

TM-209
1st printing



LIBERATOR™

Operation, Maintenance, and Service Manual

Complete with Illustrated Parts Lists

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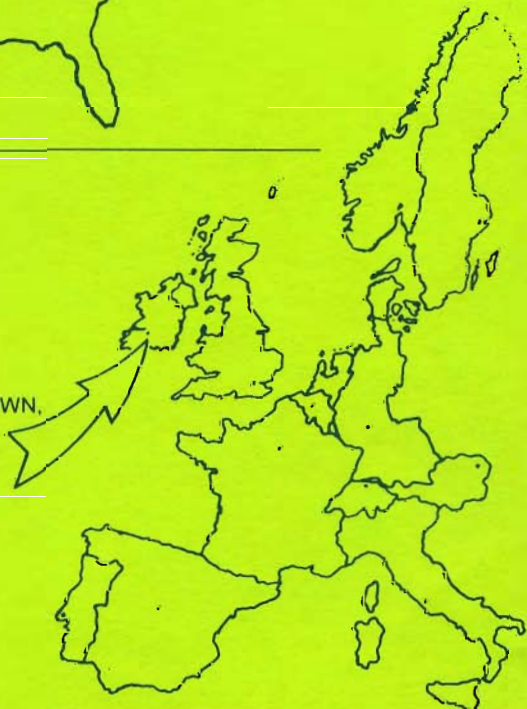
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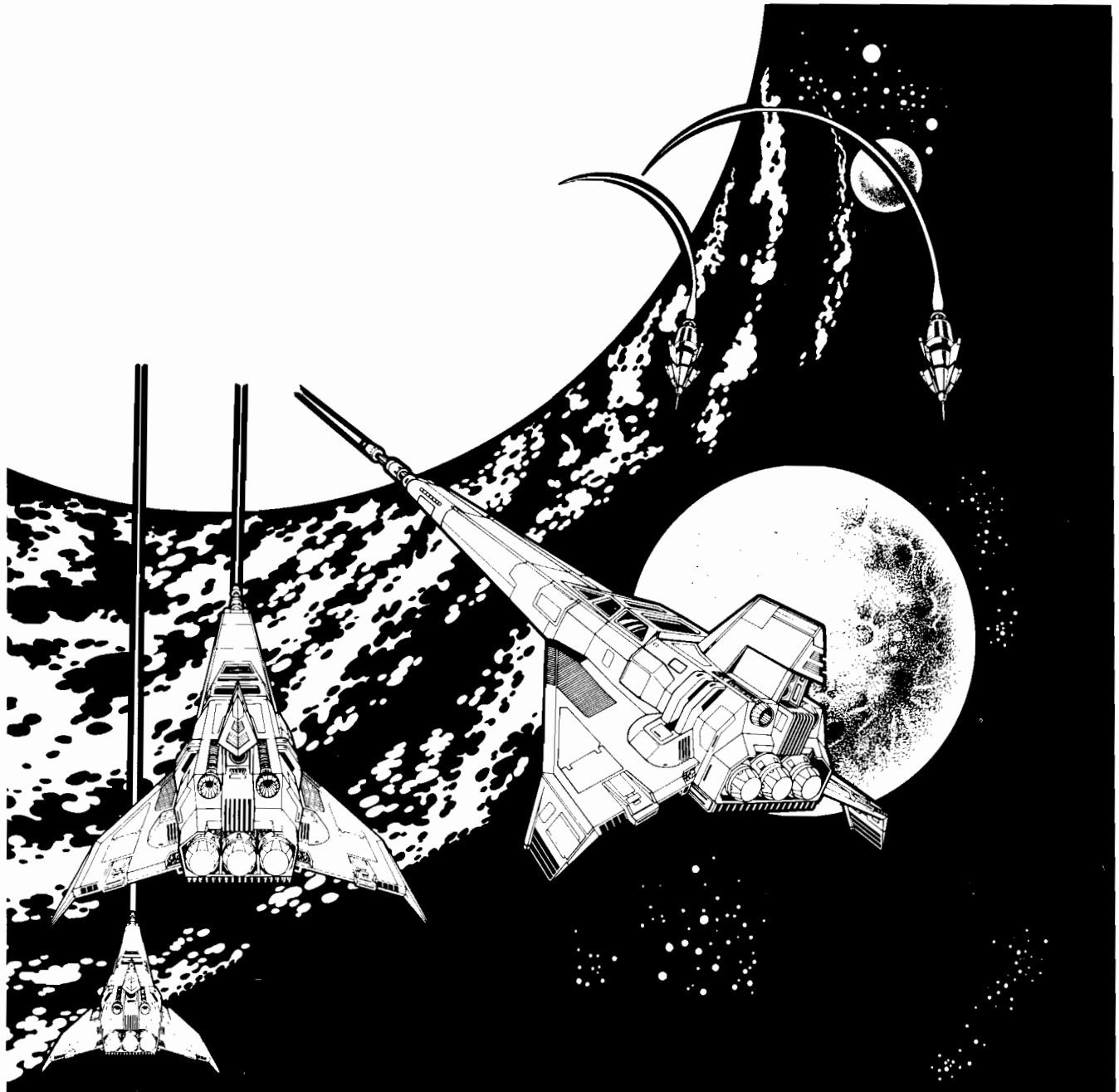
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LIBERATOR™

Operation, Maintenance,
and Service Manual

Complete with Illustrated Parts Lists

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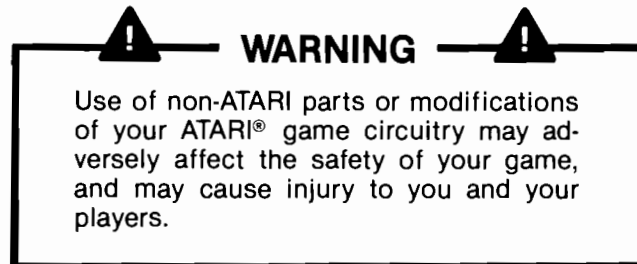
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- substitute non-ATARI parts in the game
- modify or alter any circuits in the game by using kits or parts *not* supplied by Atari.

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- the power cord is properly plugged into a **grounded** 3-wire outlet.

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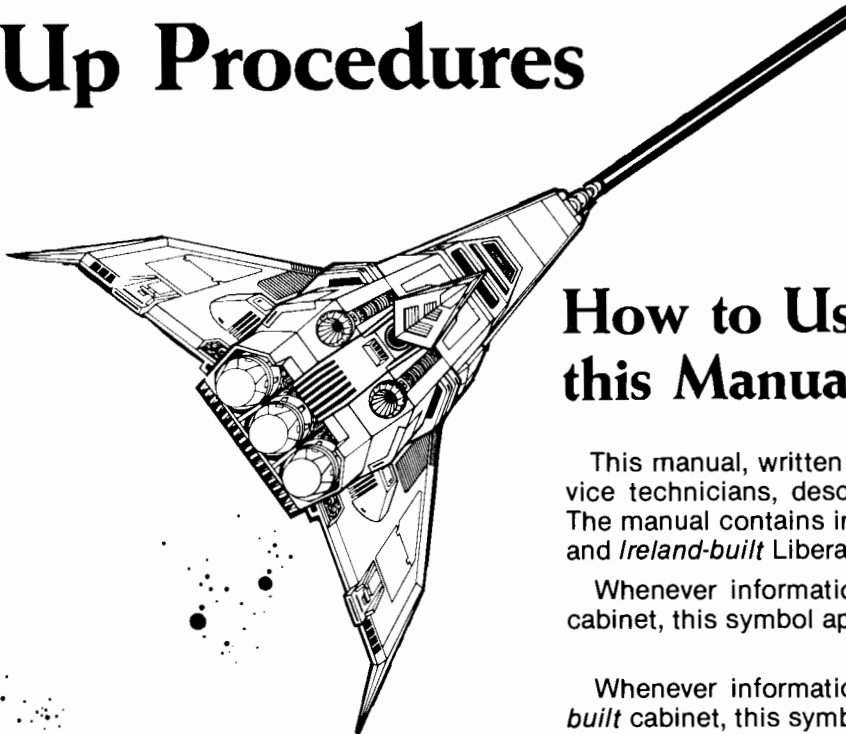
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Set-Up Procedures



How to Use this Manual

This manual, written for game operators and service technicians, describes the Liberator™ game. The manual contains information about the *Upright* and *Ireland-built* Liberator cabinets.

Whenever information is unique to the *Upright* cabinet, this symbol appears:



Whenever information is unique to the *Ireland-built* cabinet, this symbol appears:



Chapter 1 describes new features, game setup, settings of option switches, self-test procedures, and game play.

Chapter 2 contains self-test procedures.

Chapter 3 details maintenance, repair, and parts information.

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

In addition, schematic diagrams of the game circuitry are included with this manual.

Figures 1-1 and 3-1 illustrate the game cabinet. Italicized lettering on these figures refers you to other places in the manual for information about specific cabinet parts.



Chapter

1

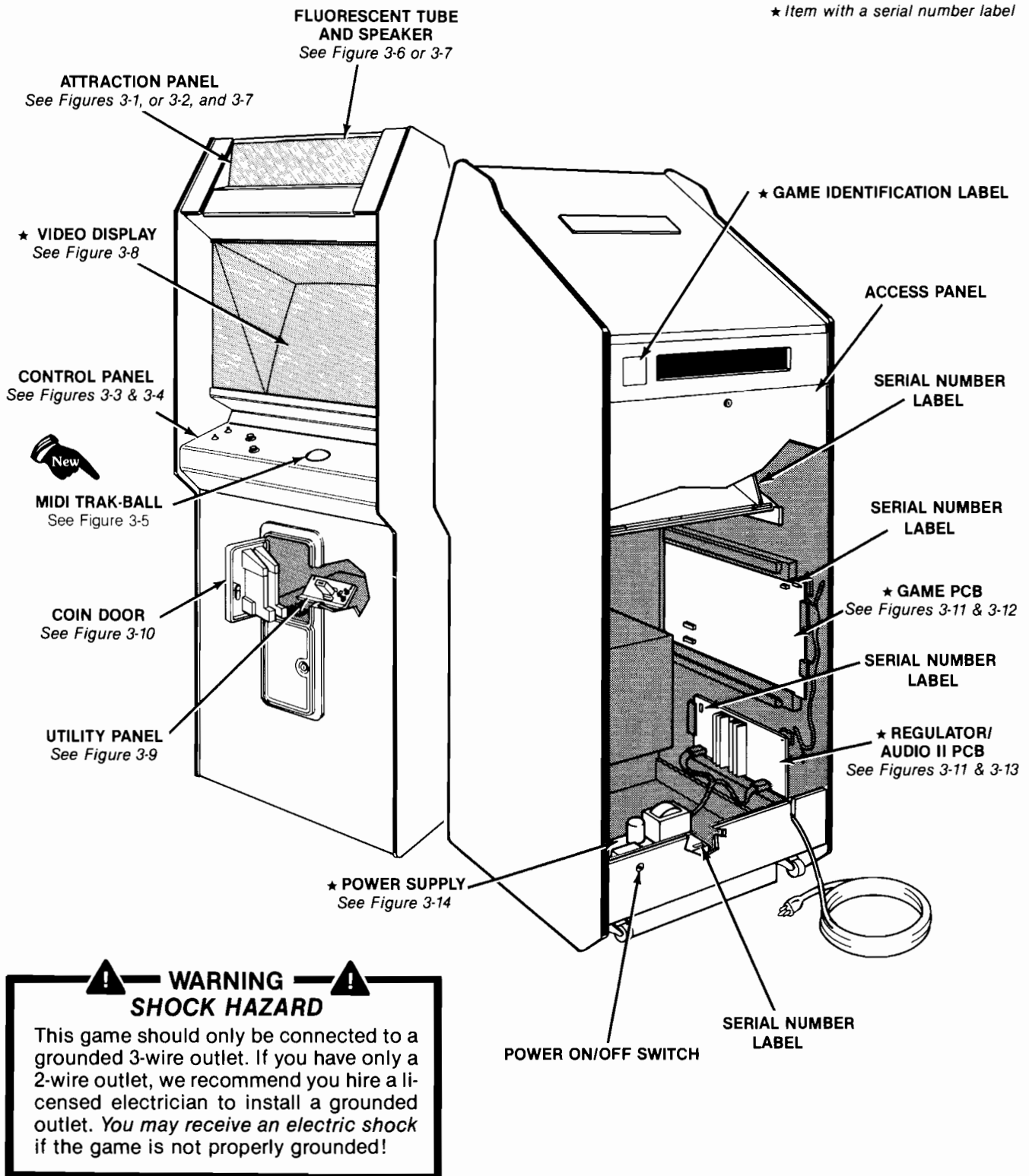


Figure 1-1 Game Overview

A. New Features

The Liberator™ game has four new features. Even if you are familiar with ATARI® games, you should note these important differences:

1. **Shielded Game Speakers.** These 8-ohm, 6-ounce, high-fidelity speakers provide exceptional audio. The speaker magnets are shielded.
2. **Midi Trak-Ball™.** The popular Trak-Ball™ assembly has been enlarged and simplified. The housing for this control is a molded plastic frame with two parts. Smooth action of the Midi Trak-Ball improves player accuracy.
3. **Grey Tinted Glass.** This new shade of tempered glass used in the display shield enhances video colors.
4. **Molded Coin Box.** This game has a sleek, one-piece molded coin box with handles on either end for easy carrying.

New features and all other major parts of the game are illustrated in Figure 1-1. Throughout this manual, wherever one of these new features is mentioned, you will see this symbol:



- c. Remove the tie-wrap that secures the coiled power cord inside the cabinet. Inspect the power cord for any cuts or dents in the insulation. Repair or replace it as required. Place the square black plastic strain-relief plate in the wood slot at the bottom of the rear panel opening.
- d. Note the game serial number printed on a label on the back of the cabinet. Verify that the same serial number is also on the Liberator game PCB, Regulator/Audio II PCB, power supply, and video display. See *Figure 1-1* for locations of the serial-numbered components. Please mention this serial number whenever you call your distributor for service.
- e. Inspect major subassemblies, such as the power supply, control panel, and video display. Make sure that they are mounted securely.

⚠ WARNING ⚠

To avoid electrical shock, do not touch internal parts of the display with your hands or with metal objects held in your hands!

B. Inspecting the Game

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

⚠ WARNING ⚠

To avoid electrical shock, do not plug in the game until inspection and installation have been completed!

1. Examine the exterior of the game cabinet for dents, chips, or broken parts.
2. Remove the screws that were used as extra security to seal the rear access panel. Unlock and open this panel and the coin door; inspect the interior of the game as follows:
 - a. Ensure that all plug-in connectors (on the game harness) are firmly plugged in. Replug any connectors found unplugged. **Do not force connectors together.** The connectors are keyed so they only fit in the proper orientation. **A reversed edge connector may damage a PCB** and will void your warranty.
 - b. Ensure that all plug-in integrated circuits on the PCB are firmly plugged into their sockets.

C. Space and Power Requirements

1. Installation Requirements

Power	200 W
Temperature	0 to +38°C (+32 to +100°F)
Humidity	Not over 95% relative

Upright Cabinet

Space Required	62 x 78 cm (25¼ x 30½ in.)
Game Height	184 cm (72 ½ in.)

Ireland-Built Cabinet

Space Required	60 x 68 cm (24 x 27 in.)
Game Height	170 cm (67 in.)

2. Selecting the Voltage Plug

The power supply used in this game operates on the line voltage of almost any country in the world. The power supply comes with either one, two, or three separate voltage-selection plugs. Plug voltages and wire colors are 100 VAC (violet wire color), 120 VAC (yellow wire color), 220 VAC (blue wire color), and 240 VAC (brown wire color).

Before plugging in your game, check your line voltage. Next, check the wire color on the voltage selection plug that is plugged into your power supply. Make sure the voltage selection plug is correct for the voltage of your location (see *Figure 3-14*).

D. Locating the Switches

1. On/Off Switch

The on/off switch is located on the back of the cabinet on the lower left side (see *Figure 1-2*).

2. Utility Panel Switches

The utility panel includes the volume control, self-test switch, coin counter(s), and auxiliary coin switch (used to credit the game without activating the coin counter). The utility panel is located inside the upper coin door (see *Figure 1-2*).

3. Option Switches

Option switches are located on the game PCB (see *Figure 1-2*).

- a. Game-price options are at PCB location A4.
- b. Game-play options are at PCB location D4.
- c. Coin-counter options are at PCB location T12.

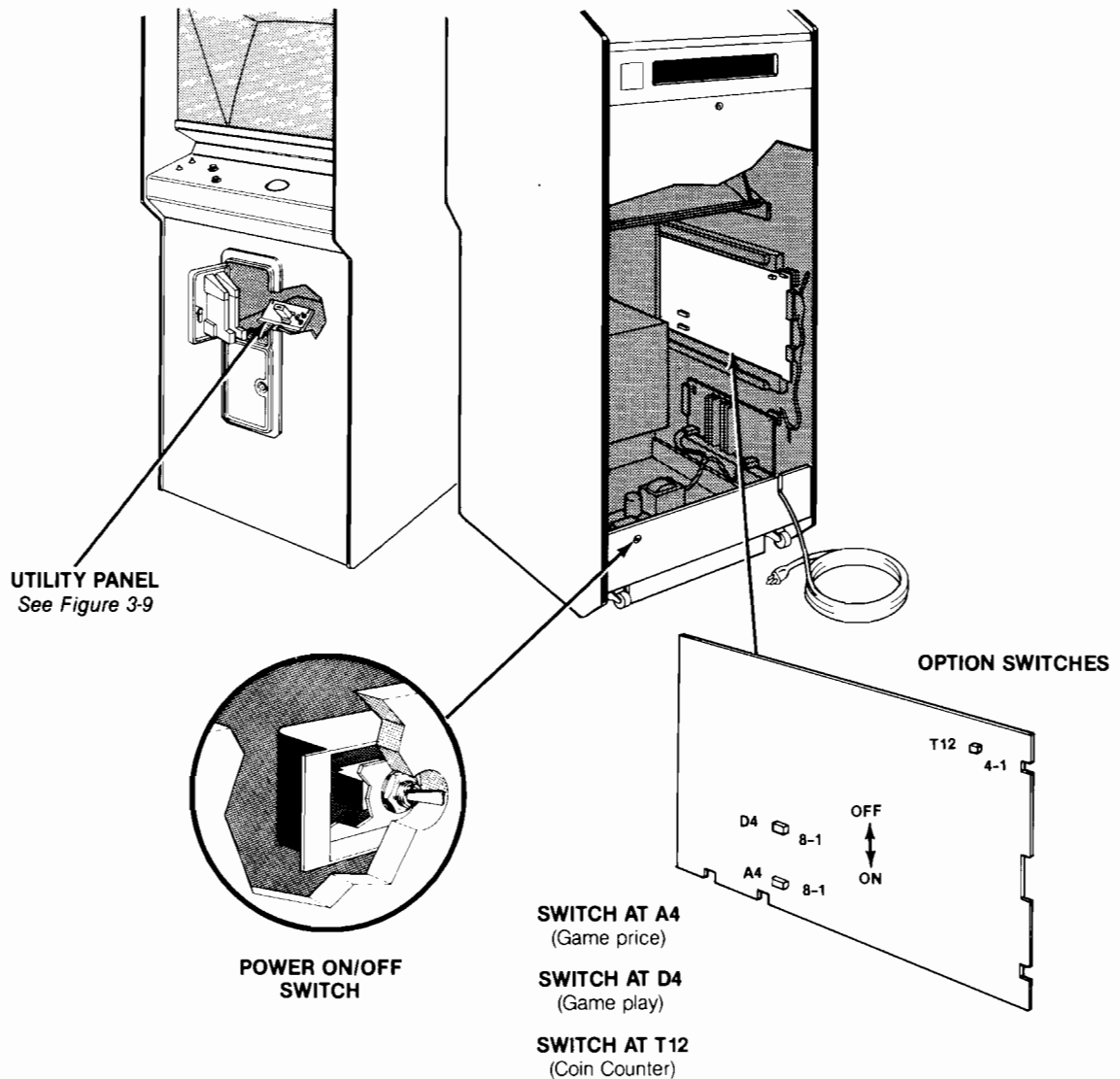


Figure 1-2 Location of Game Switches

E. Setting the Option Switches

Settings of the game option switches are explained in Tables 1-1 and 1-2. Options preset at the factory are shown by the ◀ symbols. However, you may change the settings according to your individual needs.

To verify option switch settings, first toggle the on/off switch to the *off* position and then to the *on* position. Next, set the self-test switch to the *on* position, and verify the settings on the self-test screen. Then set the self-test switch to the *off* position.

Table 1-1 contains the switch settings for options relating to game price, coin mechanism multipliers, and bonus play. The switches are on the game PCB at location A4.

The *multipliers* (toggles 4-6) determine the value of the coin mechanisms to the game's logic. A *coin mechanism* is a device on the inside of the coin

door that inspects the coin to determine if the correct coin has been inserted. After this inspection, the mechanism either accepts or rejects the coin. The coin door has two mechanisms.

The basic unit of measurement is a coin worth \$.25 or 1 DM, which equals a multiplier of x1. For example, if you have a 2 DM/1 DM coin door, you may want to set the left multiplier at x2 and the right multiplier at x1.

You may offer *bonus play* for certain combinations of coins inserted. For example, with the game set at \$.25 per play, players who deposit four successive \$.25 coins before pressing the start switch can receive a bonus play. The bonus feature encourages players to insert more money than just the minimum \$.25 required for one game.

Switch 1 of the 4-toggle switch at **PCB location T12** should be set in the *on* position. For the *Ireland-built* cabinet, this ensures that a coin inserted in either coin mechanism will be counted. Switches 2, 3, and 4 are not used.

Table 1-1 Switch Settings for Price Options

Settings of 8-Toggle Switch on Liberator PCB (at A4)								Option
8	7	6	5	4	3	2	1	
Off	Off							Free play
On	Off							1 coin for 2 credits
Off	On							1 coin for 1 credit ◀
On	On							2 coins for 1 credit
		Off	Off					Right coin mechanism x 1 ◀
		On	Off					Right coin mechanism x 4
		Off	On					Right coin mechanism x 5
		On	On					Right coin mechanism x 6
				Off				Left coin mechanism x 1 ◀
				On				Left coin mechanism x 2
					Off	Off	Off	No bonus coins ◀
					Off	On	Off	For every 4 coins inserted, logic adds 1 more coin
					On	On	Off	For every 4 coins inserted, logic adds 2 more coins
					Off	Off	On	For every 5 coins inserted, logic adds 1 more coin
					On	Off	On	For every 3 coins inserted, logic adds 1 more coin
					Off	On	On	No bonus coins
					On	On	On	No bonus coins

◀ *Manufacturer's recommended settings*

Table 1-2 contains the switch settings for options relating to number of ships per game, bonus levels, and game difficulty. The switches are on the game PCB at location D4.

Table 1-2 Switch Settings for Play Options

Settings of 8-Toggle Switch on Liberator PCB (at D4)								Option
8	7	6	5	4	3	2	1	
Off	Off							4 ships per game ◀
On	Off							5 ships per game
Off	On							6 ships per game
On	On							8 ships per game
		Off	Off			Not used	Not used	Bonus ship every 15,000 points
		On	Off					Bonus ship every 20,000 points ◀
		Off	On					Bonus ship every 25,000 points
		On	On					Bonus ship every 30,000 points
				On	Off			Easy game play
				Off	Off			Normal game play ◀
				Off	On			Hard game play

◀ *Manufacturer's recommended settings*



F. Performing the Initial Self-Test

This game will test itself and provide data to show that the game's circuitry and controls are operating properly. The data is provided on the video display and speaker. No additional equipment is necessary.

Wait at least 10 seconds after playing a game before switching to the Self-Test Mode. Otherwise, you may erase the top three scores in the high-score table or distort the statistics. All credits will be cancelled when you switch to self-test.

Refer to Figure 1-2 for the location of the self-test switch and option switches. Set the self-test switch to the *on* position (see *Figure 1-3*) to see the Self-Test Display in the Self-Test Mode. To exit the Self-Test Mode, set the self-test switch to the *off* position.

The complete self-test procedure is explained in *Chapter 2, B. Self-Test Procedure*.

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

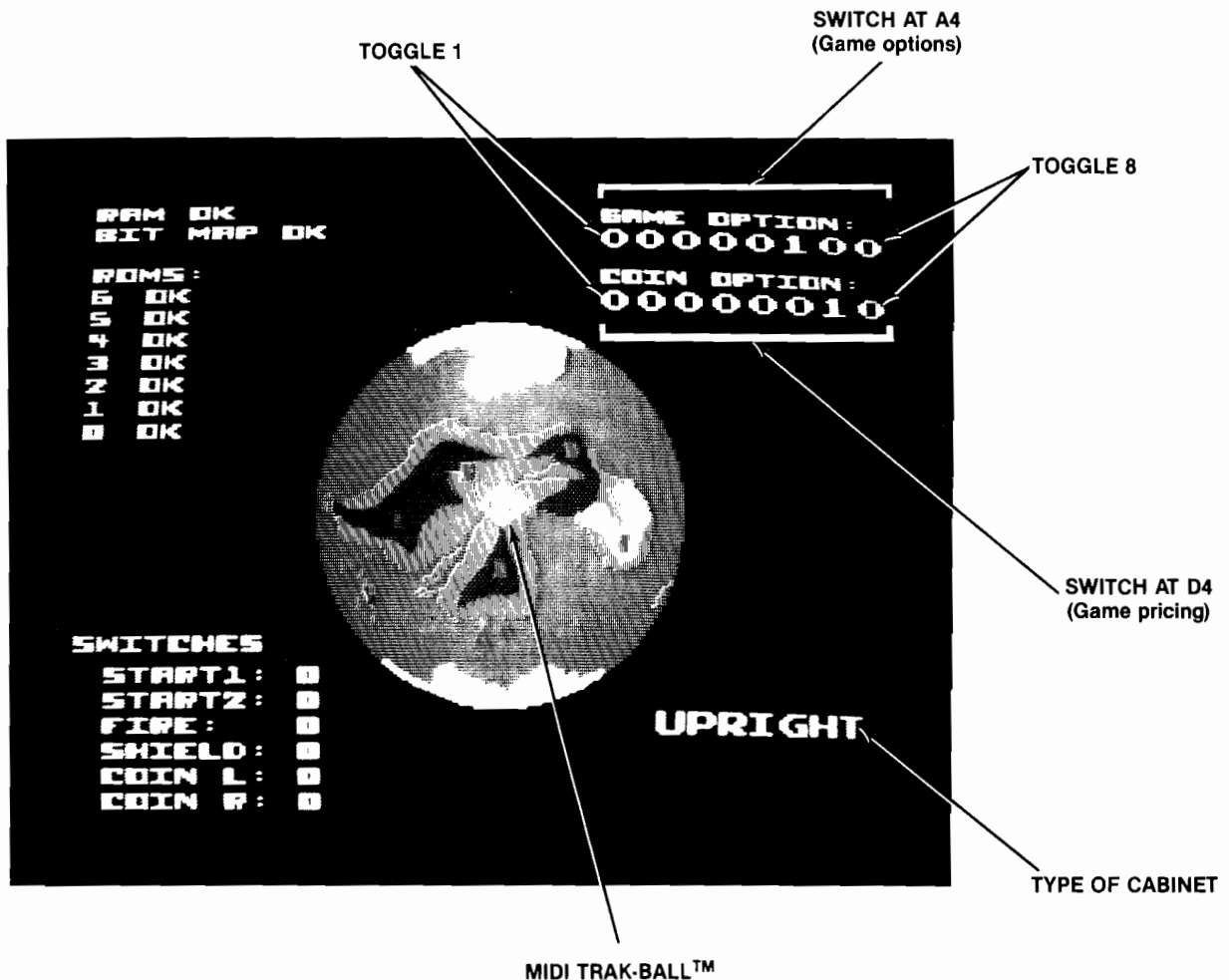


Figure 1-3 Self-Test Display

Table 1-3 Self-Test Procedure

Instruction	Test Passes
1. Switch the self-test switch to the <i>on</i> position.*	<p>The screen goes blank for a few seconds while a continuous low-to-high tone sounds. This tone means the VBLANK and timing circuits are working correctly. If there is no tone, refer to <i>Chapter 2, Self-Test Procedure</i>.</p> <p>The self-test display appears. RAMs, ROMs, and the bit map are tested. If the screen is different from the self-test display, or if there are sounds, refer to <i>Chapter 2, Self-Test Procedure</i>.</p>
2. Press the control panel pushbuttons and the left and right coin switches. Roll the Midi Trak-Ball™.	<p>As you press the pushbuttons or switches, you will hear a tone, the screen will change color, and the corresponding 0 will change to 1. Pressing any pushbutton or switch will change the color of the screen and will change the appearance of the planet alternately from Earth to Jupiter. The (Midi Trak-Ball) cursor moves freely. If the test fails, refer to <i>Chapter 2, Self-Test Procedure</i>.</p>
3. Press the auxiliary coin switch on the utility panel.	<p>The screen displays the game bookkeeping statistics as follows:</p> <ul style="list-style-type: none"> • Average of the total game scores • Average cumulative game time • Number of one-player games played • Number of two-player games played <p>If the test fails, refer to <i>Chapter 2, Self-Test Procedure</i>.</p>
4. Press the auxiliary coin switch.	<p>The screen displays the following color bar pattern:</p> <ul style="list-style-type: none"> • Three shades of blue (light to dark) • Seven shades of green (light to dark) • Seven shades of red (light to dark) • Alternate white and black squares <p>If the test fails, refer to <i>Chapter 2, Self-Test Procedure</i>.</p>
5. Press the auxiliary coin switch.	<p>A grid pattern framed in red and green appears on the screen. The corners of the green frame must be visible at all times; the corners of the red frame may or may not be visible. The corners of the display should cut across the blue boxes located in the corners of the convergence display between the red and green frames. If the test fails, refer to <i>Chapter 2, Self Test Procedure, Screen 4</i>.</p>

*All credits are cancelled when you switch to self-test.



G. Game Play

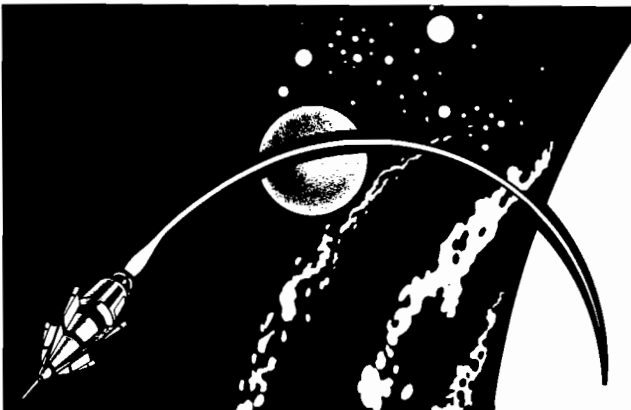
Liberator™ is a one- or two-player game with a color raster-scan video display. The game action takes place in various star systems in outer space. There are missile bases on planets and enemy spaceships that the player tries to destroy. The object of the game is to find and destroy the enemy missile bases.

The player controls a fleet of four spaceships, each located in a corner of the screen. Each ship has a weapon that shoots a laser beam. A fleet of four spaceships may have as many as 12 shots on the screen at one time. The player uses the Midi Trak-Ball™ to control a cursor (⬠ mark) that appears on the screen. The ⬠ marks where a laser shot is to explode. When the player presses the FIRE button, a laser beam is launched from the nearest spaceship to the ⬠. When the beam reaches the ⬠ there is an explosion. Any object within the explosion is destroyed. Nearby objects may also be damaged.

To protect his spaceship, a player may use the SHIELD button. Each ship has four shields at the beginning of a level of play. A hit to a shield destroys that shield and the corresponding shields that protect other spaceships.

When starting a game, a player may select an advanced level of play. When a game ends, the message *FOR ADVANCED GAME HOLD FIRE AND PRESS START* appears. The player presses FIRE to select the level of game play. Levels increase by three, up to Level 22. The player starts the game by pushing a start button.

If a player selects and successfully completes a higher level of game play, he is awarded bonus points. There are 30,000 bonus points and a bonus spaceship (for a maximum of eight regular and bonus ships per player) awarded for completion of each star system. There are three levels of game play within each star system. For example, if a player selects and completes Level 22, he is awarded 210,000 bonus points and has eight ships.



Liberator™ has five possible modes of operation: Demonstration, Attract, Play, High-Score, and Self-Test. Self-Test is a special mode for checking the game switches and computer functions. You may switch to the Self-Test Mode during any mode. All credits will be cancelled. Wait at least ten seconds after a game has been played before switching to Self-Test or switching off power; otherwise, you may erase the highscore table.

1. Demonstration Mode

To switch to the Demonstration Mode, simultaneously press any start button and the auxiliary coin switch (located inside the upper coin door). In this mode your spaceships cannot be destroyed by the enemy. Thus, you can see all the star systems and obstacles in the game. To exit this mode, press the auxiliary coin switch.

2. Attract Mode

The Attract Mode begins when power is applied to the game, after a Play or High-Score Mode, or after Self-Test. The Attract Mode ends when a credit is inserted and a start button is pressed, or when the Self-Test Mode begins.

The screen displays one of five possible pictures in the Attract Mode. The first picture takes place in hyperspace and a message to the player reads: *THE GALAXY HAS BEEN INVADED BY THE EVIL MALAGLON ARMY. COMMANDER CHAMPION OF THE ATARI FORCE HAS CHOSEN YOU TO BECOME THE LIBERATOR. THE PEOPLE OF THE UNIVERSE ARE DEPENDING ON YOU TO FREE THEM FROM THEIR EVIL MASTERS.*

In the second picture, the words *JOIN THE ATARI FORCE IN:* appear at the top of the screen. There is a rotating Earth-like planet in the center of the screen. *LIBERATOR* appears in an orbit around the planet. © ATARI 1982 appears at the bottom of the screen.



The third picture simulates game play. Two messages appear on the screen— *YOUR MISSION: SHOOT RED FLASHING MISSILE BASES ON PLANET* and *PROTECT SHIPS FROM ONCOMING MISSILES*. The number of remaining enemy bases appears at the bottom of the screen.

In the fourth picture, a planet rotates. The messages *ONE OR TWO PLAYERS* and *PRESS START* appear on the screen if the correct number of credits have been inserted.

The High-Score Table appears in the fifth picture. There is a list of the ten highest scores. Opposite each score are the initials of the player who achieved that score.

All pictures in the attract mode display information about the number of coins required to credit the game, and, if applicable, the number of credits shows at the bottom of the screen. The Attract Mode ends when a credit(s) is inserted and the 1- or 2-player button(s) is pressed.

3. Play Mode

The Play Mode begins when the correct amount of credit is inserted and a start button is pressed.

Game play begins in hyperspace of the first star system. Enemy spaceships try to ram and destroy the player's spaceships. The player must destroy

these enemy ships using the FIRE button. There is no shield in hyperspace. When the enemy spaceships on the screen are destroyed, *LEVEL 1* and a revolving Earth-like planet appear on the screen.

There are four enemy missile bases on the planet. The base launches missiles toward the player's spaceships. The missiles travel in a curved line. The player must destroy the missiles before they destroy his spaceships. When the missile bases cross an imaginary vertical line in the center of the planet, the bases become satellites. The satellite launches a missile that travels in a straight line toward the player's spaceships.

When all bases are destroyed, the player's remaining spaceships fly to the planet. Bonus points appear at the top of the screen when the ships land on the planet. There are 100 bonus points for each remaining ship. In Level 2 there are 200 bonus points per ship; Level 3 has 300 points; and so on. After Level 7, the bonus is 800 points for each remaining ship. The screen also displays the points at which the next bonus ship will be awarded.

The planets for Levels 2 and 3 contain killer saucers in addition to the missile bases. The saucer flies in space for a period of time and then stops. It emits a sound and begins to increase in size. Then it fires a death ray that cannot be stopped. FIRE and SHIELD offer no protection. The ray destroys the player's ship. The player must destroy the saucer before it increases in size; otherwise, the death ray will destroy his ship.

Game play in the second star system starts in hyperspace with enemy spaceships trying to ram and destroy the player's spaceships. After successfully destroying the enemy ships, Level 4 is displayed with a revolving Earth-like planet. The player has to destroy six missile bases on the revolving planet. Missile bases fire MIRVs, which explode into four smaller missiles when hit. In this system, there are two more planets (Levels 5 and 6) that have killer saucers and missile bases that turn into satellites.

Game play progresses through many star systems. Play in each system begins with enemy spaceships trying to ram the player's spaceships. Next, there are three levels (each with a different planet) within a system. In each new level, the color of the planet changes and the direction of planet rotation reverses. The player score and number of space ships appear at the top of the screen, and the number of missile bases appears at the bottom of the screen. As bases are destroyed, the number decreases to show the remaining bases. Game play proceeds as before, but in each new star system there are more missile bases and different obstacles. (See *Table 1-4* for a list of obstacles in each star system.)

Fireballs appear in the third star system. Fireballs are red and yellow circular shapes that appear to be burning. When shot with the laser beam, the fireball slows down. It takes four shots to destroy a fireball. In the ninth star system a master base appears. It is a white, pulsating base. The base is smart—it can sense when a laser beam is aimed at it. The master base can decrease or increase the speed of the planet or change the direction of planet rotation to avoid being destroyed!

Table 1-4 Liberator™ Game Play

STAR SYSTEM	PLANET	OBSTACLE*
1	Earth-like	4-5 bases Bases become satellites Killer saucer
2	Earth-like	6-7 bases Bases become satellites Killer saucer MIRVs
3	Jupiter-like	8-9 bases Bases become fireballs Killer saucer
4	Jupiter-like	10-11 bases MIRVs Fireballs Killer saucer
5	Earth-like	12-13 bases Faster rotation of planet Satellites Killer saucer
6	Jupiter-like	14-15 missile bases Faster rotation of planet Fireballs
7	Earth-like	16 bases MIRVs Satellites
8	Jupiter-like	16 bases Faster rotation of planet MIRVs Fireballs
9	Earth-like	16 bases Master base MIRVs Satellites
10**	Jupiter-like	16 bases Master base MIRVs Fireballs

*Each star system has enemy spaceships, missile bases, and missiles.

**After Star System 10, fireballs become starballs.

In the eleventh star system, starballs appear. (After the tenth star system, fireballs become starballs.) Starballs are red circular shapes. A starball slows down when it is shot by a laser beam, but speeds up after the hit. It takes four shots to destroy a starball.

After the fourteenth star system, there are one more MIRV and one more starball for each new star system. (See *Table 1-5* for a list of targets and their point values.)

Table 1-5 Liberator™ Scoring

TARGET	POINT VALUE
Enemy spaceship	50
Missile base	100
Satellite	20
Killer saucer	150
MIRV	10
Fireball	20
Starball	20

4. High-Score Mode

The High-Score Mode begins when a player has earned one of the ten highest scores. The player has one minute to record his initials. A player spins the Midi Trak-Ball™ to locate his initial. He presses FIRE to put his initial into the high-score table.

To reset the high-score table, power the game *off* and then *on*, or switch the self-test switch *on* and *off*. However, this does not erase the top three scores.

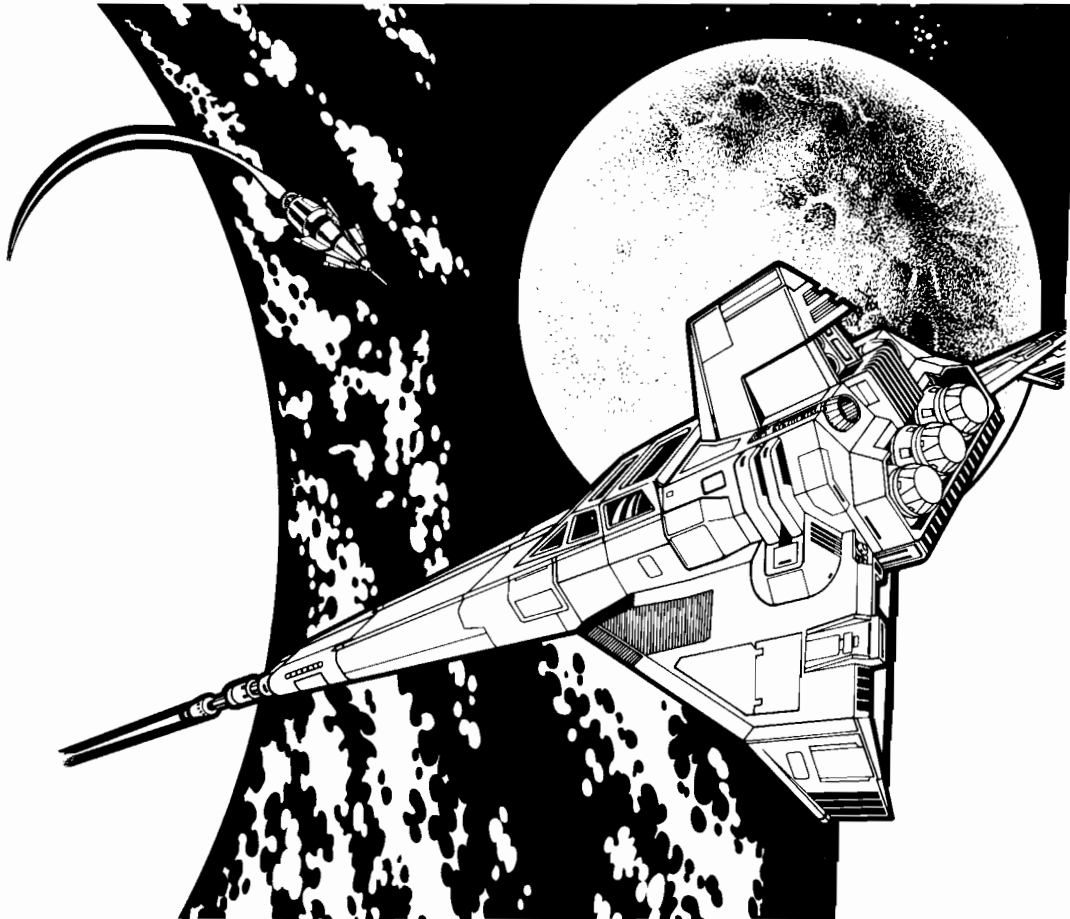
5. Hints for Game Play

- Destroy the enemy missile bases on the planet first, before they launch their missiles!
- Destroy the killer saucer as soon as it begins to grow in size and make a sound.
- Plan your shot so it explodes in front of a moving target.
- Shoot fireballs as soon as possible to slow them down.
- For fast planets, place shots in a long vertical line directly over the planet.

Self-Test Procedure

The following self-test procedures should be performed by a qualified electronic technician.

This game tests itself when the self-test switch is set to the *on* position. If there is a failure, the game produces audiovisual aids to help you find the failing portion of the game. The self-test procedure included in Chapter 1 will help you decide if the game is or is not working properly.



Chapter

2

A. Comments on Troubleshooting

When troubleshooting, first determine the symptom(s) of the failure. After determining the symptom, look over the wiring diagram and determine what assemblies could cause the failure. Could it be caused by the power supply, Regulator/Audio II PCB, or the video display?

The next step is to check all harness wires and connectors to the suspected failing assembly. If you find no harness or connector problem, substitute an assembly known to be good for the suspected failing assembly. If the game functions properly, you have successfully isolated the failure. If it doesn't, repeat the procedure with another assembly.

When you have isolated the failing assembly, you must troubleshoot that assembly and make the necessary repairs. If the video display fails, we suggest that a qualified video-display technician perform the troubleshooting and repair.

Be sure to refer to *The Book—A Guide to Electronic Game Operation and Servicing*, published by Atari, Inc., whenever you need help with the techniques, tools, and terminology associated with coin-operated electronic games.

To effectively troubleshoot a game PCB, learn as much as you can about the PCB. The diagrams in the *Schematic Package* (included with the game) show the functions of the circuitry. Again, while troubleshooting the PCB, first determine the symptom of the failure, then locate the suspected area on the schematic diagram.

A **Glossary of Game PCB Signal Names** is included in the *Schematic Package*. Each signal description states if the signal is generated by hardware or software, where it is generated, where it goes, and what it does. We suggest you use this glossary to become more familiar with the operation of the game PCB.

B. Performing the Self-Test

The following self-test procedures should only be performed by a qualified electronic technician.

This game will test itself and provide data to show that the game's circuitry and controls are operating properly. The data is provided on the video display and speaker. No additional equipment is necessary.

To switch to the Self-Test Mode, set the self-test switch, located on the utility panel, to the *on* position.

Press the auxiliary coin switch, located on the utility panel next to the self-test switch, to progress through tests 1 through 4.

SCREEN 1—Test Passes:

If the test passes, the screen goes blank for a few seconds before displaying the picture below. Upright games should display the message *UPRIGHT* in the lower right corner of the screen; cocktail games should display *COCKTAIL* in the same location. You will hear a continuous low-to-high tone while the screen is blank. See *Chapter 1, Section F, Performing the Initial Self-Test* for a complete description of this picture.

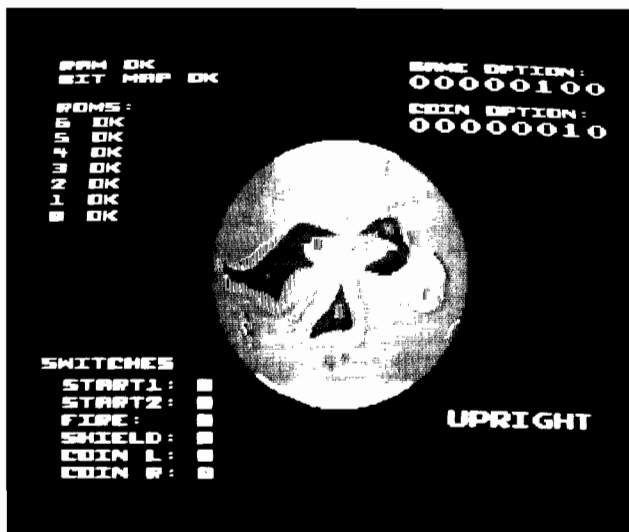


Figure 2-1 Self-Test Screen 1—Test Passes

NOTE

This procedure does not test the coin door lockout coils and coin counter. If the lockout coils do not function when the game is on, suspect the lockout coil wiring or the + 10-volt power supply. Troubleshoot using the game harness schematics. If the coin counter fails, make sure coin-counter switch 1 at T12 on the game PCB is correctly set in the *on* position. If the coin counter still fails, suspect latch T11 on the game PCB. Refer to the game schematics to troubleshoot any further problems with the coin counter.

SCREEN 1—Test Fails:

RAM failure is indicated by a blank or “garbage”-filled screen and a repeating series of eight tones. A low tone indicates a good RAM; a high tone indicates a failed RAM. The tone number and matching RAM location are listed in Table 2-1.

Table 2-1 Failing RAM Location

Tone Number	Failed RAM Location on Game PCB
1st	J10
2nd	M10
3rd	S10
4th	F10
5th	L10
6th	P10
7th	T10
8th	E10



Figure 2-2 Self-Test Screen 1—Test Fails

BIT MAP RAM failure is indicated by *BIT MAP ERROR* displayed on the top center of the screen plus a repeating series of four tones (see *Figure 2-2*). A low tone indicates a good RAM; a high tone indicates a failed RAM. Bit-map tone numbers with corresponding RAM locations are listed in Table 2-2.

Table 2-2 Failing Bit Map RAM Location

Tone Number	Failed Bit Map RAM Location on Game PCB
1st	K10
2nd	N10
3rd	R10
4th	H10

ROM failure is indicated by *BAD* message and the ROM checksum displayed opposite the number of the failed ROM. (Ignore the checksum.) The failed ROM and its location are listed in Table 2-3.

Table 2-3 Failing ROM Location

Screen Display	Failed ROM Location on Game PCB
6 *	T1
5 *	R/S1
4 *	P1
3	N1
2	L/M1
1	K1
0	J1

*This ROM contains the Self-Test program. If this ROM fails, the screen will be blank or will display “garbage.”

SWITCH failure is indicated by the corresponding 0 not changing to a 1 on the screen when the switch is pressed. Troubleshoot using the information in *Chapter 3, Section B*, and the game schematics.

SOUND failure is indicated by the absence of any sound when any of the control panel pushbuttons or game switches are pressed. Inspect the volume controls on the utility panel, or troubleshoot using the game schematics.

MIDI TRAK-BALL™ failure is indicated by no movement or jerky movement of the cursor when the Midi Trak-Ball is rolled. If the cursor fails to move, or if movement is reversed or jerky, inspect the Midi Trak-Ball connections (see *Chapter 3, Section B*).

PLANET failure is indicated in several ways:

- If the planet fails to appear, fails to rotate, or if the missile bases fail to flash, refer to the schematics.
- If the Earth-like planet fails to appear, suspect ROMs M/N8 or T8.
- If the Jupiter-like planet fails to appear, suspect ROMs P8 or R/S8.
- If either planet has horizontal bars of color, suspect ROM S7.
- If either planet has vertically jumping blocks of color, suspect ROM T7.
- If horizontal segments of either planet are uneven during rotation, suspect ROMs N6 and P6.

To see the remaining self-test screens (2, 3, and 4), press the auxiliary coin switch on the utility panel to advance to each screen.

SCREEN 2:

EAROM or CUSTOM I/O CHIP failure is indicated by *CLEARING ENTIRE EAROM* message in the top center of the screen (see *Figure 2-3*). If the program confirms a failed ROM after clearing, *EAROM BAD* message appears in the top center of the screen. If replacing the EAROM does not correct the failure, refer to the schematics.

To erase average game score and time, press both FIRE and 1-player start pushbuttons at the same time. Release the pushbuttons. Wait until the purple message *CLEARING BOOKKEEPING DATA* disappears before continuing with other tests.

To erase the entire EAROM, press all four player pushbuttons at the same time. Release the pushbuttons. Wait until the purple message *CLEARING ENTIRE EAROM* disappears before continuing with other tests.



Figure 2-3 Self-Test Screen 2

SCREEN 3:

This screen shows the intensities of red, green, and blue (see *Figure 2-4*). Refer to the color-raster display manual for the next two adjustments. Adjust the levels of each color so that the darkest intensity is just slightly visible from black. Use this pattern for tracking adjustments.

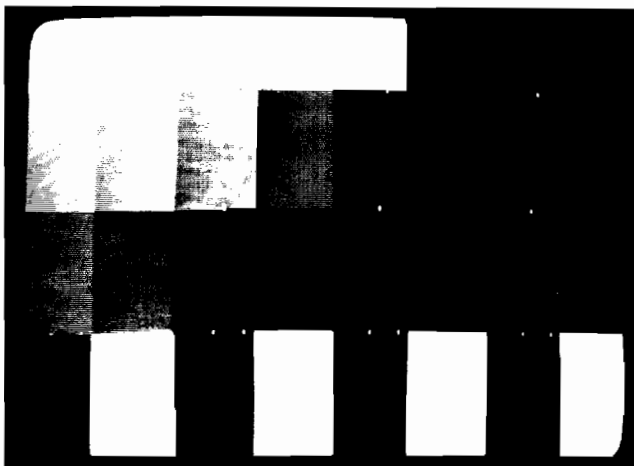


Figure 2-4 Self-Test Screen 3

SCREEN 4:

A grid pattern framed in red and green appears on the screen (see *Figure 2-5*). The corners of the green frame must be visible at all times; the corners of the red frame may or may not be visible. The corners of the display should cut across the blue boxes located in the corners of the convergence display between the red and green frames (refer to the color-raster display manual).

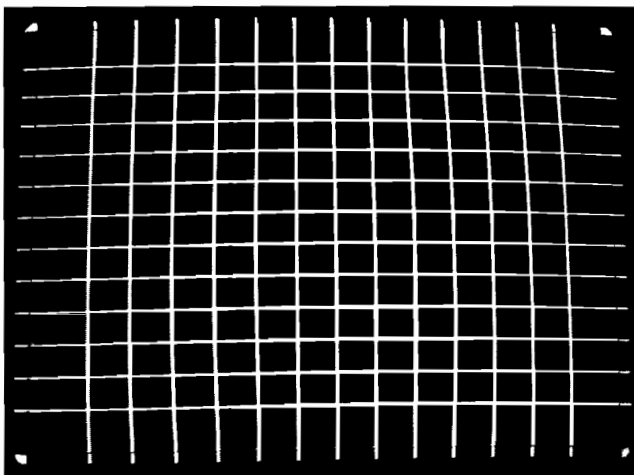


Figure 2-5 Self-Test Screen 4

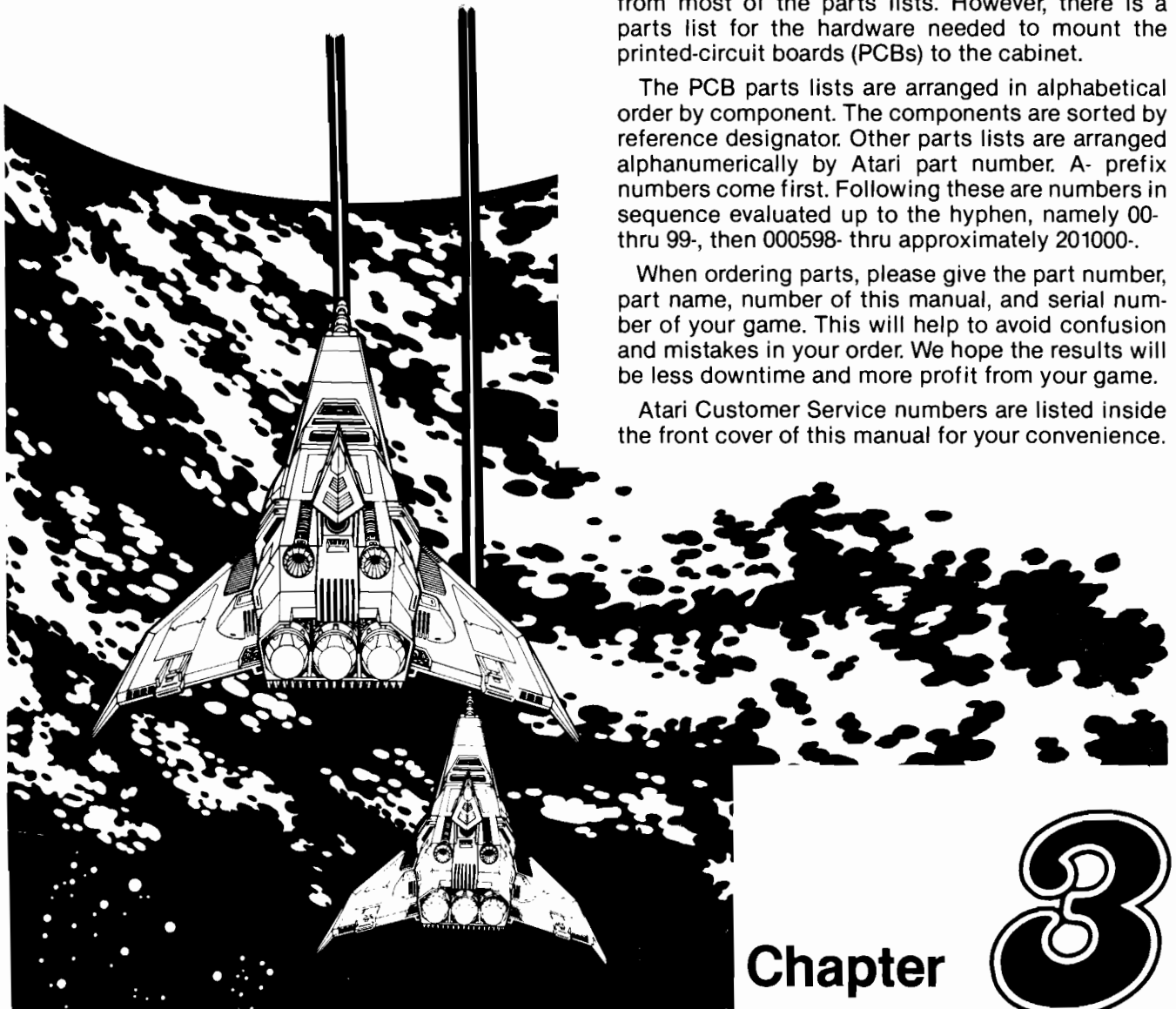
Maintenance, Repair, and Parts

This chapter details maintenance and repair information and provides information you need to order parts for your Liberator™ game. **Common hardware** (screws, nuts, washers, bolts, etc.) has been deleted from most of the parts lists. However, there is a parts list for the hardware needed to mount the printed-circuit boards (PCBs) to the cabinet.

The PCB parts lists are arranged in alphabetical order by component. The components are sorted by reference designator. Other parts lists are arranged alphanumerically by Atari part number. A- prefix numbers come first. Following these are numbers in sequence evaluated up to the hyphen, namely 00- thru 99-, then 000598- thru approximately 201000-.

When ordering parts, please give the part number, part name, number of this manual, and serial number of your game. This will help to avoid confusion and mistakes in your order. We hope the results will be less downtime and more profit from your game.

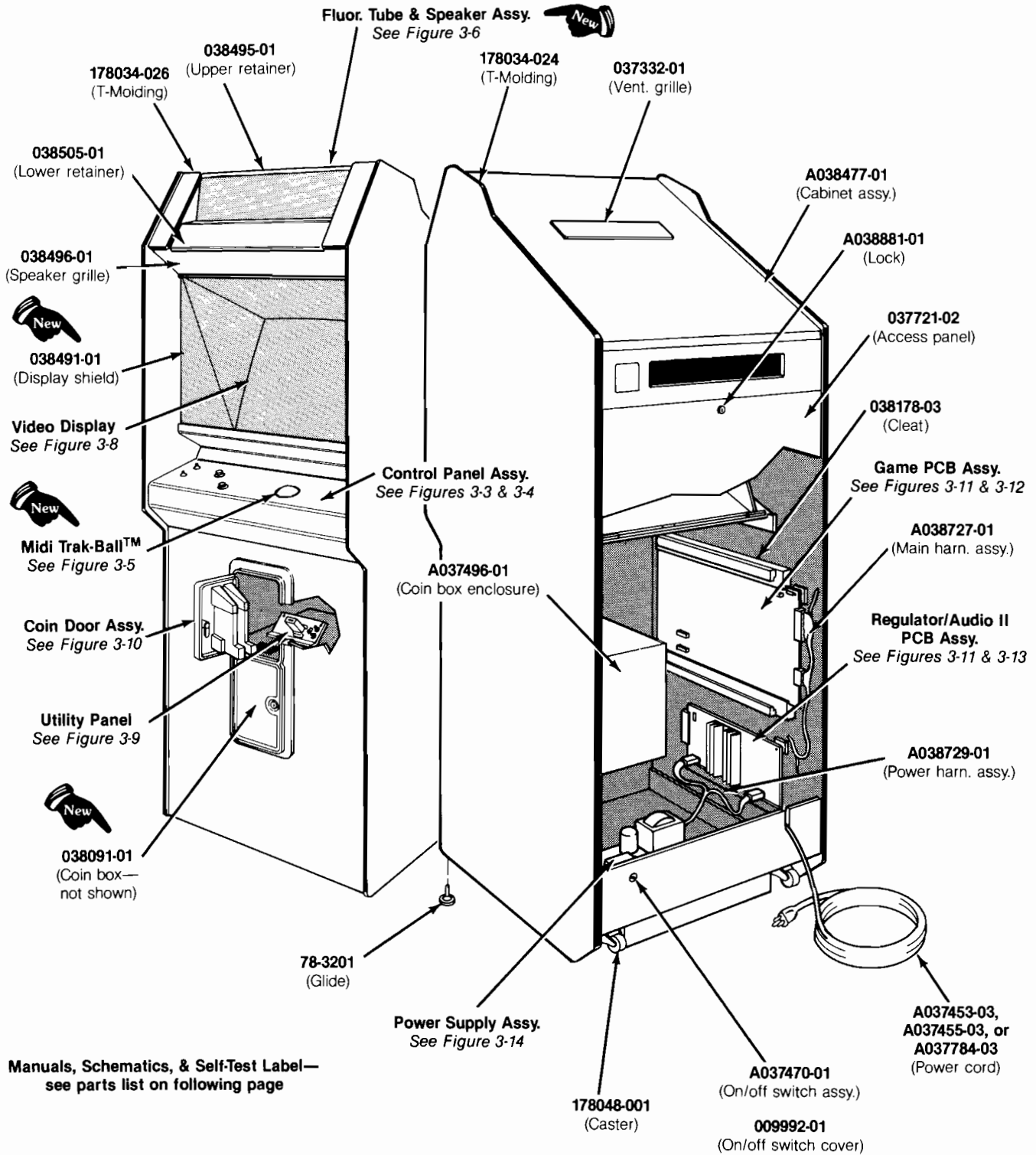
Atari Customer Service numbers are listed inside the front cover of this manual for your convenience.



Chapter

3

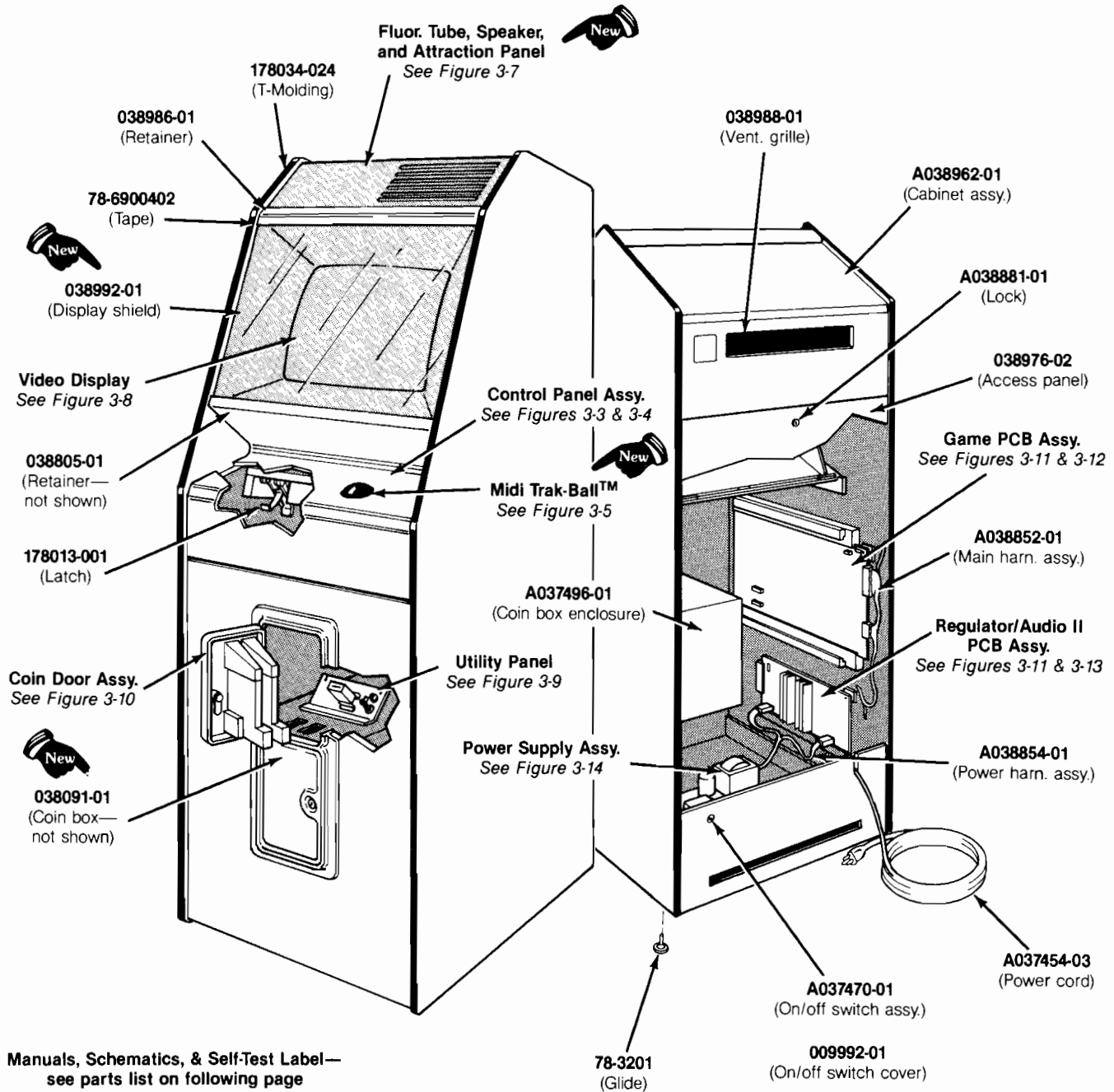
A. Cabinet-Mounted Assemblies



**Figure 3-1 Cabinet-Mounted Assemblies
Upright Cabinet A038476-01 A**

Cabinet-Mounted Assemblies Upright Cabinet Parts List

Part No.	Description
A037453-03	Strain-Relief Power Cord <i>(U.S. and Canada)</i>
A037455-03	Strain-Relief Power Cord <i>(Australia and New Zealand)</i>
A037470-01	Power On/Off Switch/Mounting Plate Assembly
A037496-01	Metal Coin Box Enclosure
A037784-03	Strain-Relief Power Cord <i>(United Kingdom, Ireland, Lebanon, Saudi Arabia, India, Hong Kong, Singapore, Egypt, Nigeria, Republic of South Africa, Zimbabwe)</i>
A038477-01	Cabinet Assembly <i>(includes glides and PCB retainers, but not the rear access panel)</i>
A038727-01	Main Harness Assembly
A038729-01	Power Harness Assembly
A038881-01	Lock Assembly <i>(for rear access panel) Acceptable substitute is part no. A038881-03</i>
 <i>The following six items are the technical information supplements to this game:</i>	
SP-209	Liberator Schematic Package
ST-209-01	Liberator Label with Self-Test Procedure and Option Switch Settings
TM-160	Service Manual for 19-Inch Electrohome Color Raster-Scan Display <i>(use with part no. 92-049)</i>
TM-201	Service Manual for 19-Inch Wells-Gardner Color Raster-Scan Display <i>(use with part no. 92-055)</i>
TM-209	Liberator Operation, Maintenance, and Service Manual
TM-220	Service Manual for 19-Inch Matsushita Color Raster-Scan Display <i>(use with part no. 139003-1004)</i>
78-3201	Adjustable Glide
009992-01	On/Off Switch Cover
037332-01	Ventilation Grille
037721-02	Rear Access Panel <i>(does not include lock)</i>
038091-01	Molded Coin Box <i>(not shown)</i>
038178-03	Dual-slotted PCB cleat
038491-01	Video Display Shield
038495-01	Upper Retainer
038496-01	Speaker Grille
038505-01	Lower Retainer
178013-001	Spring Draw Latch <i>(not shown)</i>
178034-024	3/4-Inch Black Plastic T-Molding
178034-026	13/16-Inch Black Plastic T-Molding
178048-001	2-Inch Rigid Caster



**Figure 3-2 Cabinet-Mounted Assemblies
Ireland-Built Cabinet A038961-01 & -02 A**

Cabinet-Mounted Assemblies Ireland-Built Cabinet Parts List

<i>Part No.</i>	<i>Description</i>
A037454-03	Strain-Relief Power Cord (<i>Austria, Belgium, Chile, Denmark, Finland, France, Germany, Greece, Indonesia, Italy, Netherlands, Norway, Spain, Sweden, and Uruguay</i>)
A037470-01	Power On/Off Switch/Mounting Plate Assembly
A037496-01	Metal Coin Box Enclosure
A038852-01	Main Harness Assembly
A038854-01	Power Harness Assembly
A038881-01	Lock Assembly (<i>for rear access panel</i>)
A038962-01	Cabinet Assembly (<i>includes glides and PCB retainers, but not the rear access panel</i>)
<i>The following six items are the technical information supplements to this game:</i>	
SP-209	Liberator Schematic Package
ST-209-01	Liberator Label with Self-Test Procedure and Option Switch Settings
TM-160	Service Manual for 19-Inch Electrohome Color Raster-Scan Display (<i>use with part no. 92-049</i>)
TM-201	Service Manual for 19-Inch Wells-Gardner Color Raster-Scan Display (<i>use with part no. 92-055</i>)
TM-209	Liberator Operation, Maintenance, and Service Manual
TM-220	Service Manual for 19-Inch Matsushita Color Raster-Scan Display (<i>use with part no. 139003-1004</i>)
78-3201	Adjustable Glide
78-6900402	Vinyl Foam Single-Coated Adhesive Tape, ¼-Inch Wide x ⅛-Inch Thick
009992-01	On/Off Switch Cover
038091-01	Molded Coin Box (<i>not shown</i>)
038805-01	Display Shield Retainer (<i>not shown</i>)
038976-02	Rear Access Panel (<i>does not include lock</i>)
038986-01	Attraction Panel Retainer
038988-01	Ventilation Grille
038992-01	Display Shield
178013-002	Spring Draw Latch
178034-024	¾-Inch Black Plastic T-Molding

B. The Control Panel

! WARNING !

Before you remove or repair any switch on the control panel, **switch the game to off.**

Opening the Control Panel:

1. Unlock and open the coin door (see *Figure 3-3*). Reach up through the opening to the top of the control panel and release the spring-draw latches. For the *Ireland-Built* cabinet, remove the two button-head screws that secure the panel to the lower retainer.
2. Close the coin door.
3. Lift the control panel at the top edge and tilt it toward you. The control panel on the *Upright* cabinet has foam tape on the inside edges. Make sure the tape is in good condition.

Repairing the Leaf Switches:

1. Adjust the leaf switches for a narrow gap. When a switch button is pressed, the resulting wiping action of the cross-bar contacts provides a self-cleaning feature. **Do not burnish the contacts.** To clean them, use electrical contact cleaner.
2. To remove a leaf switch, disconnect the wires and remove the screw with a Phillips-head screwdriver.

3. To remove the switch button, turn the nut with a wrench in a counterclockwise direction from inside the control panel. The ring on the outside of the control panel should not spin.
4. Replace the switch, reconnect the harness wires as shown in the *Schematic Package, Game Wiring Diagram*. Make sure the colored wires are routed to their matching colored tabs on the switch.

Repairing the LED Start Switches:

These switches have a very low failure rate. If you suspect switch failure, test it using the following directions.

Testing the LED Switch:

1. Disconnect the wires from the switch.
2. Attach the leads of an ohmmeter to the normally open and common contacts.
3. Check the contacts (push and release the switch button) for closed and open continuity.
4. If the contacts do not operate sharply or always remain closed or open, replace the switch.

Replacing the LED Switch:

1. Disconnect the wires from the switch.
2. Turn the switch counterclockwise while holding the black cone shaped bushing on the outside of the control panel.
3. Install a new switch using the reverse procedure.
4. Reconnect the wires as shown in *Figure 3-3*.

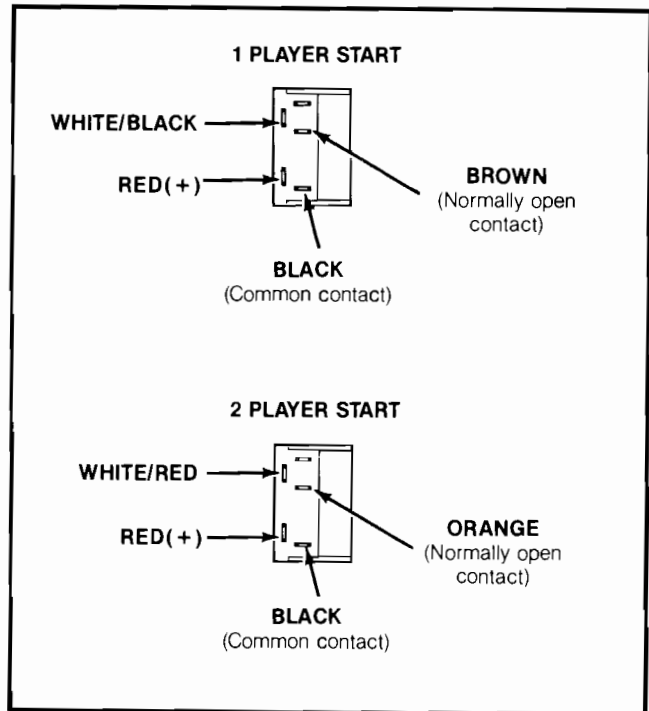
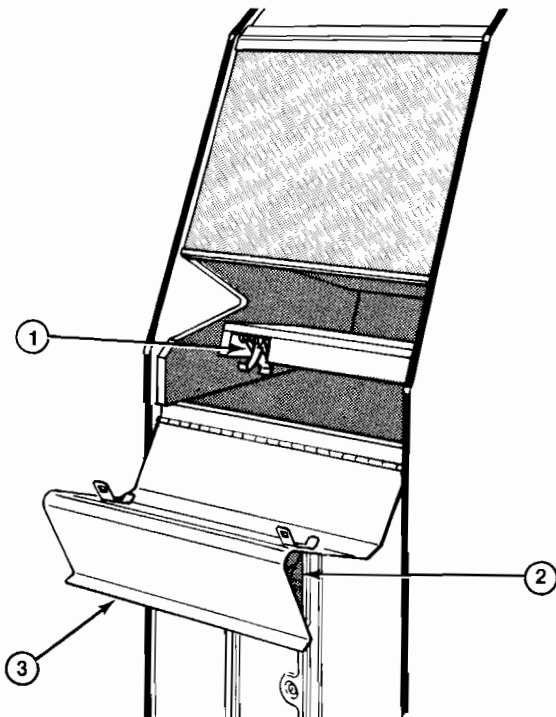


Figure 3-3 Control Panel

WARNING

Players may receive an electric shock if this control panel is not properly grounded! After servicing any parts on the panel, make sure that the ground wire is firmly attached to the metal tab on the inside of the control panel.

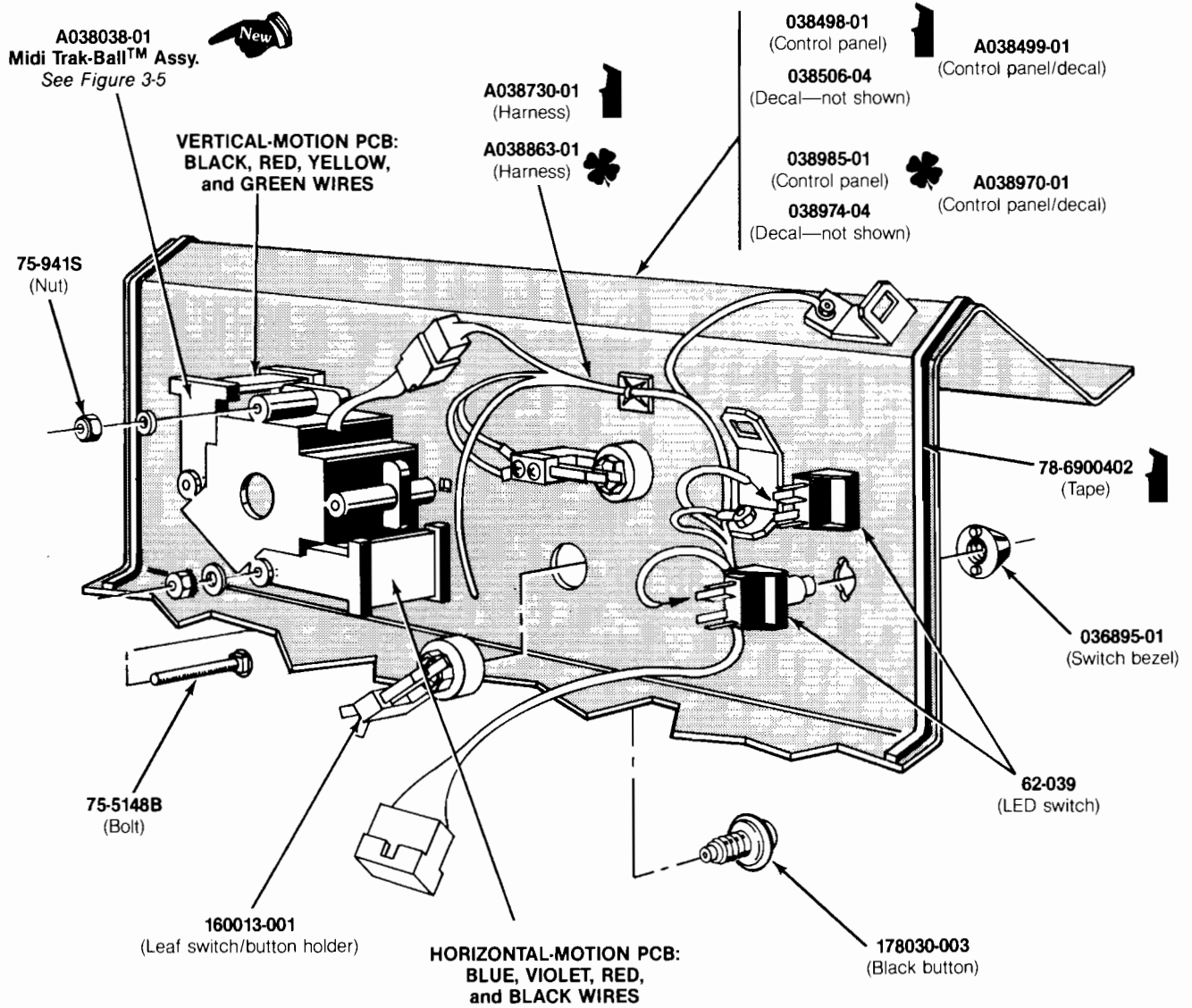


Figure 3-4 Control Panel Assembly
Upright Cabinet A038500-01 A
Ireland-Built Cabinet A038969-01 A

Control Panel Assembly Parts List

<i>Part No.</i>	<i>Description</i>
<i>Upright Cabinet</i>	
A038499-01	Control Panel with Decal
A038730-01	Control Panel Harness Assembly
78-6900402	Vinyl Foam Single-Coated Adhesive Tape, 1/4-Inch Wide x 1/8-Inch Thick (24 in. required)
038498-01	Control Panel
038506-04	Control Panel Decal
<i>Ireland-Built Cabinet</i>	
A038863-01	Control Panel Harness Assembly
A038970-01	Control Panel with Decal
038974-04	Control Panel Decal
038985-01	Control Panel
<i>Upright and Ireland-Built Cabinets</i>	
A038038-01	Midi Trak-Ball™ Assembly
62-039	SPDT Momentary Pushbutton Start Switch with Red Light-Emitting Diode
75-941S	#10-24 Self-Locking Nut
75-5148B	#10-24 Black Carriage Bolt
036895-01	Black Molded Switch Bezel
160013-001	Leaf Switch and Button Holder (leaf switch only is part no. 160012-001)
178030-003	Black Pushbutton Assembly

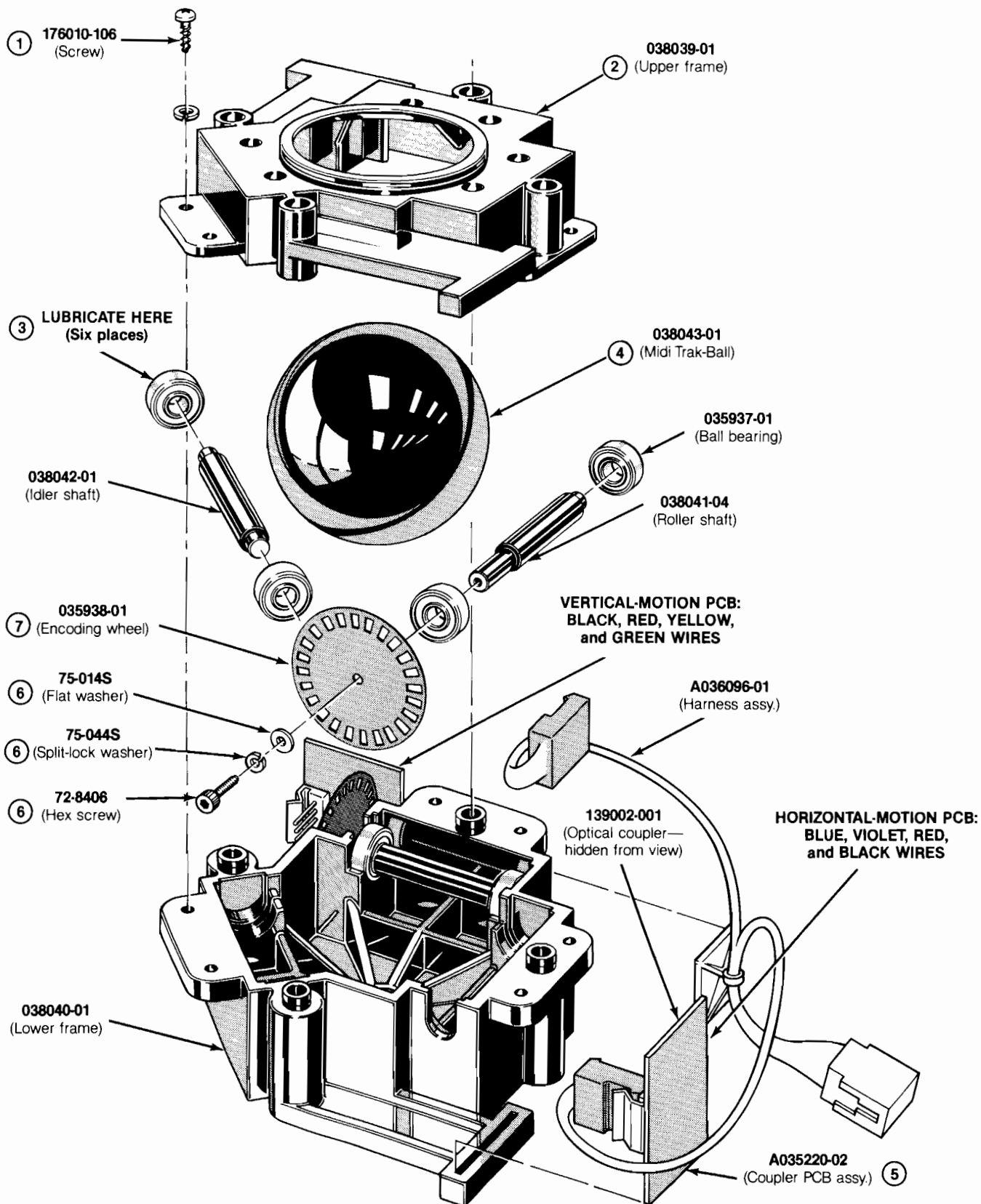


Figure 3-5 Midi Trak-Ball™ Assembly
A038038-01 A

WARNING

Prior to removing or repairing the Midi Trak-Ball, **switch the game to off.**

6. Remove the socket-head screw, flat washer, and split-lock washer that secure the encoding wheel.
7. Remove the encoding wheel.
8. Reassemble and reinstall in reverse order.

Lubricating the Midi Trak-Ball™:

1. Remove the entire Midi Trak-Ball assembly from the control panel (see *Figure 3-4*). Remove the six screws that secure the upper and lower frames together (see *Figure 3-5*).
2. Lift off the top frame.
3. Lubricate each of the six ball bearings with two drops of 3 in-One® oil. Lubricate approximately every three months or 6,000 credits (credits are counted on the coin counter).

NOTE

When you replace the PCB, make sure that the metal encoding wheel is not bent or damaged. It should turn freely between the two halves of the radial optical coupler.

Removing the Midi Trak-Ball, Coupler PCB and Encoding Wheel:

4. Follow steps 1 through 3. Then remove the Midi Trak-Ball.
5. Lift the PCB out of its slot. Carefully disconnect the red connector and remove the PCB.

Adjusting the Midi Trak-Ball control:

9. When you tighten the encoding wheel, rotate the socket-head screw on the end of the roller shaft until a hole in the shaft is visible through the hole in the top of the frame.
10. Insert a 3/16-inch diameter pin or screwdriver through the hole in the shaft.
11. Tighten the socket-head screw with an Allen wrench.

Circled numbers match numbered instructions. Disassemble in the order indicated.

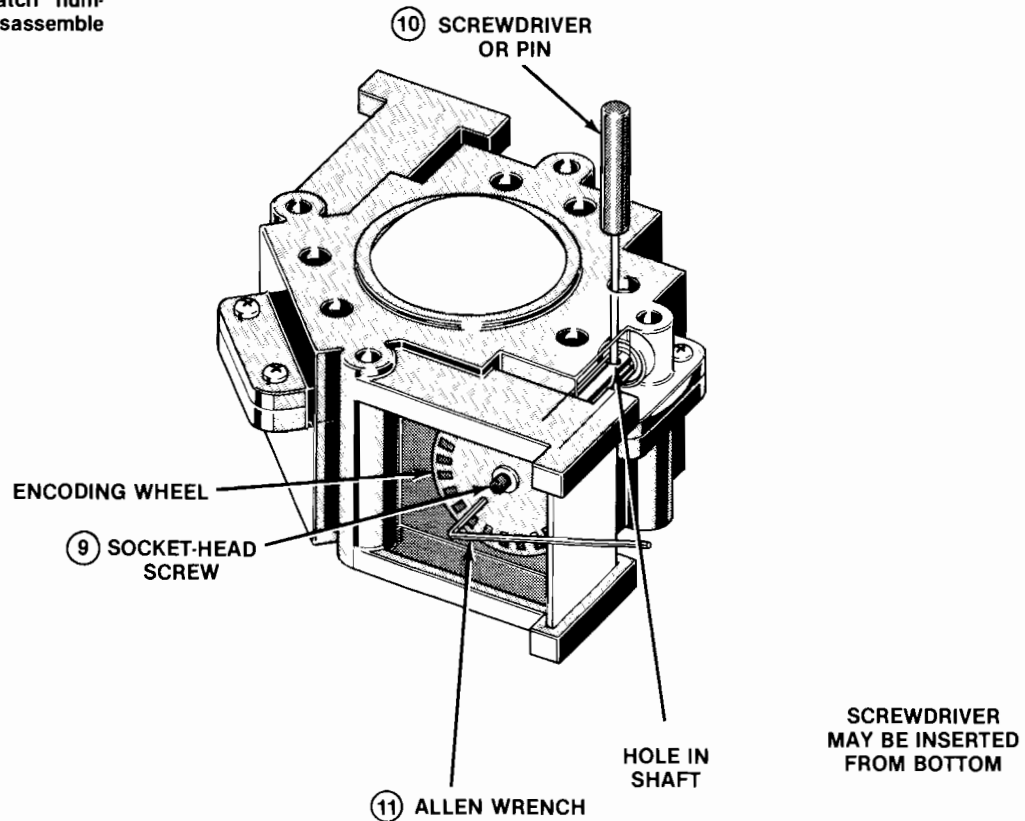


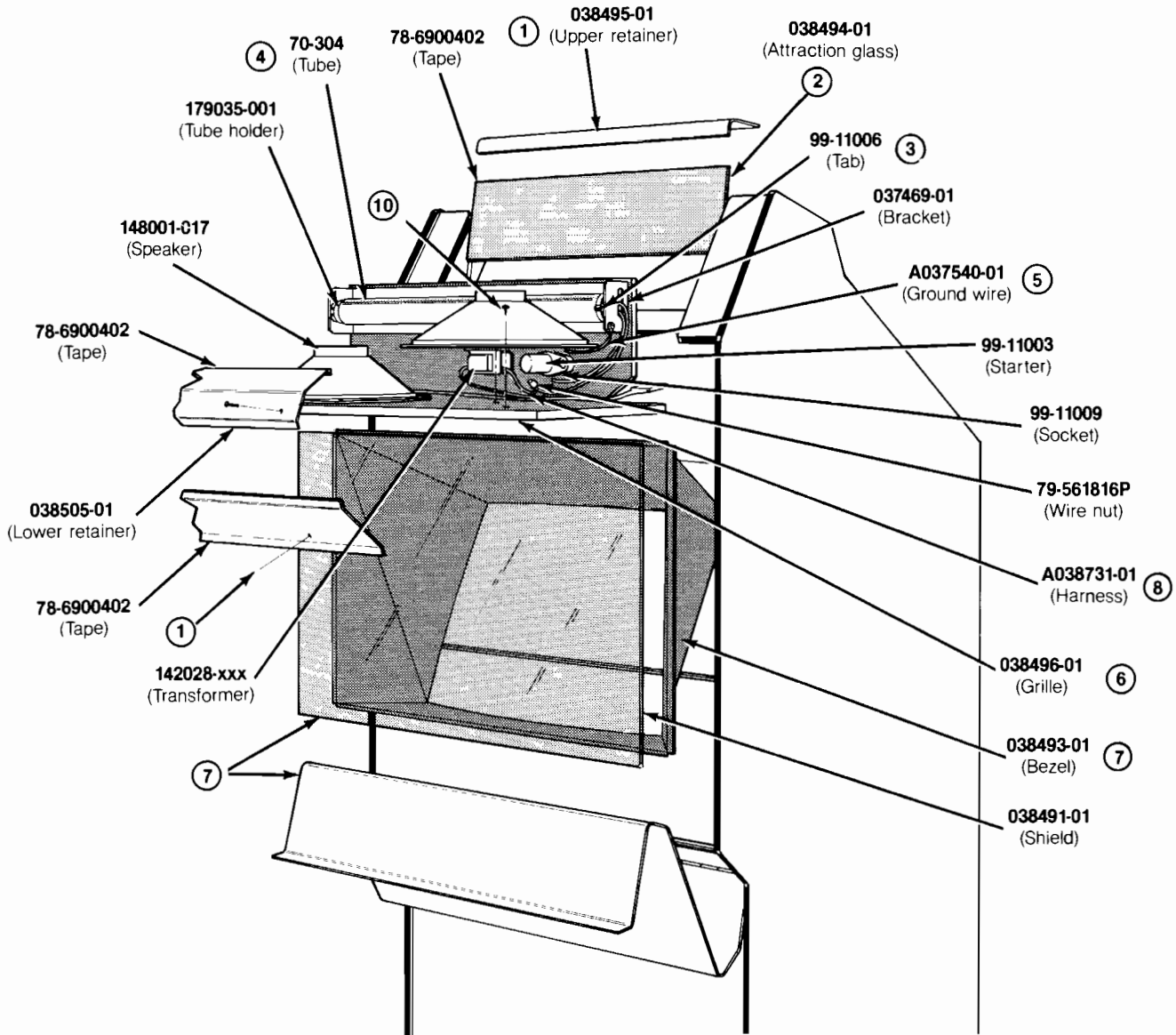
Figure 3-5 Midi Trak-Ball Assembly, continued

Midi Trak-Ball™ Assembly Parts List

<i>Part No.</i>	<i>Description</i>
A035220-02	Coupler PCB Assembly <i>(includes Radial Optical Coupler)</i>
A036096-01	Harness Assembly
72-8406	#4-40 x $\frac{3}{8}$ -Inch, Hex Socket-Head Steel Machine Screw
75-014S	#4 Flat SAE-Standard, Zinc-Plated Steel Washer
75-044S	#4 Split-Lock, Zinc-Plated Steel Washer
034168-01	Label with Lubrication Instructions <i>(not shown)</i>
035937-01	Ball Bearing <i>(6 per assembly)</i>
035938-01	Etched Encoding Wheel
038039-01	Upper Black Plastic Frame
038040-01	Lower Black Plastic Frame
038041-01	Roller Shaft
038042-01	Idler Shaft
038043-01	Midi Trak-Ball <i>(3-inch diameter)</i>
139002-001	Radial Optical Coupler <i>(located on the Coupler PCB Assembly)</i>
176010-106	#8 x $\frac{1}{8}$ -Inch Cross-Recessed, Pan-Head, Zinc-Plated Steel Screw



C. Fluorescent Tube and Speaker

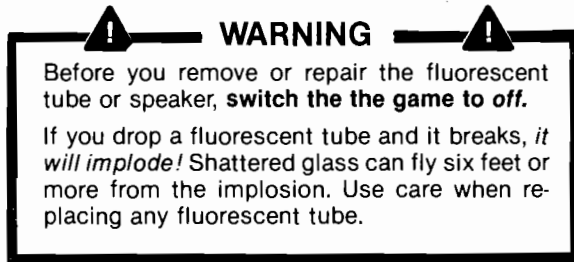


Circled numbers match numbered instructions. Disassemble in the order indicated.

NOTE

To make sure that the fluorescent tube starts, check that the ground wire is firmly attached to both the ballast transformer and the steel lamp bracket.

Figure 3-6 Fluorescent Tube and Speaker
Upright Cabinet A038504-01 & -02 A



Upright Cabinet

Replacing the Fluorescent Tube:

1. Remove the three screws and lock washers that secure the upper attraction-panel retainer to the cabinet. *Loosen* the two screws that secure the lower retainer to the cabinet.
2. Lift the attraction glass up and out of the lower retainer.
3. Remove the cardboard locking tab at each end of the tube. Slightly rotate the tube up or down and carefully remove it from the lampholders.
4. Replace it with a new tube. Do not snap in the tube vigorously—you may break it, causing an implosion! Replace the locking tabs.

5. Check that the green ground wire is securely attached to the large metal bracket and the ballast transformer on the wood panel. If the tube is not grounded, it may not start.

Upright Cabinet

Replacing the Speakers:

6. Perform steps 1 and 2. Remove the speaker grille.
7. Open the control panel, and remove the display glass and display bezel.
8. Disconnect the 5-pin fluorescent tube and speaker harness connector.
9. Remove three screws that secure the tube and speaker board to the cabinet. Hold the board **securely** with one hand and remove the fourth screw. Remove the board.
10. Disconnect the two plug-in connectors on the speaker. Note that the white wire (+) connects on the side marked with a painted dot. Remove the screws that attach the speaker to the board. Replace the speaker and reinstall the tube and speaker board. Be sure that the tube and speaker board is flush with the upper front panel when you secure the board to the cabinet. Reassemble in reverse order.

Fluorescent Tube and Speaker Upright Cabinet Parts List

Part No.	Description
A037540-01	Ground Wire with Ring Lug
A038731-01	Tube and Speaker Harness Assembly
70-304	18-Inch, 15 W, Cool White Fluorescent Tube
78-6900402	Vinyl Foam Single-Coated Adhesive Tape, ¼-Inch Wide x ½-Inch Thick
79-561816P	Spring-Connector Wire Nut for 16- to 18-Gauge Wires
99-11003	Fluorescent Tube Starter
99-11006	Fluorescent Tube Locking Tab (<i>tab consists of two pieces</i>)
99-11009	Starter Socket
037469-01	Steel Tube Bracket
038491-01	Video Display Shield
038493-01	Video Display Bezel
038494-01	Attraction Glass with Graphics
038495-01	Upper Attraction Glass Retainer
038496-01	Speaker Grille
038505-01	Lower Attraction Glass Retainer
148001-017	6 x 9-Inch Oval, 8 Ω, 6-Ounce, Shielded High-Fidelity Speaker
142028-001	60 Hz, 118 V, Ballast Transformer (<i>used on A038504-01 assembly</i>)
142028-002	50 Hz, 118 V, Ballast Transformer (<i>used on A038504-02 assembly</i>)
179035-001	2-Pin Fluorescent Tube Holder

! WARNING !

Before you remove or repair the fluorescent tube or speaker, **switch the the game to off.**

If you drop a fluorescent tube and it breaks, *it will implode!* Shattered glass can fly six feet or more from the implosion. Use care when replacing any fluorescent tube.

3. Disconnect the two speaker connectors. Note that the white wire (+) connects on the side of the speaker marked with a painted dot.
4. Remove the screws that attach the speaker to the board. Replace the speaker. Reassemble in reverse order.

Ireland-Built Cabinet

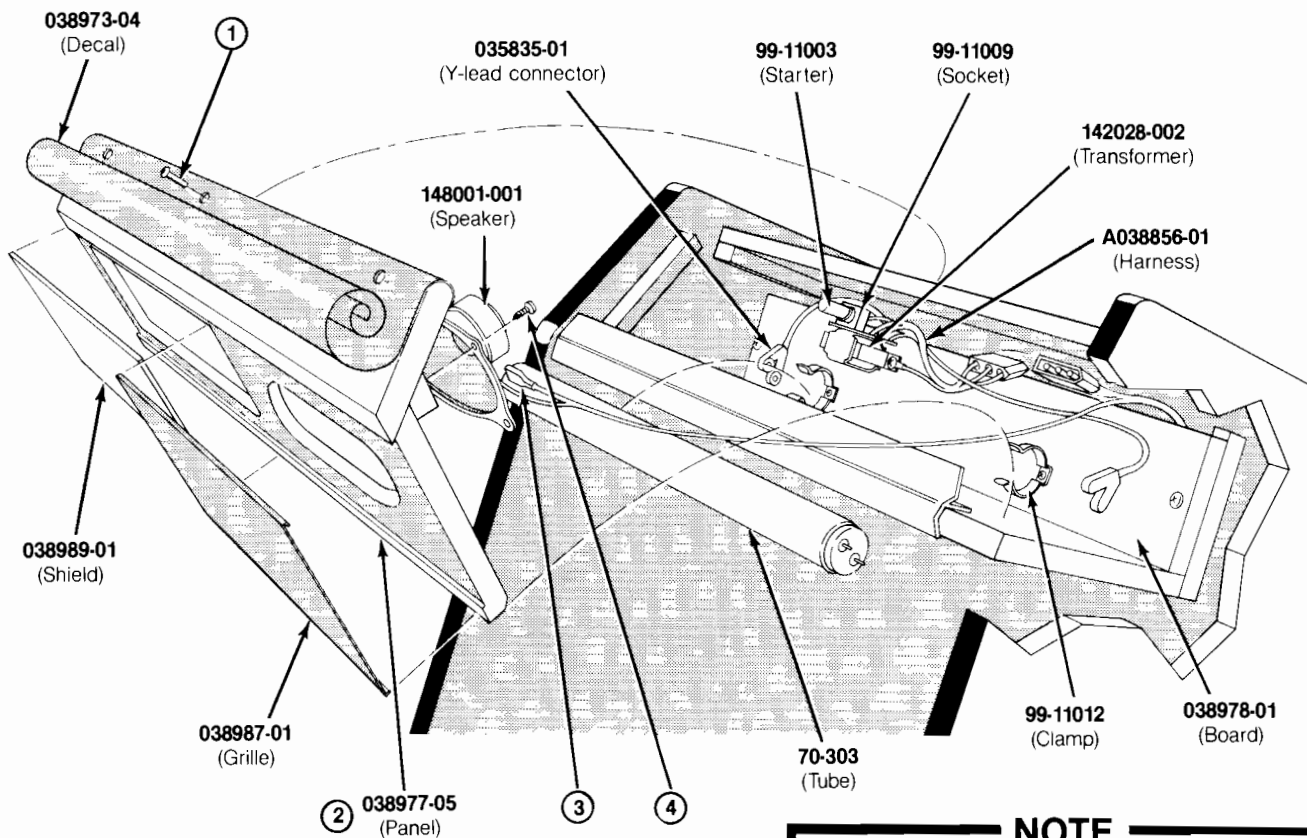
Replacing the Speaker:

1. Remove the three screws that secure the top of the attraction panel to the cabinet.
2. Grasp the panel at the top edge and pull it forward (be careful not to damage the speaker that is attached under the grille). Lift the panel up and out of the cabinet. Lay the panel on the top of the cabinet.

Ireland-Built Cabinet

Replacing the Fluorescent Tube:

5. Perform steps 1 and 2. Remove the Y-lead connectors at each end of the tube.
6. Replace with a new tube. Do not snap in the tube vigorously—you may break it, causing an implosion! Replace the Y-lead connectors.
7. Reassemble in reverse order.



Circled numbers match numbered instructions. Disassemble in the order indicated.

NOTE

To make sure that the fluorescent tube starts, check that the ground wire is firmly attached to the ballast transformer.

**Figure 3-7 Fluorescent Tube, Speaker, and Attraction Panel
Ireland-Built Cabinet**

**Fluorescent Tube, Speaker, and Attraction Panel
Ireland-Built Cabinet
Parts List**

<i>Part No.</i>	<i>Description</i>
A038856-01	Tube and Speaker Harness Assembly
70-303	18-Inch, 15-W, Cool White Fluorescent Tube
99-11003	Fluorescent Tube Starter
99-11009	Starter Socket
99-11012	1 1/8-Inch Fluorescent Tube Clamp
035835-01	12-Inch Y-Lead Connector
038973-04	Attraction Panel Decal
038977-05	Speaker/Attraction Panel
038978-01	Fluorescent Tube Board
038987-01	Speaker/Attraction Panel Grille
038989-01	Attraction Panel Shield <i>(does not include decal)</i>
142028-002	50 Hz, 118 V, Ballast Transformer
148001-001	6 x 9-Inch Oval, 4 Ω, 6-Ounce, Shielded High-Fidelity Speaker

D. Video Display



WARNING

SHOCK HAZARD

The following procedure should only be performed by a *qualified service technician*. Before removing or repairing the video display, **switch the game to off**. As an extra precaution, we highly recommend you **discharge the high voltage** from the picture tube.

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

IMPLOSION HAZARD

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

Upright Cabinet

Removing the Video Display:

1. From the back of the cabinet, open the rear access panel. Unplug the display harness connectors and disconnect the ground wire (see *Figure 3-8*). Remove the hardware that secures the display chassis to the wood display shelf.
2. From the front of the cabinet, loosen the screws on the lower retainer. Remove the three screws that secure the speaker grille to the cabinet and remove the grille (see *Figure 3-6*).
3. Open the control panel and remove the display shield (see *Figure 3-6*).
4. Remove the cardboard bezel.
5. Carefully remove the display through the front of the cabinet. Place it on a soft mat in a protected location. After servicing the display, reinstall it in reverse order.

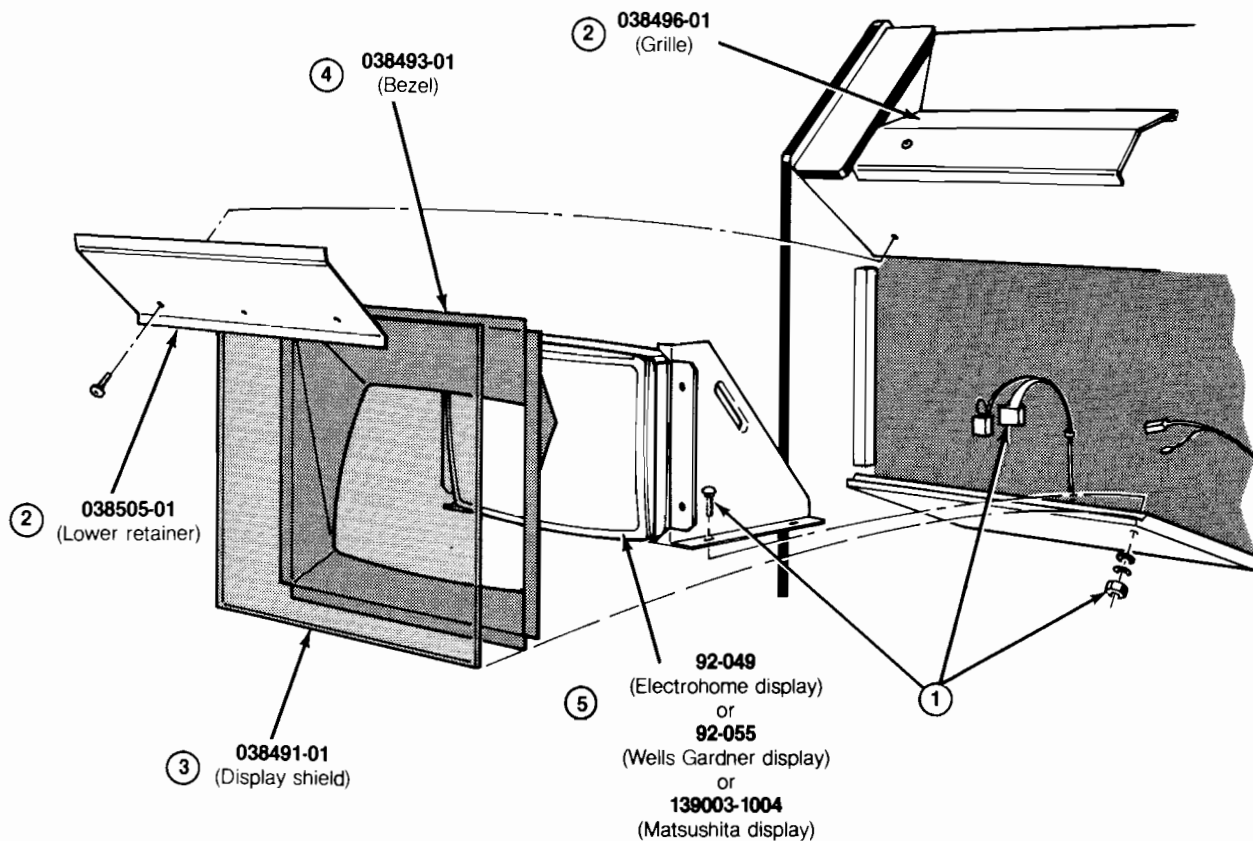


Figure 3-8 Video Display Upright Cabinet

WARNING

SHOCK HAZARD

The following procedure should only be performed by a *qualified service technician*. Before removing or repairing the video display, **switch the game to off**. As an extra precaution, we highly recommend you **discharge the high voltage** from the picture tube.

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

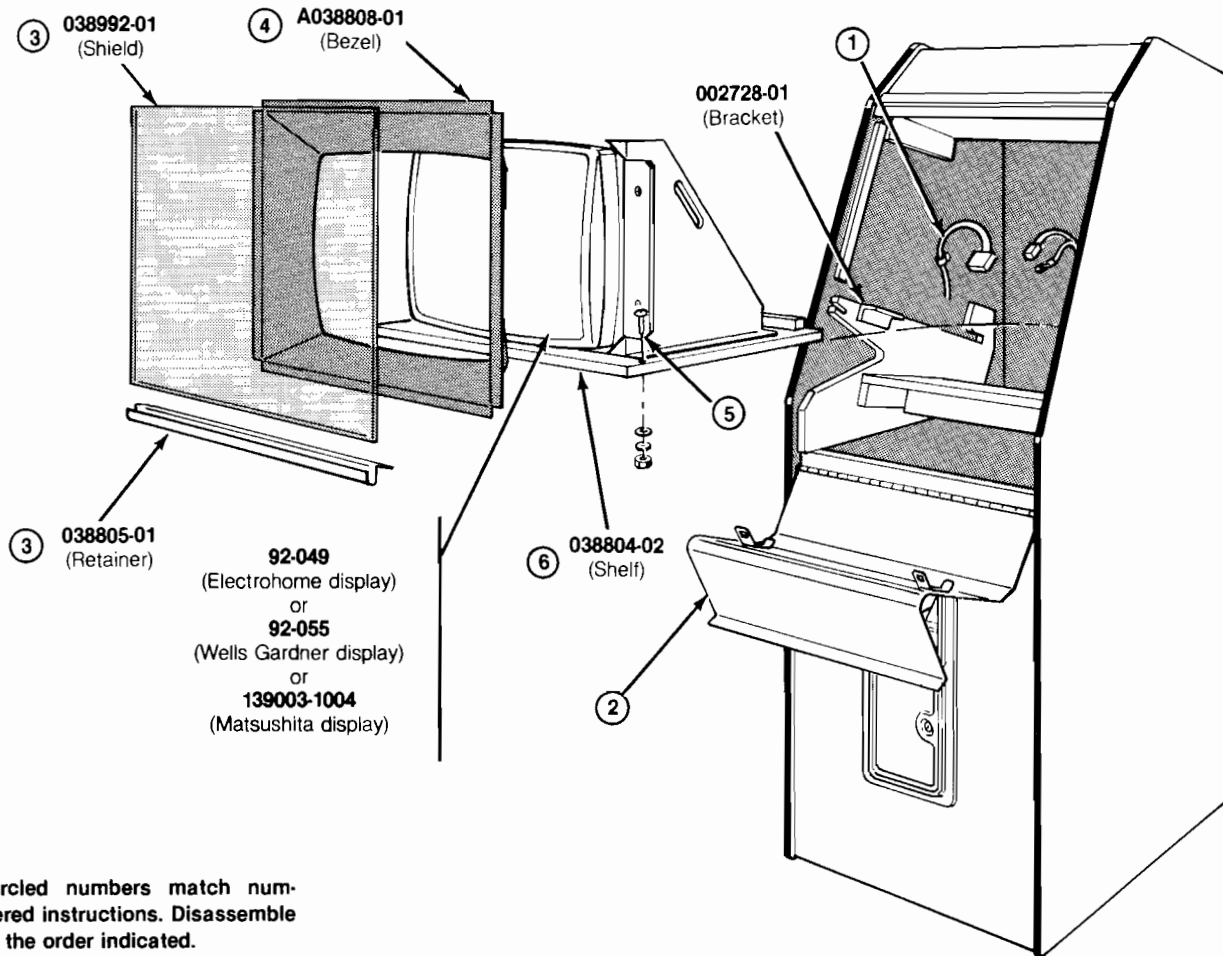
IMPLOSION HAZARD

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

Ireland-Built Cabinet

Removing the Video Display:

1. From the back of the cabinet, open the rear access panel. Unplug the display harness connectors and disconnect the ground wire (see *Figure 3-8*).
2. From the front of the cabinet, open the control panel (see *Figure 3-3*).
3. Grasp the metal retainer that holds the bottom of the video display shield and slide the retainer and the shield down and out of the cabinet.
4. Remove the cardboard bezel.
5. The wood display shelf is secured to the cabinet with two metal brackets. Remove the two sets of hardware that secure the shelf to these brackets.
6. Carefully pull the wood display shelf and display out through the front of the cabinet. Place the display in a protected location. After servicing the display, reinstall it in reverse order.



Circled numbers match numbered instructions. Disassemble in the order indicated.

**Figure 3-8 Video Display, continued
Ireland-Built Cabinet**

Video Display Upright and Ireland-Built Cabinets Parts List

<i>Part No.</i>	<i>Description</i>
<i>For Upright Cabinet</i>	
038493-01	Display Bezel
038491-01	Display Shield
038496-01	Speaker Grille
038505-01	Lower Retainer
<i>For Ireland-Built Cabinet</i>	
A038808-01	Display Bezel
002728-01	Display Shelf Bracket
038804-02	Display Shelf
038805-01	Display Shield Retainer
038992-01	Display Shield
<i>For Upright and Ireland-Built Cabinets</i>	
92-049	19-Inch Electrohome Color Raster-Scan Display <i>Alternate displays are:</i> 92-055—19-Inch Wells-Gardner Color Raster-Scan Display 139003-1004—19-Inch Matsushita Color Raster-Scan Display

E. Utility Panel

WARNING

Before removing or repairing the utility panel, **switch the game to off.**

Players may receive an electric shock if the utility panel is not properly grounded! After servicing any parts on the panel, make sure that the ground wire is firmly attached to the metal screw on the back of the coin counter.

NOTE

Only the Ireland-Built cabinet has two coin counters.

The utility panel is located inside the upper coin door. This panel includes the volume control, self-test switch, auxiliary coin switch, and the coin counter(s). The coin switch is used to credit the game without activating the coin counter.

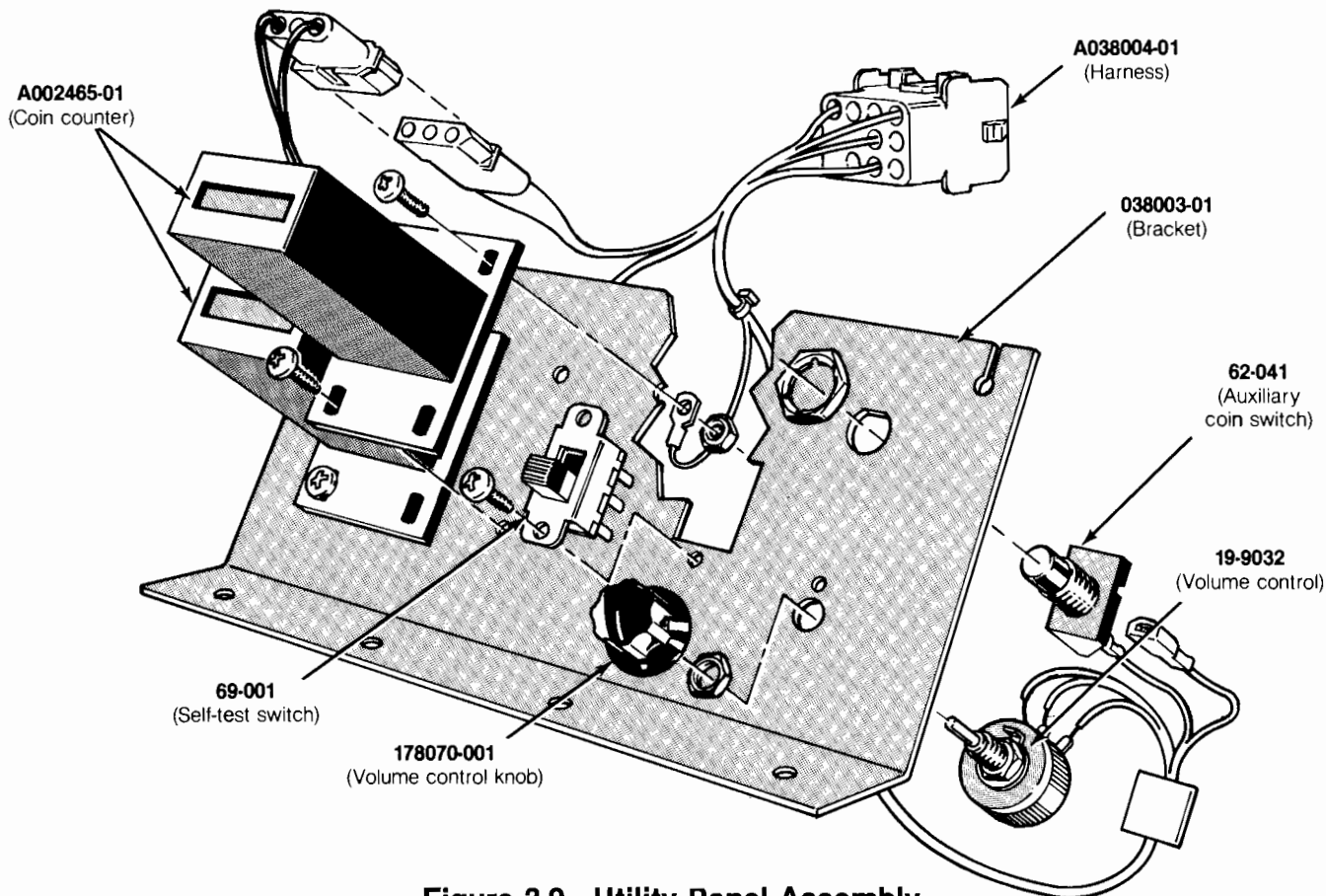
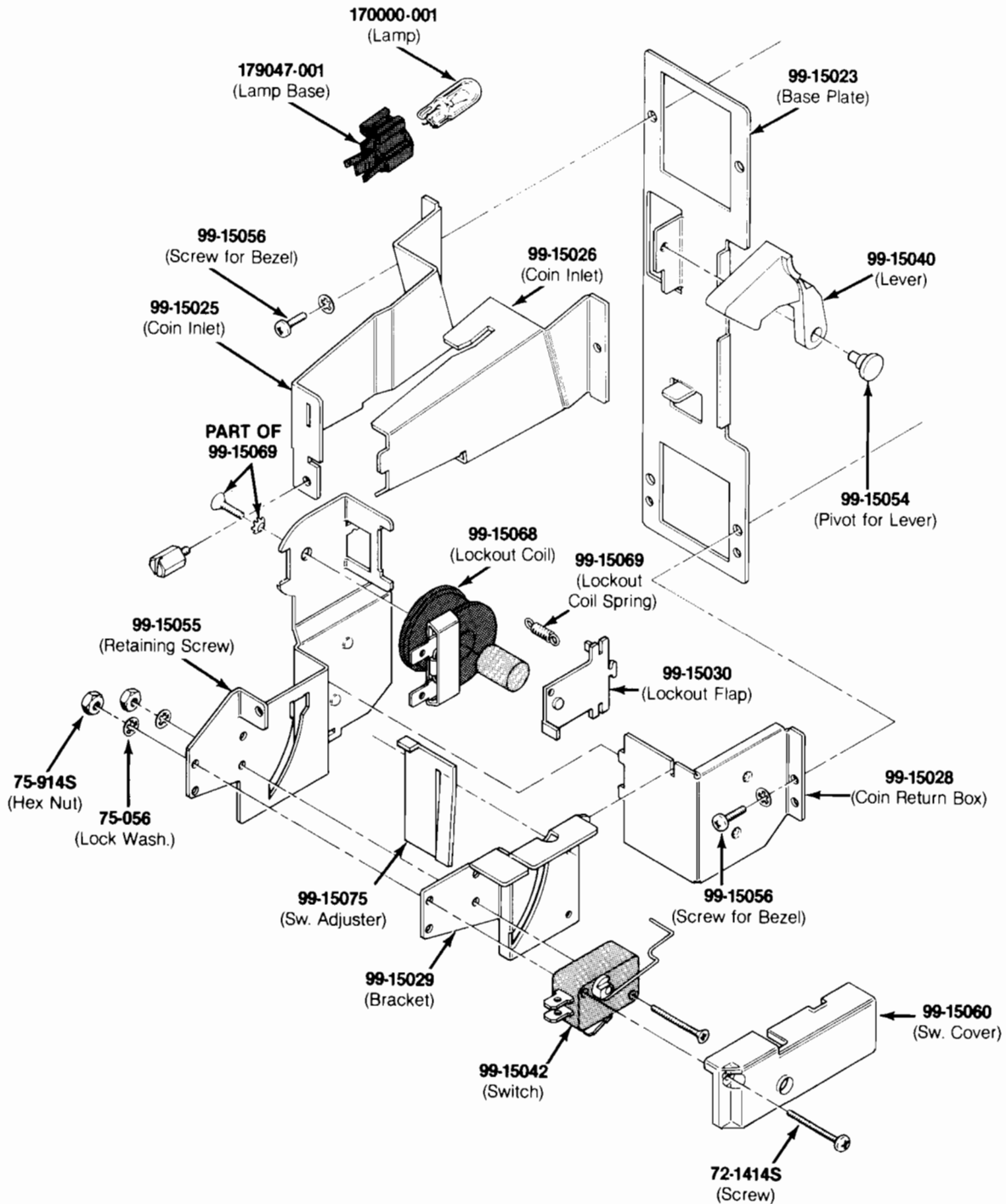


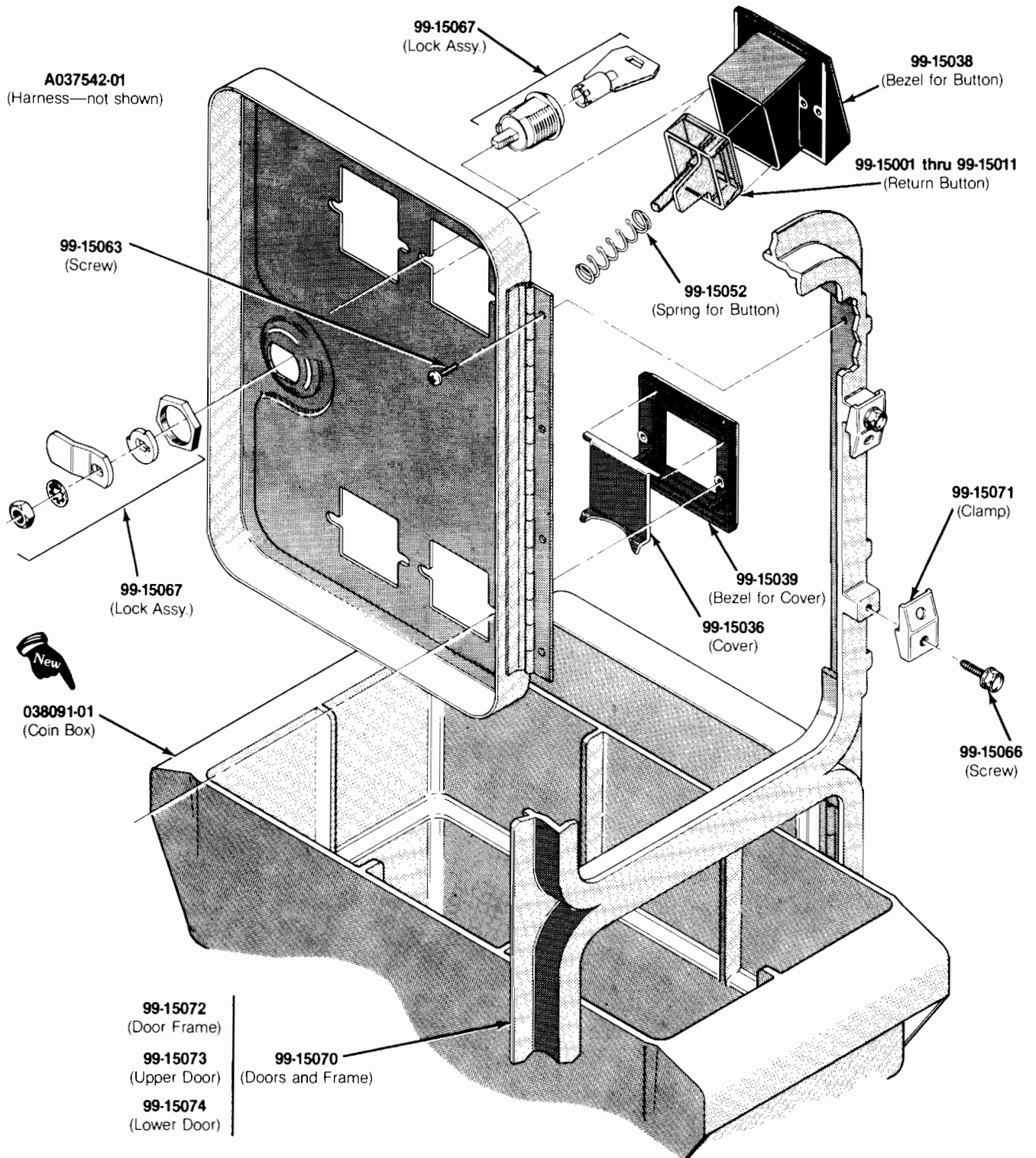
Figure 3-9 Utility Panel Assembly Parts List

Part No.	Description
A002465-01	6 V Coin Counter
A038004-01	Utility Panel Harness
19-9032	Volume Control
62-041	SPDT Momentary-Contact Pushbutton Auxiliary Coin Switch with Black Cap
69-001	DPDT Self-Test Switch
038003-01	Utility Panel Bracket
178070-001	Volume Control Knob

F. Coin Door



**Figure 3-10 Vertically Mounted Coin Door
A037619-xx D**



- A037619-01 — U.S. 25¢/25¢ Coin Door
- A037619-02 — U.S. 50¢/50¢ Coin Door
- A037619-03 — Canadian 25¢/25¢ Coin Door
- A037619-04 — British 10 P/10 P Coin Door
- A037619-05 — British 10 P/50 P Coin Door
- A037619-06 — British 20 P/50 P Coin Door
- A037619-07 — Australian 20¢/20¢ Coin Door

- A037619-08 — German 1 DM/1 DM Coin Door
- A037619-09 — German 2 DM/1 DM Coin Door
- A037619-10 — German 2 DM/5 DM Coin Door
- A037619-11 — German 1 DM/5 DM Coin Door
- A037619-12 — 5 Fr/5 Fr Coin Door
- A037619-13 — Swiss 1 Fr/1 Fr Coin Door
- A037619-14 — French 1 Fr/1 Fr Coin Door

- A037619-15 — French 2 Fr/1 Fr Coin Door
- A037619-16 — Swedish 1 Kr/1 Kr Coin Door
- A037619-17 — Spanish 25 Pts/25 Pts Coin Door
- A037619-18 — Italian 100 L/100 L Coin Door
- A037619-19 — Hong Kong \$1/\$1 Coin Door
- A037619-20 — Japanese 100Y/100Y Coin Door

Figure 3-10 Vertically Mounted Coin Door, continued
A037619-xx D

Vertically Mounted Coin Door Parts List

<i>Part No.</i>	<i>Description</i>
A037542-01	Harness Assembly
72-1414S	#4-40 × 7/8-Inch Cross-Recessed Pan-Head Steel Machine Screw
75-056	#6 Internal-Tooth Zinc-Plated Steel Lock Washer
75-914S	#4-40 Steel Machine Hex Nut
75-3414S	#4-40 × 7/8-Inch 82° Cross-Recessed Flat-Head Steel Machine Screw
99-15001	Coin Return Button with U.S. 25¢ Price Plate
99-15002	Coin Return Button with U.S. \$1 Price Plate
99-15003	Coin Return Button with German 1 DM Price Plate
99-15004	Coin Return Button with German 2 DM Price Plate
99-15005	Coin Return Button with German 5 DM Price Plate
99-15006	Coin Return Button with Belgian 5 Fr Price Plate
99-15007	Coin Return Button with French 1 Fr Price Plate
99-15008	Coin Return Button with Japanese 100 Yen Price Plate
99-15009	Coin Return Button with British 10 Pence Price Plate
99-15010	Coin Return Button with Australian 20¢ Price Plate
99-15011	Coin Return Button with Italian 100 Lire Price Plate
99-15023	Base Plate
99-15025	Left Half of Coin Inlet
99-15026	Right Half of Coin Inlet
99-15027	Side Plate of Coin Return Box
99-15028	Base Plate of Coin Return Box
99-15029	Switch Bracket
99-15030	Flap for Lockout Coil (U.S. 25¢)
99-15036	Metal Coin Return Cover
99-15038	Bezel for Coin Return Button
99-15039	Metal Bezel for Coin Return Cover
99-15040	Coin Return Lever
99-15042	Coin Switch for U.S. 25¢
99-15052	Spring for Coin Return Button
99-15054	Pivot for Coin Return Lever
99-15055	Retaining Screw
99-15056	#4-40 × 5/16-Inch Cross-Recessed Pan-Head Steel Machine Screw
99-15060	Switch Cover
99-15063	Screw for Hinge
99-15066	Screw for Clamp
99-15067	Lock Assembly
99-15068	Lockout Coil
99-15069	Spring for Lockout Coil
99-15070	Doors and Frame
99-15071	Clamp for Frame
99-15072	Door Frame
99-15073	Upper Door
99-15074	Lower Door
99-15075	Switch Adjuster
038091-01	Coin Box <i>(Not included in assembly) Acceptable substitute is part number A037491-01</i>
170000-001	6.3V Miniature Wedge-Base Incandescent Lamp
171006-035	Metal Coin Mechanism
179047-001	Lamp Base

G. Printed-Circuit Boards

WARNING

Before you remove or repair any printed-circuit board (PCB), **switch the game to off.**

Removing the Printed-Circuit Boards:

1. Open the rear access panel.
2. For the *game* PCB, unplug the two edge connectors (see Figure 3-11).
3. Remove the screw and two washers that secure the PCB to the cabinet. **Carefully** slide the PCB straight out of its slots. Be careful not to twist the board, as this may loosen connections or components. Replace or repair as required, and reinstall the PCB.
4. For the *Regulator/Audio II* PCB, disconnect the five small harness connectors on this board.

5. Remove the screw and two spacers that secure the Regulator/Audio II PCB to the cabinet, and carefully remove the board from its slot. Do not twist the board, as this may loosen connections or components. Replace or repair as required, and reinstall the PCB.

CAUTION

Make sure that the connectors on the PCB are properly plugged in. Note that they are keyed to fit only one way. If they do not slip on easily, do not force them. **A reversed connector may damage your game and void the warranty.**

6. Close and lock the rear access panel.
7. Make sure that the game is operating correctly by performing the self-test. Performing self-test is very important when you repair a PCB.

Printed-Circuit Board Mounting Hardware Parts List

Part No.	Description
72-6810S	#8 x 3/8-Inch Cross-Recessed Pan-Head Screw
034536-02	Foam Pad
038178-03	Dual-Slotted Retainer
175004-708	#8 Fiber Washer
176015-110	#10 x 3/8-Inch Pan-Head Screw

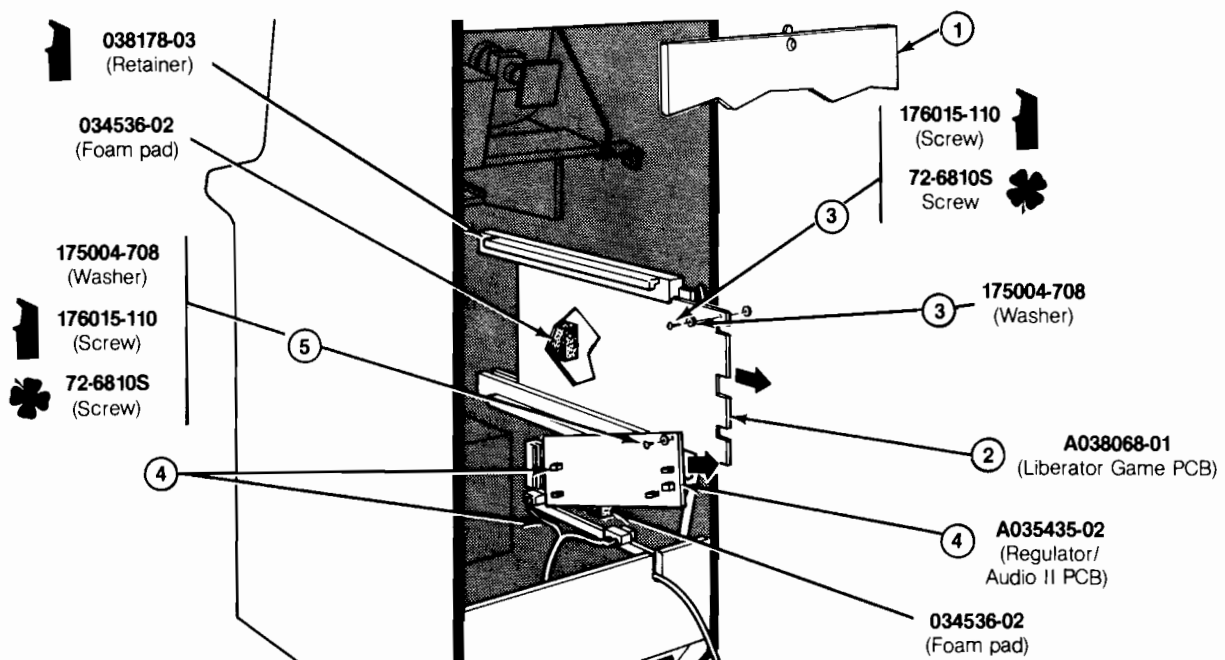
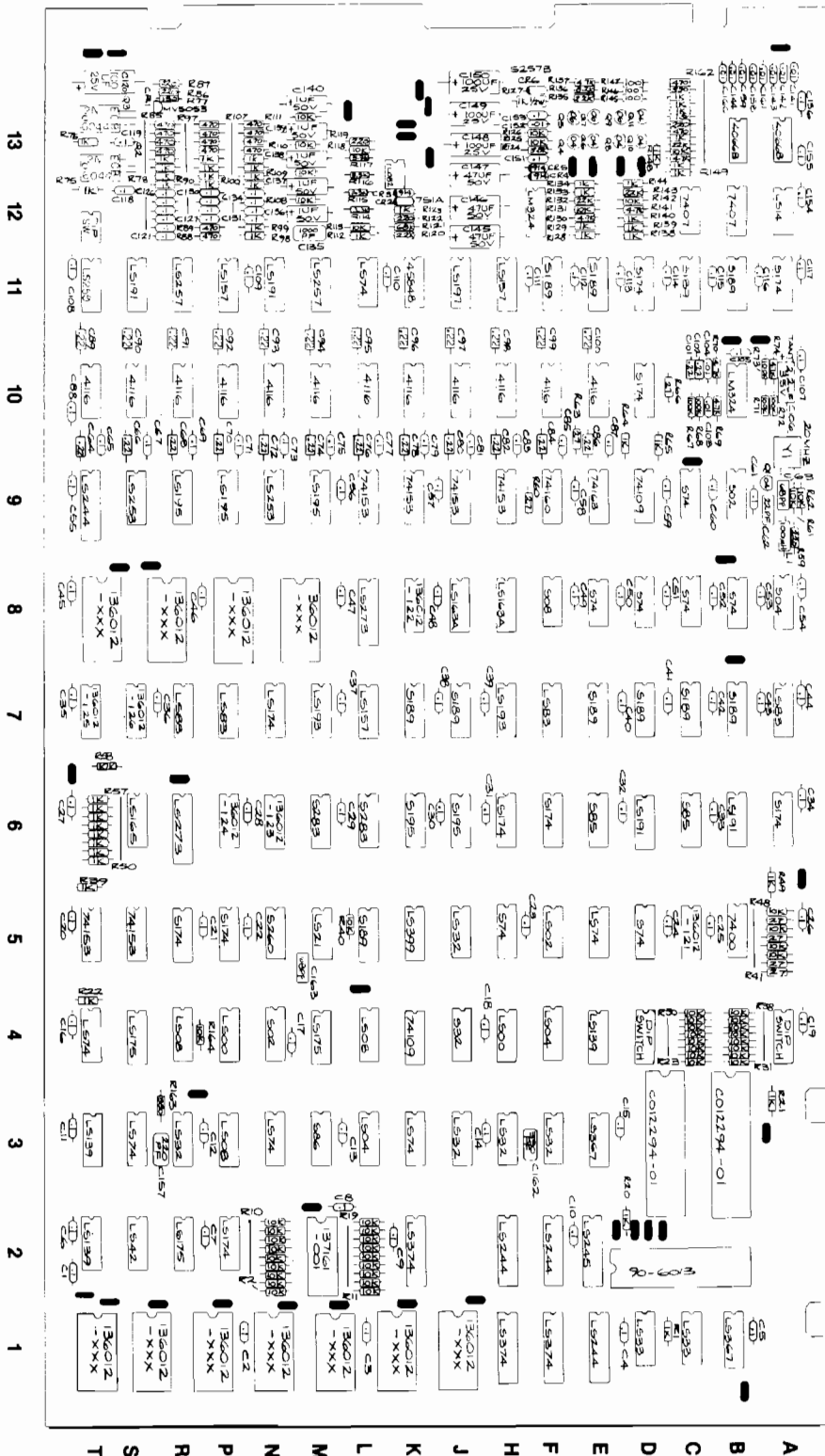


Figure 3-11 Removing the Printed-Circuit Boards

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Liberator™ Game PCB Assembly Parts List

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
Capacitors		
C1-C61	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C62	22 pF, 100 V, Epoxy-Dipped Mica Radial-Lead Capacitor	128002-220
C63	68 pF, 100 V, Epoxy-Dipped Mica Radial-Lead Capacitor	128002-680
C64	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C65	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C66	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C67	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C68	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C69	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C70	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C71	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C72	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C73	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C74	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C75	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C76	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C77	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C78	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C79	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C80	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C81	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C82	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C83	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C84	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C85	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C86	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C87, C88	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C89-C102	0.22 μ F, +80, -20%, 25 V Ceramic-Disk Radial-Lead Capacitor	122008-224
C103, C104	0.01 μ F, +80, -20%, 25 V Ceramic-Disk Axial-Lead Capacitor	122005-103
C105	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C106	2.2 μ F, \pm 10%, 35 V Tantalum Capacitor	122000-225
C107-C119	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C120	100 μ F, 25 V, Aluminum Electrolytic Axial-Lead Capacitor	24-250107
C121-C134	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C135	1000 pF, 100 V, Epoxy-Dipped Mica Radial-Lead Capacitor	128002-102
C136-C140	1 μ F, 50 V, Aluminum Electrolytic Axial-Lead Capacitor	24-500105
C141-C144	0.01 μ F, +80, -20%, 25 V Ceramic-Disk Axial-Lead Capacitor	122005-103
C145-C147	47 μ F, 50 V, Aluminum Electrolytic Axial-Lead Capacitor	24-500476
C148-C150	100 μ F, 25 V, Aluminum Electrolytic Axial-Lead Capacitor	24-250107
C151	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C152	0.01 μ F, +80, -20%, 25 V Ceramic-Disk Axial-Lead Capacitor	122005-103
C153-C156	0.1 μ F, +80, -20%, 50 V Ceramic-Disk Radial-Lead Capacitor	122002-104
C157	220 pF, 100 V, Epoxy-Dipped Mica Radial-Lead Capacitor	128002-221
C158-C161	0.01 μ F, +80, -20%, 25 V Ceramic-Disk Axial-Lead Capacitor	122005-103
C162	330 pF, 100 V, Mica Capacitor	128002-331
C163	68 pF, 100 V, Epoxy-Dipped Mica Radial-Lead Capacitor	128002-680

(Continued on next page)

Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
Diodes		
CR1	Type-MV5053 Light-Emitting Diode	38-MV5053
CR2	Type-1N751A, ± 5%, 5.1 V, 500 mW Zener Diode	32-1N751A
CR3-CR5	Type-1N914, 75 V Switching Diode	31-1N914
CR6	Type-1N5257B, ± 5%, 33 V Zener Diode	131003-001
Integrated Circuits		
A6	Type-74LS174 Integrated Circuit	137209-001
A7	Type-74LS83 Integrated Circuit	37-74LS83
A8	Type-74S04 Integrated Circuit	37-74S04
A11	Type-74LS174 Integrated Circuit	137209-001
A12	Type-74LS14 Integrated Circuit	37-74LS14
A13	Type-4066B Integrated Circuit	37-4066
B1	Type-74LS367 Integrated Circuit	37-74LS367
B5	Type-7400 Integrated Circuit	37-7400
B6	Type-74LS191 Integrated Circuit	37-74LS191
B7	Type-74S189 Integrated Circuit	37-74S189
B8	Type-74S74 Integrated Circuit	37-74S74
B9	Type-74S02 Integrated Circuit	37-74S02
B10	Type-LM324 Integrated Circuit	37-LM324
B11	Type-74S189 Integrated Circuit	37-74S189
B12	Type-7407 Integrated Circuit	37-7407
B13	Type-4066B Integrated Circuit	37-4066
C1	Type-74LS33 Integrated Circuit	137239-001
C6	Type-74S85 Integrated Circuit	37-74S85
C7	Type-74S189 Integrated Circuit	37-74S189
C8, C9	Type-74S74 Integrated Circuit	37-74S74
C11	Type-74S189 Integrated Circuit	37-74S189
C12	Type-7407 Integrated Circuit	37-7407
D1	Type-74LS33 Integrated Circuit	137239-001
D5	Type-74S74 Integrated Circuit	37-74S74
D6	Type-74LS191 Integrated Circuit	37-74LS191
D7	Type-74S189 Integrated Circuit	37-74S189
D8	Type-74S74 Integrated Circuit	37-74S74
D9	Type-74109 Integrated Circuit	37-74109
D10, D11	Type-74LS174 Integrated Circuit	137209-001
E1	Type-74LS244 Integrated Circuit	37-74LS244
E2	Type-74LS245 Integrated Circuit	37-74LS245
E3	Type-74LS367 Integrated Circuit	37-74LS367
E4	Type-74LS139 Integrated Circuit	37-74LS139
E5	Type-74LS74 Integrated Circuit	37-74LS74
E6	Type-74S85 Integrated Circuit	37-74S85
E7	Type-74S189 Integrated Circuit	37-74S189

(Continued on next page)

Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
E8	Type-74S74 Integrated Circuit	37-74S74
E9	Type-74163 Integrated Circuit	37-74163
E11	Type-74S189 Integrated Circuit	37-74S189
F1	Type-74LS374 Integrated Circuit	37-74LS374
F2	Type-74LS244 Integrated Circuit	37-74LS244
F3	Type-74LS32 Integrated Circuit	37-74LS32
F4	Type-74LS04 Integrated Circuit	37-74LS04
F5	Type-74LS02 Integrated Circuit	37-74LS02
F6	Type-74LS174 Integrated Circuit	137209-001
F7	Type-74LS83 Integrated Circuit	37-74LS83
F8	Type-74S08 Integrated Circuit	37-74S08
F9	Type-74160 Integrated Circuit	37-74160
F11	Type-74S189 Integrated Circuit	37-74S189
F/H12	Type-LM324 Integrated Circuit	37-LM324
H1	Type-74LS374 Integrated Circuit	37-74LS374
H2	Type-74LS244 Integrated Circuit	37-74LS244
H3	Type-74LS32 Integrated Circuit	37-74LS32
H4	Type-74LS00 Integrated Circuit	37-74LS00
H5	Type-74S74 Integrated Circuit	37-74S74
H6	Type-74LS174 Integrated Circuit	37-74LS174
H7	Type-74LS193 Integrated Circuit	37-74LS193
H8	Type-74LS163A Integrated Circuit	37-74LS163A
H9	Type-74153 Integrated Circuit	37-74153
H11	Type-74LS157 Integrated Circuit	37-74LS157
J3	Type-74LS32 Integrated Circuit	37-74LS32
J4	Type-74S32 Integrated Circuit	37-74S32
J5	Type-74LS32 Integrated Circuit	37-74LS32
J6	Type-74LS195 Integrated Circuit	137208-001
J7	Type-74S189 Integrated Circuit	37-74S189
J8	Type-74LS163A Integrated Circuit	37-74LS163A
J9	Type-74153 Integrated Circuit	37-74153
J11	Type-74LS197 Integrated Circuit	137240-001
K2	Type-74LS374 Integrated Circuit	37-74LS374
K3	Type-74LS74 Integrated Circuit	37-74LS74
K4	Type-74109 Integrated Circuit	37-74109
K5	Type-74LS399 Integrated Circuit	37-74LS399
K6	Type-74LS195 Integrated Circuit	137208-001
K7	Type-74S189 Integrated Circuit	37-74S189
K9	Type-74153 Integrated Circuit	37-74153
K11	Schmitt Trigger Hex Integrated Circuit	37-4584B
K12	Type-TL082 Integrated Circuit	37-TL082CP
L3	Type-74LS04 Integrated Circuit	37-74LS04
L4	Type-74LS08 Integrated Circuit	37-74LS08
L5	Type-74S189 Integrated Circuit	37-74S189

(Continued on next page)

Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
L6	Type-74LS283 Integrated Circuit	137241-001
L7	Type-74LS157 Integrated Circuit	37-74LS157
L8	Type-74LS273 Integrated Circuit	37-74LS273
L9	Type-74153 Integrated Circuit	37-74153
L11	Type-74LS74 Integrated Circuit	37-74LS74
M3	Type-74S86 Integrated Circuit	137002-001
M4	Type-74LS175 Integrated Circuit	37-74LS175
M5	Type-74LS21 Integrated Circuit	137210-001
M6	Type-74LS283 Integrated Circuit	137241-001
M7	Type-74LS193 Integrated Circuit	37-74LS193
M9	Type-74LS195 Integrated Circuit	37-74LS195
M11	Type-74LS257 Integrated Circuit	37-74LS257
N3	Type-74LS74 Integrated Circuit	37-74LS74
N4	Type-74S02 Integrated Circuit	37-74S02
N5	Type-74S260 Integrated Circuit	37-74S260
N7	Type-74LS174 Integrated Circuit	37-74LS174
N9	Type-74LS253 Integrated Circuit	37-74LS253
N11	Type-74LS191 Integrated Circuit	37-74LS191
P2	Type-74LS174 Integrated Circuit	37-74LS174
P3	Type-74LS08 Integrated Circuit	37-74LS08
P4	Type-74LS00 Integrated Circuit	37-74LS00
P5	Type-74LS174 Integrated Circuit	137209-001
P7	Type-74LS83 Integrated Circuit	37-74LS83
P9	Type-74LS195 Integrated Circuit	37-74LS195
P11	Type-74LS157 Integrated Circuit	37-74LS157
R2	Type-74LS175 Integrated Circuit	37-74LS175
R3	Type-74LS32 Integrated Circuit	37-74LS32
R4	Type-74LS08 Integrated Circuit	37-74LS08
R5	Type-74LS174 Integrated Circuit	137209-001
R6	Type-74LS273 Integrated Circuit	37-74LS273
R7	Type-74LS83 Integrated Circuit	37-74LS83
R9	Type-74LS195 Integrated Circuit	37-74LS195
R11	Type-74LS257 Integrated Circuit	37-74LS257
S2	Type-74LS42 Integrated Circuit	37-74LS42
S3	Type-74LS74 Integrated Circuit	37-74LS74
S4	Type-74LS175 Integrated Circuit	37-74LS175
S5	Type-74153 Integrated Circuit	37-74153
S6	Type-74LS165 Integrated Circuit	37-74LS165
S9	Type-74LS253 Integrated Circuit	37-74LS253
S11	Type-74LS191 Integrated Circuit	37-74LS191
T2, T3	Type-74LS139 Integrated Circuit	37-74LS139
T4	Type-74LS74 Integrated Circuit	37-74LS74
T5	Type-74153 Integrated Circuit	37-74153
T9	Type-74LS244 Integrated Circuit	37-74LS244
T11	Type-74LS259 Integrated Circuit	37-74LS259

(Continued on next page)

Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
Resistors		
R1	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R2-19	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R20-R22	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R23-R38	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R39	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R40	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R41, R42	27 Ω , \pm 5%, 1/4 W Resistor	110000-270
R43, R44	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R45	27 Ω , \pm 5%, 1/4 W Resistor	110000-270
R46	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R47	27 Ω , \pm 5%, 1/4 W Resistor	110000-270
R48	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R49-R57	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R58	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R59	220 Ω , \pm 5%, 1/4 W Resistor	110000-221
R60	27 Ω , \pm 5%, 1/4 W Resistor	110000-270
R61, R62	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R63	27 Ω , \pm 5%, 1/4 W Resistor	110000-270
R64, R65	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R66	27 Ω , \pm 5%, 1/4 W Resistor	110000-270
R67, R68	100 k Ω , \pm 5%, 1/4 W Resistor	110000-104
R69, R70	4.7 k Ω , \pm 5%, 1/4 W Resistor	110000-472
R71-R73	100 k Ω , \pm 5%, 1/4 W Resistor	110000-104
R74	47 k Ω , \pm 5%, 1/4 W Resistor	110000-473
R75, R76	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R77	150 Ω , \pm 5%, 1/4 W Resistor	110000-151
R78-R81	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R82-R85	470 Ω , \pm 5%, 1/4 W Resistor	110000-471
R86, R87	220 Ω , \pm 5%, 1/4 W Resistor	110000-221
R88, R89	470 Ω , \pm 5%, 1/4 W Resistor	110000-471
R90-R93	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R94-R97	470 Ω , \pm 5%, 1/4 W Resistor	110000-471
R98-R103	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R104-R107	470 Ω , \pm 5%, 1/4 W Resistor	110000-471
R108-R111	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R112	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R113	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R114-R117	3.3 k Ω , \pm 5%, 1/4 W Resistor	110000-332
R118	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R119	220 Ω , \pm 5%, 1/4 W Resistor	110000-221
R120	22 k Ω , \pm 5%, 1/4 W Resistor	110000-223
R121	68 k Ω , \pm 5%, 1/4 W Resistor	110000-683
R122	220 Ω , \pm 5%, 1/4 W Resistor	110000-221
R123	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102

[Continued on next page]

Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
R124	3.3 kΩ, ±5%, ¼ W Resistor	110000-332
R125, R126	10 kΩ, ±5%, ¼ W Resistor	110000-103
R127	1 kΩ, ±5%, ½ W Resistor	110001-102
R128, R129	1 kΩ, ±5%, ¼ W Resistor	110000-102
R130	4.7 kΩ, ±5%, ¼ W Resistor	110000-472
R131	10 kΩ, ±5%, ¼ W Resistor	110000-103
R132	22 kΩ, ±5%, ¼ W Resistor	110000-223
R133, R134	1 kΩ, ±5%, ¼ W Resistor	110000-102
R135	2.2 kΩ, ±5%, ¼ W Resistor	110000-222
R136	8.2 kΩ, ±5%, ¼ W Resistor	110000-822
R137	4.7 kΩ, ±5%, ¼ W Resistor	110000-472
R138–R140	1 kΩ, ±5%, ¼ W Resistor	110000-102
R141	4.7 kΩ, ±5%, ¼ W Resistor	110000-472
R142	10 kΩ, ±5%, ¼ W Resistor	110000-103
R143	22 kΩ, ±5%, ¼ W Resistor	110000-223
R144	1 kΩ, ±5%, ¼ W Resistor	110000-102
R145–R147	100 Ω, ±5%, ¼ W Resistor	110000-101
R148–R150	1 kΩ, ±5%, ¼ W Resistor	110000-102
R151	4.7 kΩ, ±5%, ¼ W Resistor	110000-472
R152	10 kΩ, ±5%, ¼ W Resistor	110000-103
R153	22 kΩ, ±5%, ¼ W Resistor	110000-223
R154	1 kΩ, ±5%, ¼ W Resistor	110000-102
R155	470 Ω, ±5%, ¼ W Resistor	110000-471
R156	220 Ω, ±5%, ¼ W Resistor	110000-221
R157	1.5 kΩ, ±5%, ¼ W Resistor	110000-151
R158–R160	1 kΩ, ±5%, ¼ W Resistor	110000-102
R161	330 Ω, ±5%, ¼ W Resistor	110000-331
R162	470 Ω, ±5%, ¼ W Resistor	110000-471
R163	330 Ω, ±5%, ¼ W Resistor	110000-331
R164	10 kΩ, ±5%, ¼ W Resistor	110000-103
Programmable Read-Only Memories		
C5	Programmable Read-Only Memory	136012-121
K8	Programmable Read-Only Memory	136012-122
N6	Programmable Read-Only Memory	136012-123
P6	Programmable Read-Only Memory	136012-124
T7	Programmable Read-Only Memory	136012-125
S7	Programmable Read-Only Memory	136012-126
<i>For -11 version only</i>		
C2	Type-6502A Microprocessor	90-6013
B/C3	Audio I/O N-Channel MOS/LSI Custom Chip	C012294-01
C/D3	Audio I/O N-Channel MOS/LSI Custom Chip	C012294-01
J1	Type-137184-001 Programmable Read-Only Memory	136012-216

(Continued on next page)

Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
K/L1	Type-137184-001 Programmable Read-Only Memory	136012-215
L/M1	Type-137184-001 Programmable Read-Only Memory	136012-214
M2	4 μ s, 64 x 8, Tri-State Electrically Alterable Read-Only Memory	137161-001
M/N8	Type-137184-001 Programmable Read-Only Memory	136012-118
N1	Type-137184-001 Programmable Read-Only Memory	136012-213
P8	Type-137184-001 Programmable Read-Only Memory	136012-120
P/R1	Type-137184-001 Programmable Read-Only Memory	136012-212
R/S1	Type-137184-001 Programmable Read-Only Memory	136012-211
R/S8	Type-137184-001 Programmable Read-Only Memory	136012-117
T1	Type-137184-001 Programmable Read-Only Memory	136012-228
T8	Type-137184-001 Programmable Read-Only Memory	136012-119
<i>For -21 version only</i>		
C2	Type-6502A Microprocessor	90-6013
B/C3	Audio I/O N-Channel MOS/LSI Custom Chip	C012294-01
C/D3	Audio I/O N-Channel MOS/LSI Custom Chip	C012294-01
J1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-206
K/L1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-205
L/M1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-204
M2	4 μ Sec, 64 x 8, Tri-State Electrically Alterable Read-Only Memory	137161-001
M/N8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-108
N1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-203
P8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-110
P/R1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-202
R/S1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-201
R/S8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-107
T1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-200
T8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-109
<i>For -31 version only</i>		
C2	Type-6502A Microprocessor	90-6013
B/C3	Audio I/O N-Channel MOS/LSI Custom Chip	C012294-01
C/D3	Audio I/O N-Channel MOS/LSI Custom Chip	C012294-01
J1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-206
K/L1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-205
L/M1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-204
M2	4 μ s, 64 x 8, Tri-State Electrically Alterable Read-Only Memory	137161-001
M/N8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-118
N1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-203
P8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-120
P/R1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-202
R/S1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-201
R/S8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-117
T1	Type-137171-001 Electrically Programmable Read-Only Memory	136012-200
T8	Type-137171-001 Electrically Programmable Read-Only Memory	136012-119

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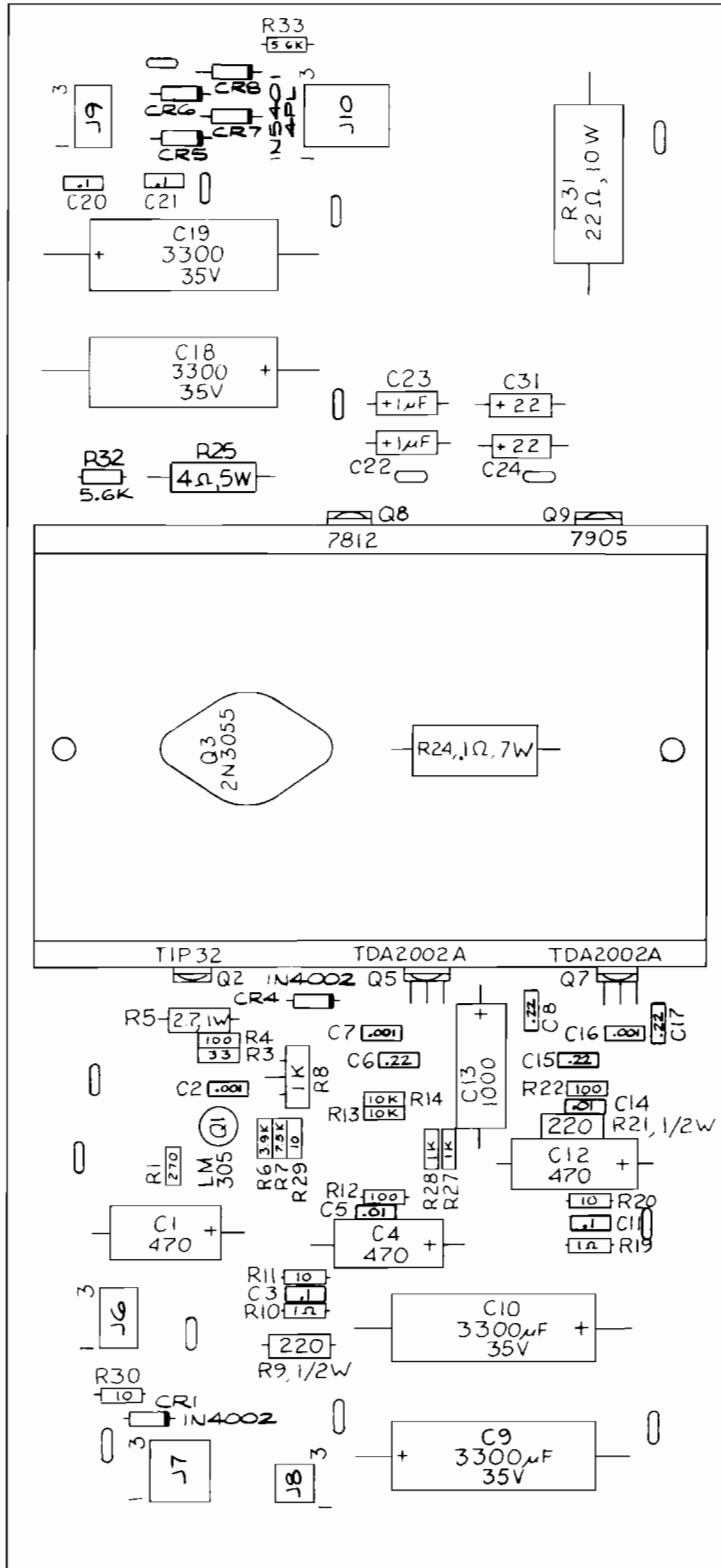
Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
Random-Access Memories		
E10	Random-Access Memory	100017-001
F10	Random-Access Memory	100017-001
H10	Random-Access Memory	100017-001
J10	Random-Access Memory	100017-001
K10	Random-Access Memory	100017-001
L10	Random-Access Memory	100017-001
M10	Random-Access Memory	100017-001
N10	Random-Access Memory	100017-001
P10	Random-Access Memory	100017-001
R10	Random-Access Memory	100017-001
S10	Random-Access Memory	100017-001
T10	Random-Access Memory	100017-001
Sockets		
B/C3	40-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C40
C2	40-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C40
C/D3	40-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C40
J1	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
K/L1	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
L/M1	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
M2	22-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C22
M/N8	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
N1	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
P8	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
P/R1	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
R/S1	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
R/S8	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
T1	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
T8	24-Contact Medium-Insertion-Force Integrated Circuit Socket	79-42C24
Switches		
A4	8-Station, SPST, Dual-Inline-Package Switch	66-118P1T
D4	8-Station, SPST, Dual-Inline-Package Switch	66-118P1T
T12	4-Station, SPST, Dual-Inline-Package Switch	66-114P1T
Transistors		
Q1	Type-2N3904 NPN 60 V, 1W Transistor	34-2N3904
Q2, Q3	Type-2N6044 Darlington NPN, 80 V, 8 A Transistor	34-2N6044
Q4	Type-2N3904 NPN 60 V, 1W Transistor	34-2N3904
Q5	Type-2N3906 PNP 40 V, 1W Transistor	33-2N3906

(Continued on next page)

Liberator™ Game PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
Q6	Type-2N3904 NPN 60 V, 1W Transistor	34-2N3904
Q7	Type-2N3906 PNP 40 V, 1W Transistor	33-2N3906
Q8	Type-2N3904 NPN 60 V, 1W Transistor	34-2N3904
Q9	Type-2N3906 PNP 40 V, 1W Transistor	33-2N3906
Q10, Q11	Type-2N3904 NPN 60 V, 1W Transistor	34-2N3904
Miscellaneous		
	Test Point <i>Acceptable substitute is part no. 020670-01</i>	179051-002
Q2, Q3	Nylon Snap-In Fastener	81-4302
L1	100 μ H, \pm 10%, Hot-Molded Plastic Fixed R.F. Choke <i>Acceptable substitute is part no. 41-3003</i>	141002-001
Y1	20.00 MHz Crystal	144000-003



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Figure 3-13 Regulator/Audio II PCB Assembly
 A035435-02 G

Regulator/Audio II PCB Assembly Parts List

Designator	Description	Part No.
Capacitors		
C1	470 μ F, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250477
C2	0.001 μ F, 50 V, Ceramic-Disc Axial-Lead Capacitor	122002-102
C3	0.1 μ F, 50 V, Ceramic-Disc Axial-Lead Capacitor	29-088
C4	470 μ F, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250477
C5	0.01 μ F, 25 V Minimum, Ceramic-Disc Axial-Lead Capacitor <i>Acceptable substitute is part no. 122005-103</i>	100015-103
C6	0.22 μ F, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C7	0.001 μ F, 50 V, Ceramic-Disc Axial-Lead Capacitor	122002-102
C8	0.22 μ F, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C9, C10	3300 μ F, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350338
C11	0.1 μ F, 50 V, Ceramic-Disc Axial-Lead Capacitor	29-088
C12	470 μ F, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250477
C13	1000 μ F, 25 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-250108
C14	0.01 μ F, 25 V Minimum, Ceramic-Disc Axial-Lead Capacitor <i>Acceptable substitute is part no. 122005-103</i>	100015-103
C15	0.22 μ F, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C16	0.001 μ F, 50 V, Ceramic-Disc Axial-Lead Capacitor	122002-102
C17	0.22 μ F, 25 V, Ceramic-Disc Axial-Lead Capacitor	122004-224
C18, C19	3300 μ F, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350338
C20, C21	0.1 μ F, 50 V, Ceramic-Disc Axial-Lead Capacitor	29-088
C22, C23	1 μ F, 50 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-500105
C24	22 μ F, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350226
C31	22 μ F, 35 V, Aluminum Electrolytic Fixed Axial-Lead Capacitor	24-350226
Diodes		
CR1	Type-1N4002, 1 A, 100 V Silicon Rectifier Diode	31-1N4002
CR4	Type-1N4002, 1 A, 100 V Silicon Rectifier Diode	31-1N4002
CR5-CR8	Type-1N5401, 3 A, 100 V Silicon Rectifier Diode	31-1N5401
Integrated Circuits		
Q1	Type-LM305, 5 V, Linear Voltage Regulator	37-LM305
Q5	Type-TDA2002A, 8 W, Linear Audio Amplifier Integrated Circuit	137151-002
Q7	Type-TDA2002A, 8 W, Linear Audio Amplifier Integrated Circuit	137151-002
Q8	Type-7812, + 12 V, Voltage Regulator	37-7812
Q9	Type-7905, -5 V, Voltage Regulator	37-7905
Resistors		
R1	270 Ω , \pm 5%, 1/4 W Resistor	110000-271
R3	33 Ω , \pm 5%, 1/4 W Resistor	110000-330
R4	100 Ω , \pm 5%, 1/4 W Resistor	110000-101
R5	2.7 Ω , \pm 5%, 1 W Resistor	110009-027

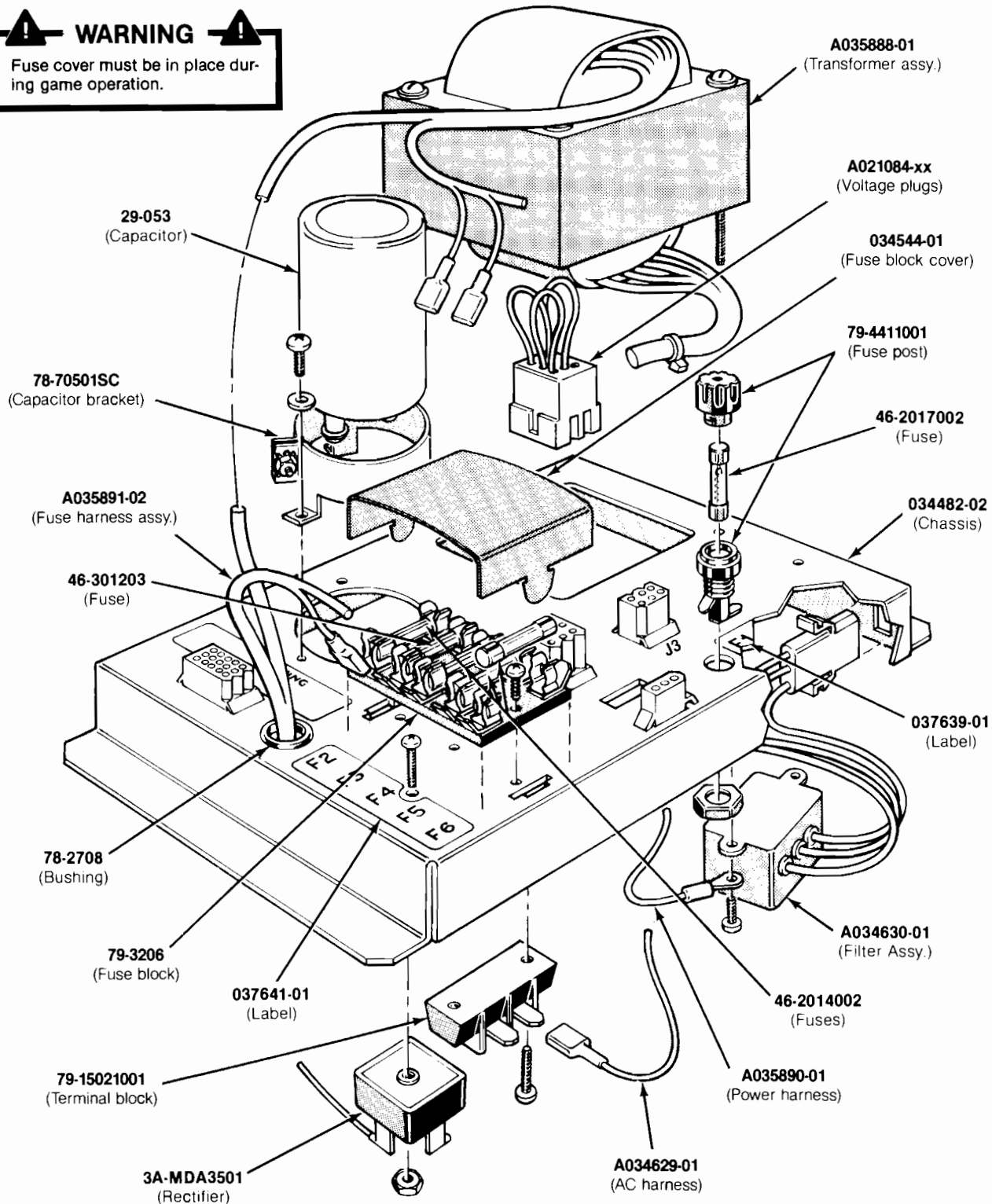
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Regulator/Audio II PCB Assembly Parts List, continued

<i>Designator</i>	<i>Description</i>	<i>Part No.</i>
R6	3.9 k Ω , \pm 5%, 1/4 W Resistor	110000-392
R7	7.5 k Ω , \pm 5%, 1/4 W Resistor	110000-752
R8	1 k Ω Vertical PCB-Mounting Cermet Potentiometer <i>Acceptable substitute is part no. 119002-102</i>	19-315102
R9	220 Ω , \pm 5%, 1/2 W Resistor	110001-221
R10	1 Ω , \pm 5%, 1/4 W Resistor	110000-010
R11	10 Ω , \pm 5%, 1/4 W Resistor	110000-100
R12	100 Ω , \pm 5%, 1/4 W Resistor	110000-101
R13, R14	10 k Ω , \pm 5%, 1/4 W Resistor	110000-103
R19	1 Ω , \pm 5%, 1/4 W Resistor	110000-010
R20	10 Ω , \pm 5%, 1/4 W Resistor	110000-100
R21	220 Ω , \pm 5%, 1/2 W Resistor	110001-221
R22	100 Ω , \pm 5%, 1/4 W Resistor	110000-101
R24	0.1 Ω , \pm 3%, 7 W Wirewound Resistor	19-100P1015
R25	4 Ω , \pm 5%, 5 W Wirewound Resistor	116001-040
R27, R28	1 k Ω , \pm 5%, 1/4 W Resistor	110000-102
R29, R30	10 Ω , \pm 5%, 1/4 W Resistor	110000-100
R31	22 Ω , \pm 5%, 10 W Wirewound Resistor	116000-220
R32, R33	5.6 k Ω , \pm 5%, 1/4 W Resistor	110000-562
Transistors		
Q2	Type-TIP32 PNP Power Transistor	33-TIP32
Q3	Type-2N3055 NPN Silicon Transistor	34-2N3055
Mechanical Parts		
J6	6-Position Connector Receptacle	79-58306
J7	9-Position Connector Receptacle	79-58308
J8	4-Position Connector Receptacle	79-58354
J9	6-Position Connector Receptacle	79-58306
J10	12-Position Connector Receptacle	79-58346
Q3	#6-32 x 1/2-Inch Cross-Recessed Pan-Head Corrosion-Resistant Steel Machine Screw	72-1608C
Q5	#6-32 x 1/4-Inch Binder-Head Nylon Screw	75-F60405
Q8	#6 x 3/8-Inch Cross-Recessed Pan-Head Thread-Forming Type-AB Zinc-Plated-Steel Screw	72-6606S
	Heat Sink	034531-01
	Test Point <i>Acceptable substitute is part no. 020670-01</i>	179051-001

H. Power Supply Assembly

WARNING
Fuse cover must be in place during game operation.



**Figure 3-14 Power Supply Assembly
A037671-01 and -02 C**

Power Supply Assembly Parts List

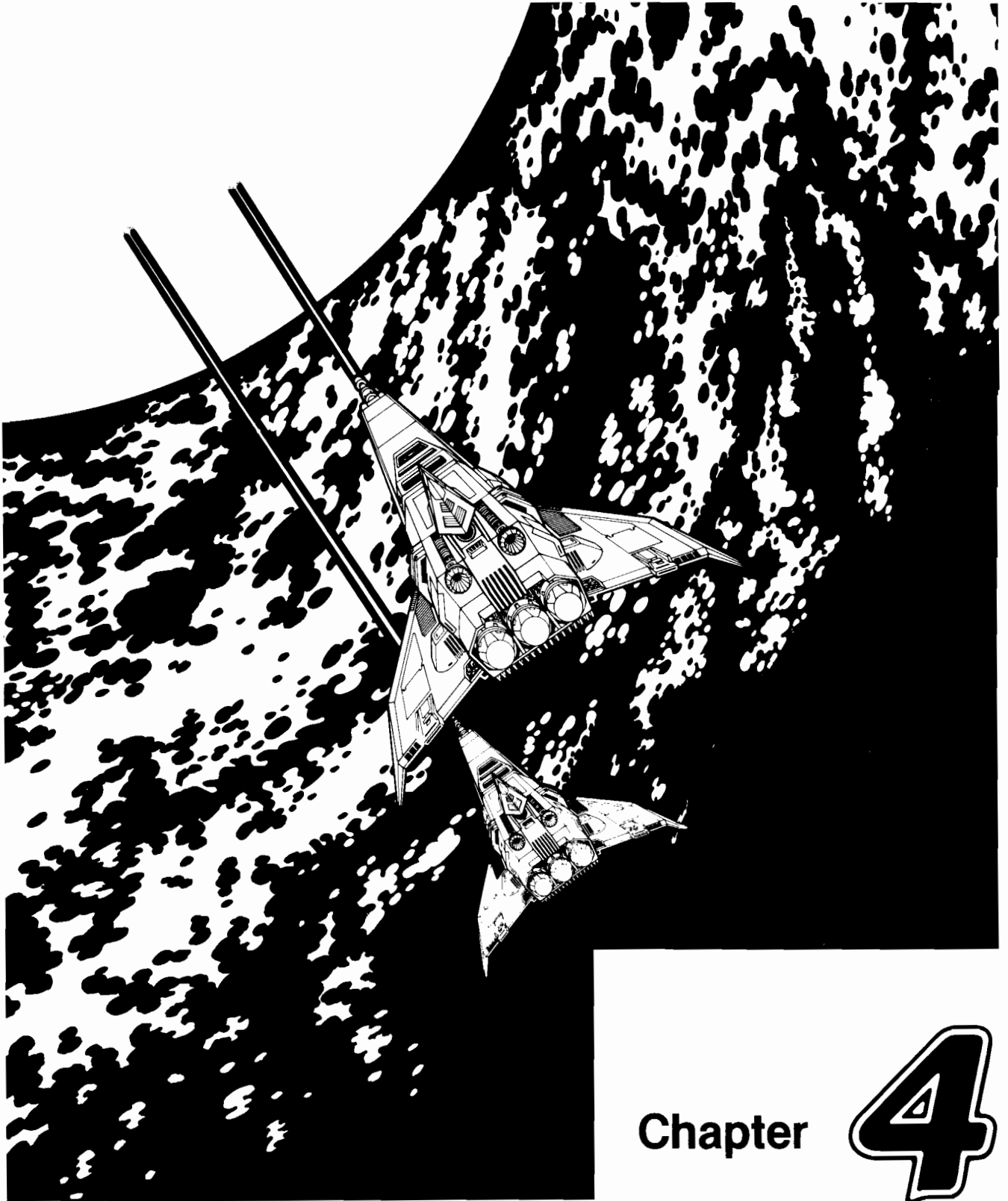
Part No.	Description
A021084-01	Voltage Plug for 100 V (90–110 VAC) <i>(violet wire color—plugs into J3)</i>
A021084-02	Voltage Plug for 120 V (105–135 VAC) <i>(yellow wire color—plugs into J3)*</i>
A021084-04	Voltage Plug for 220 V (200–240 VAC) <i>(blue wire color—plugs into J3)</i>
A021084-05	Voltage Plug for 240 V (220–260 VAC) <i>(brown wire color—plugs into J3)</i>
A034629-01	AC Harness Assembly (J4A)
A034630-01	RFI Filter Assembly (FL1—designation not marked)
A035888-01	Transformer Assembly (T1—designation covered) <i>(Acceptable substitute is part no. A035888-02)</i>
A035890-01	Power Harness Assembly (J2)
A035891-02	Fuse Harness Assembly (F2–F6)
29-053	27,000 μ F, 15 VDC Electrolytic Capacitor (C1)
3A-MDA3501	Type-MDA 3501 Bridge Rectifier (CR1)
46-2014002	4 A, 250 V, 3AG Slow-Blow Glass Cartridge-Type Fuse (F2, F4–F6)
46-2017002	7 A, 250 V, 3AG Slow-Blow Glass Cartridge-Type Fuse (F1)
46-301203	20 A, 32 V, 3AG Slow-Blow Glass Cartridge-Type Fuse (F3)
78-2708	Nylon Type 6/6 Hole Bushing with $\frac{3}{8}$ -Inch Inside Diameter x $\frac{3}{4}$ -Inch Outside Diameter x $\frac{1}{4}$ -Inch Thick
78-70501SC	2-Inch Diameter Capacitor Mounting Bracket (C1)
79-15021001	2-Circuit Single-Row Terminal Block <i>(located under F4)</i>
79-3206	5-Position 3AG Fuse Block with $\frac{1}{4}$ -Inch Quick-Disconnect Terminals (F2–F6)
79-4411001	Panel-Mounting Non-Indicating 3AG Cartridge-Type Fuse Post (F1)
034482-02	Power Supply Chassis Base
034544-01	Fuse Block Cover (F2–F6)
037243-01	Metal Base Plate <i>(not shown in illustration)</i>
037639-01	Label for Fuse Value (F1)
037641-01	Label for Fuse Values (F2–F6)

* This is the only plug provided on the North American power supply.

NOTE

A037671-01 power supply assembly has the 120 V plug.
 A037671-02 has the 100 V, 220 V, and 240 V plugs.
 A037671-03 has the 220 V and 240 V plugs.

Glossary of Terms



Chapter

4

Glossary of Terms

AC	Alternating current; from zero it rises to a maximum positive level, then passes through zero again to a maximum negative level.	BINARY	A number system that expresses all values by using the two digits 0 and 1.
ACTIVE STATE	The true state of a signal. For example: The active state for $\overline{\text{START}}$ is low.	BIT	A binary digit; expressed as a 1 or a 0.
ADDRESS	A value that identifies a specific location of data in memory; normally expressed in hexadecimal notation.	BLANKING	Turning off the beam on a cathode-ray tube during retrace.
ANALOG	Measurable in an absolute quantity (as opposed to on or off). Examples of analog devices are volume controls, light dimmers, and stereo amplifiers.	BLOCK DIAGRAM	A drawing in which functional circuitry units are represented by blocks. Very useful during initial troubleshooting.
ANODE	The positive (arrow) end of a diode.	BUFFER	<ol style="list-style-type: none"> 1. An isolating circuit designed to eliminate the reaction of a driven circuit on the circuits driving it (e.g., a buffer amplifier). 2. A device used to supply additional drive capability.
AMPLIFIER	A device used to increase the strength of an applied signal.	BUS	An electrical path over which information is transferred from any of several sources to any of several destinations.
AMPLITUDE	The maximum instantaneous value of a waveform pulse from zero.	CAPACITOR	A device capable of storing electrical energy. A capacitor blocks the flow of DC current while allowing AC current to pass.
ASTABLE	Having no normal state. An astable device will free-run or oscillate as long as operating voltage is applied. The oscillation frequency is usually controlled by external circuitry.	CATHODE	The negative end of a diode.
AUXILIARY COIN SWITCH	A momentary-contact pushbutton switch with a black cap. It is located on the utility panel. The auxiliary coin switch adds credits to the game without activating the coin counter.	CHIP	An integrated circuit comprising many circuits on a single wafer slice.
BEZEL	A cut, formed, or machined retention device, such as the conical device used to mount a pushbutton switch to a control panel, or the formed device used to frame the video display screen.	CLOCK	A repetitive timing signal for synchronizing system functions.
BIDIRECTIONAL	Able to send or receive data on the same line (e.g., the data bus of a microprocessor).	COINCIDENCE	Occurring at the same time.
		COIN COUNTER	A 6-digit electro-mechanical device that counts the coins inserted in the coin mechanism(s).
		COIN MECHANISM	A device on the inside of the coin door that inspects the coin to determine if the correct coin has been inserted.

COMPLEMENTARY	Having opposite states, such as the outputs of a flip-flop.	DOWN TIME	The period during which a game is malfunctioning or not operating correctly due to machine failure.
COMPOSITE SYNC	Horizontal and vertical synchronization pulses that are bused together into a single signal. This signal provides the timing necessary to keep the display in synchronization with the game circuitry.	LOGIC STATE	The binary (1 or 0) value at the node of a logic element or integrated circuit during a particular time. Also called the logic level. The figures below show the voltage levels corresponding to the logic states (levels) in a TTL system.
COMPOSITE VIDEO	Complete video signal from the game system to drive the display circuitry, usually comprising H SYNC, V SYNC, and the video.	LOGIC 0, LOW	{0 VDC to +0.8 VDC}
CREDIT	One play for one person based on the game switch settings.	GREY AREA (TRI-STATE LEVEL)	{+0.8 VDC to +2.4 VDC}
CRT	Cathode-ray tube.	LOGIC 1, HIGH	{+2.4 VDC to +5 VDC}
DATA	General term for the numbers, letters, and symbols that serve as input for device processing.	MULTIPLEXER	A device that takes several low-speed inputs and combines them into one high-speed data stream for simultaneous transmission on a single line.
DARLINGTON	A two-transistor amplifier that provides extremely high gain.	NMI	Non-maskable interrupt. NMI is a request for service by the microprocessor from external logic. The microprocessor cannot ignore this interrupt request.
DC	Direct current, meaning current flowing in one direction and of a fixed value.	PAGE	A subsection of memory. A read-only memory device (see ROM) is broken into discrete blocks of data. These blocks are called pages. Each block has X number of bytes.
DEFLECTION YOKE	Electromagnetic coils around the neck of a cathode-ray tube. One set of coils deflects the electron beam horizontally, and the other set deflects the beam vertically.	PCB	The abbreviation for printed-circuit board.
DIAGNOSTICS	A programmed routine for checking circuitry. For example: The self-test is a diagnostic routine.	PHOTOTRANSISTOR	A transistor that is activated by an external light source.
DIODE	A semiconductor device that conducts in only one direction.	POTENTIOMETER	<ol style="list-style-type: none"> 1. A resistor that has a continuously moving contact which is generally mounted on a moving shaft. Used chiefly as a voltage divider. Also called a POT (slang). 2. An instrument for measuring a voltage by balancing it against a known voltage.
DISCRETE	Non-integrated components, such as resistors, capacitors, and transistors.	RAM	Random-access memory. A device for the temporary storage of data.
DMA	Direct memory access. DMA is a process of accessing memory by bypassing the microprocessor logic. DMA is normally used for transferring data between the input/output ports and memory.		

RASTER-SCAN DISPLAY

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

RETRACE

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

RESISTOR

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

ROM

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

SIGNATURE ANALYSIS

A process of isolating digital logic faults at the component level by means of special test equipment called signature analyzers. Basically, signature analyzers (e.g., the ATARI® CAT Box) convert lengthy bit streams into four digit hexadecimal sig-

natures. The signature read by the analyzer at each circuit node is then compared with the known good signature for that node. This process continues until a fault is located.

TROUBLESHOOT

The process of locating and repairing a fault.

VECTOR

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

WATCHDOG

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

X-Y DISPLAY

A display system whereby images are displayed with vectors.

ZENER DIODE

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

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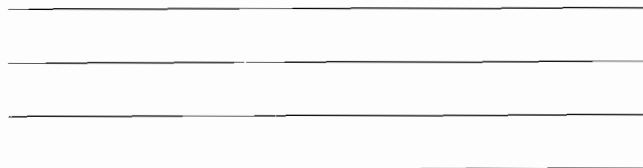
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