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ATARI®

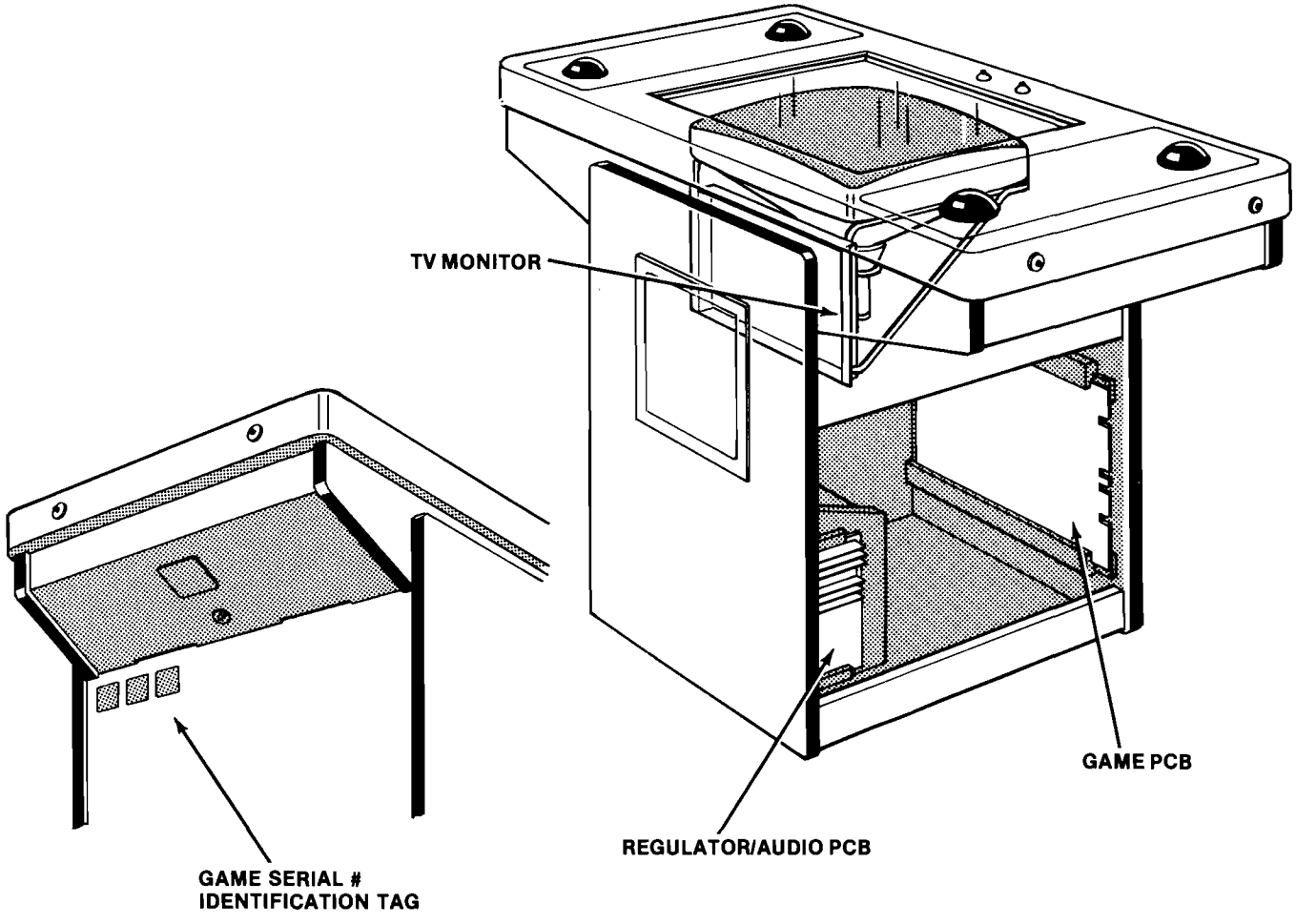
SOCCER™

Operation, Maintenance and Service Manual

Complete with Illustrated Parts Lists

GAME SERIAL NUMBER LOCATION

Your game's serial number is located below the white team control panel on the outside of the game. The same number is also stamped on the chassis of the TV monitor, game PCB and Regulator/Audio PCB. Please mention this number whenever calling your distribution for service.



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Operation, Maintenance and Service Manual

Complete with Illustrated Parts Lists

Published by:
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P. O. Box 427
Sunnyvale, California 94086

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A Warner Communications Company

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NOTE

If reading through this manual does not lead to solving a certain maintenance problem, call Tele-Help™ at the Atari Customer Service office in your geographical area, as shown in one of the two maps below. Order all parts from the California office.

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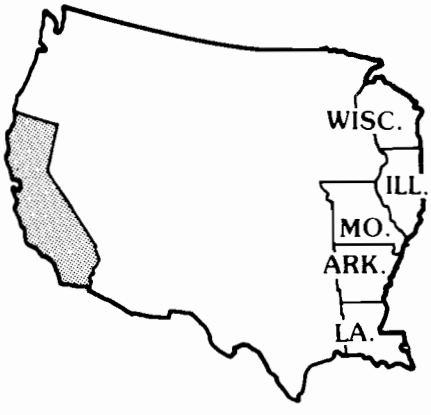

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Location Setup

A. New Parts

The Atari Soccer™ game has two new parts. If you have worked on Atari video games in the past, then you should be aware of these important differences. The new parts are described below and shown in Figure 1.

- **Power Supply Assembly.** It covers a wider voltage range than before, has higher reliability, a smaller overall size, and all fuse numbers and fuse amperages are marked directly on the metal chassis.

- **Regulator/Audio PCB.** Most of the heat-producing components have been moved off the game PCB and onto this smaller board, so the parts will not be prone to a higher rate of failure.

Throughout this manual and the illustrated parts lists, wherever one of these two parts is mentioned, you will see this symbol in the page margin:

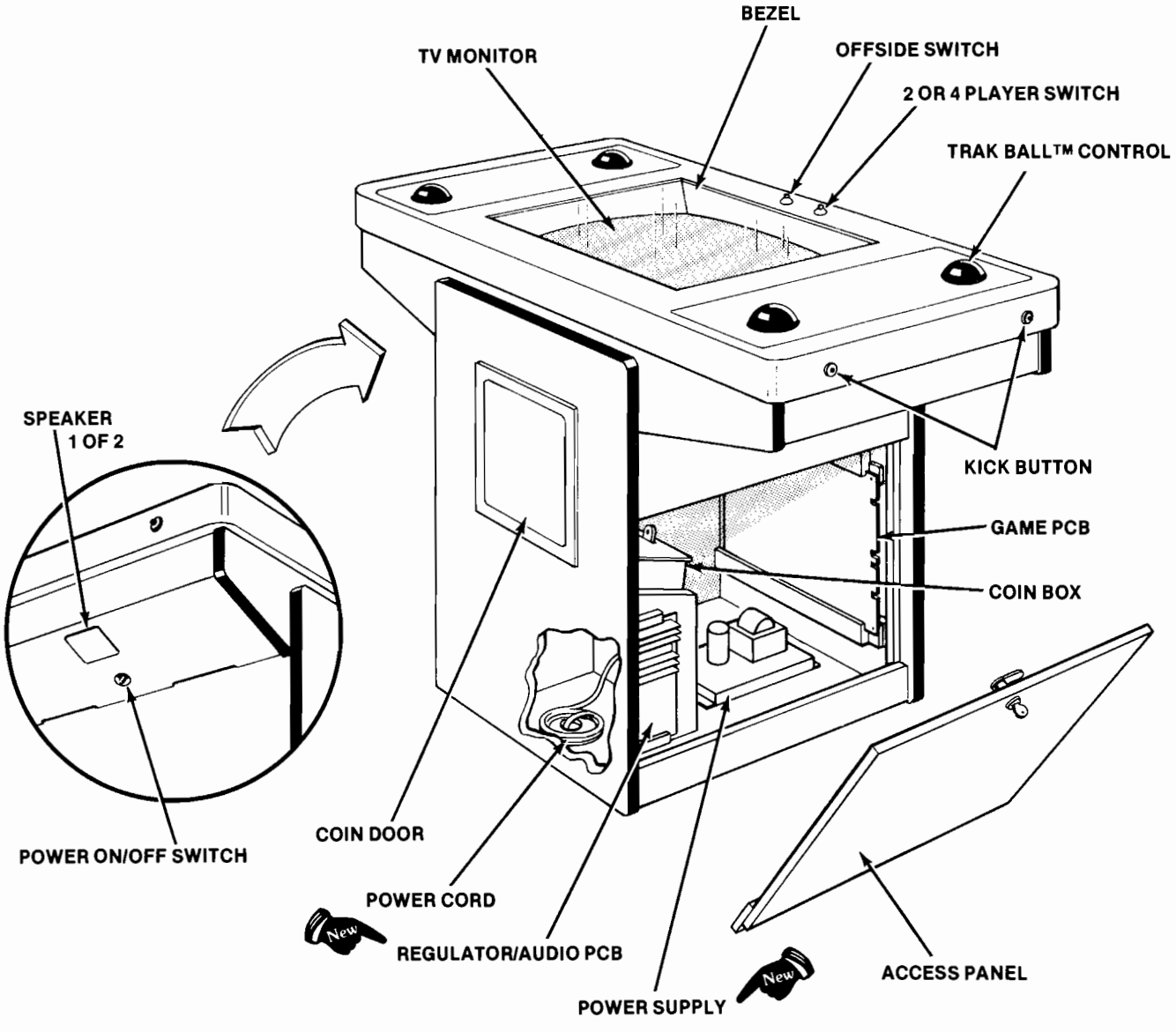


Figure 1 Overview of Game

B. Game Inspection

This new game is ready to play upon removal from the shipping carton. However, your careful inspection is needed to supply the final touch of quality control. Please follow these steps to help us insure that your new game was delivered to you in good condition.

NOTE

Do not plug the game in yet!

1. Examine the exterior of the game cabinet for dents, chips, or broken parts.
2. Unlock and open the access panel of the cabinet and inspect the interior of the game as follows:
   a. Check that all plug-in connectors (on the game harness) are firmly seated.
   b. Remove the game printed circuit board (PCB) as follows:
      - Remove the screws at the edge of the PCB closest to you.
      - Unplug the edge connectors carefully. DO NOT BEND THE PCB.
      - Slide the PCB out of its slots.
   c. Verify that all integrated circuits (ICs) are firmly seated in their sockets or soldered in place. You should eliminate any foreign material such as loose bits of wire or solder splashes that could cause unwanted conductive paths.
   d. Note the location of the game's serial number—it is on the metallic label in the upper left corner on the side of the cabinet. A serial number (not necessarily the same one) also appears in the corner of the back side of the game PCB. A drawing of this is on the inside front cover of this manual. Please mention this number whenever you call your distributor for service.
   e. Carefully slide the PCB back into its slot in the game cabinet and secure with the two screws at the board's edge closest to you.
   f. Plug the edge connectors back onto the PCB. DON'T FORCE THEM. The connectors are keyed so they will only go on in the proper orientation. **A reversed edge connector will damage the PCB.**

WARNING

To avoid possible unpleasant electrical shock, do not touch internal parts of the video monitor with your hands or metal objects held in your hands! Check the monitor chassis mounting hardware only.

3. Check all major subassemblies such as the power supply, loudspeaker (which contains powerful magnets that will attract small metal items—remove these items), and all player-operated controls and switches. Check that the video monitor is securely mounted; if necessary, tighten the monitor mounting hardware.

C. Game Installation

Figure 2 Installation Requirements

Power	110 VAC, 60 Hz (nominal), 120 watts OR 220 VAC, 50 Hz (nominal), 120 watts
Temperature	0 to 38°C (32 to 100°F)
Humidity	Not over 95% relative
Space Required	75 × 135 cm (29½ × 53 in.)
Game Height	94 cm (37 in.)

1. Voltage Selection

Before plugging in your game, make sure that the voltage selection plug on the power supply (see Figure 3) is correct for your location's line voltage. Check the wire color on the plug and see if it is correct per the list below.

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

2. Interlock and Power On/Off Switches

To minimize the hazard of electrical shock while you are working on the inside of the game cabinet, two interlock switches have been installed (see

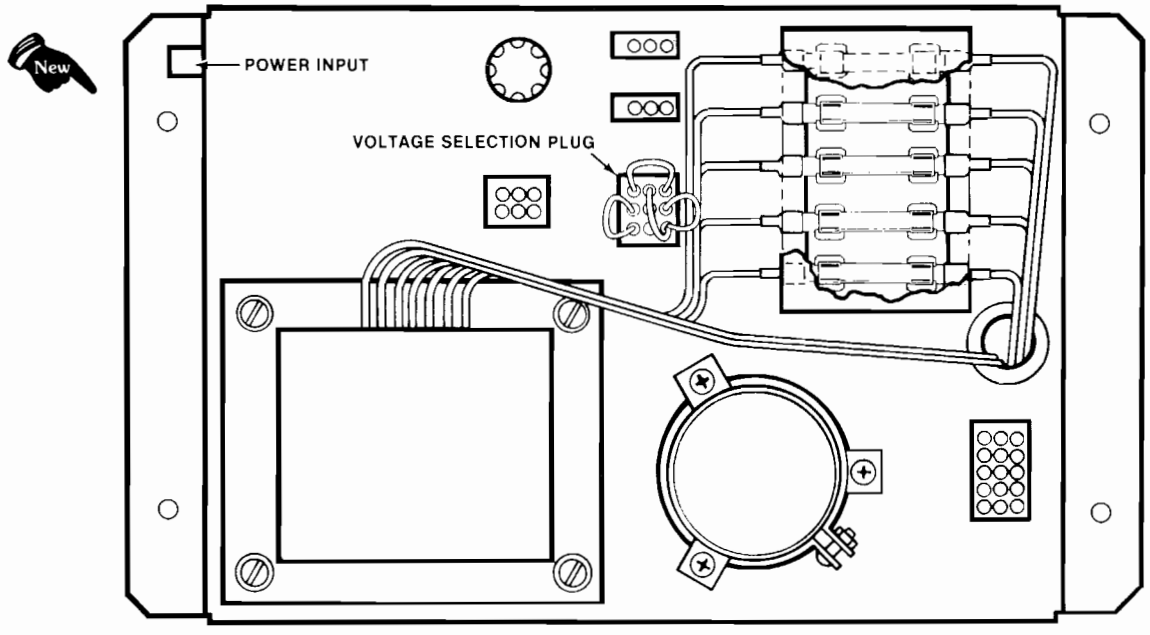


Figure 3 Power Supply

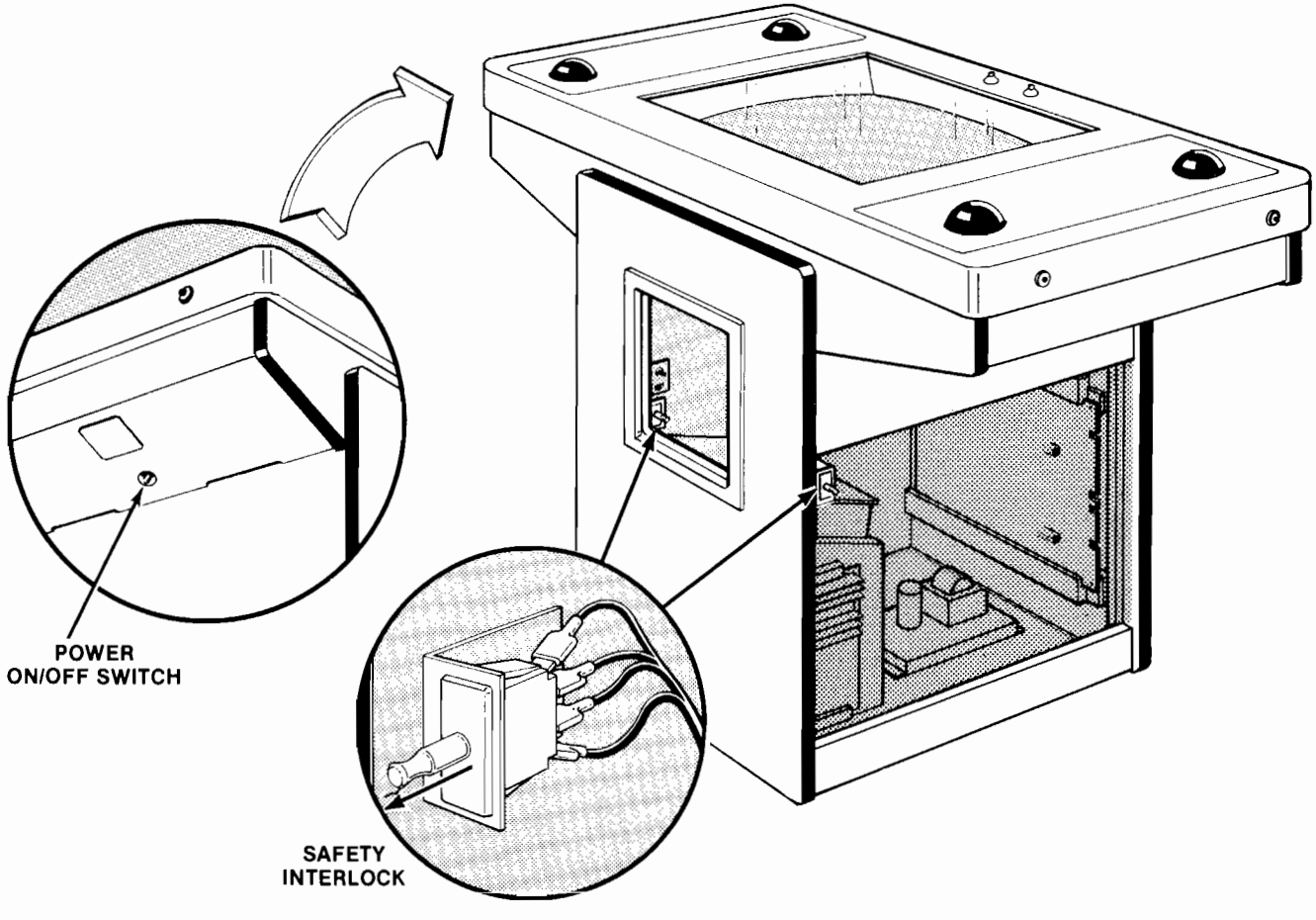


Figure 4 Interlock and Power On/Off Switches

Figure 4). One is located behind the access panel and one is behind the coin door. These switches remove all the AC line power from the game circuitry when a door is opened.

Check for proper operation of the interlock switches by performing the following steps:

1. Unlock and open the access panel and the coin door.
2. Plug the AC line power cord into an AC outlet.
3. Set the on/off switch to its **on** position.
4. Close the access panel and coin door. Within approximately 30 seconds after closing the panel and door, the TV monitor should display a picture.
5. Slowly open the rear access panel. The TV monitor picture should disappear when the panel is opened to approximately 2.5 cm (1 inch). Close and lock the access panel, and repeat this step with the coin door.
6. If the results of step 5 are satisfactory, the interlock switches are operating properly. If the TV monitor doesn't go off as described, check to see if the corresponding interlock switch is broken from its mounting or stuck in the **on** position.

3. Game Fuses

New

Fuse locations and values are marked on the power supply chassis beneath the fuse protective insulation (see Figure 22). For continued protection of your game, as well as for the safety of the players, fuses must be replaced **only** with identically rated ones.

Information on the TV monitor fuses is printed in the TV monitor manual that has been supplied with your Atari Soccer game.

D. Self-Test Procedure

This game will test itself and provide data to demonstrate that the game's circuitry and controls are operating properly. The data is provided on the TV monitor and the game speakers: no additional equipment is necessary.

Part of the self-test procedure includes the adjustment of the game's volume and a display of the operator-selected game options. Therefore, we suggest you run the self-test anytime you need to adjust the volume or change the options. Besides, this method will eliminate an inaccurate coin count, which would occur if the coin switch wire was tripped merely to change the volume level during game play.

To run the self-test, follow the instructions outlined in Figure 6.

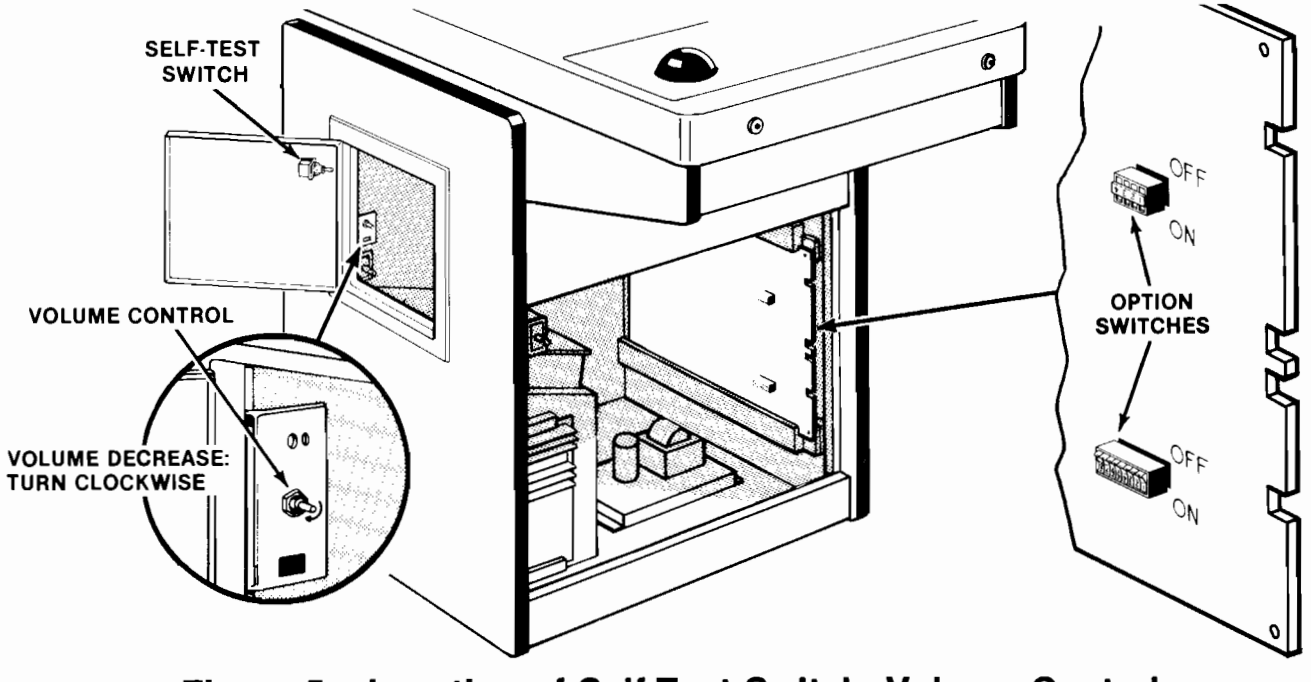


Figure 5 Location of Self-Test Switch, Volume Control and Option Switches

Figure 6 Self-Test Procedure

INSTRUCTION	RESULTS IF TEST PASSES	RESULTS IF TEST FAILS
1. Memory Check Set self-test slide switch to *on* position (see Figure 5).	TV monitor displays ROM OK RAM OK message at top of screen (see self-test display in Figure 7).	TV monitor displays ROM BAD, RAM BAD, or nothing at all.
	Offsides and 2 or 4 player switches light.	Either or both switches do not light.
2. Moving Display Check a. Press left Kick Button on Black team end of game.	Dark gray center portion of TV monitor display moves toward Black team end of game.	TV monitor display does not move.
b. Press right Kick Button on Black team end of game.	Dark gray center portion of TV monitor display moves toward White team end of game.	TV monitor display does not move.

The following test checks not only the Trak Balls but also the motion RAM. The TV monitor displays 16 arrows. Each Trak Ball moves four arrows. One arrow for each Trak Ball moves at a time in the same direction as the Trak Ball's movement. To move the second set of arrows, press any game switch while moving the Trak Ball. Release the switch to move the third set of arrows. Press any switch while moving the fourth set of arrows. The picture in Figure 7 shows the 16 arrows all moved in two rows.

3. Trak Ball and Moving Object Check Roll each Trak Ball as explained above.	All 16 arrows move in same direction of Trak Ball's movement.	One or more arrows don't move at all or don't move in same direction of Trak Ball's movement.
4. Switch Test Activate all game switches including coin trip wires and coin door slam switch.	Crowd sound heard while each switch is active.	No crowd sound heard for one or more switches.

Audio Adjustment

Activate any game switch and adjust the game sound level as desired.

Option Switch Selection

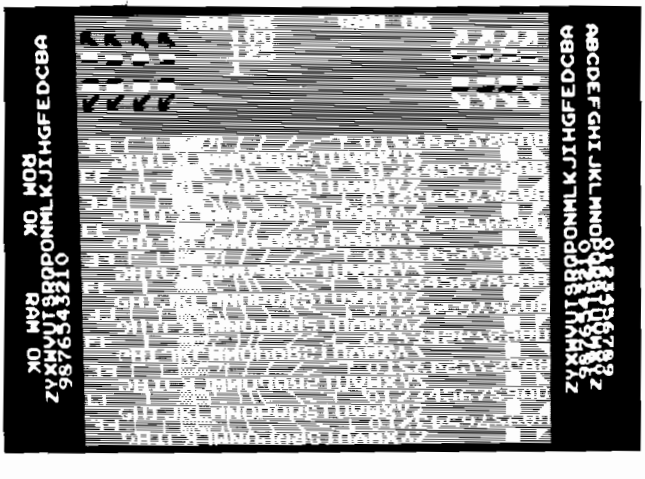
Immediately below the ROM OK message line on the TV monitor display are three lines of numbers that indicate the settings of the 8-toggle DIP switch on the game PCB. Figure 7 shows what these numbers represent and how to select the option of your choice. Figure 5 shows the location of this option switch, as well as the 4-toggle DIP switch that changes the TV monitor display language.

Figure 7 Option Switch Settings

To change toggle positions of the switch assemblies, you need not remove the game PCB. The switches, usually colored blue, are easily accessible when the PCB is mounted in place. When changing the options, verify proper results on the TV monitor display during self-test.

Toggle settings of 8-toggle switch on game PCB								Option	TV Monitor Display During Self-Test
8	7	6	5	4	3	2	1		
NOT USED					OFF	OFF	OFF	4:00 per credit	Three digits of first line immediately below ROM OK message (picture below indicates time setting of 1:00 per credit)
					OFF	OFF	ON	3:30 per credit	
					OFF	ON	OFF	3:00 per credit	
					OFF	ON	ON	2:30 per credit	
					ON	OFF	OFF	2:00 per credit	
					ON	OFF	ON	1:40 per credit	
					ON	ON	OFF	1:20 per credit	
					ON	ON	ON	1:00 per credit	
		ON						Left coin mech multiplied by 1	Second digit of second line below ROM OK message (picture below indicates 2 time credits per coin).
		OFF						Left coin mech multiplied by 2	
NOT USED			ON	ON				Right coin mech multiplied by 1	Third digit of second line below ROM OK message (picture below indicates 5 time credits per coin).
			ON	OFF				Right coin mech multiplied by 4	
			OFF	ON				Right coin mech multiplied by 5	
			OFF	OFF				Right coin mech multiplied by 6	
	ON							1 coin minimum	Single digit in third line below ROM OK message (picture below indicates 1 coin minimum).
	OFF							2 coin minimum	

Toggle setting of 4-position switch on game PCB				Language
4	3	2	1	
NOT USED	NOT USED	ON	ON	English
		ON	OFF	German
		OFF	ON	French
		OFF	OFF	Spanish



E. Game Play

The Atari Soccer™ game has four modes of operation: attract, ready-to-play, play, and self-test. Self-test is a special mode for checking the game switches, Trak Balls, and computer functions. You may enter this mode from any of the other three modes. If you enter it from the play mode, all time credit is cancelled.

1. Attract Mode

The attract mode begins when power is applied to the game, after the play mode, or after self-test. This mode is continuous and is only interrupted when one game is paid for and accepted, or if you activate the self-test. In this mode, the unit demonstrates game play as the computer controls both teams displayed on the monitor. The computer displays messages to potential players on each end of the screen. When players have paid for one game and the coin register has accepted the coins, the play mode begins. If the two-coin-minimum option is selected, the ready-to-play mode won't begin until the second coin is accepted.

2. Ready-to-Play Mode

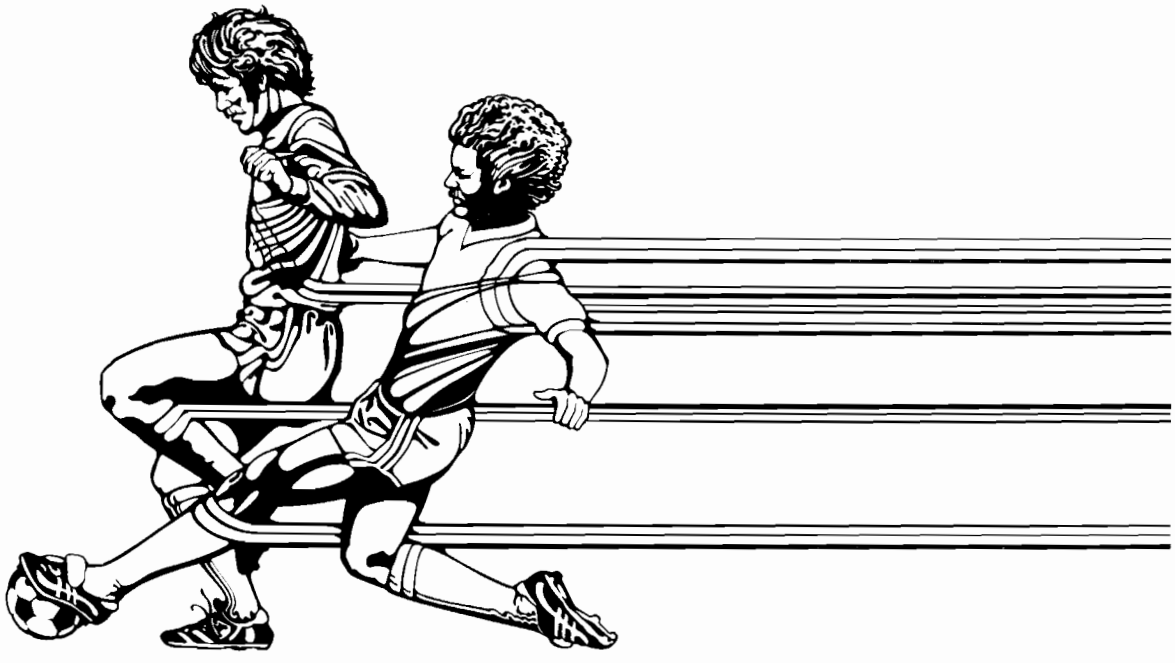
The ready-to-play mode begins when time for one game is paid and accepted by the coin register. This mode lasts for ten seconds or until one of the offensive team members displayed on the monitor has touched the ball. However, during the first three seconds of this mode, the displayed members of both teams automatically move to their starting positions, then large arrows appear on the monitor to show which Trak Balls control which team members. At the end of the three seconds, you will hear the game whistle, and the Trak Balls are enabled. At this point, play may begin or the players may use the additional time to select the offside rule or a 4-player game. The play mode begins when anyone touches the ball or at the end of ten seconds.

3. Play Mode

The play mode begins at the end of the ready-to-play mode. This mode lasts until three seconds after the game timer reaches 00. Players may buy extended time any time during this mode.

The Offside Rule and 2 or 4 player select switches are both active and you may press either one to change game play. When thirty seconds remain on the game timer, the monitor flashes the video message GAME ALMOST OVER and you will hear a whistle. When fifteen seconds remain, you will hear the whistle again. From the time of the whistle until time runs out, the crowd audio will sound as if the crowd were counting down the seconds. At zero seconds you'll hear three whistles, and all action on the monitor freezes. If players don't purchase additional time within three seconds, the game returns to the attract mode.

Maintenance and Repair



A. Cleaning

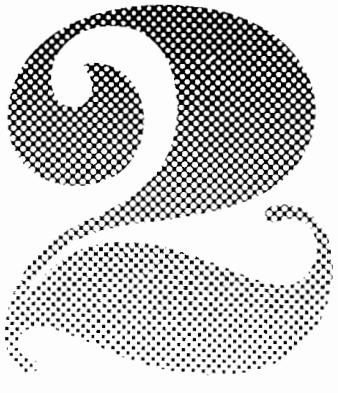
The Atari Soccer™ game requires certain maintenance to keep it in good working order. Clean, properly maintained games attract players and earn more profits.

The most important maintenance item is running the self-test every time you collect money from the cash box. Just looking at a game will not tell you if switches are broken, whether parts in a Trak Ball are defective (such as only one direction of motion working), whether the audio is set correctly, or if bulbs have burned out. The self-test will inform you of any of these possible problems.

Second, you should regularly clean the outside of the game and the coin mechanisms. In addition, you will need to regularly lubricate all the Trak Ball controls: for details see this chapter.

The exterior of the game cabinet and the glass and acrylic surfaces may be cleaned with any non-abrasive household cleaner. If desired, special coin machine cleaners that leave no residue can be obtained from your distributor.

The inside of the monitor shield has been silk-screened; be careful when cleaning this surface to avoid damaging the paint. The large monitor shield is made of tempered glass and should be scratch resistant.



B. Fuse Replacement

New

This game contains six fuses—all on the power supply assembly (not including the TV monitor fuses). Replace fuses only with the same type as listed below. See the TV monitor manual for the monitor fuse data.

F1, F2, F3	7-amp. 250V 3AG slow-blow glass cartridge-type fuse
F4, F5, F6	3-amp. 250V 3AG slow-blow glass cartridge-type fuse

The metal power supply chassis is marked with all six fuse numbers and amperages. Figure 20 shows the power supply in detail, including top and bottom views.

C. Opening the Game Top

Prior to repairing or replacing any component on the game top or prior to removing the TV monitor, unplug the game. Then open the coin door.

Reach through the opening and unlock both luggage-style latches above the coin door (see Figure 8). Lift up the game top and tilt it away from you. The two gas springs will hold the top up. *Do not* jam the game top up against its top-most position — this is hard on the gas spring mounting hardware.

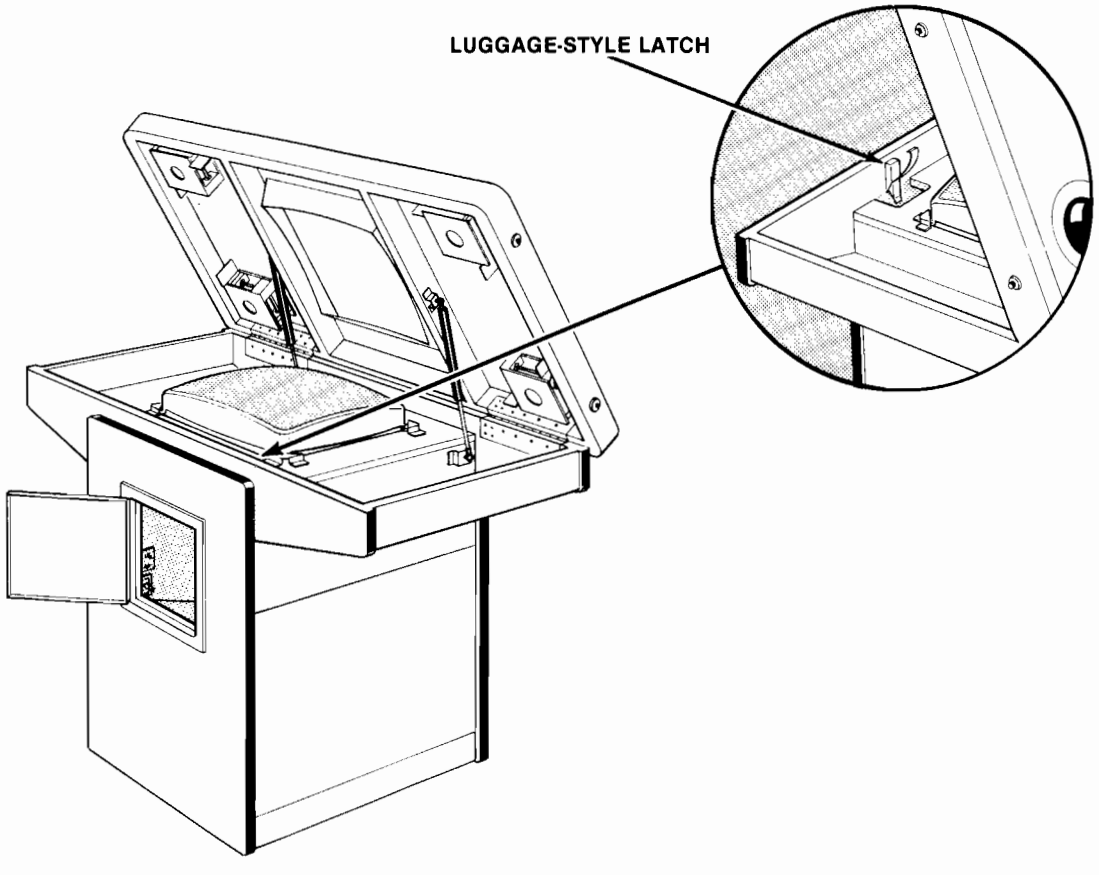
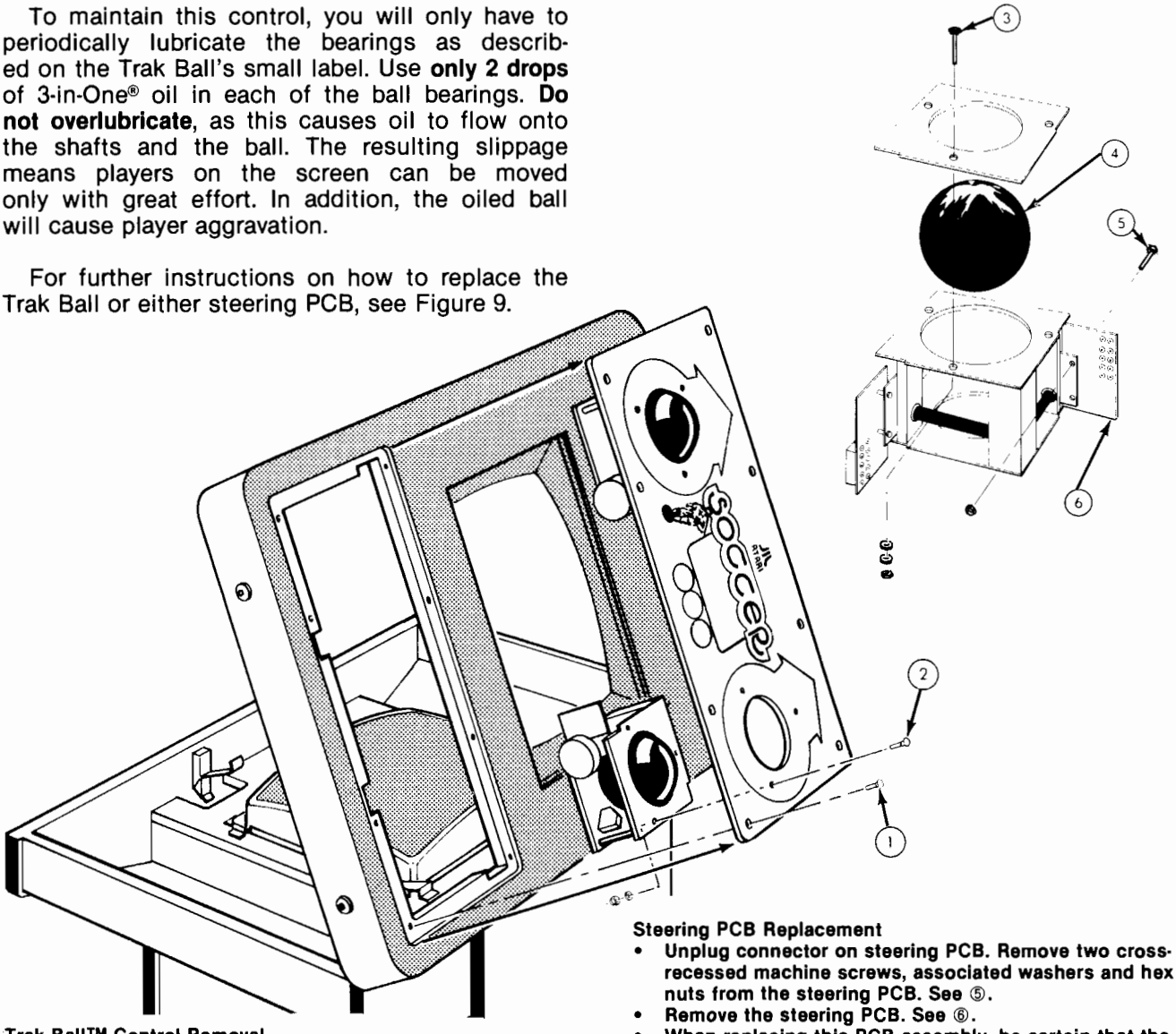


Figure 8 Opening the Game Top

1. Trak Ball™ Maintenance and Repair

To maintain this control, you will only have to periodically lubricate the bearings as described on the Trak Ball's small label. Use **only 2 drops** of 3-in-One® oil in each of the ball bearings. **Do not overlubricate**, as this causes oil to flow onto the shafts and the ball. The resulting slippage means players on the screen can be moved only with great effort. In addition, the oiled ball will cause player aggravation.

For further instructions on how to replace the Trak Ball or either steering PCB, see Figure 9.



Trak Ball™ Control Removal

- Open game top as illustrated in Figure 8.
- Unplug the control panel harness connector.
- Remove eight carriage bolts from the control panel. See ① in this figure.
- Lift out entire control panel as shown by direction of arrows.
- Remove three carriage bolts from Trak Ball assembly. See ②. Remove the Trak Ball assembly.

Ball Replacement

- Remove three countersunk machine screws from the Trak Ball assembly's acrylic top plate. (When the assembly is installed, these three screws are right underneath the control panel.) See ③.
- Remove and replace the ball. See ④.

Steering PCB Replacement

- Unplug connector on steering PCB. Remove two cross-recessed machine screws, associated washers and hex nuts from the steering PCB. See ⑤.
- Remove the steering PCB. See ⑥.
- When replacing this PCB assembly, be certain that the black toothed wheel turns freely between the two halves of the red photo sensor device.

Trak Ball™ Lubrication

- Open game top as illustrated in Figure 8.
- Unplug the control panel harness connector.
- Remove eight Allen-head screws from the control panel. See ① in this figure.
- Lift out entire control panel as shown by direction of arrows. Place the panel on a flat surface, so it lies upside down.
- Apply *only 2 drops of 3-in-One® oil* in each of the ball bearings. (Each Trak Ball control has *five* bearings.) Turn the panel over and roll the balls in all directions. Be sure the oil has not spread onto the shafts.
- Reinstall the control panel, and plug the control panel harness connector back together again.

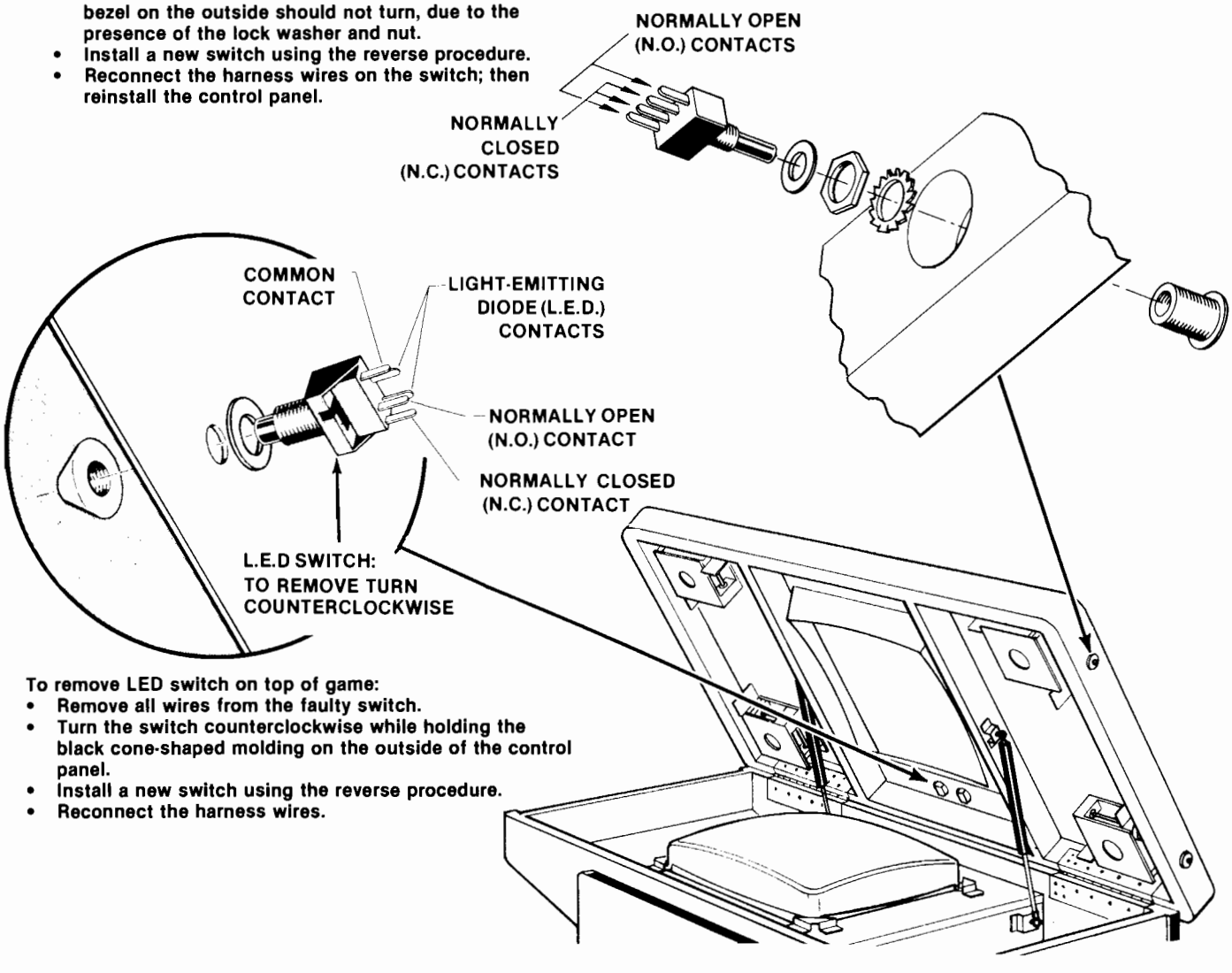
Figure 9 Trak Ball™ Maintenance and Repair

2. Pushbutton Switch Replacement

The two light-emitting diode (LED) switches on top of the game and the four kick switches have a very low failure rate. In case a switch should ever be suspect, first test it per the description that follows. To replace the switch, refer to Figure 10.

- Remove the wires from the suspected switch.
- Set multimeter to R × 1 ohms scale, then zero the meter.
- Connect multimeter leads to appropriate switch contacts. (See Figure 10 for designation of switch contacts.)
- Check contacts (push and release the switch button) for closed and open continuity.
- If the contacts do not operate sharply or always remain closed or open, then replace the switch.

To remove kick switch on side of game:
- **Disconnect the control panel harness connector; then remove the control panel.**
- **Remove the harness wires from the faulty switch.**
- **Turn the switch counterclockwise. The silver-colored bezel on the outside should not turn, due to the presence of the lock washer and nut.**
- **Install a new switch using the reverse procedure.**
- **Reconnect the harness wires on the switch; then reinstall the control panel.**



To remove LED switch on top of game:
- **Remove all wires from the faulty switch.**
- **Turn the switch counterclockwise while holding the black cone-shaped molding on the outside of the control panel.**
- **Install a new switch using the reverse procedure.**
- **Reconnect the harness wires.**

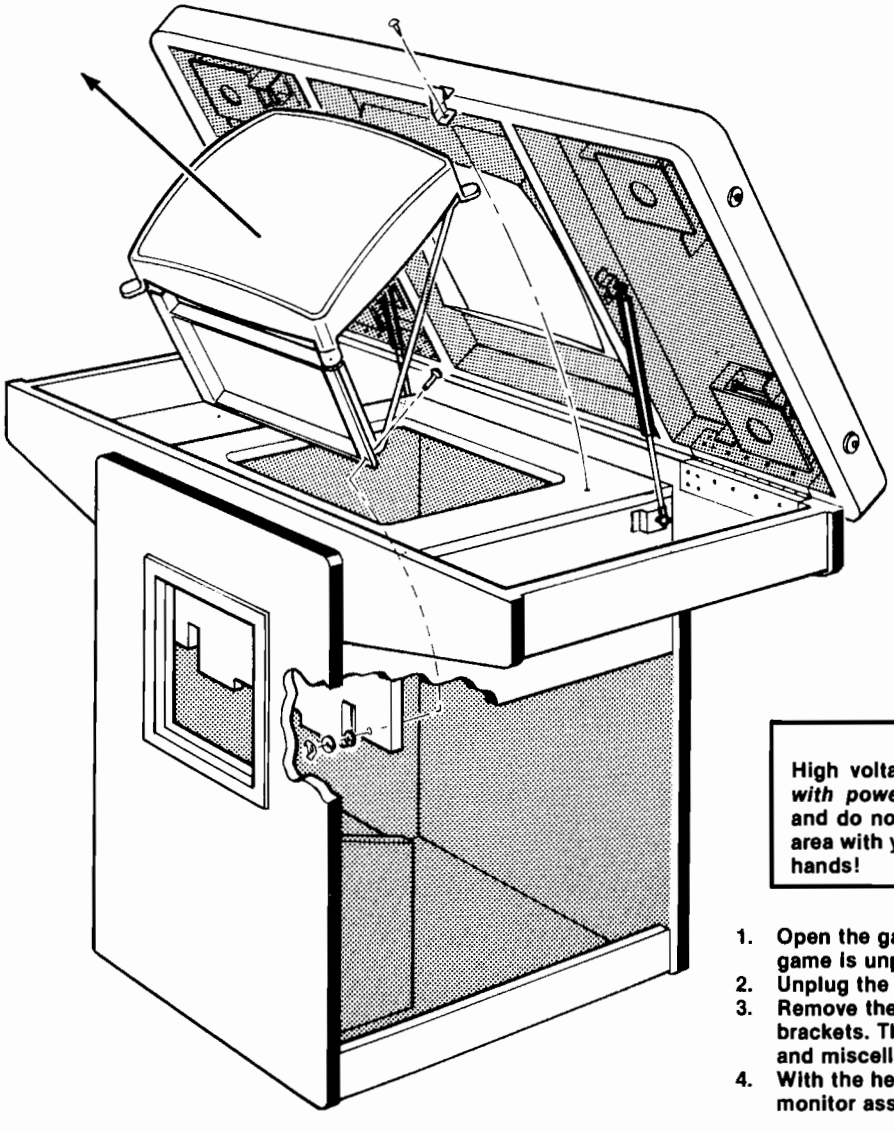
Figure 10 Pushbutton Switch Replacement

3. TV Monitor Removal

CAUTION

High voltages exist in any television unit, *even with power disconnected.* Use extreme caution and do not touch electrical parts or the TV yoke area with your hands or with metal objects in your hands!

If you should need to service or replace the 23-inch TV monitor, you must first remove it from the game cabinet. To avoid possible back strains you should have a helper assist you in this procedure. Follow the instructions in Figure 11.



CAUTION

High voltages exist in any television unit, *even with power disconnected.* Use extreme caution and do not touch electrical parts or the TV yoke area with your hands or with metal objects in your hands!

1. **Open the game top as described in Figure 8. Be sure the game is unplugged.**
2. **Unplug the TV monitor harness connector.**
3. **Remove the eight TV monitor wood screws and tie-down brackets. Then remove the two carriage bolts, wing nuts and miscellaneous washers on the TV's metal chassis.**
4. **With the help of another person, if possible, lift the monitor assembly up and out of the game.**

Figure 11 TV Monitor Removal

D. Printed Circuit Board Replacement

You may wish to remove the game printed circuit board (PCB) or the Regulator/Audio PCB for service or inspection. To do this, refer to Figure 12 and proceed as follows:

1. Open the side access panel. Be sure the game's power is off.
2. Locate the securing screws and fiber washers that hold down the PCB in its slots, and remove them (two screws and washers for each PCB).
3. If you are removing the game board, first remove the four machine screws that hold the edge connectors to the small black connector mounts, along the game PCB's edge. Then unplug the edge connectors on game PCB. If you are removing the Regulator/Audio PCB, simply disconnect the three small harness connectors on this board.
4. Carefully slide either PCB straight out of its slots. Be careful not to twist the board, as this may loosen connections or components. Replace or repair as required.
5. Reinstall the PCB, making sure that the connectors are properly plugged in. Note they are all keyed to fit on only one way, so if they don't slip on easily, don't force them! **A reversed connector will probably damage your game** and will void the warranty.
6. Replace the securing screws and fiber washers in the PCB. Reinstall the machine screws into the black connector mounts on the PCB. Close and lock the side access panel.
7. Check that the option settings of game PCB are as you desire, and **perform the self-test.** This is especially important with any game when you replace a PCB.

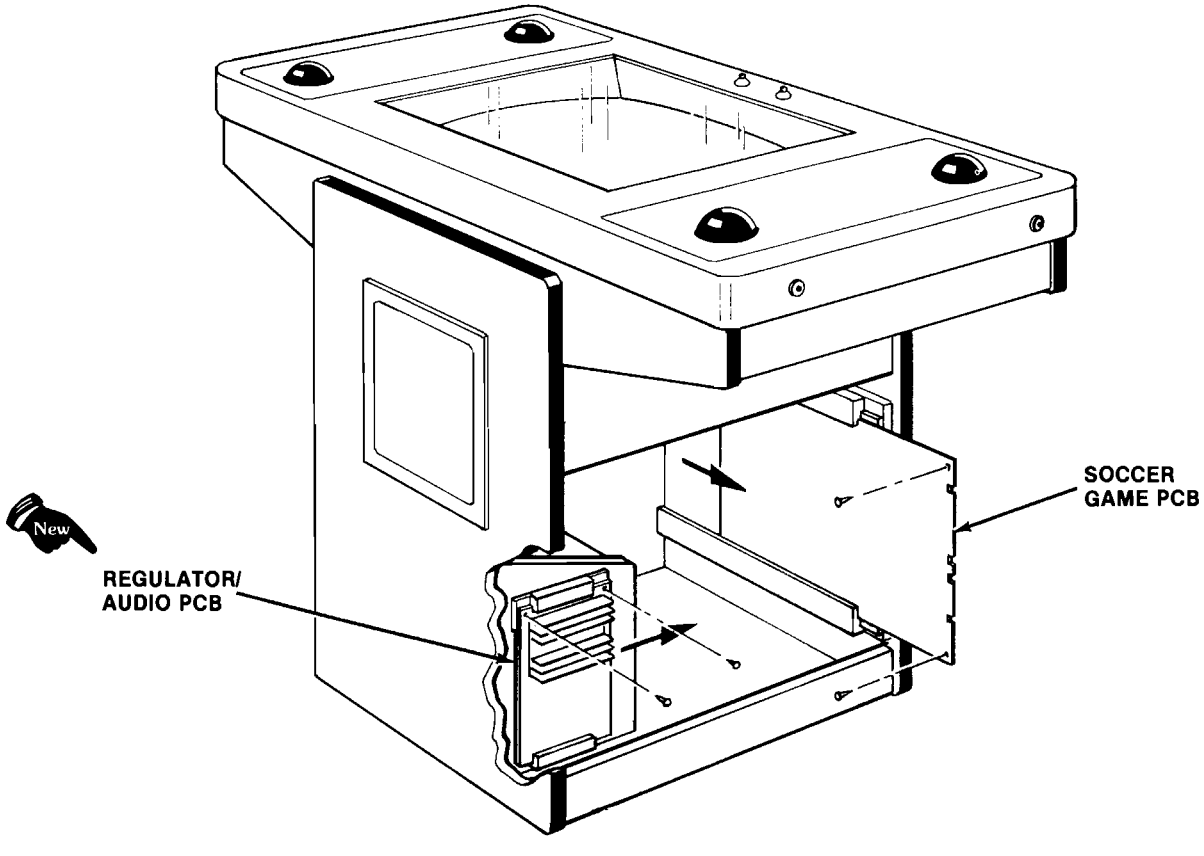


Figure 12 Game and Regulator/Audio PCB Replacement

E. Game Operation

With this manual you received two large sheets that contain the wiring and schematic diagrams for Atari Soccer. Sheet 1, Side A, includes an index that shows the arrangement of these diagrams. These diagrams include information that explains the functions of the circuits and defines inputs and outputs.

Atari Soccer is a microcomputer-controlled game. The microcomputer is contained on the game PCB. The game PCB receives inputs from the two small PCBs on each Trak Ball, from each kick button, the offsides rule and 2 or 4 player switches, and the coin door switches. All these inputs are processed by the game PCB and output to the TV monitor and the Regulator/Audio PCB.

The Regulator/Audio PCB performs two functions: 1) regulates the +10.3 VDC from the power supply to +5 VDC, and 2) amplifies the audio from the game PCB. The +5 VDC from the Regulator/Audio PCB provides all power for the game PCB, excluding the game PCB's audio amplifier. The audio from the Regulator/Audio PCB directly drives both game speakers and is controlled by the volume control mounted inside the coin door.

The Power Supply is the source of all voltages in the game. These voltages are protected by six fuses located on the top of the power supply chassis.

Figure 13 illustrates the distribution of power in this game. Figure 14 illustrates the distribution of signals.

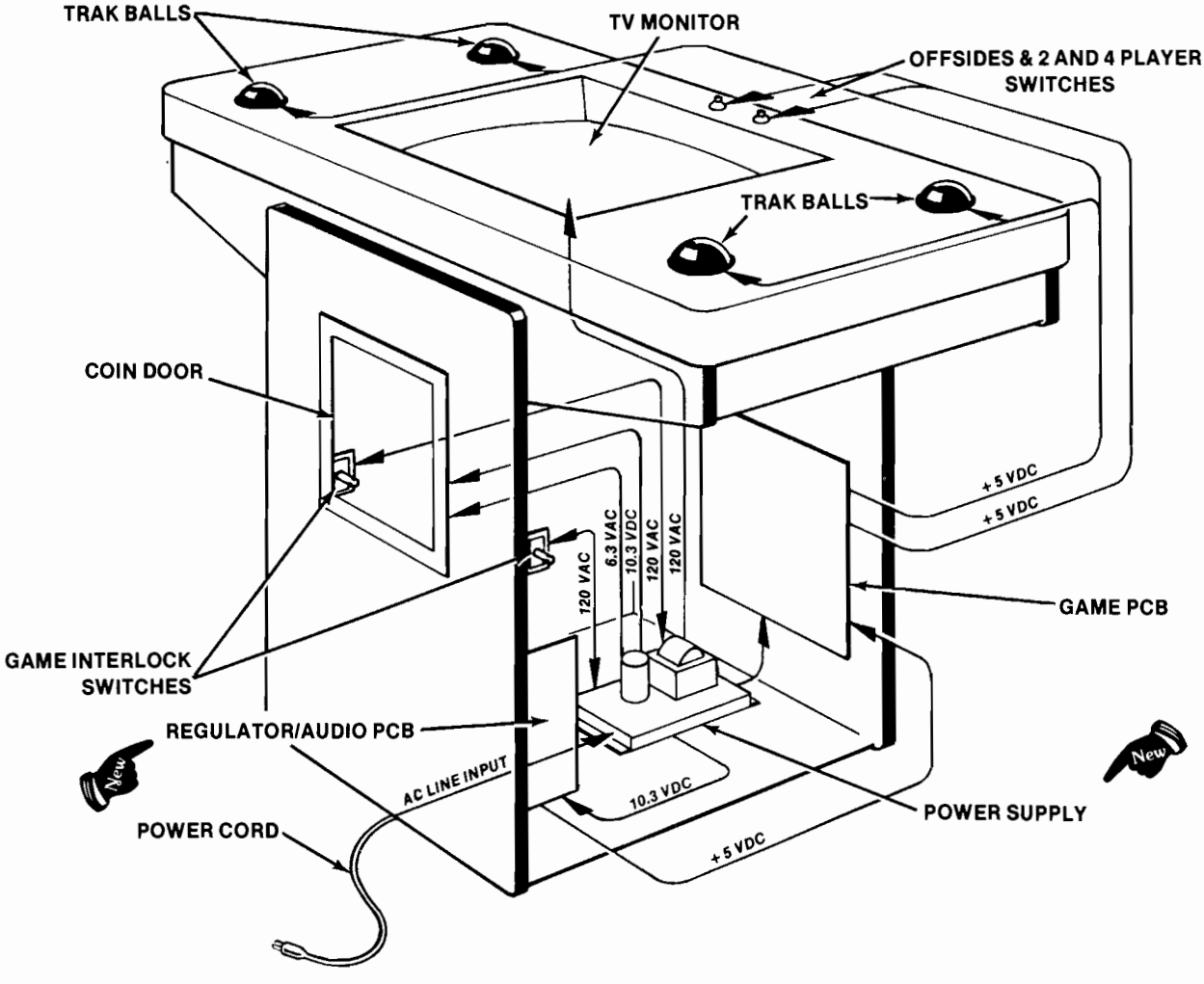


Figure 13 Power Distribution

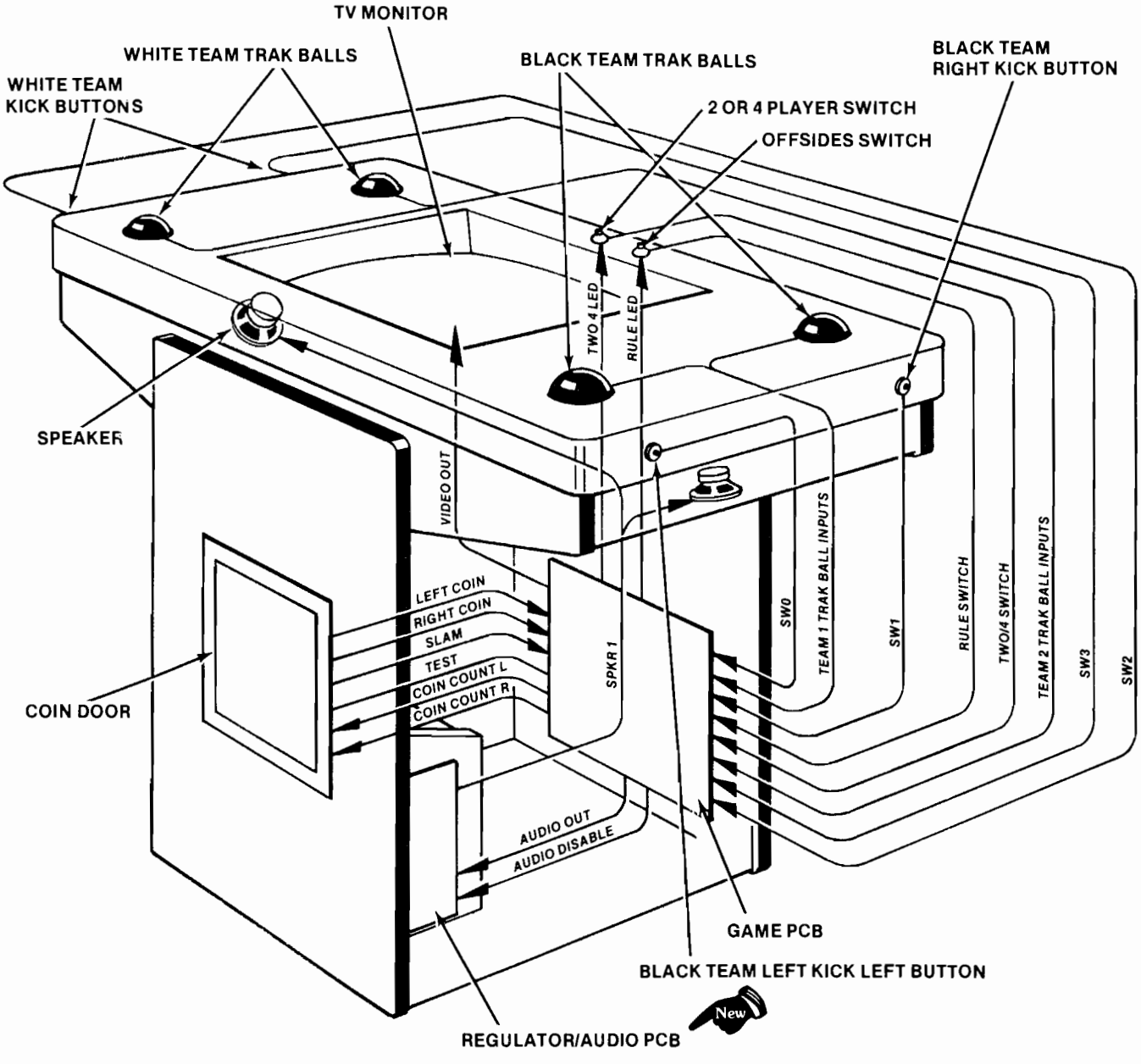
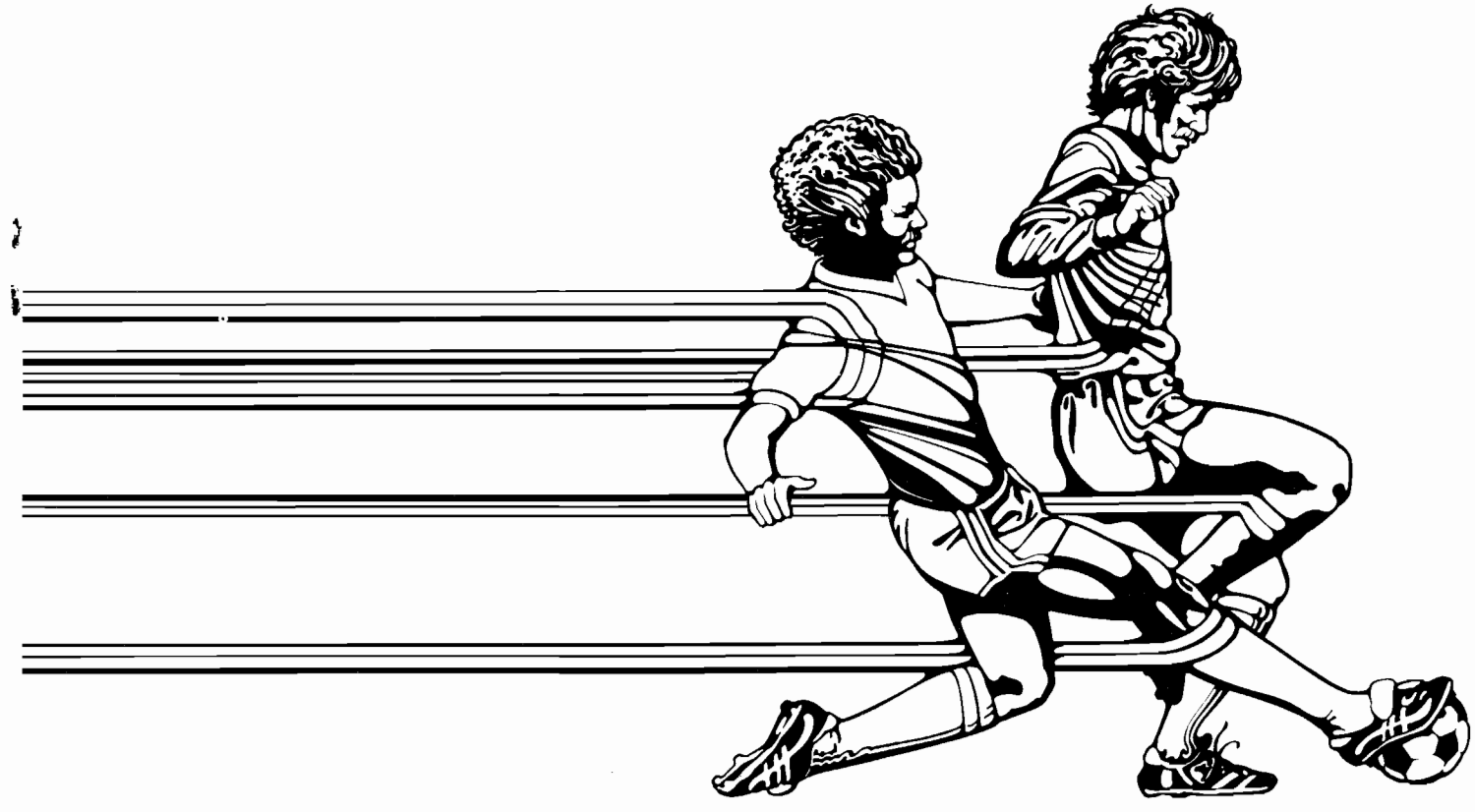


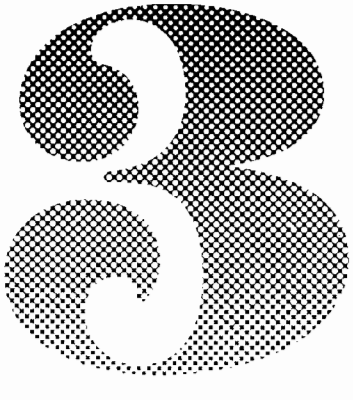
Figure 14 Signal Distribution

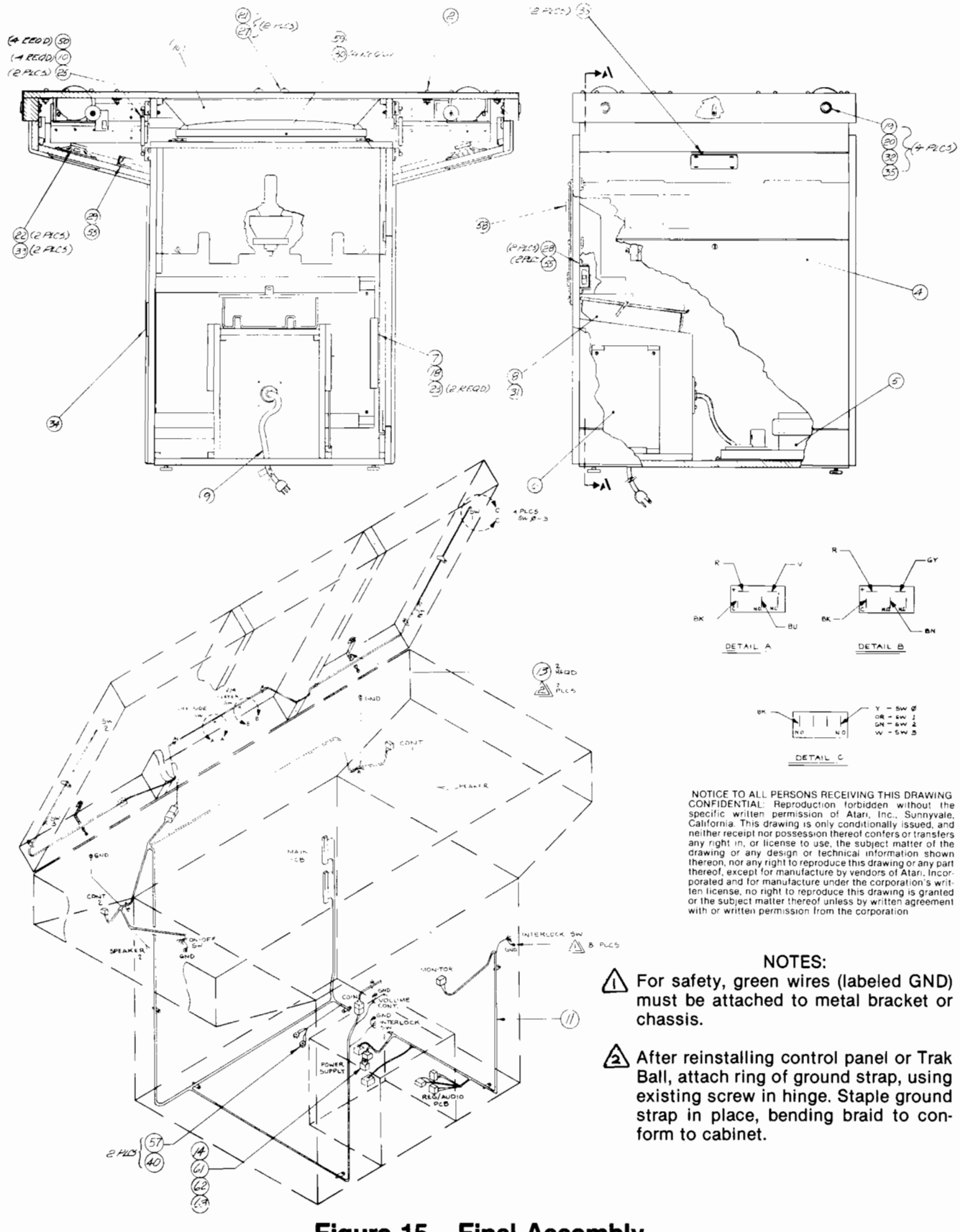
Illustrated Parts Lists



The purpose of this chapter is to provide you with the necessary information for ordering replacement parts for your Atari Soccer™ game. Please note that, for simplicity, *common hardware has been deleted* from most of these parts lists. This includes screws, nuts, washers, bolts, etc.

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





NOTES:

1. For safety, green wires (labeled GND) must be attached to metal bracket or chassis.
2. After reinstalling control panel or Trak Ball, attach ring of ground strap, using existing screw in hinge. Staple ground strap in place, bending braid to conform to cabinet.

Figure 15 Final Assembly
A035110-XX A

Figure 15 Final Assembly Parts List

Item	*Part No.*	*Description*
1	A035103-xx	Hinges, Latches and Shield—see Figure 16
2	A035105-01	Control Panel Assembly—see Figure 17
4	A035107-01	Access Panel Assembly
5	A034560-01	Power Supply Assembly for Raster-Scan Games—see Figure 20
6	A034485-01	Regulator/Audio PCB Assembly—see Figure 21
7	A034905-01	Soccer Game PCB Assembly—see Figure 22
8	A030268-01	Cash Box Assembly
9	A034841-03	Strain Relief Power Cord Assembly (domestic)
	or A034863-03	Strain Relief Power Cord Assembly (European)
10	A034974-01	Gas Spring Mounting Assembly
11	A035194-01	Main Harness and Component Assembly—see Figure 23
13	A034031-02	Ground Strap
14	A021084-01	Voltage Selection Plug, 100V *(other plugs available are listed as items 61-63)*
16	035088-01	Cardboard Bezel with Graphics
18	034536-01	Foam Vibration Damper
19	62-009	Pushbutton Switch (for Kick Switches)
20	60-06008	Red Cylindrical Plunger
21	62-039	Pushbutton LED Switch (for 2/4 Player and Offside Switches)
22	48-004	5-Inch 8-Ohm Speaker
23	030868-01	Connector Mount
25	78-3116	Gas Spring
27	033127-01	Black Molded Switch Bushing
28	007882-02	Interlock Switch Cover
29	09992-01	On/Off Switch Cover
30	005594-01	Monitor Tie-Down Brackets
31	006870-01	Coin Box Bracket
32	60-06012	Adapter Bezel for Kick Switches
33	000869-01	Speaker Grille
34	034537-01	Mesh Ventilation Grille
35	75-07068	Nylon Washer with .503" Inside Diameter × .756" Outside Diameter × .177" Thick
50	73-3029	Special Retaining Clip for Gas Spring
53	TM-144	Technical Manual for Soccer Game
55	035118-01	Danger Label (for Interlock and On/Off Switch Covers)
57	75-99518	#8-32 Nut/Washer Assembly
58	71-103203	25¢/25¢/$1.00 Coin Door Assembly
59	92-040	23-Inch Wells-Gardner Black-&-White Monitor
60	TM-125	Technical Manual for Wells-Gardner Monitor
61	A021084-02	Voltage Selection Plug (120V)
62	A021084-04	Voltage Selection Plug (220V)
63	A021084-05	Voltage Selection Plug (240V)
69	DP-144-01	Schematic Drawings for Soccer (Sheet 1)
70	DP-144-02	Schematic Drawings for Soccer (Sheet 2)

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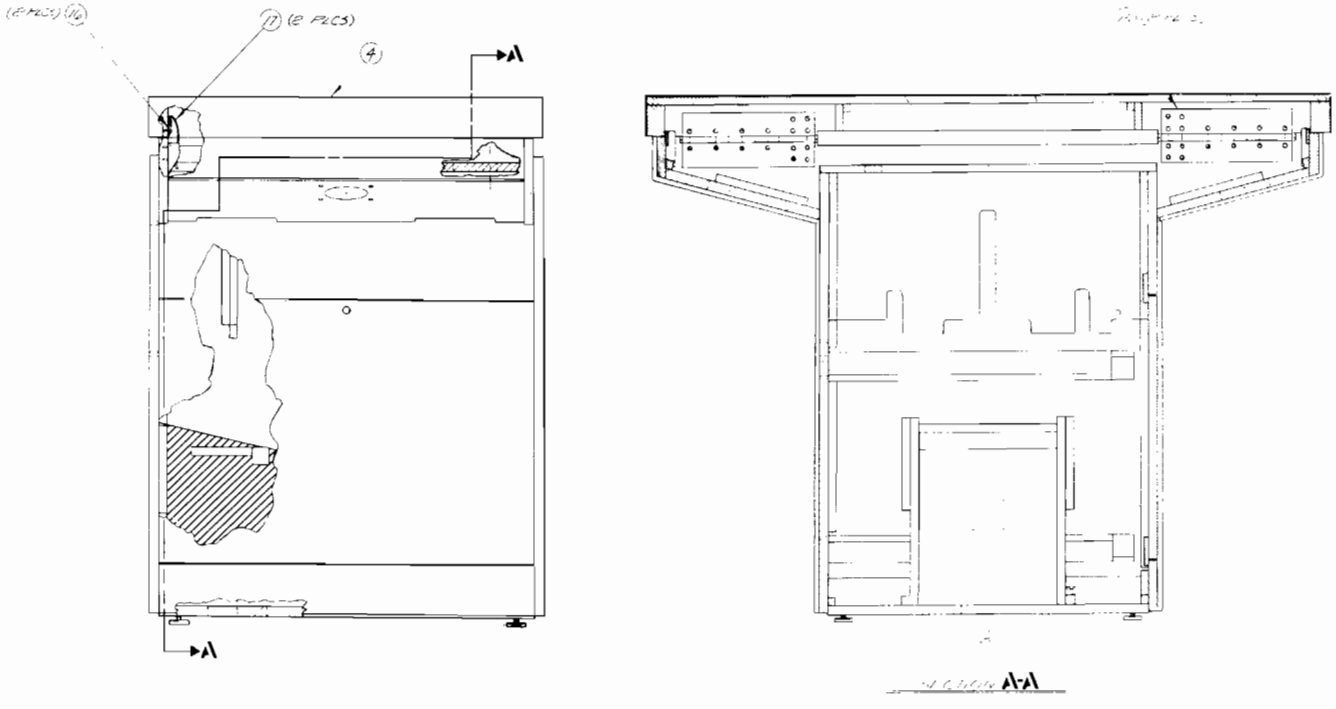

Figure 16 Hinges, Latches and Monitor Shield
A034103-XX A
Parts List

Item	*Part No.*	*Description*
4	035104-01	Tempered-Glass Monitor Shield with Graphics
15	034383-01	Hinge
16	034388-01	Latch Keeper Bracket
17	78-3408	Spring Draw Latch (Hook End)

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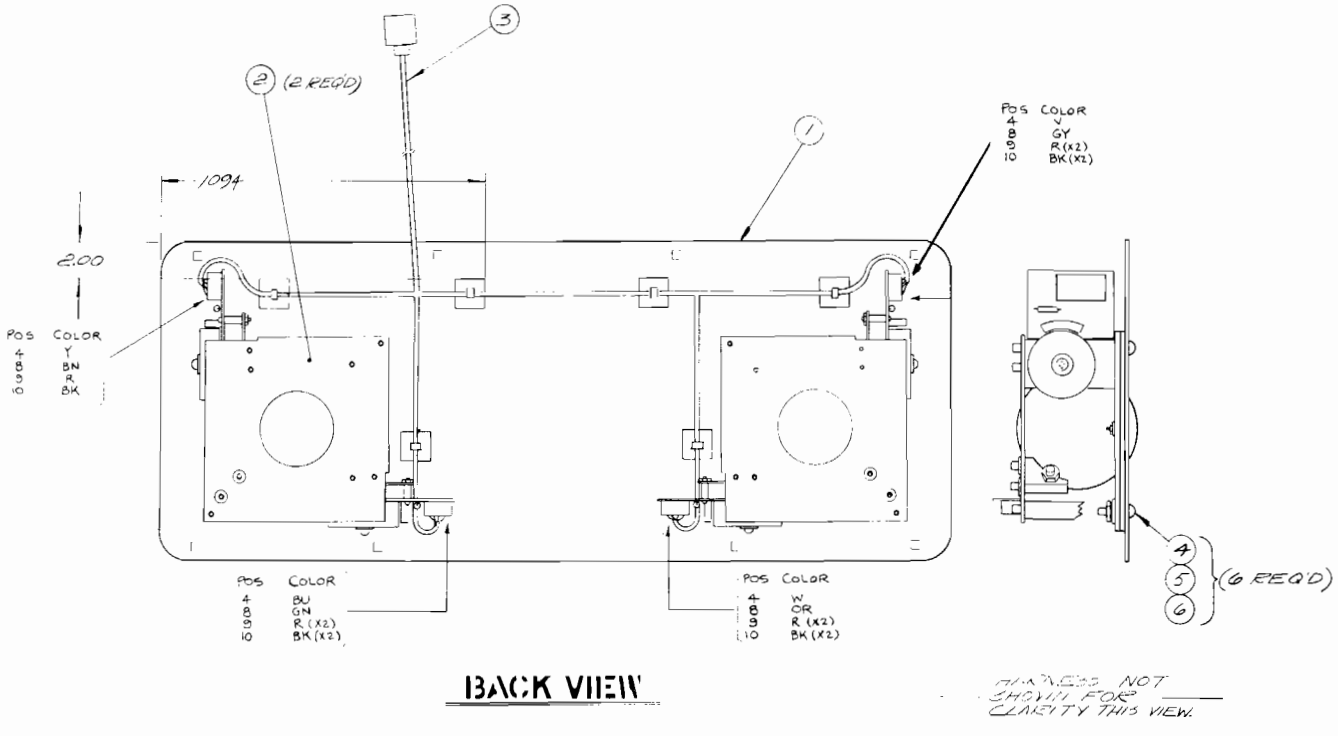

Figure 17 Control Panel Assembly A035105-01 A

Parts List

Item	*Part No.*	*Description*
1	035009-01	Control Panel with Graphics
2	A033360-01	Trak Ball Assembly
3	A035195-01	Control Harness Assembly

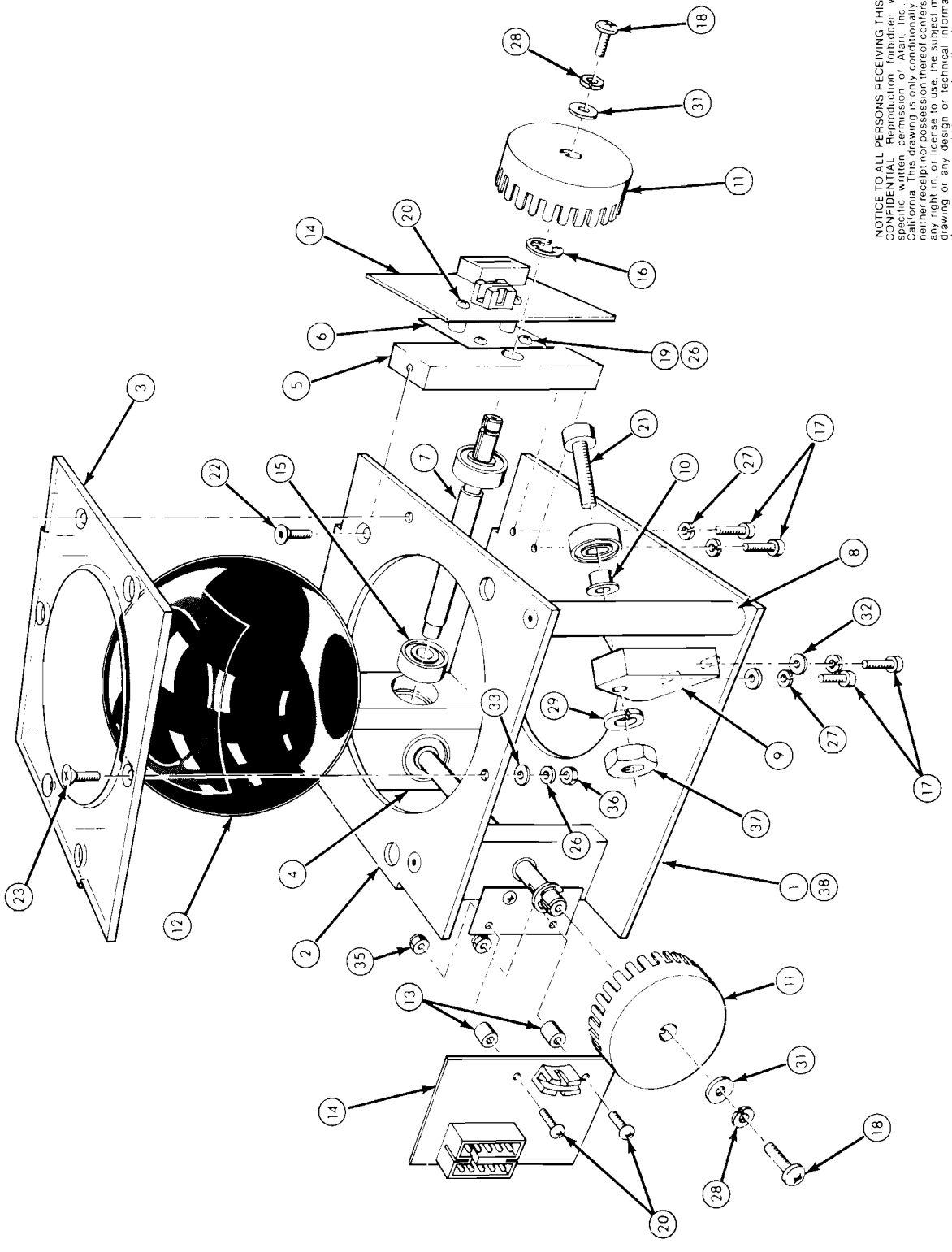

Figure 18 Trak Ball™ Assembly
A033360-01 G

Figure 18 Trak Ball™ Assembly Parts List

Item	Part No.	Qty.	Description
1	033355-01	1	Base Plate
2	033356-01	1	Top Plate
3	033357-01	1	Cover Plate (Acrylic)
4	033358-01	1	Corner Post
5	033359-01	2	End Post
6	033361-01	2	Steering PCB Bracket
7	033362-01	2	Roller Shaft
8	033363-01	1	Cylindrical Post
9	033364-01	1	Adjustable Post
10	033365-01	1	Spacer
11	000616-01	2	Light Hub
12	033366-01	1	Trak Ball
13	74-A00011	4	Phenolic Spacer, 1/8″ inside diameter × ¼″ outside diameter × ¼″ long
14	A009060-02	2	Steering Printed Circuit Board Assembly — see Figure 19
16	73-3006	2	Carbon Spring Steel External Retaining Ring, for 3/8″ shaft diameter
17	72-8808	9	#8-32 × ½″ Hex Socket-Head Cap Alloy Steel Machine Screw
18	72-1006S	2	#10-32 × 3/8″ Cross-Recessed Pan-Head Cadmium-Plated Steel Machine Screw
19	72-1606S	4	#6-32 × 3/8″ Cross-Recessed Pan-Head Cadmium-Plated Steel Machine Screw
20	72-1408S	4	#4-40 × ½″ Cross-Recessed Pan-Head Cadmium-Plated Steel Machine Screw
21	72-8920S	1	#3/8-16 × 1¼″ Hex Socket-Head Cap Alloy Steel Machine Screw
22	85-1808B	4	#8-32 × ½″ Socket Cap Flat Countersunk-Head Black-Oxide Steel Screw
23	75-3608S	3	#6-32 × ½″ Cross-Recessed Flat-Head Cadmium-Plated Steel Machine Screw
26	75-046S	7	#6 Zinc-Plated Steel Split Lock Washer
27	75-048S	9	#8 Zinc-Plated Steel Split Lock Washer
28	75-040S	2	#10 Steel Split Lock Washer
29	75-041S	1	#3/8 Steel Split Lock Washer
31	75-010S	2	#10 Flat Plain SAE-Standard Zinc-Plated Steel Washer
32	75-018S	2	#8 Flat SAE-Standard Zinc-Plated Steel Washer
33	75-016S	3	#6 Flat Plain SAE-Standard Zinc-Plated Steel Washer
35	75-990504C	4	#4-40 Shallow-Pattern Prevailing-Torque Corrosion Resistant Lock Nut
36	75-916S	3	#6-32 Standard Cadmium-Plated Steel Machine Hex Nut
37	75-919S	1	#3/8-16 Standard Cadmium-Plated Steel Machine Hex Nut
38	034168-01	1	Label with Lubrication Instructions

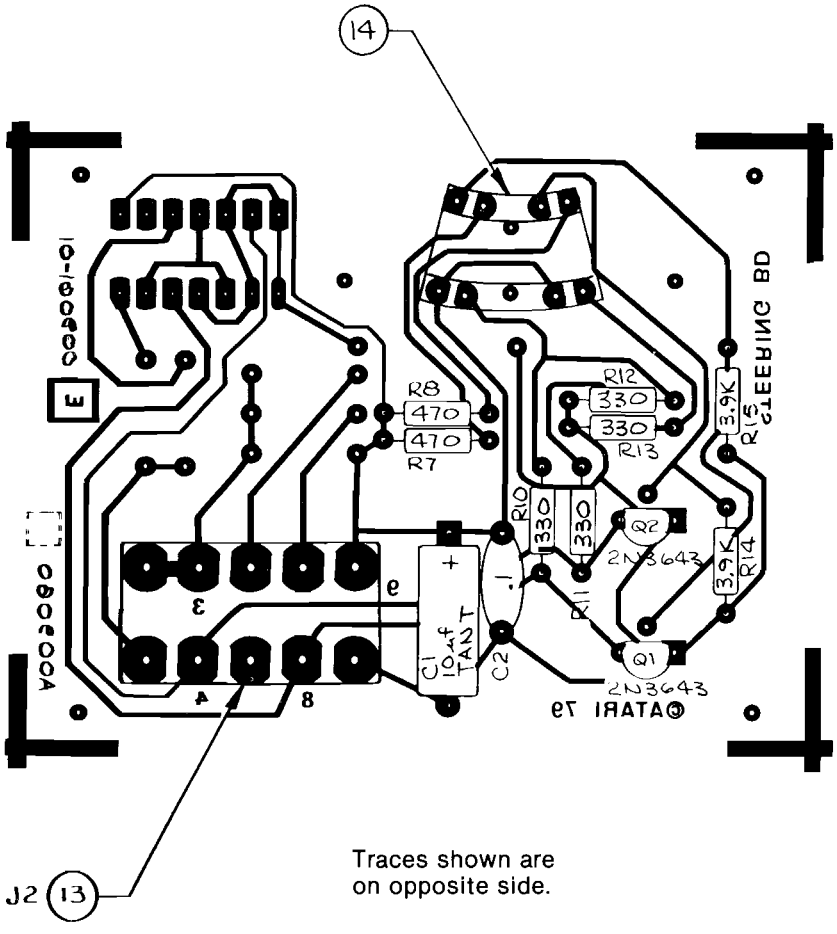

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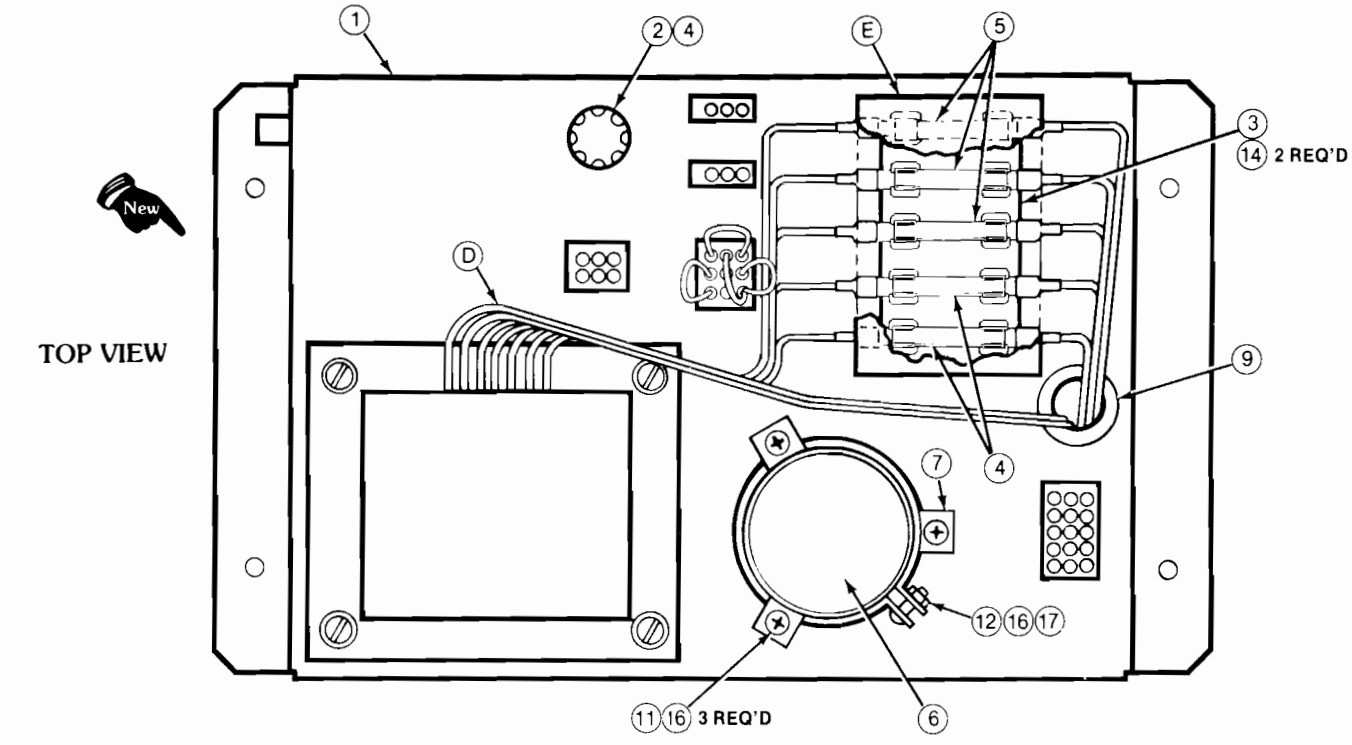
Figure 19 Steering Board Assembly
A009060-02 C
Parts List

Item	*Part No.*	*Description (Ref. Designations & Locations in Bold)*
5	10-5392	3.9K Ohm, ±5%, ¼W Resistor (**R14, 15**)
6	10-5331	330 Ohm, ±5%, ¼W Resistor (**R10-13**)
7	10-5471	470 Ohm, ±5%, ¼W Resistor (**R7- 8**)
8	27-250104	0.1 μf, ±20%, 25V Ceramic-Disk Radial-Lead Capacitor (**C2**)
9	29-046	10 μf, ±10%, 20V Tantalum Axial-Lead Capacitor (**C1**)
10	34-2N3643	Type 2N3643 Switching Transistor (**Q1, 2**)
13	79-58005	10-Contact Connector
14	030369-01	Radial Optical Coupler



NOTE:
THE FOUR AVAILABLE VOLTAGE SELECTION PLUGS ARE LISTED IN FIGURE 15, FINAL ASSEMBLY.

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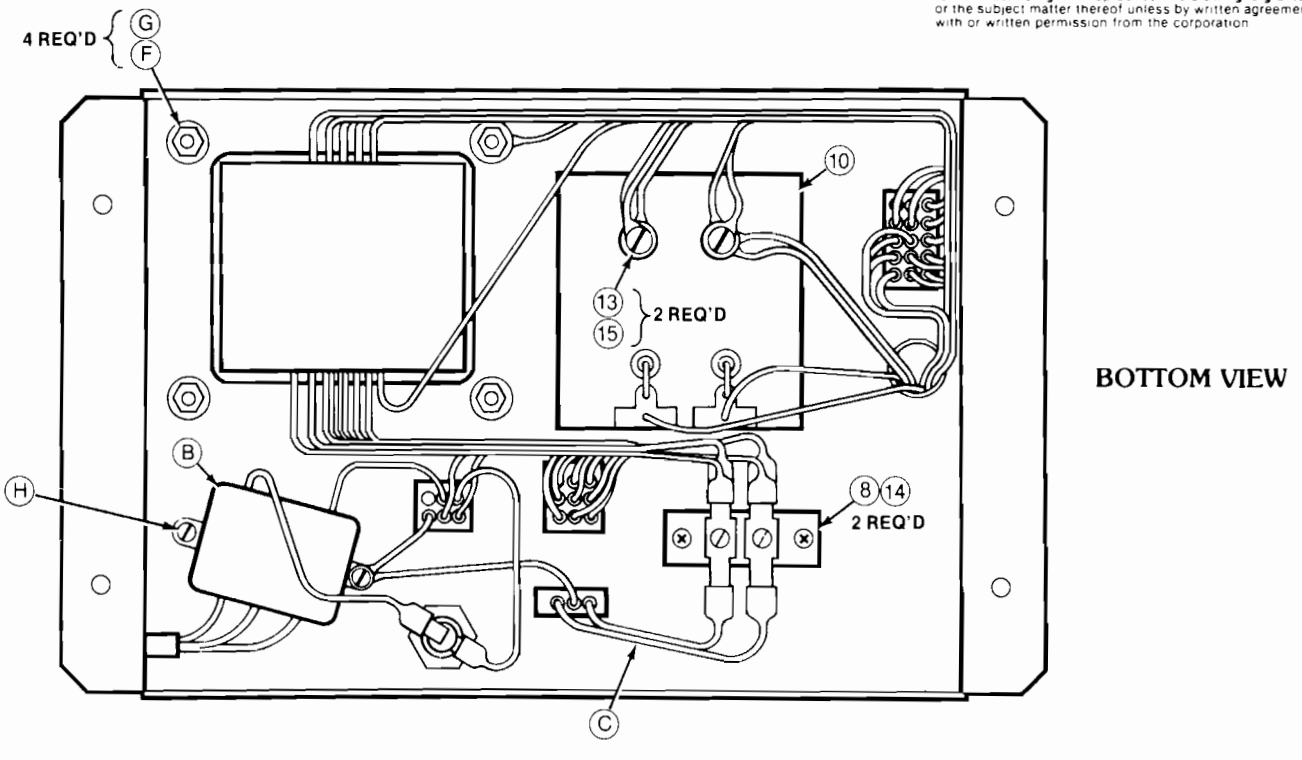

Figure 20 Power Supply Assembly for Raster-Scan Games
A034560-01 B

Figure 20 Power Supply Assembly for Raster-Scan Games Parts List

Item	Part No.	Qty.	Description
A	A034955-01	1	Power Supply Sub-Assembly, Rev. A, consisting of the following 17 items:
1	034482-01	1	Base for Power Supply Chassis
2	79-4411006	1	Panel-Mounting Non-Indicating 3AG Cartridge-Type Fuse Post
3	79-3206	1	5-Position 3AG Fuse Block with ¼" Quick-Disconnect Terminals
4	46-2017002	3	7-Amp. 250V 3AG Slow-Blow Glass Cartridge-Type Fuse
5	46-2013002	3	3-Amp. 250V 3AG Slow-Blow Glass Cartridge-Type Fuse
6	29-053	1	26,000 μf 15V Electrolytic Capacitor
7	78-70501SC	1	2" Diameter Capacitor Mounting Bracket
8	79-15021001	1	2-Circuit Single-Row Terminal Block
9	78-2708	1	Nylon Type 6/6 Hole Bushing with 5/8" Inside Diameter × 55/64" Outside Diameter × ¼" Thick
10	A006555-01	1	Rectifier Printed Circuit Board Assembly
11	72-HA4804S	3	#8-32 × ¼" Cross-Recessed Pan-Head Zinc-Plated Steel Thread-Rolling Tri-Fluted "Taptite" Screw
12	72-HA4812S	1	#8-32 × ¼" Cross-Recessed Pan-Head Zinc-Plated Steel Thread-Rolling Tri-Fluted "Taptite" Screw
13	72-1008F	2	#10-32 × ½" Cross-Recessed Pan-Head Zinc-Plated Steel Thread-Rolling Tri-Fluted "Taptite" Screw
14	72-HA4606S	4	#6-32 × 3/8" Cross-Recessed Pan-Head Zinc-Plated Steel Thread-Rolling Tri-Fluted "Taptite" Screw
15	75-010S	2	#10 Flat Plain SAE-Standard Zinc-Plated Steel Washer
16	75-018S	4	#8 Flat Plain SAE-Standard Zinc-Plated Steel Washer
17	75-99518	1	#8-32 Nut/Washer Assembly
B	A034630-01	1	RFI Filter Assembly
C	A034629-01	2	A.C. Harness Assembly
D	A034623-01	1	Power Supply Harness Assembly (for Raster-Scan Games)
E	034544-01	1	Fuse Block Cover
F	75-018S	4	#8 Flat Plain SAE-Standard Zinc-Plated Steel Washer
G	75-99518	4	#8-32 Nut/Washer Assembly
H	72-HA4812S	2	#8-32 × 3/4" Cross-Recessed Pan-Head Zinc-Plated Steel Thread-Rolling Tri-Fluted "Taptite" Screw

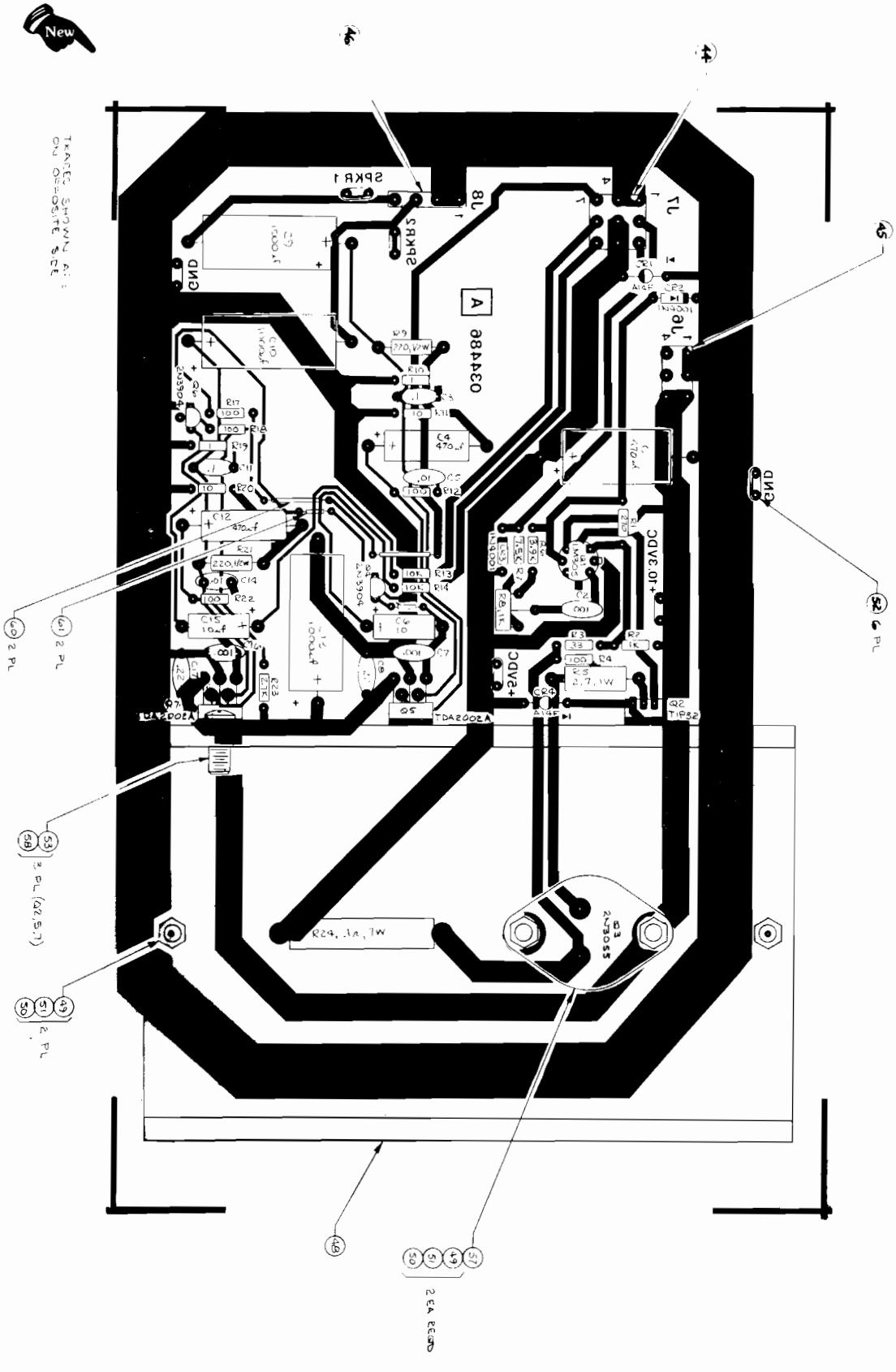

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Figure 21 Regulator/Audio PCB Assembly A034485-01 D

Figure 21 Regulator/Audio PCB Assembly Parts List

Item	Part No.	Qty.	Description (Ref. Designations in Bold)
2	10-51P0	2	1 Ohm, ± 5%, ¼W Resistor (**R10, 19**)
3	10-5100	2	10 Ohm, ± 5%, ¼W Resistor (**R11, 20**)
4	10-5330	1	33 Ohm, ± 5%, ¼W Resistor (**R3**)
5	10-5101	5	100 Ohm, ± 5%, ¼W Resistor (**R4, 12, 17, 18, 22**)
6	10-5271	1	270 Ohm, ± 5%, ¼W Resistor (**R1**)
7	10-5102	1	1K Ohm, ± 5%, ¼W Resistor (**R2**)
8	10-5272	1	2.7K Ohm, ± 5%, ¼W Resistor (**R23**)
9	10-5752	1	7.5K Ohm, ± 5%, ¼W Resistor (**R7**)
10	10-5103	2	10K Ohm, ± 5%, ¼W Resistor (**R13, 14**)
11	10-5392	1	3.9K Ohm, ± 5%, ¼W Resistor (**R6**)
13	11-5221	2	220 Ohm, ± 5%, ½W Resistor (**R9, 21**)
15	12-52P7	1	2.7 Ohm, ± 5%, 1W Resistor (**R5**)
16	19-100P1015	1	.1 Ohm, ± 3%, 7W Wirewound Resistor (**R24**)
17	19-315102	1	1K Ohm Vertical PCB-Mounting Cermet Trimpot, Bournes Series 3352V-1-1K (**R8**)
20	24-250106	2	10 μf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor (**C6, 15**)
22	24-250477	3	470 μf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor (**C1, 4, 12**)
23	24-250108	3	100 μf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor (**C9, 10, 13**)
25	27-250103	2	.01 μf Ceramic-Disc 25V Radial-Lead Capacitor (**C5, C14**)
26	27-250104	2	.1 μf Ceramic-Disc 25V Radial-Lead Capacitor (**C3, C11**)
27	27-250224	2	.22 μf Ceramic-Disc 25V Radial-Lead Capacitor (**C8, 17**)
29	27-250102	3	.001 μf Ceramic-Disc 25V Radial-Lead Capacitor (**C2, 7, 16**)
31	31-A14F	2	50V 2.5A Miniature Axial-Lead High-Current Rectifier (**CR1, CR4**)
32	31-1N4001	2	50V Silicon Rectifier 1N4001 Diode (**CR2-3**)
34	33-TIP32	1	PNP Power Transistor, Type TIP32 (**Q2**)
35	34-2N3055	1	NPN Silicon Transistor, Type 2N3055 **Q3**)
36	34-2N3904	2	NPN Silicon Transistor, Type 2N3904 (**Q4, 6**)
38	37-LM305	1	5V Linear Voltage Regulator (**Q1**)
39	37-TDA2002A	2	Type TDA2002A 8W Linear Audio Amplifier Integrated Circuit (**Q5, 7**)
44	79-58008	1	9-Position Connector Receptacle (**J7**)
45	79-58092	1	6-Position Connector Receptacle (**J6**)
46	79-58059	1	4-Position Connector Receptacle (**J8**)
47	79-20230	19	Female PCB-Mounting Terminal
48	034531-01	1	Heat Sink
49	72-1608C	4	#6-32 × ½" Cross-Recessed Pan-Head Corrosion-Resistant Steel Machine Screw
50	75-99516	7	#6-32 Nut/Washer Assembly
51	75-056	7	#6 Internal-Tooth Steel Lock Washer
52	020670-01	6	Test Point
53	75-F60805	3	#6-32 × ½" Binder-Head Nylon Screw
57	78-16008	1	Thermally Conductive Compound for the 2N3055
58	78-16014	3	Thermally Conductive Compound for TDA2002A and TIP32
60	52-003	2	Teflon-Insulated Solder-Plated Solid Copper PCB-Mounting Jumper Wire with .6" Centers
61	52-004	2	Teflon-Insulated Solder-Plated Solid Copper PCB-Mounting Jumper Wire with .3" Centers

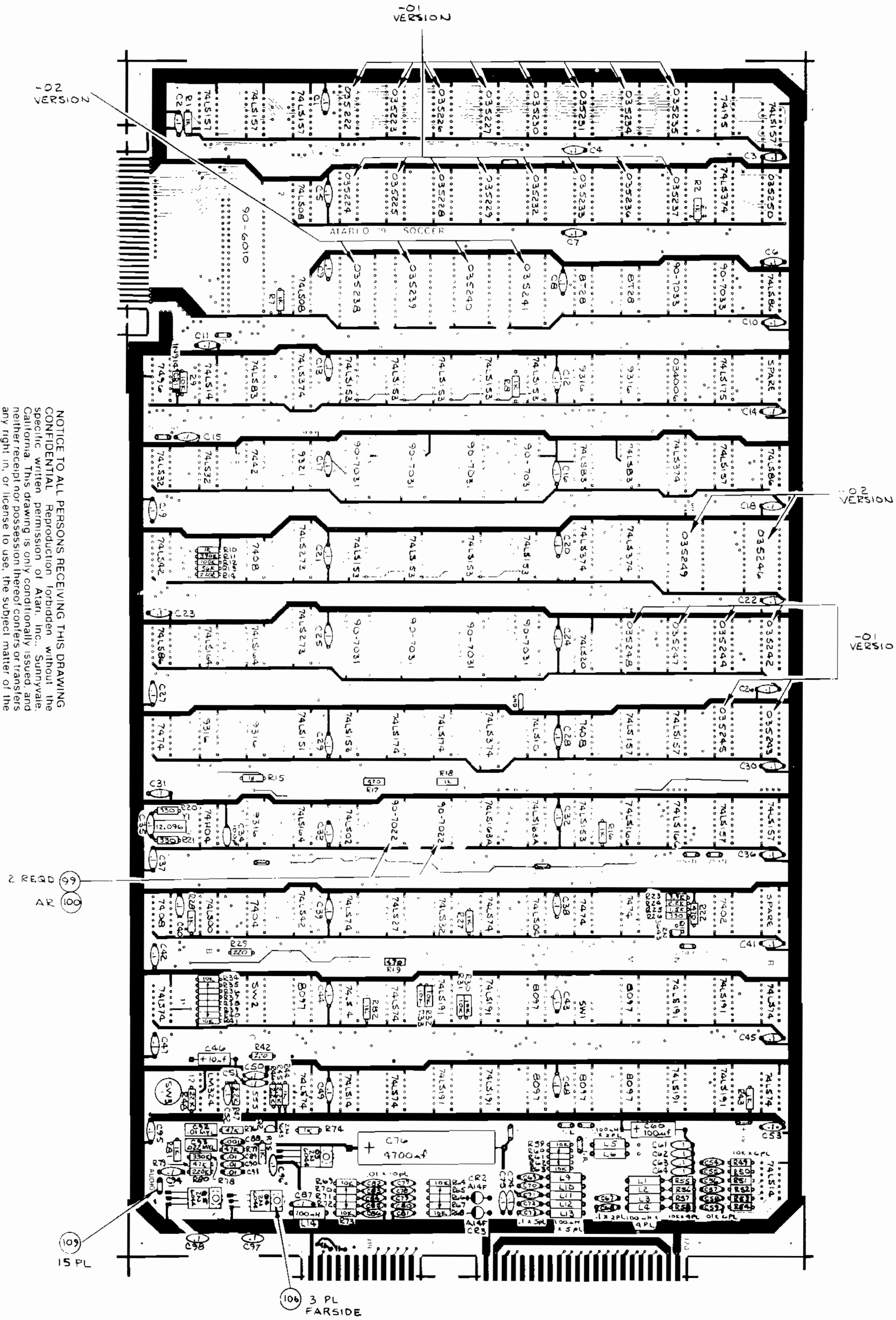

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Figure 22 Soccer Game PCB Assembly
A034905-01 and -02 A

Figure 22 Soccer Game PCB Assembly Parts List

Item	Part No.	Description (Ref. Designations and Locations in Bold)
3	100000-221	220 Ohm, ±5%, ¼W Resistor (**R29, 42**)
4	100000-331	330 Ohm, ±5%, ¼W Resistor (**R20, 21, 26**)
5	100000-471	470 Ohm, ±5%, ¼W Resistor (**R17, 19, 22**)
6	100000-102	1K Ohm, ±5%, ¼W Resistor (**R1, 2, 7, 8, 10, 15, 16, 18, 27, 28, 43, 44, 74, 75, 81, 82**)
7	100000-152	1.5K Ohm, ±5%, ¼W Resistor (**R25**)
8	100000-222	2.2K Ohm, ±5%, ¼W Resistor (**R24, 45-47**)
9	100000-392	3.9K Ohm, ±5%, ¼W Resistor (**R23**)
10	100000-103	10K Ohm, ±5%, ¼W Resistor (**R9, 30-41, 49-73**)
11	100000-223	22K Ohm, ±5%, ¼W Resistor (**R48**)
12	100000-473	47K Ohm, ±5%, ¼W Resistor (**R76, 77, 79**)
13	100000-563	56K Ohm, ±5%, ¼W Resistor (**R13**)
14	100000-104	100K Ohm, ±5%, ¼W Resistor (**R12**)
15	100000-224	220K Ohm, ±5%, ¼W Resistor (**R14, 80**)
16	100000-334	330K Ohm, ±5%, ¼W Resistor (**R78**)
17	100000-394	390K Ohm, ±5%, ¼W Resistor (**R11**)
21	21-101103	.01 μf, ±10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor (**C92**)
22	21-101223	.022 μf, ±10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor (**C93**)
25	24-250106	10 μf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor (**C46**)
26	24-250107	100 μf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor (**C60**)
27	24-250478	4700 μf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor (**C76**)
30	27-250102	.001 μf Ceramic-Disc 25V Radial-Lead Capacitor (**C88**)
31	27-250103	.01 μf Ceramic-Disc 25V Radial-Lead Capacitor (**C54-59, 77-86, 89-91**)
32	27-250104	.1 μf Ceramic-Disc 25V Radial-Lead Capacitor (**C1-33, 35-45, 47-53, 61-64, 67-75, 87, 94-98**)
35	28-101101	100 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor (**C34**)
39	31-1N914	75V 1N914 Switching Diode (**CR1**)
40	31-A14F	2.5 Amp. Miniature Axial-Lead High-Current Rectifier (**CR2, 3**)
44	34-2N3643	Type 2N3643 NPN Switching Transistor (**Q1, 2**)
45	34-2N6044	Type 2N6044 NPN Darlington Transistor (**Q3-5**)
49	37-74LS00	Type 74LS00 Integrated Circuit (**B10**)
50	37-7402	Type 7402 Integrated Circuit (**P10**)
51	37-74LS02	Type 74LS02 Integrated Circuit (**E9**)
52	37-7404	Type 7404 Integrated Circuit (**C10**)
53	37-74LS04	Type 74LS04 Integrated Circuit (**K10**)
54	37-74H04	Type 74H04 Integrated Circuit (**B9**)
55	37-7408	Type 7408 Integrated Circuit (**C6, L8, A10**)
56	37-74LS08	Type 74LS08 Integrated Circuit (**D2, D3**)
57	37-74LS10	Type 74LS10 Integrated Circuit (**K8**)
58	37-74LS14	Type 74LS14 Integrated Circuit (**B4, E11, E12, R13**)
59	37-74LS20	Type 74LS20 Integrated Circuit (**L7**)
60	37-74LS27	Type 74LS27 Integrated Circuit (**F10**)
61	37-74LS32	Type 74LS32 Integrated Circuit (**A5, B5, H10**)
62	37-7442	Type 7442 Integrated Circuit (**C5**)
63	37-74LS42	Type 74LS42 Integrated Circuit (**A6, D10**)
64	37-7474	Type 7474 Integrated Circuit (**A8, L10, M10**)
65	37-74LS74	Type 74LS74 Integrated Circuit (**E10, J10, A11, F11, R11, D12, F12, R12**)
66	37-74LS83	Type 74LS83 Integrated Circuit (**C4, L5, M5**)
67	37-74LS86	Type 74LS86 Integrated Circuit (**R3, R5, A7**)
68	37-7496	Type 7496 Integrated Circuit (**A4**)
69	37-74LS151	Type 74LS151 Integrated Circuit (**D8**)
70	37-74LS153	Type 74LS153 Integrated Circuit (**E4, F4, H4, J4, K4, E6, F/H6, H/J6, K6, E8, L9**)
71	37-74LS157	Type 74LS157 Integrated Circuit (**B1, C1, D1, R1, P5, M8, N8, P9, R9**)
72	37-74LS163A	Type 74LS163A Integrated Circuit (**J9, K9**)
73	37-74LS164	Type 74LS164 Integrated Circuit (**B7, C7, D9**)
74	37-74LS166	Type 74LS166 Integrated Circuit (**M9, N9**)
75	37-74LS174	Type 74LS174 Integrated Circuit (**F8, H8**)
76	37-74LS175	Type 74LS175 Integrated Circuit (**P4**)
77	37-74LS191	Type 74LS191 Integrated Circuit (**H11, J11, N11, P11, H12, J12, N12, P12**)

Figure 22 Soccer Game PCB Assembly, continued Parts List

Item	*Part No.*	*Description (Ref. Designations and Locations in Bold)*
78	37-74195	Type 74195 Integrated Circuit (**P1**)
79	37-74LS273	Type 74LS273 Integrated Circuit (**D6, D7**)
80	37-74LS374	Type 74LS374 Integrated Circuit (**P2, D4, N5, L6, M6, J8**)
81	37-9316	Type 9316 Integrated Circuit (**L4, M4, B8, C8, C9**)
82	37-9321	Type 9321 Integrated Circuit (**D5**)
83	37-8T28	Type 8T28 Integrated Circuit (**L3, M3**)
84	37-8097	Type DM8097N Integrated Circuit (**D11, K11, M11, K12, L12, M12**)
85	37-555	Type 555 Integrated Circuit (**C12**)
86	37-LM324	Type LM324 Integrated Circuit (**B12**)
90	41-3003	100 μH, ±5%, Hot-Molded Plastic Fixed R.F. Choke (**L1-6, 9-14**)
94	62-001	SPST Pushbutton Switch (**A12**)
95	66-114P1T	4-Station Single-Throw, Dual-Inline-Package Bit Switch (**L11**)
96	66-118P1T	8-Station Single-Throw, Dual-Inline-Package Bit Switch (**C11**)
99	035326-01	Heat Sink (**F9, H9**)
100	78-13016	Tra-Bond Cement for Heat Sink
103	79-42C40	40-Contact Medium-Insertion-Force IC Socket (**C2/3**)
106	81-4302	Nylon Snap-In Fastener (for Item 45)
109	020670-01	Test Point
112	90-102	12.096 MHz, ±.005%, Crystal (**Y1**)
115	90-6010	Microprocessor (**C2/3**)
116	90-7022	Random-Access Memory (**F9, H9**)
117	90-7031	Random-Access Memory (**E5, F/H5, H/J5, K5, E7, F/H7, H/J7, K7**)
118	90-7033	Random-Access Memory (**N3, P3**)
122	034006-01	Programmable Read-Only Memory—Sync (**N4**)
123	035250-01	Programmable Read-Only Memory—Alphanumerics (**R2**)

For remaining memory components and their part numbers, see next page.

Figure 22 Soccer Game PCB Assembly, continued Parts List

Memory Components and Their Equivalents (Locations Shown in Bold)

-01 P.C. Boards (PROMs)	Alternate -01 P.C. Boards (PROMs)	-02 P.C. Boards (ROMs)
035222-01 **E1**	035251-01 **E1**	035238-01 **E3**
035223-01 **F1**		
035224-01 **E2**	035252-01 **E2**	
035225-01 **F2**		
035226-01 **H1**	035253-01 **H1**	035239-01 **F3**
035227-01 **J1**		
035228-01 **H2**	035254-01 **H2**	
035229-01 **J2**		
035230-01 **K1**	035255-01 **K1**	035240-01 **J3**
035231-01 **L1**		
035232-01 **K2**	035256-01 **K2**	
035233-01 **L2**		
035234-01 **M1**	035257-01 **M1**	035241-01 **K3**
035235-01 **N1**		
035236-01 **M2**	035258-01 **M2**	
035237-01 **N2**		
035242-01 **R7**	035259-01 **R7**	035246-01 **R6**
035244-01 **P7**		
035243-01 **R8**	035260-01 **R8**	
035245-01 **P8**		
035247-01 **N7**		035249-01 **N6**
035248-01 **M7**		

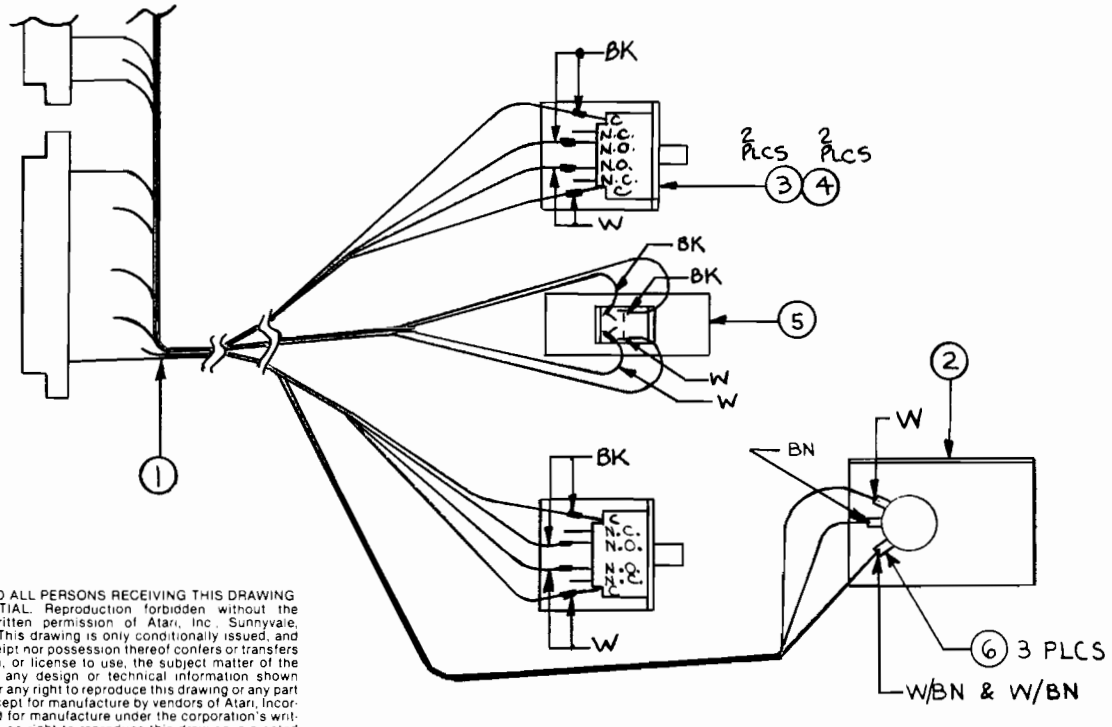

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Figure 23 Main Harness and Component Assembly A035194-01 A Parts List

Item	*Part No.*	*Description*
1	A035193-01	Main Harness
2	A030169-02	Volume Control Bracket Assembly
3	68-002	Interlock Switch (2 per game)
4	000268-02	Interlock Switch Mounting Bracket
5	A034631-01	On/Off Switch Assembly

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