# S T A R   L I G H T ®

SERVICE MANUAL
FOR LEVEL-7 GAMES

## ROM Summary

| IC | DESCRIPTION | TYPE | NUMBER | BOARD | PART NO. |
|---|---|---|---|---|---|
| Game ROM 1 | ROM 4Kx8 | 2532 | IC14 | CPU | A-5343-10690* |
| Game ROM 0 | ROM 4Kx8 | 2532 | IC20 | CPU | A-5343-10689 |
| Flipper ROM 2 | ROM 4Kx8 | 8332 | IC17 | CPU | A-5341-09554 |
| Sound ROM | ROM 2Kx8 | 2716 | IC12 | Sound | A-5343-10466 |

NOTICE

TO ORDER REPLACEMENT ROMS from your authorized WILLIAMS distributor, specify (1) part number shown above, (2) ROM-label color, (3) REV level (number) on the label, and (4) which game the ROM is used in.


## Control Locations

THE ON-OFF SWITCH is on the bottom of the cabinet near the right-front leg as you face the game.

THE VOLUME CONTROL is accessible through the coin door on the left cabinet-wall.

DIAGNOSTIC SWITCHES. ADVANCE, AUTO-UP/MANUAL-DOWN, and HIGH-SCORE RESET switches are located on the back of the coin door. Refer to Game-Adjustment Procedure and Diagnostic Procedures for operation.

THE MEMORY-PROTECT SWITCH must be open to clear bookkeeping totals and to make game adjustments. This switch is on the inside of the coin-door frame. It automatically opens when the coin door opens.

THE CPU DIAGNOSTIC-SWITCH operates the Memory-Chip Test explained in Diagnostic Procedures. This switch is on the left edge of the CPU Board.

THE SOUND-BOARD DIAGNOSTIC-SWITCH is used to initiate the Sound-Board self-test. In games with System-7 boards, this switch is on the top edge of the Sound Board. Refer to Diagnostic Procedures.


## Replacing Circuitboards

CPU BOARD. The level-7, D-8342 CPU Board (batteries at lower left) must be equipped with the ROMs specified above. Only jumpers W3, W6, W8, W10, W11, W14, W17, W19, W20, W22, W25, W26 and W29 should be connected.

DRIVER BOARD. The D-7997 Driver Board must be equipped with zero-ohm resistors or wire jumpers W9 through W16.

SOUND BOARD. The D-8223 Sound Board must be equipped with the STAR LIGHT sound-ROM. Only jumpers W1, W2, W5, W7, W9, W10 and W15 should be connected.

POWER-SUPPLY BOARD. The D-8345 Power-Supply Board is required.

DISPLAY BOARDS. The C-8363 Master-Display Board and 7-digit slave displays are required.

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*Note: German games require part no. A-5343-10690G.

## Game Play

- Making L-I-G-H-T lights spinner.
- L-I-G-H-T and S-T-A-R light right lane for bonus holdover.
- Roving light advances bonus multiplier.
- Making 10 stars lights next constellation.
- <u>Pisces lit</u>: right lane lights for extra ball.
- <u>Gemini lit</u>: outlane special lights.
- 2-ball Multi-Ball$^{TM}$ feature doubles scores.
- Lighting bonus holdover on last ball awards bonus time.

## Game Operation

<u>GAME-OVER MODE.</u> Turn the game ON. The PLAYER-1 score shows 00, all player scores flash the high score and the GAME-OVER lamp lights. All playfield-lamps cycle in <u>Attract Mode</u>.

<u>CREDIT POSTING.</u> Insert coins. A sound is produced and the number of credits is displayed. If maximum credits* are exceeded by coin or high score, credits are posted correctly. But the coin lockout de-energizes until the remaining credits are below the maximum. No credits may be won (and coins are rejected) while the coin lockout is de-energized.

<u>GAME START.</u> Push the CREDIT button. A start-up tune is played, a ball is served, and the CREDIT display is reduced by one. PLAYER 1 UP flashes until the first scoring-switch is made, and the BALL-IN-PLAY display shows 1. Additional players may enter the game by pushing the CREDIT button before BALL 2 is displayed.

<u>TILT.</u> The ball in play is tilted on the first closure of the ball-roll or playfield tilts and the third* closure of the plumb-bob tilt. The slam tilt on the coin door returns the game to the <u>Game-Over Mode</u>.

<u>END OF GAME.</u> Match digits* appear in the BALL-IN-PLAY display. Credit* is awarded for a match. Match, high score and game-over sounds are made as appropriate. One replay is awarded for each score you beat in the displays.*

### Power Turn-On And Game Setup

WARNING

This game must be plugged into a properly-grounded outlet to prevent shock hazard and to assure proper game-operation. DO NOT use a "cheater" plug to defeat the ground pin on line cord, and DO NOT cut off ground pin.

WARNING

<u>FCC STICKER.</u> Check the back of your game to see that an FCC-certification sticker was attached to your game at the factory. All games that leave WILLIAMS' plants have been tested and found to comply with FCC Rules. As the sticker is proof of this fact, <u>legal repercussions to the owner and distributor of the game</u> may result if the sticker is missing. If you receive any WILLIAMS game (manufactured after December 1982) that has no FCC sticker, call WILLIAMS for advice or write us a note on your game-registration card. <u>Be sure the card bears your game's serial number.</u>

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\* indicates adjustable feature.

ENTERING GAME-OVER MODE. With the coin door closed, plug the game in and turn it ON. The game should come on in Game-Over Mode.

1. If the game comes on in the Bookkeeping Mode (CREDITS display showing 04, BALL-IN-PLAY display showing 00, and PLAYER-1 display showing the game-identification number) turn the game OFF and ON again.

   A. If the game now comes on in Game-Over Mode, bookkeeping totals have been reset to zero.
   B. If the game still comes on in Bookkeeping Mode, open the coin door and turn the game OFF and ON twice. (A game without battery power will revert to factory settings.) Any changes from factory settings must be re-entered.

2. If the game still comes on in Bookkeeping Mode, troubleshoot the game.

<div align="center">Bookkeeping Mode<br>(Functions 01-17)</div>

1. Set the AUTO-UP/MANUAL-DOWN switch to AUTO-UP and press ADVANCE. Test 04 is indicated in the CREDITS display, Function 00 in the MATCH display, and the game-identification number in the PLAYER-1 display.

2. Press ADVANCE to display desired functions on the MATCH display (See the Bookkeeping Table below). Now record the corresponding totals (number of coins and total paid-credits) from the PLAYER-1 display. (To review a total that has been advanced past, use MANUAL-DOWN and press ADVANCE).

3. Use MANUAL-DOWN and press ADVANCE to display Function 50 in the MATCH display.

4. Returning to Game-Over Mode:
   A. Use AUTO-UP and press ADVANCE.
   B. OR: To zero bookkeeping totals and return to Game-Over Mode, (1) use AUTO-UP, (2) press the credit button to display 35 in the PLAYER-1 display, and (3) press ADVANCE.

<div align="center">Bookkeeping Table</div>

| FUNCTION | PLAYER-1 DISPLAY | PLAYER-2 DISPLAY |
|---|---|---|
| 00 | Game Identification (2520 1) | -- |
| 01 | Coins, Left chute (closest to coin door hinge) | -- |
| 02 | Coin, center chute | -- |
| 03 | Coin, right chute | -- |
| 04 | Total Paid Credits | -- |
| 05 | Special Credits | -- |
| 06 | Replay-Score Credits | -- |
| 07 | Match Credits | -- |
| 08 | Total Credits | Free Credits |
| 09 | Total Extra Balls | -- |
| 10 | Ball Time in Minutes | -- |
| 11 | Total Balls Played | -- |
| 12 | Current High-Score | -- |
| 13 | Highest Score | High-Score Credits Awarded Times exceeded |
| 14 | Replay-Level 1 | Times exceeded |
| 15 | Replay-Level 2 or Backup High-Score | 2 Times exceeded |
| 16 | Replay-Level 3 or Backup High-Score | 3 Times exceeded |
| 17 | Replay-Level 4 or Backup High-Score | 4 Times exceeded |

## Game-Adjustment Procedure
### (Functions 13-41)

### Coin door must be open to change settings

1. Use AUTO-UP and press ADVANCE. Test 04 is indicated in the CREDITS display, function 00 in the MATCH display, and the game-identification number in the PLAYER-1 display.

2. To raise the function number in the MATCH display, use AUTO-UP and push ADVANCE. To lower the function number, use MANUAL-DOWN and push ADVANCE.

3. With the desired function indicated in the MATCH display, raise the value in the PLAYER-1 display by using AUTO-UP and pressing the credit button. Reduce the value by using MANUAL-DOWN and pressing the credit button. The value remaining in the PLAYER-1 display is the new setting. Refer to the Game-Adjustment Table and the Pricing Table.

4. ADVANCE to the next function and then repeat the previous step until all adjustments have been made.

5. Hold down ADVANCE until Function 50 is indicated in the MATCH display. From Function 50 you can return to Game-Over Mode or restore factory settings. Perform either of the following as desired.

6. To return to Game-Over Mode use AUTO-UP and press ADVANCE.

7. To restore factory settings and zero bookkeeping totals:
   A. Using AUTO-UP press the CREDIT button until 45 is indicated in the PLAYER-1 display.
   B. Press ADVANCE. The game returns to Test 04, function 00.
   C. Use MANUAL-DOWN and press ADVANCE to indicate function 50.
   D. Use AUTO-UP and press ADVANCE.


## Resetting The Four High-Scores

1. Using the GAME-ADJUSTMENT PROCEDURE above, set functions 13, 15, 16 and 17 to the desired reset-values.

2. Set function 39 to 01.

3. Set function 40 to 04.

4. Use AUTO-UP and hold down ADVANCE until function 50 is indicated in the MATCH display.

5. Return to Game-Over Mode by pressing ADVANCE.

6. In Game-Over Mode, press HIGH-SCORE RESET. Four scores should come up on the displays.

7. One credit (up to four credits in one game) will be awarded for each high score that's beaten.

## Game-Adjustment Table

| FUNCTION | DESCRIPTION | FACTORY SETTING[1] |
|---|---|---|
| 13 | Highest Score | 2,500,000 |
|  | High score credits awarded--function 40) |  |
| 14 | First Replay-Level | 2,000,000 |
| 15 | Second Replay-Level or Second-Highest Score | 00 |
| 16 | Third Replay-Level or Third-Highest Score | 00 |
| 17 | Fourth Replay-Level or Fourth-Highest Score | 00 |
| 18 | Maximum Credits | 30 |
| 19 | Standard and Custom Pricing-Control | 01/02 |
| 20 | Left Coin-Slot Multiplier | 01/09 |
| 21 | Center Coin-Slot Multiplier | 04/45 |
| 22 | Right Coin-Slot Multiplier | 01/18 |
| 23 | Coin Units Required For Credit | 01/05 |
| 24 | Coin-Units Bonus-Point | 00/45 |
| 25 | Minimum Coin-Units | 00 |
| 26 | Match | 00 |
|  | 00: Match on |  |
|  | 01: Match off |  |
| 27 | Special | 00 |
|  | 00: Awards credit |  |
|  | 01: Awards extra ball |  |
|  | 02: Awards points |  |
| 28 | Replay: | 00 |
|  | 00: Awards credit |  |
|  | 01: Awards extra ball |  |
|  | 02: No award |  |
| 29 | Maximum Plumb-Bob Tilts (including warnings) | 03 |
| 30 | Number of Balls (including bonus ball) | 03 |
| 31 | Game-Adjustment #1 - Top Rollover Lanes | 01 |
|  | 00: Lane spots 1 star in constellation |  |
|  | 01: Lane spots 2 stars in constellation |  |
| 32 | Game-Adjustment #2 - Background Sound | 01 |
|  | 00: Background sound off |  |
|  | 01: Background sound on |  |
| 33 | Game-Adjustment #3 | 00 |
|  | 00: "LOCK" and holdover lamp not carried to next ball |  |
|  | 01: "LOCK" carried to next ball |  |
|  | 02: Holdover carried to next ball |  |
|  | 03: "LOCK" and holdover carried to next ball |  |
| 34 | Game-Adjustment #4 - Time to complete bonus holdover | 03 |
|  | 00: 5 seconds |  |
|  | 01: 8 seconds |  |
|  | 02: 10 seconds |  |
|  | 03: On for the remainder of the ball |  |
| 35 | Game-Adjustment #5 | 01 |
|  | 00: 10,000 lamp in "LIGHT" score-string off |  |
|  | 01: 10,000 lamp in "LIGHT" score-string on |  |
| 36 | Game-Adjustment #6 | 00 |
|  | 01: Extra ball hard |  |
|  | 00: Extra ball easy |  |
| 37 | Game-Adjustment #7 | 01 |
|  | 00: No memory on "STAR", "LIGHT" and eject extra-ball lamps |  |
|  | 01: Extra-ball lamp carried to next ball |  |
|  | 02: "STAR" & "LIGHT" lamps carried to next ball |  |
|  | 03: "STAR", "LIGHT" and extra-ball lamps carried to next ball |  |

## Game-Adjustment Table (cont'd)

| 38 | Game-Adjustment #8 | 01 |

00: Lane extra-ball and special lamps not carried to next ball
01: Extra ball and special lamps carried to next ball

| 39 | Game-Adjustment #9 | 00 |

00: Displays one high score
01: Displays four high scores

| 40 | Maximum high-score credits | 03 |

00: Displays high scores without credit payouts

| 41 | Maximum Extra-Balls at any time | 04 |

| 42-49 | Not Used |
| 50 | Special Function |

15: Auto-Cycle Mode
35: Zero bookkeeping totals
45: Restore factory settings & zero bookkeeping totals

### NOTES

1. The second factory-setting value is with jumper W25 on the CPU Board removed.
2. Functions 13 through 17 may be set to any multiple of 100,000 points.
   Setting function 40 to zero with function 13 set to any score but zero permits the high-score feature to operate but no credits are awarded.
3. Setting functions 14 through 17 (replay levels) to zero disables the replay-score point.
4. Function 39 also determines whether functions 14 through 17 represent replay levels (function 39, setting 00) or high scores (setting 01).


### Pricing Table

●indicates standard settings by adjusting ONLY function 19

| Coin-Door Mechanism | Games/Price | Function 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|
| Twin-Quarter | ●1/25¢, 4/$1 | 1 | 1 | 4 | 1 | 1 | 0 | 0 |
| or | ●1/50¢, 3/$1, 6/$2 | 3 | 1 | 4 | 1 | 2 | 4 | 0 |
| Quarter, | ●1/50¢, 2/75¢, 3/4x25¢ | 5 | 3 | 15 | 3 | 4 | 15 | 0 |
| Dollar, | 2/25¢, 8/$1 | 0 | 2 | 8 | 2 | 1 | 0 | 0 |
| Quarter | 1/25¢, 3/50¢, 6/$1 | 0 | 1 | 4 | 1 | 1 | 2 | 0 |
| | 1/25¢, 5/$1 | 0 | 1 | 4 | 1 | 1 | 4 | 0 |
| | 1/50¢ | 0 | 1 | 4 | 1 | 2 | 0 | 0 |
| 1DM, 5DM, 2DM | ●1/1DM, 3/2DM, 10/5DM | 2 | 9 | 45 | 18 | 5 | 45 | 0 |
| | 2/1DM, 5/2DM, 14/5DM | 0 | 13 | 65 | 26 | 5 | 65 | 0 |
| 20¢, 50¢ | 1/20¢, 3/50¢ | 0 | 6 | 0 | 15 | 5 | 0 | 0 |
| 1F, 10F, 5F | ●1/2F, 3/5F only, 8/10F only | 4 | 1 | 16 | 6 | 2 | 0 | 0 |
| 25-Cent | ●1/25¢, 4/1G | 6 | 1 | 0 | 4 | 1 | 0 | 0 |
| 1-Guilder | 1/25¢, 5/1G | 0 | 1 | 0 | 4 | 1 | 4 | 0 |
| 5-Franc, | ●1/5F, 2/10F | 7 | 1 | 0 | 2 | 1 | 0 | 0 |
| 10-Franc | ●1/10F | 8 | 1 | 0 | 2 | 2 | 0 | 0 |
| 1-Franc or | 1/1F, 3/2F | 0 | 1 | 1 | 1 | 1 | 2 | 0 |
| Twin 1-Franc | 1/1F | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| Twin 2-Franc | ●1/2F, 3/4F | 3 | 1 | 4 | 1 | 2 | 4 | 0 |
| 10F, 20F | ●1/10F, 2/20F | 7 | 1 | 0 | 2 | 1 | 0 | 0 |
| Twin 100-Yen | 2/100Y | 0 | 2 | 0 | 2 | 1 | 0 | 0 |
| 100L, 200L | ●1/200 Lire | 8 | 1 | 0 | 2 | 2 | 0 | 0 |
| Twin 1-Sucre | 1/3S, 2/5S | 0 | 2 | 0 | 2 | 5 | 0 | 0 |
| Any | Free Play | set function 18 to 0 for free play | | | | | | |

## Game Pricing

PRICING MADE EASY. Function 19 allows a shorthand method of setting the pricing functions. If a number from one to eight is entered into function 19, a corresponding standard setting (shown in the pricing table above) will be entered into the game. The rest of the pricing functions are automatically set for that standard.

FOR CUSTOM SETTINGS first set function 19 to zero. Then set the remaining values according to the pricing table.

THE GAMES : PRICE RATIO is equivalent to the ratio X : VC,
where:
X = COIN-SLOT MULTIPLIER (the number at function 20, 21 or 22)
V = COIN VALUE
C = COIN UNITS REQUIRED FOR CREDIT (the number at function 23)

For example at factory settings with quarter chutes the variables produce 1 : 25x1 or one game for 25¢.

## Diagnostic Procedures

### DISPLAY TEST

1. Use MANUAL-DOWN and press ADVANCE. Displays should indicate all 0's.

2. Use AUTO-UP. Displays should sequence from all 0's through all 9's. Comma segments should come on when the odd digits are displayed.

3. To stop cycling use MANUAL-DOWN. Press ADVANCE to step through the tests one number at a time. Use AUTO-UP to resume cycling.

### SOUND TEST

1. (From Display Test) Use AUTO-UP and press ADVANCE. Test 00 should be indicated in the CREDITS display and the MATCH display should sequence from 00 through 06. A different sound should be produced for each number.

2. To continuously pulse a single sound use MANUAL-DOWN. Press ADVANCE to sequence through sounds one at a time. Use AUTO-UP to resume sequencing.

### LAMP TEST

1. Refer to the Lamp-Matrix Table for lamp numbers and wiring. Driver-Board connections at jacks 2J5 (columns) and 2J7 (rows) are also shown there.

2. (From Sound Test) Use AUTO-UP and press ADVANCE. Test 01 should be indicated in the CREDITS display and all feature-lamps should flash.

### SOLENOID TEST

1. Refer to the Solenoid Table for solenoid numbers and wiring. Driver-Board connections at plugs 2P9, 2P11 and 2P12 are also shown there.

2. (From Lamp Test) Use AUTO-UP and press ADVANCE. Test 02 should be indicated in the CREDITS display. The MATCH display sequences from 01 through 25. Corresponding solenoids 01 through 24 are pulsed. The flipper relay is de-energized with subtest 25.

3. To continuously pulse a single solenoid use MANUAL-DOWN. Press ADVANCE to sequence through the solenoids one at a time. Use AUTO-UP to resume sequencing.


SWITCH TEST

1. Refer to the Switch-Matrix Table for switch numbers and wiring. Driver-Board connections at jacks 2J2 (columns) and 2J3 (rows) are also shown there.

2. (From Solenoid Test) Use AUTO-UP and press ADVANCE. Test 03 should be indicated in the CREDITS display with the switch numbers sequencing in the BALL-IN-PLAY display.

   As a switch number is displayed a sound is produced. As a switch is opened, its number is removed from the sequence. When all switches are open, the BALL-IN-PLAY display is blank and the sounds stop.

3. HOLD DOWN EACH SWITCH so its number is shown at least twice. A sound is produced and a switch number is momentarily indicated in the BALL-IN-PLAY display.

   ROW PROBLEMS. If two switches in a row are indicated with only one switch closed, check for a short between the column wires.

   FOR MULTIPLE INDICATIONS check the column wire for a short to ground.

   COLUMN PROBLEMS. If two switches in a column are indicated with only one switch closed, check for a short between row wires.

4. PLAYFIELD OR DRIVER BOARD? To determine whether the problem is in the playfield or the Driver Board, remove connectors 2P2 and 2P3 from the Driver Board. Now enter the Switch Test. Use a jumper wire to simulate switch operation:

   For example, on the Switch-Matrix Table notice that placing a jumper between 2J2-pin 8 and 2J3-pin 9 should produce an indication of switch 09 being closed.


AUTO-CYCLE MODE

1. The Auto-Cycle Mode permits you to check intermittent problems in the playfield, backbox, cabinet and driver board.

2. Set function 50 of Test 04 (Bookkeeping Mode) to 15.

3. Press ADVANCE to start the Auto-Cycle Mode. This mode repeatedly sequences through the Display Test, Sound Test (00), Lamp Test (01), and Solenoid Test (02).

4. This sequence is repeated until the game is turned off and on.

MEMORY-CHIP TEST

Press the DIAGNOSTIC button on the left side of the CPU Board.  The following indications are provided.

0-test passed (game returns to <u>Game-Over Mode</u>)
1-IC13 RAM faulty
2-IC16 RAM faulty
3-IC17 ROM 2 faulty
4-IC17 ROM 2 faulty
5-IC20 ROM 1 faulty
6-IC14 Game-ROM 1 faulty
7-IC26 Game-ROM 0 faulty
8-IC19 CPU-Board lockup; also check memory-protect circuit and CMOS RAM
9-Coin-door closed, memory-protect circuit faulty, or IC19 CMOS RAM faulty

<u>Note that "0" remaining after power turn-on indicates CPU-Board lockup.</u>


SOUND-BOARD SELF-TEST

1.  <u>PRESS THE DIAGNOSTIC BUTTON</u> at the top of the Sound Board.  Several electronic sounds should be produced.  This sequence of sounds is repeated until the game is turned OFF and back ON.

2.  <u>NO SOUND IN DIAGNOSTIC TEST</u> (but sounds are present in the Self-Test):  Check the sound-select inputs (connector 10J3 and adjacent circuitry) or replace the Sound Board and rerun the Diagnostic Test (see SOUND TEST above).

3.  <u>NEW SOUND-BOARD, SAME SYMPTOM:</u>  Check the cables to the CPU Board.  If they're good, replace the CPU Board and rerun the Diagnostic Test.

4.  <u>NO SOUND:</u>  Check +12V, -12V and +5V-supply voltages on the Sound Board.  If voltages are low (or AC ripple seems too high), replace C27 and C26.

    A.  ripple of over 0.75 VAC across C27 is excessive

    B.  ripple of over 0.005VAC across the output of the regulator IC is excessive

4.  <u>STILL NO SOUND:</u>  Turn the volume control all the way up.  With the game turned on, momentarily place a powered-up AC soldering-pencil on the center tap of the volume control.  DO NOT use a soldering iron of over 40 watts.  Cordless models will NOT work here.

    (A)  <u>If you hear a low hum,</u> the power-amplifier chip (TDA2002), volume control and speaker are okay.

    (B)  <u>If you don't hear a hum,</u> try the test again with the volume control turned halfway up.

## Solenoid Table

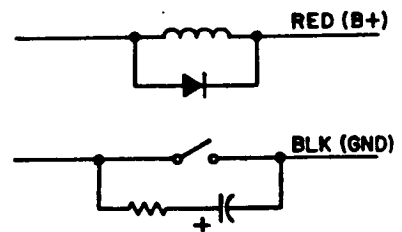| SOL. NO. | FUNCTION | WIRE COLOR | CONNECTIONS DR. BD. OTHER | | DRIVER TRANS. | SOLENOID PART-NO. |
|---|---|---|---|---|---|---|
| 01 | Outhole | GRY-BRN | 2P11-4, 8P3-1 | | Q15 | SA-23-850-DC |
| 02 | Ramp Eject | GRY-RED | 2P11-5, 8P3-2 | | Q17 | SG-1-23-850-DC |
| 03 | Eject Hole | GRY-ORN | 2P11-7, 8P3-3 | | Q19 | SG-1-23-850-DC |
| 04 | Flash Lamps | GRY-YEL | 2P11-8, 8P3-4 | | Q21 | - |
| 05 | Not Used | GRY-GRN | 2P11-9, 8P3-5 | | Q23 | - |
| 06 | Not Used | GRY-BLU | 2P11-3, 8P3-6 | | Q25 | - |
| 07 | Not Used | GRY-VIO | 2P11-2, 8P3-7 | | Q27 | - |
| 08 | Not Used | GRY-BLK | 2P11-1, 8P3-8 | | Q29 | - |
| 09 | Not Used | BRN-BLK | 2P9-9, 8P3-9 | | Q31 | - |
| 10 | Not Used | BRN-RED | 2P9-7, 8P3-10 | | Q33 | - |
| 11 | General Illumination | BRN-ORN | 2P9-1, 3P7-1 | | Q35 | 5580-09555 |
| 12 | Not Used | BRN-YEL | 2P9-2, 8P3-12 | | Q37 | - |
| 13 | Not Used | BRN-GRN | 2P9-3, 8P3-13 | | Q39 | - |
| 14 | Not Used | BRN-BLU | 2P9-4, 8P3-14 | | Q41 | - |
| 15 | Knocker | BRN-VIO | 2P9-5, 7P1-17 | | Q43 | SA-2-23-850-DC |
| 16 | Coin Lockout Coil | BRN-GRY | 2P9-6, 7P1-18, | 7P2-4 | Q45 | 904218-696 |
| *17 | Left Kicker | BLU-BRN | 2P12-7, 8P3-17 | | Q2 | SG1-23-850-DC |
| *18 | Right Kicker | BLU-RED | 2P12-4, 8P3-18 | | Q4 | SG1-23-850-DC |
| *19 | Left Jet Bumper | BLU-ORN | 2P12-4, 8P3-19 | | Q6 | SG1-23-850-DC |
| *20 | Lower Jet Bumper | BLU-YEL | 2P12-6, 8P3-20 | | Q8 | SG1-23-850-DC |
| *21 | Right Jet Bumper | BLU-GRN | 2P12-8, 8P3-12 | | Q10 | SG1-23-850-DC |
| *22 | Not Used | BLU-BLK | 2P12-9, 8P3-22 | | Q12 | - |
| | Right Flipper* | BLU-VIO | 2P12-1, 7P1-7 | | - | FL24/600-30-2600-50VDC |
| | Left Flipper* | BLU-GRY | 2P12-2, 7P1-9 | | - | FL24/600-30-2600-50VDC |

*NOTES

1. Special-switch connections for solenoids 17 through 21 are as follows:
   17--ORN-BRN--2P13-5, 8P3-24
   18--ORN-RED--2P13-3, 8P3-25
   19--ORN-BLK--2P13-2, 8P3-26
   20--ORN-YEL--2P13-4, 8P3-27
   21--ORN-GRY--2P13-8, 8P3-28

2. FLIPPER COILS. This game requires 50-volt flipper coils. For proper operation, the replacement part shown MUST be used.

3. Flipper-button connections:
   Right--ORN-VIO--2P12-1, 7P1-7
   Left--ORN-GRY--2P12-2, 7P1-9

4. Solenoid 16 has a Coinco part-number.

5. Typical wiring for solenoids and special switches follows.

## Lamp-Matrix Table

| ROW \ COLUMN | 1 YEL-BRN 2J5-8 | 2 YEL-RED 2J5-9 | 3 YEL-ORN 2J5-6 | 4 YEL-BLK 2J5-7 | 5 YEL-GRN 2J5-3 | 6 YEL-BLU 2J5-5 | 7 YEL-VIO 2J5-1 | 8 YEL-GRY 2J5-2 |
|---|---|---|---|---|---|---|---|---|
| RED-BRN 2J7-1 | GAME-OVER 1 | 2X 9 | L 17 | SPINNER 25 | STAR 8 33 | TOP LN 6 41 | 10,000 49 | LEO 57 |
| RED-BLK 2J7-2 | MATCH 2 | 3X 10 | I 18 | STAR 1 26 | STAR 9 34 | TOP LN 7 42 | 30,000 50 | ARIES 58 |
| RED-ORN 2J7-3 | TILT 3 | 5X 11 | G 19 | STAR 2 27 | STAR 10 35 | TOP LN 8 43 | 50,000 51 | LIBRA 59 |
| RED-YEL 2J7-4 | HIGH-SCORE-TO-DATE 4 | 10X 12 | H 20 | STAR 3 28 | TOP LN 1 36 | TOP LN 9 44 | 100,000 & LITES EJT. 2 | PISCES 60 |
| RED-GRN 2J7-5 | SHOOT AGAIN (INSRT)5 | S 13 | T 21 | STAR 4 29 | TOP LN 2 37 | TOP LN 10 45 | EX BALL R LANE 53 | VIRGO 61 |
| RED-BLU 2J7-6 | BALL IN PLAY 6 | T 14 | ADV'X' LEFT TGT 22 | STAR 5 30 | TOP LN 3 38 | LEFT SPECIAL 46 | EX.BALL (EJECT) 54 | GEMINI 62 |
| RED-VIO 2J7-9 | ALL SCORES DBL 7 | A 15 | ADV'X' R LANE 23 | STAR 6 31 | TOP LN 4 39 | RIGHT SPECIAL 47 | LOCK (EJECT) 55 | STAR 63 |
| RED-GRY 2J7-8 | BONUS HOLD-OVER 8 | R 16 | ADV'X' R TGT 24 | STAR 7 32 | TOP LN 5 40 | LITES BNS H/O ARR. 48 | SHOOT AGAIN PLFD 56 | LIGHT 64 |

## Switch-Matrix Table

| ROW \ COLUMN | 1 GRN-BRN 2J2-9 | 2 GRN-RED 2J2-8 | 3 GRN-ORN 2J2-7 | 4 GRN-YEL 2J2-6 | 5 GRN-BLK 2J2-5 | 6 GRN-BLU 2J2-3 | 7 GRN-VIO 2J2-2 | 8 GRN-GRY 2J2-1 |
|---|---|---|---|---|---|---|---|---|
| WHT-BRN 2J3-9 | PLUMB-BOB TILT 1 | OUTHOLE 9 | L 17 | SPINNER 25 | STAR 8 33 | LEFT JET 41 | UPR L SWITCH 49 | NOT USED 57 |
| WHT-RED 2J3-8 | BALL-ROLL TILT 2 | RAMP 1 10 | I 18 | STAR 1 26 | STAR 9 34 | LOWER JET 42 | LEFT KICKER 50 | NOT USED 58 |
| WHT-ORN 2J3-7 | CREDIT BUTTON 3 | RAMP 2 11 | G 19 | STAR 2 27 | STAR 10 35 | RIGHT JET 43 | RIGHT KICKER 51 | NOT USED 59 |
| WHT-YEL 2J3-6 | LEFT COIN 4 | SHOOTER LANE SW 12 | H 20 | STAR 3 28 | TOP LNS 1-2 36 | LEFT FLIPPER RET. 44 | EJECT 52 | NOT USED 60 |
| WHT-GRN 2J3-5 | CENTER COIN 5 | S 13 | T 21 | STAR 4 29 | TOP LNS 3-4 37 | RIGHT FLIPPER RET. 45 | PLAY-FIELD TILT 53 | NOT USED 61 |
| WHT-BLU 2J3-4 | RIGHT COIN 6 | T 14 | ADV'X' TOP L TGT 22 | STAR 5 30 | TOP LNS 5-6 38 | LEFT SPECIAL 46 | LANE CHANGE 54 | NOT USED 62 |
| WHT-VIO 2J3-3 | SLAM TILT 7 | A 15 | ADV'X' R LANE 23 | STAR 6 31 | TOP LNS 7-8 39 | RIGHT SPECIAL 47 | NOT USED 55 | NOT USED 63 |
| WHT-GRY 2J3-1 | HIGH-SCORE RESET 8 | R 16 | ADV'X' R TGT 24 | STAR 7 32 | TOP LNS 9-10 40 | LWR L SWITCH 48 | NOT USED 56 | NOT USED 64 |

## Warnings & Notices

**WARNING**

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TO MAINTAIN THESE LEVELS, reposition harnesses and reconnect ground straps to their original placements if they should be disconnected during maintenance.


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