TM-237
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ARABIAN™*

Operators Manual

With Illustrated Parts Lists

*Manufactured under license from Sun Electronics Corporation.

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Set-Up Procedures

How to Use This Manual

This manual, written for game operators and service technicians, describes the Arabian™ game.

Chapter 1 contains a game overview, game specifications, inspection procedures, voltage plug and fuse information, switch locations, option information, and a description of game play.

Chapter 2 contains self-test procedures.

Chapter 3 contains troubleshooting procedures.

Chapter 4 contains maintenance and repair procedures.

Chapter 5 contains illustrated parts lists. Figure 5-1 illustrates the game cabinet. Notes in this chapter refer you to other places in the manual for more detailed information.

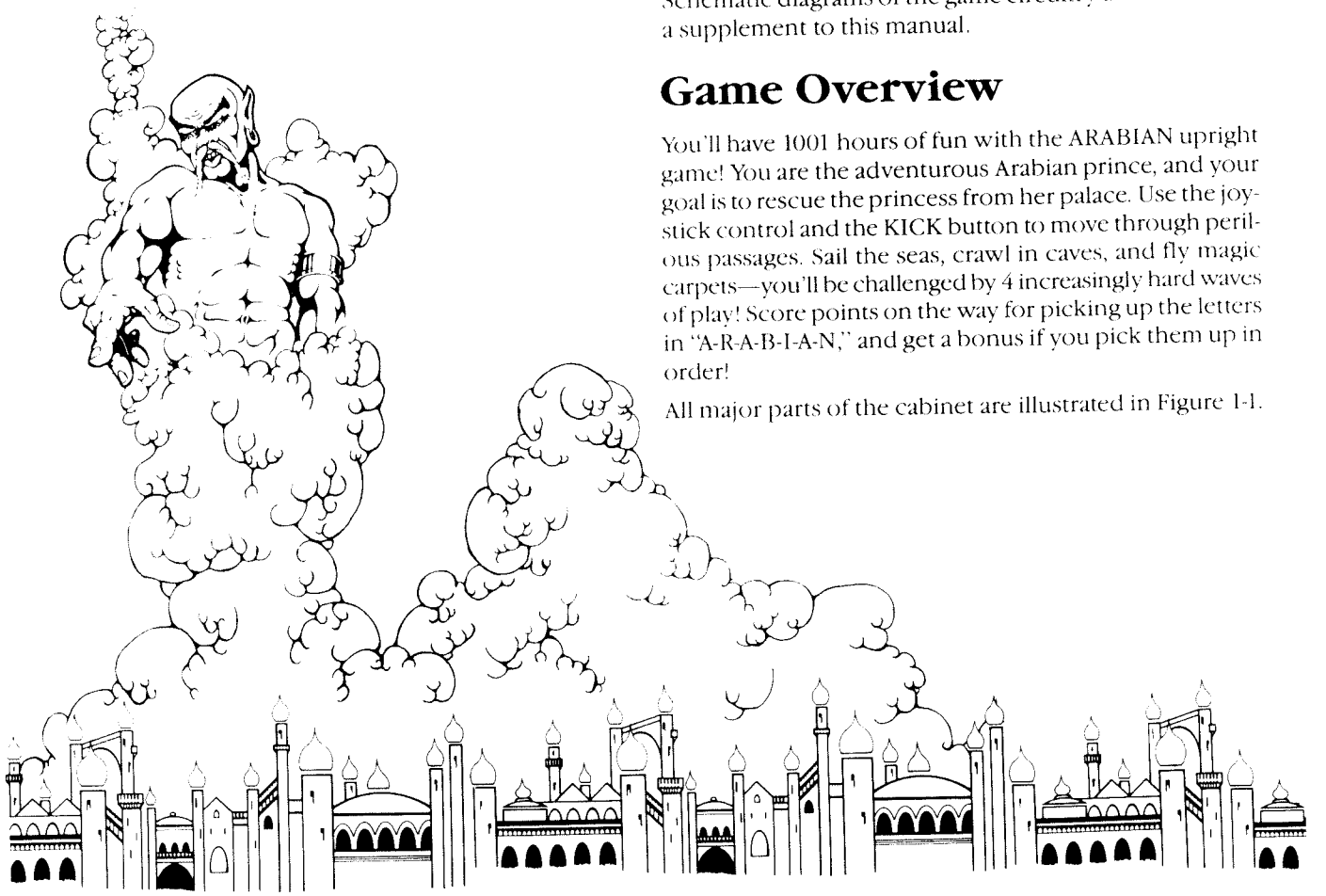
A glossary of terms is in the back of this manual for your convenience.

Schematic diagrams of the game circuitry are included as a supplement to this manual.

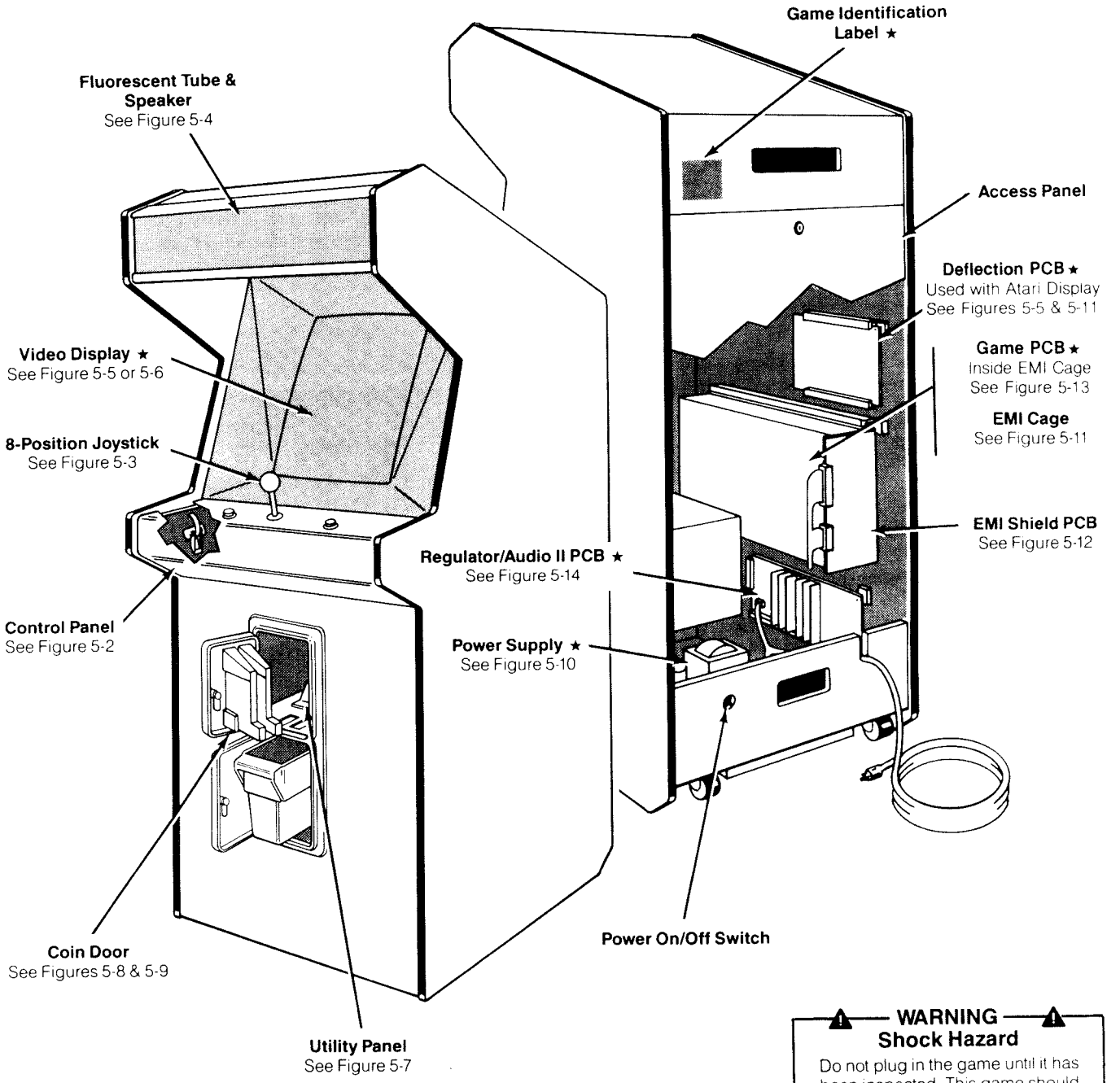
Game Overview

You'll have 1001 hours of fun with the ARABIAN upright game! You are the adventurous Arabian prince, and your goal is to rescue the princess from her palace. Use the joystick control and the KICK button to move through perilous passages. Sail the seas, crawl in caves, and fly magic carpets—you'll be challenged by 4 increasingly hard waves of play! Score points on the way for picking up the letters in "A-R-A-B-I-A-N," and get a bonus if you pick them up in order!

All major parts of the cabinet are illustrated in Figure 1-1.



Chapter 1



★ Item with a serial number label

⚠ WARNING ⚠
Shock Hazard

Do not plug in the game until it has been inspected. This game should only be connected to a grounded 3-wire outlet. If you have only a 2-wire outlet, we recommend you hire a licensed electrician to install a grounded outlet. Players may receive an electrical shock if this game is not properly grounded!

Figure 1-1 Game Overview

A. Installation Specifications

Table 1-1 describes the physical, electrical, and environmental specifications of the game.

Table 1-1 Installation Requirements

Characteristic	Requirement
Power Consumption	200 W
Temperature	0° to +32° C (+32° to +100° F)
Humidity	Not to exceed 95% relative
Line Voltage	100 to 240 VAC
Width	67.95 cm (26.75 in.)
Depth	64.14 cm (25.25 in.)
Height	180.34 cm (71 in.)

⚠ WARNING ⚠

Shock Hazard

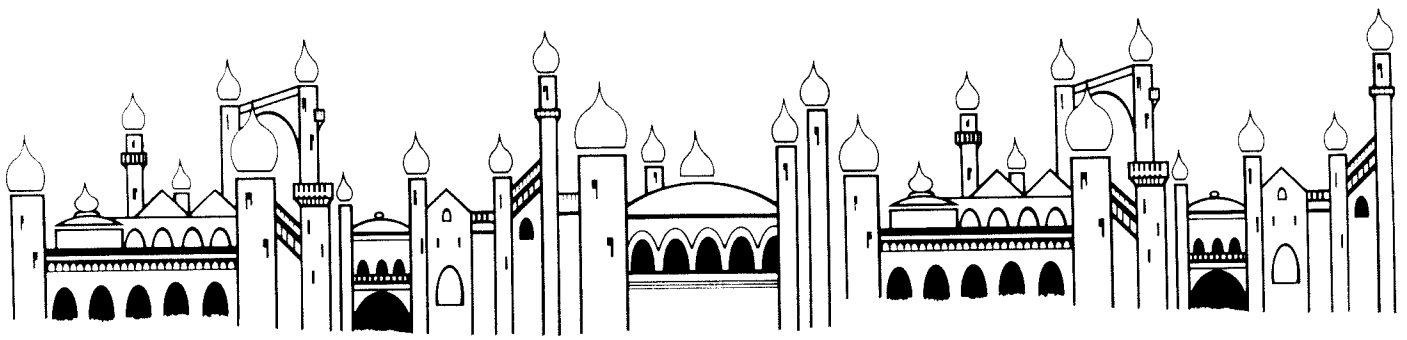
To avoid electrical shock, do not plug in the game until the procedures in Sections B and C have been completed!

Do not touch internal parts of the display with your hands or with metal objects!

B. Inspecting the Game

Please inspect your game carefully to ensure that it was delivered to you in good condition.

1. Examine the exterior of the game cabinet for dents, chips, or broken parts.
2. Remove the screws from the rear access panel. Unlock and open this panel and the coin door. Inspect the interior of the game as follows:
   a. Ensure that all plug-in connectors (on the game harnesses) are firmly plugged in. Replug any connectors found unplugged. Do not force connectors together. The connectors are keyed so they only fit in the proper orientation. *A reversed edge connector may damage a printed-circuit board (PCB) and will void your warranty.*
   b. Ensure that all plug-in integrated circuits on each (PCB) are firmly plugged into their sockets.
   c. Remove the tie-wrap that secures the coiled power cord inside the cabinet. Inspect the power cord for any cuts or dents in the insulation. Repair or replace it as required. Place the square strain-relief plate in the wood slot at the bottom of the rear panel opening.
   d. Inspect the power supply. Make sure the fuse block cover is mounted in place. Check that the green ground wire is connected.
   e. Inspect other major subassemblies, such as the control panel, video display, EMI cage, and each PCB. Make sure they are mounted securely and that the green ground wires are connected.



C. Voltage-Plug Selection and Fuses

The power supply in your game contains six fuses. When you replace a fuse, use the identical type fuse with the same electrical rating (see Figure 1-2).

This power supply operates on the line voltage of many countries. The power supply comes with either one, two, or three voltage-selection plugs. Plug voltages and wire colors are 100 VAC (violet wire color), 120 VAC (yellow wire color), 220 VAC (blue wire color), and 240 VAC (brown wire color).

See Figure 1-2 for placement of the voltage-selection plug. Before plugging in your game, check your line voltage. Next, check the wire color on the voltage-selection plug. Make sure the voltage-selection plug is correct for the line voltage of your location.

Now plug the game into a **grounded** 3-wire outlet.

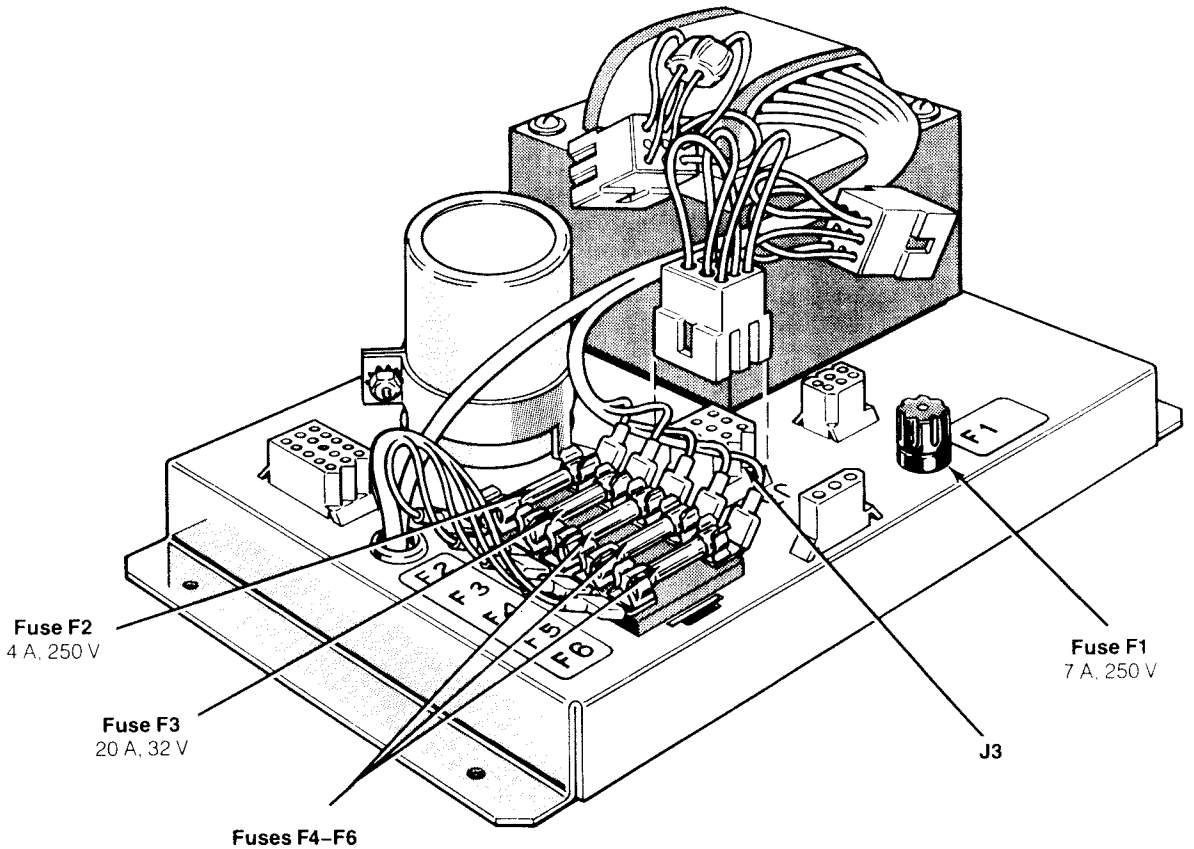


Figure 1-2 Voltage-Selection Plug and Fuse Locations

D. Switch Locations

Power On/Off Switch

The power on/off switch is located on the back of the cabinet on the lower left side (see Figure 1-1).

Utility Panel Switches

The volume control, coin counter(s), self-test switch, and auxiliary coin switch are on the utility panel. The utility panel is located inside the upper coin door (see Figure 1-1). The volume control adjusts the level of sound produced by the game. The coin counter(s) records the number of coins entered into the game. The self-test switch initiates the self-test mode. The auxiliary coin switch credits the game without activating a coin counter. See Figures 1-3 and 5-7 for details of these switches.

Option Switches

Option switches for game price selection are on the game PCB at location SW1 (see Figure 1-3).

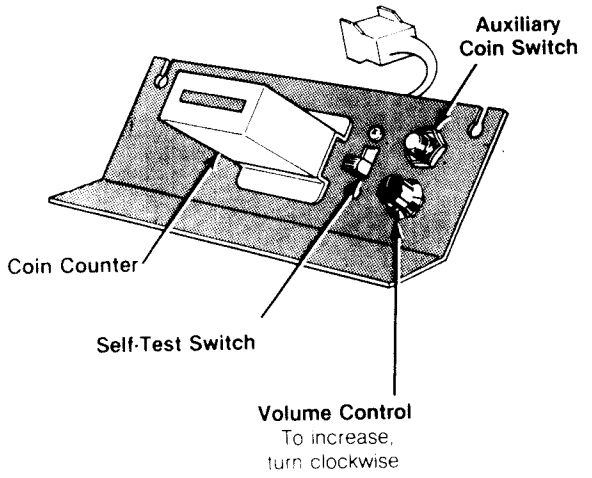
E. Selecting the Coin and Credit Options

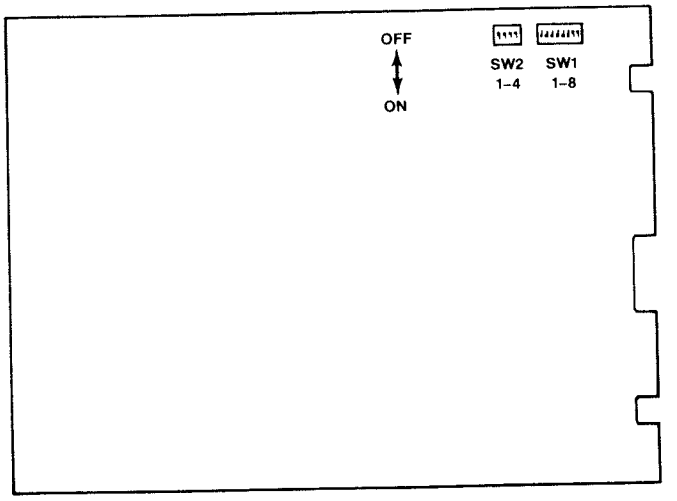
Settings for the option switches are listed in Tables 1-2 and 1-3. Note that options preset at the factory are shown by the ◄ symbol. You may change the settings according to your needs.

To verify other option selections, check the self-test display that appears when you turn on the game. Then, verify the option switch settings on the self-test display as described in Chapter 2.

Table 1-2 describes the settings for the DIP switch designated SW1. This switch selects the game coin and credit options available for the left and right coin mechanisms. Table 1-3 describes the settings for the DIP switch designated SW2. This switch selects special options (such as sound in the Attract Mode, and bonus life levels).

The basic unit of measurement is a coin worth $.25 or 1 DM. Thus, if you have a 1 DM/2 DM coin door with two coin counters, set switches 5 and 6 at location SW1 to on. Then, different denominations are counted on the two coin counters.





Game PCB

Figure 1-3 Switch Locations

Table 1-2 Switch Settings for Coin and Credit Options

Settings of 8-Toggle Switch on Arabian Game PCB at location SW1 near RA12								Option	
1	2	3	4	5	6	7	8		
Off								3 boys ◄	
On								5 boys	
	Off							Cocktail cabinet	
	On							Upright cabinet ◄	
		Off						Reverse picture frame position	
		On						Normal picture frame position ◄	
			Off					Easy game difficulty ◄	
			On					Hard game difficulty	
								Left Coin Mechanism	**Right Coin Mechanism**
				Off	Off	Off	Off	1 coin = 1 credit	1 coin = 1 credit ◄
				On	Off	Off	Off	2 coins = 1 credit	2 coins = 1 credit
				Off	On	Off	Off	2 coins = 1 credit	1 coin = 3 credits
				On	On	Off	Off	1 coin = 1 credit	1 coin = 2 credits
				Off	Off	On	Off	1 coin = 1 credit	1 coin = 3 credits
				On	Off	On	Off	1 coin = 1 credit	1 coin = 4 credits
				Off	On	On	Off	1 coin = 1 credit	1 coin = 5 credits
				On	On	On	Off	1 coin = 1 credit	1 coin = 6 credits
				Off	Off	Off	On	1 coin = 2 credits	1 coin = 2 credits
				On	Off	Off	On	1 coin = 2 credits	1 coin = 4 credits
				Off	On	Off	On	1 coin = 2 credits	1 coin = 5 credits
				On	On	Off	On	1 coin = 2 credits	1 coin = 10 credits
				Off	Off	On	On	1 coin = 2 credits	1 coin = 11 credits
				On	Off	On	On	1 coin = 2 credits	1 coin = 12 credits
				Off	On	On	On	1 coin = 2 credits	1 coin = 6 credits
				On	On	On	On	Free Play (Demonstration Mode)	

◄ *Manufacturer's recommended settings*

Table 1-3 Switch Settings for Special Options

Settings of 4-Toggle Switch on Arabian Game PCB at location SW2 near RA14				Options
1	2	3	4	
Off				2 Coin Counters
On				1 Coin Counter ◄
	Off			Attract Mode Sound
	On			No Attract Mode Sound ◄
		Off	Off	No Bonus
		On	Off	Bonus at 20,000 points
		Off	On	Bonus at 40,000 points
		On	On	Bonus at 20,000, 50,000, 100,000 and each 100,000 points thereafter ◄

◄ *Manufacturer's recommended settings*

F. Game Play

Arabian is a "video book" with a happy ending! The attract mode introduces the story, and animated storybook "pages" let you experience the Arabian Prince's adventures. Use the 8-position joystick to jump, super-jump, walk, crawl, or climb in all directions. Tap either KICK button (are you right- or left-handed?) to kick your enemies out of the way.

There are 5 modes of operation in the game program — the attract mode, play mode, high-score mode, self-test mode, and demonstration mode.

Attract Mode

Arabian has a colorful and entertaining attract mode. You can select either Music or Silence for this mode. (See Tables 1-2 and 1-3 for a complete listing of operator-selectable options.) Four scenes cycle through the attract mode. The following message appears at the top of each of these scenes (the number under *HI-SCORE* will show the highest score earned on the game):

1-UP	*HI-SCORE*	*2-UP*
000000	*000000*	*000000*

Scene 1 shows the ARABIAN logo, the message *INSERT COINS*, and the high-score table. The high-score table lists the 10 top scores. The number of credits appear at the bottom left side of the screen. A big blue Roc* flies across the screen, carrying a Princess with him. Thus the story begins—the Arabian Prince must try to rescue the Princess!

Scene 2 shows the Prince swinging across vines collecting lettered jugs. Then the Prince kicks a pair of Rocs and Oscars, while *ARABIAN* shimmers.

Scene 3 shows a sample of game play. The castle playfield appears. *SPELL 'ARABIAN' FOR BONUS* is on the top of the screen, and © *1983 ATARI, INC.* is at the bottom of the screen. Brass jugs, each with a different letter in the word A-R-A-B-I-A-N, are scattered about the castle wall. Flying carpets sail across the screen in either direction. Purple Oscars and blue Rocs are misbehaving.

The Prince jumps onto a flying carpet and captures (touches) lettered jugs. Each letter he captures is replaced on the screen by a point value. He falls off a flying carpet and loses his life.

Scene 4 continues game play. The playfield is a ship with 2 masts. Lettered jugs appear scattered about the rigging of the masts. The Prince kicks evil Genies, Oscars, and Rocs out of the way, and picks up the letters in order. When he reaches the top of the mast, *BONUS* flashes on the screen.

*A Roc is a "legendary bird of great size and strength believed to inhabit the Indian Ocean area"—*Webster's New Collegiate Dictionary*

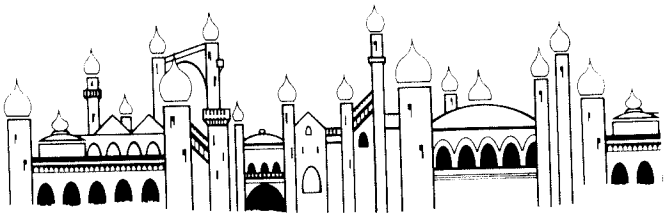
Play Mode

The player controls a young Arabian Prince who must rescue his Princess from the castle tower where she is being held prisoner. Evil Genies in brass jugs, swooping Rocs, and purple ghostly creatures called Oscars will try to stop him along the way. The Prince scores points for kicking Oscars or Rocs, picking up lettered jugs, or spelling A-R-A-B-I-A-N. The Prince loses a life when he's hit by a smokeball, falls off a ledge, flying carpet or vine, or gets caught (touched) by a Genie, Oscar, or Roc.

The Prince must successfully complete four levels to rescue the Princess. (Four levels or "pages" equals 1 section.) Each level is introduced with the turning of a page, which shows a distant view of the upcoming playfield. Each playfield has 7 lettered jugs that must be picked up before the player can advance to the next level, but he must avoid or KICK evil Genies, Oscars, and Rocs that will try to stop him.

Page 1. Page 1 turns, revealing a ship. The Prince must work his way to the crow's nest at the top of the mast before the vessel reaches the shore. As he climbs up the rigging, Rocs and Oscars dive at him in an attempt to knock him down. The Prince must KICK them out of the way to survive. While contending with these rascals, he must also try to collect all the jugs with letters on them. Beware! The jugs hold devilish Genies which can appear at any time and throw smokeballs at the Prince. Once a Genie has materialized, the Prince's kicking power cannot be used against him and he is unable to collect the jug so he should avoid the Genie. However, the Prince may collect the jug while the Genie is in smoke.

When the Arabian has collected all the jugs and reaches the top of the ship, Page 2 introduces the second level of the story.



Page 2. Now the Arabian has arrived on shore. To reach the Princess he must complete a cave maze under the cliff. Low-hanging rocks and climbing vines force him to crawl and climb. The Prince must still dodge Rocs, Oscars, and the Genie's smokeballs. And he must still collect the brass jugs. When he reaches the top of the cave, he must try to collect the letter "N" jug.

Page 3. Now the Arabian Prince must scale the walls of the castle. As flying carpets whiz by, the Arabian must jump from one to the next, taking care he isn't knocked off his present perch by another carpet flying too closely. He can duck to avoid them, but his timing has to be precise or he will take a tumble down to the ground. He must still dodge Rocs, Oscars, and the Genie's smokeballs. The player must beware—sometimes a pair will merge into one super Roc bird or super Oscar!

Page 4. The Prince has at last entered the castle. The Princess beckons him from high in the tower. To reach her, he must ride atop some flying carpets and pull himself up ropes—all the while collecting the brass jugs and kicking meddlesome Rocs and Oscars. When he reaches his loving and grateful Princess, the two fly happily into the sunset on a magic carpet.

Once the player has taken the Arabian through a section (all four levels), the next section begins. But the action gets faster, the Genies are angrier and fling more smokeballs, and there are more intelligent and challenging Rocs and Oscars. Even the brass jugs are rearranged so that it becomes more difficult for the player to spell A-R-A-B-I-A-N in order.

Hints for Game Play

- The player can still complete a level even if he collects the jugs out of sequence. But if he collects jugs in sequence to spell A-R-A-B-I-A-N, he'll score *many* more bonus points (2000 + 2000 × section number).
- Kicking a Roc or Oscar into other Rocs or Oscars awards higher points.
- Kicking a Super-Oscar or Super-Roc scores 1000 points.
- When a Genie begins to appear, the player should move to an area which allows him to avoid the smokeballs the Genie will throw!

High-Score Mode

Table 1-4 lists the point values in the Arabian game.

Table 1-4 Arabian Scoring Table

Action	Point Value
Collect letter jar	500
Spell A-R-A-B-I-A-N in order	2000 + 2000 × section number
Kick 1 Oscar or Roc with 1 kick	100
Kick 2 Oscars or Rocs with 1 kick	500 + 100
Kick 3 Oscars or Rocs with 1 kick	1000 + 500 + 100
Kick 4 Oscars or Rocs with 1 kick	2000 + 1000 + 500 + 100
Kick Super-Roc or Super-Oscar	1000

When a player has earned one of the ten highest scores on the game, the alphabet will appear on the screen. He must use the joystick to advance a jug to the letter he wants to select, and use either KICK button to select that initial. His initials and score will be transferred to the High-Score Table.

If the game is turned off, all high scores are erased.

Demonstration Mode

The demonstration mode allows an operator to demonstrate all levels of game play. To enter the demonstration mode, set the game to free play. (Refer to Table 1-2 for the option switch settings.) Press the 1-Player start switch to begin the play mode. If you press the 1- and 2-Player start switches simultaneously for just an instant, the game will advance to the end of the level you are on, the Arabian Prince will jump up and down as if the level was successfully completed, and the game will automatically start the next level of play. In the demonstration mode, you may play the game at any time.

Self-Test Mode

The self-test is a diagnostic program that will automatically check the game computer functions. You can also check the controls when the game is in self-test. Option-switch settings are displayed on the master self-test screen. Refer to Chapter 2 for complete self-test instructions (no equipment is needed).

Self-Test Procedures

This game will test itself and provide data to show that the game circuitry and controls are operating properly. Self-test data is presented visually on the video display and audibly through the speakers. No additional equipment is required.

We suggest you perform a self-test when you first set up, each time you collect money, change the game options, or suspect game failure.

Chapter 2

A. Master Self-Test Display

To enter the self-test mode, set the self-test switch on the utility panel to the on position (see Figure 1-3 for the location of this switch). The game will first test the random-access memory (RAM) and read-only memory (ROM), and then display the rest of the master self-test display, which includes the current status of the option switches. The entire master self-test display is shown in Figure 2-1. You will be returning the game to this screen between phases of the self-test procedure.

When the game RAM and ROM are tested, a message appears in the upper right corner of the display to give you the status of RAM and ROM. If the RAM and ROM are operating properly, the self-test display will show *RAM OK* and *ROM OK*.

RAM failure may cause an *ERROR RAM* message. Check the address lines at IC10. **ROM failure** is indicated on the screen by the words *ERROR ROM* followed by a number which indicates the failed ROM. Table 2-1 lists these screen messages and the corresponding ROM numbers. Not all ROM failures may be diagnosed in the master self-test display.

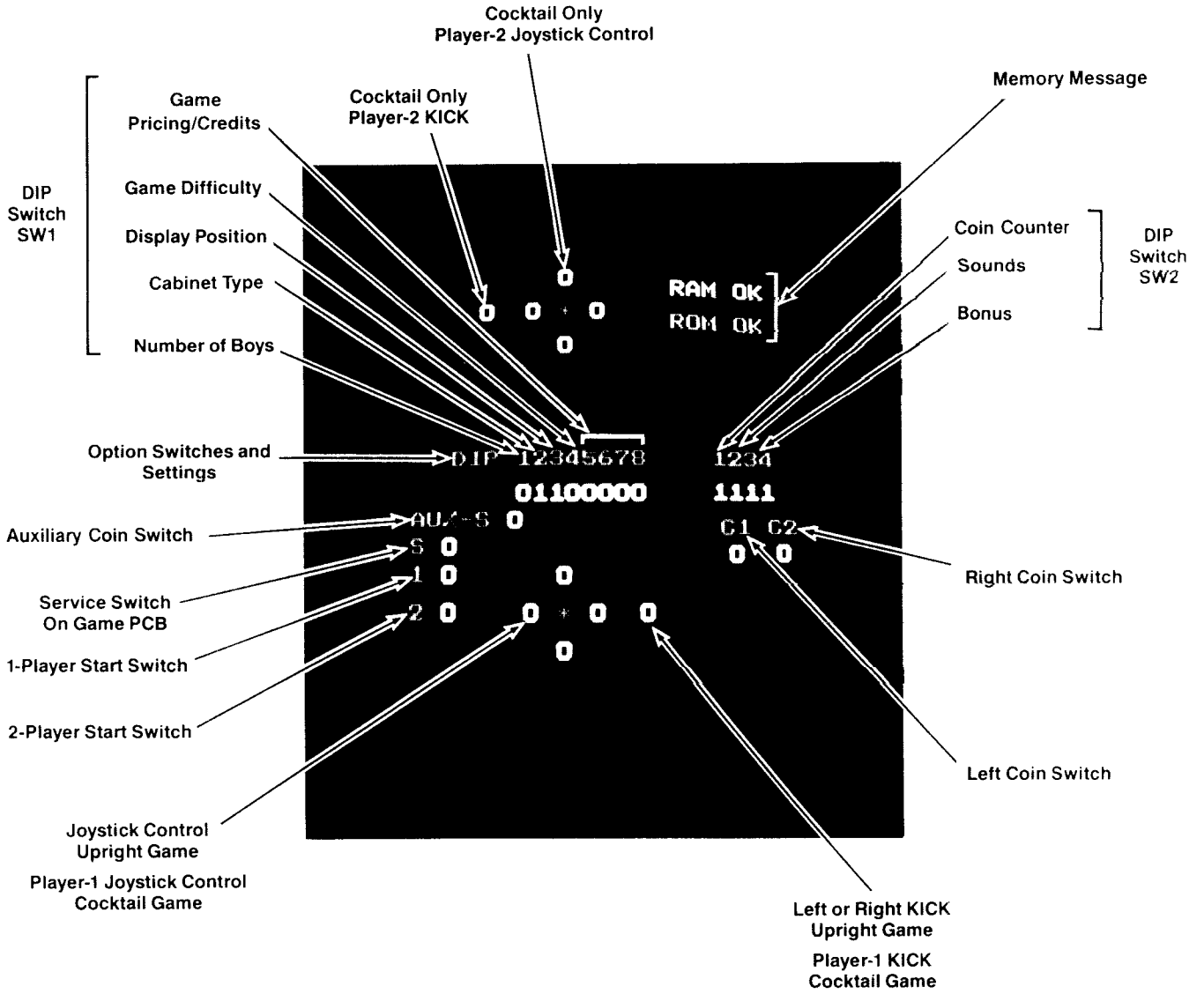


Figure 2-1 Master Self-Test Display

Table 2-1 ROM Locations

Screen Message	ROM Number
ERROR ROM 1	IC1
ERROR ROM 2	IC2
ERROR ROM 3	IC3
ERROR ROM 4	IC4

Option-switch status is shown in the center of the master self-test display (see Figure 2-1). As shown in this example, option-switch status would appear as:

DIP	*1 2 3 4 5 6 7 8*	*1 2 3 4*
	0 1 1 0 0 0 0 0	*1 1 1 1*

The status of each of the eight toggle switches of dual-in-line-package (DIP) switch SW1 is shown in the center, and the status of each of the four toggle switches of DIP switch SW2 is shown to the right. *0* indicates the switch is off; *1* indicates the switch is on. Option switch SW1 is located near RA12 on the game PCB; option switch SW2 is located near RA14 on the game PCB. Refer to Tables 1-2 and 1-3 for their possible settings.

B. Game Controls Test

You can test the following game controls and switches while the master self-test screen is displayed: the auxiliary coin switch on the utility panel, service switch on the game PCB, 1-Player start switch, 2-Player start switch, right coin switch, left coin switch, left KICK button, right KICK button, and the joystick control. Refer to Figure 2-1 for the location of the *0* that corresponds to the control or switch you will be testing.

To test a switch or control, activate it. The corresponding *0* should change to *1* as each switch is activated. If the test fails, troubleshoot using the information in Chapters 3 and 4, and the Schematic Package Supplement.

NOTE

This game uses an 8-position joystick control, which enables a player to move diagonally as well as horizontally and vertically. Test the joystick by pushing it right, left, up, and down. Each corresponding *0* should change to *1*. Then push it diagonally up and to the left. For proper game operation, both the top and left switches must close at the same time, and the top and left *0* should each become *1*. Repeat this procedure in all 4 diagonal directions. If each corresponding *0* fails to change to *1*, troubleshoot using the information in Chapters 3 and 4, and the Schematic Package Supplement.

C. Sound Test

The sound test checks the Custom Audio sound chip. To start the sound test, simultaneously press the 1-Player and 2-Player start switches. Game sounds are produced and advance automatically from *SOUND 1* through *SOUND 9* and *SOUND A* through *SOUND H*. This test is displayed in the lower right corner of the screen (see Figure 2-2). Each sound is explained in Table 2-2.

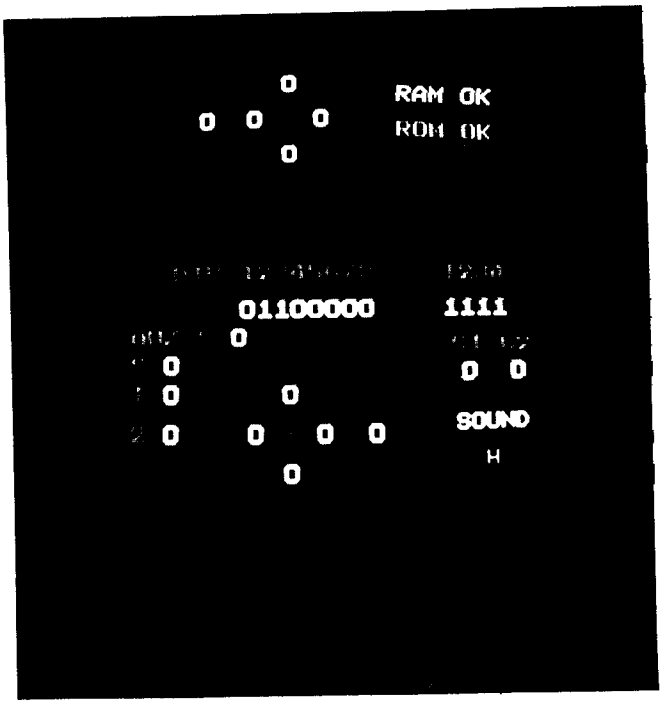


Figure 2-2 Sound Test Display

Table 2-2 Sound Test Index

Sound Number	Action
1	Jump
2	Kick
3	Crawl
4	Fatal Fall
5	Genie with Throw
6	Super Oscar/Roc Start
7	Oscar/Roc Getting Kicked
8	Birth of Oscar
9	Player Death
A	Complete Page Introduction
B	Bonus Life
C	Pick Up Jug
D	Wave 1 Music
E	Wave 2 Music
F	Page Introduction
G	Attract Mode Music
H	Complete Wave

D. Convergence Display

Simultaneously press the 1-Player start switch and either KICK button. The convergence pattern shown in Figure 2-3 should appear. If the convergence is correct the following occurs:

- the grid pattern should be pale pink
- the square sizes should be the same
- the red outline around the grid pattern should be visible within the bezel, because game play occurs within this boundary
- the dots should be displayed in the center of each square
- red and pale pink should be the *only* colors on the screen.

If any of the above conditions do not exist, refer to the raster-scan video display manual for a detailed procedure on how to adjust display convergence.

Simultaneously press the 1-Player start switch and either KICK button to end this test and return to the master self-test display.

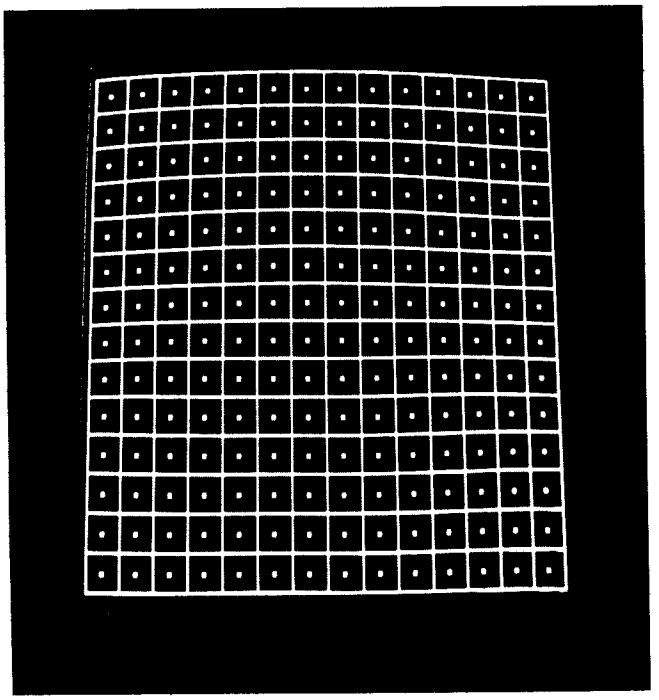


Figure 2-3 Convergence Pattern Display

E. Color Test and Character Display

Simultaneously press the 2-Player start switch and either KICK button. The color-bar pattern shown in Figure 2-4 will appear.

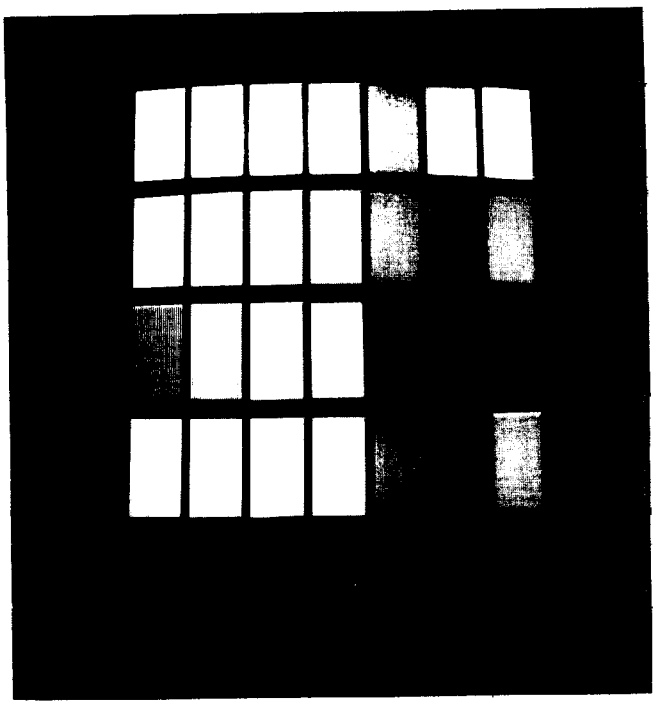


Figure 2-4 Color-Bar Display

Twenty-eight bars of color—7 across by 4 down—are shown on the screen. If the display color is correctly adjusted, the colors should match those listed in Table 2-3. If any colors on your screen do not match those listed in Table 2-3, refer to the raster-scan video display manual for a detailed procedure on how to adjust the color.

Table 2-3 Color-Bar Display Colors

Row	Column	Color
1	1	Yellow-green
1	2	Lilac
1	3	Light blue-violet
1	4	Sky blue
1	5	Red-orange
1	6	Light green
1	7	Royal blue
2	1	Orange
2	2	Bright pink
2	3	Light pink
2	4	Blue
2	5	Red-orange
2	6	Green
2	7	Dark royal blue
3	1	Dark amber
3	2	Olive green
3	3	Yellow-green
3	4	Light green
3	5	Dark red-orange
3	6	Forest green
3	7	Green
4	1	Light red-orange
4	2	Orange
4	3	Yellow-green
4	4	Dark yellow-green
4	5	Red-orange
4	6	Brown
4	7	Olive green

The next section of this test is the character display. Press the KICK button repeatedly to cycle through all playfield pictures described in Table 2-4.

Table 2-4 Character Display List

Segment	Screen Display
Playfield 1	Ship
Playfield 2	Cave Maze
Playfield 3	Castle Wall
Playfield 4	Castle Dungeon
1st Book Page	Ship Near Shore
2nd Book Page	Shore
3rd Book Page	Castle Wall
4th Book Page	Castle and Tower
Animation Between Sections	Castle and Tower Closeup
Character Display	17 Characters and Arabian Logo

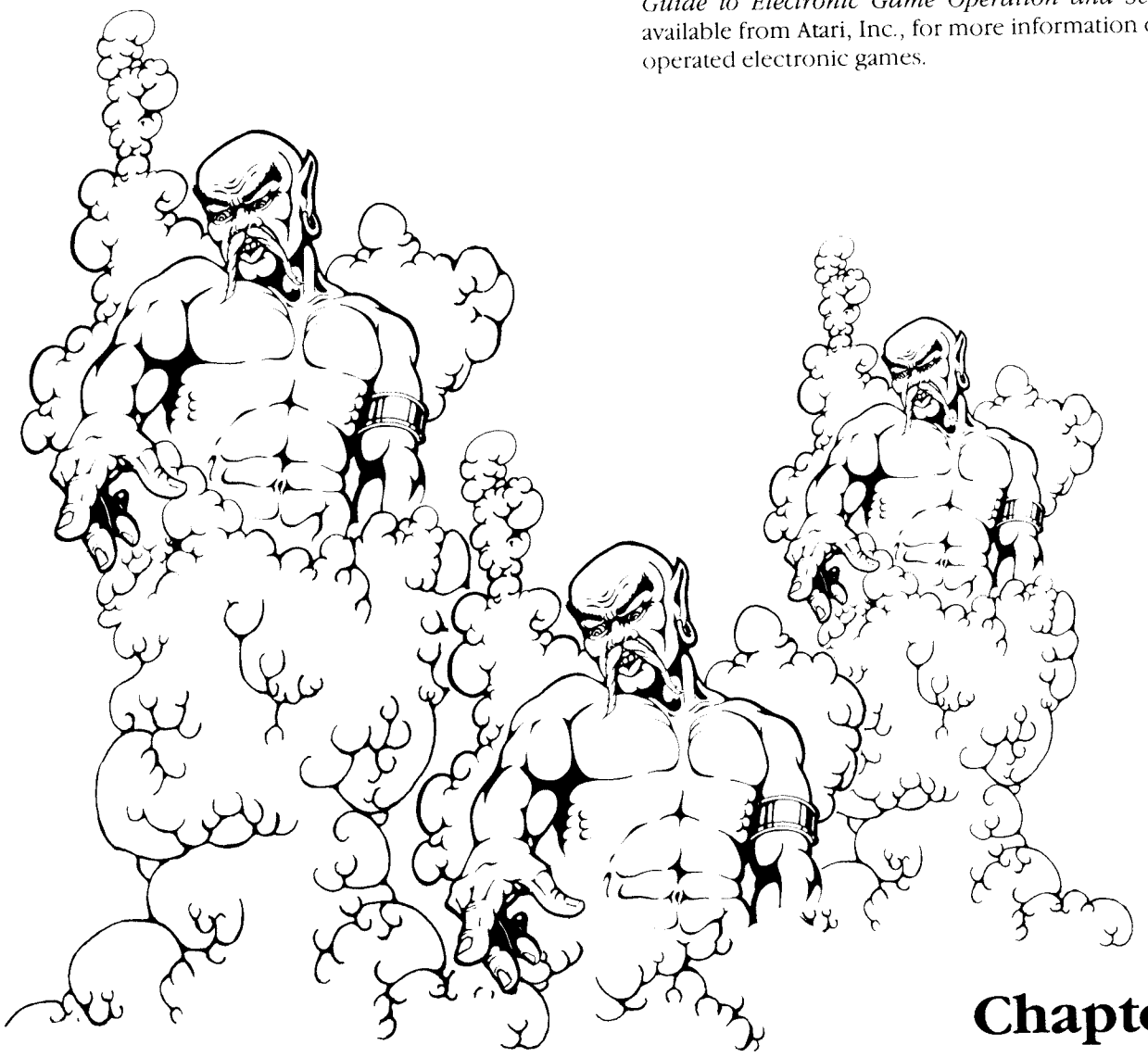
Press KICK again, and the master self-test display will appear.

To end the self-test mode, set the self-test switch to off. The attract mode will automatically start.

Troubleshooting Procedures

This chapter contains a discussion of troubleshooting aids and techniques to assist the service technician when a problem is suspected in this game. Most problems can be located quickly by following the information in this chapter. However, if problems persist, contact your nearest Atari Customer Service office listed on the inside cover of this manual for assistance.

A thorough knowledge of game operation is desirable for effective troubleshooting. In addition to the operation and service information in the Schematic Package Supplement (SP-237) included with this manual, refer to *The Book, A Guide to Electronic Game Operation and Servicing*, available from Atari, Inc., for more information on coin-operated electronic games.



Chapter 3

WARNING

To avoid electrical shock, turn the game off before removing or replacing components.

NOTE

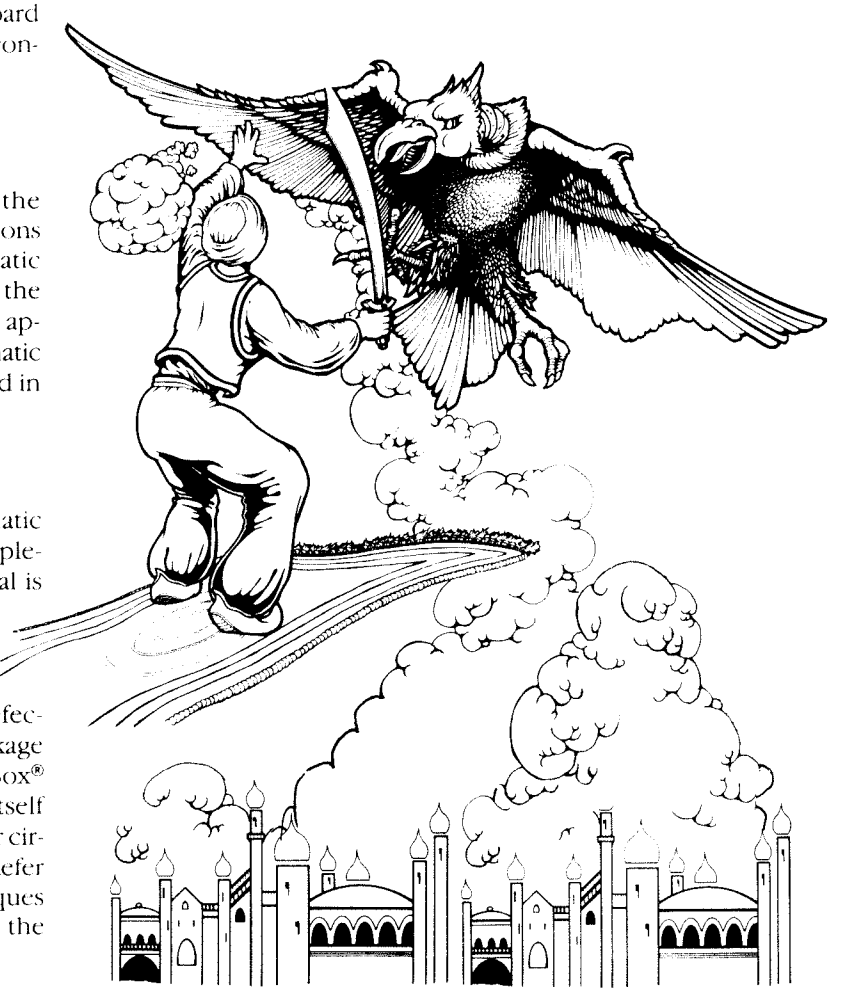
We recommend that troubleshooting and repair procedures be performed by a qualified electronic technician.

A. Troubleshooting Aids

Troubleshooting aids are provided throughout this manual and the Schematic Package Supplement. The following information is intended to acquaint the service technician with the portions of these documents that contain useful troubleshooting and repair information.

Assembly and Component Locations

The illustrated parts lists in Chapter 5 illustrate the locations of assemblies and components. Printed-circuit board (PCB) illustrations aid in rapidly locating components contained on the corresponding schematic diagram(s).



Schematic Diagrams

Complete schematic diagrams are provided in the Schematic Package Supplement. Component designations and their electrical values are included on the schematic diagrams. A block diagram of the major circuits on the game PCB (with sheet numbers to aid in locating the appropriate schematic diagrams) is included in the Schematic Package Supplement. A memory map is also included in the Schematic Package Supplement.

Signal Names

A description of signal names used on the PCB schematic diagrams is provided in the Schematic Package Supplement. Each signal description states where the signal is generated, its destination, and its purpose.

Troubleshooting Procedures

Detailed troubleshooting procedures for locating defective components are provided in the Schematic Package Supplement. These procedures utilize the Atari CAT Box® to troubleshoot the game PCB. This game will test itself and provide data to aid in localizing troubles to a major circuit. Self-test procedures are provided in Chapter 2. Refer to the following section on Troubleshooting Techniques for a suggested troubleshooting sequence that uses the self-test procedures.

B. Troubleshooting Techniques

The following troubleshooting steps are arranged in a sequence recommended for locating a defective component. The procedure begins with a check of the simple trouble possibilities and progresses to more extensive procedures for localizing the trouble to an assembly or major circuit, and then to a defective component.

1. Check Switch Settings

Incorrect switch settings can sometimes indicate a problem that does not exist. Refer to Chapter 1 Set-Up Procedures, to verify that the game has been installed properly and that the switches are set to their correct positions. Check for proper operation in all game-play modes.

2. Check Fuses

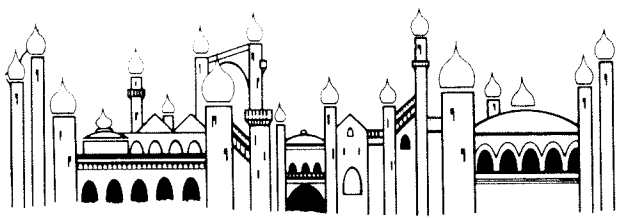
Check for open fuses. Refer to Figure 5-10 in Chapter 5 Illustrated Parts Lists, and the Color Raster Display Manual for the location and rating of each fuse used in this game. Make sure that replacement fuses are the proper type and rating.

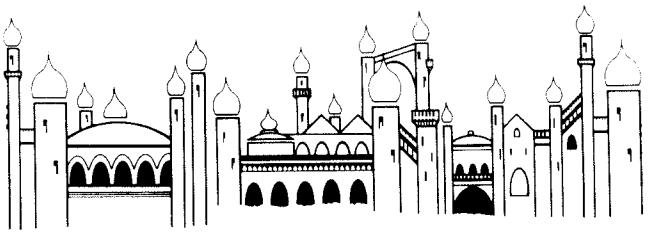
3. Check Power-Supply Voltages

Improper operation of all circuits usually indicates a power supply problem. Check that the proper line voltage is available to the power supply.

4. Localize Trouble

Determine the trouble symptom. Use the wiring diagrams in the Schematic Package Supplement to determine which assemblies or major circuits could cause the trouble. Perform the self-test procedure provided in Chapter 2.





5. Visual Check

Visually check for obvious problems in the portion of the game where a problem is suspected. For example, check for loose or defective solder connections, integrated circuits loose in their sockets, loose cable connections, broken wires, damaged printed circuit boards or components.

6. Check Voltages, Waveforms, and Signatures

Check for correct voltages and waveforms. Perform the troubleshooting procedures provided in the Schematic Package Supplement.

7. Check Individual Components

CAUTION

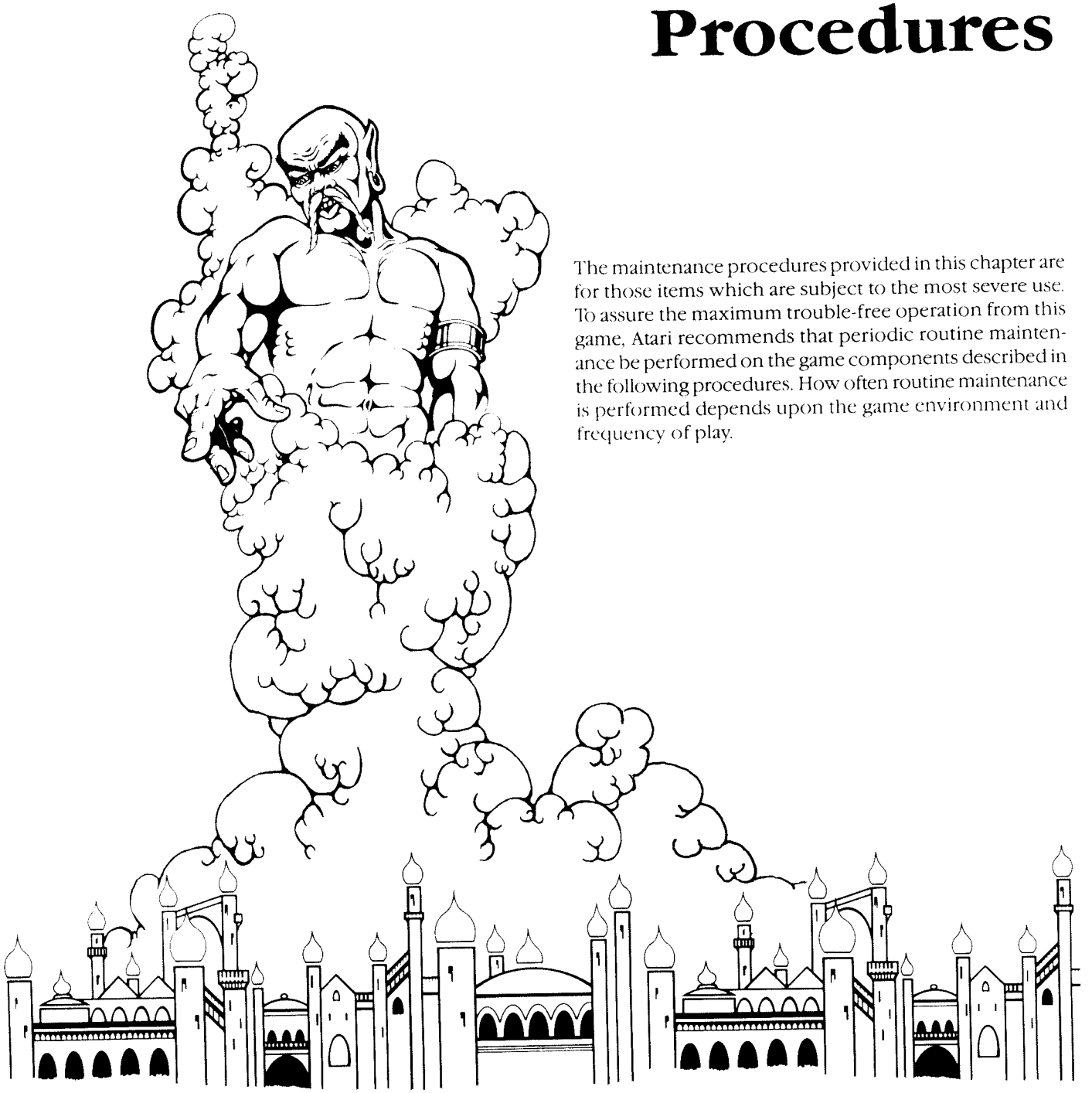
Transistors and integrated circuits soldered in place are difficult to remove without damaging the printed circuit board or component. Be extremely careful when removing these components.

Check soldered-in components by disconnecting one end to isolate the measurement from the effects of the surrounding circuitry. Often, direct substitution is the most practical way to determine if a component is faulty. However, eliminate the possibility of some other circuit problem existing which could damage the substitute component.

8. Repair the Assembly

Repair or replace the defective part. Refer to Chapter 4 Maintenance and Repair, for special repair and replacement procedures. Check for proper operation of any repaired circuit.

Maintenance and Repair Procedures



The maintenance procedures provided in this chapter are for those items which are subject to the most severe use. To assure the maximum trouble-free operation from this game, Atari recommends that periodic routine maintenance be performed on the game components described in the following procedures. How often routine maintenance is performed depends upon the game environment and frequency of play.

Chapter 4

WARNING

To avoid possible electrical shock hazard, unplug the game prior to performing any maintenance.

A. Cleaning Requirements

The game cabinet and display shield may be cleaned with any non-abrasive household cleaner. The coin mechanism should be cleaned periodically with hot or boiling water and a mild detergent. A toothbrush may be used to remove any stubborn build-up of residue in the coin path. After cleaning the coin mechanism, flush thoroughly with hot or boiling water and blow out all the water with compressed air. Compressed air is also recommended for cleaning dust from the interior of the cabinet. No lubrication is required for any of the moving parts in this game.

B. Opening the Control Panel

The remaining procedures in this chapter are performed with the control panel open to provide access to the controls. Perform the following procedure to open the control panel:

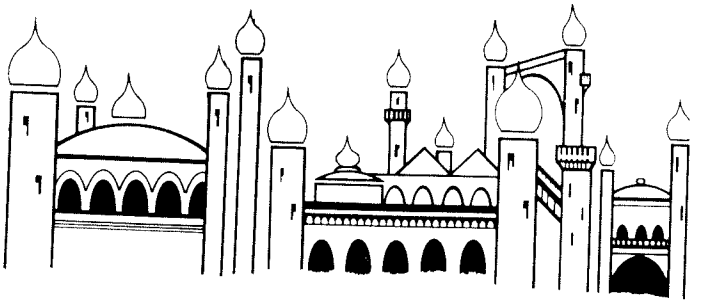
1. Unlock and open the coin door. Reach up through the opening to the top of the control panel and release the two spring-draw latches.
2. Close the coin door.
3. Lift the control panel at the top edge and tilt it toward you. The control panel has foam tape on it. Make sure the tape is in good condition.

C. Joystick Leaf Switches

1. To replace the joystick leaf switches, you do not need to disassemble the joystick. Using your thumbs, pry apart the plastic flanges on the switch holder. With your index finger, lift the switch up so that it will clear the plastic tab located on the outside end of the switch holder.
2. Slide the leaf switch out of its holder. Replace the switch in reverse order.
3. Make sure that each leaf switch is firmly seated in its holder. There is a small gray plastic tab on the outside end of the switch holder. The black plastic part of each leaf switch must be in front of this tab.
4. Check that all four leaf switches can be activated by watching the switch blades as you move the joystick handle up, down, left, and right.
5. Test the four diagonal positions. In each diagonal position, two leaf switches should close. Switches should continue bending slightly after making contact.
6. Adjust each switch contact for a narrow gap using the following procedure:
   a. Push the joystick handle away from the switch for easier servicing.
   b. Use a pair of needlenose pliers or a switch adjustment tool to bend each double set of blades in toward the center. Make the bend where the double set of blades protrude from the black plastic part of the switch.
7. Recheck the switch action. The switches must move independently for right, left, up, down, and diagonal motion of the joystick.

D. Joystick Assembly

1. Remove the entire joystick assembly from the control panel.
2. Remove the four screws in the plastic joystick frame.
3. Remove the retaining ring from the bottom of the shaft. The assembly will now come apart.
4. To replace the bellows, pry it up and out of the plastic frame. Note that the inner raised ring on the bellows is longer on one side. This longer side goes on top of the assembly (toward the control knob).
5. Reassemble the joystick in reverse order.



E. Pushbutton Leaf Switches

1. Adjust the leaf switch contacts for a narrow gap. When a pushbutton is depressed, the resulting wiping action of the cross bar contacts provides a self-cleaning feature. **Don't burnish the contacts.** To clean them, use electrical contact cleaner.
2. To replace a leaf switch, remove the screw with a Phillips-head screwdriver.
3. To replace the switch pushbutton, turn the stamped nut with a wrench in a counterclockwise direction, as seen from the inside of the control panel. The ring on the outside of the control panel should not spin.
4. Reinstall the pushbutton switch. Reconnect the harness wires to the switch terminals.

F. Start Switches

NOTE

Start switches can be checked for proper operation with an ohmmeter. Disconnect the wires from the switch terminals and connect an ohmmeter between the normally open and common contacts. Press and release the pushbutton and check for zero and infinite resistance. If the switch is not operating properly, perform the following procedure.

1. Turn the switch counterclockwise while firmly holding the black cone-shaped bushing on the outside of the control panel.
2. Install a new switch using the reverse procedure.
3. Reconnect the harness wires as shown in Figure 4-1. Make certain the right colors go to the right tabs on the switch.

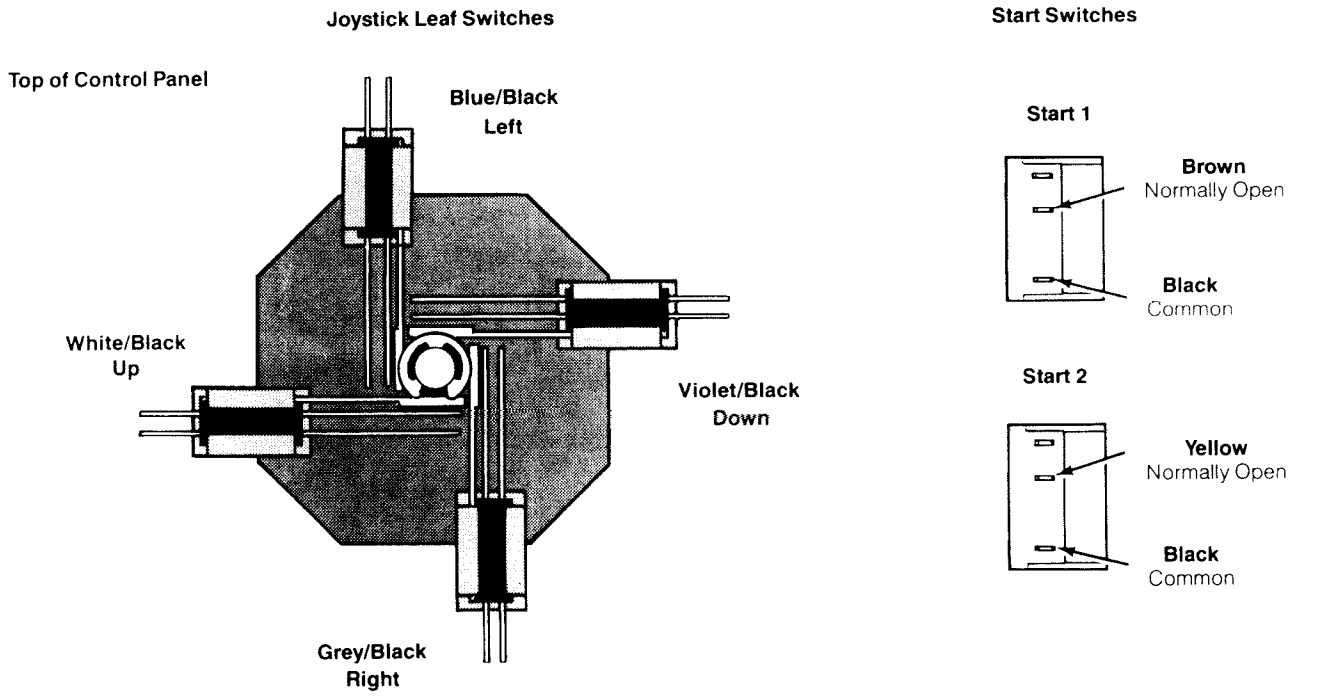


Figure 4-1 Wire Connections to Joystick Leaf and Start Switches

Illustrated Parts Lists

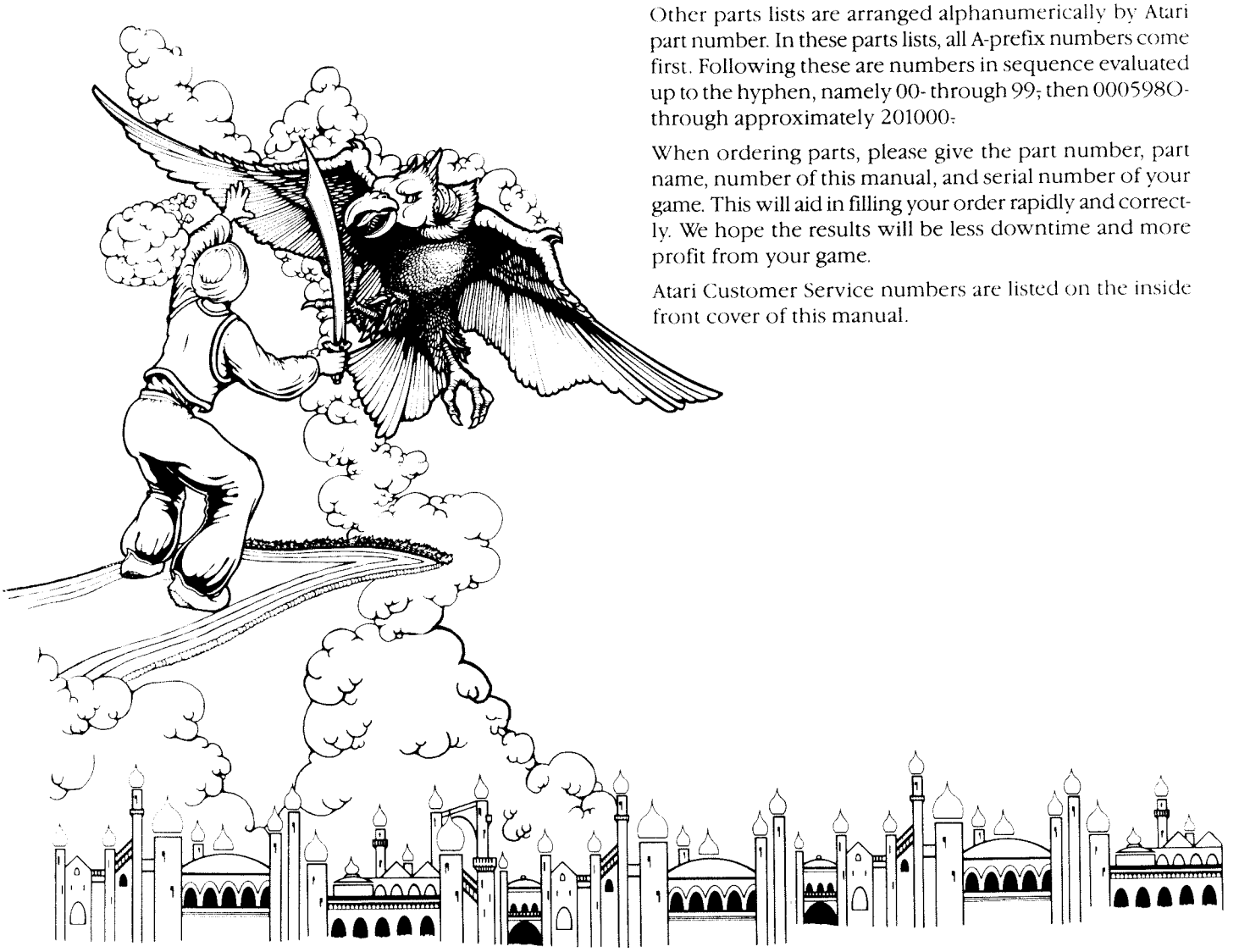
This chapter provides information you need to order parts for your game. Common hardware (screws, nuts, washers, etc.) has been deleted from most of the parts lists. However, there is a parts list for the hardware to mount the game PCB and Regulator/Audio II PCB to the cabinet.

The PCB parts lists are arranged in alphabetical order by component. Each component subsection is arranged alphanumerically by reference designator.

Other parts lists are arranged alphanumerically by Atari part number. In these parts lists, all A-prefix numbers come first. Following these are numbers in sequence evaluated up to the hyphen, namely 00- through 99; then 000598O- through approximately 201000-

When ordering parts, please give the part number, part name, number of this manual, and serial number of your game. This will aid in filling your order rapidly and correctly. We hope the results will be less downtime and more profit from your game.

Atari Customer Service numbers are listed on the inside front cover of this manual.



Chapter 5

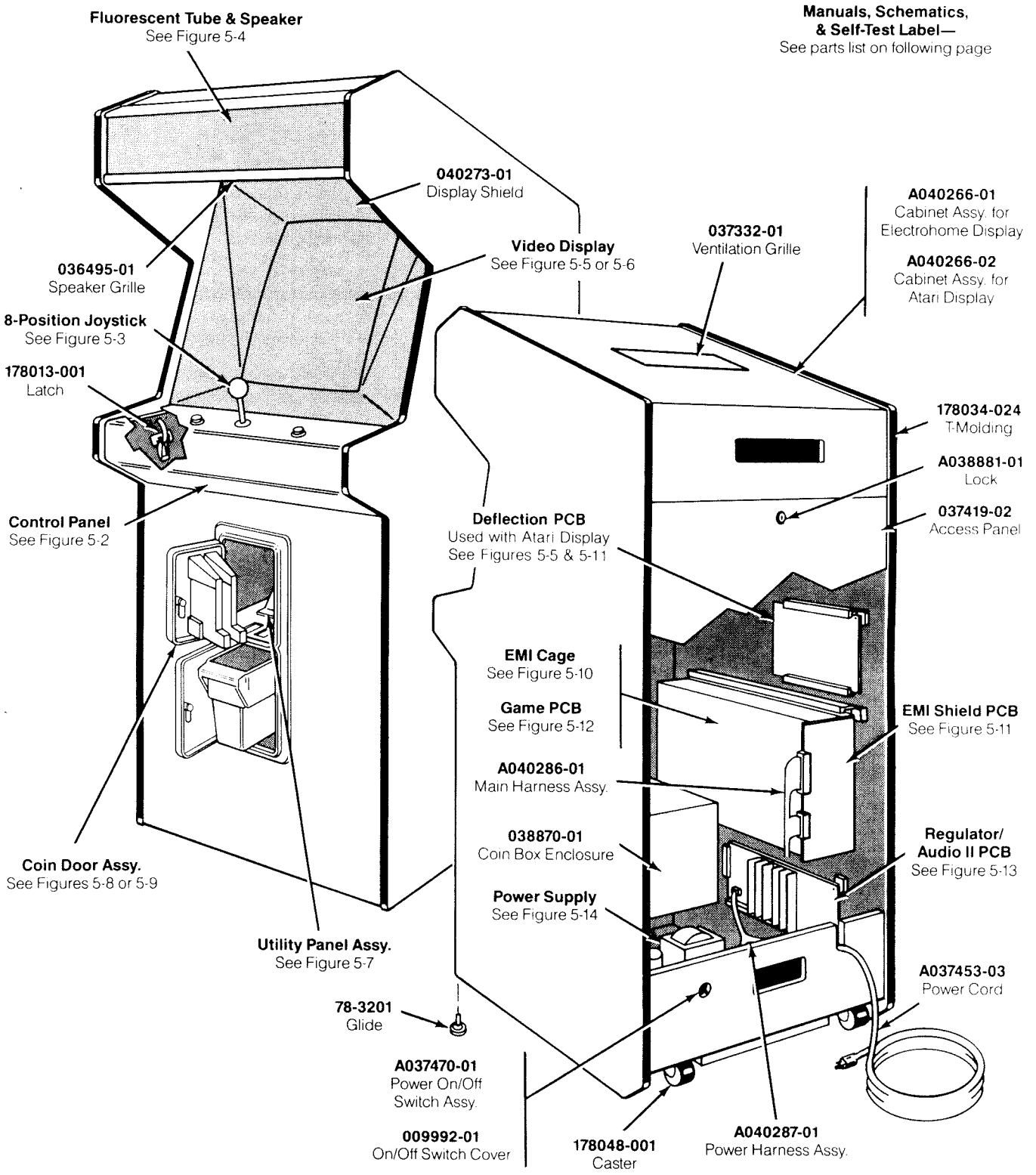


Figure 5-1 Cabinet Mounted Assemblies
A040265-01 C

Cabinet-Mounted Assemblies
Parts List

Part No.	Description
A037453-03	Strain-Relief Power Cord (U.S. and Canada)
A037470-01	Power On/Off Switch and Mounting Plate Assembly
A038881-01	Lock Assembly (for rear access panel) Acceptable substitute is part no. A038881-03
A040266-01	Cabinet Assembly for Electrohome Display (includes glides and PCB retainers, but not the rear access panel)
A040266-02	Cabinet Assembly for Atari Display (includes glides and PCB retainers, but not the rear access panel)
A040286-01	Main Harness Assembly
A040287-01	Power Harness Assembly
	The following five items are technical information supplements to this game:
SP-257	Arabian Schematic Package
ST-257-01	Arabian Label with Self-Test Procedure and Option Switch Settings
TM-220	Service Manual for 19-Inch Matsushita Color-Raster Display (use with part no. 139003-1004)
	or
TM-199	Service Manual for 19-Inch Atari Color-Raster Display
TM-257	Arabian Operators Manual with Illustrated Parts List
78-3201	Adjustable Glide
009992-01	Power On/Off Switch Cover
036495-01	Speaker Grille
037332-01	Ventilation Grille
037419-02	Rear Access Panel (does not include lock)
038091-01	Molded Coin Box
038870-01	Coin Box Enclosure
040273-01	Video Display Shield with Graphics
178013-001	Spring Draw Latch
178034-024	¾-Inch Black Plastic T-Molding
178048-001	2-Inch Rigid Caster

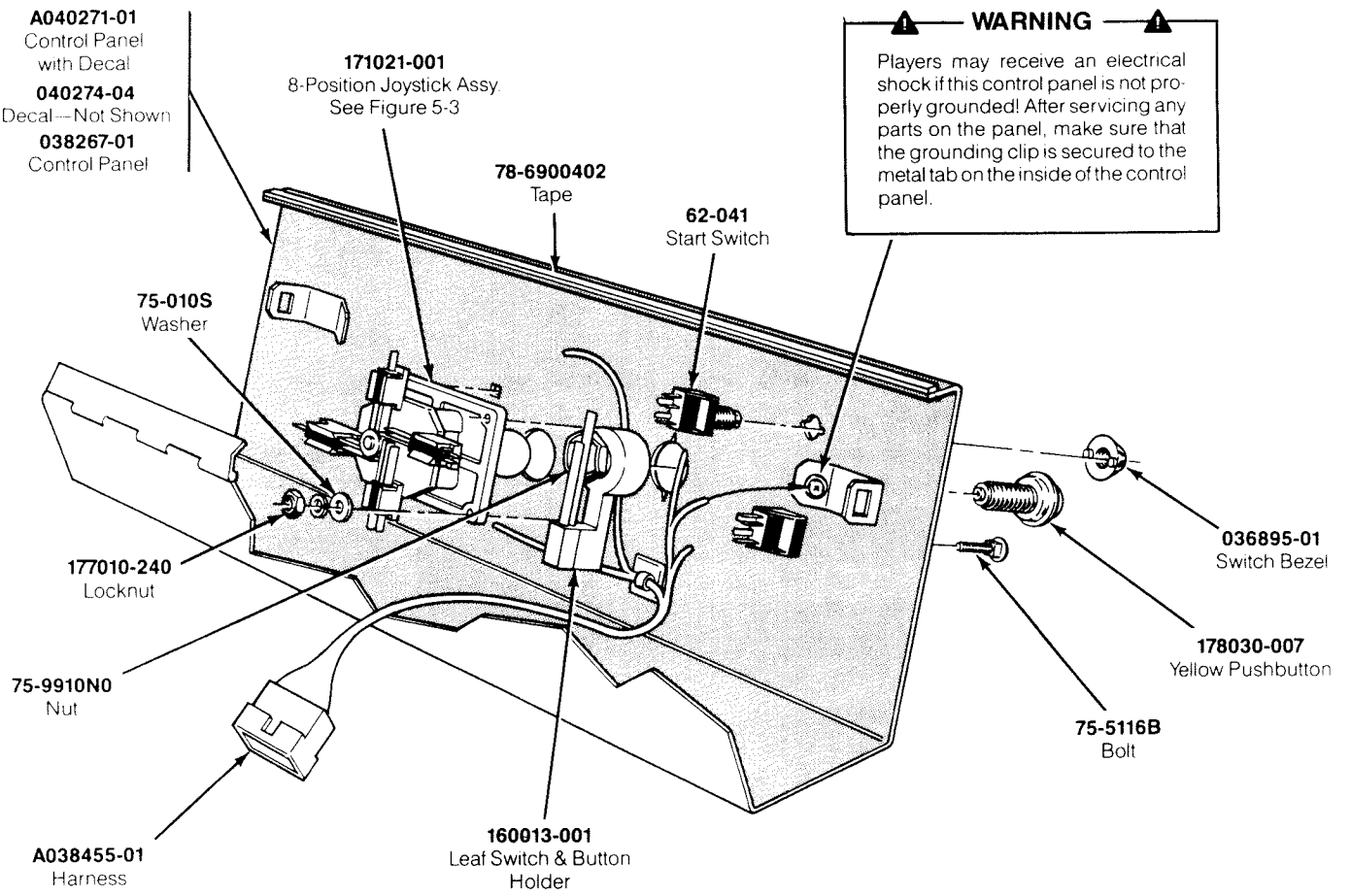


Figure 5-2 Control Panel Assembly A040270-01 A Parts List

Part No.	Description
A038455-01	Control Panel Harness Assembly
A040271-01	Control Panel with Decal
62-041	SPDT Momentary Pushbutton Start Switch
75-010S	#10 Flat Washer
75-5116B	#10-24 Black Carriage Bolt
75-9910N0	#⅜ × 11 Stamped Nut
78-6900402	Vinyl Foam Single-Coated Adhesive Tape, ¼-Inch Wide × ⅛-Inch Thick (24 inches required)
036895-01	Black Molded Switch Bezel
040274-04	Control Panel Decal (not shown)
038267-01	Control Panel
160013-001	Leaf Switch and Button Holder (leaf switch only is part no. 160012-001)
171021-001	8-Position Joystick Assembly
177010-240	#10-24 Hex Locknut
178030-007	Yellow Pushbutton Assembly
179125-001	Grounding Terminal (not shown)

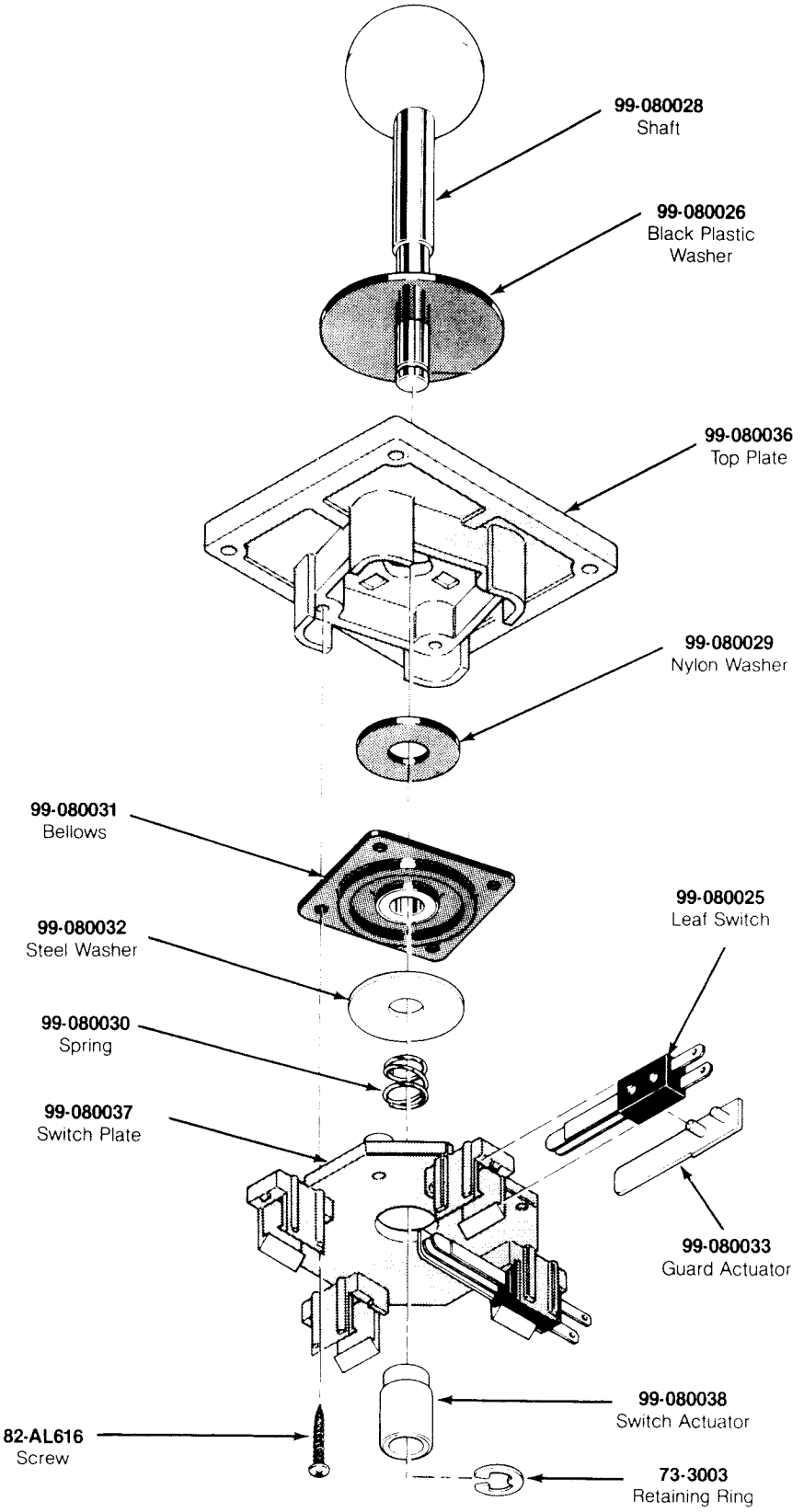


Figure 5-3 8-Position Joystick Assembly 171021-001

8-Position Joystick Assembly
Parts List

Part No.	Description
73-3003	Retaining Ring
82-AL616	#6 x 1-Inch Cross-Recessed Pan-Head Type BT Self-Tapping Steel Screw
99-080025	Leaf Switch
99-080026	2-Inch Black Plastic Washer
99-080028	Metal Shaft
99-080029	Nylon Washer
99-080030	Spring
99-080031	Bellows
99-080032	Flat Steel Washer
99-080033	Plastic Guard/Actuator
99-080036	Top Plate
99-080037	Switch Mounting Plate
99-080038	Nylon Switch Actuator

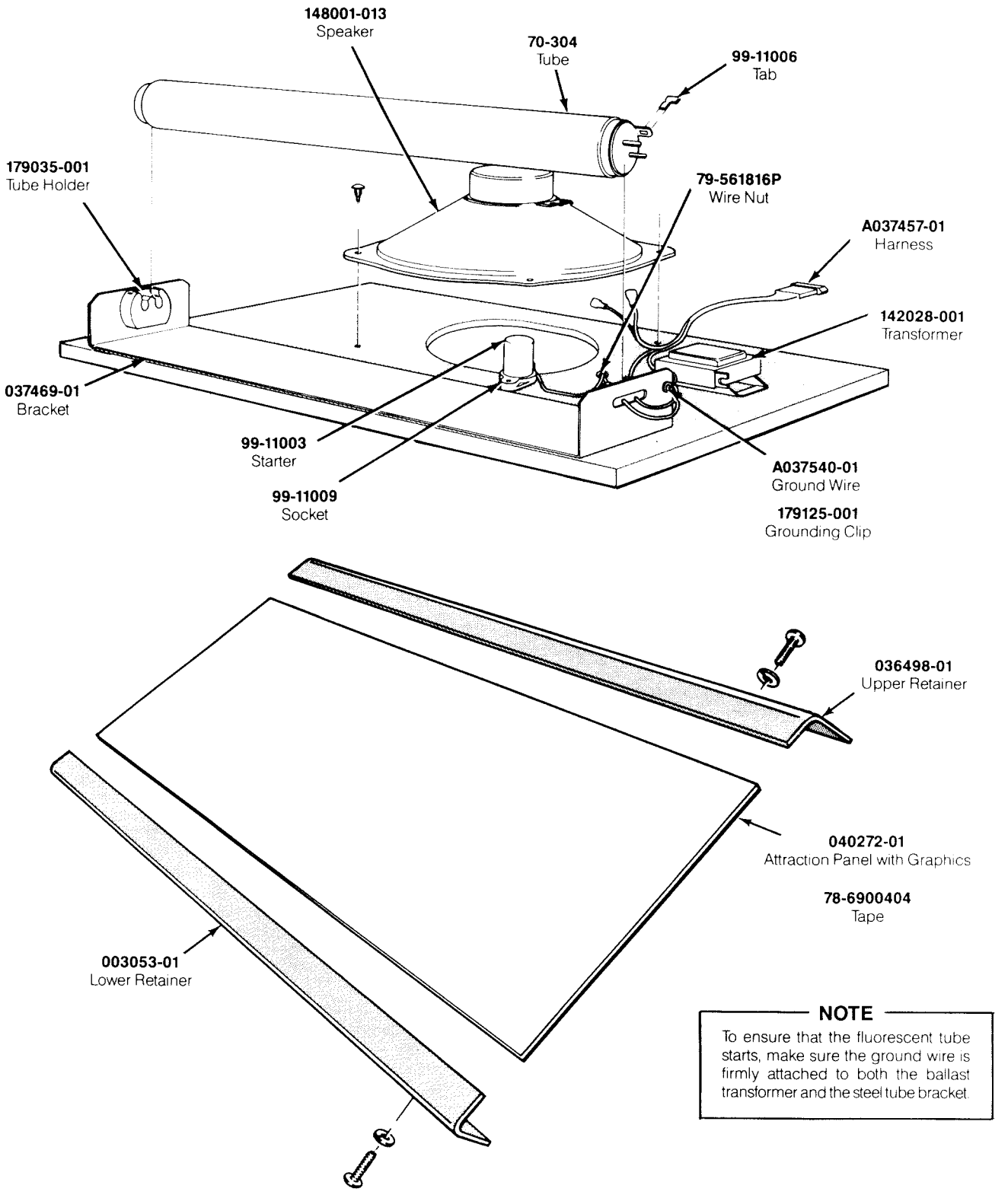


Figure 5-4 Fluorescent Tube and Speaker Assembly
A039737-01 B

Fluorescent Tube and Speaker Assembly Parts List

Part No.	Description
A037457-01	Tube and Speaker Harness Assembly
A037540-01	Ground Wire with Ring Lug
70-304	18-Inch, 15-Watt, Cool White Fluorescent Tube
78-6900404	Vinyl Foam Single-Coated Adhesive Tape, ¼-Inch Wide × ¼-Inch Thick (48 inches required)
79-561816P	Spring-Connector Wire Nut for 16- to 18-Gauge Wires
99-11003	Fluorescent Tube Starter
99-11006	Fluorescent Tube Locking Tab (consists of two pieces)
99-11009	Starter Socket
003053-01	Lower Attraction Panel Retainer
036498-01	Upper Attraction Panel Retainer
037469-01	Steel Tube Bracket
038151-01	15-Inch Jumper Wire
040272-01	Attraction Panel with Graphics
142028-001	60 Hz, 118 V, Ballast Transformer (used on A038161-01 assembly)
148001-013	6 × 9-Inch Oval, 4 Ω, 6-Ounce, Shielded High-Fidelity Speaker
179035-001	2-Pin Fluorescent Tube Holder
179125-001	Grounding Clip (Acceptable substitute is part no. 179074-010)

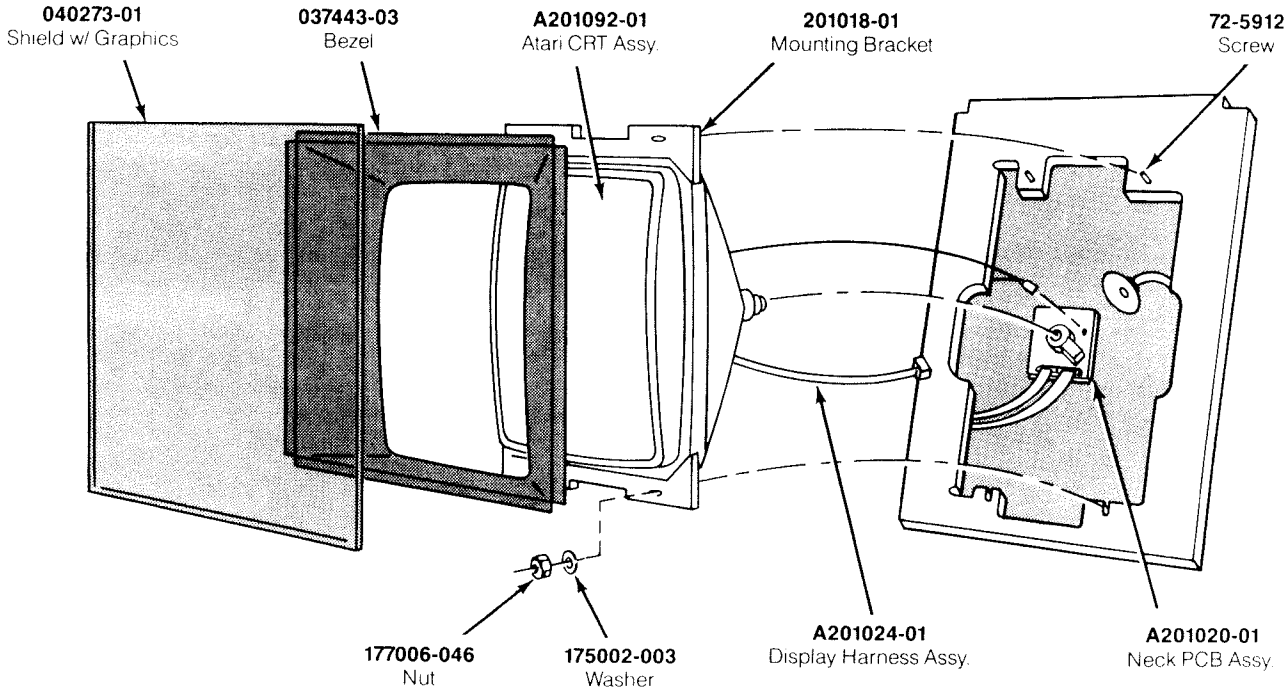


Figure 5-5 Atari Video Display Assembly A039650-01 A Parts List

Part No.	Description
A200001-01*	19-Inch Atari Color Raster-Scan Cathode-Ray Tube (CRT) Assembly—includes:
A201092-01*	CRT Assembly
A201022-01*	Deflection PCB Assembly (not shown)
A201024-01	Color Raster Harness Assembly
A201020-01*	Neck PCB Assembly
72-5912	5/16-18 x ¾-Inch Hex-Head Screw
034536-01	Foam Pad (between Deflection PCB and cabinet wall—not shown)
037443-03	Display Bezel
040273-01	Display Shield with Graphics
175002-003	1-Inch Flat Washer
177006-046	5/16-18 Caged Nut
201018-01	Mounting Bracket

*See the Atari 19-Inch Color Raster Display Manual (TM-199) for complete parts information.

⚠ WARNING ⚠

Shock Hazard

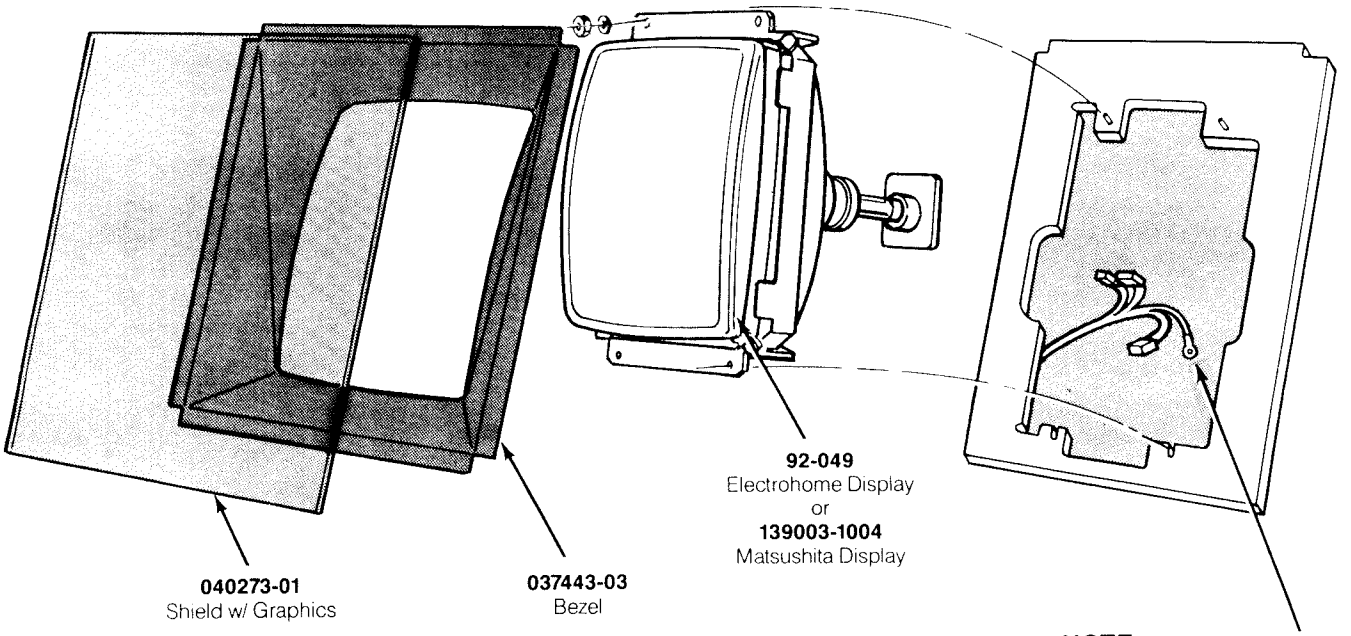
Display repair should only be performed by a qualified service technician. Before removing or repairing the video display, **unplug the game.**

High voltages may exist in any video display, even with power disconnected. Use extreme caution and do not touch electrical parts of the display yoke area with your hands!

Discharge the high-voltage from the cathode ray tube as follows: Attach one end of a large, well-insulated, 20-kV jumper to ground. Momentarily touch the free end of the grounded jumper to the anode by sliding it under the anode cap. Wait two minutes and discharge the anode again.

Implosion Hazard

If you drop the display and the picture tube breaks, it may implode! Shattered glass can fly six feet or more from the implosion. Use care when replacing any display.



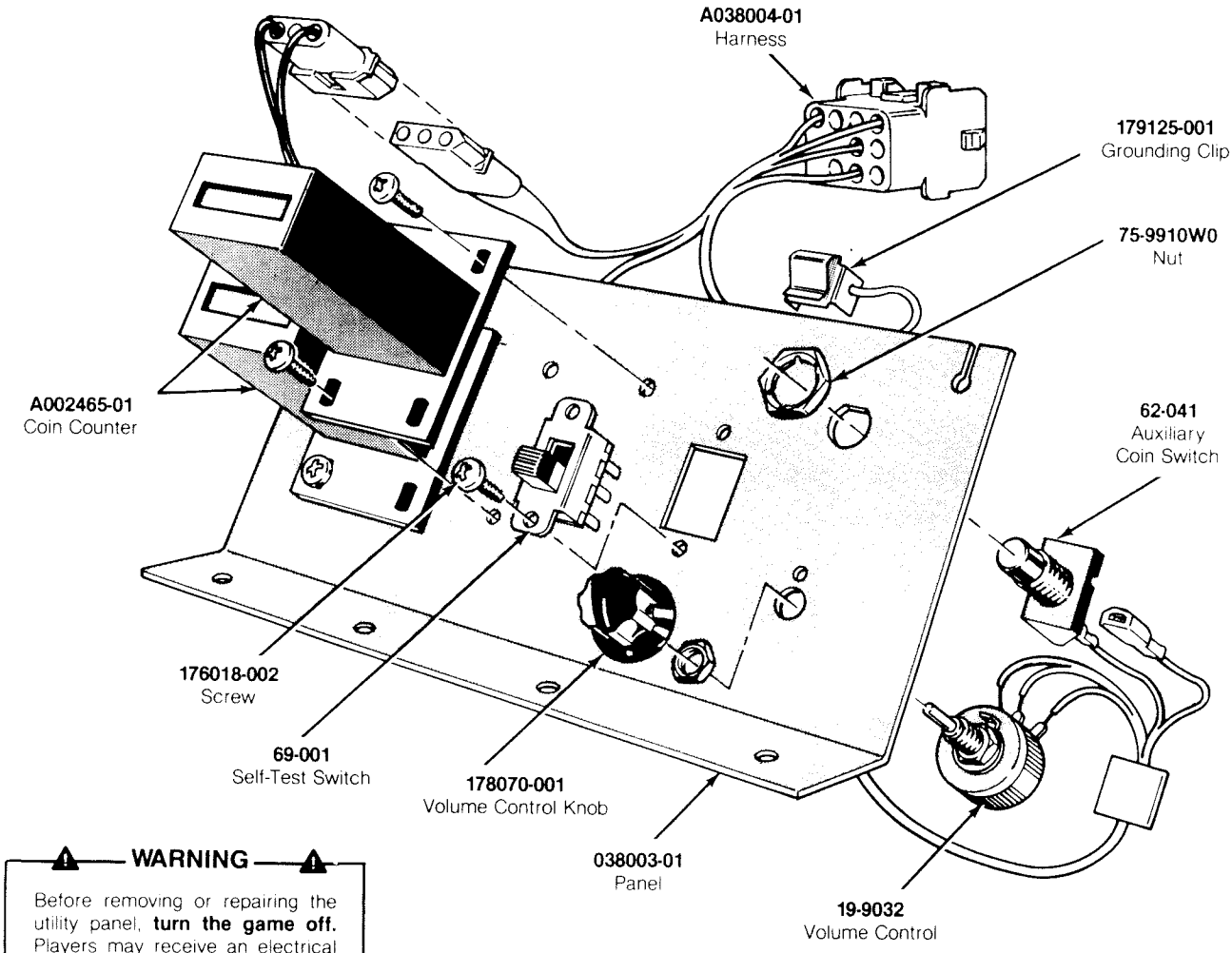
NOTE

This grounding lug is not used to ground the Atari video display. If you replace this display with an Atari video display, tie back the grounding lug securely so that it will not interfere with the game's operation.

Figure 5-6 Electrohome Video Display

Parts List

Part No.	*Description*
78-6900-402	Vinyl Foam Single-Coated Adhesive Tape, ¼-Inch Wide × ⅛-Inch Thick (24 inches required between the display shield and the control panel, not shown)
92-049	19-Inch Electrohome Color Raster-Scan Display (Acceptable substitute is part no. 139003-1004—19-Inch Matshushita Color Raster-Scan Display)
037443-03	Display Bezel
040273-01	Display Shield with Graphics



⚠ WARNING ⚠

Before removing or repairing the utility panel, **turn the game off.** Players may receive an electrical shock if the utility panel is not properly grounded! After servicing any parts on the panel, make sure that the ground wire is firmly attached to the metal screw on the back of the coin counter.

NOTE

Only the Ireland-built cabinet has two coin counters.

Figure 5-7 Utility Panel Assembly A038002-01 H Parts List

Part No.	Description
A002465-01	6 V Coin Counter
A038004-01	Utility Panel Harness
19-9032	Volume Control
62-041	SPDT Momentary-Contact Pushbutton Auxiliary Coin Switch with Black Cap
69-001	DPDT Self-Test Switch
038003-01	Utility Panel
176018-002	#6-32 x ½-Inch Machine Screw
178070-001	Volume Control Knob
75-9910W0	15/32-32 Stamped Nut
179125-001	Grounding Clip

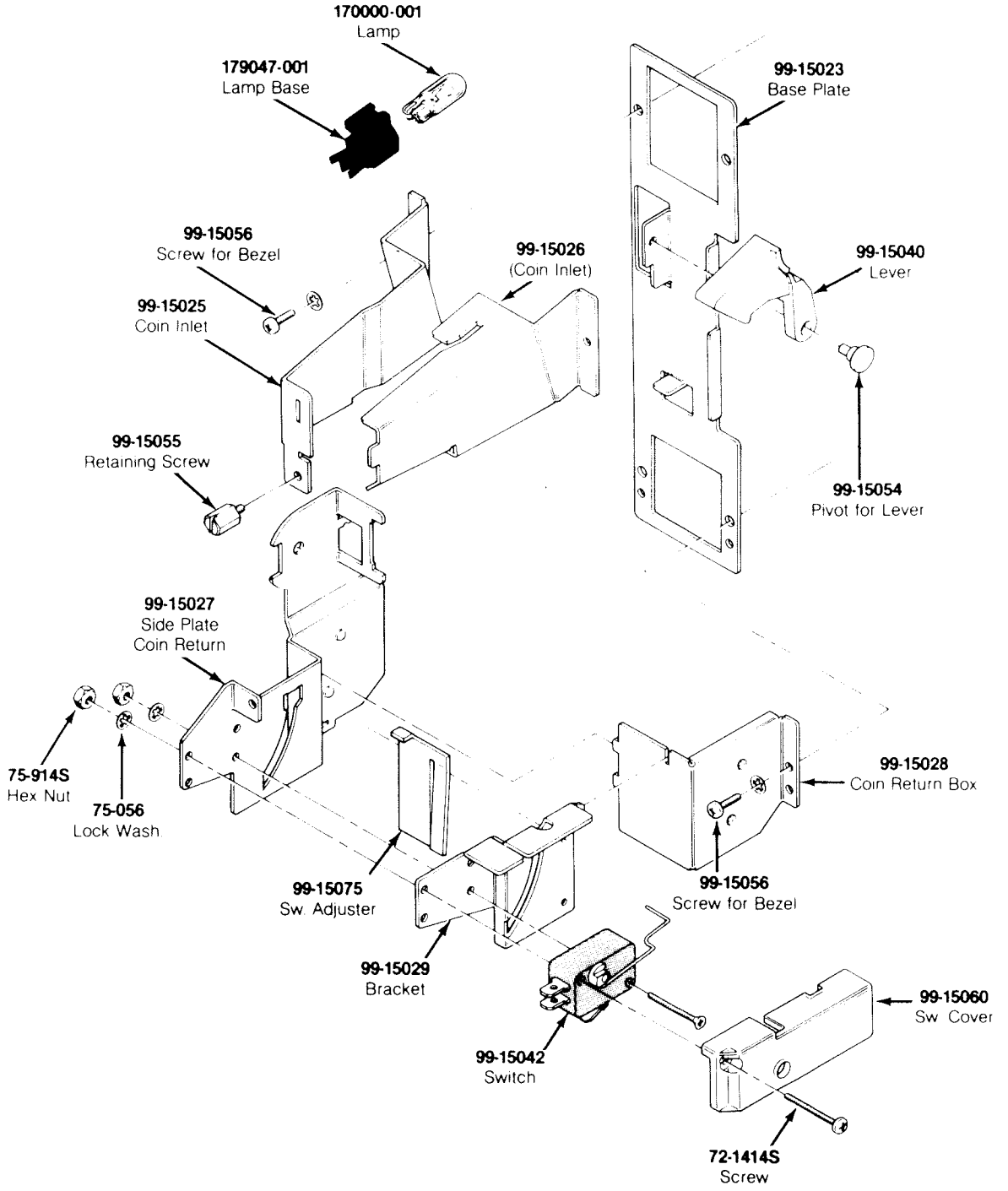
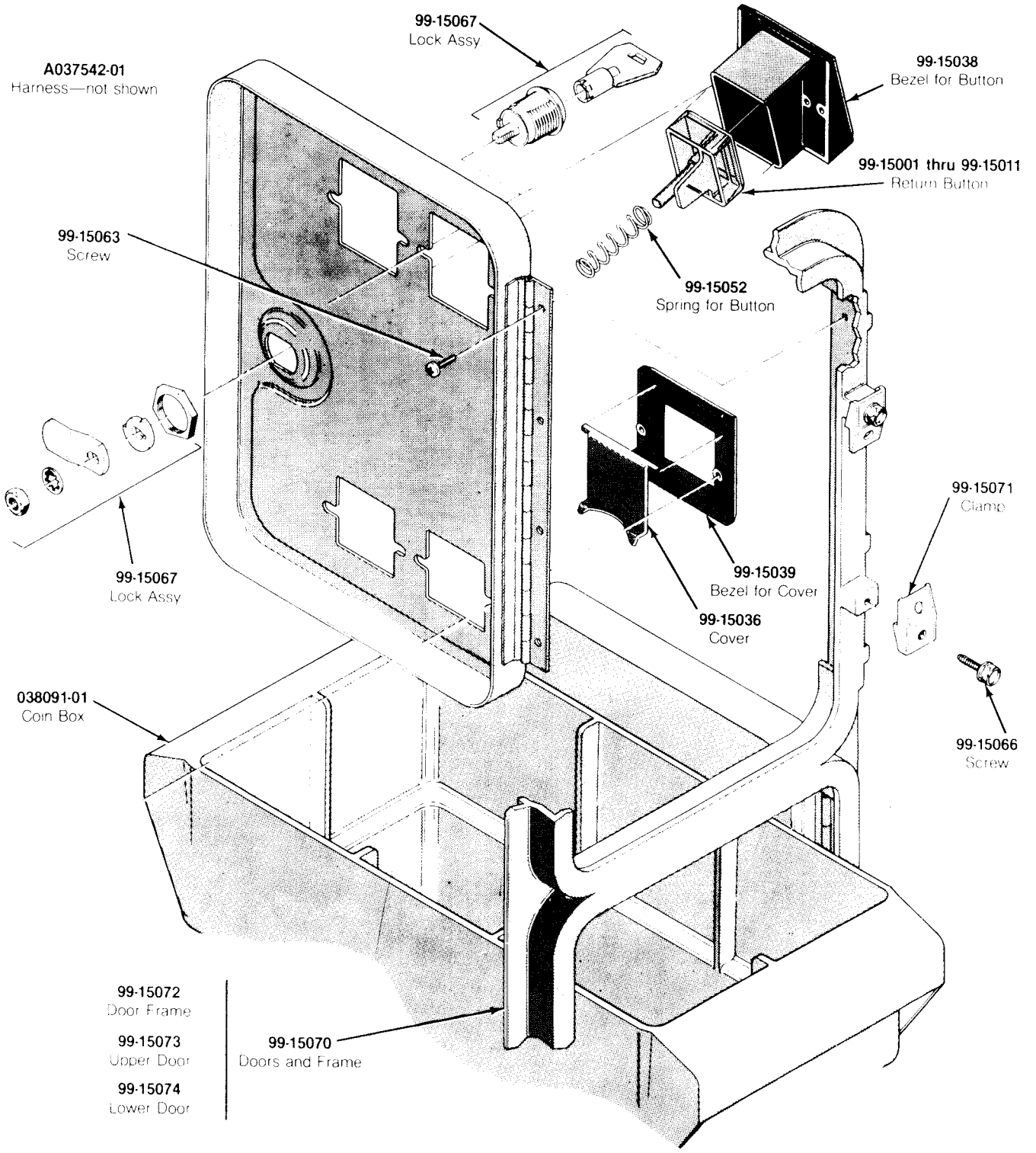


Figure 5-8 Vertically Mounted Coin Door
171034-xxx A



171034-001 — U.S. 25¢/25¢ Coin Door
171034-003 — Canadian 25¢/25¢ Coin Door
171034-005 — U.K. 10 P/50 P Coin Door
171034-006 — U.K. 20 P/50 P Coin Door
171034-009 — German 2 DM/1 DM Coin Door
171034-010 — German 2 DM/5 DM Coin Door
171034-011 — German 1 DM/5 DM Coin Door
171034-015 — French 2 Fr/1 Fr Coin Door

Figure 5-8 Vertically Mounted Coin Door, continued
171034-xxx A

Vertically Mounted Coin Door
Parts List

Part No.	Description
A037542-01	Harness Assembly
72-14148	#4-40 × 7/8-Inch Cross-Recessed Pan-Head Steel Machine Screw
75-056	#6 Internal-Tooth Zinc-Plated Steel Lock Washer
75-9148	#4-40 Steel Machine Hex Nut
75-34148	#4-40 × 7/8-Inch 82° Cross-Recessed Flat-Head Steel Machine Screw
99-15001	Coin Return Button with U.S. 25¢ Price Plate
99-15002	Coin Return Button with U.S. $1 Price Plate
99-15003	Coin Return Button with German 1 DM Price Plate
99-15004	Coin Return Button with German 2 DM Price Plate
99-15005	Coin Return Button with German 5 DM Price Plate
99-15006	Coin Return Button with Belgian 5 Fr Price Plate
99-15007	Coin Return Button with French 1 Fr Price Plate
99-15008	Coin Return Button with Japanese 100 Yen Price Plate
99-15009	Coin Return Button with British 10 Pence Price Plate
99-15010	Coin Return Button with Australian 20¢ Price Plate
99-15011	Coin Return Button with Italian 100 Lire Price Plate
99-15023	Base Plate
99-15025	Left Half of Coin Inlet
99-15026	Right Half of Coin Inlet
99-15027	Side Plate of Coin Return Box
99-15028	Base Plate of Coin Return Box
99-15029	Switch Bracket
99-15036	Metal Coin Return Cover
99-15038	Bezel for Coin Return Button
99-15039	Metal Bezel for Coin Return Cover
99-15040	Coin Return Lever
99-15042	Coin Switch for U.S. 25¢
99-15052	Spring for Coin Return Button
99-15054	Pivot for Coin Return Lever
99-15055	Retaining Screw
99-15056	#4-40 × 5/16-Inch Cross-Recessed Pan-Head Steel Machine Screw
99-15060	Switch Cover
99-15063	Screw for Hinge
99-15066	Screw for Clamp
99-15067	Lock Assembly
99-15070	Doors and Frame
99-15071	Clamp for Frame
99-15072	Door Frame
99-15073	Upper Door
99-15074	Lower Door
99-15075	Switch Adjuster
038091-01	Coin Box (Not included in assembly—Acceptable substitute is part number A037491-01)
170000-001	6.3 V Miniature Wedge-Base Incandescent Lamp
171000-035	Metal Coin Mechanism
179047-001	Lamp Base

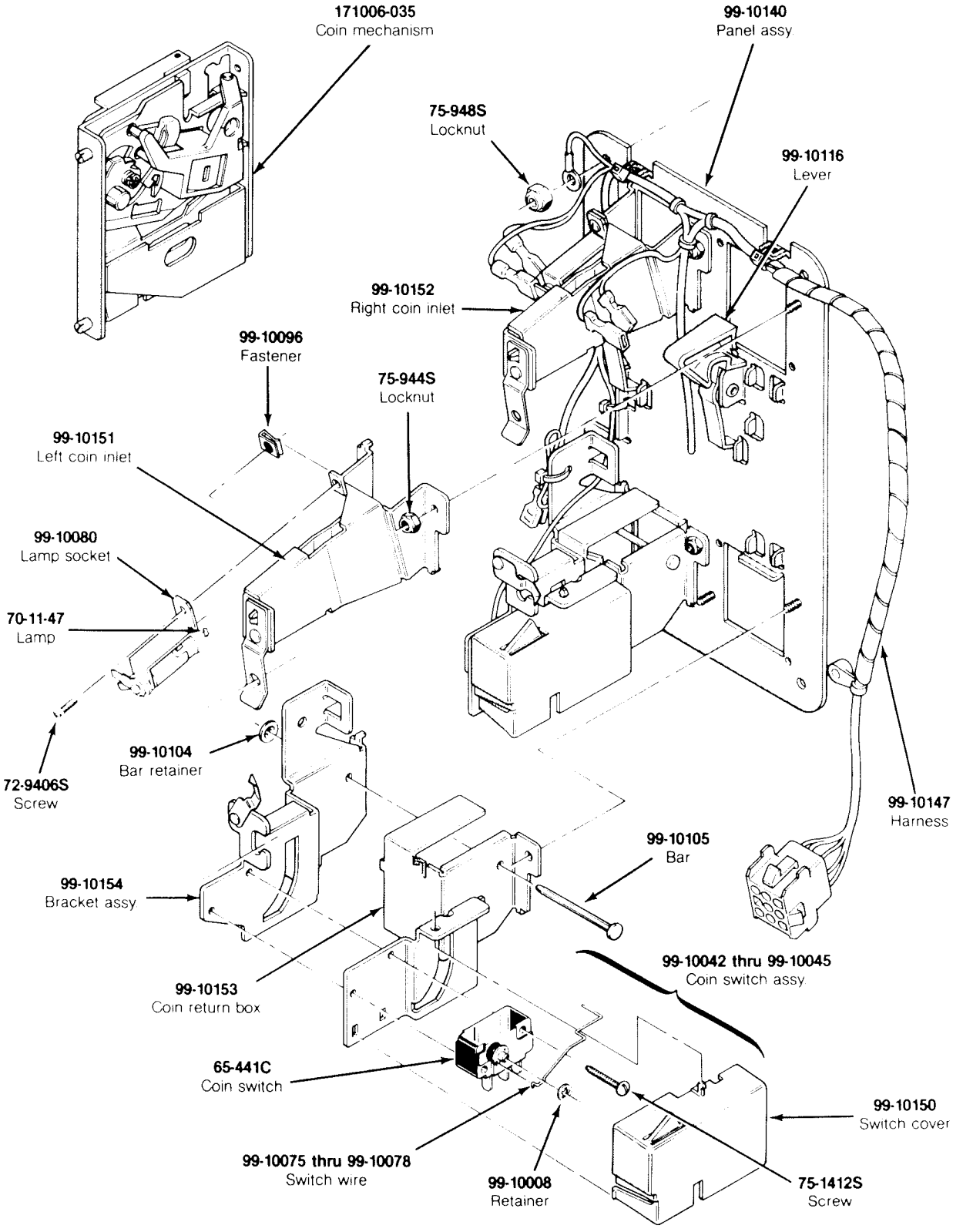


Figure 5-9 American-Made Coin-Door Assembly 171027-001 A

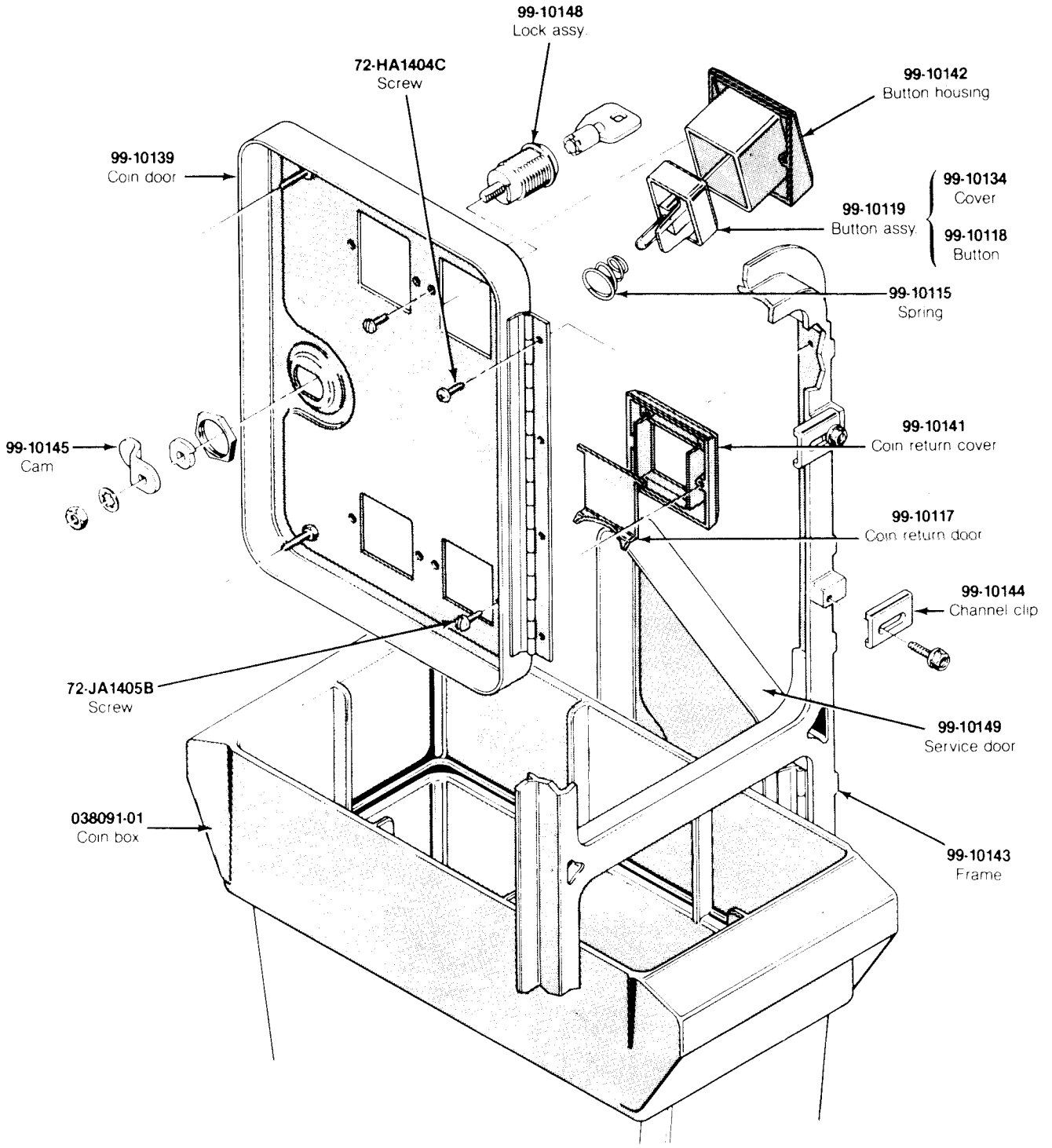


Figure 5-9 American-Made Coin-Door Assembly, continued
171027-001 A

American-Made Coin-Door Assembly
Parts List

Part No.	Description
171006-035	Metal Coin Mechanism for U.S. $.25
65-441C	Coin Switch
70-11-47	Miniature Bayonet Lamp
72-9406S	#4-40 x ⅜-Inch Truss-Head Screw
72-HA1404C	#4-40 x ¼-Inch Pan-Head Screw
72-JA1405B	#4-40 x .31-Inch Pan-Head Screw
75-1412S	#4-40 x ¾-Inch Pan-Head Screw
75-944S	#4-40 Locknut
99-10008	Retainer
99-10042	Coin Switch Assembly for Belgian 5 Fr and U.S. $.25
99-10043	Coin Switch Assembly for German 1 DM, Japanese 100 Yen, Swiss 1 Fr
99-10044	Coin Switch Assembly for German 2 DM, Italian 100 L, U.S. $1.00
99-10045	Coin Switch Assembly for Australian $.20, German 5 DM, British 10 P
99-10068	Coin Return Chute
99-10075	Switch wire (included in coin switch assembly)
99-10076	Switch wire (included in coin switch assembly)
99-10077	Switch wire (included in coin switch assembly)
99-10078	Switch wire (included in coin switch assembly)
99-10080	Lamp socket
99-10081	Key holder
99-10096	Fastener
99-10104	Bar retainer
99-10105	Bar
99-10115	Spring
99-10116	Plastic Coin Return Lever
99-10117	Steel Coin Return Door
99-10118	Amber Coin Return Button
99-10119	Amber Coin Button for U.S. $.25
99-10134	Coin Button Cover
99-10139	Coin Door
99-10140	Coin Door Inner-Panel Assembly
99-10141	Diecast Coin Return Cover
99-10142	Diecast Button Housing
99-10143	Coin Door Frame
99-10144	Coin Door Channel Clip
99-10145	Offset Cam
99-10146	Coin Inlet Chute Assembly
99-10147	American-Made Coin Door Harness
99-10148	Lock Assembly
99-10149	Service Door
99-10150	Switch Cover
99-10151	Left Coin Inlet
99-10152	Right Coin Inlet
99-10153	Coin Return Box
99-10154	Bracket Assembly

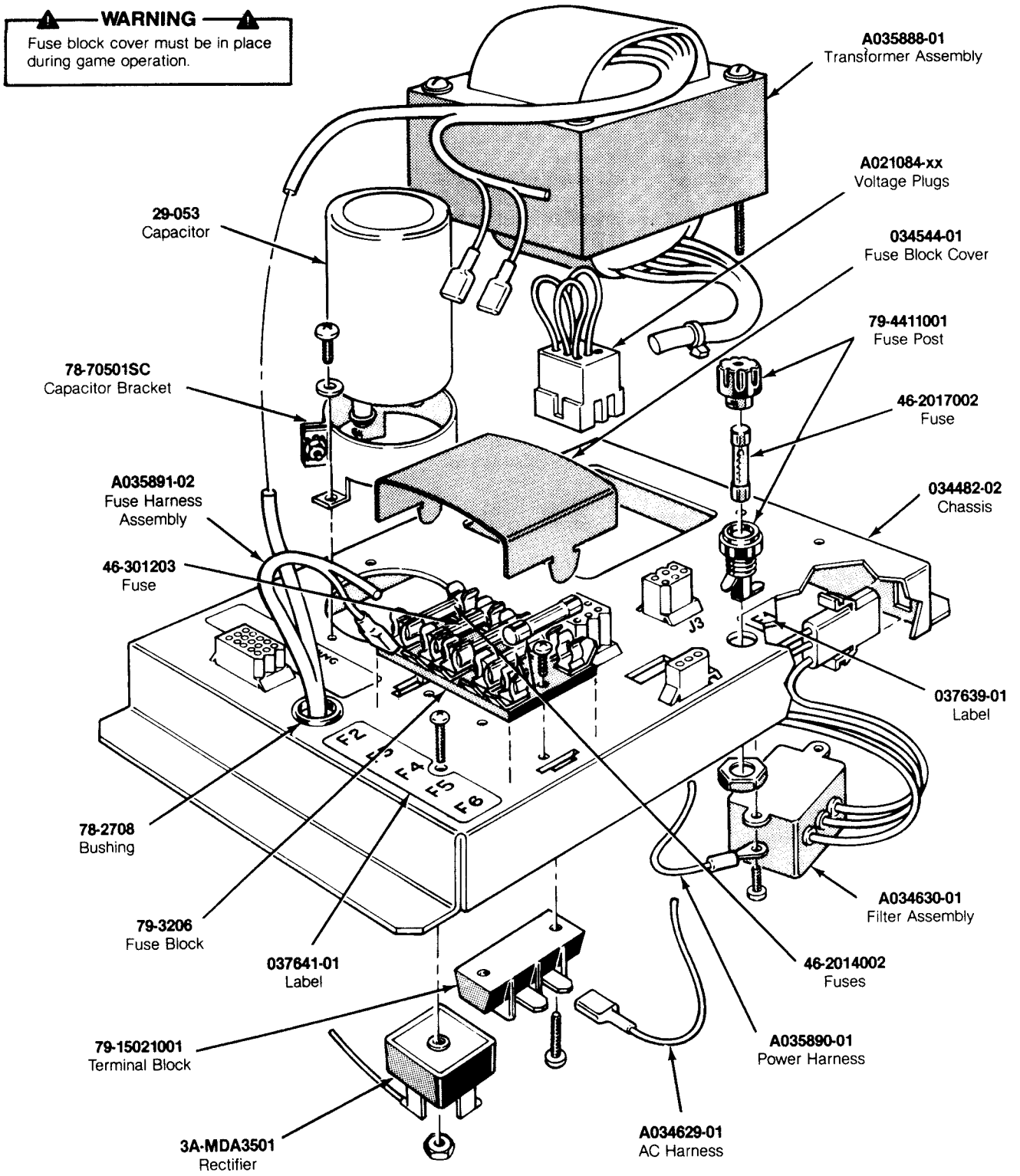


Figure 5-10 Power Supply Assembly A037671-01 H

Power Supply Assembly
Parts List

Designator	Description	Part No.
C1	27,000 μF, 15 VDC Electrolytic Capacitor	29-053
C1	2-Inch Diameter Capacitor Mounting Bracket	78-70501SC
CR1	Type-MDA 3501 Bridge Rectifier	3A-MDA3501
F1	Panel-Mounting Non-Indicating 3AG Cartridge-Type Fuse Post	79-4411001
F1	7 A, 250 V, 3AG Slow-Blow Glass Cartridge-Type Fuse	46-2017002
F1	Label for Fuse Value	037639-01
F2	4 A, 250 V, 3AG Slow-Blow Glass Cartridge-Type Fuse	46-2014002
F2–F6	5-Position 3AG Fuse Block with ¼-Inch Quick-Disconnect Terminals	79-3206
F2–F6	Fuse Harness Assembly	A035891-02
F2–F6	Fuse Block Cover	034544-01
F2–F6	Label for Fuse Values	037641-01
F3	20 A, 32 V, 3AG Slow-Blow Glass Cartridge-Type Fuse	46-301203
F4	2-Circuit Single-Row Terminal Block (located under **F4**)	79-15021001
F4–F6	4 A, 250 V, 3AG Slow-Blow Glass Cartridge-Type Fuse	46-2014002
FL1	RFI Filter Assembly (designation not marked)	A034630-01
J2	Power Harness Assembly	A035890-01
J3	Voltage Plug for 120 V (105-135 VAC) (yellow wire color—plugs into **J3**)	A021084-02
J4A	AC Harness Assembly	A034629-01
T1	Transformer Assembly (designation covered) (Acceptable substitute is part no. A035888-02)	A035888-01
	Nylon Type 6/6 Hole Bushing with ⅜-Inch Inside Diameter × $^{5}\!/_{64}$-Inch Outside Diameter × ¼-Inch Thick	78-2708
	Power Supply Chassis Base	034482-02
	Metal Base Plate (not shown in illustration)	037243-01

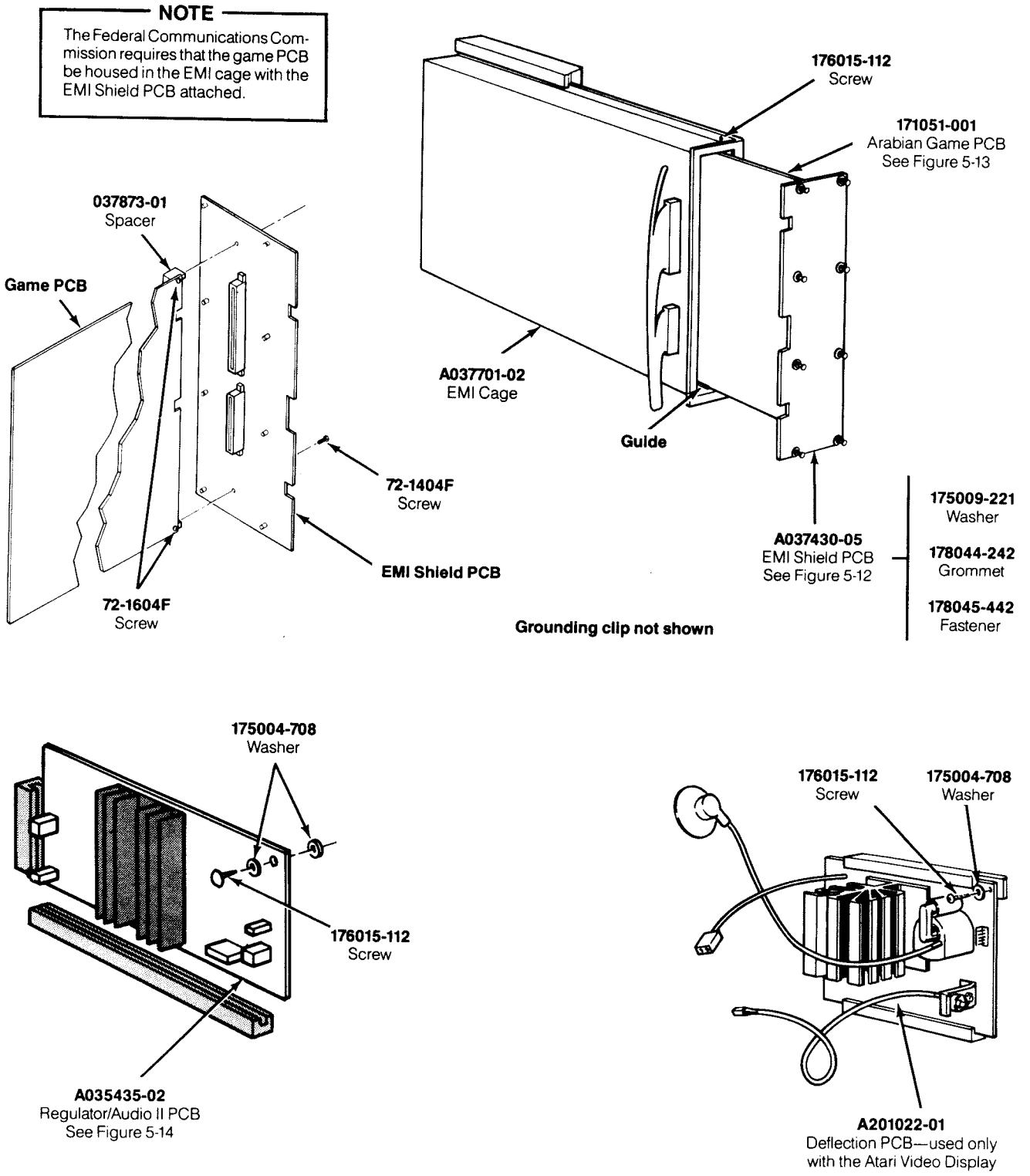


Figure 5-11 Electromagnetic Interference (EMI) Cage Assemblies and PCB Mounting Hardware

EMI Cage Assemblies and PCB Mounting Hardware Parts List

Part No.	Description
A201022-01	Deflection PCB—used only with the Atari Video Display
A035435-02	Regulator/Audio II PCB (Acceptable substitute is part no. A035435-06)
A037701-02	EMI Cage (includes guide)
A037430-05	EMI Shield PCB—includes:
72-1404F	#4-40 x ¼-Inch Cross-Recessed Steel Screw
037873-01	Spacer
175009-221	Plastic Washer
178044-242	Grommet
178045-442	Snap-In Fastener
72-1604F	#6-32 x ¼-Inch Cross-Recessed Pan-Head Steel Screw
171051-001	Arabian Game PCB
175004-708	#8 Flat Fiber Washer
176015-112	#10 x ¾-Inch Cross-Recessed Pan-Head Screw

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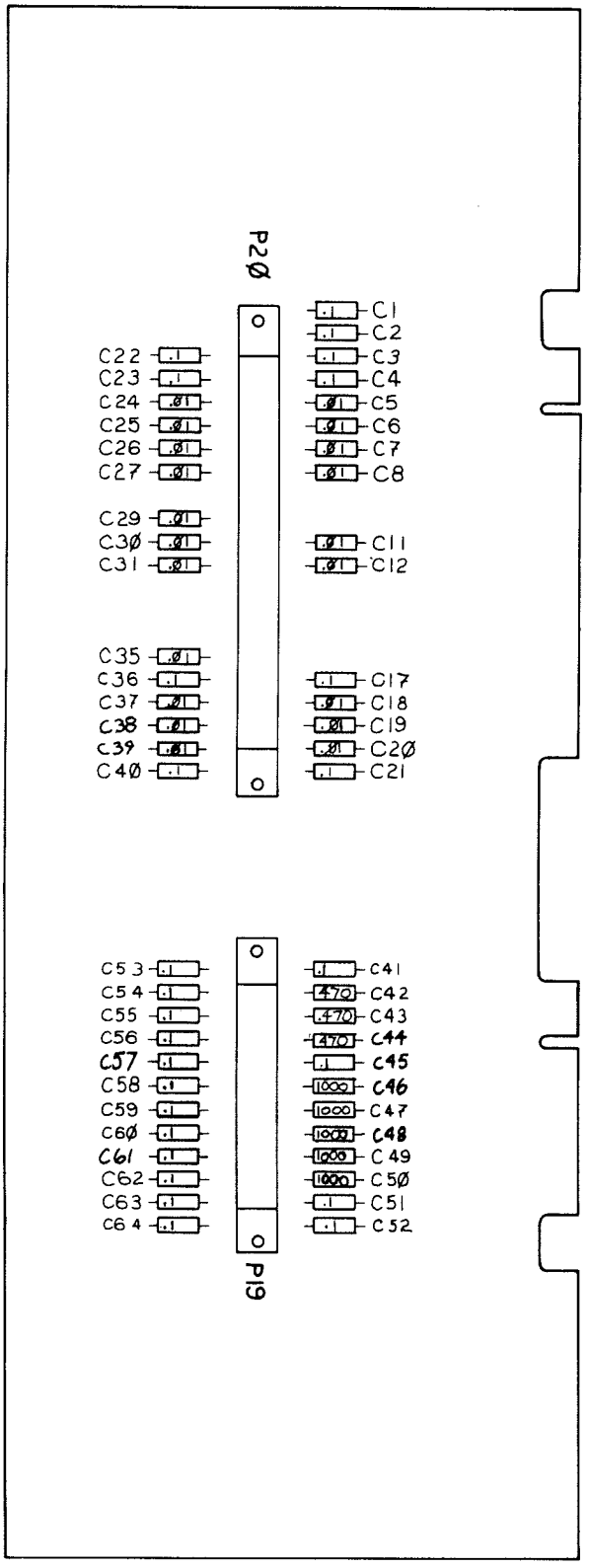

Figure 5-12 EMI Shield PCB Assembly
A037430-05 A

Electromagnetic Interference Shield PCB Parts List

Designator	Description	Part No.
	Capacitors	
C1–C4	0.1 μF, +80, -20%, 50 V Ceramic Capacitor	122002-104
C5–C8	0.01 μF, +80, -20%, 25 V Minimum Ceramic Axial-Lead Capacitor	122005-103
C11, C12	0.01 μF, +80, -20%, 25 V Minimum Ceramic Axial-Lead Capacitor	122005-103
C17	0.1 μF, +80, -20%, 50 V Ceramic Capacitor	122002-104
C18–C20	0.01 μF, +80, -20%, 25 V Minimum Ceramic Axial-Lead Capacitor	122005-103
C21–C23	0.1 μF, +80, -20%, 50 V Ceramic Capacitor	122002-104
C24–C27	0.01 μF, +80, -20%, 25 V Minimum Ceramic Axial-Lead Capacitor	122005-103
C29–C31	0.01 μF, +80, -20%, 25 V Minimum Ceramic Axial-Lead Capacitor	122005-103
C35	0.01 μF, +80, -20%, 25 V Minimum Ceramic Axial-Lead Capacitor	122005-103
C36	0.1 μF, +80, -20%, 50 V Ceramic Capacitor	122002-104
C37–C39	0.01 μF, +80, -20%, 25 V Minimum Ceramic Axial-Lead Capacitor	122005-103
C40, C41	0.1 μF, +80, -20%, 50 V Ceramic Capacitor	122002-104
C42–C44	470 pF, 100 V, Ceramic Axial-Lead Capacitor Acceptable substitute is part no. 122013-471	122016-471
C45	0.1 μF, +80, -20%, 50 V Ceramic Capacitor	122002-104
C46–C50	1000 pF, ±5%, 100 V Ceramic Axial-Lead Capacitor Acceptable substitute is part no. 122002-102	122016-102
C51–C64	0.1 μF, +80, -20%, 50 V Ceramic Capacitor	122002-104
	Connectors	
P19	24-Pin Connector	179073-024
P20	44-Pin Connector Acceptable substutute is part no. 179046-044	179073-044
	Miscellaneous	
	Spacer	037873-01
	#4-40 x ¼-Inch Cross-Recessed Steel Screw	72-1404F
	Plastic Washer	175009-221
	Grommet	178044-242
	Snap-In Fastener	178045-442

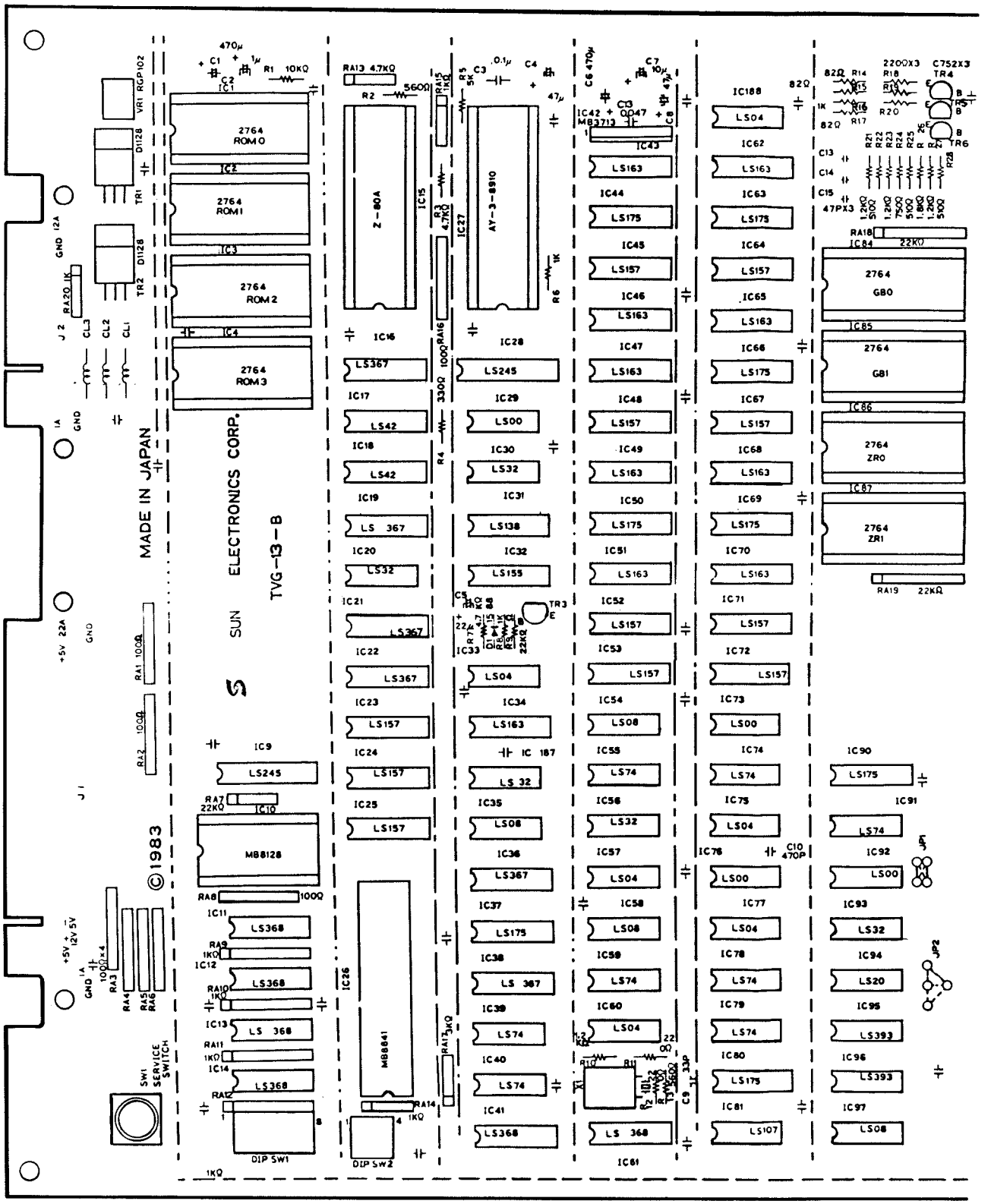

Figure 5-13 Arabian Game PCB Assembly

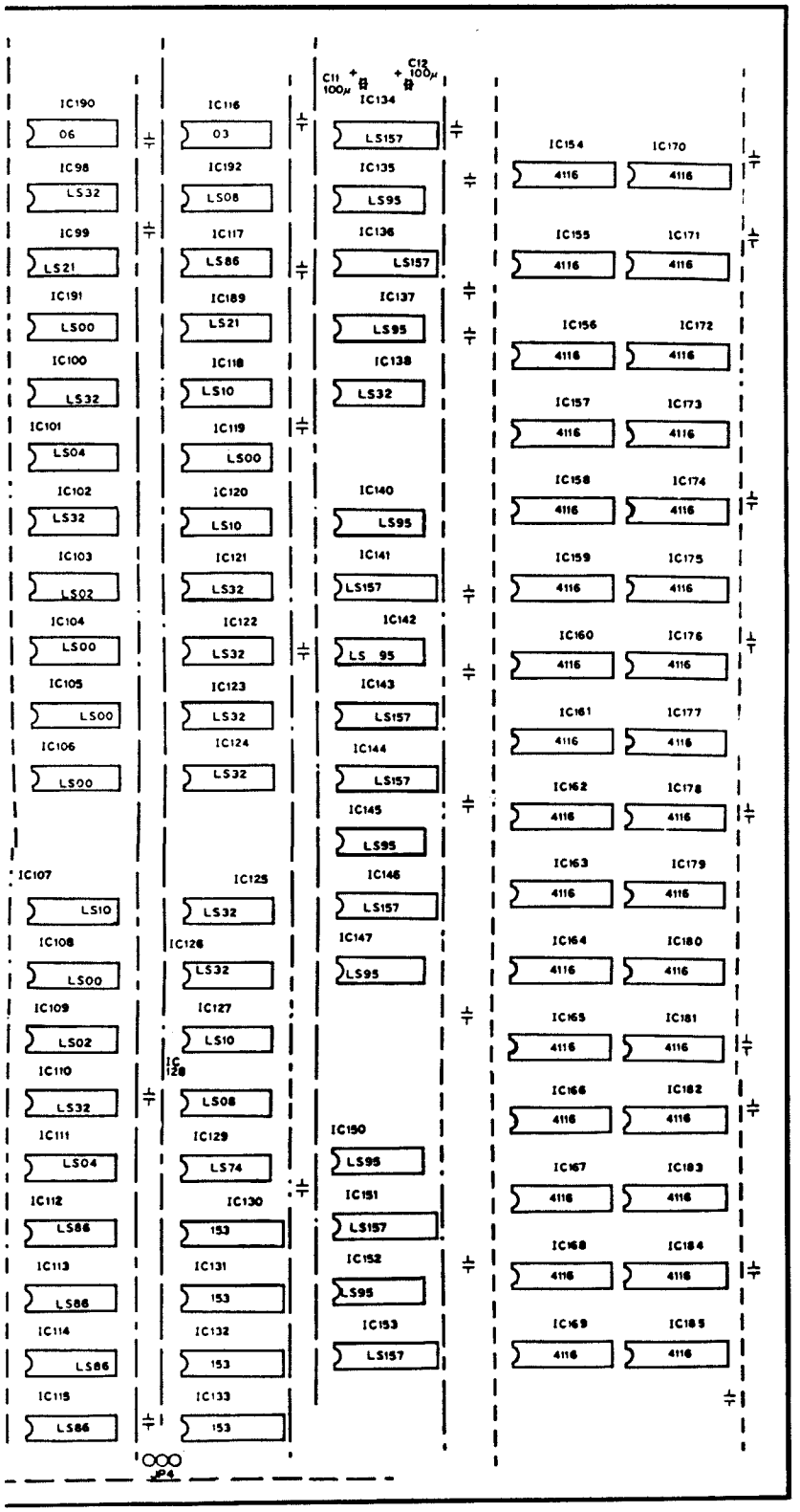

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Figure 5-13 Arabian Game PCB Assembly, continued

Game PCB Assembly Parts List

Designator	Description	Part No.
	Capacitors	
C1	470 µF, ±20%, 16-V Minimum, Radial-Lead Aluminum Electrolytic Capacitor	123004-471
C2	1 µF, 25 V, Tantalum Electrolytic Capacitor	99-200008
C3	0.1 µF, 50 V, Polyester Film Capacitor	21-101104
C4	47 µF, 16 V, Aluminum Electrolytic Capacitor	123004-470
C5	22 µF, 16 V, Electrolytic Capacitor	123004-220
C6	470 µF, ±20%, 16-V Minimum, Radial-Lead Aluminum Electrolytic Capacitor	123004-471
C7	10 µF, 16 V, Electrolytic Capacitor	123004-100
C8	47 µF, 16 V, Aluminum Electrolytic Capacitor	123004-470
C9	33 pF Ceramic Capacitor	99-200009
C10	47 pF Ceramic Capacitor	99-200013
C11, C12	100 µF, ±20%, 16-V Minimum, Radial-Lead Aluminum Electrolytic Capacitor	123004-101
C13–C15	47 pF Ceramic Capacitor	99-200010
	Coils	
CL1–CL3	1 µH Coil (SP0406/RO)	99-200012
	Crystal	
X1	12.000-MHz Crystal	99-200015
	Diodes	
D1	Type 1S1588 Diode	99-200004
	Integrated Circuits	
IC1–IC4	Type 2764 RAM	99-200005
IC9	Tri-State Octal Bus Transceiver Integrated Circuit	37-74LS245
IC10	150 ns Tri-State Static RAM Integrated Circuit	137211-001
IC11–IC14	Hex Bus Driver Integrated Circuit	137168-001
IC15	Z-80A 4-MHz Game Microprocessor	99-200014
IC16	Tri-State Hex Bus Driver Integrated Circuit	37-74LS367
IC17, IC18	4 to 10 Decoder Integrated Circuit	37-74LS42
IC19	Tri-State Hex Bus Driver Integrated Circuit	37-74LS367
IC20	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC21, IC22	Tri-State Hex Bus Driver Integrated Circuit	37-74LS367
IC23–IC25	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC26	MB8841-1057	99-200007
IC27	Programmable Sound Generator Integrated Circuit	137222-001
IC28	Tri-State Octal Bus Transceiver Integrated Circuit	37-74LS245
IC29	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC30	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC31	3 to 8 Decoder/Multiplexer Integrated Circuit	37-74LS138
IC32	Quad Data Selector/Multiplexer Integrated Circuit	137221-001
IC33	Hex Inverter Integrated Circuit	37-74LS04
IC34	4-Bit Synchronous Counter Integrated Circuit	37-74LS163

(continued on next page)

Game PCB Assembly Parts List, continued

Designator	Description	Part No.
IC35	Quad 2-Input AND Gate Integrated Circuit	37-74LS08
IC36	Tri-State Hex Bus Driver Integrated Circuit	37-74LS367
IC37	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC38	Tri-State Hex Bus Driver Integrated Circuit	37-74LS367
IC39, IC40	Dual D-Type Flip-Flop Integrated Circuit	37-74LS74
IC41	Hex Bus Driver Integrated Circuit	137168-001
IC42	Audio Power Amplifier Integrated Circuit	137223-001
IC43	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC44	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC45	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC46, IC47	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC48	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC49	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC50	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC51	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC52, IC53	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC54	Quad 2-Input AND Gate Integrated Circuit	37-74LS08
IC55	Dual D-Type Flip-Flop Integrated Circuit	37-74LS74
IC56	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC57	Hex Inverter Integrated Circuit	37-74LS04
IC58	Quad 2-Input AND Gate Integrated Circuit	37-74LS08
IC59	Dual D-Type Flip-Flop Integrated Circuit	37-74LS74
IC60	Hex Inverter Integrated Circuit	37-74LS04
IC61	Hex Bus Driver Integrated Circuit	137168-001
IC62	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC63	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC64	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC65	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC66	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC67	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC68	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC69	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC70	4-Bit Synchronous Counter Integrated Circuit	37-74LS163
IC71, IC72	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC73	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC74	Dual D-Type Flip-Flop Integrated Circuit	37-74LS74
IC75	Hex Inverter Integrated Circuit	37-74LS04
IC76	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC77	Hex Inverter Integrated Circuit	37-74LS04
IC78, IC79	Dual D-Type Flip-Flop Integrated Circuit	37-74LS74
IC80	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC81	Dual J-K Flip-Flop Integrated Circuit	137169-001
IC84–IC87	Type 2764 RAM	99-200005
IC90	Quad D-Type Flip-Flop Integrated Circuit	37-74LS175
IC91	Dual D-Type Flip-Flop Integrated Circuit	37-74LS74
IC92	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC93	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC95, IC96	Dual 4-Bit Counter Integrated Circuit	37-74LS393

(continued on next page)

Game PCB Assembly Parts List, continued

Designator	Description	Part No.
IC94	Dual 4-Input NAND Gate Integrated Circuit	37-74LS20
IC97	Quad 2-Input AND Gate Integrated Circuit	37-74LS08
IC98	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC99	Dual 4-Input AND Gate Integrated Circuit	137210-001
IC100	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC101	Hex Inverter Integrated Circuit	37-74LS04
IC102	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC103	Quad 2-Input NOR Gate Integrated Circuit	37-74LS02
IC104–IC106	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC107	Triple 3-Input NAND Gate Integrated Circuit	37-74LS10
IC108	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC109	Quad 2-Input NOR Gate Integrated Circuit	37-74LS02
IC110	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC111	Hex Inverter Integrated Circuit	37-74LS04
IC112–IC115	Quad 2-Input Exclusive-OR Gate Integrated Circuit	37-74LS86
IC116	Quad 2-Input NAND Gate Integrated Circuit	37-7403
IC117	Quad 2-Input Exclusive-OR Gate Integrated Circuit	37-74LS86
IC118	Triple 3-Input NAND Gate Integrated Circuit	37-74LS10
IC119	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC120	Triple 3-Input NAND Gate Integrated Circuit	37-74LS10
IC121–IC126	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC127	Triple 3-Input NAND Gate Integrated Circuit	37-74LS10
IC128	Quad 2-Input AND Gate Integrated Circuit	37-74LS08
IC129	Dual D-Type Flip-Flop Integrated Circuit	37-74LS74
IC130–IC133	Dual Data Selector/Multiplexer Integrated Circuit	37-74153
IC134	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC135	4-Bit Shift Register Integrated Circuit	37-74LS95
IC136	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC137	4-Bit Shift Register Integrated Circuit	37-74LS95
IC138	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC140	4-Bit Shift Register Integrated Circuit	37-74LS95
IC141	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC142	4-Bit Shift Register Integrated Circuit	37-74LS95
IC143, IC144	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC145	4-Bit Shift Register Integrated Circuit	37-74LS95
IC146	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC147	4-Bit Shift Register Integrated Circuit	37-74LS95
IC150	4-Bit Shift Register Integrated Circuit	37-74LS95
IC151	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC152	4-Bit Shift Register Integrated Circuit	37-74LS95
IC153	Quad Data Selector/Multiplexer Integrated Circuit	37-74LS157
IC154–IC185	375 ns Dynamic RAM Integrated Circuit	100017-001
IC187	Quad 2-Input OR Gate Integrated Circuit	37-74LS32
IC188	Hex Inverter Integrated Circuit	37-74LS04
IC189	Dual 4-Input AND Gate Integrated Circuit	137210-001
IC190	Hex Buffer/Driver Inverter Integrated Circuit	37-7406
IC191	Quad 2-Input NAND Gate Integrated Circuit	37-74LS00
IC192	Quad 2-Input AND Gate Integrated Circuit	37-74LS08

(continued on next page)

Game PCB Assembly Parts List, continued

Designator	Description	Part No.
	Resistors	
R1	10 KΩ, ±5%, ¼ W Resistor	110000-103
R2	560 Ω, ±5%, ¼ W Resistor	110000-561
R3	4.7 KΩ, ±5%, ¼ W Resistor	110000-472
R4	330 Ω, ±5%, ¼ W Resistor	110000-331
R5	5.1 KΩ, ±5%, ¼ W Resistor	110000-512
R6	1.0 KΩ, ±5%, ¼ W Resistor	110000-102
R7	4.7 KΩ, ±5%, ¼ W Resistor	110000-472
R8	1.0 KΩ, ±5%, ¼ W Resistor	110000-102
R9	22 KΩ, ±5%, ¼ W Resistor	110000-223
R10	1.2 KΩ, ±5%, ¼ W Resistor	110000-122
R11, R12	220 Ω, ±5%, ¼ W Resistor	110000-221
R13	560 Ω, ±5%, ¼ W Resistor	110000-561
R14	82 Ω, ±5%, ¼ W Resistor	110000-820
R15	82 Ω, ±5%, ¼ W Resistor	110000-820
R16	1.0 KΩ, ±5%, ¼ W Resistor	110000-102
R17	82 Ω, ±5%, ¼ W Resistor	110000-820
R18–20	220 Ω, ±5%, ¼ W Resistor	110000-221
R21	1.2 KΩ, ±5%, ¼ W Resistor	110000-122
R22	510 Ω, ±5%, ¼ W Resistor	110000-511
R23	1.2 KΩ, ±5%, ¼ W Resistor	110000-122
R25	510 Ω, ±5%, ¼ W Resistor	110000-511
R26	1.8 KΩ, ±5%, ¼ W Resistor	110000-182
R27	1.2 KΩ, ±5%, ¼ W Resistor	110000-122
R28	510 Ω, ±5%, ¼ W Resistor	110000-511
RA1–RA6	100 Ω, ±5%, ⅛ W Resistor Package	118000-101
RA7	22 KΩ, ±5%, ⅛ W Resistor Package	118001-223
RA8	100 Ω, ±5%, ⅛ W Resistor Package	118000-101
RA9–RA12	1.0 KΩ, ±5%, ⅛ W Resistor Package	118001-102
RA13	4.7 KΩ, ±5%, ⅛ W Resistor Package	118001-472
RA14	1.0 KΩ, ±5%, ⅛ W Resistor Package	118001-102
RA15	1.0 KΩ, ±5%, ⅛ W Resistor Package	118001-102
RA16	100 Ω, ±5%, ⅛ W Resistor Package	118000-101
RA17	3 KΩ, ±5%, ⅛ W Resistor Package	118001-332
RA18, RA19	22 KΩ, ±5%, ⅛ W Resistor Package	118001-223
RA20	1.0 KΩ, ±5%, ⅛ W Resistor Package	118000-102
VR1	10 KΩ Variable Resistor	99-200006
	Integrated Circuit Sockets	
IC1–IC5	24 Contact, Medium-Insertion-Force IC Socket	79-42C24
IC10	24 Contact, Medium-Insertion-Force IC Socket	79-42C24
IC15	40 Contact, Medium-Insertion-Force IC Socket	79-42C40
IC27	40 Contact, Medium-Insertion-Force IC Socket	79-42C40
IC82–IC84	24 Contact, Medium-Insertion-Force IC Socket	79-42C24
IC86–IC88	24 Contact, Medium-Insertion-Force IC Socket	79-42C24

(continued on next page)

Game PCB Assembly Parts List, continued

Designator	Description	Part No.
	Switches	
SW1	8 Toggle DIP Switch	66-118P1T
SW1	Tactile Service Switch	99-200011
SW2	4 Toggle DIP Switch	66-114P1T
	Transistors	
TR1, TR2	Type D1128 Transistor	99-200001
TR3	Type C1815 Transistor	99-200002
TR4–TR6	Type C752G (Y) Transistor	99-200003

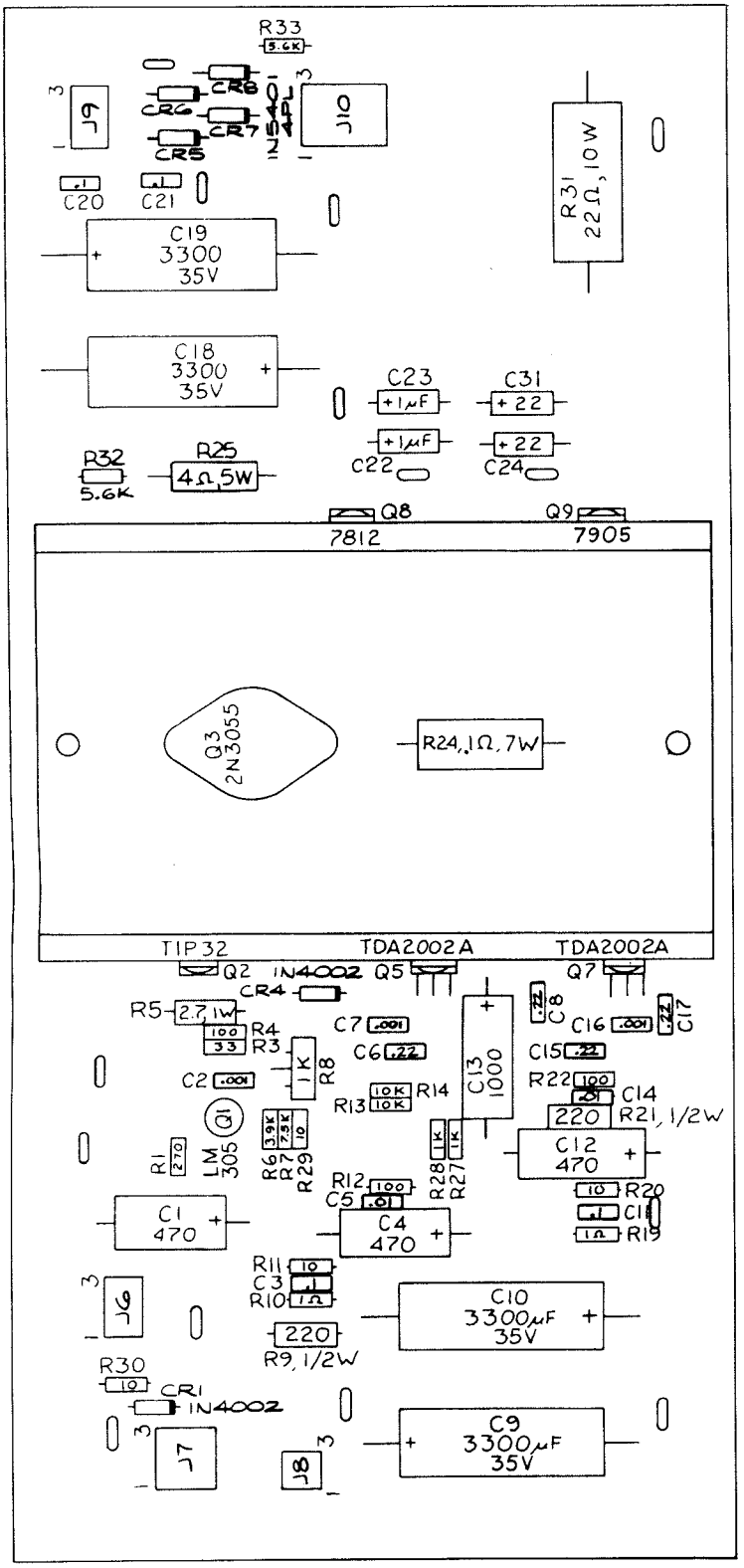

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Figure 5-14 Regulator/Audio II PCB Assembly A035435-02 G

Regulator/Audio II PCB Assembly
Parts List

Designator	Description	Part No.
	Capacitors	
C1	470 μF, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250477
C2	0.001 μF, 35 V, Ceramic-Disc Axial-Lead Capacitor	122002-102
C3	0.1 μF, 25 V, Ceramic-Disc Axial-Lead Capacitor (Acceptable substitute is part no. 122002-104	29-088
C4	470 μF, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250477
C5	.01 μF, 25 V Ceramic-Disc Axial-Lead Capacitor (Acceptable substitute is part no. 122005-103)	100015-103
C6	0.22 μF, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C7	0.001 μF, 35 V, Ceramic-Disc Axial-Lead Capacitor	122002-102
C8	0.22 μF, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C9, C10	3300 μF, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350338
C11	0.1 μF, 25 V, Ceramic-Disc Axial-Lead Capacitor (Acceptable substitute is part no. 122002-104	29-088
C12	470 μF, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250477
C13	1000 μF, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250108
C14	.01 μF, 25 V Ceramic-Disc Axial-Lead Capacitor (Acceptable substitute is part no. 122005-103)	100015-103
C15	0.22 μF, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C16	0.001 μF, 35 V, Ceramic-Disc Axial-Lead Capacitor	122002-102
C17	0.22 μF, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C18, C19	3300 μF, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350338
C20, C21	0.1 μF, 25 V, Ceramic-Disc Axial-Lead Capacitor (Acceptable substitute is part no. 122002-104	29-088
C22, C23	1 μF, 50 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-500105
C24	22 μF, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350226
C31	22 μF, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350226
	Diodes	
CR1	Type-1N4002, 1 A, 100 V Silicon Rectifier Diode	31-1N4002
CR4	Type-1N4002, 1 A, 100 V Silicon Rectifier Diode	31-1N4002
CR5–CR8	Type-1N5401, 3 A, 100 V Silicon Rectifier Diode	31-1N5401
	Resistors	
R1	270 Ω, ±5%, ¼ W Resistor	110000-271
R3	33 Ω, ±5%, ¼ W Resistor	110000-330
R4	100 Ω, ±5%, ¼ W Resistor	110000-101
R5	2.7 Ω, ±5%, 1 W Resistor	110009-027
R6	3.9 kΩ, ±5%, ¼ W Resistor	110000-392
R7	7.5 kΩ, ±5%, ¼ W Resistor	110000-752
R8	1 kΩ Vertical PCB-Mounting Cermet Potentiometer (Acceptable substitute is part no. 119002-102)	19-315102
R9	220 Ω, ±5%, ½ W Resistor	110001-221
R10	1 Ω, ±5%, ¼ W Resistor	110000-010
R11	10 Ω, ±5%, ¼ W Resistor	110000-100
R12	100 Ω, ±5%, ¼ W Resistor	110000-101
R13, R14	10 kΩ, ±5%, ¼ W Resistor	110000-103

(Continued on next page)

Regulator/Audio II PCB Assembly
Parts List, continued

Designator	Description	Part No.
R20	10 Ω, ±5%, ¼ W Resistor	110000-100
R21	220 Ω, ±5%, ½ W Resistor	110001-221
R19	1 Ω, ±5%, ¼ W Resistor	110000-010
R22	100 Ω, ±5%, ¼ W Resistor	110000-101
R24	0.1 Ω, ±3%, 7 W Wirewound Resistor	19-100P1015
R25	4 Ω, ±5%, 5 W Wirewound Resistor	116001-040
R27, R28	1 kΩ, ±5%, ¼ W Resistor	110000-102
R29, R30	10 Ω, ±5%, ¼ W Resistor	110000-100
R31	22 Ω, ±5%, 10 W Wirewound Resistor	116000-220
R32, R33	5.6 kΩ, ±5%, ¼ W Resistor	110000-562
	Transistors	
Q2	Type-TIP32 PNP Power Transistor	33-TIP32
Q3	Type-2N3055 NPN Silicon Transistor	34-2N3055
	Miscellaneous	
J6	6-Position Connector Receptacle	79-58306
J7	9-Position Connector Receptacle	79-58308
J8	4-Position Connector Receptacle	79-58354
J9	6-Position Connector Receptacle	79-58306
J10	12-Position Connector Receptacle	79-58346
Q1	5 V Linear Voltage Regulator	37-LM305
Q2, Q9	Thermally Conductive Silicon Insulator	78-16014
Q3	Thermally Conductive Silicon Insulator	78-16008
Q5	Audio Amp TDA2002A	137151-002
Q7	Audio Amp TDA2002A	137151-002
Q8	Type-7812 +12 V Voltage Regulator	37-7812
Q9	Type-7905 -5 V Voltage Regulator	37-7905
	Heat Sink	034531-01
	Test Point (Acceptable substitute is part no. 020670-01)	179051-001

Glossary

AC
Alternating current; from zero it rises to a maximum positive level, then passes through zero again to a maximum negative level.

ACTIVE STATE
The true state of a signal. For example: The active state for START is low.

ADDRESS
A value that identifies a specific location of data in memory; normally expressed in hexadecimal notation.

ANALOG
Measurable in an absolute quantity (as opposed to on or off). Analog devices are volume controls, light dimmers, stereo amplifiers, etc.

ANODE
The positive (arrow) end of a diode.

AMPLIFIER
A device used to increase the strength of an applied signal.

AMPLITUDE
The maximum instantaneous value of a waveform pulse from zero.

ASTABLE
Having no normal state. An astable device will free-run or oscillate as long as operating voltage is applied. The oscillation frequency is usually controlled by external circuitry.

AUXILIARY COIN SWITCH
A momentary-contact pushbutton switch with a black cap located on the utility panel. The auxiliary coin switch adds credits to the game without activating the coin counter.

BEZEL
A cut, formed, or machined retention device, such as the conical device used to mount a pushbutton switch to a control panel, or the formed device used to frame the video display screen.

BIDIRECTIONAL
Able to send or receive data on the same line (e.g., the data bus of a microprocessor).

BINARY
A number system that expresses all values by using two digits (0 and 1).

BIT
A binary digit; expressed as a 1 or a 0.

BLANKING
Turning off the beam on a cathode-ray tube during retrace.

BLOCK DIAGRAM
A drawing in which functional circuitry units are represented by blocks. Very useful during initial troubleshooting.

BUFFER
1. An isolating circuit designed to eliminate the reaction of a driven circuit on the circuits driving it (e.g., a buffer amplifier).

2. A device used to supply additional drive capability.

BUS
An electrical path over which information is transferred from any of several sources to any of several destinations.

CAPACITOR
A device capable of storing electrical energy. A capacitor blocks the flow of DC current while allowing AC current to pass.

CATHODE
The negative end of a diode.

CHIP
An integrated circuit comprising many circuits on a single wafer slice.

CLOCK
A repetitive timing signal for synchronizing system functions.

COINCIDENCE
Occurring at the same time.

COIN COUNTER
A 6-digit electro-mechanical device that counts the coins inserted in the coin mechanism(s).

COIN MECHANISM
A device on the inside of the coin door that inspects the coin to determine if the correct coin has been inserted.

COMPLEMENTARY
Having opposite states, such as the outputs of a flip-flop.

COMPOSITE SYNC
Horizontal and vertical synchronization pulses that are bused together into a single signal. This signal provides the timing necessary to keep the display in synchronization with the game circuitry.

COMPOSITE VIDEO
Complete video signal from the game system to drive the display circuitry, usually comprising H SYNC, V SYNC, and the video.

CREDIT
One play for one person based on the game switch settings.

CRT
Cathode-ray tube.

DATA
General term for the numbers, letters, and symbols that serve as input for device processing.

DARLINGTON
A two-transistor amplifier that provides extremely high gain.

DC
Direct current, meaning current flowing in one direction and of a fixed value.

DEFLECTION YOKE
Electro-magnetic coils around the neck of a cathode-ray tube. One set of coils deflects the electron beam horizontally and the other set deflects the beam vertically.

DIAGNOSTICS
A programmed routine for checking circuitry. For example: the self-test is a diagnostic routine.

DIODE
A semiconductor device that conducts in only one direction.

DISCRETE
Non-integrated components, such as resistors, capacitors, and transistors.

DMA
Direct memory access. DMA is a process of accessing memory that bypasses the microprocessor logic. DMA is normally used for transferring data between the input/output ports and memory.

DOWN TIME
The period during which a game is malfunctioning or not operating correctly due to machine failure.

EAROM
Electrically alterable read-only memory (see ROM). The EAROM is a memory that can be changed by the application of high voltage.

FLYBACK
A step-up transformer used in a display to provide the high voltage.

GATE
1. A circuit with one output that responds when and only when a certain combination of pulses is present at the inputs.

2. A circuit in which one signal switches another signal on and off.

3. To control the passage of a pulse or signal.

HARNESS
A prefabricated assembly of insulated wires and terminals ready to be attached to a piece of equipment.

HEXADECIMAL
A number system using the equivalent of the decimal number 16 as a base. The symbols 0–9 and A–F are usually used.

IMPLODE
To burst inward; the inward collapse of a vacuum tube.

I/O
Input/Output.

IRQ
Interrupt request. IRQ is a control signal to the microprocessor that is generated by external logic. This signal tells the microprocessor that external logic needs attention. Depending on the program, the processor may or may not respond.

LED
The abbreviation for a light-emitting diode.

LOCKOUT COIL
Directs coins into the coin return box when there is no power to the game.

LOGIC STATE
The binary (1 or 0) value at the node of a logic element or integrated circuit during a particular time. Also called the logic level. The list below shows the voltage levels corresponding to the logic states (levels) in a TTL system.

Logic 0, Low = 0 VDC to +0.8 VDC
Grey Area (Tri-State Level) = +0.8 VDC to +2.4 VDC
Logic 1, High = +2.4 VDC to +5 VDC

MULTIPLEXER
A device that takes several low-speed inputs and combines them into one high-speed data stream for simultaneous transmission on a single line.

NMI
Non-maskable interrupt. NMI is a request for service by the microprocessor from external logic. The microprocessor cannot ignore this interrupt request.

PAGE
A subsection of memory. A read-only memory device (see ROM) is broken into discrete blocks of data. These blocks are called pages. Each block has X number of bytes.

PCB
The abbreviation for a printed-circuit board.

PHOTOTRANSISTOR
A transistor that is activated by an external light source.

POTENTIOMETER
1. A resistor that has a continuously moving contact which is generally mounted on a moving shaft. Used chiefly as a voltage divider. Also called a *pot* (slang).

2. An instrument for measuring a voltage by balancing it against a known voltage.

RAM
Random-access memory. A device for the temporary storage of data.

RASTER-SCAN DISPLAY
A display system whereby images are displayed by continuously scanning the cathode-ray tube horizontally and vertically with an electron beam. The display system controls the intensity of the electron beam.

RETRACE
In a raster-scan display, retrace is the time during which the cathode-ray tube electron beam is resetting either from right to left or from bottom to top.

RESISTOR
A device designed to have a definite amount of resistance. Used in circuits to limit current flow or to provide a voltage drop.

ROM
Read-only memory. A device for the permanent storage of data.

SIGNATURE ANALYSIS
A process of isolating digital logic faults at the component level by means of special test equipment called signature analyzers. Basically, signature analyzers (e.g., the ATARI® CAT Box) convert lengthy bit streams into four-digit hexadecimal signatures. The signature read by the analyzer at each circuit node is then compared with the known good signature for that node. This process continues until a fault is located.

TROUBLESHOOT
The process of locating and repairing a fault.

VECTOR
A line segment drawn between specific X and Y coordinates on a cathode-ray tube.

WATCHDOG
A counter circuit designed to protect the microprocessor from self-destruction if a program malfunction occurs. If a malfunction does occur, the counter applies continuous pulses to the reset line of the microprocessor, which causes the microprocessor to keep resetting.

X-Y DISPLAY
A display system whereby images are displayed with vectors.

ZENER DIODE
A special diode used as a regulator. Its main characteristic is breaking down at a specified reverse-bias (Zener) voltage.

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