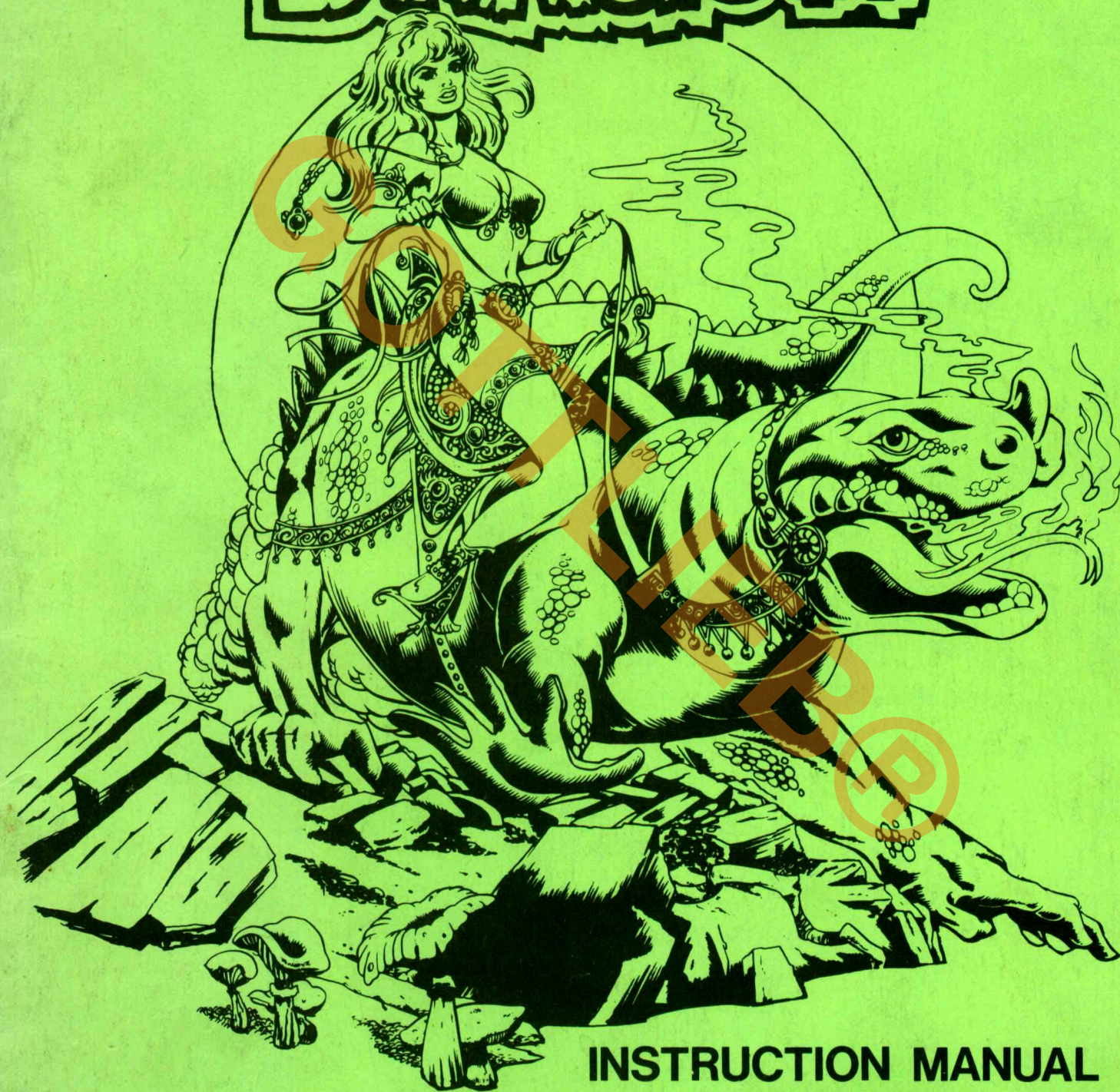


Gottlieb's SOLID STATE

DRAGON



INSTRUCTION MANUAL

D. Gottlieb & Co.



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

Price **\$3.00**

DRAGON
USES PROM MARKED

“D”

INSERT PROM WITH
INDENT NOTCH UP

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.

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 ADJUSTMENTS

A. Playfield Adjustments

Posts controlling access to the left and right outlanes can be adjusted. See page 8. The "conservative" (easier entry) position decreases playing time and scoring while the "liberal" position has the opposite effect.

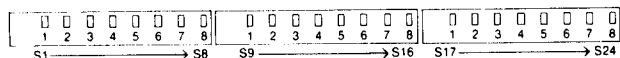
The game is shipped with adjustable posts in the position found to be suitable for the greatest number of players. Therefore the posts should not be changed unless the need is clearly evident.

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.

B. Lightbox Adjustments

There are 24 switches on the Control Board (A1) which permit adjustment of the game parameters. These switches are contained in three packages of eight switches each, as shown below.



WARNING: TURN OFF POWER BEFORE MAKING ADJUSTMENTS!

SWITCHES				COIN CHUTE ADJUSTMENTS
S1	S2	S3	S4	#1 Coin Chute
S5	S6	S7	S8	#2 Coin Chute

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

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.

SWITCH 9	BALLS PER GAME
ON	3
OFF	5

SWITCH 10	MATCH FEATURE
ON	IN
OFF	OUT

SWITCH 11	(See Note A)	GAME MODE
ON		REPLAY
OFF		EXTRA BALL

SWITCH 12	TILT EFFECT
ON	BALL IN PLAY ONLY
OFF	GAME OVER

SWITCH 13	CREDITS DISPLAYED?
ON	YES
OFF	NO

SWITCH 14	CREDIT BUTTON TUNE?
ON	YES
OFF	NO

SWITCH 15	} NOT USED—MAY BE ON OR OFF
SWITCH 16	

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

SWITCH 19	(See Note B)	COIN CHUTE CONTROL
ON		CHUTES SAME
OFF		CHUTES SEPARATE

SWITCH 20	CHIMES WHEN SCORING?
ON	YES
OFF	NO

SWITCH 21	HIGH GAME TO DATE DISPLAYED?
ON	YES
OFF	NO

SWITCH 22	BEATING HIGH GAME TO DATE AWARDS.
ON	3 REPLAYS
OFF	NO REPLAYS

SWITCH 23	COIN SWITCH TUNE?
ON	YES
OFF	NO

SWITCH 24—NOT USED—MAY BE ON OR OFF

Note A: IF SWITCH 11 IS OFF, SWITCHES 10 AND 22 HAVE NO EFFECT; THE MATCH FEATURE IS DISABLED AND NO REPLAYS ARE AWARDED FOR BEATING HIGH GAME TO DATE.

Note B: WHEN SWITCH 19 IS ON, SWITCHES 5-8 HAVE NO EFFECT; SWITCHES 1-4 CONTROL BOTH COIN CHUTES.

III. DRAGON

GAME FEATURES (5 BALL)

Hitting A-B-C-D rollovers add bonus and scores 500 or 5000 points when lit. "A" lights 2x bonus, "A"- "B" lights 3x bonus, "A"- "B"- "C" lights 4x bonus and "A"- "B"- "C"- "D" lights 5x bonus.

Rollover buttons add bonus and scores 1000 or 5000 points when lit. Lit rollover button spots indicated letter.

The vari-targets score and subtracts bonus as indicated (one, two or three bonuses) when hit. Example: hitting a vari-target to 2nd position will score 2000 points and subtract 2 bonuses. When a 2x, 3x, 4x or 5x bonus multiplier is lit bonus score is multiplied by indicated multiplier.

The pop bumpers score 1000 points.

The spinning target scores 100 or 1000 when lit.

Feature changes for 3 ball operation.

A-B-C-D rollovers always score 5000 points.

IV. 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 assembly and on the front door. Turn on the game; if the prob-

lem remains, refer to Section VI. (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 Section III. 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 assembly. 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.

V. 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 assembly 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.

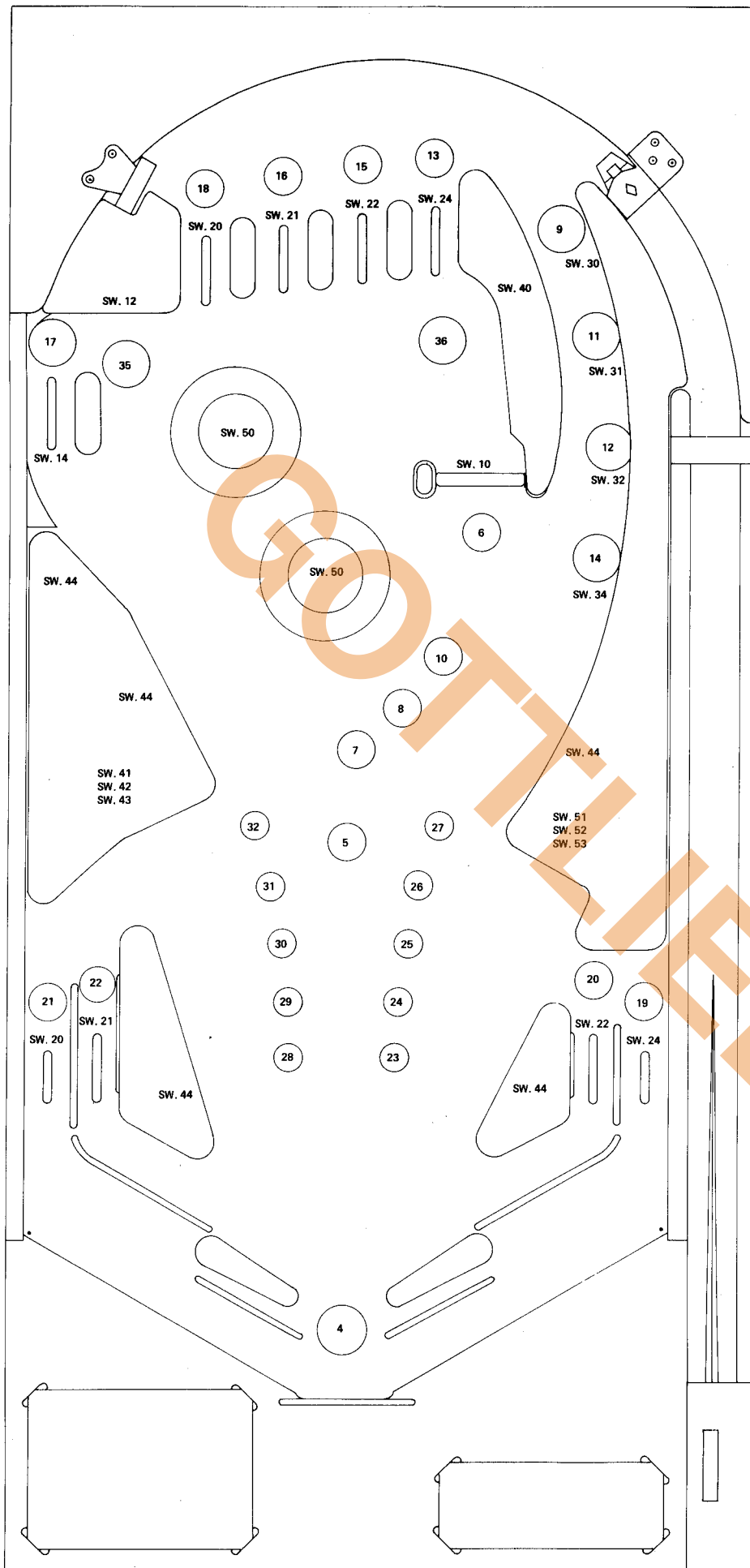
SWITCH MATRIX AND LAMP LOCATION

SWITCHES ON MATRIX

SW. MATRIX NUMBER	SWITCH 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	Spinning Target
SW.12	Left Extra Ball
SW.14	Special Rollover
SW.20	"A" Rollover—(2)
SW.21	"B" Rollover—(2)
SW.22	"C" Rollover—(2)
SW.24	"D" Rollover—(2)
SW.30	#1 Rollover Button
SW.31	#2 Rollover Button
SW.32	#3 Rollover Button
SW.34	#4 Rollover Button
SW.40	Right Extra Ball Target
SW.41	Left "1" Vari-Target
SW.42	Left "2" Vari-Target
SW.43	Left "3" Vari-Target
SW.44	10 Point Switches—(5)
SW.50	Pop Bumpers—(2)
SW.51	Right "1" Vari-Target
SW.52	Right "2" Vari-Target
SW.53	Right "3" Vari-Target

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 (Lamp in Lightbox)
4	Same Player Shoots Again (Playfield & Lightbox)
5	5X Bonus
6	1,000 Points When Lit
7	4X Bonus
8	3X Bonus
9	Rollover Button
10	2X Bonus
11	Rollover Button
12	Rollover Button
13	Top "D" Rollover
14	Rollover Button
15	Top "C" Rollover
16	Top "B" Rollover
17	Special
18	Top "A" Rollover
19	Bottom "D" Rollover
20	Bottom "C" Rollover
21	Bottom "A" Rollover
22	Bottom "B" Rollover
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
35	Left Extra Ball
36	Right Extra Ball



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
4	Hundreds
5	Thousands
6	Right Vari-Target
7	Left Vari-Target
8	Not Used

VI. TROUBLE-SHOOTING GUIDE

Trouble-shooting the solid-state pinball game on location includes inspection and repair of the electro-mechanical devices and wiring, and inspection and replacement of printed circuit boards. Repair of printed circuit boards on location, while possible, is best done in a properly equipped shop.

Before replacing the control board (A1) on the driver board (A3), measure the voltages on the power supply (A2) after first disconnecting the two connectors A2J2 and A2J3. Before replacing any printed circuit board, check all connectors, crimp connections, and wire continuity.

WARNING! TURN OFF POWER BEFORE REMOVING ANY WIRE CONNECTORS OR REPLACING ANY PRINTED CIRCUIT BOARDS. ALL CONNECTORS MUST BE RECONNECTED BEFORE TURNING POWER ON AGAIN.

Basic game troubleshooting involves determining that the game powers up 5 seconds after power is turned on. If the 5 second delay does not occur, check the TILT and SLAM (anti-cheat) switches. Cycle the game through the self-test procedures described in SECTION V and observe any malfunctions. Detailed troubleshooting procedures and diagrams are in the Solid-State Pinball Game Service Manual.

VII. 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 ABRASE GOLD-PLATED SWITCH CONTACTS.

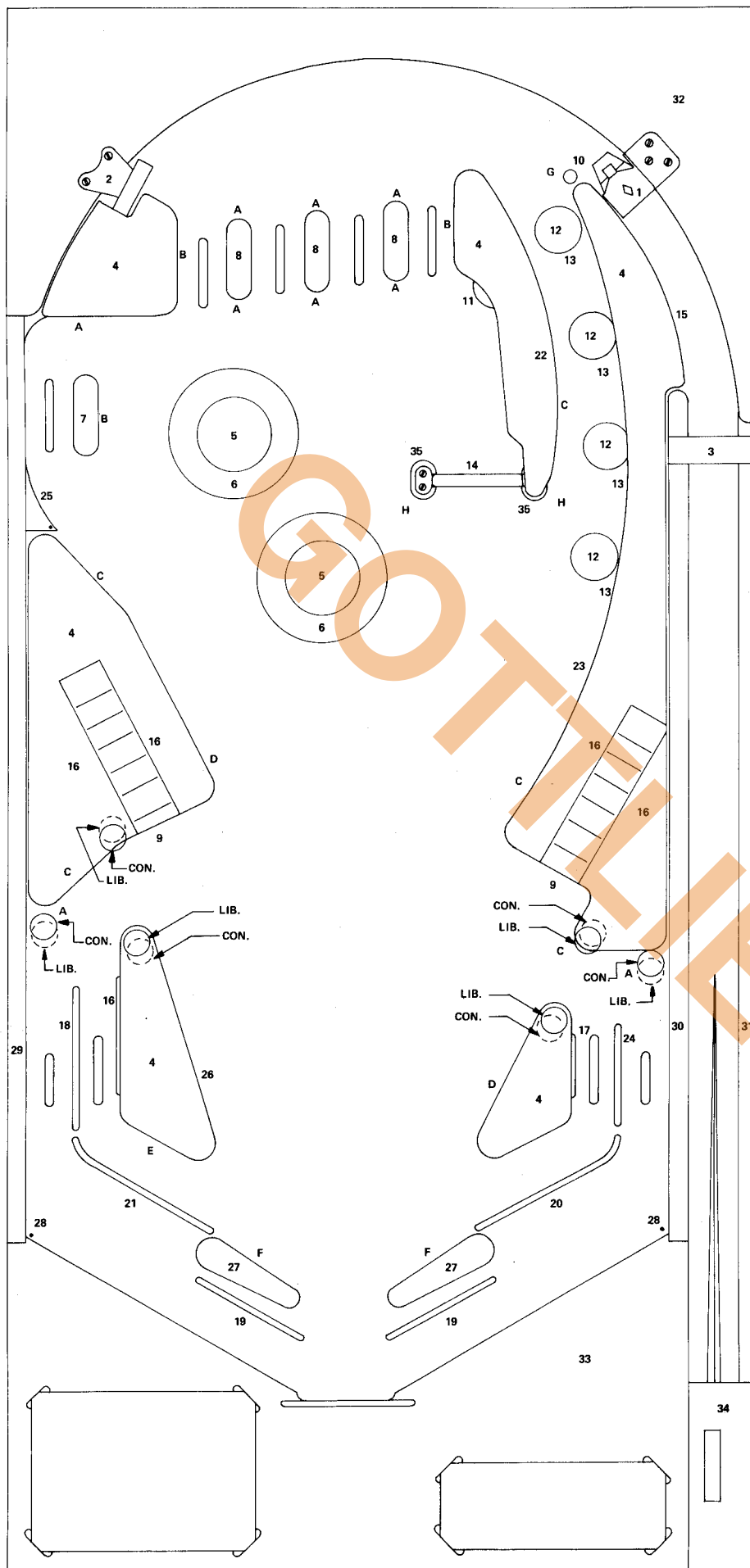
The only switches whose points may be burnished are the pop bumper cup switches, the rubber-actuated switches on kicking rubber units, and the flipper button switches.

VIII. SERVICE AND PARTS

PARTS LIST

A-9430	Plunger Link
A-18354	Assembly Ball Striker Arm
A-18356	Assembly of Track Frame and Studs
B-18358	Ball Return Fence
C-18359	Ball Return Fence
A-18361	Vari-Target Disc
A-18549	Ball Return Plunger
A-18613	Swinging Target Switch Rod
B-18627	Swinging Target Switch and Bracket
C-18638	Complete Ball Return Unit (Less Fences)
A-18687	Assembly of Plunger and Link
A-18688	Assembly Rollover Wire, Switch and Bracket
A-18702	Assembly of Coil Stop Bracket

NOTE: Dragon Uses Prom Marked "D".



PLAYBOARD INFORMATION

RUBBER RINGS

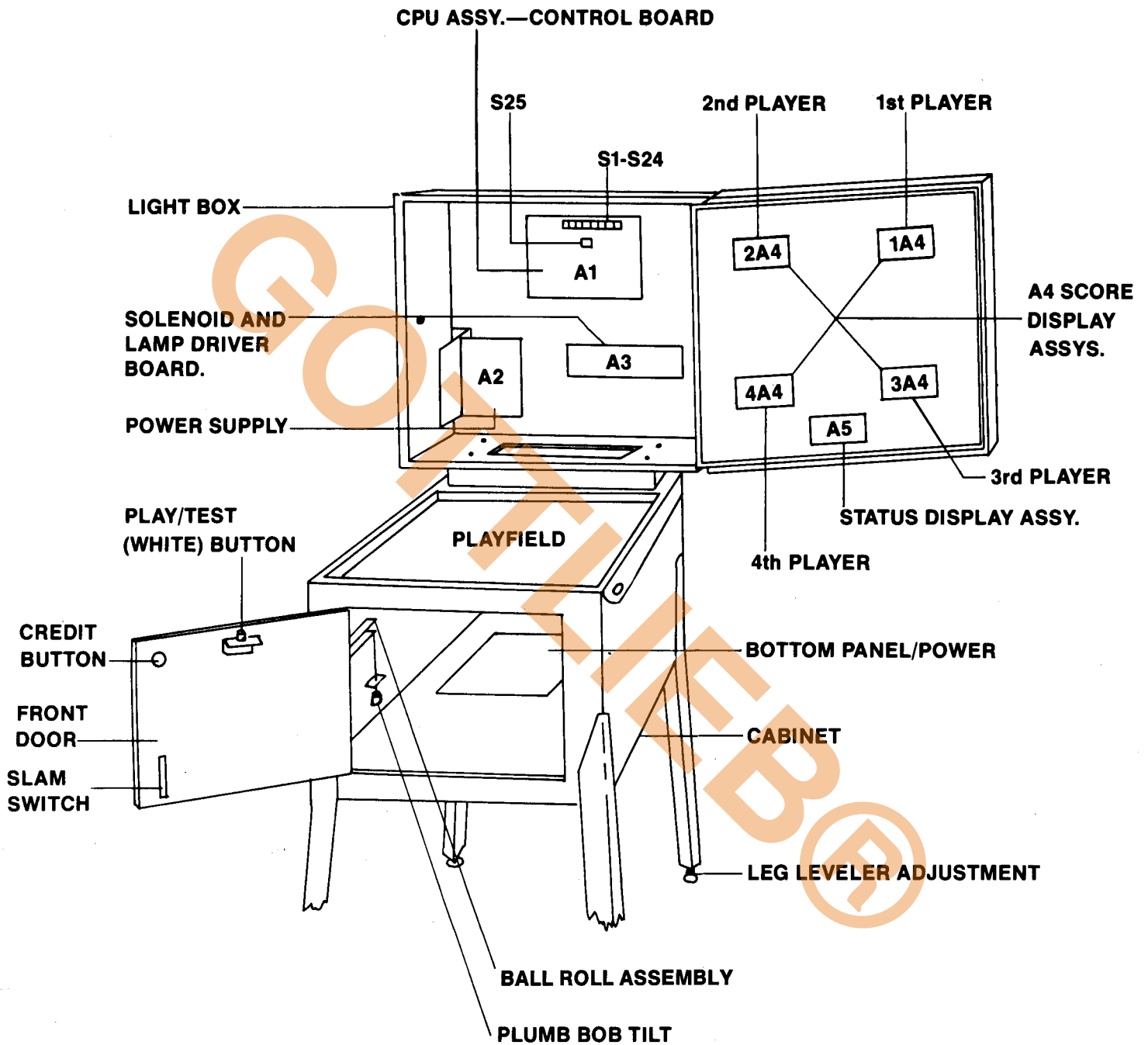
A-A-10217	(9) White
B-A-10219	(3) White
C-A-10220	(5) White
D-A-10222	(2) White
E-A-10223	(1) White
F-A-13151	(2) Red
G-A-15705	(1) White
	(Mini Post Screw)
H-A-17493	(2) White

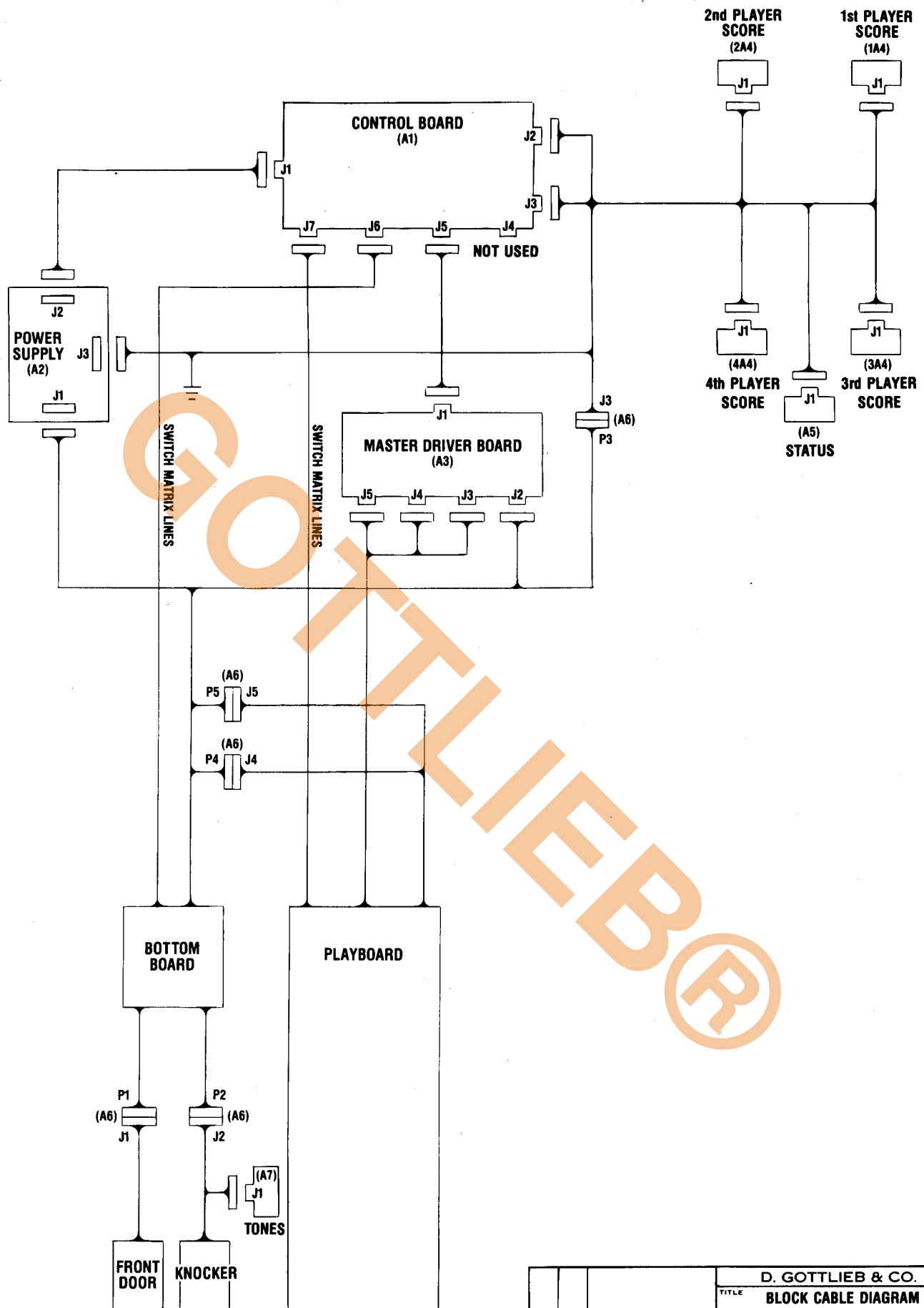
PARTS LIST

1. A-3290 Ball Gate.
2. A-9143 Ball Rebound Rubber.
3. A-8215 Ball Deflector.
4. C-18049 Plastic Shield Set.
5. Blue Pop Bumper A-13904 A-15200 White
Cap Stamped in Red & Blue.
6. B-8246 Pop Bumper Platter.—(2)
7. A-9393 Yellow Plastic Guide Rail.—(1)
8. A-9394 Yellow Plastic Guide Rail.—(3)
9. B-11535 Target Arm and Cam.
10. A-14792 Mini Post Screw.—(1)
11. A-9383 Bulls-Eye Target.—(2)
12. D-11966 Red Plastic Rollover Insert.—(4)
13. D-11968 White Plastic Rollover Button.—(4)
14. A-18759 Spinning Target.
15. A-4246 Ball Guide Rail.—(Wire Form)—(1)
16. A-4832 Ball Guide Rail.—(Wire Form)—(5)
17. A-6612 Ball Guide Rail.—(Wire Form)—(1)
18. A-13782 Ball Guide Rail.—(Wire Form)—(1)
19. A-13798 Ball Snubber Rail.—(Wire
Form)—(2)
20. A-14571 Ball Guide Rail.—(Wire Form)—(1)
21. A-14572 Ball Guide Rail.—(Wire Form)—(1)
22. A-16991 Ball Guide Rail.—(Wire Form)—(1)
23. B-16992 Ball Guide Rail.—(Wire Form)—(1)
24. A-17106 Ball Guide Rail.—(Wire Form)—(1)
25. A-17743 Metal Flat Rail.—(1)
26. A-15836 Kicking Rubber.
27. C-13150 White Jumbo Flipper.—(2)
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" & "5-6" Pos.
33. D-13647-1E Card Holder.
34. C-9767 Ball Shooter Gage.
35. A-17494 Target Mounting Bracket.—(2)
- C-11561 White Plastic Post 1" High.—(37)

LIB. = LIBERAL
CON. = CONSERVATIVE

COMPONENT LOCATION DIAGRAM





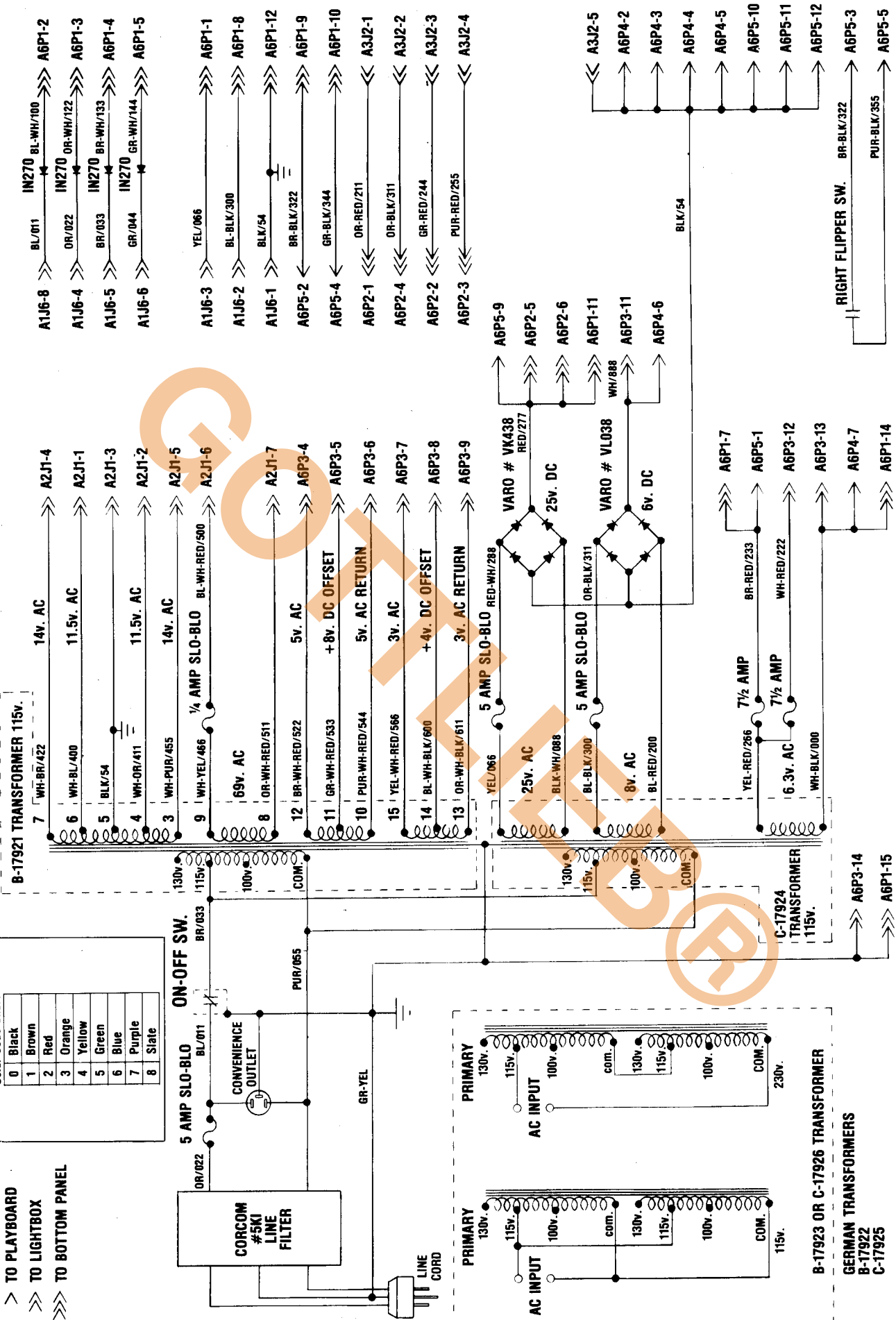
D. GOTTLIEB & CO.			
TITLE BLOCK CABLE DIAGRAM			
USED ON SOLID STATE			
DRAWN	APPROVED	DATE	C-18012
ISSUE	DATE	REVISIONS	

Note:
The number after the wire color indicates a possible color change.
The numbers correspond to a color as indicated in the color code chart.

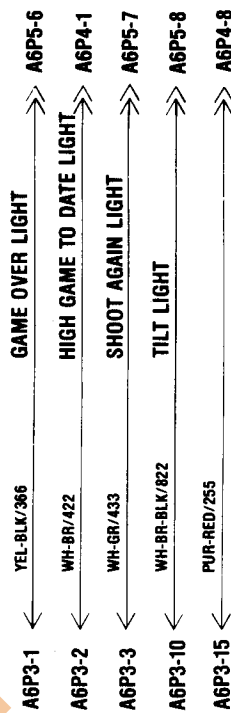
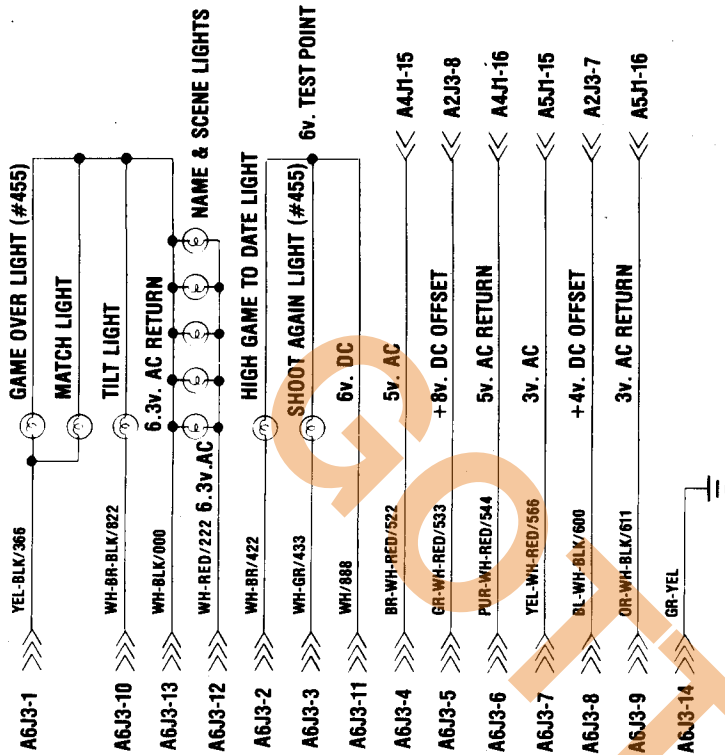
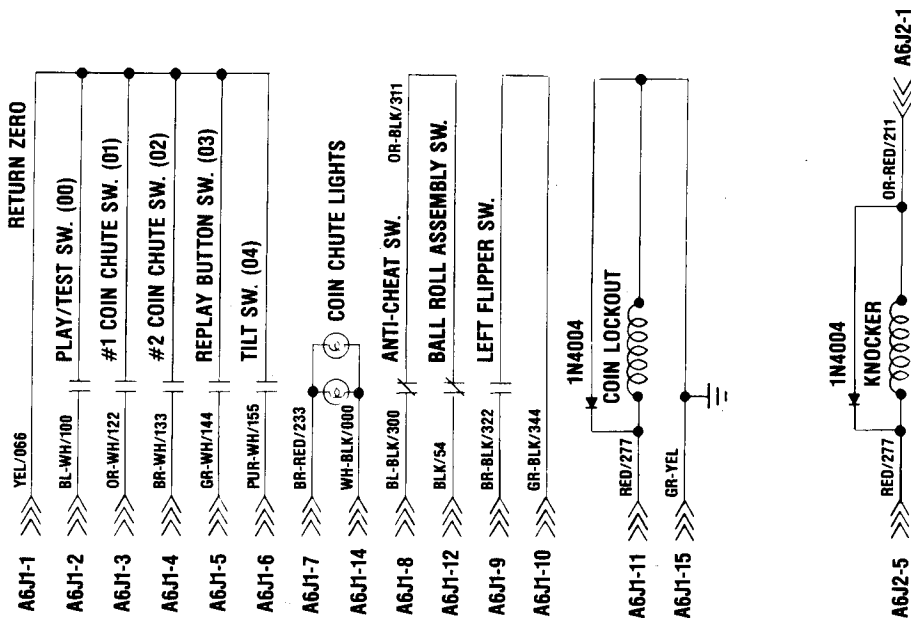
Color Code Chart

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

- NOTE:
- > TO PLAYBOARD
 - >> TO LIGHTBOX
 - >>> TO BOTTOM PANEL



D. GOTTLIEB & CO.	
TITLE	BOTTOM BOARD SCHEMATIC
USED ON	SOLID STATE
Filter Circuit Revised	DATE
1	APPROVED DATE
ISSUE DATE	REVISIONS
C-18013	



COILS USED

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

NOTE:

>	FROM PLAYBOARD
>>	FROM LIGHT BOX
>>>	FROM BOTTOM BOARD

Note:
The number after the wire color indicates a possible color change.
The numbers correspond to a color as indicated in the color code chart.

Color Code Chart

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

D. GOTTLIEB & CO.	
TITLE BOTTOM BOARD & LIGHT BOX	
SCHEMATIC	
USED ON SOLID STATE	
ISSUE DATE	REVISIONS
DRAWN	APPROVED DATE
C-18014	

SEE SWITCH MATRIX
AND LAMP LOCATION
DRAWING ON P. 5
FOR DESCRIPTION.

RETURNS

A1J7-10
NOT USED
7

A1J7-11
NOT USED
6

A1J7-15
PUR-WH/155
5

A1J7-16
GR-WH/144
4

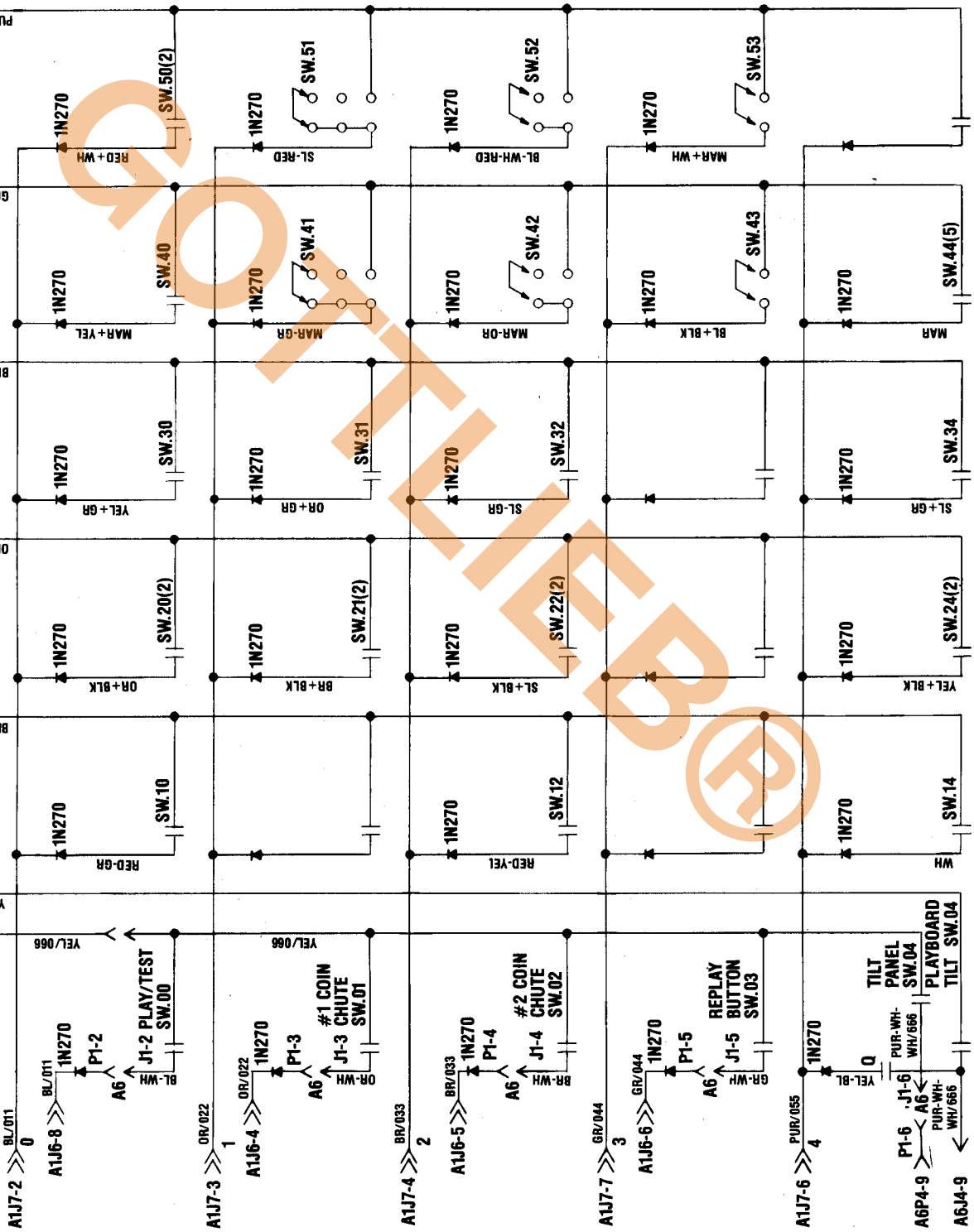
A1J7-17
BR-WH/133
3

A1J7-14
OR-WH/122
2

A1J7-13
BL-WH/100
1

A1J7-12
YEL/066
0

STROBES



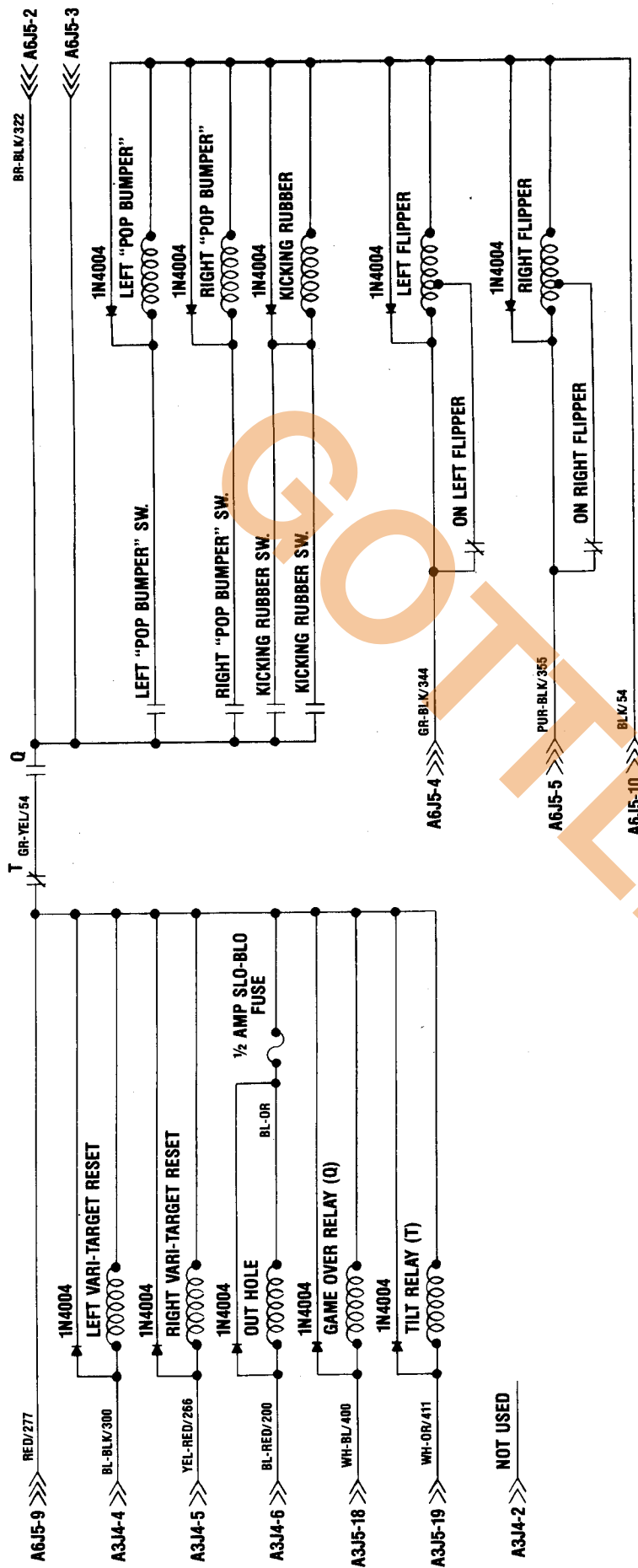
Note:
The number after the wire color indicates a possible color change.
The numbers correspond to a color as indicated in the color code chart.

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

D. GOTTLIEB & CO.	
TITLE	SWITCH MATRIX
USED ON	#419SS SOLID STATE
DRAWN	APPROVED DATE
ISSUE DATE	REVISIONS
C-18598	

NOTE: FROM PLAYBOARD

OUTHOLE SW. BLK/54 A1J7-8



NOTE:

>>> FROM LIGHTBOX

>>> FROM BOTTOM BOARD

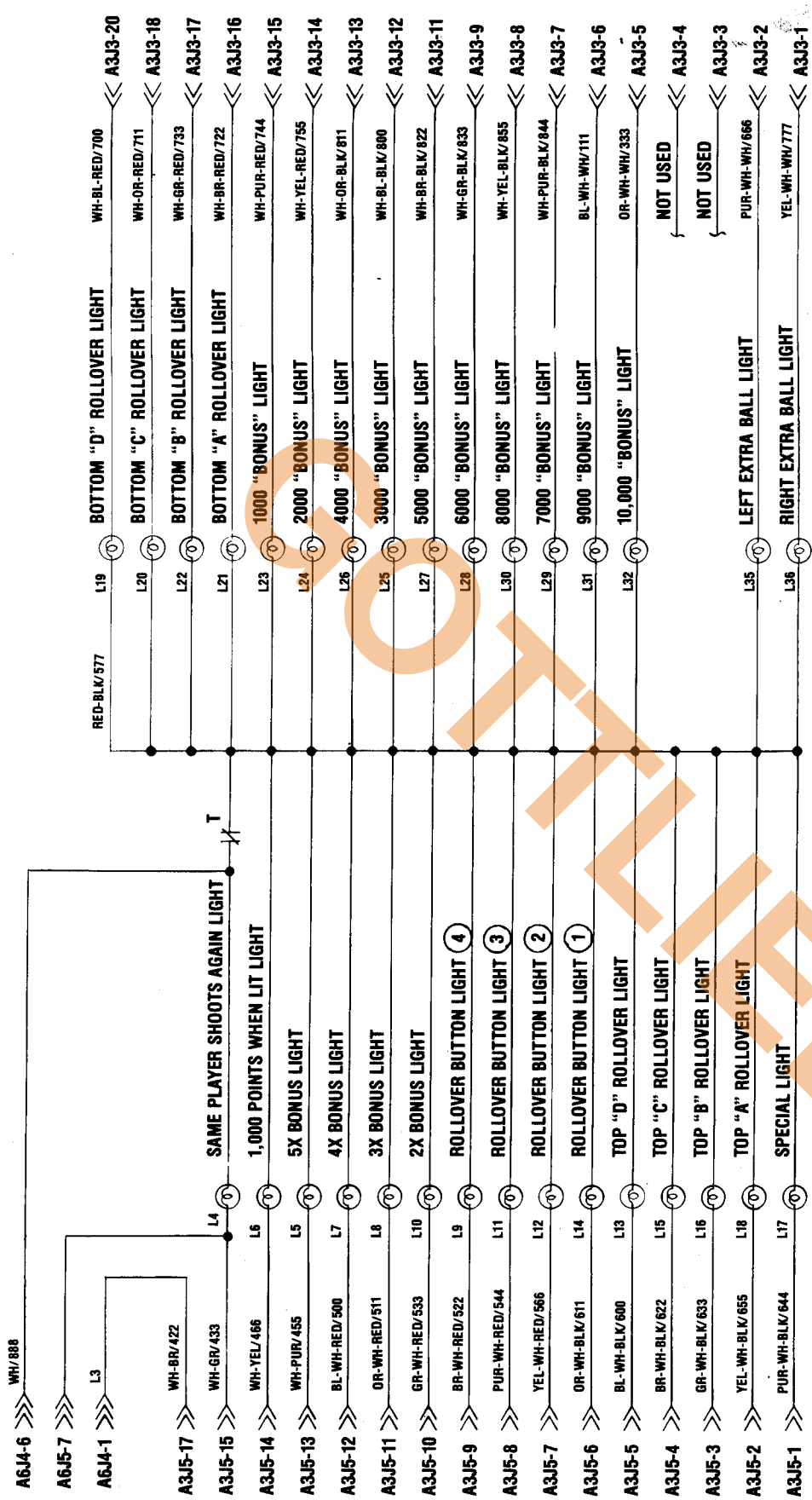
COILS USED

PART NO.	DESCRIPTION
A-1496	POP BUMPER COILS
A-5194	KICKING RUBBER COIL
A-16570	OUT HOLE COIL
A-17564	VARI-TARGET COILS
A-16890	GAME OVER RELAY COIL (Q)
A-16890	TILT RELAY COIL (T)
A-17875	FLIPPER COILS

Note: The number after the wire color indicates a possible color change. The numbers correspond to a color as indicated in the color code chart.

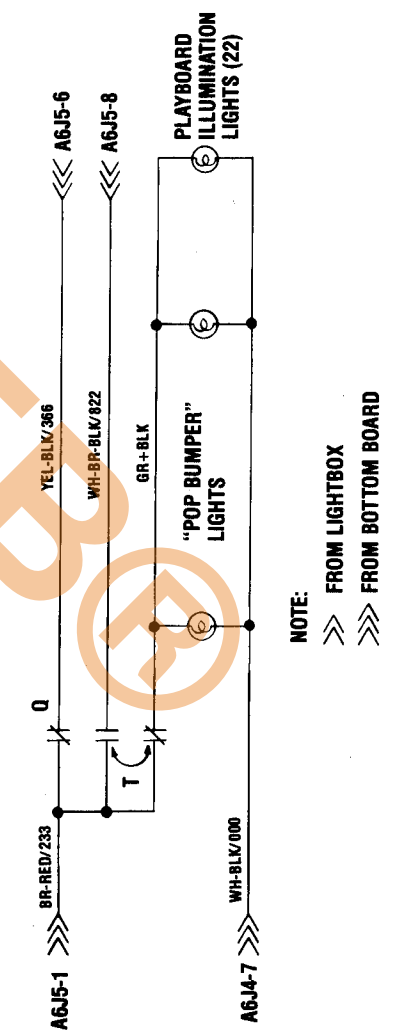
Color Code Chart
0 Black
1 Brown
2 Red
3 Orange
4 Yellow
5 Green
6 Blue
7 Purple
8 Slate
9 White

D. GOTTLIEB & CO.	
TITLE	PLAYBOARD SOLENOIDS
USED ON	#419 SS SOLID STATE
DRAWN	APPROVED DATE
ISSUE DATE	REVISIONS
	C-18597



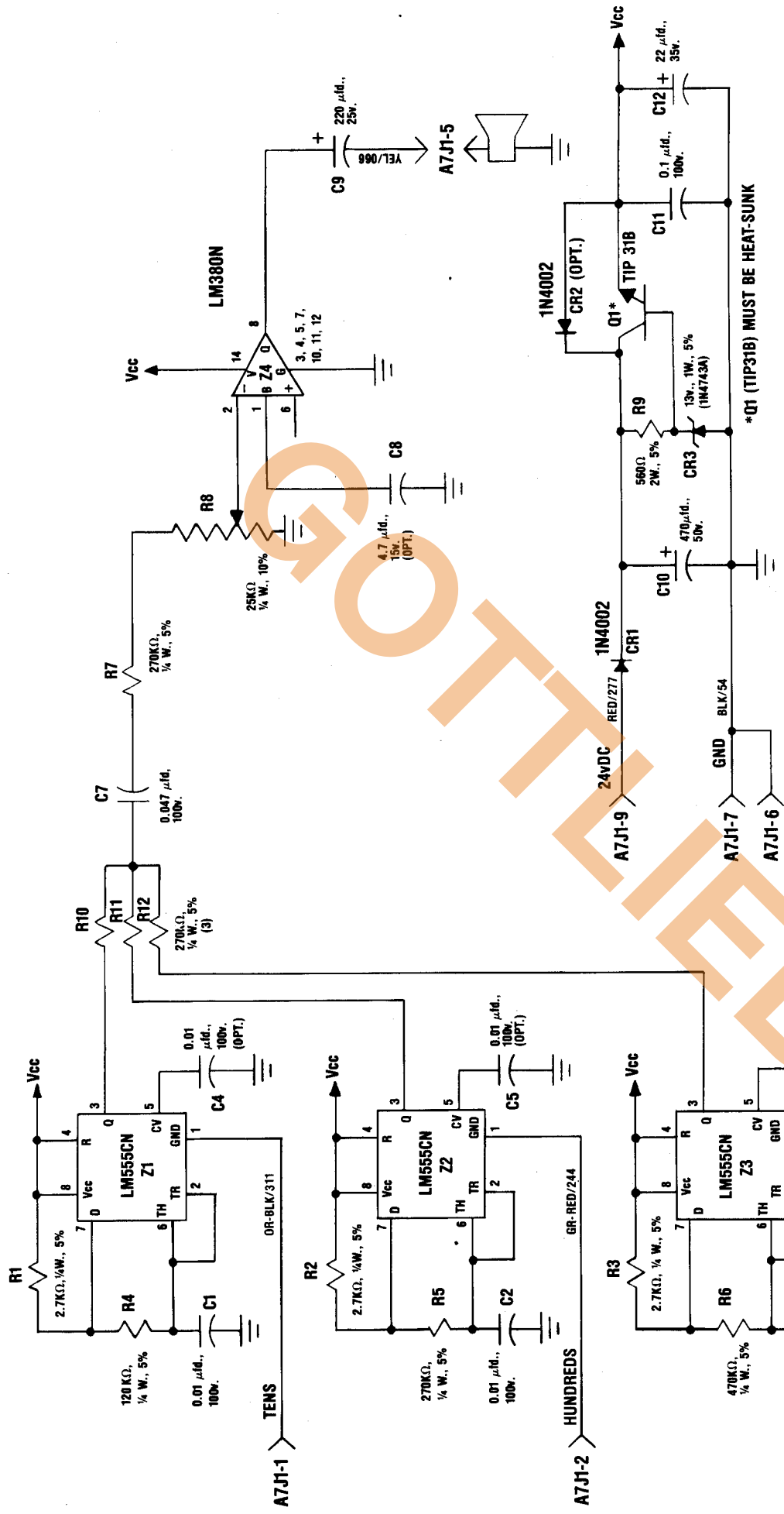
Note:
The number after the wire color indicates a possible color change. The numbers correspond to a color as indicated in the color code chart.

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



NOTE:
 >> FROM LIGHTBOX
 >>> FROM BOTTOM BOARD

D. GOTTLIEB & CO.	
TITLE	PLAYBOARD ILLUMINATION
USED ON	#419 SS
DRAWN	APPROVED DATE
ISSUE DATE	REVISIONS
C-18596	



Note:
The number after the wire color indicates a possible color change.
The numbers correspond to a color as indicated in the color code chart.

Color Code Chart

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

D. GOTTLIEB & CO.	
TITLE	SYNTHESIZED TONES
USED ON	
DRAWN	APPROVED
DATE	DATE
1	6-78 Added Colors
ISSUE	REVISIONS
B-18555-1	

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