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# ***SPACE STATION***

## **OPERATIONS MANUAL**

including  
**TEST/DIAGNOSTICS  
PROCEDURES,  
PARTS INFORMATION,  
&  
SCHEMATICS**

***Williams***   
**ELECTRONICS GAMES, INC.**

# SPACE STATION ROM and Jumper Table

| Game          | System 11B CPU Rev. | P/N - U15 Game μP | P/N - U27 G. ROM 1 | P/N - U26 G. ROM 2 | P/N - U21 S. ROM 1 | P/N - U22 S. ROM 2 | P/N - U24 Sound μP | Jumpers                                   |
|---------------|---------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------------------------------|
| BIG GUNS      | -                   | 5400-09150-00     | A-5343-557-2       | A-5343-557-1       | A-5343-557-4       | A-5343-557-3       | 5400-09150-00      | W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19 |
| SPACE STATION | -                   | ↓                 | A-5343-552-2       | A-5343-552-1       | A-5343-552-4       | A-5343-552-3       | ↓                  | W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19 |

# SPACE STATION Solenoid Table

| Sol. No.         | Function                        | Solenoid Type | Wire Color        | Connections |                                     | Driver Trans. | Solenoid Part Number Flashlamp Type |               |
|------------------|---------------------------------|---------------|-------------------|-------------|-------------------------------------|---------------|-------------------------------------|---------------|
|                  |                                 |               |                   | CPU Bd.     | Playfield/Cabinet                   |               | b - Backbox                         | p - Playfield |
| 01A <sup>3</sup> | Outsole Kicker                  | Switched      | {Vio-Brn}         | 1P11-1      | 8P3-1 (to J1-9 on Aux Pwr Dvr Bd)   | Q33           | AE-23-800                           |               |
| 01C <sup>3</sup> | Relaunch + "ON" Flashers        | Switched      | {Blk-Brn}         | (Gry-Brn)   | 8P3-2 (to J1-7 on Aux Pwr Dvr Bd)   | Q33           | #89 flashlamps                      | 2b,2p         |
| 02A <sup>3</sup> | Ball Shooter Lane Feeder        | Switched      | {Vio-Red}         | 1P11-3      | 8P3-2 (to J1-7 on Aux Pwr Dvr Bd)   | Q25           | AE-23-800                           |               |
| 02C <sup>3</sup> | Left Side + "SP" Flashers       | Switched      | {Blk-Red}         | (Gry-Red)   | 8P3-3 (to J1-6 on Aux Pwr Dvr Bd)   | Q25           | #89 flashlamps                      | 2b,2p         |
| 03A <sup>3</sup> | Left Ball Popper                | Switched      | {Vio-Orn}         | 1P11-4      | 8P3-3 (to J1-6 on Aux Pwr Dvr Bd)   | Q32           | AE-24-900                           |               |
| 03C <sup>3</sup> | Right Side + "AC" Flashers      | Switched      | {Blk-Orn}         | (Gry-Orn)   | 8P3-4 (to J1-5 on Aux Pwr Dvr Bd)   | Q32           | #89 flashlamps                      | 2b,2p         |
| 04A <sup>3</sup> | Right Ball Popper               | Switched      | {Vio-Yel}         | 1P11-5      | 8P3-4 (to J1-5 on Aux Pwr Dvr Bd)   | Q24           | AE-23-800                           |               |
| 04C <sup>3</sup> | Top (upr p/f) + "ES" Flashers   | Switched      | {Blk-Yel}         | (Gry-Yel)   | 8P3-5 (to J1-4 on Aux Pwr Dvr Bd)   | Q24           | #89 flashlamps                      | 2b,2p         |
| 05A <sup>3</sup> | Not Used                        | Switched      | {Vio-Gm}          | 1P11-6      | 8P3-5 (to J1-4 on Aux Pwr Dvr Bd)   | Q31           | #89 flashlamps                      | 2b,2p         |
| 05C <sup>3</sup> | P'fid Top Panel + "TA" Flashers | Switched      | {Blk-Gm}          | (Gry-Gm)    | 8P3-6 (to J1-3 on Aux Pwr Dvr Bd)   | Q23           | AE-26-1200                          |               |
| 06A <sup>3</sup> | 3-bank Drop Target              | Switched      | {Vio-Blu}         | 1P11-7      | 8P3-6 (to J1-3 on Aux Pwr Dvr Bd)   | Q23           | AE-26-1200                          | 4b            |
| 06C <sup>3</sup> | Flame + "TI" Flashers           | Switched      | {Blk-Blu}         | (Gry-Blu)   | 8P3-7 (to J1-2 on Aux Pwr Dvr Bd)   | Q30           | #89 flashlamps                      | 2b            |
| 07A <sup>3</sup> | Knocker (or Ticket Dispenser)   | Switched      | {Vio-Blk}         | 1P11-8      | 8P3-7 (to J1-2 on Aux Pwr Dvr Bd)   | Q30           | AE-26-1200                          |               |
| 07C <sup>3</sup> | Station Flasher                 | Switched      | {Blk-Vio}         | (Gry-Vio)   | 8P3-8 (to J1-1 on Aux Pwr Dvr Bd)   | Q22           | AE-23-800                           |               |
| 08A <sup>3</sup> | R Sngl Drop Target - Raise      | Switched      | {Vio-Gry}         | 1P11-9      | 8P3-8 (to J1-1 on Aux Pwr Dvr Bd)   | Q22           | AE-23-800                           |               |
| 08C <sup>3</sup> | Left Dock Kickbig               | Switched      | {Blk-Gry}         | (Gry-Blk)   | 8P3-9                               | Q17           | 5580-09555-01 <sup>4</sup>          |               |
| 09               | General Illum Relay (Playfield) | Controlled    | Brn-Blk           | 1P12-1      | 8P3-10                              | Q9            | 5580-09555-01 <sup>4</sup>          |               |
| 10               | General Illum Relay (Green)     | Controlled    | Brn-Red           | 1P12-2      | 6P3-5                               | Q16           | 5580-09555-01 <sup>4</sup>          |               |
| 11               | General Illum Relay (Insert Bd) | Controlled    | Brn-Orn           | 1P12-4      | 8P3-12                              | Q8            | 5580-09555-01 <sup>4</sup>          |               |
| 12               | A/C Select Relay                | Controlled    | Brn-Yel           | 1P12-5      | 8P3-13                              | Q15           | 5580-09555-01 <sup>5</sup>          |               |
| 13               | Left Re-Entry Kickback (drain)  | Controlled    | Brn-Gm            | 1P12-6      | 8P3-14                              | Q7            | AE-24-900                           |               |
| 14               | Not Used                        | Controlled    | Brn-Blu           | 1P12-7      | 8P3-15                              | Q14           | #1251 flashlamps 3b 6               |               |
| 15               | P'fid Top Panel Flashers (3)    | Controlled    | Brn-Vio           | 1P12-8      | 8P3-16                              | Q6            | 14-7941-2/5580-12145-01             |               |
| 16               | Space Station Motor/Relay       | Controlled    | Brn-Gry           | 1P12-9      | 8P3-17                              | Q75           | AE-23-800                           |               |
| 17               | Right Dock Kickback             | Special #1    | Blu-Brn           | 1P19-7      | 8P3-18                              | Q71           | AE-26-1200                          |               |
| 18               | Lower Left Kicker ("sling")     | Special #2    | Blu-Red           | 1P19-4      | 8P3-19                              | Q73           | AE-23-800                           |               |
| 19               | Rt Jet Bumper                   | Special #3    | Blu-Orn           | 1P19-3      | 8P3-20                              | Q69           | AE-26-1200                          |               |
| 20               | Lower Right Kicker ("sling")    | Special #4    | Blu-Yel           | 1P19-6      | 8P3-21                              | Q77           | AE-23-800                           |               |
| 21               | Left Jet Bumper                 | Special #5    | Blu-Gm            | 1P19-8      | 8P3-22                              | Q79           | AE-23-800                           |               |
| 22               | Lower Jet Bumper                | Special #6    | Blu-Blk           | 1P19-9      |                                     |               |                                     |               |
| -                | Right Flipper                   | -             | Orn-Vio (Blu-Vio) | 1P19-1      | 7P1-15 [7P1-16,8P3-34] <sup>2</sup> | -             | FL11630-50VDC                       |               |
| -                | Left Flipper                    | -             | Orn-Gry (Blu-Gry) | 1P19-2      | 7P1-18 [7P1-19,8P3-32] <sup>2</sup> | -             | FL11630-50VDC                       |               |

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. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" circuits are pulsed, when Sol. 12 is de-energized; "C" circuits are pulsed, with Sol. 12 energized. Wire colors in brackets are those from respective A and C terminals corresponding to the J1-terminal connection listed for the Aux Power Driver Bd, which controls the device pulsing by Sol. 12. 4. Relay is mounted on Relay Bd, p/n C-11998-1. 5. Relay is mounted on Aux Power Driver Bd, D-11813 in the backbox. 6. Relay is mounted on Relay Bd, C-11902-1.

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# Section 1

## Game Operation & Test Information

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

### SPACE STATION (System 11B) ROM Summary

| IC                 | DESCRIPTION | TYPE  | IDENTIFIER | BOARD | PART NUMBER  |
|--------------------|-------------|-------|------------|-------|--------------|
| Game ROM 1         | 32K x 8 ROM | 27256 | U27        | CPU   | A-5343-552-2 |
| Game ROM 2         | 16K x 8 ROM | 27128 | U26        | CPU   | A-5343-552-1 |
| Sound ROM 1        | 32K x 8 ROM | 27256 | U21        | CPU   | A-5343-552-4 |
| Sound ROM 2        | 32K x 8 ROM | 27256 | U22        | CPU   | A-5343-552-3 |
| Music/Speech ROM 1 | 32K x 8 ROM | 27256 | U4         | Audio | A-5343-552-5 |

#### 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.

## 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.

## SPACE STATION CIRCUIT BOARDS

*SPACE STATION's* System 11B 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 11B CPU Board (p/n D-11883-552) must be equipped with the ROMs specified in the *SPACE STATION* (System 11B) ROM Summary. For this ROM complement and CPU Board, jumpers W1, W2, W4, W5, W7, W8, W11, W14, W16, W17, and W19 must be connected. (Jumper W7 is cut/removed for West German games.)

**AUDIO BOARD.** The Audio Board is p/n D-11581-552, as supplied with ROMs and micro-processor.

**DISPLAY BOARD.** The Alphanumeric Display Unit Board is p/n D-11609.

**POWER SUPPLY BOARD.** The Power Supply Board is p/n D-8345-557.

**AUX POWER DRIVER BOARD.** The Aux Power Driver Board is D-11813-552.

Prefix numbers for the System 11B circuit boards and other major assemblies are listed below. A prefix number may precede a component designator to identify the unit (e.g., connector 1J1).

|                          |                     |                     |
|--------------------------|---------------------|---------------------|
| 1 - CPU                  | 6 - Backbox         | 11 - Audio          |
| 2 - (not assigned)       | 7 - Cabinet         | 12 - (not assigned) |
| 3 - Backbox Power Supply | 8 - Playfield       | 13 - (not assigned) |
| 4 - Alphanumeric Display | 9 - Insert Board    | 14 - (not assigned) |
| 5 - Aux Power Driver     | 10 - (not assigned) | 15 - (not assigned) |

## SPACE STATION 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.** *SPACE STATION* 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 button 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.

## SPACE STATION GAME CONTROL LOCATIONS (Continued)

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 Test/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 Test/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 (after installing leg levellers), using leg bolts. Leg levellers and leg bolts are both provided among the parts in the cash box.
3. Attach the front legs (after installing leg levellers), using leg bolts. See Figure 1 for details.

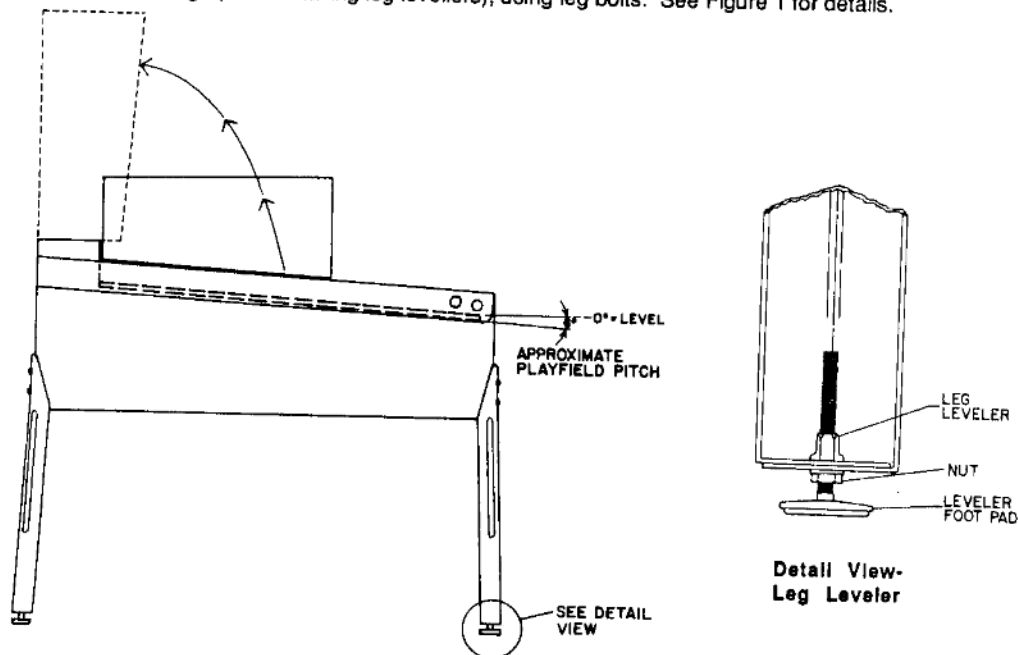


Figure 1. Pinball Assembly, Playfield Pitch Angle, and Leg Leveler Details.

4. Reach into the cabinet and backbox and check the mating of the interconnecting cables, matching several wire colors at each connector. Ensure that all connections are properly secure.

### 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 upright and stabilize it into position, using the clamp on the back of the cabinet and backbox. Unlock the backbox, and remove the backbox glass, storing it carefully to avoid scratches. Remove the shipping block holding the Insert Board. Unlatch the Insert Board and open it, then lift the Speaker/Display Panel up and lay it forward on the playfield cabinet. This allows access to the bolt holes used for securing the backbox upright. Install the mounting bolts and flat washers through the bottom holes of the backbox into the threaded fasteners in the cabinet to secure the backbox.

## PINBALL GAME ASSEMBLY INSTRUCTIONS (Continued)

### WARNING

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

6. Extend each leg leveler *slightly* below the leg bottom, so that all four foot pads are extended about the same distance. Remove the cabinet from its support and place it on the floor.
7. Adjust the 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, as shown in Figure 1.

### CAUTION

Playfield pitch angle adjustments can affect the operation of the plumb bob tilt, inside the cabinet. The operator should adjust this tilt mechanism for proper operation, after completion of the desired playfield pitch angle setting.

8. Move the game into the desired location; recheck the level and pitch angle of the playfield.
9. Verify that the **required number** of balls are installed in the game. (**SPACE STATION**: 3 balls.)
10. Clean and re-install the playfield cover glass. Prepare the game for player operation.

## GAME OPERATION

### WARNING

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 switch it ON, using the On-Off switch. In normal operation, the player 1 score display initially shows 00. Then, the game goes into the Attract Mode (playfield and backbox lamps flashing, sounds being heard, etc.).

Open the coin door and press the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN. Press the ADVANCE button to begin the game test routine. Return to AUTO-UP and perform the entire test to verify that the game is operating satisfactorily.

### NOTE

*SPACE STATION's* SYSTEM 11B game program has a great 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 60 balls (20 games). Up to three switches can be displayed during this Switch Problem reporting activity. Moreover, *SPACE STATION* compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep *SPACE STATION* earning good profits! More information is available in the Test/ Diagnostic Procedures text describing the Switch Testing.

**ATTRACT MODE\*.** Playfield and backbox lamps blink. All player score displays exhibit a series of messages informing the player concerning:

- A. Recent highest scores\*;
- B. A "custom message"  
("MISSION CONTROL ... REPORT TO... SPACE STATION")\*;
- C. The score to achieve to obtain a Replay award\*;

These (or similar) displays 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.

## GAME OPERATION (Continued)

**CREDIT POSTING.** Insert coin(s). A sound is heard for each coin, and the player score displays show the number of credits purchased. So long as the number of maximum allowable credits\* are *NOT* exceeded by coin purchase or high score, credits are posted correctly. However, after this maximum credits value is reached, posting of additional credits won (not purchased) by the player does *not* occur. *ONLY* posting of *purchased* credits occurs beyond the maximum credits value.

**STARTING A GAME.** Press the Credit button once. A startup sound plays, and the Credit amount shown in the player score display decreases by one. Player display 1 flashes 00 (until the first playfield switch is actuated), and the Player 4 display shows **ball 1**, except for 4-player games where the **ball #** shows in the individual player's display. 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 on the coin door inside the cabinet ends the current game; *SPACE STATION* then proceeds to the Game Over Mode. With the actuation of the playfield tilt switch, 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 the 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 (1 through 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 display shows in the player score displays. Then, the high scores flash on the appropriate player score displays. The game proceeds to the Attract Mode.

\* - operator-adjustable feature

## SPACE STATION GAME STATUS DISPLAYS

*SPACE STATION* provides the game owner/operator with a display of information concerning the game's bookkeeping and game play feature adjustments. Basically, three classes of information now become available in this status display mode: Id (Identification); Au (Audit); Ad (Adjustment). Each of the underscored two-letter abbreviations for these classes appears in the Player 3 score display, while the system microprocessor for the *SPACE STATION* game is displaying the items within each class.

### Identification Information--Id

With the game turned on, the coin door open, and the AUTO-UP/MANUAL-DOWN switch in the AUTO-UP position, the operator can press the ADVANCE switch once, briefly. *SPACE STATION*'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.

| Player<br>1 | Player<br>2 | Player<br>3 | Player<br>4 |
|-------------|-------------|-------------|-------------|
| SPACE       | STATION     | Id 00       | 552 L-x*    |

\* x - indicates ROM revision level; e.g., 1 is initial issue; 2, 3, etc. for later revisions.

The game is named in the player 1 score display. The game's identification number shows in the player 2 score display and the ROM revision level appears in the player 4 display. The player 3 score display shows the status display mode in abbreviated form, *Id*. The player 3 score display also shows the status display mode item (00) for this particular display.

Pressing ADVANCE once more causes the *Id 01* display to appear. This display describes which of the "Install" options is currently in effect. For example, if the YES option of the INSTALL FACTORY Adjustment Item (Ad 70) was last selected, *FACTORY SETTING* appears on the player score displays. Changing the setting of any other game adjustment item, after selecting the YES option for Ad 70 causes the display to change to *FACTORY ALTERED*. Similarly, if the operator selects the YES option for INSTALL HARD (Ad 65), the display indicates *HARD SETTING*. Changing a game adjustment item later then causes the display to show *HARD ALTERED*.

### 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. Forty-four audit entries are now available. Calculation of the various factors is no longer necessary because the System 11A 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 *SPACE STATION* Audit Table lists the 44 items of the Audit Information portion of the *SPACE STATION* Game Status Displays. Presentation of this Audit Information again utilizes the player score displays; however, the player 1 and 2 displays are combined as a descriptive phrase. The light type below the table's column headings names the respective backbox displays where the information appears. Because the player 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 player 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.)

# SPACE STATION GAME STATUS DISPLAYS (Continued)

## SPACE STATION Audit Table

| Audit Item<br>(Player 3) | Descriptive Phrases<br>(Player 1 and 2 Displays)             | Audit Factor <sup>1</sup><br>Value<br>(Player 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                       | SHUTTLE BANK (# of S-H-U-T-T-L-E completions)                |                                                  |
| 30                       | STATION BANK (# of S-T-A-T-I-O-N completions )               |                                                  |
| 31                       | MULTI BALL (# of times Multi-Ball play started)              |                                                  |
| 32                       | LEFT DRAIN (# of times ball drained on left side)            |                                                  |
| 33                       | RIGHT DRAIN (# of times ball drained on right side)          |                                                  |
| 34                       | 3 BANK (# of times 3-bank drop target was achieved)          |                                                  |
| 35                       | JACKPOT AWARDED (# of Jackpot awards)                        |                                                  |
| 36                       | DROP TG EX. BALL (# of Ex. Balls awarded via Dr Tgt)         |                                                  |
| 37                       | SPECIAL BY U S A (# of Specials awarded via USA completions) |                                                  |
| 38                       | BUMPER 3000 (# of times 3000 achieved for Bumper score)      |                                                  |
| 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 *SPACE STATION* Game Status Displays, as listed in the *SPACE STATION* Game Adjustment Table.

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.

# SPACE STATION GAME STATUS DISPLAYS (Continued)

SPACE STATION Game Adjustment Table

| Adjustment Item<br>(Player 3) | Descriptive Phrases<br>(Player 1 and 2 Displays)         | Factory Setting<br>(Player 4)                                     |
|-------------------------------|----------------------------------------------------------|-------------------------------------------------------------------|
| Ad 01                         | AUTO REPLAY <sup>1</sup><br>or FIXED REPLAY <sup>1</sup> | 10 (%)<br>SCORES <sup>1</sup>                                     |
| 02                            | REPLAY START (or REPLAY LEVEL 1) <sup>1</sup>            | 1,900,000                                                         |
| 03                            | REPLAY LEVELS (or REPLAY LEVEL 2) <sup>1</sup>           | 01 (or OFF)                                                       |
| 04                            | (REPLAY LEVEL 3) <sup>1</sup>                            | (see text)                                                        |
| 05                            | (REPLAY LEVEL 4) <sup>1</sup>                            | (see text)                                                        |
| 06                            | REPLAY AWARD                                             | Credit                                                            |
| 07                            | SPECIAL AWARD                                            | Credit                                                            |
| 08                            | MATCH FEATURE                                            | [Off, 1 - 50%]                                                    |
| 09                            | BALLS / GAME                                             | 10 (%)                                                            |
| 10                            | TILT WARNING                                             | 03                                                                |
| 11                            | MAXIMUM EX. BALL                                         | [00 = NO Ex. Ball; 1-9 Ex. Ball]                                  |
| 12                            | MAXIMUM CREDITS                                          | 02                                                                |
| 13                            | HIGHEST SCORES                                           | 10                                                                |
| 14                            | BACKUP HI. SCR.1                                         | On                                                                |
| 15                            | BACKUP HI. SCR. 2                                        | 4,000,000                                                         |
| 16                            | BACKUP HI. SCR. 3                                        | 3,500,000                                                         |
| 17                            | BACKUP HI. SCR. 4                                        | 3,000,000                                                         |
| 18                            | HI. SCR.1 CREDITS                                        | 2,500,000                                                         |
| 19                            | HI. SCR.2 CREDITS                                        | 03                                                                |
| 20                            | HI. SCR.3 CREDITS                                        | 01                                                                |
| 21                            | HI. SCR.4 CREDITS                                        | 01                                                                |
| 22                            | H. S. RESET EVERY (3,000 PLAYS) <sup>2</sup>             | 01                                                                |
| 23                            | FREE PLAY                                                | NO                                                                |
| 24                            | U.S.A. 1 COINAGE (1 COIN 1 PLAY) <sup>2,3</sup>          |                                                                   |
| 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                            | B. BALL TIME                                             | [20 - 40 sec]                                                     |
| 32                            | S/SCORE TIMER                                            | [5 - 30 sec]                                                      |
| 33                            | USA'S LITE.SPC                                           | [3 completions of USA; 4, 5]                                      |
| 34                            | SHUTTLE MEMORY                                           | [no = not stored; yes = stored]                                   |
| 35                            | STATION MEMORY                                           | [no = not stored; yes = stored]                                   |
| 36                            | 1 2 3 MEMORY                                             | [no = not stored; yes = stored]                                   |
| 37                            | U S A MEMORY                                             | [no = not stored; yes = stored]                                   |
| 38                            | B. S. LITE RE.ENTRY                                      | [yes=light L REENTRY at Ball Start;<br>no=not lit]                |
| 39                            | DOCKING W.L. INIT                                        | [on=lit at game beginning; off=not lit]                           |
| 40                            | BONUS X MEMORY                                           | [yes=Bonus X stored from ball to ball;<br>no=reset at ball start] |
| 41                            | S/S "X" MEMORY                                           | [yes=S/S "X" stored from ball to ball;<br>no=reset at ball start] |

## SPACE STATION GAME STATUS DISPLAYS (Continued)

The **SPACE STATION Game Adjustment Table** lists the 70 items of the Adjustment Information portion of the **SPACE STATION Game Status Displays**. Presentation of the displays is similar to that for the Audit Information (that is, the player 1 and 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 player 3 display shows *Ad* for all 70 adjustment items, so its entry is omitted from the tabular listing.

**SPACE STATION Game Adjustment Table (Continued)**

| Adjustment Item<br>(Player 3) | Descriptive Phrases<br>(Player 1 and 2 Displays)        | Factory Setting<br>(Player 4) |
|-------------------------------|---------------------------------------------------------|-------------------------------|
| 42                            | BUMP. VAL. MEMORY [yes=stored in memory; no=not stored] | YES                           |
| 43                            | A. MODE SOUNDS [ALOT; LESS; NONE]                       | ALOT                          |
| 44                            | EX. BALL AUTO. ADJ [NO AUTO; 1-90% for all Ex. Balls]   | 33%                           |
| 45                            | SPECIAL AUTO. ADJ [NO AUTO; 1-90% for all Specials]     | 04%                           |
| 46                            | "X" LITES EX. BALL                                      | 4X                            |
| 47                            | SPECIAL ENABLE [yes=Special is enabled; no=disabled]    | YES                           |
| 48                            | EX. BALL ENABLE [yes=Ex. Ball is enabled; no=disabled]  | YES                           |
| 49                            | CUSTOM MESSAGE 4                                        | ON                            |
| 50                            | SW. ALARM KNOCKER                                       | YES                           |
| 51                            | ENGLISH TEXT                                            |                               |
| 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                                        |                               |
| 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; install their replay level scores. Turn off any replay level by setting 00 as its value.
2. Phrase in parentheses is **Factory Setting**. Phrase appears in player 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.
7. Approximates Ad 64, yet includes all factors listed in Factory Setting column, not just Ad 31 through 47 provided by Ad 64.

## 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 Id 00 display initially appears. Press ADVANCE until the player 3 display indicates **Ad 01**. (The player 1 and 2 score displays indicate AUTO REPLAY.) If the factory setting has not been changed, the player 4 display shows 10%, indicating a 10% replay percentage. (The game program adjusts itself automatically, as discussed in the following text concerning the 'details' about Adjustment Item 01.)
2. To reach a higher item number (in the player 3 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 **SPACE STATION Game Adjustment Table**) showing in the player 3 display, increase the value (or select another option) shown in the player 4 display by using AUTO-UP and pressing the Credit button. Repeat this step for each item, until all changes to the factory settings for Game Adjustments have been made.

(The same procedure can be used for Audit Items. To zero **Au 01 - 04** (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.)

For example, the operator may desire to change the degree of game play difficulty from the Factory Setting (equivalent to the Install Medium [Ad 64] difficulty, along with a number of other automatically installed settings, as shown in the right column of the **Game Adjustment Table**) to another difficulty more suitable for the players at a particular game site. Four other 'automatic' play difficulty settings (Ad 62 - Ad 66) are available, each of which, if selected, installs all the adjustments listed for that item in the following 'details' text.

4. To proceed rapidly through the entire adjustments series, press and hold ADVANCE, until **Ad 70** shows in the player 3 display. From item 70, you can: (A) return to the Game-Over Mode; or (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. **SPACE STATION** 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 player 3 display. Press the Credit button to display the YES option in the player 4 display. Using AUTO-UP, press ADVANCE once. **SPACE STATION** 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.

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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% (German games have a Factory Setting of 15%). The game program aids a game's initial installation by causing a comparison of the value of the Replay Level to the player's score 16 times during the first 800 games. At each comparison, the program increases (or decreases) the Replay Level by 100,000 to achieve the replay percentage specified either via the factory setting or later operator adjustment. (After the first 800 games, the comparison occurs after every 500 games.) 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 below 5%, selects the FIXED REPLAY option.

For AUTO REPLAY, Ad 02 provides the Starting Replay Level (player 1 and 2 displays show REPLAY START). Ad 03 provides the number of replay levels (01, 02, 03, or 04). SPACE STATION 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 1,900,000 (German games have a Factory Setting of 1,600,000). The range of settings is 800,000 through 4,000,000 (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 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). (German games have a Factory Setting of 03). The option range is one, two, three, or four replay level(s). When the operator chooses two replay levels, SPACE STATION 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. SPACE STATION 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. SPACE STATION automatically bypasses this adjustment.

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

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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 Kicker coil to activate once per free game won (instead of awarding a credit for each level exceeded).

#### NOTE

A ticket dispenser or token dispenser can be activated by the Kicker coil driver to provide an alternative award for each free game 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 100,000 points to the player.

### 08 Match Award

The operator can select (via the Credit button) the desired percentage for the Match action occurring at the completion of each game. The choices are:

- 1%-50%* - 1% is 'hard'; 50% is 'extremely easy'. 10% is the Factory Setting. During Match action, 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 does not operate at completion of the game; no award is given.

### 09 Balls / Game

The operator can define a "game" by specifying the number of balls to be played. The range of this setting is 1 through 9. The Factory Setting is 3.

### 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 Extra Ball/Ball In Play

The operator can choose (via the Credit button) the number of Extra Balls to be awarded to a player. The range of this setting is:

## GAME ADJUSTMENT PROCEDURE (Continued)

### 11 Extra Ball/Ball In Play (Continued)

- 00 - NO extra ball play; displays a message, NO EX. BALL. A score is awarded in lieu of the Extra Ball.
- 1-9 E. B./Ball - 1 through 9 Extra Balls per ball (i.e., all balls including Extra Balls) are awarded.
- 1-9 E. B./B.I. P. - 1 through 9 Extra Balls per Ball In Play (B. I. P.) (i.e., all balls NOT including Extra Balls) are awarded.
- 1-9 E. B./Game - 1 through 9 Extra Balls per game.

The Factory Setting is 2 Extra Balls per B. I. P.

### 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 10 (Factory Setting for German games is 30). Reaching the specified setting prevents the award of additional credits by game play. Coin purchases do continue to accumulate and are displayed.

#### 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 in the player 1 score display, using the Credit button. The Factory Setting is 4,000,000. (The Factory Setting for German games is 5,500,000.) 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 player 2 score display. The adjustment technique is identical to Ad 14. The Factory Setting is 3,500,000. (The Factory Setting for German games is 5,000,000.) 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 player 3 score display. The adjustment technique is identical to Ad 14. The Factory Setting is 3,000,000. (The Factory Setting for German games is 4,500,000.) 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 player 4 score display. The adjustment technique is identical to Ad 14. The Factory Setting is 2,500,000. (The Factory Setting for German games is 4,000,000.) 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.)

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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. (Audit Item 39 displays the number of games remaining before the reset.) 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 24,750 games (in increments of 250). The Factory Setting is 3,000. (German games have a Factory Setting of 750.)

### 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 choices are:

- No - A coin is necessary for game play. This is the Factory Setting.
- Yes - Game play is free; no coin is required.

### 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 items Ad 25 through 30, which are adjustments allowing for a special custom coinage setting. The Factory Setting is U.S.A. 1 : 1 COIN 1 PLAY, as shown by the backbox display. (For German games, the Factory Setting is GERMAN2 : 7 PLAY 5 dm.)

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.

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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 certain 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 Bonus Ball Time

The operator can choose (via the Credit button) the minimum amount of time a player is given for achieving Bonus Ball Play. The range of this setting is *20 seconds*(Hard) through *40 seconds* (Very easy). The Factory Setting is 25 seconds.

### 32 STOP 'N SCORE Timer

The operator can choose (via the Credit button) the time period for display of the STOP 'N SCORE numbers. The range of this setting is *5 seconds*(Hard) through *30 seconds* (Very easy). The Factory Setting is 25 seconds.

### 33 U - S - A Lanes Light SPECIAL Lamp

The operator can choose (via the Credit button) how many times the player must complete the U - S - A lanes to light the SPECIAL lamp (lower right return lane). The choices are: 3 completions; 4 completions; or 5 completions. The Factory Setting is 4.

### 34 SHUTTLE Memory

The operator can choose (via the Credit button) whether the lamps of the word SHUTTLE that the player lighted are stored in memory for 'next ball' play. The choices are:

- No - The lamps are turned off (not stored in memory) at the start of a ball.
- Yes - The lighted lamps ARE stored in memory and recalled for the player's next ball. The Factory Setting is Yes.

## GAME ADJUSTMENT PROCEDURE (Continued)

### 35 STATION Memory

The operator can choose (via the Credit button) whether the lamps of the word STATION that the player lighted are stored in memory for 'next ball' play. The choices are:

- No - The lamps are turned off (not stored in memory) at the start of a ball.
- Yes - The lighted lamps ARE stored in memory and recalled for the player's next ball. The Factory Setting is Yes.

### 36 1 - 2 - 3 Memory

The operator can choose (via the Credit button) whether the lamps of the 1 - 2 - 3 lanes that the player lighted are stored in memory for 'next ball' play. The choices are:

- No - The lamps are turned off (not stored in memory) at the start of a ball.
- Yes - The lighted lamps ARE stored in memory and recalled for the player's next ball. The Factory Setting is Yes.

### 37 U - S - A Memory

The operator can choose (via the Credit button) whether the lamps of the U - S - A lanes that the player lighted are stored in memory for 'next ball' play. The choices are:

- No - The lamps are turned off (not stored in memory) at the start of a ball.
- Yes - The lighted lamps ARE stored in memory and recalled for the player's next ball. The Factory Setting is Yes.

### 38 B. S. (Ball Start) Lite RE.ENTRY

The operator can choose (via the Credit button) whether, at the start of each ball, a player gets the RE-ENTRY lamp (left drain lane) lighted, indicating that the Re-Entry kickback is operable. The choices are:

- No - The Re-Entry lamp is not lighted; the kickback is not active.
- Yes - The Re-Entry lamp IS lighted; the kickback is operable. The Factory Setting is Yes.

### 39 DOCKING W/L Initially

The operator can choose (via the Credit button) whether the DOCKING W/L lamp is lighted at the beginning of a game. The choices are:

- Off - The DOCKING W/L lamp is NOT lighted at the beginning of a game.
- On - The DOCKING W/L lamp IS lighted at the beginning of a game. The Factory Setting is On.

### 40 Bonus X Memory

The operator can choose (via the Credit button) whether the Bonus Multiplier (Bonus X) continues from ball to ball or is reset at Ball Start. The choices are:

- Yes - Bonus X value continues from ball to ball.
- No Memory - The value of Bonus X is reset at each Ball Start. The Factory Setting is No.

### 41 S/S "X" Memory

The operator can choose (via the Credit button) whether the Stop 'N' Score Multiplier (S/S X) continues from ball to ball or is reset at Ball Start. The choices are:

- Yes - S/S X value continues from ball to ball.
- No Memory - The value of S/S X is reset at each Ball Start. The Factory Setting is No.

## GAME ADJUSTMENT PROCEDURE (Continued)

### 42 Bumper Value Memory

The operator can choose (via the Credit button) whether the value achieved by the player on the Jet Bumpers continues from ball to ball or is reset at Ball Start. The choices are:

- Yes - Jet Bumper score value continues from ball to ball. The Factory Setting is Yes.
- No Memory - The value of the Jet Bumper score is reset at each Ball Start.

### 43 Attract Mode Sounds

The operator can select (via the Credit button) the amount of sounds occurring during the Attract Mode. The choices are:

- ALOT - Sounds occur during the Attract Mode sequence. This is the Factory Setting.
- LESS - Sounds occur during only the Attract Mode.
- NONE - No sounds occur during the Attract Mode.

### 44 Extra Ball Auto Adjustment

The operator can choose (via the Credit button) the percentage value for all Extra Balls. The range of this automatic adjustment setting is *Enabled 1% (Hard)* through *99% (Extremely easy)*; it can also be turned off (disabled), via a setting of *NO AUTO*. When the automatic adjustment is turned on (enabled), the game program adjusts the setting, at the end of a game, after 50 misses or awards, except when the current value is within 2% of the setting. Then, no auto adjustment occurs. The Factory Setting is Enabled and 33%.

### 45 SPECIAL Auto Adjustment

The operator can choose (via the Credit button) the percentage value for all Specials. The range of this automatic adjustment setting is *Enabled 1% (Hard)* through *99% (Extremely easy)*; it can also be turned off (disabled), via a setting of *NO AUTO*. When the automatic adjustment is turned on (enabled), the game program adjusts the setting, at the end of a game, after 50 misses or awards, except when the current value is within 2% of the setting. Then, no autoadjustment occurs. The Factory Setting is Enabled and 04%.

### 46 "X" Lights Extra Ball

The operator can choose (via the Credit button) the point at which the Bonus Multiplier turns on the Extra Ball lamp. The range of choices is *3X* through *7X*. The Factory Setting is *4X*.

### 47 SPECIAL ENABLE

The operator can choose (via the Credit button) whether the player can light the SPECIAL lamp. The choices are:

- No - The SPECIAL lamp cannot be lighted (it is 'disabled').
- Yes - The SPECIAL lamp CAN be lighted (it is 'enabled'). The Factory Setting is Yes.

### 48 EXTRA BALL ENABLE

The operator can choose (via the Credit button) whether the player can light the EXTRA BALL lamp. The choices are:

- No - The EXTRA BALL lamp can NOT be lighted (it is 'disabled').
- Yes - The EXTRA BALL lamp CAN be lighted (it is 'enabled'). The Factory Setting is Yes.

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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 player 4 display shows this choice as ON. This is the Factory Setting. The 3-line message provided is:  
MISSION CONTROL... REPORT TO ... SPACE STATION
- 2 - Do NOT display a message during the Attract Mode. (Player 4 shows OFF.)
- 3 - The player 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). The entire character set is the following:  
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 < > ? - / \* \*  
A . B . C . D . E . F . G . H . I . J . K . L . M . N . O . P . Q . R . S . T . U . V . W . X . Y . Z . \_
  - 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:

- YES - The knocker sounds, signalling a switch problem, at game Turn-On and at the beginning of the Test/Diagnostic Procedures. This is the Factory Setting, and is shown in the player 4 display.
- NO - The knocker does NOT sound. (Player 4 shows NO.)

### 51 ENGLISH TEXT

The operator can choose to display the message, audit, adjustment, and Test /Diagnostic information in English or German (Deutsch) via the Credit button.

### 52 UNUSED ADJUST

This adjustment is not used for *SPACE STATION*.

#### 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.

## GAME ADJUSTMENT PROCEDURE (Continued)

The Backbox displays for each Special Preset Adjustment indicate whether the operator has selected it, by identifying the Adjustment in the player 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 player 4 display. Operator installation of the 'selected' Preset Adjustment occurs by using the Credit button to choose YES and then pressing the ADVANCE switch. The displays then show the name of the Adjustment again, with DONE to show that the installation is now in effect.

Note that, when an operator installs any of the Special Preset Adjustments, Adjustment Items using the automatic adjust feature of the game program reset to the auto adjust value listed for that Adjustment Item.

### NOTE

Games in which the CPU jumper W7 is cut ("German games") automatically have certain Adjustment Items preset:

| <u>Ad</u> | <u>Name</u>     | <u>New Setting</u> | <u>Ad</u> | <u>Name</u>      | <u>New Setting</u> |
|-----------|-----------------|--------------------|-----------|------------------|--------------------|
| 01        | Auto Replay     | 15 (%)             | 18        | Hi Scr 1 Credits | 03                 |
| 02        | Replay Start    | 1,600,000          | 19        | Hi Scr 2 Credits | 00                 |
| 03        | Replay Level 2  | 03                 | 20        | Hi Scr 3 Credits | 00                 |
| 12        | Maximum Credits | 30                 | 21        | Hi Scr 4 Credits | 00                 |
| 14        | Backup Hi Scr 1 | 5,500,000          | 22        | Hi Scr Reset     | 750 games          |
| 15        | Backup Hi Scr 2 | 5,000,000          | 24        | German 2 Coinage | 7 Plays/5DM        |
| 16        | Backup Hi Scr 3 | 4,500,000          |           |                  |                    |
| 17        | Backup Hi Scr 4 | 4,000,000          | 51        | Deutsch Text     | Deutsch            |

### 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:

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

### 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:

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

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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:

| <u>Ad</u> | <u>Name</u>     | <u>New Setting</u> | <u>Ad</u> | <u>Name</u>      | <u>New Setting</u> |
|-----------|-----------------|--------------------|-----------|------------------|--------------------|
| 06        | Replay Award    | Audit              | 17        | Backup Hi Scr 4  | 00                 |
| 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                 | 24        | German 1 Coinage | 10 Plays/5DM       |

### 56 Install German 4

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Credit Award play with 7 games for 5 DM. 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    | Credit             | 17        | Backup Hi Scr 4  | 4,000,000          |
| 07        | Special Award   | Credit             | 18        | Hi Scr 1 Credits | 03                 |
| 08        | Match Feature   | 10 %               | 19        | Hi Scr 2 Credits | 00                 |
| 14        | Backup Hi Scr 1 | 5,500,000          | 20        | Hi Scr 3 Credits | 00                 |
| 15        | Backup Hi Scr 2 | 5,000,000          | 21        | Hi Scr 4 Credits | 00                 |
| 16        | Backup Hi Scr 3 | 4,500,000          | 24        | German 2 Coinage | 7 Plays/5DM        |

### 57 Install German 5

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Ticket/Token operation with 7 games for 5 DM. 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    | Coil               | 17        | Backup Hi Scr 4  | 4,000,000          |
| 07        | Special Award   | Ball               | 18        | Hi Scr 1 Credits | 03                 |
| 08        | Match Feature   | 10 %               | 19        | Hi Scr 2 Credits | 00                 |
| 14        | Backup Hi Scr 1 | 5,500,000          | 20        | Hi Scr 3 Credits | 00                 |
| 15        | Backup Hi Scr 2 | 5,000,000          | 21        | Hi Scr 4 Credits | 00                 |
| 16        | Backup Hi Scr 3 | 4,500,000          | 24        | German 2 Coinage | 7 Plays/5DM        |

### 58 Install German 6

The operator can modify the game pricing selection of Standard Setting 09 in the **Pricing Table** to permit Keyset Mode operation with 7 games for 5 DM. 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    | Audit              | 17        | Backup Hi Scr 4  | 00                 |
| 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                 | 24        | German 2 Coinage | 7 Plays/5DM        |

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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               | 18        | Hi Scr 1 Credits | 00                 |
| 07        | Special Award | Ball               | 19        | Hi Scr 2 Credits | 00                 |
| 08        | Match Feature | Off                | 20        | Hi Scr 3 Credits | 00                 |
|           |               |                    | 21        | Hi Scr 4 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> |
|-----------|--------------|--------------------|-----------|--------------|--------------------|
| 02        | Replay Start | 3,500,000          | 09        | Balls / Game | 05                 |

### 61 Install Novelty

The operator can remove all Free Play and 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> |
|-----------|----------------|--------------------|-----------|------------------|--------------------|
| 01        | Fixed Replay   | SCORES             | 07        | Special Award    | Score              |
| 02        | Replay Level 1 | Off                | 08        | Match Feature    | Off                |
| 03        | Replay Level 2 | Off                | 11        | No Extra Ball    | 00                 |
| 04        | Replay Level 3 | Off                | 18        | Hi Scr 1 Credits | 00                 |
| 05        | Replay Level 4 | Off                | 19        | Hi Scr 2 Credits | 00                 |
| 06        | Replay Award   | Audit              | 20        | Hi Scr 3 Credits | 00                 |
|           |                |                    | 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:

| <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> | <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> |
|-----------|--------------------|--------------------|-----------|--------------------|--------------------|
| 31        | Bon Ball Time      | 40 sec             | 39        | Docking W.L. Init  | On                 |
| 32        | S/SCORE Timer      | 30 sec             | 40        | Bonus X Memory     | Yes                |
| 33        | USA'S Lite Special | 3                  | 41        | S/S "X" Memory     | Yes                |
| 34        | SHUTTLE Memory     | Yes                | 42        | Bump. Val Memory   | Yes                |
| 35        | STATION Memory     | Yes                | 44        | Ex. Ball Auto Adj  | 40 %               |
| 36        | 1 2 3 Memory       | Yes                | 45        | Special Auto Adj   | 05 %               |
| 37        | U S A Memory       | Yes                | 46        | "X" Lites Ex. Ball | 3X                 |
| 38        | B.S. Lite RE.ENTRY | Yes                | 47        | Special Enable     | Yes                |
|           |                    |                    | 48        | Ex. Ball Enable    | Yes                |

### 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:

## GAME ADJUSTMENT PROCEDURE (Continued)

### 64 Install Easy (Continued)

| <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> | <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> |
|-----------|--------------------|--------------------|-----------|--------------------|--------------------|
| 31        | Bon Ball Time      | 30 sec             | 39        | Docking W.L. Init  | On                 |
| 32        | S/SCORE Timer      | 25 sec             | 40        | Bonus X Memory     | Yes                |
| 33        | USA'S Lite Special | 3                  | 41        | S/S "X" Memory     | Yes                |
| 34        | SHUTTLE Memory     | Yes                | 42        | Bump. Val Memory   | Yes                |
| 35        | STATION Memory     | Yes                | 44        | Ex. Ball Auto Adj  | 40 %               |
| 36        | 1 2 3 Memory       | Yes                | 45        | Special Auto Adj   | 05 %               |
| 37        | U S A Memory       | Yes                | 46        | "X" Lites Ex. Ball | 4X                 |
| 38        | B.S. Lite RE.ENTRY | Yes                | 47        | Special Enable     | Yes                |
|           |                    |                    | 48        | Ex. Ball Enable    | Yes                |

### 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:

| <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> | <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> |
|-----------|--------------------|--------------------|-----------|--------------------|--------------------|
| 31        | Bon Ball Time      | 25 sec             | 39        | Docking W.L. Init  | On                 |
| 32        | S/SCORE Timer      | 25 sec             | 40        | Bonus X Memory     | No                 |
| 33        | USA'S Lite Special | 4                  | 41        | S/S "X" Memory     | No                 |
| 34        | SHUTTLE Memory     | Yes                | 42        | Bump. Val Memory   | Yes                |
| 35        | STATION Memory     | Yes                | 44        | Ex. Ball Auto Adj  | 33%                |
| 36        | 1 2 3 Memory       | Yes                | 45        | Special Auto Adj   | 04%                |
| 37        | U S A Memory       | Yes                | 46        | "X" Lites Ex. Ball | 4X                 |
| 38        | B.S. Lite RE.ENTRY | Yes                | 47        | Special Enable     | Yes                |
|           |                    |                    | 48        | Ex. Ball Enable    | Yes                |

### 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:

| <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> | <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> |
|-----------|--------------------|--------------------|-----------|--------------------|--------------------|
| 31        | Bon Ball Time      | 20 sec             | 39        | Docking W.L. Init  | On                 |
| 32        | S/SCORE Timer      | 15 sec             | 40        | Bonus X Memory     | No                 |
| 33        | USA'S Lite Special | 5                  | 41        | S/S "X" Memory     | No                 |
| 34        | SHUTTLE Memory     | Yes                | 42        | Bump. Val Memory   | Yes                |
| 35        | STATION Memory     | Yes                | 44        | Ex. Ball Auto Adj  | 20 %               |
| 36        | 1 2 3 Memory       | No                 | 45        | Special Auto Adj   | 03 %               |
| 37        | U S A Memory       | No                 | 46        | "X" Lites Ex. Ball | 5X                 |
| 38        | B.S. Lite RE.ENTRY | Yes                | 47        | Special Enable     | Yes                |
|           |                    |                    | 48        | Ex. Ball Enable    | Yes                |

### 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:

| <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> | <u>Ad</u> | <u>Name</u>        | <u>New Setting</u> |
|-----------|--------------------|--------------------|-----------|--------------------|--------------------|
| 31        | Bon Ball Time      | 20 sec             | 39        | Docking W.L. Init  | Off                |
| 32        | S/SCORE Timer      | 10 sec             | 40        | Bonus X Memory     | No                 |
| 33        | USA'S Lite Special | 5                  | 41        | S/S "X" Memory     | No                 |
| 34        | SHUTTLE Memory     | No                 | 42        | Bump. Val Memory   | No                 |
| 35        | STATION Memory     | No                 | 44        | Ex. Ball Auto Adj  | 20 %               |
| 36        | 1 2 3 Memory       | No                 | 45        | Special Auto Adj   | 03 %               |
| 37        | U S A Memory       | No                 | 46        | "X" Lites Ex. Ball | 6X                 |
| 38        | B.S. Lite RE.ENTRY | No                 | 47        | Special Enable     | Yes                |
|           |                    |                    | 48        | Ex. Ball Enable    | Yes                |

## GAME ADJUSTMENT PROCEDURE (Continued)

### 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 player 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 DONE to show that the coinage audits have been reset to zero.

### 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 player 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 DONE to show that the non-coinage audits have been reset to zero.

### 70 Install Factory

The operator can request the game (via the Credit button) to provide the normal Factory Settings, essentially restoring the game to its 'factory condition'. The operator must select the 'YES' option for this adjustment. 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 selecting the YES option, 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.

**SPACE STATION Game Adjustment Setting Comparison Table**

| Adj # | Adj Description     | Extra Easy<br>Ad 62 | Easy<br>Ad 63 | Medium Ad<br>(Factory) 64 | Hard<br>Ad 65 | Extra Hard<br>Ad 66 |
|-------|---------------------|---------------------|---------------|---------------------------|---------------|---------------------|
| 31    | B. Ball Timer       | 40 sec              | 30 sec        | 25 sec                    | 20 sec        | 20 sec              |
| 32    | S/Score Timer       | 30 sec              | 25 sec        | 25 sec                    | 15 sec        | 10 sec              |
| 33    | USA's Lite Special  | 3                   | 3             | 4                         | 5             | 5                   |
| 34    | Shuttle Memory      | Yes                 | Yes           | Yes                       | Yes           | No                  |
| 35    | Station Memory      | Yes                 | Yes           | Yes                       | Yes           | No                  |
| 36    | 1 2 3 Memory        | Yes                 | Yes           | Yes                       | No            | No                  |
| 37    | U.S.A. Memory       | Yes                 | Yes           | Yes                       | No            | No                  |
| 38    | B. S. Lite Re-entry | Yes                 | Yes           | Yes                       | Yes           | No                  |
| 39    | Docking W/L Init    | On                  | On            | On                        | On            | Off                 |
| 40    | Bonus X Memory      | Yes                 | Yes           | No                        | No            | No                  |
| 41    | S/S "X" Memory      | Yes                 | Yes           | No                        | No            | No                  |
| 42    | Bump. Val Memory    | Yes                 | Yes           | Yes                       | Yes           | No                  |
| 43    | A. Mode Sounds      | ALOT                | ALOT          | ALOT                      | ALOT          | ALOT                |
| 44    | Ex. Ball Auto Adj   | 40 %                | 40 %          | 33 %                      | 20 %          | 20 %                |
| 45    | Special Auto Adj    | 05 %                | 05 %          | 04 %                      | 03 %          | 03 %                |
| 46    | "X" Lites Ex. Ball  | 3X                  | 4X            | 4X                        | 5X            | 6X                  |
| 47    | Special Enable      | Yes                 | Yes           | Yes                       | No            | No                  |
| 48    | Ex. Ball Enable     | Yes                 | Yes           | Yes                       | No            | No                  |

## 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 *SPACE STATION*, 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-set 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 player 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 player 1 display, use AUTO-UP, and press the Credit button, until the desired value shows in the player 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 player 1 display.
4. Using AUTO-UP, press and hold down ADVANCE, until the Player 3 display shows **Ad 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 (player 1, player 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. Pressing the Credit button allows the operator a choice of one of the 16 "Standard" Settings, with associated automatic pricing (Player 1 shows the Country identifier, and a setting identifier for a country having more than one "Standard" Setting; player 3 and 4 displays show the games per coin(s) information). In the *Pricing Table*, each "Standard" Setting is denoted by its identifier in the "Ad 24 Display" column. Automatic Pricing causes each of the other pricing items (columns 25 through 30) to change to the value shown in the table for that selected "Standard" Setting.

**CUSTOM PRICING.** Adjustment Item 24 must be set to the Custom Coinage Setting (player 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 coin units equal to one Credit. (A Credit is usually equal to one game.)

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 equivalent to one Credit (Item 28).

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

**UNITS REQUIRED FOR BONUS CREDIT.** Item 29 is the number of coin units that must pass through the coin chute(s) before an additional Credit (game) is posted (displayed). At the factory setting, the number in this item is 00. (This 00 means that NO bonus credit (free game) is awarded, although purchase of more than one game at a time occurs.)

# GAME PRICING (Continued)

**MINIMUM COIN UNITS.** Item 30 determines the number of coin units that must pass through the coin chute(s) 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.)

SPACE STATION Pricing Table

| Country                | Coin Chute |         |         | Games/Coin                                                                                                                                                                          | Ad 24 Display                                                        | Pricing Functions          |                            |                            |                            |                            |                            |
|------------------------|------------|---------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|                        | Left       | Center  | Right   |                                                                                                                                                                                     |                                                                      | 25                         | 26                         | 27                         | 28                         | 29                         | 30                         |
| USA and Canada         | 25¢        | -       | 25¢     | 1/25¢, 4/\$1 1,2<br>1/50¢, 2/75¢, 3/\$1 2<br>1/50¢, 2/\$1 2<br>1/25¢, 3/50¢, 6/\$1<br>1/25¢, 5/\$1                                                                                  | U.S.A. 1<br>U.S.A. 2<br>U.S.A. 3<br>CUSTOM<br>CUSTOM                 | 01<br>03<br>01<br>01<br>01 | 04<br>12<br>04<br>04<br>04 | 01<br>03<br>01<br>01<br>01 | 00<br>04<br>02<br>02<br>02 | 00<br>00<br>00<br>00<br>00 | 00<br>00<br>00<br>00<br>00 |
| West Germany           | 1 DM       | 2 DM    | 5 DM    | 1/1 DM, 2/2 DM, 7/5 DMark 2,3<br>1/1 DM, 3/2 DM, 10/5 DM 2<br>1/1 DM, 3/2 DM, 9/5 DM<br>1/2x1 DM, 1/2 DM, 3/5 DM<br>2/1 DM, 5/2 DM, 14/5 DM<br>Ticket/Token Mode 4<br>Keyset Mode 4 | GERMAN2<br>GERMAN1<br>CUSTOM<br>CUSTOM<br>CUSTOM<br>CUSTOM<br>CUSTOM | 06<br>09<br>09<br>03<br>13 | 12<br>18<br>18<br>06<br>26 | 30<br>45<br>45<br>15<br>65 | 05<br>05<br>05<br>05<br>05 | 30<br>45<br>00<br>00<br>65 | 00<br>00<br>00<br>00<br>00 |
| France                 | 1 F        | 5 F     | 10 F    | 1/3x1 F, 2/5 F, 5/10 Franc 2                                                                                                                                                        | FRANCE                                                               | 02                         | 10                         | 20                         | 05                         | 20                         | 00                         |
| Antilles (Netherlands) | 25¢        | -       | 1 G     | 1/25¢, 4/1 Guilder                                                                                                                                                                  | CUSTOM                                                               | 01                         | 01                         | 04                         | 01                         | 00                         | 00                         |
| Netherlands            | 1 HFI      | 2.5 HFI | 2.5 HFI | 1/1 HFI, 3/2.5 HFI 2                                                                                                                                                                | NETHERL.                                                             | 06                         | 15                         | 15                         | 05                         | 00                         | 00                         |
|                        | 25¢        | -       | 1 G     | 1/25¢, 5/1 Guilder                                                                                                                                                                  | CUSTOM                                                               | 01                         | 00                         | 05                         | 01                         | 00                         | 00                         |
| Belgium                | 5 F        | 5 F     | 20 F    | 1/2X5 F, 1/2X5 F, 3/20 F 2                                                                                                                                                          | BELGIUM                                                              | 03                         | 03                         | 12                         | 04                         | 00                         | 00                         |
|                        | 5 F        | -       | 20 F    | 1/2x5 F, 2/20 Franc                                                                                                                                                                 | CUSTOM                                                               | 01                         | 01                         | 04                         | 02                         | 00                         | 00                         |
|                        | 5 F        | 20 F    | 20 F    | 1/2x5 F, 2/20 F, 2/20 F                                                                                                                                                             | CUSTOM                                                               | 01                         | 04                         | 04                         | 02                         | 00                         | 00                         |
|                        | 5 F        | 5 F     | 20 F    | 1/2X5 F, 1/2X5 F, 2/20 F                                                                                                                                                            | CUSTOM                                                               | 01                         | 01                         | 04                         | 02                         | 00                         | 00                         |
| Spain                  | 25 P       | -       | 100 P   | 1/25 P, 5/100 Peseta 2                                                                                                                                                              | SPAIN                                                                | 01                         | 00                         | 05                         | 01                         | 00                         | 00                         |
| Switzerland            | 1 F        | -       | 2 F     | 1/1 F, 3/2 F 2                                                                                                                                                                      | SWISS                                                                | 03                         | 00                         | 06                         | 02                         | 00                         | 00                         |
|                        | 1 F        | 2 F     | 5 F     | 1/1 F, 3/2 F, 7/5 Franc                                                                                                                                                             | CUSTOM                                                               | 02                         | 06                         | 14                         | 02                         | 00                         | 00                         |
| Japan                  | -          | 100 ¥   | -       | 2/100 ¥ 2                                                                                                                                                                           | JAPAN                                                                | 01                         | 04                         | 01                         | 02                         | 00                         | 00                         |
|                        | 100 ¥      | -       | 100 ¥   | 2/100 Yen                                                                                                                                                                           | CUSTOM                                                               | 04                         | 00                         | 04                         | 02                         | 00                         | 00                         |
| Italy                  | 500 L      | -       | 500 L   | 1/500 Lire 2                                                                                                                                                                        | ITALY                                                                | 01                         | 04                         | 01                         | 01                         | 00                         | 00                         |
| Australia              | 20¢        | -       | \$1     | 1/2x20 ¢, 3/\$1 2                                                                                                                                                                   | AUSTRAL.                                                             | 01                         | 00                         | 06                         | 02                         | 00                         | 00                         |
| United Kingdom         | 10 P       | 50 P    | 10 P    | 1/10 P, 5/50 P 2                                                                                                                                                                    | U.K.                                                                 | 01                         | 05                         | 01                         | 01                         | 00                         | 00                         |
|                        | 10 P       | 50 P    | 20 P    | 1/10 P, 5/50 P, 2/20 Pence                                                                                                                                                          | CUSTOM                                                               | 01                         | 05                         | 02                         | 01                         | 00                         | 00                         |
| Argentina              | 10¢        | 10¢     | 10¢     | 1/1 Token                                                                                                                                                                           | CUSTOM                                                               | 01                         | 01                         | 01                         | 01                         | 00                         | 00                         |
| Austria                | 5 Sch      | 10 Sch  | 10 Sch  | 1/2x5 Sch, 3/2x10 Sch 2                                                                                                                                                             | AUSTRIA                                                              | 01                         | 02                         | 02                         | 02                         | 04                         | 00                         |
|                        | 5 Sch      | -       | 10 Sch  | 2/5 Sch, 5/10 Schilling                                                                                                                                                             | CUSTOM                                                               | 02                         | 00                         | 05                         | 01                         | 00                         | 00                         |
|                        | 1 Sch      | 5 Sch   | 10 Sch  | 2/5x1 Sch, 2/5 Sch, 5/10 Sch                                                                                                                                                        | CUSTOM                                                               | 02                         | 10                         | 25                         | 05                         | 00                         | 00                         |
| Chile                  | Token      | -       | Token   | 1/1 Token 1,2                                                                                                                                                                       | U.S.A. 1                                                             | 01                         | 04                         | 01                         | 01                         | 00                         | 00                         |
| Denmark                | 1 Kr       | 5 Kr    | 10 Kr   | 1/2x1 Kr, 3/5 Kr, 7/10 Krone                                                                                                                                                        | CUSTOM                                                               | 01                         | 06                         | 14                         | 02                         | 00                         | 00                         |
| Finland                | 1 Mka      | -       | 1 Mka   | 1/1 Markka 1,2                                                                                                                                                                      | U.S.A. 1                                                             | 01                         | 04                         | 01                         | 01                         | 00                         | 00                         |
| New Zealand            | 20¢        | -       | 20¢     | 1/2x20¢ 2                                                                                                                                                                           | U.S.A. 3                                                             | 01                         | 04                         | 01                         | 02                         | 00                         | 00                         |
| Norway                 | 1 Kr       | -       | 1 Kr    | 1/2x1 Kr, 3/5x1 Krone                                                                                                                                                               | CUSTOM                                                               | 01                         | 00                         | 01                         | 02                         | 05                         | 00                         |
| Sweden                 | 1 Kr       | 5 Kr    | 5 Kr    | 1/3x1 Kr, 2/5 Krona 2                                                                                                                                                               | SWEDEN                                                               | 02                         | 10                         | 10                         | 05                         | 00                         | 00                         |
|                        | 1 Kr       | -       | 1 Kr    | 1/2x1 Krona 2                                                                                                                                                                       | U.S.A. 1                                                             | 01                         | 04                         | 01                         | 02                         | 00                         | 00                         |

Notes: 1. Factory Default. 2. Standard Setting - Change by pressing Credit button. 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.

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 switch the game On, set the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN, and press the ADVANCE button.

### CAUTION

*SPACE STATION's System 11B game program greatly aids the operator and service personnel: When the operator is beginning the Test/Diagnostic Procedures (and also at game Turn-On), a display now signals that a switch has NOT been actuated during ball play for a lengthy period of time (60 balls, or 20 games). However, for the Switch Problem Reporting activity at the beginning of the Test/ Diagnostic Procedures, the display of problem switches is *not* limited to just three switches; it now includes *ALL* switches exhibiting problems. Refer to the text on Switch Tests for additional information. To proceed with the Test/Diagnostic Procedures, use AUTO-UP, and press ADVANCE.*

### MUSIC TEST.

1. In the Music Test, observe that the player 1 and 2 displays show the message, MUSIC TEST. Switch to AUTO-UP, and observe that the message now reads MUSIC OFF, with the player 3 score display showing 00 00. Press the Credit button to select the desired music selection: 00 01 - 'MainTheme' through 00 06 - 'High Score' (the selections repeat). 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 player 1 and 2 displays briefly show the message, DISPLAY TEST, and that the player 3 score display shows 01 (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 player score display.
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 player 1 and 2 displays show the message, SOUND TEST, and that the player 3 display shows 02 (the Sound Test identifier). The player 3 display shows a series of test steps from 00 through 07. Verify that a different sound is heard each time the number in the 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.

## TEST/DIAGNOSTIC PROCEDURES

### LAMP TESTS.

#### 1. All Lamps.

(From Sound Test) To initiate the first Lamps Test, press ADVANCE. Observe that the player 1 and 2 displays show the message, ALL LAMPS, and that the player 3 display shows 03 (All LampsTest 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 feature lamp, refer to the **Lamp-Matrix Table**. CPU Board connections at jacks 1J6 (columns) and 1J7 (rows) are also listed in the table.

#### 2. Single Lamps.

From the All Lamps test, using AUTO-UP, press ADVANCE to initiate the Single Lamps Test. The player 1 and 2 displays initially show the message, SINGLE LAMPS, and the player 3 display shows 04. Then, the player 3 display shows 04 01, and the player 1 and 2 displays change to show BON BAL PLYR 1, 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 player 1 and 2 displays showing the individual lamp's name. Press and hold the Credit button to proceed rapidly to the desired lamp.

2 Double Lamps

SPACE STATION Lamp-Matrix Table

| COLUMN                     | 1 Q66<br>YEL-BRN<br>1J7-1      | 2 Q64<br>YEL-RED<br>1J7-2 | 3 Q62<br>YEL-ORN<br>1J7-3            | 4 Q60<br>YEL-BLK<br>1J7-4             | 5 Q58<br>YEL-GRN<br>1J7-5        | 6 Q56<br>YEL-BLU<br>1J7-7             | 7 Q54<br>YEL-VIO<br>1J7-8   | 8 Q52<br>YEL-GRY<br>1J7-9   |
|----------------------------|--------------------------------|---------------------------|--------------------------------------|---------------------------------------|----------------------------------|---------------------------------------|-----------------------------|-----------------------------|
| ROW                        |                                |                           |                                      |                                       |                                  |                                       |                             |                             |
| Q80 RED-<br>1 BRN<br>1J6-1 | Bonus Ball<br>Player #1<br>1   | Change<br>Shuttle<br>9    | RE-ENTRY<br>(Left W/LIT<br>Drain) 17 | S<br>25                               | Stop & Score<br>33               | Not<br>Used 41                        | Big Flame<br>(insert bd) 49 | Big Flame<br>(insert bd) 57 |
| Q81 RED-<br>2 BLK<br>1J6-2 | Bonus Ball<br>Player #2<br>2   | Change<br>Station 10      | S<br>18                              | T<br>26                               | DOCK W/L<br>(right) 34           | RELAUNCH<br>WHEN LIT 42               | Shuttle Score<br>SPECIAL 50 | Station Score<br>SPECIAL 58 |
| Q82 RED-<br>3 ORN<br>1J6-3 | Bonus Ball<br>Player #3<br>3   | 1X<br>11                  | H<br>19                              | A<br>27                               | SPECIAL<br>35                    | DOCKED<br>Port Side 43                | Extra Ball<br>51            | Extra Ball<br>59            |
| Q83 RED-<br>4 YEL<br>1J6-4 | Bonus Ball<br>Player #4<br>4   | 2X<br>12                  | U<br>20                              | T<br>28                               | 100,000<br>When Lit 36           | Hold Bonus<br>44                      | 50,000 +<br>Re-Entry 52     | 50,000 +<br>Re-Entry 60     |
| Q84 RED-<br>5 GRN<br>1J6-5 | Extra Ball<br>(3-bnk D T)<br>5 | 4X<br>13                  | T<br>21                              | I<br>29                               | Little Shuttle<br>(insert bd) 37 | DOCKED<br>Starboard<br>Side 45        | 50,000 +<br>Bonus Ball 53   | 50,000 +<br>Bonus Ball 61   |
| Q85 RED-<br>6 BLU<br>1J6-6 | RELEASE<br>(right) 6           | 1<br>14                   | T<br>22                              | O<br>30                               | U<br>38                          | Williams<br>(insert bd,<br>left) 46   | 150,000 +<br>Hold Bonus 54  | 150,000 +<br>Hold Bonus 62  |
| Q86 RED-<br>7 VIO<br>1J6-7 | RELEASE<br>(left) 7            | 2<br>15                   | L<br>23                              | N<br>31                               | S<br>39                          | Williams<br>(insert bd,<br>middle) 47 | 75,000<br>55                | 75,000<br>63                |
| Q87 RED-<br>8 GRY<br>1J6-8 | DOCK W/L<br>(left) 8           | 3<br>16                   | E<br>24                              | RE-ENTRY<br>(Right W/LIT<br>Drain) 32 | A<br>40                          | Williams<br>(insert bd,<br>right) 48  | 25,000<br>56                | 25,000<br>64                |

# TEST/DIAGNOSTIC PROCEDURES (Continued)

## SOLENOID TEST.

1. (From Lamp Test) Using AUTO-UP, press ADVANCE. Observe that the player 1 and 2 displays show the message, COIL TEST, the player 3 display shows 05 (Solenoid Test identifier). Next, the player 3 display shows a series of test steps from 01 through 22, while the player 1 and 2 displays show the solenoid/circuit name. During each of these steps, pulsing of the respective solenoid/circuit occurs. The test cycles repeatedly, unless halted to check a single solenoid, 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/circuit, use MANUAL-DOWN. Press ADVANCE to sequence through the switched, controlled, and special solenoids. Use AUTO-UP to resume test cycling, and to proceed to the next test.

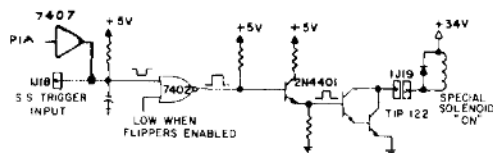
SPACE STATION Solenoid Table

| Sol. No.         | Function                        | Solenoid Type | Wire Color           | Connections |                                        | Driver Trans. | Solenoid Part Number Flashlamp Type |               |
|------------------|---------------------------------|---------------|----------------------|-------------|----------------------------------------|---------------|-------------------------------------|---------------|
|                  |                                 |               |                      | CPU Bd.     | Playfield/Cabinet                      |               | b - Backbox                         | p - Playfield |
| 01A <sup>3</sup> | Outhole Kicker                  | Switched      | { Vio-Brn }          | 1P11-1      | 8P3-1 (to J1-9 on                      | Q33           | AE-23-800                           |               |
| 01C <sup>3</sup> | Relaunch + "ON" Flashers        | Switched      | { Blk-Brn }          | (Gry-Brn)   | Aux Pwr Dvr Bd                         | Q33           | #89 flashlamps                      | 2b,2p         |
| 02A <sup>3</sup> | Ball Shooter Lane Feeder        | Switched      | { Vio-Red }          | P11-3       | 8P3-2 (to J1-7 on                      | Q25           | AE-23-800                           |               |
| 02C <sup>3</sup> | Left Side + "SP" Flashers       | Switched      | { Blk-Red }          | (Gry-Red)   | Aux Pwr Dvr Bd                         | Q25           | #89 flashlamps                      | 2b,2p         |
| 03A <sup>3</sup> | Left Ball Popper                | Switched      | { Vio-Orn }          | 1P11-4      | 8P3-3 (to J1-6 on                      | Q32           | AE-24-900                           |               |
| 03C <sup>3</sup> | Right Side + "AC" Flashers      | Switched      | { Blk-Orn }          | (Gry-Orn)   | Aux Pwr Dvr Bd                         | Q32           | #89 flashlamps                      | 2b,2p         |
| 04A <sup>3</sup> | Right Ball Popper               | Switched      | { Vio-Yel }          | 1P11-5      | 8P3-4 (to J1-5 on                      | Q24           | AE-23-800                           |               |
| 04C <sup>3</sup> | Top (upr p/f) + "ES" Flashers   | Switched      | { Blk-Yel }          | (Gry-Yel)   | Aux Pwr Dvr Bd                         | Q24           | #89 flashlamps                      | 2b,2p         |
| 05A <sup>3</sup> | Not Used                        | Switched      | { Vio-Grn }          | 1P11-6      | 8P3-5 (to J1-4 on                      | Q31           |                                     |               |
| 05C <sup>3</sup> | P'd Top Panel + "TA" Flashers   | Switched      | { Blk-Grn }          | (Gry-Grn)   | Aux Pwr Dvr Bd                         | Q31           | #89 flashlamps                      | 2b,2p         |
| 06A <sup>3</sup> | 3-bank Drop Target              | Switched      | { Vio-Blu }          | 1P11-7      | 8P3-6 (to J1-3 on                      | Q23           | AE-26-1200                          |               |
| 06C <sup>3</sup> | Flame + "TI" Flashers           | Switched      | { Blk-Blu }          | (Gry-Blu)   | Aux Pwr Dvr Bd                         | Q23           | #89 flashlamps                      | 4b            |
| 07A <sup>3</sup> | Knocker (or Ticket Dispenser)   | Switched      | { Vio-Blk }          | 1P11-8      | 8P3-7 (to J1-2 on                      | Q30           | AE-26-1200                          |               |
| 07C <sup>3</sup> | Station Flasher                 | Switched      | { Blk-Vio }          | (Gry-Vio)   | Aux Pwr Dvr Bd                         | Q30           | #89 flashlamps                      | 2b            |
| 08A <sup>3</sup> | R Sngl Drop Target - Raise      | Switched      | { Vio-Gry }          | 1P11-9      | 8P3-8 (to J1-1 on                      | Q22           | AE-23-800                           |               |
| 08C <sup>3</sup> | Left Dock Kickbkg               | Switched      | { Blk-Gry }          | (Gry-Blk)   | Aux Pwr Dvr Bd                         | Q22           | AE-23-800                           |               |
| 09               | General Illum Relay (Playfield) | Controlled    | Brn-Blk              | 1P12-1      | 8P3-9                                  | Q17           | 5580-09555-01 <sup>4</sup>          |               |
| 10               | General Illum Relay (Green)     | Controlled    | Brn-Red              | 1P12-2      | 8P3-10                                 | Q9            | 5580-09555-01 <sup>4</sup>          |               |
| 11               | General Illum Relay (Insert Bd) | Controlled    | Brn-Orn              | 1P12-4      | 6P3-5                                  | Q16           | 5580-09555-01 <sup>4</sup>          |               |
| 12               | A/C Select Relay                | Controlled    | Brn-Yel              | 1P12-5      | 8P3-12                                 | Q8            | 5580-09555-01 <sup>5</sup>          |               |
| 13               | Left Re-Entry Kickback (drain)  | Controlled    | Brn-Grn              | 1P12-6      | 8P3-13                                 | Q15           | AE-24-900                           |               |
| 14               | Not Used                        | Controlled    | Brn-Blu              | 1P12-7      | 8P3-14                                 | Q7            |                                     |               |
| 15               | P'd Top Panel Flashers (3)      | Controlled    | Brn-Vio              | 1P12-8      | 8P3-15                                 | Q14           | #1251 flashlamps 3b 6               |               |
| 16               | Space Station Motor/Relay       | Controlled    | Brn-Gry              | 1P12-9      | 8P3-16                                 | Q6            | 14-7941-2/5580-12145-01             |               |
| 17               | Right Dock Kickback             | Special #1    | Blu-Brn              | 1P19-7      | 8P3-17                                 | Q75           | AE-23-800                           |               |
| 18               | Lower Left Kicker ("sling")     | Special #2    | Blu-Red              | 1P19-4      | 8P3-18                                 | Q71           | AE-26-1200                          |               |
| 19               | Rt Jet Bumper                   | Special #3    | Blu-Orn              | 1P19-3      | 8P3-19                                 | Q73           | AE-23-800                           |               |
| 20               | Lower Right Kicker ("sling")    | Special #4    | Blu-Yel              | 1P19-6      | 8P3-20                                 | Q69           | AE-26-1200                          |               |
| 21               | Left Jet Bumper                 | Special #5    | Blu-Grn              | 1P19-8      | 8P3-21                                 | Q77           | AE-23-800                           |               |
| 22               | Lower Jet Bumper                | Special #6    | Blu-Blk              | 1P19-9      | 8P3-22                                 | Q79           | AE-23-800                           |               |
| -                | Right Flipper                   | -             | Orn-Vio<br>[Blu-Vio] | 1P19-1      | 7P1-15<br>[7P1-16,8P3-34] <sup>2</sup> | -             | FL11630-50VDC                       |               |
| -                | Left Flipper                    | -             | Orn-Gry<br>[Blu-Gry] | 1P19-2      | 7P1-18<br>[7P1-19,8P3-32] <sup>2</sup> | -             | FL11630-50VDC                       |               |

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. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" circuits are pulsed, when Sol. 12 is de-energized; "C" circuits are pulsed, with Sol. 12 energized. Wire colors in brackets are those from respective A and C terminals corresponding to the J1-terminal connection listed for the Aux Power Driver Bd, which controls the device pulsing by Sol. 12. 4. Relay is mounted on Relay Bd, p/n C-11998-1. 5. Relay is mounted on Aux Power Driver Bd, D-11813 in the backbox. 6. Relay is mounted on Relay Bd, C-11902-1.

## TEST/DIAGNOSTIC PROCEDURES (Continued)

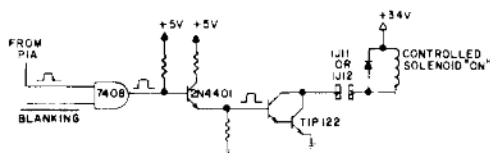
### "On" State Logic - Special Solenoid



### "Off" State - Special Solenoid:

The Special Switch Trigger Input goes low. Meanwhile, the PIA line remains high. The remaining signals reverse their states.

### "On" State Logic - Controlled Solenoid



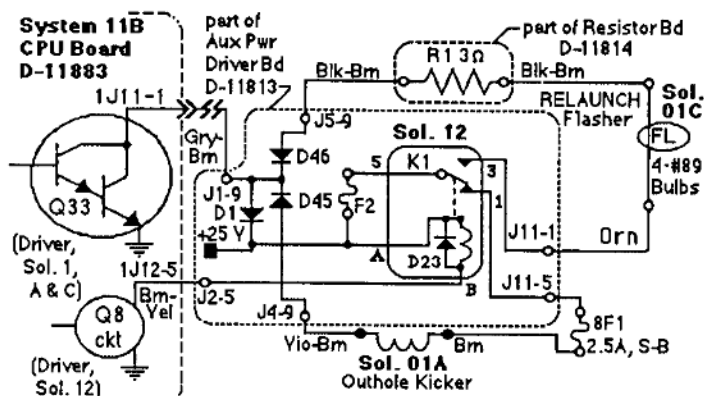
### "Off" State - Controlled Solenoid:

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

## NOTE

As directed by the game program, the A/C Select Relay (solenoid 12) switches the solenoid B+ power between two power busses to permit actuating two groups of solenoids at the proper times. In its de-energized state, the Relay connects the 'circuit A power' to 16 "controlled" and "switched" solenoids (identified in the table with no suffix letter or the letter A, after the solenoid number). Individual solenoid operation then depends on the game program enabling the ground path for solenoid actuation, via the driver transistor associated with each solenoid circuit. For example, the game program can actuate the Outhole kicker solenoid (sol. 01A), via the driver transistor Q33.

When the game program determines that the A/C Select Relay (sol. 12) must be energized, the relay connects 'circuit C power' to eight group C solenoids (01C through 08C). Now, driver transistor Q33 can actuate the Relaunch Flashlamps circuit (sol. 01C). Using this "multiplexing" technique, the same driver transistor can control actuation of two separate solenoid circuits.



Typical **SPACE STATION** +25V Circuit showing the Function of A/C Select Relay, Sol. 12

Figure 2. Typical Solenoid A/C Select Relay Circuit

## TEST/DIAGNOSTIC PROCEDURES (Continued)

### SWITCH TESTS.

#### 1. Switch Levels.

(From Solenoid Test) To initiate the Switch Levels Test, press ADVANCE. Observe that the player 1 and 2 displays show the message, SWITCH LEVELS, and the player 3 display shows 06 (Switch Levels Test identifier). Normally, the right portion of the player 3 display remains blank, indicating that no switch is actuated.

If, however, a switch is actuated (possibly stuck closed), the player 3 display shows that switch's number, while the player 1 and 2 displays indicate the switch's name. A sound also accompanies the displays. (This is another facet of the *SPACE STATION* System 11B's switch testing capability.) If more than one switch is closed, a series of displays show each actuated switch's name and number.

(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 *SPACE STATION*, switch numbers can range from 01 through 63. Refer to the **Switch-Matrix Table** for switch numbers and wiring information. CPU Board connections at jacks 1J8 (columns) and 1J10 (rows) are also listed in the table.

**SPACE STATION Switch-Matrix Table**

| COLUMN<br>ROW       | 1 Q45<br>GRN-BRN<br>1J8-1 | 2 Q46<br>GRN-RED<br>1J8-2    | 3 Q44<br>GRN-ORN<br>1J8-3 | 4 Q48<br>GRN-YEL<br>1J8-4 | 5 Q43<br>GRN-BLK<br>1J8-5                | 6 Q47<br>GRN-BLU<br>1J8-7 | 7 Q42<br>GRN-VIO<br>1J8-8            | 8 Q46<br>GRN-GRY<br>1J8-9    |
|---------------------|---------------------------|------------------------------|---------------------------|---------------------------|------------------------------------------|---------------------------|--------------------------------------|------------------------------|
| 1 WHT-BRN<br>1J10-9 | Plumb Bob<br>Tilt 1       | Playfield<br>Tilt 9          | Drain Lane<br>(left) 17   | S 25                      | Single Drop<br>Target<br>(right ramp) 33 | Left Ball<br>Popper 41    | Not Used 49                          | 3-bank Dr Tgt<br>(upr) 57    |
| 2 WHT-RED<br>1J10-8 | Not Used 2                | Outhole 10                   | S 18                      | T 26                      | (German Score<br>Board Sw) 34            | Right Ball<br>Popper 42   | 10-Point<br>(top right) 50           | 3-bank Dr Tgt<br>(cntr) 58   |
| 3 WHT-ORN<br>1J10-7 | Credit<br>Button 3        | Ball Trough<br>#1 (right) 11 | H 19                      | A 27                      | Change<br>Shuttle/Station<br>Score 35    | Ball Shooter 43           | Not Used 51                          | 3-bank Dr Tgt<br>(lwr) 59    |
| 4 WHT-YEL<br>1J10-6 | Right Coin<br>Chute 4     | Ball Trough<br>#2 (mid) 12   | U 20                      | T 28                      | Not Used 36                              | Not Used 44               | Space<br>Station #1 52               | Jet Bumper<br>(left) 60      |
| 5 WHT-GRN<br>1J10-5 | Center Coin<br>Chute 5    | Ball Trough<br>#3 (left) 13  | T 21                      | I 29                      | Top left<br>Roll-under 37                | Right Lock 45             | Space<br>Station #2 53               | Jet Bumper<br>(right) 61     |
| 6 WHT-BLU<br>1J10-3 | Left Coin<br>Chute 6      | 1 14                         | T 22                      | O 30                      | U 38                                     | Right Lock<br>Entry 46    | 10-Point<br>(lwr right) 54           | Jet Bumper<br>(lower) 62     |
| 7 WHT-VIO<br>1J10-2 | Slam<br>Tilt 7            | 2 15                         | L 23                      | N 31                      | S 39                                     | Left Lock 47              | LANE<br>CHANGE<br>(left flipper) 55  | Left Kicker<br>("sling") 63  |
| 8 WHT-GRY<br>1J10-1 | High-Score<br>Reset 8     | 3 16                         | E 24                      | Drain Lane<br>(right) 32  | A 40                                     | Left Lock<br>Entry 48     | LANE<br>CHANGE<br>(right flipper) 56 | Right Kicker<br>("sling") 64 |

**Row Problems.** If a display of two (or more) switch numbers of a row 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 in a column 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.

## TEST/DIAGNOSTIC PROCEDURES (Continued)

### SWITCH TESTS (Continued).

#### 2. Switch Edges.

From the Switch Levels Test, press ADVANCE. Observe that the player 1 and 2 displays show the message, SWITCH EDGES; the player 3 display shows 07 (Switch Edges Test identifier). The right portion of the player 3 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 11B switch testing program. When using a ball to actuate a switch, the operator should see the switch's name and number (in the player 1, 2, and 3 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 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 continue to be 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 certain now that the switch did not fail. *This test is also useful when the operator is adjusting the sensitivity of a particular switch's actuation mechanism.*

Among the possibilities is the fact that the players have not actuated 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.

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 1J10-9 and 1J8-2 should (based on the **Switch-Matrix Table**) should produce an indication of switch 09 being actuated.

### ENDING THE DIAGNOSTIC TESTS.

To end the Diagnostic Tests, reach the Switch Edges Test (07 in the Player 3 display), use AUTO-UP and press ADVANCE. The backbox displays should show the *SPACE STATION* 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, switch the game Off and then On. *SPACE STATION* 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.)

## TEST/DIAGNOSTIC PROCEDURES (Continued)

### SYSTEM-11B MEMORY CHIP TEST.

A new feature is now included in the Memory Chip Test for System 11B. During power-up, the CPU performs a self-testing routine. When all tests are satisfactory, the game proceeds to the Attract Mode, allowing players to use the game. Whenever a portion of the testing does not produce satisfactory results, the game displays a message, before proceeding to the next portion of the testing. ONLY after all tests are satisfactory does the game allow play.

In addition to the displayed message, when a test fails, the lower LED mounted on the CPU Board can be observed to determine the probable cause of the problem. The LED blinks, or flashes, a certain number of times to identify the probable cause, as described in the **CPU LED Indicator Codes Table**. The operator can also start the self-testing routine by pressing the CPU Diagnostic Switch (SW 2) on the edge of the CPU Board.

**CPU LED Indicator Codes Table**

| Diagnostic LED                                                                                                                                                                                                                                        |                    |                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Blinks/<br>Flashes                                                                                                                                                                                                                                    | Display Message    | Explanation                                                                                                                                                                                                                      |
| 1                                                                                                                                                                                                                                                     | U25 RAM FAILURE    | U25 RAM could not be used properly (NO other tests are performed; the game is locked here, until the game is turned off).                                                                                                        |
| 2                                                                                                                                                                                                                                                     | MEM. PROT. FAILURE | This message means that (A) the Coin Door may be shut; (B) the Memory Protect Switch may be stuck in the ON position; (C) the memory protect logic is protecting the memory; or (D) a U25 RAM failure is occurring. (See Note 1) |
| 3                                                                                                                                                                                                                                                     | U51 PIA FAILURE    | U51 has a malfunction. (See Note 2)                                                                                                                                                                                              |
| 4                                                                                                                                                                                                                                                     | U38 PIA FAILURE    | U38 has a malfunction. (See Note 2)                                                                                                                                                                                              |
| 5                                                                                                                                                                                                                                                     | U41 PIA FAILURE    | U41 has a malfunction. (See Note 2)                                                                                                                                                                                              |
| 6                                                                                                                                                                                                                                                     | U42 PIA FAILURE    | U42 has a malfunction. (See Note 2)                                                                                                                                                                                              |
| 7                                                                                                                                                                                                                                                     | U54 PIA FAILURE    | U54 has a malfunction. (See Note 2)                                                                                                                                                                                              |
| 8                                                                                                                                                                                                                                                     | U10 PIA FAILURE    | U10 has a malfunction. (See Note 2)                                                                                                                                                                                              |
| 9                                                                                                                                                                                                                                                     | IRQ FAILURE        | IRQ has a malfunction. It may be missing or too fast or too slow.                                                                                                                                                                |
| 10                                                                                                                                                                                                                                                    | U27 ROM FAILURE    | U27's internal checksums do not match. It may be a ROM failure, or its associated connections and connecting devices are causing it to appear to have a problem. (The following U26 test is skipped.)                            |
| 11                                                                                                                                                                                                                                                    | U26 ROM FAILURE    | U26's internal checksums do not match.                                                                                                                                                                                           |
| <b>Notes:</b> 1. This test assumes that the Coin Door is OPEN; it is initiated ONLY by pressing the CPU Diagnostic Switch (SW2).<br>2. Alternatively, its associated connections or connecting devices are causing the IC to appear to have problems. |                    |                                                                                                                                                                                                                                  |

### SYSTEM-11B SOUND CIRCUITRY TESTS.

Tests of the System-11B Sound circuitry, including the Audio Board are possible, only after successful completion of the System-11B Memory Chip Test.

- Audio Board Test.** A brief check of the Audio Board (D-11581) circuitry occurs at game Turn-on; the game reports the test results by brief sounds, as follows: No sound = Audio Board is not operating, or a failure is affecting the sound circuitry (broken cable; dead amplifier; etc.); 1 sound = system OK; 2 sounds = RAM problem; 3 sounds = U4 problem; 4 sounds = U19 problem.
- General System-11B Sound Test.** Press the Sound Diagnostic Switch (SW 1) on left edge of the CPU Board. Listen for the sound, followed by the voice ("Condition: GREEN"), showing that both the CVSD (Continuously Variable Slope Delta) Modulator, which provides the voices for *SPACE STATION*, and the DAC (Digital-to-Analog Converter) sound circuits are functioning properly.

## TEST/DIAGNOSTIC PROCEDURES (Continued)

### SYSTEM-11B SOUND CIRCUITRY TESTS (Continued)

If no sound is heard, refer to the text entitled "NO SOUND ...". If one "ring" is heard, this indicates a malfunction of the U23 RAM Chip. If either two or four "rings" is heard, this indicates a problem associated with the U21 ROM Chip. If either three or five "rings" is heard, this indicates a problem with the U22 ROM Chip.

**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 19.4 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 or a 'click' indicates that the power amplifier (U1, TDA2002), the Volume Control, and the speaker are operating satisfactorily, as is the sound circuit cabling. Not hearing a hum requires repeating the test with the Volume Control turned part way down, to determine whether the Volume Control is faulty. Also, check the cable connectors for proper mating, and that no broken wires affect this circuit.

#### FUSE LISTING.

The following fuses are used:

| Part Number   | Description                    | Circuit/Location                                      |
|---------------|--------------------------------|-------------------------------------------------------|
| 5730-09252-00 | Fuse, 8A Slow-Blow (S-B), 125v | Input Power ("high voltage") Line/Cabinet Box*        |
| 5731-09651-00 | Fuse, 5A S-B, 250v             | Gen. Illumination/Upper Rt Backbox fuseholder (4)     |
| 5730-09071-00 | Fuse, 8A S-B, 32v              | +18 VDC Lamp Ckt/ Lwr Rt Backbox fuseholder (1)       |
| 5730-12203-00 | Fuse, 1/10A S-B, 250v          | + & - 100V Display Pwr/Up'r Cntr B'box fuseholder (2) |
| 5731-08665-00 | Fuse, 2A S-B, 250v             | F1, F3 - F6; D-11813 Aux Pwr Driver Board             |
| 5731-09651-00 | Fuse, 5A S-B, 250v             | F8; D-11813 Aux Pwr Driver Board                      |
| 5731-06314-00 | Fuse, 4A S-B, 250v             | F2, F7; D-11813 Aux Pwr Driver Board                  |
| 5731-08761-00 | Fuse, 1/4A S-B, 250v           | F1, D-8345-557 Power Supply                           |
| 5731-09432-00 | Fuse, 7A S-B, 250v             | F5, F6; D-8345-557 Power Supply                       |
| 5731-09128-00 | Fuse, 2.5A S-B, 250v           | 8F1, Left underside of playfield, near pivot          |

\* One 4A S-B, 250v fuse (5731-06314-00) is provided for an overseas (220v) game installation.

## MAINTENANCE INFORMATION

Figure 3 shows the two main lubrication points of the Ball Shooter Lane Feeder (also the Right Eject Hole device, which utilizes the same mechanism). The shaded arrows show the directions in which the Ball Shooter Lane Feeder and other parts of its related assemblies can be adjusted for proper operation.

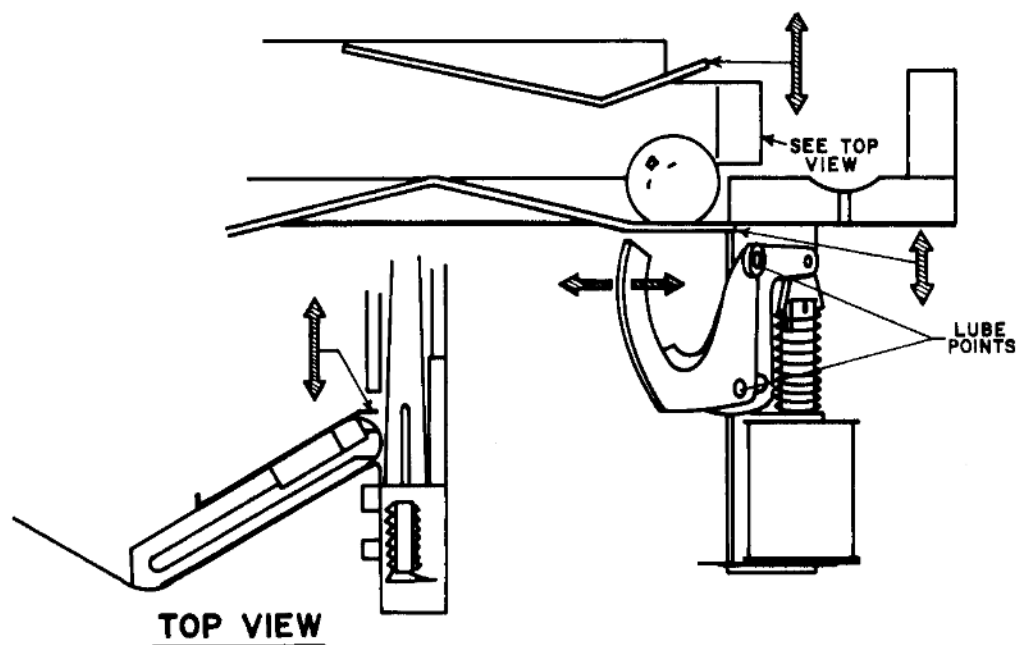


Figure 3. Adjustments and Lubrication Points, Ball Shooter Lane Feeder.

Lubrication to ensure proper operation also applies to other devices on *SPACE STATION*, such as the shaft of the Ball Poppers, and the kickbigs. Regular maintenance is essential to a game's continuing contribution to the operator's earnings.

### Solder Warning

#### WARNING

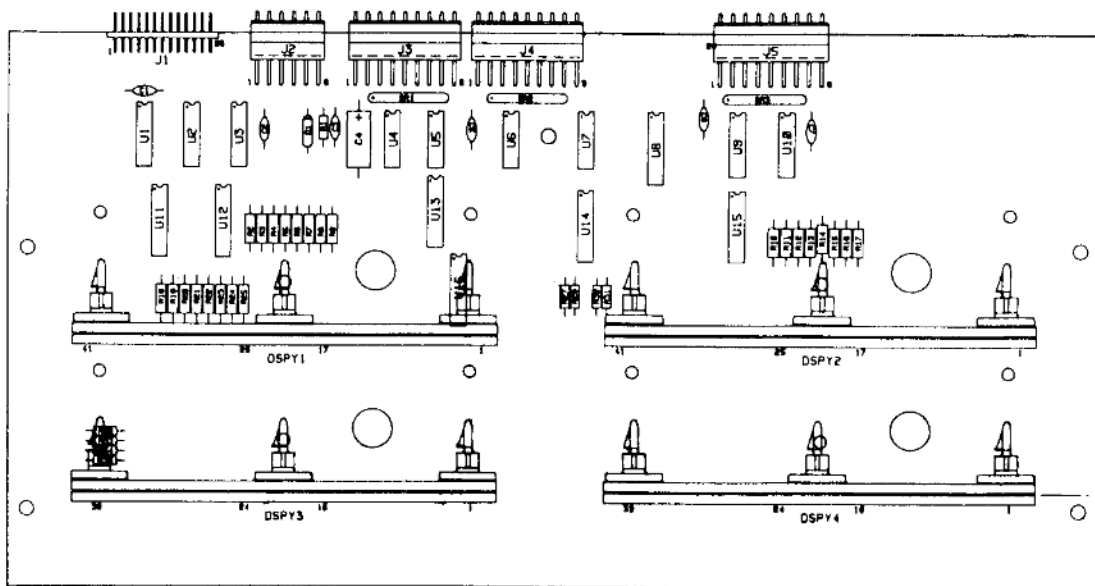
Use *ONLY Rosin-core* solder to repair electrical/electronic problems. Other types of solder can damage or destroy electronic parts, especially Printed Circuit Board wiring and switch contacts.

## **Section 2**

### ***Game Parts Information***

- **Parts Lists and Diagrams:**

- Displays Information
  - Alphanumeric Display Unit Parts
  - Power Supply Board (D-8345-557)
  - CPU Board (D-11883-552)
  - Audio Board (D-11581-552)
  - Aux Power Driver Board (D-11813-552)
- Various PCB Assemblies
- Backbox Parts
- Miscellaneous *SPACE STATION* Parts
- Flipper Assemblies
- Ball Shooter Lane Feeder
- Ball Trough Switches
- 3-Bank Drop Target Assembly
- Left Re-Entry Kickback
- Standup Target Assemblies
- Kicker & Kickbig Arm Assemblies
- Jet Bumper Assemblies
- Ball Popper Assemblies
- Space Station & Motor Assembly
- 1-2-3 Mini-Playfield Assembly
- Switches
- Lamps
- Solenoids/Flashers & Rubber Parts
- Playfield Parts
- Playfield Circuit Boards & Major Devices Locations

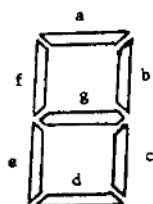
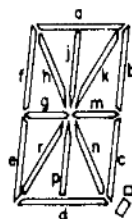


## Alphanumeric Display Unit Board

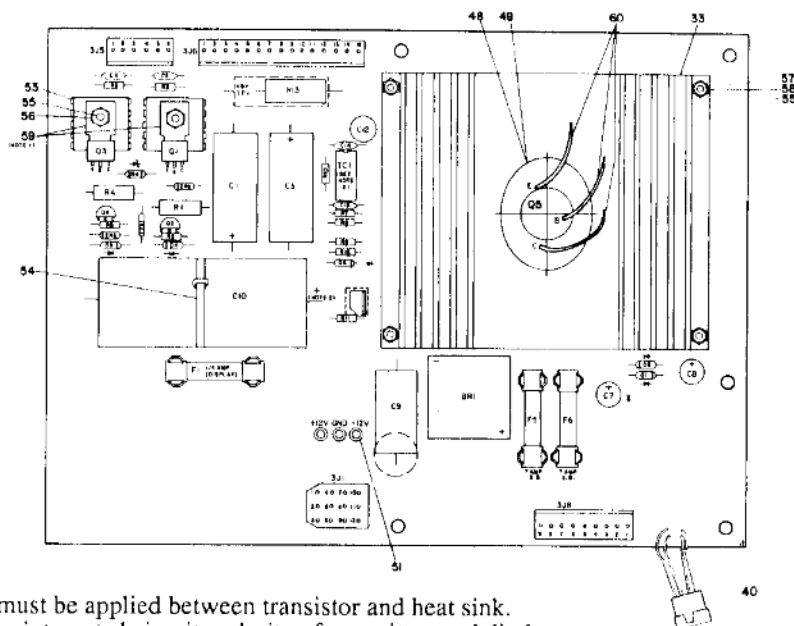
Including p/n D-11609 & associated parts

| Part No.      | Ckt Designator    | Description                                    | Part No.       | Ckt Designator                       | Description                         |
|---------------|-------------------|------------------------------------------------|----------------|--------------------------------------|-------------------------------------|
| 5760-12134-00 |                   | Bare P. C. Board                               | 5010-08773-00  | R1, R2, R8, R20, R23                 | Resistor, 18 K, 1/4 w, 5%           |
| 5680-08968-00 | U8, U13, U14, U16 | IC, Anode/Digit Driver, UD6118A or 6184        | 5010-10927-00  | R4, R6, R18, R19, R21, R22, R24, R25 | Resistor, 8.2 K, 1/2 w, 5%          |
| 5310-09882-00 | U4 - U7           | IC, Quad NOR, 4001B                            | 5010-10258-00  | R27, R28, R30 - R35                  | Resistor, 1 M, 1/4 w, 1%            |
| 5680-08969-00 | U11, U12, U15     | IC, Cathode Seg. Driver, UDN7180A              | 5010-08981-00  | R3, R5, R7, R9, R10, R12 - R17       | Resistor, 10 K, 1/2 w, 5%           |
| 5310-09153-00 | U1 - U3, U9, U10  | IC, Hex Buffer, 4050                           | 5010-08772-00  | R11                                  | Resistor, 15 K, 1/4 w, 5%           |
| 5075-09135-00 | D1                | Zener diode, 1N4740A, 10V, 1 w                 | 5670-10873-00* | DSPY1, DSPY2                         | Display, 7 - character, A/N         |
| 5040-09343-00 | C4                | Capacitor, 10 $\mu$ d., 20v, $\pm$ 20%, Axial  | 5670-09439-00* | DSPY3, DSPY4                         | Display, 7 - character, 7 - segment |
| 5043-08996-00 | C3                | Capacitor, 0.1 $\mu$ d., 50v, $\pm$ 20%, Axial | 5791-10851-00  | J1                                   | Connector, 26 pin (Hdr), Rt. Angle  |
| 5043-08980-00 | C1, C2, C5 - C7   | Capacitor, 0.01 $\mu$ d., 50v, Axial           | 5791-10869-06  | J2                                   | Connector, 6 pin (Hdr), Rt. Angle   |
| 5019-10387-00 | SR1 - SR3         | SIP, 18 K, 9R, 10P, 5%                         | 5791-10869-09  | J3 - J5                              | Connector, 9 pin (Hdr), Rt. Angle   |
|               |                   |                                                | 03-8088-1      | Support                              | Support, Display                    |

\* To show other parts locations, displays are shown vertical to pc board.



**Display Characters Segment Designations**



# NOTES:

1. Heat sink compound must be applied between transistor and heat sink.
2. Observe index mark on integrated circuit, polarity of capacitors and diodes, 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

## Power Supply p/n D-8345-557

| Item | Part No.      | Ckt Designator | Description                                       | Item | Part No.      | Ckt Designator | Description                   |
|------|---------------|----------------|---------------------------------------------------|------|---------------|----------------|-------------------------------|
| 1    | 5765-09466-01 |                | Bare P. C. Board                                  | 28   | 5164-12154-00 | Q1             | Transistor, MJE15030, NPN     |
| 2    | 5013-09426-00 | R7             | Resistor, 2.15K, 1%, 1/4w, Metal Film             | 29   | 5164-09056-00 | Q4             | Transistor, MPSD02, NPN       |
| 3    | 5013-09427-00 | R8             | Resistor, 4.99K, 1%, 1/4w, Metal Film             | 30   | 5194-12155-00 | Q3             | Transistor, MJE15031, PNP     |
| 4    | 5010-09428-00 | R11            | Resistor, 1.5K, 2%, 1/4w, C. Film                 | 31   | 5194-09055-00 | Q2             | Transistor, MPSD52, PNP       |
| 5    | 5010-09085-00 | R10            | Resistor, 1.5K, 5%, 1/4w                          | 32   | 5162-09425-00 | Q5             | Transistor, 2N6057, NPN       |
| 6    | 5010-09541-00 | R9             | Resistor, 2.7K, 2%, 1/4w                          | 33   | Not Used      |                |                               |
| 7    | 5010-09508-00 | R12            | Resistor, 270Ω, 2%, 1/4w, C. Film                 | 34   | 5791-09074-00 | 3J6            | Connector, 15 pin (Hdr)       |
| 8    | 5012-09429-00 | R13            | Resistor, 0.12Ω, 5%, 5w                           | 35   | 5791-09027-00 | 3J8            | Connector, 9 pin (Hdr)        |
| 9    | 5010-09536-00 | R1, R4         | Resistor, 39K, 5%, 1w                             | 36   | Not Used      |                |                               |
| 10   | 5010-09061-00 | R2, R5         | Resistor, 680Ω, 2w                                | 37   | 5791-09067-00 | 3J5            | Connector, 6 pin (Hdr)        |
| 11   | 5010-09069-00 | R3, R6         | Resistor, 330K, 5%, 1/2w                          | 38   | Not Used      |                |                               |
| 12   | 5040-09419-00 | C10            | Capacitor, 18,000 mfd, electr, 20v, axial         | 39   | Not Used      |                |                               |
| 13   | 5040-09420-00 | C9             | Capacitor, 1000 mfd, electr, 25v, axial or radial | 40   | H-11065       | 3J9            | Cable/Connector Assembly      |
| 14   | 5040-09423-00 | C12            | Capacitor, 330 mfd, electr, 10v, radial           | a)   | 5791-09400-00 |                | Connector shell               |
| 15   | 5043-9065-00  | C15            | Capacitor, 470 pfd                                | b)   | 5820-09080-00 |                | Connector pin                 |
| 16   | 5040-9053-00  | C1, C3         | Capacitor, 100 mfd, electr, 150v                  | 41   | 5791-09068-00 | 3J1            | Connector, 12 pin (Hdr)       |
| 17   | Not Used      |                |                                                   | 42   | 5321-09178-00 |                | Fuseholder                    |
| 18   | 5043-09072-00 | C2, C4         | Capacitor, 0.1 mfd, 500v, disc                    | 43   | 5731-06314-00 | F2             | Fuse, 4A, 250v, S-B           |
| 19   | 5043-09446-00 | C14            | Capacitor, 0.1 mfd, 50v, disc                     | 44   | Not Used      |                |                               |
| 20   | 5070-06258-00 | D1, D5, D6     | Diode, 1N4001                                     | 45   | Not Used      |                |                               |
| 21   | 5070-09054-00 | D3, D4         | Diode, 1N4004                                     | 46   | Not Used      |                |                               |
| 22   | 5075-09059-00 | ZR1, ZR3       | Zener, 1N5990, 3.9v, 5%                           | 47   | Not Used      |                |                               |
| 23   | 5075-09060-00 | ZR2, ZR4       | Zener, 1N4764, 100v, 5%                           | 48   | 5700-09445-00 |                | Socket                        |
| 24   | 5460-09424-00 | IC1            | IC, Volt. Reg., MC1723C                           | 49   | 5701-09652-00 |                | Mica Insulator                |
| 25   | Not Used      |                |                                                   | 50   | Not Used      |                |                               |
| 26   | 5040-09421-00 | C7             | Capacitor, 100 mfd, 25v, radial                   | 51   | 5824-09428-00 | TP2 - TP4      | Terminal, #1502-1 (Test Post) |
| 27   | 5040-09422-00 | C8             | Capacitor, 47 mfd, 50v, radial                    | 52   | 5100-09418-00 | BR1            | Bridge Rectifier, 35A, 100V   |
|      |               |                |                                                   | 53   | 5705-09042-00 |                | Heat Sink                     |
|      |               |                |                                                   | 54   | 03-7947       |                | Tie Wrap                      |
|      |               |                |                                                   | 55   | 4005-01016-07 |                | Mach. Screw, 5-40 x 7/16, RH  |
|      |               |                |                                                   | 56   | Not Used      |                |                               |
|      |               |                |                                                   | 57   | 4701-00023-00 |                | Lockwasher, #5, split         |
|      |               |                |                                                   | 58   | 4405-01117-00 |                | Hex Nut, 5-40                 |
|      |               |                |                                                   | 59   | 20-9229       |                | Heat sink Thermal Compound    |
|      |               |                |                                                   | 60   | Not Used      |                |                               |
|      |               |                |                                                   | 61   | 5731-09342-00 | F6, F5         | Fuse, 7A, 250V, S-B           |

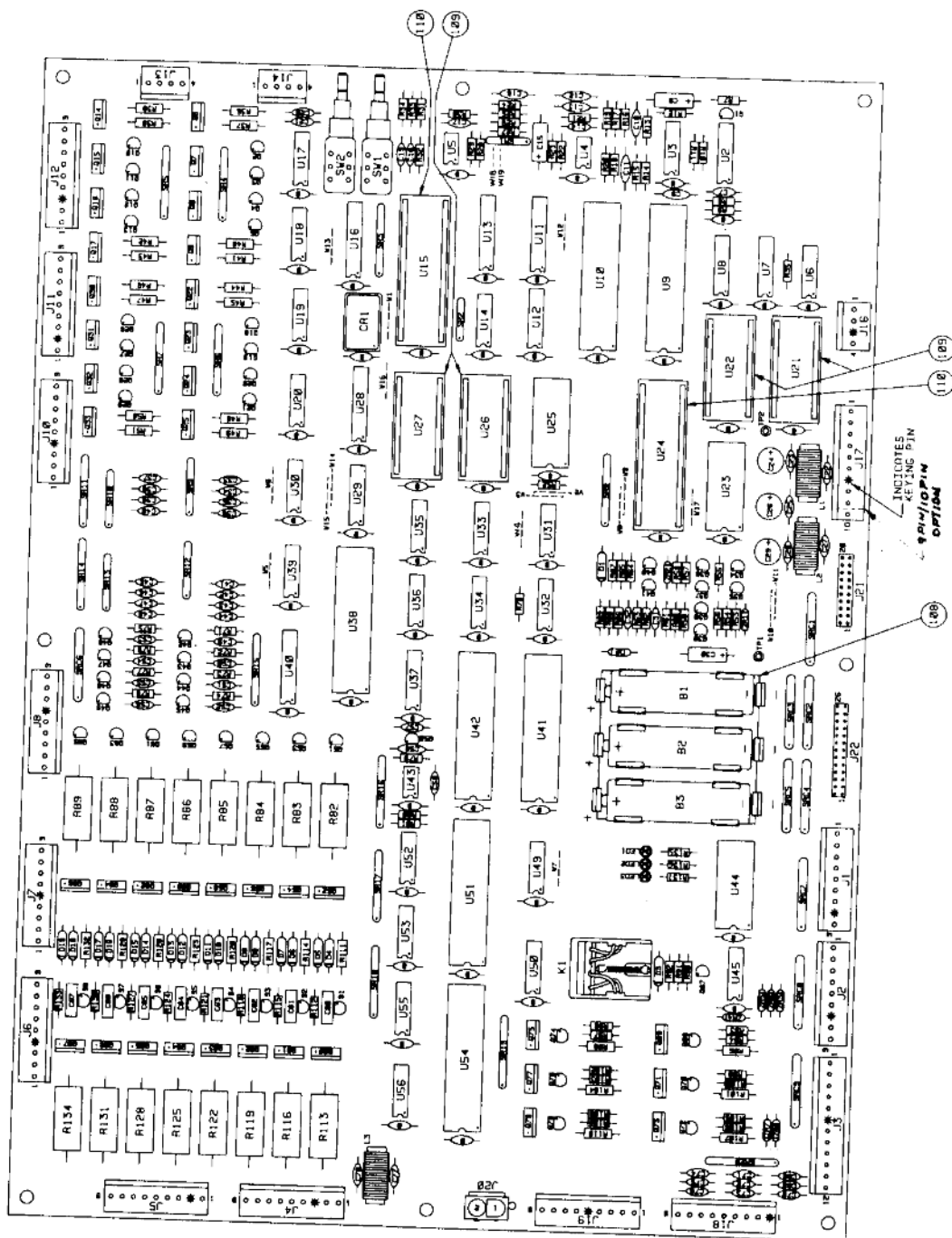
# System 11B CPU Board

p/n D-11883-552

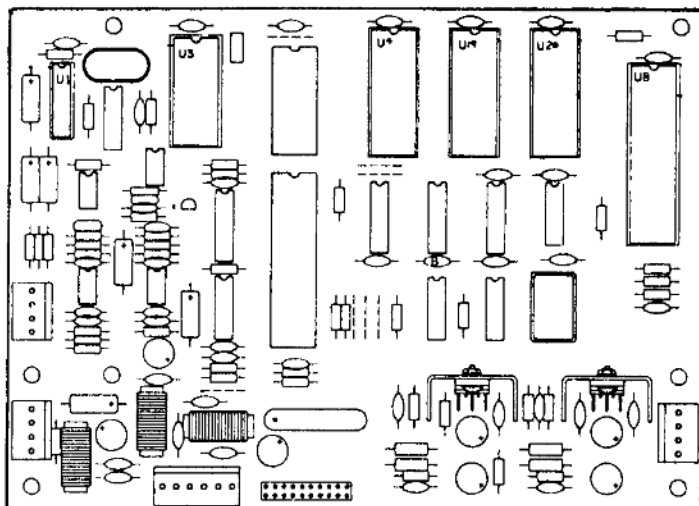
| Item | Part No.      | Ckt Designator                                                                                 | Description                                 | Item | Part No.      | Ckt Designator                                              | Description                                             |
|------|---------------|------------------------------------------------------------------------------------------------|---------------------------------------------|------|---------------|-------------------------------------------------------------|---------------------------------------------------------|
| 1    | 5764-12206-00 |                                                                                                | Bare P. C. Board                            | 63   | 5010-10171-00 | R67                                                         | Resistor, 56K $\Omega$ , 5%, 1/4w, C. F.                |
| 2    | 5370-09691-00 | U3                                                                                             | IC, CVSD Mod., 55536                        | 64   | 5010-10170-00 | R69                                                         | Resistor, 47K $\Omega$ , 5%, 1/4w, C. F.                |
| 3    | 5370-09321-00 | U4, U5                                                                                         | IC, Dual Op Amp, 1458                       | 65   | 5010-08160-00 | R59, R61, W12, W13                                          | Resistor, 220K $\Omega$ , 5%, 1/4w, C. F.               |
| 4    | 5281-09306-00 | U16                                                                                            | IC, Octal Bus Xcvr, 74LS245                 | 66   | 5010-09418-00 | R33, R34, R135-137                                          | Resistor, 470K $\Omega$ , 5%, 1/4w, C. F.               |
| 5    | 5430-08972-00 | U9, U10, U38, U41, U42, U51, U54                                                               | IC, PIA, MC6820/6821                        | 67   | 5010-09179-00 | R9                                                          | Resistor, 3.3K $\Omega$ , 5%, 1/4w, C. F.               |
| 6    | 5340-10139-00 | U25                                                                                            | IC, 2K x 8 CMOS Static RAM                  | 68   | 5010-09085-00 | R71-R78                                                     | Resistor, 1.5K $\Omega$ , 5%, 1/4w, C. F.               |
| 7    | 5280-09010-00 | U44                                                                                            | IC, 4-16 Decoder, 74154                     | 69   | 5010-10361-00 | R111, R114, R117, R120, R123, R126, R129, R132              | Resistor, 1.2K $\Omega$ , 5%, 1/2w, C. F.               |
| 8    | 5281-09246-00 | U7, U8, U12                                                                                    | IC, 2-4 Decoder, 74LS139                    | 70   | Not Used      |                                                             |                                                         |
| 9    | 5075-09406-00 | ZR3 - ZR8                                                                                      | Diode, Zener, 6.2V, 0.5w                    | 71   | Not Used      |                                                             |                                                         |
| 10   | Not Used      |                                                                                                |                                             | 72   | 5010-09120-00 | R17                                                         | Resistor, 270K $\Omega$ , 5%, 1/4w, C. F.               |
| 11   | 5281-09487-00 | U6                                                                                             | IC, Dual D Flip-flop, 74LS74                | 73   | 5010-09333-00 | R15, R16, R18                                               | Resistor, 180K $\Omega$ , 5%, 1/4w, C. F.               |
| 12   | 5431-09449-00 | U43                                                                                            | IC, Timer, MC1455                           | 74   | 5010-09324-00 | R29, R30                                                    | Resistor, 27K $\Omega$ , 5%, 1/4w, C. F.                |
| 13   | 5310-09236-00 | U29                                                                                            | IC, 14-b Counter, 4020                      | 75   | 5010-09289-00 | R20, R21                                                    | Resistor, 12K $\Omega$ , 5%, 1/4w, C. F.                |
| 14   | 5281-09743-00 | U32                                                                                            | IC, Quad 2-Input AND, 74LS08                | 76   | 5010-09356-00 | R27, R28                                                    | Resistor, 820K $\Omega$ , 5%, 1/4w, C. F.               |
| 15   | 5281-09247-00 | U14                                                                                            | IC, Quad 2-Input NOR, 74LS02                | 77   | 5019-09783-00 | SR18                                                        | SIP, 8R, 10-pin, 6.8K $\Omega$ , .125w/R, 5%            |
| 16   | 5281-09235-00 | U36                                                                                            | IC, Triple 3-Input NAND, 74LS10             | 78   | 5019-09382-00 | SR3, SR15, SR17, SR18, SR20                                 | SIP, 8R, 10-pin, 4.7K $\Omega$ , .125w/R, 5%            |
| 17   | 5280-09013-00 | U36                                                                                            | IC, Hex Inverter, 7404                      | 79   | 5019-09808-00 | SR4, SR6, SR11                                              | SIP, 8R, 10-pin, 560K $\Omega$ , .125w/R, 5%            |
| 18   | 5281-09496-00 | U31, U34                                                                                       | IC, Quad 2-Input NAND, 74LS00               | 80   | 5019-09785-00 | SR16                                                        | SIP, 8R, 10-pin, 2.2K $\Omega$ , .125w/R, 5%            |
| 19   | 5281-10014-00 | U33                                                                                            | IC, Dual 4-Input NAND, 74LS20               | 81   | 5018-10472-00 | SR14                                                        | SIP, 8R, 10-pin, 3.3K $\Omega$ , .125w/R, 5%            |
| 20   | 5281-09486-00 | U28                                                                                            | IC, Octal D Flip-flop, 74LS374              | 82   | 5019-09689-00 | SR8                                                         | SIP, 8R, 10-pin, 1.0K $\Omega$ , .125w/R, 5%            |
| 21   | 5371-09152-00 | U2                                                                                             | IC, D/A Converter, MC1408                   | 83   | 5019-09780-00 | SR9, SR10                                                   | SIP, 4R, 8-pin, 1K $\Omega$ , 5%                        |
| 22   | 5281-09745-00 | U37                                                                                            | IC, 3-8 Decoder, 74LS138                    | 84   | 5019-09786-00 | SR1, SR2                                                    | SIP, 8R, 6-pin, 4.7K $\Omega$ , .125w/R, 5%             |
| 23   | 5340-09876-00 | U23                                                                                            | IC, 2K x 8 Static RAM, 2018                 | 85   | 5019-09792-00 | SR5, SR7                                                    | SIP, 8R, 10-pin, 2.7K $\Omega$ , .125w/R, 5%            |
| 24   | Not Used      |                                                                                                |                                             | 86   | 5060-10396-00 | SRCl - SRC5, SRCl - SRC9                                    | SIP, 8R, 8C, 10-pin, 4.7K $\Omega$ & 470pfd             |
| 25   | 5281-09867-00 | U11, U13, U40                                                                                  | IC, Octal Buffer, 74LS244                   | 87   | 5010-08774-00 | R22                                                         | Resistor, 22K $\Omega$ , 5%, 1/4w, C. F.                |
| 26   | 5280-08973-00 | U17-U20, U52, U53                                                                              | IC, Quad 2-Input AND, 7408                  | 88   | 5043-08980-00 | C14, C17-C21, C31, C32, C49-C56, C59, + 54 Bypass, marked B | Capacitor, 0.01 $\mu$ fd, 50v(+80, -20%), Axial         |
| 27   | 5280-08974-00 | U55, U56                                                                                       | IC, Hex Inverter, 7406                      | 89   | 5043-09845-00 | C22, C23, C25, C27, C28                                     | Capacitor, 1K pfd, 50v(+20%), Axial                     |
| 28   | 5310-09155-00 | U30, U39                                                                                       | IC, Quad 2-Input NAND, MC14011              | 90   | 5043-08966-00 | C8, C70-75, C77, C78                                        | Capacitor, 0.1 $\mu$ fd, 50v(+20%), Axial               |
| 29   | 5280-08948-00 | U45, U50                                                                                       | IC, Quad 2-Input NOR, 7402                  | 91   | 5040-09343-00 | C8, C15                                                     | Capacitor, 10 $\mu$ fd, Electr., 20v(+20%), Axial       |
| 30   | 5280-08308-00 | U49                                                                                            | IC, Hex Buffer, 7407                        | 92   | 5043-09844-00 | C7                                                          | Capacitor, 47 pfd, 50v(+20%), Axial                     |
| 31   | 5671-09019-00 | LED1-LED3                                                                                      | LED, Red, Display                           | 93   | 5040-10074-00 | C24, C26, C29                                               | Capacitor, 100 $\mu$ fd, Electr., 25v(+50, -10%), Axial |
| 32   | 5521-10506-00 | CR1                                                                                            | Oscillator, 4 MHz                           | 94   | Not Used      |                                                             |                                                         |
| 33   | 5162-08976-00 | Q51, Q53, Q55, Q57, Q59, Q61, Q63, Q65, Q67, Q69, Q71, Q73, Q75, Q77, Q78, Q80-Q87             | Transistor, NPN Darl. 2N6427, TO-92         | 95   | 5045-09796-00 | C80-C87                                                     | Capacitor, 0.1 $\mu$ fd, Polycarbonate Rad., 100v(+10%) |
| 34   | 5191-08978-00 | Q52, Q54, Q56, Q58, Q60, Q62, Q64, Q66, Q68, Q70, Q72, Q74, Q76, Q78                           | Transistor, PNP, TIP42, TO-220              | 96   | 5043-09065-00 | C33-C40, C88, C89, C78, C10, C12                            | Capacitor, 470 pfd, 50v(+20%), Axial                    |
| 35   | 5162-09410-00 | Q8-Q9, Q14-Q17, Q22-Q26, Q30-Q33, Q69, Q71, Q73, Q75, Q77, Q78, Q80-Q87                        | Transistor, NPN, TIP122, TO-220             | 97   | 5040-09545-00 | C30                                                         | Capacitor, 22 $\mu$ fd, Electr., 10v(+50, -10%), Axial  |
| 36   | 5180-08938-00 | Q2-Q5, Q10-Q13, Q18-Q21, Q28-Q29, Q34-Q38, Q41, Q67, Q68, Q70, Q72, Q74, Q76, Q78              | Transistor, NPN, 2N4401, TO-92              | 98   | 5041-09031-00 | C58                                                         | Capacitor, 1 $\mu$ fd, Tant., 25v(+20%), Axial          |
| 37   | 5160-10269-00 | Q1, Q40, Q42-Q49                                                                               | Transistor, NPN, 2N3904, TO-92              | 99   | 5043-09030-00 | C16, C57                                                    | Capacitor, 0.047 $\mu$ fd, 50v(+20%), Axial             |
| 38   | 5190-09016-00 | Q39, Q50                                                                                       | Transistor, PNP, 2N4403, TO-92              | 100  | 5043-09492-00 | C11                                                         | Capacitor, 100 pfd, ceramic, 100v(+20%)                 |
| 39   | 5130-09014-00 | S1-S8                                                                                          | SCR, 30v, 0.8A, 2N5060                      | 101  | 5048-10992-00 | C13                                                         | Capacitor, 4700 pfd, ceramic, 50v(+10%)                 |
| 40   | 5070-06258-00 | D3-D19                                                                                         | Diode, 1N4001                               | 102  | 5561-06822-00 | L1-L3                                                       | Inductor, 4.7 $\mu$ H, 3A                               |
| 41   | 5070-08919-00 | D2                                                                                             | Diode, 1N4149, 150mA                        | 103  | 5561-06812-00 | SW1, SW2                                                    | Switch, Pushbutton, DPDT, 100v, 5A                      |
| 42   | 5070-06266-00 | D1                                                                                             | Diode, 1N5817, 1.0A                         | 104  | 5890-09022-00 | B1-B3                                                       | Battery, Alkaline, 1.5v, AA                             |
| 43   | 5075-09018-00 | ZR1                                                                                            | Diode, Zener, 1N5906A, 6.8v, 0.5w           | 105  | 5891-09021-00 | W18, W19                                                    | Bra Wire, Jumper                                        |
| 44   | 5075-09059-00 | ZR2                                                                                            | Diode, Zener, 1N5900, 3.0v, 0.5w            | 106  | 5700-10176-00 |                                                             | Battery Holder, #171                                    |
| 45   | 5010-08992-00 | R84, R97, R100, R103, R106, R109                                                               | Resistor, 560K $\Omega$ , 5%, 1/4w, C. F.   | 107  | 5700-10176-00 |                                                             | IC Socket, 28 pin                                       |
| 46   | 5010-09039-00 | R56                                                                                            | Resistor, 10K $\Omega$ , 5%, 1/4w, C. F.    | 108  | 5700-10176-00 |                                                             | IC, Game ROM 2, 27128                                   |
| 47   | 5010-09534-00 | R1, W2, W4, W5, W7, W9, W11, W14, W16, W17, W19                                                | Resistor, 0K $\Omega$ , 5%, 1/4w, C. F.     | 109  | 5700-10176-00 |                                                             | IC, Game ROM 1, 27256                                   |
| 48   | 5010-08991-00 | R31, R32, R35, R52, R56, R58, R62, R148                                                        | Resistor, 4.7K $\Omega$ , 5%, 1/4w, C. F.   | 110  | 5700-10176-00 |                                                             | IC, Sound ROM 1, 27256                                  |
| 49   | 5010-09358-00 | R54, R57, R58, R64, R66, R112, R115, R118, R121, R124, R127, R130, R133, R138-R145             | Resistor, 1.0K $\Omega$ , 5%, 1/4w, C. F.   | 111  | 5700-10176-00 |                                                             | IC, Sound ROM 2, 27256                                  |
| 50   | 5010-09113-00 | R79                                                                                            | Resistor, 33K $\Omega$ , 5%, 1/4w, C. F.    | 112  | 5700-10176-00 |                                                             | IC Socket, 40 pin                                       |
| 51   | 5010-08983-00 | R7, R8, R10, R70, R80                                                                          | Resistor, 3.3K $\Omega$ , 5%, 1/4w, C. F.   | 113  | 5400-09150-00 | U15                                                         | IC, $\mu$ Processor, 6802                               |
| 52   | 5010-09034-00 | R11-R14, R25, R26, R53, R60, R65, R90                                                          | Resistor, 10K $\Omega$ , 5%, 1/4w, C. F.    | 114  | 5400-09150-00 | U24                                                         | IC, $\mu$ Processor, 6802                               |
| 53   | 5010-09086-00 | R81                                                                                            | Resistor, 6.8K $\Omega$ , 5%, 1/4w, C. F.   | 115  | 5824-09248-00 | TP1, TP2                                                    | Test Point                                              |
| 54   | 5010-09363-00 | R3                                                                                             | Resistor, 5.6K $\Omega$ , 5%, 1/4w, C. F.   | 116  | 20-9229       |                                                             | Thermal Compound (see Note 4)                           |
| 55   | 5010-08997-00 | R23, R24, R91, R93, R96, R99, R102, R105, R108, R113, R116, R119, R122, R125, R128, R131, R134 | Resistor, 2.7K $\Omega$ , 5%, 1/4w, C. F.   | 117  | 5580-08964-01 | K1                                                          | Relay, 4-pole, 400V, 8v                                 |
| 56   | 5010-09037-00 | R15, R16, R19, R23, R51, R55, R58, R101, R104, R107, R110                                      | Resistor, 0.4K $\Omega$ , 5%, 3w, Wire-Wnd. | 118  | 5791-10862-09 | 1J1, 1J2, 1J4-1J8, 1J10-1J12, 1J17-1J19                     | Connector, 9 pin (Hdr)                                  |
| 57   | 5010-08993-00 | R82-R89                                                                                        | Resistor, 68K $\Omega$ , 5%, 1/2w, C. F.    | 119  | 5791-10862-04 | 1J13, 1J14, 1J16                                            | Connector, 4 pin (Hdr)                                  |
| 58   | 5012-10860-00 |                                                                                                | Resistor, 27K $\Omega$ , 5%, 2w, C. F.      | 120  | 5791-10862-12 | 1J3                                                         | Connector, 12 pin (Hdr)                                 |
| 59   | Not Used      |                                                                                                |                                             | 121  | Not Used      |                                                             |                                                         |
| 60   | Not Used      |                                                                                                |                                             | 122  | 5791-10850-00 | 1J22                                                        | Connector, 28 pin Ribbon (Hdr)                          |
| 61   | 5010-10987-00 | R19                                                                                            | Resistor, 56K $\Omega$ , 5%, 1/4w, C. F.    | 123  | 5791-09437-00 | 1J21                                                        | Connector, 20 pin Ribbon (Hdr)                          |
| 62   | 5010-10003-00 | R82, R63                                                                                       | Resistor, 390K $\Omega$ , 5%, 1/4w, C. F.   |      |               |                                                             |                                                         |

## NOTES:

- For Schematic, refer to drawing #16-8993.
- Items 56 and 58 (resistors) must be mounted 1/8" above PCB surface.
- Standard Jumper: W1, W2, W4, W5, W7, W8, W11, W14, W16, W17.
- Use thermal compound between item 24 (U1) and item 112 (heatsink).



System 11B CPU Board (D-11883) Parts Information



## Audio Board Assembly

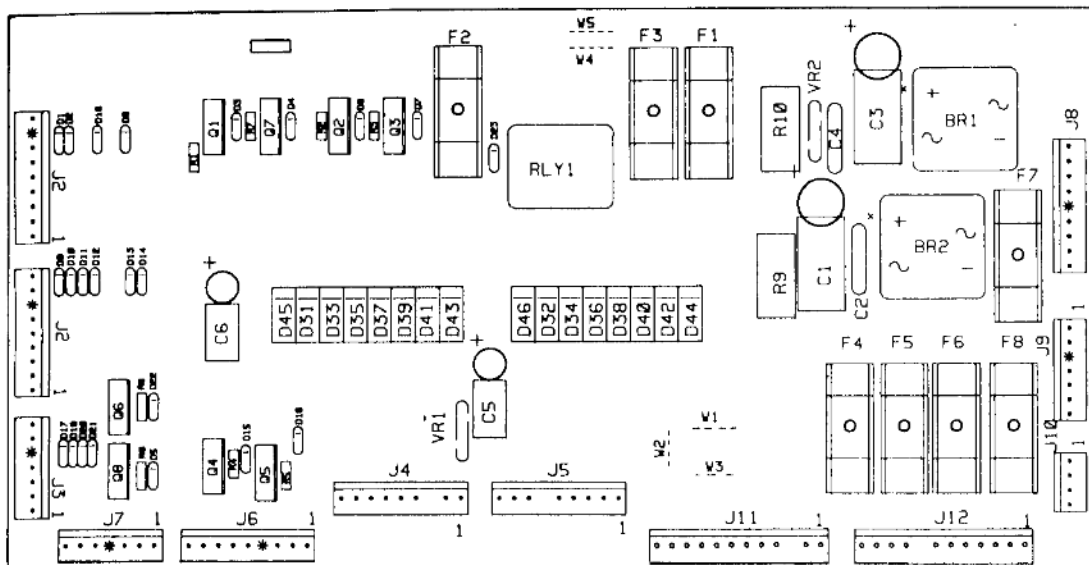
p/n D-11581-552

| Part No.         | Ckt Designator                                      | Description                       | Part No.      | Ckt Designator                | Description                             |
|------------------|-----------------------------------------------------|-----------------------------------|---------------|-------------------------------|-----------------------------------------|
| 5766-12130-00    |                                                     | Bare P. C. Board                  | 5013-09427-00 | R13                           | Resistor, 4.99K, 1/4w, 1%               |
| 5731-11087-00    | U1                                                  | IC, D/A Conv, YM3012              | 5010-09086-00 | R16                           | Resistor, 6.8K, 1/4w, 5%                |
| a) 5700-09006-00 |                                                     | Socket, IC, 16-pin (U1)           | 5010-09034-00 | R14, R15, R17, R22 - R24, R34 | Resistor, 10K, 1/4w, 5%                 |
| 5730-11088-00    | U3                                                  | IC, Sound Processor, YM2151       | 5010-08772-00 | R18                           | Resistor, 15K, 1/4w, 5%                 |
| a) 5700-09004-00 |                                                     | Socket, IC, 24-pin (U3)           | 5010-09324-00 | R6, R19 - R21, R38            | Resistor, 27K, 1/4w, 5%                 |
| 5400-10320-00    | U8                                                  | IC, $\mu$ Processor, MC68B09E     | 5010-09342-00 | R30                           | Resistor, 36K, 1/4w, 5%                 |
| a) 5700-08985-00 |                                                     | Socket, IC, 40-pin (U8)           | 5010-08824-00 | R32                           | Resistor, 43K, 1/4w, 5%                 |
| A-5343-552-5     | U4                                                  | IC, Music/Speech ROM 1            | 5010-09162-00 | R39                           | Resistor, 100K, 1/4w, 5%                |
| a) 5700-10176-00 |                                                     | Socket, IC, 28-pin (U4)           | 5010-09333-00 | R29                           | Resistor, 180K, 1/4w, 5%                |
| 5371-09152-00    | U11                                                 | IC, D/A Convtr, MC1408            | 5010-08846-00 | R31                           | Resistor, 220K, 1/4w, 5%                |
| 5430-10322-00    | U12                                                 | IC, PIA, MC68B21                  | 5010-10258-00 | R40                           | Resistor, 1M, 1/4w, 5%                  |
| 5340-09878-00    | U5                                                  | IC, RAM, 2016                     | 5010-09179-00 | R10                           | Resistor, 3.3M, 1/4w, 5%                |
| 5281-09487-00    | U7, U16                                             | IC, Dual D Flipflop, 74LS74       | 5040-09365-00 | C11                           | Capacitor, 1 $\mu$ d, 63v, +50, -10%    |
| 5281-10043-00    | U13                                                 | IC, 74LS175                       | 5040-09343-00 | C1, C3, C4, C8, C17           | Capacitor, 10 $\mu$ d, 20v, $\pm$ 20%   |
| 5281-09235-00    | U21                                                 | IC, Triple NAND, 74LS10           | 5040-10974-00 | C12, C19, C24                 | Capacitor, 100 $\mu$ d, 35v             |
| 5370-09321-00    | U9, U10, U17, U18                                   | IC, Op Amp, MC1458                | 5040-09776-00 | C26, C30                      | Capacitor, 470 $\mu$ d, 16v, +50, -10%  |
| 5281-09215-00    | U2                                                  | IC, Hex Inv, 74LS04               | 5040-12006-00 | C29, C32                      | Capacitor, 1000 $\mu$ d, 16v, 20%       |
| 5281-09246-00    | U14                                                 | IC, 2-4 Dec, 74LS139              | 5041-09243-00 | C25, C28                      | Capacitor, 10 $\mu$ d, 10v, $\pm$ 10%   |
| 5281-09745-00    | U15                                                 | IC, Dual Mux, 74LS138             | 5043-08980-00 | C5, B (21)*                   | Capacitor, 0.01 $\mu$ d, 50v, +80, -20% |
| 5370-09156-00    | U22, U23                                            | IC, Audio Amp, TDA2002            | 5043-08996-00 | C31, 33                       | Capacitor, 0.1 $\mu$ d, 50v, $\pm$ 20%  |
| a) 5705-09199-00 |                                                     | Heatsink, #6030B                  | 5043-09065-00 | C13 - C15                     | Capacitor, 470 pfd, 50v, $\pm$ 20%      |
| b) 4006-01003-06 |                                                     | 6-32 x 3/8 P-Ph-S                 | 5043-09492-00 | C2, C34                       | Capacitor, 100 pfd, 50v, $\pm$ 10%      |
| c) 4406-01117-00 |                                                     | 6-32 Hexnut                       | 5043-09844-00 | C6                            | Capacitor, 47 pfd, 50v, $\pm$ 20%       |
| d) 4703-00007-00 |                                                     | #6 Ext. Lockwasher                | 5043-09845-00 | C16, C18, C20 - C23, C27      | Capacitor, 1000 pfd, 50v, $\pm$ 20%     |
| 5370-09691-00    | U6                                                  | IC, CVSD, 55536                   | 5046-09346-00 | C7                            | Capacitor, 1200 pfd, 50v, $\pm$ 5%      |
| 5160-10269-00    | Q1                                                  | Transistor, 2N3904, NPN           | 5046-09348-00 | C10                           | Capacitor, 4700 pfd, 50v, $\pm$ 5%      |
| 5060-10396-00    | SP1                                                 | SIP 4.7K & 470pfd, BR8C           | 5046-09350-00 | C9                            | Capacitor, 180 pfd, 100v, $\pm$ 5%      |
| 5010-09181-00    | R44, R48                                            | Resistor, 1.0 $\Omega$ , 1/2w, 5% | 5520-09020-00 | X1                            | Crystal, 3.58 MHz                       |
| 5010-09161-00    | R35, R45                                            | Resistor, 2.2 $\Omega$ , 1/4w, 5% | 5521-10931-00 | CR1                           | Oscillator, 8 MHz                       |
| 5010-09361-00    | R43, R46, R47                                       | Resistor, 220 $\Omega$ , 1/2w, 5% | 5551-09822-00 | L1 - L3                       | Inductor, 4.7 $\mu$ H, 3A               |
| 5010-09358-00    | R41, R42                                            | Resistor, 1K, 1/4w, 5%            | 5791-09437-00 | J4                            | Connector, 20 pin, (Hdr), Ribbon Cable  |
| 5010-08998-00    | R2, R3, R12                                         | Resistor, 2.2K, 1/4w, 5%          | 5791-10862-04 | J1, J2, J5                    | Connector, 4 pin (Hdr)                  |
| 5010-08983-00    | R7 - R9                                             | Resistor, 3.3K, 1/4w, 5%          | 5791-10862-06 | J3                            | Connector, 6 pin (Hdr)                  |
| 5010-08991-00    | R1, R4, R5, R11, R25 - R28, R33, R36, R37, R49, R50 | Resistor, 4.7K, 1/4w, 5%          |               |                               |                                         |

Notes: \* 21 capacitors (shown on diagram with "B" symbol) provide +5VDC filtering for ICs.

All capacitors are ceramic, 50v, axial, unless otherwise noted.

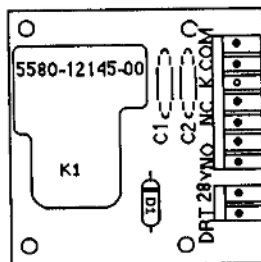
All resistors are 5%, 1/4w, Carbon Film, unless otherwise noted.



### Aux Power Driver Unit Board

p/n D-11813-552

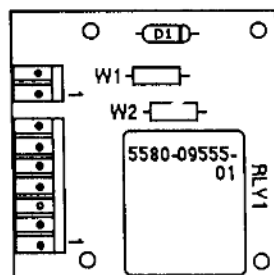
| Part No.      | Ckt Designator | Description                            | Part No.      | Ckt Designator      | Description                   |
|---------------|----------------|----------------------------------------|---------------|---------------------|-------------------------------|
| 5760-12184-00 |                | Bare P. C. Board                       | 5070-09045-00 | D31 - D46           | Diode, MR501                  |
| 5040-09537-00 | C1, C3         | Capacitor, 100 $\mu$ d., 100v, Radial  | 5191-12179-00 | Q1 - Q8             | Transistor, TIP36C            |
| 5040-12181-00 | C5, C6         | Capacitor, 10 $\mu$ d., 100v, Radial   | 5580-09555-01 | K1                  | Relay, DPDT, 13A              |
| 5043-09072-00 | C2, C4         | Capacitor, 0.1 $\mu$ d., 500v          | 5733-12060-01 |                     | Fuseholder                    |
| 5010-09160-00 | R1 - R8        | Resistor, 220 $\Omega$ , 1/4w C.F., 5% | 5733-08665-00 | F1, F3 - F6         | Fuse, 2A, S-B, 250v           |
| 5012-09874-00 | R9             | Resistor, 3.3K, 5w, 5%                 | 5733-09651-00 | F8                  | Fuse, 5A, S-B, 250v           |
| 5010-09534-00 | W1, W3, W4     | Resistor, 0 $\Omega$ , 1/4w            | 5733-06314-00 | F2, F7              | Fuse, 4A, S-B, 250v           |
| 5017-12180-00 | VR1            | Varistor, 100v                         | 5791-10862-09 | J1, J2, J4 - J6, J8 | Connector, 9-pin Hdr, Sq Pin  |
| 5017-09064-00 | VR2            | Varistor, 47v                          | 5791-10862-07 | J3, J7, J9          | Connector, 7-pin Hdr, Sq Pin  |
| 5100-09690-00 | BR1, BR2       | Bridge Rectifier, 35A, 200v            | 5791-10862-12 | J11, J12            | Connector, 12-pin Hdr, Sq Pin |
| 5070-09785-00 | D1 - D23       | Diode, 1N4003                          | 5791-10862-04 | J10                 | Connector, 4-pin Hdr, Sq Pin  |



### Motor Relay Board Assembly

p/n C-11902-1

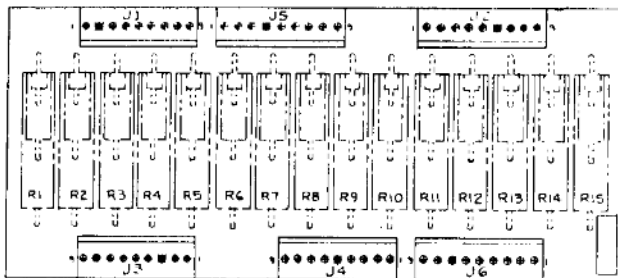
| Part No.      | Description                |
|---------------|----------------------------|
| 5768-12221-00 | PC Board                   |
| 5070-09054-00 | Diode, 1N4004, 1.0A        |
| 5580-12145-00 | Relay, 24vdc, 30A          |
| 5791-10862-02 | Header, 2-pin sq post (J1) |
| 5791-10862-07 | Header, 7-pin sq post (J2) |



### Relay Board Assembly

p/n C-11998-1

| Part No.      | Description                   |
|---------------|-------------------------------|
| 5768-12243-00 | PC Board                      |
| 5070-09054-00 | Diode, 1N4004, 1.0A (D1)      |
| 5580-09555-01 | Relay, 24vdc, 30A (K1)        |
| 5010-09534-00 | Resistor, 0 $\Omega$ (W1, W2) |
| 5791-10862-02 | Header, 2-pin sq post (J1)    |
| 5791-10862-07 | Header, 7-pin sq post (J2)    |



### Flashlamp Resistor PC Board Assembly p/n D-11814-552

| Part No.      | Description                   |
|---------------|-------------------------------|
| 5768-12183-00 | PC Board                      |
| 5012-12188-00 | Resistor, 3Ω, 5w, 10% (R1-R6) |
| 5012-10865-00 | Resistor, 5Ω, 10w, 10% (R7)   |
| 5010-09534-00 | Resistor, 0Ω (R8-R15)         |

### 4-Lamp PC Board (4-L) Assembly p/n C-11864

| Part No.      | Description             |
|---------------|-------------------------|
| 5768-12198-00 | PC Board                |
| 24-8767       | Twist Lamp Socket       |
| 24-8768       | Bulb, #555 (6.3v, .25A) |
| 5070-09054-00 | Diode, 1N4004           |
| 5791-10871-06 | Header, 6-pin sq post   |

### 14-Lamp PC Board (14-L) Assembly p/n C-11849

| Part No.      | Description             |
|---------------|-------------------------|
| 5768-12193-00 | PC Board                |
| 24-8767       | Twist Lamp Socket       |
| 24-8768       | Bulb, #555 (6.3v, .25A) |
| 5070-09054-00 | Diode, 1N4004           |
| 5791-10871-10 | Header, 10-pin sq post  |

### 3-Lamp PC Board (3Lc) Assembly p/n C-11866

| Part No.      | Description             |
|---------------|-------------------------|
| 5768-12200-00 | PC Board                |
| 24-8767       | Twist Lamp Socket       |
| 24-8768       | Bulb, #555 (6.3v, .25A) |
| 5070-09054-00 | Diode, 1N4004           |
| 5791-10871-05 | Header, 5-pin sq post   |

### 3-Lamp PC Board (3Lr) Assembly p/n C-11865

| Part No.      | Description                |
|---------------|----------------------------|
| 5768-12199-00 | PC Board                   |
| 24-8767       | Twist Lamp Socket          |
| 24-8768       | Bulb, #555 (6.3v, .25A)    |
| 5070-09054-00 | Diode, 1N4004              |
| 5791-10871-05 | Header, 5-pin sq post (J1) |

### 5-Lamp PC Board (5R) Assembly p/n C-11904

| Part No.      | Description             |
|---------------|-------------------------|
| 5768-12223-00 | PC Board                |
| 24-8767       | Twist Lamp Socket       |
| 24-8768       | Bulb, #555 (6.3v, .25A) |
| 5070-09054-00 | Diode, 1N4004           |
| 5791-10871-06 | Header, 6-pin sq post   |

### 7-Lamp PC Board (7-L) Assembly p/n C-11863

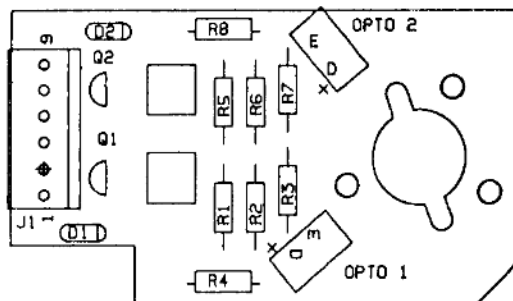
| Part No.      | Description             |
|---------------|-------------------------|
| 5768-12197-00 | PC Board                |
| 24-8767       | Twist Lamp Socket       |
| 24-8768       | Bulb, #555 (6.3v, .25A) |
| 5070-09054-00 | Diode, 1N4004           |
| 5791-10871-09 | Header, 9-pin sq post   |

### 5-Lamp/2 Flasher PC Board (5C) Assembly p/n C-11981

| Part No.      | Description                | Part No.      | Description                  |
|---------------|----------------------------|---------------|------------------------------|
| C-11917       | 5-lamp/2-flasher Assy      | C-11980       | Flashlamp Socket & Bulb Assy |
| 5768-12229-00 | PC Board                   | 5768-12241-00 | Bare PC Board                |
| 24-8767       | Twist Lamp Socket          | 24-8803       | Socket, Lamp                 |
| 24-8768       | Bulb, #555 (6.3v, .25A)    | 24-8802       | Bulb, #906 Flamp, 13v, 0.69A |
| 5070-09054-00 | Diode, 1N4004              | 5791-10871-02 | Header, 2-pin sp post (J2)   |
| 5791-10871-06 | Header, 6-pin sq post (J1) |               |                              |

## Space Station Opto Positioner PC Board Assembly

p/n C-11872

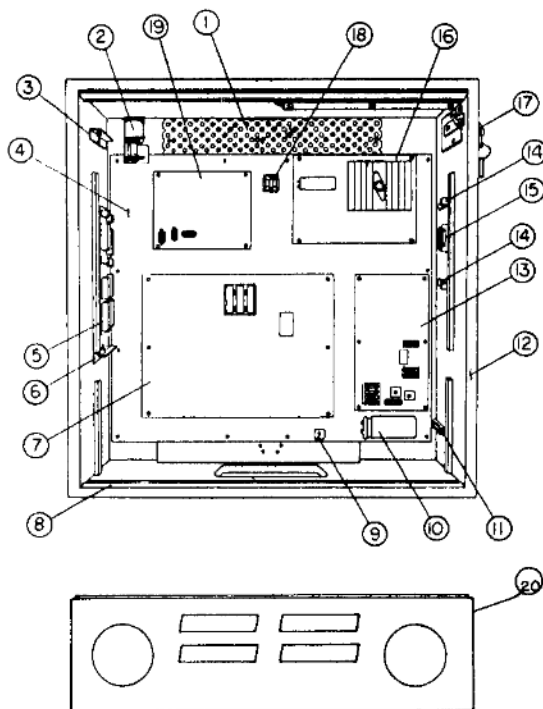


### Part No.

5768-12202-00  
5490-10159-00  
16-8850-187  
5010-08930-00  
5010-09536-00  
5010-09162-00  
5010-09324-00  
5070-08919-00  
5190-10270-00  
5791-10871-06  
EI-124

### Description

Bare PC Board  
Opto Interruptor Module  
Label, PC Identifier  
Resistor, 470Ω, 1/2w, 5%, C. F. (R4, R8)  
Resistor, 820Ω, 1/4w, 5%, C. F. (R2, R6)  
Resistor, 100K, 1/4w, 5%, C. F. (R1, R5)  
Resistor, 27K, 1/4w, 5%, C. F. (R3, R7)  
Diode, 1N4148, 150mA (D1, D2)  
Transistor, 2N3906, TO-92, PNP  
Header, 6-pin sq post (J1)  
RTV Silicone Cement



## Backbox Parts Listing

| Item | Part No.      | Description                 |
|------|---------------|-----------------------------|
| 1    | 01-6645       | Venting Screen              |
| 2    | B-10686-2     | Knocker Assembly            |
| 3    | A-7984        | Upr Insert Bd Hinge Assy    |
| 4    | D-11825       | PCB Plate Assembly          |
| 5    | C-11762-552   | B'box Interconnect Board    |
| 6    | A-10815       | Lwr Insert Bd Hinge Assy    |
| 7    | D-11883-552   | System 11B CPU Board        |
| 8    | 01-8569       | Lwr Spkr Panel Bracket      |
| 9    | 5100-09418-00 | Bridge Rectifier, 100v, 35A |
| 10   | 5040-09051-00 | Capacitor, 30,000 μFd, 25V  |
| 11   | 5733-10702-01 | Fuse Holder, 1-Pos          |
| 12   | 11-855-552    | Backbox                     |
| 13   | D-11813-552   | Aux. Pwr Driver Board       |
| 14   | 01-8084       | Insert Stop Bracket         |
| 15   | 5733-10702-04 | Fuse Holder, 4-Pos          |
| 16   | D-8345-557    | Power Supply Assembly       |
| 17   | 20-9549       | Cam Lock                    |
| 18   | 5733-10702-02 | Fuse Holder, 2-Pos          |
| 19   | D-11581-552   | Audio Board Assembly        |
| 20   | D-11611-552   | Display/Spkr Panel Assy     |
| a)   | 31-1420-552   | Cover, Displ/Spkr Pnl Assy  |

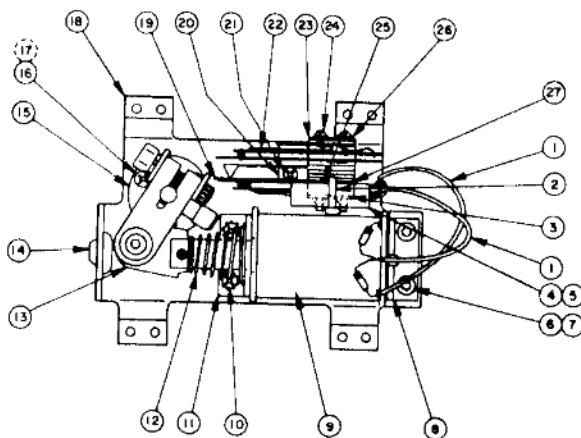
## Miscellaneous SPACE STATION Parts

| Part No.    | Description                   | Part No.      | Description                     |
|-------------|-------------------------------|---------------|---------------------------------|
| 31-1002-552 | Playfield, SPACE STATION      | 11-552-IN     | Insert Board (Backbox)          |
| 31-1357-552 | Backglass, SPACE STATION      | 5795-10937-09 | Ribbon Cable, 20-conductor, 9"  |
| 31-1006-552 | Plastics Set, SPACE STATION   | 5795-10938-27 | Ribbon Cable, 26-conductor, 27" |
| 01-6571     | Hinge Mtg Bracket, Insert Bd. | 03-7960-552   | Playfield Mylar                 |
| 01-6652     | Stop Bracket                  | 01-8431       | Playfield Post Adj Nut Plate    |
| 01-6655     | Latch - Insert Board          |               |                                 |

## Flipper Assembly

p/n C-11626-R-4

| Item | Part No.       | Description                             |
|------|----------------|-----------------------------------------|
| 1    | HW-30018-6     | Wire, 18 AWG, Blue                      |
| 2    | 03-7520-2      | Ty-Wrap, Nylon                          |
| 3    | 20-6516        | Speednut, Tinnerman                     |
| 4    | 5045-12098-00  | Capacitor, 2.2 $\mu$ Fd, 250V, 20%      |
| 5    | RM-21-06       | Sleeve, Vinyl (Cap. leads)              |
| 6    | 4010-01066-06  | Cap Screw, 10-32 x 3/8, SH              |
| 7    | 4701-00004-00  | Lockwasher, #10 split                   |
| 8    | A-10821        | Flipper Stop Assembly                   |
| 9    | FL-11630/50V   | Flipper Coil                            |
| 10   | 4006-01017-04  | Mach. Screw, 6-32 x 1/4, P-RH-S         |
| 11   | 01-7695        | Solenoid Bracket                        |
| 12   | 10-376         | Coil Plunger Spring                     |
| 13   | B-10655-R      | Crank Link Assembly                     |
| a)   | 02-4179        | Link Spacer Bushing                     |
| b)   | 4010-01066-14  | Cap Screw, 10-32 x 7/8, SH              |
| c)   | 4700-00023-00  | Washer, 5/8 o.d. x 13/64 i. d. x 15 ga. |
| d)   | 4701-00004-00  | Lockwasher, #10 split                   |
| e)   | 4410-01132-00  | Nut, 10-32 ESNA                         |
| f)   | A-10656        | Flipper Link Assembly                   |
| 1.)  | 02-4219        | Coil Plunger                            |
| 2.)  | 20-9370-1      | Spring Pin, 5/32 dia. x 7/16            |
| 3.)  | 03-8050        | Flipper Link                            |
| g)   | B-10657-R      | Flipper Crank Assembly, Right           |
| 1.)  | 01-8073-R      | Flipper Crank, Right                    |
| 2.)  | 17-1037        | Crank Washer                            |
| 3.)  | 4010-01066-18  | Cap Screw, 10-32 x 1-1/8, HCS           |
| 4.)  | 4410-01127-00  | Nut, 10-32 Hex Hd.                      |
| 5.)  | 4700-00107-00  | Washer, 5/8 o.d. x 13/64 i. d. x 12 ga. |
| 6.)  | 4701-00004-00  | Lockwasher, #10 split                   |
| 7.)  | RM-23-06       | Tubing, H. S. 1/4 DWP                   |
| 14   | 23-6577        | Bumper Plug                             |
| 15   | 03-7568        | Flipper Bushing                         |
| 16   | 4006-01005-06  | Mach. Screw, 6-32 x 3/8, P-PH           |
| 17   | 4406-01117-00  | Nut, 6-32 Hex                           |
| 18   | C-11627-R      | Flipper Base Assembly, R.               |
| 19   | 06-14G         | Insulating Blade                        |
| 20   | No part number | (Now part of item 18)                   |
| 21   | Not Used       | (Former attaching part for item 20)     |
| 22   | B-9951         | Switch & Diode Assembly                 |
| a)   | SW-1A-150      | Switch, Lane Change                     |
| b)   | 5070-06258-00  | Diode, 1N4001                           |
| 23   | 01-3670-1      | Plate, Switch                           |
| 24   | 4105-01001-20  | Sh. Metal Screw, #5 x 1-1/4, P-PH-AB    |
| 25   | 03-7811        | End of Stroke (EOS) Switch              |
| 26   | 4701-00002-00  | Lockwasher, #6 split                    |
| 27   | 23-6622        | Tape, Double-sided                      |



### Flipper Assembly Notes

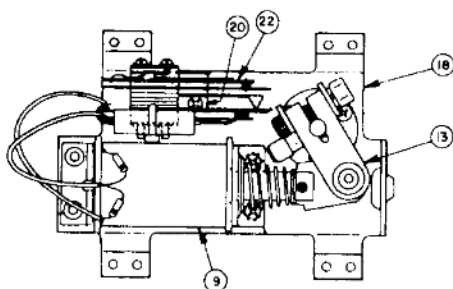
- Each Flipper Assembly is mounted beneath the playfield, in conjunction with the plastic Flipper Paddle and Shaft (20-9250-5) and flipper Rubber (23-6519-4) on the upper side of the playfield.
- The tip of the EOS Switch must travel 0.0150 (+ .010, - .000) inch, before the contacts fully open, with the flipper in the actuated position. The EOS Switch contacts must have a gap of 0.062 ( $\pm$  .015) inch. Adjustment of the EOS Switch must be made at a minimum distance of 0.25 inch from the switch body.
- The Lane Change Switch must have a gap of 0.046 ( $\pm$  .015) inch, when fully open.
- All moving elements of the assembly must operate freely, with no evidence of binding.
- The large end of the Coil Plunger Spring must fit within the four lugs of the Solenoid Bracket.
- For coil replacement, remove the Solenoid Bracket (item 3) to prevent screw damage.
- Use Loctite™ 242 when reattaching screws to the Flipper Stop Assembly, the Solenoid Bracket, and the Flipper Bushing.
- When using the Bumper Plug (item 13) on older flipper assemblies, readjust the flipper paddle and shaft position.
- Solid color blue wire connects to the banded end of the diode, mounted on the connector end of the Flipper Coil (item 8). Trace color wire connects to the unbanded end of the diode.

## Flipper Assembly

p/n C-11626-L-4

(Parts listed replace same items of C-11626-R-4)

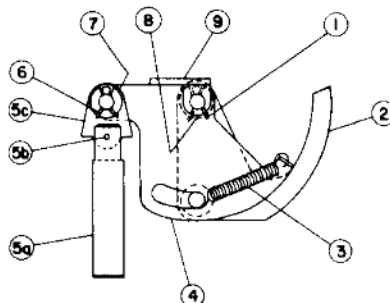
| Item | Part No.    | Description                  |
|------|-------------|------------------------------|
| 13   | B-10655-L   | Crank Link Assembly          |
| g)   | B-10657-L   | Flipper Crank Assembly, Left |
| 1.)  | 01-8073-L   | Flipper Crank, Left          |
| 18   | C-11627-L   | Flipper Base Assy, L.        |
| 20   | No p/n      | (Now part of item 18)        |
| 22   | B-9951-1    | Switch & Diode Assembly      |
| a)   | SW-1A-150-1 | Switch, Lane Change          |



# Ball Shooter Lane Feeder

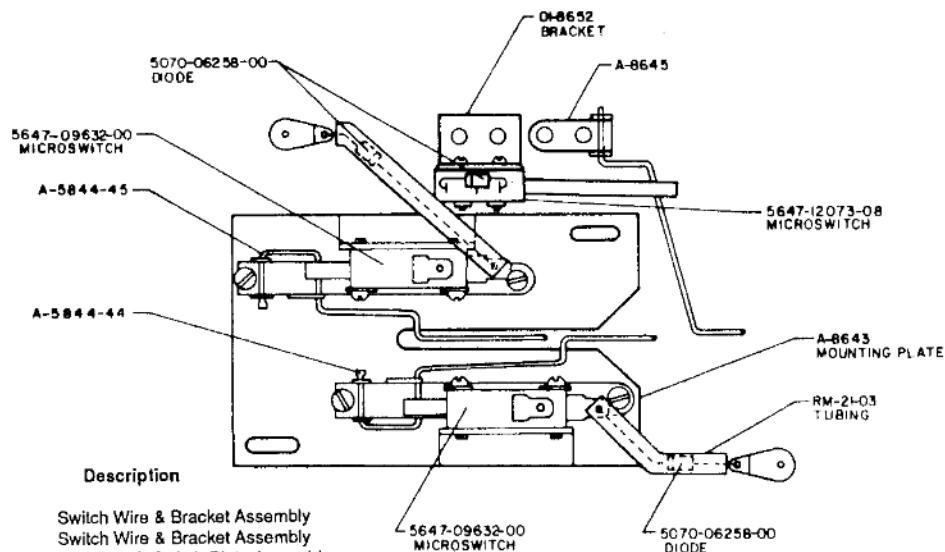
p/n C-9638-3 & Associated Parts

| Item | Part No.      | Description                               |
|------|---------------|-------------------------------------------|
| 1    | 12-6227       | Clip, Hair Pin                            |
| 2    | A-8247        | Ball Eject Cam Assembly                   |
| 3    | 10-320        | Spring                                    |
| 4    | A-6949-L      | Spring Plate Assembly                     |
| 5    | A-8050-1      | Plunger Assembly                          |
| a)   | 02-3407-2     | Coil Plunger                              |
| b)   | 20-8716-5     | Roll Pin                                  |
| c)   | 03-8085       | Armature Link                             |
| 6    | 12-6227       | Clip, Hair Pin                            |
| 7    | 4700-00030-00 | Washer, 1/2 o.d. x 17/64<br>i.d. x 15 ga. |
| 8    | 4700-00103-00 | Washer, 1/2 o.d. x 17/64<br>i.d. x 28 ga. |
| 9    | A-8268-2      | Mounting Bracket Assy                     |



## Associated Parts

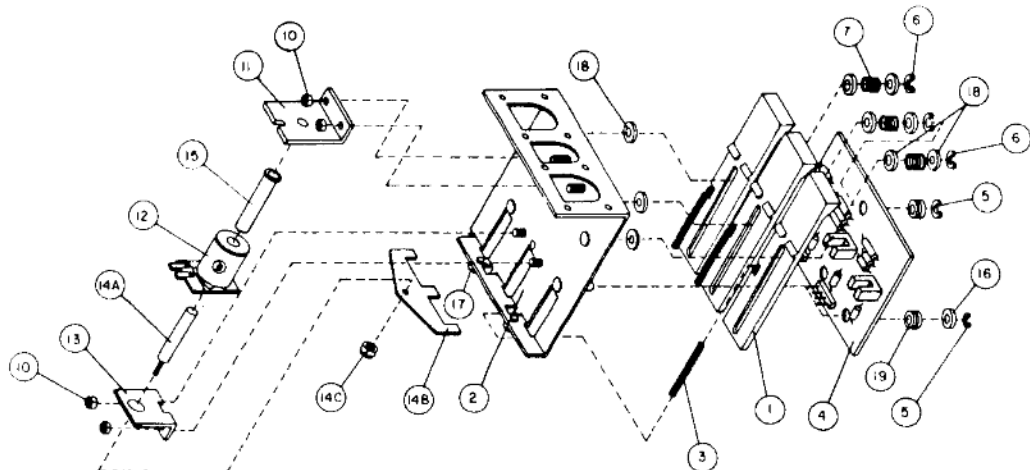
|               |                         |
|---------------|-------------------------|
| B-9362-R-1    | Coil & Bracket Assembly |
| B-7572-1      | Bracket & Stop Assembly |
| 01-8-508-S    | Coil Retaining Bracket  |
| 4006-01017-06 | Mach. Screw, 6-32 x 3/8 |
| 4406-01119-00 | Nut, 6-32 ESN           |
| AE-23-800     | Coil Assembly           |
| 03-7066       | Coil Tubing             |



| Part No.      | Description                       |
|---------------|-----------------------------------|
| A 5844-44     | Switch Wire & Bracket Assembly    |
| A-5844-45     | Switch Wire & Bracket Assembly    |
| B-8644        | Ball Trough Switch Plate Assembly |
| A-8643        | Bracket & Mounting Plate Assembly |
| 5647-09957-00 | Ball Trough Switch, Center & Left |
| 4004-01060-08 | Mach. Screw, 4-40 x 1/2, SL-PH-S  |
| 4005-01005-02 | Mach. Screw, 5-40 x 1/8, P-PH     |
| 5070-06258-00 | Diode, 1N4001                     |
| 5825-09372-00 | Solder Lug                        |
| RM-21-03      | Insulating Tubing, #10 x 1.75"    |
| A-11680       | Ball Trough Switch, Right         |
| 5647-12073-08 | Submin. Switch                    |
| 5070-06258-00 | Diode, 1N4001                     |
| A-8645        | Switch Wire & Bracket Assembly    |

## Ball Trough Switches

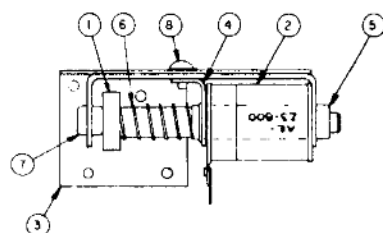
(viewed from underside of playfield to show parts locations)



### 3-Bank Drop Target

p/n C-11223-1

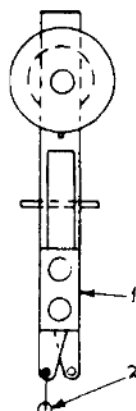
| Item | Part No.      | Description              | Item | Part No.      | Description             |
|------|---------------|--------------------------|------|---------------|-------------------------|
| 1    | 03-8036       | Target Blade, Plain      | 12   | AE-26-1200    | Coil Assembly           |
| 2    | B-11224       | Bracket, 3-Bank Mounting | 13   | 01-8413       | Bracket, Coil Mounting  |
| 3    | 10-364        | Spring, Retractor        | 14A  | 02-3972-1     | Plunger                 |
| 4    | C-11318       | Opto Switch Assembly     | 14B  | 01-8408       | Reset Plate, 3-Bank     |
| 5    | 20-8712-18    | Retaining Clip, 3/16"    | 14C  | 4410-01132-00 | Nut, 10-32 ESNA         |
| 6    | 20-8712-25    | Retaining Clip, 1/4"     | 15   | 03-7066-4     | Coil Tubing             |
| 7    | 10-392        | Spring, Compression      | 16   | 4700-00016-00 | Flatwasher, 3/16 i. dia |
| 8    | Not Used      |                          | 17   | 4008-01016-10 | Mach. Screw, 8-32 x 5/8 |
| 9    | Not Used      |                          | 18   | 4700-00072-00 | Flat Washer, 1/4 i. dia |
| 10   | 4408-01119-00 | Nut, 8-32 ESNA           | 19   | 23-6626       | Grommet, PCB Mtg        |
| 11   | A-11397       | Stop Bracket             |      |               |                         |



### Left Re-entry Kickback

p/n B-11873-1

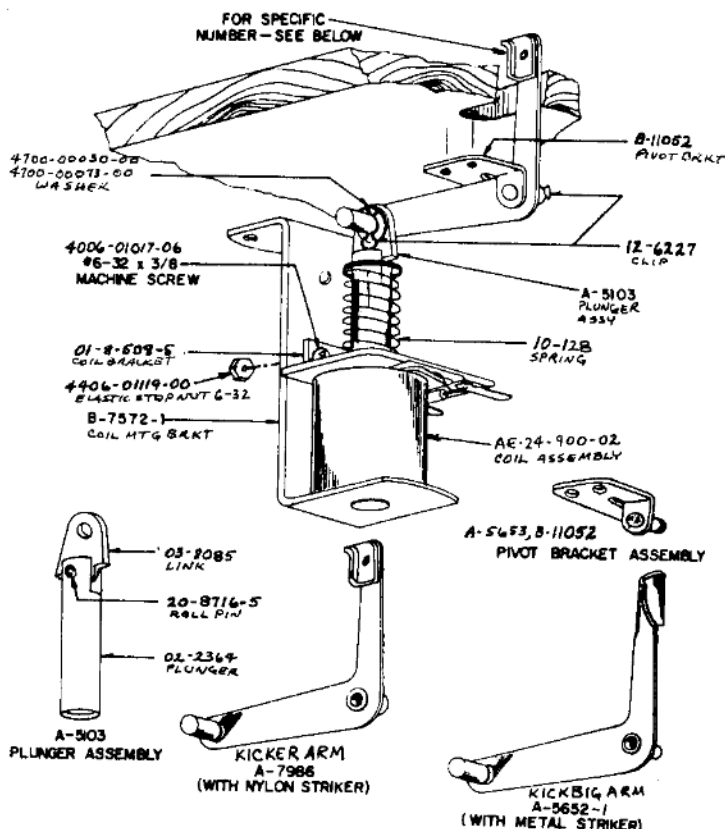
| Item | Part No.      | Description               |
|------|---------------|---------------------------|
| 1    | A-6306-2      | Bell Armature Assembly    |
| 2    | AE-24-900     | Coil Assembly             |
| 3    | B-7409-2      | Mounting Bracket Assembly |
| 4    | 01-8-508-T    | Solenoid Bracket          |
| 5    | 03-7067-5     | Coil Tubing               |
| 6    | 10-135        | Spring, Solenoid          |
| 7    | 23-6420       | Grommet, Rubber           |
| 8    | 4008-01017-05 | Mach. Screw, 8-32 x 5/16  |



### Standup Target Assemblies

|   |                   |                                      |
|---|-------------------|--------------------------------------|
| 1 | p/n B-11696-5     | SHUTTLE & STATION<br>Standup Targets |
| 1 | p/n B-11696-8     | CHANGE Bullseye Target               |
| 2 | p/n 5070-06258-00 | 1N4001 Diode                         |

# BALL KICKER ASSEMBLIES



## Kicker Arm Assembly p/n B-9463 (Left & Right Kickers)

| Part No.      | Description                              |
|---------------|------------------------------------------|
| 12-6227       | Clip, Hair Pin                           |
| A-7986        | Kicker Arm Assembly                      |
| A-5103        | Plunger Assembly                         |
| 02-2364       | Coil Plunger                             |
| 20-8716-5     | Roll Pin                                 |
| 03-8085       | Armature Link                            |
| 4700-00073-00 | Washer, 1/2 o.d. x 9/32<br>i.d. x 15 ga. |
| A-5653        | Mounting Bracket Assy                    |

### Associated Parts

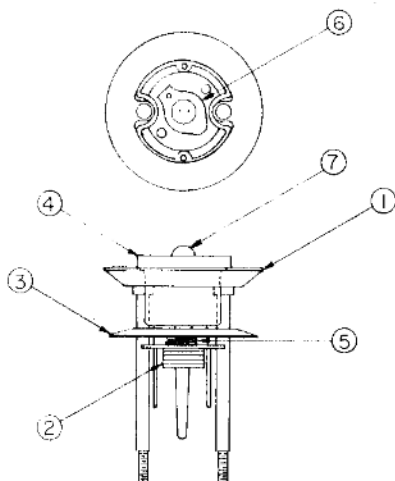
|               |                         |
|---------------|-------------------------|
| B-9362-L-2    | Coil & Bracket Assembly |
| B-7572-1      | Bracket & Stop Assembly |
| 01-8-508-S    | Coil Retaining Bracket  |
| 4006-01017-06 | Mach. Screw, 6-32 x 3/8 |
| 4406-01119-00 | Nut, 6-32 ESN           |
| AE-26-1200    | Coil Assembly           |
| 03-7066       | Coil Tubing             |

## Kickbig Arm Assembly p/n B-11051-R (Left Lock Kickbig)

| Part No.      | Description                               |
|---------------|-------------------------------------------|
| 12-6227       | Clip, Hair Pin                            |
| A-5652-1      | Kickbig Arm Assembly                      |
| A-5103        | Plunger Assembly                          |
| 02-2364       | Coil Plunger                              |
| 20-8716-5     | Roll Pin                                  |
| 03-8085       | Armature Link                             |
| 4700-00030-00 | Washer, 1/2 o.d. x 17/64<br>i.d. x 15 ga. |
| B-11052       | Mounting Bracket Assy                     |

### Associated Parts

|               |                         |
|---------------|-------------------------|
| B-9362-R-1    | Coil & Bracket Assembly |
| B-7572-1      | Bracket & Stop Assembly |
| 01-8-508-S    | Coil Retaining Bracket  |
| 4006-01017-06 | Mach. Screw, 6-32 x 3/8 |
| 4406-01119-00 | Nut, 6-32 ESN           |
| AE-23-800     | Coil Assembly           |
| 03-7066       | Coil Tubing             |

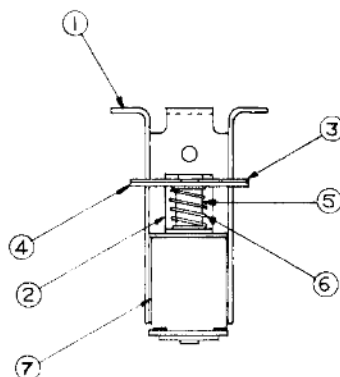


## Jet Bumper Assembly p/n B-9414 (Above the playfield)

| Item      | Part No.   | Description          |
|-----------|------------|----------------------|
| 1         | A-4754     | Bumper Ring Assembly |
| 2         | 03-6009-A5 | Bumper Base, White   |
| 3         | 03-6035-5  | Bumper Wafer, White  |
| 4         | 03-7443-5  | Bumper Body, White   |
| 5         | 10-7       | Spring               |
| 6         | 24-8776    | Lamp Socket          |
| 7         | 24-8768    | Bulb, #555           |
| Not Shown | 03-7444-9  | Cap, Jet Bumper (2)  |
|           | 17-1098    | Cap, Modified (1)    |

## Jet Bumper Coil Assembly p/n B-9415-1 (Beneath the playfield)

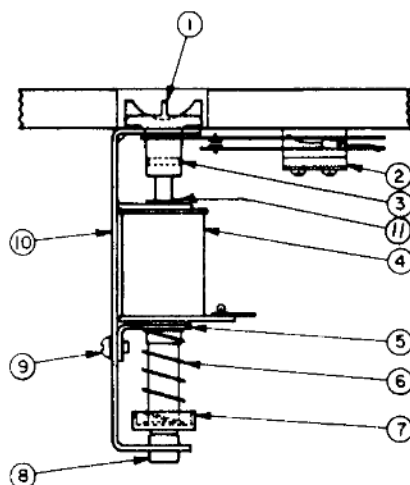
| Item | Part No.          | Description               |
|------|-------------------|---------------------------|
| 1    | B-7417            | Bracket and Stop Assembly |
| 2    | 01-1747           | Coil Retaining Bracket    |
| 3    | 01-5492           | Armature Link, Steel      |
| 4    | 01-5493           | Armature Link, Bakelite   |
| 5    | 02-3406-1         | Coil Plunger              |
| 6    | 10-326            | Armature Spring           |
| 7    | AE-23-800-03-7066 | Coil<br>Coil Tubing       |



## Left Ball Popper & Switch Assembly

including p/n D-11335-1, and associated parts

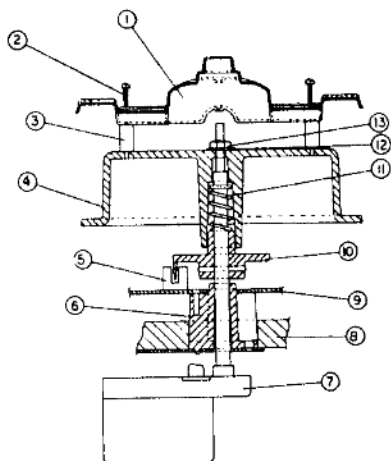
| Item | Part No.      | Description                    |
|------|---------------|--------------------------------|
| 1    | 03-8053       | Cap, Ball Popper               |
| 2    | A-11657       | Switch Assembly                |
| a)   | A-11658       | Switch & Diode Assembly        |
| b)   | 01-3670-1     | Switch Plate                   |
| c)   | 4205-01016-14 | Wood Screw, #5 x 7/8, P-RH     |
| 3    | 20-9314-7     | Dowel Pin, 3/32 dia x 1/2      |
| 4    | AE-24-900     | Coil Assembly                  |
| 5    | A-11721       | Bracket Assembly               |
| 6    | 10-135        | Spring                         |
| 7    | A-11336       | Armature Assembly              |
| 8    | 23-6420       | Grommet, Rubber                |
| 9    | 4008-01017-05 | Mach. Screw, 8-32 x 5/16, P-RH |
| 10   | B-11631       | Bracket Assembly, Ball Popper  |
| 11   | 03-7067       | Tubing, Coil                   |



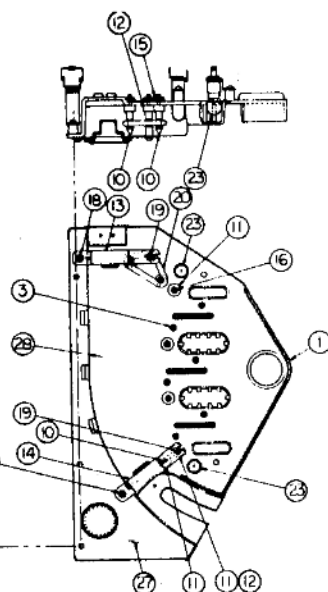
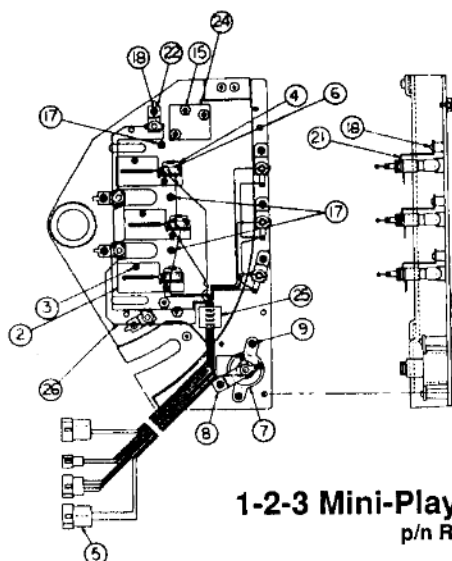
## Right Ball Popper & Switch Assembly p/n D-11335-2 & Associated Parts (Parts listed replace same items of D-11335-1)

| Item | Part No.  | Description   |
|------|-----------|---------------|
| 4    | AE-23-800 | Coil Assembly |

## Space Station & Motor Assembly



| Item | Part No.      | Description               |
|------|---------------|---------------------------|
| 1    | 03-8123       | Space Station Wheel       |
| 2    | 4205-01016-16 | Wood Screw, #5 x 1"       |
| 3    | 0-8022        | Post, Black               |
| 4    | 03-8107       | Rotating Ball Guide       |
| 5    | 5490-10159-00 | Opto Module (p/o C-11872) |
| 6    | 03-8105       | Bearing/Ckt Bd Support    |
| 7    | 14-7941-2     | Motor, 24Vac, 11 rpm      |
| 8    |               | Playfield                 |
| 9    | C-11872       | Opto Positioner Board     |
| 10   | 03-8106       | Wheel Positioner Cam      |
| 11   | 10-403        | Spring                    |
| 12   | 4700-00011-00 | Flatwasher                |
| 13   | 4410-01132-00 | Nut, 10-32 ESNA           |

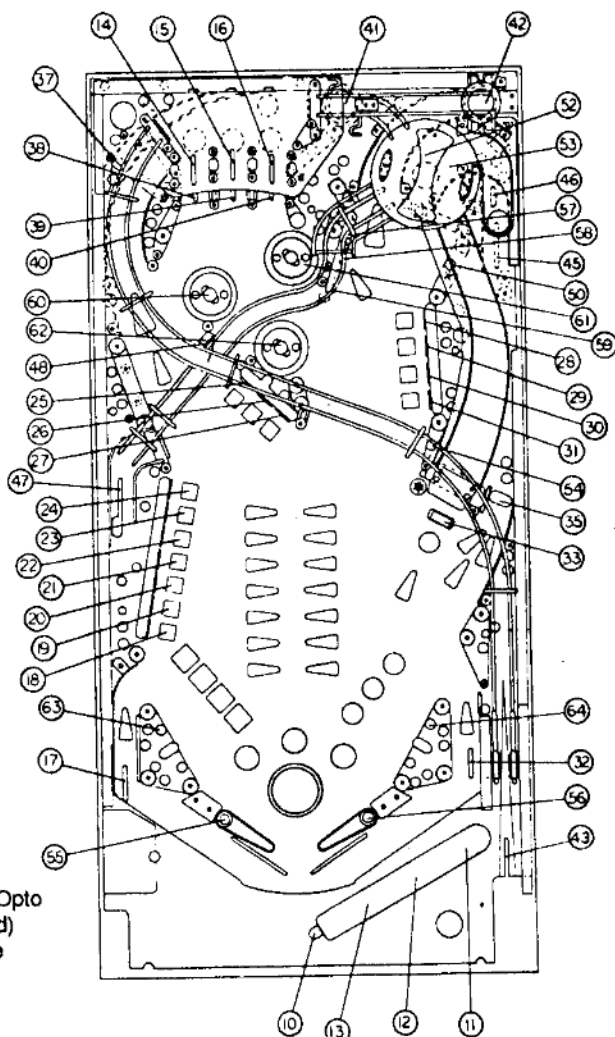


### 1-2-3 Mini-Playfield Assembly p/n R-11780

| Item             | Part No.      | Description              | Item       | Part No.      | Description               |
|------------------|---------------|--------------------------|------------|---------------|---------------------------|
| 1                | 03-8109       | 1 - 2 - 3 Mini-Playfield | 14         | B-11788       | Ball Gate Assembly        |
| 2                | 01-8801       | Switch Mounting Bracket  | a) 12-6752 |               | Gate Wire                 |
| 3                | 07-6688-19    | Rivet                    | 15         | 4406-01128-00 | Nut, 6-32 KEPS            |
| 4                | A-11991       | Switch & Diode Assy      | 16         | 03-8044-9     | Post, Plastic             |
| a) 5647-12073-01 |               | Switch                   | 17         | 4106-01019-08 | Sh Met Screw, #6 x 1/2"   |
| b) 5070-06258-00 |               | Diode, 1N4001, 1A.       | 18         | 4106-01019-04 | Sh Met Screw, #6 x 1/4"   |
| 5                | H-11958       | Playfield Cable          | 19         | 4006-01003-03 | Mach. Screw, 6-32 x 3/16" |
| 6                | 4002-1052-06  | Mach. Screw, 2-56 x 3/8" | 20         | 23-6301       | Ring, Rubber, 3/4" dia    |
| 7                | 03-8149-10    | Lamp Cover, Trans Blue   | 21         | A-11271       | Socket Assembly           |
| 8                | A-11826       | Socket Assembly          | 22         | A-11905       | Socket Assembly           |
| 9                | 4106-01019-06 | Sh Met Screw, #6 x 3/8"  | 23         | 03-8063-6     | Bulb Sleeve, Yellow       |
| 10               | 02-4321       | Bumper Post              | 24         | A-11277       | Support Plate             |
| 11               | 23-6535       | Post Rubber              | 25         | 03-7722-4     | Cable Clip, 1/4"          |
| 12               | 02-4320-1     | Bumper Post              | 26         | HW-30022-4    | Wire, #22AWG, 30-3/4"     |
| 13               | B-11861       | Ball Gate Assembly       | 27         | 31-1441-2     | Decal                     |
| a) 12-6752       |               | Gate Wire                | 28         | 31-1441-1     | Decal                     |

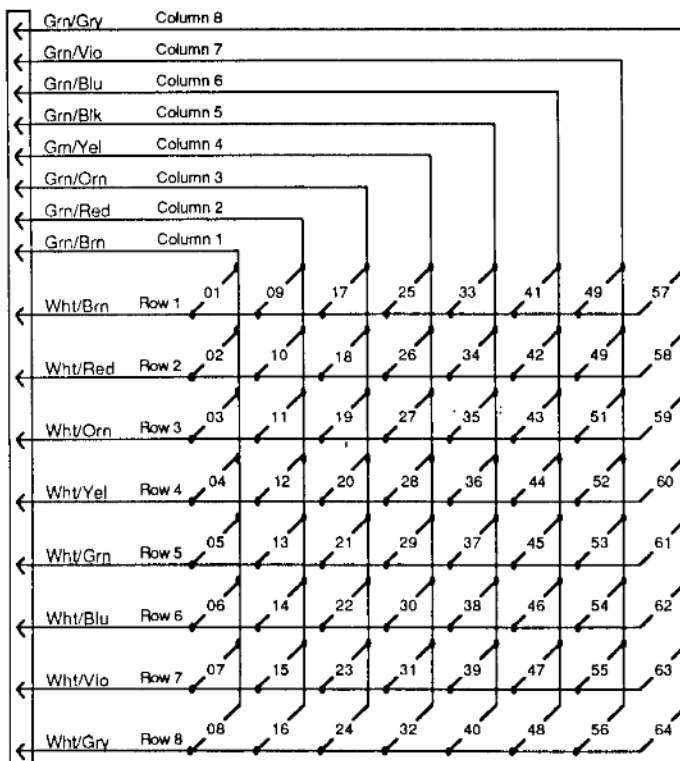
# Switches

| Item | Part No.      | Description                                     |
|------|---------------|-------------------------------------------------|
| 1    | A-8476        | Plumb Bob Tilt                                  |
| 2    |               | Not Used                                        |
| 3    | SW-1A-126     | Credit Button                                   |
| 4    | 904845*       | Right Coin Chute                                |
| 5    | 904845*       | Center Coin Chute                               |
| 6    | 904845*       | Left Coin Chute                                 |
| 7    | 904704*       | Slam Tilt                                       |
| 8    | 5641-09369-00 | High Score Reset                                |
| 9    | SW-1A-117     | Playfield Tilt                                  |
| 10   | 17-1067       | Outhole                                         |
| 11   | 5647-09938-00 | Ball Trough #1 (right)                          |
| 12   | 5647-09957-00 | Ball Trough #2 (mid)                            |
| 13   | 5647-09957-00 | Ball Trough #3 (left)                           |
| 14   | 5647-12073-01 | 1 (lane rollover)                               |
| 15   | 5647-12073-01 | 2 (lane rollover)                               |
| 16   | 5647-12073-01 | 3 (lane rollover)                               |
| 17   | 5647-12073-10 | Left Drain Lane                                 |
| 18   | B-11696-5     | S (Standup Target)                              |
| 19   | B-11696-5     | H (Standup Target)                              |
| 20   | B-11696-5     | U (Standup Target)                              |
| 21   | B-11696-5     | T (Standup Target)                              |
| 22   | B-11696-5     | T (Standup Target)                              |
| 23   | B-11696-5     | L (Standup Target)                              |
| 24   | B-11696-5     | E (Standup Target)                              |
| 25   | B-11696-5     | S (Standup Target)                              |
| 26   | B-11696-5     | T (Standup Target)                              |
| 27   | B-11696-5     | A (Standup Target)                              |
| 28   | B-11696-5     | T (Standup Target)                              |
| 29   | B-11696-5     | I (Standup Target)                              |
| 30   | B-11696-5     | O (Standup Target)                              |
| 31   | B-11696-5     | N (Standup Target)                              |
| 32   | 5647-12073-10 | Right Drain Lane                                |
| 33   | C-11903-R     | Right 1-bank Dr Tgt Opto<br>(German Scoreboard) |
| 34   |               | Change Sh/St Score                              |
| 35   | B-11696-8     |                                                 |
| 36   | Not Used      |                                                 |
| 37   | SW-1A-168     | Top left Roll-under                             |
| 38   | 5647-12073-10 | U (lane rollover)                               |
| 39   | 5647-12073-10 | S (lane rollover)                               |
| 40   | 5647-12073-10 | A (lane rollover)                               |
| 41   | SW-1A-167     | Left Ball Popper                                |
| 42   | SW-1A-167     | Right Ball Popper                               |
| 43   | 5647-12073-04 | Ball Shooter Lane                               |
| 44   |               | Not Used                                        |
| 45   | 5647-12073-10 | Right Lock                                      |
| 46   | SW-1A-164     | R Lock Entry (St. exit ramp)                    |
| 47   | 5647-12133-01 | Left Lock                                       |
| 48   | 5647-12073-01 | L Lock Entry (on wire ramp)                     |
| 49   | Not Used      |                                                 |
| 50   | B-4834-K-1    | 10 point (top right)                            |
| 51   |               | Not Used                                        |
| 52   | C-11872       | Space Station #1                                |
| 53   | C-11872       | Space Station #2                                |



| Item | Part No.    | Description                    |
|------|-------------|--------------------------------|
| 54   | B-4834-K-1  | 10 point (lwr right)           |
| 55   | SW-1A-150-1 | Lane Change (L Flipper)        |
| 56   | SW-1A-150   | Lane Change (R Flipper)        |
| 57   | C-11318     | 3-bank Dr Tgt (upper)          |
| 58   | C-11318     | 3-bank Dr Tgt (center)         |
| 59   | C-11318     | 3-bank Dr Tgt (lower)          |
| 60   | SW-11A-35   | Jet Bumper (left)              |
| 61   | SW-11A-35   | Jet Bumper (right)             |
| 62   | SW-11A-35   | Jet Bumper (lower)             |
| 63   | SW-1A-122   | Left Sling (scoring)**         |
| 64   | SW-1A-122   | Right Sling (scoring)**        |
| -    | SW-10A-48   | Flipper Button (Cabinet sides) |

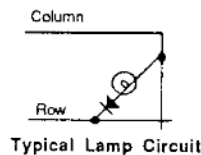
Notes: \* (Coinco Part No.) \*\* [Kicker Actuating Sw: A-4834-H; B-8734 w/RC]



SPACE STATION Switch-Matrix Table

| COLUMN | 1 Q45<br>GRN-BRN<br>1J8-1                | 2 Q49<br>GRN-RED<br>1J8-2             | 3 Q44<br>GRN-ORN<br>1J8-3            | 4 Q48<br>GRN-YEL<br>1J8-4                  | 5 Q43<br>GRN-BLK<br>1J8-5                   | 6 Q47<br>GRN-BLU<br>1J8-7                 | 7 Q42<br>GRN-VIO<br>1J8-8            | 8 Q46<br>GRN-GRY<br>1J8-9                  |
|--------|------------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------------|---------------------------------------------|-------------------------------------------|--------------------------------------|--------------------------------------------|
| ROW    |                                          |                                       |                                      |                                            |                                             |                                           |                                      |                                            |
| 1      | WHT-BRN<br>1J10-9<br>Plumb Bob<br>Tilt 1 | WHT-RED<br>1J10-8<br>Not Used 2       | WHT-ORN<br>1J10-7<br>Credit Button 3 | WHT-YEL<br>1J10-6<br>Right Coin<br>Chute 4 | WHT-BLK<br>1J10-5<br>Center Coin<br>Chute 5 | WHT-BLU<br>1J10-3<br>Left Coin<br>Chute 6 | WHT-VIO<br>1J10-2<br>Slam<br>Tilt 7  | WHT-GRY<br>1J10-1<br>High-Score<br>Reset 8 |
| 2      | Plumb Bob<br>Tilt 1                      | Not Used 2                            | Ball Trough<br>#1 (right) 11         | Right Coin<br>Chute 4                      | Center Coin<br>Chute 5                      | Left Coin<br>Chute 6                      | Slam<br>Tilt 7                       | High-Score<br>Reset 8                      |
| 3      | Playfield<br>Tilt 9                      | Outhole 10                            | Ball Trough<br>#2 (mid) 12           | Ball Trough<br>#3 (left) 13                | Not Used 36                                 | Not Used 44                               | Space<br>Station #1 52               | Jet Bumper<br>(left) 60                    |
| 4      | Drain Lane<br>(left) 17                  | S 18                                  | H 19                                 | U 20                                       | Top left<br>Roll-under 37                   | Right Lock<br>Entry 46                    | Space<br>Station #2 53               | Jet Bumper<br>(right) 61                   |
| 5      | S 25                                     | T 26                                  | A 27                                 | T 28                                       | Not Used 38                                 | Right Lock<br>Entry 46                    | 10-Point<br>(lwr right) 54           | Jet Bumper<br>(lower) 62                   |
| 6      | (German Score<br>Board Sw) 34            | Change<br>Shuttle/Station<br>Score 35 | Not Used 36                          | Not Used 44                                | Right Lock<br>Entry 46                      | Left Lock 47                              | LANE<br>CHANGE<br>(left flipper) 55  | Left Kicker<br>("sling") 63                |
| 7      | Left Ball<br>Popper 41                   | Right Ball<br>Popper 42               | Ball Shooter 43                      | Not Used 44                                | Right Lock<br>Entry 46                      | Left Lock 47                              | LANE<br>CHANGE<br>(right flipper) 56 | Right Kicker<br>("sling") 64               |
| 8      | Not Used 49                              | 10-Point<br>(top right) 50            | Not Used 51                          | Space<br>Station #1 52                     | Right Lock<br>Entry 46                      | Left Lock 47                              | LANE<br>CHANGE<br>(right flipper) 56 | Right Kicker<br>("sling") 64               |

|         |          |
|---------|----------|
| Yel/Gry | Column 8 |
| Yel/Vio | Column 7 |
| Yel/Blu | Column 6 |
| Yel/Grn | Column 5 |
| Yel/Blk | Column 4 |
| Yel/Orn | Column 3 |
| Yel/Red | Column 2 |
| Yel/Brn | Column 1 |
| Red/Brn | Row 1    |
| Red/Blk | Row 2    |
| Red/Orn | Row 3    |
| Red/Yel | Row 4    |
| Red/Grn | Row 5    |
| Red/Blu | Row 6    |
| Red/Vio | Row 7    |
| Red/Gry | Row 8    |

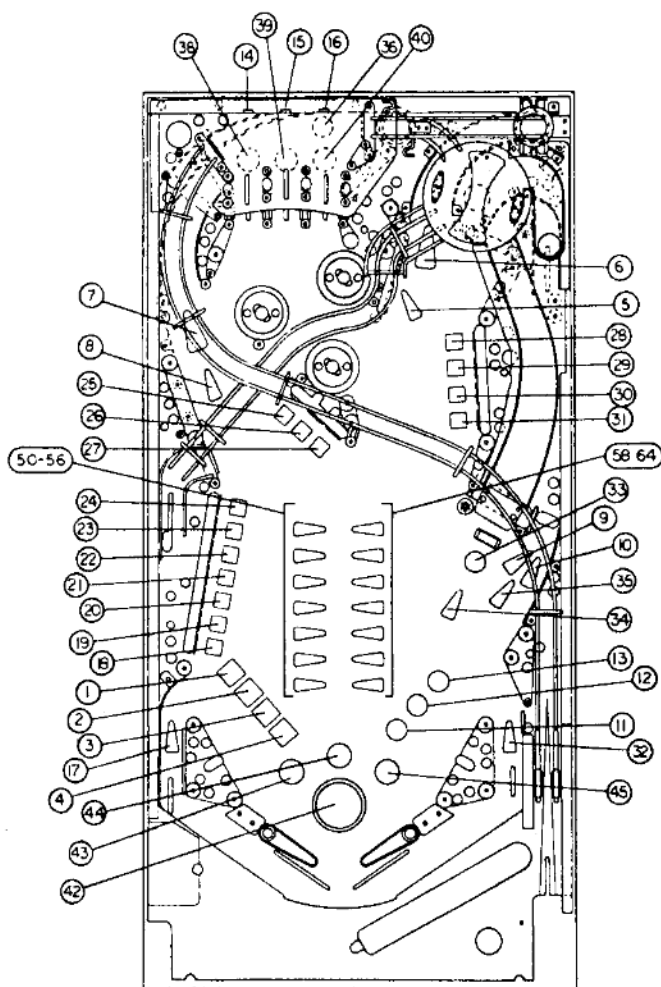


2 Double Lamps

SPACE STATION Lamp-Matrix Table

| COLUMN                           | 1 Q66<br>YEL-BRN<br>1J7-1    | 2 Q64<br>YEL-RED<br>1J7-2 | 3 Q62<br>YEL-ORN<br>1J7-3            | 4 Q60<br>YEL-BLK<br>1J7-4             | 5 Q58<br>YEL-GRN<br>1J7-6        | 6 Q66<br>YEL-BLU<br>1J7-7             | 7 Q64<br>YEL-VIO<br>1J7-8   | 8 Q52<br>YEL-GRY<br>1J7-9   |
|----------------------------------|------------------------------|---------------------------|--------------------------------------|---------------------------------------|----------------------------------|---------------------------------------|-----------------------------|-----------------------------|
| ROW                              |                              |                           |                                      |                                       |                                  |                                       |                             |                             |
| Q80<br>1<br>RED-<br>BRN<br>1J6-1 | Bonus Ball<br>Player #1<br>1 | Change<br>Shuttle<br>9    | RE-ENTRY<br>(Left W/LIT<br>Drain) 17 | S 25                                  | Stop & Score<br>33               | Not<br>Used 41                        | Big Flame<br>(insert bd) 49 | Big Flame<br>(insert bd) 57 |
| Q81<br>2<br>RED-<br>BLK<br>1J6-2 | Bonus Ball<br>Player #2<br>2 | Change<br>Station<br>10   | S 18                                 | T 26                                  | DOCK W/L<br>(right) 34           | RELAUNCH<br>WHEN LIT<br>42            | Shuttle Score<br>SPECIAL 50 | Station Score<br>SPECIAL 58 |
| Q82<br>3<br>RED-<br>ORN<br>1J6-3 | Bonus Ball<br>Player #3<br>3 | 1X 11                     | H 19                                 | A 27                                  | SPECIAL 35                       | DOCKED<br>Port Side 43                | Extra Ball<br>51            | Extra Ball<br>59            |
| Q83<br>4<br>RED-<br>YEL<br>1J6-5 | Bonus Ball<br>Player #4<br>4 | 2X 12                     | U 20                                 | T 28                                  | 100,000<br>When Lit 36           | Hold Bonus<br>44                      | 50,000 +<br>Re-Entry 52     | 50,000 +<br>Re-Entry 60     |
| Q84<br>5<br>RED-<br>GRN<br>1J6-6 | Extra Ball<br>(3-bnk D T) 5  | 4X 13                     | T 21                                 | I 29                                  | Little Shuttle<br>(insert bd) 37 | DOCKED<br>Starboard<br>Side 45        | 50,000 +<br>Bonus Ball 53   | 50,000 +<br>Bonus Ball 61   |
| Q85<br>6<br>RED-<br>BLU<br>1J6-7 | RELEASE<br>(right) 6         | 1 14                      | T 22                                 | O 30                                  | U 38                             | Williams<br>(insert bd,<br>left) 46   | 150,000 +<br>Hold Bonus 54  | 150,000 +<br>Hold Bonus 62  |
| Q86<br>7<br>RED-<br>VIO<br>1J6-8 | RELEASE<br>(left) 7          | 2 15                      | L 23                                 | N 31                                  | S 39                             | Williams<br>(insert bd,<br>middle) 47 | 75,000 55                   | 75,000 63                   |
| Q87<br>8<br>RED-<br>GRY<br>1J6-9 | DOCK W/L<br>(left) 8         | 3 16                      | E 24                                 | RE-ENTRY<br>(Right W/LIT<br>Drain) 32 | A 40                             | Williams<br>(insert bd,<br>right) 48  | 25,000 56                   | 25,000 64                   |

# Lamps



## Lamp Location/Description

- 1 Bonus Ball Player #1
- 2 Bonus Ball Player #2
- 3 Bonus Ball Player #3
- 4 Bonus Ball Player #4
- 5 EXTRA BALL (3-bk Dr Tgt)
- 6 RELEASE (right)
- 7 RELEASE (left)
- 8 DOCK W/L (left)
- 9 CHANGE Shuttle
- 10 CHANGE Station
- 11 1X
- 12 2X
- 13 4X
- 14 1 (lane)
- 15 2 (lane)
- 16 3 (lane)
- 17 RE-ENTRY W/LIT (L Drain)
- 18 S (in Shuttle)
- 19 H (in Shuttle)
- 20 U (in Shuttle)
- 21 T (in Shuttle)
- 22 T (in Shuttle)
- 23 L (in Shuttle)
- 24 E (in Shuttle)
- 25 S (in Station)
- 26 T (in Station)
- 27 A (in Station)
- 28 T (in Station)
- 29 I (in Station)
- 30 O (in Station)
- 31 N (in Station)
- 32 RE-ENTRY W/LIT (R Drain)
- 33 STOP & SCORE
- 34 DOCK W/L (right)
- 35 SPECIAL
- 36 100,000 When Lit (near "A" lane)
- 37 Little Shuttle (insert bd)
- 38 U (lane)
- 39 S (lane)
- 40 A (lane)
- 41 Dome (insert bd)
- 42 RELAUNCH WHEN LIT
- 43 DOCKED PORT SIDE
- 44 HOLD BONUS
- 45 DOCKED STARBOARD SIDE
- 46 WILLIAMS (insert bd, left)
- 47 WILLIAMS (insert bd, mid)
- 48 WILLIAMS (insert bd, right)
- 49 Big Flame #1 (insert bd)
- 50 SPECIAL (Shuttle Scores)
- 51 EXTRA BALL (Shuttle Scores)
- 52 50,000+Re-entry (Sh. Scores)
- 53 50,000+Bon.Ball (Sh. Scores)
- 54 150,000+Hold Bon (Sh. Scores)

## Lamp Location/Description

- 55 75,000 (Sh. Scores)
- 56 25,000 (Sh. Scores)
- 57 Big Flame #2 (insert bd)
- 58 SPECIAL (Station Scores)
- 59 EXTRA BALL (Station Scores)
- 60 50,000+Re-entry (St. Scores)
- 61 50,000+Bon.Ball (St. Scores)
- 62 150,000+Hold Bon (St. Scores)
- 63 75,000 (St. Scores)
- 64 25,000 (St. Scores)

# Solenoids/Flashers

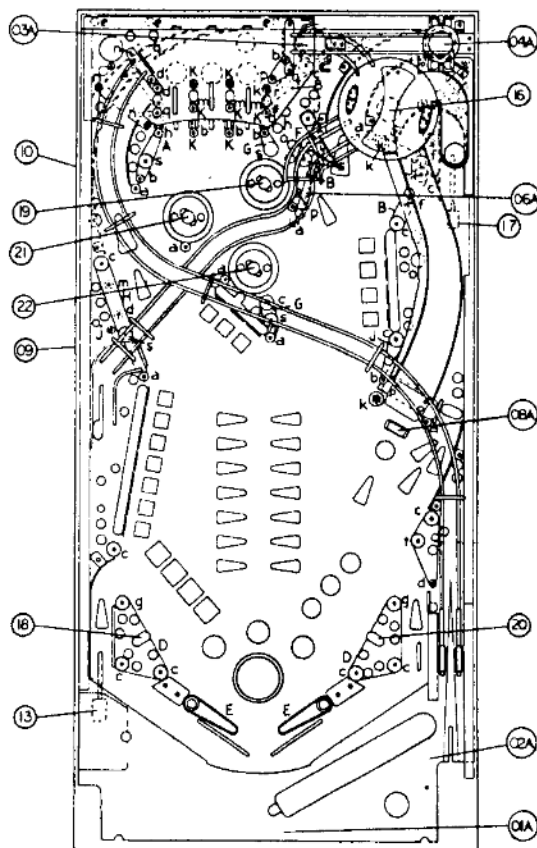
| Item | Part No.          | Description                   |
|------|-------------------|-------------------------------|
| 01A  | AE-23-800         | Outhole Kicker                |
| 01C  | 89 & 906 Flashers | Relaunch + "ON" Flashers      |
| 02A  | AE-23-800         | Ball Shooter Lane Feeder      |
| 02C  | 89 & 906 Flashers | Left Side + "SP" Flashers     |
| 03A  | AE-24-900         | Left Ball Popper              |
| 03C  | 89 & 906 Flashers | Right Side + "AC" Flashers    |
| 04A  | AE-23-800         | Right Ball Popper             |
| 04C  | 89 & 906 Flashers | Top (upr p/f) + "ES" Flashers |
| 05A  | Not Used          |                               |
| 05C  | 89 & 906 Flashers | P/f Top Panel + "TA" Flashers |
| 06A  | AE-26-1200        | 3-bank Drop Tgt-Raise         |
| 06C  | 89 & 906 Flashers | Flame + "TI" Flashers         |
| 07A  | AE-26-1200        | Knocker (or Ticket Dispenser) |
| 07C  | #89 Flashlamps    | Station Flashers              |
| 08A  | AE-23-800         | Right 1-bank Drop Tgt-Raise   |
| 08C  | AE-23-800         | Left Dock Kickbig             |
| 09   | 5580-09555-01     | Gen. Illumin. Relay, P'field* |
| 10   | 5580-09555-01     | Gen. Illumin. Relay, Green*   |
| 11   | 5580-09555-01     | Gen. Illumin. Relay, B'box*   |
| 12   | 5580-09555-01     | A/C Select Relay**            |
| 13   | AE-24-900         | Left Re-Entry Kickback        |
| 14   | Not Used          |                               |
| 15   | #1251 Flashlamps  | P/f Top Panel Flashers        |
| 16   | 5580-12145-01     | S. Station Motor Relay***     |
| 17   | AE-23-800         | Right Dock Kickback           |
| 18   | AE-26-1200        | Lower Left Kicker ("sling")   |
| 19   | AE-23-800         | Right Jet Bumper              |
| 20   | AE-26-1200        | Lower Right Kicker ("sling")  |
| 21   | AE-23-800         | Left Jet Bumper               |
| 22   | AE-23-800         | Lower Jet Bumper              |

- FL 11630-50VDC Left and Right Flipper

\* - On Relay Board, C-11998-1

\*\* - In backbox on Aux Pwr Drvr Bd, D-11813

\*\*\* - On Relay Board, C-11902-1



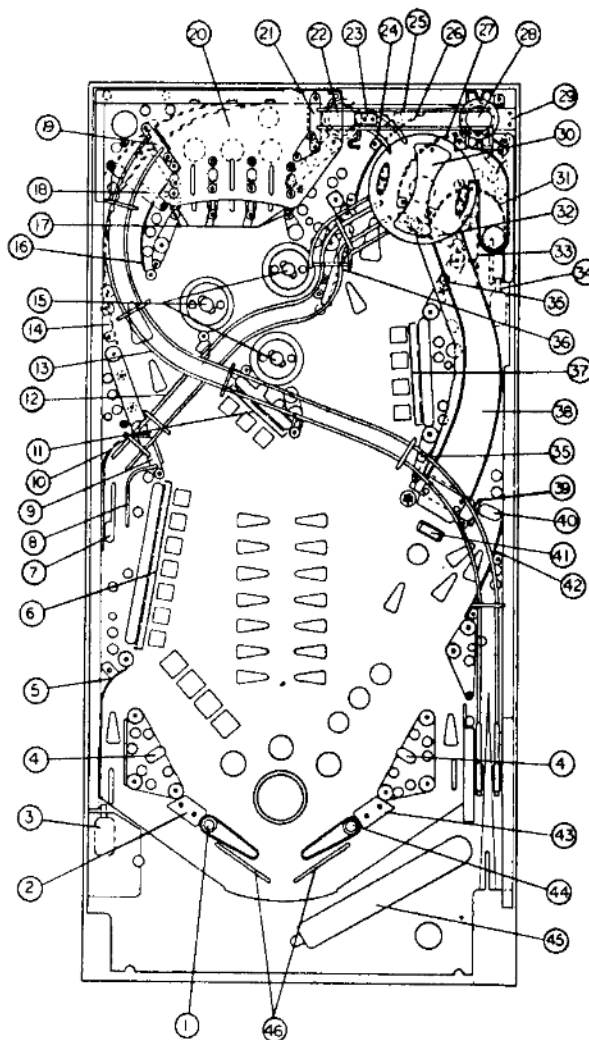
## Playfield Posts

| Item | Post Part #   | Sleeve/Rubber |
|------|---------------|---------------|
| a    | 02-4036       | 23-6552       |
| b    | 02-4003       | 23-6535       |
| c    | 02-4002-1     | 03-7542-10    |
| d    | 02-4008       |               |
| e    | 02-4322-3     |               |
| f    | 02-4322-1     |               |
| g    | 02-4002-3     | 03-7542-10    |
| h    | 02-4322-2     |               |
| j    | 02-3408       | 02-4254       |
| k    | 02-3702       | 23-6579       |
| m    | 02-3905       | 23-6535       |
| n    | 02-3648       | 02-4014       |
| p    | 02-4321       |               |
| q    | 02-4320-1     |               |
| r    | 03-8044-9     | 23-6535       |
| s    | 4006-01005-26 | 03-7542-10    |

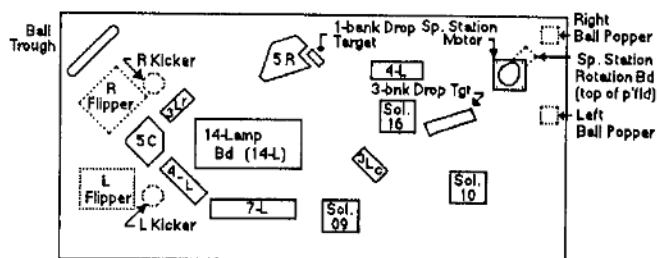
## Rubber Parts

| Item | Part No   | Description      | Qty. |
|------|-----------|------------------|------|
| A    | 23-6303   | 1-1/4" Ring      | 2    |
| B    | 23-6304   | 1-1/2" Ring      | 3    |
| D    | 23-6306   | 2-1/2" Ring      | 2    |
| E    | 23-6519-4 | Red Flipper Ring | 2    |
| F    | 23-6300   | 5/16" Ring       | 3    |
| G    | 23-6301   | 3/4" Ring        | 2    |
| H    | 23-6305   | 2" Ring          | 2    |
| J    | 23-6302   | 1" Ring          | 1    |
| K    | 23-6535   | Bumper           | 12   |

# Playfield Parts



| Item | Part No.    | Description                       |
|------|-------------|-----------------------------------|
| 1    | C-11626-L-4 | Left Flipper Assembly             |
| a)   | 20-9250-5   | Flipper Arm on Shaft              |
| 2    | B-11906-L   | Ball Guide Assembly, Left         |
| 3    | B-11873-1   | Lwr L Kickback Assy (Re-entry)    |
| 4A   | 12-6466-12  | Wireform, 3"                      |
| 4    | B-9463      | Kicker (Slingshot) Assembly       |
| 5    | B-11828     | Ball Guide Assembly               |
| 6    | C-11919-3   | 7-Target/Cable Assembly           |
| a)   | B-11696-5   | Standup Target Assembly           |
| 7    | B-11874     | Left Kickbig Assembly             |
| 8    | 12-6757     | Wireform                          |
| 9    | B-11861     | Ball Gate Assembly                |
| a)   | 12-6752     | Gate Wire                         |
| 10   | B-11829     | Ball Guide Assembly               |
| 11   | C-11919-1   | 3-Target/Cable Assembly           |
| a)   | B-11696-5   | Standup Target Assembly           |
| 12   | B-11764     | Wire Ramp Assembly                |
| a)   | 12-6739     | Wire Ramp                         |
| 13   | 12-6738     | Wire Ramp                         |
| 14   | D-11832     | Ball Guide Assembly               |
| 15   | B-9414      | Jet Bumper Assembly               |
| a)   | B-9415-1    | Coil & Bracket Assembly           |
| b)   | B-8928      | Switch Assembly                   |
| 16   | 12-6758     | Wireform                          |
| 17   | 12-6466-4   | Wireform, 1" (8 items)            |
| 18   | A-11877     | Ball Gate Assembly                |
| a)   | 12-6505     | Gate Wire                         |
| b)   | 12-6620     | Switch Actuator Wire              |
| 19   | B-11788     | Ball Gate Assembly                |
| a)   | 12-6752     | Gate Wire                         |
| 20   | R-11780     | Mini-playfield Assembly           |
| 21   | B-11861     | Ball Gate Assembly                |
| a)   | 12-6752     | Gate Wire                         |
| 22   | D-11335-1   | Left Ball Popper Assembly         |
| 23   | 01-8742     | Ball Deflector                    |
| 24   | 12-6741     | Left Popper Wire Ramp             |
| 25   | 12-6740     | Right Popper Wire Ramp            |
| 26   | C-11883     | Ball Guide Assembly               |
| 27   | B-11894     | Ball Guide Assembly               |
| 28   | D-11335-2   | Right Ball Popper Assembly        |
| 29   | 01-8626     | Ball Deflector                    |
| 30   | 03-8107     | Rotating Ball Guide (Sp. Station) |
| a)   | B-11824     | Motor Assembly                    |
| 31   | B-11843     | Ball Guide Assembly               |
| 32   | B-11788     | Ball Gate Assembly                |
| a)   | 12-6752     | Gate Wire                         |
| 33   | 12-6760     | Wireform                          |
| 34   | B-11959     | Right Kickback Assembly           |
| 35   | B-4834-K    | 10-pt Switch Assembly             |
| 36   | C-11223-1   | 3-Bank Drop Target Assembly       |
| 37   | C-11919-2   | 4-Target/Cable Assembly           |
| a)   | B-11696-5   | Standup Target Assembly           |
| 38   | D-11805     | Ramp Assembly                     |
| 39   | 12-6466-5   | Wireform, 1-1/4"                  |
| 40   | B-11696-8   | Standup Target Assembly           |
| 41   | C-11212-2   | 1-Bank Drop Target Assembly       |
| 42   | A-11830     | Ball Guide Assembly               |
| 43   | B-11906-R   | Right Ball Guide Assembly         |
| 44   | C-11626-R-4 | Flipper Assembly                  |
| a)   | 20-9250-5   | Flipper Arm on Shaft              |
| 45   | B-8623      | Guide & Baffle Assembly           |
| a)   | B-8644      | Ball Trough Switch Assembly       |
| 46   | 12-6468     | Anti-rebound wireform             |



**Playfield Circuit Boards & Major Devices Locations**  
(underside of playfield)

**Associated Parts Numbers**

(Left to right from ball trough area)

|             |                               |           |                                |
|-------------|-------------------------------|-----------|--------------------------------|
| C-11626-R-4 | Lower Right Flipper Assembly  | C-11998-1 | Relay PC Bd (Sol. 09)          |
| C-11626-L-4 | Lower Left Flipper Assembly   | C-11866   | 3-Lamp PC Bd ("3Lc")           |
| B-9463      | Right Kicker                  | C-11864   | 4-Lamp PC Bd ("4-L")           |
| C-11917-1   | 5-Lamp, 2- Flash PC Bd ("5C") | C-11902-1 | Relay PC Bd (Sol. 16)          |
| B-9463      | Left Kicker                   | C-11318-1 | 3-b Drop Target Opto Assembly  |
| C-11865     | 3-Lamp PC Bd ("3Lr")          | C-11998-1 | Relay PC Bd (Sol. 10)          |
| C-11864     | 4-Lamp PC Bd ("4-L")          | 14-7941-2 | Sp. Sta. Motor, 24V ac, 11 rpm |
| C-11849     | 14-Lamp PC Bd ("14-L")        | C-11872   | Sp. Sta. Rotation Bd           |
| C-11863     | 7-Lamp PC Bd ("7-L")          | D-11335-1 | Ball Popper Assembly (Right)   |
| C-11904     | 5-Lamp PC Bd ("5R")           | D-11335-1 | Ball Popper Assembly (Left)    |
| C-11903-R   | 1-b Drop Target Opto Assembly |           |                                |

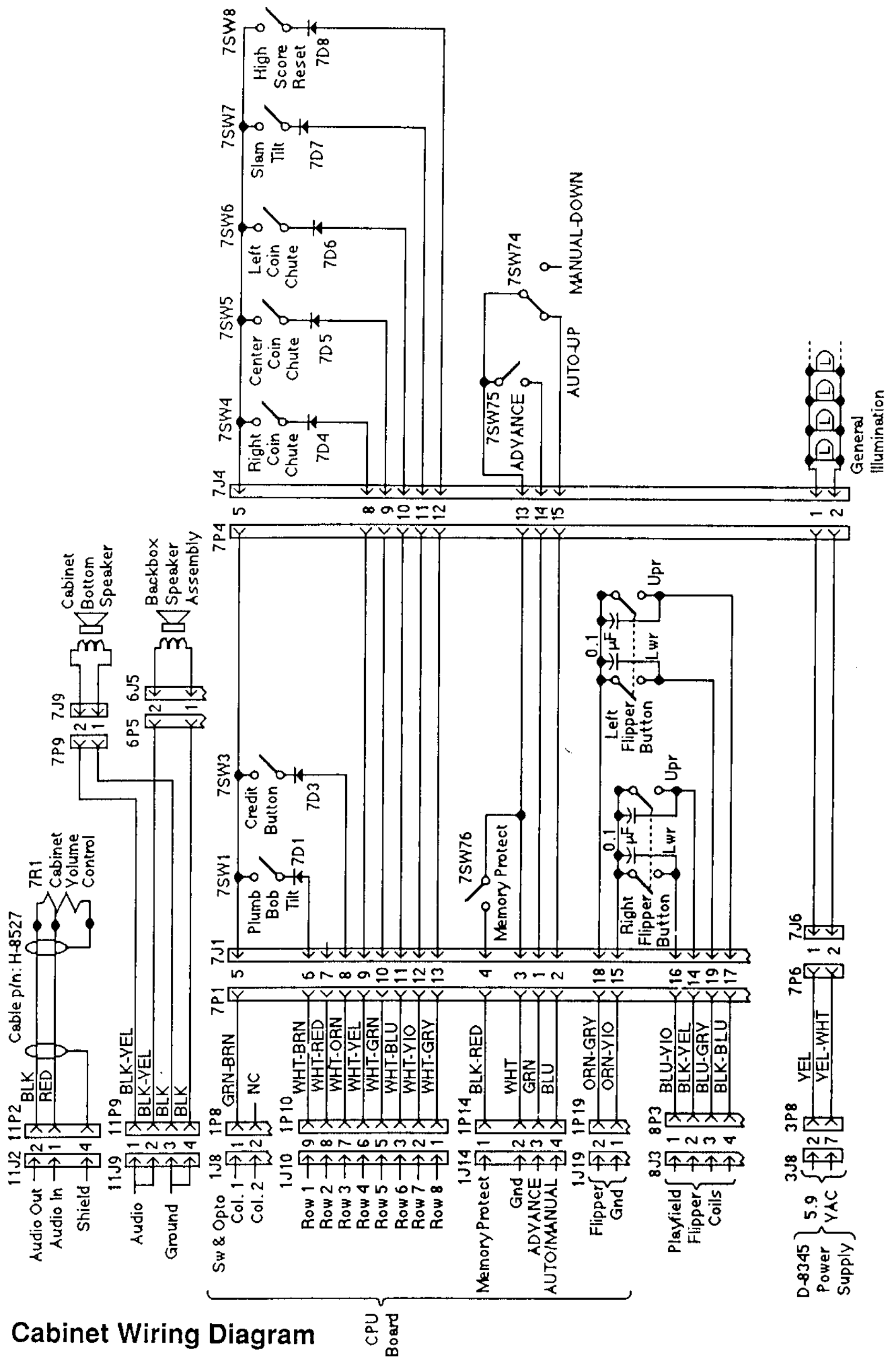
# **Section 3**

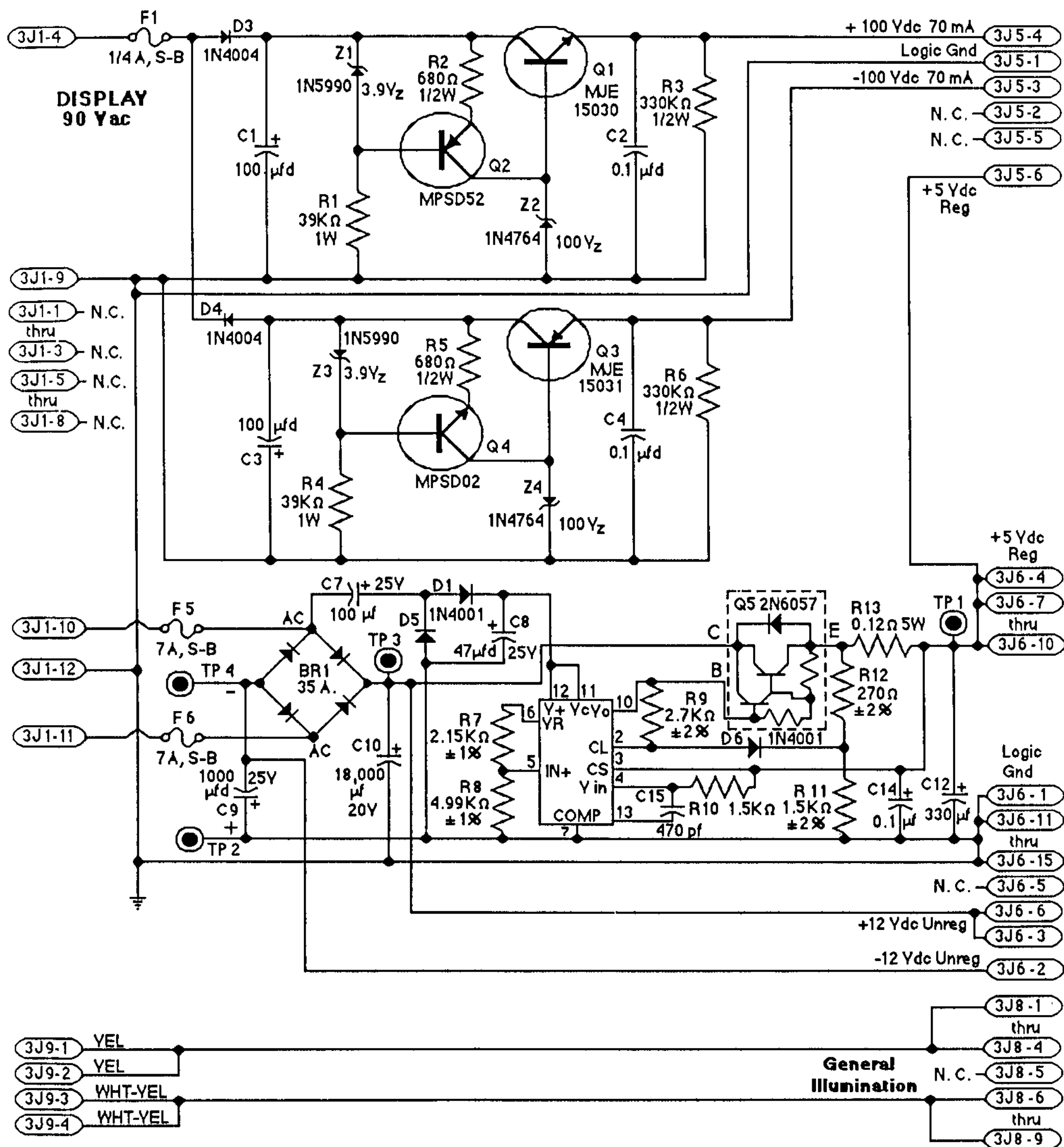
## ***Reference Diagrams & Schematics***

- **Diagrams and Schematics:**

- Cabinet Wiring**
  - Power Supply Board**
  - Aux Power Driver Board**
  - Audio Board**
  - A/N Display Unit Board**
  - Interboards Signals**
  - CPU Board**
  - Controlled, Special, & Switched Solenoids**
  - Power Wiring**

# Cabinet Wiring Diagram

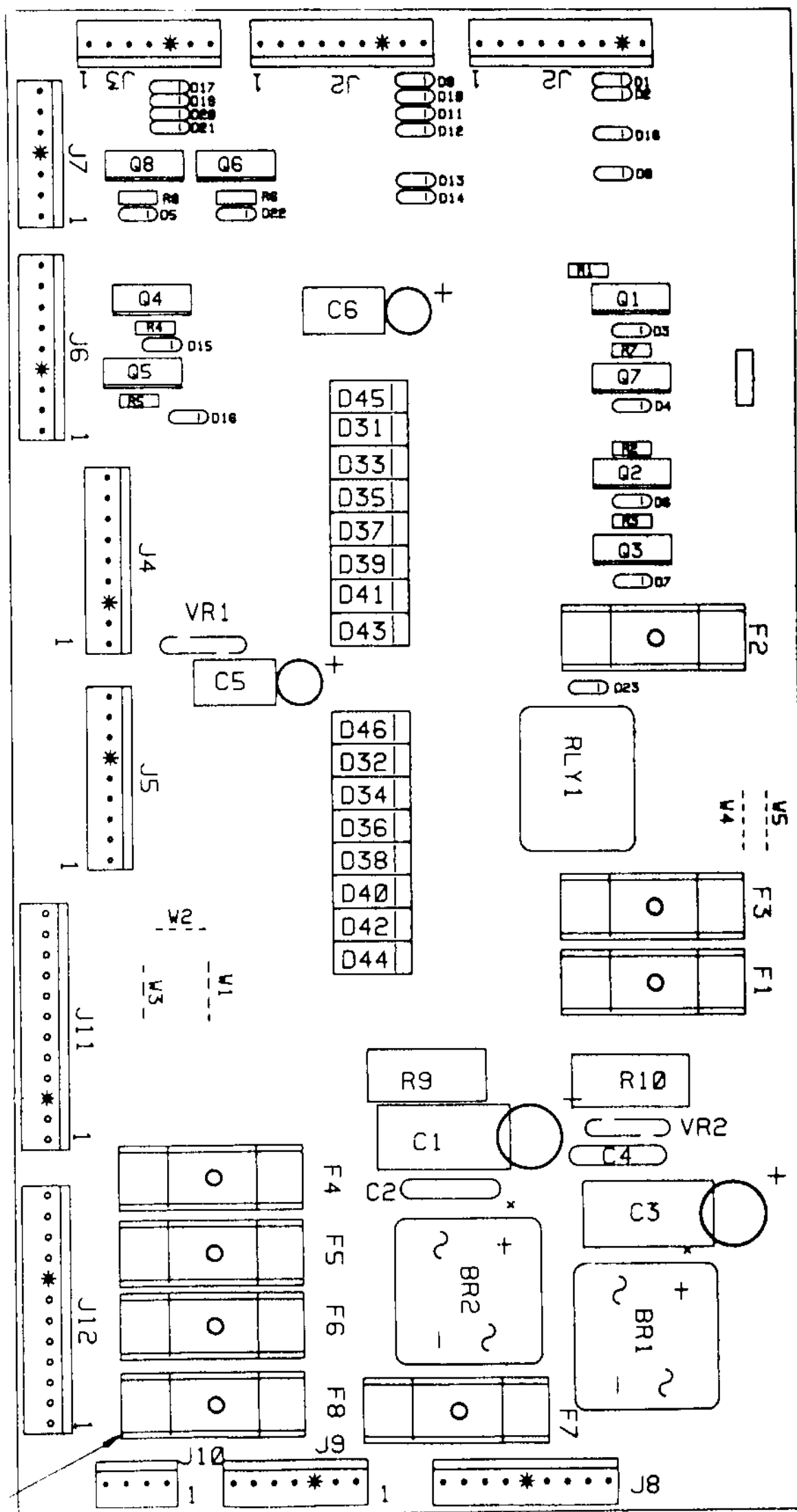




**NOTES:**

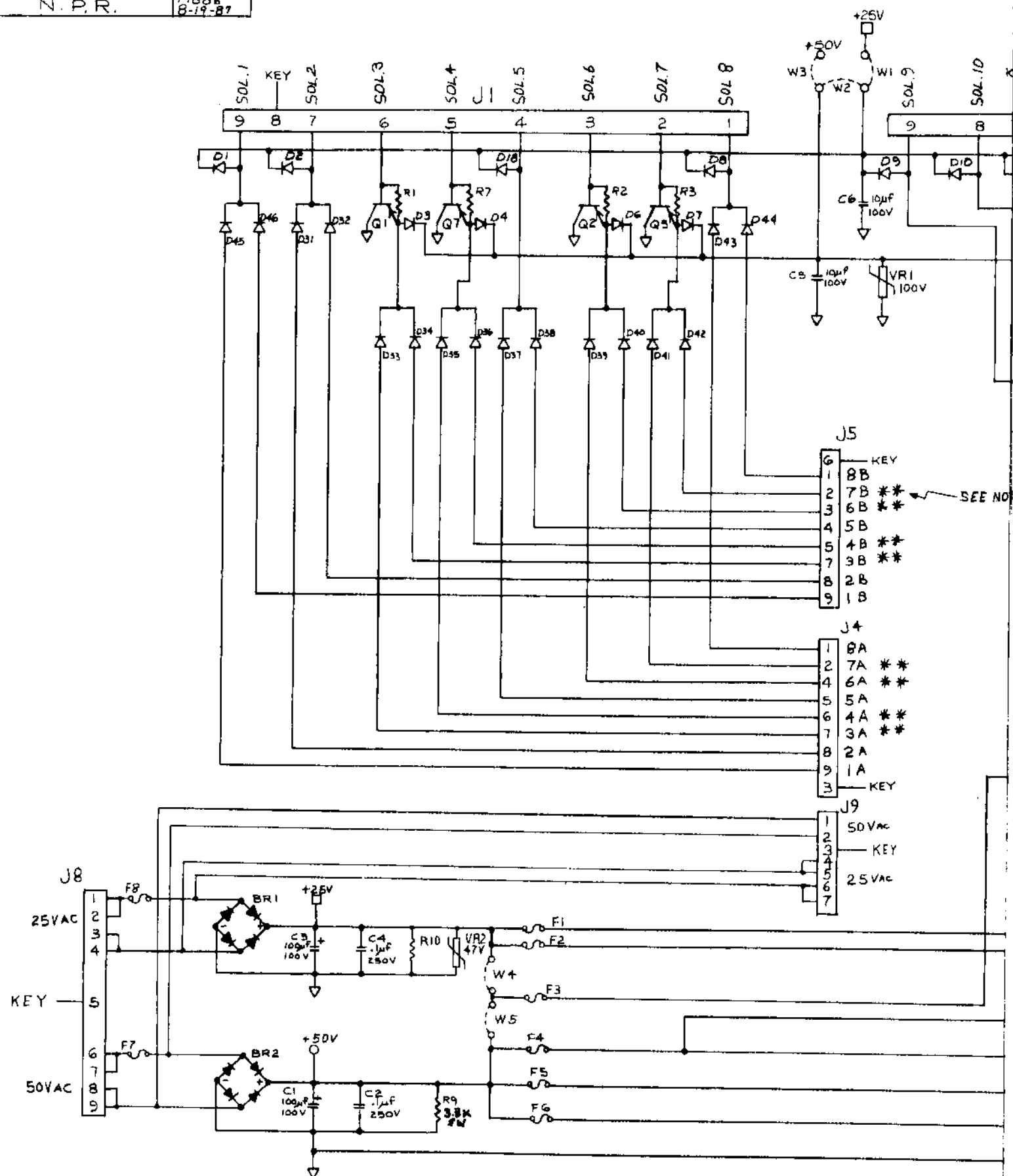
1. Display voltage measured with digits display test ON, and displays at all zeroes.
2. Unless otherwise indicated, all resistors are in ohms (Ω), 1/4 watt.
3. TP3 (unregulated +12 VDC) readout should not go lower than +10.5 V, or intermittent reset will occur.

## D-8345-557 Power Supply Schematic



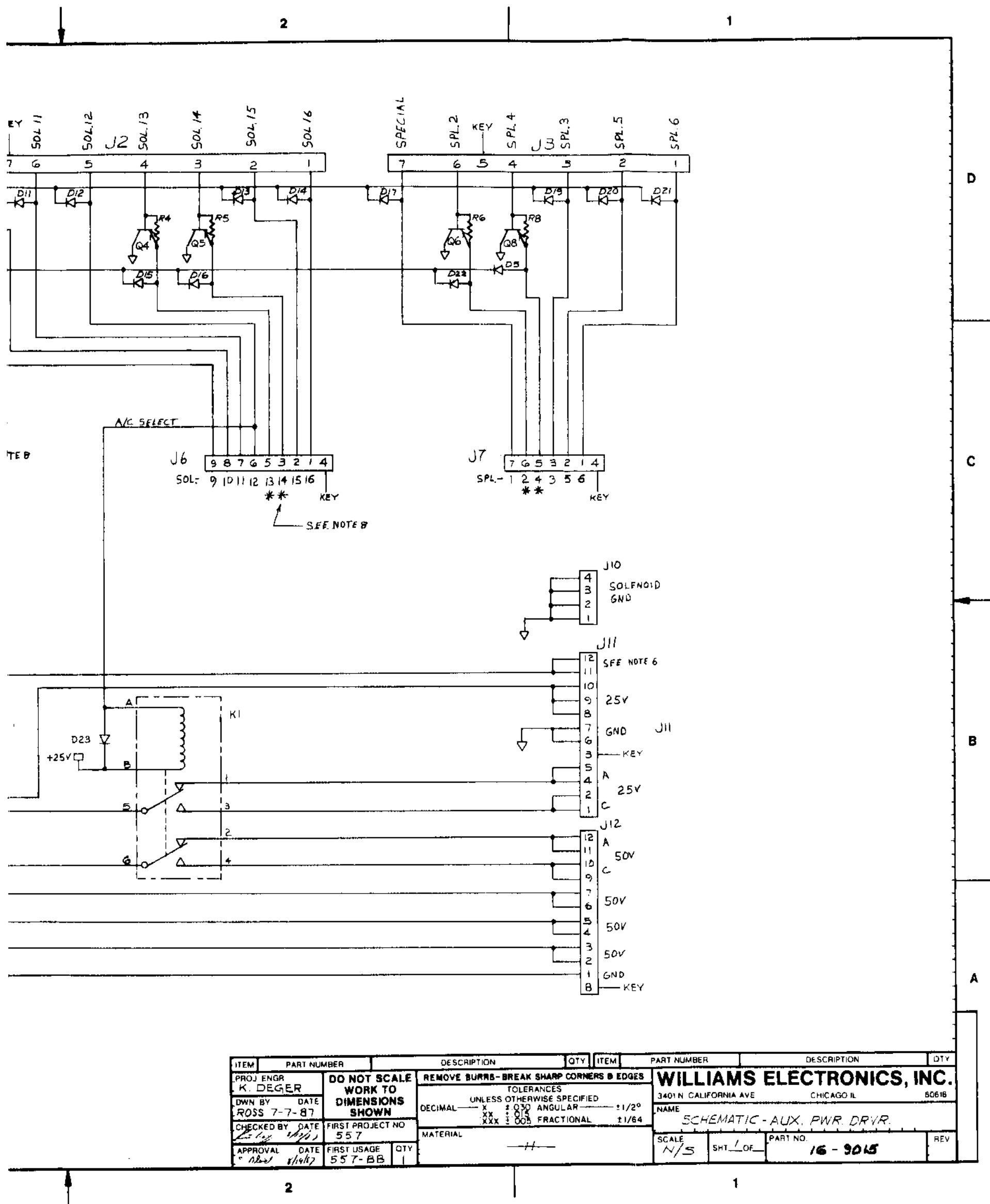
**Aux Power Driver Board, D-11813**

| REV | DESCRIPTION OF CHANGE | ECN NO | DATE    |
|-----|-----------------------|--------|---------|
|     | N.P.R.                | 17886  | 8-19-87 |



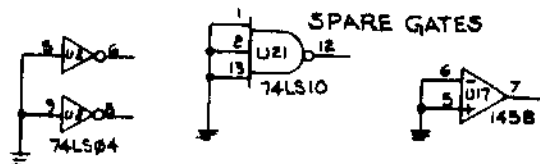
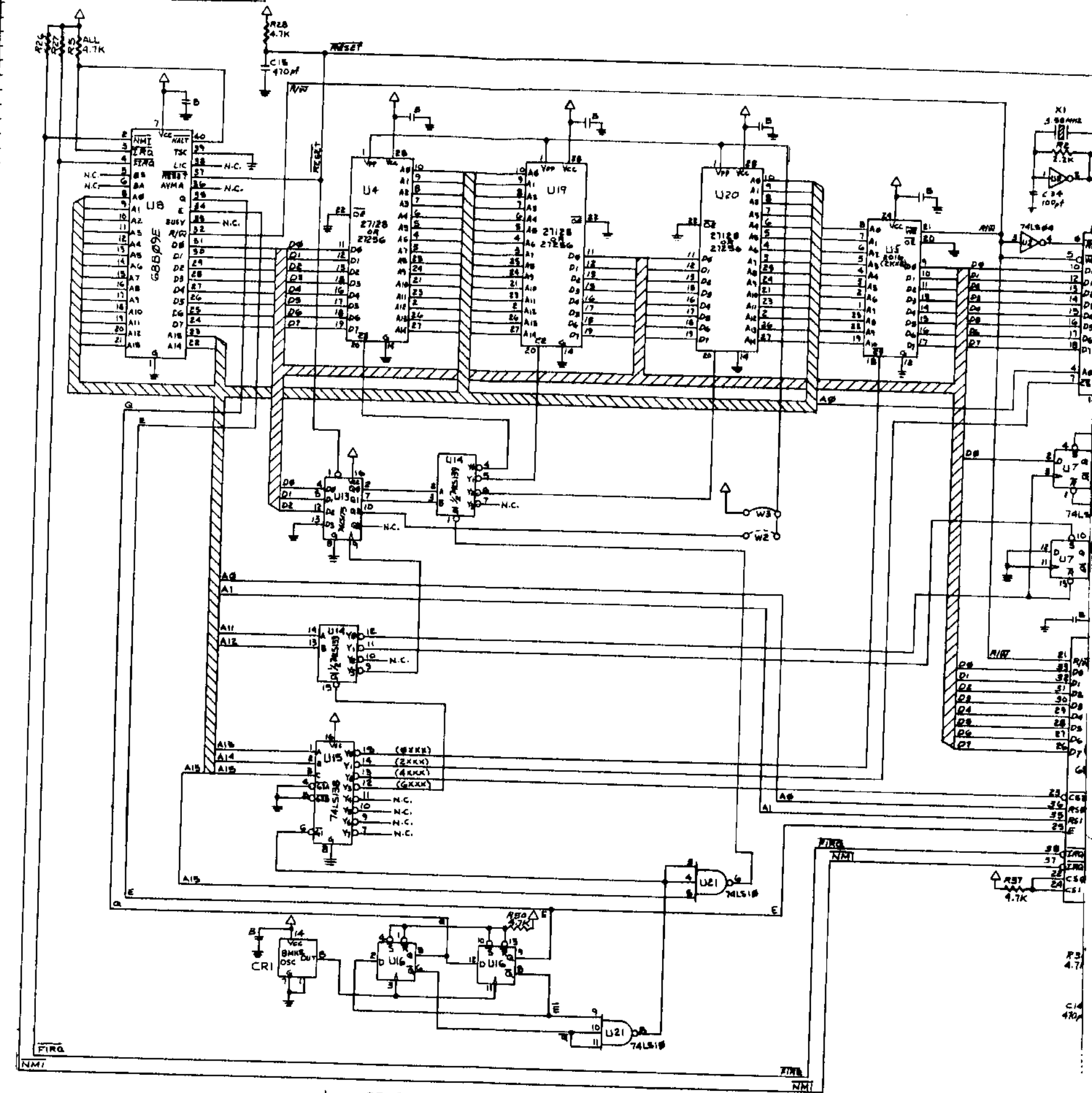
#### NOTES:

1. R1-R8, 220Ω 1/4 W
2. Q1-Q8, TIP-36C
3. D1-D23, 1N4003
4. D31-D46, MR501
5. BR1, BR2, 35A 250V
6. W1, W3, W4 JUMPERS SELECT COMBINATION OF 25V AND 50V COILS; W2, W3, W5 JUMPERS SELECT 50V COILS.
7. F1-F8, SEE APPROPRIATE ASSEMBLY FOR FUSE VALUES (D-11813-).
8. \*, 50V COILS ONLY; \*\*, 50V COIL OR FLASH LAMP ONLY.
9. VOLTAGES SPECIFIED UNDER FULL LOAD CONDITIONS.



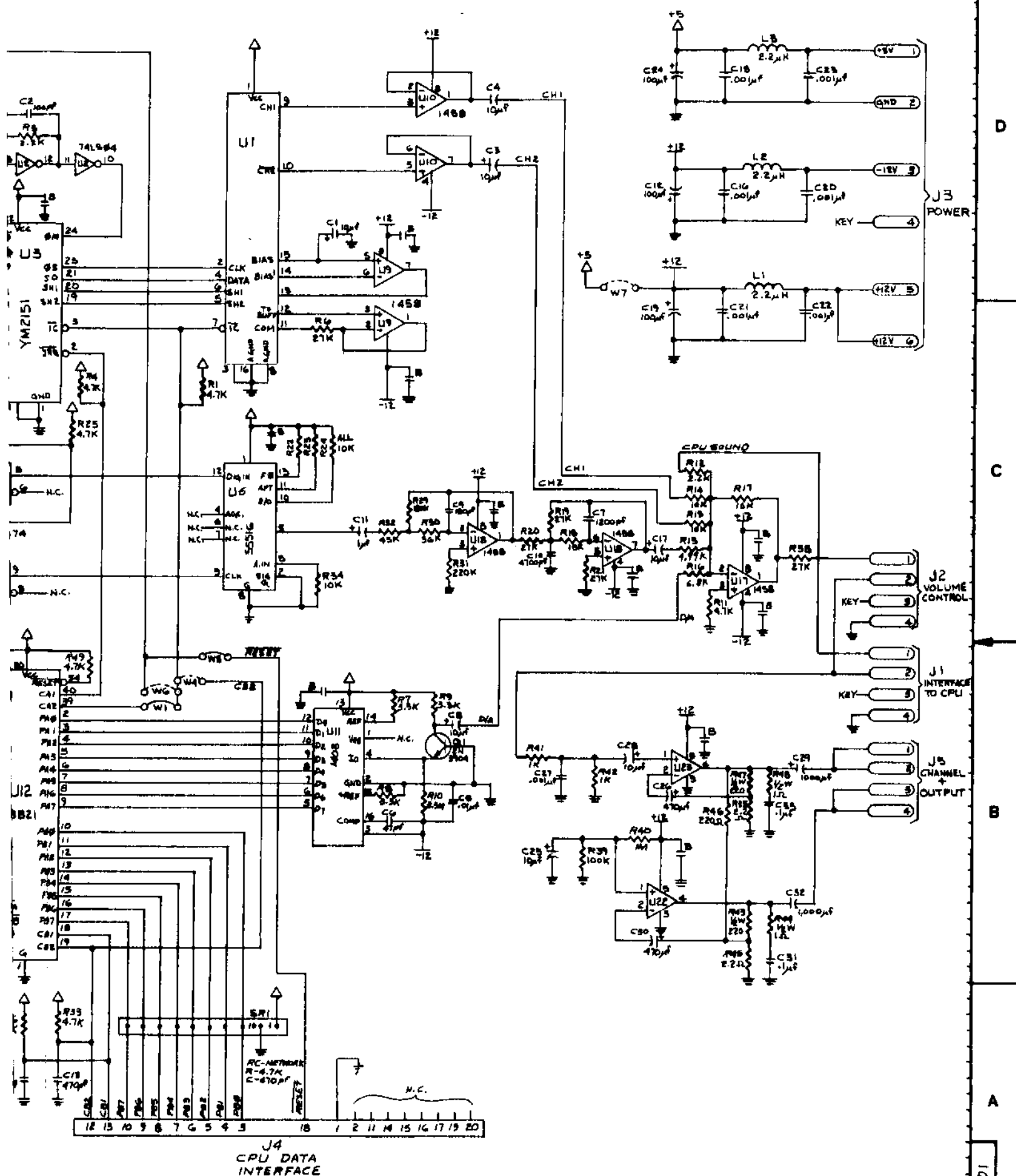
Aux Power Driver Board Schematic

| REV | DESCRIPTION OF CHANGE | ECN NO<br>DATE   |
|-----|-----------------------|------------------|
|     | N. P. R.              | 16936<br>2-27-87 |



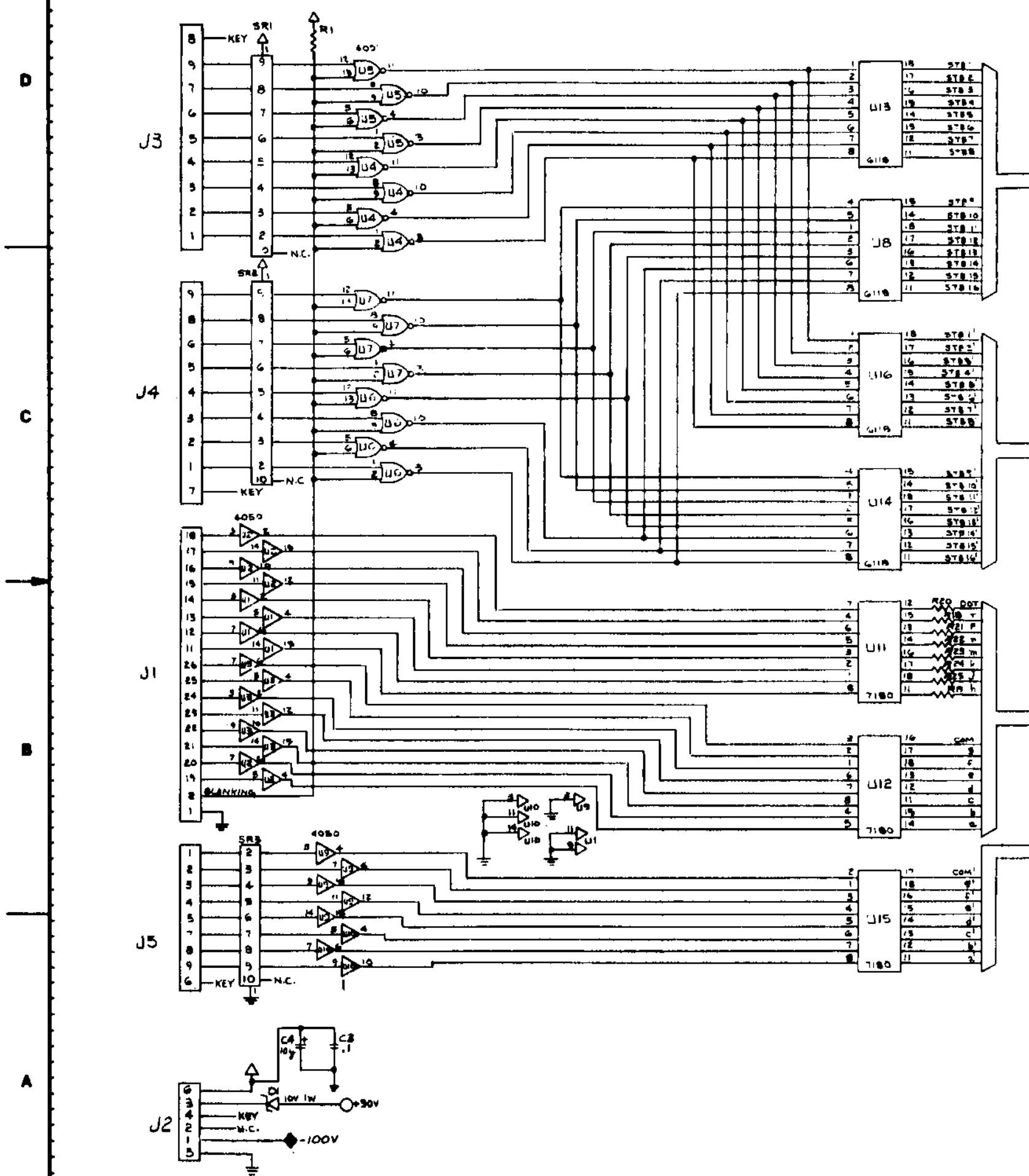
**NOTES:**

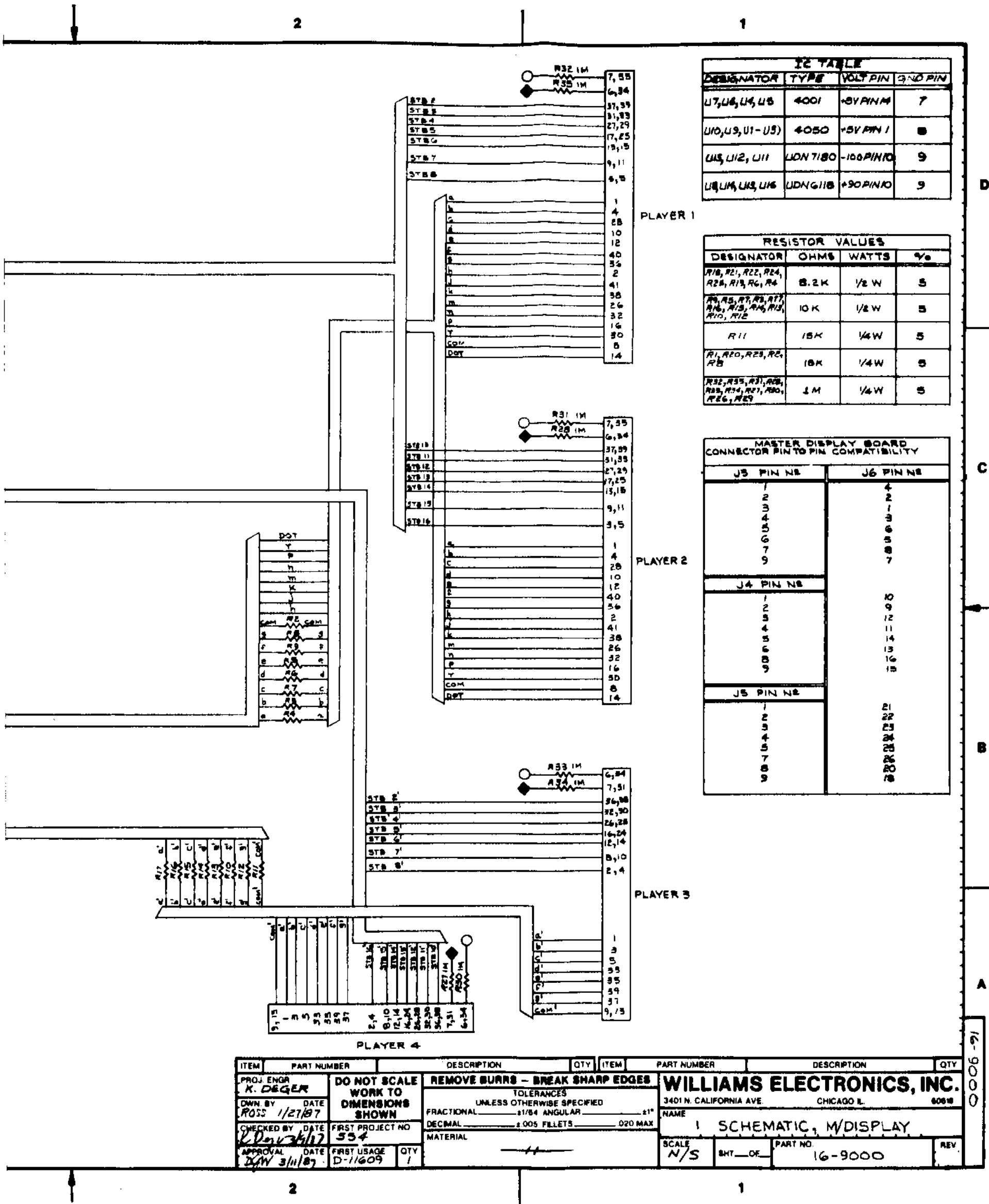
- ALL CAPACITORS WITH "B" ARE BYPASS AND HAVE A VALUE OF .01 $\mu$ F  
- LAST USED  
C31, R46, U23, W7, J5, L3.



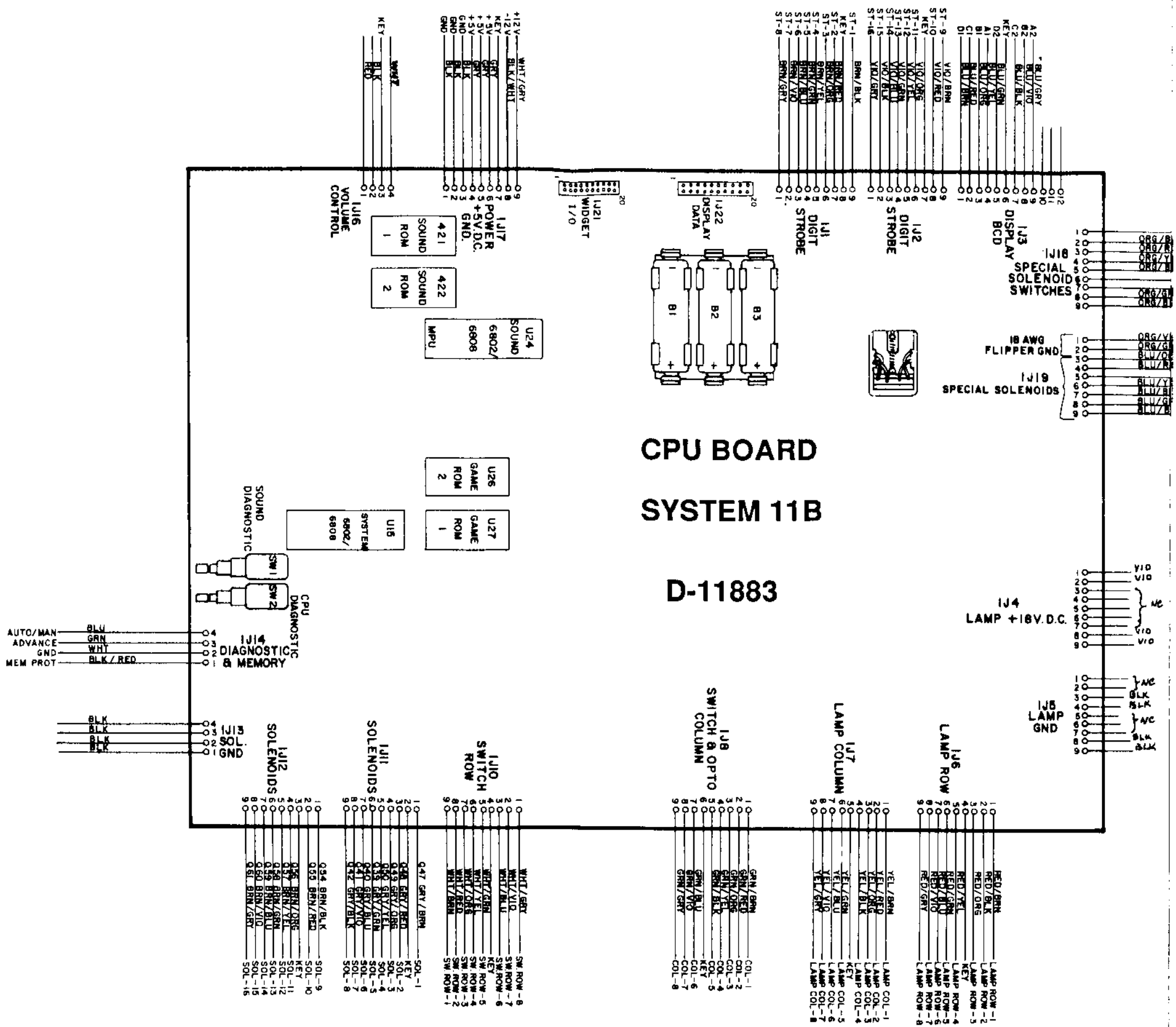
| ITEM                         | PART NUMBER                                    | DESCRIPTION                              | QTY | ITEM                                    | PART NUMBER | DESCRIPTION | QTY |
|------------------------------|------------------------------------------------|------------------------------------------|-----|-----------------------------------------|-------------|-------------|-----|
| PROJ ENGR<br>C. BLEICH       | DO NOT SCALE<br>WORK TO<br>DIMENSIONS<br>SHOWN | REMOVE BURRS—BREAK SHARP CORNERS & EDGES |     | <b>WILLIAMS ELECTRONICS, INC.</b>       |             |             |     |
| DWN. BY<br>R055              | DATE<br>1/22/87                                | TOLERANCES<br>UNLESS OTHERWISE SPECIFIED |     | 3401 N. CALIFORNIA AVE CHICAGO IL 60618 |             |             |     |
| CHECKED BY<br>C. BLEICH      | DATE<br>1/22/87                                | DECIMAL — X ± 0.50 ANGULAR — 1/2°        |     | NAME<br>AUDIO SYSTEM SCHEMATIC          |             |             |     |
| APPROVAL<br>D. V. J. 1/22/87 | DATE<br>1/22/87                                | XX ± 0.05 FRACTIONAL — 1/64              |     | SCALE<br>N/S                            |             |             |     |
| FIRST PROJECT NO.<br>554     | FIRST USAGE<br>D-11581                         | MATERIAL<br>—                            |     | PART NO.<br>16-8999                     |             |             |     |
|                              |                                                |                                          |     | REV<br>—                                |             |             |     |

| REV | DESCRIPTION OF CHANGE | ECN NO   |
|-----|-----------------------|----------|
| 1   | N. P. R.              | 10000000 |



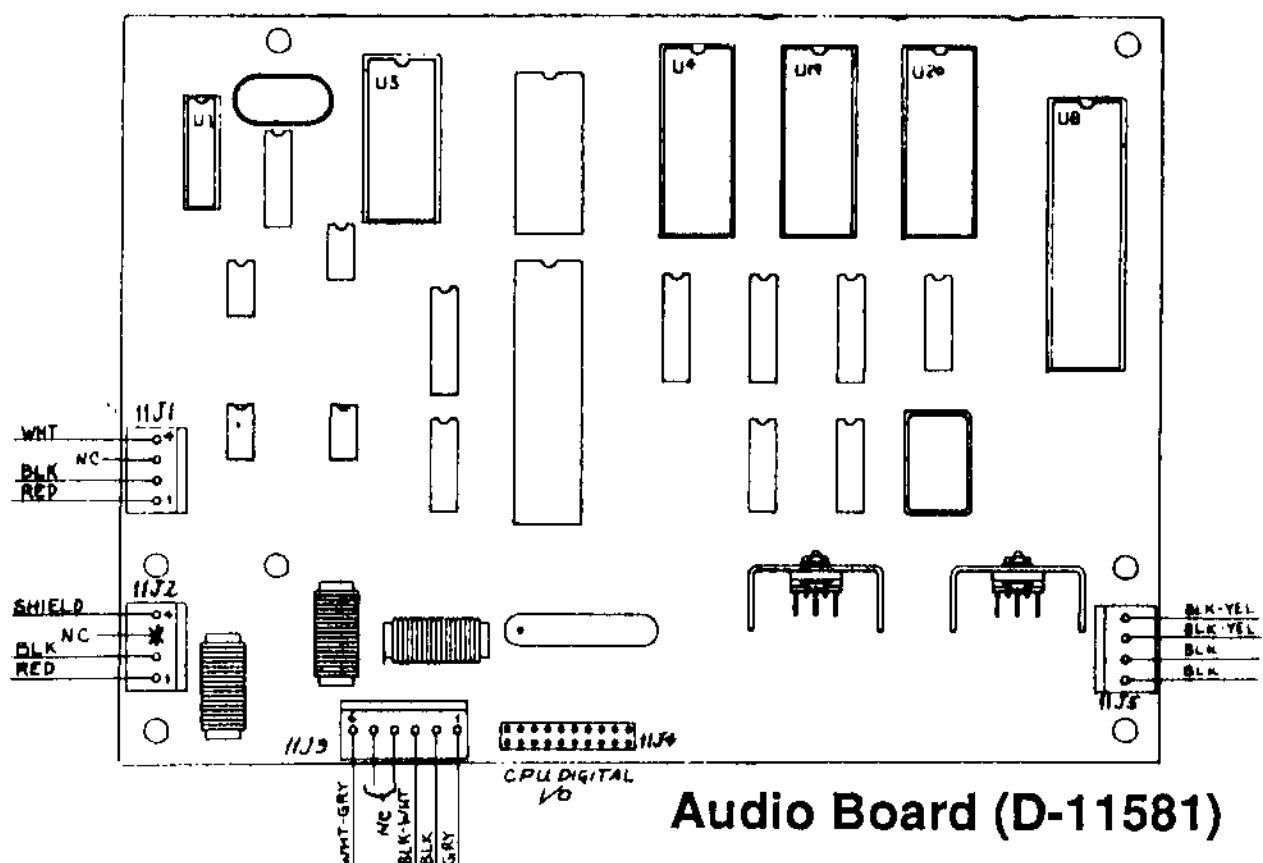
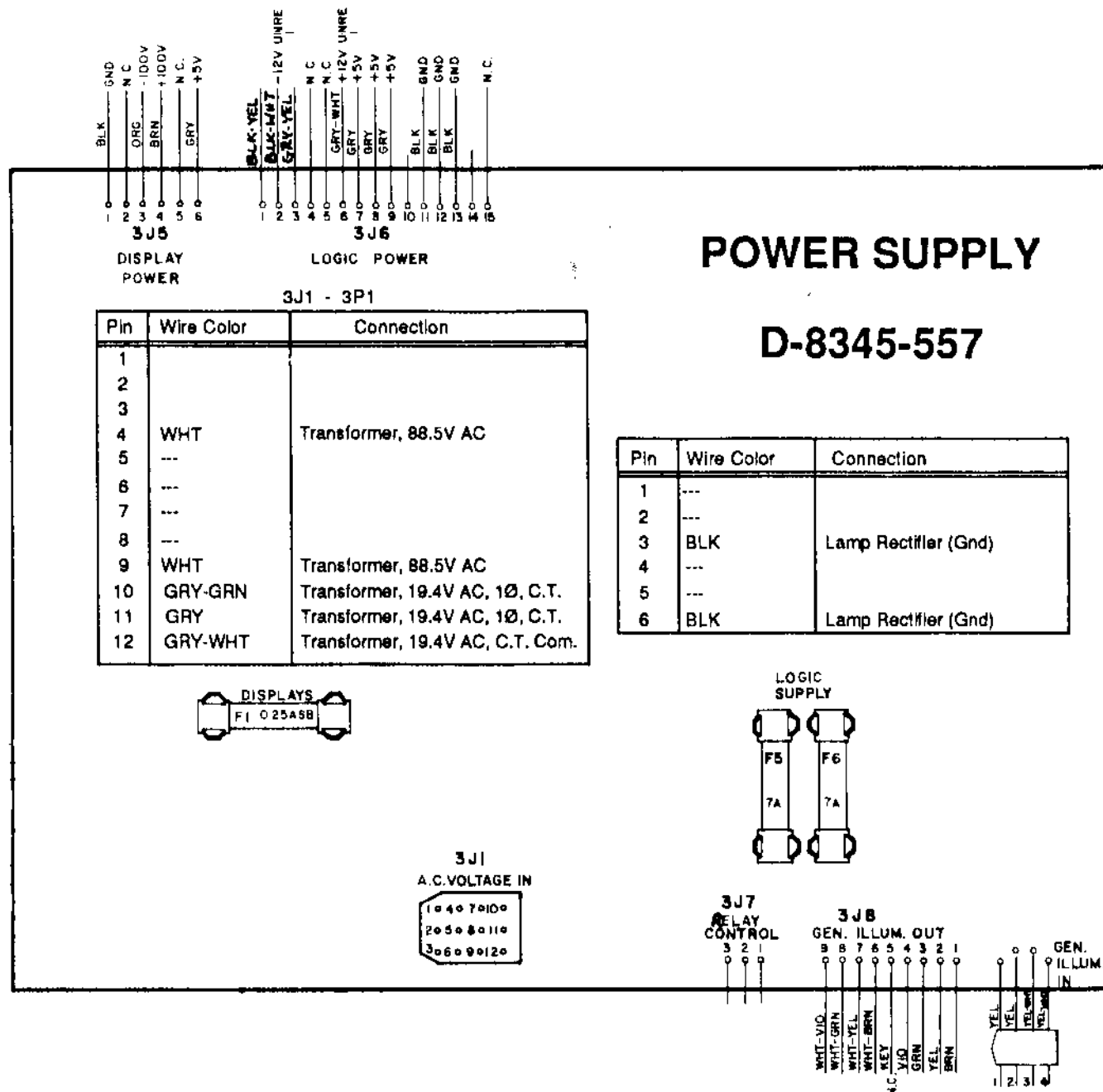


Alphanumeric Display Unit Board (D-11610) Schematic



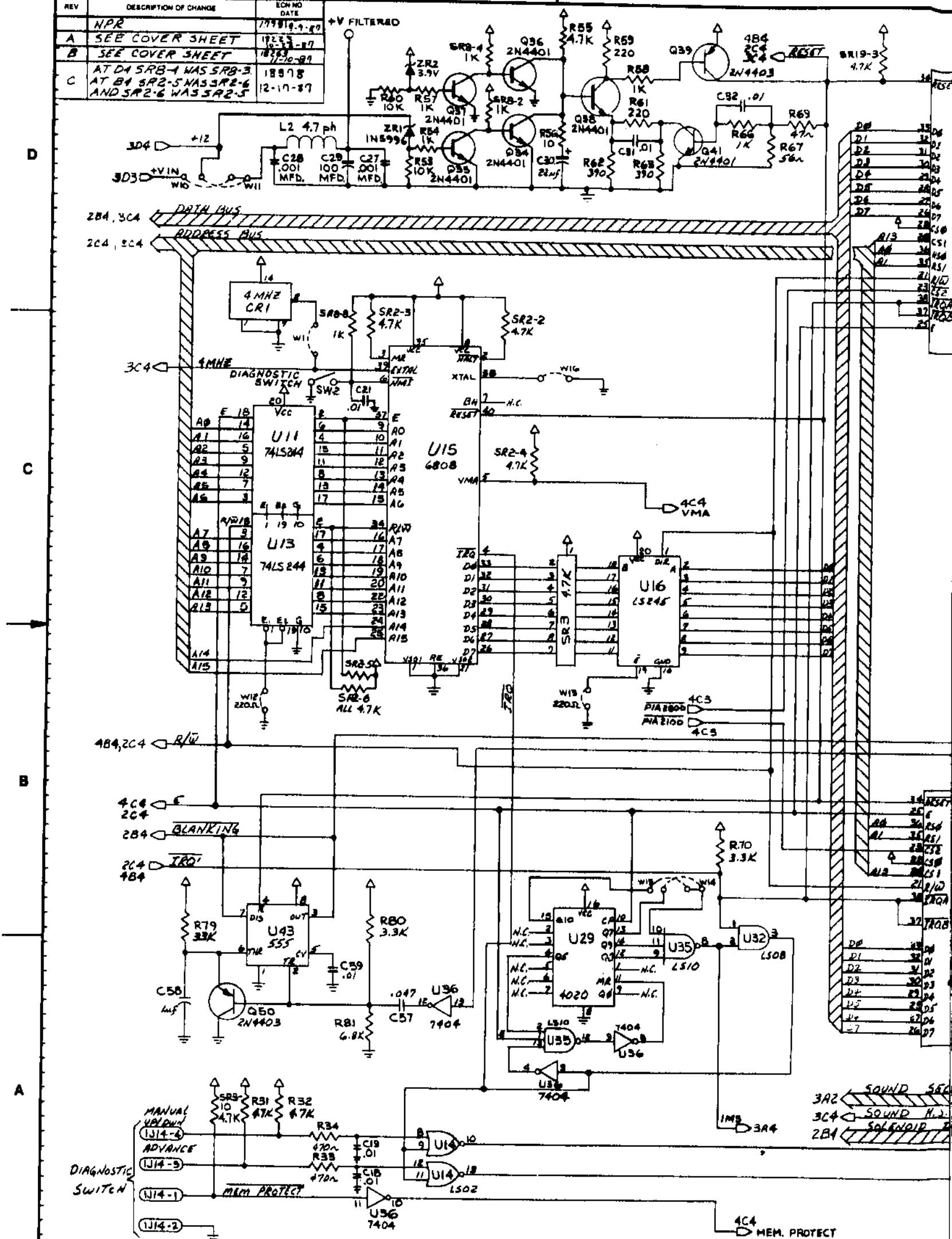
KEY  
 SP SOL - 3SW  
 SP SOL - 2SW  
 SP SOL - 4SW  
 SP SOL - 1SW  
 N.C.  
 SP SOL - 5SW  
 SP SOL - 6SW

KEY  
 SP SOL - 3  
 SP SOL - 2  
 SP SOL - 4  
 SP SOL - 1  
 SP SOL - 5  
 SP SOL - 6



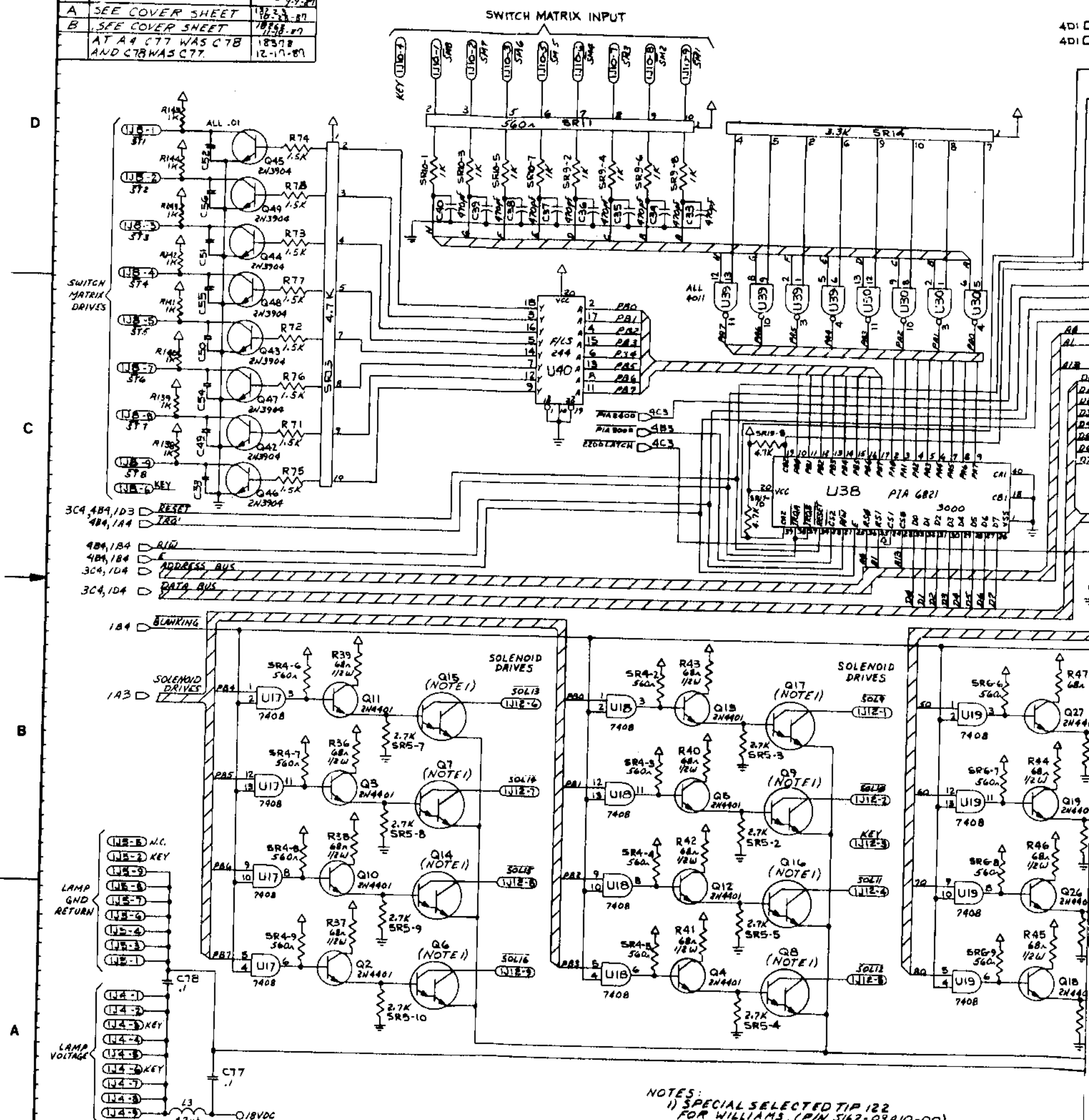
## Interboards Signals Diagrams

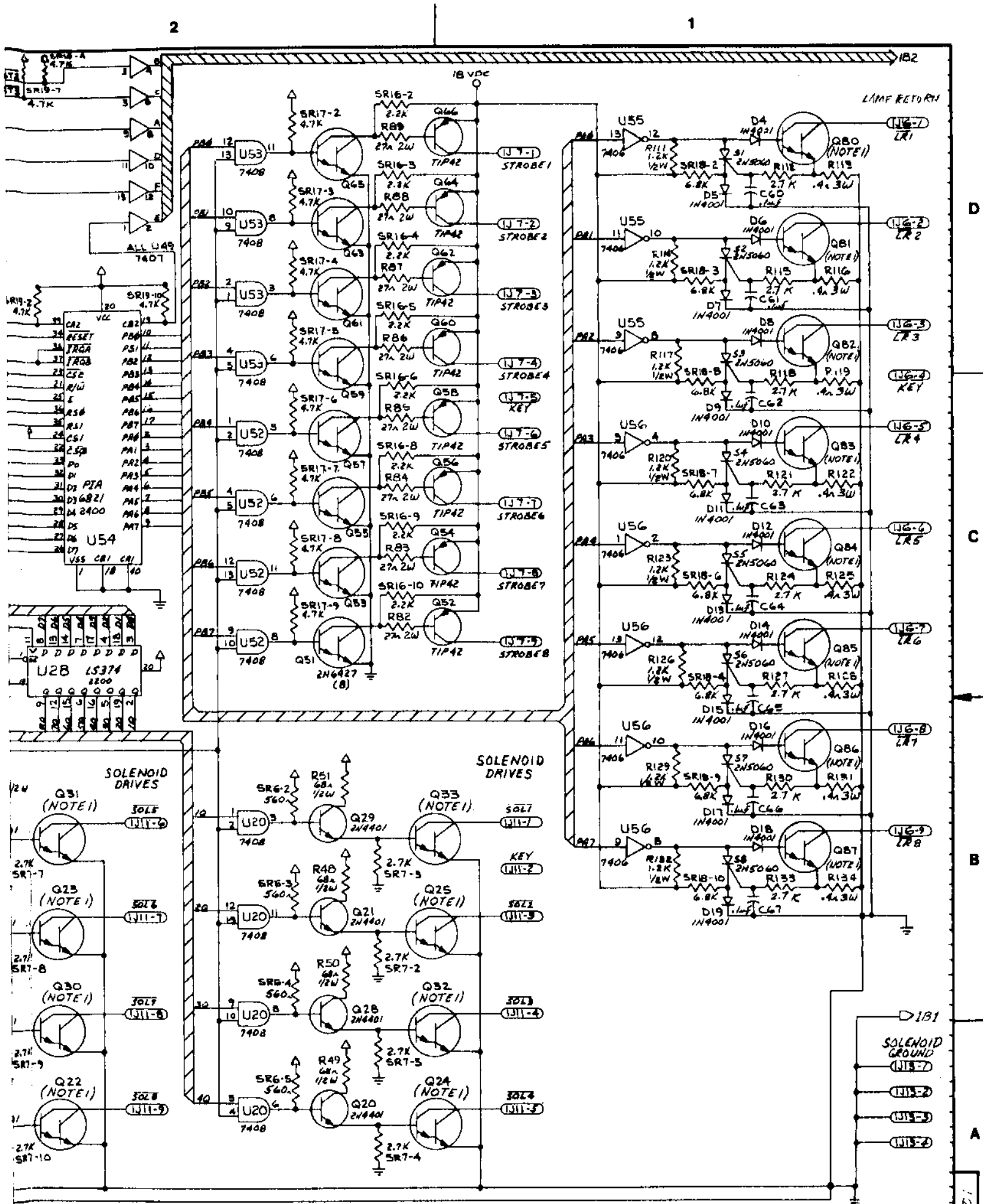
| REV      | DESCRIPTION OF CHANGE                                                          | ECH NO<br>DATE            |
|----------|--------------------------------------------------------------------------------|---------------------------|
|          | <i>NPR</i>                                                                     | <i>11-18-87</i>           |
| <i>A</i> | <i>SEE COVER SHEET</i>                                                         | <i>12-23-87</i>           |
| <i>B</i> | <i>SEE COVER SHEET</i>                                                         | <i>12-23-87</i>           |
| <i>C</i> | <i>AT D4 SRB-1 WAS SRB-3<br/>AT B4 SR2-5 WAS SR2-6<br/>AND SR2-6 WAS SR2-5</i> | <i>18898<br/>12-17-87</i> |





| REV | DESCRIPTION OF CHANGE | ECN NO | DATE     |
|-----|-----------------------|--------|----------|
|     | NPR                   | 17981  | 2-9-87   |
| A   | SEE COVER SHEET       | 18378  | 8-23-87  |
| B   | SEE COVER SHEET       | 18378  | 8-23-87  |
|     | AT A4 C77 WAS C78     | 18378  | 8-23-87  |
|     | AND C78 WAS C77.      | 18378  | 12-17-87 |



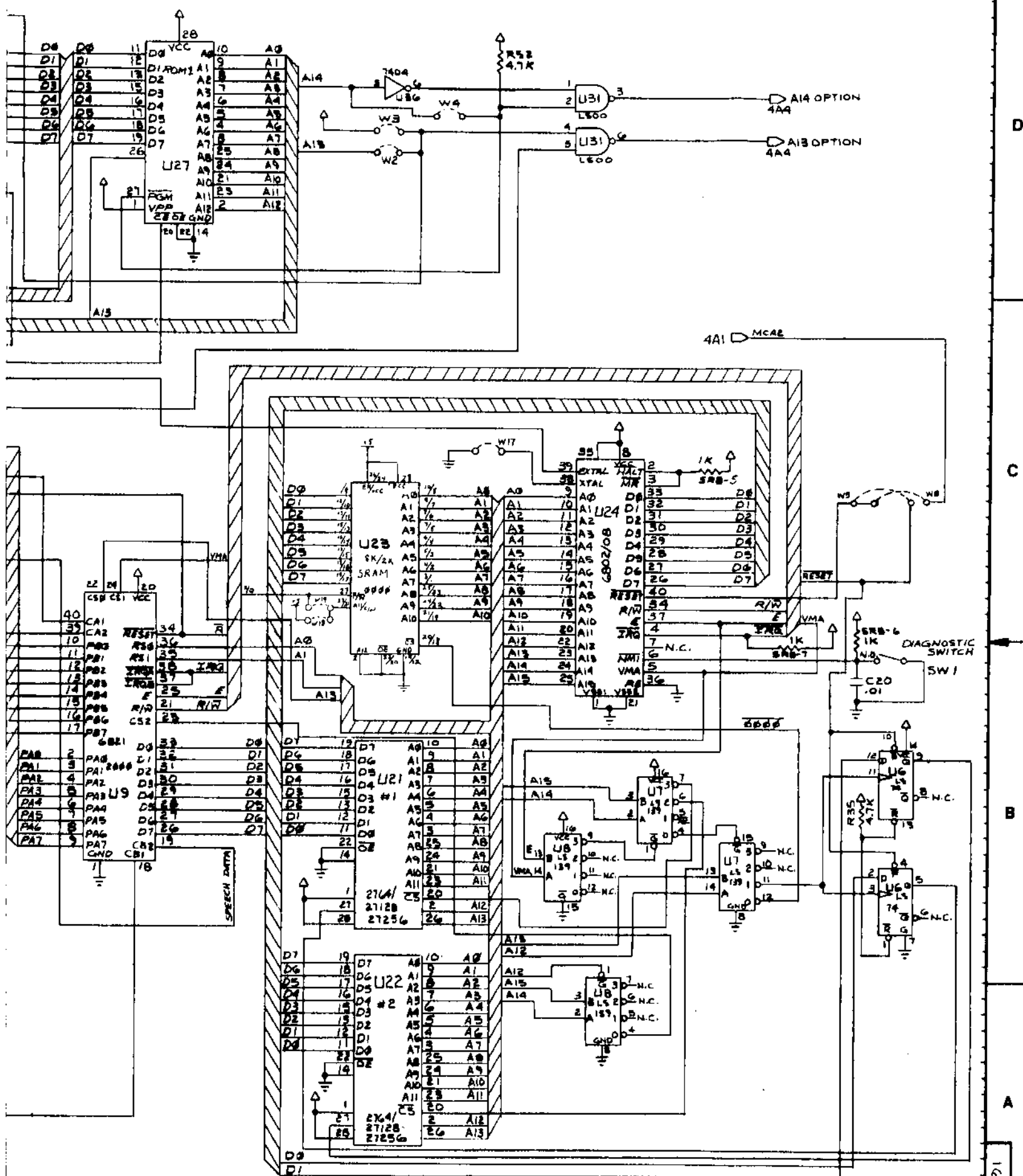


| ITEM                   | PART NUMBER                                    | DESCRIPTION                                                         | QTY | ITEM                          | PART NUMBER | DESCRIPTION         | QTY      |
|------------------------|------------------------------------------------|---------------------------------------------------------------------|-----|-------------------------------|-------------|---------------------|----------|
| PROJ ENGR<br>C. BLEICH | DO NOT SCALE<br>WORK TO<br>DIMENSIONS<br>SHOWN | REMOVE BURRS - BREAK SHARP EDGES                                    |     | WILLIAMS ELECTRONICS, INC.    |             |                     |          |
| OWN BY<br>ROSS         | DATE<br>8-20-87                                | TOLERANCES<br>UNLESS OTHERWISE SPECIFIED                            |     | 3401 N. CALIFORNIA AVE.       | CHICAGO IL  | 60618               |          |
| CHECKED BY<br>A. NEW   | DATE<br>9/1/87                                 | FRACTIONAL<br>1/8 1/4 ANGULAR<br>DECIMAL<br>0.005 FILLETS 0.020 MAX |     | NAME<br>CPU SYS 11B SCHEMATIC |             |                     |          |
| APPROVAL<br>C. BLEICH  | DATE<br>11/1/87                                | FIRST PROJECT NO<br>557                                             |     | SCALE<br>X                    | SHT 2 OF 4  | PART NO.<br>16-9019 | REV<br>C |
|                        |                                                | FIRST USAGE<br>D-11882                                              |     |                               |             |                     |          |

System 11B CPU Schematic (16-9019, Sheet 2 of 4)

C

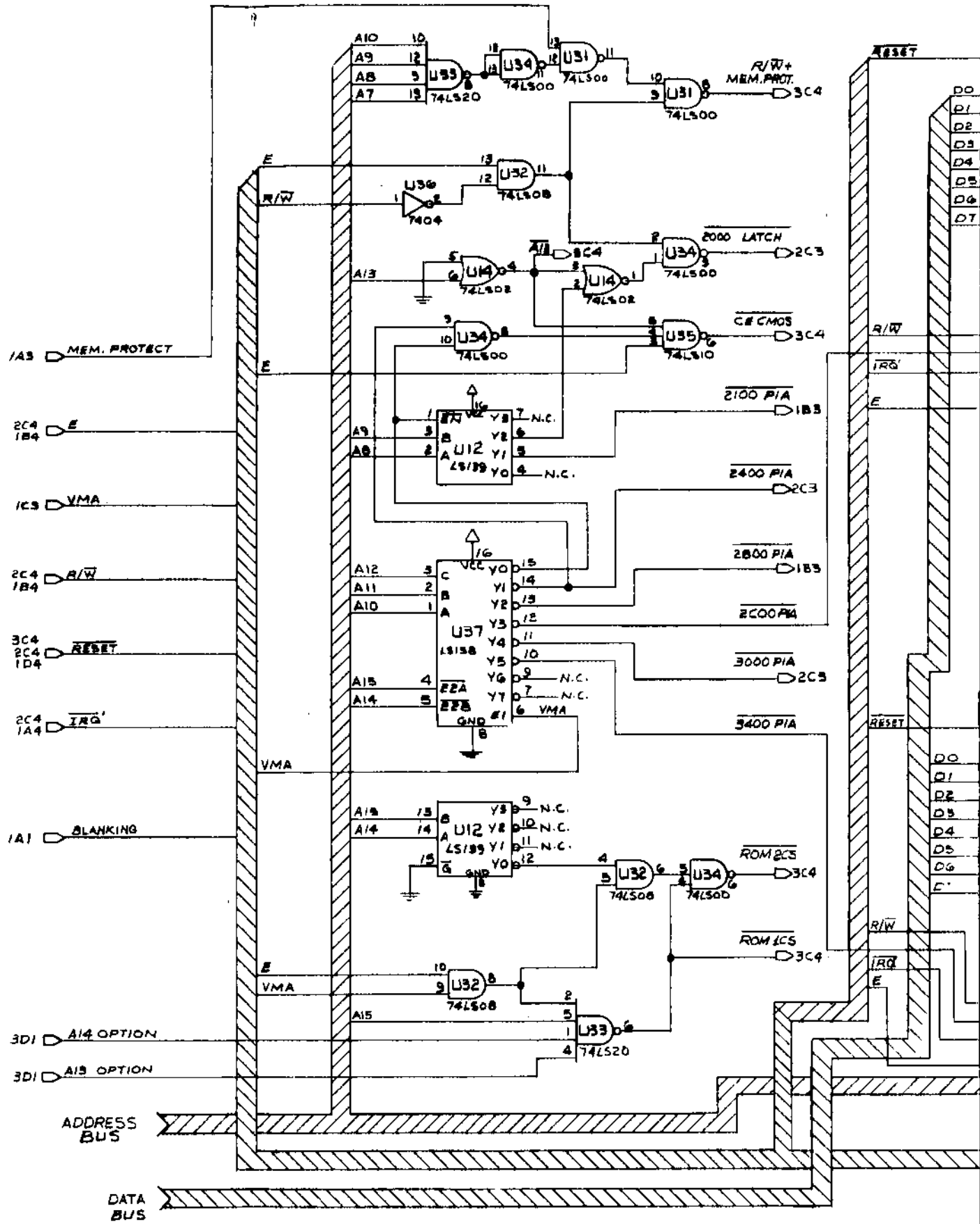
VOLUME CONTROL

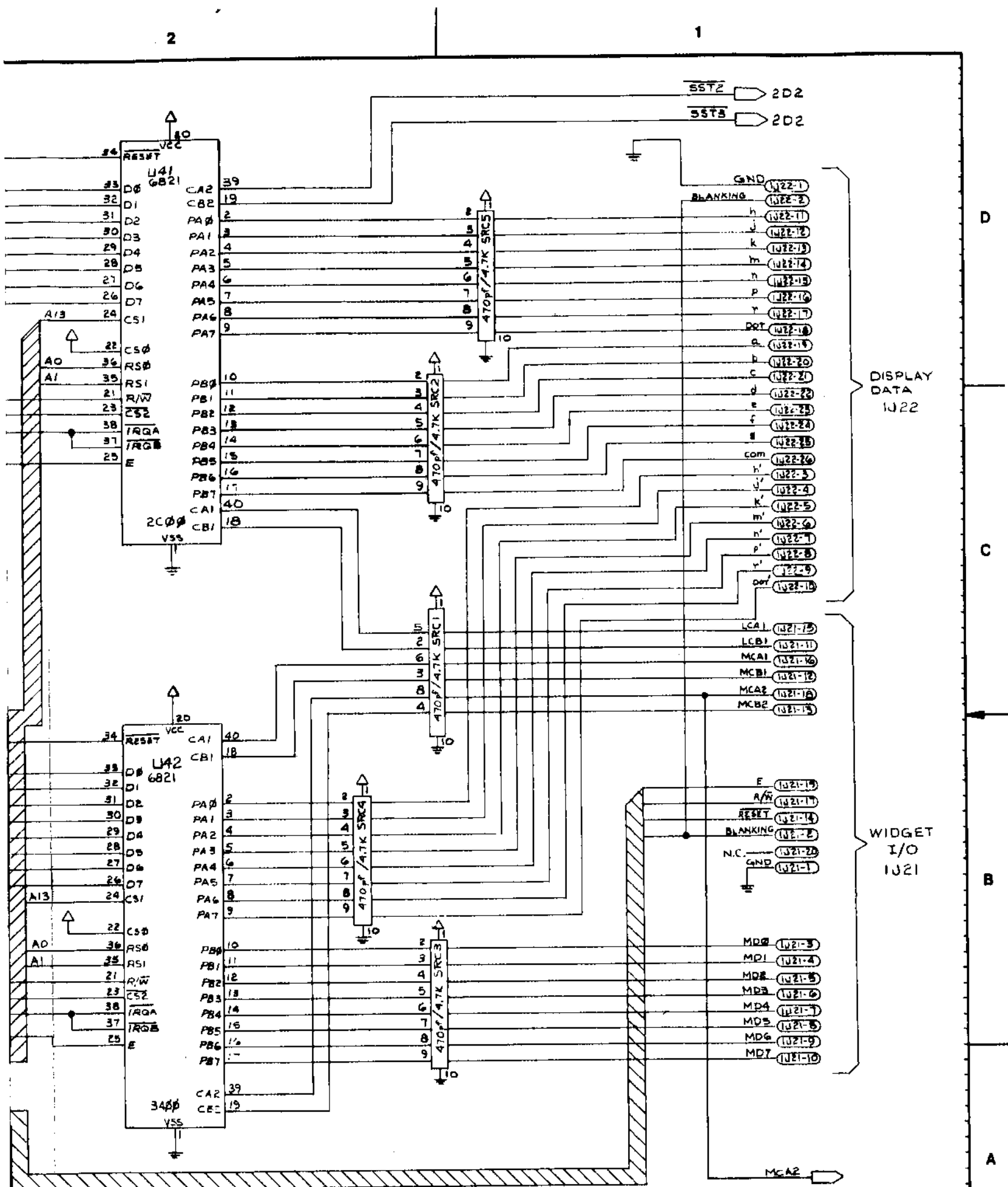


| ITEM                    | PART NUMBER                                    | DESCRIPTION                              | QTY                 | ITEM                              | PART NUMBER | DESCRIPTION         | QTY      |
|-------------------------|------------------------------------------------|------------------------------------------|---------------------|-----------------------------------|-------------|---------------------|----------|
| PROJ ENGR<br>C. BLEICH  | DO NOT SCALE<br>WORK TO<br>DIMENSIONS<br>SHOWN | REMOVE BURRS - BREAK SHARP EDGES         |                     | <b>WILLIAMS ELECTRONICS, INC.</b> |             |                     |          |
| OWN BY<br>ROSS          | DATE<br>8-20-87                                | TOLERANCES<br>UNLESS OTHERWISE SPECIFIED |                     | 3401 N. CALIFORNIA AVE            | CHICAGO, IL | 60618               |          |
| CHECKED BY<br>C. BLEICH | DATE<br>9/1/87                                 | FRACTIONAL<br>1/64                       | ANGULAR<br>31°      | NAME<br>CPU SYS 11B SCHEMATIC     |             |                     |          |
| APPROVAL<br>C. BLEICH   | DATE<br>9/1/87                                 | DECIMAL<br>0.005                         | FILLET<br>0.020 MAX | SCALE<br>1/4"                     | SHT 3 OF 4  | PART NO.<br>16-9019 | REV<br>C |
| FIRST PROJECT NO<br>557 | FIRST USAGE<br>D-11882                         | MATERIAL<br>11                           |                     |                                   |             |                     |          |

System 11B CPU Schematic (16-9019, Sheet 3 of 4)

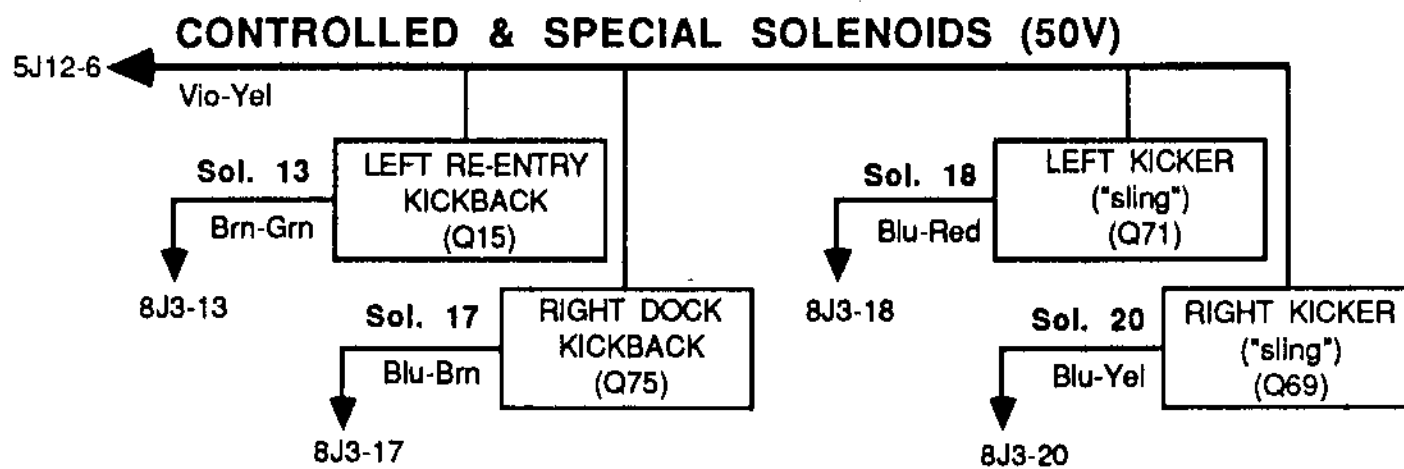
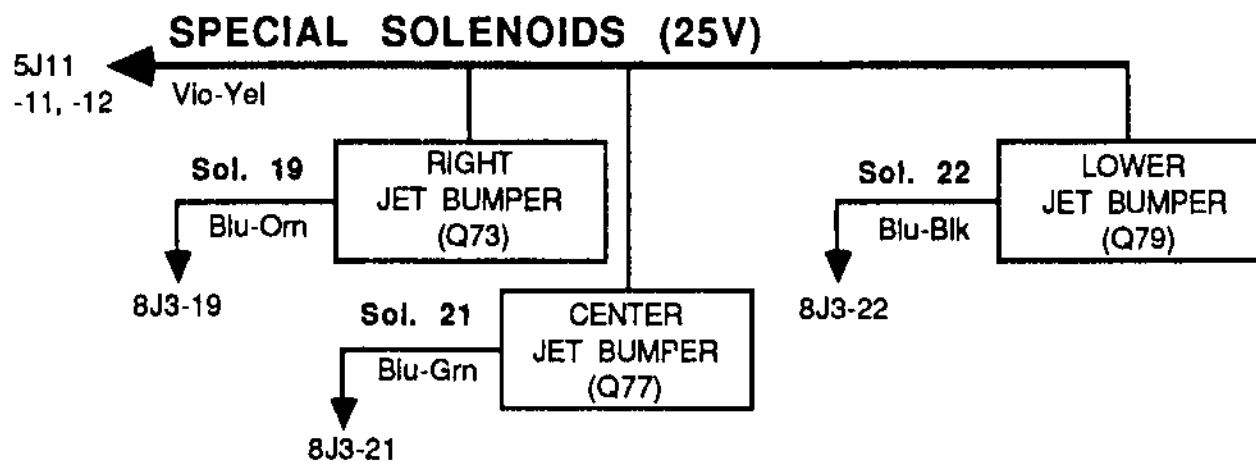
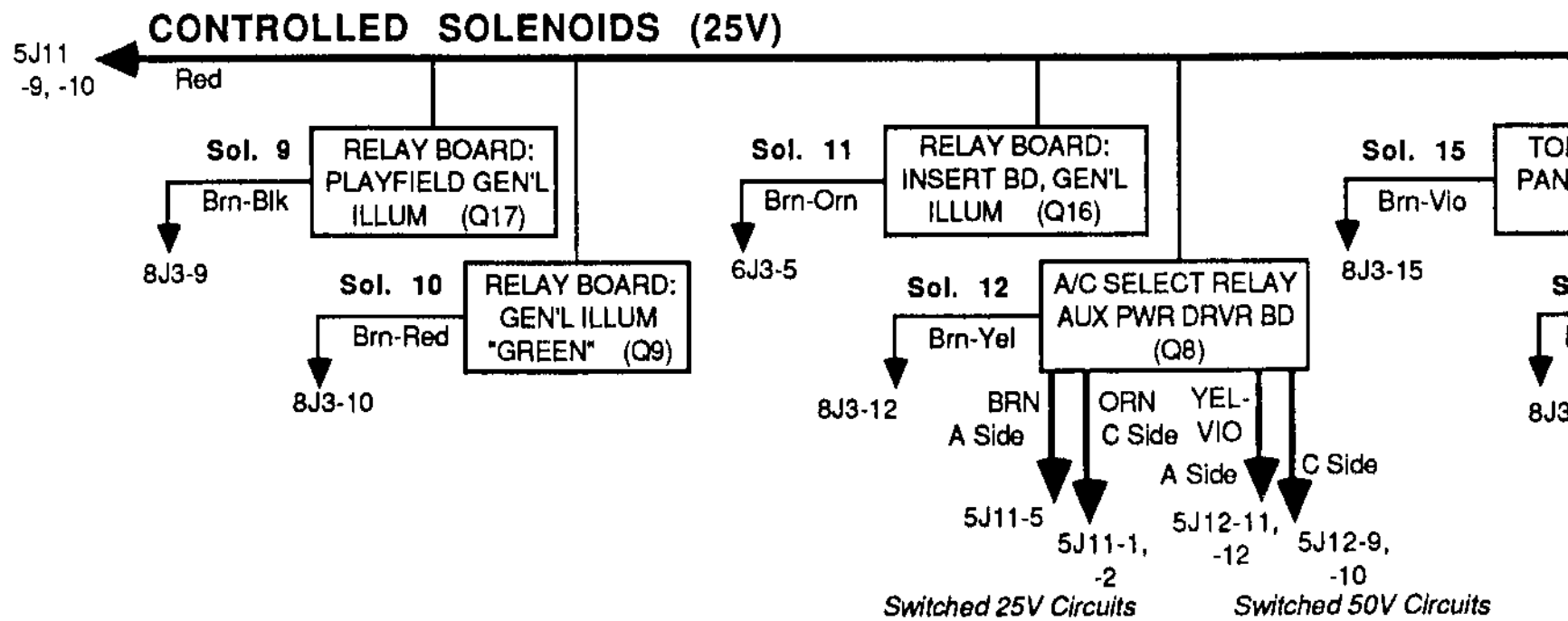
| REV | DESCRIPTION OF CHANGE | ECN NO | DATE   |
|-----|-----------------------|--------|--------|
|     | N. P. R.              | 1000   | 9-9-87 |
| A   | SEE COVER SHEET       | 1000   | 9-9-87 |
| B   | SEE COVER SHEET       | 1000   | 9-9-87 |
| C   | SEE SHEET 1-3         | 1000   | 9-9-87 |

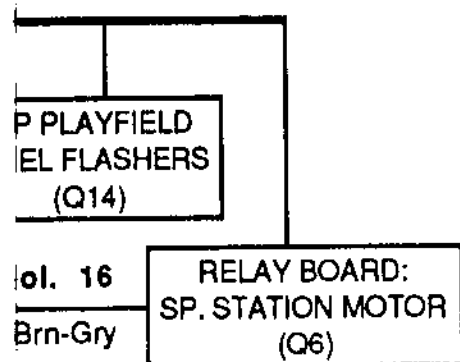




| ITEM                           | PART NUMBER                                    | DESCRIPTION                              | QTY | ITEM                          | PART NUMBER | DESCRIPTION        | QTY      |
|--------------------------------|------------------------------------------------|------------------------------------------|-----|-------------------------------|-------------|--------------------|----------|
| PROJ ENGR<br>C. BLEICH         | DO NOT SCALE<br>WORK TO<br>DIMENSIONS<br>SHOWN | REMOVE BURRS - BREAK SHARP EDGES         |     | WILLIAMS ELECTRONICS, INC.    |             |                    |          |
| OWN BY<br>ROSS 8-20-87         | FIRST PROJECT NO<br>557                        | TOLERANCES<br>UNLESS OTHERWISE SPECIFIED |     | 3401 N. CALIFORNIA AVE.       | CHICAGO IL. | 60618              |          |
| CHECKED BY<br>C. BLEICH 7/1/87 | FIRST USAGE<br>D-11882                         | FRACTIONAL<br>DECIMAL<br>MATERIAL        |     | NAME<br>CPU SYS 11B SCHEMATIC |             |                    |          |
| APPROVAL<br>C. BLEICH 7/1/87   |                                                |                                          |     | SCALE<br>N/S                  | SHT 4 OF 4  | PART NO<br>16-9019 | REV<br>C |

System 11B CPU Schematic (16-9019, Sheet 4 of 4)





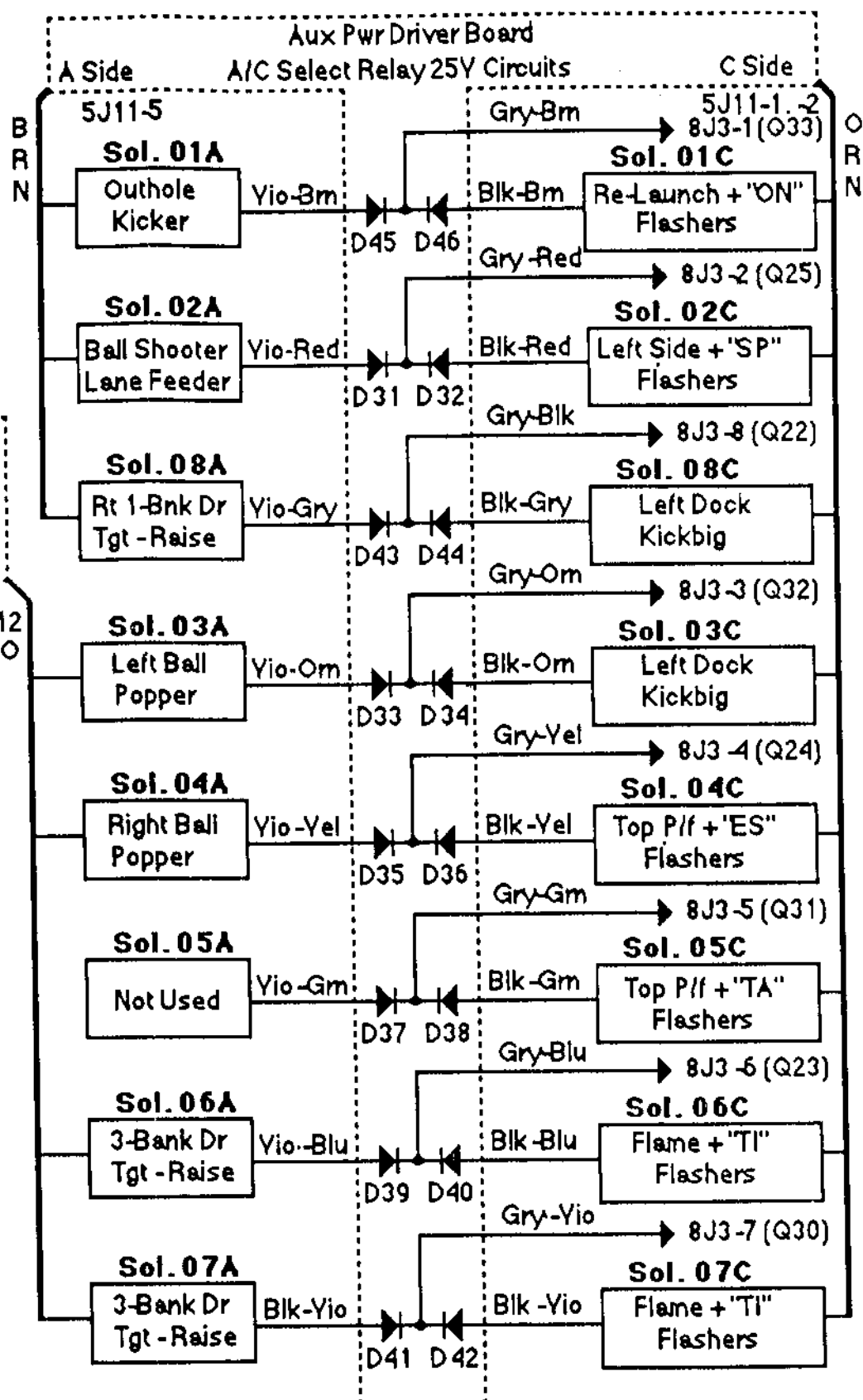
I-16

## SWITCHED SOLENOIDS

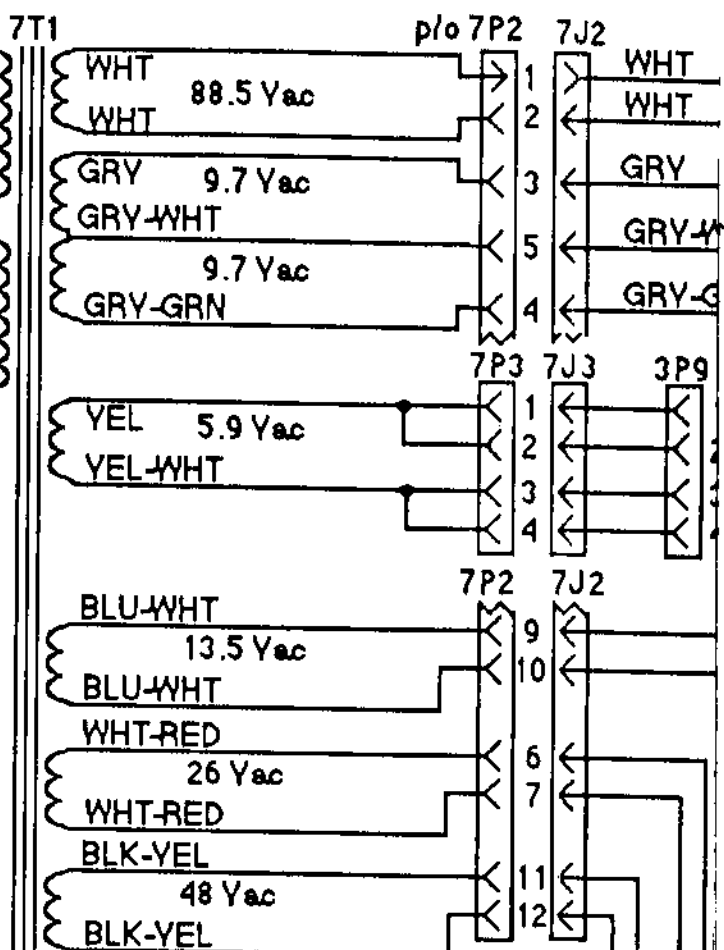
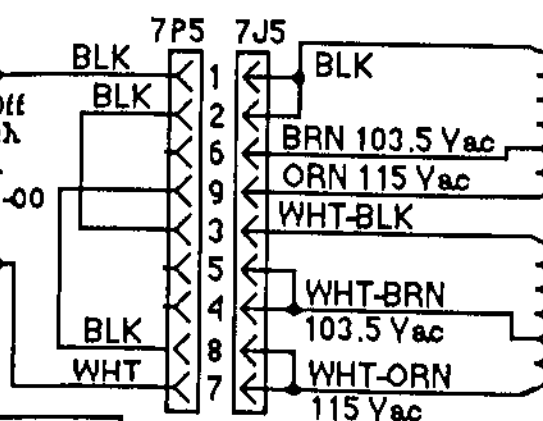
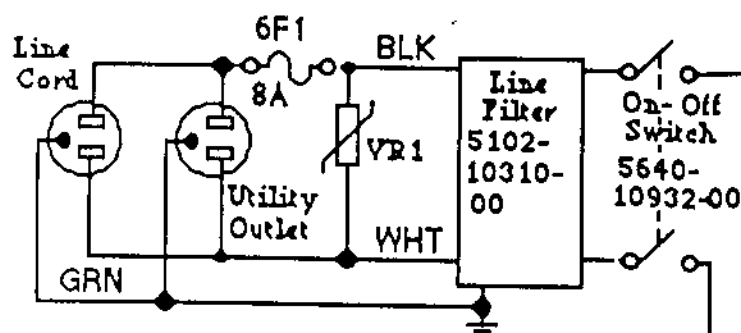
Aux Pwr Driver Bd  
A/C Select Relay  
50V Circuits

A Side

5J12-11, -12  
VEL-YIO

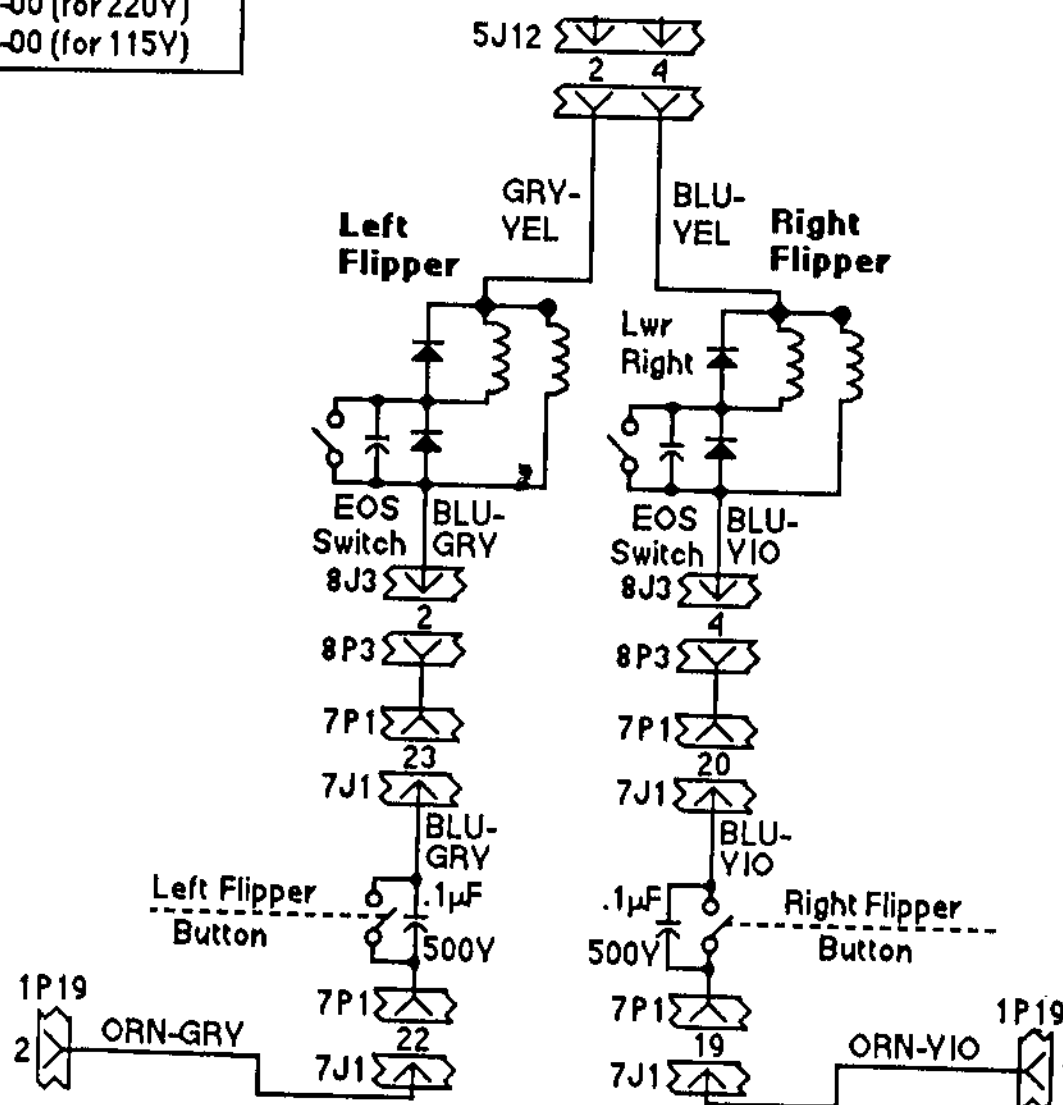


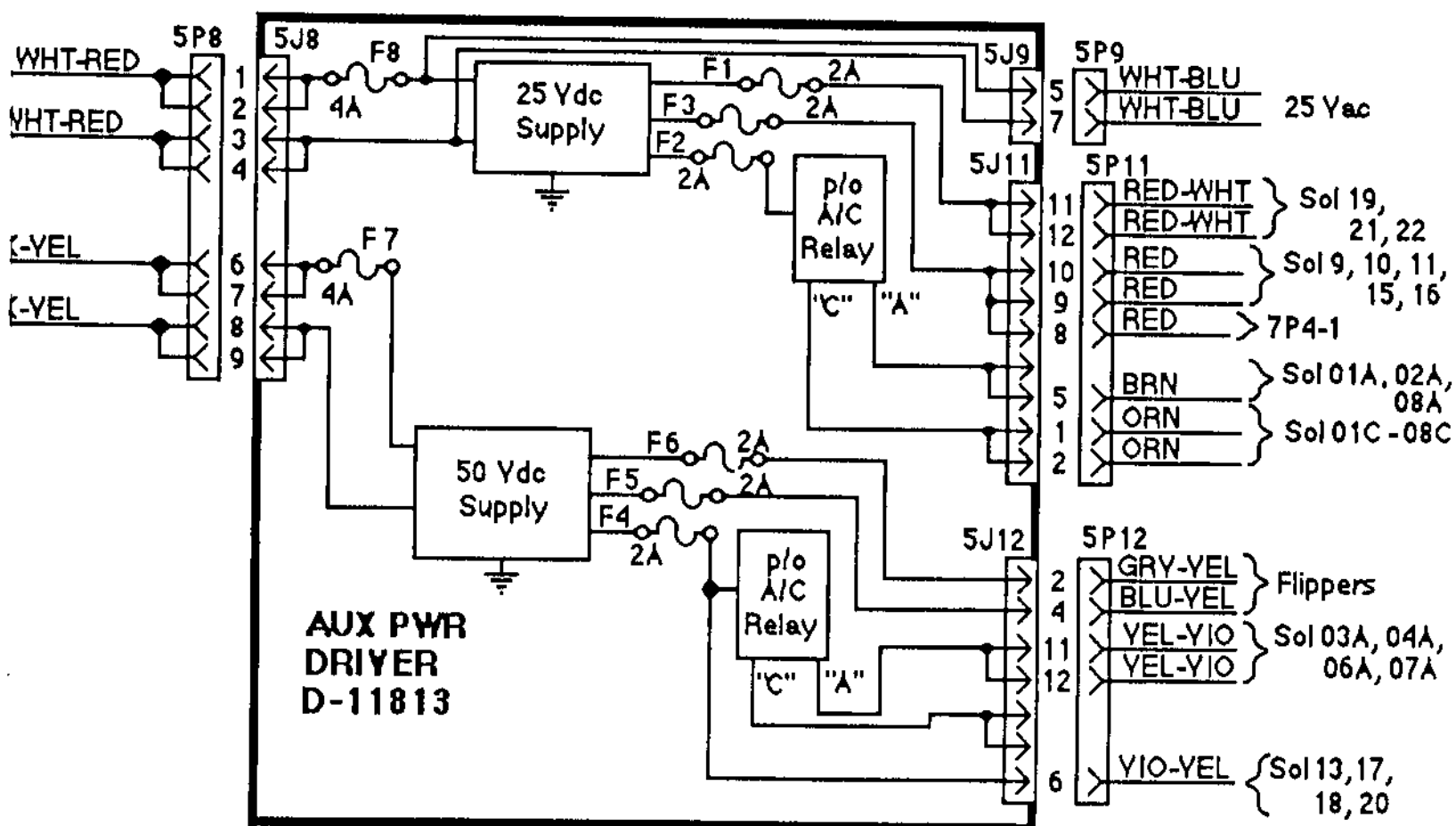
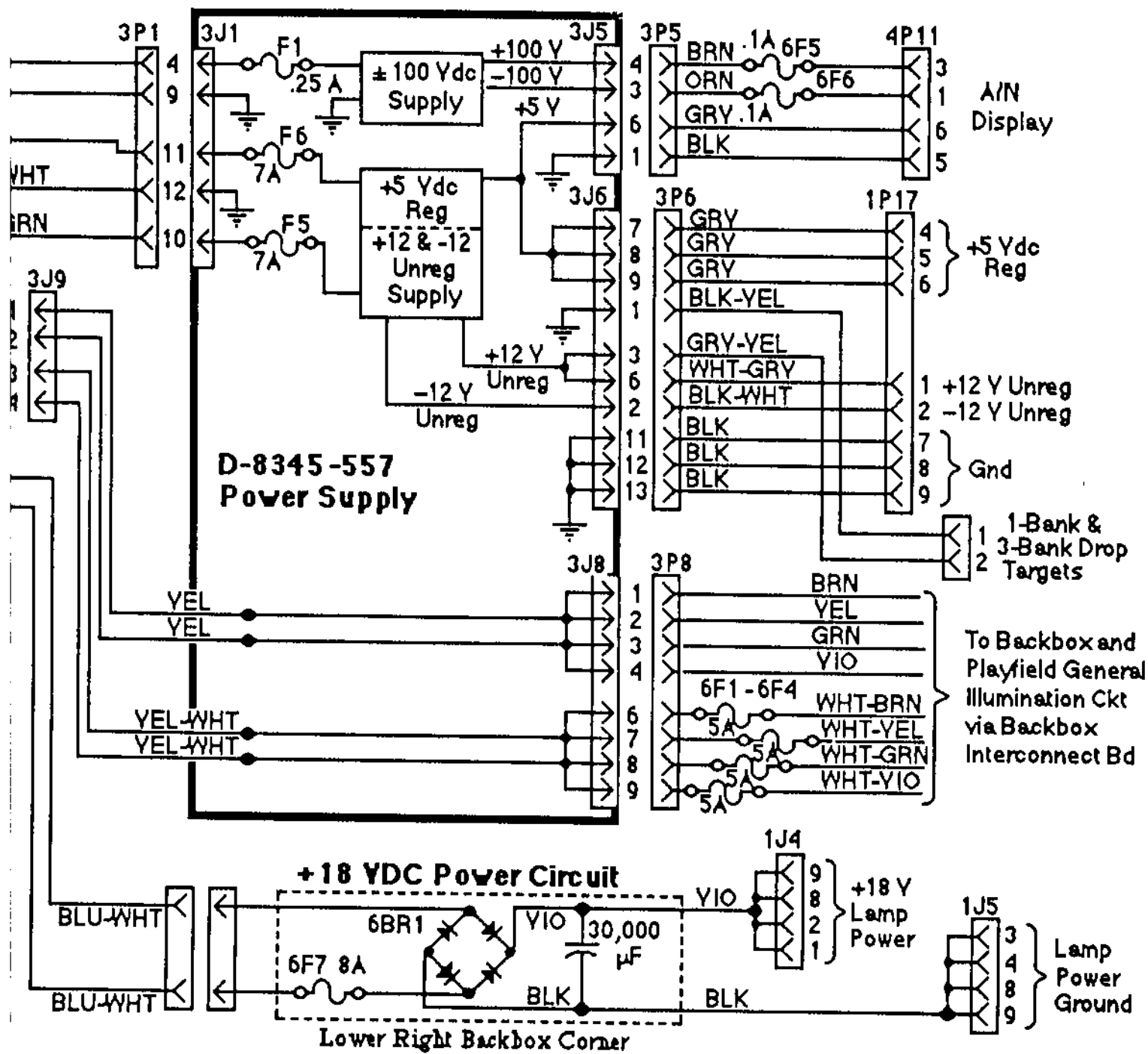
Controlled, Special, and Switched Solenoids



| TRANSFORMER JUMPER CHART                                                                                                                         |                                                       |                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| 206/218 YAC                                                                                                                                      | 230 YAC                                               | 103.5 YAC                                             |
| 7P5<br>BLK 1<br>206Y 2<br>218Y 6<br>9 3<br>WHT 5<br>4<br>8<br>7                                                                                  | 7P5<br>BLK 1<br>2<br>6<br>9 3<br>WHT 5<br>4<br>8<br>7 | 7P5<br>BLK 1<br>2<br>6<br>9 3<br>WHT 5<br>4<br>8<br>7 |
| FUSE: 4A, S-B                                                                                                                                    | 4A, S-B                                               | 8A, S-B                                               |
| VARISTOR: 275V                                                                                                                                   | 275V                                                  | 130V                                                  |
| 275V Varistor: 5017-09063-00<br>130V Varistor: 5017-09044-00<br>4A, S-B Fuse: 5731-06314-00 (for 220V)<br>8A, S-B Fuse: 5730-09252-00 (for 115V) |                                                       |                                                       |

**Note:**  
Jumpers shown are for 115 Vac. See Transformer Jumper Chart for other voltage jumper connections.





Power Wiring Diagram

2 Double Lamps

SPACE STATION Lamp-Matrix Table

| COLUMN<br>ROW                    | 1 Q66<br>YEL-BRN<br>1J7-1      | 2 Q64<br>YEL-RED<br>1J7-2 | 3 Q62<br>YEL-ORN<br>1J7-3               | 4 Q60<br>YEL-BLK<br>1J7-4                | 5 Q58<br>YEL-GRN<br>1J7-6           | 6 Q56<br>YEL-BLU<br>1J7-7                | 7 Q54<br>YEL-VIO<br>1J7-8      | 8 Q52<br>YEL-GRY<br>1J7-9      |
|----------------------------------|--------------------------------|---------------------------|-----------------------------------------|------------------------------------------|-------------------------------------|------------------------------------------|--------------------------------|--------------------------------|
| Q80<br>1<br>RED-<br>BRN<br>1J6-1 | Bonus Ball<br>Player #1<br>1   | Change<br>Shuttle<br>9    | RE-ENTRY<br>(Left W/LIT<br>Drain)<br>17 | S<br>25                                  | Stop & Score<br>33                  | Not<br>Used<br>41                        | Big Flame<br>(insert bd)<br>49 | Big Flame<br>(insert bd)<br>57 |
| Q81<br>2<br>RED-<br>BLK<br>1J6-2 | Bonus Ball<br>Player #2<br>2   | Change<br>Station<br>10   | S<br>18                                 | T<br>26                                  | DOCK W/L<br>(right)<br>34           | RELAUNCH<br>WHEN LIT<br>42               | Shuttle Score<br>SPECIAL<br>50 | Station Score<br>SPECIAL<br>58 |
| Q82<br>3<br>RED-<br>ORN<br>1J6-3 | Bonus Ball<br>Player #3<br>3   | 1X<br>11                  | H<br>19                                 | A<br>27                                  | SPECIAL<br>35                       | DOCKED<br>Port Side<br>43                | Extra Ball<br>51               | Extra Ball<br>59               |
| Q83<br>4<br>RED-<br>YEL<br>1J6-5 | Bonus Ball<br>Player #4<br>4   | 2X<br>12                  | U<br>20                                 | T<br>28                                  | 100,000<br>When Lit<br>36           | Hold Bonus<br>44                         | 50,000 +<br>Re-Entry<br>52     | 50,000 +<br>Re-Entry<br>60     |
| Q84<br>5<br>RED-<br>GRN<br>1J6-6 | Extra Ball<br>(3-bnk D T)<br>5 | 4X<br>13                  | T<br>21                                 | I<br>29                                  | Little Shuttle<br>(insert bd)<br>37 | DOCKED<br>Starboard<br>Side<br>45        | 50,000 +<br>Bonus Ball<br>53   | 50,000 +<br>Bonus Ball<br>61   |
| Q85<br>6<br>RED-<br>BLU<br>1J6-7 | RELEASE<br>(right)<br>6        | 1<br>14                   | T<br>22                                 | O<br>30                                  | U<br>38                             | Williams<br>(insert bd,<br>left)<br>46   | 150,000 +<br>Hold Bonus<br>54  | 150,000 +<br>Hold Bonus<br>62  |
| Q86<br>7<br>RED-<br>VIO<br>1J6-8 | RELEASE<br>(left)<br>7         | 2<br>15                   | L<br>23                                 | N<br>31                                  | S<br>39                             | Williams<br>(insert bd,<br>middle)<br>47 | 75,000<br>55                   | 75,000<br>63                   |
| Q87<br>8<br>RED-<br>GRY<br>1J6-9 | DOCK W/L<br>(left)<br>8        | 3<br>16                   | E<br>24                                 | RE-ENTRY<br>(Right W/LIT<br>Drain)<br>32 | A<br>40                             | Williams<br>(insert bd,<br>right)<br>48  | 25,000<br>56                   | 25,000<br>64                   |

SPACE STATION Switch-Matrix Table

| COLUMN<br>ROW              | 1 Q45<br>GRN-BRN<br>1J8-1 | 2 Q49<br>GRN-RED<br>1J8-2       | 3 Q44<br>GRN-ORN<br>1J8-3  | 4 Q48<br>GRN-YEL<br>1J8-4   | 5 Q43<br>GRN-BLK<br>1J8-5                   | 6 Q47<br>GRN-BLU<br>1J8-7  | 7 Q42<br>GRN-VIO<br>1J8-8               | 8 Q46<br>GRN-GRY<br>1J8-9       |
|----------------------------|---------------------------|---------------------------------|----------------------------|-----------------------------|---------------------------------------------|----------------------------|-----------------------------------------|---------------------------------|
| 1<br>WHT-<br>BRN<br>1J10-9 | Plumb Bob<br>Tilt<br>1    | Playfield<br>Tilt<br>9          | Drain Lane<br>(left)<br>17 | S<br>25                     | Single Drop<br>Target<br>(right ramp)<br>33 | Left Ball<br>Popper<br>41  | Not Used<br>49                          | 3-bank Dr Tgt<br>(upr)<br>57    |
| 2<br>WHT-<br>RED<br>1J10-8 | Not Used<br>2             | Outhole<br>10                   | S<br>18                    | T<br>26                     | (German Score<br>Board Sw)<br>34            | Right Ball<br>Popper<br>42 | 10-Point<br>(top right)<br>50           | 3-bank Dr Tgt<br>(cntr)<br>58   |
| 3<br>WHT-<br>ORN<br>1J10-7 | Credit<br>Button<br>3     | Ball Trough<br>#1 (right)<br>11 | H<br>19                    | A<br>27                     | Change<br>Shuttle/Station<br>Score<br>35    | Ball Shooter<br>43         | Not Used<br>51                          | 3-bank Dr Tgt<br>(lwr)<br>59    |
| 4<br>WHT-<br>YEL<br>1J10-6 | Right Coin<br>Chute<br>4  | Ball Trough<br>#2 (mid)<br>12   | U<br>20                    | T<br>28                     | Not Used<br>36                              | Not Used<br>44             | Space<br>Station #1<br>52               | Jet Bumper<br>(left)<br>60      |
| 5<br>WHT-<br>GRN<br>1J10-5 | Center Coin<br>Chute<br>5 | Ball Trough<br>#3 (left)<br>13  | T<br>21                    | I<br>29                     | Top left<br>Roll-under<br>37                | Right Lock<br>45           | Space<br>Station #2<br>53               | Jet Bumper<br>(right)<br>61     |
| 6<br>WHT-<br>BLU<br>1J10-3 | Left Coin<br>Chute<br>6   | 1<br>14                         | T<br>22                    | O<br>30                     | U<br>38                                     | Right Lock<br>Entry<br>46  | 10-Point<br>(lwr right)<br>54           | Jet Bumper<br>(lower)<br>62     |
| 7<br>WHT-<br>VIO<br>1J10-2 | Slam<br>Tilt<br>7         | 2<br>15                         | L<br>23                    | N<br>31                     | S<br>39                                     | Left Lock<br>47            | LANE<br>CHANGE<br>(left flipper)<br>55  | Left Kicker<br>(“sling”)<br>63  |
| 8<br>WHT-<br>GRY<br>1J10-1 | High-Score<br>Reset<br>8  | 3<br>16                         | E<br>24                    | Drain Lane<br>(right)<br>32 | A<br>40                                     | Left Lock<br>Entry<br>48   | LANE<br>CHANGE<br>(right flipper)<br>56 | Right Kicker<br>(“sling”)<br>64 |

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