# HIGH SPEED™

## INSTRUCTION MANUAL

*Williams*® Ⓦ
**ELECTRONICS GAMES, INC.**

# HIGH SPEED (System-11) ROM Summary

| IC | DESCRIPTION | TYPE | IDENTIFIER | BOARD | PART NUMBER |
|---|---|---|---|---|---|
| Game ROM 2 | 8K x 8 ROM | 2764 | U26 | CPU | A-5343-541-5 |
| Game ROM 1 | 256K x 8 ROM | 27256 | U27 | CPU | A-5343-541-1 |
| Sound ROM 1 | 256K x 8 ROM | 27256 | U21 | CPU | A-5343-541-3 |
| Sound ROM 2 | 256K x 8 ROM | 27256 | U22 | CPU | A-5343-541-2 |
| Background (B/G) Sound ROM | 256K x 8 ROM | 27256 | U4 | B/G Sound | A-5343-541- 4 |

## NOTICE

To order a replacement ROM from your authorized WILLIAMS ELECTRONICS GAMES distributor, specify: (1) part number (if available); (2) ROM label color; (3) ROM level (number) on the label; (4) which game the ROM is used in.

| Sol. No. | Function | Solenoid Type | Wire [1] Color | Connections CPU Bd. | Connections Playfield/ Cabinet | Driver Trans. | Solenoid Part No. |
|---|---|---|---|---|---|---|---|
| 01 | Outhole | Controlled | Gry-Brn | 1P11-1 | 8P3-1 | Q33 | AE-23-800-01 |
| 02 | Ball Release | Controlled | Gry-Red | 1P11-3 | 8P3-2 | Q25 | AE-23-800-03 |
| 03 | Eject Hole | Controlled | Gry-Orn | 1P11-4 | 8P3-3 | Q32 | AE-23-800-03 |
| 04 | Police Light Relay | Controlled | Gry-Yel | 1P11-5 | Backbox | Q24 | 5580-10883-00 |
| 05 | Flasher No. 2 (Left Blue) | Controlled | Gry-Grn | 1P11-6 | 8P3-5 | Q31 | #63 flashlamps |
| 06 | Flasher No. 3 (Right Blue) | Controlled | Gry-Blu | 1P11-7 | 8P3-6 | Q23 | #63 flashlamps |
| 07 | Left Hideout Relay | Controlled | Gry-Vio | 1P11-8 | 8P3-7 | Q30 | AE-24-900-02 |
| 08 | Right Hideout Relay | Controlled | Gry-Blk | 1P11-9 | 8P3-8 | Q22 | AE-24-900-02 |
| 09 | Flasher No. 1 (Left Red) | Controlled | Brn-Blk | 1P12-1 | 8P3-9 | Q17 | #63 flashlamps |
| 10 | Insert Board Flashers | Controlled | Brn-Red | 1P12-2 | 9P1-7 | Q9 | #63 flashlamps |
| 11 | General Illumination Relay | Controlled | Brn-Orn | 1P12-4 | 3P7-1 | Q16 | 5580-09555-00 |
| 12 | Flasher No. 4 (Right Red) | Controlled | Brn-Yel | 1P12-5 | 8P3-12 | Q8 | #63 flashlamps |
| 13 | Ramp Gates | Controlled | Brn-Grn | 1P12-6 | 8P3-13 | Q15 | AL-23-800-01 |
| 14 | Kickback (Left Outlane) | Controlled | Brn-Blu | 1P12-7 | 8P3-14 | Q7 | AE-24-900-01 & Relay |
| 15 | Knocker | Controlled | Brn-Vio | 1P12-8 | Backbox | Q14 | AE-23-800-02 |
| 16 | Coin-Lockout Relay | Controlled | Brn-Gry | 1P12-9 | 7P1-7,7P2-4 | Q6 | 404603-2 [2] |
| 17 | Left Kicker | Special #1 | Blu-Brn | 1P19-7 | 8P3-17 | Q75 | AE-23-800-03 |
| 18 | Right Kicker | Special #2 | Blu-Red | 1P19-4 | 8P3-18 | Q71 | AE-23-800-03 |
| 19 | Right Jet Bumper | Special #3 | Blu-Orn | 1P19-3 | 8P3-19 | Q73 | AE-23-800-03 |
| 20 | Lower Left Jet Bumper | Special #4 | Blu-Yel | 1P19-6 | 8P3-20 | Q69 | AE-23-800-03 |
| 21 | Upper Left Jet Bumper | Special #5 | Blu-Grn | 1P19-8 | 8P3-21 | Q77 | AE-23-800-03 |
| 22 | Top Playfield Flashers | Special #6 | Blu-Blk | 1P19-9 | 8P3-22 | Q79 | #63 flashlamps |
| - | Upper Flipper | - | (Blk-Yel) | | (7J1-19,8P3-33) [3] | - | FL23/600-30/2600-50VDC |
| - | Right Flipper | - | Orn-Vio (Blu-Vio) | 1P19-1 | 7P1-20 (7J1-21,8P3-34) [3] | - | FL23/600-30/2600-50VDC |
| - | Left Flipper | - | Orn-Gry (Blu-Gry) | 1P19-2 | 7P1-23 (7J1-24,8P3-32) [3] | - | FL23/600-30/2600-50VDC |

Notes:
1. Wire colors, except flipper Orn-Vio and Orn-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Orn-Vio and Orn-Gry wires connect from CPU Board to flipper switch.    2. Solenoid 16 has a Coinco part number.
3. Connections shown in parentheses are from flipper switch to flipper coil.

# HIGH SPEED ™

# INSTRUCTION MANUAL

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# IMPORTANT NOTES ON AUTOMATIC REPLAY
# PERCENTAGING

1. The replay percentage specified in adjustment #1 refers only to Credits (or Extra Balls) won by beating the game's replay score. (The count of which may be read in audits 8 and 9.) The **TOTAL** Free Play will be **10% or 15% higher** with the addition of Match, Special, and High Score To Date credits. The **TOTAL** Free Play is shown as audits 6 and 7.

2. Automatic Replay Percentaging also applies, when Extra Balls are awarded instead of Credits.

3. If more than 1 replay level is specified (in adjustment 3), then the game uses the sum of all replays earned (from all levels) when computing the percentage and for determining changes in the replay level.

4. The game will not change the replay score level by more than 100,000 points every 500 plays. If the game is far from the optimum level, it will take several thousand plays until an appropriate score is reached. If you detect that this is the situation, it may be appropriate to make a large change in the "Replay Start" value. The game will then start at this newly specified value and work toward the percentage specified in adjustment 1.

5. The game seeks a **Current** replay percentage as specified in adjustment #1. It will **not** try and compensate for past performance.

6. Any change of adjustments 1 (Replay Percent) or 2 (Replay Start) will cause the Automatic Replay Percentaging system to **start from scratch** using the newly specified value(s). Other than large changes in the starting value (as described in note 4), the operator should let the system work its way toward the correct replay score. If fixed replay score(s) are desired, set adjustment 1 to show the words "Fixed Replay" in the displays. Then use adjustments 2 through 5 to set the Fixed Replay Score Level(s).

7. Progress of the Automatic Replay Percentaging system may be monitored by examining audits 40 through 44.

8. The Automatic Replay Percentaging system makes a change of -100,000, or 0, or +100,000 points to the First Replay level every 500 plays. The term "change" (used from now on) will refer to the event of 500 plays having been counted (even if a change of 0 points is made on that event). Audit counter 40 (Aut. Pct. Data 1) shows the number of "changes" that have been made.

9. Audit counter 41 (Aut. Pct. Data 2) is the number of plays **since** the last "change".

10. Audit counter 42 (Aut. Pct. Data 3) is the number of times a replay score has been beaten **since** the last "change".

11. Audit counter 43 (Aut. Pct. Data 4) is the number of times a replay score was beaten during the 500 plays **before** the last "change".

12. Audit counter 44 (Aut. Pct. Data 5) is the number of times a replay score was beaten in the 500 plays before those recorded in audit 43; i.e., each time a change occurs, Aut. Pct. Data 4 is copied into Aut. Pct. Data 5.

13. When a change occurs (i.e., Aut. Pct. Data 2 reaches 500), the new replay score (if change is non-zero) is computed, but does not go into effect until the next time the game is powered up. This is so that the replay score will not change on a player in-between games.

14. The replay score(s) are shown in the backglass displays during the Attract Mode, and during game play if a player presses **and holds** either flipper.

15. Clearing the audit totals or coin counters does not affect the Automatic Replay Percentaging data.

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## Section 2 - Game Parts Information

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## Section 3 - Reference Diagrams & Schematics

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## *Game* *Operation*

## *&*

## *Test* *Information*

- *HIGH SPEED* (System-11) ROM Summary
- Pinball Game Assembly Instructions
- Game Play
- Game Status Displays
- Game Adjustment Procedure
- Game Pricing
- Test/Diagnostic Procedures

## *HIGH SPEED* (System-11) ROM Summary

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| Background (B/G) Sound ROM | 256K x 8 ROM | 27256 | U4 | B/G Sound | A-5343-541-4 |

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# CONNECTOR IDENTIFICATION

WILLIAMS ELECTRONICS GAMES uses a special technique to identify connectors. Each plug or jack receives a prefix number (which identifies the circuit board), a letter, and a number. J-designations refer to the male part of a connector. P-designations refer to the female part of a connector. For example, 1J1 designates jack 1 of board 1 (a CPU Board jack); 3P6 designates plug 6 of board 3 ( a Power Supply 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, 1J1-3 refers to pin 3 of jack 1 on board 1.

# *HIGH SPEED* CIRCUIT BOARDS

All *HIGH SPEED* Circuit Boards are in the backbox. They are accessible by removing the backbox glass, unlatching the insert board, and swinging it open.

CPU BOARD. The System-11 CPU Board (p/n D-10880) must be equipped with the ROMs specified in the *HIGH SPEED* (System-11) ROM Summary. For this ROM complement, jumpers W1, W3, W4, W5, and W7 should be connected. Jumper W7 is cut/removed for West German games.

BACKGROUND SOUND BOARD. The Background Sound Board is p/n C-11029.

DISPLAY BOARDS. The Alphanumeric Display Board is p/n D-10877. Two of the 7-digit Player Score Displays (SPEEDER 1, SPEEDER 2) are p/n C-10866. The SPEEDER 3 and 4 Displays are p/n C-8364. The 2-digit Credit, 2-digit MATCH (also Ball-in-Play) Display is p/n C-8365.

POWER SUPPLY BOARD. The Power Supply Board is p/n D-8345 (equipped with a relay).

The prefix numbers for *HIGH SPEED* System-11 circuit boards are listed below:

| | | | | | |
|---|---|---|---|---|---|
| 1 | - | CPU Board | 9 | - | Insert Board |
| 2 | - | (not assigned) | 10 | - | (not assigned) |
| 3 | - | Power Supply Board | 11 | - | B/G Sound |
| 4 | - | Alphanumeric Display Board | 12 | - | (not assigned) |
| 5 | - | Slave Display Board | 13 | - | (not assigned) |
| 6 | - | Backbox | 14 | - | (not assigned) |
| 7 | - | Cabinet | 15 | - | Flipper Power Supply |
| 8 | - | Playfield | | | |

# *HIGH SPEED* GAME CONTROL LOCATIONS

The On-Off switch is on the bottom of the cabinet near the right front leg.

The Volume Control is on the left inner wall of the cabinet on the tilt mechanisms board. It is accessible by opening the coin box door.

The Credit switch is a pushbutton to the left of the coin door on the cabinet exterior.

GAME ADJUSTMENT/DIAGNOSTIC SWITCHES. *HIGH SPEED* allows the operator to program virtually all game adjustments, obtain bookkeeping information, and diagnose problems, using only three switches mounted on the inside of the coin door and the Credit buttom beside the coin door.

ADVANCE, AUTO-UP/MANUAL-DOWN, and HIGH-SCORE RESET are the switches located on the inside of the coin door. Refer to the Game Status Displays text and the Text/Diagnostic Procedures for details concerning their operation.

The Memory Protect switch is on the inside frame of the coin door. This interlock switch must be open to clear bookkeeping totals and to make game adjustments. It automatically opens, when the coin door opens.

The CPU Diagnostic switch (SW 2) is the lower switch (of the two switches mounted on the left edge of the CPU Board) near a large, socketed microprocessor chip. This switch initiates the Memory Chip Test explained in the Diagnostic Procedures.

The Sound Diagnostic switch (SW 1) is the upper switch of the two mounted on the left edge of the CPU Board. This switch initiates the Sound Section Test. Refer to the Diagnostic Procedures.

# PINBALL GAME ASSEMBLY INSTRUCTIONS

1. Open the shipping container; remove all cartons, parts, and other items, and set them aside.
2. Place cabinet on a support and attach rear legs, using leg bolts (provided in the cash box).
3. Attach the front legs, using leg bolts.
4. Reach into the cabinet and backbox and check the mating of the interconnecting cables, matching several wire colors at each connector.

## CAUTION

Ensure that the interconnecting cables are free to move (not kinked or pinched). Be careful not to damage wires at any stage of the assembly process.

5. Raise the hinged backbox into position. Take care to prevent damage to rotating beacon on top of backbox, both now and during any further movements of the game. Secure the backbox with mounting bolts through the bottom holes into the threaded fasteners in the cabinet.
6. Extend the rear leg levelers to approximately 2/3 length below the leg bottom. Remove the cabinet from its support and place it on the floor.
7. Remove the playfield cover glass to permit accurate measurement of the playfield level and pitch. Level (side-to-side) the playfield (preferably measured ON the playfield surface), and firmly tighten the nut on each leg leveler shaft to maintain this level setting, as shown in Figure 1.
8. Adjust the front leg levelers for proper playfield level (side-to-side) _and_ playfield pitch angle (incline) of approximately 6 degrees. (Again, it is recommended that these measurements 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.

## CAUTION

Playfield pitch angle adjustments can affect the operation of the ball-roll tilt and the plumb bob tilt, inside the cabinet. The operator should adjust these tilt mechanisms for proper operation, after completion of the desired playfield pitch angle setting.

9. Move the game into the desired location; recheck the level and pitch angle of the playfield.
10. Verify that three balls are installed in the game.
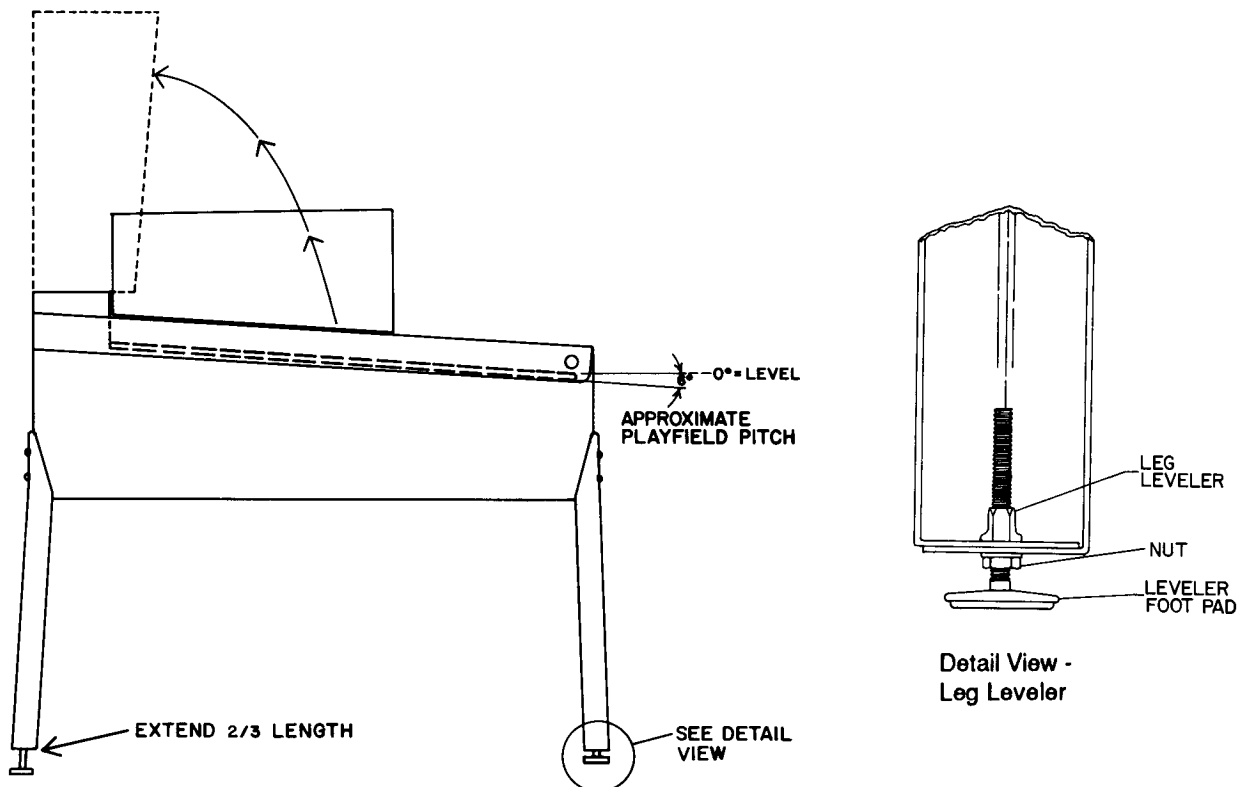11. Clean and re-install the playfield cover glass. Prepare the game for player operation.



Figure 1. Pinball Assembly, Playfield Pitch Angle, and Leg Leveler Details.

# GAME OPERATION

After assembly and installation at its 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 turn it ON, using the On-Off switch. In normal operation, the player 1 (SPEEDER 1) score display and the lower two 2-digit displays (Credits and BALL IN PLAY/MATCH) initially all show 00. The GAME OVER indicator blinks. Then, the game goes into the Attract Mode (Playfield and backbox lamps flashing, sounds being heard, etc.).

## CAUTION

*HIGH SPEED's System 11 game program* has a new capability to aid the operator and service personnel: At game Turn-On (and also when the operator is beginning the Test/Diagnostic Procedures), a display now signals when a switch has NOT been actuated during ball play for a lengthy period of time. Up to three switches can be displayed during this switch problem reporting activity. Moreover, *HIGH SPEED* compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep *HIGH SPEED* earning good profits! More information is available in the Diagnostic Procedures text describing the Switch Testing.

**ATTRACT MODE\*.** Playfield and backbox lamps blink; the rotating beacon flashes occasionally. All player score displays (SPEEDER 1, SPEEDER 2, etc.) exhibit a series of displays informing the player concerning:

    A. Recent highest scores\*;
    B. A "custom message" ("RUN THE LIGHT ... AND GET AWAY ... AT HIGH SPEED")\*;
    C. The score to achieve to obtain a Replay award\*;
    D. The "Hideout Jackpot" point value\*.

These displays (or variations of them) reappear occasionally, accompanied by sounds and music, until a player initiates game play by inserting a coin or, when credits are available, pressing the Credit button.

**CREDIT POSTING.** Insert coin(s). A sound is heard for each coin, and the Credits display shows the number of credits purchased. Even if the number of maximum allowable credits\* is exceeded by coin purchase or high score, credits are posted correctly. However, the coin-lockout coil then de-energizes, until the number of remainig credits is less than the maximum. No more credits may be purchased (and coins are rejected), while the coin-lockout coil is de-energized.

**STARTING A GAME.** Press the Credit button once. A startup sound plays, and the amount shown in the Credit display decreases by one. Player display SPEEDER 1 flashes (until the first playfield switch is actuated), and the BALL IN PLAY display shows 1. Additional players may enter the game by pressing the Credit button once for each player, before the end of play on the first ball.

**TILT.** Actuating the Slam Tilt switch inside the cabinet ends the current game; *HIGH SPEED* then proceeds to the Game Over Mode. With the actuation of the ball-roll or playfield tilt switches, or 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 a specified value, the player receives a designated award for achieving the current highest score. A random digit set\* appears in the MATCH display. Credit\* may be awarded, when the last two digits of any player's score display (SPEEDER 1 through SPEEDER 4) match the random digits of the MATCH display. Match, high score, and game over sounds are made, as appropriate.

**GAME OVER MODE.** The GAME OVER indicator lights. The SPEEDER 1 and SPEEDER 2 displays show GAME OVER . Then, the high scores flash on the appropriate player score displays. The game proceeds to the Attract Mode.

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\* - operator-adjustable feature

# *HIGH SPEED* GAME PLAY

The driver runs a red light and suddenly sirens shriek, lights flash, an APB is issued, and the police chase is on! Flying over ramps and careening down freeways, the getaway is fast and furious as the speedster races for the hideout! Only at *HIGH SPEED* will he make it in time and grab the jackkpot waiting there!

Completing the stoplight target sequence by making all 3 greens, then the 3 yellows, and finally the 3 reds turns the traffic light red. Running the red by speeding up the ranp twice starts multi-ball™, the police chase, and the getaway! The police light flashes, sirens blare, and the police call out an APB!

The driver can make it to the hideout by taking the ramp during multi-ball™! All scoring with multi-ball™ goes into the jackpot as well as toward the player's score! Making the ramp shot with 2 or more balls in play collects the hideout jackpot which, for a super-exciting first time, builds up not only from player to player, but from game to game!

A fast escape onto the Santa Monica or Bay Shore Freeway, when lit, lights progressively the flipper return lane, then the spinners for 1000 each, followed by the hold bonus feature, and finally, extra ball!

Making the 1 through 6 targets, when lit, advances the ramp value from 50,000 to 250,000 and lights the kick-back to keep the ball alive! A diverting gate feature on the ramp sends the ball to either of 2 catapults or directly back to the playfield.

The rotating police light on top of the backbox, the revving of the engine whenever the flippers are hit, police car radio messages, shierking sirens, and thrilling chase music all underscore the excitement and realism of the chase!

# *HIGH SPEED* GAME STATUS DISPLAYS

*HIGH SPEED* utilizes a new format for the display of information concerning the game's bookkeeping and game play feature adjustment. Basically, three classes of information now become available to the game owner/operator: Id (Identification); Au (Audit); Ad (Adjustment). Each of the underscored two-letter abbreviations for these classes appears in the Credits display, while the system microprocessor for the *HIGH SPEED* game is displaying the items within each class in the status display mode.

## Identification Information--Id

With the game turned on, the coin door open, and the AUTO-UP switch in the Up position, the operator can press the ADVANCE switch once, briefly. HIGH SPEED's displays immediately change from the Attract Mode to the Game Status Display Mode. This is evident by the following display, shown in columnar form. The column headings refer to the various backbox displays. (Display SPEEDER 3 does not appear in the listing because it remains blank):

| SPEEDER 1 | SPEEDER 2 | SPEEDER 4 | Credits | BALL IN PLAY/ MATCH |
|---|---|---|---|---|
| HIGH | SPEED | 541 L- * | Id | 00 |

\* - 1 indicates initial ROM revision level; 2, 3, etc. for later revisions.

The game is named in the SPEEDER 1 and 2 displays. The game's identification number and the ROM revision level appears in the SPEEDER 4 display. The Credits display shows the status display mode in abbreviated form, *Id*. The BALL IN PLAY/MATCH display shows the status display mode item for this particular display.

## Audit Information--Au

While the AUTO-UP switch remains in the Up position, the operator can press the ADVANCE switch once, briefly, to begin the backbox displays of Audit (sometimes called "bookkeeping") Information. More audit entries than ever are now available. Calculation of the various factors is no longer necessary because the *HIGH SPEED* System 11's game program now performs all the mathematical factor computations. This information is intended to aid the owner/operator in evaluating how the game is performing in each location, by providing knowledge about which game features are receiving the most play. With this information, the owner/operator can determine whether adjusting the game features to other settings will contribute to increased game earnings.

The operator can press the ADVANCE button once to view each Audit Information display item. To proceed more rapidly through this information, the operator only has to press and hold the ADVANCE button. If a desired item is passed, the operator can use the MANUAL-DOWN switch position with the ADVANCE button to back up to the desired item.

The *HIGH SPEED Audit Table* lists the 44 items of the Audit Information portion of the *HIGH SPEED* Game Status Displays. Presentation of the displays is similar to that for the Identification Information; however, the SPEEDER 1 and SPEEDER 2 displays are combined as a descriptive phrase. In light type below the column headings appear the respective backbox displays where the information appears. Because the SPEEDER 4 display contains information which depends on game play, only a few example entries are shown in the table. The Credits display shows *Au* for all 44 audit items, so its entry is omitted from the tabular listing. Detection of erroneous data affecting any of the counters used in these audit items causes the message, ERROR, to be displayed in the SPEEDER 3 display, during display of any audit item associated with that particular counter. (The program does not analyze the cause of the error; it merely alerts the operator of the error's existence by the message.)

### *HIGH SPEED* Audit Table

| Audit Item (MATCH) | Descriptive Phrases (SPEEDER 1 and 2 Displays) | Audit Factor [1] Value (SPEEDER 4) |
|---|---|---|
| 01 | Left Coins (chute next to coin door hinge) | 432 |
| 02 | Center Coins | 0 |
| 03 | Right Coins | 398 |
| 04 | Paid Credits | 830 |
| 05 | Total Plays | |
| 06 | Total Free (Total Free Plays) | |
| 07 | Percent Free (% Free Plays) | |
| 08 | Replay Awards | |
| 09 | Percent Replay (% Replay Awards) | |
| 10 | Special Awards | |
| 11 | Percent Special (% Special Awards) | |
| 12 | Match Awards | |
| 13 | HSTD ( High Score to Date) Credits | |
| 14 | Percent HSTD (% HSTD Credits) | |
| 15 | Extra Balls | |
| 16 | Percent Ex. Ball (% Extra Balls) | |
| 17 | Av. Ball Time (Average Time in Seconds) | |
| 18 | Min. of Play (Minutes of Play) | |
| 19 | Balls Played | |
| 20 | Replay 1 Awards | |
| 21 | Replay 2 Awards | |
| 22 | Replay 3 Awards | |
| 23 | Replay 4 Awards | |
| 24 | 1 Playr Games | |
| 25 | 2 Playr Games | |
| 26 | 3 Playr Games | |
| 27 | 4 Playr Games | |
| 28 | Burn in Cycles | |
| 29 | Yellow Lit (# of games when lit) | |
| 30 | Red Lit (# of games when lit) | |
| 31 | Multi Balls (# of Multi-Balls played) | |
| 32 | Jackpot Won (# of times won) | |
| 33 | Special Lit (# of times lit) | |
| 34 | Freeway E.B. (Extra Ball) Lit (# of times lit) | |
| 35 | Ramp Shot (# of times made with flipper) | |
| 36 | Jackpot E.B. Lit (# of times lit after J'pot) | |
| 37 | Kickbak Fired (# of times) | |
| 38 | A-Mode Cycles (# of times Attract Mode) | |
| 39 | H. S. Reset Counter | |
| 40 | Aut. Pct. Data 1 | |
| 41 | Aut. Pct. Data 2 | |
| 42 | Aut. Pct. Data 3 | |
| 43 | Aut. Pct. Data 4 | |
| 44 | Aut. Pct. Data 5 | |

NOTE:

1. The numbers shown in this column for Items 1 through 4 are examples. Entries for all items depend on the amount of play; thus, they will vary from location to location.

## Adjustment Information--Ad

At end of the Audit Information presentation, with the AUTO-UP switch in the Up position, the operator can press the ADVANCE button to proceed to the Adjustment Information portion of the *HIGH SPEED* Game Status Displays.

The operator can press the ADVANCE button once to view each Adjustment Information display item. To proceed more rapidly through this information, the operator only has to press and hold the ADVANCE button. If a desired item is passed, the operator can use the MANUAL-DOWN switch position with the ADVANCE button to back up to the desired item.

The *HIGH SPEED Game Adjustment Table* lists the 70 items of the Adjustment Information portion of the *HIGH SPEED* Game Status Displays. Presentation of the displays is similar to that for the Audit Information (that is, the SPEEDER 1 and SPEEDER 2 displays combine as a descriptive phrase; the light type below the column headings names the respective backbox displays where the information appears, etc.). The Credits display shows *Ad* for all 70 adjustment items, so its entry is omitted from the tabular listing.

### *HIGH SPEED* Game Adjustment Table

| Adjustment Item (MATCH) | Descriptive Phrases (SPEEDER 1 and 2 Displays) | Factory Setting (SPEEDER 4) |
|---|---|---|
| 01 | AUTO REPLAY (%) (or FIXED REPLAY SCORES) [1] | 10 (%) |
| 02 | REPLAY START (or REPLAY LEVEL 1) [1] | 1,400,000 |
| 03 | REPLAY LEVELS (or REPLAY LEVEL 2) [1] | 01 |
| 04 | (REPLAY LEVEL 3) [1] | OFF |
| 05 | (REPLAY LEVEL 4) [1] | OFF |
| 06 | REPLAY AWARD | Credit |
| 07 | SPECIAL AWARD | Credit |
| 08 | MATCH FEATURE | On |
| 09 | BALLS / GAME | 03 |
| 10 | TILT WARNING | 03 |
| 11 | MAXIMUM EX. BALL | 04 |
| 12 | MAXIMUM CREDITS | 30 |
| 13 | HIGHEST SCORES | On |
| 14 | BACKUP HI. SCR1 | 4,000,000 |
| 15 | BACKUP HI. SCR 2 | 3,500,000 |
| 16 | BACKUP HI. SCR 3 | 3,000,000 |
| 17 | BACKUP HI. SCR 4 | 2,500,000 |
| 18 | HI. SCR1 CREDITS | 03 |
| 19 | HI. SCR2 CREDITS | 01 |
| 20 | HI. SCR3 CREDITS | 01 |
| 21 | HI. SCR4 CREDITS | 01 |
| 22 | H. S. RESET EVERY (6,000 PLAYS) [2] | |
| 23 | FREE PLAY | NO |
| 24 | U.S.A. 1 COINAGE (1 COIN 1 PLAY) [2,3] | |
| 25 | LEFT UNITS | 01 |
| 26 | CENTER UNITS | 04 |
| 27 | RIGHT UNITS | 01 |
| 28 | UNITS/ CREDIT | 01 |
| 29 | UNITS/ BONUS | 00 |
| 30 | MINIMUM UNITS | 00 |
| 31 | FREEWAY START (3-BALL 50,000) [2] | |
| 32 | FREEWAY MEMORY | Regular |
| 33 | EJ. HOLE SPOTS (3-BALL YES) [2] | |
| 34 | RAMP SPOTS | YES |
| 35 | LIGHT SPECIAL (3-BALL Regular) [2] | |
| 36 | SPECIAL MEMORY | NO |
| 37 | POLICE LIGHT | ON |
| 38 | KICKBAK MEMORY | EASY |
| 39 | LIGHT FREEWAY | Regular |

## HIGH SPEED Game Adjustment Table (Continued)

| Adjustment Item (MATCH) | Descriptive Phrases (SPEEDER 1 and 2 Displays) | Factory Setting (SPEEDER 4) |
|---|---|---|
| 40 | RMP. BON. MEMORY | NO |
| 41 | EX. BALL MEMORY | YES |
| 42 | STPLITE TARGETS | Regular |
| 43 | FREEWAY TIMER | Regular |
| 44 | SIREN STYLE | USA |
| 45 | A-MODE PO. LITE | YES |
| 46 | A-MODE STARTER | YES |
| 47 | A-MODE SOUND | YES |
| 48 | GAME OV. MUSIC | YES |
| 49 | CUSTOM MESSAGE [4] | On |
| 50 | SW. ALARM KNOCKER | YES |
| 51 | UNUSED ADJUST | |
| 52 | UNUSED ADJUST | |
| 53 [5] | INSTALL GERMAN 1 [6] | |
| 54 [5] | INSTALL GERMAN 2 [6] | |
| 55 [5] | INSTALL GERMAN 3 [6] | |
| 56 [5] | INSTALL GERMAN 4 [6] | |
| 57 [5] | INSTALL GERMAN 5 [6] | |
| 58 [5] | INSTALL GERMAN 6 [6] | |
| 59 [5] | INSTALL ADDABALL | NO |
| 60 [5] | INSTALL 5-BALL | NO |
| 61 [5] | INSTALL NOVELTY | NO |
| 62 [5] | INSTALL EX. EASY | NO |
| 63 [5] | INSTALL EASY | NO |
| 64 [5] | INSTALL MEDIUM | NO |
| 65 [5] | INSTALL HARD | NO |
| 66 [5] | INSTALL EX. HARD | NO |
| 67 | AUTO BURN IN | NO |
| 68 | CLEAR COINS | NO |
| 69 | CLEAR AUDITS | NO |
| 70 | INSTALL FACTORY | NO |

NOTES:

1. Automatic Replay percentage value range is adjustable from 5 to 50%, via the Credit button. Item 02 permits changing the factory setting value for Replay Start Level (valid for next 500 games played). Item 03 permits setting up to four replay levels, with values as detailed in text describing item 03.

   For Fixed Replay Scores, set Auto Replay value to 1 less than 5(%) via the Credit button. Go to items 02, 03, 04, and 05 to install their replay level scores. Turn off any replay score level by setting 00 as its value.

2. Phrase in parentheses is Factory Setting. Phrase appears in SPEEDER 3 and 4 displays. Press Credit button to change setting of item 22, or the game pricing of item 24.

3. To change country OR coinage setting, press Credit button to obtain 16 Standard settings, followed by a Custom Setting. The Custom Setting activates items 25 through 30. When a Standard Setting is used, items 25 through 30 are set automatically, and cannot be changed.

4. To install Custom Message, press flipper button for alphabet and special characters. Press Credit button for next message letter or character.

5. Special Preset Adjustment, whose effects are noted in the Game Adjustment text.

6. Refer to Pricing Table and text describing these items.

# GAME ADJUSTMENT PROCEDURE

## Adjustment Items 01 through 70

The coin door must be open to access the Game Adjustment/Diagnostic switches. All readings and adjustments require operation of these coin door switches. Some adjustments utilize the Credit button; some also use the flipper button(s). Additional text describing the game adjustment items follows this procedure.

1. Use AUTO-UP and press ADVANCE. The Credits display indicates Ad. The BALL IN PLAY/MATCH display initially indicates 01. The SPEEDER 1 and SPEEDER 2 player score displays indicate AUTO REPLAY. The SPEEDER 3 display shows PERCENT. If the factory setting has not been changed, the SPEEDER 4 display shows 10, indicating the setting of a 10% replay percentage.

2. To reach a higher item number (in the BALL IN PLAY/MATCH display), use AUTO-UP and press ADVANCE. To return to a previous item number, use MANUAL-DOWN and press ADVANCE.

3. With the desired item number (refer to the *HIGH SPEED Game Adjustment Table*) showing in the BALL IN PLAY/MATCH display, increase the value shown in the SPEEDER 4 display by using AUTO-UP and pressing the Credit button. Repeat this step for each item, until all adjustments have been made.

   For example, the operator may desire to zero the values associated with certain items listed in the *HIGH SPEED Audit Table*. To zero the first four items (concerning the coin chutes and the total coins), the operator can proceed to item 68, Clear Coins, and press the Credit button to obtain the YES option. The operator then presses the ADVANCE button and notes the "COINS CLEARED" display, which verifies that the entry values for items 01 through 04 of the Audit Items are now reset to zero.

4. To proceed through the entire adjustments series, press *and hold* ADVANCE, until item 70 shows in the BALL IN PLAY/MATCH display. From item 70, you can: (A) return to the Game-Over Mode; (B) restore factory settings and zero audit (bookkeeping) totals. Perform either of the following, as desired:

   A. To reach Game-Over Mode, use AUTO-UP and press ADVANCE once. *HIGH SPEED* now goes to the Game-Over Mode.

   B. To restore factory settings, zero all audit (bookkeeping) totals, *and* return to Game-Over Mode, use AUTO-UP or MANUAL-DOWN to display item 70 in the BALL IN PLAY/MATCH display. Press the Credit button to display the YES option in the SPEEDER 4 display. Using AUTO-UP, press ADVANCE once. *HIGH SPEED* now zeroes ALL audit totals and changes ALL game adjustments back to those originally selected as Factory Settings. It then shows the operator a message ("FACTORY SETTING") that this has occurred. (A problem in the Memory Protection circuit or closing the coin door will cause the message "ADJUST FAILURE" to appear.) Press ADVANCE once more to return to the Game-Over Mode.

## Details of Adjustment Items 01 through 70

### 01 Auto Replay (or Fixed Replay)
Of the two options, AUTO REPLAY is the Factory Setting. The percentage of replays automatically awarded has a Factory Setting of 10 (%). Use the Credit button to change the percentage within the range of 5 to 50 (%), with the value increasing using AUTO-UP (or decreasing using MANUAL-DOWN). The next Credit button change beyond 50, or below 5, selects the FIXED REPLAY option.

For AUTO REPLAY, Ad 02 provides the Starting Replay Level (SPEEDER 1 and 2 displays show REPLAY START). Ad 03 provides the number of replay levels (01, 02, 03, or 04). *HIGH SPEED* then proceeds to Ad 06 automatically.

For FIXED REPLAY, Ad 02 is the first replay level (REPLAY LEVEL 1). Ad 03, 04, and 05 are the other replay levels.

### 02 Starting Replay Level (or Replay Level 1)
For AUTO REPLAY (refer to Ad 01), the Factory Setting is 1,400,000. The range of settings is 800,000 through 2,000,000 (by increments of 100,000 with AUTO-UP or decrements of 100,000 with MANUAL-DOWN).

For FIXED REPLAY, the operator can enter the value to be used for the first fixed replay score level via the Credit button. The range of settings is: OFF; 100,000 through 9,900,000 (by increments of 100,000 with

# GAME ADJUSTMENT PROCEDURE (Continued)

**02 Starting Replay Level (or Replay Level 1)** (Continued)

AUTO-UP, or decrements of 100,000 with MANUAL-DOWN).

**03 Replay Levels (or Replay Level 2)**
For AUTO REPLAY (refer to Ad 01), the Factory Setting is 01 (one replay level). The option range is one, two, three, or four replay level(s). When the operator chooses two replay levels, *HIGH SPEED* automatically adjusts the second replay level to be twice the value selected for Ad 02, the starting replay level. Choosing three or four replay levels automatically adjusts their replay levels to three times or four times the Ad 02 value.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

**04 (Replay Level 3)**
For AUTO REPLAY, this Adjustment Item is not applicable. *HIGH SPEED* automatically bypasses this adjustment.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

**05 (Replay Level 4)**
For AUTO REPLAY, this Adjustment Item is not applicable. *HIGH SPEED* automatically bypasses this adjustment.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

**06 Replay Award**
For either AUTO REPLAY or FIXED REPLAY (Ad 01), the operator can select the form of the award automatically provided when the player exceeds any Replay Level (Automatic or Fixed). The choices are:

Credit - Reaching each replay level obtains a credit (free game). This is the Factory Setting.
Ball - Reaching each replay level obtains an extra ball.
Audit - Reaching each replay level obtains nothing to the player; it does increase the entry value of the Audit Item(s) maintaining a tally of these awards (Au 08, and Au 20 through 23, as applicable).
Coil - Reaching each replay level causes the Knocker coil to activate once per free play won (instead of awarding a credit for each level exceeded).

## NOTE
A ticket dispenser or token dispenser can be activated by the Knocker coil
driver to provide an alternative award for each free play achieved by the player.

**07 Special Award**
The operator can select the form of the award automatically provided when the player scores a Special. The choices are:

Credit - Scoring each Special, when lit, obtains a credit (free game). This is the Factory Setting. A variation to this award occurs, when the setting of Ad 06 is Coil. (This permits a ticket or token dispenser to provide the award, when applicable.)
Ball - Scoring each Special, when lit, obtains an extra ball.
Score - Scoring each Special, when lit, obtains a score advance of 250,000 points to the player.

**08 Match Award**
The operator can select whether the Match action occurs at completion of each game. The choices are:

On - This is the Factory Setting. The game selects a random two-digit number at end of game and compares each player's score for an identical two digits in the rightmost two positions. A matching of the two digits results in the award of a credit (or a ticket/token, if a dispenser is attached, and the setting of Ad 06 is Coil).

Off - The MATCH display is deactivated at completion of the game; no award is given.

*High Speed 10*

# GAME ADJUSTMENT PROCEDURE (Continued)

**09 Balls / Game**
The operator can define a "game" by specifying the number of balls to be played. The _Factory Setting_ is 3. The range of settings is 1 through 9.

**10 Tilt Warning**
The operator can specify the allowable number of total actuations of the plumb bob and playfield tilt mechanisms that can occur before the game is "tilted". The range of this setting is 1 through 5. The _Factory Setting_ is 3.

**11 Maximum Extra Ball**
The operator can specify the maximum number of Extra Balls to be accumulated at any time. The range of this setting is 00 (which allows NO extra ball play, and displays a message, NO EX. BALL) and 1 through 9. The _Factory Setting_ is 4.

**12 Maximum Credits**
The operator can specify the maximum number of credits the game can accumulate, either through game play awards or coin purchases. The range of settings is 5 through 99. The _Factory Setting_ is 30. Reaching the specified setting actuates the coin-lockout relay, preventing the purchase of additional credits by causing the coins to be rejected.

### NOTE
Whenever the number of credits is less than the specified maximum credits, any credits obtained by coin purchase or game awards (High Score, Match, Replay Levels, etc.) will be accumulated even though they exceed the maximum value. Thereafter, no additional credits can be accumulated, until the credit total is reduced below the specified maximum setting.

**13 Highest Scores**
The operator can allow the game to maintain a record of the four highest scores achieved to date. The _Factory Setting_ is On. The optional alternative is Off, which deactivates this adjustment item.

**14 Backup High Score 1**
The operator can set the Backup High Score value for the first player score display (SPEEDER 1), by using the Credit button. The _Factory Setting_ is 4,000,000. The game automatically restores the value set, when the operator presses, and holds, the HIGH SCORE RESET switch, or when an automatic High Score Reset event (Ad 22) occurs.

**15 Backup High Score 2**
This adjustment is similar to Ad 14, except that this applies to the second player score display (SPEEDER 2). The adjustment technique is identical to Ad 14. The _Factory Setting_ is 3,800,000. It is also restored as described for Ad 14.

**16 Backup High Score 3**
This adjustment is similar to Ad 14, except that this applies to the third player score display (SPEEDER 3). The adjustment technique is identical to Ad 14. The _Factory Setting_ is 3,600,000. It is also restored as described for Ad 14.

**17 Backup High Score 4**
This adjustment is similar to Ad 14, except that this applies to the fourth player score display (SPEEDER 4). The adjustment technique is identical to Ad 14. The _Factory Setting_ is 3,400,000. It is also restored as described for Ad 14.

**18 Credits for Highest Score 1**
The operator can select the number of credits to be awarded, by using the Credit button, whenever a player exceeds the previous Highest Score. The range of this setting is 00 through 10. The _Factory Setting_ is 03. A variation to this award occurs, when the setting of Ad 06 is Coil. (This permits a ticket or token dispenser to provide the award, when applicable.)

**19 Credits for Highest Score 2**
This adjustment is similar to Ad 18, except that this applies to the player's exceeding the second highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03. The Factory Setting is 01.

**20 Credits for Highest Score 3**
This adjustment is similar to Ad 18, except that this applies to the player's exceeding the third highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03. The Factory Setting is 01.

**21 Credits for Highest Score 4**
This adjustment is similar to Ad 18, except that this applies to the player's exceeding the fourth highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03. The Factory Setting is 01.

**22 Automatic High Score Reset**
The operator can specify (via Credit button) that the game will provide an automatic reset of the displayed "Highest Scores", and the number of games to be played before the reset occurs. The values provided upon reset are those selected by the operator in Ad 14 through 17, the Backup High Scores. The range of this setting is Off (to disable this adjustment), and 1,000 to 99,000 games (in increments of 1,000). The Factory Setting is 6,000. (Audit item 39 displays the number of games remaining before the reset.)

**23 Free Play**
The operator can select (via the Credit button) whether a player can operate the game without a coin (free play) or with a coin. The optional alternatives are No (a coin is necessary) or Yes (game play is free; no coin is required). The Factory Setting is No.

**24 Coinage Selections**
The operator can specify (via the Credit button) any of the 16 Standard Settings for game pricing, each of which exhibits a message identifying the country and the number of coins required and the number of games that the coin requirement purchases. Choosing a Standard Setting permits the game to omit Ad 25 through 30,which are adjustments designed for a special coinage setting. The Factory Setting is U.S.A. 1 : 1 COIN 1 PLAY, as shown by the backbox display.

Following the last Standard Setting is a Custom Coinage Setting, which allows the operator to utilize Ad 25 through 30 in establishing a special coinage setting. A message, CUSTOM COINAGE, indicates that the operator can enter the appropriate values into the Ad 25 through 30 adjustment items.

The values for Ad 25 through 30 of each Standard Setting, as well as other possible values for the Custom Coinage Setting are shown in the *Pricing Table.*

**25 Left Chute Coin Units**
The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the left coin chute.

**26 Center Chute Coin Units**
The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the center coin chute.

**27 Right Chute Coin Units**
The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the right coin chute.

**28 Units Required for Credit**
The operator can define (via the Credit button) the number of coin units required to obtain 1 Credit. A coin unit counter in the game program totals the number of coin units purchased through all coin chutes prior to each game. If the total number of coin units purchased exceeds the 1 Credit factor by a multiple (or more, coin units) of the specified Units per Credit value, the Credits display shows the proper number of Credits. The coin unit counter retains any remaining coin units, until the start of a game; then, the coin unit counter is cleared (its contents are zeroed). The Factory Setting is 01.

**29 Units Required for Bonus**

The operator can specify (via the Credit button) that 1 additional Credit is to be indicated in the Credits display, when a particular number of coin units are accumulated. The Factory Setting is 00.

**30 Minimum Units Required for any Credits Posted**

The operator can specify that NO Credits are to be posted (indicated in the Credits display), until the credit units counter reaches a particular value. The Factory Setting is 00.

**31 Freeway Starting Level**

The operator can choose (via the Credit button) the starting value of scoring for the Bayshore (left side) and the Santa Monica (right side) freeways. Three choices are available:

1 - For 3-Ball game, the score starting level setting is automatically 50,000 (shown in the SPEEDER 4 display); for 5-Ball game, the setting is automatically 25,000 (shown in SPEEDER 4). Using this choice allows the setting of Ad 09 (Balls/Game) to define the Freeway Starting Level. (The SPEEDER 3 display shows the Ad 09 setting.) This is the Factory Setting.

2 - Freeway Starting Level score is 50,000.

3 - Freeway Starting Level score is 25,000.

**32 Freeway Memory**

The operator can choose (via the Credit button) whether the value of the Freeway award is retained in memory from ball to ball. Three choices are available:

1 - Retain the Freeway value in memory, until the Freeway Extra Ball level is achieved, then the Freeway award is not retained in memory. The SPEEDER 4 display shows this as REGULAR. This is the Factory Setting.

2 - Retain the Freeway value in memory for the entire game. SPEEDER 4 shows this choice as EASY.

3 - NEVER store any Freeway award. The Freeway Starting Level is in effect at the start of each ball. SPEEDER 4 shows this choice as HARD.

**33 Eject Hole Spots Stoplight Target**

The operator can choose (via the Credit button) whether actuation of the Eject Hole (Santa Monica Freeway) spots a Stoplight target. Three choices are available:

1 - For 3-Ball game, the Eject Hole does spot a Stoplight target; for 5-Ball game, the Eject Hole does not spot a Stoplight target. Using this choice allows the setting of Ad 09 (Balls/Game) to define the choice selected. (The SPEEDER 3 display shows the Ad 09 setting.) (SPEEDER 4 shows this choice as YES.) This is the Factory Setting.

2 - Eject Hole spots a Stoplight target. (SPEEDER 4 shows this choice as YES.)

3 - Eject Hole does not spot a Stoplight target. (SPEEDER 4 shows this choice as NO.)

**34 Ramp Spots Stoplight Target**

The operator can choose (via the Credit button) whether making a Ramp shot spots a Stoplight target. Two choices are available:

1 - A Ramp shot does spot a Stoplight target. (SPEEDER 4 shows this choice as YES.) This is the Factory Setting.

2 - A Ramp shot does not spot a Stoplight target. (SPEEDER 4 shows this choice as NO.)

### NOTE

For 3-Ball game, BEFORE a player's first Multi-ball™ event, Ramp shots from the ball shooter DO spot a Stoplight target, if the choice is YES. Using this choice allows the setting of Ad 09 (Balls/Game) to define this adjustment's operation.

For 5-Ball game, Ramp shots from the ball shooter NEVER spot a Stoplight target.

Moreover, after a player's first Multi-ball™ event, Ramp shots NEVER spot a Stoplight target for either 3-Ball or 5-Ball games.

# GAME ADJUSTMENT PROCEDURE (Continued)

**35 Light Special**

The operator can choose (via the Credit button) the degree of difficulty in lighting the Special lamp. Six choices are available:

1 - For 3-Ball game, completion of the Stoplight target sequence (Green, Yellow, and then Red) for the *second* time causes the Special lamp to light; for 5-Ball game, completion of the Stoplight target sequence for the *third* time causes the Special lamp to light. Using this choice allows the setting of Ad 09 (Balls/Game) to define the choice selected. (The SPEEDER 3 display shows the Ad 09 setting.) This is the Factory Setting.

2 - Completion of the Stoplight target sequence the *first* time lights the Special lamp. (SPEEDER 4 shows this choice as EASY.)

3 - Completion of the Stoplight target sequence the *second* time lights the Special lamp. (SPEEDER 4 shows this choice as REGULAR.)

4 - Completion of the Stoplight target sequence the *third* time lights the Special lamp. (SPEEDER 4 shows this choice as HARD.)

5 - Completion of the Stoplight target sequence the *fourth* time lights the Special lamp. (SPEEDER 4 shows this choice as HARDER.)

6 - The Special lamp never lights. (SPEEDER 4 shows this choice as NO.)

**36 Special Memory**

The operator can choose (via the Credit button) whether the achievement of lighting the Special lamp is retained in memory from ball to ball. Two choices are available:

1 - The lighted Special lamp does NOT remain in memory from ball to ball. THE SPEEDER 4 display shows this choice as NO. This is the Factory Setting.

2 - The lighted Special Lamp remains in memory from ball to ball. (SPEEDER 4 shows this as YES.)

**37 Police Light**

The operator can choose (via the Credit button) whether the Police Light (rotating beacon) operates or not. Two choices are available:

1 - Police Light operates for special effects. The SPEEDER 4 display shows this choice as ON. This is the Factory Setting.

2 - Police Light does not operate. (SPEEDER 4 shows OFF.)

**38 Kickback Memory**

The operator can choose (via the Credit button) how the Kickback operates. Five choices are available:

1 - Kickback is always ON at start of ball. The SPEEDER 4 display shows this choice as EASY. This is the Factory Setting.

2 - Kickback is always OFF at start of ball. (SPEEDER 4 shows HARDER.)

3 - Kickback is ON at start of game and stays in memory from ball to ball. (SPEEDER 4 shows REGULAR.)

4 - Kickback is OFF at start of game and stays in memory from ball to ball. (SPEEDER 4 shows HARD.)

5 - Kickback is always ON. (SPEEDER 4 shows EASIER.)

**39 Lighting Freeway Difficulty**

The operator can choose (via the Credit button) the difficulty for lighting a Freeway lane. Two choices are available:

1 - Passage through a flipper return lane lights the Freeway lane on the opposite side of the playfield; passage around the Freeway loop (Bayshore and Santa Monica) also lights a Freeway lane. The SPEEDER 4 display shows this choice as REGULAR. This is the Factory Setting.

2 - Only passage through a flipper return lane lights the opposite-side Freeway lane. (SPEEDER 4 shows this choice as HARD.)

## 40 Ramp Bonus Memory

The operator can choose (via the Credit button) whether the Ramp Bonus value (accumulated from Target 1 through Target 6 shots) remains in memory from ball to ball. Two choices are available:

1 - The Ramp Bonus value does NOT remain in memory from ball to ball. The SPEEDER 4 display shows this choice as NO. This is the Factory Setting.
2 - The Ramp Bonus value DOES remain in memory from ball to ball. (SPEEDER 4 shows YES.)

## 41 Extra Ball Memory

The operator can choose (via the Credit button) whether the lighted Eject Hole Extra Ball arrow remains in memory from ball to ball. Two choices are available:

1 - The Eject Hole Extra Ball arrow remains in memory from ball to ball. The SPEEDER 4 display shows this choice as YES. This is the Factory Setting.
2 - The Eject Hole Extra Ball arrow does NOT remain in memory from ball to ball. (SPEEDER 4 shows NO.)

## 42 Stoplight Target Sequence Difficulty

The operator can choose (via the Credit button) the difficulty level of the Stoplight targets. Two choices are available:

1 - Lighting NINE targets is the requirement for completion of the Stoplight target sequence. The SPEEDER 4 display shows this choice as REGULAR. This is the Factory Setting.
2 - Lighting SIX targets is the requirement for completion of the Stoplight target sequence. (SPEEDER 4 shows EASY.)

## 43 Freeway Timer

The operator can choose (via the Credit button) the length of time that the Freeway arrow remains lighted. Three choices are available:

1 - The Freeway arrow remains lighted for approximately 9 seconds. The SPEEDER 4 display shows this choice as REGULAR. This is the Factory Setting.
2 - The Freeway arrow remains lighted for approximately 11 seconds. (SPEEDER 4 shows EASY.)
3 - The Freeway arrow remains lighted for approximately 6 seconds. (SPEEDER 4 shows HARD.)

## 44 Siren Style

The operator can choose (via the Credit button) the style of Siren Sound. Two choices are available:

1 - Siren sound style for the police chase is American. The SPEEDER 4 display shows this choice as U.S.A. This is the Factory Setting.
2 - Siren sound style for the police chase is European. (SPEEDER 4 shows EURO.)

## 45 Attract Mode - Police Light

The operator can choose (via the Credit button) the frequency of operation of the Police Light during the Attract Mode. Two choices are available:

1 - The Police Light operates approximately every 3-1/2 minutes during the Attract Mode. This choice requires that the adjustment allowing the Police Light to operate (Ad 37) enables it to be on. The SPEEDER 4 display shows this choice as YES. This is the Factory Setting.
2 - The Police Light does NOT operate during the Attract Mode. (SPEEDER 4 shows NO.)

## 46 Attract Mode - Starter

The operator can choose (via the Credit button) whether, during the Attract Mode, the automobile starter sound occurs when the Credit button is pressed. Two choices are available:

1 - The automobile starter sound IS heard. The SPEEDER 4 display shows this choice as YES. This is the Factory Setting.
2 - The automobile starter sound is NOT heard. (SPEEDER 4 shows NO.)

# GAME ADJUSTMENT PROCEDURE (Continued)

## 47 Attract Mode - Sound

The operator can choose (via the Credit button) whether the automobile and police call sounds can be heard approximately every 3-1/2 minutes during the Attract Mode. Two choices are available:

1 - The automobile and police call sounds can be heard. The SPEEDER 4 display shows this choice as YES. This is the Factory Setting.
2 - NO Attract Mode sound can be heard. (SPEEDER 4 shows NO.)

## 48 Game Over Music

The operator can choose (via the Credit button) whether a 30-second musical tune or a shorter sound plays at Game Over. Two choices are available:

1 - A 30-second musical tune plays at Game Over. The SPEEDER 4 display shows this choice as YES. This is the Factory Setting.
2 - A shorter sound can be heard at Game Over. (SPEEDER 4 shows NO.)

## 49 Custom Message

The operator can choose (via the Credit button) whether to display a message during the Attract Mode. (When display of a message is selected, the operator can either utilize the message provided or change the message.) Three choices are available:

1 - Display a message during the Attract Mode. The SPEEDER 4 display shows this choice as ON. This is the Factory Setting. The 3-line message provided is:
RUN THE LIGHT-     AND GET AWAY--     AT HIGH SPEED.
2 - Do NOT display a message during the Attract Mode. (SPEEDER 4 shows OFF.)
3 - The SPEEDER 4 display shows this choice as CHANGE. The operator can enter a special ("custom") message, as follows:
A. Press ADVANCE once. The operator can now enter as many as three 14-character lines for display during the Attract Mode.
B. Use the flipper button(s) to select each message character (alphabet, numbers, and special symbols are available). In case of error, enter a "back arrow" (just before "space") to correct, followed by correct character. For a period after any letter, use letters with periods (following the special symbols).
C. Move to the next character via the Credit button. No entirely blank lines will be displayed.

## 50 SW. ALARM KNOCKER

The operator can choose (via the Credit button) whether the knocker operates, sounding an alarm to signal a switch problem, at the time of game Turn-On and at the beginning of the Test/Diagnostic Procedures. Two choices are available:

1 - The knocker sounds, signalling a switch problem, at game Turn-On and at the beginning of the Test /Diagnostic Procedures. The SPEEDER 4 display shows this choice as YES. This is the Factory Setting.
2 - The knocker does NOT sound. (SPEEDER 4 shows NO.)

## 51 UNUSED ADJUST

This adjustment is not used for *HIGH SPEED.*

## 52 UNUSED ADJUST

This adjustment is not used for *HIGH SPEED.*

# GAME ADJUSTMENT PROCEDURE (Continued)

## SPECIAL PRESET ADJUSTMENTS CAUTION

Adjustments 53 through 66 are Special Preset Adjustments to enable the operator to perform the setting of multiple adjustments at once. They permit the operator to: (1) modify a game for a specific area (special German coinage settings, for example, Ad 53 through 58); (2) change a group of adjustments to conform with laws of certain localities (Ad 59 through 61); and (3) to change the degree of difficulty of game play (Ad 62 through 66). A list of the preceding individual Adjustments affected accompanies each of these Special Preset Adjustments. Whenever the operator chooses to use any Special Preset Adjustment, the operator can later access any or all of the individual Adjustments affected by that Special Adjustment for subsequent changes.

A similar technique is recommended in the event of error or uncertainty concerning any Special Preset Adjustment, after the operator selects it: The operator can restore the factory setting of each individual Adjustment, then select the desired Special Preset Adjustment, and then return to any of the preceding individual adjustments to determine whether use of the Special Adjustment has had the desired effect.

The Backbox displays for each Special Preset Adjustment indicate whether the operator has selected it, by identifying the Adjustment in the SPEEDER 1 and 2 displays by name and the selection choice of NO, meaning Not Selected (this is the Factory Setting), or YES, meaning Selected, in the SPEEDER 4 display. Selection occurs by using the Credit button to choose YES and then pressing ADVANCE.

## 53 Install German 1

The operator can modify the game pricing selection of Standard Setting 09 in the *Pricing Table* to permit Credit Award play with 10 games for 5 DM. Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 24 | German 1 Coinage | 10 Plays/5DM | 07 | Special Award | Credit |
| 18 | Hi Scr 1 Credits | 03 | 08 | Match Feature | On |
| 19 | Hi Scr 2 Credits | 00 | 14 | Backup Hi Scr 1 | 4,000,000 |
| 20 | Hi Scr 3 Credits | 00 | 15 | Backup Hi Scr 2 | 3,500,000 |
| 21 | Hi Scr 4 Credits | 00 | 16 | Backup Hi Scr 3 | 3,000,000 |
| 06 | Replay Award | Credit | 17 | Backup Hi Scr 4 | 2,500,000 |

**Note:** This Special Preset Adjustment is automatically installed, when the CPU Board jumper W7 is cut or removed, AND the Factory Setting is requested.

## 54 Install German 2

The operator can modify the game pricing selection of Standard Setting 09 in the *Pricing Table* to permit Ticket/Token operation with 10 games for 5 DM. Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 24 | German 1 Coinage | 10 Plays/5DM | 07 | Special Award | Ball |
| 18 | Hi Scr 1 Credits | 03 | 08 | Match Feature | On |
| 19 | Hi Scr 2 Credits | 00 | 14 | Backup Hi Scr 1 | 4,000,000 |
| 20 | Hi Scr 3 Credits | 00 | 15 | Backup Hi Scr 2 | 3,500,000 |
| 21 | Hi Scr 4 Credits | 00 | 16 | Backup Hi Scr 3 | 3,000,000 |
| 06 | Replay Award | Coil | 17 | Backup Hi Scr 4 | 2,500,000 |

## 55 Install German 3

The operator can modify the game pricing selection of Standard Setting 09 in the *Pricing Table* to permit Keyset Mode operation with 10 games for 5 DM. Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 24 | German 1 Coinage | 10 Plays/5DM | 15 | Backup Hi Scr 2 | 00 |
| 18 | Hi Scr 1 Credits | 00 | 16 | Backup Hi Scr 3 | 00 |
| 19 | Hi Scr 2 Credits | 00 | 17 | Backup Hi Scr 4 | 00 |
| 20 | Hi Scr 3 Credits | 00 | 06 | Replay Award | Audit |
| 21 | Hi Scr 4 Credits | 00 | 07 | Special Award | Score |
| 14 | Backup Hi Scr 1 | 00 | 08 | Match Feature | Off |

# GAME ADJUSTMENT PROCEDURE (Continued)

## 56 Install German 4
The operator can modify the game pricing selection of Standard Setting 09 in the *Pricing Table* to permit <u>Credit Award play with 6 games for 5 DM</u>. Individual Adjustments are affected, as follows:

| <u>Ad</u> | <u>Name</u> | <u>New Setting</u> | <u>Ad</u> | <u>Name</u> | <u>New Setting</u> |
|---|---|---|---|---|---|
| 24 | German 2 Coinage | 6 Plays/5DM | 07 | Special Award | Credit |
| 18 | Hi Scr 1 Credits | 03 | 08 | Match Feature | On |
| 19 | Hi Scr 2 Credits | 00 | 14 | Backup Hi Scr 1 | 4,000,000 |
| 20 | Hi Scr 3 Credits | 00 | 15 | Backup Hi Scr 2 | 3,500,000 |
| 21 | Hi Scr 4 Credits | 00 | 16 | Backup Hi Scr 3 | 3,000,000 |
| 06 | Replay Award | Credit | 17 | Backup Hi Scr 4 | 2,500,000 |

## 57 Install German 5
The operator can modify the game pricing selection of Standard Setting 09 in the *Pricing Table* to permit <u>Ticket/Token operation with 6 games for 5 DM</u>. Individual Adjustments are affected, as follows:

| <u>Ad</u> | <u>Name</u> | <u>New Setting</u> | <u>Ad</u> | <u>Name</u> | <u>New Setting</u> |
|---|---|---|---|---|---|
| 24 | German 2 Coinage | 6 Plays/5DM | 07 | Special Award | Ball |
| 18 | Hi Scr 1 Credits | 03 | 08 | Match Feature | On |
| 19 | Hi Scr 2 Credits | 00 | 14 | Backup Hi Scr 1 | 4,000,000 |
| 20 | Hi Scr 3 Credits | 00 | 15 | Backup Hi Scr 2 | 3,500,000 |
| 21 | Hi Scr 4 Credits | 00 | 16 | Backup Hi Scr 3 | 3,000,000 |
| 06 | Replay Award | Coil | 17 | Backup Hi Scr 4 | 2,500,000 |

## 58 Install German 6
The operator can modify the game pricing selection of Standard Setting 09 in the *Pricing Table* to permit <u>Keyset Mode operation with 6 games for 5 DM</u>. Individual Adjustments are affected, as follows:

| <u>Ad</u> | <u>Name</u> | <u>New Setting</u> | <u>Ad</u> | <u>Name</u> | <u>New Setting</u> |
|---|---|---|---|---|---|
| 24 | German 2 Coinage | 6 Plays/5DM | 07 | Special Award | Score |
| 18 | Hi Scr 1 Credits | 00 | 08 | Match Feature | Off |
| 19 | Hi Scr 2 Credits | 00 | 14 | Backup Hi Scr 1 | 00 |
| 20 | Hi Scr 3 Credits | 00 | 15 | Backup Hi Scr 2 | 00 |
| 21 | Hi Scr 4 Credits | 00 | 16 | Backup Hi Scr 3 | 00 |
| 06 | Replay Award | Audit | 17 | Backup Hi Scr 4 | 00 |

## 59 Install Add A Ball
The operator can utilize this option to delete all Free Play awards and replace them with Extra Ball awards. Individual Adjustments are affected, as follows:

| <u>Ad</u> | <u>Name</u> | <u>New Setting</u> | <u>Ad</u> | <u>Name</u> | <u>New Setting</u> |
|---|---|---|---|---|---|
| 06 | Replay Award | Ball | 19 | Hi Scr 2 Credits | 00 |
| 07 | Special Award | Ball | 20 | Hi Scr 3 Credits | 00 |
| 08 | Match Feature | Off | 21 | Hi Scr 4 Credits | 00 |
| 18 | Hi Scr 1 Credits | 00 | | | |

## 60 Install 5 Ball
The operator can change the game to 5-Ball play, including the changing of certain features to the recommended 5-Ball play difficulty level. Individual Adjustments are affected, as follows:

| <u>Ad</u> | <u>Name</u> | <u>New Setting</u> | <u>Ad</u> | <u>Name</u> | <u>New Setting</u> |
|---|---|---|---|---|---|
| 09 | Balls / Game | 05 | 33 | Ej. Hole Spots | No |
| 02 | Replay Start | 1,900,000 | 34 | Ramp Spots | Yes |
| 31 | Freeway Start | 25,000 | 35 | Light Special | Hard |
| 32 | Freeway Memory | Regular | | | |

# GAME ADJUSTMENT PROCEDURE (Continued)

## 61 Install Novelty

The operator can remove all Free Play and Extra Ball awards.  Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 06 | Replay Award | Audit | 01 | Fixed Replay | |
| 07 | Special Award | Score | 02 | Replay Level 1 | Off |
| 08 | Match Feature | Off | 03 | Replay Level 2 | Off |
| 18 | Hi Scr 1 Credits | 00 | 04 | Replay Level 3 | Off |
| 19 | Hi Scr 2 Credits | 00 | 05 | Replay Level 4 | Off |
| 20 | Hi Scr 3 Credits | 00 | 11 | No Extra Ball | No |
| 21 | Hi Scr 4 Credits | 00 | | | |

## 62 Install Extra Easy

The operator can change the game play difficulty adjustments to a combination that is extremely easy (sometimes called "liberal").  Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 31 | Freeway Start | 50,000 | 38 | Kickbak Memory | Easier |
| 32 | Freeway Memory | Easy | 39 | Light Freeway | Regular |
| 33 | Ej. Hole Spots | Yes | 40 | Rmp. Bon. Memory | Yes |
| 34 | Ramp Spots | Yes | 41 | Ex. Ball Memory | Yes |
| 35 | Light Special | Regular | 42 | Stplite Targets | Easy |
| 36 | Special Memory | Yes | 43 | Freeway Timer | Easy |

## 63 Install Easy

The operator can change the game play difficulty adjustments to a combination that is slightly easier than the Factory Settings.  Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 31 | Freeway Start | 50,000 | 38 | Kickbak Memory | Easy |
| 32 | Freeway Memory | Easy | 39 | Light Freeway | Regular |
| 33 | Ej. Hole Spots | Yes | 40 | Rmp. Bon. Memory | Yes |
| 34 | Ramp Spots | Yes | 41 | Ex. Ball Memory | Yes |
| 35 | Light Special | Regular | 42 | Stplite Targets | Regular |
| 36 | Special Memory | No | 43 | Freeway Timer | Easy |

## 64 Install Medium

The operator can change the game play difficulty adjustments to a combination that matches the Factory Settings.  Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 31 | Freeway Start | 50,000 | 38 | Kickbak Memory | Easy |
| 32 | Freeway Memory | Regular | 39 | Light Freeway | Regular |
| 33 | Ej. Hole Spots | Yes | 40 | Rmp. Bon. Memory | No |
| 34 | Ramp Spots | Yes | 41 | Ex. Ball Memory | Yes |
| 35 | Light Special | Regular | 42 | Stplite Targets | Regular |
| 36 | Special Memory | No | 43 | Freeway Timer | Regular |

## 65 Install Hard

The operator can change the game play difficulty adjustments to a combination that is more difficult than the Factory Settings.  Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 31 | Freeway Start | 25,000 | 38 | Kickbak Memory | Regular |
| 32 | Freeway Memory | Regular | 39 | Light Freeway | Regular |
| 33 | Ej. Hole Spots | No | 40 | Rmp. Bon. Memory | No |
| 34 | Ramp Spots | Yes | 41 | Ex. Ball Memory | Yes |
| 35 | Light Special | Regular | 42 | Stplite Targets | Regular |
| 36 | Special Memory | No | 43 | Freeway Timer | Regular |

# GAME ADJUSTMENT PROCEDURE (Continued)

## 66 Install Extra Hard

The operator can change the game play difficulty adjustments to a combination that is much more difficult than the Factory Settings. Individual Adjustments are affected, as follows:

| Ad | Name | New Setting | Ad | Name | New Setting |
|----|------|-------------|----|------|-------------|
| 31 | Freeway Start | 25,000 | 38 | Kickbak Memory | Harder |
| 32 | Freeway Memory | Hard | 39 | Light Freeway | Hard |
| 33 | Ej. Hole Spots | No | 40 | Rmp. Bon. Memory | No |
| 34 | Ramp Spots | Yes | 41 | Ex. Ball Memory | Yes |
| 35 | Light Special | Hard | 42 | Stplite Targets | Regular |
| 36 | Special Memory | No | 43 | Freeway Timer | Hard |

## 67 Auto Burn-In

The operator can choose the YES option for this Special Preset Adjustment to perform certain automatic testing of the game, as used in the factory. It does not affect the game operation, but merely provides for a cyclic testing of most of the game's mechanisms.

## 68 Clear Coins

The operator can request the clearing of the coinage audits (Au 01 through 04) by selecting (via the Credit button) the YES option, as shown in the SPEEDER 4 display. This adjustment zeroes the counters tallying the number of coins through each slot, the Paid Credits counter, and the Credits display.

After the YES option is displayed, the operator must press the ADVANCE button. The game then displays COINS CLEARED.

## 69 Clear Audits

The operator can request the clearing of the non-coinage audits (Au 05 through 38) by selecting (via the Credit button) the YES option, as shown in the SPEEDER 4 display. This Adjustment zeroes the counters tallying the remaining Audit factors. Please note that this does NOT affect the Automatic Replay Percentaging data nor the automatic High Score Reset counter.

After the YES option is displayed, the operator must press the ADVANCE button. The game then displays AUDITS CLEARED.

## 70 Install Factory

The operator can request the game to provide the normal Factory Settings to restore the game to its 'factory condition'. This Adjustment clears all Audits, resets all Game Adjustments to the respective Factory Settings, and provides a restart of the Auto Replay (Ad 01).

After the YES option is displayed, the operator must press the ADVANCE button. The game then displays FACTORY SETTING.

Closing of the coin door before appearance of the FACTORY SETTING message or a problem in the Memory Protect circuit will cause the game to display ADJUST FAILURE.

A loss of battery power or improper treatment of the Game Adjustments will cause the game to attempt to restore Factory Settings. The game announces the results of this reset process with the appropriate message, FACTORY SETTING or ADJUST FAILURE.

# RESETTING THE HIGH SCORES

The challenge of exceeding the High Score (either the factory setting or a higher score by another player) is the goal of many pinball game players. To keep a pinball game challenging requires a method of resetting the High Score value for those occasions when a skilled player registers a truly excellent score. Other players note this score and may decide not to play simply because their skill is not adequate to exceed an extremely high score.

For *HIGH SPEED*, in fact, three methods of resetting the High Score values are available. The simplest method involves allowing Game Adjustment Item Ad 22 to reset the High Score values automatically after the specified number of plays designated by the operator. The second method requires pressing the High Score Reset switch on the inside of the coin door in the Attract Mode. This action simply erases the previous high score values and replaces them with the Backup High Score values. The third method establishes new values replacing the factory setting values or previous operator setting values; it requires performing the following steps:

1.  Using AUTO-UP or MANUAL-DOWN, reach item Ad 14 (and items Ad 15, 16, and 17, if desired). The High Score value of the factory setting (or previous operator-adjusted setting) appears in the SPEEDER 1 display. If this value is satisfactory, go to step 4 below.

2.  If you wish to increase the High Score value from that displayed in the SPEEDER 1 display, use AUTO-UP, and press the Credit button, until the desired value shows in the SPEEDER 1 display.

3.  If you wish to decrease the High Score value, use MANUAL-DOWN, and press the Credit button, until the desired value shows in the SPEEDER 1 display.

4.  Using AUTO-UP, press and hold down ADVANCE, until the Credits display shows  Ad  and the BALL IN PLAY/MATCH display shows  item 70.  Press ADVANCE once, to return to Game-Over Mode.

5.  Press the High Score Reset switch (on coin door), and listen for the sound signifying that the score reset action is complete. Observe player score displays (SPEEDER 1, SPEEDER 2, etc.) to verify that the new High Score values are displayed.


# GAME PRICING

**PRICING MADE EASY.** Game Adjustment Item Ad 24 allows the operator an easy method of setting the pricing functions. If the operator enters a "Standard Setting" number (from 01 to 16) into Adjustment Item 24, each of the other pricing items (25 through 30) changes to the value shown in the *Pricing Table* for that selected "Standard Setting".

**CUSTOM PRICING.** Adjustment Item 24 must be set to the Custom Coinage Setting (SPEEDER 1 and 2 displaying CUSTOM COINAGE) to enable the operator to enter desired custom pricing selections for Items 25 through 30, based on the *Pricing Table*. Item 25 is the left coin chute multiplier. Item 26 is the center coin chute multiplier. Item 27 is the right coin chute multiplier. Item 28 is the number of games that must be purchased before a free game is awarded.

The calculation of the ratio of Games : Price uses the ratio equation of  X : VC , where:

$X$ = Coin Chute Multiplier (Item 25, 26, or 27 in *Pricing Table*)
$V$ = Value of coin
$C$ = Coin units required for credit (Item 28).

For example, for 25¢ chutes at the factory setting, substituting values in the Games : Price ratio calculation gives 1 : 25 x 1, or one game for 25¢.

**UNITS REQUIRED FOR BONUS CREDIT.** Item 29 is the number of games that must be purchased before a free game is awarded. At the factory setting, the number in this item is 00. (This 00 means that NO free games are awarded, although purchase of more than one game at a time occurs.)

**MINIMUM COIN UNITS.** Item 30 determines the number of games that must be purchased before play may begin. The factory setting for this item is 00. (This 00 means that the Minimum Coin Units feature (Item 30) is disabled, by the factory setting.)

# GAME PRICING (Continued)

## Pricing Table

| Country | Coin Chute | | | Games/Coin | Pricing Functions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Center | Right | | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| USA and Canada | 25¢ | - | 25¢ | 1/25¢, 4/$1 [1,2] | 01 | 01 | 04 | 01 | 01 | 00 | 00 |
| | | | | 1/50¢, 2/$1 [2] | 03 | 01 | 04 | 01 | 02 | 00 | 00 |
| | | | | 2/25¢, 8/$1 | 00 | 02 | 00 | 02 | 01 | 00 | 00 |
| | | | | 1/25¢, 3/50¢, 6/$1 [2] | 04 | 01 | 00 | 01 | 01 | 02 | 00 |
| | | | | 1/25¢, 5/$1 | 00 | 01 | 00 | 01 | 01 | 04 | 00 |
| | | | | 1/50¢, 3/$1 [2] | 02 | 01 | 00 | 01 | 02 | 04 | 00 |
| West Germany | 1 DM | 2 DM | 5 DM | 1/1 DM, 2/2 DM, 6/5 DMark [2] | 10 | 07 | 14 | 35 | 06 | 00 | 00 |
| | | | | 1/1 DM, 3/2 DM, 9/5 DM | 00 | 09 | 18 | 45 | 05 | 00 | 00 |
| | | | | 1/2x1 DM, 1/2 DM, 3/5 DM [2] | 11 | 03 | 15 | 06 | 05 | 00 | 00 |
| | | | | 2/1 DM, 5/2 DM, 14/5 DM [2] | 12 | 13 | 65 | 26 | 05 | 65 | 00 |
| | | | | 1/1 DM, 3/2 DM, 10/5 DM [2,3] | 09 | 09 | 18 | 45 | 05 | 00 | 00 |
| | | | | 1/1 DM, 2/2 DM, 6/5 DM<br>Ticket/Token Mode [4]<br>Keyset Mode [4] | 00 | 06 | 12 | 30 | 05 | 00 | 00 |
| France | 1 F | 5 F | 10 F | 1/3x1 F, 2/5 F, 5/10 Franc [2] | 13 | 02 | 10 | 20 | 05 | 20 | 00 |
| Antilles (Netherlands) | 25¢ | - | 1 G | 1/25¢, 4/1 Guilder | 00 | 01 | 01 | 04 | 01 | 00 | 00 |
| Netherlands | 25¢ | - | 1 G | 1/25¢, 5/1 Guilder | 00 | 01 | 00 | 05 | 01 | 00 | 00 |
| Belgium | 5 F | - | 20 F | 1/2x5 F, 2/20 Franc [2] | 08 | 01 | 01 | 04 | 02 | 00 | 00 |
| | 5 F | 5 F | 20 F | 1/2X5 F, 1/2X5 F, 2/20 F [2] | 08 | 01 | 01 | 04 | 02 | 00 | 00 |
| | 5 F | 20 F | 20 F | 1/2x5 F, 2/20 F, 2/20 F [2] | 08 | 01 | 01 | 04 | 02 | 00 | 00 |
| Spain | 25 P | - | 100P | 1/25 P, 5/100 Peseta [2] | 15 | 01 | 00 | 05 | 01 | 00 | 00 |
| Switzerland | 1 F | 2 F | 5 F | 1/1 F, 3/2 F, 7/5 Franc | 00 | 02 | 06 | 14 | 02 | 00 | 00 |
| | 1 F | - | 2 F | 1/1 F, 3/2 F [2] | 07 | 03 | 00 | 06 | 02 | 00 | 00 |
| Japan | 100¥ | - | 100¥ | 2/100 Yen | 00 | 04 | 00 | 04 | 02 | 00 | 00 |
| | - | 100¥ | - | 2/100 ¥ [2] | 16 | 01 | 04 | 01 | 02 | 00 | 00 |
| Italy | 100 L | - | 100 L | 1/200 Lire [2] | 14 | 01 | 04 | 01 | 02 | 00 | 00 |
| Australia | 20¢ | - | $1 | 1/2x20 ¢, 3/$1 [2] | 05 | 01 | 00 | 06 | 02 | 00 | 00 |
| United Kingdom | 10 P | 50 P | 20 P | 1/10 P, 5/50 P, 2/20 Pence | 00 | 01 | 05 | 02 | 01 | 00 | 00 |
| | 10 P | 50 P | 10 P | 1/10 P, 5/50 P [2] | 06 | 01 | 05 | 01 | 01 | 00 | 00 |
| Argentina | 10¢ | 10¢ | 10¢ | 1/1 Token | 00 | 01 | 01 | 01 | 01 | 00 | 00 |
| Austria | 5 Sch | - | 10 Sch | 2/5 Sch, 5/10 Schilling | 00 | 02 | 00 | 05 | 01 | 00 | 00 |
| | 1 Sch | 5 Sch | 10 Sch | 2/5x1 Sch, 2/5 Sch, 5/10 Sch | 00 | 02 | 10 | 25 | 05 | 00 | 00 |
| Chile | Token | - | Token | 1/1 Token [1,2] | 01 | 01 | 04 | 01 | 01 | 00 | 00 |
| Denmark | 1 Kr | 5 Kr | 10 Kr | 1/2x1 Kr, 3/5 Kr, 7/10 Krone | 00 | 01 | 06 | 14 | 02 | 00 | 00 |
| Finland | 1 Mka | - | 1 Mka | 1/1 Markka [1,2] | 01 | 01 | 04 | 01 | 01 | 00 | 00 |
| New Zealand | 20¢ | - | 20¢ | 1/2x20¢ [2] | 03 | 01 | 04 | 01 | 02 | 00 | 00 |
| Norway | 1 Kr | - | 1 Kr | 1/2x1 Kr, 3/5x1 Krone | 00 | 01 | 00 | 01 | 02 | 05 | 00 |
| Sweden | 1 Kr | - | 1 Kr | 1/2x1 Krona [2] | 03 | 01 | 04 | 01 | 02 | 00 | 00 |

Notes: 1. Factory Default.   2. Standard Setting - Adjust setting of Item 24 ONLY.   3. Default with jumper W7 cut/removed.   4. Other functions are also affected; see the explanations for Adjustment items 53 through 58.

# TEST/DIAGNOSTIC  PROCEDURES

WILLIAMS ELECTRONICS GAMES provides a series of diagnostic tests to aid the operator in determining game condition (that is, whether the game's features and highlights are operating satisfactorily). These tests activate virtually all the electronic and electromechanical devices comprising the game, so that the operator can readily locate a malfunctioning device or simply verify that all devices are working properly. In order, these tests deal with the music, the displays, the game sounds, the lamps, the solenoids, and the switches.

## CAUTION

*HIGH SPEED's System 11 game program* has a new capability to aid the operator and service personnel: When the operator is beginning the Test/Diagnostic Procedures (and also at game Turn-On), a  display now signals when a switch has NOT been actuated during ball play for a lengthy period of time. Up to three switches can be displayed during this switch problem reporting activity. Refer to the text on Switch Tests for additional information.

In addition to the diagnostic testing, a feature called the Auto Burn-in Mode is available. Activating this mode enables the operator to observe the game while all of the diagnostic tests, *except the switch test,* occur. This can be very helpful in locating intermittent problems.

Activating either the entire test series or one of the individual tests requires use of the Game Adjustment/ Diagnostic switches. Open the coin door for access to these switches. To proceed to the Diagnostic Tests, the operator must simply turn the game On, and set the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN.

## MUSIC  TEST.
1. To initiate the Music Test, press ADVANCE. Observe that the SPEEDER 1 and 2 displays show the message, MUSIC TEST. Adjust the volume control for proper sound level for the game location.

2. Use the AUTO-UP position.

## DISPLAY  TEST.
1. To initiate the Display Test, press ADVANCE. Observe that SPEEDER 1 and 2 displays briefly show the message, DISPLAY TEST, and that the Credits display shows 00 (the Display Test identifier).

2. Use AUTO-UP. Observe that all displays begin a display cycle of all 0s through all 9s, one digit at a time. Verify that the proper comma segments light during display of the odd-numbered digits. Next, a special "all segments" character 'walks' from left to right across each display (SPEEDER 1, 2, 3, 4, BALL IN PLAY/MATCH, Credits).

3. To halt the display cycle, use MANUAL-DOWN. Then, press ADVANCE to step through the sequential digit display, digit by digit, and the subsequent "all segments" characters display test. Use AUTO-UP to resume cycling, and to proceed to the next test.

## SOUND  TEST.
1. (From Display Test) To initiate the Sound Test, press ADVANCE. Observe that the SPEEDER 1 and 2 displays show the message, SOUND TEST, and that the Credit display shows 01 (the Sound Test identifier). The BALL IN PLAY/MATCH display shows a series of test steps from 00 through 07. Verify that a different sound is heard each time the number in the BALL IN PLAY/MATCH display changes.

2. To repeatedly pulse a single sound, use MANUAL-DOWN. Verify that one particular sound repeats. Press ADVANCE to step to the next sound, which repeats until ADVANCE is pressed again. Use AUTO-UP to resume cycling the sounds, and to proceed to the next test.

## LAMP  TESTS.
1. **All Lamps.**
   (From Sound Test) To initiate the first Lamps Test, press ADVANCE. Observe that the SPEEDER 1 and 2 displays show the message, ALL LAMPS, and that the Credit display shows  02 (All Lamps Test identifier) and that all feature lamps (playfield and backbox) blink on and off. (Note, however, that the General Illumination lamps remain lighted steadily.) To locate the wiring associated with a particular lamp, refer to the **Lamp-Matrix Table.** CPU Board connections at jacks 1J6 (columns) and 1J7 (rows) are also listed in the table.

## LAMP TESTS (Continued)

### 2. Single Lamps.

From the All Lamps test, using AUTO-UP, press ADVANCE to enable *HIGH SPEED* to initiate the Single Lamps Test. The SPEEDER 1 and 2 displays initially show the message, SINGLE LAMPS, and the Credit display shows 03. Then, the BALL IN PLAY/MATCH display shows 01 and the SPEEDER 1 and 2 displays show GAME OVER, the name of the lamp currently blinking. Press the Credit button to proceed through an ascending series of designator numbers (01 through 64), with the SPEEDER 1 and 2 displays showing the individual lamp's name. Press and hold the Credit button to proceed rapidly to the desired lamp.

### HIGH SPEED Lamp-Matrix Table

2 Two lamps in circuit.

| ROW \ COLUMN | 1 Q66 YEL-BRN 1J7-1 | 2 Q64 YEL-RED 1J7-2 | 3 Q62 YEL-ORN 1J7-3 | 4 Q60 YEL-BLK 1J7-4 | 5 Q58 YEL-GRN 1J7-6 | 6 Q56 YEL-BLU 1J7-7 | 7 Q54 YEL-VIO 1J7-8 | 8 Q52 YEL-GRY 1J7-9 |
|---|---|---|---|---|---|---|---|---|
| Q80 RED-BRN 1J6-1 | Game Over [2] 1 | Flipper Return Lanes [2] 9 | Upper Left Target Bank - Red Light 17 | Standup Target Arrow #1 25 | Freeway Scores 75,000 33 | Stoplights Light Escape (Center) 41 | Bonus 5000 49 | Bonus 40,000 57 |
| Q81 RED-BLK 1J6-2 | Match 2 | Center Spinner 1000 Arrow 10 | Upper Left Target Bank - Yellow Light 18 | Standup Target Arrow #2 26 | Freeway Scores 100,000 34 | Ramp Stoplight Red Light 42 | Bonus 6000 50 | Bonus 50,000 58 |
| Q82 RED-ORN 1J6-3 | Shoot Again - Drive Again [2] 3 | Extra Ball (Eject Hole) 11 | Upper Left Target Bank - Green Light 19 | Standup Target Arrow #3 27 | Freeway Lights Extra Ball 35 | Ramp Stoplight Yellow Light 43 | Bonus 7000 51 | Bonus 60,000 59 |
| Q83 RED-YEL 1J6-5 | Left Outlane Special 4 | Escape (Eject Hole) 12 | Left Freeway Arrow 20 | Standup Target Arrow #4 28 | Ramp Earns Bonus X 36 | Ramp Stoplight Green Light 44 | Bonus 8000 52 | Bonus 5X 60 |
| Q84 RED-GRN 1J6-6 | Right Outlane Special 5 | Lower Left Target Bank - Red Light 13 | Right Freeway Arrow 21 | Standup Target Arrow #5 29 | Ramp Earns Ramp Bonus 37 | Bonus 1000 45 | Bonus 9000 53 | Bonus 4X 61 |
| Q85 RED-BLU 1J6-7 | Ball In Play 6 | Lower Left Target Bank - Yellow Light 14 | Right Target Bank - Red Light 22 | Standup Target Arrow #6 30 | Ramp Earns Getaway 38 | Bonus 2000 46 | Bonus 10,000 54 | Hold Bonus 62 |
| Q86 RED-VIO 1J6-8 | Left Spinner 1000 Arrow 7 | Lower Left Target Bank - Green Light 15 | Right Target Bank - Yellow Light 23 | Freeway Scores 25,000 31 | Ramp Earns Hideout 39 | Bonus 3000 47 | Bonus 20,000 55 | Bonus 3X 63 |
| Q87 RED-GRY 1J6-9 | Right Spinner 1000 Arrow 8 | Left Outlane Kickback Arrow 16 | Right Target Bank - Green Light 24 | Freeway Scores 50,000 32 | Ramp Earns Hideout Jackpot [2] 40 | Bonus 4000 48 | Bonus 30,000 56 | Bonus 2X 64 |

## "On" State Logic - Special Solenoid



## "On" State Logic - Controlled Solenoid
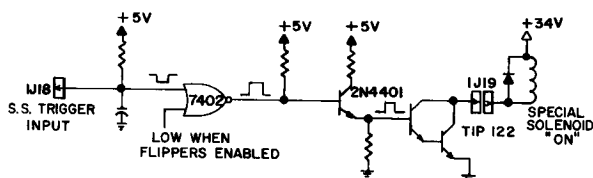


### "Off" State - Special Solenoid:

The Special Switch Trigger Input goes low. Meanwhile, the PIA line remains high. The remaining signals reverse their states. *(These six solenoids aren't pulsed during the Solenoid Test. Check them manually: Press each trigger switch, or ground each switch trigger line.)*
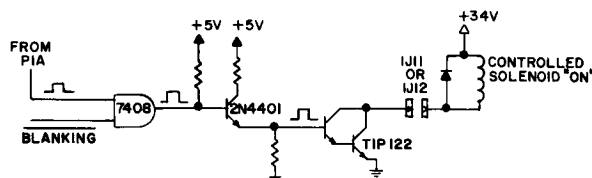
### "Off" State - Controlled Solenoid:

The Enable Input (from the PIA) goes low. Meanwhile, the BLANKING signal remains high. The rest of the signals reverse their states.

# TEST/DIAGNOSTIC PROCEDURES (Continued)

## SOLENOID TEST.
1. (From Lamp Test) Using AUTO-UP, press ADVANCE. Observe that the SPEEDER 1 and 2 displays show the message, COIL TEST, the Credit display shows 04 (Solenoid Test identifier). Next, the BALL IN PLAY/ MATCH display shows a series of test steps from 01 through 22, while the SPEEDER 1 and 2 displays show the name of the solenoid. During each of these steps, pulsing of the respective solenoid occurs. The test cycles repeatedly, unless halted via the MANUAL-DOWN switch. Refer to the *Solenoid Table* for solenoid numbers and wiring information. CPU Board connections at 1P11, 1P12, and 1P19 are also listed in the table.

To continuously pulse a single solenoid, use MANUAL-DOWN. Press ADVANCE to sequence through the controlled and special solenoids. Use AUTO-UP to resume test cycling, and to proceed to the next test.

### *HIGH SPEED* Solenoid Table

| Sol. No. | Function | Solenoid Type | Wire [1] Color | Connections CPU Bd. | Connections Playfield/ Cabinet | Driver Trans. | Solenoid Part No. |
|---|---|---|---|---|---|---|---|
| 01 | Outhole | Controlled | Gry-Brn | 1P11-1 | 8P3-1 | Q33 | AE-23-800-01 |
| 02 | Ball Release | Controlled | Gry-Red | 1P11-3 | 8P3-2 | Q25 | AE-23-800-03 |
| 03 | Eject Hole | Controlled | Gry-Orn | 1P11-4 | 8P3-3 | Q32 | AE-23-800-03 |
| 04 | Police Light Relay | Controlled | Gry-Yel | 1P11-5 | Backbox | Q24 | 5580-10883-00 |
| 05 | Flasher No. 2 (Left Blue) | Controlled | Gry-Grn | 1P11-6 | 8P3-5 | Q31 | #63 flashlamps |
| 06 | Flasher No. 3 (Right Blue) | Controlled | Gry-Blu | 1P11-7 | 8P3-6 | Q23 | #63 flashlamps |
| 07 | Left Hideout Relay | Controlled | Gry-Vio | 1P11-8 | 8P3-7 | Q30 | AE-24-900-02 |
| 08 | Right Hideout Relay | Controlled | Gry-Blk | 1P11-9 | 8P3-8 | Q22 | AE-24-900-02 |
| 09 | Flasher No. 1 (Left Red) | Controlled | Brn-Blk | 1P12-1 | 8P3-9 | Q17 | #63 flashlamps |
| 10 | Insert Board Flashers | Controlled | Brn-Red | 1P12-2 | 9P1-7 | Q9 | #63 flashlamps |
| 11 | General Illumination Relay | Controlled | Brn-Orn | 1P12-4 | 3P7-1 | Q16 | 5580-09555-00 |
| 12 | Flasher No. 4 (Right Red) | Controlled | Brn-Yel | 1P12-5 | 8P3-12 | Q8 | #63 flashlamps |
| 13 | Ramp Gates | Controlled | Brn-Grn | 1P12-6 | 8P3-13 | Q15 | AL-23-800-01 |
| 14 | Kickback (Left Outlane) | Controlled | Brn-Blu | 1P12-7 | 8P3-14 | Q7 | AE-24-900-01 & Relay |
| 15 | Knocker | Controlled | Brn-Vio | 1P12-8 | Backbox | Q14 | AE-23-800-02 |
| 16 | Coin-Lockout Relay | Controlled | Brn-Gry | 1P12-9 | 7P1-7,7P2-4 | Q6 | 404603-2 [2] |
| 17 | Left Kicker | Special #1 | Blu-Brn | 1P19-7 | 8P3-17 | Q75 | AE-23-800-03 |
| 18 | Right Kicker | Special #2 | Blu-Red | 1P19-4 | 8P3-18 | Q71 | AE-23-800-03 |
| 19 | Right Jet Bumper | Special #3 | Blu-Orn | 1P19-3 | 8P3-19 | Q73 | AE-23-800-03 |
| 20 | Lower Left Jet Bumper | Special #4 | Blu-Yel | 1P19-6 | 8P3-20 | Q69 | AE-23-800-03 |
| 21 | Upper Left Jet Bumper | Special #5 | Blu-Grn | 1P19-8 | 8P3-21 | Q77 | AE-23-800-03 |
| 22 | Top Playfield Flashers | Special #6 | Blu-Blk | 1P19-9 | 8P3-22 | Q79 | #63 flashlamps |
| - | Upper Flipper | - | (Blk-Yel) | | (7J1-19,8P3-33) [3] | - | FL23/600-30/2600-50VDC |
| - | Right Flipper | - | Orn-Vio (Blu-Vio) | 1P19-1 | 7P1-20 (7J1-21,8P3-34) [3] | - | FL23/600-30/2600-50VDC |
| - | Left Flipper | - | Orn-Gry (Blu-Gry) | 1P19-2 | 7P1-23 (7J1-24,8P3-32) [3] | - | FL23/600-30/2600-50VDC |

Notes:
1. Wire colors, except flipper Orn-Vio and Orn-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Orn-Vio and Orn-Gry wires connect from CPU Board to flipper switch.   2. Solenoid 16 has a Coinco part number.
3. Connections shown in parentheses are from flipper switch to flipper coil.

## SWITCH TESTS.
### 1. Switch Levels.
(From Solenoid Test) To initiate the Switch Levels Test, press ADVANCE. Observe that the SPEEDER 1 and 2 displays show the message, SWITCH LEVELS, the Credit display shows 05 (Switch Levels Test identifier), and the BALL IN PLAY/MATCH display is blank, indicating that no switch is actuated.

If, however, a switch *is* actuated (possibly stuck closed), the BALL IN PLAY/MATCH display shows that switch's number, while the SPEEDER 1 and 2 displays indicate the switch's name. A sound also accompanies the displays. (This is another facet of the new *HIGH SPEED System-11* switch testing capability.) If more than one switch is closed, each switch's name and number becomes a member of a series of displays, each showing the switches' names and numbers. (In addition, either of these problems could result in the reporting of a switch problem (or problems) at game Turn-on or at the beginning of Diagnostic Tests.)

As soon as the operator opens a closed switch, its name and number are eliminated from the Switch Levels display series. For *HIGH SPEED,* switch numbers can range from 01 through 52. Refer to the *Switch-*

## SWITCH TESTS (Continued).

*Matrix Table* for switch numbers and wiring information. CPU Board connections at jacks 1J8 (columns) and 1J10 (rows) are also listed in the table.

**Row Problems.** If a display of two (or more) switch numbers <u>of a row</u> occurs, although only one switch is closed, check for a short circuit between the column wires.

**Multiple Switch Number Indications.** Check the associated column wire for a short circuit to ground.

**Column Problems.** If display of two (or more) switch numbers <u>in a column</u> occurs (while only one switch is actuated), check for a short circuit between the row wires.

Use AUTO-UP to proceed to the next test.

## *HIGH SPEED* Switch-Matrix Table

| COLUMN / ROW | 1 Q45 GRN-BRN 1J8-1 | 2 Q49 GRN-RED 1J8-2 | 3 Q44 GRN-ORN 1J8-3 | 4 Q48 GRN-YEL 1J8-4 | 5 Q43 GRN-BLK 1J8-5 | 6 Q47 GRN-BLU 1J8-7 | 7 Q42 GRN-VIO 1J8-8 | 8 Q46 GRN-GRY 1J8-9 |
|---|---|---|---|---|---|---|---|---|
| 1 WHT-BRN 1J10-9 | Plumb Bob Tilt 1 | Outhole 9 | Upper Left Stoplight Bank - Red Target 17 | StandupTarget Arrow #1 25 | Upper Left Jet Bumper 33 | Playfield Tilt 41 | Left Kicker 49 | Not Used 57 |
| 2 WHT-RED 1J10-8 | Ball Roll Tilt 2 | Ball Trough #3 (Upper Left) 10 | Upper Left Stoplight Bank - Yel Target 18 | Standup Target Arrow #2 26 | Lower Left Jet Bumper 34 | Left Ramp 42 | Right Kicker 50 | Not Used 58 |
| 3 WHT-ORN 1J10-7 | Credit Button 3 | Ball Trough #2 (Center) 11 | Upper Left Stoplight Bank - Grn Target 19 | Standup Target Arrow #3 27 | Right Jet Bumper 35 | Right Ramp 43 | Left Star Rollover 51 | Not Used 59 |
| 4 WHT-YEL 1J10-6 | Right Coin Chute 4 | Ball Trough #1 (Lower Right) 12 | Left Flipper Return Lane 20 | Standup Target Arrow #4 28 | Ball Shooter 36 | Left Spinner 44 | Right Star Rollover 52 | Not Used 60 |
| 5 WHT-GRN 1J10-5 | Center Coin Chute 5 | Lower Left Stoplight Bank - Red Target 13 | Right Flipper Return Lane 21 | Standup Target Arrow #5 29 | Left Flipper Engine Revving (EOS) 37 | Center Spinner 45 | Not Used 53 | Not Used 61 |
| 6 WHT-BLU 1J10-3 | Left Coin Chute 6 | Lower Left Stoplight Bank - Yel Target 14 | Right Stoplight Bank - Red Target 22 | Standup Target Arrow #6 30 | Right Flipper Engine Revving (EOS) 38 | Right Spinner 46 | Not Used 54 | Not Used 62 |
| 7 WHT-VIO 1J10-2 | Slam Tilt 7 | Lower Left Stoplight Bank - Grn Target 15 | Right Stoplight Bank - Yellow Target 23 | Left Outlane 31 | Upper Left Hideout 39 | Upper Right Hideout 47 | Not Used 55 | Not Used 63 |
| 8 WHT-GRY 1J10-1 | High-Score Reset 8 | Eject Hole 16 | Right Stoplight Bank - Green Target 24 | Right Outlane 32 | Lower Left Hideout 40 | Lower Right Hideout 48 | Not Used 56 | Not Used 64 |

2. **Switch Edges.**
From the Switch Levels Test, press ADVANCE. Observe that the SPEEDER 1 and 2 displays show the message, SWITCH EDGES, the Credit display shows 06 (Switch Edges Test identifier), and the BALL IN PLAY/MATCH display is blank, indicating that no switch is actuated.

This test permits the operator to test whether actuating a switch provides the proper signal to the System-11 switch testing program. When actuating a switch, the operator should see the switch's name and number (in the SPEEDER 1 and 2, and the BALL IN PLAY/MATCH displays, respectively). If no indication appears at the time the switch is actuated, the operator then knows that there is a malfunction associated with that switch.

Using this technique, the operator can test each switch appearing in the *HIGH SPEED* switch problem reporting displays (either at game Turn-on or at the beginning of the Diagnostic Tests) to determine whether the switch can be actuated. If the switch's name and number are displayed while the operator checks its operation, the operator then knows that the reported problem with that switch is NOT currently caused by a switch malfunction. The operator can then seek other causes for the reported problem, being almost cer-

## SWITCH TESTS (Continued).

tain now that the switch did not fail.

Among the possibilities is the fact that the players have not hit that switch because of some other problem; the operator should try to analyze what could cause the switch to be missed, and remedy that problem cause. With these new tests, switch problems are, therefore, more easily isolated.

**Coin Chute Switches.** During the Switch Edges test, the System-11 switch testing program energizes the coin lockout relays, to prevent testing actuations of the coin chute switches from affecting the data contained in the audit counters, thereby maintaining accurate records of the game's earnings.

3. *Playfield or CPU Board?* To determine whether a switch problem is in the playfield or the CPU Board, remove connectors 1P8 and 1P10 from the CPU Board. Begin the Switch Test. Use a jumper wire to simulate switch actuation. For example, placing a jumper between 1J10-1 and 1J8-2 should (based on the *Switch-Matix Table*) should produce an indication of switch 09 being actuated.

## ENDING THE DIAGNOSTIC TESTS.

To end the Diagnostic Tests, reach the Switch Edges Test (06 in the Credits display), use AUTO-UP and press ADVANCE. The backbox displays should show the *HIGH SPEED* game's Identification Information. Use MANUAL-DOWN, and press ADVANCE to reach Adjustment Item 70 (INSTALL FACTORY). Use AUTO-UP and press ADVANCE to obtain the Attract Mode.

## AUTO BURN-IN MODE.

The Auto Burn-in Mode permits the operator to check intermittent (or nonrecurring) problems associated with most portions of the game's circuitry. Repeatedly cycling through a group of tests can sometimes bring a problem, which occurs only randomly or occasionally, to exhibit itself more frequently, thereby aiding in the isolation of the problem. To activate the Auto Burn-in Mode:

1. While in the Game Adjustments, reach Ad 67 and change the Factory Setting of NO to YES, via the Credit button. Set the AUTO-UP/MANUAL-DOWN switch to AUTO-UP.

2. Press ADVANCE to start the Auto Burn-in Mode. This mode repeatedly sequences through the Music Test, the Display Test, the Sound Test, the All Lamps portion of the Lamp Test, and the Solenoid Test.

3. To halt the Auto Burn-in Mode, turn the game Off and then On. *HIGH SPEED* now starts in the Attract Mode. (If a switch problem is now reported by the displays, perform the Switch Tests again to determine the nature of the problem; then, perform necessary repairs.)

## SYSTEM-11 MEMORY CHIP TEST.

A new feature is now included in the Memory Chip Test for System 11. A diagnosis of the condition of the "blanking circuit" now occurs during this testing. (The "blanking circuit" protects the displays, lamps, and solenoids against a hardware malfunction.) The test requires approximately 1.5 seconds. Display of an 8 on the CPU Board LED during the test indicates that the "blanking circuit" operation is normal; display of a 0 during the test indicates that the "blanking circuit" is NOT functioning. Following the complete Memory Chip Test, one of indications listed in the **CPU LED Indicator Codes Table** should appear. To perform the test, press the CPU Diagnostic Switch (SW 2) on the edge of the CPU Board.

## CPU LED Indicator Codes Table

| Code | Code Meaning |
|---|---|
| 0 [1] | Test Passed (game goes to Game-Over Mode ). |
| 1 | CPU Board lockup; also, check Memory Protect circuit and U25 CMOS RAM for 'stuck' bits. |
| 2 | U27 Game ROM 1 faulty.  (lower ROM, CPU Bd.) |
| 3 | U26 Game ROM 2 faulty.  (upper ROM, CPU Bd.) |
| 4 | Unused (see "Other or No Indications") |
| 5 | Blanking signal 'stuck'; coin door closed; Memory Protect circuit faulty; or U25 CMOS RAM faulty. |
| Other or [2] No Indications | System Failure: Check 5 VDC Power Supply; U26 Game ROM 2 faulty. |

Notes:
1. Zero (0) displayed during Memory Chip Test (using CPU Board switch SW2) indicates that Blanking Circuit is NOT functioning.
2. Eight (8) displayed during Memory Chip Test indicates that Blanking Circuit is functioning properly.

# TEST/DIAGNOSTIC PROCEDURES (Continued)

**SYSTEM-11 SOUND SECTION TEST.**

Press the Sound Diagnostic Switch (SW 1) on the CPU Board. Listen for the sound. The sound repeats, until the operator turns the *HIGH SPEED* game Off and On.

*NO SOUND DURING THIS TEST* (but sound can be heard during the Diagnostic Tests).
Check the sound-select inputs (pins 2 through 9 of U9) to see if they pulse during Sound Test 01. Also, check the -12 V supply voltage on the CPU Board. If this voltage is low (or AC ripple seems too high), perform the following checks:

1. The gray and gray-green transformer secondary wires for 18.7 VAC.
2. The CPU Board filter capacitor C26 for -12 VDC.
3. The filter capacitor C26 for excessive AC ripple (over 0.75VAC).

If the previous checks did not isolate the problem, turn the Volume Control for maximum output. Momentarily touch a powered-up AC soldering pencil on the center tap of the Volume Control.

## CAUTION
DO NOT use a soldering iron over 40 watts. Note also that cordless soldering irons will NOT work for this test.

Hearing a low hum indicates that the power amplifier (U1, TDA2002), the Volume Control, and the speaker are operating satisfactorily. Not hearing a hum requires repeating the test with the Volume Control turned part way down, to determine whether the Volume Control is faulty.

# Section 2

## Game Parts Information

• **Parts Lists and Diagrams:**

> **Playfield Mylars**
> **Playfield Parts**
> **Switches**
> **Lamps**
> **Solenoids & Rubber Parts**
> **Flipper Assemblies**
> **Ball Eject Assembly**
> **Traffic Light Assembly**
> **Jet Bumper & Coil Assembly**
> **Ramp Gate Assembly**
> **Kicker Assembly**
> **Police Light Assembly**
> **Ramp Assembly**
> **Outlane Kickback Assembly**

03-7960-541-1

03-7960-541-2

03-7960-541-3

03-7960-541-4

**High Speed** Playfield Mylars

High Speed 30
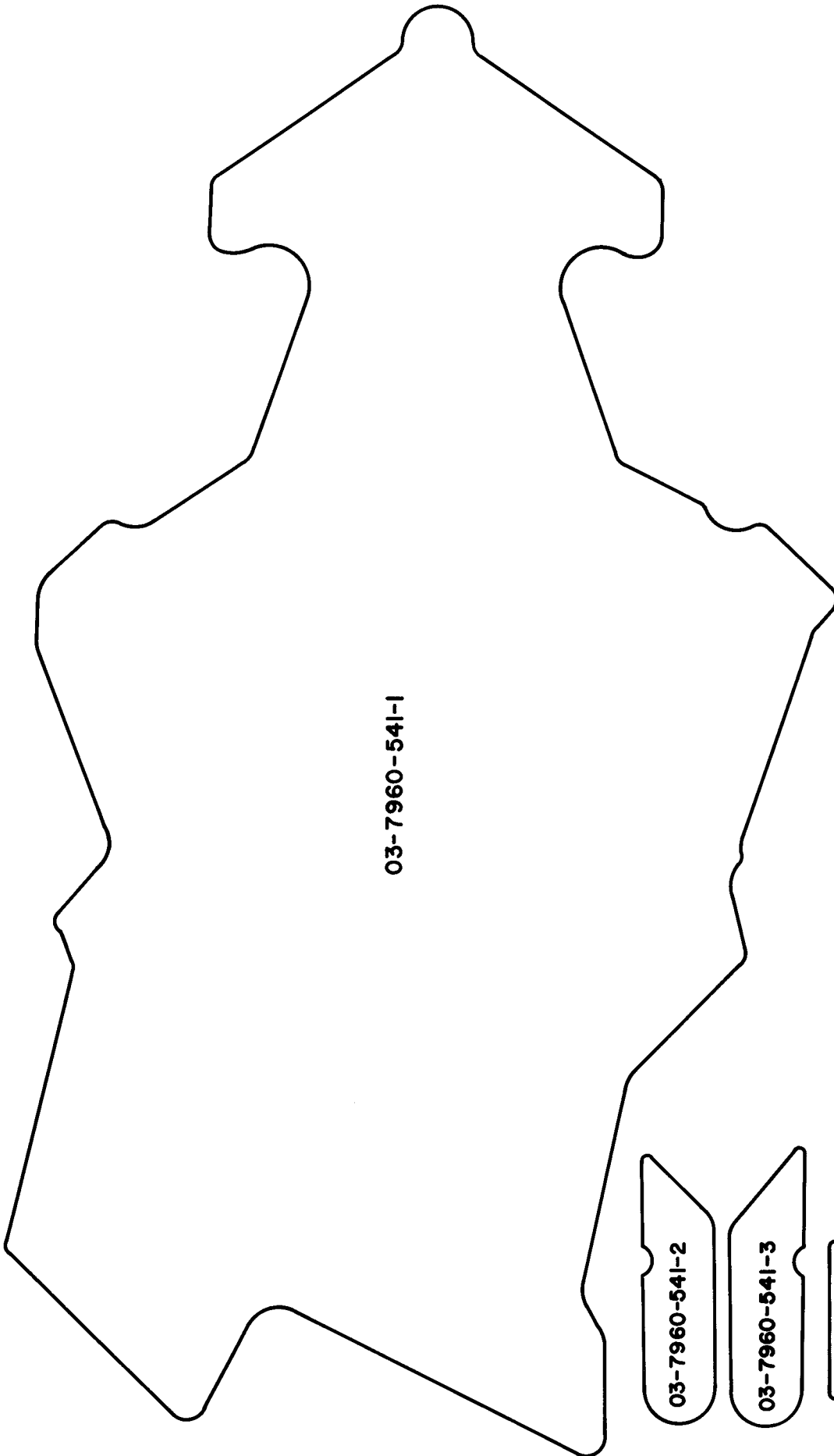
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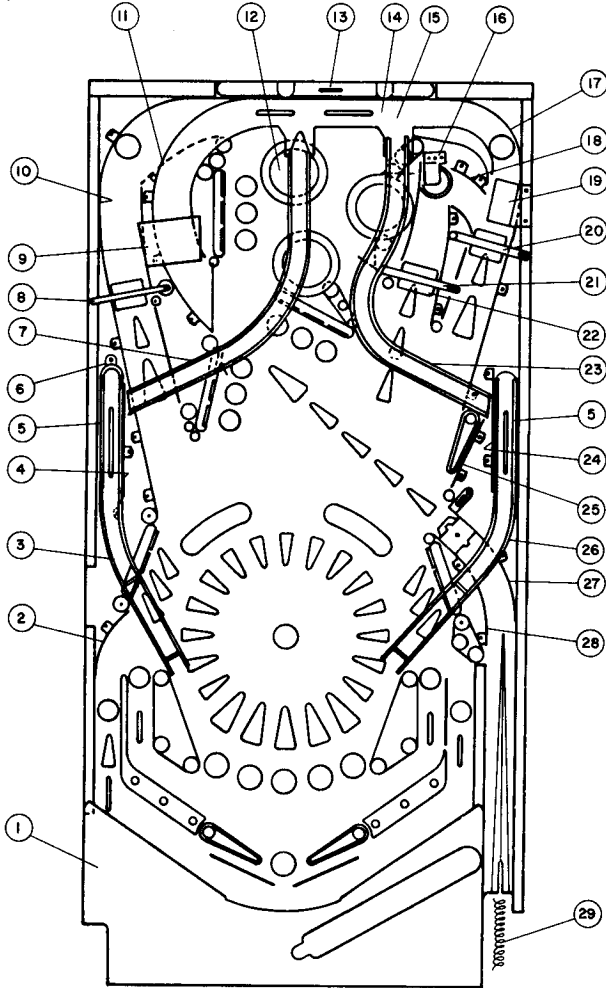
| Item | Part No. | Description |
|------|----------|-------------|
| 1 | A-11041 | Outlane Kickback Assembly |
| 2 | B-10898 | Ball Guide |
| 3 | D-11050 | Ball Chute, Lower Left |
| 4 | B-11039 | Ball Guide & Switch Bracket |
| 5 | 01-8325 | Rail Protector |
| 6 | 01-8237 | Clip |
| 7 | D-10863 | Ball Chute, Upper Left |
| 8 | B-11019-2 | Spin Target Assembly |
| a) | 01-8341 | Spin Target Mounting Bracket |
| b) | 03-7796 | Target Shaft Washer |
| c) | 12-6620 | Switch Actuator Wire |
| d) | 31-1380-2 | "Bayshore Freeway" Decal |
| e) | 31-1019-541 | *HIGH SPEED* Screened Target |
| 9 | B-10921 | Traffic Light Assembly |
| 10 | C-10893 | Ball Guide Assembly |
| 11 | 12-6680 | Ball Guide Wire |
| 12 | 17-1086 | Jet Bumper Cap |
| 13 | D-10884 | *HIGH SPEED* Ramp Gate Assembly |
| 14 | 03-8005 | Main Ramp Cover |
| 15 | D-10905 | *HIGH SPEED* Ramp Assembly |
| 16 | 01-6933-2 | Metal Eject Shield |
| 17 | C-10894 | Ball Guide Assembly |
| 18 | A-10889 | Ball Guide Assembly |
| 19 | 01-8217 | Ball Deflector |
| 20* | B-11019-1 | Spin Target Assembly |
| d) | 31-1380-1 | "Santa Monica Freeway" Decal |
| 21* | B-11019-3 | Spin Target Assembly |
| a) | 01-7649 | Spin Target Mounting Bracket |
| d) | 31-1380-3 | "San Diego Freeway" Decal |
| 22 | A-10890 | Ball Guide Assembly |
| 23 | D-10862 | Ball Chute, Upper Right |
| 24 | B-11038 | Ball Guide & Switch Bracket |
| 25 | A-10897 | Ball Guide Assembly |
| 26 | D-11049 | Ball Chute, Lower Right |
| 27 | C-10935 | Ball Guide Assembly |
| 28 | B-10896 | Ball Guide Assembly |
| 29 | 10-148-2 | Plunger Spring |

Notes: * - Complete list of parts (8a through 8e) also applies
to items 20 and 21, except for lettered items noted with
these assemblies.

# Switches

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | A-8476 | Plumb Bob Tilt |
| 2 | B-6572 | Ball Roll Tilt |
| 3 | SW-1A-126 | Credit Button |
| 4 | 904845* | Right Coin Chute   (* - Coinco p/n) |
| 5 | 904845* | Center Coin Chute |
| 6 | 904845* | Left Coin Chute |
| 7 | 904704* | Slam Tilt |
| 8 | 5641-09369-00 | High Score Reset |
| 9 | 17-1067 | Outhole |
| 10 | 5647-09957-00 | Left Trough |
| 11 | 5647-09957-00 | Center Trough |
| 12 | 5647-09933-00 | Right Trough |
| 13 | A-11022 | Red Target (Lwr Left Stoplight Bank) |
| 14 | A-11054 | Yellow Target (Lwr Left Stoplight Bank) |
| 15 | A-11055 | Green Target (Lwr Left Stoplight Bank) |
| 16 | 17-1012 | Eject Hole |
| 17 | A-11022 | Red Target (Upr Left Stoplight Bank) |
| 18 | A-11054 | Yellow Target (Upr Left Stoplight Bank) |
| 19 | A-11055 | Green Target (Upr Left Stoplight Bank) |
| 20 | SW-1A-124 | Left Flipper Return Lane |
| 21 | SW-1A-124 | Right Flipper Return Lane |
| 22 | A-11022 | Red Target (Right Stoplight Bank) |
| 23 | A-11054 | Yellow Target (Right Stoplight Bank) |
| 24 | A-11055 | Green Target (Right Stoplight Bank) |
| 25 | A-8253 | Standup Target Arrow - 1 |
| 26 | A-8253 | Standup Target Arrow - 2 |
| 27 | A-8253 | Standup Target Arrow - 3 |
| 28 | A-8253 | Standup Target Arrow - 4 |
| 29 | A-8253 | Standup Target Arrow - 5 |
| 30 | A-8253 | Standup Target Arrow - 6 |
| 31 | SW-1A-124 | Left Outlane |
| 32 | SW-1A-124 | Right Outlane |
| 33 | A-7459-7 | Upper Left Jet Bumper |
| 34 | A-7459-7 | Lower Left Jet Bumper |
| 35 | A-7459-7 | Right Jet Bumper |
| 36 | SW-1A-138 | Ball Shooter |
| 37 | SW-1A-150-1 | Left Flipper Lane Change (Engine Revs) |
| 38 | SW-1A-150 | Right Flipper Lane Change (Engine Revs) |
| 39 | A-11047 | Upper Left Hideout |
| 40 | 17-1085 | Lower Left Hideout |
| 41 | SW-1A-117 | Playfield Tilt |
| 42 | SW-1A-160 | Left Ramp |
| 43 | SW-1A-160 | Right Ramp |
| 44 | SW-1A-118 | Left Spinner |
| 45 | SW-1A-118 | Center Spinner |
| 46 | SW-1A-118 | Right Spinner |
| 47 | A-11047 | Upper Right Hideout |
| 48 | 17-1085 | Lower Right Hideout |
| 49 | SW-1A-122 | Left Kicker (scoring)   [Kicker Actuating Sw: |
| 50 | SW-1A-122 | Right Kicker (scoring)      A-4834-H; |
| 51 | SW-1A-157 | Left Star Rollover          B-8734 w/RC] |
| 52 | SW-1A-157 | Right Star Rollover |
| 53-64 | Not Used | Not Used |
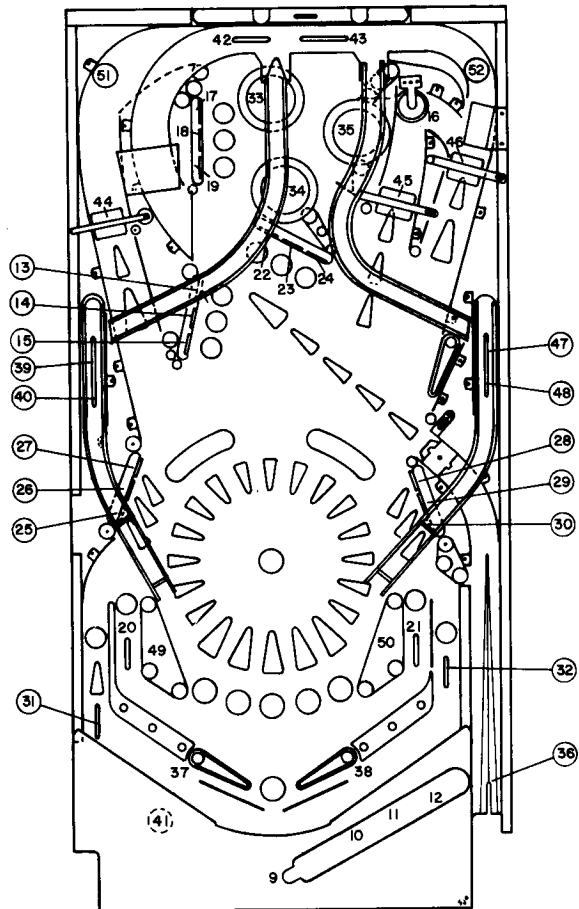
# Lamps

| Lamp | Location/Description |
|------|---------------------|
| 1 | Game Over (Backglass) |
| 2 | Match (Backglass) |
| 3 | Shoot Again (Backglass) |
|   | Drive Again (Playfield) |
| 4 | Left Outlane Special |
| 5 | Right Outlane Special |
| 6 | Ball In Play (Backglass) |
| 7 | Left Spinner 1000 Arrow |
| 8 | Right Spinner 1000 Arow |
| 9 | 20,000 Light Kickback |
|   | (Left & Right Flipper Lanes) |
| 10 | Center Spinner 1000 Arrow |
| 11 | Extra Ball (Eject Hole) |
| 12 | Escape (Eject Hole) |
| 13 | Red Light (Lwr Left Target Bank) |
| 14 | Yellow Light (Lwr Left Target Bank) |
| 15 | Green Light (Lwr Left Target Bank) |
| 16 | Kickback Arrow (Left Outlane) |
| 17 | Red Light (Upr Left Target Bank) |
| 18 | Yellow Light (Upr Left Target Bank) |
| 19 | Green Light (Upr Left Target Bank) |
| 20 | Left Freeway Arrow |
| 21 | Right Freeway Arrow |
| 22 | Red Light (Right Target Bank) |
| 23 | Yellow Light (Right Target Bank) |
| 24 | Green Light (Right Target Bank) |
| 25 | Standup Target Arrow - 1 |
| 26 | Standup Target Arrow - 2 |
| 27 | Standup Target Arrow - 3 |
| 28 | Standup Target Arrow - 4 |
| 29 | Standup Target Arrow - 5 |
| 30 | Standup Target Arrow - 6 |
| 31 | Freeway Scores 25,000 |
| 32 | Freeway Scores 50,000 |
| 33 | Freeway Scores 75,000 |
| 34 | Freeway Scores 100,000 |
| 35 | Freeway Lights Extra Ball |
| 36 | Ramp Earns Bonus X |
| 37 | Ramp Earns Ramp Bonus |
| 38 | Ramp Earns Getaway |
| 39 | Ramp Earns Hideout |
| 40 | Ramp Earns Hideout Jackpot |
| 41 | Stoplights Light Escape (Center) |
| 42 | Red Light (Ramp Stoplight) |
| 43 | Yellow Light (Ramp Stoplight) |
| 44 | Green Light (Ramp Stoplight) |
| 45 | Bonus 1000 |
| 46 | Bonus 2000 |
| 47 | Bonus 3000 |
| 48 | Bonus 4000 |
| 49 | Bonus 5000 |
| 50 | Bonus 6000 |
| 51 | Bonus 7000 |
| 52 | Bonus 8000 |
| 53 | Bonus 9000 |
| 54 | Bonus 10,000 |



| Lamp | Location/Description |
|------|---------------------|
| 55 | Bonus 20,000 |
| 56 | Bonus 30,000 |
| 57 | Bonus 40,000 |
| 58 | Bonus 50,000 |
| 59 | Bonus 60,000 |
| 60 | Bonus 5X |
| 61 | Bonus 4X |
| 62 | Hold Bonus |
| 63 | Bonus 3X |
| 64 | Bonus 2X |
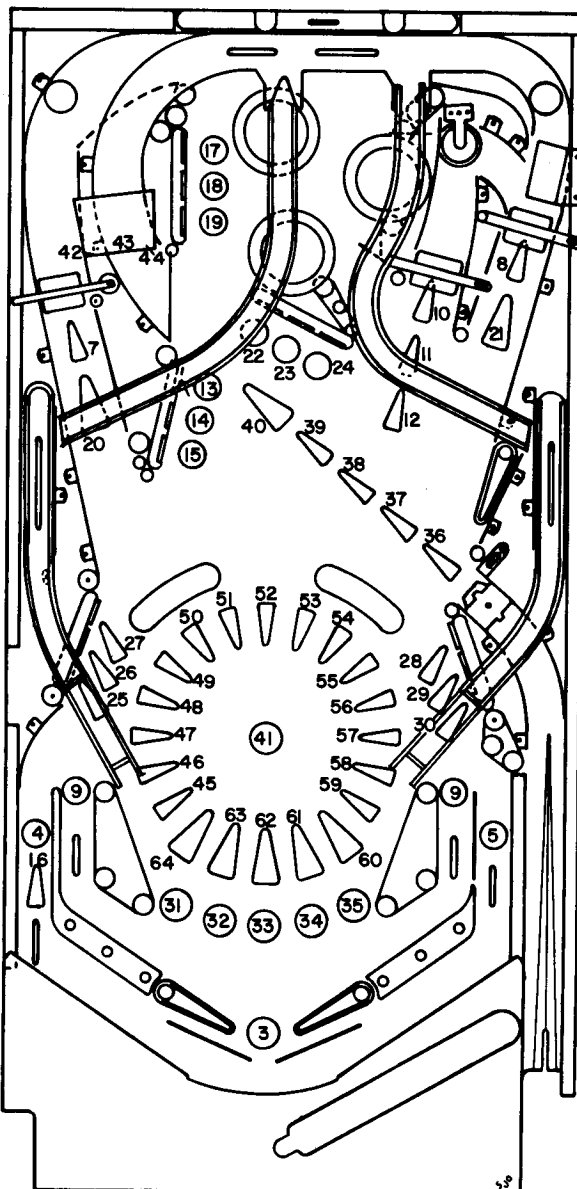
# Solenoids/ Flashers

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | AE-23-800-01 | Outhole |
| 2 | AE-23-800-03 | Ball Release |
| 3 | AE-23-800-03 | Eject Hole |
| 4 | 5580-10883-00 | Police Light Relay (Backbox) |
| 5 | #63 Flashlamps | Left Blue Playfield Flashers |
| 6 | #63 Flashlamps | Right Blue Playfield Flashers |
| 7 | AE-24-900-02 | Left Hideout Relay |
| 8 | AE-24-900-02 | Right Hideout Relay |
| 9 | #63 Flashlamps | Left Red Flashers |
| 10 | #63 Flashlamps | Insert Board Flashers |
| 11 | Pwr Sup Bd Relay | General Illumination |
| 12 | #63 Flashlamps | Right Red Flashers |
| 13 | AL-23-800-01 | Ramp Gates |
| 14 | AE-24-900-01 | Left Outlane Kickback (w/relay) |
| 15 | AE-23-800-02 | Knocker |
| 16 | 904218-696 | Coin-Lockout Relay (Coinco p/n) |
| 17 | AE-23-800-03 | Left Kicker |
| 18 | AE-23-800-03 | Right Kicker |
| 19 | AE-23-800-03 | Right Jet Bumper |
| 20 | AE-23-800-03 | Lower Left Jet Bumper |
| 21 | AE-23-800-03 | Upper Left Jeft Bumper |
| 22 | #63 Flashlamps | Top Playfield Flashers |
| - | FL 23/600-30/2600-50VDC | Upper Flipper |
| - | FL 23/600-30/2600-50VDC | Right Flipper |
| - | FL 23/600-30/2600-50VDC | Left Flipper |

## Rubber Parts

| Item | Part No. | Description |
|------|----------|-------------|
| A | 23-6300 | 5/16" Ring |
| B | 23-6302 | 1" Ring |
| C | 23-6303 | 1-1/4" Ring |
| D | 23-6306 | 2-3/8" Ring |
| E | 23-6310 | 5" Ring |
| F | 23-6519-4 | Red Ring |
| G | 23-6535 | Bumper |
| H | 23-6552 | Sleeving |
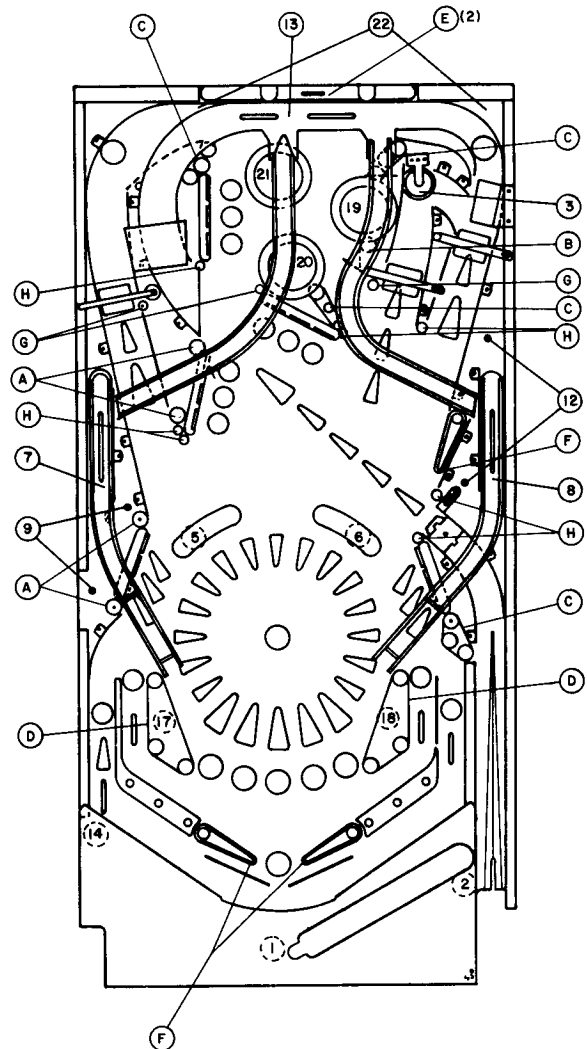
## C-9952-R FLIPPER ASSEMBLIES
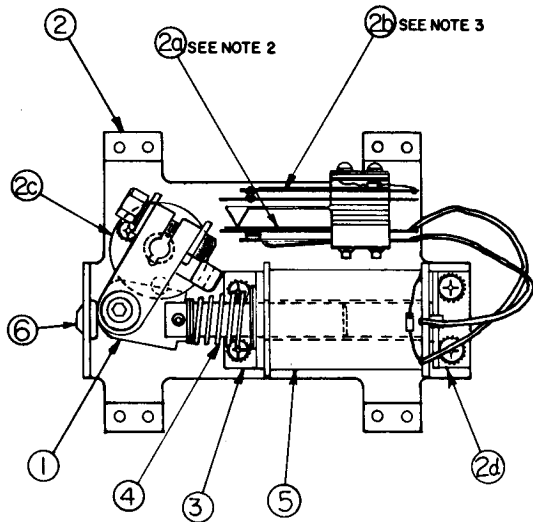
| ITEM | PART NO. | DESCRIPTION |
|------|----------|-------------|
| 1 | B-10655-R | Crank Link Assembly |
| 2 | C-9954-R | Flipper Base/Lane Change Assembly |
| 2a | 03-7811 | End of Stroke (EOS) Switch |
| 2b | SW-1A-150 | Lane Change Switch |
| 2c | 03-7568 | Flipper Bushing |
| 2d | A-10280 | Flipper Stock Bracket Assembly |
| 3 | 01-7695 | Solenoid Bracket |
| 4 | 10-376 | Coil Plunger Spring |
| 5 | FL 23/600-30/2600 | Flipper Coil |
| 6 | 23-6577 | Bumper Plug |

NOTES:
1. Each Flipper Assembly is mounted below the playfield, in conjunction with the plastic flipper and shaft (20-9250) and flipper rubber (23-6519) (on the upper side of the playfield).
2. The tip of the EOS Switch must travel .015 (+.010, −.000 inch), before the contacts fully open with the flipper in the actuated position. The EOS Switch contacts must have a gap of .062 (±.015) inch. Any adjustment of the EOS Switch must be made at a minimum distance of .25 inch from the switch body
3. The Lane Change Switch must have a gap of .046 (±.015) inch, when fully open
4. All moving elements of the assembly must operate freely without any evidence of binding
5. Coil plunger spring must fit within the four lugs of the solenoid bracket
6. For coil replacement, remove solenoid bracket (item 3) to prevent screw damage
7. Use Loctite when reassembling flipper stop bracket screws.
8. When using bumper plug on older flipper assemblies, readjust flipper position.
9. Solid color grey (or blue) wire connects to the banded end of the diode, mounted on the connector end of flipper coil (item 5). Wire with trace color connects to the unbanded end of the diode.
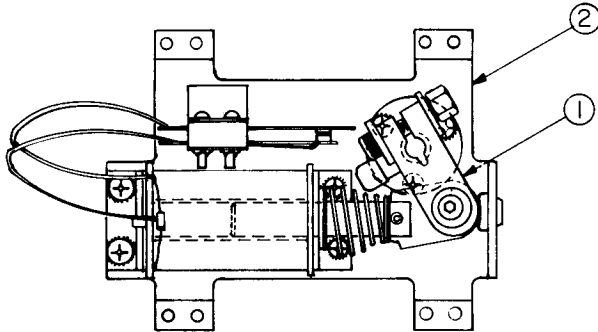
## C-9953-L UNIQUE PARTS

| ITEM | PART NO. | DESCRIPTION |
|------|----------|-------------|
| 1 | B-10655-L | Crank Link Assembly, Left |
| 2 | C-9957-L | Flipper Sub Base Assembly |
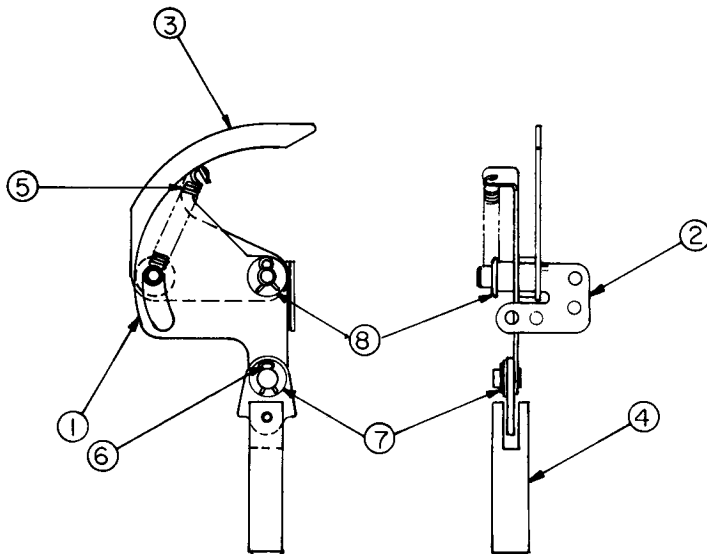


## B-9361-R-3 BALL EJECT ASSEMBLY—RIGHT

| ITEM | PART NO. | DESCRIPTION |
|------|----------|-------------|
| 1 | A-6949-R | Spring Plate |
| 2 | A-6950-R | Mounting Bracket Assembly |
| 3 | A-7471-R | Eject Cam Assembly |
| 4 | A-5103 | Coil Plunger Assembly |
| 5 | 10-362 | Spring-Eject |
| 6 | 12-6227 | Hair Pin Clip |
| 7 | 4700-00030-00 | 17/64 x 1/2 x 15G |
| 8 | 4700-00103-00 | 17/64 x 1/2 x .015 |
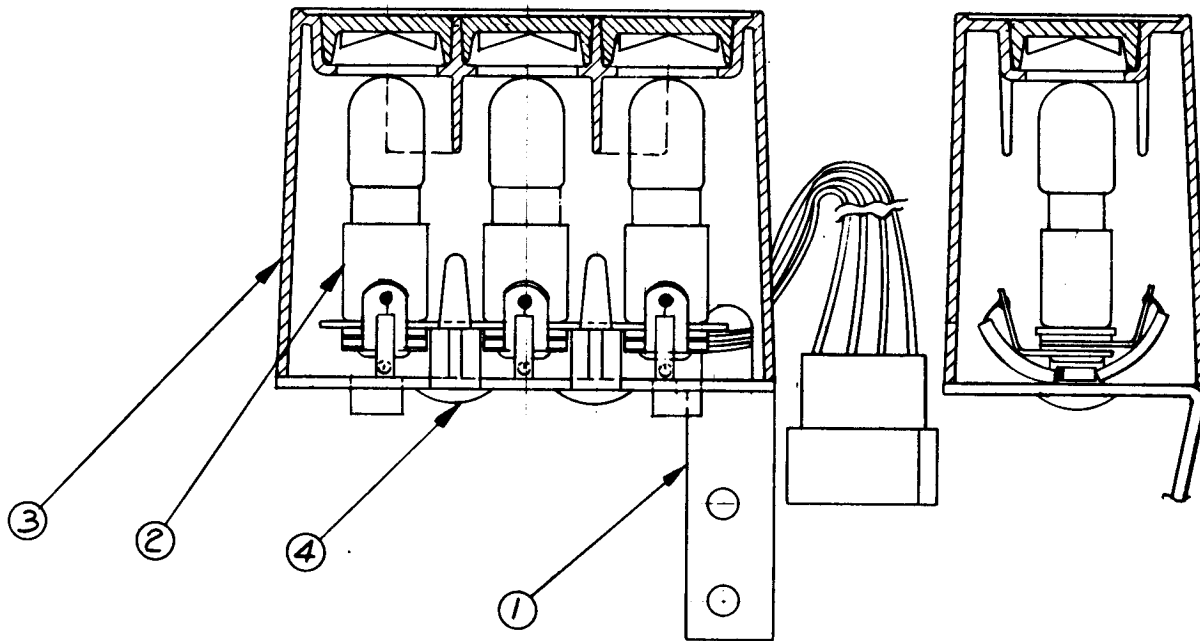
# Traffic Light Assembly
### p/n B-10921

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | 01-8231 | Light Housing Plate |
| 2 | C-10915 | Light Socket & Cable Assembly |
| 3 | B-10999 | Housing Subassembly |
| 4 | 20-9505-4 | PCB Mounting Standoff |
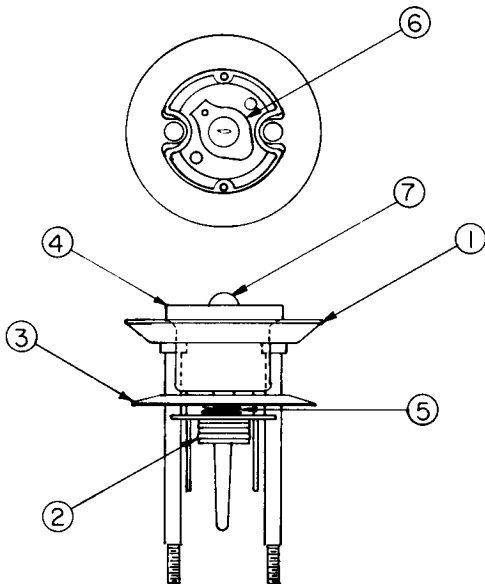
## B-9414 JET BUMPER ASSEMBLY

| ITEM | PART NO. | DESCRIPTION |
|------|----------|-------------|
| 1 | A-4754 | Bumper Ring Assembly |
| 2 | 03-6009-A5 | Bumper Base |
| 3 | 03-6035-5 | Bumper Wafer |
| 4 | 03-7443-5 | Bumper Body |
| 5 | 10-7 | Bumper Spring |
| 6 | 24-6416 | Bumper Socket |
| 7 | 24-6549 | #44 Bulb |
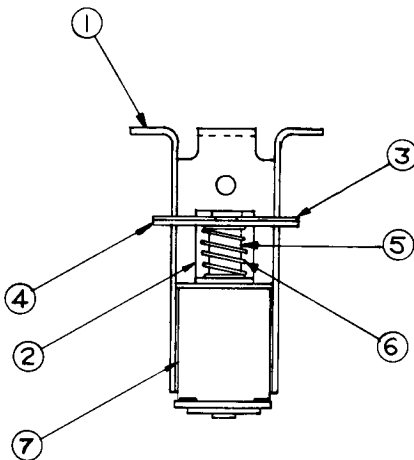
## B-9415 JET BUMPER COIL ASSEMBLY

| ITEM | PART NO. | DESCRIPTION |
|------|----------|-------------|
| 1 | B-7417 | Bracket and Stop Assembly |
| 2 | 01-1747 | Coil Retaining Bracket |
| 3 | 01-5492 | Armature Link Steel |
| 4 | 01-5493 | Armature Link Bakelite |
| 5 | 02-3406-1 | Coil Plunger |
| 6 | 10-326 | Armature Spring |
| 7 | SG1-23-850-DC | Solenoid Coil |

**NOTE:**
ADD ONE DROP OF SILICON OIL
ON ALL ROTATING SHAFTS.
DO NOT ADD OIL TO SOLENOID.
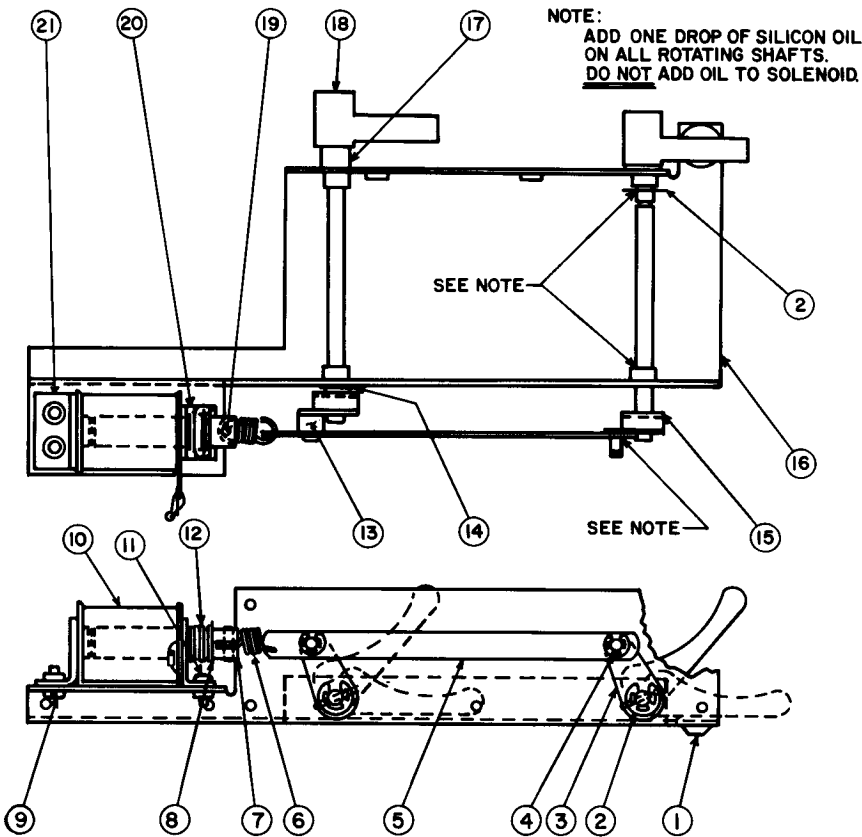
## HIGH SPEED Ramp Gate Assembly
p/n D-10884

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | 23-6577 | Plug Bumper, 5/8 dia. |
| 2 | 20-8712-25 | E-Ring, 1/4 in. shaft |
| 3 | A-10886 | Drive Arm Assembly |
| 4 | 20-8712-18 | E-Ring, 3/16 in. shaft |
| 5 | 01-8201 | Drive Link |
| 6 | 10-389 | Gate Mech. Spring |
| 7 | 02-4241 | Plunger, Coil |
| 8 | 20-8712-43 | E-Ring, 7/16 in. shaft |
| 9 | 4008-01017-06 | Mach. Screw (8-32 x 3/8 P - RH-S) |
| 10 | AL-23-800-01 | Coil Assembly |
| 11 | 4006-01003-06 | Mach. Screw (6-32 x 3/8 P - PH-S) |
| 12 | 10-303 | Master Spring |
| 13 | 03-7974 | Spacer, Nylon |
| 14 | 4700-00073-00 | Flat Washer: .281 x 0.500 x 0.031 |
| 15 | 20-8716-2 | Roll Pin, 3/32 x 5/8 |
| 16 | D-10885 | Gate Mech. Subassembly |
| 17 | 03-7973 | Spacer, Nylon |
| 18 | C-10888 | Gate |
| 19 | 20-8716-5 | Roll Pin, 1/8 x 7/16 |
| 20 | 01-8-508-S | Solenoid Bracket |
| 21 | B-10932 | Solenoid Bracket Assembly |
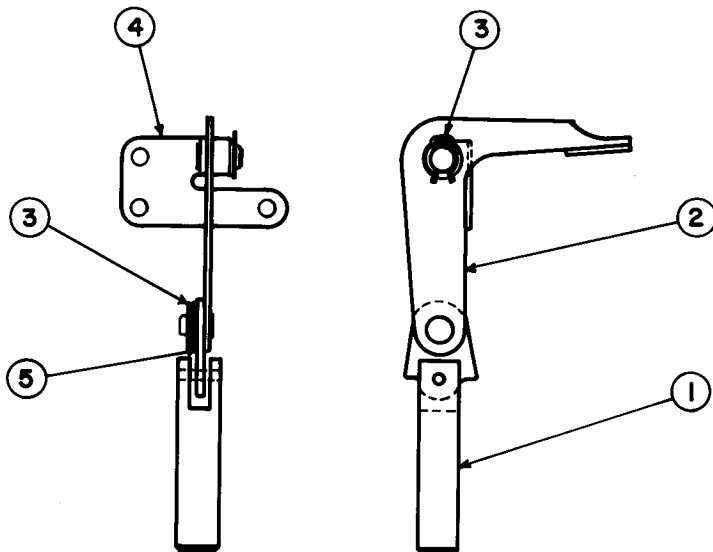
## Kicker Arm Assembly
p/n B-11051-R

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | A-5103 | Coil Plunger Assembly |
| 2 | A-5652-1 | Kicker Crank Assembly, Right |
| 3 | 12-6227 | Hair Pin Clip |
| 4 | B-11052 | Kicker Mounting Assembly |
| 5 | 4700-00030-00 | Washer, 9/32 x 1/2 x 1/32 |

## Police Light Assembly
p/n C-10933

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | 5791-09111-00 | Connector Shell |
| 2 | 5820-09080-00 | Connector Pin |
| 3 | 14-7939 | Motor, 100 rpm, 24VAC |
| 4 | 4004-01003-05 | Mach. Screw (4-40 x 5/16, P-PH-S) |
| 5 | 4006-01076-04 | Cap Screw (6-32 x 1/4) |
| 6 | 02-4239 | Motor Shaft Collar |
| 7 | 24-8771 | Bulb, #1683, 28V |
| 8 | B-10917 | Reflector Assembly |
| 9 | B-10934 | Motor Plate & Socket Assembly |
| 10* | 03-7981 | Red Lens |
| 11* | A-11053 | Lens Clip Assembly |
| 12* | 4700-00023-00 | Washer |
| 13* | 4408-01120-00 | Wing Nut |

Note: Items marked with asterisk (*) are not part of C-10933.
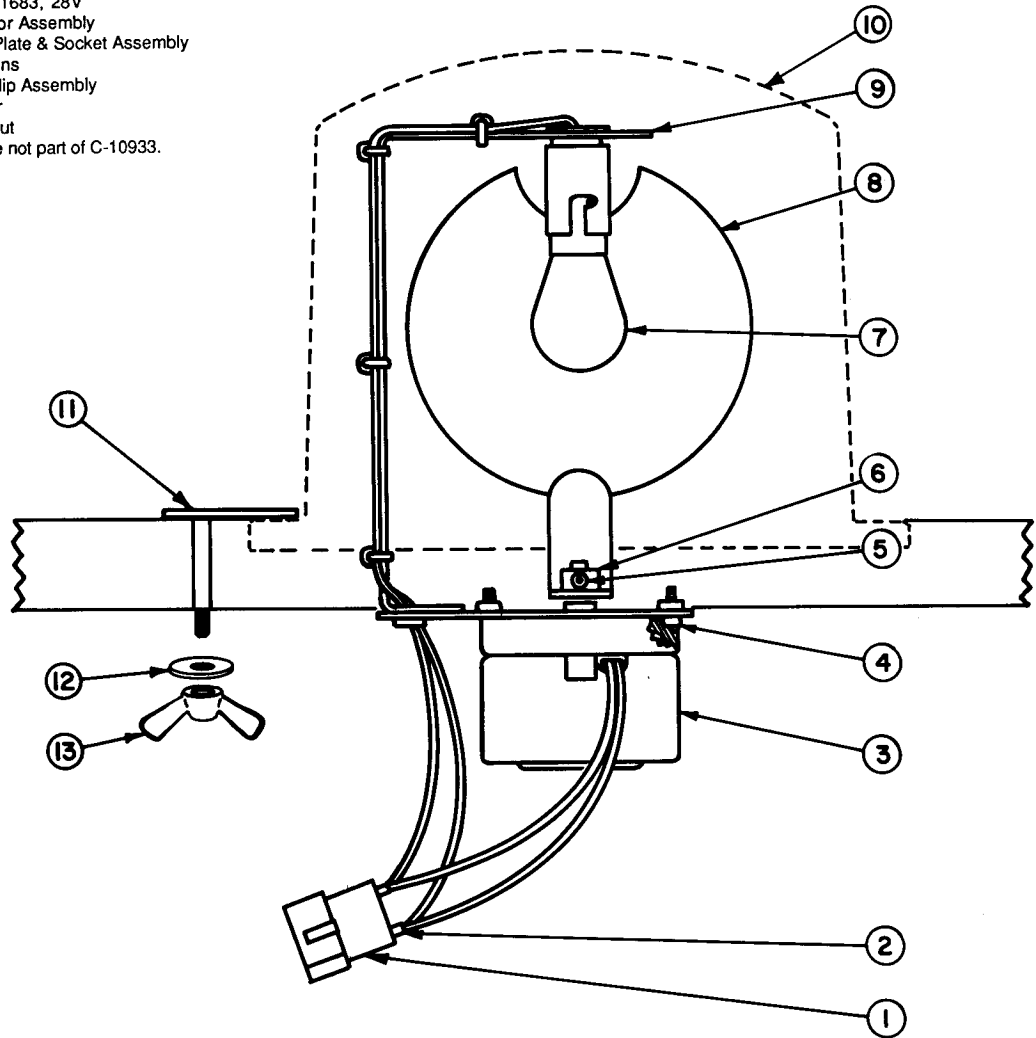


# HIGH SPEED Ramp Assembly
p/n D-10905

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | A-11063 | Ramp Wire & Bracket Assembly |
| 2 | D-10950 | Main Ramp Assembly |
| 3 | H-10909 | Top Ramp Cable |
| 4 | SW-1A-160 | Rollover Switch |
| 5 | 01-3670-1 | Switch Plate, Flat |
| 6 | 01-8227 | Switch Cover Bracket |
| 7 | 03-8005 | Main Ramp Cover |
| 8 | 4104-01001-04 | Sheet Metal Screw, #4 x 1/4, P-PH-A |
| 9 | 4106-01018-04 | Sheet Metal Screw, #6 x 1/4, P-PH-ST |
| 10 | 4404-01117-00 | Hex Nut, 4-40 |

NOTES:
1. ITEM 1 TO HIT AGAINST ITEM 3 WHEN FULLY ENERGIZED.
2. FLANGE ON COIL TUBING MUST BE BETWEEN ITEMS 3 & 6.

A-10959

01-8250

Playfield Pivot Pin & Bracket
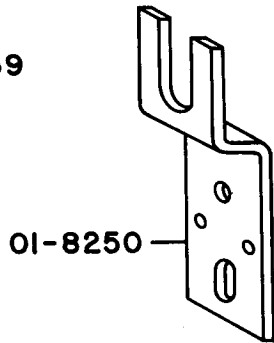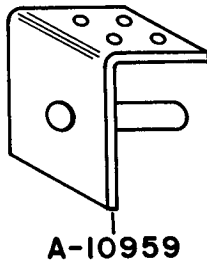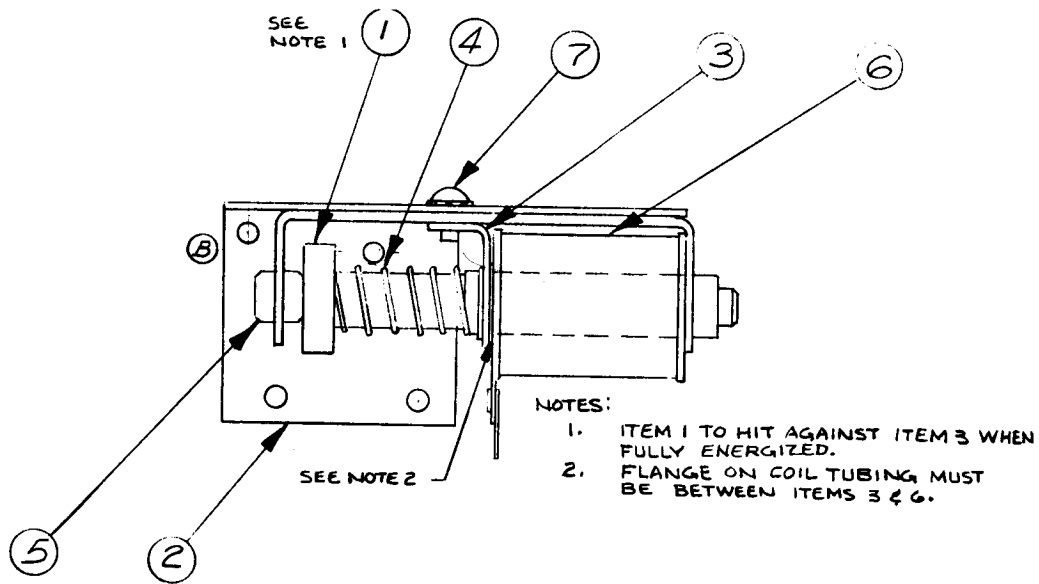
# Outlane Kickback Assembly
## p/n A-11041

| Item | Part No. | Description |
|------|----------|-------------|
| 1 | A-6306-2 | Bell Armature Assembly |
| 2 | B-7409-2 | Mounting Bracket Assembly |
| 3 | 01-8-508-T | Solenoid Bracket |
| 4 | 10-135 | Solenoid Spring |
| 5 | 23-6420 | Rubber Grommet |
| 6 | AE-24-900-01 | Coil Assembly, Complete |
| 7 | 4008-01017-05 | Mach. Screw (8-32 x 5/16, P-RH-S) |
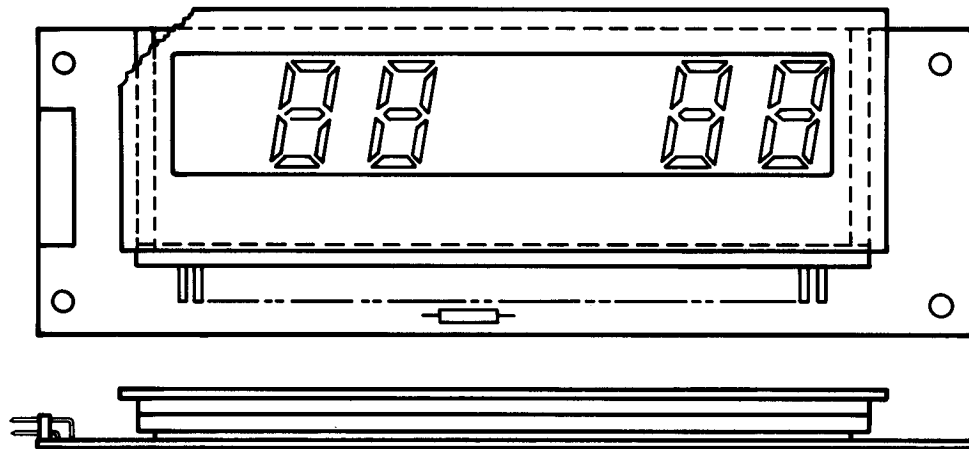


C-8365 Ball In Play/ Match Display Panel
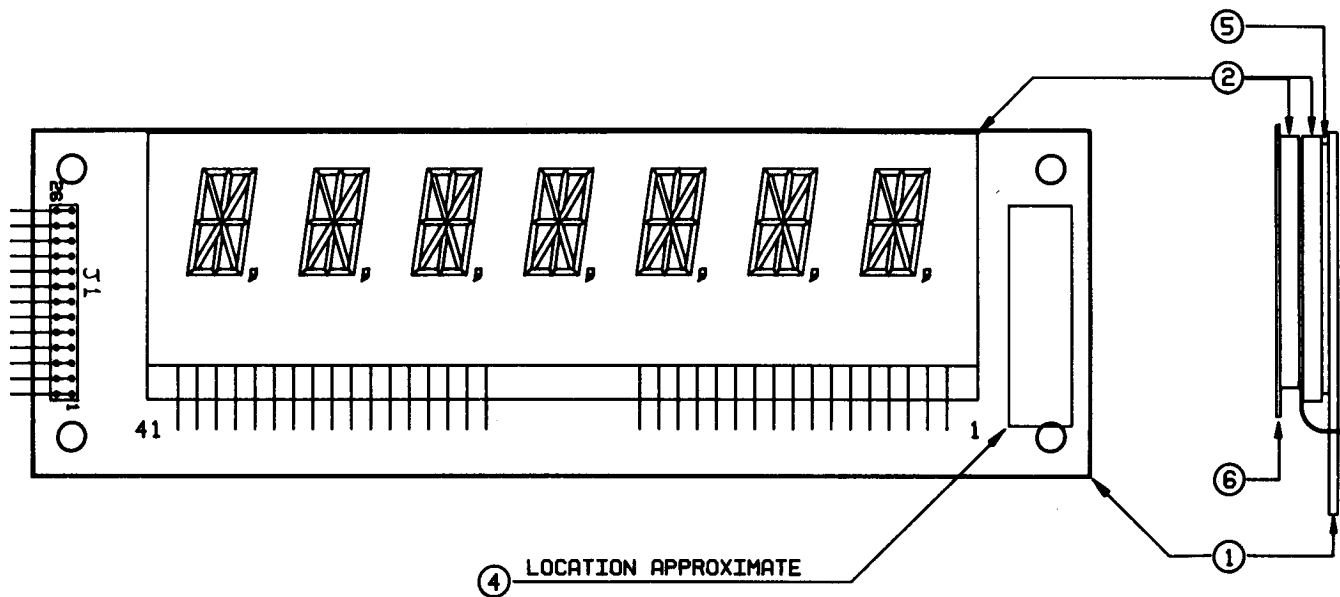
C-10866 Player Score Display Panel (Alphanumeric)
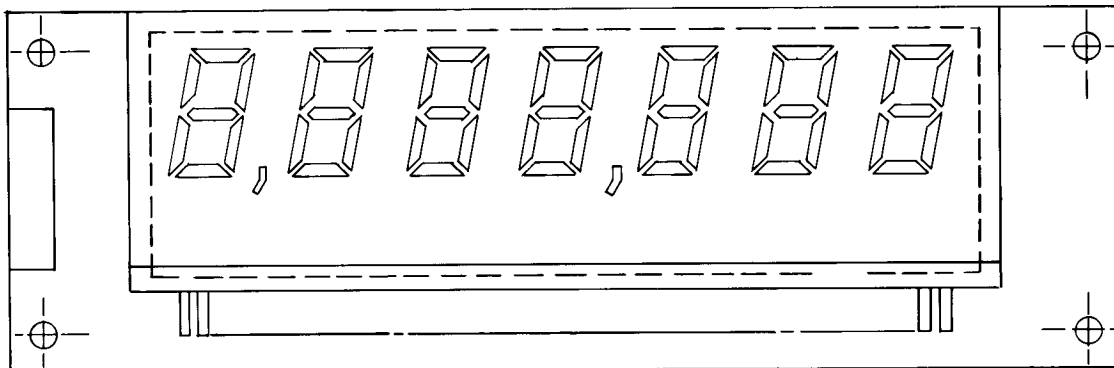


C-8364 Player Score Display Panel (7-Segment)



SEGMENT DIAGRAM

INDICATES KEYING PIN
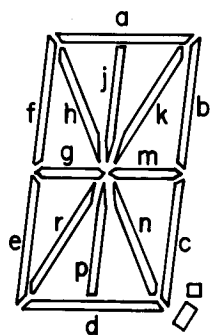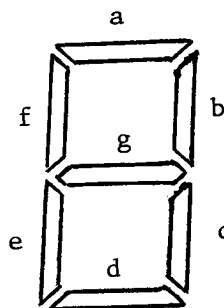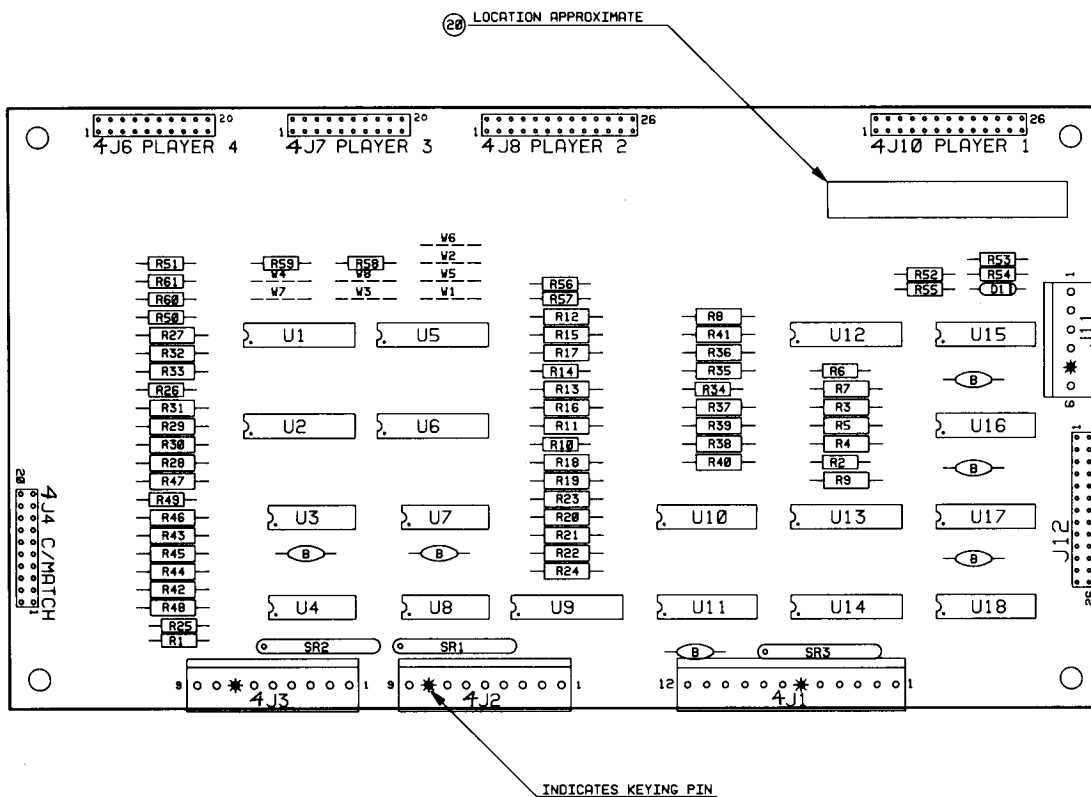
# Alphanumeric Master Display Board
## p/n  C-10877

| Item | Part No. | Ckt Designation | Description |
|---|---|---|---|
| 1 | 5760-10875-00 | | Bare P. C. Board |
| 2 | 5791-10850-00 | J8, J10, J12 | Connector, 26 pin (Hdr) |
| 3 | 5791-09437-00 | J4, J6, J7 | Connector, 20 pin (Hdr) |
| 4 | 5791-10862-12 | J1 | Connector, 12 pin (Hdr) |
| 5 | 5791-10862-09 | J2, J3 | Connector, 9 pin (Hdr) |
| 6 | 5791-10862-06 | J11 | Connector, 6 pin (Hdr) |
| 7 | 5010-10258-00 | R25, R26, R50 - R61 | Resistor, 1 M, 1/4 w, 5% |
| 8 | 5010-09774-00 | R1, R2, R6, R10, R14, R34, R35 | Resistor, 18 K, 1/4 w, 5% |
| 9 | 5010-08772-00 | R49 | Resistor, 15 K, 1/4 w, 5% |
| 10 | 5010-08981-00 | R18 - R24, R27 - R33, R36, R37, R39, R40, R42 - R48 | Resistor, 10 K, 1/4 w, 5% |
| 11 | 5010-09534-00 | W1 - W8 | Resistor, 0 Ω |
| 12 | 5019-10387-00 | SR1 - SR3 | SIP, 18 K, 9R, 10P, 5% |
| 13 | 5043-08980-00 | B | Capacitor, 0.01 mfd, 50V |
| 14 | 5075-09135-00 | D1 | Zener, 1N4740A, 10V, 1 w |
| 15 | 5310-09153-00 | U10, U11, U15 - U18 | IC, Hex Buffer, 4050 |
| 16 | 5310-09882-00 | U3, U4, U7, U8 | IC, Quad NOR, 4001B |
| 17 | 5680-08969-00 | U9, U12 - U14 | IC, Cathode Seg. Driver, UDN7180A |
| 18 | 5680-08968-00 | U1, U2, U5, U6 | IC, Anode/Digit Driver, UDN6118A or 6184 |
| 19 | 16-8850-139 | | Label, P. C. Board Ident. |
| 20 | 5010-10927-00 | R3 - R5, R7 - R9, R11 - R13, R15 - R17, R38, R41 | Resistor, 8.2 K, 1/2 w, 5% |
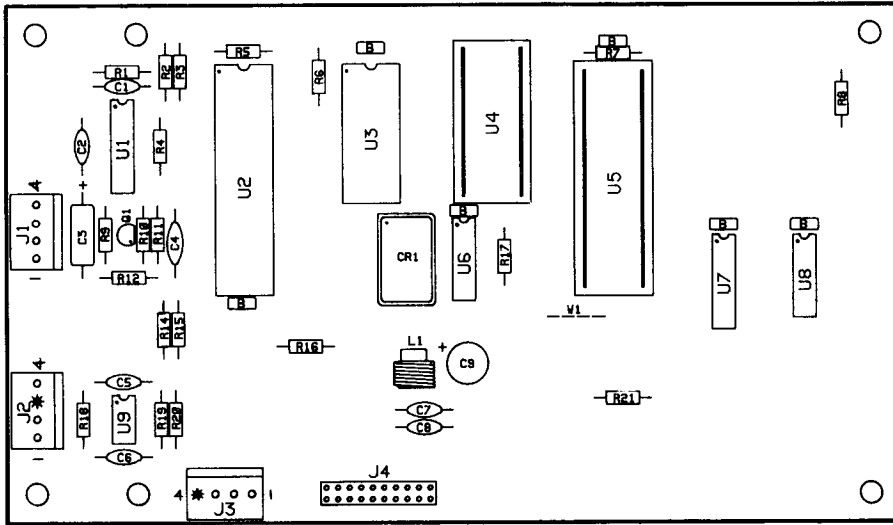
# Background Sound Board
### p/n C-11030

| Item | Part No. | Ckt Designation | Description |
|---|---|---|---|
| 1 | 5766-10929-00 | | Bare P. C. Board |
| 2 | 5371-09152-00 | U1 | IC, D/A Convtr, MC1408 |
| 3 | 5430-10322-00 | U2 | IC, PIA, MC68B21 |
| 4 | 5340-09878-00 | U3 | IC, RAM, 2016 |
| 5 | 5281-09487-00 | U6 | IC,74LS74 |
| 6 | 5281-09745-00 | U7 | IC,74LS138 |
| 7 | 5281-09235-00 | U8 | IC,74LS10 |
| 8 | 5281-09321-00 | U9 | IC, Op Amp, MC1458 |
| 9 | 5160-10269-00 | Q1 | Transistor, 2N3904, NPN |
| 10 | 5010-08983-00 | R1, R4, R11 | Resistor, 3.3K, 5%, 1/4w, Carbon Film |
| 11 | 5010-08991-00 | R2, R3, R5 - R8 R16, R17, R21 | Resistor, 4.7K, 5%, 1/4w, Carbon Film |
| 12 | 5010-08997-00 | R12 | Resistor, 2.7K, 5%, 1/4w, Carbon Film |
| 13 | 5010-09179-00 | R10 | Resistor, 3.3M, 5%, 1/4w, Carbon Film |
| 14 | 5010-09034-00 | R14, R15 | Resistor, 10K, 5%, 1/4w, Carbon Film |
| 15 | 5010-09363-00 | R18 | Resistor, 5.6K, 5%, 1/4w, Carbon Film |
| 16 | 5010-09324-00 | R19, R20 | Resistor, 27K, 5%, 1/4w, Carbon Film |
| 17 | 5043-09844-00 | C1 | Capacitor, 47 pfd, ceramic, 50V, axial |
| 18* | 5043-08980-00 | C2, C5, C6 | Capacitor, .01 mfd, ceramic, 50V, axial |
| 19 | 5043-09343-00 | C3 | Capacitor, 10 mfd, electr., 20V, axial |
| 20 | 5043-09030-00 | C4 | Capacitor, .047 mfd, ceramic, 50V, axial |
| 21 | 5043-09845-00 | C7, C8 | Capacitor, .001 mfd, ceramic, 50V, axial |
| 22 | 5040-10974-00 | C9 | Capacitor, 100mfd, electr., 35V, axial |
| 23 | 5551-10161-00 | L1 | Inductor, 2.0 µH, 3A |
| 24 | 5791-10862-04 | J1, J2, J3 | Connector, 4 pin (Hdr) |
| 25 | 5791-09437-00 | J4 | Connector, 20 pin, (Hdr) Ribbon Cable |
| 26 | 5700-10176-00 | | IC Socket, 28 pin |
| a) | A-5343-541-4 | U4 | IC, B/G Sound ROM |
| 27 | 5700-08985-00 | | IC Socket, 40 pin |
| a) | 5400-10320-00 | U5 | IC, µProcessor, MC68B09E |
| 28 | 5010-09534-00 | W1, R9 | Resistor, 0Ω, 1/4w, Carbon Film |
| 29 | 5521-10931-00 | CR1 | Oscillator, 8 MHz |

Note: Six capacitors provide +5VDC filtering for ICs; they are shown on diagram with "B" symbol.
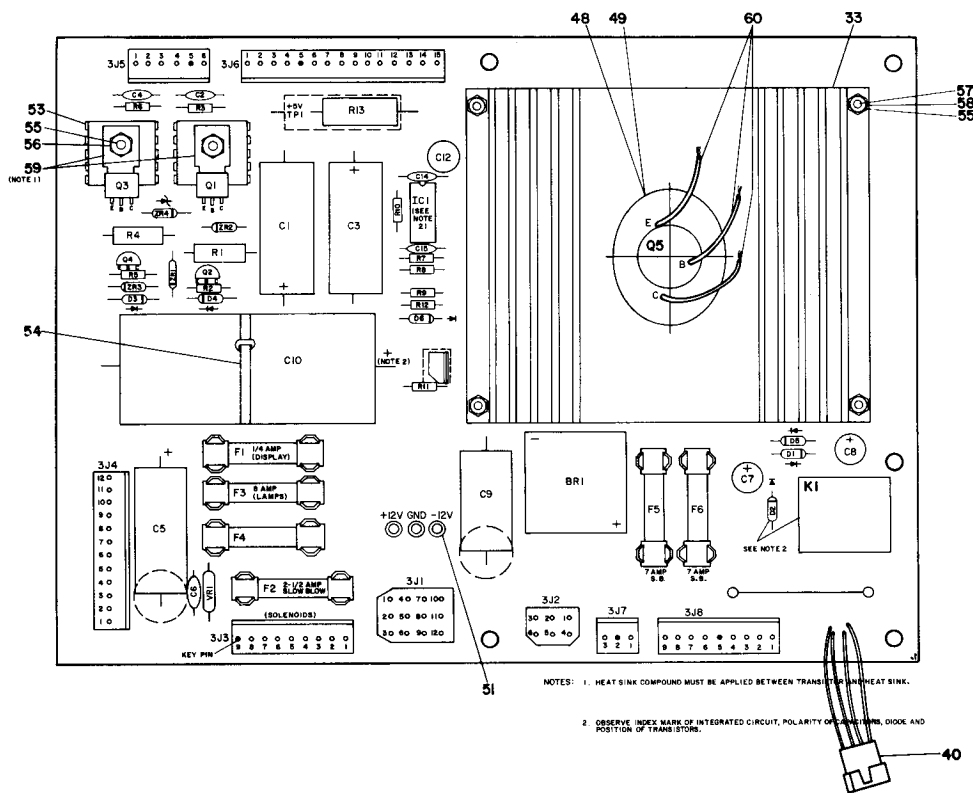
NOTES:
1. Heat sink compound must be applied between transistor and heat sink.
2. Observe index mark on integrated circuit, polarity of diodes and capacitors, and position of transistors.
3. The view of Q5 and its related heat sink and hardware is from the bottom of the heat sink, to clarify installation.

NOTES: 1. HEAT SINK COMPOUND MUST BE APPLIED BETWEEN TRANSISTOR AND HEAT SINK.
2. OBSERVE INDEX MARK OF INTEGRATED CIRCUIT, POLARITY OF CAPACITORS, DIODE AND POSITION OF TRANSISTORS.

# Power Supply
### p/n D-8345-541

| Item | Part No. | Ckt Designation | Description | Item | Part No. | Ckt Designation | Description |
|---|---|---|---|---|---|---|---|
| 1 | 5765-09466-01 | | Bare P. C. Board | 28 | 5164-09057-00 | Q1 | Transistor, SDS201, NPN |
| 2 | 5013-09426-00 | R7 | Resistor, 2.15K, 1%, 1/4w, Metal Film | 29 | 5164-09056-00 | Q4 | Transistor, MPSD02, NPN |
| | | | | 30 | 5194-09058-00 | Q3 | Transistor, SDS202, PNP |
| 3 | 5013-09427-00 | R8 | Resistor, 4.99K, 1%, 1/4w, Metal Film | 31 | 5194-09055-00 | Q2 | Transistor, MPSD52, PNP |
| | | | | 32 | 5162-09425-00 | Q5 | Transistor, 2N6057, NPN |
| 4 | 5010-09428-00 | R11 | Resistor, 1.5K, 2%, 1/4w, Carbon Film | 33 | 5705-09431-00 | | Heak Sink |
| | | | | 34 | 5791-09074-00 | 3J6 | Connector, 15 pin (Hdr) |
| 5 | 5010-09085-00 | R10 | Resistor, 1.5K, 5%,1/4w | 35 | 5791-09027-00 | 3J3, 3J8 | Connector, 9 pin (Hdr) |
| 6 | 5010-09541-00 | R9 | Resistor, 2.7K, 2%,1/4w | 36 | 5791-09038-00 | 3J2 | Connector, 6 pin (Hdr) |
| 7 | 5010-09508-00 | R12 | Resistor, 270Ω, 2%, 1/4w, Carbon Film | 37 | 5791-09067-00 | 3J5 | Connector, 6 pin (Hdr) |
| | | | | 38 | 5791-09434-00 | 3J4 | Connector, 12 pin (Hdr) |
| 8 | 5012-09429-00 | R13 | Resistor, 0.12Ω, 5%,5w | 39 | 5791-09435-00 | 3J7 | Connector, 3 pin (Hdr) |
| 9 | 5010-09536-00 | R1, R4 | Resistor, 39K, 5%,1w | 40 | H-11065 | 3J9 | Cable/Connector Assembly |
| 10 | 5010-09061-00 | R2, R5 | Resistor, 680Ω, 2w | a) | 5791-09400-00 | | Connector shell |
| 11 | 5010-09069-00 | R3, R6 | Resistor, 330K, 5%,1/2w | b) | 5820-09080-00 | | Connector pin |
| 12 | 5040-09419-00 | C10 | Capacitor, 18,000 mfd, electr., 20V, axial | 41 | 5791-09068-00 | 3J1 | Connector, 12 pin (Hdr) |
| | | | | 42 | 5321-09178-00 | | Fuseholder |
| 13 | 5040-09420-00 | C9 | Capacitor, 1000 mfd, electr., 25V, axial or radial | 43 | 5731-09128-00 | F2 | Fuse, 2.5A, 250v, S-B |
| | | | | 44 | 5731-09071-00 | F3 | Fuse, 8A, 32v |
| 14 | 5040-09423-00 | C12 | Capacitor, 330 mfd, electr., 10V,radial | 45 | 5731-09128-00 | F4 | Fuse, 2.5A, 250v, S-B |
| | | | | 46 | 5731-08761-00 | F1 | Fuse, 1/4A, 250v, S-B |
| 15 | 5043-9065-00 | C15 | Capacitor, 470 pfd | 47 | 5017-09064-00 | VR1 | Varistor |
| 16 | 5040-9053-00 | C1, C3 | Capacitor, 100 mfd, electr., 150V | 48 | 5700-09445-00 | | Socket |
| | | | | 49 | 5701-09652-00 | | Mica Insulator |
| 17 | 5040-09070-00 | C5 | Capacitor, 100 mfd, electr., 100V, axial or radial | 50 | 5580-09555-00 | K1 | Relay, 24VDC, 10A, DPDT |
| | | | | 51 | 5824-09428-00 | TP1 - TP4 | Terminal, #1502-1 (Test Post) |
| 18 | 5043-09072-00 | C2, C4 | Capacitor, 0.1 mfd, 500V, disc | 52 | 5100-09418-00 | BR1 | Bridge Rectifier, 35A, 100V |
| 19 | 5043-09446-00 | C14 | Capacitor, 0.1 mfd, 50V, disc | 53 | 5705-09042-00 | | Heat Sink |
| 20 | 5070-06258-00 | D1, D2, D5, D6 | Diode, 1N4001 | 54 | 03-7947 | | Tie Wrap |
| 21 | 5070-09054-00 | D3, D4 | Diode, 1N4004 | 55 | 4005-01016-00 | | Mach. Screw, 5-40 x 7/16, RH |
| 22 | 5075-09059-00 | ZR1, ZR3 | Zener, 1N5990, 3.9v, 5% | 56 | 4700-00004-00 | | Flatwasher, 0.146 x 3/8, 21 Ga. |
| 23 | 5075-09060-00 | ZR2, ZR4 | Zener, 1N4764, 100v, 5% | 57 | 4701-00023-00 | | Lockwasher, #5, split |
| 24 | 5460-09424-00 | IC1 | IC, Volt. Reg., MC1723C | 58 | 4405-01117-00 | | Hex Nut, 5-40 |
| 25 | 5043-09443-00 | C6 | Capacitor, 0.1 mfd, 200v, disc | 59 | 20-9229 | | Heat sink Thermal Compound |
| 26 | 5040-09421-00 | C7 | Capacitor, 100 mfd, 25v, radial | 60 | HW-30118-4 | | Lead wire, 18 AWG, 3" |
| 27 | 5040-09422-00 | C8 | Capacitor, 47 mfd, 50v, radial | 61 | 5731-01003-00 | F6, F5 | Fuse, 7A, 250V, S-B |

High Speed 49

# Section 3
## Reference Diagrams
## &
## Schematics

- **Diagrams and Schematics:**

    **Cabinet Wiring**
    **Power Wiring**
    **Alphanumeric Master Display Board**
    **Background Sound Board**
    **Interboard Wiring Diagrams**
    **CPU Board Parts**
    **CPU Board Schematic**
    **Power Supply Board Schematic**
    **Display Schematic**

Cabinet Wiring Diagram

LINE CORD
UTILITY OUTLET
VR1
LINE FILTER
5102-10310-00
LINE
LOAD
BLK
BLK
BLK
BLK
WHT
GRN
ON OFF SWITCH
5640-10932-00

7P5 7J5
BLK
BLK
BRN 103.5 VAC
BRN 115.0 VAC
WHT-BLK
WHT-BRN 103.5 VAC
115.0 VAC
WHT
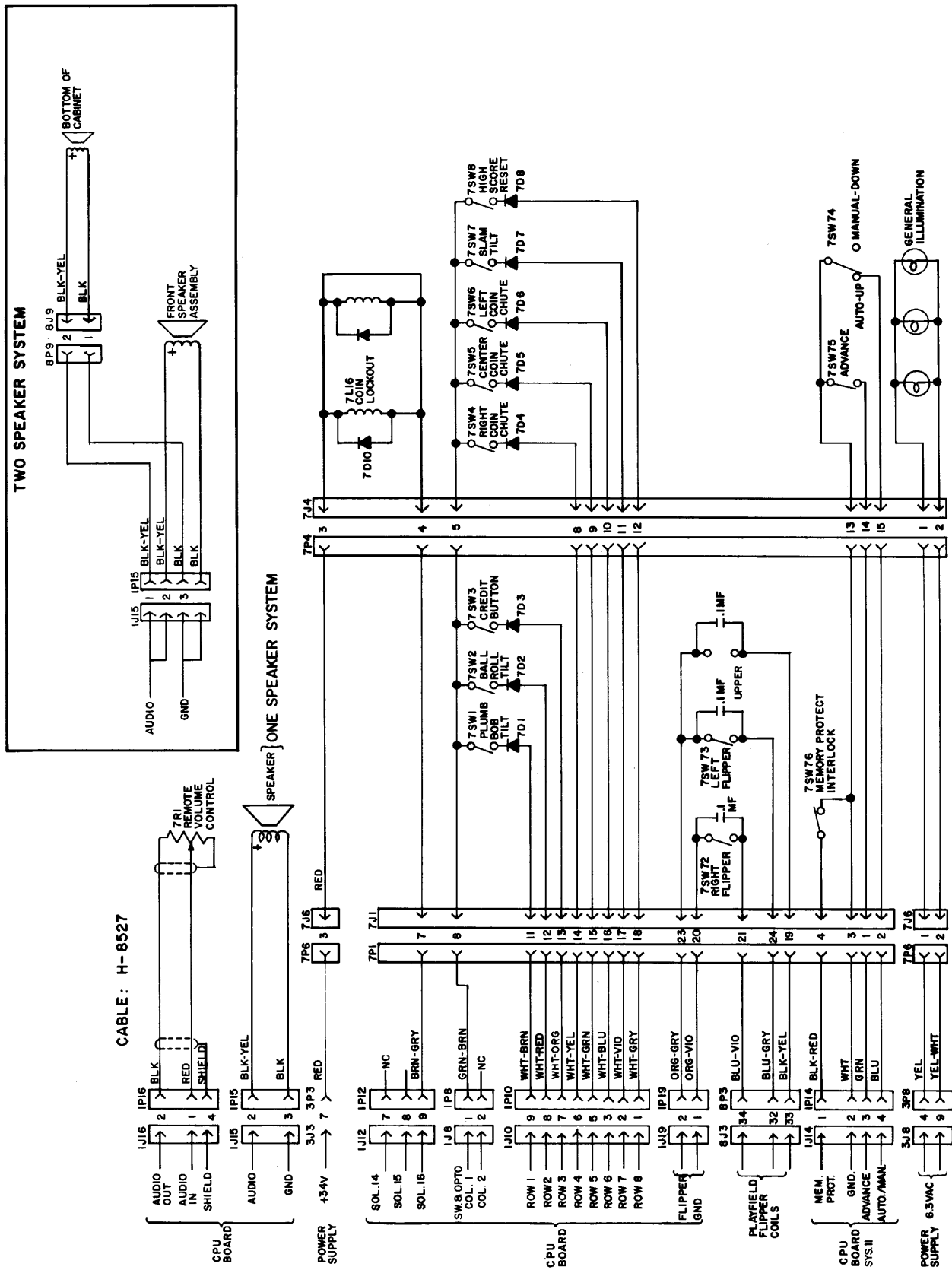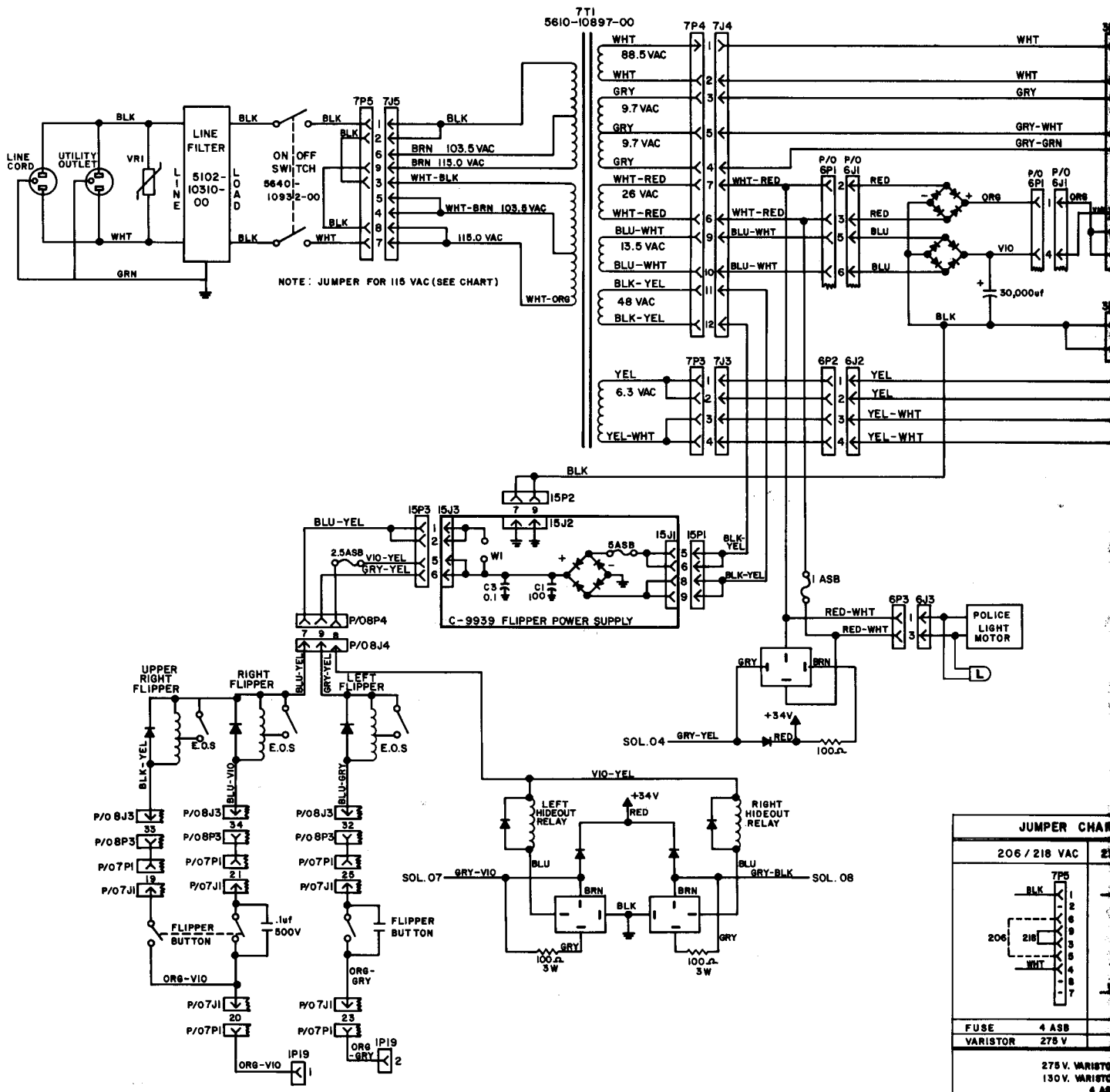
NOTE: JUMPER FOR 115 VAC (SEE CHART)

7TI
5610-10897-00

7P4 7J4
WHT
88.5 VAC
WHT
GRY
9.7 VAC
GRY
9.7 VAC
GRY
WHT-RED
26 VAC
WHT-RED
BLU-WHT
13.5 VAC
BLU-WHT
BLK-YEL
48 VAC
BLK-YEL
WHT-ORG

WHT
WHT
GRY
GRY-WHT
GRY-GRN

P/O 6P1  P/O 6J1
WHT-RED  RED
WHT-RED  RED
BLU-WHT  BLU
BLU-WHT  BLU

P/O 6P1 6J1
ORG
VIO
+ 30,000 uf
BLK

7P3 7J3
YEL
6.3 VAC
YEL
YEL-WHT

6P2 6J2
YEL  YEL
YEL  YEL
YEL-WHT
YEL-WHT

BLK
15P2
7 9

15P3 15J3
BLU-YEL
2.5 ASB  VIO-YEL
GRY-YEL
15J2
W1
C3 0.1  C1 100
5 ASB
15J1 15P1
BLK-YEL
BLK-YEL
C-9939 FLIPPER POWER SUPPLY

1 ASB
RED-WHT
RED-WHT
6P3 6J3
POLICE LIGHT MOTOR
L

GRY  BRN
+34V
SOL.04  GRY-YEL  RED  100Ω

P/O8P4
7 9 8
BLU-YEL
GRY-YEL
P/O8J4

UPPER RIGHT FLIPPER
RIGHT FLIPPER
LEFT FLIPPER
E.O.S
E.O.S
E.O.S

BLK-YEL
BLU-VIO
BLU-GRY

P/O8J3  33
P/O8P3  19
P/O7PI  19
P/O7JI

P/O8J3  34
P/O8P3  21
P/O7PI
P/O7JI

P/O8J3  32
P/O8P3  25
P/O7PI
P/O7JI

FLIPPER BUTTON
.1uf 500V
FLIPPER BUTTON
.1uf

ORG-VIO
ORG-GRY

P/O7JI  20
P/O7PI
P/O7JI  23
P/O7PI

ORG-VIO  1P19
1
ORG-GRY  1P19
2
ORG-VIO
ORG-GRY

VIO-YEL
LEFT HIDEOUT RELAY
+34V RED
RIGHT HIDEOUT RELAY
SOL.07  GRY-VIO
BLU
BLU  GRY-BLK  SOL.08
BRN  BLK  BRN
GRY  GRY
100Ω 3W  100Ω 3W

JUMPER CHART

| | 206 / 218 VAC | |
|---|---|---|
| | 7P5 | |
| BLK | 1 | |
| 206 | 218 | |
| WHT | | |

| FUSE | 4 ASB | |
| VARISTOR | 275 V | |

275 V. VARISTOR
130 V. VARISTOR
4 ASB
8 ASB

## Power Wiring Diagram

WHT — 3P1 3J1 — F1 0.25ASB — +100VDC -100VDC SUPPLY — +100 V -100 V — 3J5 3P5 4P11 — BRN ORG GRY BLK — MASTER DISPLAY

WHT — F5 7ASB — +5VDC ±12VDC UNREG SUPPLY — +5V
GRY

GRY-WHT — F4 7ASB
GRY-GRN — -12

P/O 6P1  P/O 6J1 — ORG — VIO — F3 8ASB — 18 VDC
+ ORG

VIO — F2 2.5ASB — SOL B+ +34VDC

30,000uf

3J4 3P4 (BLK) — 1P13 — SOL. GND
1P5 — LAMP GND

1P4 — LAMP B+

3P2 3J2 — 3J3 3P3 (BLU) — RED — 9P2-6
RED — 7P6-1  } SOL B+
RED — 8P4-1
RED-WHT — 8P4-2
BLK — 8P4-10
BLK-WHT — 11P3-3

3J6 3P6 1P17 — WHT-GRY — 9 +12V UNREG
BLK-WHT — 8 -12V UNREG
+12 — GRY
-12 — GRY  } +5VDC
+5 — GRY
BLK
BLK  } GND
BLK
BLK — 9P2-5
GRY — 11P3-2
WHT — 11P3-1
8P4-11

POLICE LIGHT MOTOR

3J6 3P8 — BRN — YEL — GRN — VIO
WHT-BRN — WHT-YEL — WHT-GRN — WHT-VIO — ALL 5ASB

POWER SUPPLY

9P2 9J2
7P6 7J6 7P4 7J4 — YEL — WHT-YEL

P/O 8P4  P/O 6J4 — WHT-VIO — VIO

### JUMPER CHART (Transformer)

| 206/218 VAC | 230 VAC | 103.5 VAC |
|---|---|---|
| 7P5 BLK ... WHT 206 218 | 7P5 BLK ... WHT | 7P5 BLK ... WHT |

| FUSE | 4 ASB | 4 ASB | 8 ASB |
| VARISTOR | 275 V | 275 V | 130 V |

275 V. VARISTOR: 5017-09063-00
130 V. VARISTOR: 5017-09044-00
4 ASB: 5731-06314-00
8 ASB: 5730-09252-00

Power Wiring Diagram

POWER TABLE

| TYPE | REF. DESIG. | +5V | GND | +90 | -100 |
|---|---|---|---|---|---|
| 14050 | U10, U11 U15, U16 | 1 | 8 | – | – |
| 14001 | U3, U4 U7, U8 | 14 | 7 | – | – |
| | | | | | |
| UDN 6118 | U1, U2 U5, U6 | – | 9 | 10 | – |
| UDN 7180 | U9, U12 U13, U14 | – | 9 | – | 10 |

| F. DESIG. | +5V | GND | +90 | -100 |
|---|---|---|---|---|
| ...U11 ...U18 | 1 | 8 | - | - |
| ...U4 ...U8 | 14 | 7 | - | - |
| ...U12 ...U6 | - | 9 | 10 | - |
| ...U12 ...U14 | - | 9 | - | 10 |

| VALUE OF UNMARKED RESISTORS | | | |
|---|---|---|---|
| DESIGNATORS | OHMS | WATTS | % |
| R3-R5, R7-R9, R35, R43 R11-R13, R15-R17 R36, R37, R39, R40 R18-R24, R27-R33, R42-R48 | 8.2K 10K | 1/2W 1/2W | 5 5 |
| R49 | 15K | 1/4W | 5 |
| R1, R2, R6, R10, R14, R34, R35 | 18K | 1/4W | 5 |
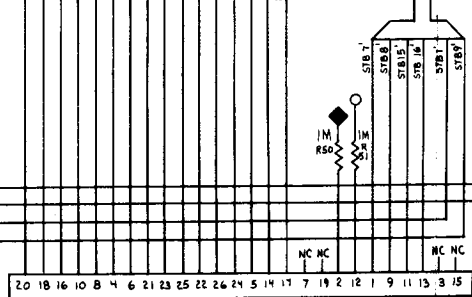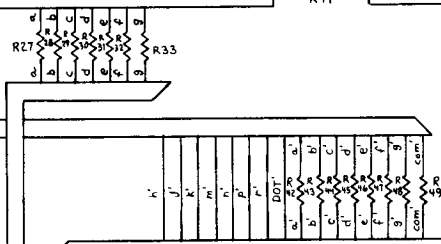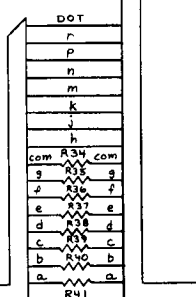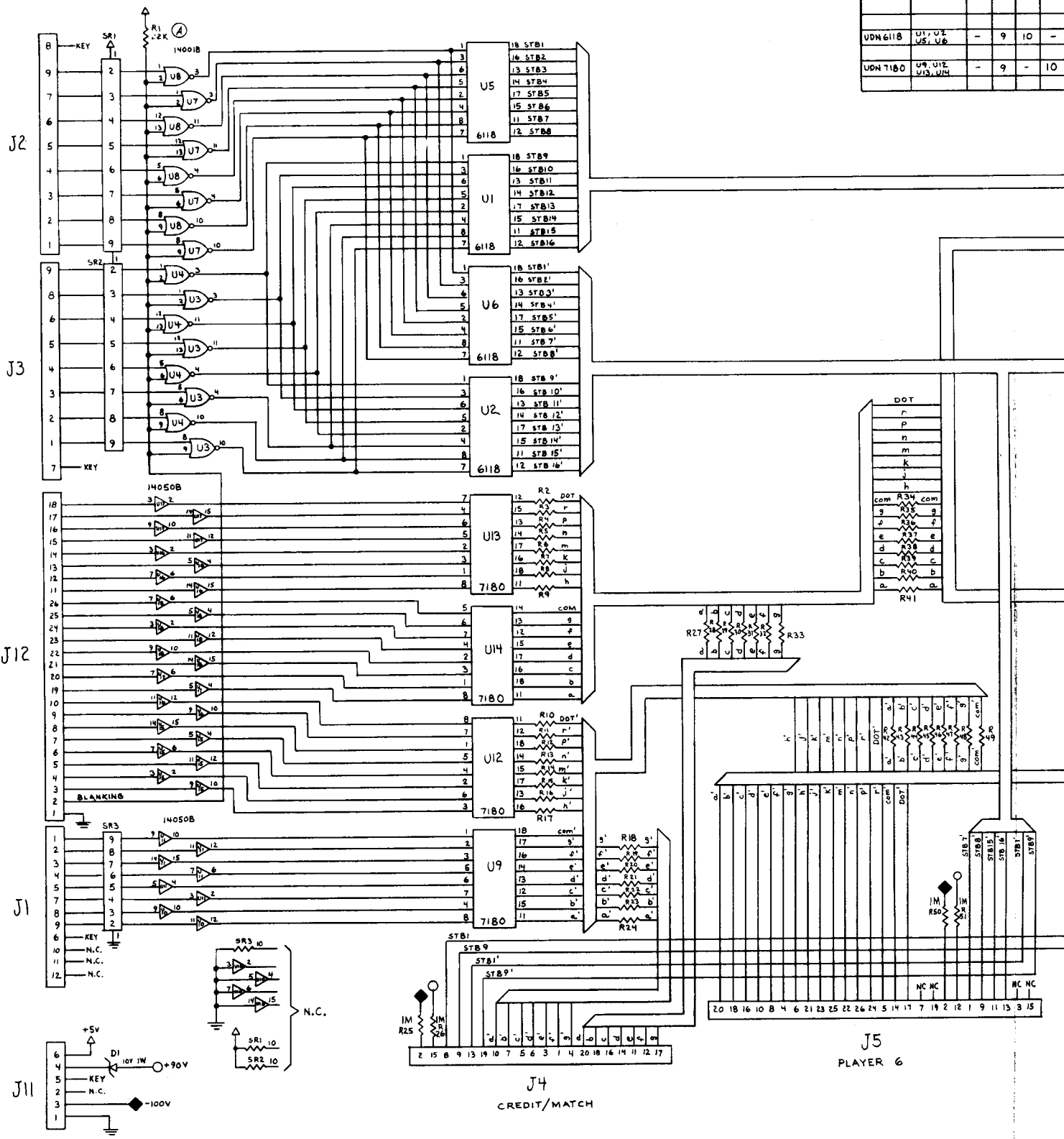
J10
PLAYER 1

J8
PLAYER 2

J7 PLAYER 3

J9
PLAYER 5

J6
PLAYER 4
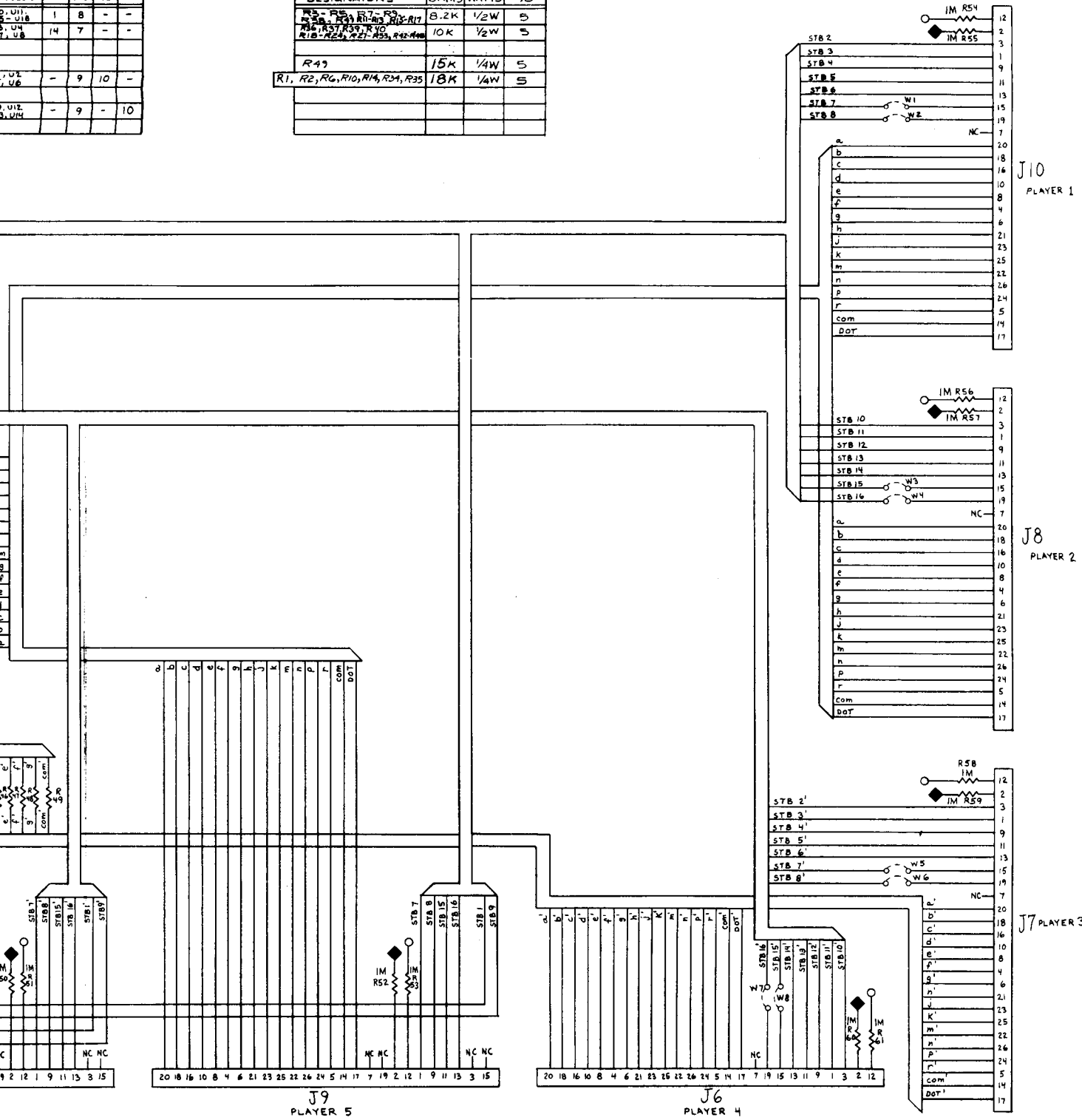
**Alphanumeric Master Display Board Schematic**

+5V

PIF Ø 12
PIF I 11
PIF 2 10
PIF 3 9
PIF 4 8
PIF 5 7
PIF 6 6
PIF 7 5

U I
1408

13
14  R4
3.3K

I  N.C.
3  -12V
16  C1
47pf
4

C2
.01  2N3904

+5V
R11
3.3K
C3
10uf  +  BG SOUND

R3  R2
4.7K  4.7K

R1
3.3K

15  2

Q1
-12V
R10
3.3

SIP I
4.7K

SR I

RESET  CAI  40
R/W  CA2  39
IRQA  PAØ  2
IRQB  PAI  4
PA2  5
PA3  6
PA4  7
PA5  8
PA6  9
PA7
PBØ  10
PBI  11
PB2  12
PB3  13
PB4  14
PB5  15
PB6  16
PB7  17
C8I  18
C82  19
CSØ  22

U 2
6821

CS1
CS2

HAND I
HAND 2

2
4
6
8
9
7
5
3

11J4
CPU
INTERFACE

3
4
5
6
7
8
9
10
13
12
RESET  18
1

R9
2.7K

R15
10K
R19
27K

R22

C5
.01

J1 - 1

J1 - 2
KEY J1 - 3
J1 - 4

11J1
CPU ANALOG
INTERFACE

BG SOUND
R12
2.7K
R14
10K
6
8
U9
5  7
1458

R18
5.6K

J2 - 1
J2 - 2
KEY J2 - 3
J2 - 4

11J2
VOLUME
CONTROL

R23  C4
.047

R20
27K
C6
.01
-12V

2
+  1
3
SPARE

Background Sound Board Schematic

CPU BOARD

SYSTEM 11

D-10881

C-11029 B/G SOUND BD.

POWER SUPPLY

D-8345- 541

3J5
DISPLAY
POWER

3J6
LOGIC
POWER

GND
ORG/BLK-WHT --I00V
BRN +I00V
GRY +5V

N/C
+I2V UNWEB
N/C
N/C
KEY
GRY-WHT +I2V
GRY +5V
GRY +5V
GRY +5V
N/C
BLK GND
BLK GND
BLK GND
N/C
N/C

LOGIC
SUPPLY
F5       F6
7A       7A

6.3 VAC      K1

3J4
LAMP POWER
SOLENOID
GROUND

HIGH VOLTAGE
F1
0.25A S.B.

LAMPS
F3
8A

F4  2.5 A-SB

SOLENOIDS
F2
2.5A S.B.

3J3
SOLENOID
POWER

3J1     3J2

3J7
SPECIAL
RELAY

3J8
GEN.
ILLUM.
OUT

GEN.
ILLUM.
IN

LAMP
GROUND   BLK BLK BLK BLK 12 11 10 9

+I8 VDC   BLU BLU BLU BLU 8 7 6 5
LAMPS

SOLENOID   BLK BLK BLK BLK 4 3 2 1
GROUND

KEY
RED +54V
RED +54V
RED +54V
NC
BLK GND
N/C

RED +54V
KEY
BRN-ORN SOL II

WHT-YEL
WHT-GRN
WHT-VIO
WHT-BRN
KEY
YEL
BRN
VIO
BRN

YEL 6.3VAC
YEL 6.3VAC

ORG/BLK ——KEY
ORG/RED ——SP SOL.-3 SW
ORG/YEL ——SP SOL.-2 SW
ORG/BRN ——SP SOL.-4 SW
          SP SOL.-1 SW
          N.C.
ORG/GRN ——N.C.
ORG/BLU ——SP SOL.-5 SW
          SP SOL.-6 SW

ORG/VIO
ORG/GRY
BLU/ORG  079 SP SOL.-3
BLU/RED  077 SP SOL.-2
          KEY
BLU/YEL  081
BLU/BRN  078 SP SOL.-4
BLU/GRN  083 SP SOL.-1
BLU/BLK  085 SP SOL.-5
          SP SOL.-6

BLU
BLU
BLU ——KEY
BLU
BLU
BLU
BLU
BLU

BLK
BLK ——KEY
BLK
BLK
BLK
BLK
BLK

FLIPPER POWER
SUPPLY

C-9939

C1

W1

F2
5A S.B.

BR1      +

         −

I5J3
FLIPPER B+
OUTPUT

+50V GRY ——o 6
+50V GRY ——o 5
KEY ———— 4
NC ——BLU—o 3
+50V BLU ——o 2
+50V BLU ——o 1

I5J1
FLIPPER
POWER
INPUT

1 o
2 o         NC
3 o
4 o
5 o—WHT-GRN—48VAC
6 o—WHT-GRN—48VAC
7 •  KEY
8 o—WHT-ORN—48VAC
9 o—WHT-ORN—48VAC

I5J2
FLIPPER
POWER GROUND

9 8 7 6 5 4 3 2 1

GND BLK
NC
GND BLK
KEY
NC

**NOTES:**

1. FOR SCHEMATIC, REFER TO DWG. #16-8947.
2. FOR ITEMS #56 AND #58 RESISTORS MUST BE MOUNTED 1/8" ABOVE SURFACE OF PCB.
3. I.C., 6820/6821, PIA: U9, U10, U58, U41, U42, U51, U54.
4. TRANSISTOR, 2N6427: Q51, Q53, Q55, Q57, Q59, Q61, Q63, Q65.
5. TRANSISTOR, TIP42: Q52, Q54, Q56, Q58, Q60, Q62, Q64, Q66.

6. TRANSISTOR, TIP122: Q6 THRU Q9, Q14 THRU Q17, Q22 THRU Q25, Q50 THRU Q53, Q69, Q71, Q73, Q75, Q77, Q79, Q80 THRU Q87.
7. TRANSISTOR, 2N4401: Q2 THRU Q5, Q10 THRU Q13, Q18 THRU Q21, Q26 THRU Q29, Q34 THRU Q35, Q41, Q67, Q68, Q70, Q72, Q74, Q76, Q78.
8. JUMPER, STANDARD: W1, W2, W4, W5, W7, W9, W11, W14, W16.

9. RESISTOR, 4.7K OHM: R31, R32, R35, R52, R55, R68, R92, R135.
10. RESISTOR, 1.0K OHM: R5, R6, R54, R57, R58, R64, R66, R112, R115, R118, R121, R124, R127, R130, R133.
11. RESISTOR, 10K OHM: R11 THRU R14, R25, R26, R53, R60, R65, R90.
12. RESISTOR, 2.7K OHM: R23, R24, R91, R93, R96, R99, R102, R105, R108.

13. RESISTOR, 4 OHM 3 WATT: R115, R116, R119, R122, R125, R128, R131, R134.
14. RESISTOR, 68 OHM 1/2 WATT: R36 THRU R51, R95, R98, R101, R104, R107, R110.
15. RESISTOR, 1.2K OHM: R11 THRU R14, R117, R120, R123, R126, R129, R132.
16. SIP, 4.7K OHM & 470 PFD: SRC1 THRU SRC5, SRC7, SRC8, SRC9.

17. CAPACITOR, .01 MFD., BYPASS (B), 55 CAPACITORS: C14, C17 THRU C21, C31, C32, C59, C70 THRU C75, C4? THRU C5?.
18. CAPACITOR, 470 PFD.: C33 THRU C40, C68, C69, C76.
19. USE THERMAL COMPOUND BETWEEN ITEM #24 (U1) AND ITEM #112.
20. CONNECTOR, 9-PIN: 1J1, 1J8, 1J14 THRU 1J8, 1J11, 1J12, 1J17, 1J18, 1J19.

INDICATES KEYING PIN

SEE NOTE #1.

| 123 | 5791-09437-00 | 1J21 | 20-PIN RIBBON HEADER | 1 |
|---|---|---|---|---|
| (B) 93 | 5040-10474-00 | C3, C24, C26, C29 | CAP., ELECT., RADIAL, 100 MFD. 35V +50-10% | 4 |
| 62 | 5010-10005-00 | R62, R63 | RESISTOR, C.F., RADIAL, 390 OHM 5% 1/4 WATT | 2 |
| 31 | 5019-10501-00 | U47 | DIP, 8R 16-PIN, 270 OHM .125 W/R 5% | 1 |

**B I L L   O F   M A T E R I A L**

**Notes:**

1. ...MOUNTED 1/8" ABOVE SURFACE OF PCB.
2. ...Q50 THRU Q55, Q58, Q59, Q71, Q73, Q75, Q77, Q79, Q80 THRU Q87.
3. I.C., 6820/6821, PIA — U9, U10, U38, U41, U42, U51, U54.
4. TRANSISTOR, 2N6427 — Q51, Q53, Q55, Q57, Q59, Q61, Q63, Q65.
5. TRANSISTOR, TIP42 — Q52, Q54, Q56, Q58, Q60, Q62, Q64, Q66.
6. ...Q2 THRU Q5, Q10 THRU Q13, Q18 THRU Q21, Q26 THRU Q29, Q34 THRU Q38, Q41, Q67, Q68, Q70, Q72, Q74, Q76, Q78.
7. TRANSISTOR, 2N4401 — Q1, ...
8. JUMPER, STANDARD — W1, W2, W4, W5, W7, W9, W11, W14, W16.
©. JUMPER ... W1, W2, W4, W5, W7, W9, W11, W14, W16.
10. RESISTOR, 1.0K OHM — R5, R6, R54, R57, R58, R64, R66, R112 THRU R115, R121, R124, R127, R136, R155.
11. RESISTOR, 10K OHM — R11 THRU R14, R25, R26, R55, R60, R65 THRU R90.
12. RESISTOR, 2.7K OHM — R23, R24, R91, R93, R96, R99, R102, R105, R108.
14. RESISTOR, 68 OHM 1/2 WATT — R56 THRU R51, R95, R98, R101, R104.
15. RESISTOR, 1.2K OHM — R11 THRU R14, R25, R117, R120, R123, R126.
16. SIP, 4.7K OHM & 470 PFD, — SRC1 THRU SRC5, SRC7, SRC8, SRC9.
18. CAPACITOR, 470 PFD, — C33 THRU C40, C68, C69, C76.
19. USE THERMAL COMPOUND BETWEEN ITEM #24 (U1) AND ITEM #112.
20. CONNECTOR, 9-PIN — 1J1, 1J2, 1J4 THRU 1J8, 1J10, 1J11, 1J12, 1J17, 1J18, 1J13.

| ITEM | PART NO. | PART DESIGNATION | DESCRIPTION | QTY. |
|---|---|---|---|---|
| 123 | 5791-09437-00 | 1J21 | 20-PIN RIBBON HEADER | 1 |
| 122 | 5791-10850-00 | 1J22 | 26-PIN RIBBON HEADER | 1 |
| 121 |  |  |  |  |
| 120 | 5791-10842-12 | 1J3 | HEADER, 12H STR. SQ. PIN, .15G | 1 |
| 119 | 5791-10842-04 | 1J13 THRU 1J16 | HEADER, 4H STR. SQ. PIN, .15G | 4 |
| 118 | 5791-10842-09 | SEE NOTE #20 | HEADER, 9H STR. SQ. PIN, .15G | 13 |
| 117 | 5090-08994-00 | K1 | RELAY, 4P, 40 OHM 6V | 1 |
| 116 | 20-9229 | SEE NOTE #19 | THERMAL COMPOUND | .010 oz. |
| 115 | 4705-00007-00 |  | #6 EXT. LOCKWASHER | 1 |
| 114 | 4406-00117-00 |  | 6-32 HEX. NUT | 1 |
| 113 | 4006-01005-06 |  | 6-32 X 3/8" P-PH-S | 1 |
| 112 | 5795-09199-00 |  | HEATSINK #6030 | 1 |
| 111 | 5824-09248-00 | TP1, TP2 | TEST POINT | 2 |
| 110 | 5700-09005-00 |  | 40-PIN SOCKET | 2 |
| 109 | 5700-10176-00 |  | 28-PIN SOCKET | 4 |
| 108 | 5801-09021-00 |  | BATTERY HOLDER #171 | 1 |
| 107 | 20-9491 | W17, W18 | BUS WIRE | 1.5" |
| 106 | 5800-09022-00 | B1, B2, B3 | BATTERY, ALKALINE, 1.5V (A-A) | 3 |
| 105 | 5641-09312-00 | SW1, SW2 | SWITCH, DPDT 100V, 5A. | 2 |
| 104 | 5641-09655-00 |  | PUSH BUTTON SWITCH, SPST | 0 |
| 103 | 5551-09822-00 | L1, L2, L3 | INDUCTOR, 4.7 uH 3A | 3 |
| 102 | 5046-09348-00 | C13 | CAPACITOR, POLYSTYRENE, 4700 PFD. 5% 50 VOLT | 1 |
| 101 | 5046-09346-00 | C12 | CAPACITOR, POLYSTYRENE, 1200 PFD. 5% 50 VOLT | 1 |
| 100 | 5046-09347-00 | C11 | CAPACITOR, POLYSTYRENE, 100 PFD. 5% 50 VOLT | 1 |
| 99 | 5046-09350-00 | C10 | CAPACITOR, POLYSTYRENE, 1000 PFD. 5% 50 VOLT | 1 |
| 98 | 5043-09351-00 | C16, C57 | CAPACITOR, AXIAL, .047 MFD. 50V +/-20% | 2 |
| 97 | 5041-09031-00 | C9, C58 | CAP., TANT., AXIAL, 1 MFD. 25V +/-20% | 2 |
| 96 | 5040-09545-00 | C30 | CAP., ELECT., AXIAL, 22 MFD. 10V +50-10% | 1 |
| 95 | 5045-09065-00 | SEE NOTE #18 | CAPACITOR, AXIAL, 470 PFD. 50V +/-20% | 11 |
| 95 | 5045-09796-00 | C60 THRU C67 | CAP. POLYCARBONATE RAD., .1 MFD. | 8 |
| 94 | 5040-09776-00 | C2 | CAP., ELECT., RADIAL, 470 MFD. 16V +50-10% | 1 |

| ITEM | PART NO. | PART DESIGNATION | DESCRIPTION | QTY. |
|---|---|---|---|---|
| 93 | 5040-10974-00 | C5, C24, C26, C29 | CAP., ELECT., RADIAL, 100 MFD. 35V +50-10% | 4 |
| 92 | 5043-09844-00 | C7, C41 THRU C48 | CAPACITOR, AXIAL, 47 PFD. 50V +/-20% | 9 |
| 91 | 5040-09343-00 | C8, C15 | CAP., ELECT., AXL., LOW L, 10 MFD. 20V +/-20% | 2 |
| 90 | 5043-08996-00 | C1, C4, C5, C77, C78 | CAPACITOR, AXIAL, .1 MFD. 50V +/-20% | 5 |
| 89 | 5043-09845-00 | C6, C22, C23, C25, C27, C28 | CAPACITOR, AXIAL, 1K PFD. 50V +/-20% | 6 |
| 88 | 5019-09980-00 | SEE NOTE #17 | CAPACITOR AXIAL, .01 MFD. 50V +80-20% | 77 |
| 87 | 5060-10524-00 | SRC6 | SIP, 8R 8C 10-PIN, 1K OHM & .001 MFD. | 1 |
| 86 | 5060-10536-00 | SEE NOTE #16 | SIP, 8R 8C 10-PIN, 4.7K OHM & 470 PFD. | 8 |
| 85 | 5019-09792-00 | SR5, SR7 | SIP, 9R 10-PIN, 4.7K OHM .125 W/R 5% | 2 |
| 84 | 5019-09786-00 | SR1, SR2 | SIP, 9R 6-PIN, 4.7K OHM .125 W/R 5% | 2 |
| 83 | 5019-09780-00 | SR9, SR10, SR12, SR13 | SIP, 4R 8-PIN, 1K OHM 5% | 4 |
| 82 | 5019-09669-00 | SR8 | SIP, 9R 10-PIN, 1.0K OHM .125 W/R 5% | 1 |
| 81 | 5019-10472-00 | SR14 | SIP, 9R 10-PIN, 3.3K OHM .125 W/R 5% | 2 |
| 80 | 5019-09785-00 | SR16 | SIP, 9R 10-PIN, 2.2K OHM .125 W/R 5% | 2 |
| 79 | 5019-09808-00 | SR4, SR6, SR11 | SIP, 9R 10-PIN, 560 OHM .125 W/R 5% | 3 |
| 78 | 5019-09362-00 | SR3, SR15, SR17, SR19, SR20 | SIP, 9R 10-PIN, 4.7K OHM .125 W/R 5% | 5 |
| 77 | 5019-09785-00 | SR18 | SIP, 9R 10-PIN, 6.8K OHM .125 W/R 5% | 1 |
| 76 | 5010-09356-00 | R27, R28 | RESISTOR, C.F., 5% 1/4 WATT, 820 OHM | 2 |
| 75 | 5010-08772-00 | R21 | RESISTOR, C.F., 5% 1/4 WATT, 15K OHM | 1 |
| 74 | 5010-09324-00 | R19, R20, R22, R29, R30 | RESISTOR, C.F., 5% 1/4 WATT, 27K OHM | 5 |
| 73 | 5010-09333-00 | R18 | RESISTOR, C.F., 5% 1/4 WATT, 180K OHM | 1 |
| 72 | 5010-09346-00 | R17 | RESISTOR, C.F., 5% 1/4 WATT, 220K OHM | 1 |
| 71 | 5010-09342-00 | R16 | RESISTOR, C.F., 5% 1/4 WATT, 36K OHM | 1 |
| 70 | 5010-09824-00 | R15 | RESISTOR, C.F., 5% 1/4 WATT, 43K OHM | 1 |
| 69 | 5010-10631-00 | SEE NOTE #15 | RESISTOR, C.F., 5% 1/2 WATT, 1.2K OHM | 8 |
| 68 | 5010-09085-00 | R71 THRU R78 | RESISTOR, C.F., 5% 1/4 WATT, 1.5K OHM | 8 |
| 67 | 5010-09179-00 | R9 | RESISTOR, C.F., 5% 1/4 WATT, 3.3M OHM | 1 |
| 66 | 5010-09416-00 | R33, R34 | RESISTOR, C.F., 5% 1/4 WATT, 470 OHM | 2 |
| 65 | 5010-09160-00 | R59, R61, W12, W13 | RESISTOR, C.F., 5% 1/4 WATT, 220 OHM | 4 |
| 64 | 5010-10170-00 | R69 | RESISTOR, C.F., 5% 1/4 WATT, 47 OHM | 1 |
| 63 | 5010-10171-00 | R67 | RESISTOR, C.F., 5% 1/4 WATT, 56 OHM | 1 |

| ITEM | PART NO. | PART DESIGNATION | DESCRIPTION | QTY. |
|---|---|---|---|---|
| 62 | 5010-10003-00 | R62, R63 | RESISTOR, C.F., 5% 1/4 WATT, 390 OHM | 2 |
| 61 | 5010-09161-00 | R4 | RESISTOR, C.F., 5% 1/4 WATT, 2.2 OHM | 1 |
| 60 | 5010-09181-00 | R2 | RESISTOR, C.F., 5% 1/2 WATT, 1.0 OHM | 1 |
| 59 | 5010-09361-00 | R1 | RESISTOR, C.F., 5% 1/2 WATT, 220 OHM | 1 |
| 58 | 5012-10860-00 | R62 THRU R89 SEE NOTE #2 | RESISTOR, C.F., 5% 2 WATT, 27 OHM | 8 |
| 57 | 5010-09995-00 | SEE NOTE #14 | RESISTOR, C.F., 5% 1/2 WATT, 68 OHM | 22 |
| 56 | 5012-09057-00 | SEE NOTES #2 AND #13 | RESISTOR, WIREWOUND, .4 OHM 5% 3 WATT | 8 |
| 55 | 5010-08997-00 | SEE NOTE #12 | RESISTOR, C.F., 5% 1/4 WATT, 2.7K OHM | 9 |
| 54 | 5010-09363-00 | R3 | RESISTOR, C.F., 5% 1/4 WATT, 5.6K OHM | 1 |
| 53 | 5010-09086-00 | R81 | RESISTOR, C.F., 5% 1/4 WATT, 6.8K OHM | 1 |
| 52 | 5010-09034-00 | SEE NOTE #11 | RESISTOR, C.F., 5% 1/4 WATT, 10K OHM | 10 |
| 51 | 5010-08983-00 | R7, R9, R10, R78, R80 | RESISTOR, C.F., 5% 1/4 WATT, 3.3K OHM | 5 |
| 50 | 5010-09113-00 | R79 | RESISTOR, C.F., 5% 1/4 WATT, 33K OHM | 1 |
| 49 | 5010-09358-00 | SEE NOTE #10 | RESISTOR, C.F., 5% 1/4 WATT, 1.0K OHM | 15 |
| 48 | 5010-08991-00 | SEE NOTE #8 | RESISTOR, C.F., 5% 1/4 WATT, 4.7K OHM | 8 |
| 47 | 5010-09534-00 | R56 | RESISTOR, 0 OHM 1/4 WATT | 9 |
| 46 | 5010-09939-00 | R56 | RESISTOR, C.F., 5% 1/4 WATT, 10 OHM | 1 |
| 45 | 5010-08992-00 | R94, R97, R100, R103, R106-R109 | RESISTOR, C.F., 5% 1/4 WATT, 560 OHM | 6 |
| 44 | 5075-09059-00 | ZR2 | ZENER DIODE, 1N5990 3.9V .5W | 1 |
| 43 | 5075-09010-00 | ZR1 | ZENER DIODE, 1N5996A 6.6V .5W | 1 |
| 42 | 5070-09266-00 | D1 | SILICON DIODE, 1N5817 1.0 A. | 1 |
| 41 | 5070-09919-00 | D2 | SILICON DIODE, 1N4148 150 mA. | 1 |
| 40 | 5070-08258-00 | D3 THRU D19 | DIODE, 1N4001 | 17 |
| 39 | 5130-09014-00 | S1 THRU S8 | SILICON CONTROL RECT., 2N5060 .8A 30V | 8 |
| 38 | 5190-09016-00 | Q39, Q50 | TRANSISTOR, TO-92, 2N4403 PNP | 2 |
| 37 | 5160-10269-00 | Q39, Q40, Q42 THRU Q49 | TRANSISTOR, TO-92, 2N5904 NPN | 10 |
| 36 | 5160-09358-00 | SEE NOTE #7 | TRANSISTOR, TO-92, 2N4401 NPN | 29 |
| 35 | 5162-09410-00 | SEE NOTE #6 | TRANSISTOR, TO-220, TIP122, NPN | 30 |
| 34 | 5191-09378-00 | SEE NOTE #5 | TRANSISTOR, TO-92, TIP42, PNP | 8 |
| 33 | 5162-08976-00 | SEE NOTE #4 | TRANSISTOR, TO-220, 2N6427 NPN DARLINGTON | 8 |
| 32 | 5521-10506-00 | CR1 | OSCILLATOR, 1 MHZ. | 1 |

| ITEM | PART NO. | PART DESIGNATION | DESCRIPTION | QTY. |
|---|---|---|---|---|
| 31 | 5019-10501-00 | U47 | DIP, 8R 16-PIN, 270 OHM .125 W/R 5% | 1 |
| 30 | 5280-09309-00 | U49 | I.C., 7407, HEX, BUFFERS/OPEN-COLLECTOR | 1 |
| 29 | 5280-08948-00 | U45, U50 | I.C., 7402, QUAD 2-INPUT NOR | 2 |
| 28 | 5310-09155-00 | U30, U39 | I.C., MC14011, QUAD 2-INPUT NAND | 2 |
| 27 | 5280-08974-00 | U55, U56 | I.C., 7406, HEX, INVERTER OPEN C. | 2 |
| 26 | 5280-08973-00 | U17 THRU U20, U52, U53 | I.C., 7408, QUAD 2-INPUT AND | 6 |
| 25 | 5281-09867-00 | U11, U15, U40 | I.C., 74LS244, OCTAL BUFFER | 3 |
| 24 | 5370-09156-00 | U1 | I.C., TDA2002, AUDIO AMPLIFIER | 1 |
| 23 | 5349-09745-00 | U23 | I.C., 2016, 2K X 8 STATIC RAM | 1 |
| 22 | 5281-09078-00 | U37 | I.C., 74LS138, 3 TO 8 LINE DECODER | 1 |
| 21 | 5371-09152-00 | U2 | I.C., MC1408, D/A CONVERTER | 1 |
| 20 | 5281-09486-00 | U28 | I.C., 74LS374, OCTAL D-TYPE FLIP-FLOP | 1 |
| 19 | 5281-10014-00 | U33 | I.C., 74LS20, DUAL 4-INPUT NAND | 1 |
| 18 | 5281-09499-00 | U31, U54 | I.C., 74LS00, QUAD 2-INPUT NAND | 2 |
| 17 | 5281-09015-00 | U36 | I.C., 7404, HEX, INVERTER | 1 |
| 16 | 5281-09235-00 | U35 | I.C., 74LS10, TRIPLE 3-INPUT NAND | 1 |
| 15 | 5281-09247-00 | U14 | I.C., 74LS02, QUAD 2-INPUT NOR | 1 |
| 14 | 5281-09743-00 | U32 | I.C., 74LS08, QUAD 2-INPUT AND | 1 |
| 13 | 5310-09236-00 | U29 | I.C., 4020, COUNTER 14 BIT CMOS | 1 |
| 12 | 5431-09449-00 | U43 | I.C., MC145S, TIMER | 1 |
| 11 | 5281-09467-00 | U6 | I.C., 74LS74, DUAL D-TYPE FLIP-FLOP | 1 |
| 10 | 5671-09411-00 | U46 | I.C., MAN72A, 7 SEG. LED DISPLAY | 1 |
| 9 | 5280-09407-00 | U48 | I.C., 7447, BCD TO 7 SEG. DECODER | 1 |
| 8 | 5281-09246-00 | U7, U8, U12 | I.C., 74LS139, DUAL 2 TO 4 LINE DECODER | 3 |
| 7 | 5290-09016-00 | U44 | I.C., 74154, 4 TO 16 DECODER | 1 |
| 6 | 5348-10139-00 | U25 | I.C., 5517-2, 2K X 8 CMOS ST. RAM | 1 |
| 5 | 5450-08972-00 | SEE NOTE #3 | I.C., 6820/6821, PIA | 7 |
| 4 | 5281-09508-00 | U16 | I.C., 74LS245, OCTAL BUS TRANCEIVER | 1 |
| 3 | 5370-09321-00 | U4, U5 | I.C., 1458, DUAL OP-AMP. | 2 |
| 2 | 5370-09991-00 | U3 | I.C., 55536, CONTINUOUSLY VARIABLE SLOPE DELTA MOD | 1 |
| 1 | 5764-10881-00 |  | BARE PC BOARD | 1 |

Schematic, System 11 CPU (16-8947, Sheet 1 of 4)

Schematic, System 11 CPU (16-8947, Sheet 2 of 4)

| REV | DESCRIPTION OF CHANGE | ECN NO. DATE |
|---|---|---|
| | N.P.R. | 14834 85 |
| A | SEE COVER SHEETS | 14981 85 |
| B | SEE COVER SHT | 15240 2-6-86 |
| C | SEE COVER SHT | 15267 2-13-86 |

LOGIC POWER

1D4 RESET

1J17-7 N.C.
1J17-6
1J17-8
1J17-4
1J17-5
1J17-2
1J17-1
N.C.
1J17-8
1J17-9
1D4 +12

L1 4.7µh
+5VDC ANALOG
+5VDC
C22 .001µf
C24 100µf
C25 .001µf
D1 1N5817
D2 1N4148
B1 B2 B3
+V IN
C26 100µf
C25 .001 µh
-12V UNREG

CMOS B+
RESET
R68 4.7K
R64 1K
2N3904 Q40
R63 10K

55TAP/8416 U25
ROM U2

DATA BUS
1C4,2B4

ADDRESS BUS
1C4,2C4

4A3 CS8 ROM
4A5 CS1 ROM
1C4 4MHz
4C3 CE CMOS
4D3 R/W + MEM. PROT.
4D3 A15

SOUND SELECT INPUTS
1A3

1A3 SOUND H.S.
1D4 RESET

SOUND/SPEECH MIXER
SPARE U5,6
1458

R26 10K
R27 820Ω
SR1 ALL 4.7K
R28 820Ω
R33
DS1
DS2
R34 2.7K
R23 2.7K
C15 10
1458
C14 .01
-12V
C12 1800pF
R21 3.9K
R22 27K 5%
C13 4700pF 5%
R19 27K 5%
R20 27K 5%
U4 1458
C11 180pF
R18 180K 5%
R16 56K 5%
R17 220K 5%
C10 1800pF 5%
R15 39K 5%
C9 1µf

R29 27K
1458
R30 27K
C17 .01
-12V

R10 3.9K
REF
VEE
-12V
C7 47pF
1408 COMP
U2
IO GND REF
-12V
R9 3.9M
R7 3.3K
+5V
R8 3.3K
C8 10 MFD
Q1 2N3904

U5 5856
Aout
A.G.C.
Ain
N.C.
SIG. G.
VDD
DIG OUT
F2
DIG IN
APT
R/D
CLK
GND
R14 10K
R13 10K
R12 10K
R11 10K

+V FILTERED
C1
U1 567
C3 .1µf
R6 1K
R3 5.6K
C2 470µf
R2 1Ω
R1 220 ½W
C5 100µf
C4 .1µf
R4 2.2Ω
R5 1K
C6 .001

SPEAKER 8 OHM
1J15-1
1J15-2
1J15-3
1J15-4

1J16-2
1J16-1
1J16-3
1J16-4
VOLUME CONTROL

1A3 1MS

Schematic, System 11 CPU (16-8947, Sheet 3 of 4)

Schematic, System 11 CPU (16-8947, Sheet 4 of 4)

| REV | DESCRIPTION OF CHANGE | ECN NO. DATE |
|---|---|---|
| | N. P. R. | 14894 11-8-85 |
| A | SEE COVER SHEETS | 1498 1-19-85 |
| B | SEE COVER SHT. | 15240 2-5-86 |
| C | SEE COVER SHT. | 15267 3-13-86 |

D

A10 10
A9 12 U35
A8 9 74LS20
A7 13

U34 74LS00
U31 74LS00
U31 74LS00

R/W̄ +
MEM. PROT.
3C4

E
R/W̄
U36 7404
U32 74LS08

Ā13 3C4
2000 LATCH 2C3
U34 74LS00

A13 U14 74LS02
U14 74LS02

/A3 ▷ MEM. PROTECT

C̄E CMOS 3C4
U34 74LS00
U35 74LS10

2C4 1B4 ▷ E

A9 EN U12 LS139
A8 A

2100 PIA 1B3
2400 PIA 2C3

/C3 ▷ VMA

2C4 1B4 ▷ R/W̄

A12 C
A11 B U37 LS138
A10 A

2800 PIA 1B3
2C00 PIA

3C4 2C4 1D4 ▷ RESET

A15 E2A
A14 E2B
GND

3000 PIA 2C3
3400 PIA

2C4 1A4 ▷ IRQ'

VMA

/A1 ▷ BLANKING

A13 13
A14 14 U12 LS139
15 G GND

ROM 2CS 3C4
U32 74LS08
U34 74LS00

B

ROM 1CS 3C4

E
VMA U32 74LS08

A15

3D1 ▷ A14 OPTION
3D1 ▷ A15 OPTION

U33 74LS20

ADDRESS BUS

DATA BUS

A

+
100VDC 70MA
LOGIC GROUND
-100VDC 70MA
+5VDC
KEY

LAMP GROUND

LAMP +18VDC

LOGIC GROUND

SOLENOID B+
34VDC

SOLENOID GROUND

5 VDC REG.
5 AMPS

LOGIC GROUND

+12VDC UNREG.
+12VDC UNREG.
-14.8 V UNREG.

GENERAL
ILLUMINATION

SKA

5

UNITS

19

10'S

15

100'S

13

1000'S

11

10,000'S

9

100000'S

1

1,000,000'S

3

DIGIT
SELECT

-100V KEEP ALIVE (CATH)

2

+100V KEEP ALIVE (ANODE)

12

G

6

F

4

E

8

D

10

C

16

B

18

A

20

COMMA

14

N.C.

17

7

SEGMENT
SELECT

1,000,000'S  100,000'S  10,000'S  1,000'S  100'S  10'S  UNITS

1000'S  100'S  10'S  UNITS  (NOTE I)

38  36  32  30  28  26  24  16  14  12  8  10  2  4

W1

W2

7  31  6  34

37  39  35  33  5  3  1

29

11

NOTE I. SHUFFLE ALLEY ONLY.

NOTES:
1. Display voltage measured with digits display test ON, and displays at all zeroes.
2. Unless otherwise indicated, all resistors are in ohms (Ω), 1/4 watt.
3. TP3 (unregulated +12 VDC) readout should not go lower than +10.5 V, or inter-
   mittent reset will occur.

## HIGH SPEED Switch-Matrix Table

| COLUMN / ROW | 1 Q45 GRN-BRN 1J8-1 | 2 Q49 GRN-RED 1J8-2 | 3 Q44 GRN-ORN 1J8-3 | 4 Q48 GRN-YEL 1J8-4 | 5 Q43 GRN-BLK 1J8-5 | 6 Q47 GRN-BLU 1J8-7 | 7 Q42 GRN-VIO 1J8-8 | 8 Q46 GRN-GRY 1J8-9 |
|---|---|---|---|---|---|---|---|---|
| 1 WHT-BRN 1J10-9 | Plumb Bob Tilt 1 | Outhole 9 | Upper Left Stoplight Bank - Red Target 17 | Standup Target Arrow #1 25 | Upper Left Jet Bumper 33 | Playfield Tilt 41 | Left Kicker 49 | Not Used 57 |
| 2 WHT-RED 1J10-8 | Ball Roll Tilt 2 | Ball Trough #3 (Upper Left) 10 | Upper Left Stoplight Bank - Yel Target 18 | Standup Target Arrow #2 26 | Lower Left Jet Bumper 34 | Left Ramp 42 | Right Kicker 50 | Not Used 58 |
| 3 WHT-ORN 1J10-7 | Credit Button 3 | Ball Trough #2 (Center) 11 | Upper Left Stoplight Bank - Grn Target 19 | Standup Target Arrow #3 27 | Right Jet Bumper 35 | Right Ramp 43 | Left Star Rollover 51 | Not Used 59 |
| 4 WHT-YEL 1J10-6 | Right Coin Chute 4 | Ball Trough #1 (Lower Right) 12 | Left Flipper Return Lane 20 | Standup Target Arrow #4 28 | Ball Shooter 36 | Left Spinner 44 | Right Star Rollover 52 | Not Used 60 |
| 5 WHT-GRN 1J10-5 | Center Coin Chute 5 | Lower Left Stoplight Bank - Red Target 13 | Right Flipper Return Lane 21 | Standup Target Arrow #5 29 | Left Flipper Engine Revving (E O S) 37 | Center Spinner 45 | Not Used 53 | Not Used 61 |
| 6 WHT-BLU 1J10-3 | Left Coin Chute 6 | Lower Left Stoplight Bank - Yel Target 14 | Right Stoplight Bank - Red Target 22 | Standup Target Arrow #6 30 | Right Flipper Engine Revving (E O S) 38 | Right Spinner 46 | Not Used 54 | Not Used 62 |
| 7 WHT-VIO 1J10-2 | Slam Tilt 7 | Lower Left Stoplight Bank - Grn Target 15 | Right Stoplight Bank - Yellow Target 23 | Left Outlane 31 | Upper Left Hideout 39 | Upper Right Hideout 47 | Not Used 55 | Not Used 63 |
| 8 WHT-GRY 1J10-1 | High-Score Reset 8 | Eject Hole 16 | Right Stoplight Bank - Green Target 24 | Right Outlane 32 | Lower Left Hideout 40 | Lower Right Hideout 48 | Not Used 56 | Not Used 64 |

## HIGH SPEED Lamp-Matrix Table

[2] Two lamps in circuit.

| COLUMN / ROW | 1 Q66 YEL-BRN 1J7-1 | 2 Q64 YEL-RED 1J7-2 | 3 Q62 YEL-ORN 1J7-3 | 4 Q60 YEL-BLK 1J7-4 | 5 Q58 YEL-GRN 1J7-6 | 6 Q56 YEL-BLU 1J7-7 | 7 Q54 YEL-VIO 1J7-8 | 8 Q52 YEL-GRY 1J7-9 |
|---|---|---|---|---|---|---|---|---|
| Q80 1 RED-BRN 1J6-1 | Game Over [2] 1 | Flipper Return Lanes [2] 9 | Upper Left Target Bank - Red Light 17 | Standup Target Arrow #1 25 | Freeway Scores 75,000 33 | Stoplights Light Escape (Center) 41 | Bonus 5000 49 | Bonus 40,000 57 |
| Q81 2 RED-BLK 1J6-2 | Match 2 | Center Spinner 1000 Arrow 10 | Upper Left Target Bank - Yellow Light 18 | Standup Target Arrow #2 26 | Freeway Scores 100,000 34 | Ramp Stoplight Red Light 42 | Bonus 6000 50 | Bonus 50,000 58 |
| Q82 3 RED-ORN 1J6-3 | Shoot Again - Drive Again [2] 3 | Extra Ball (Eject Hole) 11 | Upper Left Target Bank - Green Light 19 | Standup Target Arrow #3 27 | Freeway Lights Extra Ball 35 | Ramp Stoplight Yellow Light 43 | Bonus 7000 51 | Bonus 60,000 59 |
| Q83 4 RED-YEL 1J6-5 | Left Outlane Special 4 | Escape (Eject Hole) 12 | Left Freeway Arrow 20 | Standup Target Arrow #4 28 | Ramp Earns Bonus X 36 | Ramp Stoplight Green Light 44 | Bonus 8000 52 | Bonus 5X 60 |
| Q84 5 RED-GRN 1J6-6 | Right Outlane Special 5 | Lower Left Target Bank - Red Light 13 | Right Freeway Arrow 21 | Standup Target Arrow #5 29 | Ramp Earns Ramp Bonus 37 | Bonus 1000 45 | Bonus 9000 53 | Bonus 4X 61 |
| Q85 6 RED-BLU 1J6-7 | Ball In Play 6 | Lower Left Target Bank - Yellow Light 14 | Right Target Bank - Red Light 22 | Standup Target Arrow #6 30 | Ramp Earns Getaway 38 | Bonus 2000 46 | Bonus 10,000 54 | Hold Bonus 62 |
| Q86 7 RED-VIO 1J6-8 | Left Spinner 1000 Arrow 7 | Lower Left Target Bank - Green Light 15 | Right Target Bank - Yellow Light 23 | Freeway Scores 25,000 31 | Ramp Earns Hideout 39 | Bonus 3000 47 | Bonus 20,000 55 | Bonus 3X 63 |
| Q87 8 RED-GRY 1J6-9 | Right Spinner 1000 Arrow 8 | Left Outlane Kickback Arrow 16 | Right Target Bank - Green Light 24 | Freeway Scores 50,000 32 | Ramp Earns Hideout Jackpot [2] 40 | Bonus 4000 48 | Bonus 30,000 56 | Bonus 2X 64 |

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CABLE HARNESS PLACEMENTS and ground strap routing on this game have been designed to keep RF radiation and conduction within levels accepted by the FCC Rules.

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

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