Williams®

No. WMA486-2

MANUAL AMENDMENT

MANUAL AFFECTED: FLASH Manual

PURPOSE: This game uses different software indicated by green-labeled ROMs and PROMs. Function numbers for game adjustment are slightly rearranged from the earlier software using yellow-labeled ROMs and PROMs.

CHANGE: Refer to the attached sheets for game adjustments.

To determine which ROMs and PROMs are in use without inspecting the CPU Board, observe the Test 04 Function 00 readout. Green-labeled ROMs and PROMs [Part Nos. 5A 9233 (IC20) and 5A 9234 (IC17)]are indicated by "1486 1" and yellow-labeled ones [Part Nos. 5A 9196 (IC20) and 5A 9197 (IC17)] are indicated by "0486 1" or "0486 2".

Note that green- and yellow-labeled ROMs and PROMs cannot be intermixed in a game.

With the new program, Diagnostic Test 02 pulses solenoid 18 with 17 displayed and pulses solenoid 17 with 18 displayed.

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FLASH Game Adjustments
(Green-labled ROMs and PROMs)

FUNCTION NEW	FUNCTION OLD	DESCRIPTION	NOTES	FACTORY SETTING
00	00	Game Identification	1	1486 1
01	01	Coins, Left Chute (Closest to coin door hinge)	1	--
02	02	Coins, Center Chute	1	--
03	03	Coins, Right Chute	1	--
04	04	Total Paid Credits	1	--
05	05	Total Specials	1	--
06	06	Total Replay (Extra Ball) Scores	1	--
07	07	Match and High Score to Date Credits	1	--
08	08	Total Credits	1,2	--
09	09	Total Extra Balls	1,3	--
10	10	Total Ball Time in Minutes	1	--
11	11	Total Number of Balls Played	1	--
12	12	Current High Score to Date	4	550,000
13	13	Backup High Score to Date	5	550,000
14	14	Replay 1 Score	6	270,000
15	15	Replay 2 Score	6	370,000
16	16	Replay 3 Score	6	470,000
17	17	Replay 4 Score	6	0
18	18	Maximum Credits	7	20
19	19	Standard and Custom Pricing Control (00-07)	8	01
20	20	Left Coin Slot Multiplier	8	01
21	21	Center Coin Slot Multiplier	8	01
22	22	Right Coin Slot Multiplier	8	01
23	23	Coin Units Required for Credit	8	01
24	24	Coin Units Bonus Point	8	02
25	26	High Score Credits	5	03
26	28	Match (00=ON, 01=OFF)	--	00
27	29	Special 00 = Awards Credit 01 = Awards Extra Ball 02 = Awards Points	--	00
28	30	Scoring Awards 00 = Credits at Replay Score 01 = Extra Ball at Replay Score	--	00
29	32	Maximum Plumb Bob Tilts (1-9)	--	03
30	31	Number of Balls (03 or 05)	--	03
31	33	Sound Option 00 = Background Sound OFF 01 = Background Sound ON	--	00
32	34	SUPER FLASH Scoring 00 = Awards 50,000 Points 01 = Awards Extra Ball	--	00
33	35	SUPER FLASH Restore 00 = Restores 01 = Does Not Restore	--	00
34	27	Extra Ball Control 00 = Extra Ball Allowed 01 = No Extra Ball	--	00
35	27	Play 01 = Eject Hole Lamps Restored, 5,000 Lamp Lit Initially 02 = Eject Hole Lamps Restored, 5,000 Lamp not Lit Initially 11 = Eject Hole Lamps not Restored, 5,000 Lamp Lit Initially 12 = Eject Hole Lamps not Restored, 5,000 Lamp not Lit Initially	--	11

The Function numbers in the OLD column are provided for reference to Function numbers in the text of Section 3. Note that old Function 25 (Credits in Game) is no longer provided.

Notes:

(All notes refer to NEW Function numbers)

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 of the manual.

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 05 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 can 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.

RECOMMENDED SCORE LEVELS

Levels	Score Card
CREDIT GAMES	
3-Ball:	
*270,000; 370,000; 470,000	486-14
or 250,000; 390,000	486-33
5-Ball:	
410,000; 530,000	486-52
EXTRA BALL	
3-Ball:	
160,000	486-66
5-Ball:	
200,000	486-68

*Factory setting

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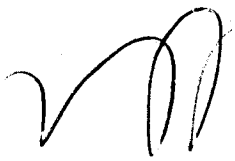
SPECIAL SOUND ADJUSTMENT

FLASH games can be adjusted to produce a background sound. To enable the background sound set Function 33 to 01 as described in the Instruction Manual or in the Game Adjustment and Diagnostic Procedures booklet located in the envelope on the right side of the cabinet just inside the coin door. Note that the background sound is possible only when the Sound Board toggle switch is set to select synthesized sounds.



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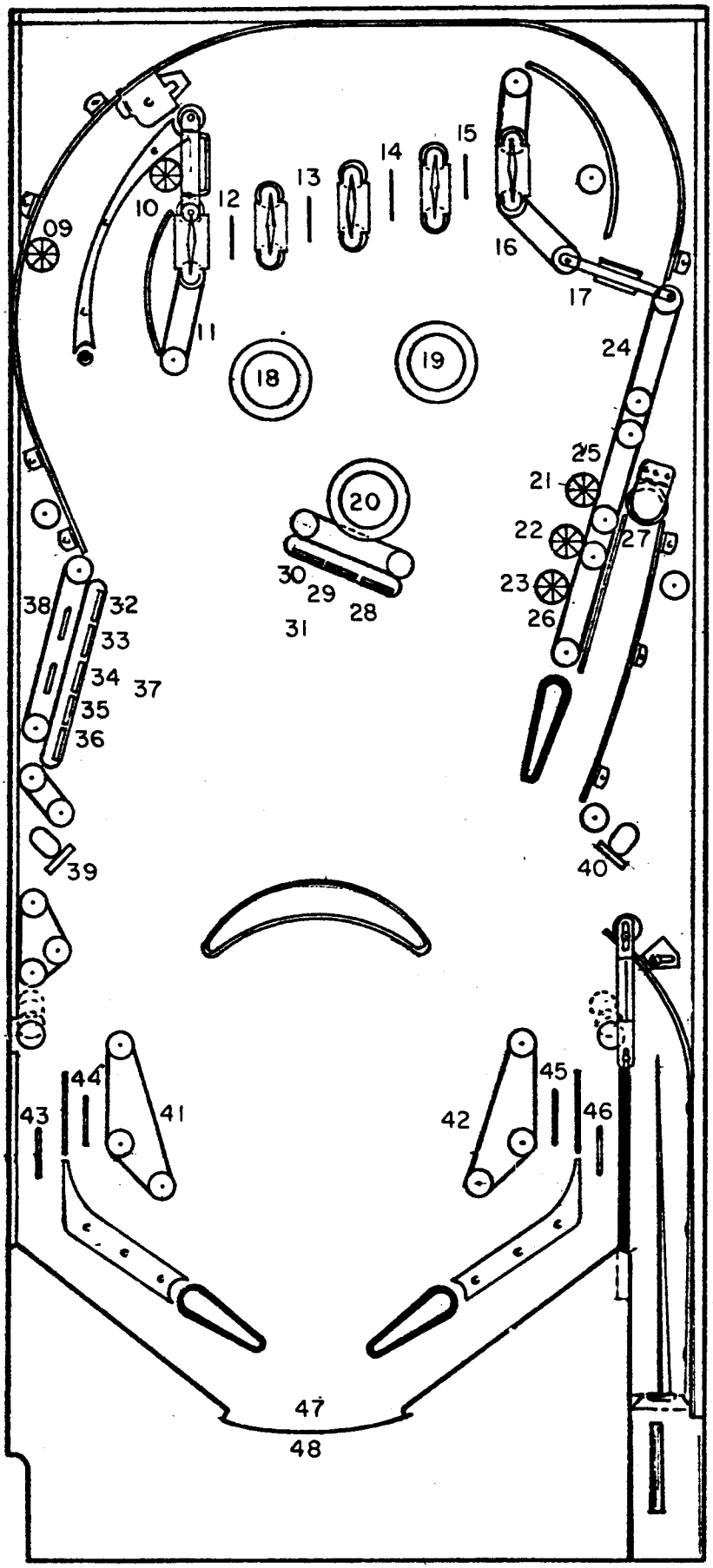

SWITCH NO.

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 to Date Reset
09 Outside Upper Left Star Rollover
10 Inside Upper Left Star Rollover
11 Upper Left Standup
12 "1" Rollover
13 "2" Rollover
14 "3" Rollover
15 "4" Rollover
16 Top Right Standup
17 Spinner
18 Left Jet Bumper
19 Right Jet Bumper
20 Lower Jet Bumper
21 Upper Right Star Rollover
22 Center Right Star Rollover
23 Lower Right Star Rollover
24 Right Side Standup, Upper
25 Right Side Standup, Center
26 Right Side Standup, Lower
27 Eject Hole
28 3 - Bank, Right Drop Target
29 3 - Bank, Center Drop Target
30 3 - Bank, Left Drop Target
31 3 - Bank, Series
32 5 - Bank, 1 Drop Target (Top)
33 5 - Bank, 2 Drop Target
34 5 - Bank, 3 Drop Target
35 5 - Bank, 4 Drop Target
36 5 - Bank, 5 Drop Target (Bottom)
37 5 - Bank, Series
38 5 - Bank Standup
39 Left Target
40 Right Target
41 Left Kicker
42 Right Kicker
43 Left Special Rollover
44 Left Flipper Return Rollover
45 Right Flipper Return Rollover
46 Right Special Rollover
47 Playfield Tilt
48 Outhole

Figure 8. Playfield Switch Locations and Switch Chart

11. To exit the Auto Cycle mode and advance to Switch Test 03, set the toggle switch to AUTO-UP and depress the ADVANCE pushbutton during the Solenoid Test. Operation is now as previously described for Test 03.
12. To terminate the Auto-Cycle mode and go to game over, turn the game OFF and back ON.

SECTION 6
MAINTENANCE

This section provides procedures for board replacement, CPU and Sound Board self-tests, and troubleshooting procedures. For any problems first perform the CPU Board Self-Tests. For sound problems also perform the Sound Board Self-Test. After performing the self-test(s), refer to the troubleshooting charts that follow.

BOARD REPLACEMENT

CPU Board
To remove the CPU Board, the Driver Board must first be unmounted. If the replacement board is not equipped with FLASH PROMs and yellow-labeled ROMs, the PROMs and ROMs must be removed from the old board. In any event, the replacement board MUST BE EQUIPPED WITH THREE PROM SOCKETS. To replace the CPU Board, proceed as follows:

1. Turn the game OFF.
2. Remove the six screws and star washers that secure the driver board to its mounting bracket.
3. Carefully unplug the Driver Board from the CPU Board.
4. Disconnect the seven plugs from the CPU Board.
5. Remove the two screws and star washers that secure the top of the CPU Board to its mounting bracket in the backbox. (The bottom of the board is secured by a groove in the bracket.)
6. Lift the CPU Board up and remove it from the backbox.
7. Inspect the PROMs and ROMs.
   a. If the replacement board does not have FLASH PROMs, remove the PROMs and insert the PROMs from the old CPU Board into the sockets on the replacement board. Make sure that the notches on the PROM #1 and #2 chips are facing down and the PROM #3 chip notch is facing left.

   NOTE

   Flash PROMs provided with prototype games **can not** be intermixed with those provided in production games. The revision level (indicated by the last digit on the PROM label) must be "1" for all PROMs or "2" for all PROMs.

   b. If the replacement board does not have yellow-labeled ROMs, remove the ROMs and insert the yellow-labeled ROMs from the old CPU Board into the sockets on the replacement board. Make sure that the notches on the chips are facing down and that ROM #1 is in the third socket from the left.
8. Set the replacement CPU Board into the groove in the bracket and secure it at the top with the two screws and star washers removed in step 5.
9. Reconnect the cables disconnected in step 4 using the keys and cut-off pins as a guide. Make sure that the pins are aligned, the connectors are firmly seated, and that no pin terminations have been pushed out of the plugs.
10. Carefully plug the Driver Board onto the CPU Board and mount the Driver Board to the bracket using the six screws and star washers removed in step 2.
11. Turn the game ON and perform the CPU Board Self-Test procedures.

Driver Board
Proceed as follows:

1. Turn the game OFF.
2. Disconnect the 12 plugs from the board.
3. Remove the six screws and star washers that secure the board to its mounting bracket.
4. Carefully unplug the Driver Board from the CPU Board and remove the Driver Board.
5. Align the replacement board over the pins on the CPU Board and carefully plug it onto the CPU Board.
6. Secure the board to the mounting bracket using the six screws and star washers removed in step 3.
7. Reconnect the cables disconnected in step 2 using the keys and cut-off pins as a guide. Make sure that the pins are aligned, the connectors are firmly seated, and that no pin terminations have been pushed out of the plugs.
8. Turn the game ON and perform Lamp, Solenoid, and Switch tests in accordance with procedures provided in Section 5.

Power Supply Board
Proceed as follows:

1. Turn the game OFF.
2. Unplug the six cables from the board.
3. Remove the six screws and star washers that secure the board to its mounting bracket.
4. Position the replacement board on the mounting bracket and secure with the six screws and star washers removed in step 2.
5. Reconnect the six cables unplugged in step 2.
6. Turn the game ON and check power supply voltage using Table 4 as a guide.

Master Display Board
Proceed as follows:

1. Turn the game OFF.
2. Unplug the seven cables from the board.
3. Remove the four nuts and lockwashers that secure the board to the nylon spacers on the insert door and remove the board.
4. Position the replacement board on the spacers and secure it using the four nuts and lockwashers removed in step 3.
5. Reconnect the seven cables unplugged in step 2.
6. Turn the power ON and perform the display digits test in accordance with procedures provided in Section 5.

Table 4. Typical Voltage Measurements

VOLTAGE	METER SETTING	MEASURE ACROSS	TYPICAL READING
Unregulated Logic Supply	+50V dc	(+) F5 (-) Ground	+11V dc
Logic B+	+10V dc	(+) 3J5-1 (Gray Lead) (-) Ground	+5.1V dc
Lamp Supply	+50V dc	(+) F3 (-) Ground	+18V dc
Solenoid Supply	+50V dc	(+) F2 (-) Ground	+40V dc
Display Voltage	+250V dc	(+) 3J5-4 (Brown-White lead) CAUTION HIGH VOLTAGE (-) Ground	+100V dc
	-250V dc	(+) 3J5-3 (Orange and White-Black Leads) CAUTION HIGH VOLTAGE (-) Ground	-100V dc
General Illumination	10V ac	(+) Fuse Card Fuse (-) Fuse Card Terminal	6.3V ac

Slave Display Board
Proceed as follows:

1. Turn the game OFF.
2. Unplug the cable connected to the board.
3. Remove the four nuts and lockwashers that secure the board to the nylon spacers on the insert door and remove the board.
4. Position the replacement board on the spacers and secure it using the four nuts and lockwashers removed in step 3.
5. Reconnect the cable unplugged in step 3.
6. Turn the game ON and perform display digits test in accordance with procedures provided in Section 5.

Sound Board
When replacing the Sound Board, the replacement board must be checked to make sure it has Sound ROM 1 installed and has jumpers for ROM operation. In addition, modification may be required to the Sound Board. Two areas may require modification. The first reduces susceptibility of the Sound Board to noise and consists of adding two resistors and a jumper. The second improves the quality of the sound at the speaker and consists of changing two resistor values. Proceed as follows:

1. Turn the game OFF.
2. Unplug the three cables from the Sound Board.
3. Remove the four screws and star washers that secure the board to its mounting bracket and remove the board.
4. If the replacement board is not equipped with Sound ROM 1, remove the ROM from the old board and insert it into the replacement board. Make sure that the notch in the chip is at the right side.
5. Refer to Figure 9 and check the jumpers on the replacement board. If the replacement board is not jumpered as indicated, remove the four jumpers from the replacement board and connect four new jumpers.
6. Inspect the replacement board. If it is equipped with two fuses or if the modification indicated in Figure 9 have already been made, proceed to step 11.
7. Connect a jumper on the solder side of the board between pins 39 and 40 of 1C3.
8. Obtain two 10K, 10%, ¼-Watt resistors and connect them as indicated in the unused IC pad. This completes the modification to reduce susceptibility to noise. Steps 9 and 10 improve the sound quality.
9. Unsolder and remove R14 and R23 (100K).
10. Obtain two 4.7K, 10%, ¼-Watt resistors and solder them in place of the resistors removed in step 9.
11. Position the replacement board on its mounting bracket and secure it using the four screws and star washers removed in step 3.
12. Reconnect the three cables unplugged in step 2.
13. Turn the game ON and perform the Sound Board Self-Test procedure.

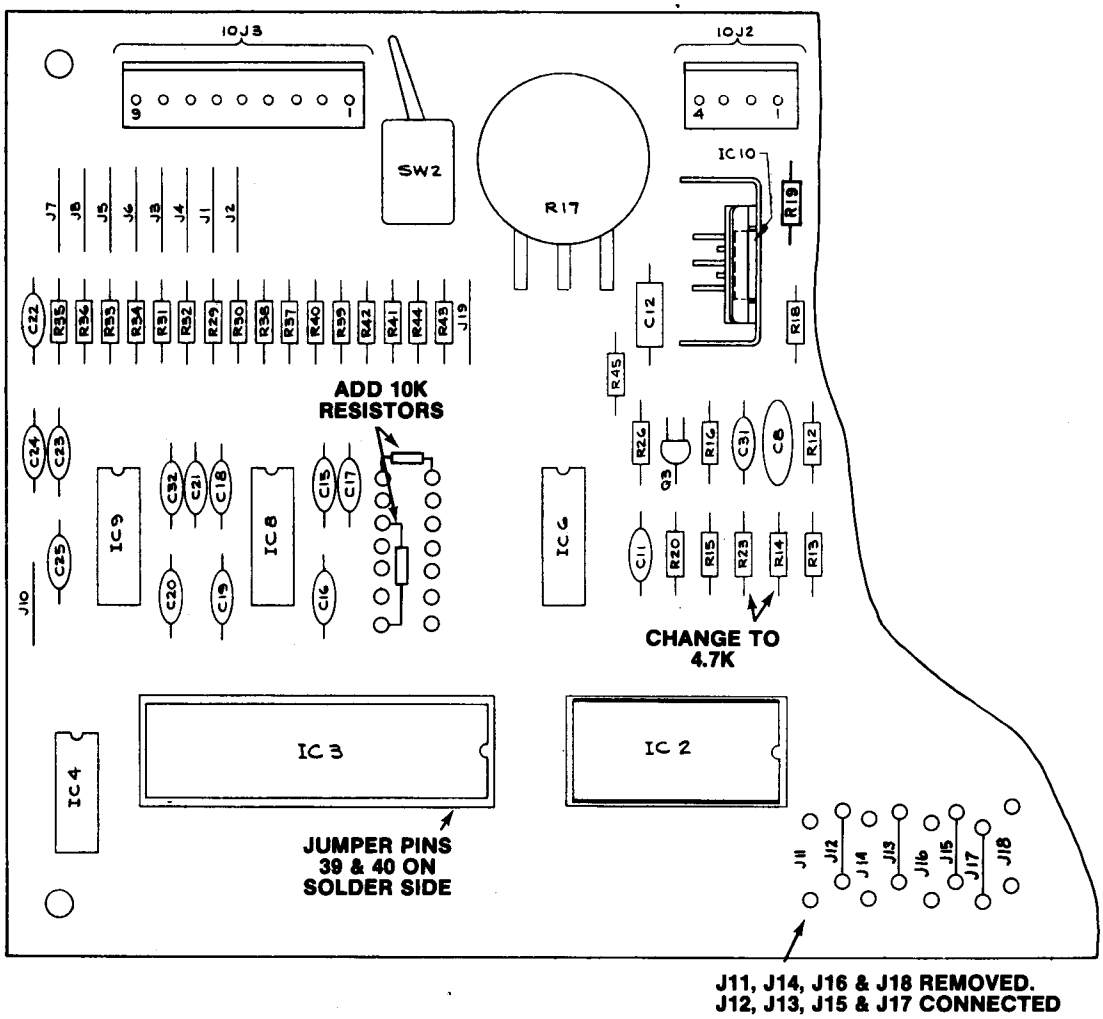

Figure 9. Sound Board Modification and ROM Jumper Details

CPU BOARD SELF-TEST

A pushbutton switch on the CPU board is used to initiate the CPU Board Self-Test. **The coin door must be open to perform this test.** Successful completion of the test is indicated by the LEDs blinking twice. Failure of a test is indicated by one or both of the LEDs lighting and staying lit. Proceed as follows:

1. Open the coin door.
2. With the game turned ON, locate the DIAGNOSTIC pushbutton on the right side of the CPU board.
3. Momentarily depress the DIAGNOSTIC pushbutton. The LEDs should blink twice and all displays should go blank.
4. For the following indications of the LEDs, proceed as follows:

   OFF ○ Indicates ROM/PROM failure; one or more
   ON ✸ of IC17, IC20, IC21, IC22, and IC26 are faulty.
   Isolate the faulty chip(s) by substitution.

   ON ✸ Indicates RAM failure (IC13 or IC16), replace
   OFF ○ the CPU Board.

   ON ✸ Indicates CMOS RAM (IC19) or PIA I (IC18)
   ON ✸ failure. Replace the CPU Board.

5. If the LEDs come on and stay on when the game is first turned ON or the LEDs remain off when the DIAGNOSTIC pushbutton is depressed, refer to Table 13 in the troubleshooting charts that follow.

SOUND BOARD SELF-TEST

The Sound Board Self-Test exercises Sound Board circuitry and causes a continuous sound to be emitted. This sound can be used for checking amplifier circuitry and for adjusting the volume. Proceed as follows:

1. Perform CPU Board Self-Tests.
2. Momentarily depress the diagnostic pushbutton on the Sound Board.
3. If no sound is produced check the setting of the volume control and the power and speaker connections to the Sound Board. Also check that the jumper connector 10P4 is in place. If this does not resolve the problem or if a sound is produced from the self-test, refer to Table 14 in the troubleshooting charts that follow.

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	Outside Upper Left Star Rollover 9	Spinner 17	Right Side Standup (Center) 25	5-Bank 2 Drop Target 33	Left Kicker 41	Not Used 49	Not Used 57
2 WHT-RED	Ball Roll Tilt 2	Inside Upper Left Star Rollover 10	Left Jet Bumper 18	Right side Standup (Lower) 26	5-Bank 3 Drop Target 34	Right Kicker 42	Not Used 50	Not Used 58
3 WHT-ORN	Credit Button 3	Upper Left Standup 11	Right Jet Bumper 19	Eject Hole 27	5-Bank 4 Drop Target 35	Left Special 43	Not Used 51	Not Used 59
4 WHT-YEL	Right Coin Switch 4	"1" Rollover 12	Lower Jet Bumper 20	3-Bank Right Drop Target 28	5-Bank 5 Drop Target (Bottom) 36	Left Flipper Return Lane Rollover 44	Not Used 52	Not Used 60
5 WHT-GRN	Center Coin Switch 5	"2" Rollover 13	Upper Right Star Rollover 21	3-Bank Center Drop Target 29	5-Bank Series 37	Right Flipper Return Lane Rollover 45	Not Used 53	Not Used 61
6 WHT-BLU	Left Coin Switch 6	"3" Rollover 14	Center Right Star Rollover 22	3-Bank Left Drop Target 30	5-Bank Standup 38	Right Special 46	Not Used 54	Not Used 62
7 WHT-VIO	Slam Tilt 7	"4" Rollover 15	Lower Right Star Rollover 23	3-Bank Series 31	Left Target 39	Playfield Tilt 47	Not Used 55	Not Used 63
8 WHT-GRY	High Score To Date Reset 8	Top Right Standup 16	Right Side Standup (Upper) 24	5-Bank 1 Drop Target (Top) 32	Right Target 40	Out Hole 48	Not Used 56	Not Used 64

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Figure 11. Switch Matrix