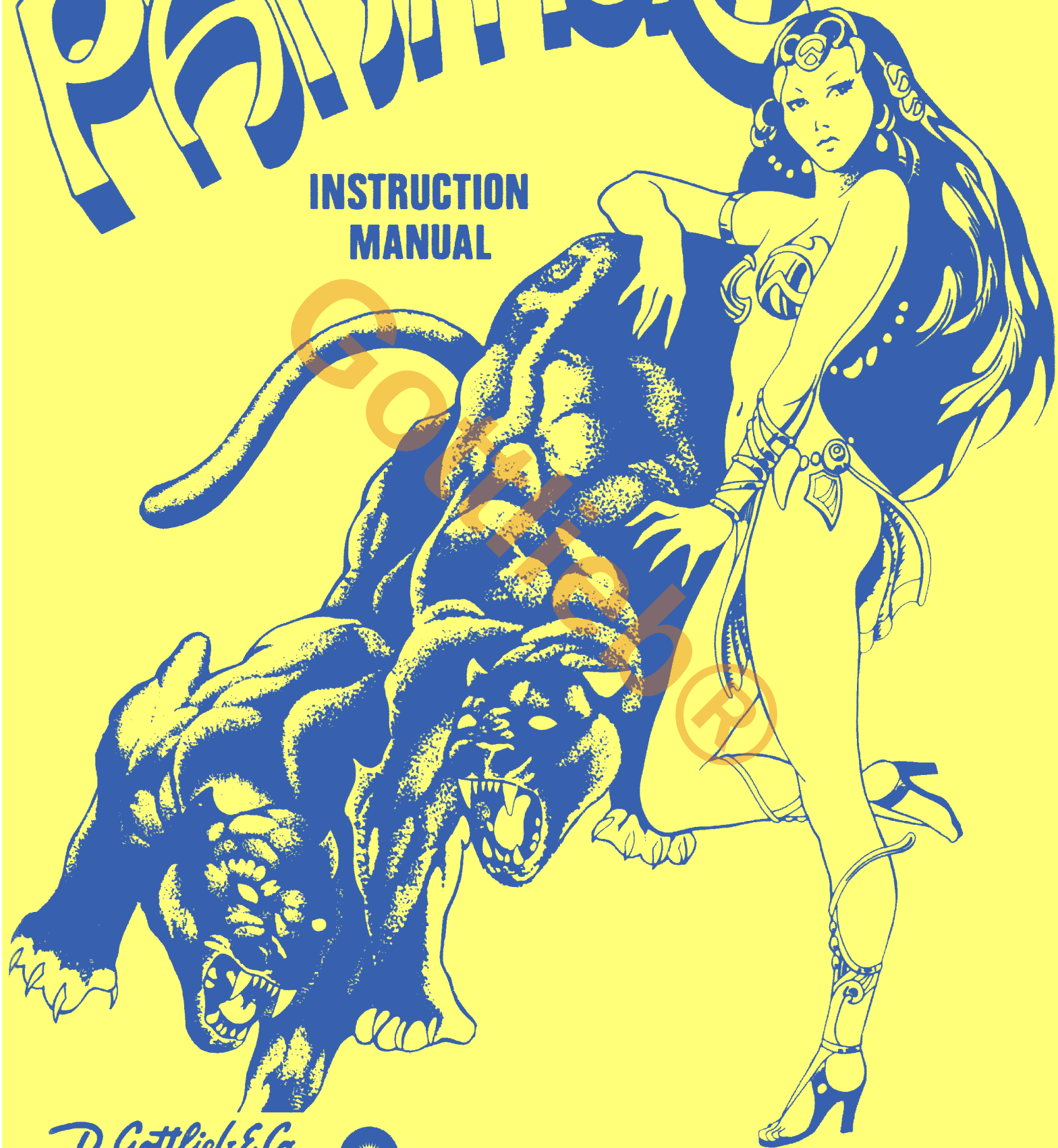


# Gottlieb's PANTHERO

## 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**

# **PANTHERA PROMS**

## **GAME #652**

**ARE MARKED AS FOLLOWS:**

**GAME PROM 1 IS 652/1X**

**GAME PROM 2 IS 652/2X**

**SOUND PROM IS 652**

**INSERT PROMS WITH  
INDENT NOTCH UP**

# **PANTHERA**

## **INSTRUCTION MANUAL**

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## PANTHERA

(SEE PAGE 6 FOR SWITCH LOCATION)

| SWITCH<br>NUMBER | SWITCH ASSIGNMENT           | SCORING                                                | FEATURE                                                                           |
|------------------|-----------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------|
| 00               | #1 Yellow Drop Target       | 500 Unlit or<br>5000 W/L (3 Ball)<br>3000 W/L (5 Ball) | Add Bonus W/L; All Three Targets of Same<br>Color Dropped W/L Advances Multiplier |
| 01               | #2 Yellow Drop Target       | Same as SW 00                                          | Same as SW 00                                                                     |
| 02               | #3 Yellow Drop Target       | Same as SW 00                                          | Same as SW 00                                                                     |
| 03               | #3 Yellow Rollovers (2)     | 500 or 5000 When Lit                                   | Add Bonus; Lights Targets                                                         |
| 04               | Bulls Eye Target            | 500 Points                                             | Add Bonus; Extra Ball When Lit                                                    |
| 05               | #1 Rollover                 | 100 or 10,000 When Lit                                 | Add Bonus When Lit                                                                |
| 10               | #1 Blue Drop Target         | Same as SW 00                                          | Same as SW 00                                                                     |
| 11               | #2 Blue Drop Target         | Same as SW 00                                          | Same as SW 00                                                                     |
| 12               | #3 Blue Drop Target         | Same as SW 00                                          | Same as SW 00                                                                     |
| 13               | Blue Rollovers (2)          | 500 or 5000 When Lit                                   | Add Bonus; Lights Target                                                          |
| 14               | Rollover Buttons (2)        | 50 Points                                              | Add Bonus                                                                         |
| 15               | #2 Rollover (2)             | 100 or 10,000 When Lit                                 | Add Bonus When Lit                                                                |
| 20               | #1 White Drop Target        | Same as SW 00                                          | Same as SW 00                                                                     |
| 21               | #2 White Drop Target        | Same as SW 00                                          | Same as SW 00                                                                     |
| 22               | #3 White Drop Target        | Same as SW 00                                          | Same as SW 00                                                                     |
| 23               | White Rollovers (2)         | 500 or 5000 When Lit                                   | Add Bonus; Lights Targets                                                         |
| 24               | Pop Bumpers (2)             | 3 Ball—1000 Points<br>5 Ball—100 Points                | Alternate Special and Extra Ball<br>(Liberal-Conservative Adj.)                   |
| 25               | #3 Rollover and Spin Target | 100 or 10,000 When Lit<br>(Max. 50,000 When Lit)       | Rollover—Adds Bonus When Lit<br>Spin Target—Adds Max. 5 Bonus When Lit            |
| 30               | #1 Green Drop Target        | Same as SW 00                                          | Same as SW 00                                                                     |
| 31               | #2 Green Drop Target        | Same as SW 00                                          | Same as SW 00                                                                     |
| 32               | #3 Green Drop Target        | Same as SW 00                                          | Same as SW 00                                                                     |
| 33               | Green Rollovers (2)         | 500 or 5000 When Lit                                   | Add Bonus; Lights Targets                                                         |
| 34               | 10 Point Contacts (10)      | 10 Points                                              | Alternate Special and Extra Ball<br>(Liberal-Conservative Adj.)                   |
| 35               | Hole                        | 1000 Points                                            | Add 3 Bonus; Special and Score<br>Bonus When Lit                                  |
| 57               | Tilt                        |                                                        | Tilt                                                                              |
| 67               | Outhole                     |                                                        | Score Bonus                                                                       |

## I. INSTALLATION

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

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

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

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

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

## II. GAME ADJUSTMENTS

### A. PLAYFIELD ADJUSTMENTS

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

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

### B. LIGHTBOX ADJUSTMENTS

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

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

#### SWITCHES

|    |     |     |     |              |
|----|-----|-----|-----|--------------|
| 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.

#### COIN CHUTE ADJUSTMENTS

#### COINS/CREDITS

|     |     |     |     |             |
|-----|-----|-----|-----|-------------|
| OFF | OFF | OFF | OFF | 1/1         |
| OFF | OFF | OFF | ON  | 1/2         |
| OFF | OFF | ON  | OFF | 1/3         |
| OFF | OFF | ON  | ON  | 1/4         |
| OFF | ON  | OFF | OFF | 1/5         |
| OFF | ON  | OFF | ON  | 1/6         |
| OFF | ON  | ON  | OFF | 1/7         |
| OFF | ON  | ON  | ON  | 1/8         |
| ON  | OFF | OFF | OFF | 1/9         |
| ON  | OFF | OFF | ON  | 2/1*        |
| ON  | OFF | ON  | OFF | 2/2*        |
| ON  | OFF | ON  | ON  | 2/3*        |
| ON  | ON  | OFF | OFF | 2/4*        |
| ON  | ON  | OFF | ON  | 2/5*        |
| ON  | ON  | ON  | OFF | 1/1 and 2/3 |
| ON  | ON  | ON  | ON  | 3/1*        |

\*NO CREDITS UNTIL LAST COIN IS INSERTED

**SWITCH 13** ..... **EXTRA CREDITS**  
 ON ..... Adds 9 credits to center coin chute setting  
 OFF ..... No effect

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

**SWITCH 14** ..... **COIN CHUTE CONTROL**  
 ON ..... Left and Right Chutes Same  
 OFF ..... Left and Right Chutes Separate

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

**SWITCHES**  
**15 16** ..... **MAXIMUM CREDITS**  
 OFF OFF ..... .8  
 OFF ON ..... .10  
 ON OFF ..... .15  
 ON ON ..... .25

**SWITCH 17** ..... **BALLS PER GAME**  
 ON ..... .3  
 OFF ..... .5

**SWITCH 18** ..... **MATCH FEATURE**  
 ON ..... ON  
 OFF ..... OFF

**SWITCH 19** ..... **REPLAY LIMIT**  
 ON ..... Limits each player to one replay per game  
 OFF ..... No replay limit

**SWITCH 20** ..... **NOVELTY MODE**  
 ON ..... Playfield SPECIAL and EXTRA BALL features award 50,000 points and 5 knocks. High score, high game to date, and match features disabled.  
 OFF ..... Normal game mode.

NOTE: SWITCH 20 overrides SWITCH 21

**SWITCH 21** ..... **GAME MODE**  
 ON ..... Extra Ball  
 OFF ..... Replay

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

**SWITCH 22** ..... **PLAYFIELD SPECIAL**  
 ON ..... Awards Extra Ball  
 OFF ..... Awards Special

**SWITCHES**  
**23 24** ..... **HIGH GAME TO DATE**  
 OFF OFF ..... Not displayed — no award  
 OFF ON ..... Displayed — No award  
 ON OFF ..... Displayed — awards 2 replays  
 ON ON ..... Displayed — awards 3 replays

**SWITCH 25** ..... **SOUND WHEN SCORING?**  
 ON ..... Yes  
 OFF ..... No

**SWITCH 26** ..... **REPLAY BUTTON TUNE?**  
 ON ..... Yes  
 OFF ..... No

**SWITCH 27** ..... **COIN SWITCH TUNE?**  
 ON ..... Yes  
 OFF ..... No

**SWITCH 28** ..... **CREDITS DISPLAYED?**  
 ON ..... Yes  
 OFF ..... No

**SWITCH 29** ..... **TILT PENALTY**  
 ON ..... Ball in play only  
 OFF ..... Game over

**SWITCH 30** ..... **ATTRACT FEATURES**  
 ON ..... ON  
 OFF ..... OFF

**SWITCH 31**  
 ON ..... LIBERAL  
 OFF ..... CONSERVATIVE

**SWITCH 32**  
 ON ..... LIBERAL  
 OFF ..... CONSERVATIVE

## LIBERAL-CONSERVATIVE ADJUSTMENTS

The two rightmost switches (31 & 32) on the control board allow liberal-conservative adjustments.

SWITCH 31 in the CONSERVATIVE position alternates the extra ball target when lit off the pop bumpers and 10 point switches.

SWITCH 32 in the CONSERVATIVE position alternates the hole for special when lit off the pop bumpers and 10 point switches.

RECOMMENDED SETTINGS ARE: SWITCH 31 — LIBERAL  
SWITCH 32 — CONSERVATIVE

## C. ELECTRONIC SOUND ADJUSTMENTS

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

### SWITCH S1

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

### SWITCH S2

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

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

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

## III. GAME OPERATION

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

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

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

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

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

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

Tilting the game results in a penalty depending on the setting of switch 29. There is a normally closed switch on the front door and one on the ball roll assembly. If either of these switches opens from raising the front of the game or pounding the front door, the entire game is ended. The Game Over light comes on and for three seconds the entire switch matrix is inactive.

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

#### IV. BOOKKEEPING AND SELF-TEST

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

| STEP<br>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<br>(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<br>PLAYER 1 shows minutes<br>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

Replays 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 | #3 Target Bank Reset       |
| 2 | #1 Target Bank Reset       |
| 3 | Left Coin Chute counter*   |
| 4 | Right Coin Chute counter*  |
| 5 | #2 Target Bank Reset       |
| 6 | Hole Kicker                |
| 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.

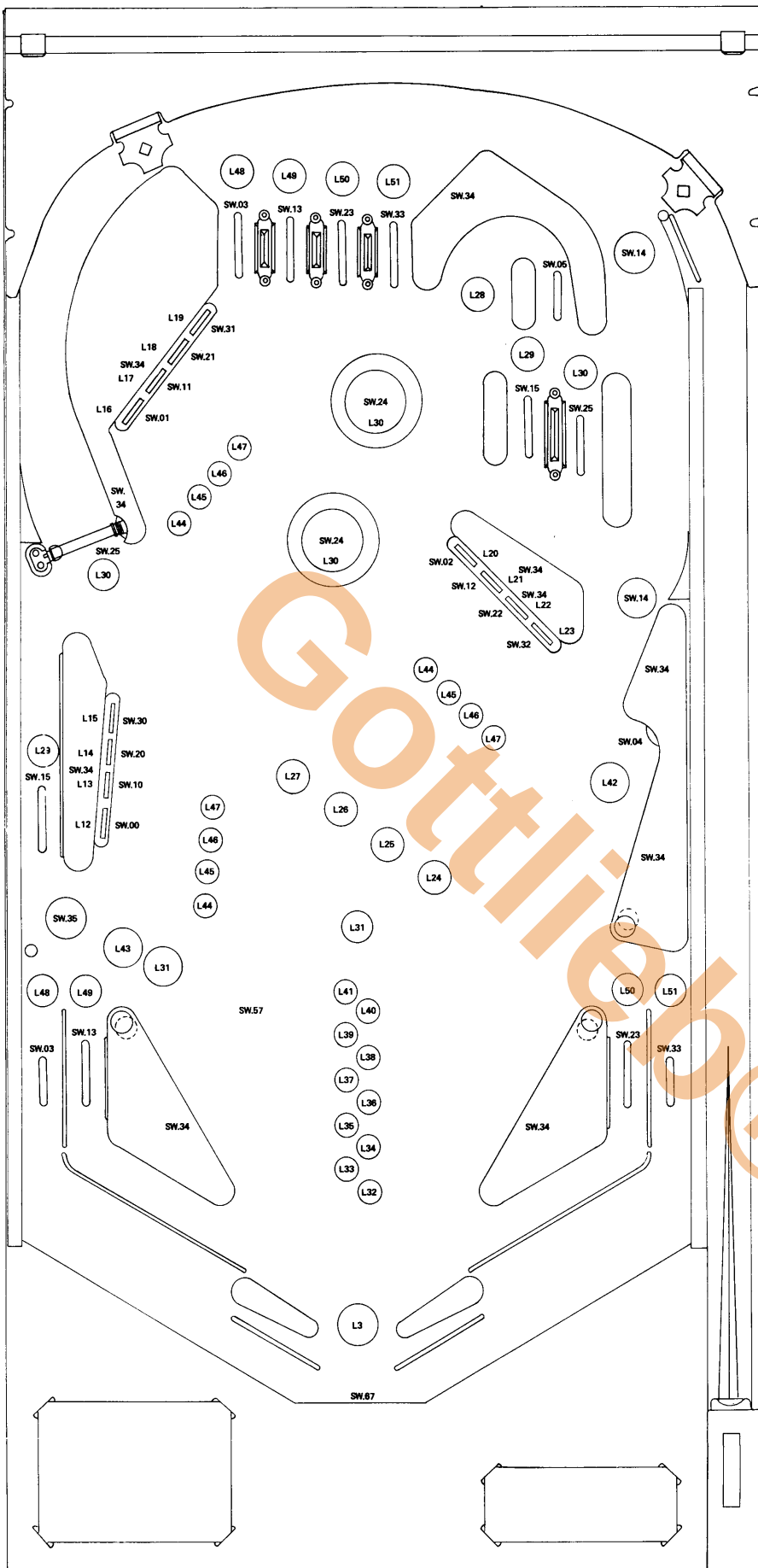
Any of the tests in steps 16 through 20 may be repeated any number of times by pressing the replay button immediately after the test is completed.

## 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

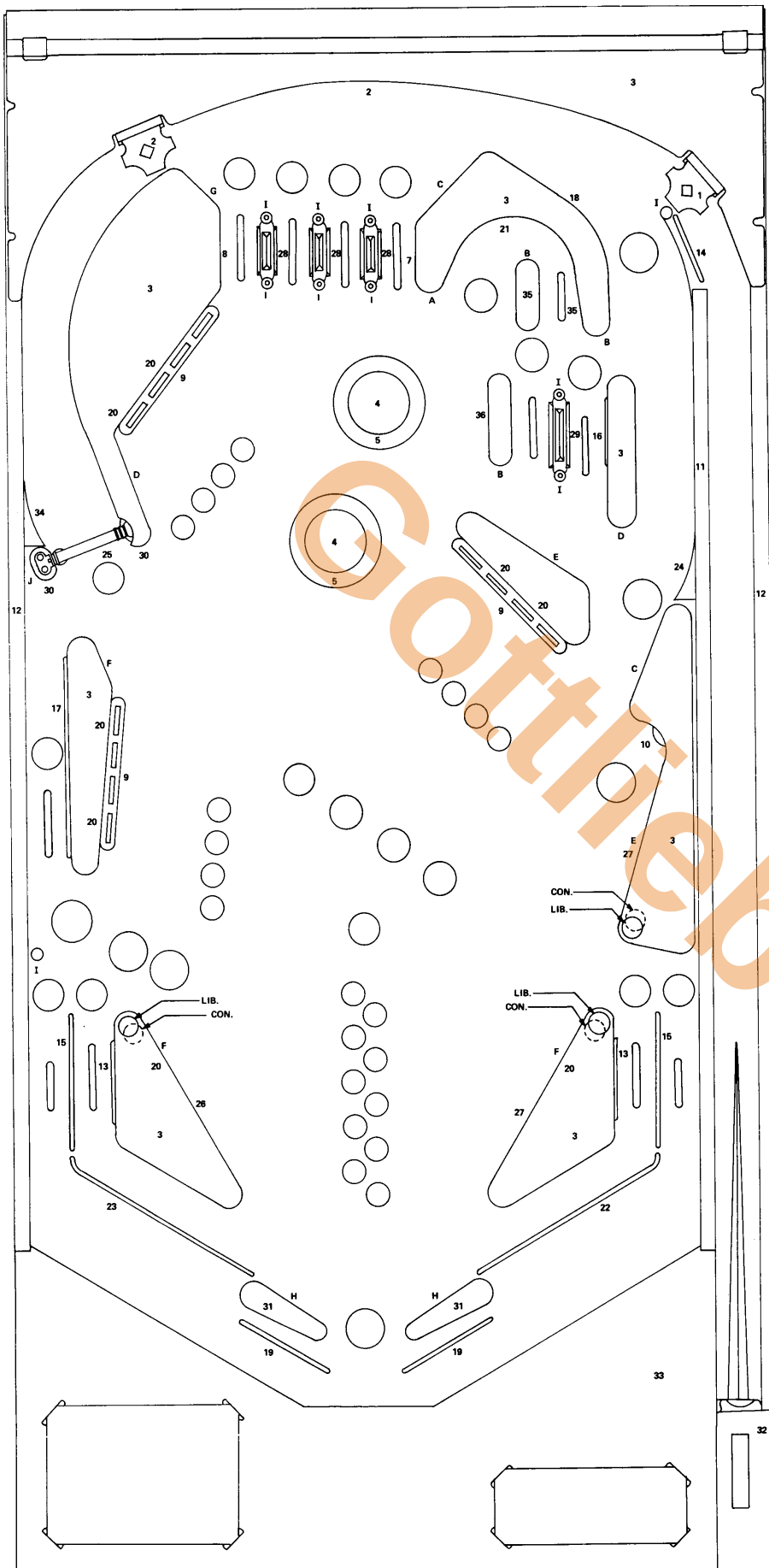
| SW. MATRIX<br>NUMBER | SWITCH FUNCTION              |
|----------------------|------------------------------|
| 00                   | #1 Yellow Drop Target.       |
| 01                   | #2 Yellow Drop Target.       |
| 02                   | #3 Yellow Drop Target.       |
| 03                   | Yellow Rollovers. (2)        |
| 04                   | Bull's Eye Target.           |
| 05                   | #1 Rollover.                 |
| 10                   | #1 Blue Drop Target.         |
| 11                   | #2 Blue Drop Target.         |
| 12                   | #3 Blue Drop Target.         |
| 13                   | Blue Rollovers. (2)          |
| 14                   | Rollover Buttons. (2)        |
| 15                   | #2 Rollovers. (2)            |
| 20                   | #1 White Drop Target.        |
| 21                   | #2 White Drop Target.        |
| 22                   | #3 White Drop Target.        |
| 23                   | White Rollovers. (2)         |
| 24                   | Pop Bumpers. (2)             |
| 25                   | #3 Rollover and Spin Target. |
| 30                   | #1 Green Drop Target.        |
| 31                   | #2 Green Drop Target.        |
| 32                   | #3 Green Drop Target.        |
| 33                   | Green Rollovers. (2)         |
| 34                   | 10 Point Contacts. (10)      |
| 35                   | Hole.                        |
| 57                   | Tilt.                        |
| 67                   | Outhole.                     |

### CPU CONTROLLED LAMPS

| LAMP<br>NUMBER | LAMP LOCATION                                         |
|----------------|-------------------------------------------------------|
| 0              | Game Over Relay.                                      |
| 1              | Tilt Relay.                                           |
| 2              | Coin Lockout Relay.                                   |
| 3              | Same Player Shoots Again.<br>(Lightbox and Playfield) |
| 4              | 1st Player.                                           |
| 5              | 2nd Player.                                           |
| 6              | 3rd Player.                                           |
| 7              | 4th Player.                                           |
| 10             | High Game To Date.                                    |
| 11             | Game Over.                                            |
| 12             | #1 Yellow Drop Target.                                |
| 13             | #1 Blue Drop Target.                                  |
| 14             | #1 White Drop Target.                                 |
| 15             | #1 Green Drop Target.                                 |
| 16             | #2 Yellow Drop Target.                                |
| 17             | #2 Blue Drop Target.                                  |
| 18             | #3 White Drop Target.                                 |
| 19             | #2 Green Drop Target.                                 |
| 20             | #3 Yellow Drop Target.                                |
| 21             | #3 Blue Drop Target.                                  |
| 22             | #3 White Drop Target.                                 |
| 23             | #3 Green Drop Target.                                 |
| 24             | 2X                                                    |
| 25             | 3X                                                    |
| 26             | 4X                                                    |
| 27             | 5X                                                    |
| 28             | #1 Rollover.                                          |
| 29             | #2 Rollovers. (2)                                     |
| 30             | #3 Rollover and Spin Target.                          |
| 31             | 20,000 and Scores Bonus.                              |
| 32             | 1000 Bonus.                                           |
| 33             | 2000 Bonus.                                           |
| 34             | 3000 Bonus.                                           |
| 35             | 4000 Bonus.                                           |
| 36             | 5000 Bonus.                                           |
| 37             | 6000 Bonus.                                           |
| 38             | 7000 Bonus.                                           |
| 39             | 8000 Bonus.                                           |
| 40             | 9000 Bonus.                                           |
| 41             | 10,000 Bonus.                                         |
| 42             | Extra Ball.                                           |
| 43             | Special.                                              |
| 44             | Yellow Drop Targets. (3)                              |
| 45             | Blue Drop Targets. (3)                                |
| 46             | White Drop Targets. (3)                               |
| 47             | Green Drop Targets. (3)                               |
| 48             | Yellow Rollovers. (2)                                 |
| 49             | Blue Rollovers. (2)                                   |
| 50             | White Rollovers. (2)                                  |
| 51             | Green Rollovers. (2)                                  |

Lamps in  
Lightbox

## VII. PLAYBOARD INFORMATION



### PLAYBOARD INFORMATION

#### RUBBER RINGS

- A—A-10217 (1)
- B—A-10219 (3)
- C—A-10220 (2)
- D—A-10221 (2)
- E—A-10223 (2)
- F—A-10224 (3)
- G—A-10225 (1)
- H—A-13151 (2)
- I—A-15705 (10)
- J—A-17493 (1)

#### PARTS LIST

1. A-19645 Ball Gate Right.
  2. A-19646 Ball Gate Left.
  3. D-20014 Plastic Shield Set.
  4. Blue Pop Bumper A-15980 and A-20109 Cap Stamped in Black. (2)
  5. C-10433 Pop Bumper Skirt in White. (2)
  6. D-19649 Arch Rail.
  7. A-9393 Yellow Plastic Guide Rail.
  8. A-9395 Yellow Plastic Guide Rail.
  9. 4 Pos. Drop Banks. (3)
  10. A-9383 Target.
  11. B-19647 Center Wood Rail.
  12. C-19648 Right and Left Wood Rail. (2)
  13. A-3722 Ball Guide Rail. (2)
  14. A-4831 Ball Guide Rail. (1)
  15. A-4833 Ball Guide Rail. (2)
  16. A-6612 Ball Guide Rail. (1)
  17. A-11703 Ball Guide Rail. (1)
  18. A-13782 Ball Guide Rail. (1)
  19. A-13798 Ball Snubber Rail. (2)
  20. A-18070 Ball Guide Rail. (8)
  21. B-19963 Ball Guide Rail. (1)
  22. A-19995 Ball Guide Rail. (1)
  23. A-19996 Ball Guide Rail. (1)
  24. B-19962 Metal Flat Rail. (1)
  25. A-20098 Spinning Target.
  26. A-15836 Left Kicking Rubber.
  27. A-15838 Right Kicking Rubber. (2)
  28. C-15647 Yellow Rollover Guide. (3)
  29. C-15648 Red Rollover Guide. (1)
  30. C-17492 White Siamese Post. (2)
  31. C-13150 White Jumbo Flipper. (2)
  32. C-9767 Ball Shooter Gage.
  33. E-18793 Card Holder.
  34. A-6509 Metal Flat Rail. (1)
  35. A-9393 Red Plastic Guide Rail. (2)
  36. A-9395 Red Plastic Guide Rail.
- C-11561 Clear 1" High Post. (33)  
A-14487 Split Post Base. (4)  
A-14488 Split Post Cap. (4)

CON.=CONSERVATIVE.  
LIB. =LIBERAL.

## VIII. CABLE PLUG WIRE ASSIGNMENTS

The following lists provide wire color and function information for each wire of each connector in the game. Wire colors are shown as numbers. Use the chart below to convert to colors.

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

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

Printed Circuit Board connectors are shown as AX-JX.

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

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

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

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

| A1-J1 |            |          | 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            |
| A1-J2 |            |          | 6     | 9          | LD2            |
| PIN   | WIRE COLOR | FUNCTION | 7     | 9          | LD1            |
| 1     | 300        | aA       | 8     | —          | SPARE          |
| 2     | 311        | bA       | 9     | —          | SPARE          |
| 3     | 322        | cA       | 10    | —          | SPARE          |
| 4     | 333        | dA       | 11    | —          | SPARE          |
| 5     | 344        | eA       | 12    | —          | SPARE          |
| 6     | 355        | fA       | 13    | —          | SPARE          |
| 7     | 366        | gA       | 14    | —          | SPARE          |
| 8     | 377        | hA       | 15    | —          | SPARE          |
| 9     | 600        | aB       | 16    | —          | SPARE          |
| 10    | 611        | bB       | 17    | —          | SPARE          |
| 11    | 622        | cB       | 18    | —          | KEY            |
| 12    | 633        | dB       | 19    | —          | SPARE          |
| 13    | 644        | eB       | 20    | —          | SPARE          |
| 14    | 655        | fB       | 21    | 9          | KNOCKER        |
| 15    | 666        | gB       | 22    | 9          | 3RD COUNTER    |
| 16    | 677        | hB       | 23    | 9          | 2ND COUNTER    |
| 17    | 800        | aC       | 24    | 9          | 1ST COUNTER    |
| 18    | 811        | bC       | A     | *54        | GROUND (SPARE) |
| 19    | 822        | cC       | B     | *688       | +5VDC (SPARE)  |
| 20    | 833        | dC       | C     | 9          | DS1            |
| 21    | 844        | eC       | D     | 9          | DS4            |
| 22    | 855        | fC       | E     | 9          | DS3            |
| 23    | 866        | gC       | F     | 9          | DS6            |
| 24    | 877        | hC       | H     | 9          | DS5            |
| A1-J3 |            |          | J     | 9          | DS8            |
| PIN   | WIRE COLOR | FUNCTION | K     | 9          | DS7            |
| 1     | 400        | D1       | L     | 9          | DS10           |
| 2     | 411        | D2       | M     | 9          | DS9            |
| 3     | 422        | D3       | N     | 9          | DS11           |
| 4     | 433        | D4       | P     | 9          | DS12           |
| 5     | 444        | D5       | R     | 9          | SOLENOID 5     |
| 6     | 455        | D6       | S     | 9          | SOLENOID 1     |
| 7     | 466        | D7       | T     | 9          | OUTHOLE        |
| 8     | 477        | D8       | U     | 9          | SOLENOID 6     |
| 9     | 700        | D9       | V     | —          | (KEY)          |
| 10    | 711        | D10      | W     | —          | SPARE          |
| 11    | 722        | D11      | X     | 9          | SOLENOID 2     |
| 12    | 733        | D12      | Y     | 9          | SOUND 8        |
| 13    | 744        | D13      | Z     | 9          | SOUND 4        |
| 14    | 755        | D14      | A     | 9          | SOUND 2        |
| 15    | 766        | D15      | B     | 9          | SOUND 1        |
| 16    | 777        | D16      |       |            |                |
| 17    | —          | SPARE    |       |            |                |

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

| A1-J5 |            |              | A2-J3 |            |                |
|-------|------------|--------------|-------|------------|----------------|
| PIN   | WIRE COLOR | FUNCTION     | PIN   | WIRE COLOR | FUNCTION       |
| 1     | 677        | RETURN 7     | 1     | 044        | +60VDC         |
| 2     | 400        | STROBE 0     | 2     | —          | (KEY)          |
| 3     | 411        | STROBE 1     | 3     | 055        | +42VDC         |
| 4     | 422        | STROBE 2     | 4     | 54         | GROUND         |
| 5     | 433        | STROBE 3     | 5     | 54         | GROUND         |
| 6     | *444       | STROBE 4     | 6     | 688        | +5VDC (SPARE)  |
| 7     | 455        | STROBE 5     | 7     | 688        | +5VDC          |
| 8     | 666        | RETURN 6     |       |            |                |
| 9     | 477        | STROBE 7     | A3-J1 |            |                |
| 10    | 700        | SLAM SW.     | PIN   | WIRE COLOR | FUNCTION       |
| A1-J6 |            |              | 1     | *54        | GROUND         |
| PIN   | WIRE COLOR | FUNCTION     | 2     | *688       | +5VDC          |
| 1     | 400        | STROBE 0     | 3     | 9          | DS2            |
| 2     | 411        | STROBE 1     | 4     | 9          | LD3            |
| 3     | 422        | STROBE 2     | 5     | 9          | LD4            |
| 4     | 433        | STROBE 3     | 6     | 9          | LD2            |
| 5     | 444        | STROBE 4     | 7     | 9          | LD1            |
| 6     | 455        | STROBE 5     | 8     | —          | SPARE          |
| 7     | 466        | STROBE 6     | 9     | —          | SPARE          |
| 8     | 477        | STROBE 7     | 10    | —          | SPARE          |
| 9     | 9          | GROUND       | 11    | —          | SPARE          |
| 10    | 600        | RETURN 0     | 12    | —          | SPARE          |
| 11    | 611        | RETURN 1     | 13    | —          | SPARE          |
| 12    | 622        | RETURN 2     | 14    | —          | SPARE          |
| 13    | 633        | RETURN 3     | 15    | —          | SPARE          |
| 14    | 644        | RETURN 4     | 16    | —          | SPARE          |
| 15    | 655        | RETURN 5     | 17    | —          | SPARE          |
| 16    | 666        | RETURN 6     | 18    | —          | SPARE          |
| 17    | 677        | RETURN 7     | 19    | —          | (KEY)          |
| 18    | 688        | +5VDC        | 20    | —          | SPARE          |
| 19    | —          | SPARE        | 21    | 9          | KNOCKER        |
| A2-J1 |            |              | 22    | 9          | 3RD COUNTER    |
| PIN   | WIRE COLOR | FUNCTION     | 23    | 9          | 2ND COUNTER    |
| 1     | (#16GA)    | 12VDC        | 24    | 9          | 1ST COUNTER    |
|       | 200        |              | A     | *54        | GROUND (SPARE) |
| 2     | (#GA)      |              | B     | *688       | +5VDC (SPARE)  |
|       | 54         | GROUND       | C     | 9          | DS1            |
| 3     | —          | SPARE        | D     | 9          | DS4            |
| 4     | —          | (KEY)        | E     | 9          | DS3            |
| 5     | 688        | +5VDC        | F     | 9          | DS6            |
| 6     | 166        | +5VDC offset | H     | 9          | DS5            |
| 7     | 100        | 60V          | J     | 9          | DS8            |
| 8     | 111        | 60V RETURN   | K     | 9          | DS7            |
| 9     | 133        | +8VDC offset | L     | 9          | DS10           |
| A2-J2 |            |              | M     | 9          | DS9            |
| PIN   | WIRE COLOR | FUNCTION     | N     | 9          | DS11           |
| 1     | *688       | +5VDC        | P     | 9          | DS12           |
| 2     | *688       | +5VDC        | R     | 9          | SOLENOID 5     |
| 3     | *54        | GROUND       | S     | 9          | SOLENOID 1     |
| 4     | *54        | GROUND       | T     | 9          | OUTHOLE        |
| 5     | —          | (KEY)        | U     | 9          | SOLENOID 6     |
| 6     | —          | SPARE        | V     | —          | SPARE          |
|       |            |              | W     | —          | (KEY)          |
| PIN   | WIRE COLOR | FUNCTION     | X     | 9          | SOLENOID 2     |
| 1     | *688       | +5VDC        | Y     | 9          | SOUND 8        |
| 2     | *688       | +5VDC        | Z     | 9          | SOUND 4        |
| 3     | *54        | GROUND       | A     | 9          | SOUND 2        |
| 4     | *54        | GROUND       | B     | 9          | SOUND 1        |
| 5     | —          | (KEY)        |       |            |                |
| 6     | —          | SPARE        |       |            |                |

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

| <b>A3-J2</b> |                       |                        |
|--------------|-----------------------|------------------------|
| <b>PIN</b>   | <b>WIRE<br/>COLOR</b> | <b>FUNCTION</b>        |
| 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            | 555                   | PLAYER 6 LAMP          |
| 10           | 544                   | PLAYER 5 LAMP          |

| <b>A3-J3</b> |                       |                  |
|--------------|-----------------------|------------------|
| <b>PIN</b>   | <b>WIRE<br/>COLOR</b> | <b>FUNCTION</b>  |
| 1            | *54                   | SPARE GROUND     |
| 2            | 777                   | L43              |
| 3            | 755                   | L41              |
| 4            | 744                   | L40              |
| 5            | 544                   | L32              |
| 6            | 555                   | L33              |
| 7            | 577                   | L35              |
| 8            | —                     | KEY              |
| 9            | 344                   | L24              |
| 10           | 355                   | L25              |
| 11           | 377                   | L27              |
| 12           | 366                   | L26              |
| 13           | 144                   | L16              |
| 14           | 155                   | L17              |
| 15           | 177                   | L19              |
| 16           | 166                   | L18              |
| 17           | (16GA) 54             | GROUND (L20-L27) |
| 18           | 322                   | L22              |
| 19           | 333                   | L23              |
| 20           | 311                   | L21              |
| 21           | 300                   | L20              |
| 22           | 122                   | L14              |
| 23           | 133                   | L15              |
| 24           | 111                   | L13              |
| 25           | 100                   | L12              |
| A            | *54                   | SPARE GROUND     |
| B            | *688                  | +5VDC (SPARE)    |
| C            | *54                   | GROUND (L44-L51) |
| D            | 800                   | L44              |
| E            | 844                   | L48              |
| F            | 811                   | L45              |
| H            | 855                   | L49              |
| J            | —                     | KEY              |
| K            | 566                   | L34              |
| L            | —                     | SPARE            |
| M            | 833                   | L47              |
| N            | 877                   | L51              |
| P            | 822                   | L46              |
| R            | 866                   | L50              |

| <b>A3-J3 continued</b> |                       |                  |
|------------------------|-----------------------|------------------|
| <b>PIN</b>             | <b>WIRE<br/>COLOR</b> | <b>FUNCTION</b>  |
| 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 |

| <b>A3-J4</b> |                       |                    |
|--------------|-----------------------|--------------------|
| <b>PIN</b>   | <b>WIRE<br/>COLOR</b> | <b>FUNCTION</b>    |
| 1            | 700                   | L36                |
| 2            | 711                   | L37                |
| 3            | 733                   | L39                |
| 4            | 722                   | L38                |
| 5            | *54                   | GROUND (L36-L39)   |
| 6            | *211                  | SOLENOID 5         |
| 7            | *266                  | SOLENOID 1         |
| 8            | *244                  | OUTHOLE (SOL. 9)   |
| 9            | *54                   | GROUND (SOL. 1, 9) |
| 10           | *54                   | GROUND (SOL. 2)    |
| 11           | *54                   | GROUND (SOL. 6)    |
| 12           | *233                  | SOLENOID 6         |
| 13           | *200                  | SOLENOID 2         |
| 14           | *54                   | GROUND (SOL. 5)    |
| 15           | *54                   | SPARE GROUND       |

| <b>A3-J5</b> |                       |                   |
|--------------|-----------------------|-------------------|
| <b>PIN</b>   | <b>WIRE<br/>COLOR</b> | <b>FUNCTION</b>   |
| 1            | 733                   | SOUND 4           |
| 2            | 877                   | COIN LOCKOUT COIL |
| 3            | 54                    | GROUND (KNOCKER)  |
| 4            | 688                   | +5VDC (SPARE)     |
| 5            | 722                   | SOUND 2           |
| 6            | 711                   | SOUND 1           |
| 7            | 744                   | SOUND 8           |
| 8            | 888                   | KNOCKER           |

| <b>A3-J6</b> |                       |                 |
|--------------|-----------------------|-----------------|
| <b>PIN</b>   | <b>WIRE<br/>COLOR</b> | <b>FUNCTION</b> |
| 1            | 633                   | 2ND COUNTER     |
| 2            | 644                   | 3RD COUNTER     |
| 3            | 655                   | 1ST COUNTER     |
| 4            | 54                    | GROUND          |

continued

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

| JA4-J1 |               |             |
|--------|---------------|-------------|
| PIN    | WIRE<br>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<br>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<br>COLOR | FUNCTION    |
| 1      | 455           | D6          |
| 2      | 444           | D5          |
| 3      | 433           | D4          |
| 4      | 422           | D3          |
| 5      | 411           | D2          |
| 6      | 400           | D1          |
| 7      | 677           | hB          |
| 8      | 666           | gB          |
| 9      | 655           | fB          |
| 10     | 644           | eB          |
| 11     | 633           | dB          |
| 12     | 622           | cB          |
| 13     | 611           | bB          |
| 14     | 600           | aB          |
| 15     | 122           | 5VAC        |
| 16     | 144           | 5VAC RETURN |
| 17     | 044           | +60VDC      |
| 18     | —             | SPARE       |
| 19     | 54            | GROUND      |

| 4A4-J1 |               |             |
|--------|---------------|-------------|
| PIN    | WIRE<br>COLOR | FUNCTION    |
| 1      | 733           | D12         |
| 2      | 722           | D11         |
| 3      | 711           | D10         |
| 4      | 700           | D9          |
| 5      | 477           | D8          |
| 6      | 466           | d7          |
| 7      | 677           | hB          |
| 8      | 666           | gB          |
| 9      | 655           | fB          |
| 10     | 644           | eB          |
| 11     | 633           | dB          |
| 12     | 622           | cB          |
| 13     | 611           | bB          |
| 14     | 600           | aB          |
| 15     | 122           | 5VAC        |
| 16     | 144           | 5VAC RETURN |
| 17     | 044           | +60VDC      |
| 18     | —             | SPARE       |
| 19     | 54            | GROUND      |

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

| A5-J1    |            |                      | A7-J2/P2 |            |                          |
|----------|------------|----------------------|----------|------------|--------------------------|
| PIN      | WIRE COLOR | FUNCTION             | PIN      | WIRE COLOR | FUNCTION                 |
| 1        | —          | SPARE                | 1        | *066       | COIN CHUTE LIGHTS        |
| 2        | 777        | D16                  | 2        | *000       | COIN CHUTE LIGHTS RETURN |
| 3        | 766        | D15                  | 3        | *055       | LEFT FLIPPER SWITCH      |
| 4        | —          | SPARE                | 4        | *388       | FLIPPER SWITCH RETURN    |
| 5        | 755        | D14                  | 5        | 222        | +24vDC                   |
| 6        | 744        | D13                  | 6        | 877        | COIN LOCKOUT             |
| 7        | 822        | cC                   | A7-J3/P3 |            |                          |
| 8        | 811        | bC                   | PIN      | WIRE COLOR | FUNCTION                 |
| 9        | 877        | hC                   | 1        | *122       | 5VAC                     |
| 10       | 866        | gC                   | 2        | *144       | 5VAC RETURN              |
| 11       | 855        | fC                   | 3        | 155        | 3VAC                     |
| 12       | 844        | eC                   | 4        | 177        | 3VAC RETURN              |
| 13       | 833        | dC                   | 5        | *54        | LAMP GROUND              |
| 14       | 800        | aC                   | 6        |            | SPARE                    |
| 15       | 155        | 3vAC                 | 7        | (16GA) 077 | 6.3 VAC                  |
| 16       | 177        | 3vAC RETURN          | 8        | (16GA) 000 | 6.3 VAC RETURN           |
| 17       | 055        | +42vDC               | 9        | *255       | +6vDC                    |
| 18       | 688        | +5vDC                | A7-J4/P4 |            |                          |
| 19       | 54         | GROUND               | PIN      | WIRE COLOR | FUNCTION                 |
| A6-J1    |            |                      | 1        | *54        | GROUND                   |
| PIN      | WIRE COLOR | FUNCTION             | 2        | *54        | GROUND                   |
| 1        | 200        | +12vDC               | 3        | *54        | GROUND                   |
| 2        | —          | SPARE                | 4        | *54        | GROUND                   |
| 3        | 333        | AC                   | 5        | *54        | GROUND                   |
| 4        | 344        | AC RETURN            | 6        | *54        | GROUND                   |
| 5        | 688        | +5vDC                | 7        | *54        | GROUND                   |
| 6        | 54         | GROUND               | 8        | *54        | GROUND                   |
| 7        | 011        | SPEAKER OUTPUT       | 9        | *54        | GROUND                   |
| 8        | 711        | SOUND 1              | 10       | *54        | GROUND                   |
| 9        | 722        | SOUND 2              | 11       | *54        | GROUND                   |
| 10       | —          | SPARE                | 12       | —          | SPARE                    |
| 11       | 733        | SOUND 4              | A7-J5/P5 |            |                          |
| 12       | 744        | SOUND 8              | PIN      | WIRE COLOR | FUNCTION                 |
| A7-J1/P1 |            |                      | 1        | (16GA) 255 | +6 VDC                   |
| PIN      | WIRE COLOR | FUNCTION             | 2        | (16GA) 54  | GROUND                   |
| 1        | 677        | RETURN 7             | 3        | (16GA) 54  | GROUND                   |
| 2        | 500        | STROBE 0             | 4        | (16GA) 54  | GROUND                   |
| 3        | 511        | STROBE 1             | 5        | (16GA) 54  | GROUND                   |
| 4        | 533        | STROBE 3             | 6        | (16GA) 222 | +24VDC                   |
| 5        | 522        | STROBE 2             | 7        | *388       | FLIPPER SW. RETURN       |
| 6        | 544        | STROBE 4             | 8        | *388       | FLIPPER SW. RETURN       |
| 7        | 555        | STROBE 5             | 9        | *055       | LEFT FLIPPER SWITCH      |
| 8        | —          | SPARE                | 10       | *044       | RIGHT FLIPPER SWITCH     |
| 9        | —          | SPARE                | 11       | (16GA) 066 | 6.3VAC                   |
| 10       | 700        | ANTI-CHEAT SW.       | 12       | (16GA) 000 | 6.3VAC RETURN            |
| 11       | 9          | ANTI-CHEAT SW. (GND) | 13       | *277       | 25VAC                    |
| 12       | *54        | EARTH GROUND         | 14       | *288       | 25VAC RETURN             |
|          |            |                      | 15       | —          | SPARE                    |

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

**A7-J6/P6**

| PIN | WIRE<br>COLOR | FUNCTION           |
|-----|---------------|--------------------|
| 1   | 011           | MATCH LIGHT        |
| 2   | 022           | TILT LIGHT         |
| 3   | 033           | BALL IN PLAY LIGHT |
| 4   | —             | SPARE              |

**A7-J7/P7**

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

**A7-J8/P8**

| PIN | WIRE<br>COLOR | FUNCTION     |
|-----|---------------|--------------|
| 1   | 022           | SPEAKER      |
| 2   | *54           | GROUND       |
| 3   | *54           | EARTH GROUND |
| 4   | —             | SPARE        |

**1A8-J1**

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

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

## IX. PARTS LIST

### CONTROL BOARD

| PART NUMBER                                        | DESCRIPTION                                                           |
|----------------------------------------------------|-----------------------------------------------------------------------|
| R6502-13                                           | CPU—(U1)                                                              |
| R6532-18                                           | RIOT—(U4, U5, U6)                                                     |
| R3273-12                                           | ROM—(U2)                                                              |
| R3272-12                                           | ROM—(U3)                                                              |
| P5101L-1                                           | RAM/CMOS—(Z5)                                                         |
| 640361-3                                           | SOCKET—DIL, 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<br>1N5987B                              | ZENER DIODE—3.0V, 5%—(VR1)                                            |
| 326R10-002                                         | BATTERY—3.6V—(BAT. 1)                                                 |
| 333R08-001                                         | CRYSTAL—3.579545 MHZ—(Y1)                                             |
| 131R06-001                                         | SPACER, CORK                                                          |
| MPS A70                                            | TRANSISTOR—PNP—(Q1, Q4)                                               |
| 341R31-005                                         | DIP SWITCH PACK—8 POS.—(SW1-SW4)                                      |
|                                                    | RESISTOR—62Ω, ¼W, 5%—(R7)                                             |
|                                                    | CAPACITOR—.01 MICROFARAD, 50V—(C2, C4-C13, C15-C24, C26-C29, C31-C35) |
|                                                    | CAPACITOR—.1 MICROFARAD, 50V—(C3, C14, C25, C30)                      |
|                                                    | CAPACITOR—100 MICROFARAD, 10V—(C1)                                    |
|                                                    | RESISTOR—3.0KΩ, ¼W, 5%—(R1, R6, R11-24, R42, R45, R46, R48, R51-R57)  |
|                                                    | RESISTOR—2.0KΩ, ¼W, 5%—(R4, R5, R44)                                  |
|                                                    | RESISTOR—180Ω, ¼W, 5%—(R8, R50)                                       |
|                                                    | RESISTOR—1KΩ, ¼W, 5%—(R9)                                             |
|                                                    | RESISTOR—2.7MΩ, ¼W, 5%—(R10)                                          |
|                                                    | RESISTOR—620Ω, ¼W, 5%—(R25-R33)                                       |
|                                                    | RESISTOR—4.7KΩ, ¼W, 5%—(R2, R34-R41)                                  |
|                                                    | RESISTOR—5.6KΩ, ¼W, 5%—(R3, R43, R49)                                 |
|                                                    | RESISTOR—24KΩ, ¼W, 5%—(R47)                                           |
|                                                    | CAPACITOR—10 MICROFARAD, 10V—(C36)                                    |
| 2N4400                                             | TRANSISTOR—MOTOROLA—(Q2, Q3)                                          |
| SN74LS05N                                          | IC—OPEN COLLECTOR INVERTER—(Z10)                                      |
| SN74LS04N                                          | IC—HEX INVERTER—(Z7)                                                  |
| MM74C04 or<br>SCL 4069B                            | IC—CMOS—(Z36)                                                         |
| 640379-3                                           | SOCKET—40 PIN—(TC1)                                                   |
| *(Z3, Z11, Z12, Z16, Z17, Z24, Z26, Z27, Z34, Z35) |                                                                       |

## MASTER DRIVER BOARD

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

## POWER SUPPLY

| PART NUMBER | DESCRIPTION                                                                      |
|-------------|----------------------------------------------------------------------------------|
|             | HEATSINK MOUNTING PLATE                                                          |
|             | SPACER—6—32 THREAD X 5/32                                                        |
|             | SPACER—6—32 THREAD X ½                                                           |
| 1N4004      | DIODE—(CR1-CR4)                                                                  |
| 1N4759A     | ZENER DIODE—62V, 1W, 5%—(CR5)                                                    |
| 1N4746A     | ZENER DIODE—18V, 1W, 5%—(CR6)                                                    |
| 1N3445      | ZENER DIODE—8.2V, 2W, 10%—(CR7)                                                  |
| 1N4734A     | ZENER DIODE—5.6V, 1W, 5%—(CR8)                                                   |
| SW4F013     | TRANSISTOR—NPN—NATIONAL—(Q1)                                                     |
| 2N5550      | TRANSISTOR—NPN—(Q2)                                                              |
| PMD10K40    | TRANSISTOR—LAMBDA—(Q3)                                                           |
| S107Y1      | SILICON CONTROLLED RECTIFIER—(SCR1)                                              |
| UA723CN     | IC—14 PIN DIP—(IC1)                                                              |
| CM4-22      | DIODE—LIGHT EMITTING—(LED1, LED2)                                                |
| 115R501A    | POTENTIOMETER—500Ω—CTS—(POT1)                                                    |
|             | RESISTOR—1.3KΩ, 5W, 10%—(R1)                                                     |
|             | RESISTOR—1KΩ, ¼W, 5%—(R2, R9)                                                    |
|             | RESISTOR—12KΩ, ½W, 5%—(R3)                                                       |
|             | RESISTOR—33Ω, 1W, 5%—(R4)                                                        |
|             | RESISTOR—510Ω, ¼W, 5%—(R6, R13)                                                  |
|             | RESISTOR—3.9KΩ, ¼W, 5%—(C7)                                                      |
|             | RESISTOR—10KΩ, ¼W, 5%—(R8)                                                       |
|             | RESISTOR—30Ω, 2W, 5%—(R10)                                                       |
|             | RESISTOR—2.2KΩ, ¼W, 5%—(R11)                                                     |
|             | RESISTOR—.33Ω, 5W, 10%—(WIRE WOUND)—(R12)                                        |
|             | RESISTOR—10KΩ, ½W, 5%—(R5)                                                       |
|             | RESISTOR—2KΩ, ¼W, 5%—(R14)                                                       |
|             | RESISTOR—100Ω, ¼W, 5%—(R15)                                                      |
|             | RESISTOR—20Ω, ¼W, 5%—(R16)                                                       |
|             | RESISTOR—620Ω, ½W, 5%—(R17)                                                      |
|             | RESISTOR—180Ω, ¼W, 5%—(R18)                                                      |
|             | CAPACITOR—470 MICROFARAD, 100V—(C1)                                              |
|             | CAPACITOR—47 MICROFARAD, 100V—(C2)                                               |
|             | CAPACITOR—1000 PICO FARAD, 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                                                                        |
| GS2-3       | 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 $\Omega$ , 1/4W, 5%—(R1, R2, R7)                |
|                 | RESISTOR—2.7 $\Omega$ , 1/4W, 5%—(R9)                         |
|                 | RESISTOR—6.8K $\Omega$ , 1/4W, 5%—(R10)                       |
|                 | RESISTOR—430 $\Omega$ , 1/2W, 5%—(R11)                        |
|                 | RESISTOR—2.7M $\Omega$ , 1/4W, 5%—(R3)                        |
|                 | RESISTOR—1.8M $\Omega$ , 1/4W, 5%—(R4)                        |
|                 | RESISTOR—22.1K $\Omega$ , 1/4W, 1%—(R12)                      |
|                 | RESISTOR—10K $\Omega$ , 1/4W, 5%—(R6)                         |
|                 | RESISTOR—5.6K $\Omega$ , 1/4W, 5%—(R8)                        |
|                 | RESISTOR—270K $\Omega$ , 1/4W, 5%—(R5)                        |
|                 | RESISTOR—47K $\Omega$ , 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:R3016-11 | 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 $\Omega$ , 1/4W, 5%—(R1)        |
|             | RESISTOR—12K $\Omega$ , 1/4W, 5%—(R2)         |
|             | RESISTOR—220 $\Omega$ , 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 $\Omega$ , 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

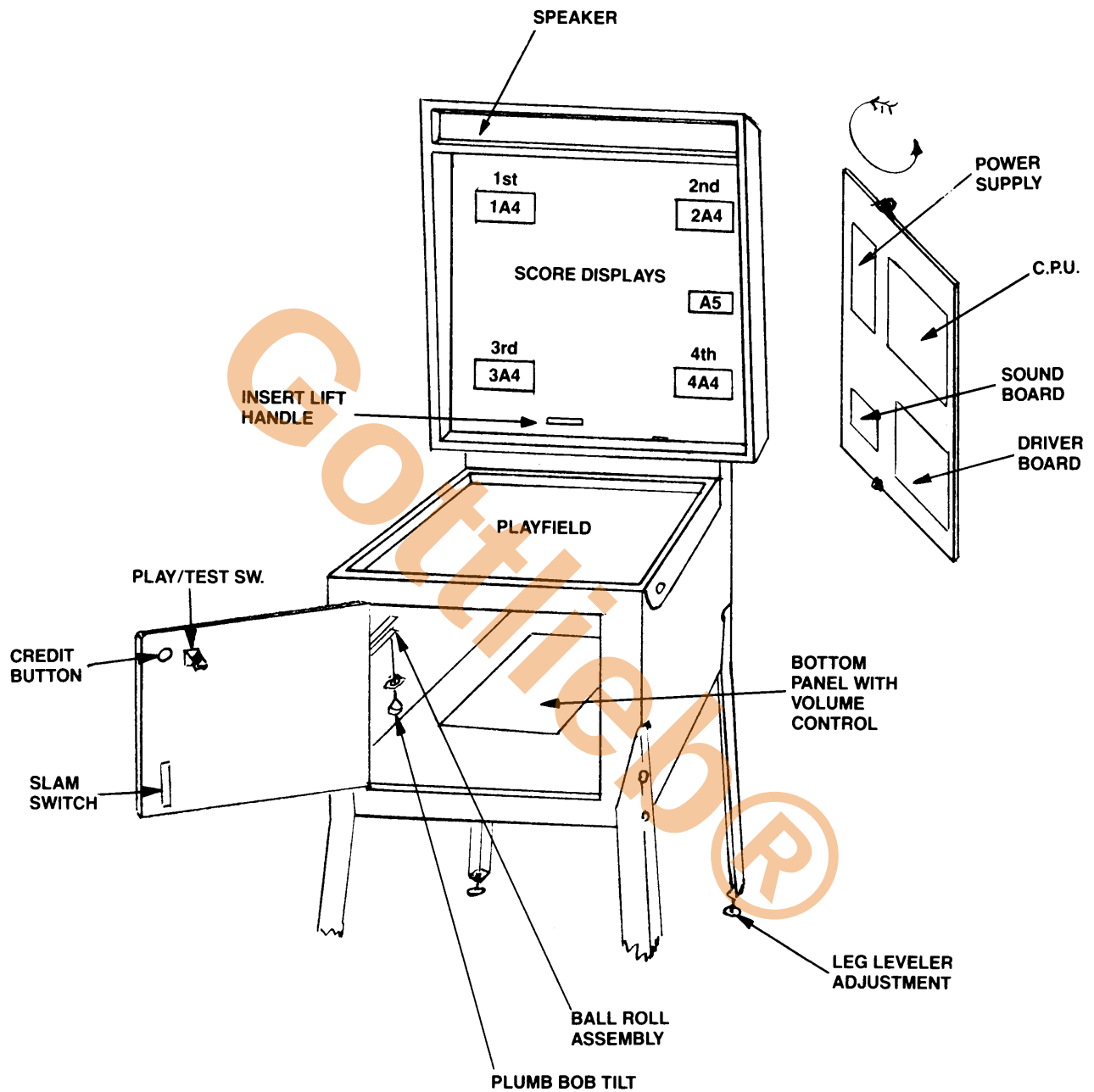
| QUANTITY | NUMBER         | DESCRIPTION                                    |
|----------|----------------|------------------------------------------------|
| 1        | TE1400         | Capacitor—1 Microfarad, 100V—Sprague (C-1)     |
| 2        | C320C103MIR5CA | Capacitor—0.01 Microfarad, 100V—Kemet (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)              |
| 2        | 721R01-113     | Resistor—4.7K $\Omega$ , 1/4W, 5% (R1, R2)     |

Gottlieb®

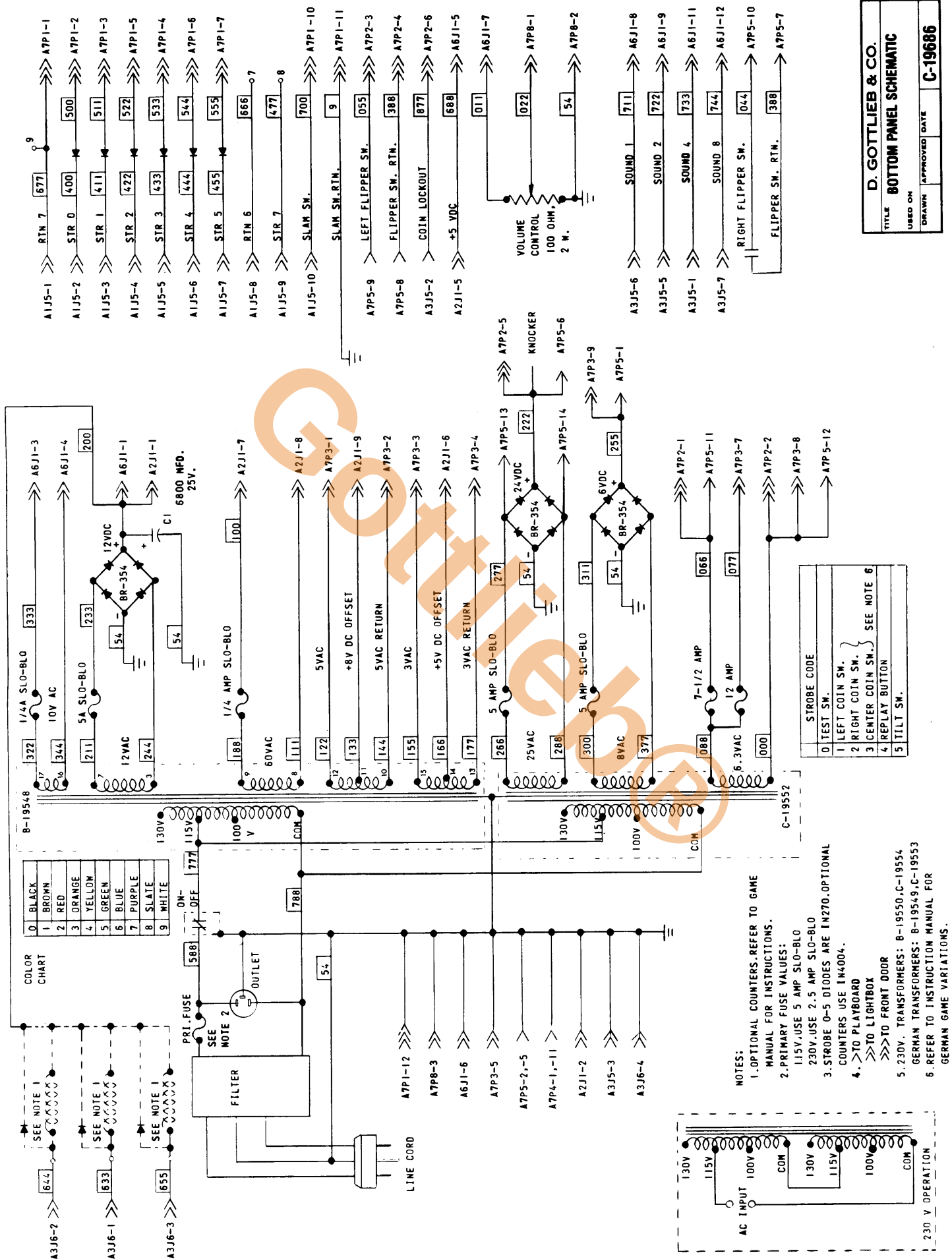
**X. WIRING AND SCHEMATIC DIAGRAMS**

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

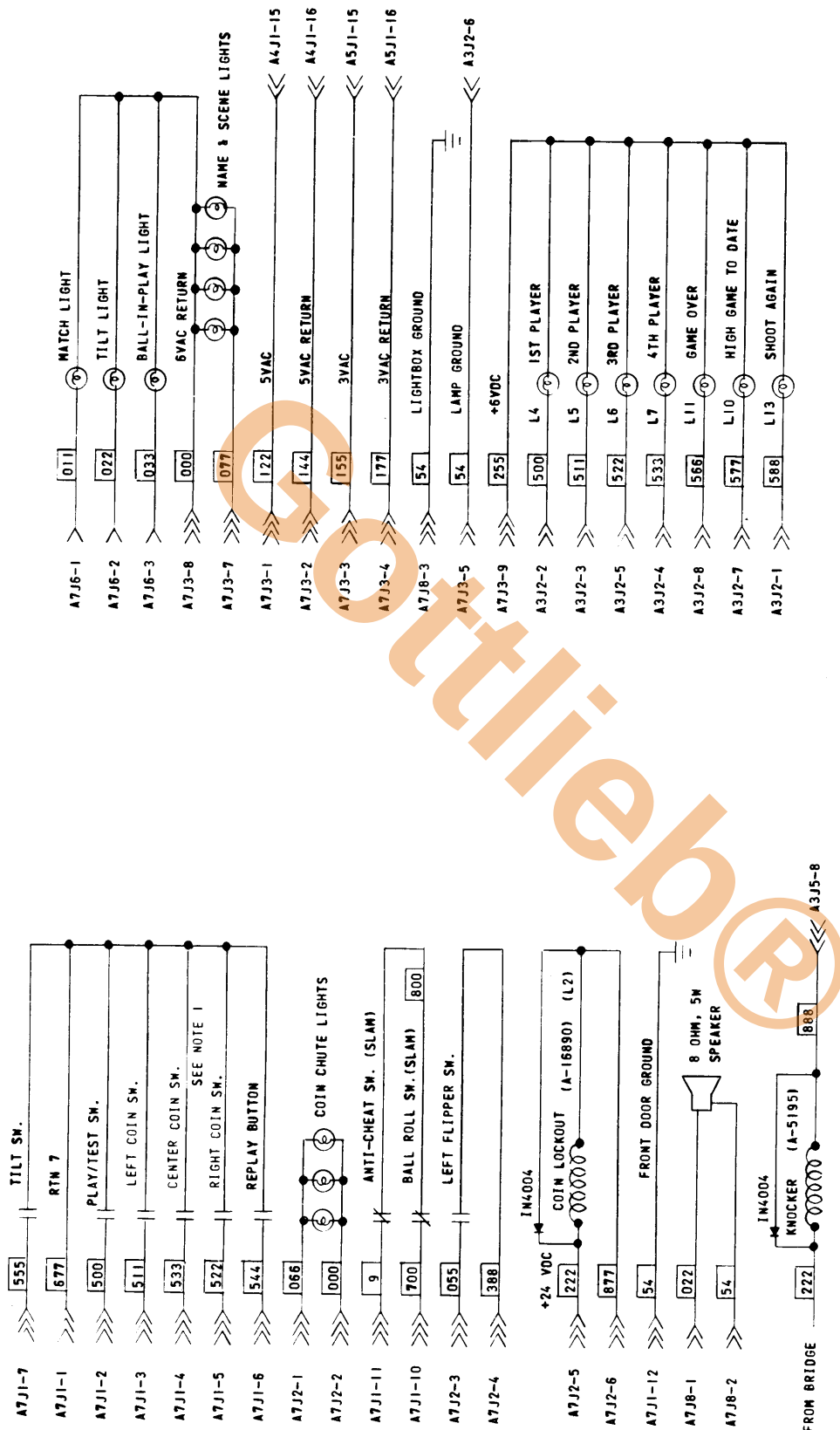
X. A. COMPONENT LOCATION DIAGRAM



**X. B. BOTTOM BOARD PANEL SCHEMATIC**



# X. C. BOTTOM BOARD & LIGHTBOX SCHEMATIC

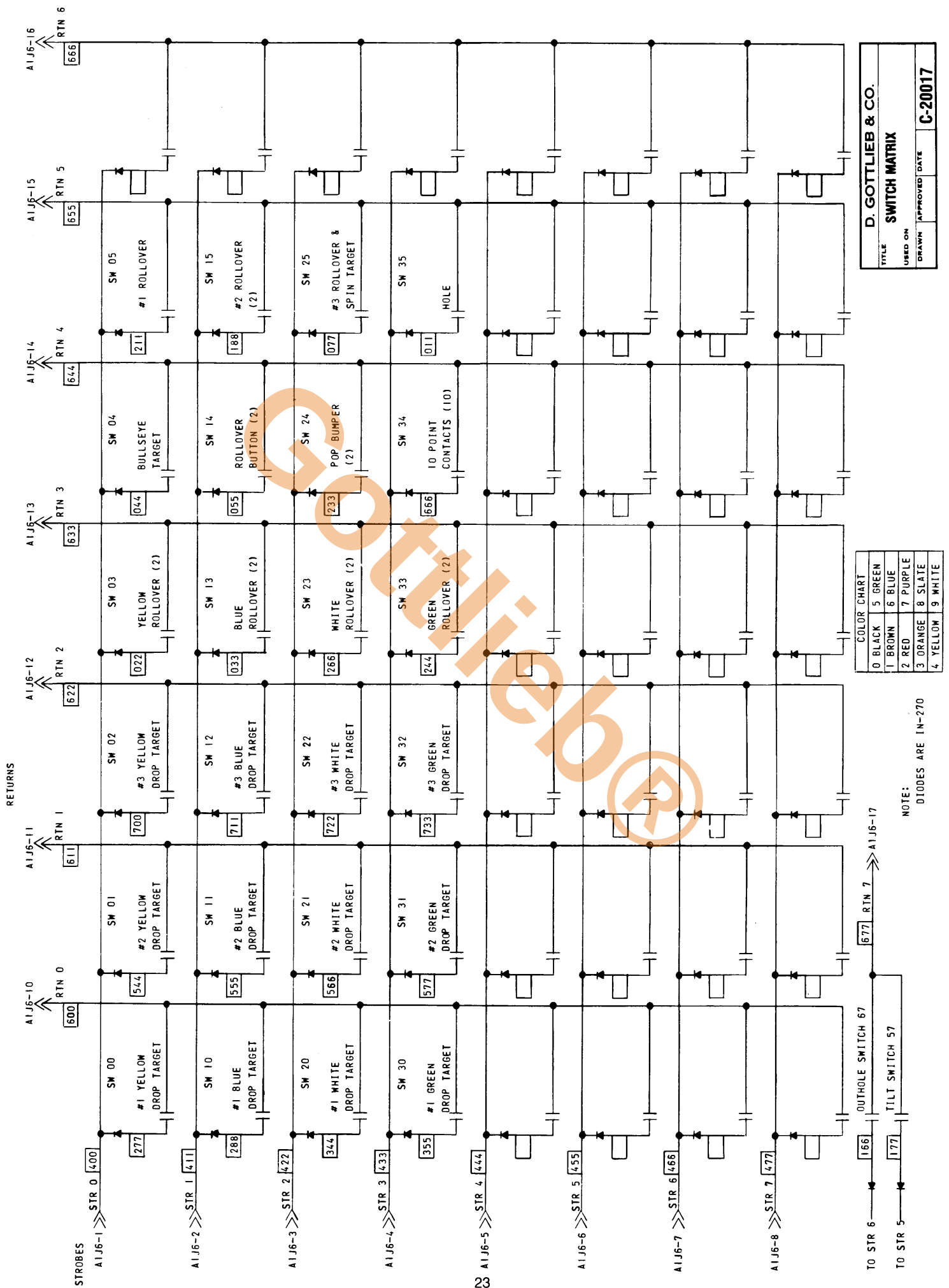


NOTE 1: REFER TO INSTRUCTION MANUAL FOR  
GERMAN GAME VARIATIONS.

> FROM PLAYBOARD  
>> FROM LIGHTBOX  
>>> FROM BOTTOM BOARD

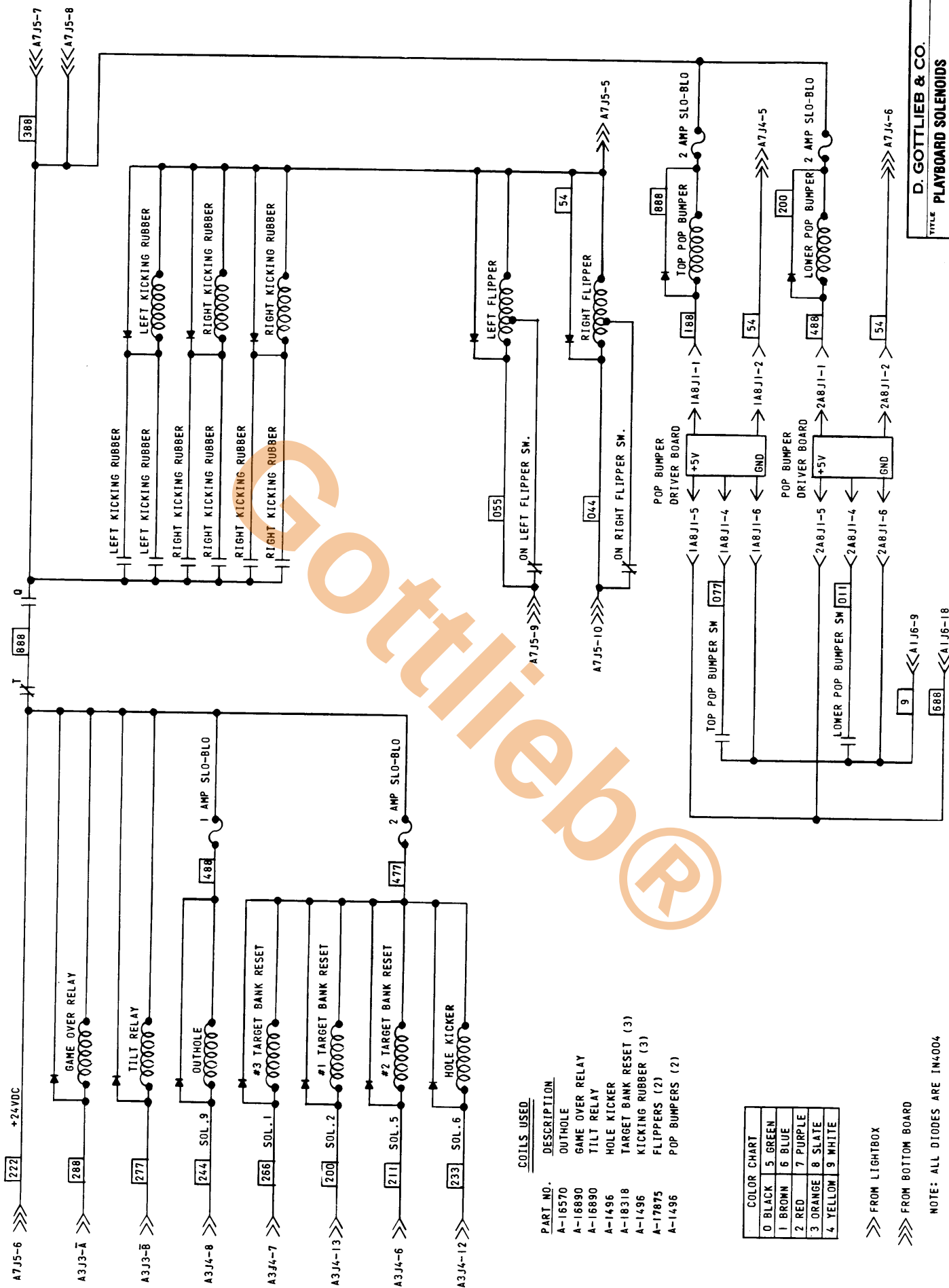
|                   |                                   |         |  |
|-------------------|-----------------------------------|---------|--|
| D. GOTTLIEB & CO. |                                   |         |  |
| TITLE             | BOTTOM BOARD & LIGHTBOX SCHEMATIC |         |  |
| USED ON       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

# X. D. SWITCH MATRIX

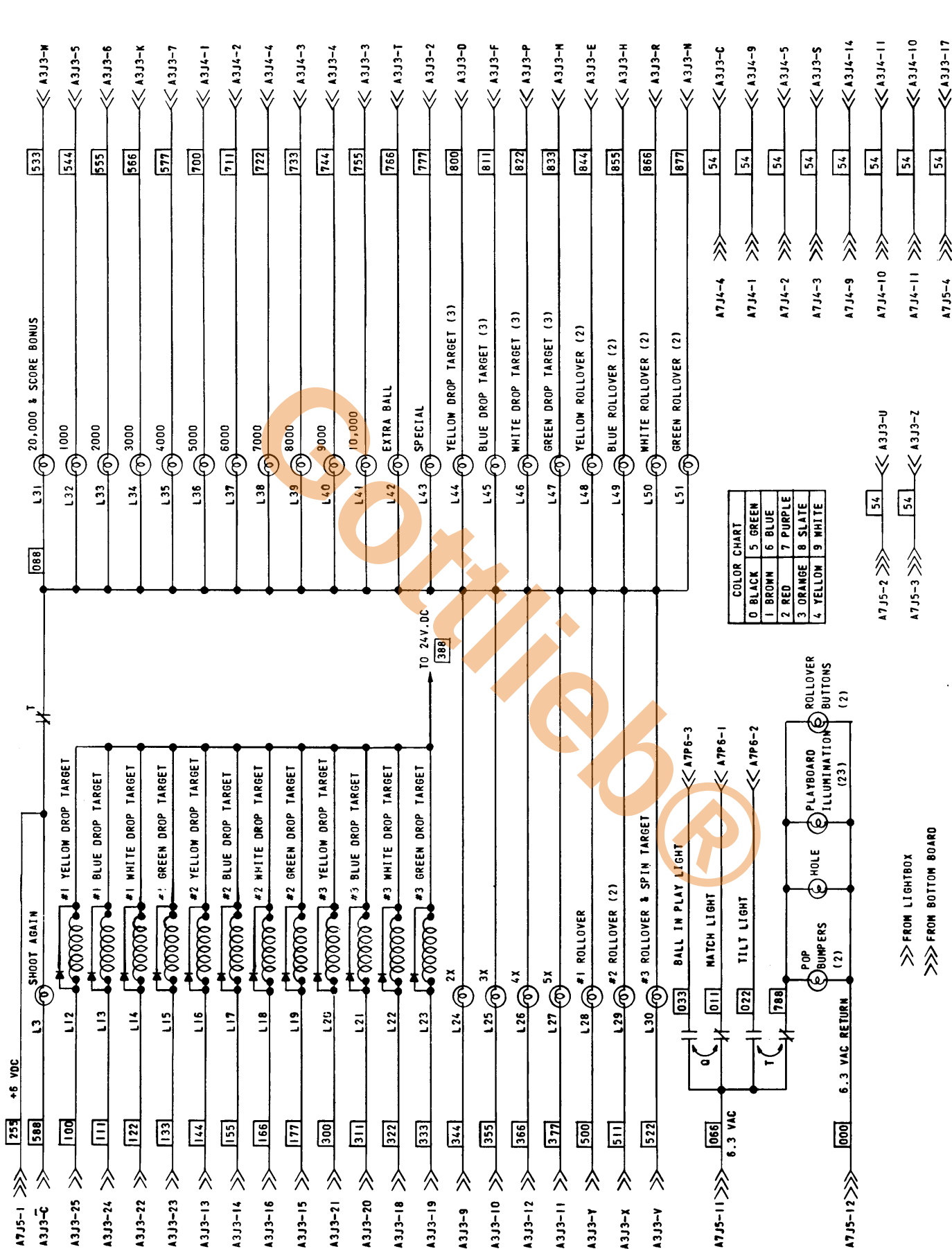


NOTE:  
DIODES ARE IN-270

# X. E. PLAYBOARD SOLENOIDS



# X. F. PLAYBOARD ILLUMINATION



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

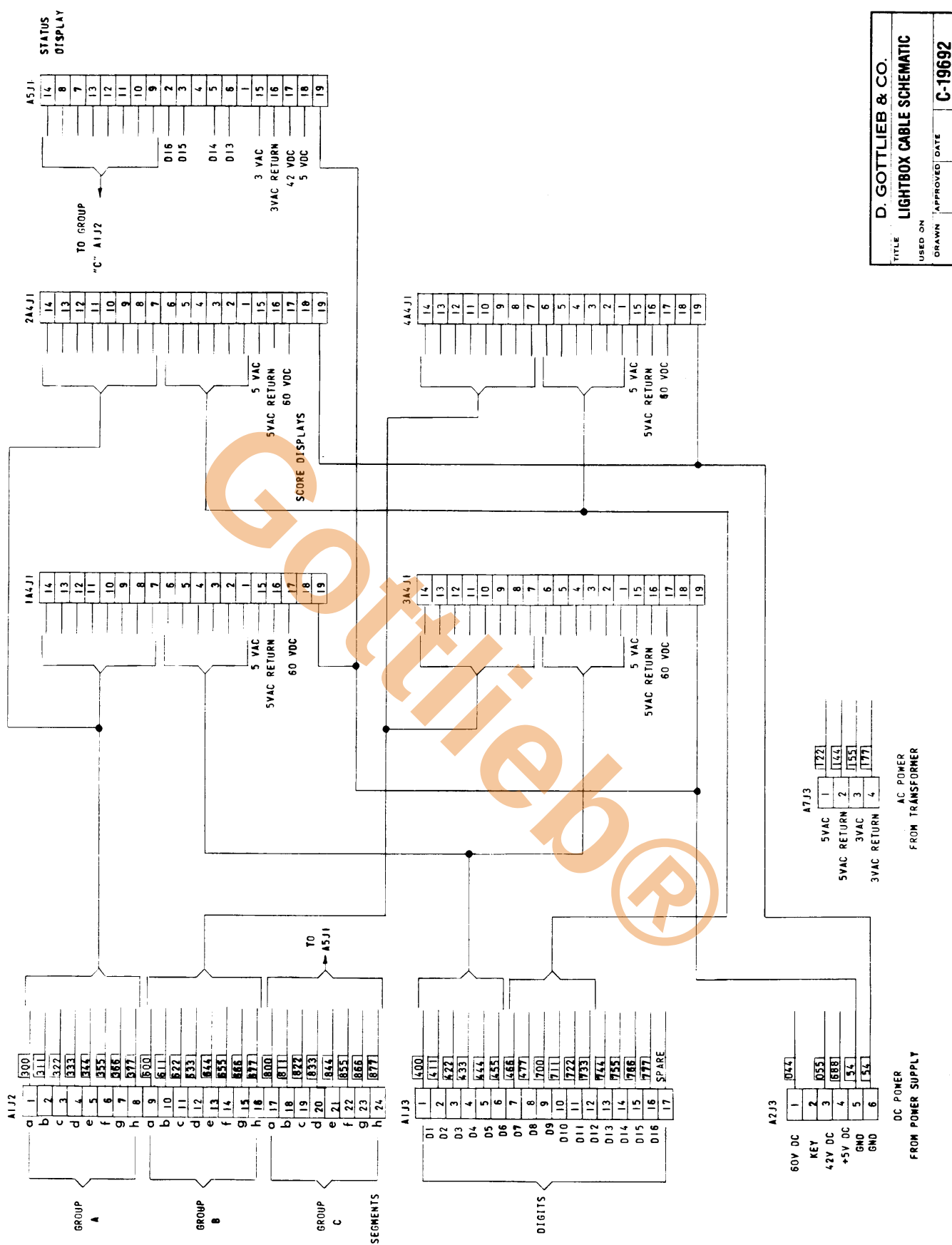
>>> FROM LIGHTBOX

>>> FROM BOTTOM BOARD

1. LAMPS L32-L43 ARE DRIVEN BY MPS-A13'S.
2. DIODES ARE IN4004.
3. DROP TARGET TRIP COILS ARE A-18642.

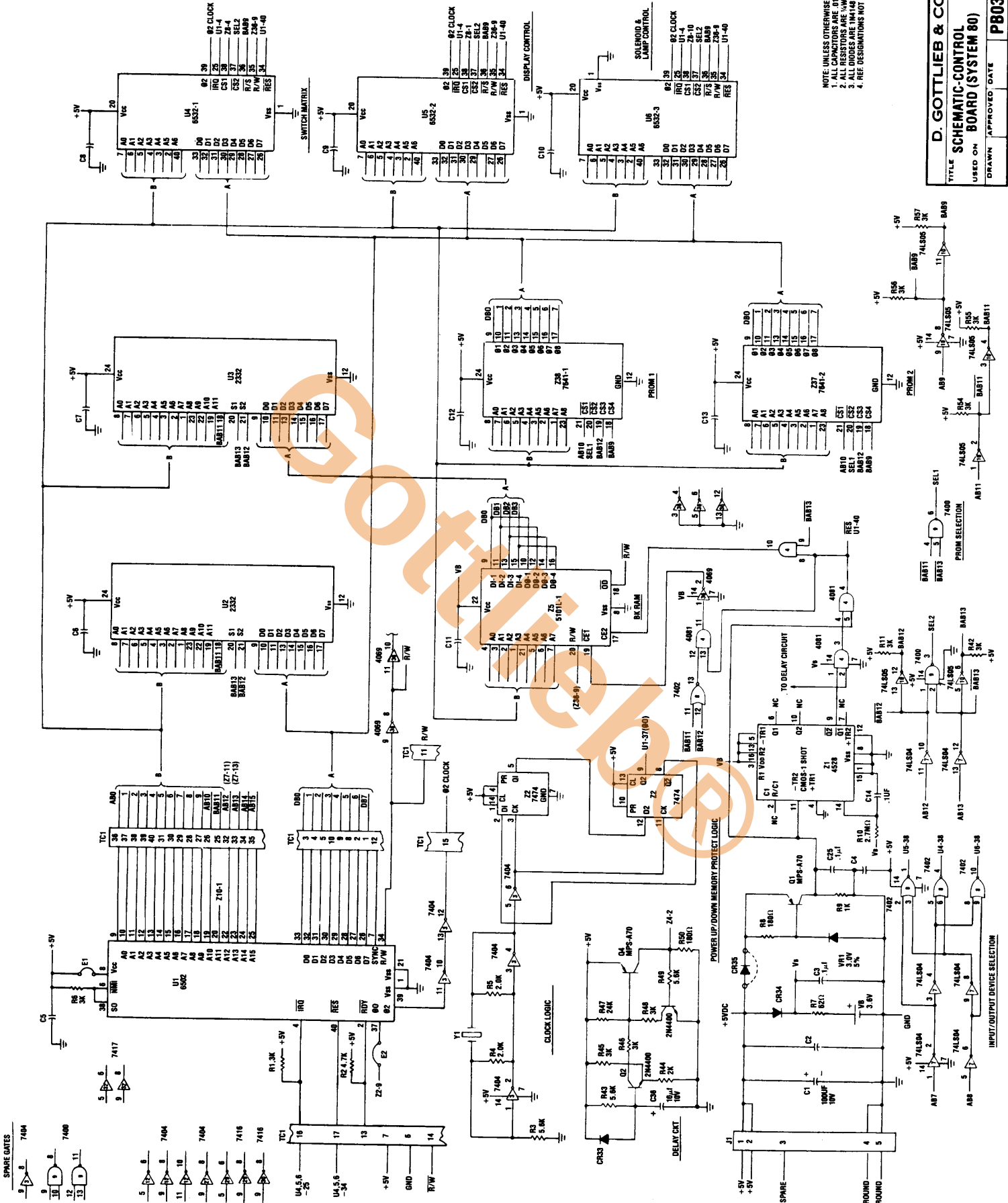
|                   |                        |
|-------------------|------------------------|
| D. GOTTLIEB & CO. |                        |
| TITLE             | PLAYBOARD ILLUMINATION |
| USED ON           |                        |
| DRAWN             | APPROVED DATE          |
| C-20016           |                        |

## X. G. LIGHTBOX CABLE SCHEMATIC



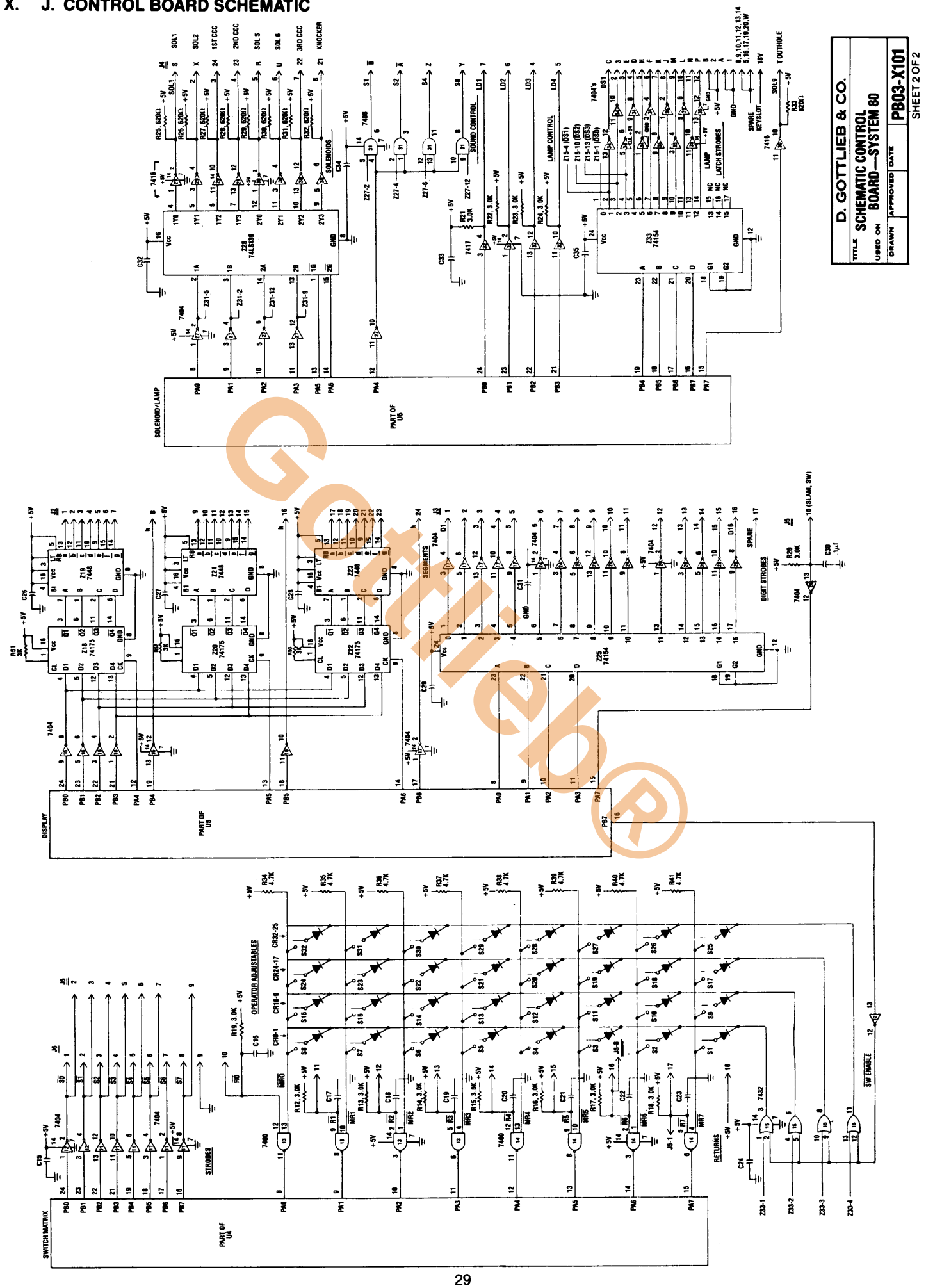


# X. I. CONTROL BOARD SCHEMATIC

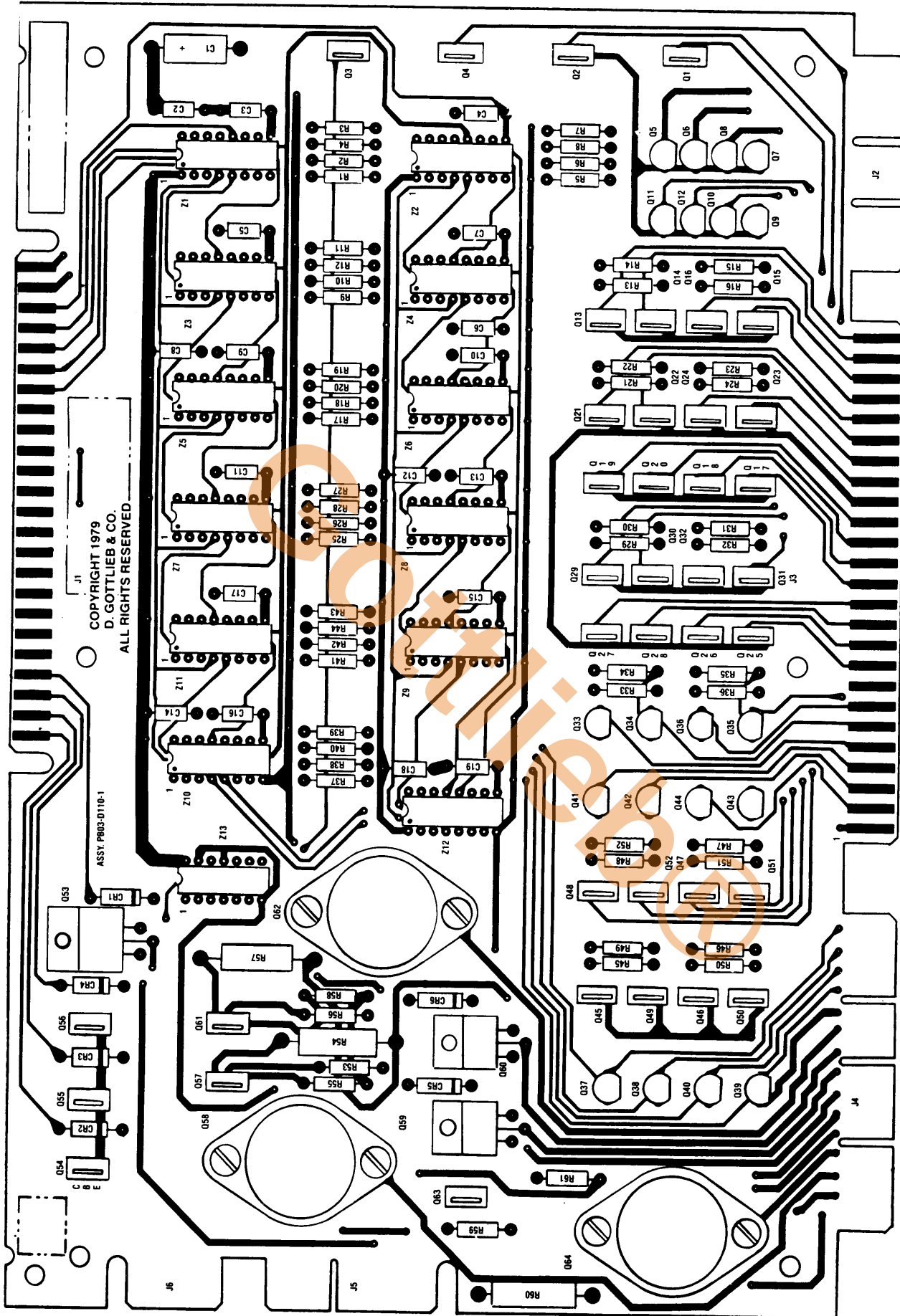


D. GOTTlieb & CO.  
 TITLE SCHEMATIC-CONTROL  
 USED ON BOARD (SYSTEM 80)  
 DRAWN APPROVED DATE  
 PB03-X101  
 SHEET 1 OF 2

X. J. CONTROL BOARD SCHEMATIC

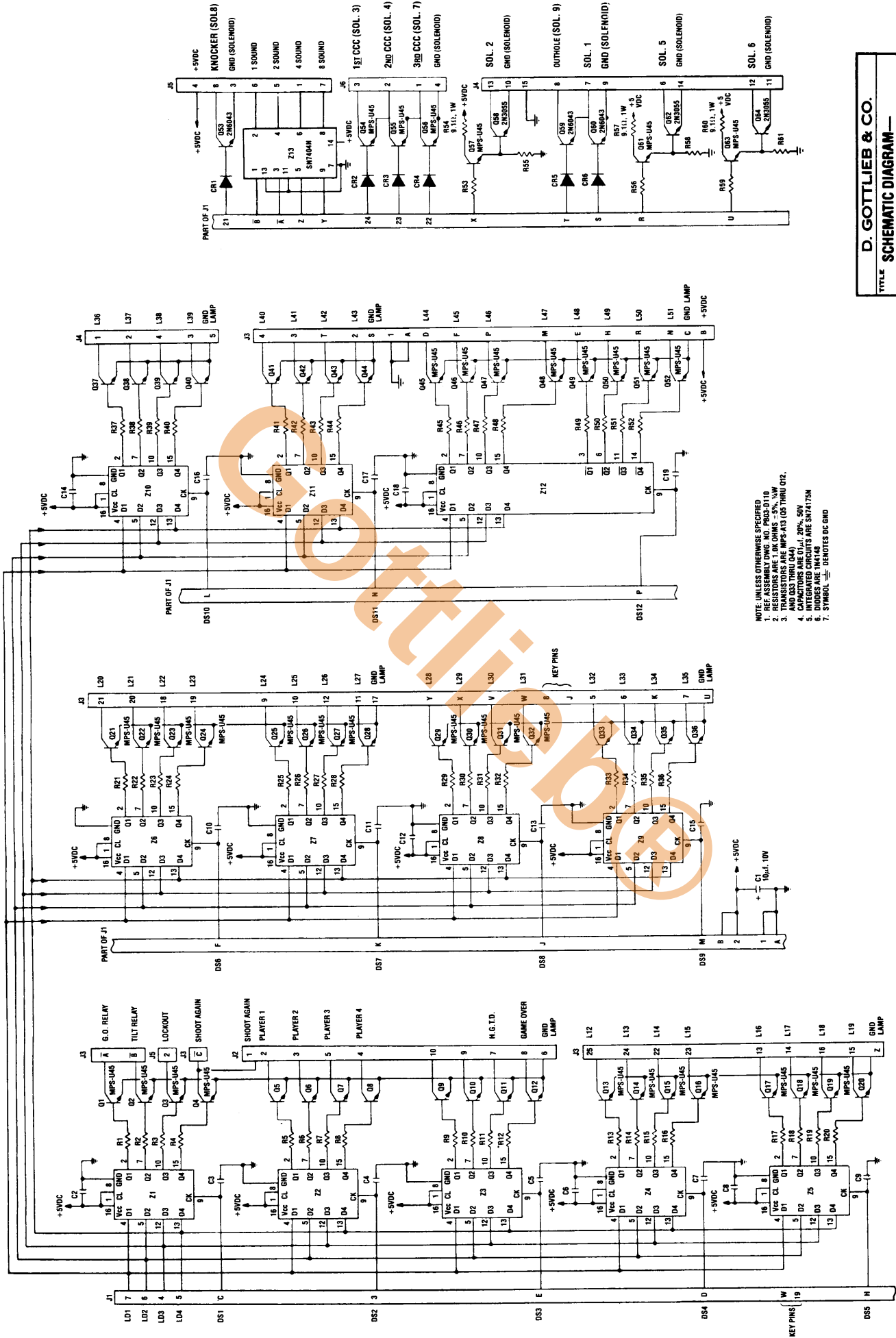


# X. K. DRIVER BOARD COMPONENT LOCATION



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

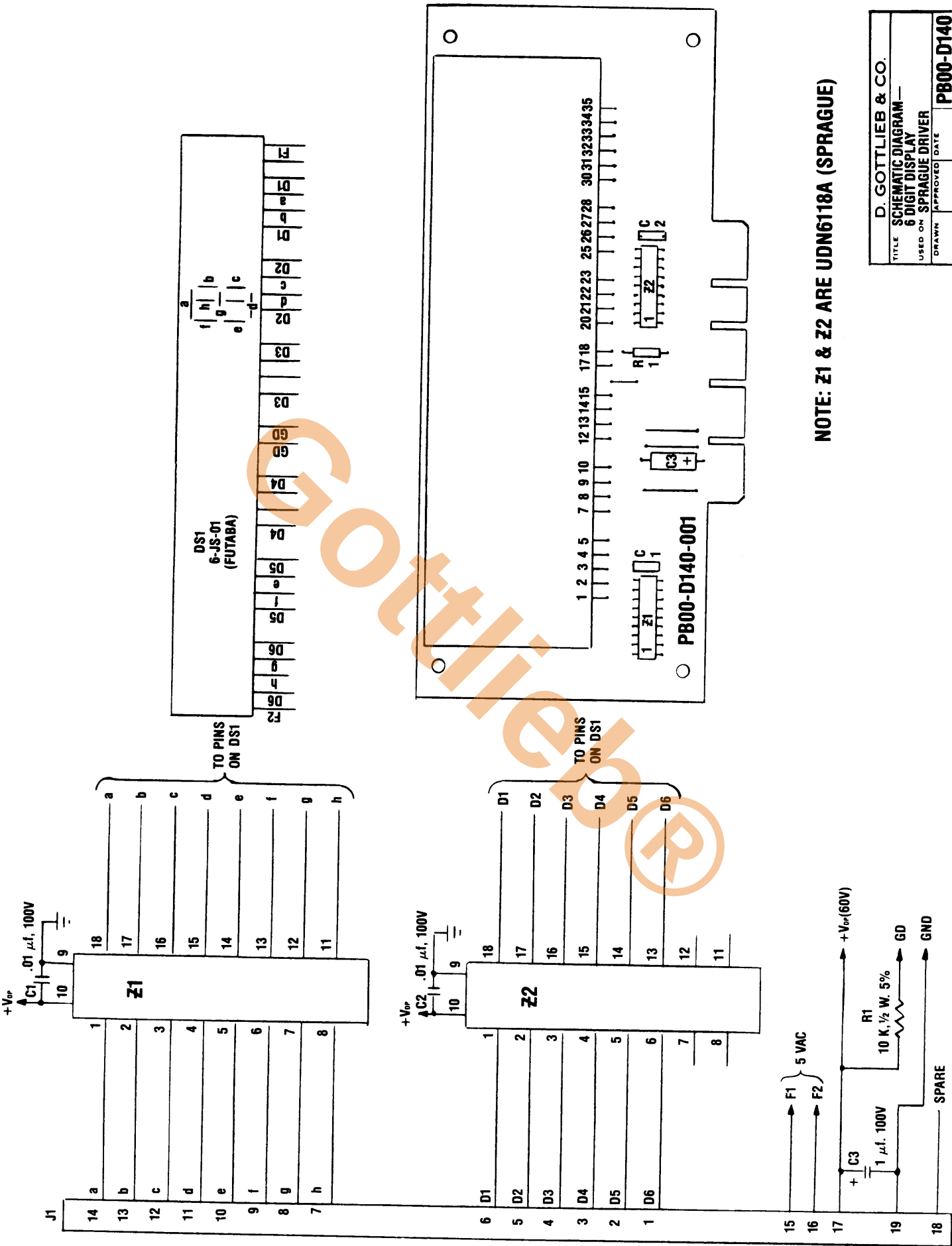
# X. L. DRIVER BOARD SCHEMATIC



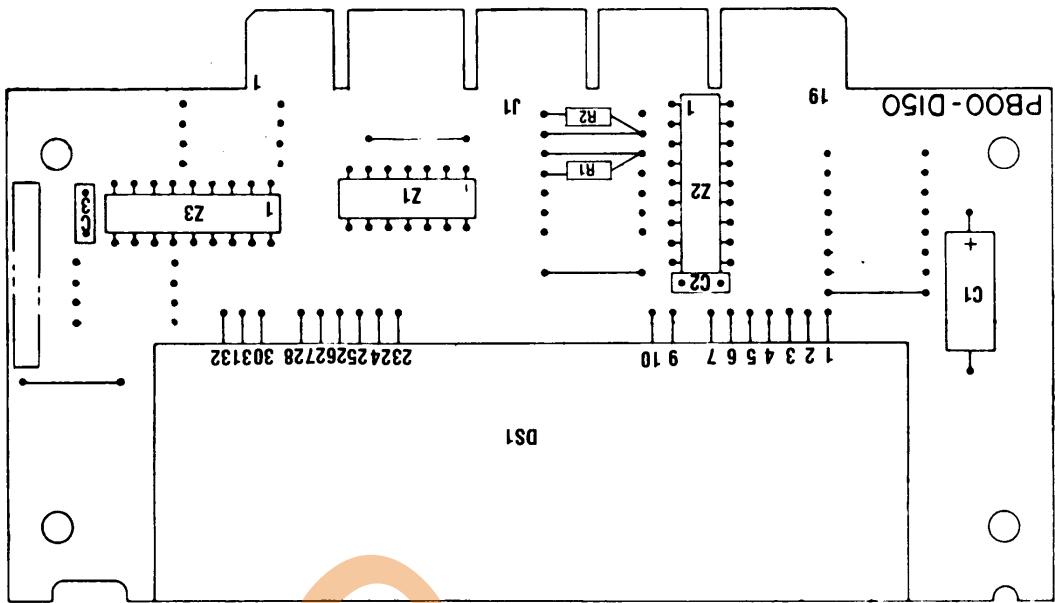
NOTE: UNLESS OTHERWISE SPECIFIED  
1. REF. ASSEMBLY DWG. NO. PB03-D110  
2. RESISTORS ARE 1/4W 5%  
3. CAPACITORS ARE 50V 10%  
4. CAPACITORS ARE 0.1μF, 20%, 50V  
5. INTEGRATED CIRCUITS ARE SN74170M  
6. DIODES ARE 1N4148  
7. SYMBOL  $\equiv$  DENOTES DC GND

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

X. M. 6 DIGIT DISPLAY

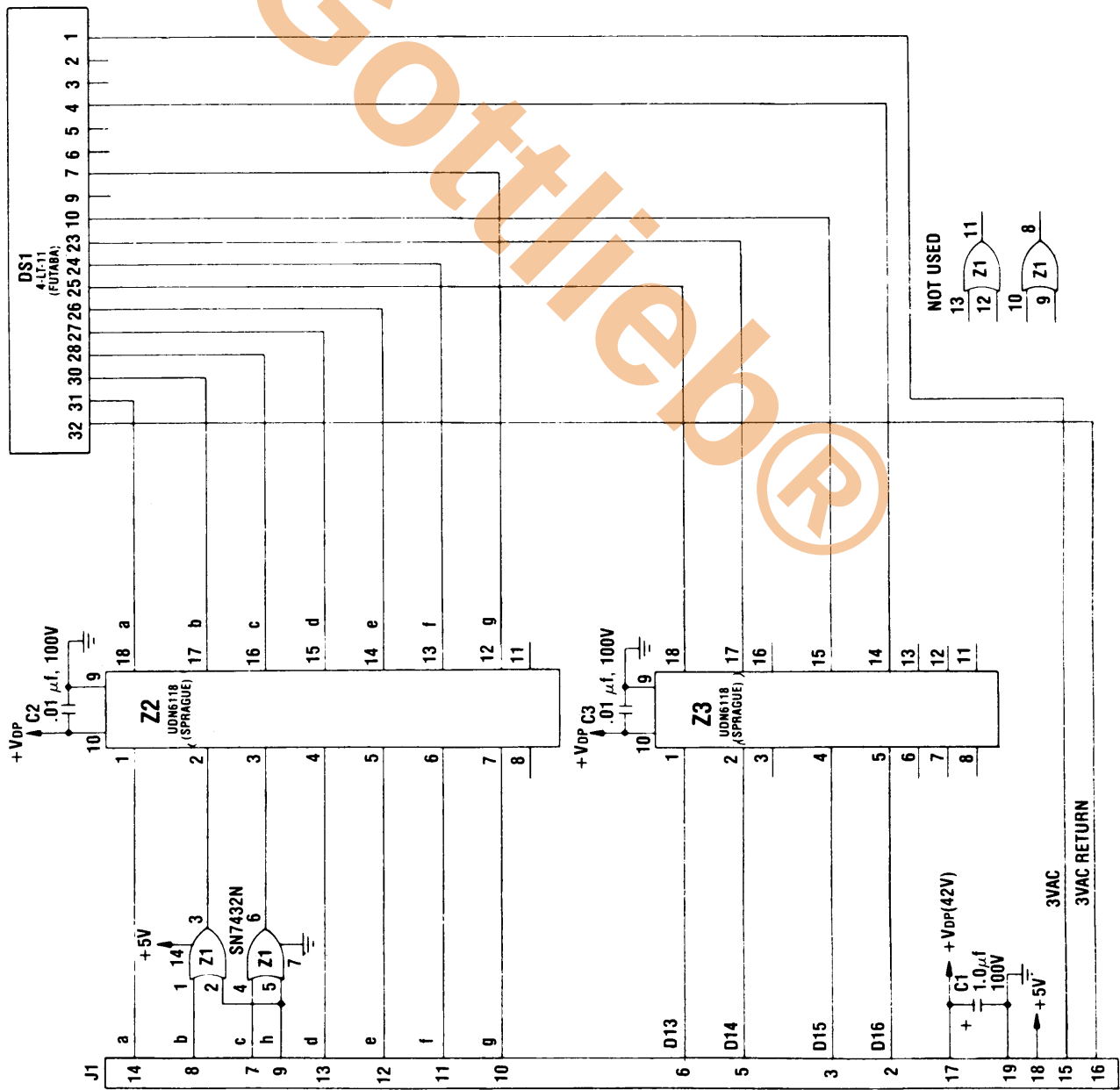


X. N. 4 DIGIT DISPLAY

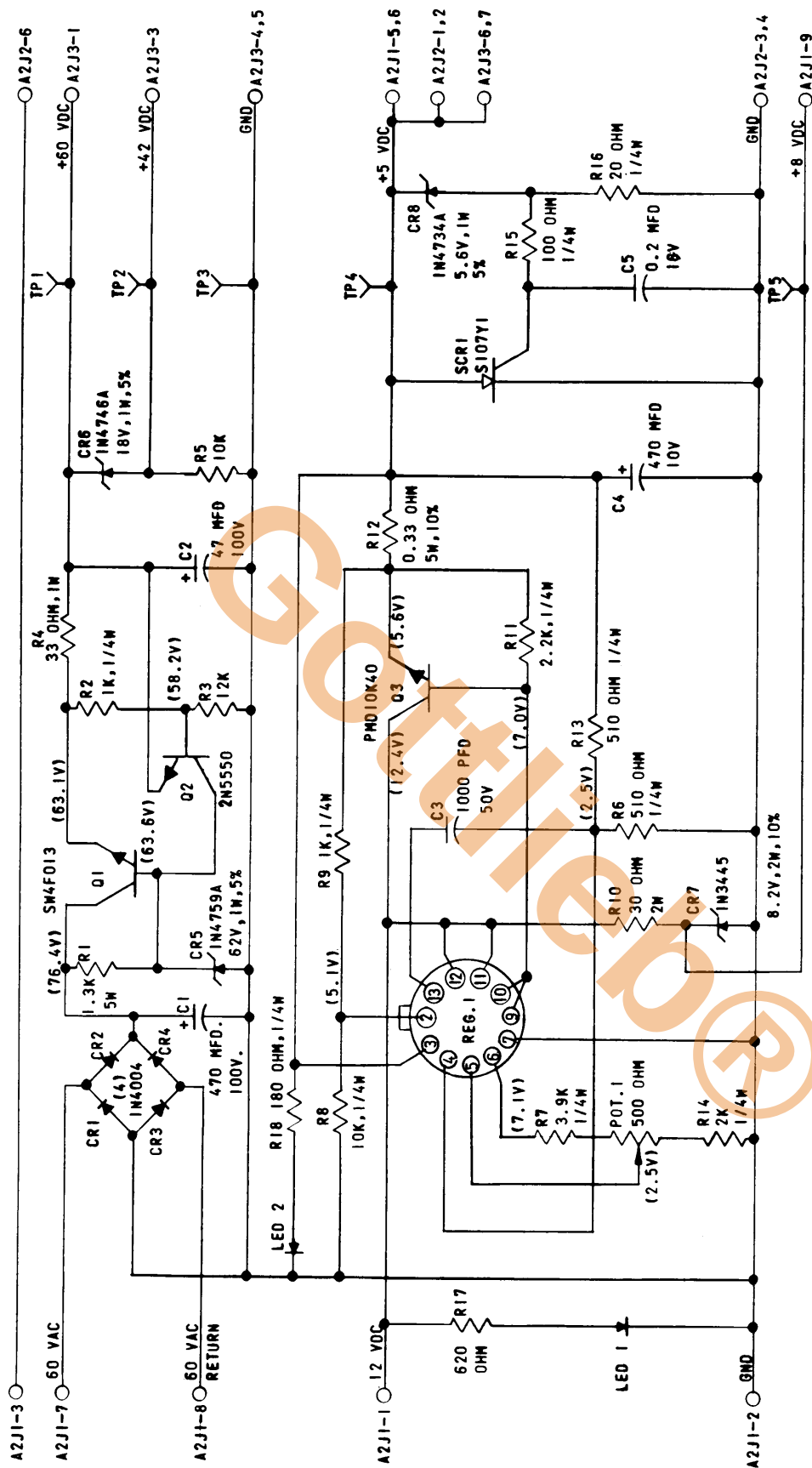


NOTE: RESISTOR VALUES ARE IN OHMS  $\pm 5\%$  1/4W

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



## X. O. POWER SUPPLY SCHEMATIC

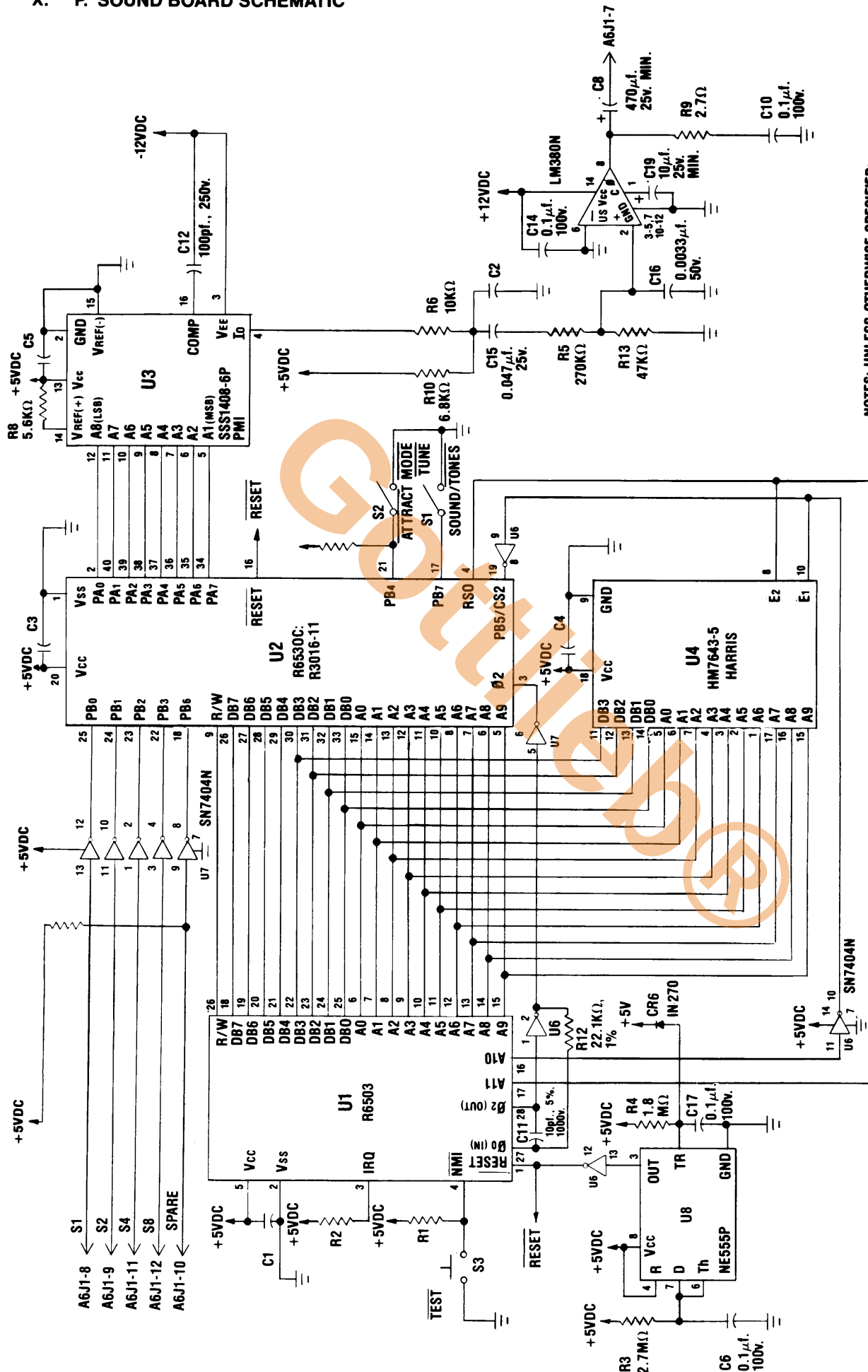


**NOTE: UNLESS OTHERWISE SPECIFIED,**

- NOTE: UNLESS OTHERWISE SPECIFIED,  
1. RESISTORS ARE 1/4W, 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                |

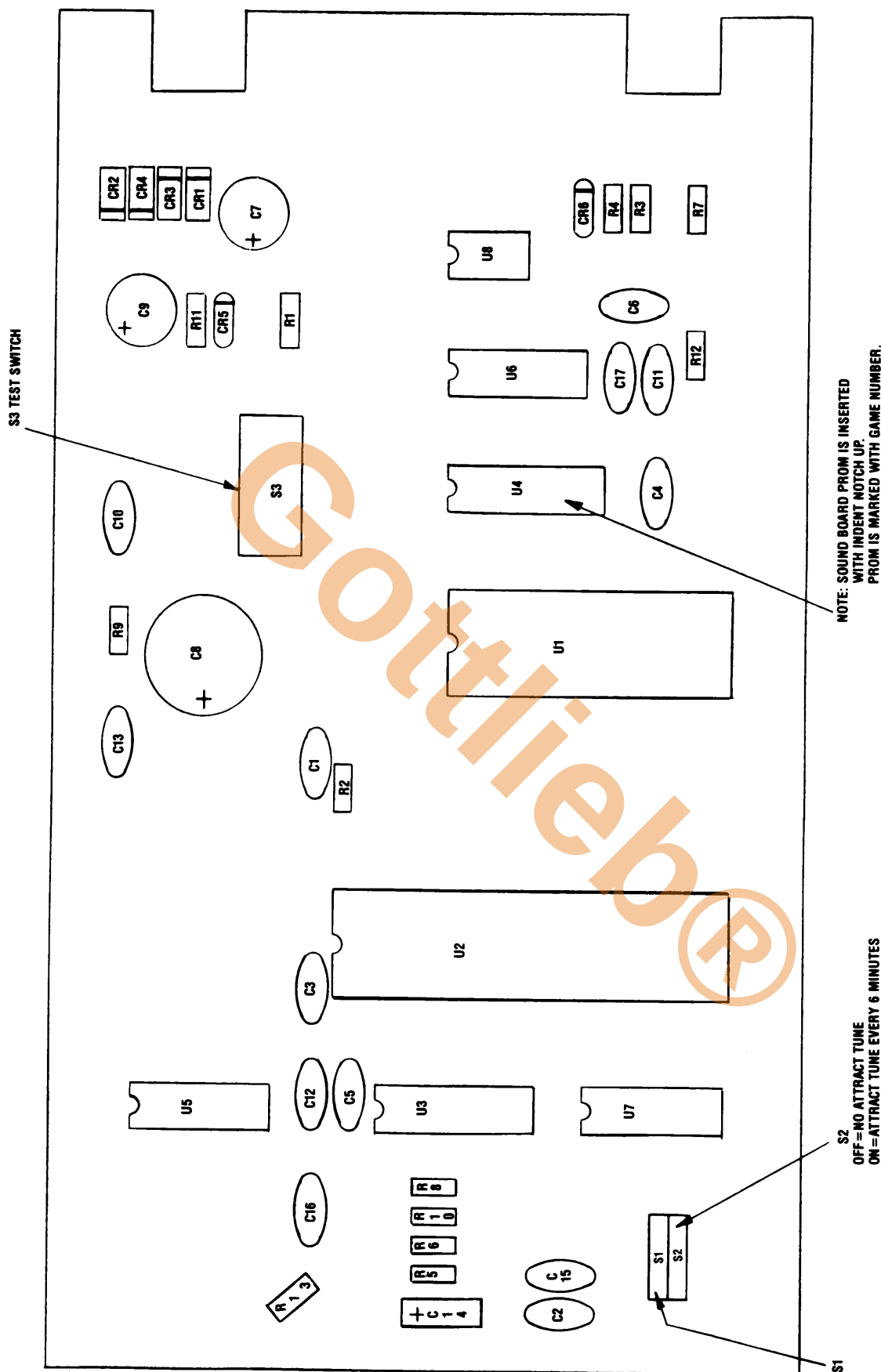
# X. P. SOUND BOARD SCHEMATIC



NOTES: UNLESS OTHERWISE SPECIFIED:  
1. ALL RESISTORS ARE 2.7KΩ, ± 5%, ¼W.  
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               |

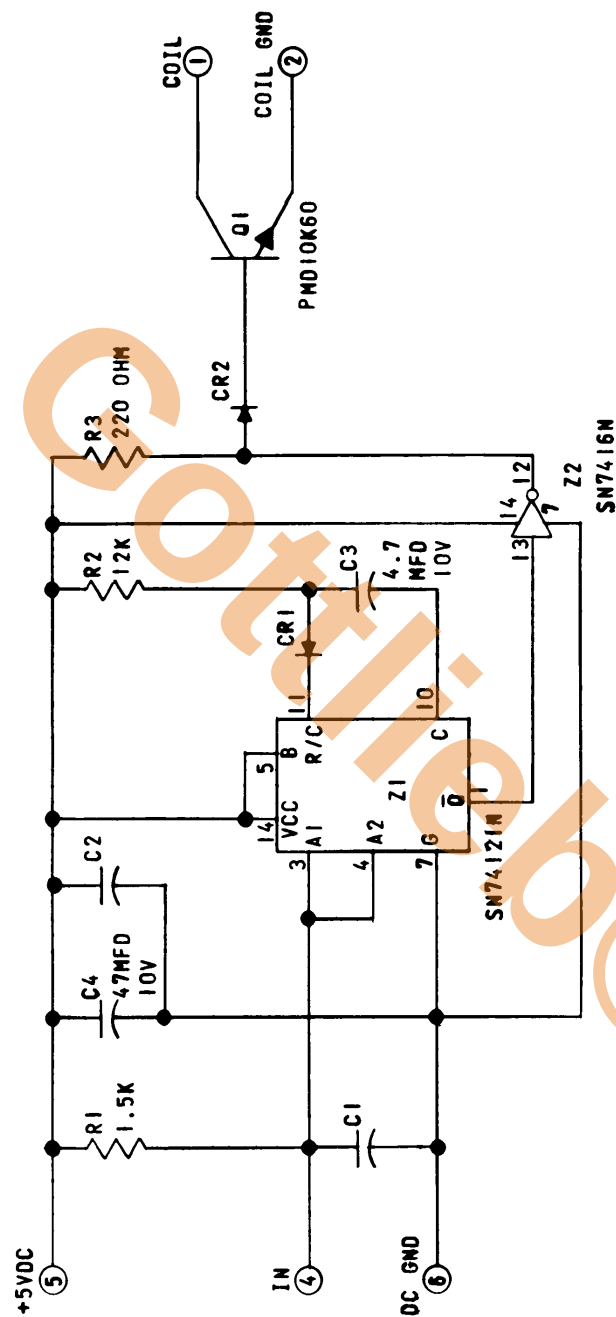
# X. Q. SOUND BOARD COMPONENT LOCATION



|                                                |          |      |         |
|------------------------------------------------|----------|------|---------|
| D. GOTTLIEB & CO.                              |          |      |         |
| TITLE SOUND BOARD COMPONENT LOCATION—SYSTEM 80 |          |      |         |
| USED ON                                        |          |      |         |
| DRAWN                                          | APPROVED | DATE | C-19829 |

OFF- CONTINUOUS SOUND  
ON- SCORING SOUNDS ONLY

X. R. POP BUMPER DRIVER BOARD SCHEMATIC



NOTE: UNLESS OTHERWISE SPECIFIED,  
1. RESISTORS ARE 1/4W, 5%,  
2. CAPACITORS ARE 0.01, MFD, 100V, 20%,  
3. DIODES ARE 1N4148  
4. ASSEMBLY NUMBER A-19741

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

Gottlieb®