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TM-313
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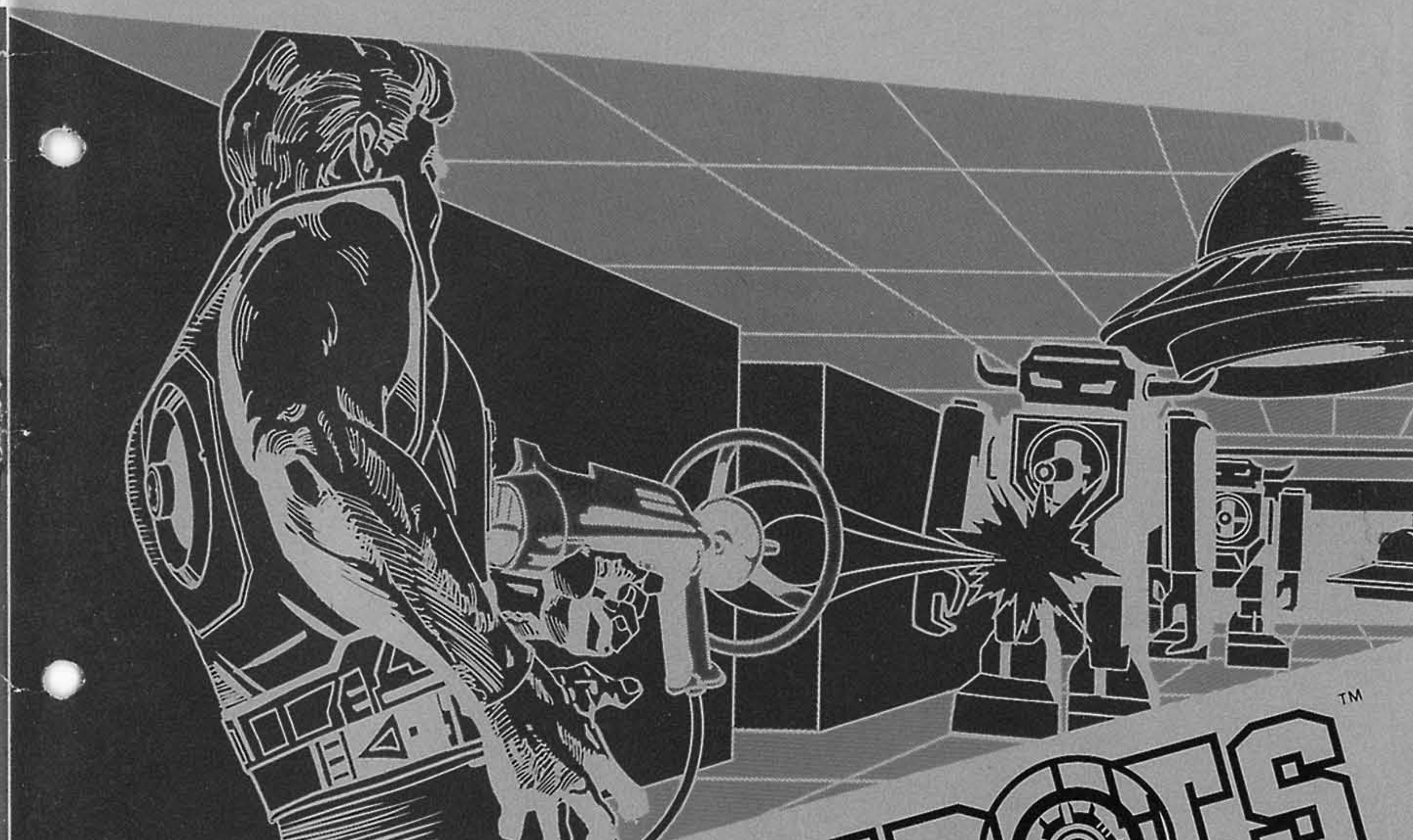

XYBOTS™

Operators Manual

with Illustrated Parts Lists

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:

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ATARI GAMES

Xybots™ 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 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 2-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 wire is firmly secured to 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 game's power supply is properly configured for the line voltage in your location.

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 electical 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 the CRT With Care. If you drop the 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.

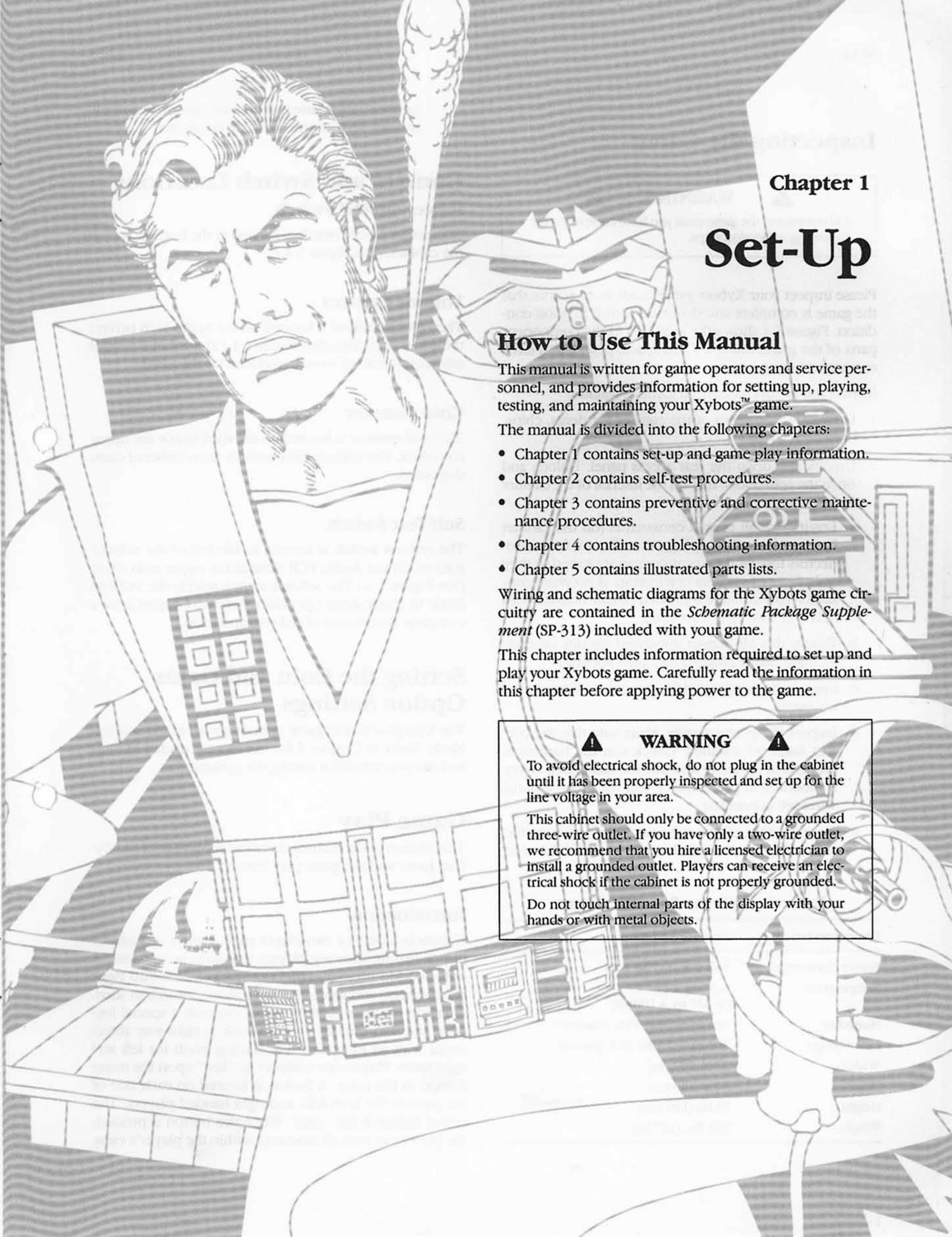
ABOUT NOTES, CAUTIONS, AND WARNINGS

In all 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 injured or killed if instructions are not followed. (The word *WARNING* is always surrounded by international warning symbols—triangles with exclamation marks inside of them.)



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 Xybots™ 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 Xybots game circuitry are contained in the *Schematic Package Supplement* (SP-313) included with your game.

This chapter includes information required to set up and play your Xybots 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 properly 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.

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

Inspecting the Game

> **⚠ WARNING ⚠**
>
> Do not plug in the game until you have completed the following inspection steps.

Please inspect your Xybots 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 speakers. Make sure that they are mounted securely and that the ground wires are connected.

Table 1-1 Game Specifications

Characteristic	Specification
Power Consumption	162 V-A, 117 W RMS
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	27 in. (69 cm)
Depth	34 in. (86 cm)
Height	73 in. (185 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.

Coin Counter

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

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.) The self-test switch selects the Self-Test Mode to check game operation. Refer to Chapter 2 for a complete description of self-test operation.

Setting the Coin and Game Option Settings

The Xybots coin and game options are set 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 Xybots game and the game play features.

Introduction

Xybots 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/blue and right player/green) and game character allows for instant identification by players. Each player controls a special joystick and two buttons. The joystick is eight-way directional with an independently turning knob for left and right turns. Players use a blaster to "fire" upon the many Xybots in the maze. A button is located on each side of the joystick for both left- and right-handed players. The center button is the "zap." When this button is pressed, the player can stun all monsters within the player's view.

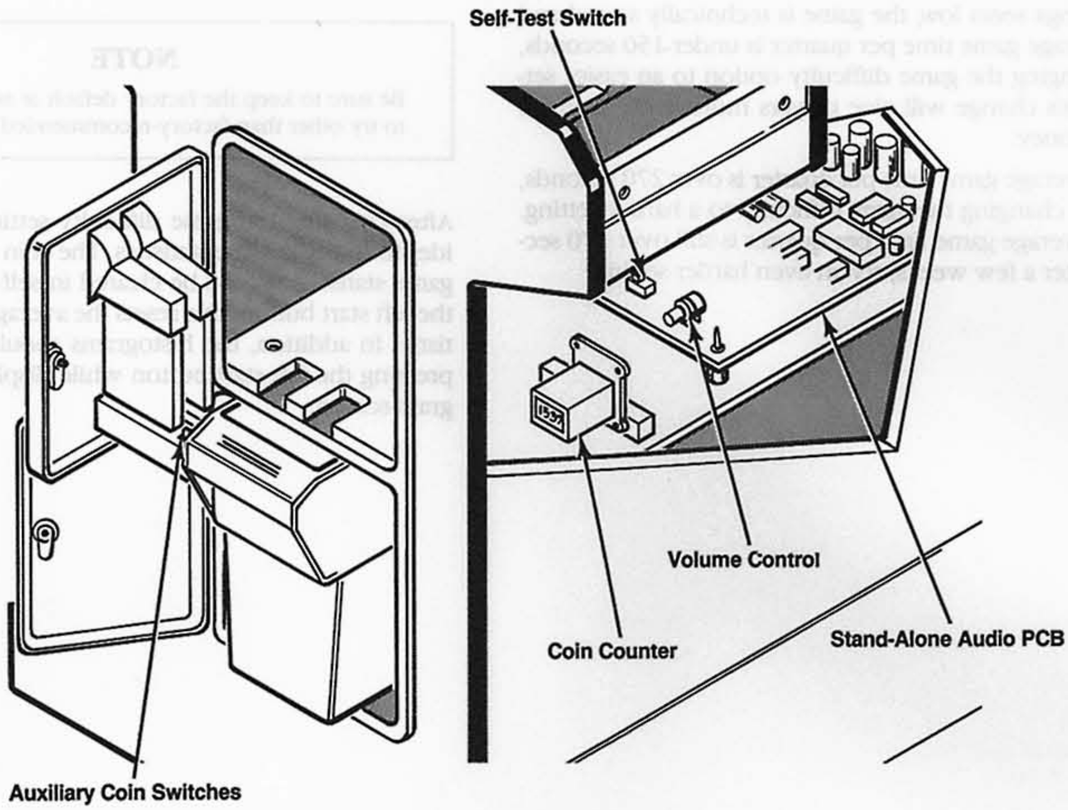


Figure 1-1 Control and Switch Locations

Play Mode

Xybots takes place in the distant future on a planet overrun by a hostile civilization of robots called Xybots. They have created huge underground multi-level cities composed of mazes with locked doors and transporters to connect different areas of the same level. Players must battle the Xybots and reach the exit elevator to advance. In the mazes players find energy pods to restore energy, keys to open doors, and coins to buy valuable supplies in the store. Players enter stores between each level. Some of the supplies purchased are temporary and must constantly be replenished.

Every few levels players must face the Master Xybot in a one-on-one duel. If players can beat the Master Xybot, they will be generously rewarded. Only by defeating the Master Xybot can players advance to the next level. The penalty for losing is to be sent back a few levels.

The Xybots robots include:

- **Saucers**: Carry coins and energy pods through the maze. They generally run away, but become "kamikazes" if cornered. One blast destroys the Saucer.
- **Tanks:** Two types. The front-armored type, but vulnerable when it opens its armor to shoot. The side-armored type, vulnerable from the front or rear.
- **Warriors**: Large red robots with enormous firepower, but without extra armor.
- **Guardians:** Similar to the Warriors, but unpredictable. They only appear on the map when players are equipped with a special power.
- **Flies**: Robots with the ability to fly over players' shots. More skill and timing are required to destroy them.

Maximizing Earnings

Operator options on this game have been kept very simple. You should thoroughly read Chapter 2, Self-Test, for the Coin Options, Game Options, Histograms, and Statistics screens so that you can effectively use the available options. Use the Self-Test screens showing Statistics and Histograms to evaluate game data, and the Game Options screen to make adjustments. (Refer also to the Self-Test chapter for more information on setting options.)

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 players a good value and ensure repeat play. (Repeat play is crucial to longevity.) The Xybots software gives the operator the flexibility to tune game difficulty and enough statistics to intelligently make adjustments.

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

If earnings seem low, the game is technically sound and the average game time per quarter is under 150 seconds, try changing the game difficulty option to an easier setting. This change will give players more game time for their money.

If the average game time per quarter is over 270 seconds, first try changing the game difficulty to a harder setting. If the average game time per quarter is still over 270 seconds after a few weeks, try an even harder setting.

NOTE

Be sure to keep the factory default at *no* if you wish to try other than factory-recommended settings.

After changing the game difficulty settings, it is a good idea to reset the game statistics. The coin information and game statistics should be cleared in self-test by pressing the left start button; this resets the average game time statistic. In addition, the histograms should be cleared by pressing the left start button while displaying the Histogram screen.

Chapter 2

Self-Test

The Xybots™ 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, or when you suspect game failure.

Thirteen self-test screens provide information pertaining to the game circuits and controls. The game enters the Self-Test Mode after the self-test switch is turned on. The following self-test screens are arranged in the sequence in which they occur when the self-test switch is 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. Refer to Chapter 1 for the self-test switch location.

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 RAM and ROM Test passes, the display advances to the Switch Test.

The RAM/ROM Test is divided into two sections. The RAM Test is performed first. If the RAM Test passes after a six-second delay, the self-test skips to the ROM Test without displaying any message. If the RAM fails, a message will be displayed in the center of the screen as shown in Table 2-1. The RAM Test will continue to run until it passes. If the left Fire button is pressed and released, the RAM Test will advance to the next RAM or ROM Test.

The ROM Test will display no messages and advance to the Switch Test if no errors occur. If a ROM fails, a message is displayed. Table 2-2 shows the location of the failing ROM. If the left Fire button is pressed, and released, the ROM Test will advance to the next ROM.

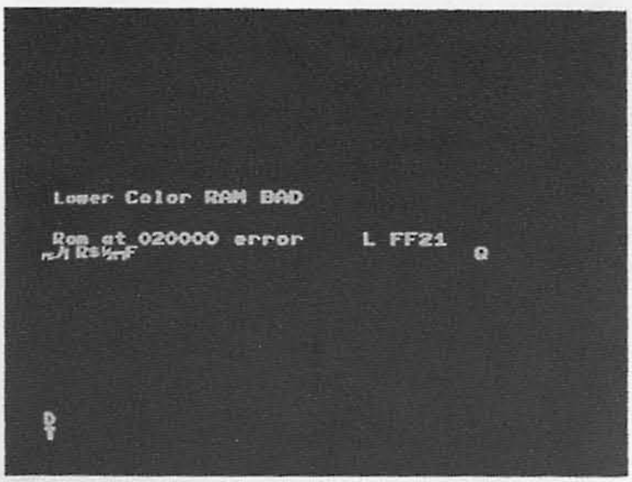


Figure 2-1 RAM Test Fails

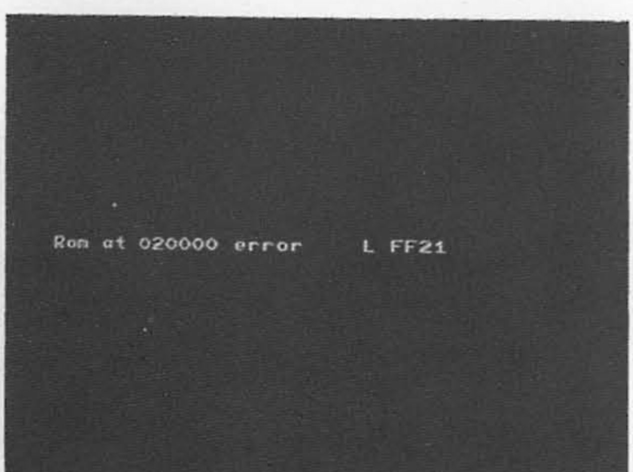


Figure 2-2 ROM Test Fails

Table 2-1 Faulty RAM Locations

RAM Type	Location on Game PCB	Video Display Characteristic
Upper Video RAM Lower Video RAM	14J 14E	Background color is dark green and foreground is blue. The messages may be hard to read. The program will reset if the self-test is advanced beyond the ROM Test.
Upper Color RAM	17K	Reddish or brightly colored.
Lower Color RAM	17J	Blues and greens will be the prevalent colors.

Table 2-2 Faulty Upper or Lower Main ROM Locations

Error Address	Location on Game PCB	
00000	U = 17C/D	L = 19C/D
10000	U = 17C/D	L = 19C/D
20000	U = 17B	L = 19B
8000*	U = 17C/D	L = 19C/D

**This message can also occur if there is any error with the custom chip at 14B or its associated circuitry.*

Figure 2-3 Switch Test

Switch Test

The Switch Test is shown in Figure 2-3. This test checks the condition of the player controls. The joystick movement and the buttons that are checked include:

Left Player Up	Right Player Up
Left Player Down	Right Player Down
Left Player Left	Right Player Left
Left Player Right	Right Player Right

Left Player Turn Left	Right Player Turn Left
Left Player Turn Right	Right Player Turn Right
Left Player Fire	Right Player Fire
Left Player Start	Right Player Start

Operate the joysticks and pushbuttons for the right player first, and then the left player. Check that the screen highlights in white the appropriate joystick movement or button that was pressed.

Press the left Fire button to obtain the next screen.

Coin Options

The Coin Options screen is shown in Figure 2-4. The Coin Options screen indicates the current coin option settings and is used to change those settings.

GAME PRICE should have a red box around it. Move the left joystick right or left to cycle through four game price selections as follows:

- One Coin (Default)
- Two Coins
- Three Coins
- Four Coins

Select the desired value. Note that the default (recommended) setting of *One Coin* is highlighted in green.

Move the left joystick down to move the red box to *MULTIPLIER*. Then move the left joystick right or left to cycle through eight multiplier selections as follows:

- 1 Coin Counts as 1 Coin (Default)
- 1 Coin Counts as 2 Coins
- 1 Coin Counts as 3 Coins
- 1 Coin Counts as 4 Coins
- 1 Coin Counts as 5 Coin
- 1 Coin Counts as 6 Coins
- 1 Coin Counts as 7 Coins
- 1 Coin Counts as 8 Coins

Select the desired value. Note that the default (recommended) setting of *1 Coin Counts as 1 Coin* is highlighted in green.

Move the left joystick down to move the red box to *BONUS ADDER*. Move the left joystick right or left to cycle through seven bonus adder selections as follows:

- None (Default)
- 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

Select the desired value. Note that the default (recommended) setting *None* is highlighted in green.

If you replace the EEROM at location 20C/D or a hardware problem occurs, the coin options will switch to the default (green) settings.

If you want to cancel the coin option changes and restore the original settings, press the left Start button.

Press the left Fire button to set the game for the options selected and obtain the next screen. *Exiting from the Coin Options screen by turning off the self-test switch will **not** set the game for the selected coin options.*

Game Options

The Game Options screen is shown in Figure 2-5. This screen indicates the current game option settings, and is used to reset the high score table and change the game option settings. Refer to Table 2-3 for the available op-

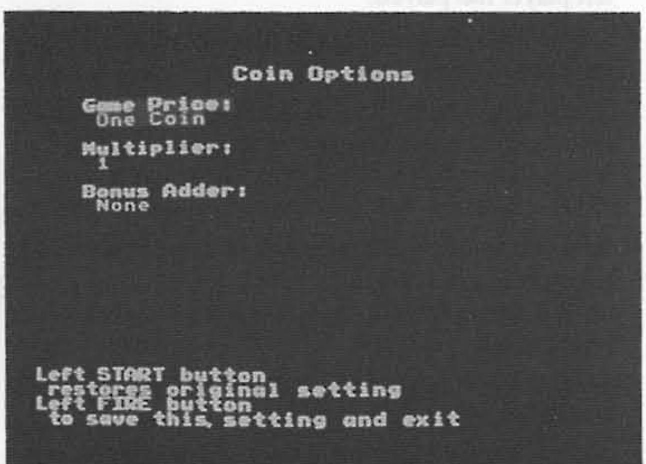


Figure 2-4 Coin Options

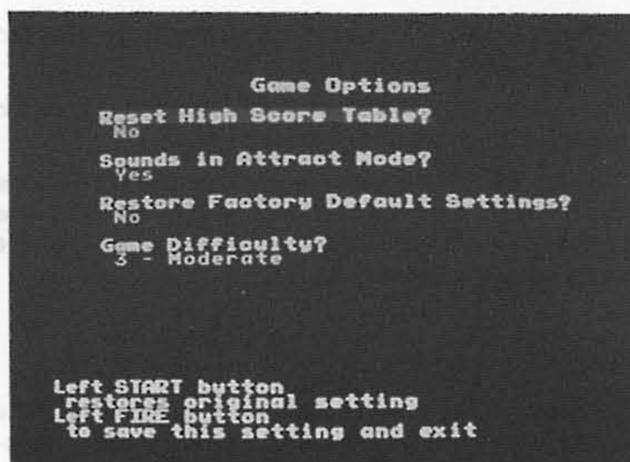


Figure 2-5 Game Options

Table 2-3 Game Option Settings

Option Name	Available Settings
Reset High Score Table	No ◄ Yes
Sounds in Attract Mode	No Yes ◄
Restore Factory Default Settings	No ◄ Yes
Game Difficulty	0—Easy 1 2 3—Moderate ◄ 4 5 6—Hard 7—Hardest

◄ *Manufacturer's recommended settings*

tions and the default (recommended) settings. Note that the default settings are highlighted in green.

Move the left joystick right or left and note that the settings in the red box change. Select the desired value. Move the left joystick up or down to move the red box to the desired option. Move the left joystick right or left to cycle through all the available game option settings, and select the desired value. Repeat this procedure for the remaining options.

Reset High Score Table—The high score table is not reset unless you select *Yes*.

Sounds in Attract Mode—Sound is played in the Attract Mode unless you select *No*.

Restore Factory Default Settings—If you select *Yes* and exit from the Game Options Screen by pressing the left Fire button, the game option settings stored in nonvolatile RAM will be cleared and replaced by the manufacturer's default (recommended) settings when the game enters the Attract Mode.

Game Difficulty—The Game Difficulty settings adjust the difficulty of the Xybots.

If you want to cancel the option changes and restore the original settings, press the left Start button.

Press the left Fire button to set the game for the options selected and obtain the next screen. *Exiting the Game Options screen by turning off the self-test switch will **not** set the game for the selected options.*

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

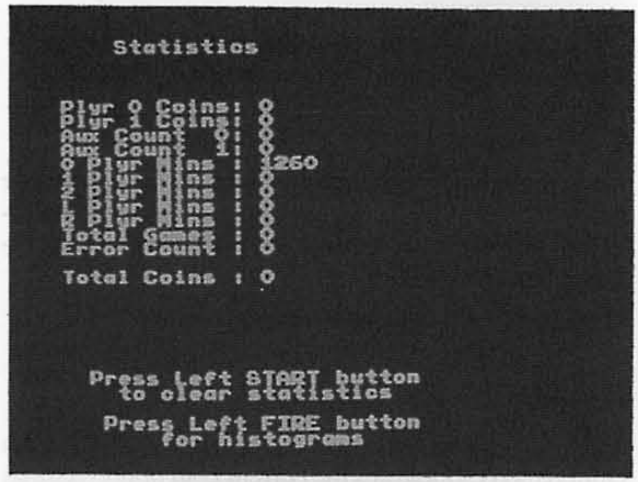


Figure 2-6 Statistics

the statistics were reset. To reset the statistics information, press the left Start button.

The following information appears on the Statistics screen:

- *Plyr 0 Coins* shows the number of coins deposited in the left coin mechanism.
- *Plyr 1 Coins* shows the number of coins deposited in the right coin mechanism.
- *Aux Count 0* shows the number of times players continued their characters at level 10 or earlier.
- *Aux Count 1* shows the number of times players continued their characters at level 11 or higher.
- *0 Plyr Mins* shows the minutes of idle time.
- *1 Plyr Mins* shows the minutes played as a 1-player game.
- *2 Plyr Mins* shows the minutes played as a 2-player game.
- *L Plyr Mins* shows the total number of minutes that the left player has played.
- *R Plyr Mins* shows the total number of minutes that the right player has played.
- *Total Games* shows the total number of games played. One "game" is the time between the first player starting and both players dying, regardless of time, number of coins inserted, or how many have played Xybots.
- *Error Count* shows the number of EEROM errors that were detected. Replace the EEROM at location 20C/D on the Game PCB if the errors detected exceed approximately 75 per week.
- *Total Coins* shows the total number of coins deposited in all the coin mechanisms.
- *Avg Time/Coin* shows the average game time per coin, in seconds, for all players.

Press the left Fire button to obtain the next screen.

Histograms

The Histogram screen is shown in Figure 2-7. For both players, the screen shows the lengths of the games from 0 to 300 or more seconds. The Histogram also provides corresponding bar graphs.

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. To reset the Histograms, press the left Start button.

Press the left Fire button to obtain the next screen.

Playfield Test

The Playfield Test is shown in Figure 2-8. Under the title *PLAYFIELD TEST* are five rows of pictures. The first row has sixteen colors: black, red, green, blue, white, . . . , and orange. The second row has 16 different symbols in various colors. Some of the symbols include: a yellow right angle with a dot inside of it, blue-and-orange arrows pointing in different directions, an orange diamond, etc.

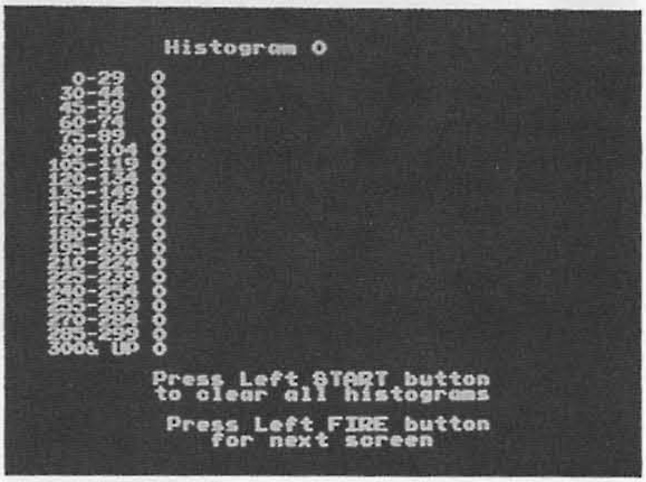


Figure 2-7 Histograms

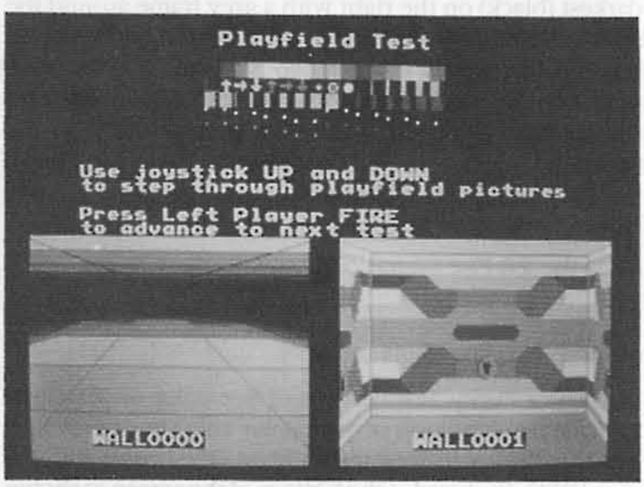


Figure 2-8 Playfield Test

The third row has 16 colored blocks of different sizes: two white blocks, seven yellow, and seven red. The fourth row has one line of white dots slanting down to the right, followed by one line of yellow dots. The fifth row has one line of orange dots slanting down to the right and one line of red dots.

At the bottom of the screen are two large pictures of the view seen by the players. By moving the left-player joystick up or down, the pictures will change. By advancing through 18 sets of pictures, you can visually check that the data in playfield EPROMs located at 8L, 11L, and 12L are OK.

Not all pictures in the playfield EPROMs are tested. If the attract mode pictures of the title screen, the high score screen, the story line screen, or the pictures surrounding the players score are incorrect, then this could indicate a failure in the playfield circuitry.

Press the left Fire button to obtain the next screen.

Motion Object Test

The Motion Object Test appears is shown in Figure 2-9. The Motion Object Test indicates the condition of the motion-object buffer circuit. There are fifty-six objects, eight pixels wide, placed in two rows in the center of the screen. The following information is provided at the bottom of the screen:

- *OBJECT* indicates the number of the motion object selected.
- *PICTURE* indicates the stamp number in ROM.
- *HORIZONTAL* indicates the horizontal position of the object.
- *VERTICAL* indicates the vertical position of the object.
- *SIZE* indicates the number of stamps high.
- *COLOR PALETTE* indicates the palette number for colors.

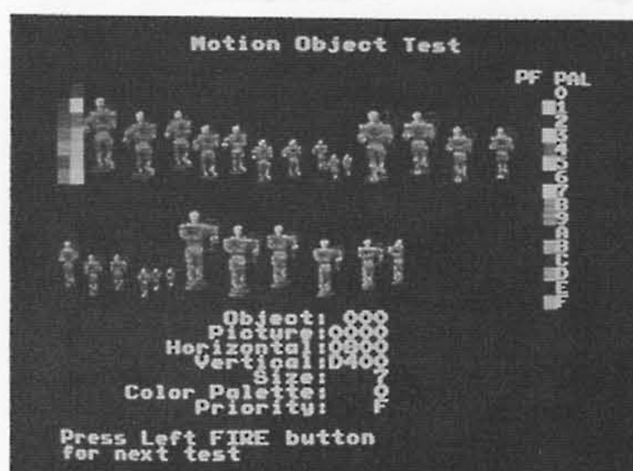


Figure 2-9 Motion Object Test

- *PRIORITY* indicates which playfield palettes have priority over the motion object.

Perform the test procedure as described in Table 2-4.

Press the left Fire button to obtain the next screen.

Alphanumerics Test

The Alphanumerics Test is shown in Figure 2-10. This test indicates the condition of the alphanumerics circuit. Check that there are no errors on the screen. If there are errors, check the EPROM at 5C or its circuitry.

Press the left Fire button to obtain the next screen.

Color Test

The Color Test is shown in Figure 2-11. This Test indicates the condition of the display color circuits.

Table 2-4 Motion Object Test Description

Control/Movement	Function	
Left Start	Displays a different set of pictures. (See *PICTURE.*) Press this button and inspect all pictures from 0 to 37FF. If there are errors, inspect:	
	Picture	**EPROM Location on Game PCB**
	0-7FF	2E
	800-FFF	2E/F
	1000-17FF	2F
	1800-1FFF	2F/J
	2000-27FF	2J/K
	2800-2FFF	2K
	3000-37FF	2L
Left Joystick	Changes the horizontal and vertical position of the selected object. (See *HORIZONTAL* and *VERTICAL.*)	
Left Joystick/Turn Left	Decreases the selected object number. (See *OBJECT.*)	
Left Joystick/Turn Right	Increases the selected object number. (See *OBJECT.*)	
Right Start	Toggles the horizontal flip bit of the selected object. (See *PICTURE.*)	
Right Fire	Increases the priority of the selected object. (See *PRIORITY.*)	
Right Joystick/Left	Decreases the palette of the selected object. (See *COLOR PALETTE.*)	
Right Joystick/Right	Increases the palette of the selected object. (See *COLOR PALETTE.*)	
Right Joystick/Up	Increases the size of the selected object. (See *SIZE.*)	
Right Joystick/Down	Decreases the size of the selected object. (See *SIZE.*)	
Right Joystick/Turn Left	Decreases the picture of the selected object. (See *PICTURE.*)	
Right Joystick/Turn Right	Increases the picture of the selected object. (See *PICTURE.*)	

Figure 2-10 Alphanumerics Test

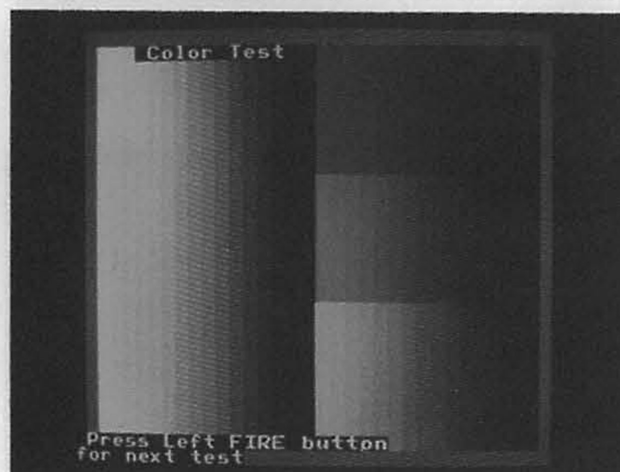


Figure 2-11 Color Test

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 left and darkest (black) on the right with a grey frame around the screen. This frame will help 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 darkest column (not black) with the red, green, and blue colors. This column should be just barely visible.

Press the left Fire button to obtain 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 to appear should be a red screen with the word RED displayed at the bottom of the screen as shown in Figure 2-12.

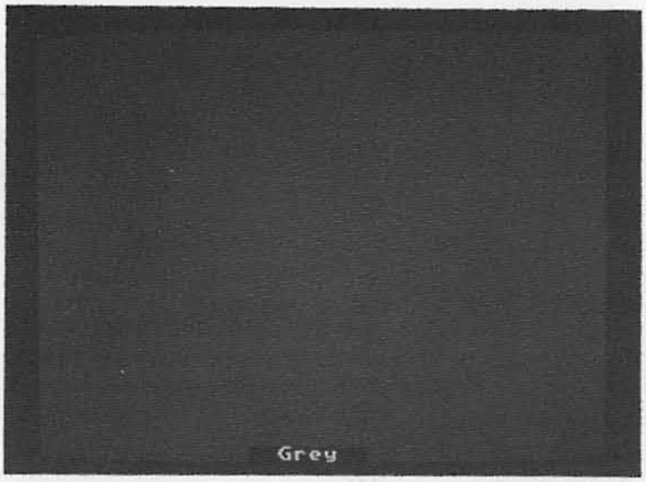


Figure 2-12 Color Purity Test

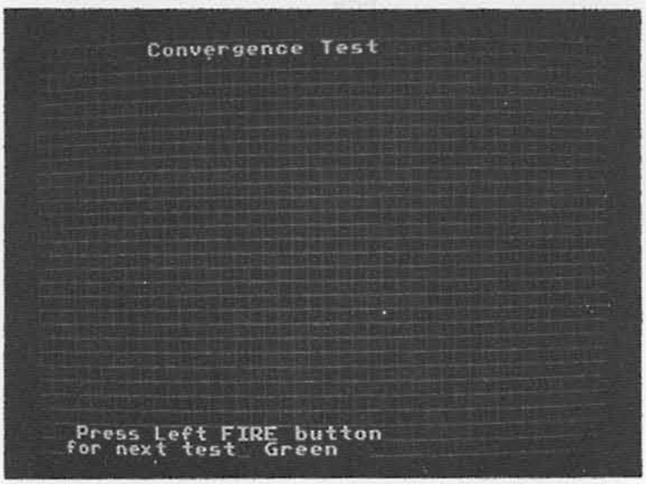


Figure 2-13 Convergence Test

Press the left Start button, and the next display to appear should be green with the word GREEN displayed at the bottom of the screen. Press the left Start 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 display manual for the color-purity adjustment procedure or the possible cause of failure.

Press the left Fire button to obtain the next screen.

Convergence Test

The Convergence Test is shown in Figure 2-13. This test indicates the condition of the display size, centering, linearity, and convergence. The grid pattern should be white.

Press the left Start button and the grid pattern should turn violet. Pressing the left Start button again should cause the grid pattern to turn green. Check the grid pattern for the following characteristics (the violet and white patterns are used to adjust the display convergence):

- The four corners of the frame around the grid pattern should touch all four corners of the screen.
- Grid lines should show 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 convergence adjustment procedures or to determine the possible cause of failure.

Press the left Fire button to obtain the next screen.

Sound Test

The Sound Test is shown in Figure 2-14. This test indicates the condition of the coin mechanisms and the music, speech, and sound-effects circuits.

The sound microprocessor is reset at the beginning of this test. The game may take up to three seconds to produce the first sound. If the sound-microprocessor reset fails, the message *SOUND PROCESSOR NOT RESPONDING* should blink near the top of the screen, or *SOUND CPU RAM 1 ERROR* will be displayed near the top of the screen. If the sound microprocessor is good, check the coin mechanisms and the sound microprocessor circuits by observing the following messages:

- *CURRENT COIN VALUE* consists of four zeros. For the left and right coin mechanisms, the third and fourth 0 respectively, should change to a 1 as the coin switch is held down, and should change back to 0 when the coin switch is released.
- *NUMBER OF SOUNDS* indicates of the number of sounds used in the Xybots game.

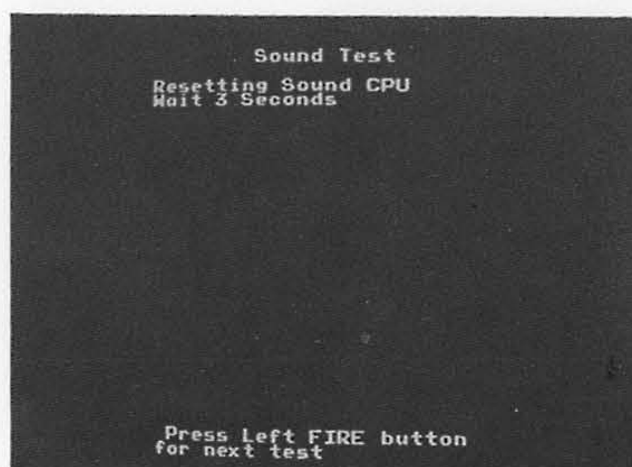


Figure 2-14 Sound Test

good, the word *GOOD* should appear. 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.

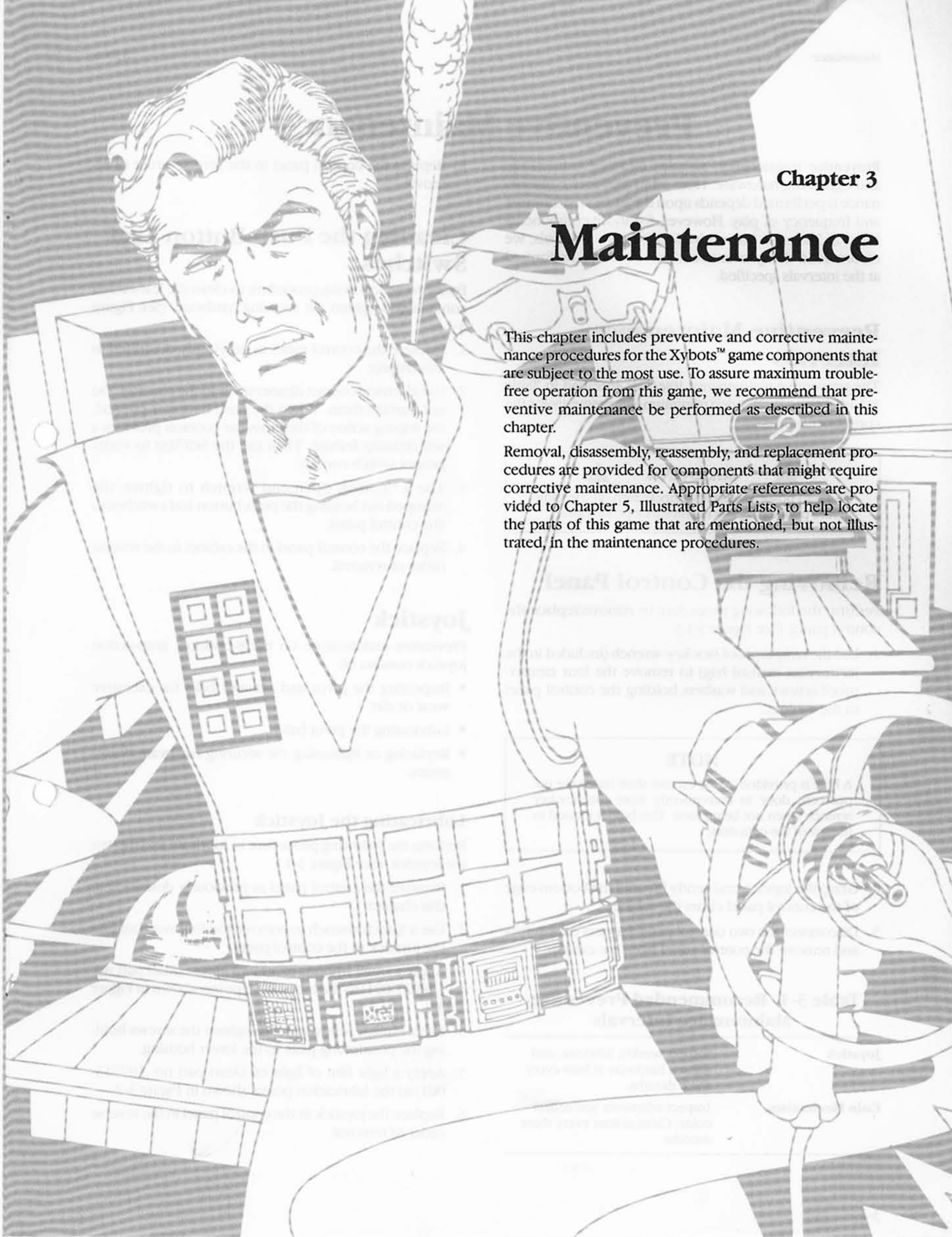
- *SOUND #* indicates the sound selected by moving the left joystick up (increments the sound number) or down (decrements the sound number). To hear the sound, press the left Start button one or more times. Moving the left joystick right or left silences the sound. You can select the following integrated 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 left Fire button to return to the Switch Test.

Table 2-5 Faulty Sound RAM and ROM Locations

Error Message	Location on Stand-Alone Audio PCB/Cause
Music Chip Time Out	2F
Sound CPU Interrupt Error	2F, 5K, Transistor Q8
Sound CPU RAM 1 Error	2H If displayed when entering test, then sound processor cannot run further. Press Fire button to obtain next test.
Sound CPU ROM 1 Error	2K
Communications Error #1	1M Will count number of errors caused by either the Audio PCB or Game PCB.
Communications Error #2	A probable disconnection of Audio PCB from Game PCB, or the chip at 1M is not inserted into its socket.
Sound Processor Not Responding	A major problem with the Audio PCB.

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



Chapter 3

Maintenance

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

Removal, disassembly, reassembly, and replacement procedures are provided for components that might require corrective maintenance. Appropriate references are provided to Chapter 5, Illustrated Parts Lists, to help locate the parts of this game that are mentioned, but not illustrated, in the maintenance procedures.

Preventive Maintenance

Preventive maintenance includes cleaning, lubricating, and tightening hardware. How often preventive maintenance is performed depends upon the game environment and frequency of play. However, for those components listed in Table 3-1 Preventive-Maintenance Intervals, we recommend that preventive maintenance be performed at the intervals specified.

Preventive-Maintenance Intervals

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

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

Removing the Control Panel

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

1. 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 conveniently store the hex-key wrench when not being used. This hole is located to the left of the coin slots.

2. Grasp the joystick and gently lift until the bottom edge of the control panel clears the cabinet.
3. Disconnect the two control panel harness connectors and remove the control panel from the cabinet.
4. Replace the control panel in the reverse order of removal.

Table 3-1 Recommended Preventive-Maintenance Intervals

Joystick	Inspect weekly, lubricate, and tighten hardware at least every three months.
Coin Mechanism	Inspect whenever you collect coins. Clean at least every three months.

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. Then use the Self-Test to verify proper switch contact.
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.

Joystick

Preventive maintenance on the 8-position, snap-action joystick consists of:

- Inspecting the pivot and actuator balls for excessive wear or dirt.
- Lubricating the pivot ball.
- Replacing or tightening the securing hardware if necessary.

Lubricating the Joystick

Perform the following procedure to lubricate and tighten the joystick. (See Figure 3-1.)

1. Remove the control panel as previously described in this chapter.
2. Use a $^{3}\!/_{8}$-inch wrench to remove the four nuts holding the joystick to the control panel.
3. Apply a small amount of lithium grease (Atari part no. 178027-001) to the lubrication points shown in Figure 3-2.
4. Use a Phillips screwdriver to tighten the screws holding the positioning plate to the lower housing.
5. Apply a light film of light oil (Atari part no. 107013-001) to the lubrication points shown in Figure 3-2.
6. Replace the joystick in the control panel in the reverse order of removal.

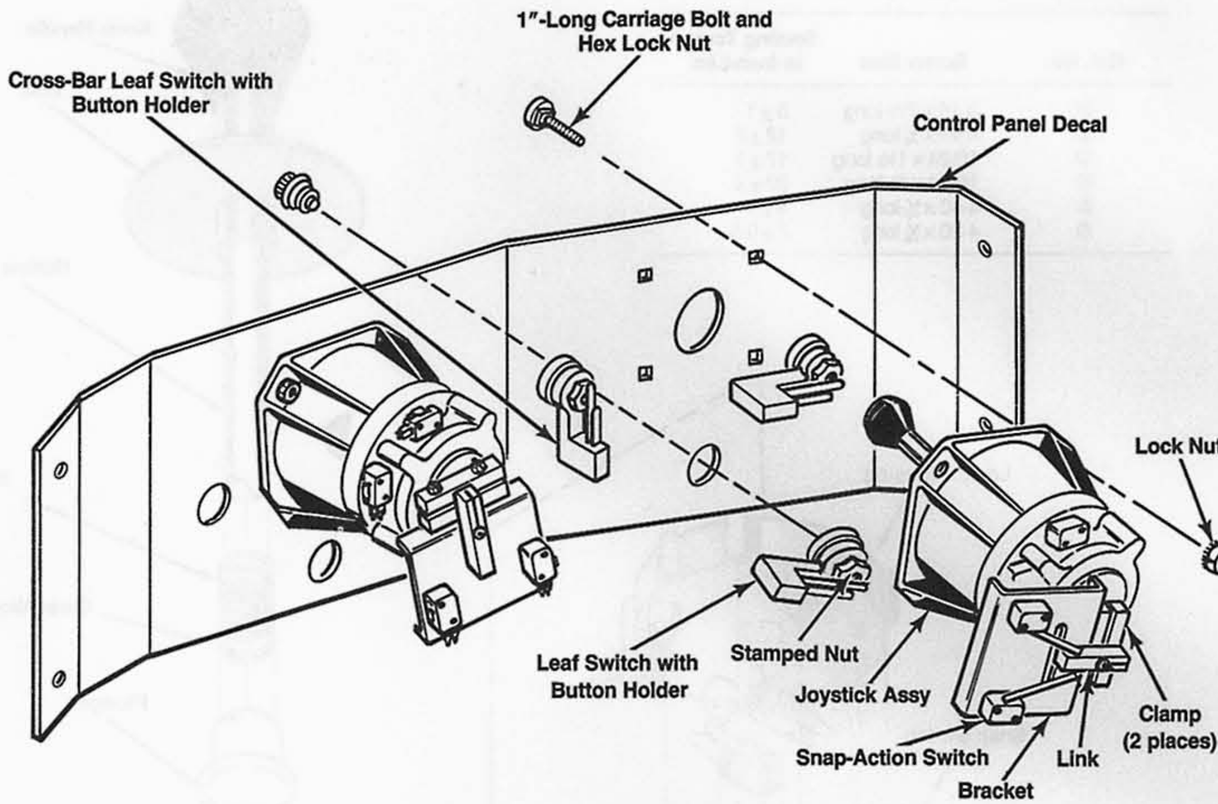


Figure 3-1 Leaf Switch and Joystick Removal

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.

> **⚠ 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.

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.

> **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.

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

Screw Torque Specifications

Ref. No.	Screw Size	Seating Torque in Inch-Lbs.
①	8-16×2½ long	5±1
②	4-40×⅜ long	12±2
③	10-24×1½ long	17±1
④	10-24×¾ long	20±2
⑤	4-40×⅜ long	4±1
⑥	4-20×⅜ long	2±0.5

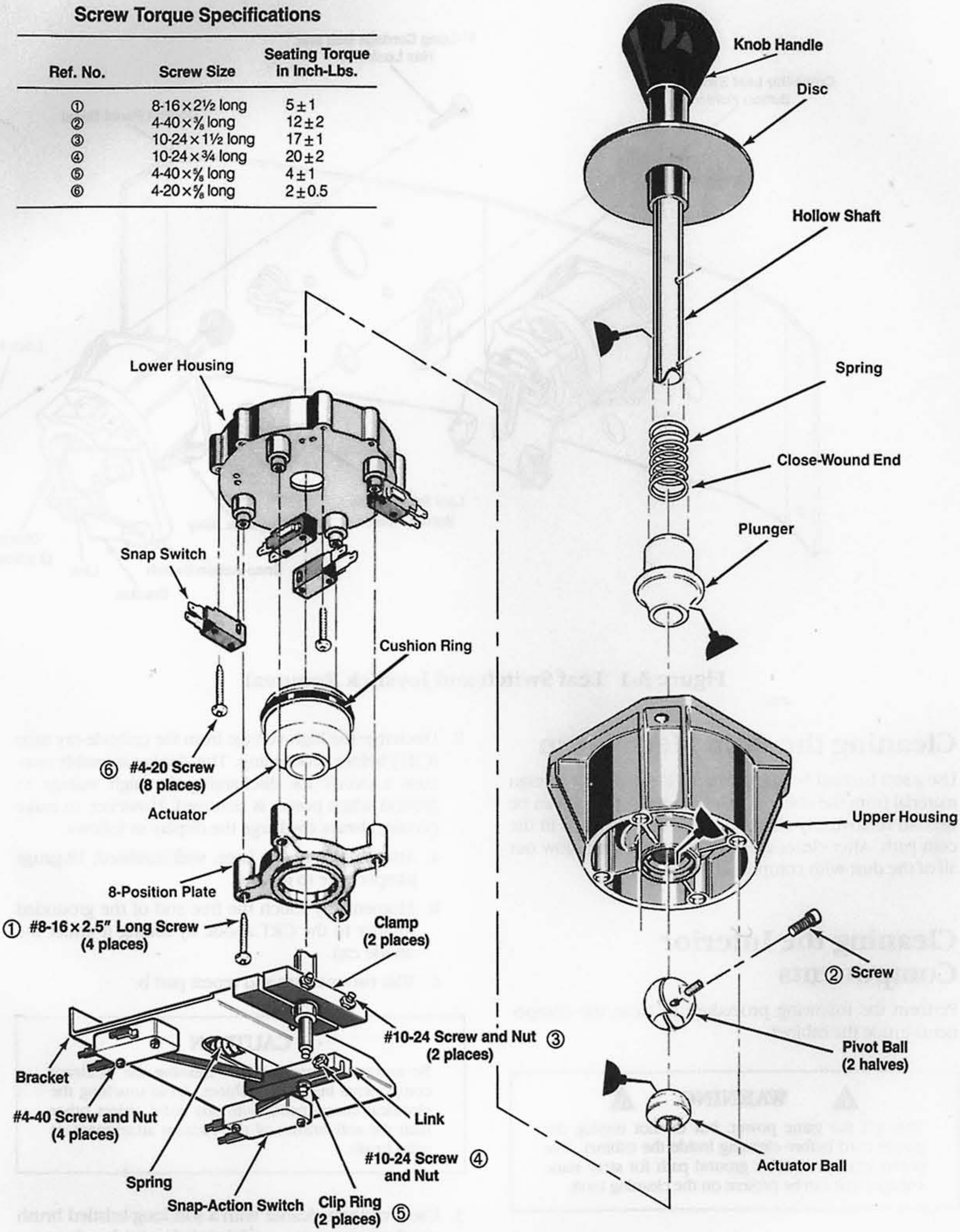


Figure 3-2 Joystick Disassembly and Lubrication

the cabinet. Be sure to clean the electrical components thoroughly (power supplies, PCB assemblies, display, etc.).

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 Joystick

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

1. Remove the control panel as described under *Preventive Maintenance.*
2. Disconnect the fast-on connectors from the six snap-action switches.
3. Use a ⅜-inch hex driver to remove the four nuts holding the joystick to the control panel.
4. Carefully lift the joystick out of the control panel.
5. Replace the joystick in the reverse order of removal. Reconnect the fast-on connectors to the snap-action switch terminals as shown in the Detailed Control Panel Game Wiring Diagram in the *Schematic Package (SP-313).*

Disassembling the Joystick

Perform the following procedure to disassemble the joystick assembly. (See Figure 3-2.)

1. Use a small screwdriver (or appropriate tool) to remove the ring cip from the bottom of the shaft.
2. Remove the extension spring from the link pin. Remove the link.
3. Use a small screwdriver (or appropriate tool) to remove the second ring clip from the bottom of the shaft.
4. Remove the knob handle and disc.
5. Use a $\frac{5}{32}$ Allen wrench and ⅜-inch wrench (or hex-driver) to remove the two clamps from the switch bracket.
6. Use a Phillips screwdriver to remove the four screws holding the positioner plate to the lower housing.
7. Remove the actuator.
8. Remove the lower housing with the four snap-action switches from the upper housing.

NOTE

The following steps describe the procedure for disassembling the upper housing assembly.

9. Remove the actuator ball from the shaft.
10. Use a $\frac{3}{32}$ Allen wrench to remove the two cap screws holding the pivot-ball halves to the shaft.
11. Slide the shaft out of the housing and remove the plunger and spring from the shaft.
12. Reassemble the joystick as described in the following procedure.

Reassembling the Joystick

Perform the following procedure to reassemble the joystick. (See Figure 3-2.)

NOTE

If the upper housing assembly was not previously disassembled, proceed to step 7.

1. Slide the spring onto the hollow shaft.
2. With the bell-shaped end toward the end of the shaft, slide the plunger onto the hollow shaft and over the spring.
3. Slide the end of the hollow shaft through the top of the upper housing.
4. Attach the pivot-ball halves to the hollow shaft with the two 4-40 × ⅜-inch cap screws.
5. Slide the actuator ball onto the end of the hollow shaft.
6. Tilt the hollow shaft to one side, and apply a small amount of lithium-base lubricant (Atari part no. 178027-001) to the contact area between the plunger and the upper housing.
7. Place the lower housing over the hollow shaft and align the four screw holes in the upper housing with those in the lower housing.
8. Apply a thin film of light oil lubricant (Atari part no. 107013-001) to the inside and thrust surfaces of the bronze bearings in the hollow shaft.
9. With the beveled hole toward the lower housing, place the actuator over the hollow shaft. Be sure that the cushion ring is in place.
10. Gently place the positioner plate over the actuator and adjust the plate until the four screw holes are aligned with those in the lower housing.

11. Insert the four 2½-inch screws into the four screw holes in the positioner plate.
12. Use a Phillips screwdriver to tighten the four screws until the head of each screw touches the plastic surface. Check that the ball handle returns freely to the centered position.
13. Next, attach the two clamps on the shaft.
14. Slide the disc onto the hollow shaft.
15. Insert the knob handle through the hollow shaft.
16. Place one ring clip on the shaft directly below the bronze bearing.
17. Attach the link with the pin below the ring clip. Be sure that the pin is aligned so that the pin protrudes through the center of the opening in the switch bracket.
18. Place the second ring clip at the end of the shaft.
19. Attach the extension spring of the bracket onto the clamp pin.

Removing the Video Display

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

1. Turn the game power off and wait two minutes. Unplug the power cord.
2. Use a ⅛-inch hex driver to remove the eight screws holding the display frame to the cabinet. Remove the frame.
3. Remove the video display shield.
4. Carefully remove the bezel from the protective foam tape.
5. Use a ⅛-inch hex driver to remove the four screws holding the display service panel. Remove the panel.

> **⚠ WARNING ⚠**
>
> **High Voltage**
>
> 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.
>
> **X-Radiation**
>
> The video display has been designed to minimize X-radiation. However, to avoid possible exposure to soft X-radiation, *never* modify the high-voltage circuitry.
>
> **Implosion Hazard**
>
> 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. Be sure that the game power is turned off before discharging the high-voltage from the cathode-ray tube (CRT). 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.

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 7/16-inch nut driver to loosen the four screws holding the display to the two mounting brackets.
9. Use a 7/16-inch nut driver to remove the four nuts and washers holding the mounting brackets to the cabinet studs.
10. Carefully lift the display out through the front of the cabinet.
11. Replace the video display as described in the following procedure.

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

Replacing the Video Display

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.

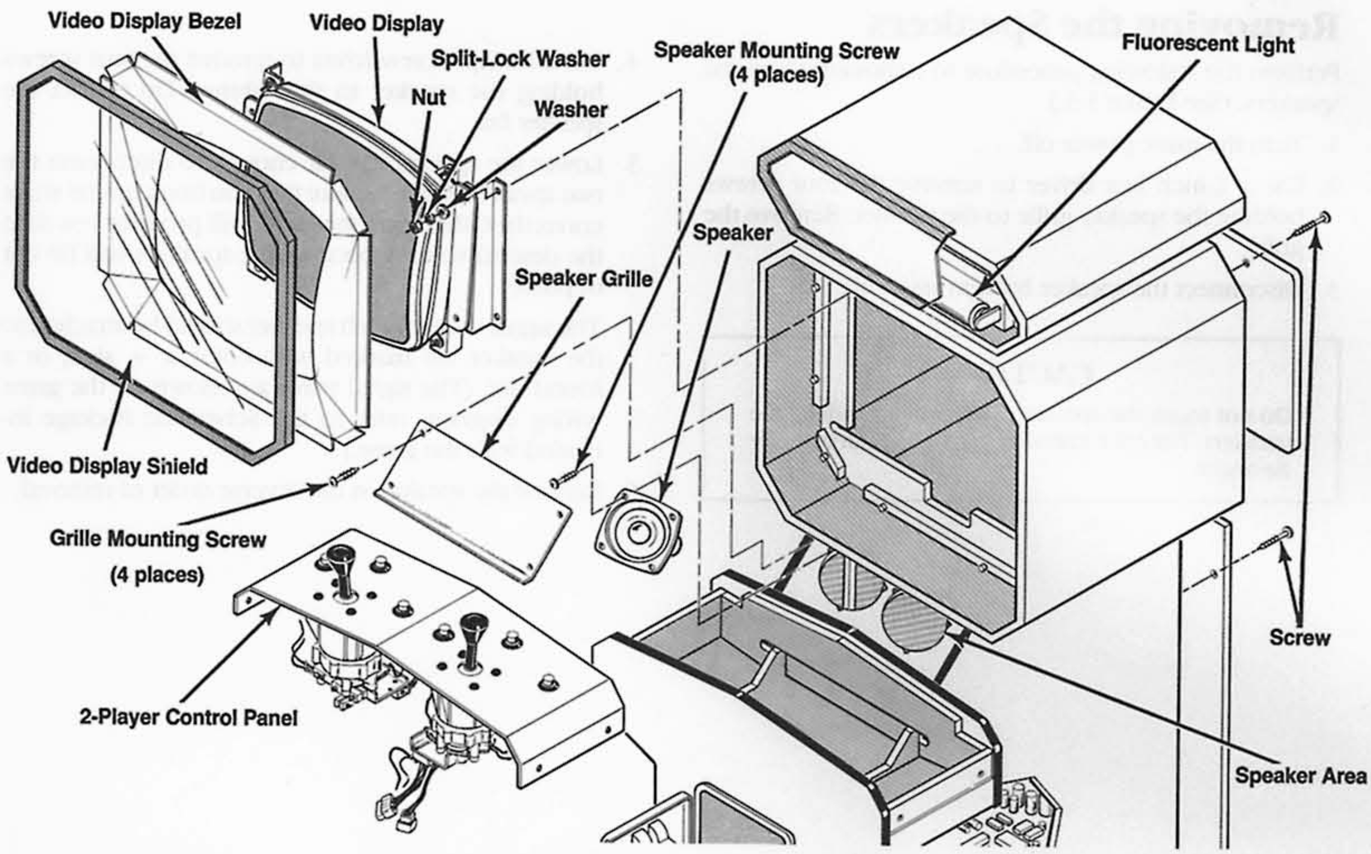


Figure 3-3 Control Panel, Video Display, and Speaker Removal

4. Use a $\frac{7}{16}$-inch nut driver to tighten the four screws securing the display to the mounting brackets. Be sure that the display is centered horizontally.
5. Connect the display harnesses to the display.
6. Replace the bezel, display shield, and display frame.

Removing the Game PCB

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

1. Turn the game power off.
2. Use a $\frac{1}{8}$-inch hex driver to remove the six screws holding the light-box frame to the top of the cabinet. Remove the frame.
3. Remove the light-box plastic shield.
4. Remove the fluorescent light from the light fixture.
5. To remove the entire light fixture, use a $\frac{1}{8}$-inch hex driver to remove the four screws holding the display service panel at the rear of the cabinet. Remove the door.
6. Disconnect the light harness connector in the rear of the cabinet.
7. Use a Phillips screwdriver to remove the two screws holding the light fixture. Remove the light fixture.
8. Replace the fluorescent light and/or light fixture in the reverse order of removal.

Removing the Speakers

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

1. Turn the game power off.
2. Use a $\frac{1}{8}$-inch hex driver to remove the four screws holding the speaker grille to the cabinet. Remove the grille.
3. Disconnect the speaker harness assembly.

> **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 the speaker to the cabinet. Do not let the speaker fall.
5. Lower the speaker just far enough to disconnect the two speaker 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 on 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.

Chapter 4

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 throughout this manual and the schematic package supplement. The following information is intended to acquaint the service technician with the portions of these documents that contain useful troubleshooting and repair information.

Assembly and Component Locations

The parts lists in Chapter 5 of this manual illustrate the locations of assemblies and components. Printed-circuit board (PCB) illustrations 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 display manual for the location and rating of each fuse used in this game. Make sure that replacement fuses are the proper type and rating.

Check Power-Supply Voltages

Improper operation of all circuits 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.

Localize Trouble

Determine the trouble symptom. Use the wiring diagrams in the schematic package supplement to determine which assemblies or major circuits could cause the trouble. Perform the self-test procedure provided in Chapter 2 of this manual.

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, direct substitution is the most practical way to determine if a component is faulty. However, eliminate the possibility of some other circuit problem that could damage the substitute 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 3 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. Poor soldering practices can damage a PCB or heat-sensitive electrical components.

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

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

CAUTION

Solder guns are *not* recommended for removing or replacing soldered-in components on a printed-circuit board. Solder guns can overheat a device, and their large transient voltage can damage a voltage-sensitive device.

The following additional equipment is recommended for removing and replacing soldered-in components:

- Solder Sucker—Hand-operated vacuum tool used to remove liquified solder from the PCB. We recommend the top-of-the-line Soldapullt® brand.
- Solder Wick—Resin-soaked copper braid used for removing 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 multilayer PCB with plated-through holes.
- Flux Remover—Non-corrosive chemical used to clean foreign material from the PCB before soldering and to remove any flux residue where components have been replaced. Also used 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)

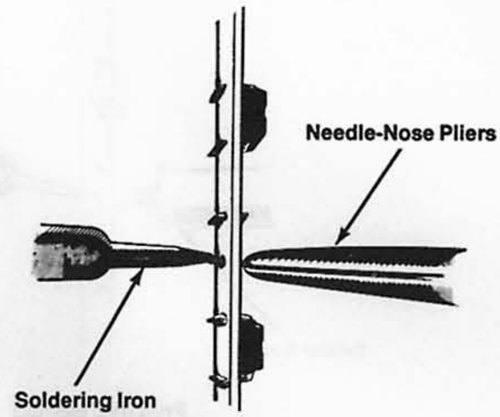


Figure 4-2 Removing IC Pins

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, e.g., 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 failure.

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 de-

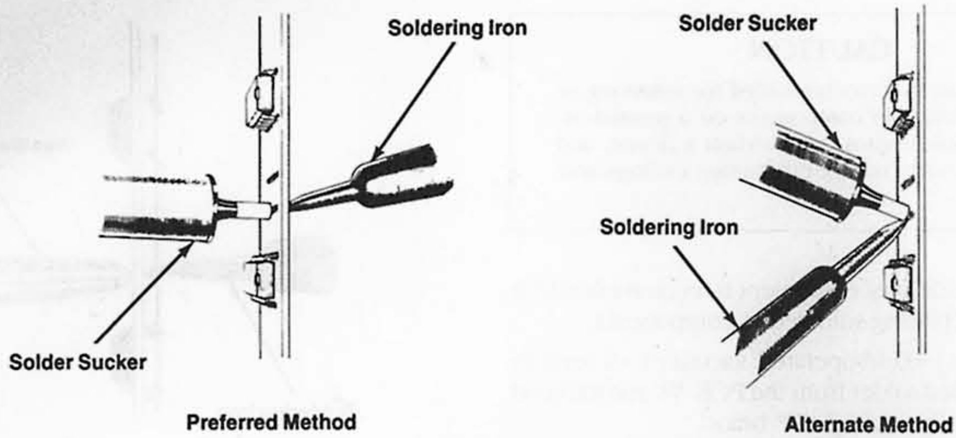


Figure 4-3 Removing Solder from Plated-Through Holes

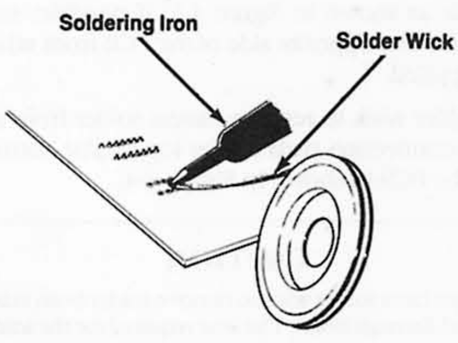
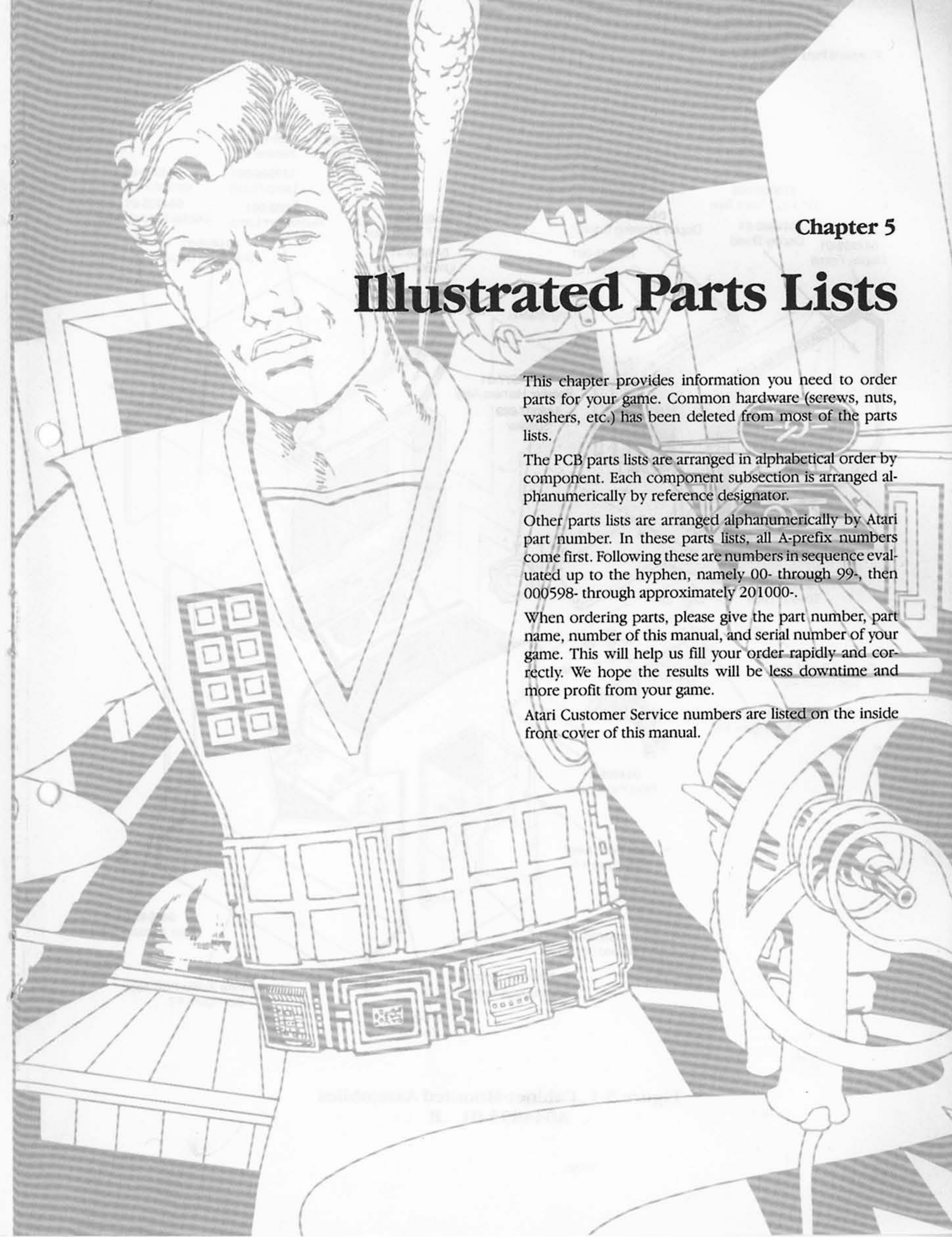


Figure 4-4 Removing Solder from Lead Connection Pads

vices. When soldering a static-sensitive 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.)

A static-sensitive device can appear defective due to leakage on a PCB. Observe the precautions for grounding static voltages described in the preceding paragraph and clean both sides of the PCB with flux remover or an eraser before replacing what can be a good static-sensitive device. For discrete FETs, clean thoroughly between the gate, drain, and source leads.

Static-sensitive devices can be packaged in conductive foam or 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.



Chapter 5

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.

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 help us fill 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.

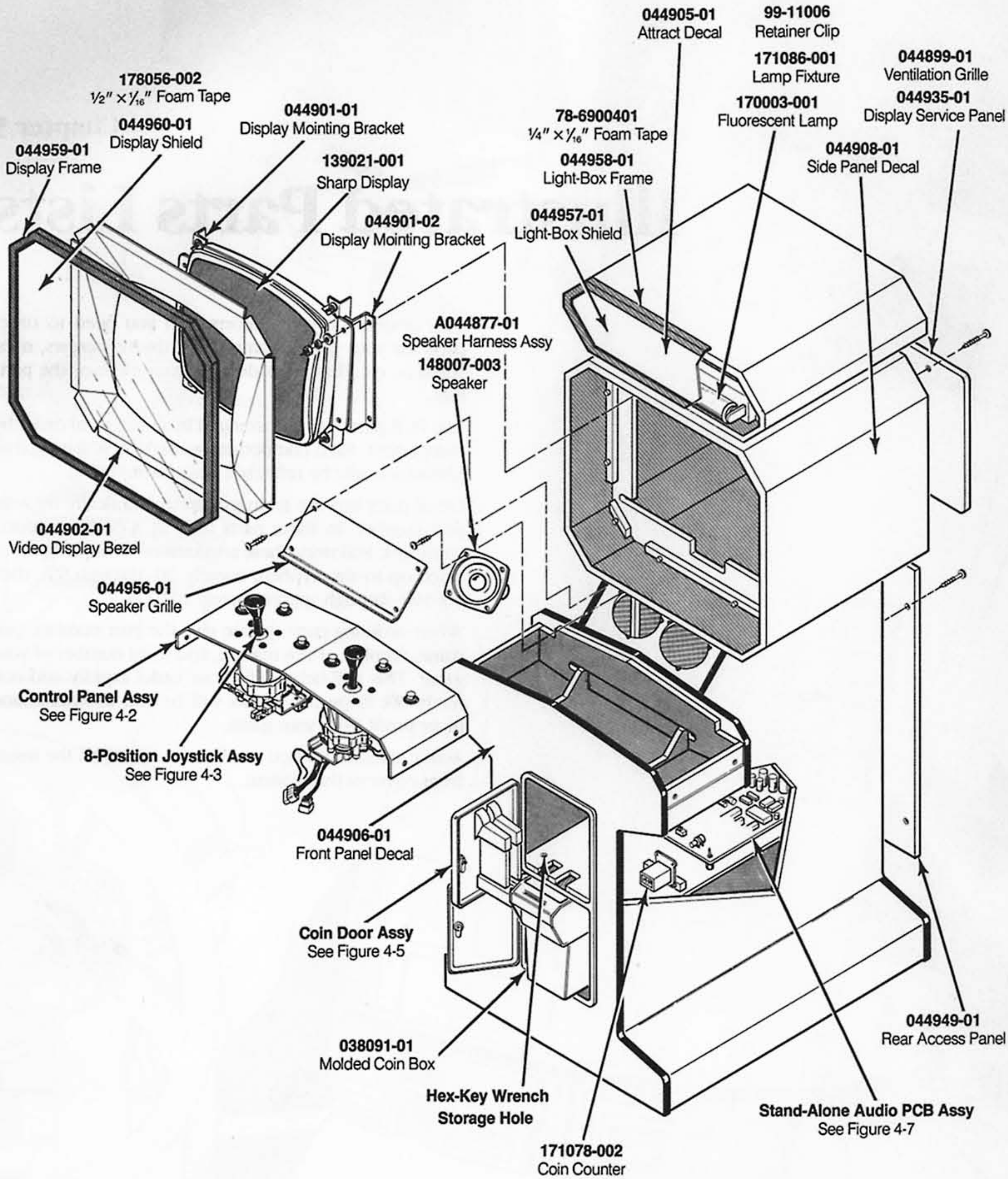


Figure 5-1 Cabinet-Mounted Assemblies
A044895-01 B

> **NOTE**
>
> For more information on installing harnesses in the cabinet, see the Xybots Harness Installation Diagram in the *Xybots Schematic Package Supplement* (SP-313).

Items Not Shown:

178126-002
Tamperproof 5/32 Hex-Key Wrench

178093-001
Fan Blade Guard

A044875-01
AC Power Harness Assy

A044876-01
Display Harness Assy

A044878-01
Com/Aud Harness Assy

A044879-01
Cabinet and Coin Harness Assy

A044883-01
Ground Strap Assy

044902-02
Water Deflector

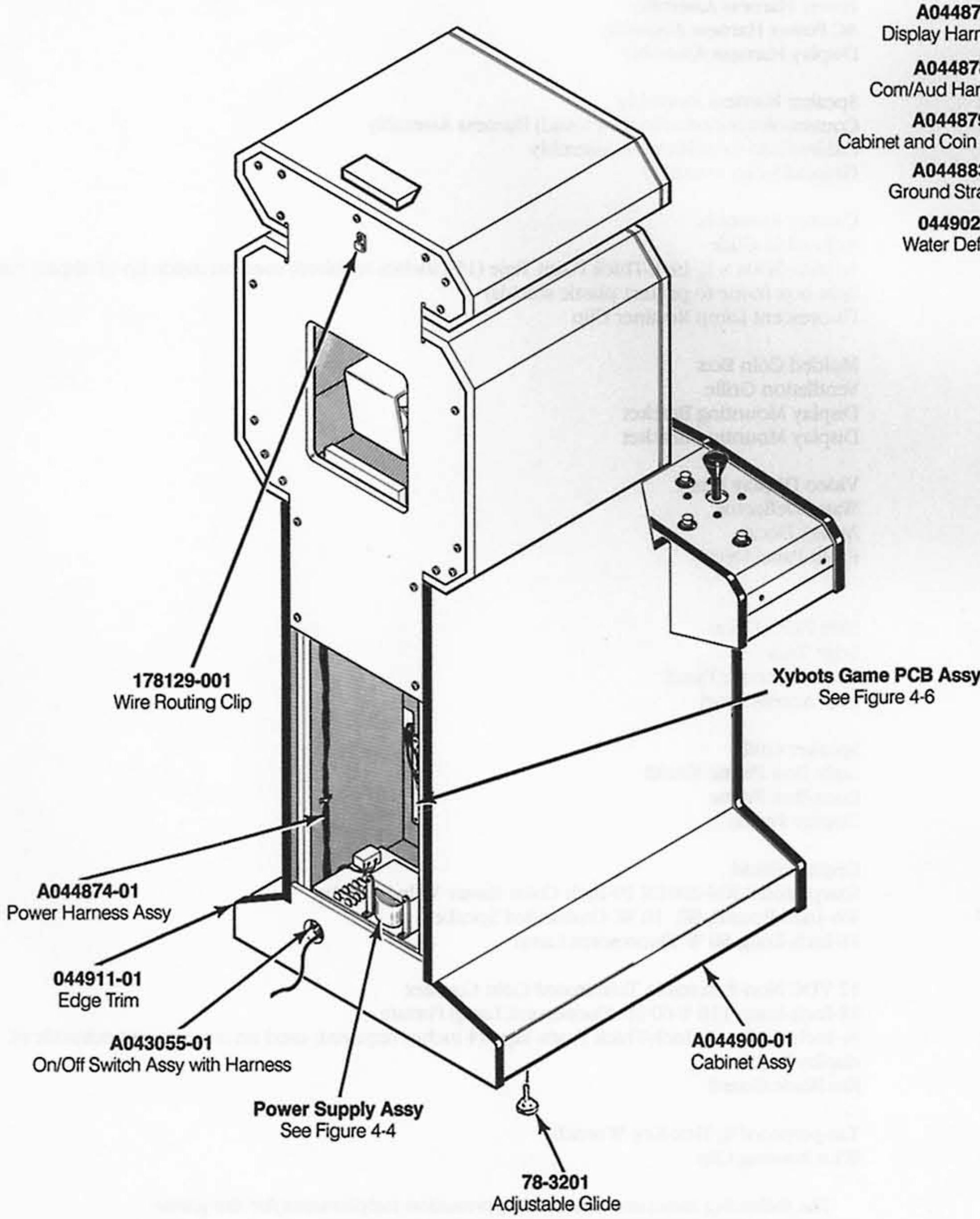


Figure 5-1 Cabinet-Mounted Assemblies, Continued

Cabinet-Mounted Assemblies
Parts List

Part No.	Description
A043055-01	12-Inch-Long On/Off Switch Assembly with Harness
A044874-01	Power Harness Assembly
A044875-01	AC Power Harness Assembly
A044876-01	Display Harness Assembly
A044877-01	Speaker Harness Assembly
A044878-01	Communications/Audio (Com/Aud) Harness Assembly
A044879-01	Cabinet and Coin Harness Assembly
A044883-01	Ground Strap Assembly
A044900-01	Cabinet Assembly
78-3201	Adjustable Glide
78-6900401	¼-Inch-Wide × $\frac{1}{16}$-Inch-Thick Foam Tape (150 inches required; used on inside lip of display frame and light-box frame to protect plastic shields)
99-11006	Fluorescent Lamp Retainer Clip
038091-01	Molded Coin Box
044899-01	Ventilation Grille
044901-01	Display Mounting Bracket
044901-02	Display Mounting Bracket
044902-01	Video Display Bezel
044902-02	Water Deflector
044905-01	Attract Decal
044906-01	Front Panel Decal
044908-01	Side Panel Decal
044911-01	Edge Trim
044935-01	Display Service Panel
044949-01	Rear Access Panel
044956-01	Speaker Grille
044957-01	Light-Box Plastic Shield
044958-01	Light-Box Frame
044959-01	Display Frame
044960-01	Display Shield
139021-001	Sharp Model XM-2001N 19-Inch Color Raster Video Display
148007-003	4½-Inch Round, 8Ω, 10 W, Unshielded Speaker
170003-001	18-Inch-Long 50 W Fluorescent Lamp
171078-002	12 VDC Non-Resettable Terminated Coin Counter
171086-001	18-Inch-Long 118 V 60 Hz Fluorescent Lamp Fixture
178056-002	½-Inch-Wide × $\frac{1}{16}$-Inch-Thick Foam Tape (4 inches required; used on corners on underside of display bezel)
178093-001	Fan Blade Guard
178126-002	Tamperproof $\frac{5}{32}$ Hex-Key Wrench
178129-001	Wire Routing Clip
	The following items are technical information supplements for this game:
TM-304	Sharp Model XM-2001N Video Display Service Manual
TM-313	Xybots Operators Manual
SP-313	Xybots Schematic Package
ST-313	Xybots Self-Test Label

Item Not Shown:
78-6900402
Foam Tape

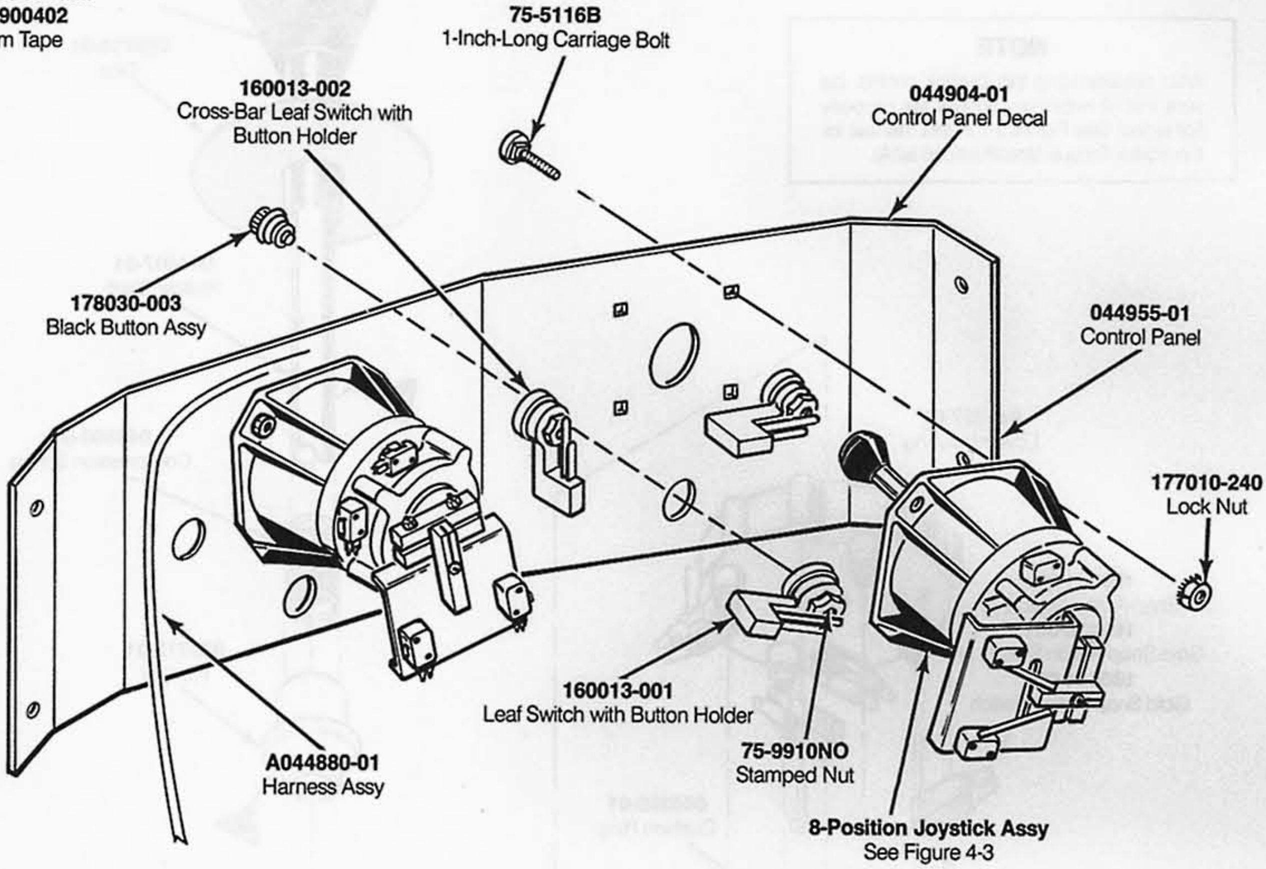


Figure 5-2 Control Panel Assembly
A044898-01 A

Control Panel Assembly Parts List

Part No.	Description
A044405-01	8-Position Joystick Assembly
A044880-01	Control Harness Assembly
75-5116B	#10-24 × 1.00-Inch-Long Black Carriage Bolt
75-9910NO	#11-⅜-Inch Stamped Nut
78-6900402	¼-Inch Wide × ⅛-Inch Thick Foam Tape (50 inches required)
044904-01	Control Panel Decal
044955-01	Control Panel
160013-001	Leaf Switch with Button Holder
160013-002	Cross-Bar Leaf Switch with Button Holder
177010-240	#10-24 Polymer Lock, Hex Lock Nut
178030-003	Black Nylon Button Assembly

NOTE

After reassembling this joystick control, be sure that all necessary screws are properly tightened. See Figure 3-2 in this manual for the Screw Torque Specifications table.

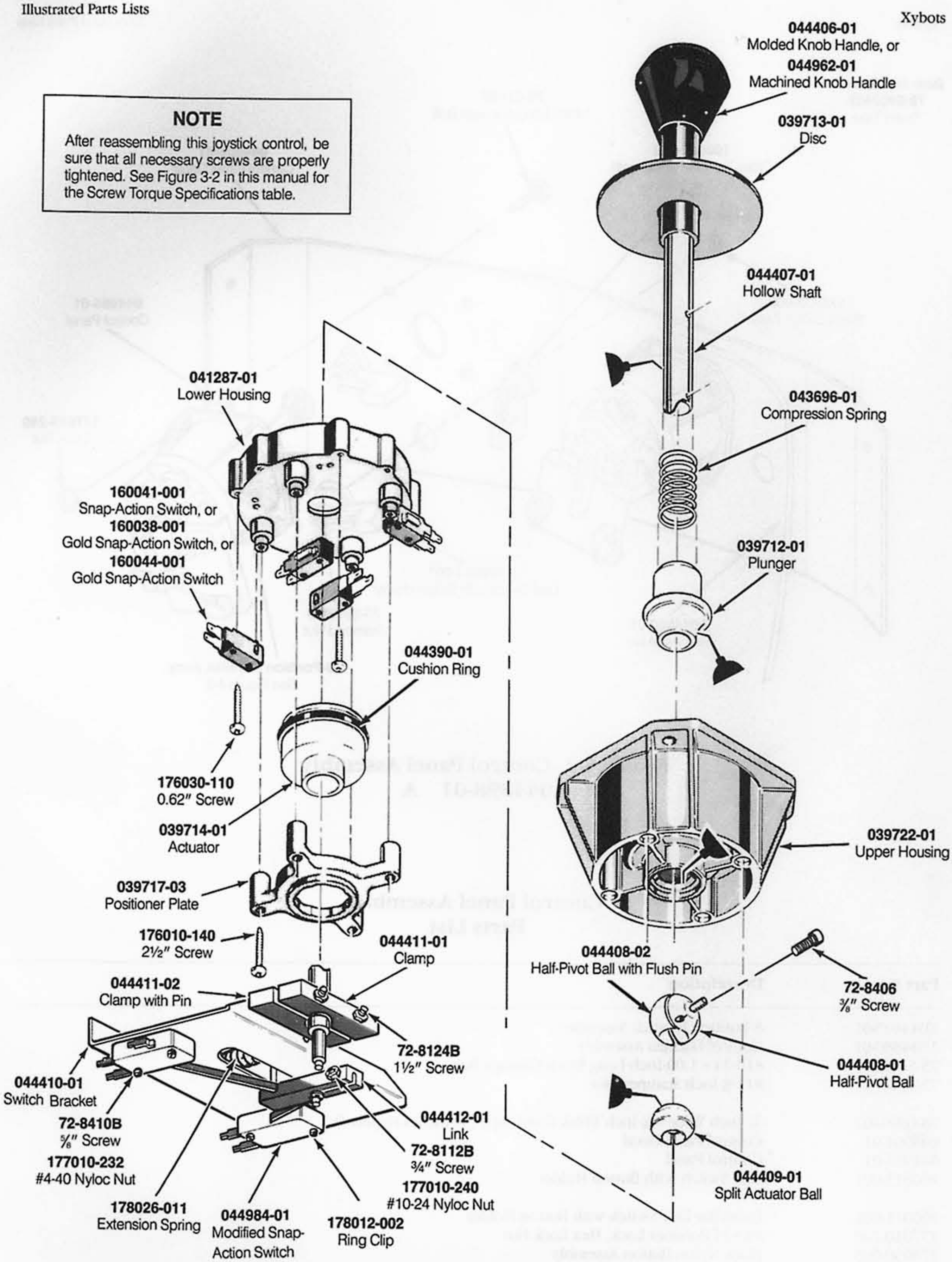


Figure 5-3 8-Position Joystick Assembly
A044405-01 A

8-Position Joystick Assembly Parts List

Part No.	Description
72-8112B	#10-24 × ¾-Inch Socket-Head Cap Screw
72-8124B	#10-24 × 1½-Inch Black Socket-Head Cap Screw
72-8406	#4-40 × ⅜-Inch Socket-Head Cap Screw
72-8410B	#4-40 × ⅝-Inch Socket-Head Cap Screw
039712-01	Plunger
039713-01	Disc
039714-01	Actuator
039717-03	8-Position Positioner Plate
039722-01	Upper Housing
041287-01	Lower Housing
043696-01	Compression Spring
044406-01	Molded Knob Handle (Acceptable substitute is part no. 044962-01, Machined Knob Handle)
044407-01	Hollow Shaft
044408-01	Half-Pivot Ball
044408-02	Half-Pivot Ball with Flush Pin
044409-01	Split Actuator Ball
044410-01	Switch Bracket
044411-01	Clamp
044411-02	Clamp with Pin
044412-01	Link
044390-01	Cushion Ring
044984-01	Modified Snap-Action Switch
107013-001	Light Oil Lubricant
160044-001	SPDT Snap-Action Switch with Gold Contacts
176010-140	#8-16 × 2½-Inch-Long Cross-Recessed Pan-Head Screw
176030-110	#4-20 × .62-Inch-Long Self-Tapping Hex Washer-Head Screw
177010-232	#4-40 Nyloc Nut
177010-240	#10-24 Nyloc Nut
178012-002	Ring Clip for ¼-Inch Shaft
178026-011	Extension Spring
178027-001	Lithium Lubricant

⚠ 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.

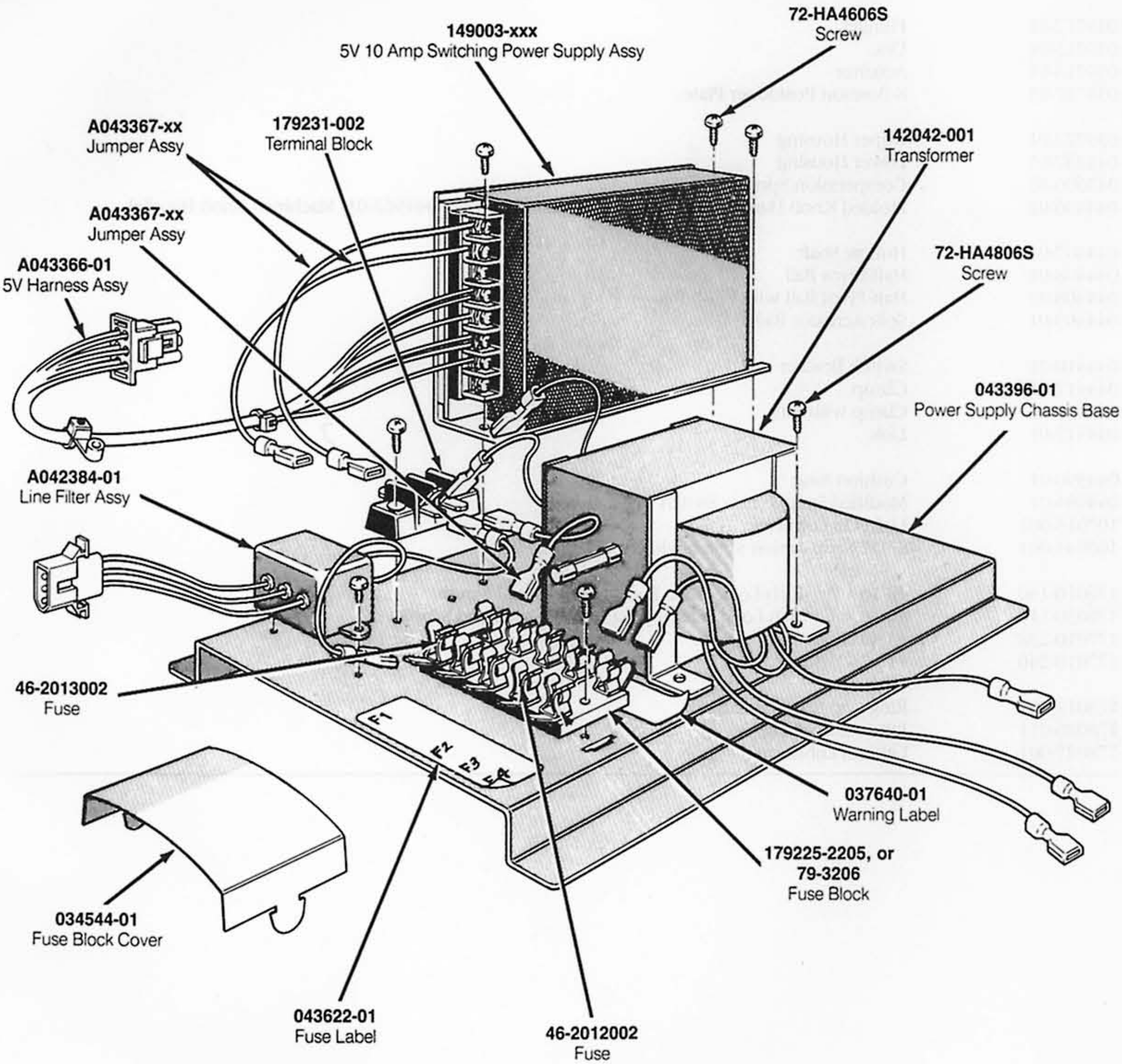


Figure 5-4 Switching/Linear (SL) Power Supply Assembly A044872-03 A

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.
	Capacitors	
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
	Diodes	
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

Designator	Description	Part No.
D9	Diode, Fast Recovery, 30DF1	99-211006
D11, D12	Diode, Schottky, S10SC4M	99-211005
D13–D16	Diode, Rectifier, 1N4006	99-211008
	Inductors	
L1	Inductor, 15 mH	99-211052
L3	Inductor, 7 μH (Acceptable substitute is part no. 99-211051)	99-211050
L4	Inductor, 2.2 μH	99-211054
L5	Inductor, 1.5 mH	99-211053
	Resistors	
R1, R2	Resistor, Carbon Film, 180 kΩ, ±5%, 1 W	99-211034
R3	Resistor, Wirewound, 120 Ω, ±5%, 2 W	99-211019
R4	Resistor, Wirewound, 0.47 Ω, ±5%, 2 W	99-211018
R5	Resistor, Wirewound, 33 Ω, ±5%, 2 W	99-211017
R6, R7	Resistor, Carbon Film, 5.6 Ω, ±5%, ¼ W	99-211027
R8	Resistor, Wirewound, 0.47 Ω, ±5%, 2 W	99-211018
R9	Resistor, Carbon Film, 10 Ω, ±5%, ¼ W	99-211029
R10	Resistor, Carbon Film, 1 kΩ, ±5%, ¼ W	99-211032
R11	Resistor, Carbon Film, 47 Ω, ±5%, ¼ W	99-211025
R12	Resistor, Carbon Film, 5.6 Ω, ±5%, ¼ W	99-211027
R13	Resistor, Carbon Film, 330 Ω, ±5%, ¼ W	99-211026
R14	Resistor, Carbon Film, 270 Ω, ±5%, ½ W	99-211023
R15	Resistor, Carbon Film, 330 Ω, ±5%, ½ W	99-211022
R16	Resistor, Carbon Film, 8.2 Ω, ±5%, ¼ W	99-211028
R17, R18	Resistor, Carbon Film, 56 Ω, ±5%, ¼ W	99-211031
R19	Resistor, Carbon Film, 39 Ω, ±5%, ¼ W	99-211030
R20	Resistor, Carbon Film, 2 kΩ, ±5%, ¼ W	99-211035
R21	Resistor, Carbon Film, 470 Ω, ±5%, ¼ W	99-211024
R22	Resistor, 2.2 kΩ, ±2%, ¼ W	99-211021
R23	Resistor, Metal Film, 2 kΩ, ±2%, ¼ W	99-211033
R25	Resistor, Carbon Film, 10 Ω, ±5%, ¼ W	99-211029
R26	Resistor, Wirewound, 50 Ω, ±5%, 2 W	99-211015
R27	Resistor, Carbon Film, 47 Ω, ±5%, ¼ W	99-211025
R31	Resistor, Wirewound, 150 Ω, ±5%, 2 W	99-211016
	Transistors	
Q1	Transistor, NPN, 2SC1413A	99-211002
Q3	Transistor, NPN, PE8050B	99-211003
Q3	Transistor, PNP, PE8550B	99-211004
	Miscellaneous	
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 Ω, ±5%, 5 W	99-211020
VR1	Potentiometer, Trimming, 3 kΩ	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

N O T E S

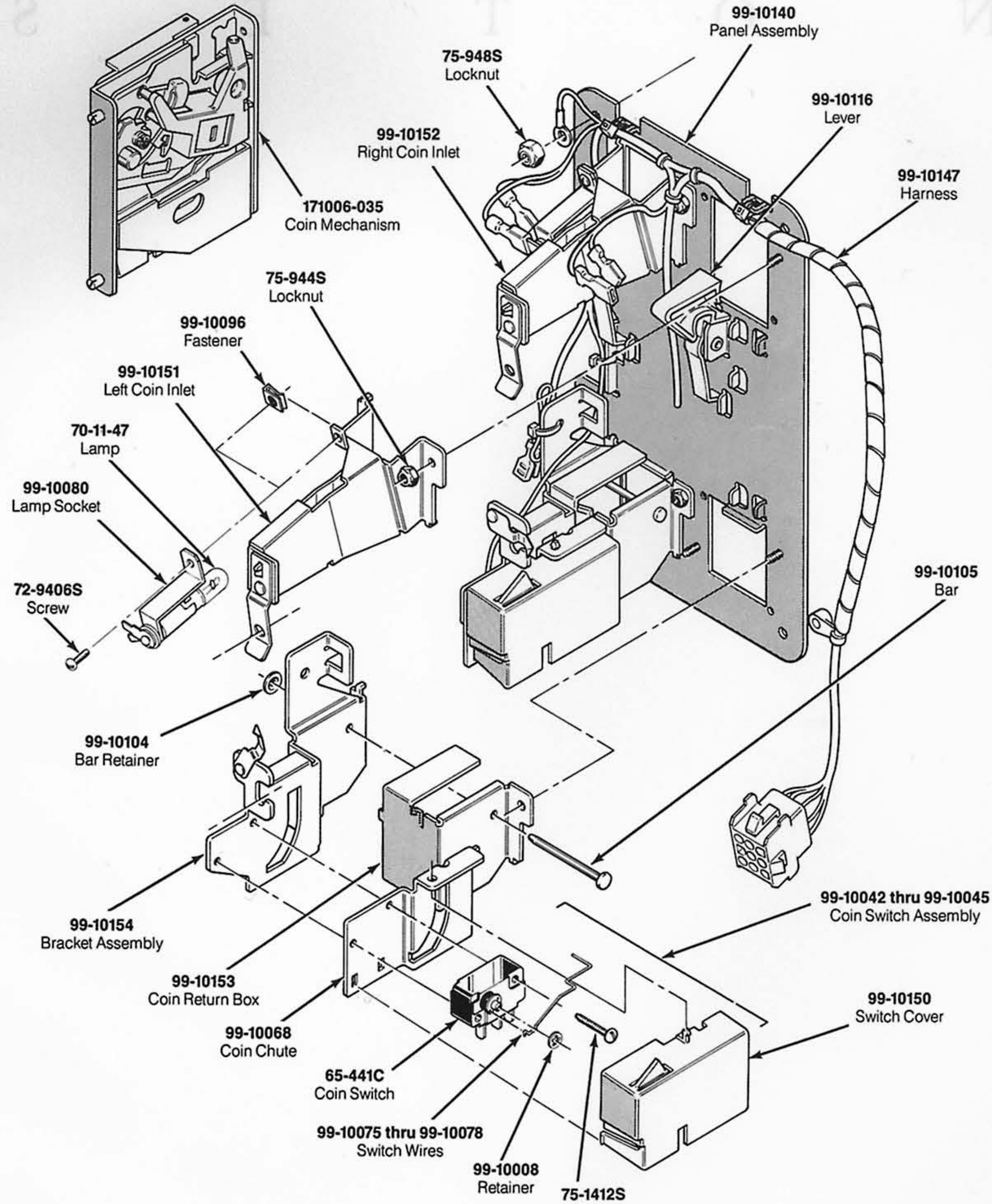
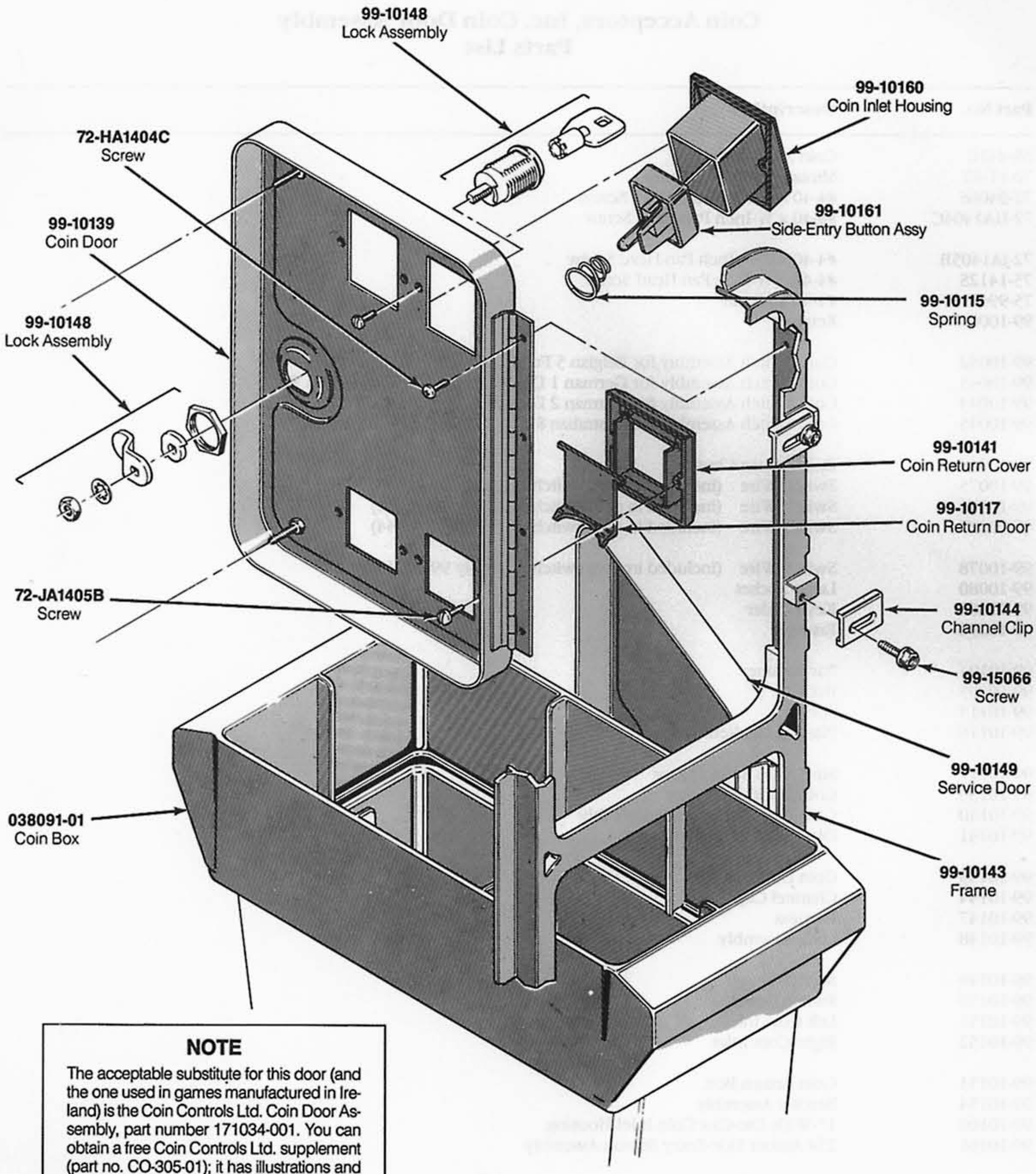


Figure 5-5 Coin Acceptors, Inc. Coin Door Assembly
171027-001 A



NOTE

The acceptable substitute for this door (and the one used in games manufactured in Ireland) is the Coin Controls Ltd. Coin Door Assembly, part number 171034-001. You can obtain a free Coin Controls Ltd. supplement (part no. CO-305-01); it has illustrations and a parts list. Write to Atari Games Ireland Limited, Tipperary Town, Ireland. Telephone 062-52155.

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 × ⅜-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 × ¾-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¢

N O T E S

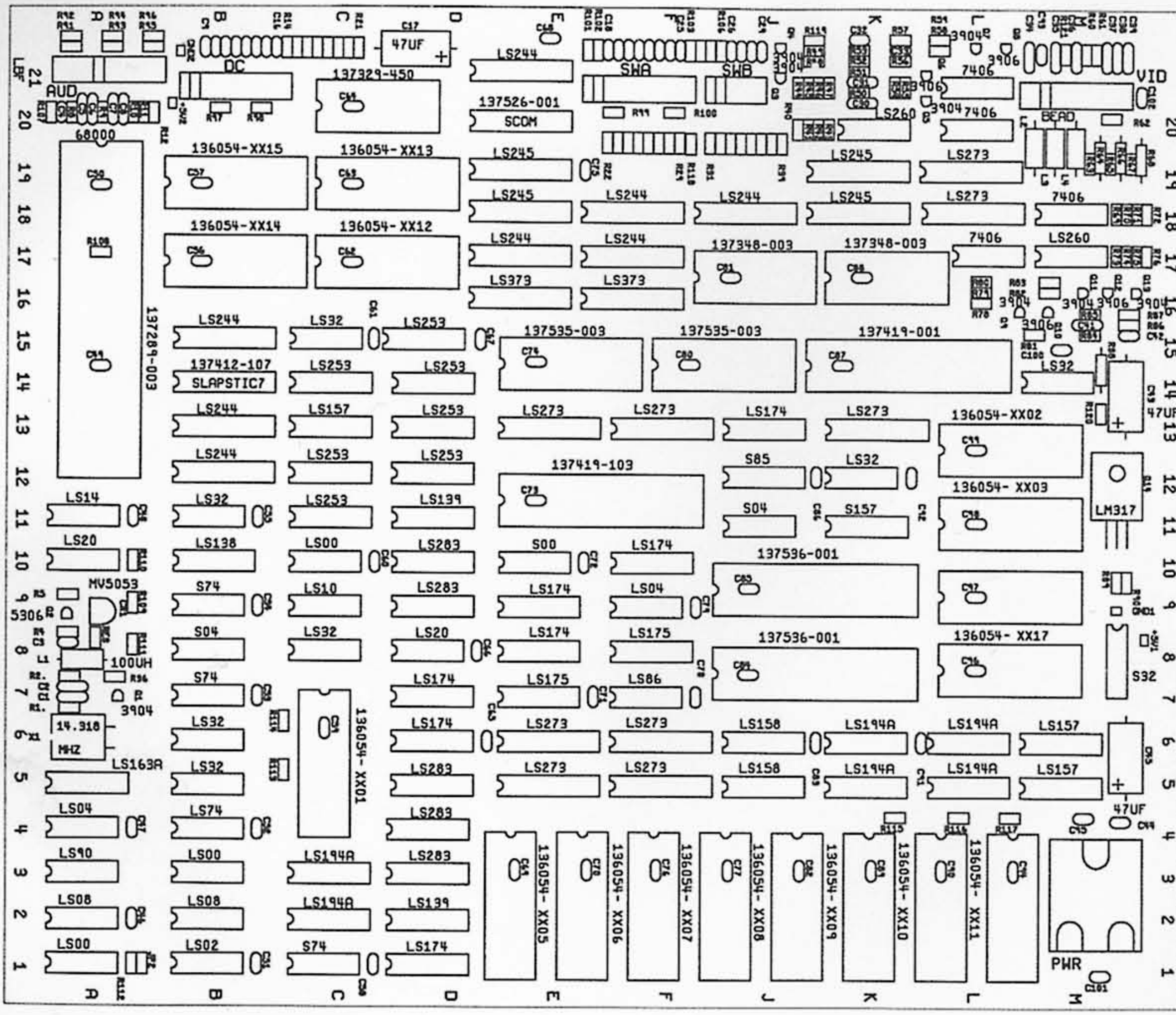


Figure 5-6 Xybots Game PCB Assembly
A044423-21 B

Xybots Game PCB Assembly
Parts List

Designator	Description	Part No.
	Integrated Circuits	
1A	Integrated Circuit, 74LS00	37-74LS00
1B	Integrated Circuit, 74LS02	37-74LS02
1C	Integrated Circuit, 74S74	37-74S74
1D	Integrated Circuit, 74LS174	37-74LS174
2A, 2B	Integrated Circuit, 74LS08	37-74LS08
2C	Integrated Circuit, 74LS194A	37-74LS194
2D	Integrated Circuit, 74LS139	37-74LS139
2E	Integrated Circuit, EPROM, 27512-200	136054-1105
2E/F	Integrated Circuit, EPROM, 27512-200	136054-1106
2F	Integrated Circuit, EPROM, 27512-200	136054-1107
2F/J	Integrated Circuit, EPROM, 27512-200	136054-1108
2J/K	Integrated Circuit, EPROM, 27512-200	136054-1109
2K	Integrated Circuit, EPROM, 27512-200	136054-1110
2L	Integrated Circuit, EPROM, 27512-200	136054-1111
3A	Integrated Circuit, 74LS90	37-74LS90
3B	Integrated Circuit, 74LS00	37-74LS00
3C	Integrated Circuit, 74LS194A	37-74LS194
3D	Integrated Circuit, 74LS283	137204-001
4A	Integrated Circuit, 74LS04	37-74LS04
4B	Integrated Circuit, 74LS74	37-74LS74
4D	Integrated Circuit, 74LS283	137204-001
5A	Integrated Circuit, 74LS163A	37-74LS163A
5B	Integrated Circuit, 74LS32	37-74LS32
5C	Integrated Circuit, EPROM, 2764-300	136054-1101
5D	Integrated Circuit, 74LS283	137204-001
5E, 5F	Integrated Circuit, 74LS273	37-74LS273
5J	Integrated Circuit, 74LS158	137203-001
5K, 5L	Integrated Circuit, 74LS194A	37-74LS194
5M	Integrated Circuit, 74LS157	37-74LS157
6B	Integrated Circuit, 74LS32	37-74LS32
6D	Integrated Circuit, 74LS174	37-74LS174
6E, 6F	Integrated Circuit, 74LS273	37-74LS273
6J	Integrated Circuit, 74LS158	137203-001
6K, 6L	Integrated Circuit, 74LS194A	37-74LS194
6M	Integrated Circuit, 74LS157	37-74LS157
7B	Integrated Circuit, 74S74	37-74S74
7D	Integrated Circuit, 74LS174	37-74LS174
7E	Integrated Circuit, 74LS175	37-74LS175
7F	Integrated Circuit, 74LS86	37-74LS86
8B	Integrated Circuit, 74S04	37-74S04
8C	Integrated Circuit, 74LS32	37-74LS32
8D	Integrated Circuit, 74LS20	37-74LS20
8E	Integrated Circuit, 74LS174	37-74LS174
8F	Integrated Circuit, 74LS175	37-74LS175
8K	Integrated Circuit, LB	137536-001
8L	Integrated Circuit, EPROM, 27512-200	136054-1117
8M	Integrated Circuit, 74S32	37-74S32
9B	Integrated Circuit, 74S74	37-74S74

Xybots Game PCB Assembly
Parts List, Continued

Designator	Description	Part No.
9C	Integrated Circuit, 74LS10	37-74LS10
9D	Integrated Circuit, 74LS283	137204-001
9E	Integrated Circuit, 74LS174	37-74LS174
9F	Integrated Circuit, 74LS04	37-74LS04
9K	Integrated Circuit, LB	137536-001
10A	Integrated Circuit, 74LS20	37-74LS20
10B	Integrated Circuit, 74LS138	137177-001
10C	Integrated Circuit, 74LS00	37-74LS00
10D	Integrated Circuit, 74LS283	137204-001
10E	Integrated Circuit, 74S00	37-74S00
10F	Integrated Circuit, 74LS174	37-74LS174
11A	Integrated Circuit, 74LS14	37-74LS14
11B	Integrated Circuit, 74LS32	37-74LS32
11C	Integrated Circuit, 74LS253	37-74LS253
11D	Integrated Circuit, 74LS139	37-74LS139
11E/F	Integrated Circuit, SYNGEN	137419-103
11J	Integrated Circuit, 74S04	37-74S04
11K	Integrated Circuit, 74S157	37-74S157
11L	Integrated Circuit, EPROM, 27512-200	136054-1103
12B	Integrated Circuit, 74LS244	37-74LS244
12C, 12D	Integrated Circuit, 74LS253	37-74LS253
12J	Integrated Circuit, 74S85	37-74S85
12K	Integrated Circuit, 74LS32	37-74LS32
12L	Integrated Circuit, EPROM, 27256-200 (OTP)	136054-1102
13B	Integrated Circuit, 74LS244	37-74LS244
13C	Integrated Circuit, 74LS157	37-74LS157
13D	Integrated Circuit, 74LS253	37-74LS253
13E, 13F	Integrated Circuit, 74LS273	37-74LS273
13J	Integrated Circuit, 74LS174	37-74LS174
13K	Integrated Circuit, 74LS273	37-74LS273
14B	Integrated Circuit, SLAPSTIC 7	137412-107
14C, 14D	Integrated Circuit, 74LS253	37-74LS253
14E, 14J	Integrated Circuit, 8464D70	137535-003
14K	Integrated Circuit, GPC	137419-101
14M	Integrated Circuit, 74LS32	37-74LS32
15B	Integrated Circuit, 74LS244	37-74LS244
15C	Integrated Circuit, 74LS32	37-74LS32
15D	Integrated Circuit, 74LS253	37-74LS253
16A	Integrated Circuit, 68000	137289-003
16E, 16F	Integrated Circuit, 74LS373	37-74LS373
17B	Integrated Circuit, EPROM, 27256-300	136054-1114
17C/D	Integrated Circuit, EPROM, 27512-300	136054-1112
17E, 17F	Integrated Circuit, 74LS244	37-74LS244
17J, 17K	Integrated Circuit, RAM, 2K × 8, 100 ns	137348-003
17L	Integrated Circuit, 7406	37-7406
17M	Integrated Circuit, 74LS260	137332-001
18E	Integrated Circuit, 74LS245	37-74LS245
18F, 18J	Integrated Circuit, 74LS244	37-74LS244

Xybots Game PCB Assembly
Parts List, Continued

Designator	Description	Part No.
18K	Integrated Circuit, 74LS245	37-74LS245
18L	Integrated Circuit, 74LS273	37-74LS273
18M	Integrated Circuit, 7406	37-7406
19B	Integrated Circuit, EPROM, 27256-300	136054-1115
19C/D	Integrated Circuit, EPROM, 27512-300	136054-1113
19E, 19K	Integrated Circuit, 74LS245	37-74LS245
19L	Integrated Circuit, 74LS273	37-74LS273
20C/D	Integrated Circuit, 2804A-45, 450 ns	137329-450
20E	Integrated Circuit, SCOM	137526-001
20K	Integrated Circuit, 74LS260	137332-001
20L	Integrated Circuit, 7406	37-7406
21E	Integrated Circuit, 74LS244	37-74LS244
21L	Integrated Circuit, 7406	37-7406
	Capacitors	
C1	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C2	Capacitor, 39 pF, 100 V, Ceramic	122016-390
C3, C4	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C5	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C6, C7	Capacitor, .001 μF, 50 V, Ceramic	122002-102
C8	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C9–C16	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C17	Capacitor, 47 μF, 25 V, Electrolytic	24-250476
C18–C29	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C30, C31	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C32, C33	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C34–C36	Capacitor, 470 pF, 50 V, Ceramic	122013-471
C37–C39	Capacitor, .001 μF, 50 V, Ceramic	122002-102
C41	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C42	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C43	Capacitor, 47 μF, 25 V, Electrolytic	24-250476
C44	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C45	Capacitor, 47 μF, 25 V, Electrolytic	24-250476
C46–C102	Capacitor, .1 μF, 50 V, Ceramic	122002-104
	Inductors	
L1	Inductor, 100 μH	141002-001
L2–L4	Inductor, Ferrite Bead, N12N	141003-005
	Transistors	
Q1	Transistor, 2N3904	34-2N3904
Q2	Transistor, 2N5306	133033-001
Q3–Q5	Transistor, 2N3904	34-2N3904
Q6	Transistor, 2N3906	33-2N3906
Q7	Transistor, 2N3904	34-2N3904
Q8	Transistor, 2N3906	33-2N3906
Q9	Transistor, 2N3904	34-2N3904
Q10	Transistor, 2N3906	33-2N3906
Q11	Transistor, 2N3904	34-2N3904
Q12	Transistor, 2N3906	33-2N3906
Q13	Transistor, 2N3904	34-2N3904
Q14	Integrated Circuit, LM317	137233-001

Xybots Game PCB Assembly
Parts List, Continued

Designator	Description	Part No.
	Resistors	
R1, R2	Resistor, 10 kΩ, ±5%, ⅛ W	110027-103
R4	Resistor, 100 kΩ, ±5%, ⅛ W	110027-104
R5	Resistor, 240 Ω, ±5%, ⅛ W	110027-241
R8, R9	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R10	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R11	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R12	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R14–R29	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R31–R34	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R35	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R36	Resistor, 390 Ω, ±5%, ⅛ W	110027-391
R37–R39	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R40	Resistor, 4.7 kΩ, ±5%, ⅛ W	110027-472
R41	Resistor, 2.4 kΩ, ±5%, ⅛ W	110027-242
R42	Resistor, 1.2 kΩ, ±5%, ⅛ W	110027-122
R43, R44	Resistor, 620 Ω, ±5%, ⅛ W	110027-621
R45	Resistor, 4.7 kΩ, ±5%, ⅛ W	110027-472
R46	Resistor, 2.4 kΩ, ±5%, ⅛ W	110027-242
R47	Resistor, 1.2 kΩ, ±5%, ⅛ W	110027-122
R48, R49	Resistor, 10 kΩ, ±5%, ⅛ W	110027-103
R50, R51	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R52	Resistor, 3 kΩ, ±5%, ⅛ W	110027-302
R53	Resistor, 330 Ω, ±5%, ⅛ W	110027-331
R54, R55	Resistor, 390 Ω, ±5%, ⅛ W	110027-391
R56	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R57	Resistor, 330 Ω, ±5%, ⅛ W	110027-331
R58	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R59	Resistor, 3 kΩ, ±5%, ⅛ W	110027-302
R60–R62	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R63	Resistor, 10 Ω, ±5%, ⅛ W	110027-100
R64	Resistor, 68 Ω, ±5%, ¼ W	110000-680
R65	Resistor, 10 Ω, ±5%, ⅛ W	110027-100
R66	Resistor, 68 Ω, ±5%, ¼ W	110000-680
R67	Resistor, 10 Ω, ±5%, ⅛ W	110027-100
R68	Resistor, 68 Ω, ±5%, ¼ W	110000-680
R69	Resistor, 240 Ω, ±5%, ⅛ W	110027-241
R70	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R71	Resistor, 120 Ω, ±5%, ⅛ W	110027-121
R72	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R73	Resistor, 4.7 kΩ, ±5%, ⅛ W	110027-472
R74	Resistor, 1.2 kΩ, ±5%, ⅛ W	110027-122
R75	Resistor, 2.4 kΩ, ±5%, ⅛ W	110027-242
R76	Resistor, 620 Ω, ±5%, ⅛ W	110027-621
R78	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R79	Resistor, 240 Ω, ±5%, ⅛ W	110027-241
R80	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R81	Resistor, 430 Ω, ±5%, ⅛ W	110027-431
R82	Resistor, 470 Ω, ±5%, ⅛ W	110027-471

Xybots Game PCB Assembly
Parts List, Continued

Designator	Description	Part No.
R83	Resistor, 10 kΩ, ±5%, ⅛ W	110027-103
R84	Resistor, 3 kΩ, ±5%, ⅛ W	110027-302
R85	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R86	Resistor, 330 Ω, ±5%, ⅛ W	110027-331
R87	Resistor, 390 Ω, ±5%, ⅛ W	110027-391
R88	Resistor, 68 Ω, ±5%, ¼ W	110000-680
R89	Resistor, 240 Ω, ±5%, ⅛ W	110027-241
R90	Resistor, 1.8 kΩ, ±5%, ⅛ W	110027-182
R91–R106	Resistor, 470 Ω, ±5%, ⅛ W	110027-471
R107–R117	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
R118–R120	Resistor, 47 Ω, ±5%, ⅛ W	110027-470
R121	Resistor, 1 kΩ, ±5%, ⅛ W	110027-102
	Connectors	
AUD	Connector, 11-Circuit, Header, .100 Ctr, Key 5	179118-011
DC	Connector, 11-Circuit, Header, .100 Ctr, Key 5	179118-011
JP2	Connector, 2-Circuit, Header, .100 Ctr	179048-002
PWR	Connector, 12-Circuit, Header, .250 Ctr	179069-012
RES	Connector, 2-Circuit, Header, .100 Ctr	179048-002
SWB	Connector, 6-Circuit, Header, .100 Ctr, Key 2	179118-006
SWA	Connector, 11-Circuit, Header, .100 Ctr, Key 5	179118-011
VID	Connector, 11-Circuit, Header, .100 Ctr, Key 5	179118-011
	Sockets	
	20-Pin Medium-Insertion-Force Socket	79-42C20
	28-Pin Medium-Insertion-Force Socket	79-42C28
	40-Pin Medium-Insertion-Force Socket	79-42C40
	64-Pin Medium-Insertion-Force Socket	79-42C64
	Miscellaneous	
CR1	Diode, Light-Emitting, Type-MV5053	38-MV5053
GND1, GND2	Test Point	179051-001

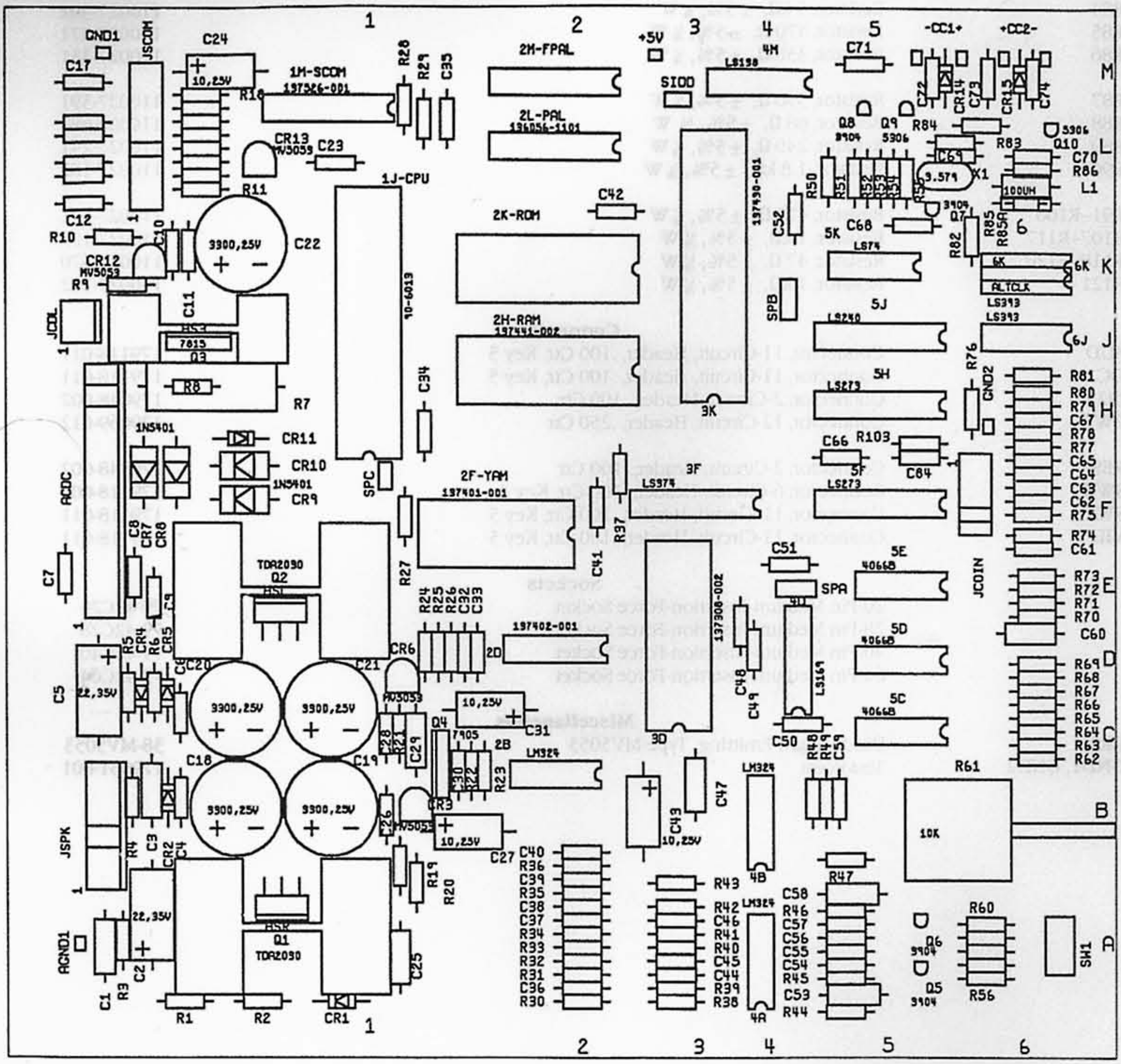


Figure 5-7 Stand-Alone Audio PCB Assembly
A043713-21 B

Stand-Alone Audio PCB Assembly
Parts List

Designator	Description	Part No.
	Integrated Circuits	
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, 27256, 300 ns	136054-1116
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
	Capacitors	
C1	Capacitor, .22 μF, 50 V, Ceramic	122015-224
C2	Capacitor, 22 μF, 35 V, Electrolytic	24-350226
C3	Capacitor, .22 μF, 50 V, Ceramic	122015-224
C4	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C5	Capacitor, 22 μF, 35 V, Electrolytic	24-350226
C6–C9	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C12	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C13–C16	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C17	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C18–C21	Capacitor, 3300 μF, 25 V, Electrolytic, Radial	123003-338
C23	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C24	Capacitor, 10 μF, 25 V, Electrolytic	24-250106
C25	Capacitor, .22 μF, 50 V, Ceramic	122015-224
C26	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C27	Capacitor, 10 μF, 25 V, Electrolytic	24-250106
C28	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C29	Capacitor, .22 μF, 50 V, Ceramic	122015-224
C30	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C31	Capacitor, 10 μF, 25 V, Electrolytic	24-250106
C32, C33	Capacitor, .001 μF, 50 V, Ceramic	122002-102
C34, C35	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C38	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C41, C42	Capacitor, .1 μF, 50 V, Ceramic	122002-104
C43	Capacitor, 10 μF, 25 V, Electrolytic	24-250106

Stand-Alone Audio PCB Assembly
Parts List

Designator	Description	Part No.
C48–C52	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C53	Capacitor, .0022 µF, 50 V, Axial Ceramic	122015-222
C54	Capacitor, .0027 µF, 50 V, Ceramic	122015-272
C55	Capacitor, .001 µF, 50 V, Ceramic	122002-102
C56	Capacitor, .0027 µF, 50 V, Ceramic	122015-272
C57	Capacitor, .001 µF, 50 V, Ceramic	122002-102
C58	Capacitor, .0022 µF, 50 V, Axial Ceramic	122015-222
C61–C68	Capacitor, .1 µF, 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 µF, 50 V, Ceramic	122002-104
C84	Capacitor, .1 µF, 50 V, Ceramic	122002-104
	Diodes	
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
	Inductor	
L1	Inductor, 100 µH	41-3003
	Resistors	
R1	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R2	Resistor, 10 kΩ, ±5%, ¼ W	110000-103
R3, R4	Resistor, 1 Ω, ±5%, ¼ W	110000-010
R5	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R6	Resistor, 10 kΩ, ±5%, ¼ W	110000-103
R10	Resistor, 0 Ω, ¼ W	110005-001
R11	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R12	Resistor, 470 Ω, ±5%, ¼ W	110000-471
R13	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R14	Resistor, 470 Ω, ±5%, ¼ W	110000-471
R15	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R16	Resistor, 470 Ω, ±5%, ¼ W	110000-471
R17, R18	Resistor, 10 kΩ, ±5%, ¼ W	110000-103
R19	Resistor, 22 kΩ, ±5%, ¼ W	110000-223
R20	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R21	Resistor, 22 kΩ, ±5%, ¼ W	110000-223
R22	Resistor, 10 Ω, ±5%, ¼ W	110000-100
R23	Resistor, 560 Ω, ±5%, ¼ W	110000-561
R24	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R26, R27	Resistor, 10 Ω, ±5%, ¼ W	110000-100
R28	Resistor, 10 kΩ, ±5%, ¼ W	110000-103
R29	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R33, R34	Resistor, 470 Ω, ±5%, ¼ W	110000-471
R35	Resistor, 75 kΩ, ±5%, ¼ W	110000-753
R36, R37	Resistor, 10 kΩ, ±5%, ¼ W	110000-103
R38	Resistor, 47 kΩ, ±5%, ¼ W	110000-473
R43–R48	Resistor, 12 kΩ, ±5%, ¼ W	110000-123
R49	Resistor, 10 kΩ, ±5%, ¼ W	110000-103

Stand-Alone Audio PCB Assembly
Parts List

Designator	Description	Part No.
R50	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R51	Resistor, 10 kΩ, ±5%, ¼ W	110000-103
R52	Resistor, 10 kΩ, ±5%, ¼ W	110000-103
R53, R54	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R55, R56	Resistor, 150 kΩ, ±5%, ¼ W	110000-154
R58	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R59	Resistor, 150 kΩ, ±5%, ¼ W	110000-154
R60	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R61	Resistor Pot, 10 kΩ, Horizontal, Dual	119011-103
R62	Resistor, 7.5 kΩ, ±5%, ¼ W	110000-752
R63	Resistor, 30 kΩ, ±5%, ¼ W	110000-303
R64	Resistor, 15 kΩ, ±5%, ¼ W	110000-153
R65, R66	Resistor, 12 kΩ, ±5%, ¼ W	110000-123
R67	Resistor, 15 kΩ, ±5%, ¼ W	110000-153
R68	Resistor, 30 kΩ, ±5%, ¼ W	110000-303
R69	Resistor, 7.5 kΩ, ±5%, ¼ W	110000-752
R74–R81	Resistor, 1 kΩ, ±5%, ¼ W	110000-102
R82	Resistor, 470 Ω, ±5%, ¼ W	110000-471
R83	Resistor, 150 kΩ, ±5%, ¼ W	110000-154
R84	Resistor, 0 Ω, ¼ W	110005-001
R85A	Resistor, 470 Ω, ±5%, ¼ W	110000-471
R86	Resistor, 220 Ω, ±5%, ¼ W	110000-221
R103	Resistor, 150 kΩ, ±5%, ¼ W	110000-154
	Transistors	
Q5–Q8	Transistor, 2N3904	34-2N3904
Q9, Q10	Transistor, 2N5306	133033-001
	Connectors	
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
	Sockets	
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
	Miscellaneous	
HSL	Heat Sink, TDA2030	178190-032
Q1	Nut/Washer Assy, #6-32	75-99516
Q1	Screw, Pan-Head, Cross-Recessed, #6-32 × ⅜-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

Xybots™

Date: ______________

Coin Information and Game Statistics

Plyr 0 Coins	______________	Number of coins deposited in left coin mechanism
Plyr 1 Coins	______________	Number of coins deposited in right coin mechanism
Aux Count 0	______________	Number of times players continued their characters at level 10 or earlier
Aux Count 1	______________	Number of times players continued their characters at level 11 and higher
0 Plyr Mins	______________	Minutes of idle time
1 Plyr Mins	______________	Minutes played as a 1-player game
2 Plyr Mins	______________	Minutes played as a 2-player game
L Plyr Mins	______________	Total number of minutes that left player played
R Plyr Mins	______________	Total number of minutes that right player played
Total Games	______________	Total number of unique games played*
Error Count	______________	EEROM errors
Total Coins	______________	Total number of coins deposited in both coin mechanisms
Avg. Time/Coin	______________	Average game time per coin in seconds (including add-a-coin continuation games)

Histogram Information

Length of Game in Seconds	Number of Games	Length of Game in Seconds	Number of Games
0–29	______________	180–194	______________
30–44	______________	195–209	______________
45–59	______________	210–224	______________
		225–239	______________
60–74	______________	240–254	______________
75–89	______________	255–269	______________
90–104	______________	270–284	______________
105–119	______________	285–299	______________
120–134	______________	300 & up	______________
135–149	______________		
150–164	______________		
165–179	______________		

**One "game" is the time between the first player starting and both players dying, regardless of time, number of coins inserted, or how many have played Xybots.*

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 applying high voltage.

EPROM
Erasable programmable read-only memory (see ROM).

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.

HISTOGRAM
A special type of bar graph that shows how quantities are distributed. Histograms are included in the self-test of most Atari games, and typically show how long players play that game.

IC
Integrated circuit. An electronic circuit in which all elements and the connections are made in or on a single semiconductor substrate. See also *chip*.

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.

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.

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(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.

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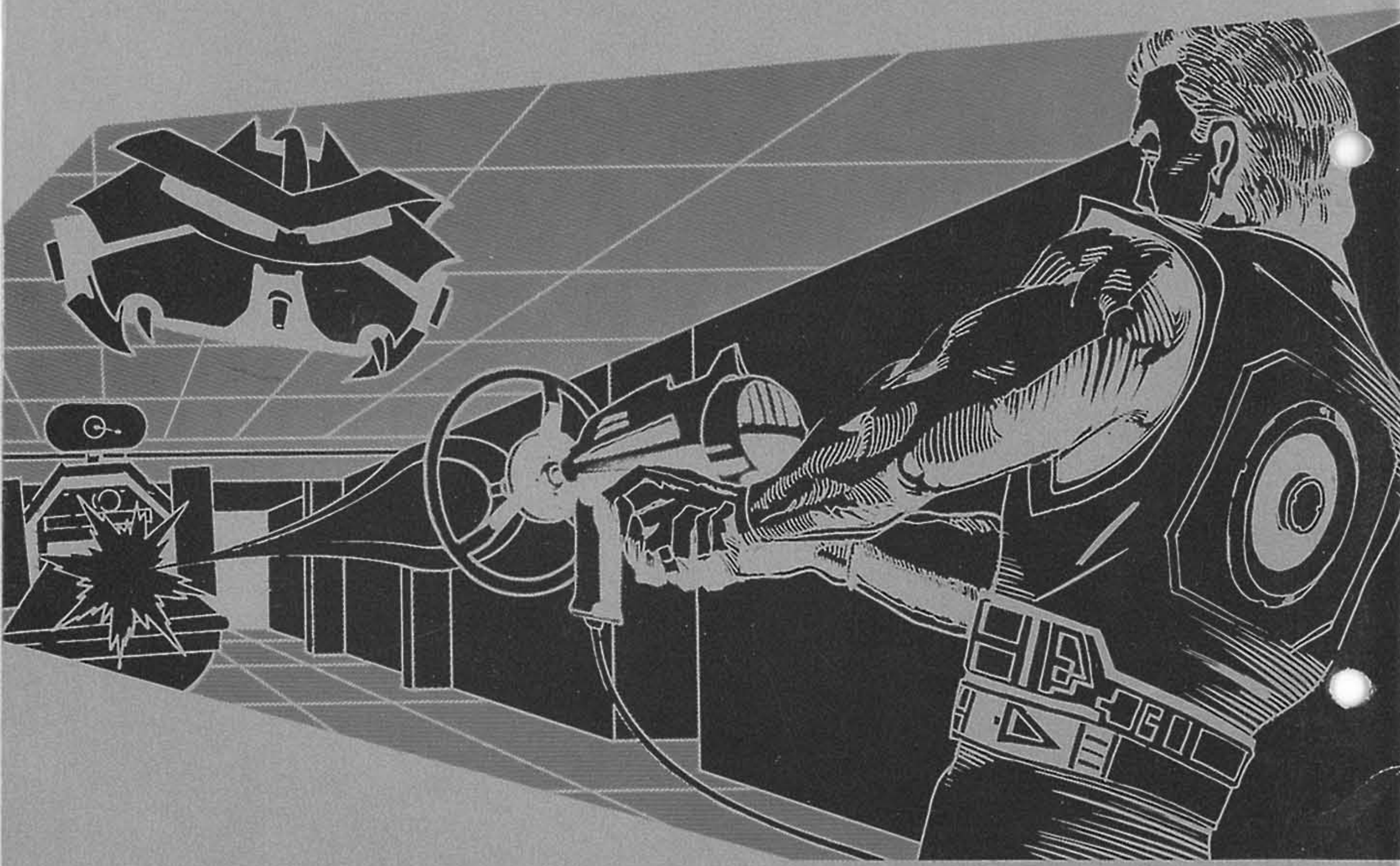

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