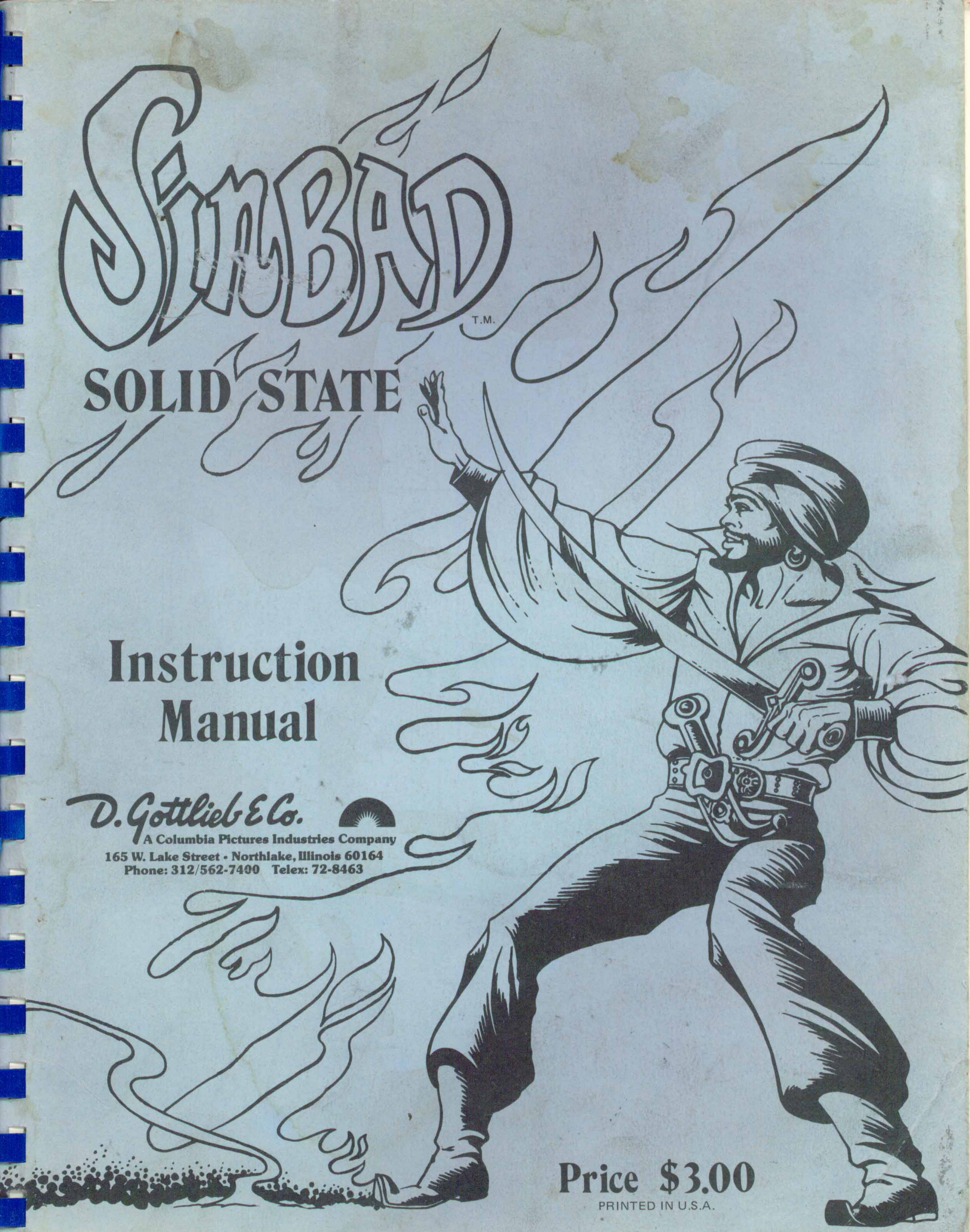
SINBAD™

SOLID STATE



Instruction Manual

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SINBAD (SOLID STATE)
GENERAL GAME OPERATING INSTRUCTIONS

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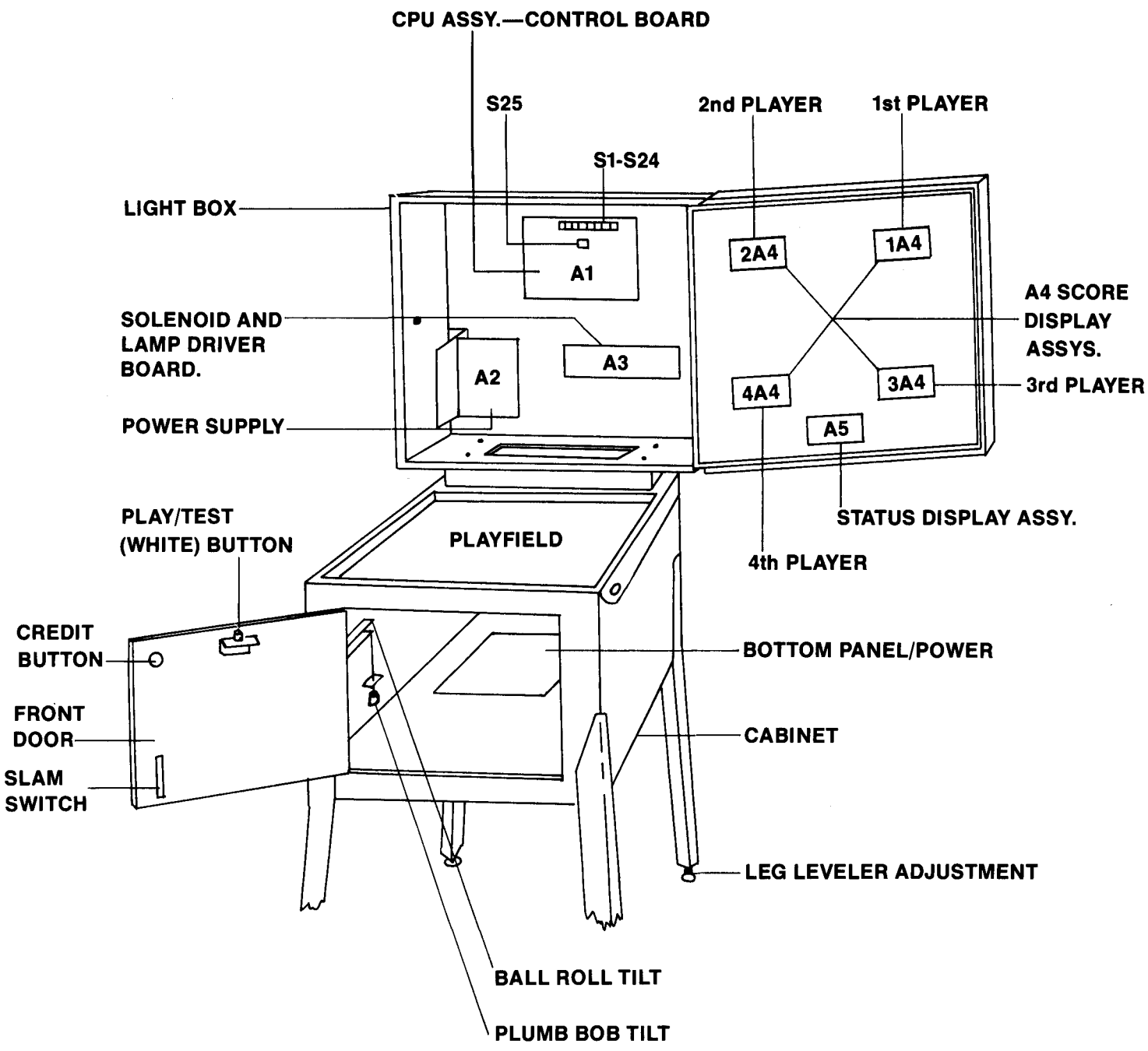
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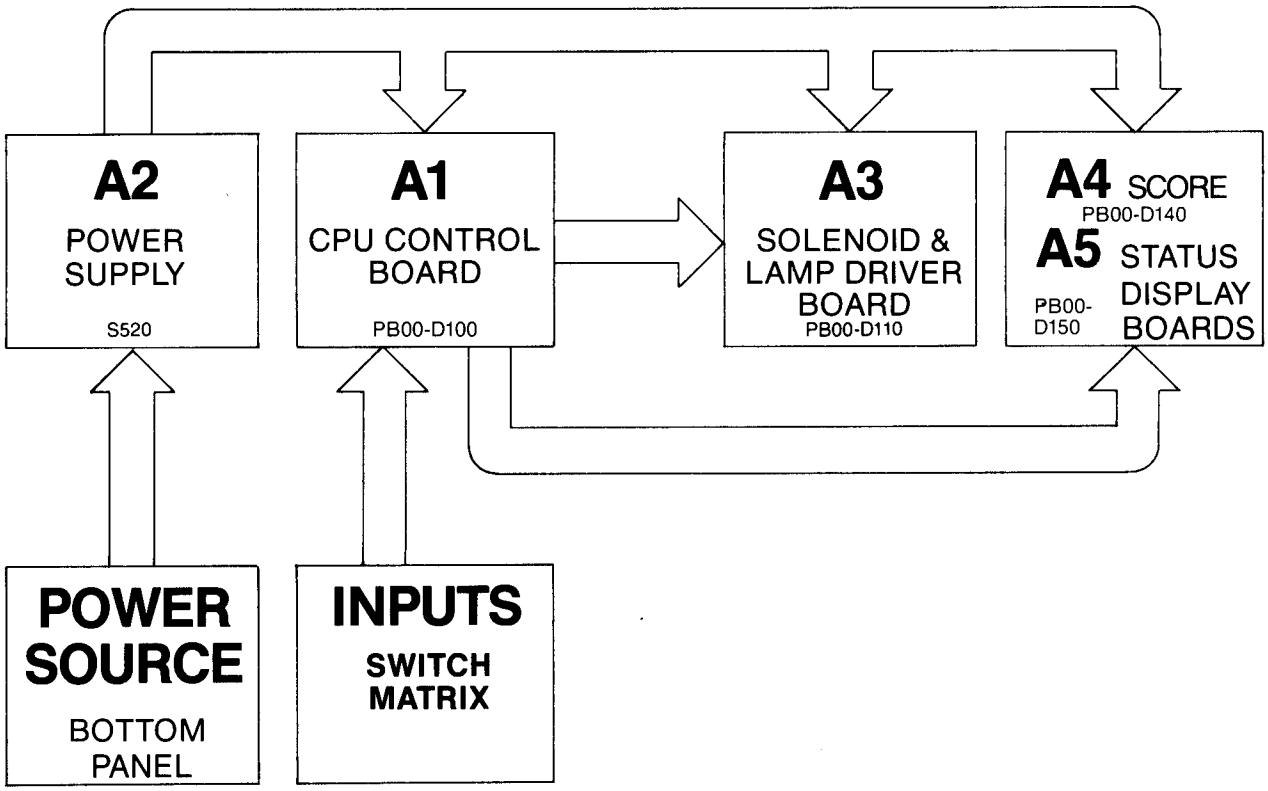
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COMPONENT LOCATION DIAGRAM



BLOCK DIAGRAM



I. INSTALLATION

To assemble the game, first bolt the legs to the cabinet. Place the lightbox atop the pedestal and insert the four #10-32 truss-head screws into the back of the pedestal. Open the lightbox and secure it to the cabinet with the long lightbox bolts. Connect all cables and gently but fully insert the connectors onto the printed circuit boards. Be sure to touch only the edges of the boards.

NOTE: TOUCHING THE STATIC-SENSITIVE MOS COMPONENTS ON THE CPU CONTROL BOARD CAN DAMAGE THEM, MAKING THE GAME INOPERATIVE AND INVALIDATING THE WARRANTY.

CAUTION: IF GAME WAS SUBJECTED TO EXTREME COLD, ALLOW GAME TO WARM UP TO ROOM TEMPERATURE BEFORE PLUGGING IN LINE CORD.

Inspecting the following items before plugging in the line cord may prevent future trouble:

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. Check the soldering generally for cold joints.
5. Be certain all fuses are firmly seated.
6. Check the transformers for foreign matter across the terminals.
7. Be sure that the transformer wiring corresponds to the supply voltage.
8. 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 plumb-bob tilt (on left side of cabinet near front door) to the sensitivity desired.

II. 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 all score displays will light and read zeros. The credit display will show the number of credits remaining and the ball in play display will show "70." If the credits fail to light, turn off the game and inspect the normally closed switch on the ball-roll tilt and on the front door. Turn on the game; if the problem remains, refer to Section VII. (Trouble-shooting).

Five seconds after the score displays light, they will flash "High Game to Date" score for one second. This cycle continues until the game is started. All playfield lights controlled by the micro-processor will be off.

Insert one or more coins 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 credit button to reset the game; the ball should now be at the shooter. The first player score reads "0" and flashes, indicating that that player is now scoring. The other player displays are blank and a "1" appears on the ball-in-play display.

Additional players are indicated by a "0" showing in each corresponding player display. Thus if there are three players, a "0" will show in the first three player displays. After the fourth player has been added (or when the credit display reads "0"), the credit button has no effect.

The game features are described in a later section. 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. All playfield features reset after each ball. When the "Shoot Again" light is lit, neither the player designation (the 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 the player's score, a replay is added to the credit display. At this time a "High Game to Date" score is periodically flashed in all four player displays. When this score is achieved, three replays are given. This feature is adjustable.

Tilting the machine results in the loss of the ball in play or the entire game, depending upon the Tilt Reset adjustment. With this adjustment "on," the game comes on again when the ball enters the outhole, and play resumes. There is a normally-closed switch on the front door and one in the ball-roll tilt. If either of these switches opens from raising the front of the cabinet or pounding the front door, the entire game is ended. "The "Game Over" light comes on and for three seconds the coin chute switches and replay button are inactive. This prevents accidental closing of these switches from residual vibration.

III. SINBAD (SOLID STATE)

GAME FEATURES (5 BALL)

The red drop targets score 3000 points and increase the bonus value. The white, yellow and purple drop targets score 500 points and increase the bonus value.

Hitting the white drop target lights 2x bonus light. Hitting the white and both of the yellow drop targets lights 3x bonus value. Hitting the white, 2 yellow and 3 purple drop targets lights 4x bonus value. Completing all drop targets, white, yellow, purple and red, lights 5x bonus, resets all drop targets, scores bonus as indicated and resets 5x bonus light.

Completing groups of white and purple drop targets lights corresponding rollovers and target features. Completing the yellow drop targets lights corresponding rollovers alternately for increased score. Completing the red drop targets lights red rollover alternately for "special." "Special" and "extra ball" feature reset when hit awarding one of each per ball in play.

The swinging target and rollover buttons score 10 points and add one advance. 5 advances adds one bonus and 1000 points.

Bonus is scored and features reset after each ball.

FEATURE CHANGES FOR 3 BALL OPERATION

All drop targets score 3000 points.

The yellow and red rollovers do not alternate.

The 5x bonus does not reset until ball leaves the playfield.

The swinging target and rollover buttons score 100 points.

IV. BOOKKEEPING FUNCTIONS AND SELF-TESTING

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 button on the inside of the front door (the play/test button) 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 machine returns to normal playing condition.

The data in any bookkeeping step may be reset to zero while it is displayed by pressing Switch Button #25 on A1, the CPU control board in the lightbox. Then the play/test button must be pressed to enter the zero.

STEP (Credit Display)	INFORMATION SHOWN (First Player Display)
0	Total coins through #1 coin chute (left chute).
1	Total coins through #2 coin chute.*
2	Total plays.
3	Total replays given.
4	Number of times anti-cheat switches on front door and on ball-roll tilt have opened.
5	Total extra balls.
6	Number of tilts.
7	First high score replay.
8	Second high score replay.
9	Third high score replay.
10	Current "High Game to Date" score.
11	Display test: All digits in first and third player displays step "0" through "9."**
12	Display test: All digits in second and fourth player displays step "0" through "9."**
13	Self-test: All CPU-controlled lights come on for five seconds. Each solenoid is energized one at a time. All closed switches noted by a code number in ball-in-play display.

*If chutes are adjusted to be the same, coins deposited in either chute add only to the #1 chute total.

**If button is not pressed within two 0-9 cycles, machine returns to normal playing condition.

TO CHANGE REPLAY SCORES OR "HIGH GAME TO DATE" SCORE:

1) Press the play/test button on the front door at one-second intervals to advance to step 7 (first high score replay).
2) Reset the display by pressing Switch Button #25 on A1, the CPU control board.
3) Press the replay button. This causes the display to advance by 10,000's. Hold in the replay button until the desired replay score is shown.
4) The new score is entered by advancing to the next function by pressing the play/test button.

To eliminate entirely one or more replay scores, set step 7, 8, or 9 at zero (as in #2 above), then press the play/test button to enter the value.

The switches and solenoids are checked in Step 13 in the order given in the following lists. A faulty solenoid or a closed switch that should be open will not stop the test sequence; the code number of the component will be shown in the ball-in-play display. The machine returns to the normal playing condition at the end of the test. It will do so also if a tilt switch is closed, if an anti-cheat switch is opened, or if the power is interrupted.

SOLENOID NUMBER	SOLENOID
1	Outhole
2	Knocker
3	Tens Chime
4	Hundreds Chime
5	Thousands Chime
6	White-Yellow Drop Target Bank Reset
7	Purple Drop Target Bank Reset
8	Red Drop Target Bank Reset

SINBAD (SOLID STATE)

SWITCH NUMBER	SWITCH CODE LIST	SWITCH
00	.....	Play/test button (on front door)
01	.....	#1 Coin Chute (on front door)
02	.....	#2 Coin Chute (on front door)
03	.....	Replay Button (on front door)
04	.....	Tilt Switches
10	.....	Swinging Target
11	.....	Not Used
12	.....	Not Used
13	.....	Not Used
14	.....	Pop Bumpers (2)
20	.....	White Drop Target
21	.....	Yellow Drop Target
22	.....	Not Used
23	.....	Not Used
24	.....	Yellow Drop Target
30	.....	Purple Drop Target
31	.....	Purple Drop Target
32	.....	Not Used
33	.....	Not Used
34	.....	Purple Drop Target
40	.....	Top and Left Yellow Rollovers (2)
41	.....	White Rollover and Target
42	.....	Not Used
43	.....	Not Used
44	.....	Right Yellow Rollovers (2)
50	.....	Red Drop Target
51	.....	Red Drop Target
52	.....	Not Used
53	.....	Not Used
54	.....	10 Point Switches (8)
60	.....	Red Drop Target
61	.....	Red Drop Target
62	.....	Not Used
63	.....	Not Used
64	.....	Not Used
70	.....	Red Rollover
71	.....	Purple Rollover
72	.....	Not Used
73	.....	Not Used
74	.....	Rollover Buttons (4)

V. GAME ADJUSTMENTS

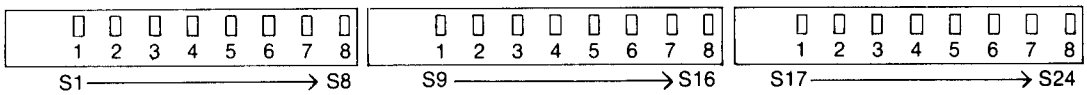
A. Playfield Adjustments

Posts controlling access to the left and right outlanes can be adjusted. See page 35. The "conservative" (easier entry) position decreases playing time and scoring while the "liberal" position has the opposite effect.

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.

B. Lightbox Adjustments

There are 24 switches on the CPU control board (A1). These allow many features of the game to be adjusted to fit the location. The switches are contained in three "packages" of eight switches each, as shown in the following illustration.



WARNING: TURN OFF POWER BEFORE MAKING ADJUSTMENTS! BE CAREFUL TO TOUCH ONLY THE SWITCHES. DO NOT TOUCH THE STATIC-SENSITIVE MOS COMPONENTS.

1. Coin and Credit

The number of plays (credits) and the number of coins are adjustable. Switches #1 through #4 adjust the first coin chute (#1 chute, on the left). Switches #5 through #8 adjust #2 coin chute.

The two chutes can be adjusted to be the same. When this is done, both chutes are adjusted using switches #1 through #4.

COIN CHUTES	SWITCH 19
Separate	OFF
Same	ON

COIN CHUTE ADJUSTMENTS

#1 Coin Chute	**S1**	**S2**	**S3**	**S4**
#2 Coin Chute	**S5**	**S6**	**S7**	**S8**

Coins/Credits

1/1	OFF	OFF	OFF	OFF
1/2	OFF	OFF	OFF	ON
1/3	OFF	OFF	ON	OFF
1/4	OFF	OFF	ON	ON
1/5	OFF	ON	OFF	OFF
1/6	OFF	ON	OFF	ON
1/7	OFF	ON	ON	OFF
1/8	OFF	ON	ON	ON
1/9	ON	OFF	OFF	OFF
2/1	ON	OFF	OFF	ON
2/2	ON	OFF	ON	OFF
2/3	ON	OFF	ON	ON
2/4	ON	ON	OFF	OFF
2/5	ON	ON	OFF	ON
2/3	ON	ON	ON	OFF
3/1	ON	ON	ON	ON

Note 1 (2/1 through 2/5)

Note 2 (2/3 ON ON ON OFF)

Note 3 (3/1 ON ON ON ON)

Note 1: No credits until second coin is deposited.

Note 2: First coin gives one credit. Second coin gives two credits provided that no score is made between first and second coin. If scoring occurred, second coin becomes a "first" coin, giving one credit.

Note 3: No credit until third coin is deposited.

2. Maximum Credits

This adjustment determines the maximum number of games which may be accumulated on the credit display, whether by adding replays or by inserting coins.

MAXIMUM CREDITS	SWITCHES 17	SWITCHES 18
5	OFF	OFF
8	OFF	ON
10	ON	OFF
15	ON	ON

3.

BALLS PER GAME	SWITCH 9
3	ON
5	OFF

4.

MATCH FEATURE	SWITCH 10
IN	ON
OUT	OFF

5.

CREDITS DISPLAYED	SWITCH 13
YES	ON
NO	OFF

6.

CHIMES WHEN SCORING	SWITCH 20
YES	ON
NO	OFF

7.

TILT	SWITCH 12
BALL IN PLAY ONLY	ON
GAME OVER	OFF

8. Score Feature

This adjustment determines game mode. (Replay or Extra Ball).

	SWITCH 11
REPLAY	ON
EXTRA BALL	OFF

9. Chimes When Resetting Game (Tune)

The game may be adjusted to play a tune when the credit button is pressed and a different tune when a coin is dropped.

CREDIT BUTTON TUNE	SWITCH 14
ON	ON
OFF	OFF
COIN SWITCH TUNE	**SWITCH 23**
ON	ON
OFF	OFF

10. High Game to Date Feature

When the High Game to Date score is reached, three replays are given and that score becomes the new High Game to Date. That score is flashed periodically on all four player displays at the end of the game.

HIGH GAME TO DATE	SWITCH 21
IN	ON
OUT	OFF

	SWITCH 22
11. HIGH GAME TO DATE FEATURE GIVES 3 REPLAYS	ON
HIGH GAME TO DATE FEATURE GIVES NO REPLAYS	OFF

VI. ROUTINE MAINTENANCE

After a successful completion of the self-test, check the playfield for dirt or particles. The playfield should be cleaned frequently with a non-abrasive wax-based cleaner. Any of the polishes made specifically for use on pinball machine playfields may be used. Make certain that kicker fulcrums and all pivot points receive a drop of fine oil. The pop bumper cup switches, the drop target shanks and the discs of Vari-targets should be lightly coated with White Lube, a special Gottlieb lubricant available at distributors.

When the playboard is clean and all components are working properly, start the game and try each feature. Make certain each rollover operates, that each pop bumper scores and kicks correctly and that in general everything works as it should. If an intermittent or dirty switch is found, clean the points by pressing them together with a piece of paper or a business card between them, moving the card back and forth.

WARNING: DO NOT FILE, BURNISH OR IN ANY WAY ABRADE GOLD-PLATED SWITCH CONTACTS.

The only switches whose points may be burnished are the pop bumper cup switches, the rubber-actuated switches on kicking rubber units, and the flipper button switches.

VII. TROUBLE-SHOOTING

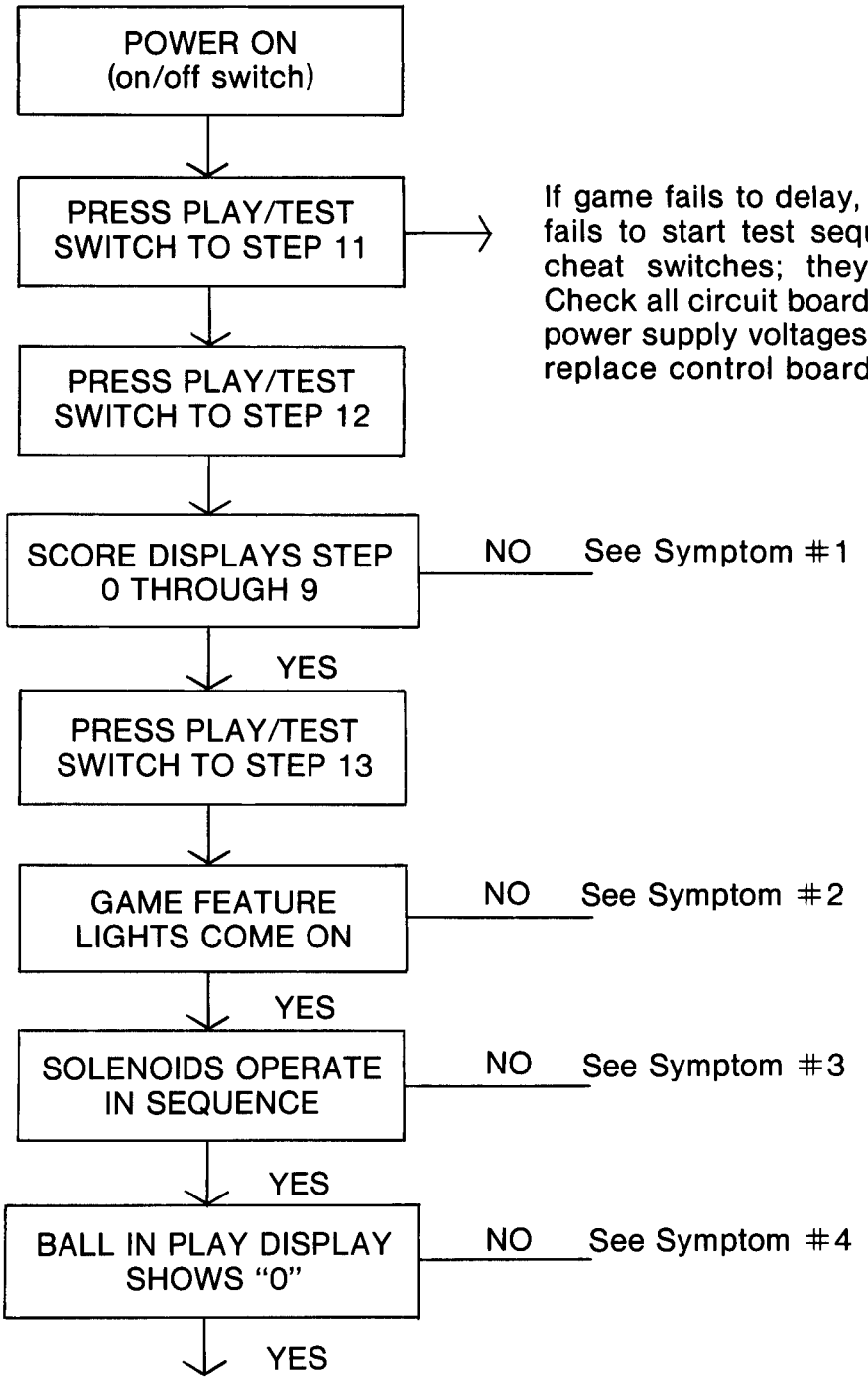
Trouble-shooting of the mechanical devices in the game can be held to a minimum by diligent maintenance. Trouble-shooting of the solid-state components is very seldom required and in fact on location is limited to inspection and replacement of entire boards. Detailed diagnosis and repair of boards can be made at a service center or properly equipped shop.

Before replacing the CPU board or driver board, measure the voltages on the power supply board (A2) after first disconnecting the two connectors A2J2 and A2J3. If any fault is found here, replace this board and recheck power supply voltages before reconnecting A2J2 and A2J3. Before replacing anything, check carefully all connectors, crimp connectors and wires. Make certain all grounds are intact.

After any repairs, all connectors *must* be re-connected before the game is turned on.

WARNING! TURN OFF POWER BEFORE REMOVING OR REPLACING ANY OF THE BOARDS.

GAME TEST AND TROUBLE SHOOTING GUIDE



SYMPTOM #1 DISPLAYS

Note: Before replacing a display, check the connector and the individual crimped wires.

1A) Symptom: One or several display segments or digits always off, always on, or mottled. May appear on one or more players but *not all.*

Action:
1. Open front door and press play/test button until step 11 or 12 is reached. Note any defective display boards.
2. Turn power off.
3. Replace defective score display board (see parts list). Turn power on and repeat 1. If trouble persists, go to 1B2.

1B) Symptom: *All* player displays improper; segments or digits always on or always off.

Action:
1. Repeat 1A-1.
2. Check power supply voltages.
3. Turn power off.
4. Replace CPU board A1. (see parts list)
5. Turn power on and repeat 1.

SYMPTOM #2 FEATURE LIGHTS

2A) Symptom: Not all feature lights come on during play.

Action:
1. Check the wiring and bulb, of lights not working.
2. Check connectors and crimped wires on the driver board (A3).
3. Open the front door and press play/test button until step 13 is reached. Feature lights come on.
4. Turn power off.
5. Replace driver board A3. (see parts list)
6. Turn power on and repeat 3. If not correct, turn power off.
7. Replace CPU board A1. (see parts list)
8. Turn power on and repeat 3.

2B) Symptom: One or more feature lights always on.

Action:
1. Perform 2A-2 through 2A-8.

SYMPTOM #3 SOLENOIDS

3A) Symptom: Controlled solenoid does not operate during play (may be one or more). NOTE: Flipper, kicking rubber and pop bumper solenoids are non-CPU controlled. They have nothing to do with boards A1 and A3.

Action:

1. Open front door and press play/test button until step 13 is reached. Each solenoid operates once. (See solenoid list in Section III).
2. Turn power off.
3. Raise the playfield and check the solenoid not operating. Replace if damaged. Check for free movement of the device operated by the solenoid. Check 24 VDC fuse.
4. Inspect connectors and crimped wires on driver board (A3).
5. Replace driver board A3. (see parts list)
6. Turn power on and repeat 3A-1. If solenoid does not operate, turn power off.
7. Inspect connectors and crimped wires on CPU control board (A1). Repeat 3A-1.
8. Turn power off and replace CPU control board A1. (see parts list)
9. Turn power on and repeat 3A-1.

3B) Symptom: One or more controlled solenoids always energized.
NOTE: Solenoids other than flippers will overheat if kept energized continuously. Do not allow more than 20 seconds of operation. Follow this with several minutes with the power off.

Action:

1. Turn power off.
2. Check coil for shorted or open diode and/or shorted coil. Replace if defective, carefully noting diode polarity.
3. Turn power on and test solenoid. If a problem still exists, turn game off. Refer to symptom 3A2.

SYMPTOM #4 GAME FEATURES

4A) Symptom: Game feature does not score.

Action:

1. Open front door and press play/test button until step 13 is reached. Each switch is checked automatically and any closed switch is indicated in code in the ball-in-play display (see Section III and switch code list).
2. Raise the playfield and locate the faulty switch indicated by the code. The switch should have an approximate 1/16" gap. Check for loose solder or other foreign matter across the points or teminals. Make sure that the device operating the switch operates freely. The code may represent several parallel switches; be sure to check all similar (such as yellow rollovers) switches.
3. Repeat 4A1. If trouble persists, replace personality prom.
4. If trouble still exists, replace control board. (A1)

SYMPTOM #5 GENERAL

5A) Symptom: A Fuse or fuses blow repeatedly.

Action:

1. Inspect the circuits controlled by each fuse which blows for shorts, loose wires, etc.
2. If either 5 amp fuse blows, check the bridge rectifiers located on the bottom board.

VIII. SERVICE AND PARTS

All solid-state components are listed in the parts catalog and are available at Gottlieb distributors. When making replacements of any components, always use Gottlieb parts to assure infrequent service calls. The parts catalog lists all current components and their prices, enabling the repairman to quickly and easily select the item he needs. Whenever parts are ordered, state the part number, the part name, the game for which it is intended and, if applicable, the color or design.

SINBAD (SOLID STATE)
Lamp Assignments

Latch	Position	Lamp Number	Function
L1	1	1	Game over relay
	2	2	Tilt relay
	3	3	High game to date
	4	4	Same player shoots again
L2	1	5	Red rollover
	2	6	Purple rollover
	3	7	Top yellow rollover
	4	8	Bottom left yellow rollover
L3	1	9	White rollover
	2	10	Top white target
	3	11	Bottom white target
	4	12	Not used
L4	1	13	Not used
	2	14	Advance
	3	15	Advance
	4	16	Advance
L5	1	17	Advance
	2	18	Advance
	3	19	5x bonus
	4	20	3x bonus
L6	1	21	4x bonus
	2	22	2x bonus
	3	23	1000 bonus
	4	24	2000 bonus
L7	1	25	3000 bonus
	2	26	4000 bonus
	3	27	5000 bonus
	4	28	6000 bonus
L8	1	29	7000 bonus
	2	30	8000 bonus
	3	31	9000 bonus
	4	32	10,000 bonus
L9	1	33	Right yellow rollover
	2	34	Bottom yellow rollover
	3	35	Not used
	4	36	Not used

WIRE COLOR ASSIGNMENTS

LAMP	COLOR
1	White-Blue
2	White-Orange
3	White-Brown
4	White-Green
5	White-Purple
6	White-Yellow
7	Blue-White-Red
8	Orange-White-Red
9	Brown-White-Red
10	Green-White-Red
11	Purple-White-Red
12	Yellow-White-Red
13	Blue-White-Black
14	Orange-White-Black
15	Brown-White-Black
16	Green-White-Black
17	Purple-White-Black
18	Yellow-White-Black
19	White-Blue-Red
20	White-Orange-Red
21	White-Brown-Red
22	White-Green-Red
23	White-Purple-Red
24	White-Yellow-Red
25	White-Blue-Black
26	White-Orange-Black
27	White-Brown-Black
28	White-Green-Black
29	White-Purple-Black
30	White-Yellow-Black
31	Blue-White-White
32	Orange-White-White
33	Brown-White-White
34	Green-White-White
35	Purple-White-White
36	Yellow-White-White

WIRE COLOR ASSIGNMENTS
(continued)

STROBE	COLOR
0	Blue
1	Orange
2	Brown
3	Green
4	Purple

RETURNS	
0	Yellow
1	Blue-White
2	Orange-White
3	Brown-White
4	Green-White
5	Purple-White
6	Yellow-White
7	Yellow-Black

SOLENOIDS	
1	Blue-Red
2	Orange-Red
3	Orange-Black
4	Green-Red
5	Purple-Red
6	Yellow-Red
7	Blue-Black
8	Orange-Black

Flipper Switches
Left: Green-Black
Right: Purple-Black

Anti-Cheat Switches
Blue-Black
Orange-Black

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A1-J1

PIN	WIRE COLOR	FUNCTION
1	———	Spare
2	*Blue	−12 VDC
3	*Black	Ground
4	*Black	Ground
5	*Red	+5 VDC
6	*Red	+5 VDC

PLUG A1-J2

1	White-Blue-Red	f A
2	White-Orange-Red	g A
3	White-Brown-Red	a A
4	White-Green-Red	b A
5	White-Purple-Red	c A
6	White-Yellow-Red	d A
7	White-Blue-Black	e A
8	———	Spare
9	———	Spare
10	———	Spare
11	White-Purple	f B
12	White-Yellow	g B
13	Brown-White-White	a B
14	Green-White-White	b B
15	Blue-White-Red	c B
16	Orange-White-Red	d B
17	White-Green-Black	e B
18	White-Purple-Black	h A
19	White-Yellow-Black	h B

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A1-J3

PIN	WIRE COLOR	FUNCTION
1	———	Spare
2	———	Spare
3	———	Spare
4	Black	Ground
5	*Red	+5 VDC
6	Blue	D 3
7	Orange	D 4
8	Brown	D 2
9	Green	D 1
10	Purple	D 10
11	Yellow	D 9
12	Blue-White	D 11
13	Orange-White	D 12
14	Brown-White	D 7
15	Green-White	D 8
16	Purple-White	D 6
17	Yellow-White	D 5
18	Blue-Red	D 14
19	Orange-Red	D 13
20	Brown-Red	D 15
21	Green-Red	D 16

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A1-J5

PIN	WIRE COLOR	FUNCTION
1	Blue-Black	Solenoid 7
2	Orange-Black	Solenoid 8
3	White-Green	LD 4
4	White-Brown	LD 3
5	White-Orange	LD 2
6	White-Blue	LD 1
7	Green-Red	Hundreds chime
8	Purple-Red	Thousands chime
9	Yellow-Red	Solenoid 6
10	Blue-White-Red	Tens chime
11	Orange-Red	Knocker
12	Blue-Red	Outhole
13	Brown-White	DS 9
14	Orange-White	DS 7
15	Blue-White	DS 8
16	Yellow	DS 6
17	Purple	DS 5
18	Green	DS 4
19	Brown	DS 3
20	Orange	DS 2
21	Blue	DS 1
22	———	Spare
23	*Red	+5 VDC
24	*Black	Ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A1-J6

PIN	WIRE COLOR	FUNCTION
1	Black	Ground
2	Blue-Black	Anti-cheat switch
3	Yellow	Return 0
4	Orange	Strobe 1
5	Brown	Strobe 2
6	Green	Strobe 3
7	Purple	Strobe 4
8	Blue	Strobe 0
9	———	Spare

PLUG A1-J7

1	White-Green-Black	Outhole
2	Blue	Strobe 0
3	Orange	Strobe 1
4	Brown	Strobe 2
5	———	Spare
6	Purple	Strobe 4
7	Green	Strobe 3
8	*Black	Ground
9	———	Spare
10	Yellow-Black	Return 7
11	Yellow-White	Return 6
12	Yellow	Return 0
13	Blue-White	Return 1
14	Orange-White	Return 2
15	Purple-White	Return 5
16	Green-White	Return 4
17	Brown-White	Return 3

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A2-J1

PIN	WIRE COLOR	FUNCTION
1	White-Blue	11.5 VAC
2	White-Orange	11.5 VAC Return
3	*Black	Ground
4	White-Brown	14 VAC
5	White-Purple	14 VAC Return
6	Blue-White-Red	69 VAC
7	Orange-White-Red	69 VAC Return

PLUG A2-J2

1	*Red	+5 VDC
2	*Red	+5 VDC
3	———	Spare
4	*Black	Ground
5	*Black	Ground
6	*Blue	−12 VDC

PLUG A2-J3

1	White-Blue	+60 VDC
2	———	Spare
3	White-Orange	+42 VDC
4	———	Spare
5	Black	Ground
6	———	Spare
7	Blue-White-Black	+4 VDC
8	Green-White-Red	+8 VDC

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A3-J1

PIN	WIRE COLOR	FUNCTION
1	White-Orange	LD 2
2	White-Brown	LD 3
3	White-Blue	LD 1
4	White-Green	LD 4
5	Blue	DS 1
6	Orange	DS 2
7	Brown	DS 3
8	Blue-Red	Outhole
9	Yellow-Red	Solenoid 6
10	Green	DS 4
11	Blue-Black	Solenoid 7
12	Orange-Black	Solenoid 8
13	Purple	DS 5
14	Yellow	DS 6
15	Orange-White	DS 7
16	Blue-White	DS 8
17	Brown-White	DS 9
18	Purple-Red	Thousands chime
19	Green-Red	Hundreds chime
20	Blue-White-Red	Tens chime
21	Orange-Red	Knocker
22	*Black	Ground
23	*Red	+5 VDC
24	———	Spare

PLUG A3-J2

1	*Orange-Red	Knocker
2	*Orange-Black	Tens chime
3	*Green-Red	Hundreds chime
4	*Purple-Red	Thousands chime
5	*Black	Ground
6	———	Spare ground
7	———	Spare ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A3-J3

PIN	WIRE COLOR	FUNCTION
1	Yellow-White-White	L36
2	Purple-White-White	L35
3	Green-White-White	L34
4	Brown-White-White	L33
5	Orange-White-White	L32
6	Blue-White-White	L31
7	White-Purple-Black	L29
8	White-Yellow-Black	L30
9	White-Green-Black	L28
10	*Black	Ground
11	White-Brown-Black	L27
12	White-Blue-Black	L25
13	White-Orange-Black	L26
14	White-Yellow-Red	L24
15	White-Purple-Red	L23
16	White-Brown-Red	L21
17	White-Green-Red	L22
18	White-Orange-Red	L20
19	*Black	Ground
20	White-Blue-Red	L19
21	*Black	Ground

PLUG A3-J4

1	(#16 Gauge) Black	Ground
2	(#16 Gauge) Orange-Black	Solenoid 8
3	———	Spare ground
4	*Blue-Black	Solenoid 7
5	*Yellow-Red	Solenoid 6
6	*Blue-Red	Outhole
7	(#16 Gauge) Black	Ground
8	———	Spare ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A3-J5

PIN	WIRE COLOR	FUNCTION
1	Purple-White-Black	L17
2	Yellow-White-Black	L18
3	Green-White-Black	L16
4	Brown-White-Black	L15
5	Blue-White-Black	L13
6	Orange-White-Black	L14
7	Yellow-White-Red	L12
8	Purple-White-Red	L11
9	Brown-White-Red	L9
10	Green-White-Red	L10
11	Orange-White-Red	L8
12	Blue-White-Red	L7
13	White-Purple	L5
14	White-Yellow	L6
15	White-Green	L4
16	*Black	Ground
17	White-Brown	L3
18	White-Blue	L1
19	White-Orange	L2

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG 1A4-J1

PIN	WIRE COLOR	FUNCTION
1	Purple-White	D 6
2	Yellow-White	D 5
3	Orange	D 4
4	Blue	D 3
5	Brown	D 2
6	Green	D 1
7	White-Purple-Black	h A
8	White-Orange-Red	g A
9	White-Blue-Red	f A
10	White-Blue-Black	e A
11	White-Yellow-Red	d A
12	White-Purple-Red	c A
13	White-Green-Red	b A
14	White-Brown-Red	a A
15	Brown-White-Red	5 VAC
16	Purple-White-Red	5 VAC Return
17	White-Blue	+60 VDC
18	———	Spare
19	Black	Ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG 2A4-J1

PIN	WIRE COLOR	FUNCTION
1	Blue-Red	D 14
2	Orange-Red	D 13
3	Orange-White	D 12
4	Blue-White	D 11
5	Purple	D 10
6	Yellow	D 9
7	White-Purple-Black	h A
8	White-Orange-Red	g A
9	White-Blue-Red	f A
10	White-Blue-Black	e A
11	White-Yellow-Red	d A
12	White-Purple-Red	c A
13	White-Green-Red	b A
14	White-Brown-Red	a A
15	Brown-White-Red	5 VAC
16	Purple-White-Red	5 VAC Return
17	White-Blue	+60 VDC
18	———	Spare
19	Black	Ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG 3A4-J1

PIN	WIRE COLOR	FUNCTION
1	Purple-White	D 6
2	Yellow-White	D 5
3	Orange	D 4
4	Blue	D 3
5	Brown	D 2
6	Green	D 1
7	White-Yellow-Black	h B
8	White-Yellow	g B
9	White-Purple	f B
10	White-Green-Black	e B
11	Orange-White-Red	d B
12	Blue-White-Red	c B
13	Green-White-White	b B
14	Brown-White-White	a B
15	Brown-White-Red	5 VAC
16	Purple-White-Red	5 VAC Return
17	White-Blue	+60 VDC
18	———	Spare
19	Black	Ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG 4A4-J1

PIN	WIRE COLOR	FUNCTION
1	Blue-Red	D 14
2	Orange-Red	D 13
3	Orange-White	D 12
4	Blue-White	D 11
5	Purple	D 10
6	Yellow	D 9
7	White-Yellow-Black	h B
8	White-Yellow	g B
9	White-Purple	f B
10	White-Green-Black	e B
11	Orange-White-Red	d B
12	Blue-White-Red	c B
13	Green-White-White	b B
14	Brown-White-White	a B
15	Brown-White-Red	5 VAC
16	Purple-White-Red	5 VAC Return
17	White-Blue	+60 VDC
18	———	Spare
19	Black	Ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A5-J1

PIN	WIRE COLOR	FUNCTION
1	———	Spare
2	Green-Red	D 16
3	Brown-Red	D 15
4	———	Spare
5	Green-White	D 8
6	Brown-White	D 7
7	White-Purple-Red	c A
8	White-Green-Red	b A
9	White-Purple-Black	h A
10	White-Orange-Red	g A
11	White-Blue-Red	f A
12	White-Blue-Black	e A
13	White-Yellow-Red	d A
14	White-Brown-Red	a A
15	Yellow-White-Red	3 VAC
16	Orange-White-Black	3 VAC Return
17	White-Orange	+42 VDC
18	*Red	+5 VDC
19	Black	Ground

All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A6-J1

PIN	WIRE COLOR	FUNCTION
1	Yellow	Return 0
2	Blue-White	Play/test switch
3	Orange-White	#1 coin chute
4	Brown-White	#2 coin chute
5	Green-White	Replay button
6	Purple-White	Tilt pendulum
7	*Brown-Red	Coin chute lights
8	Blue-Black	Anti-cheat switches
9	*Brown-Black	Left flipper switch
10	*Green-Black	Flipper return
11	*Red	Coin lockout
12	*Black	Ball roll tilt ground
13	Spare	
14	*White-Black	Coin chute lights return
15	*Green-Yellow	Earth ground and coin lockout return

PLUG A6-J2

1	*Orange-Red	Knocker
2	*Green-Red	Hundreds chime
3	*Purple-Red	Thousands chime
4	*Orange-Black	Tens chime
5	*Red	24 VDC
6	*Red	24 VDC

All wires #22 gauge unless specified *(#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A6-J3

PIN	WIRE COLOR	FUNCTION
1	Yellow-Black	Game over light
2	White-Brown	High game to date light
3	White-Green	Shoot Again light
4	Brown-White-Red	5 VAC
5	Green-White-Red	+8 VDC offset
6	Purple-White-Red	5 VAC Return
7	Yellow-White-Red	3 VAC
8	Blue-White-Black	+4 VDC offset
9	Orange-White-Black	3 VAC Return
10	White-Brown-Black	Tilt light
11	*White	6 VDC
12	(#16 Gauge) White-Red	6.3 VAC (lightbox)
13	(#16 Gauge) White-Black	6.3 VAC Return
14	*Green-Yellow	Earth ground
15	———	Spare

PLUG A6-J4

1	White-Brown	High game to date light
2	*Black	Ground
3	*Black	Ground
4	*Black	Ground
5	*Black	Ground
6	(#16 Gauge) White	6 VDC
7	(#16 Gauge) White-Black	6.3 VAC Return
8	———	Spare
9	———	Spare

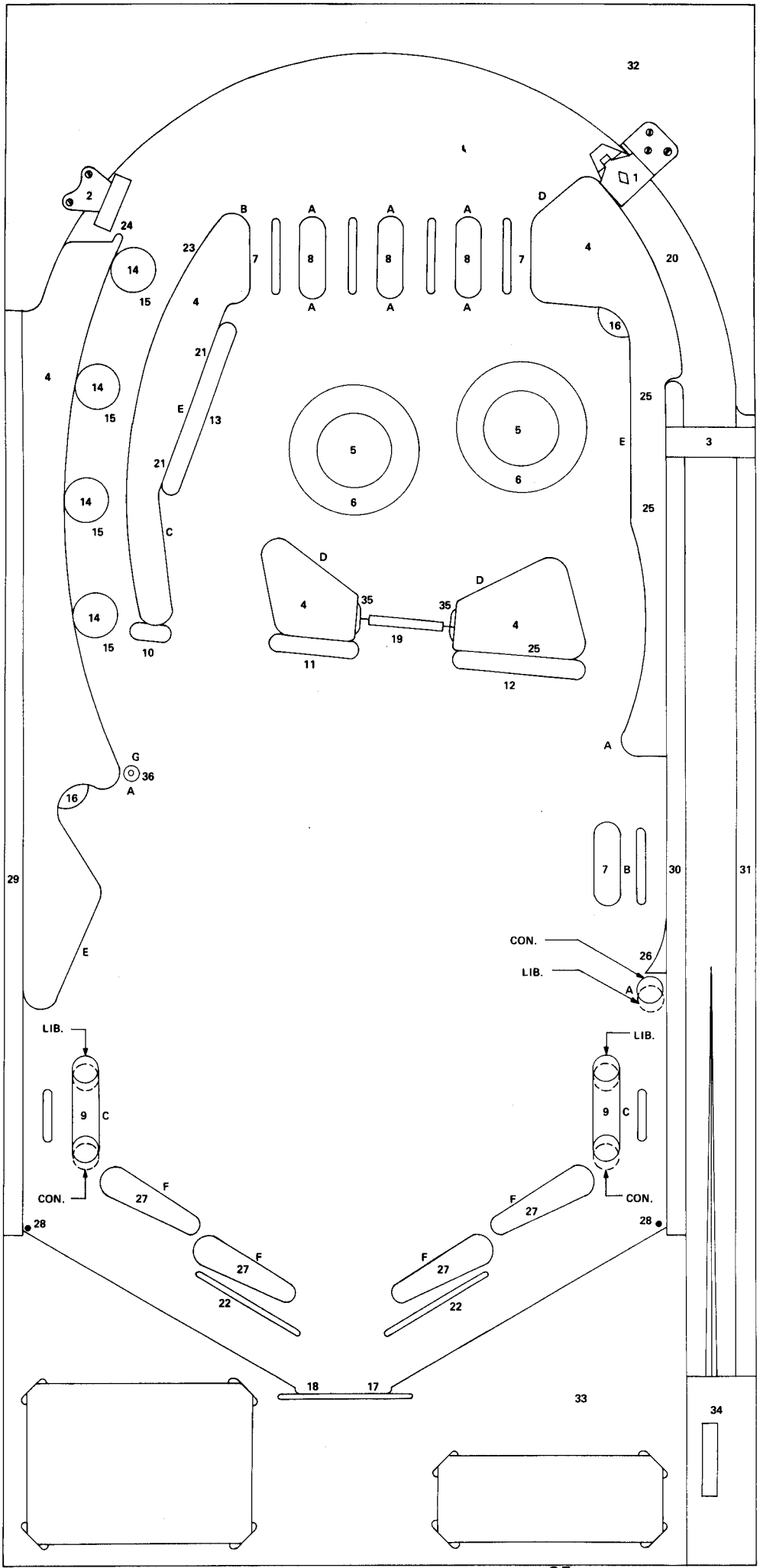
All wires #22 gauge unless specified * (#18 gauge)

CABLE PLUGS FOR SOLID-STATE GAMES

PLUG A6-J5

PIN	WIRE COLOR	FUNCTION
1	(#16 Gauge) Brown-Red	6.3 VAC (playboard)
2	*Brown-Black	Flipper switch
3	*Brown-Black	Flipper switch
4	*Green-Black	Left flipper sw.
5	*Purple-Black	Right flipper sw.
6	Yellow-Black	Game Over light
7	White-Green	Shoot Again light
8	White-Brown-Black	Tilt light
9	(#16 Gauge) Red	24 VDC
10	(#16 Gauge) Black	Ground
11	(#16 Gauge) Black	Ground
12	(#16 Gauge) Black	Ground

All wires #22 gauge unless specified * (#18 gauge)



PLAYBOARD INFORMATION

RUBBER RINGS

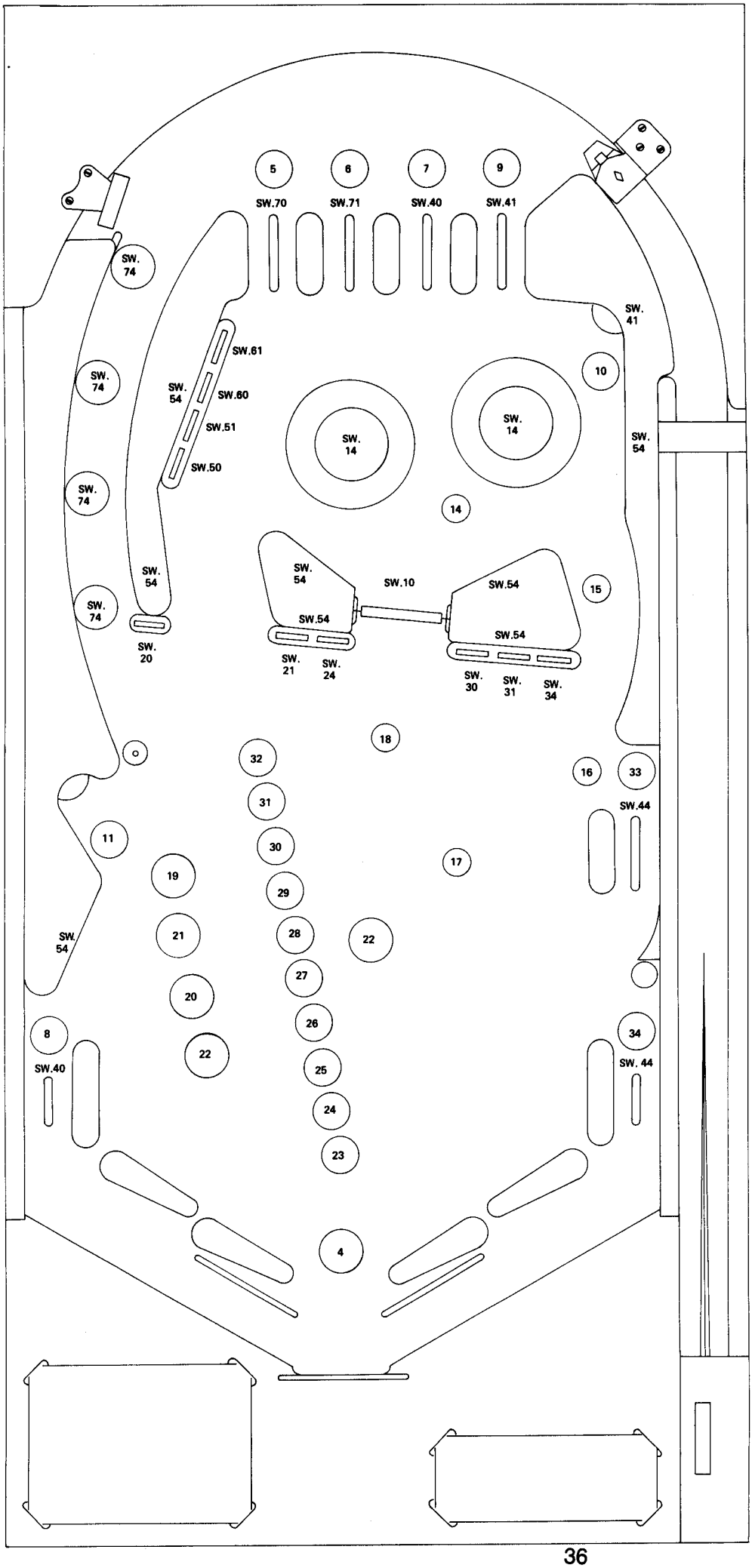
A – A-10217	(9) White
B – A-10219	(2) White
C – A-10220	(3) White
D – A-10221	(3) White
E – A-10222	(3) White
F – A-13151	(4) Red
G – A-14793	(1) White

PARTS LIST

1. A-3290 Ball Gate.
2. A-9143 Ball Rebound Rubber.
3. A-8215 Ball Deflector.
4. C-17512 Plastic Shield Set.
5. Blue Pop Bumper A-13904 and A-11425 White Cap Stamped in Red.
6. B-8246 Pop Bumper Platter.–(2)
7. A-9393 Yellow Plastic Guide Rail.–(3)
8. A-9394 Yellow Plastic Guide Rail.–(3)
9. A-9395 Yellow Plastic Guide Rail.–(2)
10. 1-Pos. Drop Target White, with A-13179 Stamped in Red.
11. 2-Pos. Drop Target Yellow, with A-13179 Stamped in Black.
12. 3-Pos. Drop Target Purple, with A-13179 Stamped in White.
13. 4-Pos. Drop Target Bank, Red with A-13179 Stamped in White.
14. D-11966 Green Rollover Insert.–(4)
15. D-11968 White Rollover Button.–(4)
16. A-9383 Bulls-Eye Target. (B-17974 Sw. & Target Assem.)–(2)
17. C-15707 White Hole Base Plate with C-15708 White Sw. Arm.
18. A-11151 Hole Liner.
19. A-18151 Swing Target, Stamped in Blue.
20. A-4246 Ball Guide Rail.– (Wire Form)–(1)
21. A-6612 Ball Guide Rail.– (Wire Form)–(2)
22. A-13798 Ball Snubber Rail.– (Wire Form)–(2)
23. A-16991 Ball Guide Rail.–(1)
24. B-16992 Ball Guide Rail.–(1)
25. B-18070 Ball Guide Rail.–(3)
26. A-6509 Metal Flat Rail.–(1)
27. C-13150 White Flipper.–(4)
28. A-10542 Steel Pin.–(2)
29. C-7393 Wood Rail. (Left Side)
30. C-9771 Wood Rail. (Center)
31. C-13977 Wood Rail. (Right Side)
32. D-4806 Top Arch. (With "G" & "4"-"5" Pos.)
33. D-13647-1A Card Holder.
34. C-9767 Ball Shooter Gage.
35. C-17492 White Siamese Post.–(2)
36. A-14792 Mini Post Screw.

A-14487 White Split Post Base.–(2)
A-14488 White Split Post Cap.–(2)
C-11561 White Plastic Post 1" High.–(36)

LIB. = LIBERAL.
CON. = CONSERVATIVE.



SWITCH MATRIX AND LAMP LOCATION

SWITCHES ON MATRIX

SW. MATRIX NUMBER	SW. FUNCTION
SW.00	Test Button (On Front Door)
SW.01	#1 Coin Chute (On Front Door)
SW.02	#2 Coin Chute (On Front Door)
SW.03	Replay Button (On Front Door)
SW.04	Tilt Switches
SW.10	Swinging Target
SW.14	Pop Bumpers – (2)
SW.20	White Drop Target
SW.21	Yellow Drop Target
SW.24	Yellow Drop Target
SW.30	Purple Drop Target
SW.31	Purple Drop Target
SW.34	Purple Drop Target
SW.40	Top and Left Yellow Rollover–(2)
SW.41	White Rollover and Target
SW.44	Right Yellow Rollovers–(2)
SW.50	Red Drop Target
SW.51	Red Drop Target
SW.54	10 Point Switches–(8)
SW.60	Red Drop Target
SW.61	Red Drop Target
SW.70	Red Rollover
SW.71	Purple Rollover
SW.74	Rollover Buttons–(4)

CPU CONTROLLED LAMPS

LAMP NUMBER	LAMP FUNCTION
1	Game Over Relay (Lamp in Lightbox)
2	Tilt Relay (Lamp in Lightbox)
3	High Game To Date (In Lightbox)
4	Same Player Shoots Again (Playfield & Lightbox)
5	Red Rollover
6	Purple Rollover
7	Top Yellow Rollover
8	Bottom Left Yellow Rollover
9	White Rollover
10	Top White Target
11	Bottom White Target
14	Advance
15	Advance
16	Advance
17	Advance
18	Advance
19	5 X Bonus
20	3 X Bonus
21	4 X Bonus
22	2 X Bonus
23	1000 Bonus
24	2000 Bonus
25	3000 Bonus
26	4000 Bonus
27	5000 Bonus
28	6000 Bonus
29	7000 Bonus
30	8000 Bonus
31	9000 Bonus
32	10,000 Bonus
33	Right Yellow Rollover
34	Bottom Yellow Rollover

PARTS LIST

ELECTRONIC COMPONENTS

PB00-D100	Control Board (A1) (Less Prom)
S520	Power Supply Board (A2)
PB00-D110	Master Driver Board (A3)
PB00-D140	Display Board—Score (A4)
PB00-D150	Display Board—Ball in Play, Credit (A5)
MMI-6351-1J	Prom (Must have name of game)
#5K1	Line Filter
#VK-438	Bridge Rectifier
#VL-038	Bridge Rectifier
#1N-270	Germanium Diode
#1N-4004	Diode

MECHANICAL COMPONENTS

A-17906	Bracket and Stop—Pop Bumper
A-17907	Bracket and Stop—Hole Kickers
A-17908	Bracket and Stop—Flipper
A-17958	Bracket and Stop—Target Bank Reset
B-17543	Ball Roll Tilt Switch Assembly
B-17838	Flipper Button Switch Assembly
B-18079	Rubber Contact Switch Assembly
B-18080	Rollover Button Switch Assembly
B-18081	Rollover Button Switch Assembly
B-18083	Rollover Switch Assembly
B-18084	Rollover Switch Assembly
B-18085	Ball Return Switch Assembly
B-18089	Pop Bumper Switch Assembly
B-18091	Coin Chute Switch Assembly
B-18092	Replay Button Switch Assembly
B-18364	Swinging Target Switch Assembly
#E-69-01A	Play/Test Switch
	Carbon Tilt Bob

PARTS LIST

CONTROL BOARD

PB00-D100

1	MMI-6351-1J	Prom – Monolithic Memories
2	15-24-1151	Molex Connector – (TC1, TC2)
1	CA-08P02	Plug
1	CA-08-160-000	Cover
1	41B901CD05-1	Battery Pack – 3.6V. General Electric
2	V-1003	Battery Clip-Richo
1	44-111-021	Switch-Push Button – (S 25)
3	10040-008	Molex-Switch Matrix – (Dip Sw. 1, 2, 3)
1	CA-18SE-10SD	IC Socket – 18 Pin-Circuit Ass'y
1	333R08-001	Crystal – 3.579545 MHZ.
1	11660CF	MOS/LSI-CPU-(U1)
2	10696EE	MOS/LSI-GPIØ-(U2, U3)
1	A1753CE	MOS/LSI-ROM/RAM/IØ (U4)
1	A1752CF	MOS/LSI-ROM/RAM/IØ (U5)
1	10788PA	MOS/LSI-GPKD (U6)
1	SCL4081BE	IC-Quad and – Sol. St. Scientific (Ƶ1)
1	SN74154N	IC-4 to 16 Decoder – T.I. (Ƶ30)
4	SN7405N	IC-Hex Inverter – OC – T.I. (Ƶ9, 27, 28, 29)
1	SN7416N	IC-Hex Inverter – OC/HV. – T.I. (Ƶ26)
5	SN7404N	IC-Hex Inverter – T.I. (Ƶ8, Ƶ13, 14, 25, 24)
4	SN7417N	IC-Hex Buffer – OC (Ƶ6, 7, 11, 12)
1	SN74H21N	IC-Dual 4-Input and – T.I. (Ƶ15)
2	SN7448N	IC-4 to 7 Decoder T.I. (Ƶ16, 17)
4	SN7408N	IC-Quad 2 Input and – T.I. (Ƶ18, 19, 20, 21)
1	P5101L-3	CMOS-Static Ram (256X4) (Ƶ22)
2	CD4049AE	IC-Hex Buffer/Conv. – National (Ƶ3, 4)
1	SN74LSO5N	IC-LP Hex Inverter – OC – T.I. (Ƶ5)
1	SCL4528BE	IC-Dual One Shot – Sol. St. Scientific (Ƶ2)
6	461RO2-001	Transistor, PNP (MPS-A70) (Q1-6)
36	742RO1-001	Diode, GP (1N4148) (CRI-24, 26-37)
2	721RO1-025	Resistor-1 OHM, 1/4 W. 5% (R107-R108)
1	721RO1-068	Resistor-62 OHM, 1/4 W. 5% (R133)
12	721RO1-092	Resistor-620 OHM, 1/4 W. 5% (R45-R56)
3	721RO1-097	Resistor-IK OHM, 1/4 W. 5% (R109, 156, 157)
27	721RO1-107	Resistor-2.7K OHM, 1/4 W. 5% (R11-16, 73-80, 99-106, 110, 113, 116, 119, 147)
8	721RO1-113	Resistor-4.7K OHM, 1/4 W. 5% (R25-32)
54	721RO1-117	Resistor-6.8K OHM, 1/4 W. 5% (R3-10, 33-44, 57-62, 82-98, 122-131, 162)
17	721RO1-123	Resistor-12K OHM, 1/4 W. 5% (R134-145, 149-153)
21	721RO1-130	Resistor-24K OHM, 1/4 W. 5% (R1, 2, 17-24, 65-72, 81, 154, 155)
11	721RO1-131	Resistor-27K OHM, 1/4 W. 5% (R111-112, 114-115, 117-118, 120-121, 160-161, 163)
1	10/40/80000	Capacitor – 10 Micro-Farad, 40V. – Siemens (C20)
1	ECE-B25V100L	Capacitor – 100 Micro-Farad, 25V. – Matsushita (C17)
1	ECE-B10V100L	Capacitor – 100 Micro-Farad, 10V. – Matsushita (C16)
26	C320C103MIR5CA	Capacitor – .01 Micro-Farad, 100V. – Sprague/Kemet (C1-15, 18, 19, 22-30)
3	703RO1-003	Capacitor – 0.1 Micro-Farad, 100V. (C31-33)
1	1N703	Diode – Motorola/Siemens (CR38)
1	721RO1-175	Resistor – 1.8M, 1/4 W. 5% (R158)
1	721RO1-179	Resistor – 2.7M, 1/4 W. 5% (R159)
1	CA-08SE-10SD	Socket (TC3)

PARTS LIST

MASTER DRIVER BOARD

PB00-D110

9	**SN74175N**	Integrated Circuit, Quad "D" Flip-Flop-T.I. (Z1-Z9)
38	**721R01-097**	Resistor-IK OHM, 5%, 1/4 W. (R1-R38)
1	**721R01-052**	Resistor-13 OHM, 5%, 1/4 W. (R39)
14	**C320C103MIR5CA**	Capacitor-.01 Micro-Farad, 20%, 100V. – Kemet (C2-C15)
1	**T320B106-010AS**	Capacitor-10 Micro-Farad, 10V. – Kemet (C1)
5	**MPS-U45**	Transistor, NPN – Motorola (Q1-Q4, Q29)
32	**MPS-A13**	Transistor, NPN – Motorola (Q5-Q24, Q33-Q44)
7	**2N6043**	Transistor, NPN – Motorola (Q25-Q28, Q30-Q32)
1	**2N3055**	Transistor, NPN – RCA (Q45)
1	**43-03-4**	Insulator – Thermalloy (Q45 Ref.)

PARTS LIST

6 DIGIT DISPLAY

PB00-D140

1	**RC20GF103**	Resistor, 10K, 1/2 W., 5% (R1)
1	**TE1400**	Capacitor – 1 Micro-Farad 100V. (C3)
2	**C320C103MIR5CA**	Capacitor – .01 Micro-Farad, 100V. (C1, C2)
2	**UDN6118A**	IC-Fluorescent Dis. Driver – Sprague (Z1, Z2)
1	**6-JS-01**	6 Digit Display – Futaba Ind. U.S.A.

4 DIGIT DISPLAY

PB00-D150

1	**TE1400**	Capacitor – 1 Micro-Farad, 100V. – Sprague (C1)
2	**C320C103MIR5CA**	Capacitor – .01 Micro-Farad, 100V. – Kemet (C2, C3)
2	**UDN6118A**	IC – Fluorescent Dis. Driver – Sprague (Z2, Z3)
1	**SN7432N**	IC – Quad or Gate – T.I. (Z1)
1	**4-LT-11**	4 Digit Display – Futuba Ind. U.S.A. (DS1)

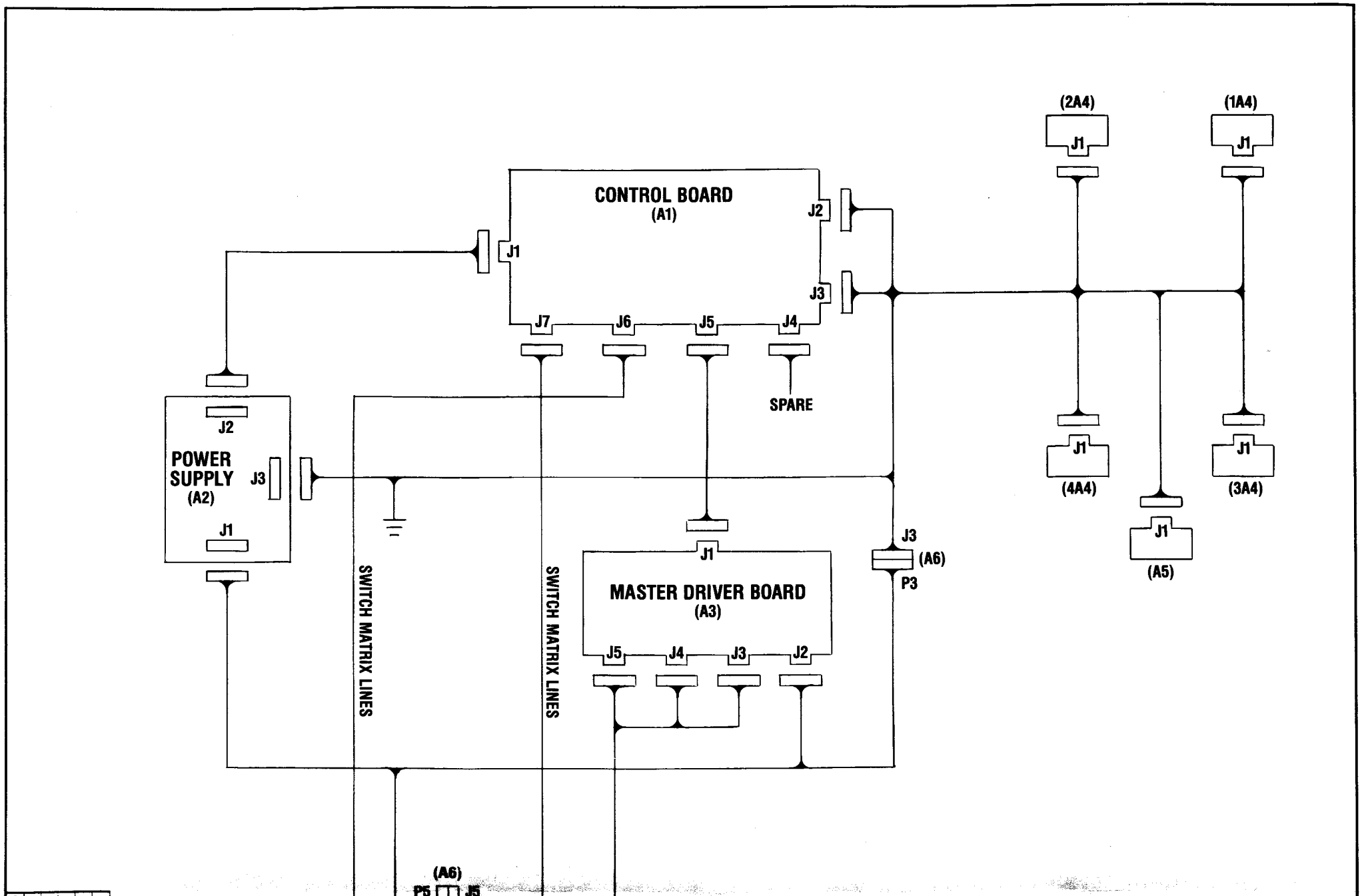
PARTS LIST

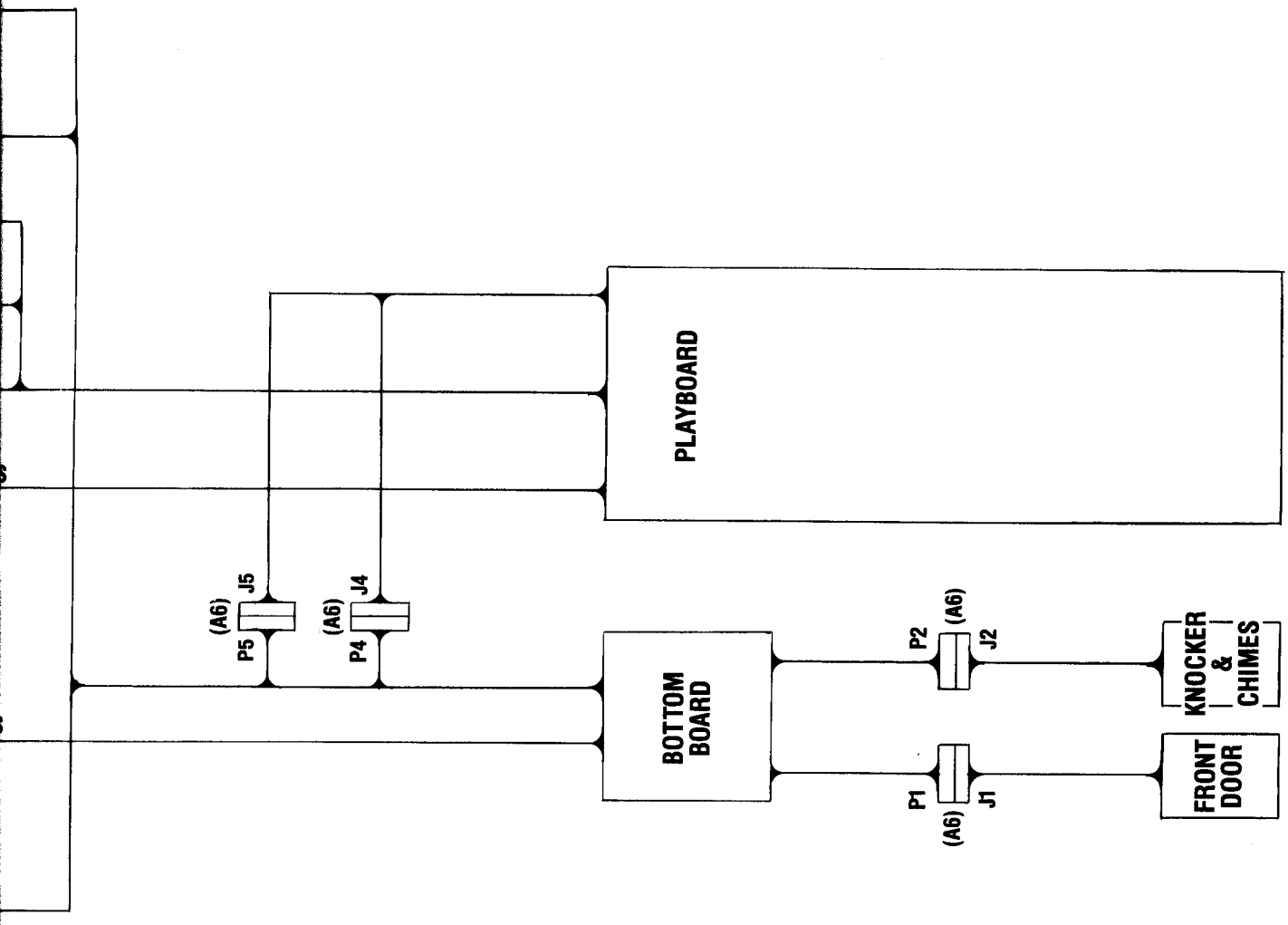
POWER SUPPLY

S520

1	RC42GF18R2	Resistor, .18 OHM, 2 W. ± 5% (R1)
3	RC20GF101	Resistor, 100 OHM, ½ W. ± 5% (R2, R101, R201)
1	RC20GF431	Resistor, 430 OHM, ½ W. ± 5% (R3)
1	RC20GF681	Resistor, 680 OHM, ½ W. ± 5% (R21)
1	C173BNA	Resistor, 1.2K OHM, ½ W. ± 1% (R5) MEPCO
1	RC20GF202	Resistor, 2K OHM, ½ W. ± 5% (R6)
2	RC20GF152	Resistor, 1.5K OHM, ½ W. ±5% (R7, R8)
1	RC20GF222	Resistor, 2.2K OHM, ½ W. ± 5% (R9)
2	RC20GF153	Resistor, 15K OHM, ½ W. ± 5% (R10, R11)
1	RC20GF102	Resistor, 1K OHM, ½ W. ± 5% (R12)
1	RC20GF330	Resistor, 33 OHM, ½ W. ± 5% (R13)
1	RC20GF123	Resistor, 12K OHM, ½ W. ± 5% (R14)
2	RC20GF103	Resistor, 10K OHM, ½ W. ± 5% (R15, R18)
1	RC20GF242	Resistor, 2.4K OHM, ½ W. ± 5% (R17)
2	RC20GF201	Resistor, 200 OHM, ½ W. ± 5% (R102, R202)
1	RC20GF471	Resistor, 470 OHM, ½ W. ± 5% (R22)
1	115R102A	Pot. 1K OHM, 2 W. 10% (R4) CTS
1	115R501A	Pot. 500 OHM, 2W. 10% (R16) CTS
1	PMD12K40	Transistor (Q1) Power Monolithics
1	MJE340K	Transistor (Q2) Motorola
1	2N3416	Transistor (Q3)
1	MPSA43	Transistor (Q4) Motorola
2	MR751	Diode, 3 AMP (CR1, CR2) Motorola
2	1N4002	Diode, 1 AMP, 100 V. (CR3, CR4) Motorola
3	1N914	Diode (CR5, CR22, CR23)
4	1N4004	Diode, 1 AMP, 400 V. (CR6, CR7, CR8, CR9)
1	1N4753	Diode (CR10) Motorola
1	1N4742A	Diode (CR11) Motorola
1	1N4746A	Diode (CR12) Motorola
1	1N4738A	Diode (CR21) Motorola
1	1N4734A	Diode (CR101) Motorola
2	S0306SL3	Rectifier (SCR101, SCR201)
1	UA723CL	+ 5 V. Regulator (IC1) TI
1	UA79MI2CKC	−12 V. Regulator (LIC1) TI
1	7735	Capacitor 2.9K Micro-Farad 30 V. (C1)
1	8101-100W5RO221K	Capacitor 220 Pico-Farad 16 V. (C2) Erie
1	7545	Capacitor 470 Micro-Farad 10 V. (C3) TI
1	7732	Capacitor 1K Micro-Farad 35 V. (C4) TI
1	7345	Capacitor 47 Micro-Farad 50 V. (C5) TI
1	CEO2W	Capacitor 200 Micro-Farad 150 V. (C6) Towa
1	8121-050651104M	Capacitor 0.1 Micro-Farad 10 V. (C7)
1	7745	Capacitor 10 Micro-Farad 160 V. (C8)
2	UK10-204	Capacitor 0.2 Micro-Farad 10 V. (C101, C201)
1	09-60-1071	Connector (J1) Molex
1	09-67-1061	Connector (J2) Molex
1	09-67-1081	Connector (J3) Molex
1	1N4743A	Diode (CR201) Motorola

C-18012 BLOCK CABLE DIAGRAM





ISSUE	DATE	REVISIONS

DO NOT SCALE DRAWING	SCALE
TOLERANCES ±	MATERIAL
DECIMAL	HARDNESS
FRACTION	FINISH
ANGULAR	NOTE
UNLESS OTHERWISE SPECIFIED	

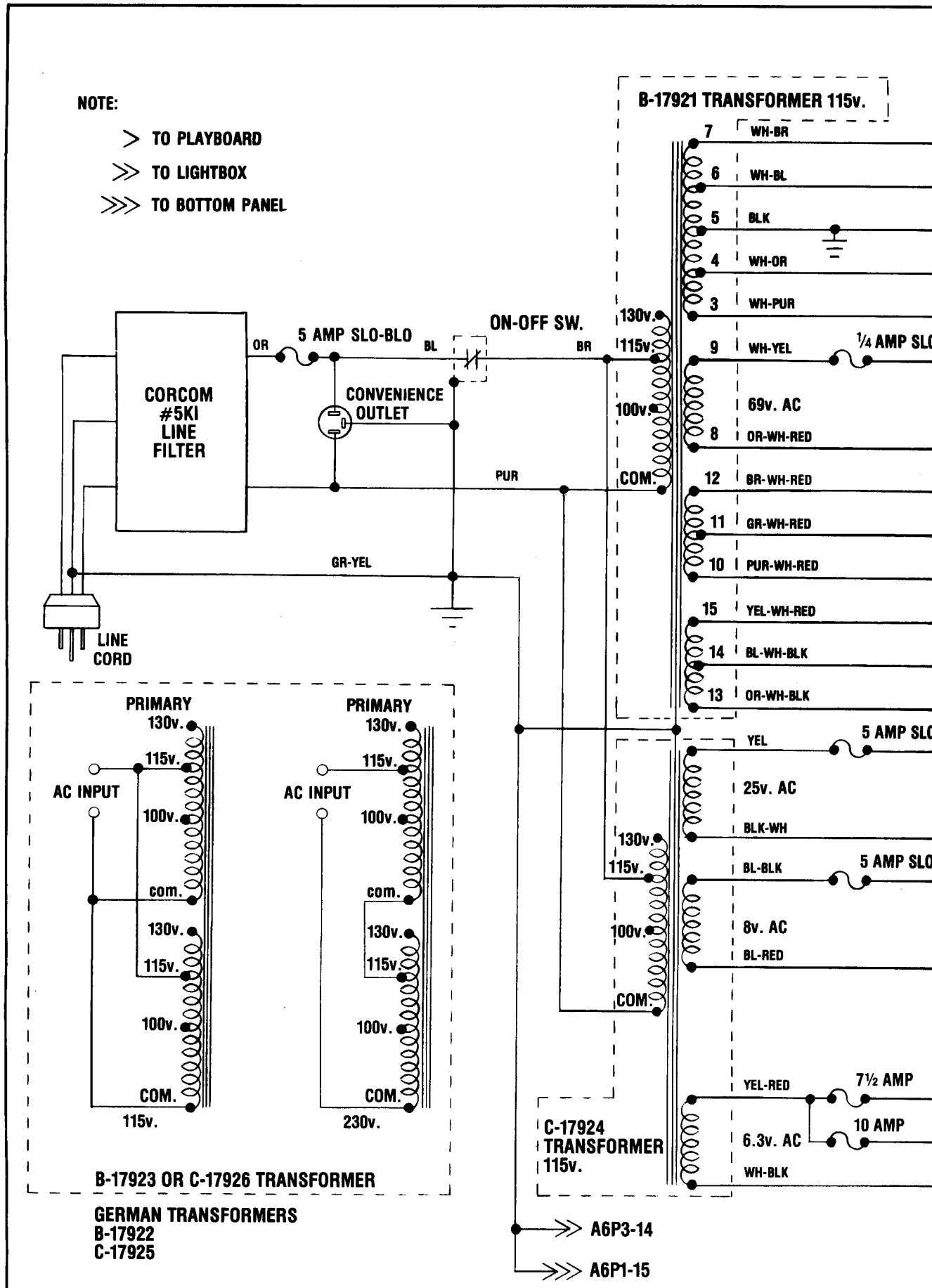
D. GOTTLIEB & CO.

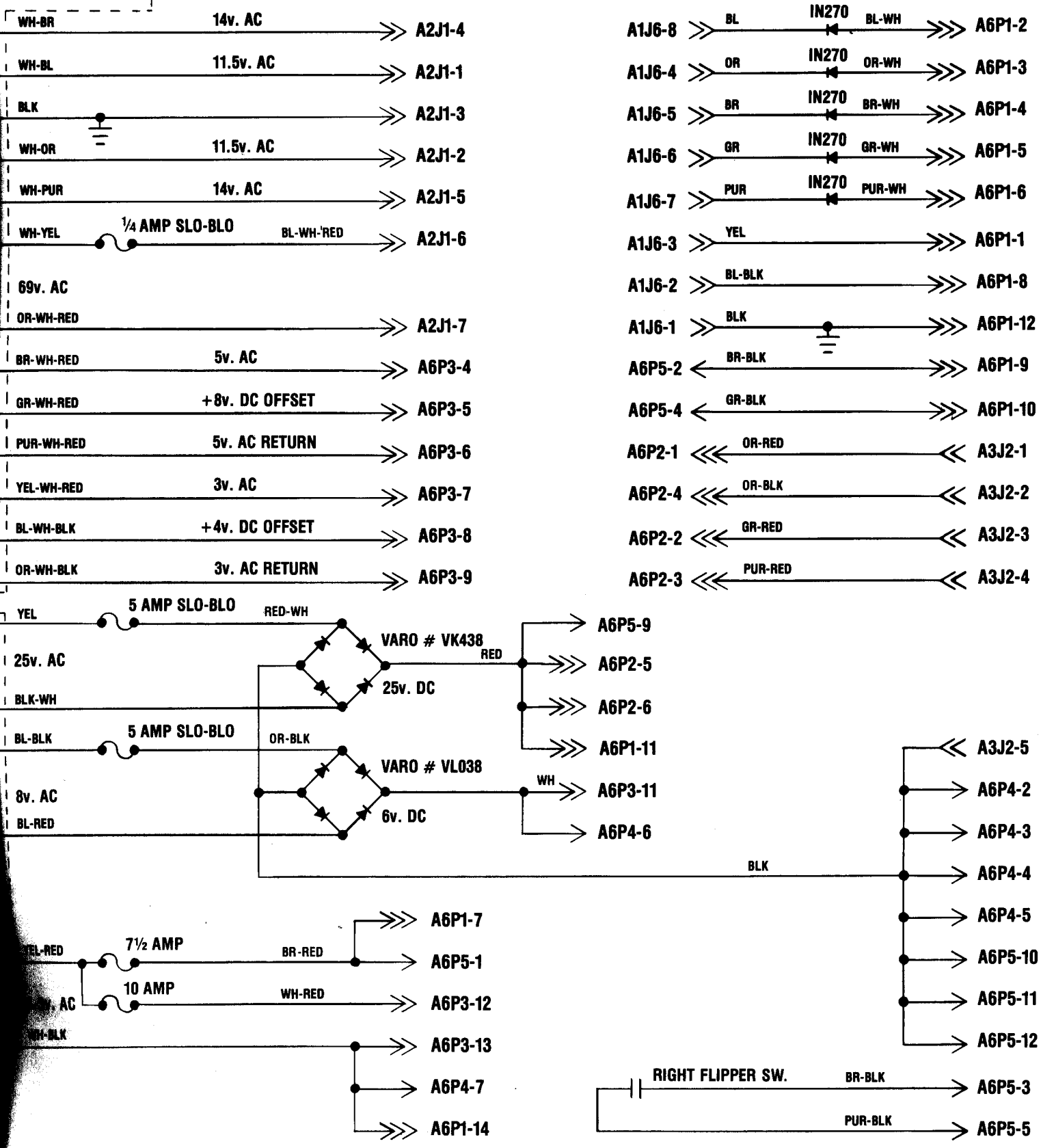
TITLE **BLOCK CABLE DIAGRAM**

USED ON **SOLID STATE**

DRAWN	APPROVED	DATE

C-18013 BOTTOM BOARD SCHEMATIC





ISSUE	DATE	REVISIONS
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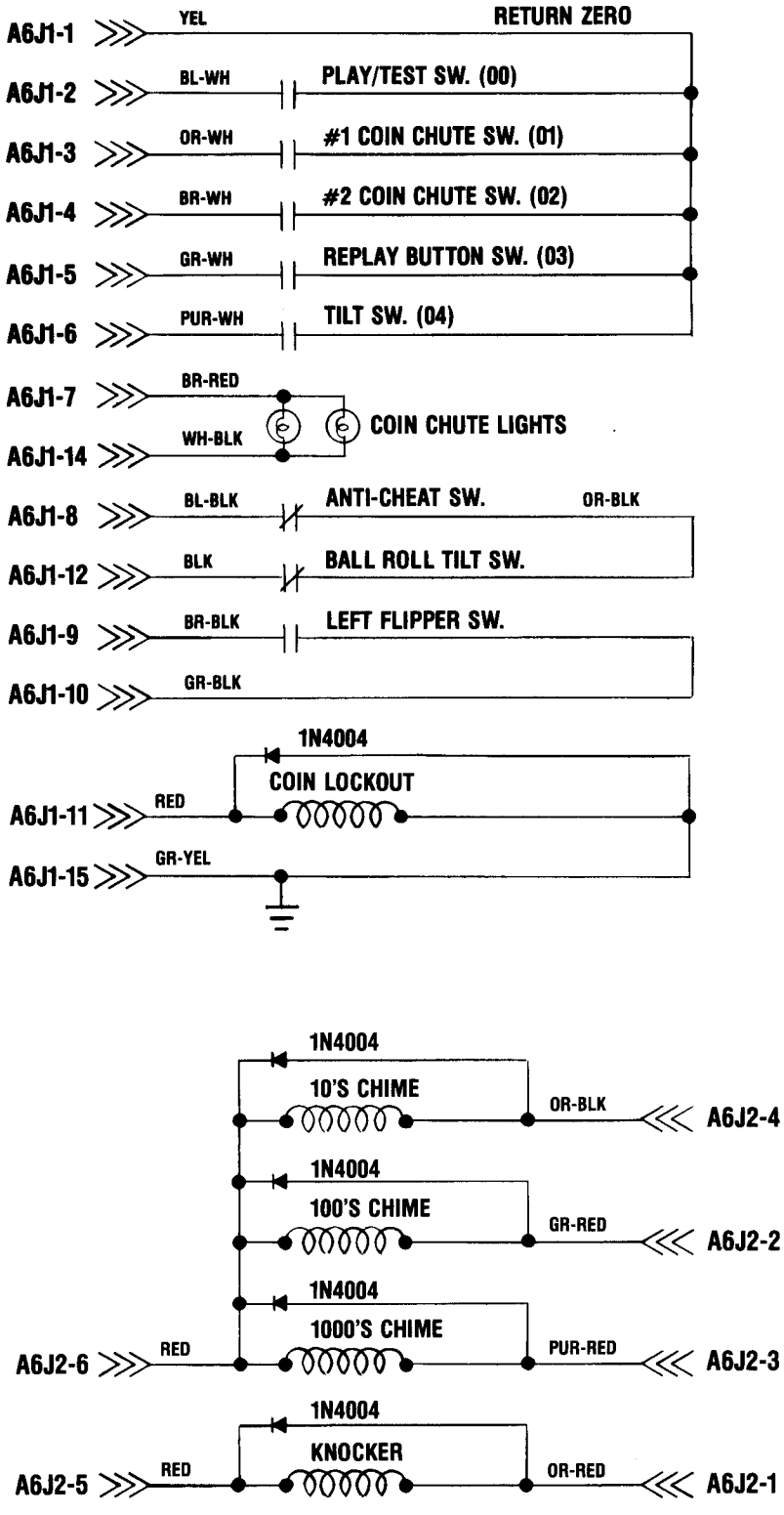
DO NOT SCALE DRAWING	SCALE
TOLERANCES ±	MATERIAL
DECIMAL	HARDNESS
FRACTION	FINISH
ANGULAR	NOTE
UNLESS OTHERWISE SPECIFIED	

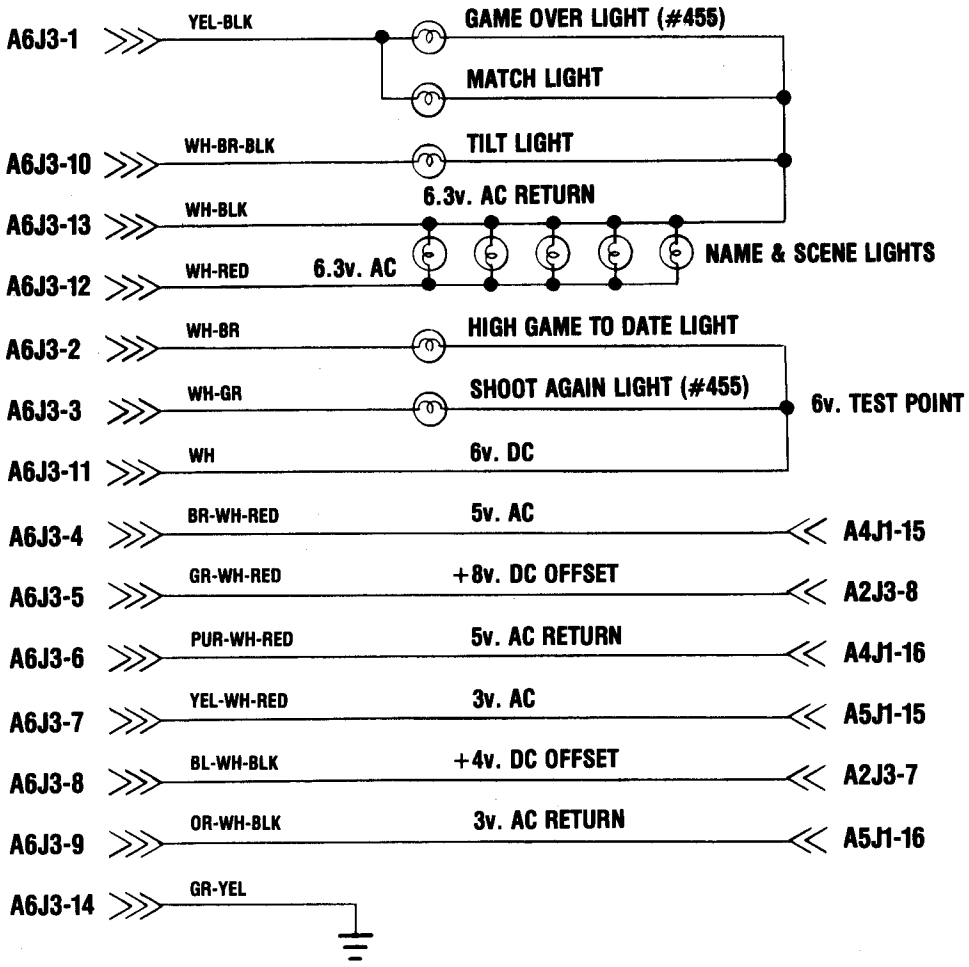
D. GOTTLIEB & CO.

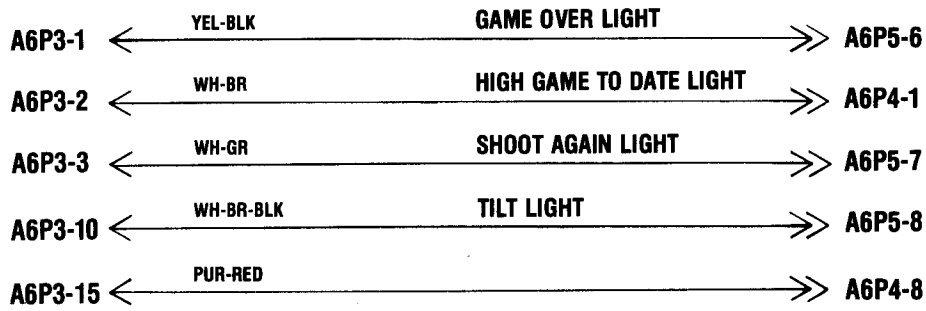
TITLE BOTTOM BOARD SCHEMATIC

USED ON SOLID STATE

DRAWN	APPROVED	DATE	C-18013


A6J1-1
YEL
RETURN ZERO
A6J1-2
BL-WH
PLAY/TEST SW. (00)
A6J1-3
OR-WH
#1 COIN CHUTE SW. (01)
A6J1-4
BR-WH
#2 COIN CHUTE SW. (02)
A6J1-5
GR-WH
REPLAY BUTTON SW. (03)
A6J1-6
PUR-WH
TILT SW. (04)
A6J1-7
BR-RED
A6J1-14
WH-BLK
COIN CHUTE LIGHTS
A6J1-8
BL-BLK
ANTI-CHEAT SW.
OR-BLK
A6J1-12
BLK
BALL ROLL TILT SW.
A6J1-9
BR-BLK
LEFT FLIPPER SW.
A6J1-10
GR-BLK
1N4004
COIN LOCKOUT
A6J1-11
RED
A6J1-15
GR-YEL
1N4004
10'S CHIME
OR-BLK
A6J2-4
1N4004
100'S CHIME
GR-RED
A6J2-2
1N4004
1000'S CHIME
A6J2-6
RED
PUR-RED
A6J2-3
1N4004
KNOCKER
A6J2-5
RED
OR-RED
A6J2-1





COILS USED

PART NO.	DESCRIPTION
A-17876	CHIME COILS
A-5195	KNOCKER COIL
A-16890	COIN LOCKOUT COIL

NOTE:

> FROM PLAYBOARD

>> FROM LIGHT BOX

>>> FROM BOTTOM BOARD

ISSUE	DATE	REVISIONS

DO NOT SCALE DRAWING | SCALE

TOLERANCES ± DECIMAL FRACTION ANGULAR UNLESS OTHERWISE SPECIFIED

MATERIAL | HARDNESS | FINISH | NOTE

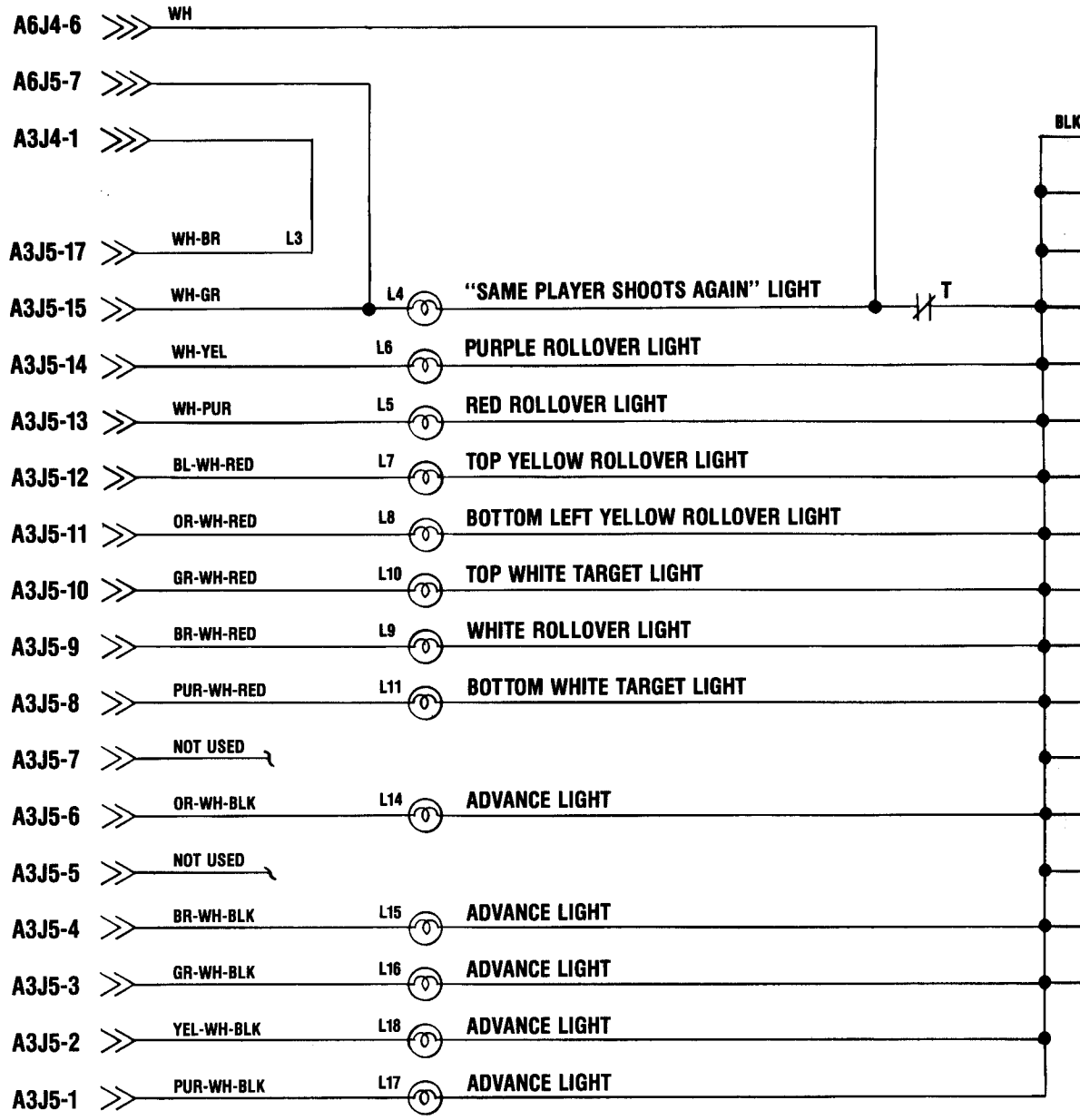
D. GOTTLIEB & CO.

TITLE BOTTOM BOARD & LIGHT BOX SCHEMATIC

USED ON SOLID STATE

DRAWN | APPROVED | DATE

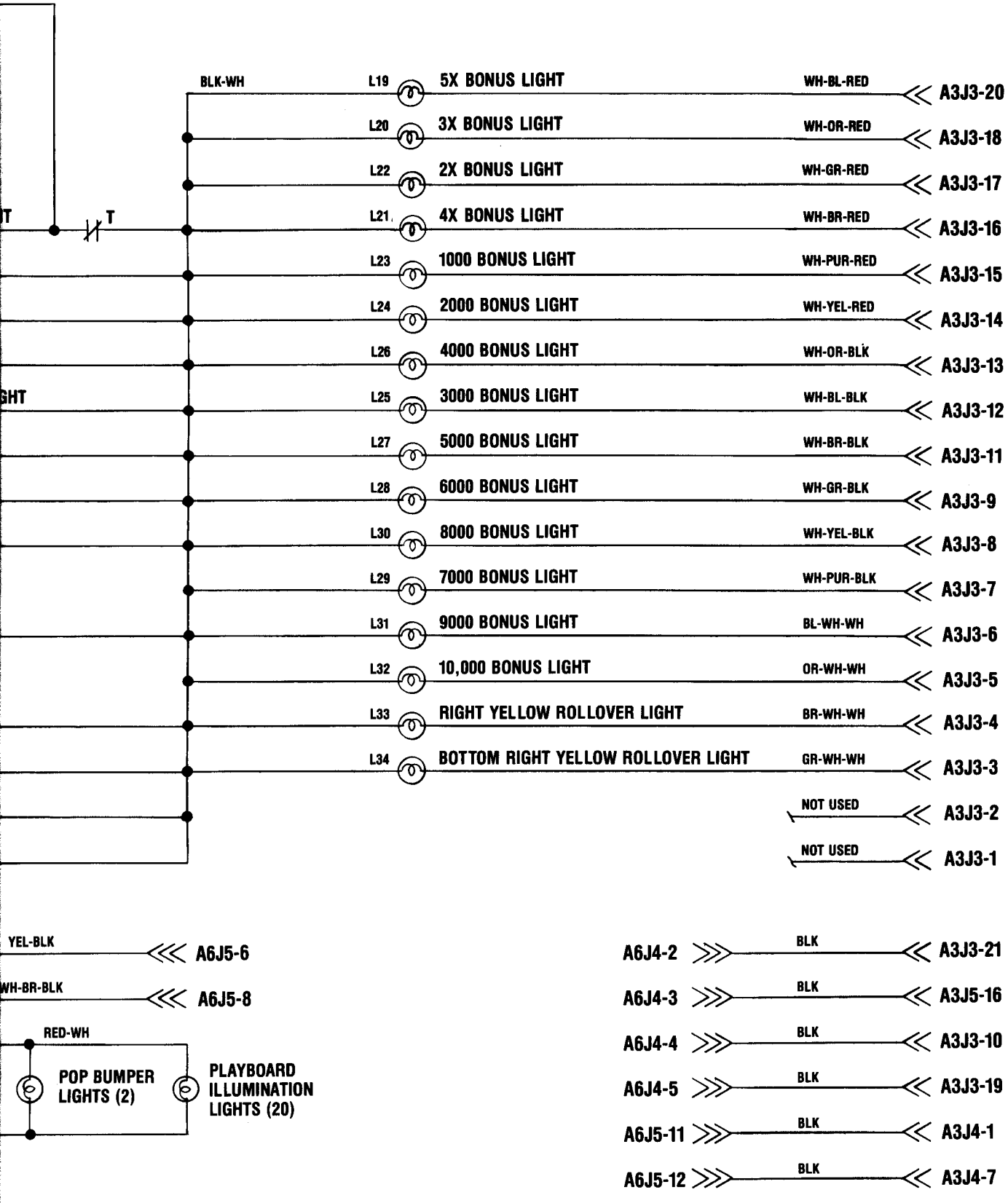
C-18014



NOTE:

>> FROM LIGHTBOX

>>> FROM BOTTOM BOARD



ISSUE	DATE	REVISIONS

DO NOT SCALE DRAWING | SCALE

TOLERANCES ±
DECIMAL
FRACTION
ANGULAR
UNLESS OTHERWISE SPECIFIED

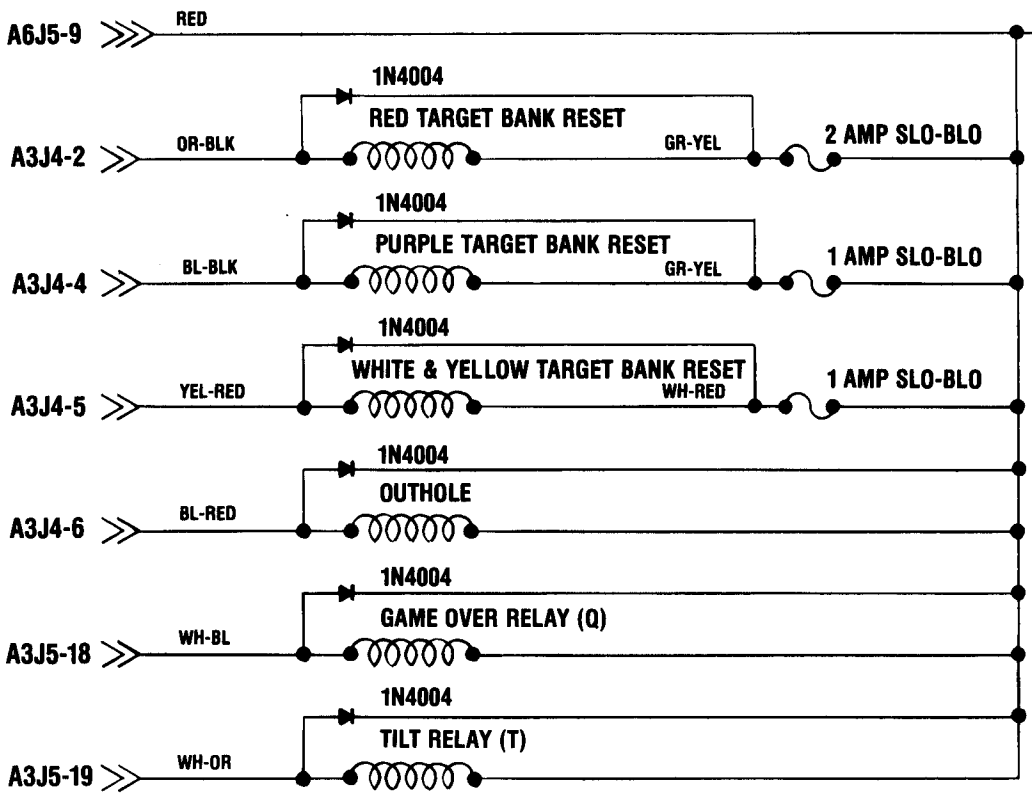
MATERIAL
HARDNESS
FINISH
NOTE

D. GOTTLIEB & CO.

TITLE PLAYBOARD ILLUMINATION

USED ON SINBAD #412SS

DRAWN	APPROVED	DATE	C- 18035



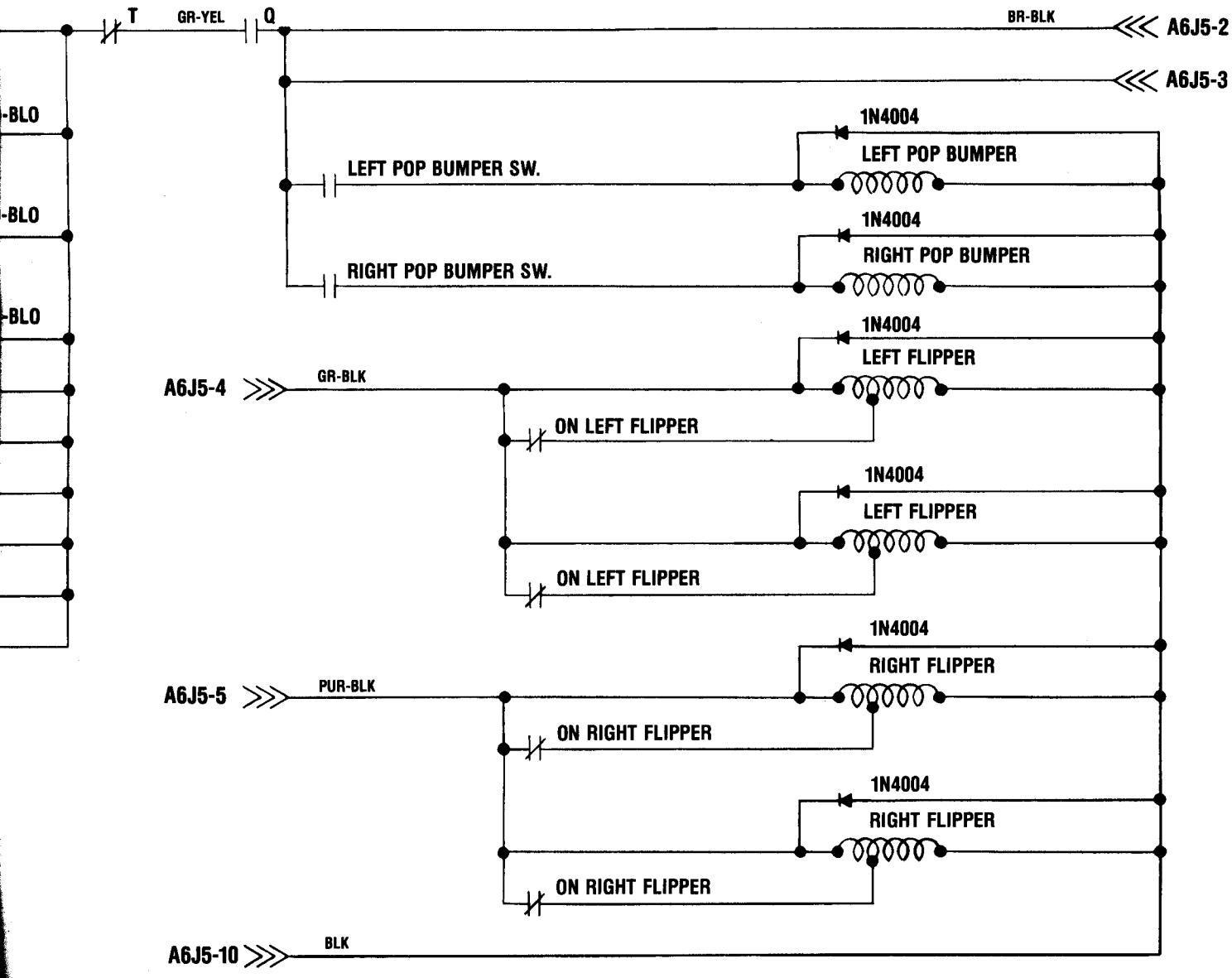
NOTE:

>> FROM LIGHTBOX

>>> FROM BOTTOM BOARD

COILS USED

PART NO.	DESCRIPTION
A-1496	POP BUMPER COILS
A-5195	OUTHOLE COIL
A-16890	GAME OVER RELAY COIL (Q)
A-16890	TILT RELAY COIL (T)
A-17875	FLIPPER COILS
A-17891	RED TARGET BANK RESET COIL
A-18102	WHITE & YELLOW TARGET BANK RESET COIL
A-18102	PURPLE TARGET BANK RESET COIL



ISSUE	DATE	REVISIONS

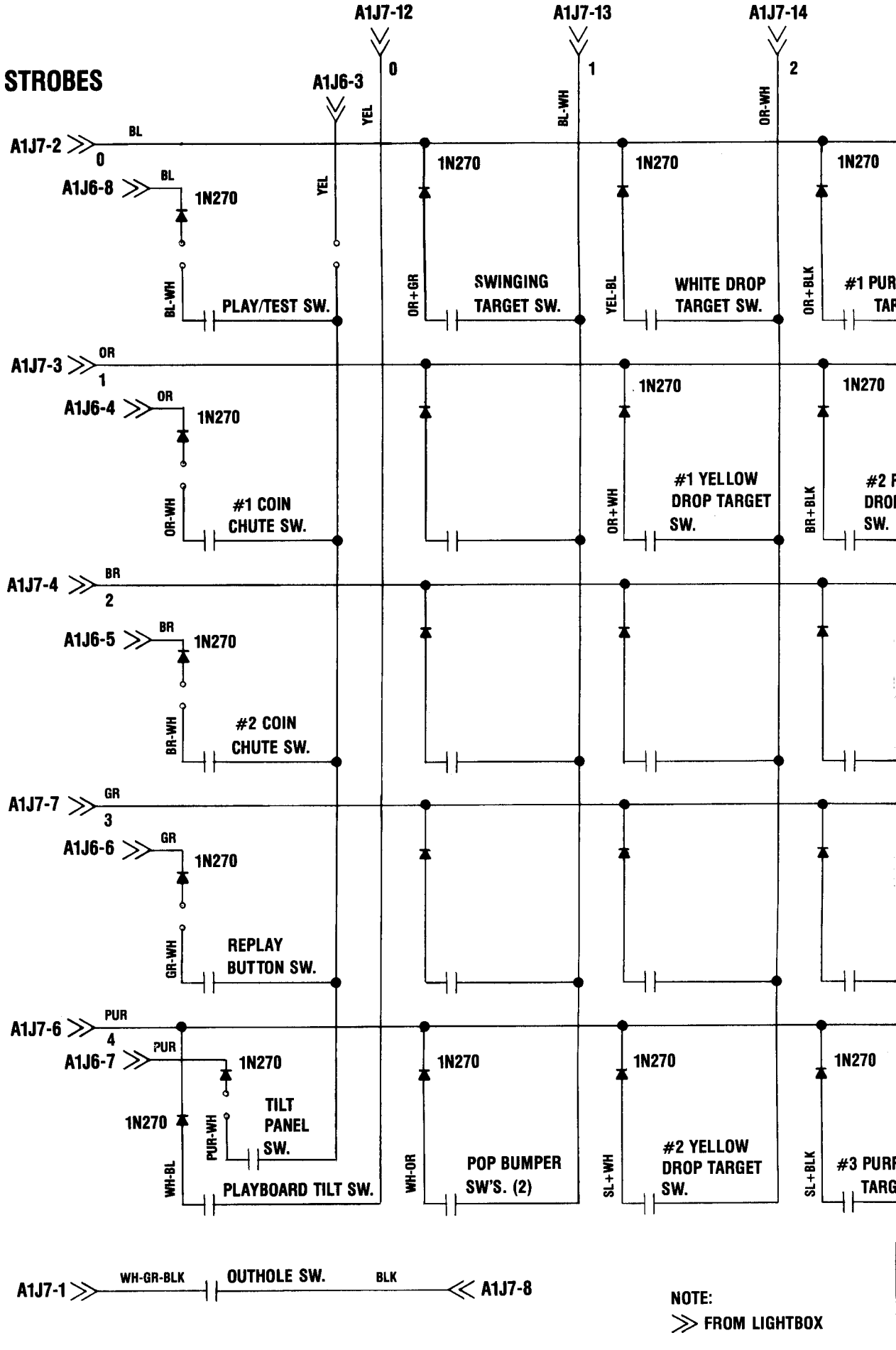
DO NOT SCALE DRAWING	SCALE
TOLERANCES ±	MATERIAL
DECIMAL	HARDNESS
FRACTION	FINISH
ANGULAR	NOTE
UNLESS OTHERWISE SPECIFIED	

D. GOTTLIEB & CO.

TITLE PLAYBOARD SOLENOIDS

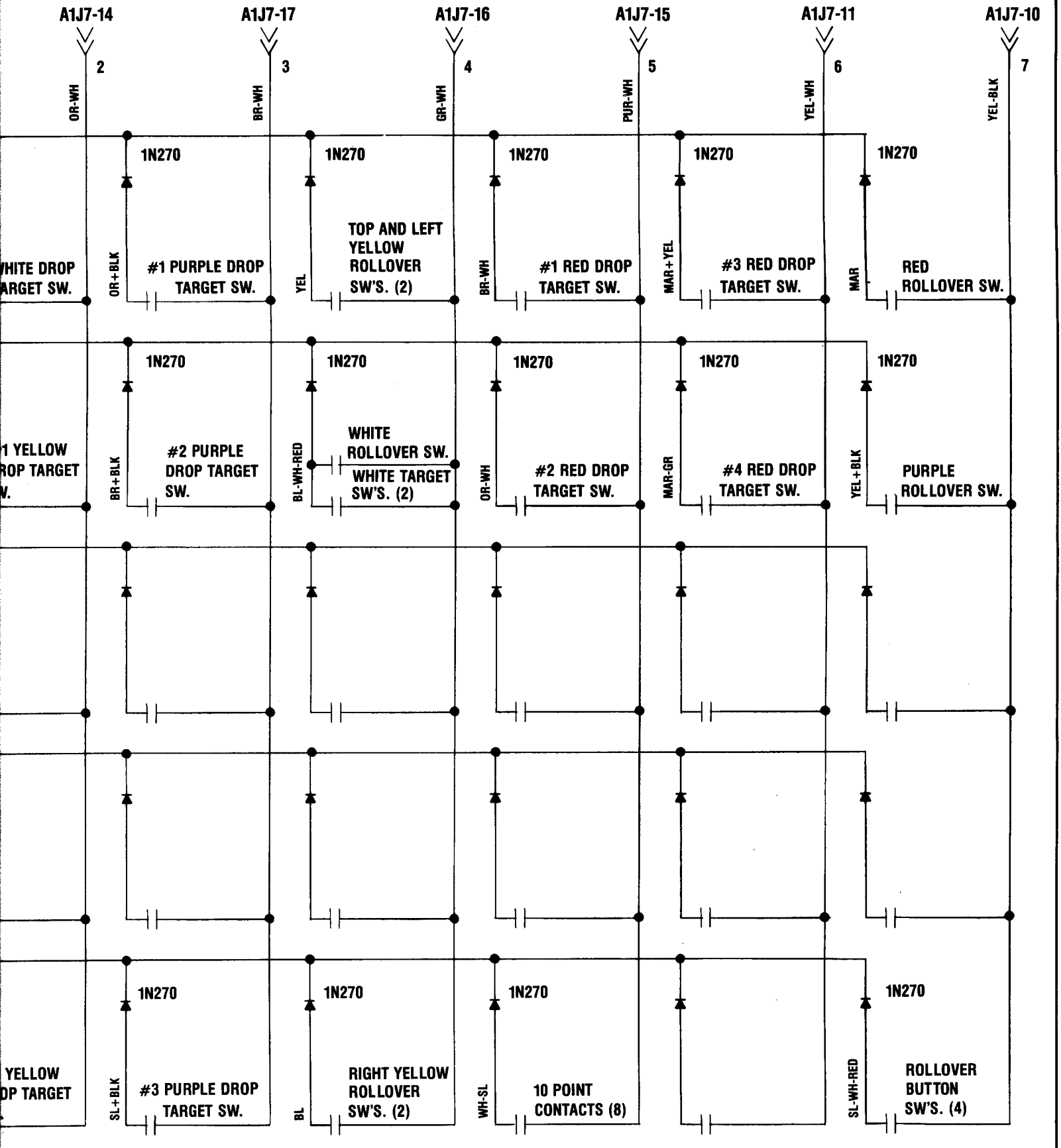
USED ON SINBAD #412SS

DRAWN	APPROVED	DATE	C- 18036


STROBES
A1J7-12
A1J7-13
A1J7-14
A1J6-3
0
1
2
YEL
BL-WH
OR-WH
A1J7-2
BL
0
A1J6-8
BL
1N270
BL-WH
PLAY/TEST SW.
OR+GR
SWINGING TARGET SW.
YEL-BL
WHITE DROP TARGET SW.
OR+BLK
#1 PUR
TAR
A1J7-3
OR
1
A1J6-4
OR
1N270
OR-WH
#1 COIN CHUTE SW.
OR+WH
#1 YELLOW DROP TARGET SW.
BR+BLK
#2 F
DROI
SW.
A1J7-4
BR
2
A1J6-5
BR
1N270
BR-WH
#2 COIN CHUTE SW.
A1J7-7
GR
3
A1J6-6
GR
1N270
GR-WH
REPLAY BUTTON SW.
A1J7-6
PUR
4
A1J6-7
PUR
1N270
TILT PANEL SW.
PUR-WH
WH-BL
PLAYBOARD TILT SW.
WH-OR
POP BUMPER SW'S. (2)
SL+WH
#2 YELLOW DROP TARGET SW.
SL+BLK
#3 PURF
TARG
A1J7-1
WH-GR-BLK
OUTHOLE SW.
BLK
A1J7-8
NOTE:
FROM LIGHTBOX

C- 18037

RETURNS



DTE:
> FROM LIGHTBOX

ISSUE	DATE	REVISIONS

DO NOT SCALE DRAWING	SCALE
TOLERANCES ±	MATERIAL
DECIMAL	HARDNESS
FRACTION	FINISH
ANGULAR UNLESS OTHERWISE SPECIFIED	NOTE

D. GOTTLIEB & CO.

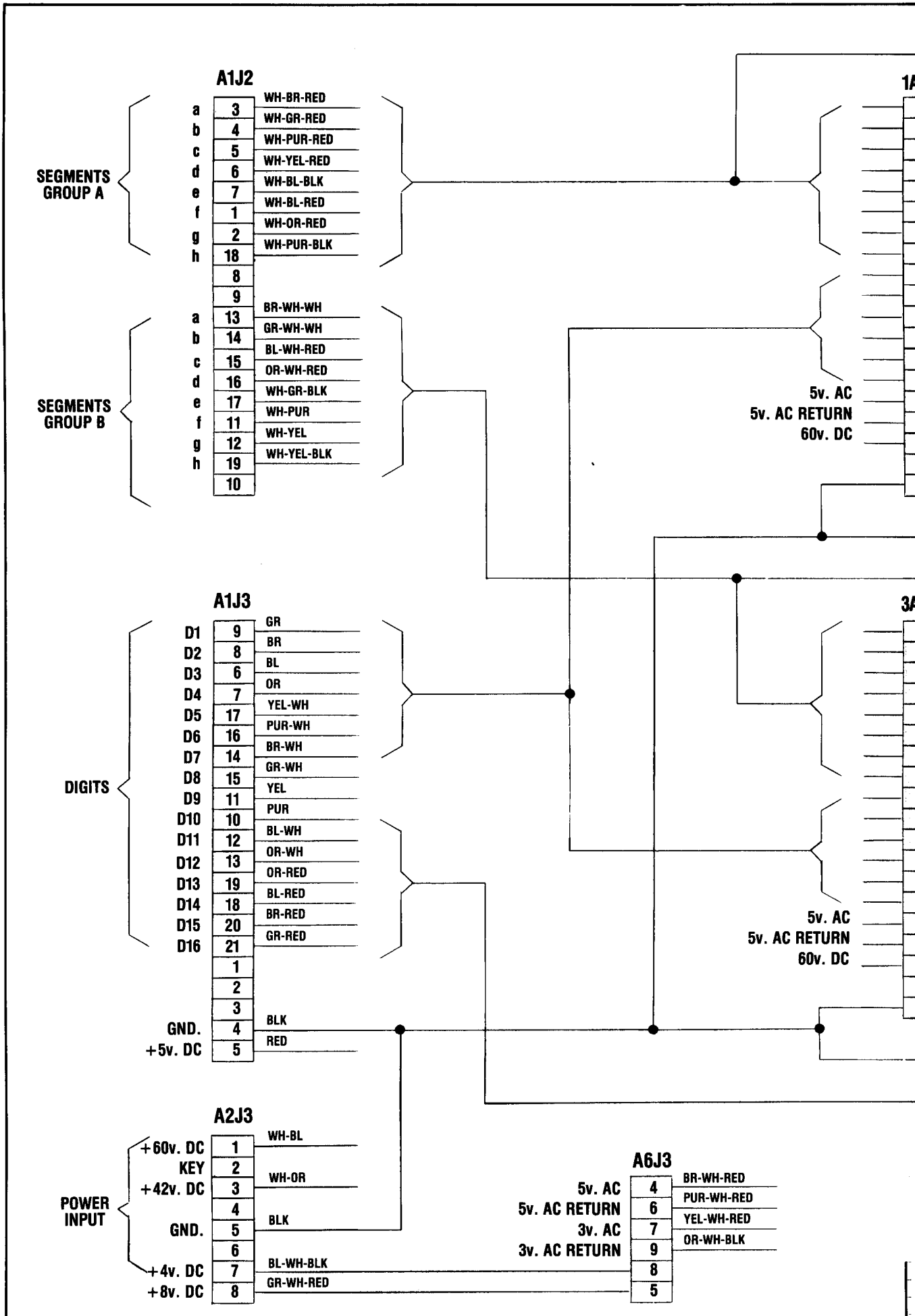
TITLE SWITCH MATRIX

USED ON SINBAD #412SS

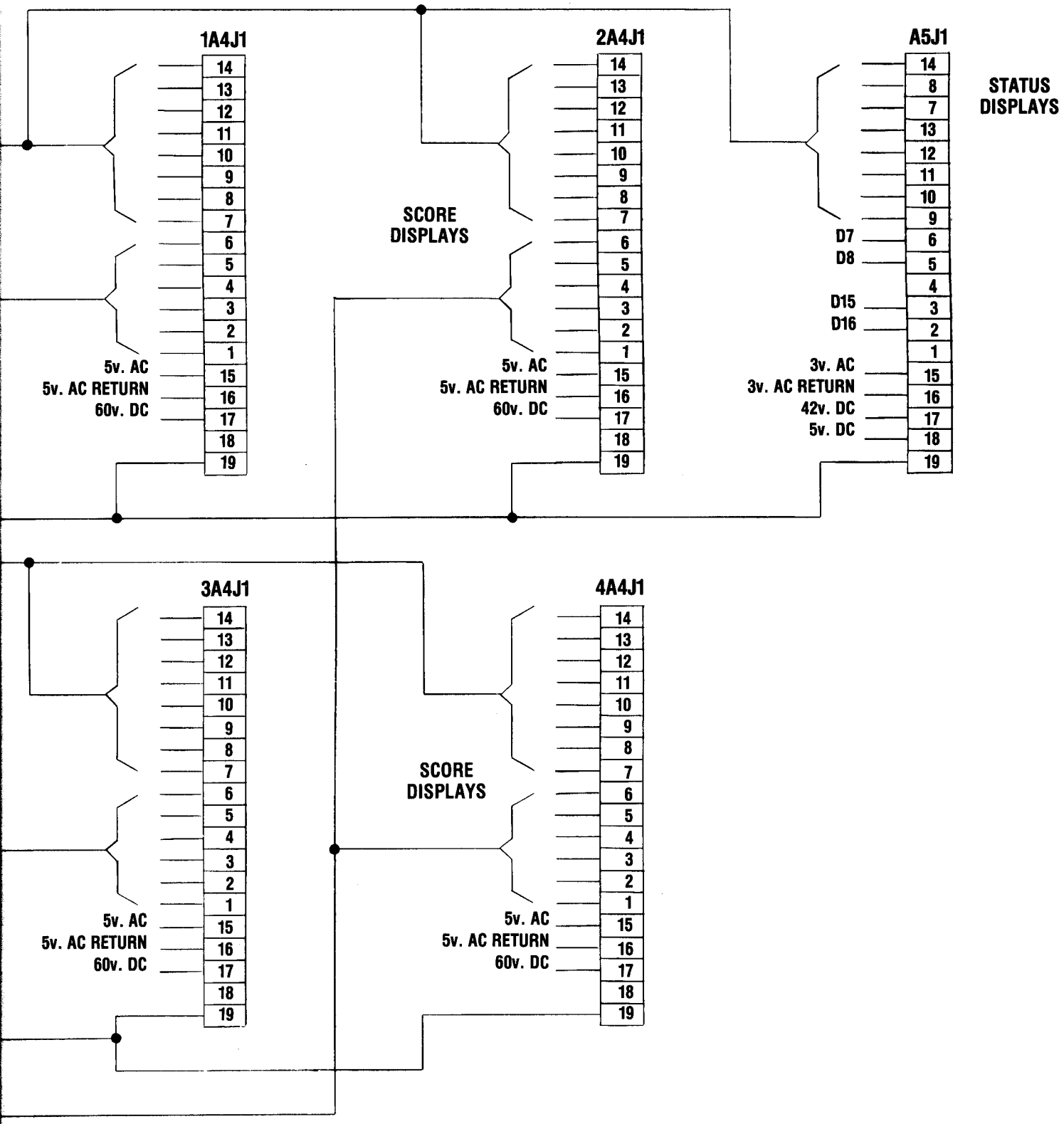
DRAWN	APPROVED	DATE

C- 18037

C-18207 LIGHTBOX CABLE



C-18207



H-RED
WH-RED
WH-RED
H-BLK

ISSUE	DATE	REVISIONS

DO NOT SCALE DRAWING | SCALE

TOLERANCES ±
DECIMAL
FRACTION
ANGULAR
UNLESS OTHERWISE SPECIFIED

MATERIAL
HARDNESS
FINISH
NOTE

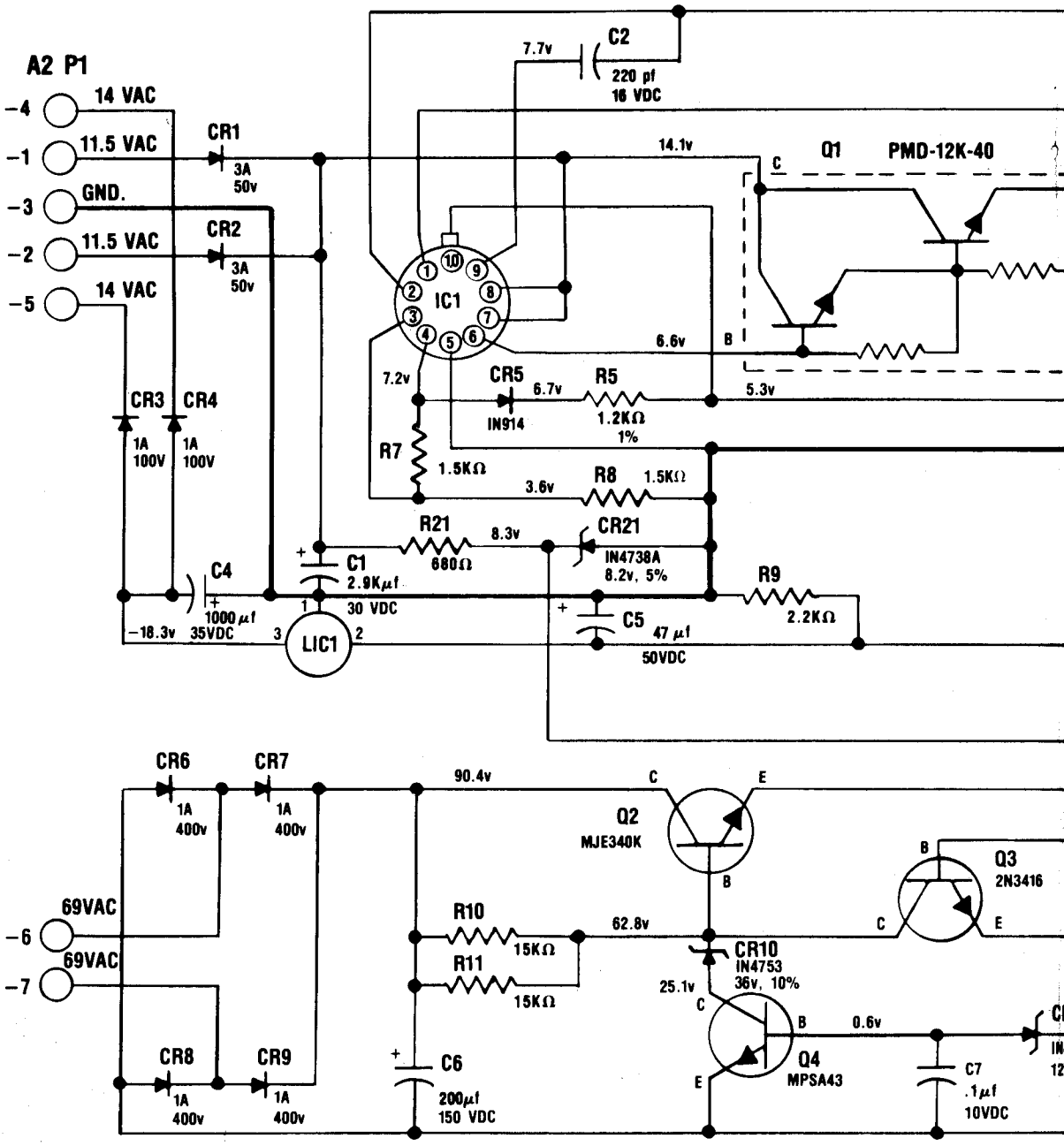
D. GOTTLIEB & CO.

TITLE LIGHTBOX CABLE

USED ON SOLID STATE

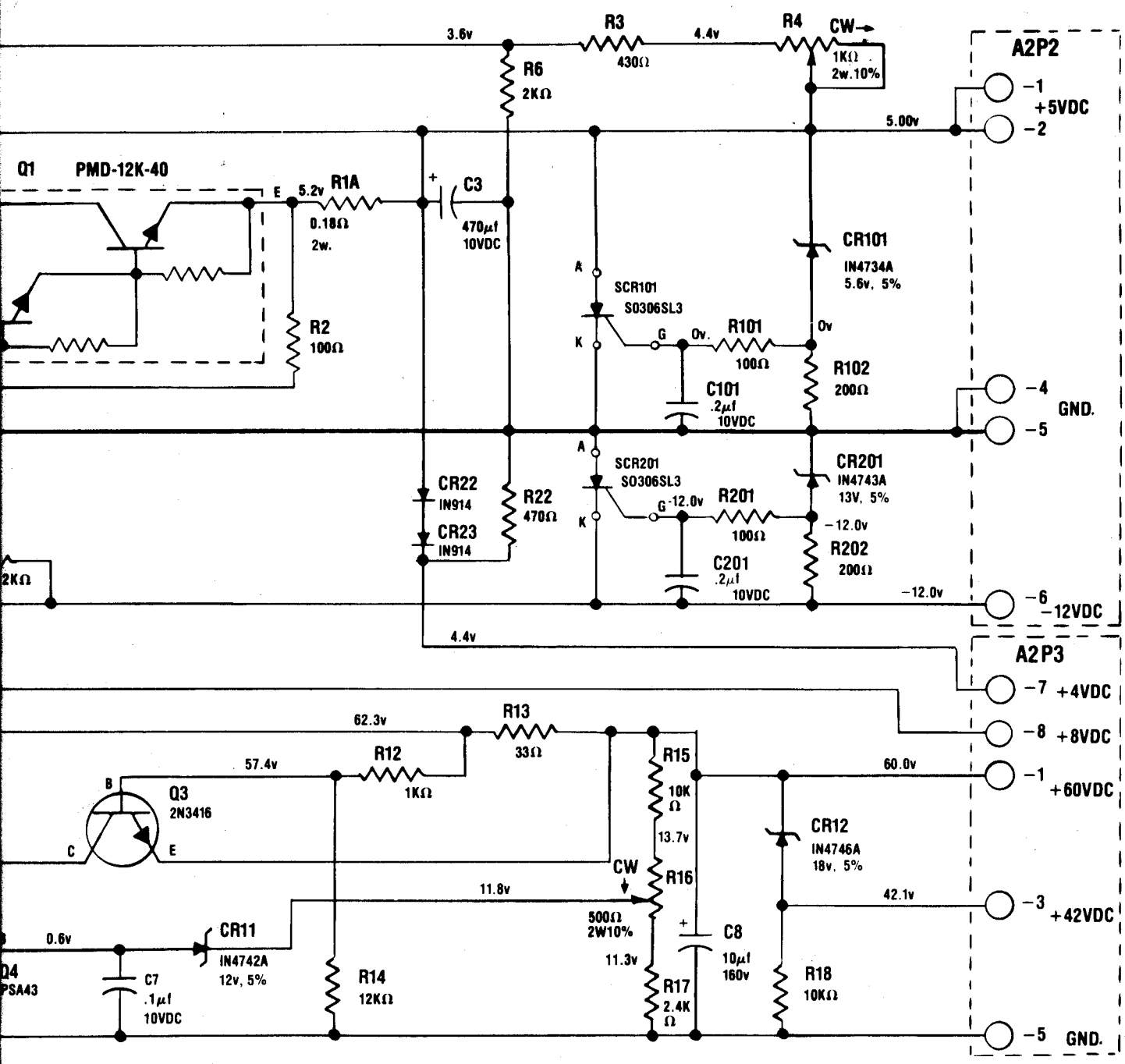
DRAWN	APPROVED	DATE	C-18207

B-18396 POWER SUPPLY SCHEMATIC



NOTE: UNLESS OTHERWISE SPECIFIED

1. RESISTORS ARE ½ w. ± 5%
2. VOLTAGES ARE DC AND WITH RESPECT TO GROUND.
3. ALL VOLTAGES ARE TYPICAL.



ISSUE	DATE	REVISIONS
3	2-1-78	REVISED
2	1-18-78	ADDED VOLTAGES
1	1-16-78	R13 WAS 56 Ω

DO NOT SCALE DRAWING | SCALE

TOLERANCES
DECIMAL
FRACTION
ANGULAR
UNLESS OTHERWISE SPECIFIED

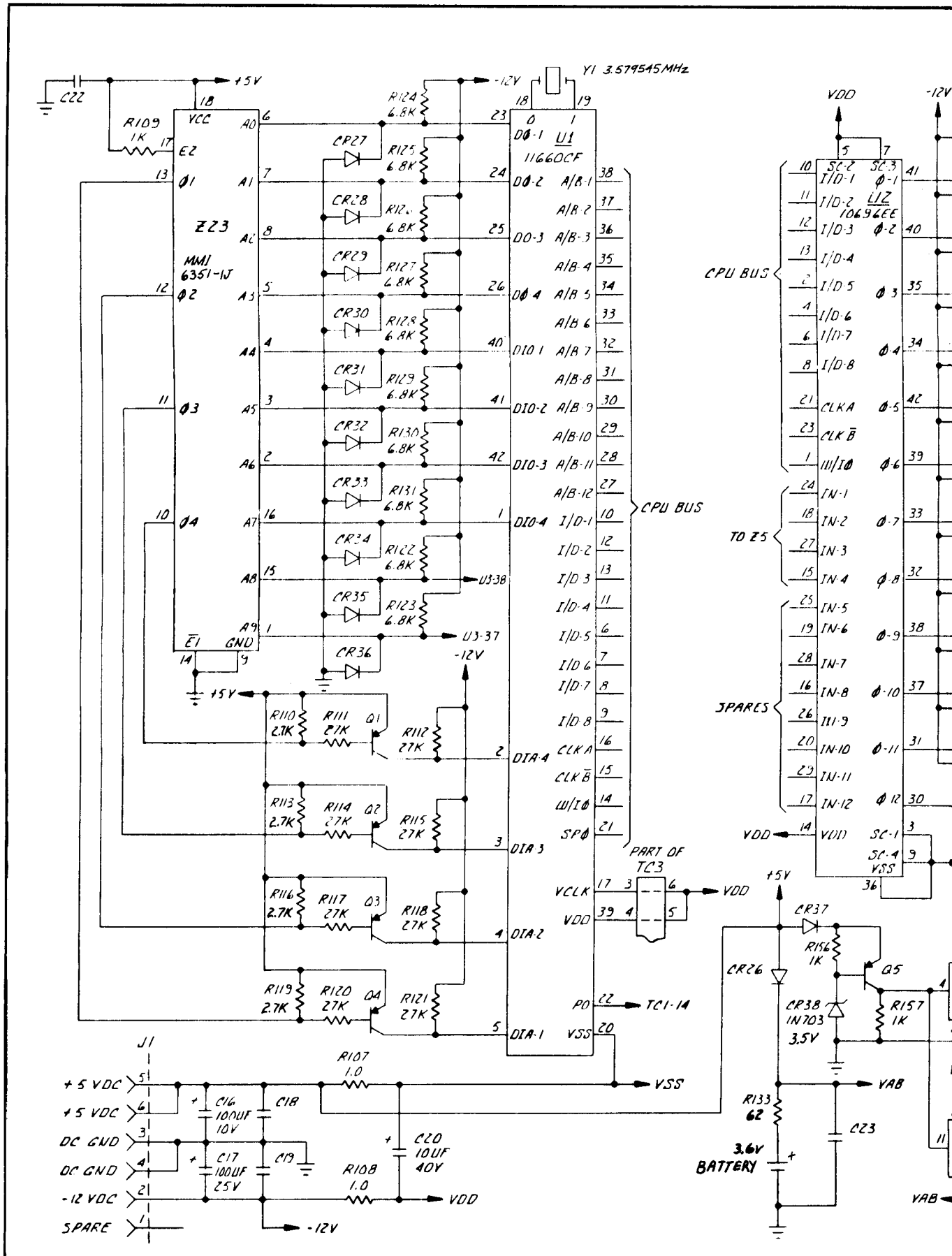
MATERIAL | HARDNESS | FINISH | NOTE

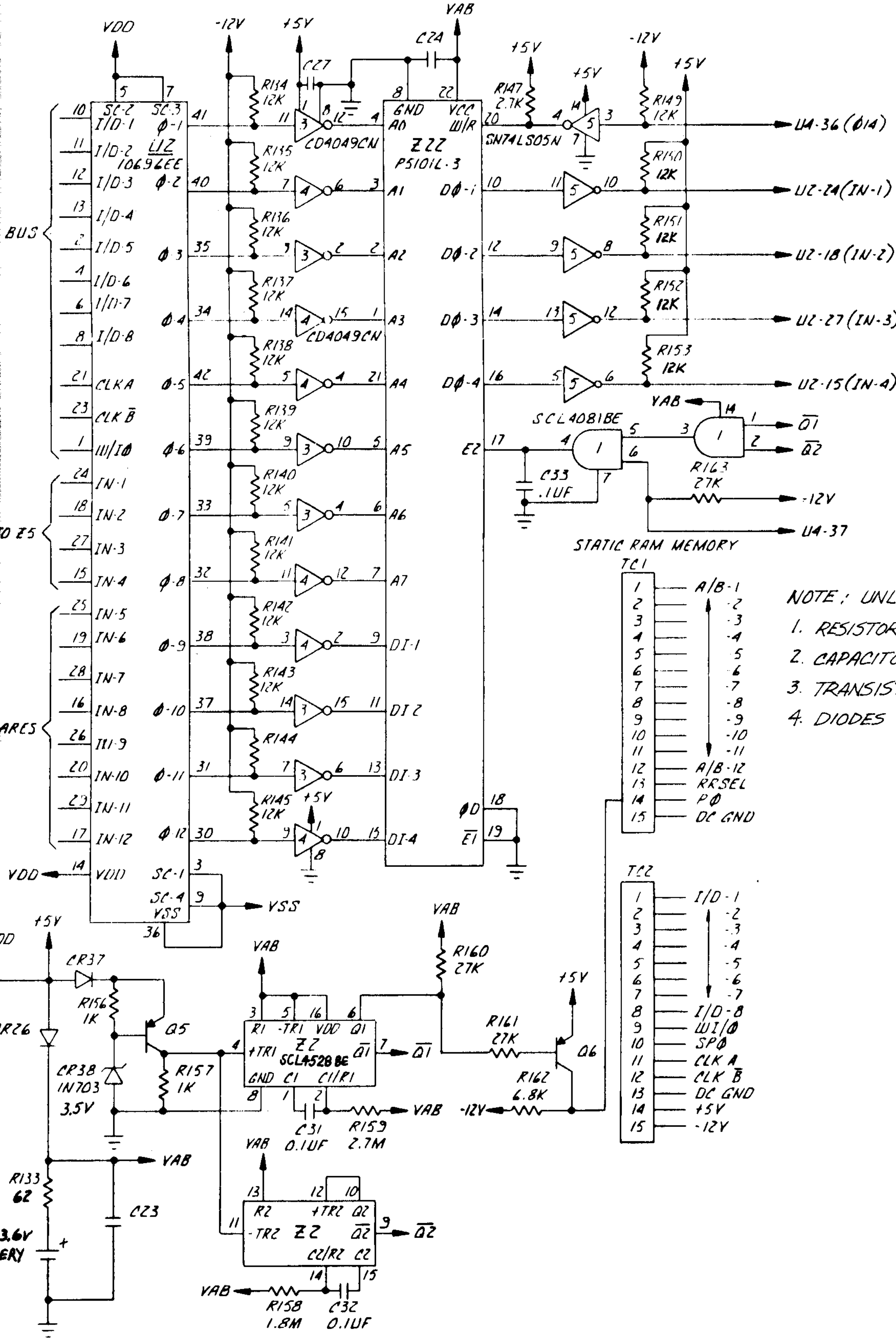
D. GOTTLIEB & CO.

TITLE: POWER SUPPLY SCHEMATIC

USED ON: SOLID STATE GAME

DRAWN	APPROVED	DATE	
R.H.M.		1-9-78	B-18396


Y1 3.579545MHz
+5V
-12V
C22
R109 1K
Z23
MMI 6351-1J
U1 11660CF
R124 6.8K
R125 6.8K
R126 6.8K
R127 6.8K
R128 6.8K
R129 6.8K
R130 6.8K
R131 6.8K
R122 6.8K
R123 6.8K
CR27
CR28
CR29
CR30
CR31
CR32
CR33
CR34
CR35
CR36
U3-38
U3-37
CPU BUS
R110 2.7K
R111 27K
Q1
R112 27K
R113 2.7K
R114 27K
Q2
R115 27K
R116 2.7K
R117 27K
Q3
R118 27K
R119 2.7K
R120 27K
Q4
R121 27K
PART OF TC3
VDD
TC1-14
VSS
J1
+5 VDC
+5 VDC
DC GND
DC GND
-12 VDC
SPARE
C16 100UF 10V
C17 100UF 25V
C18
C19
C20 10UF 40V
R107 1.0
R108 1.0
TO Z5
SPARES
U2 106.9EE
CR26
CR37
CR38 IN703 3.5V
R156 1K
R157 1K
Q5
R133 62
3.6V BATTERY
C23
VAB



NOTE: UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES ARE IN OHMS ±5%, 1/4W.
2. CAPACITORS ARE .01UF & RATED 100V.
3. TRANSISTORS ARE MPS-A70
4. DIODES ARE 1N4148.

ISSUE	DATE	REVISIONS
1	2-1-78	REVISED

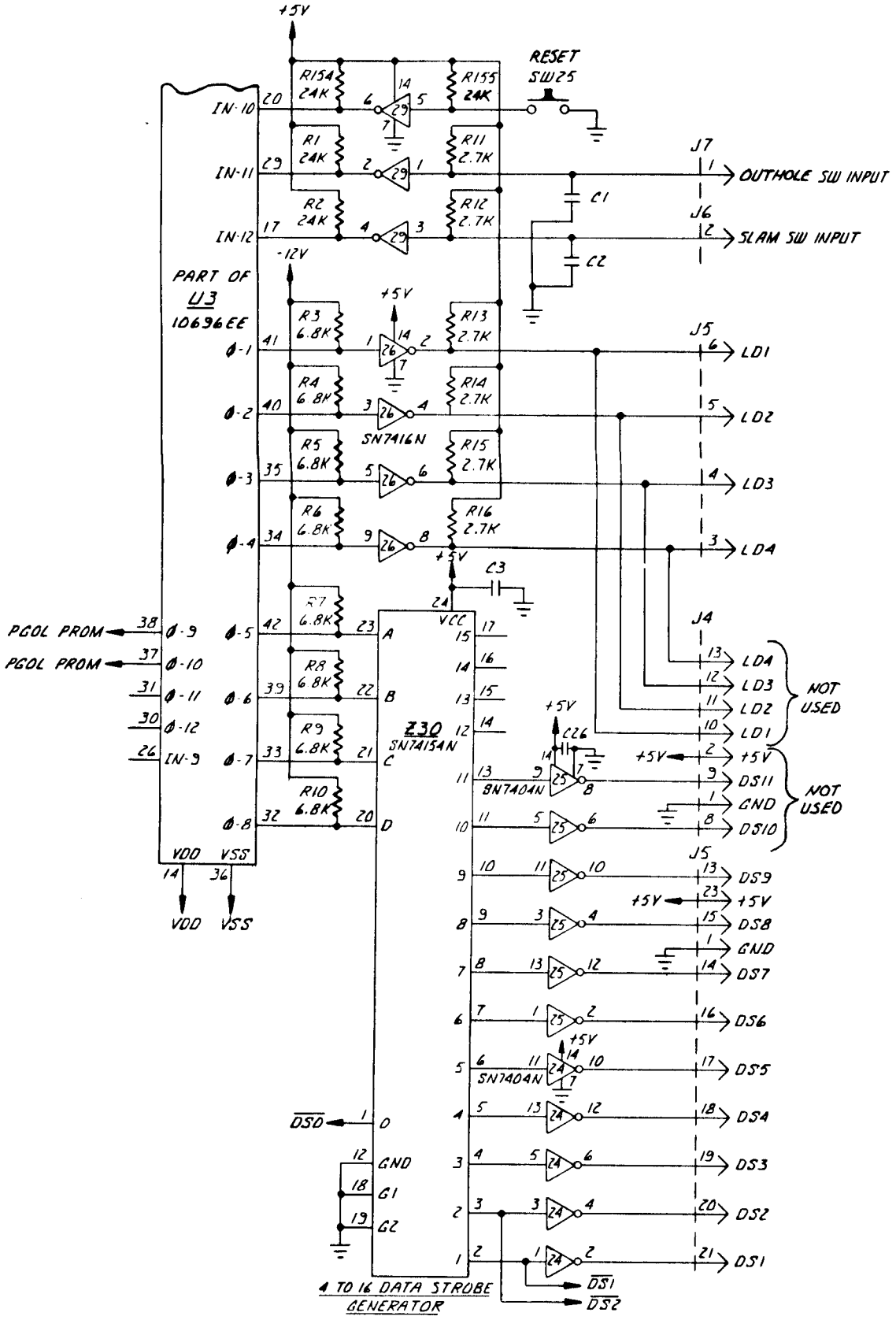
DO NOT SCALE DRAWING		SCALE
TOLERANCES ±	MATERIAL	
DECIMAL	HARDNESS	
FRACTION	FINISH	
ANGULAR UNLESS OTHERWISE SPECIFIED	NOTE	

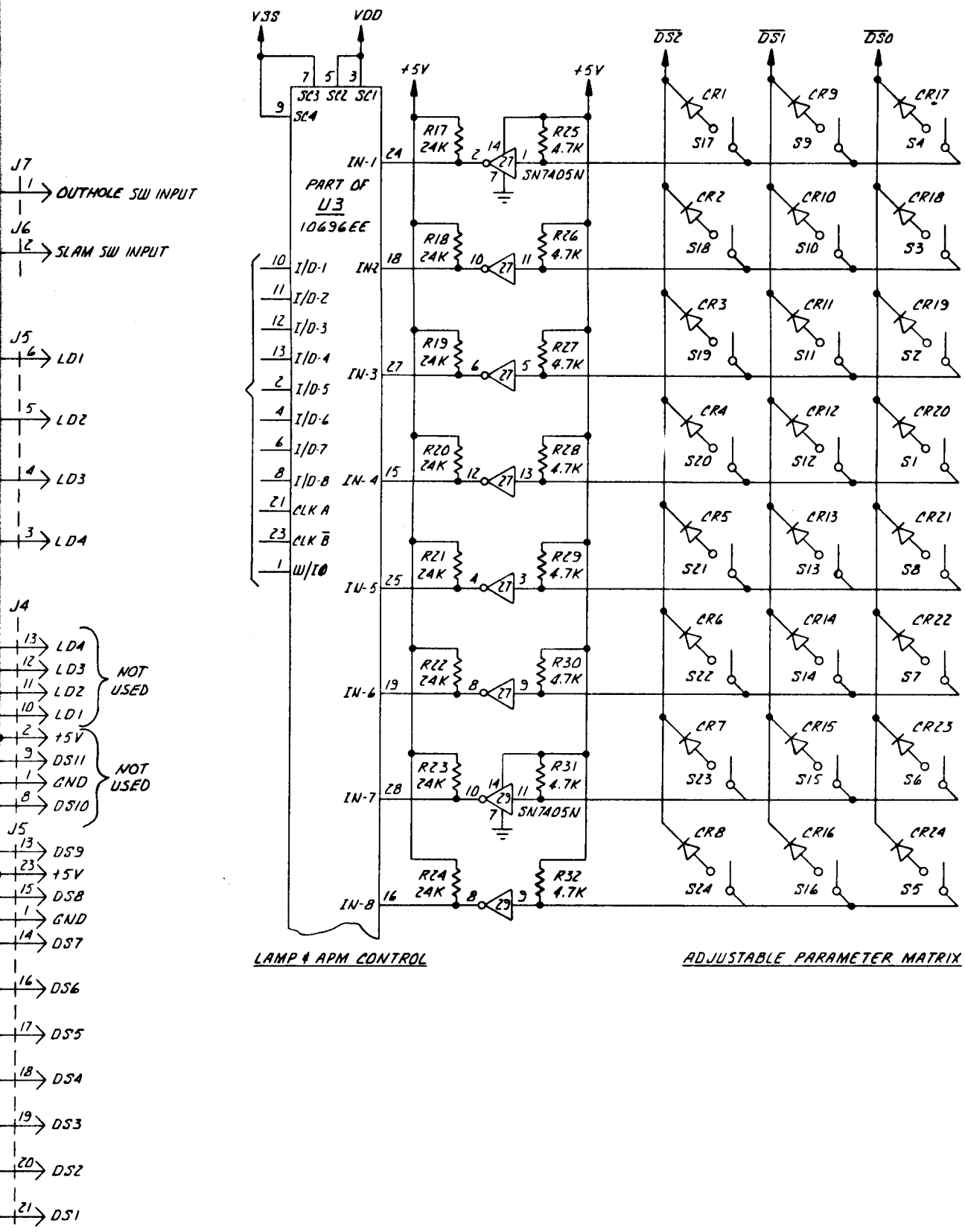
D. GOTTLIEB & CO.

TITLE **SCHEMATIC DIAGRAM-**

USED ON **CONTROL BOARD**

DRAWN	APPROVED	DATE	
			PB00-X101


+5V
RESET
SW25
R154 24K
R155 24K
R1 24K
R11 2.7K
R2 24K
R12 2.7K
IN-10
IN-11
IN-12
J7
OUTHOLE SW INPUT
J6
SLAM SW INPUT
C1
C2
-12V
PART OF
U3
10696EE
R3 6.8K
R13 2.7K
R4 6.8K
R14 2.7K
R5 6.8K
R15 2.7K
R6 6.8K
R16 2.7K
SN7416N
J5
LD1
LD2
LD3
LD4
C3
R7 6.8K
R8 6.8K
R9 6.8K
R10 6.8K
Ø-1
Ø-2
Ø-3
Ø-4
Ø-5
Ø-6
Ø-7
Ø-8
Ø-9
Ø-10
Ø-11
Ø-12
IN-9
PGOL PROM
PGOL PROM
VDD
VSS
Z30
SN74154N
VCC
GND
G1
G2
DSO
DS1
DS2
4 TO 16 DATA STROBE GENERATOR
J4
NOT USED
C26
SN7404N
DS11
DS10
DS9
DS8
DS7
DS6
DS5
DS4
DS3
DS2
DS1



LAMP & APM CONTROL

ADJUSTABLE PARAMETER MATRIX

ISSUE	DATE	REVISIONS
1	2-1-78	REVISED

DO NOT SCALE DRAWING | SCALE

TOLERANCES ± | MATERIAL

DECIMAL | HARDNESS

FRACTION | FINISH

ANGULAR UNLESS OTHERWISE SPECIFIED | NOTE

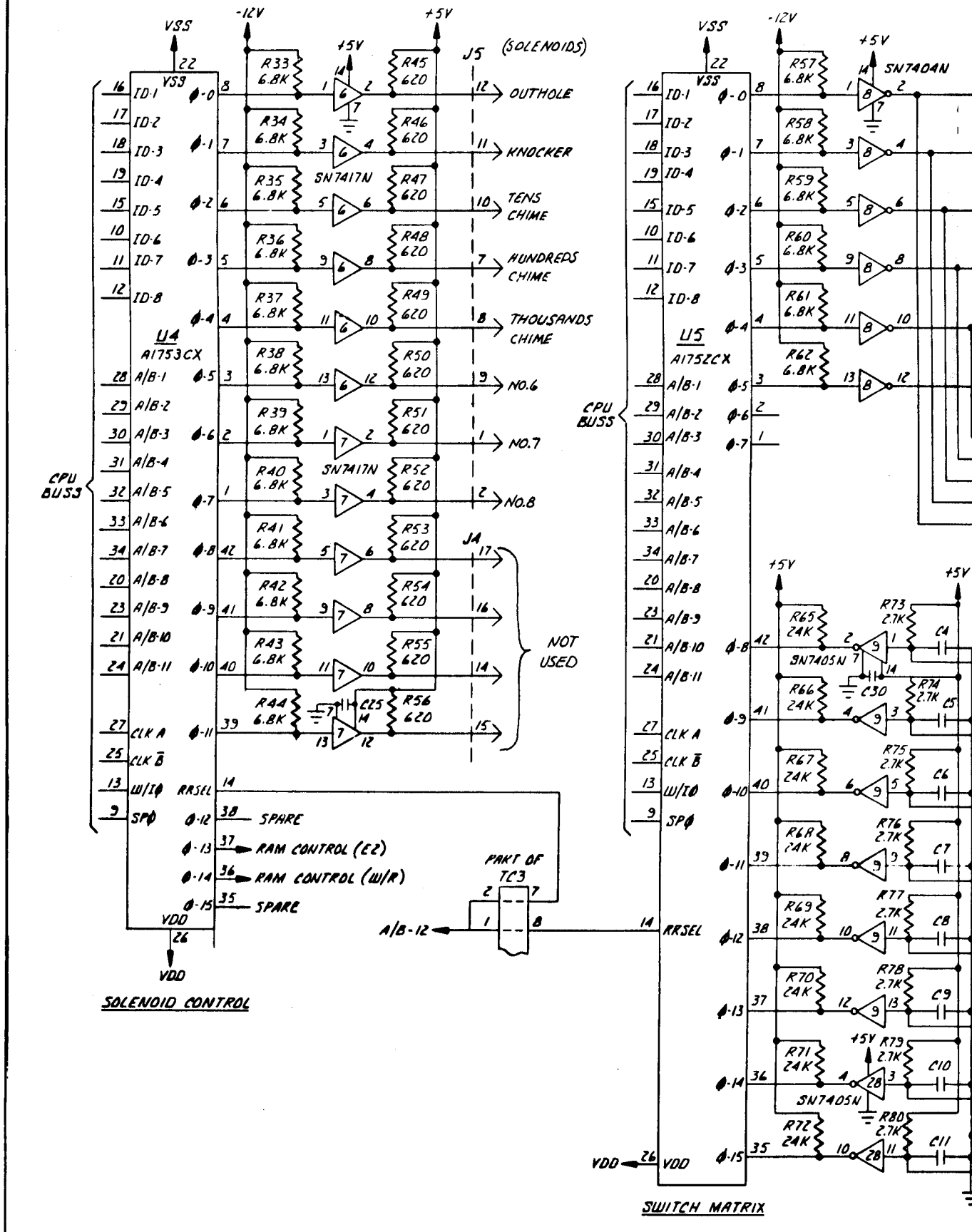
D. GOTTLIEB & CO.

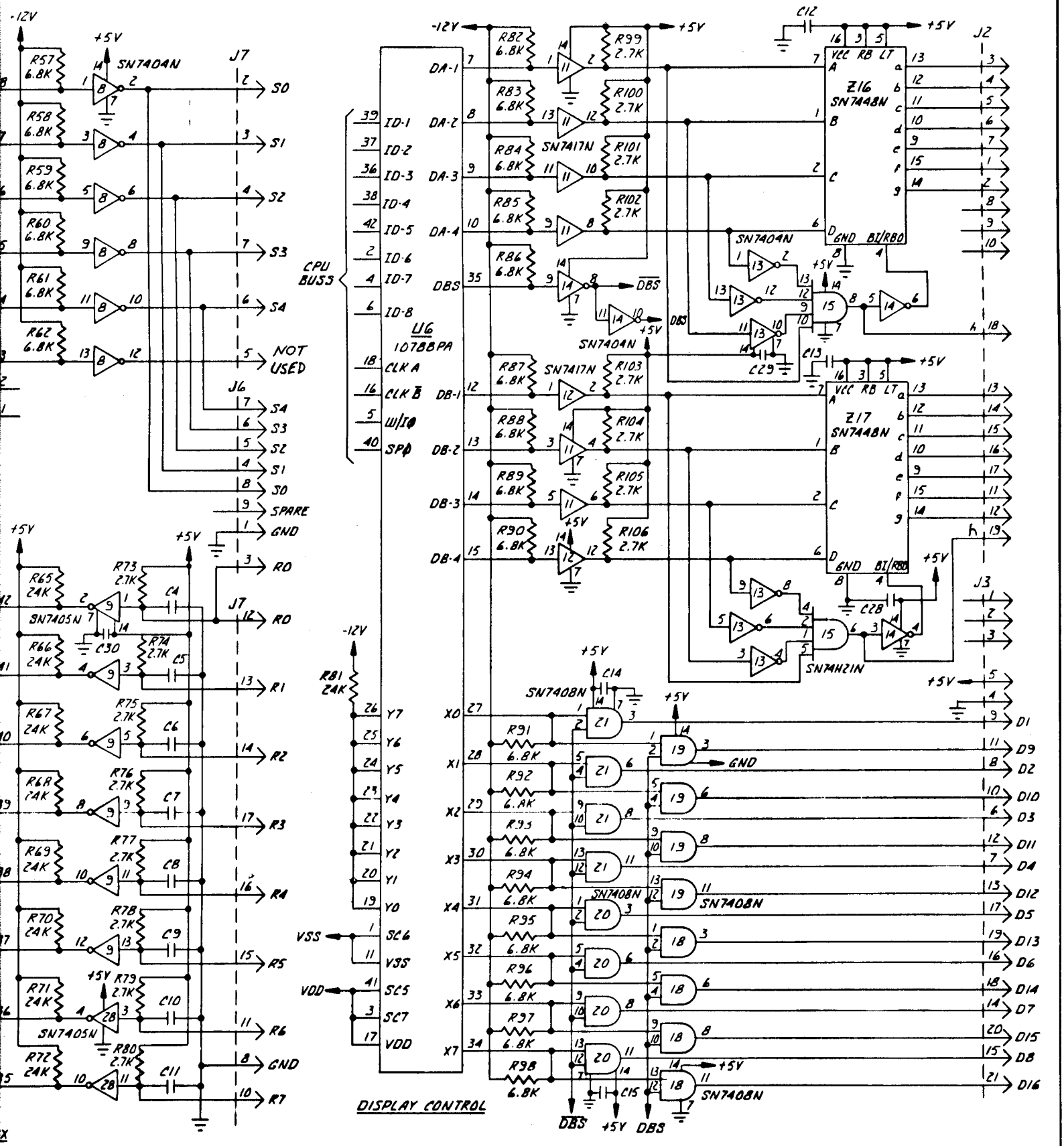
TITLE SCHEMATIC DIAGRAM-

USED ON CONTROL BOARD

DRAWN	APPROVED	DATE

PB00-X101


VSS
-12V
+5V
J5
(SOLENOIDS)
OUTHOLE
KNOCKER
TENS CHIME
HUNDREDS CHIME
THOUSANDS CHIME
NO.6
NO.7
NO.8
NOT USED
J4
U4
A1753CX
CPU BUSS
SN7417N
SPARE
RAM CONTROL (E2)
RAM CONTROL (W/R)
SPARE
PART OF TC3
A/B-12
SOLENOID CONTROL
U5
A1752CX
SN7404N
SN7405N
SWITCH MATRIX



ISSUE	DATE	REVISIONS
1	2-1-78	REVISED

DO NOT SCALE DRAWING | SCALE

TOLERANCES ± | MATERIAL

DECIMAL | HARDNESS

FRACTION | FINISH

ANGULAR | NOTE

UNLESS OTHERWISE SPECIFIED

D. GOTTLIEB & CO.

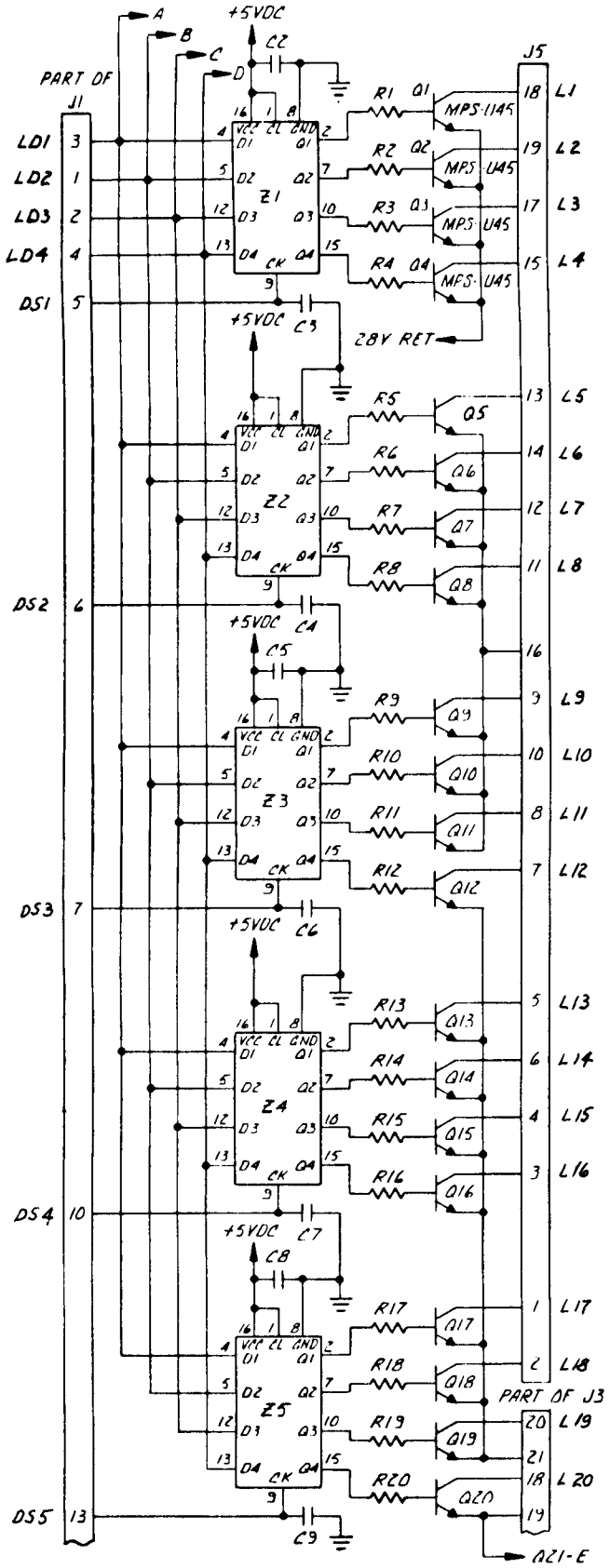
TITLE **SCHEMATIC DIAGRAM-**

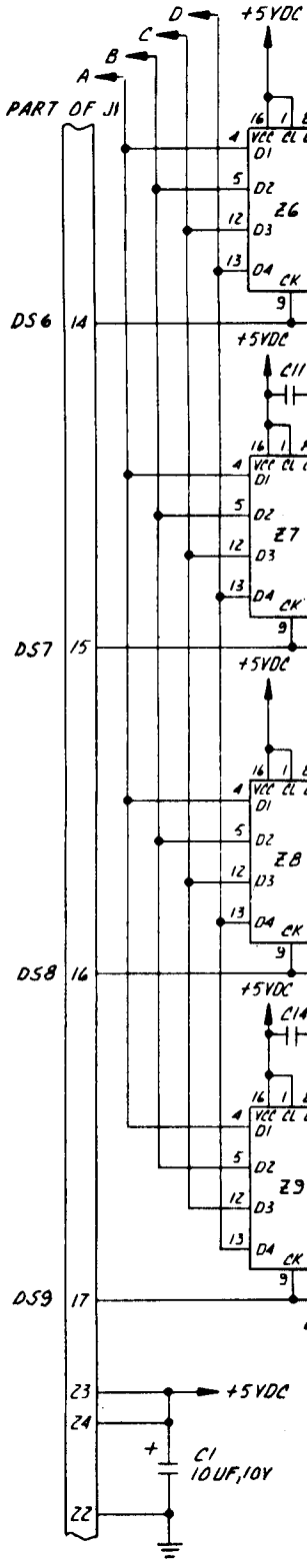
USED ON **CONTROL BOARD**

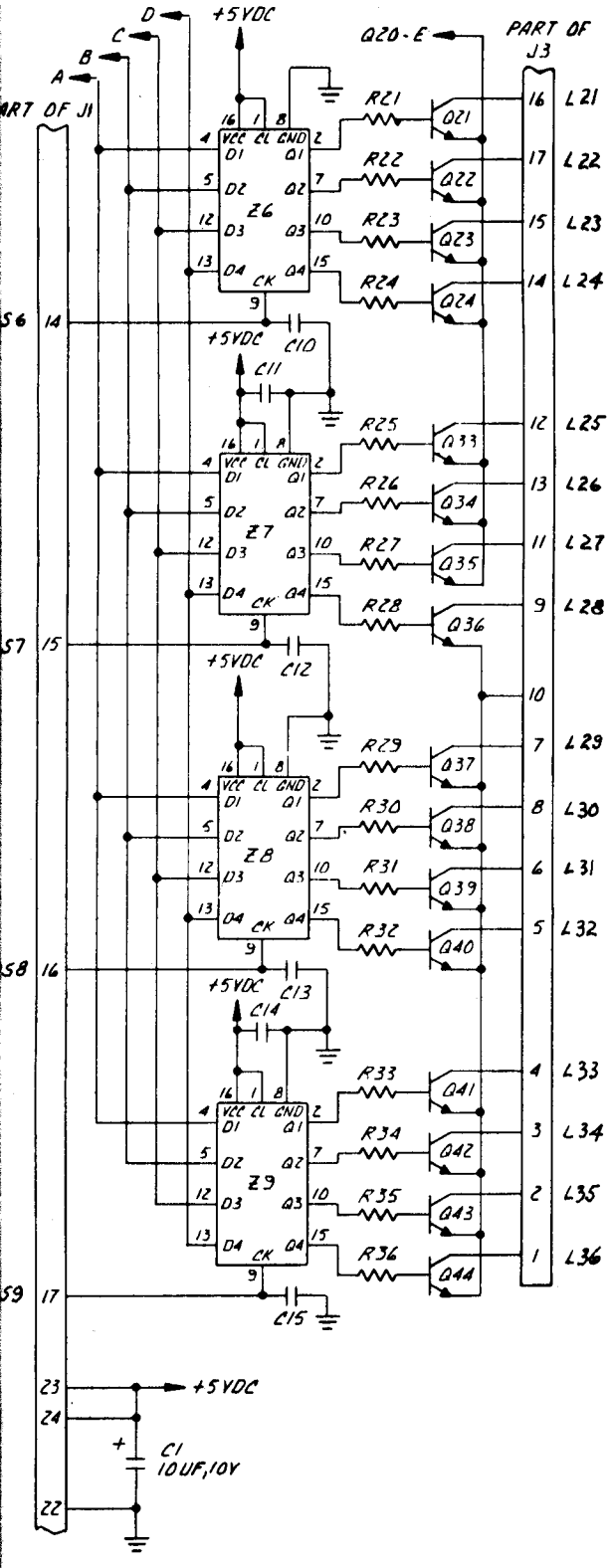
DRAWN	APPROVED	DATE

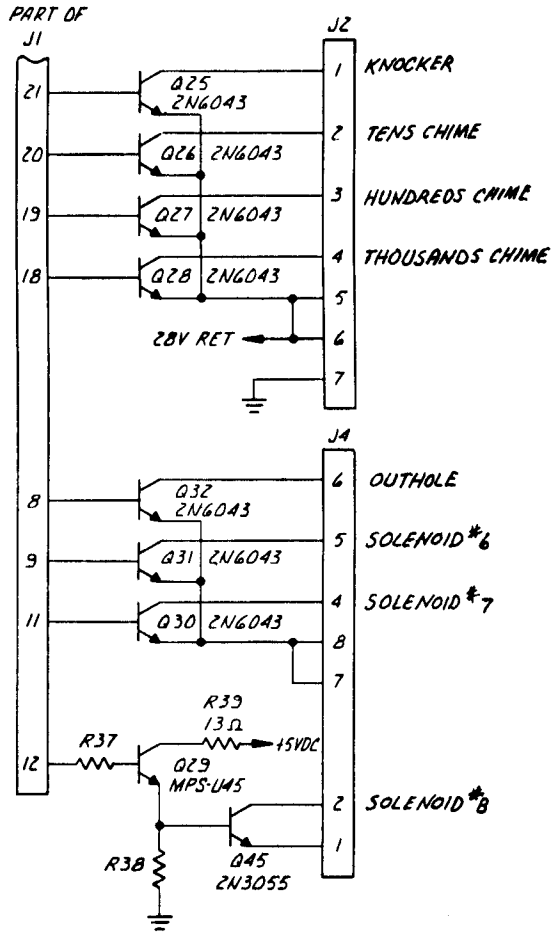
PB00-X101

PB00-X111 SCHEMATIC DIAGRAM—MASTER DRIVER







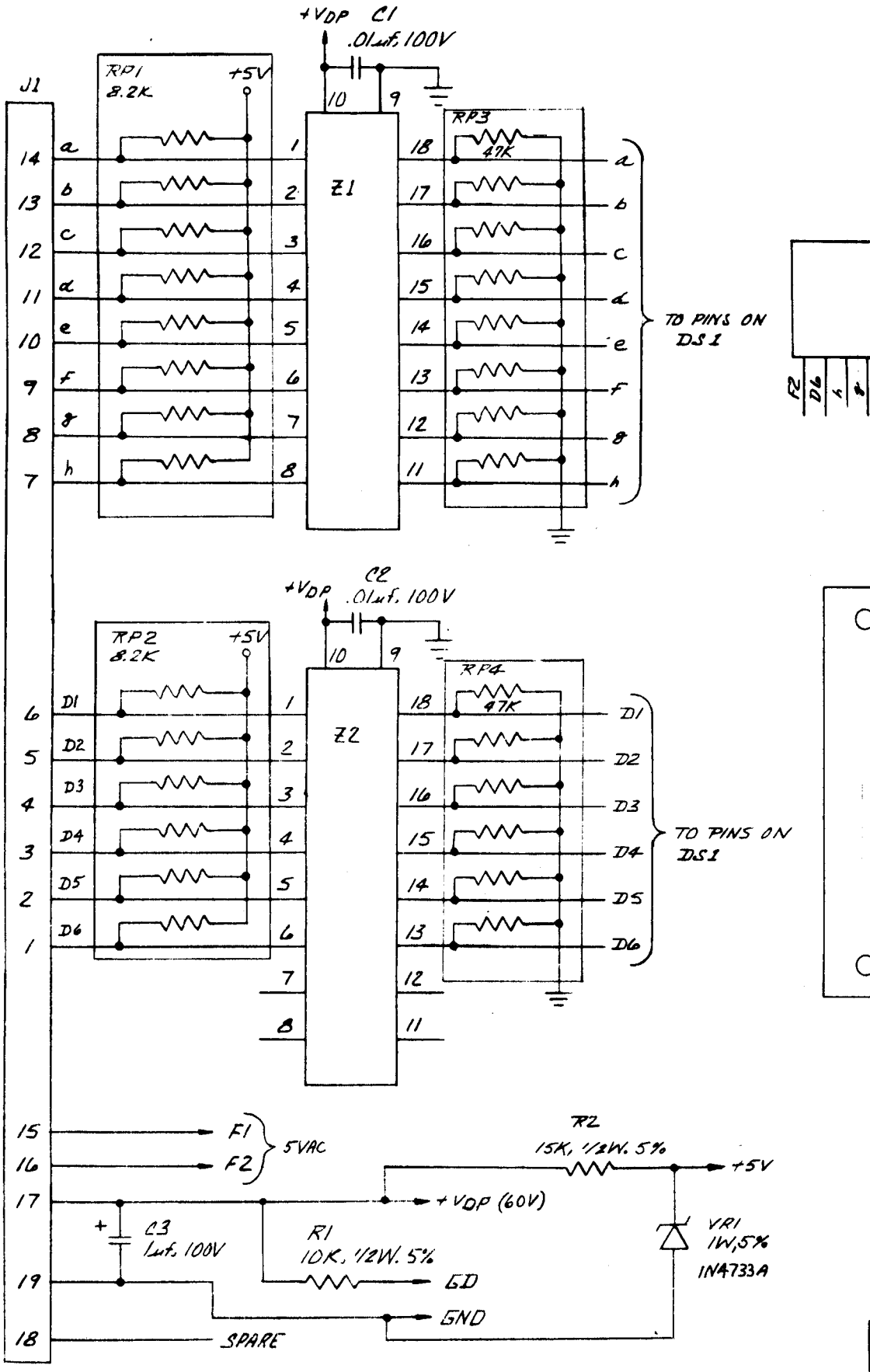


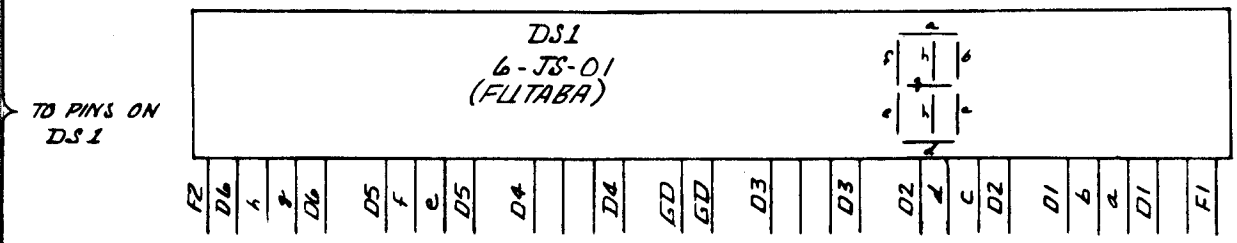
NOTE: UNLESS OTHERWISE SPECIFIED

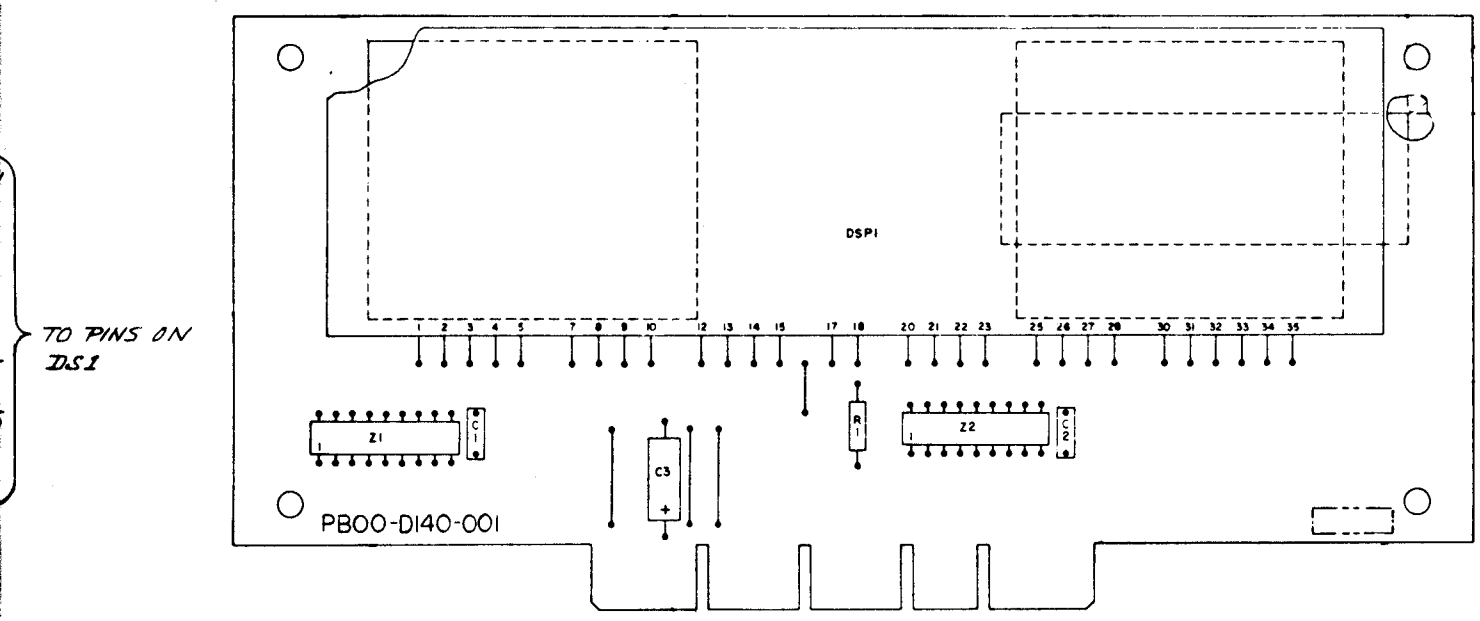
1. RESISTORS ARE 1.0K OHMS ±5%, 1/4W.
2. TRANSISTORS ARE MPS-A13
3. CAPACITORS ARE .01UF, 20%, 100V
4. INTEGRATED CIRCUITS ARE SN74175N

ISSUE	DATE	REVISIONS
1	2-1-78	REVISED

DO NOT SCALE DRAWING	SCALE	D. GOTTLIEB & CO.
TOLERANCES ±	MATERIAL	TITLE SCHEMATIC DIAGRAM-
DECIMAL	HARDNESS	USED ON MASTER DRIVER
FRACTION	FINISH	DRAWN / APPROVED / DATE: PB00-X111
ANGULAR UNLESS OTHERWISE SPECIFIED	NOTE	

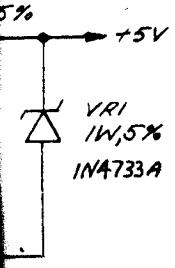

+VDP C1
.01uf. 100V
J1
RP1
8.2K
+5V
Z1
RP3
47K
TO PINS ON DS1
C2
.01uf. 100V
RP2
8.2K
Z2
RP4
47K
TO PINS ON DS1
F1
F2
5VAC
R2
15K, 1/2W. 5%
+5V
+VDP (60V)
C3
1uf. 100V
R1
10K, 1/2W. 5%
VR1
1W, 5%
1N4733A
GD
GND
SPARE





NOTE: UNLESS OTHERWISE SPECIFIED

1. Z1 & Z2 ARE UDN6118A (SPRAGUE) -1 ONLY; Z1 & Z2 ARE DI513 (DIONICS) -11 ONLY.
2. RP1, RP2, RP3, RP4, R2 & VR1 ARE USED ON -11 ASSY ONLY.



ISSUE	DATE	REVISIONS
1	2-1-78	REVISED

DO NOT SCALE DRAWING | SCALE

TOLERANCES ± | MATERIAL

DECIMAL | HARDNESS

FRACTION | FINISH

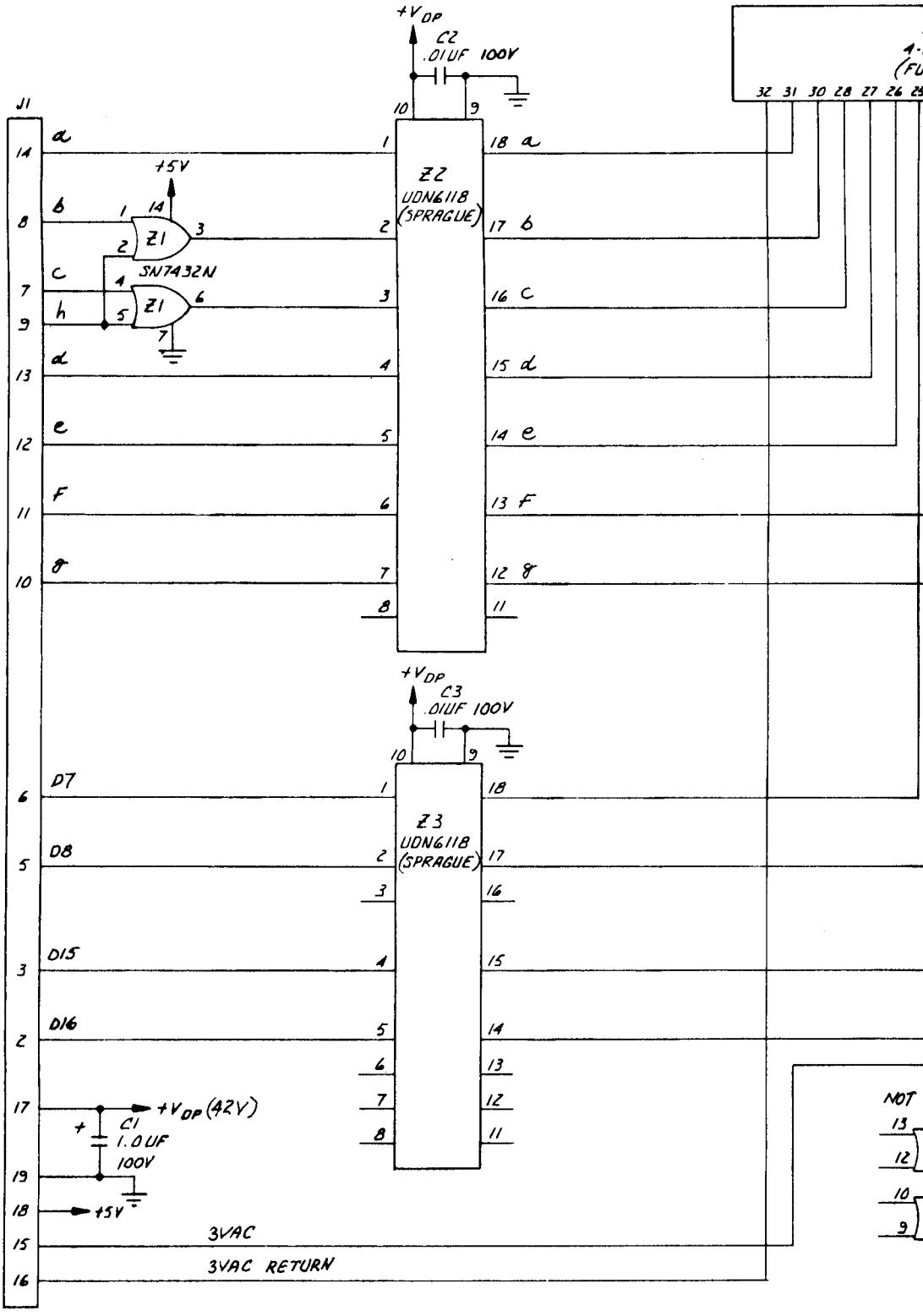
ANGULAR UNLESS OTHERWISE SPECIFIED | NOTE

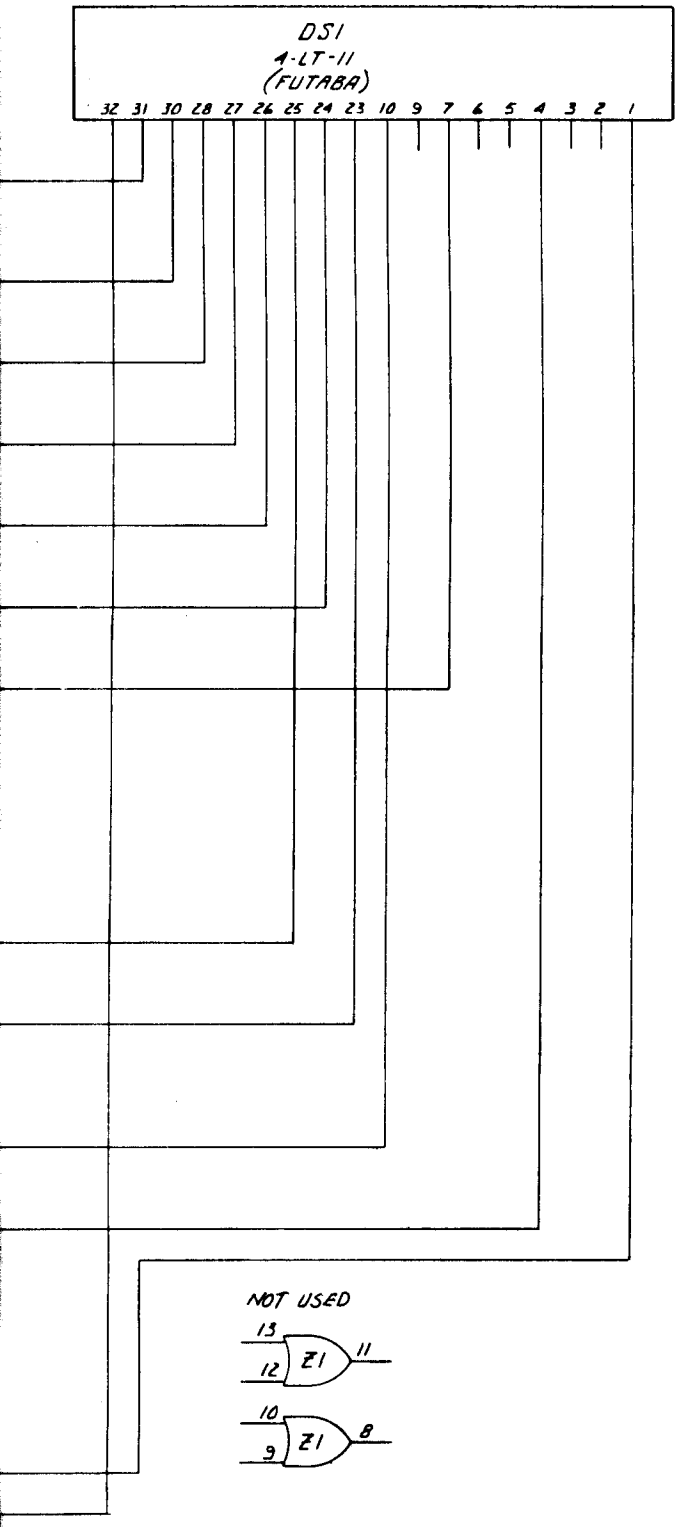
D. GOTTLIEB & CO.

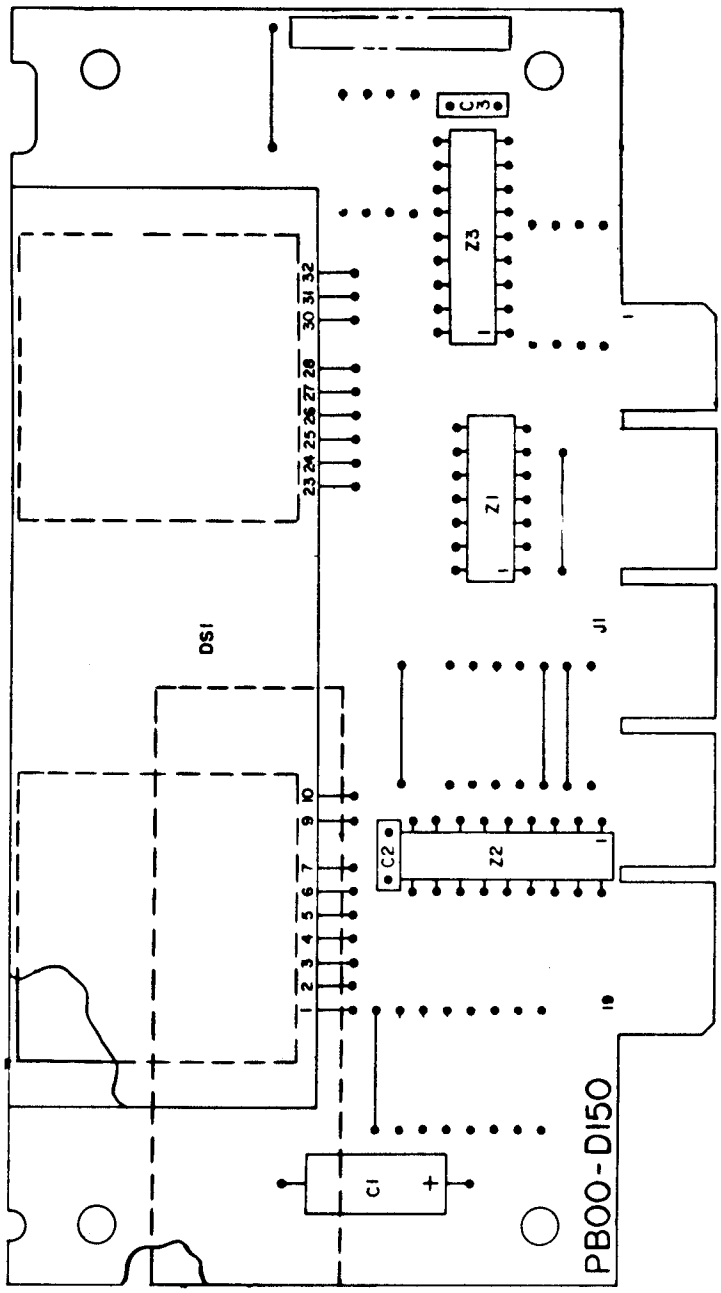
TITLE **SCHEMATIC DIAGRAM- 6 DIGIT DISPLAY**

USED ON

DRAWN	APPROVED	DATE	PB00-X141


J1
+VDP
C2
.01UF 100V
Z2
UDN6118
(SPRAGUE)
+5V
Z1
SN7432N
a
b
c
h
d
e
F
g
D7
D8
D15
D16
C3
.01UF 100V
Z3
UDN6118
(SPRAGUE)
+VDP (42V)
C1
1.0 UF
100V
+5V
3VAC
3VAC RETURN
32 31 30 28 27 26
NOT





NOTE:
RESISTOR VALUES ARE IN
OHMS ±5%, ¼ W

ISSUE	DATE	REVISIONS
1	2-1-78	REVISED

DO NOT SCALE DRAWING | SCALE

TOLERANCES ±
DECIMAL
FRACTION
ANGULAR
UNLESS OTHERWISE SPECIFIED

MATERIAL
HARDNESS
FINISH
NOTE

D. GOTTLIEB & CO.

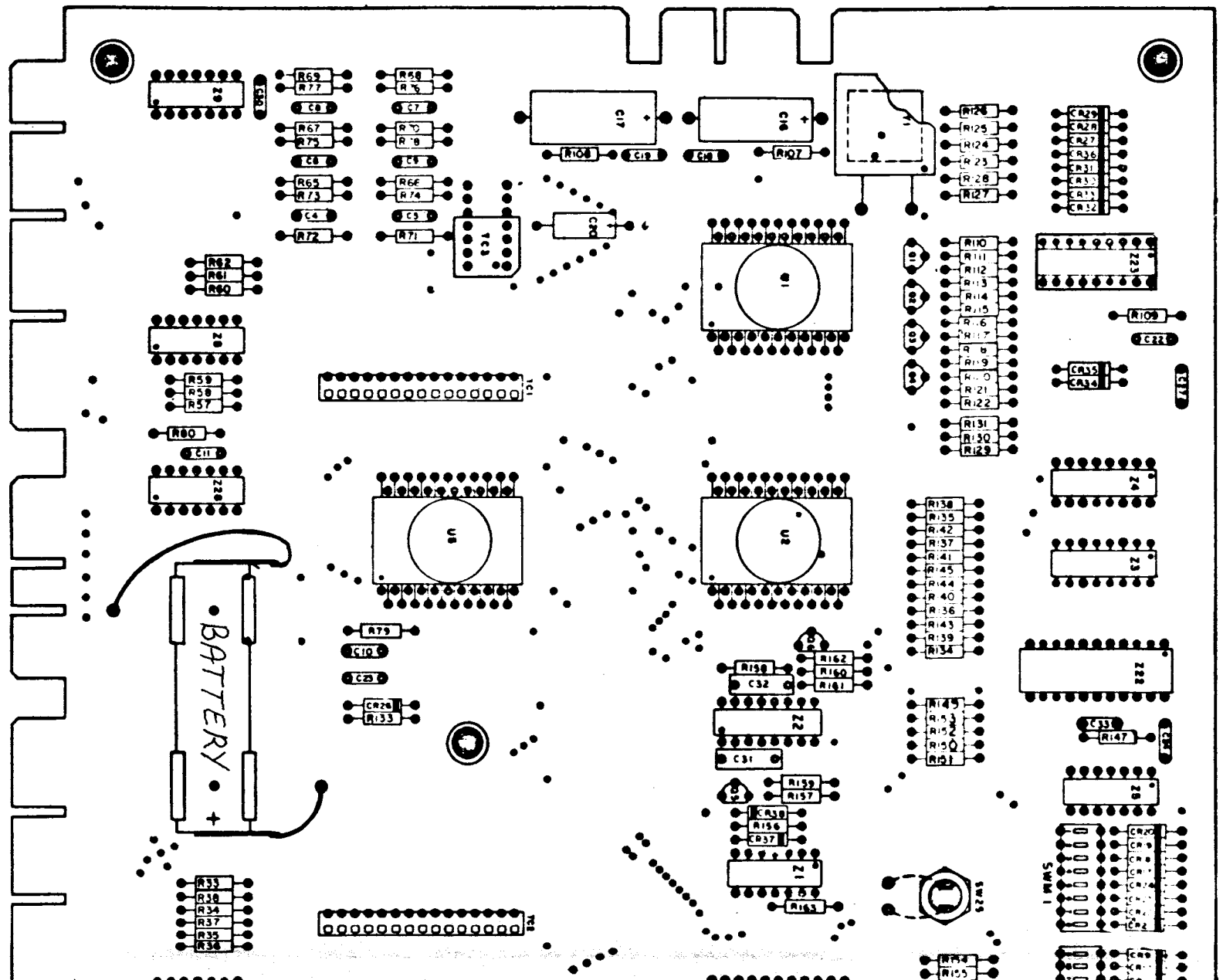
TITLE SCHEMATIC DIAGRAM-
4 DIGIT DISPLAY

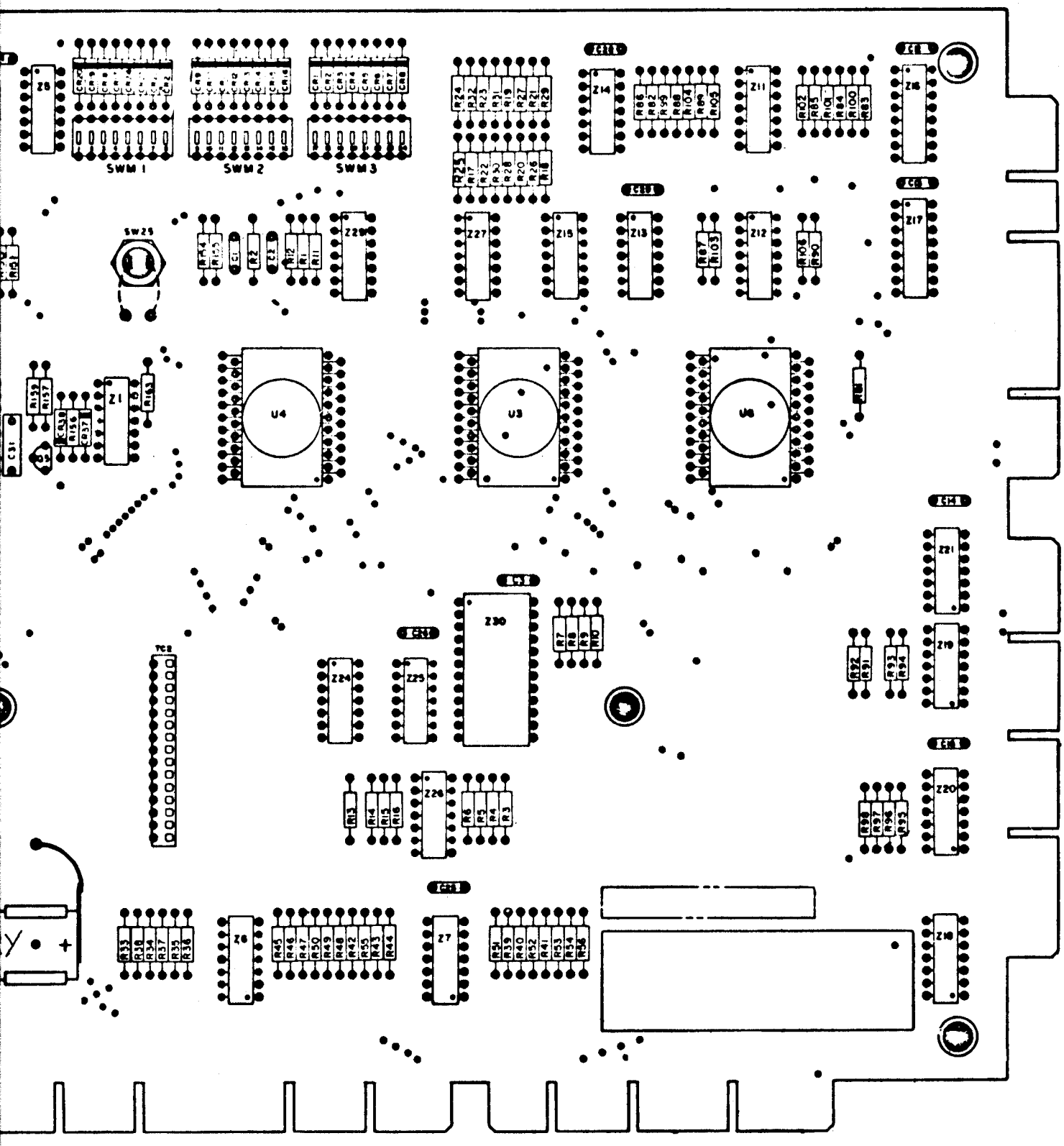
USED ON

DRAWN	APPROVED	DATE

PB00-X151

PB00-D100 CONTROL BOARD





ISSUE	DATE	REVISIONS
1	2-1-78	REVISED

DO NOT SCALE DRAWING | SCALE

TOLERANCES ±
DECIMAL
FRACTION
ANGULAR
UNLESS OTHERWISE SPECIFIED

MATERIAL
HARDNESS
FINISH
NOTE

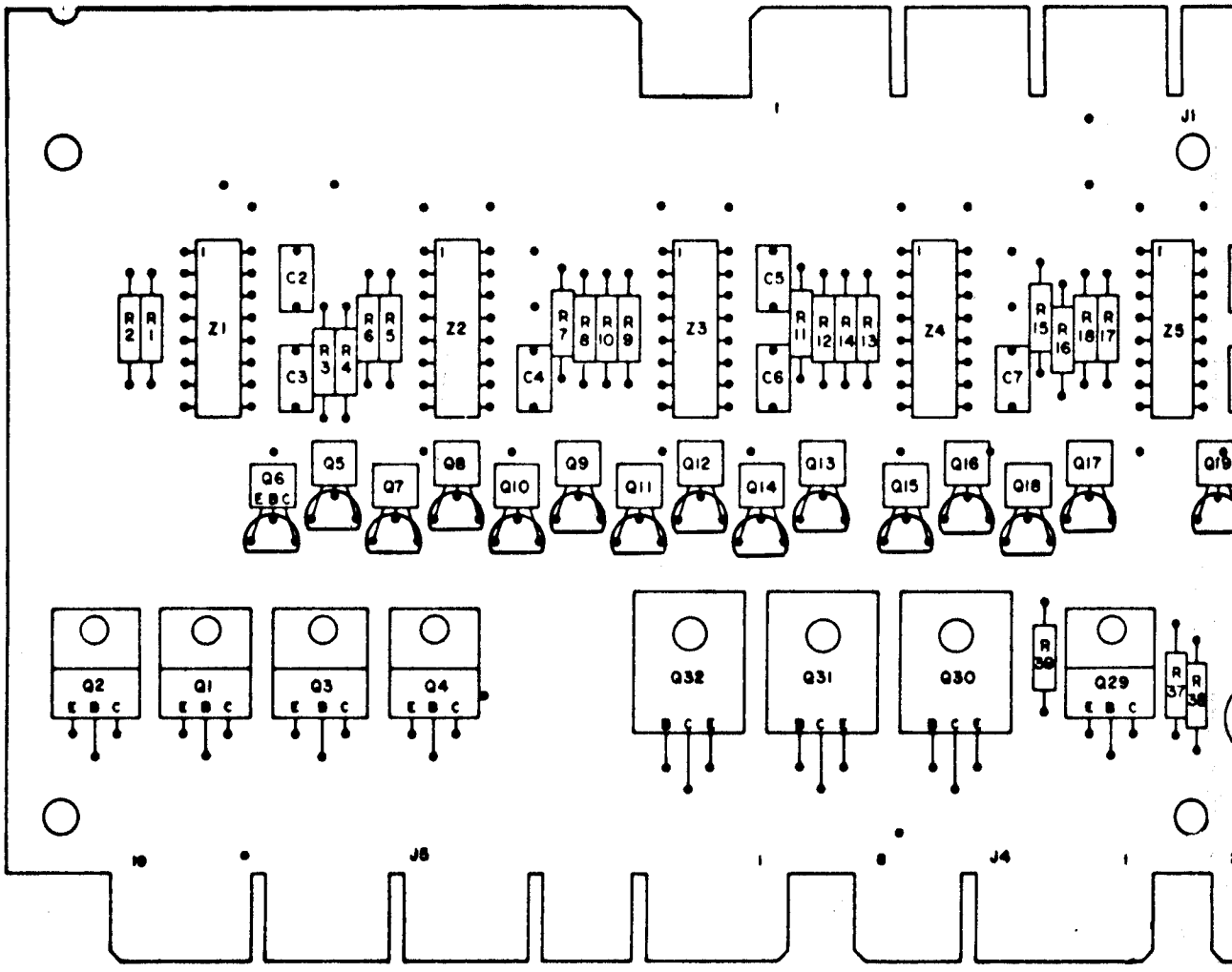
D. GOTTLIEB & CO.

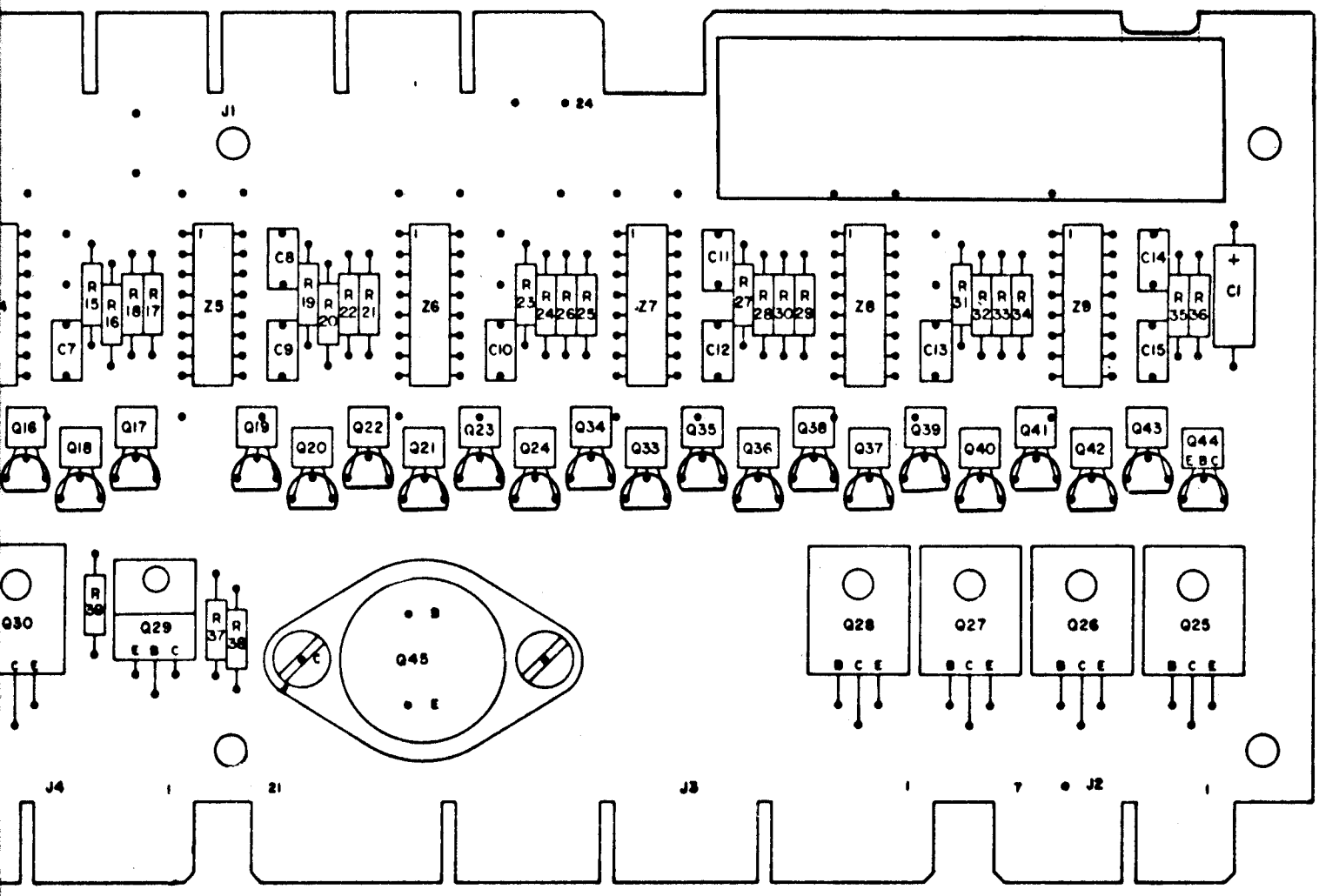
TITLE **SCHEMATIC DIAGRAM-CONTROL BOARD**

USED ON

DRAWN	APPROVED	DATE

PB00-D100


J1
Z1
Z2
Z3
Z4
Z5
R2
R1
C2
C3
R3
R4
R6
R5
C4
R7
R8
R10
R9
C5
C6
R11
R12
R14
R13
C7
R15
R16
R18
R17
Q6
E B C
Q5
Q7
Q8
Q10
Q9
Q11
Q12
Q14
Q13
Q15
Q16
Q18
Q17
Q2
E B C
Q1
Q3
Q4
Q32
C
Q31
Q30
R36
Q29
R37
J8
J4



DO NOT SCALE DRAWING	SCALE	D. GOTTLIEB & CO.	
TOLERANCES ±	MATERIAL	TITLE SCHEMATIC DIAGRAM-MASTER DRIVER	
DECIMAL		USED ON	
FRACTION	HARDNESS		
ANGULAR	FINISH		
UNLESS OTHERWISE SPECIFIED	NOTE	DRAWN / APPROVED / DATE	PB00-D110

ISSUE	DATE	REVISIONS

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