

INDIANA JONES

and the
TEMPLE OF DOOM

Operators Manual with Illustrated Parts Lists




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INDIANA JONES

and the
TEMPLE OF DOOM

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Published by
Atari Games Corporation
1272 Borregas Avenue
P.O. Box 3618
Sunnyvale, California 94088

Printed in the U.S.A. **8P**

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 green 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.
- The game printed-circuit boards (PCB) are properly installed with the Electromagnetic Interference (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 throughout this manual where 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 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 grounded outlet. Players may receive an electrical shock if the control panel is not properly grounded! After servicing any parts on the control panel, check that the grounding clip is firmly secured to the metal tab on the inside of the control panel. Only then should you lock up the game.

AC Power Connection. Before connecting the game to the AC power source, verify that the proper voltage-selection plug is installed on the game's power supply.

Disconnect Power During Repairs. To avoid electrical shock, disconnect the game from the AC power source before removing or repairing any part of the game. When removing or repairing the video display, extra precautions **must** be taken to avoid electrical shock because high voltages may exist within the display circuitry and cathode-ray tube (CRT) even after power has been disconnected. Do not touch internal parts of the display with your hands or with metal objects! Always discharge the high voltage from the CRT before servicing this area of the game. To discharge the CRT: Attach one end of a large, well-insulated, 18-gauge jumper wire to ground. Momentarily touch the free end of the grounded jumper to the CRT anode by sliding it under the anode cap. Wait two minutes and discharge the anode again.

Use Only ATARI Parts. To maintain the safety integrity of your ATARI game, do not use non-ATARI parts when repairing the game. Use of non-ATARI parts or other modifications to the game circuitry may adversely affect the safety of your game, and injure you or your players.

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

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. Note that they are keyed to fit only one way. If they do not slip on easily, do not force them. A reversed connector may damage your game and void the warranty.

Ensure the Proper AC Line Frequency. Video games manufactured for operation on 60 Hz line power (i.e., United States) must not be operated in countries with 50 Hz line power (i.e., Europe). The fluorescent light ballast transformer will overheat, causing a potential fire hazard if 60 Hz games are operated on power lines using 50 Hz. Check the product identification label of your game for the line frequency required.

Installation

How to Use This Manual

This manual is written for game operators and service technicians and describes how to install, test, and maintain YOUR INDIANA JONES AND THE TEMPLE OF DOOM* game.

Your TEMPLE OF DOOM* game uses the Atari Games System I™ cabinet, which is designed to accept the necessary hardware to easily convert the System I cabinet into a variety of games. Consequently, this manual contains information that applies to those parts of your existing System I cabinet that are added or replaced to convert the cabinet for the TEMPLE OF DOOM game (see Figure 1-1). Information that applies to those parts of the System I cabinet that are common to all games is contained in a separate *System I Operators Manual* (TM-277), included with your System I cabinet. Where applicable, references are provided in this manual to the *System I Operators Manual*.

This manual contains the following information on the TEMPLE OF DOOM game:

- Chapter 1 provides a kit parts inventory, conversion instructions, inspection procedures, and option setting information.
- Chapter 2 provides self-test procedures (includes procedures for setting the coin and game options).
- Chapter 3 provides maintenance information for the Joystick Assembly and the player-start pushbutton switches.
- Chapter 4 provides game play information
- Chapter 5 provides illustrated parts lists for the control-panel assembly, Joystick Assembly, and TEMPLE OF DOOM Cartridge Printed-Circuit Board (PCB).

Wiring and schematic diagrams for the TEMPLE OF DOOM control panel and Cartridge PCB are contained in the SP-282 Schematic Package Supplement included with this manual. Refer to the Schematic Package Supplement included with the *System I Operators Manual* for the wiring and schematic diagrams that apply to the System I cabinet hardware.

Chapter 1

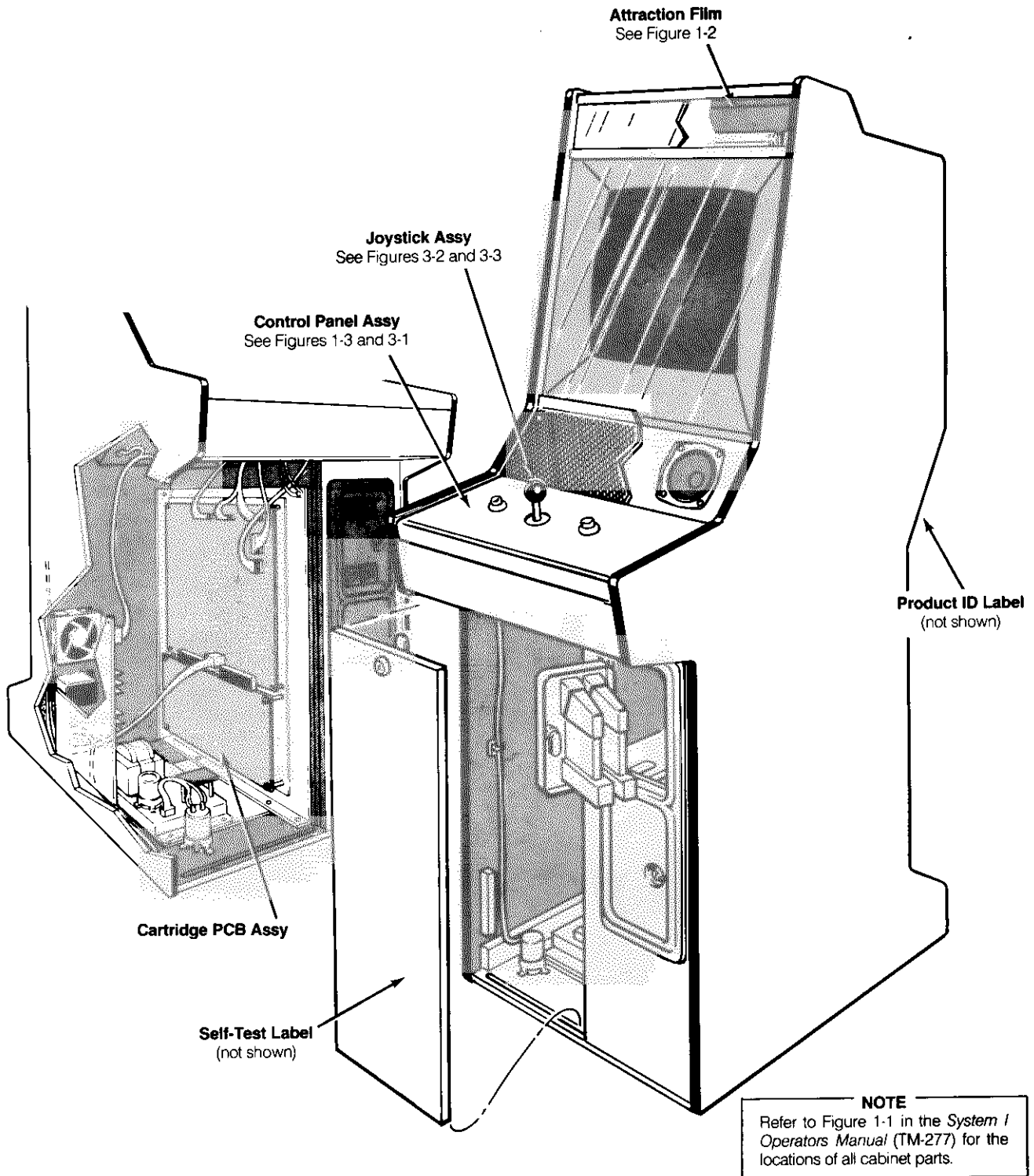


Figure 1-1 Conversion Kit Part Locations

Introduction

This chapter includes the instructions necessary for converting your existing System I game into a TEMPLE OF DOOM game. The conversion instructions include: (1) removing the existing attraction film, control panel, and Cartridge Printed-Circuit Board (PCB); and (2) installing a TEMPLE OF DOOM attraction film, Cartridge PCB, and control panel. Refer to Figure 1-1 for the locations of the parts of the System I cabinet that are replaced.

Kit Parts Inventory

The assemblies listed in Table 1-1 are included in the TEMPLE OF DOOM Conversion Kit. Refer to Chapter 5, Illustrated Parts Lists, for a description of the component parts comprising the control panel and Cartridge PCB assemblies listed in Table 1-1.

Tools Required

The only tools required to perform a complete TEMPLE OF DOOM game conversion are a Phillips screwdriver, and a 1/8-inch hex driver.

Conversion Instructions

WARNING

To avoid electrical shock, unplug the game before performing the conversion procedures.

**Table 1-1 Kit Parts Inventory
A043301-01**

Part No.	Quantity	Description
A043302-01	1	Control Panel Assembly
A043307-01	1	Cartridge PCB Assembly
038158-01	1	Product Identification Label (without UL logo)
		OR
038158-02	1	Product Identification Label (with UL logo)
043304-01	1	Attraction Film
SP-282	1	TEMPLE OF DOOM Schematic Package Supplement
ST-282	1	TEMPLE OF DOOM Self-Test Label
TM-282	1	TEMPLE OF DOOM Operators Manual

NOTE

The following conversion should be performed by qualified service personnel.

The following procedures are arranged in the sequence recommended for performing the game conversion. The parts of your cabinet that are affected by the conversion are removed first and then replaced by the new TEMPLE OF DOOM kit parts.

Replace the Attraction Film

Perform the following procedure to remove/replace the existing attraction film with the TEMPLE OF DOOM attraction film (see Figure 1-2).

1. Turn off the game power.
2. Use a 1/8-inch hex driver to remove the three screws and washers securing the upper retainer to the top of the cabinet.
3. Grasp the top edge of the existing attraction film behind the attraction shield and slide it up to remove.
4. Install the TEMPLE OF DOOM attraction film. Make sure the film is fully inserted into the bottom slot.
5. Replace the upper retainer.

Replace the Control Panel

Perform the following procedure to remove/replace the existing control panel with the TEMPLE OF DOOM control panel (see Figure 1-3).

1. Unlock and open the coin door on the front of the cabinet.
2. Carefully reach through the coin door opening and release the spring-draw latch located under the control panel on the right side of the cabinet.
3. Unlock and remove the front access panel.
4. Reach through the front access-panel opening and disconnect the control-panel harness from the top of the Main PCB.
5. Carefully reach up under the top of the front access-panel opening and release the spring-draw latch located under the control panel on the left side of the cabinet.
6. From underneath, push up on the front edge of the control panel to free the panel from the slot in the cabinet.
7. Disconnect the green ground wire from the control-panel harness and remove the control panel from the cabinet.
8. Install the TEMPLE OF DOOM control panel in the reverse order of removal. Refer to Figure 3-1 for the proper

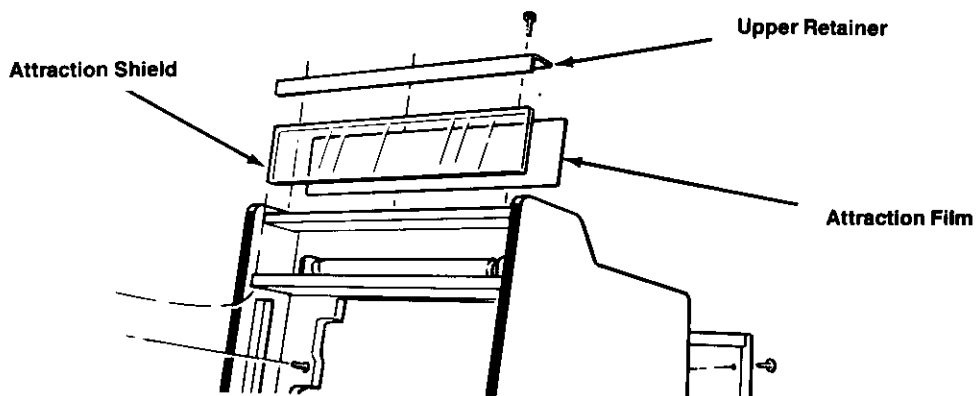


Figure 1-2 Attraction Film Replacement

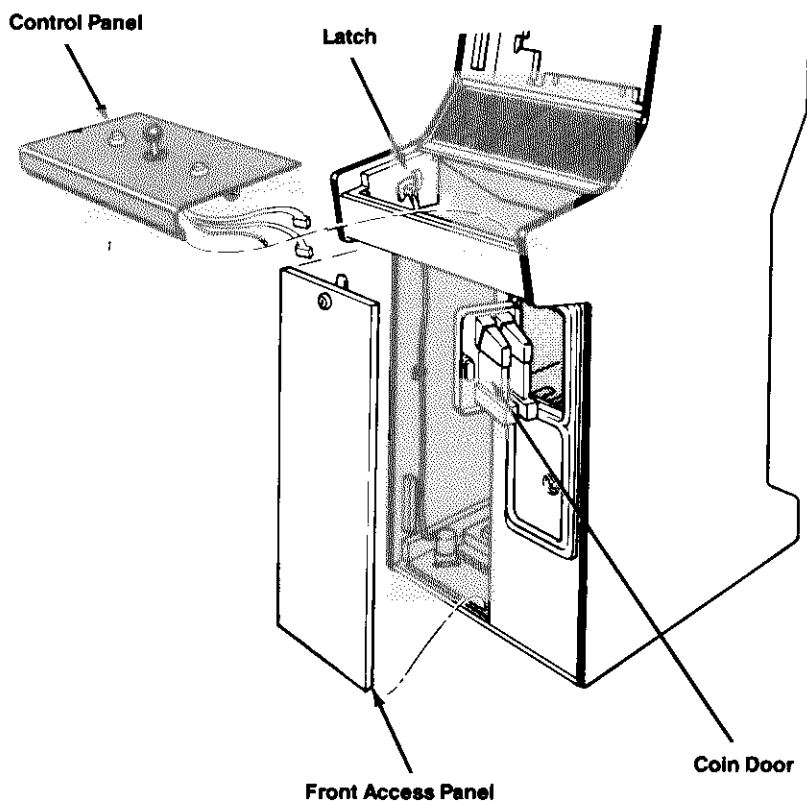


Figure 1-3 Control Panel Replacement

control-panel harness connections to the Main PCB. Make sure the green ground wire is connected to the control-panel harness.

Replace the Cartridge PCB

Perform the following procedure to remove/replace the existing game Cartridge PCB and replace with the TEMPLE OF DOOM Cartridge PCB (see Figure 1-4).

1. Turn the cabinet power off.
2. Unlock and remove the front access panel from the cabinet.
3. Turn the four thumbscrews (some System I games may have Phillips screws) that secure the existing Cartridge PCB to the ground plane.
4. Gently disconnect the Cartridge PCB from the Main PCB.

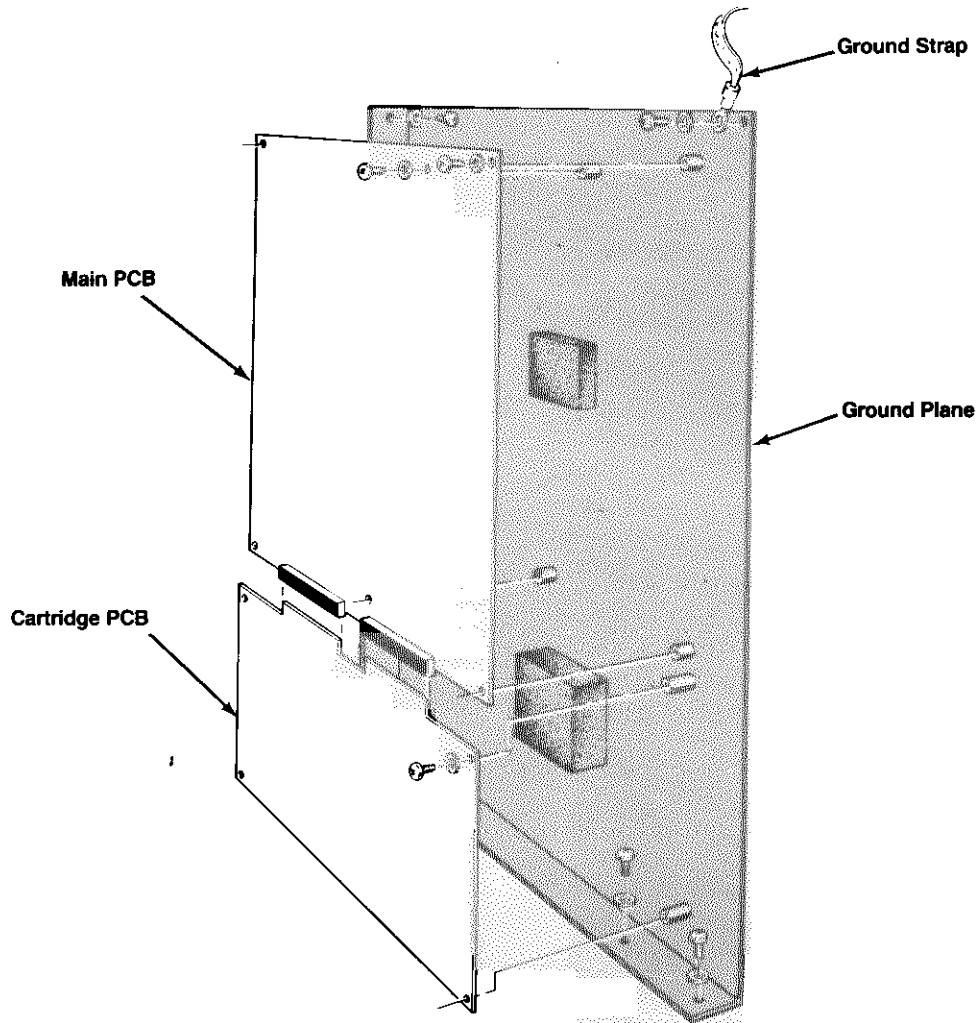


Figure 1-4 Cartridge PCB Replacement

5. Connect the TEMPLE OF DOOM Cartridge PCB to the Main PCB. Make sure that the Cartridge PCB is fully inserted into the Main PCB edge connectors.
6. Replace the four thumbscrews on the Cartridge PCB. Refer to Figure 1-1 for the locations of the printed-circuit boards.

NOTE

The procedure for removing the Main PCB is included in the Maintenance chapter of the *System I Operators Manual*.

Install the Self-Test Label

Staple or tape the TEMPLE OF DOOM self-test label on the inside of the front access panel.

Install the Product Identification Label

Perform the following procedure to install the TEMPLE OF DOOM product identification label.

1. Remove the protective backing from the TEMPLE OF DOOM product identification label.
2. Place the TEMPLE OF DOOM product identification label over the existing product identification label on the back of the cabinet.

Inspect the Game

Before applying power, perform the following inspection procedure.

1. Carefully check that the TEMPLE OF DOOM conversion kit parts have been properly installed. Make sure the control-panel harness connector is tightly connected and that the spring-draw latches under the control panel are securely fastened.
2. Regularly clean the air filter at the back of the game (located in front of the fan). Use a vacuum cleaner to remove dust from the filter, vacuuming the dust in the opposite direction of the air flow. If a vacuum cleaner is not available, remove the filter and wash it with any mild detergent. Let the filter dry *thoroughly* before replacing it in the frame. Equipment failure can result from dust accumulation if the filter is not replaced.
3. Plug in the game power.
4. Perform the self-test procedure as given in Chapter 2 of this manual. If the self-test indicates that the display requires adjustment, perform the adjustment procedures described in the display manual.
5. When you are confident that all instructions were properly followed, close and lock the front access panel.

Setting the Coin and Game Options

The TEMPLE OF DOOM coin and game options are set in the Self-Test Mode. Refer to the options display described in Chapter 2 for the recommended settings and the procedure for setting the options.

Operator Hints

Your System I cabinet with the TEMPLE OF DOOM game uses more effective audio than previous games, which results in more player involvement and enjoyment. The System I games use advanced, digital, sound-generation tech-

niques to create realistic musical instrument sounds (such as clarinets, harmonicas, drums, and violins). Although a player may not be consciously aware of the music, it has a direct effect on the excitement and emotional experience of the game.

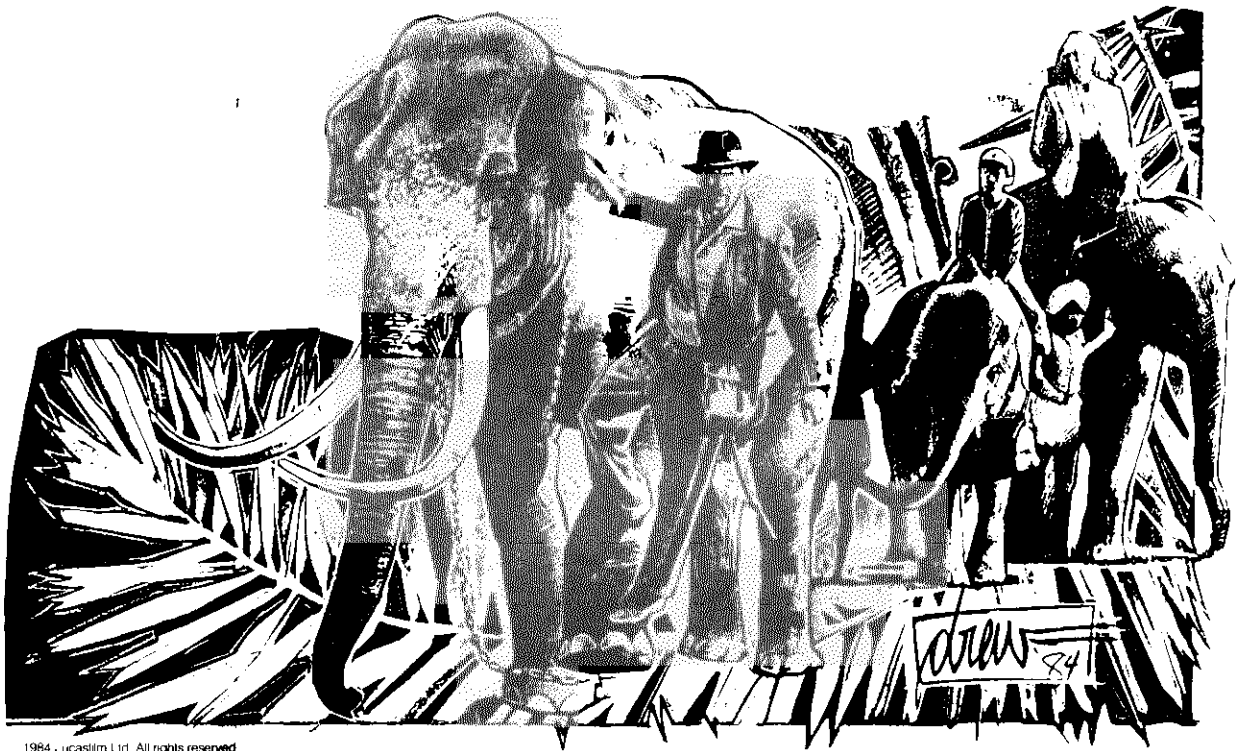
The TEMPLE OF DOOM game creates ear-catching sound effects, which are designed to give feedback to make the player believe that the game is responding directly to his actions. To maximize the player's enjoyment of this enhanced audio, we are providing some hints for the operator:

1. The game location should be a relatively dead acoustical environment. The goal is to minimize unnecessary sound reflection, so that the sounds from the TEMPLE OF DOOM game won't be drowned out by the accumulation of other sounds that bounce around the room. Carpets help eliminate sound reflections from the floor. Acoustical tile is also useful, especially if you have low ceilings.
2. If you use an environmental sound system or a stereo, consider lowering its volume or perhaps even turning it off. In the days when video games just made harsh beeps and boops, a central sound system helped make up for the lack of drive and excitement in a game's sounds. But your TEMPLE OF DOOM game is very musical, and a sound system interferes with the game's ability to interest players and draw bystanders.
3. Be concerned with the overall volume levels in arcade environments. The goal is to involve the players' emotions, not to damage their hearing. To a certain point, raising the game volume helps add to player excitement, but above that level it creates hearing fatigue and the high volume starts to drive players away. Rather than turning up the volume on the TEMPLE OF DOOM games to cut through the background sound level, try lowering the volume of any neighboring games that have sounds which are not an attractive or important element. Careful placement of games and attention to unnecessary noise sources can also help increase the player's sense of game involvement and interaction.

Self-Test

After the self-test switch is set to the on position, 16 self-test screens provide a visual and audible check of the INDIANA JONES AND THE TEMPLE OF DOOM game circuits. On System I games, the self-test switch is typically located on the Regulator/Audio PCB.

When the self-test switch is turned on, and the power is then turned on, the game enters the full Self-Test Mode. If the self-test switch is turned on any other time, then the game will enter a shorter Self-Test Mode. The following self-test screens are arranged in the sequence in which they occur after the self-test switch is first turned on. After the Sound Test, the sequence starts over with the Switch Test. Turning the self-test switch off at any time during the Self-Test Mode causes the game to return to the Attract Mode.



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Chapter 2

RAM/ROM Test

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

The RAM/ROM Test is divided into two sections. The condition of the RAM circuitry is displayed in the bottom half of the screen and, after about an eight-second delay, the condition of the ROM circuitry is displayed in the top half of the screen. An error message indicates that the RAM, ROM, or associated circuitry may be faulty.

If the ROM test fails, the error messages may appear in the top half of the screen as shown in Figure 2-1. Refer to Table 2-1 for the faulty ROM locations.

If the upper or lower main memory ROM circuits on the Main PCB fail, an *Upper or Lower Main ROM Error* message will appear at the top of the screen. Press the player 1 start button to obtain any RAM or ROM error message(s) from the Cartridge PCB RAM or ROM circuits. Press the player 1 start button again. If the bank switch ROM circuits on the Cartridge PCB are faulty, the message *Bank Switch Error* will appear.

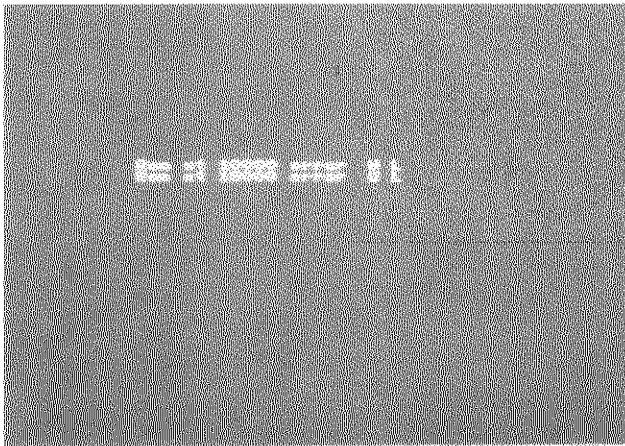


Figure 2-1 ROM Test Fails

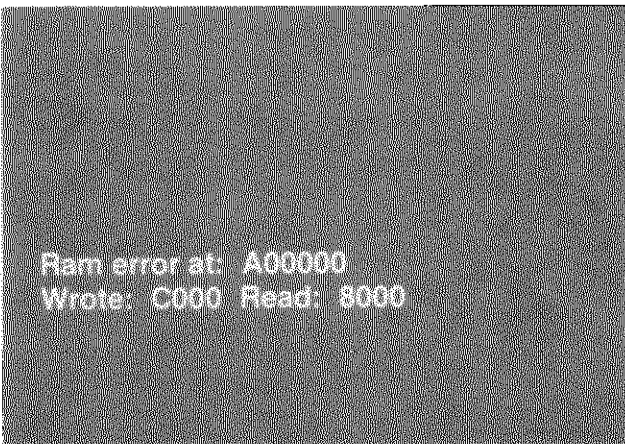


Figure 2-2 RAM Test Fails

Table 2-1 Faulty ROM Locations

Error Message	Location
ROM at 10000 error	U = 10B L = 10A
ROM at 18000 error	U = 10B L = 10A
ROM at 20000 error	U = 12B L = 12A
ROM at 28000 error	U = 12B L = 12A
ROM at 30000 error	U = 14B U = 14A
ROM at SLAPSTIC error	U = 16B L = 16A

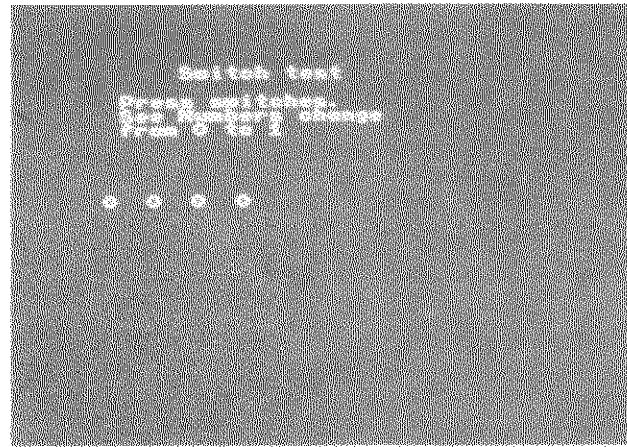


Figure 2-3 Switch Test

If the RAM test fails, the error messages appear as shown in Figure 2-2. Refer to the memory maps and schematic diagrams in the schematic package supplements for this manual and for the *System 1 Operators Manual* to determine the location of the faulty RAM circuit.

Repair the faulty RAM or ROM circuit or press the player 1 start button to obtain the Switch Test.

Switch Test

The Switch Test appears as shown in Figure 2-3. This test indicates the condition of the player 2 start pushbutton switch. Press the player 2 start button and note that the first number changes to a 1. Press the player 1 start button to obtain the next screen.

Coin Options

The Coin Options screen appears as shown in Figure 2-4. This screen indicates the current coin-option settings and is used to change the coin option settings. Refer to Table 2-2 for the available and recommended settings.

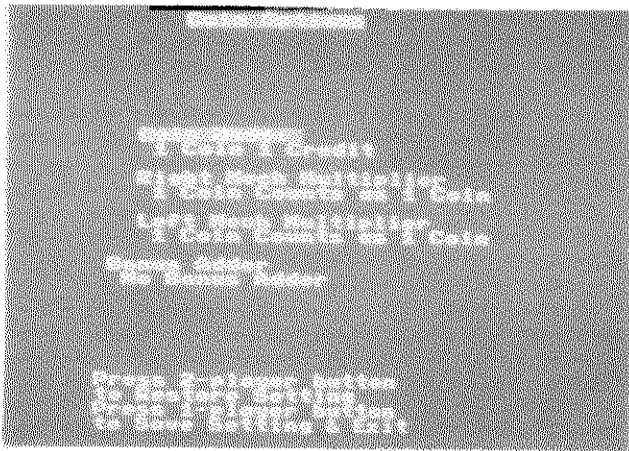


Figure 2-4 Coin Options

Table 2-2 Coin Option Settings

Option Name	Available Settings
Credit Mode	1 Coin 1 Credit ◀ 2 Coins 1 Credit 3 Coins 1 Credit 4 Coins 1 Credit
Right Mech Multiplier	1 Coin Counts as 1 Coin ◀ 1 Coin Counts as 4 Coins 1 Coin Counts as 5 Coins 1 Coin Counts as 6 Coins
Left Mech Multiplier	1 Coin Counts as 1 Coin ◀ 1 Coin Counts as 2 Coins
Bonus Adder	No Bonus Adder ◀ 2 Coins Give 1 Extra Coin 4 Coins Give 1 Extra Coin 4 Coins Give 2 Extra Coins 5 Coins Give 1 Extra Coin 3 Coins Give 1 Extra Coin Free Play

◀ *Manufacturer's recommended settings.*

Coin Mode should have a red or green box around it. Move the joystick right or left, and note that the coin mode values change. Select the desired value. Move the joystick down to move the red or green box to *Right Mech Multiplier*. Move the joystick right or left to cycle through all the available multiplier values. Select the desired value. Repeat this procedure for the remaining options.

If you want to cancel the option changes and restore the previous settings, press the player 2 start button. Pressing the player 1 start button will set the options as shown on the screen and will advance you to the Game Option screen. *Simply exiting from the self-test by moving the self-test switch to "off" will not save any changed settings.*

Game Options

The Game Options screen appears as shown in Figure 2-5. This screen indicates the current option settings; use this screen to reset the high-score table and change the game option settings. Refer to Table 2-3 for the available options and the recommended settings. Note that the recommended settings are displayed in green.

Move the joystick right or left and note that the settings for the option in the shaded block will change. Select the desired value. Move the joystick up or down to move the desired option into the shaded block. Move the joystick right or left to cycle through all the available option settings. Select the desired value. Repeat this procedure for the remaining options.

If you wish to cancel the option changes and restore the original settings, press the player 2 start button.

Press the player 1 start button to set the game for the options selected and obtain the Statistics screen.

Statistics

The Statistics screen appears as shown in Figure 2-6. This screen provides a visual check of the current game statistics. The statistics information is accumulated either from the first time the game was turned on or from the last time the statistics were reset. Reset the statistics information by pressing the player 2 start button.

The following information appears on the Statistics screen:

- *Aux coins* is not used on the INDIANA JONES AND THE TEMPLE OF DOOM game.

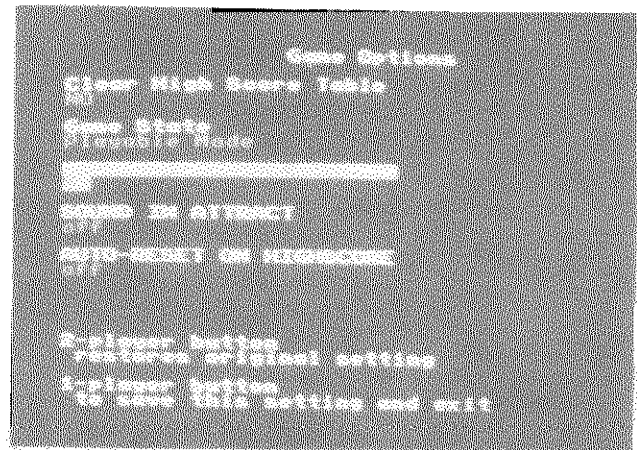


Figure 2-5 Game Options

Table 2-3 Game Option Settings

Option Name	Available Settings	Comments
Reset High-Score Table	Yes ◀ No	
Demo/Play Mode	Playable mode ◀ Demonstration mode	Free play mode for demonstration only. Press both start buttons simultaneously to advance to next wave.
Restore Factory Options	Yes No ◀	
Sounds in Attract Mode	On ◀ Off	
Automatic Reset of High-Score Table	On ◀ Off	Table is reset to factory scores and initials every 2,000 plays but no less than 200 plays since the last person entered initials. If this is set to "on", you should also set the Reset High-Score Table option to "yes."
Number of Starting Lives	2 3 4 5 6 7 8 3 lives for one credit/7 lives for two credits ◀	
Maximum Number of Extra Lives	5 ◀ 6 7 8	
Game Difficulty	Easy Medium ◀ Hard Real, real hard	
Extra Life Intervals (Extra Life Granted at)	10,000, 30,000, 60,000, 100,000, 150,000, 200,000, 300,000, and 400,000 points 20,000, 50,000, 100,000, 150,000, 200,000, 300,000, 400,000, and 500,000 points ◀ 30,000, 75,000, 150,000, 250,000, 350,000, 450,000, 550,000, and 650,000 points 50,000, 125,000, 250,000, 400,000, 600,000, 800,000, 1,000,000, and 1,200,000 points 20,000, 40,000, 60,000, 80,000, 100,000, 120,000, 140,000, and 160,000 points 30,000, 60,000, 90,000, 120,000, 150,000, 180,000, 210,000, and 240,000 points 40,000, 80,000, 120,000, 160,000, 200,000, 240,000, 280,000, and 320,000 points No extra lives granted	Screen shows "Increasing from 10,000 points" Screen shows "Increasing from 20,000 points" Screen shows "Increasing from 30,000 points" Screen shows "Increasing from 50,000 points" Screen shows "Every 20,000 points" Screen shows "Every 30,000 points" Screen shows "Every 40,000 points"

◀ *Manufacturer's recommended settings*

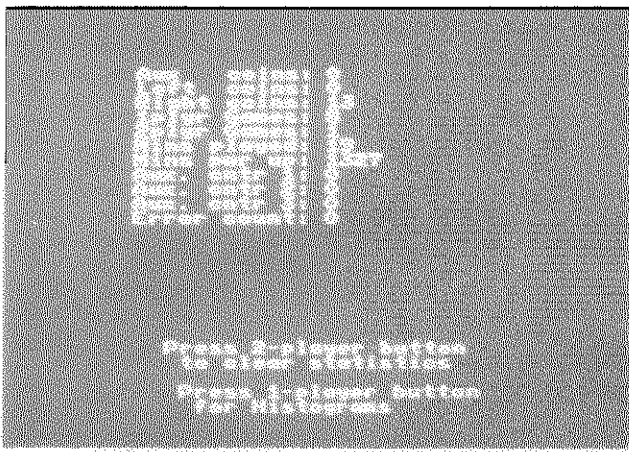


Figure 2-6 Statistics

- *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.
- *1 plyr Games* shows the number of 1-player games.
- *2 plyr Games* shows the number of 2-player games.
- *Mins played* shows the total time, in minutes, of all the games played.
- *Mins pur up* shows the total time, in minutes, that the game has been turned on.
- *Aux. cntr 1* shows the games played up to the final bridge wave on the Easy level.
- *Aux. cntr 2* shows the total number of extra lives earned in Easy level with 1 credit.
- *Aux. cntr 3* shows the number of games played on the 7 lives for 2 credits factory-recommended setting.
- *Error count* shows the number of EEPROM errors that were detected. Replace the EEPROM at location 15F on the Main PCB if the errors detected exceed approximately 25 per week.
- *Avg. Game Time* shows the average game time per play in seconds.

Press the player 1 start button to obtain the Histogram Screen.

Histograms

Six Histogram screens are provided in this game; one of them is shown in Figure 2-7. Histogram levels 1-3 show the total game times for all games played with *one credit*, as follows:

Level 1	Easy level select
Level 2	Medium level select
Level 3	Hard level select

The Histogram levels 4-6 show total game times for all games played with *two credits*, as shown below. However,

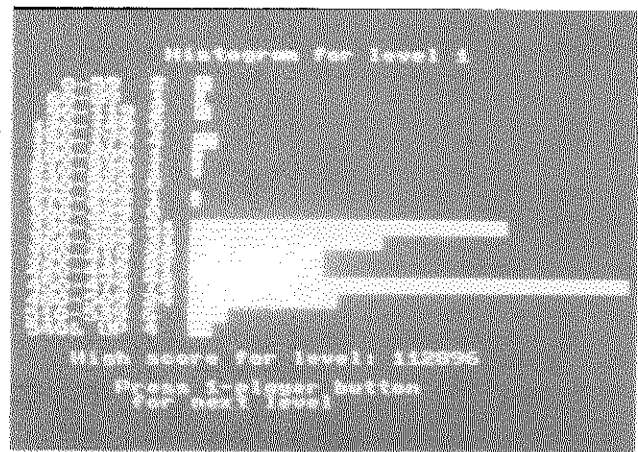


Figure 2-7 Histograms (One of Six Screens)

if you do not use the 3 lives for 1 credit/7 lives for 2 credits game option setting, your game's screen will show zeroes for high scores and no histogram bars in Levels 4-6.

Level 4	Easy level select
Level 5	Medium level select
Level 6	Hard level select

Select each Histogram level screen by pressing the player 1 start button. These six screens show the game times from 0 to 540 seconds. Also displayed is the high score for each level.

The game times information is accumulated either from the first time the game was turned on or from the last time the game times were reset. Reset the Histograms by pressing the player 2 start button while displaying the Histogram Level 6 screen.

Press the player 1 start button to obtain the Playfield Test.

Playfield Test and Joystick Test

The Playfield Test indicates the condition of some of the graphics ROM, the vertical and horizontal playfield scrolling registers, and the joystick control. The display (see Figure 2-8) should not show any abnormalities.

Move the joystick control to the left. The playfield should slowly scroll to the left. Move the joystick control up and the playfield will scroll up—likewise for right and down.

As you move the image of INDIANA JONES up, you should see 16 uniquely colored boxes on the screen—the same colors as used in the picture of INDIANA JONES.

Press the player 1 start button to obtain the Motion Object Test.

Motion Object Test

The Motion Object Test appears as shown in Figure 2-9. This test indicates the condition of the motion-object buffer circuit. The seven groups of eight motion objects should be identical and eight pixels high.



Figure 2-8 Playfield Test

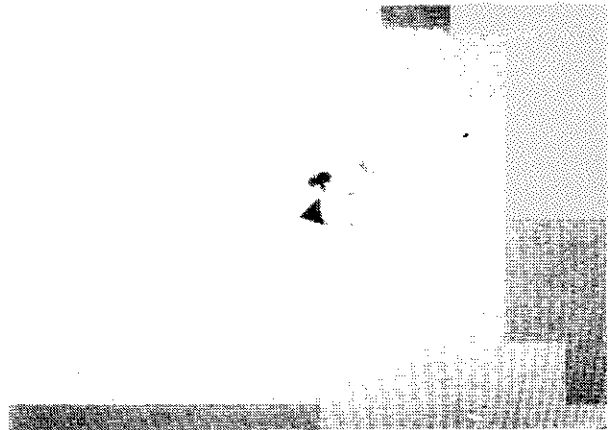


Figure 2-10 Motion Object Picture Test

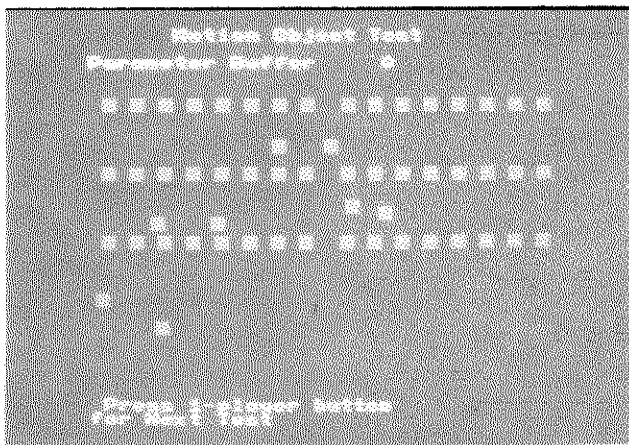


Figure 2-9 Motion Object Test

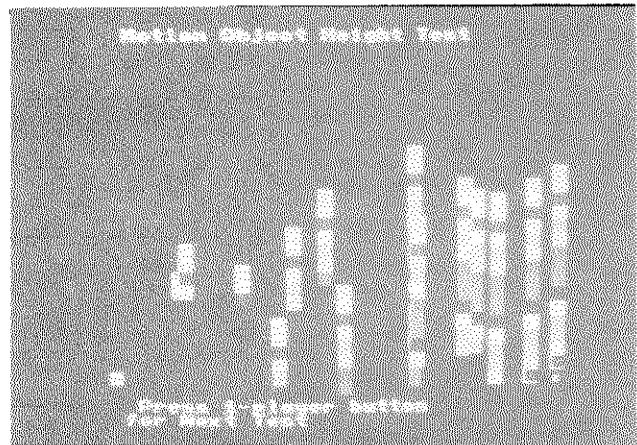


Figure 2-11 Motion Object Height Test

Press the player 2 start button to select any of the 56 motion objects. If the Joystick is moved, the selected motion object should move in the same direction.

Press the player 1 start button to obtain the Motion Object Picture Test.

Motion Object Picture Test

The Motion Object Picture Test appears as shown in Figure 2-10. By moving the Joystick up or down the pictures should change. By selecting all of the available pictures, you can see the state of the graphics ROMs.

Press the player 1 start button to obtain the next test.

Motion Object Height Test

The Motion Object Height Test appears as shown in Figure 2-11. This test indicates the condition of the motion object/playfield graphic address generator circuit.

Observe the rightmost column: the top 14 boxes in it should be uniquely colored. From top to bottom, the colors should be: royal blue, light blue, black, dark tan,

dark purple, yellow, deep rust, olive green, red, black, light grey, dark cranberry, light cranberry, and light tan. The color pattern of the rightmost column can be used to find errors in the bit plane circuits.

Press the player 1 start button to obtain the next test.

Alphanumerics Test

The Alphanumerics Test should appear as shown in Figure 2-12. This test indicates the condition of the alphanumeric circuit.

Press the player 1 start button to obtain the Color Test.

Color Test

The Color Test appears as shown in Figure 2-13. This test indicates the condition of the display color circuits.

There should be eight vertical gray-scale bars and three groups of eight horizontal bars with shades of red, green, and blue. The brightest bars should be on the left, and the darkest (black) bars should be on the right with a bright white frame around the screen. This frame will help to



Figure 2-12 Alphanumeric Test

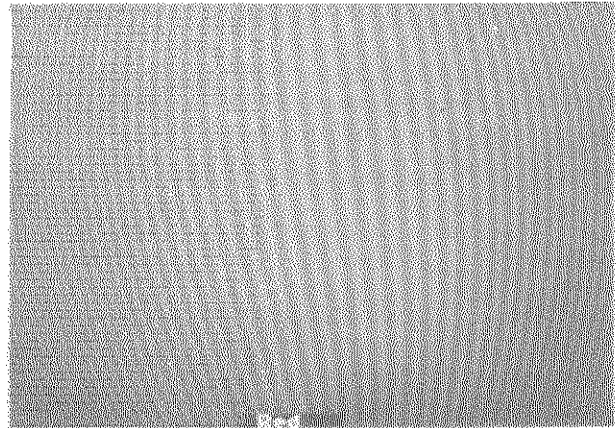


Figure 2-14 Color Purity Test

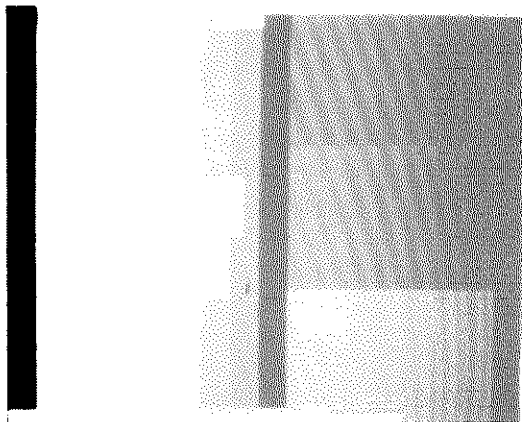


Figure 2-13 Color Test

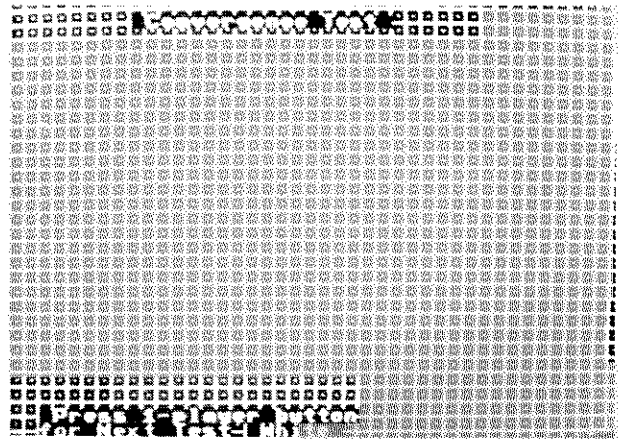


Figure 2-15 Convergence Test

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.

Press the player 1 start button to obtain the Color Purity Test.

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 to appear should be a red screen with the word *RED* displayed at the bottom of the screen as shown in Figure 2-14.

Press the player 2 start button and the next display to appear should be green with the word *GREEN* displayed at the bottom of the screen. Press the player 2 start button to obtain a blue, white, and finally a gray screen. After the gray screen, the display will repeat the white screen again.

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

Press the player 1 start button to obtain the Convergence Test.

Convergence Test

The Convergence Test appears as shown in Figure 2-15. The grid pattern should be white. This test indicates the condition of the display size, centering, linearity, and convergence.

Press the player 2 start button, and the pattern should turn violet. Repeated pressing of the player 2 button should cause the screen to alternate between violet and white. 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 exhibit no pincushioning or barreling, and the lines should be straight within 3.0 mm.
- Violet and white pattern convergence should be within 2.0 mm.

If the display characteristics are not within these limits, refer to the display manual for the linearity and conver-

gence adjustment procedures or to determine the possible cause of failure.

Move the joystick up, and the pattern should slowly scroll up the screen. Moving the joystick left or right should cause the pattern to scroll accordingly.

Press the player 1 start button to obtain the Sound Test.

Sound Test.

The Sound Test should appear as shown in Figure 2-16. This test indicates the condition of the coin mechanisms and the music and sound-effects circuits.

The sound microprocessor is reset at the beginning of this test; the reset may take several seconds. If the sound-microprocessor reset fails, the message *SOUND PROCES-*

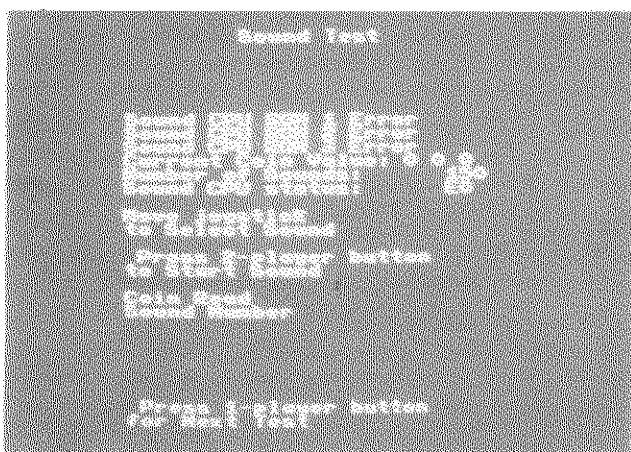


Figure 2-16 Sound Test

SOUND NOT RESPONDING should flash near the top of the screen. Move the joystick up to sequence through the sounds. Move the joystick down to sequence backwards through the sounds. The Sound Test provides the following sound information:

- *Current Coin Value* consists of three zeros. Ignore the left zero. As coins are deposited in each of the coin mechanisms, the middle and right zeroes should change to 1. The numbers should change back to 0 each time the coin switch is released.
- *Number of Sounds* consists of the number of sounds used in the INDIANA JONES AND THE TEMPLE OF DOOM game.
- *Sound CPU Status* indicates the condition of the sound microprocessor. If the sound microprocessor is good, the word *Good* should appear. If the sound microprocessor is faulty, the message *Sound CPU ROM 1* or *2* appears at the top of the screen.
- *Music Chip Test* consists of eight tones in a major scale that alternate between sound channels (16 tones in all).
- *Effects Chip Test* consists of four tones in a major chord that come from both sound channels simultaneously.
- *Speech Chip Test* consists of a synthesized voice repeating the message "Speech chip test."

Move the joystick up or down to select one of the audio tests or game sounds. Press the player 2 start button to begin playing the selected sound. Move the joystick right or left to stop the selected sound. Note: Some of the selectable numbers *will not* cause an audible sound.

Press the player 1 start button to return to the Switch Test, or turn off the self-test switch to return to the Attract Mode.

Maintenance

This chapter includes preventive and corrective maintenance procedures for the INDIANA JONES AND THE TEMPLE OF DOOM controls and for the Cartridge PCB. To assure maximum trouble-free operation of this game, we recommend that you perform preventive and corrective maintenance as described in this chapter and in the *System I*[™] Operators Manual.



Chapter 3

Preventive Maintenance

Preventive maintenance for this game includes inspecting and cleaning the control and switches. How often preventive maintenance is performed depends upon the game environment and frequency of play. However, we recommend that preventive maintenance be performed at least every three months.

Removing the Control Panel

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

1. Unlock and open the coin door on the front of the cabinet.
2. Carefully reach through the coin door opening and release the spring-draw latch located under the control panel on the right side of the cabinet.
3. Unlock and remove the front access panel.
4. Reach through the front access panel opening and disconnect the control-panel harness from the top of the Main PCB.
5. Carefully reach up under the top of the front access-panel opening and release the spring-draw latch located under the control panel on the left side of the cabinet.

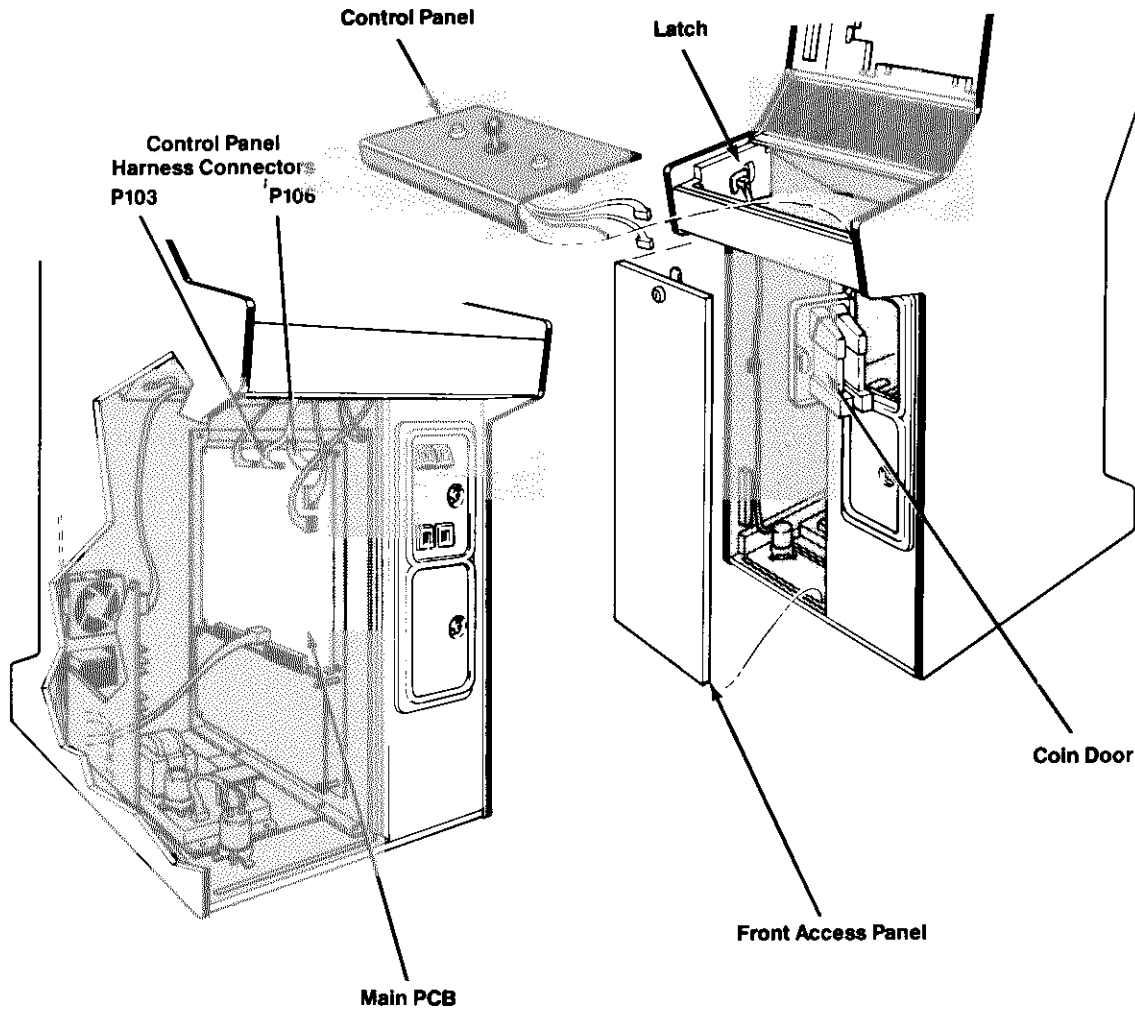


Figure 3-1 Control Panel Removal

6. From underneath, push up on the front edge of the control panel to free the panel from the slot in the cabinet.
7. Disconnect the ground wire single line connector. Remove the control panel from the cabinet.
8. Replace the control panel in the reverse order of removal.

Cleaning the Player Start Switches

Perform the following procedure to clean the switch contacts and tighten the securing hardware.

1. Remove the control panel as previously described.
2. Use electrical contact cleaner to clean the contacts. Do not burnish them. When a switch button is pressed, the wiping action of the cross-bar contacts provides a self-cleaning feature.
3. Using a 5/8-inch open-end wrench, tighten the stamped nut securing the player start switches to the control panel.

To replace the switch button, turn the stamped nut with a wrench in a counterclockwise direction, as seen from the inside of the control panel. The ring on the outside of the control panel should not spin.

Leaf Switch Repair or Replacement

To replace the leaf switch in the Joystick Assembly, you do *not* need to disassemble the joystick if the joystick is still in the control panel.

1. Disconnect the two wires from the defective switch.
2. Remove the screw in the leaf switch with a #10 Torx driver.
3. Replace the switch in reverse order of removal. Be sure to align the small extrusion on the bottom of the switch with the small hole nearest the screw casing on the bottom of the lower housing.
4. If required, adjust the switch to a narrow gap (about 1/16 inch).

Reconnect the harness wires as shown in Figure 3-2.

Joystick Control

Preventive maintenance on the joystick control consists of inspecting the shaft for excessive wear or dirt, adjusting the leaf switches, and, if necessary, replacing and tightening the securing hardware.

The joystick assembly is made of heavy-duty engineering plastics and should be lubricated with lithium grease every three months, or when you reassemble the control.

NOTE

To disassemble the upper and lower housings, refer to *Disassembling the Joystick Assembly* in the next section entitled *Corrective Maintenance*.

Corrective Maintenance

Corrective maintenance consists of removing, disassembling, reassembling, and replacing the control handle, player start switches, and leaf switches. (The Cartridge PCB replacement procedure is described in Chapter 1 of this manual.)

Removing the Player Start Switches

Perform the following procedure to remove/replace the player start switches (see Figure 3-2).

NOTE

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

1. With the control panel open, adjust the leaf switch contacts for a narrow gap. Don't burnish the contacts. To clean them, use electrical contact cleaner.
2. To replace a leaf switch, remove the screw with a Phillips-head screw driver.
3. To remove the switch pushbutton, turn the stamped nut with a wrench in a counterclockwise direction, as seen from the inside of the control panel. The ring on the outside of the control panel should not spin (see Figure 3-2).
4. Reinstall the pushbutton switch. Reconnect the harness wires to the switch terminals as shown in Figure 3-2.

Removing the Joystick Assembly

Perform the following procedure to remove/replace the joystick from the control panel (see Figure 3-2).

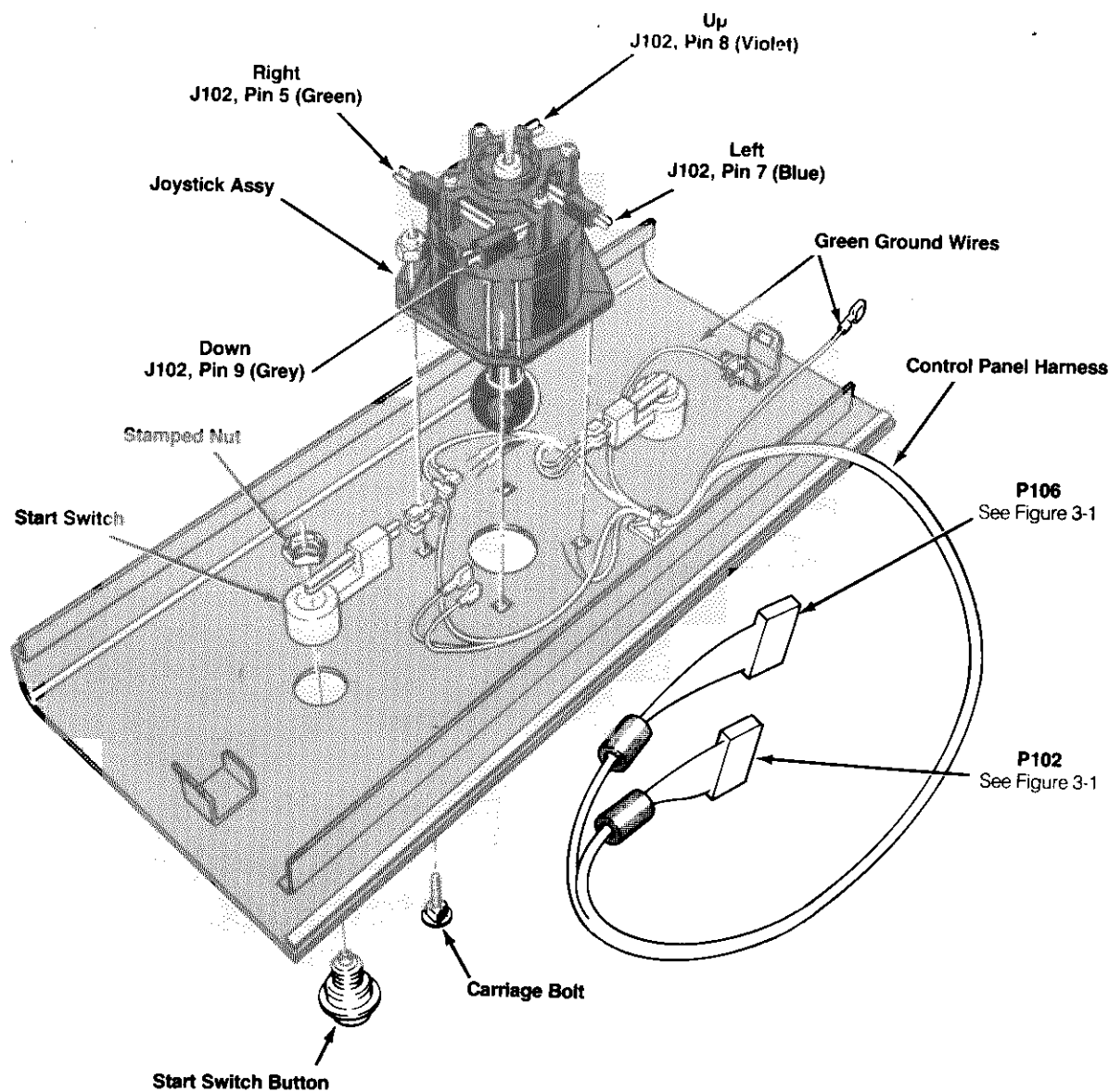


Figure 3-2 Removing the Joystick Assembly and Start Switches

1. Remove the control panel as described under *Preventive Maintenance*.
2. Use a 3/8-inch wrench to remove the four locknuts holding the joystick assembly to the control panel.
3. Lift the joystick assembly out of the control panel.
4. Replace the joystick in the reverse order of removal.

Disassembling the Joystick Assembly

Perform the following procedure to disassemble/reassemble the joystick assembly (see Figure 3-3).

1. Remove the joystick assembly from the control panel as previously described.
2. Remove the four screws holding the positioning plate.
3. Remove the leaf switch actuator.

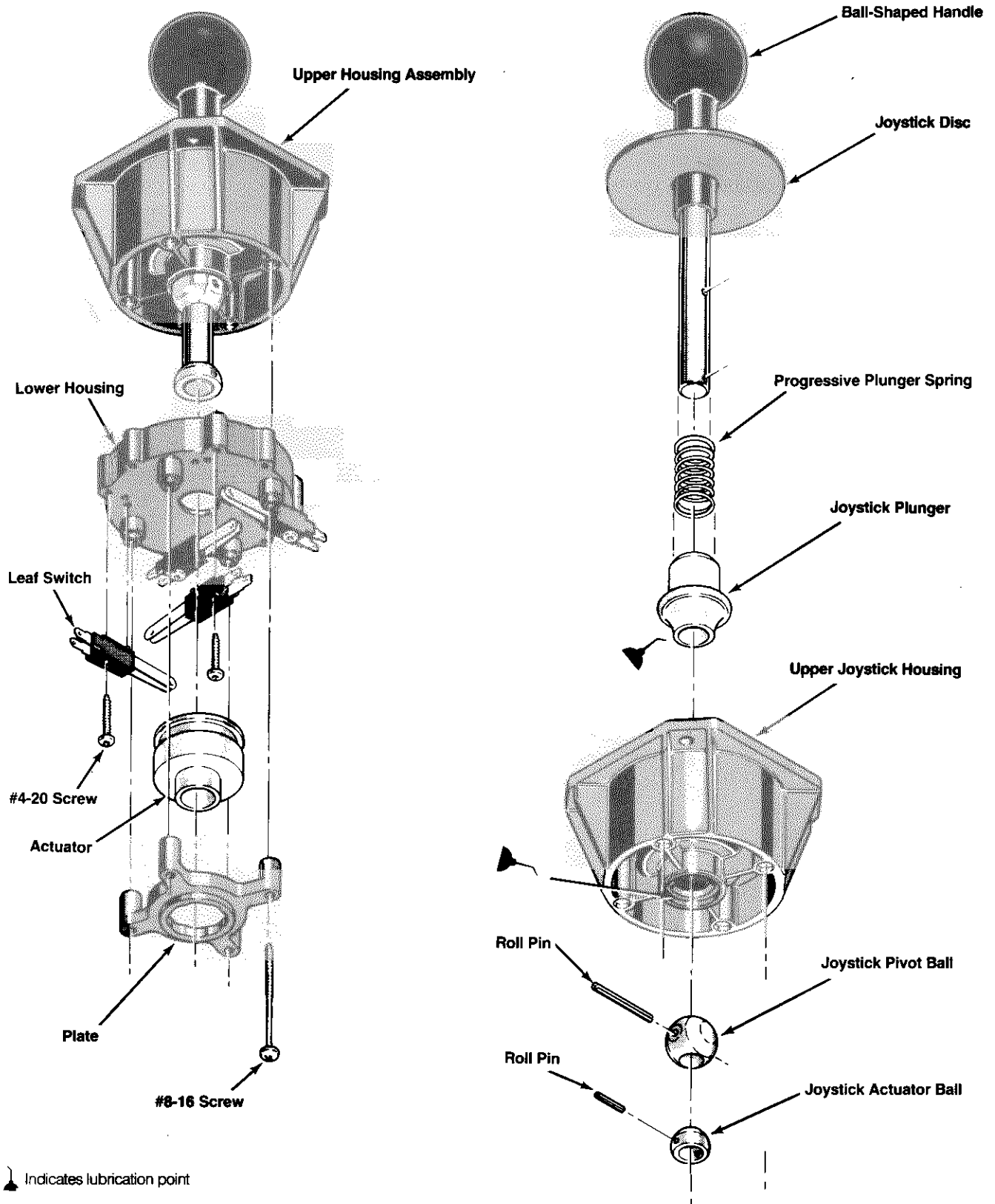


Figure 3-3 Joystick Disassembly and Lubrication

4. Remove the lower housing holding the four leaf switches.
5. Remove the actuator ball by pushing the ½-inch roll pin through the shaft. Slide the actuator ball off the end of the shaft.
6. Push the 1 ½-inch roll pin through the pivot ball and shaft. Be prepared for back pressure as the tension is released on the pivot ball. Slide the pivot ball off the shaft.
7. Slide the upper housing off the shaft.
8. Slide the plunger and spring off the shaft.
9. Slide the disc off the shaft.

NOTE

After reassembling the joystick, make sure the control handle returns freely to the center position.

Reassembling the Joystick Assembly

1. Slip the disc onto the shaft.
2. Push the larger spring onto the shaft down to the shoulder.
3. Push large end of plunger onto the shaft and over part of the larger spring (see Figure 3-3).

NOTE

Lubricate the plunger, ball, and housing at this point in the reassembly procedure.

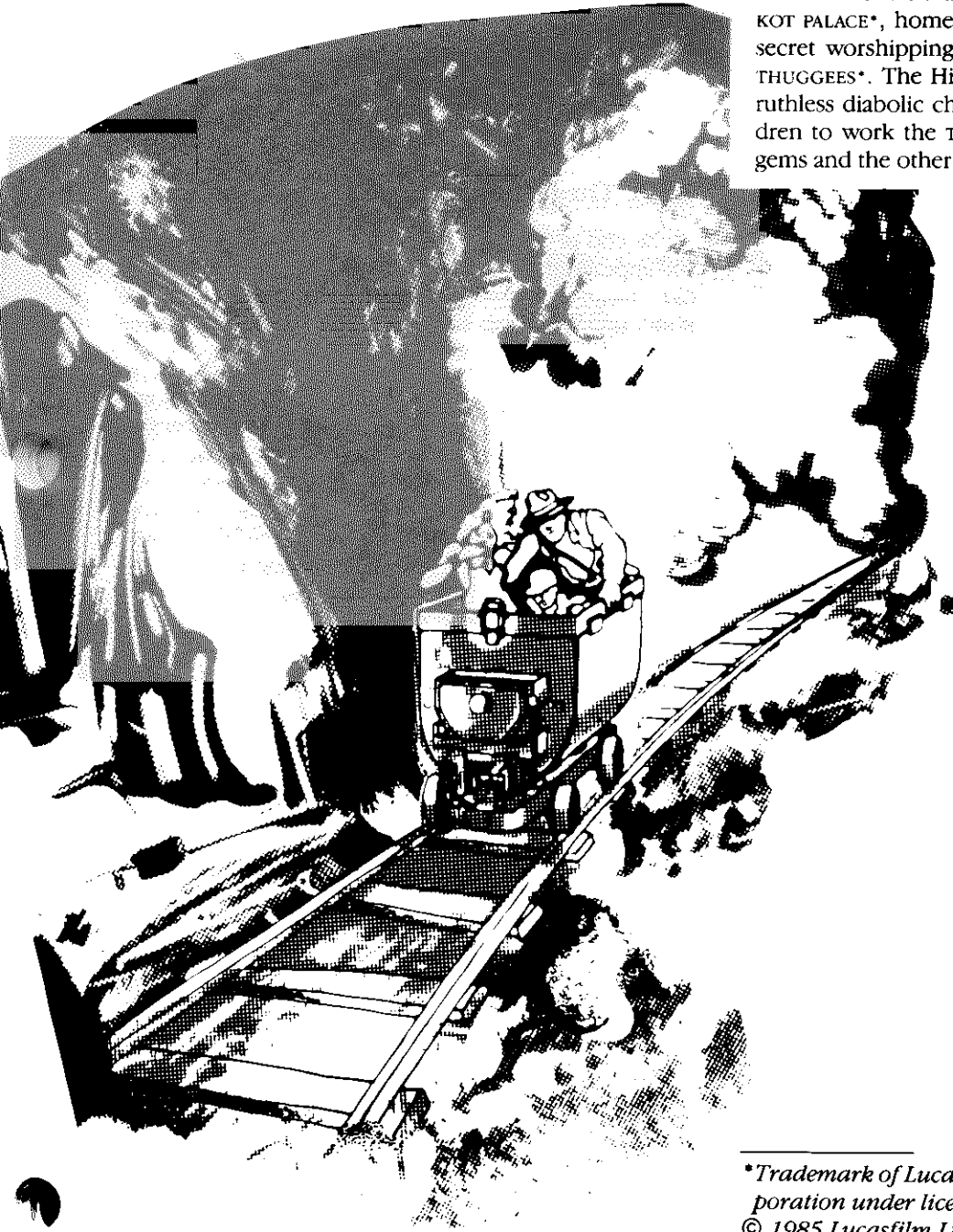
4. Slide the upper housing onto the shaft.
5. Insert the 1 ½-inch roll pin partly into the pivot ball. Slide the pivot ball with the roll pin partly inserted onto the shaft. Line up the roll pin with the hole in the shaft, and push the pin through. Center the roll pin so that the amount extending is even on both sides.
6. Push the actuator ball onto the shaft, and insert the ½-inch roll pin through the shaft.
7. Fit the lower housing over the shaft so that the holes align with the 1 ½-inch roll pin. Rotate the lower housing so that screw casings align with the holes in the upper housing.
8. Fit the positioning plate over the lower housing and actuator so that the holes align for reinserting the 2 ½-inch screws. Do not over-tighten this screw. The handle shaft must return to center freely.
9. Screw the leaf switches into place as previously described in *Preventive Maintenance*.
10. Reinstall the joystick assembly into the control panel.
11. Reconnect the wires to the leaf switches and the harness assembly.

Game Play

Storyline

In his continuing search for fortune and glory, INDIANA JONES* stumbles across a remote village in India. The people of the village were once protected by a powerful sacred stone. This stone, the SANKARA*, was stolen from the village, and devastation followed, as the children of the village disappeared.

INDY* discovers that the children are enslaved at the PAN-KOT PALACE*, home of the maharajah. The palace is the secret worshipping grounds for a death cult known as THUGGEES*. The High Priest of this cult is MOLA RAM*, a ruthless diabolic character who is using the village children to work the THUGGEE mines, digging for precious gems and the other missing SANKARA STONES*.



Chapter 4

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Operating Modes

The INDIANA JONES AND THE TEMPLE OF DOOM* arcade game has five operating modes: Attract, Difficulty select, Play, High Score, and Self-Test. In the High-Score Mode, if a player's score is among the top ten, 45 seconds is allowed to enter initials onto the High Score Table. Initials are selected by moving the joystick and pressing the button control when the desired initial is displayed.

Game Play

Introduction

The player takes on the role of INDIANA JONES, in his quest to free the enslaved children and recover the sacred stone. The action takes place beneath the palace where INDY is being pursued by the THUGGEE GUARDS*.

The player uses an eight-position joystick to control INDY, as he escapes from one dangerous situation after another. A button control is used to activate INDY'S bullwhip which allows the player to swing across dead-end pathways or defend against a variety of hazards.

At the start of each game, players enter a bug-infested room where three tunnel entrances are seen. Each of the entrances represents a different difficulty level: easy, medium, or hard.

Wave One

The player controls INDY in the mine caverns, as he makes his way through a labyrinth of narrow passages, ladders, chutes, and conveyor belts. Along the pathways are enslaved children that are freed when INDY whips the lock on their cages. If all the children are freed, bonus points are awarded. Throughout the mine, the THUGGEE GUARDS are in pursuit. INDY can stun the THUGGEE GUARDS by whipping them, or by setting off gas cans. If the player delays in freeing the children, MOLA RAM will appear and throw fireballs at the player. These fireballs can be intercepted if the player uses the whip. To complete this wave, the player must reach the tunnel entrance.

Wave Two

Upon reaching the tunnel entrance, the player controls INDY in a mine car along a fast-paced, unpredictable railway track. The joystick controls the speed and direction of the mine car. The player must look ahead to spot any dead-end tracks that will cause derailing. Alongside the tracks are many THUGGEE GUARDS that the player can whip for higher scores. THUGGEE GUARDS are also in mine cars trying to ram the player from behind or collide with the

player from one of the side tracks. Whipping either of the two THUGGEE GUARDS in a pursuing mine car will slow them down. The whip button can also be used to set off traps, such as the gas cans and the dynamite, to derail other mine cars.

In higher levels of this wave, the hazards increase. The player must watch for:

- Missing rails where INDY'S mine car must be tilted to avoid derailing,
- Jump ramps that require higher speeds to successfully be crossed,
- Giant bats that can collide with the player, and
- A THUGGEE GIANT* who tries to prevent the player from passing.

Wave Three

At the end of the track, INDY jumps out of the mine car and appears in the TEMPLE OF DOOM*, the sacrificial THUGGEE chamber where the SANKARA STONE is placed. The player must reach the stone situated in front of the statue of KALI*, the four-armed goddess of death.

Once the stone is retrieved, an exit door will open and INDY is once again in the mine caverns. The game action continues until INDY successfully recovers three of the SANKARA STONES, for a total of 12 unique waves. INDY is then faced with the ultimate challenge of escaping from the palace by way of a rope bridge. If successful, a "bonus round" follows, that allows players to build their scores while testing their game skills.



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Hints for Game Play

Wave One

Incremental points are awarded for each successive child freed. INDY can fall a short distance without losing a life. Use this to take short cuts (jump down to ledges below). MOLA RAM will disappear if one of the captured children is freed.

Wave Two

Incremental points are awarded for each successive THUGGEE knocked down by whipping. Whip switch posts along track intersections to change direction of THUGGEE mine cars.

Maximizing Earnings

The key to maximum earnings is striking a midpoint on game times. Initially, game times should be short enough to allow higher player turnover. At the same time, game times must be long enough to give the player good value and insure repeat play.

YOUR INDIANA JONES AND THE TEMPLE OF DOOM game has a comprehensive statistics and coin accounting package. (This package of information is described in greater detail in Chapter 2 of this manual.) To find out whether or not your players are getting adequate value for their money, you should evaluate the following information.

NOTE

For your convenience, a pre-printed, tear-out statistics sheet is included at the back of this manual. Use this sheet to track your INDIANA JONES AND THE TEMPLE OF DOOM game statistics and histograms in self-test.

Average Game Times

The average game times are shown on the Statistics Screen. If the game is set at the factory-recommended settings, initial game times should average 120–150 seconds. If this is not the case, check the Histograms and Auxiliary Counters.

Histograms

Six levels of histograms are provided. Levels 1–3 show the total game times for all games played on easy, medium, and hard level select, respectively, with one credit per play.

Initially, the Level 1 Histogram should show most games being played for 90–150 seconds. If a high percentage of games are under 90 seconds, the current settings may be too difficult and you should consider changing the diffi-

culty option to easy instead of medium. If a high percentage of games are over 180 seconds, the settings should be made more difficult.

The last three histograms (Levels 4–6) show the total game times for all games played on easy, medium, and hard, respectively, with two credits per play. The majority of games on Level 4 should be giving 180–240 seconds of play, because players are paying two credits for these games and should be getting higher game time value.

Auxiliary Counters

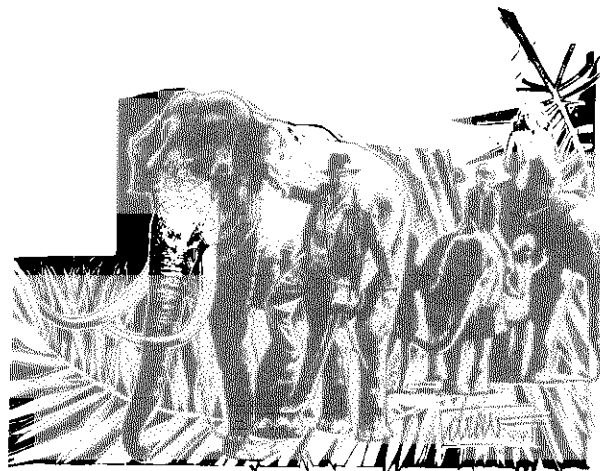
The Statistics Screen has three Auxiliary Counters. These are particularly useful in troubleshooting any option setting adjustments that might be needed, both initially and long-term.

For example, the *Aux. cntr 1* shows the total number games played to the final bridge wave on the Easy level of the game. In most locations, very few players will be able to reach this high level in the first two or three weeks. However, by the fourth week, you should see a small number of games reaching this level in the game. If this reading still shows 0, you should consider changing the game difficulty setting or the bonus life condition to an easier setting, that is, change the bonus from *increasing from 20,000 points* to *increasing from 10,000 points*.

Aux. cntr 2 shows the total number of bonus lives earned in the Easy level with 1 credit. If after several weeks this reading looks low relative to the total number of games played on Easy (level 1 histogram), you may want to try an easier bonus setting.

Aux. cntr 3 shows the total number of games played on the 7 lives for 2 credits factory-recommended setting. If a high percentage of the games being played is with 7 lives, the average game time reading on the Statistics Screen will be skewed higher, because the reading will include all games played with 7 starting lives.

To change the option settings, clear or reset the Statistics by pressing the player 2 start button.



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Illustrated Parts Lists



This chapter provides information you need to order parts for your game. Common hardware (screws, nuts, washers, etc.) has been deleted from most of the parts lists. Refer to the *Atari System I™ Operators Manual*, Chapter 4, for additional parts lists that describe the parts common to all System I games.

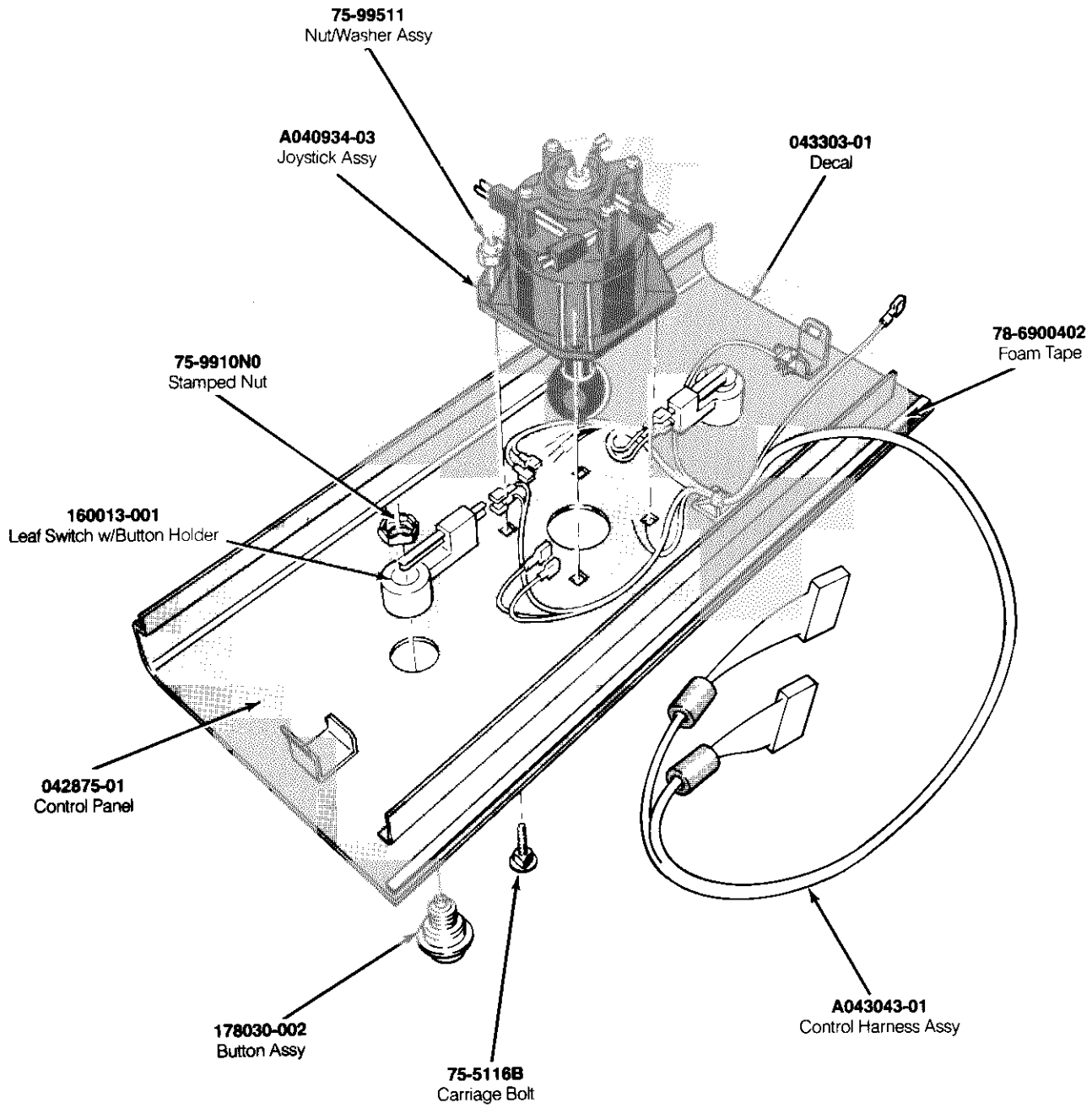
The PCB parts lists are arranged in alphabetical order by component. Each component subsection is arranged alphanumerically by reference designator.

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

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

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

Chapter 5



**Figure 5-1 Control Panel Assembly
A043302-01 A**

Control Panel Assembly Parts List

Part No.	Description
A040934-03	8-Position Joystick Assembly with Leaf Switches
A043043-01	Control Harness Assembly
042875-01	Control Panel
043303-01	Control Panel Decal
75-5116B	#10-24 × 1-Inch-Long Black Carriage Bolt
75-9910N0	5/8-11 Stamped Nut
75-99511	#10-24 Nut/Washer Assembly
78-6900402	¼-Inch × 1/8-Inch-Thick Foam Tape (24 inches required)
160013-001	Leaf Switch with Button Holder
178030-002	Orange Button Assembly

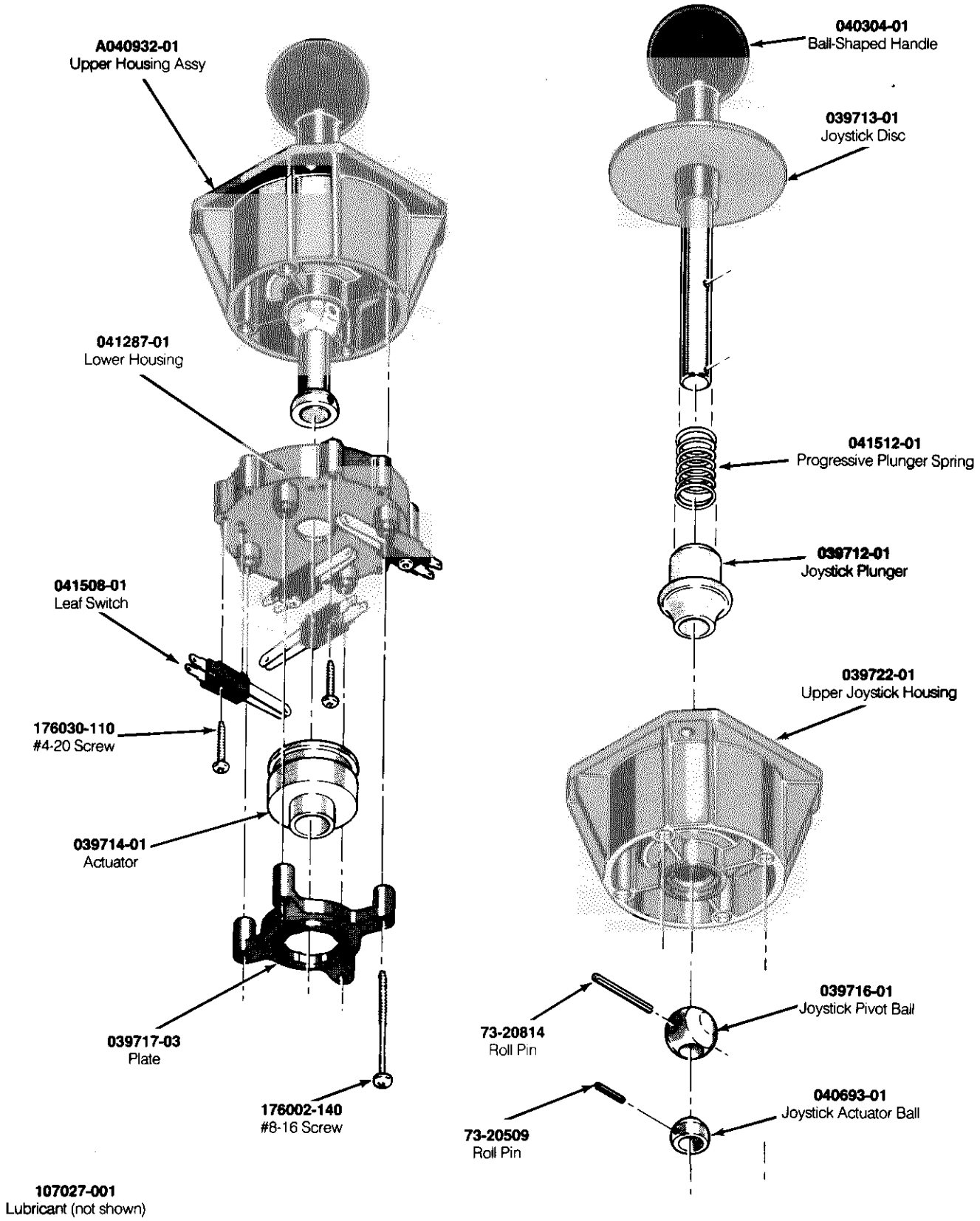


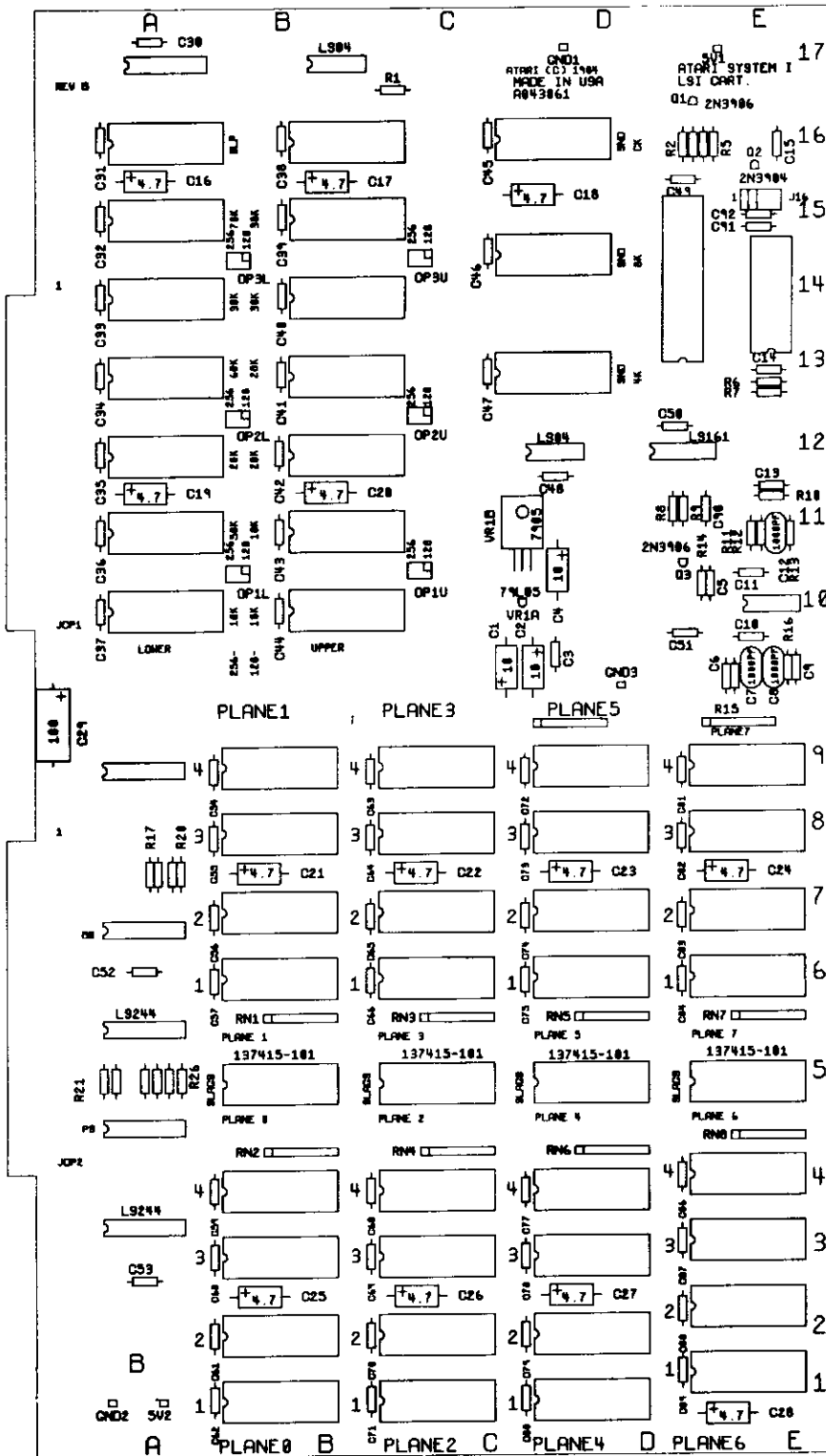
Figure 5-2 Joystick Assembly
A040934-03 B

Joystick Assembly Parts List

Part No.	Description
A040932-01	Upper Housing Assembly, consisting of the following parts:
73-20509	.086-Inch-Diameter x .563-Inch-Long Roll Pin
73-20814	.125-Inch-Diameter x .875-Inch-Long Roll Pin
039712-01	Joystick Plunger
039713-01	Joystick Disc
039716-01	Joystick Pivot Ball
039722-01	Upper Joystick Housing
040304-01	Ball-Shaped Handle
040693-01	Joystick Actuator Ball
041512-01	Progressive Plunger Spring
107027-001	Lithium Grease Lubricant
041287-01	Lower Housing
041508-01	Leaf Switch
039714-01	Actuator
039717-03	8-Position Positioner Plate with Detents
176002-140	#8-16 x 2.50-Inch-Long Self-Tapping Hex Washer-Head Screw
176030-110	#4-20 x .62-Inch-Long Hex Washer-Head Self-Tapping Screw

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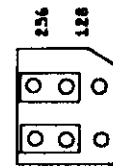


Part Numbers of Program ICs (All are 136036-xxx)

IC Location	A043307-01 PCB Assembly	A043307-02 PCB Assembly
7A	-123	-152
4/5A	-122	-151
13D	-124	-153
14/15D	-125	-154
16D	-126	-155
10A	-102	-132
12A	-104	-134
14A	-127	-156
16A	-129	-158
10B	-101	-131
12B	-103	-133
14B	-128	-157
16B	-130	-159
1B	-105	-135
2B	-106	-136
6B	-109	-139
7B	-110	-140
1C	-113	-149
2C	-115	-144
6C	-118	-147
7C	-119	-148
3B	-107	-137
4B	-108	-138
8B	-111	-141
9B	-112	-142
3C	-116	-145
4C	-117	-146
8C	-120	-149
9C	-121	-150

NOTE

For -01 version of this PCB, install option jumpers on OP1U, OP1L, OP2U, and OP2L as shown below:



Install option jumpers OP3U and OP3L as shown below:

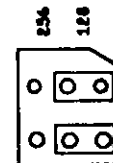


Figure 5-3 LSI Cartridge PCB Assembly A043307-xx A

LSI Cartridge PCB Assembly Parts List

Designator	Description	Part No.
Capacitors		
C1, 2	10 μ F, 35 V, Electrolytic Capacitor	24-350106
C3	0.1 μ F, 50 V, Ceramic Capacitor	122002-104
C4	10 μ F, 35 V, Electrolytic Capacitor	24-350106
C5	0.1 μ F, 50 V, Ceramic Capacitor	122002-104
C6	0.22 μ F, 25 V, Ceramic Capacitor	122004-224
C7, 8	1000 pF, 100 V, Mica Capacitor	128002-102
C9	0.22 μ F, 25 V, Ceramic Capacitor	122004-224
C10, 11	0.1 μ F, 50 V, Ceramic Capacitor	122002-104
C12	1000 pF, 100 V, Mica Capacitor	128002-102
C13	0.22 μ F, 25 V, Ceramic Capacitor	122004-224
C14, 15	0.1 μ F, 50 V, Ceramic Capacitor	122002-104
C16-28	4.7 μ F, 50 V, Electrolytic Capacitor	24-500475
C29	100 μ F, 25 V, Electrolytic Capacitor	24-250107
C30-57, 59-66, 68-73, 75-84, 86-89	0.1 μ F, 50 V, Ceramic Capacitor	122002-104
C90	100 pF, 100 V, Ceramic Capacitor	122016-101
Integrated Circuits for A043307-01 PCB Assembly		
1B	ROM Integrated Circuit	136036-105
1C	ROM Integrated Circuit	136036-113
2B	ROM Integrated Circuit	136036-106
2C	ROM Integrated Circuit	136036-115
3B	ROM Integrated Circuit	136036-107
3C	ROM Integrated Circuit	136036-116
4/5A	ROM Integrated Circuit	136036-122
4B	ROM Integrated Circuit	136036-108
4C	ROM Integrated Circuit	136036-117
5B	Custom SLAGS (Storage/Logic Array Graphics Shifter) Integrated Circuit	137415-101
5C	Custom SLAGS Integrated Circuit	137415-101
5D	Custom SLAGS Integrated Circuit	137415-101
5E	Custom SLAGS Integrated Circuit	137415-101
6B	ROM Integrated Circuit	136036-109
6C	ROM Integrated Circuit	136036-118
7A	ROM Integrated Circuit	136036-123
7B	ROM Integrated Circuit	136036-110
7C	ROM Integrated Circuit	136036-119
8B	ROM Integrated Circuit	136036-111
8C	ROM Integrated Circuit	136036-120
9B	ROM Integrated Circuit	136036-112
9C	ROM Integrated Circuit	136036-121
10A	ROM Integrated Circuit	136036-102
10B	ROM Integrated Circuit	136036-101
10E	Type-TL084 Operational Amplifier Integrated Circuit	37-347
12A	ROM Integrated Circuit	136036-104
12B	ROM Integrated Circuit	136036-103
13D	ROM Integrated Circuit	136036-124

Continued on next page

LSI Cartridge PCB Assembly, continued

Parts List

Designator	Description	Part No.
14A	ROM Integrated Circuit	136036-127
14B	ROM Integrated Circuit	136036-128
14D/E	Type-6522A Parallel Interface Adapter Integrated Circuit	137260-001
14/15D	ROM Integrated Circuit	136036-125
14E	Type-5220C Voice Synthesizer Integrated Circuit	137308-002
16A	ROM Integrated Circuit	136036-129
16B	ROM Integrated Circuit	136036-130
16D	ROM Integrated Circuit	136036-126
17A	Custom SLAPSTIC Integrated Circuit	137412-105
Integrated Circuits for A043307-02 PCB Assembly		
1B	ROM Integrated Circuit	136036-135
1C	ROM Integrated Circuit	136036-143
2B	ROM Integrated Circuit	136036-136
2C	ROM Integrated Circuit	136036-144
3B	ROM Integrated Circuit	136036-137
3C	ROM Integrated Circuit	136036-145
4/5A	ROM Integrated Circuit	136036-151
4B	ROM Integrated Circuit	136036-138
4C	ROM Integrated Circuit	136036-146
5B	Custom SLAGS (Storage/Logic Array Graphics Shifter) Integrated Circuit	137415-101
5C	Custom SLAGS Integrated Circuit	137415-101
5D	Custom SLAGS Integrated Circuit	137415-101
5E	Custom SLAGS Integrated Circuit	137415-101
6B	ROM Integrated Circuit	136036-139
6C	ROM Integrated Circuit	136036-147
7A	ROM Integrated Circuit	136036-152
7B	ROM Integrated Circuit	136036-140
7C	ROM Integrated Circuit	136036-148
8B	ROM Integrated Circuit	136036-141
8C	ROM Integrated Circuit	136036-149
9B	ROM Integrated Circuit	136036-142
9C	ROM Integrated Circuit	136036-150
10A	ROM Integrated Circuit	136036-132
10B	ROM Integrated Circuit	136036-131
10E	Type-TL084 Operational Amplifier Integrated Circuit	37-347
12A	ROM Integrated Circuit	136036-134
12B	ROM Integrated Circuit	136036-133
13D	ROM Integrated Circuit	136036-153
14A	ROM Integrated Circuit	136036-156
14B	ROM Integrated Circuit	136036-157
14D/E	Type-6522A Parallel Interface Adapter Integrated Circuit	137260-001
14/15D	ROM Integrated Circuit	136036-154
14E	Type-5220C Voice Synthesizer Integrated Circuit	137308-002
16A	ROM Integrated Circuit	136036-158
16B	ROM Integrated Circuit	136036-159
16D	ROM Integrated Circuit	136036-155
17A	Custom SLAPSTIC Integrated Circuit	137412-105

Continued on next page

LSI Cartridge PCB Assembly, continued

Parts List

Designator	Description	Part No.
Resistors		
R1	4.7 k Ω , \pm 5%, 1/4 W Resistor	110000-472
R2	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R3	3.3 k Ω , \pm 5%, 1/4 W Resistor	110000-332
R4	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R5	3.3 k Ω , \pm 5%, 1/4 W Resistor	110000-332
R6	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R7	1.8 k Ω , \pm 5%, 1/4 W Resistor	110000-182
R8	3.3 k Ω , \pm 5%, 1/4 W Resistor	110000-332
R9	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R10	27 k Ω , \pm 5%, 1/4 W Resistor	110000-273
R11, 13	33 k Ω , \pm 5%, 1/4 W Resistor	110000-333
R12	43 k Ω , \pm 5%, 1/4 W Resistor	110000-433
R14	390 Ω , \pm 5%, 1/4 W Resistor	110000-391
R15, 16	43 k Ω , \pm 5%, 1/4 W Resistor	110000-433
R17-20	2.4 k Ω , \pm 5%, 1/4 W Resistor	110000-242
R21	330 Ω , \pm 5%, 1/4 W Resistor	110000-331
R22	220 Ω , \pm 5%, 1/4 W Resistor	110000-221
R23-26	4.7 k Ω , \pm 5%, 1/4 W Resistor	110000-472
RN1-8	4.7 k Ω \times 8 Single-Inline-Package Resistor	118002-472
Sockets		
1B-16B	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
1C-9C	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
1D-9D	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
1E-9E	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
4/5A	20-Contact, Medium-Insertion-Force IC Socket	79-42C20
7A	20-Contact, Medium-Insertion-Force IC Socket	79-42C20
10A-16A	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
10E	14-Contact, Medium-Insertion-Force IC Socket	79-42C14
13D	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
14/15D	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
14D/E	40-Contact, Medium-Insertion-Force IC Socket	79-42C40
14E	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
16D	28-Contact, Medium-Insertion-Force IC Socket	79-42C28
17A	20-Contact, Medium-Insertion-Force IC Socket	79-42C20
Transistors		
Q1	Type-2N3906 Transistor	33-2N3906
Q2	Type-2N3904 Transistor	34-2N3904
Q3	Type-2N3906 Transistor	33-2N3906
Miscellaneous		
OP1L-OP3L	6-Position Header Connector	179177-006
OP1U-OP3U	6-Position Header Connector	179177-006
OP1L-OP3L	2-Position Connector Receptacle	179178-002
OP1U-OP3U	2-Position Connector Receptacle	179178-002
VR1A	Type-79L05 Voltage Regulator (Acceptable substitute is part no. 37-7905, Designator VR1B) Test Point (Acceptable substitute is part no. 020670-01)	37-79L05 179051-002

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 $\overline{\text{START}}$ is low.

ADDRESS

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

ANALOG

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

ANODE

The positive (arrow) end of a diode.

AMPLIFIER

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

AMPLITUDE

The maximum instantaneous value of a waveform pulse from zero.

ASTABLE

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

AUXILIARY COIN SWITCH

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

HARNES

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

HEXADECIMAL

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

IMPLODE

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

I/O

Input/Output.

IRQ

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

LED

The abbreviation for a light-emitting diode.

LOCKOUT COIL

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

LOGIC STATE

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

Logic 0, Low = 0 VDC to +0.8 VDC

Grey Area (Tri-State Level) =

+0.8 VDC to +2.4 VDC

Logic 1, High = +2.4 VDC to +5 VDC

MULTIPLEXER

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

NMI

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

PAGE

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

PCB

The abbreviation for a printed-circuit board.

PHOTOTRANSISTOR

A transistor that is activated by an external light source.

POTENTIOMETER

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

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

RAM

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

RASTER-SCAN DISPLAY

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

RETRACE

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

RESISTOR

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

ROM

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

SIGNATURE ANALYSIS

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

TROUBLESHOOT

The process of locating and repairing a fault.

VECTOR

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

WATCHDOG

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

X-Y DISPLAY

A display system whereby images are displayed with vectors.

ZENER DIODE

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

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