16-532-103
March 25, 1985

SORCERER

INSTRUCTION MANUAL

Williams®

System-9 ROM Summary

IC	DESCRIPTION	TYPE	NUMBER	BOARD	PART NO.
Game-ROM 1	ROM 8Kx8	2764	U20	CPU	A-5343-10764
Game-ROM 2	ROM 4Kx8	2732	U19	CPU	A-5343-10765
Sound ROM	ROM 16Kx8	25128	U49	CPU	A-5343-10766
Speech ROM	ROM 4Kx8	2532	U6	Speech	A-5343-10806
Speech ROM	ROM 4Kx8	2532	U7	Speech	A-5343-10807
Speech ROM	ROM 4Kx8	2532	U8	Speech	A-5343-10808
Speech ROM	ROM 4Kx8	2532	U9	Speech	A-5343-10809

2732 ROMS may also be used for the speech ROMS.

NOTICE

TO ORDER REPLACEMENT ROMS from your authorized ***WILLIAMS*** distributor, specify (1) part number (if available), (2) ROM-label color, (3) REV level (number) on the label, and (4) which game the ROM is used in.

CONNECTOR CODE

WILLIAMS USES A SPECIAL TECHNIQUE to name plugs and jacks. Each connector receives a number, a letter and a number. A hyphen separates the plug or jack-designation from the pin number.

For example 1J1-3 refers to a connector at board 1, specifies the jack (male or board) side of the connector, identifies the connector as number three on the board, and stipulates pin number three.

☐ 1J1 is board 1, jack 1 (a CPU-Board jack).
☐ 3P6 is board 3, plug 6 (a Power-Supply plug).
☐ J-designations refer to the male part of a connector.
☐ P-designations refer to the female part of a connector.
☐ The prefix numbers for System-9 games are as listed below.

1-CPU Board
2-(not assigned)
3-Power-Supply Board
4-Master-Display Board
5-Slave-Display Board
6-Backbox
7-Cabinet
8-Playfield
9-Insert Board
10-(not assigned)
11-(not assigned)
12-Speech Board
13-(not assigned)
14-(not assigned)
15-Flipper Power-Supply

System-9 Control Locations

THE ON-OFF SWITCH is on the bottom of the cabinet near the right-front leg as you face the game.

THE VOLUME CONTROL is accessible through the coin door on the left cabinet-wall.

DIAGNOSTIC SWITCHES. ADVANCE, AUTO-UP/MANUAL-DOWN, and HIGH-SCORE RESET switches are located on the back of the coin door. Refer to **Game-Adjustment Procedure** and **Diagnostic Procedures** for operation.

THE MEMORY-PROTECT SWITCH must be open to clear bookkeeping totals and to make game adjustments. This switch is on the inside of the coin-door frame. It automatically opens when the coin door opens.

ALL CIRCUITBOARDS are in the backbox.

THE CPU DIAGNOSTIC-SWITCH operates the Memory-Chip Test explained in **Diagnostic Procedures.** This switch is on one edge of the CPU Board near a microprocessor (large, socketed) chip.

THE SOUND DIAGNOSTIC-SWITCH is on the CPU Board near the batteries. This switch is used to initiate the Sound Section Test. Refer to **Diagnostic Procedures.**

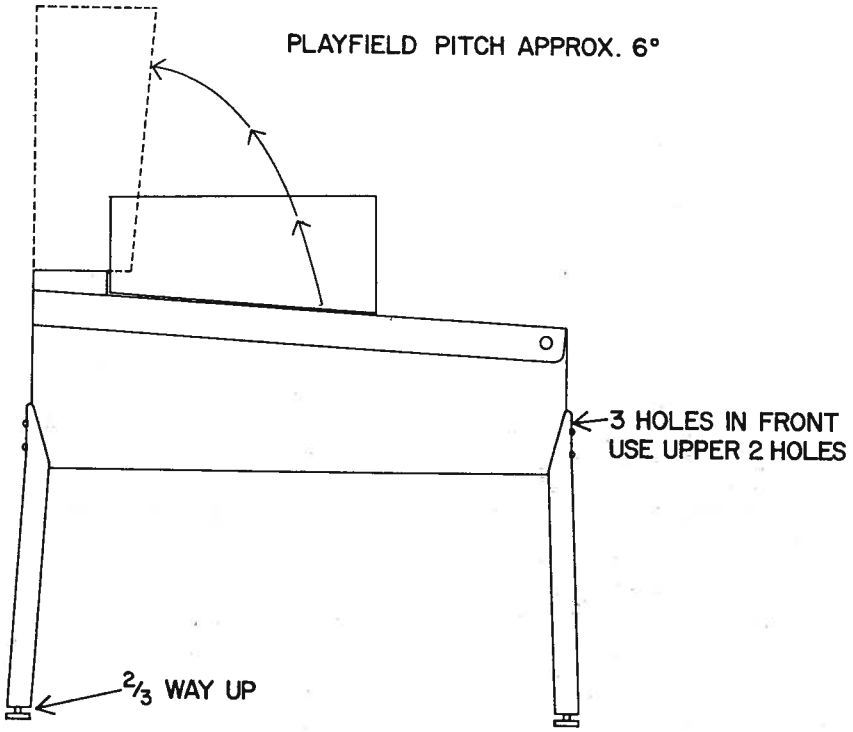


INSTRUCTION MANUAL

including procedures for...

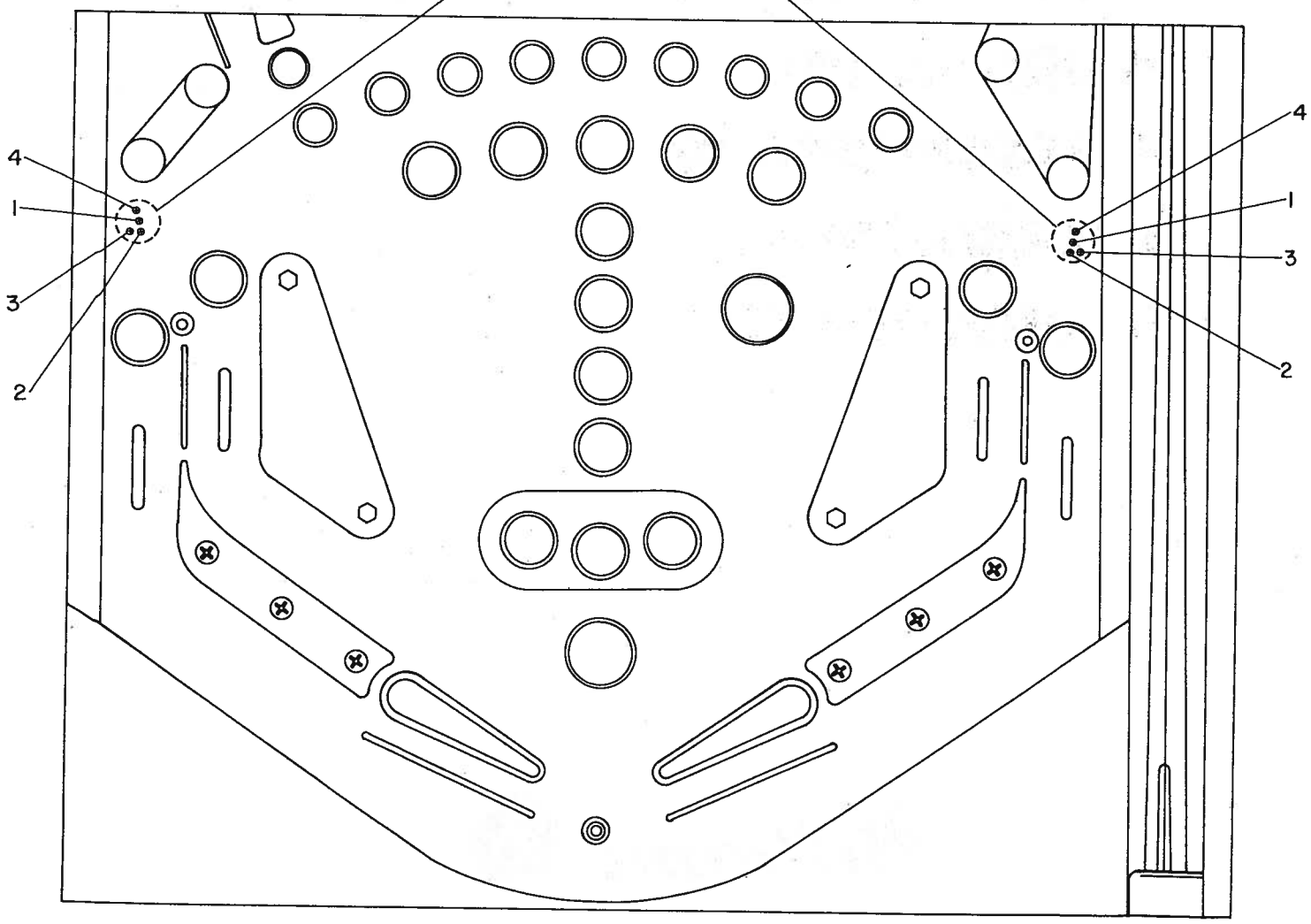
- operation
- bookkeeping
- adjustment
- diagnostics

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ADJUSTABLE POSTS

1 = MODERATE
2 & 3 = LIBERAL
4 = CONSERVATIVE



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Replacing System-9 Circuitboards

CPU BOARD. Your level-9, D-10535 CPU Board must be equipped with the ROMs specified in the **ROM Summary.** Only jumpers W2, W5 through W7, W9 and W11 should be connected. Substitute W1 for W2 when a 6802 microprocessor is used instead of a 6808 microprocessor.

DISPLAY BOARDS. Use the C-8363 Master Display Board with the C-8364 7-digit Slave Display. The C-8365 4-digit Slave Display is also used.

POWER-SUPPLY BOARD. Use the D-8345 board (equipped with a relay).

Game Play

- **SPOTTING A-B-C-D...**advances bonus multiplier (2X, 4X, 6X, 8X), then scores 50,000.
- **SPOTTING S-O-R-C-E-R-E-R...**lights DEMON at 3-bank, spinners, ***EXTRA BALL,*** *and playfield* ***SPECIAL.***
- **COMPLETING 3-BANK DROP TARGET...**lights one flipper return lane and awards flashing value, awards EXTRA BALL (when lit), and spots BONUS HELD OVER (with DEMON lit).
- **MAKING THE RAMP SHOT...**first time locks the ball: Second time: starts ***MULTI-BALL***™ play: Each successive time advances playfield multiplier.

Game Operation

GAME-OVER MODE. Turn the game ON. The PLAYER-1 score shows 00, player scores display the high score and the GAME-OVER lamp lights. All playfield-lamps cycle in **Attract Mode.**

CREDIT POSTING. Insert coins. A sound is produced and the number of credits is displayed. If maximum credits* are exceeded by coin or high score, credits are posted correctly. But the coin-lockout coil de-energizes until the remaining credits are below the maximum. No credits may be won (and coins are rejected) while the coin-lockout coil is de-energized.

GAME START. Push the CREDIT button. A start-up tune is played, a ball is served, and the CREDIT display is reduced by one. PLAYER 1 UP flashes until the first scoring-switch is made, and the BALL-IN-PLAY display shows 1. Additional players may enter the game by pushing the CREDIT button before BALL 2 is displayed.

TILT. With the first closure of the ball-roll or playfield tilts, or the third* closure of the plumb-bob tilt, the player loses the rest of his turn. The slam tilt on the coin door returns the game to the **Game-Over Mode.**

END OF GAME. Match digits* appear in the BALL-IN-PLAY display. Credit* is awarded for a match. Match, high score and game-over sounds are made as appropriate. One replay is awarded for each score you beat in the displays.*

Game Setup

WARNING

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, and DO NOT cut off the ground pin.

ENTERING GAME-OVER MODE. With the coin door closed, plug the game in and turn it ON. The game should come on in **Game-Over Mode.**

1. If the game comes on in the **Bookkeeping Mode** (CREDITS display showing 04, BALL-IN-PLAY display showing 00, and PLAYER-1 display showing the game-identification number) turn the game OFF and ON again.

   A. If the game now comes on in **Game-Over Mode,** bookkeeping totals have been reset to zero.

   B. If the game still comes on in **Bookkeeping Mode,** open the coin door and turn the game OFF and ON twice. (A game without battery power will revert to factory settings.) *Any changes from factory settings must be reentered.*

2. If the game *always* comes on in **Bookkeeping Mode,** troubleshoot the game. With the game OFF, check for a *minimum* of 3.5VDC at pin 24 of the CMOS RAM, chip U18 on your CPU Board.

   A. **Less than 3.5VDC.** Replace the three AA alkaline cells.

   B. **No voltage.** Matching polarity, replace diode D3 *(type 1N4148)* on your CPU Board. Now recheck the voltage at pin 24 of chip U18.

Bookkeeping Mode

FUNCTIONS 01-17, 42-48

1. Set the AUTO-UP/MANUAL-DOWN switch to AUTO-UP and press ADVANCE. Test 04 is indicated in the CREDITS display, Function 00 in the MATCH display, and the game-identification number in the PLAYER-1 display.

* indicates adjustable feature.

2. Press ADVANCE to display desired functions in the MATCH display (Refer to the ***Bookkeeping Table***). Now record the corresponding totals (number of coins and total paid-credits) from the PLAYER-1 display. (To review a total that has been advanced past, use MANUAL-DOWN and press ADVANCE).

3. Use MANUAL-DOWN and press ADVANCE to display Function 50 in the MATCH display.

4. Returning to **Game-Over Mode:**

   A. Use AUTO-UP and press ADVANCE.

   B. OR: To zero bookkeeping totals *and* return to **Game-Over Mode,** (1) use AUTO-UP, (2) press the credit button to display 35 in the PLAYER-1 display, and (3) press ADVANCE.

Bookkeeping Table

FUNCTION	PLAYER-1 DISPLAY	PLAYER-2 DISPLAY
00	Game Identification (2535 1)	—
01	Coins, Left Chute (closest to coin-door hinge)	—
02	Coins, Center Chute	—
03	Coins, Right Chute	—
04	Total Paid-Credits	—
05	Special Credits	—
06	Replay-Score Credits	—
07	Match Credits	—
08	Total Credits	5+6+7+13
09	Total Extra Balls	—
10	Ball Time in Minutes	—
11	Total Balls Played	—
12	High Scores	(see below)
13	Backup High-Scores	0; 1, 2, 3, 4
14	Replay-Level 1	Times Exceeded
15	Replay-Level 2	Times Exceeded
16	Replay-Level 3	Times Exceeded
17	Replay-Level 4	Times Exceeded
42	Times ***MULTI-BALL*** play was achieved	—
43	Number of 3X's in ***MULTI-BALL*** play	—
44	Number of 5X's in ***MULTI-BALL*** play	—
45	Number of Ramps over 5X	—
46	Number of Bonus Holdovers	—
47	Number of Playfield Specials (from spotting S-O-R-C-E-R-E-R)	—
48	Times A-B-C-D was completed	—

Game-Adjustment Procedure

FUNCTIONS 13-41

Coin door must be open to change settings

1. Use AUTO-UP and press ADVANCE. Test 04 is indicated in the CREDITS display, function 00 in the MATCH display, and the game-identification number in the PLAYER-1 display.

2. To raise the function number in the MATCH display, use AUTO-UP and push ADVANCE. To lower the function number, use MANUAL-DOWN and push ADVANCE.

3. With the desired function indicated in the MATCH display, raise the value in the PLAYER-1 display by using AUTO-UP and pressing the credit button. Repeat this step until all adjustments have been made.

4. Hold down ADVANCE until Function 50 is indicated in the MATCH display. From Function 50 you can return to ***Game-Over Mode*** or restore factory settings. Perform either of the following as desired.

5. To return to **Game-Over Mode** use AUTO-UP and press ADVANCE.

6. To restore factory settings and zero bookkeeping totals:

   A. Using AUTO-UP press the CREDIT button until 45 is indicated in the PLAYER-1 display.

   B. Press ADVANCE. The game returns to Test 04, function 00.

   C. Use MANUAL-DOWN and press ADVANCE to indicate function 50.

   D. Return to ***Game-Over Mode*** by using AUTO-UP and pressing ADVANCE.

   E. Press, and hold, HIGH-SCORE RESET to replace all four high scores with factory settings.

High Scores

Function 12 determines whether the game remembers the high scores.

NO HIGH-SCORE FEATURE...

1. Enter function 12.
2. Press the CREDIT button until the PLAYER-1 display is blank.
3. Use AUTO-UP and ADVANCE to enter ***Game-Over Mode.***

USING THE HIGH-SCORE FEATURE...

1. Enter function 12.
2. Hold down the CREDIT button until scores appear in *all four* score displays.
3. Use AUTO-UP and ADVANCE to enter function 13. One of function 13's five sub-functions will show in the PLAYER-2 display. Sub-function 0 shows the number of credits won from the high-score feature (in the PLAYER-1 display). Sub-functions 1 through 4 show (and allow you to adjust) the four backup high scores. These are the values that are restored when you press *and hold* the HIGH-SCORE RESET button.
4. Use AUTO-UP and the CREDIT button to change any of these values. At Game-Over Mode, one credit will be awarded for each of the top four scores that's beaten. The maximum number of credits awarded for a high score is determined by function 40.
5. To use the high-score feature *without awarding any credits,* set function 40 to 0.

USING ONLY ONE HIGH SCORE...

1. Enter function 12.
2. Press the CREDIT button until a score appears in the PLAYER-1 display. The other displays should be blank.
3. Use AUTO-UP and ADVANCE to enter function 13. In the PLAYER-2 display function 13 shows the number of credits won from the high-score feature. The PLAYER-1 display shows (and allows you to adjust) the backup high-score. *(This value is restored when you press* and hold *HIGH-SCORE RESET.)*
4. Use AUTO-UP and the CREDIT button to change the backup high-scores. At Game-Over Mode, the number of credits indicated by function 40 will be awarded if someone beats the high score.
5. To use the high-score feature *without awarding credits,* ***set function 40 to 0.***

Game-Adjustment Table

FUNCTION	DESCRIPTION	FACTORY SETTING[1]
12	High Scores	(see above)
13	Backup High Score(s)	2,500,000
	(High score credits awarded—function 40)	
14	First Replay-Level	1,000,000
15	Second Replay-Level or Second-Highest Score	00
16	Third Replay-Level or Third-Highest Score	00
17	Fourth Replay-Level or Fourth-Highest Score	00
18	Maximum Credits	30
19	Standard and Custom Pricing-Control	01/02
20	Left Coin-Slot Multiplier	01
21	Center Coin-Slot Multiplier	04/10
22	Right Coin-Slot Multiplier	01/03
23	Coin Units Required For Credit	01
24	Units Required For Bonus Credit	00
25	Minimum Coin-Units	00
26	Match 00: Standard Match (awards 10% replays) 01: Match off	00
27	Special 00: Awards credit 01: Awards extra ball 02: Awards points	00
28	Replay 00: Awards credit 01: Awards extra ball 02: No award	00
29	Maximum Plumb-Bob Tilts (including warnings)	03
30	Number of Balls	03

Game-Adjustment Table, continued

31	Game-Adjustment #1 - Extra Ball Lamp in Memory 00: No-Conservative 01: Yes-Liberal	00
32	Game-Adjustment #2 - Reset Interval for Drop Targets 00-09 00: Fast 09: Slow	05
33	Game-Adjustment #3 - Bell 00: Off 01: On	01
34	Game-Adjustment #4 - Blink Interval for Drop Target Lights 00-09 00: Fast 09: Slow	05
35	Game-Adjustment #5 - Background Sound 00: Off 01: On	01
36	Game-Adjustment #7 - Sound for Attract Mode 00: Off 01: On	01
37	Game-Adjustment #8 - Bonus Holdover in Memory 00: Off 01: On	00
38	Game-Adjustment #9 - S-O-R-C-E-R-E-R Target Memory 00: Off-Conservative 01: On-Liberal	00
40	Maximum high-score credits 00: Displays high scores without credit payouts	03
41	Maximum Extra-Balls at any time	04
42-48	Foreground Bookkeeping-Totals (See ***Bookkeeping Table)***	
49	Not Used	
50	Special Function 15: **Auto-Cycle Mode** 35: Zero bookkeeping totals 45: Restore factory settings & zero bookkeeping totals	

NOTES

1. The second factory-setting value is with jumper W5 on the CPU Board removed.

2. Functions 14 through 17 (replay levels) may be set to any multiple of 100,000 points. Setting function 40 to zero with function 13 set to *any score but zero* permits the high-score feature to operate but no credits are awarded.

3. Setting functions 14 through 17 (replay levels) to zero disables the replay-score point.

4. High scores are displayed or suppressed by adjusting function 12: Use AUTO-UP and press ADVANCE repeatedly until the number of high scores you wish to show (0, 1, 2, or all 4) appears on the displays. Now return to **Game-Over Mode.**

Pricing Table

•Indicates standard settings by adjusting ONLY function 19

Coin-Door Mechanism	Games/Price	Function						
		19	20	21	22	23	24	25
Twin Quarter	**•1/25¢, 4/$1**	**1**	**1**	**4**	**1**	**1**	**0**	**0**
or	**•1/50¢**	**3**	**1**	**4**	**1**	**2**	**0**	**0**
Quarter,	**•1/50¢, 2/75, 3/4x25¢**	**0**	**3**	**15**	**3**	**4**	**15**	**0**
Dollar,	2/25¢, 8/$1	0	2	8	2	1	0	0
Quarter	1/25¢, 3/50, 6/$1	0	1	4	1	1	2	0
(USA and Canada)	1/25¢, 5/$1	0	1	4	1	1	4	0
	1/50¢, 3/$1	0	1	4	1	2	4	0
1DM, 5DM, 2DM	**•1/1DM, 2/2DM, 6/5DM**	**2**	**6**	**12**	**30**	**5**	**0**	**0**
(West Germany)	1/2x1DM, 1/2DM, 3/5DM	0	3	15	6	5	0	0
	2/1DM, 5/2DM, 14/5DM	0	13	65	26	5	65	0
1F, 5F, 10F (France)	**•1/3x1F, 2/5F, 5/10F**	**4**	**2**	**10**	**20**	**5**	**20**	**0**
25-Cent	**•1/25¢, 4/1G**	**0**	**1**	**0**	**4**	**1**	**0**	**0**
1-Guilder (Netherlands)	1/25¢, 5/1G	0	1	0	5	1	0	0
5-Franc,	1/5F, 2/10F	0	1	0	2	1	0	0
10-Franc (Belgium)	**•1/10F**	**8**	**1**	**0**	**2**	**2**	**0**	**0**
1F, 2F (Switzerland)	**•1/1F, 3/2F**	**7**	**3**	**0**	**6**	**2**	**0**	**0**
Twin 100-Yen (Japan)	**•2/100Y**	**3**	**1**	**4**	**1**	**2**	**0**	**0**
Twin 100L (Italy)	**•1/200 Lire**	**3**	**1**	**4**	**1**	**2**	**0**	**0**
20¢, $1 (Australia)	**•1/40¢, 3/$1**	**5**	**1**	**0**	**6**	**2**	**0**	**0**
10P, 50P (UK)	**•1/10P, 5/50P**	**6**	**1**	**5**	**1**	**1**	**0**	**0**
Any	Free Play	set function 18 to 0 for free play						

Game Pricing

PRICING MADE EASY. Function 19 allows a *shorthand* method of setting the pricing functions. If a number from one to eight is entered into function 19, a corresponding standard setting (shown in the pricing table above) will be entered into the game. *The rest of the pricing functions are automatically set for that standard.*

FOR CUSTOM SETTINGS first set function 19 to zero. Then set the remaining values according to the pricing table.

THE GAMES : PRICE RATIO is equivalent to the ratio *X : VC*, where:

X = COIN-SLOT MULTIPLIER (the number at function 20, 21 or 22)
V = COIN VALUE
C = COIN UNITS REQUIRED FOR CREDIT (the number at function 23)

For example (assuming quarter chutes) at factory settings the variables produce 1 : 25x1 or one game for 25¢.

UNITS REQUIRED FOR BONUS CREDIT *(function 24)* is the number of games that must be purchased before a free game is awarded. The factory settings for this function is 0, *which means the function is disabled.*

MINIMUM COIN-UNITS *(function 25)* determines the number of games that must be purchased before play may begin. The factory setting for this function is 0. *This 0 means that the MINIMUM COIN-UNITS feature is disabled.*

Diagnostic Procedures

DISPLAY TEST

1. Use MANUAL-DOWN and press ADVANCE. Displays should indicate all 0's.

2. Use AUTO-UP. Displays should sequence from all 0's through all 9's. Comma segments should come on when the odd digits are displayed.

3. To stop cycling use MANUAL-DOWN. Press ADVANCE to step through the tests one number at a time. Use AUTO-UP to resume cycling.

SOUND TEST

1. *(From Display Test)* Use AUTO-UP and press ADVANCE. Test 00 should be indicated in the CREDITS display and the MATCH display should sequence from 00 through 06. A different sound should be produced for each number.

2. To continuously pulse a single sound use MANUAL-DOWN. Press ADVANCE to step through sounds one at a time. Use AUTO-UP to resume sequencing.

3. Listen for the following words. Missing or damaged words indicate the failure of a particular ROM as shown below. For part-ordering information, see the **ROM Summary** at the beginning of this manual.

WORDS	ROM NO.	TYPE	BOARD
Feel	U4	2532	Speech
My	U4	2532	Speech
Power	U4	2532	Speech
SORCERER	U5	2532	Speech
You	U5	2532	Speech
Are	U6	2532	Speech
Well	U6	2532	Speech
Done	U6	2532	Speech
Mortal	U49	27128	CPU
I am	U49	27128	CPU
Master	U49	27128	CPU

LAMP TEST

1. Refer to your system's ***Lamp-Matrix Table*** for lamp numbers and wiring. CPU-Board connections at jacks 1J6 (rows) and 1J7 (columns) are also shown there.

2. *(From Sound Test)* Use AUTO-UP and press ADVANCE. Test 01 should be indicated in the CREDITS display and all feature-lamps should flash.

SOLENOID TEST

1. Refer to your ***Solenoid Table*** for solenoid numbers and wiring. CPU-Board connections at jacks 1J11 and 1J12 are also shown there.

2. *(From Lamp Test)* Use AUTO-UP and press ADVANCE. Test 02 should be indicated in the CREDITS display. The MATCH display sequences from 01 through 25. Corresponding solenoids are pulsed. The flipper relay is de-energized with sub-test 25.

3. Special solenoids (jet bumpers, kickers, etc.) *are not pulsed during the Solenoid Test.* Instead, you must check these solenoids manually. Press on their trigger switches or pull their switch-trigger lines low.

4. To continuously pulse a single solenoid use MANUAL-DOWN. Press ADVANCE to step through controlled solenoids one at a time. Use AUTO-UP to resume sequencing.

SWITCH TEST

1. Refer to the ***Switch-Matrix Table*** for switch numbers and wiring. CPU-Board connections at jacks 1J8 (columns) and 1J10 (rows) are also shown there.

2. *(From Solenoid Test)* Use AUTO-UP and press ADVANCE. Test 03 should be indicated in the CREDITS display with the switch numbers sequencing in the BALL-IN-PLAY display.

   As a switch number is displayed a sound is produced. *As a switch is opened, its number is removed from the sequence.* When all switches are open, the BALL-IN-PLAY display is blank and the sounds stop.

3. **HOLD DOWN EACH SWITCH** so its number is shown at least twice. A sound is produced and a switch number is momentarily indicated in the BALL-IN-PLAY display.

   ROW PROBLEMS. If two switches in a row are indicated with only one switch closed, check for a short between the column wires.

   FOR MULTIPLE INDICATIONS check the column wire for a short to ground.

   COLUMN PROBLEMS. If two switches in a column are indicated with only one switch closed, check for a short between row wires.

4. **PLAYFIELD OR CPU BOARD?** To determine whether the problem is in the playfield or the CPU Board, remove connectors 1P8 and 1P10 from the CPU Board. Now enter the Switch Test. Use a jumper wire to simulate switch operation.

   For example, on the Switch-Matrix Table notice that placing a jumper between 1J10-pin 9 and 1J8-pin 2 should produce an indication of switch 09 being closed.

AUTO-CYCLE MODE

1. The ***Auto-Cycle Mode*** permits you to check intermittent problems in the playfield, backbox, cabinet and CPU Board.

2. Set function 50 of Test 04 (***Bookkeeping Mode***) to 15.

3. Press ADVANCE to start the **Auto-Cycle Mode**. This mode repeatedly sequences through the Display Test, Sound Test (00), Lamp Test (01), and Solenoid Test (02).

4. This sequence is repeated until the game is turned off and on.

SYSTEM-9 MEMORY-CHIP TEST

Press the DIAGNOSTIC button on the CPU Board. The CPU Board's seven-segment display provides the following indications.

INDICATION	PROBABLE CAUSE
0	test passed (game returns to **Game-Over Mode**)
1	CPU-Board lockup; also check memory-protect circuit and U18 CMOS RAM for stuck bits
2	U20 Game ROM 1 faulty
3	U20 Game ROM 1 faulty
4	U19 Game ROM 2 faulty
5	Blanking-signal stuck, coin door closed, memory-protect circuit faulty, or U18 CMOS RAM faulty
7	CPU-Board lockup or PIA U5 faulty
None	U20 Game-ROM 1 faulty

SOUND-SECTION TEST FOR SYSTEM 9

1. **PRESS THE DIAGNOSTIC BUTTON SW2** on the CPU Board. Several electronic sounds should be produced. This sequence of sounds is repeated until the game is turned OFF and back ON.

2. **NO SOUND IN DIAGNOSTIC TEST** (but sounds are present in the Self Test): Check the sound-select inputs (pins 2 through 9 of U 13) to see if they pulse during Test 00.

3. **NO SOUND:** Check the -12V-supply voltage on the CPU Board. If this voltage is low (or AC ripple seems too high)...

   A. Check the gray and gray-green transformer secondary wires for 18.7VAC;

   B. Check the -12V filter-capacitor C7 on the CPU Board;

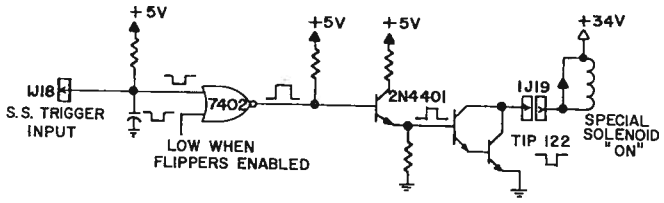
   C. Check for excessive AC (over 0.75 VAC) across C7 on the CPU Board.

4. **STILL NO SOUND:** Turn the volume control all the way up. With the game turned on, momentarily place a powered-up AC soldering-pencil on the center tap of the volume control. DO NOT use a soldering iron of over 40 watts. Cordless models will NOT work here.

   A. **If you hear a low hum,** the power-amplifier chip (TDA2002), volume control and speaker are okay.

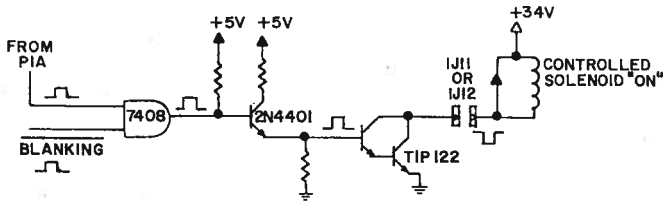
   B. **If you don't hear a hum,** try the test again with the volume control turned halfway up.

SPECIAL-SOLENOID LOGIC FOR "ON" STATE



IN THE SOLENOID-OFF STATE, (1) the switch trigger (eg., kicker switch) goes high. (2) Meanwhile the PIA line remains low. (3) The rest of the signals reverse their phase. *(These six solenoids aren't pulsed during the Solenoid Test. Instead, you must check them manually: Press on their trigger switches or pull their switch-trigger lines low.)*

CONTROLLED-SOLENOID LOGIC FOR "ON" STATE



IN THE SOLENOID-OFF STATE, (1) the PIA line goes low. (2) Meanwhile the BLANKING signal remains high. (3) The rest of the signals reverse their phase.

System 9 Lamp-Matrix Table

ROW \ COLUMN	1 YEL-BRN 1J7-1	2 YEL-RED 1J7-2	3 YEL-ORN 1J7-3	4 YEL-BLK 1J7-4	5 YEL-GRN 1J7-6	6 YEL-BLU 1J7-7	7 YEL-VIO 1J7-8	8 YEL-GRY 1J7-9
1 RED-BRN 1J6-1	Game Over Lamp 1	S 9	A 17	Right Drain 25	1 33	9 41	2X 49	Backglass Effect 57
2 RED-BLK 1J6-2	Match 2	O 10	B 18	Left Flipper Ret. 26	2 34	10 42	4X 50	Backglass Effect 58
3 RED-ORN 1J6-3	Tilt 3	R 11	C 19	Right Flipper Ret. 27	3 35	20 43	6X 51	Backglass Effect 59
4 RED-YEL 1J6-5	High-Score-To-Date 4	C 12	D 20	All Scores 2X 28	4 36	30 44	8X 52	Backglass Effect 60
5 RED-GRN 1J6-6	Shoot Again (Insert) 5	E 13	Extra Ball 21	All Scores 3X 29	5 37	40 45	Left Drop-Tgt 53	Backglass **SORCERER** art 61
6 RED-BLU 1J6-7	Ball-In-Play 6	R 14	Bonus Hold Over 22	All Scores 5X 30	6 38	50 46	Center Drop-Tgt 54	Backglass **SORCERER** art 62
7 RED-VIO 1J6-8	Shoot Again (Pfld) 7	E 15	Demon 23	Light Below "S" 31	7 39	Lock 47	Right Drop-Tgt 55	Backglass **SORCERER** art 63
8 RED-GRY 1J6-9	Play-field Special 8	R 16	Left Drain 24	Light Below "R" 32	8 40	Release 48	Backglass Effect 56	Backglass **SORCERER** art 64

System 9 Switch-Matrix Table

ROW \ COLUMN	1 GRN-BRN 1J8-1	2 GRN-RED 1J8-2	3 GRN-ORN 1J8-3	4 GRN-YEL 1J8-4	5 GRN-BLK 1J8-5	6 GRN-BLU 1J8-7	7 GRN-VIO 1J8-8	8 GRN-GRY 1J8-9
1 WHT-BRN 1J10-9	Plumb-Tilt 1	Left Spinner S 9	A 17	Right Drain 25	Right Kicker 33	Not Used 41	Not Used 49	Not Used 57
2 WHT-RED 1J10-8	Ball-Roll Tilt 2	O 10	B 18	Left Flpr Ret. 26	Left Drop-Tgt 34	UPR-L Switch 42	Not Used 50	Not Used 58
3 WHT-ORN 1J10-7	Credit Button 3	R 11	C 19	Right Flpr Ret. 27	Center Drop-Tgt 35	Lane Switch 43	Not Used 51	Not Used 59
4 WHT-YEL 1J10-6	Right Coin 4	C 12	D 20	Outhole 28	Right Drop-Tgt 36	Lane Change 44	Not Used 52	Not Used 60
5 WHT-GRN 1J10-5	Center Coin 5	E 13	Left Jet 21	Ramp 1 29	Multi-Ball Ramp 37	Play-Field Tilt 45	Not Used 53	Not Used 61
6 WHT-BLU 1J10-3	Left Coin 6	R 14	Lower Jet 22	Ramp 2 30	Multi Ball SW 38	Not Used 46	Not Used 54	Not Used 62
7 WHT-VIO 1J10-2	Slam Tilt 7	E 15	Right Jet 23	Shooter Lane SW 31	Lower Right SW 39	Not Used 47	Not Used 55	Not Used 63
8 WHT-GRY 1J10-1	High-Score Reset 8	Right Spinnter R 16	Left Drain 24	Left Kicker SW 32	Lower Left SW 40	Not Used 48	Not Used 56	Not Used 64

System-9 Solenoid Table

SOL. NO.	FUNCTION	SOLENOID TYPE	WIRE COLOR	CONNECTIONS		DRIVER TRANS.	SOLENOID PART NO.
				CPU BOARD	PLAYFIELD/ CABINET		
01	Outhole	controlled	GRY-BRN	1J11-1	8P3-1	Q47	SA-23-850-DC
02	Ramp Eject	controlled	GRY-RED	1J11-3	8P3-2	Q48	SG1-23-850-DC
03	Multi-Ball Eject	controlled	GRY-ORN	1J11-4	8P3-3	Q49	SG1-23-850-DC
04	3-Bank Drop Target	controlled	GRY-YEL	1J11-5	8P3-4	Q50	SA-3-23-850-DC
05	Demon Background	controlled	GRY-GRN	1J11-6	8P3-5	Q39	#63 Flashlamp
06	3-Bank Flash	controlled	GRY-BLU	1J11-7	8P3-6	Q40	#63 Flashlamp
07	**SORCERER** Bank	controlled	GRY-VIO	1J11-8	8P3-7	Q41	#63 Flashlamp
08	Flash Eyes (cabinet)	controlled	GRY-BLK	1J11-9	8P3-8	Q42	5580-08994-00
09	Not Used	controlled	BRN-BLK	1J12-1	8P3-9	Q54	—
10	Not Used	controlled	BRN-RED	1J12-2	8P3-10	Q55	—
11	General Illumination	controlled	BRN-ORN	1J12-4	3P7-1	Q56	5580-09555-00
12	Not Used	controlled	BRN-YEL	1J12-5	8P3-12	Q57	—
13	Not Used	controlled	BRN-GRN	1J12-6	8P3-13	Q58	—
14	Not Used	controlled	BRN-BLU	1J12-7	8P3-14	Q59	SA-4-23-850-DC
15	Bell	controlled	BRN-VIO	1J12-8	7P1-17	Q60	SM-29-1000-DC
16	Coin-Lockout Coil	controlled	BRN-GRY	1P12-9	7P1-18, 7P2-4	Q61	SM-35-4000-DC
*17	Left Kicker	special #1	BLU-BRN	1J19-7	8P3-17	Q75	SG1-23-850-DC
*18	Right Kicker	special #2	BLU-RED	1J19-4	8P3-18	Q77	SG1-23-850-DC
*19	Left Jet-Bumper	special #3	BLU-ORN	1J19-3	8P3-19	Q79	SG1-23-850-DC
*20	Lower Jet-Bumper	special #4	BLU-YEL	1J19-6	8P3-20	Q81	SG1-23-850-DC
*21	Right Jet-Bumper	special #5	BLU-GRN	1J19-8	8P3-21	Q83	SG1-23-850-DC
*22	Not Used	special #6	BLU-BLK	1J19-9	8P3-22	Q85	—
—	Top Flipper		BLK-BLU	1J19-2	7P1-30	—	FL24/600-30/2600-50VDC
—	Right Flipper*		ORN-VIO	1J19-1	7P1-7	—	FL23/600-30/2600-50VDC
—	Left Flipper*		ORN-GRY	1J19-2	7P1-9	—	FL23/600-30/2600-50VDC

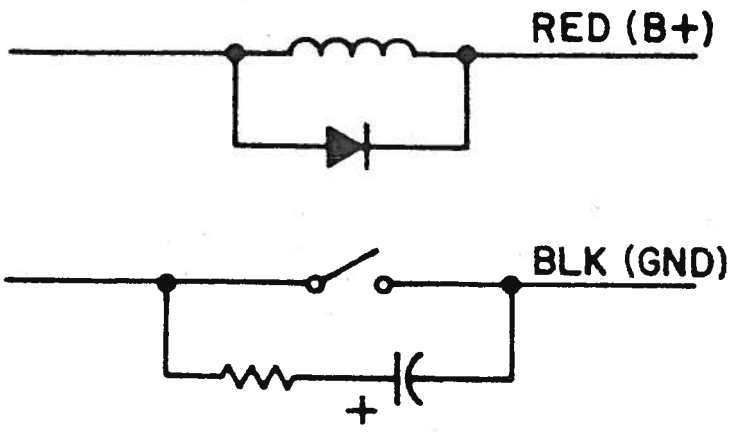
***NOTES**

1. Special-switch connections for solenoids 17 thru 21 are as follows:
   17—ORN-BRN—1J18-5, 8P3-24
   18—ORN-RED—1J18-3, 8P3-25
   19—ORN-BLK—1J18-2, 8P3-26
   20—ORN-YEL—1J18-4, 8P3-27
   21—ORN-GRN—1J18-8, 8P3-28

2. **FLIPPER COILS.** This game requires 50-volt flipper coils. For proper operation, the replacement part shown MUST be used.

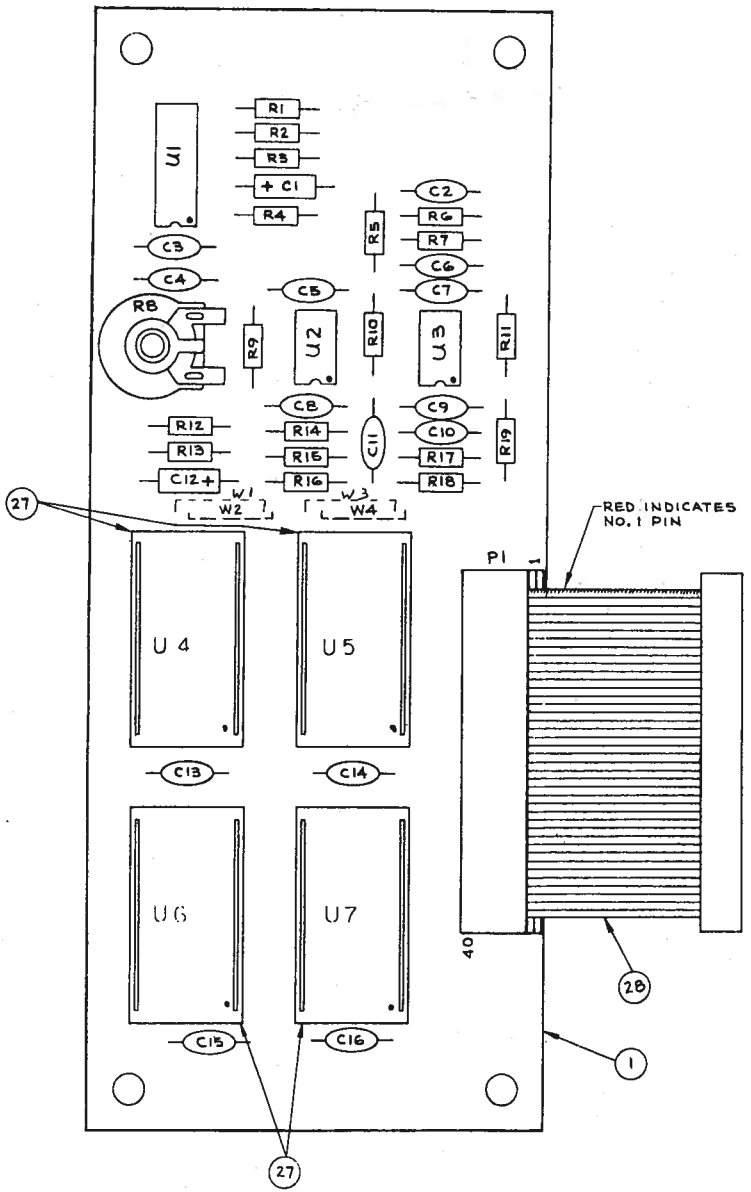
3. Flipper-button connections:
   Right—ORN-VIO—1J19-1, 7P1-7
   Left—ORN-GRY—1J19-2, 7P1-9
   Top—BLK-BLU—1J19-2, 7P1-30

4. Typical wiring for solenoids and special switches follows.



C-10716

SPEECH BOARD



BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	5766-10805-00		BARE P.C. BOARD	1
2	5370-09691-00	U1	55534 CONTINUOUSLY VARIABLE SLOPE DELTA MODULATOR	1
3	5370-09321-00	U2, U3	1458 DUAL OP-AMP.	2
4	5010-09534-00	W2, W4	RESISTOR, C.F., 0 OHM	2
5				
6				
7				
8				
9				
10	5010-08896-00	R11	RESISTOR, FC, 220 K OHM 5% 1/4 WATT	1
11	5010-09034-00	R1, R2, R3, R4, R14, R16	RESISTOR, FC, 10 K OHM 5% 1/4 WATT	6
12	5010-08824-00	R5	RESISTOR, FC, 43 K OHM 5% 1/4 WATT	1
13	5010-09333-00	R6	RESISTOR, FC, 180 K OHM 5% 1/4 WATT	1
14	5010-09342-00	R7	RESISTOR, FC, 36 K OHM 5% 1/4 WATT	1
15	5019-09183-00	R8	POTENTIOMETER, 5K OHM	1
16	5010-09329-00	R9, R10, R15, R18, R19	RESISTOR, FC, 27 K OHM 5% 1/4 WATT	5
17	5010-08997-00	R12, R13	RESISTOR, FC, 2.7 K OHM 5% 1/4 WATT	2
18	5010-08772-00	R17	RESISTOR, FC, 15 K OHM 5% 1/4 WATT	1
19	5043-09030-00	C4	CAPACITOR, .047 MFD. 20% 50 VOLT	1
20	5046-09350-00	C6	CAPACITOR, POLYSTYRENE 180 PFD. 5% 100 VOLT	1
21	5043-08980-00	C3, C5, C7, C8, C9, C13 THRU C16	CAPACITOR, CERAMIC, .01 MFD. +80%-20% 50 VOLT	9
22	5041-09031-00	C1	CAPACITOR, TANTALUM, 1 MFD. 20% 25 VOLT	1
23	5046-09347-00	C2	CAPACITOR, POLYSTYRENE 1800 PFD. 5% 50 VOLT	1
24	5040-09343-00	C12	CAPACITOR, ELECTROLYTIC, 10 MFD. 20% 20 VOLT LOW LEAK	1
25	5046-09348-00	C11	CAPACITOR, POLYSTYRENE 4700 PFD. 5% 50 VOLT	1
26	5046-09346-00	C10	CAPACITOR, POLYSTYRENE 1200 PFD. 5% 50 VOLT	1
27	5700-09004-00		24 PIN SOCKET	4
28	5745-09352-00	P1	RIBBON CABLE ASSEM.	1

NOTE:
FOR SCHEMATIC, REFER TO DWG. #16-8937.
ASSEMBLY IS C-10717 - Game number
ASSEMBLY INCLUDES 2532 or 2732 ROMS (U4-U7)
SEE ROM SUMMARY FOR ROM PART NUMBERS

QTY.	ASSEMBLE ON
1	C-10717

TOLERANCES
UNLESS OTHERWISE SPECIFIED
FRACTIONAL ± 1/64"
DECIMAL .XX ± .005" .XXX ± .010"
HOLE DIA. .XXX + .002 - .000"
ANGULAR ± 1/2°
CONCENTRICITIES T.I.R. .003" SCREW THREADS CLASS 2

WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-8260

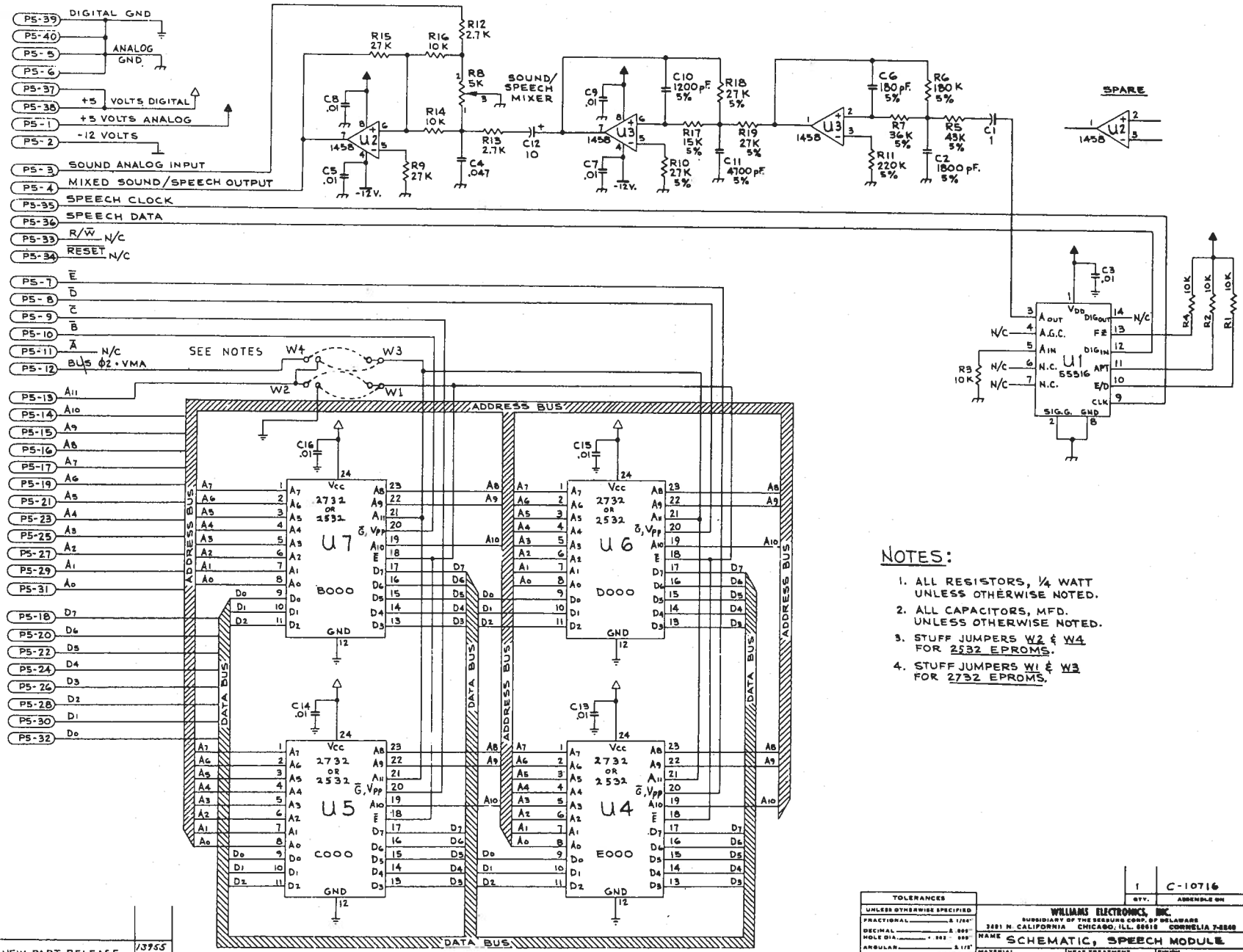
NAME SPEECH MODULE SUB-ASSEM.

MATERIAL — HEAT TREATMENT — FINISH

M. LOFFREDO	DES'N. R.G.H.	DATE 2-27-85	APP'D. D.G.W.	SCALE 2:1	C-10716

REVISION LETTER	REVISION	BY
	NEW PART RELEASE	13988 3-11-85

SPEECH BOARD

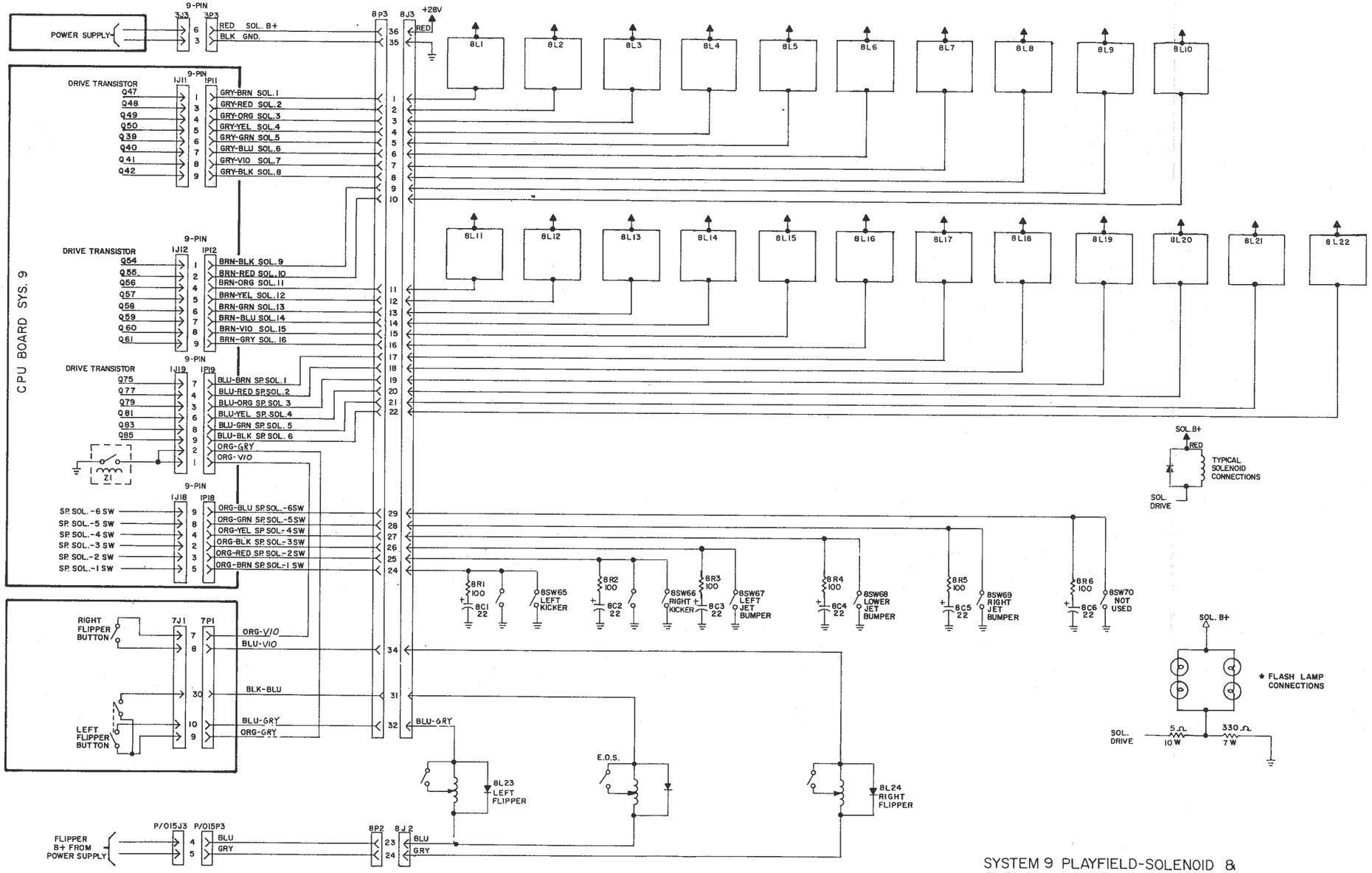


NOTES:

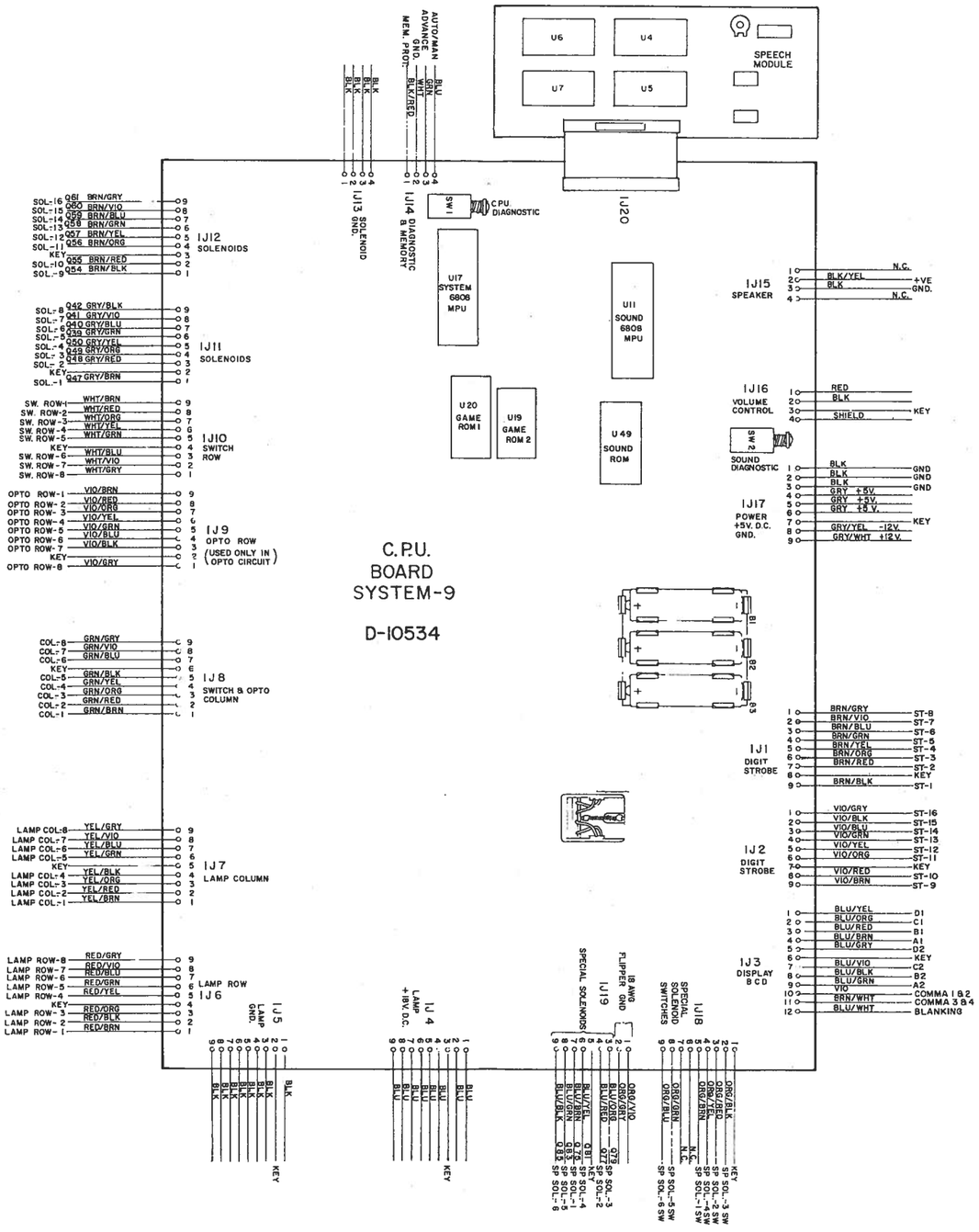
1. ALL RESISTORS, ¼ WATT UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS, MFD. UNLESS OTHERWISE NOTED.
3. STUFF JUMPERS W2 & W4 FOR 2532 EPROMS.
4. STUFF JUMPERS W1 & W3 FOR 2732 EPROMS.

REVISION LETTER	REVISION	BY
	NEW PART RELEASE	13955 3-14-85

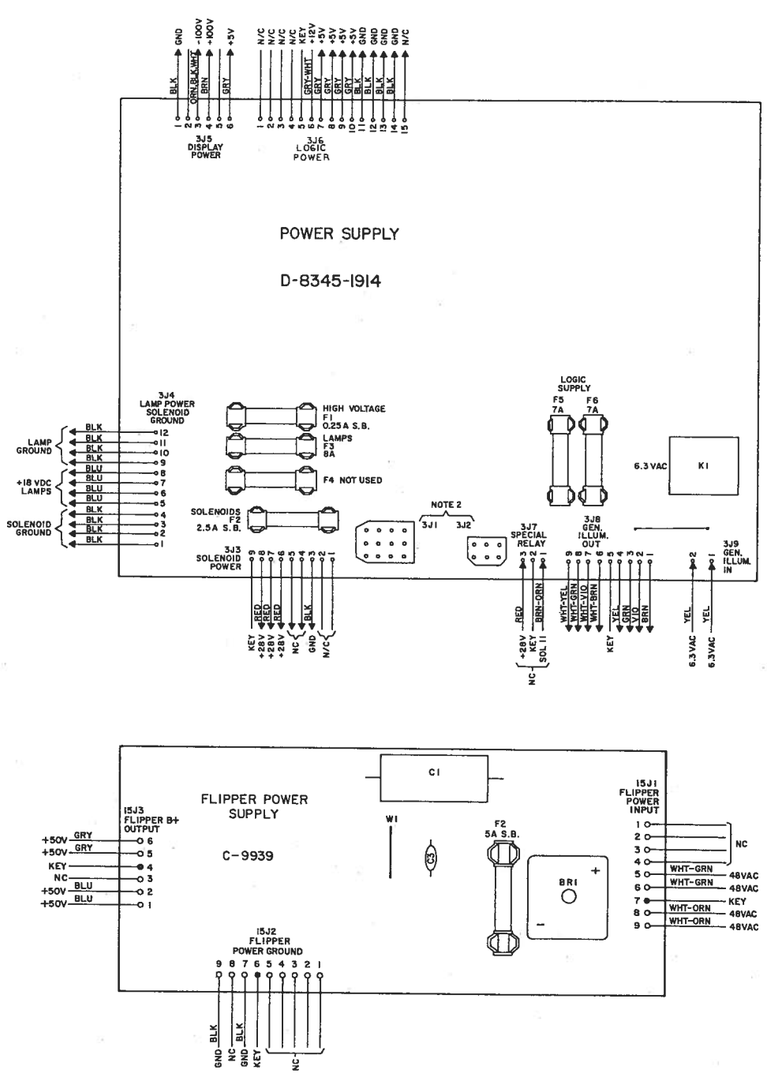
TOLERANCES UNLESS OTHERWISE SPECIFIED		QTY. 1	ASSEMBLY NO. C-10716
	WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-8840		
	NAME SCHEMATIC, SPEECH MODULE		
	MATERIAL / HEAT TREATMENT / FINISH		
M. LOFFREDO	DRN. M.G.M. DATE 2-27-85	APP'D. D.W. SCALE —	16-8937



SYSTEM 9 PLAYFIELD-SOLENOID & SPECIAL-SWITCH WIRING DIAGRAM

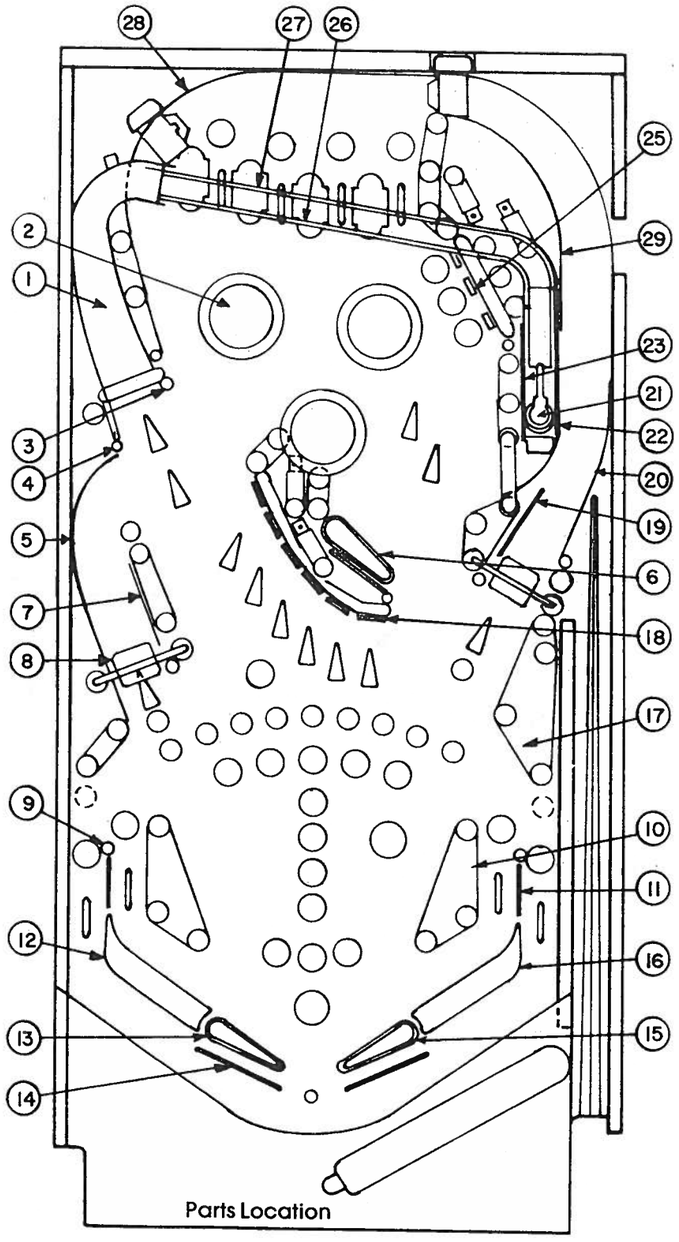


C.P.U. BOARD SYSTEM 9



NO. OF CONNECTIONS	WILLIAMS PART NO.	LOCATIONS
4 PIN	5792-09103-00	IP16
4 PIN	5792-09288-00	IP13, IP14, IP15
9 PIN	5792-09359-00	IP19
9 PIN	5792-09290-00	IP1, IP2, IP4, IP5, IP6, IP7, IP8, IP9 IP10, IP11, IP12, IP17, IP18
12 PIN	5792-09103-00	IP3

PLAYFIELD PARTS

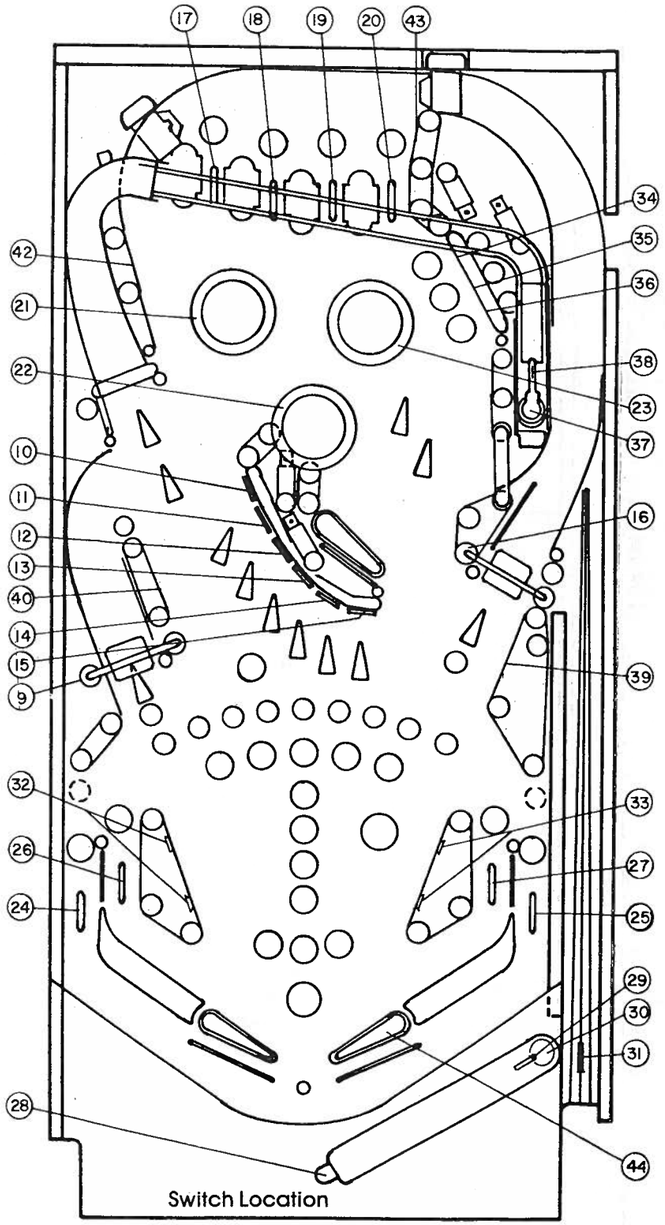


Parts Location

PLAYFIELD PARTS

1.	D-10550	Ball Chute Assembly
2.	B-9414	Jet Bumper Assembly
3.	02-4036	Bumper Post
4.	02-4003	Bumper Post
5.	C-10552	Ball Guide
6.	C-10605-L	Flipper Assembly
7.	12-6466-12	3" Wire Ball Guide
8.	B-9655-532	Spin Target Assembly
9.	02-3905	Bumper Post
10.	12-6466-8	2" Wire Ball Guide
11.	12-6466-7	1 ¾" Wire Ball Guide
12.	A-8108-L	Left Flipper Return Assembly
13.	C-9953-L	Left Flipper Assembly
14.	12-6468	Wire Anti-Rebound
15.	C-9952-R	Right Flipper Assembly
16.	A-8108-R	Right Flipper Return Assembly
17.	12-6466-4	1" Wire Ball Guide
18.	A-10038	Target Assembly
19.	12-6466-11	2 ¾" Wire Ball Guide
20.	12-6644	Wire Ball Guide
21.	B-9361-R-3	Ball Eject Assembly
22.	C-10548	Ball Guide
23.	12-6466-16	4" Wire Ball Guide
24.	12-6651	Wire Ball Guide
25.	D-9355	3-Bank Drop Target
26.	12-6626	Lower Ball Chute Wire
27.	12-6625	Upper Ball Chute Wire
28.	D-10549	Ball Guide

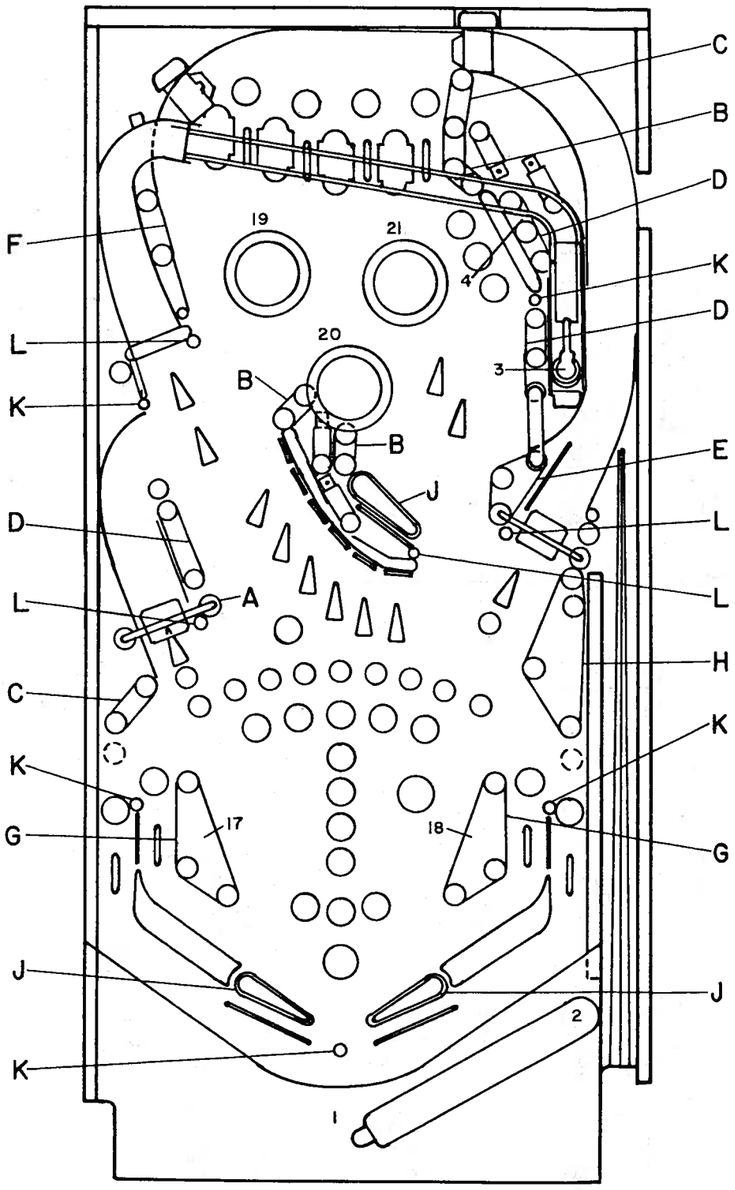
SWITCH LOCATIONS



Switch Location

ITEM NO.	ASSEMBLY NO.	FUNCTION
1.	A-8476	Plumb tilt
2.	B-6572	Ball Roll Tilt
3.	B-8536	Credit Button
4.	5647-10141-00	Right Coin Switch
5.	BLANK FOR DOMESTIC	Center Coin Switch
6.	5647-10141-00	Left Coin Switch
7.	SW-1A-127	Slam Tilt
8.	5647-09957-00	High Score Reset
9.	B-8307	Left Spinner, "S"
10.	A-9267	"O" Target
11.	"	"R" Target
12.	"	"C" Target
13.	"	"E" Target
14.	"	"R" Target
15.	"	"E" Target
16.	B-8307	Right Spinner, "R"
17.	B-8410	"A"
18.	"	"B"
19.	"	"C"
20.	"	"D"
21.	B-8316	Left Jet Bumper
22.	"	Lower Jet Bumper
23.	"	Right Jet Bumper
24.	B-8410	Left Drain
25.	"	Right Drain
26.	"	Left Flipper Return
27.	"	Right Flipper Return
28.	A-10417	Outhole
29.	B-8642	Ramp 1
30.	A-8659	Ramp 2
31.	B-8677	Shooter Lane
32.	B-8284	Left Kicker
33.	B-8284	Right Kicker
34.	A-9417	Left Drop Target
35.	"	Center Drop Target
36.	"	Right Drop Target
37.	A-10590	Ramp Eject for MULTIBALL
38.	A-8659	Ramp Switch for MULTIBALL
39.	A-4834-K	Lower Right Switch
40.	A-4834-K	Lower Left Switch
41.	NOT USED	NOT USED
42.	A-4834-K	Upper Left Switch
43.	A-4834-J	Lamp Shift
44.	B-9951	Lane Change
45.	B-8306	Playfield Tilt
46-64.	NOT USED	NOT USED

SOLENOIDS AND RUBBERS



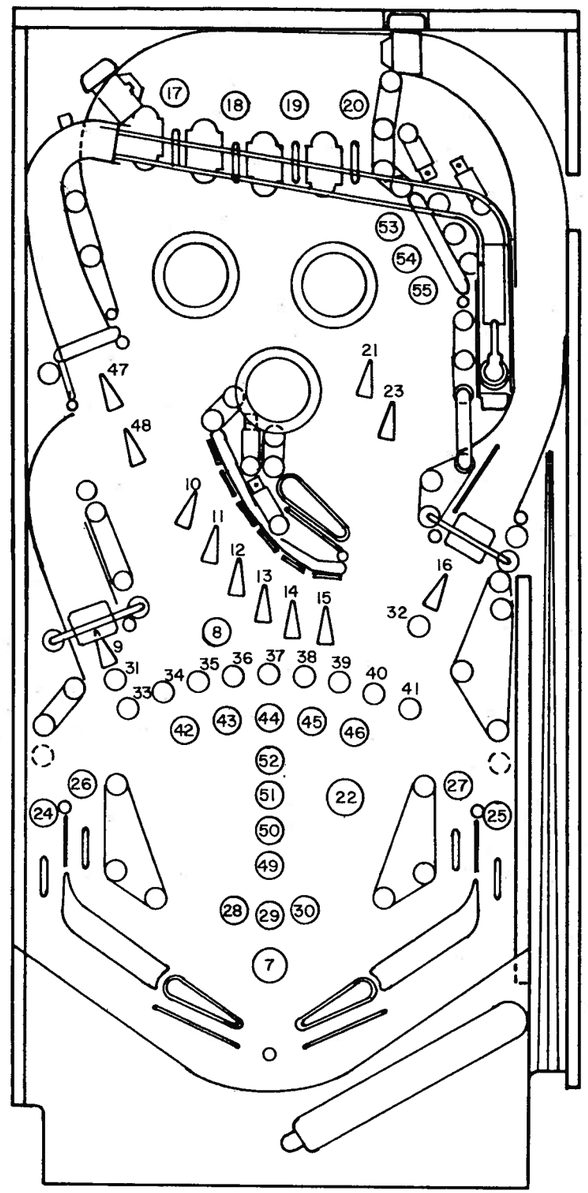
SOLENOIDS

ITEM NO.	ASSEMBLY NO.	FUNCTION
1.	SA-23-850-DC	Outhole
2.	SG1-23-850-DC	Ramp Eject
3.	SG1-23-850-DC	MULTI-BALL Eject
4.	SA-3-23-850-DC	3-Bank Drop Target
5.	NOT USED	-
6.	NOT USED	-
7.	NOT USED	-
8.	5580-08994-00	Flipper-Enable Relay
9.	NOT USED	-
10.	NOT USED	-
11.	5580-09555-00	General Illumination
12.	NOT USED	-
13.	NOT USED	-
14.	NOT USED	-
15.	SM-29-1000-DC	Bell
16.	SM-35-4000-DC	Coin-Lockout
17.	SG1-23-850-DC	Left Kicker
18.	SG1-23-850-DC	Right Kicker
19.	SG1-23-850-DC	Left Jet Bumper
20.	SG1-23-850-DC	Lower Jet Bumper
21.	SG1-23-850-DC	Right Jet Bumper
22.	NOT USED	
	FL24/600-30/2600-50VDC	Top Flipper
	FL23/600-30/2600-50VDC	Right Flipper
	FL23/600-30/2600-%)VDC	Left Flipper

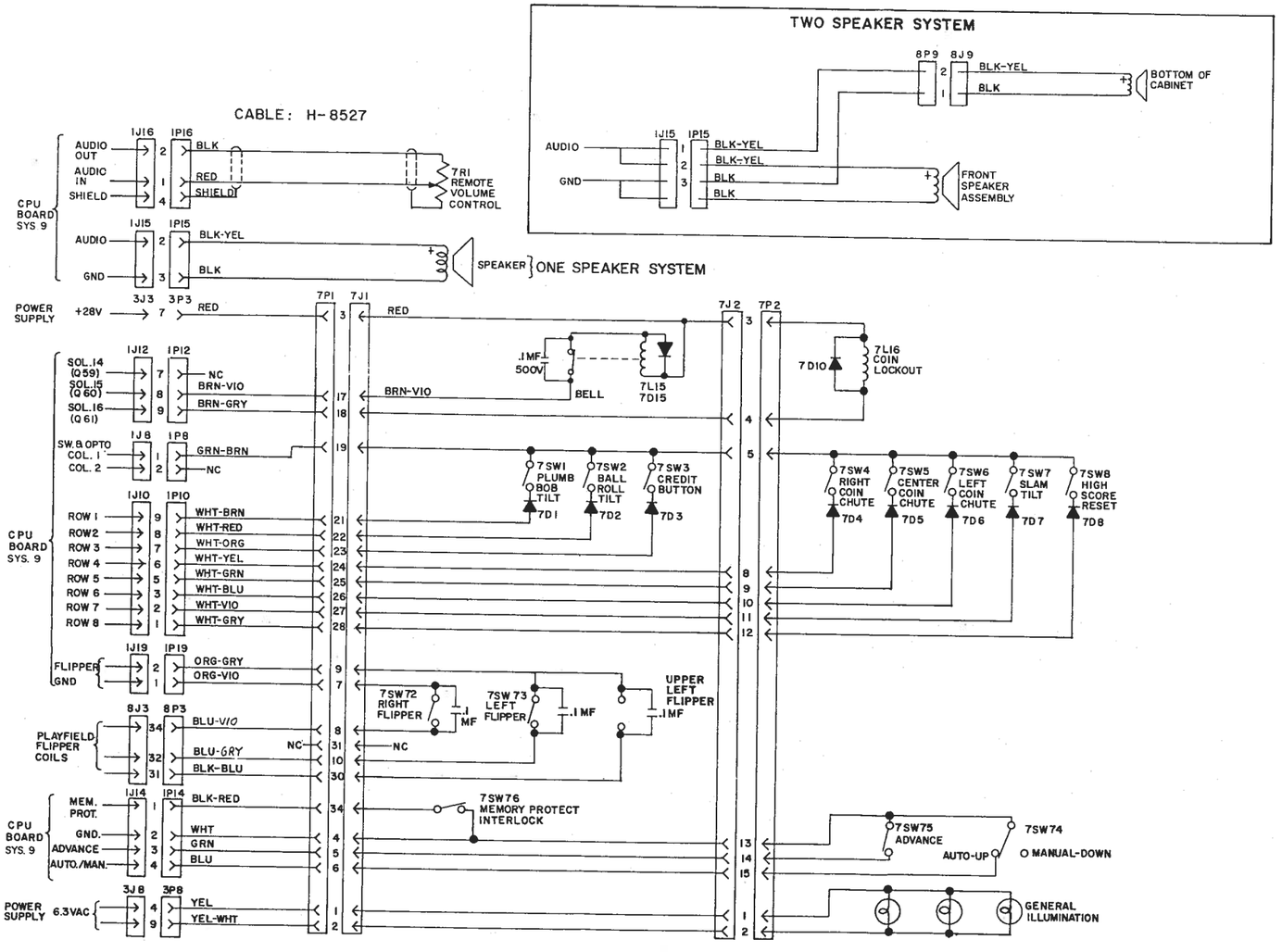
RUBBER PARTS

A.	23-6300	5/16" Rubber Ring
B.	23-6301	3/4" Rubber Ring
C.	23-6302	1" Rubber Ring
D.	23-6303	1 1/4" Rubber Ring
E.	23-6304	1 1/2" Rubber Ring
F.	23-6306	2 3/8" Rubber Ring
G.	23-6307	2 7/8" Rubber Ring
H.	23-6308	3 3/8" Rubber Ring
I.	23-6313-1	Rubber Grommet
J.	23-6519-4	Rubber Ring - Red
K.	23-6535	Rubber Bumper
L.	23-6552	Rubber Sleeving

LAMP LOCATIONS



ITEM NO.	ASSEMBLY NO.	FUNCTION
1.	A-8262	Game Over
2.	"	Match
3.	"	Tilt
4.	"	High Score to Date
5.	"	Shoot Again (Backglass)
6.	"	Ball-in-Play
7.	A-8265	Shoot Again (Playfield)
8.	A-8265	Special
9.	B-9558-41	"S"
10.	B-8445	"O"
11.	"	"R"
12.	"	"C"
13.	B-8443	"E"
14.	"	"R"
15.	"	"E"
16.	A-8265	"R"
17.	A-8265	"A"
18.	"	"B"
19.	"	"C"
20.	"	"D"
21.	A-8265	Extra Ball
22.	"	Bonus Hold Over
23.	"	DEMON
24.	"	Left Drain
25.	"	Right Drain
26.	"	Left Flipper Return
27.	"	Right Flipper Return
28.	B-9558-42	2X
29.	"	3X
30.	"	5X
31.	B-9558-41	Light Below "S"
32.	A-8265	Light Below "R"
33.	B-9558-41	"1"
34.	B-9558-21	"2"
35.	"	"3"
36.	"	"4"
37.	"	"5"
38.	B-9558-39	"6"
39.	"	"7"
40.	"	"8"
41.	"	"9"
42.	B-8445	"10"
43.	"	"20"
44.	"	"30"
45.	A-8265	"40"
46.	"	"50"
47.	"	Lock
48.	"	Release
49.	B-9558-21	2X
50.	"	4X
51.	"	6X
52.	"	8X
53.	A-8449	Left Drop Target
54.	"	Center Drop Target
55.	"	Right Drop Target
56-64	GENERAL ILLUMINATION	



SYSTEM 9 CABINET WIRING DIAGRAM

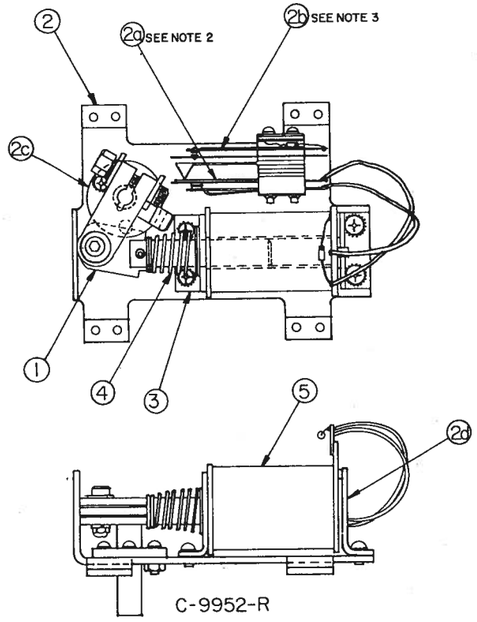
Flipper Assemblies

C-9952-R-

ITEM NO.	PART NO.	DESCRIPTION
1	B-10655-R	CRANK LINK ASSEMBLY
2	C-9954-R	FLIPPER BASE/ LANE CHANGE ASSEMBLY
2a	03-7811	END OF STROKE
2b	SW-1A-150	LANE CHANGE SWITCH
2c	03-7568	FLIPPER BUSHING
2d	A-10280	FLIPPER STOP BRKT ASSM
3	01-7695	SOLENOID BRACKET
4	10-376	COIL PLUNGER SPRING
5	FL 23/600-30-2600	FLIPPER COIL

NOTES:

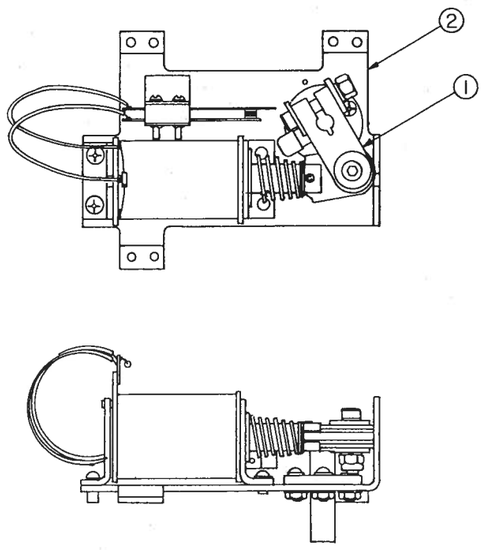
1. FLIPPER ASSEMBLIES ARE MOUNTED ON THE PLAYFIELD IN CONJUNCTION WITH THE PLASTIC FLIPPER AND SHAFT (20-9250) AND FLIPPER RUBBER (23-6519).
2. THE TIP OF THE E.O.S. SWITCH MUST TRAVEL .015, +.010, -.000 INCHES BEFORE THE CONTACTS FULLY OPEN. WITH THE FLIPPER IN THE ACTUATED POSITION, THE E.O.S. SWITCH CONTACTS MUST HAVE A GAP OF .062 ± .015 INCHES. ANY ADJUSTMENT OF THE E.O.S SWITCH MUST BE MADE AT A MINIMUM DISTANCE OF .25 INCHES FROM THE SWITCH BODY.
3. THE LANE CHANGE SWITCH MUST HAVE A GAP OF .046 ± .015 INCHES WHEN FULLY OPEN.
4. ALL MOVING ELEMENTS OF THE ASSEMBLY MUST OPERATE FREELY WITHOUT ANY EVIDENCE OF BINDING.
5. COIL PLUNGER SPRING MUST FIT WITHIN THE 4 LUGS OF THE SOLENOID BRACKET
6. FOR COIL REPLACEMENT REMOVE ITEM 3 SOLENOID BRACKET TO PREVENT SCREW DAMAGE.



C-9952-R

C-10605-L UNIQUE PARTS

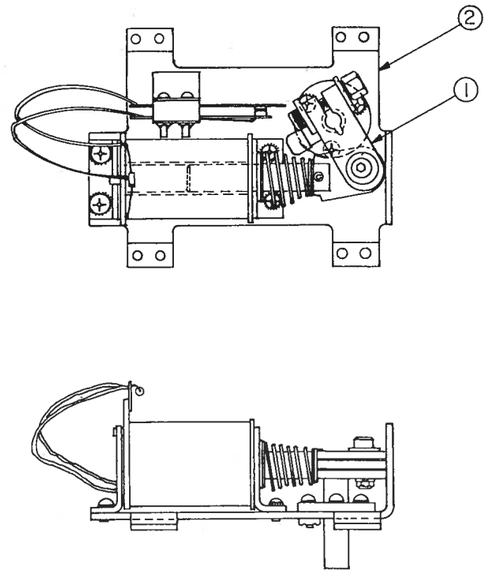
ITEM NO.	PART NO.	DESCRIPTION
1	B-10655-L	CRANK LINK ASSEMBLY, LEFT
2	C-10604	FLIPPER SUB BASE ASSEMBLY



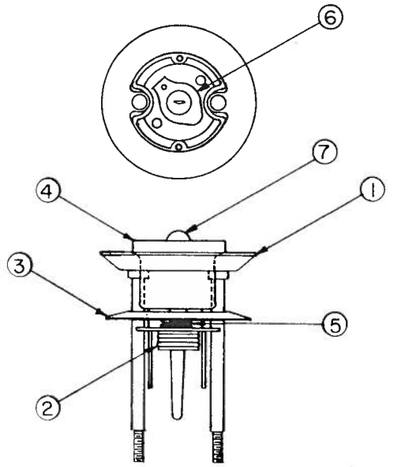
C-10605-L

C-9953-L UNIQUE PARTS

ITEM NO.	PART NO.	DESCRIPTION
1	B-10655-L	CRANK LINK ASSEMBLY, LEFT
2	C-9957-L	FLIPPER SUB BASE ASSEMBLY



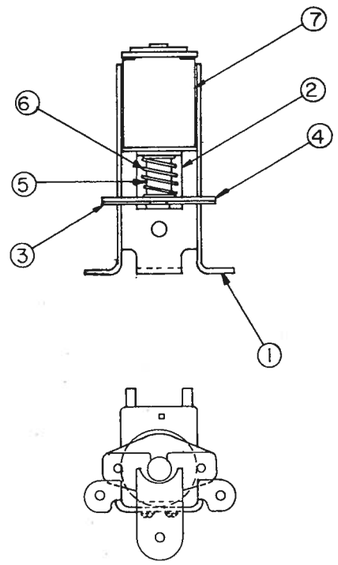
C-9953-L



B-9414

B-9414 JET BUMPER ASSEMBLY

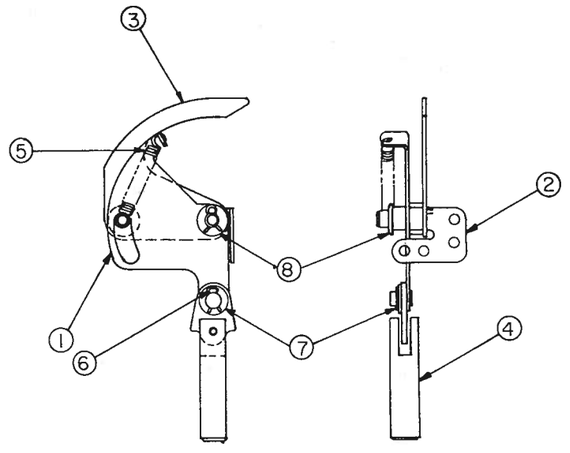
ITEM NO.	PART NO.	DESCRIPTION
1	A-4754	BUMPER RING ASSEMBLY
2	03-6009-A5	BUMPER BASE
3	03-6035-5	BUMPER WAFER
4	03-7443-5	BUMPER BODY
5	10-7	BUMPER SPRING
6	24-6416	BUMPER SOCKET



B-9415

B-9415 JET BUMPER COIL ASSEMBLY

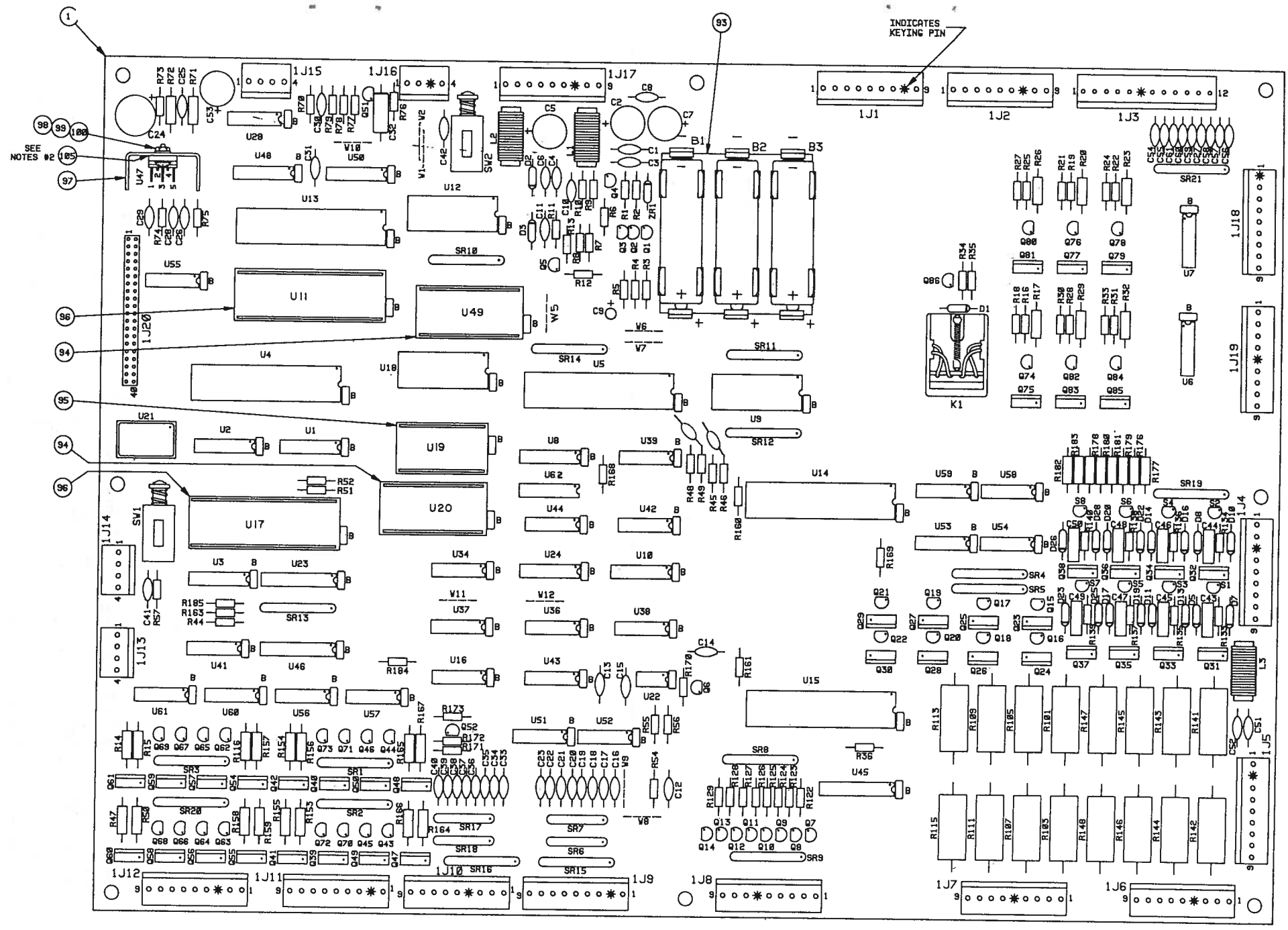
ITEM NO.	PART NO.	DESCRIPTION
1	B-7417	BRACKET AND STOP ASSEMBLY
2	01-1747	COIL RETAINING BRACKET
3	01-5492	ARMATURE LINK STEEL
4	01-5493	ARMATURE LINK BAKELITE
5	02-3406-1	COIL PLUNGER
6	10-326	ARMATURE SPRING
7	SG1-23-850-DC	SOLENOID COIL



B-9361-R-3

B-9361-R-3 BALL EJECT ASSEMBLY RIGHT

ITEM NO.	PART NO.	DESCRIPTION
1	A-6949-R	SPRING PLATE
2	A-6950-R	MOUNTING BRACKET ASSEMBLY
3	A-7471-R	EJECT CAM ASSEMBLY
4	A-5103	COIL PLUNGER ASSEMBLY
5	10-362	SPRING-EJECT
6	12-6227	HAIR PIN CLIP
7	4700-00030-00	17/64 X 1/2 X 15G
8	4700-00103-00	17/64 X 1/2 X .015



ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	QTY.
10				
9				
8				
7				
6	SEE CHART		LABEL – PCB ASSY. ID.	1
5	SEE CHART	U49	SOUND ROM ASSY.	1
4	SEE CHART	U20	GAME ROM-1 ASSY.	1
3	SEE CHART	U19	GAME ROM-2 ASSY.	1
2	5400-09250-00	U11, U17	I.C., 6808, MICROPROCESSOR	2
1	D-10534		CPU PCB SUB-ASSEM.	1

NOTES:

1. FOR SCHEMATIC, REFER TO DRAWING NO. 16-8923.
2. USE THERMAL COMPOUND BETWEEN ITEM #24 (U47) AND ITEM #97.
3. FOR GERMAN GAMES CUT W5.

CHART						
NAME OF GAME	ASSY. NO.	ITEM 3	ITEM 4	ITEM 5	ITEM 6	JUMPERS TO BE DELETED
STAR-LIGHT	D-10535-530	A-5343-10761	A-5343-10760	A-5343-10762	16-8850-117	W12
SPACE SHUTTLE	D-10535-535	NOT USED	A-5343-10767	A-5343-10768	16-8850-120	W10 W11
STRIKE ZONE	D-10535-1916	A-5343-10794	A-5343-10793	A-5343-10795	16-8850-124	W12
SORCERER	D-10535-532	A-5343-10765	A-5343-10764	A-5343-10766		W10 W11

NOTES:

1. FOR SCHEMATIC, REFER TO DWG. #16-8923.
2. DIODE, IN4001,
   D1, D5, D7, D8, D10, D11, D13, D14, D16, D17, D19, D20, D22, D23, D25, D26, D28.
3. RESISTOR, 4.7K OHM,
   R4, R36, R44, R45, R48, R51, R52, R160, R161, R163, R169, R170, R172, R184, R185.
4. RESISTOR, 1.0K OHM,
   R2, R3, R8, R11, R57, R74, R75, R133, THRU R140, R173.
5. CAPACITOR, .01 MFD,
   BYPASS (B) 48 CAPACITORS, C10, C11, C13, C30, C41, C56 THRU C60, C42, C27.
6. FOR ITEMS #53 AND #55 RESISTORS MUST BE MOUNTED 1/8" ABOVE SURFACE OF PCB.
7. RESISTOR, 68 OHM 1/2 WATT,
   R14, R15, R17, R20, R23, R26, R29, R32, R47, R50, R116, R153 THRU R159, R164 THRU R167.
8. RESISTOR, 27 OHM 2 WATT,
   R101, R103, R105, R107, R109, R111, R113, R115.
9. TRANSISTOR, TIP122,
   Q31 THRU Q42, Q47 THRU Q50, Q54 THRU Q61, Q75, Q77, Q79, Q81, Q83, Q85.
10. TRANSISTOR, 2N4401,
    Q1, Q2, Q3, Q5, Q43 THRU Q46, Q62 THRU Q73, Q74, Q76, Q78, Q80, Q82, Q84, Q86.
11. JUMPERS: STANDARD
    W2, W6, W7, W9, W10, W11, W5.
    OPTIONS

    FOR SPEECH DELETE W10
    FOR 27128 (GAME) DELETE W11 ADD W12
12. USE THERMAL COMPOUND BETWEEN ITEM #24 (U47) AND ITEM #97.
13. RESISTOR, 2.7K OHM,
    R18, R21, R24, R27, R30, R33, R35.
14. 9-PIN CONNECTOR,
    1J1, 1J2, 1J4 THRU 1J12, 1J17, 1J18, 1J19.

ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	QTY.
119				
118				
117				
116				
115				
114				
113				
112				
111				
110				
109				
108				
107				
106	5791-09349-00	1J20	40-PIN HEADER, RIBBON CABLE	1
105	20-9229	SEE NOTE #12	THERMAL COMPOUND	.010 OZ.
104	5791-09043-00	1J3	12-PIN HEADER, 09-65-1121	1
103	5791-09028-00	1J13 THRU 1J16	4-PIN HEADER, 09-65-1041	4
102	5791-09027-00	SEE NOTE #14	9-PIN HEADER, 09-65-1091	14
101	5580-08994-00	K1	RELAY, 4P, 40 OHM 6V	1
100	4703-00007-00		#6 EXT. LOCKWASHER	1
99	4406-01117-00		6-32 HEX. NUT	1
98	4006-01003-06		6-32 X 3/8" P-PH-S	1
97	5705-09199-00		HEATSINK #6030	1
96	5700-08985-00		40-PIN SOCKET	2
95	5700-09004-00		24-PIN SOCKET	1
94	5700-10176-00		28-PIN SOCKET	2
93	5881-09021-00		BATTERY HOLDER #171	1
92	5880-10628-00	B1, B2, B3	BATTERY PACK, ALKALINE, 4.5V	0
	5880-09022-00		BATTERY, ALKALINE, 1.5V (A-A)	3
91	5551-09822-00	L1, L2, L3	INDUCTOR, 4.7 µH 3A	3

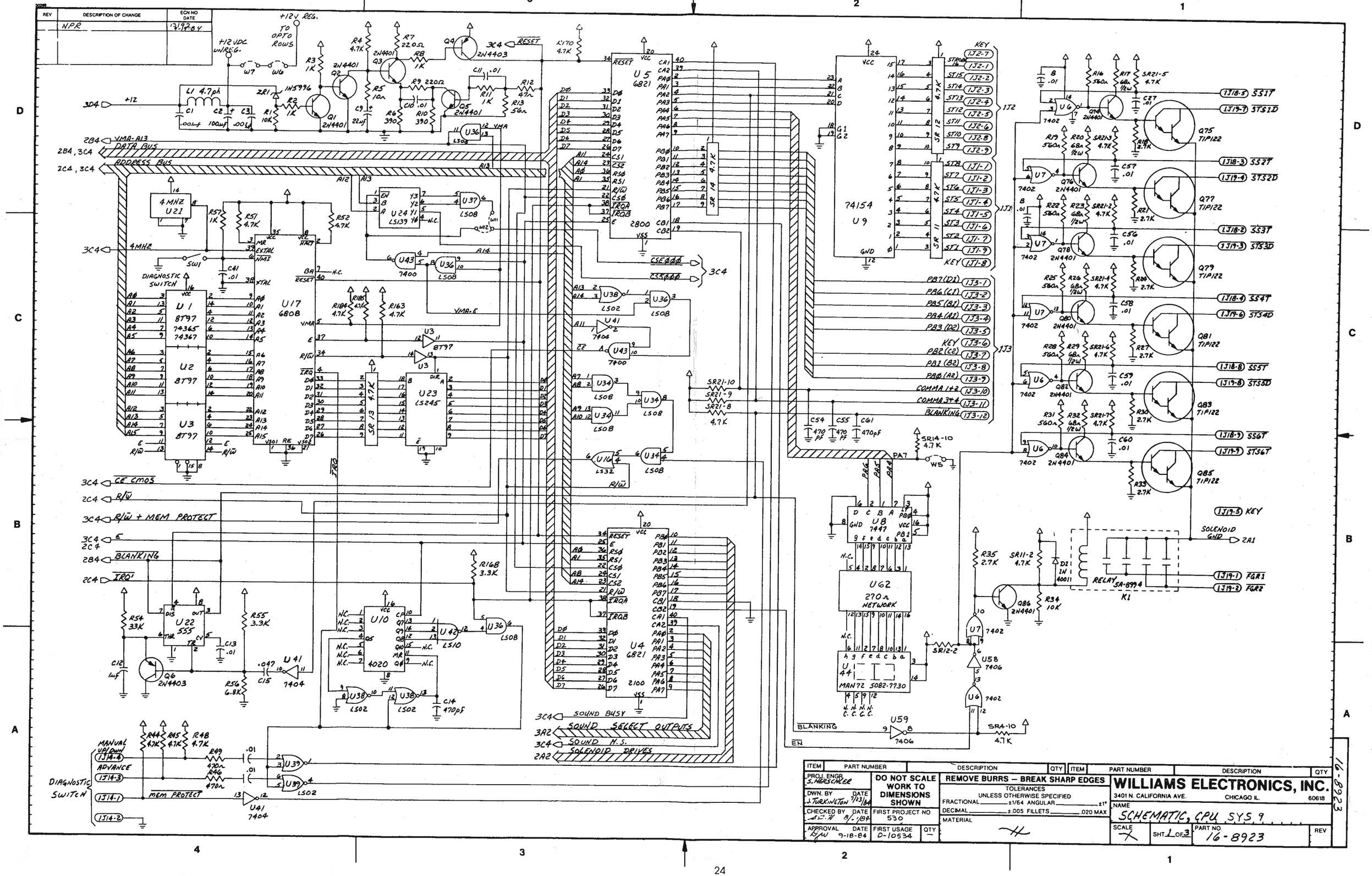
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	QTY.
90	5641-09653-00	SW1, SW2	PUSH BUTTON SWITCH, SPST	2
89				
88	5043-09030-00	C15	CAPACITOR, AXIAL, .047 MFD. 50V +/-20%	1
87	5041-09031-00	C12	CAP., TANT., AXIAL, 1 MFD. 25V +/-20%	1
86	5040-09493-00	C9	CAP., ELECT., RADIAL, 22 MFD. 10V +50-10%	1
85	5043-09065-00	C14, C33 THRU C40,C54,C55,C61	CAPACITOR, AXIAL, 470 PFD. 50V +/-20%	12
84	5045-09796-00	C43 THRU C50	CAP., POLYCARBONATE, RAD. .1 MFD. 100V +/-10%	8
83	5040-09776-00	C24	CAP., ELECT., RADIAL, 470 MFD. 16V +50-10%	1
82	5040-09421-00	C2, C5, C7, C53	CAP., ELECT., RADIAL, 100 MFD. 25V +50-10%	4
81	5043-09844-00	C31, C16 THRU C23	CAPACITOR, AXIAL, 47 PFD. 50V +/-20%	9
80	5040-09343-00	C32	CAP., ELECT., AXL., LOW L. 10 MFD. 20V +/-20%	1
79	5043-08996-00	C25, C26, C29, C51, C52	CAPACITOR, AXIAL, .1 MFD. 50V +/-20%	5
78	5043-09845-00	C1, C3, C4, C6, C8, C28	CAPACITOR, AXIAL, 1K PFD. 50V +/-20%	6
77	5043-08980-00	SEE NOTE #5	CAPACITOR, AXIAL, .01 MFD. 50V +80-20%	60
76	5019-09792-00	SR2, SR20	SIP, 9R 10-PIN, 2.7K OHM .125 W/R 5%	2
75				
74	5019-10501-00	U62	DIP, 8R 16-PIN, 270 OHM .125 W/R 5%	1
73	5019-09780-00	SR6, SR7, SR17, SR18	SIP, 4R 8-PIN, 1K OHM 5%	4
72	5019-09669-00	SR9, SR10	SIP, 9R 10-PIN, 1.0K OHM .125 W/R 5%	2
71	5019-10472-00	SR15	SIP, 9R 10-PIN, 3.3K OHM .125 W/R 5%	1
70	5019-09785-00	SR5	SIP, 9R 10-PIN, 2.2K OHM 1/4 WATT 5%	1
69	5019-09808-00	SR1, SR3, SR16	SIP, 9R 10-PIN, 560 OHM .125 W/R 5%	3
68	5019-09362-00	SR4, SR8, SR11 THRU SR14, SR21	SIP, 9R 10-PIN, 4.7K OHM .125 W/R 5%	7
67	5019-09783-00	SR19	SIP, 9R 10-PIN, 6.8K OHM .125 W/R 5%	1
66	5010-10631-00	R176 THRU R183	RESISTOR, C.F., 1.2K OHM 5% 1/4 WATT	8
65	5010-09085-00	R122 THRU R129	RESISTOR, C.F., 1.5K OHM 5% 1/4 WATT	8
64	5010-09179-00	R77	RESISTOR, C.F., 3.3M OHM 5% 1/4 WATT	1
63	5010-09416-00	R46, R49	RESISTOR, C.F., 470 OHM 5% 1/4 WATT	2
62	5010-09160-00	R7, R9	RESISTOR, C.F., 220 OHM 5% 1/4 WATT	2
61	5010-10170-00	R12	RESISTOR, C.F., 47 OHM 5% 1/4 WATT	1

ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	QTY.
60	5010-10171-00	R13	RESISTOR, C.F., 56 OHM 5% 1/4 WATT	1
59	5010-10003-00	R6, R10	RESISTOR, C.F., 390 OHM 5% 1/4 WATT	2
58	5010-09161-00	R73	RESISTOR, C.F., 2.2 OHM 5% 1/4 WATT	1
57	5010-09181-00	R71	RESISTOR, C.F., 1 OHM 5% 1/2 WATT	1
56	5010-09361-00	R72	RESISTOR, C.F., 220 OHM 5% 1/2 WATT	1
55	5010-08999-00	SEE NOTES #6 AND #8	RESISTOR, C.F., 27 OHM 5% 2 WATT	8
54	5010-08993-00	SEE NOTE #7	RESISTOR, C.F., 68 OHM 5% 1/2 WATT	22
53	5012-09037-00	R141 THRU R148 SEE NOTE #6	RESISTOR, WIREWOUND .4 OHM 5% 3 WATT	8
52	5010-08997-00	SEE NOTE #13	RESISTOR, C.F., 2.7K OHM 5% 1/4 WATT	7
51	5010-09363-00	R76	RESISTOR, C.F., 5.6K OHM 5% 1/4 WATT	1
50	5010-09086-00	R56	RESISTOR, C.F., 6.8K OHM 5% 1/4 WATT	1
49	5010-09034-00	R1, R34, R171	RESISTOR, C.F., 10K OHM 5% 1/4 WATT	3
48	5010-08983-00	R55, R78, R79, R70, R168	RESISTOR, C.F., 3.3K OHM 5% 1/4 WATT	5
47	5010-09113-00	R54	RESISTOR, C.F., 33K OHM 5% 1/4 WATT	1
46	5010-08984-00	SEE NOTE #4	RESISTOR, C.F., 1.0K OHM 5% 1/4 WATT	16
45	5010-08991-00	SEE NOTE #3	RESISTOR, C.F., 4.7K OHM 5% 1/4 WATT	15
44	5010-09534-00	SEE NOTE #11	RESISTOR, C.F., 0 OHM 1/4 WATT	7
43	5010-09039-00	R5	RESISTOR, C.F., 10 OHM 5% 1/4 WATT	1
42	5010-08992-00	R16, R19, R22, R25, R28, R31	RESISTOR, C.F., 560 OHM 5% 1/4 WATT	6
41				
40	5075-09018-00	ZR1	ZENER DIODE, 1N5996A 6.8V .5W	1
39	5070-09266-00	D2	SILICON DIODE, 1N5817 1.0 A.	1
38	5070-08919-00	D3	SILICON DIODE, 1N4148 150 mA.	1
37	5070-06258-00	SEE NOTE #2	DIODE, 1N4001	17
36	5130-09014-00	S1 THRU S8	SILICON CONTROL RECT., 2N5060 .8A 30V	8
35	5190-09016-00	Q4, Q6	TRANSISTOR, TO-92, 2N4403, PNP	2
34	5160-10269-00	Q7 THRU Q14 Q51, Q52	TRANSISTOR, TO-92, 2N3904, PNP	10
33	5160-08938-00	SEE NOTE #10	TRANSISTOR, TO-92, 2N4401, NPN	27
32	5162-09410-00	SEE NOTE #9	TRANSISTOR, TO-220, TIP122, NPN	30
31	5191-08978-00	Q23 THRU Q30	TRANSISTOR, TO-220, TIP42, PNP	8

ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	QTY.
30	5162-08976-00	Q15 THRU Q22	TRANSISTOR, TO-92, 2N6427 NPN DARLINGTON	8
29	5280-08948-00	U6, U7	I.C., 7402, QUAD 2-INPUT NOR	2
28	5310-09155-00	U51, U52	I.C., MC14011, QUAD 2-INPUT NAND	2
27	5280-08974-00	U58, U59	I.C., 7406, HEX. INVERTER OPEN C.	2
26	5280-08973-00	U53, U54, U56, U57, U60, U61	I.C., 7408, QUAD 2-INPUT AND	6
25	5281-09867-00	U45	I.C., 74LS244, OCTAL BUFFER	1
24	5370-09156-00	U47	I.C., TDA2002, AUDIO AMPLIFIER	1
23	5340-09003-00	U12	I.C., 6810, 128 X 8 STATIC RAM	1
22	5281-09745-00	U50	I.C., 74LS138, 3 TO 8 LINE DECODER	1
21	5371-09152-00	U48	I.C., MC1408, D/A CONVERTER	1
20	5281-09486-00	U46	I.C, 74LS374, OCTAL D-TYPE FLIP-FLOP	1
19	5281-09500-00	U16	I.C., 74LS32, QUAD 2-INPUT OR	1
18	5281-09499-00	U55	I.C., 74LS00, QUAD 2-INPUT NAND	1
17	5280-09013-00	U41	I.C., 7404, HEX. INVERTER	1
16	5281-09235-00	U28, U42	I.C., 74LS10, TRIPLE 3-INPUT NAND	2
15	5281-09247-00	U38, U39	I.C., 74LS02, QUAD 2-INPUT NOR	2
14	5281-09743-00	U34, U36, U37	I.C., 74LS08, QUAD 2-INPUT AND	3
13	5310-09236-00	U10	I.C., 4020, COUNTER 14 BIT CMOS	1
12	5431-09449-00	U22	I.C., MC1455, TIMER	1
11	5521-10506-00	U21	OSCILLATOR, 4 MHZ.	1
10	5671-09411-00	U44	I.C., MAN72A, 7 SEG. LED DISPLAY	1
9	5280-09407-00	U8	I.C., 7447, BCD TO 7 SEG. DECODER	1
8	5281-09246-00	U24	I.C., 74LS139, DUAL 2 TO 4 LINE DECODER	1
7	5280-09010-00	U9	I.C., 74154, 4 TO 16 DECODER	1
6	5340-10139-00	U18	I.C., 5517-2, 2K X 8 CMOS ST. RAM	1
5	5430-08972-00	U4, U5, U13, U14, U15	I.C., 6820/6821, PIA	5
4	5281-09308-00	U23	I.C., 74LS245, OCTAL BUS TRANCEIVER	1
3	5370-08989-00	U1, U2, U3	I.C., 8T97, HEX. TRISTATE BUFFER	3
2	5280-09073-00	U43	I.C., 7400, QUAD 2-INPUT NAND	1
1	5764-10749-00		BARE PC BOARD	1

BILL OF MATERIAL

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	NPR	13197 8-Y



ITEM	PART NUMBER	DESCRIPTION	QTY

PROJ. ENGR. S. HERSCHER		REMOVE BURRS — BREAK SHARP EDGES	WILLIAMS ELECTRONICS, INC.
DWN. BY J. TURKINGTON	DATE 3/23/84	TOLERANCES UNLESS OTHERWISE SPECIFIED	3401 N. CALIFORNIA AVE. CHICAGO IL. 60618
CHECKED BY L.W.	DATE 8/1/84	FRACTIONAL ±1/64 ANGULAR ±1°	NAME SCHEMATIC, CPU SYS 9
APPROVAL R/W	DATE 9-18-84	DECIMAL .XX ±.005 .XXX ±.010 FILLETS .020 MAX	SCALE X
DO NOT SCALE WORK TO DIMENSIONS SHOWN		MATERIAL	SHT 1 OF 3
FIRST PROJECT NO. 530			PART NO. 16-8923
FIRST USAGE D-10534	QTY —		REV

16-8923

REV	DESCRIPTION OF CHANGE	ECN NO. DATE
	NPR	13197 4-19-84

MECHANICAL SWITCH MATRIX INPUTS OPTOS

KEY J10-4 J10-1 J10-2 J10-3 J10-5 J10-6 J10-7 J10-8 J10-9 J12-4 J12-1 J12-2 J12-3 J12-5 J12-6 J12-7 J12-8 J12-9 J11-10 J11-9 J11-8 J11-7 J11-6 J11-5

SW8 SW7 SW6 SW5 SW4 SW3 SW2 SW1 SW8 SW7 SW6 SW5 SW4 SW3 SW2 SW1

560Ω SR16 10K/3.3K SR15 12 VDC W8 W9 1K (ALL) IN5817 (ALL)

SR17-1 SR18-1 SR17-3 SR18-3 SR17-5 SR18-5 SR17-7 SR18-7 SR17-8 SR18-8 SR17-4 SR18-4 SR17-6 SR18-6 SR17-2 SR18-2

C33 C34 C35 C36 C37 C38 C39 C40 C41 C42 C43 C44 C45 C46 C47 C48

SWITCH MATRIX DRIVES

IJ8-1 ST1 IJ8-2 ST2 IJ8-3 ST3 IJ8-4 ST4 IJ8-5 ST5 IJ8-7 ST6 IJ8-8 ST7 IJ8-9 ST8 IJ8-6 KEY

1.0K SR9 4.7K SR8

Q7 2N3904 Q8 2N3904 Q9 2N3904 Q10 2N3904 Q11 2N3904 Q12 2N3904 Q13 2N3904 Q14 2N3904

R122 1.5K R123 1.5K R124 1.5K R125 1.5K R126 1.5K R127 1.5K R128 1.5K R129 1.5K

ALL 4011 U52 U53 U55 U50 U51 U51 U51 U51

F/LS 244 U45 PB0 PB1 PB2 PB3 PB4 PB5 PB6 PB7

R161 4.7K R160 4.7K R169 4.7K R136 4.7K

U15 PIA 6821 3000 U14 PIA 6821 2400

U46 LS374 2200

1D4 RESET 1A4 IRQ' 1D4 VMA-A13 1B4 R/W 1B4 E 3C4, 1D4 ADDRESS BUS 3C4, 1D4 DATA BUS

U42 LS10 U16 LS32

1B4 BLANKING 1A2 SOLENOID DRIVES

SOLENOID DRIVES

U61 7408 U60 7408 U56 7408 U57 7408 U54 7408 U53 7408

SR3-6 560Ω SR3-7 560Ω SR3-8 560Ω SR3-9 560Ω SR3-3 560Ω SR3-2 560Ω SR3-4 560Ω SR3-5 560Ω SR1-6 560Ω SR1-7 560Ω SR1-8 560Ω SR1-9 560Ω SR1-2 560Ω SR1-3 560Ω SR1-4 560Ω SR1-5 560Ω

R50 68Ω 1/2W R14 68Ω 1/2W R47 68Ω 1/2W R15 68Ω 1/2W R116 68Ω 1/2W R159 68Ω 1/2W R158 68Ω 1/2W R157 68Ω 1/2W R153 68Ω 1/2W R154 68Ω 1/2W R155 68Ω 1/2W R156 68Ω 1/2W R164 68Ω 1/2W R165 68Ω 1/2W R166 68Ω 1/2W R167 68Ω 1/2W

Q66 2N4401 Q67 2N4401 Q68 2N4401 Q69 2N4401 Q62 2N4401 Q63 2N4401 Q64 2N4401 Q65 2N4401 Q70 2N4401 Q71 2N4401 Q72 2N4401 Q73 2N4401 Q43 2N4401 Q44 2N4401 Q45 2N4401 Q46 2N4401

TIP122 Q58 Q59 Q60 Q61 Q54 Q55 Q56 Q57 Q39 Q40 Q41 Q42 Q47 Q48 Q49 Q50

2.7K SR20-10 2.7K SR20-8 2.7K SR20-9 2.7K SR20-7 2.7K SR20-2 2.7K SR20-3 2.7K SR20-5 2.7K SR20-4 2.7K SR2-7 2.7K SR2-8 2.7K SR2-9 2.7K SR2-10 2.7K SR2-3 2.7K SR2-2 2.7K SR2-5 2.7K SR2-4

SOL13 IJ12-6 SOL14 IJ12-7 SOL15 IJ12-8 SOL16 IJ12-9 SOL9 IJ12-1 KEY IJ12-3 SOL11 IJ12-4 SOL12 IJ12-5 SOL5 IJ11-6 SOL6 IJ11-7 SOL7 IJ11-8 SOL8 IJ11-9 SOL1 IJ11-1 KEY IJ11-2 SOL2 IJ11-3 SOL3 IJ11-4 SOL4 IJ11-5

LAMP GND RETURN IJ5-5 N.C. IJ5-2 KEY IJ5-9 IJ5-8 IJ5-7 IJ5-6 IJ5-4 IJ5-3 IJ5-1

LAMP VOLTAGE IJ4-1 IJ4-2 IJ4-3 KEY IJ4-4 IJ4-5 IJ4-6 KEY IJ4-7 IJ4-8 IJ4-9

C52 .1 C51 .1 L3 4.7μH 18VDC

18 VDC

SR4-2 4.7K SR4-3 4.7K SR4-4 4.7K SR4-5 4.7K SR4-6 4.7K SR4-7 4.7K SR4-8 4.7K SR4-9 4.7K

SR5-2 2.2K SR5-3 2.2K SR5-4 2.2K SR5-6 2.2K SR5-10 2.2K SR5-8 2.2K SR5-9 2.2K SR5-7 2.2K

R101 27Ω 2W R103 27Ω 2W R105 27Ω 2W R107 27Ω 2W R109 27Ω 2W R111 27Ω 2W R113 27Ω 2W R115 27Ω 2W

Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 2N6427 (8)

Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30 TIP42

STROBE1 IJ7-1 STROBE2 IJ7-2 STROBE3 IJ7-3 STROBE4 IJ7-4 KEY IJ7-5 STROBE5 IJ7-6 STROBE6 IJ7-7 STROBE7 IJ7-8 STROBE8 IJ7-9

LAMP RETURN

U58 7406 U59 7406

R176 1.2K R177 1.2K R178 1.2K R179 1.2K R180 1.2K R181 1.2K R182 1.2K R183 1.2K

SR19-2 6.8K SR19-3 6.8K SR19-6 6.8K SR19-7 6.8K SR19-10 6.8K SR19-9 6.8K SR19-4 6.8K SR19-8 6.8K

D5 IN4001 D8 IN4001 D11 IN4001 D14 IN4001 D17 IN4001 D20 IN4001 D23 IN4001 D26 IN4001

D21 IN4001 D24 IN4001 D27 IN4001 D28 IN4001

S1 2N5060 S3 2N5060 S4 2N5060 S5 2N5060 S6 2N5060 S7 2N5060 S8 2N5060

Q31 TIP122 Q32 TIP122 Q33 TIP122 Q34 TIP122 Q35 TIP122 Q36 TIP122 Q37 TIP122 Q38 TIP122

R133 1K R134 1K R135 1K R136 1K R137 1K R138 1K R139 1K R140 1K

R141 .4Ω 3W R142 .4Ω 3W R143 .4Ω 3W R144 .4Ω 3W R145 .4Ω 3W R146 .4Ω 3W R147 .4Ω 3W R148 .4Ω 3W

C43 .1uF C44 .1uF C45 .1uF C46 .1uF C47 .1uF C48 .1uF C49 .1uF C50 .1uF

IJ6-1 LR1 IJ6-2 LR2 IJ6-3 LR3 IJ6-4 KEY IJ6-5 LR4 IJ6-6 LR5 IJ6-7 LR6 IJ6-8 LR7 IJ6-9 LR8

1B1 SOLENOID GROUND IJ13-1 IJ13-2 IJ13-3 IJ13-4

ITEM	PART NUMBER	DESCRIPTION	QTY
PROJ. ENGR. S. HERSCHLER		DO NOT SCALE WORK TO DIMENSIONS SHOWN	
DWN. BY J. TURKINGTON DATE 9/11/84		FIRST PROJECT NO 530	
CHECKED BY S.H. DATE 9/21/84		FIRST USAGE D-10534	QTY —
APPROVAL R/W DATE 9-18-84			

REMOVE BURRS – BREAK SHARP EDGES

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONAL ±1/64 ANGULAR ±1° DECIMAL .XX ±.005 FILLETS .020 MAX

MATERIAL X

ITEM	PART NUMBER	DESCRIPTION	QTY

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

NAME SCHEMATIC, CPU SYS 9

SCALE X SHT 2 OF 3 PART NO. 16-8923 REV

16-8923

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	NPR	13192 9-19-84

LOGIC POWER

1D4 RESET

IJ17 -7 N.C.

IJ17 -6

IJ17 -5

IJ17 -4

IJ17 -3

IJ17 -2

IJ17 -1

IJ17 -8

IJ17 -9

1D4 *12

L2 4.7μh

+5VDC

C4 .001μf

C5 100μf

C6 .001μf

D2 IN5817

D3 IN4148

B1 B2 B3

RESET

R173 1K

R172 4.7K

Q52 2N3904

R171 10K

C7 100μf

C8 .001

-12V UNREG

CMOS B+

U18 5517AP/8416

U19 2732

U20 2764/27128/2732A

U43 74LS04

1C4,2B4 DATA BUS

1C4,2C4 ADDRESS BUS

1C3 CS5@@@

1C3 CS2@@@

1C4 4MHZ

1B4 CE CMOS

1B4 R/W + MEM. PROT.

1B4 E

SOUND SELECT INPUTS

1A2

1A3

1D4 RESET

U12 6810

U11 6802/08

SA10-7 1K

SA10-2 1K

SA10-8 1K

SA10-5 1K

SA10-6 1K

SA10-3 1K

DIAGNOSTIC SWITCH SW2

W1 W2

.01 C42

U28 LS10

U55 LS04

U50 LS138

U49 2764/27128

U48 1408

U13 2002

U59 2002

3.3K R70

.01 C30

47pf C31

-12V R77 3.3M

+5V R78 3.3K

R79 3.3K

C32 10 MFD.

Q51 2N3904

W10

R76 5.6K

N.C.

SPEECH CLK

SPEECH DATA

+12

C26 .1

C24 470μf

C29 .1μf

R75 1K

C28 .001

R71 1Ω 1/2W

R72 220 1/2W

R73 2.2Ω

.1μf C25

100μf C53

R74 1K

SPEAKER 8 OHM

IJ15-1 IJ15-2 IJ15-3 IJ15-4

IJ16-2 IJ16-1 IJ16-3 IJ16-4

VOLUME CONTROL

ITEM	PART NUMBER	DESCRIPTION	QTY

ITEM	PART NUMBER	DESCRIPTION	QTY

PROJ ENGR S.HERSCHLER

DWN BY DATE

CHECKED BY DATE 9/21/84

APPROVAL DATE 9-18-84

DO NOT SCALE WORK TO DIMENSIONS SHOWN

FIRST PROJECT NO 530

FIRST USAGE D-10534 QTY

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 SCHEMATIC, CPU SYSTEM-9

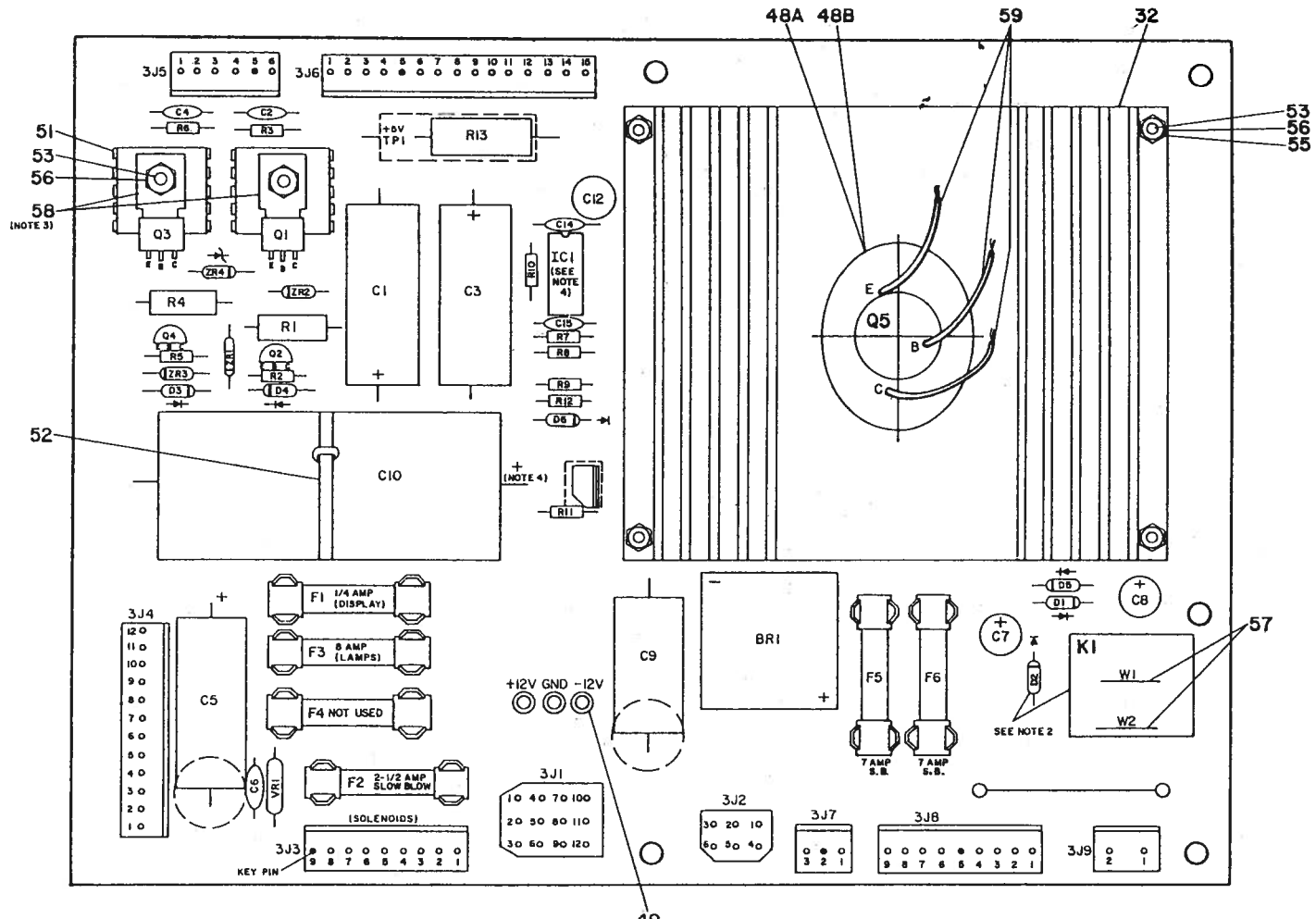
SCALE 1

SHT 3 OF 10

PART NO 16-8923

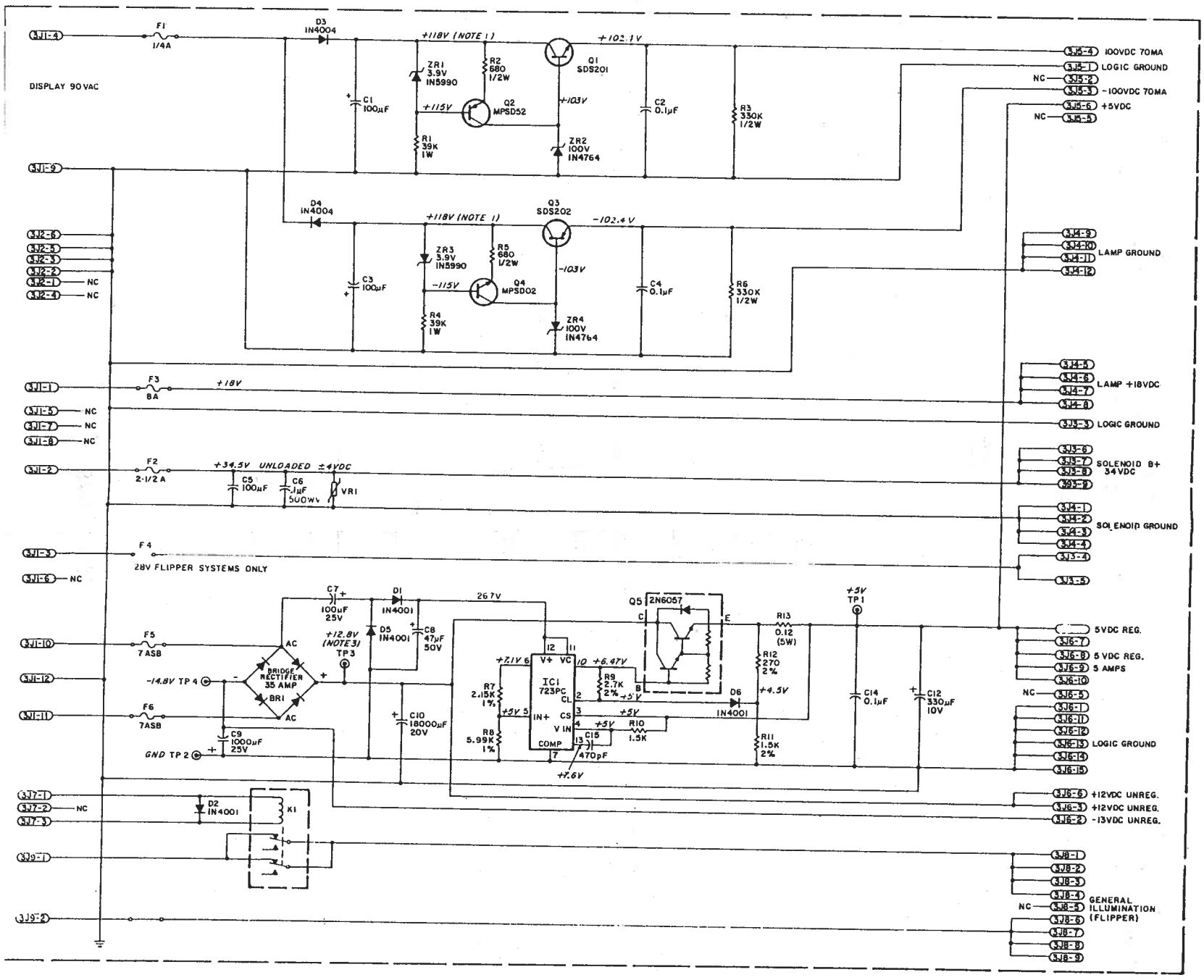
RFV

16-8923



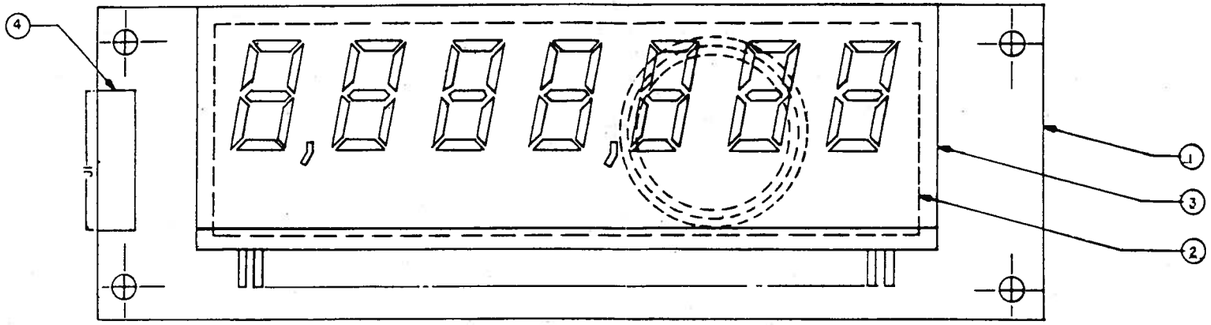
ITEM NO.	PART NO.	DESIGNATION	DESCRIPTION
1	5765-09446-00		Bare P.C. Board
2	5013-09426-00	R7	Resistor, 2.15K, 1%, 1/4 W, Metal Film
3	5010-09427-00	R8	Resistor, 5.99K, 1%, 1/4 W, Metal Film
4	5010-09427-00	R11	Resistor, 1.5K, 2%, 1/4 W, Carbon Film
5	5010-09065-00	R10	Resistor, 1.5K, 2%, 1/4 W
6	5010-09543-00	R9	Resistor, 2.7K, 2%, 1/4 W
7	5010-09508-00	R12	Resistor, 270 Ohm, 2%, 1/4 W, Carbon Film
8	5012-09429-00	R13	Power Resistor, 0.12 Ohm, 5%, 5 W
9	5010-09536-00	R1, R4	Resistor, 39K, 5%, 1 W
10	5010-09061-00	R2, R5	Resistor, 680 Ohm, 2 W
11	5010-09069-00	R3, R6	Resistor, 330K, 5%, 1/2 W
12	5048-89819-00	C10	Cap.,Electrolytic, 18,000 MFD, 20V, Axial
13	5040-09420-00	C9	Cap., Electrolytic, 1000 MFD, 25V Radial or Axial
14	5040-09423-00	C12	Cap., Electrolytic, 330 MFD, 10V, Radial
15	5043-09065-00	C15	Cap., 470 pFD
16	5040-89053-00	C1, C3	Capacitor, 100 MFD, Elect.,150V
17	5040-09070	C5	Capacitor, 180 MFD, Elect., 180V, Axial or Radial
18	5043-09072-00		Capacitor, 0.1 MFD, 500V
19	5043-09446-00	C14	Capacitor, 0.1 MFD, 50V, Disc.
20	5070-06258	D1, D2, D5, D6	Diode, IN4001
21	5070-09054-00	D3, D4	Diode, IN4004
22	5075-09059-00	ZR1, ZR3	Zener, IN5993, 3.9V, 5%
23	5075-09068-00	ZR2, ZR4	Zener, IN4764, 100V, 5%
24	5460-09424-00	IC1	Voltage Regulator, MC1723 DC
25	5043-09443-00	C2, C4, C6	Capacitor, 0.1 MFD, 200V, Disc.
26	5040-09421-00	C7	Capacitor, 100 MFD, 25V, Radial
27	5040-09422-00	C8	Capacitor, 47 MFD, 50V, Radial
28	5164-09057-00	Q1	Transistor, SuS201 NPN
29	5164-09056-00	Q4	Transistor, MPSD02 NPN
30	5194-09058-00	Q3	Transistor, SDS202 PNP
31	5194-09055-00	Q2	Transistor, MPSD52 PNP
32	5162-09425-00	Q5	Transistor, Power, 2N6057 NPN
33	5705-09431-00		Heat Sink
34	5791-89074-00	3J6	Connector, 15-pin (d)
35	5791-09027-00	3J3, 3J8	Connector, 9-pin (d)
36	5791-89036-00	3J2	Connector, 6-pin (m)
37	5791-09067-00	3J5	Connector, 6-pin (d)
38	5791-09043-00	3J4	Connector, 12-pin (d)
39	5791-09435-00	3J7	Connector, 3-pin(s)
40	5791-09436-00	3J9	Connector, 2-pin (d)
41	5791-09068-00	3J1	Connector, 12-pin (m)
42	5732-09178-00		Fuse holder
43	5731-09128-00	F2	Fuse, 2-1/2 AMP, S.B.
44	5730-09071-00	F3	Fuse, 8 AMP
45		F4	NOT USED
46	5731-09[illegible]-00	F1	Fuse, 20 AMP
47	5017-09064-00	VR1	Varistor
48A	5780-09445-00		Socket
48B	5701-09652-00		Mica Insulator
48C	5580-09555-00	K1	Relay, 26VDC, 10 AMP, DPDT
49	5424-09248		Terminal, 81302-1 (Test Post)
50	5100-89418-00	BR-1	Bridge Rectifier, 35 AMP, 100V
51	5705-09042-00		Heat Sink
52	03-7520-1		Tie Wrap
53	4005-01014-07		5-40 x 7/16 RH Mach Screw
54	4700-80004-00		.146 x 3/8, 21 GA
55	4700-00023-00		Lw #3, Split
56	4405-01117-00		5-40 Hex Nut
57		W1, W2	Jumper, #18 AWG
58	20-9229		Thermal Compound
59			Lead Wire, #18 AWG (3")
60	5731-09432-00	F5, F5	Fuse, 7 AMP, 5x, 250V

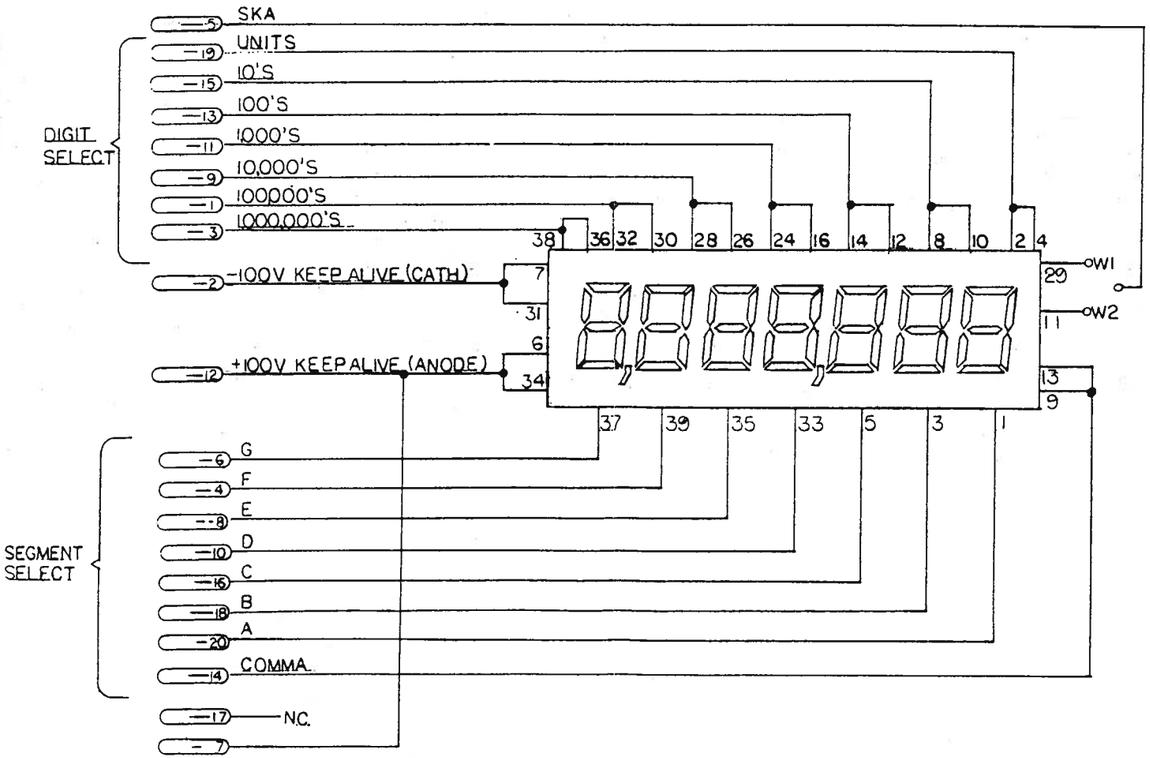
NOTES:
1. HEAT SINK COMPOUND MUST BE APPLIED BETWEEN TRANSISTOR AND HEAT SINK.
2. FOR BLACKOUT AND FUTURE GAME WITH SAME FEATURE REMOVE JUMPERS (W1 & W2) AND INSERT RELAY K1, DIODE D2 AND 3J7.
3. OBSERVE INDEX MARK OF INTEGRATED CIRCUIT, POLARITY OF CAPACITORS, DIODE AND POSITION OF TRANSISTORS.
4. REFERENCE DWG'S: SCHEMATIC 16-8786.



1. DISPLAY VOLTAGE MEASURED WITH DIGITS DISPLAY TEST ON & DISPLAYS AT ALL ZEROS.
2. UNLESS OTHERWISE INDICATED ALL RESISTORS ARE IN OHMS (Ω) 1/4 WATT.
3. TP3, UNREG. +12VDC TYPICAL READOUT NOT TO GO LOWER THAN +10.5V OR INTERMITTENT RESET WILL OCCUR.

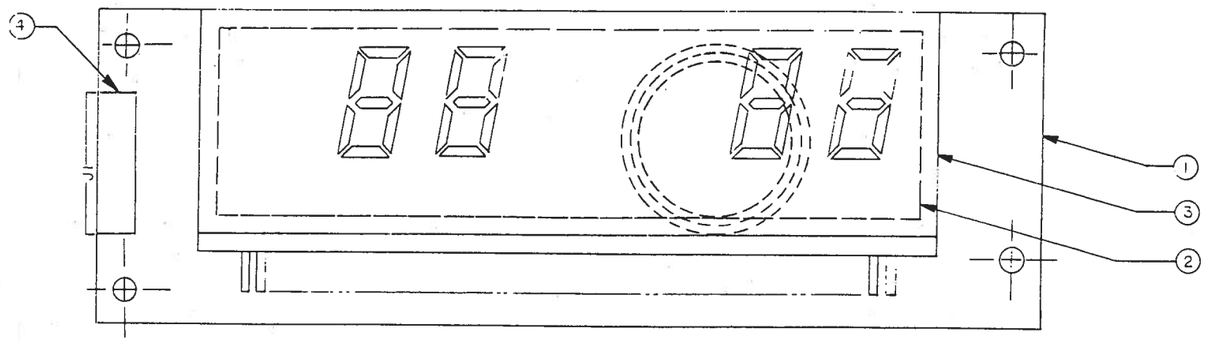
BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D.
1	5762-09448-XP		SLAVE DISPLAY P.C. BOARD	1
2	23-6545		DISPLAY MTG ADHESIVE FOAM	1
3	5670-09428-XP		7 DIGIT DISPLAY	1
4	5791-09428-XP	J1	20 PIN RIBBON HEADER	1
5	03-1573-2		CAPLUG	?

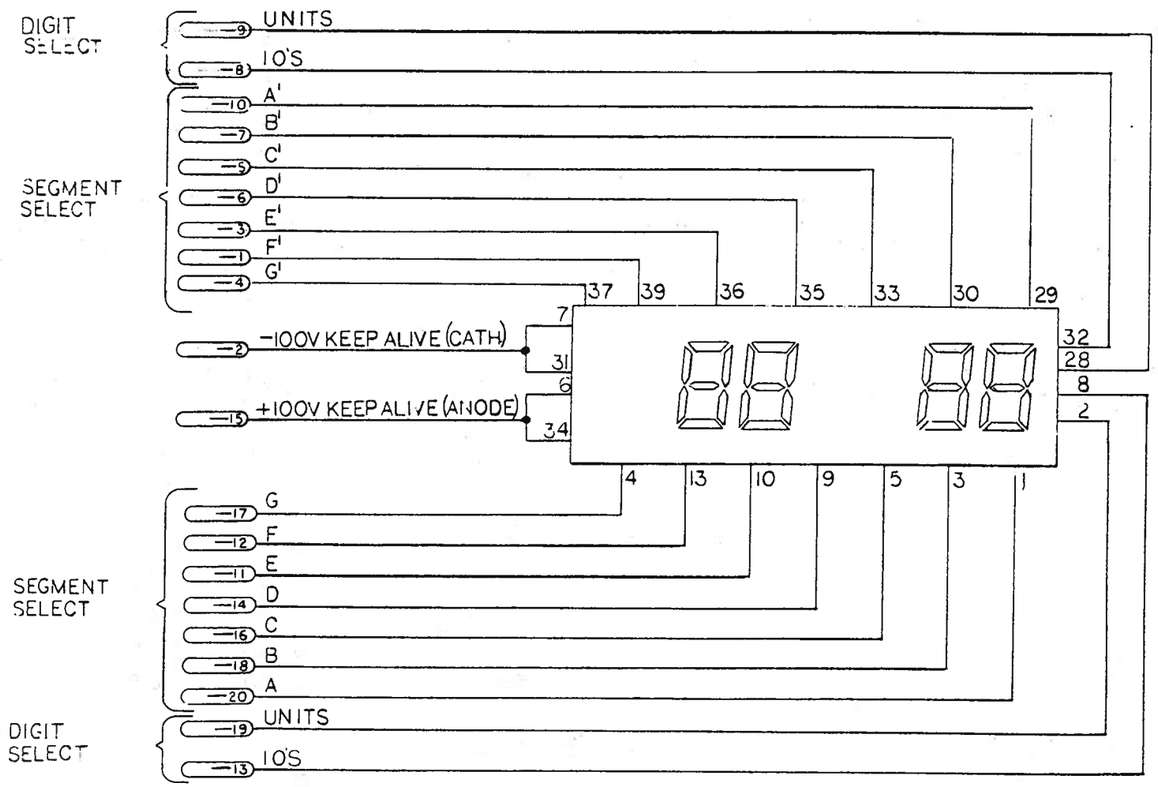




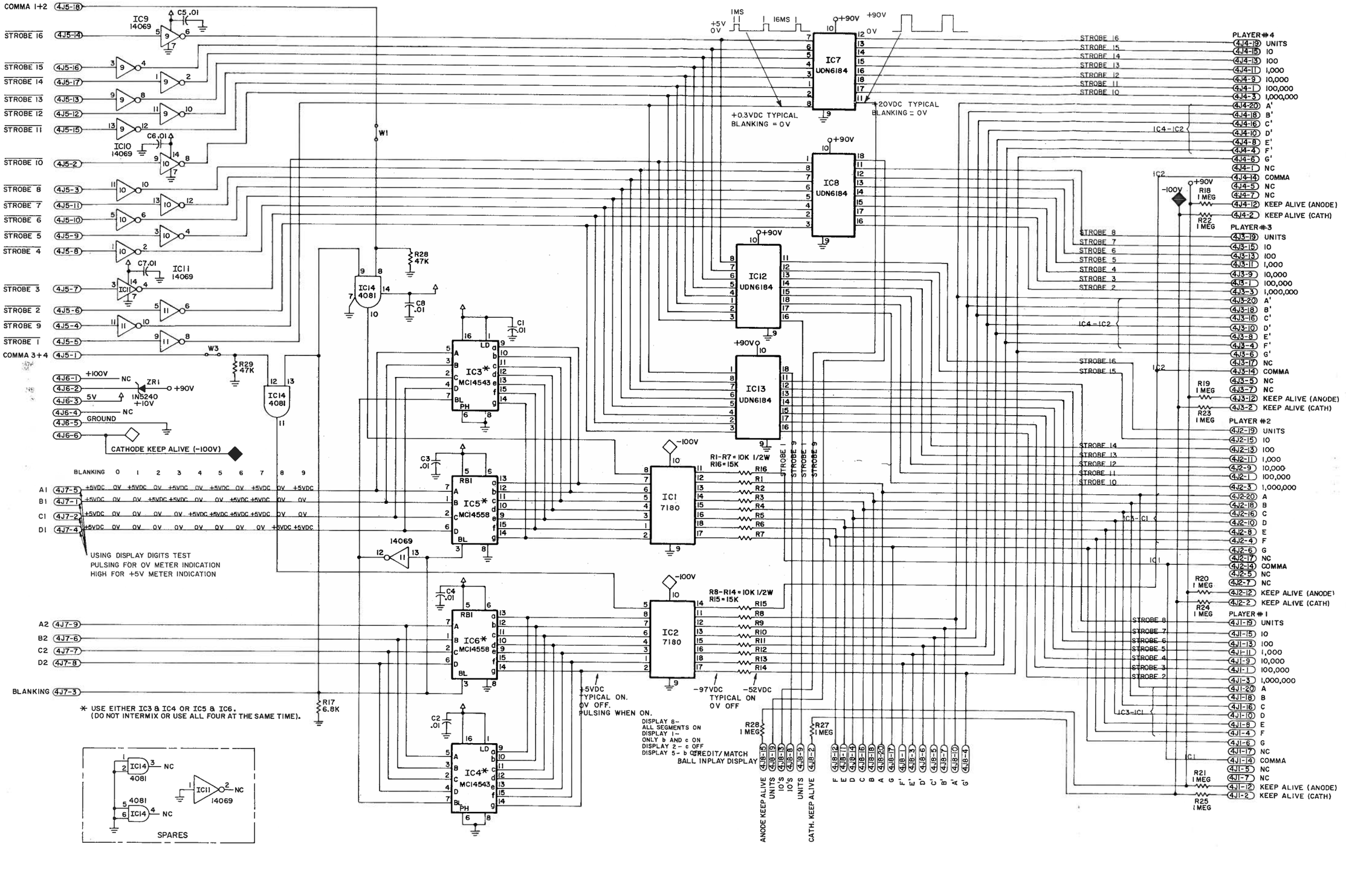
C 8364 PLAYER SLAVE DISPLAY

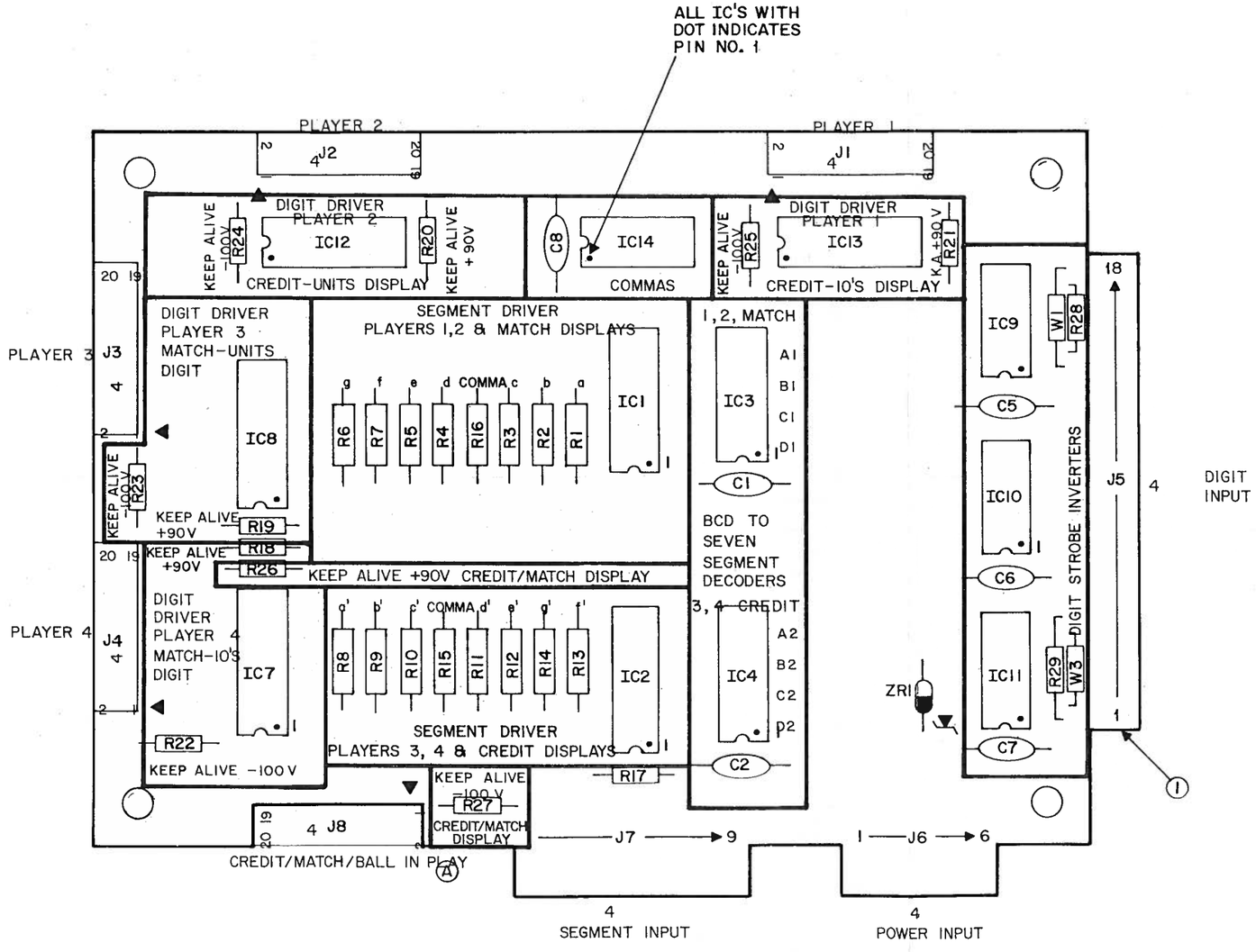
BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D
1	5767-09448-00		CREDIT/MATCH SLAVE P.C. BOARD	1
2	23-6545 -		FOAM DISPLAY - BACK	1
3	5670-09428-00		4 DIGIT DISPLAY	1
4	5791-09428-00	J1	20 PIN RIBBON HEADER	1
5	23-6546		FOAM DISPLAY - FRONT	1
6	03-1573-2		CAPLUG	1





C 8365 CREDIT/MATCH SLAVE DISPLAY


COMMA 1+2 4J5-18
STROBE 16 4J5-14
STROBE 15 4J5-16
STROBE 14 4J5-17
STROBE 13 4J5-13
STROBE 12 4J5-12
STROBE 11 4J5-15
STROBE 10 4J5-2
STROBE 8 4J5-3
STROBE 7 4J5-11
STROBE 6 4J5-10
STROBE 5 4J5-9
STROBE 4 4J5-8
STROBE 3 4J5-7
STROBE 2 4J5-6
STROBE 9 4J5-4
STROBE 1 4J5-5
COMMA 3+4 4J5-1
IC9 14069
IC10 14069
IC11 14069
C5 .01
C6 .01
C7 .01
W1
W3
R28 47K
R29 47K
IC14 4081
C8 .01
4J6-1 +100V
4J6-2 NC
4J6-3 5V
4J6-4 NC
4J6-5 GROUND
4J6-6
ZR1 IN5240 +10V
+90V
CATHODE KEEP ALIVE (-100V)
BLANKING 0 1 2 3 4 5 6 7 8 9
A1 4J7-5 +5VDC 0V +5VDC 0V +5VDC 0V +5VDC 0V +5VDC 0V +5VDC
B1 4J7-1 +5VDC 0V 0V +5VDC +5VDC 0V 0V +5VDC +5VDC 0V 0V
C1 4J7-2 +5VDC 0V 0V 0V 0V +5VDC +5VDC +5VDC +5VDC 0V 0V
D1 4J7-4 +5VDC 0V 0V 0V 0V 0V 0V 0V 0V +5VDC +5VDC
USING DISPLAY DIGITS TEST
PULSING FOR 0V METER INDICATION
HIGH FOR +5V METER INDICATION
A2 4J7-9
B2 4J7-6
C2 4J7-7
D2 4J7-8
BLANKING 4J7-3
* USE EITHER IC3 & IC4 OR IC5 & IC6.
(DO NOT INTERMIX OR USE ALL FOUR AT THE SAME TIME).
R17 6.8K
IC3* MC14543
IC4* MC14543
IC5* MC14558
IC6* MC14558
C1 .01
C2 .01
C3 .01
C4 .01
14069
SPARES
IC14 4081
IC11 14069
+5V 0V
1MS
16MS
+90V
0V
IC7 UDN6184
IC8 UDN6184
IC12 UDN6184
IC13 UDN6184
+0.3VDC TYPICAL BLANKING = 0V
+20VDC TYPICAL BLANKING = 0V
-100V
IC1 7180
IC2 7180
R1-R7 = 10K 1/2W
R16 = 15K
R8-R14 = 10K 1/2W
R15 = 15K
+5VDC TYPICAL ON. 0V OFF. PULSING WHEN ON.
-97VDC TYPICAL ON 0V OFF
-52VDC TYPICAL ON 0V OFF
DISPLAY 8- ALL SEGMENTS ON
DISPLAY 1- ONLY b AND c ON
DISPLAY 2 - c OFF
DISPLAY 5 - b OFF
CREDIT/MATCH
BALL IN PLAY DISPLAY
R28 1 MEG
R27 1 MEG
ANODE KEEP ALIVE
UNITS
10'S
10'S
UNITS
CATH. KEEP ALIVE
STROBE 16
STROBE 15
STROBE 14
STROBE 13
STROBE 12
STROBE 11
STROBE 10
STROBE 8
STROBE 7
STROBE 6
STROBE 5
STROBE 4
STROBE 3
STROBE 2
STROBE 1
STROBE 9
IC4-IC2
IC3-IC1
IC2
IC1
-100V
+90V
R18 1 MEG
R22 1 MEG
R19 1 MEG
R23 1 MEG
R20 1 MEG
R24 1 MEG
R21 1 MEG
R25 1 MEG
PLAYER #4
4J4-19 UNITS
4J4-15 10
4J4-13 100
4J4-11 1,000
4J4-9 10,000
4J4-1 100,000
4J4-3 1,000,000
4J4-20 A'
4J4-18 B'
4J4-16 C'
4J4-10 D'
4J4-8 E'
4J4-4 F'
4J4-6 G'
4J4-1 NC
4J4-14 COMMA
4J4-5 NC
4J4-7 NC
4J4-12 KEEP ALIVE (ANODE)
4J4-2 KEEP ALIVE (CATH)
PLAYER #3
4J3-19 UNITS
4J3-15 10
4J3-13 100
4J3-11 1,000
4J3-9 10,000
4J3-1 100,000
4J3-3 1,000,000
4J3-20 A'
4J3-18 B'
4J3-16 C'
4J3-10 D'
4J3-8 E'
4J3-4 F'
4J3-6 G'
4J3-17 NC
4J3-14 COMMA
4J3-5 NC
4J3-7 NC
4J3-12 KEEP ALIVE (ANODE)
4J5-2 KEEP ALIVE (CATH)
PLAYER #2
4J2-19 UNITS
4J2-15 10
4J2-13 100
4J2-11 1,000
4J2-9 10,000
4J2-1 100,000
4J2-3 1,000,000
4J2-20 A
4J2-18 B
4J2-16 C
4J2-10 D
4J2-8 E
4J2-4 F
4J2-6 G
4J2-17 NC
4J2-14 COMMA
4J2-5 NC
4J2-7 NC
4J2-12 KEEP ALIVE (ANODE)
4J2-2 KEEP ALIVE (CATH)
PLAYER #1
4J1-19 UNITS
4J1-15 10
4J1-13 100
4J1-11 1,000
4J1-9 10,000
4J1-1 100,000
4J1-3 1,000,000
4J1-20 A
4J1-18 B
4J1-16 C
4J1-10 D
4J1-8 E
4J1-4 F
4J1-6 G
4J1-17 NC
4J1-14 COMMA
4J1-5 NC
4J1-7 NC
4J1-12 KEEP ALIVE (ANODE)
4J1-2 KEEP ALIVE (CATH)



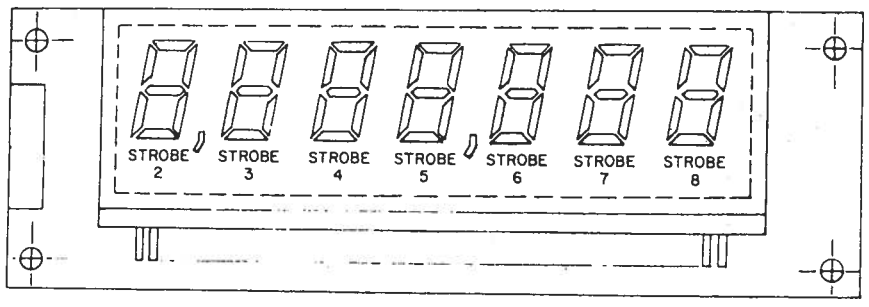
BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5760-09461		BARE P.C. BOARD	1
2	5310-08971	IC9,IC10,IC11	MC14069 HEX INVERTER	3
3	5310-08970	IC3, IC4	MC14543 BCD TO SEVEN SEGMENT LATCH/DECODER/DRIVER	2
4	5680-08969	IC1, IC2	UDN-7180 GAS DISCHARGE DISPLAY SEGMENT DRIVER	2
5	5680-08968	IC7,IC8,IC12,IC13	UDN-6184A OR UDN-6118A GAS DISCHARGE DISPLAY SEGMENT DR.	4
6	5310-09450	IC14	MC14081 QUAD 2-INPUT AND GATE	1
7	5010-08981	R1-R14	RESISTOR,FC,10K OHM, 5%, 1/2 WATT	14
8	5075-09135	ZR1	IN4740A ZENER DIODE 10V, 5%, 1 WATT	1
9	5043-08980	C1,C2 C5 THRU C8	CAPACITOR, CERAMIC, 0.01 MFD., 50V, +80 -20%	6
10	5010-09035	R28, R29	RESISTOR, FC,47K OHM, 5%, 1/4 WATT	2
11	5010-09086	R17	RESISTOR, FC, 6.8K OHM, 5%, 1/4 WATT	1
12	5010-08982	R18 THRU R27	RESISTOR, FC, 3 MEG. OHM, 5%, 1/4 WATT	10
13	5791-09437	J1 THRU J4, J8	20 PIN RIBBON HEADER	5
14	5010-09149	R15, R16	RESISTOR, FC, 15K OHM, 5%, 1/2 WATT	2
15	5010-09534	W1, W3	RESISTOR, 0 OHM	2

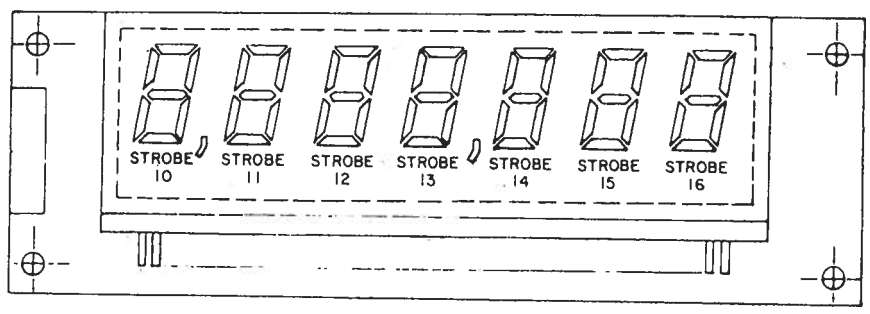
DIGIT CROSS REFERENCE

DIGIT	7-SEGMENT DECODER/DRIVER	STROBE (DRIVER)
Credit 10's	IC4/IC2	1 (IC13)
Credit Units	IC4/IC2	9 (IC12)
Match 10's	IC3/IC1	1 (IC7)
Match Units	IC3/IC1	9 (IC8)
#1 1,000,000	IC3/IC1	2 (IC13)
#1 100,000's	IC3/IC1	3 (IC13)
#1 10,000's.	IC3/IC1	4 (IC13)
#1 1,000's	IC3/IC1	5 (IC13)
#1 100's	IC3/IC1	6 (IC13)
#1 10's	IC3/IC1	7 (IC13)
#1 Units	IC3/IC1	8 (IC13)
#2 1,000,000's	IC3/IC1	10 (IC12)
#2 100,000's	IC3/IC1	11 (IC12)
#2 10,000's	IC3/IC1	12 (IC12)
#2 1,000's	IC3/IC1	13 (IC12)
#2 100's	IC3/IC1	14 (IC12)
#2 10's	IC3/IC1	15 (IC12)
#2 Units	IC3/IC1	16 (IC12)
#3 1,000,000's	IC4/IC2	2 (IC8)
#3 100,000's	IC4/IC2	3 (IC8)
#3 10,000's	IC4/IC2	4 (IC8)
#3 1,000's	IC4/IC2	5 (IC8)
#3 100's	IC4/IC2	6 (IC8)
#3 10's	IC4/IC2	7 (IC8)
#3 Units	IC4/IC2	8 (IC8)
#4 1,000,000's	IC4/IC2	10 (IC7)
#4 100,000's	IC4/IC2	11 (IC7)
#4 10,000's	IC4/IC2	12 (IC7)
#4 1,000's	IC4/IC2	13 (IC7)
#4 100's	IC4/IC2	14 (IC7)
#4 10's	IC4/IC2	15 (IC7)
#4 Units	IC4/IC2	16 (IC7)
#1 Comma	-/IC1	2,5 (IC13)
#2 Comma	-/IC2	10,13 (IC12)
#3 Comma	-/IC1	2,5 (IC8)
#4 Comma	-/IC2	10,13 (IC7)

PLAYERS #1 AND 3



PLAYERS #2 AND 4



4J1/5J1 (PLAYER 1)

1	100,000's
2	-100V KEEP ALIVE
3	1,000,000's
4	f SEGMENT
5	N/C
6	g SEGMENT
7	+100V (N/C)
8	e SEGMENT
9	10,000's
10	d SEGMENT
11	1,000's
12	+100V KEEP ALIVE
13	100's
14	COMMA
15	10's
16	c SEGMENT
17	N/C
18	b SEGMENT
19	UNITS
20	a SEGMENT

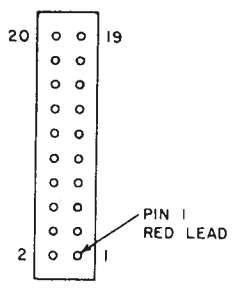
4J2/5J2 (PLAYER 2)

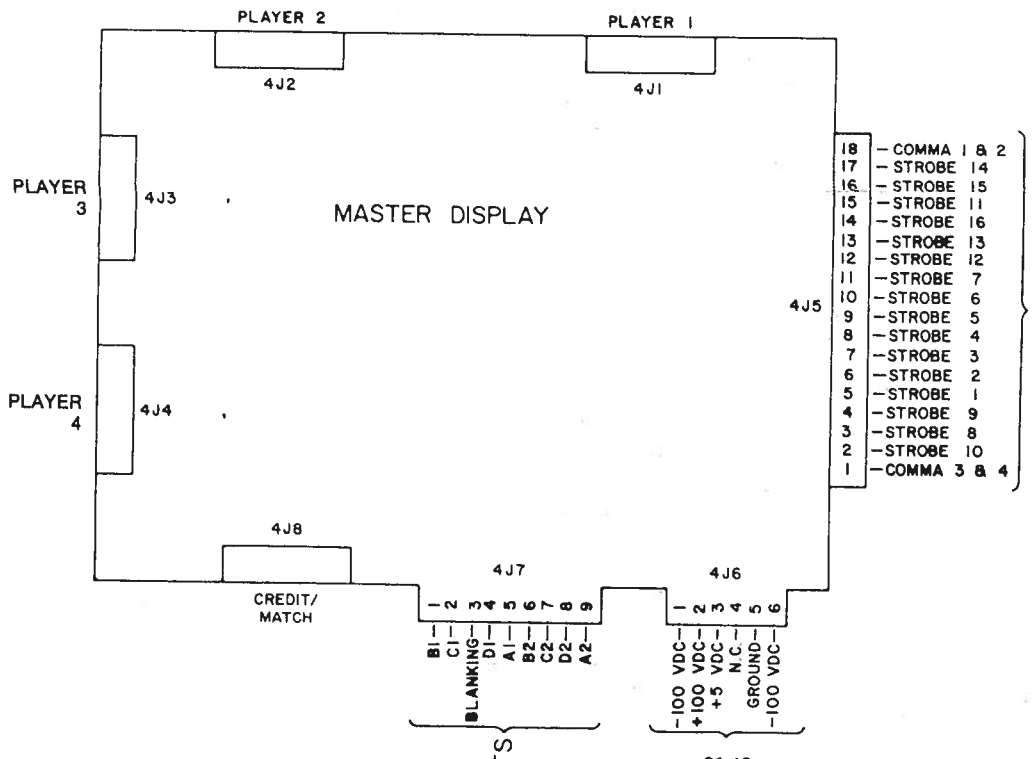
1	100,000's
2	-100V KEEP ALIVE
3	1,000,000's
4	f' SEGMENT
5	N/C
6	g' SEGMENT
7	+100V (N/C)
8	e' SEGMENT
9	10,000's
10	d' SEGMENT
11	1,000's
12	+100V KEEP ALIVE
13	100's
14	COMMA
15	10's
16	c' SEGMENT
17	N/C
18	b' SEGMENT
19	UNITS
20	a' SEGMENT

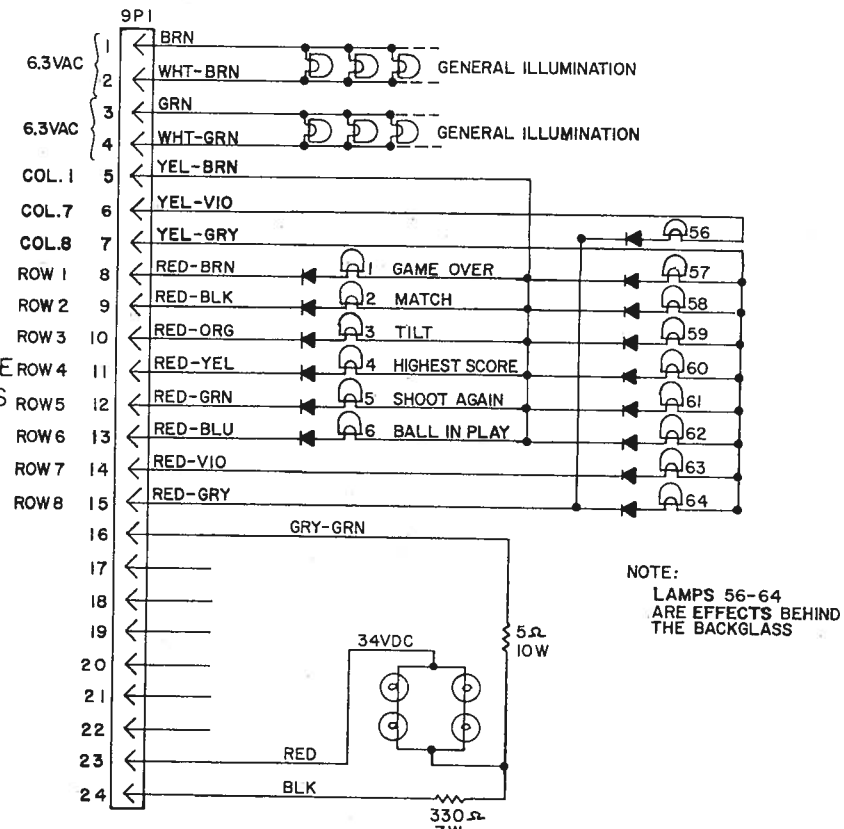
4J8/5J5 (CREDIT/MATCH)

1	f' Segment (Credit)	
2	-100V Keep Alive	
3	e' Segment	Credit
4	g' Segment	
5	c' Segment	
6	d' Segment	
7	b' Segment	
8	10's	
9	Units	
10	a' Segment	
11	e Segment	Match
12	f Segment	
13	10's	
14	d Segment	
15	+100V Keep Alive	
16	c Segment	Match
17	g Segment	
18	b Segment	
19	Units	
20	a Segment	

DETAIL A
4J1 – 4J4, 4J8
5J1 – 5J5
CONNECTORS

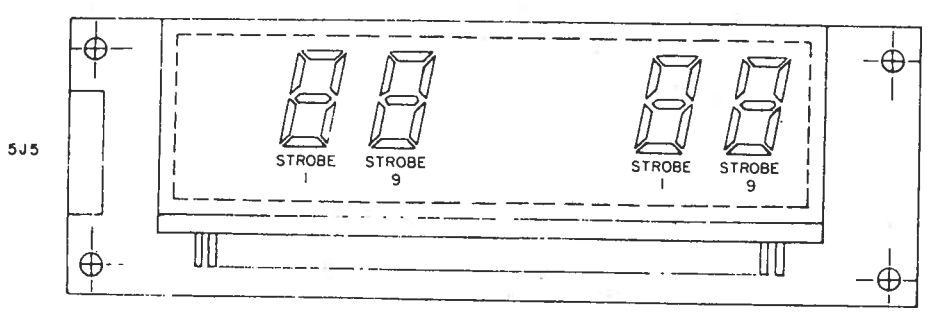






NOTE:
LAMPS 56-64 ARE EFFECTS BEHIND THE BACKGLASS

CREDITS / BALL IN PLAY



POWER WIRING

7TI (5610-09563-00)

NOTES:

1. FOR 105 OR 117 V.A.C., 8A FUSE AND 130V. VARISTOR 5017-09044 ARE USED.
2. FOR 210 OR 235V.A.C., 4A FUSE AND 275V. VARISTOR 5017-09063 ARE USED.
3. JUMPER WIRES ON 7P3 AND 7P5 SHOWN WITH SOLID LINES ARE CONNECTED FOR 117 V.A.C. OPERATION. ONLY THE ONE SHOWN WITH A DASHED LINE IS CONNECTED FOR 220V.A.C. OPERATION.
4. FOR LOW-LINE CONDITIONS (105 OR 210 V.A.C.) MOVE BLK-WHT WIRE FROM 7TI-4 TO 7TI-3 AND MOVE 2 WHT-RED WIRES FROM 7TI-8 TO 7TI-7.

A.C. FUSE
LINE PLUG
BLK
VRI
WHT
UTILITY OUTLET
GRN
LFI LINE FILTER
LINE
LOAD
ON-OFF SWITCH
7P4 7J4
7P3 7J3
WHT-RED
N.C.
YEL
BLK-WHT
BRN-WHT
NOTE 3
NOTE 4
9 WHT
90 V.A.C.
10 WHT
15 GRY
9.3 V.A.C.
18 GRY-WHT
16 GRY-GRN
11 BLU
13.5 V.A.C.
12 BLU
13 RED
25.5 V.A.C.
14 RED
17 YEL
6.3 V.A.C.
19 YEL
P/O 6P1
P/O 6J1
LAMP RECTIFIER
6BRI
6BR2
A.C.
+ 6CI
30,000µF
ORG
VIO
3P1
3P2
3P9
N.C.
KI SPECIAL RELAY
3J1
F1 0.25ASB
+100V.D.C. -100V.D.C. SUPPLIES
+100V.D.C.
-100V.D.C
F5 7ASB
+5V.D.C. +12V.D.C. -12V.D.C. SUPPLIES
+5V.D.C.
+12V.D.C.
-12V.D.C.
F6 7ASB
F3 8ASB
+18V.D.C.
F2 2.5ASB
SOLENOID B+
+34V.D.C.
FOR +34V FLIPPERS
F4
NOT USED
3J2
3J9
POWER SUPPLY BOARD
3J5
3P5
4P7
BRN
ORG.WHT-BLK
GRY
BLK
MASTER DISPLAY
3J3
3P3
8P3
35 SPEC. SW. GND
36 SOL. B+
PLAYFIELD
7P1
3 SOL. B+ CABINET
9P1
24
3J4
3P4
1P4
+16V.D.C. LAMP B+
DRIVER BOARD
KEY
1P5
LAMP GROUND DRIVER BOARD
BLU
BLK
3J6
3P6
GRY
GRY-WHT
GRY-YEL
1P13
SOLENOID GROUND
1P17
GROUND
+5V.D.C.
C.P.U. BOARD
-12V.D.C.
+12V.D.C.
UNREG.
3J8
3P8
WHT-VIO
WHT-YEL
WHT-BRN
WHT-GRN
YEL
VIO
GRN
BRN
5A SB
8J8
8P8
8P5
PLAYFIELD ILLUM.
7P1
COIN DOOR
9P1
INSERT DOOR
7P5 7J5
7T2(5610-10355-00)
10 WHT-GRN
48Vrms
9 WHT-ORG
48Vrms
15P4
15J4
15P2
15J2
15J3
15P3
F2 5ASB
BRI
C1 100
C3 0.1
+50V.D.C.
WI
23
24
FLIPPER B+ PLAYFIELD
FLIPPER POWER SUPPLY

System 9 Lamp-Matrix Table

COLUMN / ROW	1 YEL-BRN 1J7-1	2 YEL-RED 1J7-2	3 YEL-ORN 1J7-3	4 YEL-BLK 1J7-4	5 YEL-GRN 1J7-6	6 YEL-BLU 1J7-7	7 YEL-VIO 1J7-8	8 YEL-GRY 1J7-9
1 RED-BRN 1J6-1	Game Over Lamp 1	S 9	A 17	Right Drain 25	1 33	9 41	2X 49	Backglass Effect 57
2 RED-BLK 1J6-2	Match 2	O 10	B 18	Left Flipper Ret. 26	2 34	10 42	4X 50	Backglass Effect 58
3 RED-ORN 1J6-3	Tilt 3	R 11	C 19	Right Flipper Ret. 27	3 35	20 43	6X 51	Backglass Effect 59
4 RED-YEL 1J6-5	High-Score-To-Date 4	C 12	D 20	All Scores 2X 28	4 36	30 44	8X 52	Backglass Effect 60
5 RED-GRN 1J6-6	Shoot Again (Insert) 5	E 13	Extra Ball 21	All Scores 3X 29	5 37	40 45	Left Drop-Tgt 53	Backglass **SORCERER** art 61
6 RED-BLU 1J6-7	Ball-In-Play 6	R 14	Bonus Hold Over 22	All Scores 5X 30	6 38	50 46	Center Drop-Tgt 54	Backglass **SORCERER** art 62
7 RED-VIO 1J6-8	Shoot Again (Pfld) 7	E 15	Demon 23	Light Below "S" 31	7 39	Lock 47	Right Drop-Tgt 55	Backglass **SORCERER** art 63
8 RED-GRY 1J6-9	Play-field Special 8	R 16	Left Drain 24	Light Below "R" 32	8 40	Release 48	Backglass Effect 56	Backglass **SORCERER** art 64

System 9 Switch-Matrix Table

COLUMN / ROW	1 GRN-BRN 1J8-1	2 GRN-RED 1J8-2	3 GRN-ORN 1J8-3	4 GRN-YEL 1J8-4	5 GRN-BLK 1J8-5	6 GRN-BLU 1J8-7	7 GRN-VIO 1J8-8	8 GRN-GRY 1J8-9
1 WHT-BRN 1J10-9	Plumb-Tilt 1	Left Spinner S 9	A 17	Right Drain 25	Right Kicker 33	Not Used 41	Not Used 49	Not Used 57
2 WHT-RED 1J10-8	Ball-Roll Tilt 2	O 10	B 18	Left Flpr Ret. 26	Left Drop-Tgt 34	UPR-L Switch 42	Not Used 50	Not Used 58
3 WHT-ORN 1J10-7	Credit Button 3	R 11	C 19	Right Flpr Ret. 27	Center Drop-Tgt 35	Lane Switch 43	Not Used 51	Not Used 59
4 WHT-YEL 1J10-6	Right Coin 4	C 12	D 20	Outhole 28	Right Drop-Tgt 36	Lane Change 44	Not Used 52	Not Used 60
5 WHT-GRN 1J10-5	Center Coin 5	E 13	Left Jet 21	Ramp 1 29	Multi-Ball Ramp 37	Play-Field Tilt 45	Not Used 53	Not Used 61
6 WHT-BLU 1J10-3	Left Coin 6	R 14	Lower Jet 22	Ramp 2 30	Multi Ball SW 38	Not Used 46	Not Used 54	Not Used 62
7 WHT-VIO 1J10-2	Slam Tilt 7	E 15	Right Jet 23	Shooter Lane SW 31	Lower Right SW 39	Not Used 47	Not Used 55	Not Used 63
8 WHT-GRY 1J10-1	High-Score Reset 8	Right Spinnter R 16	Left Drain 24	Left Kicker SW 32	Lower Left SW 40	Not Used 48	Not Used 56	Not Used 64

Warnings & Notices

WARNING

FOR SAFETY AND RELIABILITY, ***WILLIAMS*** does not recommend or authorize any substitute parts or modifications of ***WILLIAMS*** equipment.

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NOTICE

SORCERER, MULTI-BALL and ***LANE CHANGE*** are trademarks of ***WILLIAMS ELECTRONICS, INC.***

WARNING

FCC STICKER. Check the back of your game to see that an FCC-certification sticker was attached to your game at the factory.

All games that leave ***WILLIAMS'*** plants have been tested and found to comply with FCC Rules. As the sticker is proof of this fact, *legal repercussions to the owner and distributor of the game* may result if the sticker is missing.

If you receive any ***WILLIAMS*** game (manufactured after December 1982) that has no FCC sticker, call ***WILLIAMS*** for advice or write us a note on your game-registration card. *Be sure the card bears your game's serial number.*

CAUTION

RAISING THE PLAYFIELD. Take special care when raising the ***SORCERER*** playfield. This game has several fragile plastic pieces above the level of the playfield. If the weight of the playfield were to rest against them, these pieces might break.

CAUTION

BACKBOX SETUP. When you raise the Backbox into its upright position, be careful not pinch the cable assemblies in either the hinge or in the surface between the Backbox and the playfield cabinet. A pinched cable assembly can adversely affect the game's operation or result in severed wires.

RF-INTERFERENCE NOTICE

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

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

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