLE SCHEMATIC CONTROL BOARD (SYSTEM 80)	
USED ON	DRAWN
APPROVED DATE	PB03-X101
SHEET 1 OF 2	

X. J. CONTROL BOARD SCHEMATIC (DET. PB03-D102-001)



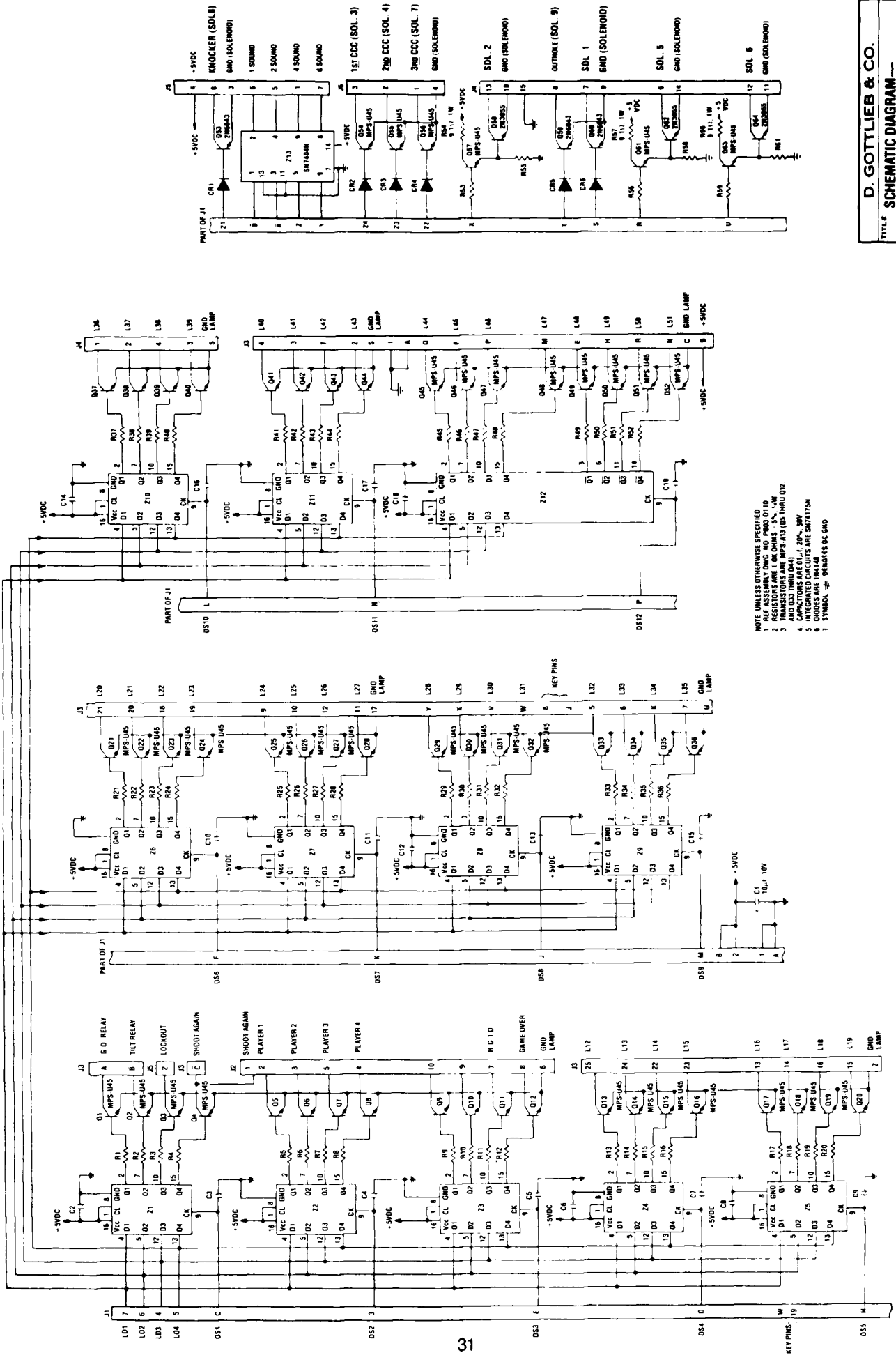
D. GOTTLIEB & CO.
 TITLE SCHEMATIC CONTROL BOARD—SYSTEM 80
 USED ON
 DRAWN APPROVED DATE PB03-X101
 SHEET 2 OF 2

X. K. DRIVER BOARD COMPONENT LOCATION



D. GOTTLIEB & CO.	
TITLE MASTER DRIVER SYSTEM 80	
USED ON	APPROVED DATE
DRAWN	PB03-D110

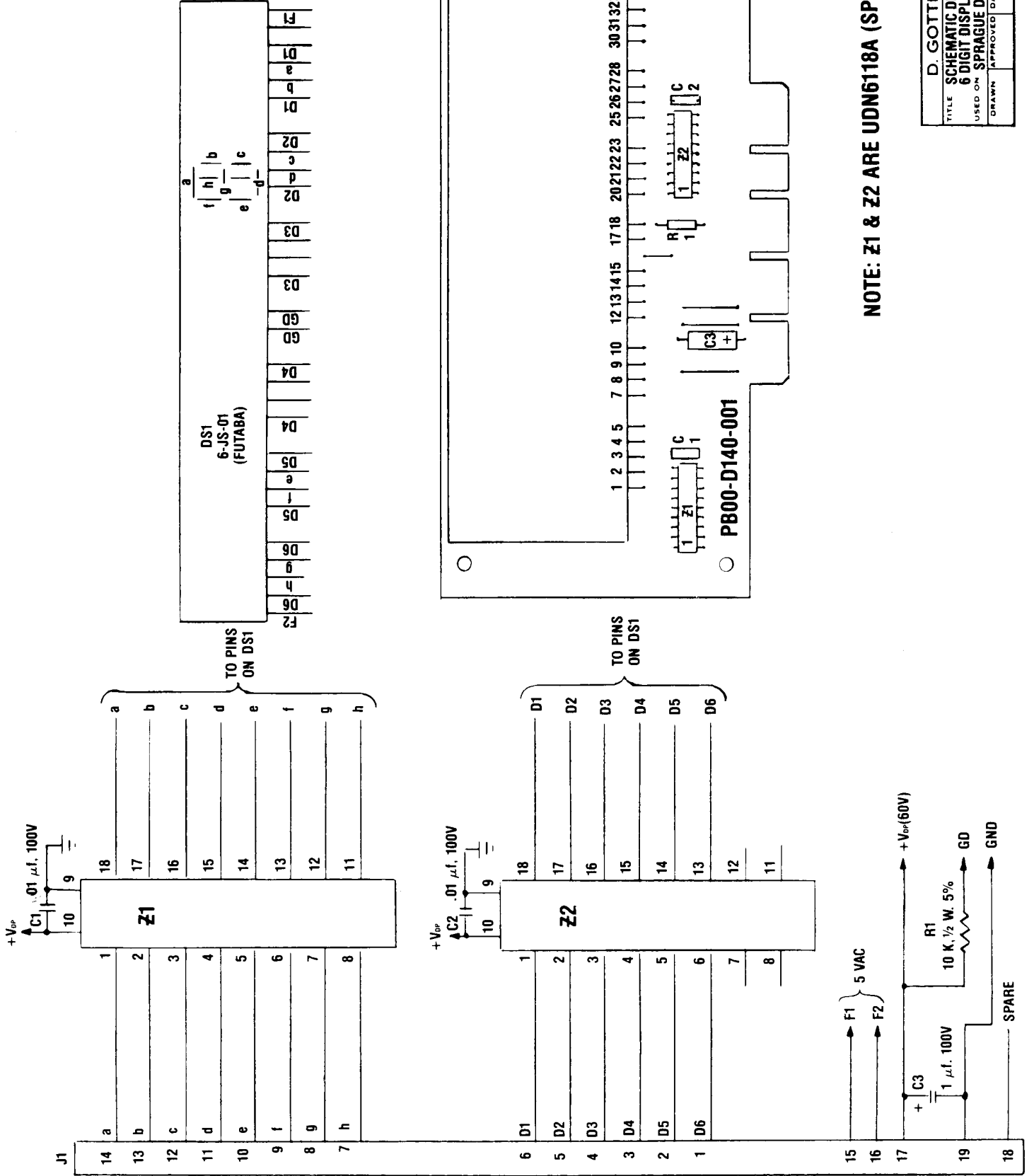
X. L. DRIVER BOARD SCHEMATIC



NOTE: UNLESS OTHERWISE SPECIFIED
 1. REF. ASSEMBLY NO. PMA3-0119
 2. RESISTORS ARE 1% OR 5% TOL.
 3. TRANSISTORS ARE MPS-A13 (S1) THRU Q12.
 4. CAPACITORS ARE 0.1μF, 20%, 50V.
 5. INTEGRATED CIRCUITS ARE SN74175M.
 6. DIODES ARE 1N4148.
 7. SYMBOLS: ⊕ = WIREBOND DC GND

D. GOTTLIEB & CO.	
TITLE SCHEMATIC DIAGRAM USED ON MASTER DRIVER SYSTEM 80	
DRAWN	APPROVED DATE
PB03-X111	

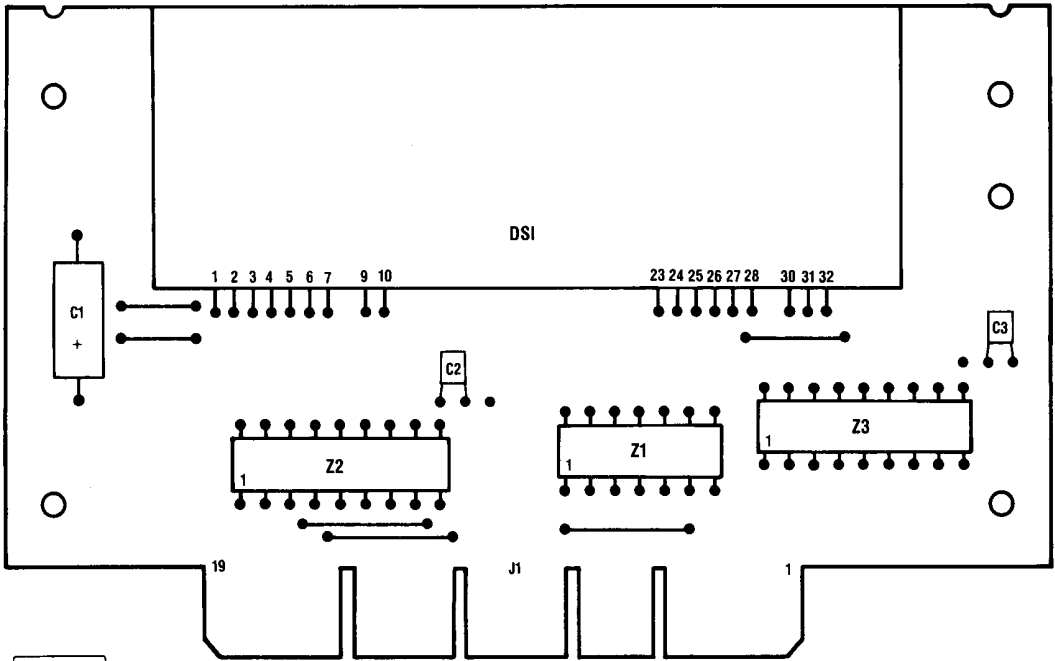
X. M. 6 DIGIT DISPLAY



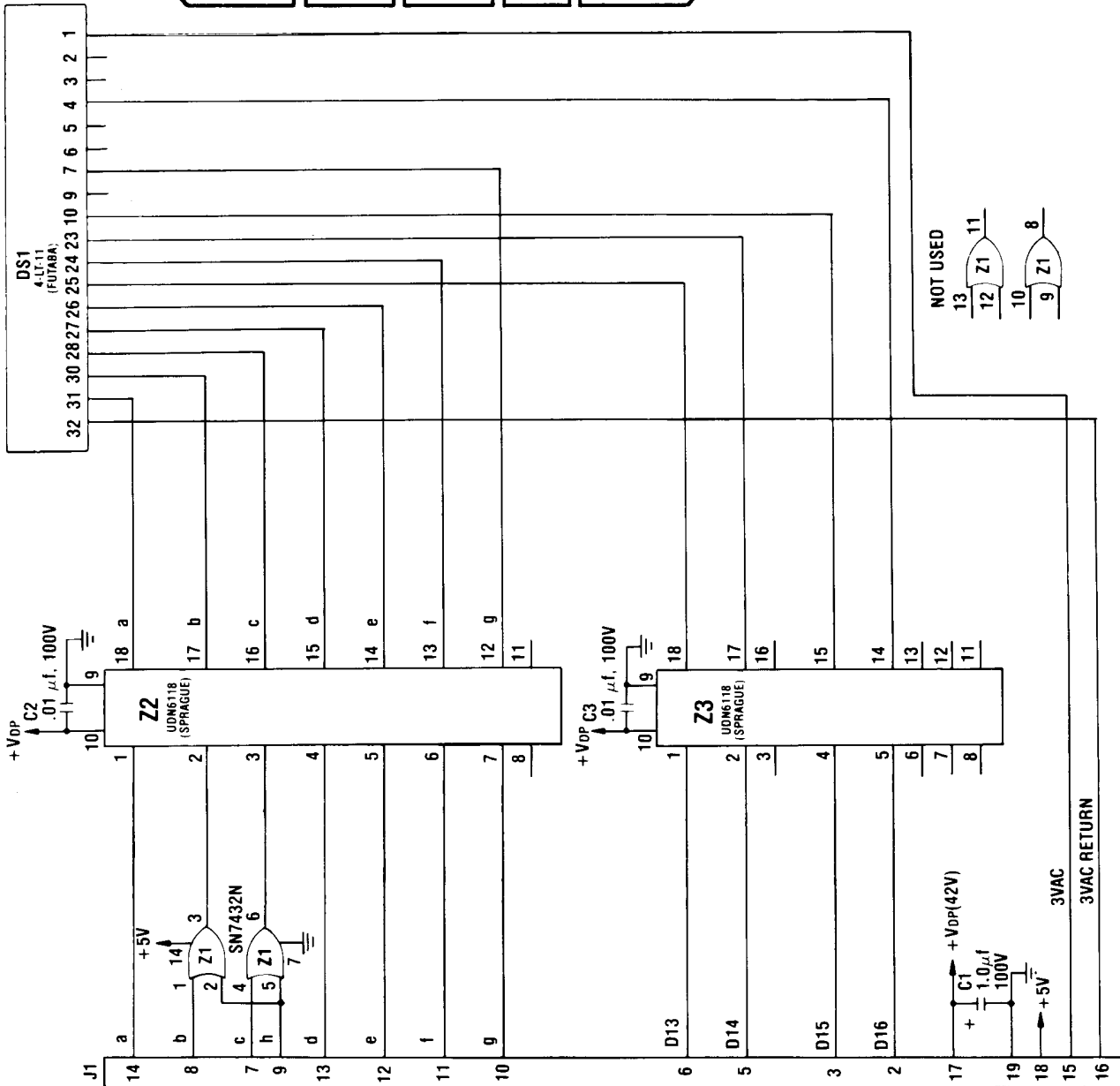
NOTE: Z1 & Z2 ARE UDN6118A (SPRAGUE)

D. GOTTLIEB & CO.	
TITLE SCHEMATIC DIAGRAM —	
6 DIGIT DISPLAY	
USED ON SPRAGUE DRIVER	
DRAWN	APPROVED DATE
	PB00-D140

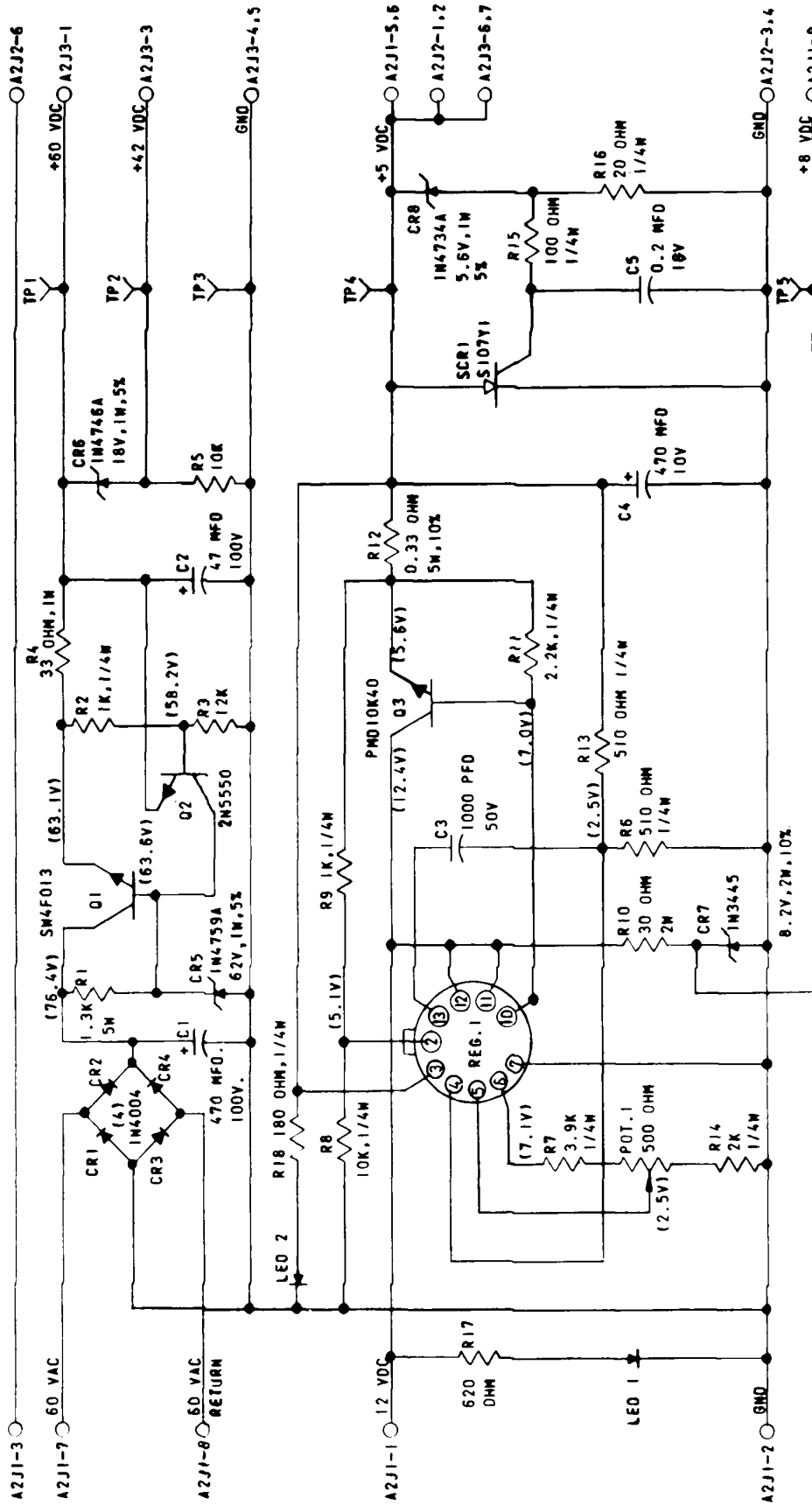
X. N. 4 DIGIT DISPLAY



D. GOTTLIEB & CO.	
TITLE SCHEMATIC DIAGRAM -	
USED ON 4 DIGIT DISPLAY	
DRAWN	APPROVED DATE
PB00-D150	



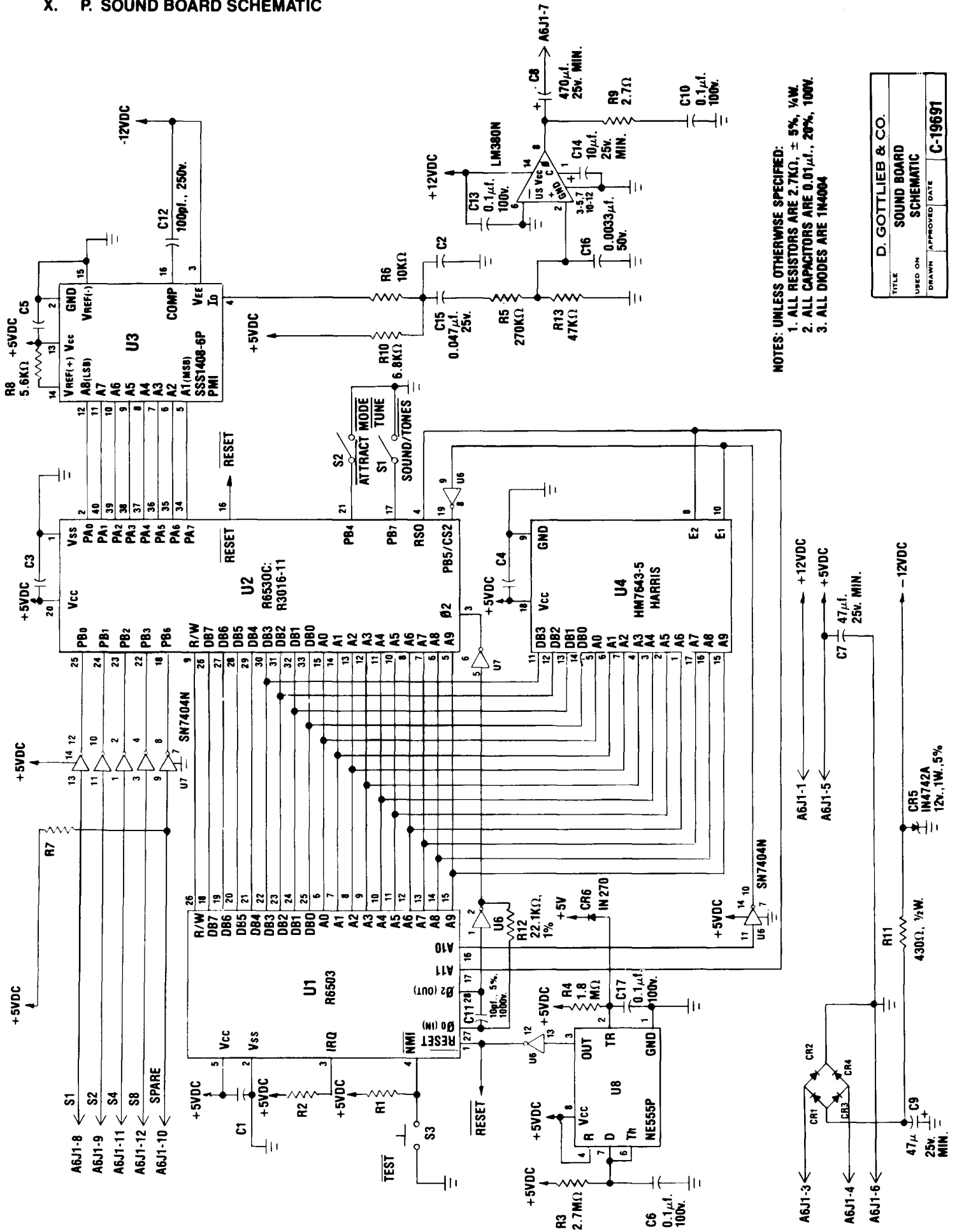
X. O. POWER SUPPLY SCHEMATIC



- NOTE: UNLESS OTHERWISE SPECIFIED,
 1. RESISTORS ARE 1/2W, 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	

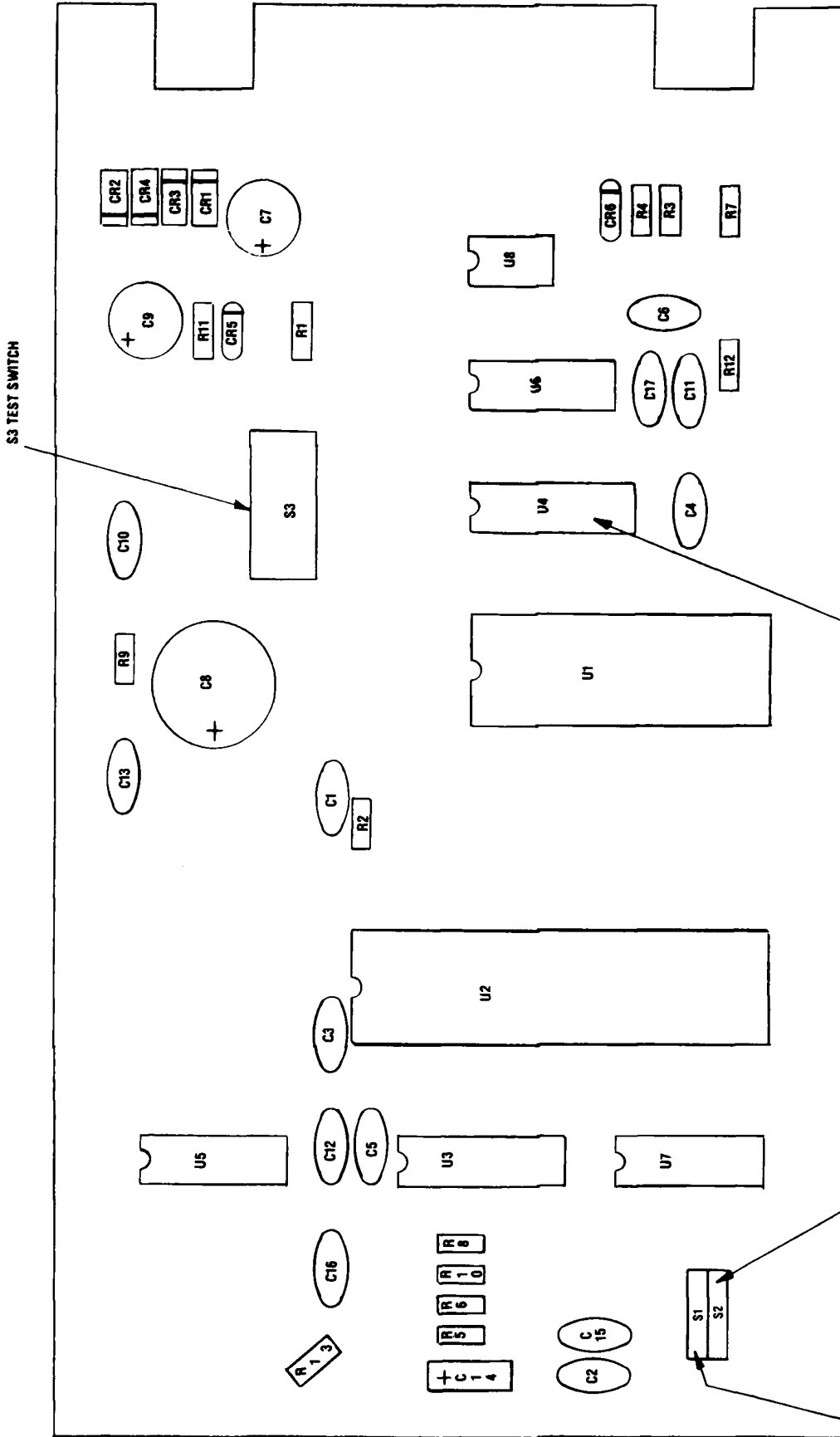
X. P. SOUND BOARD SCHEMATIC



NOTES: UNLESS OTHERWISE SPECIFIED:
 1. ALL RESISTORS ARE 2.7KΩ, ± 5%, 1/4W.
 2. ALL CAPACITORS ARE 0.01μf., 20%, 100V.
 3. ALL DIODES ARE 1N4004

D. GOTTLIEB & CO.	
TITLE	SOUND BOARD SCHEMATIC
USED ON	
DRAWN	APPROVED DATE
	C-19691

X. Q. SOUND BOARD COMPONENT LOCATION



NOTE: SOUND BOARD PROM IS INSERTED WITH INDENT NOTCH UP PROM IS MARKED WITH GAME NUMBER.

S2
OFF = NO ATTRACT TUNE
ON = ATTRACT TUNE EVERY 6 MINUTES

S1
OFF = CONTINUOUS SOUND
ON = SCORING SOUNDS ONLY

D. GOTTLIEB & CO.	
TITLE	SOUND BOARD COMPONENT
USED ON	LOCATION—SYSTEM 80
DRAWN	APPROVED
DATE	A-19998

X. S. SYSTEM 80 CONTROL BOARD CONVERSION INSTRUCTIONS

CONTROL BOARD INTERCHANGEABILITY

SUBJECT: Commencing with the game James Bond, the System 80 control board has been modified so that one 2K EPROM may be used in place of the two ½K PROMS used in previous System 80 games. This change doubles the memory space allowing greater flexibility in game design. Older System 80 control boards can be easily modified to accept the 2K EPROM so that they may be used in James Bond and newer System 80 games.

CONTROL BOARD IDENTIFICATION: The older board is DET. PB03-D102-001.

The new board revision is DET. PB03-D107-001.

MODIFICATION PROCEDURE: 3 traces to be cut, 4 jumpers to be added.

1. Top of board. Cut trace extending to the left from between pins 6 and 7 of Z-10.
2. Bottom of board; J1 connector to the right, J4, 5, 6 connectors facing down. Jumper Z-10 pin 13 to the pad located just below and to the right of Z-9 pin 7.
3. Cut traces leading to PROM socket 1 pins 21 and 19.
4. Jump PROM socket 1 pin 21 to PROM socket 2 pin 24.
5. Jump PROM socket 1 pin 22 to PROM socket 2 pin 18.
6. Jump PROM socket 1 pin 19 to PROM socket 2 pin 21.

TO REVERSE THIS MODIFICATION BACK TO TWO ½K PROMS:

1. Unsolder jumper on Z-10 pin 13 and solder to Z-10 pin 11.
2. Unsolder jumper on PROM socket 2 pin 24 and solder to PROM socket 2 pin 21.
3. Unsolder jumper on PROM socket 2 pin 21 and solder to PROM socket 2 pin 19.

