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SPACE STATION

OPERATIONS MANUAL

including
TEST/DIAGNOSTICS
PROCEDURES,
PARTS INFORMATION,
&
SCHEMATICS

Williams®
ELECTRONICS GAMES, INC.

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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 [1] Color	Connections: CPU Bd.	Connections: Playfield/ Cabinet	Driver Trans.	Solenoid Part Number Flashlamp Type (b = Backbox, p = Playfield)
01A [3]	Outhole Kicker	Switched	{Vio-Brn	1P11-1	8P3-1 (to J1-9 on	Q33	AE-23-800
01C [3]	Relaunch + "ON" Flashers	Switched	Blk-Brn}	(Gry-Brn)	Aux Pwr Drvr Bd)	Q33	#89 flashlamps 2b,2p
02A [3]	Ball Shooter Lane Feeder	Switched	{Vio-Red}	1P11-3	8P3-2 (to J1-7 on	Q25	AE-23-800
02C [3]	Left Side + "SP" Flashers	Switched	Blk-Red}	(Gry-Red)	Aux Pwr Drvr Bd)	Q25	#89 flashlamps 2b,2p
03A [3]	Left Ball Popper	Switched	{Vio-Orn}	1P11-4	8P3-3 (to J1-6 on	Q32	AE-24-900
03C [3]	Right Side + "AC" Flashers	Switched	Blk-Orn}	(Gry-Orn)	Aux Pwr Drvr Bd)	Q32	#89 flashlamps 2b,2p
04A [3]	Right Ball Popper	Switched	{Vio- Yel}	1P11-5	8P3-4 (to J1-5 on	Q24	AE-23-800
04C [3]	Top (upr p/f) + "ES" Flashers	Switched	Blk-Yel}	(Gry-Yel)	Aux Pwr Drvr Bd)	Q24	#89 flashlamps 2b,2p
05A [3]	Not Used	Switched	{Vio-Grn}	1P11-6	8P3-5 (to J1-4 on	Q31	
05C [3]	P'fld Top Panel + "TA" Flashers	Switched	Blk-Grn}	(Gry-Grn)	Aux Pwr Drvr Bd)	Q31	#89 flashlamps 2b,2p
06A [3]	3-bank Drop Target	Switched	{Vio-Blu}	1P11-7	8P3-6 (to J1-3 on	Q23	AE-26-1200
06C [3]	Flame + "TI" Flashers	Switched	Blk-Blu}	(Gry-Blu)	Aux Pwr Drvr Bd)	Q23	#89 flashlamps 4b
07A [3]	Knocker (or Ticket Dispenser)	Switched	{Vio-Blk}	1P11-8	8P3-7 (to J1-2 on	Q30	AE-26-1200
07C [3]	Station Flasher	Switched	Blk-Vio}	(Gry-Vio)	Aux Pwr Drvr Bd)	Q30	#89 flashlamps 2b
08A [3]	R Sngl Drop Target - Raise	Switched	{Vio-Gry}	1P11-9	8P3-8 (to J1-1 on	Q22	AE-23-800
08C [3]	Left Dock Kickbig	Switched	Blk-Gry}	(Gry-Blk)	Aux Pwr Drvr Bd)	Q22	AE-23-800
09	General Illum Relay (Playfield)	Controlled	Brn-Blk	1P12-1	8P3-9	Q17	5580-09555-01 [4]
10	General Illum Relay (Green)	Controlled	Brn-Red	1P12-2	8P3-10	Q9	5580-09555-01 [4]
11	General Illum Relay (Insert Bd)	Controlled	Brn-Orn	1P12-4	6P3-5	Q16	5580-09555-01 [4]
12	A/C Select Relay	Controlled	Brn-Yel	1P12-5	8P3-12	Q8	5580-09555-01 [5]
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'fld 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 [Blu-Vio]	1P19-1	7P1-15 [7P1-16,8P3-34] [2]	-	FL11630-50VDC
-	Left Flipper	-	Orn-Gry {Blu-Gry}	1P19-2	7P1-18 [7P1-19,8P3-32] [2]	-	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.

Contents

Section 1 - Game Operation & Test Information

SPACE STATION (System 11B) ROM Summary . . . 1
Connector Identification . . . 2
SPACE STATION Circuit Boards . . . 2
SPACE STATION Game Control Locations . . . 2
Pinball Game Assembly Instructions . . . 3
Figure 1. Pinball Assembly, Playfield Pitch Angle, and Leg Leveler Details . . . 3
Game Operation . . . 4
SPACE STATION Game Status Displays . . . 6
SPACE STATION Audit Table . . . 7
SPACE STATION Game Adjustment Table . . . 8-9
Game Adjustment Procedure . . . 10
Items 01 - 05 . . . 11
06 - 11 . . . 12
12 - 18 . . . 13
19 - 26 . . . 14
27 - 34 . . . 15
35 - 41 . . . 16
42 - 48 . . . 17
49 - 52 . . . 18
53 - 54 . . . 19
55 - 58 . . . 20
59 - 63 . . . 21
64 - 68 . . . 22
69 - 70 . . . 23
SPACE STATION Game Adjustment Setting Comparison Table . . . 23
Resetting the High Scores . . . 24
Game Pricing . . . 24
SPACE STATION Pricing Table . . . 25
Test/Diagnostic Procedures . . . 26
Music Test . . . 26
Display Test . . . 26
Sound Test . . . 26
Lamp Tests . . . 27
SPACE STATION Lamp-Matrix Table . . . 27
Solenoid Test . . . 28
SPACE STATION Solenoid Table . . . 28
Special and Controlled Solenoids - Diagrams and Details . . . 29
Figure 2. Typical Solenoid A/C Select Relay Circuit . . . 29
Switch Tests . . . 30
SPACE STATION Switch-Matrix Table . . . 30
Ending the Diagnostic Test . . . 31
Auto Burn-in Mode . . . 31
System-11B Memory Chip Test . . . 32
CPU LED Indicator Codes Table . . . 32
System-11B Sound Circuitry Tests . . . 32
Fuse Listing . . . 33
Maintenance Information . . . 34
Figure 3. Adjustments and Lubrication Points, Ball Shooter Lane Feeder . . . 34
Solder Warning . . . 34

Contents

Section 2 - Game Parts Information

Alphanumeric Display Unit Board (D-11610) Parts List 36
Player Score Display Segments Diagrams 36
D-8345 Power Supply Board 37
System 11B CPU Board Parts Layout and Parts Listing . . . . . 38 - 39
Audio Board Assembly (D-11581-552) 40
Aux Power Driver Board (D-11813-552) Parts Listing. 41
Motor Relay Board Assembly (C-11902-1) 41
Relay Board Assembly (C-11998-1) 41
Flashlamp Resistor PC Board Assembly (D-11814-552). 42
4-Lamp PC Board (4-L) Assembly (C-11864) Parts List. 42
14-Lamp PC Board (14-L) Assembly (C-11849) Parts List. 42
3-Lamp PC Board (3Lc) Assembly (C-11866) Parts List 42
3-Lamp PC Board (3Lr) Assembly (C-11865) Parts List. 42
5-Lamp PC Board (5R) Assembly (C-11904) Parts List 42
7-Lamp PC Board (7-L) Assembly (C-11863) Parts List. 42
5-Lamp/2 Flasher PC Board (5C) Assembly (C-11981) Parts List. 42
Space Station Opto Positioner PC Board Assembly (C-11872) 43
Backbox Parts Listing 43
Miscellaneous *SPACE STATION* Parts 43
Flipper Assemblies (C-11626-R-4 and C-11626-L-4). 44
Ball Shooter Lane Feeder (C-9638-3 & Associated Parts). 45
Ball Trough Switch Assembly Parts 45
3-Bank Drop Target (C-11223-1) 46
Left Re-Entry Kickback (B-11873-1) 46
Standup Target Assemblies 46
Ball Kicker Assemblies 47
Jet Bumper Assemblies 48
Left Ball Popper & Switch Assembly (D-11335-1 & Associated Parts) 48
Space Station & Motor Assembly. 49
1-2-3 Mini-Playfield Assembly (R-11780) 49
Switches. 50
Switch Matrix Diagram and Typical Switch Circuit 51
Lamp Matrix Diagram and Typical Lamp Circuit 52
Lamps 53
Solenoids/Flashers, Playfield Posts & Rubber Parts 54
Playfield Parts. 55
Playfield Circuit Boards & Major Devices Locations 56

Section 3 - Reference Diagrams & Schematics

Cabinet Wiring Diagram 58
D-8345-557 Power Supply Schematic. 59
Aux Power Driver Board (D-11813) & Schematic 60-61
Audio Board Schematic. 62
Alphanumeric Display Unit Board Schematic 63
Interboard Signals Diagrams 64
Schematic, System 11B CPU (16-9019, Sheet 1 of 4) 65
Schematic, System 11B CPU (16-9019, Sheet 2 of 4) 66
Schematic, System 11B CPU (16-9019, Sheet 3 of 4) 67
Schematic, System 11B CPU (16-9019, Sheet 4 of 4) 68
Solenoids and Special Switches Control Diagram 69
Power Wiring Diagram 70

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 microprocessor.

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.

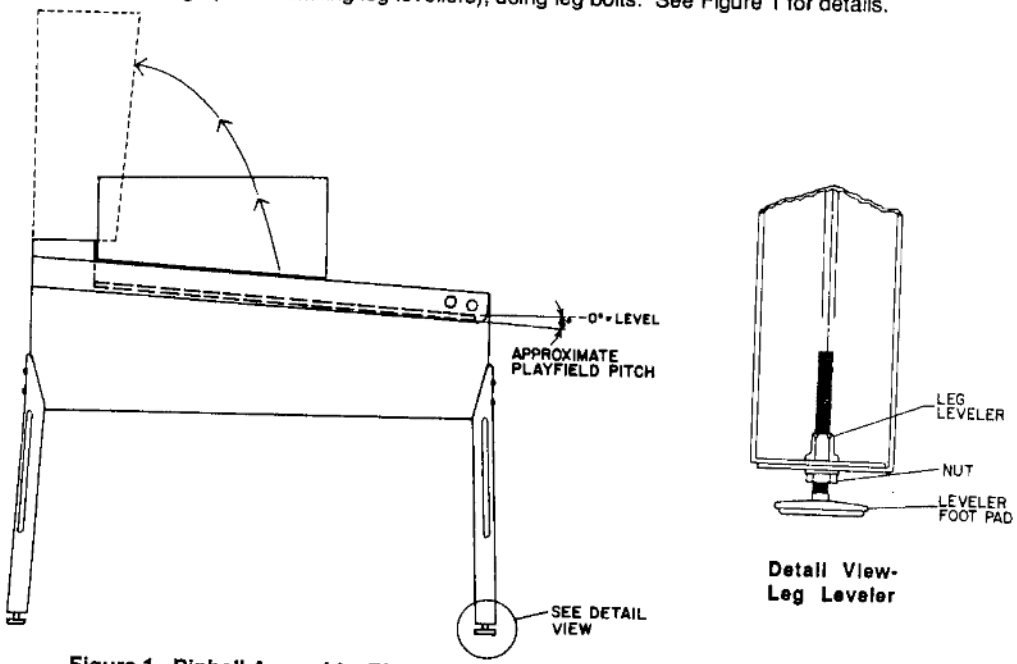


Figure 1. Pinball Assembly, Playfield Pitch Angle, and Leg Leveler Details.

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.

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 coindoor 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 1	Player 2	Player 3	Player 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 (Player 3)	Descriptive Phrases (Player 1 and 2 Displays)	Audit Factor [1] Value (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 (Player 3)	Descriptive Phrases (Player 1 and 2 Displays)		Factory Setting (Player 4)
Ad 01	AUTO REPLAY [1]		10 (%)
	or FIXED REPLAY [1]		SCORES [1]
02	REPLAY START (or REPLAY LEVEL 1) [1]		1,900,000
03	REPLAY LEVELS (or REPLAY LEVEL 2) [1]		01 (or OFF)
04	(REPLAY LEVEL 3) [1]		(see text)
05	(REPLAY LEVEL 4) [1]		(see text)
06	REPLAY AWARD		Credit
07	SPECIAL AWARD		Credit
08	MATCH FEATURE	[Off, 1 - 50%]	10 (%)
09	BALLS / GAME		03
10	TILT WARNING	[00 = NO Ex. Ball; 1-9 Ex. Ball]	03
11	MAXIMUM EX. BALL		02
12	MAXIMUM CREDITS		10
13	HIGHEST SCORES		On
14	BACKUP HI. SCR.1		4,000,000
15	BACKUP HI. SCR. 2		3,500,000
16	BACKUP HI. SCR. 3		3,000,000
17	BACKUP HI. SCR. 4		2,500,000
18	HI. SCR.1 CREDITS		03
19	HI. SCR.2 CREDITS		01
20	HI. SCR.3 CREDITS		01
21	HI. SCR.4 CREDITS		01
22	H. S. RESET EVERY (3,000 PLAYS) [2]		
23	FREE PLAY		NO
24	U.S.A. 1 COINAGE (1 COIN 1 PLAY) [2,3]		
25	LEFT UNITS		01
26	CENTER UNITS		04
27	RIGHT UNITS		01
28	UNITS/ CREDIT		01
29	UNITS/ BONUS		00
30	MINIMUM UNITS		00
31	B. BALL TIME	[20 - 40 sec]	25 sec
32	S/SCORE TIMER	[5 - 30 sec]	25 sec
33	USA'S LITE.SPC	[3 completions of USA; 4, 5]	4
34	SHUTTLE MEMORY	[no = not stored; yes = stored]	YES
35	STATION MEMORY	[no = not stored; yes = stored]	YES
36	1 2 3 MEMORY	[no = not stored; yes = stored]	YES
37	U S A MEMORY	[no = not stored; yes = stored]	YES
38	B. S. LITE RE.ENTRY	[yes=light L REENTRY at Ball Start; no=not lit]	YES
39	DOCKING W.L. INIT	[on=lit at game beginning; off=not lit]	ON
40	BONUS X MEMORY	[yes=Bonus X stored from ball to ball; no=reset at ball start]	NO
41	S/S "X" MEMORY	[yes=S/S "X" stored from ball to ball; no=reset at ball start]	NO

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 (Player 3)	Descriptive Phrases (Player 1 and 2 Displays)		Factory Setting (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		NO
60 [5]	INSTALL 5-BALL		NO
61 [5]	INSTALL NOVELTY		NO
62 [5]	INSTALL EX. EASY		NO
63 [5]	INSTALL EASY		NO
64 [5]	INSTALL MEDIUM		NO
65 [5]	INSTALL HARD		NO
66 [5]	INSTALL EX. HARD		NO
67	AUTO BURN-IN		NO
68	CLEAR COINS		NO
69	CLEAR AUDITS		NO
70	INSTALL FACTORY		NO

NOTES:

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

   For Fixed Replay Scores, set Auto Replay value to 1 less than 5(%) via the Credit button. Go to items 02, 03, 04, and 05; 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 shows10%, 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 Knocker 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 Knocker 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:

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.)

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.

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.

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.

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:

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting
06	Replay Award	Audit
07	Special Award	Score
08	Match Feature	Off
14	Backup Hi Scr 1	00
15	Backup Hi Scr 2	00
16	Backup Hi Scr 3	00
17	Backup Hi Scr 4	00
18	Hi Scr 1 Credits	00
19	Hi Scr 2 Credits	00
20	Hi Scr 3 Credits	00
21	Hi Scr 4 Credits	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:

Ad	Name	New Setting
06	Replay Award	Credit
07	Special Award	Credit
08	Match Feature	10 %
14	Backup Hi Scr 1	5,500,000
15	Backup Hi Scr 2	5,000,000
16	Backup Hi Scr 3	4,500,000
17	Backup Hi Scr 4	4,000,000
18	Hi Scr 1 Credits	03
19	Hi Scr 2 Credits	00
20	Hi Scr 3 Credits	00
21	Hi Scr 4 Credits	00
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:

Ad	Name	New Setting
06	Replay Award	Coil
07	Special Award	Ball
08	Match Feature	10 %
14	Backup Hi Scr 1	5,500,000
15	Backup Hi Scr 2	5,000,000
16	Backup Hi Scr 3	4,500,000
17	Backup Hi Scr 4	4,000,000
18	Hi Scr 1 Credits	03
19	Hi Scr 2 Credits	00
20	Hi Scr 3 Credits	00
21	Hi Scr 4 Credits	00
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:

Ad	Name	New Setting
06	Replay Award	Audit
07	Special Award	Score
08	Match Feature	Off
14	Backup Hi Scr 1	00
15	Backup Hi Scr 2	00
16	Backup Hi Scr 3	00
17	Backup Hi Scr 4	00
18	Hi Scr 1 Credits	00
19	Hi Scr 2 Credits	00
20	Hi Scr 3 Credits	00
21	Hi Scr 4 Credits	00
24	German 2 Coinage	7 Plays/5DM

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:

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting	Ad	Name	New Setting
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 (sometines called "liberal"). Individual Adjustments are affected, as follows:

Ad	Name	New Setting	Ad	Name	New Setting
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:

64 Install Easy (Continued)

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting	Ad	Name	New Setting
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:

Ad	Name	New Setting	Ad	Name	New Setting
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

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 Ad 62	Easy Ad 63	Medium (Factory) Ad 64	Hard Ad 65	Extra Hard 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 the16 "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 eqivalent 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 x 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 Left	Coin Chute Center	Coin Chute Right	Games/Coin	*Ad 24 Display*	Pricing Functions 25	26	27	28	29	30
USA and Canada	25¢	-	25¢	1/25¢, 4/$1 [1,2]	U.S.A. 1	01	04	01	01	00	00
				1/50¢, 2/75¢, 3/$1 [2]	U.S.A. 2	03	12	03	04	00	00
				1/50¢, 2/$1 [2]	U.S.A. 3	01	04	01	02	00	00
				1/25¢, 3/50¢, 6/$1	CUSTOM	01	04	01	01	02	00
				1/25¢, 5/$1	CUSTOM	01	00	01	01	04	00
West Germany	1 DM	2 DM	5 DM	1/1 DM, 2/2 DM, 7/5 DMark [2,3]	GERMAN2	06	12	30	05	30	00
				1/1 DM, 3/2 DM, 10/5 DM [2]	GERMAN1	09	18	45	05	45	00
				1/1 DM, 3/2 DM, 9/5 DM	CUSTOM	09	18	45	05	00	00
				1/2x1 DM, 1/2 DM, 3/5 DM	CUSTOM	03	06	15	05	00	00
				2/1 DM, 5/2 DM, 14/5 DM	CUSTOM	13	26	65	05	65	00
				Ticket/Token Mode [4]	CUSTOM						
				Keyset Mode [4]	CUSTOM						
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 Hfl	2.5 Hfl	2.5 Hfl	1/1 Hfl, 3/2.5 Hfl [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	-	100P	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 / ROW	1 Q66 YEL-BRN 1J7-1	2 Q64 YEL-RED 1J7-2	3 Q62 YEL-ORN 1J7-3	4 Q60 YEL-BLK 1J7-4	5 Q58 YEL-GRN 1J7-5	6 Q56 YEL-BLU 1J7-7	7 Q54 YEL-VIO 1J7-8	8 Q52 YEL-GRY 1J7-9
Q80 RED-BRN 1J6-1	Bonus Ball Player #1 1	Change Shuttle 9	RE-ENTRY (Left W/LIT Drain) 17	S 25	Stop & Score 33	Not Used 41	Big Flame (insert bd) 49	Big Flame (insert bd) 57
Q81 RED-BLK 1J6-2	Bonus Ball Player #2 2	Change Station 10	S 18	T 26	DOCK W/L (right) 34	RELAUNCH WHEN LIT 42	Shuttle Score SPECIAL 50	Station Score SPECIAL 58
Q82 RED-ORN 1J6-3	Bonus Ball Player #3 3	1X 11	H 19	A 27	SPECIAL 35	DOCKED Port Side 43	Extra Ball 51	Extra Ball 59
Q83 RED-YEL 1J6-5	Bonus Ball Player #4 4	2X 12	U 20	T 28	100,000 When Lit 36	Hold Bonus 44	50,000 + Re-Entry 52	50,000 + Re-Entry 60
Q84 RED-GRN 1J6-6	Extra Ball (3-bnk D T) 5	4X 13	T 21	I 29	Little Shuttle (insert bd) 37	DOCKED Starboard Side 45	50,000 + Bonus Ball 53	50,000 + Bonus Ball 61
Q85 RED-BLU 1J6-7	RELEASE (right) 6	1 14	T 22	O 30	U 38	Williams (insert bd, left) 46	150,000 + Hold Bonus 54	150,000 + Hold Bonus 62
Q86 RED-VIO 1J6-8	RELEASE (left) 7	2 15	L 23	N 31	S 39	Williams (insert bd, middle) 47	75,000 55	75,000 63
Q87 RED-GRY 1J6-9	DOCK W/L (left) 8	3 16	E 24	RE-ENTRY (Right W/LIT Drain) 32	A 40	Williams (insert bd, right) 48	25,000 56	25,000 64

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.

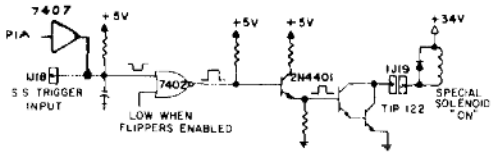
   To continuously pulse a single solenoid/circuit, use MANUAL-DOWN. Press ADVANCE to sequence through the switched, controlled, and special solenoids. Use AUTO-UP to resume test cycling, and to proceed to the next test.

SPACE STATION Solenoid Table

Sol. No.	Function	Solenoid Type	Wire Color [1]	Connections: CPU Bd.	Connections: Playfield/ Cabinet	Driver Trans.	Solenoid Part Number / Flashlamp Type (b – Backbox, p – Playfield)
01A [3]	Outhole Kicker	Switched	{Vio-Brn	1P11-1	8P3-1 (to J1-9 on	Q33	AE-23-800
01C [3]	Relaunch + "ON" Flashers	Switched	Blk-Brn}	(Gry-Brn)	Aux Pwr Drvr Bd)	Q33	#89 flashlamps 2b,2p
02A [3]	Ball Shooter Lane Feeder	Switched	{Vio-Red	P11-3	8P3-2 (to J1-7 on	Q25	AE-23-800
02C [3]	Left Side + "SP" Flashers	Switched	Blk-Red}	(Gry-Red)	Aux Pwr Drvr Bd)	Q25	#89 flashlamps 2b,2p
03A [3]	Left Ball Popper	Switched	{Vio-Orn	1P11-4	8P3-3 (to J1-6 on	Q32	AE-24-900
03C [3]	Right Side + "AC" Flashers	Switched	Blk-Orn}	(Gry-Orn)	Aux Pwr Drvr Bd)	Q32	#89 flashlamps 2b,2p
04A [3]	Right Ball Popper	Switched	{Vio- Yel	1P11-5	8P3-4 (to J1-5 on	Q24	AE-23-800
04C [3]	Top (upr p/f) + "ES" Flashers	Switched	Blk-Yel}	(Gry-Yel)	Aux Pwr Drvr Bd)	Q24	#89 flashlamps 2b,2p
05A [3]	Not Used	Switched	{Vio-Grn	1P11-6	8P3-5 (to J1-4 on	Q31	
05C [3]	P'fld Top Panel + "TA" Flashers	Switched	Blk-Grn}	(Gry-Grn)	Aux Pwr Drvr Bd)	Q31	#89 flashlamps 2b,2p
06A [3]	3-bank Drop Target	Switched	{Vio-Blu	1P11-7	8P3-6 (to J1-3 on	Q23	AE-26-1200
06C [3]	Flame + "TI" Flashers	Switched	Blk-Blu}	(Gry-Blu)	Aux Pwr Drvr Bd)	Q23	#89 flashlamps 4b
07A [3]	Knocker (or Ticket Dispenser)	Switched	{Vio-Blk	1P11-8	8P3-7 (to J1-2 on	Q30	AE-26-1200
07C [3]	Station Flasher	Switched	Blk-Vio}	(Gry-Vio)	Aux Pwr Drvr Bd)	Q30	#89 flashlamps 2b
08A [3]	R Sngl Drop Target - Raise	Switched	{Vio-Gry	1P11-9	8P3-8 (to J1-1 on	Q22	AE-23-800
08C [3]	Left Dock Kickbig	Switched	Blk-Gry}	(Gry-Blk)	Aux Pwr Drvr Bd)	Q22	AE-23-800
09	General Illum Relay (Playfield)	Controlled	Brn-Blk	1P12-1	8P3-9	Q17	5580-09555-01 [4]
10	General Illum Relay (Green)	Controlled	Brn-Red	1P12-2	8P3-10	Q9	5580-09555-01 [4]
11	General Illum Relay (Insert Bd)	Controlled	Brn-Orn	1P12-4	6P3-5	Q16	5580-09555-01 [4]
12	A/C Select Relay	Controlled	Brn-Yel	1P12-5	8P3-12	Q8	5580-09555-01 [5]
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'fld 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 [Blu-Vio]	1P19-1	7P1-15 [7P1-16,8P3-34] [2]	-	FL11630-50VDC
-	Left Flipper	-	Orn-Gry [Blu-Gry]	1P19-2	7P1-18 [7P1-19,8P3-32] [2]	-	FL11630-50VDC

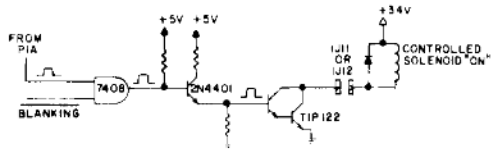
Notes: 1. Wire colors, except flipper Orn-Vio and Orn-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Orn-Vio and Orn-Gry wires connect from CPU Board to flipper switch. 2. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" circuits 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.

"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

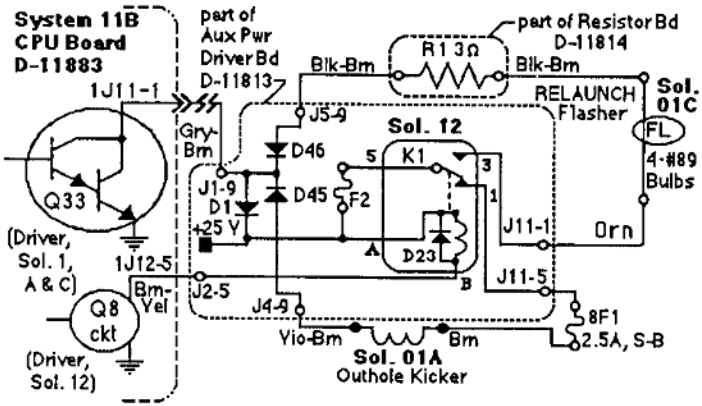


"Off" State - Controlled Solenoid:
The Enable Input (from the PIA) goes low. Meanwhile, the BLANKING signal remains high. The rest of the signals reverse their states.

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

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 connec- tions at jacks 1J8 (columns) and 1J10 (rows) are also listed in the table.

***SPACE STATION* Switch-Matrix Table**

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

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.)

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/ 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 connectingdevices 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.

Notes: 1. This test assumes that the Coin Door is OPEN; it is initiated ONLY by pressing the CPU Diagnostic Switch (SW2).

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.

1. **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.

2. **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.

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/Upr 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.

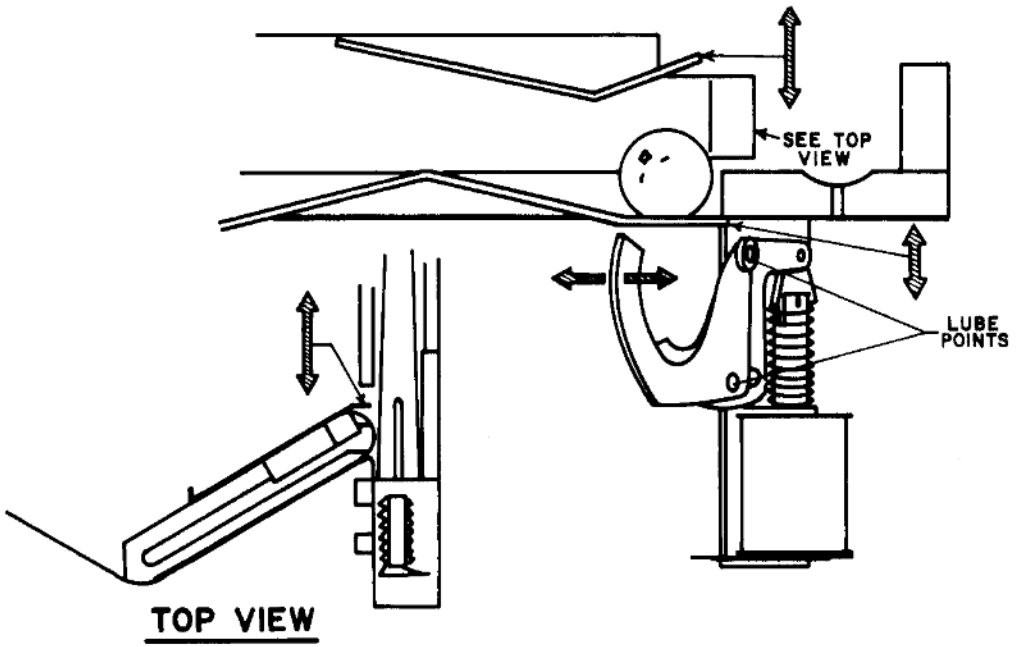


Figure 3. Adjustments and Lubrication Points, Ball Shooter Lane Feeder.

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

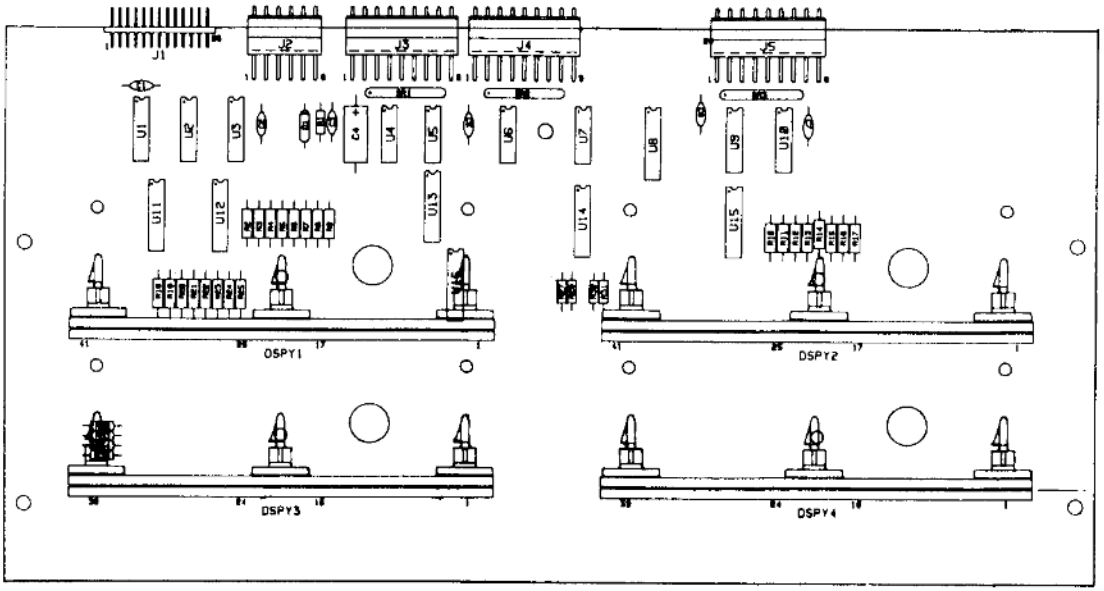
WARNING

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



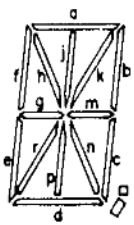
Alphanumeric Display Unit Board

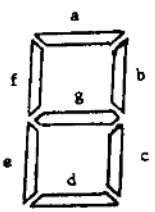
Including p/n D-11609 & associated parts

Part No.	Ckt Designator	Description
5760-12134-00		Bare P. C. Board
5680-08968-00	U8, U13, U14, U16	IC, Anode/Digit Driver, UDN6118A or 6184
5310-09882-00	U4 - U7	IC, Quad NOR, 4001B
5680-08969-00	U11, U12, U15	IC, Cathode Seg. Driver, UDN7180A
5310-09153-00	U1 - U3, U9, U10	IC, Hex Buffer, 4050
5075-09135-00	D1	Zener diode, 1N4740A, 10V, 1 w
5040-09343-00	C4	Capacitor, 10 µfd., 20v, ±20%, Axial
5043-08996-00	C3	Capacitor, 0.1 µfd., 50v, ±20%, Axial
5043-08980-00	C1, C2, C5 - C7	Capacitor, 0.01 µfd, 50v, Axial
5019-10387-00	SR1 - SR3	SIP, 18 K, 9R, 10P, 5%

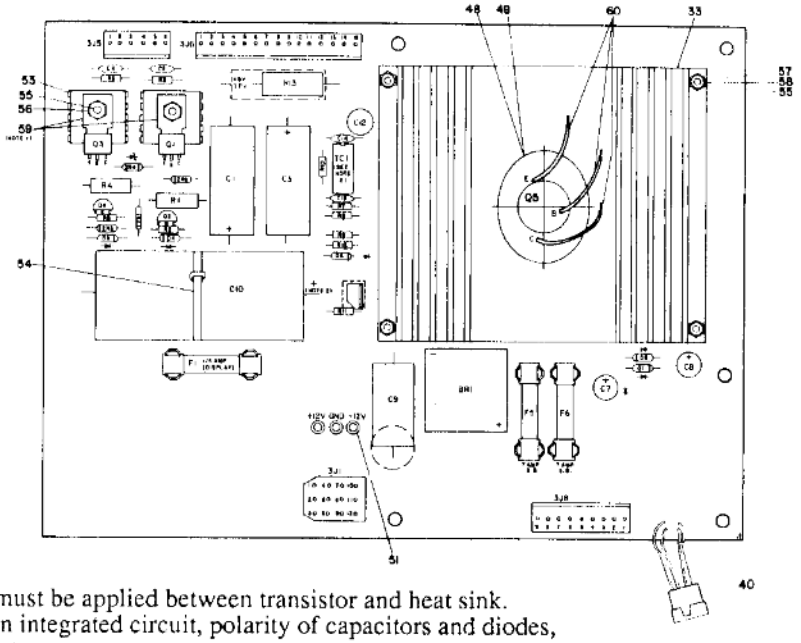
Part No.	Ckt Designator	Description
5010-08773-00	R1, R2, R8, R20, R23	Resistor, 18 K, 1/4 w, 5%
5010-10927-00	R4, R6, R18, R19, R21, R22, R24, R25	Resistor, 8.2 K, 1/2 w, 5%
5010-10258-00	R27, R28, R30 - R35	Resistor, 1 M, 1/4 w, 5%
5010-08981-00	R3, R5, R7, R9, R10, R12 - R17	Resistor, 10 K, 1/2 w, 5%
5010-08772-00	R11	Resistor, 15 K, 1/4 w, 5%
5670-10873-00*	DSPY1, DSPY2	Display, 7 -character, A/N
5670-09439-00*	DSPY3, DSPY4	Display, 7-character, 7-segment
5791-10851-00	J1	Connector, 26 pin (Hdr), Rt. Angle
5791-10869-06	J2	Connector, 6 pin (Hdr), Rt. Angle
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
1	5765-09466-01		Bare P. C. Board
2	5013-09426-00	R7	Resistor, 2.15K, 1%, 1/4w, Metal Film
3	5013-09427-00	R8	Resistor, 4.99K, 1%, 1/4w, Metal Film
4	5010-09428-00	R11	Resistor, 1.5K, 2%, 1/4w, C. Film
5	5010-09085-00	R10	Resistor, 1.5K, 5%,1/4w
6	5010-09541-00	R9	Resistor, 2.7K, 2%,1/4w
7	5010-09508-00	R12	Resistor, 270Ω, 2%, 1/4w, C. Film
8	5012-09429-00	R13	Resistor, 0.12Ω, 5%,5w
9	5010-09536-00	R1, R4	Resistor, 39K, 5%,1w
10	5010-09061-00	R2, R5	Resistor, 680Ω, 2w
11	5010-09069-00	R3, R6	Resistor, 330K, 5%,1/2w
12	5040-09419-00	C10	Capacitor, 18,000 mfd, electr, 20v, axial
13	5040-09420-00	C9	Capacitor, 1000 mfd, electr, 25v, axial or radial
14	5040-09423-00	C12	Capacitor, 330 mfd, electr, 10v,radial
15	5043-9065-00	C15	Capacitor, 470 pfd
16	5040-9053-00	C1, C3	Capacitor, 100 mfd, electr, 150v
17	Not Used		
18	5043-09072-00	C2, C4	Capacitor, 0.1 mfd, 500v, disc
19	5043-09446-00	C14	Capacitor, 0.1 mfd, 50v, disc
20	5070-06258-00	D1, D5, D6	Diode, 1N4001
21	5070-09054-00	D3, D4	Diode, 1N4004
22	5075-09059-00	ZR1, ZR3	Zener, 1N5990, 3.9v, 5%
23	5075-09060-00	ZR2, ZR4	Zener, 1N4764, 100v, 5%
24	5460-09424-00	IC1	IC, Volt. Reg., MC1723C
25	Not Used		
26	5040-09421-00	C7	Capacitor, 100 mfd, 25v, radial
27	5040-09422-00	C8	Capacitor, 47 mfd, 50v, radial

Item	Part No.	Ckt Designator	Description
28	5164-12154-00	Q1	Transistor, MJE15030, NPN
29	5164-09056-00	Q4	Transistor, MPSD02, NPN
30	5194-12155-00	Q3	Transistor, MJE15031, PNP
31	5194-09055-00	Q2	Transistor, MPSD52, PNP
32	5162-09425-00	Q5	Transistor, 2N6057, NPN
33	Not Used		
34	5791-09074-00	3J6	Connector, 15 pin (Hdr)
35	5791-09027-00	3J8	Connector, 9 pin (Hdr)
36	Not Used		
37	5791-09067-00	3J5	Connector, 6 pin (Hdr)
38	Not Used		
39	Not Used		
40	H-11065	3J9	Cable/Connector Assembly
a)	5791-09400-00		Connector shell
b)	5820-09080-00		Connector pin
41	5791-09068-00	3J1	Connector, 12 pin (Hdr)
42	5321-09178-00		Fuseholder
43	5731-06314-00	F2	Fuse, 4A, 250v, S-B
44	Not Used		
45	Not Used		
46	Not Used		
47	Not Used		
48	5700-09445-00		Socket
49	5701-09652-00		Mica Insulator
50	Not Used		
51	5824-09428-00	TP2 - TP4	Terminal, #1502-1 (Test Post)
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

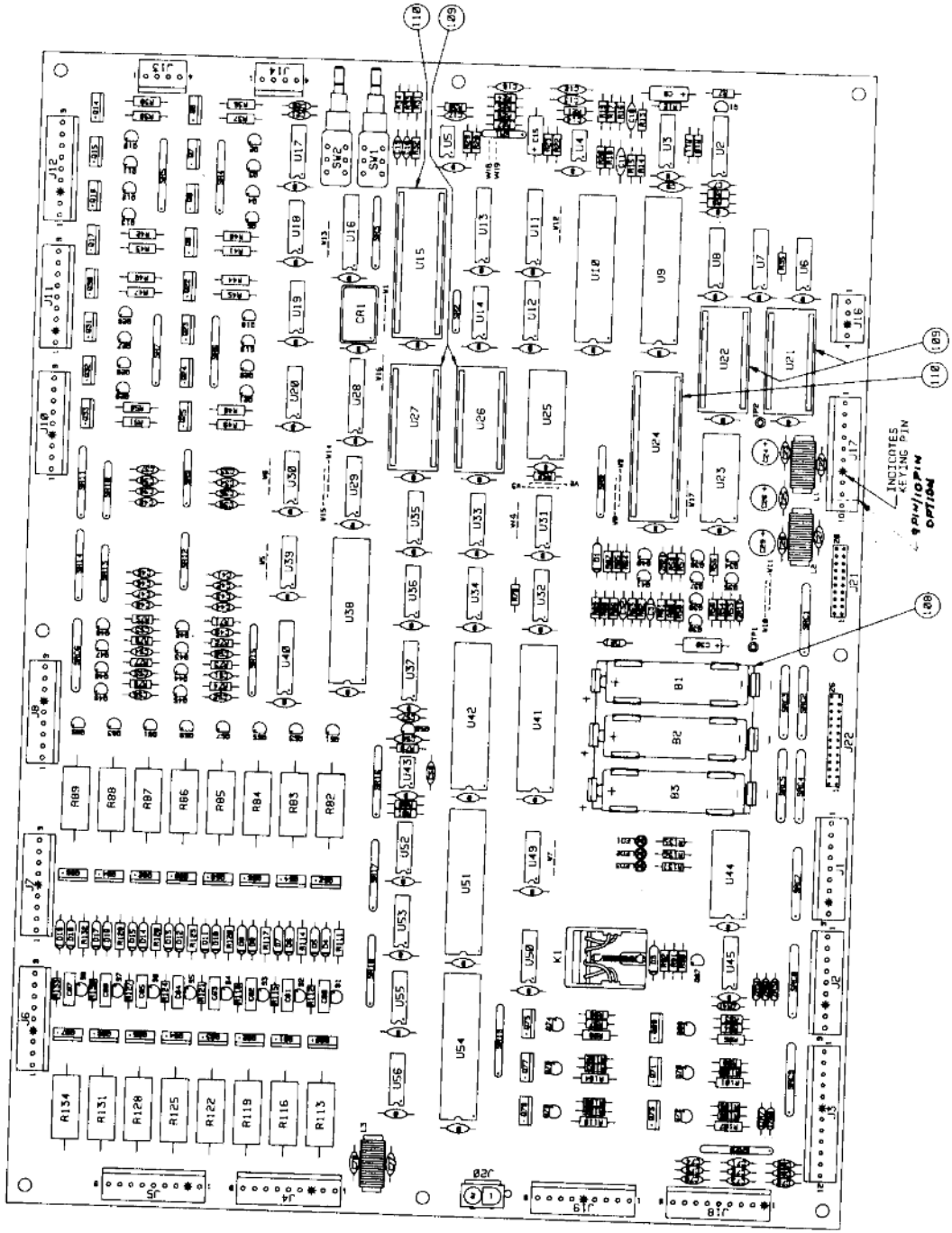
System 11B CPU Board

p/n D-11883-552

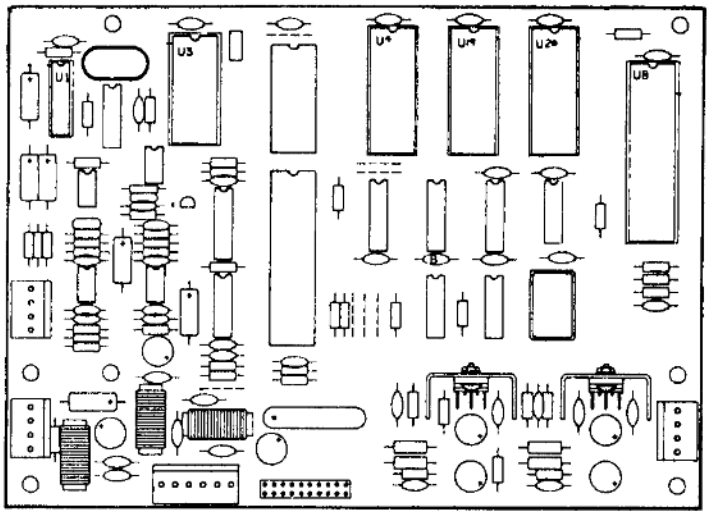
Item	Part No.	Ckt Designator	Description
1	5764-12206-00		Bare P. C. Board
2	5370-09691-00	U3	IC, CVSD Mod., 55536
3	5370-09321-00	U4, U5	IC, Dual Op Amp, 1458
4	5281-09308-00	U16	IC, Octal Bus Xcvr, 74LS245
5	5430-08972-00	U9, U10, U38, U41, U42, U51, U54	IC, PIA, MC6820/6821
6	5340-10139-00	U25	IC, 2K x 8 CMOS Static RAM
7	5280-09010-00	U44	IC, 4-16 Decoder, 74154
8	5281-09246-00	U7, U8, U12	IC, 2-4 Decoder, 74LS139
9	5075-09406-00	ZR3 - ZR8	Diode, Zener, 6.2v, 0.5w
10	Not Used		
11	5281-09487-00	U6	IC, Dual D Flip-flop,74LS74
12	5431-09449-00	U43	IC, Timer, MC1455
13	5310-09236-00	U29	IC, 14-b Counter, 4020
14	5281-09743-00	U32	IC, Quad 2-Input AND, 74LS08
15	5281-09247-00	U14	IC, Quad 2-Input NOR, 74LS02
16	5281-09235-00	U35	IC, Triple 3-Input NAND, 74LS10
17	5280-09013-00	U36	IC, Hex Inverter, 7404
18	5281-09499-00	U31, U34	IC, Quad 2-Input NAND, 74LS00
19	5281-10014-00	U33	IC, Dual 4-Input NAND, 74LS20
20	5281-09486-00	U28	IC, Octal D Flip-flop, 74LS374
21	5371-09152-00	U2	IC, D/A Converter, MC1408
22	5281-09745-00	U37	IC, 3-8 Decoder, 74LS138
23	5340-09878-00	U23	IC, 2K x 8 Static RAM, 2016
24	Not Used		
25	5281-09867-00	U11, U13, U40	IC, Octal Buffer, 74LS244
26	5280-08973-00	U17-U20, U52, U53	IC, Quad 2-Input AND, 7408
27	5280-08974-00	U55, U56	IC, Hex Inverter, 7406
28	5310-09155-00	U30, U39	IC, Quad 2-Input NAND, MC14011
29	5280-08948-00	U45, U60	IC, Quad 2-Input NOR, 7402
30	5280-09309-00	U49	IC, Hex Buffer, 7407
31	5671-09019-00	LED1-LED3	LED, Red, Display
32	5521-10506-00	CR1	Oscillator, 4 MHz
33	5182-08976-00	Q51, Q53, Q55, Q57, Q59, Q61, Q63, Q65	Transistor, NPN Darl. 2N6427, TO-92
34	6191-08978-00	Q52, Q54, Q56, Q58, Q60, Q62, Q64, Q66	Transistor, PNP, TIP42, TO-220
35	5182-09410-00	Q6-Q9, Q14-Q17, Q22-Q25, Q30-Q33, Q69, Q71, Q73, Q75, Q77, Q79, Q80-Q87	Transistor, NPN, TIP122, TO-220
36	5160-08938-00	Q2-Q5, Q10-Q13, Q18-Q21, Q26-Q29, Q34-Q38, Q41, Q67, Q68, Q70, Q72, Q74, Q76, Q78	Transistor, NPN, 2N4401, TO-92
37	5160-10269-00	Q1, Q40, Q42-Q49	Transistor, NPN, 2N3904, TO-92
38	5190-09016-00	Q39, Q50	Transistor, PNP, 2N4403, TO-92
39	5130-09014-00	S1-S8	SCR, 30v, 0.8A, 2N5060
40	5070-08258-00	D3-D19	Diode, 1N4001
41	5070-08919-00	D2	Diode, 1N4148, 150mA
42	5070-09266-00	D1	Diode, 1N5817, 1.0A
43	5075-09018-00	ZR1	Diode, Zener, 1N5996A, 6.8v, 0.5w
44	5075-09059-00	ZR2	Diode, Zener, 1N5990, 3.9v, 0.5w
45	5010-08992-00	R94, R97, R100, R103, R106, R109	Resistor, 560Ω, 5%, 1/4w, C. F.
46	5010-09039-00	R56	Resistor, 10Ω, 5%, 1/4w, C. F.
47	5010-09534-00	W1, W2, W4, W5, W7, W8, W11, W14, W16, W17, W19	Resistor, 0Ω, 5%, 1/4w, C. F.
48	5010-08991-00	R31, R32, R35, R52 R55, R68, R92, R146	Resistor, 4.7KΩ, 5%, 1/4w, C. F.
49	5010-09358-00	R54, R57, R58, R64, R66, R112, R115, R118, R121, R124, R127, R130, R133, R136-R145	Resistor, 1.0KΩ, 5%, 1/4w, C. F.
50	5010-09113-00	R79	Resistor, 33KΩ, 5%, 1/4w, C. F.
51	5010-08983-00	R7, R8, R10, R70, R80	Resistor, 3.3KΩ, 5%, 1/4w, C. F.
52	5010-09034-00	R11-R14, R25, R26, R53, R60, R65, R90	Resistor, 10KΩ, 5%, 1/4w, C. F.
53	5010-09086-00	R81	Resistor, 6.8KΩ, 5%, 1/4w, C. F.
54	5010-09363-00	R3	Resistor, 5.6KΩ, 5%, 1/4w, C. F.
55	5010-08997-00	R23, R24, R91, R93, R96, R99, R102, R105, R108	Resistor, 2.7KΩ, 5%, 1/4w, C. F.
56[2]	5012-09037-00	R113, R116, R119, R122, R125, R128, R131, R134	Resistor, 0.4Ω, 5%, 3w, Wire-Wnd.
57	5010-08993-00	R36-R51, R95, R98, R101, R104, R107, R110	Resistor, 68Ω, 5%, 1/2w, C. F.
58[2]	5012-10860-00	R82-R89	Resistor, 27Ω, 5%, 2w, C. F.
59	Not Used		
60	Not Used		
61	5010-10987-00	R19	Resistor, 56KΩ, 5%, 1/4w, C. F.
62	5010-10003-00	R62, R63	Resistor, 390Ω, 5%, 1/4w, C. F.
63	5010-10171-00	R67	Resistor, 58Ω, 5%, 1/4w, C. F.
64	5010-10170-00	R69	Resistor, 47Ω, 5%, 1/4w, C. F.
65	5010-09160-00	R59, R61, W12, W13	Resistor, 220Ω, 5%, 1/4w, C. F.
66	5010-09418-00	R33, R34, R135-137	Resistor, 470Ω, 5%, 1/4w, C. F.
67	5010-09179-00	R9	Resistor, 3.3MΩ, 5%, 1/4w, C. F.
68	5010-09085-00	R71-R78	Resistor, 1.5KΩ, 5%, 1/4w, C. F.
69	5010-10361-00	R111, R114, R117, R120, R123, R126, R129, R132	Resistor, 1.2KΩ, 5%, 1/2w, C. F.
70	Not Used		
71	Not Used		
72	5010-09120-00	R17	Resistor, 270KΩ, 5%, 1/4w, C. F.
73	5010-09333-00	R15, R16, R18	Resistor, 180KΩ, 5%, 1/4w, C. F.
74	5010-09324-00	R29, R30	Resistor, 27KΩ, 5%, 1/4w, C. F.
75	5010-09289-00	R20, R21	Resistor, 12KΩ, 5%, 1/4w, C. F.
76	5010-09356-00	R27, R28	Resistor, 820Ω, 5%, 1/4w, C. F.
77	5019-09783-00	SR18	SIP, 9R, 10-pin, 6.8KΩ, .125w/R, 5%
78	5019-09362-00	SR3, SR15, SR17, SR19, SR20	SIP, 9R, 10-pin, 4.7KΩ, .125w/R, 5%
79	5019-09808-00	SR4, SR6, SR11	SIP, 9R, 10-pin, 560Ω, .125w/R, 5%
80	5019-09785-00	SR16	SIP, 9R, 10-pin, 2.2KΩ, .125w/R, 5%
81	5019-10472-00	SR14	SIP, 9R, 10-pin, 3.3KΩ, .125w/R, 5%
82	5019-09669-00	SR8	SIP, 9R, 10-pin, 1.0KΩ, .125w/R, 5%
83	5019-09780-00	SR9,SR10	SIP, 4R, 8-pin, 1KΩ, 5%
84	5019-09786-00	SR1, SR2	SIP, 5R, 6-pin, 4.7KΩ, .125w/R, 5%
85	5019-09792-00	SR5, SR7	SIP, 9R, 10-pin, 2.7KΩ, .125w/R, 5%
86	5060-10396-00	SRC1 - SRC5, SRC7 - SRC9	SIP, 8R, 8C,10-pin, 4.7KΩ & 470pfd
87	5010-08774-00	R22	Resistor, 22KΩ, 5%, 1/4w, C. F.
88	5043-08980-00	C14, C17-C21, C31, C32, C49-C56, C59, + 54 Bypass, marked B	Capacitor, 0.01 µfd, 50v(+80,-20%), Axial
89	5043-09845-00	C22, C23, C25, C27, C28	Capacitor, 1K pfd, 50v(±20%), Axial
90	5043-08998-00	C9, C70-75, C77, C78	Capacitor, 0.1 µfd, 50v(±20%), Axial
91	5040-09343-00	C8, C15	Capacitor, 10 µfd, Electr., 20v(±20%), Axial
92	5043-09844-00	C7	Capacitor, 47 pfd, 50v(±20%), Axial
93	5040-10974-00	C24, C26, C29	Capacitor, 100 µfd, Electr., 25v(+50,-10%), Axial
94	Not Used		
95	5045-09796-00	C60-C67	Capacitor, 0.1 µfd, Polycarbonate Rad., 100v(±10%)
96	5043-09065-00	C33-C40, C68, C69, C76, C10, C12	Capacitor, 470 pfd, 50v(±20%), Axial
97	5040-09545-00	C30	Capacitor, 22 µfd, Electr., 10v(+50,-10%), Axial
98	5041-09031-00	C58	Capacitor, 1 µfd, Tant., 25v(±20%), Axial
99	5043-09030-00	C16, C57	Capacitor, 0.047 µfd, 50v(±20%), Axial
100			
101	5043-09492-00	C11	Capacitor, 100 pfd, ceramic,100v(±20%)
102			
103	5048-10992-00	C13	Capacitor, 4700 pfd, ceramic,50v(±10%)
104	5551-09822-00	L1-L3	Inductor, 4.7 µH, 3A
105	5641-09312-00	SW1, SW2	Switch, Pushbutton, DPDT, 100v, 5A
106	5880-09022-00	B1-B3	Battery, Alkaline, 1.5v, AA
107	20-9491	W18, W19	Bus Wire, Jumper
108	5881-09021-00		Battery Holder, #171
109	5700-10176-00		IC Socket, 28 pin
a)	A-5343-552-1	U26	IC, Game ROM 2, 27128
b)	A-5343-552-2	U27	IC, Game ROM 1, 27256
c)	A-5343-552-4	U21	IC, Sound ROM 1, 27256
d)	A-5343-552-3	U22	IC, Sound ROM 2, 27256
110	5700-08985-00		IC Socket, 40 pin
a)	5400-09150-00	U15	IC, µProcessor, 6802
b)	5400-09150-00	U24	IC, µProcessor, 6802
111	5824-09248-00	TP1, TP2	Test Point
112 - 115		Not Used	
116	20-9229		Thermal Compound (see Note 4)
117	5580-08994-01	K1	Relay, 4-pole, 40Ω, 6v
118	5791-10862-09	1J1, 1J2, 1J4-1J8, 1J10-1J12, 1J17-1J19	Connector, 9 pin (Hdr)
119	5791-10862-04	1J13, 1J14,1J16	Connector, 4 pin (Hdr)
120	5791-10862-12	1J3	Connector, 12 pin (Hdr)
121	Not Used		
122	5791-10850-00	1J22	Connector, 26 pin Ribbon (Hdr)
123	5791-09437-00	1J21	Connector, 20 pin Ribbon (Hdr)

NOTES:

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



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



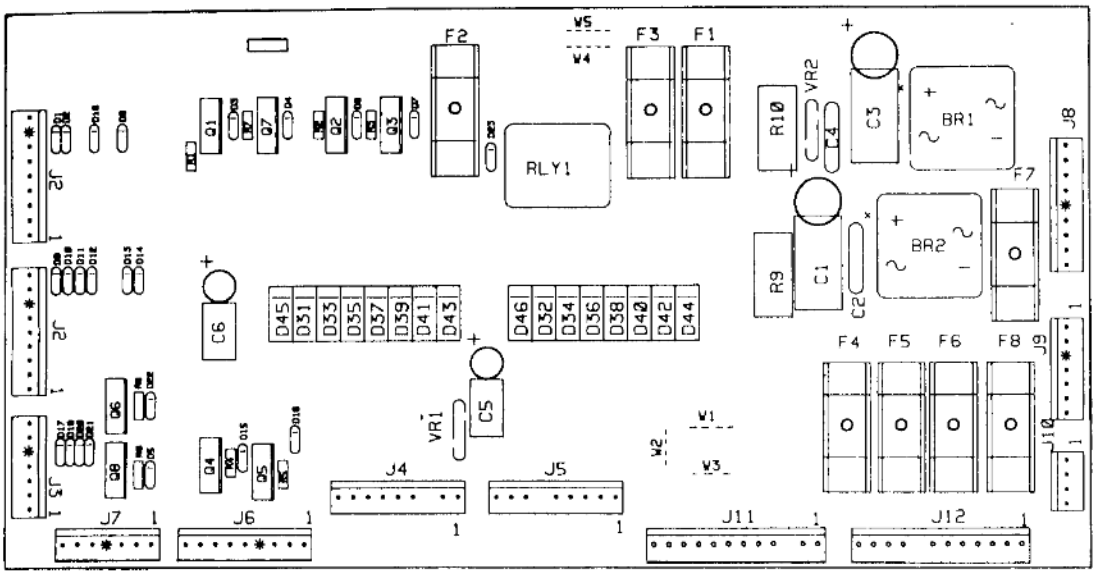
Audio Board Assembly

p/n D-11581-552

Part No.	Ckt Designator	Description
5766-12130-00		Bare P. C. Board
5731-11087-00	U1	IC, D/A Conv, YM3012
a) 5700-09006-00		Socket, IC, 16-pin (U1)
5730-11086-00	U3	IC, Sound Processor, YM2151
a) 5700-09004-00		Socket, IC, 24-pin (U3)
5400-10320-00	U8	IC, µProcessor, MC68B09E
a) 5700-08985-00		Socket, IC, 40-pin (U8)
A-5343-552-5	U4	IC, Music/Speech ROM 1
a) 5700-10176-00		Socket, IC, 28-pin (U4)
5371-09152-00	U11	IC, D/A Convtr, MC1408
5430-10322-00	U12	IC, PIA, MC68B21
5340-09878-00	U5	IC, RAM, 2016
5281-09487-00	U7, U16	IC, Dual D Flipflop, 74LS74
5281-10043-00	U13	IC, 74LS175
5281-09235-00	U21	IC,Triple NAND, 74LS10
5370-09321-00	U9, U10, U17, U18	IC, Op Amp, MC1458
5281-09215-00	U2	IC, Hex Inv, 74LS04
5281-09246-00	U14	IC, 2-4 Dec, 74LS139
5281-09745-00	U15	IC, Dual Mux, 74LS138
5370-09156-00	U22, U23	IC, Audio Amp, TDA2002
a) 5705-09199-00		Heatsink, #6030B
b) 4006-01003-06		6-32 x 3/8 P-PH-S
c) 4406-01117-00		6-32 Hexnut
d) 4703-00007-00		#6 Ext. Lockwasher
5370-09691-00	U6	IC, CVSD, 55536
5160-10269-00	Q1	Transistor, 2N3904, NPN
5060-10396-00	SP1	SIP 4.7K & 470pfd, 8R8C
5010-09181-00	R44, R48	Resistor, 1.0Ω, 1/2w, 5%
5010-09161-00	R35, R45	Resistor, 2.2Ω, 1/4w, 5%
5010-09361-00	R43, R46, R47	Resistor, 220Ω, 1/2w, 5%
5010-09358-00	R41, R42	Resistor, 1K, 1/4w, 5%
5010-08998-00	R2, R3, R12	Resistor, 2.2K, 1/4w, 5%
5010-08983-00	R7 - R9	Resistor, 3.3K, 1/4w, 5%
5010-08991-00	R1, R4, R5, R11, R25 - R28, R33, R36, R37, R49, R50	Resistor, 4.7K, 1/4w, 5%

Part No.	Ckt Designator	Description
5013-09427-00	R13	Resistor, 4.99K, 1/4w, 1%
5010-09086-00	R16	Resistor, 6.8K, 1/4w, 5%
5010-09034-00	R14, R15, R17, R22 - R24, R34	Resistor, 10K, 1/4w, 5%
5010-08772-00	R18	Resistor, 15K, 1/4w, 5%
5010-09324-00	R6, R19 - R21, R38	Resistor, 27K, 1/4w, 5%
5010-09342-00	R30	Resistor, 36K, 1/4w, 5%
5010-08824-00	R32	Resistor, 43K, 1/4w, 5%
5010-09162-00	R39	Resistor, 100K, 1/4w, 5%
5010-09333-00	R29	Resistor, 180K, 1/4w, 5%
5010-08846-00	R31	Resistor, 220K, 1/4w, 5%
5010-10258-00	R40	Resistor, 1M, 1/4w, 5%
5010-09179-00	R10	Resistor, 3.3M, 1/4w, 5%
5040-09365-00	C11	Capacitor, 1µfd, 63v; +50, -10%
5040-09343-00	C1, C3, C4, C8, C17	Capacitor, 10µfd, 20v, ±20%
5040-10974-00	C12, C19, C24	Capacitor, 100µfd, 35v
5040-09776-00	C26, C30	Capacitor, 470µfd, 16v; +50, -10%
5040-12006-00	C29, C32	Capacitor, 1000µfd, 16v, 20%
5041-09243-00	C25, C28	Capacitor, 10µfd, 10v,±10%
5043-08980-00	C5, B (21)*	Capacitor, 0.01µfd, 50v,+80, -20%
5043-08996-00	C31, 33	Capacitor, 0.1µfd, 50v, ±20%
5043-09065-00	C13 - C15	Capacitor, 470 pfd, 50v, ±20%
5043-09492-00	C2, C34	Capacitor, 100 pfd, 50v, ±10%
5043-09844-00	C6	Capacitor, 47 pfd, 50v, ±20%
5043-09845-00	C16, C18, C20 - C23, C27	Capacitor, 1000 pfd, 50v, ±20%
5046-09346-00	C7	Capacitor, 1200 pfd, 50v, ±5%
5046-09348-00	C10	Capacitor, 4700 pfd, 50v, ±5%
5046-09350-00	C9	Capacitor, 180 pfd, 100v, ±5%
5520-09020-00	X1	Crystal, 3.58 MHz
5521-10931-00	CR1	Oscillator, 8 MHz
5551-09822-00	L1 - L3	Inductor, 4.7 µH, 3A
5791-09437-00	J4	Connector, 20 pin, (Hdr), Ribbon Cable
5791-10862-04	J1, J2, J5	Connector, 4 pin (Hdr)
5791-10862-06	J3	Connector, 6 pin (Hdr)

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.

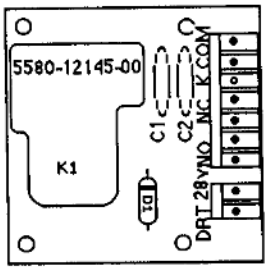


Aux Power Driver Unit Board

p/n D-11813-552

Part No.	Ckt Designator	Description
5760-12184-00		Bare P. C. Board
5040-09537-00	C1, C3	Capacitor, 100 µfd., 100v, Radial
5040-12181-00	C5, C6	Capacitor, 10 µfd., 100v, Radial
5043-09072-00	C2, C4	Capacitor, 0.1 µfd., 500v
5010-09160-00	R1 - R8	Resistor, 220Ω, 1/4w C.F., 5%
5012-09874-00	R9	Resistor, 3.3K, 5w, 5%
5010-09534-00	W1, W3, W4	Resistor, 0Ω, 1/4w
5017-12180-00	VR1	Varistor, 100v
5017-09064-00	VR2	Varistor, 47v
5100-09690-00	BR1, BR2	Bridge Rectifier, 35A, 200v
5070-08785-00	D1 - D23	Diode, 1N4003

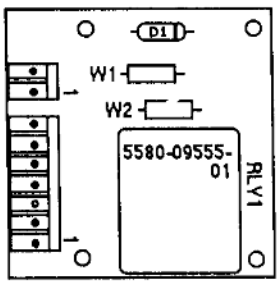
Part No.	Ckt Designator	Description
5070-09045-00	D31 - D46	Diode, MR501
5191-12179-00	Q1 - Q8	Transistor, TIP36C
5580-09555-01	K1	Relay, DPDT, 13A
5733-12060-01		Fuseholder
5733-08665-00	F1, F3 - F6	Fuse, 2A, S-B, 250v
5733-09651-00	F8	Fuse, 5A, S-B, 250v
5733-06314-00	F2, F7	Fuse, 4A, S-B, 250v
5791-10862-09	J1, J2, J4 - J6, J8	Connector, 9-pin Hdr, Sq Pin
5791-10862-07	J3, J7, J9	Connector, 7-pin Hdr, Sq Pin
5791-10862-12	J11, J12	Connector, 12-pin Hdr, Sq Pin
5791-10862-04	J10	Connector, 4-pin Hdr, Sq Pin



Motor Relay Board Assembly

p/n C-11902-1

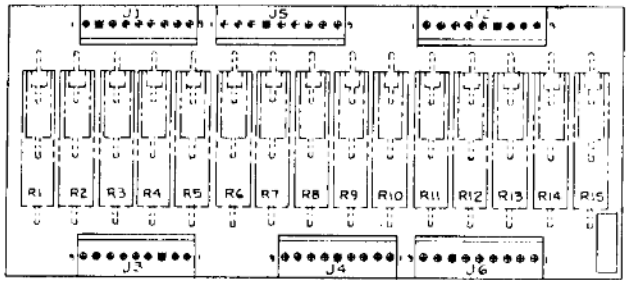
Part No.	Description	
5768-12221-00	PC Board	
5070-09054-00	Diode, 1N4004, 1.0A	
5580-12145-00	Relay, 24vdc, 30A	
5791-10862-02	Header, 2-pin sq post	(J1)
5791-10862-07	Header, 7-pin sq post	(J2)



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, 0Ω	(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

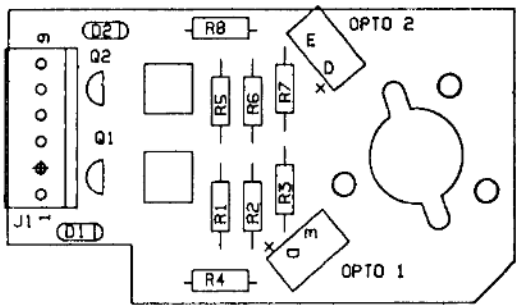
Part No.	Description
5768-12223-00	PC Board
24-8767	Twist Lamp Socket
24-8768	Bulb, #555 (6.3v, .25A)
5070-09054-00	Diode, 1N4004
5791-10871-06	Header, 6-pin sq post

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

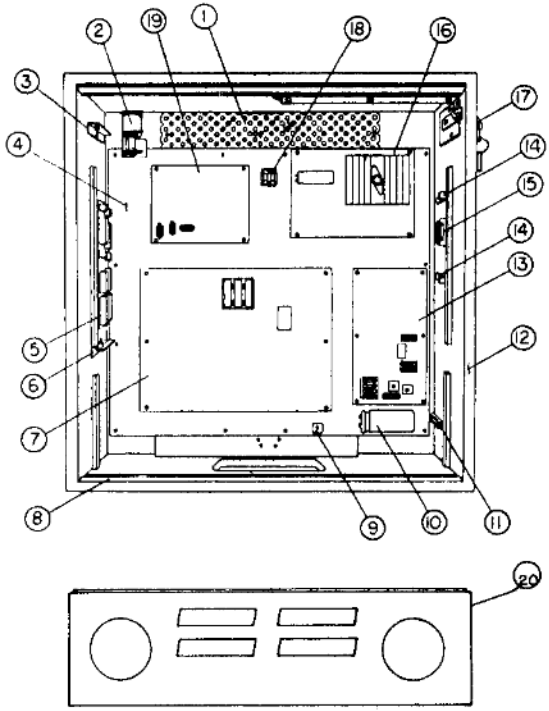
Part No.	Description	Part No.	Description
C-11917	5-lamp/2-flasher Assly	C-11980	Flashlamp Socket & Bulb Assy
5768-12229-00	PC Board	5768-12241-00	Bare PC Board
24-8767	Twist Lamp Socket	24-8803	Socket, Lamp
24-8768	Bulb, #555 (6.3v, .25A)	24-8802	Bulb, #906 F'lamp, 13v, 0.69A
5070-09054-00	Diode, 1N4004	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.	Description
5768-12202-00	Bare PC Board
5490-10159-00	Opto Interruptor Module
16-8850-187	Label, PC Identifier
5010-08930-00	Resistor, 470Ω, 1/2w, 5%, C. F. (R4, R8)
5010-09536-00	Resistor, 820Ω, 1/4w, 5%, C. F. (R2, R6)
5010-09162-00	Resistor, 100K, 1/4w, 5%, C. F. (R1, R5)
5010-09324-00	Resistor, 27K, 1/4w, 5%, C. F. (R3, R7)
5070-08919-00	Diode, 1N4148, 150mA (D1, D2)
5190-10270-00	Transistor, 2N3906, TO-92, PNP
5791-10871-06	Header, 6-pin sq post (J1)
EI-124	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/Speaker Panel Assy
a)	31-1420-552	Cover, Displ/Spkr Pnl Assy

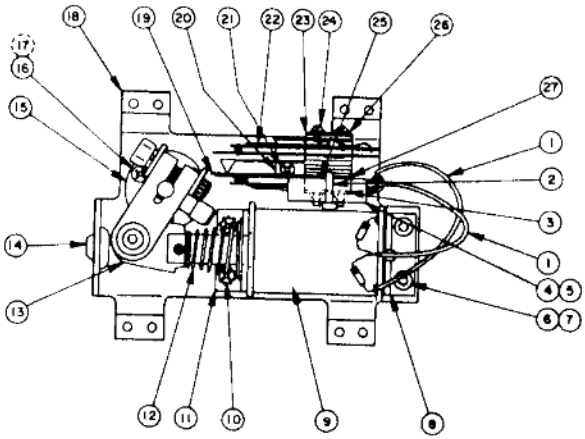
Miscellaneous *SPACE STATION* Parts

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 µFd, 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)	4010-01086-14	Cap Screw, 10-32 x 7/6, SH
c)	4700-00023-00	Washer, 5/8 o.d. x 13/64 i. d. x 16 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

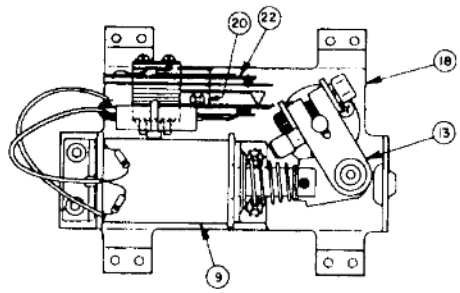
1. Each Flipper Assembly is mounted beneath the playfield, in conjunction with the plastic Flipper Paddle and Shaft (20-9250-5) and flipper Rubber (23-6519-4) on the upper side of the playfield.
2. The tip of the EOS Switch must travel 0.0150 (+ .010, - .000) inch, before the contacts fully open, with the flipper in the actuated position. The EOS Switch contacts must have a gap of 0.062 (± .015) inch. Adjustment of the EOS Switch must be made at a minimum distance of 0.25 inch from the switch body.
3. The Lane Change Switch must have a gap of 0.046 (±.015) inch, when fully open.
4. All moving elements of the assembly must operate freely, with no evidence of binding.
5. The large end of the Coil Plunger Spring must fit within the four lugs of the Solenoid Bracket.
6. For coil replacement, remove the Solenoid Bracket (item 3) to prevent screw damage.
7. Use Loctite™ 242 when reattaching screws to the Flipper Stop Assembly, the Solenoid Bracket, and the Flipper Bushing.
8. When using the Bumper Plug (item 13) on older flipper assemblies, readjust the flipper paddle and shaft position.
9. 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)

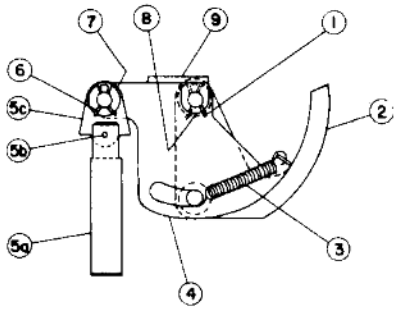
Item	Part No.	Description
13	B-10655-L	Crank Link Assembly
g)	B-10657-L	Flipper Crank Assembly, Left
1.)	01-8073-L	Flipper Crank, Left
18	C-11627-L	Flipper Base Assy, L.
20	No p/n	(Now part of item 18)
22	B-9951-1	Switch & Diode Assembly
a)	SW-1A-150-1	Switch, Lane Change



Ball Shooter Lane Feeder

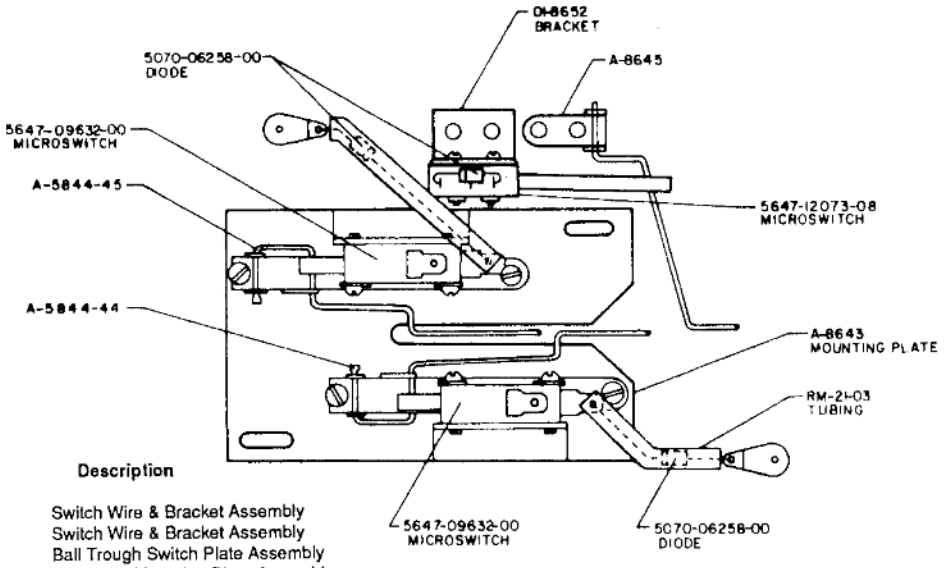
p/n C-9638-3 & Associated Parts

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 i.d. x 15 ga.
8	4700-00103-00	Washer, 1/2 o.d. x 17/64 i.d. x 28 ga.
9	A-8268-2	Mounting Bracket Assy



Associated Parts

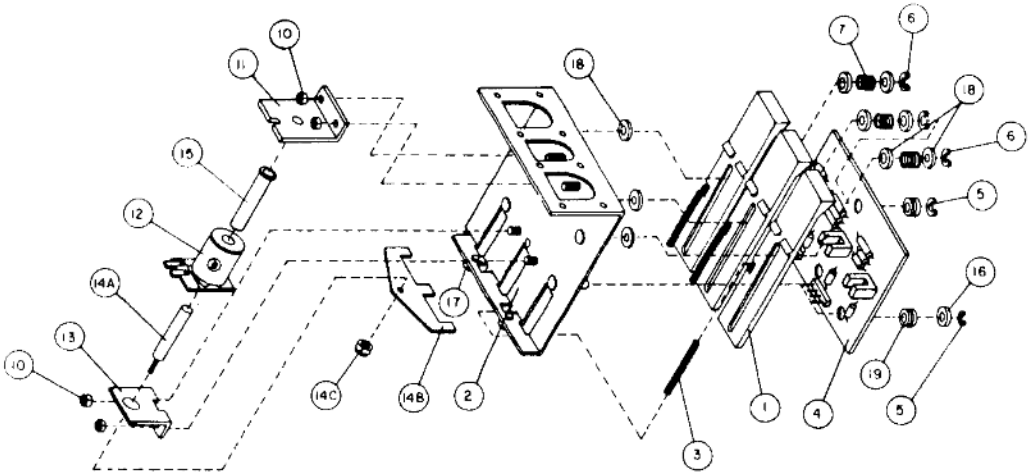
B-9362-R-1	Coil & Bracket Assembly
B-7572-1	Bracket & Stop Assembly
01-8-508-S	Coil Retaining Bracket
4006-01017-06	Mach. Screw, 6-32 x 3/8
4406-01119-00	Nut, 6-32 ESN
AE-23-800	Coil Assembly
03-7066	Coil Tubing



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

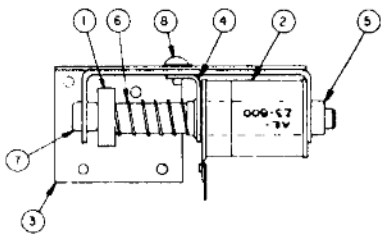
(viewed from underside of playfield to show parts locations)



3-Bank Drop Target

p/n C-11223-1

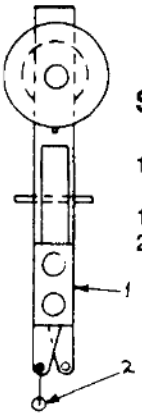
Item	Part No.	Description
1	03-8036	Target Blade, Plain
2	B-11224	Bracket, 3-Bank Mounting
3	10-364	Spring, Retractor
4	C-11318	Opto Switch Assembly
5	20-8712-18	Retaining Clip, 3/16"
6	20-8712-25	Retaining Clip, 1/4"
7	10-392	Spring, Compression
8	Not Used	
9	Not Used	
10	4408-01119-00	Nut, 8-32 ESNA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



Left Re-entry Kickback

p/n B-11873-1

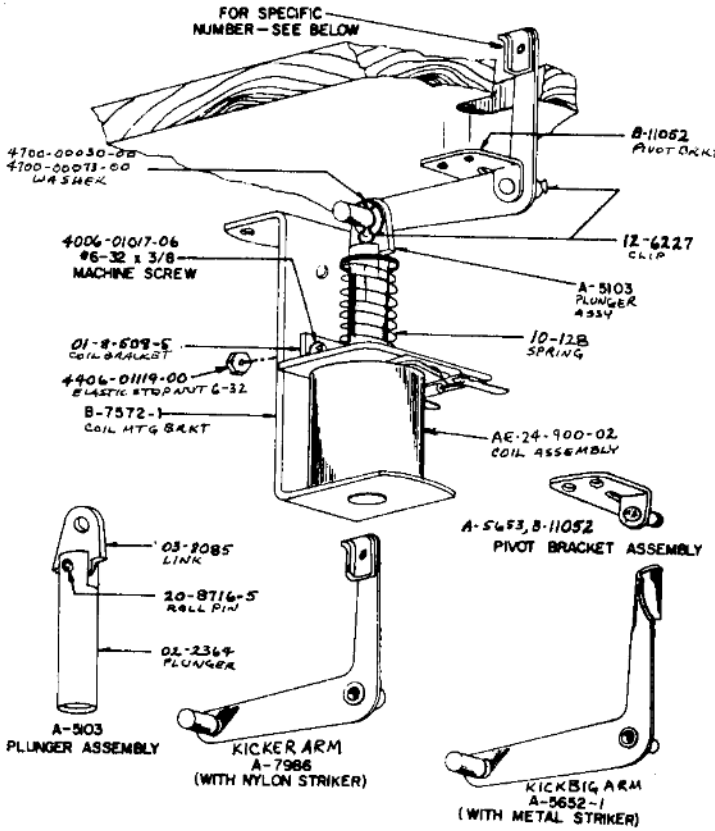
Item	Part No.	Description
1	A-6306-2	Bell Armature Assembly
2	AE-24-900	Coil Assembly
3	B-7409-2	Mounting Bracket Assembly
4	01-8-508-T	Solenoid Bracket
5	03-7067-5	Coil Tubing
6	10-135	Spring, Solenoid
7	23-6420	Grommet, Rubber
8	4008-01017-05	Mach. Screw, 8-32 x 5/16



Standup Target Assemblies

1	p/n B-11696-5	SHUTTLE & STATION 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 i.d. x 15 ga.
A-5653	Mounting Bracket Assy

Associated Parts

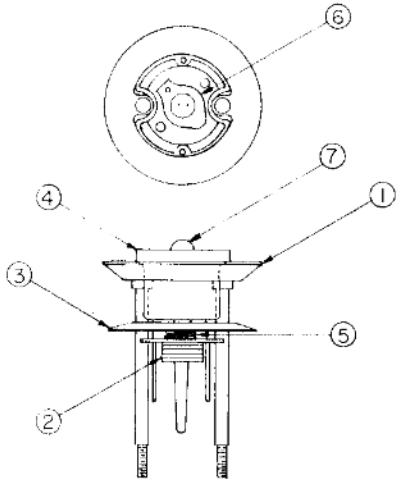
B-9362-L-2	Coil & Bracket Assembly
B-7572-1	Bracket & Stop Assembly
01-8-508-S	Coil Retaining Bracket
4006-01017-06	Mach. Screw, 6-32 x 3/8
4406-01119-00	Nut, 6-32 ESN
AE-26-1200	Coil Assembly
03-7066	Coil Tubing

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 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

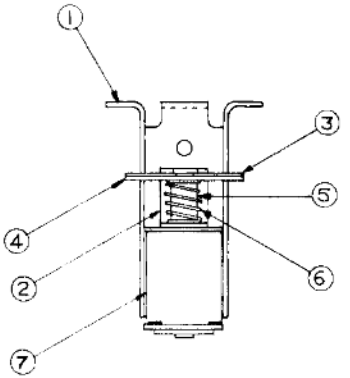
p/n B-9414 (Above the playfield)

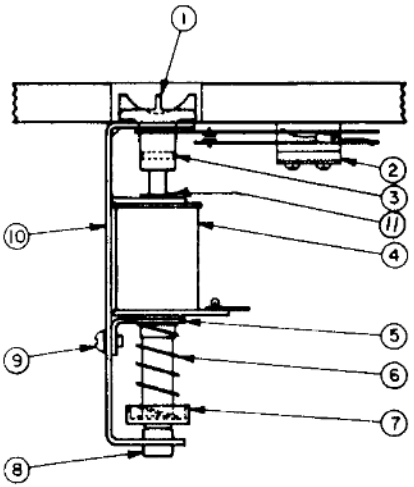
Item	Part No.	Description
1	A-4754	Bumper Ring Assembly
2	03-6009-A5	Bumper Base, White
3	03-6035-5	Bumper Wafer, White
4	03-7443-5	Bumper Body, White
5	10-7	Spring
6	24-8776	Lamp Socket
7	24-8768	Bulb, #555
Not Shown	03-7444-9	Cap, Jet Bumper (2)
	17-1098	Cap, Modified (1)

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-	Coil
	03-7066	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

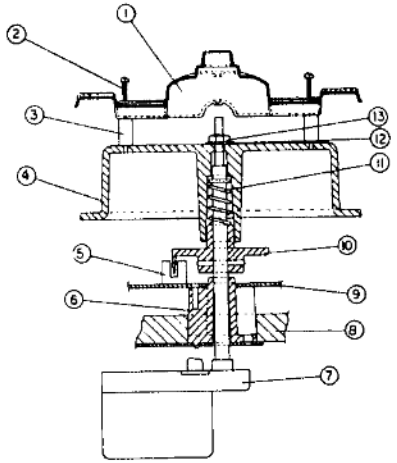
Right Ball Popper & Switch Assembly

p/n D-11335-2 & Associated Parts

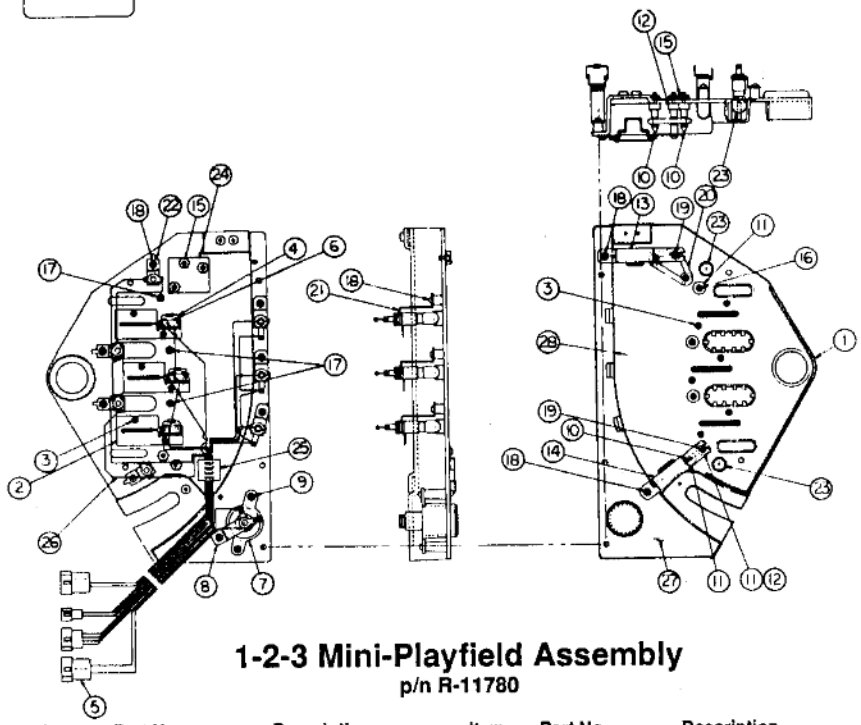
(Parts listed replace same items of D-11335-1)

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



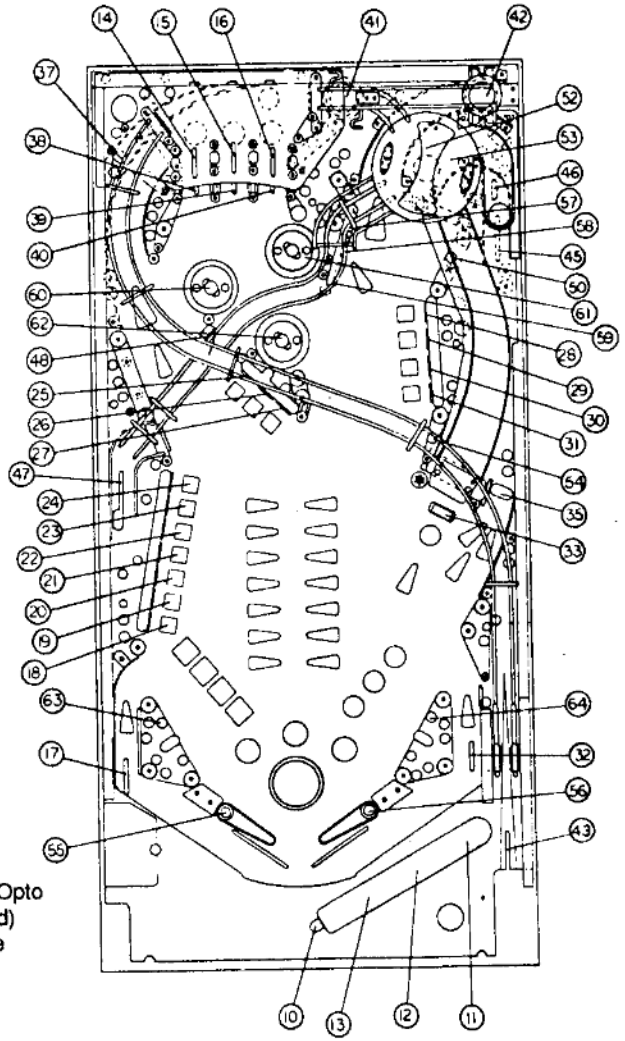
1-2-3 Mini-Playfield Assembly

p/n R-11780

Item	Part No.	Description
1	03-8109	1 - 2 - 3 Mini-Playfield
2	01-8801	Switch Mounting Bracket
3	07-6688-19	Rivet
4	A-11991	Switch & Diode Assy
a)	5647-12073-01	Switch
b)	5070-06258-00	Diode, 1N4001, 1A.
5	H-11958	Playfield Cable
6	4002-1052-06	Mach. Screw, 2-56 x 3/8"
7	03-8149-10	Lamp Cover, Trans Blue
8	A-11826	Socket Assembly
9	4106-01019-06	Sh Met Screw, #6 x 3/8"
10	02-4321	Bumper Post
11	23-6535	Post Rubber
12	02-4320-1	Bumper Post
13	B-11861	Ball Gate Assembly
a)	12-6752	Gate Wire
14	B-11788	Ball Gate Assembly
a)	12-6752	Gate Wire
15	4406-01128-00	Nut, 6-32 KEPS
16	03-8044-9	Post, Plastic
17	4106-01019-08	Sh Met Screw, #6 x 1/2"
18	4106-01019-04	Sh Met Screw, #6 x 1/4"
19	4006-01003-03	Mach. Screw, 6-32 x 3/16"
20	23-6301	Ring, Rubber, 3/4" dia
21	A-11271	Socket Assembly
22	A-11905	Socket Assembly
23	03-8063-6	Bulb Sleeve, Yellow
24	01-8727	Support Plate
25	03-7722-4	Cable Clip, 1/4"
26	HW-30022-4	Wire, #22AWG, 30-3/4"
27	31-1441-2	Decal
28	31-1441-1	Decal

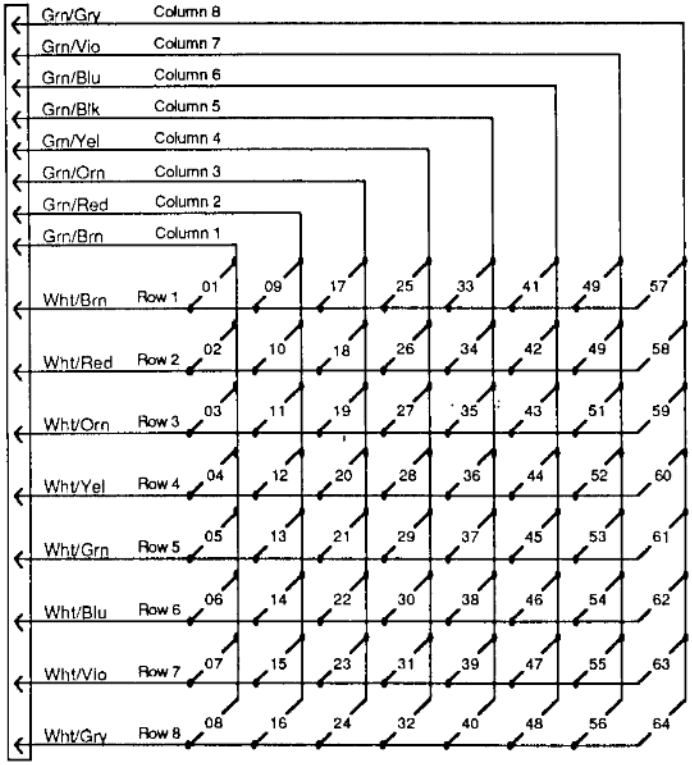
Switches

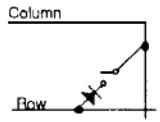
Item	Part No.	Description
1	A-8476	Plumb Bob Tilt
2		Not Used
3	SW-1A-126	Credit Button
4	904845*	Right Coin Chute
5	904845*	Center Coin Chute
6	904845*	Left Coin Chute
7	904704*	Slam Tilt
8	5641-09369-00	High Score Reset
9	SW-1A-117	Playfield Tilt
10	17-1067	Outhole
11	5647-09938-00	Ball Trough #1 (right)
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	Right1-bank Dr Tgt Opto (German Scoreboard)
34		
35	B-11696-8	Change Sh/St Score
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	RightSling (scoring)**
-	SW-10A-48	Flipper Button (Cabinet sides)

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

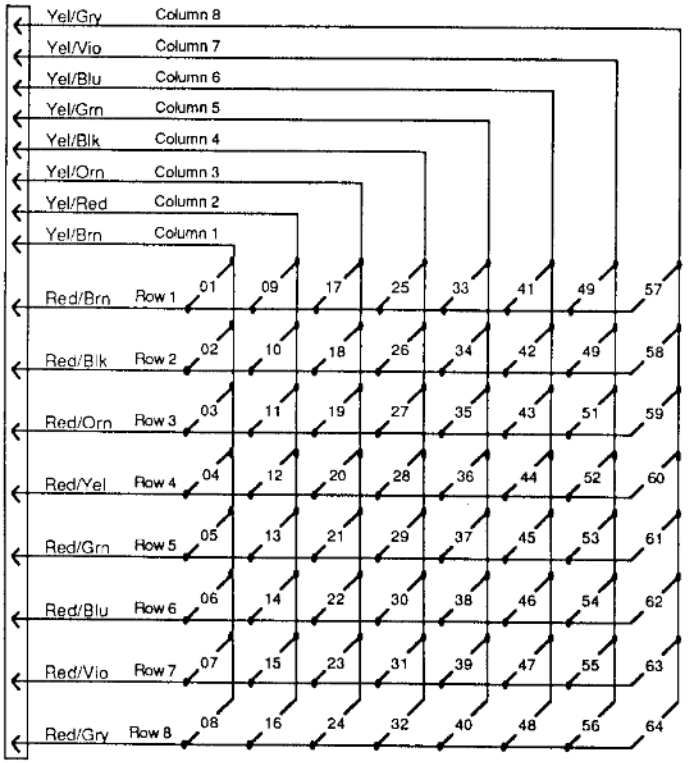


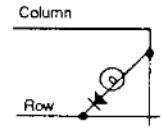


Typical Switch Circuit

SPACE STATION Switch-Matrix Table

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





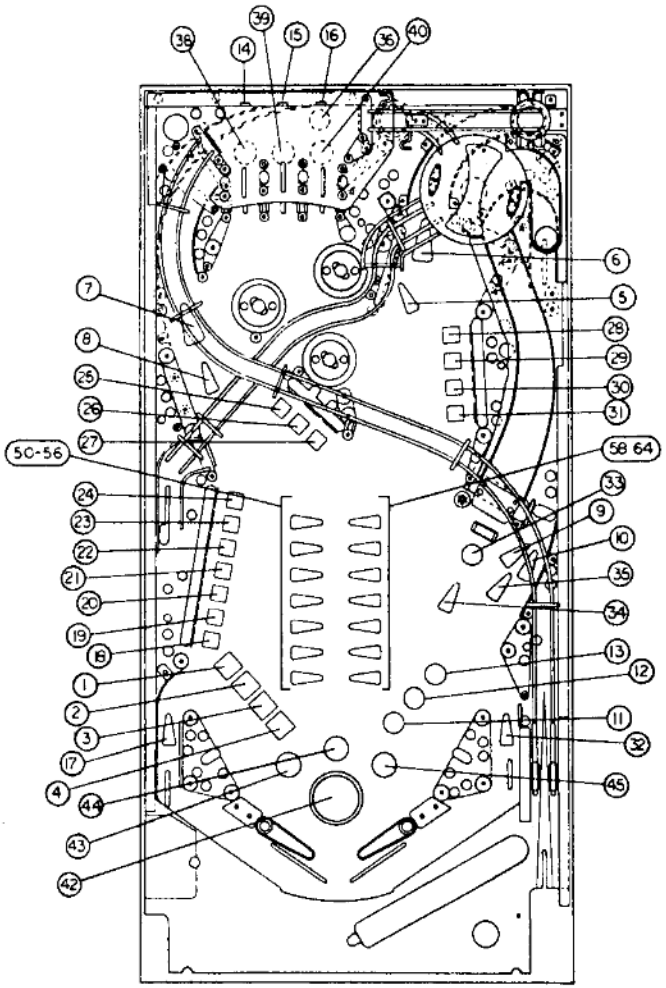
Typical Lamp Circuit

2 Double Lamps

SPACE STATION Lamp-Matrix Table

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

Lamps

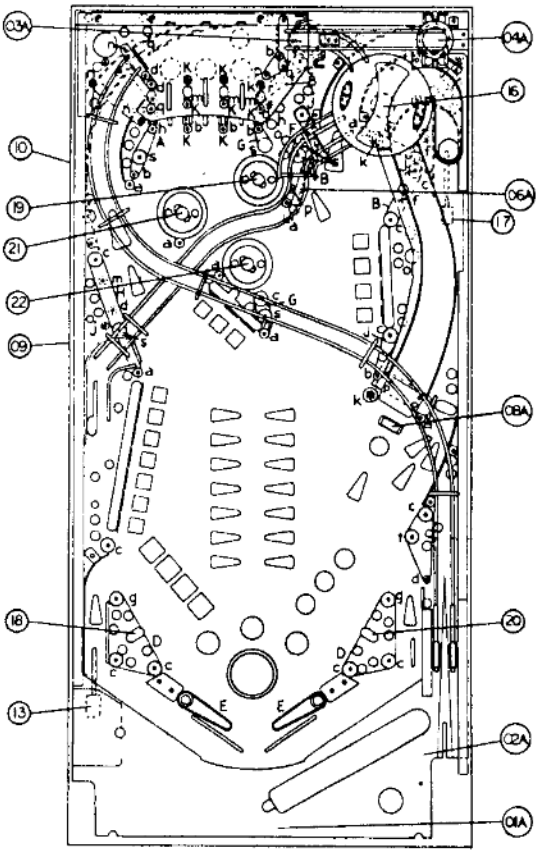


Lamp	Location/Description
1	Bonus Ball Player #1
2	Bonus Ball Player #2
3	Bonus Ball Player #3
4	Bonus Ball Player #4
5	EXTRA BALL (3-bk Dr Tgt)
6	RELEASE (right)
7	RELEASE (left)
8	DOCK W/L (left)
9	CHANGE Shuttle
10	CHANGE Station
11	1X
12	2X
13	4X
14	1 (lane)
15	2 (lane)
16	3 (lane)
17	RE-ENTRY W/LIT (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

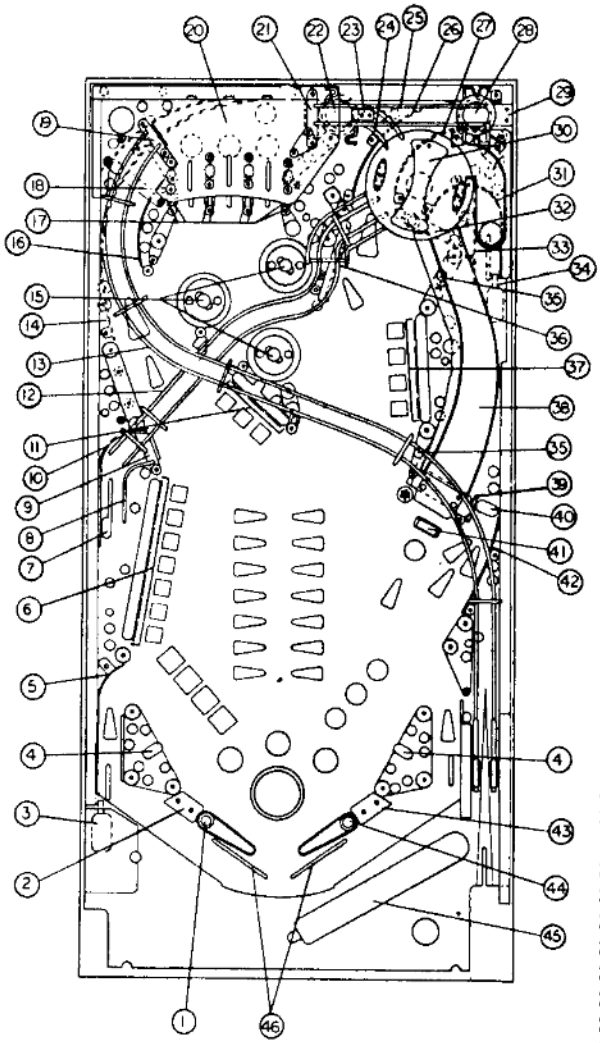
Playfield Posts

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

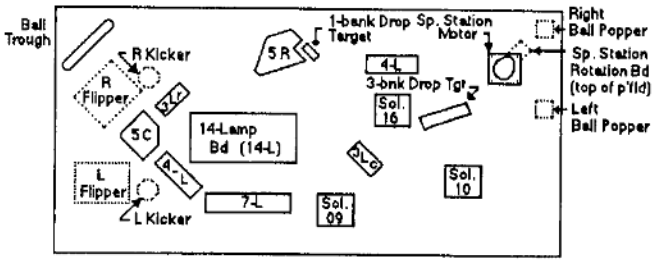
Item	Part No	Description	Qty.
A	23-6303	1-1/4" Ring	2
B	23-6304	1-1/2" Ring	3
D	23-6306	2-1/2" Ring	2
E	23-6519-4	Red Flipper Ring	2
F	23-6300	5/16" Ring	3
G	23-6301	3/4" Ring	2
H	23-6305	2" Ring	2
J	23-6302	1" Ring	1
K	23-6535	Bumper	12

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. Statior
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"

Item	Part No.	Description
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)

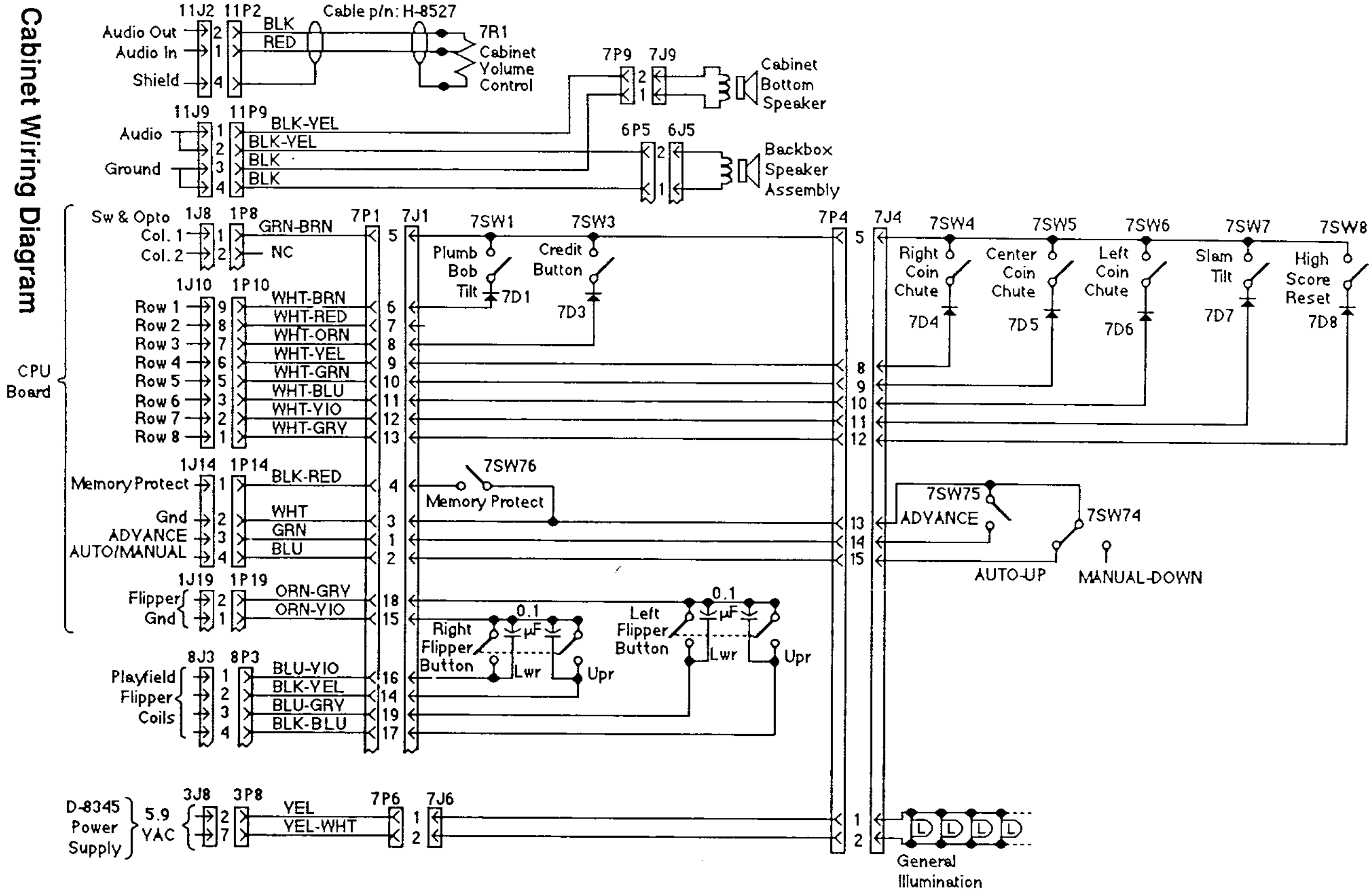
C-11626-R-4	Lower Right Flipper Assembly	C-11998-1	Relay PC Bd (Sol. 09)
C-11626-L-4	Lower Left Flipper Assembly	C-11866	3-Lamp PC Bd ("3Lc")
B-9463	Right Kicker	C-11864	4-Lamp PC Bd ("4-L")
C-11917-1	5-Lamp, 2- Flash PC Bd ("5C")	C-11902-1	Relay PC Bd (Sol. 16)
B-9463	Left Kicker	C-11318-1	3-b Drop 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		

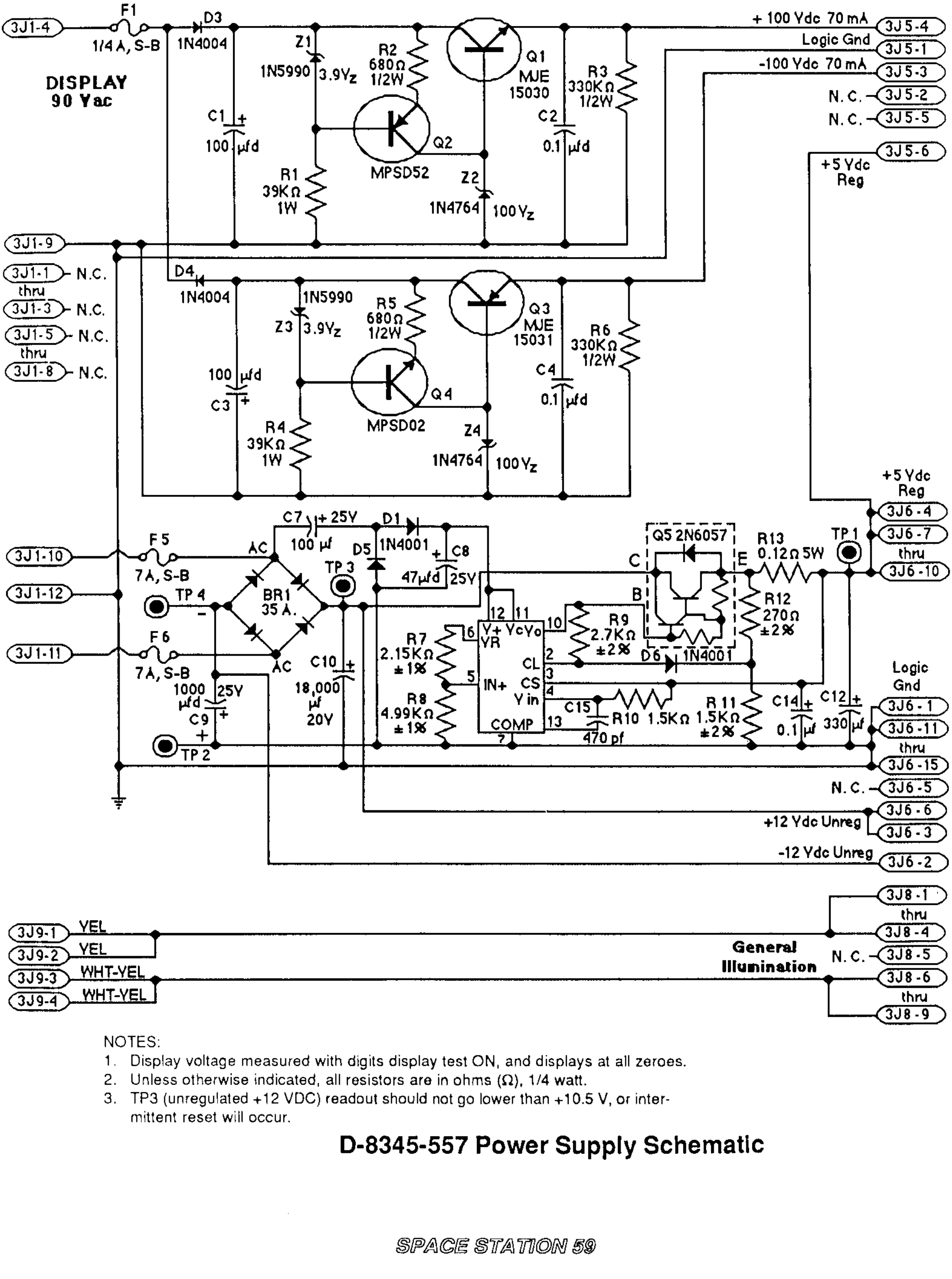
Section 3
Reference Diagrams & Schematics

- **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

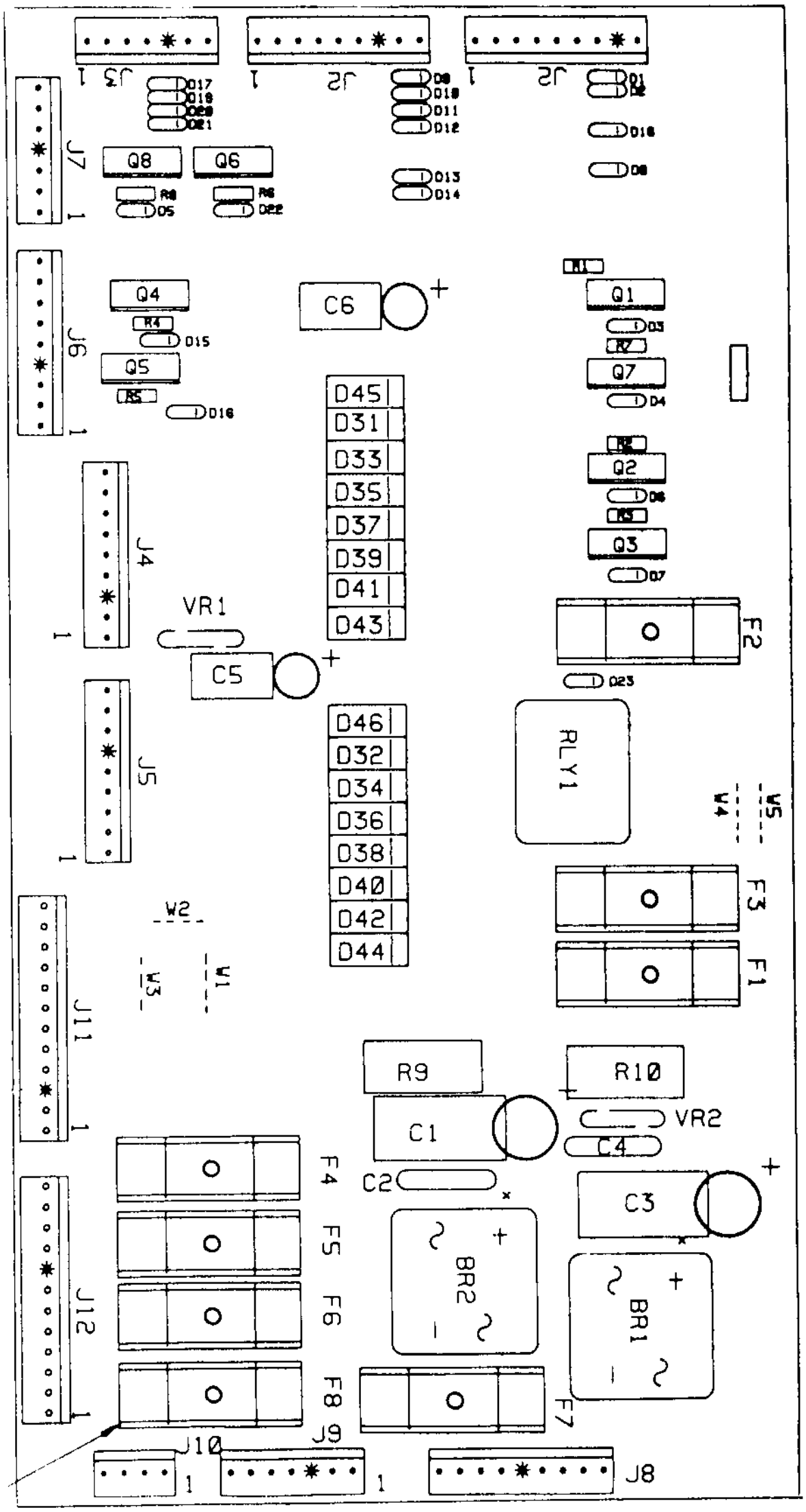




NOTES:

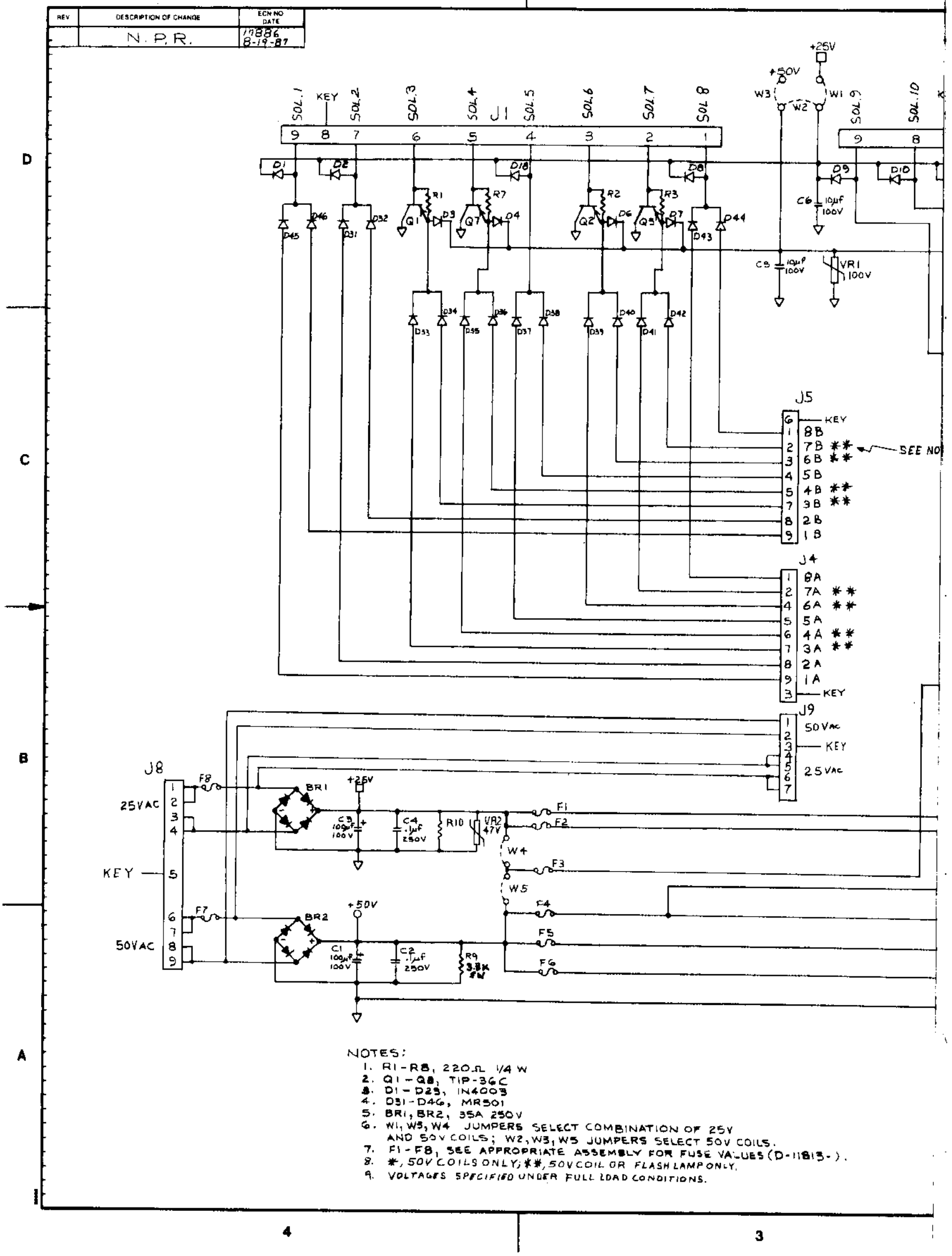
1. Display voltage measured with digits display test ON, and displays at all zeroes.
2. Unless otherwise indicated, all resistors are in ohms (Ω), 1/4 watt.
3. TP3 (unregulated +12 VDC) readout should not go lower than +10.5 V, or intermittent reset will occur.

D-8345-557 Power Supply Schematic



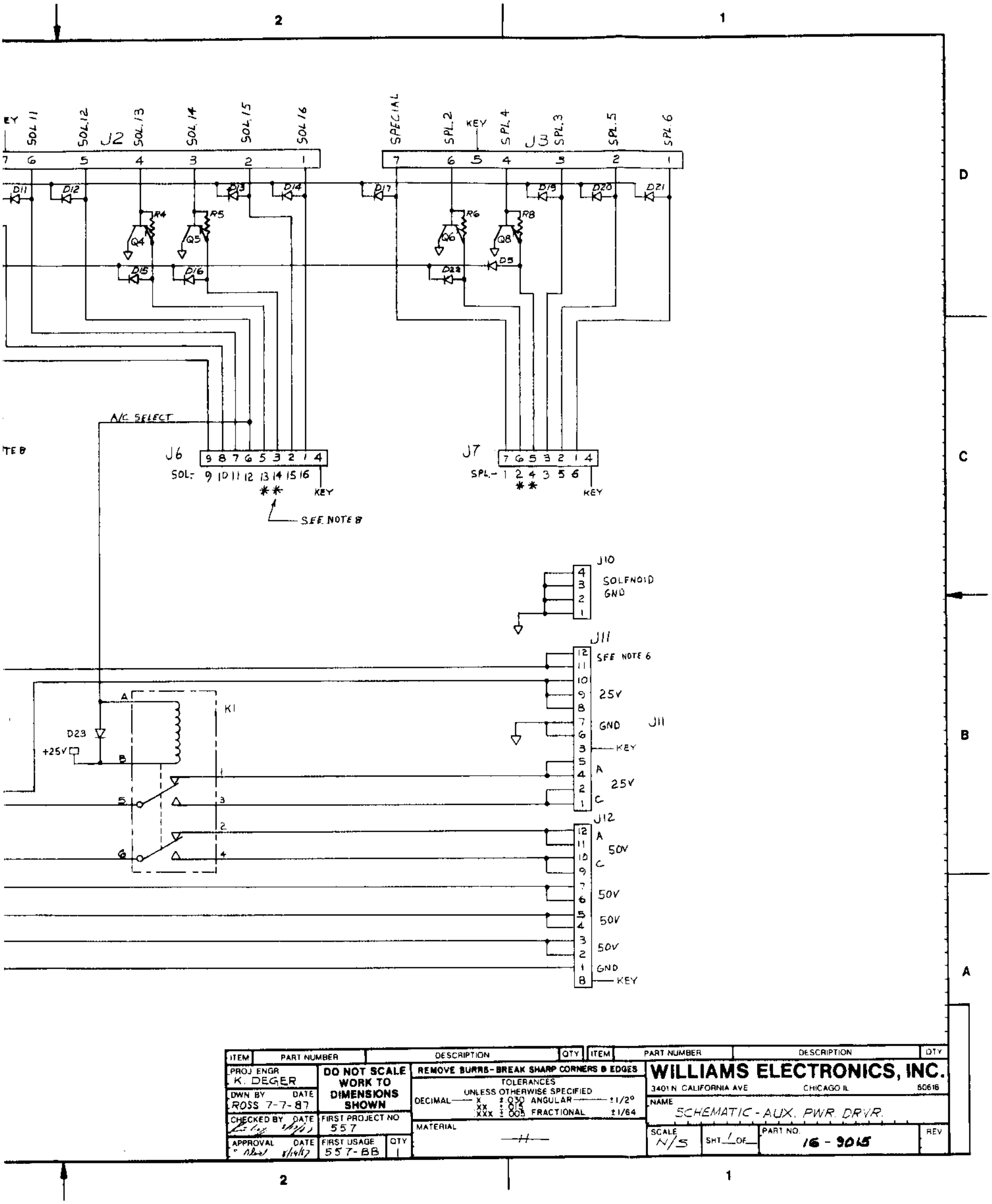
Aux Power Driver Board, D-11813

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N. P. R.	11886 8-19-87



NOTES:

1. R1-R8, 220Ω 1/4 W
2. Q1-Q8, TIP-36C
3. D1-D23, IN4003
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.



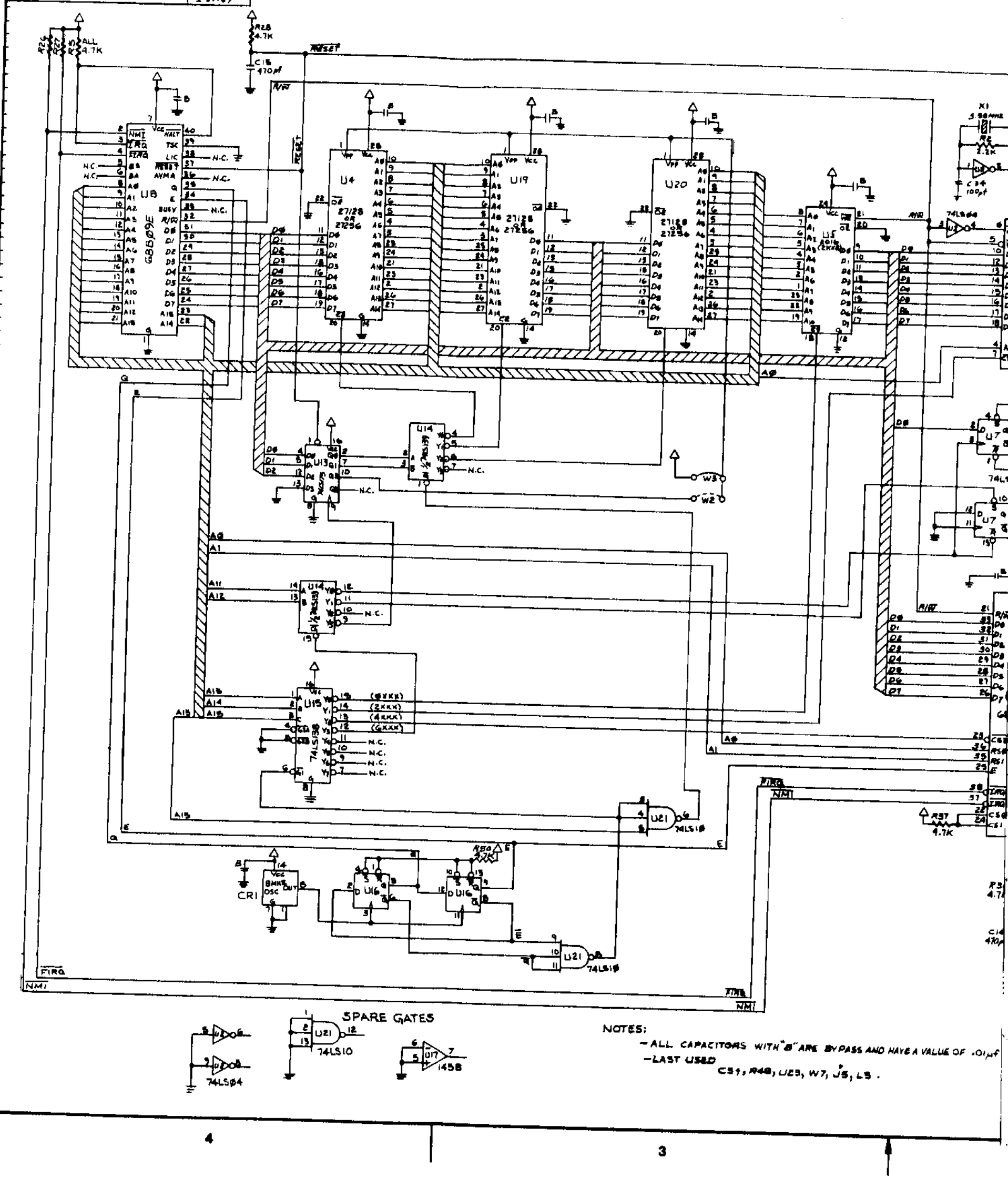
ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY

PROJ ENGR: K. DEGER
DWN BY / DATE: ROSS 7-7-87
CHECKED BY / DATE:
APPROVAL / DATE: 8/4/87
DO NOT SCALE WORK TO DIMENSIONS SHOWN
FIRST PROJECT NO: 557
FIRST USAGE: 557-BB
QTY: 1
REMOVE BURRS - BREAK SHARP CORNERS & EDGES
TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL — X ±.030 ANGULAR ±1/2°
XX ±.015
XXX ±.005 FRACTIONAL ±1/64
MATERIAL —H—

WILLIAMS ELECTRONICS, INC.
3401 N. CALIFORNIA AVE CHICAGO IL 60618
NAME: SCHEMATIC - AUX. PWR. DRVR.
SCALE: N/S
SHT 1 OF
PART NO. 16 - 9015
REV

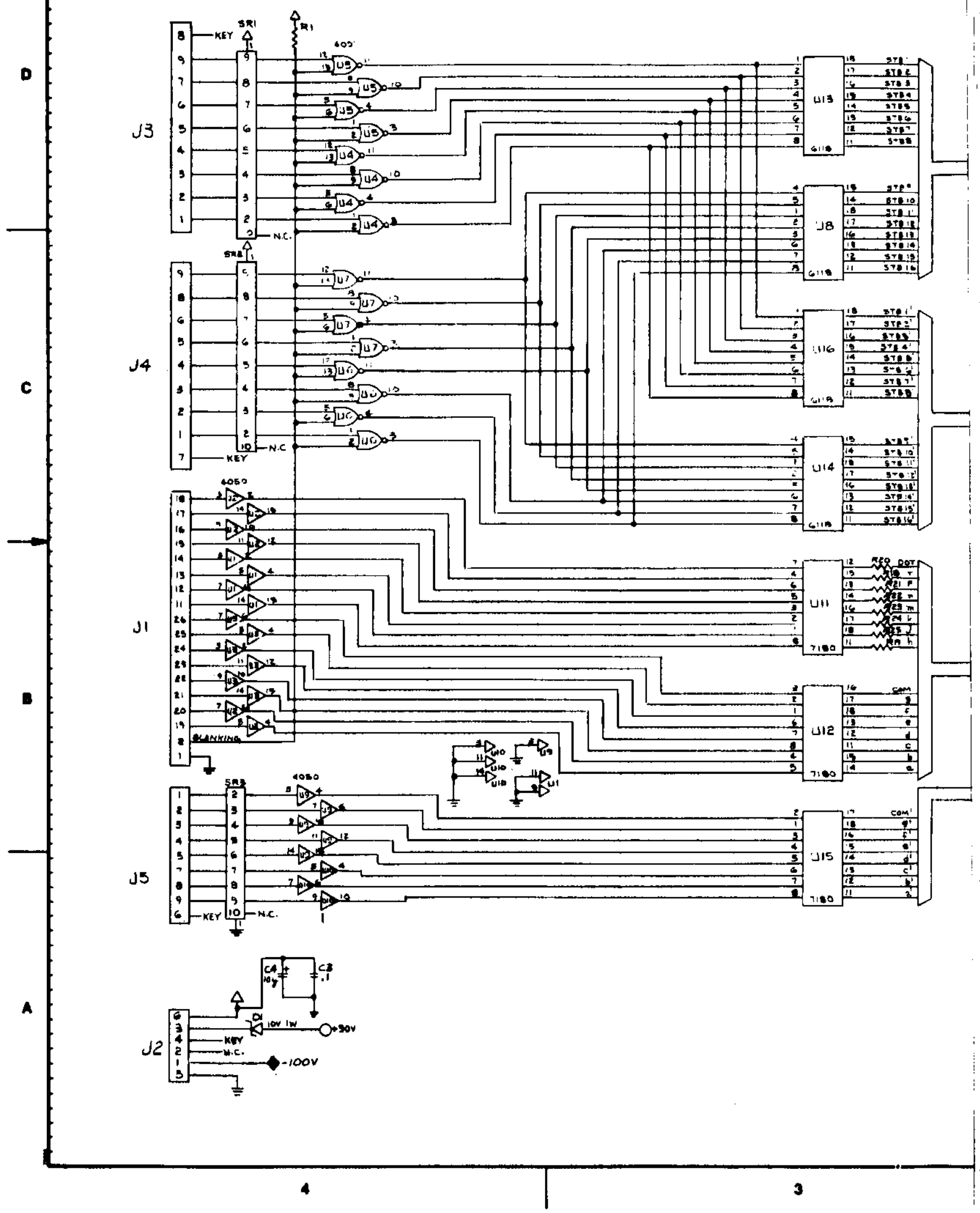
Aux Power Driver Board Schematic

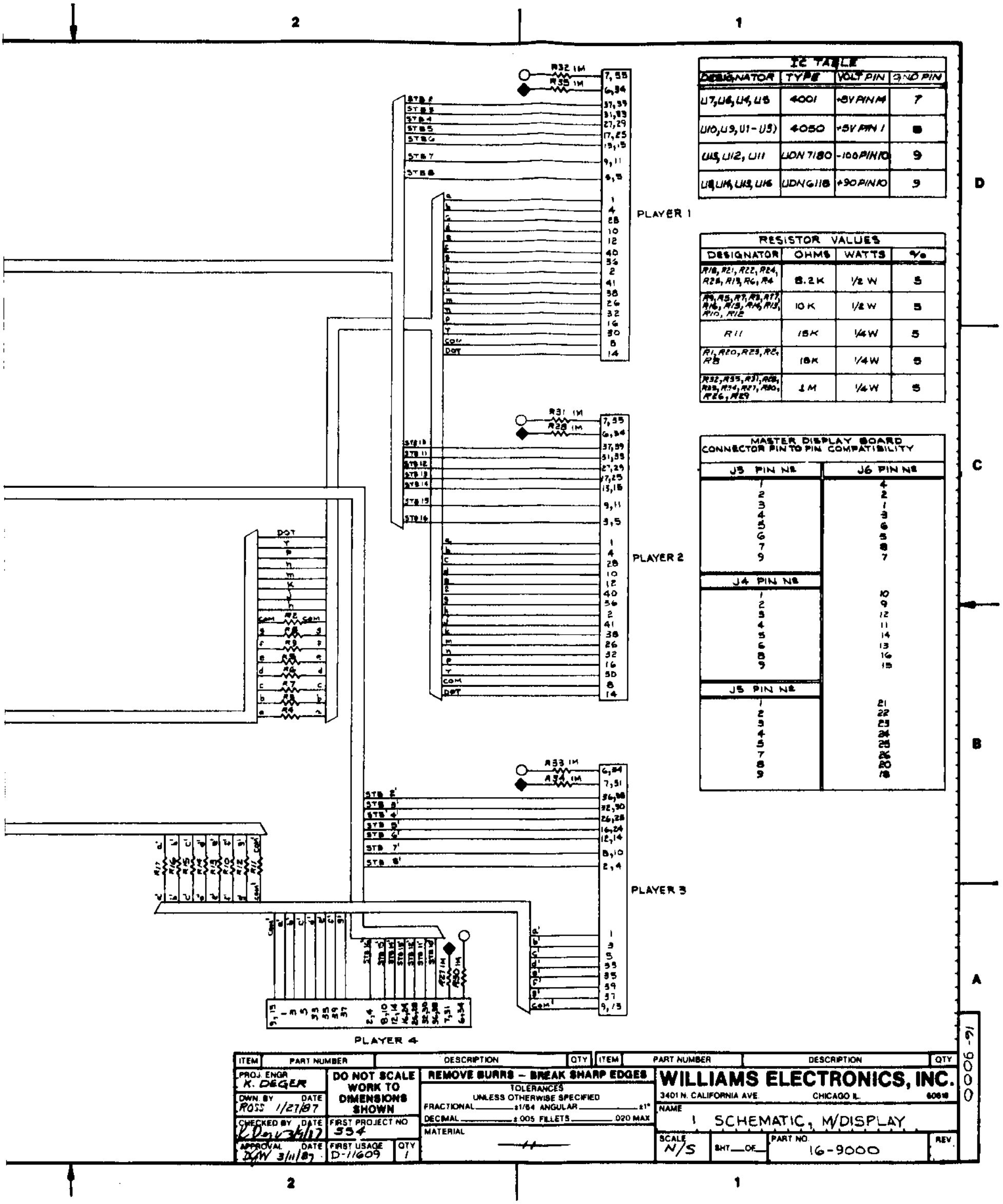
REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N. P. R.	16926 2-27-87



Audio Board (D-11581) Schematic

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N. P. R.	10787 2-11-82





IC TABLE			
DESIGNATOR	TYPE	VOLT PIN	GND PIN
U7, U6, U4, U5	4001	+5V PIN 14	7
U10, U9, U1 - U3)	4050	+5V PIN 1	8
U15, U12, U11	UDN 7180	-100 PIN 10	9
U8, U14, U13, U16	UDN 6118	+90 PIN 10	9

RESISTOR VALUES			
DESIGNATOR	OHMS	WATTS	%
R18, R21, R22, R24, R28, R19, R6, R4	8.2 K	1/2 W	5
R9, R5, R7, R8, R17, R16, R15, R14, R13, R10, R12	10 K	1/2 W	5
R11	15K	1/4W	5
R1, R20, R23, R2, R3	18K	1/4W	5
R32, R35, R31, R28, R33, R34, R27, R30, R26, R29	1 M	1/4W	5

MASTER DISPLAY BOARD
CONNECTOR PIN TO PIN COMPATIBILITY

J5 PIN NO	J6 PIN NO
1	4
2	2
3	1
4	3
5	6
6	5
7	8
9	7

J4 PIN NO	
1	10
2	9
3	12
4	11
5	14
6	13
8	16
9	15

J5 PIN NO	
1	21
2	22
3	23
4	24
5	25
7	26
8	28
9	27

ITEM	PART NUMBER	DESCRIPTION	QTY

ITEM	PART NUMBER	DESCRIPTION	QTY

PROJ. ENGR: K. DEGER
DWN. BY: ROSS DATE: 1/27/87
CHECKED BY: DATE:
APPROVAL: DATE: 3/11/87

DO NOT SCALE WORK TO DIMENSIONS SHOWN

FIRST PROJECT NO: 354
FIRST USAGE: D-11609
QTY: 1

REMOVE BURRS – BREAK SHARP EDGES
TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL ±1/64 ANGULAR ±1°
DECIMAL ±.005 FILLETS .020 MAX
MATERIAL

WILLIAMS ELECTRONICS, INC.
3401 N. CALIFORNIA AVE. CHICAGO IL. 60618

NAME: 1 SCHEMATIC, W/DISPLAY
SCALE: N/S SHT __ OF __ PART NO: 16-9000 REV:

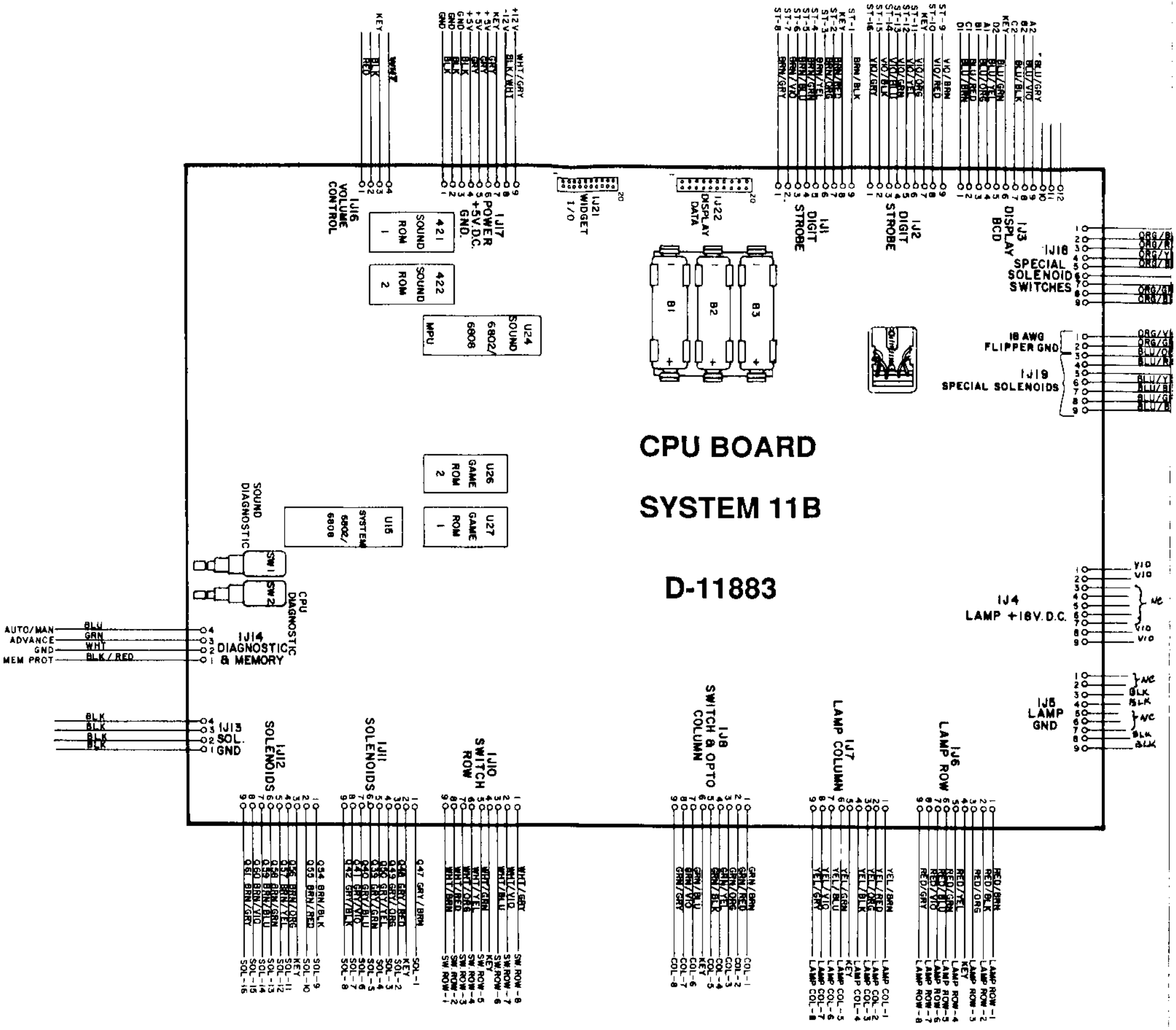
16-9000

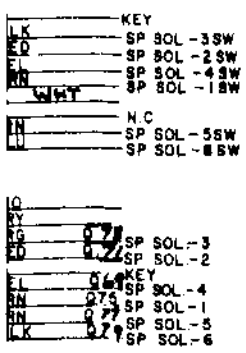
Alphanumeric Display Unit Board (D-11610) Schematic

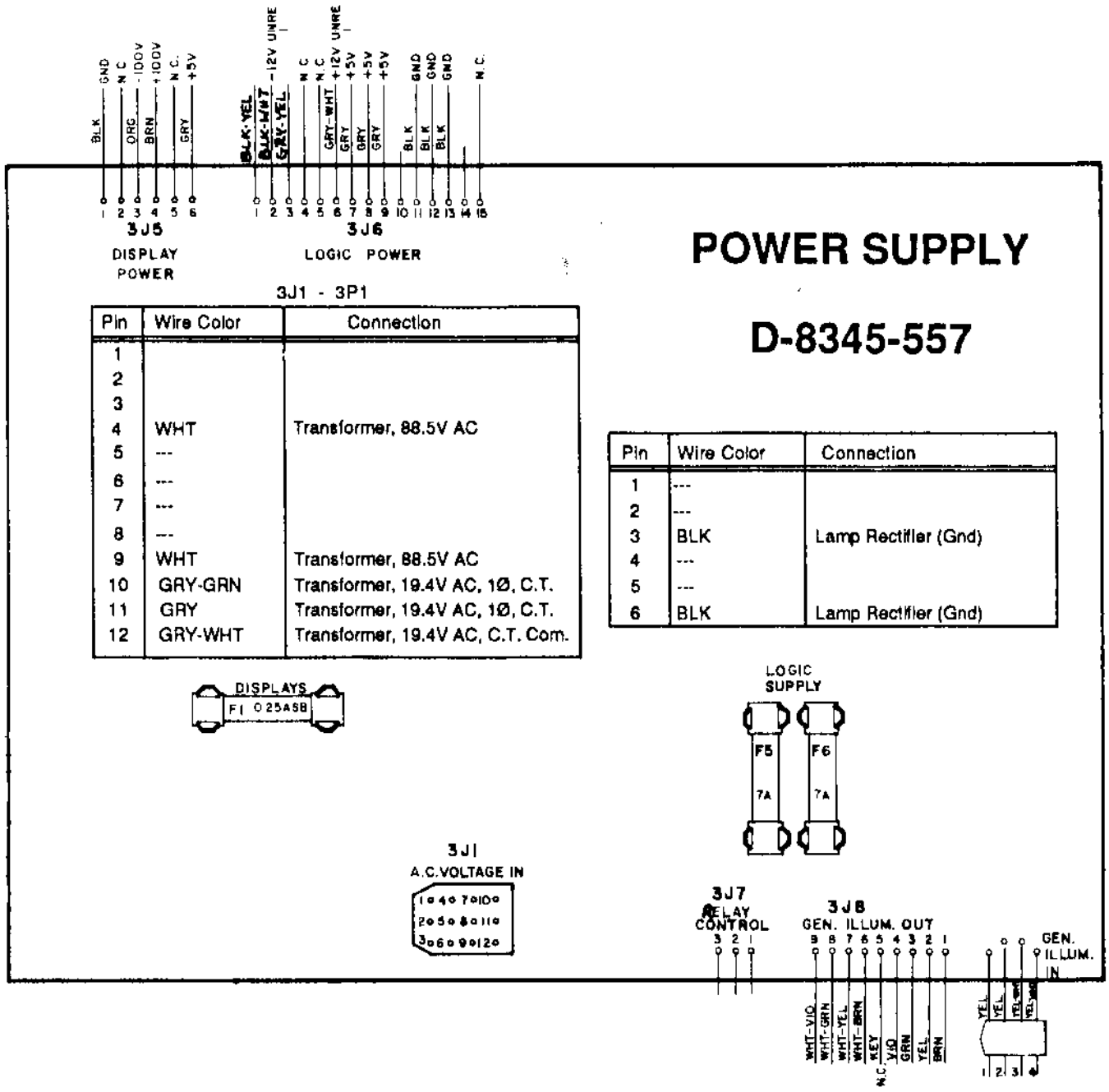
CPU BOARD

SYSTEM 11B

D-11883

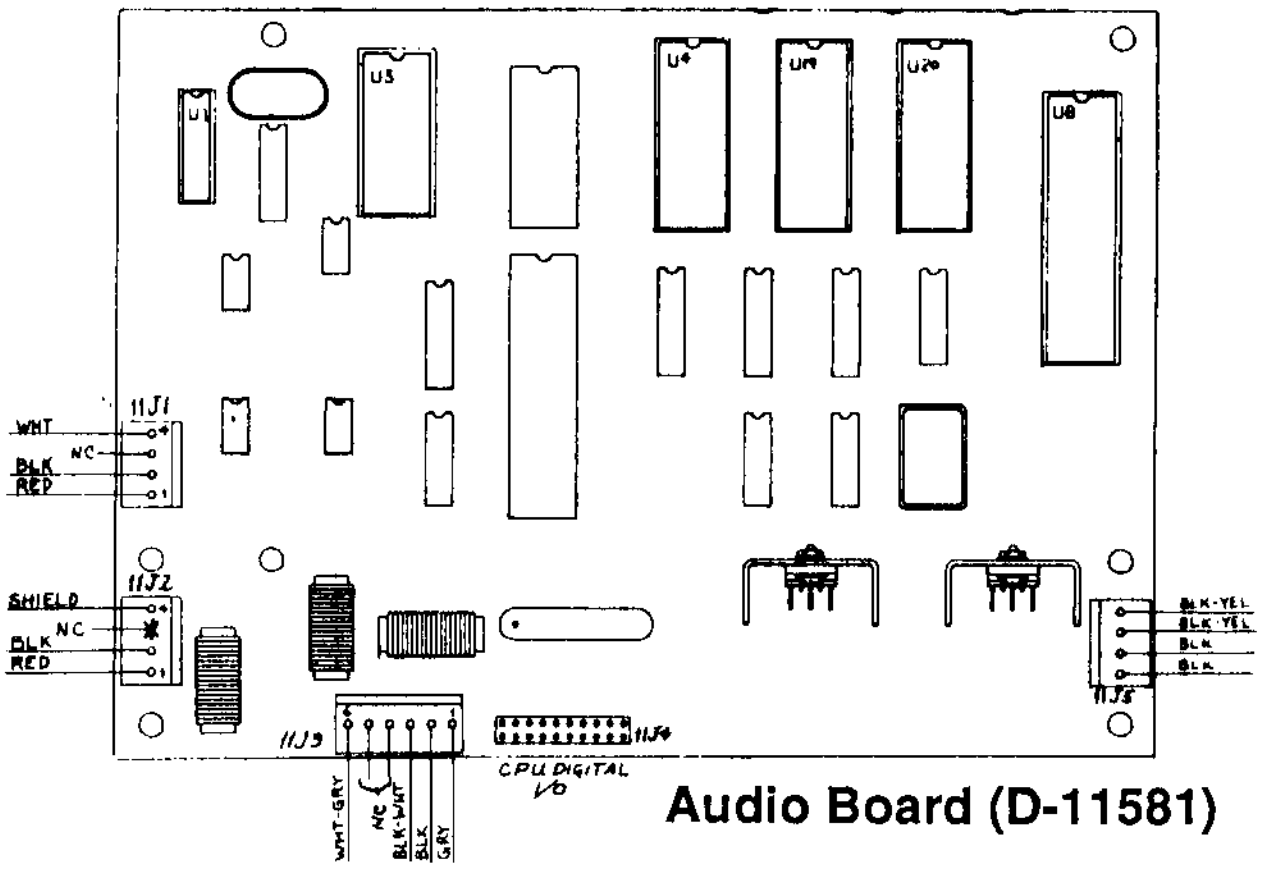






Pin	Wire Color	Connection
1		
2		
3		
4	WHT	Transformer, 88.5V AC
5	---	
6	---	
7	---	
8	---	
9	WHT	Transformer, 88.5V AC
10	GRY-GRN	Transformer, 19.4V AC, 1Ø, C.T.
11	GRY	Transformer, 19.4V AC, 1Ø, C.T.
12	GRY-WHT	Transformer, 19.4V AC, C.T. Com.

Pin	Wire Color	Connection
1	---	
2	---	
3	BLK	Lamp Rectifier (Gnd)
4	---	
5	---	
6	BLK	Lamp Rectifier (Gnd)



Audio Board (D-11581)

Interboards Signals Diagrams

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	NPR	17981 9-9-87
A	SEE COVER SHEET	18223 10-23-87
B	SEE COVER SHEET	18263 11-10-87
C	AT D4 SR8-4 WAS SR8-3. AT B4 SR2-5 WAS SR2-6 AND SR2-6 WAS SR2-5	18978 12-17-87

4 3

D C B A

+V FILTERED

+12 3D4 +V IN 3D3 WIO WII

L2 4.7 ph

ZR1 IN5996 ZR2 3.9V

Q36 Q37 Q34 Q35 Q38 Q39 Q41 2N4401 2N4403

SR8-4 SR8-2 SR8-1 1K

R55 4.7K R59 220 R58 1K R61 220 R69 4.7K R66 1K R67 56Ω R60 10K R57 1K R54 1K R56 10 R53 10K R62 390 R63 390

C28 .001 MFD. C29 100 MFD. C27 .001 MFD. C30 22mf C32 .01 C31 .01

RESET 4B4 2C4

SR19-3 4.7K

2B4, 3C4 DATA BUS

2C4, 3C4 ADDRESS BUS

4 MHZ CR1 W11

SR8-8 1K SR2-3 4.7K SR2-2 4.7K SR2-4 4.7K SR2-5 SR2-6 ALL 4.7K

3C4 1 MHZ DIAGNOSTIC SWITCH SW2 C21 .01

U11 74LS244 U13 74LS244 U15 6808 U16 LS245 SR3 4.7K

XTAL W16 BA N.C. RESET VMA 4C4 VMA

W12 220Ω W13 220Ω

4C3 PIA 6805 PIA 2100 4C5

4B4,2C4 R/W

4C4 2C4 Φ

2B4 BLANKING

2C4 4B4 IRQ'

R70 3.3K W15 W14

U43 555 R79 33K R80 3.3K C58 1mf C59 .01 Q50 2N4403 R81 6.8K C57 .047 U36 7404

U29 4020 U35 LS10 U32 LS08

3A2 SOUND SEL

3C4 SOUND M.2

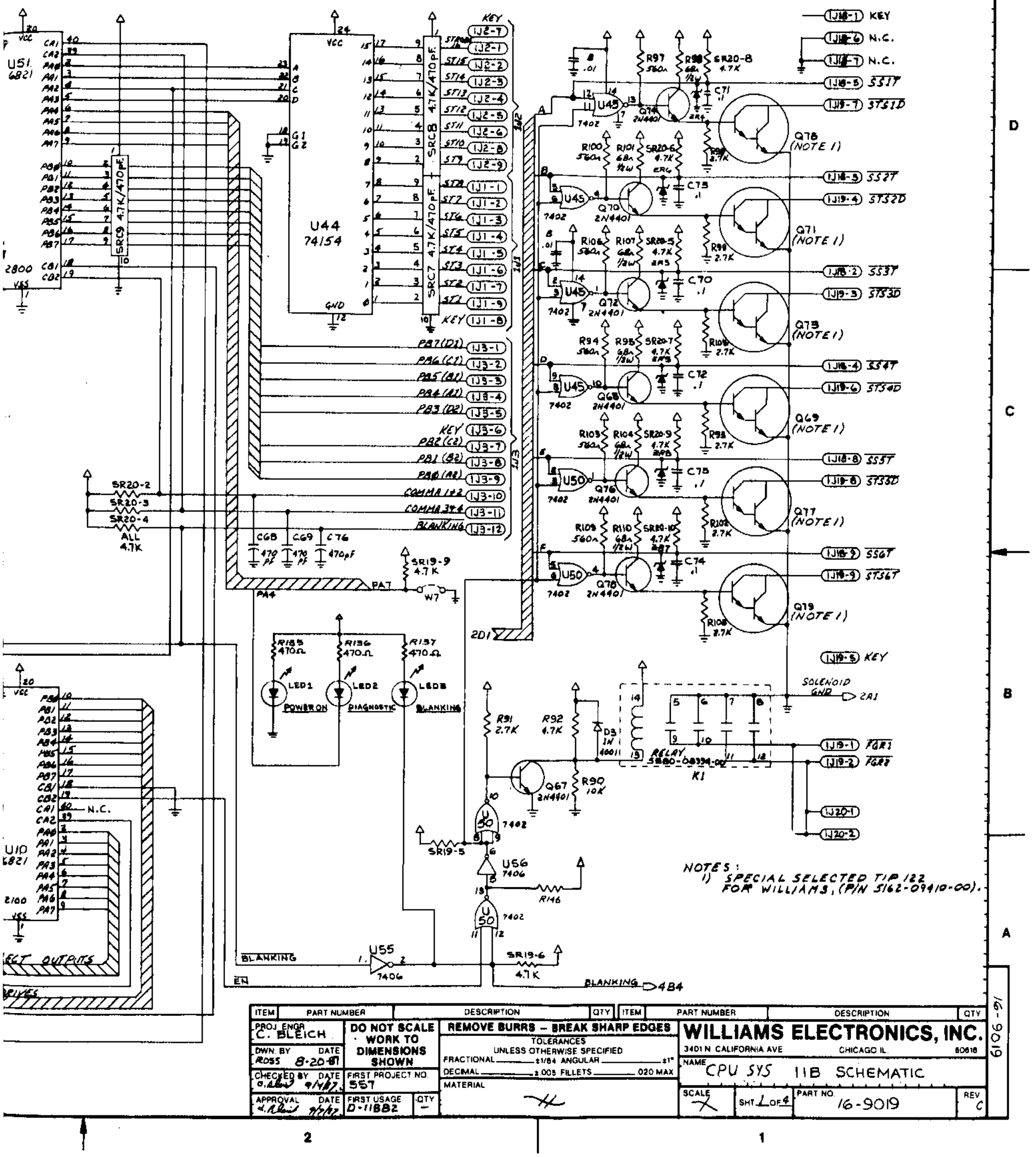
2B4 SOLENOID

1M5 3A4

MANUAL UP/DOWN (J14-4) ADVANCE (J14-5) DIAGNOSTIC SWITCH (J14-1) (J14-2)

SR5 10 4.7K R31 4.7K R32 4.7K R34 470Ω R35 470Ω C19 .01 C18 .01 U14 LS02 U36 7404

MEM PROTECT 4C4 MEM. PROTECT



System 11B CPU Schematic (16-9019, Sheet 1 of 4)

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	NPR	19981 2-9-87
A	SEE COVER SHEET	18323 10-23-87
B	SEE COVER SHEET	18868 11-30-87
	AT A4 C77 WAS C78 AND C78 WAS C77.	18978 12-10-87

SWITCH MATRIX INPUT

SWITCH MATRIX DRIVES

LAMP GND RETURN

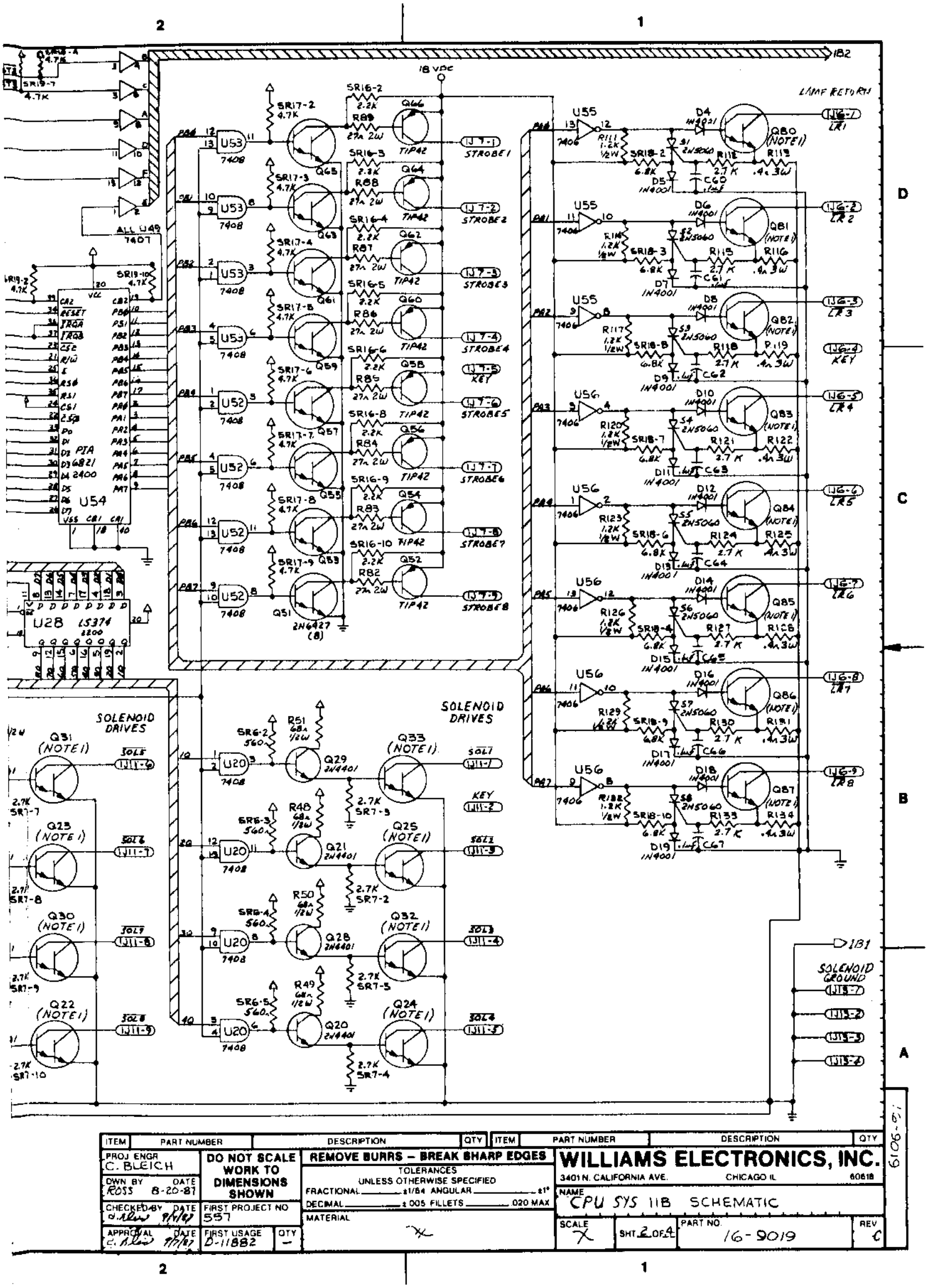
LAMP VOLTAGE

SOLENOID DRIVES

ALL 4011

3C4,4B4,1D3 RESET
4B4,1A4 IRQ'
4B4,1B4 R/W
4B4,1B4 E
3C4,1D4 ADDRESS BUS
3C4,1D4 DATA BUS
1B4 BLANKING
1A3 SOLENOID DRIVES

NOTES:
1) SPECIAL SELECTED TIP 122 FOR WILLIAMS, (P/N 5162-09910-00).



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

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N.P.R.	17481 9-9-87
A	SEE COVER SHEET	18223 4-88
B	SEE COVER SHEET	18287 11-18-87
C	AT C1 SPB-5 WAS SPB-4 DELETE SOUND SECTION @ LOCATION A3	18398 12-19-89

4 3

D

C

B

A

LOGIC POWER

J17-1 N.C.

L1 4.7µh

+5VDC ANALOG

+5VDC

C22 .001µf

C24 100µf

C29 .001µf

D1 1N5817

D2 1N4148

B1 B2 B3

J17-6 J17-8 J17-4 J17-3 J17-2 J17-1

J17-10 +V IN

J17-8

J17-9

C26 100µf

C25 .001 -12V UNREG

ID4 +12

ID4 RESET

RESET

R65 4.7K

R66 10K

2N3904 Q40

C.MOS B+

U25 5K CMOS SRAM

U26 ROM 2

DATA BUS IC4,2B4

ADDRESS BUS IC4,2C4

4A3 CE2 ROM

4A5 CE1 ROM

1C4 4MHz

4C5 CE CMOS

4D3 R/W + MEM. PROT.

4D5 A15

SOUND SELECT INPUTS 1A3

1A3 SOUND H.S.

ID4 RESET

SOUND/ SPEECH MIXER

R26 10K

R27 820Ω

DS1

SR1 ALL 4.7K

R28 820Ω

DS2

R25 2.7K

C16 .047

R24 2.7K

R29 2.7K

R30 27K

C17 .01

-12V

C12 470pF

R19 56K 5%

R21 12K 5%

R20 12K 5%

C14 .01

R22 22K 5%

C15 4700pF

U4 1458

C11 100pF

R16 180K 5%

R17 210K 5%

R18 180K 5%

C10 470pF

C9 .1µF

SPARE U5.6

U3 SSI 263 APT

R11 10K

R14 10K

R13 10K

R12 10K

R10 3.9K

C7 47µF

U2 1408

-12V

R9 3.3M

+5V

R7 3.3K

R8 5.3K

C8 10 MFD.

Q1 2N3904

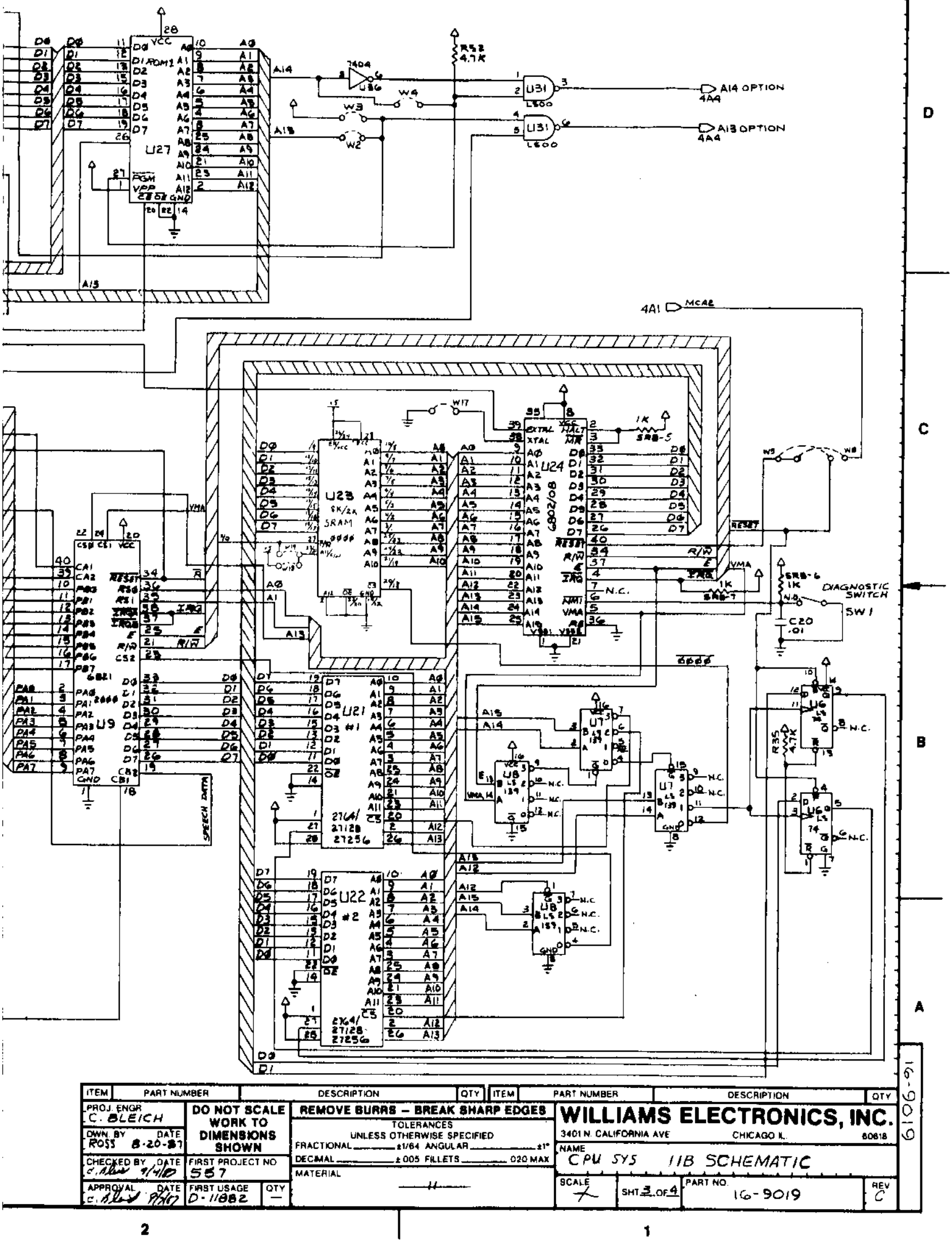
R3 5.6K

N.C.

J16-1 J16-3 J16-4

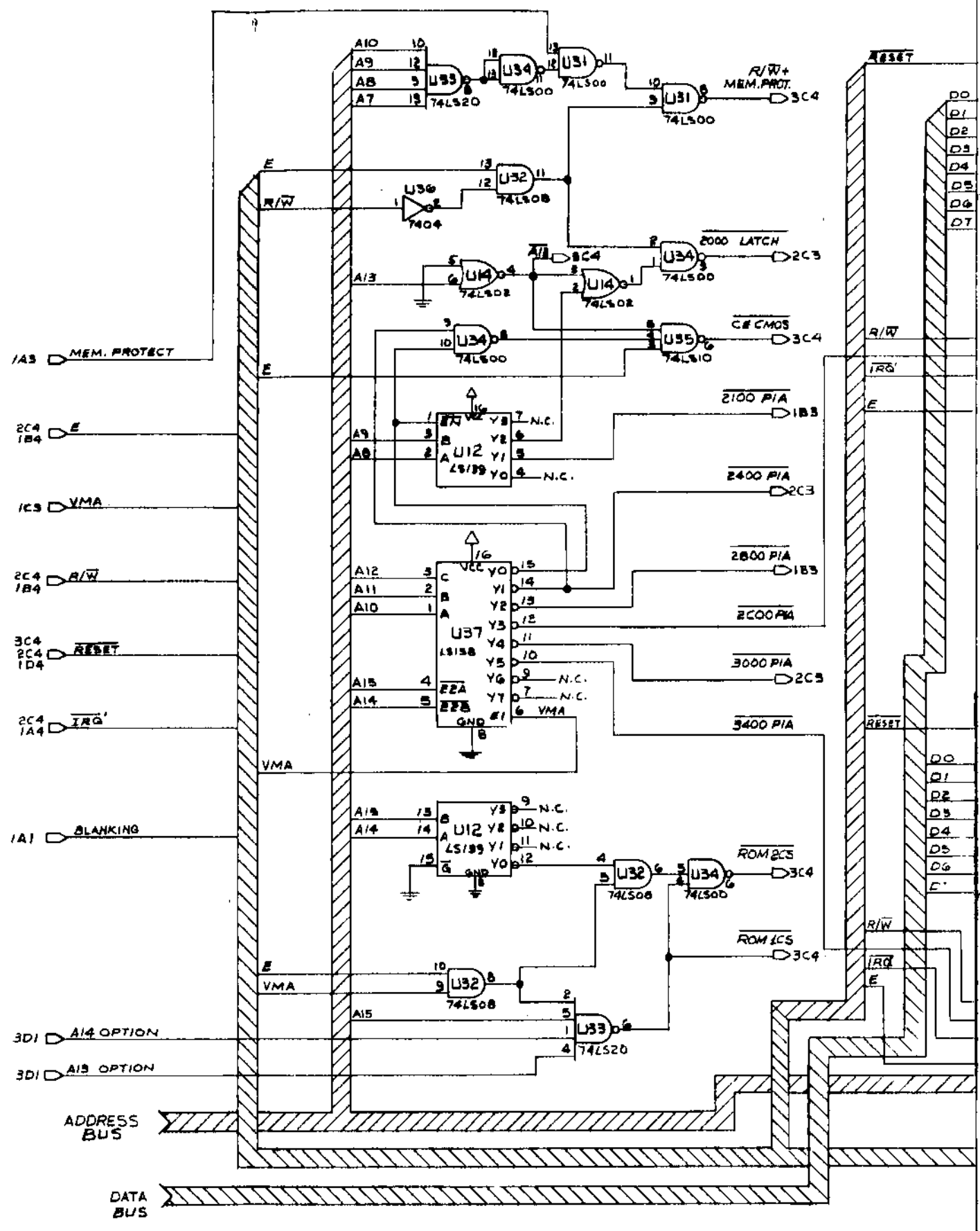
VOLUME CONTROL

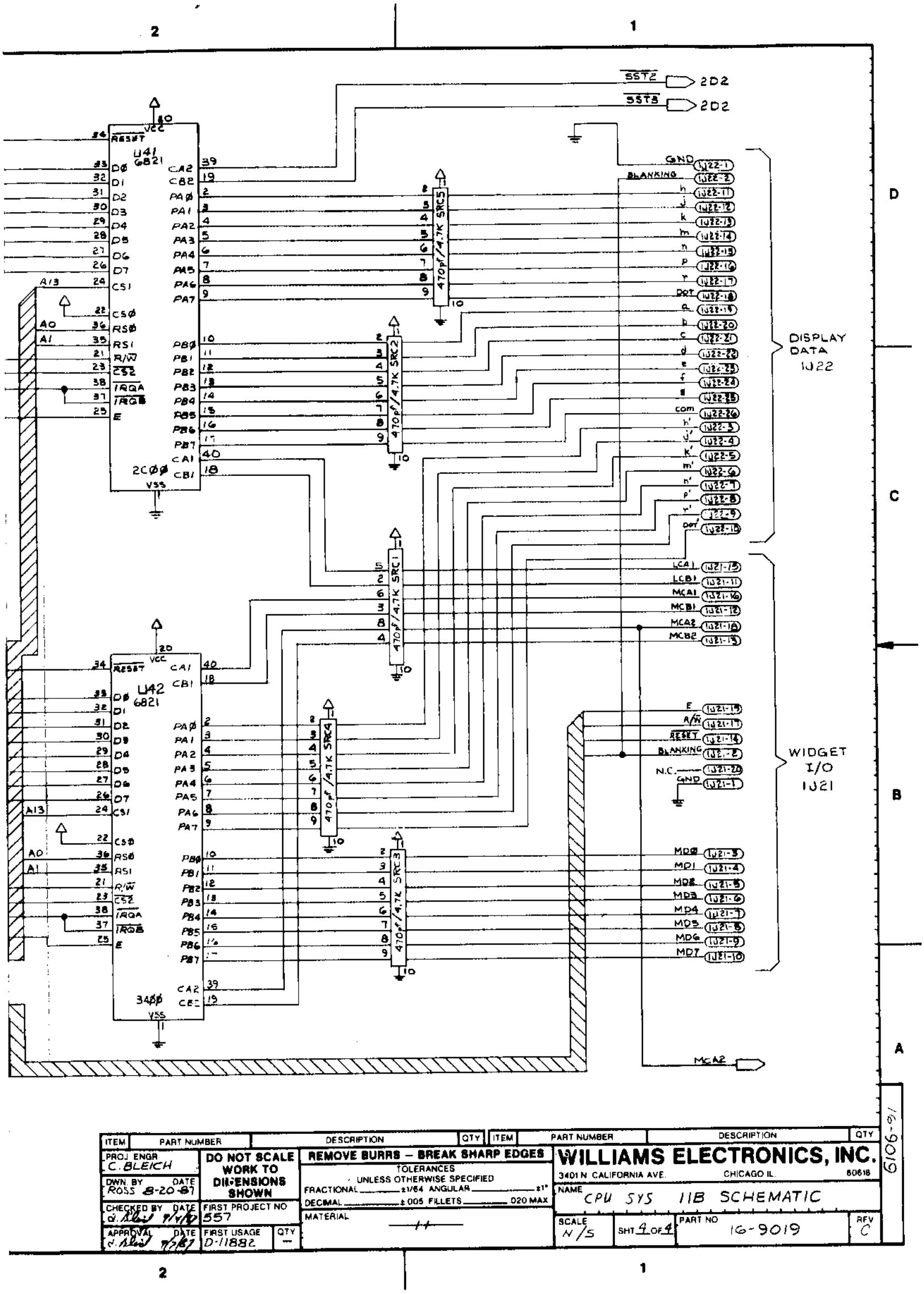
1A3 SMS



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

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N. P. R.	9-9-87
A	SEE COVER SHEET	10-28-87
B	SEE COVER SHEET	
C	SEE SHEET 1-3	



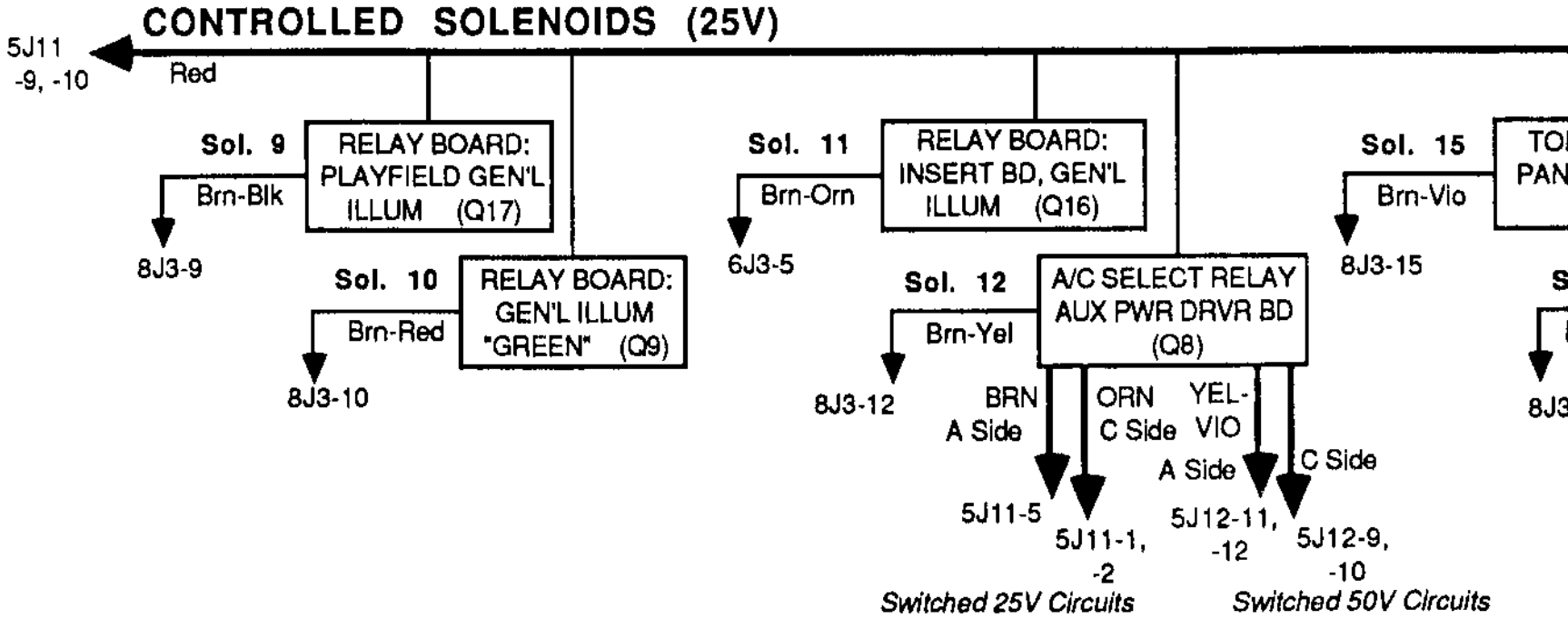


ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY

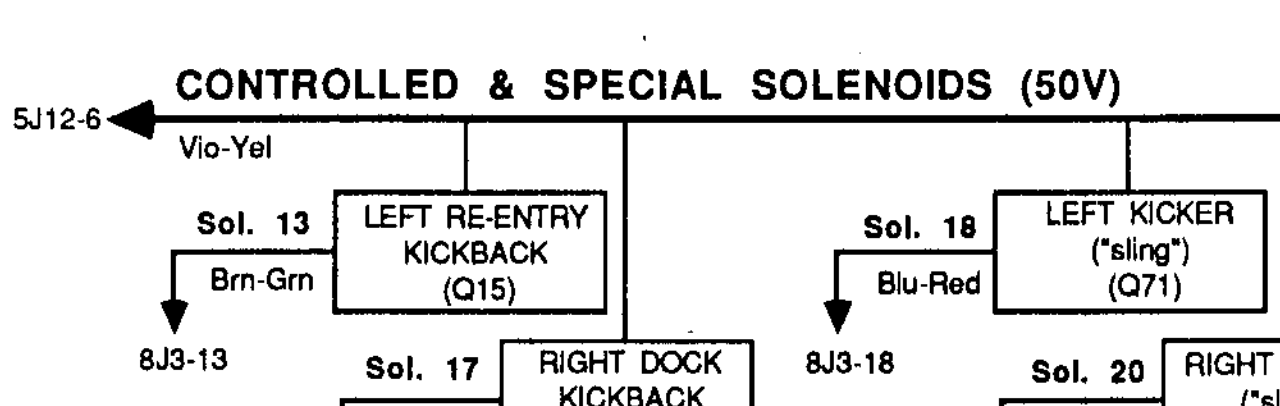
PROJ ENGR C. BLEICH	DO NOT SCALE WORK TO DIMENSIONS SHOWN	REMOVE BURRS – BREAK SHARP EDGES	WILLIAMS ELECTRONICS, INC. 3401 N. CALIFORNIA AVE. CHICAGO IL. 60618	6106-91
DWN. BY ROSS 8-20-87 DATE		TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONAL ±1/64 ANGULAR ±1° DECIMAL ±.005 FILLETS .020 MAX	NAME CPU SYS 11B SCHEMATIC	
CHECKED BY DATE	FIRST PROJECT NO 557	MATERIAL	SCALE N/S SHT 4 OF 4	PART NO 16-9019 REV C
APPROVAL DATE	FIRST USAGE D-11882 QTY —			

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

CONTROLLED SOLENOIDS (25V)



SPECIAL SOLENOIDS (25V)



CONTROLLED & SPECIAL SOLENOIDS (50V)

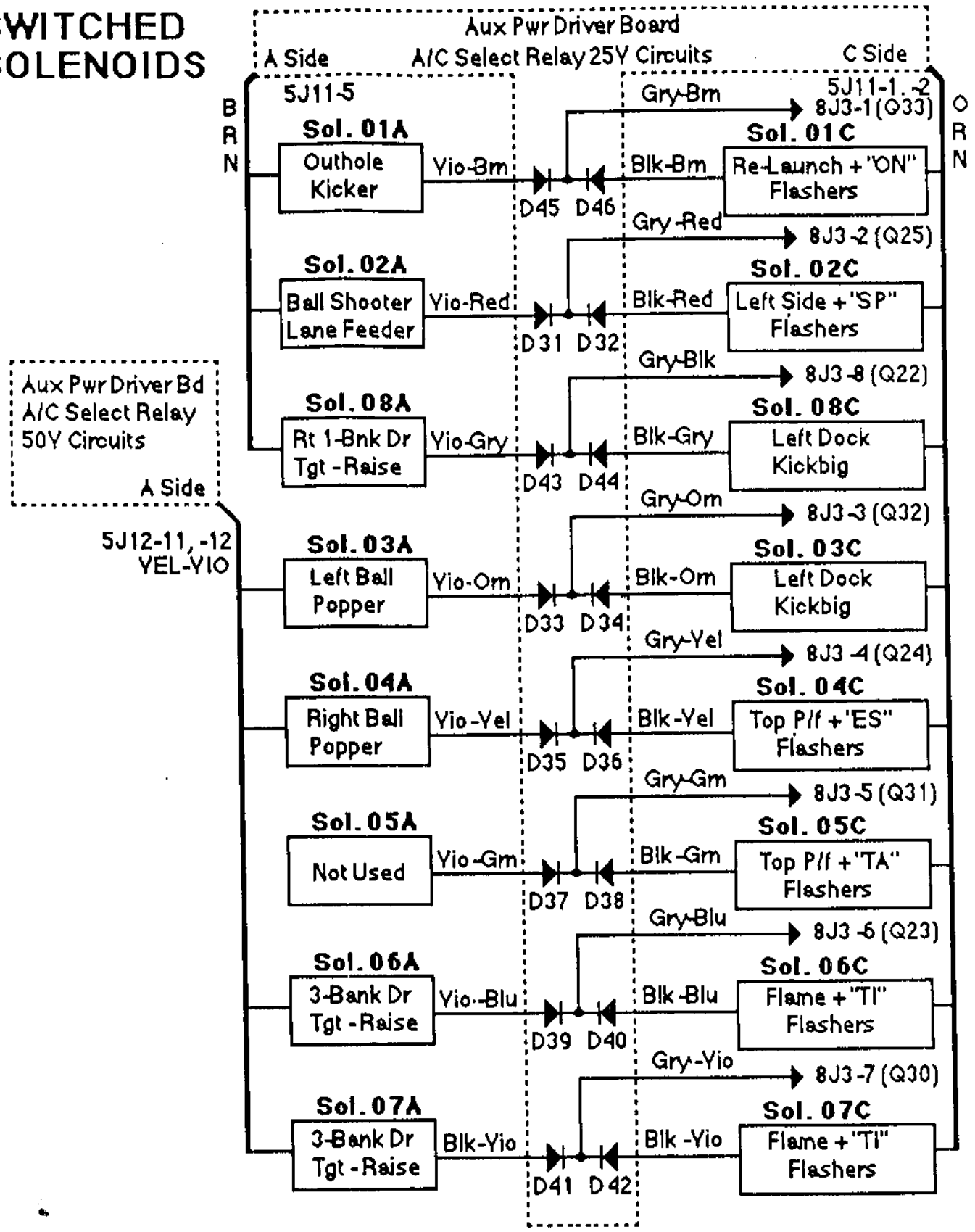
P PLAYFIELD
EL FLASHERS
(Q14)

ol. 16
Brn-Gry

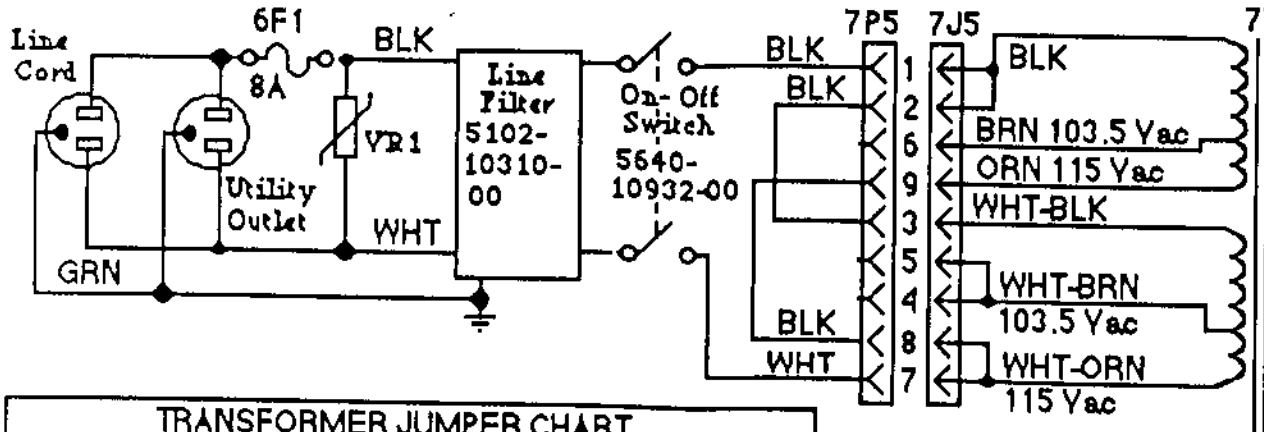
RELAY BOARD:
SP. STATION MOTOR
(Q6)

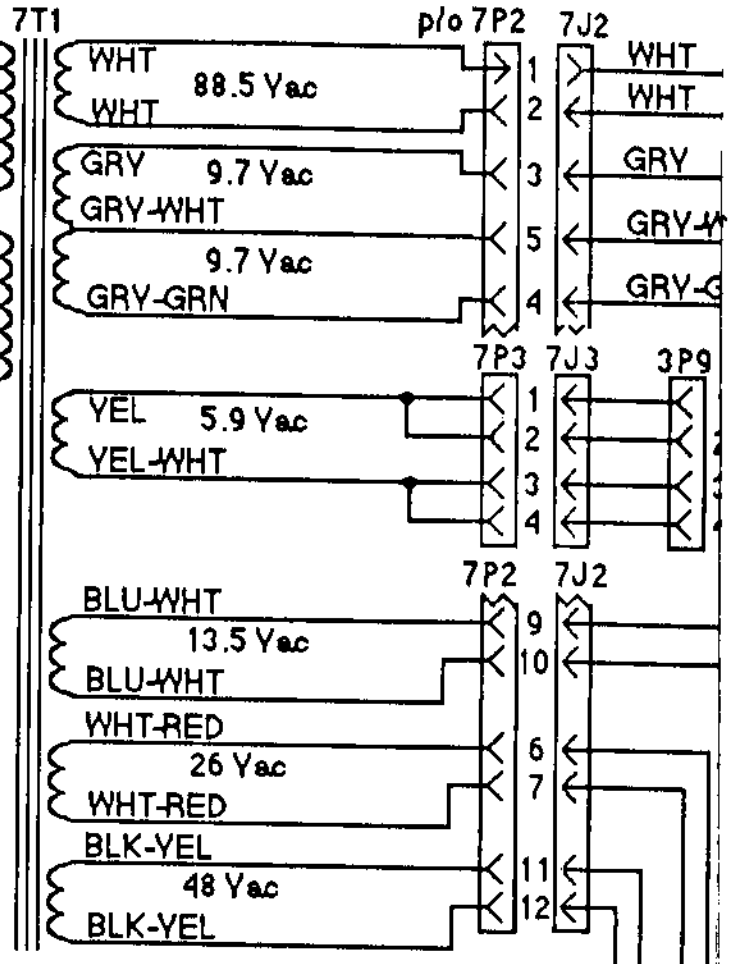
I-16

SWITCHED SOLENOIDS



Controlled, Special, and Switched Solenoids

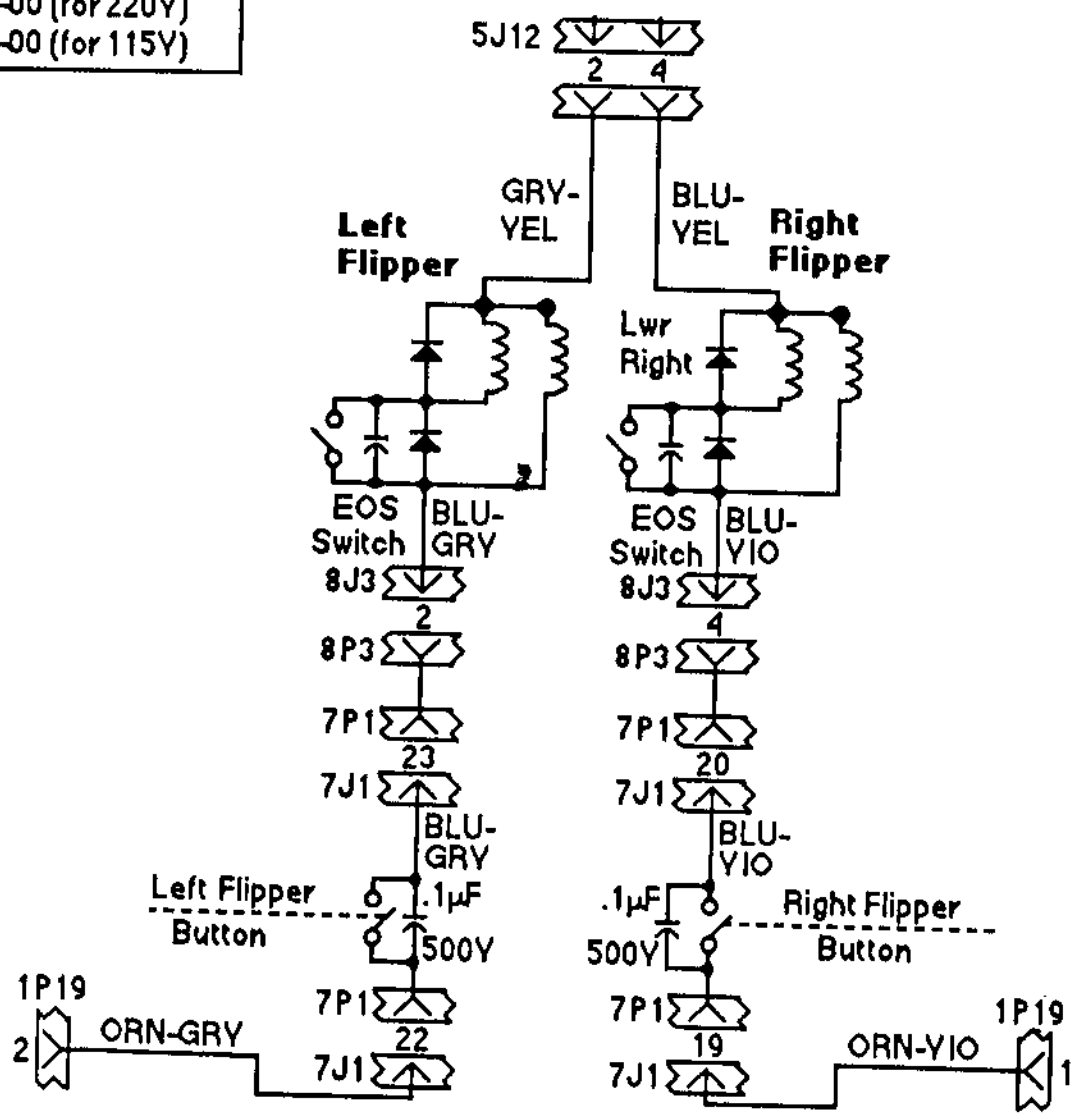


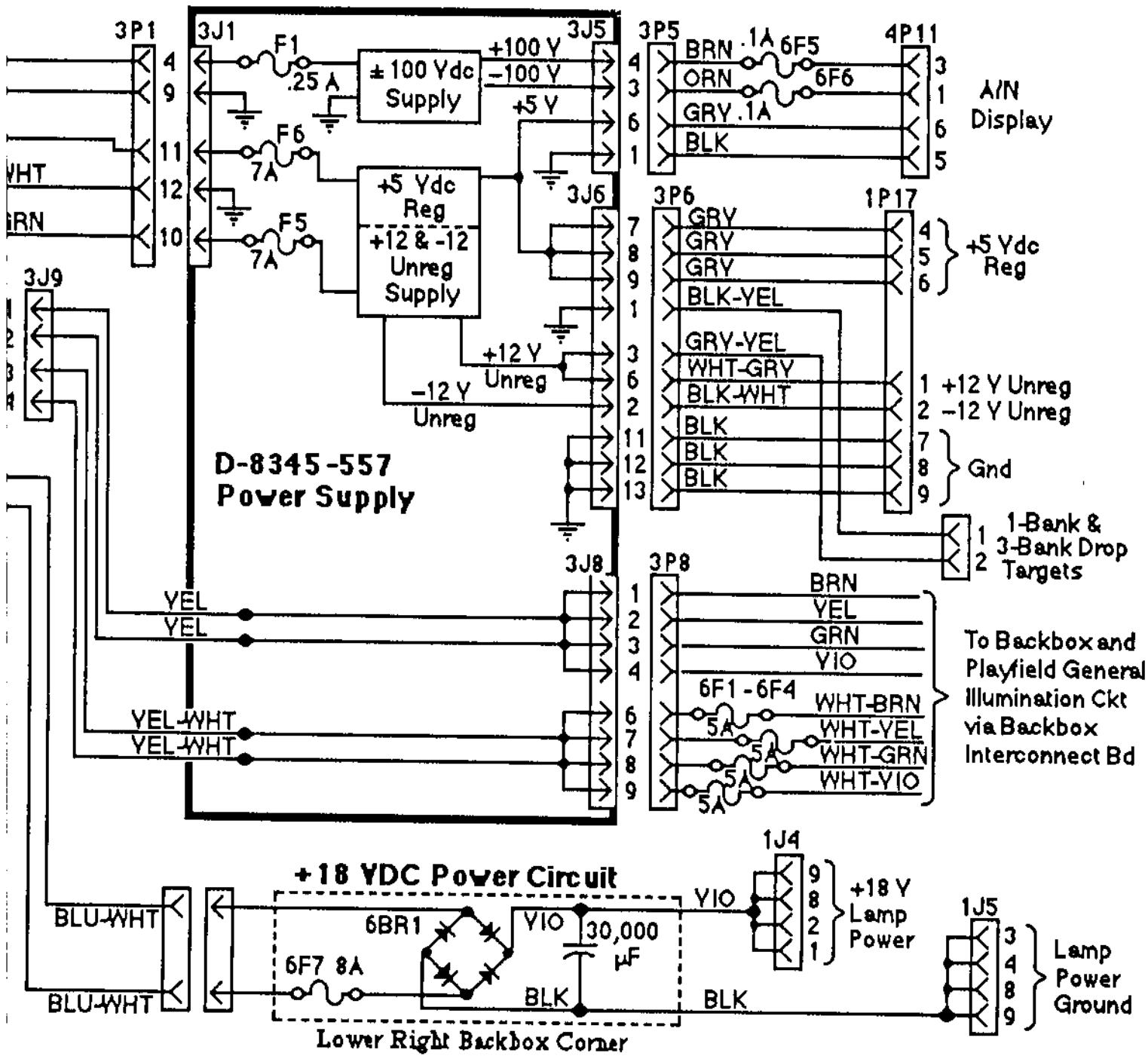


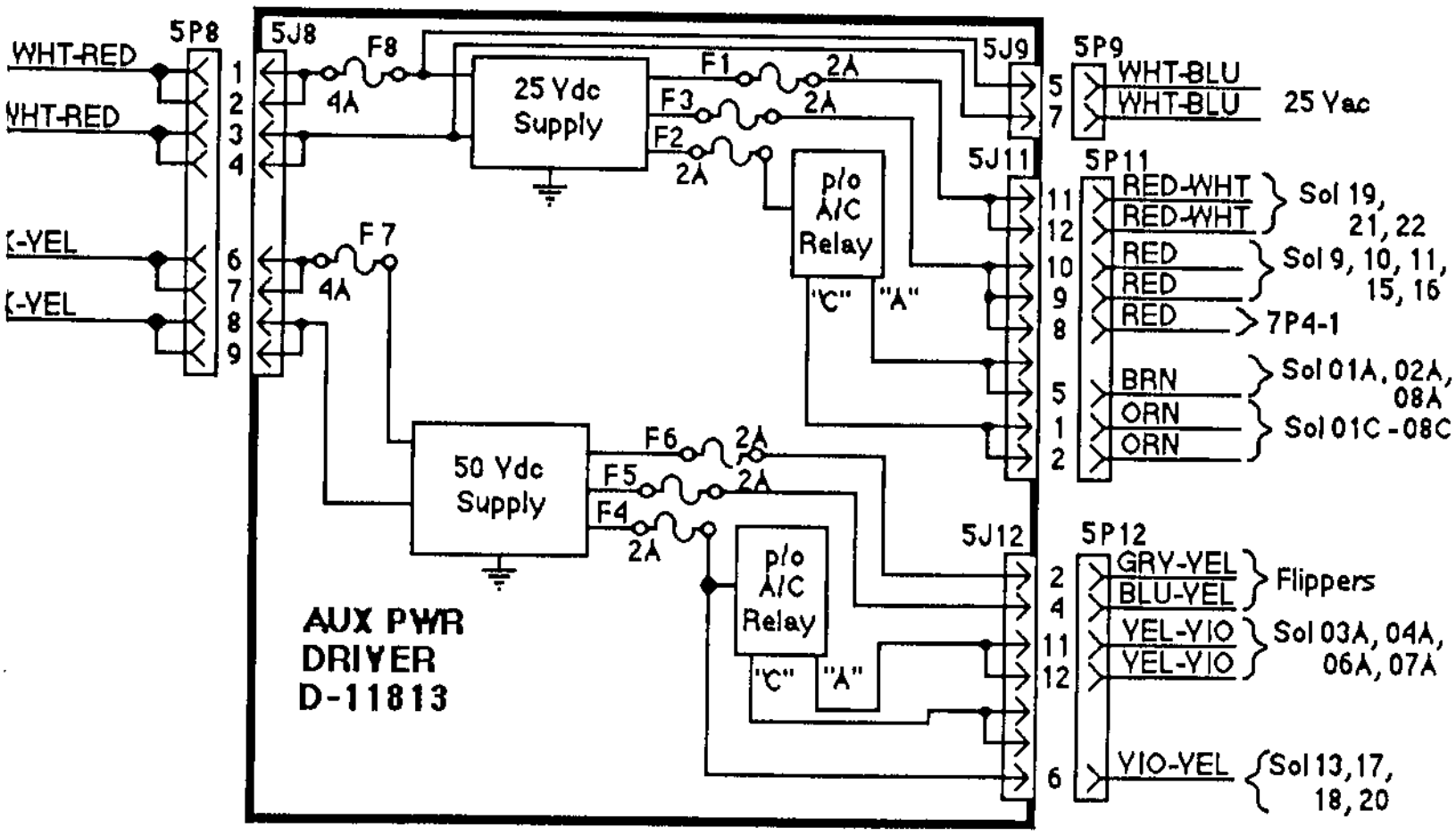
TRANSFORMER JUMPER CHART		
206/218 VAC	230 VAC	103.5 VAC
7P5: BLK–1, 206Y–6, 218Y–9, WHT–5, 2–3–4–8–7	7P5: BLK–1, 6–9, WHT–5, 2–3–4–8–7	7P5: BLK–1, 6–9, WHT–4, 2–3–5–8–7
FUSE: 4A, S-B	4A, S-B	8A, S-B
YARISTOR: 275V	275V	130V

275V Varistor: 5017-09063-00
130V Varistor: 5017-09044-00
4A, S-B Fuse: 5731-06314-00 (for 220V)
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

SPACE STATION Lamp-Matrix Table

[2] Double Lamps

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

SPACE STATION Switch-Matrix Table

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

WARNINGS & NOTICES

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

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WARNING: **Transport this game ONLY with hinged backbox down!**