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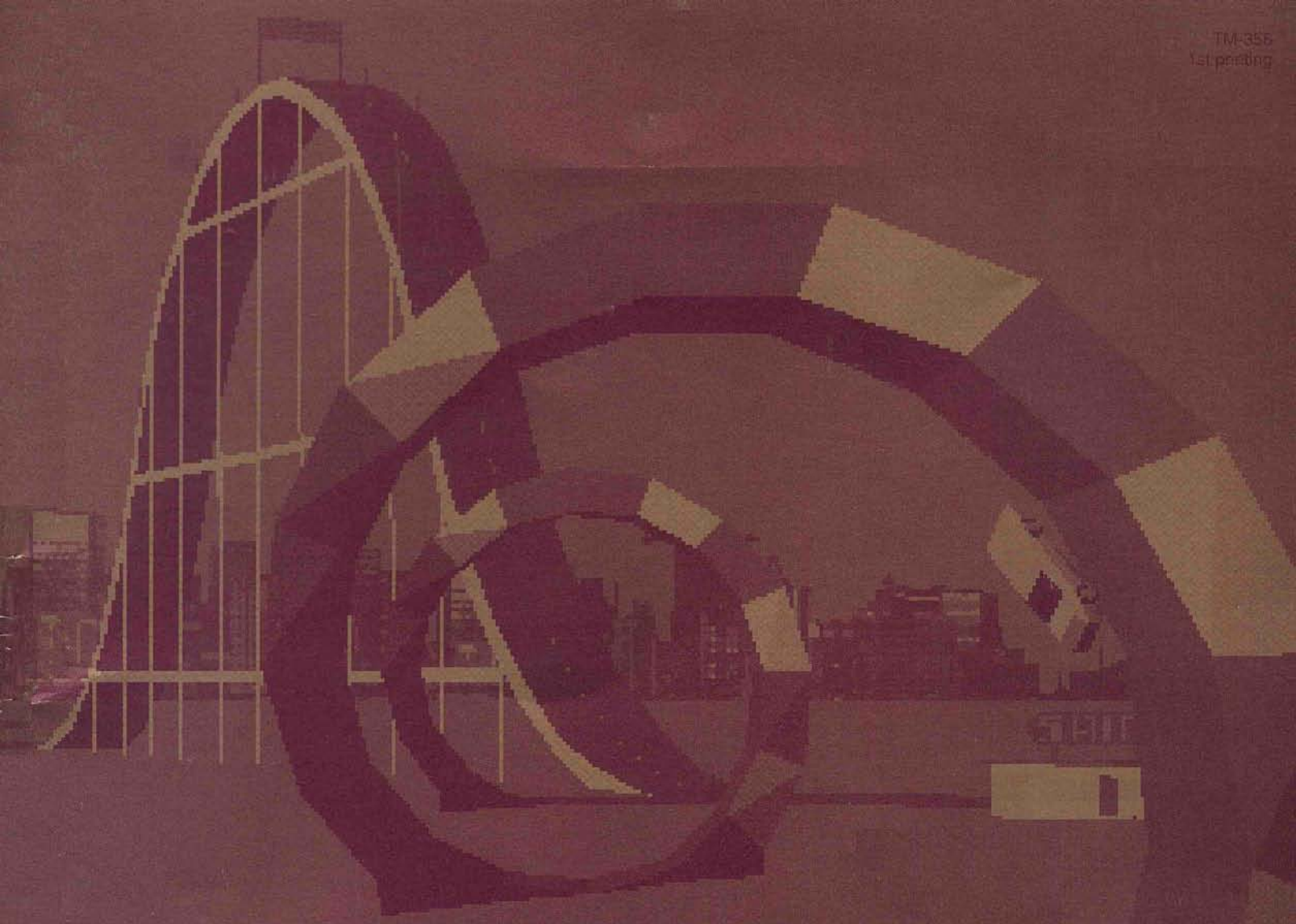

Race Drivin'

Kit Installation Instructions

ATARI GAMES

For technical assistance:

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

United States

Atari Games Corporation
California Customer Service Office
737 Sycamore Drive
Milpitas, CA 95035
Fax (408) 434-3945
Telex 5101007850
✆ **(408) 434-3950**
(Monday–Friday, 7:30 a.m.–4:00 p.m. Pacific time)

Europe

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European Customer Service Office
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Fax 062-51702
Telex 70665
✆ **062-52155**
(Monday–Friday, 9:00 a.m.–5:30 p.m. GMT)

ATARI®
GAMES

Race Drivin'

Kit Installation Instructions

Conversion kit for Hard Drivin' deluxe cockpit driving simulators

Patents are pending on several parts of the Race Drivin' simulator.

Published by:
Atari Games Corporation
675 Sycamore Drive
P.O. Box 361110
Milpitas, California 95036

Printed in the U.S.A. **10/90**

Produced by the Atari Games Technical Publications Department.
Writing and Editing: Andrea Dencker
Illustration and Design: Mary Ohanessian Sumner

Notice Regarding Non-Atari® Parts

WARNING

Use of non-Atari parts or modifications of any Atari game circuitry may adversely affect the safety of your game, and may cause injury to you and your players.

You may void the game warranty (printed on the inside back cover of this manual) if you do any of the following:

- Substitute non-Atari parts in the game.
- Modify or alter any circuits in the game by using kits or parts *not* supplied by Atari Games Corporation.

NOTE

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of Federal Communications Commission (FCC) Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area or modification to this equipment is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference. If you suspect interference from an Atari game at your location, check the following:

- All ground wires in the game are properly connected as shown in the game wiring diagram.
- The power cord is properly plugged into a grounded three-wire outlet.
- On games provided with an Electromagnetic Interference (EMI) ground cage, be sure that the game printed-circuit boards (PCBs) are properly installed on the EMI ground cage and that the end board is securely installed with **all** screws in place and tightened.

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

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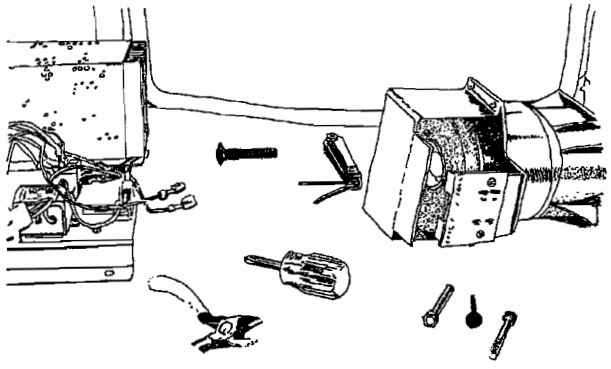


Safety Summary

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

WARNING

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

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

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

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

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

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

CAUTION

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

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

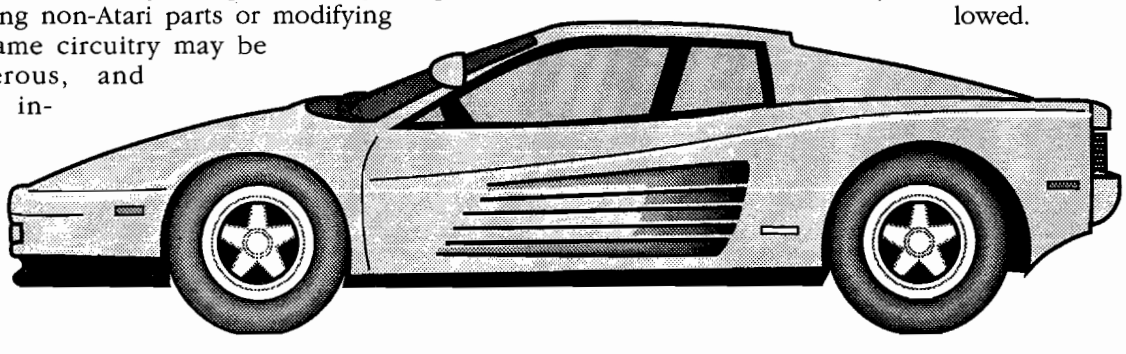
ABOUT NOTES, CAUTIONS, AND WARNINGS

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

NOTE — A highlighted piece of information.

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

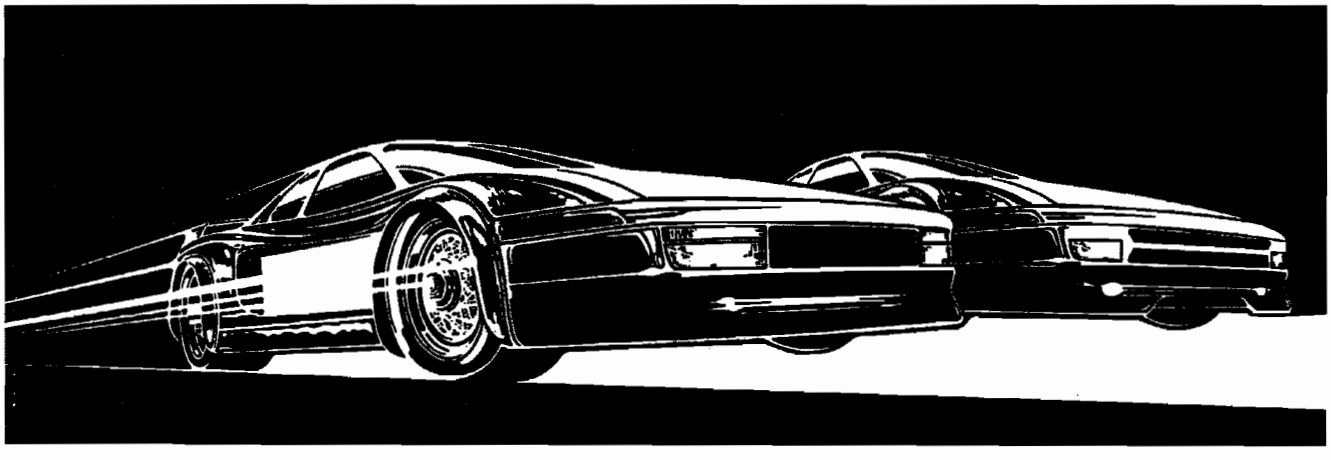
WARNING — Players and/or technicians can be killed or injured if instructions are not followed.



N O T E S

CHAPTER 1

Set-Up



How to Use This Manual

This manual provides information for installing, testing, and troubleshooting the Race Drivin'™ deluxe cockpit conversion kit. ■ Chapter 1 describes how to install the Race Drivin' kit in your Hard Drivin' cockpit cabinet. This chapter also describes simulator driving. ■ Chapter 2 contains self-test procedures and additional diagnostic tests. The self-test is important in the Race Drivin' simulator. You can troubleshoot the PC boards, main circuits, and controls using the more than 60 screens in the self-test. You should regularly test the boards and controls with the self-test to keep your simulator in peak condition and at top earnings. ■ Chapter 3 contains contains troubleshooting and maintenance procedures for the newly-designed shifter assembly.

Table 1-1 Contents of Race Drivin' Kit

Part No.	Description	Part No.	Description
038158-01	Product I.D. Label	136077-X021	EPROM Integrated Circuit
039450-01	FCC Compliance Label	136077-X022	EPROM Integrated Circuit
047788-01	Upper Rear Panel Decal	136077-X023	EPROM Integrated Circuit
047788-02	Rear Door Panel Decal	136077-X024	EPROM Integrated Circuit
		136077-1032	EPROM Integrated Circuit
047788-03	Lower Rear Panel Decal	136077-1033	EPROM Integrated Circuit
047793-02	Attraction Decal	137412-117	SLAPSTIC IC
048813-01	Left Side Panel Decal		
048813-02	Right Side Panel Decal	150034-002	DB25 Null Modem Cable
		175014-1025	Steel/Zinc .156 x .312 Flat Washer
048813-03	Left Side Canopy Decal	176015-110	#10 x 5/8-Inch-Long Pan-Head,
048813-04	Right Side Canopy Decal		Cross-Recessed Self-Tapping Screw
136052-3125	EPROM Integrated Circuit	178171-1616	Alum 1/4 6-32 x 1.00 Round Standoff
136077-X001	EPROM Integrated Circuit		
136077-X002	EPROM Integrated Circuit	72-036S	Steel/Zinc Ext, #6 Lock Washer
136077-X003	EPROM Integrated Circuit	72-1606F	Zinc 6-32 x 3/8, Cross-Recessed
136077-X004	EPROM Integrated Circuit		Pan-Head Screw
136077-X005	EPROM Integrated Circuit	72-1640F	Zinc 6-32 x 2.50, Cross-Recessed
136077-X006	EPROM Integrated Circuit		Pan-Head Screw
136077-X007	EPROM Integrated Circuit	A047724-01	DSK Board Assembly
136077-X008	EPROM Integrated Circuit		
136077-X009	EPROM Integrated Circuit	A047750-01	Link Assembly
136077-X010	EPROM Integrated Circuit	A047752-01	PCB Ribbon Cable Assembly
136077-X011	EPROM Integrated Circuit	A048305-01	Shifter Kit Assembly
136077-X012	EPROM Integrated Circuit	TM-356	Race Drivin' Kit Installation Instructions
136077-X013	EPROM Integrated Circuit	*Packaging materials are not listed. "X" in an EPROM part number represents a changeable number.*	
136077-X014	EPROM Integrated Circuit		
136077-X015	EPROM Integrated Circuit		
136077-X016	EPROM Integrated Circuit		
136077-X017	EPROM Integrated Circuit		

Inspecting the Kit

Check to see that you have all the parts listed in the kit parts list in Table 1-1. If any part is missing or damaged, contact your distributor with the Race Drivin' cockpit kit serial number, part number and description of the missing or damaged parts, and date received. To assemble the kit parts, you need the following tools: A 5/32 tamperproof hex-key driver (*178126-002*), a hammer, screwdriver and a squeegee.

Preparing the Cabinet for the Kit Installation

WARNING

To avoid electrical shock, unplug the cabinet while installing the kit. After installation, plug the game only into a grounded 3-wire outlet.

Figures 1-1 and 1-2 show almost all kit parts installed in a Hard Drivin' cabinet. Use these illustrations as guides while you install the parts.

1. Enter the self-test and see if the PCBs have problems indicated in the Statistics screen (a number appears after the *Error Count* phrase). Then clear the statistics by pressing and holding the abort button and turning the key at the same time.
2. Turn off power to the game, but *leave the power cord plugged in.*
3. Remove the following from the cabinet:
   - Existing stack of PCBs
   - Attraction shield
4. Wipe down and vacuum the cabinet. Paint the cabinet, if required.

Disassembling the PC Board Stack

Three PC boards are stacked in the following order (top to bottom) in the Hard Drivin' Game.

1. The Sound PC board
2. The ADSP II (or ADSP) PC board
3. The Main PC board

You must disassemble the board stack to install the

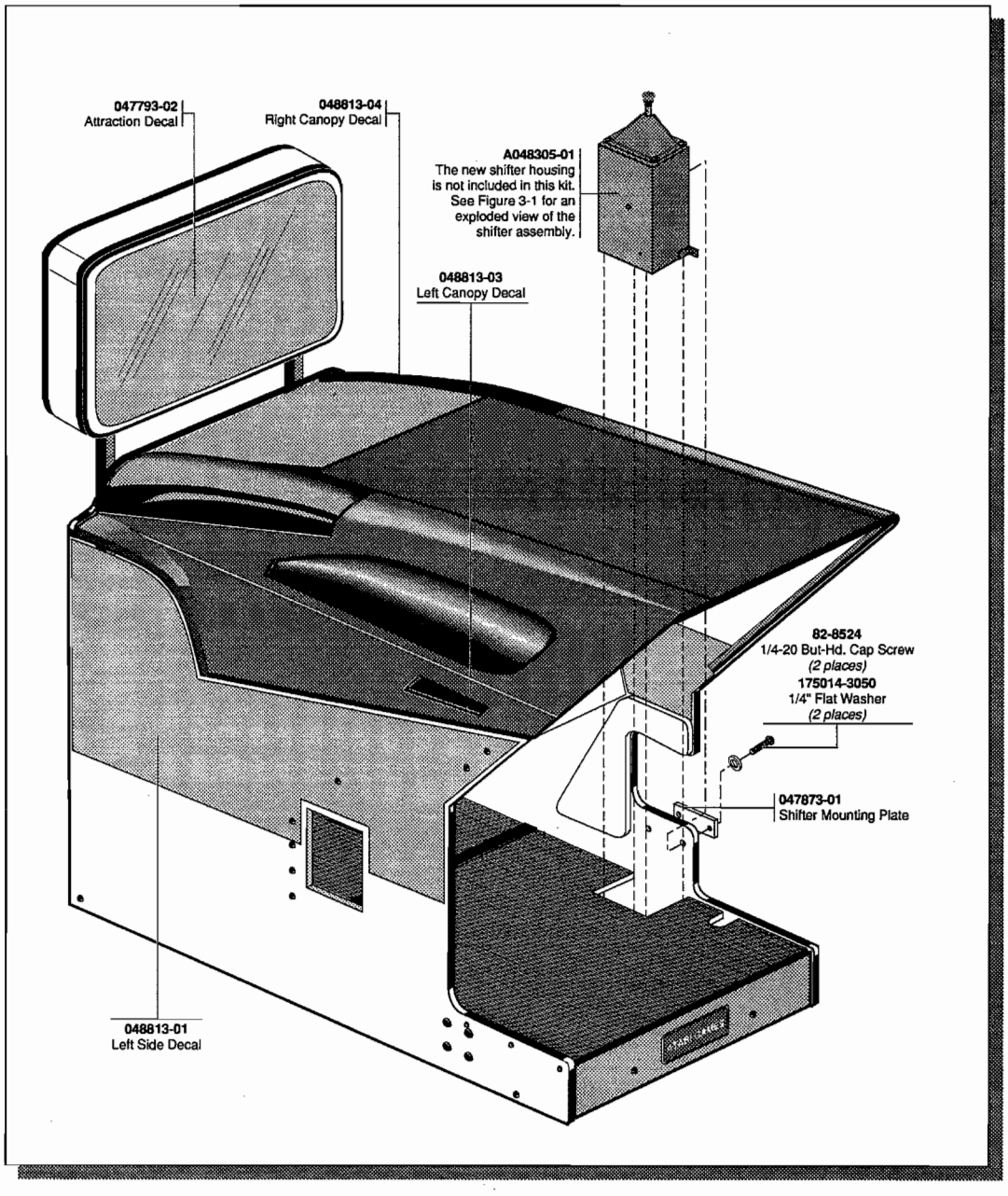


Figure 1-1 Installed Kit Parts, Front View

new DSK PC board as illustrated in Figure 1-3 between the 1st and 2nd boards (from top to bottom). You will also be installing all the integrated circuits included in the kit.

1. Remove the bottom service door at the back of the simulator.
2. Remove the board stack from the simulator.
3. Remove the four 2-1/2 inch screws from the corners of the Sound PC board on the top of the stack and save the eight 1 inch spacers from the original assembly.
4. Disconnect the harness and the ribbon cable.
5. Install the standoffs on the boards following the steps in Figure 1-3:
   - Install four round threaded standoffs (*178171-1616*) on the Main PC board using the appropriate hardware shown in detail A, of Figure 1-3.
   - Install two round threaded standoffs (*178171-1616*) between the DSK board and Sound board

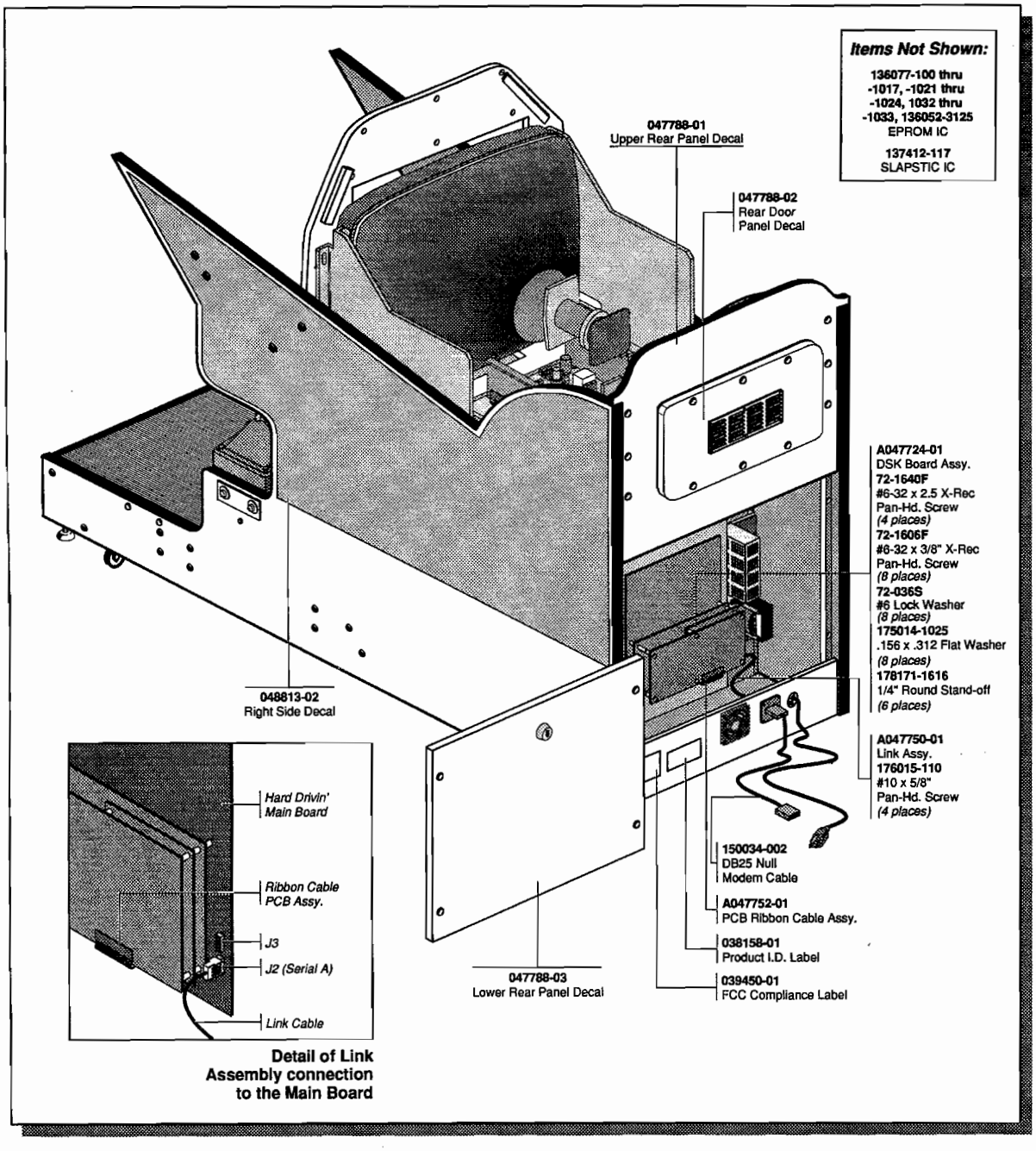


Figure 1-2 Installed Kit Parts, Rear View

using the appropriate hardware shown in detail B, of Figure 1-3.

- Connect the PCB Ribbon Cable to all of the four boards (in this order: Sound PCB, DSK PCB, ADSP or ADSP II PCB and the Main PCB) before securing the rest of the stack. Place ADSP board onto the Main board. Assemble the DSK and Sounds boards together with the ADSP board and the Main board using the eight original spacers and the hardware shown in detail C, of Figure 1-3.
- Use the PCB Interconnect harness to connect the Main board to the Sound board as shown in detail D, of Figure 1-3.

6. Install the entire board stack into the game. **Then unplug the game power cord for safety while completing the kit installation.**

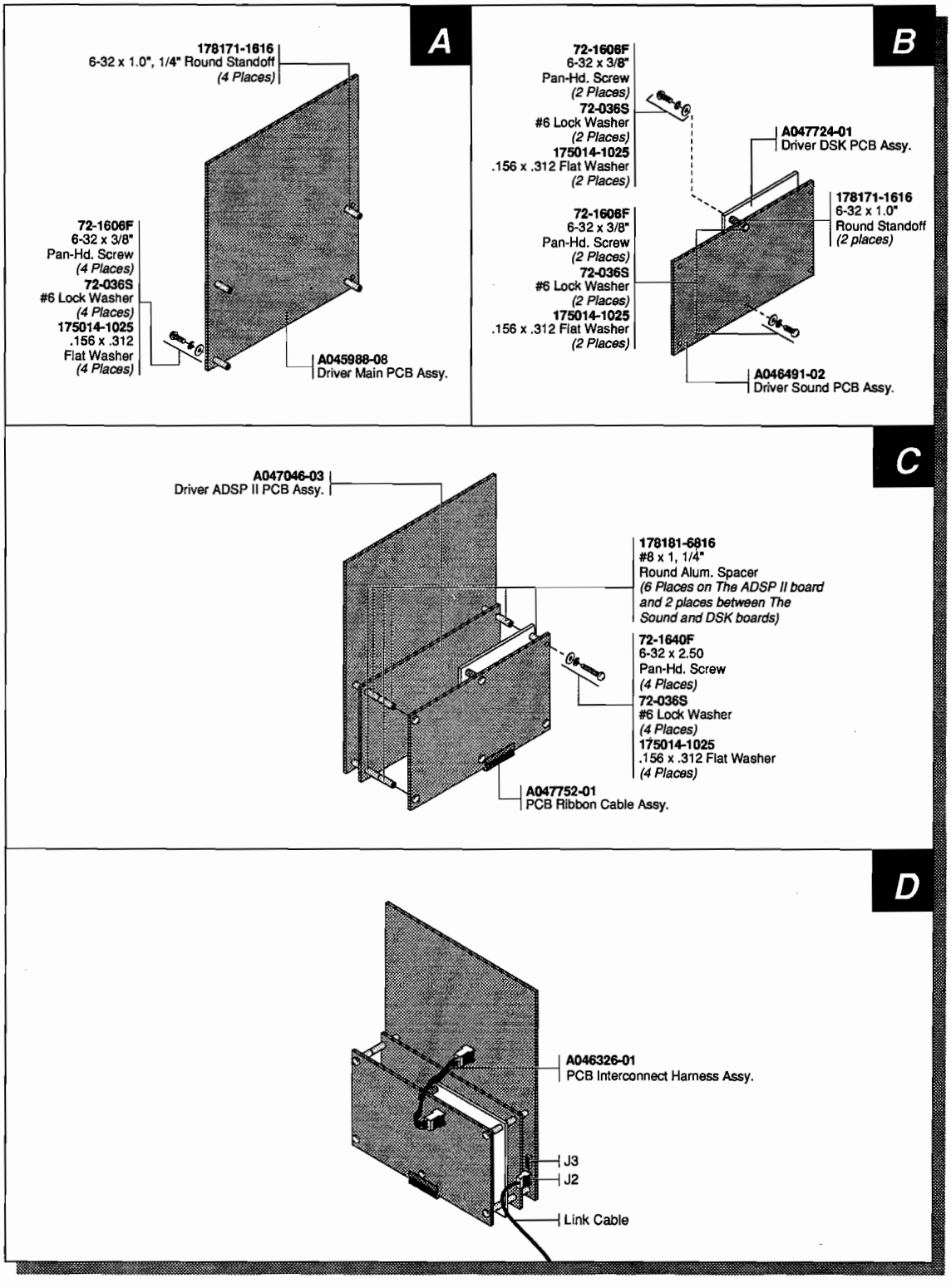


Figure 1-3 Disassembling the PC Board Stack

Installing the EPROM Chips

The erasable programmable read-only memory chips to update to the Race Drivin' software are packaged in two anti-static tubes. These devices are static-sensitive: handle them carefully as described below in the *Replacing Static-Sensitive Devices*. Follow the illustrations in Figure 1-4 through 1-7 to determine where you should install the chips.

Replacing Static-Sensitive Devices

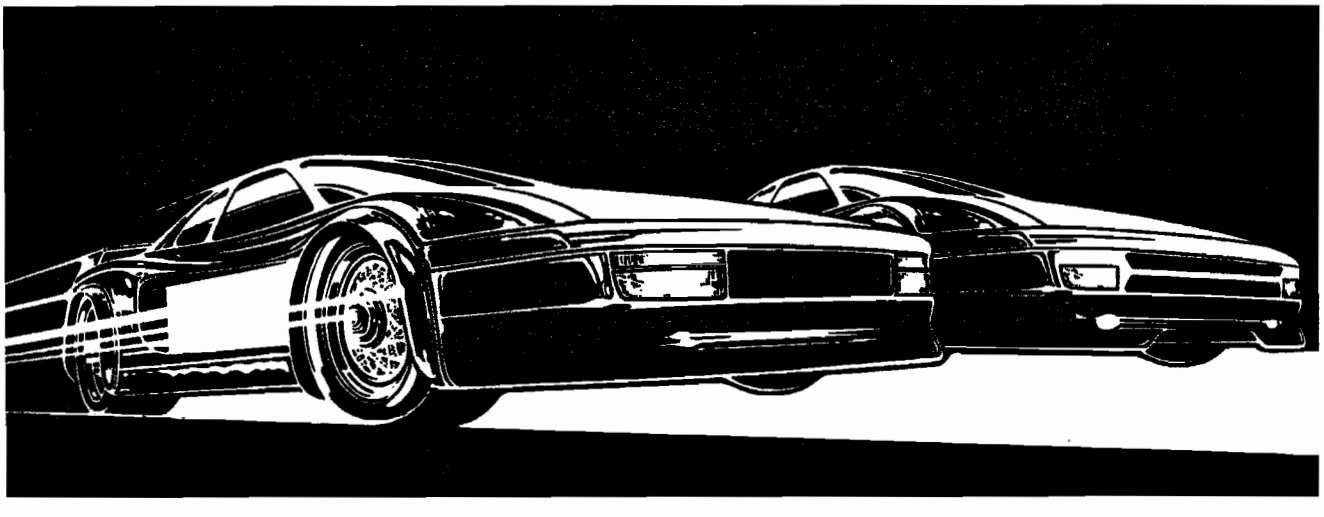
Be careful when you work with static-sensitive devices on the simulator PCBs. These devices can be microprocessors, field-effect transistors (FET), complementary metal-oxide semiconductors (CMOS), and other large-scale integration (LSI) devices that use metal-oxide semiconductor (MOS) technolory.

These devices can fail from a static charge that has built up in your body. They can also fail because of leakage from an improperly grounded soldering iron.

Before you handle a static-sensitive device or a PCB with such devices attached to it, ground any static voltage that may have accumulated in your body by touching an object that is earth-grounded. If you solder a static-sensitive device, use a soldering iron with a properly grounded three-wire cord.

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

A new static sensitive device may be packaged in conductive foam or may have a protective shorting wire attached to the pins. Remove the conductive foam just prior to inserting the device into its socket or soldering it to a PCB. Remove the shorting wire only after the device is inserted into its socket or after all the leads are soldered in place.



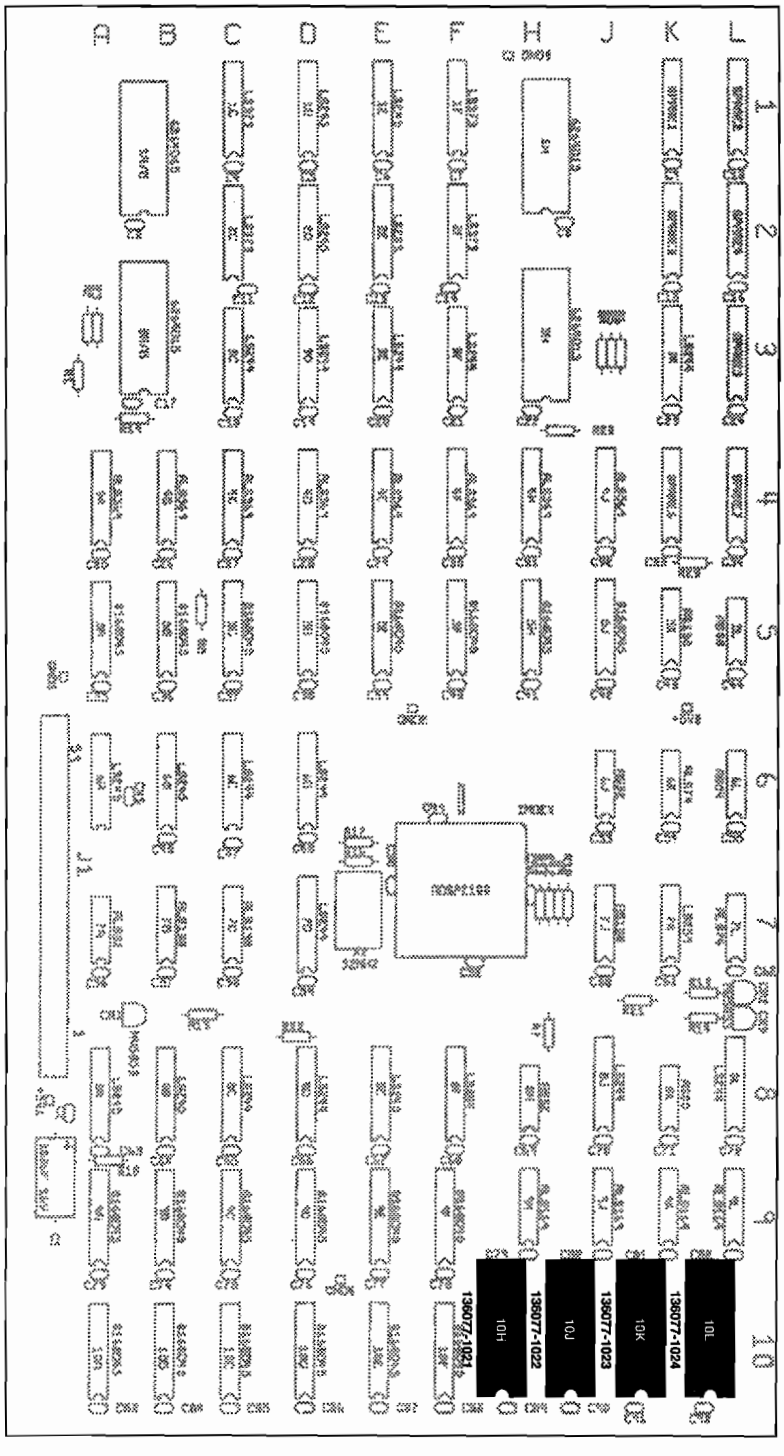


Figure 1-4 Installing the EPROMs in the ADSP Board

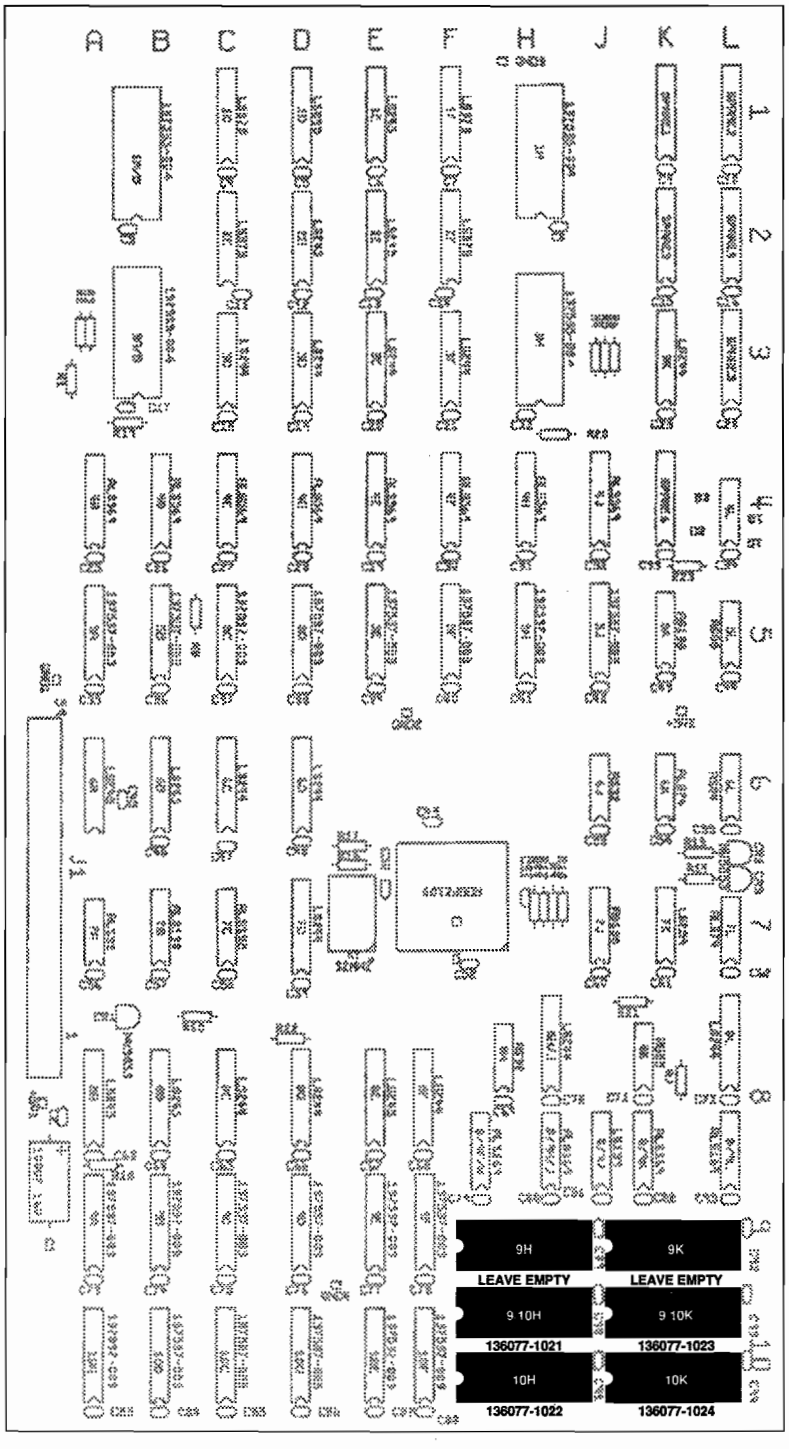


Figure 1-5 Installing the EPROMs in the ADSP II Board

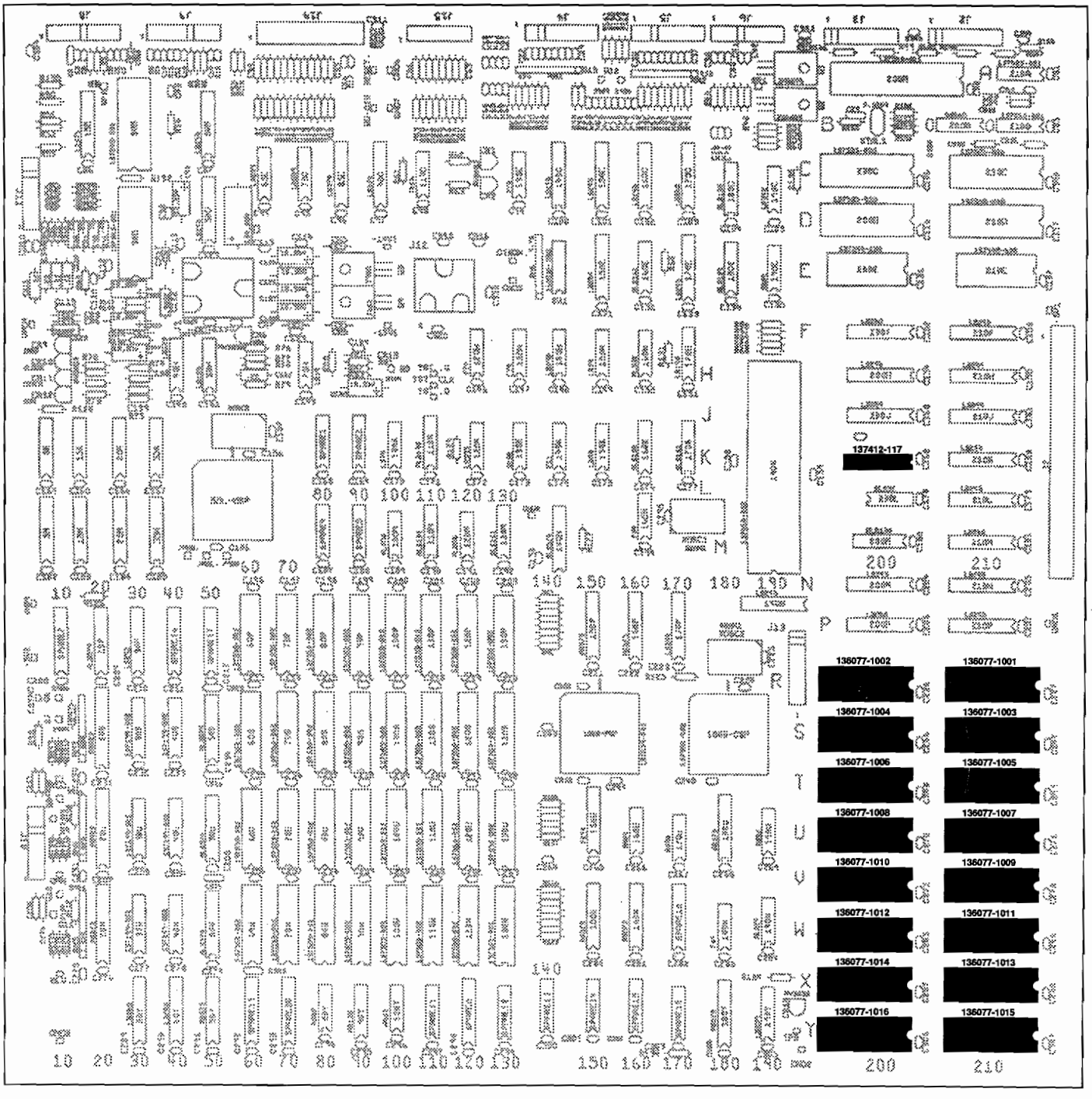


Figure 1-6 Installing the EPROMs in the Main Board

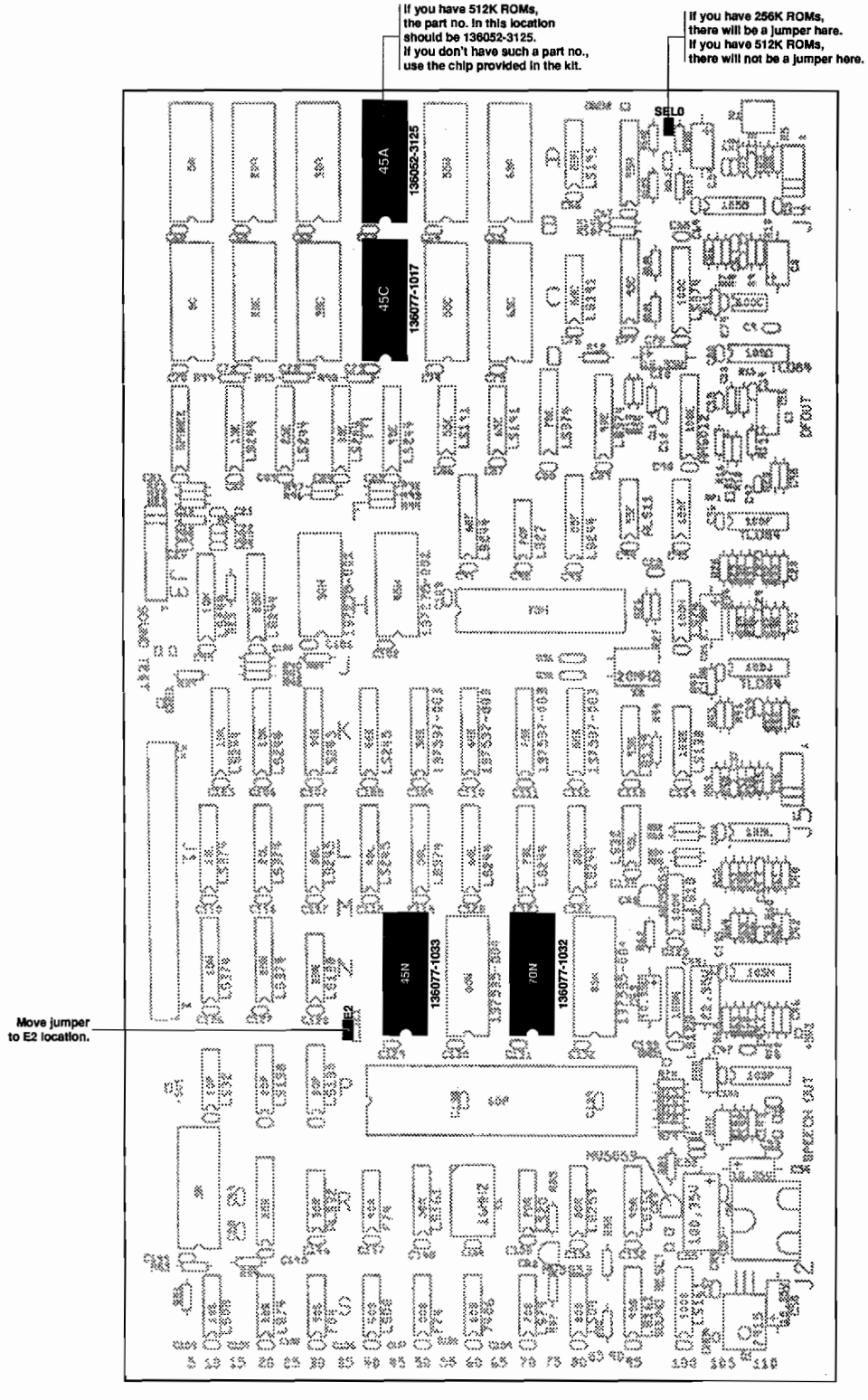


Figure 1-7 Installing the EPROMs in the Sound Board

Installing the Shifter Assembly

To install the new shifter assembly into the cabinet, first you have to remove the old shifter from the cabinet following these steps:

To Remove the Old Shifter:

1. Remove the shifter housing from the cabinet and completely remove the parts from the shifter housing except the carriage bolt (*75-5528B*).
2. Remove the Allen-head screw in the knob and remove the knob.
3. Remove the four tamperproof screws that hold the boot cover plate on the shifter case. Lift off the boot, the cover plate, and the shifter gate which has the shift pattern in it.
4. Remove the screw on the tie-wrap that holds the shifter harness on the side of the case. Disconnect the six-pin connector on the simulator harness from the shifter.
5. Remove the two screws on the outside of the cabinet to take the housing out.
6. Take out the Phillips-head screws on the back edge of the floor trim, which is the strip of metal across the middle of the floor. Remove the three Phillips-head screws along the front of the simulator under the rubber floor mat.
7. Turn the seat out of the simulator as far as it will go. Use two screwdrivers to lift and pry up the front corner of the floor. Take out the floor.
8. Remove the locknuts that hold the shifter on the seat assembly frame. Remove the shifter.
9. Unscrew the nut on the carriage bolt on the left side of the case and slip the long thin pitch bar off the bolt.
10. Inside the case, remove the cotter pin on the right side of the pivot shaft.
11. Use a screwdriver or a pencil to push the pivot shaft out of the case through the hole on the outside of the cabinet.

To Install the New Shifter:

1. Replace the magnet plate in the Hard Drivin' game with the solenoid plate, using the original hardware.
2. Install the new shifter assembly with shaft and cotter pin in the housing.
3. Install solenoid wires into the harness assembly (*A047751-01*) by inserting the two connectors.
4. Remove the socket-head screw (*72-8010*), #8 lock -washer (*75-048S*) and #8 flat washer (*175014-1031*) for reverse, from the shifter gate plate to enable the reverse gear.
5. To put the new shifter assembly in the game, simply reverse the process and note the following:

   A. Slip the long thin pitch bar onto the carriage bolt on the left side of the case.

   B. Before installing the gate boot, make sure that the harness doesn't interfere with the mechanical movement. Install the new boot, by first putting the boot on the shaft and pushing it down. Then install the knob and the pin. Use double-sided tape around the shaft below the knob and pull the boot up and put the tie-wrap around the shaft.

   C. Use the two new screws (*82-8524*), washers (*175014-3050*) and the shifter mounting plate (*047873-01*) from the outside, to install the shifter housing on the cabinet.

NOTE

You must perform the Set Controls *screens because you replaced the potentiometer. Otherwise the simulator will not operate correctly.*

For additional information on shifter installation, please refer to Shifter Assembly Section in the Maintenance Chapter (*page 3-2*).

Installing the Link Assembly

The link assembly allows you to join two Race Drivin' cockpit games together, so two players can play simultaneously. Provided with the kit is a 10-foot cable; therefore, the two games can be approximately that far apart.

Drill a hole in the rear of the cabinet as shown in Figure 1-9. Install the Link Cable plate to the outside of the cabinet wall. Then plug the link cable into the plate and inside the simulator to the Hard Drivin' Main Board as shown in the detail of Figure 1-2. **Make sure you arrange the link cable so that players and operators do not trip over it!**

Installing the Decals and Labels

Install the new attraction decal, the two side-panel decals, the two canopy decals, and the three rear decals as follows. Wet the appropriate panel of the cabinet with slightly soapy water dispensed from a spray bottle. Then position each decal as shown in Figures 1-1 and 1-2. Remove any wrinkles in the artwork using a squeegee. Allow the decal to dry.

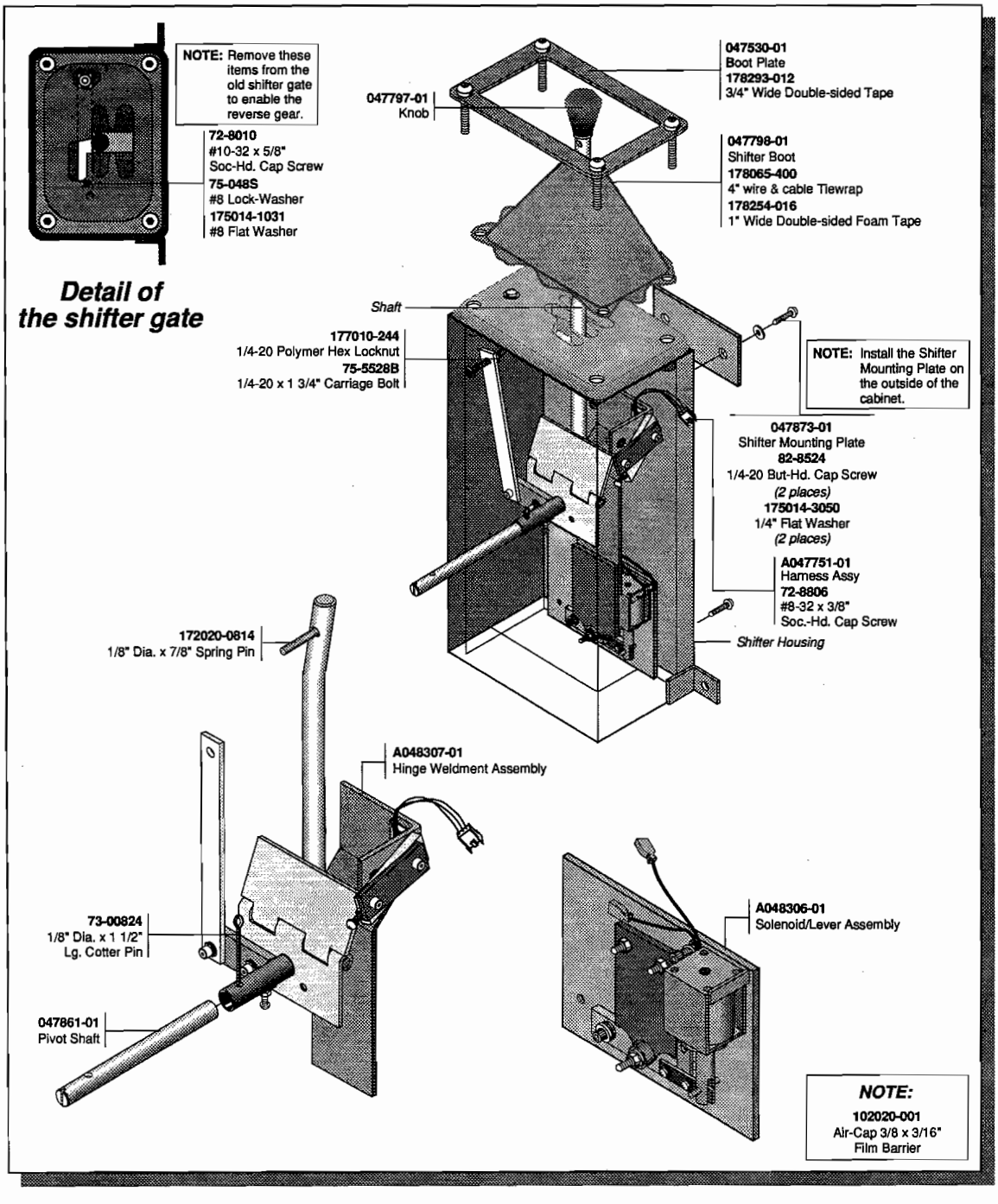


Figure 1-8 Installing the Shifter Assembly

Install the self-adhesive product ID label and the FCC label on the back of the cabinet, where the Hard Drivin' labels had been located.

Software Set-Up

When you are finished, plug in the game and turn the power switch on. Enter the self-test and set the controls in the *Set Controls* screen. Check all the ROMs in the self-test.

Setting the Coin and Game Options

Set the coin and game options in the self-test. See Chapter 2 for information about the option settings.

Maximizing Earnings

For maximum earnings, regularly maintain your Race Drivin' simulator following the instructions in Table 3-1, in Chapter 3.

When you set up the simulator and when you collect money, perform the automated self-test and check the controls with the *Control Inputs* screen in the self-test.

Simulator Driving

This section describes the features and driving of the Race Drivin' simulator.

Introduction

Race Drivin' includes all of the innovative game features that made Hard Drivin' the industry's first true driving simulation game, plus many more new features.

New Features

Improved Handling — Faster microprocessor and more efficient software code provides a now imperceptible lag time between control input and screen graphic response. Race Drivin' feels even more like a real car!

New Tracks — The Super Stunt track will challenge even the best Hard Drivin' stunt racers. New tests of skill include a corkscrew loop, a jump loop, and a winding mountain road.

The autocross track with a built-in pace car provides feedback to hone competitive driving skills. The vector-drawn pace car is actually a recorded view of the player's best lap.

Buddy Race — Two-player sequential race in which the computer records the performance of player one, and player two races head-to-head against the first player and the clock.

Linked Race — Install a simple cable between two Race Drivin' deluxe simulator cabinets, adjust game options, and the buddy race becomes a true head-to-head competition.

Select a Car — Players can select from several different sports cars to suit the race track chosen. The Race Drivin' cars are modeled after the performance features of several well-known sports cars. Each car has its own handling characteristics of off-the-line quickness, top speed, and cornering.

In addition to all of the innovations aimed at the player, Atari has also included many improvements that will be appreciated by the operator. Race Drivin' includes new materials for the shifter boot and electromechanical parts.

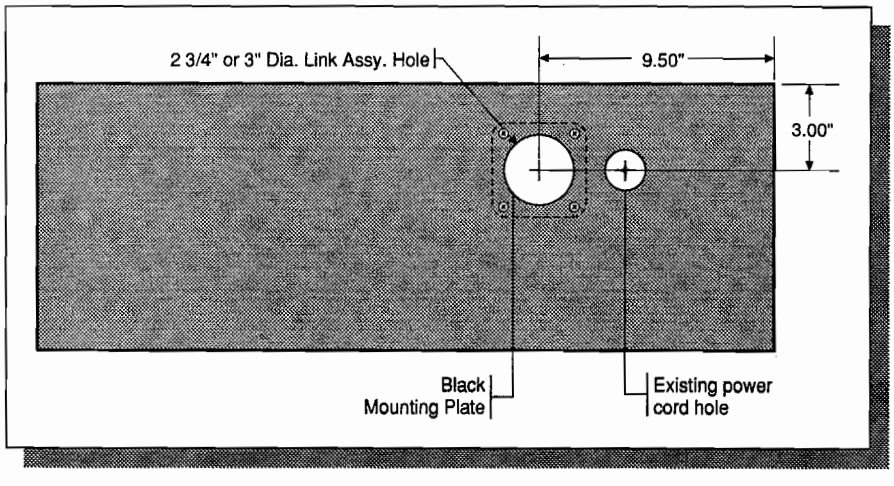
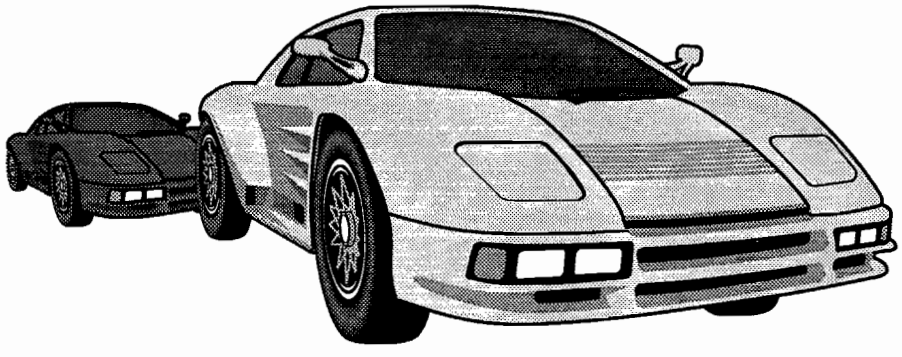


Figure 1-9 Drilling the Link Assembly Hole

N O T E S

CHAPTER 2

Self-Test



TESTING THE GAME

The *Race Drivin'* simulator is a complex machine. To keep it at peak efficiency and maximum earnings, you should regularly check the controls, RAMs, ROMs, PCBs, and microprocessor systems. You can check all of these when you switch on the self-test. Also in the self-test you can check the video display, the statistics, and set the internal clock.

If you cannot use the self-test because the screen is dark, you can use a DIP switch on the main PCB to find the source of the problem. If you are having electronic problems, you can check the state of various signals with the LEDs on the main PCB.

You should regularly check the following screens and information. We recommend you check these when you first set up the simulator, each time you collect money, or when the simulator is not working correctly.

- Use the automated self-test, which begins automatically when you turn on the self-test to test the program RAMs and ROMs, the video RAMs, color RAMs, the DSK PCB, the ADSP PCB, and the sound PCB. The test takes about 5 minutes to run.
- Check the *Control Inputs* screen, which you choose from the *Test Menu* screen. This shows the voltage input to the main PCB from the steering wheel, brake pedal, gas pedal, clutch pedal, seat, and shifter. With this information you can easily check how the controls are working.

NOTE

If the control inputs are wrong, your earnings may drop, since the realistic driving feel is lost.

- Check the *Statistics, Histogram,* and *Games Played by Day and Hour* screens which show the statistical information about how and when your simulator is played.

Table 2-1 shows you what tests and screens to use at different times and for different problems.

Entering and Exiting the Self-Test

You enter and exit the automated self-test procedure by turning the self-test switch on or off. The switch is located at the back of the upper coin compartment. You run the tests with the door open so that you can press the right and left coin switches to move up and down the menus.

The self-test consists of:

- A five-minute automated self-test of the ROM, RAM, the microprocessor, and the PC boards
- A Test menu from which you can run specific tests in the event that you receive error messages

If you are running a specific test and turn off the self-test switch to exit, you may need to proceed through all the screens in the submenu and return to the Test menu before you return to the attract mode.

Automated Self-Test

When you enter the self-test, the simulator automatically tests the program ROM and RAM, the video RAM, the color RAM, the DSK PCB, the ADSP PCB, and the sound PCB.

NOTE

If you do not see anything on the video display screen, you may have a video display problem or a simulator system problem. See DIP Switches *at the end of this chapter to diagnose the problem.*

Table 2-1 Using the Self-Test Screens and Diagnostics

Problem or Type	Explanation
Automated Self-Test	When you switch on the self-test, the automated self-test is performed. This tests the program RAM and ROM and the PCBs. You can skip the self-test by turning and holding the key as soon as you enter the self-test. If you cannot run the self-test at all, use the DIP switches to diagnose the problem. These are explained at the end of this chapter.
Test Menu	Appears after the automated self-test. Select tests and information on this screen.
Regular Maintenance	Regularly do the following: 1. Do the automated self-test. 2. Check the *Operator Screens.* 3. Go to the *Control Inputs* screen to test the controls.
Game Set-Up	When you first set up your game, do the following: 1. Do the automated self-test. 2. Make sure the options on the *Operator Screens* are set correctly for your location, or set to the defaults. 3. Go to the *Control Inputs* screen to test the controls. 4. Set the clock, if necessary, using the *Set Time* screen.
Control Problem	1. Do the *Set Controls* screens. 2. If that does not correct the problem, go to the *Control Inputs* screen and see if the input from the control changes as you use the control. 3. Go to Chapter 3 and check the troubleshooting table and maintenance information for that control. 4. If the shifter, brake, clutch, or seat potentiometer is broken and you cannot fix it immediately, but still want to operate the game, turn off the control circuit in the *Disable Broken Controls* screen.
Video Display Problem	1. Try the *Monitor Test Patterns* screens. 2. If you cannot go into the self-test or the screen is dark, use the DIP switch diagnostics.
Electronics Problems	1. Do the automated self-test. 2. Choose the *Special Functions* screen that applies to your problems: the GSP, program ROM, ADSP PC board, sound PC board, or DSK PC board test.
Game Clock	Use the *Set Time* screen to set the internal game clock. This time is used in the statistics screen that shows games played by day and time and in the schedule for clearing the high score table.
Cannot Enter the Self-Test	Use the DIP switches and the LEDs to diagnose the problem. These are explained at the end of the chapter.

The automated testing takes about five minutes. The results appear on the screen. Messages in red alert you to a problem. You can run further testing from the Test menu.

If you do not want to wait for the systems and PCBs to be tested, you can skip these tests by turning the ignition key while in the program ROM and RAM screen, Figure 2-1. (If the self-test proceeds beyond this screen, it will run its course.) If you want to exit to the attract mode, just turn the self-test switch off.

Program ROM and RAM Test

When you enter self-test, the simulator tests the program ROM and RAM. The screen in Figure 2-1 shows the results of a program ROM and RAM test.

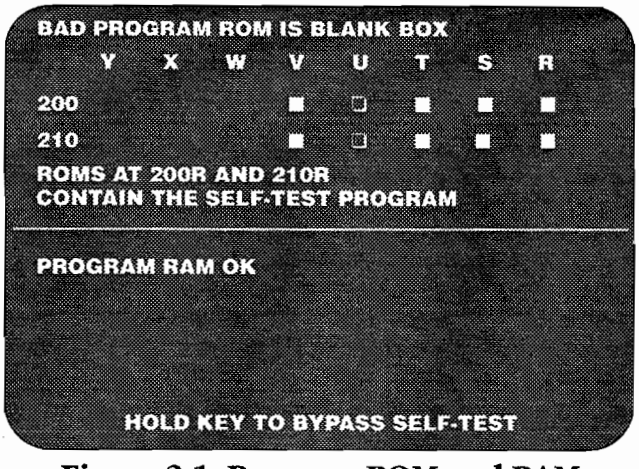


Figure 2-1 Program ROM and RAM Test Screen

The top of the screen shows the ROM test result. The numbers on the left and the letters on the top of the screen show the locations of the ROMs on the main PCB. If a white box appears, then the ROM there is good. If an empty box appears (as shown at 200U and 210U), then the ROM there is bad. If nothing appears, then nothing was tested there.

The RAMs are tested after the ROMs. If the RAMs have no errors, then you see the message *Program RAM OK*. If the test finds an error, then you see *Bad Program RAM At* with the bad RAM location listed.

This screen disappears after a few seconds and the self-test continues. However, the screen with the results of the complete self-test, shown in Figure 2-2, shows the message *Bad Program ROM* (or *Bad Program RAM*) if it found an error in the program ROMs or RAMs.

Microprocessor and Board Tests

After checking the program RAM and ROM, the automated self-test checks the simulator's microprocessor and PC boards. It tests the video RAM and color RAM in the GSP microprocessor system, the DSK board, the ADSP board, and the sound board. The test takes four to five minutes. You see the screen in Figure 2-2 when the test finishes.

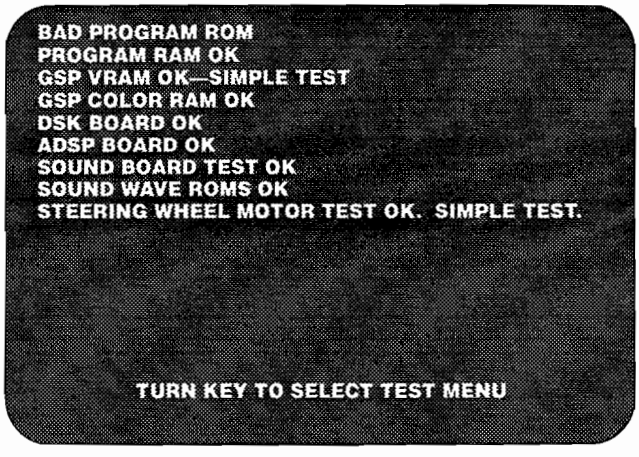


Figure 2-2 Microprocessor and Board Tests Screen

If the system or board is good, *OK* follows the test name. If it is bad, the word *Bad* precedes the name of the board or system (except for the ADSP board test, which gives more information). If you have a bad system or board, then choose *Special Functions* from the Test menu, choose the appropriate system or board tests from the Special Functions menu, and read the description of the tests in this chapter.

Here is a brief description of each microprocessor and board test performed during the automated self-test.

PROGRAM ROM: Described above.

PROGRAM RAM: Described above.

GSP VRAM: Uses the Simple GSP VRAM Test. (Described in the section *Main Board GSP Tests.*)

GSP COLOR RAM: Uses the GSP Color RAM Test. (Described in the section *Main Board GSP Tests.*)

DSK Board: Tests two ASIC systems, the DSK Program RAM, the DSK ZeroPower RAM, and the DSK Program ROM. These tests are described in the section *DSK Board Tests.*

ADSP Board: Tests the ADSP board memory and the ADSP-2100. Most of the error messages are self-explanatory. (*Does Not Respond* generally indicates a missing board.)

Sound Board: Tests the sound program ROM and RAM, the sound board communications ROM and the 32010 ROM.

Sound Wave ROMS: Tests the ROMs that have the sound waveform data. If any are bad, the message *Bad Sound Wave ROMs* appears on the screen.

Steering Wheel Motor Test: Performs a simple test of the steering wheel system.

Test Menu Screens

After the microprocessor and board test is finished or you bypass it, turn the key to proceed to the Test menu. The Test menu screens let you conduct specific troubleshooting in the event of problems.

Turn the key once to see a screen that explains how to select from the Test menu, shown in Figure 2-3. Turn the key again to see the Test menu, shown in Figure 2-4.

As the screen shown in Figure 2-3 explains, you use the right and left coin switches and the ignition key to make a selection from the Test menu. Pressing the right or left coin switch on the back of the upper coin door moves you up or down the menu. When the option you want is white, turn the ignition key to select it. The submenus for the specific tests work the same way.

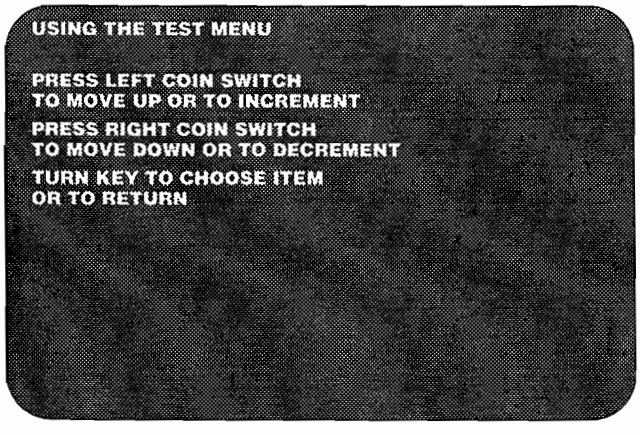


Figure 2-3 Instructions for Test Menu Screen

Figure 2-4 Test Menu Screen

The Test menu, shown in Figure 2-4, is the most important screen in the self-test. Use this screen to choose specific tests to pinpoint problems and to set the game options. Table 2-4 shows all the tests that are available from the Test menu.

Operator Screens

Choose Operator Screens from the menu by pressing the right or left coin switch until this item is white, then turn the ignition key to select it.

If you are in the operator screens and want to go to the attract mode, first turn the key to go through the remaining operator screens. When you return to the Test menu, turn off the self-test switch.

The Operator Screens let you set game options and monitor the use of the simulator. The choices on the Operator Screens submenu are:

- Coin Options
- Link Options
- Game Options
- Statistics
- Histograms of Game Times
- Error Count
- Games Played by Day and Hour

Coin Options

The first operator screen, Coin Options, lets you reset the coin credits (see Figure 2-5).

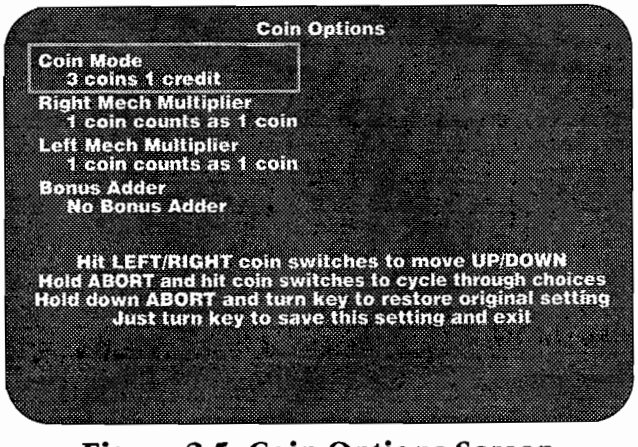


Figure 2-5 Coin Options Screen

To reset the coin options:

- Move up or down the list by pressing the right or left coin switch. A blue box indicates which item is selected.
- Press the Abort button and either coin switch to scroll through the settings until you see the one you want.
- To return to the original settings, press the Abort button and turn the ignition key.

Table 2-2 Coin Option Settings

Option	Available Settings
Coin Mode	1 coin/1 credit
	2 coins/1 credit
	3 coins/1 credit ♦
	4 coins/1 credit
Right Mech Multiplier	1 coin counts as 1 coin ♦
	1 coin counts as 4 coins
	1 coin counts as 5 coins
	1 coin counts as 6 coins
Left Mech Multiplier	1 coin counts as 1 coin ♦
	1 coin counts as 2 coins
Bonus Adder	No bonus adder ♦
	2 coins give 1 extra coin
	3 coins give 1 extra coin
	4 coins give 1 extra coin
	4 coins give 2 extra coins
	5 coins give 1 extra coin
	Free Play

♦ *Manufacturer's recommended settings*

- When through, turn the key to exit the screen.

The default setting of each option is green. The available settings are listed in Table 2-2.

The Coin Options are as follows:

- *Coin Mode* is the number of coins required for one credit.
- *Right Mech Multiplier* is the number of coins each coin counts as in the right coin mechanism.
- *Left Mech Multiplier* is the number of coins each coin counts as in the left coin mechanism.
- *Bonus Adder* lets you choose bonus coins, no bonus, or free play.

Game Difficulty

The game difficulty of each track and the difficulty of the drone car for each track can be set with this screen

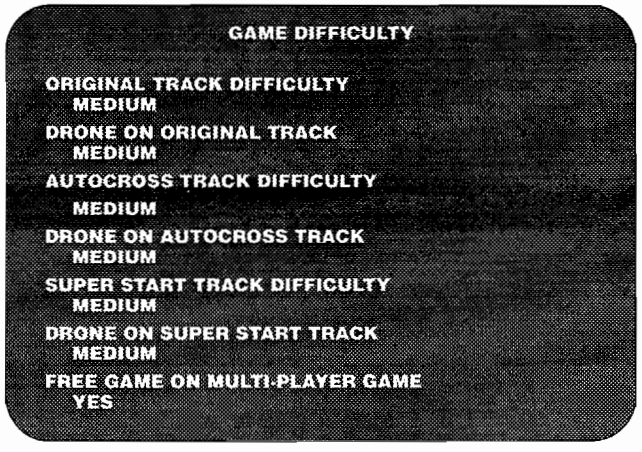


Figure 2-6 Game Difficulty

(Figure 2-6). In addition to settings of easy, medium, hard and very hard, custom tuning is provided. In the *Custom* setting, you can choose the actual amount of time a driver is given. You can select different times for each individual lap in this option.

The actual times for easy, medium, hard, and very hard game difficulty settings are also shown in the custom settings. For example, if you have chosen the medium setting in *Game Difficulty,* then the custom screen appears as shown in Figure 2-7.

NOTE

Always use the preset Game Difficulty *settings before you use the settings of the* Custom *game options.*

To move and choose in this screen, do the following:

- To move up or down the list, press the right or left coin switch.

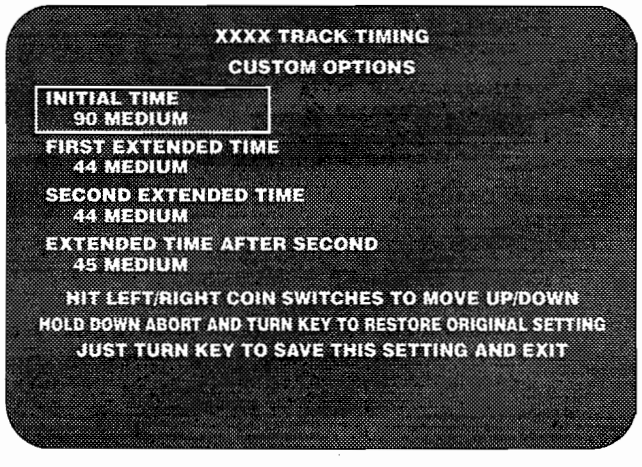


Figure 2-7 Custom Game Options Screen

Table 2-3 All Screens Appearing in the Self-Test

Screen	Use
Automated Self Test	
Program RAM and ROM	Tests the program RAM and ROM.
Automated Self-Test Results	Shows results of the program RAM and ROM, VRAM, color RAM, MSP DRAM, ADSP PCB, and sound PCB tests.
Test Menu Screens	
Instructions for Test Menu	Information about using the test menu.
Test Menu	List of available tests and information you can choose.
Operator Screens	
Coin Options	Sets the coin options.
Game Difficulty	Sets track and drone difficulty.
Track Timing	Use preset game options first.
Game Options	Sets the game options, controls the high score table and steering in the attract mode.
Statistics	Shows game statistics.
Histograms	Shows game histograms, and number of games by length of play.
Error Count	Shows the error count from the PC boards. Used by the factory for debugging.
Games Played by Day and Hour	The simulator clock must be set correctly to get maximum use from this screen.
Set Controls	Use if you are having any control problems or replace or repair a control or a PCB.
Initialize Pot Inputs	Initializes all the simulator potentiometers.
Initialize Steering Limits	Sets the steering limits.
Initialize Shifter Limits	Sets the shifter limits.
Initialize Seat Limits	Sets the seat movement limits.
Initialize Force Brake	Sets the limit on the force on the brake.
Control Inputs	Check this screen *regularly* to make sure your controls are operating correctly.
Monitor Test Patterns	Use these screens to check the performance of your video display.
Color Bars	Shows the video display colors.
Monitor Adjust	Used for the monitor setup.
Monitor Brightness	Shows the brightness adjustment.
Grey Scale	Shows the grey scale of the video display.
B/W Dots	Shows convergence and focus of the video display.
B/W Grid	Shows convergence and focus of the video display.
Diagonal Lines	Shows linearity of the video display.
Full Screen Grey	Shows the color purity of the video display.
Full Screen White	Shows the color purity of the video display.
Full Screen Red	Shows the color purity of the video display.
Full Screen Green	Shows the color purity of the video display.
Full Screen Blue	Shows the color purity of the video display.
Monitor High Voltage Test	Checks the regulation of the high voltage to the video display.
Scrolling Test	Checks the scrolling mechanism of the GSP microprocessor.
Set Clock	Set the time so that you can get maximum use from the *Games Played By Day and Hour* screen and so that the high score table reset occurs at the right time.
Disable Broken Controls	If you cannot repair a broken shifter, brake, clutch or seat potentiometer immediately, you can disable that control's circuit so you can continue to operate the game. *Repair the broken control as soon as possible. Use this screen only as a temporary measure.*

Table 2-3 All Screens Appearing in the Self-Test, Continued

Screen	Use
Special Functions	Use this screen for tests of the controls, PCBs, and microprocessors.
Main Board GSP Tests	Use this screen if you have a VRAM failure in the automated self-test.
VRAM Simple Test	Checks for bad VRAMs in the GSP microprocessor system.
VRAM Verify Test	Tests all the VRAM GSP memory.
VRAM Complete Test	Completely tests all VRAM.
Color RAM	Tests the color RAM.
VRAM Shift Register Test	Checks the VRAM shift register.
Main Board Controls	Shows much the same information as the *Control Inputs* screen, but has additional tests for the steering wheel, shifter, and line voltage calibration.
Pots: 8 Bit	Shows the gas pedal, clutch pedal, seat movement, shifter movement, steering wheel movement, line voltage and the shifter force input to the main PCB.
Pots: 12 Bit	Shows the steering wheel movement and the brake force input to the main PCB.
Steering Wheel	Use if the steering wheel does not work. See the steering wheel flow charts in Chapter 3 for information about their use.
Send Force	Use this test as directed in the flowchart in Chapter 3.
Sine Wave	Sends a sine wave force to the motor amplifier PCB.
Square Wave	Sends a square wave force to the motor amplifier PCB.
Triangle Wave	Use this test as directed in the flowchart in Chapter 3.
Closed Loop Test	Sends a force to the motor amplifier PCB simulating a simple spring.
Line Voltage Calibration	Calibrates the line voltage display in the self-test.
Opto Test	For factory use only.
Life Test	For factory use only.
Shifter	Use this screen if the shifter does not work correctly.
Link Connector	Use this screen if the game link does not work correctly.
Main Board ROM Checksums	Use this test if the program ROMs fail the automated self-test.
Main Board ZRAM Tests	Check the ZRAMs. Use this if all the controls are operating erratically or the statistics are not kept correctly.
ADSP Board Tests	
ADSP RAM .TESTED BY 68010.	Use this test if the ADSP board fails the automated self-test.
ADSP PROGRAM MEMORY TEST .2100.	The 2100 runs a standard, complete test on its own program memory.
ADSP DATA MEMORY TEST .2100.	The 2100 runs a standard, complete test on its own data memory.
2100 Test	Tests the response of the 2100 integrated circuit on the ADSP PCB.
IRQ Test	Tests if the ADSP system can generate IRQs.
ROM Checksums	Tests the graphics ROMs on the ADSP PCB.
ADSP Special Functions	Performs hardware diagnosis and oscilloscope test loops for use by a repair technician.
Sound Board Tests	Use these tests if the sound board fails the automated self-test.
Sound Board Self-Test	Tests the sound program RAM and ROM, COMRAM and the 320 RAM.
Play Sounds	Choose and hear game sounds.
Sound Board ROM Checksums	Tests the sound PCB ROMs.
Sound Board Program RAMs	Tests the sound PCB program RAMs.
Sound Board Program ROMs	Tests the sound PCB program ROMs.
COMRAM	Tests the sound PCB communication ROM.
320 RAM	Tests the sound PCB 32010 program RAM.

- To change a setting, press the abort button and either coin switch.
- To return to the setting that was originally on the screen, press the abort button and turn the key.
- To exit the screen, turn the key.

You can change an option when it is inside the blue box. The default setting of each option is green. The other settings are blue when the option is selected. (The other settings are white when the option is *not* selected.)

The custom game options are explained below.

- *Initial Time* is the amount of time always given for one driving session.
- *First Extended Time* is the amount of time given if the driver crosses the finish line before the initial time is up.
- *Second Extended Time* is the amount of time given if the driver crosses the finish line before the time is up on his second lap.
- *Extended Time After Second* is the amount of time given when the driver crosses the finish line before the time is up after the first two laps.

Game Options

Use the Game Options screen to set the game difficulty and the operator options as explained below. The screen is shown in Figure 2-8.

Table 2-4 Game Option Settings

Option	Available Settings	
Champ Lap Qualification	Easy Hard	Medium ♦ Very Hard
Steering During Attract Mode	On ♦	Off
Steering Wheel Force	Very Light Medium ♦	Light Stiff
High Score Name Censor	Easygoing ♦	Strict
Clear High Score Table	Don't Clear Clear Now Clear Every Week Clear Every 2 Weeks ♦	
Signs and Gauges	Miles per Hour ♦ Kilometers per Hour	
Game Type	Available Soon	

♦ *Manufacturer's recommended settings*

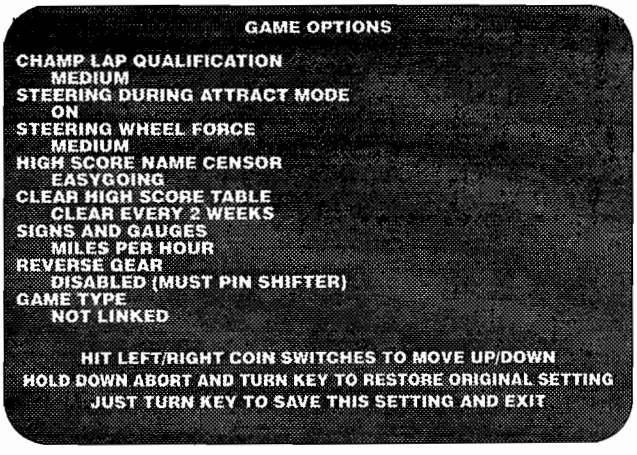


Figure 2-8 Game Options Screen

You operate this screen the same as Coin Options. Press the coin switch to select an option, and press Abort and a coin switch to scroll to the setting you want. Turn the key to save the settings and exit. A list of the available settings is shown in Table 2-4.

The Game Options available on this screen set the following:

- *Game Difficulty* sets the game difficulty for the drivers. The settings are shown in Table 2-4. The *custom* setting lets you choose the actual amount of time the players receive. We suggest you use the preset factory setting (easy, medium, hard, and very hard), not the custom setting.
- *Champ Lap Qualification* sets the difficulty of qualifying for the championship lap.
- *Steering During Attract Mode* allows you turn the movement of the steering wheel on or off while the simulator is in the attract mode.
- *Steering Wheel Force* is the amount of force exerted by the steering assembly motor on the steering wheel.
- *High Score Name Censor* controls a program to censor names entered on the high score table. The program deletes letters in possibly objectionable words in the high score table.
- *Clear High Score Table* clears the high score table at the time chosen. You can choose not to clear the table, clear it now, clear every week, or clear every two weeks. If you choose clear every week or clear every two weeks, the table is cleared when the simulator is turned on after Wednesday midnight every week or every second week. Be sure your simulator clock is set correctly so the table clears at the right time.

- *Signs and Gauges* allows you to choose whether the signs and gauges are displayed in kilometers or miles.

Statistics

The statistics screen is shown in Figure 2-9. The statistics are collected from the last time the statistics screen was cleared. Write this information on the statistics sheet in the back of this manual to help you maximize your profit.

To move to the next screen, just turn the key. To clear the statistics, press and hold the abort button and turn the key at the same time.

The statistics the simulator collects are explained below.

- *Left Coins* shows the number of coins counted in the left coin mechanism.
- *Right Coins* shows the number of coins counted in the right coin mechanism.
- *Aux Coins* shows the number of times the auxiliary coin switch (inside the coin door) is pressed.
- *Idle Mins* shows the number of minutes the simulator has been idle.
- *Active Mins* shows the number of minutes the simulator has been played.
- *Error Count* shows the number of errors counted in the erasable memory. If you have more than 75, check the ZRAMs with the self-test. Your simulator may need service.
- *Total Games* shows the number of unique games played.

Bottom Half of Screen

For the remaining statistics (except for the five entries at the very bottom of the screen), the three numbers after each entry represent, from left to right: first — original track at the beginning, second — autocross track, and third — super stunt track.

- *Laps by Track* is numbers of laps, completed or not, on each track.
- *No X Games by Track* is the number of times the drivers did not get extended games on either track. If the numbers are very high, then the game difficulty may be too hard.
- *1, 2, and 3+ X Play Games by Track* is the number of additional laps given to drivers if they complete the track before the time allotted. These additional laps do not need to be completed to be counted.

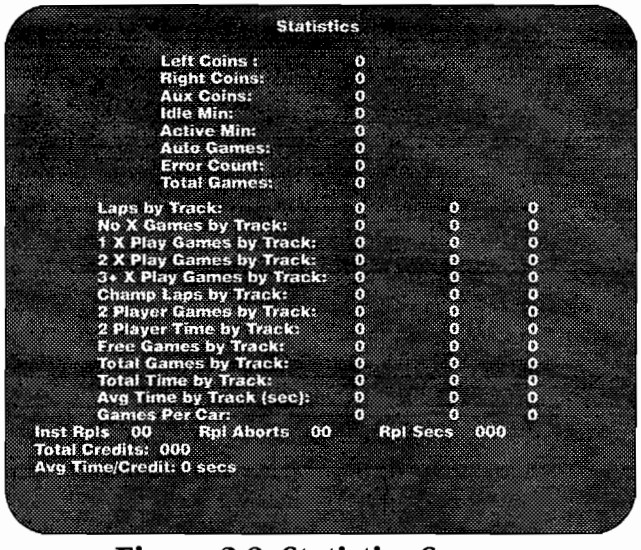


Figure 2-9 Statistics Screen

- *Champ Laps* is the number of times drivers qualified to race a championship lap.
- *2 Player Games by Track* is the number of games played with two players.
- *2 Player Time by Track* is the average time of all games played with two players.
- *Free Games by Track* is the number of free games played on each track.
- *Total Games by Track* shows the number of unique games for each track, regardless of how many additional laps each driver received.
- *Total Time by Track* shows the total time of all games for each track.
- *Avg Time by Track (sec)* shows the average total time of all games for each track.
- *Games by Car* shows the number of games played with each type of car.
- *Inst Rpls* is the total number of instant replays.
- *Rpl Abort* is the times the drivers pressed the abort button to cut the instant replay short.
- *Rpl Secs* is the total seconds the simulator is in the replay mode.
- *Total Credits* is calculated by multiplying the coins by the credit setting you chose in Coin Mode.
- *Avg Time Per Credit* is the average amount of time in seconds that each credit gave.

Histogram

The histogram screen shows the length of driving time in seconds and the how many times the simulator was driven. The screen is shown in Figure 2-10. Write these numbers on the statistics sheet in the back of this manual to help you maximize your profit.

To move to the next screen, turn the key. To clear the histograms, press and hold the abort button and turn the key at the same time.

Error Count

This screen shows the error count on the PC boards. If you call Atari Game Customer Service, the numbers on this screen may help Customer Service personnel troubleshoot your problem.

Games Played By Day and Hour

This screen, illustrated in Figure 2-11, shows the number of games played every hour in each day. The information on this screen relies on the simulator clock being set correctly. (The clock time is shown on the bottom of the Test menu screen. If the time is incorrect, follow the instructions in the *Set Clock* section of this chapter to set the clock.)

Write the simulator driving information on the statistics sheet in the back of this manual to help you maximize your profit.

To clear the screen, press and hold the abort button and turn the key at the same time.

Set Controls Screens

If you have problems with a control in the simulator, use the *Set Controls* screens before doing any troubleshooting or repairs. These screens allow you to set the beginning and ending points of the control input to the main PCB. Often, resetting these points will solve the problem you have. If resetting does not solve the problem, then check the *Control Inputs* screen, described below.

If you repair a control, then when you put the control back in the simulator, go through the *Set Control* screens. If you install a new board or a new control, you must go through the *Set Control* screens too.

The first *Set Controls* screen is shown in Figure 2-12.

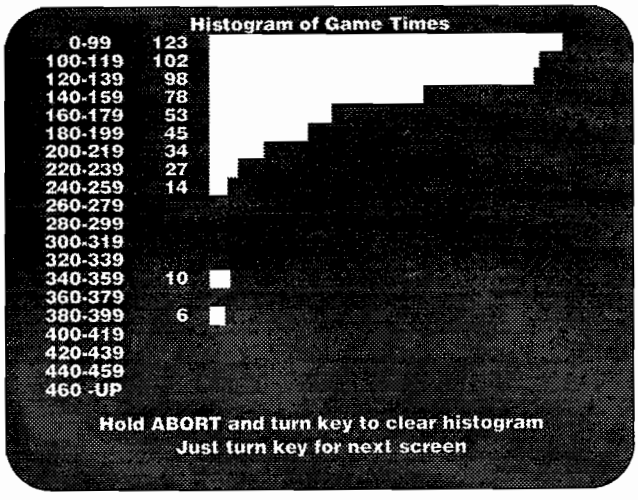


Figure 2-10 Histogram Screen

NOTE

If you take a control out of the simulator for repair or maintenance, you must go through all the Set Controls *screens after you replace it. If you do not, the simulator will not operate correctly.*

After you choose *Set Controls*, simply do what the screens say. You must reset all the controls after you start the screens. The first screen initializes all potentiometers in the simulator. (The steering wheel, shifter, seat, gas, and brake have potentiometers.) The next screens initialize the limits for the steering wheel, shifter, seat, and brake. The numbers on each screen are for factory use.

NOTE

When you initialize the brake, the instructions say to "step firmly" on the brake. Do not stomp on the brake or gently press it. Either way sets the brake limits incorrectly and drivers will be frustrated when they use the brake.

Control Inputs Screen

Check this screen as part of your regular maintenance to be sure your controls are operating correctly.

The *Control Inputs* screen is shown in Figure 2-13. This screen shows the voltage inputs from the control potentiometers to the A/D converter circuits on the main

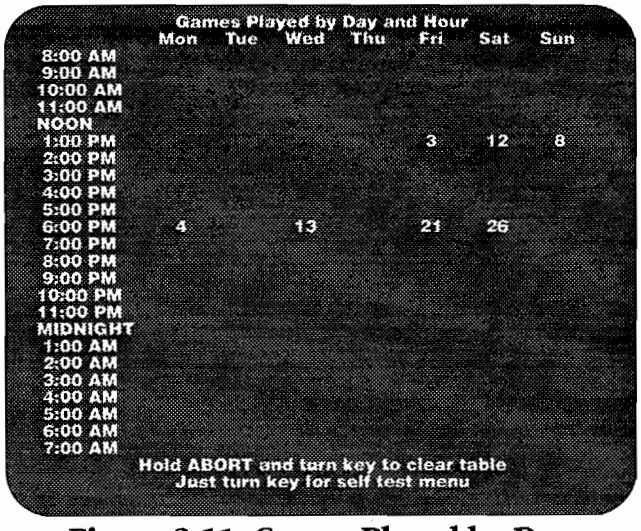


Figure 2-11 Games Played by Day and Hour Screen

PC board. As you use a control, the line length on the screen changes, showing the change in the voltage input from the potentiometer. If the line length does not change, you have a problem.

If you have a problem, first go through the *Set Controls* screens to see if that solves the problem. Check the results on the *Control Inputs* screen. If using the *Set Controls* screens does not solve the problem, check Chapter 3 for troubleshooting and repair information.

The first control on the screen is the *Steering Wheel.* This line shows the movement of the steering wheel. As you turn the steering wheel counterclockwise, the line should disappear.

The second line is *Brake Force* which measures the force with which the brake is pushed. As you push harder and harder on the brake, its line should disappear.

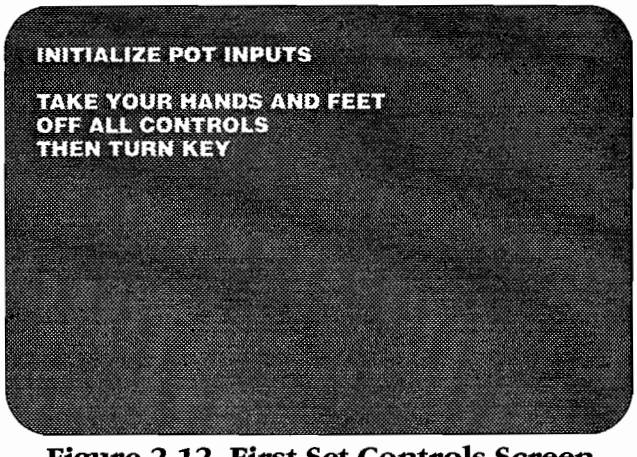


Figure 2-12 First Set Controls Screen

In both of these lines, 0 Volts appears as no line or a short line on the screen, and 5 Volts appears as almost eight full lines on the screens.

Below these two lines are the gas pedal, clutch pedal, seat movement, shifter (front to back), shifter (left to right), steering wheel, line voltage, and shifter force. (The steering wheel movement is checked with two lines.) As you use the controls, the lines should become longer and shorter. If the line does not move, then see Chapter 3 for more information. (The line voltage varies at 60 Hz. You cannot test the line voltage.)

For these controls, 0 Volts input appears as no line or a short line on the screen and 5 Volts appears as a line halfway across the screen.

At the bottom of the screen, you can check the left and right coin mechanism, the auxiliary coin switch behind the coin door, and the seat magnet. Use the seat magnet test to determine whether the seat is locking as it should and if the magnet is good.

If the seat has not been working correctly, but does lock in this test, the switch probably should be repaired or replaced. If the seat does *not* lock, then your problem is probably the harness or the magnet.

Monitor Test Patterns

Use this item to see the fourteen screens for checking the video display, the color RAMs, the GSP, which controls the video RAMs (VRAMs), and the video output. To move through the screens, press the coin switches.

- *Color Bars* screen shows these colors from left to right: white, yellow, light blue, green, purple, red, blue, and grey. If the colors are incorrect, see your video display manual for adjustment procedures.

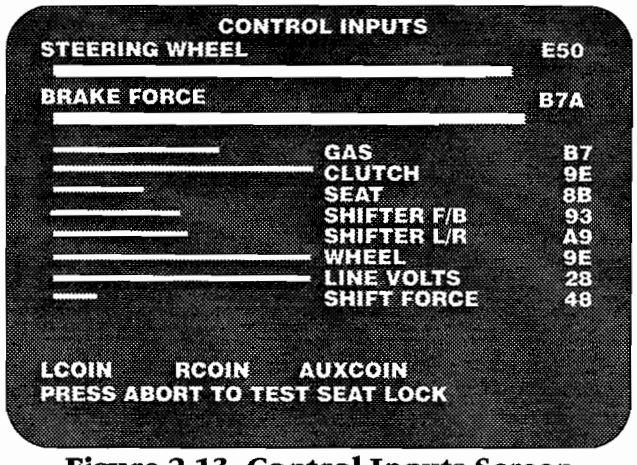


Figure 2-13 Control Inputs Screen

- *Monitor Adjust* is used to set up the monitor.
- *Monitor Brightness* checks the adjustment of the video display brightness.
- *Grey Scale* screen shows a white line on the left, and a grey scale showing black on the left.
- *B/W Dots* screen can be used to check convergence and focus.
- *B/W Grid* screen, shows a black background and a white grid pattern to check convergence. The grid lines should be straight within 3.0 mm. If you need to adjust the convergence, see the video display manual included with the simulator.
- *Diagonal Lines* screen can be used to check video display linearity.
- *Full Screen* colors test the color purity of the color RAMs and the display. The test displays a grey, white, red, green, and then blue screen. Each screen should be a rectangle of color, with no curving at the corners and no lines in the raster. If it does not, see your video display manual included with the simulator for adjustment procedures.
- *Monitor High Voltage Test* screens switch between a white screen and a grey screen. If the high voltage to the display is regulated properly, the sides of the screen will fluctuate about 3/4 inch from the white to the grey screen.
- *Scrolling Test* screen checks the scrolling mechanism in the GSP.

Set Clock Screen

Choose this item if you want to set the clock, turn the clock on, or turn it off. The clock should be set correctly so the statistics on the operator screen *Games Played by Day and Time* will be right.

The time on the clock also determines when the high score table is cleared. If you set the *Clear High Score Table* option in the *Game Options* screen to clear every week or every other week, then the high score table is cleared the first time the simulator is turned on after Wednesday midnight.

You may need to turn on the clock if the simulator has a program crash. Turn off the clock only if you plan to store the simulator more than six months. (The clock has a lithium battery that should last more than five years in normal use.)

To turn off the clock, choose *Clock Off* from the clock submenu, shown in Figure 2-14. To turn on the clock, choose *Start Clock* from the menu. In about two seconds, the clock starts.

If the clock is losing or gaining time, then use *Clock Faster* or *Clock Slower* to adjust the calibration of the clock.

Choose the item you need from the menu by using either coin switch. Change the setting by turning the key until you see the correct time.

The items on the clock menu are explained below.

- *Exit* returns you to the Test menu.
- *Inc Hours* changes the hour setting ahead.
- *Inc Minutes* changes the minute setting ahead.
- *Inc Seconds* changes the second setting ahead.
- *Inc Day* changes the day of the week (for example, Monday or Tuesday) setting ahead.
- *Inc Month* changes the month setting ahead.
- *Inc Date* changes the date setting ahead.
- *Inc Year* changes the year setting ahead.
- *Faster Clock* changes the calibration setting ahead. Each increase in the calibration setting makes the clock run about 5 seconds faster per month.
- *Clock Off* turns the clock off.
- *Dec Hours* changes the hour setting back.
- *Dec Minutes* changes the minute setting back.
- *Dec Seconds* changes the second setting back.
- *Dec Day* changes the day of the week (for example, Monday or Tuesday) setting back.
- *Dec Month* changes the month setting back.

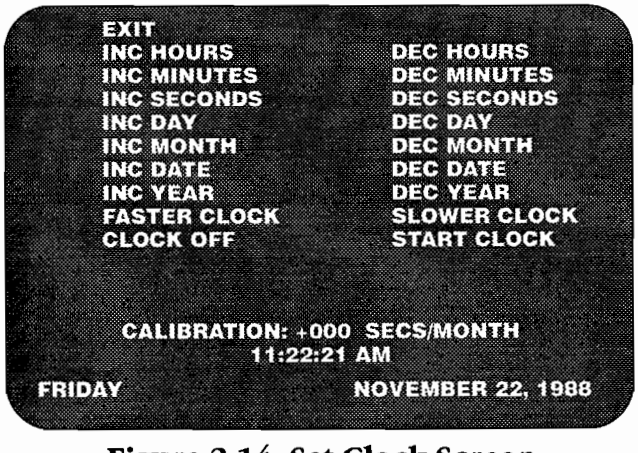


Figure 2-14 Set Clock Screen

- *Dec Date* changes the date setting back.
- *Dec Year* changes the year setting back.
- *Slower Clock* changes the calibration setting back. Each decrease in the calibration setting makes the clock run about 5 seconds slower per month.
- *Start Clock* starts the clock.

Disable Broken Controls Screen

Use this screen, shown in Figure 2-15, if you have a broken shifter, brake pedal, clutch pedal, or seat potentiometer and cannot repair it immediately. Before you use this screen use the *Set Controls* screens and read the information about the control in Chapter 3.

Disable these controls *only* as a *temporary* measure so you can continue to operate the simulator while waiting for parts. If you disable a control, the realistic driving feel of that control is lost. *Earnings could drop.*

When you disable a control, the control circuit is overridden, and the simulator compensates for the loss of the control. If you have disabled a control, remember to choose *working* after you repair it so the control works correctly.

Special Functions Screens

Use the items on this screen, shown in Figure 2-16, if a system or board failed the program RAM and ROM test or the board and microprocessor test in the automated self-test. Also use this screen if you have problems with the steering wheel, the shifter, or if the clock settings or the statistics are erratic. A short summary of when to use these items is shown in Table 2-5.

The *Special Functions* items are explained below.

- *Exit* returns you to the Test menu.
- *Main Board GSP Tests* should be used if you get the message *Bad GSP VRAM* or *Bad GSP Color RAM* in the automated self-test. This screen has six tests you can use.
- *Main Board Controls* gives you most of the same information as provided in the *Control Inputs* screen plus five steering wheel tests, a line voltage calibration screen, additional shifter tests, and a link connect test. (All controls are "main board" controls.)

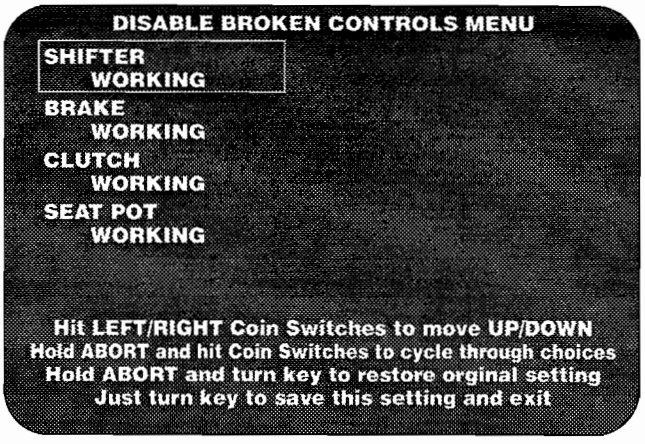


Figure 2-15 Disable Broken Controls Screen

- *Main Board ROM Checksums* should be used if you get the message *Bad Program ROM* in the automated self-test. This tests the program ROMs individually and shows the results on the screen.
- *Main Board ZRAM Tests* should be used if your controls settings are changing or erratic even though you used the *Set Controls* screen. Also use these tests if you suspect the simulator is not keeping the statistics correctly.
- *ADSP Board Tests* should be used if you get any message other than *ADSP Board OK* for the ADSP board test in the automated self-test. This screen has three tests and an ADSP ROM checksum test. It also has eight "scope loop" tests for factory use only since they require schematics and an oscilloscope.
- *Sound Board Tests* should be used if you get the message *Bad Sound Board* in the automated self-test. However, many of the sound board tests are for factory use only since they require schematics and an oscilloscope.
- *DSK Board Tests* should be used if you get the message *Bad DSK Board* in the automated self-test. This screen allows you to test the DSK ROMs, the DSK RAM, the DSK ZeroPower RAM (ZRAM), and the two ASIC subsystems. It also has a Special Functions screen for factory quality assurance.

Main Board GSP Tests

If the automated self-test reports bad VRAMs, choose *Main Board GSP Tests* and the screen in Figure 2-16 appears.

First run the VRAM simple test. It gives the location of the bad VRAMs. If the VRAMs pass this test, but you think the simulator has a bad VRAM, run the VRAM verify test.

Table 2-5 When to Use the Special Function Items

Item	When to Use
Main Board GSP Tests	If you see the message *Bad GSP VRAM* or *Bad GSP Color RAM* in the automated self-test.
Main Board Controls	If you have control problems and/or game link problems.
Main Board ROM Checksums	If you see the message *Bad Program ROM* in the automated self-test.
Main Board ZRAM Tests	If your controls settings are changing even though you have used the *Set Controls* screen or if the statistics are not being kept correctly.
ADSP Board Tests	If you see any message other than *ADSP Board OK* for the ADSP PC board test in the automated self-test.
Sound Board Tests	If you see the message *Bad Sound Board* in the automated self-test.
DSK Board Tests	If you see the message *Bad DSK Board* in the automated self-test.

- *VRAM Simple Test* is the same test that is run in the automated self-test. It is run by the 68010 through the GSP interface and detects open or shorted address or data lines or missing parts. The results are displayed on-screen with a picture showing the VRAM section of the main PC board. The good parts are shown in green and the bad parts are shown in red. If an entire section appears in red, the problem may be with a buffer associated with that section. The test takes about 30 seconds.

- *VRAM Verify Test* is a complete memory test run by the GSP. The results are reported on the screen like in the simple test. The test takes about three minutes to run.

  Since the verify test is run by the GSP program in the VRAMs, a single bad VRAM can cause the GSP program to crash. When this happens, the 68010 microprocessor reports that all the VRAMs are bad, although probably only one VRAM is bad. You must run the VRAM complete test (described below) to find out which VRAM is bad.

  If the VRAM verify test fails, but the VRAM simple test shows the VRAMs are good, you should run the VRAM complete test.

  If the verify test runs and reports that the VRAMs are good, then the VRAMs should be good.

- *VRAM Complete Test* is a complete memory test run by the 68010 through the GSP interface. Because the 68010 runs the test, a single bad VRAM does not cause the test to report all the VRAMs are bad (as it does the verify test).

  Any VRAMs that are bad are shown on the screen at the end of the test. This test takes at least 22 minutes to run.

- *Test VRAM for Display Errors* checks for video display problems.

- *Color RAM* is the same test that is performed in the automated self-test. It tests the color RAM and reports the results.

- *VRAM Shift Register Test* checks the shift register part of the video RAMs.

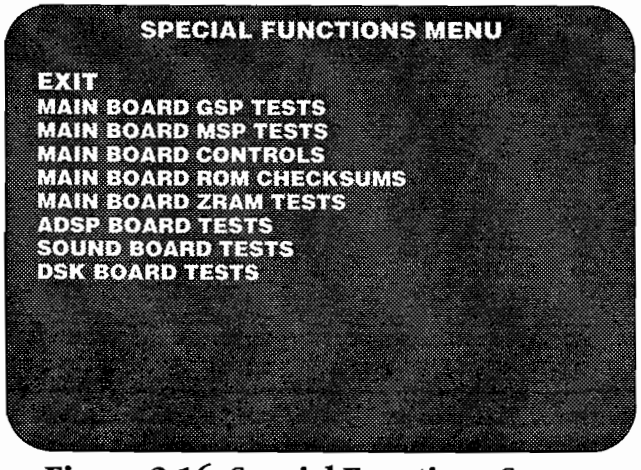


Figure 2-16 Special Functions Screen

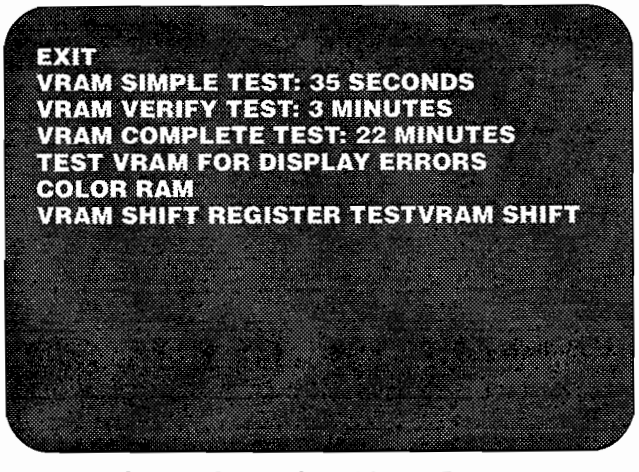


Figure 2-17 GSP Tests Screen

Main Board Controls

This screen provides more information about the controls than is shown in the *Control Inputs* screen. The items on the screen are described below and shown in Figure 2-18. After you choose any item on this screen and go to that item, you can return to this screen by turning the key.

The *Pots: 8 Bit* and *Pots: 12 Bit* screens have the same information as the the *Control Inputs* screen. They show the voltage inputs from the control potentiometers to the A/D converter circuits. As you use a control, the line on the screen changes as the voltage input changes. If the voltage does not change, you should check that control according to the procedures in Chapter 3, *Maintenance and Troubleshooting.*

- The controls under the heading *Pots: 8-Bit* feed into the 8-Bit A/D converter circuit on the main PCB. (See Figure 2-19.) These controls are the gas pedal, clutch pedal, seat movement, shifter (front to back), shifter (left to right), steering wheel position, and shifter force. (The steering wheel position is also checked on the 12-bit A/D converter circuit. If the numbers do not match, the steering wheel force is turned off.)

  As you use the controls, the lines should become longer and shorter. If the line does not move, then you have a problem with the control and you should see the information about the control in Chapter 3.

  In these controls, 0 Volts appears as no line or a short line and 5 Volts appears as a line halfway across the screen.

- In the *Pots: 12-Bit* screen, shown in Figure 2-20, *Steering Wheel* shows the position of the steering wheel. The steering wheel location input is sent to both the 12-bit and the 8-bit A/D converter circuits and is compared. If the numbers do not match, the simulator turns the steering motor force off.

  Brake Force shows the force on the brake pedal. As you push harder and harder on the brake, the line disappears. If the line does not move, then you have a problem with the brake, the connection, or the A/D Converter circuit on the main PCB.

  In the steering wheel and the brake force lines, 0 Volts appears as no line or a short line and 5 Volts appears as almost eight full lines drawn across the screen.

  (The two lines on the bottom of this screen are not used.)

- *Steering Wheel* screen is explained below and shown in Figure 2-21.

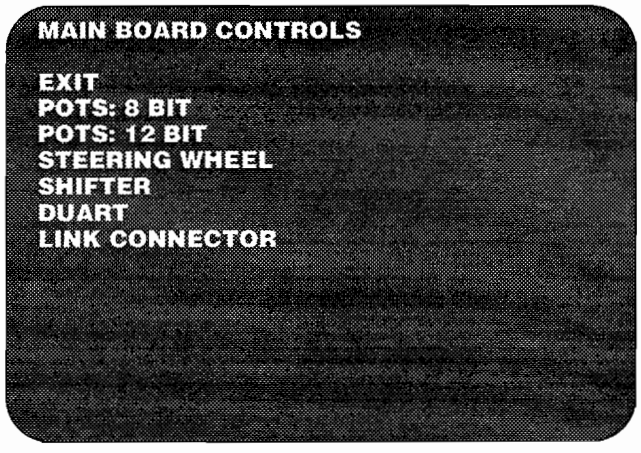


Figure 2-18 Main Board Controls Screen

- *Shifter* screen is described below and shown in Figure 2-23.
- *Duart* does not apply to this simulator.
- *Link Connector* tests the RS232 channel used to link two simulators together.

Steering Wheel Submenu

Use these item if you believe you have a problem with the steering assembly or the motor amplifier assembly. The screen is shown in Figure 2-21. The section *Steering Assembly* in Chapter 3 explains how to use these tests.

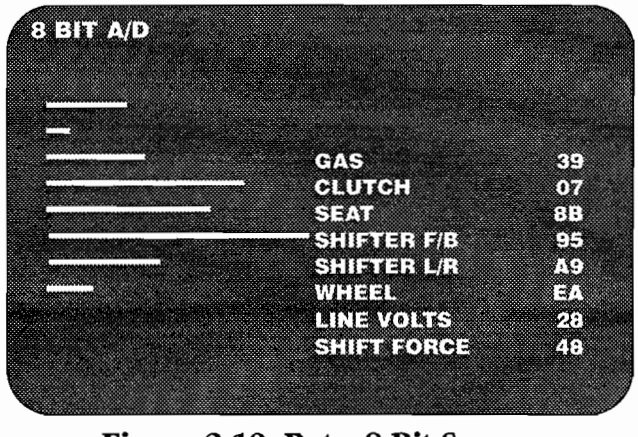


Figure 2-19 Pots: 8-Bit Screen

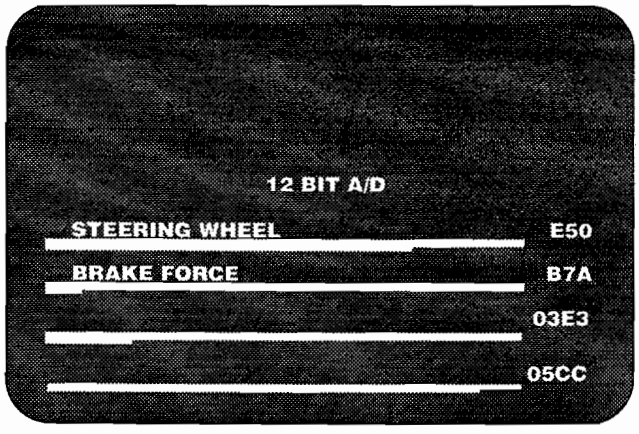


Figure 2-20 Pots: 12-Bit Screen

CAUTION

Do not service the motor amplifier assembly, which is mounted on the left side of the cabinet. The assembly contains high voltage.

If you have a problem with the motor amplifier assembly return the entire assembly to your distributor for replacement.

To move through the menu and the screens, use the coin switches. To exit a screen, push both coin switches down.

- *Exit* returns to the *Main Board Controls* screen.
- *Send Force* sends a steady force to the motor amplifier PCB. See Figure 2-22.
- *Sine Wave* sends a sine wave force to the motor amplifier PCB. This screen is similar to Figure 2-22.
- *Square Wave* sends a square wave force to the motor amplifier PCB. This screen is similar to Figure 2-22.
- *Triangle Wave* sends a triangle wave force to the motor amplifier PCB. This screen is similar to Figure 2-22.
- *Closed Loop Test* reads the steering wheel position and sends a force to the motor amplifier PCB to simulate a simple spring.
- *Line Voltage Calibration* can be used to calibrate the simulator voltage reading to the line voltage reading. Put a voltmeter on the line, then set the voltage on this screen to match.
- *Opto Test* is a test used by manufacturing.

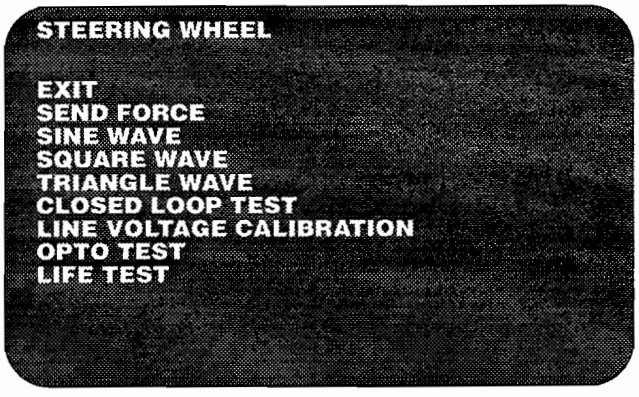


Figure 2-21 Steering Wheel Submenu Screen

- *Life Test* is a test used by manufacturing quality assurance.

CAUTION

Do not use the Life Test. *It is used only in the factory for testing of potentiometers. If you leave the simulator in this test for a long time, you can destroy the potentiometer on the steering assembly.*

Shifter Test Screen

Use this screen if you have a problem with the shifter. Before you use the screen, see Figure 3-12, the shifter flowchart, to find out how to use the tests and settings on this screen. If you need to repair the shifter or the shifter PCB, see the shifter section in Chapter 3 for further information. The shifter screen is shown in Figure 2-23.

Under *Shifter Outputs,* you can see the voltage outputs change as you push the shifter from left to right and

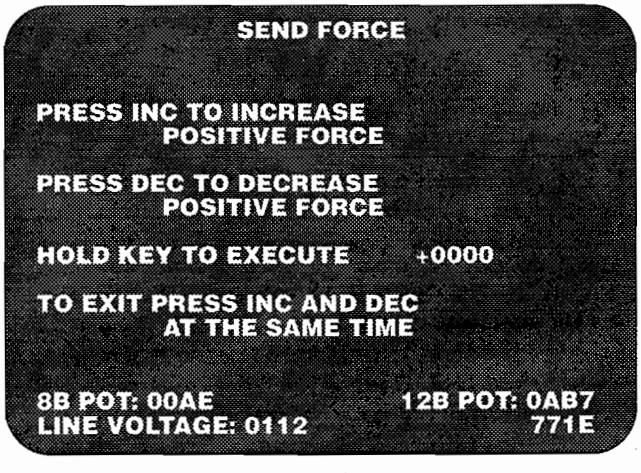


Figure 2-22 Send Force Screen

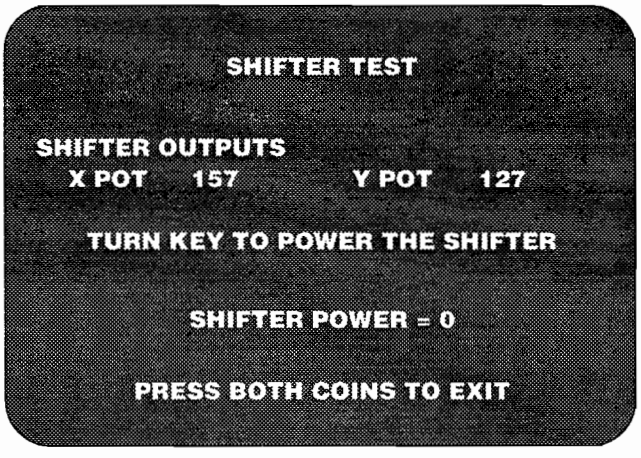


Figure 2-23 Shifter Screen

front to back. These numbers show the change in the voltage input from the shifter potentiometers to the 8-bit A/D converter circuit on the main PCB.

The *X Pot* number changes as you move the shifter handle from left to right. The *Y Pot* number changes as you move the shifter from front to back.

After *Shifter Power,* either a *0* or *1* will be displayed. Turning the start key switch on causes the shifter solenoid to be energized and the number *1* to be displayed. Releasing the key switch should display a *0.*

Exit the screen by pressing both coin switches simultaneously.

Link Connector Test

Use this test if you have a problem when linking two simulators together. This test requires a special test connector plugged into the Link Connector on the game.

The special test connector is a female DB-25 with pins 2 and 3 connected together. Contact Atari Games Customer Service on how to obtain a test connector.

The test results are displayed (in color) as shown in Figure 2-24.

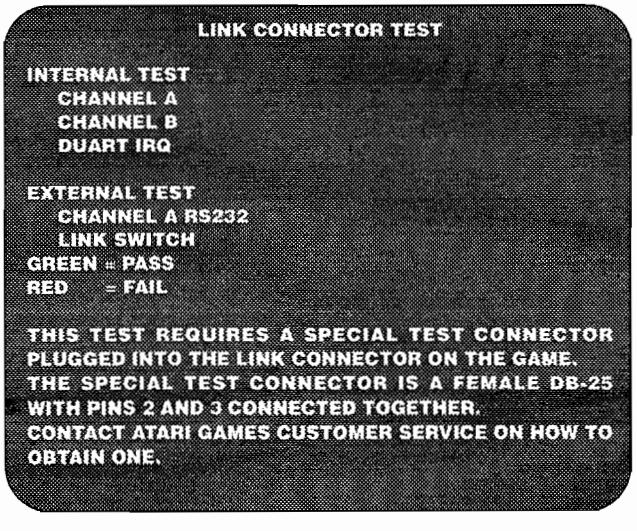


Figure 2-24 Link Connector Test Screen

Main Board ROM Checksums

This screen checks the main PC board program ROMs for errors. Use this test if you have a bad program ROM message in the automated self-test or you suspect program ROM failure. To exit this screen, turn the key.

When the checksum test is complete, a hexadecimal number follows each ROM as shown in Figure 2-24.

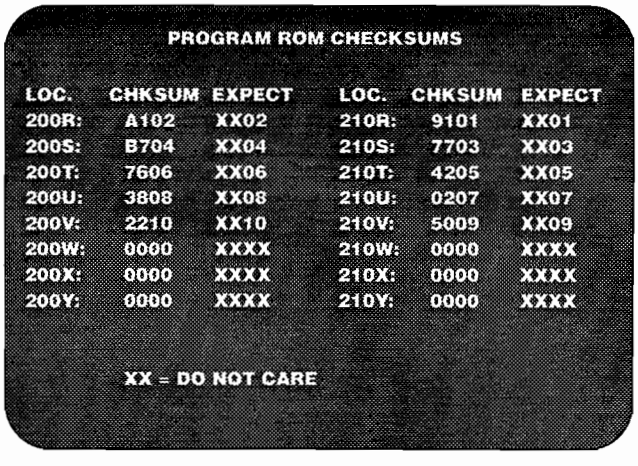


Figure 2-25 ROM Checksums Screen

The first two digits in each hexadecimal number can be any number, but the last two digits must be the ones shown in Figure 2-25.

Main Board ZRAM Test

This test checks the non-volatile RAM where the simulator statistics and control set-up values are kept. Check the ZRAMs if you think the statistics are incorrect. Also use this test if the control settings are changing even though you have recently set them with the *Set Controls* screens.

If the simulator loses power or is reset while it is in this test, then the statistics and the control settings will be lost. If this happens, use the *Set Controls* item from the main menu to reset the controls. The statistics cannot be restored.

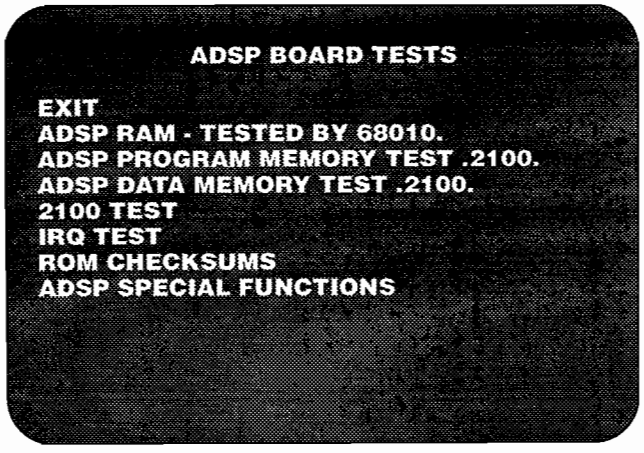


Figure 2-26 ADSP Board Tests Screen

ADSP Board Tests

Use this item if the ADSP PC board fails the microprocessor and board tests performed in the automated self-test.

When you select *ADSP Board Tests* from the Test menu the screen in Figure 2-26 appears. The items on the screen are explained below.

- *Exit* returns to the Test menu.
- *ADSP RAM Tested by 68010* tests the memory on the ADSP PC board. The 68010 on the main PCB test the ADSP program memory, the ADSP data memory, and both ADSP output buffers. The memory tests are the standard, complete tests but are run at the 68010's bus speed, which is slower than that of the 2100.
- *ADSP Program Memory Test .2100.* is a standard, complete memory test run by the 2100 on it own program memory. Since the test program must reside in memory, a bad program RAM may prevent the test from running. However, because the program memory is divided into two banks, the test is divided into two parts.

  The program to test the upper bank is run from the lower bank; the program to test the lower bank is run from the upper bank. Unfortunately, the 2100 always starts operating from a specific address in the lower bank. Therefore, the lower bank must be operating to the extent that it can execute a JUMP instruction to the upper bank.

  These tests operate solely with program memory; they do not require that any data memory be operational.
- *ADSP Data Memory Test* is a standard, complete test run by the 2100. It operates solely with program memory and does not require that any data memory be functional.
- *2100 Test* checks the response of the 2100 integrated circuit on the ADSP PC board by copying data from one location to another using a 2100 program.
- *IRQ Test* checks if the ADSP can generate interrupts for the 68010.
- *ROM Checksums* tests the graphic ROMs on the ADSP PC board. When the checksum test is complete a hexadecimal number follows each ROM as shown in Figure 2-27. The first two digits in each hexadecimal number can be any number, but the last two digits must be the ones shown in Figure 2-27. If the last two numbers are different, then the ROM is bad or it is not on the board.
- *ADSP Special Functions* performs hardware diagnosis for use by a repair technician.

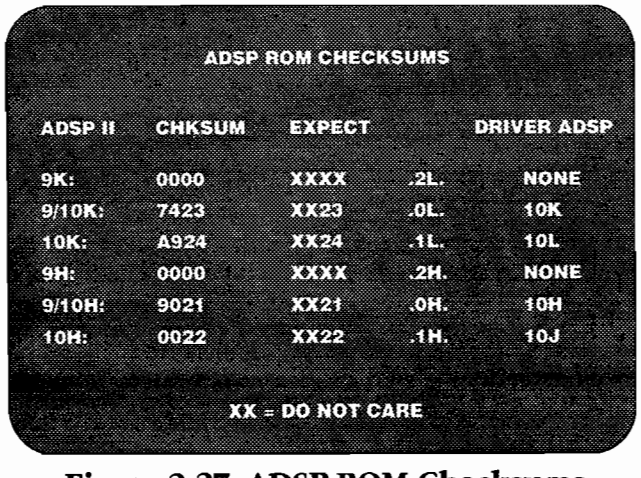


Figure 2-27 ADSP ROM Checksums Tests Screen

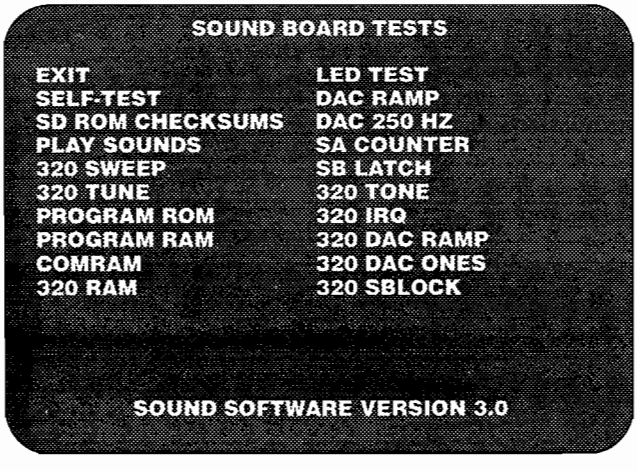


Figure 2-28 Sound Board Tests Screen

Sound Board

Use these tests if the sound PC board failed the microprocessor and board tests in the automated self-test.

If the sound PC board failed the test, select this item from the Test menu and Figure 2-28 appears. Many of the tests require an oscilloscope and schematics. These are indicated on the list below. The tests are explained below.

- *Exit* returns to the Test menu.
- *Play Sounds* takes you to the *Requesting Sound Screen.* Follow the instructions on the screen to hear the simulator sounds.
- *Self-Test* checks the sound program ROM and RAM, COMRAM, and 320 RAM.
- *SD ROM Checksums* tests the ROMs holding the waveform data. The screen appears in Figure 2-29. It shows the ROM location, a hexadecimal number, and the results of the test for each ROM. The result will be one of the following:

  NL—Nothing is loaded in that socket. No action is required.

  BAD—The ROM is bad.

  OK—The ROM is OK.

  PROG DEV—The ROM is a program development ROM.

  320 Sweep—Runs a program in the sound PC board 32010 to generate a sine wave sweep from 20 Hz to 9 KHz (requires oscilloscope).

  320 Tune—Runs a program in the sound PC board 32010 to play a tune.

Program ROM—Tests the sound PC board program ROMs with the sound PC board 68000 and reports the results on the screen.

Program RAM—Tests the sound PC board program RAMs with the sound PC board 68000 and reports the results on the screen.

COMRAM—Tests the sound PC board communications RAM with the sound PC board 32010 and reports the results on the screen.

320 RAM—Tests the sound PC board 32010 program RAM with the sound PC board 68000 and reports the results on the screen.

LED Test—Flashes the Test LED with the sound PC board 68000.

DAC Ramp—Writes to every DAC value with the sound PC board 68000. The sawtooth frequency is about 60 Hz (requires oscilloscope).

DAC 250 Hz—Writes to every fourth DAC value with the sound PC board 68000. The sawtooth frequency is about 250 Hz (requires oscilloscope).

SA Counter—Creates an oscilloscope loop for the sound address counter (requires oscilloscope).

SB Latch—Creates an oscilloscope loop for the sound block latch (requires oscilloscope).

320 Tone—Plays a sine wave tone created by the 32010 (requires oscilloscope).

320 IRQ—Generates interrupts with the 32010 which the 68000 on the sound board recognizes (requires oscilloscope).

320 DAC Ramp—The sound PC board 32010 ramps the DAC (requires oscilloscope).

320 DAC Ones—The sound PC board 32010 writes walking ones through the DAC latch (requires oscilloscope).

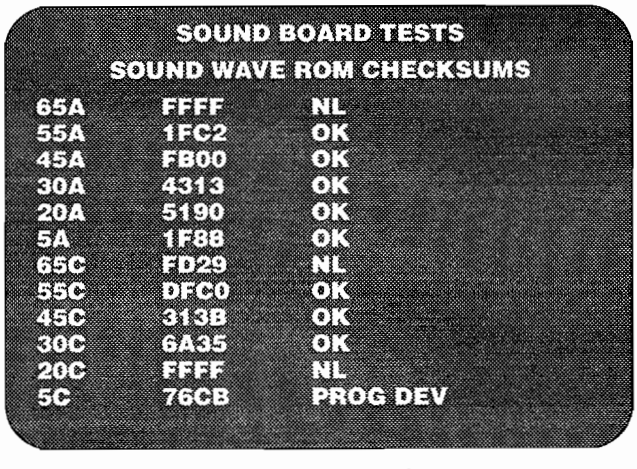


Figure 2-29 Sound Board Sound Wave ROM Checksums

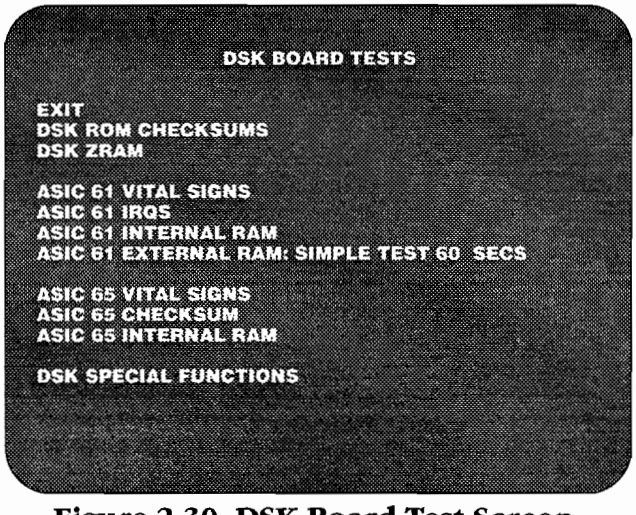


Figure 2-30 DSK Board Test Screen

320 SBLOCK—The sound PC board 32010 writes increasing addresses to the Sound Block Latch (requires oscilloscope).

DSK Board Tests

The DSK board is part of the Driver Speed Kit and turbocharges the simulator. The DSK board features:

- extra RAM for storing player races
- extra non-volatile RAM for remembering the Championship Lap
- extra ROM
- two separate ASIC systems for increasing the performance level of the simulator

The DSK Board Test screen is shown in Figure 2-30.

- *DSK ROM Checksums* tests the ROMs on the DSK board.
- *DSK ZRAM* test the additional non-volatile RAM used for storing the race of the Challenge Lap champion.

The remaining tests on the menu (ASIC 61xxxx, ASIC 65xxxx, and DSK Special Functions) are used by the factory for quality testing.

LEDs on the Main PCB

The LEDs (light emitting diodes) on the main PCB show you the status of various signals on the main PCB. Using the LEDs, you can check signals from various circuits going to the 68010 processor. The state of the signals is indicated by the LEDs which flash or stay lit.

Figure 2-31 shows the location of the LEDs on the main PCB. Table 2-6 shows the possible status of the LEDs, with an explanation of what they indicate.

DIP Switches

If you try to enter the self-test, but nothing appears on the screen, use the DIP switch tests. Use the information from these diagnostic tests to help you find the problem.

Before you begin with these following tests, be sure that the problem is in the simulator hardware, not in the video display. If you have a completely dark screen, check the following:

- Do you have power to the video display?
- Are the video display's filaments lit?
- Do you have high voltage to the video display?

Table 2-6 LED Status

LED	Indicates	Status
Run LED	State of 68010 HALT signal.	*On* when 68010 is running. *Off* when 68010 processor is not running. *Flashing at 2 Hz* if the 68010 cannot run. (The watchdog and clock must be running.) (The Run LED is *on* in game mode.)
DTACK LED	State of 68010 DTACK (data acknowledge) signal.	*On* when the 68010 processor is running and the timing circuit is probably operating. *Flashes at 2 Hz* when the 68010 processor cannot run. (The watchdog and processor clock must be running.) (The DTACK LED is *on* in game mode.)
Clock LED	State of the 68010 processor clock signal.	*On* when the game board is on. *Off* if the processor clock signal is stuck high or low.
IRQS LED	State of all 68010 interrupts.	*On* in the game mode. *Off* in hardware diagnostic mode and the early part of self-test. *Off* if no interrupts are occurring or any interrupt signal is stuck low.

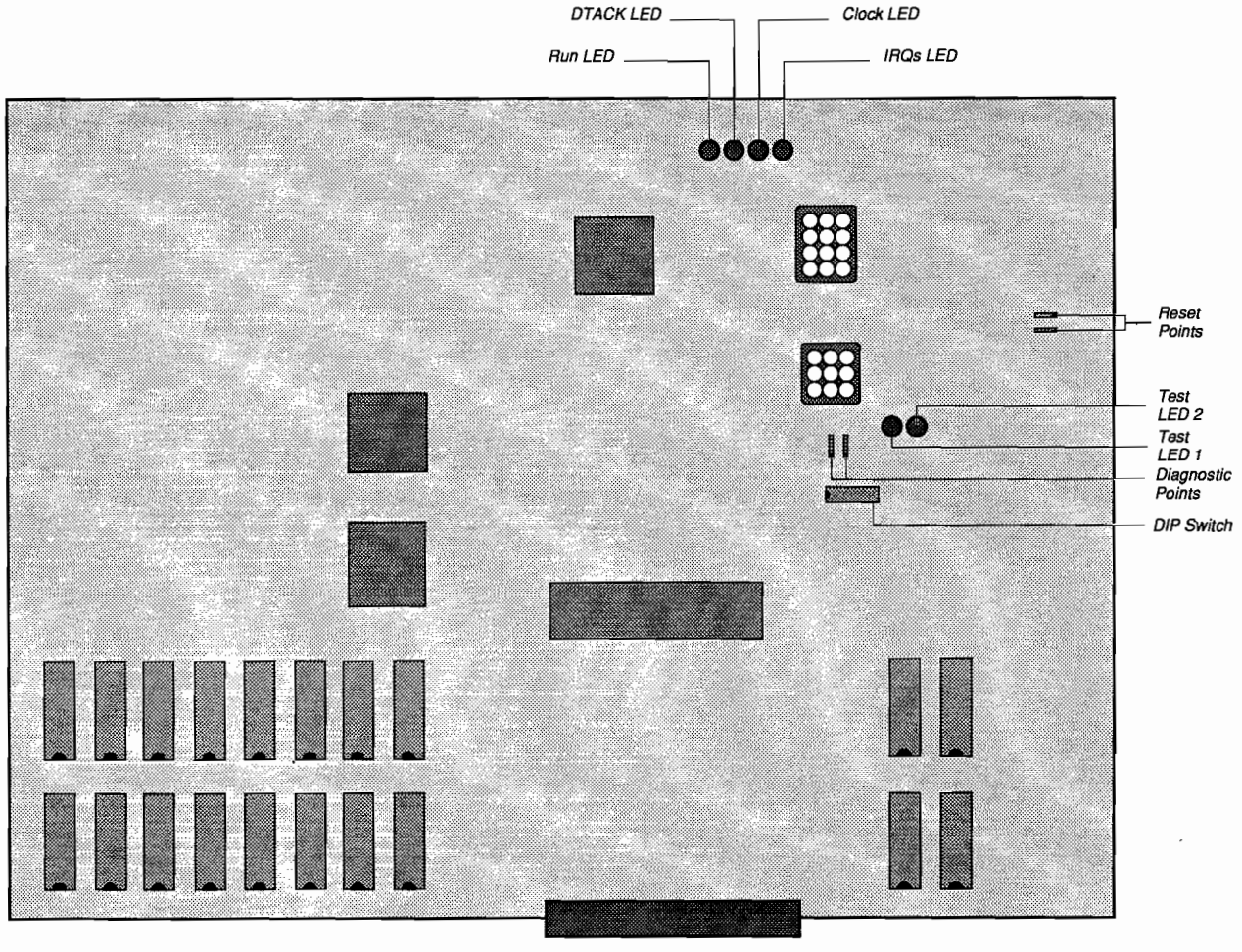


Figure 2-31 DIP Switch and LED Locations on the Main PCB

If the answer to any of these questions is no, then you have a problem in the video display. Check the video display service manual included with your simulator for suggested procedure.

If you are sure that the problem is not with the video display, then try the DIP switch diagnostics shown in Table 2-8. These tests isolate various ICs and systems for troubleshooting. The results of the tests are indicated by the main PC board LEDs or on the video display screen.

Setting the DIP Switches for the Tests

1. Put a jumper across the DIAGN test points, shown in Figure 2-30.
2. Select the diagnostic test you want to use with the DIP switch settings.
3. Turn on the self-test switch.
4. Put a jumper momentarily across the RESET test points, shown in Figure 2-30

Changing to Another DIP Switch Test

1. Change the DIP switch settings.
2. Put a jumper momentarily across the RESET test points, shown in Figure 2-30.

Ending the DIP Switch Testing

1. Take the jumper off the DIAGN test points.
2. Put a jumper momentarily across the RESET test points.

The DIP switch settings are *on* in the top position when the main PCB is in the simulator.

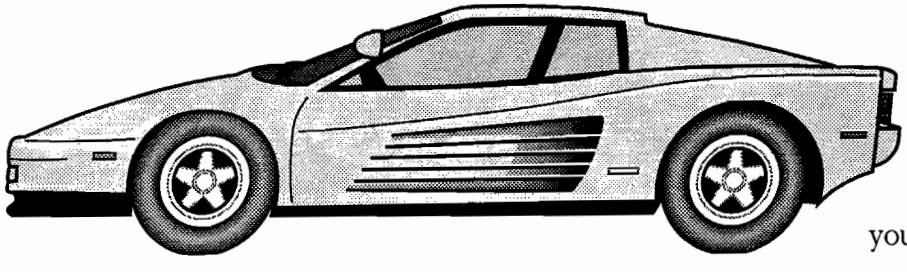
Table 2-7 Using the DIP Switches

Type of Test	Purpose and Results	DIP Switch Settings 1 2 3 4 5 6 7 8
	Watchdog, Test Program ROMs, Test Menu RAMs, and LED Tests	
Uncleared Watchdog	Puts the 68010 in a loop. Does *not* clear the watchdog counter. The program RAM does not need to work. If the watchdog is working, the run LED, DTACK LED, and IRQs LED flash at 2 Hz and the clock LED is on.	X X 0 0 0 0 0 0
Cleared Watchdog	Puts the 68010 in a loop. Clears the watchdog counter. The program RAM does not need to work. If the watchdog is working, the run LED, clock LED, DTACK LED and IRQs LED are on.	X X 0 0 0 0 0 1
Test LEDs	Tests the test LEDs. The program RAM does not need to work. If the test LEDs are working, they flash at 2 Hz.	X X 0 0 0 0 1 1
Test Program ROM 0	Tests ROM 0 H and 0 L, which hold the test program. (This test takes about 5 seconds.) LED 1 and LED 2 flash together if both ROMs are good. If ROM 0 L is bad, LED 1 does not flash. If ROM 0 H is bad, LED 2 does not flash.	X X 0 0 0 1 1 1
Test Menu RAM 0	Tests RAM 0 H and 0 L, which run the test menu. (This test takes about 5 seconds.) LED 1 and LED 2 flash together if both RAMs are good. If RAM 0 L is bad, LED 1 does not flash. If RAM 0 H is bad, LED 2 does not flash.	X X 0 0 1 1 1 1
	GSP Tests	
GSP Communications	Tests if the 68010 can communicate with the GSP, which produces the video. If the GSP responds, the LEDs flash together. If the GSP does *not* respond, LED 1 and 2 flash alternately.	X X 0 1 1 1 1 1
Red Screen	Produces a red screen from the color RAM, regardless of GSP VRAM input. Use this to check the red video outputs.	X X 0 1 1 1 1 0
Green Screen	Produces a green screen from the color RAM, regardless of GSP VRAM input. Use this to check the green video outputs.	X X 0 1 1 1 0 0
Blue Screen	Produces a blue screen from the color RAM, regardless of GSP VRAM input. Use this to check the blue video outputs.	X X 0 1 1 0 0 0
GSP Memory Fill	Does a very slow GSP memory fill so you can test the pixel scanner.	X X 0 1 0 0 0 0
GSP VRAM Verify	Performs the GSP VRAM verify test. (This test is also in the self-test.)	X X 1 0 0 0 0 0
	ROM and RAM Tests	
ROM Test Loop	The results are displayed on the screen.	X X 1 0 0 0 0 1
RAM Test Loop	The results are displayed on the screen.	X X 1 0 0 0 1 1
	MSP Tests	
MSP Interface	Tests the MSP interface. Results are displayed on the screen.	X X 1 0 0 1 1 1
MSP Auto Increment	Tests the MSP auto-increment. Results are displayed on the screen.	X X 1 0 1 1 1 1
MSP Interrupts	Tests the MSP interrupts (IRQs). Results are displayed on the screen.	X X 1 1 1 1 1 1
MSP DRAM Verify	Performs the MSP DRAM verify test. (This test is also in the self-test.) The results are displayed on the screen.	X X 1 1 1 1 1 0
	Bus Error Test	
BERR	The DTACK timer times out and generates a bus error (BERR) signal. The results are displayed on the screen.	X X 1 1 1 1 0 0

1=On; 0=Off; X=Doesn't Matter.

CHAPTER 3

Maintenance and Troubleshooting



This chapter contains a troubleshooting table and detailed servicing information on your new Race Drivin'™ shifter assembly. The shifter assembly includes part numbers and names of common hardware. For information on all other parts, refer to your *Hard Drivin' Operator's Manual* that you received with your game. With correct part numbers and names, we can fill your order rapidly and correctly. We hope this will create less downtime and more profit from your games. Atari Games Customer Service phone numbers are listed on the inside front cover of this manual.

Shifter Assembly

If you have problems with the shifter, check Table 3-1, *Troubleshooting the Shifter Assembly.*

If the shifter is not working but you cannot repair it immediately, you can disable the shifter circuit. When the shifter circuit is disabled, the simulator drives only with the automatic transmission, even if the driver chooses manual transmission. The driver can shift, but this has no effect. Disable the shifter circuit only as a *temporary* measure. Repair the shifter as soon as possible.

To disable the shifter, go to the screen *Disable Broken Controls* in the self-test. Choose *broken* under shifter. Remember to change this setting back to *working* when you repair the shifter.

Installing a New Shifter Boot

The shifter is shown in Figure 3-1.

1. Remove the roll pin in the knob using a 1/8-inch punch and take off the knob.
2. Remove the four tamperproof screws that hold the boot cover plate on the shifter case. Lift off the boot and the cover plate.
3. Discard the boot.
4. Replace the double-sided tape in between the holes on the top of the shifter gate. If necessary, also replace the double-sided tape on the shaft where the hole of the boot attaches.
5. Replace the boot and use a tie-wrap to secure at top.
6. Install the boot cover plate and the screws. Secure the knob back on the shaft by tapping in the roll pin.

Replacing a Shifter Potentiometer

If the shifter acts erratically, follow the flowchart in Figure 3-2 to make sure that the problem is with the potentiometers. Before you replace the potentiometers, check that the screws on the ends of the roll link and the pitch link are tight but still allow free movement. If you tighten these screws, do the *Set Controls* screens in the self-test to see if the problem is solved.

The shifter is shown in Figure 3-1.

1. Remove the roll pin in the knob using a 1/8 inch punch and take off the knob.
2. Remove the four tamperproof screws that hold the boot cover plate on the shifter case. Lift off the boot, the cover plate, and the shifter gate which has the shift pattern in it.
3. Remove the screw on the tie wrap that holds the shifter harness on the side of the case.
4. Unscrew the nut on the carriage bolt on the left side of the case and slip the long thin pitch bar off the bolt.
5. Inside the case, remove the cotter pin on the right side of the pivot shaft.
6. Push the pivot shaft out of the case through the hole on the outside of the cabinet. Use a screwdriver or a pencil. Disconnect the nine-pin connector on the simulator harness from the shifter and the two wires from the solenoid. Lift the shifter assembly out of the case.
7. Test the locknuts on the end of the roll link and the pitch link and the shoulder screws on the thin roll bar and pitch bar. These should be tight but still allow free movement of the bar and attached link. If these are fine, then go to the next steps. Otherwise, tighten them, assemble the shifter, do

Table 3-1 Troubleshooting the Shifter Assembly

Problem	Solution
Shifter does not work or works erratically.	1. Go through the *Set Controls* screen in the self-test. 2. See Figure 3-2 to determine the cause of the problem. 3. Check voltage level to the main PCB. See Table 3-3. 4. Check the F4 fuse on the power supply. (If this is blown, then the brake pedal will not work either.) 5. Check the setting of the shifter option on the *Disable Broken Controls* screen. If the shifter potentiometer is not working, set it to *broken* and repair as soon as possible. If it is working, set the option to *working*.
Moves in and out of gear freely without using the clutch.	Check the shifter PCB and magnet.
Shifter squeaks and squeals.	Some noise is normal. If you think the noise is excessive, replace the magnet or the magnet plate.

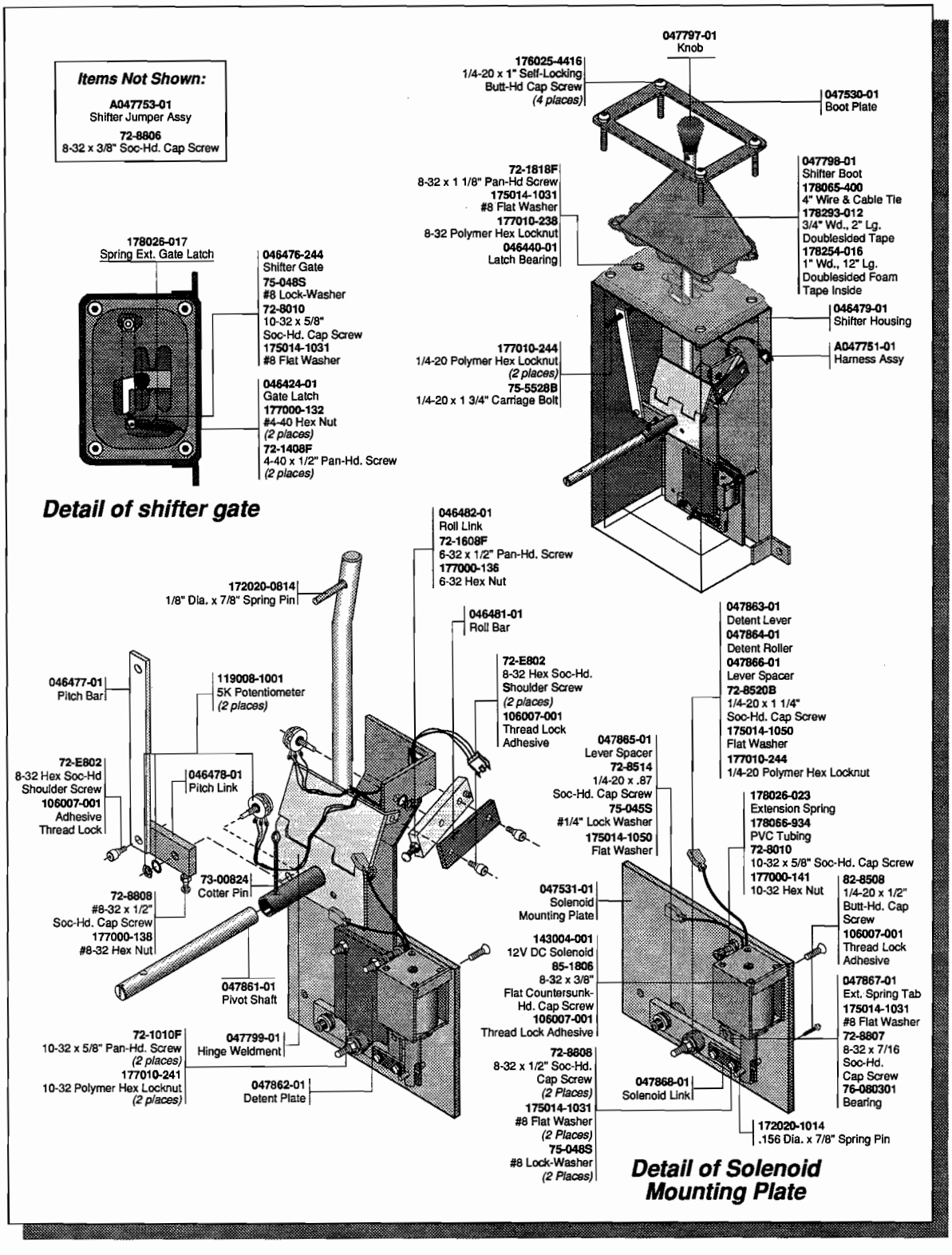


Figure 3-1 Shifter Assembly

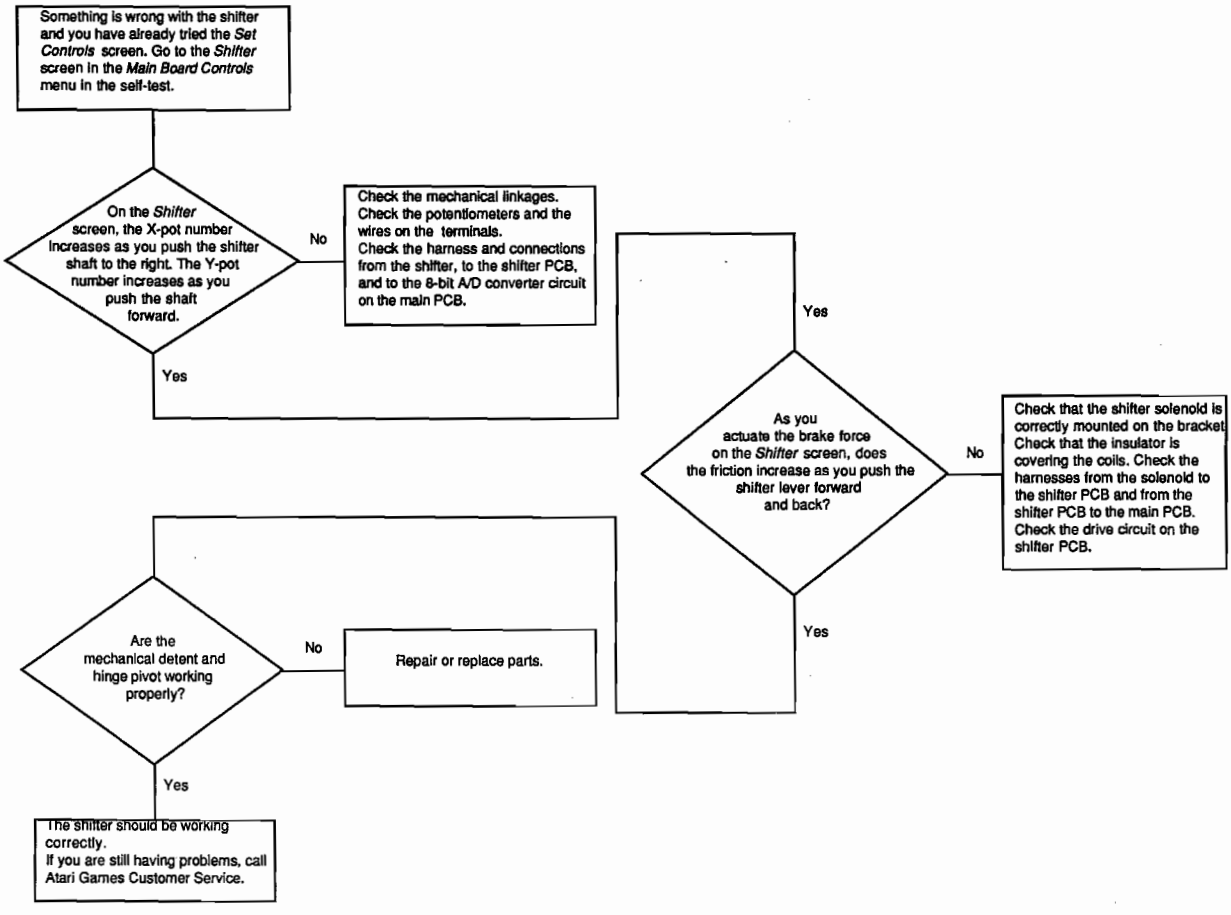


Figure 3-2 Shifter Is Not Working or Working Erratically and You Have Already Tried the *Set Controls* Screens

the *Set Controls* screens, and check the results on the *Control Inputs* screen.

8. If the screws and nuts are tight, disconnect the harness from the potentiometer that you are replacing. Loosen the 6-32 screw of the roll link and slip off the potentiometer shaft. Loosen the nut on the potentiometer shaft with a 1/2-inch flat wrench. Remove the potentiometer.
9. Solder the harness to the new potentiometer. With the shaft facing you and the terminals pointing down, solder the black wire to the left terminal, the white to the middle, and the red to the right.
10. Install the new potentiometer. Put the potentiometer key in the key slot in the shifter. Tighten the nut.
11. Put the shifter assembly back in the case. Attach the pitch bar to the carriage bolt at the top of the case with the locknut.
12. Attach the simulator harness assembly. Install the screw through the tie wrap on the shifter harness on the side of the shifter case. Connect the two solenoid wires.
13. Line up the tube for the pivot shaft with the holes in the case for the pivot shaft. Insert the shaft into the case from the driver's side with the cotter pin hole and the slotted end on the left.
14. With the pivot shaft through both sides of the case, put a screwdriver on the slotted end and turn the shaft until the holes in the shaft line up with the holes in the tube. Put in the cotter pin. Do not bend the legs of the cotter pin.

15. Put the shifter gate back on, with the latch and the spring facing down. Replace the double-sided tape in between the holes on the top of the shifter gate. If necessary, also replace the double-sided tape on the shaft where the hole of the boot attaches.
16. Put the boot on, then the boot cover plate. Install the four tamperproof screws. Install the knob and secure by tapping in the roll pin.
17. Go into the self-test and perform the *Set Controls* screens.

NOTE

You must perform the Set Controls *screens because you replaced the potentiometer. Otherwise the simulator will not operate correctly.*

Replacing the Solenoid

If the shifter shifts without the clutch pedal being pressed, you may want to replace the solenoid. Shifting without the clutch does not impair the game's performance. You can replace the solenoid itself as described here or order the solenoid assembly (part no. A048306-01). Note that in order to remove the solenoid housing, you must remove the shifter housing from the game. The solenoid is shown in Figure 3-1.

1. To remove the shifter housing from the game, first disconnect the solenoid wires from the harness. Then remove the two screws and the reinforcement plate on the outside of the cabinet.
2. Take out the Phillips-head screws on the back edge of the floor trim, which is the strip of metal across the middle of the floor. Remove the three Phillips-head screws along the front of the simulator under the rubber floor mat.
3. Turn the seat out of the simulator as far as it will go. Use two screwdrivers to lift and pry up the front corner of the floor. Take out the floor.
4. Remove the locknuts that hold the shifter on the seat assembly frame. Remove the shifter.
5. Remove the two button-head screws from the housing and lift the solenoid mounting plate out.
6. Remove the roll pin to free the solenoid plunger. Remove the four flat screws to remove the solenoid from the plate.
7. Replace the solenoid, solder the solenoid wires, and reassemble following the reverse procedure.

N O T E S

Race Drivin' Statistics Sheet

Location: _____ Date Recorded: _____

Meter: _____

STATISTICS INFORMATION

		Original	Autocross	Super Stunt		Original	Autocross	Super Stunt
Left Coins:		Laps by Track:			Free Games by Track:			
Right Coins:								
Aux Coins:		No X Games by Track:			Total Games by Track:			
Idle Min:								
Active Min:		1 X Play Games by Track:			Total Time by Track:			
Auto Games:								
Error Count:		2 X Play Games by Track:			Avg Time by Track (sec):			
Total Games:								
		3+ X Play Games by Track:			Games by Car:			
		Champ Laps by Track:						
		2 Player Games by Track:						
					Inst Rpls:			
		2 Player Time by Track:			Rpl Abrts:			
					Rpl Secs:			
					Total Credits:			
					Avg Time/Credit:			

HISTOGRAM INFORMATION

Time	*No. of Games*	*Time*	*No. of Games*	*Time*	*No. of Games*	*Time*	*No. of Games*
0-99		180-199		280-299		380-399	
100-119		200-219		300-319		400-419	
120-139		220-239		320-339		420-439	
140-159		240-259		340-359		440-459	
160-179		260-279		360-379		460 & UP	

ERROR COUNTS

Watch Dog Resets		Bad Poly Buff Error	
Bus Error		MSP Timeout Error	
Address Error		ADSP Timeout Error	
Illegal Inst Error		GSP Timeout Error	
Divide by Zero Err		Generic Error	
Chk Inst Error		NMI Error	
Trap Error		Spur Exptn Error	
Piv Vio Error		ASIC 65 Timeout Error	
GSP Handshake Error		Illegal Error Code	

Race Drivin' Statistics Sheet

Location: _____ Date Recorded: _____

Meter: _____

GAMES PLAYED BY DAY AND HOUR							
Time	***Monday***	***Tuesday***	***Wednesday***	***Thursday***	***Friday***	***Saturday***	***Sunday***
Midnight							
1:00 a.m.							
2:00 a.m.							
3:00 a.m.							
4:00 a.m.							
5:00 a.m.							
6:00 a.m.							
7:00 a.m.							
8:00 a.m.							
9:00 a.m.							
10:00 a.m.							
11:00 a.m.							
Noon							
1:00 p.m.							
2:00 p.m.							
3:00 p.m.							
4:00 p.m.							
5:00 p.m.							
6:00 p.m.							
7:00 p.m.							
8:00 p.m.							
9:00 p.m.							
10:00 p.m.							
11:00 p.m.							

Glossary

AC
Alternating current; from zero it rises to a maximum positive level, then passes through zero again to a maximum negative level.

ACTIVE STATE
The true state of a signal. For example: The active state for is low.

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

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

ANODE
The positive (arrow) end of a diode.

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

AMPLITUDE
The maximum instantaneous value of a waveform pulse from zero.

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

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

BEZEL
A cut, formed, or machined retention device, such as the conical device used to mount a pushbutton switch to a control panel, or the formed device used to frame the video display screen.

BIDIRECTIONAL
Able to send or receive data on the same line (e.g., the data bus of a microprocessor).

BINARY
A number system that expresses all values by using two digits (0 and 1).

BIT
A binary digit; expressed as 1 or 0.

BLANKING
Turning off the beam on a cathode-ray tube during retrace.

BLOCK DIAGRAM
A drawing in which functional circuitry units are represented by blocks. Very useful during initial troubleshooting.

BUFFER
1. An isolating circuit designed to eliminate the reaction of a driven circuit on the circuits driving it (e.g., a buffer amplifier).

2. A device used to supply additional drive capability.

BUS
An electrical path over which information is transferred from any of several sources to any of several destinations.

CAPACITOR
A device capable of storing electrical energy. A capacitor blocks the flow of DC current while allowing AC current to pass.

CATHODE
The negative end of a diode.

CHIP
An integrated circuit comprising many circuits on a single wafer slice.

CLOCK
A repetitive timing signal for synchronizing system functions.

COINCIDENCE
Occurring at the same time.

COIN COUNTER
A 6-digit electromechanical device that counts the coins inserted in the coin mechanism(s).

COIN MECHANISM
A device on the inside of the coin door that inspects the coin to determine if the correct coin has been inserted.

COMPLEMENTARY
Having opposite states, such as the outputs of a flip-flop.

COMPOSITE SYNC
Horizontal and vertical synchronization pulses that are bused together into a single signal. This signal provides the timing necessary to keep the display in synchronization with the game circuitry.

COMPOSITE VIDEO
Complete video signal from the game system to drive the display circuitry, usually comprising H SYNC, V SYNC, and the video.

CREDIT
One play for one person based on the game switch settings.

CRT
Cathode-ray tube.

DATA
General term for the numbers, letters, and symbols that serve as input for device processing.

DARLINGTON
A two-transistor amplifier that provides extremely high gain.

DC
Direct current, meaning current flowing in one direction and of a fixed value.

DEFLECTION YOKE
Electromagnetic coils around the neck of a cathode-ray tube. One set of coils deflects the electron beam horizontally and the other set deflects the beam vertically.

DIAGNOSTICS
A programmed routine for checking circuitry. For example: the self-test is a diagnostic routine.

DIODE
A semiconductor device that conducts in only one direction.

DISCRETE
Non-integrated components, such as resistors, capacitors, and transistors.

DMA
Direct memory access. DMA is a process of accessing memory that bypasses the microprocessor logic. DMA is normally used for transferring data between the input/output ports and memory.

DOWN TIME
The period during which a game is malfunctioning or not operating correctly due to machine failure.

EAROM
Electrically alterable read-only memory (see ROM). The EAROM is a memory that can be changed by the application of high voltage.

FLYBACK
A step-up transformer used in a display to provide the high voltage.

GATE
1. A circuit with one output that responds only when a certain combination of pulses is present at the inputs.

2. A circuit in which one signal switches another signal on and off.

3. To control the passage of a pulse or signal.

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

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

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

I/O
Input/Output.

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

LED
The abbreviation for a light-emitting diode.

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

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

Logic 0, Low = 0 VDC to +0.8 VDC

Grey Area (Tri-State Level) = +0.8 VDC to +2.4 VDC

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

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

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

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

PCB
The abbreviation for a printed-circuit board.

PHOTOTRANSISTOR
A transistor that is activated by an external light source.

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

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

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

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

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

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

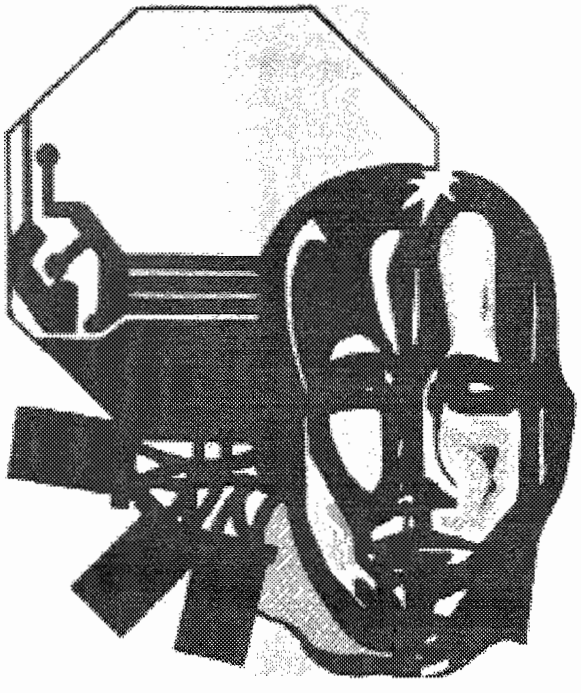
ROM
Read-only memory. A device for the permanent storage of data.

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

TROUBLESHOOT
The process of locating and repairing a fault.

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

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



X-Y DISPLAY
A display system whereby images are displayed with vectors.

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

Warranty

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

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

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

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

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

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

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

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

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

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