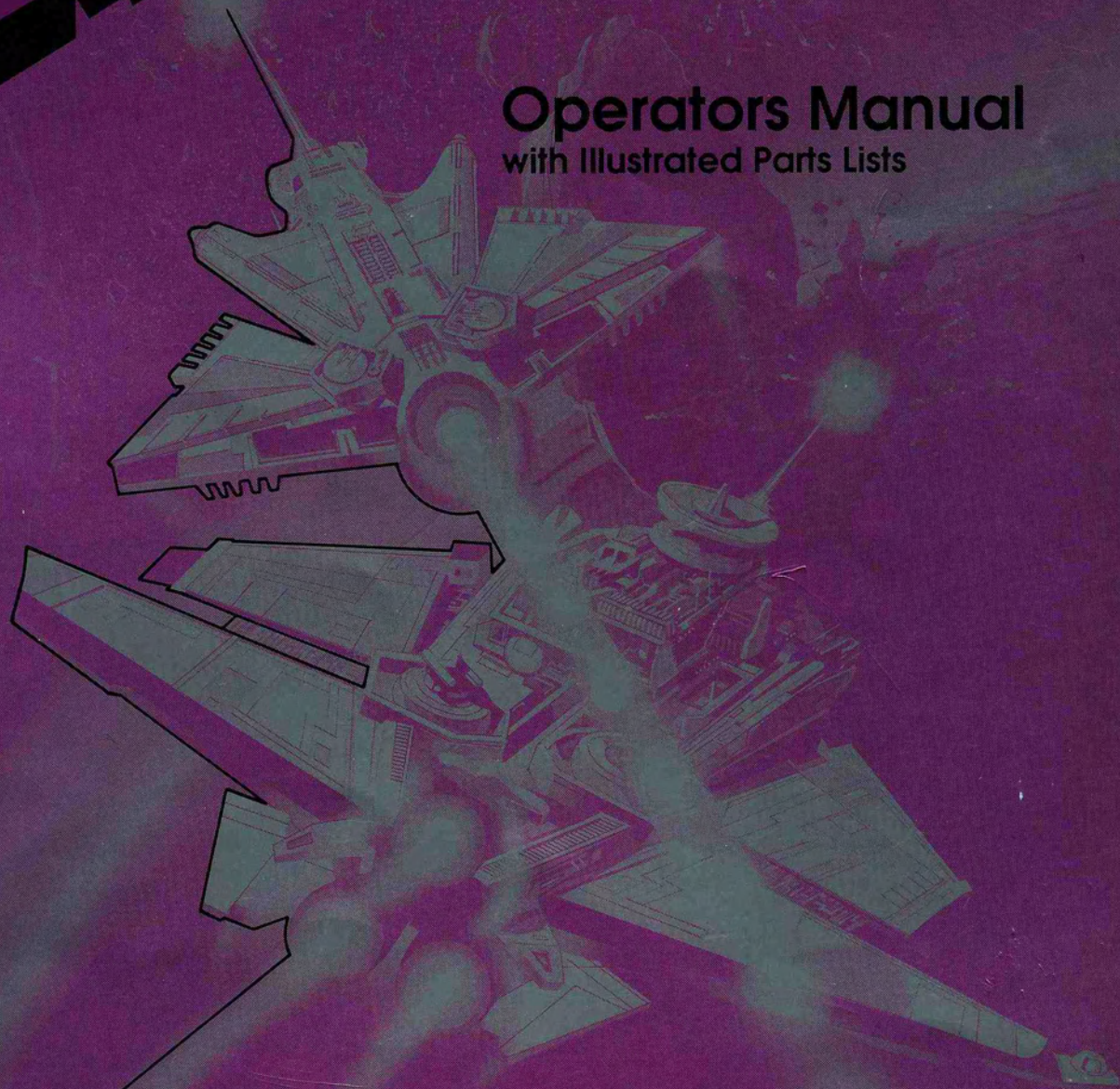


TM-316  
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# BLASTEROIDS™

Operators Manual  
with Illustrated Parts Lists



ATARI®  
GAMES

## **For technical assistance:**

If reading through this manual does not lead to solving a maintenance or repair problem, call TELEHELP® at one of these Atari Games Customer Service offices:

### **UNITED STATES**

Atari Games Corporation  
California Customer Service Office  
737 Sycamore Drive  
P.O. Box 361110

Milpitas, CA 95035

**Fax (408) 434-3945**

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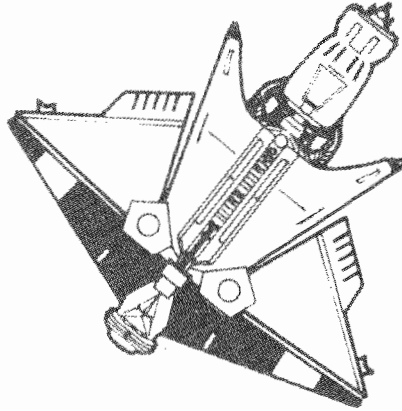
Atari Games Ireland Limited  
European Customer Service Office  
Tipperary Town, Ireland

**Fax 062-51702**

**Telex 70665**

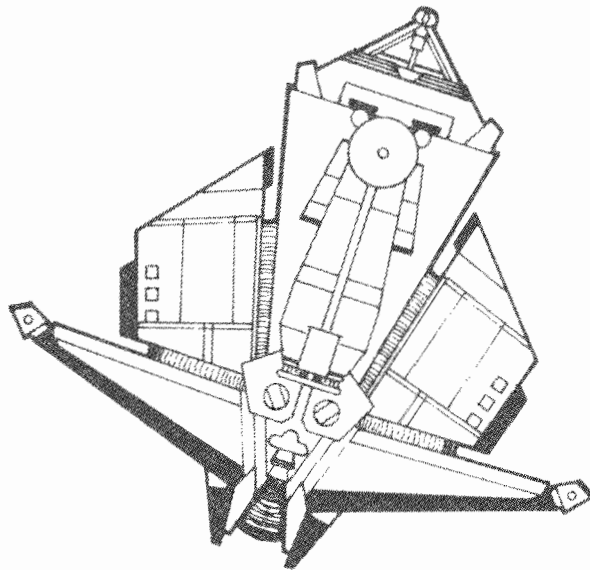
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# Blasteroids™ Operators Manual

with Illustrated Parts Lists



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## Notice Regarding Non-Atari® Parts

### WARNING

Use of non-Atari parts or modifications of any Atari game circuitry may adversely affect the safety of your game, and may cause injury to you and your players.

You may void the game warranty (printed on the inside back cover of this manual) if you do any of the following:

- Substitute non-Atari parts in the game.
- Modify or alter any circuits in the game by using kits or parts *not* supplied by Atari Games Corporation.

### NOTE

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of Federal Communications Commission (FCC) Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area or modification to this equipment is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference. If you suspect interference from an Atari game at your location, check the following:

- All ground wires in the game are properly connected as shown in the game wiring diagram.
- The power cord is properly plugged into a grounded three wire outlet.
- On games provided with an Electromagnetic Interference (EMI) ground plane, be sure the game printed-circuit boards (PCBs) are properly installed on the EMI Ground Plane. If you are still unable to solve the interference problem, please contact Customer Service at Atari Games Corporation. See the inside front cover of this manual for service in your area.

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# Safety Summary

The following safety precautions apply to all game operators and service personnel. Specific warnings and cautions will be found in this manual whenever they apply.

## WARNING

**Properly Ground the Game.** Players may receive an electrical shock if this game is not properly grounded! To avoid electrical shock, do not plug in the game until it has been inspected and properly grounded. This game should be only be plugged into a grounded three-wire outlet. If you have only a two-wire outlet, we recommend you hire a licensed electrician to install a three-wire grounded outlet. If the control panel is not properly grounded, players may receive an electrical shock! After servicing any part on the control panel, check that the grounding wire is firmly secured to the inside of the control panel. After you have checked this, lock up the game.

**AC Power Connection.** Before you plug in the game, be sure that the game's power supply can accept the AC line voltage in your location. The line voltage requirements are listed in the first chapter of this manual.

**Disconnect Power During Repairs.** To avoid electrical shock, disconnect the game from the AC power before removing or repairing any part of the game. If you remove or repair the video display, be very careful to avoid electrical shock. High voltages continue to exist even after power is disconnected in the display circuitry and the cathode-ray tube (CRT). Do not touch the internal parts of the display with your hands or with metal objects! Always discharge the high voltage from the CRT before servicing it. Do this after you disconnect it from the power source. First, attach one end of a large, well-insulated, 18-gauge jumper wire to ground. Then momentarily touch the free end of the grounded jumper wire to the CRT anode by sliding the wire under the anode cap. Wait two minutes and do this again.

**Use Only Atari Parts.** To maintain the safety of your Atari game, use only Atari parts when you repair it. Using non-Atari parts or modifying the game circuitry may be dangerous, and could injure you and your players.

**Handle the CRT With Care.** If you drop the CRT and it breaks, it may implode! Shattered glass from the implosion can fly six feet or more.

**Use the Proper Fuses.** To avoid electrical shock, use replacement fuses which are specified in the parts list for this game. Replacement fuses must match those replaced in fuse type, voltage rating, and current rating. In addition, the fuse cover must be in place during game operation.

## CAUTION

**Properly Attach All Connectors.** Make sure that the connectors on each printed circuit board (PCB) are properly plugged in. The connectors are keyed to fit only one way. If they do not slip on easily, do not force them. If you reverse a connector, it may damage your game and void your warranty.

**Ensure the Proper AC Line Frequency.** Video games manufactured for operation on 60 Hz line power (used in the United States) must not be operated in countries with 50 Hz line power (used in Europe). If a 60 Hz machine operates on 50 Hz line power, the fluorescent line ballast transformer will overheat and cause a potential fire hazard. Check the product identification label on your machine for the line frequency required.

## ABOUT NOTES, CAUTIONS, AND WARNINGS

In Atari publications, notes, cautions and warnings have the following meaning:

**NOTE**—A highlighted piece of information.

**CAUTION**—Equipment and/or parts can be damaged or destroyed if instructions are not followed. You will void the warranty on Atari printed-circuit boards, parts thereon, and video displays if equipment or parts are damaged or destroyed due to failure of following instructions.

**WARNING**—Players and/or technicians can be killed or injured if instructions are not followed.



## Chapter 1

# Set-Up

### How to Use This Manual

This manual is written for game operators and service personnel, and provides information for setting up, playing, testing, and maintaining your Blasteroids™ game. The manual is divided into the following chapters:

- Chapter 1 contains set-up and game play information.
- Chapter 2 contains self-test procedures.
- Chapter 3 contains preventive and corrective maintenance procedures.
- Chapter 4 contains troubleshooting information.
- Chapter 5 contains illustrated parts lists.

Wiring and schematic diagrams for the Blasteroids game circuitry are contained in the *Schematic Package Supplement* (SP-316) included with your game. This chapter includes information required to set up and play your Blasteroids game. Carefully read the information in this chapter before applying power to the game.

#### **WARNING**

To avoid electrical shock, do not plug in the cabinet until it has been inspected and set up for the line voltage in your area. This cabinet should only be connected to a grounded three-wire outlet.

If you have only a two-wire outlet, we recommend that you hire a licensed electrician to install a grounded outlet. Players can receive an electrical shock if the cabinet is not properly grounded.

**WARNING**

Do not plug in the game until you have completed the following inspection steps.

## Inspecting the Game

Please inspect your Blasteroids game carefully to ensure that the game is complete and delivered to you in good condition. Figure 5-1 shows the locations of the component parts of the game. Table 1-1 lists space, power, and environmental requirements.

Inspect the factory-assembled game as follows:

1. Examine the exterior of the cabinet for dents, chips, or broken parts.
2. Unlock and open the rear access panel. Unlock and open the coin doors. Inspect the interior of the cabinet as follows:
  - a. Ensure that all plug-in connectors (on the cabinet harnesses) are firmly plugged in. Do not force connectors together. The connectors are keyed so they only fit in the proper orientation. *A reversed connector can 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. Inspect the power cord for any cuts or dents in the insulation.
  - d. Inspect the power supply. Make sure that the correct fuses are installed. Check that the harness is plugged in correctly and that the fuse block cover is mounted in place. Check that the green ground wires are connected.
  - e. Inspect other major sub-assemblies, such as the video display, printed-circuit boards (PCBs), and the speakers. Make sure that they are mounted securely and the ground wires are connected.

**Table 1-1 Game Specifications**

Characteristic	Specification
Power Consumption	134 V-A
Temperature	+5° to +38° C (+37° to +100° F)
Humidity	Not to exceed 95% relative
Line Voltage	102 to 132 VAC (U.S. games)
Width	26.75 in. (70 cm)
Depth	34.38 in. (87 cm)
Height	70 in. (178 cm)
Weight	302 lbs. (137 kg)

## Control and Switch Locations

### Power On/Off Switch

The power on/off switch is located at the bottom rear of the cabinet. (See Figure 5-1.)

### Volume Control

The volume control is located on the Audio PCB behind the upper coin door. (See Figure 1-1.) The volume control adjusts the level of sound produced by the game.

### Self-Test Switch

The self-test switch is located to the left of the volume control on the Audio PCB behind the upper coin door. (See Figure 1-1.) Use the Self-Test switch to select the Self-Test Mode to check game operation. Refer to Chapter 2 for a complete description of self-test operation.

### Coin Counter

The coin counter is located on the shelf inside the upper coin door. The coin counter records the number of coins deposited.

### Auxiliary Coin Switches

Two auxiliary coin switches are located on the lower part of the coin mechanism. Push either switch down to give one player coin.

## Setting the Coin and Game Option Settings

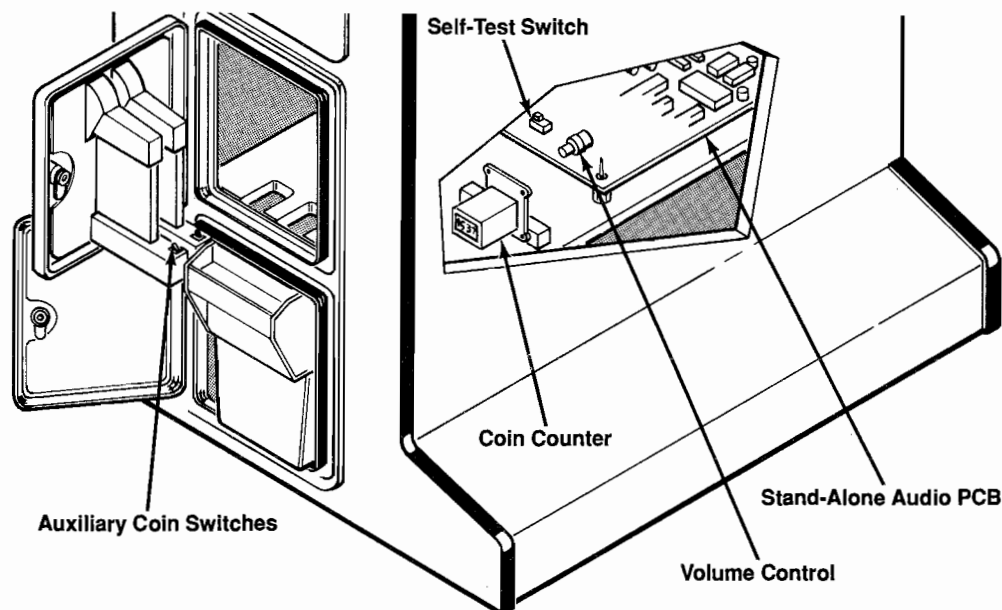
Set the Blasteroids coin and game options in the Self-Test Mode. Refer to Chapter 2 for the recommended settings and the procedure for setting the options.

## Game Play

This section of the manual describes the theme of the Blasteroids game and the game play.

### Introduction

Blasteroids is an updated version of one of the most successful games in the history of the industry, Asteroids®. By taking this highly successful game concept of yesterday and combining it with the technology of today, Atari has created a unique attraction for a whole new generation of players.



**Figure 1-1 Control and Switch Locations**

Blasteroids is a one- or two-player game with a continuous buy-in feature allowing players to join in at any time. A color-coded control panel (left player red and right player green) and spaceship allow for easy identification by players. Each player controls a whirly-gig and three buttons. The whirly-gig controls rotation, while the buttons control thrust, firing and the transformation of the spaceship.

### Attract Mode

The Attract Mode begins when the game is powered up or after exiting the Play or Self-Test Modes. The Attract Mode ends when coins or tokens are inserted and the start button is pressed. The Attract Mode continuously cycles through the following displays:

- Blasteroids title screen
- Game play demonstration alternates with the ship features screen
- Opponent characteristics
- High score table
- Audiovisual credits alternates with the scoring screen and the hints screen

### Play Mode

Players blast their way through numerous galaxies filled with asteroids and other challenging obstacles. After each galaxy has been cleared, the player meets Mukor, the green slime monster. Mukor taunts the player with one of several voice phrases, including "Mukor controls this galaxy."

The player can choose from four starting difficulties: easy, medium, hard, or expert. Each difficulty level is a

game within itself; therefore, a player starting at the medium level will face a different challenge from a player beginning on the easy level.

### Unique Features to Attract Players

Blasteroids has all of the proven player appeal of Atari's 1979 classic hit, Asteroids, and adds all of the special game play features that today's players expect.

- **Distinctive transformation feature:** At the press of a button, players can change their ship into three different sizes, each with its own advantages and disadvantages for different game play situations. The Speeder, the smallest ship, is the fastest. The Fighter, the medium ship, has the most firepower. The Warrior, the largest ship, has the best armor.
- **Multiple opponents:** Each of the six enemy ships (Sluggo, Dervish, Reboz, Bandit, Bumper and Bomber) has its own unique way of challenging the player. Energy leeches and the formidable Mukor must also be conquered.
- **Special temporary powers:** As the enemy ships are destroyed, their hidden cargo is revealed. Players can acquire special attributes from the debris of the enemy ships they conquer. There are Blasters for protection, Boosters for speed, Crystal Magnets to grab energy crystals, Extra Tanks to hold more energy, Cloaking Devices to hide from enemy ships, and Ripstars to wreak mass havoc.
- **A hidden source of energy:** Crystals concealed inside red asteroids provide players with the energy they need to continue their outer-space adventure.

- **Powerful sound effects:** Atari's new Housequake™ sound system provides improved feedback to the player while drawing a crowd of spectators. The rumbling sound effects can be felt by players through the vibration of the game cabinet.
- **Colorful, realistic graphics:** Background spacescapes, pictures of space ships, asteroids and other obstacles are actually digitized pictures of real-life objects.
- **Competition and cooperation for two players:** Players compete with each other for special attributes and power crystals. Cooperation also pays off when two players dock their spaceships for added firepower and armor. Blasteroids' one- or two-player simultaneous game play insures maximum earning potential.
- **Atari's maximum earnings features:** Player-selectable level of initial difficulty, buy-in and add-a-coin game continuation features.

### High Score Mode

Upon completing a game, if a player is among the top ten scorers recorded on the game, he can enter three initials. The player selects his initials by turning the player knob and pressing the fire button when the proper initial is displayed. The player can correct the initials by selecting the arrow that points to the left and pressing the fire button, then choosing the correct initials.

### Maximizing Earnings

Operator options on this game have been kept very simple. Use the Self-Test Statistics and Histogram screens to evaluate game data and the Self-Test Game

Options screen to make adjustments.

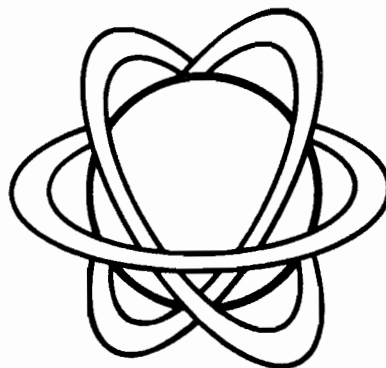
The key to maximum earnings is striking a midpoint on game times. Game times must be short enough so that player turnover is high. Conversely, game times must be long enough to give a player a good value and insure repeat play (repeat play is crucial to longevity). Blasteroids gives the operator the flexibility to tune game difficulty and enough statistics to intelligently make adjustments.

If collections seem low or are dropping off, first check all player controls and coin mechanisms for proper operation.

If earnings are lower than usual for a game in your location, the game is technically sound and the average game time per quarter is under 110 seconds, try changing the game difficulty option to an easier setting. This change will give players more game time for their money. Change the option settings only one notch at a time and evaluate the change in game statistics that results.

If the average game time per quarter is over 180 seconds, first try changing the game difficulty to a harder setting. If the average game time per quarter is still over 180 seconds after a few weeks, try an even harder setting. Again, it is important to change the difficulty settings one notch at a time and check game statistics before making further adjustments.

If you change the game difficulty settings, it is a good idea to reset the game statistics. You can reset the coin information, game statistics and histograms in the Self-Test. Clear the coin information and game statistics at the statistics screen by simultaneously pressing the red Thrust and Transform buttons. Clear the histograms at the first histogram screen by simultaneously pressing the red Thrust and Transform buttons.



# Self-Test

The Blasteroids™ game tests itself and provides visual and audible indications of the condition of the game circuitry and controls. Self-test information is displayed on the screen and through the sound system. No additional equipment is required.

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

The self-test screens provide information about the game circuits, controls, and monitor adjustments. The game enters the Self-Test Mode after the self-test switch is turned on. The switch is on the front corner of the Stand-Alone Audio PCB located behind the upper coin door.

This chapter shows the self-test screens in the order in which you will see them when the self-test switch is turned on. At the end, after the Sound Test, the sequence starts over with the Switch Test. When you are finished with the Self-Test, turn off the Self-Test switch, and the game will return to the Attract mode.



## RAM/ROM Test

The RAM/ROM Test screens are shown in Figures 2-1 and 2-2. This test provides a visual check of the game RAM, ROM, and associated circuitry. If the game passes the RAM/ROM Test, the display advances to the Switch Test.

The RAM/ROM Test is divided into two sections. The RAM Test is performed first. If the game passes the RAM Test, then after a six-second delay, the self-test goes immediately to the ROM Test without displaying any message. If the game fails the RAM test, a message is displayed in the center of the screen. This message is shown in Table 2-1. The RAM Test continues to run until it passes.

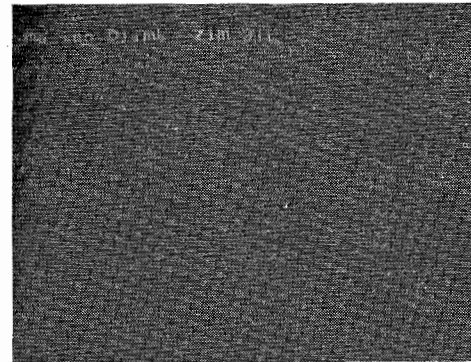
If you press and release the red Fire button, the RAM Test advances to the next RAM or ROM Test. If the game passes the ROM Test, no messages are displayed and the self-test advances to the Switch Test. If a ROM fails, a message is displayed. Table 2-2 shows the a message with the location of a failing ROM. If you press and release the red Fire button the ROM Test advances to the next ROM.

**Table 2-1 Faulty RAM Locations**

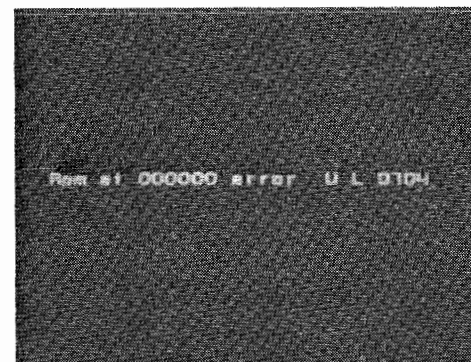
Video Characteristic	Location on Game PCB	RAM Type
Red Background	6/7L 5L	Upper Video RAM Lower Video RAM
Black Background	16/17C 15/16B	Upper Video RAM Lower Video RAM

**Table 2-2 Faulty Program ROM Locations**

Error Address	Location on Game PCB
00000	U=6C L=6B
20000	U=4C L=4B



**Figure 2-1 RAM Test Fails**



**Figure 2-2 ROM Test Fails**

## Switch Test

Use the Switch Test screen, shown in Figure 2-3, to check the condition of the controls. The Switch Test checks the following buttons:

- Left Spare
- Left Xform
- Left Thrust
- Left Fire
- Right Spare
- Right Xform
- Right Thrust
- Right Fire

(Left and Right Spares are for factory use.)

When you press a button, the name is highlighted on the screen if it is operating properly.

Test the operation of the knobs by turning each knob quickly. Eight white numbers should appear below the “red knob” and the “green knob” messages on the screen. If any of these numbers are red, the knob mechanism is not working correctly. If any numbers are yellow, the knob is operating poorly. If no num-

bers appear, the mechanism is unplugged or defective. The number values are for factory use only.

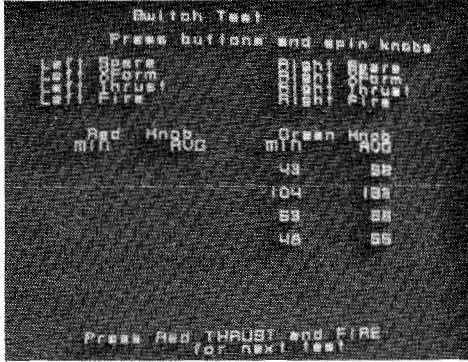


Figure 2-3 Switch Test

## Coin Options

The Coin Options screen, shown in Figure 2-4, shows the current coin settings. If you want to change these settings, use this screen.

To move around the screen, hold down the red Transform button and turn the red knob. If you turn the knob clockwise, you will move down the settings list. If you turn it counterclockwise, you will move up the settings list. You can tell where you are on the screen by looking for the white box around the option.

To change a coin option, release the red Transform button and turn the red knob.

To cancel all the changes you have made, press the red Thrust button. This restores the settings used before you entered the Self-Test mode.

To save all settings and go to the next screen, press the red Fire button. *If you turn off the self-test switch before you press the red Fire button, you will **not** save the selected coin settings.*

All of the default settings are shown in green letters.

The following are the Blasteroids coin options:

- *Game Price* is the top line on the screen. Turn the red knob to change the game price to one of the four game price settings shown below:

One Coin (Default)    Three Coins  
Two Coins            Four Coins

- *Right Mech Multiplier* is the second option on the screen. You can choose one of the following multiplier selections:

1 coin counts as 1 coin (Default)  
1 coin counts as 4 coins  
1 coin counts as 5 coins

1 coin counts as 6 coins

- *Left Mech Multiplier* is the third option on the screen. You can choose one of the following multiplier selections:

1 coin counts as 1 coin (Default)  
1 coin counts as 2 coins

- *Bonus Adder* is the last option on the screen. This option has the following settings:

No bonus adder (Default)  
2 coins give 1 extra coin  
4 coins give 1 extra coin  
4 coins give 2 extra coin  
5 coins give 1 extra coin  
3 coins give 1 extra coin

Free play (Choose this if you want to use the Demonstration mode.)

If you replace the EEROM at location 2A/B or a hardware problem occurs, all of the coin options will change to the default settings.

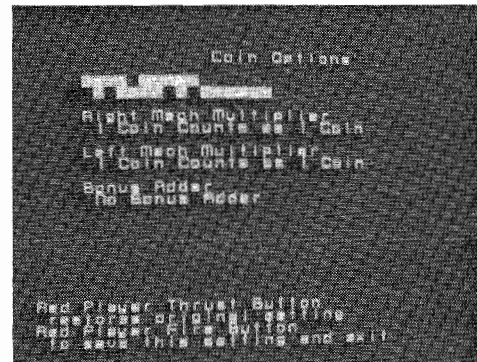


Figure 2-4 Coin Options

Table 2-3 Game Option Settings

Option Name	Available Settings	
Restore Factory Options	No♦	Yes
Difficulty Level	Easiest	Medium Hard
	Easier	Hard
	Easy	Harder
	Medium♦	Hardest
Clear High Score Table	Yes♦	No
Demo/Play Mode	Playable Game Mode♦	
	Demonstration Only Mode	
Music In Attract	Yes♦	No

♦ Indicates default and manufacturer's recommended settings.

## Game Options

The Game Options screen, shown in Figure 2-5, indicates the current game option settings. If you want to reset the Blasteroids game options, use this screen.

The Game Option Settings Table, below, shows the available options and the default settings recommended by Atari Games.

To move through the game options, hold down the red Transform button and turn the red knob. If you turn the knob clockwise, you will move down the option list. If you turn it counterclockwise, you will move up the option list. You can find your position on the screen by looking for the option with a white box around it.

To change a game option, release the red Transform button and turn the red knob.

To cancel all the changes you have made, press the red Thrust button. This restores the settings used before you entered the Self-Test mode.

To save all settings and go to the next screen, press the red Fire button. *If you turn off the self-test switch before you press the red Fire button, you will **not** save the selected game options.*

The default settings on the Game Options screen are highlighted in green. The Game Option settings are:

- *Restore Factory Options*—If you select Yes, and exit from this screen using the red Fire button, your chosen game options will be cleared, the default settings will be used, and the High Score Screen will be cleared when the game returns to the Attract mode.
- *Difficulty Level*—This adjusts the difficulty in Blasteroids.
- *Clear High Score Screen*—If you select Yes, the High Score screen will be cleared.
- *Demo/Play Mode*—You can choose Demonstration mode or Play mode. To operate in the Demonstration mode, you must have Free Play specified in the Coin Option Bonus Adder setting.
- *Music In Attract*—Music is played in the Attract mode unless you select No.

## Statistics

You can check the current game statistics on the statistics screen, shown in Figure 2-6. Use the information on this screen and on the histogram screens to fill out the Blasteroids statistics sheet in the back of this manual.

The statistics information accumulates from the last time the statistics were cleared. If you want to clear the statistics information, simultaneously press the red

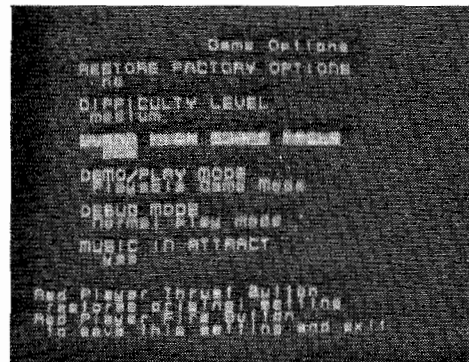


Figure 2-5 Game Options

Thrust and Transform buttons. To go to the histograms, press the red Fire button.

The following information appears on the Statistics screen:

- *Left Coins* shows the number of coins deposited in the left coin mechanism.
- *Right Coins* shows the number of coins deposited in the right coin mechanism.
- *New Games* shows the number of new games started.
- *Continuation* shows the number of times players continued their games.
- *0 Mins* shows the number of minutes of idle time.
- *1 Mins* shows the number of minutes played as a one-person game.
- *2 Mins* shows the number of minutes played as a two-person game.
- *Red Mins* shows the number of minutes played on the red side.
- *Green Mins* shows the number of minutes played on the green side.
- *Sessions* shows the total number of sessions. One session is the time between the first player starting and both players dying, regardless of time, number of coins inserted, or how many people have played Blasteroids.
- *Error Count* shows the number of EEROM errors that were detected. Replace the EEROM at location 2A/B on the Game PCB if the errors detected exceed more than 75 per week.
- *Total Coins* shows the total number of coins deposited in both coin mechanisms.
- *Avg Time/Coin* shows the average game time per coin, in seconds.





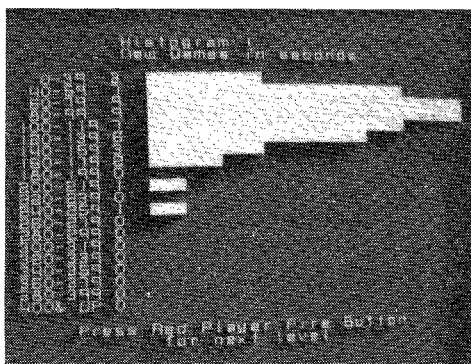
**Figure 2-6 Statistics**

## Histograms

The seven histogram screens show the length of the games for both players in bar graph form. To move through the histogram screens, press the red Fire button. The first histogram screen is shown in Figure 2-7.

The histogram information accumulates from the first time the game was turned on or from the last time the histograms were cleared. To clear the histograms, simultaneously press the red Thrust and Transform buttons.

The first three histogram screens show the new game time in seconds for the easy, medium, and hard level selection. (The hard and expert player-selected levels are displayed together on the hard level screens in the game time and continuation time histograms.) The next three screens show continuation time in seconds for the easy, medium, and hard level selections. The final screen shows session length in minutes.



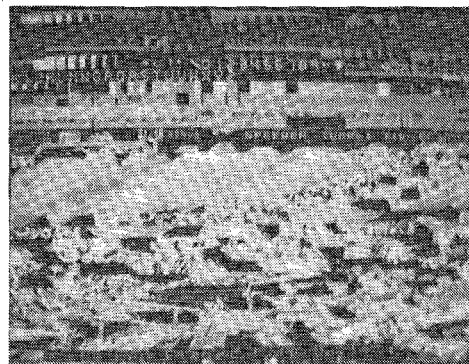
**Figure 2-7 Histograms**

## Playfield Test

The Playfield Test is shown in Figure 2-8. It tests the condition of the playfield circuit. If you see errors, check the circuitry and the ROMs at 1L and 1M on the Blasteroids PCB. (If your game has EPROMs instead of ROMs, check the EPROMs at 1L, 3L, 1M, and 3M on the Blasteroids PCB.)

If you want to look at all the playfields, turn off the Self-Test switch while you are in the Self-Test Playfield screen. Next, press either the red Transform or Thrust button to advance through all the playfields. You can also see all the playfield screens as the game cycles through the Attract mode. If a screen is incorrect, this could indicate a failure in the playfield circuitry.

Press the red Fire button to go to the next screen.



**Figure 2-8 Playfield Test**

## Motion Object Test

The Motion Object Test is shown in Figure 2-9. The Motion Object Test indicates the condition of the motion-object buffer circuit. Hold down the green Thrust button and turn the green knob to see all the objects used in the game. To rotate an object, release the green Thrust button and turn the green knob.

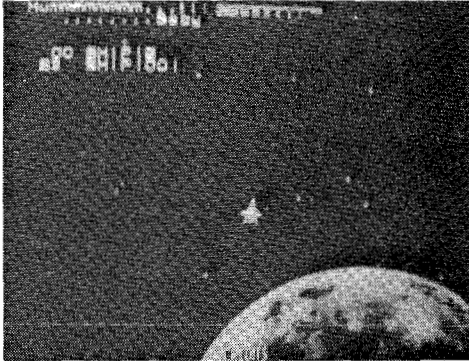
In the upper left corner of the screen are three lines of text. The first gives the number and short name of the object. The second gives the rotation view number and the name also. The last line gives the horizontal object size.

Check to be sure all of the objects in the game are shown in the test. If an object is missing, you have a ROM error.

Press the red Fire button to move to the next screen.

**NOTE**

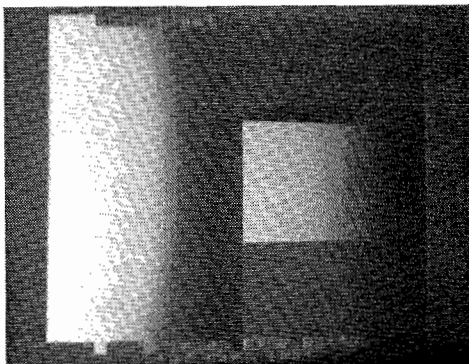
If you cannot enter the sound self-test, the cause may be a harness disconnection between the Audio and Game PCBs.



**Figure 2-9 Motion Object Test**

**Color Test**

The Color Test is shown in Figure 2-10. This test indicates the condition of the display color circuits. The screen should show 16 vertical grey-scale bars and three blocks of red, green, and blue, each containing 16 vertical bars. The brightest bars should be on the red and darkest (black) on the right with a grey frame around the screen. This frame helps to identify the darkest color band. If the display characteristics are not correct, refer to the display manual for the color-gun adjustment procedure or to determine the possible cause of failure. To adjust the brightness, find the



**Figure 2-10 Color Test**

**Table 2-5 Faulty Sound RAM and ROM Locations**

<b>Error and Cause Message</b>	<b>Location on Stand-Alone Audio PCB</b>
Music Chip Time Out	2F
Sound CPU Interrupt Error	2F, 5K, Transistor Q8
Sound CPU RAM 1 Error	2H
Sound CPU ROM 1 Error	2K
	If this error is displayed when entering the test, then the sound processor cannot run further. Press the red Fire button to obtain the next test.
Communications Error #1	1M
	Counts the number of errors caused by either the Audio PCB or Game PCB.
Communications Error #2	Indicates a probable disconnection of the Audio PCB from the Game PCB, or the chip at 1M is not inserted into its socket.

darkest column (not black) with the red, green, and blue colors. This column should be just barely visible. Press the red Fire button to move to the next screen.

**Color Purity Test**

The Color Purity Test consists of five color displays that indicate the condition of the display color-purity circuits. The first display is a red screen with the word *Red* at the top of the screen as shown in Figure 2-11.



**Figure 2-11 Color Purity Test**

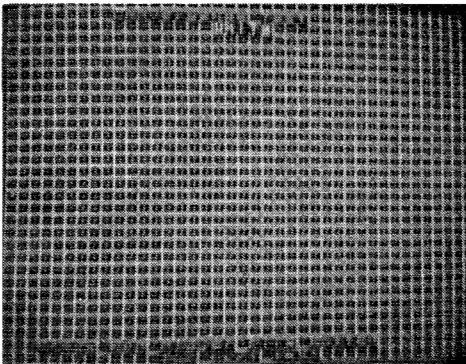
Press the red Thrust button, and the next display is green with the word *Green* at the top of the screen. Press the red Thrust button to obtain a blue, white, and finally a grey screen. After the grey screen, the display will repeat the red, green, blue, white, and grey sequence again.

If the display characteristics are not correct, refer to the video display manual for the color-purity adjustment procedure or the possible cause of failure.

Press the red Fire button to move to the next screen.

## Convergence Test

The Convergence Test screen is shown in Figure 2-12. This test indicates the condition of the display size, centering, linearity, and convergence. The grid pattern should be white.



**Figure 2-12 Convergence Test**

Press the red Thrust button and the grid pattern turns violet. Pressing the red Thrust button again causes the grid pattern to turn green. Check the grid pattern for the following characteristics:

- The four corners of the frame around the grid pattern should touch all four corners of the screen.
- Grid lines should show little pincushioning or barreling, and the lines should be straight within 1.2 mm.
- White pattern convergence should be within 1.5 mm.

If the display characteristics are not within these limits, refer to the display manual for the linearity and convergence adjustment procedures or to determine the possible cause of failure. Use the violet and white patterns to adjust the display convergence.

Press the red Fire button to move to the next screen.

## Sound Test

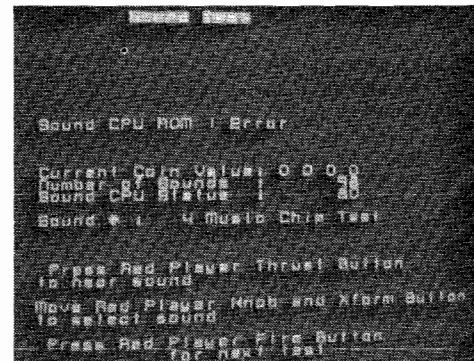
The Sound Test screen is shown in Figure 2-13. This test indicates the condition of the coin mechanisms

and the music, speech, and sound-effects circuits. The game may take up to three seconds to produce the first sound because the sound microprocessor is reset at the beginning of this test.

If the sound-microprocessor resets correctly, check the coin mechanisms and the sound microprocessor circuits as described below. If the sound microprocessor reset fails, the message *SOUND PROCESSOR NOT RESPONDING* should blink near the top of the screen.

The sound test screen shows the following messages:

- *CURRENT COIN VALUE* consists of four zeros. When you hold down the left coin switch mechanism, the third 0 changes to 1 and changes back to 0 when you release it. When you hold down the right coin switch mechanism, the fourth 0 changes to 1, then changes back to 0 when you release it.
- *NUMBER OF SOUNDS* indicates the number of sounds used in the Blasteroids game.
- *SOUND CPU STATUS* indicates the condition of the sound microprocessor. If the sound microprocessor



**Figure 2-13 Sound Test**

is good, the word *Good* appears. If the sound microprocessor or associated circuitry is faulty, a number will appear (to indicate sound status) in addition to an error message located at the top of the screen. Refer to Table 2-5 for the error messages and faulty sound RAM and ROM locations on the Audio PCB.

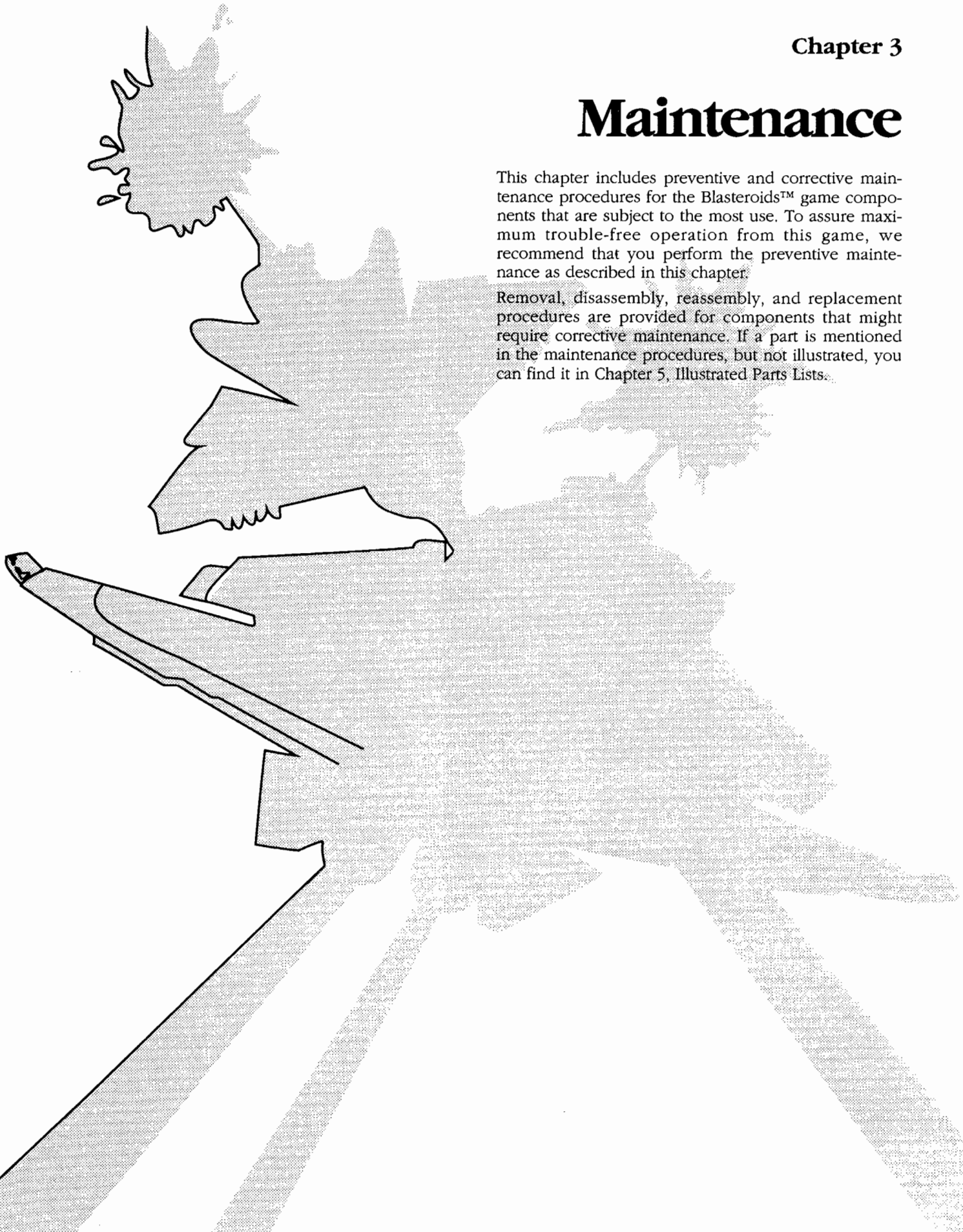
- *SOUND #* indicates the number of the sound. Choose a sound by turning the red knob. To hear the sound, press the red Thrust button one or more times. Press the red Transform button to silence the sound. You can also select the following integrated circuit (chip) tests during the Sound Test:
- Sound 4 (Music Chip Test) consists of eight tones in a major scale that alternate between sound channels (16 tones in all). Press the red Fire button to return to the Switch Test.

# N O T E S

# Maintenance

This chapter includes preventive and corrective maintenance procedures for the Blasteroids™ game components that are subject to the most use. To assure maximum trouble-free operation from this game, we recommend that you perform the preventive maintenance as described in this chapter.

Removal, disassembly, reassembly, and replacement procedures are provided for components that might require corrective maintenance. If a part is mentioned in the maintenance procedures, but not illustrated, you can find it in Chapter 5, Illustrated Parts Lists.



# Preventive Maintenance

Preventive maintenance includes cleaning, lubricating, and tightening hardware. How often you perform preventive maintenance depends upon the game environment and frequency of play. However, for the encoder wheel and the coin mechanism, we recommend that preventive maintenance be performed at the intervals specified in Table 3-1.

## Preventive-Maintenance Intervals

The preventive-maintenance intervals in Table 3-1 are the minimum requirements for the components listed.

**WARNING**

To avoid possible electrical shock, turn off the game before performing any maintenance procedures.

**Table 3-1 Recommended Preventive-Maintenance Interval**

Component	Maintenance Interval
Encoder Wheel	Inspect weekly, lubricate, and tighten hardware at least every six months.
Coin Mechanism	Inspect whenever you collect coins. Clean at least every three months.

## Removing the Control Panel

Perform the following procedure to remove/replace the control panel. (See Figure 3-1.)

1. Turn off the game.
2. Use the tamperproof hex-key wrench (included in the instruction manual bag) to remove the four tamperproof screws and washers holding the control panel to the cabinet.

**NOTE**

A hole is provided on the cabinet shelf inside the upper coin door to store the hex-key wrench when not being used. This hole is located to the left of the coin slots.

3. Pull the control panel towards you until you can tip the panel and reach underneath it.
4. Disconnect the control panel harness connector. You can now remove the control panel from the cabinet.
5. Replace the control panel in the reverse order of removal.

**WARNING**

Players may receive an electrical shock if this control panel is not properly grounded! After servicing any parts on the panel, make sure that the green ground wire is firmly attached to the metal tab on the inside of the control panel. Only then should you lock up the game.

## Cleaning the Push-Button Leaf Switches

Perform the following procedure to clean the leaf-switch contacts and tighten the securing hardware. (See Figure 3-1.)

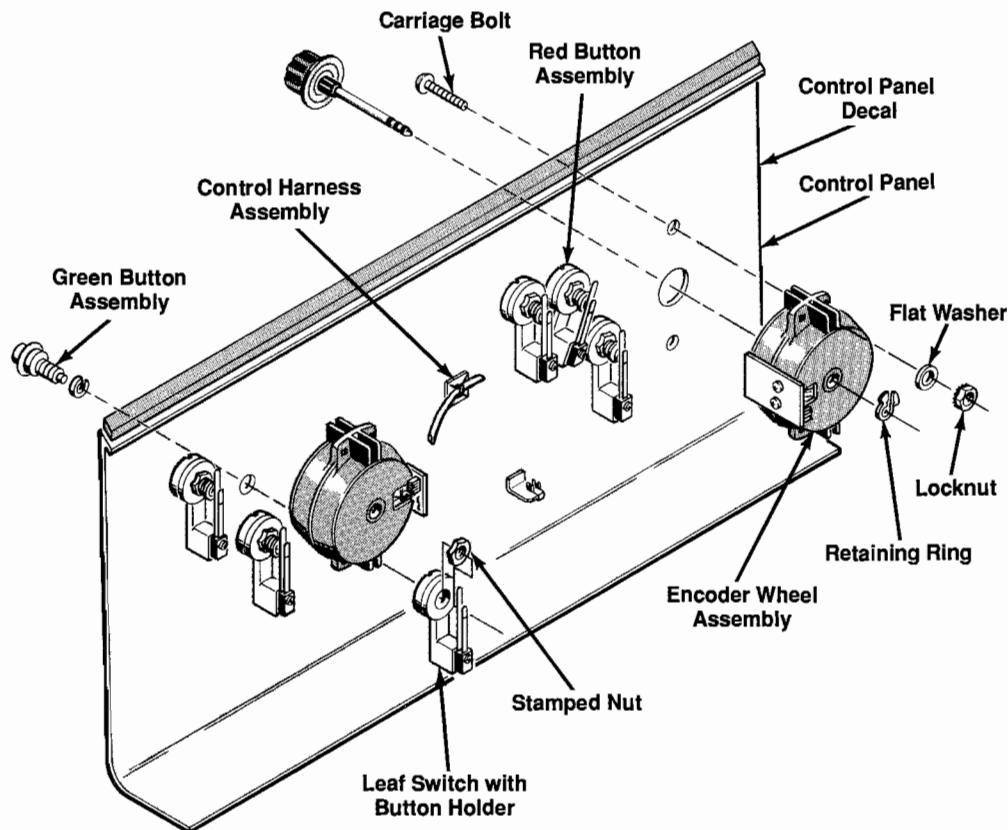
1. Remove the control panel as previously described in this chapter.
2. Use electrical contact cleaner to clean the contacts. Do **not** burnish them. When the push button is pressed, the wiping action of the cross-bar contacts provides a self-cleaning feature.
3. Use a 15/16-inch open-end wrench to tighten the stamped nut holding the push-button leaf switches to the control panel.
4. Replace the control panel in the cabinet in the reverse order of removal. Use the Self-Test to verify proper switch contact.

## Cleaning the Coin Mechanism

Use a soft-bristled brush to remove loose dust or foreign material from the coin mechanism. A toothbrush can be used to remove any stubborn build-up of residue in the coin path. After cleaning the coin mechanism, blow out all of the dust with compressed air.

## Cleaning the Interior Components

Perform the following procedure to clean the components inside the cabinet.



**Figure 3-1 Leaf Switch and Encoder Wheel Removal**

### WARNING

Turn off the game power, but do not unplug the power cord before cleaning inside the cabinet. The power cord provides a ground path for stray static voltages that can be present on the cleaning tools.

### CAUTION

Be extremely careful when cleaning the electrical components inside the cabinet. Avoid touching the electrical components with any solid object other than the soft bristles of the vacuum attachment or paint brush.

1. Unlock and open the rear access panel and display service panel.
2. Discharge the high-voltage from the cathode-ray tube (CRT) before proceeding. The display assembly contains a circuit for discharging the high voltage to ground when power is removed. However, to make certain, always discharge the display as follows:
  - a. Attach one end of a large, well-insulated, 18-gauge jumper wire to ground.
  - b. Momentarily touch the free end of the grounded jumper to the CRT anode by sliding it under the anode cap.
  - c. Wait two minutes and repeat part b.
3. Use a vacuum cleaner with a soft long-bristled brush attachment or use a soft-bristled paint brush to remove loose dirt and dust accumulated on the inside of the cabinet. Be sure to clean the electrical components thoroughly (power supplies, PCB assemblies, display, etc.).

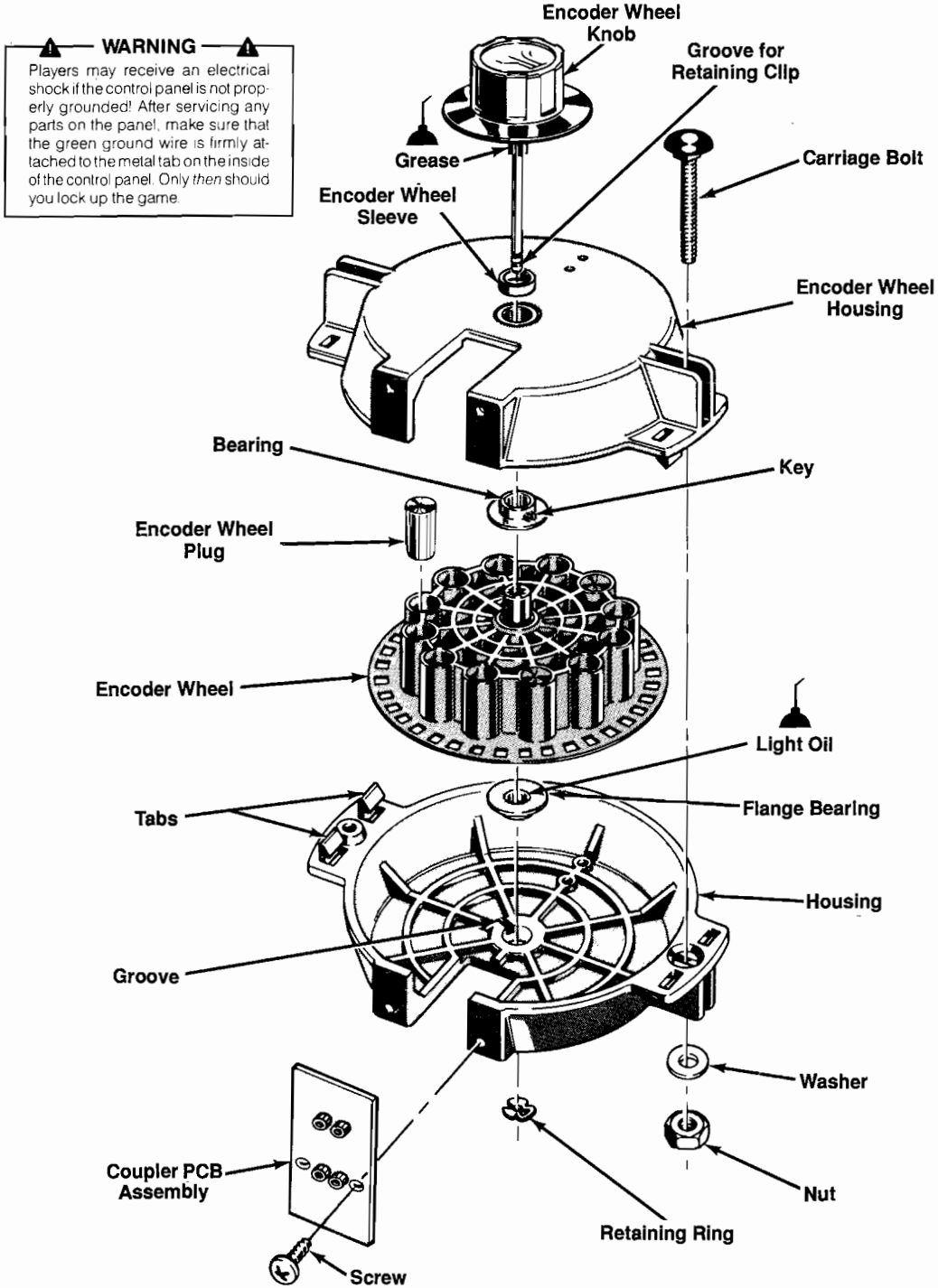
## Encoder Wheel Maintenance

The encoder wheel assembly is designed for maximum performance with minimum maintenance. To maintain this control, put two drops of a lightweight machine oil on each bearing once every six months. The encoder wheel must be disassembled in order to do this. Follow the next procedure and refer to Figure 3-1 and

Figure 3-2 before you begin the maintenance procedure. Figure 3-1 illustrates how the encoder wheel is removed from the control panel. Figure 3-2 illustrates the disassembled encoder wheel.

### Removing the Encoder Wheel

1. Remove the Control Panel from the game.
2. Disconnect the 4-pin harness from the Coupler printed-circuit board (PCB).
3. Use a flat-tipped screwdriver to pry the retaining clip off of the shaft of the knob. Save this retaining



**Figure 3-2 Encoder Wheel Disassembly and Lubrication**



clip for reassembly. The encoder wheel knob can be removed now from the top of the control board.

### NOTE

The retainer can fly off at a high speed when you are prying it off. Be sure to cover the retainer with a rag or block it with your hand so that the retainer will not be lost if it flies off.

4. Remove the two locknuts and washers from each encoder. Now you can remove the encoder from the long carriage bolts that hold it onto the control panel. Remove the carriage bolts, nuts, and washers. Save this hardware for reassembly.

### Opening the Encoder Wheel Housing

1. Use a Phillips-head screwdriver to remove the screws that attach the Coupler PCB to the housing. Carefully remove the Coupler PCB.
2. Two identical parts snap together to form the housing for the encoder wheel. To unsnap these two parts, place two fingertips on the tabs that protrude on one end of the housing. Pull these tabs away from the center of the housing until they release. Turn the housing over and place two fingertips on the tabs that protrude on the other end of the housing. Pull these tabs away from the center of the housing until they release.
3. Pull the bottom half of the housing off, leaving the encoder wheel and the top half of the housing together.
4. Pry off the aluminum sleeve around the knob insertion hole. Remove the encoder wheel from the housing.
5. Check the plugs in the encoder wheel. They should be evenly spaced. If they are not, poke them out from the back and reposition them.

### Lubricating the Encoder Wheel

Remove the identical plastic flange bearings on either side of the encoder wheel by sliding them off of the shaft. Apply one drop of a lightweight machine oil to the flat surface that touches the encoder wheel and one drop to the inside diameter of each bearing.

Put a light coating of grease on the encoder wheel knob spline.

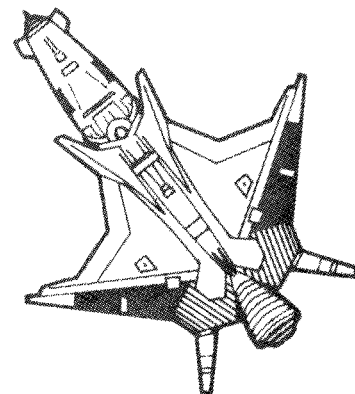
### Reassembling the Encoder Wheel Housing

1. Put a bearing in each housing and line up the key on the bearing with the groove near the center hole of each housing.

2. Find the housing half with the threaded holes in the side for the Coupler PCB. Find the encoder wheel shaft end that does not have the splined hole. Insert this shaft end into the bearing in this housing half.
3. Insert the shaft with the splined hole into the other half of the housing. Make sure that the bearing key does not leave the encoder housing groove.
4. Push the two halves of the housing together, and make sure the tabs click closed. If the two halves will not fit together, probably the bearing keys are not in the encoder housing grooves.
5. Push the aluminum sleeve over the spine hole end of the encoder and make sure the sleeve is flush with the top of the encoder wheel shaft.
6. Use a Phillips-head screwdriver to reattach the Coupler PCB to the threaded holes in the housing. The components on the Coupler PCB should face in towards the encoder wheel, and the encoder wheel should be between optical couplers.

### Attaching the Encoder Wheel Assembly To the Control Panel

1. Place the encoder wheel housing against the control panel, with the splined hole facing the control panel, and the pins on the Coupler PCB facing away from it.
2. Insert the carriage bolts through the control panel, the encoder wheel housing, and the washers. Screw on the nuts.
3. Use a 3/8-inch hex driver to tighten the nuts.
4. Connect the 4-pin harness to the Coupler PCB.
5. From the player side of the control panel, insert the encoder wheel knob into the housing.
6. Place the retaining clip on the shaft of the encoder knob in the groove closest to the housing.
7. Reconnect the game harness assembly. Do not force the connectors together. Be sure you have them in proper configuration.
8. Slide the control panel onto the cabinet.
9. Screw in the four tamperproof screws and washers.



## Corrective Maintenance

Corrective maintenance consists of removal, disassembly, reassembly, and replacement of game components. The following procedures are provided for components that may require corrective maintenance.

### Removing the Video Display

Perform the following procedure to remove or replace the video display. (See Figure 3-3.)

1. Turn the game power off and wait two minutes. Unplug the power cord.
2. Remove the control panel.
3. Remove the video display shield by sliding it down, out of the slot in the cabinet which holds the shield's top edge. Bring the shield towards you, sliding its bottom edge across the area where the control panel was located.
4. Carefully remove the bezel from the protective foam tape on the back.

#### WARNING

The video display contains lethal high voltages. To avoid injury, do not attempt to service this display until you observe all precautions necessary for working on high-voltage equipment. The video display has been designed to minimize X-radiation. However, to avoid possible exposure to soft X-radiation, do **not** modify the high-voltage circuitry. The cathode-ray tube may implode if struck or dropped. Shattered glass may cause injury within a 6-foot radius. Use care when handling the display.

6. Discharge the cathode-ray tube (CRT). Be sure that the game power is turned off. Although the display assembly contains a circuit for discharging the high voltage to ground when power is removed, to be certain, always discharge the display as follows.
  - a. Attach one end of a large, well-insulated, 18-gauge jumper wire to ground.
  - b. Momentarily touch the free end of the grounded

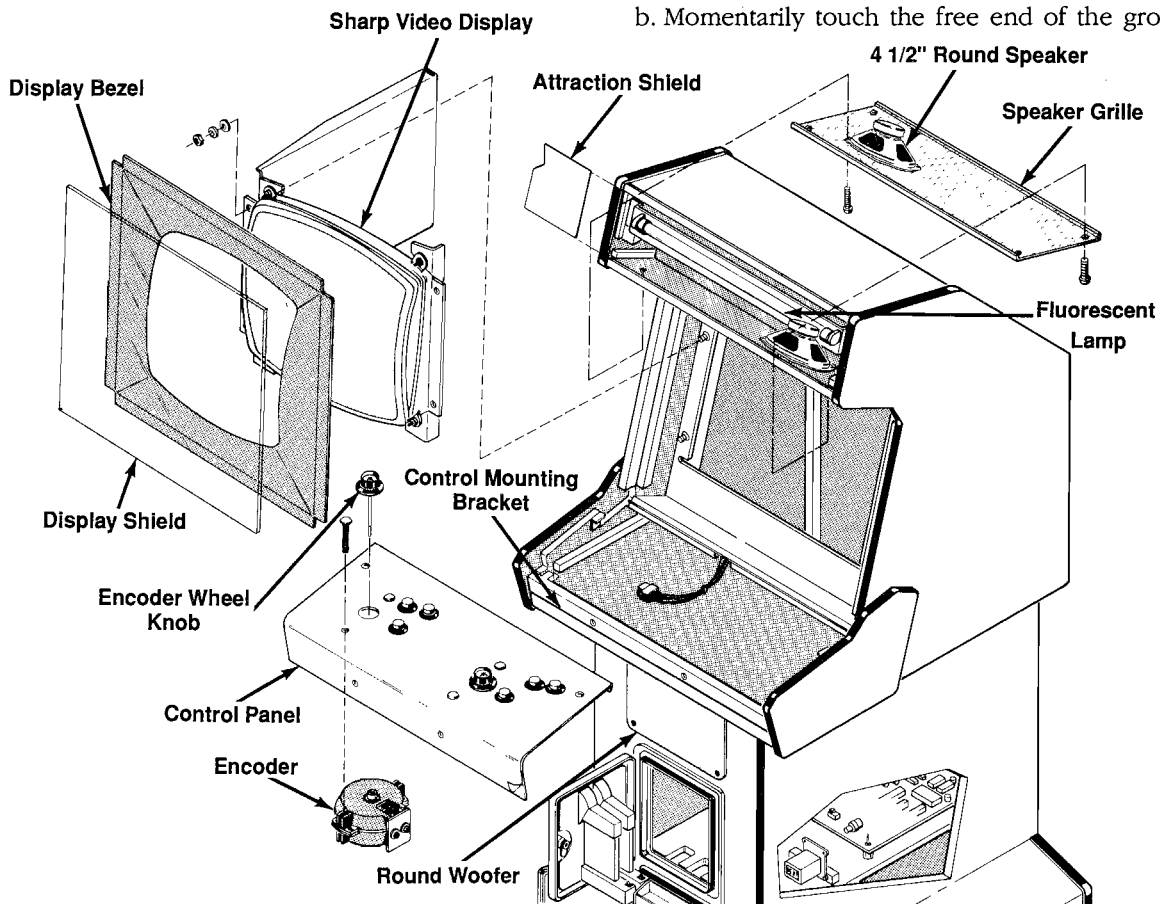


Figure 3-3 Control Panel, Video Display, and Speaker Removal

jumper to the CRT anode by sliding it under the anode cap.

- c. Wait two minutes and repeat part b.
7. From the rear of the cabinet, disconnect the display harness connectors from the display.

### WARNING

To avoid dropping the video display, use extreme care when removing the display from the cabinet. We recommend that no one weighing less than 150 pounds should attempt to remove the display. In addition, we recommend that you wear gloves to protect your hands from the sheet-metal edges.

8. Use a 3/8-inch nut driver to loosen the four nuts and washers holding the display to the cabinet mounting panel.
9. Carefully lift the display out through the front of the cabinet.
10. Replace the video display as described in the following procedure.

## Replacing the Video Display

### NOTE

Whenever the cathode-ray tube and yoke are replaced as a single unit, readjust the brightness, size, and centering as described in the video display manual. Check the purity and convergence also according to the display manual instructions, but adjust these *only if required*.

Perform the following procedure to replace the video display in the cabinet. (See Figure 3-3.)

1. Carefully lift the video display through the front of the cabinet.
2. Position the display so that the four holes in the two mounting brackets align with the four studs in the cabinet.
3. Tighten the four mounting nuts and washers holding the mounting brackets to the cabinet studs. Use a 3/8-inch nut driver.
4. Connect the display harnesses to the display.
5. Replace the bezel and display shield. Replace the control panel.

## Removing the Game PCB

Perform the following procedure to remove or replace the Game PCB.

1. Turn the game power off.
2. Unlock and remove the rear access panel from the cabinet.
3. Disconnect the harness connectors from the Game PCB.
4. Use a Phillips screwdriver to remove the two screws and washers holding the Game PCB to the cabinet.
5. Grasp the edge of the Game PCB and gently lift it out of the slotted guide.
6. Replace the Game PCB in the reverse order of removal.

## Removing the Fluorescent Light

Perform the following procedure to remove or replace the fluorescent light. (See Figure 3-3.)

1. Turn the game power off.
2. Use a 1/8-inch hex driver to remove the three screws in the retainer on the top of the cabinet which hold the attraction shield in place. Remove the retainer.
3. Remove the attraction shield. The shield has foam tape on the front and back edges.
4. Remove the fluorescent light from the light fixture.
5. To remove the entire light fixture, disconnect the light harness connector in the rear of the cabinet.
6. Use a Phillips screwdriver to remove the two screws holding the light fixture. Remove the light fixture.
7. Replace the fluorescent light and/or light fixture in the reverse order of removal.

## Removing the Speakers

Perform the following procedure to remove or replace the speakers. (See Figure 3-3.)

1. Turn the game power off.
2. Unfasten the grille.
  - a. Upper Speakers—Use a 1/8-inch hex driver to remove the eight screws holding the speaker grille to the cabinet. Remove the grille.
  - b. Lower Speaker—Use a 1/8-inch hex driver to remove the four screws holding the speaker grille to the cabinet. Remove the grille.

**CAUTION**

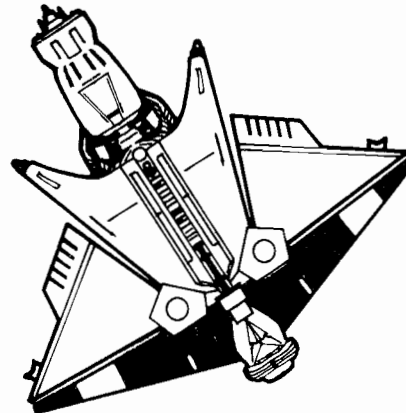
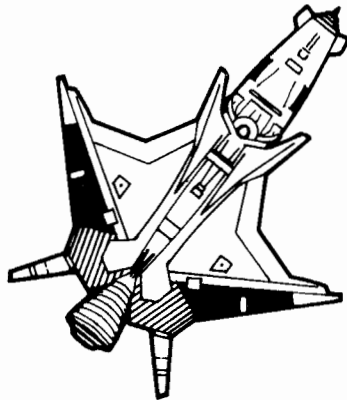
Do not touch the speaker cones when handling the speakers. The cone material is fragile and can be easily damaged.

4. Use a Phillips screwdriver to remove the four screws holding each speaker to the cabinet. Do not let the speaker fall.
5. Remove the speaker just far enough to disconnect

the two speaker wires. When you reassemble the speaker and the wires, be sure that you hook up the wires correctly. Otherwise, the game will produce less than the desired volume because the speakers will be out of phase.

The signal wire for each speaker should be attached to the speaker tab marked with color, a + sign, or a round dot. (The signal wires are shown on the game wiring diagram; refer to the Schematic Package included with the game.)

6. Replace the speaker in the reverse order of removal.

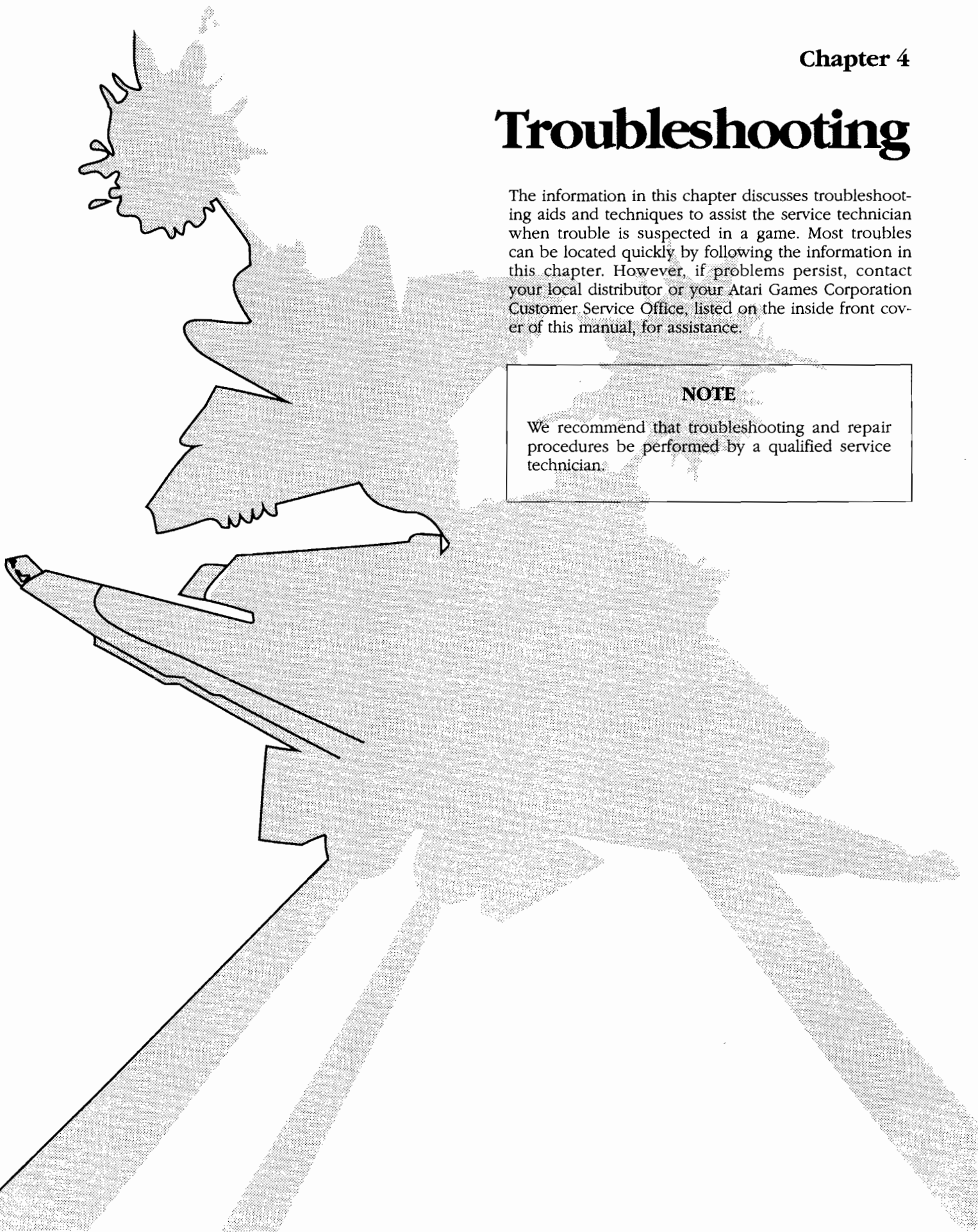


# Troubleshooting

The information in this chapter discusses troubleshooting aids and techniques to assist the service technician when trouble is suspected in a game. Most troubles can be located quickly by following the information in this chapter. However, if problems persist, contact your local distributor or your Atari Games Corporation Customer Service Office, listed on the inside front cover of this manual, for assistance.

**NOTE**

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



## Troubleshooting Aids

Troubleshooting aids are provided in this manual and in the schematic package supplement. The most useful of these are:

### Assembly and Component Locations

The locations of assemblies and components are in the parts lists in Chapter 5 of this manual. The Printed-circuit board (PCB) illustrations can aid in rapidly locating components shown on the corresponding schematic diagram(s).

### Diagrams

The schematic package supplement for this manual contains schematic diagrams with component locations, active component type numbers, and electrical values.

## Troubleshooting Techniques

### WARNING

To avoid electrical shock, turn off the game power before attempting to troubleshoot this game.

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 problem to an assembly or major circuit, and then to a defective component.

### Check Fuses

Check for open fuses. Refer to the power supply parts list in Chapter 5 and to the schematic package supplement for the location and rating of each fuse used in this game. Make sure that replacement fuses are the proper type and rating.

### Check Power-Supply Voltages

If all circuits are operating improperly, this usually indicates a power supply problem. Be sure that the proper line voltage is available to the power supply. Refer to the label on the power supply for its voltage rating.

### Locate the Trouble

Decide what the symptom is. Perform the self-test procedure provided in Chapter 2 of this manual. Use the wiring diagrams in the schematic package supplement to determine which assemblies or major circuits may be causing the trouble.

### Visual Check

Visually check for obvious problems in the portion of the game where the trouble is suspected. For example, check for loose or defective solder connections, integrated circuits loose in their sockets, loose cable connections, broken wires, and damaged PCBs or components.

### Check Individual Components

Check soldered-in passive components (e.g., resistors, capacitors, diodes) by disconnecting one end to isolate the measurement from the effects of the surrounding circuitry. Often, the most practical way to determine if a component is faulty is to substitute a new component. Before you do this, make sure that you do not have some other circuit problem that could damage the new component.

### Repair the Assembly

### CAUTION

Soldered-in transistors and integrated circuits are difficult to remove without damaging the printed-circuit board or component. Refer to the information in this chapter pertaining to soldering and replacing integrated circuits and transistors.

Repair or replace the defective part. Refer to Chapter 4 and information in this chapter for special removal and replacement procedures. Check for proper operation of the repaired circuit.

## Soldering Techniques

Observe the following recommendations when removing or replacing components soldered to a PCB. You can damage a PCB or heat-sensitive electrical components with poor soldering practices.

Choose the proper soldering iron before you attempt to remove or replace soldered-in components. Excessive heat from a soldering iron is a common cause of damage to a component or PCB. Also, transient voltages from solder guns or improperly grounded soldering irons can damage certain voltage-sensitive semiconductor devices. Refer to *Troubleshooting Static-Sensitive Devices* for more specific information.

We recommend a 15- to 27-watt pencil-tip soldering iron to avoid separating the etched circuit wiring from the board material and to avoid damaging active components. You can also use a temperature-controlled soldering station rated at 700° F with a fine cone or a very fine chisel tip.

**CAUTION**

Do not use a solder gun to remove or replace soldered-in components on a printed circuit board. A solder gun can overheat a device, and its large transient voltage can damage a voltage-sensitive device.

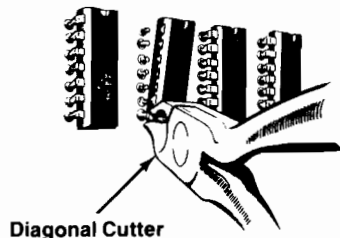
You will also need the following additional equipment for removing and replacing soldered-in components:

- **Solder Sucker**—Hand-operated vacuum tool to remove liquified solder from the PCB. We recommend the top-of-the-line Soldapull<sup>®</sup> brand.
- **Solder Wick**—Resin-soaked copper braid to remove excess solder from the lead connections on the PCB. See *Removing Integrated Circuits* for precautions relating to the use of a solder wick on a multi-layer PCB with plated-through holes.
- **Flux Remover**—Non-corrosive chemical to clean foreign material from the PCB before soldering and to remove any flux residue where components have been replaced. Also use it to clean any foreign material from the PCB during preventive maintenance. Isopropyl alcohol is recommended.
- **Acid Brush**—Small stiff-bristled paint or toothbrush used with flux remover to clean flux and other foreign material from the PCB.

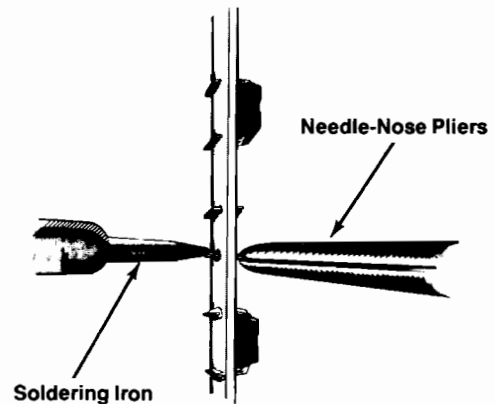
**Removing Integrated Circuits**

The easiest and safest method for removing soldered-in integrated circuits (IC) from a PCB is to cut off each pin as close to the IC case as possible with a tip dyke (diagonal cutter) as shown in Figure 4-1.

Use the proper soldering iron as previously described under *Soldering Techniques*. Then, to avoid excessive heat buildup in one area of the PCB, apply heat directly to each pin in a random order. Remove the loosened pin with the tip of the soldering iron or a needle-nose pliers as shown in Figure 4-2. Allow a moment for the PCB to cool before proceeding to the next pin. Apply just enough heat to remove any stubborn pins.



**Figure 4-1 Removing IC (Cut-Pin Method)**



**Figure 4-2 Removing IC Pins**

For a multi-layer PCB with plated-through holes, use a solder sucker to remove the remaining solder from inside each hole as shown in Figure 4-3. If possible, suck the solder from the opposite side of the PCB from where the heat is applied.

Use a solder wick to remove excess solder from around the lead connection pads on the top and/or bottom surface of the PCB as shown in Figure 4-4.

**CAUTION**

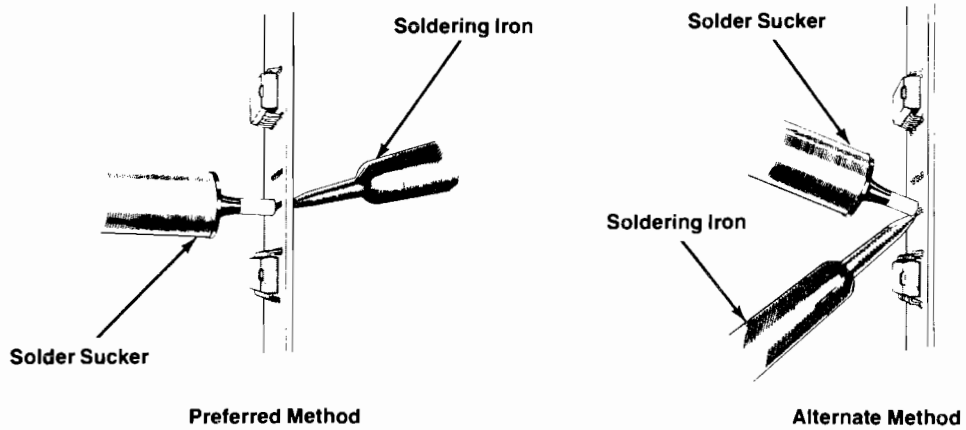
Do not use a solder wick to remove solder from inside plated-through holes. The heat required for the solder wick to remove the solder from inside the hole could damage the PCB.

Use an integrated-circuit (IC) pulling tool to remove socketed ICs. Do not pry up on one end of the ICs because the pins could be bent or broken.

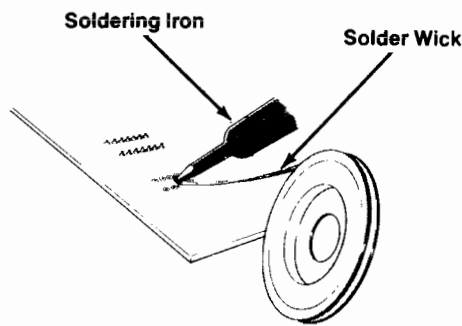
**Troubleshooting Static-Sensitive Devices**

Certain precautions must be taken when working with static-sensitive devices, such as microprocessors, field-effect transistors (FET), complementary metal-oxide semiconductors (CMOS), and other large-scale integration (LSI) devices that use metal-oxide semiconductor (MOS) technology. Static charge buildup in a person's body or leakage from an improperly grounded soldering iron can cause static-sensitive device to fail.

Before handling a static-sensitive device or a PCB with such devices attached to it, ground any static voltage that may have accumulated in your body by touching an object that has been earth grounded. A bare wire wrapped around your wrist and attached to an earth ground is effective when working extensively with static-sensitive devices. When soldering a static-sensi-



**Figure 4-3 Removing Solder from Plated-Through Holes**

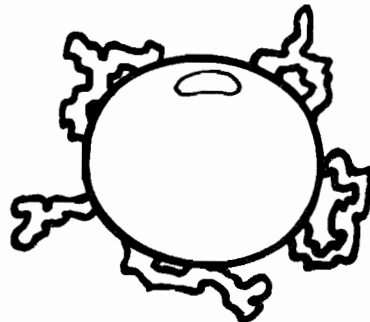


**Figure 4-4 Removing Solder from Lead Connection Pads**

tive device, use a soldering iron with a properly grounded three-wire cord. (Refer to *Soldering Techniques* for a discussion of recommended soldering irons and procedures.)

Before you replace a static-sensitive device, make sure it is actually defective. A static-sensitive device can appear defective due to leakage on a PCB. To make sure a device is defective, ground static voltages as described in the paragraph above. Clean both sides of the PCB with flux remover or an eraser. For discrete FETs, clean thoroughly between the gate, drain, and source leads. Then test the device.

New static-sensitive devices can be packaged in conductive foam or can have a protective shorting wire attached to the pins. Remove the conductive foam just prior to inserting the device into its socket or soldering it to a PCB. Remove the shorting wire only *after* the device is inserted into its socket or *after* all the leads are soldered in place.





# Illustrated Parts Lists

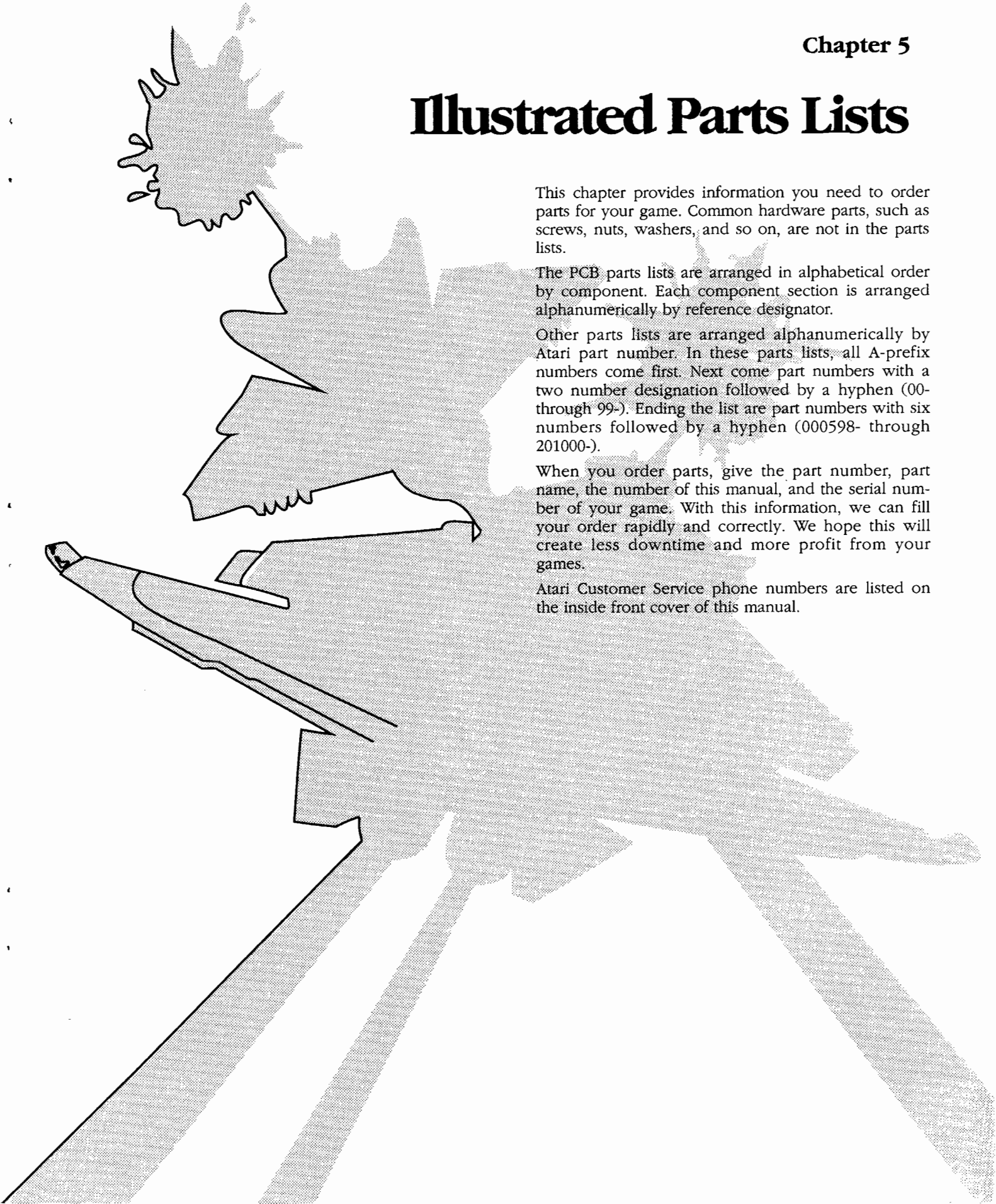
This chapter provides information you need to order parts for your game. Common hardware parts, such as screws, nuts, washers, and so on, are not in the parts lists.

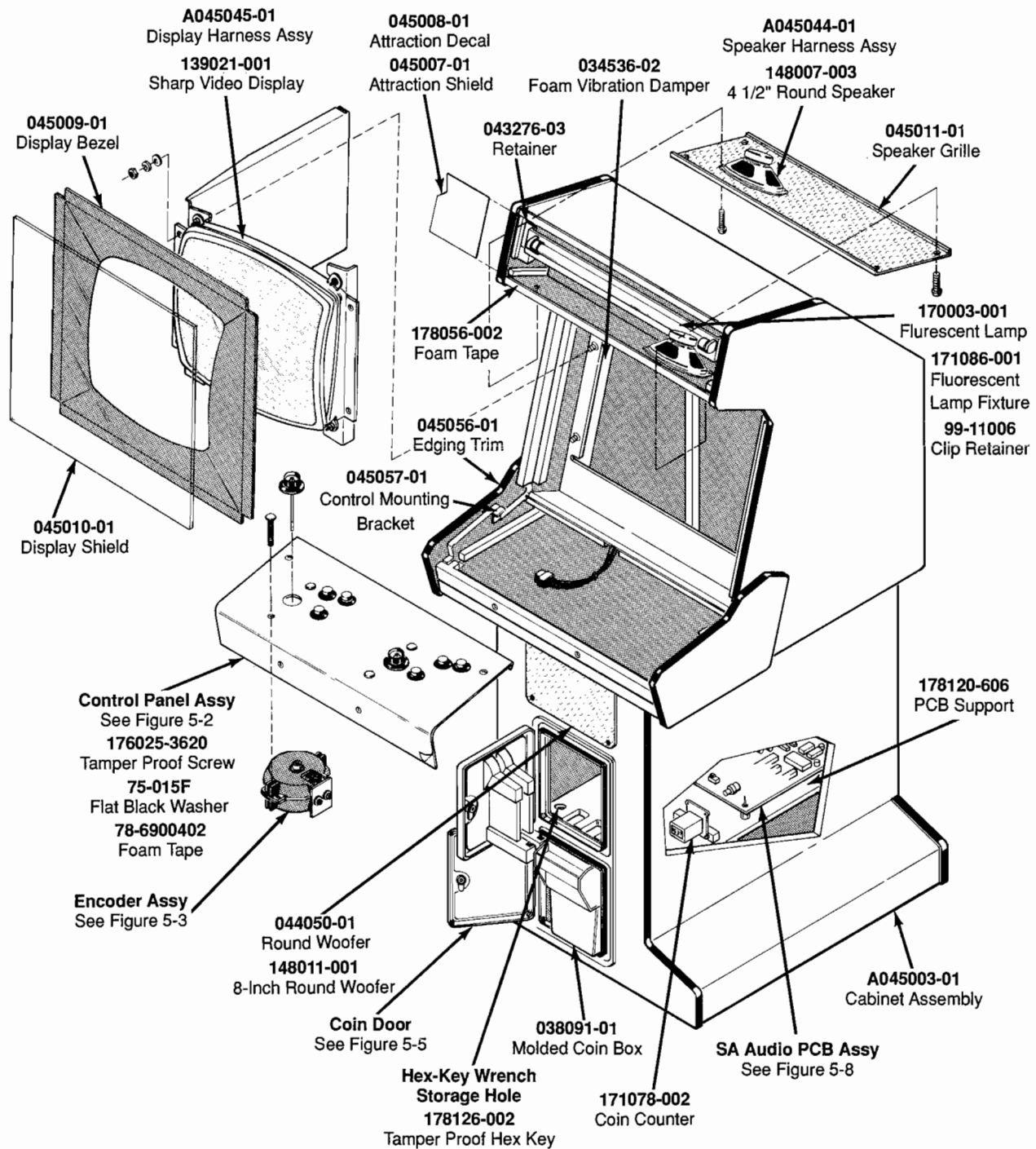
The PCB parts lists are arranged in alphabetical order by component. Each component section is arranged alphanumerically by reference designator.

Other parts lists are arranged alphanumerically by Atari part number. In these parts lists, all A-prefix numbers come first. Next come part numbers with a two number designation followed by a hyphen (00-through 99-). Ending the list are part numbers with six numbers followed by a hyphen (000598- through 201000-).

When you order parts, give the part number, part name, the number of this manual, and the serial number of your game. With this information, we can fill your order rapidly and correctly. We hope this will create less downtime and more profit from your games.

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

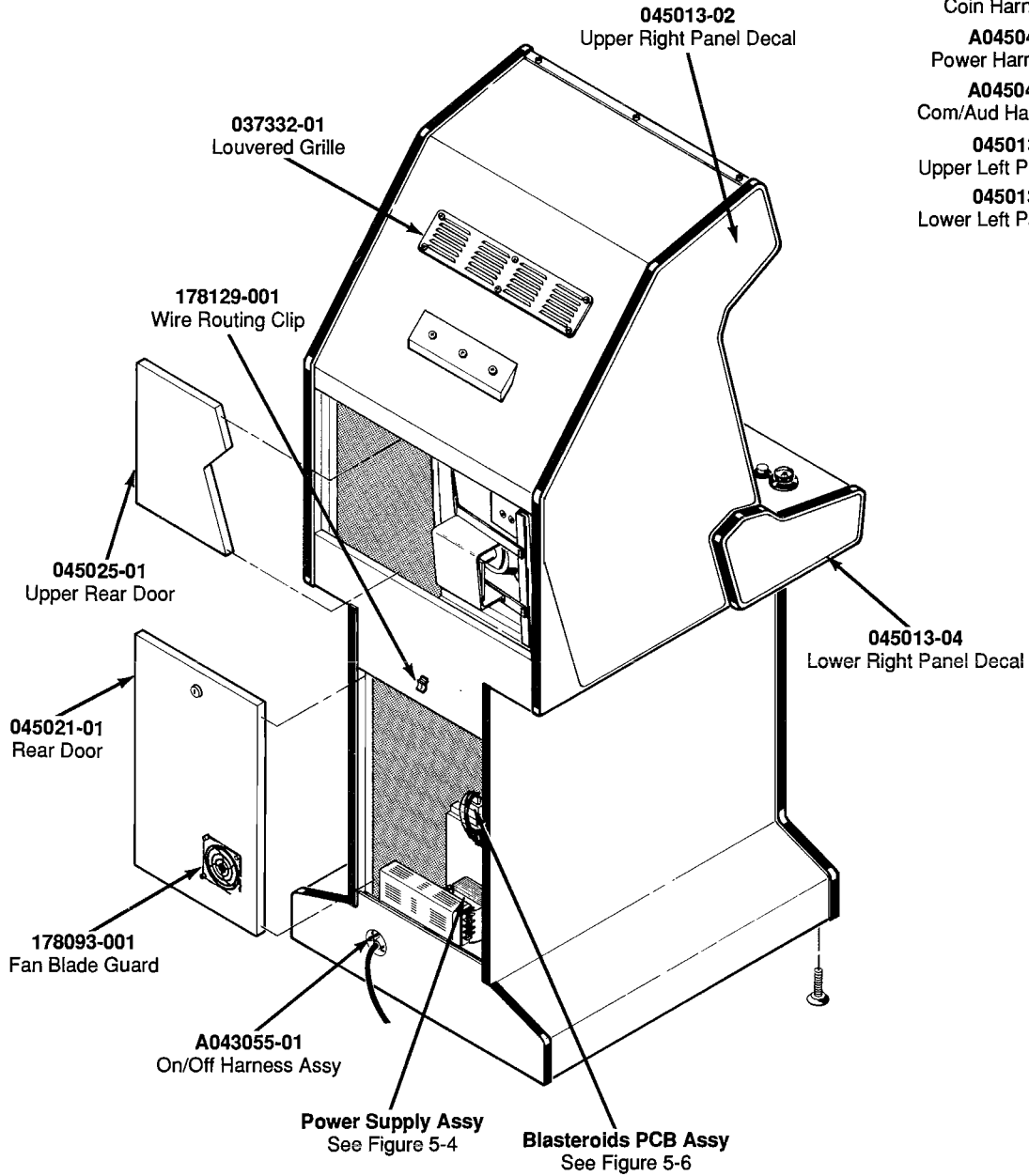




**Figure 5-1 Cabinet-Mounted Assemblies  
A045000-01 B**

**NOTE**  
 For more information on installing harness in the cabinet, see the Blasteroids Harness Installation Diagram in the Blasteroids Schematic Package Supplement, SP-316.

- House Quake PCB Assy**  
 See Figure 5-7
- A045042-01**  
 Cabinet Harness Assy
- 175007-001**  
 Flat Fender Washer
- A044875-01**  
 AC Power Harness Assembly
- A045041-01**  
 Coin Harness Assy
- A045046-01**  
 Power Harness Assy
- A045040-01**  
 Com/Aud Harness Assy
- 045013-01**  
 Upper Left Panel Decal
- 045013-03**  
 Lower Left Panel Decal



**Figure 5-1 Cabinet-Mounted Assemblies, Continued**

## Cabinet-Mounted Assemblies Parts List

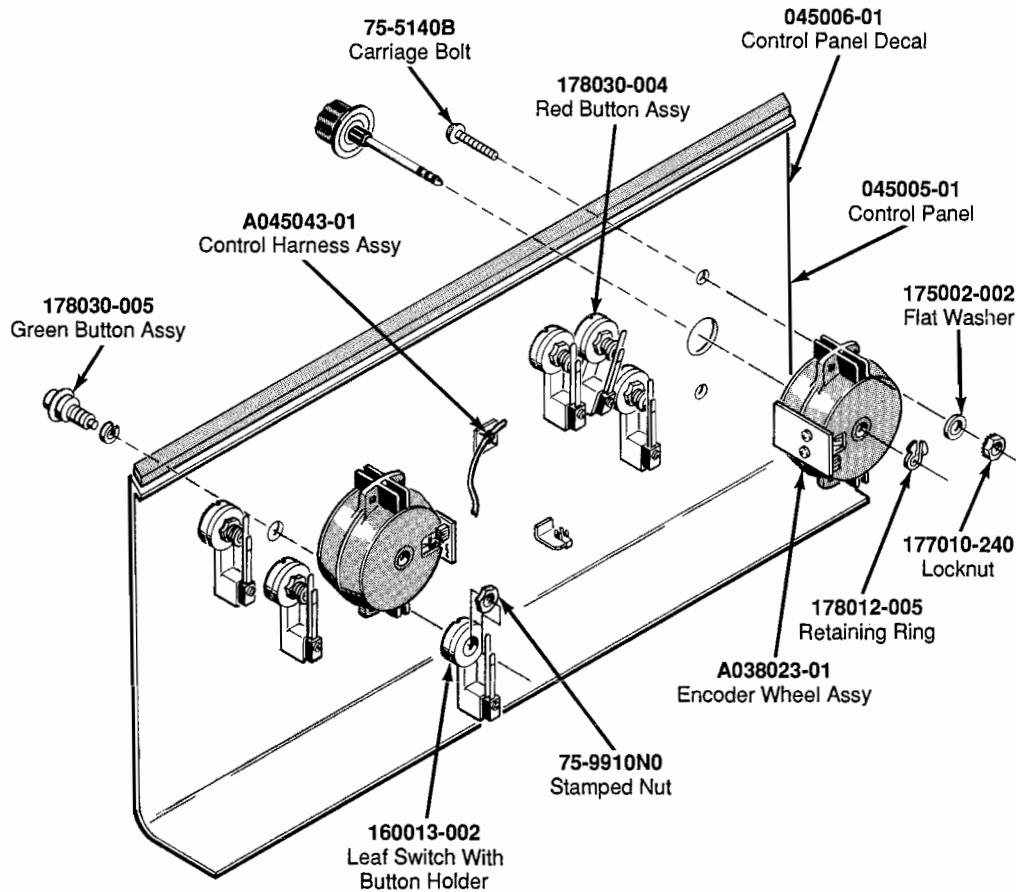
Part No.	Description
A043055-01	12-Inch-Long On/Off Harness Assembly
A043713-22	SA Audio PCB Assembly
A044326-21	Main Blasteroids PCB Assembly
A044872-03	Power Supply Assembly
A044875-01	AC Power Harness Assembly
A045003-01	Cabinet Assembly
A045004-01	Control Panel Assembly
A045040-01	Communication/Audio (Com/Aud) Harness Assembly
A045041-01	Coin Harness Assembly
A045042-01	Cabinet Harness Assembly
A045044-01	Speaker Harness Assembly
A045045-01	Display Harness Assembly
A045046-01	Power Harness Assembly
A045050-01	Housequake PCB Assembly
034536-02	Foam Vibration Damper (0.50-Inch Thick)
037332-01	Louvered Grille
038091-01	Molded Coin Box
043276-03	22.20-Inch-Long Machined Retainer
044050-01	Square Grille Speaker
045007-01	Attraction Shield
045008-01	Attraction Decal
045009-01	Video Display Bezel
045010-01	Tinted Display Shield
045011-01	Speaker Grille
045013-01	Upper Left Panel Decal
045013-02	Upper Right Panel Decal
045013-03	Lower Left Panel Decal
045013-04	Lower Right Panel Decal
045021-01	Rear Door
045025-01	Upper Rear Door
045056-01	Edging Trim
045057-01	Control Mounting Bracket
139021-001	Sharp Model #XM-2001N 19-Inch Color Raster Video Display
148007-003	4 1/2-Inch Round Unshielded Speaker
148011-001	8-Inch Round Woofer (Acceptable Substitute is part number 148008-002, 8-Inch Round Speaker)
170003-001	18-Inch-Long 50W Fluorescent Lamp
171027-001	Over/Under 25¢/25¢ Coin Door
171078-002	Non-Resettable 12VDC Coin Counter
171086-001	118V 60Hz 18-Inch-Long Fluorescent Lamp Fixture
175007-001	#10 Flat Fender Washer
176025-3620	Tamper-Proof Screw
178056-002	1/2-Inch Wide × 1/16-Inch Thick Foam Tape (64 Inches)
178093-001	Fan Blade Guard
178126-002	Tamper-Proof 5/32-Inch Hex Key

### Cabinet-Mounted Assemblies Parts List, Continued

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<b>Part No.</b>	<b>Description</b>
178129-001	Wire Routing Clip
75-015F	Flat Black 1/4-Inch Washer
78-6900402	1/4-Inch Wide × 1/8-Inch Thick Foam Tape (48 Inches)
99-11006	Fluorescent Lamp Clip Retainer
	<i>The following items are the technical information supplements for this game:</i>
TM-304	Sharp (Model # XM-2001N) Video Display Manual
SP-316	Blasteroids Schematic Package
ST-316	Blasteroids Self-Test Label
TM-316	Blasteroids Operator's Manual

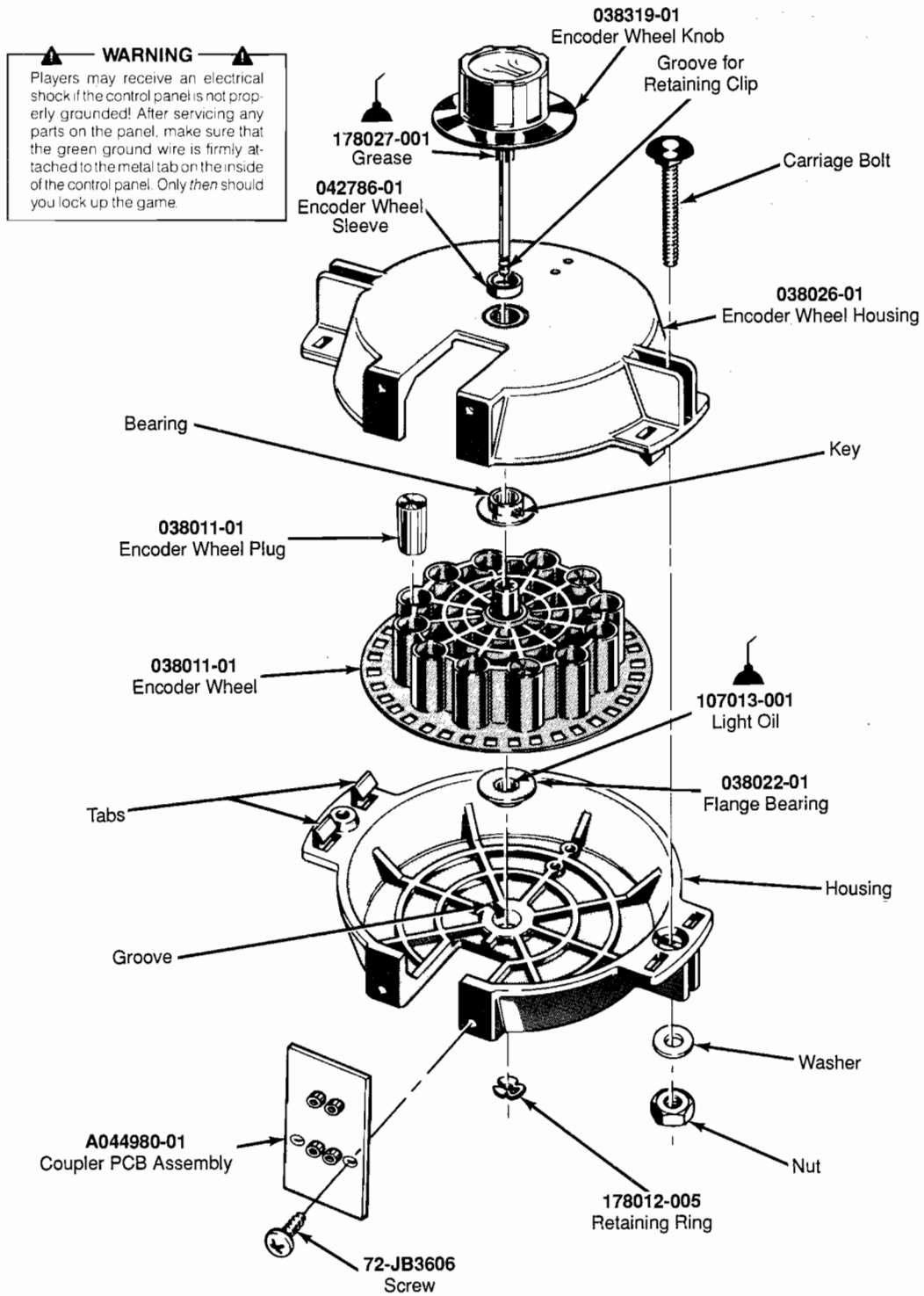
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**Figure 5-2 Control Panel Assembly  
A045004-01 A**

**Control Panel Assembly  
Parts List**

Part No.	Description
A038023-01	Encoder Wheel Assembly
A045043-01	Control Harness Assembly
75-5140B	#10-24 X 2.50-Inch Black Carriage Bolt
75-9910N0	5/8-Inch #11 Stamped Nut
045005-01	Control Panel
045006-01	Control Panel Decal
160013-002	Leaf Switch With Button Holder and Cross Bar
175002-002	#10 Flat Washer
177010-240	#10-24 Locknut
178030-004	Red Button Assembly
178030-005	Green Button Assembly



**Figure 5-3 Encoder Wheel Assembly  
A038023-01 E**

### Encoder Wheel Assembly Parts List

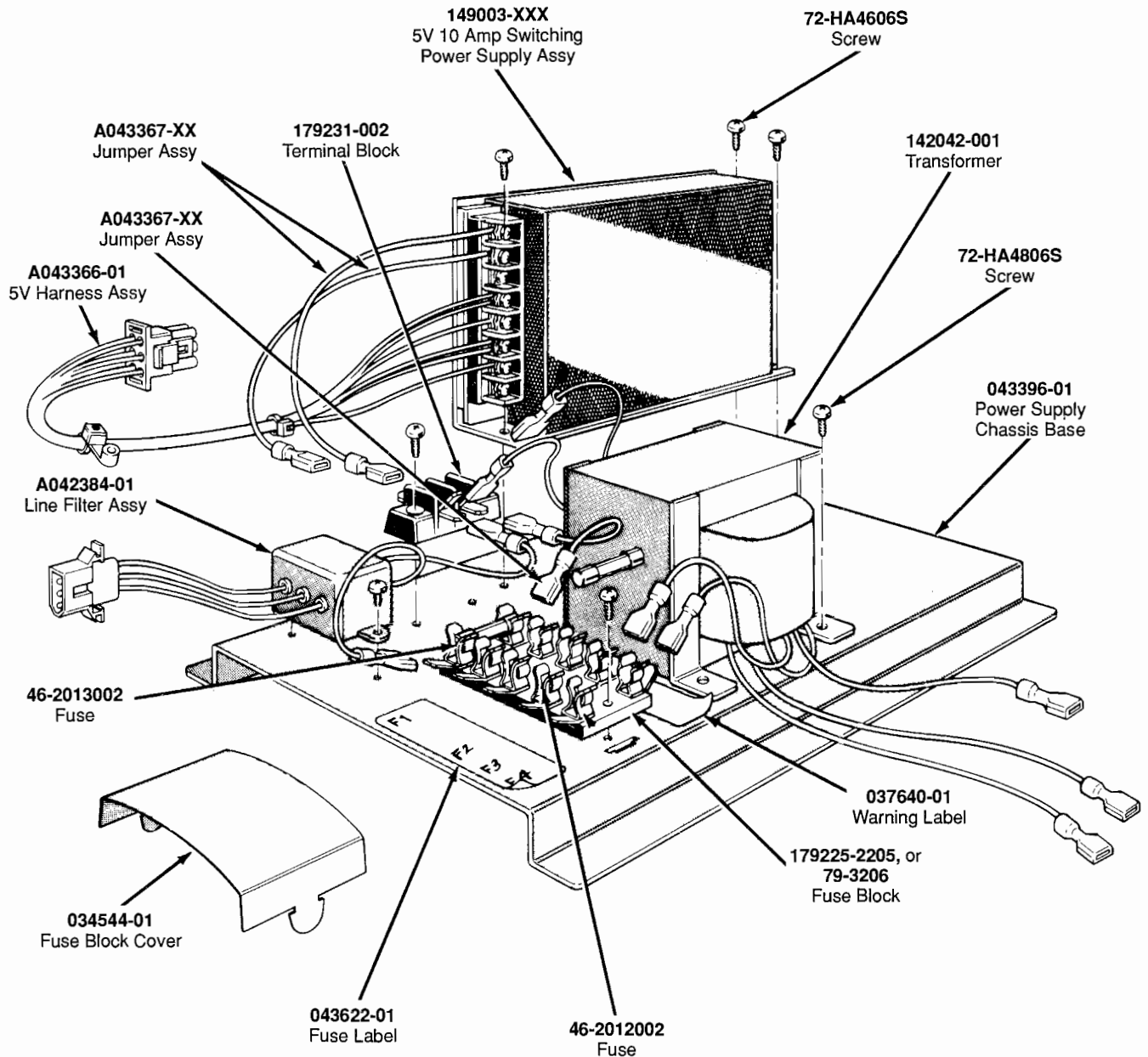
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<b>Part No.</b>	<b>Description</b>
A044980-01	PCB Coupler Assembly
72-JB3606	Twin Helix Plastite Hex #6 Screw
038010-01	Encoder Wheel
038011-01	Encoder Wheel Plug
038022-01	Flange Bearing
038026-01	Encoder Wheel Housing
038319-01	Encoder Wheel Knob
042786-01	Encoder Wheel Sleeve
107013-001	Light Oil
178012-005	0.156 Inch Diameter Shaft Retaining Ring
178027-001	Grease

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**⚠ WARNING ⚠**  
The switching power supply has high voltages on it when power is turned on. Therefore, be sure you *do not touch this power supply* unless you have turned off the power to the game.



**Figure 5-4 Switching/Linear (SL) Power Supply Assembly  
A044872-03 A**

**Switching/Linear (SL) Power Supply Assembly  
Parts List**

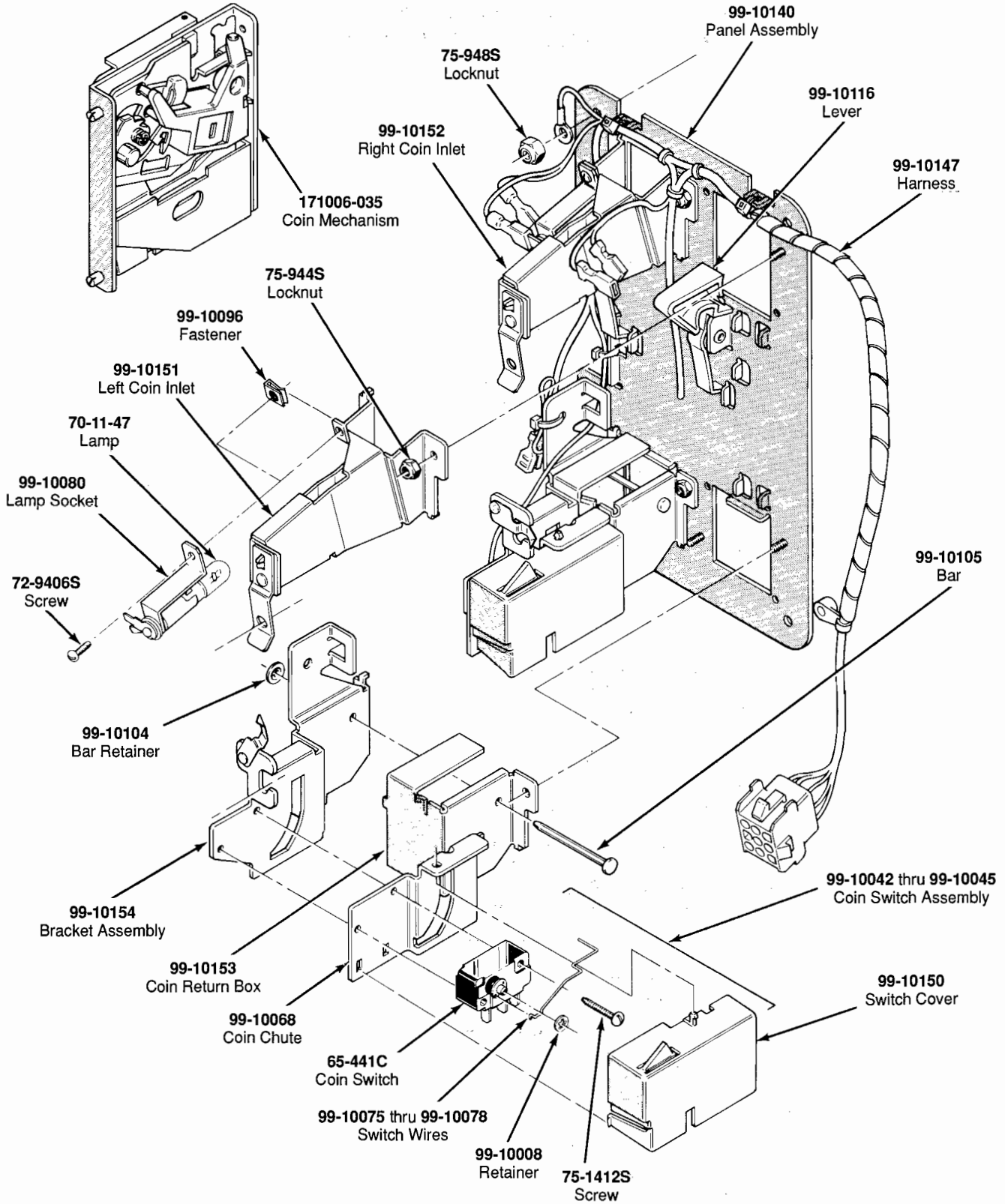
Part No.	Description
A042384-01	Line Filter Assembly
A043367-01	Jumper Assembly
A043367-02	6-Inch Black Jumper Assembly
A043367-03	6-Inch White Jumper Assembly
A043909-01	5 V Harness Assembly
46-2012002	250 V Slow-Blow 2 A Fuse
46-2013002	250 V Slow-Blow 3 A Fuse
72-HA4606S	#6-32 × 3/8-Inch Cross-Recessed Pan-Head Thread-Forming Screw
72-HA4806S	#8-32 × 3/8-Inch Cross-Recessed Pan-Head Thread-Forming Screw
034544-01	Fuse Block Cover
037640-01	Power Supply Warning Label
043396-01	Power Supply Chassis Base
043622-01	Power Supply Fuse Label
142047-001	Transformer
149003-003	Hitron 5 V 10 A Switching Power Supply Subassembly
179225-2205	5-Position Fuse Block (Acceptable substitute is part no. 79-3206)
179231-002	2-Position Terminal Block

**Hitron 5-Volt Power Supply Sub-Assembly  
Model HSA-122B(S) Parts List**

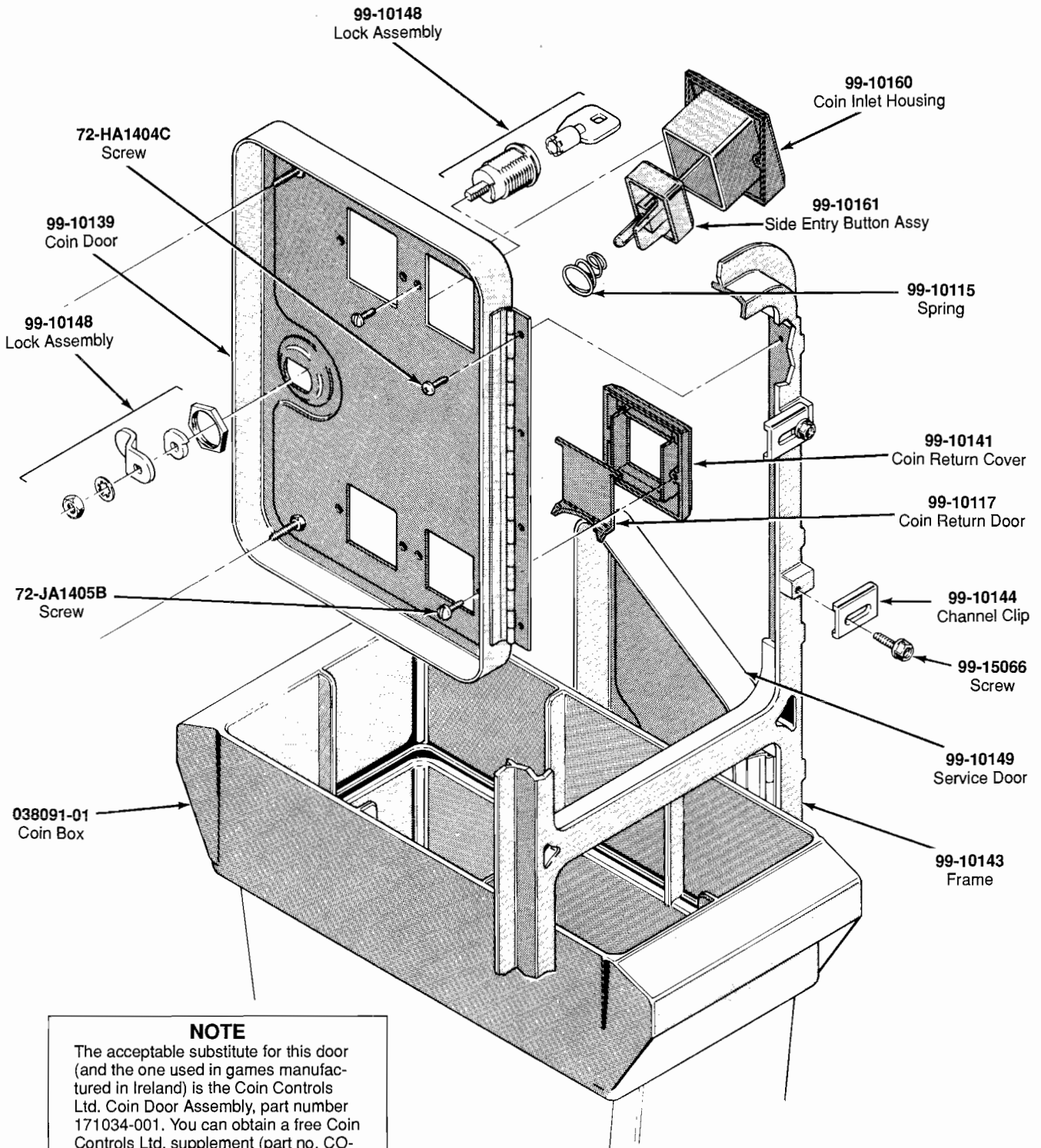
Designator	Description	Part No.
<b>Capacitors</b>		
C1	Capacitor, Metal Film, 0.047 μF, 250 V	99-211036
C2	Capacitor, Metal Film, 0.1 μF, 400 V	99-211038
C3, C4	Capacitor, Ceramic, 4700 μF, 400 V	99-211049
C5, C6	Capacitor, Electrolytic, 100 μF, 200 V	99-211046
C7	Capacitor, Metal Film, 0.1 μF, 400 V	99-211038
C8	Capacitor, Ceramic, 0.001 μF, 2 kV	99-211042
C9	Capacitor, Ceramic, 0.01 μF, 1 kV, Z5U	99-211041
C10	Capacitor, Electrolytic, 220 μF, 25 V	99-211045
C11	Capacitor, Metal Film, 0.22 μF, 100 V	99-211037
C12	Capacitor, Metal Film, 0.022 μF, 100 V	99-211039
C13	Capacitor, Metal Film, 0.22 μF, 100 V	99-211037
C14	Capacitor, Ceramic, 1800 PF, 2 kV, Z5 V	99-211040
C17	Capacitor, Electrolytic, 470 μF, 25 V	99-211044
C19	Capacitor, Electrolytic, 2200 μF, 16 V	99-211048
C20	Capacitor, Electrolytic, 1000 μF, 25 V	99-211047
C21	Capacitor, Ceramic, 470 PF, 1 kV, Z5P	99-211043
C22	Capacitor, Electrolytic, 2200 μF, 16 V	99-211048
C23	Capacitor, Electrolytic, 1000 μF, 25 V	99-211047
C24	Capacitor, Electrolytic, 2200 μF, 16 V	99-211048
<b>Diodes</b>		
D1, D2	Diode, Fast Recovery, RPG10K	99-211010
D3	Diode, Fast Recovery, RPG15B	99-211011
D4	Diode, Fast Recovery, RPG10B	99-211009
D5-D7	Diode, Switching, 1N4148	99-211012

**Hitron 5-Volt Power Supply Sub-Assembly  
Model HSA-122B(S) Parts List, Continued**

<b>Designator</b>	<b>Description</b>	<b>Part No.</b>
D9	Diode, Fast Recovery, 30DF1	99-211006
D11, D12	Diode, Schottky, S10SC4M	99-211005
D13-D16	Diode, Rectifier, 1N4006	99-211008
<b>Inductors</b>		
L1	Inductor, 15 mH	99-211052
L3	Inductor, 7 $\mu$ H (Acceptable substitute is part no. 99-211051)	99-211050
L4	Inductor, 2.2 $\mu$ H	99-211054
L5	Inductor, 1.5 mH	99-211053
<b>Resistors</b>		
R1, R2	Resistor, Carbon Film, 180 k $\Omega$ , $\pm$ 5%, 1 W	99-211034
R3	Resistor, Wirewound, 120 $\Omega$ , $\pm$ 5%, 2 W	99-211019
R4	Resistor, Wirewound, 0.47 $\Omega$ , $\pm$ 5%, 2 W	99-211018
R5	Resistor, Wirewound, 33 $\Omega$ , $\pm$ 5%, 2 W	99-211017
R6, R7	Resistor, Carbon Film, 5.6 $\Omega$ , $\pm$ 5%, 1/4 W	99-211027
R8	Resistor, Wirewound, 0.47 $\Omega$ , $\pm$ 5%, 2 W	99-211018
R9	Resistor, Carbon Film, 10 $\Omega$ , $\pm$ 5%, 1/4 W	99-211029
R10	Resistor, Carbon Film, 1 k $\Omega$ , $\pm$ 5%, 1/4 W	99-211032
R11	Resistor, Carbon Film, 47 $\Omega$ , $\pm$ 5%, 1/4 W	99-211025
R12	Resistor, Carbon Film, 5.6 $\Omega$ , $\pm$ 5%, 1/4 W	99-211027
R13	Resistor, Carbon Film, 330 $\Omega$ , $\pm$ 5%, 1/4 W	99-211026
R14	Resistor, Carbon Film, 270 $\Omega$ , $\pm$ 5%, 1/2 W	99-211023
R15	Resistor, Carbon Film, 330 $\Omega$ , $\pm$ 5%, 1/2 W	99-211022
R16	Resistor, Carbon Film, 8.2 $\Omega$ , $\pm$ 5%, 1/4 W	99-211028
R17, R18	Resistor, Carbon Film, 56 $\Omega$ , $\pm$ 5%, 1/4 W	99-211031
R19	Resistor, Carbon Film, 39 $\Omega$ , $\pm$ 5%, 1/4 W	99-211030
R20	Resistor, Carbon Film, 2 k $\Omega$ , $\pm$ 5%, 1/4 W	99-211035
R21	Resistor, Carbon Film, 470 $\Omega$ , $\pm$ 5%, 1/4 W	99-211024
R22	Resistor, 2.2 k $\Omega$ , $\pm$ 2%, 1/4 W	99-211021
R23	Resistor, Metal Film, 2 k $\Omega$ , $\pm$ 2%, 1/4 W	99-211033
R25	Resistor, Carbon Film, 10 $\Omega$ , $\pm$ 5%, 1/4 W	99-211029
R26	Resistor, Wirewound, 50 $\Omega$ , $\pm$ 5%, 2 W	99-211015
R27	Resistor, Carbon Film, 47 $\Omega$ , $\pm$ 5%, 1/4 W	99-211025
R31	Resistor, Wirewound, 150 $\Omega$ , $\pm$ 5%, 2 W	99-211016
<b>Transistors</b>		
Q1	Transistor, NPN, 2SC1413A	99-211002
Q3	Transistor, NPN, PE8050B	99-211003
Q3	Transistor, PNP, PE8550B	99-211004
<b>Miscellaneous</b>		
F1	Fuse, 2 A, 250 V, SEMKO	99-211058
IC1	Regulator, UA431AWC	99-211001
SCR1	Thyristor, SCR	99-211013
T1	Transformer	99-211055
TR1	Thermistor, 0.5 $\Omega$ , $\pm$ 5%, 5 W	99-211020
VR1	Potentiometer, Trimming, 3 k $\Omega$	99-211014
ZD1	Diode, Zener, 1N752A	99-211007
	Fuse, 2 A, 250 V	99-211056
	Fuse Holder, 6.35 mm	99-211060
	Terminal Block, 8 Ckt	99-211057
	Heat Sink	99-211059
	Heat Sink, 1.5 mm	99-211061



**Figure 5-5 Coin Acceptors, Inc. Coin Door Assembly  
171027-001 A**



**Figure 5-5 Coin Acceptors, Inc. Coin Door Assembly, Continued**  
171027-001 A

## Coin Acceptors, Inc. Coin Door Assembly Parts List

Part No.	Description
65-441C	Coin Switch
70-11-47	Miniature Bayonet Lamp
72-9406S	#4-40 × ¼-Inch Truss-Head Screw
72-HA1404C	#4-40 × ¼-Inch Pan-Head Screw
72-JA1405B	#4-40 × 0.31-Inch Pan-Head Screw
75-1412S	#4-40 × ¼-Inch Pan-Head Screw
75-994S	#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 99-10043)
99-10076	Switch Wire (included in coin switch assembly 99-10042)
99-10077	Switch Wire (included in coin switch assembly 99-10044)
99-10078	Switch Wire (included in coin switch assembly 99-10045)
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
99-10139	Coin Door
99-10140	Coin Door Inner-Panel Assembly
99-10141	Die-Cast Coin Return Cover
99-10143	Coin Door Frame
99-10144	Channel Clip
99-10147	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
99-10160	1"-Wide Die-Cast Coin Inlet Housing
99-10161	25¢ Amber Side-Entry Button Assembly
99-15066	Screw for Clamp
171006-035	Metal Coin Mechanism for U.S. 25¢

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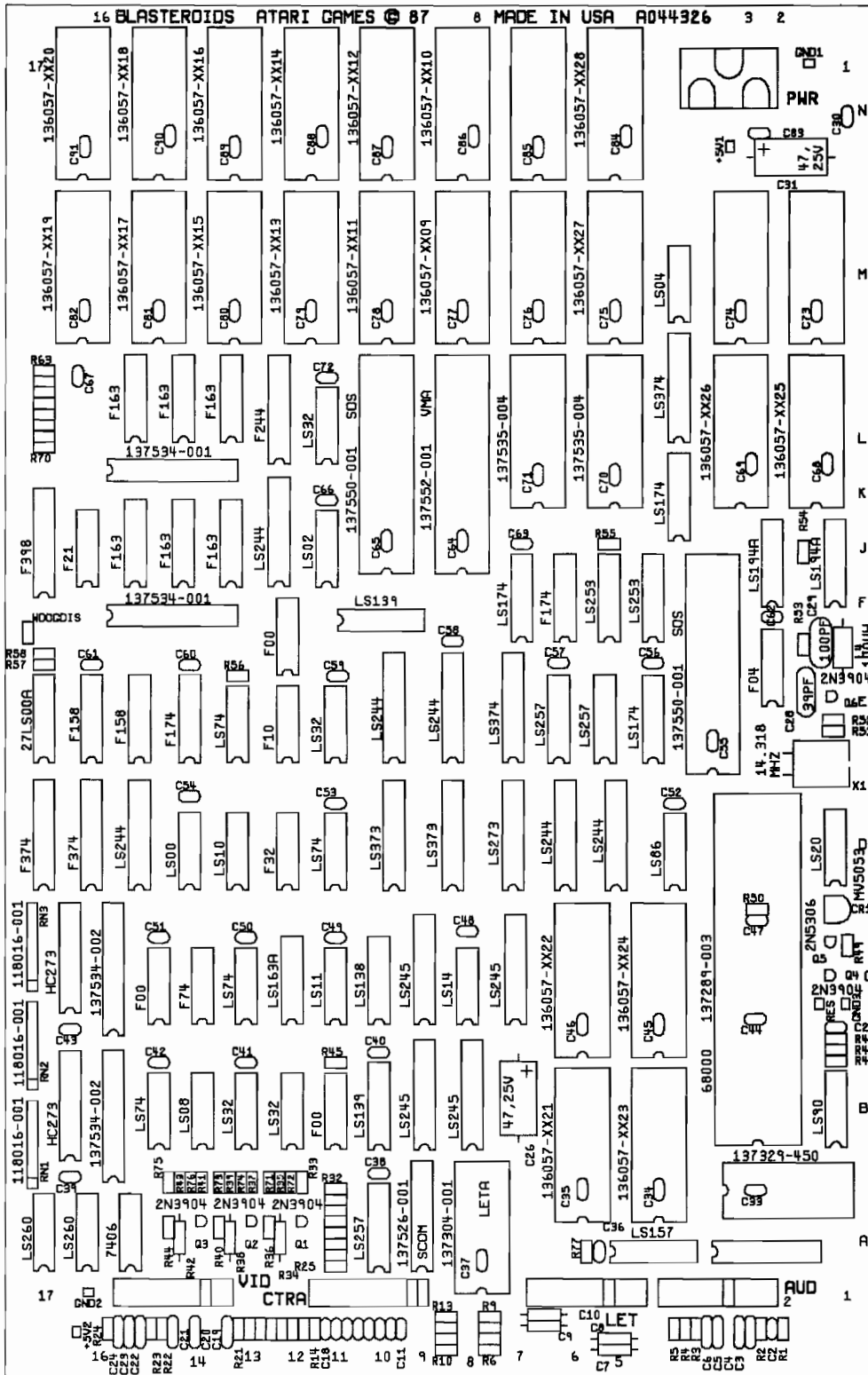


Figure 5-6 Blasteroids Game PCB Assembly  
A044326-21 C



## Blasteroids Game PCB Assembly Parts List

Designator	Description	Part No.
<b>Integrated Circuits</b>		
1B	IC, 74LS90	37-74LS90
1D	IC, 74LS20	37-74LS20
1J	IC, 74LS194 A	37-74LS194
1L	IC, 1M Bit Mask ROM, LH231000	136057-1125
2A/B	IC, 2804 A-45, 450 nsec	137329-450
2C	IC, 68000, 8 Mhz	137289-003
2E/F	IC, 74F04	137437-001
2J	IC, 74LS194 A	37-74LS194
3F	IC, SOS	137550-001
3L	IC, 1M Bit Mask ROM, LH231000	136057-1126
4A	IC, 74LS157	37-74LS157
4B	IC, EPROM, 27512-300	136057-2122
4C	IC, EPROM, 27512-300	136057-2124
4D	IC, 74LS86	37-74LS86
4E	IC, 74LS174	37-74LS174
4F	IC, 74LS253	37-74LS253
4K	IC, 74LS174	37-74LS174
4L	IC, 74LS374	37-74LS374
4M	IC, 74LS04	37-74LS04
5D	IC, 74LS244	37-74LS244
5E	IC, 74LS257	37-74LS257
5F	IC, 74LS253	37-74LS253
5L	IC, 6264-10, 100 nsec	137535-004
5M	IC, 1M Bit Mask ROM, LH231000	136057-1127
6/7L	IC, 6264-10, 100 nsec	137535-004
6B	IC, EPROM, 27512-300	136057-2121
6C	IC, EPROM, 27512-300	136057-2123
6D	IC, 74LS244	37-74LS244
6E	IC, 74LS257	37-74LS257
6F	IC, 74F174	137531-001
7C	IC, 74LS245	37-74LS245
7D	IC, 74LS273	37-74LS273
7E	IC, 74LS374	37-74LS374
7F	IC, 74LS174	37-74LS174
8A	IC, Leta	137304-1001
8B	IC, 74LS245	37-74LS245
8C	IC, 74LS14	37-74LS14
8D	IC, 74LS373	37-74LS373
8E	IC, 74LS244	37-74LS244
8K	IC, Vmatch	137552-001
8M	IC, EPROM, 27512-250	136057-1109
8N	IC, EPROM, 27512-250	136057-1110
9A	IC, SCOM	137526-001
9B, 9C	IC, 74LS245	37-74LS245

**Blasteroids Game PCB Assembly  
Parts List, Continued**

<b>Designator</b>	<b>Description</b>	<b>Part No.</b>
10A	IC, 74LS257	37-74LS257
10B	IC, 74LS139	37-74LS139
10C	IC, 74LS138	137177-001
10D	IC, 74LS373	37-74LS373
10E	IC, 74LS244	37-74LS244
10F	IC, 74LS139	37-74LS139
10K	IC, SOS	137550-001
10M	IC, EPROM, 27512-250	136057-1111
10N	IC, EPROM, 27512-250	136057-1112
11B	IC, 74F00	137327-001
11C	IC, 74LS11	137149-001
11D	IC, 74LS74	37-74LS74
11E	IC, 74LS32	37-74LS32
11J	IC, 74LS02	37-74LS02
11L	IC, 74LS32	37-74LS32
11M	IC, EPROM, 27512-250	136057-1113
11N	IC, EPROM, 27512-250	136057-1114
12B	IC, 74LS32	37-74LS32
12C	IC, 74LS163 A	37-74LS163A
12D	IC, 74F32	137486-001
12E	IC, 74F10	137428-001
12F	IC, 74F00	137327-001
12J	IC, 74LS244	37-74LS244
12L	IC, 74F244	137502-001
13B	IC, 74LS32	37-74LS32
13C	IC, 74LS74	37-74LS74
13D	IC, 74LS10	37-74LS10
13E	IC, 74LS74	37-74LS74
13J, 13L	IC, 74F163	137345-001
13M	IC, EPROM, 27512-250	136057-1115
13N	IC, EPROM, 27512-250	136057-1116
14/15B	IC, 74LS74	37-74LS74
14/15C	IC, 74F00	137327-001
14/15M	IC, EPROM, 27512-250	136057-1117
14/15N	IC, EPROM, 27512-250	136057-1118
14B	IC, 74LS08	37-74LS08
14C	IC, 74F74	137436-001
14D	IC, 74LS00	37-74LS00
14E	IC, 74F174	137531-001
14F	IC, RAM, 2KX8, 35 nsec	137534-001
14J	IC, 74F163	137345-001
14K	IC, RAM, 2KX8, 35 nsec (Acceptable substitutes are part nos. 137533-002, 137534-201, and 137534-301.)	137534-001
14L	IC, 74F163	137345-001
15/16B, 15/16C	IC, RAM, 2KX8, 45 nsec (Acceptable substitutes are part nos. 137533-001, 137534-202, and 137534-302.)	137534-002
15A	IC, 7406	37-7406
15D	IC, 74LS244	37-74LS244

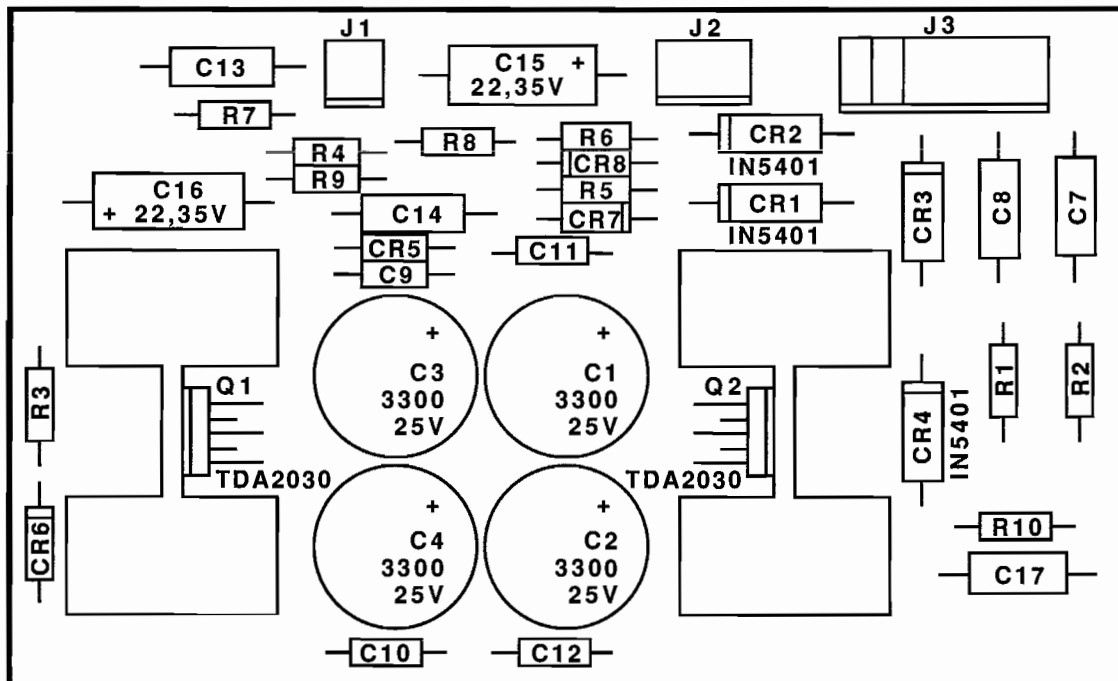
### Blasteroids Game PCB Assembly Parts List, Continued

Designator	Description	Part No.
15E	IC, 74F158	137326-001
15J, 15L	IC, 74F163	137345-001
16/17B, 16/17C	IC, 74HC273	137556-001
16A	IC, 74LS260	137332-001
16D	IC, 74F374	137420-001
16E	IC, 74F158	137326-001
16J	IC, 74F21	137555-001
16M	IC, EPROM, 27512-250	136057-1119
16N	IC, EPROM, 27512-250	136057-1120
17A	IC, 74LS260	137332-001
17D	IC, 74F374	137420-001
17E	IC, 27LS00 A (Acceptable substitute is part no. 137175-002 )	137170-003
17J	IC, 74F398	137557-001
<b>Capacitors</b>		
C2	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C3-C6	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C7-C10	Capacitor, .01 $\mu$ F, 50 V, Ceramic	122002-103
C11-C18	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C19-C21	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C22-C24	Capacitor, .001 $\mu$ F, 50 V, Ceramic	122002-102
C26	Capacitor, 47 $\mu$ F, 25 V, Electrolytic	24-250476
C27	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C28	Capacitor, 39 pF, 100 V, Mica	128002-390
C29	Capacitor, 100 pF, 100 V, Mica	128002-101
C30	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C31	Capacitor, 47 $\mu$ F, 25 V, Electrolytic	24-250476
C33-C91	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
<b>Inductor</b>		
L4	Inductor, 100 $\mu$ H	41-3003
<b>Transistors</b>		
Q1-Q4	Transistor, 2N3904	34-2N3904
Q5	Transistor, 2N5306	133033-001
Q6	Transistor, 2N3904	34-2N3904
<b>Resistors</b>		
R1	Resistor, 1 K , $\pm$ 5%, 1/8 W	110027-102
R2-R5	Resistor, 470 , $\pm$ 5%, 1/8 W	110027-471
R6-R9	Resistor, 1 K , $\pm$ 5%, 1/8 W	110027-102
R10-R13	Resistor, 3.3 K , $\pm$ 5%, 1/8 W	110027-332
R14-R24	Resistor, 470 , $\pm$ 5%, 1/8 W	110027-471
R25-R32	Resistor, 1 K , $\pm$ 5%, 1/8 W	110027-102
R33	Resistor, 2.4 K , $\pm$ 5%, 1/8 W	110027-242
R34	Resistor, 68 , $\pm$ 5%, 1/4 W	110000-680
R35	Resistor, 1.5 K , $\pm$ 5%, 1/8 W	110027-152
R36	Resistor, 10 , $\pm$ 5%, 1/8 W	110027-100

### Blasteroids Game PCB Assembly Parts List, Continued

Designator	Description	Part No.
R37	Resistor, 2.4 K , ±5%, 1/8 W	110027-242
R38	Resistor, 68 ±5%, 1/4 W	110000-680
R39	Resistor, 1.5 K , ±5%, 1/8 W	110027-152
R40	Resistor, 10 , ±5%, 1/8 W	110027-100
R41	Resistor, 2.4 K , ±5%, 1/8 W	110027-242
R42	Resistor, 68 , ±5%, 1/4 W	110000-680
R43	Resistor, 1.5 K , ±5%, 1/8 W	110027-152
R44	Resistor, 10 , ±5%, 1/8 W	110027-100
R45	Resistor, 1 K , ±5%, 1/8 W	110027-102
R46	Resistor, 10 K , ±5%, 1/8 W	110027-103
R47	Resistor, 1 K , ±5%, 1/8 W	110027-102
R48	Resistor, 100 K , ±5%, 1/8 W	110027-104
R49	Resistor, 240 , ±5%, 1/8 W	110027-241
R50	Resistor, 1 K , ±5%, 1/8 W	110027-102
R51, R52	Resistor, 10 K , ±5%, 1/8 W	110027-103
R53	Resistor, 390 , ±5%, 1/8 W	110027-391
R54-R58, R63-R71	Resistor, 1 K , ±5%, 1/8 W	110027-102
R72	Resistor, 47 , ±5%, 1/8 W	110027-470
R73	Resistor, 1 K , ±5%, 1/8 W	110027-102
R74	Resistor, 47 , ±5%, 1/8 W	110027-470
R75	Resistor, 1 K , ±5%, 1/8 W	110027-102
R76	Resistor, 47 , ±5%, 1/8 W	110027-470
R77	Resistor, 1 K , ±5%, 1/8 W	110027-102
<b>Connectors</b>		
AUD	Conn, 11 Ckt, Hdr, .100 Ctr, Key 5	179118-011
CTRA	Conn, 11 Ckt, Hdr, .100 Ctr, Key 2	179118-011
LET	Conn, 11 Ckt, Hdr, .100 Ctr, Key 4	179118-011
VID	Conn, 11 Ckt, Hdr, .100 Ctr, Key 3	179118-011
PWR	Conn, 6 Ckt, Hdr, .250 Ctr	179069-006
<b>Sockets</b>		
	Socket, 20 Pin	79-42C20
	Socket, 24 Pin	79-42C24
	Socket, 28 Pin	79-42C28
	Socket, 40 Pin	79-42C40
	Socket, 64 Pin	79-42C64
<b>Miscellaneous</b>		
CR1	Diode, Light Emitting, Type MV5053	38-MV5053
GND1-RES3	Test Point	179051-001
RN1-RN3	Resistor Network, R/2R	118016-001
RES	Test Point	179051-001
X1	Crystal, 14.318	144000-004

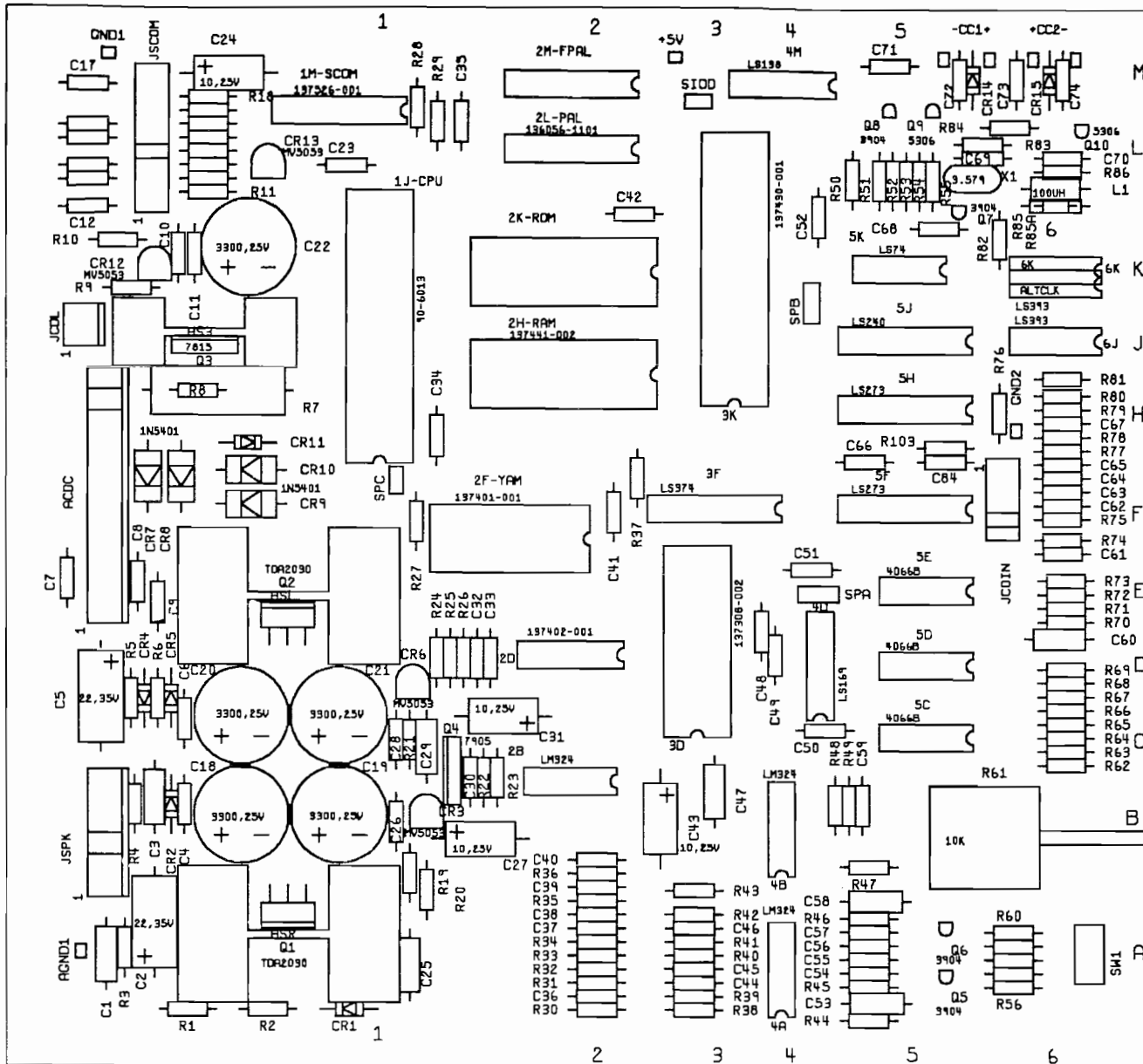
# N O T E S



**Figure 5-7 Housequake PCB Assembly  
A045050-01 A**

## Housequake PCB Assembly Parts List

Designator	Description	Part No.
<b>Capactors</b>		
C1-C4	Capacitor, 3300 $\mu$ F, 25 V, Electrolytic	123003-338
C7, C8	Capacitor, .22 $\mu$ F, 50 V, Ceramic	122015-224
C9-C12	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C13, C14	Capacitor, .22 $\mu$ F, 50 V, Ceramic	122015-224
C15, C16	Capacitor, 22 $\mu$ F, 35 V	24-350226
C17	Capacitor, .0068 $\mu$ F, 50 V, Ceramic	122015-682
<b>Diodes</b>		
CR1-CR4	Diode, 1N5401	31-1N5401
CR5-CR8	Diode, 1N4001	31-1N4001
<b>Integrated Circuit</b>		
Q1, Q2	IC, TDA2030	137301-001
<b>Resistors</b>		
R1, R2	Resistor, 22 K , $\pm$ 5%, 1/4 W	110000-223
R3-R5	Resistor, 10 K , $\pm$ 5%, 1/4 W	110000-103
R6	Resistor, 1 K , $\pm$ 5%, 1/4 W	110000-102
R7, R8	Resistor, 1 , $\pm$ 5%, 1/4 W	110000-010
R9	Resistor, 1 K , $\pm$ 5%, 1/4 W	110000-102
R10	Resistor, 910 , $\pm$ 5%, 1/4 W	110000-911
<b>Connectors</b>		
J1	Connector, 2 Circuit, Header, 0.156-Inch Ctr	179213-002
J2	Connector, 3 Circuit, Header, 0.156-Inch Ctr	179213-003
<b>Miscellaneous</b>		
	Heat Sink, TDA2030	178190-032
IC1	Nut/Washer Assembly, #6-32	75-99516
IC1	Pan Head Screw, #6-32	72-1606S
	Nut/Washer Assembly, #6-32	75-99516
	Pan Head Screw, #6-32	72-1606S
IC1,2	Thermal Compound	78-16001
C1-4	Hot Melt Adhesive	106006-001



**Figure 5-8 Stand-Alone Audio PCB Assembly  
A043713-22 A**



## Stand-Alone Audio PCB Assembly Parts List

Designator	Description	Part No.
<b>Integrated Circuits</b>		
1J-CPU	Integrated Circuit, 6502A	90-6013
1M-SCOM	Integrated Circuit, SCOM	137526-001
2B	Integrated Circuit, LM324	37-LM324
2D	Integrated Circuit, YM3012	137402-001
2F-YAM	Integrated Circuit, YM2151	137401-001
2H-RAM	Integrated Circuit, 6264-15, 150 ns	137441-002
2K-ROM	Integrated Circuit, 27512, 300 ns	136057-1135
2L-PAL	Integrated Circuit, Programmed PAL16L8A, 25 ns	136056-2101
3F	Integrated Circuit, 74LS374	37-74LS374
4A, 4B	Integrated Circuit, LM324	37-LM324
4M	Integrated Circuit, 74LS138	137177-001
5C, 5D	Integrated Circuit, 4066B	37-4066
5F, 5H	Integrated Circuit, 74LS273	37-74LS273
5J	Integrated Circuit, 74LS240	137251-001
5K	Integrated Circuit, 74LS74	37-74LS74
6J	Integrated Circuit, 74LS393	37-74LS393
ALTCLK	Integrated Circuit, 74LS393	37-74LS393
Q1, Q2	Integrated Circuit, TDA2030	137301-001
Q4	Integrated Circuit, 7905, Standup	37-7905
<b>Capacitors</b>		
C1	Capacitor, .22 $\mu$ F, 50 V, Ceramic	122015-224
C2	Capacitor, 22 $\mu$ F, 35 V, Electrolytic	24-350226
C3	Capacitor, .22 $\mu$ F, 50 V, Ceramic	122015-224
C4	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C5	Capacitor, 22 $\mu$ F, 35 V, Electrolytic	24-350226
C6-C9	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C12	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C13-C16	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C17	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C18-C21	Capacitor, 3300 $\mu$ F, 25 V, Electrolytic, Radial	123003-338
C23	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C24	Capacitor, 10 $\mu$ F, 25 V, Electrolytic	24-250106
C25	Capacitor, .22 $\mu$ F, 50 V, Ceramic	122015-224
C26	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C27	Capacitor, 10 $\mu$ F, 25 V, Electrolytic	24-250106
C28	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C29	Capacitor, .22 $\mu$ F, 50 V, Ceramic	122015-224
C30	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C31	Capacitor, 10 $\mu$ F, 25 V, Electrolytic	24-250106
C32, C33	Capacitor, .001 $\mu$ F, 50 V, Ceramic	122002-102
C34, C35	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C38	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C41, C42	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C43	Capacitor, 10 $\mu$ F, 25 V, Electrolytic	24-250106

## Stand-Alone Audio PCB Assembly Parts List

Designator	Description	Part No.
C48-C52	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C53	Capacitor, .0022 $\mu$ F, 50 V, Axial Ceramic	122015-222
C54	Capacitor, .0027 $\mu$ F, 50 V, Ceramic	122015-272
C55	Capacitor, .001 $\mu$ F, 50 V, Ceramic	122002-102
C56	Capacitor, .0027 $\mu$ F, 50 V, Ceramic	122015-272
C57	Capacitor, .001 $\mu$ F, 50 V, Ceramic	122002-102
C58	Capacitor, .0022 $\mu$ F, 50 V, Axial Ceramic	122015-222
C61-C68	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C69	Capacitor, 39 pF, 100 V, Ceramic	122016-390
C70	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C71-C74	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
C84	Capacitor, .1 $\mu$ F, 50 V, Ceramic	122002-104
<b>Diodes</b>		
CR1, CR2	Diode, 1N4001	31-1N4001
CR3	Diode, MV5053, Light Emitting	38-MV5053
CR4, CR5	Diode, 1N4001	31-1N4001
CR6	Diode, MV5053, Light Emitting	38-MV5053
CR7-CR10	Diode, 1N5401	31-1N5401
CR13	Diode, MV5053, Light Emitting	38-MV5053
CR14, CR15	Diode, 1N4001	31-1N4001
<b>Inductor</b>		
L1	Inductor, 100 $\mu$ H	41-3003
<b>Resistors</b>		
R1	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R2	Resistor, 10 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-103
R3, R4	Resistor, 1 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-010
R5	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R6	Resistor, 10 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-103
R10	Resistor, 0 $\Omega$ , $\frac{1}{4}$ W	110005-001
R11	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R12	Resistor, 470 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-471
R13	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R14	Resistor, 470 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-471
R15	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R16	Resistor, 470 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-471
R17, R18	Resistor, 10 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-103
R19	Resistor, 22 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-223
R20	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R21	Resistor, 22 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-223
R22	Resistor, 10 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-100
R23	Resistor, 560 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-561
R24	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R26, R27	Resistor, 10 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-100
R28	Resistor, 10 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-103
R29	Resistor, 1 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-102
R33, R34	Resistor, 470 $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-471
R35	Resistor, 75 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-753
R36, R37	Resistor, 10 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-103
R38	Resistor, 47 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-473
R43-R48	Resistor, 12 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-123
R49	Resistor, 10 k $\Omega$ , $\pm$ 5%, $\frac{1}{4}$ W	110000-103

## Stand-Alone Audio PCB Assembly Parts List

Designator	Description	Part No.
R50	Resistor, 1 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-102
R51	Resistor, 10 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-103
R52	Resistor, 10 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-103
R53, R54	Resistor, 1 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-102
R55, R56	Resistor, 150 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-154
R58	Resistor, 1 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-102
R59	Resistor, 150 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-154
R60	Resistor, 1 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-102
R61	Resistor Pot, 10 k $\Omega$ , Horizontal, Dual	119011-103
R62	Resistor, 7.5 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-752
R63	Resistor, 30 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-303
R64	Resistor, 15 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-153
R65, R66	Resistor, 12 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-123
R67	Resistor, 15 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-153
R68	Resistor, 30 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-303
R69	Resistor, 7.5 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-752
R74-R81	Resistor, 1 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-102
R82	Resistor, 470 $\Omega$ , $\pm$ 5%, 1/4 W	110000-471
R83	Resistor, 150 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-154
R84	Resistor, 0 $\Omega$ , 1/4 W	110005-001
R85A	Resistor, 470 $\Omega$ , $\pm$ 5%, 1/4 W	110000-471
R86	Resistor, 220 $\Omega$ , $\pm$ 5%, 1/4 W	110000-221
R103	Resistor, 150 k $\Omega$ , $\pm$ 5%, 1/4 W	110000-154
<b>Transistors</b>		
Q5-Q8	Transistor, 2N3904	34-2N3904
Q9, Q10	Transistor, 2N5306	133033-001
<b>Connectors</b>		
JACDC	Connector, 12 Ckt., Header, .156-Inch Ctr., Key 11	179213-012
JCDL	Connector, 2 Ckt., Header, .156-Inch Ctr.	179213-002
JCOIN	Connector, 6 Ckt., Header, .100-Inch Ctr., Key 2	179118-006
JSCOM	Connector, 11 Ckt., Header, .100-Inch Ctr., Key 5	179118-011
JSPK	Connector, 6 Ckt., Header, .156-Inch Ctr., Key 3	179213-006
<b>Sockets</b>		
1J-CPU	Socket, Medium-Insertion-Force IC, 40-Contact	79-42C40
2D	Socket, Medium-Insertion-Force IC, 16-Contact	79-42C16
2F-YAM	Socket, Medium-Insertion-Force IC, 24-Contact	79-42C24
2H-RAM	Socket, Medium-Insertion-Force IC, 28-Contact	79-42C28
2K-ROM	Socket, Medium-Insertion-Force IC, 28-Contact	79-42C28
<b>Miscellaneous</b>		
HSL	Heat Sink, TDA2030	178190-032
Q1	Nut/Washer Assy, #6-32	75-99516
Q1	Screw, Pan-Head, Cross-Recessed, #6-32 $\times$ 3/8-Inch	72-1606S
Q1, Q2	Compound, Thermal	78-16001
SW1	Switch, Self-Test, Slide, SPDT	69-004
	Adhesive, Hot Melt	106006-001
	Test Point	179051-001

N O T E S

# Blasteroids

Date: \_\_\_\_\_

## Coin Information and Game Statistics

Left Coins	_____	Number of coins deposited in the left coin mechanism.
Right Coins	_____	Number of coins deposited in the right coin mechanism.
New Games	_____	Number of new games started.
Continuation	_____	Number of times players continued their games.
0 Mins	_____	Minutes of idle time.
1 Mins	_____	Minutes played as a one-person game.
2 Mins	_____	Minutes played as a two-person game.
Red Mins	_____	Minutes played on the red side.
Green Mins	_____	Minutes played on the green side.
Sessions	_____	Total number of games played.
Error Count	_____	EEROM errors detected.
Total Coins	_____	Number of coins deposited in both coin mechanisms.
Avg Time/Coin	_____	Average game time per coin, in seconds.

## New Game Times Histogram Information

Easy Level		Medium Level		Hard Level	
Length in Seconds	Number of Games	Length in Seconds	Number of Games	Length in Seconds	Number of Games
0-39	_____	0-39	_____	0-39	_____
40-59	_____	40-59	_____	40-59	_____
60-79	_____	60-79	_____	60-79	_____
80-99	_____	80-99	_____	80-99	_____
100-119	_____	100-119	_____	100-119	_____
120-139	_____	120-139	_____	120-139	_____
140-159	_____	140-159	_____	140-159	_____
160-179	_____	160-179	_____	160-179	_____
180-199	_____	180-199	_____	180-199	_____
200-219	_____	200-219	_____	200-219	_____
220-239	_____	220-239	_____	220-239	_____
240-259	_____	240-259	_____	240-259	_____
260-279	_____	260-279	_____	260-279	_____
280-299	_____	280-299	_____	280-299	_____
300-319	_____	300-319	_____	300-319	_____
320-339	_____	320-339	_____	320-339	_____
340-359	_____	340-359	_____	340-359	_____
360-379	_____	360-379	_____	360-379	_____
380-399	_____	380-399	_____	380-399	_____
400 & up	_____	400 & up	_____	400 & up	_____

## Continuation Times Histogram Information

Easy Level		Medium Level		Hard Level	
Length in Seconds	Number of Games	Length in Seconds	Number of Games	Length in Seconds	Number of Games
0-39	_____	0-39	_____	0-39	_____
40-59	_____	40-59	_____	40-59	_____
60-79	_____	60-79	_____	60-79	_____
80-99	_____	80-99	_____	80-99	_____
100-119	_____	100-119	_____	100-119	_____
120-139	_____	120-139	_____	120-139	_____
140-159	_____	140-159	_____	140-159	_____
160-179	_____	160-179	_____	160-179	_____
180-199	_____	180-199	_____	180-199	_____
200-219	_____	200-219	_____	200-219	_____
220-239	_____	220-239	_____	220-239	_____
240-259	_____	240-259	_____	240-259	_____
260-279	_____	260-279	_____	260-279	_____
280-299	_____	280-299	_____	280-299	_____
300-319	_____	300-319	_____	300-319	_____
320-339	_____	320-339	_____	320-339	_____
340-359	_____	340-359	_____	340-359	_____
360-379	_____	360-379	_____	360-379	_____
380-399	_____	380-399	_____	380-399	_____
400 & up	_____	400 & up	_____	400 & up	_____

### Session Time in Minutes

Length in Seconds	Number of Games	Length in Seconds	Number of Games	Length in Seconds	Number of Games
0-9	_____	40-44	_____	75-79	_____
10-14	_____	44-49	_____	80-84	_____
15-19	_____	50-54	_____	85-89	_____
20-24	_____	55-59	_____	90-94	_____
25-29	_____	60-64	_____	95-99	_____
30-34	_____	65-69	_____	100 & up	_____
35-39	_____	70-74	_____		

# 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 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 a 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 1 or 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 electromechanical 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**

Electromagnetic 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 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 +5VDC

**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**

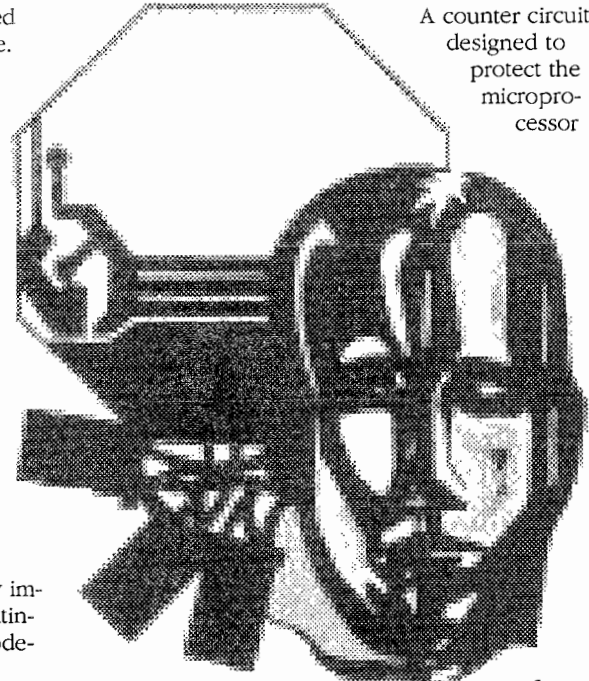
The process of locating and repairing a fault.

**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.







# Warranty

Seller warrants that its printed-circuit boards and parts thereon are free from defects in material and workmanship under normal use and service for a period of ninety (90) days from date of shipment. Seller warrants that its video displays and laser-video disc players (in games supplied with displays and video-disc players) are free from defects in material and workmanship under normal use and service for a period of thirty (30) days from date of shipment. None of the Seller's other products or parts thereof are warranted.

If the products described in this manual fail to conform to this warranty, Seller's sole liability shall be, at its option, to repair, replace, or credit Buyer's account for such products which are returned to Seller during said warranty period, provided:

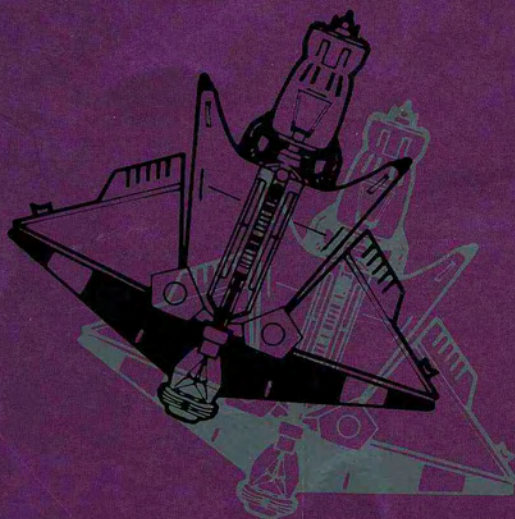
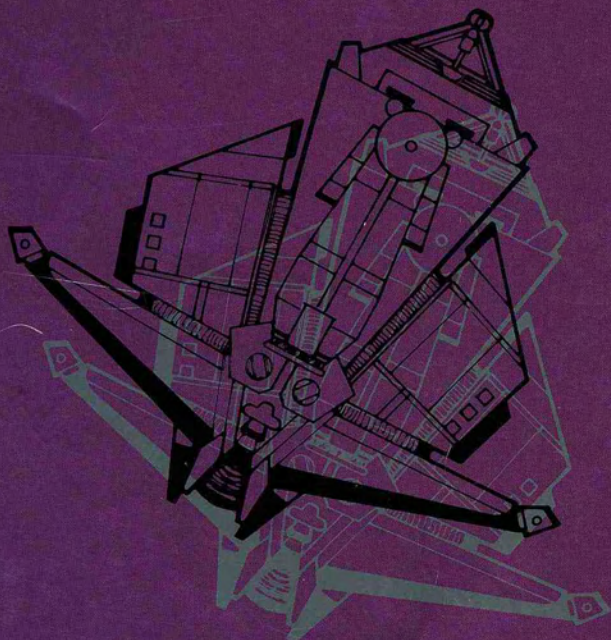
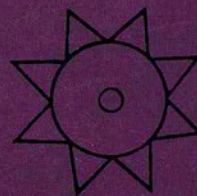
- (a) Seller is promptly notified in writing upon discovery by Buyer that said products are defective;
- (b) Such products are returned prepaid to Seller's plant; and
- (c) Seller's examination of said products discloses to Seller's satisfaction that such alleged defects existed and were not caused by accident, misuse, neglect, alteration, improper repair, installation, or improper testing.

In no event shall Seller be liable for loss of profits, loss of use, incidental or consequential damages.

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Atari Games Corporation  
675 Sycamore Drive  
P.O. Box 361110  
Milpitas, California 95035