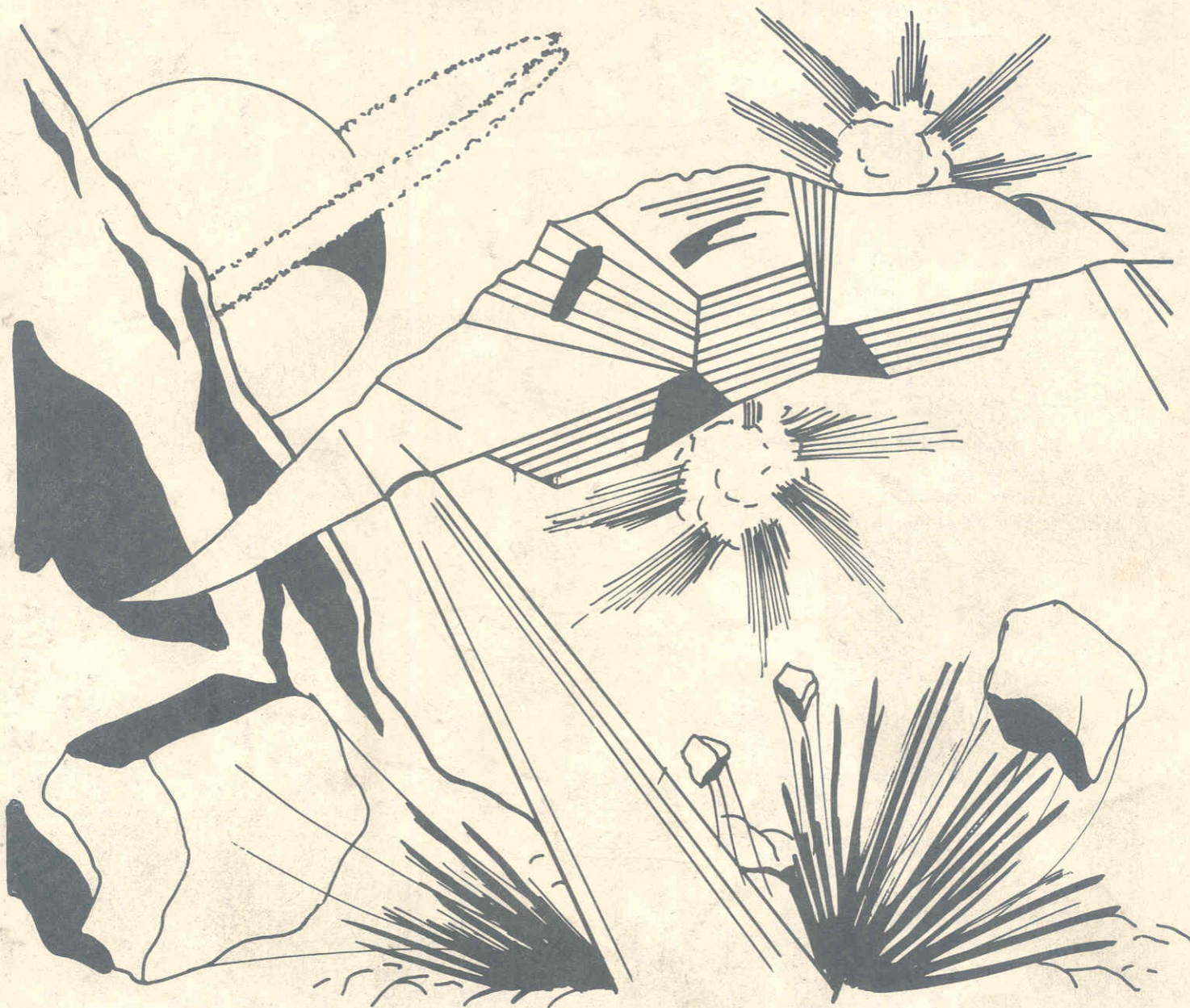


*Williams*<sup>®</sup>

16P-490-100  
Game No. 490  
February, 1979

# STELLAR WARS



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## PRELIMINARY

This is not a complete instruction manual; only the major differences from previous games are provided. For detailed troubleshooting and interconnection information, use the instruction manual provided with FLASH as a guide.

### SPECIAL CONSIDERATIONS WHEN REPLACING CIRCUIT BOARDS

#### CPU Board

1. Must have three PROM sockets.
2. Must be equipped with STELLAR WARS PROMs and yellow-labeled ROMs.

#### Sound Board

1. Must be jumpered for ROM operation and be equipped with Sound ROM 1.
2. May require modifications if equipped with only one fuse clip; refer to procedures in the manual provided with FLASH.



## SECTION 1

### INSTALLATION

This section provides information for assembly and interconnection, inspection, and power turn-on for solid state pinballs.

#### ASSEMBLY AND INTERCONNECTION

To assemble and interconnect the game, proceed as follows:

1. Remove the two cartons and the cabinet from the shipping carton.
2. Carefully set the cabinet on end with the rear of the cabinet on the floor.
3. Open the stapled carton and remove the four legs and the cashbox.
4. Remove the ball, eight acorn bolts and four backbox mounting bolts from the cash box.
5. Mount the two front legs using four acorn bolts.
6. Carefully lower the cabinet so that it is supported on the front legs.
7. Take the backbox from its carton and remove the envelope containing the backbox keys from the top of it.
8. Center the backbox on the floor at the rear of the cabinet in an upright position oriented with the insert board parallel to the length of the cabinet.
9. Lift up the rear of the cabinet and carefully slide the backbox underneath it for support.
10. Mount the two rear legs using four acorn bolts.
11. Reach into the large hole at the rear of the cabinet, pull out the power cord, and place it in the slot provided.

#### NOTE

Do not plug the game in and do not pull up any other cables from the cabinet at this time.

12. The backbox has a metal bracket protruding from the bottom hole that will engage a similar bracket on the cabinet pedestal to prevent the backbox from tipping forward when the insert door is opened. Place the backbox onto the pedestal, engaging the bracket.
13. Remove the shipping blocks from the insert door.
14. Lift up on the latch at the right side of the insert door and open the door.
15. Secure the backbox to the cabinet using the four bolts and washers.

#### NOTE

Refer to Figure 1. There are seven cables (four from the playfield and three from the cabinet) that must be interconnected with cables from the backbox. The connectors are size and color coded except for the power switch to transformer connection, where the colors do not match.

16. Reach into the cabinet through the hole in the backbox and pull out all cables.
17. Interconnect the 24-pin black plug and connector (8P3/8J3) for the playfield solenoids.
18. Interconnect the 24-pin white plug and connector (8P2/8J2) for the playfield lamps.
19. Interconnect the 15-pin white plug and connector (8P1/8J1) for the playfield switches.
20. Interconnect the 3-pin white plug and connector (6P1/6J1) for the switched ac power to the transformer.
21. Interconnect the 1-pin white plug and connector (6P2/6J2) for the flipper solenoid B+.
22. Interconnect the 9-pin white plug and connector (6P3/6J3) for the sound board power.
23. Interconnect the 36-pin white plug and connector (7P1/7J1) for the cabinet solenoids and switches.
24. Pull the ground braid from the left side of the cabinet through the hole in the backbox and connect it under the wing nut and washer located on the backbox shield liner in front of the rectangular hole.
25. With the coin door keys (taped to the ball shooter handle) unlock the coin door.
26. Install the coin box.

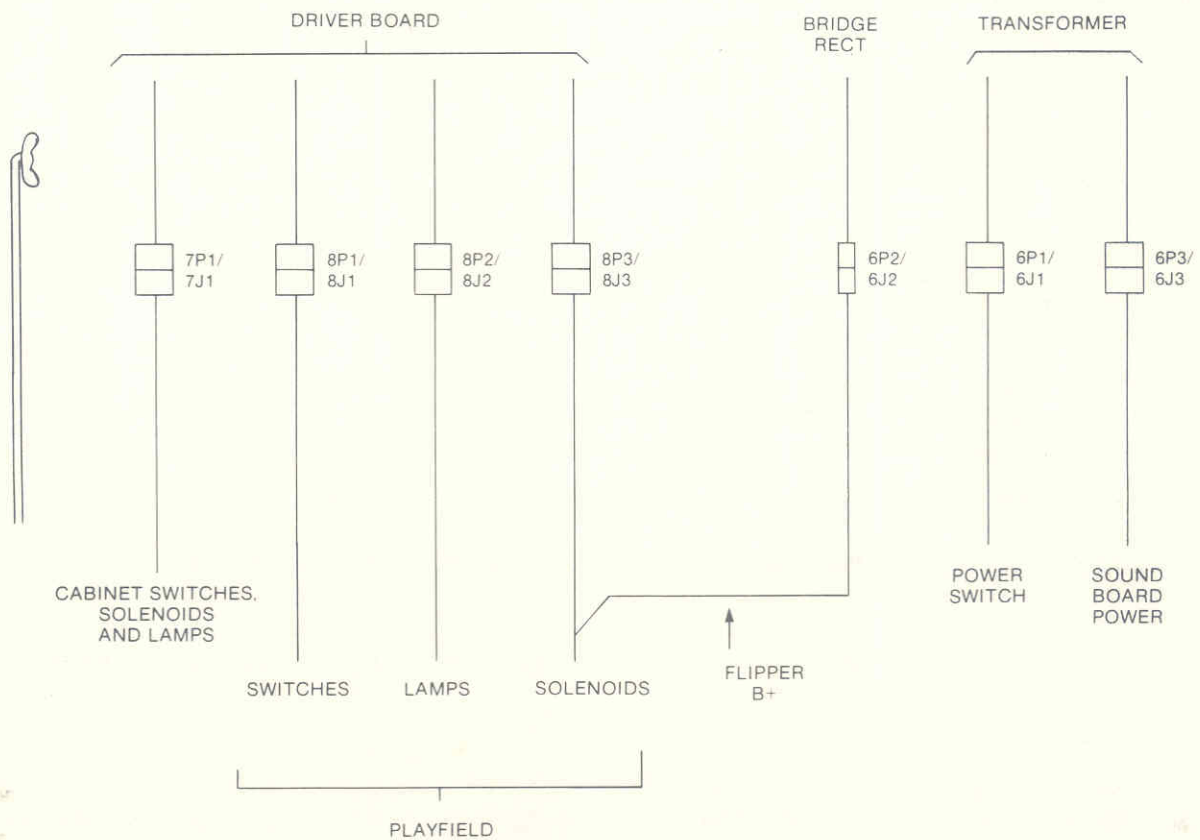


Figure 1. Backbox Interconnections

## INSPECTION

Inspection consists of checking that all cable connections are securely made, that all socketed integrated circuits (ICs) are firmly in their sockets, and a general visual inspection.

1. Check all connectors in the backbox to make sure that none of the wire terminations have come loose or were pushed out. Reseat any loose wires by pushing in on the wire termination.
2. Push on all connectors attached to the CPU Board (Figure 2 - No. 1) to make sure they are firmly seated.
3. Push on all connectors attached to the Driver Board (Figure 2 - No. 2) to make sure they are firmly seated.
4. Push on all connectors attached to the Power Supply Board (Figure 2 - No. 3) to make sure they are firmly seated.
5. Check the connection on both bridge rectifiers (Figure 2 - No. 5) and the filter capacitor (Figure 2 - No. 6).
6. Push on all connectors attached to the Master Display Board (Figure 2 - No. 12) and the four individual player displays (Figure 2 - Nos. 8, 9, 10, and 11).
7. Gently press on the socketed IC packages on the CPU Board (Figure 3). DO NOT remove any of the IC packages from their sockets.
8. Check that the batteries are still securely mounted on the CPU Board. DO NOT REMOVE THE BATTERIES! If the batteries are removed with power OFF, the game will go to factory settings for all the features and particular changes will have to be restored manually before the game can be put on location.

## NOTE

The batteries are all installed with the positive (+) end up. Battery life is about the same as shelf life or about one year. When it is time to replace the batteries, remove the batteries with the power ON or the game will revert to factory settings.

9. Check and push on the connectors which interconnect the coin door mechanism to the cabinet.
10. Remove the playfield glass and carefully set it aside.
11. Carefully raise the playfield and support it with the brace(s).
12. Push on all the connectors attached to the Sound Board (Figure 2-No.20)
13. Gently press on the socketed IC packages on the Sound Board (Figure 4).



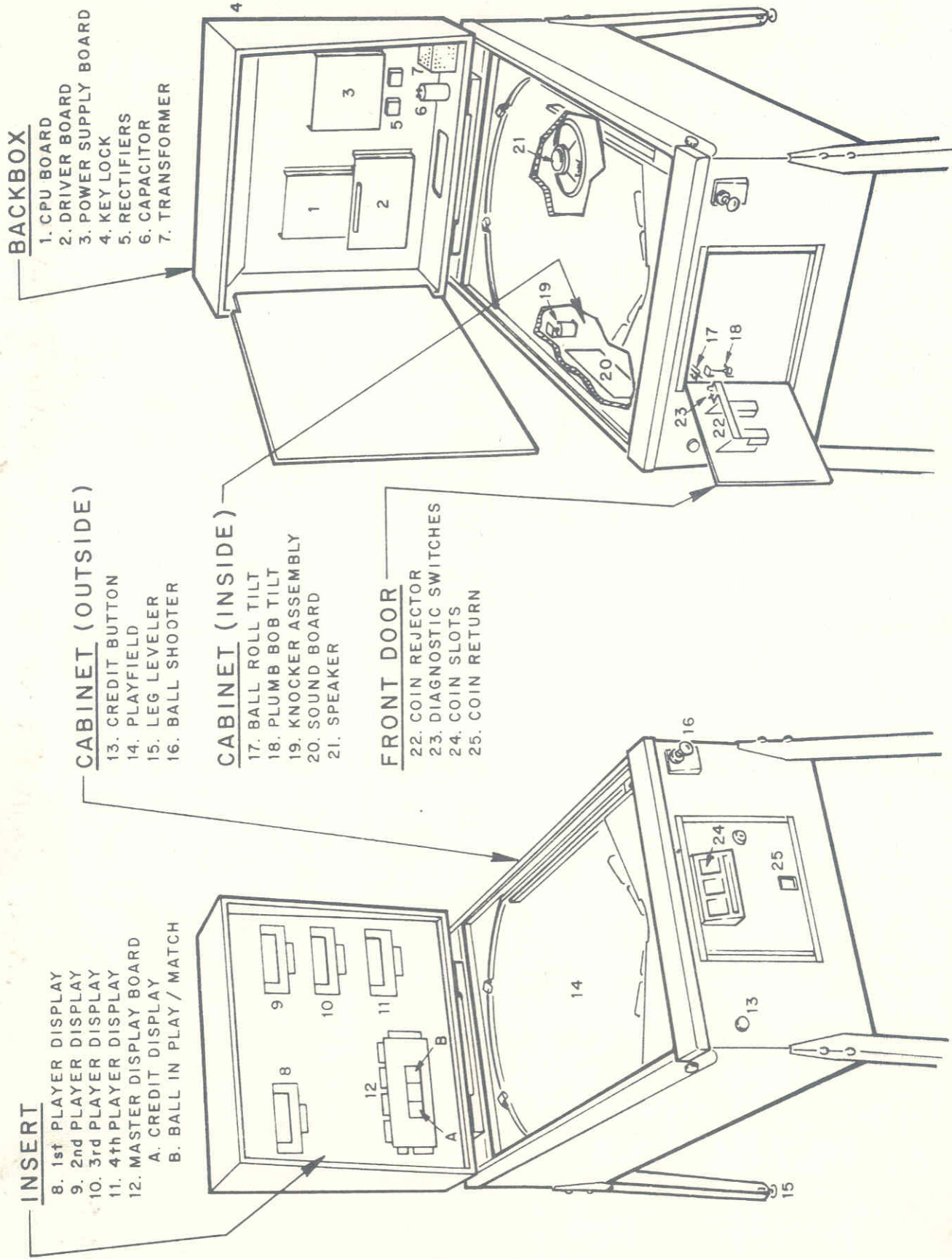


Figure 2. Location of Major Assemblies

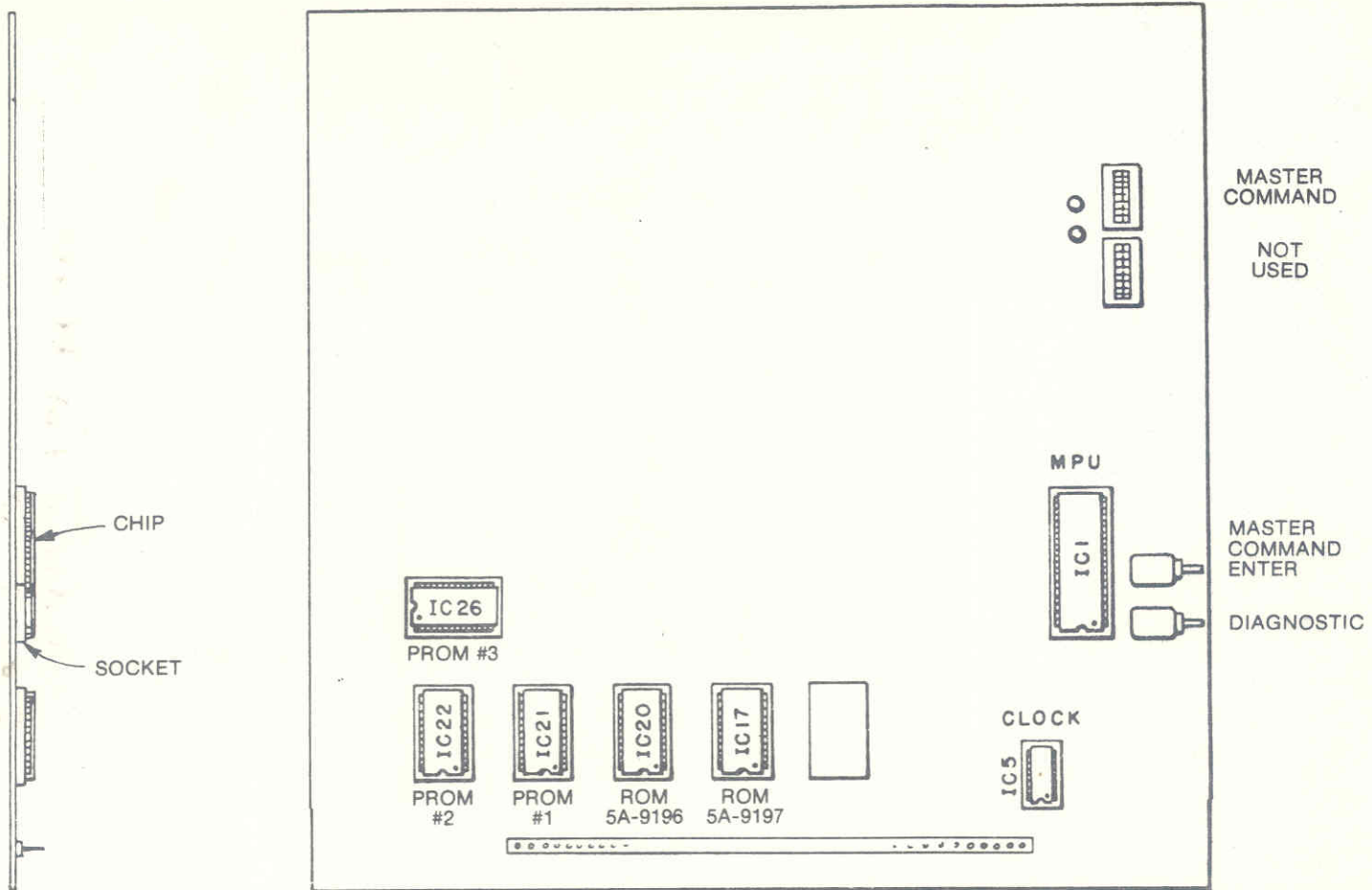


Figure 3. Location of Socketed Components and Switches on CPU Board

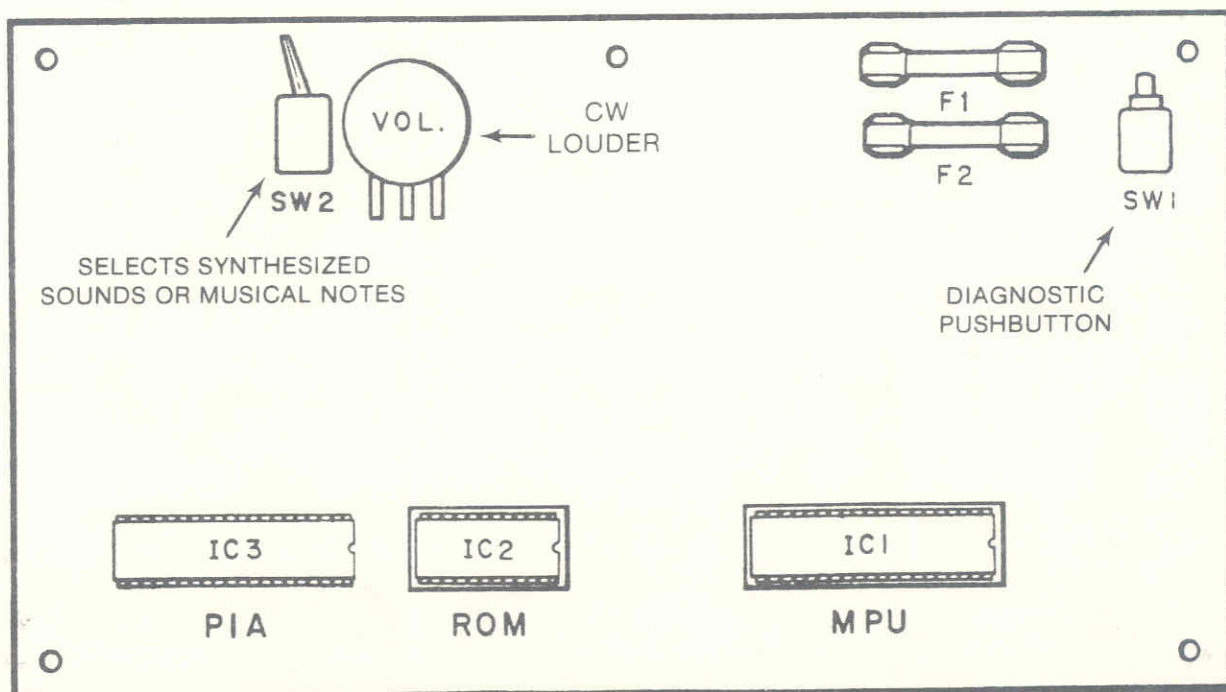


Figure 4. Location of Key Components on Sound Board

14. Check that all cables are clear of moving parts and for any wires that may have come disconnected from the playfield or cabinet.
15. Check switches for loose solder or other foreign material that may have come loose during shipment.
16. Check wires on coils for proper soldering.
17. Check that the flipper B+ fuse on the playfield is secure and that the fuse on the sound board and the two fuses adjacent to it are secure.
18. Check adjustment of the tilt switches:
  - a. Playfield Shake on the bottom of the playfield.
  - b. Plumb Bob and Ball Roll tilts (Figure 2 Nos. 18 and 17).
  - c. Slam Tilt on the coin door.
19. Install the ball in the ball roll tilt if not already installed.
20. Lower the playfield and check that the four fuses on the Power Supply Board are secure.

#### POWER TURN-ON

This machine MUST BE PLUGGED INTO A PROPERLY GROUNDED OUTLET to PREVENT SHOCK HAZARD and to insure PROPER GAME OPERATION. DO NOT use a "cheater plug" to defeat the ground pin on the power cord, and DO NOT cut off the ground pin. The line voltage MUST agree with that specified on the shipping carton or serious damage to the game will occur when it is plugged in. To apply power and check out the game, proceed as follows:

1. Plug the power cord into an outlet and turn on the power switch located near the right front cabinet leg. 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 with the number of credits display (Figure 2 - No. 12A) showing 04, the ball in play display (Figure 2 - No. 12B) showing 00, and the player 1 display showing the PROM identification and revision number, turn the game OFF and then ON again. The game should now come up in the game over mode.

#### NOTE

Indications in step 2 are a result of the batteries being removed with the power OFF or coming loose during shipment. This has also resulted in features reverting to factory settings and any changes from the factory settings must be re-entered using procedures provided in Section 3 of this manual.



3. If the game does not come up in the game over mode after Steps 1 and 2, refer to troubleshooting in Section 6.
4. Perform diagnostic tests in accordance with procedures provided in Section 5 of this manual.
5. Make any desired changes to features in accordance with procedures provided in Section 3 of this manual.
6. Latch the insert door into position.
7. Release the backglass retainer bar with the backbox keylock, insert the backglass, and secure the backglass with the keylock.
8. Verify proper game operation using Section 2 as a guide.
9. Replace the playfield glass.

## 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.

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 outhole kicker 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 or bumper is made. Pressing the credit button at any time before the ball in play 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 each wire form rollover, each drop target, the captive ball target, and the eject hole. The bonus multiplier is advanced by spotting "1" through "4", spotting S-T-E-L-L-A-R, and spotting W-A-R-S. Spotting S-T-E-L-L-A-R and W-A-R-S scores 50,000.

The left 3-bank drop targets spots S-T as indicated by the arrows with general illumination bulbs. Making all targets on the left 3-bank the first time scores 5000 and lights the top jet bumpers. Making them a second time scores 10,000 and flashes the top jet bumpers. Each additional time they are made scores 10,000. The top jet bumpers each score 100, 1000 when lit, and 2000 when flashing.

The 4-bank drop targets spots E-L-L-A. as indicated by the arrows with general illumination bulbs. Making all targets in the 4-bank scores 5000 and advances lighting of the eject hole lamps for a possible Extra Ball and towards lighting the outlane rollovers for a possible special.

The center target in the right 3-bank of drop targets spots "R". Making all targets in the right 3-bank the first time scores 5000; a second time scores 10,000,\* a third time scores 15,000, a fourth time scores 20,000, and fifth and succeeding times score 30,000. In addition, making all targets in this bank advances lighting of the captive ball, bottom jet bumpers, the spinners, and the lower right Bull's-Eye target Special. The captive ball target scores 5000 and when lit score 10,000 and spots a letter in STELLAR WARS. The bottom jet bumpers and spinners score 100 and 1000 when lit. The lower right bull's-eye target scores 2000.

All standups and kickers score 10. All other scoring is as previously described or as indicated on the playfield. Partial spotting of "1" through "4" and bonus multipliers below 5X are restored\* for subsequent balls. Lighting of eject hole lamps are also restored\* for subsequent balls.

Extra 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 Ball Roll and Playfield Shake 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 revealing game status. There are four switches, all accessible from the coin door (Figure 5) 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 PROM ID 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

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 6) 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 troubleshooting. 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 13 through 35 to factory settings, 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.





Table 2. Standard and Custom Pricing Settings

COIN DOOR MECHANISM	CREDITS	FUNCTION					
		19*	20	21	22	23	24
Quarter, Twin-Quarter, or 3-Quarter	1/25c, 3/50c	01	01	01	01	01	02
	1/25c	02	01	01	01	01	00
	2/25c, 5/50c	00	02	02	02	01	04
	2/25c	00	02	02	02	01	00
	1/50c	00	01	01	01	02	00
	1/50c, 3/\$1	00	01	01	01	02	04
	1/75c	00	01	01	01	03	00
Nickel-Dime- Quarter	1/25c, 3/50c	00	01	02	05	05	10
	1/25c	00	01	02	05	05	00
	2/25c	00	01	02	05	05	05
	1/15c, 2/25c	00	02	04	10	05	00
	1/10c, 3/25c	00	03	06	15	05	00
1DM, 5DM, 2DM	2/1DM, 5/2DM, 14/5DM	03	13	65	26	05	65
20-Cent, 50-Cent	1/20c, 3/50c	00	06	00	15	05	00
1 Franc, 5 Franc	1/1F, 6/5F	04	01	00	05	01	05
	1/1F, 7/5F	05	06	00	30	05	30
25 Cent, 1 Guilder	1/25c	06	01	00	04	01	00
	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	01	01	01	01	01	02
1 Franc, 1 Franc	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
2 Franc, 2 Franc	1/2F	02	01	01	01	01	00
10 Franc, 20 Franc	1/10F, 2/20F	07	01	00	02	01	00
1 Sucre, 1 Sucre	1/3S, 2/5S	00	02	00	02	05	00

\*Function 19 set to values 01-07 automatically selects corresponding values of Functions 20-24. With Function 19 set to 00, Functions 20-24 must be set manually.

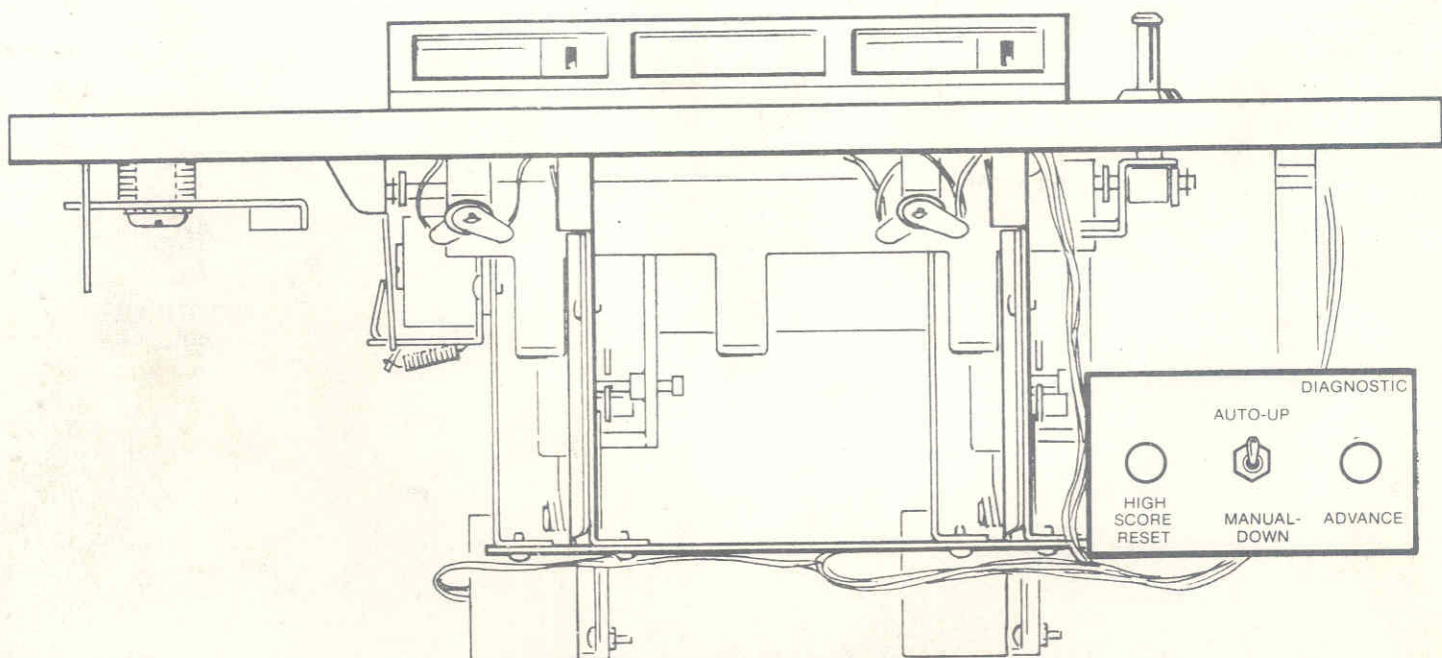


Figure 5. Coin Door Switches

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.

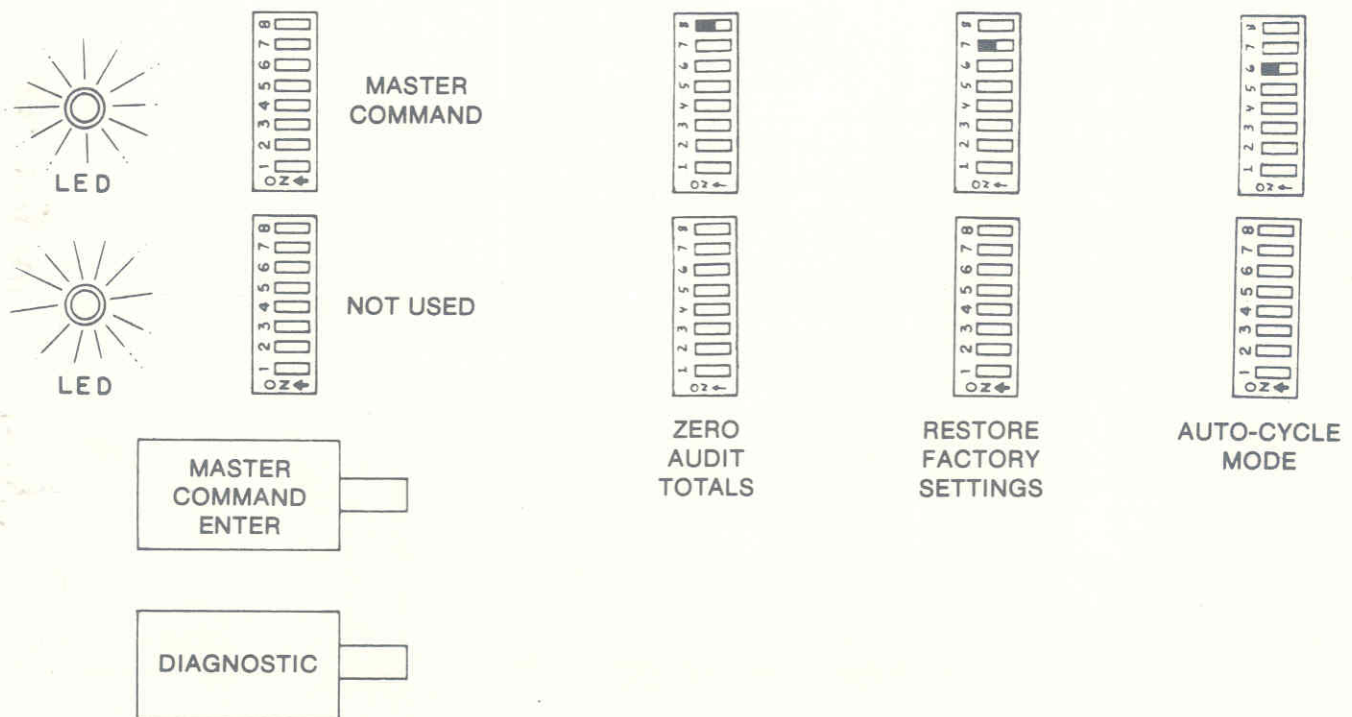


Figure 6. Master Command Switch Settings



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 PROM ID 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 the following as desired:  
    % Paid Credits =  $\text{Function 08} \div \text{Function 04}$   
    Average Ball Time (Seconds) =  $60 \times \text{Function 10} \div \text{Function 11}$
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. On the right side of the CPU Board (Figure 6) 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 8 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 01 through 11 to zero, 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 return to the game over mode.

SECTION 5  
BUILT-IN DIAGNOSTICS

Procedure (Display Digits, Lamp, Solenoid, and Switch Tests; see Table 3 and Figure 7)

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.

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. On the right side of the CPU Board (Figure 6) 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 troubleshooting. The game is first placed in a blanking mode from the coin door and then switch number 6 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). Next, the MASTER COMMAND ENTER pushbutton is depressed and finally, the sequence is started from the coin door. To initiate the Auto-Cycle mode 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).



**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 Reset
- 09 Outhole
- 10 Left Special
- 11 "W" Rollover
- 12 "A" Rollover
- 13 Left Kicker
- 14 Bottom Left Jet Bumper
- 15 Not Used
- 16 Left 3-Bank, Bottom Drop Target
- 17 Left 3-Bank, Center Drop Target
- 18 Left 3-Bank, Top Drop Target
- 19 Left 3-Bank Drop Target Series
- 20 Left 3-Bank Standup
- 21 Eject Hole
- 22 Captive Ball Target
- 23 Lower Top Left Standup
- 24 Upper Top Left Standup
- 25 Left Spinner
- 26 "1" Rollover
- 27 "2" Rollover
- 28 "3" Rollover
- 29 "4" Rollover
- 30 Middle Right Standup
- 31 Top 3-Bank, Left Drop Target
- 32 Top 3-Bank, Center Drop Target
- 33 Top 3-Bank, Right Drop Target
- 34 Top 3-Bank, Drop Target Series
- 35 Top 3-Bank Series
- 36 Top Right Standup
- 37 Right Spinner
- 38 Right Bull's-Eye Target
- 39 Not Used
- 40 Top Center Jet Bumper
- 41 Right Special
- 42 "S" Rollover
- 43 "R" Rollover
- 44 Right Kicker
- 45 Top Left Jet Bumper
- 46 Top Right Jet Bumper
- 47 Lower Right Jet Bumper
- 48 Center Standup
- 49 Playfield Tilt
- 50 4-Bank, Left Drop Target
- 51 4-Bank, Left Center Drop Target
- 52 4-Bank, Right Center Drop Target
- 53 4-Bank, Right Drop Target
- 54 4-Bank, Series

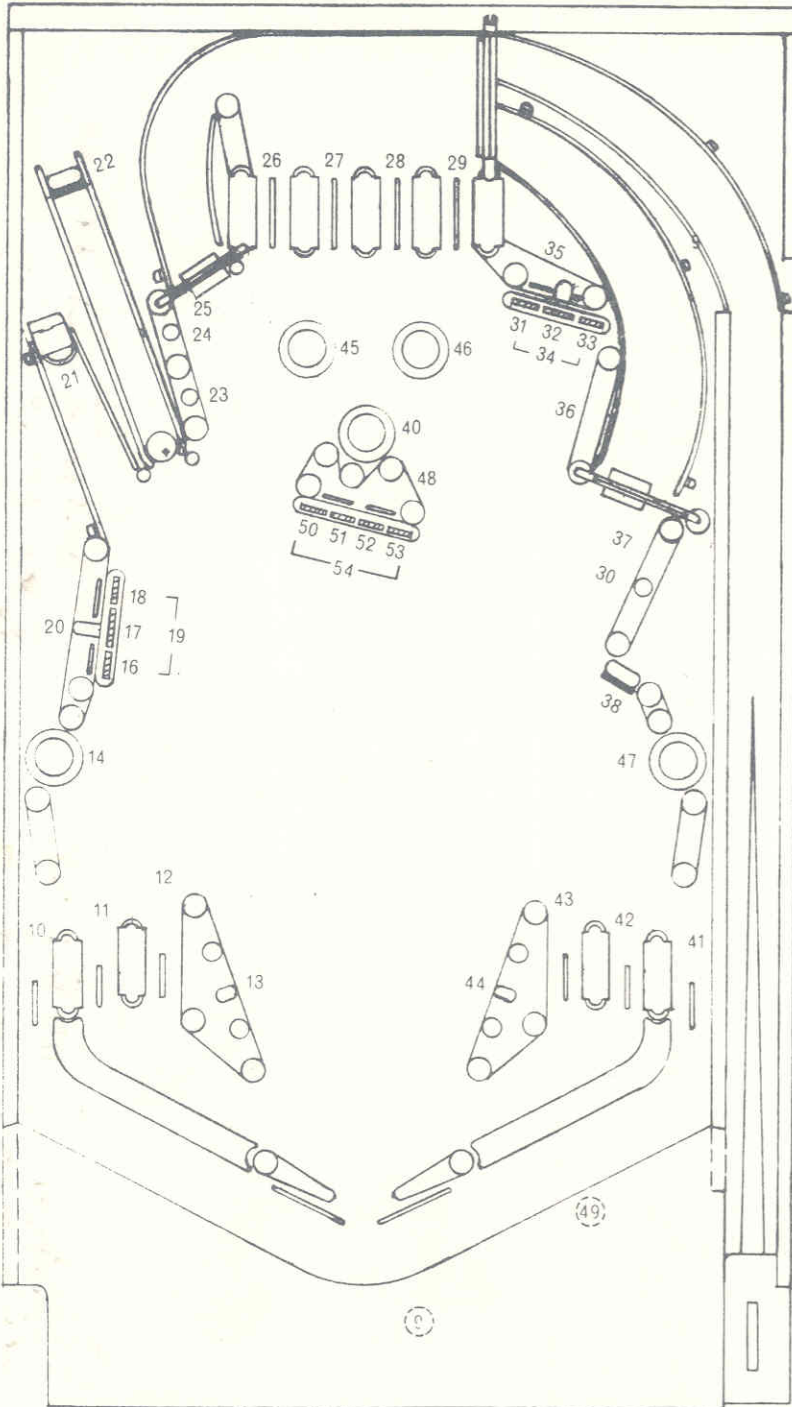


Figure 7. Playfield Switch Locations and Switch Chart

Table 3. Solenoids

**SOLENOID  
NO.**

1.	Ball Release	
2.	Left 3-Bank Drop Targets Reset	
3.	Eject Hole	
4.	4-Bank Left Drop Targets Reset	
5.	4-Bank Right Drop Targets Reset	
6.	Right 3-Bank Drop Targets Reset	
7.	Bottom Right Jet Bumper	
8.	Flash Lamps*	
9.	Sound	
10.	Sound	
11.	Sound	
12.	Sound	
13.	Sound	
14.	Credit Knocker	
15.	Not Used	
16.	Coin Lockout	
17.	Bottom Left Jet Bumper	
18.	Left Kicker	*Flash lamps glow
19.	Top Left Jet Bumper	dimly as part of
20.	Top Right Jet Bumper	normal operation
21.	Top Center Jet Bumper	
22.	Right Kicker	

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. The Auto-Cycle mode should start with the Display Digits test.
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 8 and 9), solenoid identification and connections (Table 4), and playfield spare parts identification (Figure 10).

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	FIRE AGAIN	"W"	OUTLANE SPECIALS (2)	"W" ROLLOVER	SPINNERS (2)	"2" BONUS	NOT USED	#1 PLAYER UP
2 RED-BLK	"S"	"A"	BULL'S EYE TARGET SPECIAL	"A" ROLLOVER	"X2"	"3" BONUS	1 CAN PLAY	#2 PLAYER UP
3 RED-ORN	"T"	"R"	EJECT HOLE EXTRA BALL	"R" ROLLOVER	"X3"	"4" BONUS	2 CAN PLAY	#3 PLAYER UP
4 RED-YEL	"E"	"S"	CAPTIVE BALL	"S" ROLLOVER	"X4"	"5" BONUS	3 CAN PLAY	#4 PLAYER UP
5 RED-GRN	"L"	EJECT HOLE 2000	"1"	BOTTOM JET BUMPERS (2)	"X5"	"6" BONUS	4 CAN PLAY	TILT
6 RED-BLU	"L"	EJECT HOLE 5000	"2"	TOP LEFT JET BUMPER	"10" BONUS	"7" BONUS	MATCH	GAME OVER
7 RED-VIO	"A"	EJECT HOLE 10,000	"3"	TOP CENTER JET BUMPER	"20" BONUS	"8" BONUS	BALL IN PLAY	SHOOT AGAIN
8 RED-GRY	"R"	NOT USED	"4"	TOP RIGHT JET BUMPER	"1" BONUS	"9" BONUS	CREDITS (PLAYFIELD)	HIGH SCORE

Figure 8. Lamp Matrix



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

Figure 9. Switch Matrix

Table 4. Solenoids

SOL. NO.	FUNCTION	WIRE COLOR	CONNECTIONS	DRIVER TRANS.	COIL PART NO.
1	Ball Release	GRY-BRN	2P11-4, 8P3-17	Q15	SA-23-900-DC
2	Left 3-Bank Drop Targets Reset	GRY-RED	2P11-5, 8P3-18	Q17	SA3-23-900-DC
3	Eject Hole	GRY-ORN	2P11-7, 8P3-19	Q19	SG-23-900-DC
4	4-Bank Left Drop Targets Reset	GRY-YEL	2P11-8, 8P3-20	Q21	SA3-23-900-DC
5	4-Bank Right Drop Targets Reset	GRY-GRN	2P11-9, 8P3-21	Q23	SA3-23-900-DC
6	Right 3-Bank Drop Targets Reset	GRY-BLU	2P11-3, 8P3-22	Q25	SA3-23-900-DC
7	Bottom Right Jet Bumper	GRY-VIO	2P11-2, 8P3-23	Q27	SA3-23-900-DC
8	Flash Lamps	GRY-BLK	2P11-1, 8P3-24	Q29	Type 89 Bulbs
9	Sound	BRN-BLK	2P9-9, 7P1-11, 10P3-3	Q31	—
10	Sound	BRN-RED	2P9-7, 7P1-12, 10P3-2	Q33	—
11	Sound	BRN-ORN	2P9-1, 7P1-13, 10P3-5	Q35	—
12	Sound	BRN-YEL	2P9-2, 7P1-14, 10P3-4	Q37	—
13	Sound	BRN-GRN	2P9-3, JP1-15, 10P3-7	Q39	—
14	Credit Kicker	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-35-9000-DC
17*	Bottom Left Jet Bumper	BLU-RED	2P12-4, 8P3-12	Q4	SG-23-900-DC
18*	Left Kicker	BLU-BRN	2P12-7, 8P3-11	Q2	SG-23-900-DC
19*	Top Left Jet Bumper	BLU-ORN	2P12-3, 8P3-13	Q6	SG-23-900-DC
20*	Top Right Jet Bumper	BLU-YEL	2P12-6, 8P3-14	Q8	SG-23-900-DC
21*	Top Center Jet	BLU-GRN	2P12-8, 8P3-15	Q10	SG-23-900-DC
22*	Right Kicker	BLU-BLK	2P12-9, 8P3-16	Q12	SG-23-900-DC
*	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:**

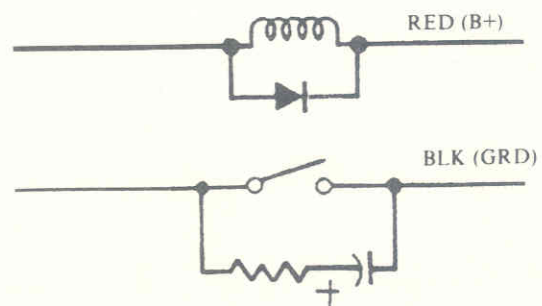
1. Special switch connections for solenoids 17 thru 22 are as follows:

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

2. Flipper button connections are as follows:

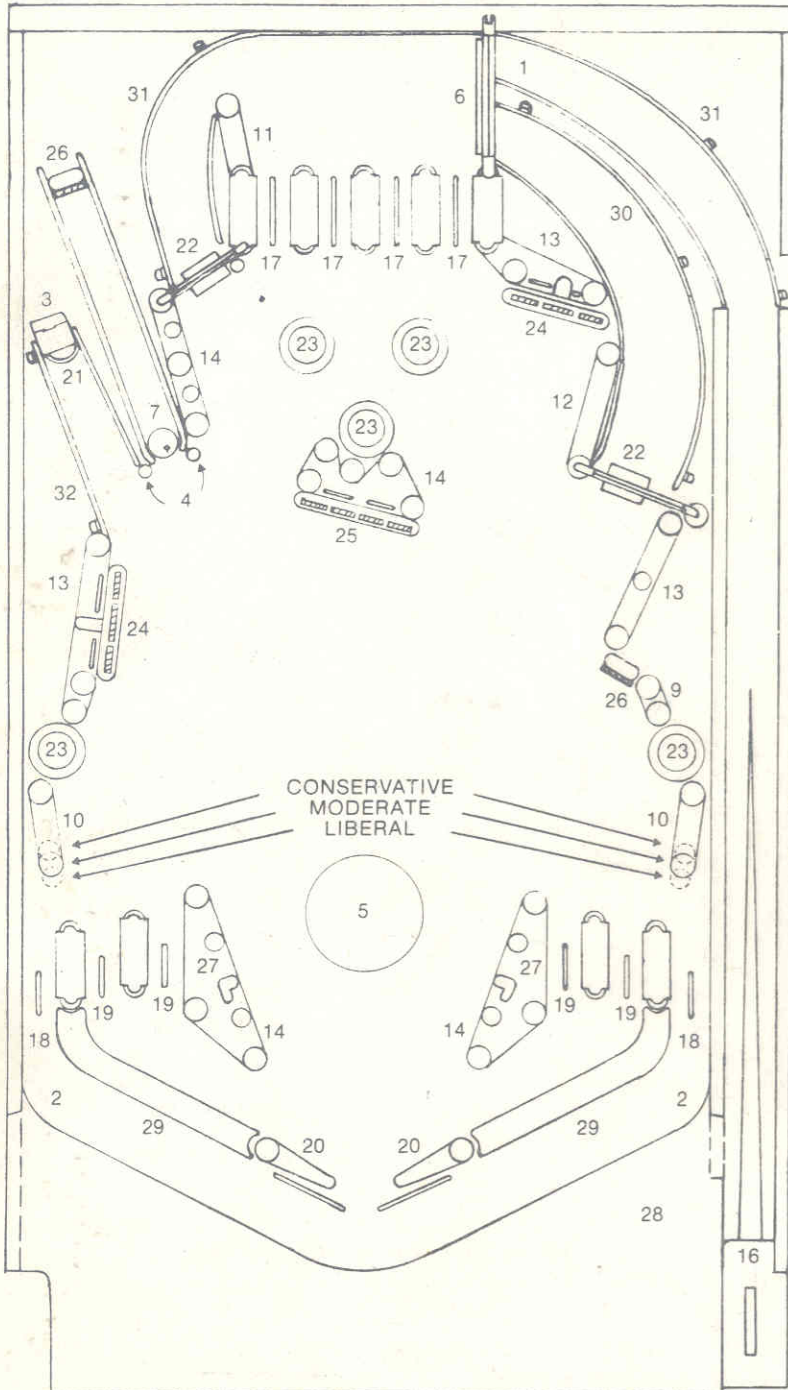
- Right—ORN-VIO—2P12-1, 7P1-7
- Left—ORN-GRY—2P12-2, 7P1-9

3. Typical wiring for solenoids and special switches:





## PLAYFIELD PARTS



Item	Part No.	Description
1.	1A-3206-5	MOUNTING BRACKET FOR BALLGATE WIRE
2.	1B-3417-11	CHROME BALL GUIDE—LEFT OR RIGHT
3.	1A-6793	STOP BRACKET FOR BALL EJECTOR HOLE
4.	2A-4008	POST FOR RUBBER BUMPER (2 USED)
5.	3B-7545	PLEXIGLASS INSERT 5" DIA.
6.	12A-6532	BALLGATE WIRE
7.	20A-6500	CAPTIVE BALL 1-1/16 DIA.
8.	23A-6300	RUBBER RING 5/16" ID (17 USED)
9.	23A-6301	RUBBER RING 3/4" ID
10.	23A-6303	RUBBER RING 1-1/4" ID
11.	23A-6304	RUBBER RING 1-1/2" ID
12.	23A-6305	RUBBER RING 2" ID
13.	23A-6306	RUBBER RING 2-3/8" ID
14.	23A-6307	RUBBER RING 2-7/8" ID
15.	30C-490	SET OF 10 PLAYFIELD PLASTICS
16.	30B-3573-1	BALL SHOOTER GAUGE PLATE
17.	A-5844-8	ROLLOVER WIRE ASSY (4 USED)
18.	A-5844-9	ROLLOVER WIRE ASSY (2 USED)
19.	A-5844-34	ROLLOVER WIRE ASSY (4 USED)
20.	B-7060	FLIPPER ASSY
21.	B-7472-5R	BALL EJECTOR ASSY
22.	B-7875-490	SPINNING TARGET ASSY
23.	B-7894	JET BUMPER ASSY
24.	D-7931-3S	DROP TARGET ASSY (TRIPLE BANK)
25.	D-7931-4S	DROP TARGET ASSY (FOUR BANK)
26.	A-8054	STATIONARY TARGET ASSY (2 USED)
27.	B-8055	BALL KICKER ASSY
28.	D-8088	BOTTOM ARCH ASSY
29.	B-8144	FLIPPER RETURN FRAME (LEFT OR RIGHT)
30.	C-8157	UPPER RIGHT BALLRAIL ASSY
31.	C-8158	TOP BALLRAIL ASSY
32.	A-8159	UPPER LEFT BALLRAIL ASSY

### POST ADJUSTMENTS

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

Figure 10. Playfield Spare Parts