



LASER BALL

INSTRUCTION BOOKLET

This booklet provides game operation, bookkeeping, game adjustment, and diagnostic procedures for LASER BALL. For installation information refer to the blue-covered game manual. For detailed information refer to Williams Solid State Flipper Maintenance Manual.

SPECIAL CONSIDERATIONS WHEN REPLACING CIRCUIT BOARDS

CPU BOARD

1. For memory protection feature, revision level 6 CPU Boards (batteries located on lower right corner of board) must be used. Revision level 4 CPU BOARDS equipped with three PROM sockets may be used but the memory protection feature is lost:
2. Must be equipped with green-labeled LASER BALL PROMs and green-labeled flipper ROMs.

Sound Board

1. **Must** be equipped with two fuse clips.
2. Must be jumpered for ROM operation and be equipped with Sound ROM 2 or be jumpered for PROM operation and be equipped with LASER BALL Sound PROM.

Power Supply Board

1. Fuse F4 (10A SB) for flipper solenoids must be installed.

GAME OPERATION

*Indicates adjustable features

Game Over Mode - Turn game ON; player scores show zero, high score to date* alternates with player 1 score, player 1 up lamp flashes, game over lamp lights, all playfield lamps except for credit lamp cycle in attract mode.

Credit Posting - Insert coin; knocker sounds, number of credits displayed. If maximum credits* exceeded by coin or high score to date*, credits are posted correctly, coin lockout deenergized until remaining credits are below maximum. No credits may be won and coins are rejected while lockout is deenergized.

Game Start - Push credit button; start-up tune played, ball served, credit display reduced by one, player 1 up lamp flashes until first scoring switch is made, ball in play shows 1. Pushing credit button before ball 2 displayed allows additional players.

Bonus Advance - top rollovers, left side target, B-A-L-L drop targets, and bottom inside rollovers. Bonus multiplier advanced by Bull's-Eye Target or eject hole; lighting 5X lights both spinners.

Æ Lamps - Advanced by spotting stars "1" to "10"; spotting all stars scores 10,000.

Special - awarded from Bull's-Eye Target after spotting 6th Æ lamp or from outlanes after collecting 20,000 L-A-S-E-R bonus.

Extra Ball - (Maximum of two per ball) - awarded from Bull's-Eye Target after spotting 5th Æ lamp or from eject hole after collecting 20,000 L-A-S-E-R bonus.

Memory - Spotted stars, Æ lamps, Bull's-Eye Target lamps, partial lighting of L-A-S-E-R lamps*, and bonus multipliers* below 5X.

End of Game - Match Digits* appears in ball in play display, *credit awarded for match. Exceeding high score to date awards *three credits, Match, High Score to Date, and Game Over sounds made as appropriate.

BOOKKEEPING AND EVALUATION TOTALS

(Functions 01-12)

1. In game over mode, set toggle switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in number of credits display, Function 00 in ball in play display, and game identification in Player 1 display.
2. Operate the ADVANCE pushbutton to display each function on the ball in play display (see Table 1) and record each total from Player 1 display. (To review a total that has been advanced past, set toggle switch to MANUAL-DOWN and operate the ADVANCE pushbutton.)
3. Calculate the following if desired:
 $\% \text{ Paid Credits} = \text{Function 04} \div \text{Function 08}$
4. Turn the game OFF and back ON to return to game over mode.
5. To change current High Score to Date to value of Function 13, momentarily depress HIGH SCORE RESET pushbutton.
6. To zero Functions 01-11, see page 7

GAME ADJUSTMENT PROCEDURE

(Functions 13-35)

Coin door must be open to change settings.

1. In game over mode, set toggle switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in number of credits display, Function 00 in ball in play display, and game identification in Player 1 display.
2. To raise Function number in ball in play display, operate ADVANCE pushbutton with switch set to AUTO-UP. To lower Function number operate ADVANCE with it set to MANUAL-DOWN.
3. With desired Function indicated in ball in play display, raise value in player 1 display by operating credit button with switch set to AUTO-UP; lower value by operating credit button with it set to MANUAL-DOWN. Value left of Player 1 display is new setting. For values see Table 1 and (for pricing) Table 2.
4. Repeat steps 2 and 3 until all required adjustments have been made.
5. Turn game OFF and back ON to return to game over mode.
6. To restore factory settings and zero audit totals, see page 7.

DIAGNOSTIC PROCEDURES

(Display Digits, Lamp, Solenoid, and Switch Tests)

1. In game over mode, set toggle switch to MANUAL-DOWN and depress ADVANCE. All displays should go blank.
2. Momentarily depress ADVANCE and set toggle switch to AUTO-UP. Display Digits test is performed.
3. Momentarily depress ADVANCE. Test 01 is indicated on number of credits display and Lamp Test is performed.
4. Set toggle switch to MANUAL-DOWN and momentarily depress ADVANCE. Test 02 is indicated on number of credits display and solenoid 01 on the ball in play display; solenoid 01 is pulsed by driver board.
5. Operate ADVANCE to pulse each solenoid (see Figure 3).
6. Set toggle switch to AUTO-UP and momentarily depress ADVANCE. Test 03 is indicated on number of credits display and stuck switches on ball in play display.
7. See Figure 4. Operate switches; switch number is indicated on ball in play display.
8. Turn game OFF and back ON to return to game over mode.
9. To set up Auto-Cycle Mode (Display Digits, Lamp, and Solenoid Tests) see page 7.

Table 1. Game Adjustments

FUNCTION	DESCRIPTION	NOTES	FACTORY SETTING
00	Game Identification	1	1493 2
01	Coins, Left Chute (Closest to coin door hinge)	1	—
02	Coins, Center Chute	1	—
03	Coins, Right Chute	1	—
04	Total Paid Credits	1	—
05	Total Specials	1	—
06	Total Replay (Extra Ball) Scores	1	—
07	Match and High Score to Date Credits	1	—
08	Total Credits	1,2	—
09	Total Extra Balls	1,3	—
10	Total Ball Time in Minutes	1	—
11	Total Number of Balls Played	1	—
12	Current High Score to Date	4	500,000
13	Backup High Score to Date	5	500,000
14	Replay 1 Score	6	270,000
15	Replay 2 Score	6	390,000
16	Replay 3 Score	6	510,000
17	Replay 4 Score	6	0
18	Maximum Credits	7	20
19	Standard and Custom Pricing Control (00-07) — 01	8	00
20	Left Coin Slot Multiplier	8	01
21	Center Coin Slot Multiplier	8	04
22	Right Coin Slot Multiplier	8	01
23	Coin Units Required for Credit	8	01
24	Coin Units Bonus Point	8	00
25	High Score Credits	5	03
26	Match (00=ON, 01=OFF)	—	00
27	Special 00 = Awards Credit 01 = Awards Extra Ball 02 = Awards Points	—	00
28	Scoring Awards 00 = Credits at Replay Score 01 = Extra Ball at Replay Score	—	00
29	Maximum Plumb Bob Tilts (1-9)	—	03
30	Number of Balls (03 or 05)	9	03
31	Top Rollover Control 00 = Stars Lit Separately 01 = Stars Lit Together	—	01
32	Æ Control 00 = 1st Æ Not Lit Initially Æs 2 & 3 Lit Separately 01 = 1st Æ Lit Initially Æs 2 & 3 Lit Separately 02 = 1st Æ Lit Initially Æs 2 & 3 Lit Together	9	01
33	LASER Lamp and Multiplier Restore 00 = Both Features Restore 01 = Only LASER Lamp Restores 02 = Only Bonus Multiplier Restores 03 = Neither Feature Restores	—	00
34	Extra Ball Control 00 = Extra Ball Allowed 01 = No Extra Ball	—	00
35	Outlane Special Control 00 = L-A-S-E-R 10,000 Not Lit Initially 01 = L-A-S-E-R 10,000 Lit Initially	—	00

Notes:

1. Functions 00-11 cannot be changed from the coin door; however, Functions 01-11 can be set to zero as described in Section 4.
2. Total Credits (Function 08) is the sum of Function 04 and as applicable, Functions 05, 06, and 07.
3. Total Extra Balls (Function 09) is the sum of the game extra ball feature and Functions 15 and 06, as applicable.
4. Current High Score to Date (Function 12) can be changed to the value of the Backup High Score to Date (Function 13) by operating the HIGH SCORE RESET switch while in the game over mode.
5. Function 13 may be set to any multiple of 10,000 points. Setting Function 25 to zero with Function 13 set to any score but zero permits the High Score to Date feature to operate but no credits are awarded.
6. Functions 14-17 (Replay Scores) may be set to any multiple of 10,000 points. Setting a function to zero disables the replay score point. **Always disable the Replay 4 level first, the Replay 3 level second, etc. The replay levels must be set with ascending values.**
7. Setting Maximum Credits (Function 18) to zero places the game in a free play mode.
8. With Function 19 set to 00, Functions 20-24 must be set manually. Refer to Table 2 for seven standard pricing schemes (selected by values of 01-07 for Function 19) and custom pricing values.
9. For 5 ball play, it is recommended that Function 32 be set to 00.

RECOMMENDED SCORE LEVELS

Levels	Score Card
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CREDIT GAMES

3-Ball:	
*270,000; 390,000; 510,000	493-13
or 260,000; 390,000	493-28
5-Ball:	
(See Note 9)	
390,000; 540,000	493-44

EXTRA BALL

3-Ball:	
160,000; 290,000	493-64
5-Ball:	
200,000; 330,000	493-66

*Factory setting

Table 2. Standard and Custom Price Settings

COIN DOOR MECHANISM	CREDITS	FUNCTION				
		19	20	21	22	23 24
Twin-Quarter Quarter, Dollar, Quarter <i>First Digit in Function 19 sets the Rest</i>	1 25c, 3 50c, 7 \$1	00	03	12	03	02 12
	1 25c, 3 50c, 7 \$1 coin only	00	03	14	03	02 00
	1 25c, 7 \$1 coin only	00	01	07	01	01 00
	•1/25c, 3/50c, 6/\$1	01	01	04	01	01 02
	1 25c, 6 \$1 coin only	00	01	06	01	01 00
	•1/25c, 5/\$1	00	01	03	01	01 04
	1 25c, 5 \$1 coin only	00	01	05	01	01 00
	•1/25c, 4/\$1	02	01	04	01	01 00
	1 50c, 3 \$1	00	01	04	01	02 04
	1 50c	00	01	04	01	02 00
1DM, 5DM, 2DM	•2/1DM, 5/2DM, 14/5DM	03	09	45	18	05 45
	1 1DM, 3 2DM, 10 5DM	00	09	45	18	05 45
20-Cent, 50-Cent	1 20c, 3 50c	00	06	00	45	05 00
1 Franc, 5 Franc	•1/1F, 6/\$F	04	01	00	05	01 05
	1 1F, 7 5F	00	06	00	30	05 30
25 Cent,	•1/25c, 4/1G	06	01	00	04	01 00
1 Guilder,	1 25c, 5 1G	00	01	00	04	01 04
50 Yen, 100 Yen	•1/50Y, 2/100Y	07	01	00	02	01 00
1 Franc or	1 1F, 3 2F	00	01	01	01	01 02
Twin-1 Franc	1 1F	00	01	01	01	01 00
5 Franc,	•1/5F, 2/10F	07	01	00	02	01 00
10 Franc	1 10F	00	01	00	02	02 00
Twin-2 Franc	•1/2F	02	01	04	01	01 00
10, 20 Franc	•1/10F, 2/20F	07	01	00	02	01 00
Twin-1 Sucre	1 3S, 2 5S	00	02	00	02	05 00

•Indicates standard price settings by adjusting only Function 19. For other price settings, set Function 19 to 00 and set Functions 20 through 24 to the values indicated in the chart.

RESETTING AUDIT TOTALS AND ADJUSTMENTS; INITIATING AUTO-CYCLE MODE

1. In game over mode, set the alternate-action switch to MANUAL-DOWN (in) and momentarily depress the ADVANCE pushbutton. All displays should go blank.
2. Remove the backglass and unlatch and open the insert door.
3. Set all switches on the MASTER COMMAND slide switch to OFF (move to the right).
4. Set switch on MASTER COMMAND switch to ON (move to left):
 - a. To zero audit totals (Functions 01-11) set switch 8 to ON.
 - b. To restore factory settings **and** zero audit totals, set switch 7 to ON. *Coin Door must remain open to restore factory settings.*
 - c. For Auto-Cycle Mode set switch 6 to ON.
5. Momentarily depress MASTER COMMAND ENTER pushbutton. The LEDs should blink once.
6.
 - a. After zeroing audit totals turn game OFF and ON to return to game over mode.
 - b. After restoring factory settings, turn game OFF and ON **twice** to return to game over mode.
 - c. To initiate Auto-Cycle Mode, set alternate-action switch to AUTO-UP (out) and momentarily depress the ADVANCE pushbutton. Each cycle of this mode sequences through display digits test, flashes all multiplexed lamps 64 times and pulses each solenoid. To terminate the Auto-Cycle mode and go to game over, turn the game OFF and ON.

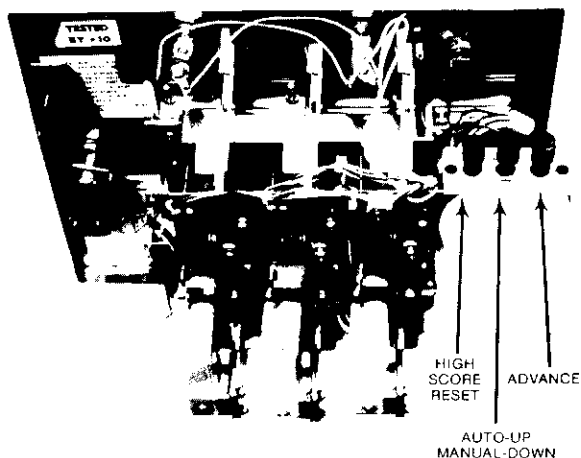


Figure 1. Coin Door Diagnostic Switches

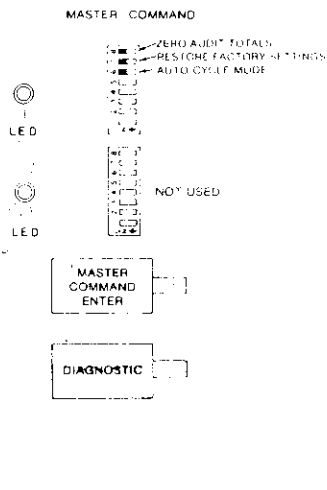
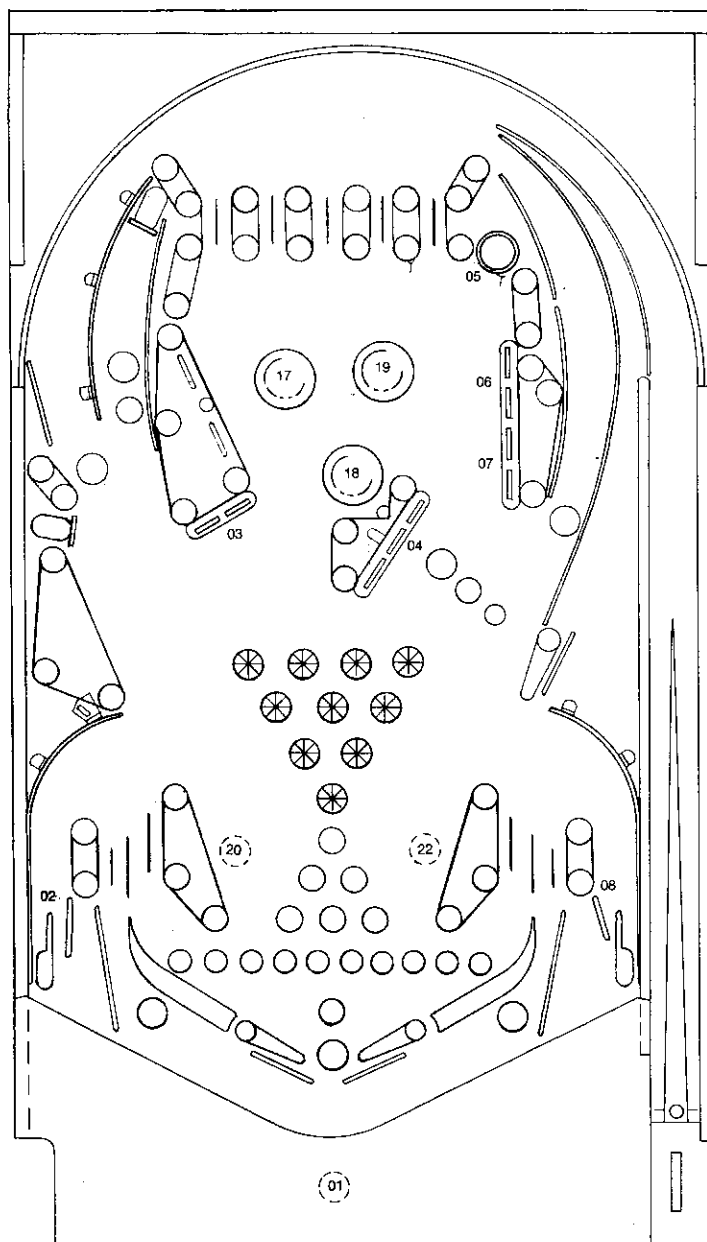


Figure 2.
Master Command
Settings Switch



SOL. NO.	DESCRIPTION
01	Ball Release
02	Left Shooter
03	"L-A" Drop Targets Reset
04	"S-E-R" Drop Targets Reset
05	Eject Hole
06	"B-A" Drop Targets Reset
07	"L-L" Drop Targets Reset
08	Right Shooter
09	Sound
10	Sound
11	Sound
12	Sound
13	Sound
14	Credit Knocker
15	LASER Lamps (Insert Board)
16	Coin Lockout
17	Left Jet Bumper
18	Center Jet Bumper
19	Right Jet Bumper
20	Right Kicker
21	Not Used
22	Left Kicker

Figure 3. Playfield Solenoid Locations and Solenoid Chart

Table 3. Solenoid Connections

SOL. NO.	FUNCTION	WIRE COLOR	CONNECTIONS	DRIVER TRANS.	SOLENOID PART NO.
01	Ball Release	GRY-BRN	2P11-4, 8P3-17	Q15	SA1-23-850-DC
02	Left Shooter	GRY-RED	2P11-5, 8P3-18	Q17	SG-23-850-DC
03	"L-A" Drop Targets Reset	GRY-ORN	2P11-7, 8P3-19	Q19	SA3-23-850-DC
04	"S-E-R" Drop Targets Reset	GRY-YEL	2P11-8, 8P3-20	Q216	SA3-23-850-DC
05	Eject Hole	GRY-GRN	2P11-9, 8P3-21	Q23	SG-23-850-DC
06	"B-A" Drop Targets Reset	GRY-BLU	2P11-3, 8P3-22	Q25	SA3-23-850-DC
07	"L-L" Drop Targets Reset	GRY-VIO	2P11-2, 8P3-23	Q27	SA3-23-850-DC
08	Right Shooter	GRY-BLK	2P11-1, 8P3-24	Q29	SG-23-850-DC
09	Sound	BRN-BLK	2P9-9, 10P3-3	Q31	--
10	Sound	BRN-RED	2P9-7, 10P3-2	Q33	--
11	Sound	BRN-ORN	2P9-1, 10P3-5	Q35	--
12	Sound	BRN-YEL	2P9-2, 10P3-4	Q37	--
13	Sound (Wired, not used)	BRN-GRN	2P9-3, 10P3-7	Q39	--
14	Credit Kicker	BRN-BLU	2P9-4, 7P1-16	Q41	SA2-23-850-DC
15	LASER Lamps (Insert Board)	BRN-VIO	2P9-5, 9P6-2	Q43	Type 89 Bulbs
16	Coin Lockout	BRN-GRY	2P9-6, 7P1-18, 7P2-4	Q45	SM-35-4000-DC
*17	Left Jet Bumper	BLU-BRN	2P12-7, 8P3-11	Q2	SG-23-850-DC
*18	Center Jet Bumper	BLU-RED	2P12-4, 8P3-12	Q4	SG-23-850-DC
*19	Right Jet Bumper	BLU-ORN	2P12-3, 8P3-13	Q6	SG-23-850-DC
*20	Right Kicker	BLU-YEL	2P12-6, 8P3-14	Q8	SG-23-850-DC
*21	Not Used	BLU-GRN	2P12-8, 8P3-15	Q10	--
*22	Left Kicker	BLU-BLK	2P12-9, 8P3-16	Q12	SG-23-850-DC
*	Lower Right Flipper	BLU-VIO	7P1-8, 8P3-3	--	SFL-20-300/ 30-800-DC
*	Upper Right Flipper	BLK-YEL	Lower Right Flipper	--	SFL-20-300/ 30-800-DC
*	Left Flipper	BLU-GRY	7P1-10, 8P3-4	--	SFL-20-300/ 30-800-DC

***NOTES:**

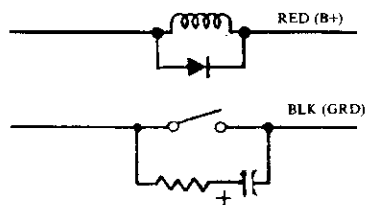
1. Special switch connections for solenoids 17 through 22 are as follows:

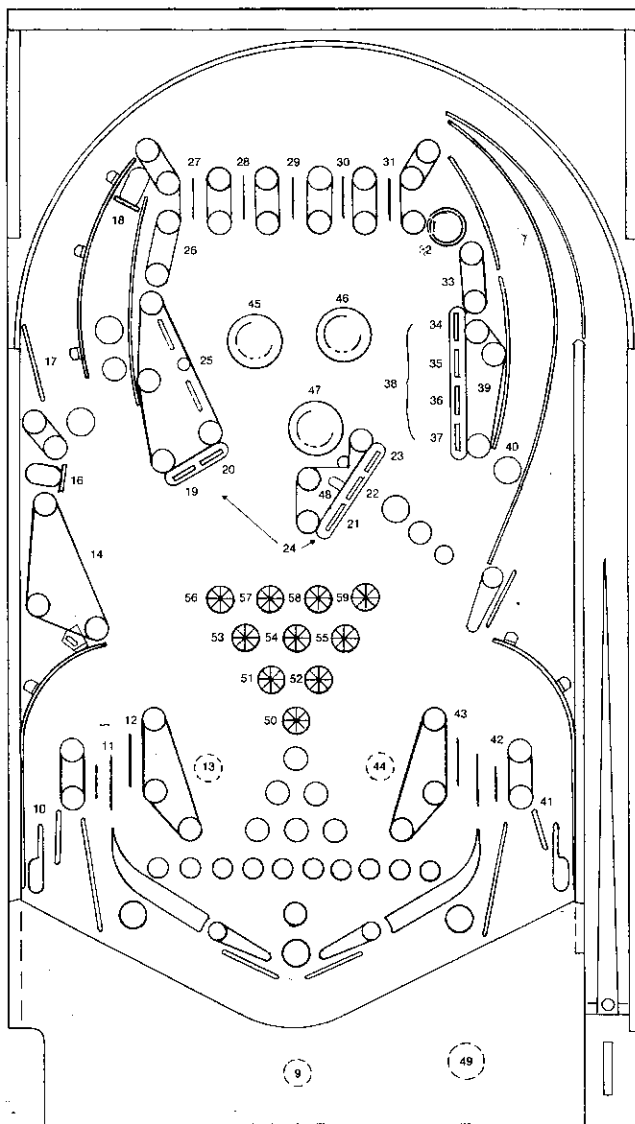
- 17 -- ORN-BRN -- 2P13-5, 8P3-5
- 18 -- ORN-RED -- 2P13-3, 8P3-6
- 19 -- ORN-BLK -- 2P13-2, 8P3-7
- 20 -- ORN-YEL -- 2P13-4, 8P3-8
- 21 -- ORN-GRN -- 2P13-8, 8P3-9
- 22 -- ORN-BLU -- 2P13-9, 8P3-10

2. Flipper button connections are as follows:

- Right -- ORN-VIO -- 2P12-1, 7P1-7
- Left -- ORN-GRY -- 2P12-2, 7P1-9

3. Typical wiring for solenoids and special switches:





SWITCH

NO.	FUNCTION (Score)
01	Plumb Bob Tilt
02	Ball Roll Tilt
03	Credit Button
04	Right Coin Switch
05	Center Coin Switch
06	Left Coin Switch
07	Slam Tilt
08	High Score Reset
09	Outhole
10	Left Shooter (500/1000 per lit star)
11	Left Special (5000)
12	Left Inside Rollover (3000)
13	Left Kicker (10)
14	Middle Left Side Standup (300)
15	Not Used
16	Left Side Target (1000)
17	Left Spinner (100/1000)
18	Bull's-Eye Target (10,000)
19	"L" Drop Target (500)
20	"A" Drop Target (500)
21	"S" Drop Target (500)
22	"E" Drop Target (500)
23	"R" Drop Target (500)
24	L-A-S-E-R Drop Target Series (5,000/lit value)
25	Lower Top Left Standup (10)
26	Upper Top Left Standup (10)
27	"1" and "2" Rollover (1000)
28	"3" and "4" Rollover (1000)
29	"5" and "6" Rollover (1000)
30	"7" and "8" Rollover (1000)
31	"9" and "10" Rollover (1000)
32	Eject Hole (5000)
33	Upper Right Standup (10)
34	"B" Drop Target (500)
35	"A" Drop Target (500)
36	"L" Drop Target (500)
37	"L" Drop Target (Bottom) (500)
38	B-A-L-L Drop Target Series (5000/10,000 per lit AE)
39	B-A-L-L Drop Target Standup (50)
40	Right Spinner (100/1000)
41	Right Shooter (500/1000 per lit star)
42	Right Special (5000)
43	Right Inside Rollover (3000)
44	Right Kicker (10)
45	Left Jet Bumper (100)
46	Right Jet Bumper (100)
47	Center Jet Bumper (100)
48	"S-E-R" Drop Target Standup (10)
49	Playfield Tilt
50	Star 1 Rollover (50)
51	Star 2 Rollover (50)
52	Star 3 Rollover (50)
53	Star 4 Rollover (50)
54	Star 5 Rollover (50)
55	Star 6 Rollover (50)
56	Star 7 Rollover (50)
57	Star 8 Rollover (50)
58	Star 9 Rollover (50)
59	Star 10 Rollover (50)

Note: Second score is lit value.

Figure 4. Playfield Switch Locations and Switch Chart

COLUMN ROW	1 GRN-BRN	2 GRN-RED	3 GRN-ORN	4 GRN-YEL	5 GRN-BLK	6 GRN-BLU	7 GRN-VIO	8 GRN-GRY
1 WHT-BRN	PLUMB BOB TILT 1	OUTHOLE 9	LEFT SPINNER 17	LOWER TOP LEFT STANDUP 25	UPPER RIGHT STANDUP 33	RIGHT SHOOTER 41	PLAYFIELD TILT 49	STAR 8 ROLLOVER 57
2 WHT-RED	BALL ROLL TILT 2	LEFT SHOOTER 10	BULL'S EYE TARGET 18	UPPER TOP LEFT STANDUP 26	"B" DROP TARGET 34	RIGHT SPECIAL ROLLOVER 42	STAR 1 ROLLOVER 50	STAR 9 ROLLOVER 58
3 WHT-ORN	CREDIT BUTTON 3	LEFT SPECIAL ROLLOVER 11	"L" DROP TARGET 19	"1" AND "2" ROLLOVER 27	"A" DROP TARGET 35	RIGHT INSIDE ROLLOVER 43	STAR 2 ROLLOVER 51	STAR 10 ROLLOVER 59
4 WHT-YEL	RIGHT COIN SWITCH 4	LEFT INSIDE ROLLOVER 12	"A" DROP TARGET 20	"3" AND "4" ROLLOVER 28	"L" DROP TARGET 36	RIGHT KICKER 44	STAR 3 ROLLOVER 52	NOT USED 60
5 WHT-GRN	CENTER COIN SWITCH 5	LEFT KICKER 13	"S" DROP TARGET 21	"5" AND "6" ROLLOVER 29	"L" DROP TARGET (BOTTOM) 37	LEFT JET BUMPER 45	STAR 4 ROLLOVER 53	NOT USED 61
6 WHT-BLU	LEFT COIN SWITCH 6	MIDDLE LEFT SIDE STANDUP 14	"E" DROP TARGET 22	"7" AND "8" ROLLOVER 30	B-A-L-L DROP TARGET SERIES 38	RIGHT JET BUMPER 46	STAR 5 ROLLOVER 54	NOT USED 62
7 WHT-VIO	SLAM TILT 7	NOT USED 15	"R" DROP TARGET 23	"9" AND "10" ROLLOVER 31	B-A-L-L DROP TARGET STANDUP 39	CENTER JET BUMPER 47	STAR 6 ROLLOVER 55	NOT USED 63
8 WHT-GRY	HIGH SCORE RESET 8	LEFT SIDE TARGET 16	L-A-S-E-R DROP TARGET SERIES 24	EJECT HOLE 32	RIGHT SPINNER 40	S-E-R DROP TARGET STANDUP 48	STAR 7 ROLLOVER 56	NOT USED 64

Figure 5. Switch Matrix

ROW \ COLUMN	1 YEL-BRN	2 YEL-RED	3 YEL-ORN	4 YEL-BLK	5 YEL-GRN	6 YEL-BLU	7 YEL-VIO	8 YEL-GRY
1 RED-BRN	SHOOT AGAIN EXTRA BALL WHEN LIT	LEFT AND RIGHT SPECIALS (2)	4,000 BONUS	20,000 BONUS	TOP 5	STAR 3	EJECT HOLE EXTRA BALL WHEN LIT	#1 PLAYER UP
2 RED-BLK	BULL'S EYE EXTRA BALL WHEN LIT	10,000 BONUS	5,000 BONUS	LASER 10,000	TOP 6	STAR 4	1 CAN PLAY	#2 PLAYER UP
3 RED-ORN	Æ 1 (TOP)	2x	6,000 BONUS	LASER 15,000	TOP 7	STAR 5	2 CAN PLAY	#3 PLAYER UP
4 RED-YEL	Æ 2	3x	7,000 BONUS	LASER 20,000	TOP 8	STAR 6	3 CAN PLAY	#4 PLAYER UP
5 RED-GRN	Æ 3	5x	8,000 BONUS	TOP 1	TOP 9	STAR 7	4 CAN PLAY	TILT
6 RED-BLU	Æ 4	1,000 BONUS	9,000 BONUS	TOP 2	TOP 10	STAR 8	MATCH	GAME OVER
7 RED-VIO	Æ 5	2,000 BONUS	BULL'S EYE SPECIAL	TOP 3	STAR 1	STAR 9	BALL IN PLAY AGAIN (BACKBOX)	SAME PLAYER SHOOTS AGAIN (BACKBOX)
8 RED-GRY	Æ 6 (BOTTOM)	3,000 BONUS	SPINNER 1,000 (2)	TOP 4	STAR 2	STAR 10	CREDITS (PLAYFIELD)	HIGH SCORE TO DATE

Figure 6. Lamp Matrix