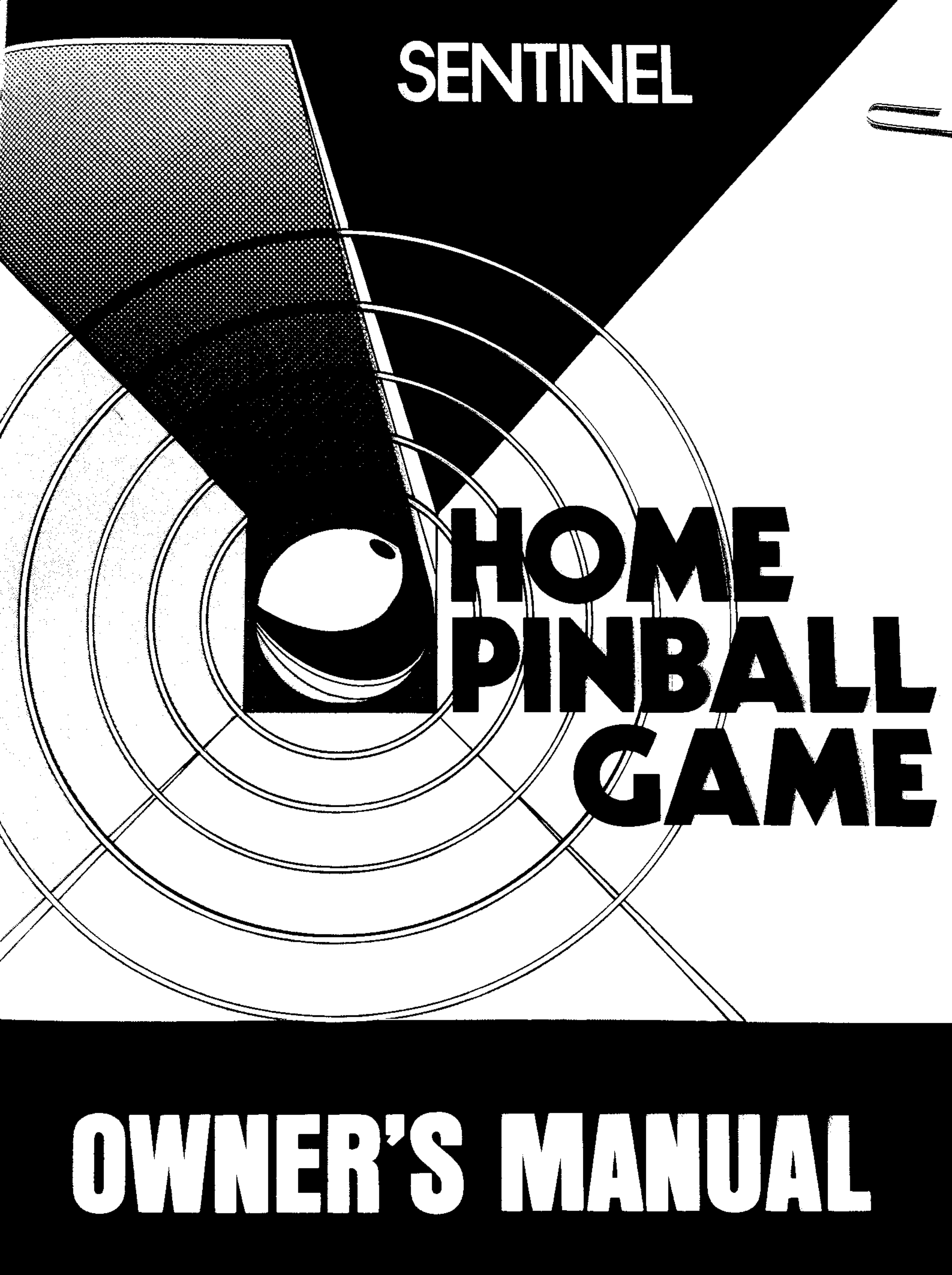




SENTINEL

**HOME
PINBALL
GAME**

OWNER'S MANUAL

MODEL NUMBER		SERIAL NUMBER		INSPECTION	
		2315			
FINAL ELECTRICAL		FINAL MECHANICAL			
		"			
FINAL CABINET					
4347K101 F					
DATE UNPACKED BY DEALER			FINAL PERFORMANCE		
			1004		
IBM WS446B					

The Model and Serial Number of your Sentinel Inc. home pinball game will be found on the back of the vertical cabinet assembly. Please record this Model and Serial Number in the space provided below.

Model Number _____

Serial Number _____

WARNING — TO PREVENT DAMAGE WHICH MAY RESULT IN FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR EXCESSIVE MOISTURE

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CAUTION: BEFORE ATTEMPTING ASSEMBLY OR DISASSEMBLY OR BEFORE PERFORMING ANY MAINTENANCE OR SERVICE ON YOUR MACHINE, DISCONNECT THE ELECTRICAL CORD FROM THE ELECTRICAL OUTLET AND LEAVE IT DISCONNECTED UNTIL THE MACHINE HAS BEEN COMPLETELY RE-ASSEMBLED.

SECTION I: UNPACKING AND ASSEMBLY INSTRUCTIONS

UNPACKING: When unpacking your Home Pinball Game, use caution not to scratch or damage any of the cabinet, panels, or other materials. Do not throw away any of the packing materials until the machine is completely assembled as some small items are packaged within small inner cartons.

HARDWARE LIST: Make sure the hardware listed below is complete.

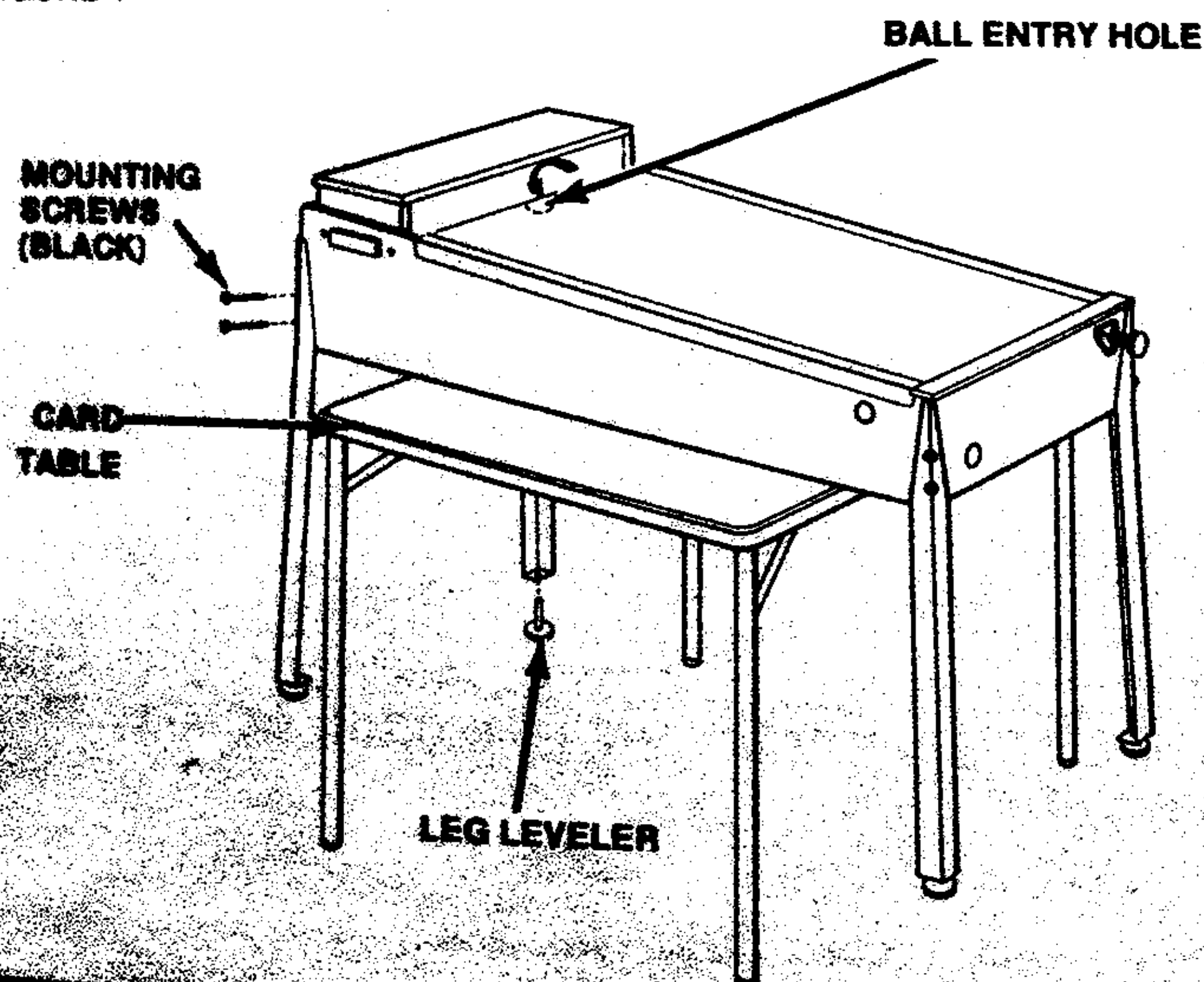
Description	Part Number	Quantity
Horizontal Cabinet Assembly		1
*Vertical Electronics Assembly		1
Vertical Cabinet	697981-2	1
Vertical Panel	644034	1
Black Rail	798199-5157	1
Legs	733364-1	4
Legs Levelers	121631-1	4
Steel Game Ball	733356-1	1
**Leg Mounting Screws (Black)	103350-1801	8
**Vertical Cabinet Mounting Screws (Brown)	103349-701	4
Plastic Sleeves		2
Rubber Bumpers (Extra)		2

*Mounted inside the Horizontal Cabinet Assembly

**May be either in hardware bag or in final position on cabinet

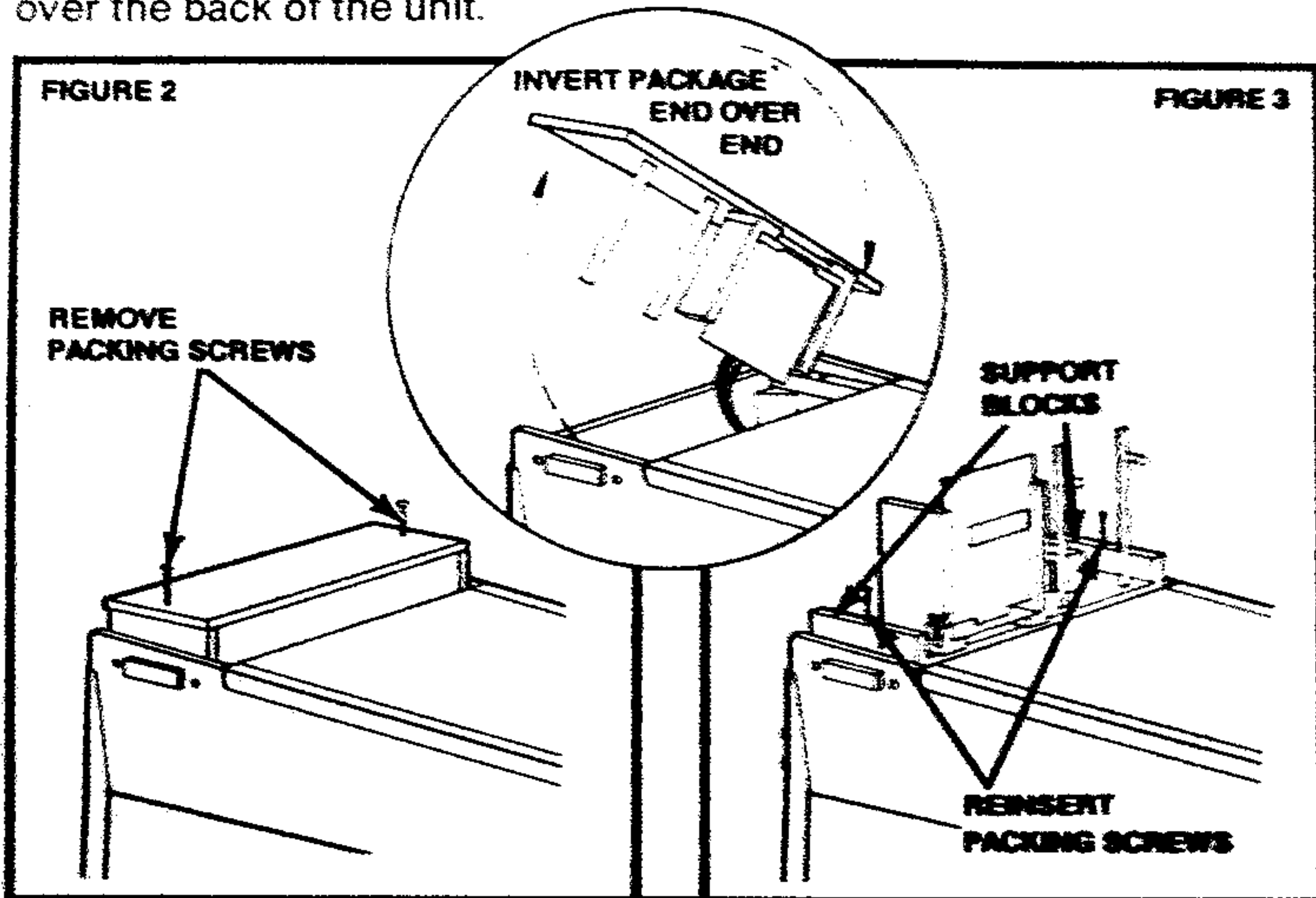
ASSEMBLY: Take the four leg levelers and screw one into each of the four legs to approximately the same depth. Place the Horizontal Cabinet across a card table or other small table (refer to Figure 1). Securely fasten a leg to each corner of the Horizontal Cabinet using two of the large, black Phillips screws which may be either in place in the leg mounting holes on the cabinet or in the hardware bag. After legs are

FIGURE 1

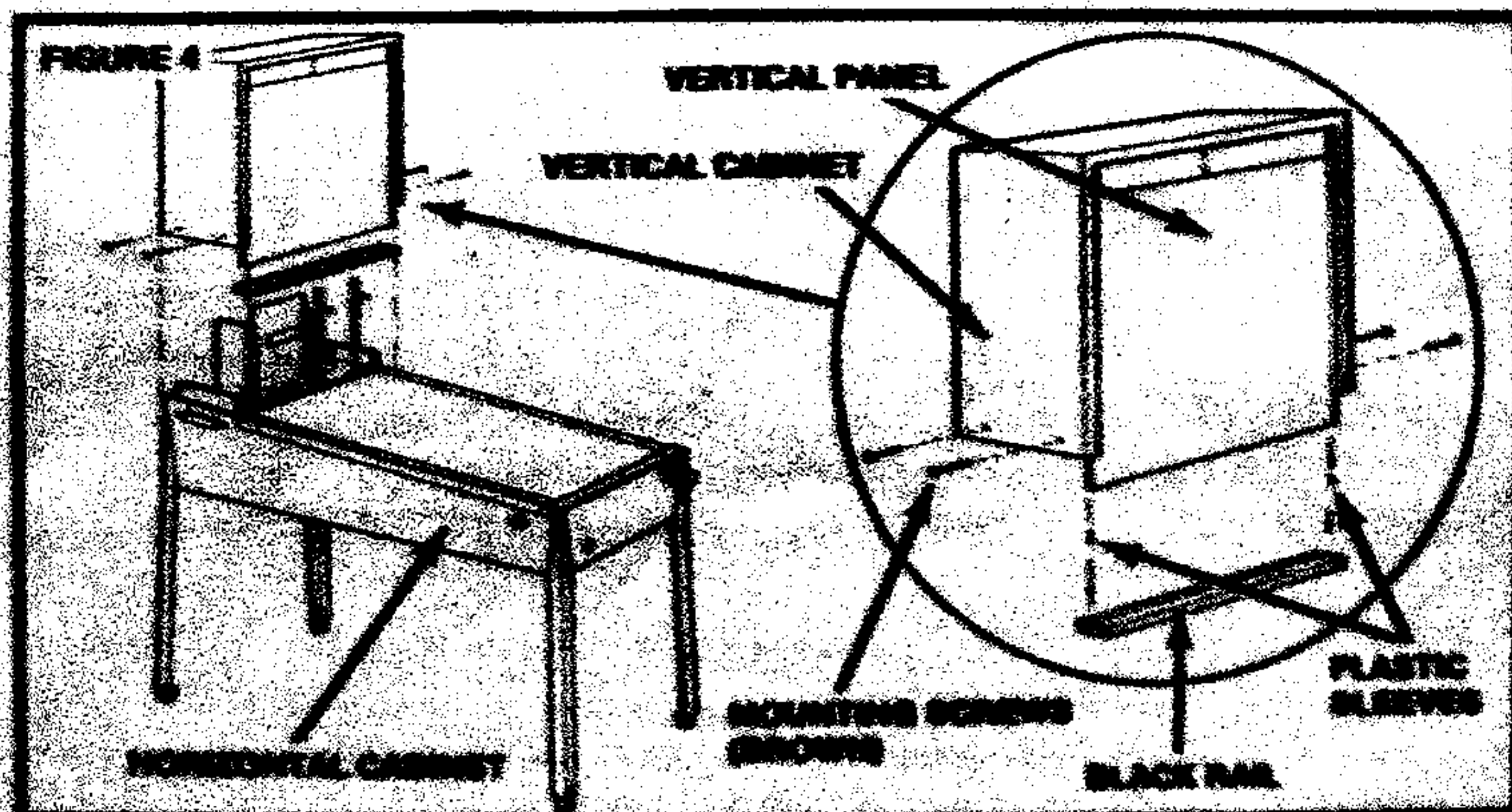


mounted securely move the cabinet from the table to the floor. Now take the Steel Game Ball, clean it thoroughly with a dry cloth, and insert in the Horizontal Cabinet through the hole located at the back rail of the Playing Surface (refer to Figure 1).

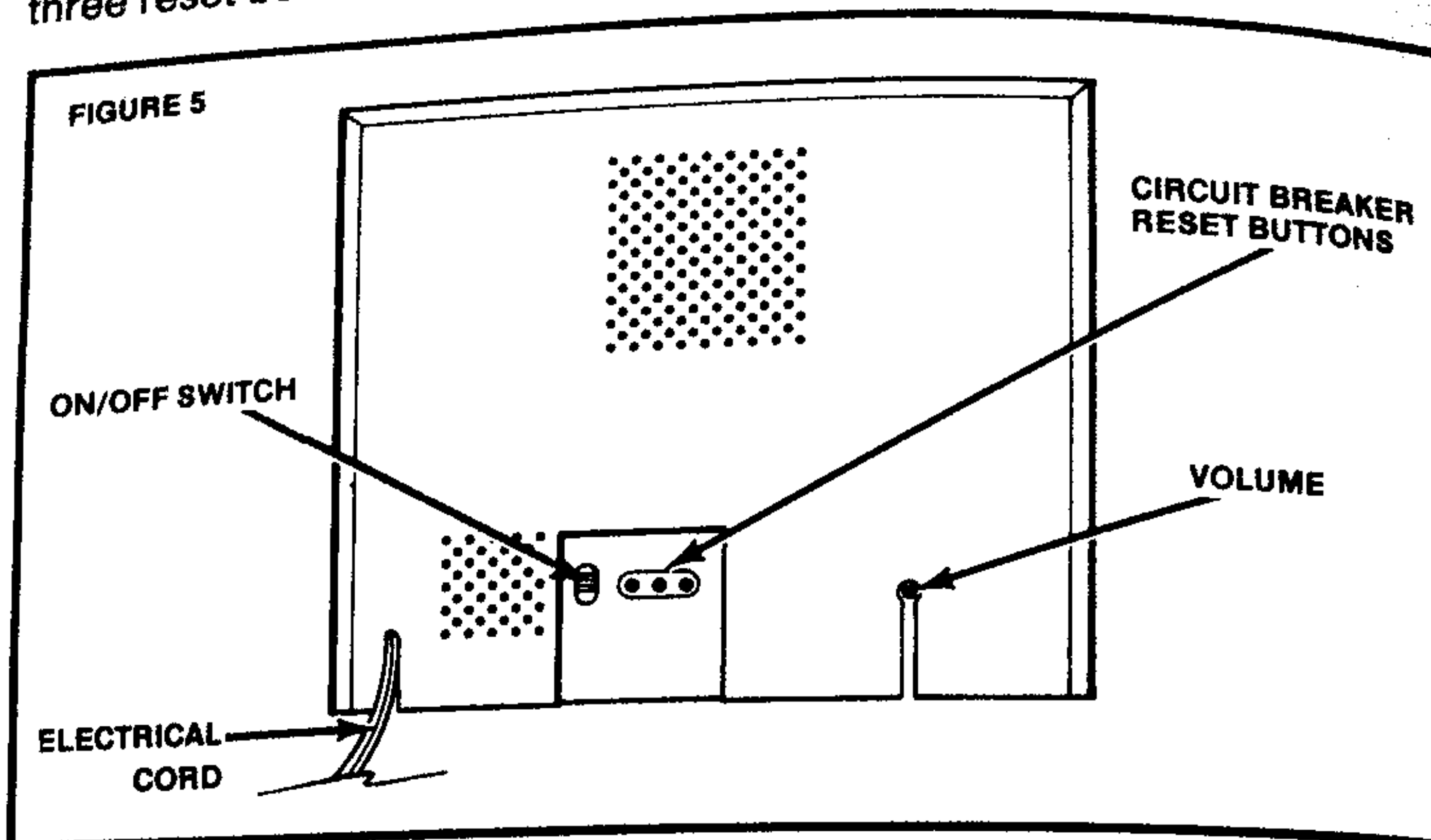
To mount the Vertical Electronics Assembly, refer to Figures 2 and 3. Remove the packing screws and support blocks (do not throw away) and invert the package end over end. Use caution not to entangle the wiring. Place the Vertical Electronics Assembly on the upper end of the Horizontal Cabinet. Reinsert the packing screws thru the support blocks and Vertical Panel to secure the Vertical Electronics Assembly. Make sure the electronics wiring plug is firmly seated. Drape the A.C. cord over the back of the unit.



Remove the plastic protective coating from the horizontal and vertical plexiglass panels. Next lay the Vertical Cabinet on its side (refer to Figure 4) and slide the Vertical Panel (printed side out) into the slots. Then insert the plastic sleeves (one on each side) into the slots in the Vertical Cabinet so that the Vertical Panel will be held securely during assembly. Then insert the black rail at the bottom of the Vertical Panel. Make sure the vertical plexiglas panel is in the groove on the top of the black rail. Place the Vertical Cabinet over the Vertical Electronics Assembly and thread the electrical cord through the slot on the Vertical Cabinet back. Insert the four brown mounting screws which may be either in place in the cabinet or in the hardware bag — two on each side.

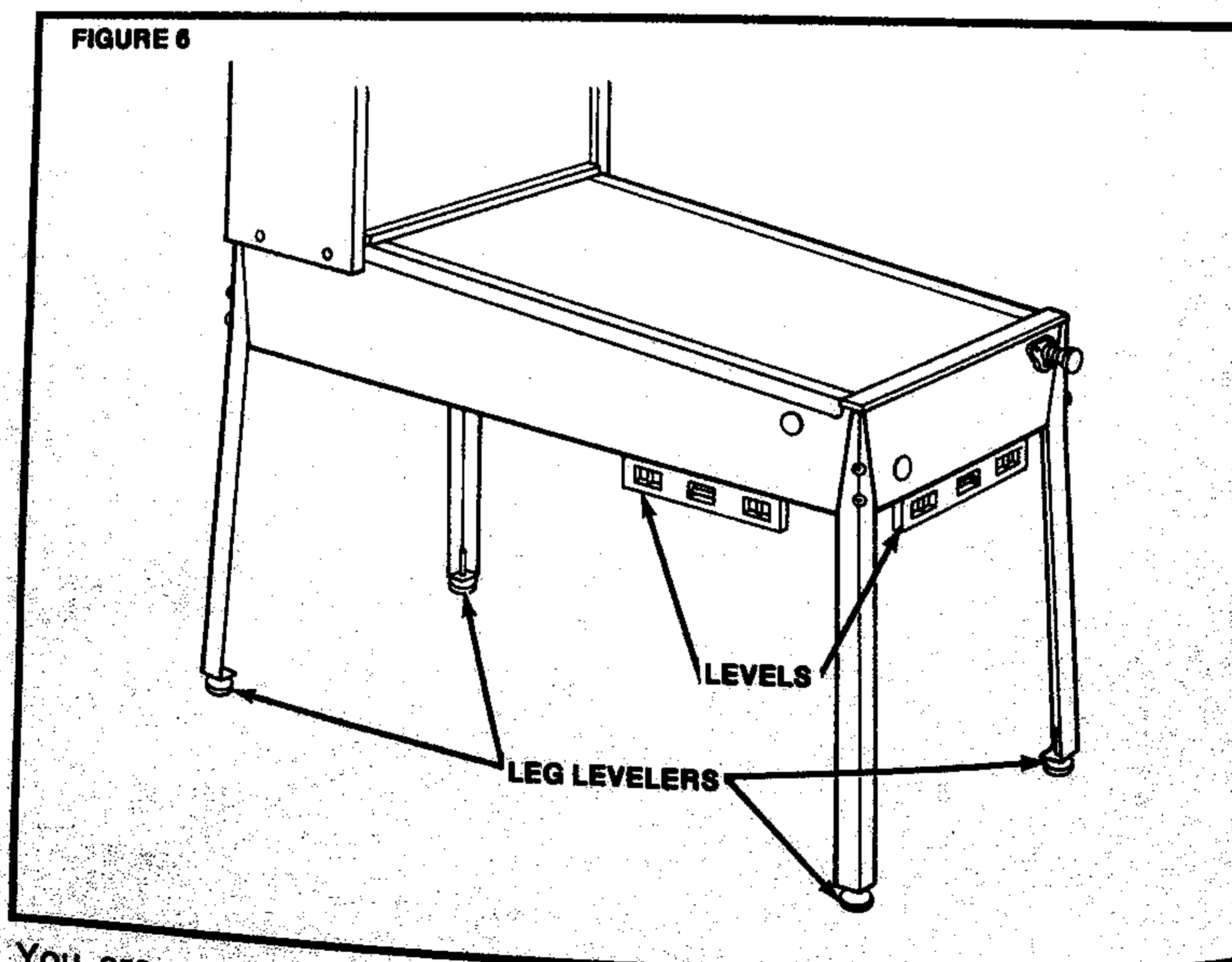


Next, plug the electrical cord into an electrical wall outlet, depress the three reset buttons (refer to Figure 5) and turn on the on/off switch.



Then observe the alignment of the Vertical Panel in relationship to the display lights. If they are not aligned, slide the Vertical Panel to either the left or right to properly align the display lights with the Vertical Panel.

To level your Home Pinball Game, refer to Figure 6. Place the game in its playing position. Place a level on the bottom front edge of the Horizontal Cabinet and level from side to side by adjusting the levelers in the legs. Then place the level on the bottom side edge and level from front to back. Repeat for the other side. For best operation your pinball machine must be properly leveled.



You are now ready to play. Refer to Section II for "How to Play" instructions.

SECTION II: BASIC OPERATION

HOW TO PLAY (Refer to Figure 7)

First, plug your Home Pinball Game electrical cord into an electrical outlet and turn on the power switch located on the back of the Vertical Cabinet.

Push the reset button located on the front panel of the Horizontal Cabinet. This releases the Steel Game Ball into the shooting position, sets the electrical scoring to zero, and advances the ball indicator to one.

Pull back the ball shooter and release it to shoot the ball onto the Playing Surface. Once the ball is on the Playing Surface, scoring begins. There are numerous ways to score (from 100 points for hitting a bumper to bonus scoring for rolling in the special hole in the center of the Playing Surface), and the object of the game is to score as many points as possible.

The flippers located at the bottom of the Playing Surface are used to keep the ball in play. Depressing either of the buttons (located on the right and left side of the Horizontal Cabinet) will operate both flippers.

There is a free ball slot on the right side of the Playing Surface and a lost ball slot on the left. When a ball is lost, the next ball is automatically released to the shooting position and the ball counter is advanced by one. When the third ball is lost, the ball counter advances to "game over". To Start a new game, simply depress the reset button.

Improper leveling may cause the ball speed to be excessively fast or slow. Excessive ball speed may cause erratic scoring from the roll over switches causing them to register 0 or 1000 instead of 2000. Excessive slowness may cause failure to score from thumpers and bumpers even when there is action present. Some individuals like to jiggle the machine to put speed or "English" on the ball. Excessive speed or "English" caused from jiggling may also cause erratic scoring. This is part of the competitive aspects of playing your Home Pinball Game.

Your Home Pinball Game includes a tilt feature. Excessive movement of the machine will cause it to "tilt" and scoring will stop for the ball in play. The tilt feature resets when the next ball is released to the shooting position.

As scoring occurs, four different sounds are heard. The loudness of these sounds may be raised or lowered by adjusting the volume control located on the back of the vertical cabinet (refer to Figure 5).

HOW IT WORKS (Refer to Figure 7)

This section explains how the game actually operates so that the maintenance section of this manual is easier to understand.

Basically, your Home Pinball Game is made up of transistors, switches, solenoids and lights that operate on low voltage. The game has three main operating sections: 1) The Vertical Electronics Assembly, 2) The Playing Surface, and 3) The Player Controls. Each of these sections is explained below.

Vertical Electronics Assembly (Scoring)

The Vertical Electronics Assembly receives power from the transformer and power supply which convert the alternating current power from the wall outlet to direct current power. The transformer and power supply are protected by three resettable circuit breakers which help prevent overload. The power supply also delivers low voltage power to the Playing Surface that operates all transistors (14 volts), solenoids (34 volts), and lights (5.5 volts). The ball rolling on the Playing Surface will close various switches that send signals to the Vertical Electronics Assembly. These wires are combined into a wiring harness. The wiring harness is connected to the Vertical Electronics Assembly by a wiring plug.

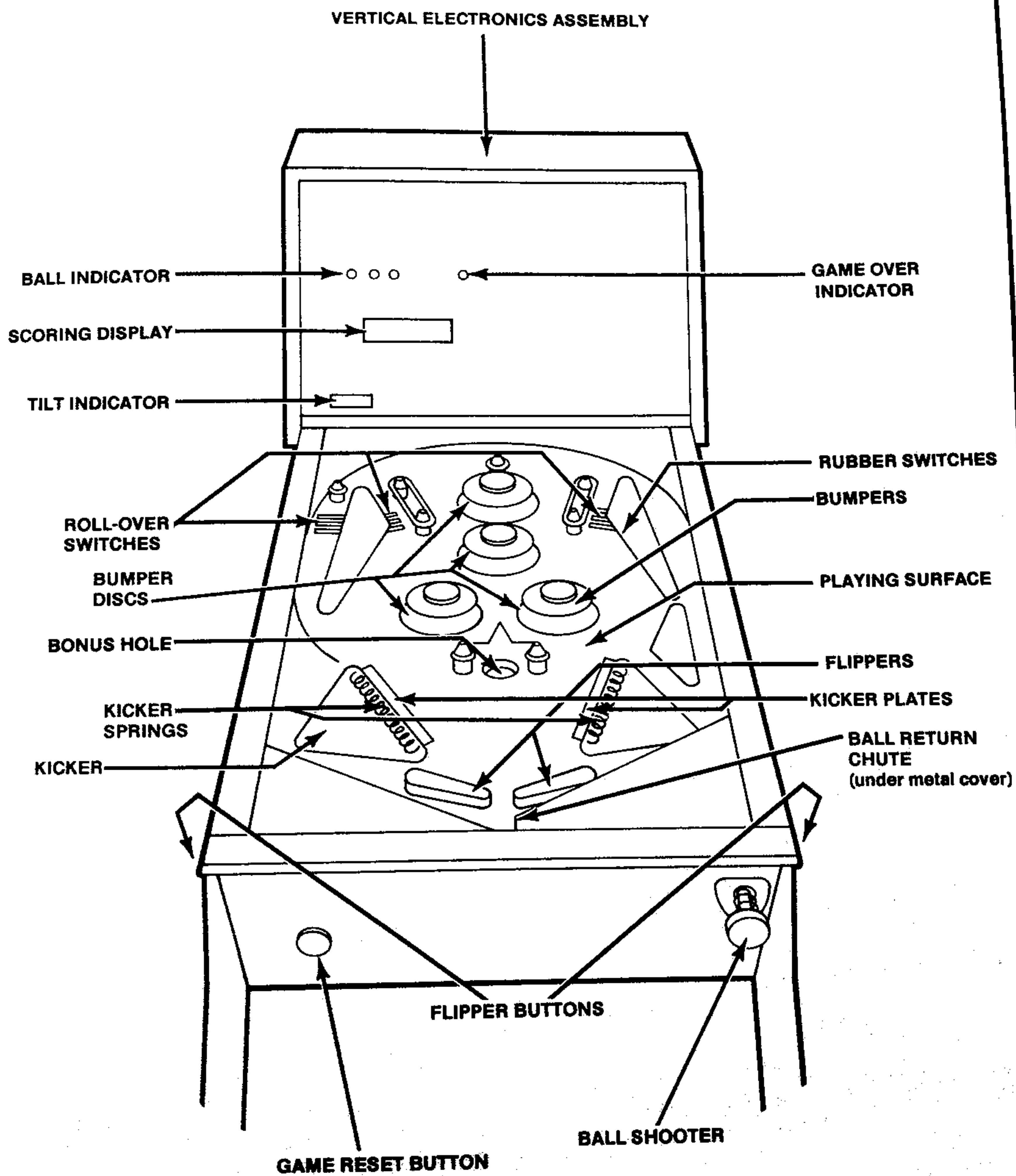
Playing Surface

The Playing Surface contains all the parts that cause scoring and ball action. When the ball hits one of the bumpers or kickers, a transistor is energized, sending a signal to the appropriate solenoid. The solenoid mechanically reacts to move the ball away. At the same time, a signal is sent through the wiring harness to the Vertical Electronics Assembly which increases the total score by the appropriate amount. The Roll-Overs and Rubber Band Switches do not activate solenoids but do send a scoring signal to the Vertical Electronics Assembly. Your Home Pinball Game has two bonus scoring features. The first is a roll-over feature on the left side of the Playing Surface that triggers a special scoring circuit. The second is a bonus-hole in the center of the Playing Surface that triggers another special circuit. When scoring is over, the circuit triggers a solenoid that kicks the ball out of the hole.

Player Controls

The Player Controls are located on the outside of the Horizontal Cabinet, and they are the Game Reset Button, the two Flipper Buttons and the Ball Shooter. They are mechanically operated by the player and operate solenoids or energize transistors. Depressing the Game Reset Button automatically sets electronic circuits that trigger a solenoid to kick the ball into shooting position, resets the scoring to zero, and advances the ball indicator to number one. The Ball Shooter applies force directly to the ball. Depressing either Flipper Button closes a switch that causes the flipper solenoid to move both flippers.

FIGURE 7



SECTION III: OWNER MAINTENANCE AND SERVICE

Owner Maintenance on your Home Pinball Game is very important. Because there is a great amount of activity on the playfield your Home Pinball Game requires regular cleaning, lubrication and replacement of worn or broken parts. Please read the following section carefully and keep it handy for future reference.

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OWNER MAINTENANCE

The switches used for initiating scoring, sound and action are of an inert type which is extremely reliable because it has no moving parts other than the steel ball which makes contact when it rolls over these switches. Because the ball and the switches become coated with a film of microscopic dust, it is necessary to clean the complete playfield periodically. Special attention must be given to cleaning the metal foil kicker plates, bumper discs, rollover switches, kicker springs, the steel ball and the ball return chute. (See figure 7, page 7 for location of these parts.) Use a clean cloth slightly moistened in Isopropyl Alcohol (**CAUTION: Do not saturate cloth as excessive wetting with alcohol could damage the adhesive which holds the switches to the playfield surface**).

The playing surface plexiglas cover, the vertical panel, the cabinet and trim parts can be cleaned with a soft, damp cloth. Cleaners using ammonia, solvents, detergents and glass cleaners could cause damage and should not be used.

As a result of a great deal of rollover, kicker and thumper activity the disc and plate switches may tend to pull away from the playfield surface. If this does occur push them firmly down so that adhesive makes contact and holds them in place. In extreme cases it may be necessary to use a few drops of one of the fast drying liquid glues now on the market to permanently reattach the foil to the playfield surface.

Light bulbs are subject to damage from a mechanical jar which can be transmitted during play or during shipment resulting in a broken filament. If a light bulb fails to operate make sure it is fully seated in the socket. If it must be replaced identify it by the number stamped on it, 455, 1847 or 1892. These bulbs may be obtained from any electronic parts store or servicer — just ask for them by number. Bulbs may also be ordered from the manufacturer as indicated in the order instruction in your owners manual.

Periodic lubrication of the ball shooter and to the moving parts located under the playfield surface will improve the crispness of ball shooting and surface activity. The flipper linkages and the solenoid linkages make up the moving parts underneath the playfield surface. Use a light weight machine oil only, do not use aerosol can lubricants as the aerosol carrier can cause damage to some of the plastic parts.

Worn rubber bumpers may be replaced at any time you feel that they are affecting the play. Two of these bumpers are included in the hardware list with each machine.

OWNER SERVICE SUGGESTIONS

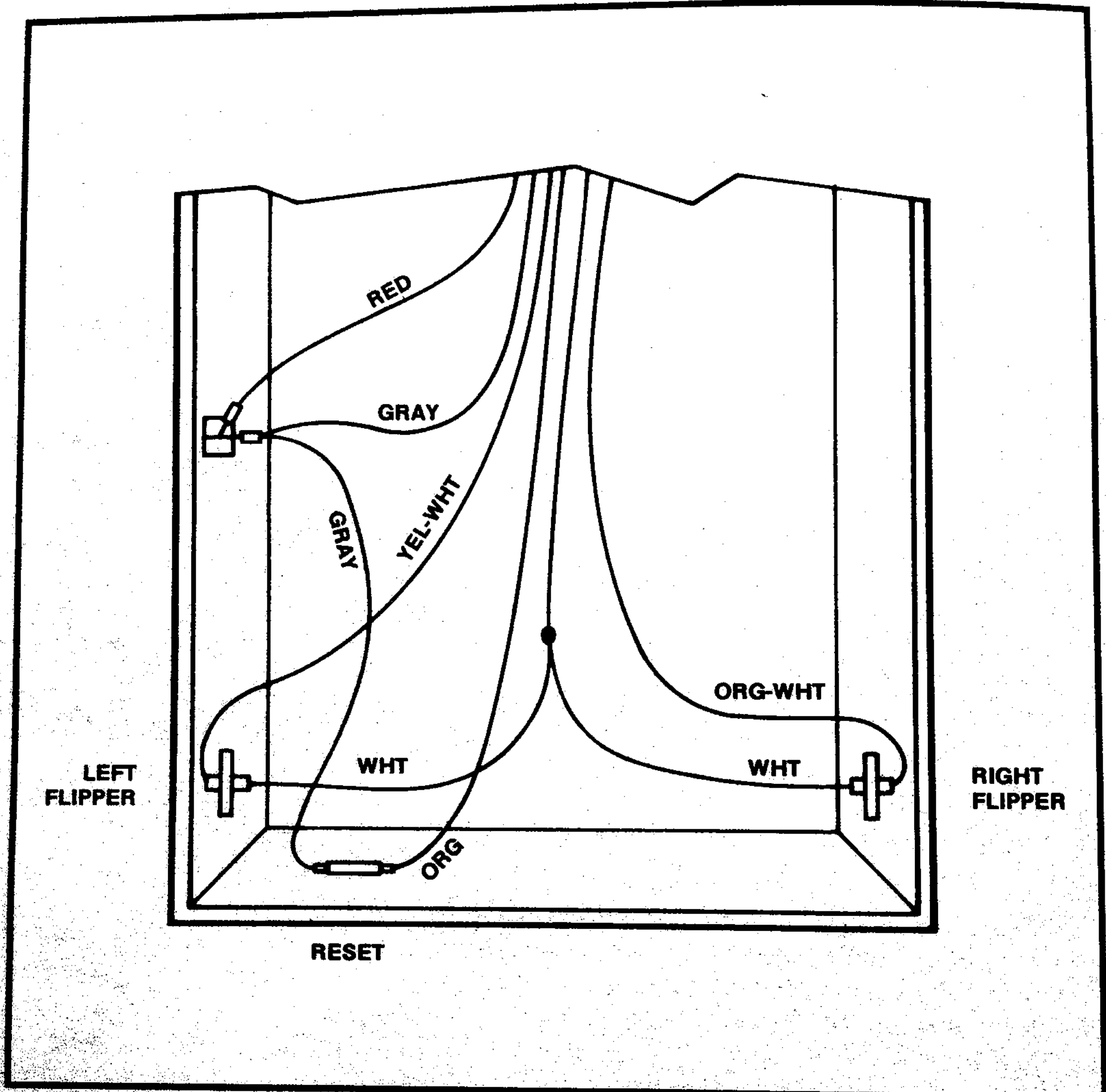
Following are service suggestions for items that may be easily identified and serviced in your home. Preceding these suggestions are procedures for gaining access to the various areas of the machine. A number of possible problem symptoms are listed and each is followed by a list of suggested solutions.

To Gain Access to the Vertical Electronics Assembly, remove the four brown mounting screws (two on each side) from the Vertical Cabinet and carefully lift the cabinet from the Vertical Electronics Assembly. See Figure 4 on Page 3.

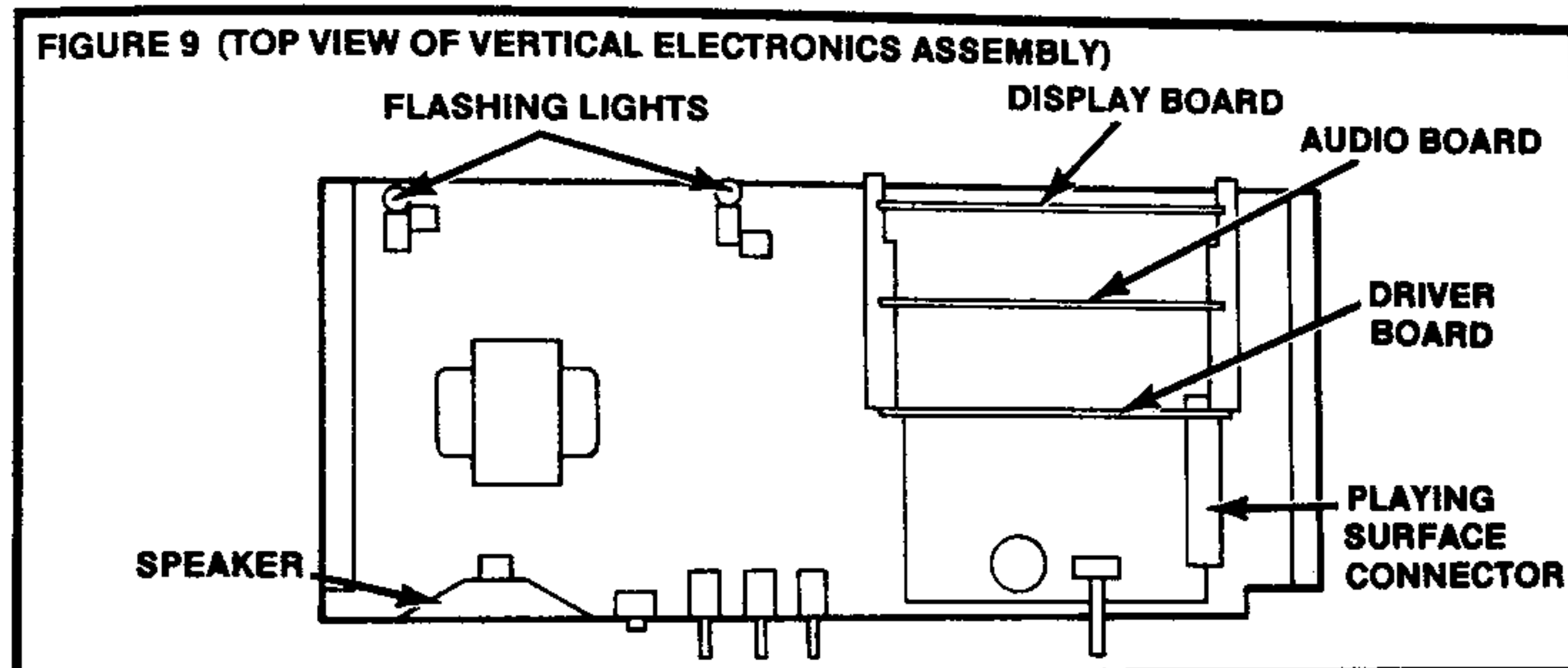
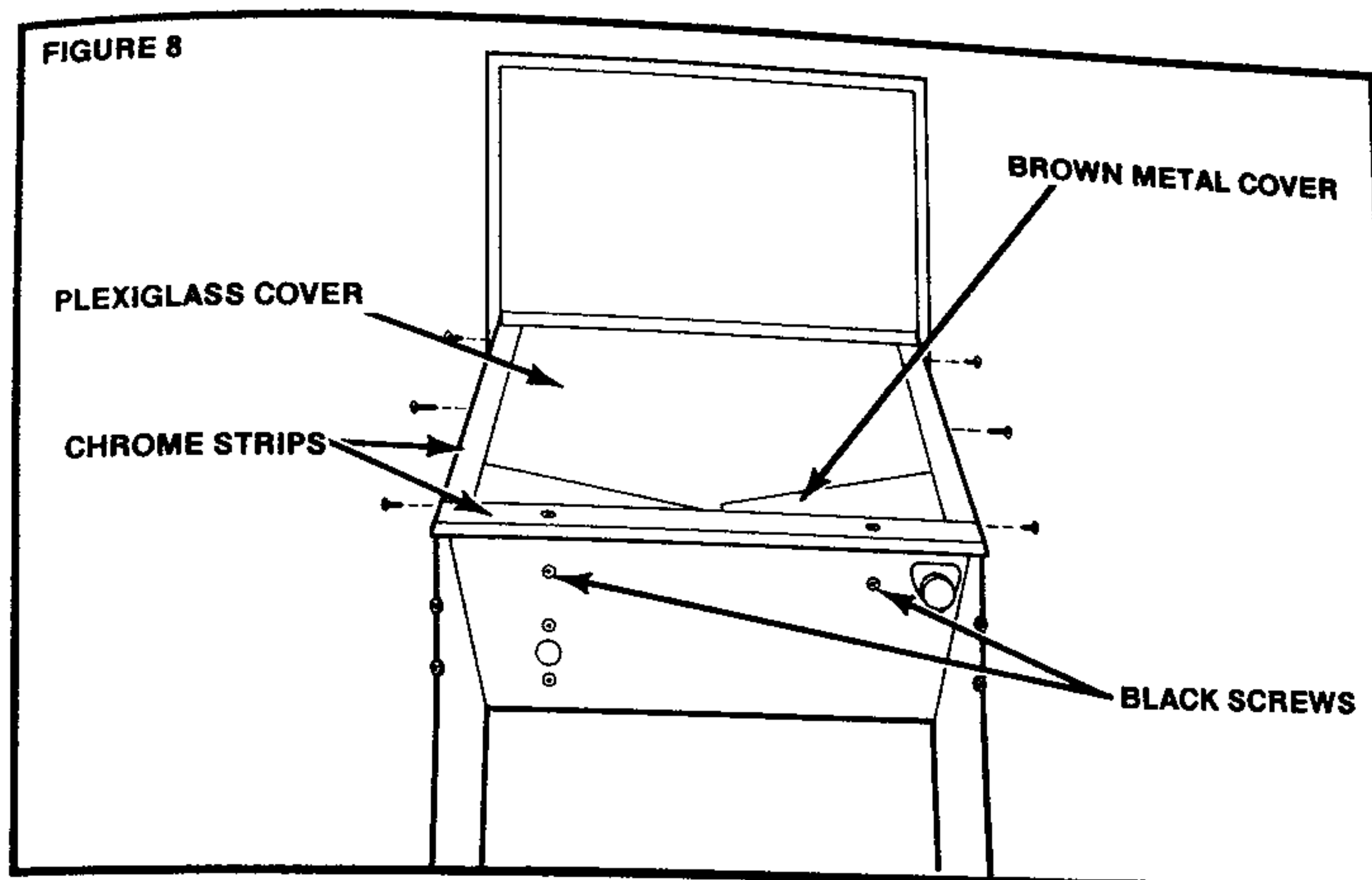
To Gain Access to the Playing Surface, remove the trim strip at the lower end of the Horizontal Cabinet. Remove the trim strips from each side of the Horizontal Cabinet and lift the Plexiglass cover off. Use caution not to scratch the cover. See Figure 8 on Page 11.

To Gain Access to the Underneath Side of the Playing Surface, repeat the above step. Then remove the brown metal cover and set aside. Remove the two black screws from the front of the Horizontal Cabinet. Carefully lift the Playing Surface Assembly and turn up on side using caution not to pull loose any of the slip-on connectors. See Figure 8 on Page 11.

**WIRING DIAGRAM and COLOR CODE
for QUICK DISCONNECT CLIPS**



**MAKE SURE THAT WIRES ARE ALWAYS RE-CONNECTED
ACCORDING TO THIS WIRING DIAGRAM.**



Service Suggestions:

(Disconnect the electrical cord from the wall outlet)

1. No lights, scoring, or solenoid action.
 - a. Make sure electrical cord is firmly plugged into wall.
 - b. Check on/off switch (Figure 5, Page 4).
 - c. Depress all (3) circuit breaker reset buttons. (Fig. 5, Page 4)
 - d. Check electrical outlet for power by plugging a known working appliance into the same outlet.
2. All white lights not working.
 - a. Depress circuit breakers (Figure 5, Page 4).
3. Any one white light not working.
 - a. Check bulb to see if it is fully inserted by pushing down on the bulb and twisting clockwise.
 - b. Replace bulb. Remove bulb by pushing down on the bulb and twisting counterclockwise.
4. White lights on Playing Surface not working.
 - a. Check Playing Surface connector in Vertical Electronics Assembly to see if it is fully inserted (Figure 9, Page 11).

5. Bumpers, flippers and kickers not working.
 - a. Depress circuit breakers (Figure 5, Page 4).
 - b. Check Playing Surface connector in Vertical Electronics Assembly to see if it is fully inserted (Figure 9, Page 11).
6. Any one or all bumpers or kickers not working but flippers okay.
 - a. Reseat Driver Board in Vertical Electronics Assembly (Figure 9, Page 11).
7. Any one bumper, kicker or flipper not working.
 - a. Check for loose connections underneath the Playing Surface.
8. All white lights, bumpers, kickers, and flippers not working.
 - a. Check Playing Surface connector in Vertical Electronics Assembly to see if it is fully inserted (Figure 9, Page 11).
9. Scoring, ball number indicator, sound, bumpers and kickers not working.
 - a. Depress circuit breakers (Figure 5, Page 4).
10. Will not reset or tilt.
 - a. Check Playing Surface connector in Vertical Electronics Assembly to see if it is fully inserted (Figure 9, Page 11).
11. Will not tilt or stays tilted.
 - a. Reseat Display Board (Figure 9, Page 11).
 - b. Recheck leveling of machine.
12. Bumper(s), kicker(s) or flipper(s) operate with no ball action and circuit breaker trips.
 - a. Reseat Driver Board (Figure 9, Page 11).
13. No sound or hum in sound.
 - a. Check volume control (Figure 5, Page 4).
 - b. Check speaker connections (Figure 9, Page 11).
 - c. Reseat Audio Board (Figure 9, Page 11).
14. All or some scoring numbers missing or scoring incorrectly.
 - a. Reseat Display Board (Figure 9, Page 11).
15. Will not return ball.
 - a. Depress circuit breakers.
 - b. Reseat Display Board (Figure 9, Page 11).
16. Will not count balls or counts incorrectly.
 - a. Reseat Display Board (Figure 9, Page 11).
17. No scoring from hole or special roll-over.
 - a. Reseat Audio Board (Figure 9, Page 11).
18. Ball will not kick out of hole or hole kicker stays on.
 - a. Reseat Audio Board (Figure 9, Page 11).
19. Nothing on Playing Surface works except lights, flippers and hole.
 - a. Check Playing Surface connector in Vertical Electronics Assembly to see if it is fully inserted (Figure 9, Page 11).

- b. Replace Display Board (Figure 9, Page 11).
- 20. Scoring or Ball Counter will not reset.
 - a. Replace Display Board (Figure 9, Page 11).
- 21. If roll over switch scoring becomes erratic or intermittent, carefully repeat machine leveling instructions on page 4. If the problem persists, clean all three roll over switches (Figure 7, Page 7) with a clean pencil eraser. Carefully remove all remaining dust and dirt.
- 22. Occasionally the ball may fail to seat itself properly in the ball return chute. When this occurs the ball will fail to return automatically. This problem can usually be corrected by giving the machine a sharp rap with your hand to the trim strip along the top edge of the Horizontal Cabinet end nearest you.
- 23. Retain all extra parts from hardware kit for future replacement.
- 24. If in following the general maintenance and service suggestions you detect a defective part or component, refer to Section No. IV for description and part number.
 - 1. If the game is still under the 90-day parts warranty, refer to the warranty service instructions contained in the Limited Warranty on the inside back cover of the Owner Manual for instructions on ordering replacement parts.
 - 2. If the 90-day warranty has expired, disregard the proof of purchase required for in warranty machines. Enclose your mailing address and authorize a C.O.D. shipment.
- 25. If all general maintenance and service instructions have been carefully followed and your Home Pinball Game still malfunctions, refer to the warranty service instructions on the inside back cover of the Owners Manual.

SECTION IV: SERVICE PARTS

Item	Description	Part Number	Quantity Used
1	Audio Board	702602-1	1
2	Driver Board	702603-1	1
3	Display Board	702604-1	1
Light Bulbs			
4	Flashing Lights (V.E.A.)*	181265-1	2
5	Flashing Bumper Lights (P.S.)*	181265-1	2
6	Other Bumper Lights (P.S.)	180161-17	2
7	Decorative Lights (P.S.)	180161-17	4
8	Steel Game Ball	733356-1	1
9	Rubber Bumper (5/16 inch)	644031-2	4
10	Rubber Bumper (1 1/2 inch)	644031-1	2
11	Rubber Bumper (2 1/2 inch)	644031-3	1
12	Rubber Bumper (5 inch)	644031-4	2
13	Flipper Rubber Bumper	644032-1	2

*V.E.A. — Vertical Electronics Assembly

P.S. — Playing Surface

PARTS CENTER LOCATIONS

7500 Frontage Road
Skokie, Illinois 60077

1898 Leland Drive
Marietta, Georgia 30067

14094 Detroit Road
Westlake, Ohio 44145

159 E. Union Avenue
E. Rutherford, New Jersey 07073

2649 Maricopa Street
Torrance, California 90503