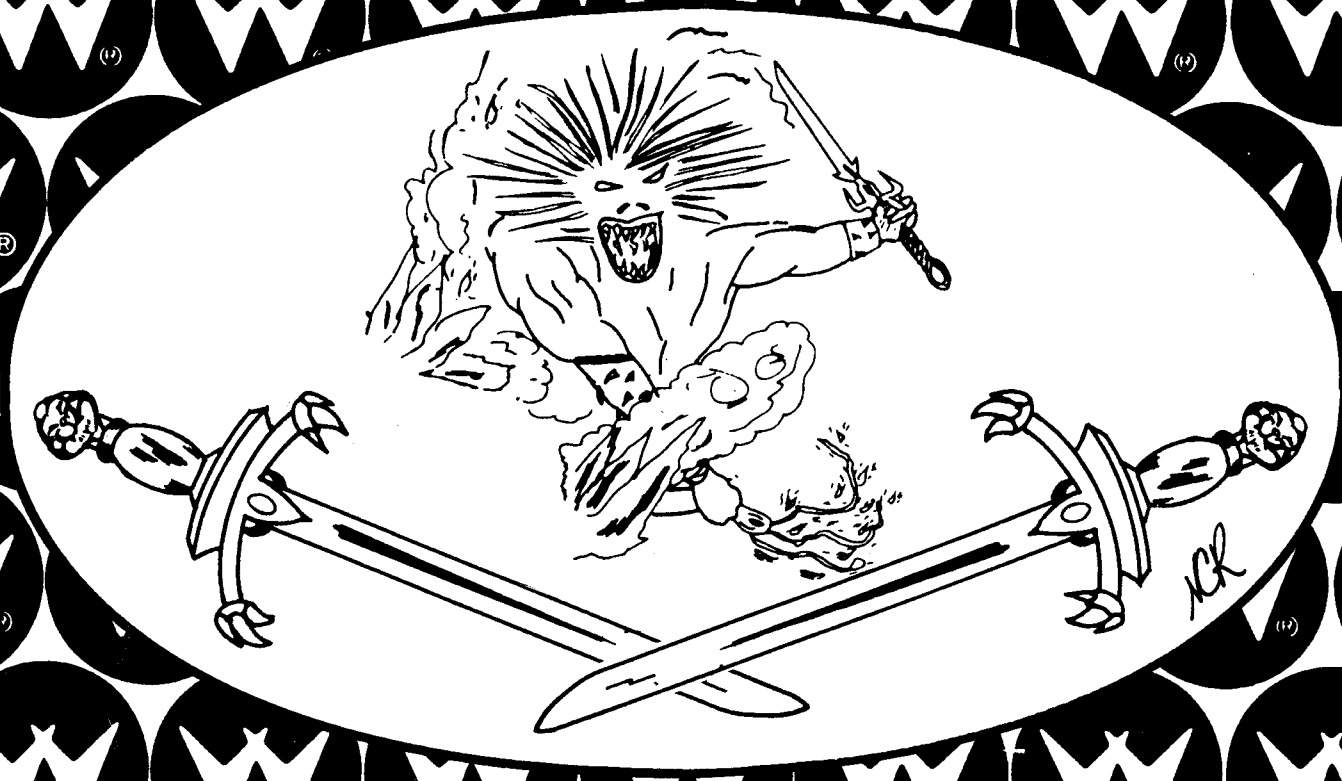


Swords of Fury™

OPERATIONS MANUAL
including
TEST/DIAGNOSTIC PROCEDURES, REFERENCE INFORMATION, & SCHEMATICS

Swords of Fury 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
CYCLONE	-	↓	A-5343-564-2	A-5343-564-1	A-5343-564-4	A-5343-564-3	↓	W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
BANZAI RUN	-	↓	A-5343-566-2	A-5343-566-1	A-5343-566-4	A-5343-566-3	↓	W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
SWORDS OF FURY		↓	A-5343-559-2	A-5343-559-1	A-5343-559-4	A-5343-559-3	↓	W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19

Swords of Fury Solenoid Table

Sol. No.	Solenoid Description (p = Playfield; b = Backbox; i = Insert Bd)	Solenoid Type	Wire[1] Color	Connections: CPU Bd	Connections: Backbox/ Playfield/Cabinet	CPU Drvr Xstr	Solenoid P/N Flashlamp Type (i = Insert, b = B'box, p = Playfield)
01A[3]	Outhole Kicker	Switched	{Vio-Brn	1P11-1	5J1-9: 5P4-9 (A) +	Q33	AE-23-800
01C[3]	Mini-Playfield (p) Flasher	Switched	Blk-Brn}	(Gry-Brn)	5J5-9 (C): 2J4-1: 2P12-15	Q33	#1251 flashlamp 1p
02A[3]	Ball Shooter Feeder	Switched	{Vio-Red	1P11-3	5J1-7: 5P4-8 (A) +	Q25	AE-23-800
02C[3]	Left Loop (p) Flashers	Switched	Blk-Red}	(Gry-Red)	5P5-8 (C): 2J4-2: 2P12-14	Q25	#89 flashlamps 2p
03A[3]	(Not Used)	Switched	{Vio-Orn	1P11-4	5J1-6: (2P12-13	Q32	
03C[3]	Tube (i,p) Flashers	Switched	Blk-Orn}	(Gry-Orn)	5P5-7 (C): 2J4-3: 2P11-13 + ^	Q32	#89 flashlamps 1i,1p
04A[3]	Top Left Eject	Switched	{Vio- Yel	1P11-5	5J1-5: 5P4-6 (A) +	Q24	AE-23-800
04C[3]	Top Ramp (p) Flasher	Switched	Blk-Yel}	(Gry-Yel)	5P5-5 (C): 2J4-4: 2P12-12	Q24	#89 flashlamp 1p
05A[3]	Drop Bank 2 ("A")	Switched	{Vio-Grn	1P11-6	5J1-4: 5P4-5 (A) +	Q31	AE-26-1400
05C[3]	Left Lockup (p) Flasher	Switched	Blk-Grn}	(Gry-Grn)	5P5-4 (C): 2J4-5: 2P12-11	Q31	#89 flashlamp 1p
06A[3]	Left Lockup	Switched	{Vio-Blu	1P11-7	5J1-3: 5P4-4 (A) +	Q23	AE-23-800
06C[3]	Balrod (p) Flasher	Switched	Blk-Blu}	(Gry-Blu)	5P5-3 (C): 2J4-6: 2P12-10	Q23	#89 flashlamp 1p
07A[3]	Knocker /Ticket Dispenser (b'box)	Switched	{Vio-Blk	1P11-8	5J1-2: 5P4-2 (A) +	Q30	AE-26-1200
07C[3]	Left Spin (p) Flasher	Switched	Blk-Vio}	(Gry-Vio)	5P5-2 (C): 2J4-7: 2P12-9	Q30	#89 flashlamp 1p
08A[3]	Drop Bank 3 ("G")	Switched	{Vio-Gry	1P11-9	5J1-1: 5P4-1 (A) +	Q22	AE-26-1400
08C[3]	Shooter Lane (p) Flasher	Switched	Blk-Gry}	(Gry-Blk)	5P5-1 (C): 2J4-8: 2P12-7	Q22	#89 flashlamp 1p
09	Top Center Flashers (i,p)	Contrld	Brn-Blk	1P12-1	5J2-9: 5P6-9: 2J4-10: 2P11/12-6	Q17	#89 flashlamps 1p,1i
10	Gen Illumin Relays (i,p)	Contrld	Brn-Red	1P12-2	5J2-8: 5P6-8: 2J4-13: 2P11/12-3	Q9	5580-09555-01[4] 1p,1i
11	Swords (i) Flashers	Contrld	Brn-Orn	1P12-4	5J2-6: 5P6-7:2J4-11: 2P11-5	Q16	#89 flashlamps 3i
12	Solenoid A/C Select Relay (b)	Contrld	Brn-Yel	1P12-5	5J2-5	Q8	5580-09555-01[5]
13	(Not Used)	Contrld	Brn-Grn	1P12-6	5J2-4	Q15	
14	Left Outlane Kickback	Contrld	Brn-Blu	1P12-7	5J2-3: 5P6-3: 2J4-14: 2P12-2	Q7	AE-23-800
15	Drop Bank 1 ("M")	Contrld	Brn-Vio	1P12-8	5J2-2: 5P6-2: 2J4-15: 2P12-1	Q14	AE-26-1400
16	Left Outlane (p) Flasher	Contrld	Brn-Gry	1P12-9	5J2-1: 5P6-1: 2J4-12: 2P12-4	Q6	#89 flashlamp 1p
17	Bottom Diverter	Specl #1	Blu-Brn	1P19-7	5J3-7: 5P7-7	Q75	AE-26-1200
18	Left Kicker ("sling")	Specl #2	Blu-Red	1P19-4	5J3-6: 5P7-6	Q71	AE-26-1500
19	Top Diverter	Specl #3	Blu-Orn	1P19-3	5J3-3: 5P7-3	Q73	AE-26-1200
20	Right Kicker ("sling")	Specl #4	Blu-Yel	1P19-6	5J3-4: 5P7-5	Q69	AE-26-1500
21	Drop Bank 4 ("I")	Specl #5	Blu-Grn	1P19-8	5J3-2: 5P7-2	Q77	AE-26-1400
22	Drop Bank 5 ("C")	Specl #6	Blu-Blk	1P19-9	5J3-1: 5P7-1	Q79	AE-26-1400
	Flippers						
1F	Lower Right Flipper	-	Orn-Vio [Blu-Vio]	1P19-1	2J5-5: 2P10-7: Sw [Sw: 2J10-1: 2P8-15: Flp][2]	-	FL11630/50VDC
2F	R Flipper - Mini-Playfield		[Blk-Blu]		[Sw: 2J10-4: 2P8-12: Flp][2]		FL-11753/50VDC
3F	Lower Left Flipper	-	Orn-Gry [Blu-Gry]	1P19-2	2J5-4: 2P10-8: Sw [Sw: 2P10-2: 2P8-14: Flp][2]	-	FL11630/50VDC
4F	Upper Left Flipper (main P/F)		[Blk-Yel]		[Sw: 2P10-3: 2P8-13: Flp][2]		FL-11753/50VDC

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" coils are pulsed, when Sol. 12 is de-energized; "C" coils 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 Pwr Driver Bd. D-12247 in the backbox.

Contents

Section 1 - Game Operation & Test Information

Swords of Fury (System 11B) ROM Summary 1
Connector Identification 2
Swords of Fury Circuit Boards 2
Swords of Fury Game Control Locations 2
Pinball Game Assembly Instructions 3
Figure 1. Pinball Assembly, Playfield Pitch Angle, and Leg Leveler Details 3
Game Operation 4
Swords of Fury Game Status Displays 6
Swords of Fury Audit Table 7
Swords of Fury Game Adjustment Table 8
Game Adjustment Procedure 10
Items 01 - 05 11
06 - 11 12
12 - 17 13
18 - 25 14
26 - 36 15
37 - 42 16
43 - 48 17
49 - 52 18
Swords of Fury Game Adjustments Table for German Games 19
53 - 56 19
57 - 63 20
64 - 70 21
Swords of Fury Game Adjustment Setting Comparison Table 22
Resetting the High Scores 23
Game Pricing 24
Swords of Fury Pricing Table 25
Test/Diagnostic Procedures 26
Music Test 26
Display Test 26
Sound Test 26
Lamp Tests 27
Swords of Fury Lamp-Matrix Table 27
Solenoid Test 28
Swords of Fury Solenoid Table 28
Special and Controlled Solenoids - Diagrams and Details 29
Figure 2. Typical Solenoid A/C Select Relay Circuit 29
Switch Tests 30
Swords of Fury Switch-Matrix Table 30
Ending the Diagnostic Tests 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, Shooter Lane Feeder 34

Contents

Section 2 - Reference Diagrams & Schematics

Location Diagram - Game Circuit Boards and Major Mechanisms. 36
Solenoids/Flashers & Rubber Parts. 37
Switches Locations. 38
Switch Circuitry, Typical Switch Circuit, and Matrix Diagram. 39
Lamp Circuitry, Typical Lamp Circuit, and Matrix Diagram 40
Lamps. 41
Cabinet Wiring Diagram 42
Aux Power Driver Board (D-12247) & Schematic. 43
D-8345-566 Power Supply Schematic 44
Master Interconnect Board (D-12185) Schematic 44
Alphanumeric Display Unit Board (D-11609) Schematic 45
Audio Board (D-11581-559) Schematic 46
Schematic, System 11B CPU (16-9019, Sheet 1 of 4). 47
Schematic, System 11B CPU (16-9019, Sheet 2 of 4). 48
Schematic, System 11B CPU (16-9019, Sheet 3 of 4). 49
Schematic, System 11B CPU (16-9019, Sheet 4 of 4). 50
Controlled, Special, and Switched Solenoids 51
Power Wiring Diagram 52
Diagnostic Test Flowchart (Side 1) 53
Diagnostic Test Flowchart (Side 2) 54

Section 1
Game Operation & Test Information

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

Swords of Fury (System 11B) ROM Summary

IC	DESCRIPTION	TYPE	IDENTIFIER	BOARD	PART NUMBER
Game ROM 1	32K x 8 ROM	27256	U27	CPU	A-5343-559-2
Game ROM 2	16K x 8 ROM	27256	U26	CPU	A-5343-559-1
Sound ROM 1	32K x 8 ROM	27256	U21	CPU	A-5343-559-4
Sound ROM 2	32K x 8 ROM	27256	U22	CPU	A-5343-559-3
Music/Speech ROM 1	32K x 8 ROM	27256	U4	Audio	A-5343-559-5
Music/Speech ROM 2	32K x 8 ROM	27256	U19	Audio	A-5343-559-6

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.

Swords of Fury CIRCUIT BOARDS

The System 11B Circuit Boards for *Swords of Fury* 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-11883-559) must be equipped with the ROMs specified in the *Swords of Fury* (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-11581-559, 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-12247-559.

MASTER INTERCONNECT BOARD. The Master Interconnect Board is D-12185-559.

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	5 - Aux Power Driver	9 - Insert Board
2 - Master Interconnect	6 - Backbox	10 - Audio
3 - Backbox Power Supply	7 - Cabinet	
4 - Alphanumeric Display	8 - Playfield	

Swords of Fury 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. *Swords of Fury* 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.

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.

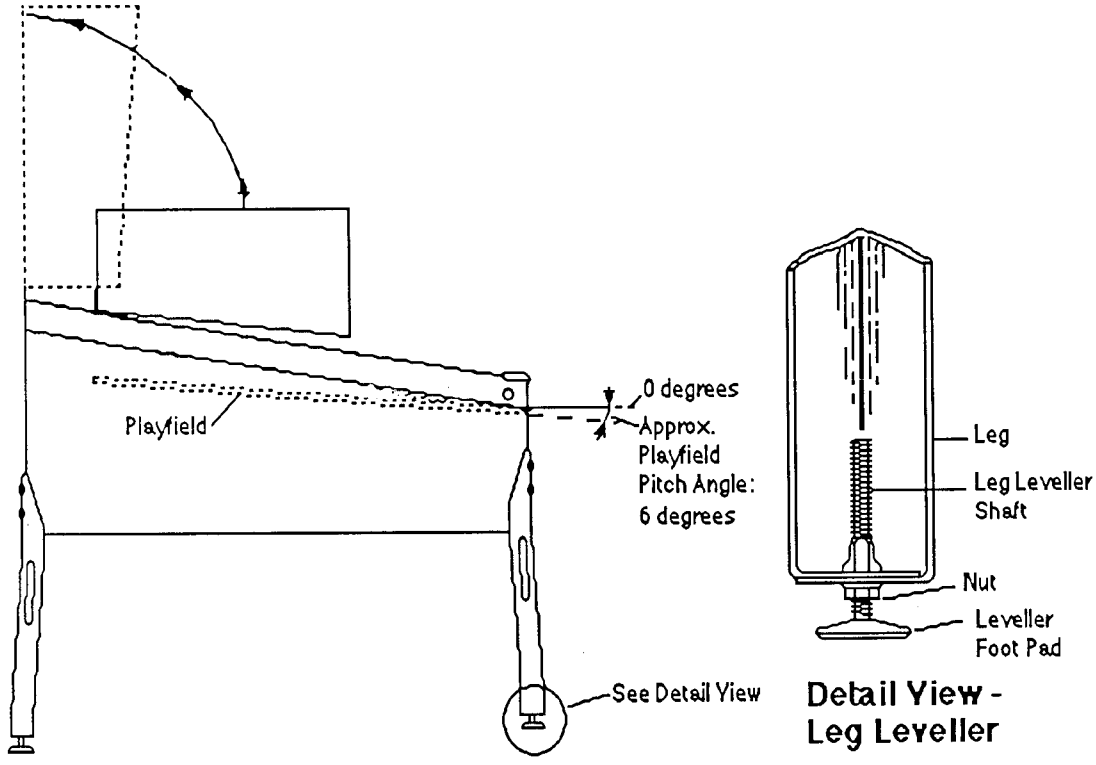


Figure 1. Pinball Assembly, Playfield Pitch Angle, and Leg Leveler Details.

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. (*Swords of Fury:* 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., if the operator does not change the Factory Setting).

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

NOTE

The SYSTEM 11B game program has a great capability to aid the operator and service personnel: At game Turn-On (and also at the beginning of the Test/Diagnostic Procedures), the Player 1 display now signals, with a decimal point by the rightmost character, that at least one switch has NOT been actuated during ball play for 120 balls (≈ 40 games). [Note: Only one dot appears, although more than one switch may be affected.] Moreover, *Swords of Fury* compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep *Swords of Fury* 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"
("**FOR PEACE ... AND HARMONY... FREE TITANS**")*;
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.

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; *Swords of Fury* 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

Swords of Fury GAME STATUS DISPLAYS

Swords of Fury 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 *Swords of Fury* 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. Player displays for 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
Swords	**of Fury**	**Id 00**	**559 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 11B 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 *Swords of Fury* **Audit Table** lists the 49 items of the Audit Information portion of the *Swords of Fury* 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 49 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.)

Swords of Fury Audit Table

Audit Item (Player 3)	Descriptive Phrases (Player 1 and 2 Displays)	Audit Factor [1] Value (Player 4)
AU 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	REPLAY1 AWARDS	
21	REPLAY2 AWARDS	
22	REPLAY3 AWARDS	
23	REPLAY4 AWARDS	
24	1 PLAYR. GAMES	
25	2 PLAYR. GAMES	
26	3 PLAYR. GAMES	
27	4 PLAYR. GAMES	
28	BURN IN CYCLES	
29	LEFT OUTLANE (# of times ball drained via left outlane)	
30	RIGHT OUTLANE (# of times ball drained via right outlane)	
31	AVENGER MADE (# of times A-V-E-N-G-E-R was made)	
32	EX BALL LIT (# of times Extra Ball was lit)	
33	7X LIT (# of times 7X Bonus Multiplier was lit)	
34	SPECIAL LIT (# of times Special lamp was lit)	
35	MULTI BALL (# of times Multi-Ball™ was obtained)	
36	LIONMAN BONUS (# of times Lionman Bonus was collected)	
37	TP LOOP 500000 (# of times Top Loop 500K was collected)	
38	JACKPOT MADE (# of times Jackpot was collected)	
39	H.S.RESET COUNTER	
40	0.0-0.4 M. SCORE (# of games <500K)	
41	0.5-0.9 M. SCORE (# of games ≥500K, <1M)	
42	1.0-1.4 M. SCORE (# of games ≥1M, <1.5M)	
43	1.5-1.9 M. SCORE (# of games ≥1.5M, <2.0M)	
44	2.0-2.4 M. SCORE (# of games ≥2.0M, <2.5M)	
45	2.5-9.9 M. SCORE (# of games ≥2.5M or more)	
46	H.S.T.D. 1> ??? (1st in HSTD Table, w/Initials)	
47	H.S.T.D. 2> ??? (2nd in HSTD Table, w/Initials)	
48	H.S.T.D. 3> ??? (3rd in HSTD Table, w/Initials)	
49	H.S.T.D. 4> ??? (4th in HSTD Table, w/Initials)	

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.

Swords of Fury Game Adjustment Table

Adjustment Item (Player 3)	Descriptive Phrases (Player 1 and 2 Displays)	Factory Setting (Player 4)
Ad 01	AUTO REPLAY [1] *or* FIXED REPLAY [1]	10 (%) SCORES [1]
02	REPLAY START (or REPLAY LEVEL 1) [1]	2,000,000
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	03
11	EX. BALL / B. I. P. { [00 = NO Ex. Ball; 1-9 E. B. /Ball; 1-9 E. B. /B. I. P.; 1-9 E. B. /Game] }	2/BIP
12	MAXIMUM CREDITS	10
13	HIGHEST SCORES	On
14	BACKUP HI. SCR.1	5,000,000
15	BACKUP HI. SCR. 2	4,500,000
16	BACKUP HI. SCR. 3	4,000,000
17	BACKUP HI. SCR. 4	3,500,000
18	HI. SCR.1 CREDITS	01
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
23	FREE PLAY	NO
24	U.S.A. 1 COINAGE (1 COIN 1 PLAY) [2,3,6]	
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 - 47	Game-specific Adjustments (detailed in text and the Game Adjustment Setting Comparison Table)	
48	A-MODE SOUND [alot; less; none]	ALOT
49 [4]	CUSTOM MESSAGE	ON
50	SW. ALARM KNOCKER [yes=knock for inop switch; no=no knock]	NO
51-52	UNUSED ADJUST	
53 -58 [5,6]	Special Pricing Adjustments- See text for 53-58 details.	
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 [7]	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 2 and 4 displays. Press Credit button to change setting of 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.

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 *Swords of Fury* Game Status Displays, as listed in the *Swords of Fury* **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.

The *Swords of Fury* **Game Adjustment Table** lists the 70 items of the Adjustment Information portion of the *Swords of Fury* 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.

GAME ADJUSTMENT PROCEDURE

Adjustment Items 01 through 70

The coin door must be open to access the Game Adjustment/Diagnostic switches. All readings and setting changes require operation of these coin door switches. Some setting changes utilize the Credit button; some also use the flipper button(s). *Additional text describing the game adjustment items follows this procedure; the value of the Factory Setting for each Game Adjustment item is in the preceding Swords of Fury* **Game Adjustment Table.**

1. Use AUTO-UP and press ADVANCE. The Id 00 display initially appears. Press ADVANCE until the Player 3 display indicates **Ad 01.** If the factory setting has not changed, the Player 1 and 2 Score displays indicate AUTO REPLAY, and 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 Game Adjustment Item number showing in the Player 3 display, increase the setting 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 the Game Adjustment Items have been made. The preceding Game Adjustment Table consolidates the Factory Settings into one grouping.

   (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 difficulty in the Game Adjustment Setting Comparison Table, which follows the '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. *Swords of Fury* now goes to the Game-Over Mode.

   B. To restore the Factory Settings for Game Adjustment Items (as listed in the Game Adjustments Table), zero all audit (bookkeeping) totals, *and* return to Game-Over Mode, use AUTO-UP or MANUAL-DOWN to display Ad 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. *Swords of Fury* now zeroes ALL Audit Item totals and changes ALL Game Adjustment Items 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 percentage of replays automatically awarded per game. The game program aids a pinball's initial installation by causing a comparison of the value of the Replay Level to the value of all players' scores every 50 games for the first 1,000 games. At each comparison, the program increases (or decreases) the Replay Level by an amount necessary to achieve the replay percentage specified either via the factory setting (or later operator selection). (After the first 1,000 games, the comparison occurs after every 500 games. The adjustment value is 100K, for this (and each subsequent) comparison.) Use the Credit button to change the percentage within the range of *5* to *25* (%), 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). *Swords of Fury* 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 initial Factory Setting is listed in the Game Adjustment Table, but this will change when the game compares the players' scores with this adjustment's value during its auto adjustment activity. 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), this is the number of replay levels in a game. The option range is *one, two, three, or four* replay level(s). When the operator chooses two replay levels, *Swords of Fury* 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. *Swords of Fury* 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. *Swords of Fury* automatically bypasses this adjustment.

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

06 Replay Award

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

Credit - Reaching each replay level obtains a credit (free game).
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, if installed, 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). 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'. 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*.

10 Tilt Warning

The operator can specify the 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*.

11 Extra Ball/Ball In Play

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

GAME ADJUSTMENT PROCEDURE (Continued)

11 Extra Ball/Ball In Play (Continued)

00 - NO extra ball play; displays a message, NO EX. BALL. A score is awarded in lieu of the Extra Ball.

1-9 E. B./Ball - 1 through 9 Extra Balls per ball (i.e., all balls including Extra Balls) are awarded.

1-9 E. B./B.I. P. - 1 through 9 Extra Balls per Ball In Play (B. I. P.) (i.e., all balls NOT including Extra Balls) are awarded.

1-9 E. B./Game - 1 through 9 Extra Balls per game.

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 *10*. 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 specify (via the Credit button) whether the game is to maintain a record of the four highest scores achieved to date. The choices are:

Off - NO high scores are recorded.

On - The four highest scores are stored in memory for use by Game Adjustment 22.

Auto - The four highest scores are stored in memory for use in a game program subroutine associated with Game Adjustment 22.

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 game automatically restores this value, 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. 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. 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. 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.* 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.*

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.*

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.*

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 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).

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.
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.

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.

GAME ADJUSTMENT PROCEDURE (Continued)

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).

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.

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.

31 DROP DELAY 1
32 DROP DELAY 2
33 DROP DELAY 3
34 DROP DELAY 4
35 DROP DELAY 5
The operator can choose (via the Credit button) the time period for the targets remaining down after each 'bank' (set of 5) of targets is completed. Completing each 'bank' increases the Bonus Multiplier. The range of this setting is *01 second* (Liberal) through *99 seconds* (Conservative). Note that the 'down' time lengthens as the player increases the Bonus Multiplier by completing each 'bank'. The Factory Setting is 1 second for Drop Delay 1. The Factory Setting is 3 seconds for Drop Delay 2. The Factory Setting is 8 seconds for Drop Delay 3. The Factory Setting is 16 seconds for Drop Delay 4. The Factory Setting is 32 seconds for Drop Delay 5.

36 2 Million Kickback
The operator can choose (via the Credit button) whether to allow the Shield (left Outlane kickback) lamp to light, when the player's score exceeds 2,000,000. The choices are:

Yes - (Liberal) The Shield lamp is turned ON at ball start. The Factory Setting is Yes (except German games where the setting is Nein, for the Medium setting).
No - (Conservative) Lamp is turned Off at ball start, whenever the player's score exceeds 2,000,000.

37 Extra Ball Memory

The operator can choose (via the Credit button)whether the lighted Extra Ball lamp is stored in memory for 'next ball' play (continues from ball to ball) or is reset for each ball. The choices are:

Yes - (Liberal) When lighted , the Extra Ball lamp is turned ON at ball start (stored in memory) for each ball during the game.
No - (Conservative) Lamp is turned Off at ball start.

38 Increase Multi-Ball™ Play

The operator can choose (via the Credit button) whether the balls that are 'locked' at Game Over are saved (retained in the Left Tunnel or in the middle Lockup) for the next game. The choices are:

Easy - (Liberal) All locked balls are saved at Game Over.
Hard - (Conservative) No balls are saved at Game Over.

39 Game Hardness

The operator can choose (via the Credit button) whether the game program lights certain feature lamps at Game Start or leaves them off requiring game play to light them. The choices are:

Easy - (Liberal) Certain feature lamps are lighted at Game Start.
Hard - (Conservative) No feature lamps are lighted.

40 Jackpot Value

The operator can choose (via the Credit button) the value of the Jackpot award. The range of this setting is *1,000* to *99,000;* the Factory Setting range is 3,000 (Conservative) to 10,000 (Liberal). Note that the setting of this Adjustment can affect the Replay Level value, if too Liberal a setting is selected, allowing high scores.

41 Jackpot Hardness

The operator can choose (via the Credit button) the speed of movement of the lighted target lamp, which affects the difficulty of obtaining the Jackpot award. The range of this setting is *Easy* (Liberal, slower lamp movement) to *Hard* (Conservative, faster lamp movement).

42 SPECIAL Auto Adjustment

The operator can choose (via the Credit button) the percentage value for all Specials per game. 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 *Off.* When the automatic adjustment is turned on (enabled), the game program adjusts the setting at the end of a game, after each 50 games, unless the current value is within 2% of the setting; then, no auto adjustment occurs. The Factory Setting is 5%, for all levels of difficulty.

GAME ADJUSTMENT PROCEDURE (Continued)

43 SPECIAL Setting

The operator can choose (via the Credit button) whether the Special lamp lights when the 7X Bonus Multiplier is lighted. The range of this setting is *Easy* (Liberal, Special lamp lights when the 7X Bonus Multiplier level is achieved); *Hard* (Special lamp lights with the next completion of the 'Magic' 5-Bank drop targets after the 7X Bonus Multiplier); *E Hard* (Special lamp lights with the second completion of the 'Magic' 5-Bank drop targets after the 7X Bonus Multiplier).

44 LIONMAN (Center Ramp) Auto Adjustment

The operator can choose (via the Credit button) the percentage of players who get the Lionman Bonus. 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 *Off*. When the automatic adjustment is turned on (enabled), the game program adjusts the setting at the end of a game, after each 50 games, unless the current value is within 2% of the setting; then, no auto adjustment occurs. From the factory, the range of this setting is *10%* (Conservative; Extra Hard) to *20%* (Liberal; Extra Easy).

45 LIONMAN TIME

The operator can choose (via the Credit button) the time period in which the Lionman Bonus may be obtained. The range of this setting is *5 seconds* to *40 seconds;* the range associated with the difficulty levels runs from 10 seconds (Conservative; Extra Hard) to 25 seconds (Liberal; Extra Easy).

46 Consolation Extra Ball

The operator can choose (via the Credit button) whether a less-skilled player can obtain an Extra Ball by completing the A V E N G E R targets and obtain 30 seconds of Left Outlane Kickback operation for a better score. The choices are:

Yes - With a ball time less than the setting of Ad 47, the player receives an opportunity to obtain an Extra Ball.
No - The player does not receive this opportunity.

47 Average Ball Time

The operator can choose (via the Credit button) the minimum game time below which a form of 'Consolation' becomes effective. This compensates for less skilled players to encourage them to continue playing the game. (Less skilled players are those whose game time is less than the selected setting (Ad 46) and who did not get a Special, an Extra Ball, or other type of 'specialty' shot.

48 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 for approximately 8 minutes during the Attract Mode sequence.
LESS - Sounds occur for approximately 2 mintues during only the Attract Mode.
NONE - No sounds occur during the Attract Mode.

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. The 3-line message provided is:

FOR PEACE ... AND HARMONY ... FREE TITANS.

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.

NO - The knocker does NOT sound. (Player 4 shows NO.)

51 & 52 Not Used

SPECIAL PRESET ADJUSTMENTS CAUTION

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

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

The Backbox displays for each Special Preset Adjustment indicate whether the operator has selected it, by identifying the Adjustment in the 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.

GAME ADJUSTMENT PROCEDURE (Continued)

SPECIAL PRESET ADJUSTMENTS CAUTION (Continued)

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 has ROMs installed for German (Deutsch) language and play adjustments automatically have certain Adjustment Items preset. The following table shows these Preset Adjustment Items for each of the special German Coinage Adjustments.

Swords of Fury Game Adjustments Table for German Games

Adj #	Adj Description	German Ad 1 53	German Ad 2 54	German Ad 3 55	German Ad 4 56	German Ad 5 57	German Ad 6 58
01	Auto Replay	10 (%)	10 (%)	10 (%)	10 (%)	10 (%)	10 (%)
02	Replay Start	2.500.000	2.500.000	2.500.000	2.500.000	2.500.000	2.500.000
03	Replay Level 2	03	03	03	03	03	03
06	Replay Award	Credit	Coil	Audit	Credit	Coil	Audit
07	Special Award	Credit	Ball	Score	Credit	Ball	Score
08	Match Feature	10 %	10 %	10 %	10 %	10 %	10 %
12	Max. Credits	30	30	30	30	30	30
14	Backup High Score 1	5.600.000	5.600.000	00	5.600.000	5.600.000	00
15	Backup High Score 2	5.000.000	5.000.000	00	5.000.000	5.000.000	00
16	Backup High Score 3	4.800.000	4.800.000	00	4.800.000	4.800.000	00
17	Backup High Score 4	4.500.000	4.500.000	00	4.500.000	4.500.000	00
18	High Score 1 Credits	03	03	00	03	03	00
19	High Score 2 Credits	00	00	00	00	00	00
20	High Score 3 Credits	00	00	00	00	00	00
21	High Score 4 Credits	00	00	00	00	00	00
22	High Score Reset	750 spiele	750 spiele	750 spiele	750 spiele	750 spiele	750 spiele
24	Coinage Setting	6 spiele/5 DM	6 spiele/5 DM	6 spiele/5 DM7	spiele/5 DM	7 spiele/5 DM7	spiele/5 DM

5 3 Install German 1

The operator can use this Adjustment Item to modify the game pricing selection of Standard Setting named "German 2" in the **Pricing Table** to permit Credit Award play with 6 games for 5 DM. Individual Adjustments affected are shown in the preceding table.

5 4 Install German 2

The operator can use this Adjustment Item to modify the game pricing selection of Standard Setting named "German 2" in the **Pricing Table** to permit Ticket/Token operation with 6 games for 5 DM. Individual Adjustments affected are shown in the preceding table.

5 5 Install German 3

The operator can use this Adjustment Item to modify the game pricing selection of Standard Setting named "German 2" in the **Pricing Table** to permit Keyset Mode operation with 6 games for 5 DM. Individual Adjustments affected are shown in the preceding table.

5 6 Install German 4

The operator can use this Adjustment Item to modify the game pricing selection of Standard Setting named "German 1" in the **Pricing Table** to permit Credit Award play with 7 games for 5 DM. Individual Adjustments affected are shown in the preceding table.

57 Install German 5

The operator can use this Adjustment Item to modify the game pricing selection of Standard Setting named "German 1" in the **Pricing Table** to permit Ticket/Token operation with 7 games for 5 DM. Individual Adjustments affected are shown in the preceding table.

58 Install German 6

The operator can use this Adjustment Item to modify the game pricing selection of Standard Setting named "German 1" in the **Pricing Table** to permit Keyset Mode operation with 7 games for 5 DM. Individual Adjustments affected are shown in the preceding table.

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	3,000,000	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"). The Game Adjustment Setting Comparison Table, which follows these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Extra Easy' group.

63 Install Easy

The operator can change the game play difficulty adjustments to a combination that is slightly easier than the Factory Settings. The Game Adjustment Setting Comparison Table, which follows these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Easy' group.

64 Install Medium

The operator can change the game play difficulty adjustments to a combination that matches the Factory Settings. The Game Adjustment Setting Comparison Table, which follows these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Medium' group.

65 Install Hard

The operator can change the game play difficulty adjustments to a combination that is more difficult than the Factory Settings. The Game Adjustment Setting Comparison Table, which follows these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Hard' group.

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. The Game Adjustment Setting Comparison Table, which follows these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Extra Hard' group.

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.

GAME ADJUSTMENT PROCEDURE (Continued)

Swords of Fury 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	Drop Tgt Time Dly 1	1 sec	1 sec	1 sec	2 sec	2 sec
32	Drop Tgt Time Dly 2	2 sec	2 sec	3 sec	6 sec	6 sec
33	Drop Tgt Time Dly 3	4 sec	4 sec	8 sec	10 sec	10 sec
34	Drop Tgt Time Dly 4	8 sec	8 sec	16 sec	20 sec	20 sec
35	Drop Tgt Time Dly 5	8 sec	16 sec	32 sec	40 sec	40 sec
36	2,000,000 Kickback	Yes	Yes	Yes	No	No
37	Ex. Ball Memory	Yes	Yes	Yes	Yes	No
38	Inc. M-Ball Play	Easy	Hard	Hard	Hard	Hard
39	Game Hardness	Easy	Easy	Easy	Hard	Hard
40	Jackpot Incr Value	10,000	7,000	5,000	5,000	3,000
41	J'pot Collec. Hrdnes	Easy	Easy	Easy	Hard	Hard
42	Special Auto. Ad.	5 %	5 %	5 %	5 %	5 %
43	Special Setting	@ 7X	@ 7X	1>7X	2>7X	2>7X
44	Cntr Ramp Auto. Ad.	20 %	20 %	20 %	15 %	10 %
45	Cntr Ramp Time	25 sec	25 sec	20 sec	15 sec	10 sec
46	Consolation Ex. Ball	Yes	Yes	Yes	Yes	Yes
47	Avg Ball Time	30	30	30	30	30

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

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

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

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

4. Using AUTO-UP, press and hold down ADVANCE, until the Player 3 display shows **Ad 70** Press ADVANCE once, to return to Game- Over Mode.

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

GAME PRICING

PRICING MADE EASY. Game Adjustment Item Ad 24 allows the operator an easy method of setting the pricing functions. Pressing the Credit button allows the operator a choice of one of the 16 "Standard" Settings, with associated automatic pricing (Player 1 and 2 displays show the Country identifier, with a number 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 a 2-digit number (other than 00) in column 24. 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.)

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.)

GAME PRICING (Continued)

Swords of Fury 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	01	04	01	02	04	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]	GERMAN1	06	12	30	05	30	00
				1/1 DM, 2/2 DM, 6/5 DM [2]	GERMAN2	06	12	30	05	00	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	10 F	5 F	10 F	3/10 F, 1/5 F, 3/10 Franc [2]	FRANCE	02	01	02	01	02	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	20 F	20 F	20 F	3/20 F [2]	BELGIUM	12	12	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	06	00	12	04	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	500L	500 L	1/500 Lire [2]	ITALY	01	01	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

The System-11B game program greatly aids the operator and service personnel: At the beginning of the Test/Diagnostic Procedures (and also at game Turn-On), the Player 1 display now signals, with a decimal point by the rightmost character, that a switch has *NOT* been actuated during ball play for a lengthy period of time (120 balls, or ≈40 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. Switching to AUTO-UP, observe that the message now reads MUSIC OFF, and that the player 3 score display shows 00 00. Press the Credit button to select the desired music selection: 01 - 'Main Theme' through 06 - 'Hi. Score Theme' (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 (Continued)

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 HOLD, 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.

Backglass Lamps: 6, 7,16, 41, 42, 51, 52, and 57 - 64

Swords of Fury **Lamp-Matrix Table**

[2] Two Lamps

Lamps = #44 Bulb, p/n 24-6549
# 555 Bulb, p/n 24-8768

COLUMN / ROW	1 Q66 YEL-BRN 1J7-1	2 Q64 YEL-RED 1J7-2	3 Q62 YEL-ORN 1J7-3	4 Q60 YEL-BLK 1J7-4	5 Q58 YEL-GRN 1J7-6	6 Q56 YEL-BLU 1J7-7	7 Q54 YEL-VIO 1J7-8	8 Q52 YEL-GRY 1J7-9
Q80 1 RED-BRN 1J6-1	Magic Scores 50K 1	Left Outlane Advance 9	Drop Bank Red 17	25	Avenger Scores 50K 33	Top Loop [2] 20K 41	Left Outlane Kicker 49	500,000 57
Q81 2 RED-BLK 1J6-2	Magic Scores 100K 2	Left Outlane Collect 10	Drop Bank Yellow 18	Word A 26	Avenger Scores 150K 34	Top Loop [2] 30K 42	Release Titans 50	1,000,000 58
Q82 3 RED-ORN 1J6-3	Magic Scores 150K 3	Right Outlane Advance 11	Drop Bank Blue 19	Word V 27	Avenger Scores 250K 35	Left Spin 1K 43	Top Loop [2] 40K 51	1,500,000 59
Q83 4 RED-YEL 1J6-5	Magic Scores 200K 4	Right Outlane Collect 12	Drop Bank Orange 20	Word E 28	Extra Ball 36	Left Spin 1.5K 44	Top Loop [2] 50K 52	2,000,000 60
Q84 5 RED-GRN 1J6-6	Magic Scores 250K 5	Bonus Mult 1X 13	Drop Bank Red II 21	Word N 29	Right Ramp 37	Left Spin 2K 45	Top Loop Left Advance 53	2,500,000 61
Q85 6 RED-BLU 1J6-7	Top Loop [2] 100K 6	Bonus Mult 2X 14	Avenge Again 22	Word G 30	Playfield Mult 3X 38	Ball Deflect Top 46	Top Loop Right Advance 54	3,000,000 62
Q86 7 RED-VIO 1J6-8	Top Loop [2] 500K 7	Bonus Mult 4X 15	Left Loop "Left" 23	Word E 31	Playfield Mult 2X 39	Ball Deflect Middle 47	Top Loop Left Collect 55	3,500,000 63
Q87 8 RED-GRY 1J6-9	8	Special [2] 16	Left Loop "Right" 24	Word R 32	Lionman Bonus 40	Ball Deflect Bottom 48	Top Loop Right Collect 56	4,000,000 64

TEST/DIAGNOSTIC PROCEDURES (Continued)

SOLENOID TEST.

1. (From Lamp Test) Using AUTO-UP, press ADVANCE. Observe that the Player 1 and 2 displays show the message, COIL TEST, the Player 3 display shows 05 (Solenoid Test identifier). Next, the Player 3 display shows a series of test steps from 01 through 22, while the Player 1 and 2 displays show the solenoid/circuit name. During each of these steps, pulsing of the respective solenoid/circuit occurs. The test cycles repeatedly, unless halted 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.

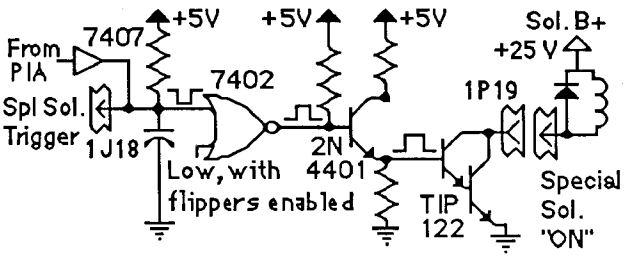
   To continuously pulse a single solenoid/circuit, use MANUAL-DOWN. Press ADVANCE to sequence through the switched, controlled, and special solenoids. Use AUTO-UP to resume test cycling, and to proceed to the next test.

Swords of Fury Solenoid Table

Sol. No.	Solenoid Description (p = Playfield;b = Backbox; i = Insert Bd)	Solenoid Type	Wire [1] Color	Connections: CPU Bd	Connections: Backbox/ Playfield/Cabinet	CPU Drvr Xstr	Solenoid P/N / Flashlamp Type (i = Insert b = B'box p = Playfield)
01A[3]	Outhole Kicker	Switched	{Vio-Brn	1P11-1	5J1-9: 5P4-9 (A) +	Q33	AE-23-800
01C[3]	Mini-Playfield (p) Flasher	Switched	Blk-Brn}	(Gry-Brn)	5J5-9 (C): 2J4-1: 2P12-15	Q33	#1251 flashlamp 1p
02A[3]	Ball Shooter Feeder	Switched	{Vio-Red	1P11-3	5J1-7: 5P4-8 (A) +	Q25	AE-23-800
02C[3]	Left Loop (p) Flashers	Switched	Blk-Red}	(Gry-Red)	5P5-8 (C): 2J4-2: 2P12-14	Q25	#89 flashlamps 2p
03A[3]	(Not Used)	Switched	{Vio-Orn	1P11-4	5J1-6: (2P12-13	Q32	
03C[3]	Tube (i,p) Flashers	Switched	Blk-Orn}	(Gry-Orn)	5P5-7 (C): 2J4-3: 2P11-13 + ^	Q32	#89 flashlamps 1i,1p
04A[3]	Top Left Eject	Switched	{Vio- Yel	1P11-5	5J1-5: 5P4-6 (A) +	Q24	AE-23-800
04C[3]	Top Ramp (p) Flasher	Switched	Blk-Yel}	(Gry-Yel)	5P5-5 (C): 2J4-4: 2P12-12	Q24	#89 flashlamp 1p
05A[3]	Drop Bank 2 ("A")	Switched	{Vio-Grn	1P11-6	5J1-4: 5P4-5 (A) +	Q31	AE-26-1400
05C[3]	Left Lockup (p) Flasher	Switched	Blk-Grn}	(Gry-Grn)	5P5-4 (C): 2J4-5: 2P12-11	Q31	#89 flashlamp 1p
06A[3]	Left Lockup	Switched	{Vio-Blu	1P11-7	5J1-3: 5P4-4 (A) +	Q23	AE-23-800
06C[3]	Balrod (p) Flasher	Switched	Blk-Blu}	(Gry-Blu)	5P5-3 (C): 2J4-6: 2P12-10	Q23	#89 flashlamp 1p
07A[3]	Knocker /Ticket Dispenser (b'box)	Switched	{Vio-Blk	1P11-8	5J1-2: 5P4-2 (A) +	Q30	AE-26-1200
07C[3]	Left Spin (p) Flasher	Switched	Blk-Vio}	(Gry-Vio)	5P5-2 (C): 2J4-7: 2P12-9	Q30	#89 flashlamp 1p
08A[3]	Drop Bank 3 ("G")	Switched	{Vio-Gry	1P11-9	5J1-1: 5P4-1 (A) +	Q22	AE-26-1400
08C[3]	Shooter Lane (p) Flasher	Switched	Blk-Gry}	(Gry-Blk)	5P5-1 (C): 2J4-8: 2P12-7	Q22	#89 flashlamp 1p
09	Top Center Flashers (i,p)	Contrld	Brn-Blk	1P12-1	5J2-9: 5P6-9: 2J4-10: 2P11/12-6	Q17	#89 flashlamps 1p,1i
10	Gen Illumin Relays (i,p)	Contrld	Brn-Red	1P12-2	5J2-8: 5P6-8: 2J4-13: 2P11/12-3	Q9	5580-09555-01[4] 1p,1i
11	Swords (i) Flashers	Contrld	Brn-Orn	1P12-4	5J2-6: 5P6-7:2J4-11: 2P11-5	Q16	#89 flashlamps 3i
12	Solenoid A/C Select Relay (b)	Contrld	Brn-Yel	1P12-5	5J2-5	Q8	5580-09555-01[5]
13	(Not Used)	Contrld	Brn-Grn	1P12-6	5J2-4	Q15	
14	Left Outlane Kickback	Contrld	Brn-Blu	1P12-7	5J2-3: 5P6-3: 2J4-14: 2P12-2	Q7	AE-23-800
15	Drop Bank 1 ("M")	Contrld	Brn-Vio	1P12-8	5J2-2: 5P6-2: 2J4-15: 2P12-1	Q14	AE-26-1400
16	Left Outlane (p) Flasher	Contrld	Brn-Gry	1P12-9	5J2-1: 5P6-1: 2J4-12: 2P12-4	Q6	#89 flashlamp 1p
17	Bottom Deflect	Specl #1	Blu-Brn	1P19-7	5J3-7: 5P7-7	Q75	AE-26-1200
18	Left Kicker ("sling")	Specl #2	Blu-Red	1P19-4	5J3-6: 5P7-6	Q71	AE-26-1500
19	Top Deflect	Specl #3	Blu-Orn	1P19-3	5J3-3: 5P7-3	Q73	AE-26-1200
20	Right Kicker ("sling")	Specl #4	Blu-Yel	1P19-6	5J3-4: 5P7-5	Q69	AE-26-1500
21	Drop Bank 4 ("I")	Specl #5	Blu-Grn	1P19-8	5J3-2: 5P7-2	Q77	AE-26-1400
22	Drop Bank 5 ("C")	Specl #6	Blu-Blk	1P19-9	5J3-1: 5P7-1	Q79	AE-26-1400
-	Lower Right Flipper	-	Orn-Vio [Blu-Vio] [Blk-Blu]	1P19-1	2J5-5: 2P10-7: Sw [Sw: 2J10-1: 2P8-15: Flp] [2] [Sw: 2J10-4: 2P8-12: Flp] [2]	-	FL11630/50VDC
	R Flipper - Mini-Playfield						FL-11753/50VDC
-	Lower Left Flipper	-	Orn-Gry [Blu-Gry] [Blk-Yel]	1P19-2	2J5-4: 2P10-8: Sw [Sw: 2P10-2: 2P8-14: Flp] [2] [Sw: 2P10-3: 2P8-13: Flp] [2]	-	FL11630/50VDC
	Upper Left Flipper (main P/F)						FL-11753/50VDC

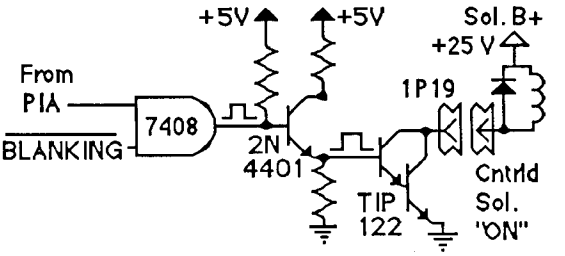
Notes: 1. Wire colors, except flipper Orn-Vio and Orn-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Orn-Vio and Orn-Gry wires connect from CPU Board to flipper switch. 2. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" coils are pulsed, when Sol. 12 is de-energized; "C" coils 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 Pwr Driver Bd. D-12247 in the backbox.

"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 Solenoid 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 Solenoid 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 Left Ferris Wheel (p/f) and Jackpot (bb) Flasher circuit (sol. 01C). Using this "multiplexing" technique, the same driver transistor can control actuation of two separate solenoid circuits.

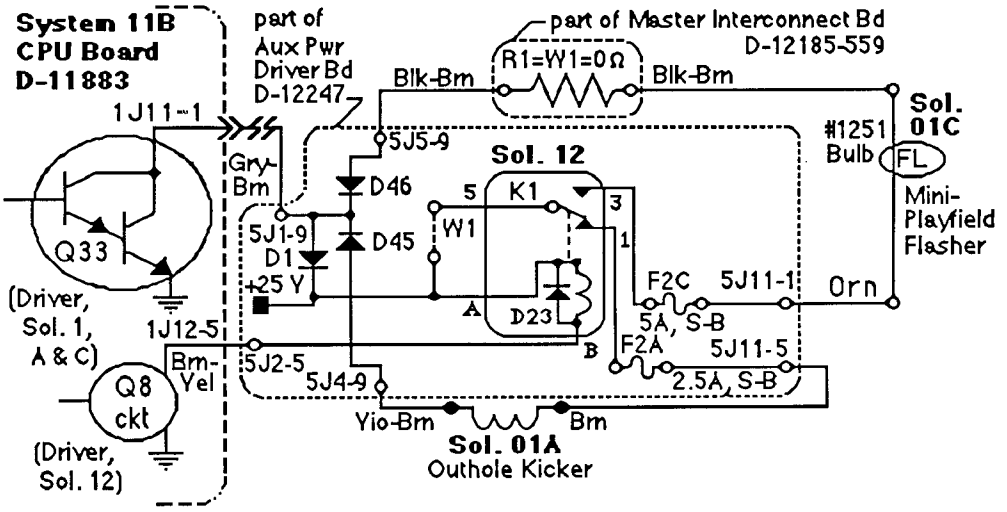


Figure 2. Typical Solenoid A/C Select Relay Circuit, showing the function of Solenoid 12, the Solenoid A/C Select Relay.

TEST/DIAGNOSTIC PROCEDURES (Continued)

SWITCH TESTS.

1. Switch Levels.

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

If, however, a switch *is* actuated (possibly stuck closed), the Player 3 display shows that switch's number, while the Player 1 and 2 displays indicate the switch's name. A sound also accompanies the displays. (This is another facet of the *Swords of Fury* 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 *Swords of Fury*, switch numbers can range from 01 through 64. Refer to the **Switch-Matrix Table** for switch numbers and wiring information. CPU Board connections at jacks 1J8 (columns) and 1J10 (rows) are also listed in the table.

Swords of Fury **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	Drop Target Red 17	Left Return Lane 25	33	41	49	Left Outlane 57
2 WHT-RED 1J10-8	German Score Board 2	Outhole 10	Drop Target Yellow 18	Word A 26	34	42	50	Lane Change L Flipper 58
3 WHT-ORN 1J10-7	Credit Button 3	Ball Trough 1 (right) 11	Drop Target Blue 19	Word V 27	35	43	51	Right Outlane 59
4 WHT-YEL 1J10-6	Right Coin Chute 4	Ball Trough 2 (mid) 12	Drop Target Orange 20	Word E 28	36	44	52	Lane Change R Flipper 60
5 WHT-GRN 1J10-5	Center Coin Chute 5	Ball Trough 3 (left) 13	Drop Target Red II 21	Word N 29	Upr Right 10 pt 37	45	53	Top Loop "Left" 61
6 WHT-BLU 1J10-3	Left Coin Chute 6	Ball Shooter Lane 14	22	Word G 30	Right Ramp 38	Payoff Ramp 46	Top Eject 54	Top Loop "Right" 62
7 WHT-VIO 1J10-2	Slam Tilt 7	Top Tube 15	Left Loop "Left" 23	Word E 31	Left Spin 39	Top Center Ramp 47	Left Slot Lockup 55	Left Kicker 63
8 WHT-GRY 1J10-1	High-Score Reset 8	Bottom Tube 16	Left Loop "Right" 24	Word R 32	Lwr Right 10 pt 40	Right Return Lane 48	Upper Left Lock 56	Right Kicker 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 actuating 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 *Swords of Fury* switch problem reporting displays (either at game Turn-On or at the beginning of the Diagnostic Tests) to determine whether the switch can be actuated. If the switch's name and number are displayed while the operator checks its operation, the operator then knows that the reported problem with that switch is NOT currently caused by a switch malfunction. The operator can then seek other causes for the reported problem, being almost 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 (06 in the Player 3 display), use AUTO- UP and press ADVANCE. The backbox displays should show the *Swords of Fury* 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. *Swords of Fury* now starts in the Attract Mode. (If a switch problem is now reported by the displays, perform the Switch Tests again to determine the nature of the problem; then, perform necessary repairs.)

TEST/DIAGNOSTIC PROCEDURES (Continued)

SYSTEM-11B MEMORY CHIP TEST.

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

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

CPU LED Indicator Codes Table

Diagnostic LED		
Blinks/ 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. **Sound/Speech 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 = Sound/ Speech 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 two test sounds, showing that both the CVSD (Continuously Variable Slope Delta) Modulator, which provides the voices for *Swords of Fury,* and the DAC (Digital-to-Analog Converter) sound circuits are functioning properly.

   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.

TEST/DIAGNOSTIC PROCEDURES (Continued)

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 sound 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	F1 - F4: Gen. Illumination/B'box Interconnect Board
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	F4 - F6; D-12247 Aux Pwr Driver Board
5731-06314-00	Fuse, 4A S-B, 250v	F7; D-12247 Aux Pwr Driver Board
5731-09651-00	Fuse, 5A S-B, 250v	F2C; D-12247 Aux Pwr Driver Board
5731-09128-00	Fuse, 2-1/2A S-B, 250v	F1, F2A, F3; D-12247 Aux Pwr Driver Board
5731-08761-00	Fuse, 1/4A S-B, 250v	F1, D-8345-566 Power Supply
5731-09432-00	Fuse, 7A S-B, 250v	F5, F6; D-8345-566 Power Supply

* 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 Shooter Lane Feeder. The shaded arrows show the directions in which the Shooter Lane Feeder and other parts of its related assemblies can be adjusted for proper operation. Note that the Top Left Eject Hole Arm Assembly is quite similar; it has the same lubrication requirements and adjustment capabilities as the Shooter Lane Feeder.

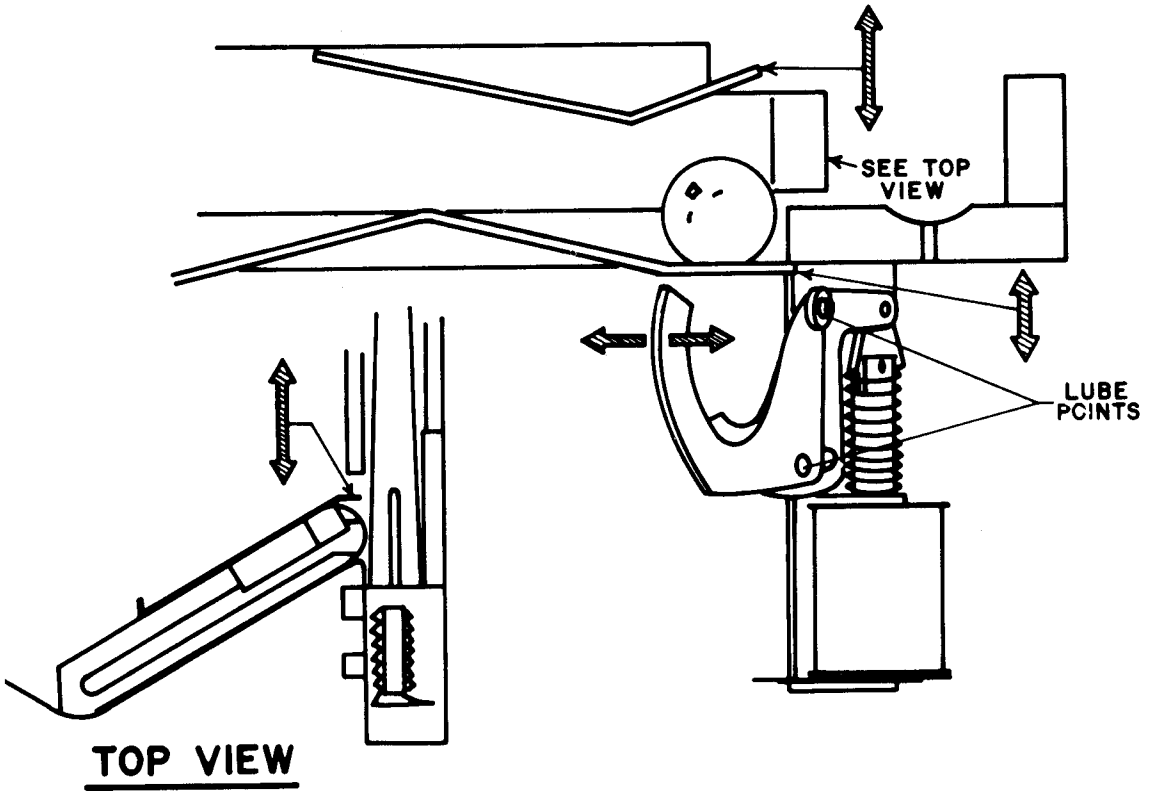


Figure 3. Adjustments and Lubrication Points, Shooter Lane Feeder.

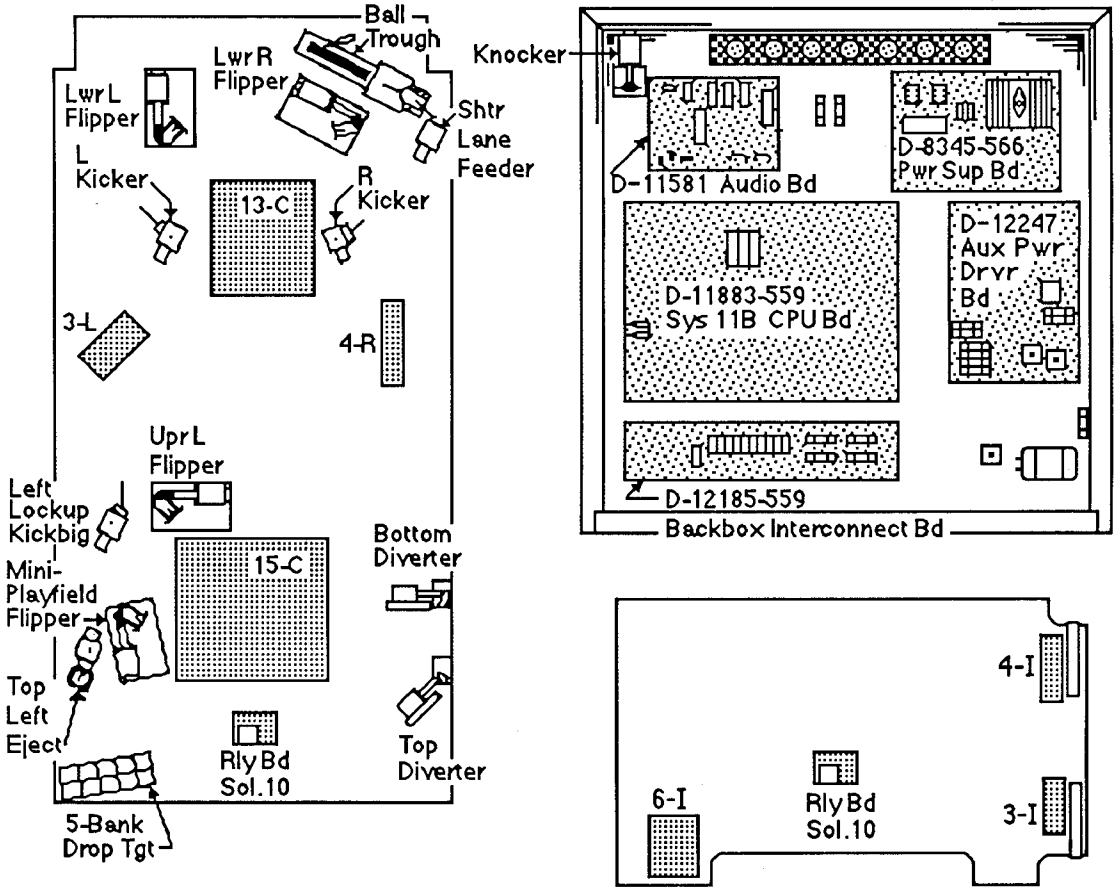
Because of the functional design (arm-actuated via solenoid plunger operation), the pivot points of the Left and Right Kickers ("Slingshots") and the Left Lockup Kickbig all require lubrication as a regular servicing procedure. Mechanical adjustments are simple and somewhat similar to the Shooter Lane Feeder. These mechanisms should also be checked for proper fit (snugly tight) where they attach to the playfield.

Lubrication to ensure proper operation also applies to the target blades of the 5-Bank Drop Target. Regular maintenance is essential to a game's continuing contribution to the operator's earnings.

Section 2
Reference Diagrams & Schematics

- **Diagrams and Schematics:**

  Locations - Game Circuit Boards & Major Mechanisms
  Switches
  Lamps
  Solenoids/Flashers & Rubber Parts
  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



Underside of Playfield
Viewed in Raised Position

Inside of Insert Board
Viewed in Open Position

Locations

Circuit Boards

Major Mechanisms

Locations Diagram - Game Circuit Boards and Major Mechanisms

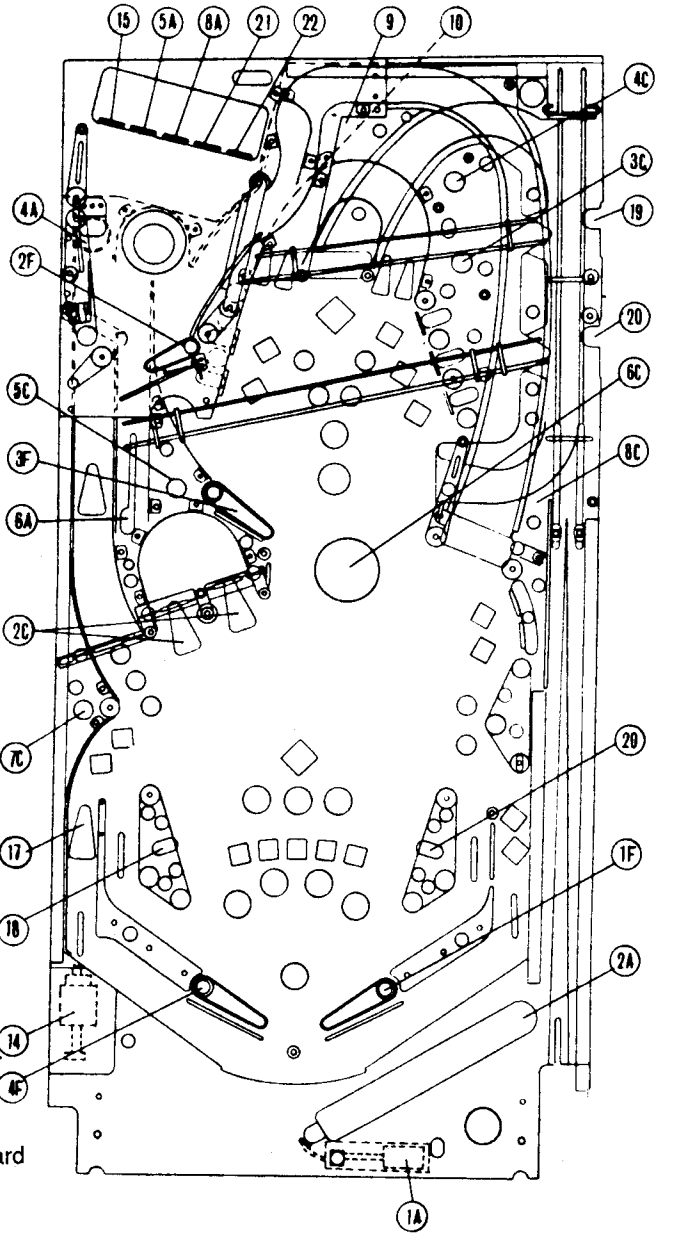
C-11626-L-3	Lower Left Flipper
C-11626-R-3	Lower Right Flipper
C-9638	Ball Shooter Lane Feeder
B-9362-L-1	Coil & Bracket Assembly
B-12283	Left & Right Kicker Arm Assembly
B-11203-L-1	Coil & Bracket Assembly (Left)
B-11203-R-1	Coil & Bracket Assembly (Right)
D-12178	Lamp Board ("13-C")
C-11866	Lamp Board ("3-L")
C-12177	Lamp Board ("4-R")
B-12265	Left Lockup Kickbig
B-9362-R-1	Coil & Bracket Assembly
C-11626-L-8	Upper Left Flipper
D-12179	Lamp Board ("15-C")
C-11897-1	Bottom Diverter
C-11626-R-8	Upper Right (Mini-pl'fld) Flipper
B-9361-L-2	Top Left Eject Hole Arm Assembly
B-9362-L-1	Coil & Bracket Assembly
C-11897-2	Top Diverter
C-11930	5-Bank Drop Target Assembly
C-11844	5-Bank Dr Tgt Opto Board
C-11998-1	Relay Board (Sol. 10 Gen. Illum)
B-10686-2	Knocker Assembly
D-11581-559	Audio Board
D-8345-566	Power Supply Board
D-11883-559	System 11B CPU Board
D-12247-559	Aux Power Driver Board
D-12185-559	Backbox Interconnect Board
C-12256	Lamp Board ("4-I")
C-12257	Lamp Board ("6-I")
C-11998-1	Relay Board (Sol. 10 Gen. Illum)
C-12253	Lamp Board ("3-I")

Solenoids/Flashers

Item	Part No.	Description
01A	AE-23-800	Outhole Kicker
01C	#1251 Flashlamp	Mini-Playfield (p) Flasher
02A	AE-23-800	Ball Shooter Lane Feeder
02C	#89 Flashlamps	Left Loop (p) Flashers
03A	Not Used	
03C	#89 Flashlamps	Tube li,p) Flashers
04A	AE-23-800	Top Left Eject Hole
04C	#89 Flashlamp	Top Ramp (p) Flasher
05A	AE-26-1400	Drop Bank 2 ("A")
05C	#89 Flashlamp	Left Lockup (p) Flasher
06A	AE-23-800	Left Lockup Kickbig
06C	#89 Flashlamp	Balrod (p) Flasher
07A	AE-26-1200	Knocker/Ticket Dispenser (b)
07C	#89 Flashlamp	Left Spinner (p) Flasher
08A	AE-26-1400	Drop Bank 3 ("G")
08C	#89 Flashlamp	Shooter Lane (p) Flasher
09	#89 Flashlamps	Top Center (i) Flashers
10	5580-09555-01	General Illumin Relays (i,p) *
11	#89 Flashlamps	Swords (i) Flashers
12	5580-09555-01	Solenoid A/C Select Relay**
13	Not Used	
14	AE-23-800	Left Outlane Kickback
15	AE-26-1400	Drop Bank 1 ("M")
16	#89 Flashlamp	Left Outlane (p) Flasher
17	AE-26-1200	Bottom Diverter
18	AE-26-1500	Left Kicker ("Sling")
19	AE-26-1200	Top Diverter
20	AE-26-1500	Right Kicker ("Sling")
21	AE-26-1400	Drop Bank 4 ("I")
22	AE-26-1400	Drop Bank 5 ("C")
-	FL 11630/50VDC	Lower Left and Right Flipper
-	FL11753/50VDC	Upper Left Flipper & Mini-Playfield R Flipper

* - On Relay Board, C-11998-1, on Playfield and Insert Board

** - In backbox on Aux Power Driver Bd, D-12247

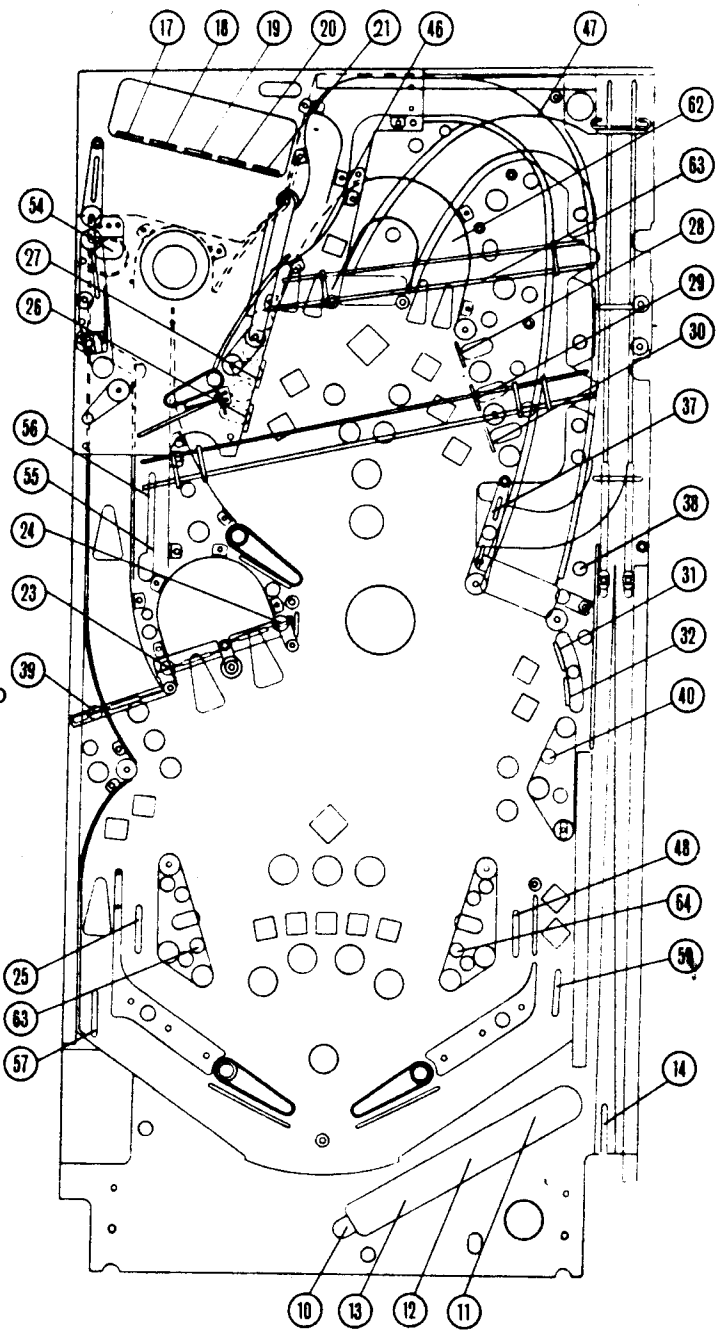


Rubber Parts

Item	Part No.	Description	Qty	Item	Part No.	Description	Qty
A	23-6300	5/16" Ring	8	J	23-6327	Ball Shooter Tip	1
B	23-6301	3/4" Ring	1	K	23-6519-4	Lg Red Flipper Ring	3
C	23-6302	1" Ring	3	L	23-6535	Bumper	6
D	23-6303	1-1/4" Ring	2	M	23-6553-4	Sm Red Flipper Ring	9
E	23-6304	1-1/2" Ring	1	N	23-6556	Sleeving, Black	6
F	23-6305	2" Ring	2	P	23-6626	Grommet	4
G	23-6306	2-1/2" Ring	2	Q	23-6632	Bumper	3
H	23-6313-1	Grommet	1				

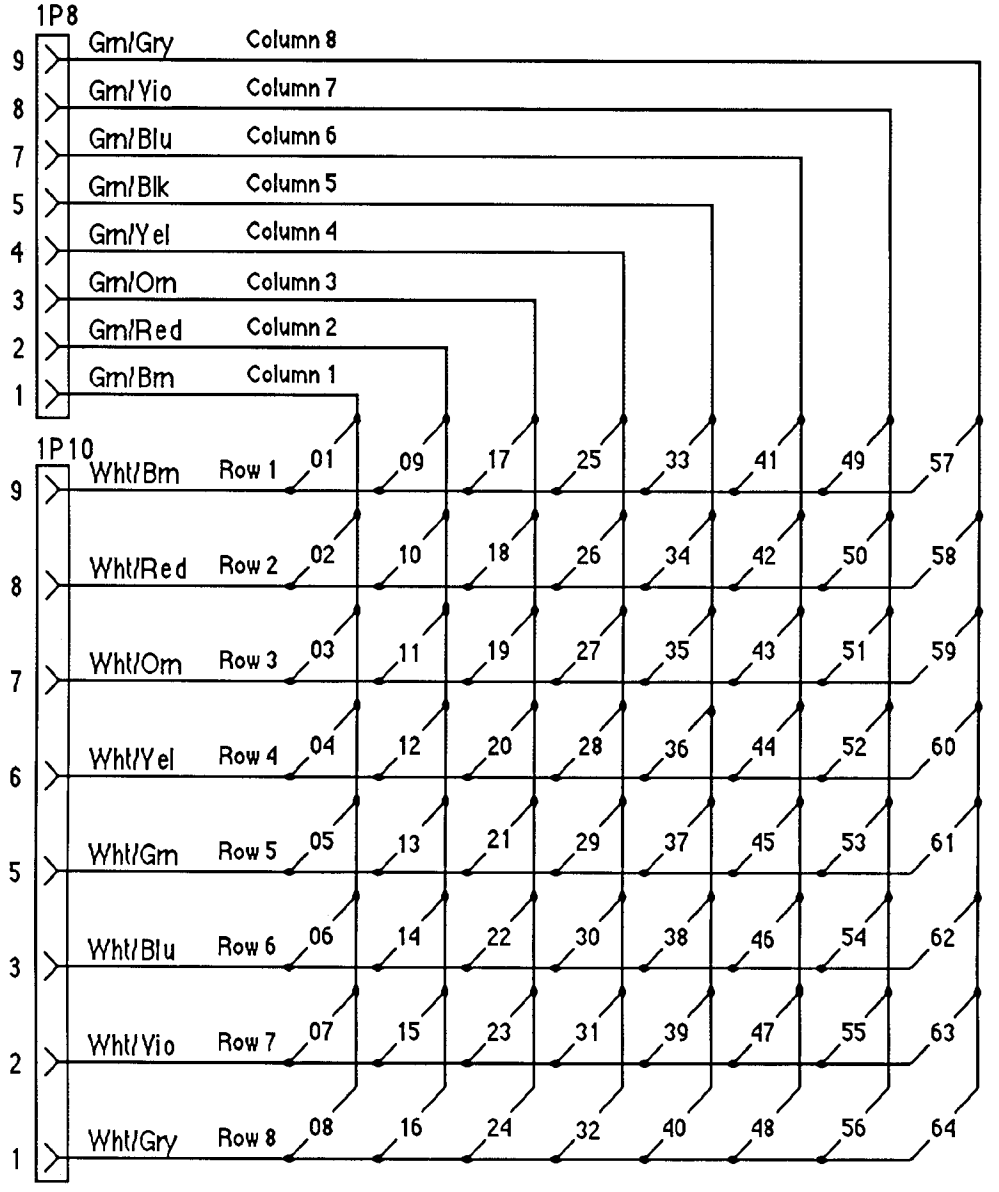
Switches

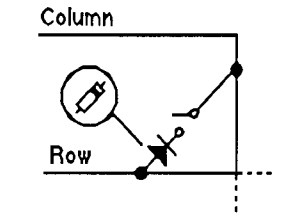
Item	Part No.	Description
1	A-8476	Plumb Bob Tilt
2	Not Used	
3	SW-1A-126	Credit Button
4	27-1092	R Coin Chute (USA)
5	Not Used (USA)	Center Coin Chute
6	27-1092	L Coin Chute (USA)
7	27-1066	Slam Tilt
8	27-1008	High Score Reset*
9	B-8306-1	Playfield Tilt
10	17-1067	Outhole
11	5647-12073-08	Ball Trough 1 (right)
12	5647-09957-00	Ball Trough 2 (mid)
13	5647-09957-00	Ball Trough 3 (left)
14	5647-12073-04	Ball Shooter Lane
15	5647-12073-01	Top Tube
16	5647-12073-01	Bottom Tube
17	p/o C-111844	L Red, 5-bank Opto
18	p/o C-111844	Yellow, 5-bank Opto
19	p/o C-111844	Blue, 5-bank Opto
20	p/o C-111844	Orange, 5-bank Opto
21	p/o C-111844	R Red, 5-bank Opto
22	Not Used	
23	5647-12133-08	Left Loop "Left"
24	5647-12133-08	Left Loop "Right"
25	5647-12073-10	Left Return Lane
26	B-11696-5	A
27	B-11696-5	V
28	B-11696-5	E
29	B-11696-5	N
30	B-11696-5	G
31	B-11696-5	E
32	B-11696-5	R
33	Not Used	
34	Not Used	
35	Not Used	
36	Not Used	
37	A-4834-J	10 pt (top right)
38	5647-12133-08	Right Ramp
39	5647-12133-08	Left Spin
40	A-4834-J	10 pt (lwr right)
41	Not Used	
42	Not Used	
43	Not Used	
44	Not Used	
45	Not Used	
46	5647-12073-01	Payoff Ramp
47	5647-12133-04	Top Center Ramp
48	5647-12073-10	Right Return Lane
49	Not Used	
50	Not Used	
51	Not Used	
52	Not Used	
53	Not Used	



Item	Part No.	Description
54	5647-12073-15	Top Eject Hole
55	5647-12133-01	Left Slot Lockup
56	5647-12073-10	Upper Left Lock
57	5647-12073-10	Left Outlane (drain)
58	5647-12073-14	L Flipper Lane Change**
59	5647-12073-10	Right Outlane (drain)
60	5647-12073-14	R Flipper Lane Change**
61	5647-12073-11	Top Loop "Left"
62	5647-12073-11	Top Loop "Right"
63		Left Kicker***
64		Right Kicker***
-	SW-10A-48	Flipper Button (Cabinet sides)

Notes: * Part Number is for entire Diagnostic Switch Assembly, including H S Reset Switch;
** with Flipper Button switch on cabinet side; *** [Paired Kicker Actuating Sw: A-4834-H; B-8734-1]

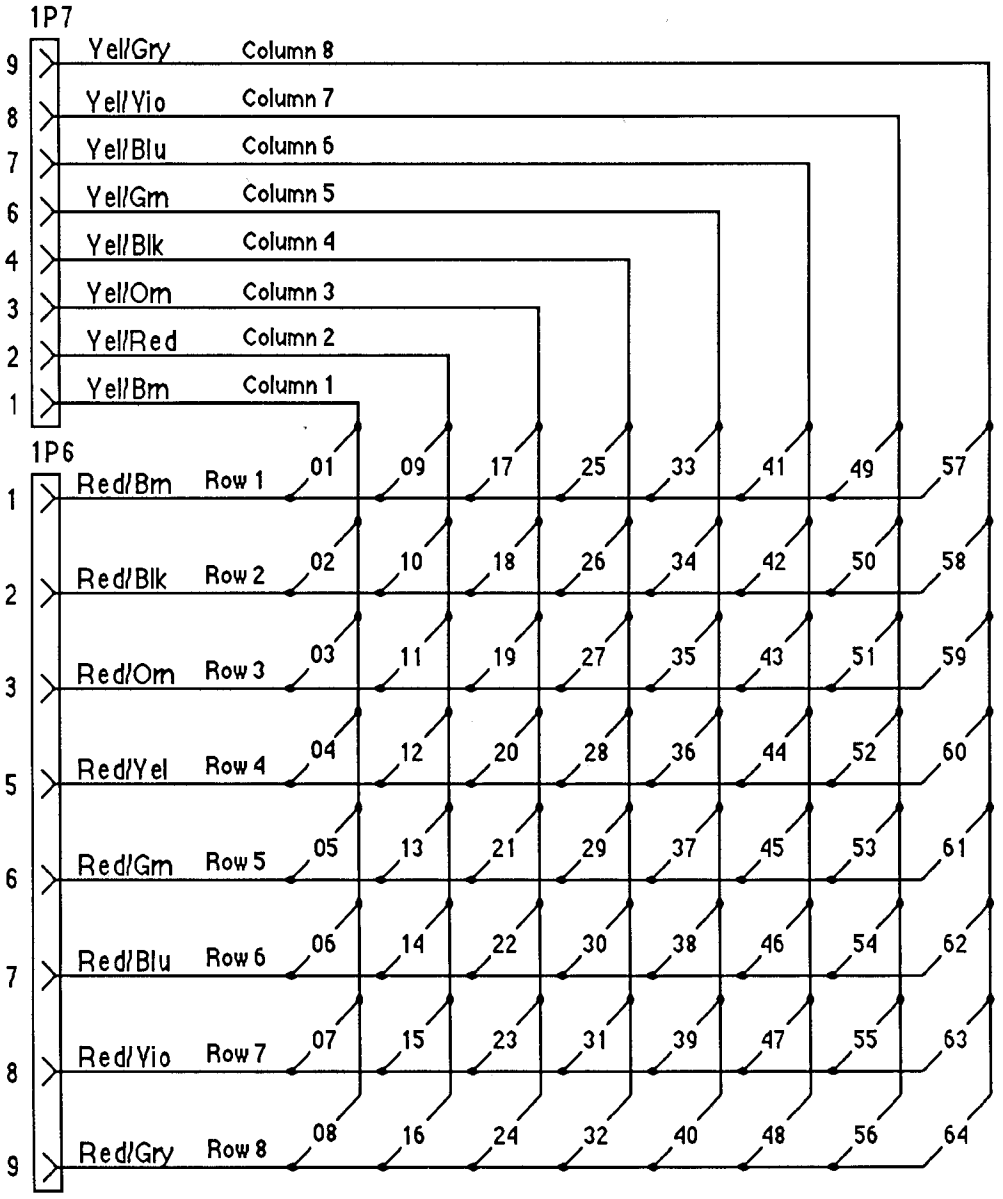


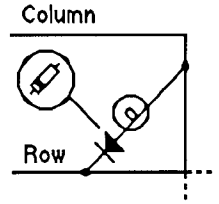


Typical Switch Circuit

Swords of Fury **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	Drop Target Red 17	Left Return Lane 25	33	41	49	Left Outlane 57
2 WHT-RED 1J10-8	German Score Board 2	Outhole 10	Drop Target Yellow 18	Word A 26	34	42	50	Lane Change L Flipper 58
3 WHT-ORN 1J10-7	Credit Button 3	Ball Trough 1 (right) 11	Drop Target Blue 19	Word V 27	35	43	51	Right Outlane 59
4 WHT-YEL 1J10-6	Right Coin Chute 4	Ball Trough 2 (mid) 12	Drop Target Orange 20	Word E 28	36	44	52	Lane Change R Flipper 60
5 WHT-GRN 1J10-5	Center Coin Chute 5	Ball Trough 3 (left) 13	Drop Target Red II 21	Word N 29	Upr Right 10 pt 37	45	53	Top Loop "Left" 61
6 WHT-BLU 1J10-3	Left Coin Chute 6	Ball Shooter Lane 14	22	Word G 30	Right Ramp 38	Payoff Ramp 46	Top Eject 54	Top Loop "Right" 62
7 WHT-VIO 1J10-2	Slam Tilt 7	Top Tube 15	Left Loop "Left" 23	Word E 31	Left Spin 39	Top Center Ramp 47	Left Slot Lockup 55	Left Kicker 63
8 WHT-GRY 1J10-1	High-Score Reset 8	Bottom Tube 16	Left Loop "Right" 24	Word R 32	Lwr Right 10 pt 40	Right Return Lane 48	Upper Left Lock 56	Right Kicker 64





Typical Lamp Circuit

Backglass Lamps: 6, 7,16, 41, 42, 51, 52, and 57 - 64

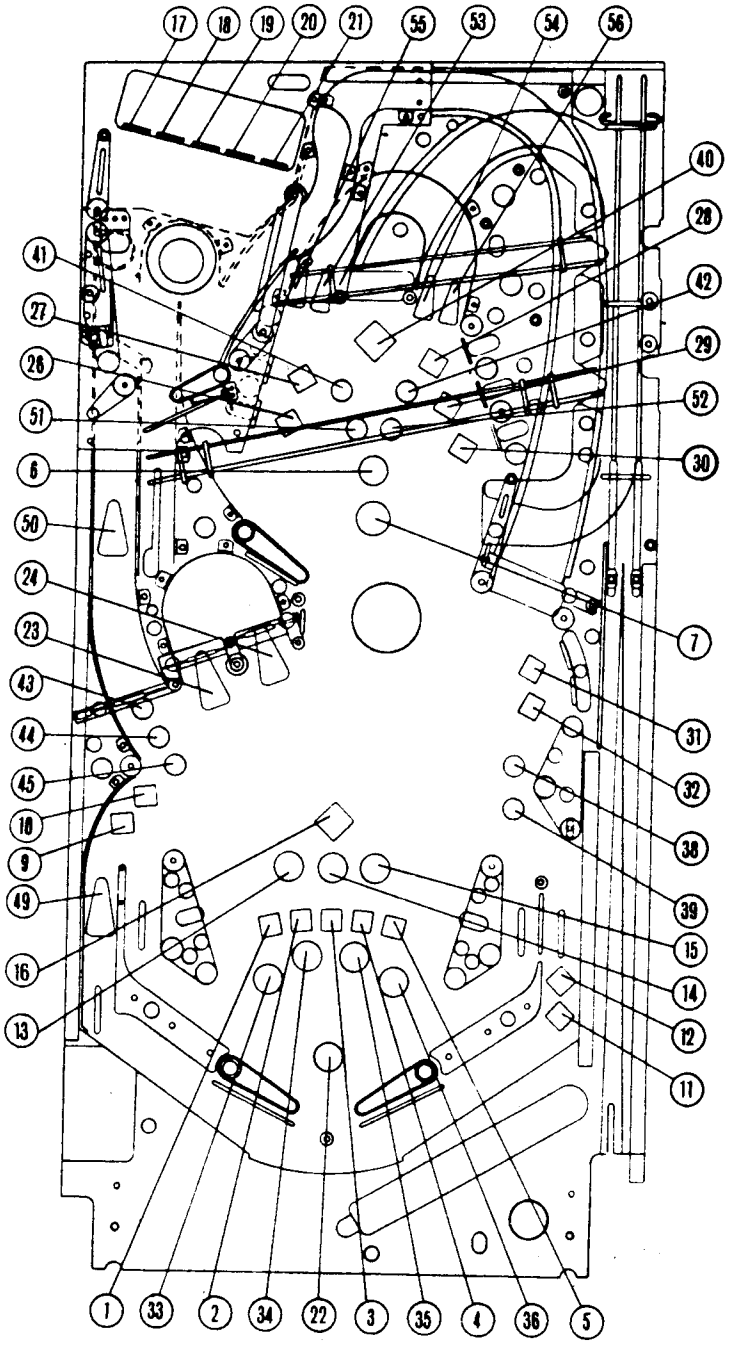
Swords of Fury Lamp-Matrix Table

[2] Two Lamps

Lamps = #44 Bulb, p/n 24-6549
# 555 Bulb, p/n 24-8768

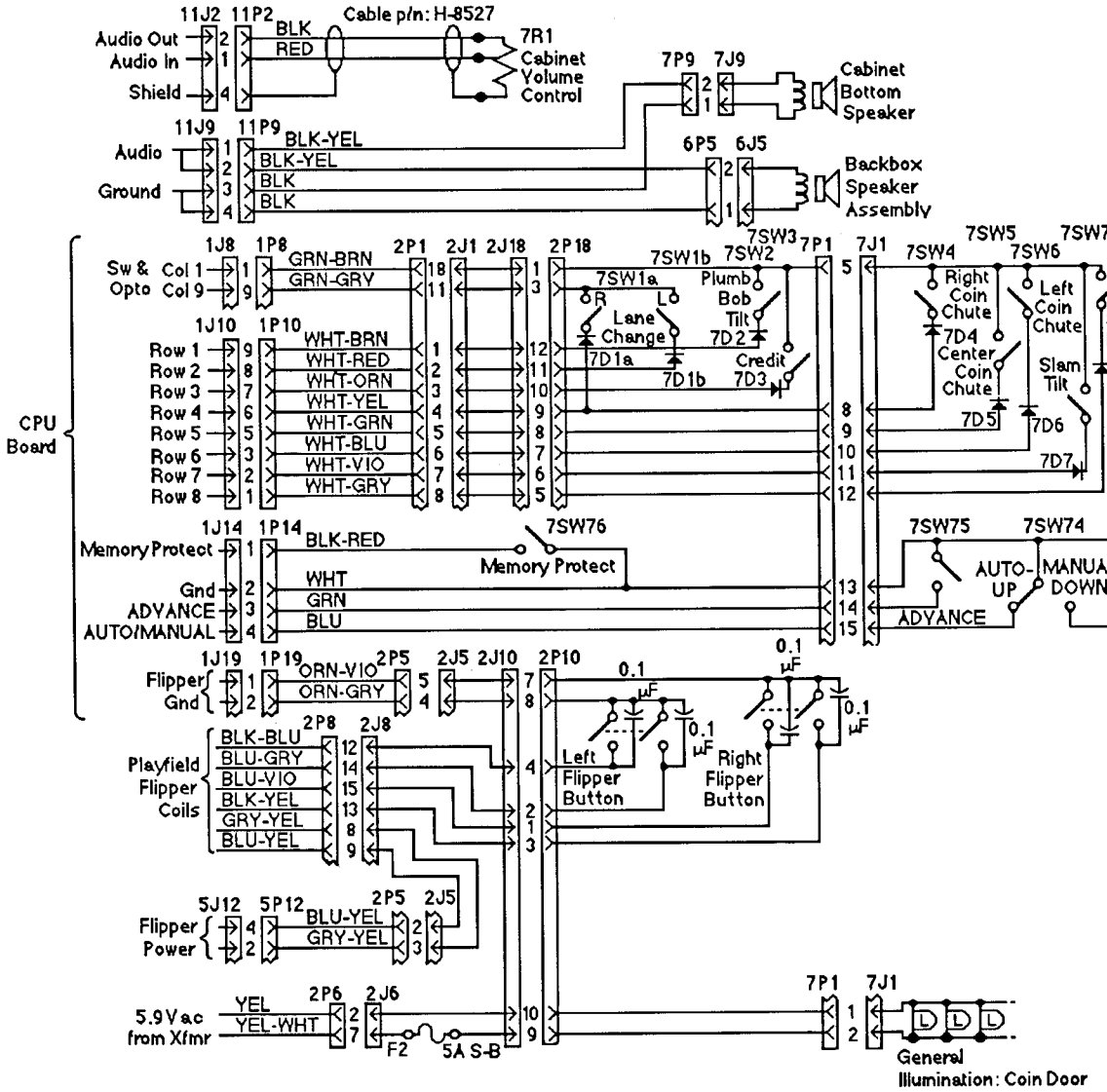
COLUMN / ROW	1 Q66 YEL-BRN 1J7-1	2 Q64 YEL-RED 1J7-2	3 Q62 YEL-ORN 1J7-3	4 Q60 YEL-BLK 1J7-4	5 Q58 YEL-GRN 1J7-6	6 Q56 YEL-BLU 1J7-7	7 Q54 YEL-VIO 1J7-8	8 Q52 YEL-GRY 1J7-9
Q80 1 RED-BRN 1J6-1	Magic Scores 50K 1	Left Outlane Advance 9	Drop Bank Red 17	25	Avenger Scores 50K 33	Top Loop [2] 20K 41	Left Outlane Kicker 49	500,000 57
Q81 2 RED-BLK 1J6-2	Magic Scores 100K 2	Left Outlane Collect 10	Drop Bank Yellow 18	Word A 26	Avenger Scores 150K 34	Top Loop [2] 30K 42	Release Titans 50	1,000,000 58
Q82 3 RED-ORN 1J6-3	Magic Scores 150K 3	Right Outlane Advance 11	Drop Bank Blue 19	Word V 27	Avenger Scores 250K 35	Left Spin 1K 43	Top Loop [2] 40K 51	1,500,000 59
Q83 4 RED-YEL 1J6-5	Magic Scores 200K 4	Right Outlane Collect 12	Drop Bank Orange 20	Word E 28	Extra Ball 36	Left Spin 1.5K 44	Top Loop [2] 50K 52	2,000,000 60
Q84 5 RED-GRN 1J6-6	Magic Scores 250K 5	Bonus Mult 1X 13	Drop Bank Red II 21	Word N 29	Right Ramp 37	Left Spin 2K 45	Top Loop Left Advance 53	2,500,000 61
Q85 6 RED-BLU 1J6-7	Top Loop [2] 100K 6	Bonus Mult 2X 14	Avenge Again 22	Word G 30	Playfield Mult 3X 38	Ball Deflect Top 46	Top Loop Right Advance 54	3,000,000 62
Q86 7 RED-VIO 1J6-8	Top Loop [2] 500K 7	Bonus Mult 4X 15	Left Loop "Left" 23	Word E 31	Playfield Mult 2X 39	Ball Deflect Middle 47	Top Loop Left Collect 55	3,500,000 63
Q87 8 RED-GRY 1J6-9	8	Special [2] 16	Left Loop "Right" 24	Word R 32	Lionman Bonus 40	Ball Deflect Bottom 48	Top Loop Right Collect 56	4,000,000 64

Lamps



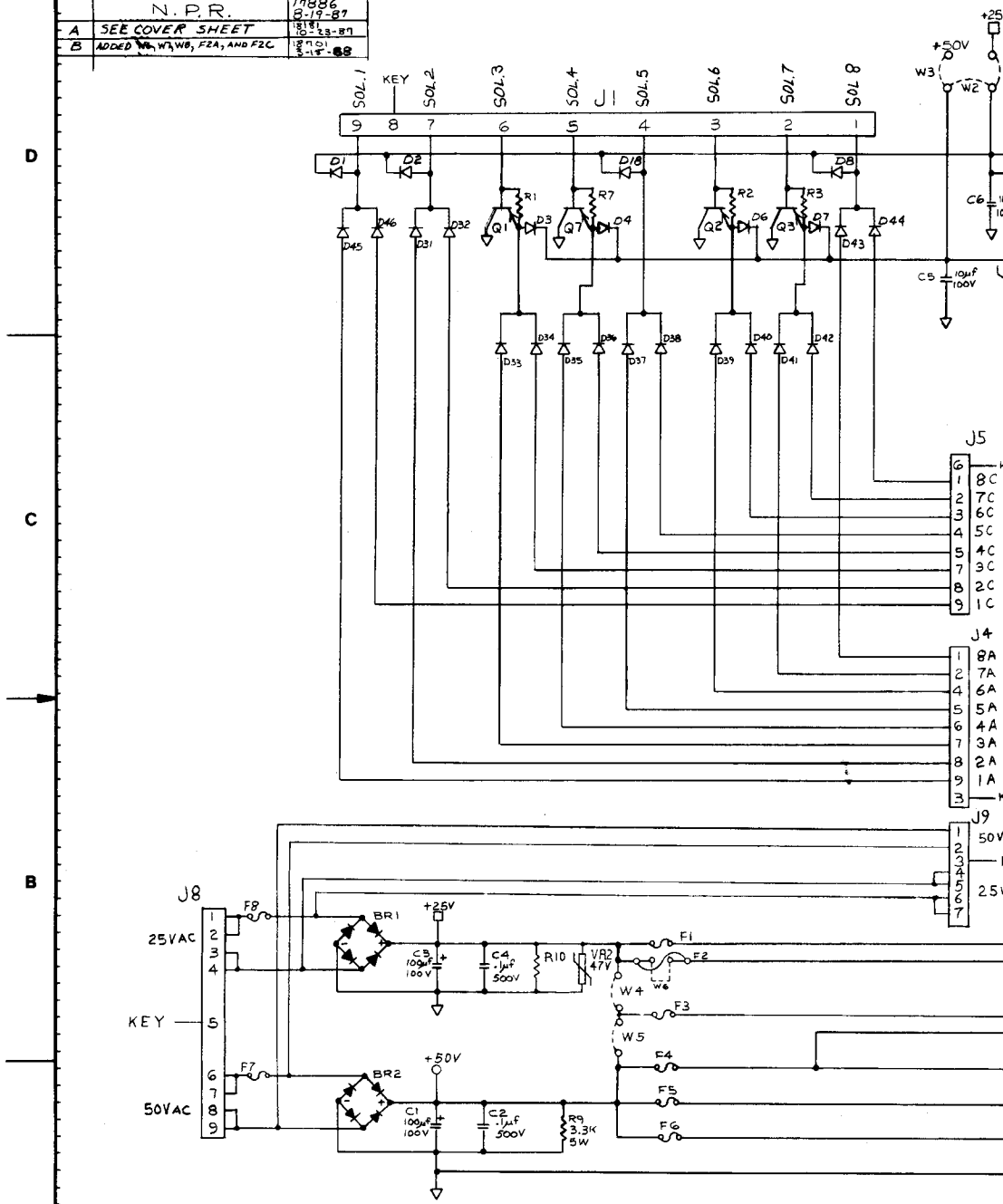
Lamp	Location/Description
1	Magic Scores 50K
2	Magic Scores 100K
3	Magic Scores 150K
4	Magic Scores 200K
5	Magic Scores 250K
6	Top Loop 100K
7	Top Loop 500K
8	(Not Used)
9	ADVANCE (Left Outlane)
10	COLLECT (Left Outlane)
11	ADVANCE (Right Outlane)
12	COLLECT (Right Outlane)
13	1X (Bonus Multiplier)
14	2X (Bonus Multiplier)
15	4X (Bonus Multiplier)
16	Magic Special
17	Left Red Drop Target
18	Yellow Drop Target
19	Blue Drop Target
20	Orange Drop Target
21	Right Red Drop Target
22	AVENGE AGAIN
23	Left Loop "Left"
24	Left Loop "Right"
25	(Not Used)
26	A
27	V
28	E
29	N
30	G
31	E
32	R
33	Avenger Scores 50K
34	Avenger Scores 150K
35	Avenger Scores 250K
36	Avenger Scores Extra Ball
37	Right Ramp
38	Playfield Multiplier 3X
39	Playfield Multiplier 2X
40	LIONMAN Bonus
41	Top Loop 20K
42	Top Loop 30K
43	1,000 (Left Spinner)
44	1,500 (Left Spinner)
45	2,000 (Left Spinner)
46	Ball Diverter Top
47	Ball Diverter Middle
48	Ball Diverter Bottom
49	SHIELD (Left Outlane Kicker)
50	RELEASE TITANS (Left Tunnel)
51	Top Loop 40K
52	Top Loop 50K
53	ADVANCE (Top Loop Left)
54	ADVANCE (Top Loop Right)

Lamp	Location/Description
55	COLLECT (Top Loop Left)
56	COLLECT (Top Loop Right)
57	500,000 Jackpot (backglass)
58	1,000,000 Jackpot (backglass)
59	1,500,000 Jackpot (backglass)
60	2,000,000 Jackpot (backglass)
61	2,500,000 Jackpot (backglass)
62	3,000,000 Jackpot (backglass)
63	3,500,000 Jackpot (backglass)
64	4,000,000 Jackpot (backglass)



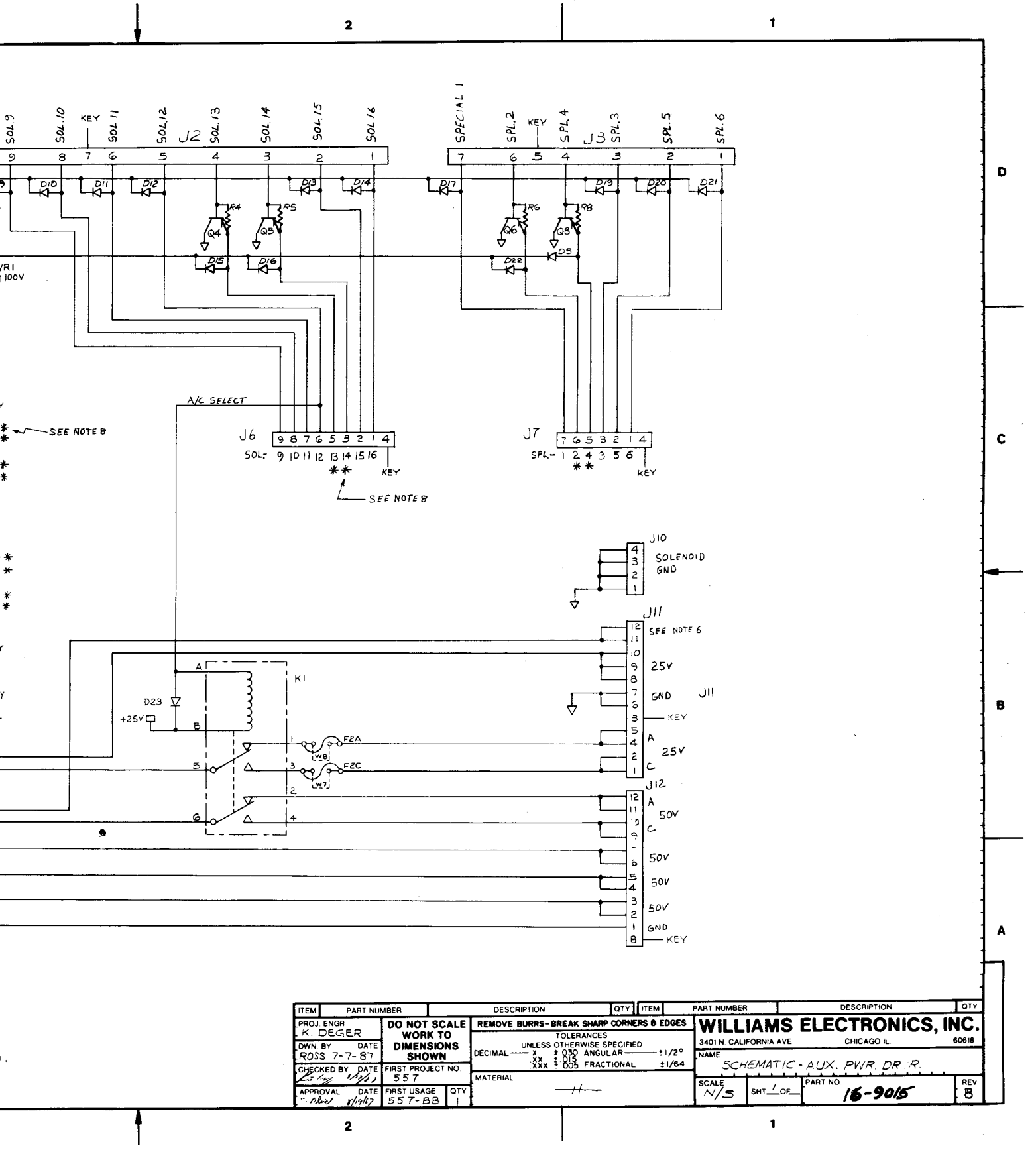
Swords of Fury **Cabinet Wiring**

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N. P. R.	17886 8-19-87
A	SEE COVER SHEET	18181 10-23-89
B	ADDED W6, W7, W8, F2A, AND F2C	18701 5-18-88



NOTES:

1. R1-R8, 220Ω 1/4 W
2. Q1-Q8, TIP-36C
3. D1-D25, 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.

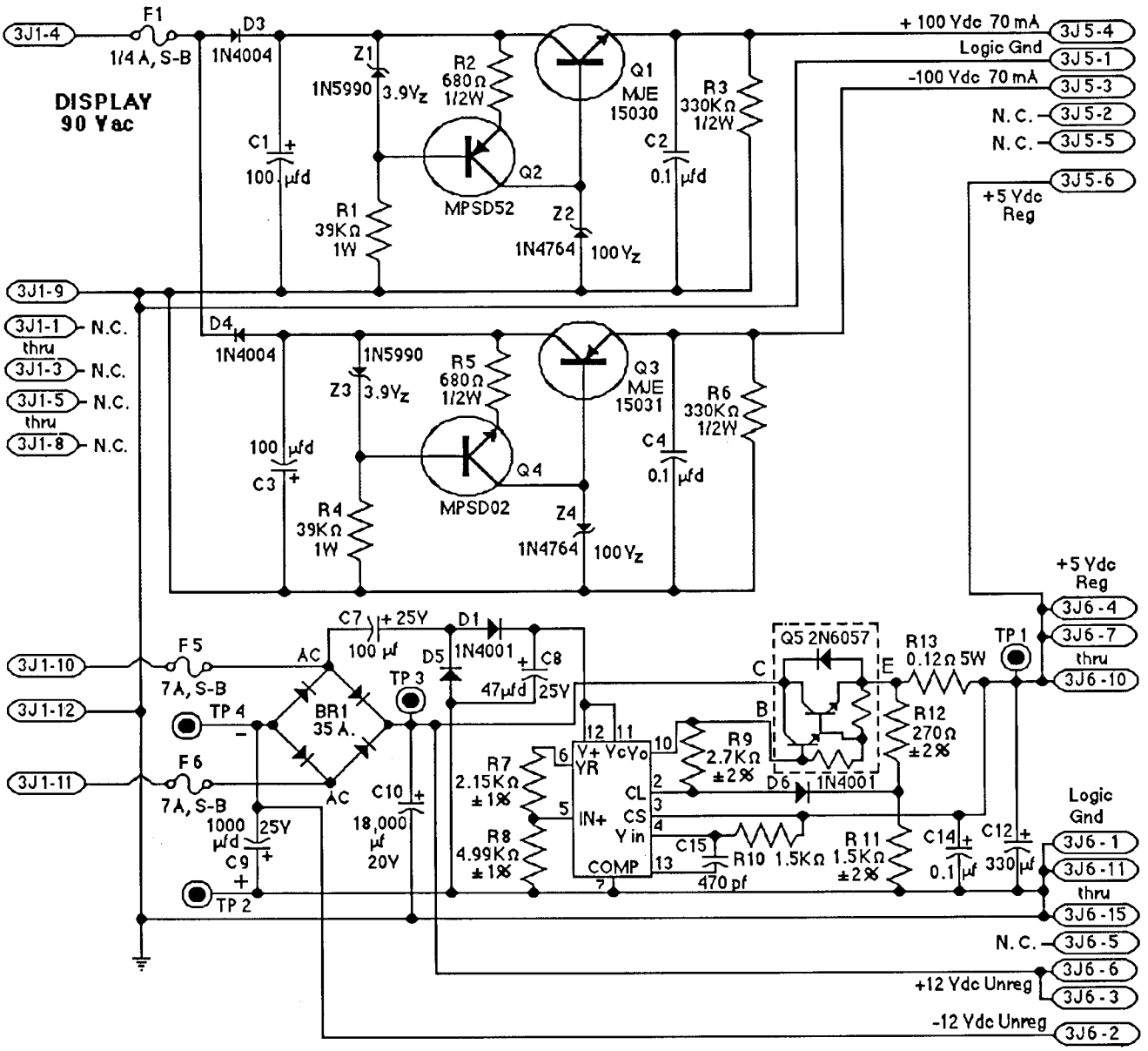


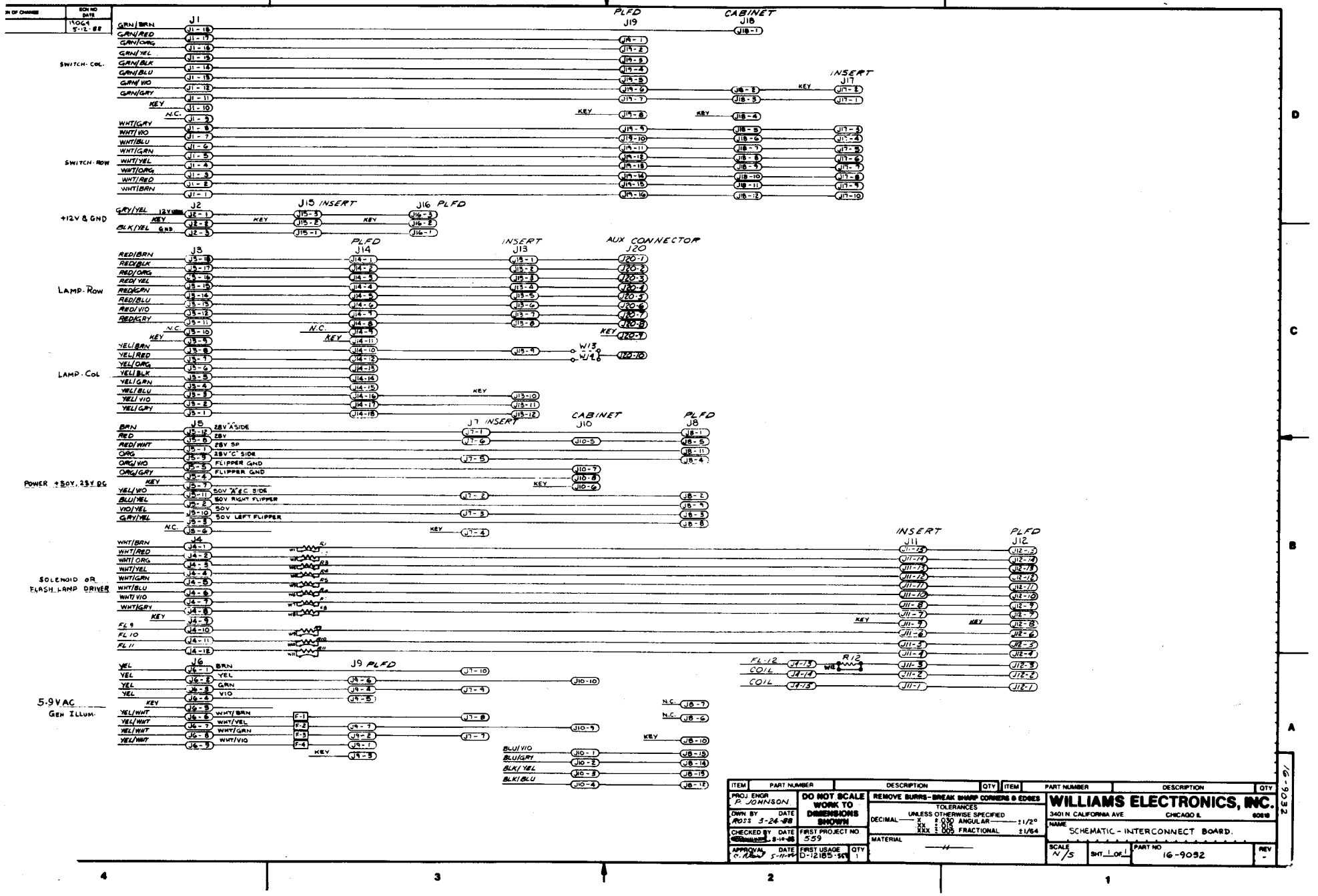
ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY

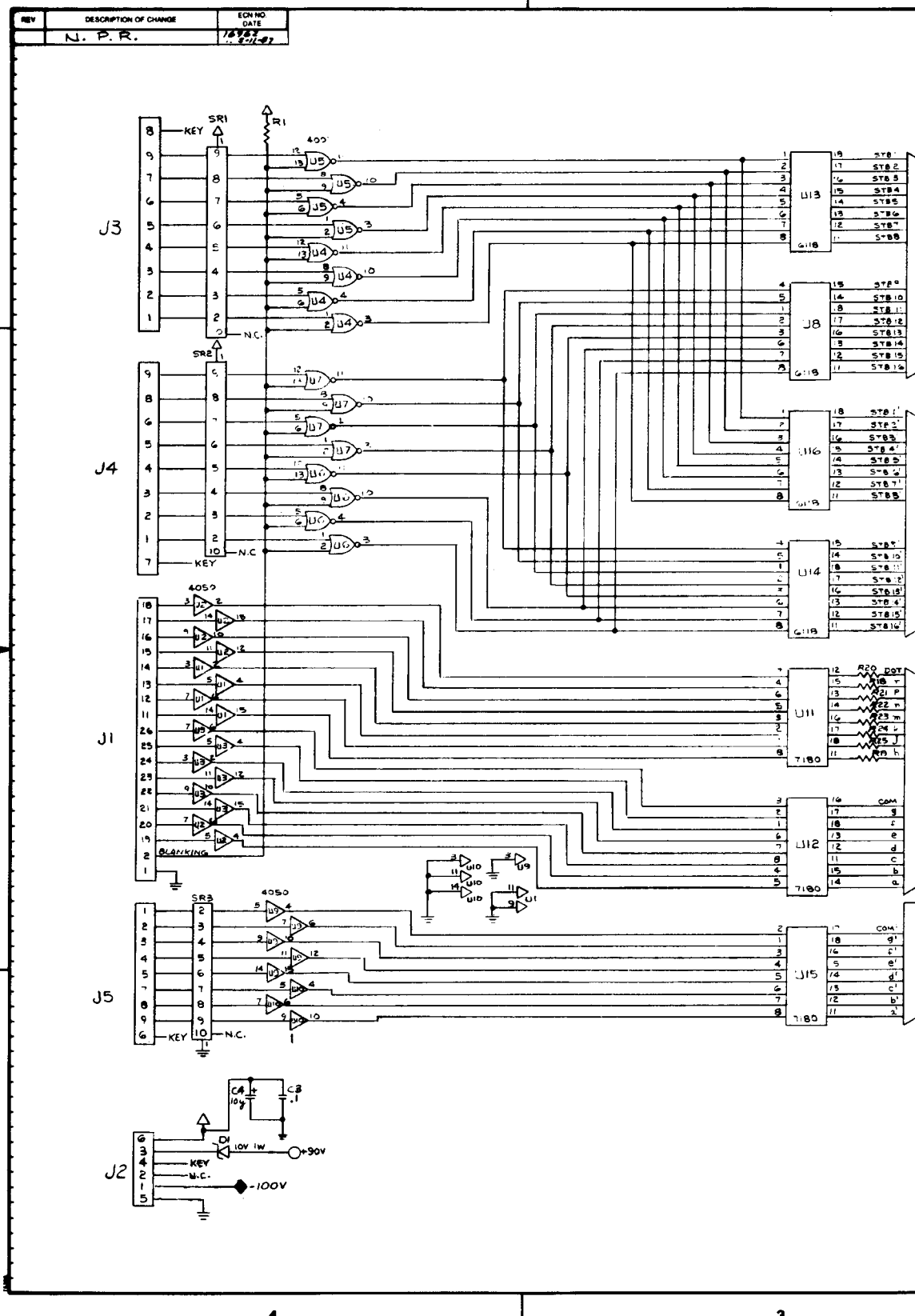
PROJ. ENGR: K. DEGER	DO NOT SCALE WORK TO DIMENSIONS SHOWN	REMOVE BURRS-BREAK SHARP CORNERS & EDGES	WILLIAMS ELECTRONICS, INC.
DWN BY / DATE: ROSS 7-7-87		TOLERANCES UNLESS OTHERWISE SPECIFIED: DECIMAL X ±.030, XX ±.015, XXX ±.005; ANGULAR ±1/2°; FRACTIONAL ±1/64	3401 N. CALIFORNIA AVE. CHICAGO IL 60618
CHECKED BY / DATE	FIRST PROJECT NO: 557		NAME: SCHEMATIC - AUX. PWR. DR. R.
APPROVAL / DATE	FIRST USAGE: 557-BB	QTY: 1	MATERIAL: —
			SCALE: N/S; SHT 1 OF; PART NO: 16-9015; REV: B

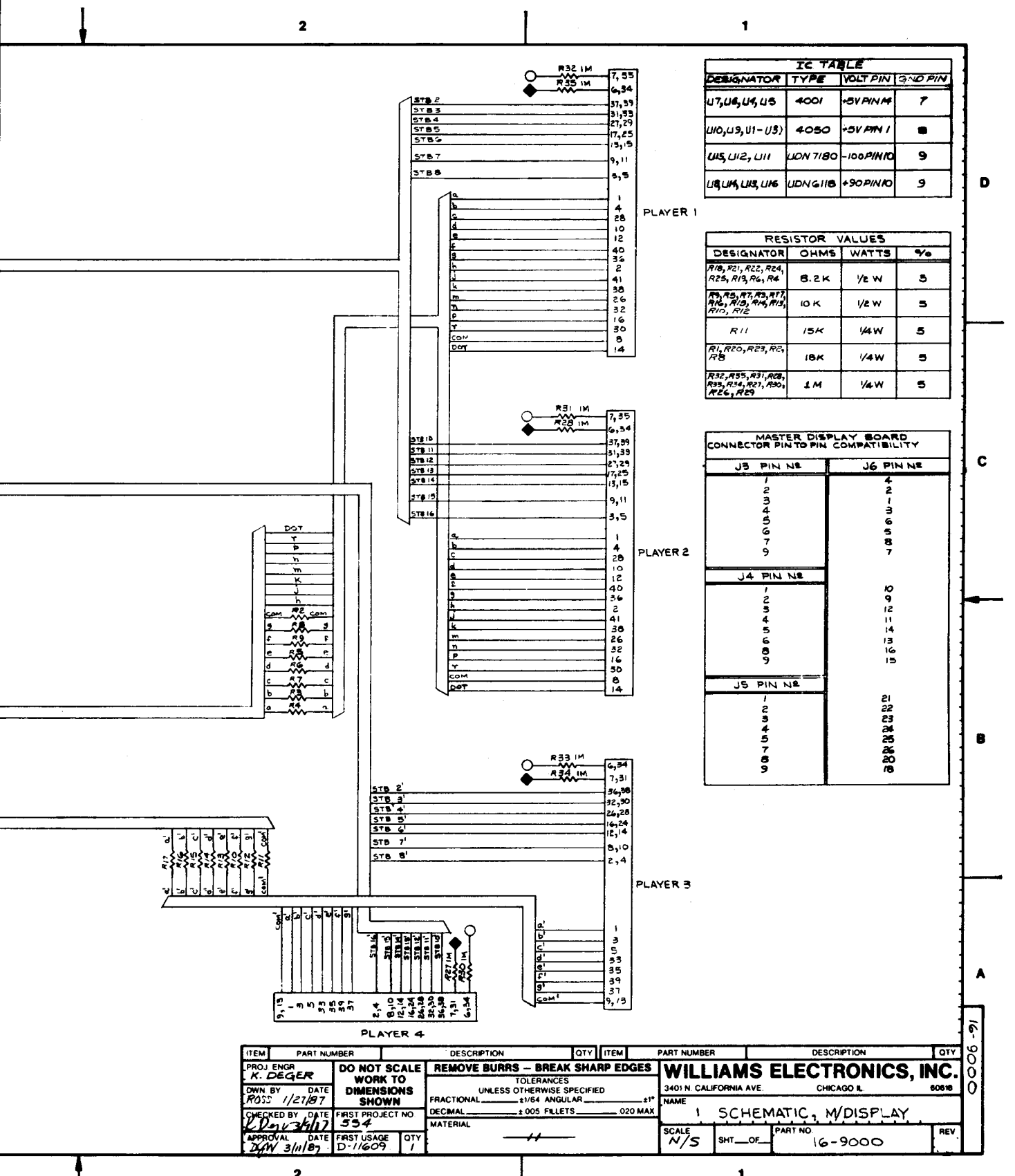
Aux Power Driver Board Schematic

Swords of Fury 43


3J1-4
F1
1/4 A, S-B
D3
1N4004
DISPLAY
90 Vac
Z1
1N5990
3.9Vz
R2
680Ω
1/2W
Q1
MJE
15030
R3
330KΩ
1/2W
C1
100 µfd
Q2
MPSD52
C2
0.1 µfd
R1
39KΩ
1W
Z2
1N4764
100Vz
+ 100 Vdc 70 mA
Logic Gnd
-100 Vdc 70 mA
N. C.
N. C.
3J5-4
3J5-1
3J5-3
3J5-2
3J5-5
3J5-6
+5 Vdc
Reg
3J1-9
3J1-1
thru
3J1-3
3J1-5
thru
3J1-8
N.C.
D4
1N4004
1N5990
Z3
3.9Vz
R5
680Ω
1/2W
Q3
MJE
15031
R6
330KΩ
1/2W
100 µfd
C3
Q4
MPSD02
C4
0.1 µfd
R4
39KΩ
1W
Z4
1N4764
100Vz
+5 Vdc
Reg
3J6-4
3J6-7
thru
3J6-10
3J1-10
3J1-12
3J1-11
F5
7A, S-B
F6
7A, S-B
AC
BR1
35 A.
AC
TP4
TP3
TP2
C7
100 µf
+25Y
D1
1N4001
D5
1N4001
C8
47µfd 25Y
C9
1000 µfd 25Y
C10
18,000 µf
20Y
R7
2.15KΩ ±1%
R8
4.99KΩ ±1%
12
11
10
6
5
2
3
4
13
7
V+
YR
Yc
Yo
IN+
CL
CS
Yin
COMP
R9
2.7KΩ ±2%
C15
470 pf
R10 1.5KΩ
R11
1.5KΩ ±2%
Q5 2N6057
C
B
E
D6
1N4001
R13
0.12Ω 5W
TP1
R12
270Ω ±2%
C14
0.1 µf
C12
330 µf
Logic
Gnd
3J6-1
3J6-11
thru
3J6-15
N. C.
3J6-5
+12 Vdc Unreg
3J6-6
3J6-3
-12 Vdc Unreg
3J6-2


4
3
2
1
D
C
B
A
J1
J2
J3
J4
J5
J6
J7 INSERT
J8 PLFD
J9 PLFD
J10 CABINET
J11 INSERT
J12 PLFD
J13 INSERT
J14 PLFD
J15 INSERT
J16 PLFD
J17 INSERT
J18 CABINET
J19 PLFD
J20 AUX CONNECTOR
SWITCH-COL.
SWITCH-ROW
+12V & GND
LAMP-ROW
LAMP-COL
POWER ±50V, 28V DC
SOLENOID OR FLASH LAMP DRIVER
5.9VAC GEN ILLUM.
KEY
N.C.
W13
W14
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
FL-12 COIL
FLASH LAMP DRIVER
DO NOT SCALE WORK TO DIMENSIONS SHOWN
REMOVE BURRS - BREAK SHARP CORNERS & EDGES
TOLERANCES
UNLESS OTHERWISE SPECIFIED
DECIMAL X ±.030 ANGULAR ±1/2°
XX ±.010
XXX ±.005 FRACTIONAL ±1/64
MATERIAL
PROJ ENGR P. JOHNSON
DWN BY MOSS DATE 3-26-88
CHECKED BY DATE 8-19-88
APPROVAL C. Adams DATE 5-11-89
FIRST PROJECT NO. 559
FIRST USAGE D-12185-561
QTY 1
WILLIAMS ELECTRONICS, INC.
3401 N CALIFORNIA AVE CHICAGO IL 60618
NAME SCHEMATIC - INTERCONNECT BOARD.
SCALE N/S
SHT 1 OF 1
PART NO 16-9052
REV -
16-9052


REV
DESCRIPTION OF CHANGE
ECN NO
DATE
N. P. R.
J3
J4
J1
J5
J2
SR1
SR2
SR3
R1
KEY
N.C.
BLANKING
4050
400
U13
U8
U16
U14
U11
U12
U15
7180
COM
-100V
+90V
10V 1W



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
U5, 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, R25, R19, R6, R4	8.2K	1/2 W	5
R9, R5, R7, R3, R17, R16, R15, R14, R13, R10, R12	10K	1/2 W	5
R11	15K	1/4W	5
R1, R20, R23, R2, R8	18K	1/4W	5
R32, R35, R31, R28, R33, R34, R27, R30, R26, R29	1M	1/4W	5

MASTER DISPLAY BOARD CONNECTOR PIN TO PIN COMPATIBILITY	
J3 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	20
9	18

ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY

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

DO NOT SCALE WORK TO DIMENSIONS SHOWN

FIRST PROJECT NO: 554
FIRST USAGE: D-11609
QTY: 1

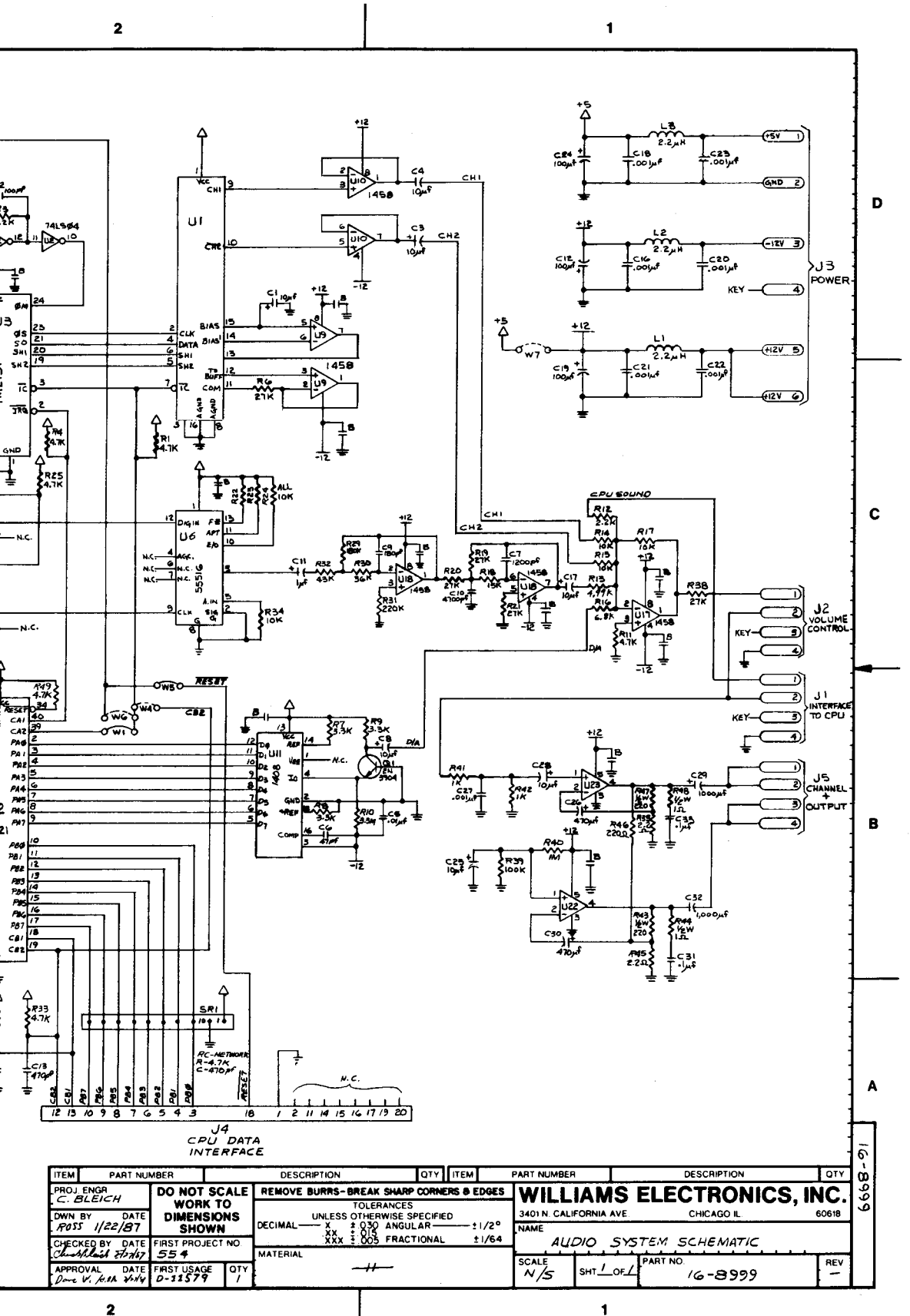
REMOVE BURRS – BREAK SHARP EDGES
TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL ±1/64 ANGULAR ±1°
DECIMAL ± .005 FILLETS .020 MAX
MATERIAL

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

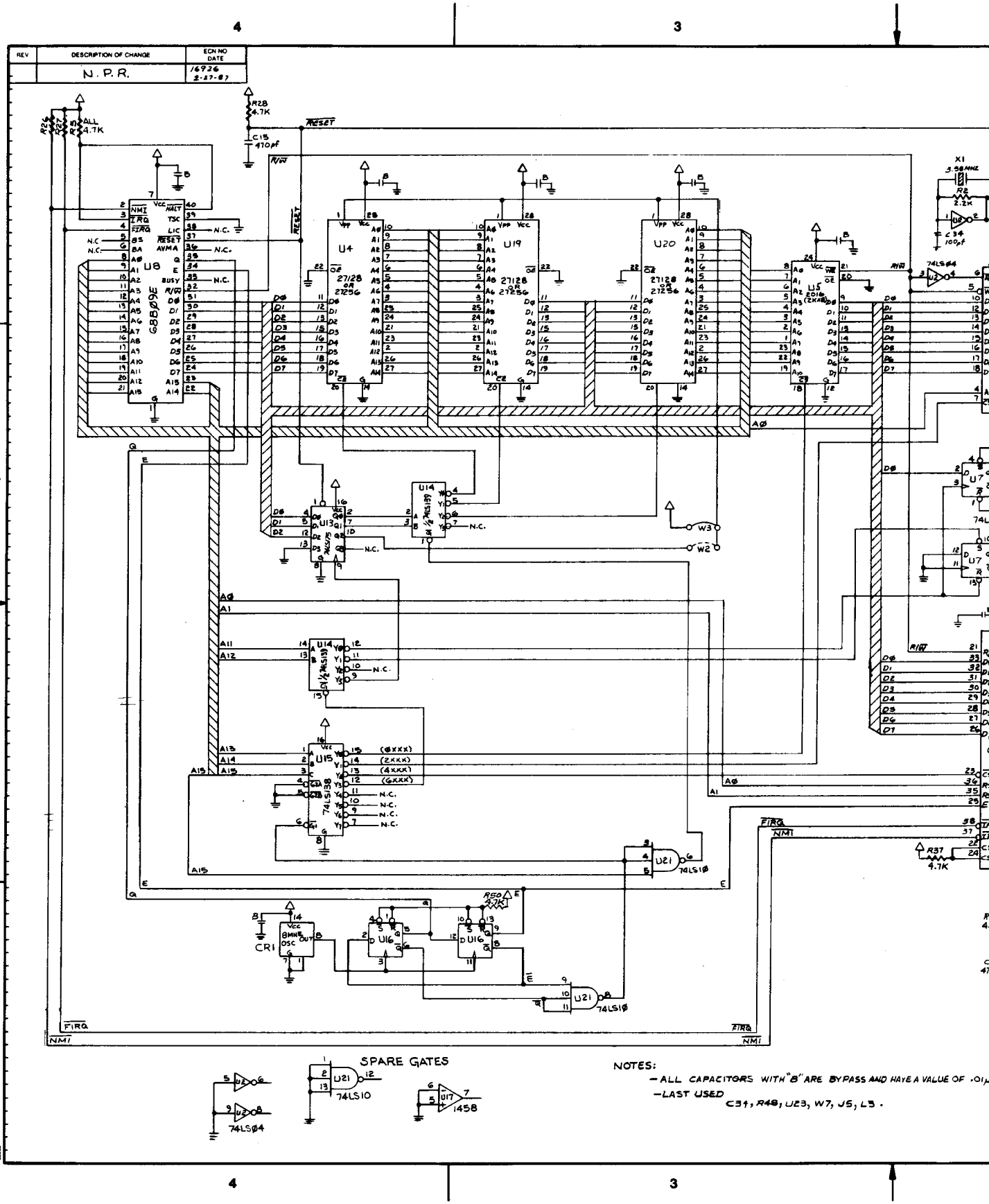
NAME: 1 SCHEMATIC, M/DISPLAY
SCALE: N/S
SHT ___ OF ___
PART NO: 16-9000
REV

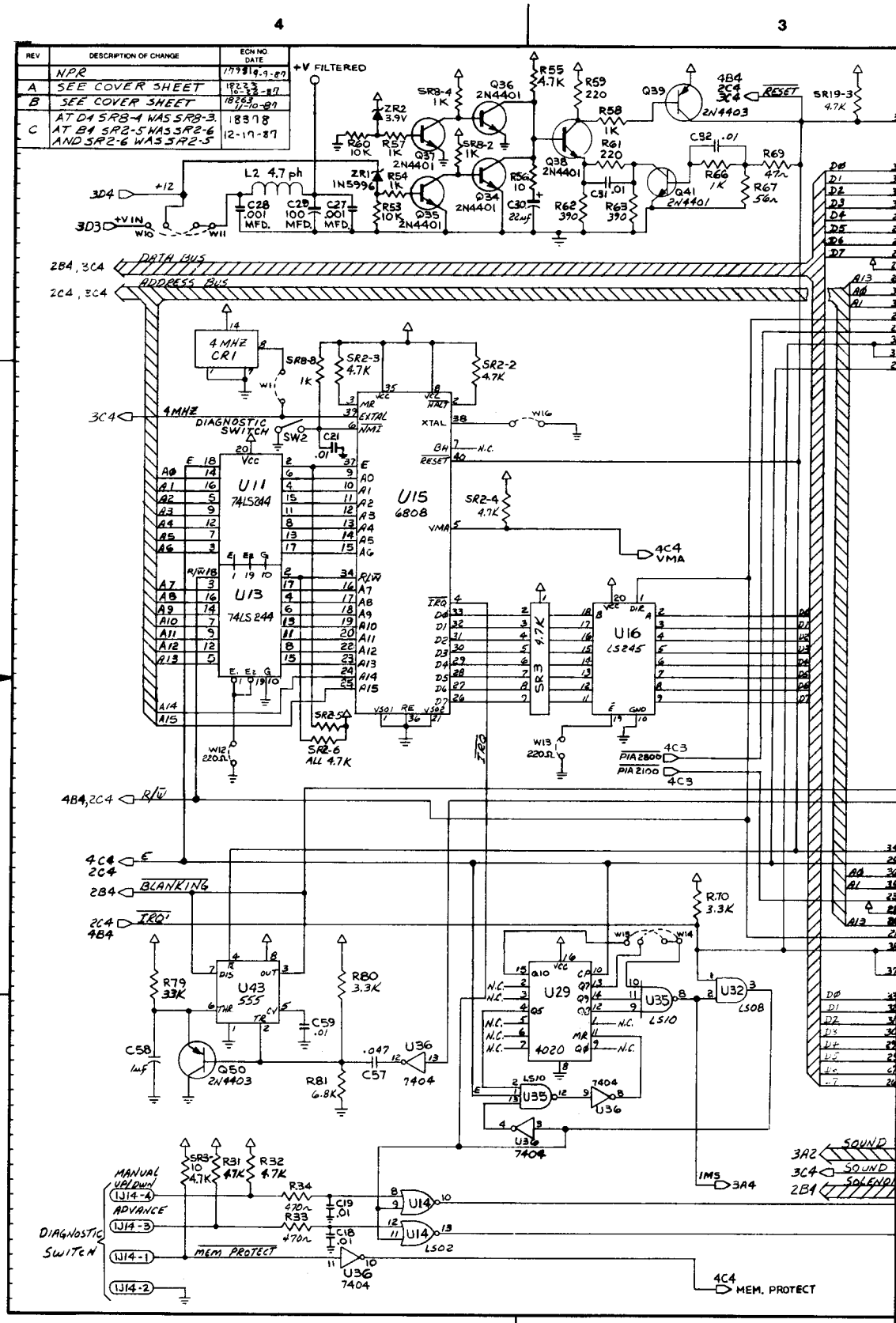
16-9000

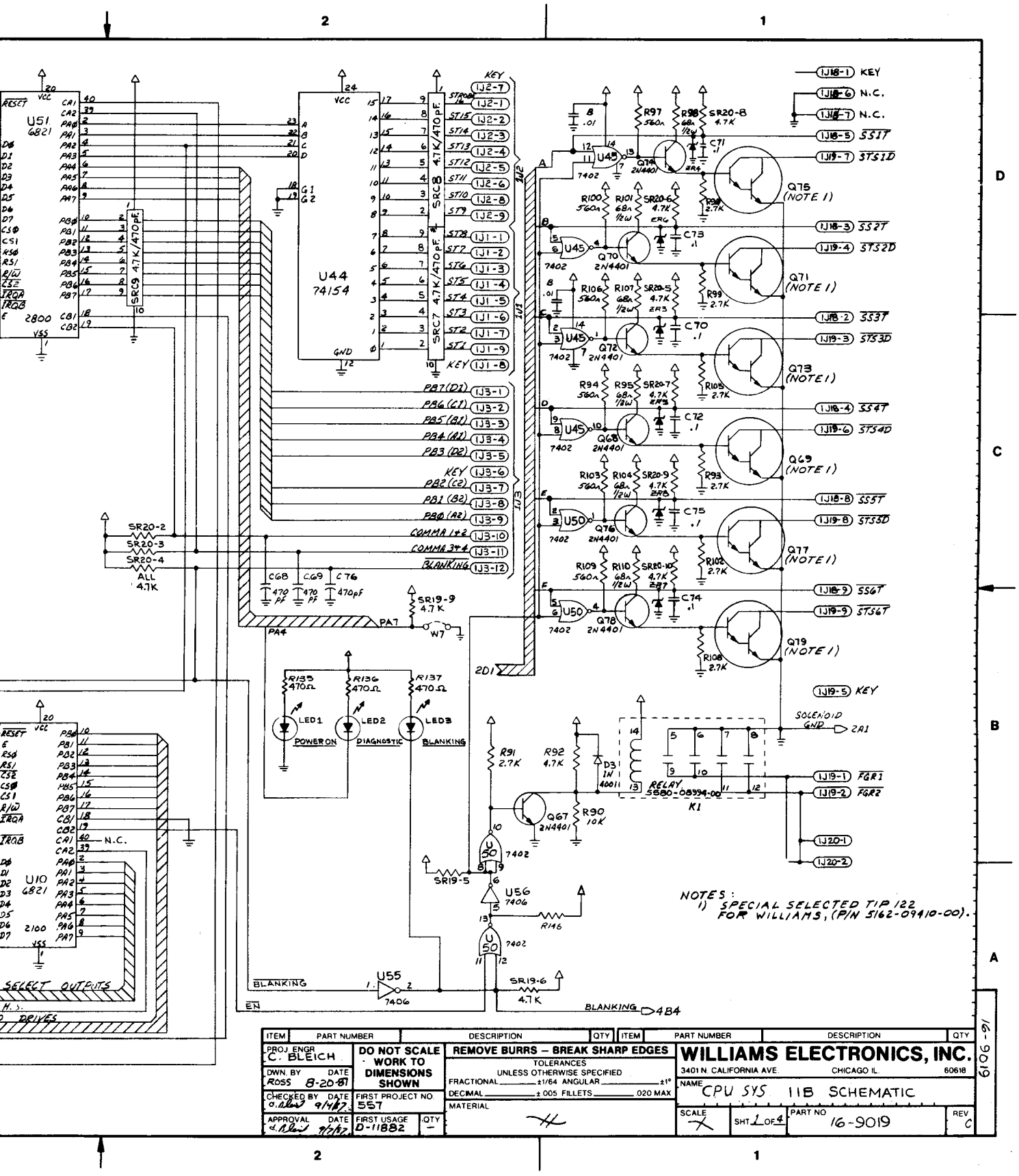
Alphanumeric Display Unit Board (D-11610) Schematic



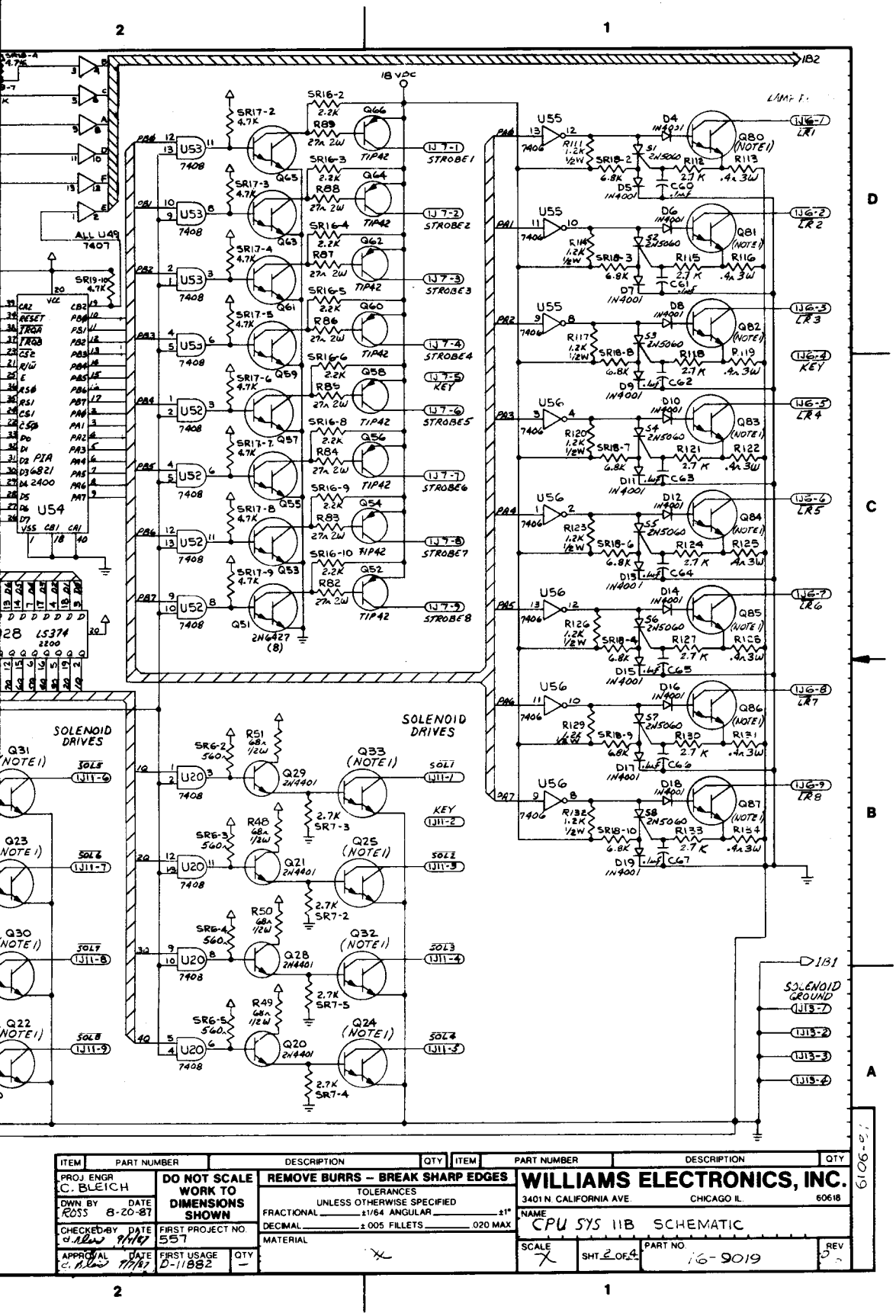
Audio Board (D-11581) Schematic


REV
DESCRIPTION OF CHANGE
ECN NO
DATE
N. P. R.
16926
2-27-87
RESET
NMI
U8
6809E
U4
U19
U20
27128
27256
U13
74LS139
U14
74LS139
U15
74LS138
U16
74LS74
U21
74LS10
U17
1458
CR1
8MHz OSC
X1
3.58MHz
R28
4.7K
ALL
4.7K
C15
470pf
R2
2.2K
C36
100pf
R37
4.7K
W3
W2
N.C.
(8XXX)
(2XXX)
(4XXX)
(6XXX)
IRQ
FIRQ
NMI
SPARE GATES
74LS04
74LS10
1458
NOTES:
-ALL CAPACITORS WITH "B" ARE BYPASS AND HAVE A VALUE OF .01µ
-LAST USED
C31, R48, U23, W7, J5, L3.


REV
DESCRIPTION OF CHANGE
ECN NO DATE
NPR
SEE COVER SHEET
SEE COVER SHEET
AT D4 SRB-4 WAS SRB-3. AT B4 SR2-5 WAS SR2-6 AND SR2-6 WAS SR2-5
+V FILTERED
+12
+VIN
L2 4.7 ph
ZR1 IN5996
ZR2 3.9V
Q36 2N4401
Q37 2N4401
Q34 2N4401
Q35 2N4401
Q38 2N4401
Q39 2N4403
Q41 2N4401
Q50 2N4403
RESET
DATA BUS
ADDRESS BUS
4 MHZ CR1
DIAGNOSTIC SWITCH
SW2
4MHZ
XTAL
U11 74LS244
U13 74LS244
U15 6808
U16 LS245
U43 555
U29 4020
U32 LS08
U35 LS10
U36 7404
U14 LS02
VMA
4C4 VMA
IRQ
R/W
4B4,2C4 R/W
4C4 E
2C4 E
2B4 BLANKING
2C4 IRQ
4B4 IRQ
PIA 2800
PIA 2100
4C3
4C5
MANUAL UP/DOWN
ADVANCE
DIAGNOSTIC SWITCH
MEM PROTECT
4C4 MEM. PROTECT
SOUND
SOUND
SOLENOI
3A2
3C4
2B4
3A4
1MS

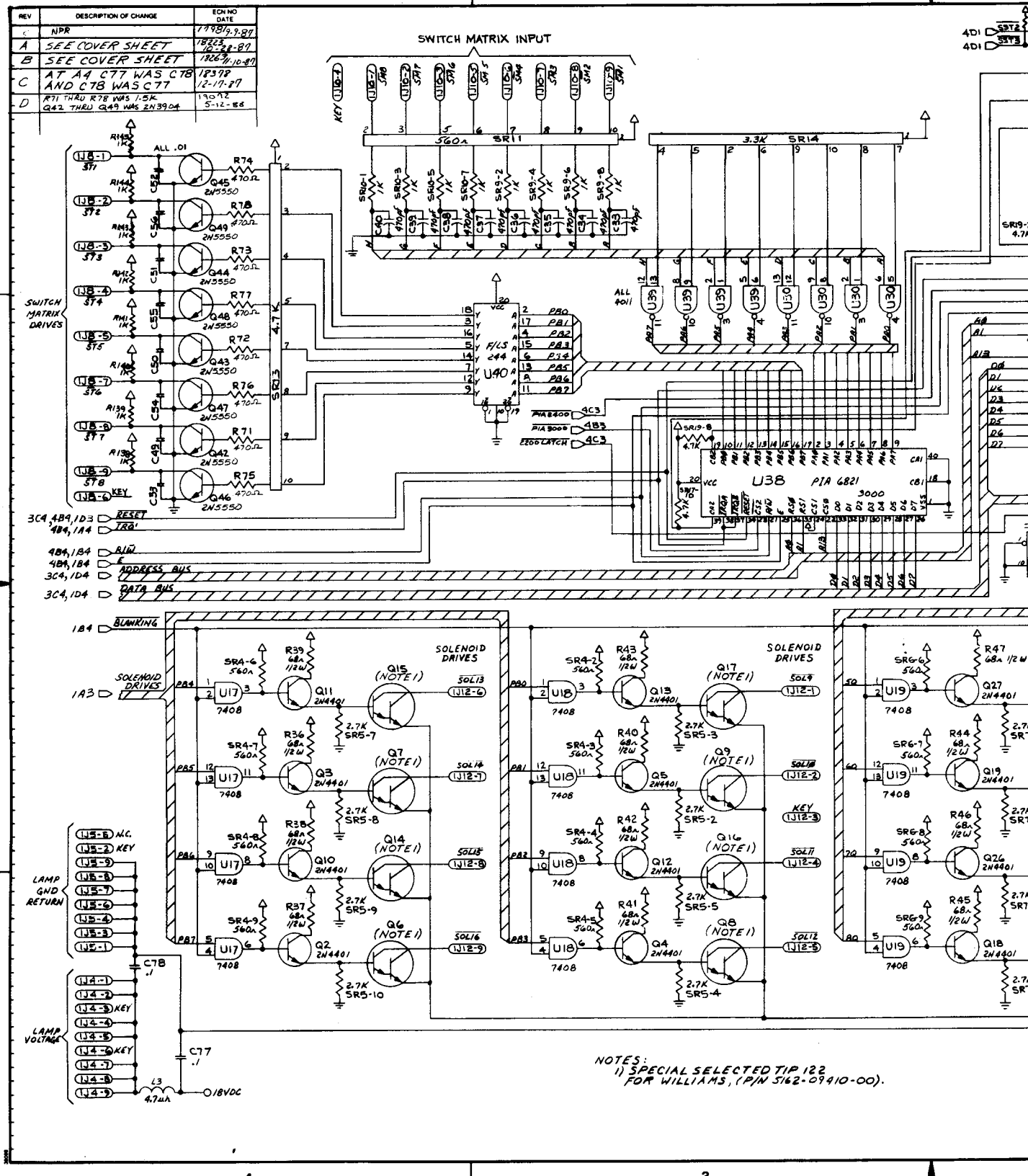


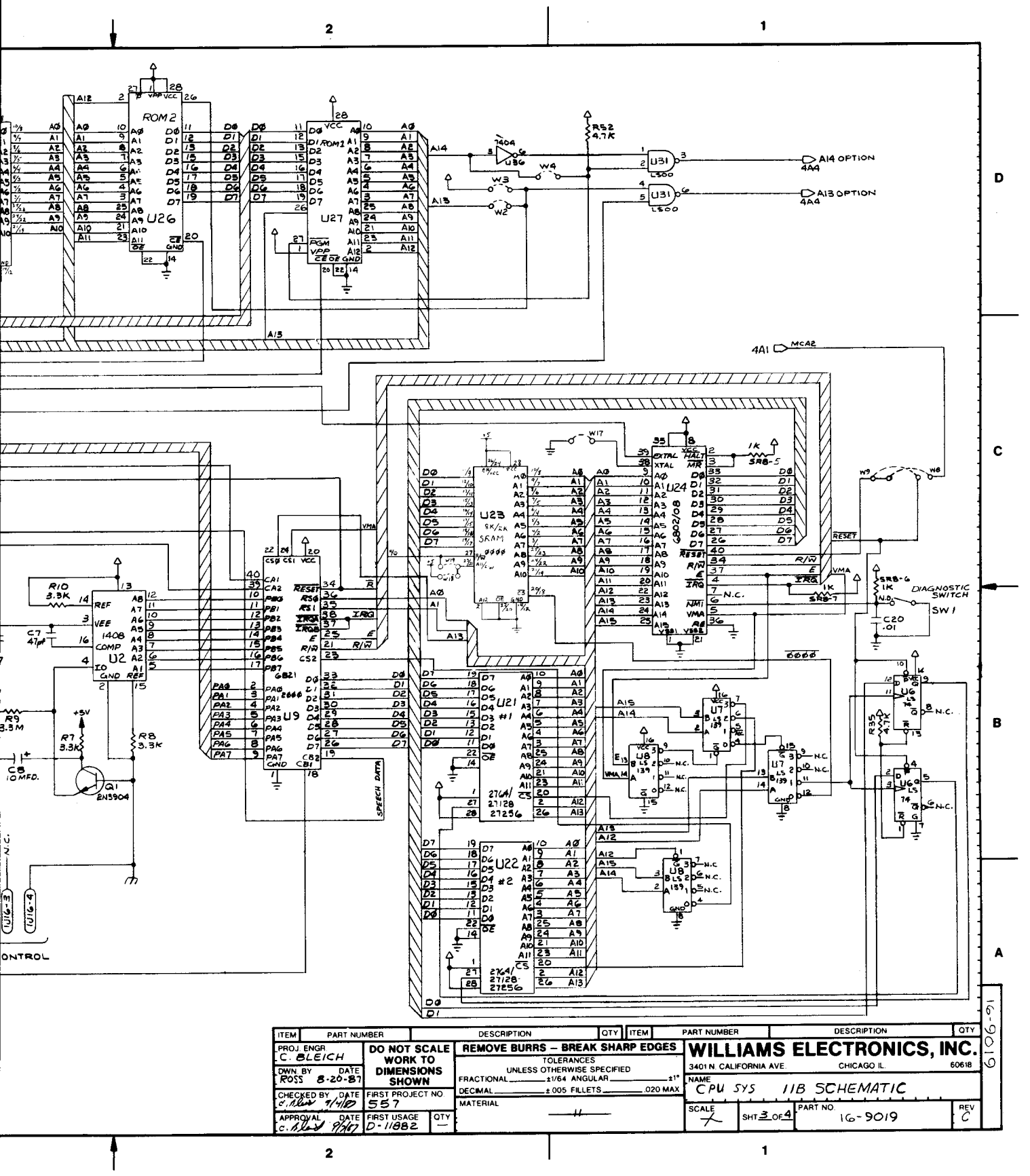
System 11B CPU Schematic (16-9019, Sheet 1 of 4)



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

REV	DESCRIPTION OF CHANGE	ECN NO DATE
-	NPR	179981 9-9-87
A	SEE COVER SHEET	18263 10-28-87
B	SEE COVER SHEET	19067 11-10-87
C	AT A4 C77 WAS C78 AND C78 WAS C77	18398 12-17-87
D	R71 THRU R78 WAS 1.5K Q42 THRU Q49 WAS 2N3904	19092 5-12-88



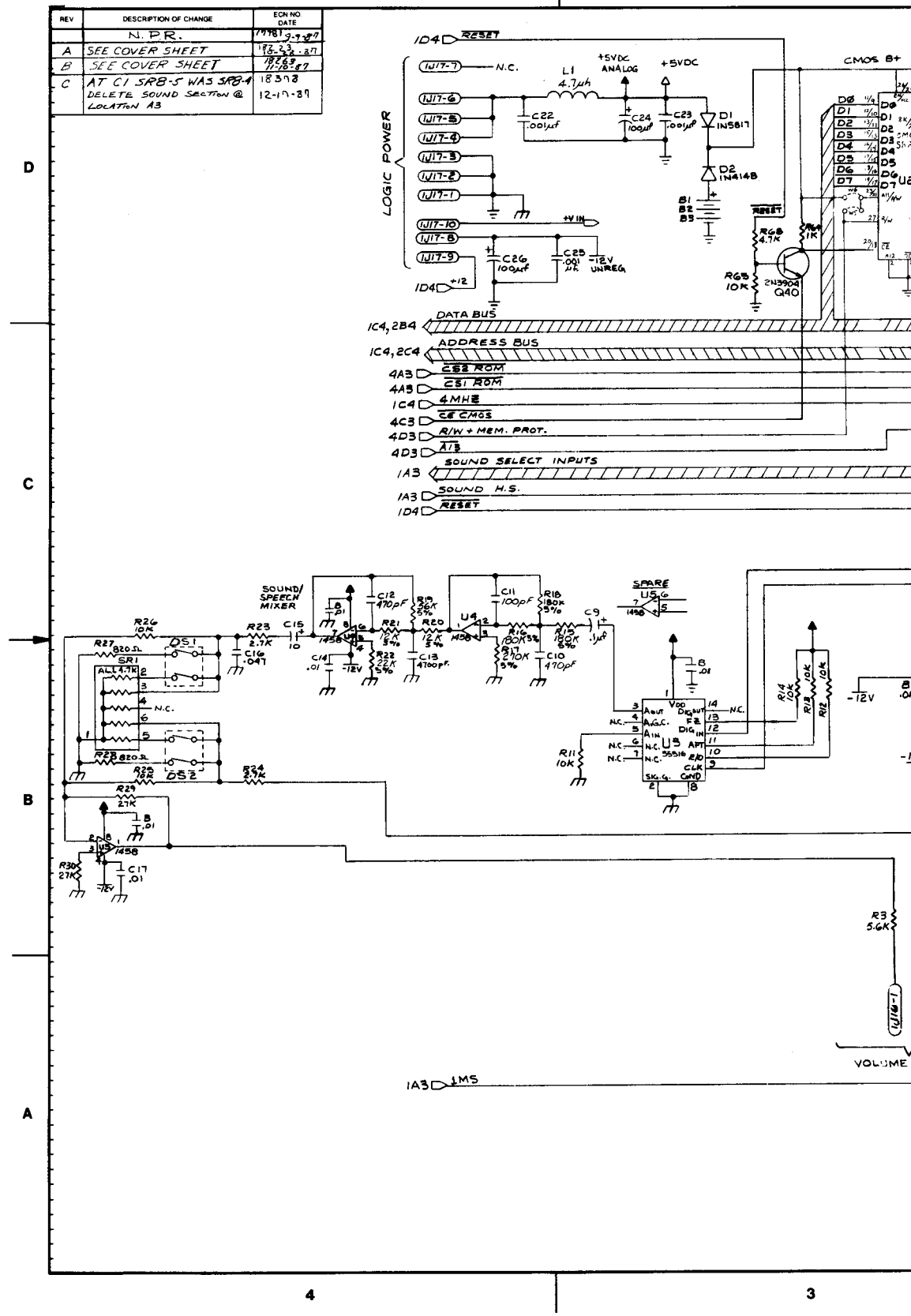


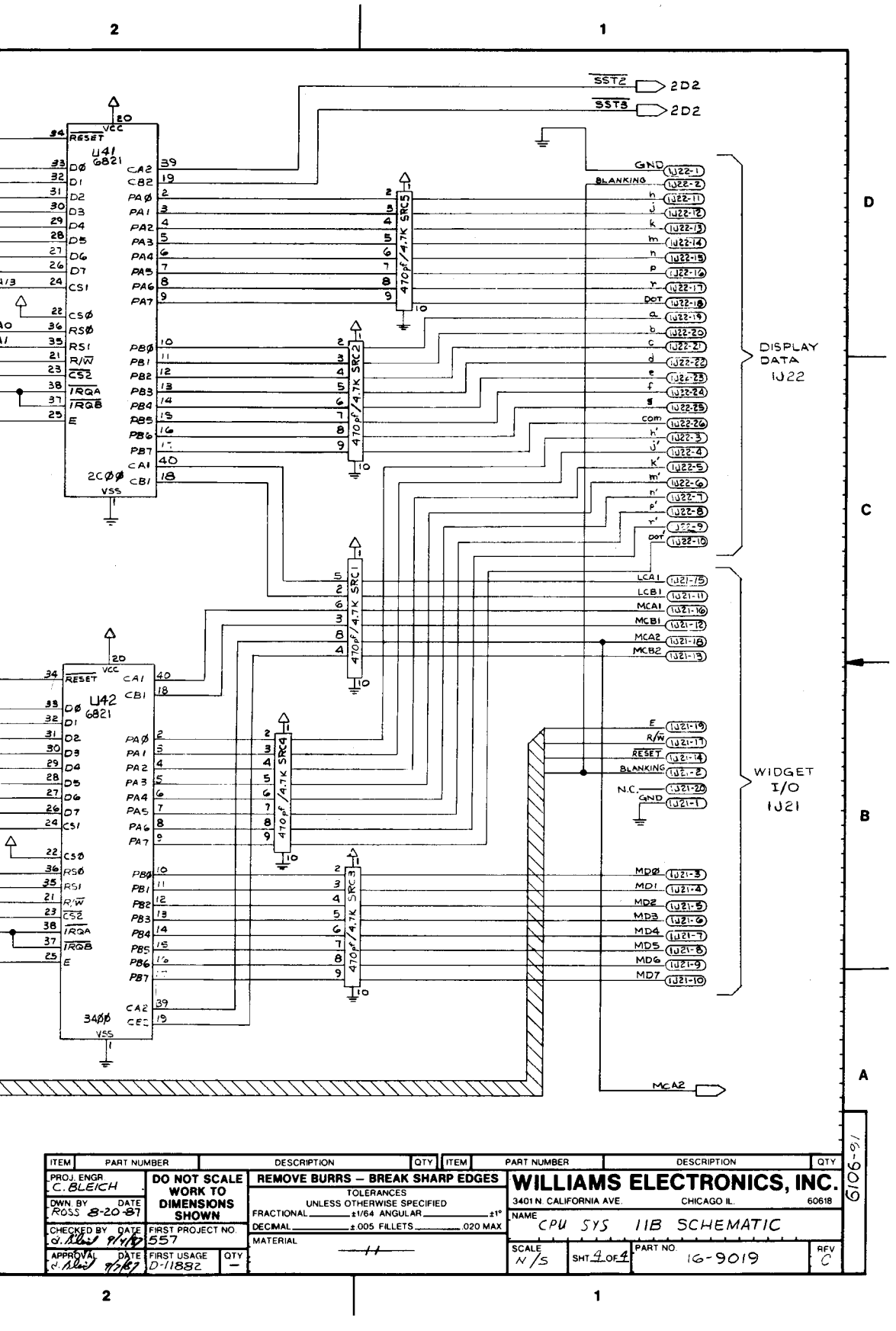
ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY
PROJ. ENGR. C. BLEICH	DO NOT SCALE WORK TO DIMENSIONS SHOWN	REMOVE BURRS – BREAK SHARP EDGES				WILLIAMS ELECTRONICS, INC.	
DWN. BY ROSS DATE 8-20-87		TOLERANCES UNLESS OTHERWISE SPECIFIED				3401 N. CALIFORNIA AVE. CHICAGO IL. 60618	
CHECKED BY C. Bleich DATE 9/4/87	FIRST PROJECT NO. 557	FRACTIONAL ±1/64 ANGULAR ±1°				NAME CPU SYS 11B SCHEMATIC	
APPROVAL C. Bleich DATE 9/4/87	FIRST USAGE D-11882	DECIMAL ±.005 FILLETS .020 MAX				SCALE	SHT 3 OF 4
		MATERIAL				PART NO. 16-9019	REV C

16-9019

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

REV	DESCRIPTION OF CHANGE	ECN NO. DATE
	N.P.R.	17981 9-9-87
A	SEE COVER SHEET	18223 10-22-87
B	SEE COVER SHEET	18289 11-20-87
C	AT C1 SRB-5 WAS SRB-4 DELETE SOUND SECTION @ LOCATION A3	18378 12-10-87





ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY

PROJ. ENGR. C. BLEICH
DWN. BY ROSS 8-20-87
CHECKED BY DATE
APPROVAL DATE
FIRST PROJECT NO. 557
FIRST USAGE D-11882
QTY —

DO NOT SCALE WORK TO DIMENSIONS SHOWN

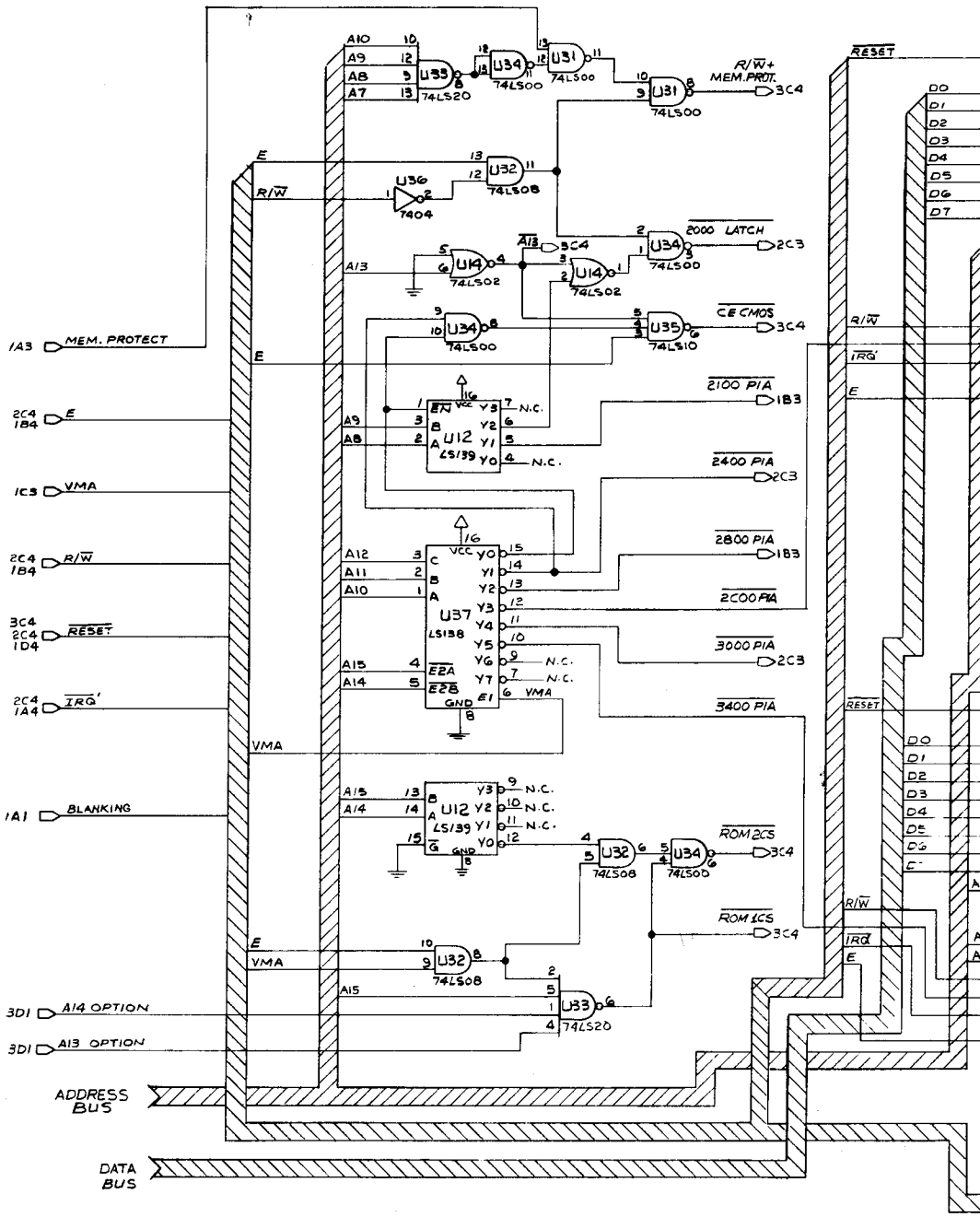
REMOVE BURRS – BREAK SHARP EDGES
TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL ±1/64 ANGULAR ±1°
DECIMAL ±.005 FILLETS .020 MAX
MATERIAL

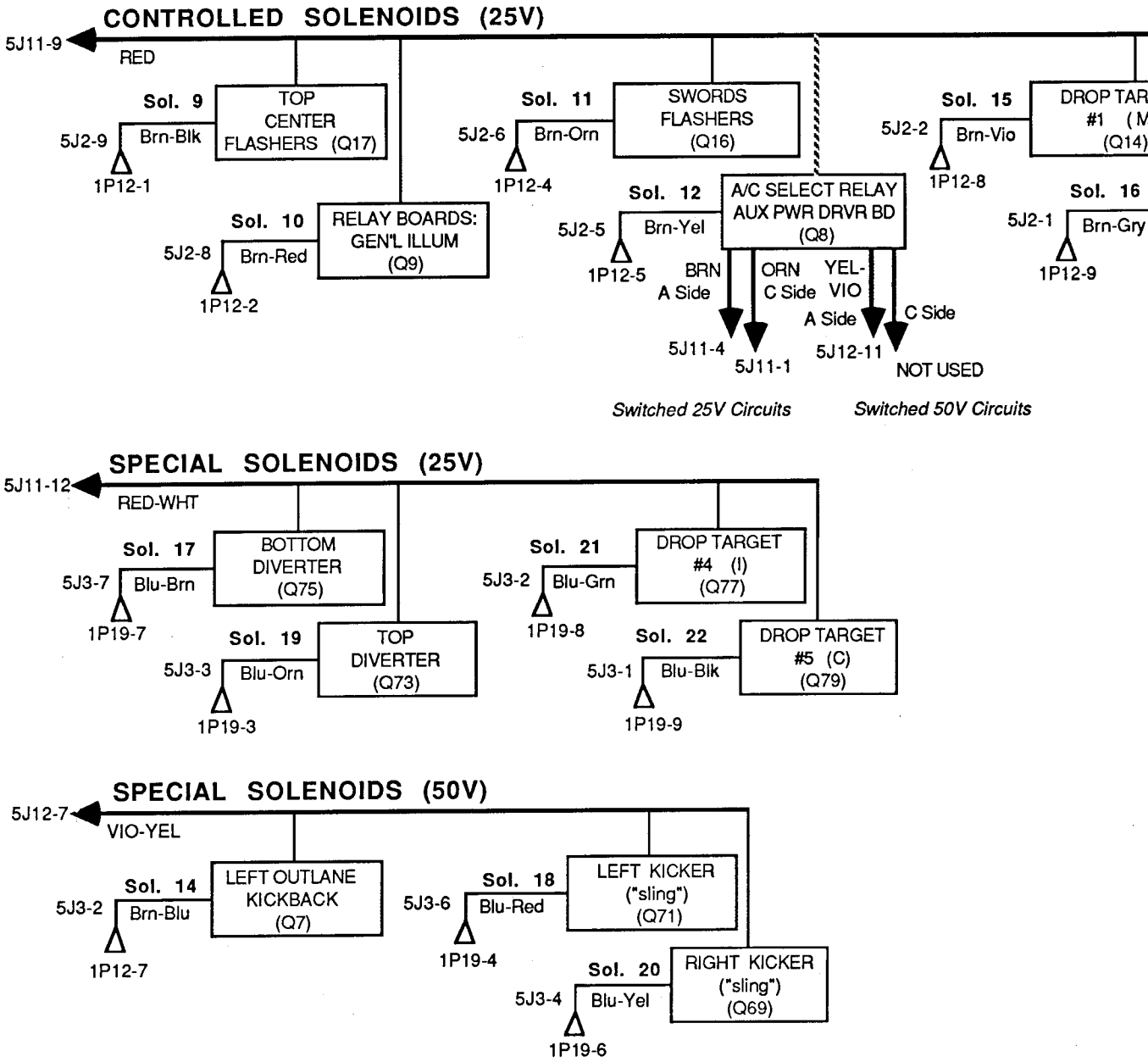
WILLIAMS ELECTRONICS, INC.
3401 N. CALIFORNIA AVE. CHICAGO IL. 60618
NAME CPU SYS 11B SCHEMATIC
SCALE N/S SHT 4 OF 4 PART NO. 16-9019 REV C

6106-91

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

REV	DESCRIPTION OF CHANGE	ECN NO DATE
	N. P. R.	17981 9-9-87
A	SEE COVER SHEET	18223 10-28-87
B	SEE COVER SHEET	18263 11-18-87
C	SEE SHEET 1-3	18518 12-14-87

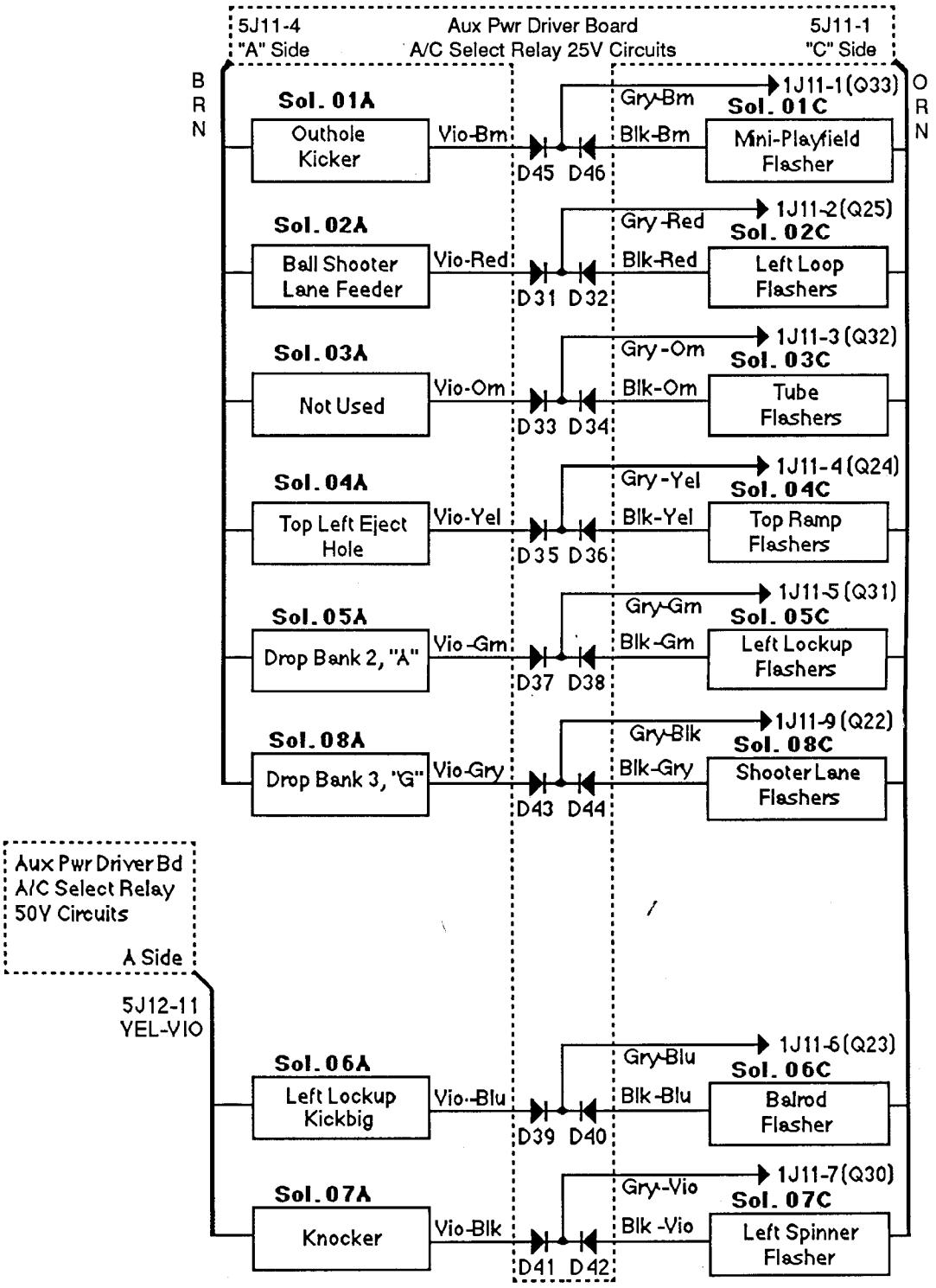



CONTROLLED SOLENOIDS (25V)
5J11-9
RED
Sol. 9
5J2-9
Brn-Blk
1P12-1
TOP CENTER FLASHERS (Q17)
Sol. 10
5J2-8
Brn-Red
1P12-2
RELAY BOARDS: GEN'L ILLUM (Q9)
Sol. 11
5J2-6
Brn-Orn
1P12-4
SWORDS FLASHERS (Q16)
Sol. 12
5J2-5
Brn-Yel
1P12-5
A/C SELECT RELAY AUX PWR DRVR BD (Q8)
BRN A Side
ORN C Side
YEL-VIO A Side
C Side
5J11-4
5J11-1
5J12-11
NOT USED
Sol. 15
5J2-2
Brn-Vio
1P12-8
DROP TAR #1 (M (Q14)
Sol. 16
5J2-1
Brn-Gry
1P12-9
Switched 25V Circuits
Switched 50V Circuits
SPECIAL SOLENOIDS (25V)
5J11-12
RED-WHT
Sol. 17
5J3-7
Blu-Brn
1P19-7
BOTTOM DIVERTER (Q75)
Sol. 19
5J3-3
Blu-Orn
1P19-3
TOP DIVERTER (Q73)
Sol. 21
5J3-2
Blu-Grn
1P19-8
DROP TARGET #4 (I) (Q77)
Sol. 22
5J3-1
Blu-Blk
1P19-9
DROP TARGET #5 (C) (Q79)
SPECIAL SOLENOIDS (50V)
5J12-7
VIO-YEL
Sol. 14
5J3-2
Brn-Blu
1P12-7
LEFT OUTLANE KICKBACK (Q7)
Sol. 18
5J3-6
Blu-Red
1P19-4
LEFT KICKER ("sling") (Q71)
Sol. 20
5J3-4
Blu-Yel
1P19-6
RIGHT KICKER ("sling") (Q69)

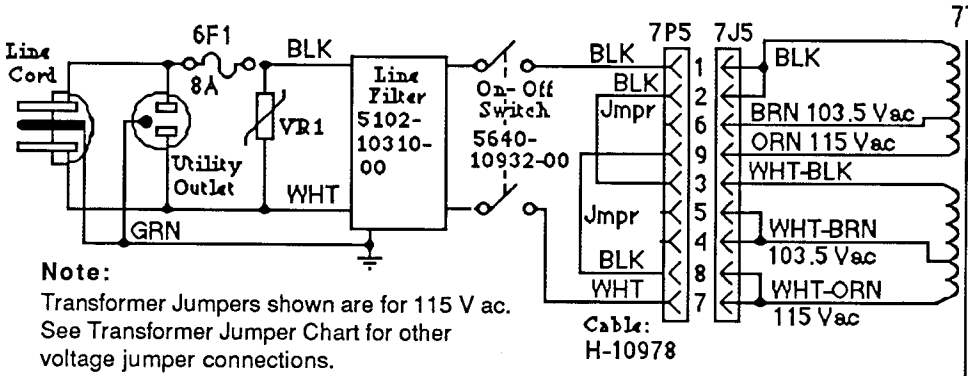
ET

LEFT
OUTLANE
FLASHER (Q6)

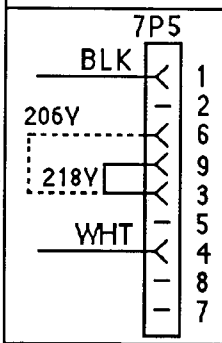
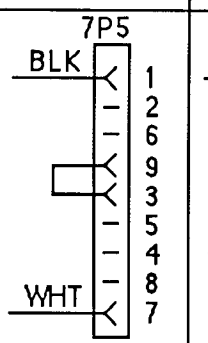
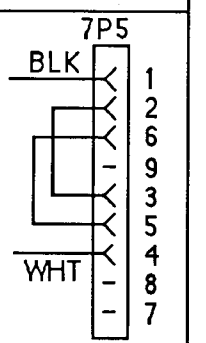
SWITCHED SOLENOIDS



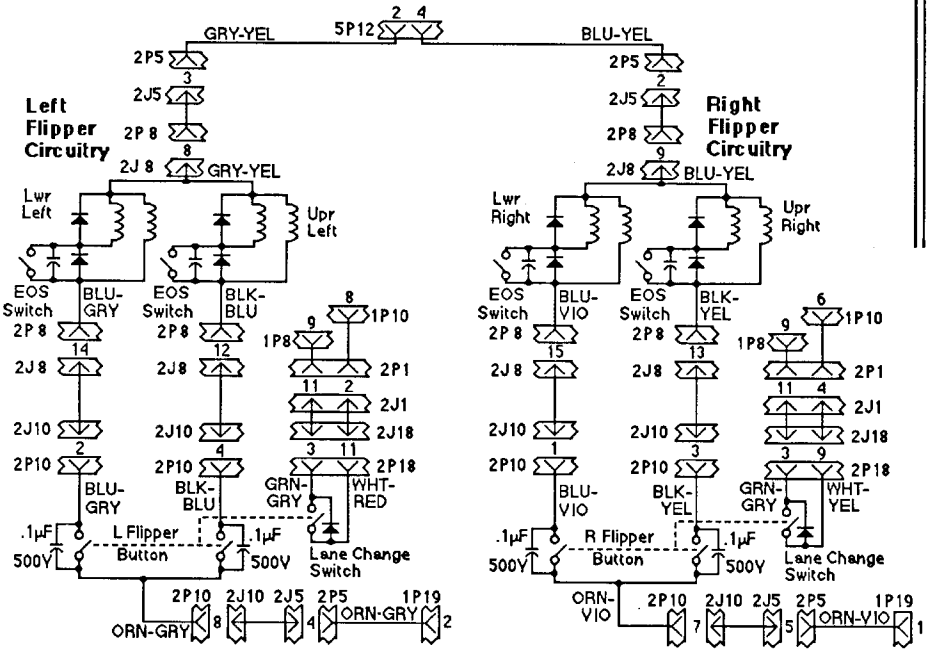
Controlled, Special, and Switched Solenoids



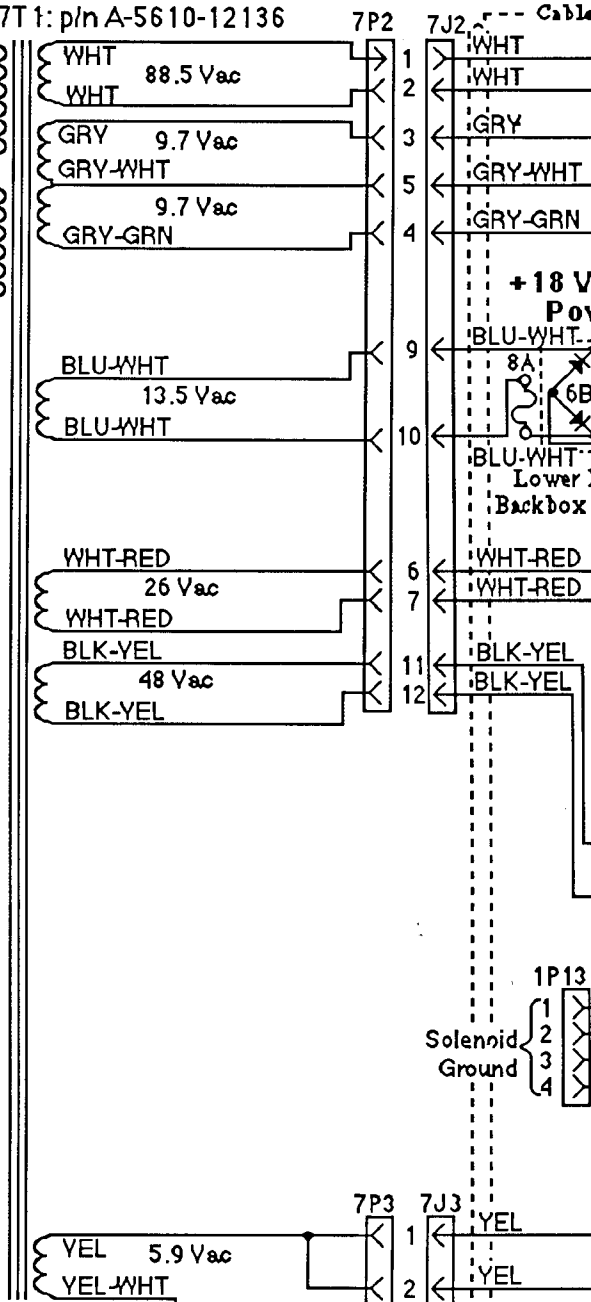
Note:
Transformer Jumpers shown are for 115 V ac.
See Transformer Jumper Chart for other voltage jumper connections.

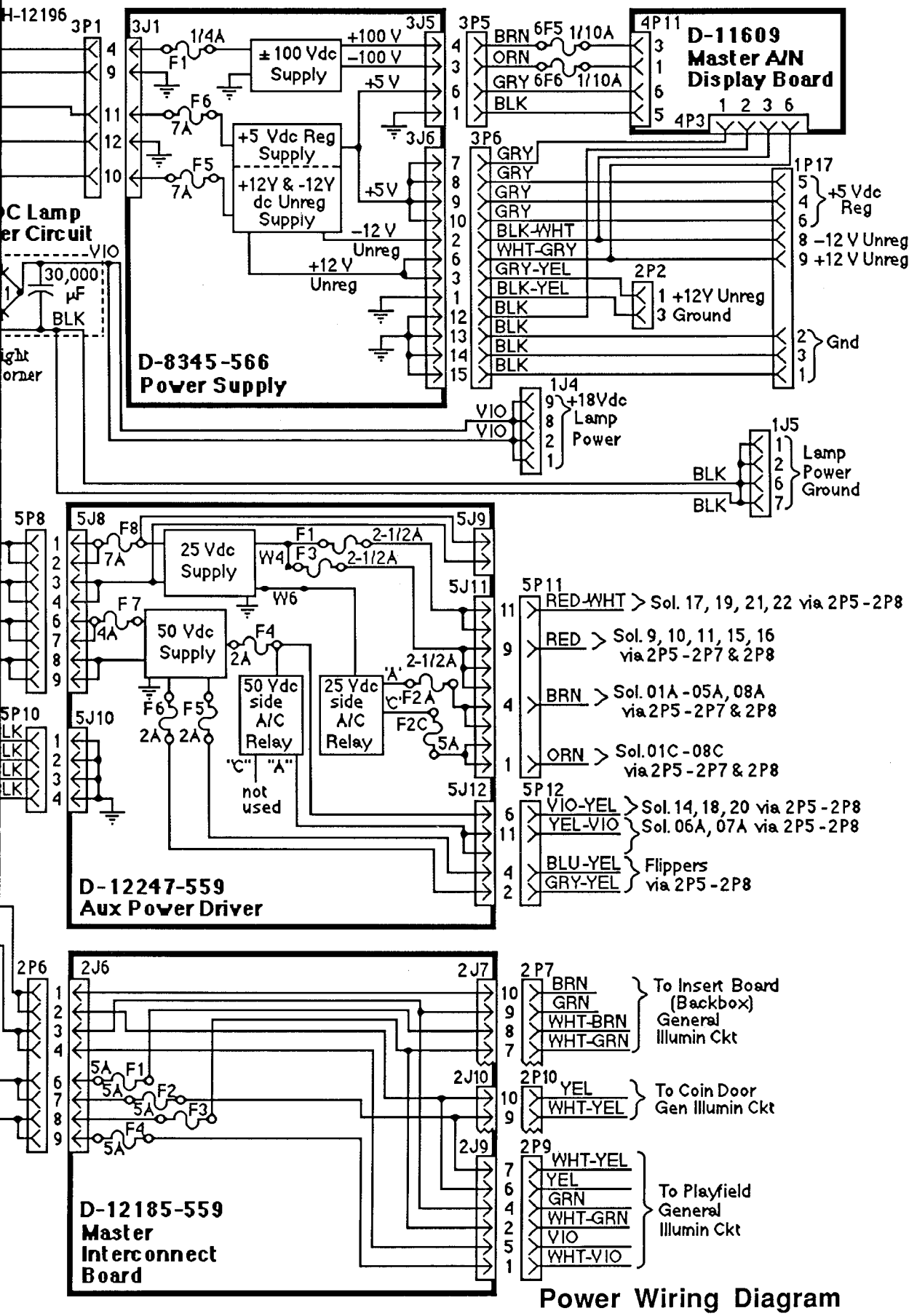
TRANSFORMER JUMPER CHART		
206/218 VAC	230 VAC	103.5 VAC
		
FUSE (6F1): 4A, S-B	4A, S-B	8A, N-B
VARISTOR: 275V	275V	130V

275V Varistor: 5017-09063-00
130V Varistor: 5017-09044-00
4A, S-B Fuse: 5731-06314-00 (for 220V)
8A, N-B Fuse: 5730-09252-00 (for 115V)



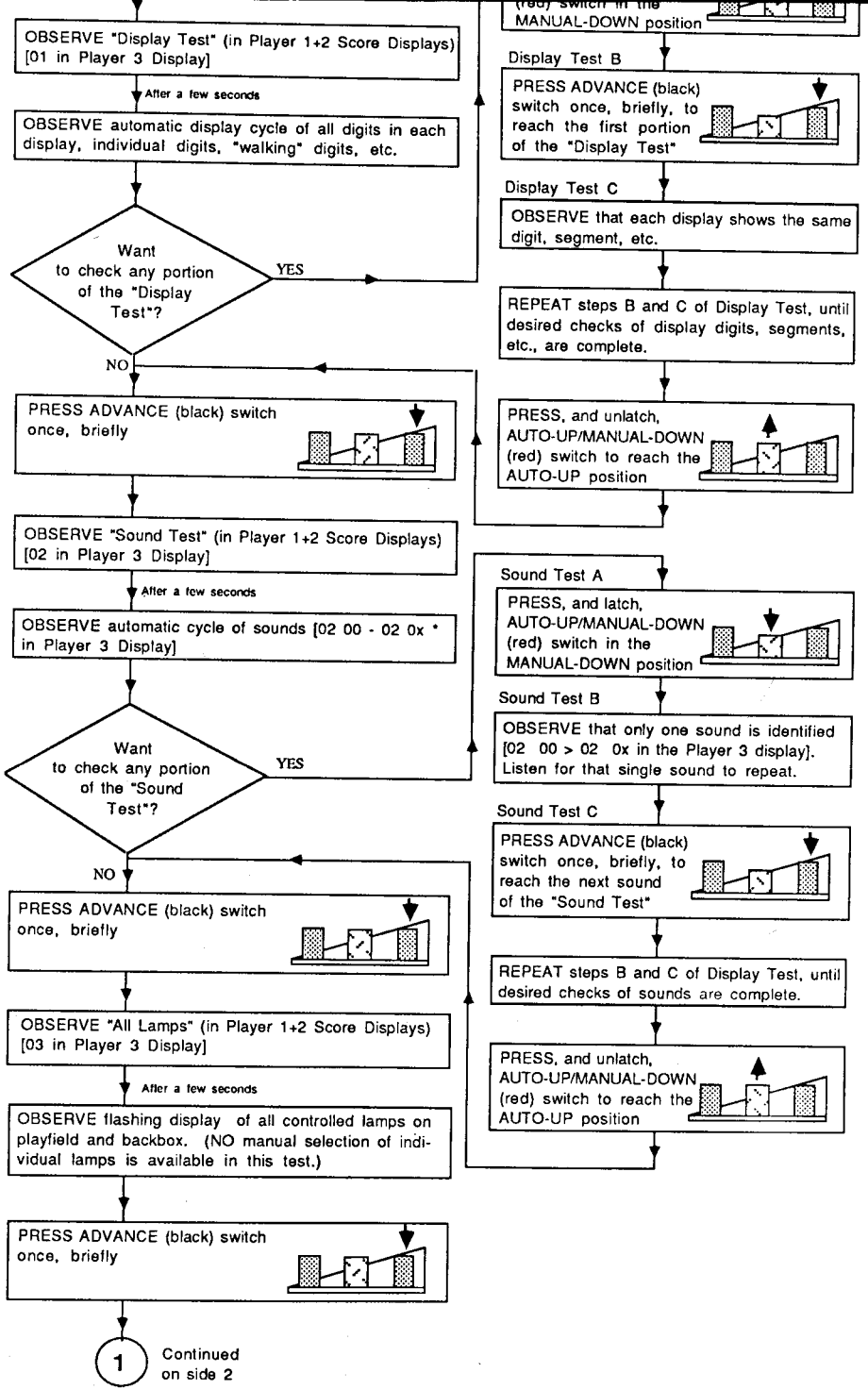
7T1: p/n A-5610-12136





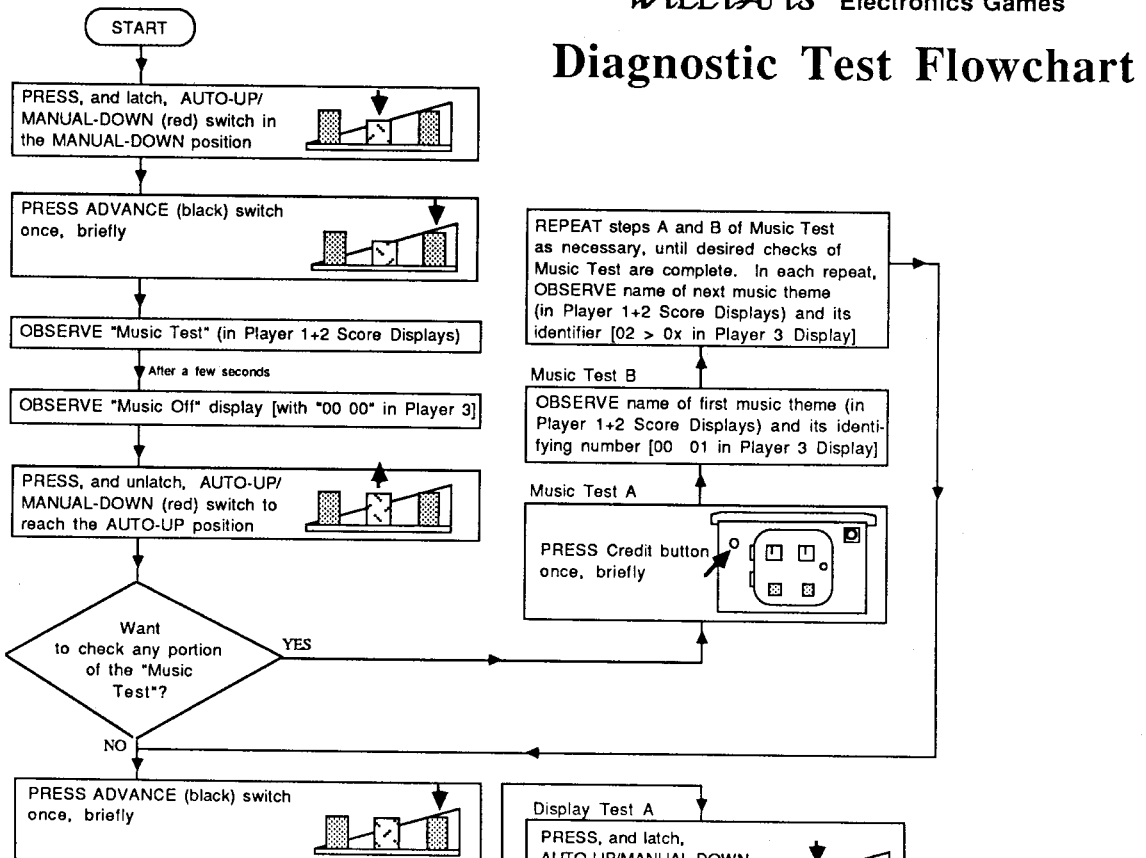
Power Wiring Diagram

Diagnostic Test Flowchart (Side 1)



WILLIAMS Electronics Games

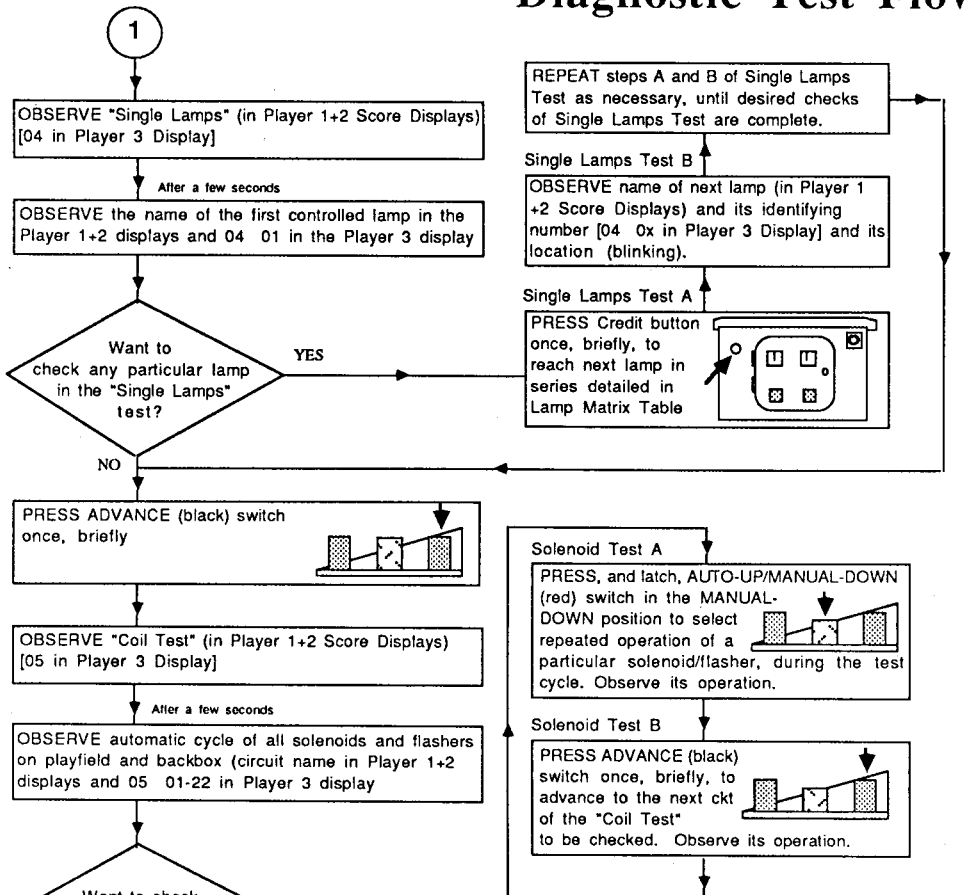
Diagnostic Test Flowchart



WILLIAMS Electronics Games

Diagnostic Test Flowchart

Side 2



Diagnostic Test Flowchart (Side 2)

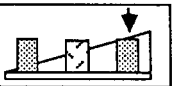
Swords of Fury 54

any particular solenoid in the "Coil Test" ?

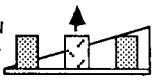
desired checks of solenoid/flasher circuits are complete.

NO

PRESS ADVANCE (black) switch once, briefly



PRESS, and unlatch, AUTO-UP/MANUAL-DOWN (red) switch to reach the AUTO-UP position

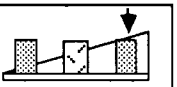


OBSERVE "Switch Levels" (in Player 1+2 Score Displays) [06 in Player 3 Display]

After a few seconds

OBSERVE name and number (06 xx) of each switch that is presently actuated, if any

PRESS ADVANCE (black) switch once, briefly



OBSERVE "Switch Edges" (in Player 1+2 Score Displays) [07 in Player 3 Display]

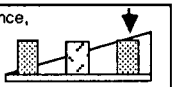
Want to check any particular switch?

YES

OPERATE any switch listed in the Switch Matrix Table to check whether its operation is detected by the CPU for use in the game program. OBSERVE the switch's name and number in the Player Score displays, verifying proper switch operation. Select and operate switches, until desired checks of switch circuits are complete.

NO

PRESS ADVANCE (black) switch once, briefly, to proceed to special game tests, if any; otherwise, exit Test/Diagnostic program.

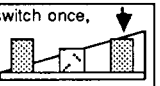


OBSERVE Game name and number in Player 1+2 Score Displays and Id 00 in Player 3 Display, showing the exit from the Test/Diagnostic portion of the game program

Go to Audits and Adjustments or Go to Game Over?

Audits/Adjustments

PRESS ADVANCE (black) switch once, briefly, to advance to the Id 01 display, which tells about changes from Factory Settings. Press ADVANCE switch again to advance to Audit Items (Au 01 > 44) and then to Adjustment Items (Ad 01 > 70).



OBSERVE desired data in Audit Items (to determine game operations and earnings). CHANGE desired Adjustment Items (to enhance the game play and earnings). Refer to game manual for details.

Proceed to Ad 70, press ADVANCE again, briefly, to reach Attract Mode, ready to play.

Game Over

TOGGLE game On-Off switch to Off, then to ON.

Game is in Attract Mode, ready to play.

Backglass Lamps: 6, 7,16, 41, 42, 51, 52, and 57 - 64

Swords of Fury Lamp-Matrix Table

[2] Two Lamps

Lamps = #44 Bulb, p/n 24-6549
# 555 Bulb, p/n 24-8768

COLUMN / ROW	1 Q66 YEL-BRN 1J7-1	2 Q64 YEL-RED 1J7-2	3 Q62 YEL-ORN 1J7-3	4 Q60 YEL-BLK 1J7-4	5 Q58 YEL-GRN 1J7-6	6 Q56 YEL-BLU 1J7-7	7 Q54 YEL-VIO 1J7-8	8 Q52 YEL-GRY 1J7-9
Q80 1 RED-BRN 1J6-1	Magic Scores 50K 1	Left Outlane Advance 9	Drop Bank Red 17	25	Avenger Scores 50K 33	Top Loop [2] 20K 41	Left Outlane Kicker 49	500,000 57
Q81 2 RED-BLK 1J6-2	Magic Scores 100K 2	Left Outlane Collect 10	Drop Bank Yellow 18	Word A 26	Avenger Scores 150K 34	Top Loop [2] 30K 42	Release Titans 50	1,000,000 58
Q82 3 RED-ORN 1J6-3	Magic Scores 150K 3	Right Outlane Advance 11	Drop Bank Blue 19	Word V 27	Avenger Scores 250K 35	Left Spin 1K 43	Top Loop [2] 40K 51	1,500,000 59
Q83 4 RED-YEL 1J6-5	Magic Scores 200K 4	Right Outlane Collect 12	Drop Bank Orange 20	Word E 28	Extra Ball 36	Left Spin 1.5K 44	Top Loop [2] 50K 52	2,000,000 60
Q84 5 RED-GRN 1J6-6	Magic Scores 250K 5	Bonus Mult 1X 13	Drop Bank Red II 21	Word N 29	Right Ramp 37	Left Spin 2K 45	Top Loop Left Advance 53	2,500,000 61
Q85 6 RED-BLU 1J6-7	Top Loop [2] 100K 6	Bonus Mult 2X 14	Avenge Again 22	Word G 30	Playfield Mult 3X 38	Ball Diverter Top 46	Top Loop Right Advance 54	3,000,000 62
Q86 7 RED-VIO 1J6-8	Top Loop [2] 500K 7	Bonus Mult 4X 15	Left Loop "Left" 23	Word E 31	Playfield Mult 2X 39	Ball Diverter Middle 47	Top Loop Left Collect 55	3,500,000 63
Q87 8 RED-GRY 1J6-9	8	[2] Special 16	Left Loop "Right" 24	Word R 32	Lionman Bonus 40	Ball Diverter Bottom 48	Top Loop Right Collect 56	4,000,000 64

Swords of Fury 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	Drop Target Red 17	Left Return Lane 25	33	41	49	Left Outlane 57
2 WHT-RED 1J10-8	German Score Board 2	Outhole 10	Drop Target Yellow 18	Word A 26	34	42	50	Lane Change L Flipper 58
3 WHT-ORN 1J10-7	Credit Button 3	Ball Trough 1 (right) 11	Drop Target Blue 19	Word V 27	35	43	51	Right Outlane 59
4 WHT-YEL 1J10-6	Right Coin Chute 4	Ball Trough 2 (mid) 12	Drop Target Orange 20	Word E 28	36	44	52	Lane Change R Flipper 60
5 WHT-GRN 1J10-5	Center Coin Chute 5	Ball Trough 3 (left) 13	Drop Target Red II 21	Word N 29	Upr Right 10 pt 37	45	53	Top Loop "Left" 61
6 WHT-BLU 1J10-3	Left Coin Chute 6	Ball Shooter Lane 14	22	Word G 30	Right Ramp 38	Payoff Ramp 46	Top Eject 54	Top Loop "Right" 62
7 WHT-VIO 1J10-2	Slam Tilt 7	Top Tube 15	Left Loop "Left" 23	Word E 31	Left Spin 39	Top Center Ramp 47	Left Slot Lockup 55	Left Kicker 63
8 WHT-GRY 1J10-1	High-Score Reset 8	Bottom Tube 16	Left Loop "Right" 24	Word R 32	Lwr Right 10 pt 40	Right Return Lane 48	Upper Left Lock 56	Right Kicker 64