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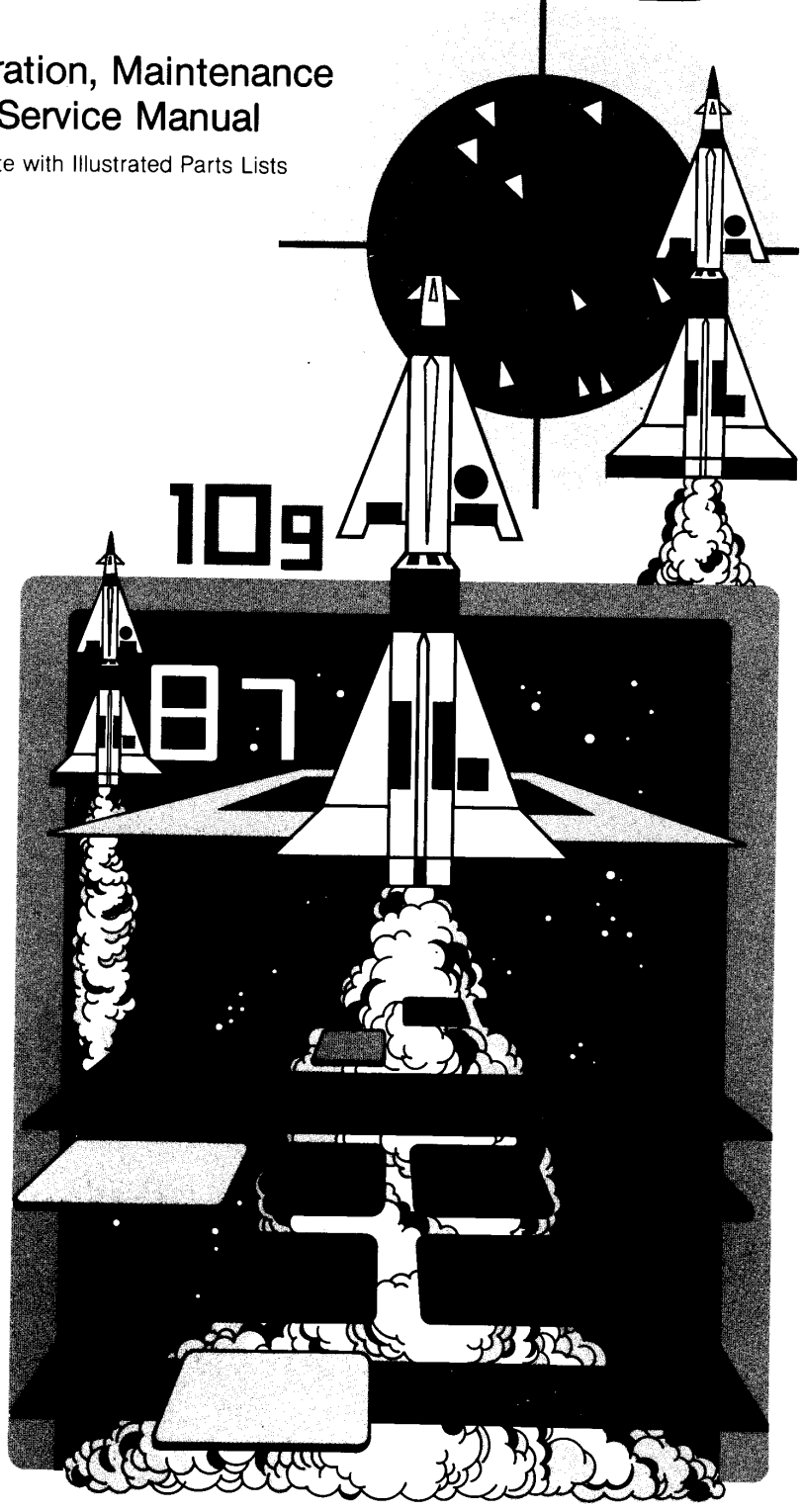
ATARI®

MISSILE COMMAND™

Operation, Maintenance and Service Manual

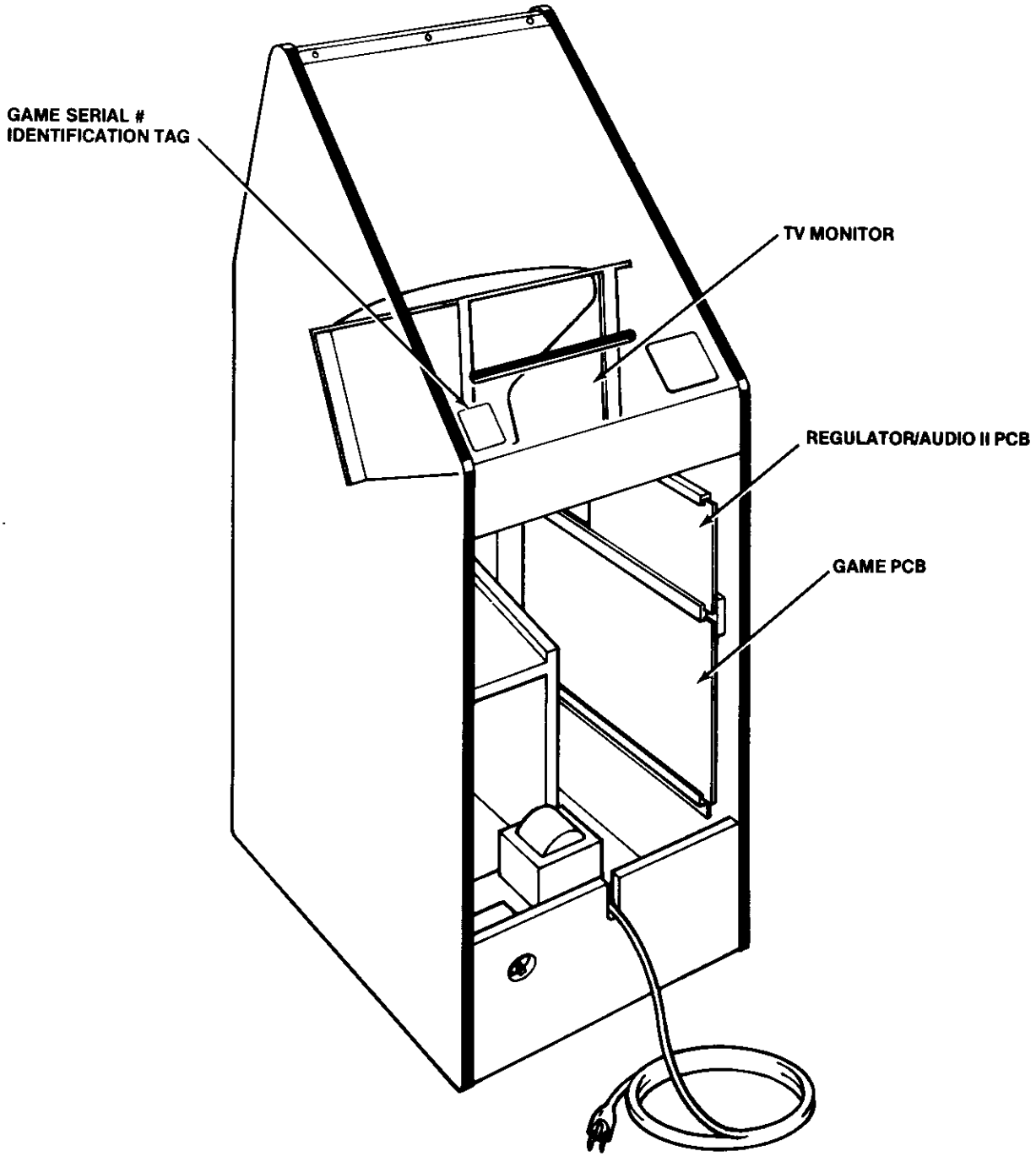
Complete with Illustrated Parts Lists



CABARET

GAME SERIAL NUMBER LOCATION

Your game's serial number is stamped on a plate on the outside of the game. The same number is also stamped on the chassis of the TV monitor, Regulator/Audio II PCB, and Game PCB. Please mention this number whenever calling your distributor for service.



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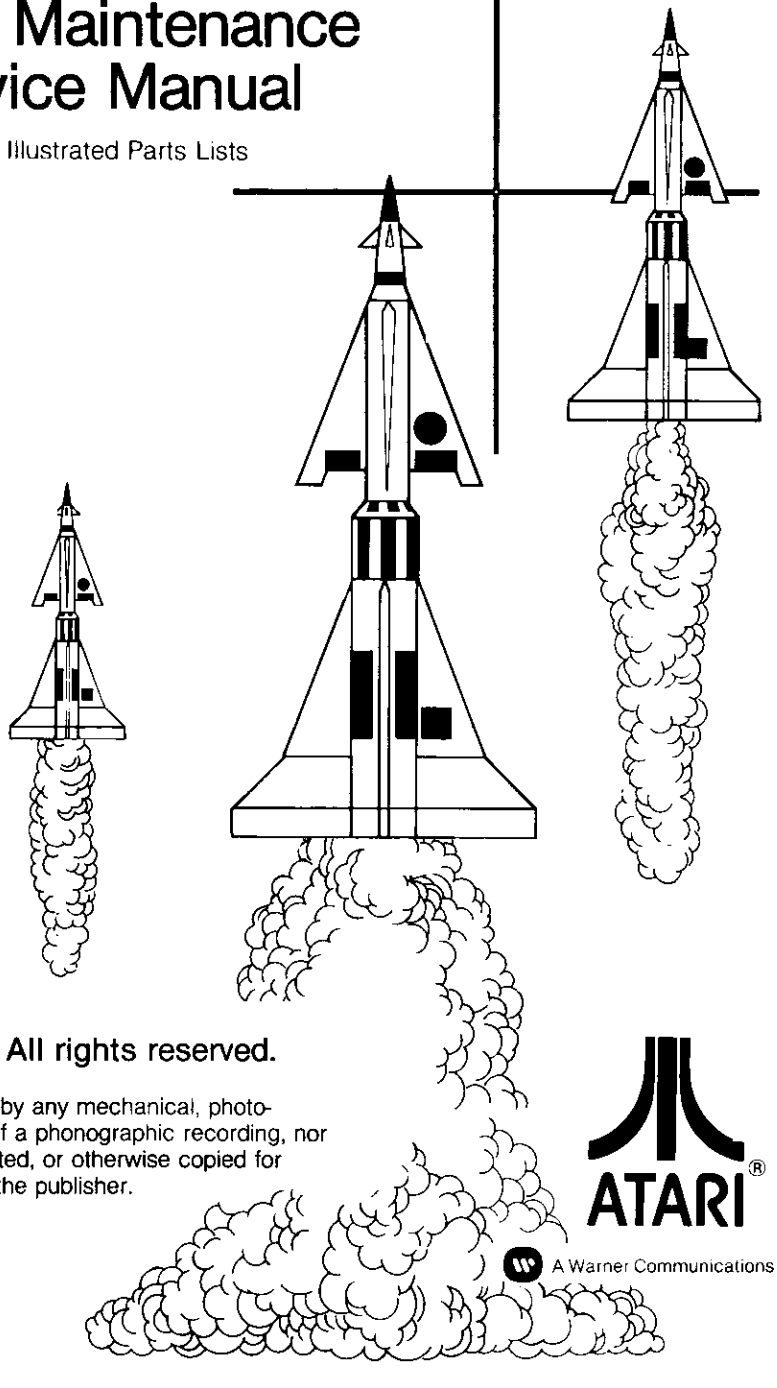

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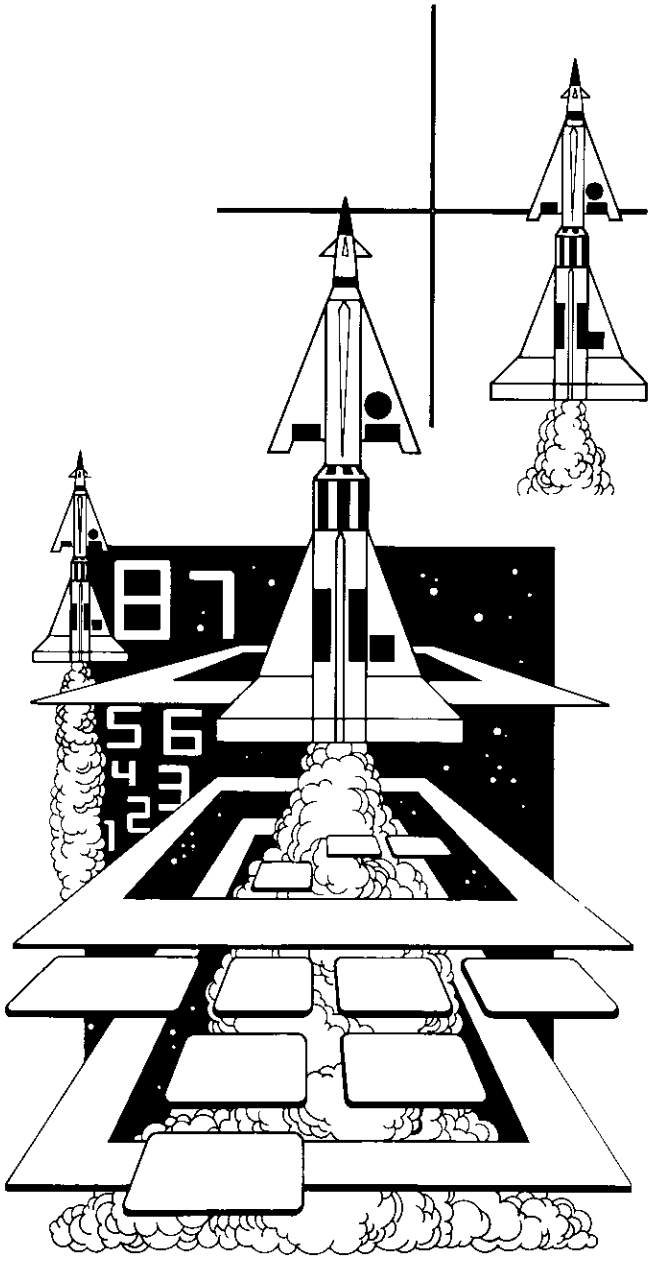


A. New Parts

The Missile Command™/Cabaret game has four new parts. If you have worked on Atari games in the past, then you should be aware of these important differences. The new parts are:

- **14-Inch Color TV Monitor.** Made to Atari specifications by either Matsushita or Sanyo, it has high reliability, a compact size, and should maintain its color convergence for a long period of time.
- **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. Its transformer includes isolation windings, so no separate isolation transformer is needed.
- **Cabaret Cabinet Design.** This more compact cabinet was designed to occupy less than 4 square feet of floor space.
- **Mini-Trak Ball™ Assembly.** The widely used Trak Ball Assembly has been redesigned and scaled down for use in Atari's compact Cabaret and cocktail-table games.

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

Location Setup

1

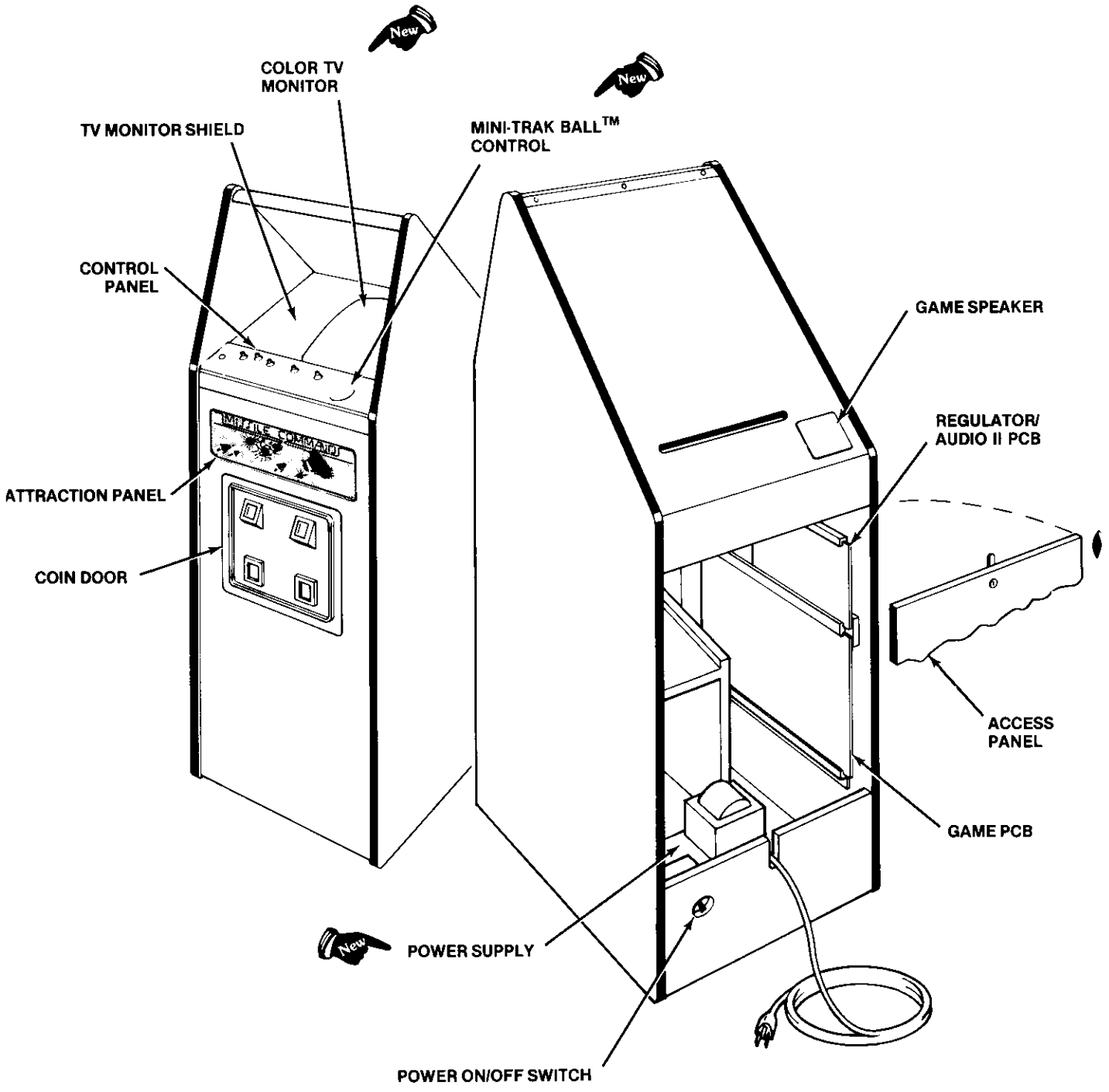


Figure 1 Overview of Game

B. Game Inspection

WARNING

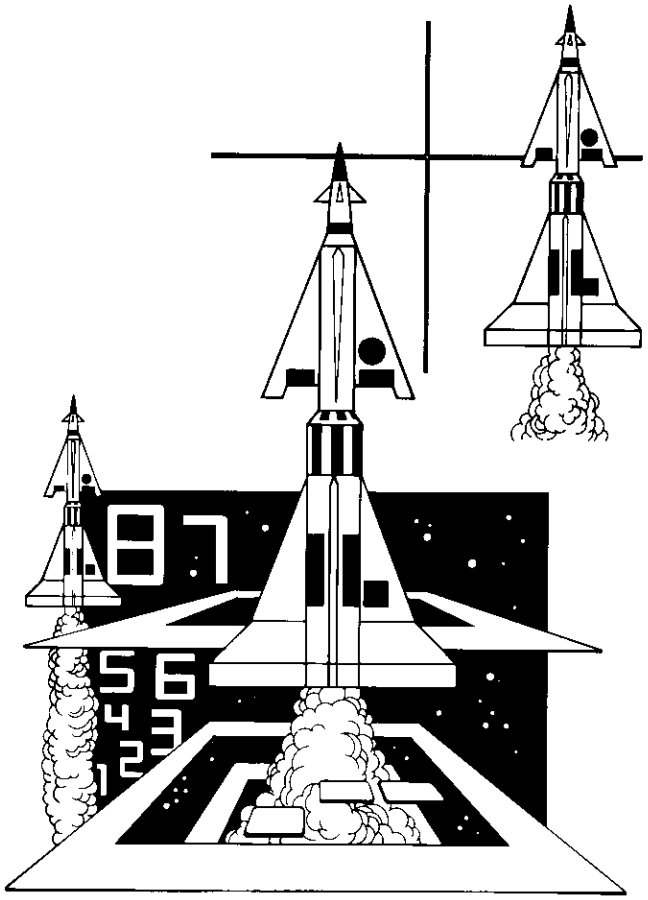
To avoid possible unpleasant electrical shock, do not touch internal parts of the TV monitor with your hands or metal objects held in your hands!

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:
   - Check that all plug-in connectors (on the game harness) are firmly seated. Replug any connectors found unplugged. **DON'T FORCE CONNECTORS TOGETHER.** The connectors are keyed so they only go on in the proper orientation. **A reversed edge connector will damage a PCB!**
   - Check that all plug-in integrated circuits on the game PCB are firmly seated in their sockets.
   - Note the location of the game's serial number—it is printed on the special label on the outside of the game cabinet. Verify that the serial numbers also stamped on the Game PCB, Regulator/Audio II PCB and TV Monitor are all identical. A drawing of the serial number locations is on the inside front cover of this manual. Please mention this number whenever you call your distributor for service.
   - Check all major subassemblies such as the power supply, control panel and TV monitor for secure mounting.



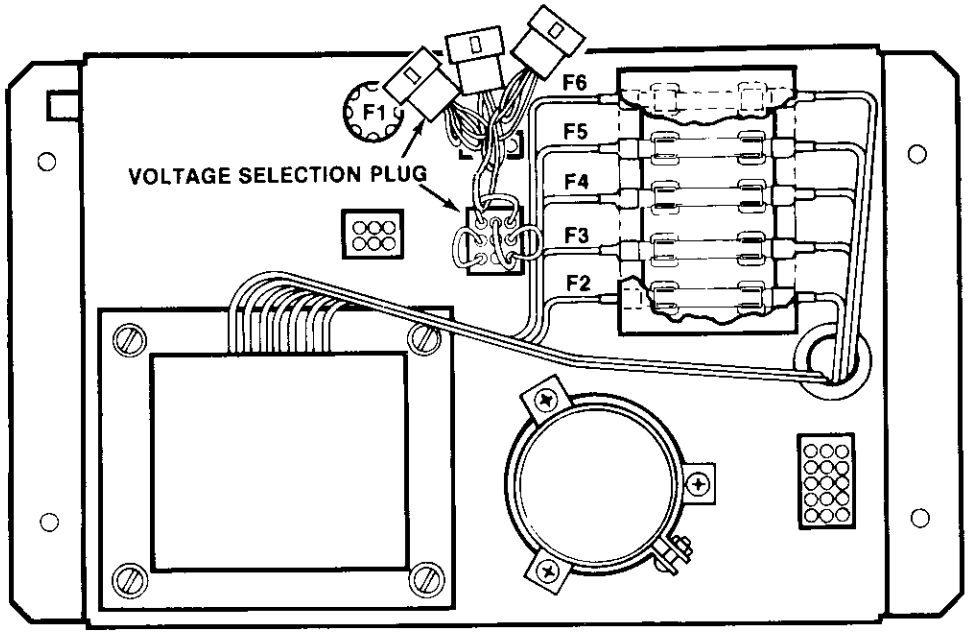


Figure 3 Voltage Selection

C. Game Installation

Figure 2 Installation Requirements

Power	120 watts
Temperature	0 to 38°C (32 to 100°F)
Humidity	Not over 95% relative
Space Required	52 × 60 cm (20 3/8 × 23¾ in.)
Game Height	140 cm (55 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 working on the inside of the game cabinet, two interlock switches have been installed (see Figure 4). One is located behind the access panel and one is behind the coin door. These switches remove all AC line power from the game circuitry when the door or panel is opened.

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

- Plug the AC line power cord into an AC outlet.
- Make sure the access panel and coin door are closed.
- Set the power on/off switch to the "on" position. Within 30 seconds the TV monitor should display a picture.
- Slowly open the access panel. The TV monitor picture should disappear when the panel is opened approximately 2.5 cm (1 inch). Close and lock the access panel and repeat this step with the coin door.
- If the results of the previous step 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.

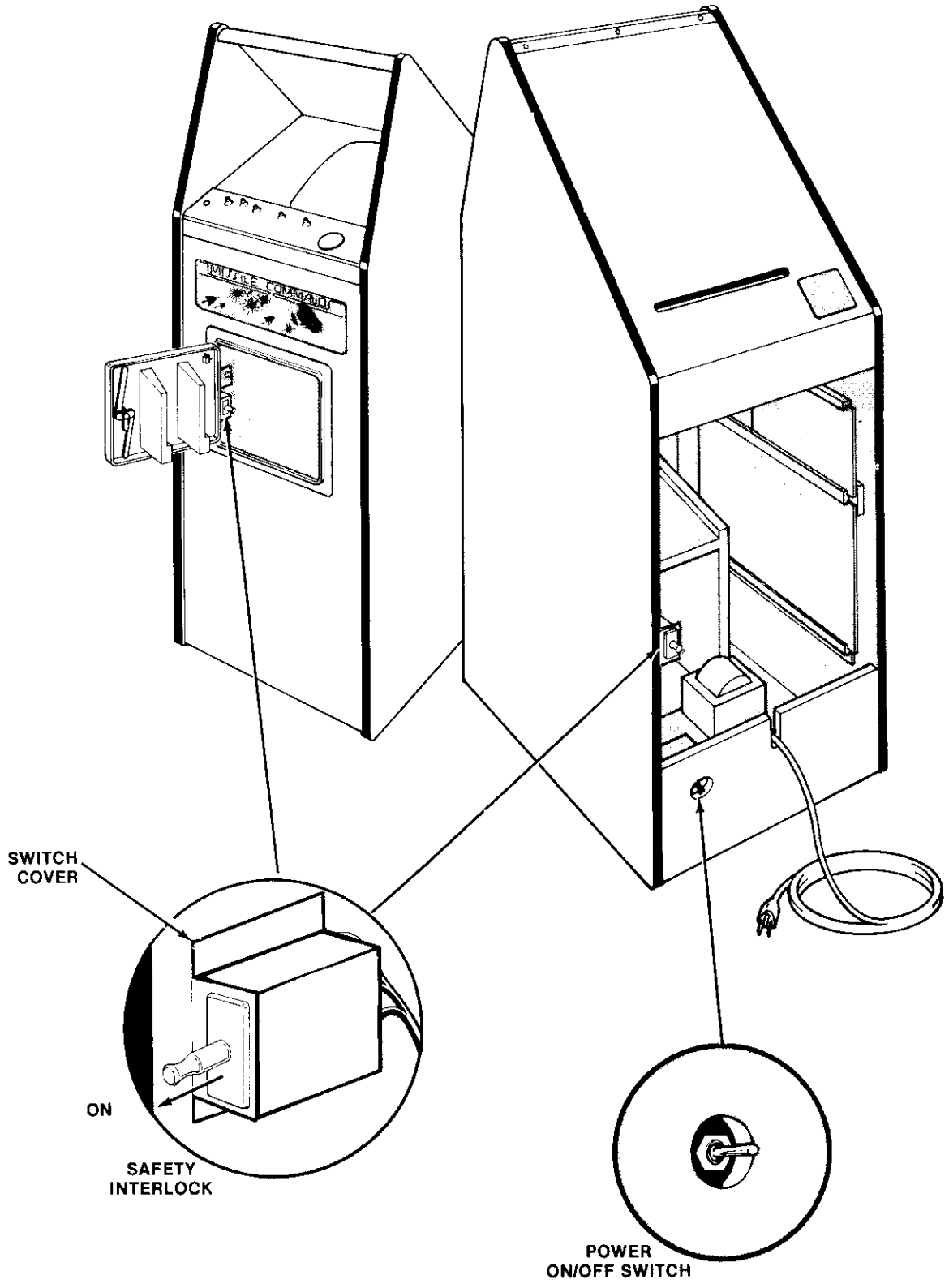


Figure 4 Interlock and Power On/Off Switches

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 color TV monitor and the game speaker; no additional equipment is necessary.

Part of the self-test procedure includes a display of the operator-selectable game options. Therefore, we suggest you run the self-test procedure anytime you need to change the game's options.

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

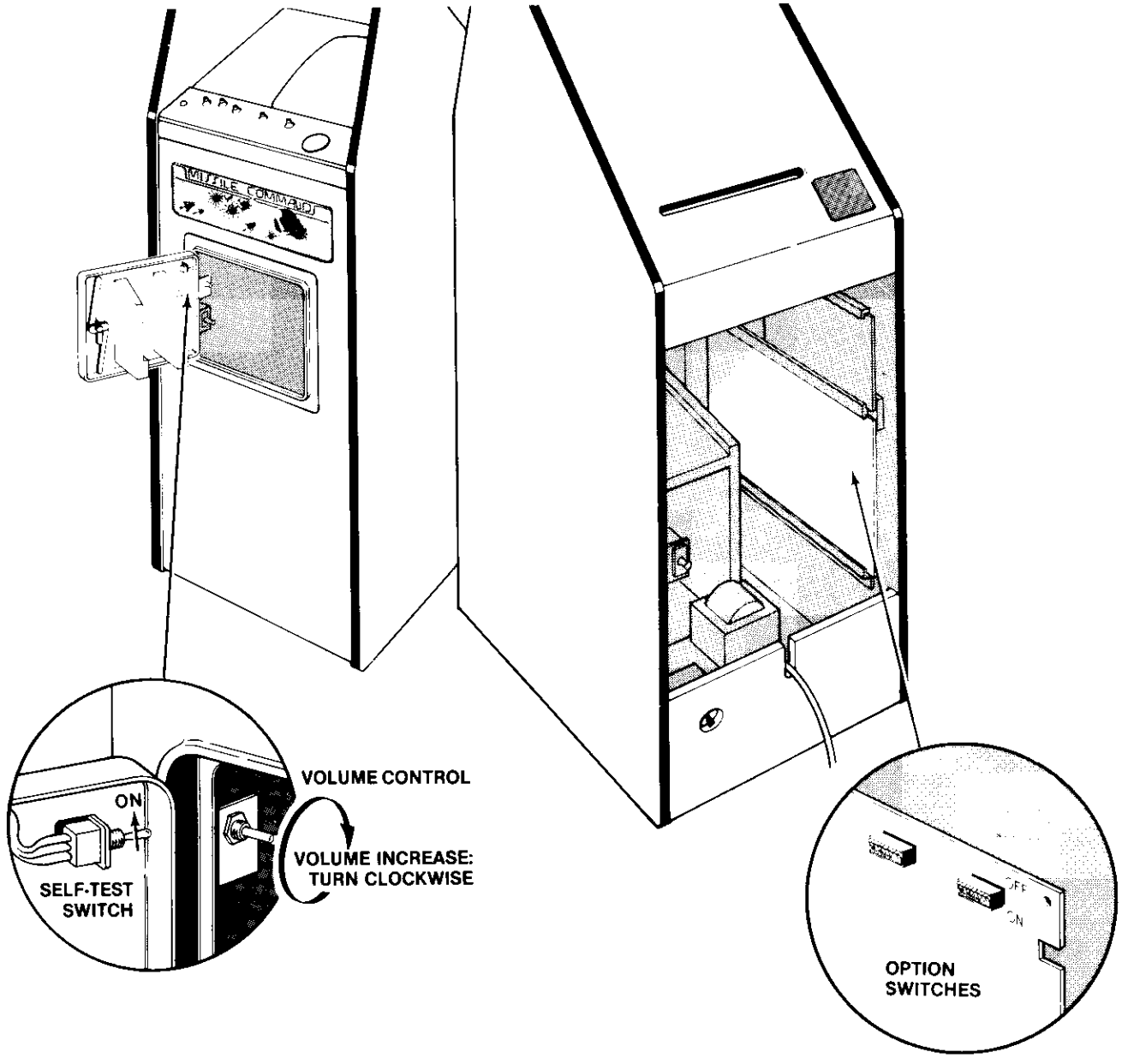


Figure 5 Location of Self-Test Switch, Volume Control and Option Switches

Figure 6 Self-Test Procedure

Instruction	Result if Test Passes	Result if Test Fails
1. Set self-test switch to **on** position (see Figure 5). Note: entering self-test will set the HIGH SCORE TODAY display to 7500.	After about 5 seconds of frozen attract mode, a low raspy tone is followed by a low beep, then high beep. TV monitor screen displays picture as shown below: **ROM OK** **MAP OK** **RAM OK** + ...plus the options display—see Figure 7 for explanation. Both LED start buttons will also be lighted.	A continuous raspy tone means V BLANK is malfunctioning. Self-test will not continue. A RAM failure is indicated by a blank or "garbage"-filled screen and a repeated series of 8 beeps, separated by a low raspy tone. See note 1 below. Self-test will not restart. ROM failure is indicated by **BAD ROM**; see note 2 below. **BAD MAP** means bit-mapping hardware has failed. **BAD CHIP** means custom audio I/O chip at location P8/9 has failed.
2. Roll the Trak Ball control in all directions.	The + moves around on the screen in directions corresponding to Trak Ball control—up to an invisible border along the screen's edges.	The + doesn't move in same direction as ball, or not at all. One of the Steering PCBs on Trak Ball control may be bad, harness wires or connector may be loose, Trak Ball reading circuitry on Game PCB may be bad, or Trak Ball bearings may need oiling.
3. Press the following switches: • Coin switch trip wires • Slam switch • All three fire switches • Player start buttons	A sound is heard as each switch is pressed. The background color also changes.	No sound or color changes are produced when pressing one of these switches: indicates a bad switch, loose harness wires, or loose connector.
4. Set self-test switch to **off** position.		

Note 1: In test no. 1, a low beep means a good chip; a high beep is a bad RAM, as follows:

High beep in series of 8 tones:	*Bad chip at location:*
1st	P4
2nd	N4
3rd	M4
4th	L4
5th	K4
6th	J4
7th	H4
8th	F4

Note 2: **BAD ROM** plus some or all of the digits 1 thru 6 are displayed. These numbers show which 2K of memory are bad. For example, **1** means the first 2K are bad. The + may not appear.

E. Option Switch Settings

1. Bonus Play Feature

Missile Command™ is the first Atari game to offer a bonus play for every $1.00 worth of coins inserted. This bonus feature is operator-selectable, meaning you may choose to offer it or not.

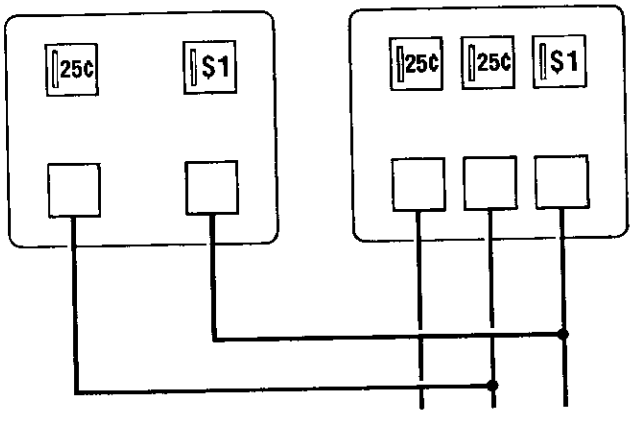
With your game set at 50¢ per play, players who deposit four successive quarters or a $1.00 coin, then press the start button, will receive a bonus play. Therefore, players receive 3 plays for $1.00.

This bonus feature encourages players to insert more money than just the minimum 50¢ required for one game.

2. Coin Mechanism Multipliers

Since early in 1980, Atari has made available its new coin door which has either two or three mechanisms. All recent Atari game PCBs identify the different mechanisms in a certain pattern.

The right coin mechs are all the same to the game's logic, regardless of whether you have two or three mechs in your door. In addition, the logic sees the left mech in a 2-mech door and the center mech in a 3-mech door as the same. Refer to the diagram below.



This pattern is important for you to know, so you can correctly set the "multipliers" for each mech. The multipliers determine how much each mechanism will be worth to the game's logic.

The basic unit of measurement is 25¢, which equals a multiplier of ×1. Therefore, if you have a 25¢/25¢/$1 coin door, you will probably want to set the center and right option-switch multipliers at ×1/×4. (The left mech in a 3-mech door always has a value of ×1—you cannot change its value.)

You can set these multipliers with toggles 3 thru 5 on the Missile Command PCB switch assembly at location R10. For exact settings of these toggles, refer to Figure 7 on the next page.

3. Examples of Option Switch Settings

To explain the options, we have provided below four examples of the most common U.S. situations. The toggles mentioned below **only** relate to game price, coin mechanism multipliers, and the bonus credit for 4 successive quarters or the $1.00 coin. You should set the toggles relating to other functions as you see fit, although Figure 7 provides "$" signs indicating Atari's recommendations.

For the first and second examples, we will assume your door (either 2 or 3 mechanisms) has only 25¢ slots:

If you want 50¢ (2 coins) for 1 play, and $1.00 for 3 plays:

At R10, set toggles—

5	4	3	2	1
on	on	on	on	off

At R8, set toggle 3 off.

If you want 50¢ (2 coins) for 1 play, and no bonus credit:

At R10, set toggles—

5	4	3	2	1
on	on	on	on	off

At R8, set toggle 3 on.

For the third and fourth examples, we will assume your door (either 2 or 3 mechanisms) has a 25¢ mechanism at left and center, and $1.00 mechanism at right:

If you want 50¢ (2 coins) for 1 play, and $1.00 for 3 plays:

At R10, set toggles—

5	4	3	2	1
on	on	off	on	off

At R8, set toggle 3 off.

If you want 50¢ (2 coins) for 1 play, and no bonus credit:

At R10, set toggles—

5	4	3	2	1
on	on	off	on	off

At R8, set toggle 3 on.

Figure 7 Option Switch Settings

To change toggle positions on the switch assemblies, you need not remove the game PCB. The switches, usually colored blue, are easily accessible when the game PCB is mounted in place.

When changing the options, verify proper results on the TV monitor display **by performing the self-test.** Note that changing an option on any toggle will cause an immediate change on the TV monitor screen during the self-test.

Toggle Settings of 8-Toggle Switch on Game PCB *(at R10)*
(RIGHT switch when PCB is in game)

8	7	6	5	4	3	2	1	Option
						On	On	1 coin* for 1 play
						Off	On	Free play
						On	Off	2 coins* for 1 play $
						Off	Off	1 coin* for 2 plays
Not Used				On	On			Right coin mech × 1 $
				On	Off			Right coin mech × 4
				Off	On			Right coin mech × 5
				Off	Off			Right coin mech × 6
			On					Center coin mech × 1 $ *(Center mech is a left*
			Off					Center coin mech × 2 *mech in a 2-mech door)*
	On	On						English language
	On	Off						French language
	Off	On						German language
	Off	Off						Spanish language

Toggle Settings of 8-Toggle Switch on Game PCB *(at R8)*
(LEFT switch when PCB is in game)

8	7	6	5	4	3	2	1	Option
						Off	Off	Game starts with 7 cities
						On	On	Game starts with 6 cities $
						Off	On	Game starts with 5 cities
						On	Off	Game starts with 4 cities
Not Used					On			No bonus credit
					Off			1 bonus credit for 4 successive quarters or a $1 coin $
				——				Switch position is irrelevant for Missile Command/-Cabaret
	Off	Off	On					Bonus city every 8,000 points
	On	On	On					Bonus city every 10,000 points $
	On	On	Off					Bonus city every 12,000 points
	On	Off	On					Bonus city every 14,000 points
	On	Off	Off					Bonus city every 15,000 points
	Off	On	On					Bonus city every 18,000 points
	Off	On	Off					Bonus city every 20,000 points
	Off	Off	Off					No bonus city

The format of the self-test display is as follows:

Bonus city every _____ points (line disappears if no bonus city is chosen)

\+

Coinage setting
4, 5, 6, or 7 cities (always in English)
A B C D

A is the center mech multiplier for 3-mech doors, left mech multiplier if a 2-mech door. This number is either 1 or 2.
B is the right coin mech multiplier and is 1, 4, 5, or 6.
C: ignore this display.
D is an "X" if switch 3 (of R8) is off.

An example of an actual option switch display is as follows:

BONUS CITY EVERY 10,000 POINTS

\+

2 COINS 1 PLAY
6 CITIES
1 1 X

* *In the U.S., a "coin" is defined as 25¢. If your game also has a $1 mechanism, you must set the right coin mechanism multiplier as per your choice.*

$ *Manufacturer's suggested settings*

F. Game Play

Missile Command™ is a 1- or 2-player game with a color monitor. The game depicts an Armageddon-style war in which players defend their bases and cities with antiballistic missiles (ABMs). The enemy—the game computer—launches incoming waves of attack missiles. These weapons may be either individual or branching attack missiles. In addition, the enemy occasionally launches missiles from a fast-moving "killer" satellite or from bombers. The enemy also launches "smart" missiles that usually avoid explosions.

Players receive varying numbers of points for intercepting attack missiles, for having unused missiles still in their bases' arsenals, and for having their cities undamaged after a missile wave.

The game has five possible modes of operation: attract, ready-to-play, play, high-score initial, and self-test. The latter is a special mode for checking the game switches and computer functions. You may enter this mode at any time. When entered, all game credits are cancelled, and the "HIGH SCORE TODAY" is reset to 7500. A list of eight "highest" scores and initials are also reset onto the screen (to provide player challenge).

1. Attract Mode

The attract mode begins when power is applied to the game, after a play or high-score initial mode, or after self-test. This mode is continuous and is only interrupted when a game is paid for and accepted, or when entering self-test.

In this mode, the *Missile Command* name is displayed, then the computer plays one wave—handling both offense and defense. Following this, the computer displays the high score table, then the *Missile Command* graphics reappear.

2. Ready-to-Play Mode

This mode begins when sufficient coins have been accepted for a one- or two-player game. It ends when the 1 PLAYER START or 2 PLAYER START pushbutton is pressed.

When this mode begins, the message **PRESS START** scrolls along the bottom of the screen. **DEFEND CITIES** and red arrows pointing down to each city also appear on the screen. The displayed pictures are otherwise the same as those shown in the attract mode.

3. Play Mode

The play mode begins when either start pushbutton is pressed. The mode ends when the player's last city is destroyed.

The three bases—Alpha, Delta and Omega—each have 10 ABMs ready to be fired (shown as ⅄'s). Players must be careful to fire the missiles more or less evenly from among those bases, because no more missiles are granted until the screen resets in preparation for a new wave of attack missiles. If the enemy missiles strike a city or base, the colorful buildings or base will change to the solid color of the landscape.

The game continues until all cities are destroyed. Missile Command™ has no operator-selectable fixed time length. Thus a highly skilled player can play longer than the novice.

During the second wave, a "killer" satellite and/or bomber will appear on the screen, moving quickly and launching attack missiles at the bases and cities. Players get bonus points for shooting down the satellites or bombers.

The general approach for getting high point scores is fairly quickly discovered: try to launch your ABMs when the enemy missiles have just appeared at the top of the screen. Then they are clustered together, where one ABM can usually destroy several enemy missiles. In the later more advanced waves, players can lay out a blanket of explosions.

4. High Score Initial Mode

If a player's score exceeds the minimum on the high score initial list, he or she may put up to three initials on this list at the end of the game. Spinning the Trak Ball control changes the letters (A thru Z and a blank are available). Pressing any fire switch will fix that letter on the screen, and move the choice to the next letter. If the player doesn't enter his or her initials within 90 seconds, three blank spaces will be entered automatically.

Maintenance and Repair

All games require certain maintenance to keep them in good working order. Clean, properly maintained games will 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 the Mini-Trak Ball™ control or the light-emitting-diode switches are broken, or if LEDs have burned out. The self-test will inform you of any of these possible problems.

New

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

2

Missile Command™ / Cabaret

A. Cleaning

The exterior of the game cabinet and the metal 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. **Do not** dry-wipe the acrylic monitor shield or attraction panel, because any dust can scratch their surfaces and result in fogging the plastic.

B. Fuse Replacement

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 in Figure 21 of this manual. See the color TV monitor manual for the monitor fuse data. (The Matsushita monitor manual is Atari part number TM-153, and the Sanyo monitor manual is number TM-157.)

C. Opening the Control Panel

Prior to repairing any switch, the Mini-Trak Ball™ or the TV monitor, unplug the game. Then open the coin door.

Reach through the opening and remove both sets of carriage bolts, wing nuts, split lock washers, and flat washers, located on the underside of the control panel (see Figure 8). Lift up the control panel's top edge and swing it towards you.

1. LED Switch Replacement

The light-emitting diode (LED) switches on the control panel 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 8.

- Remove the wires from the suspected switch.
- Set multimeter to ohms scale. Set ohms scale to R × 1, then zero the meter.

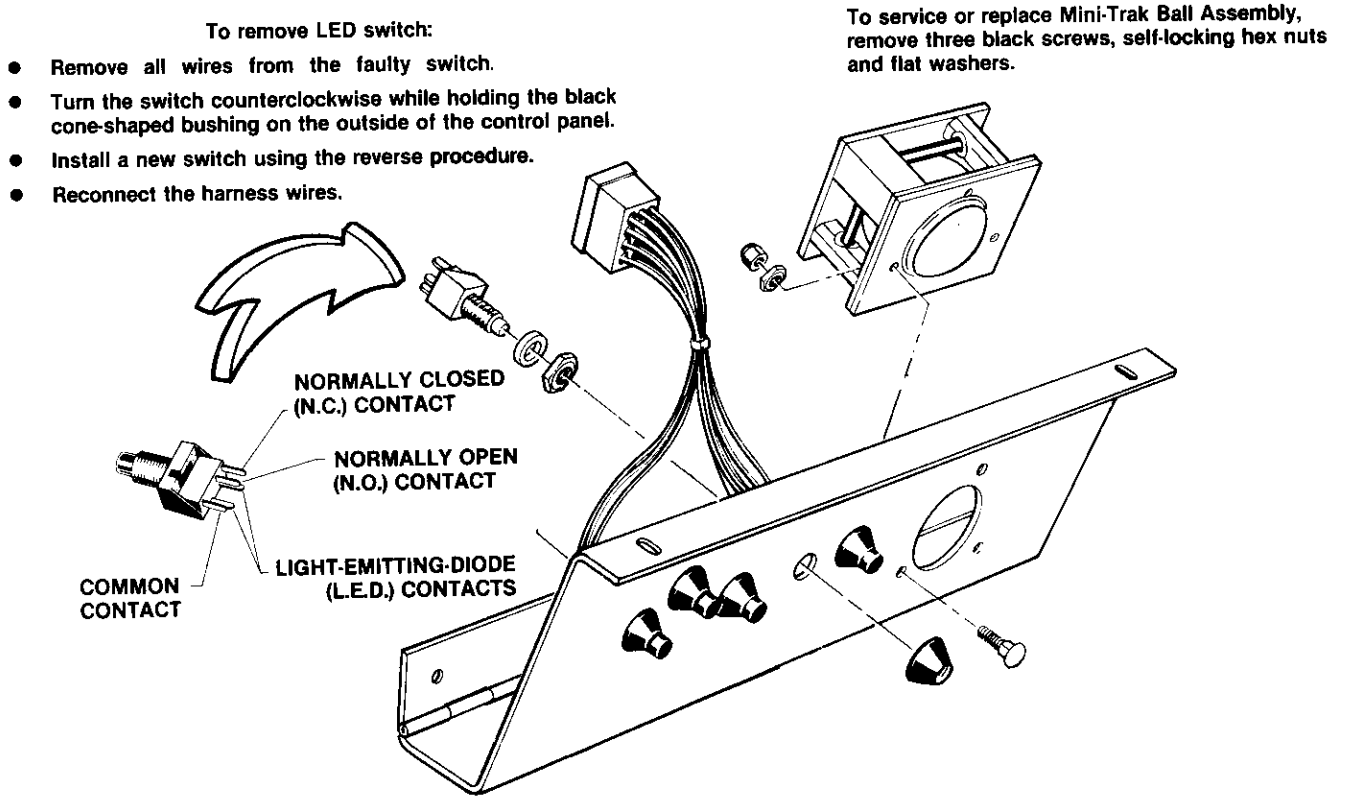
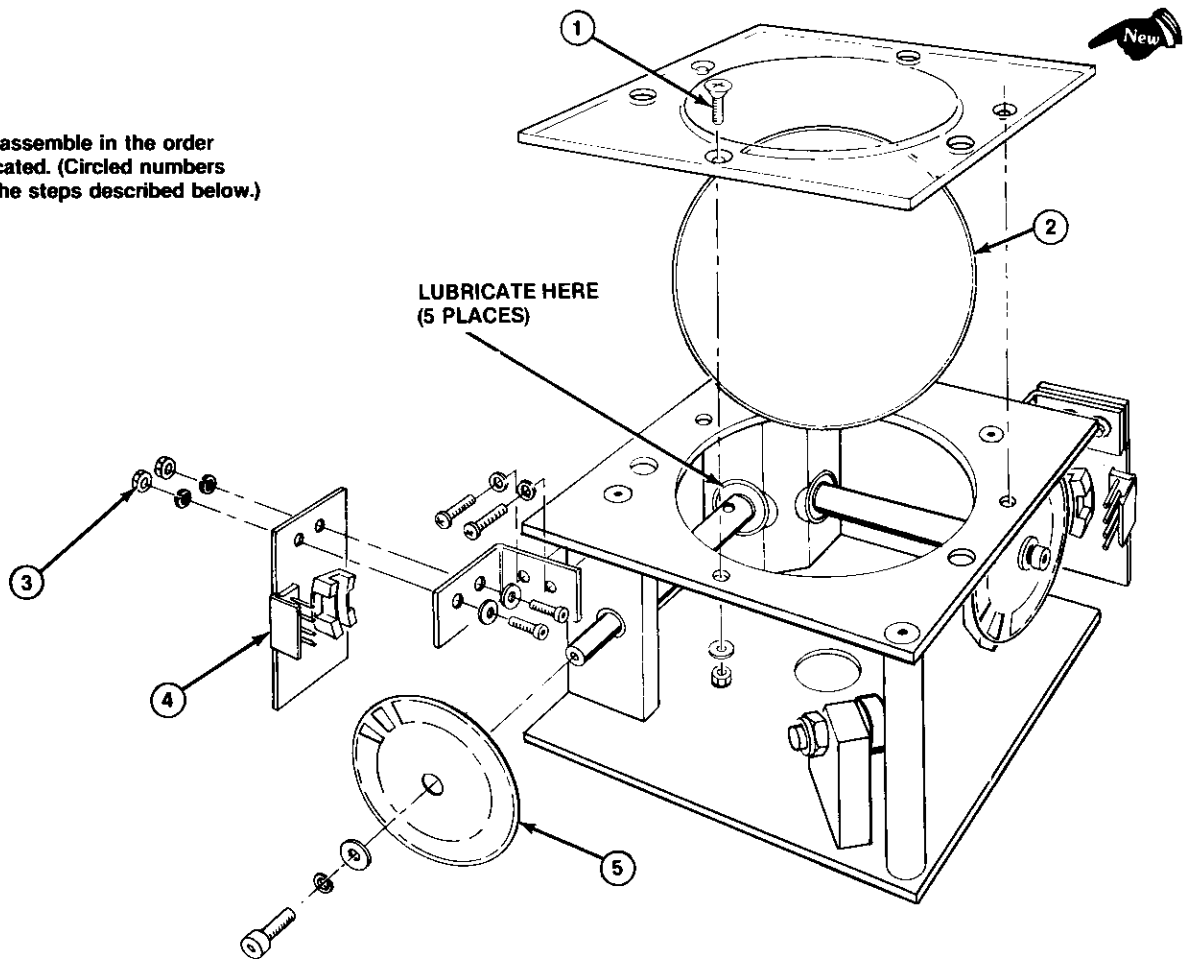


Figure 8 Opening the Control Panel and Replacing Switches



Ball Replacement

1. First remove the entire Mini-Trak Ball assembly from the control panel as shown in Figure 8. Now locate the three countersunk machine screws in the acrylic top plate; remove these screws, flat washers, and lock nuts. (When the assembly is installed, these three screws are right underneath the control panel.)
2. Lift off the acrylic top plate; remove and replace the ball.

Coupler PCB Replacement

3. Unplug the red connector on the coupler PCB. Remove the two socket-head machine screws, flat and lock washers, and hex nuts from the coupler PCB.
4. Remove the coupler PCB.
5. When replacing this PCB assembly, be certain that the black metal encoding wheel turns freely between the two halves of the red photosensor device.

Figure 9 Mini-Trak Ball™ Maintenance and Repair

- Connect multimeter leads to appropriate LED switch contacts (see Figure 8 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 LED switch as outlined in the figure.

2. Mini-Trak Ball™ Maintenance and Repair

To maintain this control, you will only have to lubricate the bearings approximately every 2,000 credits. The number of credits can be read off the coin counter, located on the coin door. Use **only 2 drops** of 3-in-One® oil in each of the ball bearings. (Each Mini-Trak Ball™ control has five bearings.)

For further instructions on how the replace the ball or either coupler PCB, see Figure 9.

D. TV Monitor Removal

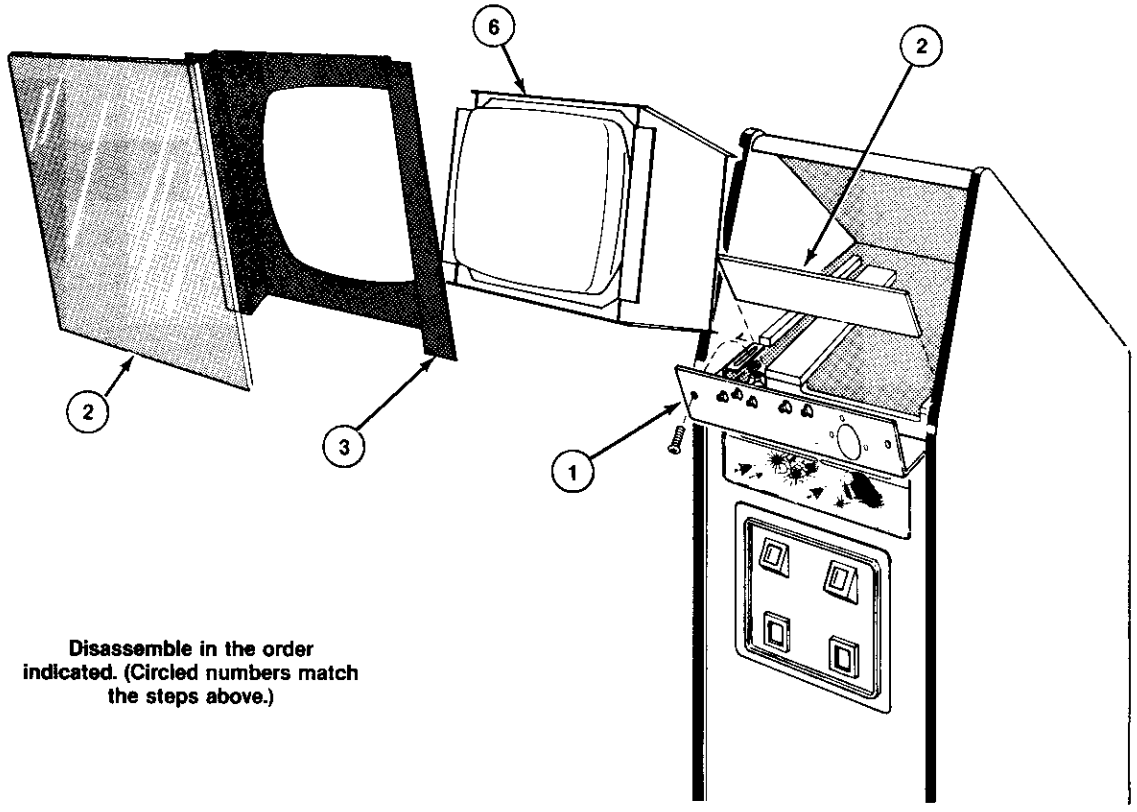
WARNING

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

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

If you should need to remove the color TV monitor, follow steps 1 thru 5 below. Refer also to Figure 10.

1. Open the control panel as described in Section C, Opening the Control Panel. **Be sure the game is unplugged from its wall outlet!**
2. Remove the acrylic TV monitor shield by lifting up and sliding out its lower edge. Remove the small ¼" plywood panel that acts as a monitor shield support (it prevents players from flexing the shield downwards).
3. Carefully remove the black cardboard bezel: it lies on top of the wood cleats and is attached with staples.
4. Open the rear access panel and unplug the 3-pin and 6-pin TV monitor harness connectors.
5. Locate the four Phillips-head screws (one at each corner of the TV monitor screen) that attach the TV monitor to the cabinet. Remove these screws.
6. Carefully lift the TV monitor chassis up and out of the cabinet's top opening.



Disassemble in the order indicated. (Circled numbers match the steps above.)

Figure 10 TV Monitor Removal

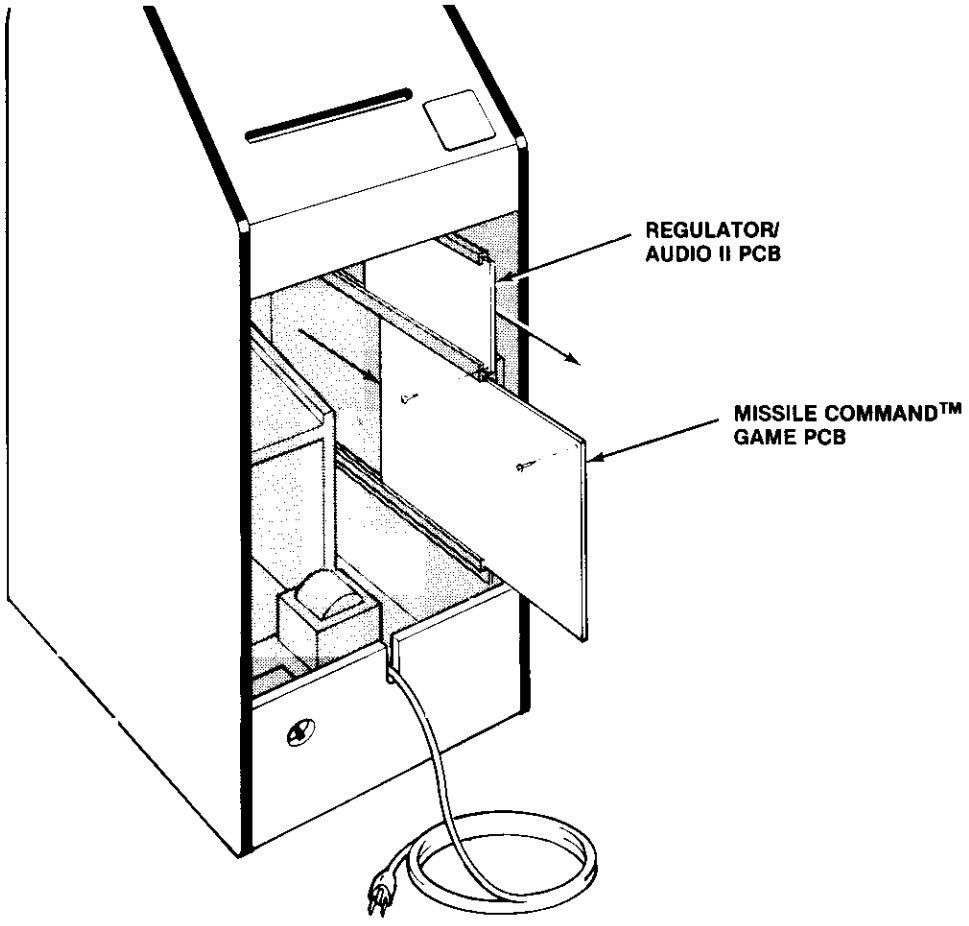


Figure 11 Game and Regulator/Audio II PCB Replacement

E. Printed-Circuit Board Replacement

You may wish to remove the game printed-circuit board (PCB) or the Regulator/Audio II PCB for service or inspection. To do this, refer to Figure 11 and proceed as follows:

1. Open the rear access panel.
2. Locate the securing screw and fiber washer that hold down the PCB in its slots, and remove them. (Each PCB has one set of this fastening hardware.)
3. If you are removing the game board, first remove the two tie wraps that fasten the edge connector to the game PCB. Then unplug the edge connector on the game PCB. If you are removing the Regulator/Audio II PCB, simply disconnect the three small harness connectors on this board.
4. Carefully slide either PCB straight out of its gray plastic 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 that they are 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 screw and fiber washer in the PCB. Reinstall the fasteners used to secure the edge connectors to the PCB. Close and lock the rear access panel.
7. Check that the operation of the game is correct and **perform the self-test.** This is especially important with any game when you replace a PCB. Normally the **only** adjustments on this game are option switch changes (made on both 8-toggle DIP switches). Unless you are a qualified technician, ***do not turn the small knob on the Regulator/Audio II PCB.***

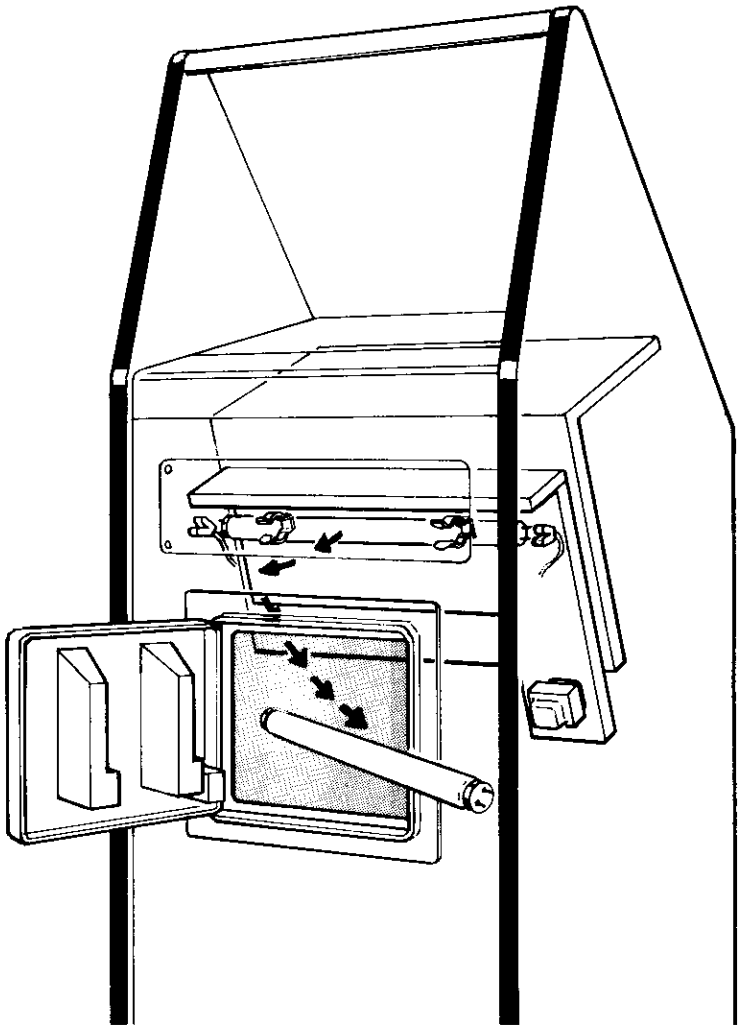


Figure 12 Fluorescent Tube Replacement

F. Fluorescent Tube Replacement

CAUTION

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

To replace the white fluorescent tube behind the front graphics attraction panel, follow this procedure (see Figure 12).

1. Open the coin door. Remove the two Y-shaped connectors from the ends of the fluorescent tube. Now carefully remove the tube from its clamps by pulling it towards you.
2. Replace with a new tube. Do not snap the tube in vigorously—**you may break it, causing an implosion!**
3. Close the coin door and lock it.

G. Game Operation

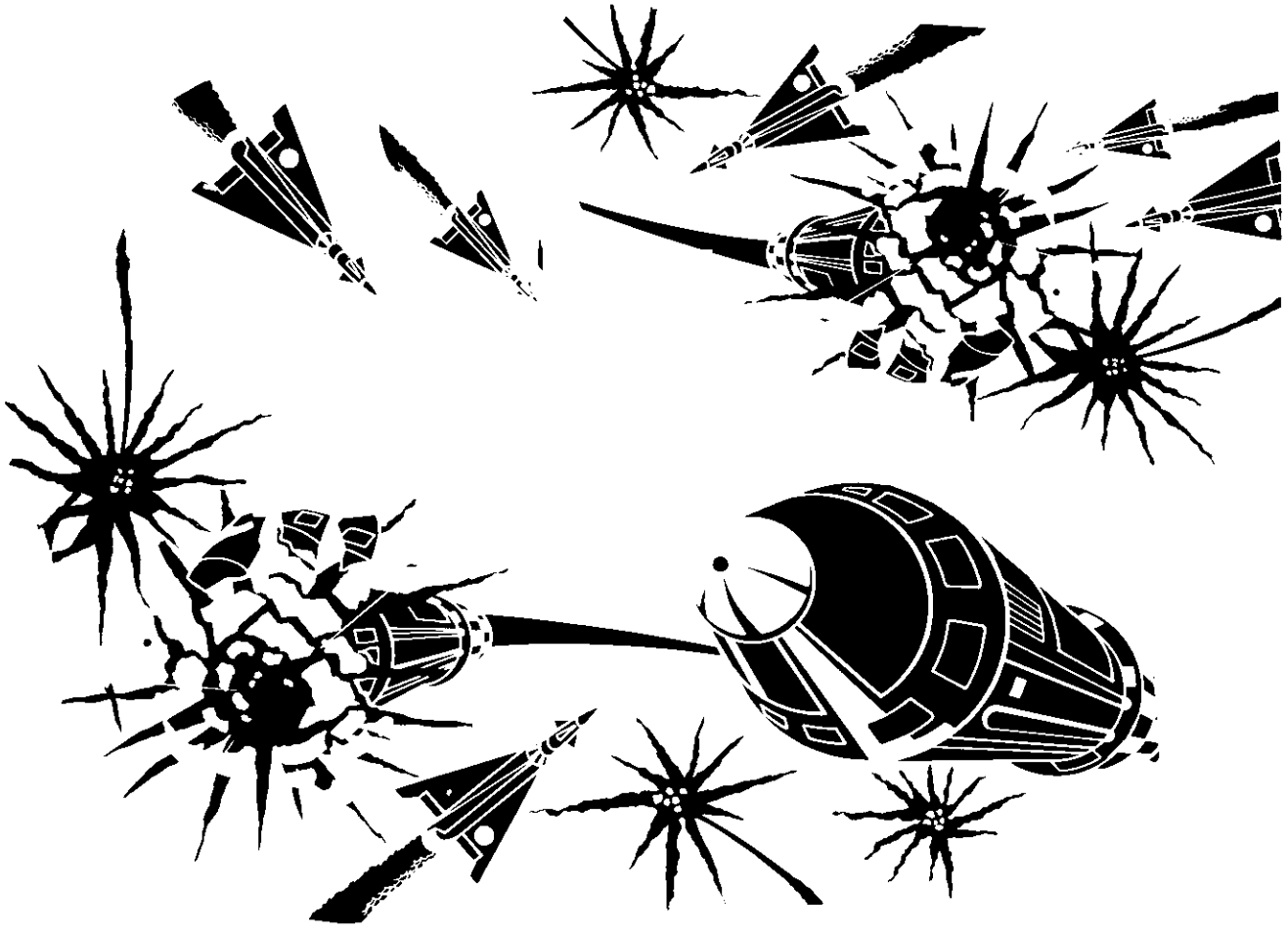
With this manual you received two large sheets that contain the wiring and schematic diagrams for your game. Sheet 1, Side A, includes information that explains the functions of the circuits and defines inputs and outputs.

Atari's Missile Command™/Cabaret is a microprocessor-controlled game. The microprocessor is mounted on the game PCB. The game PCB receives switch inputs from the control panel and coin mechanism. These inputs are processed by the game PCB and output to the TV monitor, Regulator/Audio II PCB, loudspeaker, and control panel.

The Regulator/Audio II PCB performs two functions: 1) it regulates the +10 VDC from the power supply to +5 VDC, and 2) it amplifies the audio output from the game PCB. The +5 VDC from the Regulator/Audio II PCB provides most logic power to the game PCB. The audio output from the Regulator/Audio II PCB directly drives the game speakers and is controlled by the volume control, mounted on the bracket inside the coin door.

The Power Supply is the source of all voltages in the game. These voltages are protected by three fuses (F3, F4 and F5) on the power supply chassis. The primary winding of the power supply transformer is protected by the fuses F1 and F2 on the power supply chassis.

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



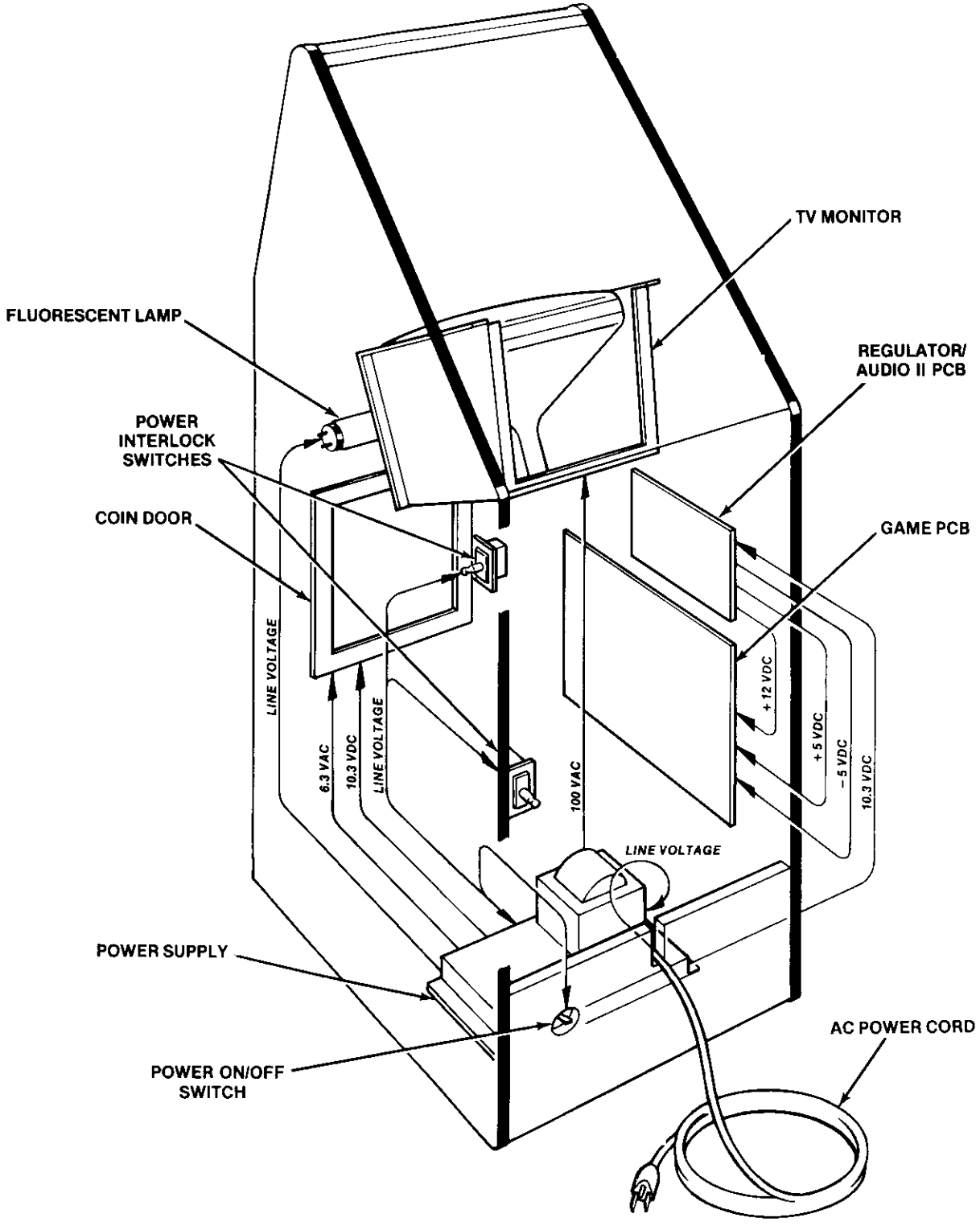


Figure 13 Power Distribution

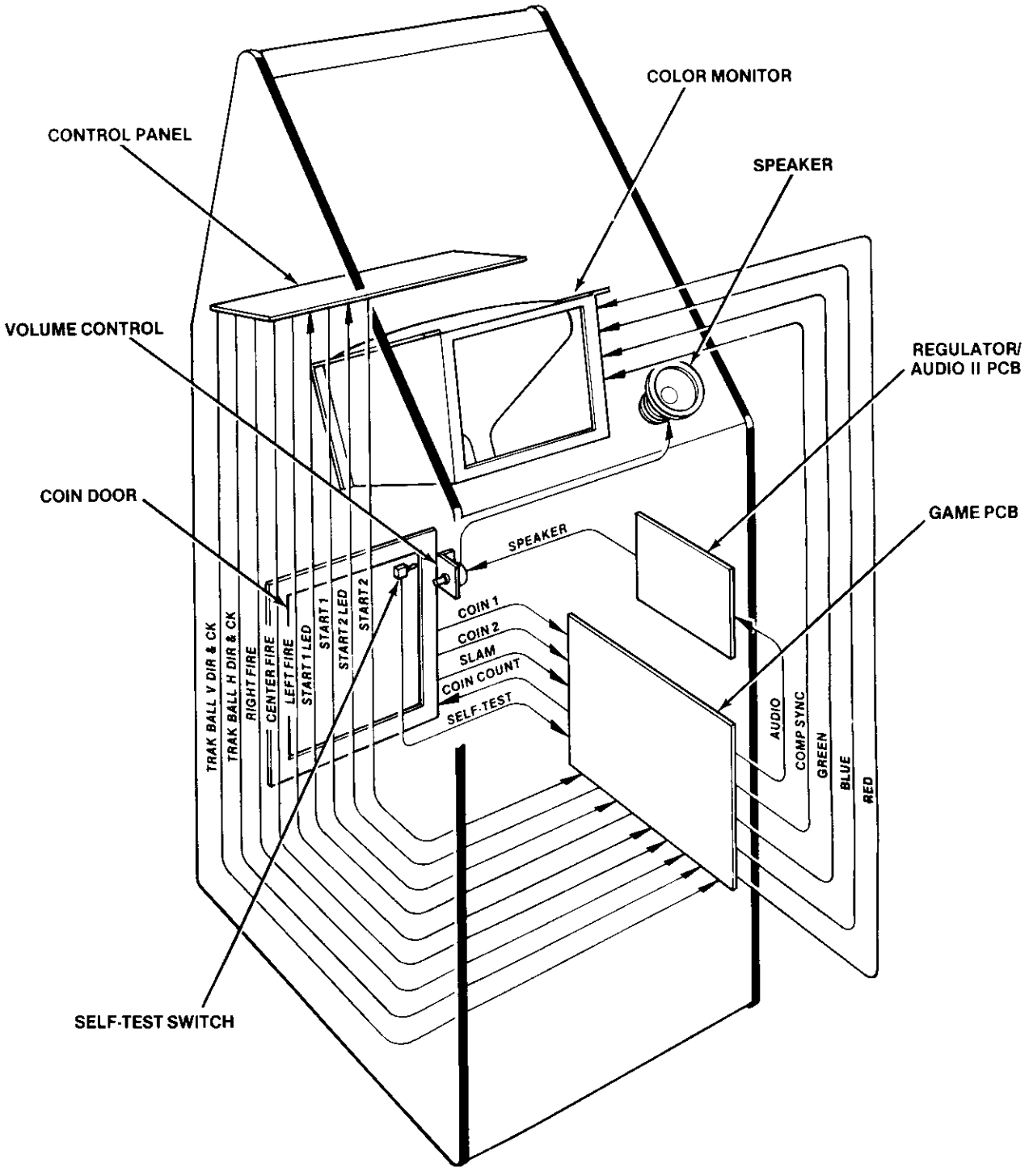


Figure 14 Signal Distribution

Illustrated Parts Lists

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

The parts lists have been arranged in alpha-numeric order. For example, all "A-" prefix numbers come first. Following this are numbers in sequence evaluated up to the hyphen, namely 00- thru 99-, then 000598- thru approximately 110000-.

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.

3

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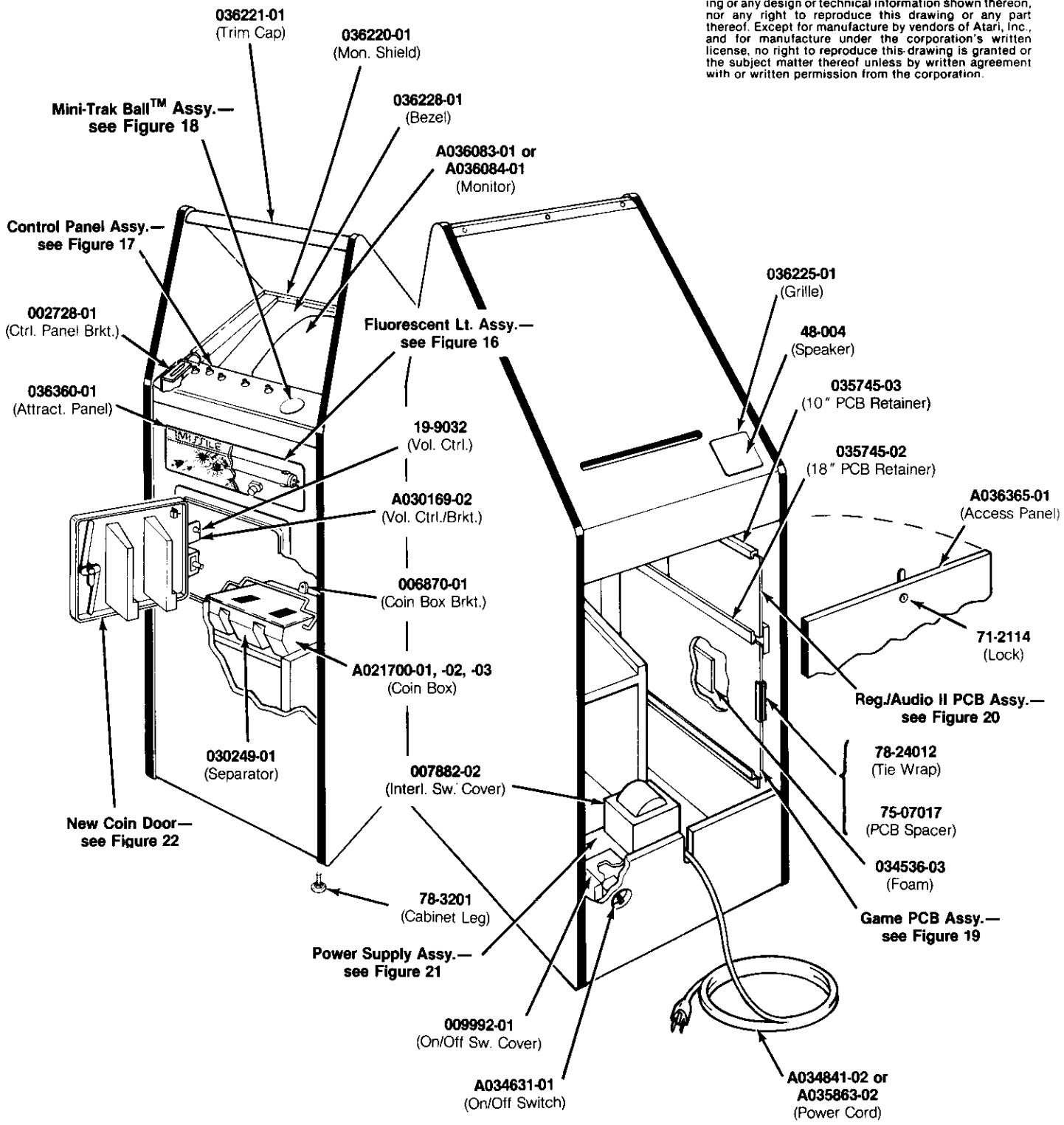

Figure 15 Cabinet-Mounted Assemblies A036230-xx C

Figure 15 Cabinet-Mounted Assemblies Parts List

Part No.	Description
A021700-01	Coin Box Assembly *(for all the same coins)*
A021700-02	Coin Box Assembly *(for two different coin denominations—has one separator)*
A021700-03	Coin Box Assembly *(for three different coin denominations—has two separators)*
A030169-02	Volume Control & Bracket Assembly
A034631-01	On/Off Switch Assembly
A034841-02	Strain Relief Power Cord *(domestic)*
OR	
A034863-02	Strain Relief Power Cord *(German)*
A036083-01	14-Inch Matsushita Color Monitor Assembly
OR	
A036084-01	14-Inch Sanyo Color Monitor Assembly
A036189-01	Interlock Switch & Bracket Assembly *(modified for safety)*
A036295-01	Main Harness Assembly
A036365-01	Access Panel Assembly
DP-158-01	Missile Command™/Cabaret Schematic Drawings, Sheet 1
DP-158-02	Missile Command/Cabaret Schematic Drawings, Sheet 2
TM-153	Service Manual for Matsushita Color Monitor
OR	
TM-157	Service Manual for Sanyo Color Monitor
TM-158	Missile Command/Cabaret Operation, Maintenance, Service Manual
19-9032	Volume Control Potentiometer
48-004	5-Inch 8-Ohm 5-Watt High-Fidelity Speaker
70-304	18-Inch 15-Watt Cool White Fluorescent Tube
71-2114	Panel Cartridge Lock Mechanism *(for access panel)*
75-07017	Spacer for Mounting Printed-Circuit Boards *(two per screw)*
78-24012	5-Inch Beaded Nylon Tie Wrap *(for securing edge connector to Game PCB)*
78-3201	Cabinet-Leveling Leg
002728-01	Control-Panel Mounting Bracket
006870-01	Coin Box Bracket
007882-02	Interlock Switch Cover
009992-01	On/Off Switch Cover
030249-01	Coin Box Separator
034536-03	Foam Vibration Damper
035745-02	18-Inch Plastic PCB Retainer
035745-03	10-Inch Plastic PCB Retainer
036220-01	Monitor Shield *(smoke color)*
036221-01	Rounded Trim Cap
036225-01	Speaker Grille
036228-01	Cardboard Bezel *(for monitor)*
036360-01	Attraction Panel with Graphics

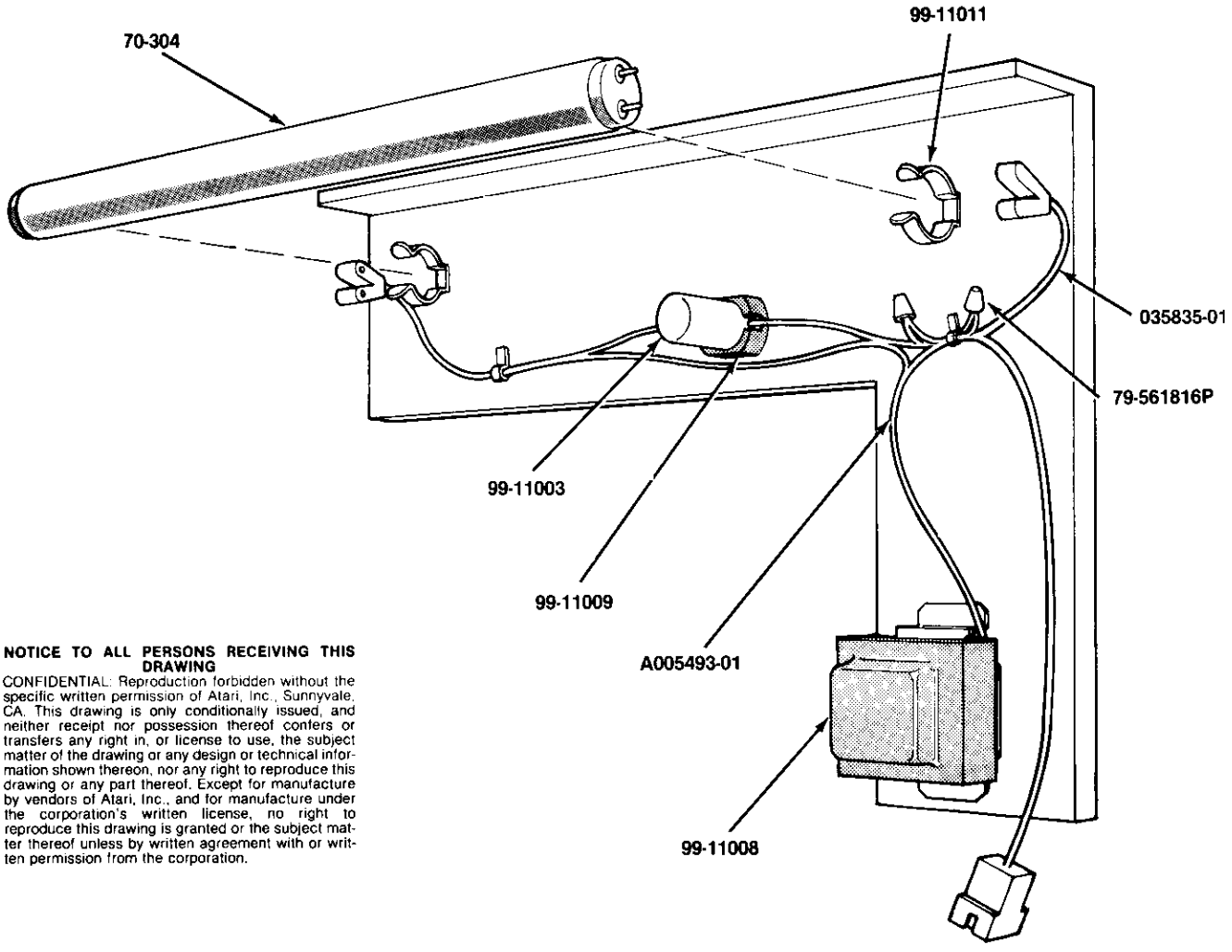

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Figure 16 Fluorescent Light Assembly A036205-01 A

Parts List

Part No.	*Description*
A005493-01	Fluorescent Light Harness Assembly
70-304	18″ 15-Watt Cool White Fluorescent Lamp
79-561816P	Wire Nut for 16- to 18-Guage Wires
99-11003	Fluorescent Lamp Starter
99-11008	Ballast Transformer
99-11009	Starter Socket
99-11011	1½″ Clamp
035835-01	Y-Lead Connector

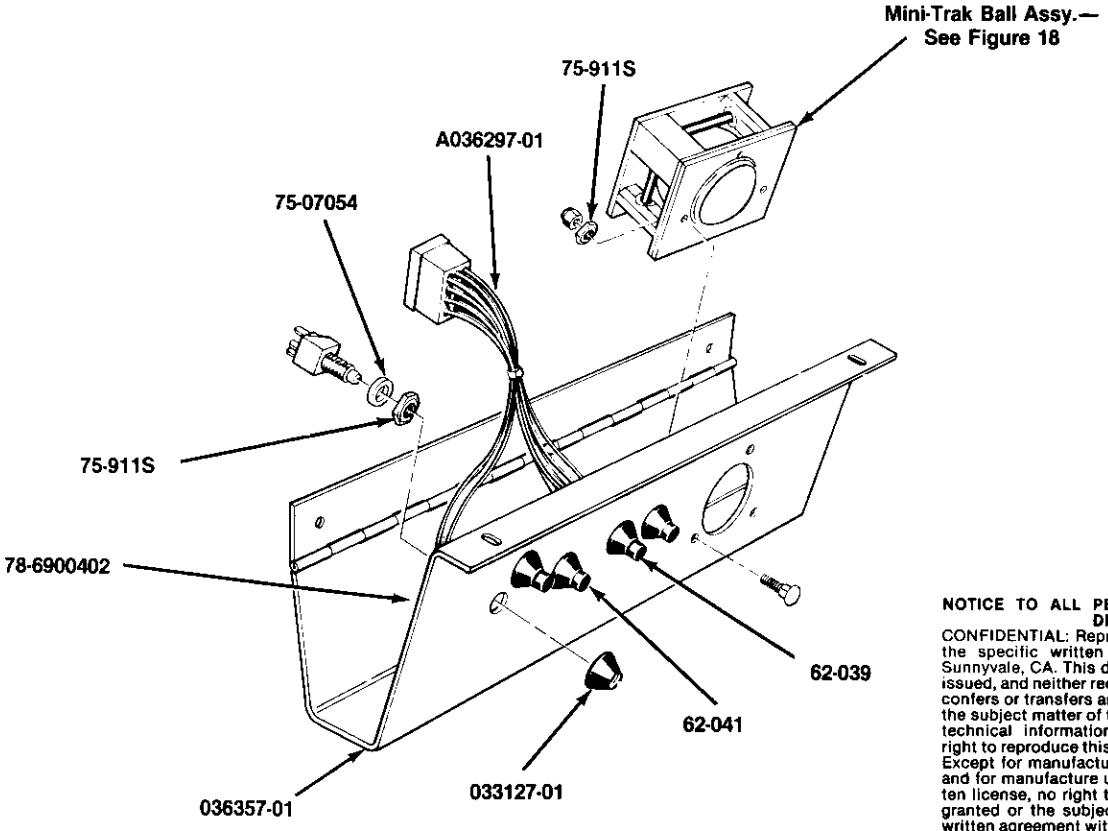

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Figure 17 Control Panel Assembly A036364-01 B

Parts List

Part No.	*Description*
A036297-01	Control Panel Harness Assembly
62-039	SPDT Momentary Pushbutton Switch, with Red Cap and Light-Emitting Diode
62-041	SPDT Momentary Pushbutton Switch with Black Cap
75-07054	Flat Nylon Washer, 0.470 inch inside diameter × 0.968 inch outside diameter × 0.075 inch thick
75-911S	#10-24 Steel Stamped Nut
78-6900402	Self-Adhesive Foam Tape, 1/8 inch thick × ¼ inch wide × 18½ inches long
033127-01	Black Molded Switch Bushing
036357-01	Control Panel with Graphics

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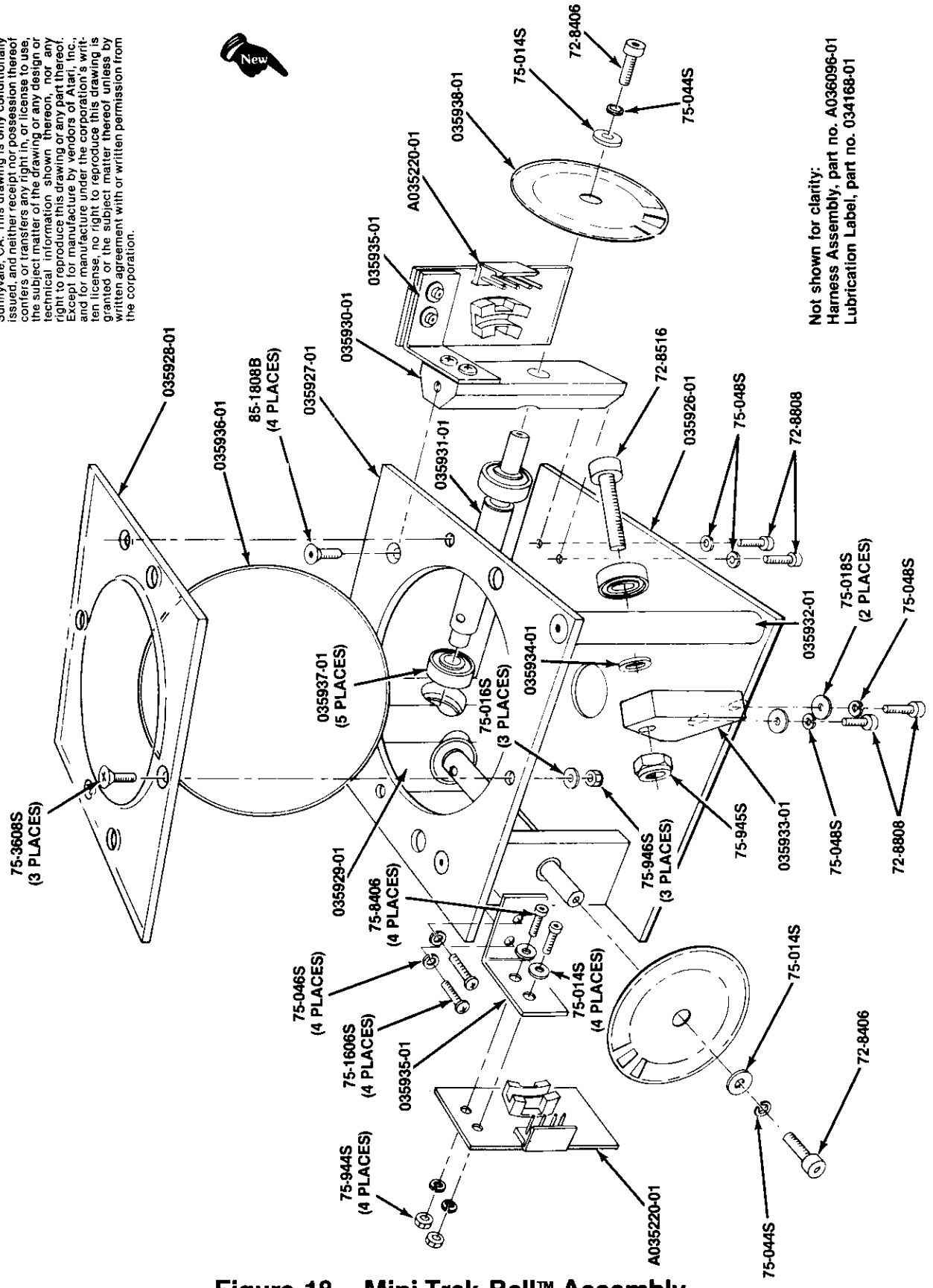

Figure 18 Mini-Trak Ball™ Assembly A035940-01 A

Figure 18 Mini-Trak Ball™ Assembly Parts List

Part No.	*Description*
A035220-01	Coupler PCB Assembly
A036096-01	Harness Assembly
72-1606S	#6-32 × 3/8″ Cross-Recessed Pan-Head Cadmium-Plated Steel Machine Screw
72-8406	#4-40 × 3/8″ Hex Socket-Head Cap Alloy Steel Machine Screw
72-8516	¼-20 × 1″ Hex Socket-Head Cap Alloy Steel Machine Screw
72-8808	#8-32 × ½″ Hex Socket-Head Cap Alloy Steel Machine Screw
75-014S	#4 Flat Plain SAE-Standard Zinc-Plated Steel Washer
75-016S	#6 Flat Plain SAE-Standard Zinc-Plated Steel Washer
75-018S	#8 Flat SAE-Standard Zinc-Plated Steel Washer
75-044S	#4 Zinc-Plated Steel Split Lock Washer
75-046S	#6 Zinc-Plated Steel Split Lock Washer
75-048S	#8 Zinc-Plated Steel Split Lock Washer
75-944S	#4-40 Self-Locking Steel/Polymer Hex Nut
75-945S	¼-20 Self-Locking Steel/Polymer Hex Nut
75-946S	#6-32 Self-Locking Steel/Polymer Hex Nut
85-1808B	#8-32 × ½″ Socket Cap Flat Countersunk-Head Black-Oxide Steel Screw
034168-01	Label with Lubrication Instructions
035926-01	Base Plate
035927-01	Top Plate (Metal)
035928-01	Top Plate (Acrylic)
035929-01	Corner Post
035930-01	End Post
035931-01	Roller Shaft
035932-01	Standoff
035933-01	Adjustable Post
035934-01	Spacer
035935-01	Angle Bracket
035936-01	Mini-Trak Ball™
035937-01	Bearing
035938-01	Encoding Wheel

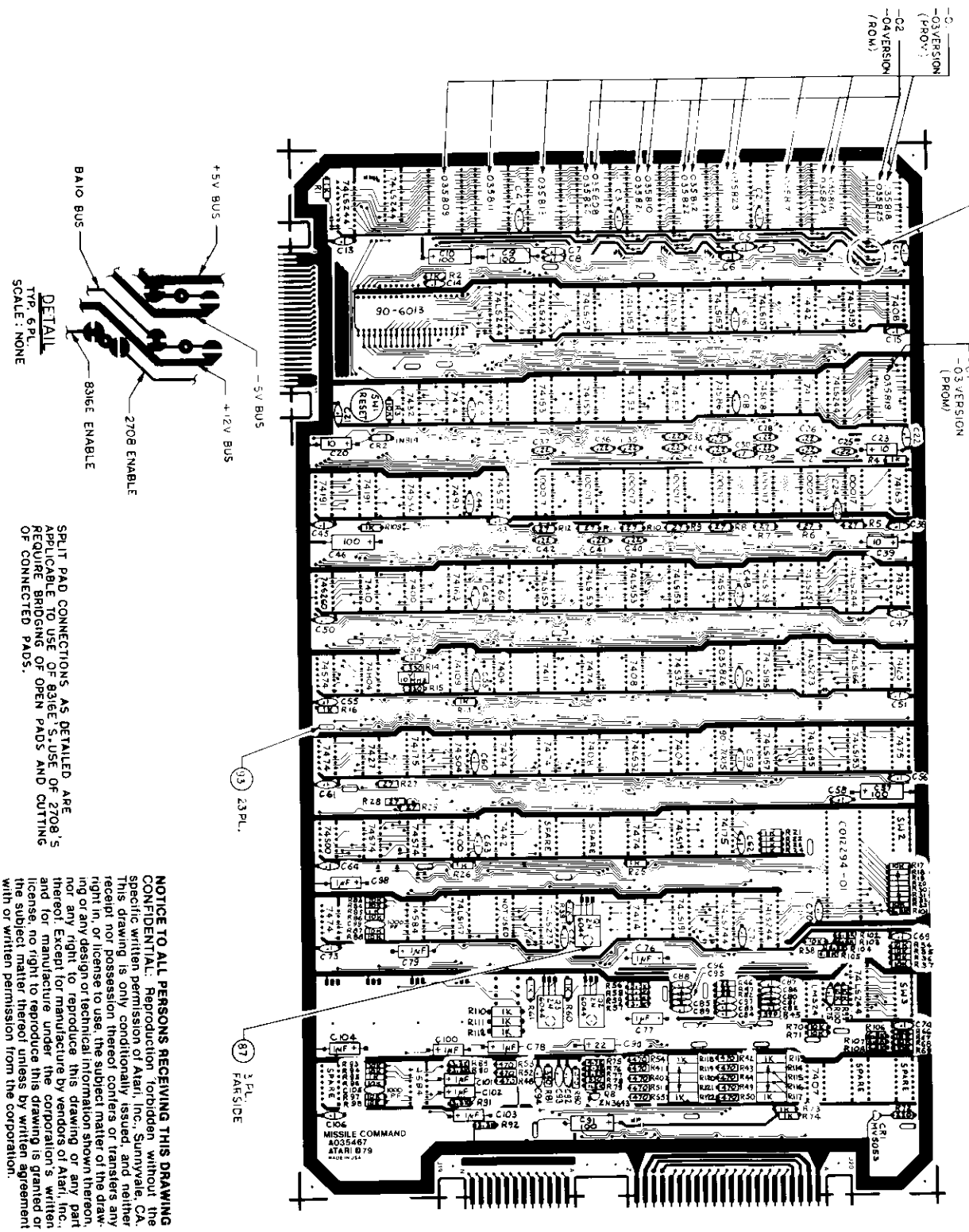

Figure 19 Missile Command™ Game PCB Assembly A035467-01 thru -04 D

Figure 19 Game PCB Assembly Parts List

Part No.	*Description (Reference Designations and Locations in Bold)*
C012294-01	Audio I/O N-Channel MOS/LSI Custom Chip **(P8/9)**
21-101683	.068 uf, ± 10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor **(C65-68)**
24-250105	1 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C76-79, 98, 100-104)**
24-250106	10 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C20, 23, 39)**
24-250107	100 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C9, 10, 46, 57, 91)**
24-250226	22 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C90)**
27-250103	.01 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C76-79)**
28-101102	1000 pf Epoxy-Dipped 100V Radial-Lead Mica Capacitor **(C99, 105)**
29-088	.1 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C1-8, 13-16, 18, 19, 21, 22, 30, 38, 43-45, 47-56, 58-64, 69-75, 80-89, 92-97, 106)**
31-1N914	75V Type-1N914 Switching Diode **(CR2)**
34-2N3643	Type 2N3643 NPN Switching Transistor **(Q8)**
34-2N6044	Type 2N6044 NPN Darlington Transistor **(Q1-3)**
37-4584B	Type 14584 Integrated Circuit **(C9, C11)**
37-7400	Type 7400 Integrated Circuit **(C5, D8)**
37-74S00	Type 74S00 Integrated Circuit **(A8)**
37-7404	Type 7404 Integrated Circuit **(E6, K7)**
37-74H04	Type 74H04 Integrated Circuit **(B6)**
37-74S04	Type 74S04 Integrated Circuit **(D7)**
37-7407	Type 7407 Integrated Circuit **(N11)**
37-74LS08	Type 74LS08 Integrated Circuit **(R2, J6, H7)**
37-74S08	Type 74S08 Integrated Circuit **(M3)**
37-74LS10	Type 74LS10 Integrated Circuit **(E3, B5)**
37-74LS14	Type 74LS14 Integrated Circuit **(D3, J9)**
37-7427	Type 7427 Integrated Circuit **(B7)**
37-7432	Type 7432 Integrated Circuit **(C3, R5)**
37-74LS32	Type 74LS32 Integrated Circuit **(J7)**
37-74S32	Type 74S32 Integrated Circuit **(C4, L5, K6)**
37-7442	Type 7442 Integrated Circuit **(N2, E8)**
37-7474	Type 7474 Integrated Circuit **(H6, A7, E7, F7, J8, A9)**
37-74S74	Type 74S74 Integrated Circuit **(A6, B8, C8)**
37-7475	Type 7475 Integrated Circuit **(R7)**
37-7493	Type 7493 Integrated Circuit **(D4)**
37-74109	Type 74109 Integrated Circuit **(D6)**
37-74125	Type 74125 Integrated Circuit **(R6)**
37-74LS139	Type 74LS139 Integrated Circuit **(P2, M5)**
37-74LS153	Type 74LS153 Integrated Circuit **(F5, H5, J5, K5, P7)**
37-74153	Type 74153 Integrated Circuit **(F3, H3, J3, K3)**
37-74LS157	Type 74LS157 Integrated Circuit **(H2, J2, K2, L2, M2, M7, D9)**
37-74S157	Type 74S157 Integrated Circuit **(E4)**
37-74160	Type 74160 Integrated Circuit **(E5)**

Figure 19 Game PCB Assembly, continued
Parts List

Part No.	*Description (Reference Designations and Locations in Bold)*
37-74163	Type 74163 Integrated Circuit **(D5)**
37-74LS163A	Type 74LS163A Integrated Circuit **(R4)**
37-74LS166	Type 74LS166 Integrated Circuit **(P6)**
37-74175	Type 74175 Integrated Circuit **(L8)**
37-74LS175	Type 74LS175 Integrated Circuit **(C7)**
37-74LS191	Type 74LS191 Integrated Circuit **(K8, K9)**
37-74191	Type 74191 Integrated Circuit **(A4, B4)**
37-74LS195	Type 74LS195 Integrated Circuit **(M6, N7)**
37-74LS244	Type 74LS244 Integrated Circuit **(A/B1, E2, F2, P5, L9, M9, P10, B/C1, N/P3)**
37-74LS251	Type 74LS251 Integrated Circuit **(N5)**
37-74S260	Type 74S260 Integrated Circuit **(A5)**
37-74LS273	Type 74LS273 Integrated Circuit **(N6, F9)**
37-LM324	Type LM324 Integrated Circuit **(N10)**
38-MV5053	Type MV5053 Light-Emitting Diode **(CR1)**
62-001	SPST Pushbutton Switch **(B3)**
66-118P1T	8-Station Single-Throw, Dual-Inline-Package Bit Switch **(R8, R10)**
79-42C24	24-Contact Medium-Insertion-Force Integrated Circuit Socket **(For -01 and -03 PCB Assemblies: D1, E1, F1, H1, J/K1, K/L1, L/M1, M/N1, N/P1, R1, R3; For -02 and -04 PCB Assemblies: H1, J/K1, K/L1, L/M1, N/P1, R1)**
79-42C40	40-Contact Medium-Insertion-Force Integrated Circuit Socket **(C2, P8/9)**
81-4302	Nylon Snap-In Fastener
90-123	10.000 MHz, ±.005%, Crystal **(Y1)**
90-6013	Microprocessor **(C2)**
90-7005	Random-Access Memory **(L7)**
020670-01	Test Point
035826-01	Programmable Read-Only Memory **(L6)**
100017-001	Random-Access Memory **(F4, H4, J4, K4, L4, M4, N4, P4)**
110000-102	1K Ohm, ±5%, ¼W Resistor **(R1, 2, 4, 13, 16, 21-26, 39, 60, 61, 73, 74, 85, 95, 109-122)**
110000-103	10K Ohm, ±5%, ¼W Resistor **(R3, 17-20, 30-38, 60-71, 83, 84, 86-88, 93, 94, 96-100)**
110000-152	1.5K Ohm, ±5%, ¼W Resistor **(R79)**
110000-220	22 Ohm, ±5%, ¼W Resistor **(R46, 47, 82)**
110000-221	220 Ohm, ±5%, ¼W Resistor **(R72)**
110000-222	2.2K Ohm, ±5%, ¼W Resistor **(R76)**
110000-332	3.3K Ohm, ±5%, ¼W Resistor **(R56-59, 89-92)**
110000-270	27 Ohm, ±5%, ¼W Resistor **(R5-12, 27-29)**
110000-331	330 Ohm, ±5%, ¼W Resistor **(R14, 15, 78)**
110000-391	390 Ohm, ±5%, ¼W Resistor **(R45, 81)**
110000-471	470 Ohm, ±5%, ¼W Resistor **(R40-44, 48-55, 80)**
110000-472	4.7K Ohm, ±5%, ¼W Resistor **(R75)**
110000-682	6.8K Ohm, ±5%, ¼W Resistor **(R101-108)**
110000-822	8.2K Ohm, ±5%, ¼W Resistor **(R77)**
122004-224	.22 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C24-29, 31-37, 40-42)**
137002-001	Type 74S86 Integrated Circuit **(L3)**
137149-001	Type 74LS11 Integrated Circuit **(F6, N3)**

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

Figure 19 Game PCB Assembly, continued
Parts List

Memory Components and Their Equivalents (Locations Shown in Bold)

-01 P.C. Boards (mostly PROMs)	-02 P.C. Boards (ROMs)	-03 P.C. Boards (mostly PROMs)	-04 P.C. Boards (ROMs)
035812-01 **K/L1**	035822-01 **K/L1**	035812-02 **K/L1**	035822-02 **K/L1**
035813-01 **F1**		035813-02 **F1**	
035823-01 **L/M1**	035823-01 **L/M1**	035823-02 **L/M1**	035823-02 **L/M1**
035816-01 **N/P1**	035824-01 **N/P1**	035816-02 **N/P1**	035824-02 **N/P1**
035817-01 **M/N1**		035817-02 **M/N1**	
035818-01 **R1**	035825-01 **R1**	035818-02 **R1**	035825-02 **R1**
035819-01 **R3**		035819-02 **R3**	
035808-01 **H1**	035820-01 **H1**	035808-02 **H1**	035820-02 **H1**
035809-01 **D1**		035809-02 **D1**	
035810-01 **J/K1**	035821-01 **J/K1**	035810-02 **J/K1**	035821-02 **J/K1**
035811-01 **E1**		035811-02 **E1**	

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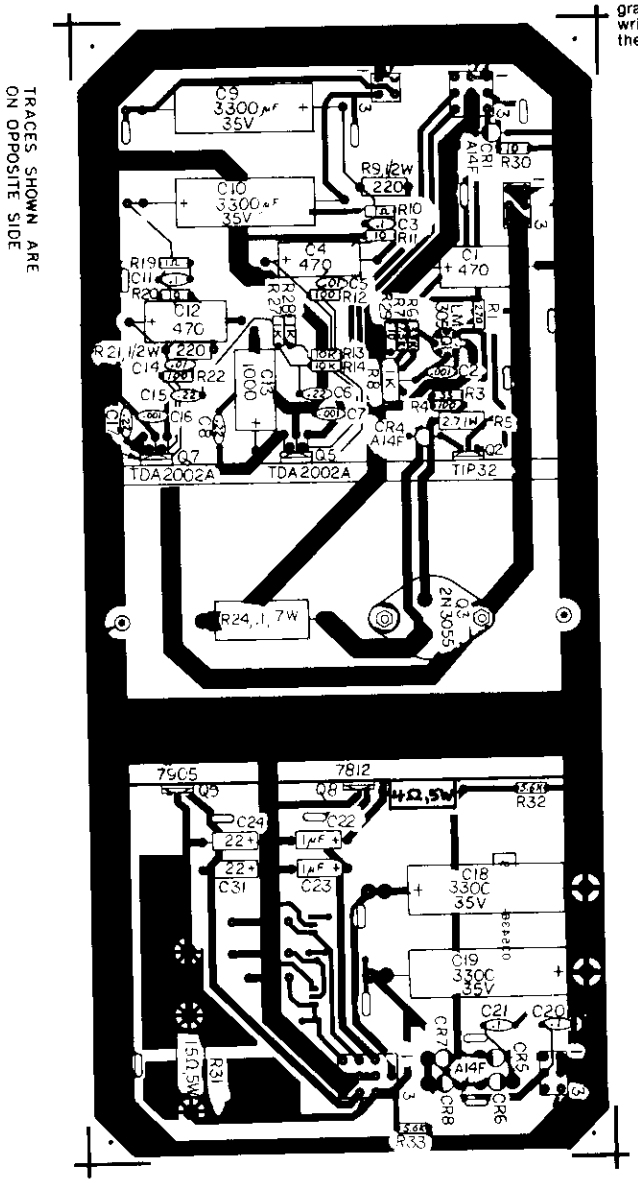
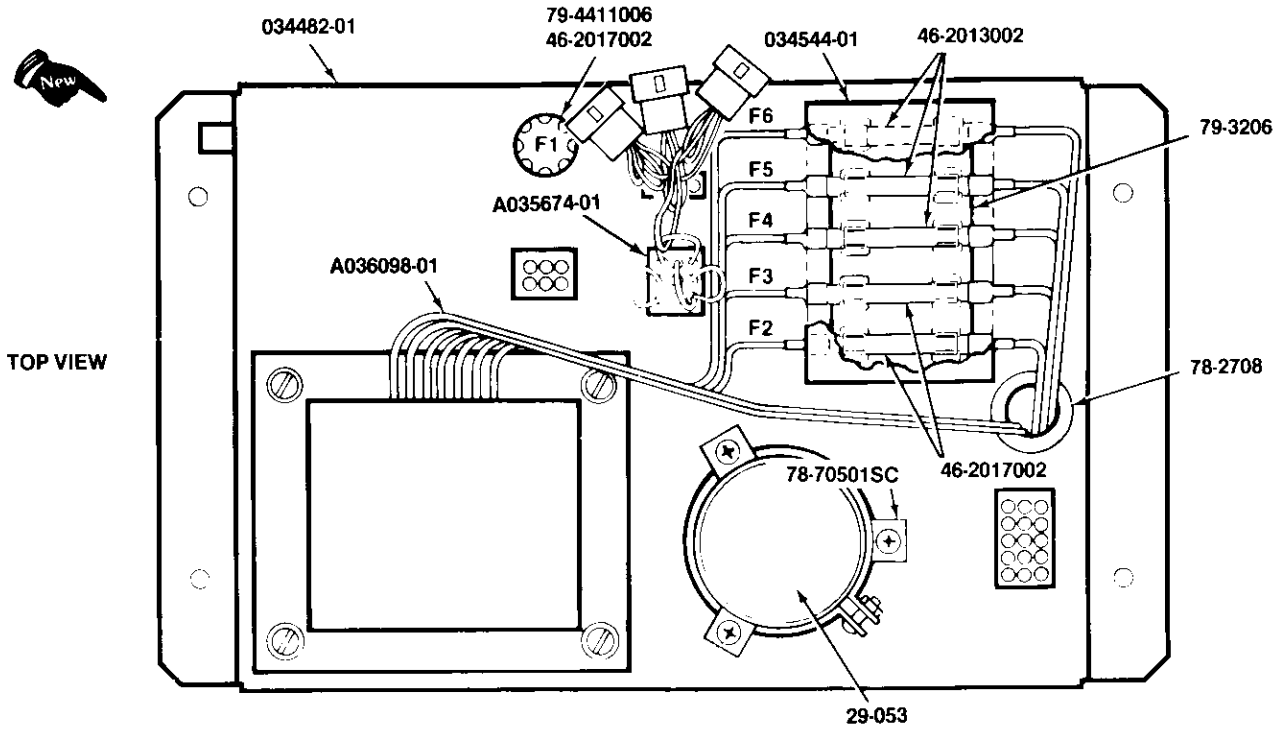


Figure 20 Regulator/Audio II PCB Assembly A035435-02 B

Figure 20 Regulator/Audio II PCB Assembly Parts List

Part No.	*Description (Reference Designations and Locations in Bold)*
12-52P7	2.7 Ohm, ± 5%, 1W Resistor **(R5)**
16-54P0	4 Ohm, ± 5%, 5W Wirewound Resistor **(R25)**
19-100P1015	.1 Ohm, ± 3%, 7W Wirewound Resistor **(R24)**
19-315102	1K Ohm Vertical PCB-Mounting Cermet Trimpot **(R8)**
24-250106	10 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C5, 15)**
24-250108	1000 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C9, 10, 13)**
24-250477	470 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C1, 4, 12)**
24-250478	4700 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C29)**
24-250108	1000 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C13)**
24-250477	470 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C1, 4, 12)**
24-350226	22 uf Aluminum Electrolytic Fixed Axial-Lead 35V Capacitor **(C24, 31)**
24-350338	3300 uf Aluminum Electrolytic Fixed Axial-Lead 35V Capacitor **(C9, 10, 18, 19)**
24-500105	1 uf Aluminum Electrolytic Fixed Axial-Lead 50V Capacitor **(C22, 23)**
27-250102	.001 uf Ceramic-Disc 35V Radial-Lead Capacitor **(C2, 7, 16)**
27-250103	.01 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C5, C14)**
29-088	.1 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C3, 11, 20, 21)**
31-A14F	50V 2.5A Miniature Axial-Lead High-Current Rectifier **(CR1, 4-8)**
33-TIP32	PNP Power Transistor, Type TIP32 **(Q2)**
34-2N3055	NPN Silicon Transistor, Type 2N3055 **(Q3)**
37-LM305	5V Linear Voltage Regulator **(Q1)**
37-7812	+ 12V Voltage Regulator, Type 7812 **(Q8)**
37-7905	− 5V Voltage Regulator, Type 7905 **(Q9)**
72-1608C	#6-32 × ½" Cross-Recessed Pan-Head Corrosion-Resistant Steel Machine Screw
75-F60405	#6-32 × ¼" Binder-Head Nylon Screw
75-99516	#6-32 Nut/Washer Assembly
78-16008	Thermally Conductive Compound **(Q3)**
78-16014	Thermally Conductive Compound **(Q2, 5, 7-9)**
79-58306	6-Position Connector Receptacle **(J6, 9)**
79-58308	9-Position Connector Receptacle **(J7)**
79-58346	12-Position Connector Receptacle **(J10)**
79-58354	4-Position Connector Receptacle **(J8)**
020670-01	Test Point
034531-01	Heat Sink
110000-010	1 Ohm, ± 5%, ¼W Resistor **(R10, 19)**
110000-100	10 Ohm, ± 5%, ¼W Resistor **(R11, 20, 29, 30)**
110000-101	100 Ohm, ± 5%, ¼W Resistor **(R4, 12, 22)**
110000-102	1K Ohm, ± 5%, ¼W Resistor **(R27, 28)**
110000-103	10K Ohm, ± 5%, ¼W Resistor **(R13, 14)**
110000-271	270 Ohm, ± 5%, ¼W Resistor **(R1)**
110000-330	33 Ohm, ± 5%, ¼W Resistor **(R3)**
110000-392	3.9K Ohm, ± 5%, ¼W Resistor **(R6)**
110000-562	5.6K Ohm, ± 5%, ¼W Resistor **(R32, 33)**
110000-752	7.5K Ohm, ± 5%, ¼W Resistor **(R7)**
110001-221	220 Ohm, ± 5%, ½W Resistor **(R9, 21)**
116000-220	22 Ohm, ± 5%, 10W Wirewound Resistor **(R31)**
122004-224	.22 uf Ceramic-Disc 25V Capacitor **(C6, 8, 15, 17)**
137151-002	Type TDA2002A 8W Linear Audio Amplifier Integrated Circuit **(Q5, 7)**



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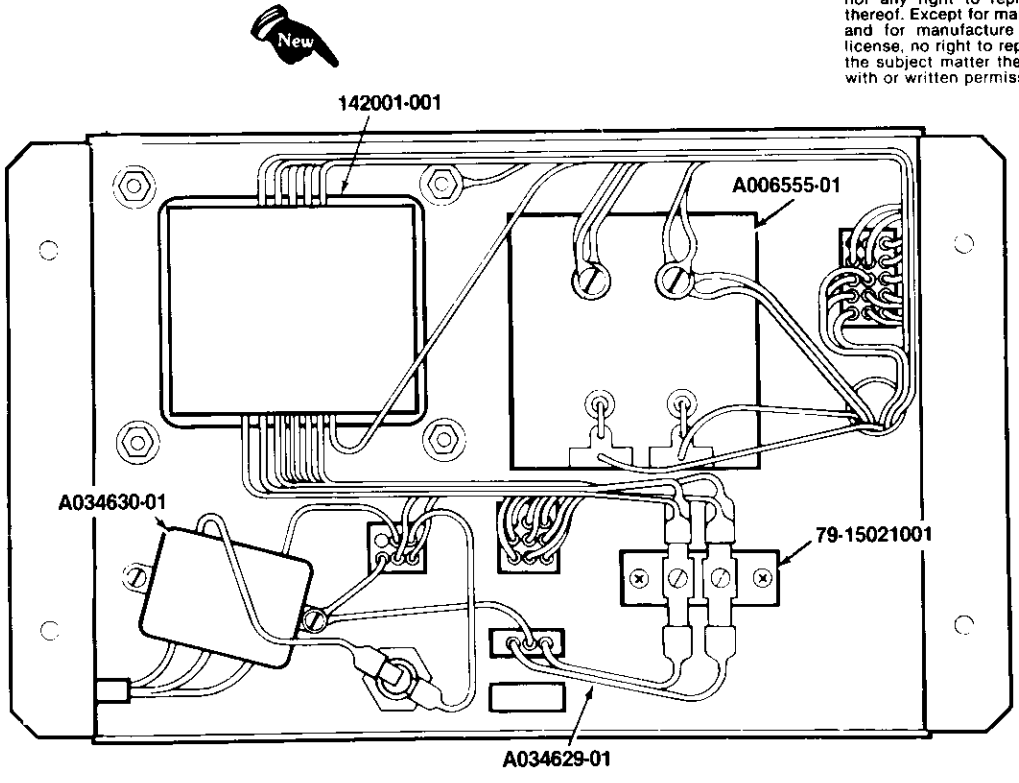

Figure 21 Power Supply Assembly for Color Raster-Scan Games
A036099-01 A

Figure 21 Power Supply Assembly for Color Raster-Scan Games Parts List

Part No.	*Description*
A006555-01	Rectifier Printed Circuit Board Assembly
A036098-01	Transformer and Harness Assembly *(includes Shielded Power Transformer)*
A034629-01	AC Harness Assembly
A034630-01	RFI Filter Assembly
A035674-01	Voltage Plug Assembly *(set of four plugs)*
29-053	26,000 uf 15V Electrolytic Capacitor
46-2013002	3-Amp. 250V 3AG Slow-Blow Glass Cartridge-Type Fuse
46-2017002	7-Amp. 250V 3AG Slow-Blow Glass Cartridge-Type Fuse
78-2708	Nylon Type 6/6 Hole Bushing with 5/8" Inside Diameter × 55/64" Outside Diameter × ¼" Thick
78-70501SC	2"-Diameter Capacitor Mounting Bracket
79-15021001	2-Circuit Single-Row Terminal Block
79-3206	5-Position 3AG Fuse Block with ¼" Quick-Disconnect Terminals
79-4411006	Panel-Mounting Non-Indicating 3AG Cartridge-Type Fuse Post
034544-01	Fuse Block Cover
142001-001	Shielded Power Transformer Only *(with isolation windings)*

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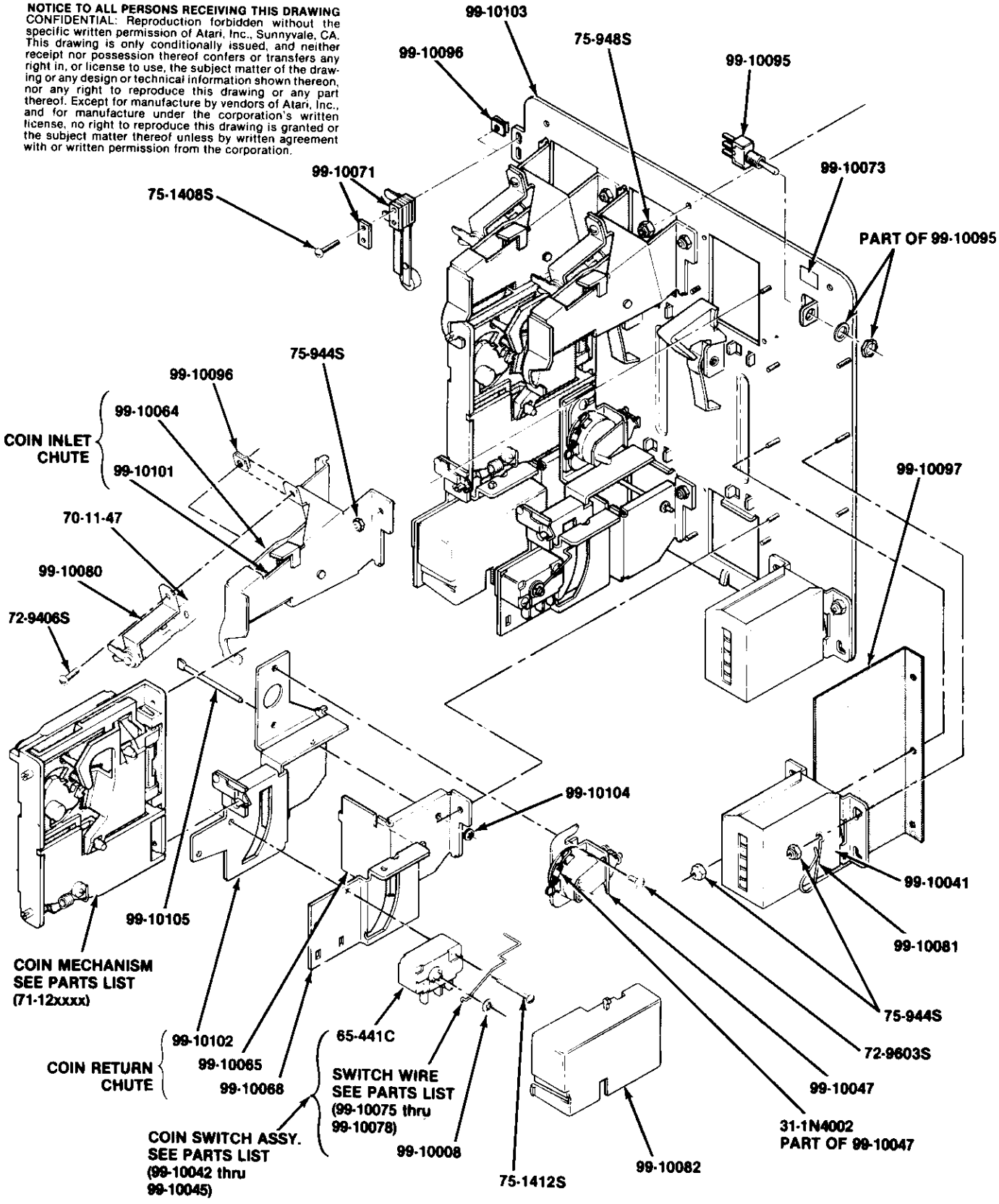

Figure 22 New Coin Door 71-10xxxx

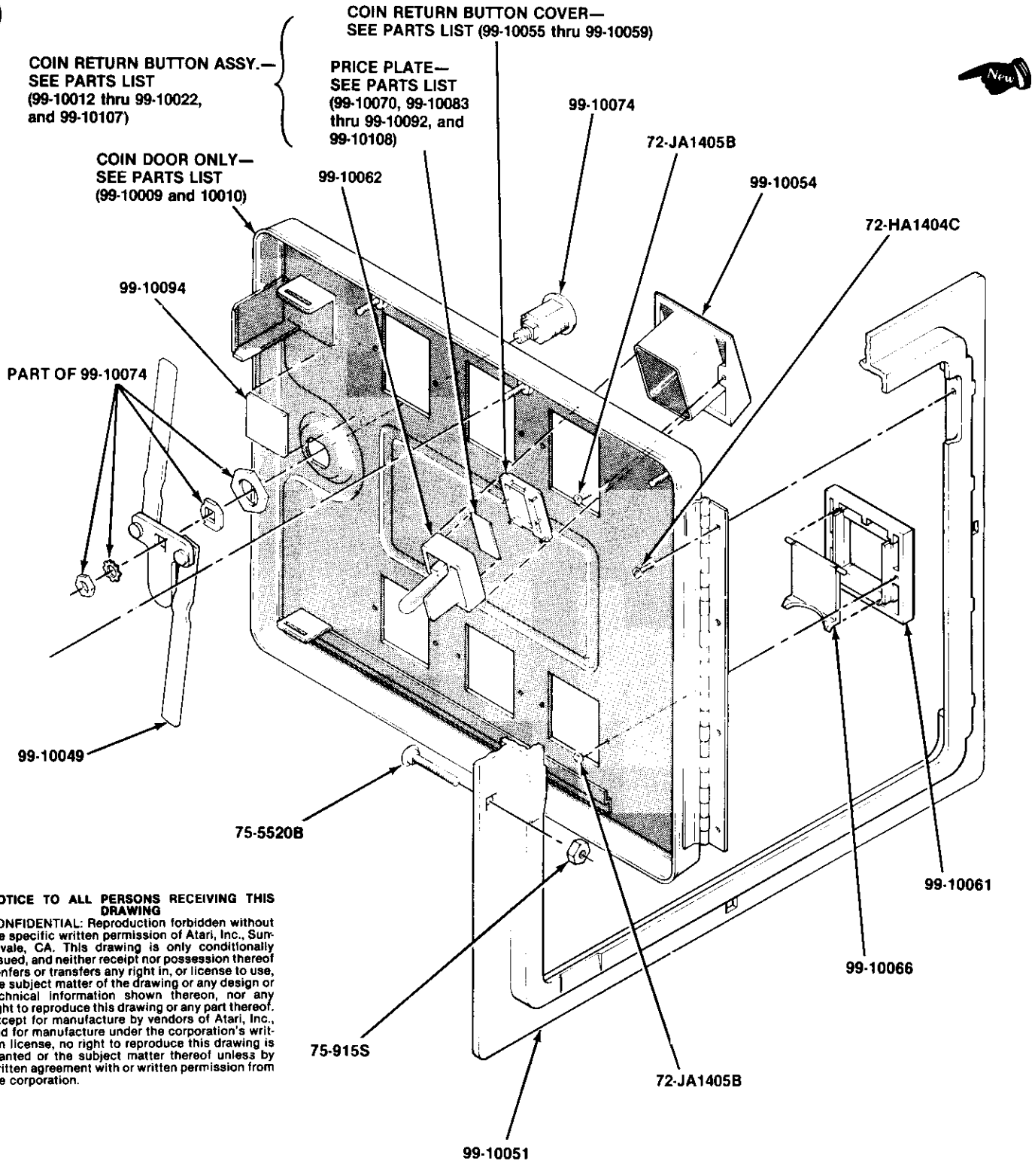

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Figure 22 New Coin Door 71-10xxxx

Figure 22 New Coin Door, continued Parts List

Part No.	Description
31-1N4002	100V Silicon Rectifier 1N4002 Diode
65-441C	General-usage low-force miniature switch
70-11-47	Miniature bayonet-base incandescent lamp, type #47
71-1201ADU	U.S. $1.00 coin mechanism
71-1201FCH	Swiss 1 Fr coin mechanism
71-1201MG	German 1 DM coin mechanism
71-1202MG	German 2 DM coin mechanism
71-1205FB	Belgian 5 Fr coin mechanism
71-1205MG	German 5 DM coin mechanism
71-1210PE	U.K. 10 P coin mechanism
71-1220CA	Australian 20¢ coin mechanism
71-1225CU	U.S. 25¢ coin mechanism
71-12100LI	Italian 100 Lire coin mechanism
71-12100YJ	Japanese Y100 coin mechanism
72-HA1404C	#4x¼" Slotted pan-head thread-rolling tri-fluted "Taptite" cadmium-plated screw
72-JA1405B	#4x5/16" Slotted pan-head thread-rolling tri-fluted "Plastite" black screw
72-9406S	#4-40x3/8" Slotted truss-head steel machine screw
72-9603S	#6-32x3/16" Slotted truss-head steel machine screw
75-915S	#¼-20 Standard pattern cadmium-plated steel hex nut
75-918S	#8-32 Standard pattern cadmium-plated steel hex nut
75-944S	#4-40 Polymer self-locking steel hex nut
75-948S	#8-32 Polymer self-locking steel hex nut
75-1408S	#4-40x½" Slotted pan-head steel machine screw
75-1412S	#4-40x¾" Slotted pan-head steel machine screw
75-5520B	#¼-20x1¼" Round-head square-neck steel bolt with black finish
99-10008	Switch wire retainer
99-10009	2-Mech coin door only
99-10010	3-Mech coin door only
99-10011	Inner panel
99-10012	U.S. 25¢ coin return button assembly
99-10013	U.S. $1.00 coin return button assembly
99-10014	German 1 DM coin return button assembly
99-10015	German 2 DM coin return button assembly
99-10016	German 5 DM coin return button assembly
99-10017	Belgian 5 Fr coin return button assembly
99-10018	Swiss 1 Fr coin return button assembly
99-10019	Japanese Y100 coin return button assembly
99-10020	U.K. 10 P coin return button assembly
99-10021	Australian 20¢ coin return button assembly
99-10022	Italian 100 Lire coin return button assembly
99-10040	Coin inlet chute assembly
99-10041	Coin counter assembly
99-10042	Coin switch assembly for U.S. 25¢ and Belgian 5 Fr coins (silver wire)
99-10043	Coin switch assembly for German 1 DM, Swiss 1 Fr, and Japanese Y100 coins (black wire)
99-10044	Coin switch assembly for U.S. $1.00, German 2 DM, and Italian 100 Lire coins (gold wire)

Figure 22 New Coin Door, continued
Parts List

Part No.	Description
99-10045	Coin switch assembly for German 5 DM, U.K. 10 P, and Australian 20¢ coins (green wire)
99-10047	Lockout coil assembly
99-10048	Coin door harness assembly
99-10049	Locking arm assembly
99-10051	Coin door frame
99-10052	Coin return lever
99-10054	Coin button housing
99-10055	Coin return button cover for Japanese Y100 coin
99-10056	Coin return button cover for German 1 DM and Swiss 1 Fr coins
99-10057	Coin return button cover for U.S. 25¢ and Belgian 5 Fr coins
99-10058	Coin return button cover for U.S. $1.00, German 2 DM, and Italian 100 Lire coins
99-10059	Coin return button cover for German 5 DM, U.K. 10 P, and Australian 20¢ coins
99-10061	Coin return bezel
99-10062	Coin return button
99-10063	Right half of coin inlet chute
99-10064	Left half of coin inlet chute
99-10065	Coin return box
99-10066	Coin return cover
99-10070	U.S. 25¢ price plate
99-10071	Slam switch assembly
99-10073	Test switch decal
99-10074	Lock assembly
99-10075	Black switch wire—for German 1DM, Swiss 1Fr and Japanese Y100 coins
99-10076	Silver switch wire—for U.S. 25¢ and Belgian 5Fr coins
99-10077	Gold switch wire—for U.S. $1.00, German 2DM and Italian 100 Lire coins
99-10078	Green switch wire—for German 5DM, U.K. 10P and Australian 20¢ coins
99-10080	Miniature bayonet-base lamp socket
99-10081	Wire key holder
99-10082	Switch cover
99-10083	U.S. $1.00 price plate
99-10084	German 1 DM price plate
99-10085	German 2 DM price plate
99-10086	German 5 DM price plate
99-10087	Belgian 5 Fr price plate
99-10088	Swiss 1 Fr price plate
99-10089	Japanese Y100 price plate
99-10090	U.K. 10 P price plate
99-10091	Australian 20¢ price plate
99-10092	Italian 100 Lire price plate
99-10094	Fish paper insulation
99-10095	Toggle switch
99-10096	"U"-type fastener
99-10097	Fish paper insulation
99-10101	Coin inlet chute sub-assembly
99-10102	Switch and lockout coil bracket sub-assembly
99-10103	Inner panel with levers sub-assembly
99-10104	Anti-penny-flip bar retainer
99-10105	Anti-penny-flip bar
99-10107	U.S. 50¢ coin return button assembly
99-10108	U.S. 50¢ price plate—for two quarters