TM-326
2nd Printing

ATARI
GAMES

CYBERBALL

Operators Manual

with Illustrated Parts Lists

For technical assistance:

If reading through this manual does not lead to solving your game maintenance or repair problem, call TELE-HELP® at one of these Atari Games Customer Service offices:

UNITED STATES

Atari Games Corporation
California Customer Service Office
737 Sycamore Drive
P.O. Box 361110
Milpitas, CA 95035
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GAMES

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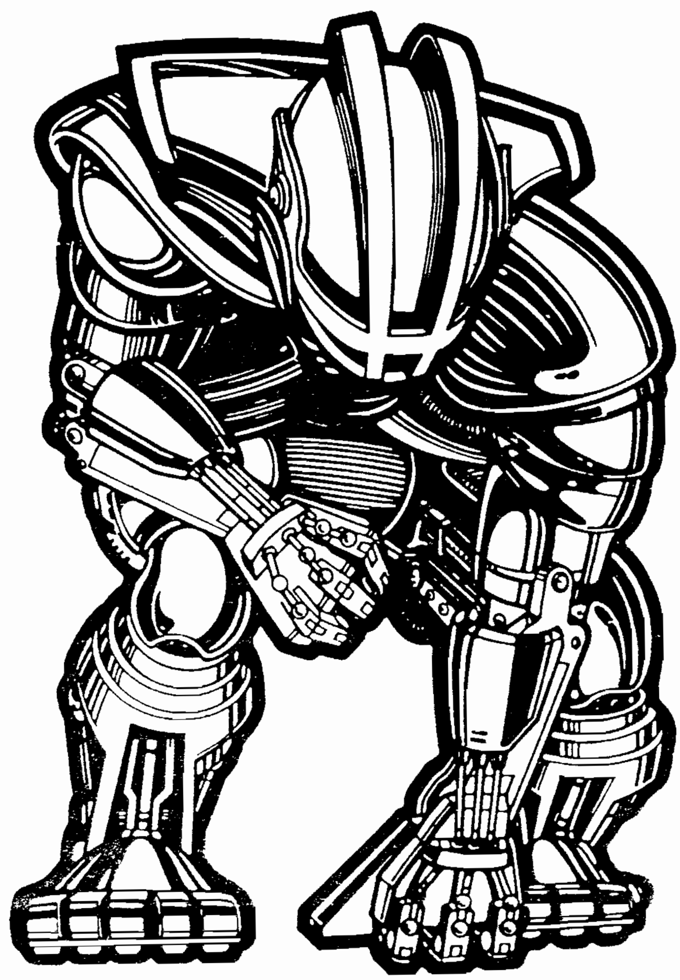

Published by:
Atari Games Corporation
675 Sycamore Drive
P.O. Box 361110
Milpitas, California 95035

Printed in the U.S.A **9S**

Produced by the Atari Games Technical Publications Department.

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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 cage, be sure that the game printed-circuit boards (PCBs) are properly installed on the EMI ground cage and that the end board is securely installed with **all** screws in place and tightened.

If you are still unable to solve the interference problem, please contact Customer Service at Atari Games Corporation. See the inside front cover of this manual for service in your area.

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Safety Summary

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

WARNING

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

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

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

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

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

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

CAUTION

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

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

ABOUT NOTES, CAUTIONS, AND WARNINGS

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

NOTE—A highlighted piece of information.

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

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

Chapter 1

Set-Up

How to Use This Manual

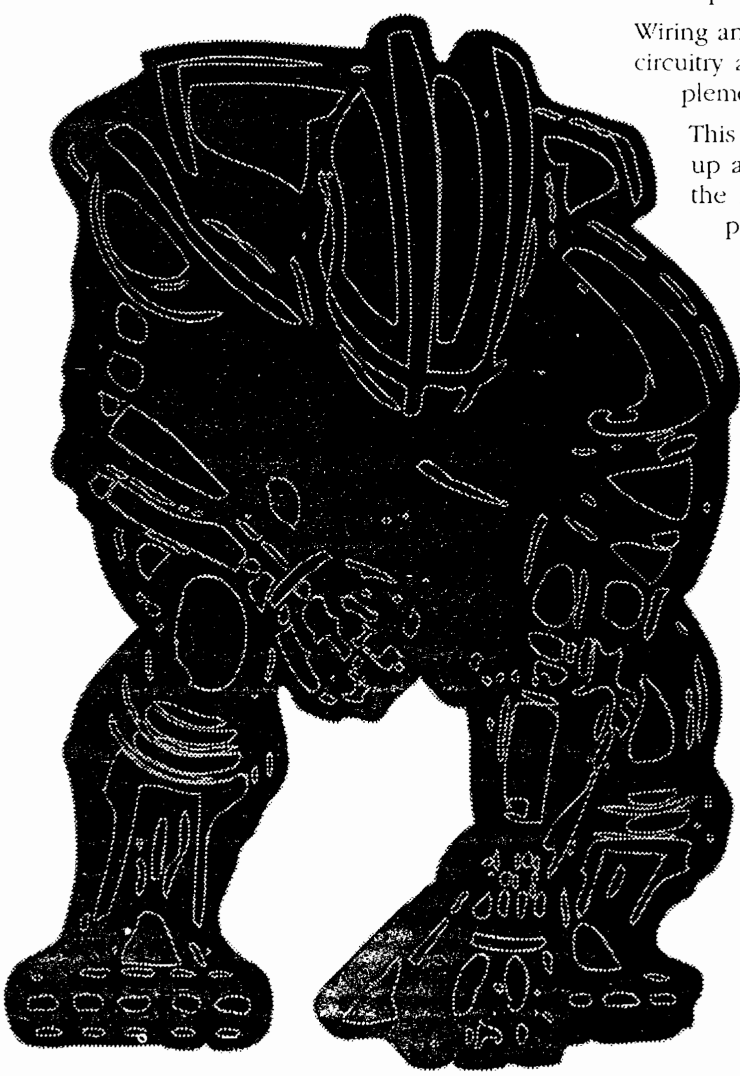
This manual is written for game operators and service personnel, and provides information for setting up, playing, testing, and maintaining your Cyberball™ game.

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 illustrated part lists.

Wiring and schematic diagrams for the Cyberball game circuitry are contained in the Schematic Package Supplement (SP-326), included with your game.

This chapter includes information required to set up and play your Cyberball game. Carefully read the information in this chapter before applying power.



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

WARNING

To avoid electrical shock, plug in the cabinet only after you have inspected it. After inspection, plug it in only to a grounded 3-wire outlet.

Inspecting the Game

Please inspect your Cyberball game carefully to ensure that the game is complete and was delivered to you in good condition.

Figure 4-1 shows the locations of the game parts. Table 1-1 lists space, power, and environmental requirements.

Inspect the game cabinet as follows:

1. Examine the exterior of the cabinet for dents, chips, or broken parts.
2. Unlock and open the service door. 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 fit only in the proper orientation.
   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.
   e. Inspect other major sub-assemblies, such as the video display, printed-circuit boards (PCBs), and speaker. Make sure that they are mounted securely and that the ground wires are connected.

Installing the Control Pod

Your Cyberball game is shipped without the control pods assembled on the cabinet to reduce shipping costs and the chance of damage. To install the control pods, do the following:

1. Unpack the control pods. Inspect them for damage.
2. From the spare parts bag in the coin box, take out four large flat washers, four split-lock washers, and four nuts.
3. Open the rear access panel on the cabinet.
4. Put a wooden control pod against the cabinet and line up the holes. Push the studs on the control pod through the holes. Push the control panel harness through the center hole.
5. Have someone hold the control pod on the cabinet while you reach in through the back of the cabinet and put a fender washer, a split-lock washer, and a nut on each stud. Tighten the nuts with a 7/16-inch wrench. Repeat with the other control pod.
6. Connect the control panel harnesses to the cabinet harness.
7. Reinstall the rear access panel on the cabinet.

Table 1-1 Game Specifications

Characteristic	Specification
Power Consumption	132 VAC, 230 W RMS
Temperature	+5° to +50° C (+37° to +122° F)
Humidity	Not to exceed 95% relative
Line Voltage	102 to 132 VAC (U.S. games)
Width	51 in. (134 cm.)
Depth	36 in. (95 cm.)
Height	79 in. (208 cm.)
Weight	475 lbs. (216 kg.)

Control and Switch Locations

All of the Cyberball controls and switches, except for the on/off switch, are located in the front of the game.

Power On/Off Switch

The power on/off switch is located at the bottom rear of the cabinet. (See Figure 4-1.)

Volume Control

The volume control is located on the SAC audio board. (See Figure 1-1.)

Self-Test Switch

The self-test switch is located on the SAC audio board behind the upper coin door on the right. See Chapter 2 for a complete description of the self-test.

Auxiliary Coin Switches

An auxiliary coin switch is located on each coin mechanism. Use these auxiliary coin switches to give a player coin credits.

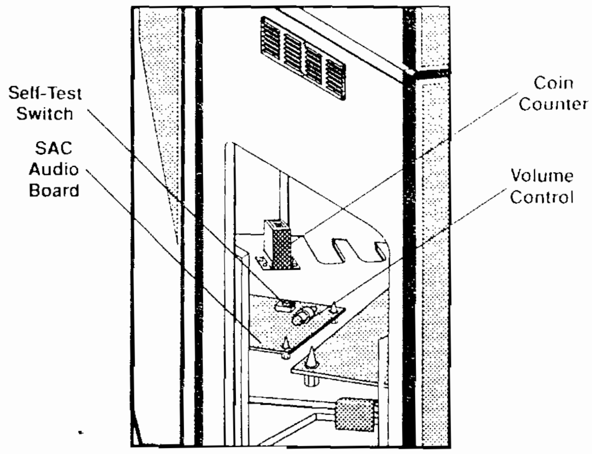


Figure 1-1 Control and Switch Locations

Coin Counter

The coin counter is located beside the SAC audio board inside the upper coin door on the right. The coin counter records the number of coins deposited.

Setting the Coin and Game Options

The Cyberball 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 Cyberball game and the game play features.

Introduction

Welcome to Cyberball, where the players are bigger, stronger, and faster, and the action more explosive! The year is 2022, and human football games are history. The new game of Cyberball has replaced human players with robot players five times their size and an exploding ball, instead of a pigskin.

Cyberball has two monitors for two teams and up to four players. Each player uses an 8-way joystick and button to call the plays and control the action. Before the action on the field starts, the player chooses the plays with the controls. During the play, the joystick controls the robot's direction on the field. On the offense, the button controls the quarterback's passes and laterals. On the defense, the button gives a defensive player Turbo Defense, a quick burst of speed.

Cyberball can be played by one to four players; the players compete against each other or the computer. One player can play against the computer, another player, or two other players. Two players can form a team and play against the computer, or other players.

Play Mode

Cyberball rules are similar to football rules, but players must keep the ball from exploding. If the ball explodes, possession turns over. The ball status display shows whether the ball is cool, warm, hot, or critical. A critical ball will explode if it is not defused. The player can defuse the ball by moving it over the 50-yard line or the goal line.

On the line of scrimmage, the robot that the player controls is a slightly different color from the others. Each player controls one robot on his team. By pressing a player button before the ball is hiked, the player can control a different robot.

A complete Cyberball game has 6 three-minute periods. Every player buying into the game adds more time for everyone. The more people that play, the more time everyone gets per period. If a game ends in a tie, there's a sudden death period to settle the score. The first team to score is declared the winner.

Auto-Challenge: If one or two players are playing against the computer on one monitor and a new player starts a game on the other monitor, the first players are automatically challenged by the newcomer. The original players can choose to accept or decline the challenge. With the Atari buy-in anytime feature, new players and teammates can enter the action anytime during the game.

Player Choices: Players can select offensive and defensive plays, time-outs, and replace weak or demolished players.

Cyberball has over 100 offensive and defensive plays to choose from. The offensive player can choose a running play, option play, pass play, or a time-out. After the player selects the type of play, four patterns appear to choose from. The computer chooses these four patterns based on the current ball status and yards to the defuse line or to the goal line.

Meanwhile, the defensive player can choose a short, medium, or long defense. The computer also presents four patterns for the player to choose from.

If a Cyberball robot is damaged during the action by tackles or exploding shrapnel, the player can replace it with a better robot bought with team "funds," which are awarded for good performance. If the player doesn't replace the damaged robot, it handles the ball poorly and may fumble.

High Score Table: A high-score table ranks the performance of players by the amount of team funds awarded during play. Points scored are converted to "money" and added to the team funds.

Maximizing Earnings

Operator options on this game have been kept very simple. You should thoroughly read Chapter 2, Self-

Test, for information on the Coin Options, Game Options, Histogram, and Statistics screens so that you can effectively use the available options. Use the Self-Test screens showing Statistics and Histogram 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 Cyberball 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, choose a slower clock speed setting or timer bar speed setting on the game option screen. Either change will give players more game time for their money.

After changing game option settings, it is a good idea to reset the game statistics and the histograms. The game statistics can be cleared in the self-test on the second statistics screen by moving the left joystick and pressing any left player button. The histograms can be cleared by moving the left joystick and pressing any left player button while you are on the histogram screen.

Chapter 2

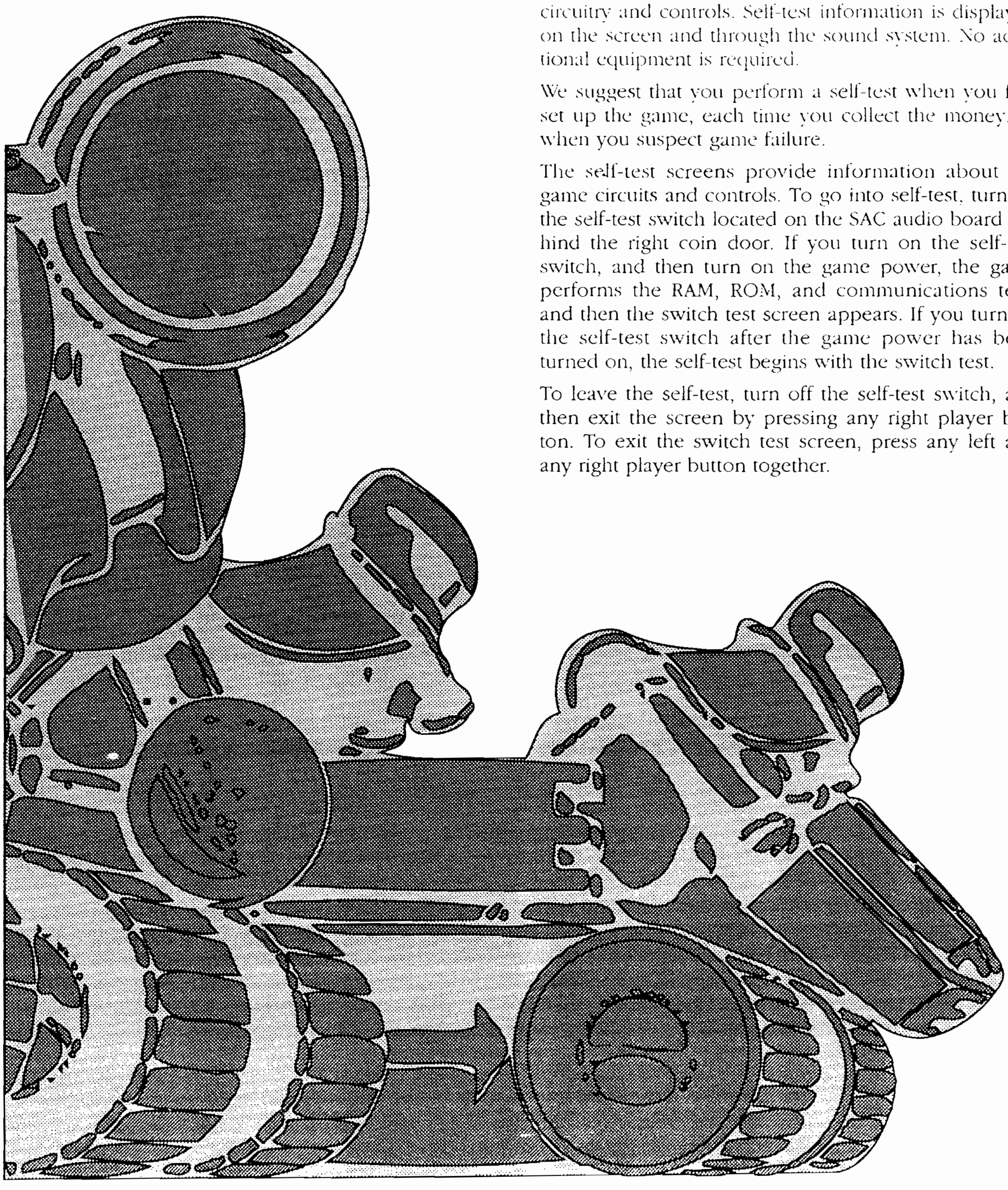
Self-Test

The Cyberball™ 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.

The self-test screens provide information about the game circuits and controls. To go into self-test, turn on the self-test switch located on the SAC audio board behind the right coin door. If you turn on the self-test switch, and then turn on the game power, the game performs the RAM, ROM, and communications tests and then the switch test screen appears. If you turn on the self-test switch after the game power has been turned on, the self-test begins with the switch test.

To leave the self-test, turn off the self-test switch, and then exit the screen by pressing any right player button. To exit the switch test screen, press any left and any right player button together.



NOTE

You can perform the self-test two ways. If you turn on the self-test switch first, and then the power switch, the self-test starts with the RAM, ROM, and Communications tests.

If you turn on the power first, then the self-test switch, the self-test begins with the switch test.

RAM, ROM, and Communications Tests

In addition to the usual RAM and ROM tests, a communications test has been added for Cyberball's dual microprocessor which checks the communications between the dual microprocessors, P1 and P2. If the game has an error in RAM, program ROM, or communications you will see information about the error displayed on the screen as shown in Figure 2-1 and 2-2.

If the test finds no RAM or communications errors, then after a 30-second delay, the self-test goes to the ROM test without displaying a message. If the game has no ROM errors, then you will not see any message either.

If you have an error in any of these tests and you see a message, you can move to the next test by pressing the right player button.

If you have a RAM or communications error, check Table 2-1 for the location of the problem. If you have a ROM error, see Table 2-2 for information about the location of the error. If you think you have a ROM error, but the screens show no messages, look at Table 3-2 for information about the locations of various ROM functions.

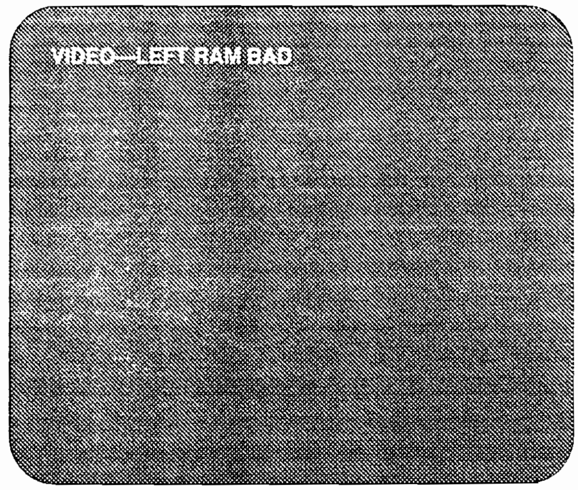


Figure 2-1 RAM or Communications Error Message

Table 2-2 ROM Error Locations

Micro-processor	Error Address	Location on Game PCB*	
P1	000000	U=1M	L=1K/L
P2	000000	U=3C/D	L=1B
P2	020000	U=1C/D	L=3B

The error is identified as an upper or lower error (U or L) on the screen, after the word error.

Table 2-1 RAM and Communication Error Locations

Error Message[1]	Display Background	Location
P2[2]—Working RAM Bad	Red	4E, 4F
Video—Left RAM Bad	Green	9K, 11K
Video—Right RAM Bad	Green	8K, 10K
Color RAM—Left Bad	Black	21M, 22M
Color RAM—Right Bad	Black	25M, 26M
P2[2]—Common RAM Bad	Blue	4E, 4F
P2[2]—Detects Communications Error[3]	Purple	
P1[2]—Working RAM Bad	Red	4E, 4F
P1[2]—Common RAM Bad	Blue	4E, 4F
P1[2]—Detects Communications Error[3]	Purple	

[1] *If two errors are detected, for instance, P2 finds the common RAM bad and P1 finds a communications error, then the screen may be split or may have only one color. However, both messages will appear, no matter what the display background is.*

[2] *P1 and P2 are the dual microprocessors.*

[3] *"Detects Communications Error" applies to communications problems other than the common RAM being bad.*

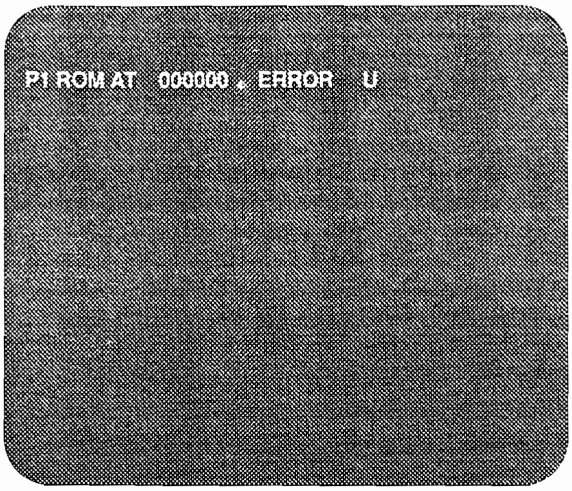


Figure 2-2 ROM Error Message

Switch Test

The switch test is shown in Figure 2-3. Use this test to check the controls. As you press the buttons and move the joysticks, the zeros on the screen should change to ones. If they do not, follow the maintenance and repair procedures for the controls in Chapter 3 of this manual. Press any right and any left player button together to move to the next screen.

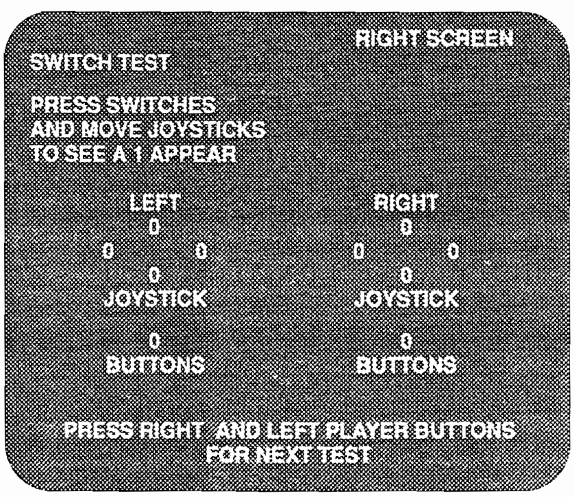


Figure 2-3 Switch Test Screen

Coin Options

Check and select the coin options on this screen. The screen is shown in Figure 2-4.

To move through the coin options, push the left joystick up or down. You can change the coin option shown in green. The factory default settings are shown in blue. To change an option setting, move the left joystick right or left.

If you change an option, but then want to change it back to the previous setting, press either left player

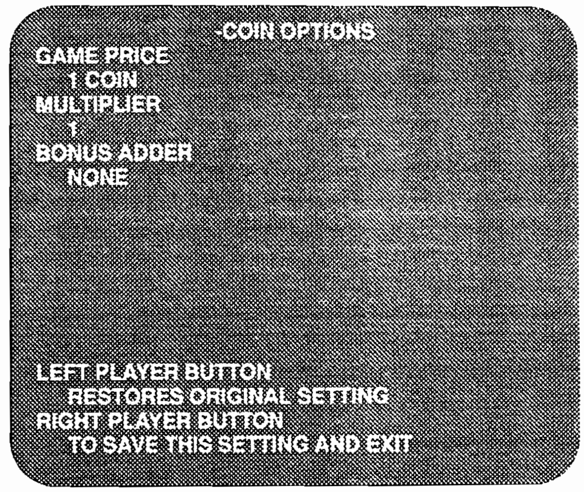


Figure 2-4 Coin Options Screen

button. To save the new settings and exit from the screen, press either right player button.

If you want to exit the self-test, turn off the self-test switch, and press any right player button to exit the screen. All your changes are saved and you return to the attract mode.

The coin options are explained below. The settings, with defaults, are shown in Table 2-2.

- *Game Price* is the number of coins required for one credit.
- *Multiplier* is the number of coins each coin counts as in the coin mechanisms. For example, if you select 2, then each coin counts as two coins.
- *Bonus Adder* lets you choose bonus coins, no bonus, or free play.

Table 2-3 Coin Option Settings

Option	Settings
Game Price	One coin ✦ Two coins Three coins Four coins
Multiplier	1✦ 2 3 4 5 6 7 8
Bonus Adder	None ✦ 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 (for demonstration mode)

✦ *Manufacturer's recommended settings*

Game Options

Check and select the game options on this screen. The screen is shown in Figure 2-5.

To move through the game options, push the left joystick up or down. You can change the coin option shown in green. The factory default settings are shown in blue. To change an option setting, move the left joystick right or left.

If you change an option setting, but then want to change it back to the previous setting, press either left player button. To save the new settings and exit from the screen, press any right player button.

If you want to exit the self-test, turn off the self-test switch, and press any right player button to exit the screen. All your changes are saved and you return to the attract mode.

NOTE

Not all of the options are shown when you enter this screen. The word More *shows at the top or bottom of the screen to indicate more options. Use the left joystick to scroll through the options.*

The game options are explained below. The settings, with defaults, are shown in Table 2-3.

- *Restore Factory Options* allows you to set all the game options to the factory options by choosing yes. If you want to use your own settings, be sure to set this to no.
- *Clock Speed* sets the amount of time the players receive per play period.
- *Timer Bar Speeds* controls the amount of time given on the timer bar shown on the play selection screen.
- *Time-Outs Per Period* is the number of time-outs a player is permitted per play period.
- *Drone Players' Intelligence* controls the responsiveness of the defensive players on the field. You can choose average, smart, or very smart. The higher the intelligence level, the faster the defense reacts. This setting does not affect the length of play time.
- *Clear High Score Table* clears the high score table, if it is set to yes.
- *Auto High-Score-Table Reset* automatically clears the high score table if 2,000 games have been played, and if at least 200 games have been played since the last player entered the high score table.

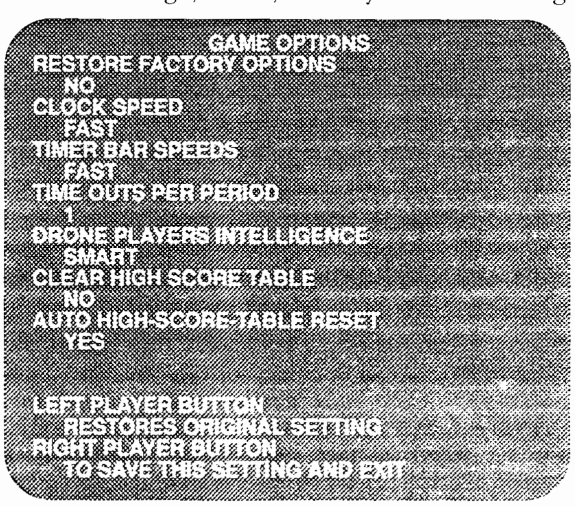


Figure 2-5 Game Options Screen

Table 2-4 Game Option Settings

Option	Settings	
Restore Factory Options	Yes	No✦
Clock Speed	Very slow Fast✦	Slow Very Fast
Timer Bar Speeds	Very Slow Fast✦	Slow Very Fast
Time-Outs Per Period	1✦	2
Drone Players' Intelligence	Average Very Smart	Smart✦
Clear High Score Table	No✦	Yes
Auto High-Score-Table Reset	No	Yes✦

✦ *Manufacturer's recommended settings*

Statistics Screens

Use the information shown on the two statistics screens and on the histogram screen to keep track of your game use. Record the information on the Cyberball statistics page in the back of this manual.

The information shown on the two statistics screens (shown in Figure 2-6 and 2-7) is accumulated from the last time the statistics were reset.

At the bottom of the first statistics screen are several times and dates. These are the program version dates. If you are having problems with your game, you may need to give Atari Games Customer Service this information.

You can reset the statistics when you are on the second statistics screen by moving the left joystick and pressing any left player button.

First Statistics Screen

The first statistics screen shows the following information:

- *Left/Right Screen, Left/Right Mech Coins* show the number of coins counted in each of the game's four coin mechanisms.
- *Total Games* shows the number of unique games played. A unique game is counted from the first player starting to the last player quitting, regardless

of how many times the game was continued, or how many people played.

- *0 Plyr Min* is the number of minutes the game was idle.
- *1/2/3/4 Plyr Min* are the number of minutes the game was played by one, two, three, or four players, respectively.
- *Error Count* shows the number of errors counted in the erasable memory. If you have a count of more than 75, you should have your game serviced by a qualified service technician.
- *Total Credits* is calculated by multiplying the coins by the credit setting you chose in *Game Price*.
- *Avg Time Per Credit* is the average amount of time in seconds that each credit gave.

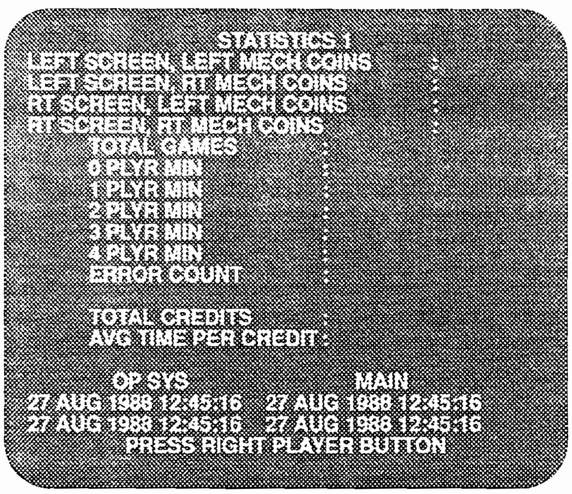


Figure 2-6 First Statistics Screen

Second Statistics Screen

The second statistics screen shows the following statistics both as the amount and as a percentage of the total games played.

- *Comp Games Left* is the number of games played by one or two players on the left screen against the computer.
- *Comp Games Right* is the number of games played by one or two players on the right screen against the computer.

The rest of the statistics on this screen are for games played by players against each other.

- *1 Period Games* is the number of games in which all the players played for only one period of the complete six-period Cyberball game.
- *2/3/4/5/6 Period Games* show the number of games in which all the players played for two to six periods.
- *7 Plus Period Games* shows the number of games in which all the players played for seven or more periods. This means that the players completed at least one Cyberball game and started another.

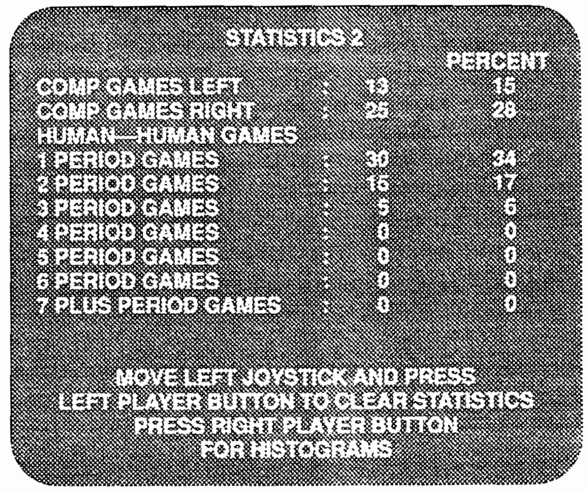


Figure 2-7 Second Statistics Screen

Histogram Screen

The histogram screen shows the length of game play and the number of games played. The screen is shown in Figure 2-8. Write these numbers on the Cyberball statistics sheet in the back of this manual to assist in maximizing your profit.

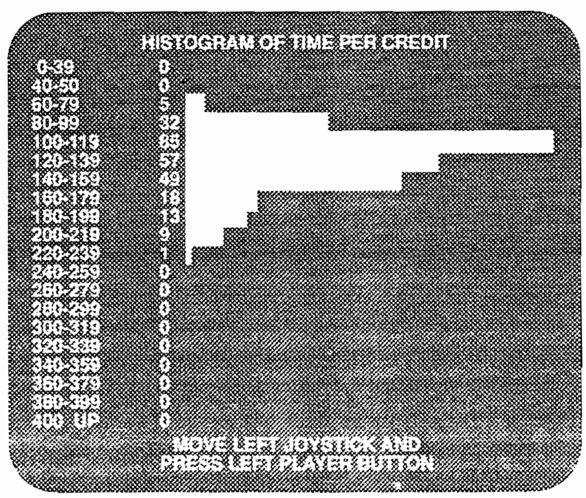


Figure 2-8 Histogram Screen

Playfield Scrolling Test

You can test the playfield scrolling circuitry in this screen. Use the left joystick to move left, right, up, and down. The screen is shown in Figure 2-9.

Exit the screen by pressing any right player button.

Figure 2-9 Playfield Scrolling Test

Motion Object Test

The motion object test screen is shown in Figure 2-10. This tests the movement and color of various game objects.

Choose a stack with the left player button. Use the left joystick to move the stack. Press the left player button to move to the next stack.

Exit the screen by pressing any right player button.

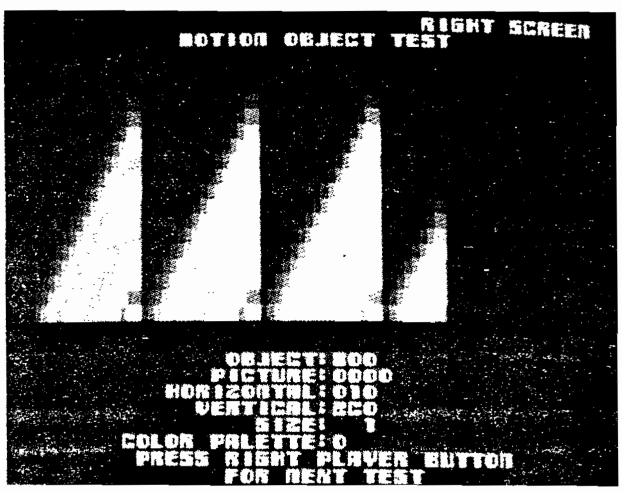


Figure 2-10 Motion Object Test

Alphanumerics Test

The alphanumerics test checks the condition of the alphanumerics in the game. The screen is shown in Figure 2-11.

If you see an error on the screen, check the EPROMS at 15N and 16N.

Press any right player button to go to the next test.

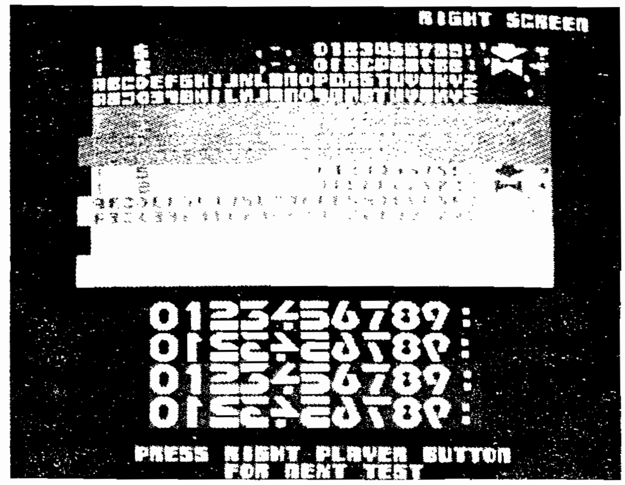


Figure 2-11 Alphanumerics Test

Color Test

This test indicates the condition of the left and right video display color circuits. The screen is shown in Figure 2-12.

The left side of both screens should be black and change to grey in the middle. To the right of the grey the screen should appear red, green, blue, and white from top to bottom.

If the screen does not fit this description, see the video display manual included with the game for adjustments.

Exit the screen by pressing any right player button.

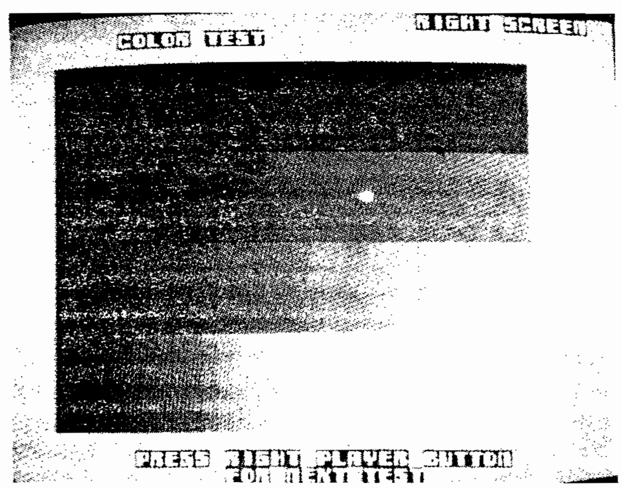


Figure 2-12 Color Test

Color Purity Test

The color purity test has five screens. The first screen is shown in Figure 2-13.

These screens show the condition of the color purity circuit in the video display. Each screen should display a rectangle of color, with no curving at the corners and no lines in the display. The screens are red, green, blue, white, and gray.

If the screens are not correct, see the video display manual included with the game for adjustments.

Exit each screen by pressing any right player button.

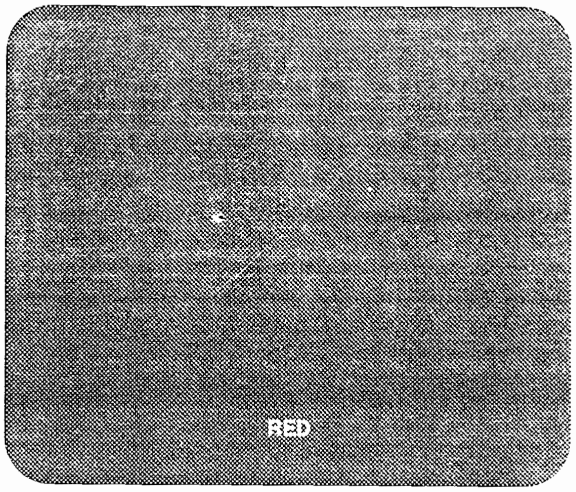


Figure 2-13 Color Purity Test

Convergence Test

The convergence test is shown in Figure 2-14. This test has three screens. The first is white, the second is purple, and the last is green.

Check the following on the screens:

- The grid lines should be straight within 3.0 mm and the lines should not pincushion or barrel.
- The convergence of the lines on the violet and white screens should be within 2.0 mm.

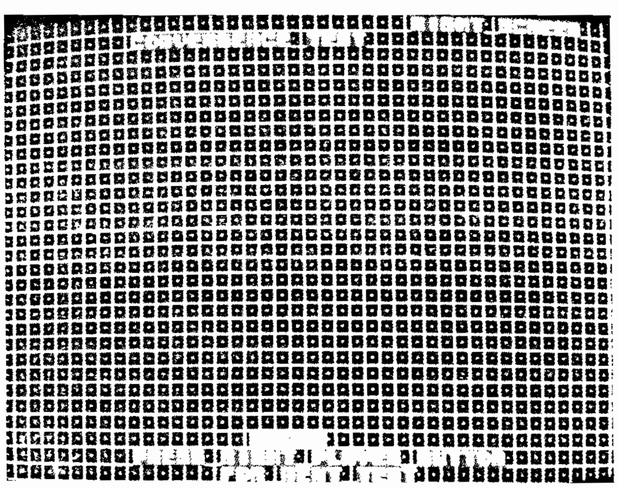


Figure 2-14 Convergence Test

If these screens do not meet these criteria, see the video display manual for suggested adjustments.

Exit the screen by pressing any right player button.

Sound Test

The sound test indicates the condition of the music and sound effects circuits on the SAC (Sampled Audio Cruncher) PCB. (This board replaces the Stand-Alone Audio Board used in previous games.) The sound test screen is shown in Figure 2-15. The sound microprocessor resets at the beginning of the test. You will hear the first sound three seconds after the test starts.

After the microprocessor is reset and you hear the first sound, the number of game sounds and the sound CPU status information appear. If the CPU is good, the word "Good" appears. If you get an error message at any point in the sound test, see Table 2-4 for more information.

The test cycles through the following tests:

- Music Chip Test
- Sampled Audio Test
- SCOM Reset Test

Use the left joystick and the left player buttons to select sounds and listen to them.

To leave the self-test, switch off the self-test switch, and then press any right player button. You will return to the attract mode.

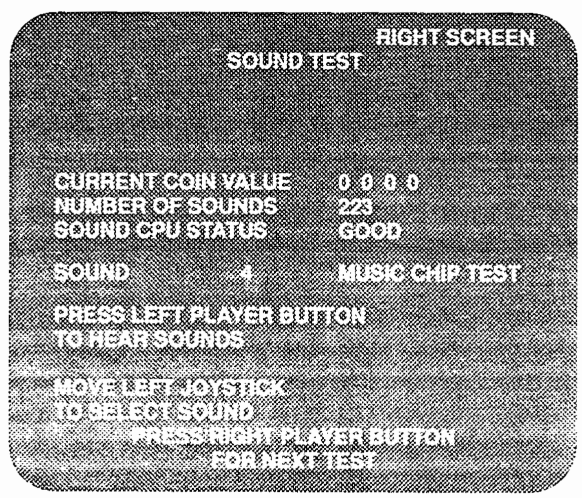


Figure 2-15 Sound Test

Table 2-5 Faulty Sound RAM and ROM Locations

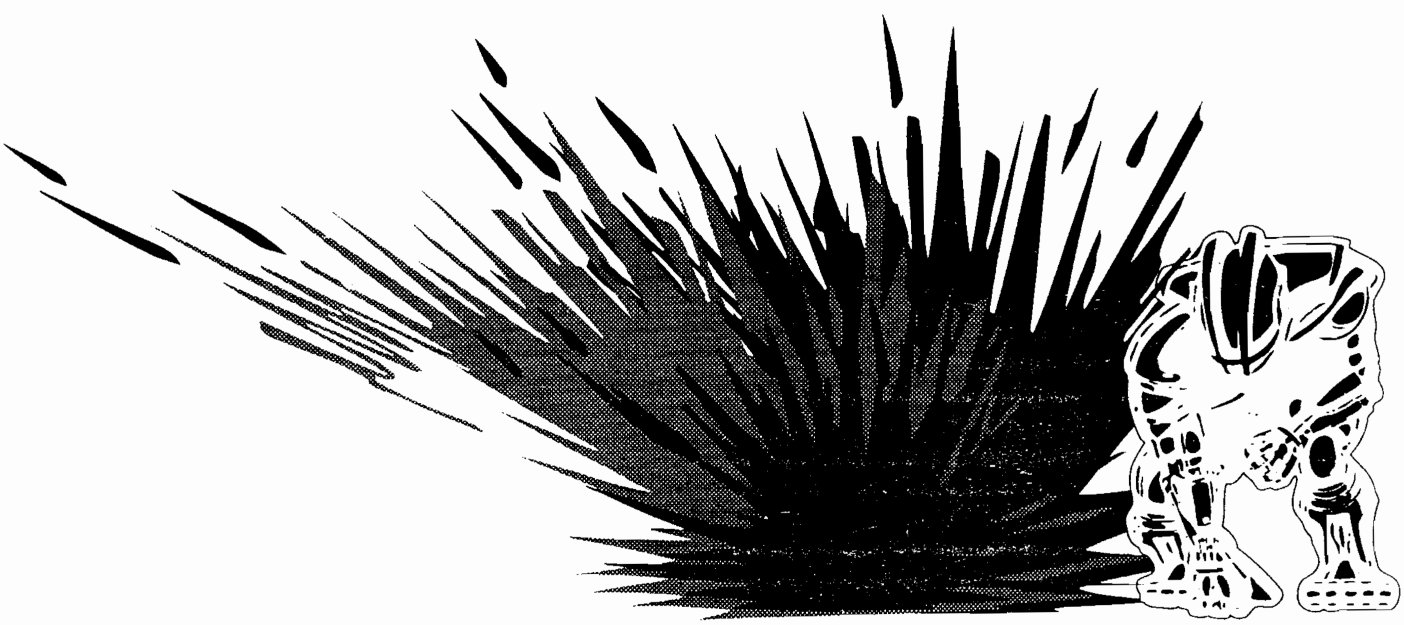
Error Message	Location on SAC PCB	Cause or Comment
Music Chip Time Out	4H	
Sound CPU Interrupt Error	2D, 1E, 6K	
Sound CPU RAM 1 Error	2H	
Sound CPU ROM 1 Error	2F	If you see this when you enter the sound test, the sound processor cannot proceed any further. Press any right player button to exit the test.
Communications Error #1	1D	Counts the number of errors caused by the SAC PCB or Game PCB. This means that the SCOM chip (part no. 137526-001) on one of these boards is bad. **CAUTION** The SCOM chip is a CMOS IC and is static sensitive. If you do not handle it properly, you can permanently damage this chip. See the section *Replacing Static-Sensitive Devices*, in Chapter 3 of this manual, for more information.
Communications Error #2		Probably the SAC PCB is disconnected from the Game PCB, or the chip at 1D is not inserted into its socket.
Sound Processor Not Responding		A major problem with the SAC PCB. If you cannot enter the self-test, the harness may be disconnected between the SAC PCB and the Game PCB.

Chapter 3

Maintenance

This chapter includes preventive maintenance and repair procedures for the Cyberball™ game components that are subject to the most use. To make sure you have maximum trouble-free operation from this game, perform the preventive maintenance described in this chapter at the intervals recommended.

Removal, disassembly, re-assembly, and replacement procedures are provided for components that might need to be repaired. If a part is mentioned, but not illustrated, check in Chapter 4, Illustrated Parts Lists, to locate the part.



Preventive Maintenance

Preventive maintenance includes cleaning, lubricating, and tightening hardware. How often you perform preventive maintenance depends upon the game environment and frequency of play. However, you should regularly maintain the components listed in Table 3-1, Recommended Preventive-Maintenance Intervals.

WARNING

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

Preventive-Maintenance Intervals

For the best performance from your Cyberball game, perform the maintenance in Table 3-1 at the intervals specified.

Opening the Control Panel

1. Turn off the power to the game.
2. Unscrew the two tamperproof screws on either side of the control panel.

NOTE

A hole is provided inside the upper coin door to store the tamperproof key wrench when it is not in use.

3. Pull the control panel up and disconnect the harness connector.
4. To replace the control panel, first fit the front edge into the slot in the cabinet. Reconnect the harness connector. Now fit the control panel in place and reinstall the tamperproof screws and flat washers.

Maintaining the Joystick

Maintain the joystick by inspecting the pivot ball, actuator half-ball, and the shaft and lubricating the joystick with lithium grease.

1. Turn off the power to the game.
2. Open the control panel and disconnect the harness connector.
3. Remove the joystick from the control panel. Use a 3/8-inch wrench to remove the nuts and washers that hold the joystick on the control panel.

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Table 3-1 Recommended Preventive Maintenance Intervals

Joystick	Lubricate and inspect every three months.
Leaf Switch	Clean every 3 months.
Coin Mechanism	Inspect whenever you collect coins. Clean every three months.

4. Remove the four long screws that hold the joystick together. See Figure 3-1.
5. Take off the 8-position plate, the actuator, and the lower housing.
6. Check the actuator half-ball, the pivot ball, and the shaft for dirt and wear.
7. Lubricate the actuator half-ball on the end of the joystick shaft, the pivot ball below the upper housing, and the spring inside the upper housing. Use lithium grease.
8. Put the joystick assembly back together. Fit the pin in the pivot ball into the slot in the lower housing.
9. Replace the long screws and tight them. Do not over-tighten the screws. The joystick handle must return to center easily.

NOTE

Do not tighten the long screws too much. If you do, the handle will be difficult to move and players may become frustrated with the game.

10. Replace the joystick assembly on the control panel.
11. Use the Self-Test to make sure you have reassembled the joystick correctly.

Cleaning the Leaf Switches

Your game may have either snap-action switches or leaf switches. The snap-action switches require no maintenance. The leaf switches should be cleaned and tightened as follows:

1. Remove the control panel.
2. Use electrical contact cleaner to clean the contacts. Do not burnish the contacts. The wiping action of the cross-bar contacts of the leaf switch is a self-cleaning action.

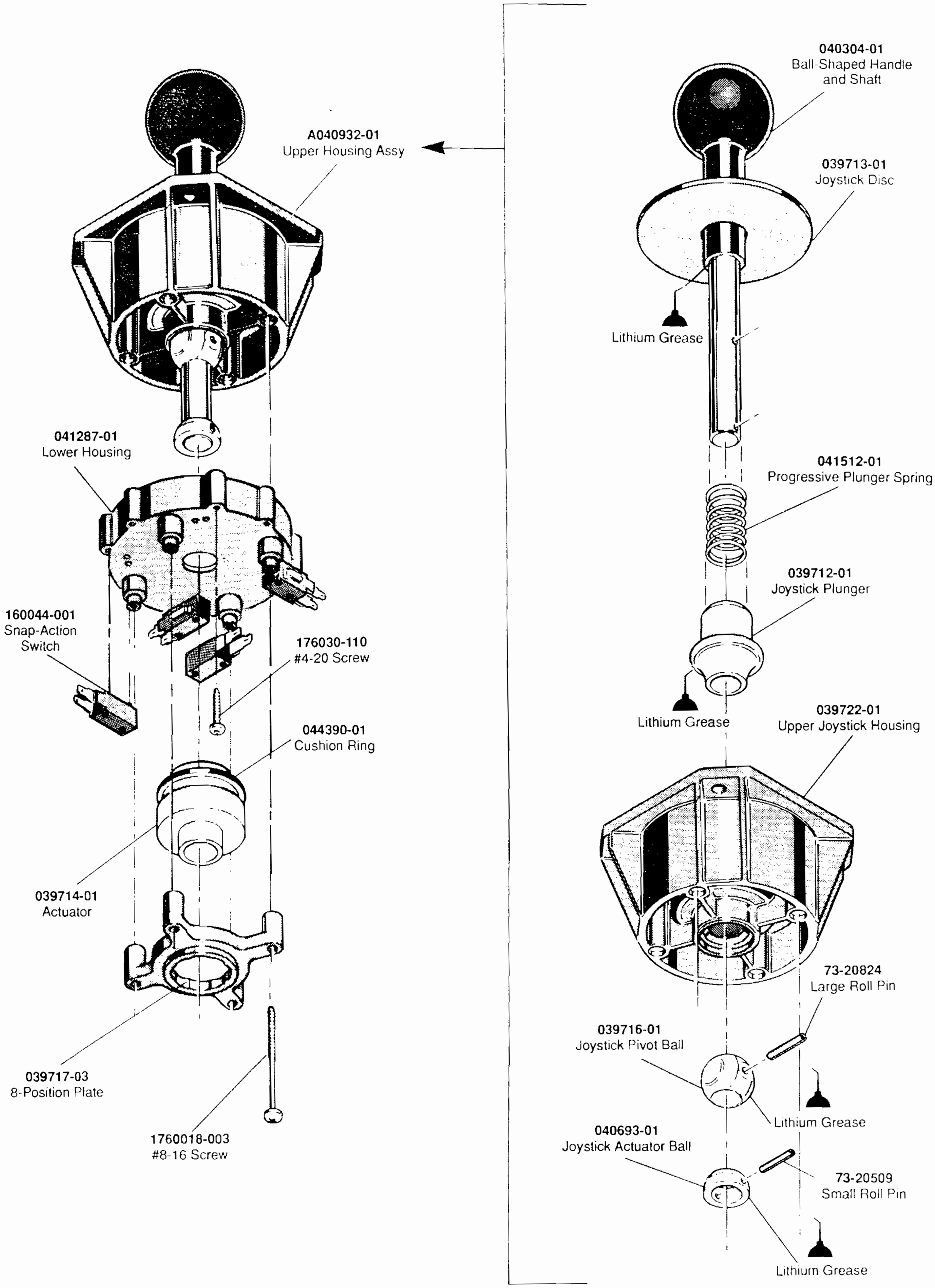

Figure 3-1 Maintaining the Joystick

5. Tighten the stamped nut holding the leaf switches on the control panel using a 5/8-inch wrench.

If you need to replace a switch button, take off the stamped nut with a wrench while firmly holding the bezel on the outside of the control panel.

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

WARNING

Turn off the game power but leave the power cord plugged in while you clean the inside of the cabinet. The power cord provides a ground path for stray static voltages that can be present on the cleaning tools.

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

1. Turn the game power off and wait two minutes. Leave the power cord plugged in.
2. Remove the rear access door.

WARNING

The video display contains lethal high voltages. To avoid injury, do not attempt to service this display until you observe all precautions necessary for working on high-voltage equipment.

3. 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 a length of solid gauge wire to the blade of a well-insulated screw driver.
   b. Attach the other end of the wire to an earth ground.
   c. Quickly touch the blade of the screwdriver to the CRT anode by sliding it under the anode cap.
   d. Wait two minutes and repeat step c.

CAUTION

Be very careful when you clean the electrical components in the cabinet. Do not touch the electrical components with any object other than the soft bristles of the vacuum attachment or paint brush.

4. Use a vacuum cleaner with a soft long-bristled brush attachment or use a soft-bristled paint brush to remove loose dirt and dust accumulated on the inside of the cabinet. Be sure to thoroughly clean the electrical components (power supplies, PCB assemblies, display, etc.).

Repairs

Repairs include the removal, disassembly, re-assembly, and replacement of game components. The following procedures are provided for components that may require repairs.

Disassembling the Joystick

Perform the following procedure to disassemble the joystick (see Figure 3-1).

1. Take off the control panel and disconnect the harness connectors.
2. Remove the joystick from the control panel. Use a 3/8-inch wrench to remove the four locknuts and washers holding the joystick onto the control panel.
3. Remove the four screws holding the 8-position plate on the bottom of the assembly.
4. Remove the white plastic actuator and the lower housing that the four switches are attached to.
5. Remove the small roll pin holding the actuator half-ball on the bottom of the shaft by pushing the roll pin all the way through the shaft. Slide the actuator half-ball off the end of the shaft.
6. Remove the large roll pin holding the large pivot ball on the shaft below the upper housing. Push the pin through the ball and the shaft. The pin will not be easy to remove because of the pressure on the pivot ball from the spring above it. After you push the pin all the way through the ball, slide the pivot ball off the shaft.
7. Slide the upper housing off the shaft.
8. Slide the plunger and the spring off the shaft.
9. Slide the disc off the shaft.

Reassembling the Joystick

1. Install the disc on the shaft.
2. Slide the spring on the shaft. Push the large end of plunger onto the shaft and over part of the spring (see Figure 3-2).

NOTE

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

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3. Slide the upper housing onto the shaft.
4. Before you put the pivot ball on the shaft, insert the large roll pin partway into the pivot ball. The roll pin should not interfere with sliding the pivot ball onto the shaft. Slide the ball onto the shaft, and line up the roll pin with the hole in the shaft. Now push the pin through the shaft.

   You will have to hold the pivot ball against the pressure of the spring. Make sure the ends of the roll pin extend out the same amount on both sides.
5. Put the small roll pin part way into the actuator ball and slide the ball onto the shaft. Line up the roll pin with the shaft hole. Push the roll pin through the ball and the shaft.
6. Fit the lower housing over the shaft so that the ends of the large roll pin fit into the slots on the inside of the housing. Turn the lower housing so that screw casings align with the holes in the upper housing.
7. Put on the white plastic actuator so that the black cushion ring is opposite the switches.
8. Now install the 8-position plate below the actuator so that you can reinsert the long screws.
9. Put the long Phillips head screws through the 8-position plate and up through the housings. Do not over-tighten the screws, or the joystick will be too hard to move.

NOTE

The joystick handle must return freely to the center position. If it does not, players will become frustrated with the game.

---

10. Reinstall the joystick on the control panel.

Removing the Video Display

Perform the following procedure to remove the video display. (See Figure 3-2.)

WARNING

Be very careful when you remove the display from the cabinet. Do not drop it!

You should weigh at least 150 pounds to remove the display by yourself.

You should also wear gloves so you do not cut your hands on the sheet-metal edges.

---

1. Turn the game power off and wait two minutes. Leave the power cord plugged in.
2. Remove the rear service door.

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.

---

3. 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 a length of solid gauge wire to a well-insulated screwdriver.
   b. Attach the other end of the wire to an earth ground.
   c. Quickly touch the blade of the screwdriver to the CRT anode by sliding it under the anode cap.
   d. Wait two minutes and repeat step c.
4. Disconnect the display harness connectors from the display.
5. Take off the retainer holding the top of the display shield. Remove the shield.
7. Remove the bezel carefully from the cabinet. the bezel is held in place with double-sided tape.
8. Remove the two wood cleats on the left and right sides of the cabinet. Use a Phillips screwdriver to remove the two screws on each side.
9. Use a 3/8-inch nut driver or socket to remove the four lock nuts and washers holding the display onto the metal mounting brackets in the cabinet.
10. Carefully lift the display out through the front of the cabinet.
11. Replace the video display as described in the following procedure.

Replacing the Video Display

Perform the following procedure to replace the video display in the cabinet. (See Figure 3-2.)

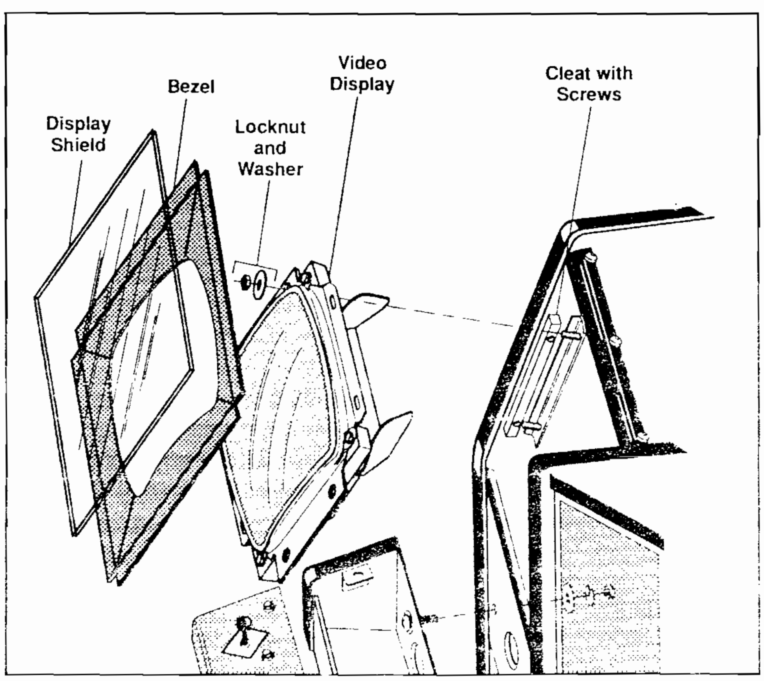


Figure 3-2 Removing the Video Display

NOTE

If you replace the cathode-ray tube and yoke together, adjust the brightness, size, and centering as described in the display service manual. Check the purity and convergence according to the display service manual instructions, but do not adjust these two unless it is required.

2. Position the display so that the four holes in the video display mounting brackets align with the four threaded studs in the metal brackets.
3. Install the four large washers and locknuts on the display frame and mounting brackets.
4. Use a 3/8-inch nut driver to tighten the locknuts. Be sure that the display is centered horizontally.
5. Connect the display harnesses to the display.
6. Install the two cleats that support the bezel and the display shield.
7. Replace the bezel and display shield. Reinstall the top retainer.

Replacing Static-Sensitive Devices

Be careful when you are working with static-sensitive devices on the game PC boards. Static charge that has built up in your body can cause a static-sensitive device to fail. Leakage from an improperly grounded soldering iron can also cause a static-sensitive device to fail.

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

If you replace a static-sensitive device, be careful when you handle the new static-sensitive device. The device may be packaged in conductive foam or may 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 PC board. Remove the shorting wire only *after* the device is inserted into its socket or *after* all the leads are soldered in place.

Troubleshooting ROM Problems

Use Table 3-2 to find the location of ROM problems in your Cyberball game.

Table 3-2 ROM Functions

Problem	Type of ROM	Location
Score box disappears. Letters and numbers disappear. Play diagrams disappear. Vertical lines appear over the entire screen.	Alphanumeric	15N or 16N
Totally black screen	Both Alphanumeric ROMs **NOTE:** Check video display before replacing ROMs.	15N and 16N
Playfield has several rows of short vertical lines across it. Play diagrams and high score tables have several rows of short vertical lines across them.	Playfield	8L/M, 9L/M, 10L/M, or 11L/M
Linebacker, running back, or quarterback are breaking up.	Motion Object	11A, 11C, 15/16A, or 15/16C
Quarterback or cornerback are breaking up.		12A, 12C, 16/17A, or 16/17C
Linemen, receiver, or safety are breaking up.		13A, 13C, 18A, or 18C
Sidelines, ball, receiver marks, or tight end are breaking up.		14A, 14C, 19A, or 19C

N O T E S

Chapter 4

Illustrated Parts Lists

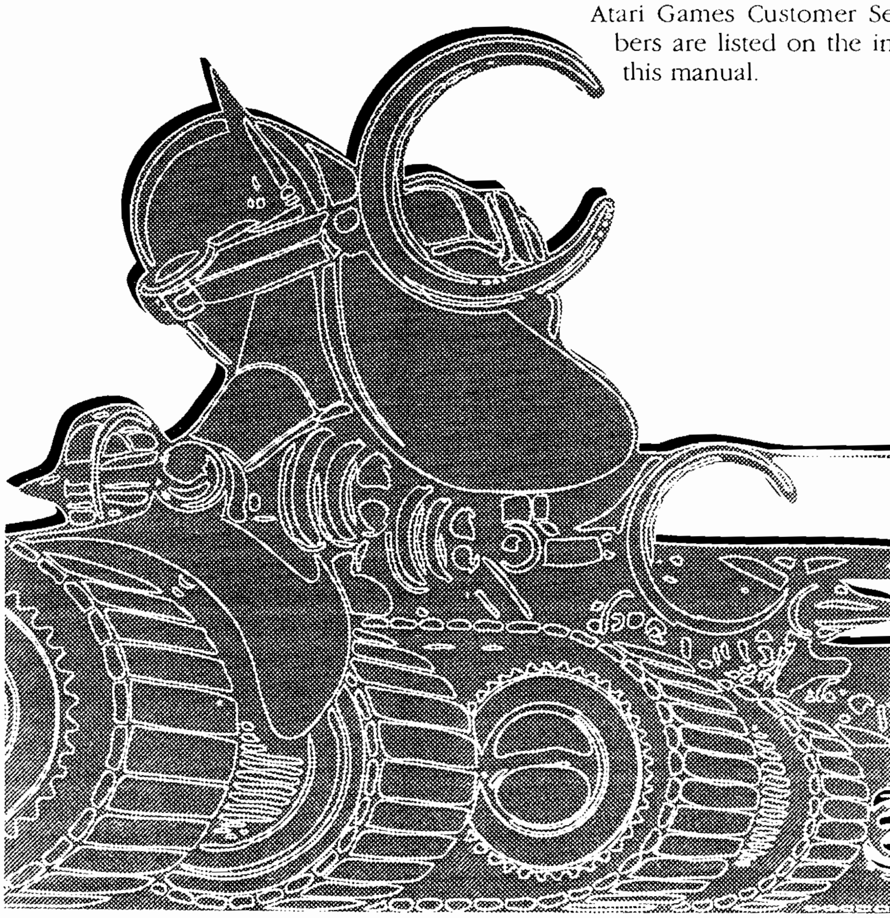
This chapter provides information you need to order parts for your game. Common hardware parts, such as screws, nuts, and washers are usually not listed in the parts lists.

The parts lists (except for the PCB parts lists) are arranged alphanumerically by Atari part number. All A-prefix numbers, which are assemblies, come first. Next are part numbers with six numbers followed by a hyphen (000598- through 201000-). Ending the list are part numbers with a two-number designation followed by a hyphen (00- through 99-).

The PCB parts lists are arranged in alphabetical order by component. Within each component list the parts are arranged numerically by part number.

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

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



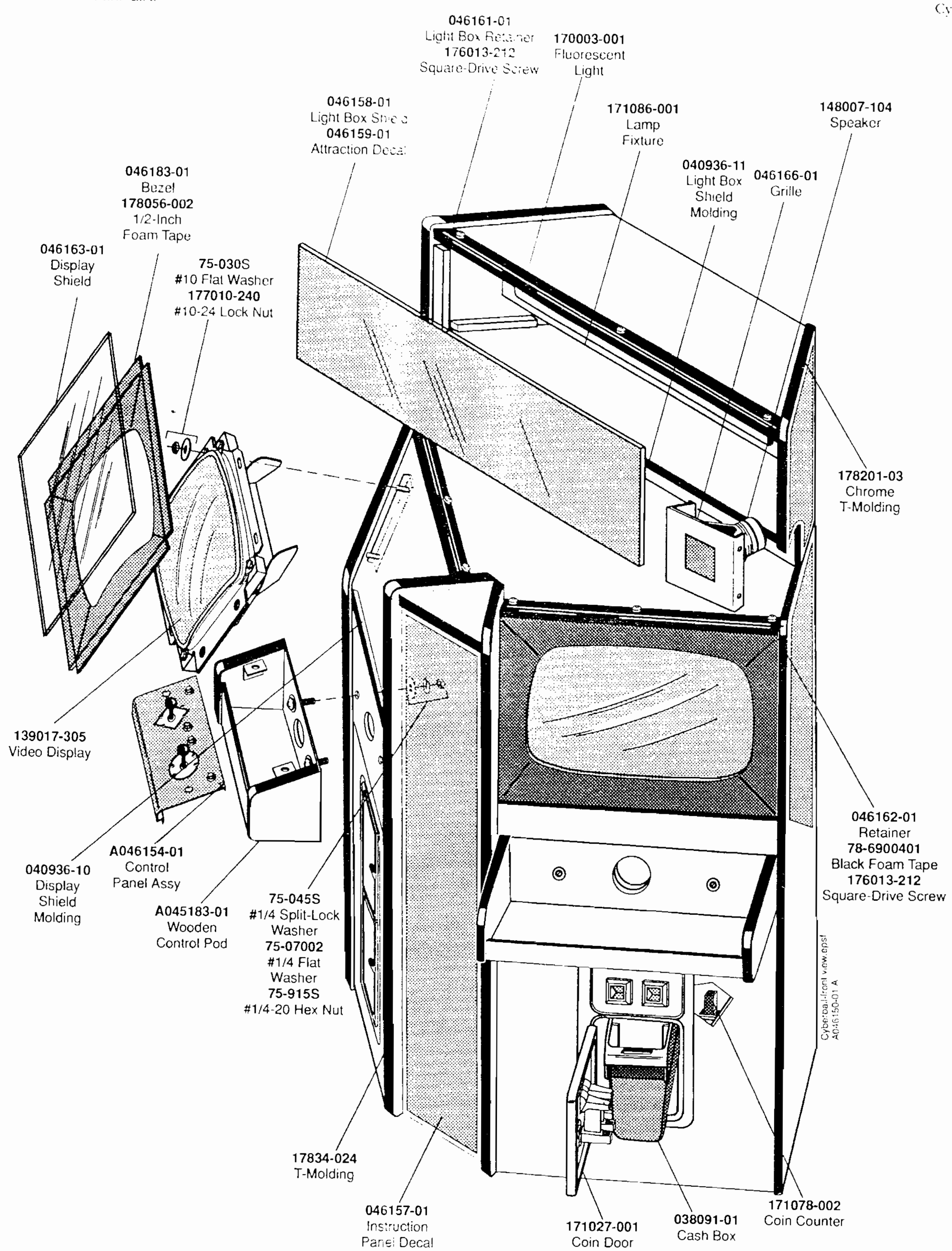


Figure 4-1 Cabinet-Mounted Assemblies, Front View
A046150-01 B

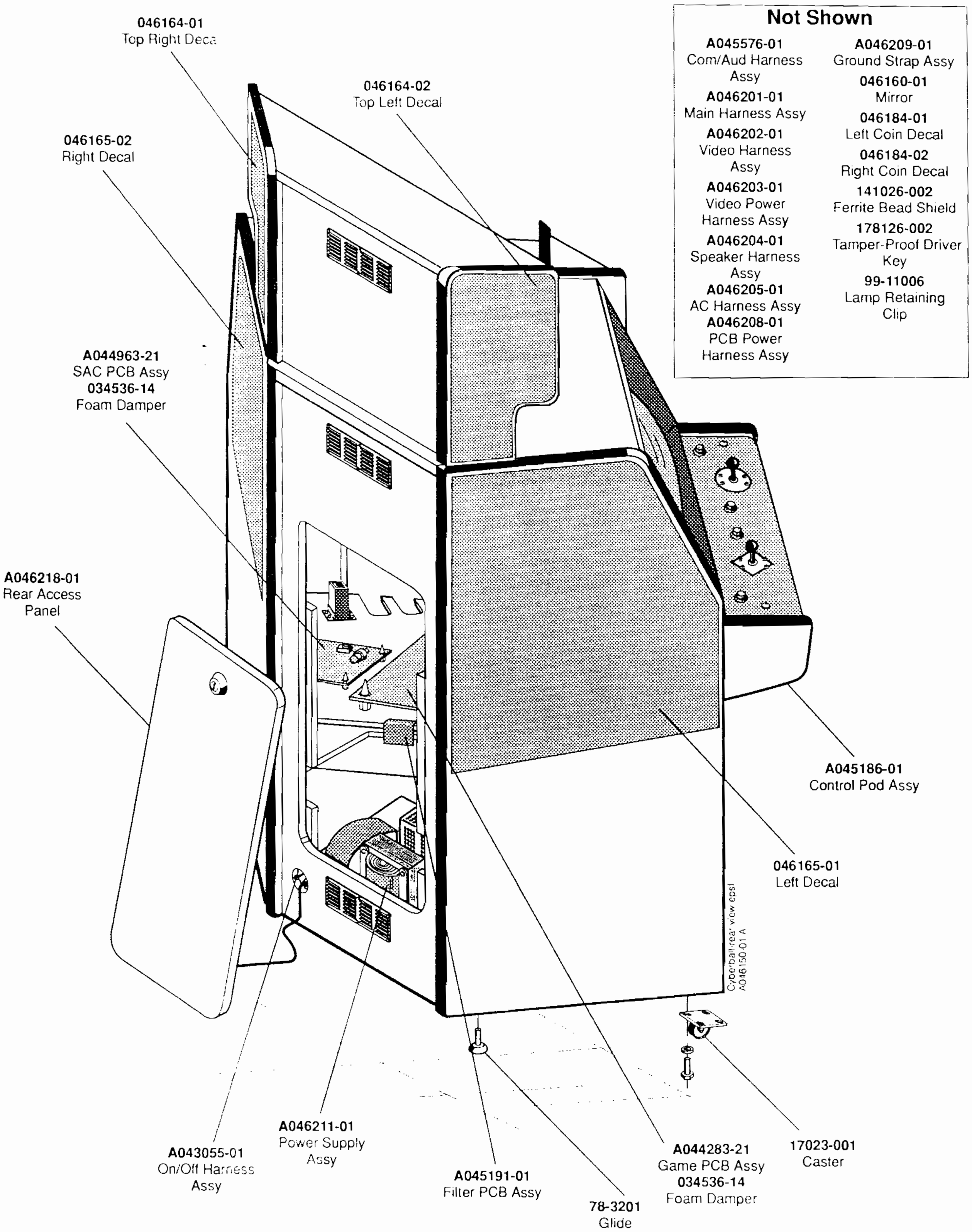


Figure 4-1 Cabinet-Mounted Assemblies, Rear View
A046150-01 B

Cabinet-Mounted Assemblies
Parts List

Part No.	Description
A043055-01	On/Off Harness Assembly
A044283-21	Cyberball Game PCB Assembly (see Figure 4-6)
A044963-21	SAC Audio PCB Assembly (see Figure 4-7)
A045183-01	Wooden Control Panel Pod
A045186-01	Control Panel Pod Assembly (Includes wood pod (part no. A0451830-01) and the Control Panel Assembly shown in Figure 4-2.)
A045191-01	Filter PCB Assembly (see Figure 4-8)
A045576-01	Com/Aud Harness Assembly
A046154-01	Control Panel Assembly (see Figure 4-2)
A046201-01	Main Harness Assembly
A046202-01	Video Harness Assembly
A046203-01	Video Power Harness Assembly
A046204-01	Speaker Harness Assembly
A046205-01	AC Harness Assembly
A046208-01	PCB Power Harness Assembly
A046209-01	Ground Strap Assembly
A046211-01	Power Supply Assembly (see Figure 4-4)
A046218-01	Rear Access Panel
034536-14	Foam Vibration Damper
038091-01	Cash Box
040936-10	Display Shield Molding
040936-11	Light Box Shield Molding
046157-01	Instruction Panel Decal
046158-01	Light Box Shield
046159-01	Light Box Attraction Decal
046160-01	Mirror
046161-01	Light Box Shield Retainer
046162-01	Display Shield Retainer
046163-01	Display Shield
046164-01	Top Left Decal
046164-02	Top Right Decal
046165-01	Left Side Decal
046165-02	Right Side Decal
046166-01	Speaker Grille
046183-01	Display Bezel
046184-01	Left Coinage Decal
046184-02	Right Coinage Decal
139017-305	19-Inch Color Standard-Resolution Prismatic Video Display (Model 19K7601)
141026-002	Ferrite Bead Shield
148007-104	4 1/2-Inch Shielded Speaker
17023-001	4-Inch Swivel Caster
17834-024	Black T-Molding
170003-001	18-Inch, 15 Watt Fluorescent Light
171027-001	Coin Acceptors, Inc. Coin Door Assembly (see Figure 4-5)
171078-002	Non-Resettable Coin Counter

Cabinet-Mounted Assemblies
Parts List, Continued

Part No.	Description
171086-001	18-Inch Fluorescent Lamp Fixture
176013-212	#8-32 Square Drive Screw
177010-240	#10-24 Polymer Locknut
178056-002	1/2-Inch Foam Tape
178126-002	Tamper-Proof Hex Driver Key
178201-03	Chrome T-Molding
75-030S	#10 Flat Wide Washer
75-045S	#1/4 Split-Lock Washer
75-07002	#1/4 Flat Wide Washer
75-915S	#1/4-20 Hex Nut
78-3201	Adjustable Glide
78-6900401	1/4-Inch Black Foam Tape
99-11006	Fluorescent Lamp Retaining Clip
	These are the technical information supplements to the game:
SP-326	Cyberball Schematic Package
ST-326	Cyberball Self-Test Label
TM-296	19-Inch Color Standard-Resolution Prismatic Video Display Service Manual
TM-326	Cyberball Operator's Manual

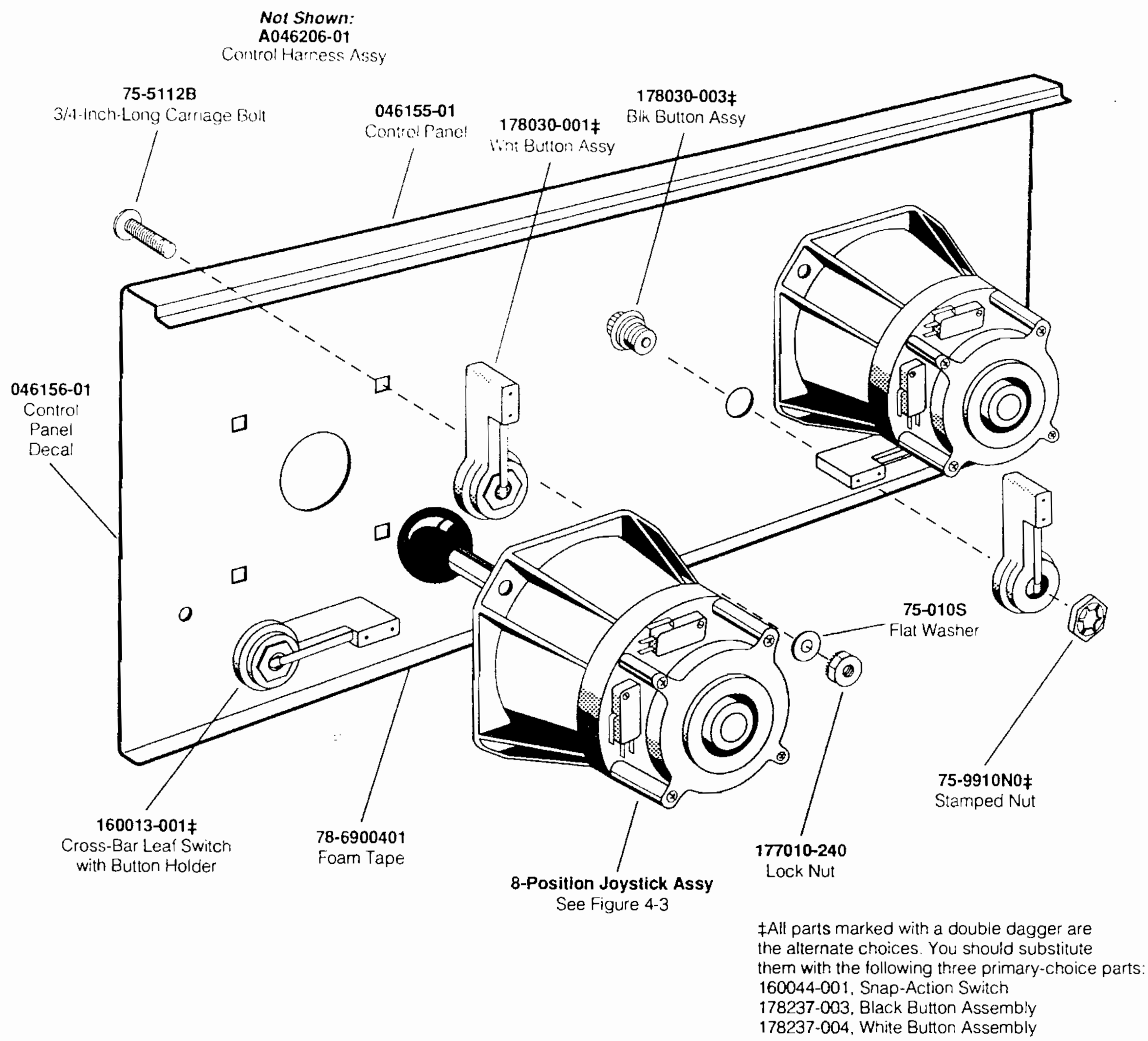


Figure 4-2 Control Panel Assembly
A046154-01 A

Control Panel Assembly Parts List

Part No.	Description
A040933-03	Joystick Assembly (see Figure 4-3)
A046206-01	Control Harness Assembly
046155-01	Control Panel
046156-01	Control Panel Decal
160044-001	Snap-Action Switch (Acceptable substitutes are part no. 160013-001, leaf switch with button holder, with part no. 75-9910N0, stamped nut.)
177010-240	#10-24 Polymer Locknut
178237-003	Black Button Assembly (Acceptable substitute is part. no. 178030-003.)
178237-004	White Button Assembly (Acceptable substitute is part no. 178030-001.)
75-010S	#10 Flat Washer
75-5112B	#10-24 Black Carriage Bolt
78-6900401	1/4-Inch Black Foam Tape

N O T E S

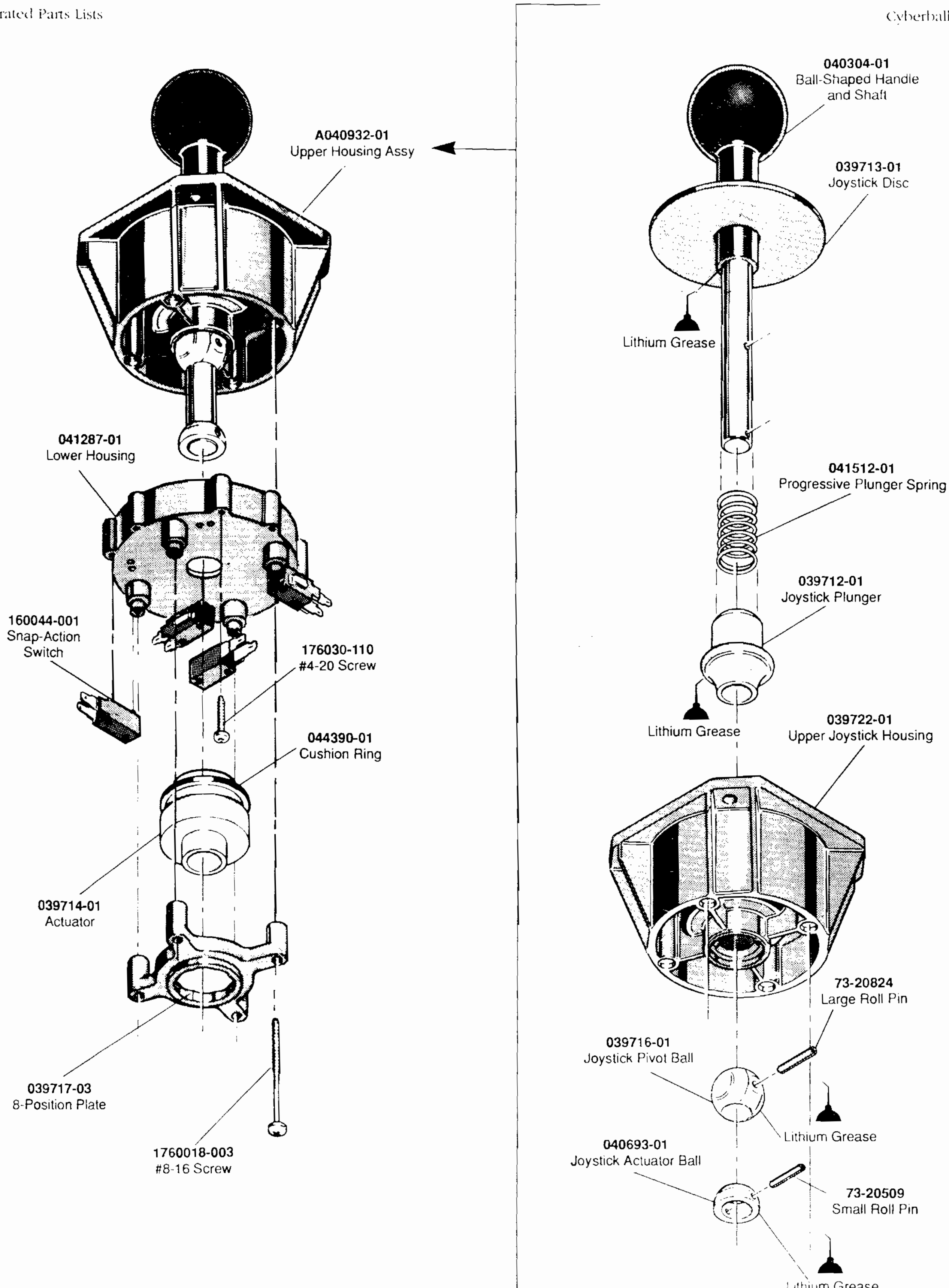


Figure 4-3 Joystick Assembly
A040933-03 E

Joystick Assembly
Parts List

Part No.	Description
A040932-01	Upper Housing Assembly
039712-01	Plunger
039713-01	Disc
039714-01	Actuator
039716-01	Pivot Ball
039717-03	8-Position Plate
039722-01	Upper Housing
040304-01	Ball-Shaped Handle and Shaft
040693-01	Actuator Ball
041287-01	Lower Housing
043696-01	Pregressive Plunger Spring
044390-01	Cushion Ring
107027-001	Lithium Grease
160044-001	Snap Action Switch
1760018-003	=8-16 Phillips Head Screw
176030-110	=4-20 Hex Washer Head Screw
73-20509	Small Roll Pin
73-20824	Large Roll Pin

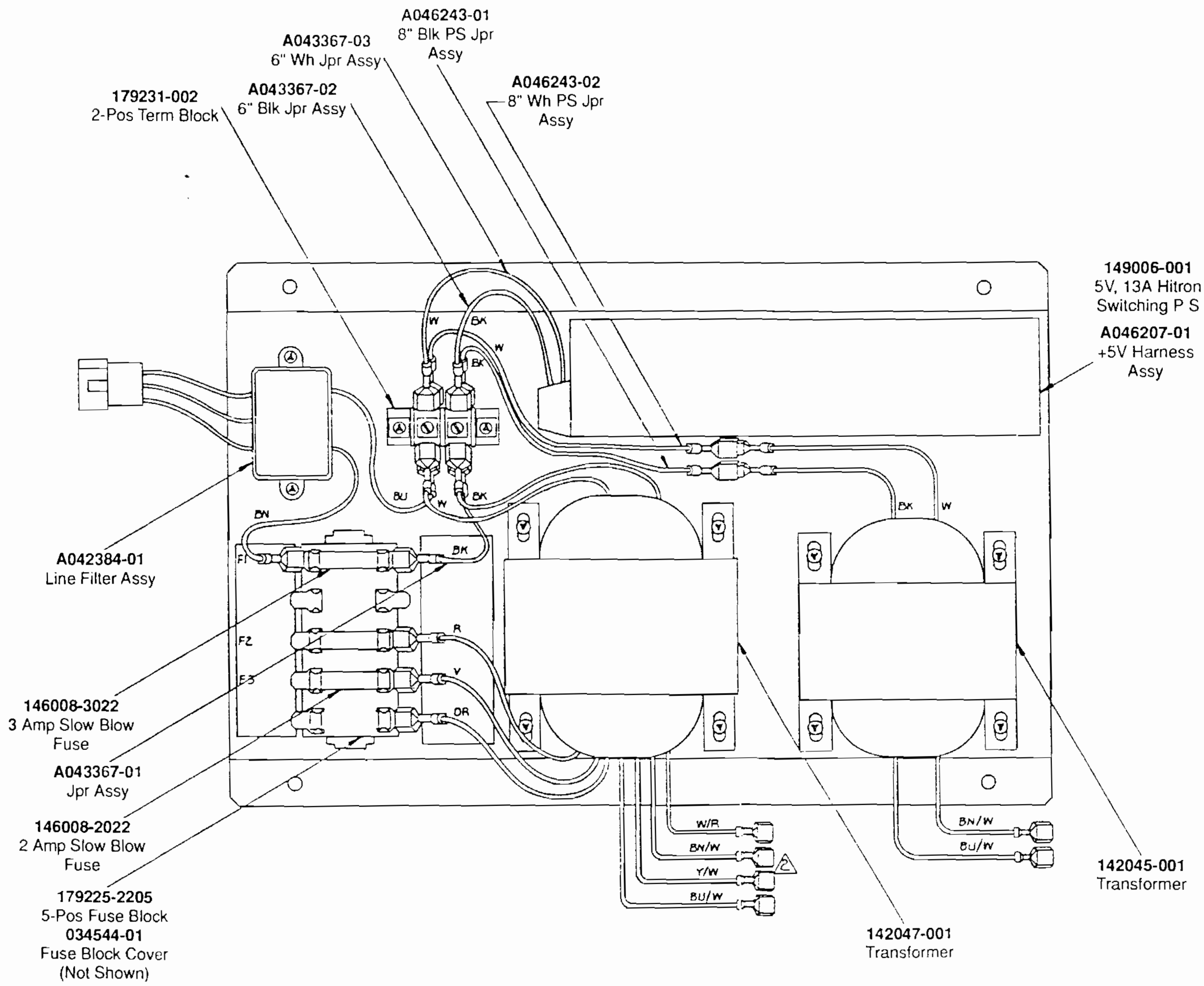


Figure 4-4 Power Supply Assembly
A046211-01 A

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
A046207-01	+5V Harness Assembly
A046243-01	8-Inch Black Power Supply Jumper Assembly
A046243-02	8-Inch White Power Supply Jumper Assembly
034544-01	Fuse Block Cover
142045-001	Transformer
142047-001	Transformer
149006-001	5V, 13A Hitron Switching Power Supply
179225-2205	5-Position Fuse Block
179231-002	2-Position Terminal Block
146008-2022	2 Amp, 250V Slow Blow Fuse
146008-3022	3 Amp, 250V Slow Blow Fuse

Hitron 5 Volt, 13 Amp Power Supply Sub-Assembly
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	99-211057
C12	Capacitor, Metal Film, 0.022 µF, 100 V	99-211039
C13	Capacitor, Metal Film, 0.22 µF, 100 V	99-211057
C14	Capacitor, Ceramic, 1800 PF, 2 kV, Z5V	99-2110[illegible]
C17, C18	Capacitor, Electrolytic, 2200 µF, 16 V	99-211069
C19	Capacitor, Ceramic, 470 PF, 1 kV, Z5P	99-211043
C20	Capacitor, Electrolytic, 2200 µF, 16 V	99-211069
C21	Capacitor, Ceramic, 220 µF, 25 V	99-21107[illegible]
	Diodes	
[illegible], D2	Diode, Fast Recovery, RPG16B	99-2110[illegible]
D8	Diode, Fast Recovery, RPG15B	99-[illegible]
D[illegible]	Diode, Fast Recovery, RPG16P	99-2[illegible]
[illegible], D[illegible]	Diode, Switching, 1N4148	99-[illegible]
[illegible], D[illegible]	Diode, Schottky, [illegible]	99-[illegible]

Hitron 5V, 13A Power Supply Assembly Parts List, Continued

Designator	Description	Part No.
D11, D12	Diode, Schottky, S10SC4M	99-211005
D13-D16	Diode, Rectifier, 1N4006	99-211008
ZD1	Diode, Zener, 1N752A	99-211007
	Inductors	
L1	Inductor, 15 mH	99-211052
L2	Inductor, 9.8 μH	99-211071
L6, L7	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 kOhm, ±5%, 1 W	99-211034
R3	Resistor, Wirewound, 120 Ohm, ±5%, 2 W	99-211019
R4	Resistor, Wirewound, 0.47 Ohm, ±5%, 2 W	99-211018
R5	Resistor, Wirewound, 27 Ohm, ±5%, 2 W	99-211065
R6, R7	Resistor, Carbon Film, 5.6 Ohm, ±5%, 1/4 W	99-211027
R8	Resistor, Wirewound, 0.47 Ohm, ±5%, 2 W	99-211018
R9	Resistor, Carbon Film, 10 Ohm, ±5%, 1/4 W	99-211029
R10	Resistor, Carbon Film, 1 kOhm, ±5%, 1/4 W	99-211032
R11	Resistor, Carbon Film, 47 Ohm, ±5%, 1/4 W	99-211025
R12	Resistor, Carbon Film, 5.6 Ohm, ±5%, 1/4 W	99-211027
R13	Resistor, Carbon Film, 330 Ohm, ±5%, 1/4 W	99-211026
R14	Resistor, Carbon Film, 270 Ohm, ±5%, 1/2 W	99-211023
R15	Resistor, Carbon Film, 330 Ohm, ±5%, 1/2 W	99-211022
R16	Resistor, Carbon Film, 8.2 Ohm, ±5%, 1/4 W	99-211028
R17, R18	Resistor, Carbon Film, 56 Ohm, ±5%, 1/4 W	99-211031
R19	Resistor, Carbon Film, 39 Ohm, ±5%, 1/4 W	99-211030
R20	Resistor, Carbon Film, 2 kOhm, ±5%, 1/4 W	99-211035
R21	Resistor, Carbon Film, 470 Ohm, ±5%, 1/4 W	99-211024
R22	Resistor, 2.2 kOhm, ±2%, 1/4 W	99-211021
R23	Resistor, Metal Film, 2 kOhm, ±2%, 1/4 W	99-211033
R25	Resistor, Carbon Film, 10 Ohm, ±5%, 1/4 W	99-211029
R26	Resistor, Carbon Film, 6.8 Ohm, ±5%, 1/2 W	99-211066
R27	Resistor, Carbon Film, 12 Ohm, ±5%, 1/4 W	99-211067
R28	Resistor, Carbon Film, 2.4 Ohm, ±5%, 1/2 W	99-211068
R31	Resistor, Wirewound, 150 Ohm, ±5%, 2 W	99-211016
	Transistors	
Q1	Transistor, NPN, 2SD725	99-211062
Q2	Transistor, NPN, PE8050B	99-211003
Q3	Transistor, PNP, PE8550B	99-211063
	Miscellaneous	
F1	Fuse, 2 A, 125 V, Semko	99-211058
IC1	Regulator, UA431AWC	99-211001
SCR1	Thyristor, SCR	99-211013
T1	Transformer	99-211055

Hitron 5V, 13A Power Supply Assembly Parts List, Continued

Designator	Description	Part No.
T2	Transformer	99-211055
TR1	Thermistor, 0.5 Ohm, ±5%, 5 W	99-211020
VR1	Potentiometer, Trimming, 3 kOhm	99-211014
	Fuse, 2 A, 250 V	99-211056
	Fuse Holder	99-211060
	Terminal Block, 8 Ckt.	99-211057
	Heat Sink	99-211059
	Heat Sink, 1.5 mm	99-211061

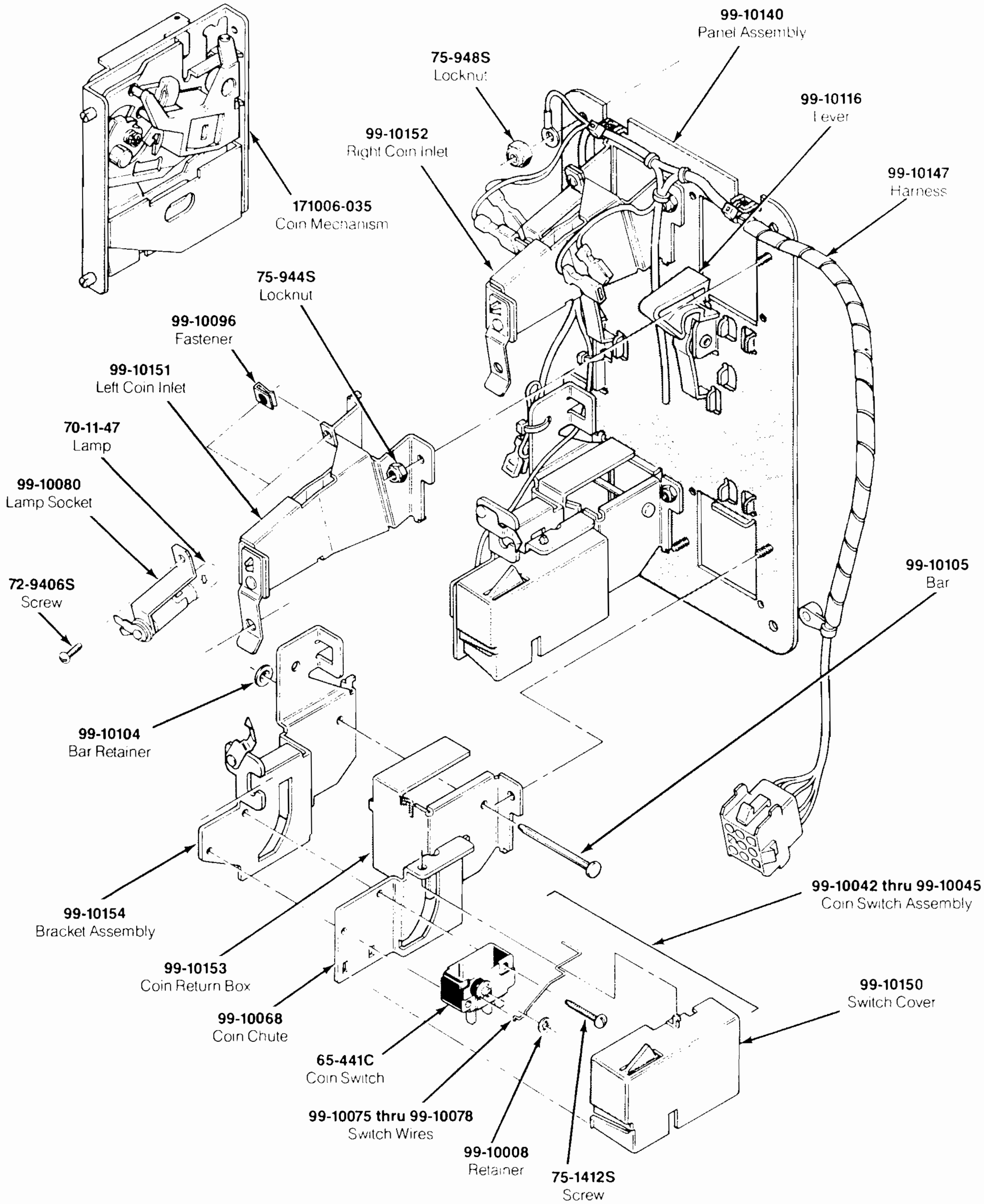
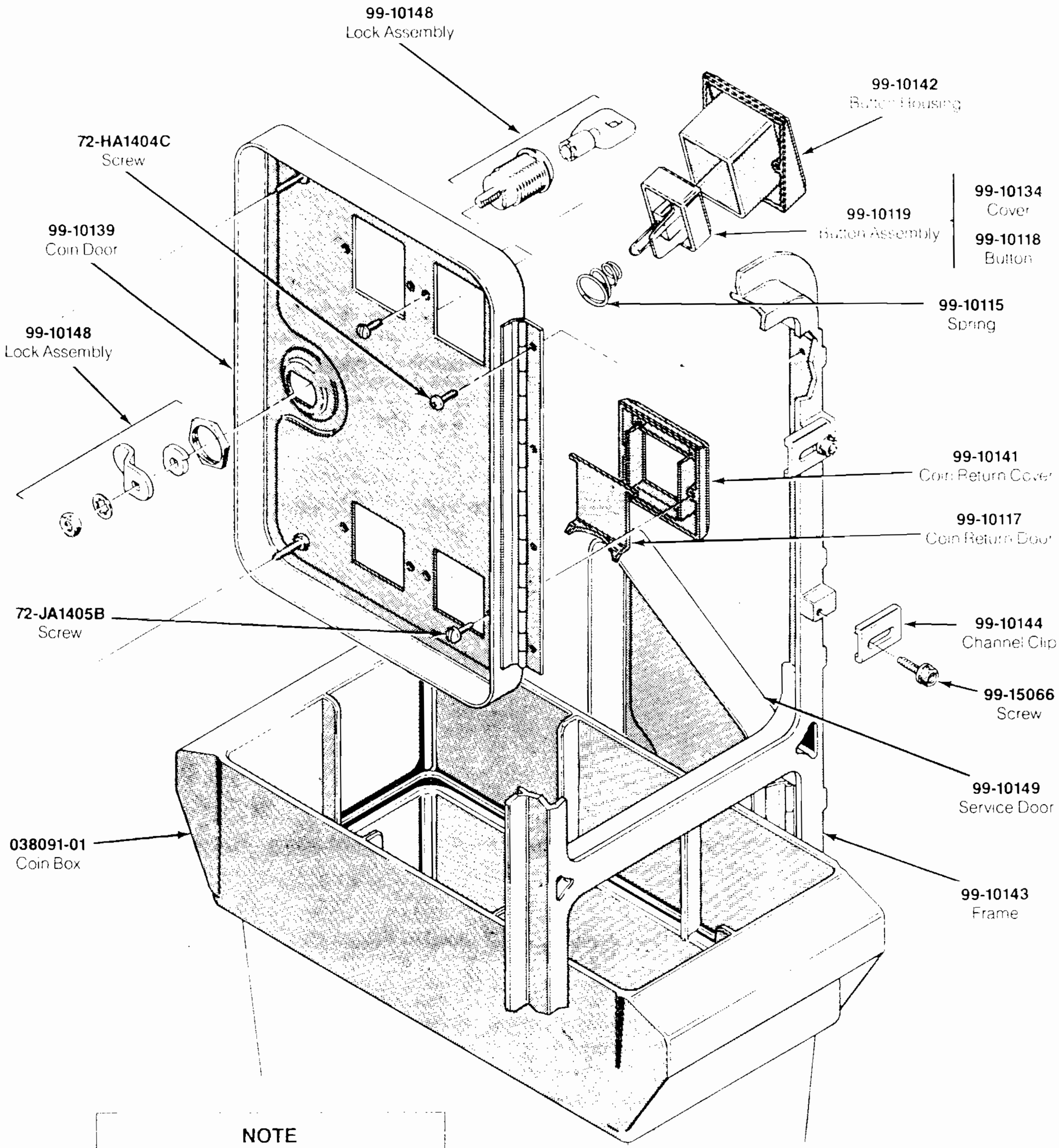


**Figure 4-5 Coin Acceptors, Inc. Coin Door Assembly
171027-001 A**



NOTE

The acceptable substitute for this door (and the one used in games manufactured in Ireland) is the Coin Controls, Inc. Coin Door Assembly, part number 171034-001.

Figure 4-5 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 x 3/8-Inch Truss-Head Screw
72-HA1404C	#4-40 x 1/4-Inch Pan-Head Screw
72-JA1405B	#4-40 x .31-Inch Pan-Head Screw
75-1412S	#4-40 x 3/4-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-Inch Wide Die-Cast Coin Inlet Housing
99-10161	25¢ Amber Side-Entry Coin Button Assembly
99-15066	Screw for Clamp
171006-035	Metal Coin Mechanism for U.S. 25¢

N O T E S

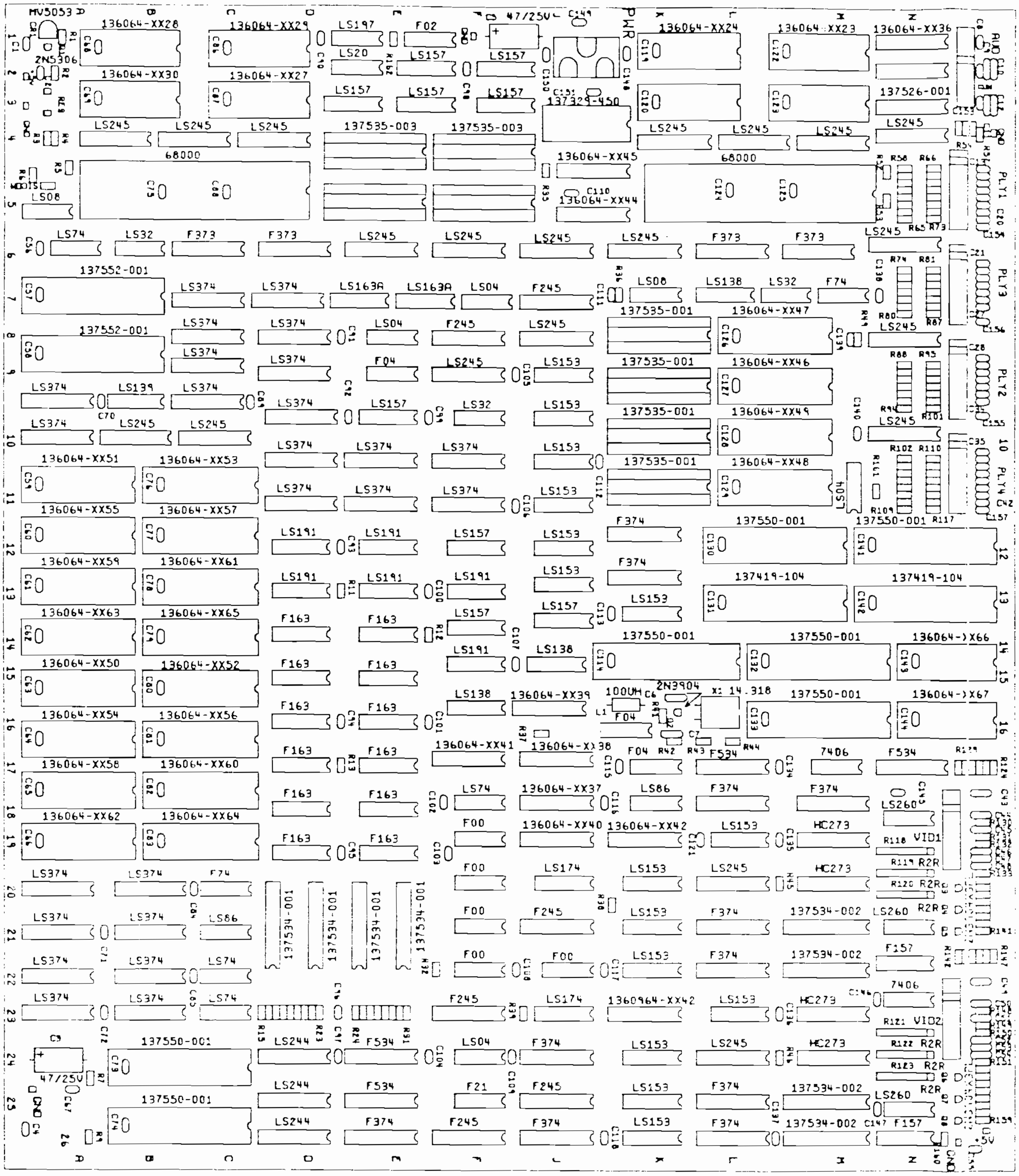


Figure 4-6 Cyberball Game PCB Assembly
A044283-21 C

Cyberball Game PCB Assembly
Parts List

Designator	Description	Part No.
	Integrated Circuits	
1B	Integrated Circuit, EPROM, 27512-300	136064-2128
1C/D	Integrated Circuit, EPROM, 27512-300	136064-2129
1D/F	Integrated Circuit, 74LS197	137240-001
1E/F	Integrated Circuit, 74F02	137481-001
1K/L	Integrated Circuit, EPROM, 27512-300	136064-2124
1M	Integrated Circuit, EPROM, 27512-300	136064-2123
1N	Integrated Circuit, PAL, 16L8 A	136064-1136
2D/F	Integrated Circuit, 74LS20	137060-001
2E/F, 2F	Integrated Circuit, 74LS157	137029-001
3B	Integrated Circuit, EPROM, 27512-300	136064-2130
3C/D	Integrated Circuit, EPROM, 27512-300	136064-2127
3D/E, 3E/F, 3F	Integrated Circuit, 74LS157	137029-001
3/4J	Integrated Circuit, 2804 A-45, 450 nsec	137329-450
3N	Integrated Circuit, SCOM	137526-001
4/5J	Integrated Circuit, PAL, 16R6 A	136064-1145
4B, 4C, 4C/D	Integrated Circuit, 74LS245	137134-001
4E, 4F	Integrated Circuit, RAM, 8K x 8, 70 nsec (Acceptable substitute is part no. 137588-005 with socket part no. 179259-028.)	137535-003
4K/L, 4L/M, 4M, 4N	Integrated Circuit, 74LS245	137134-001
5/6J	Integrated Circuit, PAL, 16R6 A	136064-1146
5A	Integrated Circuit, 74LS08	137012-001
5C	Integrated Circuit, 68000, 8MHZ, PLAS	137289-003
5E, 5F	Integrated Circuit, RAM, 8K x 8, 70 nsec (Acceptable substitute is part no. 137588-005 with socket part no. 179259-028.)	137535-003
5L	Integrated Circuit, 68000, 8MHZ, PLAS	137289-003
6A	Integrated Circuit, 74LS74	137023-001
6B	Integrated Circuit, 74LS32	137019-001
6C, 6D	Integrated Circuit, 74F373	137575-001
6E, 6F, 6J, 6K	Integrated Circuit, 74LS245	137134-001
6L, 6M	Integrated Circuit, 74F373	137575-001
6N	Integrated Circuit, 74LS245	137134-001
7A	Integrated Circuit, VMATCH	137552-001
7C, 7D	Integrated Circuit, 74LS374	137144-001
7D/E, 7E/F	Integrated Circuit, 74LS163 A	137114-001
7F	Integrated Circuit, 74LS04	137009-001
7J	Integrated Circuit, 74F245	137591-001
7K	Integrated Circuit, 74LS08	137012-001
7L	Integrated Circuit, 74LS138	137177-001
7L/M	Integrated Circuit, 74LS32	137019-001
7M	Integrated Circuit, 74F74	137436-001
8C, 8D	Integrated Circuit, 74LS374	137144-001
8E	Integrated Circuit, 74LS04	137009-001
8F	Integrated Circuit, 74F245	137591-001
8J	Integrated Circuit, 74LS245	137134-001
8K	Integrated Circuit, RAM, 8K x 8, 45 nsec (Acceptable substitute is part no. 137589-003 with socket part no. 179259-028.)	137535-001
8L/M	Integrated Circuit, OTP, 27512-250	136064-1147

Cyberball Game PCB Assembly
Parts List, Continued

Designator	Description	Part No.
8N	Integrated Circuit, 74LS245	137134-001
9/10A	Integrated Circuit, 74LS374	137144-001
9/10B	Integrated Circuit, 74LS139	137097-001
9/10C, 9/10D	Integrated Circuit, 74LS374	137144-001
9/10E	Integrated Circuit, 74LS157	137029-001
9/10F	Integrated Circuit, 74LS32	137019-001
9/10J	Integrated Circuit, 74LS153	137104-001
9A	Integrated Circuit, VMATCH	137552-001
9C, 9D	Integrated Circuit, 74LS374	137144-001
9E	Integrated Circuit, 74F04	137437-001
9F	Integrated Circuit, 74LS245	137134-001
9J	Integrated Circuit, 74LS153	137104-001
9K	Integrated Circuit, RAM, 8K x 8, 45 nsec (Acceptable substitute is part no. 137589-003 with socket part no. 179259-028.)	137535-001
9L/M	Integrated Circuit, OTP, 27512-250	136064-1146
10/11D, 10/11E, 10/11F	Integrated Circuit, 74LS374	137144-001
10/11J	Integrated Circuit, 74LS153	137104-001
10A	Integrated Circuit, 74LS374	137144-001
10B, 10C	Integrated Circuit, 74LS245	137134-001
10K	Integrated Circuit, RAM, 8K x 8, 45 nsec (Acceptable substitute is part no. 137589-003 with socket part no. 179259-028.)	137535-001
10L/M	Integrated Circuit, OTP, 27512-250	136064-1149
10N	Integrated Circuit, 74LS245	137134-001
11A	Integrated Circuit, OTP, 27512-250	136064-1151
11C	Integrated Circuit, OTP, 27512-250	136064-1153
11D, 11E, 11F	Integrated Circuit, 74LS374	137144-001
11J	Integrated Circuit, 74LS153	137104-001
11K	Integrated Circuit, RAM, 8K x 8, 45 nsec (Acceptable substitute is part no. 137589-003 with socket part no. 179259-028.)	137535-001
11L/M	Integrated Circuit, OTP, 27512-250	136064-1148
11M	Integrated Circuit, 74LS04	137009-001
12A	Integrated Circuit, OTP, 27512-250	136064-1155
12C	Integrated Circuit, OTP, 27512-250	136064-1157
12D, 12E	Integrated Circuit, 74LS191	137036-001
12F	Integrated Circuit, 74LS157	137029-001
12J	Integrated Circuit, 74LS153	137104-001
12K	Integrated Circuit, 74F374	137420-001
12L/M, 12N	Integrated Circuit, SOS	137550-001
13A	Integrated Circuit, OTP, 27512-250	136064-1159
13C	Integrated Circuit, OTP, 27512-250	136064-1161
13D, 13E, 13F	Integrated Circuit, 74LS191	137036-001
13J	Integrated Circuit, 74LS153	137104-001
13K	Integrated Circuit, 74F374	137420-001
13L/M, 13N	Integrated Circuit, PFHS	137419-104
14A	Integrated Circuit, OTP, 27512-250	136064-1163
14C	Integrated Circuit, OTP, 27512-250	136064-1165
14D, 14E	Integrated Circuit, 74F163	137345-001

Cyberball Game PCB Assembly
Parts List

Designator	Description	Part No.
14E, 14J	Integrated Circuit, 74LS157	137029-001
14K	Integrated Circuit, 74LS153	137104-001
15/16A	Integrated Circuit, OTP, 27512-250	136064-1150
15/16C	Integrated Circuit, OTP, 27512-250	136064-1152
15D, 15E	Integrated Circuit, 74F163	137345-001
15F	Integrated Circuit, 74LS191	137036-001
15J	Integrated Circuit, 74LS138	137177-001
15K, 15M	Integrated Circuit, SOS	137550-001
15N	Integrated Circuit, OTP, 27512-250	136064-1166
16/17A	Integrated Circuit, OTP, 27512-250	136064-1154
16/17C	Integrated Circuit, OTP, 27512-250	136064-1156
16D, 16E	Integrated Circuit, 74F163	137345-001
16F	Integrated Circuit, 74LS138	137177-001
16J	Integrated Circuit, PAL, 16L8 A	136064-1139
16K	Integrated Circuit, 74F04	137437-001
16M	Integrated Circuit, SOS	137550-001
16N	Integrated Circuit, OTP, 27512-250	136064-1167
17D, 17E	Integrated Circuit, 74F163	137345-001
17F	Integrated Circuit, PAL, 16L8 A	136064-1141
17J	Integrated Circuit, PAL, 16R8 A	136064-1138
17K	Integrated Circuit, 74F04	137437-001
17L	Integrated Circuit, 74F534	137590-001
17M	Integrated Circuit, 7406	137052-001
17N	Integrated Circuit, 74F534	137590-001
18A	Integrated Circuit, OTP, 27512-250	136064-1158
18C	Integrated Circuit, OTP, 27512-250	136064-1160
18D, 18E	Integrated Circuit, 74F163	137345-001
18F	Integrated Circuit, 74LS74	137023-001
18J	Integrated Circuit, PAL, 16R8 A	136064-1137
18K	Integrated Circuit, 74LS86	137079-001
18L, 18M	Integrated Circuit, 74F374	137420-001
18N	Integrated Circuit, 74LS260	137332-001
19A	Integrated Circuit, OTP, 27512-250	136064-1162
19C	Integrated Circuit, OTP, 27512-250	136064-1164
19D, 19E	Integrated Circuit, 74F163	137345-001
19F	Integrated Circuit, 74F00	137327-001
19J	Integrated Circuit, PAL, 16R8 A	136064-1140
19K	Integrated Circuit, PAL, 16L8 A	136064-1142
19L	Integrated Circuit, 74LS153	137104-001
19M	Integrated Circuit, 74HC273	137556-001
20A, 20B	Integrated Circuit, 74LS374	137144-001
20C	Integrated Circuit, 74F74	137436-001
20F	Integrated Circuit, 74F00	137327-001
20J	Integrated Circuit, 74LS174	137122-001
20K	Integrated Circuit, 74LS153	137104-001
20L	Integrated Circuit, 74LS245	137154-001
20M	Integrated Circuit, 74HC273	137556-001

Cyberball Game PCB Assembly Parts List, Continued

Designator	Description	Part No.
21A, 21B	Integrated Circuit, 74LS374	137144-001
21C	Integrated Circuit, 74LS86	137079-001
21D, 21D/E, 21E, 21E/F	Integrated Circuit, RAM, 2KX8, 35 nsec	137534-001
21F	Integrated Circuit, 74F00	137327-001
21J	Integrated Circuit, 74F245	137591-001
21K	Integrated Circuit, 74LS153	137104-001
21L	Integrated Circuit, 74F374	137420-001
21M	Integrated Circuit, RAM, 2KX8, 35 nsec	137534-001
21N	Integrated Circuit, 74LS260	137332-001
22A, 22B	Integrated Circuit, 74LS374	137144-001
22C	Integrated Circuit, 74LS74	137023-001
22F, 22J	Integrated Circuit, 74F00	137327-001
22K	Integrated Circuit, 74LS153	137104-001
22L	Integrated Circuit, 74F374	137420-001
22M	Integrated Circuit, RAM, 2KX8, 35 nsec	137534-001
22N	Integrated Circuit, 74F157	137494-001
23A, 23B	Integrated Circuit, 74LS374	137144-001
23C	Integrated Circuit, 74LS74	137023-001
23F	Integrated Circuit, 74F245	137591-001
23J	Integrated Circuit, 74LS174	137122-001
23K	Integrated Circuit, PAL, 16L8 A	136064-1143
23L	Integrated Circuit, 74LS153	137104-001
23M	Integrated Circuit, 74HC273	137556-001
23N	Integrated Circuit, 7406	137052-001
24B/C	Integrated Circuit, SOS	137550-001
24D	Integrated Circuit, 74LS244	137038-001
24E	Integrated Circuit, 74F534	137590-001
24F	Integrated Circuit, 74LS04	137009-001
24J	Integrated Circuit, 74F374	137420-001
24K	Integrated Circuit, 74LS153	137104-001
24L	Integrated Circuit, 74LS245	13713[illegible]-001
24M	Integrated Circuit, 74HC273	137556-001
25D	Integrated Circuit, 74LS244	137038-001
25E	Integrated Circuit, 74F534	137590-001
25F	Integrated Circuit, 74F21	137555-001
25J	Integrated Circuit, 74F245	137591-001
25K	Integrated Circuit, 74LS153	137104-001
25L	Integrated Circuit, 74F374	137420-001
25M	Integrated Circuit, RAM, 2KX8, 35 nsec	137534-001
25N	Integrated Circuit, 74LS260	137332-001
26B/C	Integrated Circuit, SOS	137550-001
26D	Integrated Circuit, 74LS244	137038-001
26E	Integrated Circuit, 74F374	137420-001
26F	Integrated Circuit, 74F245	137591-001
26J	Integrated Circuit, 74F374	137420-001
26K	Integrated Circuit, 74LS153	137104-001
26L	Integrated Circuit, 74F374	137420-001

Cyberball Game PCB Assembly
Parts List, Continued

Designator	Description	Part No.
26M	Integrated Circuit, RAM, 2KX8, 35 nsec	137554-001
26N	Integrated Circuit, 74F157	137494-001
	Capacitors	
C1, C2	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C3	Capacitor, 47 µF, 25 V, Electrolytic	124009-476
C4	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C5	Capacitor, 47 µF, 25 V, Electrolytic	124009-476
C6, C7	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C8	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C9-C12	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C13-C42	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C43-C54	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C55, C56	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C59-C72	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C75-C113	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C115-C129	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C131	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C134-C140	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C142-C157	Capacitor, .1 µF, 50 V, Ceramic	122002-104
	Inductor	
L1	Inductor, 100 µH	141024-001
	Diode	
CR1	Diode, MV5053, Light-Emitting	131027-002
	Resistors	
R1	Resistor, 220 Ohm,±5%, 1/8 W	110027-221
R2	Resistor, 100 K Ohm, ±5%, 1/8 W	110027-104
R3-R6	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R7, R9	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R11, R12	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R13	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R15	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R16-R31	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R32, R35	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R36-R38	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R39, R41, R42	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R43, R44	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R45, R46, R49, R52, R53	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R54-R57	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R58-R65	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R66-R73	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R74-R80	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R81-R87	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R88-R94	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R95-R101	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R102-R109	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R110-R117	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471

Cyberball Game PCB Assembly
Parts List

Designator	Description	Part No.
R118-R123	Resistor, R2R	118016-001
R124	Resistor, 2.2 K Ohm, ±5%, 1/8 W	110027-222
R125	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R126	Resistor, 2.2 K Ohm, ±5%, 1/8 W	110027-222
R127	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R128	Resistor, 2.2 K Ohm, ±5%, 1/8 W	110027-222
R129	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R130-R132	Resistor, 220 Ohm,±5%, 1/8 W	110027-221
R133, R134	Resistor, 10 Ohm, ±5%, 1/8 W	110027-100
R135	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R136, R137	Resistor, 10 Ohm, ±5%, 1/8 W	110027-100
R138	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R139, R140	Resistor, 10 Ohm, ±5%, 1/8 W	110027-100
R141	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R142	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R143	Resistor, 2.2 K Ohm, ±5%, 1/8 W	110027-222
R144	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R145	Resistor, 2.2 K Ohm, ±5%, 1/8 W	110027-222
R146	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R147	Resistor, 2.2 K Ohm, ±5%, 1/8 W	110027-222
R148-R150	Resistor, 220 Ohm,±5%, 1/8 W	110027-221
R151, R152	Resistor, 10 Ohm, ±5%, 1/8 W	110027-100
R153	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R154, R155	Resistor, 10 Ohm, ±5%, 1/8 W	110027-100
R156	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R157, R158	Resistor, 10 Ohm, ±5%, 1/8 W	110027-100
R159	Resistor, 100 Ohm, ±5%, 1/8 W	110027-101
R160-R162	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
	Transistors	
Q1	Transistor, 2N5306	133033-001
Q2-Q8	Transistor, 2N3904	133041-001
	Sockets	
	Socket, 14 Pin, .300 Inch	179257-014
	Socket, 24 Pin, .300 Inch	179259-024
	Socket, 24 Pin, .600 Inch	179257-024
	Socket, 28 Pin, .600 Inch	179257-028
	Socket, 40 Pin, .600 Inch	179257-040
	Socket, 64 Pin, .900 Inch	179256-064
	Connectors	
AUD	Connector, 11 Ckt, Header, .100	179118-011
VID1, VID2	Connector, 11 Ckt, Header, .100	179118-011
WDDIS	Connector, 2 Ckt, Header, .100 Ctr	179048-002
CTR	Connector, 11 Ckt, Header, .100	179118-011
PLY1-CTR4	Connector, 11 Ckt, Header, .100	179118-011
PWR	Connector, 6 Ckt, Header, .250 Ctr	179069-006
WDDIS	Connector, 2 Ckt, Hdr, .100 Ctr	179048-002
	Miscellaneous	
	Test Point	179051-001

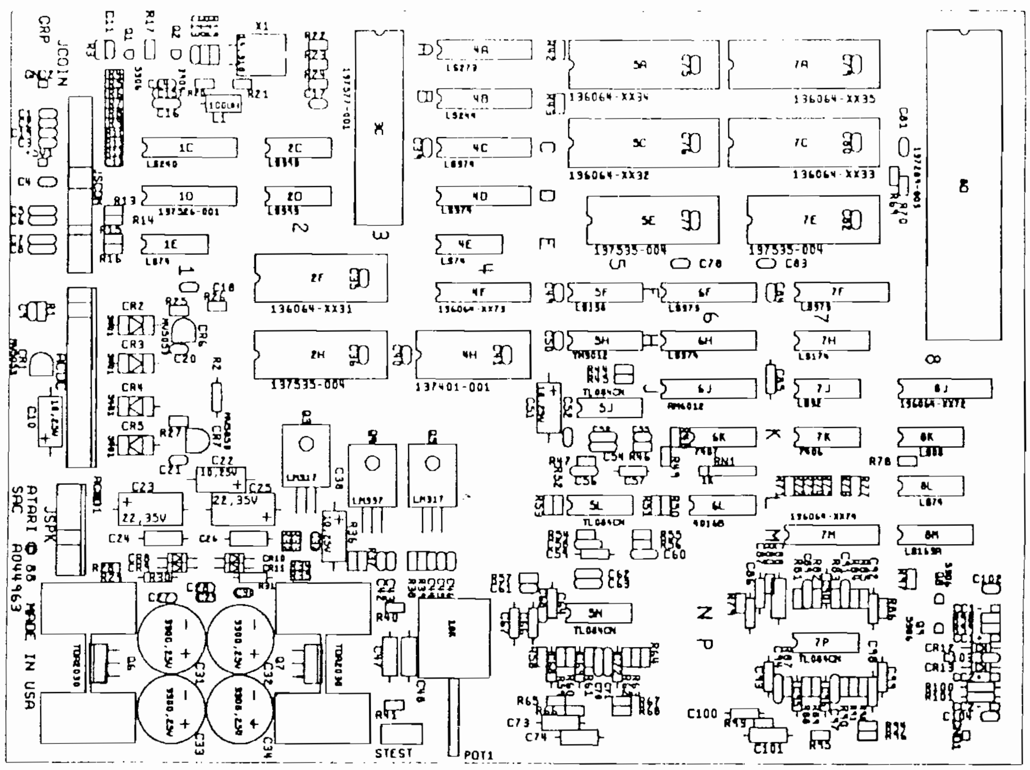


Figure 4-7 SAC (Sampled Audio Cruncher) PCB Assembly
A044963-21 A

SAC PCB Assembly
Parts List

Designator	Description	Part No.
	Integrated Circuits	
1C	Integrated Circuit, 74LS240	137251-001
1D	Integrated Circuit, SCOM	137526-001
1E	Integrated Circuit, 74LS74	137023-001
2C, 2D	Integrated Circuit, 74LS393	137146-001
2F	Integrated Circuit, EPROM, 27512-300 ns	136064-1131
2H	Integrated Circuit, RAM, 8K x 8, 100 ns	137535-004
3C	Integrated Circuit, 6502 A	137577-001
4A	Integrated Circuit, 74LS273	137040-001

SAC PCB Assembly
Parts List

Designator	Description	Part No.
4B	Integrated Circuit, 74LS244	137038-001
4C, 4D	Integrated Circuit, 74LS374	137144-001
4E	Integrated Circuit, 74LS74	137023-001
4F	Integrated Circuit, PAL16L8	136064-1173
4H	Integrated Circuit, YM2151	137401-001
5A	Integrated Circuit, EPROM, 27512-200 ns (Acceptable substitute is OTP, 27512-200ns, part no.136064-1170.)	136064-1134
5C	Integrated Circuit, EPROM, 27512-200 ns (Acceptable substitute is OTP, 27512-200ns, part no. 136064-1168.)	136064-1132
5E	Integrated Circuit, RAM, 8K x 8, 100 ns	137535-004
5F	Integrated Circuit, 74LS138	137177-001
5H	Integrated Circuit, YM3012	137402-001
5J, 5L, 5N	Integrated Circuit, TL084CN	137579-001
6F	Integrated Circuit, 74LS373	137143-001
6H	Integrated Circuit, 74LS374	137144-001
6J	Integrated Circuit, AM6012	137158-002
6K	Integrated Circuit, 7407	137011-001
6L	Integrated Circuit, 4016B	137592-001
7A	Integrated Circuit, EPROM, 27512-200 ns (Acceptable substitute is OTP, 27512-200ns, part no. 136064-1171.)	136064-1135
7C	Integrated Circuit, EPROM, 27512-200 ns (Acceptable substitute is OTP, 27512-200ns, part no. 136064-1169.)	136064-1133
7E	Integrated Circuit, RAM, 8K x 8, 100 ns	137535-004
7F	Integrated Circuit, 74LS373	137143-001
7H	Integrated Circuit, 74LS174	137122-001
7J	Integrated Circuit, 74LS32	137019-001
7K	Integrated Circuit, 7406	137052-001
7M	Integrated Circuit, PAL16R4	136064-1174
7P	Integrated Circuit, TL084CN	137579-001
8D	Integrated Circuit, 68000, 8MHz, PLAS	137289-003
8J	Integrated Circuit, PAL16L8	136064-1172
8K	Integrated Circuit, 74LS08	137012-001
8L	Integrated Circuit, 74LS74	137023-001
8M	Integrated Circuit, 74LS163 A	137114-001
	Capacitors	
C1-C4	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C5-C8	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C9	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C10	Capacitor, 10 µF, 25 V, Electrolytic	124009-106
C11-C14	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C15	Capacitor, 39 pF, 100 V, Ceramic	122016-390
C16	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C17-C21	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C22	Capacitor, 10 µF, 25 V, Electrolytic	124009-106
C23	Capacitor, 22 µF, 35 V, Electrolytic	124000-226

SAC PCB Assembly
Parts List, Continued

Designator	Description	Part No.
C24	Capacitor, .22 µF, ±10%, 50 V, Ceramic	122015-224
C25	Capacitor, 22 µF, 35 V, Electrolytic	124000-226
C26	Capacitor, .22 µF, ±10%, 50 V, Ceramic	122015-224
C27-C30	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C31-C34	Capacitor, 3300 µF, 25 V, Electrolytic, Radial	123003-338
C35-C37	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C38	Capacitor, 10 µF, 25 V, Electrolytic	124009-106
C39-C46	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C47, C48	Capacitor, .22 µF, ±10%, 50 V, Ceramic	122015-224
C49, C50	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C51	Capacitor, 10 µF, 25 V, Electrolytic	124009-106
C52	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C53, C54	Capacitor, .001 µF, 50 V, Ceramic	122002-102
C55	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C56	Capacitor, 470 pF, 50 V, Ceramic	122015-471
C57	Capacitor, 1200 pF, 100 V, Ceramic	122016-122
C58	Capacitor, 470 pF, 50 V, Ceramic	122015-471
C59	Capacitor, 1200 pF, 100 V, Ceramic	122016-122
C60	Capacitor, 10 pF, 100 V, Ceramic	122016-100
C61	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C62, C63	Capacitor, .001 µF, 50 V, Ceramic	122002-102
C64, C64A	Capacitor, .01 µF, ±5%, 100 V, Poly, Radial	126009-103
C65	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C66, C66A	Capacitor, .01 µF, ±5%, 100 V, Poly, Radial	126009-103
C67, C68	Capacitor, 2000 pF, ±5%, 500 V, Mica	128004-202
C69	Capacitor, 1000 pF, 100 V, Ceramic	122016-102
C70, C71	Capacitor, .001 µF, 50 V, Ceramic	122002-102
C72	Capacitor, 1000 pF, 100 V, Ceramic	122016-102
C73, C74	Capacitor, 4700 pF, 50 V, Ceramic	122019-472
C75-C84	Capacitor, .1 µF, 50 V, Ceramic	122002-104
C85	Capacitor, 47 pF, 100 V, Ceramic	122016-470
C86	Capacitor, .015 µF, ±5%, 100 V, Poly, Radial	126009-153
C87	Capacitor, 1100 pF, ±5%, 100 V, Mica	128002-112
C88	Capacitor, 560 pF, 100 V, Ceramic	122016-561
C89	Capacitor, .01 µF, 50 V, Ceramic	122002-103
C90	Capacitor, 3600 pF, ±5%, 500 V, Mica	128004-362
C91	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C92, C93	Capacitor, .039 µF, ±5%, 50 V, Poly, Radial	126008-393
C94	Capacitor, .01 µF, 50 V, Ceramic	122002-103
C95, C96	Capacitor, .22 µF, ±10%, 50 V, Ceramic,	122017-224
C97	Capacitor, 100 pF, 100 V, Ceramic	122016-101
C98	Capacitor, .015 µF, ±5%, 100 V, Poly, Radial	126009-153
C99	Capacitor, 3600 pF, ±5%, 500 V, Mica	128004-362
C100	Capacitor, 1100 pF, ±5%, 100 V, Mica	128002-112
C101	Capacitor, 560 pF, 100 V, Ceramic	122016-561
C102-C104	Capacitor, .1 µF, 50 V, Ceramic	122002-104

SAC PCB Assembly
Parts List, Continued

Designator	Description	Part No.
	Diodes	
CR1	Diode, MV5053, Light-Emitting	131027-002
CR2-CR5	Diode, 1N5401	131051-002
CR6, CR7	Diode, MV5053, Light-Emitting	131027-002
CR8-CR13	Diode, 1N4001	131048-001
	Inductor	
L1	Inductor, 100 µH	141024-001
	Potentiometer	
POT1	Potentiometer 10K Ohm, Horizontal, Dual	119011-103
	Transistors	
Q1	Transistor, 2N5306	133033-001
Q2	Transistor, 2N3904	133041-001
Q3	Integrated Circuit, LM317	137233-001
Q4	Integrated Circuit, LM337	137232-001
Q5	Integrated Circuit, LM317	137233-001
Q6, Q7	Integrated Circuit, TDA2030	137301-001
Q8, Q9	Transistor, 2N5306	133033-001
	Resistors	
R1	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R2	Resistor, 0 Ohm, ±5%, 1/4 W	110005-001
R3	Resistor, 100 K Ohm, ±5%, 1/8 W	110027-104
R4-R12	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R13	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R14, R15	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R16	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R17	Resistor, 220 Ohm, ±5%, 1/8 W	110027-221
R18, R19	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R20	Resistor, 68 Ohm, ±5%, 1/8 W	110027-680
R21	Resistor, 220 Ohm, ±5%, 1/8 W	110027-221
R22-R24	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R25-R28	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R29	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R30, R31	Resistor, 1 Ohm, ±5%, 1/4 W	110000-010
R32	Resistor, 1.8 K Ohm, ±5%, 1/8 W	110027-182
R33	Resistor, 240 Ohm, ±5%, 1/8 W	110027-241
R34	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R35	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R36	Resistor, 240 Ohm, ±5%, 1/8 W	110027-241
R37	Resistor, 1.8 K Ohm, ±5%, 1/8 W	110027-182
R38	Resistor, 240 Ohm, ±5%, 1/8 W	110027-241
R39	Resistor, 560 Ohm, ±5%, 1/8 W	110027-561
R40, R41	Resistor, 22 K Ohm, ±5%, 1/8 W	110027-223
R42, R43	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R44	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R45	Resistor, 560, ±5%, 1/8 W	110027-561
R46	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103

SAC PCB Assembly Parts List, Continued

Designator	Description	Part No.
R47	Resistor, 27 K Ohm, ±5%, 1/8 W	110027-273
R48	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R49	Resistor, 4.7 K Ohm, ±5%, 1/8 W	110027-472
R50	Resistor, 1.2 K Ohm, ±5%, 1/8 W	110027-122
R51	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R52, R53	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R54	Resistor, 27 K Ohm, ±5%, 1/8 W	110027-273
R55	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R56	Resistor, 1.2 K Ohm, ±5%, 1/8 W	110027-122
R57, R58	Resistor, 3.9 K Ohm, ±5%, 1/8 W	110027-392
R59	Resistor, 1.8 K Ohm, ±5%, 1/8 W	110027-182
R60	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R61	Resistor, 82 K Ohm, ±5%, 1/8 W	110027-823
R62	Resistor, 1.8 K Ohm, ±5%, 1/8 W	110027-182
R63	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R64	Resistor, 18 K Ohm, ±5%, 1/8 W	110027-183
R65, R66	Resistor, 7.5 K Ohm, ±5%, 1/8 W	110027-752
R67	Resistor, 82 K Ohm, ±5%, 1/8 W	110027-823
R68	Resistor, 18 K Ohm, ±5%, 1/8 W	110027-183
R69, R70	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R71	Resistor, 470 Ohm, ±5%, 1/8 W	110027-471
R72	Resistor, 20 K Ohm, ±5%, 1/8 W	110027-203
R73	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R74	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R75-R77	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R78	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R79	Resistor, 3.6 K Ohm, ±5%, 1/8 W	110027-362
R80	Resistor, 24 K Ohm, ±5%, 1/8 W	110027-243
R81	Resistor, 7.5 K Ohm, ±5%, 1/8 W	110027-752
R82	Resistor, 20 K Ohm, ±5%, 1/8 W	110027-203
R83	Resistor, 100 K Ohm, ±5%, 1/8 W	110027-104
R84	Resistor, 6.8 K Ohm, ±5%, 1/8 W	110027-682
R85	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R86	Resistor, 2 K Ohm, ±5%, 1/8 W	110027-202
R87	Resistor, 22 K Ohm, ±5%, 1/8 W	110027-223
R88	Resistor, 20 K Ohm, ±5%, 1/8 W	110027-203
R89	Resistor, 22 K Ohm, ±5%, 1/8 W	110027-223
R90	Resistor, 6.8 K Ohm, ±5%, 1/8 W	110027-682
R91	Resistor, 10 K Ohm, ±5%, 1/8 W	110027-103
R92	Resistor, 2 K Ohm, ±5%, 1/8 W	110027-202
R93	Resistor, 24 K Ohm, ±5%, 1/8 W	110027-243
R94	Resistor, 3.6 K Ohm, ±5%, 1/8 W	110027-362
R95	Resistor, 7.5 K Ohm, ±5%, 1/8 W	110027-752
R96	Resistor, 100 K Ohm, ±5%, 1/8 W	110027-104
R97-R99	Resistor, 1 K Ohm, ±5%, 1/8 W	110027-102
R100	Resistor, 10 Ohm, ±5%, 1/4 W	110009-100
R101	Resistor, 0 Ohm, ±5%, 1/4 W	110005-001

SAC PCB Assembly Parts List, Continued

Designator	Description	Part No.
RN1	Resistor Network, 1K x 5, ±5%, 1/8 W, SIP (6 Pin)	118009-102
	Connectors	
JCOIN, JSPK	Connector, 6 Ckt, Header, .100 Ctr, Key 5	179118-006
JSCOM	Connector, 11 Ckt, Header, .100 Ctr, Key 5	179118-011
ACDC	Connector, 12 Ckt, Header, .156 Ctr, Key 11	179213-012
	Sockets	
4H	Socket, 24 Pin, .600 Inch	179257-024
2F, 2H, 7E, 5E	Socket, 28 Pin, .600 Inch	179257-028
5A, 5C, 7A, 7C	Socket, 32 Pin, .600 Inch	179257-032
3C	Socket, 40 Pin, .600 Inch	179257-040
8D	Socket, 64 Pin, .900 Inch	179256-064
	Miscellaneous	
X1	Crystal, 14.318 Mhz	144000-004
HS1, HS2	Heat Sink, TDA2030	178190-032
STEST	Switch, Slide	160040-001
	Test Point	179051-001

If You Have Sanyo Video Displays. . .

Most Cyberball games have Wells-Gardner video displays. However, some have Sanyo video displays. Check the label on the back of your video display chassis for the manufacturer's name. If you have Sanyo video displays, check this page before you do any repairs or order any parts.

Games with Sanyo video displays have a few different parts in the cabinet-mounted assemblies, power supply assembly and the game PCB assembly. These parts are listed below.

Changes to the Cabinet-Mounted Assemblies, Figure 4-1

Old Part No.	New Description	New Part No.
A046202-01	Video Harness Assy (100 V)	A046471-01
A046203-01	Video Power Harness Assy (100 V)	A046470-01
046163-01	Tinted Display Shield	046163-02
139017-305	Sanyo 19-Inch Color Std. Res. Video Display	139021-002
TM-296	Sanyo 19-Inch Std. Res. Video Display Service Manual	TM-311

Changes to the Power Supply Assembly, Figure 4-1

Old Part No.	New Description	New Part No.
142045-001	Transformer (100V/120V)	A044337-01

Changes to the Cyberball Game PCB Assembly, Figure 4-6

Designator	New Description	New Part No.
R124	2.2 KΩ Resistor	110027-122
R126	2.2 KΩ Resistor	110027-122
R128	2.2 KΩ Resistor	110027-122
R134	47 Ω Resistor	110027-470
R137	47 Ω Resistor	110027-470
R140	47 Ω Resistor	110027-470
R143	2.2 KΩ Resistor	110027-122
R145	2.2 KΩ Resistor	110027-122
R147	2.2 KΩ Resistor	110027-122
R152	47 Ω Resistor	110027-470
R155	47 Ω Resistor	110027-470
R158	47 Ω Resistor	110027-470

N O T E S

Cyberball™ Statistics Sheet

Statistics Screens

First Statistics Screen

Left Screen, Left Mech Coins	________
Left Screen, Right Mech Coins	________
Right Screen, Left Mech Coins	________
Right Screen, Right Mech Coins	________
Total Games	________
0 Player Minutes	________
1 Player Minutes	________
2 Player Minutes	________
3 Player Minutes	________
4 Player Minutes	________
Error Count	________
Total Credits	________
Average Time per Credit	________

Second Statistics Screen

		Percent
Computer Games Left	________	________
Computer Games Right	________	________
Human–Human Games		
1 Period Games	________	________
2 Period Games	________	________
3 Period Games	________	________
4 Period Games	________	________
5 Period Games	________	________
6 Period Games	________	________
7 Plus Period Games	________	________

Histogram Screen

Seconds	**Number of Credits**
0-39	________
40-50	________
60-79	________
80-99	________
100-119	________
120-139	________
140-159	________
160-179	________
180-199	________
200-219	________

Seconds	**Number of Credits**
220-239	________
240-259	________
260-279	________
280-299	________
300-319	________
320-339	________
340-359	________
360-379	________
380-399	________
400-Up	________

Warranty

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

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

(a) Seller is promptly notified in writing upon discovery by Buyer that said products are defective;

(b) Such products are returned prepaid to Seller's plant; and

(c) Seller's examination of said products discloses to Seller's satisfaction that such alleged defects existed and were not caused by accident, misuse, neglect, alteration, improper repair, installation, or improper testing.

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

Except for any express warranty set forth in a written contract between Seller and Buyer which contract supersedes the terms herein, this warranty is expressed in lieu of all other warranties expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose, and of all other obligations or liabilities on the Seller's part, and it neither assumes nor authorizes any other person to assume for the Seller any other liabilities in connection with the sale of products by Seller.

The use of any non-Atari parts may void your warranty, according to the terms of the warranty. The use of any non-Atari parts may also adversely affect the safety of your game and cause injury to you and others. Be very cautious in using non-Atari-supplied components with our games, in order to ensure your safety.

Atari distributors are independent, being privately owned and operated. In their judgment they may sell parts or accessories other than Atari parts or accessories. Atari Games Corporation cannot be responsible for the quality, suitability or safety of any non-Atari part or any modification including labor which is performed by such distributor.

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