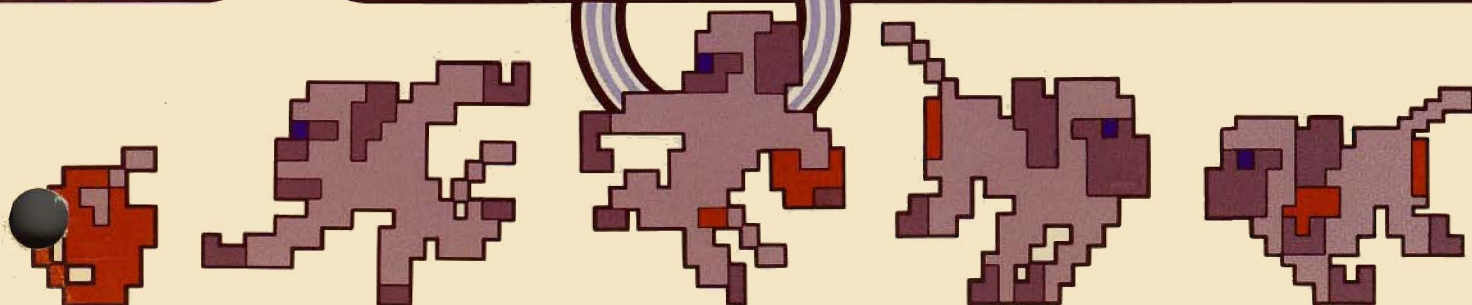


Operation, Maintenance and Service Manual

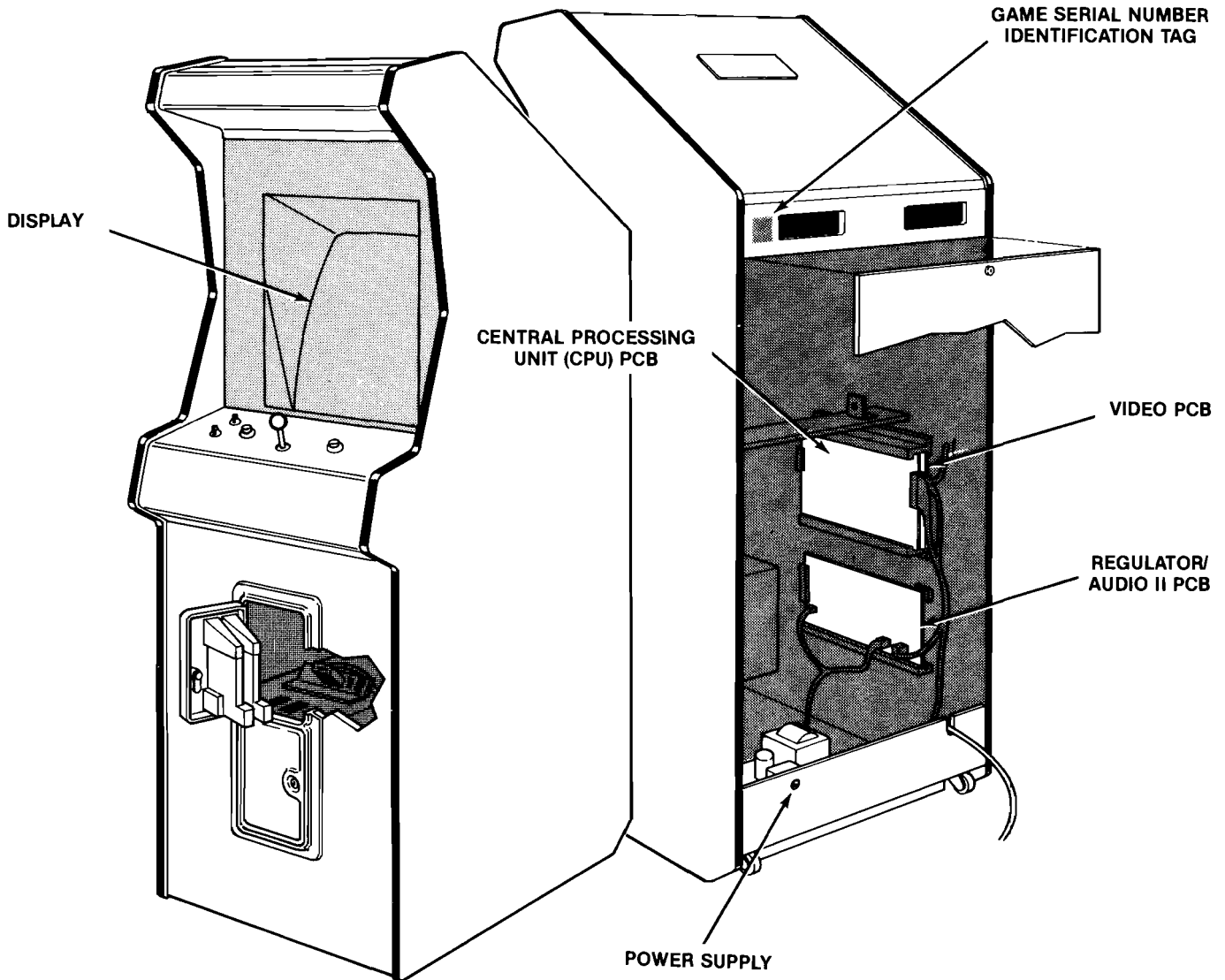
Complete with Illustrated Parts Lists

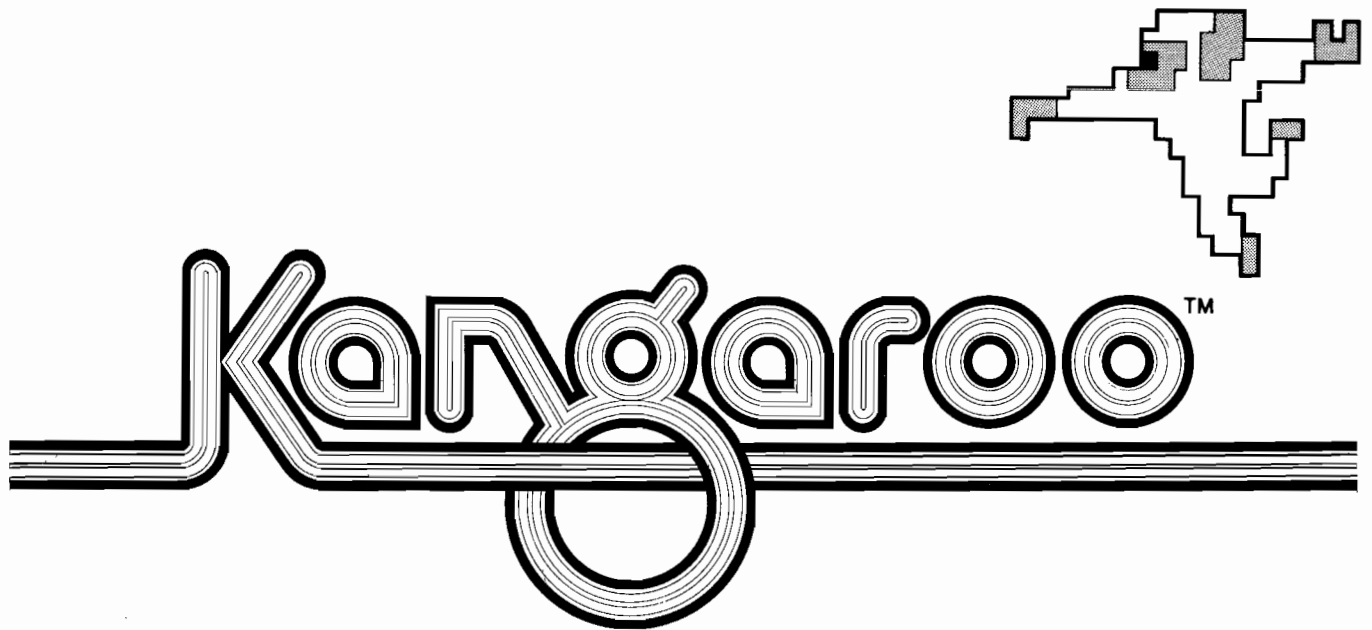
Kangaroo™



GAME SERIAL NUMBER LOCATION

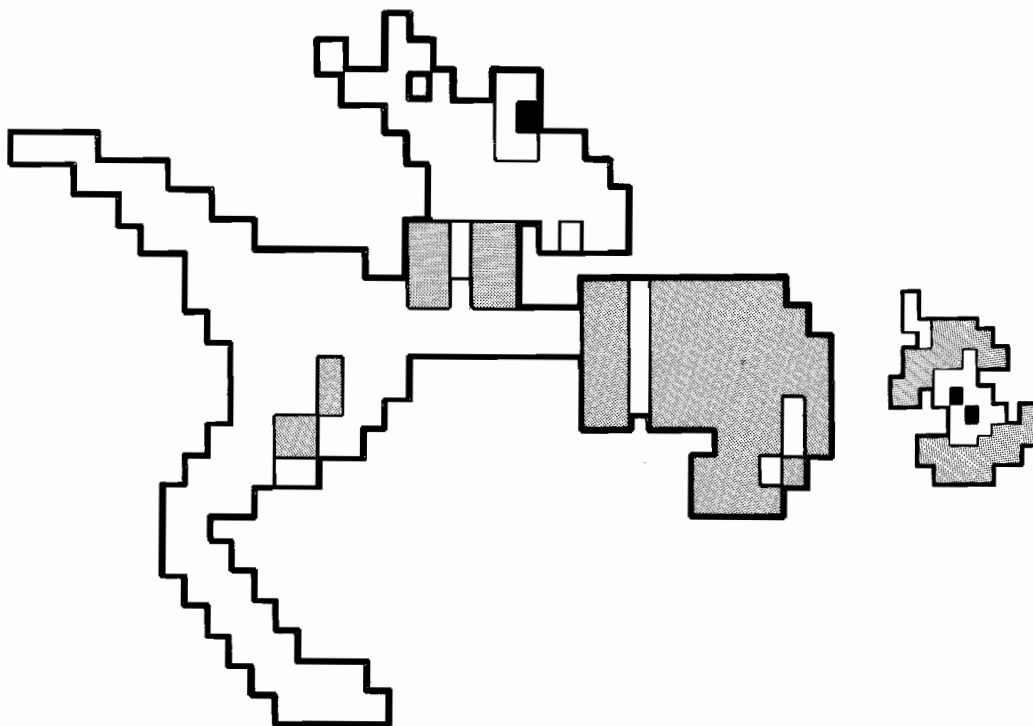
Your game's serial number is stamped on a label on the outside back of the game. The same number is also on the chassis of the video display, power supply, Regulator/Audio II Printed Circuit Board (PCB), and the Central Processing Unit (CPU) and Video PCBs. Please mention this number when calling your distributor for service.





Operation, Maintenance and Service Manual

Complete with Illustrated Parts Lists



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INTERFERENCE

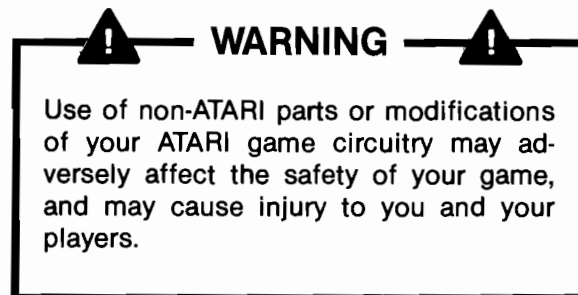
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- All grounds (green wires) in the game are properly connected as shown in the game wiring diagram, and
 - The game's power cord is properly plugged into a **grounded** 3-wire outlet.
- If you are unable to solve the interference problem, please contact:

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or
(800) 538-1611

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The warranty printed on the inside back cover of this manual may be voided, if you do any of the following:

- you substitute non-ATARI parts in your coin-operated game, or
- you modify or alter any circuits in your ATARI game by using kits or parts **not** supplied by Atari.

Not only may the use of any non-ATARI parts void your warranty, but any such alteration may also adversely affect the safety of your game and may cause injury to you and your players.

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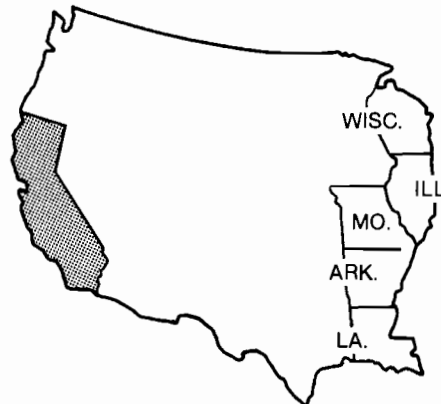
If reading through this manual does not lead to solving a certain maintenance problem, call TELEHELP® at the Atari Customer Service office in your geographical area, as shown below.

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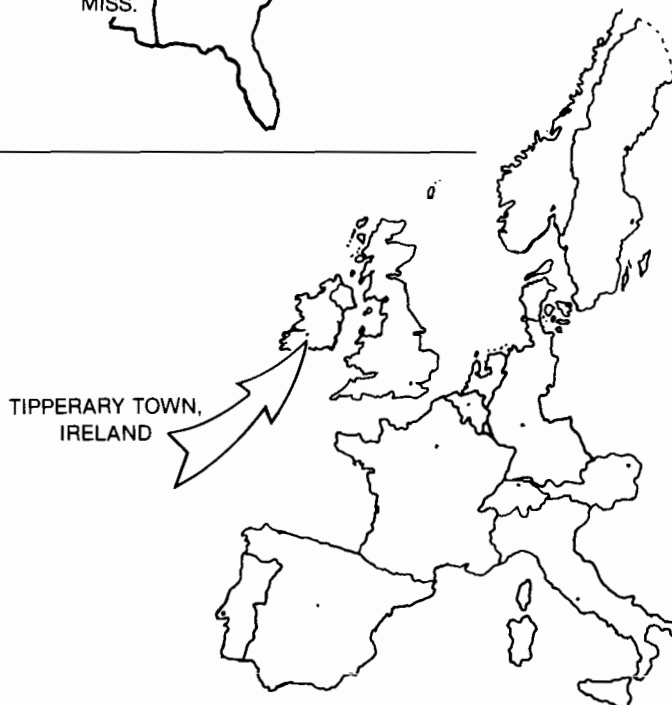


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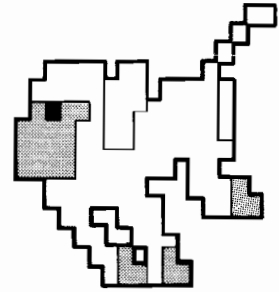
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Set-Up Procedures



How to Use This Manual

This manual, written for game operators and service technicians, describes the Kangaroo™ game.

The manual contains information about *all* Kangaroo cabinets. Whenever information is unique to the Upright cabinet, this symbol appears:



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



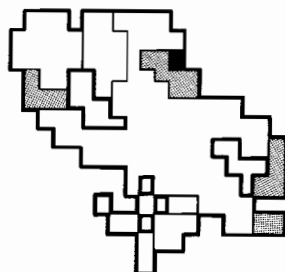
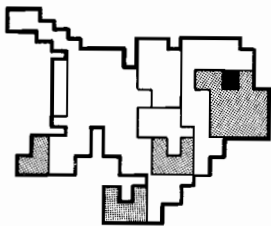
Chapter One details new features, game set-up, option switch settings, self-test procedures, and game play.

Chapter Two includes troubleshooting procedures.

Chapter Three contains maintenance, repair, and parts information.

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**

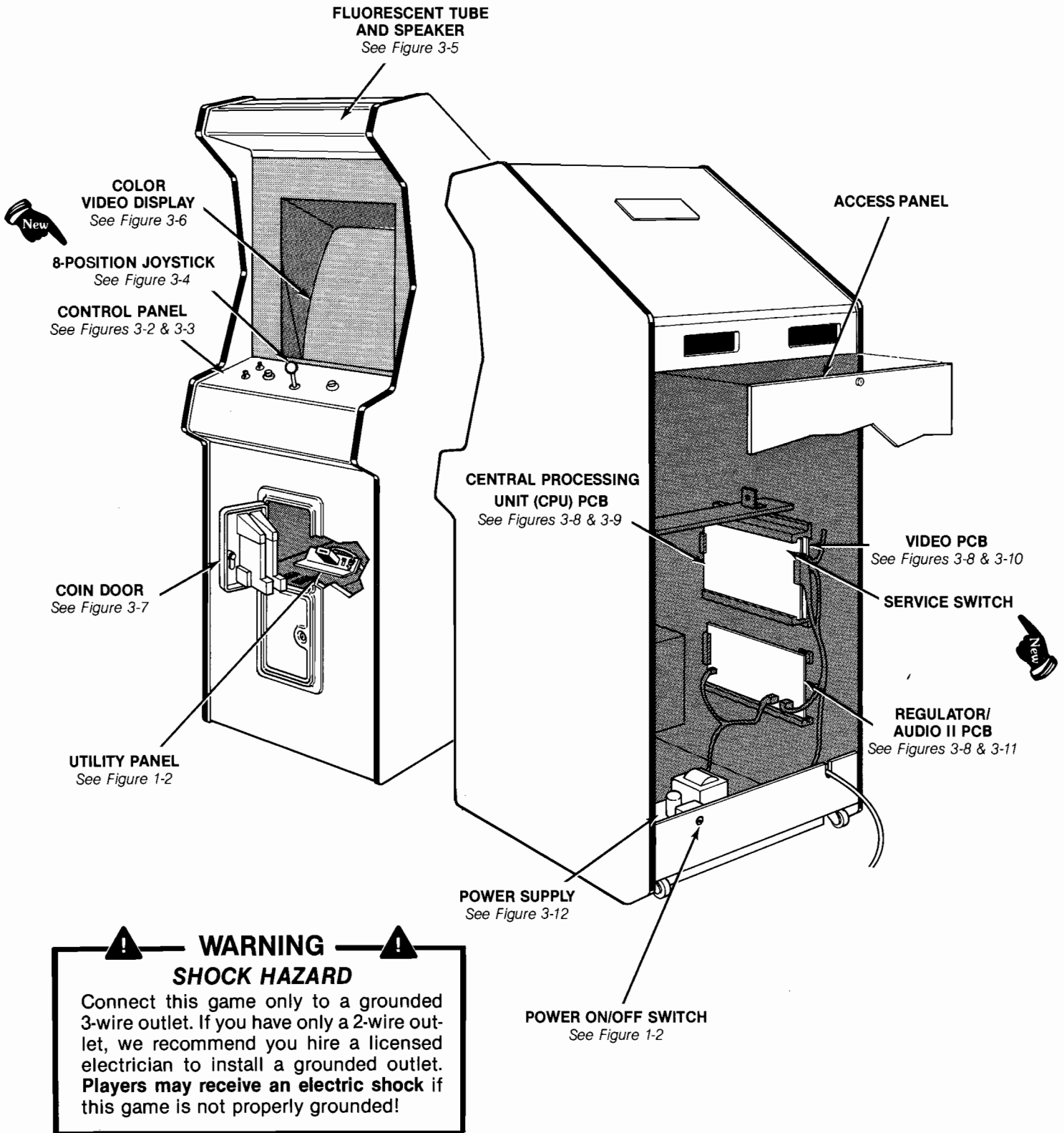


Figure 1-1 Game Overview

A. New Features

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

- **Joystick Control.** This new eight-position control is made of steel and molded plastic. It has few parts, which make servicing easier. The leaf switches snap in and out for easy replacement. The rubber bellows is designed for a quick return to center.
- **Service Switch.** There is a service switch located on the CPU PCB which allows you to enter credits without tripping the coin counter.

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



B. Game Inspection

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

NOTE
Do not plug the game in yet!

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:
 - Check that all plug-in connectors (on the game harness) are firmly seated. Replug any connectors found unplugged. **Don't force connectors together.** The connectors are keyed so they only go on in the proper orientation. **A reversed edge connector will damage a PCB** and will void your warranty.
 - Check that all plug-in integrated circuits on the PCBs are firmly seated in their sockets.
 - Remove the tie-wrap that holds the coiled power cord on the inside cabinet wall. Check the power cord for any cuts or dents in the insulation. Place the square black plastic strain-relief plate in the wood slot at the bottom of the rear panel opening.

WARNING

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

- Note the game's serial number. It is printed on a label on the back of the cabinet. Verify that the same serial number is also on the Kangaroo game PCBs, Regulator/Audio II PCB, power supply and video display. A drawing of the serial-numbered components is on the inside front cover of this manual. Please mention this number whenever you call your distributor for service.
- Check major subassemblies, such as the power supply, control panel and video display, for secure mounting.

C. Game Installation

1. Installation Requirements

Power	150W
Temperature	0 to 38°C (32 to 100°F)
Humidity	Not over 95% relative
	<i>Upright Cabinet</i>
Space Required	64 × 79 cm (25 $\frac{1}{8}$ × 31 in.)
Game Height	174 cm (68 $\frac{3}{4}$ in.)
	<i>Ireland-Built Cabinet</i>
Space Required	64 × 79 cm (25 $\frac{1}{8}$ × 31 in.)
Game Height	174 cm (68 $\frac{3}{4}$ in.)

2. Voltage Selection

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 different 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. Then 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 your location's line voltage (see *Figure 3-12*).

D. Switch Locations

1. On/Off Switch

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

2. Utility Panel Switches

The utility panel includes the volume control, self-test, coin switch, and coin counter(s). The coin switch is used to credit the game and it activates the left coin counter. These switches are located inside the upper coin door (see *Figure 1-2*).

3. Service Switch

The service switch is located on the CPU PCB. It is used to credit the game without activating the coin counter. It can also start self-test if it is pressed while powering on the game.

4. Option Switches

Option switches are located on the CPU PCB in the upper right corner, to the right of IC42.

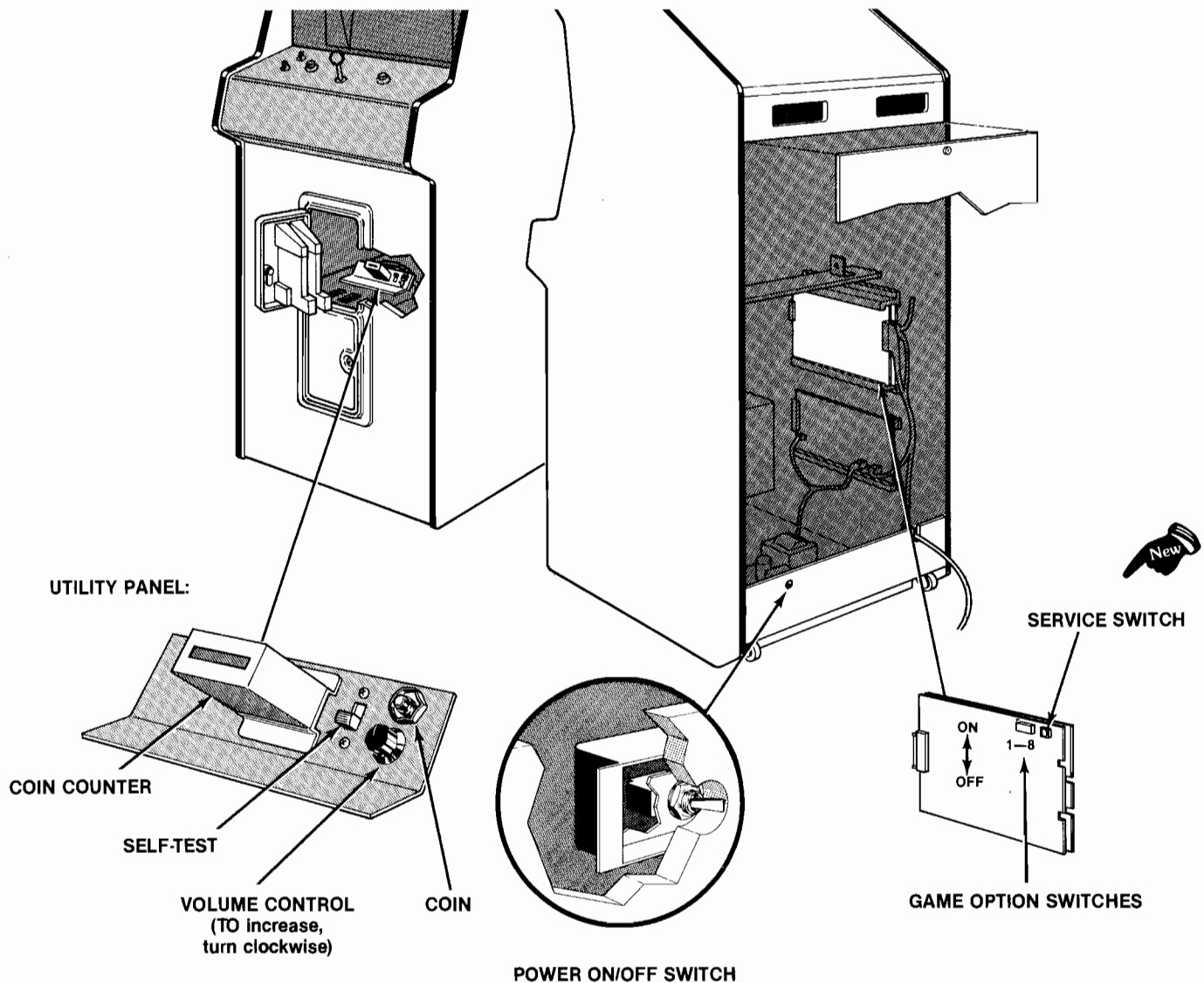


Figure 1-2 Game Switch Locations

E. Option Switch Settings

Table 1-1 details game option switch settings. Options are preset at the factory and shown by the ◀ symbols. However, you may change the settings to suit your individual needs.

To verify option switch settings, power the game off and then on again. Set the self-test switch to *on* and verify the settings on the self-test screen. Then set the self-test switch to *off*.

Table 1-1 Option Switch Settings

The table below contains the switch settings for options relating to number of Kangaroo lives, game difficulty, bonus and price options. The switches are on the CPU PCB to the right of IC42 and are accessible when the PCB is mounted in place.

The coin mechanism(s) 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 the coin or rejects it.

Settings of 8-Toggle Switch on Kangaroo CPU PCB								Option
1	2	3	4	5	6	7	8	
Off								3 Kangaroo Lives ◀
On								5 Kangaroo Lives
	Off							Easy game difficulty ◀
	On							Hard game difficulty
		Off	Off					No Bonus Kangaroos
		On	Off					Bonus Kangaroo at 10,000
		Off	On					Bonus Kangaroo at 10,000, 30,000 and every 30,000 thereafter ◀
		On	On					Bonus Kangaroo at 20,000, 40,000 and every 40,000 thereafter
								Left Coin Mechanism
								Games with one coin counter
				Off	Off	Off	Off	1 coin for 1 credit
				On	Off	Off	Off	2 coins for 1 credit
				Off	On	Off	Off	2 coins for 1 credit
				On	On	Off	Off	1 coin for 1 credit
				Off	Off	On	Off	1 coin for 1 credit
				On	Off	On	Off	1 coin for 1 credit
				Off	On	On	Off	1 coin for 1 credit
				On	On	On	Off	1 coin for 1 credit
				Off	Off	Off	On	1 coin for 2 credits
				On	Off	Off	On	1 coin for 2 credits
				Off	On	Off	On	1 coin for 2 credits
				On	On	Off	On	1 coin for 2 credits
				Off	Off	On	On	1 coin for 2 credits
				On	Off	On	On	1 coin for 2 credits
				Off	On	On	On	1 coin for 2 credits
				On	On	On	On	Free play
								Right Coin Mechanism
								Games with two coin counters
								1 coin for 1 credit ◀
								2 coins for 1 credit
								1 coin for 3 credits
								1 coin for 2 credits
								1 coin for 3 credits
								1 coin for 4 credits
								1 coin for 5 credits
								1 coin for 6 credits
								1 coin for 2 credits
								1 coin for 4 credits
								1 coin for 5 credits
								1 coin for 10 credits
								1 coin for 11 credits
								1 coin for 12 credits
								1 coin for 6 credits
								Free play

◀ *Manufacturer's recommended settings*

NOTE

When bonus life options are changed, make sure the proper sticker behind the shield is displayed.

F. Self-Test Procedure

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.

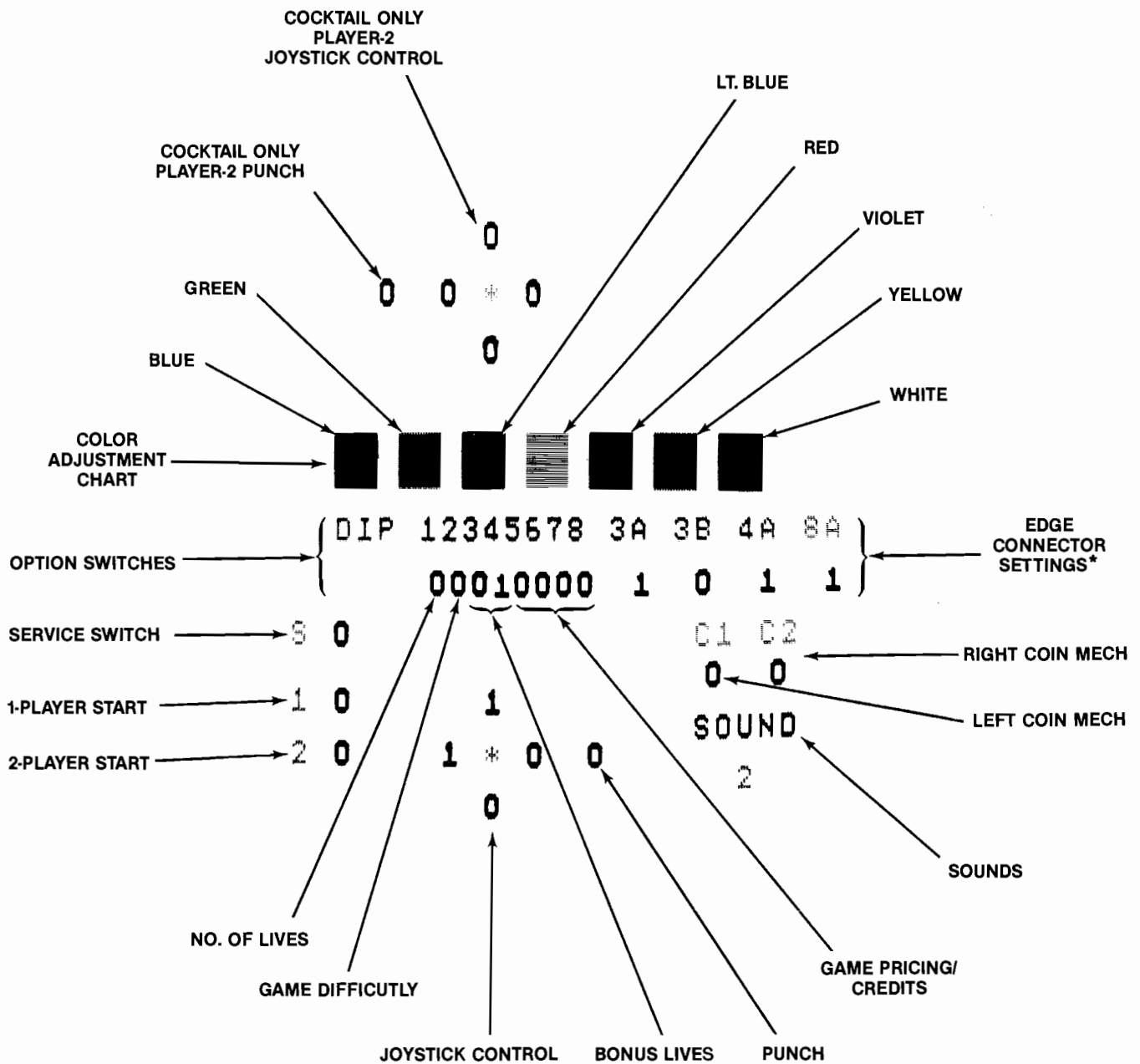
We suggest you perform the self-test procedure when you first set up the game, any time you collect money from the game, when you change game options, or when you suspect game failure.

Refer to Figure 1-2 for the location of the self-test switch and option switches. To perform the self-test, set the self-test switch to *on* or simultaneously power the game *on* and press the service switch. To end the self-test, set the self-test switch to *off*.

The complete self-test procedure is explained in *Chapter 2, Self-Test Procedure*. If a part of the test described in Figure 1-3 *fails*, refer to Chapter 2.

Figure 1-3 Self-Test Procedure

Instruction	Test Passes
1. Set the self-test switch to <i>on</i> (see Figure 1-2).	The screen shows the self-test display. The ROMs and RAMs are tested. If the screen is different from the self-test display, refer to <i>Chapter 2, Self-Test Procedure</i> .
2. Observe the seven colored squares.	Colors are blue, green, light blue, red, violet, yellow and white. If colors are not as described, refer to the raster-scan video display manual.
3. Activate all switches: control panel, coin and service.	The 0 changes to 1 as the switch is activated. If test fails, refer to <i>Chapter 3, The Control Panel</i> . Push the joystick diagonally up and to the left. For proper game operation, both the top and left switches must close at the same time, and the top and left 0s should each become 1. Push the joystick diagonally up and to the right, repeating the same procedure. Both the top and right switches should close, changing the corresponding 0s to 1s on the screen. If the test fails, refer to <i>Chapter 3, 8-Position Joystick Assembly</i> .
4. Simultaneously press Player 1 and Player 2 start switches.	Game sounds are produced and increment automatically from <i>SOUND 1</i> through <i>SOUND J</i> . If test fails, refer to <i>Chapter 2, Self-Test Procedure</i> .
	Game sounds: <i>SOUND 1</i> Game melody <i>SOUND 2</i> Kangaroo jumping <i>SOUND 3</i> Kangaroo punching <i>SOUND 4</i> Kangaroo falling <i>SOUND 5</i> Kangaroo dying <i>SOUND 6</i> Apple falling <i>SOUND 7</i> Kangaroo punching apple or gorilla <i>SOUND 8</i> Bonus Kangaroo awarded <i>SOUND 9</i> Begin new level <i>SOUND A</i> Monkey dying <i>SOUND B</i> Kangaroo getting fruit <i>SOUND C</i> End of level <i>SOUND D</i> Bell ringing <i>SOUND E</i> Monkey column decreasing by one monkey <i>SOUND F</i> Gorilla taking Kangaroo's gloves <i>SOUND G</i> Kangaroo crouching <i>SOUND H</i> Apples falling from broken branch <i>SOUND I</i> Kangaroo climbing ladder <i>SOUND J</i> Kangaroo hopping



* These represent harness connections on the CPU PCB.
 1 means the pin is shorted to ground in the harness.
 0 means there is no connection in the harness.

Screen Shows	Pin on CPU Harness Connector
3A	C
3B	3
4A	D
8A	J

NOTE: 8A is a zero if you enter self-test mode by pressing the service switch on the CPU PCB.

**Figure 1-3 Self-Test Procedure, continued
 Self-Test Display**

G. Game Play

The Kangaroo™ game is a one- or two-player game with a color raster-scan video display. Game action takes place in the branches of a tree. The player controls a mother Kangaroo who must hop and leap from the bottom of the screen to the top to rescue her kidnapped baby. In her effort to get to her baby, the Kangaroo must punch out monkeys and avoid fruit that is thrown or dropped by the monkeys.

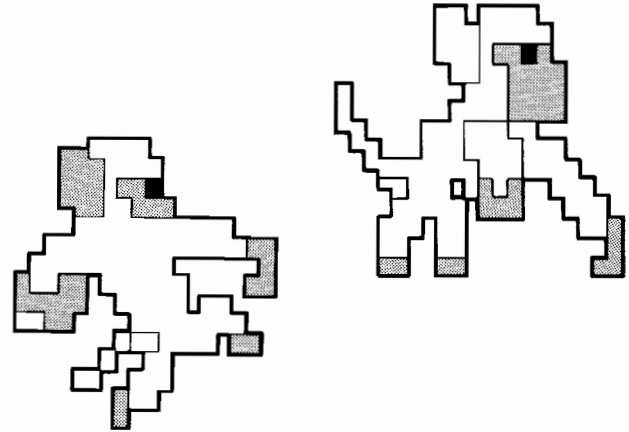
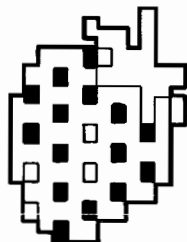
Kangaroo has five possible modes of operation: attract, ready-to-play, play, high-score and self-test. Self-test is a special mode for checking the game switches and computer functions. You may enter self-test at any time (all credits will be cancelled and the high score table will be erased).

1. Attract Mode

The attract mode begins when power is applied to the game, after a play or high-score mode, or after self-test. This mode is continuous and stops only when a credit is entered, or when in self-test. In the attract mode, the screen displays one of three possible pictures.

The first picture shows ways to score points during game play. A mother Kangaroo hops across a top branch of the tree. She leaps to touch hanging fruit with her head and to ring a bell. When she touches the fruit, it disappears and a point value appears in its place. When she rings the bell, a new fruit appears where the old fruit was hanging. A monkey pursues the mother Kangaroo and she punches him. The monkey disappears, and a point value appears in his place. Meanwhile, the baby Kangaroo climbs down a ladder and goes to the mother Kangaroo. When they touch, the word *MOM* appears on the screen above the baby.

In addition to the game play simulation, *PLAYER-1*, *LEVEL = 1*, *PLAYER-2* and *KANGAROO* appear at the top of the screen. The high score appears in the center of the screen. Credits and © 1982 ATARI, INC. appear at the bottom of the screen.



The second picture shows the high-score table. The top ten scores and their matching initials appear on the screen. The words *KANGAROO* and *INSERT COINS* also appear.

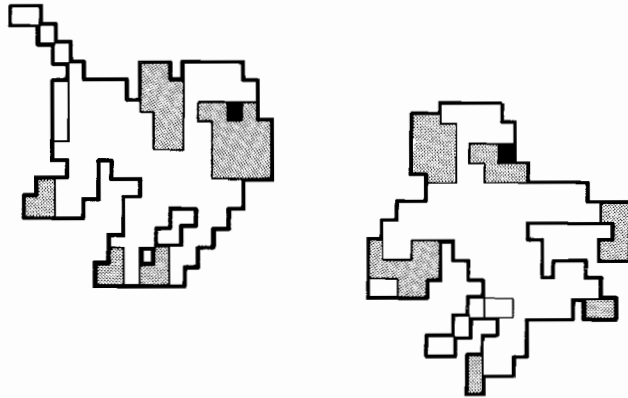
The third picture simulates game play. Mother Kangaroo enters at the bottom of the screen. She hops across a tree branch and avoids fruit thrown or dropped by monkeys and punches out monkeys. She leaps to touch fruit with her head. She climbs a ladder to get to the next branch of the tree. In this way she hops, leaps and climbs to the top of the tree to rescue her baby. She rescues her baby, or in another simulated game, is destroyed by an apple thrown by a monkey.

In addition to game play, *PLAYER-1*, *LEVEL = 1*, *PLAYER-2*, number of Kangaroo lives and bonus information appear at the top of the screen. The attract mode ends when coins are entered and accepted for game play.

2. Ready-To-Play Mode

During this mode the game level and score(s) for one or both players appear at the top of the screen. The words *PUSH ONLY 1 PLAYER BUTTON* appear when 1 credit is inserted. The words *PUSH 1 OR 2 PLAYERS BUTTON* appear when 2 or more credits are inserted. *LET'S CHALLENGE* also appears in the center of the screen. Credits appear in the bottom left corner of the screen. This mode ends when a player pushes the start button.

A picture appears briefly on the screen, showing three mother Kangaroos on three branches of the tree. The mother Kangaroo on the top branch falls through a gap to the bottom of the screen. The other Kangaroos join their babies, and the words *MOM* appear above their heads.



3. Play Mode

In the Play Mode, the player controls the mother Kangaroo with an 8-position joystick. Thus, the player causes the Kangaroo to hop to the right or left, or to leap up to touch fruit, or to jump over apples thrown at her by monkeys. She may climb up ladders, or SUPER-LEAP diagonally to the left or right to climb up log-type stairs. The Kangaroo may also duck to avoid thrown apples, or hop down diagonally to the left or right to get down the log-type stairs.

Another player control is the PUNCH button. When pushed, it causes the Kangaroo to punch with her boxing glove. She may punch monkeys for 200 to 400 points. She may also punch fruit that is thrown or dropped by monkeys for 100 to 200 points. In addition, Big Ape may appear and try to take the Kangaroo's gloves. Punching Big Ape is worth 800 points.

Game play progresses by levels. Each level has four rounds. Game play begins at Level 1. Bonus points appear at the top left of the screen. There are 2,000 bonus points at the beginning of each round, and the points decrease by 100 every five seconds. Remaining bonus points are awarded at the end of the round.

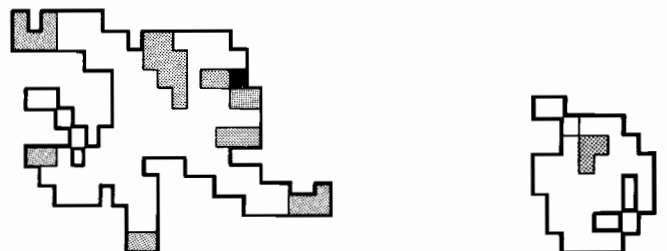
In Level 1, Round 1, mother Kangaroo is at the bottom of the screen on the branch of a tree. She must get to the top of the screen to rescue her kidnapped baby by hopping across tree branches and climbing up ladders to get to the next branch. The Kangaroo must avoid apples thrown or apple cores dropped by monkeys. She must punch out the monkeys that are in her way. For extra points, she touches strawberries by leaping to touch them with her head or by hopping on them. (If the Kangaroo rings the bell, new fruit appears in place of the strawberries.)

The Kangaroo may also punch thrown or falling fruit for extra points. But if she is hit by fruit or touched by a monkey, she dies and a halo appears over her head. If she hops, leaps and climbs to the top of the tree and gets to her baby, this round ends.

In Round 2 there are log stairs instead of ladders for the mother Kangaroo to climb. To get up the stairs, she must leap diagonally (SUPER-LEAP). The Kangaroo must be careful not to fall through any gaps in the stairs or on the branches, or she will die. Also, Big Ape may appear in this round. He takes the Kangaroo's glove away from her by coming close to her and extending his arm. For about 10 seconds, the Kangaroo has to defend herself with a white flag. Then her glove reappears.

In Round 3 the baby Kangaroo is in a cage at the top of a column of monkeys. Mother Kangaroo may either punch out the monkeys one by one (for 400 points each), or climb up ladders to a branch of the tree where she can hop into the cage. The column increases by one monkey every 10 seconds. In addition, monkeys climb up a vine to get to a stack of 11 apples on a branch at the top of the screen. If the mother Kangaroo takes too long to get to her baby and a monkey gets to the apples, the branch breaks, and all the apples fall at one time.

In Round 4 there are ladders with missing rungs, stairs to climb, and gaps in the branches, making the rescue more difficult. If a player completes this round, Level 2, Round 1 begins. The player may punch the thrown fruit to score points. Play becomes more difficult as game play progresses. The game ends when all the Kangaroo's lives are used up.



4. High-Score Mode

This mode begins when a player has one of the top ten scores. Letters of the alphabet are at the top of the screen, and the high score table is below the letters. A player enters his initials by using the joystick to guide a highlighted square to his initials. By pressing the PUNCH button, the initial is transferred onto a line between the alphabet and the high-score table. After the initials are entered, they are transferred into the table. To reset the high-score table, power the game *off* and then *on*, or enter and end the self-test mode.

5. Hints for Game Play

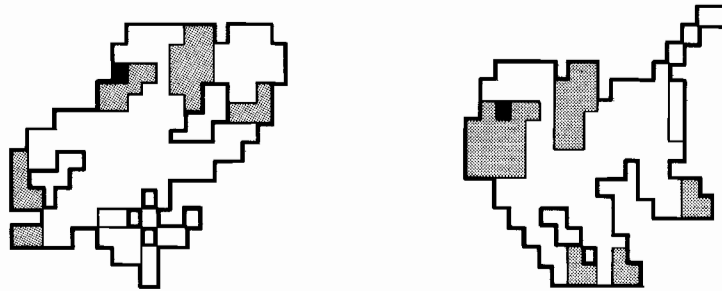
- Ring the bell for extra points. New fruit with higher point value will appear in place of the old fruit.
- Avoid walking into a monkey.
- Punch monkeys for 200-400 points each.
- Do not let Big Ape take mother Kangaroo's glove (it reappears after 10 seconds).
- Mother Kangaroo must duck, leap or punch to avoid being killed by thrown or dropped fruit.

Table 1-2 Kangaroo Scoring

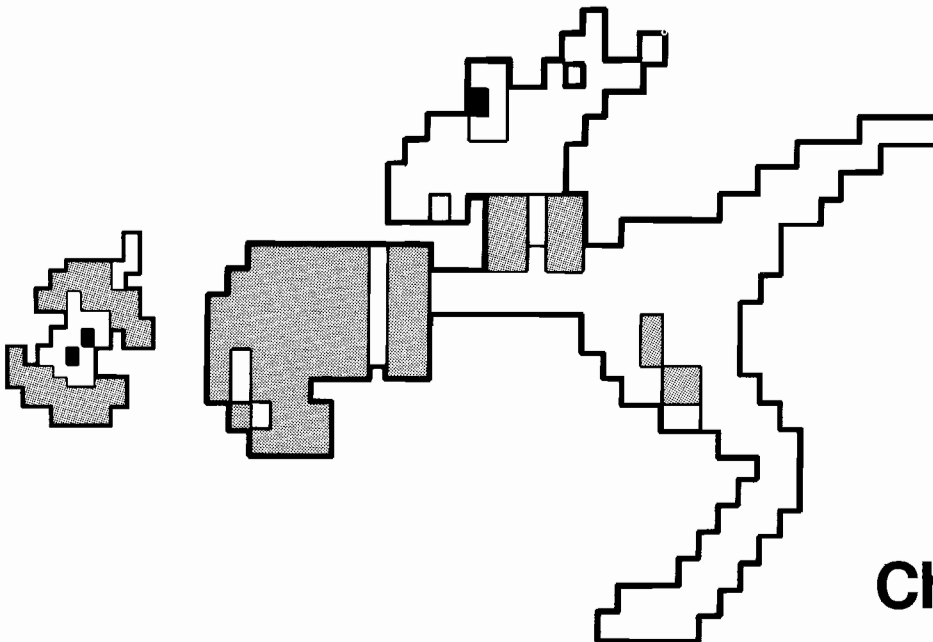
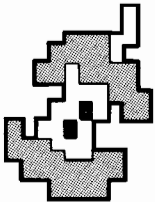
Kangaroo Punching	Points
Thrown Apples	100
Monkey	200
Apple Cores	200
Monkey from Column	400
Big Ape	800
Kangaroo Jumping to Touch Fruit	
	Points
Strawberry	100
Tomato	200
Cherries	400
Pineapple	800
Completing Round	2000-100*

* Decreases by 100 every 5 seconds

Troubleshooting



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 isolate the failing portion of the game. The self-test procedure included in Chapter 1 will help you decide if the game is or isn't working properly. The expanded self-test procedures in this chapter are included to help the qualified electronic technician determine why the game isn't working properly.



Chapter

2

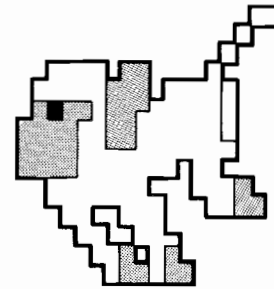
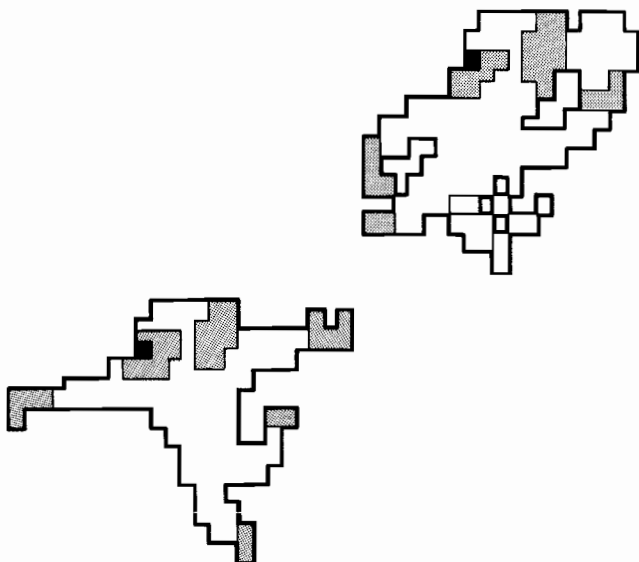
A. Comments on Troubleshooting

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 display is failing, we suggest that a qualified video display technician handle the troubleshooting and repair. If the power supply or Regulator/Audio II PCB is failing, troubleshooting and repair are relatively simple, as these assemblies are not too complicated. If a game PCB is failing, troubleshooting and repair will greatly depend on your understanding of the operation of the PCB.

To effectively troubleshoot problems of a game PCB, it is necessary for you, the technician, to become familiar with the PCB's hardware. 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.



B. Self-Test Procedure

To enter Self-Test, set the self-test switch to the on position. The screen displays the picture below. See Chapter 1, Section F, Self-Test Procedure for a complete description of this picture.

NOTE
This procedure does not test the coin door lockout coils. If the Self-Test passes, but the lockout coils do not energize when power is applied to the game, suspect the lockout coil wiring, coin door harness, game PCB harness, or transistor TR3 (for the *Ireland-Built* cabinet check TR3 and TR4) and related circuitry of the CPU PCB.

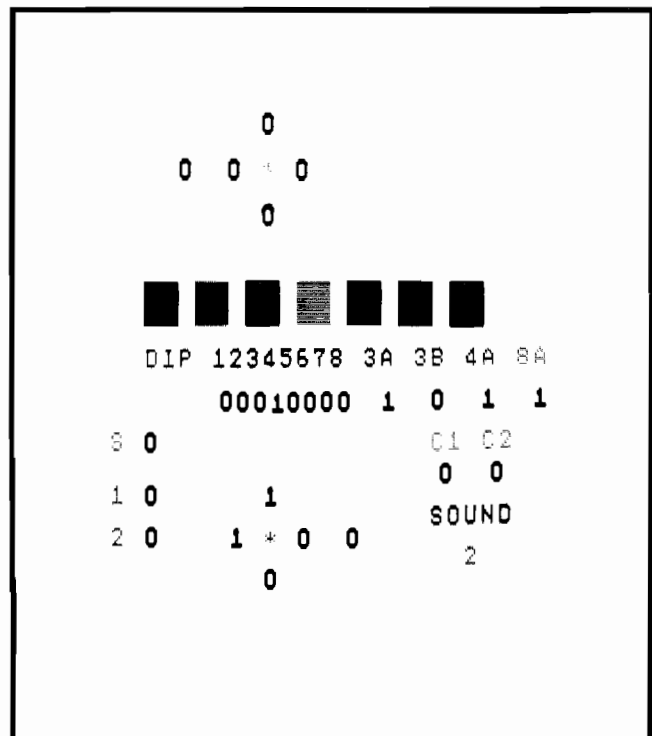


Figure 2-1 Self-Test Screen 1
Test Passes

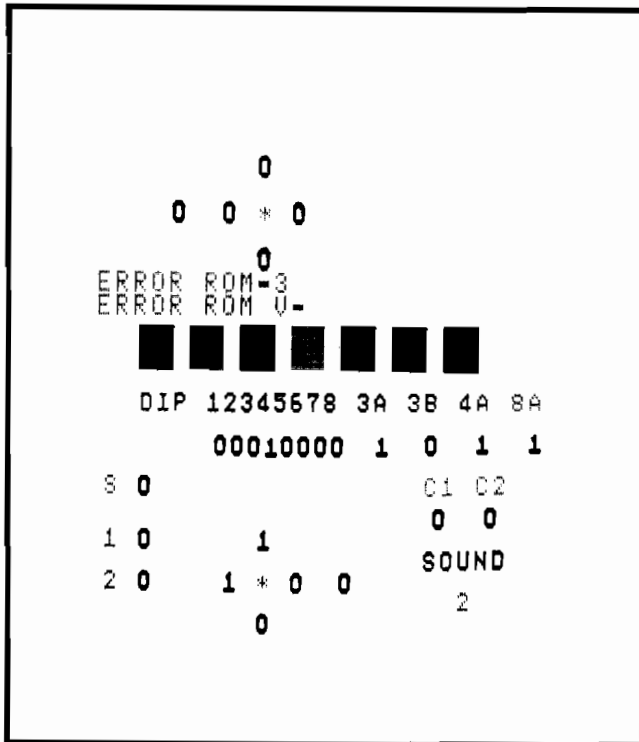


Figure 2-2 Self-Test Screen 1 Test Fails

SCREEN 1:

ROM FAILURE is indicated on the screen by the words *ERROR ROM-* and a number (for a ROM failure on the CPU PCB), or the words *ERROR ROM V-* and a number (for a failure on the Video PCB). Note the indication of failure in Figure 2-2. The following lists the ROM chips and their locations.

Screen Display	Bad ROM Chip Location
<i>ROM-0*</i>	<i>IC7</i>
<i>ROM-1</i>	<i>IC8</i>
<i>ROM-2</i>	<i>IC9</i>
<i>ROM-3</i>	<i>IC10</i>
<i>ROM-4</i>	<i>IC16</i>
<i>ROM-5*</i>	<i>IC17</i>
<i>ROM-8*</i>	<i>IC24</i>
<i>ROM-12*</i>	<i>IC28</i>
	Video PCB
<i>ROM V-0</i>	<i>IC76</i>
<i>ROM V-1</i>	<i>IC52</i>
<i>ROM V-2</i>	<i>IC77</i>
<i>ROM V-3</i>	<i>IC53</i>

*Does not display on the screen if defective.

RAM FAILURE is indicated by a blank screen or by garbage displayed on the screen for a defective RAM at IC5 or IC6 on the CPU PCB. Make sure that ROM-0 and ROM-5 are good on the CPU PCB. In addition, inspect the dynamic RAM on the Video PCB

at locations IC55-62, 66-73, 79-86 or 93-100. Troubleshoot using the game schematics and the CAT Box (using a Z80 interface) or a bus controller to locate the failing RAM.

SWITCH FAILURE is indicated by the proper 0 or 1 not changing on the screen when the switch is activated. Troubleshoot using the information in *Chapter 3, Section B* and game schematics.

SOUND FAILURE is indicated by no sound. Check the volume control levels on the utility panel and on the CPU PCB at VR2. Troubleshoot the following sound circuitry on the CPU PCB: G.I. sound chip at IC50, ROM 8 at IC24, Z80 Microprocessor at IC34, RAMs at IC32 or 33, or audio amplifier at IC61.

To go to screen 2, push the 1-player start and either PUNCH switch at the same time.

SCREEN 2:

A white crosshatch pattern with white dots centered in each square appears on the screen (see *Figure 2-3*). The center part of each side of the red rectangle should be 1/4-inch behind the bezel, out of view. Use this pattern for convergence and white balance (see the raster-scan video display manual).

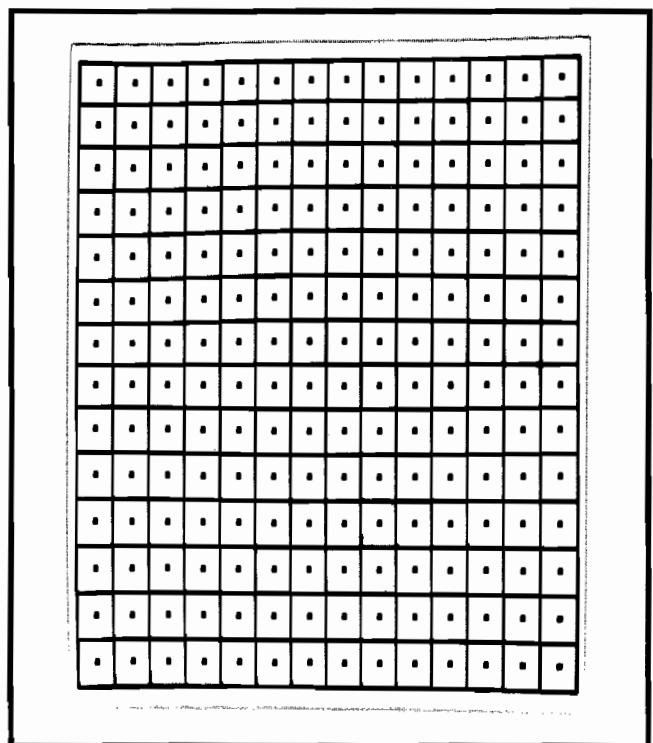


Figure 2-3 Self-Test Screen 2

C. Troubleshooting With the CAT Box and Z80 Interface Adapter

1. Preliminary Set-Up Procedure

- Disconnect the electrical power from the game.
- Disconnect the wiring harness from the game PCB.
- Remove the game PCB from the game cabinet following the procedure given in Chapter 3. Remove Z80 microprocessor IC15 from the game PCB.
- Connect the CAT Box flat cable connector to the 50-pin connector of the CAT Box/Z80 Interface Adapter.
- Connect one end of the 40-pin flat cable supplied with the Interface Adapter to the 40-pin connector of the Interface Adapter.
- Connect the other end of the 40-pin flat cable to the socket of Z80 microprocessor IC15 on the game PCB.
- Connect the DATA PROBE ground of the CAT Box to pin 8 of IC1 on the game PCB.
- Apply power to both the CAT Box and the game.
- Set the following CAT Box switches as indicated:
R/W MODE: (OFF)
R/W: WRITE
BYTES: 1024
DBUS SOURCE: ADDR
TESTER MODE: R/W
TESTER SELF-TEST: OFF
- Press the TESTER RESET button on the CAT Box.

2. Working RAM Check

Check Working RAM of the game PCB as follows:

- Perform the Preliminary Set-Up Procedure.
- Enter address E000 on the CAT Box keyboard. Check that E000 is shown on the ADDRESS/SIGNATURE display of the CAT Box.
- Set R/W MODE to PULSE and then back to (OFF).
- Set R/W to READ.
- Set R/W MODE to PULSE.
- Check the COMPARE ERROR light-emitting diode (LED) on the CAT Box. If this LED is off, the game Working RAM is okay. If this

LED is turned on, first check that all interconnections between the CAT Box, Interface Adapter, and game PCB are correctly and securely made. Then repeat parts a through f of this procedure. If the COMPARE ERROR LED lights up again, check the game Working RAM for failure.

3. Display RAM Check

Check the Display RAM of the game PCB as follows:

- Perform the Preliminary Set-Up Procedure.
- Perform the Working RAM Check.
- Set the following CAT Box switches as indicated:
R/W MODE: (OFF)
DBUS SOURCE: DATA
BYTES: 1
- Write FF to address E808. (To write data from the CAT Box to the game memory, first set R/W to WRITE. Then, enter the hexadecimal address with the keyboard on the CAT Box. Check that the address shown in the ADDRESS/SIGNATURE display of the CAT Box is correct. Then press the DATA SET button and enter the hexadecimal data with the keyboard on the CAT Box. Check that the data shown in the DATA display is correct. Then set R/W MODE to PULSE and back to (OFF) to send the data to the game memory address shown in the ADDRESS/SIGNATURE display.)
- Press the ADDRESS INCR button to advance the ADDRESS/SIGNATURE display to E809. Write 0C to address E809.
- Press the ADDRESS INCR button to advance the ADDRESS/SIGNATURE display to E80A. Write FF to address E80A.
- Set BYTES to 1024.
- Write 00 to addresses 8000, 8400, 8800, 8C00, 9000, 9400, 9800, 9C00, A000, A400, A800, AC00, B000, B400, B800, and BC00.
- Check that a section of the game display is erased when the R/W MODE switch is used to write data to each of the above addresses. The erasing begins at the bottom of the display and proceeds upward by sections.
- Set BYTES to 1.
- Write 03 to game address E808.

- l. Enter the game memory address in Table 2-1.
- m. Press DATA SET.
- n. Enter the data from Table 2-1.
- o. Set R/ \overline{W} MODE to PULSE and back to (OFF).
- p. Repeat parts l through o for each address listed in Table 2-1.
- q. Check that a Mother Kangaroo has been drawn at the center of the game display screen. If the Mother Kangaroo is not accurately displayed, repeat parts g through p. If the Mother Kangaroo still is not accurately displayed, check the game display circuitry for failure.

Table 2-1 Display RAM

ADDRESS	DATA
E800	00
E801	C0
E802	80
E803	20
E804	1B
E805	06*

*This data must be written last.

4. Sound Microprocessor Check

Check the Sound Microprocessor as follows:

- a. Perform the Preliminary Set-Up Procedure.
- b. Perform the Working RAM Check.
- c. Set the following CAT Box switches as indicated:
 BYTES: 1
 R/ \overline{W} : WRITE
 R/ \overline{W} MODE: (OFF)
- c. Enter game memory address EC00 with the CAT Box keyboard.
- d. Press DATA SET.
- e. Enter the data from Table 2-2.
- f. Set R/ \overline{W} MODE to PULSE and back to (OFF).
- g. Check for the response indicated in Table 2-2. If the correct response does not occur, check the game sound circuitry for failure.
- h. Repeat parts d through g for each data listed in Table 2-2.

Table 2-2 Sound Microprocessor

ADDRESS	DATA	RESULTING SOUND
EC00	01	Stops all sounds.
EC00	02	Initializes the Sound Microprocessor. No sound is produced.
EC00	03	Game melody.
EC00	04	Stops game melody.
EC00	02	Initializes the Sound Microprocessor.
EC00	05	Kangaroo jumping.
EC00	06	Kangaroo punching.
EC00	07	Kangaroo falling.
EC00	08	Monkey dying.
EC00	09	Kangaroo punching apple or gorilla.
EC00	0A	Bonus Kangaroo awarded.
EC00	0B	Begin new level.
EC00	0C	Apple falling.
EC00	0D	Kangaroo dying.
EC00	0E	Kangaroo getting fruit.
EC00	0F	End of level.
EC00	10	Bell ringing.
EC00	11	Monkey column decreasing by one monkey.
EC00	12	Gorilla taking Kangaroo's gloves.
EC00	13	Kangaroo crouching.
EC00	14	Apples falling from broken branch.
EC00	15	Kangaroo climbing ladder.
EC00	04	Stops Kangaroo climbing ladder sound.
EC00	02	Initializes Sound Microprocessor.
EC00	16	Kangaroo hopping.
EC00	17	Stops Kangaroo hopping sound.

Table 2-3 Display Addressing Memory Map

ADDRESS	DATA BIT STATE	FUNCTION
E808	DB0 = 1	Enables writing to playfield red RAM and bright RAM.
	DB0 = 0	Disables writing to playfield red RAM and bright RAM.
	DB1 = 1	Enables writing to playfield blue RAM and playfield green RAM.
	DB1 = 0	Disables writing to playfield blue RAM and playfield green RAM.
	DB2 = 1	Enables writing to Motion red RAM and bright RAM.
	DB2 = 0	Disables writing to motion red RAM and bright RAM.
	DB3 = 1	Enables writing to motion blue RAM and motion green RAM.
	DB3 = 0	Disables writing to motion blue RAM and motion green RAM.
E809	DB0 = 1	Disables priority to motion RAM.
	DB0 = 0	Enables priority to motion RAM.
	DB1 = 1	Disables priority to playfield RAM.
	DB1 = 0	Enables priority to playfield RAM.
	DB2 = 1	Enables motion display.

ADDRESS	DATA BIT STATE	FUNCTION
E809	DB2 = 0	Disables motion display.
	DB3 = 1	Enables playfield display.
	DB3 = 0	Disables playfield display.
	DB4 = 1	Flips the motion display.
	DB5 = 1	Flips the playfield display.
E80A	DB0 = 1	Disables motion blue bright bit.
	DB0 = 0	Enables motion blue bright bit.
	DB1 = 1	Disables motion green bright bit.
	DB1 = 0	Enables motion green bright bit.
	DB2 = 1	Disables motion red bright bit.
	DB2 = 0	Enables motion red bright bit.
	DB3 = 1	Disables playfield blue bright bit.
	DB3 = 0	Enables playfield blue bright bit.
	DB4 = 1	Disables playfield green bright bit.
	DB4 = 0	Enables playfield green bright bit.
DB5 = 1	Disables playfield red bright bit.	
DB5 = 0	Enables playfield red bright bit.	

D. Glossary of Schematic Signal Descriptions

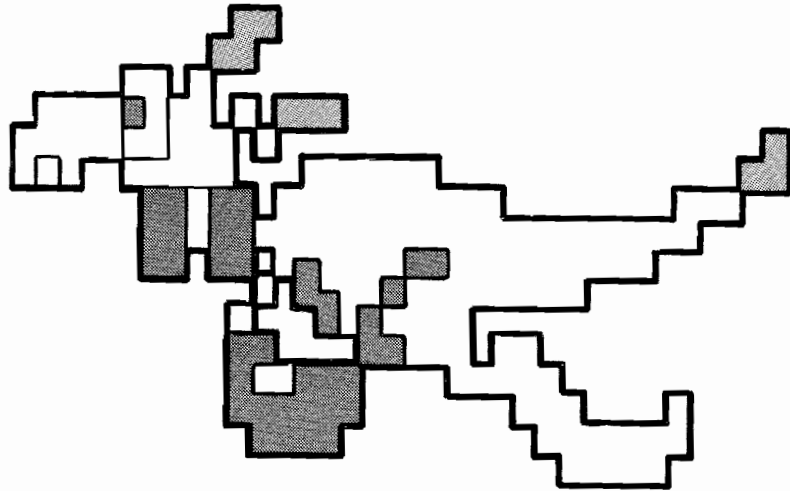
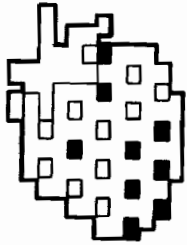
CPU PCB Signals

$\overline{\text{NMI}}$	Non-Maskable Interrupt
$\overline{\text{WAIT}}$	Wait
$\overline{\text{INT}}$	Interrupt Request (every 16 ms)
ϕ	CPU Clock (2.5MHz)
$\overline{\text{CS2}}$	Address Select (E8XX-EBXX)
$\overline{\text{RD(L)}}$	Low Byte Start Address of Data in Picture ROM for DMA
$\overline{\text{RD(H)}}$	
$\overline{\text{WR(L)}}$	Low Byte Start Address in Bit Map RAM (Where Picture is Written) During DMA
$\overline{\text{WR(H)}}$	
$\overline{\text{XY(L)}}$	Low Byte Picture Size for DMA and DMA Start
$\overline{\text{XY(H)}}$	
$\overline{\text{VPOS}}$	Vertical Start Address in Bit Map
$\overline{\text{HPOS}}$	Horizontal Start Address in Bit Map
$\overline{\text{BSEL}}$	Dynamic RAM Bank Select Latch Set
$\overline{\text{I/II EN PRI}}$	A and B Bit Map Control Latch Set
$\overline{\text{IN0}}$	Input Address Select EC00 (See Memory Map)
$\overline{\text{IN1}}$	Input Address Select ED00 (See Memory Map)
$\overline{\text{IN2}}$	Input Address Select EE00 (See Memory Map)
$\overline{\text{IN3}}$	Input Address Select EF00 (See Memory Map)
$\overline{\text{IN4}}$	Input Address Select E400 (See Memory Map)
$\overline{\text{OUT0}}$	Output Address Select EC00 (See Memory Map)
$\overline{\text{OUT1}}$	Output Address Select ED00 (See Memory Map)
$\overline{\text{OUT2}}$	Output Address Select EE00 (Not Used)

$\overline{\text{OUT3}}$	Output Address Select EF00 (See Memory Map)
$\overline{\text{HFEN}}$	Set Color-Shading Latch
$\overline{\text{SD0-SD7}}$	Sound Microprocessor Data Bus
$\overline{\text{BDIR}}$	GI AY-3-8910 Sound Chip Input/Output Select
$\overline{\text{BC1}}$	GI AY-3-8910 Sound Chip Address/Data Latch Select
$\overline{\text{IS0-IS3}}$	MB8841 Custom Microcomputer Input Data Bus
$\overline{\text{OS0-OS3}}$	MB8841 Custom Microcomputer Output Data Bus

Video PCB Signals

$\overline{\text{KO}}$	Dynamic RAM Timing Signals (See Timing Diagram in Kangaroo Schematic Package)	
$\overline{\text{K1}}$		
$\overline{\text{K2}}$		
$\overline{\text{KIS1}}$		
$\overline{\text{KOS1}}$		
$\overline{\text{XG}}$		
$\overline{\text{LD/SFT}}$		
$\overline{\text{WE}}$		
$\overline{\text{EXCT}}$		DMA in Progress (Active High)
$\overline{\text{EXCT}}$		DMA in Progress (Active Low)
$\overline{\text{SEL I/II (A)}}$	Flip Video Address (Dynamic RAM A)	
$\overline{\text{SEL I/II (B)}}$	Flip Video Address (Dynamic RAM B)	
$\overline{\text{CSC000}}$	Character ROM Address Select	
$\overline{\text{BSEL0}}$	Bank Select Dynamic RAM A	
$\overline{\text{BSEL 2}}$	Bank Select Dynamic RAM B	
$\overline{\text{AV6'}}$	Horizontal Blanking (Active Low)	

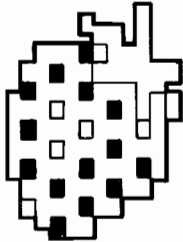
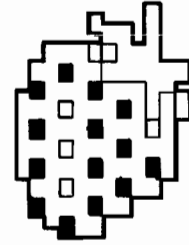


$\overline{\text{TRGA}}$	Horizontal Sync	$\overline{\text{BCAS0}}$	Dynamic RAM B Color Shading/Red CAS
$\overline{\text{VSYNC}}$	Vertical Sync	$\overline{\text{BCAS1}}$	Dynamic RAM B Blue/Green CAS
$\overline{\text{ARAS0}}$	Dynamic RAM A* Color Shading/Red RAS	$\overline{\text{BWE0}}$	Dynamic RAM B Color Shading/Red Write Enable
$\overline{\text{ARAS1}}$	Dynamic RAM A Blue/Green RAS	$\overline{\text{BWE1}}$	Dynamic RAM B Blue/Green Write Enable
$\overline{\text{ACAS0}}$	Dynamic RAM A Color Shading/Red CAS	AVAX0-13	Dynamic RAM A Video Address
$\overline{\text{ACAS1}}$	Dynamic RAM A Blue/Green CAS	AVBX0-13	Dynamic RAM B Video Address
$\overline{\text{AWE0}}$	Dynamic RAM A Color Shading/Red Write Enable	ABP0-11	Picture ROM Address
$\overline{\text{AWE1}}$	Dynamic RAM A Blue/Green Write Enable	ABX0-13	Dynamic RAM Address from CPU and for DMA
$\overline{\text{BRAS0}}$	Dynamic RAM B Color Shading/Red RAS	DPZ0-3	DMA Color Shading Data from Picture ROM
$\overline{\text{BRAS1}}$	Dynamic RAM B Blue/Green RAS	DPR0-3	DMA Red Data from Picture ROM
		DPG0-3	DMA Green Data from Picture ROM
		DPB0-3	DMA Blue Data from Picture ROM
		DXZ0-3	Dynamic RAM Data Bus—Color Shading Data

* NOTE: Dynamic RAM A refers to Playfield Bit Map; Dynamic RAM B refers to Motion Object Bit Map

DXR0-3	Dynamic RAM Data Bus—Red Data	$\overline{\text{BBHF}}$	Motion Object Blue Color Shading (Active Low)
DXG0-3	Dynamic RAM Data Bus—Green Data	AR	Playfield Red Data
DXB0-3	Dynamic RAM Data Bus—Blue Data	AG	Playfield Green Data
XXA0-6	Dynamic RAM A Address Bus	AB	Playfield Blue Data
XXB0-6	Dynamic RAM B Address Bus	AVR	Playfield Red Data AND Playfield Red Color Shading AND Playfield Priority
$\overline{\text{PRIA}}$	Playfield Priority (Active Low)	AVG	Playfield Green Data AND Playfield Green Color Shading AND Playfield Priority
$\overline{\text{PRIB}}$	Motion Object Priority (Active Low)		
ENA	Playfield Video Output Enable (Active High)	AVB	Playfield Blue Data AND Playfield Blue Color Shading AND Playfield Priority
ENB	Motion Object Video Output Enable (Active High)	BR	Motion Object Red Data
$\overline{\text{ARHF}}$	Playfield Red Color Shading (Active Low)	BG	Motion Object Green Data
$\overline{\text{AGHF}}$	Playfield Green Color Shading (Active Low)	BB	Motion Object Blue Data
$\overline{\text{ABHF}}$	Playfield Blue Color Shading (Active Low)	BVR	Motion Object Red Data AND Motion Object Red Color Shading AND Motion Object Priority
$\overline{\text{BRHF}}$	Motion Object Red Color Shading (Active Low)	BVG	Motion Object Green Data AND Motion Object Green Color Shading AND Motion Object Priority
$\overline{\text{BGHF}}$	Motion Object Green Color Shading (Active Low)	BVB	Motion Object Blue Data AND Motion Object Blue Color Shading AND Motion Object Priority

Maintenance, Repair and Parts

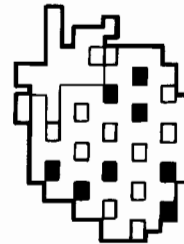
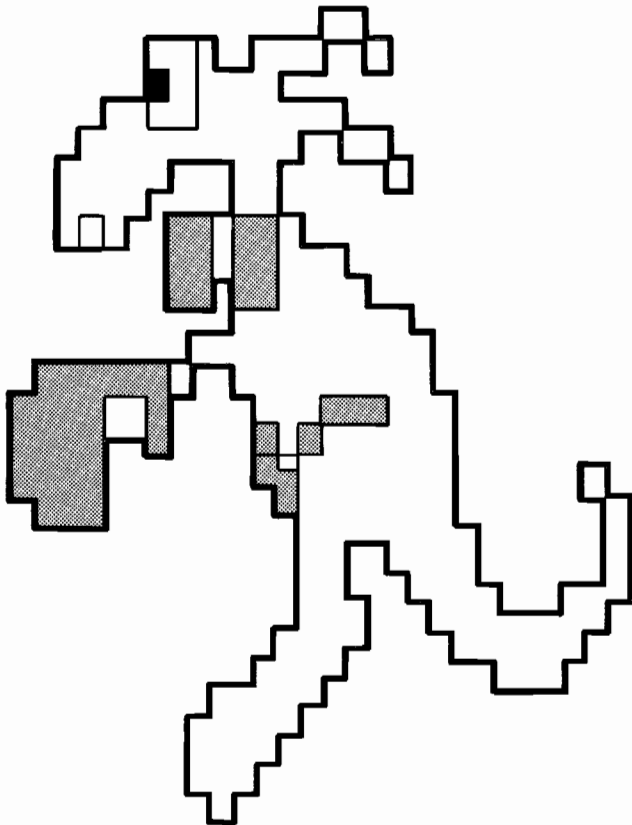


This chapter details maintenance and repair information, and provides information for you to order parts for your Kangaroo game. Please note that **common hardware has been deleted** from most of the parts lists. This includes screws, nuts, washers, bolts, etc.

The parts lists are arranged in alphanumeric order. For example, all "A." prefix numbers come first. Following these are numbers in sequence evaluated up to the hyphen, namely 00- thru 99-, then 000598- thru approximately 190000-.

When ordering parts, please give the part number, part name, applicable figure 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 in the front of this manual for your convenience.



Chapter

3

A. Cabinet-Mounted Assemblies

Schematics, Self-Test Label & Manuals—
see parts list on following page

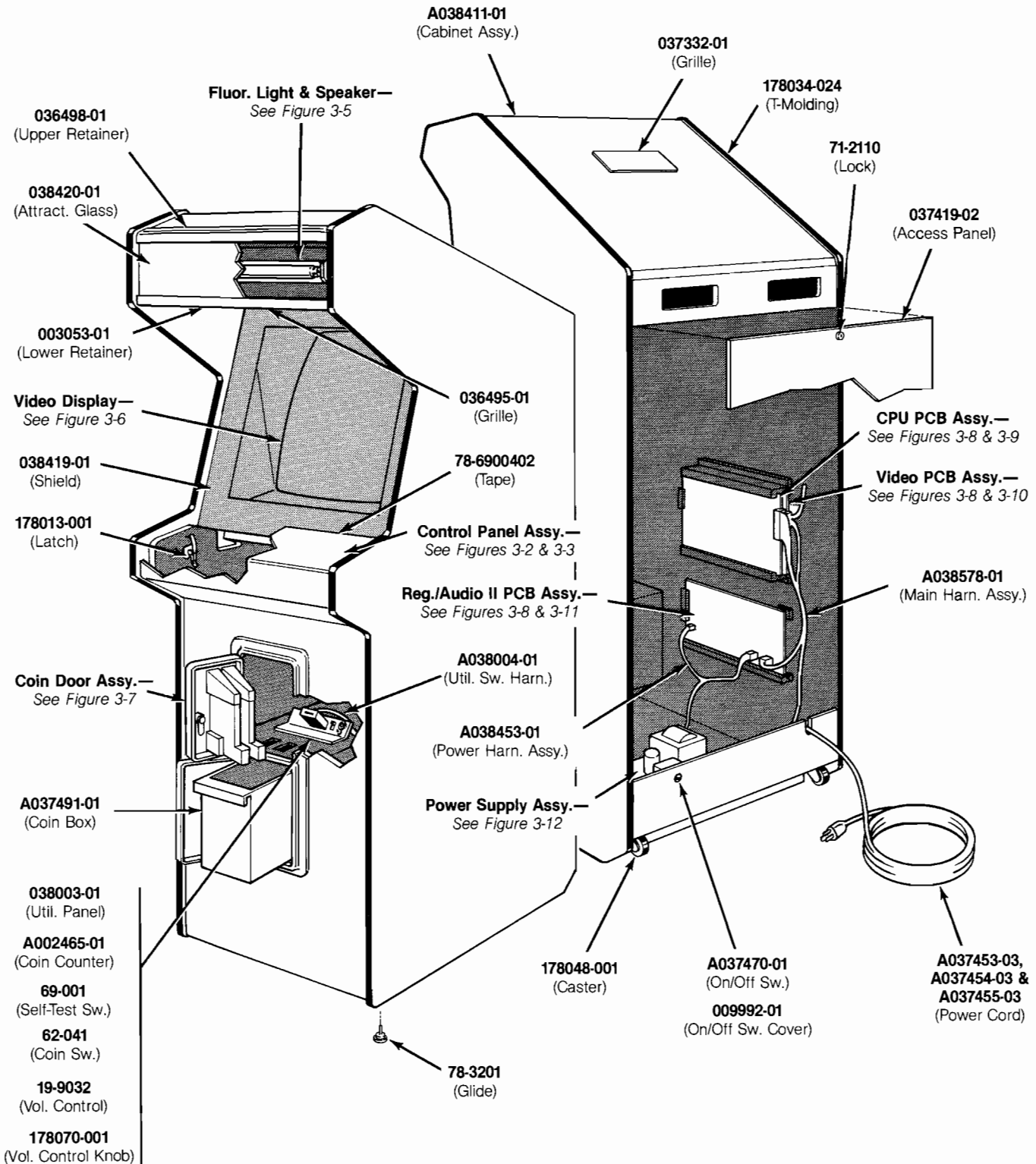


Figure 3-1 Cabinet-Mounted Assemblies
Upright Cabinet A038410-01 E

Figure 3-1 Cabinet-Mounted Assemblies, continued Upright Cabinet Parts List

Part No.	Description
A002465-01	6V Coin Counter
A037453-03	Strain-Relief Power Cord (U.S.)
A037454-03	Strain-Relief Power Cord (Austria, Belgium, Chile, Denmark, Finland, France, Germany, Greece, Indonesia, Italy, Netherlands, Norway, Spain, Sweden, and Uruguay)
A037455-03	Strain-Relief Power Cord (Australia and New Zealand)
A037470-01	Power On/Off Switch and Mounting Plate Assembly
A037491-01	Coin Box
A038004-01	Utility-Switch Panel Harness Assembly
A038411-01	Cabinet Assembly (includes legs and PCB retainers, but not the rear access panel)
A038578-01	Main Harness Assembly
A038453-01	Power Harness Assembly
<i>The following four items are the technical information supplements to this game:</i>	
SP-204	Kangaroo™ Schematic Package
ST-204-01	Kangaroo Label with Self-Test Procedure and Option Switch Settings
TM-160	Service Manual for 19-Inch Electrohome Color Raster-Scan Display Substitute TM-201 when using part no. 92-055, Wells-Gardner 19-Inch Display Substitute TM-205 when using part no. 139003-1005 or -1205, Sanyo 19-Inch Display Substitute TM-197 when using part no. 139003-1004 or -1204, Matsushita 19-Inch Display
TM-204	Kangaroo Operation, Maintenance and Service Manual
19-9032	Volume Control
62-041	SPDT Momentary-Contact Pushbutton Utility Coin Switch with Black Cap
69-001	DPDT Self-Test Switch
71-2110	Lock Mechanism (for rear access panel)
78-3201	Adjustable Glide
78-6900402	Vinyl Foam Single-Coated Adhesive Tape, ¼-Inch Wide × ⅛-Inch Thick (72 in. required)
003053-01	Lower Attraction Glass Retainer
009992-01	On/Off Switch Cover
034536-01	Foam Vibration Damper (for Kangaroo game PCBs)
034536-02	Foam Vibration Damper (for Regulator/Audio II PCB)
036495-01	Speaker Grille
036498-01	Upper Attraction Glass Retainer
036686-01	Card of Game Pricing Labels (not shown in illustration)
037419-02	Rear Access Panel (does not include lock)
037332-01	Ventilation Grille (located on cabinet top)
038003-01	Utility Switch Panel for Volume Control, Self-Test Switch, Coin Switch and Coin Counter
038419-01	Video Display Shield with Graphics
038420-01	Attraction Glass with Graphics
178013-001	Spring Draw Latch
178034-024	¾-Inch Black Plastic T-Molding
178048-001	2-Inch Rigid Caster
178070-001	Volume Control Knob

Schematics, Self-Test Label & Manuals—
see parts list on following page

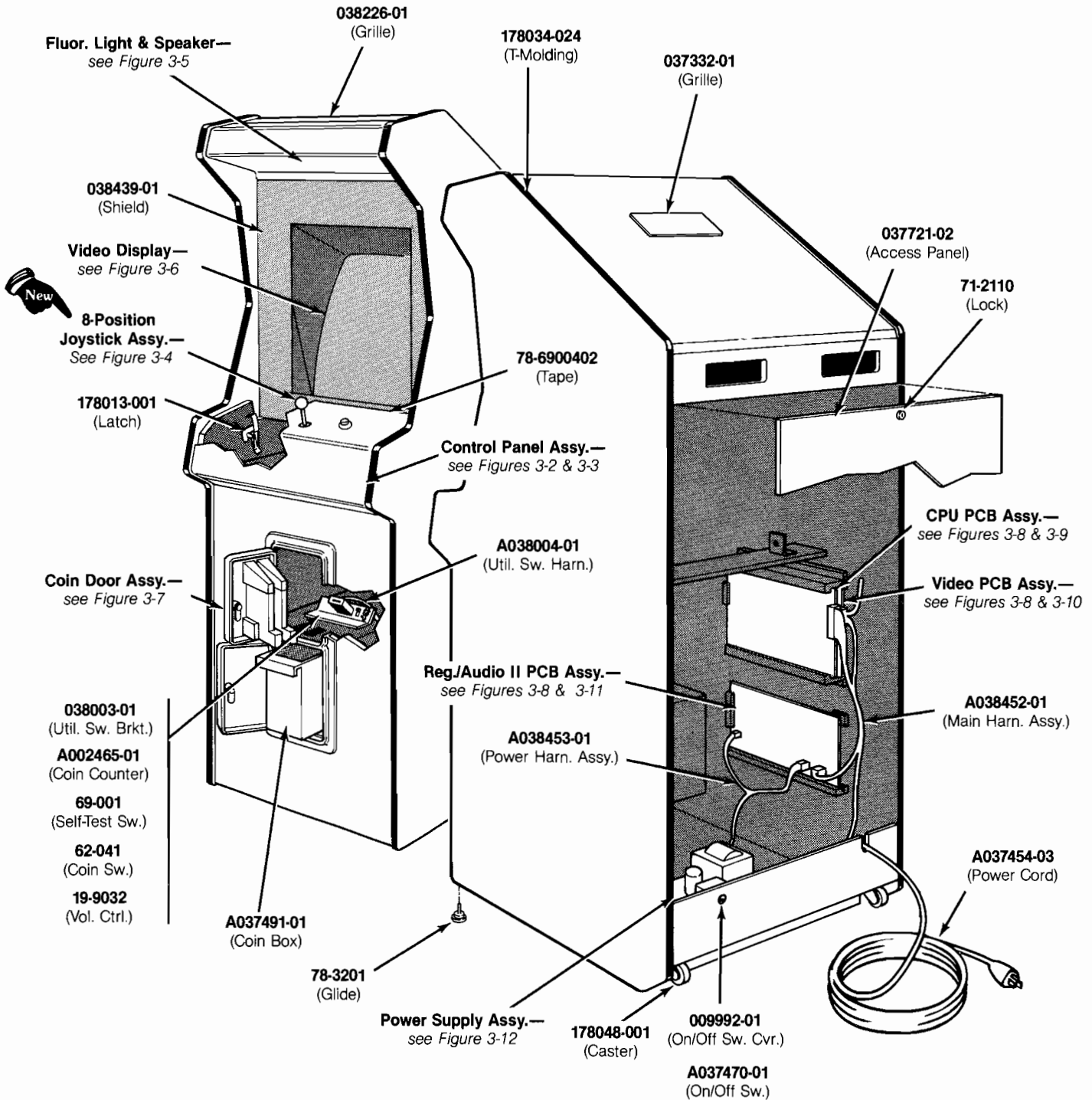
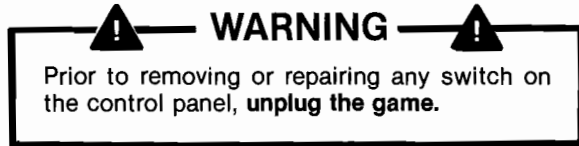


Figure 3-1 Cabinet Mounted Assemblies, continued
Ireland-Built Cabinet A038430-01 B

Figure 3-1 Cabinet-Mounted Assemblies, continued Ireland-Built Cabinet Parts List

<i>Part No.</i>	<i>Description</i>
A002465-01	Coin Counter
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 and Mounting Plate Assembly
A037491-01	Coin Box
A038004-01	Harness for Volume Control/Self-Test Switch/Coin Counter Assembly
A038431-01	Cabinet Assembly (<i>includes glides and PCB retainers, but not the rear access panel</i>)
A038452-01	Main Harness Assembly
A038453-01	Power Harness Assembly
<i>The following four items are the technical information supplements to this game:</i>	
SP-204	Kangaroo™ Schematic Package
ST-204-01	Kangaroo Label with Self-Test Procedure and Option Switch Settings
TM-160	Service Manual for 19-Inch Electrohome Color Raster-Scan Display (<i>Substitute TM-201 when using part no. 92-055, 19-Inch Wells Gardner Display</i>)
TM-204	Kangaroo Operation, Maintenance and Service Manual
19-9032	Volume Control
62-041	SPDT Momentary-Contact Pushbutton Utility Coin Switch with Black Cap
69-001	DPDT Self-Test Switch
71-2110	Lock Mechanism (<i>for rear access panel</i>)
78-3201	Adjustable Glide
78-6900402	Vinyl Foam Single-Coated-Adhesive Tape, ¼-Inch Wide × ⅛-Inch Thick
009992-01	On/Off Switch Cover
036686-01	Card of Game Pricing Labels (<i>not shown in illustration</i>)
037721-02	Rear Access Panel (<i>does not include lock</i>)
037332-01	Ventilation Grille (<i>located on cabinet top</i>)
038003-01	Utility Switch Bracket for Volume Control, Self-Test Switch, Coin Switch and Coin Counter
038226-01	Upper Cabinet Grille
038439-01	Video Display Shield with Graphics
038441-01	Side Panel Decal (<i>not shown in illustration</i>)
178013-001	Spring Draw Latch
178034-024	¾-Inch Black Plastic T-Molding
178048-001	2-Inch Rigid Caster

B. The Control Panel



To Open the Control Panel:

1. Open the coin door. Reach up through the opening and release the spring-draw latches. They are on the cabinet side walls at each end of the control panel.
2. Lift up on the control panel at the top edge, and tilt it toward you. The control panel edge next to the display shield has foam tape applied to it. The tape cushions the shield and prevents liquids from entering the cabinet interior. Make sure this tape is in good condition.

Leaf Switch Repair:

- Adjust the leaf switches for a narrow gap. When a switch button is depressed, the resulting wiping action of the cross-bar contacts provides a self-cleaning feature. **Don't burnish the contacts.** To clean them, use electrical contact cleaner.
- To replace a leaf switch, remove the screw with a Phillips-head screwdriver.
- To replace the switch button, turn the stamped nut with a wrench in a counterclockwise direction, as seen from the inside of the control panel. The ring on the outside of the control panel should not spin, due to its design.

- Reinstall the switch. Reconnect the harness wires as shown in the *Schematic Package, Game Wiring Diagram*. Make certain the right colors go to the right tabs on the switch.

Start-Switch Replacement:

These switches have a very low failure rate. If a switch should ever be suspect, first test it using the directions that follow.

To Test Switch:

- Remove the wires from the suspected switch.
- Attach the leads of an ohmmeter to normally open and common contacts.
- Check contacts (push and release the switch button) for closed and open continuity.
- If the contacts do not operate sharply or always remain closed or open, then replace the switch.

To Replace Switch:

- Remove all wires from the faulty switch.
- Turn the switch counterclockwise while holding the black cone-shaped bushing on the outside of the control panel.
- Install a new switch using the reverse procedure.
- Reconnect the harness wires as shown.

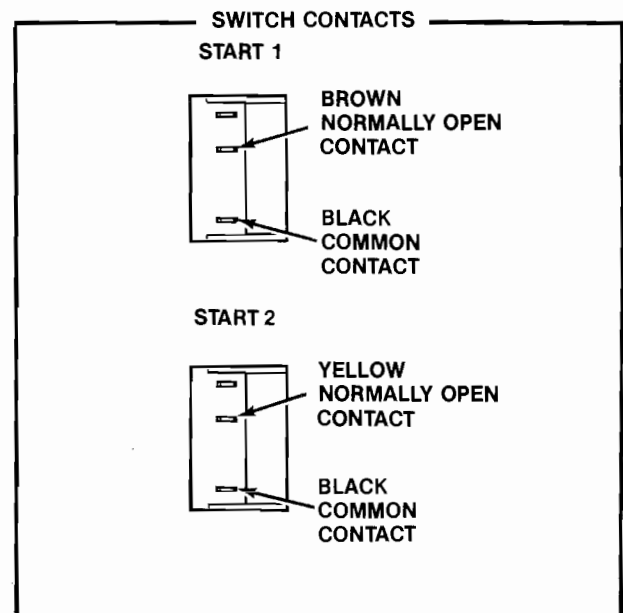
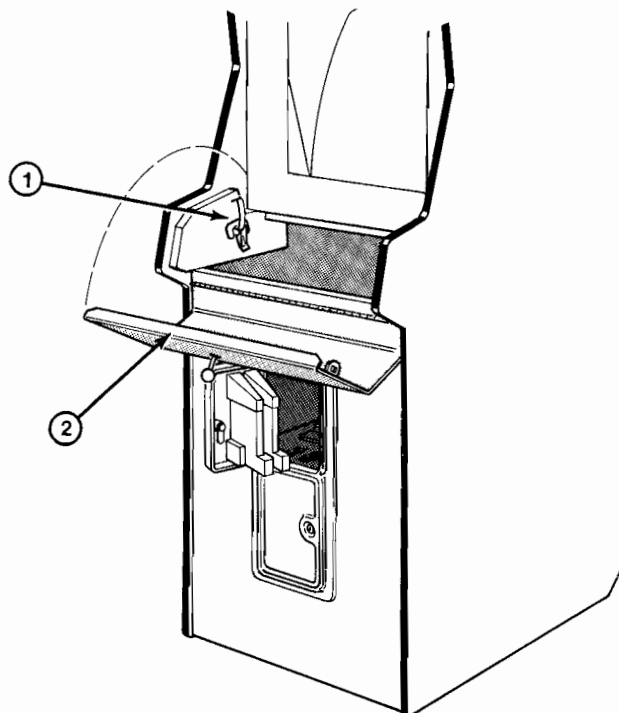


Figure 3-2 The Control Panel

WARNING

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

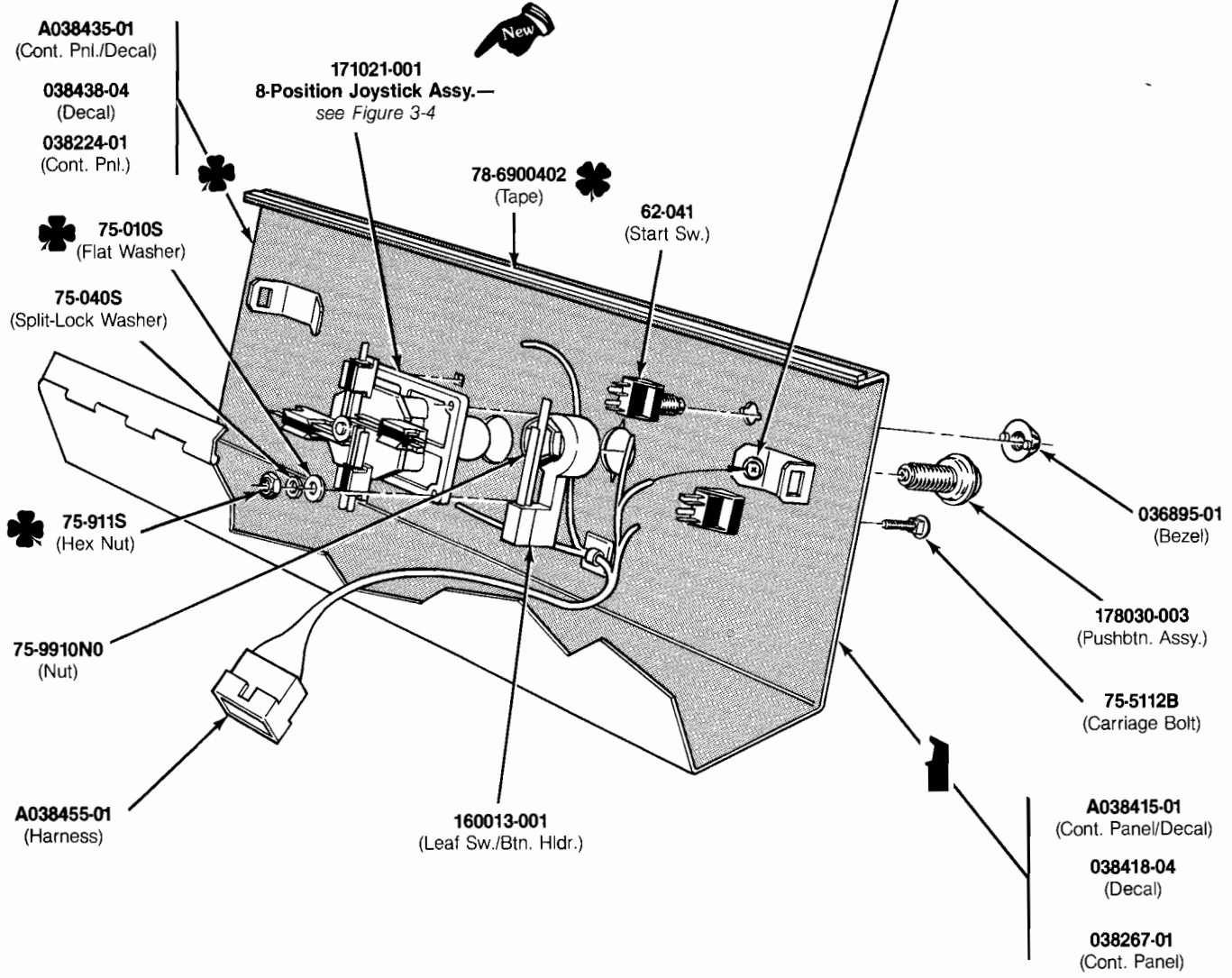


Figure 3-3 Control Panel Assembly
Upright Cabinet A038414-01 B
Ireland-Built Cabinet A038434-01 A

Figure 3-3 Control Panel Assembly, continued Parts List

Part No.	Description
<i>Upright Cabinet</i>	
A038415-01	Control Panel with Decal
75-941S	#10-24 Hex Locknut
038267-01	Control Panel
038418-04	Control Panel Decal
<i>Ireland-Built Cabinet</i>	
A038435-01	Control Panel with Decal
75-010S	#10 Flat Washer
75-911S	#10-24 Hex Nut
78-6900402	Vinyl Foam Single-Coated-Adhesive Tape, 1/4-Inch Wide × 1/8-Inch Thick (24 in. required)
038224-01	Control Panel
038438-04	Control Panel Decal
<i>For Upright and Ireland-Built Cabinets</i>	
A038455-01	Control Panel Harness Assembly
62-041	SPDT Momentary Pushbutton Start Switch
75-040S	#10 Split-Lock Washer
75-5112B	#10-24 × 3/4-Inch Black Carriage Bolt
75-9910N0	#5/8-11 Steel Stamped Nut
036895-01	Black Molded Switch Bezel
160013-001	Leaf Switch and Button Holder (Leaf switch only is part no. 160012-001)
171021-001	8-Position Joystick Assembly
178030-003	Black Pushbutton Assembly

WARNING

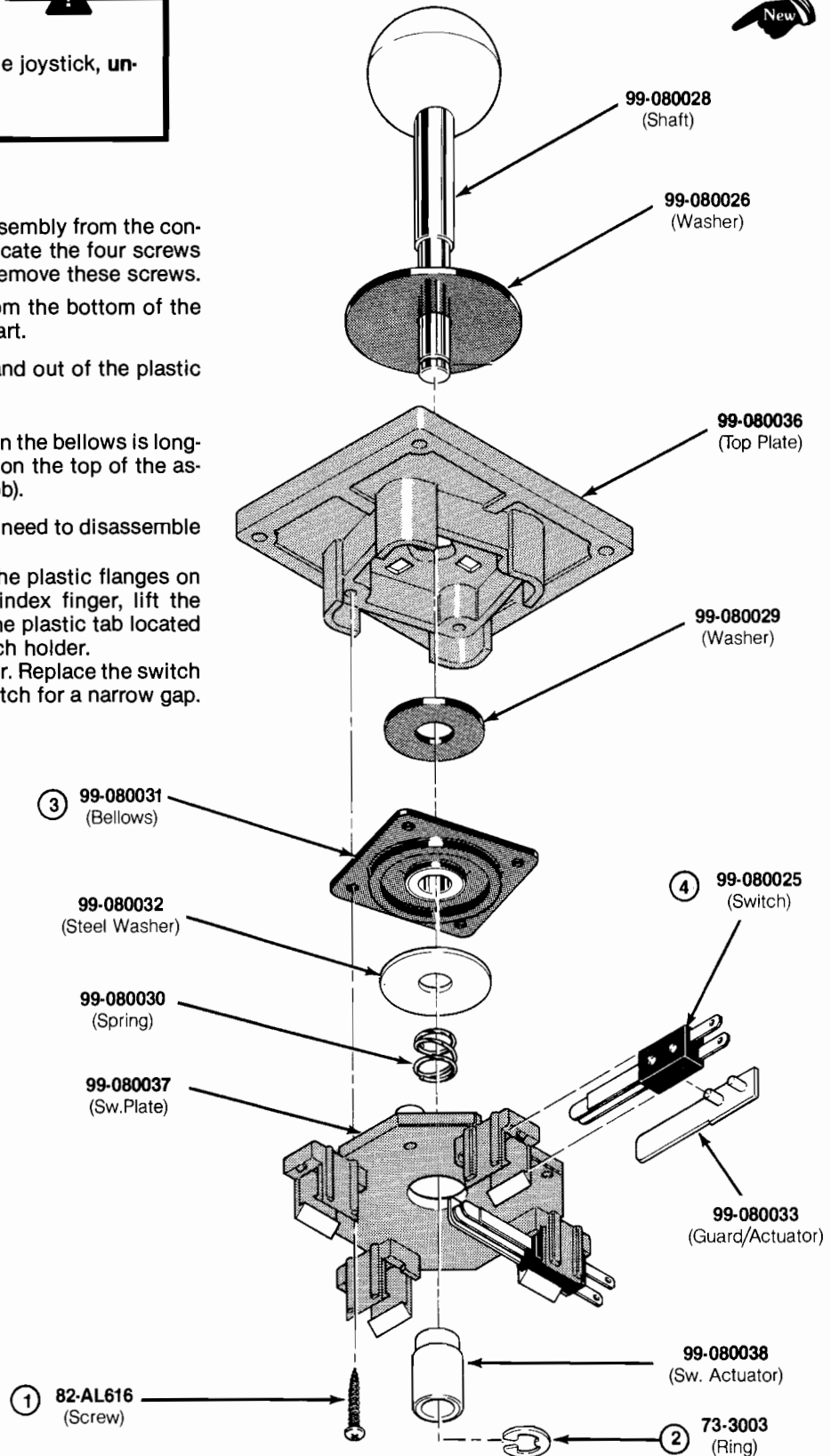
Prior to removing or repairing the joystick, **unplug the game.**



To Repair the Joystick:

1. First remove the entire joystick assembly from the control panel (see *Figure 3-3*). Now locate the four screws in the plastic joystick frame and remove these screws.
2. Next remove the retaining ring from the bottom of the shaft. The assembly will come apart.
3. To replace the *bellows*, pry it up and out of the plastic frame.
 - Reassemble in reverse order.
 - Note that the inner raised ring on the bellows is longer on one side. This side goes on the top of the assembly (toward the control knob).
4. To replace a *leaf switch*, you don't need to disassemble the joystick.
 - Using your thumbs, pry apart the plastic flanges on the switch holder. With your index finger, lift the switch up so that it will clear the plastic tab located on the outside end of the switch holder.
 - Slide the switch out of its holder. Replace the switch in reverse order. Adjust the switch for a narrow gap.

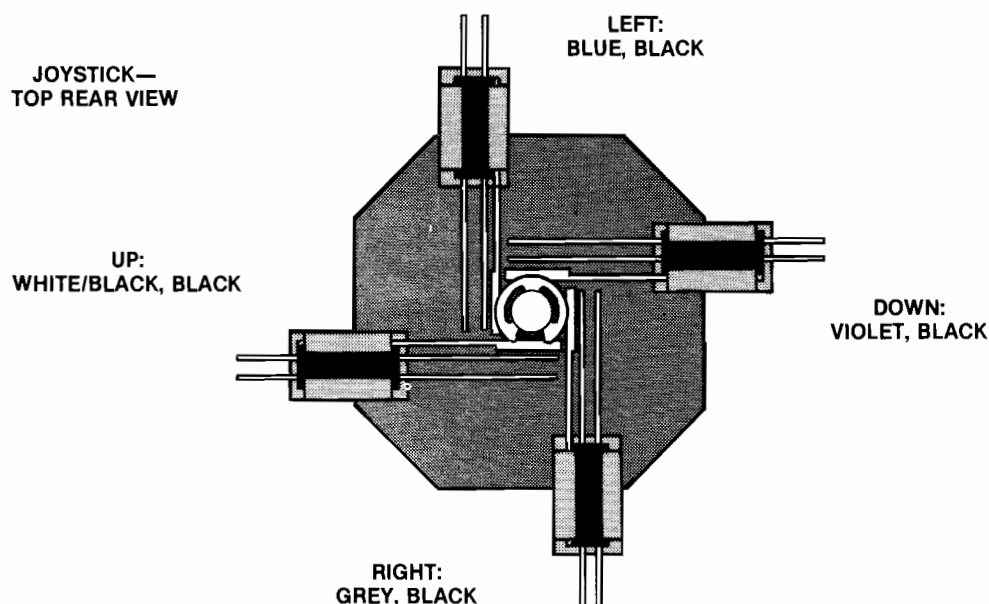
Disassemble in the order indicated. (Circled numbers match the numbered instructions.)



**Figure 3-4 8-Position Joystick Assembly
171021-001**

To Adjust the Joystick:

1. Make sure that each leaf switch is firmly seated in its holder. There is a small gray plastic tab on the outside end of the switch holder. The black plastic part of each leaf switch must be in front of this tab.
2. Check that all four leaf switches can be activated by watching the switch blades as you move the joystick handle up, down, left and right.
3. Test the four diagonal positions. In each diagonal position, two leaf switches should close. Switches should continue bending slightly after making contact.
4. Adjust each switch for narrow gap.
 - Push the joystick handle away from the switch for easier servicing.
 - Use a pair of needlenose pliers or a switch adjustment tool to bend each double set of blades in toward the center. Make the bend where the double set of blades comes out of the black plastic part of the switch.
5. Recheck the switch action. The switches must move independently for right, left, up, down and diagonal motion of the joystick.

**Figure 3-4 8-Position Joystick Assembly, continued****Parts List**

<i>Part No.</i>	<i>Description</i>
73-3003	Retaining Ring
82-AL616	#6 × 1-Inch Cross-Recessed Pan-Head Type BT Tapping Steel Screw
99-080025	Leaf Switch
99-080026	2-Inch Black Plastic Washer
99-080028	Metal Shaft
99-080029	Nylon Washer
99-080030	Spring
99-080031	Bellows
99-080032	Flat Steel Washer
99-080033	Plastic Guard/Actuator
99-080036	Top Plate
99-080037	Switch Mounting Plate
99-080038	Nylon Switch Actuator
171021-001	Joystick Assembly

C. Fluorescent Tube and Speaker

WARNING

Before removing or repairing the speaker, fluorescent tube or fan, **unplug the game.** If you drop a fluorescent tube and it breaks, *it will implode!* Shattered glass can fly 6 feet or more from the implosion. Use care when replacing any fluorescent tube.

Upright Cabinet

To Replace Fluorescent Tube:

1. At the top front of the game, remove the three screws that secure the upper attraction-panel retainer to the cabinet. Loosen the three screws that secure the lower retainer to the cabinet. Lift the attraction panel up and out of its lower retainer.
2. Remove the cardboard locking tab at each end of the tube.

3. Slightly rotate the tube up or down, and carefully remove it from the lampholders. Replace with a new tube. Do not snap the tube in vigorously—you may break it, causing an implosion! Replace the locking tabs.
4. Check that the green ground wire is securely attached to the large metal bracket and the ballast transformer on the wood board. If the tube is not grounded, it may not start.

To Replace Speaker:

5. Remove the two Phillips-head screws that secure the light board to the cabinet. Slide the board out and unplug the 5-pin harness connector. Remove the board from the cabinet.
6. Unplug the two plug-in connectors on the speaker. Remove the hardware that attaches the speaker to the board. Replace the speaker, and reinstall in reverse order.

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

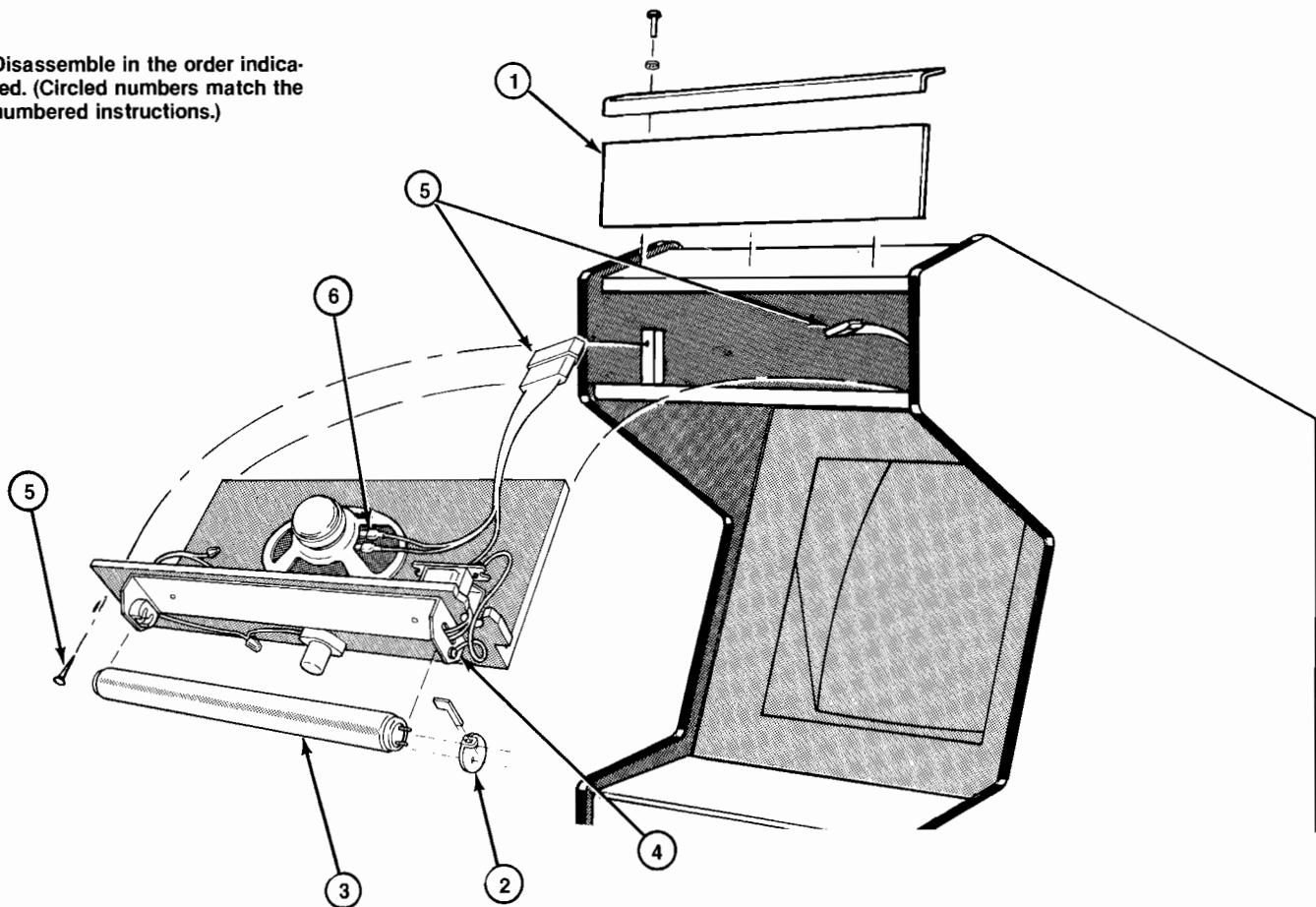
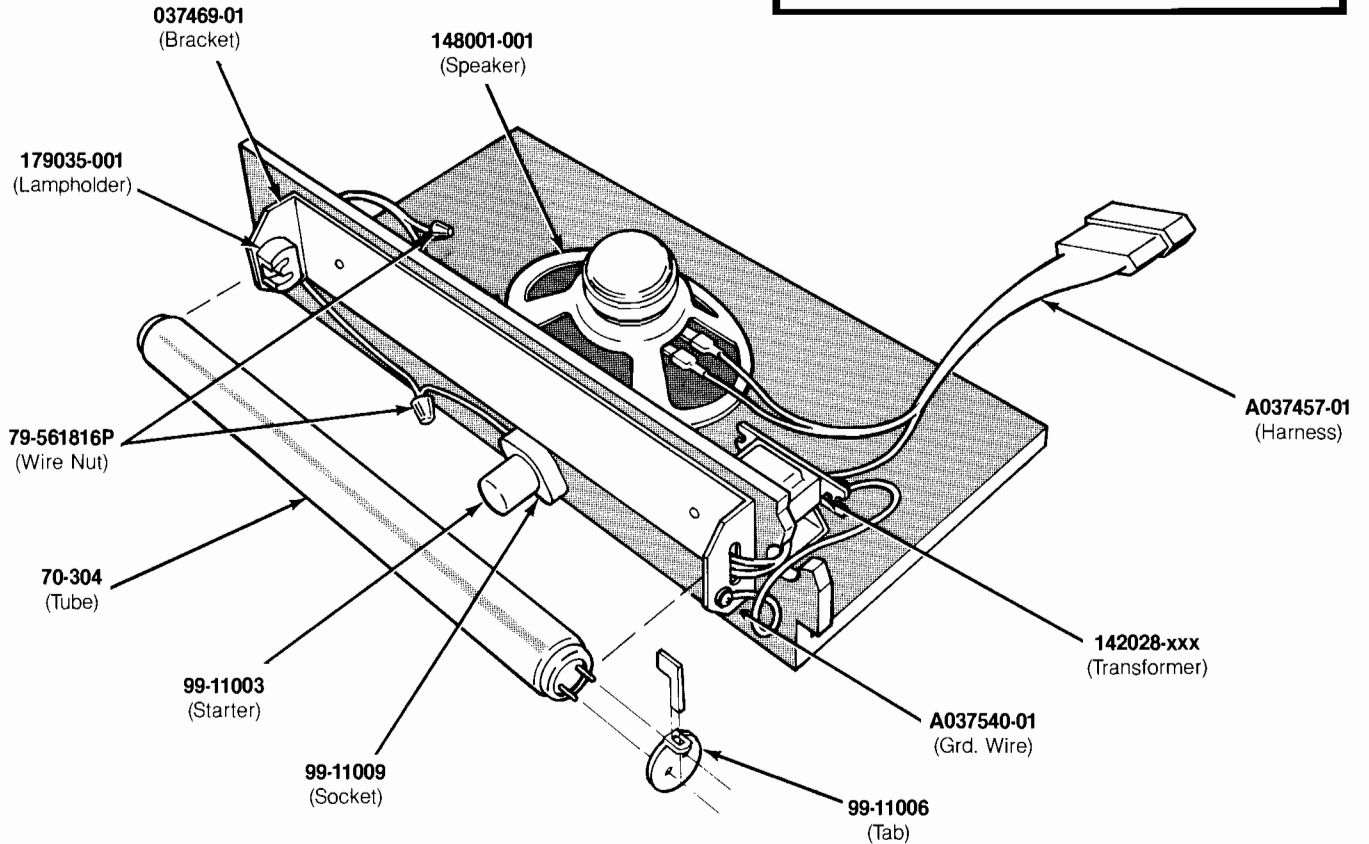


Figure 3-5 Fluorescent Tube and Speaker

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



**Figure 3-5 Fluorescent Tube and Speaker, continued
 Upright Cabinet Assembly A037417-01 and -02 G
 Parts List**

Part No.	Description
A037457-01	Fluorescent Tube and Speaker Harness
A037540-01	Ground Wire with Ring Lug
70-304	18-Inch 15W Cool White Fluorescent Tube
79-561816P	Spring-Connector Wire Nut for 16- to 18-Gauge Wires
99-11003	Fluorescent Lamp Starter
99-11006	Fluorescent Lamp Locking Tab <i>(tab consists of two pieces)</i>
99-11009	Starter Socket
037469-01	Steel Lamp Bracket
142028-001	60 Hz 118V Ballast Transformer <i>(used on A037417-01 assembly)</i>
142028-002	50 Hz 118V Ballast Transformer <i>(used on A037417-02 assembly)</i>
148001-001	6 x 9-Inch 4-Ohm 15W Oval High-Fidelity Speaker
179035-001	2-Pin Fluorescent Lampholder

! WARNING !

Prior to removing or repairing the speaker, fluorescent tube or fan, **unplug the game.**

If you drop a fluorescent tube and it breaks, *it will implode!* Shattered glass can fly 6 feet or more from the implosion. Use care when replacing any fluorescent tube.

Ireland-Built Cabinet



To Remove the Tube and Speaker Board:

1. From the back of the game, unlock and open the rear access panel. Unplug the tube and speaker's 5-pin harness connector.
2. Open the control panel (see *Figure 3-2, The Control Panel*).
3. From the top front of the game, remove the five button-head screws that secure the upper cabinet grille to the cabinet. Lift the grille up and away from the cabinet. Be careful that the glass display shield doesn't fall forward.
4. Lift the video display shield up and out of the cabinet.
5. Slide the baffle board that is below the fluorescent tube out through the front of the cabinet.

6. Remove the screws that secure the tube and speaker board to the cabinet. Slide this board up and out of the cabinet.

To Replace Fluorescent Tube:

7. Remove the Y-lead connectors at each end of the fluorescent tube.
8. Slightly rotate the tube up or down, and carefully remove it from its clamps. Replace it with a new tube. Do not snap the tube in vigorously—you may break it, causing an implosion! Replace the Y-lead connectors. Reinstall the light and speaker board, baffle board, shield, grille, and reconnect the harness. Close and lock the control panel and the rear access panel.

To Replace The Speaker:

9. Unplug the two plug-in connectors on the back of the speaker.
10. Remove the hardware that attaches the speaker to the board. Replace the speaker and reinstall the hardware and two plug-in connectors. Reinstall the light and speaker board, baffle board, shield, grille, and reconnect the harness. Close and lock the control panel and the rear access panel.

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

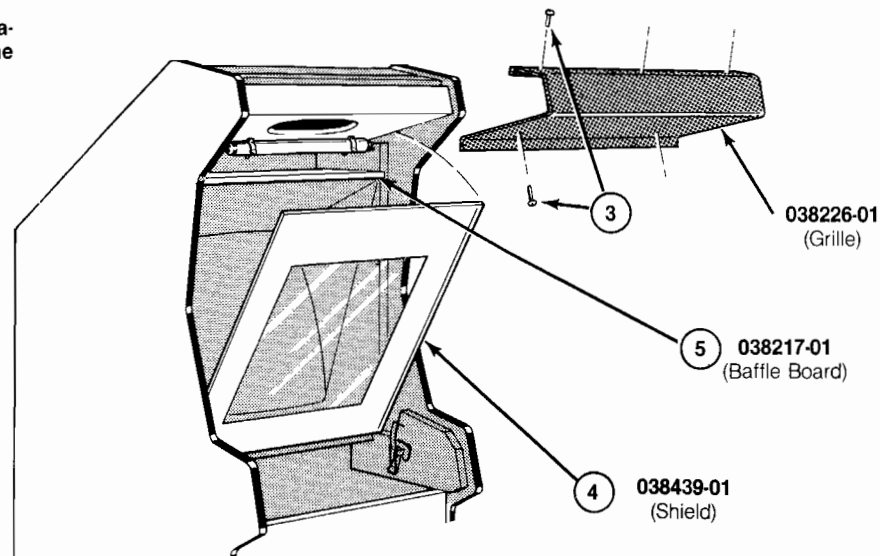
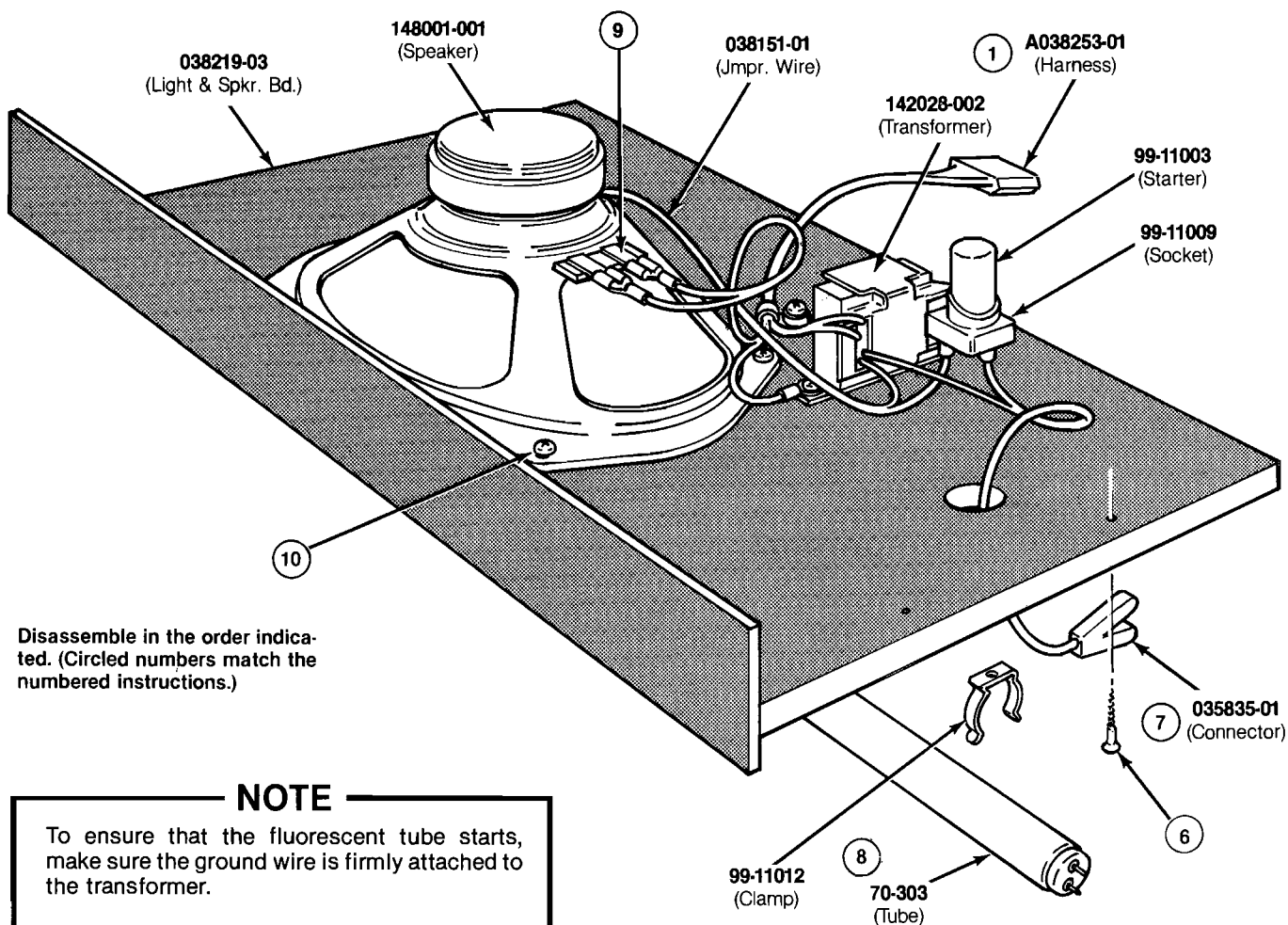


Figure 3-5 Fluorescent Tube and Speaker, continued



**Figure 3-5 Fluorescent Tube and Speaker, continued
Ireland-Built Cabinet A038228-01 B
Parts List**

Part No.	Description
A038253-01	Tube and Speaker Harness Assembly
70-303*	18-Inch, 1-Inch Diameter, 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
038151-01	Jumper Wire
038217-01	Baffle Board
038219-03	Tube and Speaker Board
038226-01	Cabinet Grille
038689-01	Display Shield
142028-002	50 Hz, 118 V Ballast Transformer
148001-001	6 x 9-Inch, 4Ω, 15 W Oval High-Fidelity Speaker

* Acceptable substitutes are part numbers 70-304 (tube) and 99-11011 (clamp). They must be used together.

D. Video Display

WARNING

Shock Hazard

The following procedure should only be performed by a *qualified service technician*. Prior to removing or repairing the video display, **unplug the game**. 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 6 feet or more from the implosion. Use care when replacing any display.

To Remove Video Display:

1. Open the rear access panel. Unplug the three display harness connectors and disconnect the green ground wire.
2. Remove the hardware that secures the rear of the *Upright* cabinet display chassis to a wood cleat. Remove the hardware that secures the *Ireland-Built* cabinet display chassis to a metal bracket.
3. Open the control panel (see *Figure 3-2*). For the *Ireland-Built* cabinet, remove the 5 button-head screws that secure the upper cabinet grille to the cabinet (see *Figure 3-5*). Lift the grille up and away from the cabinet.
4. Lift the video display shield up and out of the cabinet.
5. Carefully remove the cardboard bezel.
6. Remove the four sets of hardware that secure the front of the display chassis to the wood frame.
7. Carefully pull the display out through the front of the cabinet. Place the display on a padded table in a protected area so that nothing can hit it or fall on it. After servicing the display, reinstall in reverse order.

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

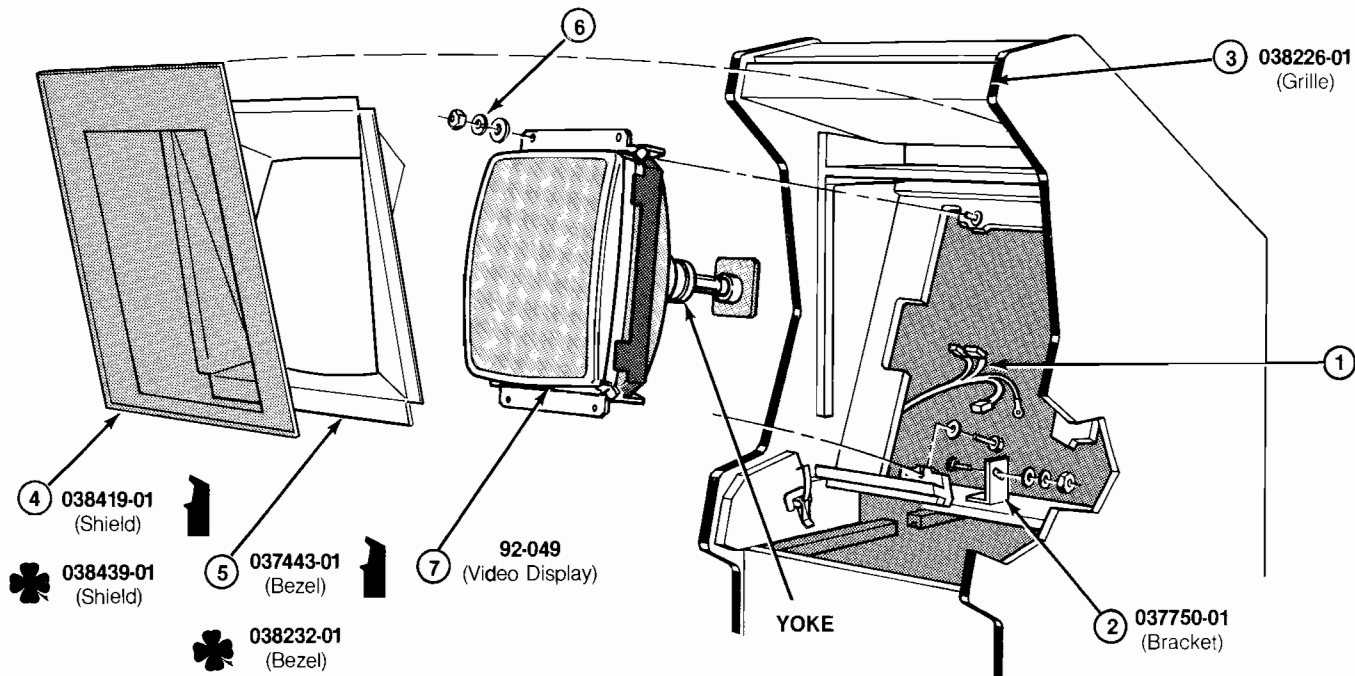


Figure 3-6 Video Display

Figure 3-6 Video Display, continued Parts List

<i>Part No.</i>	<i>Description</i>
<i>Upright Cabinet</i>	
92-049	19-Inch Electrohome Color Raster-Scan Video Display <i>Acceptable substitutes are:</i> 92-055, Wells-Gardner 19-Inch Display—use with TM-201 139003-1005 or -1205, Sanyo 19-Inch Display—use with TM-205 139003-1004 or -1204, Matsushita 19-Inch Display—use with TM-197
037443-01	Display Bezel
038419-01	Display Shield with Graphics
<i>Ireland-Built Cabinet</i>	
92-049	19-Inch Electrohome Color Raster-Scan Video Display <i>Acceptable substitute is part no.</i> 92-055—use with TM-201
037750-01	Display Mounting Bracket
038439-01	Display Shield with Graphics
038226-01	Upper Cabinet Grille
038232-01	Display Bezel

E. Coin Door

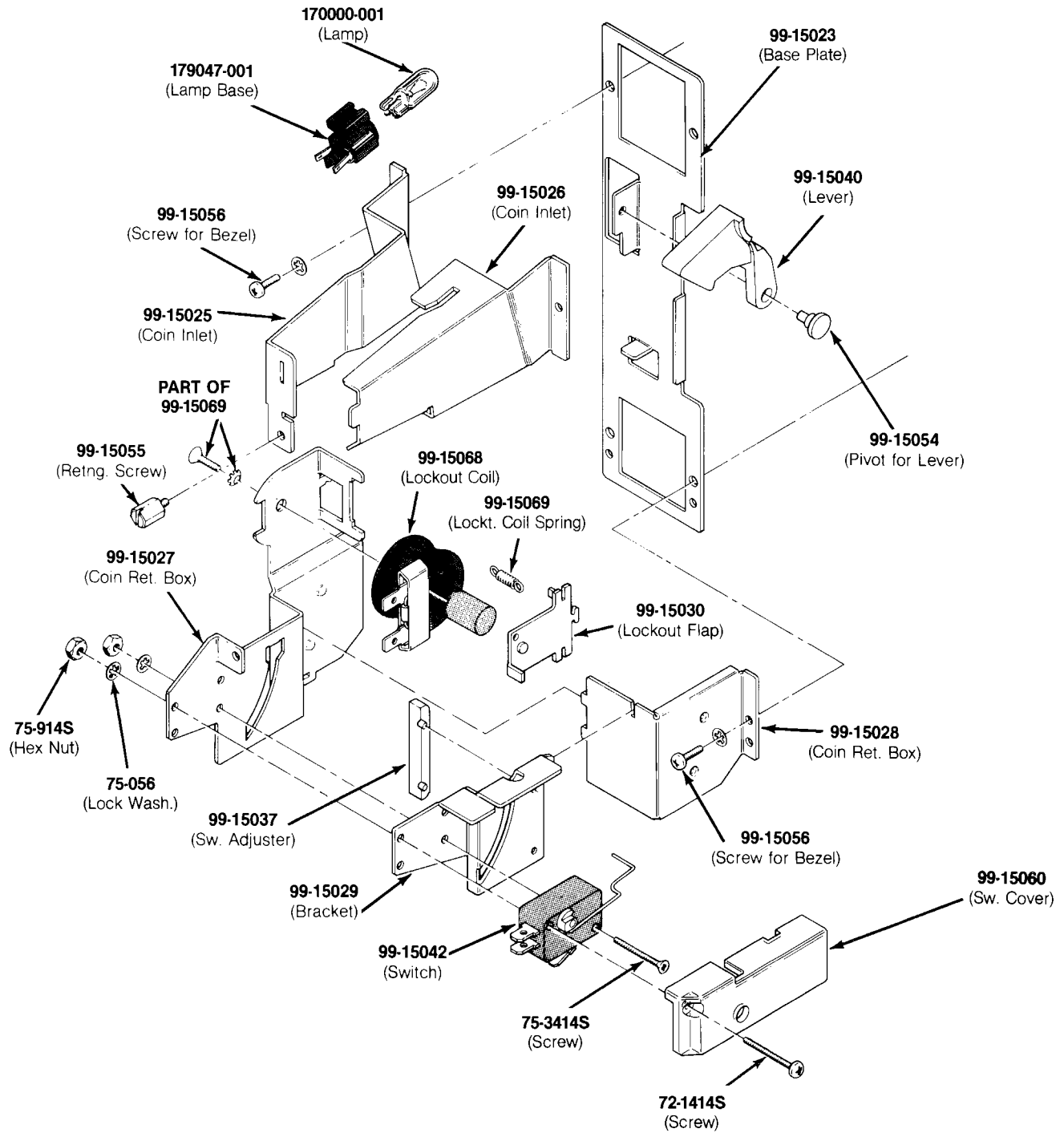
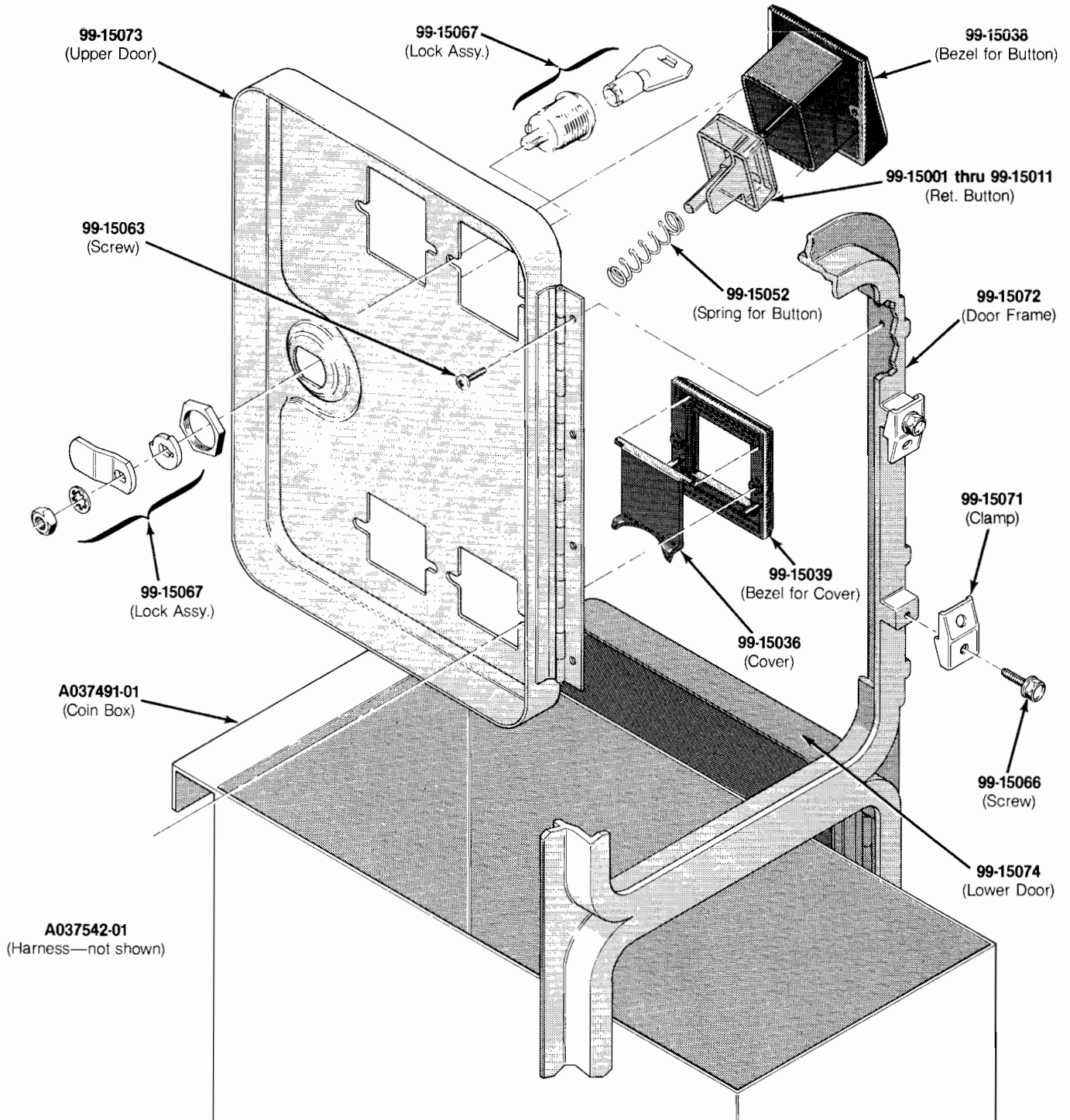


Figure 3-7 Vertically Mounted Coin Door
A037619-xx C



- 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

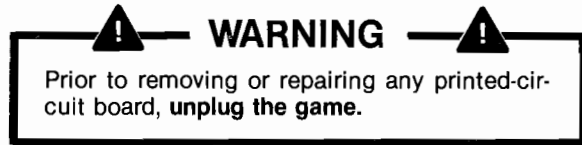
- A037619-15 — French 2 Fr/1 Fr Coin Door
- A037619-16 — Swedish 1 Kr/1 Kr Coin Door
- A037619-17 — Spanish 25 Pts/25 Pts Coin Door
- A037619-18 — Italian 100 L/100 L Coin Door
- A037619-19 — Hong Kong \$1/\$1 Coin Door
- A037619-20 — Japanese 100Y/100Y Coin Door

Figure 3-7 Vertically Mounted Coin Door, continued
A037619-xx C

Figure 3-7 Vertically Mounted Coin Door, continued Parts List

Part No.	Description
A037491-01	Coin Box <i>(Not included in assembly)</i>
A037542-01	Harness Assembly
72-1405S	#4-40 × 5/16-Inch Cross-Recessed Pan-Head Steel Machine Screw
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 <i>(U.S. 25¢)</i>
99-15036	Metal Coin Return Cover
99-15037	Switch Adjuster
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	Screw for Both Bezels
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
99-15071	Clamp for Frame
99-15072	Door Frame
99-15073	Upper Door
99-15074	Lower Door
170000-001	6.3V Miniature Wedge-Base Incandescent Lamp
171006-035	Metal Coin Mechanism
179047-001	Lamp Base

F. Printed-Circuit Boards



To Remove Printed-Circuit Boards:

1. Open the rear access panel.
 2. For the *game PCBs*, unplug the edge connectors. Remove the wood screws that attach the top cleat to the game cabinet, and remove this cleat. The sides of the video PCB are secured by plastic retainers. To release this PCB from the retainers, gently pry the retainers away from the PCB.
 3. Carefully remove the PCBs from the slots in the bottom cleat. Be careful not to twist the boards, as this may loosen connections or components. Repair as required.
 - Reinstall the game PCBs, making sure they fit securely into the slots of the bottom cleat.
- Gently pry the plastic retainers back and secure the video PCB in these retainers. To insure that the game PCBs will not be damaged when you move the game, be sure to **reinstall the top cleat.**
 - 4. For the *Regulator/Audio II PCB*, disconnect the four small harness connectors on this board.
 - 5. Remove the screw and two spacers that secure this board to the cabinet and carefully remove the board from its slot. Be careful not to twist the board, as this may loosen connections or components. Repair as required and reinstall the board.
 - Make sure that the connectors on the game or Regulator/Audio II PCBs are properly plugged in. Note that they are keyed to fit only one way, so if they don't slip on easily, don't force them. **A reversed connector will probably damage your game** and void the warranty.
 - Close and lock the rear access panel.
 - Check that the operation of the game is correct by performing the self-test. This is very important when you repair a PCB.

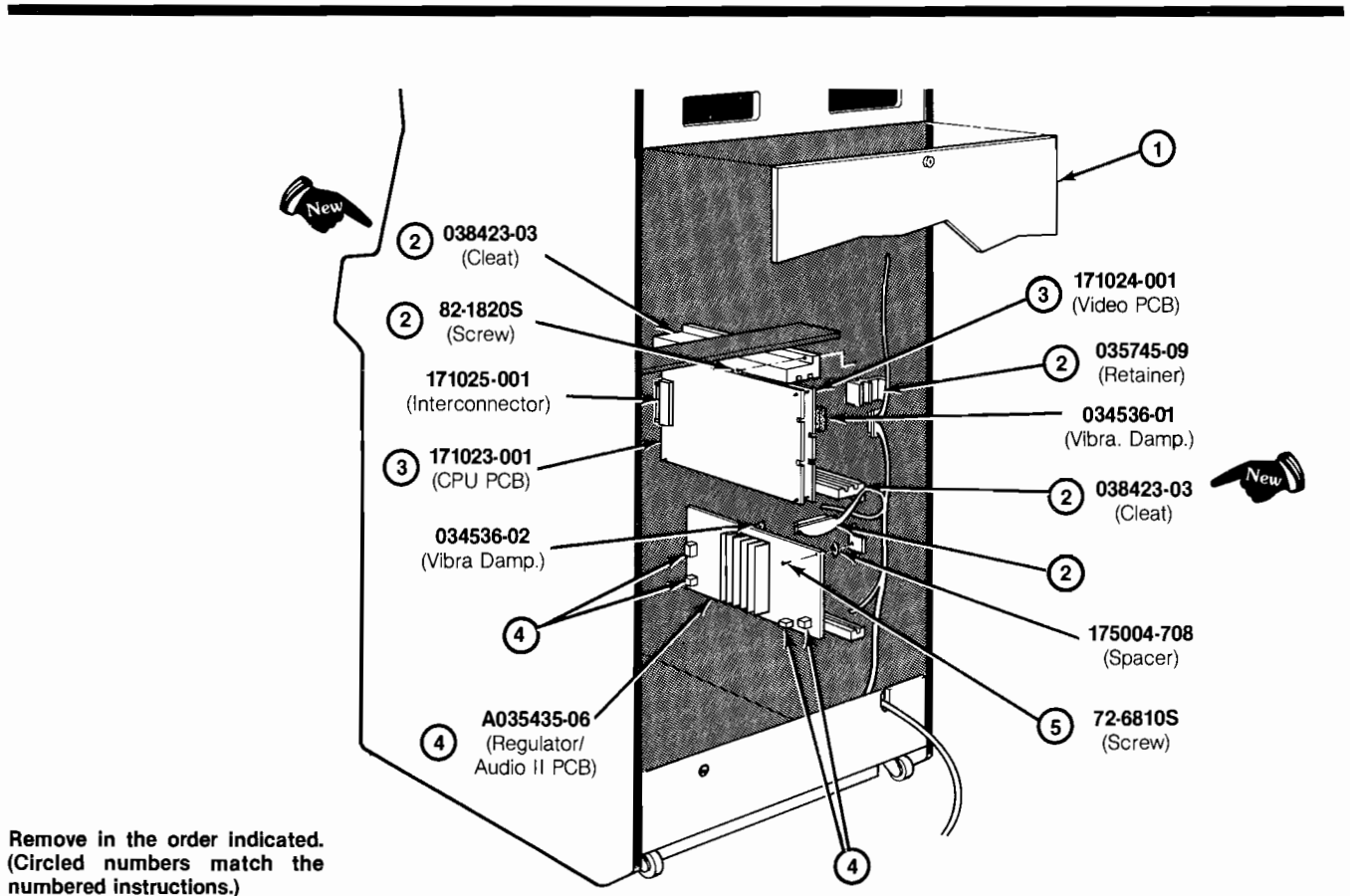


Figure 3-8 Printed-Circuit Board Removal

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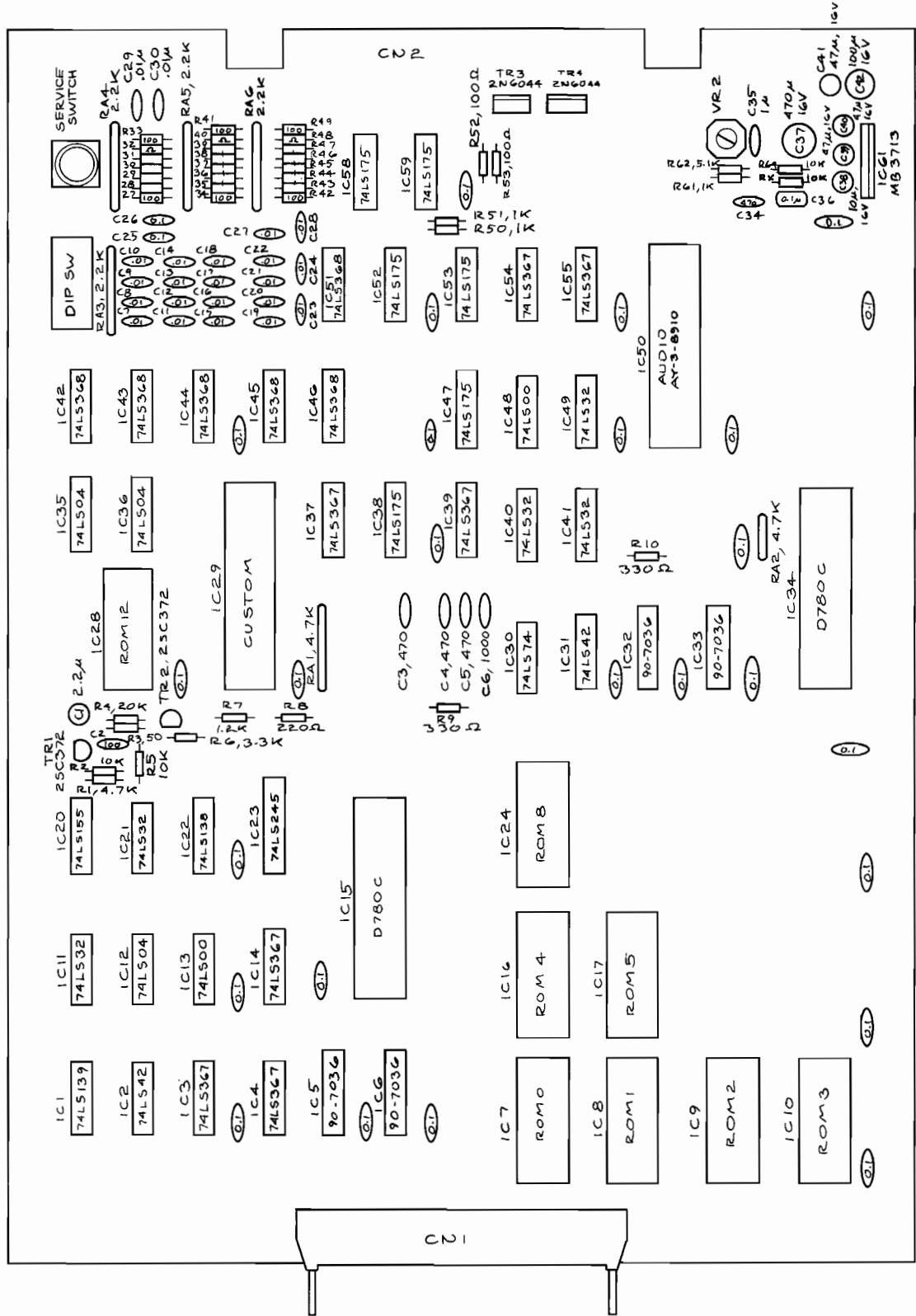


Figure 3-9 Kangaroo™ Central Processing Unit PCB Assembly
 171023-001

Figure 3-9 Kangaroo™ Central Processing Unit PCB Assembly, continued Parts List

<i>Part No.</i>	<i>Description (Reference Designations and Locations in Bold)</i>
34-2N6044	Type-2N6044 Darlington NPN Transistor (TR-3, TR-4)
37-74LS00	Type-74LS00 Integrated Circuit (IC13, 48)
37-74LS04	Type-74LS04 Integrated Circuit (IC12, 35, 36)
37-74LS32	Type-74LS32 Integrated Circuit (IC11, 21, 40, 41, 49)
37-74LS42	Type-74LS42 Integrated Circuit (IC2, 31)
37-74LS74	Type-74LS74 Integrated Circuit (IC30)
37-74LS139	Type-74LS139 Integrated Circuit (IC1)
37-74LS175	Type-74LS175 Integrated Circuit (IC38, 47, 52, 53, 58, 59)
37-74LS245	Type-74LS245 Integrated Circuit (IC23)
37-74LS367	Type-74LS367 Integrated Circuit (IC3, 4, 14, 37, 39, 54, 55)
62-001	SPST Momentary Pushbutton Switch (SERVICE SW)
66-118P1T	8-Station SPST, Dual-Inline-Package Switch (DIP SW)
79-42C24	24-Contact Medium-Insertion-Force Integrated Circuit Socket (IC7-10, 16, 17, 24, 28)
79-42C40	40-Contact Medium-Insertion-Force Integrated Circuit Socket (IC15, 34, 50)
82-1820S	#8 × 1¼-Inch Flat-Head Wood Screw <i>(for mounting PCB to cabinet)</i>
90-7036	Random-Access Memory (IC5, 6, 32, 33)
034536-01	Foam Vibration Damper
035745-09	Plastic PCB Retainer <i>(for mounting PCB to cabinet)</i>
038423-03	Dual Slotted Wood Cleat <i>(for mounting PCB to cabinet)</i>
110000-101	100 Ohm, ± 5%, ¼W Resistor (R27-49, 52, 53)
110000-102	1K Ohm, ± 5%, ¼W Resistor (R50, 51, 61)
110000-103	10K Ohm, ± 5%, ¼W Resistor (R2, 5, 64, RX)
110000-122	1.2K Ohm, ± 5%, ¼W Resistor (R7)
110000-203	20K Ohm, ± 5%, ¼W Resistor (R4)
110000-221	220 Ohm, ± 5%, ¼W Resistor (R8)
110000-331	330 Ohm, ± 5%, ¼W Resistor (R9, 10)
110000-332	3.3K Ohm, ± 5%, ¼W Resistor (R6)
110000-472	4.7K Ohm, ± 5%, ¼W Resistor (R1)
110000-510	51 Ohm, ± 5%, ¼W Resistor (R3)
110000-512	5.1K Ohm, ± 5%, ¼W Resistor (R62)
118001-472	4.7K Ohm, 4-Element, 5-Pin, Single-Inline-Package Resistor Network (RA2)
118002-222	2.2K Ohm, 8-Element, 9-Pin, Single-Inline-Package Resistor Network (RA3-6)
118002-472	4.7K Ohm, 8-Element, 9-Pin Single-Inline-Package Resistor Network (RA1)
119003-102	1K Ohm ± 20% Horizontal Trimpot (VR2)
121015-103	.01 µF, ± 10%, 50V Radial-Lead Ceramic-Disc Capacitor (C7-30)
121015-104	.1 µF, ± 10%, 50V Radial-Lead Ceramic-Disc Capacitor (Bypass, 26 places)
121020-101	100 pF, ± 10%, 50V Radial-Lead Ceramic-Disc Capacitor (C2)
121020-102	1000 pF, ± 10%, 50V Radial-Lead Ceramic-Disc Capacitor (C6)
121020-471	470 pF 50V Radial-Lead Ceramic-Disc Capacitor (C3-5, 34)
121021-105	1 µF, ± 10%, 16V Tantalum Capacitor (C35)
121022-104	0.1 µF, ± 10%, 50V Polyester Film Capacitor (C36)
123004-101	100 µF, ± 20%, 16V (min.) Aluminum Electrolytic Fixed Radial-Lead Capacitor (C42)
123004-470	47 µF, ± 20%, 16V (min.) Aluminum Electrolytic Fixed Radial-Lead Capacitor (C39-41)
123004-471	470 µF, ± 20%, 16V (min.) Aluminum Electrolytic Fixed Radial-Lead Capacitor (C37)

[Continued on next page]

Figure 3-9 Kangaroo Central Processing Unit PCB, continued Parts List

<i>Part No.</i>	<i>Description</i>
123005-225	2.2 μ F, \pm 20%, 50V (min.) Aluminum Electrolytic Fixed Radial-Lead Capacitor (C1)
123006-106	10 μ F, \pm 20%, 16V (min.) Aluminum Electrolytic Fixed Radial-Lead Capacitor (C38)
133010-001	Type-2SC372 NPN 50V 400mW Transistor (TR1, 2)
136008-101	Programmable Read-Only Memory, #75 (IC7)
136008-102	Programmable Read-Only Memory, #76 (IC8)
136008-103	Programmable Read-Only Memory, #77 (IC9)
136008-104	Programmable Read-Only Memory, #78 (IC10)
136008-105	Programmable Read-Only Memory, #79 (IC16)
136008-106	Programmable Read-Only Memory, #80 (IC17)
136008-107	Programmable Read-Only Memory, #81 (IC24)
136008-112	Programmable Read-Only Memory, #82 (IC28)
137168-001	Type-74LS368 Integrated Circuit (IC42-46, 51)
137177-001	Type-74LS138 Integrated Circuit (IC22)
137194-001	Z80 Microprocessor (IC15, 34)
137221-001	Type-74LS155 Integrated Circuit (IC20)
137222-001	Type-G.I. AY3-8910 Sound Integrated Circuit (IC50)
137223-001	Audio Amplifier Integrated Circuit (IC61)
137224-001	Microcomputer Custom Integrated Circuit (IC29)
171022-001	CPU PCB, Video PCB and Interconnector Assembly
171023-001	Central Processing Unit PCB Assembly
171025-001	50-Pin Flat Cable PCB Interconnector, Fujitsu FCN-707B050-AU/B
179100-050	50-Pin PCB Mount Connector, Fujitsu FCN-705Q050-AU/M (CN1)

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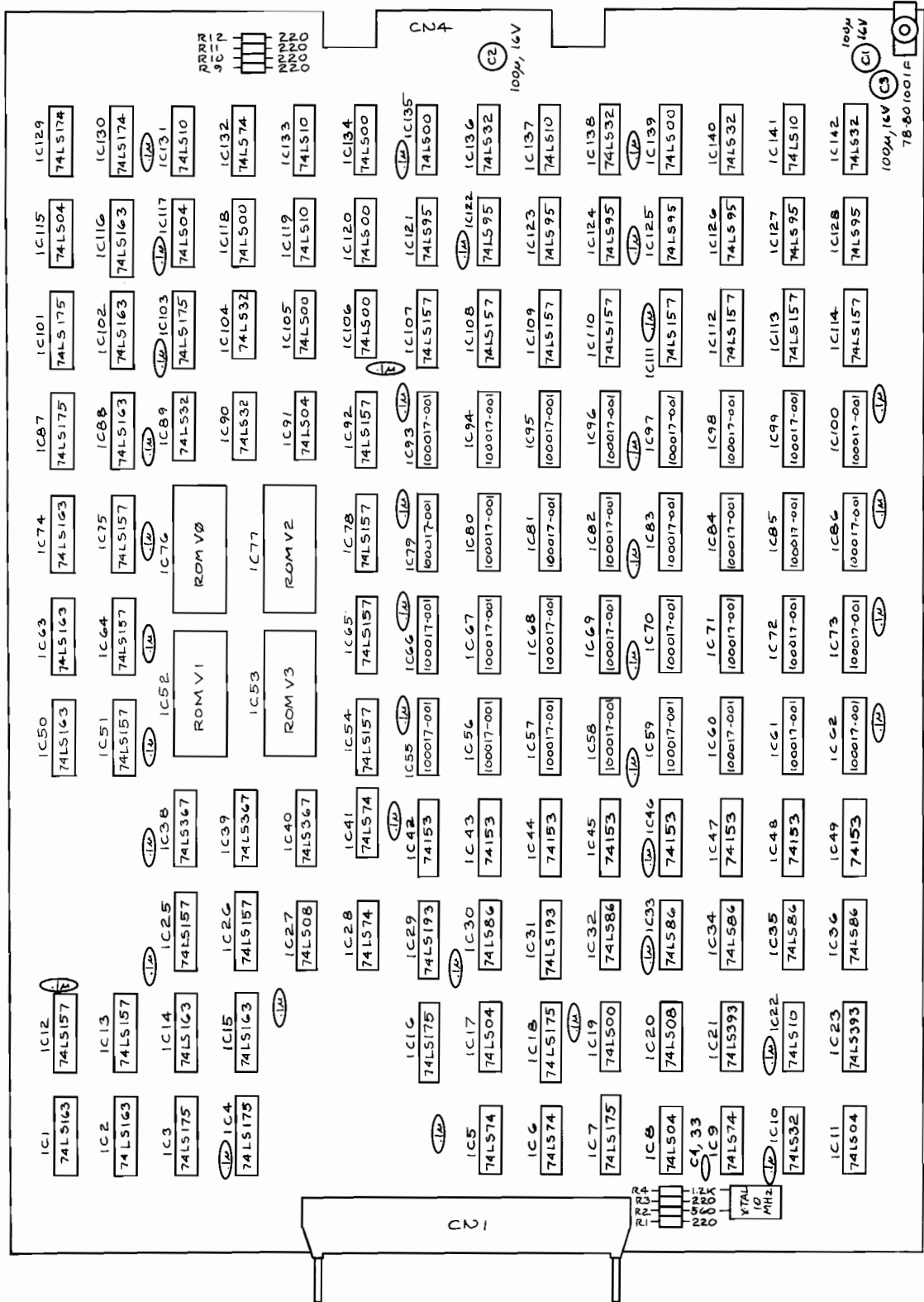
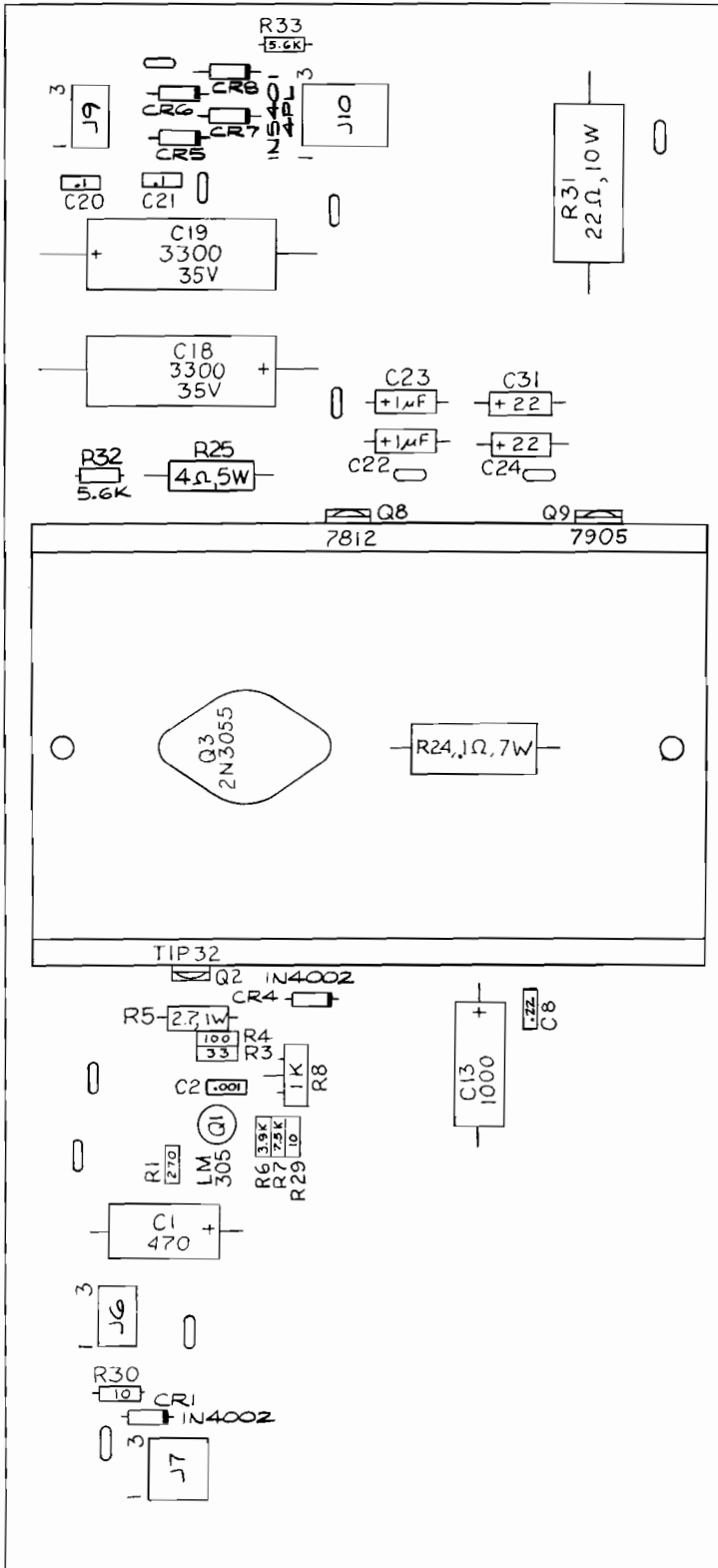


Figure 3-10 Kangaroo™ Video PCB Assembly
 171024-001

**Figure 3-10 Kangaroo Video PCB Assembly, continued
Parts List**

<i>Part No.</i>	<i>Description (Reference Designations and Locations in Bold)</i>
37-74153	Type-74153 Integrated Circuit (IC42-49)
37-74LS00	Type-74LS00 Integrated Circuit (IC19, 105, 106, 118, 120, 134, 135, 139)
37-74LS04	Type-74LS04 Integrated Circuit (IC8, 11, 17, 91, 115, 117)
37-74LS08	Type-74LS08 Integrated Circuit (IC20, 27)
37-74LS10	Type-74LS10 Integrated Circuit (IC22, 119, 131, 133, 137, 141)
37-74LS32	Type-74LS32 Integrated Circuit (IC10, 89, 90, 104, 136, 138, 140, 142)
37-74LS74	Type-74LS74 Integrated Circuit (IC5, 6, 9, 28, 41, 132)
37-74LS86	Type-74LS86 Integrated Circuit (IC30, 32-36)
37-74LS95	Type-74LS95 Integrated Circuit (IC121-128)
37-74LS157	Type-74LS157 Integrated Circuit (IC12, 13, 25, 26, 51, 54, 64, 65, 75, 78, 92, 107-114)
37-74LS163	Type-74LS163 Integrated Circuit (IC1, 2, 14, 15, 50, 63, 74, 88, 102, 116)
37-74LS174	Type-74LS174 Integrated Circuit (IC129, 130)
37-74LS175	Type-74LS175 Integrated Circuit (IC3, 4, 7, 16, 18, 87, 101, 103)
37-74LS193	Type-74LS193 Integrated Circuit (IC29, 31)
37-74LS367	Type-74LS367 Integrated Circuit (IC38-40)
37-74LS393	Type-74LS393 Integrated Circuit (IC21, 23)
78-801001F	PCB Plastic Standoff
79-42C24	24-Contact Medium-Insertion-Force Integrated Circuit Socket (IC52, 53, 76, 77)
90-123	10MHz Crystal (XTAL—Left of IC9)
100017-001	Random-Access Memory (IC55-62, 66-73, 79-86, 93-100)
110000-122	1.2K Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R4)
110000-221	220 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R1, 3, 9-12)
110000-561	560 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R2)
121015-104	.1 μ F, $\pm 10\%$, 50V Radial-Lead Ceramic-Disc Capacitor (Bypass, 38 places)
121020-330	33 pF, $\pm 10\%$, 10V Radial-Lead Ceramic-Disc Capacitor (C4)
123004-101	100 μ F 16V Aluminum Electrolytic Radial-Lead Capacitor (C1, 3)
136008-108	Programmable Read-Only Memory, #83 (IC76)
136008-109	Programmable Read-Only Memory, #84 (IC52)
136008-110	Programmable Read-Only Memory, #85 (IC77)
136008-111	Programmable Read-Only Memory, #86 (IC53)
179100-050	50-Pin PCB Mount Connector, Fujitsu FCN-705Q050-AU/M (CN1)



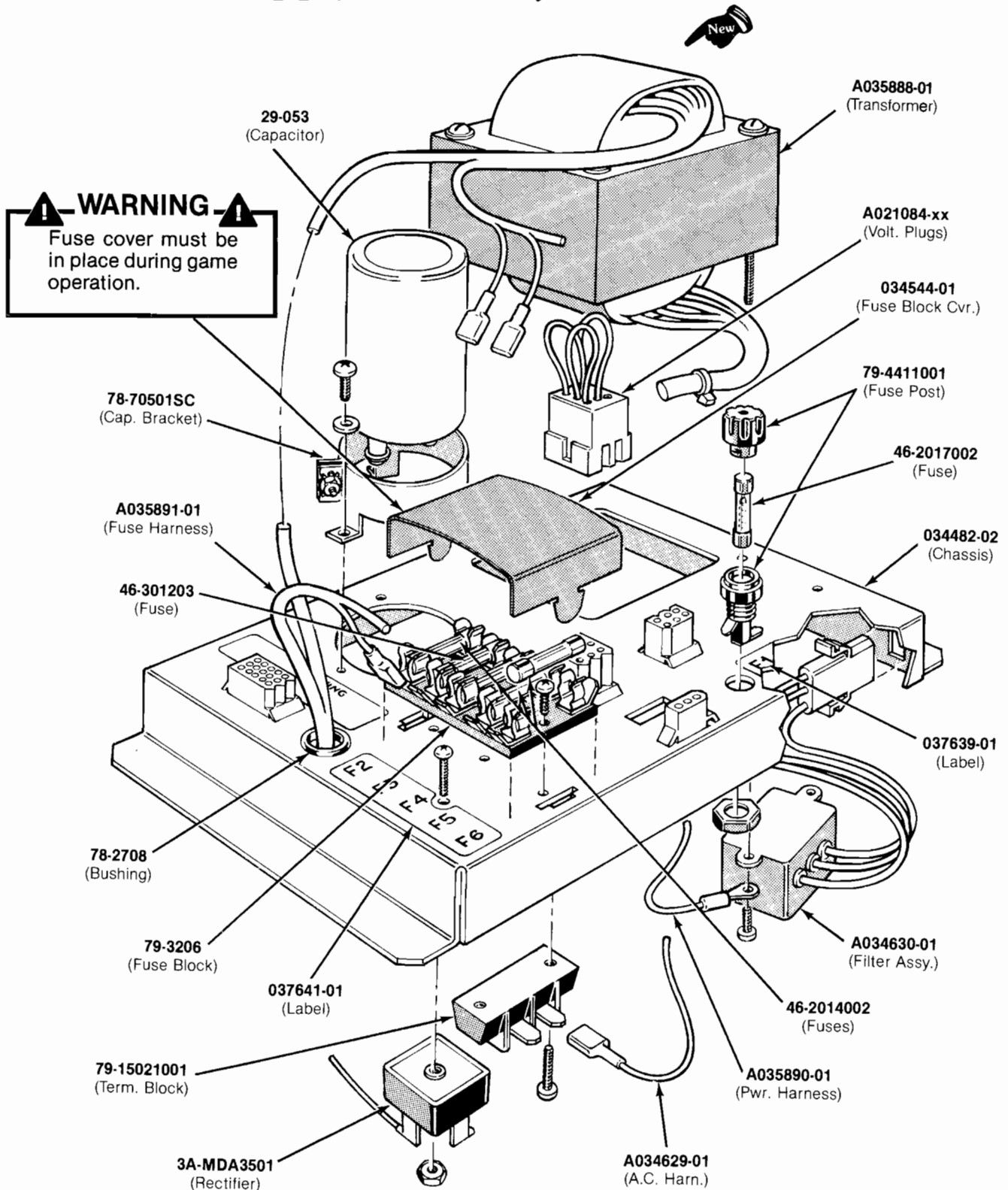
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Figure 3-11 Regulator/Audio II PCB Assembly
 A035435-06 B

Figure 3-11 Regulator/Audio II PCB Assembly Parts List

Part No.	Description (Reference Designations and Locations in Bold)
19-100P1015	.1 Ohm, $\pm 3\%$, 7W Wirewound Resistor (R24)
19-315102	1K Ohm Vertical PCB-Mounting Cermet Trimpot (R8) (Acceptable substitute is part no. 119002-102.)
24-250108	1000 μF 25V Aluminum Electrolytic Fixed Axial-Lead Capacitor (C13)
24-250477	470 μF 25V Aluminum Electrolytic Fixed Axial-Lead Capacitor (C1)
24-350226	22 μF 35V Aluminum Electrolytic Fixed Axial-Lead Capacitor (C24, 31)
24-350338	3300 μF 35V Aluminum Electrolytic Fixed Axial-Lead Capacitor (C18, 19)
24-500105	1 μF 50V Aluminum Electrolytic Fixed Axial-Lead Capacitor (C22, 23)
29-088	.1 μF 50V Ceramic-Disc Axial-Lead Capacitor (C20, 21)
31-1N4002	Type-1N4002 100V 1-Amp. Silicon Rectifier Diode (CR1, 4)
31-1N5401	Type-1N5401 100V 3-Amp. Silicon Rectifier Diode (CR5-8)
33-TIP32	Type-TIP32 PNP Power Transistor (Q2)
34-2N3055	Type-2N3055 NPN Silicon Transistor (Q3)
37-LM305	5V Linear Voltage Regulator (Q1)
37-7812	Type-7812 + 12V Voltage Regulator (Q8)
37-7905	Type-7905 - 5V Voltage Regulator (Q9)
72-1608C	#6-32 \times 1/2-Inch Cross-Recessed Pan-Head Corrosion-Resistant Steel Machine Screw
72-6812S	#8 \times 3/4-Inch Phillips-Head Wood Screw (for mounting PCB to cabinet)
75-F60405	#6-32 \times 1/4-Inch Binder-Head Nylon Screw
75-99516	#6-32 Nut/Washer Assembly
78-16014	Thermally Conductive Silicon Insulator (Q2, 9)
79-58306	6-Position Connector Receptacle (J6, 9)
79-58308	9-Position Connector Receptacle (J7)
79-58346	12-Position Connector Receptacle (J10)
034531-01	Heat Sink
034536-02	Foam Vibration Damper (goes between PCB and cabinet wall)
110000-100	10 Ohm, $\pm 5\%$, 1/4W Resistor (R29, 30)
110000-101	100 Ohm, $\pm 5\%$, 1/4W Resistor (R4)
110000-271	270 Ohm, $\pm 5\%$, 1/4W Resistor (R1)
110000-330	33 Ohm, $\pm 5\%$, 1/4W Resistor (R3)
110000-392	3.9K Ohm, $\pm 5\%$, 1/4W Resistor (R6)
110000-562	5.6K Ohm, $\pm 5\%$, 1/4W Resistor (R32, 33)
110000-752	7.5K Ohm, $\pm 5\%$, 1/4W Resistor (R7)
110009-027	2.7 Ohm, $\pm 5\%$, 1W Resistor (R5)
116000-220	22 Ohm, $\pm 5\%$, 10W Wirewound Resistor (R31)
116001-040	4 Ohm, $\pm 5\%$, 5W Wirewound Resistor (R25)
122002-102	.001 μF 50V Ceramic-Disc Axial-Lead Capacitor (C2)
122004-224	.22 μF 25V (min.) Ceramic-Disc Axial-Lead Capacitor (C8)
175004-708	Fiber Spacer (for mounting PCB to cabinet)
179051-001	Test Point (Acceptable substitute is part no. 020670-01)

G. Power Supply Assembly



**Figure 3-12 Power Supply Assembly
A037671-01 and -02 C**

Figure 3-12 Power Supply Assembly, continued Parts List

Part No.	Description (Reference Designations in Bold)
A021084-01	Voltage Plug for 100 V (<i>violet</i>)
A021084-02	Voltage Plug for 120 V (<i>yellow</i>)
A021084-04	Voltage Plug for 220 V (<i>blue</i>)
A021084-05	Voltage Plug for 240 V (<i>brown</i>)
A034629-01	AC Harness Assembly
A034630-01	RFI Filter Assembly (FL1)
A035888-01	Upright Transformer Assembly (T1) (<i>Acceptable substitute is part no. A035888-02</i>)
A035890-01	Power Harness Assembly
A035891-02	Fuse Harness Assembly
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 $\frac{5}{8}$ -Inch Inside Diameter \times $\frac{55}{64}$ -Inch Outside Diameter \times $\frac{1}{4}$ -Inch Thick
78-70501SC	2-Inch Diameter Capacitor Mounting Bracket
79-15021001	2-Circuit Single-Row Terminal Block
79-3206	5-Position 3AG Fuse Block with $\frac{1}{4}$ -Inch Quick-Disconnect Terminals
79-4411001	Panel-Mounting Non-Indicating 3AG Cartridge-Type Fuse Post
034482-02	Power Supply Chassis
034544-01	Fuse Block Cover
037243-01	Metal Base Plate (<i>goes under the power supply—not shown in illustration</i>)
037639-01	Label for Fuse Value (F1)
037641-01	Label for Fuse Values (F2-F6)

Line Voltage Range	Voltage Selection Plug Wire Color
90-110 VAC (100)	Violet
105-135 VAC (120)	Yellow*
200-240 VAC (220)	Blue
220-260 VAC (240)	Brown

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

NOTE

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

NOTES:

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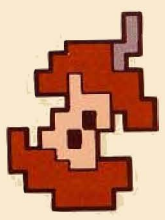
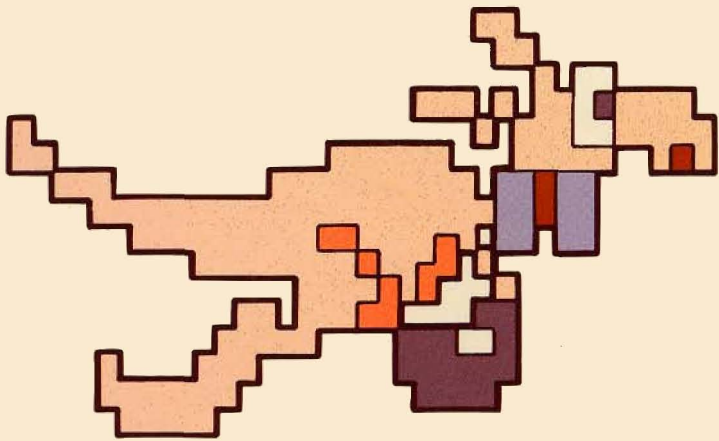
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