

Williams[®]

Game No. 487
January, 1979

TRI ZONE



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FOREWORD

This is a basic instruction manual that provides information unique to TRI ZONE. For detailed troubleshooting and interconnection information refer to the 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. Earlier boards may be used but the memory protection feature is lost:
With PROMs - any earlier board
With Game ROM - only revision level 4 CPU Boards equipped with IC14 socket.
2. Must be equipped with green-labeled TRI ZONE PROMs or game ROM and green-labeled flipper ROMs. Yellow-labeled ROMs and PROMs provided with prototype games **cannot be intermixed** with green-labeled ones.
3. With Game ROM, jumper J3 must be connected and jumper J4 removed.

Sound Board

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

Power Supply Board

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

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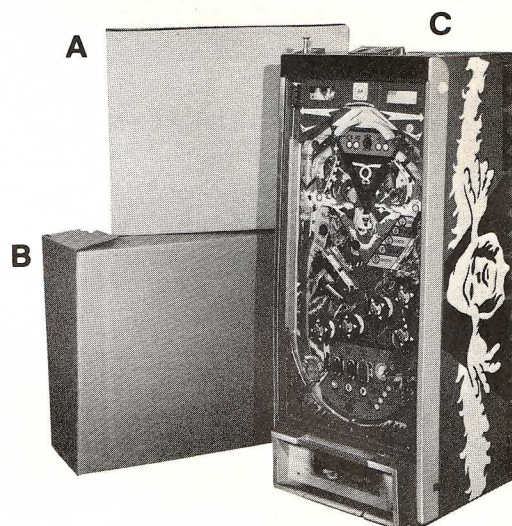
SECTION 1 INSTALLATION

Assembly and Interconnection

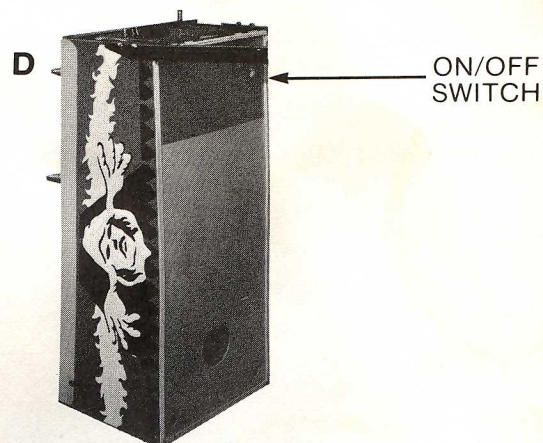
A Carton with backglass, coin box, legs, and mounting hardware.

B Backbox

C Cabinet



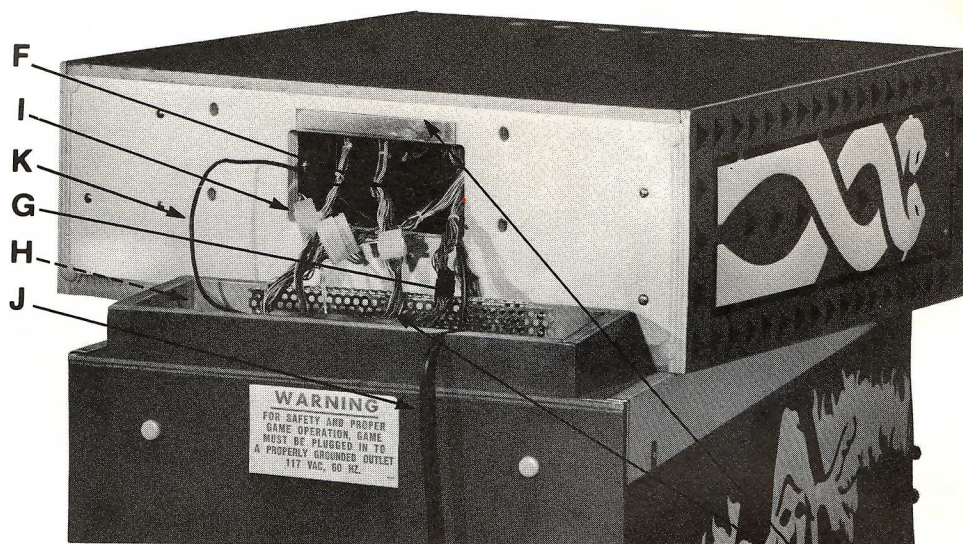
D Attach front legs using four acorn bolts.



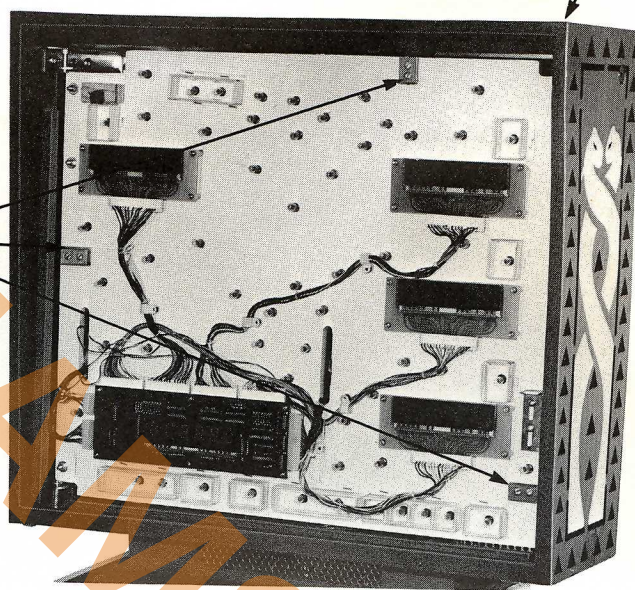
E Lay backbox on side to support rear of cabinet. Attach rear legs using four acorn bolts.



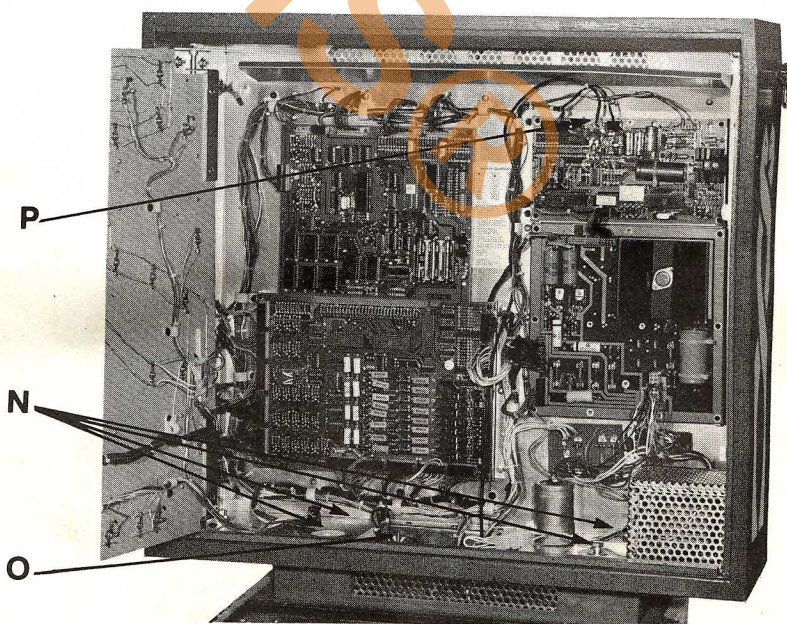
- F Pull five cables from backbox.
- G Reach into right side of pedestal hole, pull up ground strap, and push it into backbox.
- H Remove the tie securing cabinet and playfield cables to cabinet and pull up these cables.
- I Interconnect five cables. They are size and color coded except for power connector where wire colors do not match.
- J Insert line cord into notch in cabinet. DO NOT PLUG IN AT THIS TIME.
- K Push remote volume control cable into backbox.
- L Lift up backbox and position on cabinet pedestal, engaging brackets for support.



- M Remove shipping blocks.



- N Secure backbox to cabinet using four bolts and washers.
- O Connect ground braid under wing nut and washer.
- P Loosely position remote volume control cable in harness and plug connector into 10J4 on Sound Board.



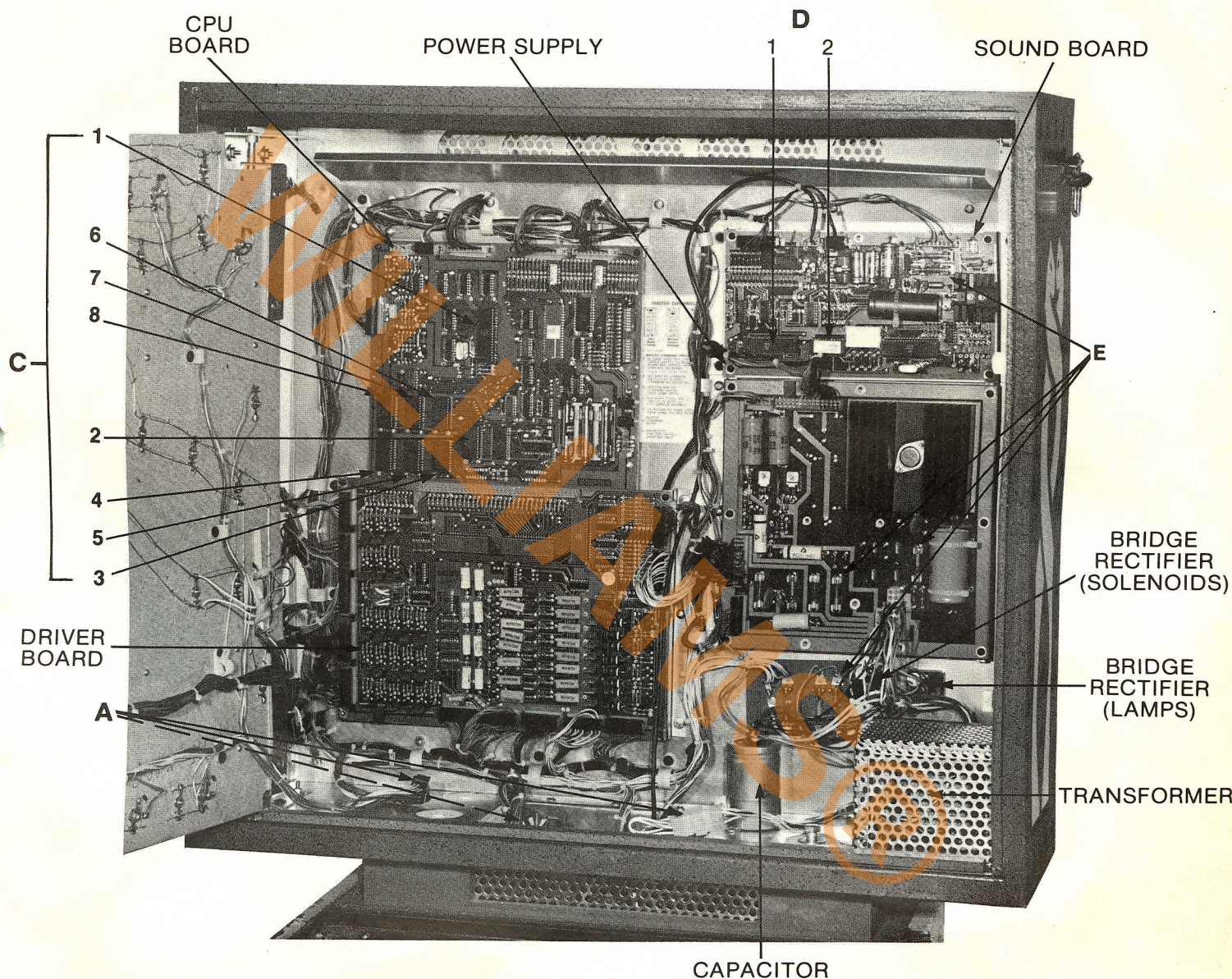
Inspection

- A** Check all connectors in backbox for loose wire terminations. Reseat any loose wires by pushing in on the termination.
- B** (Not called out) Push on all connectors attached to the CPU, Driver, Sound, and Power Supply Boards and check terminations on capacitor and bridge rectifiers.
- C** Gently press on the socketed IC packages on CPU Board:

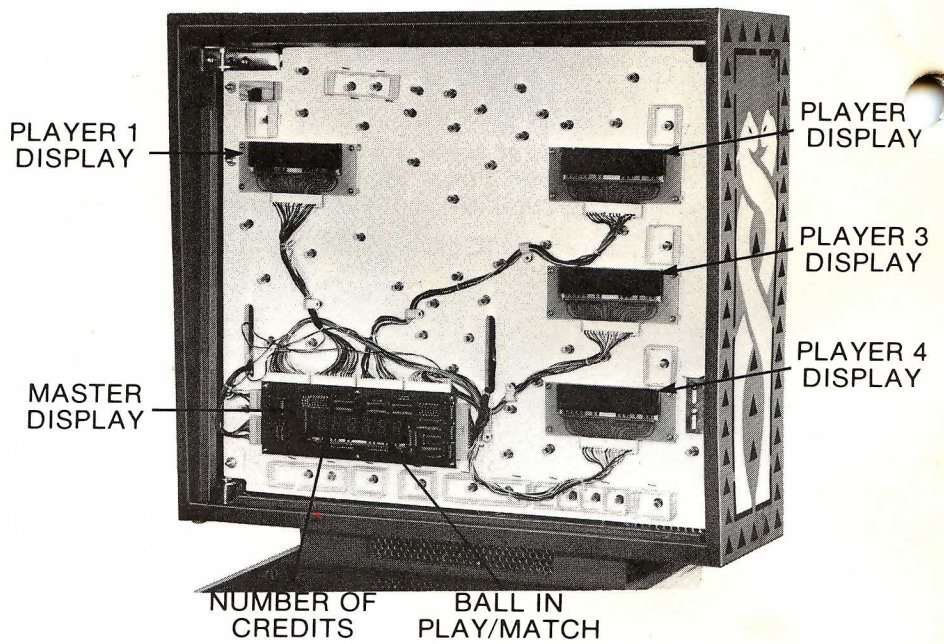
1 MPU, 2 RAM, 3 Game ROM (or 6 and 7 PROMs), and 4 and 5 ROMS.

- D** Gently press on the socketed IC packages on Sound Board: 1 MPU, 2 Sound ROM.

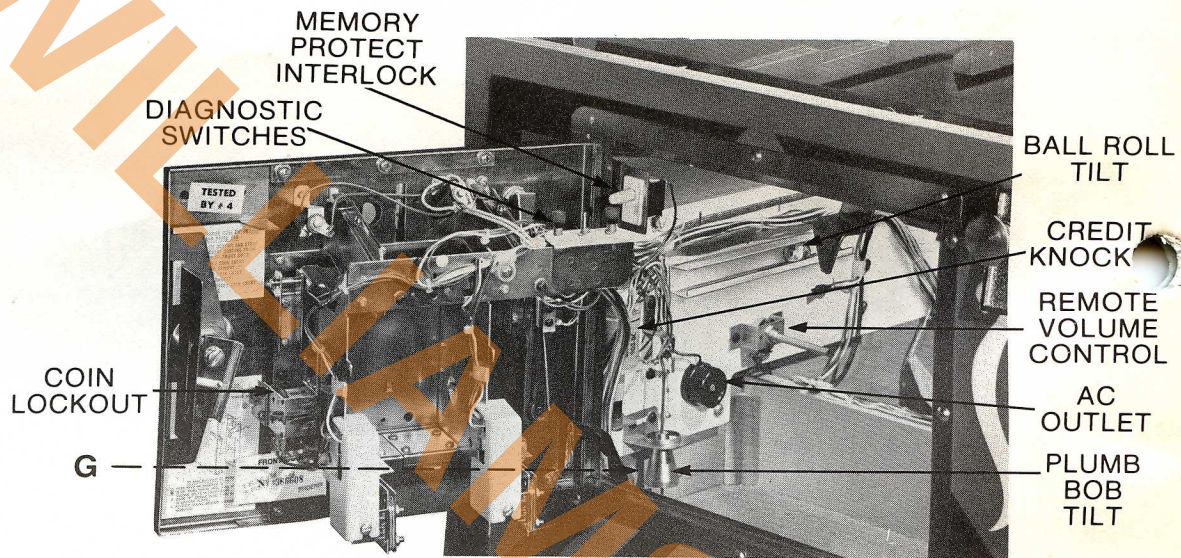
- E** Check that two fuses on Sound Board, five fuses on Power Supply, and three fuses on fuse card are secure.



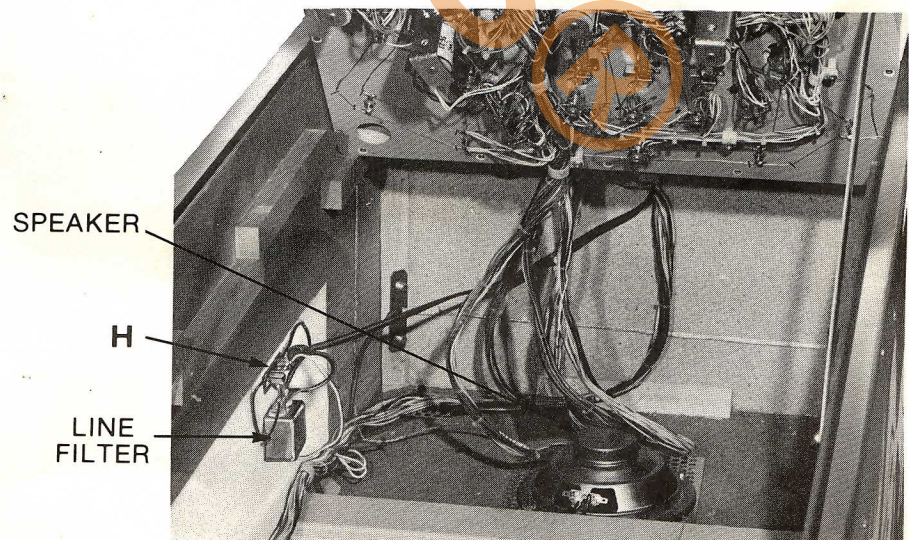
F (Not called out) Push on all connectors attached to Master and Player Display Boards.



G Check the cabinet to coin door connectors for loose wire terminations. Reseat any loose wires by pushing in on the termination.



H Check that the line fuse is secure.



Power Turn-On

This machine **MUST BE PLUGGED INTO A PROPERLY GROUNDED OUTLET** to **PREVENT SHOCK HAZARD** and to ensure **PROPER GAME OPERATION**. **DO NOT** use a "cheater" plug to defeat the ground pin on the line cord, and **DO NOT** cut off the ground pin. The line voltage **MUST** agree with that specified on the back of the cabinet or serious damage to the machine could occur. For low-line applications (105 or 210V ac), refer to the power wiring diagram in the drawing set.

1. **With the coin door closed**, plug the game in and turn it ON. The game should come on in the game over mode as indicated by the player scores reading zero, player 1 up light flashing, game over lights lit, and the high score to date alternating with the player 1 score.
2. If the game comes on in the diagnostic mode (number of credits display showing 04, ball in play display showing 00, and player 1 display showing game identification) turn the game OFF and ON again.
 - a. If the game now comes on in the game over mode the bookkeeping and game evaluation totals have been reset to zero.
 - b. If the game still comes on in the diagnostic mode, open the coin door and turn the game OFF and ON twice. This is an indication of the batteries being removed with the power OFF or coming loose during shipment. This has also resulted in features reverting to factory settings. Any changes from factory settings must be reentered using procedures provided in Section 3 of this manual.
3. If the game still comes on in the diagnostic mode, refer to troubleshooting procedures in the maintenance manual.
4. Perform diagnostic tests (Section 5) and make any desired changes to features (Section 3).

SECTION 2 GAME OPERATION

This Section provides an explanation of game operation.

Place the ball onto the playfield by the outhole. When the game is turned on it will come up in the game over mode. All player scores will be zero, high score to date* will alternate with the player 1 score, the player 1 up light will flash, and the game over lights will light. All playfield lights except for the credit lamp cycle in an attract mode.

When coins are inserted, credits will be posted. The knocker will sound for each credit. When the credit button on the front of the cabinet is pressed, the ball release solenoid serves the ball, the credit display will be reduced by one, the ball in play will show 1, the startup tune will be played, and the player 1 up light will flash until the first switch is made. Pressing the credit button at any time before the ball in play display indicates 2 will allow additional players, change the number of player lights, and reduce the number of credits by one for each additional player.

The bonus is advanced by making each top and bottom A and B rollover and each T-R-I rollover. Spotting A and B advances the bonus multiplier. Spotting T-R-I scores the lit value and advances the T-R-I lamps; initially the T-R-I 5000* lamp is lit. Spotting T-R-I with the Extra Ball or Special lamps lit awards an extra ball or a special, respectively. After winning the T-R-I Special, the T-R-I 3,000 lamp is lit. The lit T-R-I lamp, partial spotting of T-R-I and A and B, and any bonus multiplier* below 5X are restored for subsequent balls.

Making the four Z-O-N-E drop targets advances the lighting of "1" through "4". Lighting "1" also lights the spinner and lighting "2" lights the eject hole for scoring 10,000. Lighting "3" lights the four Z-O-N-E drop targets and lighting "4" alternately lights the left and right outside rollovers for a possible Special. The Special lights alternate with each 10 point score.

The top left and right standups each score 10 and the bottom left and right standups each score 50. The spinner scores 10 and 200 when lit, the kickers score 100, and the jet bumpers each score 100 or 1000 when lit. The lighting of the jet bumpers sequences with the spinner switch. The left and right outside rollovers each score 500 and the inside rollovers each score 1000. The eject hole scores 5000 and 10,000 when lit. The Z-O-N-E drop targets each score 1000 and 10,000 when lit. The T-R-I rollovers each score 1000; spotting the third letter scores the lit value, 10,000 when the Extra Ball lamp is lit, and 1000 when the Special lamp is lit.

Extra ball* (maximum of one extra ball per ball) won during the course of the game is played immediately after the player's regular ball enters the outhole. After the last ball is played, the match digits* appear where the ball in play digits were. If match occurs an extra credit will be awarded,* the match and game over tunes will play and the game over lights will light. The high score to date will alternate with the winning player's score.

If a player's score exceeds the current high score to date, three* credits will be awarded, the game will play a high score to date tune, and the highest score to date lights will remain lit.

The Plumb Bob Tilt tilts the ball in play on the third* closure. The Playfield Shake and Ball Roll tilt switches tilt the ball in play immediately. The slam tilt switch on the coin door sets all player scores to zero and returns the game to game over.

If coins are inserted or credits won and the maximum* number of credits is exceeded, the credits will be posted correctly but the coin lockout coil will be de-energized until the number of remaining credits is below the maximum. While the coil is de-energized, no credits may be won and any coins inserted will be rejected.

*These features are adjustable and the procedure is outlined in Section 3.

SECTION 3 GAME ADJUSTMENTS

This section provides information for making game adjustments and reviewing game status. There are four switches, all accessible from the coin door (Figure 1) or the front of the cabinet, which are used to display and change game features:

1. AUTO-UP/MANUAL-DOWN toggle switch (inside coin door)
2. ADVANCE pushbutton (inside coin door)
3. HIGH SCORE RESET pushbutton (inside coin door)
4. Credit button (front of cabinet)

Procedure (Refer to Table 1 and [for pricing] Table 2 for Function 13-35 adjustment values).

Coin door must remain 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 number 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 on player 1 display is new setting.
4. Repeat steps 2 and 3 until all desired adjustments have been made.

5. Turn game OFF and back ON to return to game over mode.

Restoring Factory Settings (Functions 01-35)

Coin door must remain open to restore factory settings

Factory settings are restored using the coin door switches and two switches on the CPU Board. On the right side of the CPU Board (Figure 2) there are two 8-position miniature slide switches and two pushbutton switches. The lower 8-position switch is not used and the lower (DIAGNOSTIC) pushbutton switch is used only for trouble-shooting. The game is first placed in a blanking mode from the coin door and then switch number 7 on the MASTER COMMAND (upper) slide switch is set to ON (moved to left) and all other switches are set to OFF (moved to the right). Finally, the MASTER COMMAND ENTER pushbutton is depressed. To reset Functions 12 through 35 to factory settings and to zero audit totals (Functions 01-11), proceed as follows:

1. With the game in the game over mode, set the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN 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 switch to OFF (move to the right).
4. Set switch 7 on the MASTER COMMAND switch to ON (move to the left).
5. Momentarily depress MASTER COMMAND ENTER pushbutton. The LEDs should blink once.
6. Turn the game OFF and ON twice to return to the game over mode.

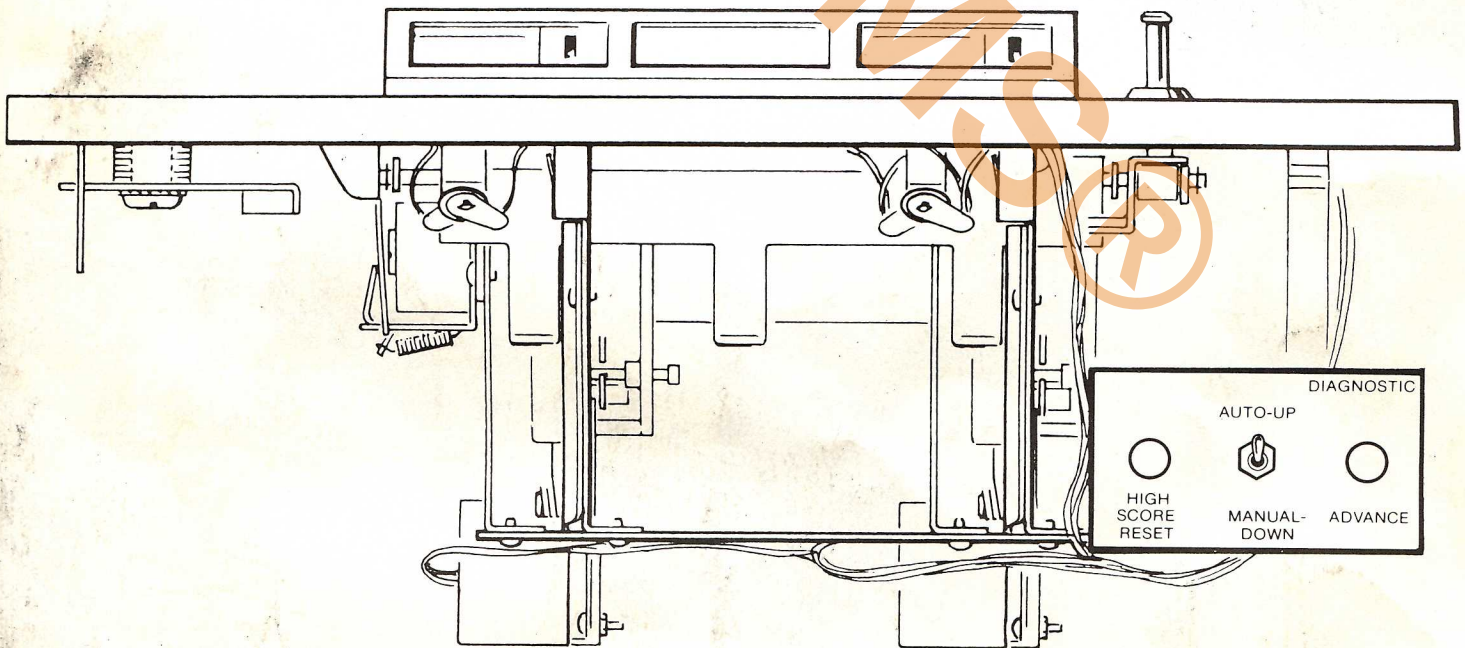


Figure 1. Coin Door Switches

Table 1. Game Adjustments

FUNCTION	DESCRIPTION	NOTES	FACTORY SETTING	Notes:
00	Game Identification	1	1487 1	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.
01	Coins, Left Chute (Closest to coin door hinge)	1	—	
02	Coins, Center Chute	1	—	2. Total Credits (Function 08) is the sum of Function 04 and as applicable, Functions 05, 06, and 07.
03	Coins, Right Chute	1	—	
04	Total Paid Credits	1	—	3. Total Extra Balls (Function 09) is the sum of the game extra ball feature and Functions 05 and 06, as applicable.
05	Total Specials	1	—	
06	Total Replay (Extra Ball) Scores	1	—	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.
07	Match and High Score to Date Credits	1,2	—	
08	Total Credits	1,3	—	
09	Total Extra Balls	1	—	
10	Total Ball Time in Minutes	1	—	
11	Total Number of Balls Played	1	—	
12	Current High Score to Date	4	—	
13	Backup High Score to Date	5	550,000	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.
14	Replay 1 Score	6	550,000	
15	Replay 2 Score	6	270,000	
16	Replay 3 Score	6	370,000	
17	Replay 4 Score	6	470,000	
18	Maximum Credits	6	0	
19	Standard and Custom Pricing Control (00=07)	7	20	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.
20	Left Coin Slot Multiplier	8	01	7. Setting Maximum Credits (Function 18) to zero places the game in a free play mode.
21	Center Coin Slot Multiplier	8	01	
22	Right Coin Slot Multiplier	8	01	
23	Coin Units Required for Credit	8	01	
24	Coin Units Bonus Point	8	01	
25	High Score Credits	8	02	
26	Match (00=ON, 01=OFF)	5	03	
27	Special	—	00	
	00 = Awards Credit	—	00	
	01 = Awards Extra Ball	—	00	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.
28	Scoring Awards	—	00	9. For 5 ball play, a setting of 00 for Function 32 is recommended.
	00 = Credits at Replay Score	—	00	
29	01 = Extra Ball at Replay Score	—	00	
30	Maximum Plumb Bob Tilts (1-9)	—	03	
31	Number of Balls (03 or 05)	9	03	
	Play	—	01	
	01 = Liberal-1 and 2 Lit Together	—	—	
	02 = Moderate-1 and 2 Lit Separately	—	—	
	04 = No Extra Ball-1 and 2 Lit Separately	—	—	
32	T-R-1 Award Control	9	01	
	00 = 3,000 Lamp Lit Initially	—	—	
33	01 = 5,000 Lamp Lit Initially	—	00	
	Bonus Multiplier Restore Control	—	—	
	00 = Restores	—	—	
	01 = Does Not Restore	—	—	
34	Not Used	—	—	
35	Not Used	—	—	

Levels	CREDIT GAMES	Score Card
3-Ball:		
*270,000; 370,000; 470,000		487-12
or 230,000; 380,000		487-25
5-Ball:		
(See Note 9)		
390,000; 590,000		487-41
	EXTRA BALL	
3-Ball:		
180,000; 280,000		487-68
5-Ball:		
300,000; 400,000		487-69
*Factory setting		

Table 2. Standard and Custom Price Settings

COIN DOOR MECHANISM	CREDITS	FUNCTION					
		19	20	21	22	23	24
Quarter, Twin-Quarter, or 3-Quarter	•1/25¢, 3/50¢	01	01	01	01	01	02
	•1/25¢	02	01	01	01	01	00
	2/25¢, 5/50¢	00	02	02	02	01	04
	2/25¢	00	02	02	02	01	00
	1/25¢, 5/\$1	00	01	01	01	04	00
	1/50¢	00	01	01	01	02	00
	1/50¢, 3/\$1	00	01	01	01	02	04
*Quarter, Dollar, Quarter	1/25¢, 5/\$1	00	01	04	01	01	04
	1/25¢, 4/\$1	00	01	04	01	01	00
1DM, 5DM, 2 DM	•2/1DM, 5/2DM, 14/5DM	03	13	65	26	05	65
20-Cent, 50-Cent	1/20¢, 3/50¢	00	06	00	15	05	00
1 Franc, 5 Frank	•1/1F, 6/5F	04	01	00	05	01	05
	•1/1F, 7/5F	05	06	00	30	05	30
25 Cent, 1 Guilder	•1/25¢, 4/1G	06	01	00	04	01	00
	1/25¢, 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 Twin-1 Franc	•1/1F, 3/2F	01	01	01	01	01	02
	•1/1F	02	01	01	01	01	00
5 Franc, 10 Franc	•1/5F, 2/10F	07	01	00	02	01	00
	1/10F	00	01	00	02	02	00
Twin-2 Franc	•1/2F	02	01	01	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.

*Or Quarter, Dollar, —.

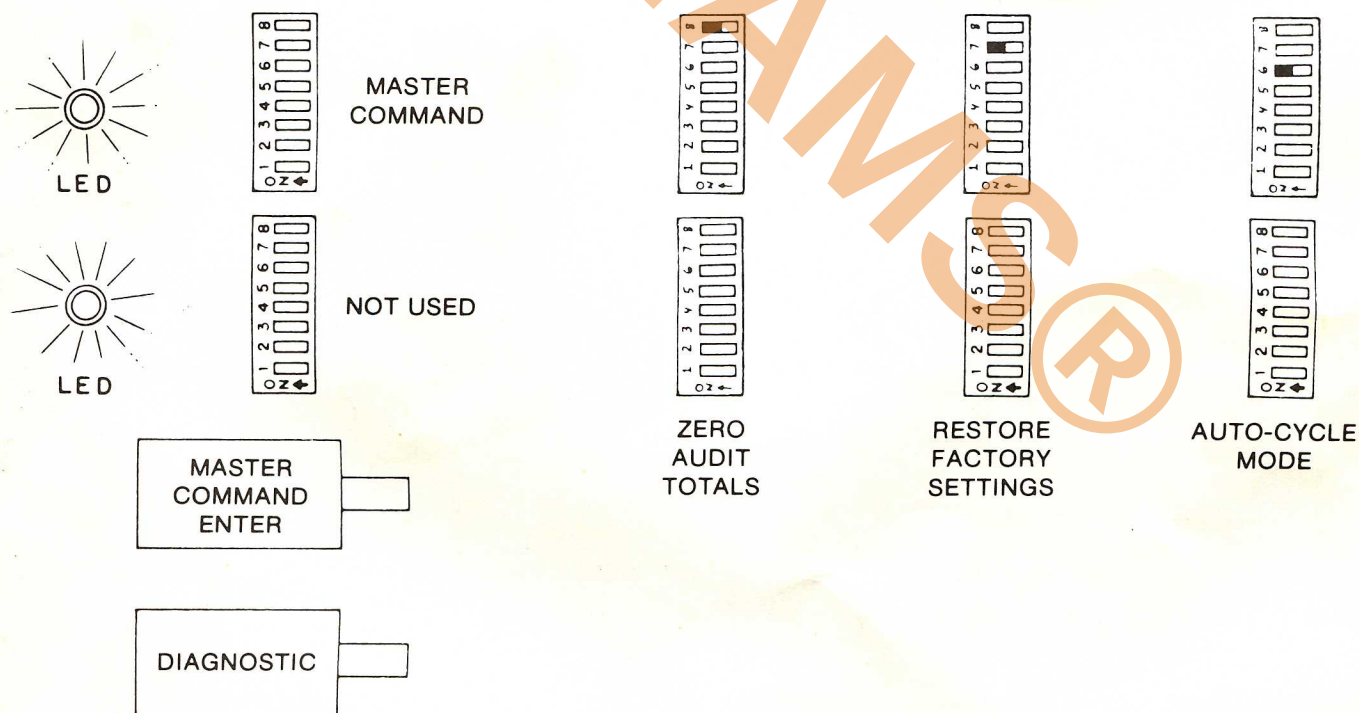


Figure 2. Master Command Switch Settings

SECTION 4 BOOKKEEPING AND GAME EVALUATION

Procedure (Functions 01-12, see Table 1)

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 and record each total from the player 1 display. (To review a total that has been advanced past, set toggle switch to MANUAL-DOWN and operate ADVANCE pushbutton).
3. Calculate percentage of paid credits as follows:

$$\% \text{ Paid Credits} = \text{Function 04} \div \text{Function 08}$$
4. Turn game OFF and back ON to return to game over mode.

High Score Reset

The current High Score to Date (Function 12) may be reset to the backup High Score to Date (Function 13) from the coin door. To adjust the backup High Score to Date, see Section 3. With the game in the game over mode, momentarily depress the HIGH SCORE RESET pushbutton.

Resetting Audit Totals (Functions 01-11)

Audit totals may be reset to zero using the coin door switches and two switches on the CPU Board described in Section 3. To reset Functions 01 through 11 to zero, refer to Figure 2 and proceed as follows:

1. With the game in the game over mode, set the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN 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 8 on the MASTER COMMAND switch to ON (move to the left).
5. Momentarily depress MASTER COMMAND ENTER pushbutton. The LEDs should blink once.
6. Turn the game OFF and ON to the game over mode.

SECTION 5 BUILT-IN DIAGNOSTICS

Procedure (Display Digits, Lamp, Solenoid, and Switch Tests; see Table 3 and Figure 3)

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. (All multiplexed lamps blink).
4. Set toggle switch to MANUAL-DOWN and momentarily depress ADVANCE. Test 02 is indicated on number of credits display and solenoid 01 on ball in play display; solenoid 01 is pulsed by Driver Board.
5. Operate ADVANCE to pulse each solenoid.

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. Operate switches; switch number is indicated on ball in play display.
8. Turn game OFF and ON to return to game over mode.

Table 3. Solenoids

SOL. NO.	DESCRIPTION
01	Ball Release
02	Eject Hole
03	"Z" Drop Target Reset
04	"O" Drop Target Reset
05	"N" Drop Target Reset
06	"E" Drop Target Reset
07	Not Used
08	Not Used
09	Sound
10	Sound
11	Sound
12	Sound
13	Sound
14	Credit Knocker
15	Not Used
16	Coin Lockout
17	Top Jet Bumper
18	Left Jet Bumper
19	Bottom Jet Bumper
20	Left Kicker
21	Right Kicker
22	Not Used

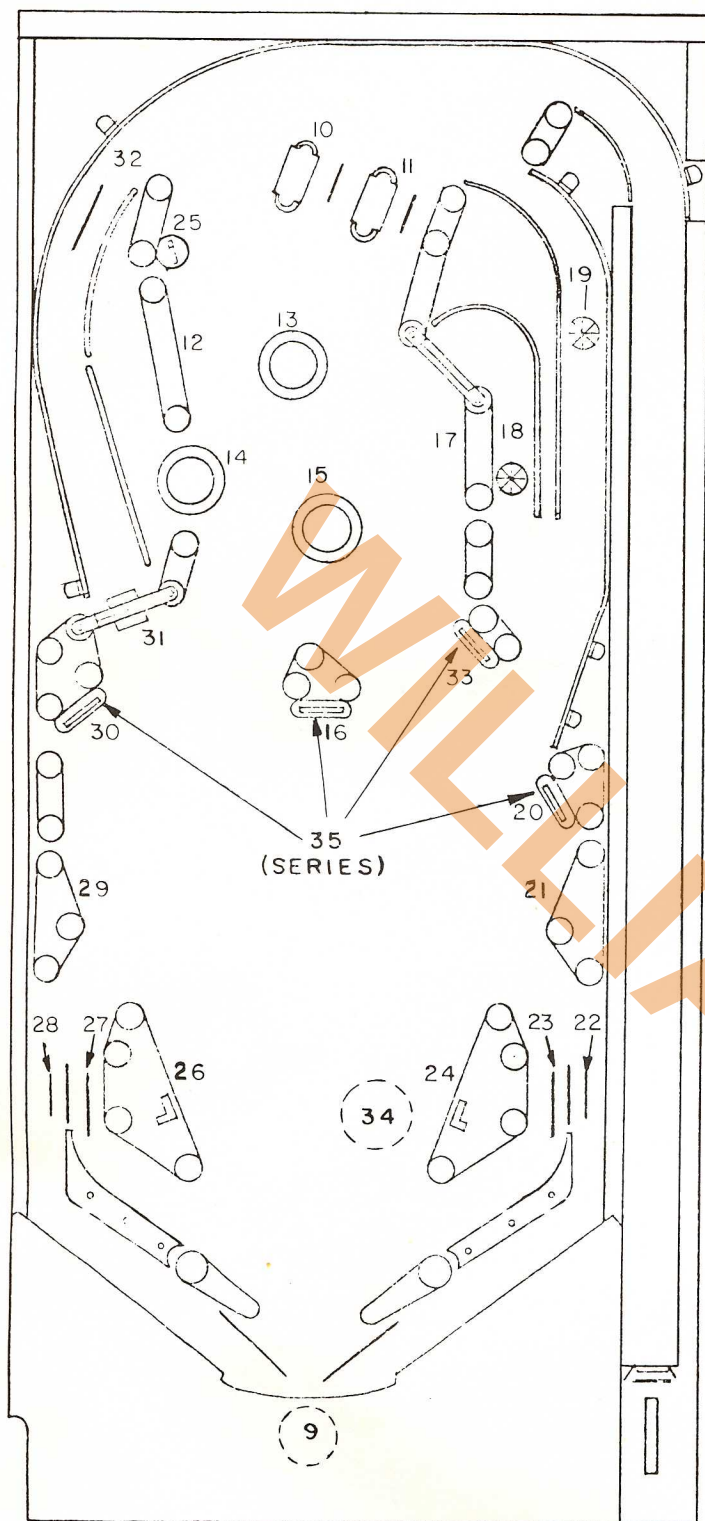
Auto-Cycle Mode

This mode is provided to help diagnose intermittent problems by continuously performing the Display Digits, Lamp, and Solenoid Tests. Each cycle of this mode sequences through the display tests, flashes the lamps 64 times, and pulses each solenoid. This mode is initiated using the coin door switches and two switches on the CPU Board described in Section 3. To initiate the Auto-Cycle mode refer to Figure 2 and proceed as follows:

1. With the game in the game over mode, set the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN 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 6 to ON (move to the left).
5. Momentarily depress the MASTER COMMAND ENTER pushbutton. The LEDs should blink once.
6. Set the toggle switch to AUTO-UP and momentarily depress the ADVANCE pushbutton.
7. To terminate the Auto-Cycle mode and go to game over, turn the game OFF and ON.

SECTION 6 MATRIX CHARTS AND PLAYFIELD SPARE PARTS

This section provides matrix charts for lamps and switches (Figures 4 and 5), solenoid identification and connections (Table 4), and playfield spare parts identification (Figure 6).


**SWITCH
NO.**
FUNCTION

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	Top A Rollover
11	Top B Rollover
12	Left Standup
13	Top Jet Bumper
14	Left Jet Bumper
15	Right Jet Bumper
16	"O" Drop Target
17	Right Standup
18	"R" Rollover
19	"I" Rollover
20	"E" Drop Target
21	Lower Right Standup
22	Right Outside Rollover
23	Right Inside Rollover
24	Right Kicker
25	Eject Hole
26	Left Kicker
27	Left Inside Rollover
28	Left Outside Rollover
29	Bottom Left Standup
30	"Z" Drop Target
31	Spinner
32	"T" Rollover
33	"N" Drop Target
34	Playfield Tilt
35	"Z-O-N-E" Drop Targets Series

Figure 3. Playfield Switch Locations and Switch Chart

COLUMN ROW	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	NOT USED	8,000 BONUS	"T"	"TRI" SCORES 5,000	"1"	TOP "A"	NOT USED	#1 PLAYER UP
2 RED-BLK	1,000 BONUS	9,000 BONUS	"R"	"TRI" SCORES 10,000	"2"	TOP "B"	1 CAN PLAY	#2 PLAYER UP
3 RED-ORN	2,000 BONUS	NOT USED	"I"	"TRI" SCORES EXTRA BALL	"3"	BOTTOM "A"	2 CAN PLAY	#3 PLAYER UP
4 RED-YEL	3,000 BONUS	10,000 BONUS	"Z"	"TRI" SCORES SPECIAL	"4"	BOTTOM "B"	3 CAN PLAY	#4 PLAYER UP
5 RED-GRN	4,000 BONUS	X2	"O"	LEFT SPECIAL	NOT USED	NOT USED	4 CAN PLAY	TILT
6 RED-BLU	5,000 BONUS	X3	"N"	RIGHT SPECIAL	TOP JET BUMPER	EJECT HOLE 10,000	MATCH	GAME OVER
7 RED-VIO	6,000 BONUS	X4	"E"	SAME PLAYER SHOOTS AGAIN (PLAYFIELD)	LEFT JET BUMPER	NOT USED	BALL IN PLAY	SAME PLAYER SHOOTS AGAIN (BACKBOX)
8 RED-GRY	7,000 BONUS	X5	"TRI" SCORES 3,000	SPINNER	BOTTOM JET BUMPER	NOT USED	CREDITS (PLAYFIELD)	HIGH SCORE TO DATE

Figure 4. Lamp Matrix

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

Figure 5. S Matrix

Table 4. Solenoid Connections

SOL. NO.	FUNCTION	WIRE COLOR	CONNECTIONS	DRIVER TRANS.	SOLENOID PART NO.
01	Ball Release	GRY-BRN	2P11-4, 8P3-17	Q15	SA-23-900-DC
02	Eject Hole	GRY-RED	2P11-5, 8P3-18	Q17	SG-23-900-DC
03	"Z" Drop Target Reset	GRY-ORN	2P11-7, 8P3-19	Q19	SG-24-875-DC
04	"O" Drop Target Reset	GRY-YEL	2P11-8, 8P3-20	Q21	SG-24-875-DC
05	"N" Drop Target Reset	GRY-GRN	2P11-9, 8P3-21	Q23	SG-24-875-DC
06	"E" Drop Target Reset	GRY-BLU	2P11-3, 8P3-22	Q25	SG-24-875-DC
07	Not Used	GRY-VIO	2P11-2, 8P3-23	Q27	--
08	Not Used	GRY-BLK	2P11-1, 8P3-24	Q29	--
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	BRN-GRN	2P9-3, 10P3-7	Q39	--
14	Credit Knocker	BRN-BLU	2P9-4, 7P1-16	Q41	SA2-23-900-DC
15	Not Used	BRN-VIO	2P9-5, 7P1-17	Q43	--
16	Coin Lockout	BRN-GRY	2P9-6, 7P1-18, 7P2-4	Q45	SM-35-4000-DC
*17	Top Jet Bumper	BLU-BRN	2P12-7, 8P3-11	Q2	SG-23-900-DC
*18	Left Jet Bumper	BLU-RED	2P12-4, 8P3-12	Q4	SG-23-900-DC
*19	Bottom Jet Bumper	BLU-ORN	2P12-3, 8P3-13	Q6	SG-23-900-DC
*20	Left Kicker	BLU-YEL	2P12-6, 8P3-14	Q8	SG-23-900-DC
*21	Right Kicker	BLU-GRN	2P12-8, 8P3-15	Q10	SG-23-900-DC
*22	Not Used	BLU-BLK	2P12-9, 8P3-16	Q12	--
*	Right Flipper	BLU-VIO	7P1-8, 8P3-3	--	SFL-20-300/ 30-800-DC
*	Left Flipper	BLU-GRY	7P1-10, 8P3-4	--	SFL-20-300/ 30-800-DC

***NOTES:**

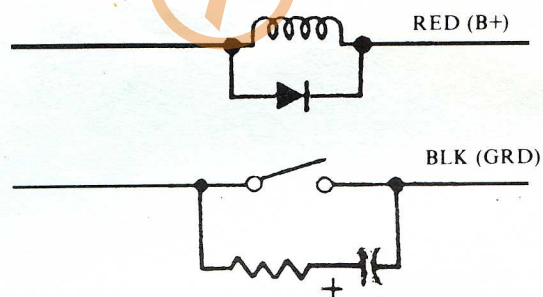
1. Special switch connections for solenoids 17 through 22 are as follows:

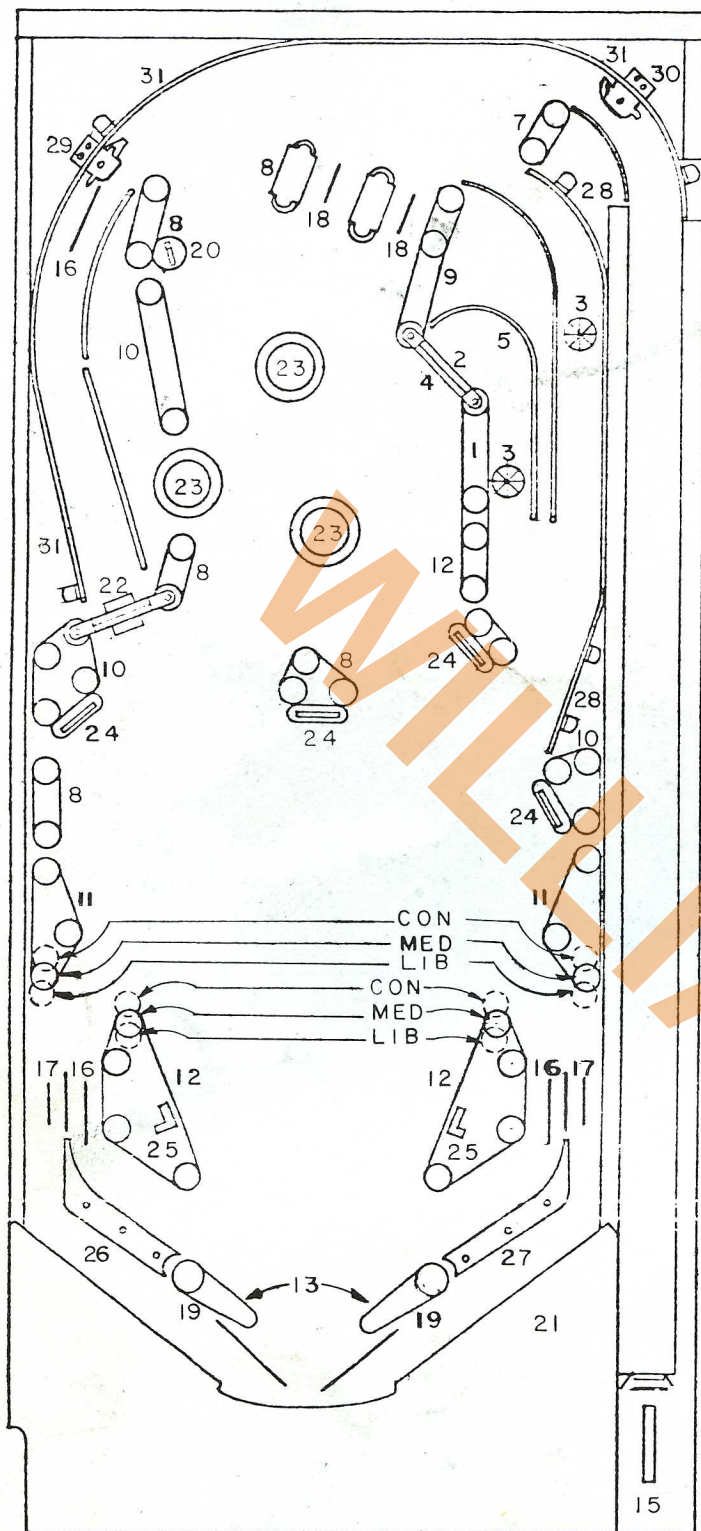
17 -- ORN-BRN -- 2P13-5, 8P3-5
 18 -- ORN-RED -- 2P13-3, 8P3-6
 19 -- ORN-BLK -- 2P13-2, 8P3-7
 20 -- ORN-YEL -- 2P13-4, 8P3-8
 21 -- ORN-GRN -- 2P13-8, 8P3-9
 22 -- ORN-BLU -- 2P13-9, 8P3-10

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:



**Part No.****Description**

1 1C-1241-32	CHROME COVER PLATE
2 1A-3206-1	MOUNTING BRACKET FOR BALLGATE WIRE
3 3A-7537-5	STAR ROLLOVER BUTTON (2 USED)
4 12A-6511	BALLGATE WIRE
5 12A-6513	BALLGUIDE WIRE
6 23A-6300	RUBBER RINGS 5/16" ID (3 USED)
7 23A-6301	RUBBER RING 3/4" ID
8 23A-6302	RUBBER RING 1" ID
9 23A-6303	RUBBER RING 1 1/4" ID
10 23A-6304	RUBBER RING 1 1/2" ID
11 23A-6305	RUBBER RING 2" ID
12 23A-6306	RUBBER RING 2 3/8" ID
13 23A-6519-4	FLIPPER RUBBER - RED
14 30C-487	SET OF 11 PLAYFIELD PLASTICS
15 30B-3573	BALL SHOOTER GAUGE PLATE
16 A-5844-8	ROLLOVER WIRE ASSY (4 USED)
17 A-5844-9	ROLLOVER WIRE ASSY (2 USED)
18 A-5844-35	ROLLOVER WIRE ASSY (2 USED)
19 B-7060	FLIPPER ASSY
20 B-7472-SR	BALL EJECT ASSY
21 D-7473	BOTTOM ARCH ASSY
22 B-7875-473	SPINNING TARGET ASSY
23 B-7894	JET BUMPER ASSY
24 D-7931-1S	DROP TARGET ASSY (4 USED)
25 B-8055	BALL KICKER ASSY
26 A-8108-L	FLIPPER RETURN FRAME - LEFT
27 A-8108-R	FLIPPER RETURN FRAME - RIGHT
28 C-8111	SIDE BALL RAIL ASSY
29 A-8112-L	LEFT BALL GATE ASSY
30 A-8112-R	RIGHT BALL GATE ASSY
31 D-8114	TOP BALL RAIL ASSY

POST ADJUSTMENTS

To make game more conservative or liberal, move posts 3/16" as shown in drawing. Spotting holes are provided and can be seen upon removal of posts.

Figure 6. Playfield Spare Parts