

# SOLAR FIRE

## INSTRUCTION BOOKLET

This booklet provides game operation, bookkeeping, game adjustment, diagnostic, and self-test procedures for SOLAR FIRE. For installation and special maintenance 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. Revision level 7 CPU Boards (batteries located on lower left corner at board) of later boards must be used.
2. Must be equipped with blue-labeled Flipper ROMs and blue-labeled Game ROMs.
3. Jumpers W3, W10, W11, W14, W17, W19, W20, and W22 must be connected. Jumpers W4, W9, W12, W15, W16, W18, W21, and W23 must be removed. With the exception of W25, (Factory Setting Jumper) all other jumpers are not changed.

#### Driver Board

Must be equipped with zero-ohm resistors or wire jumpers (W9-W16) in place of switch matrix drive series resistors R204-R211.

#### Sound Board

Must be jumpered for ROM operation and be equipped with Sound ROM 7. (Jumpers W3, W5, W7, W9, W10, W12, and W15 connected; W2, W4, W6, W8, W11, and W13 removed).

#### Power Supply Board

1. Model D 8345 board required (equipped with relay).
2. Fuse F4 (20A SB) for flipper solenoids and magnets must be installed.

#### Display Boards

Model C 8363 Master Display and 7-digit Slave Displays required.

### GAME OPERATION

\*Indicates adjustable features.

**Game Over Mode** - Turn game ON; player 1 score shows 00; all player scores alternate the high score to date, Game Over lamps light. All playfield lamps cycle in attract mode.

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

**Game Start** - Three balls must be resting on ball ramp or ball shooter switches (maximum of one ball in ball shooter trough) before game will start. Push credit button, startup tune played, ball served, credit display reduced by 1, player 1 score flashes 00 until first scoring switch is made, ball in play shows 1. Pushing credit button before ball 2 displayed allows additional players.

\**Multi-Ball* and *Magna-Save* are trademarks of Williams Electronics, Inc.

**Bonus** - The bonus can be advanced from 1 to 63 thousand. One advance for left and right inside and outside rollovers, SOLAR ramp target and each drop target in the 4-bank, two advances for eject holes, and three advances for completing a drop target 3-bank. The SOLAR ramp target spots letters in SOLAR for bonus multipliers; from 2X with one letter lit to 6X with all letters lit. During **Multi-Ball™** play, the **Multi-Ball** bonus is also advanced from 1 to 63 thousand as described. With full bonus(es), 1,000 points are scored in place of each bonus advance.

**FIRE** - Completing the top drop target 3-bank while associated lamp is flashing spots a letter of FIRE and starts 20 seconds of 2X scoring. Completing FIRE lights the lower right Bull's-Eye Target for a possible Special.

**Drain Shield** - Completing the top drop target 3-bank at any time advances the horseshoe values (25,000, 50,000, and Drain Shield). Making the horseshoe shot collects and resets\* the value; with horseshoe Drain Shield lamp on, the left or right drain shield lamp is turned on. A ball draining through a lit lane is returned to the ball shooter trough.

**SOLAR Gun** - Completing either bottom drop target 3-bank while associated lamp is flashing advances SOLAR Gun timing. Hitting the SOLAR Gun button drives a captive ball past a scoring switch. When a lamp (3, 5, or 10 seconds) is lit, a magnet is energized to cause the captive ball to oscillate. As the ball oscillates and makes the switch, the magnet is momentarily de-energized.

**Magna-Save™ Feature** - Completing a drop target 3-bank at any time advances lighting of **Magna-Save** lamps. With lamps lit, holding in the **Magna-Save** button on the corresponding side of the cabinet energizes the magnet.

**Multi-Ball Play** - Completing a bottom drop target 3-bank at any time randomly lights an eject hole lock lamp. With two lock lamps lit, locking two balls initiates 2-ball **Multi-Ball** play. With three lock lamps lit, locking three balls initiates 3-ball **Multi-Ball** play.

**4-Bank Bonus** - Making a target in the drop target 4-bank stops bonus lamp cycling and flashes a bonus lamp (20, 40, 60, 80, or 100 thousand). Completing the 4-bank while the lamp is flashing collects the bonus. If not completed, the bank is reset and cycling resumes. Completing the 4-bank during 2-ball **Multi-Ball** play awards double bonus; during 3-ball **Multi-Ball** play, triple bonus.

**Mystery** - The left inside rollover flashes the Mystery lamp for the right ramp rollunder. Making the rollunder while flashing randomly spots magnet, Bonus X (S-O-L-A-R), or Drain Shield lamps or awards a random score.

**Extra Ball** - Completing SOLAR awards an Extra Ball or 200,000 points.

**Memory** - Lock lamps and locked up balls, magnet lamps, SOLAR Gun lamps, S-O-L-A-R\* (Bonus X) lamps, and F-I-R-E\* lamps.

**Tilt** - Ball in play tilted on first closure of ball roll tilt and third\* closure of plumb bob and playfield tilts. Slam tilt returns game to game over.

**End of Game** - Match Digits\* appear 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. A new game cannot be started until all balls are returned to the ball ramp and rest on the ball-ramp switches.

## BOOKKEEPING AND GAME EVALUATION

(Functions 01-17)

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in the credits display, Function 00 in Match display, and Game Identification in Player 1 display.
2. Operate the ADVANCE pushbutton to display Functions 01 thru 04 on the Match display (See Table 1) and 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, set switch to MANUAL-DOWN and operate the ADVANCE pushbutton).
3. Operate the ADVANCE pushbutton to display Functions 05, 06, and 07 in the Match display and record the corresponding free credit totals from the Player 1 display.
4. Operate the ADVANCE pushbutton to display Function 08 in the Match display. Total credits is indicated in the Player 1 display, total free credits in the Player 2 display, and percentage of free credits in the Player 4 display.
5. Operate the ADVANCE pushbutton to display Function 09 thru 12 in the Match display and record the corresponding totals from the Player 1 display.
6. Operate the ADVANCE pushbutton to display Functions 13 thru 17 in the Match display and record the corresponding totals from the Player 2 display.
7. With switch set to MANUAL-DOWN operate ADVANCE to display Function 50 in the Match Display. From Function 50 you can return to game over or zero audit totals and return to game over. Perform step 8.a. or 8.b. as desired.
8.
  - a. To return to game over, set the switch to AUTO-UP and depress ADVANCE.
  - b. To zero audit totals and return to game over set switch to AUTO-UP, operate the credit button to display 35 in the Player 1 display, and depress ADVANCE.

Table 1. Audit Totals

FUNCTION	DESCRIPTION		
	PLAYER 1	PLAYER 2	PLAYER 4
00	Game Identification (2507 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	% Free Credits
09	Total Extra Balls	—	—
10	Ball Time in Minutes	—	—
11	Total Balls Played	—	—
12	Current High Score to Date	—	—
13	Backup High Score to Date	High Score to Date Credits Awarded	—
14	Replay 1 Score	Times exceeded	—
15	Replay 2 Score	Times exceeded	—
16	Replay 3 Score	Times exceeded	—
17	Replay 4 Score	Times exceeded	—

## GAME ADJUSTMENT PROCEDURE

(Functions 13-41)

### **Coin door must be open to change settings.**

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress the ADVANCE pushbutton. Test 04 is indicated in the Credits display, Function 00 in Match display, and game identification in Player 1 display.
2. To **raise** Function number in Match display, operate ADVANCE pushbutton with switch set to AUTO-UP. To **lower** Function number, operate ADVANCE with switch set to MANUAL-DOWN.
3. With desired Function indicated in Match display, **raise** value in player 1 display by operating credit button with switch set to AUTO-UP; **lower** value by operating credit button with switch set to MANUAL-DOWN. Value left in Player 1 display is the new setting. For values see Table 2, and for pricing Table 3.
4. Repeat steps 2 and 3 until all required adjustments have been made.
5. Operate ADVANCE until Function 50 is indicated in Match display. From Function 50 you can return to game over or **restore factory settings**. Perform step 6 or 7 as desired.
6. To return to game over, depress ADVANCE with switch set to AUTO-UP.
7. To restore factory settings **and** zero audit totals:
  - a. Operate Credit button with switch set to AUTO-UP until 45 is indicated in Player 1 Display.
  - b. Depress ADVANCE. The game returns to Test 04, Function 00.
  - c. Set switch to MANUAL-DOWN and depress ADVANCE to indicate Function 50.
  - d. Set switch to AUTO-UP and depress ADVANCE.

## RESETTING HIGH SCORE TO DATE

1. Using game adjustment procedure, set Function 13 to the desired reset value.
2. Depress HIGH SCORE RESET pushbutton.

## FACTORY AUDIT TOTALS

(Functions 42-49)

The factory audit functions are not assigned.

Table 2. Game Adjustments

FUNCTION	DESCRIPTION	NOTES	*FACTORY SETTING
13	Backup High Score to Date [HSTD Credits Awarded]	1	2,500,000
14	Replay 1 Score [Times exceeded]	2	1,000,000
15	Replay 2 Score [Times exceeded]	2	2,000,000
16	Replay 3 Score [Times exceeded]	2	0
17	Replay 4 Score [Times exceeded]	2	0
18	Maximum Credits	3	30
19	Standard and Custom Pricing Control (00-08)	4	01/02
20	Left Coin Slot Multiplier	4	01/09
21	Center Coin Slot Multiplier	4	04/45
22	Right Coin Slot Multiplier	4	01/18
23	Coin Units Required for Credit	4	01/05
24	Coin Units Bonus Point	4	00/45
25	Minimum Coin Units	4	00
26	Match: 00 = Match ON; 01 = Match OFF	-	00
27	Special: 00 = Awards Credit; 01 = Awards Extra Ball 02 = Awards Points	-	01
28	Replay Scores: 00 = Awards Credit; 01 = Awards Extra Ball or Bonus Ball	-	00
29	Maximum Plumb Bob Tilts	-	03
30	Number of Balls (03 or 05)	-	03
31	Drop Target 4-Bank Timing: 00 (conservative) to 09 (liberal)	-	07
32	Bottom Drop Target 3-Banks Timing: 00 (conservative) to 09 (liberal)	-	06
33	Top Drop Target 3-Bank Timing: 00 (conservative) to 09 (liberal)	-	08
34	Mystery timing: 00 (conservative) to 09 (liberal)	-	07
35	S-O-L-A-R Ramp Target Timing: 01 (conservative) to 10 (liberal)	-	04
36	Bonus Multiplier Memory (S-O-L-A-R lamps): 00 = memory, 01 = no memory	-	00
37	F-I-R-E Lamp Memory: 00 = memory, 01 = no memory	-	00
38	Attract Mode/Background Sounds 11 = Attract Mode/Background      10 = Attract Mode/No Background 01 = No Attract Mode/Background      00 = No Attract Mode/No Background	-	11
39	Horseshoe Lamps 00 = Reset only when Drain Shield is awarded 01 = Reset whenever collected	-	00

\* Second Factory Setting value (Functions 14 thru 24) is with jumper W25 on CPU Board connected.

[ ] Description in brackets shown in Player 2 Display.

- Function 13 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 to Date feature to operate but no credits are awarded.
- Functions 14-17 (Replay Scores) may be set to any multiple of 100,000 points. Setting a function to zero disables the replay score point.
- Setting Maximum Credits (Function 18) to zero places the game in a **free play mode**.
- With Function 19 set to 00, Functions 20-25 must be set manually. Refer to Table 2 for eight standard pricing schemes (selected by values of 01-08 for Function 19) and custom pricing values.

**RECOMMENDED REPLAY LEVELS  
CREDIT**

3-Ball: 1,000,000; 2,000,000\*  
5-Ball: 1,800,000; 3,600,000

**EXTRA BALL**

3-Ball: 600,000  
5-Ball: 800,000

\*Factory Setting

Table 3. Standard and Custom Price Settings

COIN DOOR MECHANISM	CREDITS	FUNCTION							
		19	20	21	22	23	24	25	
Twin-Quarter Quarter, Dollar, Quarter	1/25¢, 3/50¢, 7/\$1	00	03	12	03	02	12	00	
	1/25¢, 3/50¢, 7/\$1 coin only	00	03	14	03	02	00	00	
	1/25¢, 7/\$1 coin only	00	01	07	01	01	00	00	
	1/25¢, 3/50¢, 6/\$1	00	01	04	01	01	02	00	
	1/25¢, 6/\$1 coin only	00	01	06	01	01	00	00	
	1/25¢, 5/\$1	00	01	04	01	01	04	00	
	2/50¢, 5/\$1	00	01	04	01	01	04	02	
	1/25¢, 5/\$1 coin only	00	01	05	01	01	00	00	
	•1/25¢, 4/\$1	01	01	04	01	01	00	00	
	2/50¢, 4/\$1	00	01	04	01	01	00	02	
	•1/50¢, 2/75¢, 3/4 x 25¢	05	03	15	03	04	15	00	
	4/\$1 or 5 x 24¢								
	1/50¢, 3/\$1, 4/\$1.25	00	03	12	03	04	15	00	
	1/50¢, 3/\$1, 7/\$2	00	12	48	12	14	96	18	
•1/50¢, 3/\$1, 6/\$2	03	01	04	01	02	04	00		
1/50¢	00	01	04	01	02	00	00		
1DM, 5DM, 2DM	•1/1DM, 3/2DM, 10/5DM 2/1DM, 5/2DM, 14/5DM	02 00	09 13	45 65	18 26	05 05	45 65	00 00	
20-Cent, 50-Cent	1/20¢, 3/50¢	00	06	00	15	05	00	00	
1 Franc, 10 Franc, 5 Franc	•1/2F, 3/5F only, 8/10F only	04	01	16	06	02	00	00	
25 Cent, 1 Guilder,	•1/25¢, 4/1G 1/25¢, 5/1G	06 00	01 01	00 00	04 04	01 01	00 04	00 00	
Twin 100 Yen 1 Franc or Twin-1 Franc	2/100Y 1/1F, 3/2F 1/1F	00 00	02 01	00 01	02 01	01 01	00 02	00 00	
5 Franc, 10 Franc	•1/5F, 2/10F •1/10F	07 08	01 01	00 00	02 02	01 02	00 00	00 00	
Twin-2 Franc 10, 20 Franc Twin-1 Sucre	•1/2F •1/10F, 2/20F 1/3S, 2/5S	03 07 00	01 01 02	04 00 00	01 02 02	01 01 05	00 00 00	00 00 00	

•Indicates standard price settings by adjusting only Function 19. For other price settings, set Function 19 to 00 and set Functions 20 through 25 to the values indicated in the chart.

## **DIAGNOSTIC PROCEDURES**

### **Display Digits Test**

1. Set AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN and depress ADVANCE. Displays should indicate all 0's.
2. Set the switch to AUTO-UP. Displays should sequence from all 0's thru all 9's. Comma segments should come on when odd digits are displayed.
3. To stop cycling, set switch to MANUAL-DOWN. Operate ADVANCE pushbutton to step through the tests one number at a time. Set switch to AUTO-UP to resume cycling.

### **Sound Test**

1. From Display Digits Test depress ADVANCE with the switch set to AUTO-UP. Test 00 should be indicated in the Credits display and the Match display should sequence from 00 thru 06. Different sounds should be produced for 00, 01, 02, 03, and 04.
2. To continuously pulse a single sound, set the toggle switch to MANUAL-DOWN. Operate ADVANCE pushbutton to sequence through sounds one at a time. Set toggle switch to AUTO-UP to resume sequencing.

**Lamp Test**

From Sound Test depress ADVANCE with the switch set to AUTO-UP. Test 01 should be indicated in the Credits display and all multiplexed lamps should flash.

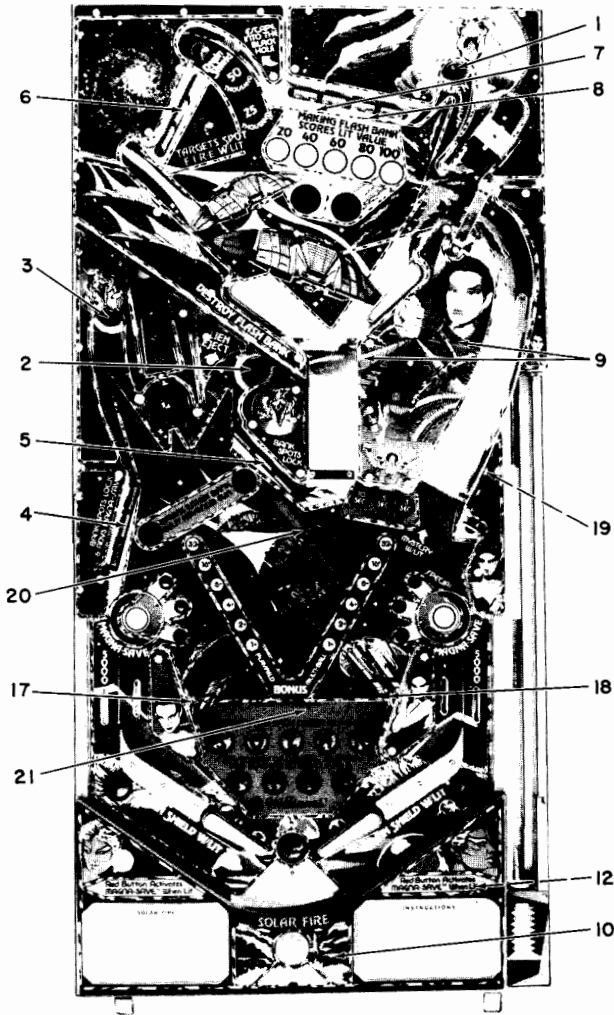


COLUMN ROW	1 YEL-BRN 2J5-8	2 YEL-RED 2J5-9	3 YEL-ORN 2J5-6	4 YEL-BLK 2J5-7	5 YEL-GRN 2J5-3	6 YEL-BLU 2J5-5	7 YEL-VIO 2J5-1	8 YEL-GRY 2J5-2
1 RED- BRN 2J7-1	Same Player Shoots Again (Backbox)	Left Magnet "3"	Top Eject Hole Lock Arrow	Right Bull's-Eye Special	4-Bank 2X	"I"	"1" Bonus	Multi-Ball "4" Bonus
2 RED- BLK 2J7-2	Ball in Play	Right Magnet "1"	Bottom Right Eject Hole Lock Arrow	Right Ramp Mystery	4-Bank 3X	"R"	"2" Bonus	Multi-Ball "8" Bonus
3 RED- ORN 2J7-3	Tilt	Right Magnet "2"	Bottom Left Eject Hole Lock Arrow	Bottom Left 3-Bank	4-Bank "20"	"E"	"4" Bonus	Multi-Ball "16" Bonus
4 RED- YEL 2J7-4	Game Over	Right Magnet "3"	Ramp "S"	Bottom Right 3-Bank	4-Bank "40"	"S"	"8" Bonus	Multi-Ball "32" Bonus
5 RED- GRN 2J7-5	Match	Left Drain Shield	Ramp "O"	Top 3-Bank	4-Bank "60"	"O"	"16" Bonus	SOLAR Gun 3 Seconds
6 RED- BLU 2J7-6	High Score To Date	Right Drain Shield	Ramp "L"	Horseshoe "25"	4-Bank "80"	"L"	"32" Bonus	SOLAR Gun 5 Seconds
7 RED- VIO 2J7-9	Left Magnet "1"	Shoot Again (Playfield)	Ramp "A"	Horseshoe "50"	4-Bank "100"	"A"	Multi-Ball "11" Bonus	SOLAR Gun 10 Seconds
8 RED- GRY 2J7-8	Left Magnet "2"	Not Used	Ramp "R"	Horseshoe Drain Shield	"F"	"R"	Multi-Ball "2" Bonus	Not Used

Figure 1. Lamp Matrix

## Solenoid Test

1. From Lamp Test depress ADVANCE with the switch set to AUTO-UP. Test 02 should be indicated in the Credits display. The Match display sequences from 01 thru 25. Corresponding solenoids 01 thru 24 are pulsed. Flipper relay is de-energized with subtest 25.
2. To continuously pulse a single solenoid set switch to MANUAL-DOWN. Operate ADVANCE pushbutton sequence through the solenoids one at a time. Set switch to AUTO-UP to resume sequencing.



### Sol. No. Function

- |    |   |
|----|---|
| 01 | Top Eject Hole                          |
| 02 | Bottom Right Eject Hole                 |
| 03 | Bottom Left Eject Hole                  |
| 04 | Bottom Left Drop Target                 |
| 05 | Bottom Right Drop Target                |
| 06 | Top Right Drop Target                   |
| 07 | Drop Target 4-Bank, Left Targets Reset  |
| 08 | Drop Target 4-Bank, Right Targets Reset |
| 09 | SOLAR Gun Lamps                         |
| 10 | Ball Release                            |
| 11 | General Illumination                    |
| 12 | Ball Ramp Thrower                       |
| 13 | Backbox Flash Lamps                     |
| 14 | Backbox Flash Lamps                     |
| 15 | Credit Knocker                          |
| 16 | Coin Lockout                            |
| 17 | Left Kicker                             |
| 18 | Right Kicker                            |
| 19 | SOLAR Gun Magnet Relay                  |
| 20 | Left Magnet Relay                       |
| 21 | Right Magnet Relay                      |
| 22 | Not Used                                |

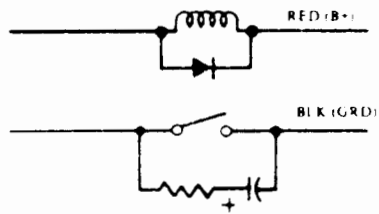
Figure 2. Playfield Solenoid Locations and Solenoid Chart

Table 4. Solenoid Connections

SOL. NO.	FUNCTION	WIRE COLOR	CONNECTIONS	DRIVER TRANS.	SOLENOID PART NO.
01	Top Eject Hole	GRY-BRN	2P11-4, 8P3-1	Q15	SG-23-850-DC
02	Bottom Right Eject Hole	GRY-RED	2P11-5, 8P3-2, 8P6-12	Q17	SG-23-850-DC
03	Bottom Left Eject Hole	GRY-ORN	2P11-7, 9P2-2, 8P6-13	Q19	SG-23-850-DC
04	Bottom Left Drop Target 3-Bank Reset	GRY-YEL	2P11-8, 8P3-4, 8P6-14	Q21	SA3-23-850-DC
05	Bottom Right Drop Target 3-Bank Reset	GRY-GRN	2P11-9, 8P3-5, 8P6-15	Q23	SA3-23-850-DC
06	Top Right Drop Target 3-Bank Reset	GRY-BLU	2P11-3, 8P3-6	Q25	SA3-23-850-DC
07	Drop Target 4-Bank, Left Targets Reset	GRY-VIO	2P11-2, 8P3-7	Q27	SA3-23-850-DC
08	Drop Target 4-Bank, Right Targets Reset	GRY-BLK	2P11-1, 8P3-8	Q29	SA3-23-850-DC
09	SOLAR Gun Lamps	BRN-BLK	2P9-9, 8P3-9, 8P6-16	Q31	Type 89 Bulbs
10	Ball Release	BRN-RED	2P9-7, 8P3-10, 8P6-17	Q33	SA3-23-850-DC
11	General Illumination	BRN-ORN	2P9-1, 3P7-1	Q35	5580-09555-00
12	Ball Ramp Thrower	BRN-YEL	2P9-2, 8P3-12, 8P6-18	Q37	SG-23-850-DC
13	Backbox Flash Lamps	BRN-GRN	2P9-3, 9P1-21	Q39	Type 89 Bulbs
14	Backbox Flash Lamps	BRN-BLU	2P9-4, 9P1-22	Q41	Type 89 Bulbs
15	Credit Knocker	BRN-VIO	2P9-5, 7P1-17	Q43	SA2-23-850-DC
16	Coin Lockout	BRN-GRY	2P9-6, 7P1-18, 7P2-4	Q45	SM-35-4000-DC
17	Left Kicker	BLU-BRN	2P12-7, 8P3-17, 8P6-7	Q2	SG-23-850-DC
18	Right Kicker	BLU-RED	2P12-4, 8P3-18, 8P6-8	Q4	SG-23-850-DC
19	SOLAR Gun Magnet Relay	BLU-ORN	2P12-3, 8P3-19, 8P6-9	Q6	A-8592
20	Left Magnet Relay	BLU-YEL	2P12-6, 8P3-20, 8P6-10	Q8	A-8592
21	Right Magnet Relay	BLU-GRN	2P12-8, 8P3-21, 8P6-11	Q10	A-8592
22	Not Used	BLU-BLK	2P12-9, 8P3-22	Q12	—
*	Lower Right Flipper	BLU-VIO	7P1-8, 8P3-34, 8P6-3	—	SFL-19-400/ 30-750-DC
*	Upper Right Flipper	BLK-YEL	7P1-31, 8P3-33	—	SFL-19-400/ 30-750-DC
*	Lower Left Flipper	BLU-GRY	7P1-10, 8P3-32, 8P6-4	—	SFL-19-400/ 30-750-DC
*	Upper Left Flipper	BLK-BLU	7P1-30, 8P3-31	—	SFL-19-400/ 30-750-DC

**\*NOTES:**

- Contacts of solenoids 19, 20, and 21 switch ground to magnets (Part No. 20-9297).
- Special switch connections for solenoids 17 and 18 are as follows:
  - 17 — ORN-BRN — 2P13-5, 8P3-24, 8P6-5
  - 18 — ORN-RED — 2P13-3, 8P3-25, 8P6-6
- Flipper button connections are as follows:
  - Right — ORN-VIO — 2P12-1, 7P1-7
  - Left — ORN-GRY — 2P12-2, 7P1-9
- Typical wiring for solenoids and special switches:



**Switch Test**

- From Solenoid Test depress ADVANCE with the switch set to AUTO-UP. Test 03 should be indicated in the Credits display and any stuck switches in the Master display. As stuck switch(es) is displayed a sound is produced. The display continuously cycles through the stuck switches and as they are opened, the number is removed from the sequence. When all switches are open, the Match display is blank and the sounds stop.
- If all switches in a row are displayed, first verify that all are open and then check for a short to ground on the row wire.

- Operate switches; a sound is produced and switch number is momentarily indicated in the ball in play display. If two switches in a row are indicated with one switch closed, check for a short between the column wires; for multiple indication check column wire for short to ground. If two switches in a column are indicated with one switch closed, check for short between row wires.
- If proper indications are obtained in Test 03 but matrix problem is suspected in game play, disconnect lamp connectors 2P5 and 2P7. Recheck in game play. Perform CPU Self-Test if problem remains. If problem is cleared, check for short between lamp matrix and jet bumper mounting brackets.
- Shorted diodes can cause "rectangle" switch matrix problems as follows: With balls in the top eject hole and bottom left eject hole (switches 17 and 19), and in making the SOLAR ramp target (switch 41), a shorted diode at switch 17 would cause switch 43, Playfield Tilt to be indicated. Note that the "rectangle" is always completed with an incorrect switch diagonally opposite from the switch with the shorted diode.

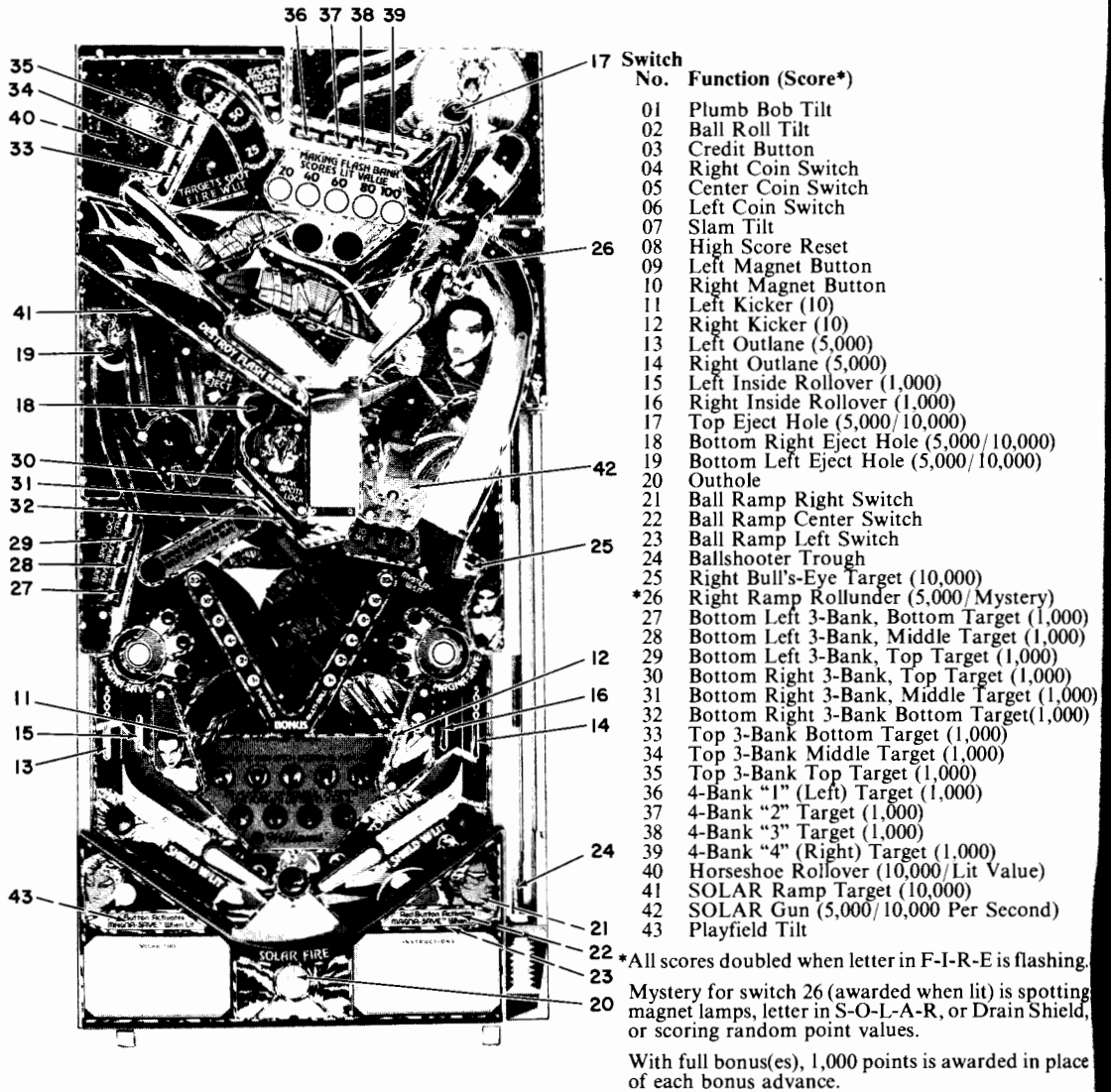


Figure 3. Playfield Switch Locations and Switch Chart

COLUMN ROW	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
1 WHT- BRN 2J3-9	1 Plumb Bob Tilt	9 Left Magnet Button	17 Top Eject Hole	25 Right Bull's-Eye Target	33 Top 3-Bank Bottom Target	41 SOLAR Ramp Target	49 Not Used	57 Not Used
2 WHT- RED 2J3-8	2 Ball Roll Tilt	10 Right Magnet Button	18 Bottom Right Eject Hole	26 Right Ramp Roller	34 Top 3-Bank Middle Target	42 SOLAR Gun	50 Not Used	58 Not Used
3 WHT- ORN 2J3-7	3 Credit Button	11 Left Kicker	19 Bottom Left Eject Hole	27 Bottom Left 3-Bank, Bottom Target	35 Top 3-Bank Top Target	43 Playfield Tilt	51 Not Used	59 Not Used
4 WHT- YEL 2J3-6	4 Right Coin Switch	12 Right Kicker	20 Outhole	28 Bottom Left 3-Bank, Middle Target	36 4-Bank '1' (Left) Target	44 Not Used	52 Not Used	60 Not Used
5 WHT- GRN 2J3-5	5 Center Coin Switch	13 Left Outlane	21 Ball Ramp Right Switch	29 Bottom Left 3-Bank, Top Target	37 4-Bank '2' Target	45 Not Used	53 Not Used	61 Not Used
6 WHT- BLU 2J3-4	6 Left Coin Switch	14 Right Outlane	22 Ball Ramp Center Switch	30 Bottom Right 3-Bank, Top Target	38 4-Bank '3' Target	46 Not Used	54 Not Used	62 Not Used
7 WHT- VIO 2J3-3	7 Slam Tilt	15 Left Inside Roller	23 Ball Ramp Left Switch	31 Bottom Right 3-Bank, Middle Target	39 4-Bank '4' (Right) Target	47 Not Used	55 Not Used	63 Not Used
8 WHT- GRY 2J3-1	8 High Score Reset	16 Right Inside Roller	24 Ballshooter Trough	32 Bottom Right 3-Bank, Bottom Target	40 Horseshoe Roller	48 Not Used	56 Not Used	64 Not Used

Figure 5. Switch Matrix

## **INITIATING AUTO-CYCLE MODE**

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in Credit display and Function 00 in Match Display.
2. Set switch to MANUAL-DOWN and depress ADVANCE to indicate Function 50 in the Match Display.
3. Set switch to AUTO-UP and operate Credit button to indicate 15 in Player 1 Display.
4. Depress ADVANCE pushbutton to start Auto-Cycle mode. Each cycle of this mode sequences thru the Display Digits Test, Sound Test (00), Lamp Test (01), and Solenoid test (02).
5. To terminate the test and return to game over, turn the game OFF and back ON.

## **CPU BOARD SELF-TEST**

Depress the DIAGNOSTIC pushbutton on the left side of the CPU Board. The following indications are provided. With 0 indication the game returns to the game over mode.

0 - Test Passed

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 CMOS RAM or Memory Protect Circuit Faulty

9 - Coin-door closed, Memory Protect Circuit Faulty, or IC19 CMOS RAM Faulty.

Note that "0" remaining after power turn-on indicates CPU Board lockup.

## **SOUND BOARD SELF-TEST**

Depress DIAGNOSTIC pushbutton on 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.