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<td>J907-8 9</td>
<td>Q5</td>
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### General Illumination

<table>
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<tr>
<th>01 Left Playfield</th>
<th>G.I.</th>
<th>J121-1</th>
<th>Q18</th>
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<td>G.I.</td>
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<td>Lwr. Lt. Power</td>
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</table>

* J1xx=Power Driver Board; J9xx=Fliptronics II Board; 24-6549=#44 bulb; 24-8704=#89 bulb; 24-8768=#555 bulb; 24-8802=#906 bulb
This pinball game is equipped with a SAFETY FEATURE to prevent shocks from the solenoid circuit when the coin door is open. A new interlock switch assembly (part no. A-18249-1), located at the left of the coin door opening, has been added to the game. This assembly is a bracket containing the existing memory protect switch on the bottom and a new interlock switch on the top. When the coin door is open, the new interlock switch opens, breaking the connection to the +50V and +20V winding of the transformer secondary.

A special tool called the Service Switch Actuator is provided for the serviceman/technician that repairs the game. This tool is painted yellow and located in a bag stapled inside the cabinet. The Service Switch Actuator slips over the interlock switch and holds it closed while the coin door is open, allowing the serviceman to test and repair the solenoid circuit.

Hold the top interlock switch in, then slide the short end of the Service Switch Actuator over the top of the interlock switch bracket and the long end over the center of the switch plunger to hold it in.
ATTENTION

This game uses a new Security CPU Board that is not downward compatible to the CPU boards used in previous games. The new board has an added security chip that can be interchanged between other Who Dunnit games and software revision levels. The CPU board itself is interchangeable with later model games, but must be equipped with the correct security chip and software for that specific game.

The games' electronic ID number is shown in the display during power-up. The number displayed is the same nine digit number printed on the security chip label. The first three digits are the project number without a country specific code. An example of the power-up display is shown below, the electronic ID number is bolded.

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<td>50044</td>
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<tr>
<td>EPROM D:0 A</td>
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<tr>
<td>544 100020 65349</td>
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</table>
Information current at time of release.

Fill out and mail in game registration card. Be sure to include the game serial number. For your records, write the game serial number in the manual.

Midway Manufacturing Company reserves the rights to make modifications and improvements to its products.

The specifications and parts identified in this manual are subject to change without notice.
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Bally’s

WHO DUNNIT™

A MURDER MYSTERY

Background Story, Game Rules and Shotmaps
BACKGROUND STORY

CHARACTERS:

TONY'S PALACE - Casino, The place it all happens.

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nick Spade</td>
<td></td>
<td>Private eye.</td>
</tr>
<tr>
<td>Tony</td>
<td>38</td>
<td>Owner of the casino and very content.</td>
</tr>
<tr>
<td>Trixie</td>
<td>23</td>
<td>Works as a dealer, for Tony.</td>
</tr>
<tr>
<td>Bruno</td>
<td>42</td>
<td>Tony's bouncer/body guard.</td>
</tr>
<tr>
<td>Victoria</td>
<td>34</td>
<td>Spider Lady from Europe.</td>
</tr>
<tr>
<td>Butler</td>
<td>53</td>
<td>Victoria's Manservant.</td>
</tr>
</tbody>
</table>

TIME LINE:

1900
Walter, a young wealthy playboy, and Mia, wife of the English Ambassador have a fling. They conceive VICTORIA, a secret VICTORIA's mother keeps. She doesn't tell him before he leaves, never to see him again.

1911
TRIXIE'S mom dies giving birth to her. Tex is forced to be a single parent.

1915
Walter comes to town, meets TONY, and they become partners. They start the W&T PALACE, a struggling casino. TONY then cheats Walter out of his half of the casino and Walter disappears.

1917
Walter returns to Europe to find that VICTORIA'S mother has died and that VICTORIA has grown up in a boarding school. VICTORIA looks amazingly like her mother. Walter can only think of how much he loved Mia when he sees VICTORIA. Walter changes his name to BUTLER. He tells VICTORIA that he used to work for her mom and she hires him as her manservant. BUTLER, trapped by the memory of Mia, does whatever VICTORIA says. VICTORIA treats BUTLER like dirt...as she does most everyone.

1919
Tex forms a partnership with TONY and they create the T&T PALACE. This casino thrives and they become rich. TONY and Tex each get a tattoo on their arm that reads T&T PALACE. TRIXXIE is 8 and has a crush on TONY. TONY and Tex are like brothers.
1922 MAY
BUTLER suspects the fate of all his daughter's past husbands and encourages VICTORIA to go after TONY. VICTORIA shows up with BUTLER. VICTORIA and TONY have been lovers off and on for a couple of years. TONY still avoids her grasp. VICTORIA marries Tex, her Third husband. She becomes TRIXIE'S stepmother. TONY doesn't recognize Walter because BUTLER is the shadow of the man Walter was and looks 10 years older.

1923 JANUARY
VICTORIA and TONY conspire to kill Tex. The plan was: VICTORIA gets the money and TONY gets the Casino. Tex overhears VICTORIA'S half of the conspiracy. When she hangs up the phone he roughs her up and threatens that if anything happened to him she would be sorry. BUTLER witnessed Tex roughing her up. Unknowing to VICTORIA or TONY, BUTLER sabotages the brakes of Tex's car. Tex drives off a cliff. Car explodes. Body was never found.

Tex, injured and disfigured, makes it to an underground doctor/plastic surgeon. Tex is reborn as Bruno. Bruno has one agenda, to get VICTORIA for attempting to kill him. No one will get in his way.

TRIXIE, now 11, moves in with TONY. VICTORIA can not be tied down with a child. TONY is the closest family that TRIXIE has. She resents VICTORIA for this and still has a crush on TONY.

TONY and VICTORIA each believe that the other did the brake job on Tex. VICTORIA and BUTLER leave for Europe in search of another husband for VICTORIA.

T&T PALACE becomes TONY'S PALACE.

1930
TRIXIE and TONY are lovers but TONY will not commit. TONY gives her a job at his Casino. He keeps her on a string, never letting her get enough money to be free.

1932
Bruno goes on a fact-finding mission about VICTORIA. He learns all about her and her dead husbands. He learns about her real father. He also learns about her relationship with TONY. He now suspects TONY and VICTORIA of "fixing" his brakes.

TONY, unknowingly, hires Bruno to work for him. Bruno wants to be close because he knows that sooner or later VICTORIA will show up, and he wants to keep an eye on TRIXIE, his daughter. TRIXIE has been his only reason to live on some dark lonely nights. Bruno keeps a locker full of TRIXIE pictures and news clippings.

1934 (Yesterday)
Bruno waits for the day that he can extract his revenge on VICTORIA and TONY.

TONY thinks all is well and is ready to enjoy the good life that he deserves.

TRIXIE has finally learned that TONY is not to be trusted and she must do what it takes to protect herself.

VICTORIA and BUTLER show up to try and snag TONY once more!
GAME RULES

OBJECTIVE: To catch the killer of the current case. There are four main steps to catching a killer:

STEP 1 - Collect a clue (This lights the phone for interrogating suspects).
STEP 2 - Answer the Phone. Answering the phone will interrogate a suspect.
STEP 3 - Shoot "WHO dunnit", and pick the killer out of the remaining suspects.
STEP 4 - Catch the killer on "THE ROOF" to close the case.

SKILL SHOT Hit flashing "TAXI" light to score value shown on display, or hit lock entry for super skill shot and instant lock.

CLUES Spelling T-A-X-I gives a clue:
- Bullet,
- Broken Mirror,
- Dagger,
- Fingerprint,
- or Matchbook.

Left and right flipper return lanes lite loops for TAXI CHASE. Making loop shots or hitting TAXI targets light letters in TAXI. Collecting a clue, rings (lites) the TELEPHONE. Collect all 5 clues to light EXTRA BALL.

TELEPHONE Make the phone shot to answer the phone and interrogate a suspect. Listen to the suspect carefully because they will discuss the killer, unless they ARE the killer. Interrogating a suspect then lites WHO dunnit.

WHO dunnit Shoot WHO dunnit for an opportunity to pick the correct killer out of the remaining suspects. Use either flipper button to select the possible murderer, then push both buttons to enter. If you select the correct suspect then a chase on "THE ROOF" will begin. If you do not select the correct suspect then the suspect is eliminated and you must start over at STEP 1.

THE ROOF The is an opportunity to catch the killer and close the current case. Shoot for flashing lane to light the phone for ROOF HURRY UP. If the "HURRY UP" times out, you must relight it. completing the two shots starts a 4-ball ROOF Multi-ball, during which all lit shots scores the Hurry-Up value. When Multi-ball ends a new case is started.

CASES There are 5 cases:
- Missing Bullet,
- Broken Mirror,
- Bloody Dagger,
- Sticky Fingers,
- and The Tattoo.

Each case starts with one of 5 possible victims:
- Tony,
- Veronica,
- Butler,
- Bruno,
- or Trixie.

The VICTIM will be lit with a steady light and all the suspects will be flashing. As suspects are eliminated their lights will go out. Once you solve "WHO DUNNIT" you must catch the murderer on "THE ROOF" (see THE ROOF).
EQUIPMENT  There are 4 pieces of equipment:
Gun,
Magnifying Glass,
Flashlight,
and Map.
Items can be picked up:
in the Sewer,
making Train Combo's,
playing Roulette,
or on the 6th Floor.
The GUN helps you during “Multi-ball” by increasing the value of the jackpot in the jets.
The MAGNIFYING GLASS eliminates suspects if the phone shot is made and no other award is given.
The FLASHLIGHT helps you in the “Sewer” to find the MAP.
The MAP helps you in the “Sewer”.

ROULETTE  Left (red) and Right (black) mini targets select color for betting on roulette table. Spinner
determines size of bet. MAIN FLOOR, TRAIN COMBO, or shooting the roulette table
lights ROULETTE. Making ROULETTE shot when lit gives you the option to "bet" (right
flapper) or "pass" (left flapper). If your color comes up you win the "bet", if not the “bet” is
deducted from your score.

TRAIN COMBOS  Making consecutive “ramp shots” scores a TRAIN COMBO.
1st lights ROULETTE
2nd gives EQUIPMENT
3rd lights EXTRA BALL
4th starts LOOP CHAMPION (Try to beat the previous champion for “big points”.)

ELEVATOR  The center scoop is the ELEVATOR in “Tony’s Place”.
The left shot is ELEVATOR UP.
The right shot is ELEVATOR DOWN.
The center shot is ELEVATOR EXIT.
There are 11 floors:
Basement,
Main Floor,
2nd thru 8th,
Penthouse,
and The Roof.
Exiting on a floor collects the award for that floor.
Basement = Starts Multi-ball
Main Floor = Lights ROULETTE and SPINS for the SLOT MACHINE
2nd Floor = Spells TAXI to award a CLUE and lights the phone
3rd and 5th Floor = Collect evidence OR Pick WHO dun nit
4th Floor = Spin Slot Machine
6th Floor = EQUIPMENT
7th Floor = ELEVATOR MADNESS
8th Floor = WHO DUNNIT
Penthouse = PENHOUSE PARTY
The Roof = THE ROOF

MULTI-BALL™ During multiball, SPINNER LANE and SEWER SHOT are lit for JACKPOT. All 3 slot reels
are spinning. Left, center and right scoop shots (elevator) stop respective reels.
Stopping all 3 reels scores JACKPOT.
**ELEVATOR MADNESS**  "Elevator Madness" is a 2-ball Multi-Ball. Either left or right shot reverses direction of elevator, and collects value for that floor. Exiting on a floor, also collects point value for that floor. Avoid moving 3-bank target.

**PENTHOUSE PARTY**  You cannot exit to the PENTHOUSE until you collect the KEY by hitting the right 2-bank. Entering the penthouse starts PENTHOUSE PARTY—all flashing shots scores increasing values (10 Million, 20 Million, 30 Million, Etc.) until timer runs out.

**SLOT MACHINE**  To spin SLOT MACHINE make 1 of 3 SPIN shots when lit: Telephone, Roulette Table or Sewer.
Completing the 3-bank in front of the "Elevator" relights SPIN.

The awards that can be collected are:
3 Bars = 100 Million
3 Fingerprints = Clue
3 Multi-balls = Instant Multi-ball
3 Extra Balls = Extra Ball
3 Jackpots = Instant Jackpot
3 Magnifying Glasses = Equipment
3 Question marks = Elevator Madness
3 Wilds = "THE ROOF"
Wild/Choice = Select your award with left or right flippers.
If you get 2 of the same symbols the third real spins for a "second chance".

**SECOND CHANCE**  Second Chance is a chance to shoot the ball into one of the three holes to stop the third real on the award, and collect that award.

**MYSTERY TARGET**  Hitting the PENTHOUSE KEY targets light the mystery target. The MYSTERY TARGET awards whatever should be awarded at the time. For example, if during Penthouse party, it awards the 3 penthouse party awards.

**OUTLANES**  Gives a FREE SPIN on slot machine when lit. (Use the flippers to change lanes to light the outlanes at the appropriate item.)

**JET BUMPERS**  Nudge slot machine reels. Falling into hole below jets scores value of slot machine.
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SECTION ONE

GAME OPERATION
AND TEST INFORMATION

(System WPC) ROM Summary

<table>
<thead>
<tr>
<th>IC</th>
<th>TYPE</th>
<th>BOARD</th>
<th>LOCATION</th>
<th>PART NUMBER</th>
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</thead>
<tbody>
<tr>
<td>Game 1</td>
<td>27c040</td>
<td>CPU</td>
<td>U6</td>
<td>A-5343-50044-1R (For All Countries Except France, Belgium &amp; Switzerland)</td>
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<td>U6</td>
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<tr>
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<td>U6</td>
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<td>A-5343-50044-S7</td>
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NOTICE
Order replacement ROM's from your authorized MIDWAY MANUFACTURING CO. Distributor. Specify:
(1) Part Number (if available); (2) ROM Level (number on the label); (3) Game in which ROM is used.
PINBALL GAME ASSEMBLY INSTRUCTIONS

WHO DUNNIT IS A 4 BALL GAME.

Power: Domestic 120V @ 60 Hz  
Foreign 230V @ 50 Hz  
Japan 100V @ 50 Hz  

Temp: 32°F to 100°F  
(0°C to 38°C)

Humidity: Not to exceed 95% relative.

Weight: Approx. 325 Lbs. (crated)

Dimensions: Width: 29” Approx.  
Depth: 55” Approx.  
Height: 78” Approx.

1. Remove all cartons, parts, and miscellaneous items from the shipping container and set them aside.

2. Leg levelers and leg bolts are provided among the parts in the cash box. Install leg levelers on front and back legs (View 1). Place the cabinet on a support and attach rear legs using leg bolts (View 2).

3. Attach the front legs using leg bolts (View 2).

VIEW 1

VIEW 2
4. Reach into the cabinet and backbox and ensure that the interconnecting cables are not kinked or pinched. Be careful to avoid damaging wires at any stage of the assembly process.

5. Raise the hinged backbox upright and latch it into position. Unlock the backbox, and remove the backglass, storing it carefully to avoid damage. Remove the shipping screws holding the Insert Panel. Unlatch and open the Insert Panel. Carefully lift the Speaker Panel and lay it down on the playfield glass. Be careful not to damage the Dot Matrix Display/Driver Board. This allows access to the bolt holes used for securing the backbox upright. Install the washer-head mounting bolts through the bottom holes of the backbox into the threaded fasteners in the cabinet to secure the backbox. Close the Insert Panel and latch into position. Replace the Speaker Panel. Reinstall the backglass, and lock the backbox.

**CAUTION**

*FAILURE TO INSTALL* the backbox mounting hardware properly can cause personal injury.

*NEVER TRANSPORT* a pinball game with the hinged backbox erect. Always lower the backbox forward onto the playfield cabinet on a layer of protective material to prevent marring or damage and possible personal injury.

6. Extend each leg leveler slightly below the leg bottom, so that all four foot pads protrude approximately the same distance. Remove the cabinet from its support and place it on the floor.

7. Unlock and open the coin door. Move the molding latch lever toward the left side of the game, to release the front molding. Lift the front molding off the playfield cover glass, return the latch lever to the right, and close the coin door. Carefully slide the glass downward, until it clears the grooves of the left and right side moldings. Lift the glass up and away from the game, storing it carefully to avoid breakage.

8. Place a level or an inclinometer on the playfield surface. Adjust the leg levelers for proper playfield level (side-to-side). **NOTE:** These measurements must be made ON the playfield, not the cabinet nor the playfield cover glass. Tighten the nut on each leg leveler shaft to maintain this setting.

9. The TRU-PITCH™ level is located on the right shooter rail. This allows the playfield pitch angle to be accurately adjusted WITHOUT REMOVING THE GLASS. The first line (closest to the front of the game) on the level is approximately 6 degrees. Every line thereafter is approximately another 1/2 degree of pitch. The recommended pitch is 6 1/2 degrees. The nose of the bubble should be between the first and second line on the level (see diagram below).

![TRU-PITCH™ level](image)

**CAUTION**

*Playfield pitch angle adjustments can affect the operation of the plumb bob tilt, inside the cabinet. The plumb bob weight is among the parts in the cash box; the operator should install the weight and adjust the tilt mechanism for proper operation, after completion of the desired playfield pitch angle setting. The unit is factory installed for a 6 1/2 degree angle. If an adjustment is necessary, loosen screw at the bottom of the unit. Move the pointer, one groove at a time to the left or right, depending on the degree desired. Hold pointer in place and tighten screw.*
10. Move the game into the desired location; recheck the level and pitch angle of the playfield.

11. Verify that the **required number** of balls are installed in the game. This game uses 4 balls.

12. Install playfield mylars if desired.

   **NOTE:** This playfield has a special hardcoat surface and does not require a full protective mylar. However, mylars can be purchased through your local Bally Distributor. Specify part number 03-9459-2 for full playfield mylar.

13. Clean and reinstall the playfield cover glass, reversing the procedure of step 7.

14. To attach line cord, remove envelope stapled to the inside cabinet (near cashbox). Remove the four Phillips-head screws that mount the line cord cover plate to the rear cabinet. Match the prongs on the plug with the holes in the receptacle and push line cord securely into place. Make sure cord aligns with the indentation of plate (indentation should point toward bottom of cabinet). Remount line cord cover plate. If desired, tamper resistant screws are provided in an envelope marked "Security Screws" (located in cashbox) to remount cover plate.

15. **IMPORTANT:** Fill out and return the registration card.
RAISING THE PLAYFIELD

⚠️ CAUTION
Do not raise the playfield straight up! This game uses a slide assembly to raise and lower the playfield.

To Raise Playfield:

1. Grasp bottom arch and carefully lift up playfield only high enough to clear safety brackets. Rear guide legs should not hit wood guide rails or be used to slide out playfield.

2. Pull the playfield out toward you until it stops (rest position) and raise it approximately 3". Be sure playfield is in locked position and does not slide back into the cabinet. If it does, repeat Step 2 before proceeding to Step 3.

3. Rotate playfield to upright service position (lean on backbox) by pulling toward you and up. Listen for the sound of a click; this insures locking and pivoting sequence.

To Lower Playfield:

4. Rotate the playfield to the rest position. This unlocks the pivoting sequence.

5. Push back playfield into cabinet and into playing position.
GAME CONTROL LOCATIONS

Cabinet Switches
The On-Off switch is located on the bottom of the cabinet near the right front leg. The Start Button is the push-button to the left of the coin door on the cabinet exterior. Press the Start button to begin a game, or during the diagnostic mode, to ask for HELP.

Coin Door Switches
The operator controls all game adjustments, obtains bookkeeping information, and diagnoses problems, using only four push-button switches mounted on the inside of the coin door. The Coin Door Switches have two modes of operation Normal Function and Test Function.

Normal Function
The Service Credits button puts credits on the game that are not included in any of the game audits. The Volume Up (+) button raises the sound level of the game. Press and hold the button until the desired level is reached. The Volume Down (-) button lowers the sound level of the game. Press and hold the button until the desired level is reached. See Adjustment A.1 28 to shut sound OFF completely. The *Begin Test button starts the Menu System Operation and changes the Coin Door Switches from Normal Function to Test Function.

Test Function
The Escape button allows you to get out of a menu selection or return to the Attract Mode. The Up (+) button allows you to cycle forward through the menu selections or adjustment choices. The Down (-) button allows you to cycle backward through the menu selections or adjustment choices. The *Enter button allows you to get into a menu selection or lock in an adjustment choice.

*To reset High Score, hold down the Begin Test/Enter switch for 5 seconds while in the Attract Mode.
GAME OPERATION

**CAUTION**
After assembly and installation at the site location, this game must be plugged into a properly grounded outlet to prevent shock hazard, and to assure proper game operation. **DO NOT** use a 'cheater' plug to defeat the ground pin on the line cord. **DO NOT** cut off the ground pin.

**POWERING UP.** With the coin door closed, plug the game in and switch it On. In normal operation, testing will show in the display as the game performs Start-Up Tests. Once the Start-Up Tests have been successfully completed the last score is displayed. After which, the game goes into the Attract Mode.

**Note:** After the game has been on location for a period of time, the Start-Up Tests may contain messages concerning game problems. See 'Error Messages' for more detailed information regarding messages.

Open the coin door and press the Begin Test Switch. The display shows the game name, number, and software revision. The message changes. The display shows the sound software revision, revision level of the system software and date the game software was revised.

<table>
<thead>
<tr>
<th>Example:</th>
<th>WHO DUNNIT</th>
<th>Sound Rev. P-0</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>50044 Rev. D.55A</td>
<td>Sy. 3.46 7/31/95</td>
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Press the Enter button to enter the WPC Menu System (refer to the section entitled 'Menu System Operation' for more information). Slide the Service Switch Actuator over the top interlock switch located in the bottom left corner of the coin door opening. Perform the entire Test Menu routine to verify the game is operating satisfactorily.

**ATTRACT MODE**. After completing the Test Menu routine, press the Escape button three times to enter the Attract Mode. During the Attract Mode the display shows a series of messages informing the player of the recent highest scores, custom messages, and the score to achieve to obtain a replay award.

**CREDIT POSTING.** Insert coin(s). A sound is heard for each coin and the display shows the number of credits purchased. So long as the number of maximum allowable credits are NOT exceeded by coin purchase or high score, credits are posted correctly.

**STARTING A GAME.** Press the Start button once. A startup sound plays and the credit amount shown in the display decreases by one. The display flashes 00 (until the first playfield switch is actuated), and shows ball 1. If credits are posted, additional players may enter the game by pressing the Start button once for each player, before the end of play on the first ball.

**TILTS.** Actuating the cabinet tilt switch inside the cabinet ends the current game and proceeds to the Game Over Mode. With the third closure of the plumb bob tilt switch, the player loses the remaining play of that ball, but can complete the game.

**END OF GAME.** All earned scores and bonuses are awarded. If a player's final score exceeds the specified value, the player receives a designated award for achieving the current highest score. A random digit set appears in the display. Credit may be awarded when the last two digits of any player's score match the random digits. Match, high score, and game over sounds are made, as appropriate.

**GAME OVER MODE.** Game Over will show in the display. Afterward, the high scores flash on the display. The game proceeds to the Attract Mode.

*Operator-adjustable feature.
MENU SYSTEM OPERATION

The Main Menu allows you to choose from several categories, which in turn lead to other menus. To access the Main Menu, open the coin door and press the Begin Test button, then press the Enter button. Press the Up or Down buttons to cycle through the Main Menu. Press the Enter button to access a menu. Press the Escape button to return to the Main Menu. Press the Start button for HELP at any time.

<table>
<thead>
<tr>
<th>Main Menu</th>
<th>B. Bookkeeping Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.1 Main Audits</td>
</tr>
<tr>
<td></td>
<td>B.2 Earnings Audits</td>
</tr>
<tr>
<td></td>
<td>B.3 Standard Audits</td>
</tr>
<tr>
<td></td>
<td>B.4 Feature Audits</td>
</tr>
<tr>
<td></td>
<td>B.5 Histograms</td>
</tr>
<tr>
<td></td>
<td>B.6 Time-Stamps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P. Printouts Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.1 Earnings Data</td>
</tr>
<tr>
<td>P.2 Main Audits</td>
</tr>
<tr>
<td>P.3 Standard Audits</td>
</tr>
<tr>
<td>P.4 Feature Audits</td>
</tr>
<tr>
<td>P.5 Score Histograms</td>
</tr>
<tr>
<td>P.6 Game Time Histograms</td>
</tr>
<tr>
<td>P.7 Time-Stamps</td>
</tr>
<tr>
<td>P.8 All Data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T. Test Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.1 Switch Edges</td>
</tr>
<tr>
<td>T.2 Switch Levels</td>
</tr>
<tr>
<td>T.3 Single Switches</td>
</tr>
<tr>
<td>T.4 Solenoid Test</td>
</tr>
<tr>
<td>T.5 Flasher Test</td>
</tr>
<tr>
<td>T.6 General Illumination</td>
</tr>
<tr>
<td>T.7 Sound &amp; Music Test</td>
</tr>
<tr>
<td>T.8 Single Lamps</td>
</tr>
<tr>
<td>T.9 All Lamps</td>
</tr>
<tr>
<td>T.10 Lamp &amp; Flasher Test</td>
</tr>
<tr>
<td>T.11 Display Test</td>
</tr>
<tr>
<td>T.12 Flipper Test</td>
</tr>
<tr>
<td>T.13 Ordered Lamp Test</td>
</tr>
<tr>
<td>T.14 Lamp Row-Col Test</td>
</tr>
<tr>
<td>T.15 Dip Switch Test</td>
</tr>
<tr>
<td>T.16 3-Bank Test</td>
</tr>
<tr>
<td>T.17 Ramp Test</td>
</tr>
<tr>
<td>T.18 Reel Test</td>
</tr>
<tr>
<td>T.19 Empty Balls Test</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U. Utilities Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.1 Clear Audits</td>
</tr>
<tr>
<td>U.2 Clear Coins</td>
</tr>
<tr>
<td>U.3 Reset H.S.T.D.</td>
</tr>
<tr>
<td>U.4 Set Time &amp; Date</td>
</tr>
<tr>
<td>U.5 Custom Message</td>
</tr>
<tr>
<td>U.6 Set Game I.D.</td>
</tr>
<tr>
<td>U.7 Factory Adjustments</td>
</tr>
<tr>
<td>U.8 Factory Resets</td>
</tr>
<tr>
<td>U.9 Presets</td>
</tr>
<tr>
<td>U.10 Clear Credits</td>
</tr>
<tr>
<td>U.11 Auto Burn-In</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A. Adjustments Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1 Standard Adjustments</td>
</tr>
<tr>
<td>A.2 Feature Adjustments</td>
</tr>
<tr>
<td>A.3 Pricing Adjustments</td>
</tr>
<tr>
<td>A.4 H.S.T.D. Adjustments</td>
</tr>
<tr>
<td>A.5 Printer Adjustments</td>
</tr>
</tbody>
</table>

Press Escape
To move out of a menu selection.

Press Enter
To get into a menu selection.

Press Up
Increases sequence; Example A.1, A.2, A.3, A.4.

Press Down
Decreases sequence; Example A.4, A.3, A.2, A.1.

Use Up and Down to cycle through the selections in a menu.

Use Escape and Enter to move into and out of the selected menu.
Press the Up or Down buttons to cycle through the menu. Press the Enter button to access an audit menu. Press the Escape button to return to the Bookkeeping Menu.

### B. BOOKKEEPING MENU

#### B.1 Main Audits
- **B.1 01** Total Earnings 00
- **B.1 02** Recent Earnings 00
- **B.1 03** Free Play Percent 00
- **B.1 04** Average Ball Time 00
- **B.1 05** Time Per Credit 00

#### B.2 Earning Audits*
- **B.2 01** Recent Earnings 00
- **B.2 02** Recent Left Slot 00
- **B.2 03** Recent Center Slot 00
- **B.2 04** Recent Right Slot 00
- **B.2 05** Recent 4th Slot 00
- **B.2 06** Recent Paid Credits 00

#### B.3 Standard Audits
- **B.3 01** Games Started 00
- **B.3 02** Total Plays** 00
- **B.3 03** Total Free Play 00
- **B.3 04** Free Play Percent 00
- **B.3 05** Replay Awards 00
- **B.3 06** Percent Replays 00
- **B.3 07** Not Used 00
- **B.3 08** Not Used 00
- **B.3 09** Match Awards 00
- **B.3 10** Percent Match 00
- **B.3 11** H.S.T.D. Credits 00
- **B.3 12** Percent H.S.T.D 00
- **B.3 13** Extra Balls 00
- **B.3 14** Percent Extra Ball 00
- **B.3 15** Tickets Awarded 00
- **B.3 16** Percent Tickets 00
- **B.3 17** Left Drains 00
- **B.3 18** Right Drains 00
- **B.3 19** Average Ball Time 00

#### B.4 Feature Audits

#### B.5 Histograms

### B.6 Time-Stamps

**One Button Audit System.** The Bookkeeping Menu is obtainable directly from the Attract Mode. Repeatedly pressing the Enter button, while in the Attract Mode, will cycle through all of the game audits.

### B.1 Main Audits

- **B.1 01** Total Earnings 00
- **B.1 02** Recent Earnings 00
- **B.1 03** Free Play Percent 00
- **B.1 04** Average Ball Time 00
- **B.1 05** Time Per Credit 00

### B.2 Earning Audits*

- **B.2 01** Recent Earnings 00
- **B.2 02** Recent Left Slot 00
- **B.2 03** Recent Center Slot 00
- **B.2 04** Recent Right Slot 00
- **B.2 05** Recent 4th Slot 00
- **B.2 06** Recent Paid Credits 00

### B.3 Standard Audits

- **B.3 01** Games Started 00
- **B.3 02** Total Plays** 00
- **B.3 03** Total Free Play 00
- **B.3 04** Free Play Percent 00
- **B.3 05** Replay Awards 00
- **B.3 06** Percent Replays 00
- **B.3 07** Not Used 00
- **B.3 08** Not Used 00
- **B.3 09** Match Awards 00
- **B.3 10** Percent Match 00
- **B.3 11** H.S.T.D. Credits 00
- **B.3 12** Percent H.S.T.D 00
- **B.3 13** Extra Balls 00
- **B.3 14** Percent Extra Ball 00
- **B.3 15** Tickets Awarded 00
- **B.3 16** Percent Tickets 00
- **B.3 17** Left Drains 00
- **B.3 18** Right Drains 00
- **B.3 19** Average Ball Time 00

**These audits are NOT resettable. They are a record of the earnings of the game since the "CLOCK 1ST SET" Time-Stamp.

**This Audit is not resettable.**
### B.4 Feature Audits

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Novice Modes</strong></td>
<td>The number of games the player selected NOVICE to REGULAR.</td>
</tr>
<tr>
<td><strong>Total Multi-Balls</strong></td>
<td>The TOTAL # of MULTI-BALLS the player started.</td>
</tr>
<tr>
<td><strong>Extra Balls</strong></td>
<td>The TOTAL # of EXTRA BALLS the player was awarded.</td>
</tr>
<tr>
<td><strong>Roof Multi-Balls</strong></td>
<td>The TOTAL # of ROOF MULTI-BALLS the player started.</td>
</tr>
<tr>
<td><strong>Time Per Credit</strong></td>
<td>The TOTAL time allowed per credit to play a game.</td>
</tr>
<tr>
<td><strong>Buy-In Extra Balls</strong></td>
<td>The TOTAL # of times a player bought an extra ball at the end of the game.</td>
</tr>
<tr>
<td><strong>1 Buy-In Games</strong></td>
<td>The TOTAL # of times a player bought 1 or more extra balls at the end of the game.</td>
</tr>
<tr>
<td><strong>2 Buy-In Games</strong></td>
<td>The TOTAL # of times a player bought 2 or more extra balls at the end of the game.</td>
</tr>
<tr>
<td><strong>3 Buy-In Games</strong></td>
<td>The TOTAL # of times a player bought 3 or more extra balls at the end of the game.</td>
</tr>
<tr>
<td><strong>&gt;=4 Buy-In Games</strong></td>
<td>The TOTAL # of times a player bought 4 or more extra balls at the end of the game.</td>
</tr>
<tr>
<td><strong>Ball Saves</strong></td>
<td>The TOTAL # of balls saved by the AUTOFIRE feature.</td>
</tr>
<tr>
<td><strong>Super Skill</strong></td>
<td>The TOTAL # of times a player made the super skill shot.</td>
</tr>
<tr>
<td><strong>Skill Shot Made</strong></td>
<td>The TOTAL # of times a player made the regular skill shot.</td>
</tr>
<tr>
<td><strong>Clue Awarded</strong></td>
<td>The TOTAL # of clues awarded to players.</td>
</tr>
<tr>
<td><strong>All Clues</strong></td>
<td>The TOTAL # of times a player collected all clues for a case.</td>
</tr>
<tr>
<td><strong>New Phone Lit</strong></td>
<td>The TOTAL # of times the player lit the phone.</td>
</tr>
<tr>
<td><strong>Phone Answered</strong></td>
<td>The TOTAL # of times the player answered the phone.</td>
</tr>
<tr>
<td><strong>Who Dunnits</strong></td>
<td>The TOTAL # of times the player was able to choose WHO DUNNIT.</td>
</tr>
<tr>
<td><strong>Who Dunnit Roof</strong></td>
<td>The # of times the player started THE ROOF from WHO DUNNIT.</td>
</tr>
<tr>
<td><strong>Total Roofs</strong></td>
<td>The TOTAL # of times the player started THE ROOF.</td>
</tr>
<tr>
<td><strong>Roof Multi-Balls</strong></td>
<td>The TOTAL # of times the player started THE ROOF MULTI-BALLS.</td>
</tr>
<tr>
<td><strong>Total Slot Spins</strong></td>
<td>The TOTAL # of times the player SPUN the Slot Machine.</td>
</tr>
<tr>
<td><strong>Nudge Slots Awards</strong></td>
<td>The TOTAL # of slot awards from the jets.</td>
</tr>
<tr>
<td><strong>Free Spins</strong></td>
<td>The # of free spins from drains and the 4th floor.</td>
</tr>
<tr>
<td><strong>Slot Multi-Ball</strong></td>
<td>The # of times the Slot Machine awarded MULTI-BALL.</td>
</tr>
<tr>
<td><strong>Slot Extra Ball</strong></td>
<td>The # of times the Slot Machine awarded EXTRA BALL.</td>
</tr>
<tr>
<td><strong>Slot Bar</strong></td>
<td>The # of times the Slot Machine awarded BAR.</td>
</tr>
<tr>
<td><strong>Slot Madness</strong></td>
<td>The # of times the Slot Machine awarded ELEVATOR MADNESS.</td>
</tr>
<tr>
<td><strong>Slot Jackpot</strong></td>
<td>The # of times the Slot Machine awarded a JACKPOT.</td>
</tr>
<tr>
<td><strong>Slot Equipment</strong></td>
<td>The # of times the Slot Machine awarded EQUIPMENT.</td>
</tr>
<tr>
<td><strong>Slot Clue</strong></td>
<td>The # of times the Slot Machine awarded a CLUE.</td>
</tr>
<tr>
<td><strong>Slot Roof</strong></td>
<td>The # of times the Slot Machine awarded THE ROOF.</td>
</tr>
<tr>
<td><strong>Slot Choice</strong></td>
<td>The # of times the Slot Machine awarded a CHOICE.</td>
</tr>
<tr>
<td><strong>Slot Second Chance</strong></td>
<td>The # of times the Slot Machine awarded SECOND CHANCE.</td>
</tr>
<tr>
<td><strong>Slot Nothing</strong></td>
<td>The # of times the Slot Machine awarded NOTHING.</td>
</tr>
<tr>
<td><strong>Second Chance Complete</strong></td>
<td>The # of times the player completed a Second Chance opportunity.</td>
</tr>
<tr>
<td><strong>Exit Basement</strong></td>
<td>The # of times the player exited the Elevator on to the BASEMENT.</td>
</tr>
<tr>
<td><strong>Exit Main</strong></td>
<td>The # of times the player exited the Elevator on to the MAIN FLOOR.</td>
</tr>
<tr>
<td><strong>Exit 2nd</strong></td>
<td>The # of times the player exited the Elevator on to the 2ND FLOOR.</td>
</tr>
<tr>
<td><strong>Exit 3rd</strong></td>
<td>The # of times the player exited the Elevator on to the 3RD FLOOR.</td>
</tr>
<tr>
<td><strong>Exit 4th</strong></td>
<td>The # of times the player exited the Elevator on to the 4TH FLOOR.</td>
</tr>
<tr>
<td><strong>Exit 5th</strong></td>
<td>The # of times the player exited the Elevator on to the 5TH FLOOR.</td>
</tr>
<tr>
<td><strong>Exit 6th</strong></td>
<td>The # of times the player exited the Elevator on to the 6TH FLOOR.</td>
</tr>
</tbody>
</table>
### B.4 Feature Audits Continued

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.4 44 Exit 7th</td>
<td>The # of times the player exited the Elevator on to the 7TH FLOOR.</td>
</tr>
<tr>
<td>B.4 45 Exit 8th</td>
<td>The # of times the player exited the Elevator on to the 8TH FLOOR.</td>
</tr>
<tr>
<td>B.4 46 Exit Penthouse</td>
<td>The # of times the player exited the Elevator on to the PENTHOUSE.</td>
</tr>
<tr>
<td>B.4 47 Exit Roof</td>
<td>The # of times the player exited the Elevator on to THE ROOF.</td>
</tr>
<tr>
<td>B.4 48 Equipment Awards</td>
<td>The TOTAL # of times the player was awarded EQUIPMENT.</td>
</tr>
<tr>
<td>B.4 49 Total Multi-Balls</td>
<td>The TOTAL # of times the player was awarded MULTI-BALL.</td>
</tr>
<tr>
<td>B.4 50 Total Jackpots</td>
<td>The TOTAL # of jackpots the player was awarded.</td>
</tr>
<tr>
<td>B.4 51 Roulette Lit</td>
<td>The TOTAL # of times the player lit Roulette.</td>
</tr>
<tr>
<td>B.4 52 Roulette Ask</td>
<td>The TOTAL # of times the player was prompted to play Roulette.</td>
</tr>
<tr>
<td>B.4 53 Roulette Spins</td>
<td>The TOTAL # of times the player choose to play Roulette.</td>
</tr>
<tr>
<td>B.4 54 Roulette Wins</td>
<td>The TOTAL # of times the player won on Roulette.</td>
</tr>
<tr>
<td>B.4 55 Train Combo Lit</td>
<td>The TOTAL # of times the player lit TRAIN COMBOS.</td>
</tr>
<tr>
<td>B.4 56 Train Combo L1</td>
<td>The TOTAL # of times the player completed level 1 of Train Combos.</td>
</tr>
<tr>
<td>B.4 57 Train Combo L2</td>
<td>The TOTAL # of times the player completed level 2 of Train Combos.</td>
</tr>
<tr>
<td>B.4 58 Train Combo L3</td>
<td>The TOTAL # of times the player completed level 3 of Train Combos.</td>
</tr>
<tr>
<td>B.4 59 Train Combo L4</td>
<td>The TOTAL # of times the player completed level 4 of Train Combos.</td>
</tr>
<tr>
<td>B.4 60 New Loop Champ</td>
<td>The TOTAL # of times the player made enough loops to be loop champ.</td>
</tr>
<tr>
<td>B.4 61 Special Modes</td>
<td>The TOTAL # of times the player started a special mode.</td>
</tr>
</tbody>
</table>
### B.5 Histograms

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>0-39 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>02</td>
<td>40-59 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>03</td>
<td>60-79 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>04</td>
<td>80-99 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>05</td>
<td>100-149 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>06</td>
<td>150-249 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>07</td>
<td>250-399 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>08</td>
<td>400-599 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>09</td>
<td>600-999 Million Scores</td>
<td>0%</td>
</tr>
<tr>
<td>10</td>
<td>1-1.49 Billion Scores</td>
<td>0%</td>
</tr>
<tr>
<td>11</td>
<td>1.5-1.9 Billion Scores</td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>2-2.9 Billion Scores</td>
<td>0%</td>
</tr>
<tr>
<td>13</td>
<td>Over 3 Billion</td>
<td>0%</td>
</tr>
<tr>
<td>14</td>
<td>Game Time 0.0-1.0 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>15</td>
<td>Game Time 1.0-1.5 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>16</td>
<td>Game Time 1.5-2.0 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>17</td>
<td>Game Time 2.0-2.5 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>18</td>
<td>Game Time 2.5-3.0 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>19</td>
<td>Game Time 3.0-3.5 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>20</td>
<td>Game Time 3.5-4.0 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>21</td>
<td>Game Time 4-5 Mins</td>
<td>0%</td>
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<tr>
<td>22</td>
<td>Game Time 5-6 Mins</td>
<td>0%</td>
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<tr>
<td>23</td>
<td>Game Time 6-8 Mins</td>
<td>0%</td>
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<tr>
<td>24</td>
<td>Game Time 8-10 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>25</td>
<td>Game Time 10-15 Mins</td>
<td>0%</td>
</tr>
<tr>
<td>26</td>
<td>Game Time Over 15 Mins</td>
<td>0%</td>
</tr>
</tbody>
</table>

### B.6 Time-Stamps

The Time-Stamps Menu allows you to view dates and times that are important to game software.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Current Time</td>
</tr>
<tr>
<td>02</td>
<td>Totals Cleared</td>
</tr>
<tr>
<td>03</td>
<td>Clock Last Set</td>
</tr>
<tr>
<td>04</td>
<td>Audits Cleared</td>
</tr>
<tr>
<td>05</td>
<td>Coins Cleared</td>
</tr>
<tr>
<td>06</td>
<td>Factory Setting</td>
</tr>
<tr>
<td>07</td>
<td>Last Game Start</td>
</tr>
<tr>
<td>08</td>
<td>Last Replay</td>
</tr>
<tr>
<td>09</td>
<td>Last H.S.T.D. Reset</td>
</tr>
<tr>
<td>10</td>
<td>Champion Reset</td>
</tr>
<tr>
<td>11</td>
<td>Last Printout</td>
</tr>
<tr>
<td>12</td>
<td>Last Service Credit</td>
</tr>
</tbody>
</table>
Press the Up or Down buttons to cycle through the menu. Press the Enter button to access a menu. Press the Escape button to return to the Printouts Menu.

**P. PRINTOUTS MENU**  
(optional board required)

P.1  Earnings Data  
P.2  Main Audits  
P.3  Standard Audits  
P.4  Feature Audits  
P.5  Score Histograms  
P.6  Time Histograms  
P.7  Time-Stamps  
P.8  All Data

The Printouts Menu is a combination of the other menus. This menu allows you to access and print information in the available menu selections.

If no printer is attached the message "Waiting for Printer" appears in the displays.  
Note: Set print specification from the Adjustment Menu, A.5 Printer Adjustments.
Use the Service Switch Actuator to hold in the top interlock switch located in the bottom left corner of the coin door opening. The actuator must be in place in order to activate the solenoids and flashlamps.

Press the Up or Down buttons to cycle through the menu. Press the Enter button to access a test. Press the Escape button to return to the Test Menu.

Note: During any test, press the Start button to obtain the wire color, driver number, connector number and fuse location.

### T. TEST MENU

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<td>T.19</td>
<td>Empty Balls Test</td>
</tr>
</tbody>
</table>

The switch matrix, on the left side of the display, shows the state of all switches. A dot indicates the switch is open, and a square indicates the switch is closed. The numbers assigned to each switch indicate where the switch is located in the matrix. The number on the left indicates the column, and the number on the right indicates the row. Example: Switch 23 is 2nd column, 3rd row.

A short to ground, on either the row or column wire, appears as a shorted row(s). However, a column wire shorted to ground disappears when all the indicated row switches are open. A row wire shorted to ground does not disappear.

A shorted diode in the switch matrix can cause other switches to appear closed. These "phantom" switches (though not actually closed) complete a rectangle in the switch matrix. Therefore, if two switches in the same column are closed (example; #22 and #24), and a third switch is pressed in another column but in the same row as one of the first two (example; #32), the "phantom" switch #34 is falsely indicated as closed. The switch with the shorted diode is diagonally opposite the "phantom" switch (in this case #22).

**T.1 Switch Edges**  
Press each switch one at a time. The name and number of the switch is shown in the display. If a switch other than the one pressed, or no switch at all is indicated, the system has detected a problem with the switch circuit.

**T.2 Switch Levels**  
This test automatically cycles through all switches that are detected closed. The name and number of each switch that is detected is shown in the display. A filled square indicates the switch’s position in the matrix.
T.3 Single Switches  The Single Switch Test isolates a particular switch by blocking signals from all other switches. Use the Up or Down buttons to select the switch to be tested.

T.4 Solenoid Test  The Solenoid Test has three modes: Repeat, Stop, and Run. Only one solenoid should pulse at a time. The system has detected a problem if more than one solenoid pulses, a solenoid comes On and stays On, or no solenoids pulse during the Repeat or Run modes.

Repeat - The Repeat Mode pulses a single solenoid. After entering this test, Solenoid 1 shows in the display, and the corresponding solenoid activates. Press the Up or Down button to cycle through the solenoids, one at a time. The same solenoid pulses until the Up or Down button is pressed. Either press the Escape button to return to the Test Menu, or press the Enter button to advance to the next mode.

Stop - The Stop Mode halts the Solenoid Test. Press Enter during the Repeat mode and the Solenoid Test Stops. No solenoids should be activated while the test is stopped. Either press the Escape button to return to the Test Menu, or the Enter button to advance to the next mode.

Run - The Run Mode cycles through the solenoids automatically. The display shows the name and number of the solenoid currently being pulsed. Either press the Escape button to return to the Test Menu, or the Enter button to advance to the next mode.

T.5 Flasher Test  This tests the flashlamp part of the solenoid circuit exclusively. This, like the Solenoid Test has three test modes: Repeat, Stop, and Run. During this test, only one flashlamp circuit should pulse at a time. The system has detected a problem if more than one circuit pulses, a circuit stays On, or no circuits pulse during the Repeat or Run modes.

Repeat - The Repeat mode pulses a single flashlamp. After entering this test, the name and number of the first flashlamp circuit will show in the display and the corresponding bulb(s) flash. Press the Up or Down button to cycle through all of the flashlamp circuits one at a time. The same circuit pulses until the Up or Down button is pressed. Either press the Escape button to return to the Test Menu, or press the Enter button to advance to the next mode.

Stop - The Stop Mode halts the Flasher Test. No flashlamp circuit should be active during this mode. Either press the Escape button to return to the Test Menu, or the Enter button to advance to the next mode.

Run - The Run Mode cycles through the flashlamps automatically. The display shows the name and number of the flashlamp circuit currently being pulsed and the corresponding bulb(s) flash. Either press the Escape button to return to the Test Menu, or the Enter button to advance to the next mode.

1-15
**T.6 General Illumination**  This test checks all of the General Illumination circuits. There are two modes of operation: Stop and Run.

**Stop**  
Press the Up or Down buttons to cycle through the General Illumination Test manually. All illumination is tested first, followed by an individual circuit test. The circuit name and number will show in the display while the corresponding lamps light. If any other results occur the system has detected an error.

**Run**  
Press the Enter button any time during Stop mode and the General Illumination Test cycles through automatically. For each circuit shown in the displays the corresponding bulbs should light. If any other results occurs the system has detected a problem.

**T.7 Sound and Music Test**  
The Sound and Music Test allows you to check the audio circuits. This test has three modes for testing the sound and music circuits: Run, Repeat, and Stop.

**Run**  
The Run Mode steps through a sequence of sounds and music. Pressing the Up or Down button during this portion of the Sound and Music test advances to a particular sound/tune without having to wait for the program to play all the sounds available in the test. A sound/tune should be heard for each name and number that appears in the display. Any other results indicate the system has detected a problem.

**Repeat**  
Press the Enter button at any time during the Run Mode to cause the program to stop and repeat a particular sound/tune. The same sound should repeat continuously until the Up or Down button is pressed. Any other results indicates the system has detected a problem.

**Stop**  
Press the Enter button at any time during the Repeat Mode to stop this test altogether. No sound/tune should be heard. Any other results indicates the system has detected a problem.

**T.8 Single Lamp Test**  
The number assigned to each lamp indicates the lamp's position in the matrix. The number on the left indicates the column. The number on the right indicates the row. Example: Lamp 23 means 2nd column, 3rd row.

**T.9 All Lamps Test**  
This test causes all the controlled lamps to flash at the same time. Every controlled lamp should flash. Any other results indicate the system has detected a problem.

**T.10 Lamp and Flasher Test**  
This test causes all the flashlamps and the controlled lamps to flash at the same time. The controlled lamps blink, while the flashlamps cycle from highest to lowest. Any other results indicates the system has detected a problem.

**T.11 Display Test**  
This test automatically lights every dot in the Dot Matrix Display. A series of patterns appear in sequence. Each pattern turns On and Off a section of dots. Every dot on the display should be turned On and Off during this test.
T.12 Flipper Coil Test

The Flipper Coil Test has three modes: Repeat, Stop, and Run. Only one flipper should pulse at a time. The system has detected a problem if more than one flipper pulses, a flipper comes On and stays On, or no flippers pulse during the Repeat or Run modes.

Repeat - The Repeat Mode pulses a single flipper. After entering this test, coil 01 shows in the display and the corresponding flipper activates. Press the Up or Down button to cycle through the flipper coils, one at a time. The same flipper coil pulses until the Up or Down button is pressed. Either press the Escape button to return to the Test Menu, or press the Enter button to advance to the next mode.

Stop - The Stop Mode halts the Flipper Coil Test. Press Enter during the Repeat mode and the Flipper Coil Test stops. No flipper coil should be activated while the test is stopped. Either press the Escape button to return to the Test Menu, or the Enter button to advance to the next mode.

Run - The Run Mode cycles through the flippers automatically. The display shows the name and number of the flipper coil currently being pulsed. Either press the Escape button to return to the Test Menu, or the Enter button to advance to the next mode.

T.13 Ordered Lamp Test

The number assigned to each lamp indicates the lamp's position in the matrix. The number on the left indicates the column. The number on the right indicates the row. Example - Lamp 23 means 2nd column, 3rd row.

This test checks each lamp circuit individually. Press the Up or Down button to cycle through the lamps. Lamps light in a clock-wise or counter clock-wise direction starting from the bottom of the playfield. Direction depends on which button, Up or Down, is pressed. For each name and number that is shown in the display the corresponding lamp should light. Any other results indicates the system has detected a problem.

T.14 Lamp Row-Col Test

This test allows individual rows and columns in the lamp matrix to be operated. This is useful for trouble-shooting wiring and driver problems.

Press the UP or DOWN buttons to cycle through the different rows and columns.

T.15 Dip Switch Test

This test is used to show the positions of the dip switches on the CPU board (U27).

T.16 3-Bank Test

This TEST allows the operator to test the motorized 3-bank. The state of the switches are displayed at the bottom.

The +(plus) and -(minus) buttons change the state of the test.

- Cycle the bank from UP to DOWN.
- Move the bank to the UP position.
- Move the bank to the DOWN position.

The ENTER button toggles the test.

- STOPPED - The three bank is stationary.
- RUNNING - The three bank can move.

The ESCAPE button exits the test.
**T.17 Ramp Test**  This TEST allows the operator to test the UP/DOWN ramp. The state of the switch is displayed at the bottom.

The +(plus) and -(minus) buttons change the state of the test.
- RAMP UP - Move the ramp to the UP position.
- RAMP DOWN - Move the ramp to the DOWN position.

The ENTER button toggles the test.
- RUNNING - The ramp will move if necessary.
- REPEAT - The appropriate coil will continue to fire regardless of position
- STOPPED - The ramp is stationary.

The ESCAPE button exits the test.

**T.18 Reel Test**  This TEST allows the operator to test the slot machine. The state of the current switch is displayed at the bottom. The lamp of the current reel should be on.

The +(plus) and -(minus) buttons change the state of the test.
- LEFT REEL - SETS the left reel as current and starts it moving.
- CENTER REEL - SETS the center reel as current and starts it moving.
- RIGHT REEL - SETS the right reel as current and starts it moving.
- STOP TEST - Stops all reels.

ENTER button exits the test if the current state is Stop Test.

ESCAPE button exits the test.

**T.19 Empty Balls Test**  This test kicks out all balls loaded in troughs, lockups, poppers, and kickouts until no balls remain in those locations.

Note: As the trough kicks out balls, they will stack up in the shooter groove, which may require manual clearing in order to allow further balls to be kicked out.
Press the Up or Down buttons to cycle through the menu. Press the Enter button to access a utility. Press the Up or Down buttons to see the setting choices. Press the Enter button to lock in a choice. If a mistake is made, press Escape while "Saving Adjustment Value" is in the display. The original settings is retained and the new settings is ignored. Press the Escape button to return to the Utility Menu.

**U. UTILITIES MENU**

U.1 Clear Audits
U.2 Clear Coins
U.3 Reset H.S.T.D.
U.4 Set Time & Date
U.5 Custom Message
U.6 Set Game I.D.
U.7 Factory Adjustments
U.8 Factory Resets
U.9 Presets
U.10 Clear Credits
U.11 Auto Burn-in

**U.1 Clear Audits** Press the Enter button to clear the Standard Audits (except Burn-In Time), Feature Audits, and Histograms.

**U.2 Clear Coins** Press the Enter button to clear the Earnings Audits.

**U.3 Reset H.S.T.D.** Press the Enter button to clear the High Score to Date Table and the Grand Champion.

**U.4 Set Time and Date** Press the Enter button to activate the time and date. Use the Up or Down button to change the value, then press the Enter button to lock in that value. If a mistake is made, press the Escape button while "Saving Adjustment Value" is displayed. The new value is ignored and the original value is retained.

**U.5 Custom Message** Set A.1 20 to ON before writing a Custom Message. Press the Enter button to begin entry of the custom message. Use the Up or Down button to cycle through letters. Use the Start button to cycle through punctuation marks. Press the Enter button to lock in the desired letter and punctuation. If you make a mistake, use Up and Down to select the "back-arrow" character. The "back-arrow" character is located before the space character and after the number nine. Press Enter while the back-arrow shows to erase the previously entered character. Once your message is complete, press and hold the Enter button until "Message Stored" is displayed.

Press the Escape button to cancel the new message. The message "Press Enter to Reset" appears. If you press Enter, the custom message is cleared and no message is displayed. If Escape is pressed, the original message remains intact.

**U.6 Set Game I.D.** This utility allows the operator to install a message, such as game location, that only appears on printouts. Press the Enter button to activate Set Game I.D. Use the Up or Down button to cycle through letters. Use the Start button to cycle through punctuation marks. Press the Enter button to lock in the desired letter and punctuation.

**U.7 Factory Adjustment** Press the Enter button to restore the adjustments to factory settings.
U.8 Factory Reset  Press the Enter button to restore the adjustments to their factory setting, clear the Audits, H.S.T.D Table, and Custom Message/Game I.D.

U.9 Presets  Use the Up or Down buttons to cycle through the available Presets. When the desired Preset is displayed, press the Enter button to lock in that Preset. If a mistake is made, press the Escape button while "Saving Adjustment Value" is displayed. The new value is ignored and the original value is retained.

Game Difficulty Levels  The game play difficulty adjustments can be changed to a combination that is MUCH LESS to MUCH MORE difficult than Factory Settings. The Game Difficulty Setting Table lists the adjustments and settings that comprise the individual groups.

U.9 01 Install Extra Easy  MUCH LESS difficult than factory setting.

U.9 02 Install Easy  Somewhat LESS difficult than factory setting.

U.9 03 Install Medium  About the SAME as factory setting.

U.9 04 Install Hard  Somewhat MORE difficult than factory setting.

U.9 05 Install Extra Hard  MUCH MORE difficult than factory setting.

Game Difficulty Setting Table for U.S./Canadian/French Games

<table>
<thead>
<tr>
<th>Adj. No.</th>
<th>Adjustment Description</th>
<th>Extra Easy</th>
<th>Easy</th>
<th>Medium</th>
<th>Hard</th>
<th>Extra Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.2 04</td>
<td>Ball Save Time</td>
<td>6 seconds</td>
<td>6 sec</td>
<td>6 sec</td>
<td>3 sec</td>
<td>3 seconds</td>
</tr>
<tr>
<td>A.2 13</td>
<td>Extra Ball Percent</td>
<td>45%</td>
<td>40%</td>
<td>35%</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>A.2 14</td>
<td>Multi-ball Percent</td>
<td>45%</td>
<td>40%</td>
<td>35%</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>A.2 15</td>
<td>Extra Ball Memory</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>A.2 16</td>
<td>Roof Champ Hard</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

Game Difficulty Setting Table for German/European Games

<table>
<thead>
<tr>
<th>Adj. No.</th>
<th>Adjustment Description</th>
<th>Extra Easy</th>
<th>Easy</th>
<th>Medium</th>
<th>Hard</th>
<th>Extra Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.2 04</td>
<td>Ball Save Time</td>
<td>6 seconds</td>
<td>6 sec</td>
<td>6 sec</td>
<td>3 sec</td>
<td>3 seconds</td>
</tr>
<tr>
<td>A.2 13</td>
<td>Extra Ball Percent</td>
<td>45%</td>
<td>40%</td>
<td>35%</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>A.2 14</td>
<td>Multi-ball Percent</td>
<td>45%</td>
<td>40%</td>
<td>35%</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>A.2 15</td>
<td>Extra Ball Memory</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>A.2 16</td>
<td>Roof Champ Hard</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>
Install 5 Ball
Install 3 Ball

Adjustments U.9 06 and U.9 07 can be used to change a game to 3 or 5 ball play, including the changing of certain features to the recommended 3- and 5-ball level. The Preset Game Adjustments Table for U.S./Canadian Games lists the adjustments and settings that comprise the individual groups.

### Preset Game Adjustments Table

<table>
<thead>
<tr>
<th>Adjustment Number</th>
<th>Adjustment Description</th>
<th>Install 3-Ball U.9 07 (factory)</th>
<th>Install 5 Ball U.9 06</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.2 04</td>
<td>Ball Save Time</td>
<td>6 seconds</td>
<td>3 seconds</td>
</tr>
<tr>
<td>A.2 13</td>
<td>Extra Ball Percent</td>
<td>35%</td>
<td>25%</td>
</tr>
<tr>
<td>A.2 14</td>
<td>Multi-ball Percent</td>
<td>35%</td>
<td>25%</td>
</tr>
<tr>
<td>A.2 15</td>
<td>Extra Ball Memory</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>A.2 16</td>
<td>Roof Champ Hard</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>A.1 07</td>
<td>Replay Start</td>
<td>1.5 BILLION</td>
<td>2.5 BILLION</td>
</tr>
</tbody>
</table>

### U.9 08 Install Add-A-Ball
This option deletes all Free Play awards and replaces them with Extra Ball awards. Individual adjustments are affected, as follows:

<table>
<thead>
<tr>
<th>Adjustment Number</th>
<th>Adjustment Name</th>
<th>New Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1 13</td>
<td>Replay Boost</td>
<td>Off</td>
</tr>
<tr>
<td>A.1 14</td>
<td>Replay Award</td>
<td>Extra Ball</td>
</tr>
<tr>
<td>A.1 15</td>
<td>Special Award</td>
<td>Extra Ball</td>
</tr>
<tr>
<td>A.1 17</td>
<td>Extra Ball Ticket</td>
<td>No</td>
</tr>
<tr>
<td>A.1 19</td>
<td>Match Feature</td>
<td>Off</td>
</tr>
<tr>
<td>A.4 04</td>
<td>Champion Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 05</td>
<td>High Score 1 Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 06</td>
<td>High Score 2 Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 08</td>
<td>High Score 3 Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 07</td>
<td>High Score 4 Credits</td>
<td>00</td>
</tr>
</tbody>
</table>

### U.9 09 Install Ticket
This option deletes Credit awards and replaces them with Ticket awards. Individual adjustments are affected, as follows:

<table>
<thead>
<tr>
<th>Adjustment Number</th>
<th>Adjustment Name</th>
<th>New Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1 14</td>
<td>Replay Award</td>
<td>Ticket</td>
</tr>
<tr>
<td>A.1 15</td>
<td>Special Award</td>
<td>Ticket</td>
</tr>
<tr>
<td>A.1 16</td>
<td>Match Award</td>
<td>Ticket</td>
</tr>
<tr>
<td>A.1 17</td>
<td>Extra Ball Ticket</td>
<td>Yes</td>
</tr>
<tr>
<td>A.1 31</td>
<td>Ticket Expansion Board</td>
<td>Yes</td>
</tr>
<tr>
<td>A.4 02</td>
<td>H.S.T.D. Award</td>
<td>Ticket</td>
</tr>
</tbody>
</table>
U.9 10 Install Novelty  This option removes all Free Play and Extra Ball awards. Individual adjustments are affected, as follows:

<table>
<thead>
<tr>
<th>Adjustment</th>
<th>Name</th>
<th>New Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1 04</td>
<td>Max. Extra Ball</td>
<td>Off</td>
</tr>
<tr>
<td>A.1 05</td>
<td>Replay System</td>
<td>Fixed</td>
</tr>
<tr>
<td>A.1 09</td>
<td>Replay Level 1</td>
<td>Off</td>
</tr>
<tr>
<td>A.1 10</td>
<td>Replay Level 2</td>
<td>Off</td>
</tr>
<tr>
<td>A.1 11</td>
<td>Replay Level 3</td>
<td>Off</td>
</tr>
<tr>
<td>A.1 12</td>
<td>Replay Level 4</td>
<td>Off</td>
</tr>
<tr>
<td>A.1 15</td>
<td>Special Award</td>
<td>Points</td>
</tr>
<tr>
<td>A.1 19</td>
<td>Match Feature</td>
<td>Off</td>
</tr>
<tr>
<td>A.4 01</td>
<td>Highest Score</td>
<td>On</td>
</tr>
<tr>
<td>A.4 04</td>
<td>Champion Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 05</td>
<td>High Score 1 Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 06</td>
<td>High Score 2 Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 07</td>
<td>High Score 3 Credits</td>
<td>00</td>
</tr>
<tr>
<td>A.4 08</td>
<td>High Score 4 Credits</td>
<td>00</td>
</tr>
</tbody>
</table>

U.9 11 Not Used

U.9 12 Serial Capture  This sets up the printer adjustments for serial transmission to a laptop computer (9600 baud, 40 column, no page breaks, serial printer). This option requires the installation of the optional printer kit, part number 63110.

U.9 13 thru U.9 16 Not Used

U.9 17 Install German 1*
U.9 18 Install German 2*
U.9 19 Install German 3*
U.9 20 Install German 4*
U.9 21 Install German 5*
U.9 22 Install German 6*  Adjustments U.9 17 through U9 22 are used to modify game pricing and type of game play. The Preset Game Adjustments Table for German/European Games lists the adjustments and settings that comprise the individual groups. **NOTE:** German Replay starts at 50,000,000.

U.9 23 Install French 1*
U.9 24 Install French 2*
U.9 25 Install French 3*
U.9 26 Install French 4*
U.9 27 Install French 5*
U.9 28 Install French 6*  Adjustments U.9 23 through U.9 28 are used to modify game pricing and type of play. The Preset Game Adjustments Table for French Games lists the adjustments and settings that comprise the individual groups.

* The French DIP Switch Settings are:  

<table>
<thead>
<tr>
<th>SW4</th>
<th>SW5</th>
<th>SW6</th>
<th>SW7</th>
<th>SW8</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
</tr>
</tbody>
</table>

U.10 Clear Credits  Press the Enter button to clear the game Credits.
U.11 Auto Burn-in Press the Enter button to activate Auto Burn-in. This utility automatically cycles through several tests. This will help in find intermittent problems. The tests that Auto Burn-in cycle through are: the Display Test, Sound and Music Test, All Lamps Test, Solenoid Test, Flashers Test, General Illumination Test, and the Flipper Coil Test. All of the tests are run concurrently. The time spent on the current burn-in cycle, and the total time the game has spent in burn-in are displayed.
Press the Up or Down buttons to cycle through the menu. Press the Enter button to access an adjustment. Press the Up or Down buttons to see the setting choices. Press the Enter button to lock in a choice. If a mistake is made, press Escape while "Saving Adjustment Value" is in the display. The original settings is retained and the new value is ignored. Press the Escape button to return to the Adjustment Menu.

A. ADJUSTMENTS MENU
A.1 Standard Adjustments
A.2 Feature Adjustments
A.3 Pricing Adjustments
A.4 H.S.T.D Adjustments
A.5 Printer Adjustments (optional board required)

A.1 Standard Adjustments

A.1 01 Balls Per Game
A "game" is defined by specifying the number of balls to be played.
Range: 1-10

A.1 02 Tilt Warnings
The number of total actuation's of the plumb bob mechanism that can occur before the game is "tilted".
Range: 1-10

A.1 03 Maximum Extra Balls
The number of extra balls that a player may accumulate.
Range: 1-10

A.1 04 Maximum Extra Balls/Ball in Play
The number of extra balls to be awarded per ball in play.
OFF - No maximum number of Extra Balls per ball in play.
1-10 - 1 through 10 Extra Balls per ball in play.

A.1 05 Replay System
The type of replay system to be used.
Fixed - Replay value is set and does not change during game play.
Auto % - Replay starting value is set and changes every 50 games to comply with the percentage of replays desired.

A.1 06 Replay Percent*
The percentage of replays the players are able to earn when Auto Replay is used.
Range: 5-50%

A.1 07 Replay Start*
The replay start value when Auto % Replay is used. The range of this setting is 100,000,000 to 700,000,000.
A.1 08 Replay Levels*

The number of replay levels used by the Auto % Replay mode. The range of this setting is 1 to 4. When two replay levels are chosen, the second replay level is automatically adjusted to twice the starting replay level value. When three of four replay levels are chosen, their values are automatically adjusted to three or four times the starting replay level.

*For Auto % Replay.

A.1 13 Replay Boost

The replay score can be temporarily boosted by the selected amount EACH time the player reaches or exceeds the replay score. This temporary boost is canceled when credits equal 0, the player inserts another coin, or Begin Test is pressed.

ON - Score is boosted between 1,000,000 and 75,000,000 points.
OFF - Replay score is not boosted.

A.1 14 Replay Award

For the form of award automatically provided when the player exceeds any replay level for either Auto % Replay, or Fixed Replay.

Credit - Reaching each Replay level awards credit.
Ticket - Reaching each Replay level awards a ticket.
Ball - Reaching each Replay level awards an Extra Ball.
Audit - Reaching each Replay level awards nothing to the player; it does increase the entry value of the Audit Item(s) maintaining a tally of these awards.

A.1 16 Match Award

The award automatically provided when the players wins a match.

Credit - Winning a Match awards a Credit.
Ticket - Winning a Match awards a Ticket.

A.1 17 Extra Ball Ticket

A Ticket is awarded when the player earns an Extra Ball.

YES - The player is awarded a Ticket in addition to an Extra Ball.
NO - The player is not awarded a Ticket.

A.1 18 Maximum Ticket/Player

The amount of Tickets each player can earn.
Range 00 - 100

A.1 19 Match Feature

The desired percentage for the Match Feature occurring at the end of the game.

OFF - Match Feature is not available.
1 - 50% - 1% is 'hard'; 50% is 'extremely easy'. The Match Feature selects a random two-digit number at the end of the game and compares each players score for an identical two digits in the rightmost two positions. A matching of these two digits results in an award of a Credit or a Ticket.
A.1 20 Custom Message
The message displayed during the Attract Mode.

YES  -  A message is displayed
NO   -  A message is not displayed.

A.1 21 Language
The language the game uses: English, German, French or Spanish.

A.1 22 Clock Style
The style of clock the game uses: A.M./P.M., or 24 Hours.

A.1 23 Date Style
The style of date the game uses: Month/Date/Year, or Date/Month/Year.

A.1 24 Show Date and Time
The date and time show in the Attract Mode.

YES  -  Show date and time in status report, or Attract Mode.
NO   -  Do Not show date and time in status report or Attract Mode.

A.1 25 Allow Dim Illumination
The game program dims the General Illumination for special effects and during the Attract Mode.

YES  -  Dim General Illumination for spiral effects and Attract Mode.
NO   -  Do Not dim General Illumination.

A.1 26 Tournament Play
Equalize Multi-ball and Jackpots during multi-player games, (do not carry over to next player).

YES  -  Keep Multi-ball and Jackpots equal.
NO   -  Do Not Keep Multi-ball and Jackpots equal.

A.1 27 Euro. Scr. Format
Use either commas or dots between digits when numbers are displayed.

YES  -  Dots instead of commas, (example 1.000,000).
NO   -  Commas instead of dots, (example 1,000,000).

A.1 28 Minimum Volume Override
The volume can be turned Off.

YES  -  Volume can be turned Off.
NO   -  Volume can be turned Down but not Off.
A.1 29 General Illumination Power Saver
This allows the general illumination and controlled lamps to be dimmed following a time interval after a game is played. Power Saver Level (A.1 30) determines dimness of the lamps. Using this feature will substantially increase the life of the lamps.

Setting: - Off, 2-60 Minutes

A.1 30 Power Saver Level
When General Illumination Power Saver (A.1 29) is set to On, this controls the intensity of the G.I. and controlled lamps once the game has been idle for a specified period of time.

Range: 4-7 (4 = dimmest, 7 = brightest)

A.1 31 Ticket Expansion Board
When a Ticket Expansion Board is connected, full control of the ticket dispenser is available. This includes a ticket low/error lamp, resume on ticket jam switch, and manual ticket dispense switch.

Yes - Ticket Expansion Board is connected.
No - Ticket Expansion Board is NOT installed in the game.

A.1 32 No Bonus Flips
The activation of flippers during the end of ball "bonus" sequence. Setting this to "YES" may extend the life of the flipper mechanisms.

A.1 33 Game Restart
When the start button is pressed during or after the 2nd ball, the game in progress will end and a new game will begin. This adjustment has 3 settings to determine how this is handled.

Never: - Do not allow a new game to start until the current game is over.
Slow: - Restart if the start button is pressed continuously for over 1/2 second. This helps to prevent the unintended restart of game in progress.
Instantly: - Restart as soon as the start button is pressed.

When the start button is pressed during game over, or during the 1st ball (to add a player), it is always handled instantly.
A.2 Feature Adjustments

A.2 01 Buy Extra Ball - Buy-In Feature
This determines whether each player may buy 1 extra ball for 1 credit at the end of the game.
Settings: 1 Credit
Off

Factory Default: 1 Credit

A.2 02 Buy-In Count
If A.2 01 (BUY EXTRA BALL) is set to "1 CREDIT", this determines the number of Extra Balls that may be purchased at the end of the game. The choices are 1-3 or Unlimited.

Factory Default: 3 Buy-Ins

A.2 03 Ball Saves
Maximum number of ball saves a player is allowed.
Setting: 1-5 Balls

Factory Default: 1 Ball

A.2 04 Ball Save Time
Sets the amount of time a player has Ball Save active at the start of each ball.
Setting: 3-15 seconds
OFF

Factory Default: 6 Seconds

A.2 05 Timed Plunger
The ball launch plunger automatically shoots for the player after specified amount of time.
Setting: ON = After 30 - 90 Seconds, the plunger will kick automatically.
OFF = The plunger will NOT kick automatically.

Factory Default: OFF

A.2 06 Flipper Plunger
Pressing The flipper button will fire the launch plunger. (Turn this adjustment on ONLY if the Launch button does not function properly.) The choices are:

NO = Pressing the right flipper does not launch the ball.
YES = Pressing the right flipper will launch the ball.

Factory Default: NO
A.2 07 Novice Mode
This allows the operator to prompt the player for SKILL LEVEL at the start of each game. The choices are:

ON = Allow player prompt for Skill Level.
OFF = No player prompt for Skill Level.

Factory Default: ON

A.2 08 Special Mode
This allows the operator to turn Special Modes on or off. The choices are:

ON = Allow Special Modes.
OFF = No Special Modes.

Factory Default: ON

A.2 09 Player Tournament
The operator chooses if holding both flipper buttons for approximately 5 seconds will allow the player to play a game in tournament mode. The choices are:

YES - If the player holds both flippers for approximately 5 seconds, they will be allowed to play a game with tournament mode settings.
NO - Tournament mode is NOT available from the flippers. (Tournament mode is still available using the adjustment.)

Factory Default: YES

A.2 10 Staged Ball
This allows the operator to turn the Staged Ball feature on or off. The choices are:

ON = Allow Staged Ball feature.
OFF = No Staged Ball feature.

Factory Default: ON

A.2 11 Attract Mode Sounds
This allows the operator to select whether or not the game will play music and speech during the attract mode to attract players. The choices are:

ON = The attract mode does have sound on buttons.
OFF = The attract mode does not have sound on buttons.

Factory Default: OFF
A.2 12  **Clock Bong Sounds**
This allows the operator to turn the Game Over clock bongs ON, SPARSE or OFF. The choices are:

ON = The Game Over clock will bong.
SPARSE = The Game Over clock will only bong 1/3 of the time.
OFF = The Game Over clock will not bong.

Factory Default: SPARSE

A.2 13  **Extra Ball Percent**
This allows the operator to effect the number of EXTRA BALLS the game gives out, if any. **NOTE:** This adjustment may change if the difficulty settings are changed. The setting range is 25% to 45%.

Factory Default: 35%

A.2 14  **Multi-ball Percent**
This allows the operator to effect the number of MULTI-BALLS the game gives out. **NOTE:** This adjustment may change if the difficulty settings are changed. The setting range is 25% to 45%.

Factory Default: 35%

A.2 15  **Extra Ball Memory**
This allows the operator to select whether or not the Extra Ball light is carried over from ball to ball, or reset at ball start. **NOTE:** This adjustment may change if the difficulty settings are changed.

ON = The Extra Ball light is carried over from ball to ball.
OFF = The Extra Ball light is reset at ball start.

Factory Default: ON

A.2 16  **Roof Champ Hard**
This allows the operator to make the ROOF CHAMPION feature harder to achieve. **NOTE:** This adjustment may change if the difficulty settings are changed.

ON = The player must make 1 BILLION or more during "THE ROOF" to be the champion.
OFF = The player must only reach ROOF MULTI-BALL to be the champion.

Factory Default: OFF

A.2 17  **Disable Slots**
This allows the operator to disable the SLOT MACHINE. **WARNING** - This will cause an error message to appear.

ON = The SLOT MACHINE is disabled.
OFF = The SLOT MACHINE is not disabled.

Factory Default: OFF
A.2 18 Disable Ramp
This allows the operator to disable the UP/DOWN RAMP. **WARNING** - This will cause an error message to appear.

ON = The UP/DOWN RAMP is disabled.
OFF = The UP/DOWN RAMP is not disabled.

Factory Default: OFF

A.2 19 Disable 3-Bank
This allows the operator to disable the MOTORIZED 3-BANK. **WARNING** - This will cause an error message to appear.

ON = The MOTORIZED 3-BANK is disabled.
OFF = The MOTORIZED 3-BANK is not disabled.

Factory Default: OFF
A.3 Pricing Adjustments

A.3 01 Game Pricing (if set to custom, then 02 to 09 are available). Custom pricing is not available for U.S.A. and Canadian games.
   The cost of a game is selected here, from the Standard Pricing Table or by using the Custom Pricing Editor (A.3.27).

A.3 02 thru A.3 09 Not Used

A.3 10 Coin Door Type (if set to custom, then 11 to 15, 20 and 25 are available)
   This adjustment is used to preset adjustments 11 through 15, 20 and 25, based on standard coin doors (U.S.A., German, Etc.).

A.3 11 Collection Text
   The coin system used to display the Earning Audits.

A.3 12 Left Slot Value
A.3 13 Center Slot Value
A.3 14 Right Slot Value
A.3 15 4th Slot Value
   The monetary value of the left, center, right, and 4th coin chutes. Formerly, these values only affected the way in which the coins were totaled for auditing displays. In the new 10/94 pricing system, these values are added for each coin inserted and credits are awarded based on the amount of money accumulated. See Pricing Editor (A.3.27) for more information.

A.3 16 Maximum Credits
   The maximum number of credits the game can accumulate, either through game play awards or coin purchases. The range of this setting is 5 through 99. Reaching the specified setting prevents the award of any credits. The factory default is 10.

A.3 17 Free Play
   The player can operate the game without a coin (free play) or with a coin.

   NO - A coin is necessary for game play.
   YES - Game play is free; no coin required.

A.3 18 Hide Coin Audits
   The coin audits may, or may not be displayed.

   YES - The coin audits are not displayed.
   NO - The coin audits are displayed.
   HIDE NAMES - The coin audit value is shown but not the audit name.

A.3 19 Not Used

A.3 20 Base Coin Size
   This is the smallest unit of coin that may be used when creating a custom pricing mode using the Pricing Editor (A.3.27). For example, in the USA this is typically $0.25. All pricing levels are then specified in 25 cent (or greater) increments.
A.3 21 Coin Meter Units
It is possible to connect a coin meter to the knocker coil driver which will log all coins through all slots. This adjustment activates the use of the knocker driver for this purpose, and determines the value of each unit on the meter. For example, to show the total amount of money collected as "total quarters", set this adjustment to "0.25". To show the amount of money collected as "total dollars", set this adjustment to "1.00".

Setting this adjustment to anything other than Off establishes the coin unit for a meter attached to the knocker driver, and overrides use of the knocker during awards.

A.3 22 Dollar Bill Slot
The system normally requires 150 microseconds between coin pulses. This is too long a delay for a fast-pulsing dollar bill validator. This adjustment may be used to tell the game that there is a fast pulsing dollar bill validator connected to one of the coin switches. The options are:

NONE = No validator connected.
LEFT = Validator connected to left slot.
CENTER = Validator connected to center slot.
RIGHT = Validator connected to right slot.
FOURTH = Validator connected to fourth slot.

A.3 23 Minimum Coin Microseconds
This is the minimum width required for coin pulses to be accepted as valid coins. This may be changed to prevent certain kinds of cheating.

A.3 25 Allow Hundredths
This is used for a custom door specifier. If set to "YES", then the values for A.3 12-15 are specified in units and hundredths (such as dollars and quarters). If set to "NO", then all values are in units (such as Francs and Lire).

A.3 26 Credit Fraction
This determines the smallest fraction used for credits. It must always be even to accommodate the extra ball buy-in option of 1/2 credit, and is typically 1/2 but may need to be a different value for modes requiring more coins per credit.

A.3 27 Pricing Editor
Custom pricing is not available for U.S.A. and Canadian games.
This function is now used to enter information for a custom pricing mode. The adjustment A.3 26 (Credit Fraction) may need to be set before entering the Custom Pricing Editor. This specifies the smallest fraction available for partial credits.

Because of the availability of an extra ball (buy-in) for 1/2 credit, this value is always even (1/2, 1/4, 1/6 etc.). The typical setting for A.3 26 is 1/2 (such that there are only full credits and half credits) but you may need to use a different value for other pricing modes.
Please note that formerly, the coin values specified by custom coin door adjustments A.3 12-15 only affected audit totals that showed collection totals. In the 10/94 pricing system, these coin values are added up for each coin received and credits are awarded based on pricing levels being reached. The pricing editor described here allows you to set these levels, however, it may be necessary for you to set A.3 10 (Coin Door Type) to "CUSTOM" and then change A.3 11-15, 20 and 25 to reflect the value of the coins being used. This is usually NOT NECESSARY, but must be done BEFORE using the custom pricing editor when it is necessary.

Begin the custom pricing function by pressing the "Enter" button while A.3 27 "PRICING EDITOR" is showing on the display.

The pricing editor will now show the data for the currently selected pricing mode. If this is the 1st use of the pricing editor then this will show the last built-in pricing that was selected. Otherwise it will be the last custom mode created by this function. (Note that A.3 01 will display "Custom" any time a non-standard pricing has been used.)

Assuming that last mode installed was 1/$0.50 2/$0.75 3/$1.00 the display will appear as follows:

<table>
<thead>
<tr>
<th>Custom Pricing Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) $0.25 1/2 cred.</td>
</tr>
<tr>
<td>2) $0.50 1 cred.</td>
</tr>
<tr>
<td>3) $0.75 2 cred.</td>
</tr>
<tr>
<td>4) $1.00 3 cred.</td>
</tr>
</tbody>
</table>

The "$0.25" field will be flashing. You may now use the test mode buttons to perform the following functions:

**Escape:** Undo any changes to the current field and move to the previous field.

"-" (Down): Make the current field lower.

"+" (Up): Made the current field higher.

**Enter:** Save any change to the current field and move to the next field. Note that there are two columns of fields. Price levels are in the left column and credit levels are in the right column. Pressing "Enter" will move from the left column to the right column before moving to the next line.

**Start:** Save the current custom price mode or start over.

By using the above functions, simply enumerate each pricing level and the number of credits that should be awarded at that level. Please note that you must specify each fractional level in the sequence.

**Example:**

<table>
<thead>
<tr>
<th></th>
<th>1/$0.50</th>
<th>2/$1.00</th>
<th>4/$1.50</th>
<th>6/$2.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$0.25</td>
<td>1/2 cred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$0.50</td>
<td>1 cred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$0.75</td>
<td>1 1/2 cred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$1.00</td>
<td>2 cred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$1.25</td>
<td>2 1/2 cred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>$1.50</td>
<td>4 cred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>$1.75</td>
<td>4 1/2 cred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>$2.00</td>
<td>6 cred.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Also note that once the value of the coins repeat that no further specification is necessary.

Example: 1/$0.50 2/$1.00

1) $0.25 1/2 cred.

In the above example, only one line needs to be specified, indicating that 1/2 credit is awarded for each $0.25 received.

Special Features:
There are some special features available by pressing the "-" (Down) button while in the left column. The following words will be displayed instead of a pricing level:

- End
- Delete
- Insert
- Clear
- Repeat 1
- Repeat 2
- Repeat 3
- Repeat 4
- Repeat 5
- Repeat 6
- Repeat 7
- Repeat 8
- Repeat 9
- Repeat 10
- Repeat 11
- Repeat 12
- Repeat 13
- Repeat 14
- Repeat 15
- Repeat 16
- Repeat 17
- Repeat 18
- Repeat 19
- Repeat 20

Pressing "Enter" with the above words selected will activate the following functions:

**End**  This is the same as pressing the start button. A menu of choices will be provided (see "Start Button" below).

**Delete**  This will delete the current level from the pricing mode.

**Insert**  This will insert a new pricing level ABOVE the current level. The current level will be unaffected. There must be room for at least 1 coin between the current level and the previous level, and at least one fractional credit unit between the current level and the previous level.
Example: Inserting a new pricing level.

<table>
<thead>
<tr>
<th>Custom Pricing Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) $0.50 1 cred.</td>
</tr>
<tr>
<td>2) $1.00 2 cred.</td>
</tr>
<tr>
<td>3) $1.50 4 cred.</td>
</tr>
<tr>
<td>4) $2.00 6 cred.</td>
</tr>
</tbody>
</table>

Display View

Use the “Enter” button to move to the $1.50 field. Now press the “-” button once to create the following display:

<table>
<thead>
<tr>
<th>Custom Pricing Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) $0.50 1 cred.</td>
</tr>
<tr>
<td>2) $1.00 2 cred.</td>
</tr>
<tr>
<td>3) INSERT 4 cred.</td>
</tr>
<tr>
<td>4) $2.00 6 cred.</td>
</tr>
</tbody>
</table>

Display View

Now press the “Enter” button. The display will now show:

<table>
<thead>
<tr>
<th>Custom Pricing Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) $0.50 1 cred.</td>
</tr>
<tr>
<td>2) $1.00 2 cred.</td>
</tr>
<tr>
<td>3) $1.25 2 1/2 cred.</td>
</tr>
<tr>
<td>4) $2.00 6 cred.</td>
</tr>
</tbody>
</table>

Display View

Note that the line “5) $2.00 6 cred.” no longer fits on the display. Whenever there are more than 4 pricing levels the display will scroll up and down as “Enter” and “Escape” are used to move from field to field. If you repeatedly press “Enter” the display will then show:

<table>
<thead>
<tr>
<th>Custom Pricing Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) $1.00 2 cred.</td>
</tr>
<tr>
<td>3) $1.25 2 1/2 cred.</td>
</tr>
<tr>
<td>4) $1.50 4 cred.</td>
</tr>
<tr>
<td>5) $2.00 6 cred.</td>
</tr>
</tbody>
</table>

Display View

Clear This will clear out the current entries to allow a new price mode to be entered.

Repeat (1-20) This will cause all entries above the current line to be repeated the number of times specified. This is only available when there are no pricing levels below the current line.

Example: 1/$0.50 2/$1.00 15/$5.00

Use the “Edit New Pricing Mode” feature described below to clear out the current levels.
Use "+" and "Enter" to specify 1/2 credit for $0.25:

```
Custom Pricing Editor
1) $0.25 1/2 cred.
```

Display View

Now, use "-" until the display shows "Repeat 20". The display will show the following:

```
Custom Pricing Editor
1) $0.50 1 cred.
2) REPEAT 20
```

Display View

Press "Enter" and the display will show the following:

```
Custom Pricing Editor
1) $0.25 1/2 cred.
2) $0.50 1 cred.
3) $0.75 1 1/2 cred.
4) $1.00 2 cred.
```

Display View

Actually, by repeating the 1st line 20 times the pricing mode is currently set up as follows, but only the 1st 4 lines are displayed.

```
Custom Pricing Editor
1) $0.25 1/2 cred.
2) $0.50 1 cred.
3) $0.75 1 1/2 cred.
4) $1.00 2 cred.
5) $1.25 2 1/2 cred.
6) $1.50 3 cred.
7) $1.75 3 1/2 cred.
8) $2.00 4 cred.
9) $2.25 4 1/2 cred.
10) $2.50 5 cred.
11) $2.75 5 1/2 cred.
12) $3.00 6 cred.
13) $3.25 6 1/2 cred.
14) $3.50 7 cred.
15) $3.75 7 1/2 cred.
16) $4.00 8 cred.
17) $4.25 8 1/2 cred.
18) $4.50 9 cred.
19) $4.75 9 1/2 cred.
20) $5.00 10 cred.
```
Now, repeatedly press “Enter” to move to the right hand column of the 20th level. The display will show (with “10 cred.” blinking):

<table>
<thead>
<tr>
<th>Custom Pricing Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>17) $4.25 8 1/2 cred.</td>
</tr>
<tr>
<td>18) $4.50 9 cred.</td>
</tr>
<tr>
<td>19) $4.75 9 1/2 cred.</td>
</tr>
<tr>
<td>20) $5.00 10 cred.</td>
</tr>
</tbody>
</table>

Display View

Now, press “+” repeatedly until the right hand column of line 20) reads “15 cred.”.

**Start Button:** Once the pricing mode has been specified, exit the custom pricing editor by pressing the “Start” button. This will bring up a menu with (some or all of) the following choices:

<table>
<thead>
<tr>
<th>Choose an Option:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to Editor</td>
</tr>
<tr>
<td>Clear Pricing</td>
</tr>
<tr>
<td>Ignore Changes</td>
</tr>
<tr>
<td>Save Changes</td>
</tr>
</tbody>
</table>

Display View

Use the “+” and “-” button to select your choice and press the “Enter” button to activate. The selections cause the following actions:

**Return to Editor:** This option will allow you to continue to edit the pricing information.

**Clear Pricing:** This option will clear out all pricing levels and bring you back to the pricing editor to create a pricing mode from scratch.

**Ignore Changes:** This option will discard the work done in the pricing editor and leave the previously installed pricing mode in the game.

**Save Changes:** Press “Enter” to save your custom edited pricing mode and install it as the pricing for the game. Note that this choice will not be displayed if there is not at least one pricing level specified in the pricing editor, or if no changes have been made.

**Exit Pricing Editor:** This option will appear if no changes have been made. It will exit the Pricing Editor leaving the pricing as is.
<table>
<thead>
<tr>
<th>Country</th>
<th>25¢</th>
<th>5¢</th>
<th>20¢</th>
<th>50¢</th>
<th>10¢</th>
<th>25¢</th>
<th>50¢</th>
<th>100¢</th>
<th>500¢</th>
</tr>
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Note: 1. Factory Default. 2. Standard Setting - Change by pressing Enter button. 3. Other functions are also affected. * Only if Bill Acceptor and Center Coin Chute are available.
A.4 **H.S.T.D. Adjustments**

**A.4 01 Highest Scores**
The game maintains a record of the four highest scores achieved to date.

- **OFF** - No high scores are recorded, or displayed.
- **ON** - The four highest scores are stored in memory and displayed in the Attract Mode.

**A.4 02 H.S.T.D. Award**
The award given for achieving the High Score To Date, or the Champion H.S.T.D: Credit or Ticket.

**A.4 03 Champion H.S.T.D.**
The “Highest” High Score is displayed in the Attract Mode. This score is not cleared when “High Score Reset Every” occurs.

- **ON** - The “Highest” High Score is retained in memory and is displayed.
- **OFF** - The “Highest” High Score is not retained.

**A.4 04 Champion Credits**
The operator chooses the number of credits or tickets awarded for a Grand Champion Score. Range: 00 - 10.

**A.4 05 H.S.T.D. 1 Credits**
**A.4 06 H.S.T.D. 2 Credits**
**A.4 07 H.S.T.D. 3 Credits**
**A.4 08 H.S.T.D. 4 Credits**
The number of credits or tickets to be awarded whenever a player exceeds the 1st, 2nd, 3rd, and 4th highest scores. Range: 00 - 10.

**A.4 09 High Score Reset Every**
The number of games to be played before an automatic reset of the displayed “Highest Score” occurs. The values provided upon reset are those selected by the operator in the Back-up High Scores. Range: OFF (disabled); 250 to 20,000.

**A.4 10 Backup Champion**
The Back-up Grand Champion Score. Range: 00 - 99,900,000.

**A.4 11 Backup H.S.T.D. 1**
**A.4 12 Backup H.S.T.D. 2**
**A.4 13 Backup H.S.T.D. 3**
**A.4 14 Backup H.S.T.D. 4**
The first through the fourth Back-up High Score values. The game automatically restores this value when the High Score Reset Every value is reached. Range: 00 - 99,900,000.
A.5 Printer Adjustments (optional board required)

A.5 01 Column Width
The column width to be printed. Range: 22 - 80.

A.5 02 Lines Per Page
The amount of lines per page. Range: 20 - 80.

A.5 03 Pause Every Page
Choose whether the printer pauses at the end of a page.
YES - The printer does pause.
NO - The printer does not pause.

A.5 04 Printer Type
Select the type of printer. Choices: Parallel, Serial, ADP., Mini-Drucker, or NSM.

A.5 05 Serial Baud Rate
The baud rate used for Serial or ADP communications (bit rate). Choices: 300, 600, 1200, 2400, 4800, or 9600.

A.5 06 Serial D.T.R. (Data Terminal Ready)
When a Serial Printer is used, this line may be connected to a printer output line signaling that the printer is busy.
Normal - Normal D.T.R. signal goes low to indicate the printer is not ready.
Inverted - Inverted D.T.R. (busy) signal goes high to indicate printer is not ready.
Ignore - D.T.R. signal is ignored.

A.5 07 Auto Printout
With the optional printer board installed, this adjustment allows the initiation of printouts whenever the game detects a printer connected to the game. Parallel printers are detected automatically by plugging them in and putting them on-line. Serial printers (or computers) are detected by sending a carriage return (ASCII 0x0D) or XON (ASCII 0x11).
This adjustment has the following settings:
OFF Disable automatic printouts
MAIN AUDS Main Audit table (B.1)
EARNINGS Earning Audits (B.2)
STD. AUDITS Standard Audits (B.3)
FEATURES Feature Audits (B.4)
HISTOGRAMS Histograms (B.5)
TIMESTAMPs Time Stamps (B.6)
ALL DATA All of the above data

The table specified above will automatically be printed when a printer (or computer) is detected.

If the printer is detected during game over or test mode, the printout will take place right away.

If the printer is connected while a game is being played, it will take up to 10 seconds to be detected, after which the printout will occur. The game will resume after the printout is complete.

Automatic printout will only take place if the coin door is open.

After an automatic printout has been generated, a second automatic printout will not be possible until a new game has started, or test mode begins.
ERROR MESSAGES

The WPC game program has the capability to aid the operator and service personnel. At Game Turn-on, or after pressing the Begin Test switch, (once the game has been operating for an extended period), the display may signal with the message, "Press ENTER for Test Report". This indicates the game program has detected a possible problem with the game.

To obtain details of the problem, open the coin door and press the Begin Test switch. Press the Enter button to begin displaying the message(s). The following messages apply to your game.

SLOTS DISABLED, ADJUSTMENT IS SET TO ON
Adjustment A.2 17 is set to on. Please reset the adjustment after the problem is fixed.

RAMP DISABLED, ADJUSTMENT IS SET TO ON
Adjustment A.2 18 is set to on. Please reset the adjustment after the problem is fixed.

3 BANK DISABLED, ADJUSTMENT IS SET TO ON
Adjustment A.219 is set to on. Please reset the adjustment after the problem is fixed.

MOTORIZED 3-BANK ERROR
The motorized 3-bank is having trouble finding one or both of the position switches. One of the switches are broken or needing attention.

SLOT MACHINE IS STUCK
One or more of the reels have recently tried to spin and was unable to. The opto of the reel needs some attention.

UP / DOWN RAMP ERROR
The Up / down ramp recently had trouble moving into position. The ramp switch needs attention.

Check Switch #. 
This message indicates that at least one switch was stuck 'On' at game turn-on or has NOT been actuated during ball play (for 90 balls or A30 games). The game program compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep the game earning, until the service technician can repair the problem.

To verify the problem, refer to the Test Menu text describing Switch Testing, and check each reported switch using applicable switch tests. Always check switch operation using a ball, to simulate game conditions. Switch problems may often be resolved by adjusting the wire switch actuators, fixing switch circuitry problems, securing loose connectors, etc. Mechanisms using 'opto switches' (drop targets, etc.) need to be checked for proper power connections (+12V dc and ground).

Check Fuses F115 and F116 and Opto 12V Supply.
This message will be displayed if the game senses that all optical switches are not functioning. This usually occurs when there is no 12V supply to the playfield optics.

The problem is likely to be a blown fuse (F115 or F116) or at connectors J112, J116, J117 or J118 on the power driver board.
**Opto Trough Bad Check Connectors, Wires and 12V Supply**
This message will be displayed if all of the optics in the playfield ball trough are not functioning. This is usually caused by a problem with a ball trough connector supplying 12V and Ground for the optical circuits.

**Pinball Missing.**
This game normally uses 4 balls; however, it will operate with as few as one ball. This message announces that a ball is missing or stuck. When the ball is located, return it to the game via the Outhole. Other possibilities for this problem could be malfunctions of the Ball Trough optos or the Ball Shooter switch.

**xxxxx Sw. is Stuck On.**
This message indicates that a switch, which is not usually On, remains in the On position after the game is switched On. The stuck switch is essential for game play (for example, a coin chute switch, the slam tilt switch, the plumb bob tilt switch), and should be cleared to permit proper game operation.

**Ground Short Row-N, Wht-xxx.**
This message indicates that the switch wires being called out are touching a grounded part on the playfield or coin door. The following should be checked:
1. Slam Tilt (or other coin door) switch touching the grounded coin door.
2. A leaf-type, playfield switch touching a grounded part.
3. Players poking metallic objects (wires, coat hanger, etc.) into the game.
4. Switch cable insulation pierced or damaged allowing bare wire contact with a grounded part.
5. All switches in a row closing at the same time. Note: This instance is NOT a switch problem; however, for most games this is a very rare possibility.

**U6 Checksum Error.**
The game ROM checksum is invalid. If this occurs replace the game ROM.

**Time and Date Not Set.**
The real time clock is not set. If this occurs go to U.4 of the Utilities Menu and set the time and date.

**Factory Settings Restored.**
This message indicates that the CMOS RAM no longer retains any custom Pricing or Game Adjustment settings and has reverted to factory default settings. Generally, the following CPU checks will isolate the cause of the CMOS RAM memory failure. The voltage at pin 28 and pin 26 of U8 should be +5V (game turned On) and at least +4V (game turned Off). When the voltage drops below +4V, memory reset occurs. Check the batteries and battery holder. Be sure that the batteries are good and that there is no contamination on the battery holder terminals. Turn the game OFF, and use an ohmmeter to check diodes D1 and D2 on the CPU Board. D1 should read 0 ohms when forward-biased and infinite ohms when reverse-biased. D2 should read 15 ohms when forward-biased and infinite ohms when reverse-biased. Note: Readings taken from Analog Meter. This message can also indicate that there is an open diode on a 50V coil circuit and noise is entering the circuit.
CPU L.E.D.'s

The CPU has three L.E.D.'s located on the upper left side of the board: D19, D20, and D21. On game power-up D19 and D21 turn on for a moment then, D19 turns off and D20 starts to blink rapidly. D21 remains on. The system has detected a problem if the following happens:

**CPU Board L.E.D. Error Codes**

| Center L.E.D. blinks one time | ROM Error U6 |
| Center L.E.D. blinks two times | RAM Error U8 |
| Center L.E.D. blinks three times | Custom Chip Failure U9 |

**Sound Board Beep Error Codes**

**Upon Game Turn-On:**

- 1 Beep = Sound Board O.K.
- 2 Beeps = U2 Failure
- 3 Beeps = U3 Failure
- 4 Beeps = U4 Failure
- 5 Beeps = U5 Failure
- 6 Beeps = U6 Failure
- 7 Beeps = U7 Failure
- 8 Beeps = U8 Failure
- 9 Beeps = U9 Failure

**OPTO THEORY**

The opto receiver (Photo Transistor) should be approximately 0.1-0.7 volts when the opto beam is unblocked and approximately 11-13 volts when the opto beam is blocked. The opto transmitter (L.E.D.) should always be approximately 1.4 volts. Note, the transmitter (L.E.D.) is larger than the receiver (Photo Transistor); it protrudes further from its case.

---

**LED Board (A-16908)**

- **Transmitter**
  - 1.0-1.1 Volts

**Photo Transistor Board (A-16909)**

- **Receiver**
  - 0.1-0.7V Unblocked
  - 11-13V Blocked
**LED List**

**CPU Board**
D19, Blanking
D20, Diagnostic
D21, +5vdc
At Game Turn-On = D19 & D21 On, D20 Off
During Normal Operation = D19 Off, D20 flashing, D21 On

**Power Driver Board**
LED 1, +12vdc, Switch Circuit, Normally On
LED 2, Not Used
LED 3, Not Used
LED 4, +5vdc, Digital Circuit, Normally On
LED 5, +20vdc, Flashlamp Circuit, Normally On
LED 6, +18vdc, Lamps Circuit, Normally On
LED 7, +12vdc, Power Circuit (Motors, Relays, Etc.), Normally On
### Fuse List

#### Audio Board
- F501: -25V Circuit
- F502: +25V Circuit

#### Dot Matrix Controller Board
- F601: +62V Circuit
- F602: -113V and -125V Circuits

#### Fliptronic II Controller Board
- F901: Lower Right Flipper
- F902: Lower Left Flipper
- *F903: Upper Right Flipper
- *F904: Upper Left Flipper

#### Power Driver Board
- F101: +50VDC General (Not Used)
- F102: +50VDC General (Not Used)
- F103: Solenoid #25-#28
- F104: Solenoid #1-#8
- F105: Solenoid #9-#16
- F106: G.I. #5 Wht-Vio
- F107: G.I. #4 Wht-Gmn
- F108: G.I. #3 Wht-Yel
- F109: G.I. #2 Wht-Org
- F110: G.I. #1 Wht-Brn
- F111: Flasher Secondary
- F112: Solenoid Secondary
- F113: +5V Logic
- F114: +18V Lamp Matrix
- F115: +12V Switch Matrix
- F116: +12V Secondary
- F117: Line Filter
- F118: Domestic Game
- F119: Foreign Game

### Notes
- 3A, 250V, S.B.
- 5A, 250V, S.B.
- 8A, 32V, N.B.
- 3/8A, 250V, F.B.

*May be used for circuits other than flipper circuits.
MAINTENANCE INFORMATION

LUBRICATION

The two main lubrication points of the Ball Eject mechanism* are the pivots for the arm. The mechanisms of other playfield devices are somewhat similar and have the same lubrication requirements. A medium viscosity oil (switch target grease) is satisfactory for these devices. Also, regularly lubricate the slide-mechanism rails and the leg levers.

Because of the functional design (arm-actuated via solenoid plunger operation), the pivot points of the Left and Right Kickers ("Slingshots") all require lubrication as a regular servicing procedure.

Lubrication to ensure proper operation also applies to the target blades of Drop Targets. MBI Instrument Grease, also known as Drop Target Switch Lubricant, (Bally part number of El 165), is a recommended lubricant.

SWITCH CONTACTS

Playfield Switches
For proper game operation, switch contacts should be free of dust, dirt, contamination, and corrosion. Blade switch contacts are plated to resist corrosion. Cleaning blade switch contacts requires gentle closing of the contacts on a clean business card or piece of paper, and then pulling the paper about 2 inches, which should restore the clean contact surface. Adjust the switch contacts to a 1/16-inch gap.

Flipper Switches
This game uses the new Fliptronic II Electronic Flipper System. The end-of-stroke switches are NORMALLY OPEN and should close when the flipper is energized. All end-of-stroke switches are gold flashed computer grade leaf switches. Only low computer current is carried through these switches. DO NOT FILE or abrasively clean these switches! DO NO REPLACE these switches with the old style tungsten high current type switches, as intermittent operation could occur. Please note that unlike the old style of flipper, an end-of-stroke switch failure will not harm the flipper. The game will notify the operator of a switch being misadjusted in the test report, but will continue to play. The end-of-stroke switches are a means by which the new electronic flippers feel and play with all of the subtleties of the old flippers.

CLEANING

Good game action and extended playfield life are the results of regular playfield cleaning. During each collection stop, the playfield glass should be removed and thoroughly cleaned and the playfield should be wiped off with a clean, lint-free cloth. The game balls should be cleaned and inspected for any chips, nicks, or pits. Replace any damaged balls to prevent playfield damage.

Regular, more extensive, playfield cleaning is recommended. However, avoid excessive use of water and caustic or abrasive cleaners because they tend to damage the playfield surface. Playfield wax (or any carnauba based wax), or polish may be used sparingly, to prevent a buildup on the playfield surface. Do not use cleaners containing petroleum distillates on any playfield plastics because they may dissolve the plastic material or damage the artwork.

*May not be used on all games.
WHO DUNNIT
A MURDER MYSTERY

Unit Disassembly for Repair

Major Component Service Instructions
REEL ASSEMBLY

1. Lift the playfield to its raised position (leaning against the backbox).
2. Disconnect the three cable from the reel assembly.
3. Remove eight \( \frac{3}{8} \)" hex-head screws holding the base to the playfield.
4. Remove assembly and repair as needed.
5. Reassemble in reverse order.

*Underside of Playfield, Viewed in Raised Position*
NOTES
SECTION TWO

GAME PARTS INFORMATION
50044-BB-1
Backbox Assembly

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<td>Secondary Cable</td>
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<td>H-20470</td>
<td>Insert Cable</td>
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### 50044-CAB-1

**Cabinet Assembly**

#### Miscellaneous Parts

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<tr>
<th>Item</th>
<th>Part Number</th>
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<tr>
<td>1</td>
<td>A-16773-1</td>
<td>Lever Guide Assembly</td>
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<td>2</td>
<td>B-12445-7</td>
<td>Ball Shooter Assembly</td>
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<td>3</td>
<td>20-9663-18</td>
<td>Push Button w/Sw., Extra Ball (Org)</td>
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<td>4</td>
<td>A-16883-4</td>
<td>Flipper Button, Red (2)</td>
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<td>5</td>
<td>A-18531-1</td>
<td>4-Ball Cashbox Assembly</td>
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<td>6</td>
<td>A-17540-1</td>
<td>Univ. Power Interface Assy.</td>
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<td>7</td>
<td>5610-14515-00</td>
<td>WPC Transformer</td>
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<td>8</td>
<td>5555-12929-00</td>
<td>Speaker, 4Ω, 6&quot;, 25w</td>
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<td>9</td>
<td>20-9347</td>
<td>Toggle Latch</td>
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<td>10</td>
<td>A-17051-1</td>
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<td>11</td>
<td>A-19514</td>
<td>Leg Assembly, Chrome (4)</td>
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<td>12</td>
<td>D-12615</td>
<td>Front Molding Assembly</td>
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<td>13</td>
<td>20-6502-A</td>
<td>Plum Bob</td>
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<td>14</td>
<td>A-15361</td>
<td>Tilt Mechanism Assembly</td>
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<td>Cordset</td>
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<td>16</td>
<td>A-17316</td>
<td>Opto Flipper Assembly (2)</td>
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<td>01-10714</td>
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<td>18</td>
<td>A-12359-3</td>
<td>Side Molding Assembly (2)</td>
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<td>20</td>
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<td>Push Button w/Sw., Start (Clear)</td>
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<td>21</td>
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<td>22</td>
<td>A-18249-1</td>
<td>Cable &amp; Interlock Switch Assy.</td>
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<td>23</td>
<td>09-61000-1</td>
<td>Coin Door-USA</td>
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<td>24</td>
<td>01-13936</td>
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<td>02-4329-1</td>
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<td>27</td>
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<td>Pivot Bushing (2)</td>
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#### Part Number | Description

- A-17195: Tilt Switch Assy. w/Cable
- A-19562.1: Stay Arm Assembly
- 01-12352: Clip Bracket
- 01-9011.1-L: Backbox Mtg. Bracket, Left
- 01-9011.1-R: Backbox Mtg. Bracket, Right
- 01-6389-1: Cashbox Lock Bracket
- 08-7028-T: Playfield Glass
- 08-7377: Leg Leveler Adjuster, 3"
- 20-6500: Steel Ball, 1-1/16" (4)
- 01-3635: Rod Mounting Plate

#### Cabinet Cables

- A-20201: Cable & Jumper Assy., Coin Door
- H-17217: Plumb/Bob Mech. Protect Cable
- H-17837-2: Voltage Program Jumper Cable
- H-19524: Cabinet Cable
- H-19601-1: Power Extension Cable
- H-20593: Cabinet Switch/Lamp Cable

*See Application Chart p.2-36.*
# A-17651-50044
## WPC CPU Security Board Assembly

## Table of Parts

<table>
<thead>
<tr>
<th>Part Number</th>
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<th>Description</th>
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<tr>
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<tr>
<td>5010-09314-00</td>
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<td>5010-09358-00</td>
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<td>5010-09416-00</td>
<td>R5-R18, R12, R13, R18-R19, R9, R100</td>
<td>Res., 470Ω, 1/4W, 5%</td>
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<tr>
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<td>R92</td>
<td>Res., 470KΩ, 1/4W, 5%</td>
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<tr>
<td>5010-12104-00</td>
<td>R91</td>
<td>Res., 22MΩ, 1/4W, 5%</td>
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<tr>
<td>5010-08991-00</td>
<td>R100, R104</td>
<td>Res., 4.7KΩ, 1/4W, 5%</td>
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<tr>
<td>519-09362-00</td>
<td>S1P</td>
<td>Sip 4.7K, 8R, 10P, 5%</td>
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<td>5049-08982-00</td>
<td>C31</td>
<td>Cap., 100M, 10V (±20%)</td>
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<tr>
<td>5049-09080-00</td>
<td>B</td>
<td>Cap., 01M, 50V (+8%, -20%)</td>
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<td>C27</td>
<td>Cap., 047M, 50V (±20%)</td>
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<td>Cap., 470p, 50V (±20%)</td>
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<tr>
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<td>C29, C30</td>
<td>Cap., 22pF, 1KV (±10%)</td>
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<td>5049-09492-00</td>
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<td>Cap., 2.2µF, 15V (±20%) Ax.</td>
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<td>5070-08919-00</td>
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<td>Diode, 1N5817, 1.0A</td>
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<td>5281-09308-00</td>
<td>U10</td>
<td>IC, 74LS245 TRNCV</td>
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<td>5281-00486-00</td>
<td>U14, U24</td>
<td>IC, 74LS374 8D F/F</td>
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<td>U5</td>
<td>IC, 74LS14 SMT TRG</td>
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## Table of Designators

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<tr>
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<tr>
<td>IC, 74LS240</td>
<td>4.7K, 9R, 10pF, 5%</td>
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<tr>
<td>IC, 74LS245</td>
<td>4.7K, 9R, 10pF, 5%</td>
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<tr>
<td>IC, 74LS374</td>
<td>4.7K, 9R, 10pF, 5%</td>
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<td>Cap., 2.2µF, 15V (±20%) Ax.</td>
<td>470p, 50V (±20%)</td>
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<td>470p, 50V, (±20%)</td>
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<td>Cap., 22pF, 1KV (±10%)</td>
<td>22pF, 1KV (±10%)</td>
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<td>100p, 50V (±10%)</td>
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<td>2.2µF, 15V (±20%) Ax.</td>
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<td>Diode, 1N4148 150MA</td>
<td>Diode, 1N4148 150MA</td>
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<td>Diode, 1N5817, 1.0A</td>
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<td>Trans., 2N3904 NPN</td>
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<td>IC Socket 18-pin</td>
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## Diagram

The diagram shows the layout of the WPC CPU Security Board Assembly, including the placement of components such as resistors, capacitors, and diodes. The diagram is crucial for understanding the assembly and connectivity of the board.

## Notes

- **Part Number**: A reference number for each component.
- **Designator**: A unique identifier for each component.
- **Description**: Technical specifications and characteristics of the components.

The table and diagram together provide a comprehensive overview of the WPC CPU Security Board Assembly, allowing for accurate identification and replacement of components as necessary.
A-16917-50044
Sound Board Assembly
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<td>Q1-Q4</td>
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<td>D1-D24</td>
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<tr>
<td>4006-01003-08</td>
<td>Q1-Q4</td>
<td>Mach. Screw, 6-32</td>
<td>5100-09690-00</td>
<td>BR1</td>
<td>Bridge Rectifier</td>
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<td>Nut 6-32 KEPS</td>
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<td>Q5-Q12</td>
<td>Trans., TIP102 NPN</td>
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<td>Fuse S-B, 3A., 250v</td>
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<td>F901-F904</td>
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<td>C5-C7, C11, C30</td>
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<td>5040-09890-00</td>
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<td>BR1-1265-00</td>
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<td>5010-11079-00</td>
<td>R7, R10, R13, R16, R19</td>
<td>Res., 51Ω, 1/2W, 5%</td>
<td>6250-12634-00</td>
<td>Q91-998</td>
<td>IC, LM339 Quad Comp.</td>
</tr>
<tr>
<td>5010-12427-00</td>
<td>R155-R153, R172-175</td>
<td>Res., 22Ω, 1W, 5%</td>
<td>5791-10862-02</td>
<td>J101, J108, J136</td>
<td>IC, LM7812</td>
</tr>
</tbody>
</table>
A-12697-4
WPC Power Driver Assembly
### A-17051-1

**Coin Door Interface PCB Assembly**

![Coin Door Interface PCB Assembly Diagram](image)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Designator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5791-10662-03</td>
<td>J8</td>
<td>Connector, 3-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5791-10662-05</td>
<td>J2, J9</td>
<td>Connector, 5-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5791-10662-11</td>
<td>J1, J7</td>
<td>Connector, 11-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5791-10662-12</td>
<td>J3</td>
<td>Connector, 12-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5791-10662-13</td>
<td>J5</td>
<td>Connector, 13-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5791-10662-15</td>
<td>J6</td>
<td>Connector, 15-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5791-11000-10</td>
<td>J4</td>
<td>Connector, 10-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5645-09025-00</td>
<td>SW5</td>
<td>Switch DIP 8 Pos.</td>
</tr>
<tr>
<td>5070-09054-00</td>
<td>D1 - D11</td>
<td>Diode, 1N4004, 1.0A.</td>
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</table>

### A-17316

**Flipper Opto PCB Assembly**

![Flipper Opto PCB Assembly Diagram](image)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Designator</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A-20207</td>
<td>-</td>
<td>Flipper Opto Switch PCB</td>
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<tr>
<td>5010-09061-00</td>
<td>R1, R2</td>
<td>Resistor, 680Ω, 1/2w, 5%</td>
</tr>
<tr>
<td>5490-14575-00</td>
<td>OPTO1, OPTO2</td>
<td>IC Opto Integ Schmitt 10mA.</td>
</tr>
<tr>
<td>5791-13830-07</td>
<td>J1</td>
<td>Connector, 7-pin Header Solid Sq.</td>
</tr>
<tr>
<td>03-9001</td>
<td>-</td>
<td>Interrupter Flip-Opto</td>
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2-10
### A-18617-1
**Trough IRED LED PCB Assembly**

<table>
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<tr>
<th>Part Number</th>
<th>Designator</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>5671-12731-00</td>
<td>LED1 - LED5</td>
<td>Infra Red Diode</td>
</tr>
<tr>
<td>5791-12622-09</td>
<td>J1</td>
<td>Connector, 9-pin Header Sq.</td>
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### A-18618-1
**Trough IRED Transistor PCB Assembly**

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<th>Designator</th>
<th>Description</th>
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<tbody>
<tr>
<td>5163-14114-00</td>
<td>Q1 - Q5</td>
<td>Infra Red Photo Transistor</td>
</tr>
<tr>
<td>5791-12622-09</td>
<td>J1</td>
<td>Connector, 9-pin Header Sq.</td>
</tr>
</tbody>
</table>
### A-17223
### 16-Opto PCB & Bracket Assembly

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Designator</th>
<th>Description</th>
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<tbody>
<tr>
<td>A-16998.1</td>
<td>-</td>
<td>16-Opto Dual Mount PCB Assy</td>
</tr>
<tr>
<td>5043-08996-00</td>
<td>C1-C5</td>
<td>Capacitor, 0.1µF, 50v(±20%) Axial</td>
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<tr>
<td>5040-13102-00</td>
<td>C6</td>
<td>Capacitor, 470µF, @35v (±20%)</td>
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<tr>
<td>5791-13830-10</td>
<td>J1-J4</td>
<td>Connector, 10-pin Header STR Sq.</td>
</tr>
<tr>
<td>5791-10862-13</td>
<td>J5</td>
<td>Connector, 13-pin Header STR Sq.</td>
</tr>
<tr>
<td>5671-13732-00</td>
<td>LED1</td>
<td>Display LED Red</td>
</tr>
<tr>
<td>5010-12928-00</td>
<td>R1-R4, R23-R30, R47-R50</td>
<td>Resistor, 270Ω, 2w, 5%</td>
</tr>
<tr>
<td>5010-09999-00</td>
<td>R5-R12, R15-R22, R31-R46</td>
<td>Resistor, 2KΩ, 1/4w, 5%</td>
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<tr>
<td>5010-08774-00</td>
<td>R13, R14, R51</td>
<td>Resistor, 22KΩ, 1/4w, 5%</td>
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<tr>
<td>5010-09162-00</td>
<td>R52, R54, R56,</td>
<td>Resistor, 100KΩ, 1/4w, 5%</td>
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<tr>
<td>5010-09034-00</td>
<td>R53, R55</td>
<td>Resistor, 10KΩ, 1/4w, 5%</td>
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<tr>
<td>5010-10631-00</td>
<td>R57</td>
<td>Resistor, 1.2KΩ, 1/2w, 5%</td>
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<tr>
<td>5370-12272-00</td>
<td>U1-U5</td>
<td>IC LM339 Quad Comp.</td>
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<tr>
<td>5070-09054-00</td>
<td>D1-D19</td>
<td>Diode 1N4004 1.0A</td>
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<tr>
<td>01-20756</td>
<td>-</td>
<td>PCB Mounting Bracket</td>
</tr>
<tr>
<td>07-6688-18N</td>
<td>-</td>
<td>Rivet 3/16 x 1/8&quot; Nickel</td>
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A-19043-1
Stepper Motor Driver-Bipolar Universal PCB

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Designator</th>
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<tbody>
<tr>
<td>5370-12272-00</td>
<td>U1</td>
<td>IC LM339 Quad Comp</td>
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<tr>
<td>5010-09999-00</td>
<td>R9</td>
<td>Resistor, 2KΩ, 1/4w, 5%</td>
</tr>
<tr>
<td>5010-08991-00</td>
<td>R7, R8</td>
<td>Resistor, 4.7KΩ, 1/4w, 5%</td>
</tr>
<tr>
<td>5010-09034-00</td>
<td>R5, R6</td>
<td>Resistor, 10KΩ, 1/4w, 5%</td>
</tr>
<tr>
<td>5010-08998-00</td>
<td>R1 - R4</td>
<td>Resistor, 2.2KΩ, 1/4w, 5%</td>
</tr>
<tr>
<td>5192-12428-00</td>
<td>Q5 - Q8</td>
<td>Transistor TIP107</td>
</tr>
<tr>
<td>5162-12635-00</td>
<td>Q1 - Q4</td>
<td>Transistor TIP102</td>
</tr>
<tr>
<td>5671-13732-00</td>
<td>LED1</td>
<td>LED Dspl Red</td>
</tr>
<tr>
<td>5791-10862-06</td>
<td>J2</td>
<td>Connector, 6-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5791-10862-05</td>
<td>J1</td>
<td>Connector, 5-pin Header Str. Sq.</td>
</tr>
<tr>
<td>5070-09054-00</td>
<td>D1 - D9</td>
<td>Diode 1N4004 1.0A.</td>
</tr>
<tr>
<td>5043-08980-00</td>
<td>C3 - C5</td>
<td>Capacitor, 0.01µf, 50v (+50%, -20%) Ax.</td>
</tr>
<tr>
<td>5040-09365-00</td>
<td>C2</td>
<td>Capacitor, 1µf, 63v (+50%, -10%) Ax.</td>
</tr>
<tr>
<td>5040-12298-00</td>
<td>C1</td>
<td>Capacitor, 100µf, 40v (+50%, -10%) Ax.</td>
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A-20511
Reel Opto PCB Assembly

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<th>Part Number</th>
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<tbody>
<tr>
<td>5791-12622-05</td>
<td>J1</td>
<td>Connector, 5-pin Header R/A</td>
</tr>
<tr>
<td>5010-08930-00</td>
<td>R1</td>
<td>Resistor, 470Ω, ½w, 5%</td>
</tr>
<tr>
<td>5070-09064-00</td>
<td>D1</td>
<td>Diode 1N4004, 1.0A.</td>
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<tr>
<td>5490-12481-00</td>
<td>OPTO1</td>
<td>Opto Inter Lg. 10mA</td>
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A-15340
Motor EMI w/Brake PCB Assembly

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<tr>
<td>5551-09822-00</td>
<td>L1, L2</td>
<td>Inductor, 4.7MH3AMP</td>
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<tr>
<td>5791-12273-03</td>
<td>J1</td>
<td>Connector, 3-pin Header Str Sq.</td>
</tr>
<tr>
<td>5791-12273-02</td>
<td>J2</td>
<td>Connector, 2-pin Header Str Sq.</td>
</tr>
<tr>
<td>5070-09054-00</td>
<td>D1</td>
<td>Diode, 1N4004 1.0A.</td>
</tr>
<tr>
<td>5010-08998-00</td>
<td>R1</td>
<td>Resistor, 2.2KΩ, 1/4w, 5%</td>
</tr>
<tr>
<td>5162-12635-00</td>
<td>Q1</td>
<td>Transistor TIP 102</td>
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## A-20439
### Shooter Lane Auto Kicker Assembly

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<th>Item</th>
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<tr>
<td>1</td>
<td>04-10210.3</td>
<td>Kicker Crank Assembly</td>
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<td>2</td>
<td>04-10211.3</td>
<td>Coil Mounting Bracket</td>
</tr>
<tr>
<td>3</td>
<td>A-12390</td>
<td>Flipper Stop Bracket Assembly</td>
</tr>
<tr>
<td>4</td>
<td>4010-01066-06</td>
<td>Cap Screw, #10 x 3/8&quot;</td>
</tr>
<tr>
<td>5</td>
<td>4701-00004-00</td>
<td>Lock Washer #10 Split</td>
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<tr>
<td>6</td>
<td>AE-23-800</td>
<td>Coil Assembly</td>
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<tr>
<td>7</td>
<td>03-7066</td>
<td>Coil Tubing</td>
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<td>8</td>
<td>01-8413</td>
<td>Coil Mounting Bracket</td>
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<tr>
<td>9</td>
<td>10-128</td>
<td>Spring</td>
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<tr>
<td>10</td>
<td>A-15847</td>
<td>Flipper Link Assembly</td>
</tr>
<tr>
<td>11</td>
<td>4700-00104-00</td>
<td>Flat Washer, 23/64 x 1/2 x 16ga.</td>
</tr>
<tr>
<td>12</td>
<td>12-6227</td>
<td>Hairpin Clip</td>
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<td>13</td>
<td>4006-01003-05</td>
<td>Mach. Screw, 6-32 x 5/16&quot;</td>
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<tr>
<td>14</td>
<td>01-8600</td>
<td>Insulator</td>
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<td>5647-12693-62</td>
<td>Mini-Micro Switch</td>
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<td>16</td>
<td>4002-01105-08</td>
<td>Mach. Screw, #2-56 x 1/2&quot;</td>
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<td>17</td>
<td>H-16437</td>
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<td>18</td>
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<td>Diode1N4004</td>
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<td>19</td>
<td>H-19523</td>
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### A-14876-R-5
### Flipper Assembly

<table>
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<tbody>
<tr>
<td>1</td>
<td>A-14877-R</td>
<td>Flipper Base Assembly, Right</td>
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<td>SW-1A-194</td>
<td>Switch Assembly</td>
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<tr>
<td>3</td>
<td>4701-00002-00</td>
<td>Lockwasher #6 Split</td>
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</tr>
<tr>
<td>4</td>
<td>4105-01019-10</td>
<td>Sh. Metal Screw, #5 x 5/8&quot;</td>
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<tr>
<td>5</td>
<td>4008-01079-05</td>
<td>Mach. Screw, 8-32 x 5/16&quot;</td>
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<tr>
<td>6</td>
<td>4701-00003-00</td>
<td>Lockwasher #8 Split</td>
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<tr>
<td>7</td>
<td>01-9375</td>
<td>Switch Mounting Bracket</td>
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</tr>
<tr>
<td>8</td>
<td>20-6516</td>
<td>Speednut, Tinnerman</td>
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</tr>
<tr>
<td>9</td>
<td>4010-01066-06</td>
<td>Cap Screw, 10-32 x 3/8&quot;</td>
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<tr>
<td>10</td>
<td>4701-00004-00</td>
<td>Lockwasher #10 Split</td>
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<tr>
<td>11</td>
<td>A-12390</td>
<td>Flipper Stop Assembly</td>
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<tr>
<td>12</td>
<td>FL-15411</td>
<td>Flipper Coil, Orange</td>
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<td>13</td>
<td>01-7695</td>
<td>Solenoid Bracket</td>
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<td>Mach. Screw, 6-32 x 1/4&quot;</td>
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<td>15</td>
<td>10-364</td>
<td>Spring</td>
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<tr>
<td>16</td>
<td>4006-01005-06</td>
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<td>Nut 6-32 Hex.</td>
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<tr>
<td>18</td>
<td>A-15848-R</td>
<td>Crank Link Assembly, Right</td>
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</tr>
<tr>
<td></td>
<td>a) A-17050-R</td>
<td>Flipper Crank Assembly, Right</td>
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</tr>
<tr>
<td></td>
<td>b) A-15847</td>
<td>Flipper Link Assembly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) 02-4676</td>
<td>Link Spacer Bushing</td>
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<tr>
<td></td>
<td>d) 4010-01086-14</td>
<td>Cap Screw, 10-32 x 7/8&quot;</td>
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<tr>
<td></td>
<td>e) 4700-00023-00</td>
<td>Flat Washer, 5/8 x 13/64 x 16ga.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>f) 4701-00004-00</td>
<td>Lockwasher #10 Split</td>
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</tr>
<tr>
<td></td>
<td>g) 4410-01132-00</td>
<td>Nut 10-32 ESN</td>
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<tr>
<td></td>
<td>19 23-6577</td>
<td>Bumper Plug, 5/8&quot;</td>
<td></td>
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<tr>
<td></td>
<td>20 03-7568</td>
<td>Flipper Bushing</td>
<td></td>
</tr>
</tbody>
</table>

### Associated Parts:
(Not Shown)
- Flipper Rubber Ring, Red
- Flipper Bat w/Shaft

### Flipper Notes...

1. Each Flipper Assembly is mounted beneath the playfield, in conjunction with the Plastic Flipper & Shaft, and Flipper Rubber on the upper side of the playfield.
2. With the flipper, in the non-activated position, the E.O.S. Switch contacts must have a gap of .062 (±.015) inch. When flipper is activated switch must close.
3. Any adjustment of the E.O.S. switch must be made at a minimum distance of 0.25 inch from the switch body.
4. Longer blade of E.O.S. switch must be made straight. Gap adjustment is done by adjusting shorter blade.
5. All moving elements of the assembly must operate freely without any evidence of binding.
6. Apply Loctite™ 245 when reattaching screws to the Flipper Stop Assembly, the Solenoid Bracket, and the Flipper Bushing.
A-15849-L-4
Flipper Assembly

<table>
<thead>
<tr>
<th>Item</th>
<th>Part Number</th>
<th>Description</th>
<th>Item</th>
<th>Part Number</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>B-13104-L</td>
<td>Flipper Base Assembly, Left</td>
<td>18</td>
<td>A-15848-L</td>
<td>Crank Link Assembly, Left</td>
</tr>
<tr>
<td>2</td>
<td>SW-1A-194</td>
<td>Switch Assembly</td>
<td>a)</td>
<td>A-17050-L</td>
<td>Flipper Crank Assembly, Left</td>
</tr>
<tr>
<td>3</td>
<td>4701-00002-00</td>
<td>Lockwasher #6 Split</td>
<td>b)</td>
<td>A-15847</td>
<td>Flipper Link Assembly</td>
</tr>
<tr>
<td>4</td>
<td>4105-01019-10</td>
<td>Sh. Metal Screw, #5 x 5/8&quot;</td>
<td>c)</td>
<td>02-4676</td>
<td>Link Spacer Bushing</td>
</tr>
<tr>
<td>5</td>
<td>4008-01079-05</td>
<td>Mach. Screw, 8-32 x 5/16&quot;</td>
<td>d)</td>
<td>4010-01086-14</td>
<td>Cap Screw, 10-32 x 7/8&quot;</td>
</tr>
<tr>
<td>6</td>
<td>4701-00003-00</td>
<td>Lockwasher #8 Split</td>
<td>e)</td>
<td>4700-00023-00</td>
<td>Flat Washer, 5/8 x 13/64 x 16ga.</td>
</tr>
<tr>
<td>7</td>
<td>01-9375</td>
<td>Switch Mounting Bracket</td>
<td>f)</td>
<td>4701-00004-00</td>
<td>Lockwasher #10 Split</td>
</tr>
<tr>
<td>8</td>
<td>20-6516</td>
<td>Speednut, Tinnerman</td>
<td>g)</td>
<td>4410-01132-00</td>
<td>Nut 10-32 ESN</td>
</tr>
<tr>
<td>9</td>
<td>4010-01066-06</td>
<td>Cap Screw, 10-32 x 3/8&quot;</td>
<td>19</td>
<td>23-6577</td>
<td>Bumper Plug, 5/8&quot;</td>
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<tr>
<td>10</td>
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<tr>
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<td>A-12360</td>
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<td>FL-15411</td>
<td>Flipper Link Assembly</td>
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<td>a)</td>
<td>03-7066-5</td>
<td>Coil Tubing</td>
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<td>02-4676</td>
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<td>4010-01086-14</td>
<td>Cap Screw, 10-32 x 7/8&quot;</td>
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<td>4700-00023-00</td>
<td>Flat Washer, 5/8 x 13/64 x 16ga.</td>
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<td>4701-00004-00</td>
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Associated Parts:
(Not Shown)

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<td>Flipper Rubber Ring, Red</td>
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<td>22</td>
<td>20-10110-5</td>
<td>Flipper Bat w/Shaft (White)</td>
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A-17811
Kicker Arm (Slingshot) Assembly

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<td>Kicker Crank Assembly</td>
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<td>12-6227</td>
<td>Hairpin Clip</td>
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<td>FW, 17/64 x 1/2 x 15ga.</td>
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<td>03-8085</td>
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<td>20-8716-5</td>
<td>Roll Pin, 1/8 x 7/16&quot;</td>
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<td>8b</td>
<td></td>
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<tr>
<td>8c</td>
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<td>8d</td>
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Associated Parts for Right & Left Kickers:

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<td>Coil &amp; Bracket Assembly, Left</td>
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<td>Spring</td>
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B-9362-R-3  | Coil & Bracket Assembly, Right  

a) A-17808  | Bracket & Stop Assembly  
b) 01-8-508-S  | Coil Retaining Bracket  
c) 4006-01017-06  | Mach. Screw, 6-32 x 3/8"  
d) 4406-01119-00  | Nut, 6-32 ESN  
e) AE-26-1200  | Coil Assembly  
f) 03-7066  | Coil Tubing  

A-19963-1
Ball Trough Assembly Complete

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<th>Item</th>
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<th>Description</th>
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<td>A-16809-2</td>
<td>Ball Trough Welded Assy.</td>
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<td>4408-01119-00</td>
<td>Nut 8-32 ESN</td>
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<td>Ball Trough Front</td>
<td>13</td>
<td>4008-01017-06</td>
<td>Mach. Screw, 8-32 x 3/8&quot;</td>
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<td>3</td>
<td>A-6306-2</td>
<td>Bell Armature Assembly</td>
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<td>23-6702</td>
<td>Bumper Plug</td>
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<td>AE-26-1500</td>
<td>Coil Assembly</td>
<td>15</td>
<td>A-18617-1</td>
<td>Trough IRED LED PCB Assembly</td>
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<td>01-8-508-T</td>
<td>Solenoid Assembly</td>
<td>16</td>
<td>A-18618-1</td>
<td>Trough IRED Transistor PCB Assy.</td>
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<td>4006-01003-10</td>
<td>Mach. Screw, 6-32 x 5/8&quot; SEMS</td>
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<td>Spring</td>
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<td>23-6626</td>
<td>Rubber Grommet</td>
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<td>8</td>
<td>23-6420</td>
<td>Rubber Grommet</td>
<td>19</td>
<td>4700-00004-00</td>
<td>Flat Washer, 9/64 x 7/16 x 21ga.</td>
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<td>9</td>
<td>03-8523</td>
<td>Insulator</td>
<td>20</td>
<td>02-4975</td>
<td>Bushing</td>
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<td>01-1158</td>
<td>Coil Mounting Bracket</td>
<td>21</td>
<td>H-19523</td>
<td>Mini Solenoid Cable</td>
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<td>11</td>
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<td>Mach. Screw, 8-32 x 5/16&quot;</td>
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# B-9414-3
## Jet Bumper Assembly

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<td>03-6009-A5</td>
<td>Bumper Base, White</td>
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<td>3</td>
<td>03-6035-4</td>
<td>Bumper Wafer, Red</td>
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<td>4</td>
<td>03-7443-5</td>
<td>Bumper Body, White</td>
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<td>5</td>
<td>10-7</td>
<td>Spring</td>
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<td>6</td>
<td>24-8776</td>
<td>Socket-Wedge Base</td>
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<td>7</td>
<td>24-8768</td>
<td>Bulb #555(6.3v., 0.25A.)</td>
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**Associated Parts:**

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<td>03-8254-9</td>
<td>Jet Bumper Cap, Tr. Red (3)</td>
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# A-9415-2
## Jet Bumper Coil Assembly

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<td>Coil Retaining Bracket</td>
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<td>3</td>
<td>01-5492</td>
<td>Armature Link, Steel</td>
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<td>4</td>
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<td>Armature Link, Bakeline</td>
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<td>Coil Plunger</td>
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<td>Coil Assembly</td>
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<tr>
<td>8</td>
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<td>Mach. Screw, 6-32 x 1/4&quot;</td>
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<td>9</td>
<td>03-7066</td>
<td>Coil Tubing</td>
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### Associated Parts:
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<td>B-12030-2</td>
<td>Leaf Switch Assembly</td>
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<td>A-16443</td>
<td>Switch &amp; Diode Assembly</td>
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<td>b)</td>
<td>01-1168</td>
<td>Switch Mounting Bracket</td>
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<td>c)</td>
<td>01-3670</td>
<td>Switch Plate</td>
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<td>d)</td>
<td>03-7395</td>
<td>Switch Actuator</td>
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<td>e)</td>
<td>4005-01003-12</td>
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<td>f)</td>
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A-15361
Tilt Mechanism Assembly

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<td>Bracket, Tilt Lower</td>
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<td>12-6231</td>
<td>Plumb Bob Wire</td>
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Associated Parts:

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B-10686-1
Knocker Assembly

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### A-17932
#### Disappearing Post Assembly

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<td>4</td>
<td>AE-27-1200</td>
<td>Coil Sub-Assembly</td>
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### A-20435
#### Eject Assembly

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A-20488
Ball Popper Assembly

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<td>Photo Transistor Assembly-RTV</td>
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A-19543
Ball Popper Assembly

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<td>A-15821</td>
<td>Armature Sub-Assembly</td>
<td>14</td>
<td>4008-01017-05</td>
<td>Mach. Screw, 8-32 x 5/16&quot;</td>
</tr>
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<td>4</td>
<td>AE-26-1200</td>
<td>Coil Assembly Complete</td>
<td>15</td>
<td>4008-01021-07</td>
<td>Mach. Screw, 8-32 x 7/16&quot;</td>
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<td>A-16248</td>
<td>Post Lift Ramp Sub-Assy.</td>
<td>16</td>
<td>4700-00089-00</td>
<td>Flat Washer, 11/64 x 7/16 x 16ga.</td>
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<tr>
<td>6</td>
<td>SM1-28-900-DC</td>
<td>Coil Assembly</td>
<td>17</td>
<td>4701-00003-00</td>
<td>Lockwasher #8 Split</td>
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<tr>
<td>7</td>
<td>01-9794</td>
<td>Coil Retain Bracket Assy.</td>
<td>18</td>
<td>5647-12693-36</td>
<td>Mini Switch</td>
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<td>8</td>
<td>01-8240</td>
<td>Nut Plate</td>
<td>19</td>
<td>20-8712-43</td>
<td>&quot;E&quot;-Ring, 7/16&quot; Shaft</td>
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<td>9</td>
<td>01-8600</td>
<td>Insulator</td>
<td>20</td>
<td>5070-09054-00</td>
<td>Diode 1N4004</td>
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<td>01-14075</td>
<td>Reels Mounting Frame</td>
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<td>Mach. Screw, 4-40 x 1/4&quot; (12)</td>
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<td>Motor Mounting Bracket (3)</td>
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<td>Mach. Screw, 6-32 x 1/4&quot; (6)</td>
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<td>Mach. Screw, 6-32 x 7/8&quot; (12)</td>
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<td>4</td>
<td>14-8024</td>
<td>Stepper Motor, 1.8 (3)</td>
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<td>Set Screw, 6-32 x 1/4&quot; (3)</td>
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<td>A-20507</td>
<td>Socket &amp; Bulb w/Diode (3)</td>
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<td>4008-01003-04</td>
<td>Mach. Screw, 8-32 x 1/4&quot; (14)</td>
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<td>6</td>
<td>A-19745-1</td>
<td>Stepper Motor PCB w/Spacers (3)</td>
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<td>Mach. Screw, 8-32 x 3/16&quot; (3)</td>
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<td>*7</td>
<td>31-2517-3A</td>
<td>Decal, Left</td>
<td>17</td>
<td>A-20511</td>
<td>Reel Opto PCB Assembly (3)</td>
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<td>*8</td>
<td>31-2517-1A</td>
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<td>03-7655-8</td>
<td>Wire Harness Clip, 1/2&quot;</td>
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<td>*9</td>
<td>31-2517-2A</td>
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<td>**9</td>
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<td>10</td>
<td>03-9454</td>
<td>Tie-Wrap - Nylon 3-7/8&quot; (10)</td>
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<td>03-7655-4</td>
<td>Wire Harness Clip, 1/4&quot; (4)</td>
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* Not available for individual sale. Order Decal Set 31-2517.
** Not Shown.
## A-20522 Back Panel Assembly

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<td>11-831-50044.2</td>
<td>Back Panel Assembly</td>
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<td>31-2518-6</td>
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<td>01-12569</td>
<td>Gusset Bracket</td>
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<td>4</td>
<td>4008-01168-12</td>
<td>Mach. Screw, 8-32 x ¾”</td>
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* Not available for individual sale. Order Decal Set 31-2518.
### A-20574
#### Telephone Assembly

**Item** | **Part Number** | **Description** |
--- | --- | --- |
1 | 03-9443.1 | Telephone |
2 | 4700-00011-00 | Flat Washer, 11/64 x 7/16 x 16ga. |
3 | 31-2509-26A | Playfield Plastic |
4 | 4006-01027-10 | Mach. Screw, #6-32 x 5/8" |
5 | 4406-01119-00 | Nut 6-32 ESNA |
6 | 01-14134.1 | Telephone Mounting Bracket |
7 | 4808-01175-08 | EP #8 x 1/2" |
8 | A-17802 | Bulb & Socket |
9 | 4006-01113-04 | Mach. Screw, 6-32 x 1/2" |
10 | H-18219-1 | Cable |

### A-20531-2
#### Roulette Assembly

**Item** | **Part Number** | **Description** |
--- | --- | --- |
1 | 03-9429 | Roulette |
2 | 31-2519-1 | Roulette Decal |
3 | 31-2509-11 | Playfield Plastic |
4 | 31-2509-16 | Playfield Plastic |
5 | 01-9878 | Switch Mounting Bracket |
6 | 07-6688-18N | Rivet, 1/8 x 3/16" |
7 | 4106-01114-08 | TCS #6 x ½" |
8 | 07-6688-19N | Rivet, 1/8 x 7/32" |
9 | 4700-00003-00 | Flat Washer, 1/8x9/32x1/32" |
## A-20483
### Motor Bracket Assembly

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<td>Motor Cam Assembly</td>
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<td>3</td>
<td>14-8026</td>
<td>3-Bank Target Motor</td>
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<td>01-8600</td>
<td>Insulator (2)</td>
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<td>5</td>
<td>4002-01105-07</td>
<td>Mach. Screw, 2-56 x 7/16&quot; (4)</td>
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<td>4010-01007-16</td>
<td>Mach. Screw, 10-32 x 1&quot; (2)</td>
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<td>4008-01041-04</td>
<td>Mach. Screw, 8-32 x 1/4&quot; (4)</td>
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<td>4008-01083-04</td>
<td>Set Screw, 8-32 x 1/4&quot;</td>
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<td>5070-09054-00</td>
<td>Diode 1N4004, 1.0Amp (2)</td>
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<td>Sub Miniature Switch</td>
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2-30
## A-20512

### 3-Position Moving Target Assembly

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<td>Retainer Carrier (2)</td>
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<td>01-8494</td>
<td>Support Bracket (2)</td>
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<td>3</td>
<td>4106-01001-10</td>
<td>Sh. Metal Screw, #6 x 5/8&quot; (4)</td>
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<td>4</td>
<td>23-6534-9</td>
<td>Edge Protector</td>
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<td>5</td>
<td>01-3670-1</td>
<td>Switch Plate - Flat (3)</td>
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<td>6</td>
<td>4004-01003-12</td>
<td>Mach. Screw, 4-40 x 3/4&quot; (6)</td>
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<td>4404-01119-00</td>
<td>Nut 4-40 ESNA (6)</td>
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<td>03-8235</td>
<td>Target Guide</td>
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<td>03-8236</td>
<td>Carrier Target</td>
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<td>SW-1A-197-5</td>
<td>Stationary Target Assembly</td>
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<td>SW-1A-198-5</td>
<td>Stationary Target Assembly (2)</td>
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<td>12</td>
<td>17-1116-3</td>
<td>Cut Wire 3&quot;</td>
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<td>14</td>
<td>03-9454</td>
<td>Cable Tie</td>
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Playfield Slide Mechanism Assembly

(Left Assembly Shown)

A-17749.1-1
Playfield Slide Mechanism
(Left Assembly)

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<td>01-12304-1</td>
<td>Slide, Left</td>
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<td>2</td>
<td>01-10664.1</td>
<td>Lever Retainer</td>
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<td>3</td>
<td>02-4615</td>
<td>Shoulder Rivet</td>
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Associated Part:

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<td>10-439</td>
<td>Spring</td>
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A-17749.1-2
Playfield Slide Mechanism
(Right Assembly)

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<td>01-10664.1</td>
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Associated Part:

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B-12445-7
Ball Shooter Assembly

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<td>Ball Shooter Rod</td>
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<td>10-149</td>
<td>Outer Spring</td>
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<td>4700-00051-00</td>
<td>Flat Washer, 25/64 x 5/8 x 16ga.</td>
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<td>21-6645-1</td>
<td>Shooter Housing</td>
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<td>03-7357</td>
<td>Shooter Sleeve</td>
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<td>10-148-7</td>
<td>Power Spring, White</td>
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<td>7</td>
<td>20-8712-37</td>
<td>Ball Shooter Tip</td>
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Associated Assemblies:
(Not Shown)
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<td>01-3535</td>
<td>Mounting Plate</td>
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<td>4010-01006-08</td>
<td>Mach. Screw, 10-32 x ½&quot;</td>
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2-33
### Universal Power Interface Assembly

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<td>1</td>
<td>04-10292</td>
<td>Power Control Chassis Box</td>
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<td>H-17542</td>
<td>Ground Jumper Grn/Yel Cable</td>
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<td>4406-01128-00</td>
<td>Nut #6-32 KEPS (3)</td>
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<td>5797-13940-01</td>
<td>Jumper Cable</td>
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<td>Switch Mounting Plate Assembly</td>
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<td>Insulator, Thermistor</td>
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<td>5642-13935-00</td>
<td>Power Switch</td>
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<td>01-12299</td>
<td>Insulator, Terminal Strip</td>
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<td>5733-14734-00</td>
<td>Fuse Holder Panel (5x20mm)</td>
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<td>#18 Vinyl Fngs</td>
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<td>5851-13867-00</td>
<td>Outlet-IEC Conn. 237 Socket</td>
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<td>Terminal Strip 3-CKT 2-Mtg.</td>
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<td>Jumper Cable, Transformer Prog.</td>
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<td>Ty-Wrap Nylon</td>
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<td>Boot w/9-32 Dia. Hole</td>
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<td>Jumper Cable Neutral Sw/1FC</td>
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<td>Line Filter w/IEC Connector</td>
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<td>Hot Jumper Black Cable</td>
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<td>Jumper Switch/Fuse Black Cable</td>
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**Diagram:**
- **Part 1:** Item 1
- **Part 2:** Item 2
- **Part 3:** Item 3
- **Part 4:** Item 4
- **Part 5:** Item 5
- **Part 6:** Item 6
- **Part 7:** Item 7
- **Part 8:** Item 8
- **Part 9:** Item 9
- **Part 10:** Item 10
- **Part 11:** Item 11
- **Part 12:** Item 12
- **Part 13:** Item 13
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<th>VOLTAGE PROGRAMMING JUMP CABLE</th>
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2-35
### Unique Game Assemblies

#### Backbox
- A-16917-50044 WPC Sound Board Assy.
- 04-10012-50044 Backbox Assembly

#### Playfield (continued)
- 01-14036 Ball Guide #3
- 01-14039 Ball Guide #6
- 01-14044 Ball Guide #11
- 01-14053 Plate Nut
- 01-14064 Ramp Support Bracket
- 01-14087 Ball Deflector
- 01-14117 Back Panel Bracket
- 02-4250-23 M-F Spacer 6-32 x 1-7/16
- 02-4765-21 Post, 10-32 x 3.88”
- 02-5049-10 F-F Spacer 8-32 x 2.75”
- 02-5049-6 F-F Spacer 8-32 x 1.62”
- 02-5049-8 F-F Spacer 8-32 x 1.38”
- 02-5049-9 F-F Spacer 8-32 x 2.56”
- 02-5217 Pin Pivot Ramp
- 04-10241.1 Hood
- 04-10262.1 Ball Guide #2
- 04-10263 Ball Guide #4
- 04-10264 Ball Guide #5
- 04-10267 Ball Guide #12
- 04-10283 Decal & Window Assembly
- 11-1301-1A,-2,-3 Wood Rail
- 12-7305 Ball Guide Wireform
- 31-2509-1 Playfield Plastic Set
- 31-2516-1A Scoop Decal
- 31-2516-2 Center Ramp Decal
- 31-2516-4 Main Ramp Decal
- 31-2516-5 Main Ramp Decal
- 31-2516-6 Main Ramp Decal
- 31-2517-1A Left Reel Decal
- 31-2517-2A Center Reel Decal
- 31-2517-3A Right Reel Decal
- 31-2518-1 Hood Decal
- 31-2518-2 Hood Decal
- 31-2518-3 Ramp Decal
- 31-2518-4 Ramp Decal
- 31-2518-5 Roulette Bracket Decal
- 31-2518-6 Back Panel Decal
- 31-2519-1 Roulette Wheel Decal
- 31-2520-1 Target Decal
- 31-2520-2 Target Decal
- 31-2528 Playfield Plastic
- 31-2539 Playfield Plastic

#### Cabinet
- H-20599 Cabinet Switch/Lamp Cable
- 11-1303 Wood Cabinet

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**Note:** The document appears to be a part of a game assembly guide, detailing various components and their placements in a game, such as backboxes, playfields, and cabinets. The text is listed in a tabular format with columns for the part numbers and descriptions, along with some additional notes on specific configurations and accessories.
## Posts

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**NOT SHOWN:**

- A-13204-50044 Bottom Arch Assembly
- A-13205-50044 Bottom Arch Assembly
- A-17812-2 Cable Mounting Bracket ½"*
- A-17812-4 Cable Mounting Bracket 1½*
- A-20419 Under Playfield Trough Assy
- A-20487 Bottom Trough Assembly
- A-20491 Trough Assembly
- A-20660 Playfield Plastic Assembly
- 03-9459-1 Jet Bumper Area Mylar
- 03-9459-2 Full Playfield Mylar
- 03-9459-3 Ramp Drop Area Mylar
- 36-50044 Mounted Playfield

**MISCELLANEOUS:**

- *Located under playfield.
- ** Not Shown
- †The WHO DUNNIT hardcoat playfield does not require a full mylar. However, mylars can be purchased through your local Bally Distributor.
Upper Playfield Parts
# Lower Playfield Parts

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*Underside of Playfield, Viewed in Raised Position*
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LAMPMATRIX

Yellow (B+)

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Lamp Locations

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J1XX = Power Driver Board

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*Not Shown

24-8768 = #555 Bulb
24-6549 = #44 Bulb
### SWITCH MATRIX

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**Switch Locations**

- **Item No.**
- **Switch Part**
- **Description**

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- **Switch Grounded Switches**
- **Item No.**
- **Switch Part**
- **Description**

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*Not Shown
† Located Under Playfield
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*Not Shown
† Located Under Playfield
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<td>Q82</td>
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<td>Viol-Brown</td>
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<td>Q80</td>
<td>J130-2</td>
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<td>J907-8,9</td>
<td>Q5</td>
<td>J802-1</td>
<td>Orange-Grey</td>
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### General Illumination

<table>
<thead>
<tr>
<th>Flipper Circuits</th>
<th>Voltage Connections Playfield</th>
<th>Drive Transistors Power Hold</th>
<th>Drive Connectors Playfield</th>
<th>Drive Wire Colors Power Hold</th>
<th>Coil Part No.</th>
<th>Coil Color</th>
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<tr>
<td>01 Left Playfield</td>
<td>G.I. J121-1</td>
<td>Q18</td>
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<td>Q14</td>
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### Voltage Connections

- **Lwr. Rt. Power**
- **Lwr. Lt. Hold**
- **Upr. Lt. Hold**
- **Upr. Lt. Power**

### Drive Transistors

- **J907-1 (Red-Gry)**
- **J907-2 (Red-Gry)**
- **J907-4 (Red-Blu)**
- **J907-6 (Red-Vio)**

### Drive Connectors

- **J802-15 (Yel-Grn)**
- **J902-9 (Yel-Blu)**
- **J902-7 (Org-Blu)**
- **J802-4 (Org-Vio)**

### Drive Wire Colors

- **J802-1 (Or-Grn)**
- **J902-1 (Org-Blu)**
- **J902-3 (Blk-Yel)**
- **J902-2 (Brn-Yel)**

### Color Reference

- **---**
- **#44**
- **#555**

---

## SOLENOID/FLASHER LOCATIONS

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<th>Item Coil/ Assy. No.</th>
<th>Flasher No.</th>
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<td><strong>02</strong></td>
<td>AE-23-800</td>
<td>Plunger</td>
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<td>AE-27-1200</td>
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<td>AE-24-900</td>
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<td>AE-26-1200</td>
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<td>AE-23-800</td>
<td>&quot;Knocker&quot;</td>
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<td>AE-23-800</td>
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<td>AE-26-1200</td>
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**NOT SHOWN**
### Solenoid/Flasher Locations (continued)

#### General Illumination Circuits

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<td>G.I. String 2</td>
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<td>#44</td>
<td>G.I. String 3</td>
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#### Flipper Coils

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<td>Org</td>
<td>A-14876-R-5</td>
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<td>Org</td>
<td>A-15849-L-4</td>
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<table>
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<td>24-8704</td>
<td>#89 bulb</td>
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<td>24-8768</td>
<td>#555 bulb</td>
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<tr>
<td>24-8802</td>
<td>#906 bulb</td>
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#### Coil/Assy. No.

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<td>A-20425</td>
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<td>A-20425</td>
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<td>Org</td>
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<td>A-15849-L-4 Lwr L Flipper</td>
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### Description

- Lwr R Flasher (1)
- Motor 3-Bank
- Left Slot B
- Left Slot A
- Center Slot B
- Center Slot A
- Right Slot B
- Right Slot A
- Up Down Post

### Bulb No.

- 24-6549 = #44 bulb
- 24-8704 = #89 bulb
- 24-8768 = #555 bulb
- 24-8802 = #906 bulb
# Ramps

<table>
<thead>
<tr>
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<td>Photo Transistor Assy. (2)</td>
<td>Photo Transistor Assy. (2)</td>
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<td></td>
<td>*b) A-16909</td>
<td>LED Assembly (2)</td>
<td>LED Assembly (2)</td>
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<td>2</td>
<td>A-20421</td>
<td>Right Ramp Assembly</td>
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<td>*a) A-20659</td>
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<td>Reflector/Light &amp; Cable Assy.</td>
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<td>Center Ramp Assembly</td>
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<td>*a) 5647-12693-21</td>
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<td>Switch Sub Miniature (3)</td>
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* Not Shown.
SECTION THREE

GAME WIRING
AND SCHEMATICS

CONNECTOR & COMPONENT IDENTIFICATION

Each plug or jack (except the Sound Board and Dot Matrix Display/Driver Board) receives a number that identifies the circuit board and position on that board that it connects to. J-designations refer to the male part of a connector. P-designations refer to the female part of a connector. For example, J101 designates jack 1 of board 1 (a Power Driver Board jack); P206 designates plug 6 of board 2 (a CPU Board plug). Identifying the specific pin number of a connector involves a hyphen, which separates the pin number from the plug or jack designation. For example, J101-3 refers to pin 3 of jack 1 on board 1.

Other game components may also have similar numbers to clarify their locations or related circuits. For example, F501 refers to a fuse located on the Sound Board.

Prefix number for the WPC circuit boards are as listed below.

<table>
<thead>
<tr>
<th>Prefix Number</th>
<th>Board Description</th>
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<tr>
<td>1</td>
<td>Power Driver Board</td>
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<tr>
<td>2</td>
<td>CPU Board</td>
</tr>
<tr>
<td>6</td>
<td>Dot Matrix Controller</td>
</tr>
<tr>
<td>9</td>
<td>Fliptronic II Controller Board</td>
</tr>
</tbody>
</table>

P.C. BOARD LEGEND

J1XX = Power Driver Board
J2XX = CPU Board
J3XX = Dot Matrix Controller
J4XX = Fliptronic II Board

The Sound Board and the Dot Matrix Display/Driver Board do not have an identification number.

Schematics for standard WPC backbox boards are found in the WPC Schematics Manual. Playfield, cabinet, and all other backbox board schematics are found in this section.
The microprocessor is constantly strobing the column side of the switch. When point "A" on the column circuit toggles low, the column side is active.

When a switch closes, the row side of the circuit activates. The "+" input to the LM339 drops below +5V causing its output to go low. Corresponding row and column switches must be low at the same time for the switch to be considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row is inactive.
The dedicated switches operate similar to switches in the matrix except that instead of a column circuit there is a direct tie to ground. Therefore, the column side is constantly active (low).

When a switch closes the row side (dedicated input) of the circuit activates. The "+" input to the LM339 drops below +5V causing its output to go low. Since the row circuit (dedicated input) is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is about +5V, its output is high and the row is inactive.
The processor sends a signal to the column circuit, causing the output of the ULN-2803 to toggle. When point "A" drops low, the TIP107 transistor conducts and point "B" changes to a high state. At the same time the processor drives the input of the 74LS74 low, causing a high at output "F". A high state at the base of TIP102 causes the transistor to conduct, bringing the row circuit to ground and turning the lamp on.

The processor changes the input of the 74LS74 to a high state to turn the lamp off.

In over current conditions the lamps are shut off through the comparator. If the voltage at the negative input of the LM330 rises above 1.4V the output changes to a low, which is fed back to the 74LS74 and shuts the row circuit off.
### SOLENOID/FLASHER TABLE

<table>
<thead>
<tr>
<th>Sol. No.</th>
<th>Function</th>
<th>Solenoid Type</th>
<th>Voltage Connections</th>
<th>Drive Xister</th>
<th>Drive Connections</th>
<th>Drive Wire Color</th>
<th>Solenoid Part number</th>
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<td>Backbox</td>
<td>Cabinet</td>
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<td>028 J107-6</td>
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<tr>
<td>13</td>
<td>Right Jet</td>
<td>Low Power</td>
<td>J107-3</td>
<td>Q50</td>
<td>J127-6</td>
<td>Bln-Grn</td>
<td>AE-26-1500</td>
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<td>14</td>
<td>Phone Flasher</td>
<td>Low Power</td>
<td>J107-6</td>
<td>Q48</td>
<td>J127-7</td>
<td>Bln-Blu</td>
<td>#906 (1)</td>
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<tr>
<td>15</td>
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<td>J107-3</td>
<td>Q48</td>
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<td>16</td>
<td>Ramp Up</td>
<td>Low Power</td>
<td>J107-3</td>
<td>Q44</td>
<td>J127-9</td>
<td>Bln-Gry</td>
<td>SM1-28-900-DC</td>
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<td>17</td>
<td>Back Flasher</td>
<td>Flasher</td>
<td>J107-6</td>
<td>Q42</td>
<td>J126-1</td>
<td>Blk-Bln</td>
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<td>18</td>
<td>Autofire Flasher</td>
<td>Flasher</td>
<td>J107-6</td>
<td>Q40</td>
<td>J126-2</td>
<td>Blk-Red</td>
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<td>19</td>
<td>Lower Left Flasher</td>
<td>Flasher</td>
<td>J107-6</td>
<td>Q38</td>
<td>J126-3</td>
<td>Blk-Org</td>
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<td>20</td>
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<td>Flasher</td>
<td>J107-6</td>
<td>Q36</td>
<td>J126-4</td>
<td>Blk-Red</td>
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<td>Flasher</td>
<td>J107-6</td>
<td>Q36</td>
<td>J126-4</td>
<td>Blk-Red</td>
<td>#906 (1)</td>
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<tr>
<td>22</td>
<td>Motor 3-Bank</td>
<td>Flasher</td>
<td>J116-2</td>
<td>Q30</td>
<td>J126-6</td>
<td>Blk-Red</td>
<td>#906 (1)</td>
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<tr>
<td>23</td>
<td>Left Slot B</td>
<td>Flasher</td>
<td>J116-2</td>
<td>Q34</td>
<td>J126-7</td>
<td>Blk-Blu</td>
<td>14-8024 12V</td>
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<td>24</td>
<td>Left Slot A</td>
<td>Flasher</td>
<td>J116-2</td>
<td>Q32</td>
<td>J126-8</td>
<td>Blk-Blu</td>
<td>14-8024 12V</td>
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<td>Center Slot B</td>
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<td>J116-2</td>
<td>Q26</td>
<td>J122-1</td>
<td>Blk-Bln</td>
<td>14-8024 12V</td>
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<tr>
<td>26</td>
<td>Center Slot A</td>
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<td>Q24</td>
<td>J122-2</td>
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<td>27</td>
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<td>J116-2</td>
<td>Q23</td>
<td>J122-3</td>
<td>Blk-Blu</td>
<td>14-8024 12V</td>
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<td>28</td>
<td>Right Slot A</td>
<td>Flasher</td>
<td>J116-2</td>
<td>Q20</td>
<td>J122-4</td>
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<td>14-8024 12V</td>
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<tr>
<td>29</td>
<td>Up Down Post</td>
<td>Low Power</td>
<td>J907-8</td>
<td>Q5</td>
<td>J902-1</td>
<td>Org-Gry</td>
<td>AE-27-1200</td>
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### General Illumination

<table>
<thead>
<tr>
<th>Sol No.</th>
<th>Function</th>
<th>Solenoid Type</th>
<th>Voltage Connections</th>
<th>Drive Xister</th>
<th>Drive Connections</th>
<th>Drive Wire Color</th>
<th>Solenoid Part number</th>
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<tr>
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<td>Playfield</td>
<td>Backbox</td>
<td>Cabinet</td>
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<td>Playfield</td>
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<td>01</td>
<td>Left Playfield</td>
<td>G.I.</td>
<td>J121-1</td>
<td>Q18</td>
<td>J121-7</td>
<td>Wht-Bln</td>
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<td>02</td>
<td>Right Playfield</td>
<td>G.I.</td>
<td>J121-2</td>
<td>Q16</td>
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<td>Back Playfield</td>
<td>G.I.</td>
<td>J121-3</td>
<td>Q16</td>
<td>J121-9</td>
<td>Wht-Org</td>
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<tr>
<td>04</td>
<td>Insert 1</td>
<td>G.I.</td>
<td>J120-5</td>
<td>Q16</td>
<td>J120-10</td>
<td>Wht-Gry</td>
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<td>05</td>
<td>Insert 2</td>
<td>G.I.</td>
<td>J120-6</td>
<td>Q16</td>
<td>J121-11</td>
<td>Wht-Blu</td>
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### Flipper Circuits

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<tr>
<th>Sol No.</th>
<th>Function</th>
<th>Solenoid Type</th>
<th>Voltage Connections</th>
<th>Drive Transistors</th>
<th>Drive Connectors</th>
<th>Drive Wire Colors</th>
<th>Coil Part No.</th>
<th>Coil Color</th>
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<tr>
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<td>Playfield</td>
<td>Power Hold</td>
<td>Playfield</td>
<td>Power Hold</td>
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<tr>
<td>29</td>
<td>Lower Right Flipper</td>
<td>Lwr. Rt Power</td>
<td>J907-1 (Red-Grn)</td>
<td>Q4</td>
<td>J902-13</td>
<td>Yel-Gry</td>
<td>FL-11541</td>
<td>ORANGE</td>
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<tr>
<td>30</td>
<td>Left Left Flipper</td>
<td>Lwr. Rt Hold</td>
<td>J907-1 (Red-Grn)</td>
<td>Q11</td>
<td>J902-11</td>
<td>Org-Gry</td>
<td>FL-11541</td>
<td>ORANGE</td>
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<td>31</td>
<td>Lower Left Flipper</td>
<td>Lwr. Lt Power</td>
<td>J907-4 (Red-Blu)</td>
<td>Q3</td>
<td>J902-9</td>
<td>Yel-Blu</td>
<td>FL-11541</td>
<td>ORANGE</td>
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<td>32</td>
<td>Upper Right Flipper</td>
<td>Lwr. Lt Hold</td>
<td>J907-6 (Red-Blu)</td>
<td>Q9</td>
<td>J902-7</td>
<td>Org-Blu</td>
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<td>NOT USED</td>
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<tr>
<td>33</td>
<td>Lower Right Flipper</td>
<td>Upr. Rt Power</td>
<td>J907-6 (Red-Blu)</td>
<td>Q2</td>
<td>J902-6</td>
<td>Yel-Vio</td>
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<td>NOT USED</td>
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<tr>
<td>34</td>
<td>Left Left Flipper</td>
<td>Upr. Lt Power</td>
<td>J907-8 (Red-Gry)</td>
<td>Q5</td>
<td>J902-3</td>
<td>Yel-Gry</td>
<td>SEE</td>
<td>ABOVE</td>
</tr>
<tr>
<td>35</td>
<td>Upper Right Flipper</td>
<td>Upr. Lt Hold</td>
<td>J907-8 (Red-Gry)</td>
<td>Q5</td>
<td>J902-1</td>
<td>Org-Gry</td>
<td>SEE</td>
<td>ABOVE</td>
</tr>
</tbody>
</table>

**J1xx=Power Driver Board, J9xx=Fliptronnic II Board, 24-6549=#44 bulb, 24-8704=#89 bulb, 24-8768=#555 bulb, 24-8802=#906 bulb**
High Power Solenoid Circuit

The microprocessor toggles the output of the 74LS374. When point "A" drops low, point "B" the collector of the 2N5401 transistor is high. A high at point "B" causes point "C" the collector of the TIP102 transistor, and point "D" the emitter of the TIP36 transistor to drop low. When point "D" is low the coil is grounded through the transistor and the coil turns On. The coil shuts Off when point "A" toggles high.

Low Power Solenoid Circuit

The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B" the collector of the 2N5401 transistor is driven high. A high at point "B" turns On the TIP102 transistor, and causes point "C" to drop low. When point "C" is low the coil is grounded through the transistor and the coil turns On. The coil shuts Off when point "A" toggles high.

3-8
Flashlamp Circuit

The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B" the collector of the 2N5401 transistor is high. Once point "B" is high, point "C" the collector of the TIP102 transistor is low. When point "C" is low the flashlamp is grounded through the transistor and the flashlamp turns On. When point "A" toggles high the circuit shuts Off.

Special (General Purpose) Solenoid Circuit

The microprocessor toggles the output of the 74LS374. When point "A" drops low, point "B" is high. A high at point "B" causes a low at point "C". When point "C" is low the coil/flashlamp is grounded through the transistor and the coil/flashlamp turns On. When point "A" toggles high the coil/flashlamp turns Off.

*Tieback Diode is not used for flashlamp circuit.
When point "A" toggles low, then points "B" and "C" are high. This turns On the triac and the desired general illumination string lights.
LED P.C.B. Assembly (transmitter)
A-16908

Photo Transistor P.C.B. Assembly (receiver)
A-16909

3-11
Flipper Opto P.C.B. Assembly
A-17316

Left Side Flipper Cabinet Opto Switch Board
J1-1 Black-Blue from Fliptronic II Board J905-5
J1-2 Blue-Gray from Fliptronic II Board J905-2
J1-3 Not Used
J1-4 Orange from Fliptronic II Board J905-6
J1-5 Key
J1-6 Gray-Yellow to Right Flipper Opto Board J1-6
J1-7 Gray-Yellow from Fliptronic II Board J118-2

Right Side Flipper Cabinet Opto Switch Board
J2-1 Black-Yellow from Fliptronic II Board J905-3
J2-2 Blue-Violet from Fliptronic II Board J905-1
J2-3 Orange from Fliptronic II Board J905-6
J2-4 Orange from Left Flipper Opto Board J1-4
J2-5 Key
J2-6 Gray-Yellow to Left Flipper Opto Board J1-6
J2-7 Not Used

3-12
Flipper Circuit Diagram

END-OF-STROKE SWITCHES

Yellow-Violet Power Q2
Orange-Violet Holding Q7
Yellow-Green Power Q4
Orange-Green Holding Q11
Yellow-Gray Power Q1
Orange-Gray Holding Q5
Yellow-Blue Power Q2
Orange-Blue Holding Q8

CABINET OPTO SWITCHES

Gray-Yellow +12V

POWER DRIVER BOARD

*NOTE: May be used as circuits other than flipper circuits.
The flipper switch circuits operate similar to the dedicated switch circuit. The circuits are active low and tied to ground through the switch.

When a switch closes the row side (dedicated input) of the circuit activates. The "+" input to the LM339 drops below +5V therefore its output is low. Since the row (dedicated input) circuit is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is about +5V, its output is high and the row (dedicated input) is inactive.
flipper switch circuits operate similar to the dedicated switch circuit. The circuits are active low and to ground through the switch.

When a switch closes the row side (dedicated input) of the circuit activates. The "+" input to the LM339 is below +5V therefore its output is low. Since the row (dedicated input) circuit is tied directly to and through the switch, the switch is considered closed by the microprocessor. When the switch is, the "+" input to the LM339 is about +5V, its output is high and the row (dedicated input) is inactive.
TROUGH IRED LED P.C.B. ASSEMBLY
A-18617-1

J1-1 Not Used
J1-2 Not Used
J1-3 Gray-Green, from 16 Opto P.C.B. J1-4
J1-4 Gray-Black, from 16 Opto P.C.B. J1-5
J1-5 Gray-Orange, from 16 Opto P.C.B. J165
J1-6 Gray-Red, from 16 Opto P.C.B. J1-7
J1-7 Gray-Brown, from 16 Opto P.C.B. J1-9
J1-8 Key
J1-9 Black, from 16 Opto P.C.B. J1-10

LED 1 (BALL 1)
LED 2 (BALL 2)
LED 3 (BALL 3)
LED 4 (BALL 4)
LED 5 (BALL 5)

Trough 7 IRED Circuit
TROUGH IRED TRANSISTOR P.C.B. ASSEMBLY
A-18618-1

J1-1 Gray-Yellow, from 16 Opto P.C.B. J2-1
J1-2 Key
J1-3 Orange-Brown, from 16 Opto P.C.B. J2-10
J1-4 Orange-Red, from 16 Opto P.C.B. J2-9
J1-5 Orange-Black, from 16 Opto P.C.B. J2-8
J1-6 Orange-Yellow, from 16 Opto P.C.B. J2-7
J1-7 Orange-Green, from 16 Opto P.C.B. J2-6
J1-8 Not Used
J1-9 Not Used

[Diagram of circuit connections]

Trough 7 IR TSTR Circuit
J1-1 Black-Red from J126-6
J1-2 Key
J1-3 Gray-Yellow +12VDC from J116-2

J2-1 Red +20VDC to motor (Sol 22)
J2-2 Black Ground to motor (Sol 22)
**STEPPER MOTOR DRIVER P.C.B.**

A-19043-1

1-1 Black-Brown from J126-1
1-2 Key
1-3 Gray-Yellow +12VDC from J116-2
2-1 Red +20VDC to motor (Sol 17)
2-2 Black Ground to motor (Sol 17)

---

**Schematic**

**Circuit**

---

3-19
J1-1 Gray-White to A-16908 (LED) Sw #38
J1-2 Gray-Violet to A-16908 (LED) Sw #37
J1-3 Gray-Blue to A-16908 (LED) Sw #36
J1-4 Gray-Green to A-18617-1 (LED) J1-3 Sw #35
J1-5 Gray-Black to A-18617-1 (LED) J1-4 Sw #34
J1-6 Gray-Orange to A-18617-1 (LED) J1-5 Sw #33
J1-7 Gray-Red to A-18617-1 (LED) J1-6 Sw #32
J1-8 Key
J1-9 Gray-Brown to A-18617-1 (LED) J1-7 Sw #31
J1-10 Black, Ground

J2-1 Gray-Yellow +12VDC
J2-2 Orange-Gray to A-16909 (Trans) Sw #38
J2-3 Orange-Violet to A-16909 (Trans) Sw #37
J2-4 Orange-Blue to A-16909 (Trans) Sw #36
J2-5 Key
J2-6 Orange-Green to A-18618-1 (Trans) J1-7 Sw #35
J2-7 Orange-Yellow to A-18618-1 (Trans) J1-6 Sw #34
J2-8 Orange-Black to A-18618-1 (Trans) J1-5 Sw #33
J2-9 Orange-Red to A-18618-1 (Trans) J1-4 Sw #32
J2-10 Orange-Brown to A-18618-1 (Trans) J1-3 Sw #31

J3-1 Not Used
J3-2 Key
J3-3 Gray-Brown to A-16908 (LED) Sw #41
J3-4 Gray-Red to A-16908 (LED) Sw #42
J3-5 Gray-Orange to A-16908 (LED) Sw #43
J3-6 Gray-Black to A-16908 (LED) Sw #44
J3-7 Gray-Green to A-16908 (LED) Sw #45
J3-8 Gray-Blue to A-16908 (LED) Sw #46
J3-9 Gray-Violet to A-16908 (LED) Sw #47
J3-10 Not Used

J4-1 Not Used
J4-2 Orange-Brown to A-16909 (Trans Switch)
J4-3 Orange-Red to A-16909 (Trans Switch)
J4-4 Key
J4-5 Orange-Black to A-16909 (Trans Switch)
J4-6 Orange-Yellow to A-16909 (Trans Switch)
J4-7 Orange-Green to A-16909 (Trans Switch)
J4-8 Orange-Blue to A-16909 (Trans Switch)
J4-9 Orange-Violet to A-16909 (Trans Switch)
J4-10 Not Used

J5-1 White-Brown from J209-1
J5-2 White-Red from J209-2
J5-3 White-Orange from J209-3
J5-4 White-Blue from J209-4
J5-5 White-Violet from J209-5
J5-6 White-Gray from J209-6
J5-7 White-Red from J209-7
J5-8 White-Black from J209-8
J5-9 White-Yellow from J209-9
J5-10 White-Gray from J209-10
J5-11 Key
J5-12 Gray-Yellow +12VDC from J1162
J5-13 Black, Ground from J116-3
16 OPTO P.C.B.
A-16998.1

Circuit Diagram
STEPPER MOTOR DRIVER P.C.B.
A-19043-1

Circuit Diagram Left Reel

Circuit Diagram Center Reel

Circuit Diagram Right Reel

Left Reel Sol 23 & 24
J1-1 Blue-Orange from J122-3
J1-2 Key
J1-3 Blue-Yellow from J122-4
J1-4 Gray-Yellow +12VDC from J116-2
J1-5 Black ground from J116-3
J2-1 Orange to Stepper Motor
J2-2 Brown to Stepper Motor
J2-3 Key
J2-4 Not Used
J2-5 Yellow to Stepper Motor
J2-6 Red to Stepper Motor

Center Reel Sol 25 & 26
J1-1 Blue-Brown from J122-1
J1-2 Key
J1-3 Blue-Red from J122-2
J1-4 Gray-Yellow +12VDC from J116-2
J1-5 Black ground from J116-3
J2-1 Orange to Stepper Motor
J2-2 Brown to Stepper Motor
J2-3 Key
J2-4 Not Used
J2-5 Yellow to Stepper Motor
J2-6 Red to Stepper Motor

Right Reel Sol 27 & 28
J1-1 Blue-Violet from J126-7
J1-2 Key
J1-3 Blue-Gray from J126-8
J1-4 Gray-Yellow +12VDC from J116-2
J1-5 Black ground from J116-3
J2-1 Orange to Stepper Motor
J2-2 Brown to Stepper Motor
J2-3 Key
J2-4 Not Used
J2-5 Yellow to Stepper Motor
J2-6 Red to Stepper Motor
Fliptronic II Board
A-15472-1

J901-1 White-Blue, 50VAC from J104-1
J901-2 White-Blue, loop from J901-1
J901-3 White-Blue, 50VAC from J104-2
J901-4 Key
J901-5 White-Blue, loop from J901-3
J902-1 Orange-Gray, Sol 36 to playfield coil
J902-2 Not Used
J902-3 Not Used
J902-4 Not Used
J902-5 Not Used
J902-6 Not Used
J902-7 Orange-Blue, holding lower left flipper
J902-8 Not Used
J902-9 Yellow-Blue, power lower left flipper
J902-10 Key
J902-11 Orange-Green, holding lower right flipper
J902-12 Not Used
J902-13 Yellow-Green, power lower right flipper
J903 Ribbon Cable, data to/from J202; J506; J601
J904-1 Gray, +5V to/from J114-4; J210-4
J904-2 Gray-Green, +12V to/from J114-2; J210-6
J904-3 Key
J904-4 Black, Ground to/from J114-7; J210-1
J904-5 Black, Ground to/from J114-8; J210-3
J905-1 Black-Violet, to right flipper opto
J905-2 Blue-Gray, to left flipper opto
J905-3 Black-Yellow, to right flipper opto
J905-4 Key
J905-5 Black-Blue, to left flipper opto
J905-6 Orange, Switch Ground
J906-1 Black-Green, to lower right E.O.S. switch
J906-2 Key
J906-3 Black-Blue, to lower left E.O.S. switch
J906-4 Black-Violet, to playfield switch
J906-5 Not Used
J906-6 Orange, Switch Ground
J907-1 Red-Green, +50V to lower right flipper
J907-2 Red-Green, loop from J907-1
J907-3 Key
J907-4 Red-Blue, +50V to lower left flipper
J907-5 Red-Blue, loop from J907-4
J907-6 Not Used
J907-7 Not Used
J907-8 Red-Gray, +50V to upper left flipper
J907-9 Red-Gray, loop from J907-8
Power Driver Board
A-12697-4

J101-1 Red 9VAC from xfmr secondary
J101-2 Red 9VAC from xfmr secondary
J101-3 Key
J101-4 Blue-White 13VAC from xfmr secondary
J101-5 Blue-White loop from J101-4
J101-6 Blue-White 13VAC from xfmr secondary
J101-7 Blue-White loop from J101-6
J102-1 White-Red loop from J102-2
J102-2 White-Red 16VAC from xfmr secondary
J102-3 White-Red loop from J102-4
J102-4 White-Red 16VAC from xfmr secondary
J102-5 Black-Yellow loop from J102-6
J102-6 Black-Yellow 16VAC from xfmr secondary
J102-7 Key
J102-8 Black-Yellow loop from J102-9
J102-9 Black Yellow 16VAC from xfmr secondary
J103 Not Used
J104-1 White-Blue 50VAC to J901-1,2
J104-2 White-Blue 50VAC to J901-3,5
J104-3 Key
J104-4 Not Used
J104-5 Not Used

J105-1 Not Used
J105-2 Not Used
J105-3 Not Used
J105-4 Key
J105-5 Red-White +20V to insert flashlamps
J106 Not Used
J107-1 Not Used
J107-2 Red-Brown 50V to playfield coils
J107-3 Red-Black 50V to playfield coils
J107-4 Key
J107-5 Not Used
J107-6 Red-White +20V to playfield flashlamps
J108 Not Used
J109 Not Used
J110 Not Used
J111 Not Used
J128 Not Used
J129 Not Used
J130-1 Violet-Brown Sol 1 to playfield coil
J130-2 Violet-Red Sol 2 to playfield coil
J130-3 Key
J130-4 Violet-Orange Sol 3 to playfield coil
J130-5 Violet-Yellow Sol 4 to playfield coil
J130-6 Violet-Green Sol 5 to playfield coil
J130-7 Violet-Blue Sol 6 to playfield coil
J130-8 Violet-Black Sol 7 to backbox coil
J130-9 Violet-Gray Sol 8 to playfield coil

J131 Not Used
J132 Not Used
J133 Not Used
J134-1 Not Used
J134-2 Not Used
J134-3 Key
J134-4 Not Used
J134-5 Not Used
J134-6 Not Used
J134-7 Red-Blue Row 6 to cabinet lamp
J134-8 Red-Violet Row 7 to cabinet lamp
J134-9 Red-Gray Row 8 to cabinet lamp

J135-1 Red-Brown Row 1 to playfield lamps
J135-2 Red-Black Row 2 to playfield lamps
J135-3 Key
J135-4 Red-Orange Row 3 to playfield lamps
J135-5 Red-Yellow Row 4 to playfield lamps
J135-6 Red-Green Row 5 to playfield lamps
J135-7 Red-Blue Row 6 to playfield lamps
J135-8 Red-Violet Row 7 to playfield lamps
J135-9 Red-Gray Row 8 to playfield lamps

J136-1 Key
J136-2 Not Used
J136-3 Yellow-Gray Col 8 to insert lamps

J137 Not Used
J138-1 Yellow-Brown Col 1 to playfield lamps
J138-2 Yellow-Red Col 2 to playfield lamps
J138-3 Yellow-Orange Col 3 to playfield lamps
J138-4 Yellow-Black Col 4 to playfield lamps
J138-5 Yellow-Green Col 5 to playfield lamps
J138-6 Yellow-Blue Col 6 to playfield lamps
J138-7 Yellow-Violet Col 7 to playfield lamps
J138-8 Key
J138-9 Yellow-Gray Col 8 to playfield lamps
WPC Security CPU Board
A-17651-50044

J201 Ribbon Cable data to J602
J202 Ribbon Cable data to J903; J506; J601
J203 Not Used
J204 Ribbon Cable data to A-16100 J1
J205-1 Orange-Brown Dir Sw 1, Left Coin to J1-14
J205-2 Orange-Red Dir Sw 2, Center Coin to J1-13
J205-3 Orange-Black Dir Sw 3, Right Coin to J1-12
J205-4 Orange-Yellow Dir Sw 4, 4th Coin to J1-17
J205-5 Key
J205-6 Orange-Green Dir Sw 5, Escape/Service to J1-11
J205-7 Orange-Blue Dir Sw 6, Down/Vol Down to J1-10
J205-8 Orange-Violet Dir Sw 7, Up/Vol Up to J1-9
J205-9 Orange-Gray Dir Sw 8, Enter/Test to J1-8
J205-10 Black ground to J1-15
J205-11 Not Used
J205-12 Orange-White Enable to J1-18
J206 Not Used
J207-1 Green-Brown Sw Col 1 to playfield switches
J207-2 Green-Red Sw Col 2 to playfield switches
J207-3 Green-Orange Sw Col 3 to playfield switches
J207-4 Green-Yellow Sw Col 4 to playfield switches
J207-5 Green-Black Sw Col 5 to playfield switches
J207-6 Green-Blue Sw Col 6 to playfield switches
J207-7 Green-Violet Sw Col 7 to playfield switches
J207-8 Key
J207-9 Not Used
J207-10 Not Used
J207-11 Not Used
J208 Not Used

J209-1 White-Brown Sw Row 1 to playfield switches
J209-2 White-Red Sw Row 2 to playfield switches
J209-3 White-Orange Sw Row 3 to playfield switches
J209-4 White-Yellow Sw Row 4 to playfield switches
J209-5 White-Green Sw Row 5 to playfield switches
J209-6 Key
J209-7 White-Blue Sw Row 6 to playfield switches
J209-8 White-Violet Sw Row 7 to playfield switches
J209-9 White-Gray Sw Row 8 to playfield switches
J210-1 Black ground from J904-4; J3-4 Sound Bd; J114-7
J210-2 Key
J210-3 Black ground from J904-4; J3-5 Sound Bd; J114-5
J210-4 Gray +5VDC from J901-1; J3-1 Sound Bd; J114-4
J210-5 Gray +5VDC from J3-3 Sound Bd; J114-3
J210-6 Gray-Green +12VDC from J904-2; J114-2
J210-7 Gray-Green +12VDC from J114-1
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J212-1 Green-Brown Sw Col 1 to J1-1
J212-2 Green-Red Sw Col 2 to J1-7
J212-3 Not Used
J212-4 White-Brown Sw Row 1 to J1-6
J212-5 Key
J212-6 White-Red Sw Row 2 to J1-5
J212-7 White-Orange Sw Row 3 to J1-4
J212-8 White-Yellow Sw Row 4 to J1-3
J213-1 Black to battery holder J1-1
J213-2 Black to battery holder J1-2
J213-3 Key
J213-4 Gray to battery holder J1-4
J213-5 Gray to battery holder J1-5

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P1 34-pin Ribbon Cable data to/from J601; J903; J202
J1-1 Black-Yellow signal to cabinet speaker
J1-2 Not Used
J1-3 Key
J1-4 Black ground
J2-1 Black-Yellow signal to display panel speakers
J2-2 Key
J2-3 Not Used
J2-4 Black ground
J3-1 Gray +5V from J114-4; J904-1; J210-4
J3-2 Key
J3-3 Gray +5V from J114-3; J210-5
J3-4 Black ground from J114-7; J904-4; J210-1
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J4-1 Gray-Green 18VAC from xfrmr secondary
J4-2 Gray-Green 18VAC loop from J4-1
J4-3 Key
J4-4 Gray 18VAC from xfrmr secondary
J4-5 Gray 18VAC loop from J4-4
J4-6 Gray-White 18VAC from xfrmr secondary
J4-7 Gray-White loop from J4-6

Speaker Wiring Diagram
Dot Matrix Controller Board
A-14039.1

J601 Ribbon Cable data to/from J202, J903; Dot Matrix Display/Driver P1

J602 Ribbon Cable data from J201

J603 Ribbon Cable data to Dot Matrix Display/Driver

J604-1 Orange -125V to Dot Matrix Display/Driver Pin 1
J604-2 Blue -113V to Dot Matrix Display/Driver Pin 2
J604-3 Key
J604-4 Black ground to Dot Matrix Display/Driver Pin 4
J604-5 Black ground to Dot Matrix Display/Driver Pin 5
J604-6 Gray +5V to Dot Matrix Display/Driver Pin 6
J604-7 Gray-Yellow +12V to Dot Matrix Display/Driver Pin 7
J604-8 Brown +62 to Dot Matrix Display/Driver Pin 8

J605-1 White 80VAC from xfmr secondary
J605-2 White 80VAC from xfmr secondary
J605-3 Violet 100VAC from xfmr secondary
J605-4 Key
J605-5 Violet 100VAC from xfmr secondary
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J605-7 Violet 100VAC from xfmr secondary
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J605-11 Gray +5V loop from J605-5
J605-12 +5V from J117-4
J605-13 Gray-Yellow +12V loop from J605-7
J605-14 Gray-Yellow +12V from J117-2

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<th>Column</th>
<th>Row</th>
<th>1: Yellow Brown</th>
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<th>3: Yellow Orange</th>
<th>4: Yellow Black</th>
<th>5: Yellow Green</th>
<th>6: Yellow Blue</th>
<th>7: Yellow Violet</th>
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<td>Red</td>
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<td>J137-1 Q98</td>
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### SWITCH MATRIX

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<th>Dedicated Grounded Switches</th>
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<td>Orange-Brown (1) J205-1</td>
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<tr>
<td>Left Coin Chute D1</td>
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<td>Orange-Red (2) J205-2</td>
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<td>Center Coin Chute D2</td>
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<td>Orange-Black (3) J205-3</td>
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<tr>
<td>Right Coin Chute D3</td>
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<td>Orange-Yellow (4) J205-4</td>
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<td>4th Coin Chute D4</td>
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<td>Orange-Green (5) J205-6</td>
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<td>Orange-Blue (6) J205-7</td>
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<td>Orange-Violet (7) J205-8</td>
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<td>Orange-Gray (8) J205-9</td>
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<tr>
<td>Home</td>
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</table>

J1XX = Power Driver Board

J2XX = CPU Board; J9XX = Fliptron II Board; [ ] = Opto, Typically Closed
WARNINGS & NOTICES

WARNING
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TO MAINTAIN THESE LEVELS, reposition harnesses and reconnect ground straps to their original placements, if they become disconnected during maintenance.

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FOR SERVICE...
CALL your authorized
BALLY Distributor

MIDWAY Manufacturing Company
3401 N. California Avenue
Chicago, IL 60618

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Midway Manufacturing Company reserves the rights to make modifications and improvements to its products. The specifications and parts identified in this manual are subject to change without notice.
2. RESISTOR VALUES ARE IN OHMS, 1/8 WATT, 5%

1. CAPACITOR VOLTAGES ARE 50V, 20%

NOTES: UNLESS OTHERWISE SPECIFIED
Lowpass Filter

Highpass Filter

NOTES:
1. Normal configuration uses two power amps, U27 and U28.
2. For single amplifier operation:
   A. U27 not stuffed
   B. WI stuffed with 6.8K resistor
   C. WI stuffed with zero ohm resistor
   D. Components in dashed lines not stuffed
3. Speaker wiring changes for single amplifier operation.