

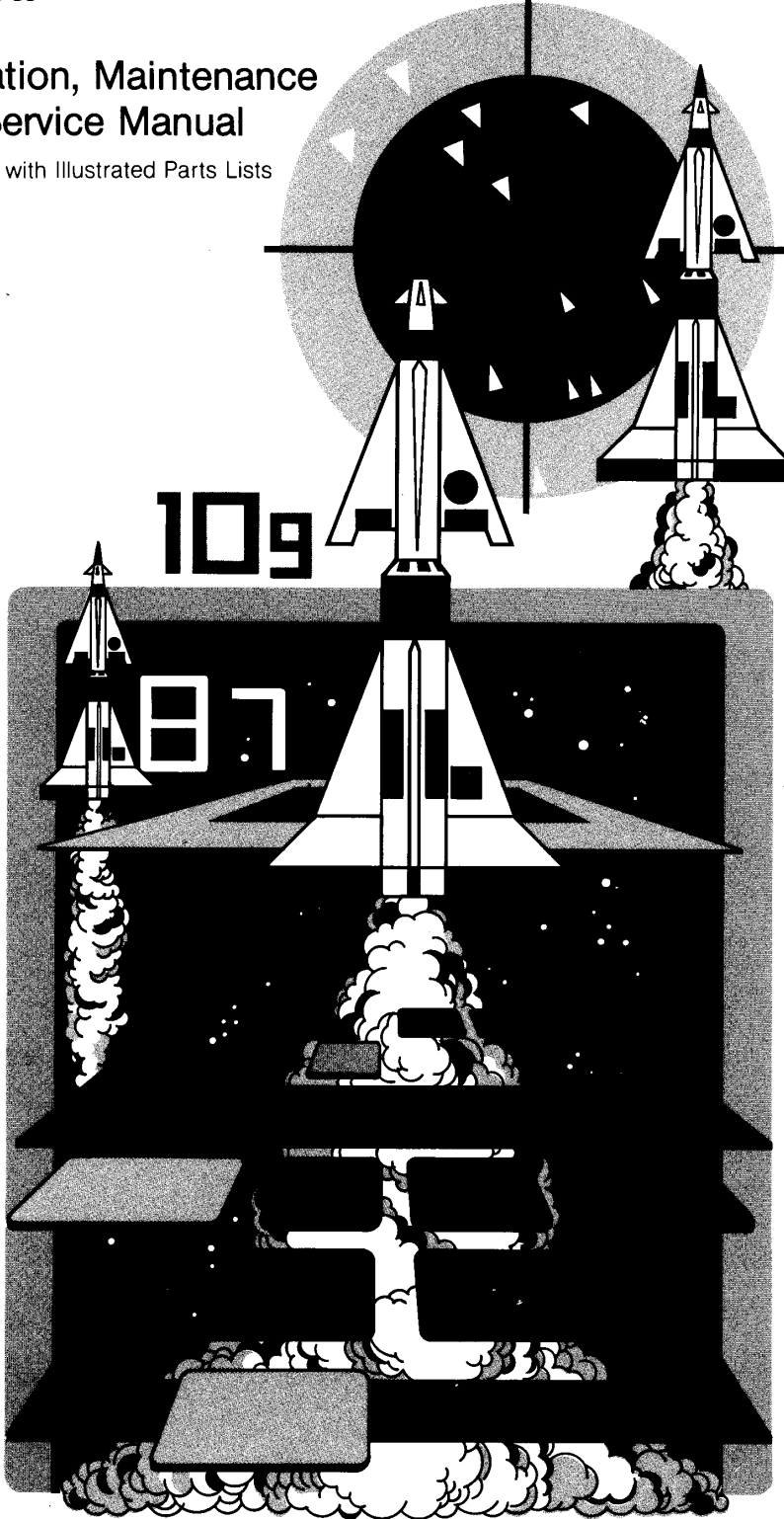


MISILE

TM-147
3rd printing

Operation, Maintenance
and Service Manual

Complete with Illustrated Parts Lists



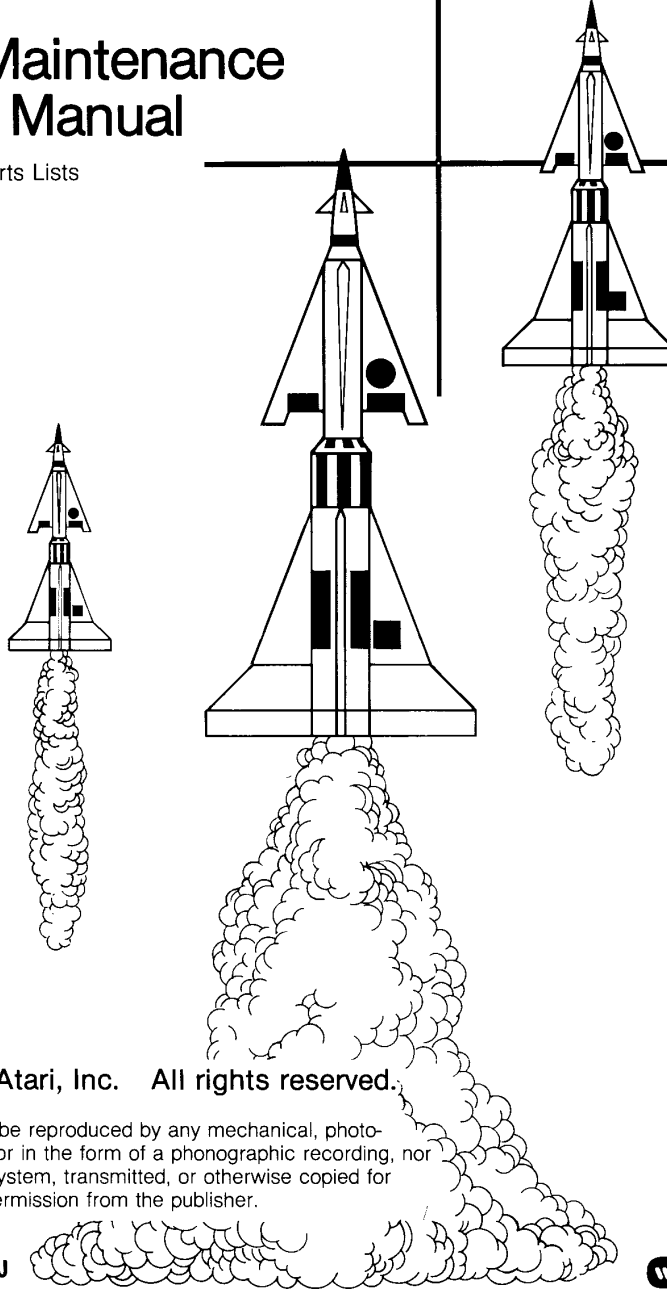
COMMANCHEE

TM

MISSILE COMMAND™

Operation, Maintenance and Service Manual

Complete with Illustrated Parts Lists



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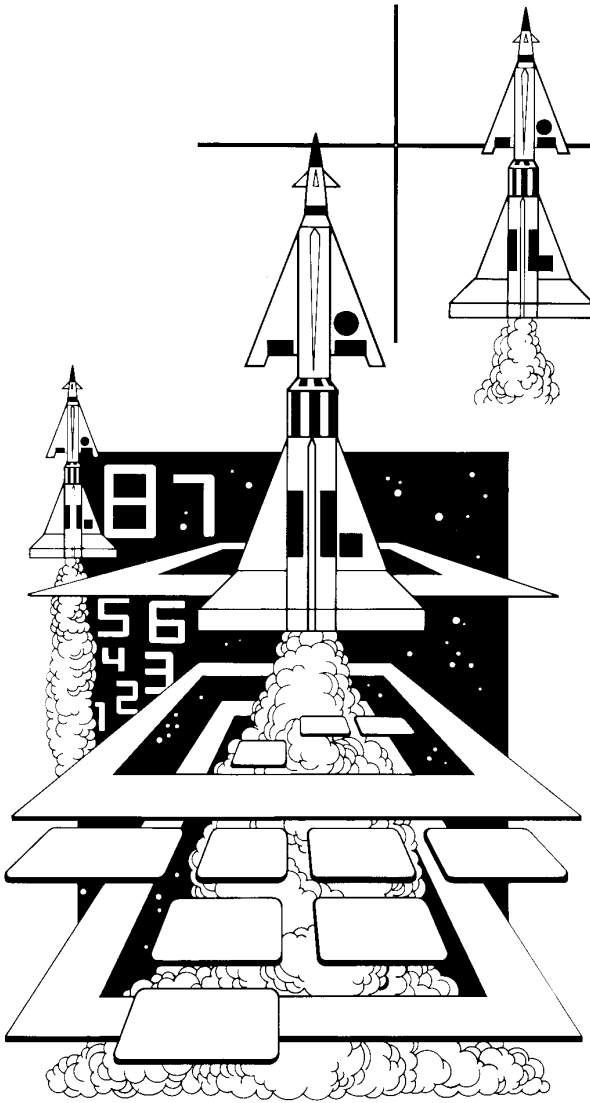
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Location Setup

A. New Parts

The Missile Command™ 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:

- Color TV Monitor. Made especially to Atari specifications, the 19-inch monitor has been color-converged at the factory. All convergence adjustments are cemented and locked in place, to prevent accidental changes. This helps provide higher reliability for the service technician.
- Isolation Transformer. The color TV monitor chassis in this game does not contain an isolation transformer. Atari has mounted an isolation transformer on the floor of the cabinet to protect operators. **If you service this color TV on a test bench, you must isolate the line voltage!** (See instructions on pages 14-15.)



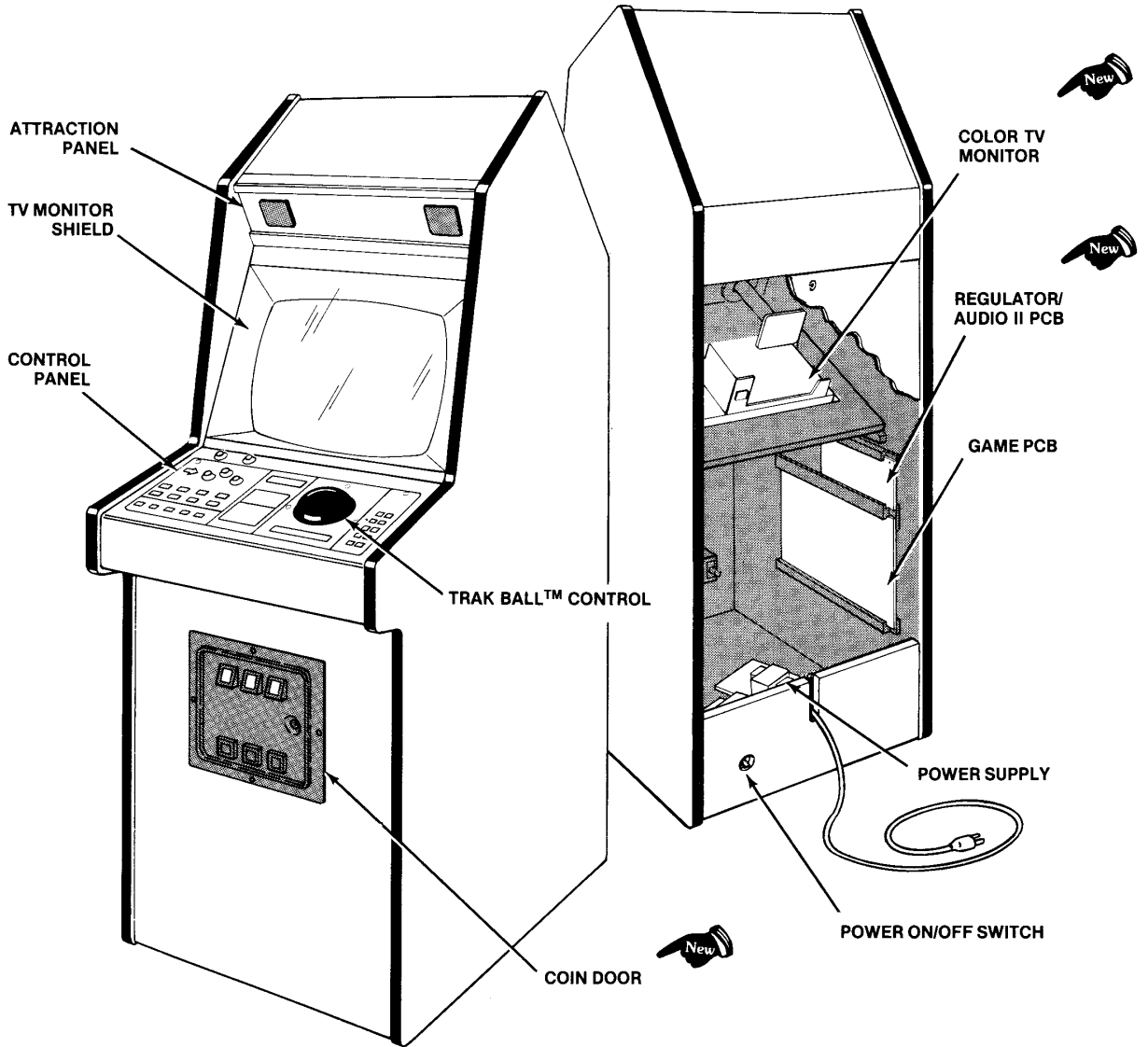


Figure 1 Overview of Game

- Regulator/Audio II PCB. This slightly redesigned printed-circuit board has two additional voltage regulators for games using 2708 EPROM memory chips. The board's new +12V and -5V regulators are both mounted on the heat sink. Otherwise this board is the same as past Regulator/Audio PCBs.
- New Coin Door. This door will accommodate two or three mechanisms, and up to four coin counters. Its triple-arm locking bar provides added security. For greater ease of access, the self-test switch is now mounted on the door, rather than inside the cabinet.

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:



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:
 - 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.

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!

- Note the location of the game's serial number—it is on the metallic label on the back 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.

C. Game Installation

Figure 2 Installation Requirements

Power	150 watts
Temperature	0 to 38° C (32 to 100°F)
Humidity	Not over 95% relative
Space Required	64 × 83 cm (25¼ × 32¾ in.)
Game Height	186 cm (73¼ 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

86-104 VAC (95)	Black
100-125 VAC (110)	Orange
190-220 VAC (205)	Green
210-240 VAC (220)	Red

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 a door or panel is opened.

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

- Unlock and open the access panel and the coin door.
- Plug the AC line power cord into an AC outlet.

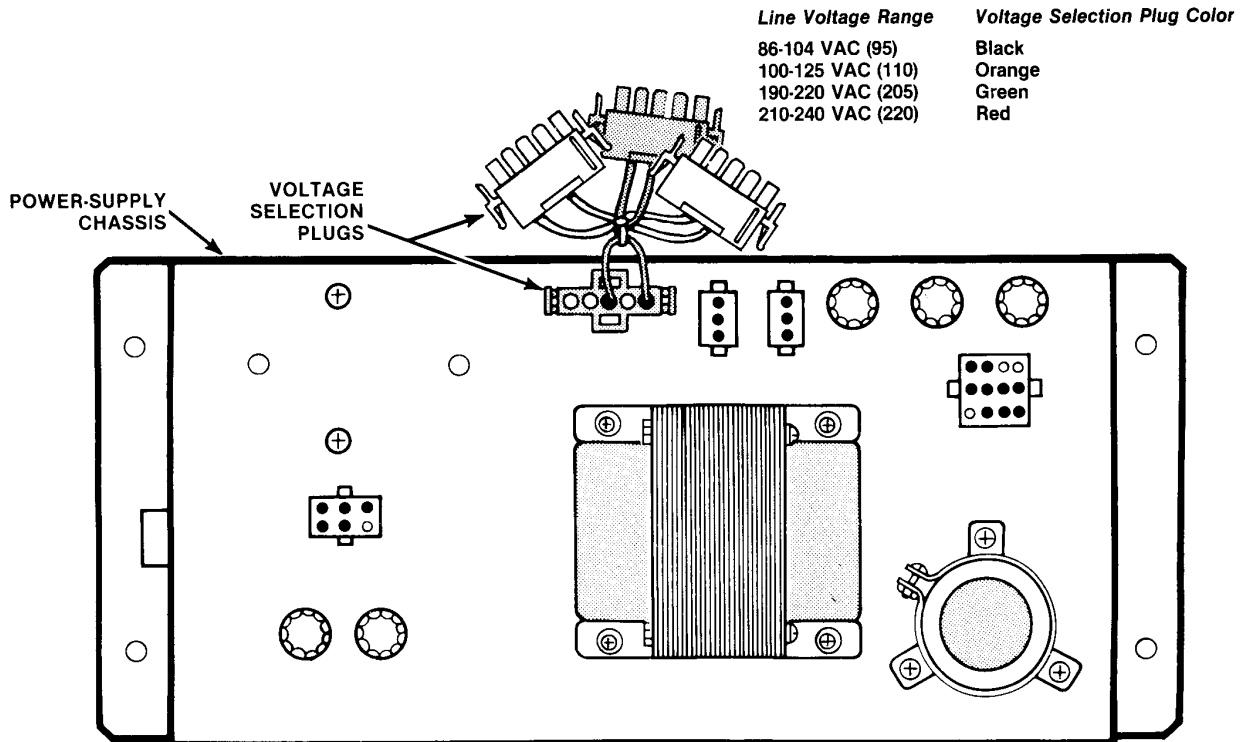
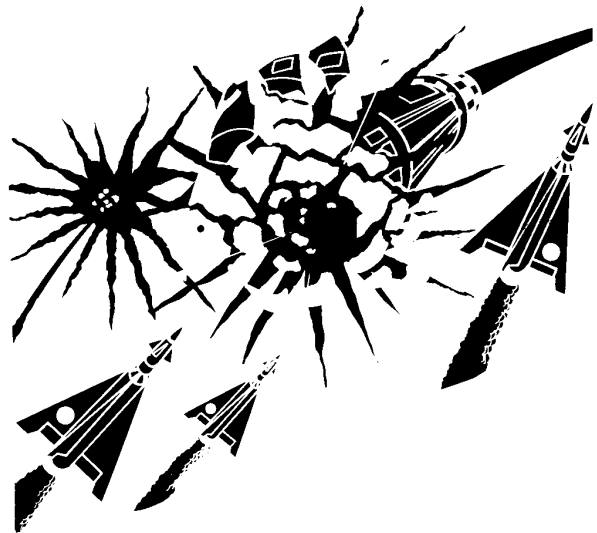


Figure 3 Power Supply

- Close the access panel and coin door.
- Set the power on/off switch to the on position. Within approximately 30 seconds the TV monitor should display a picture.
- Slowly open the rear 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.



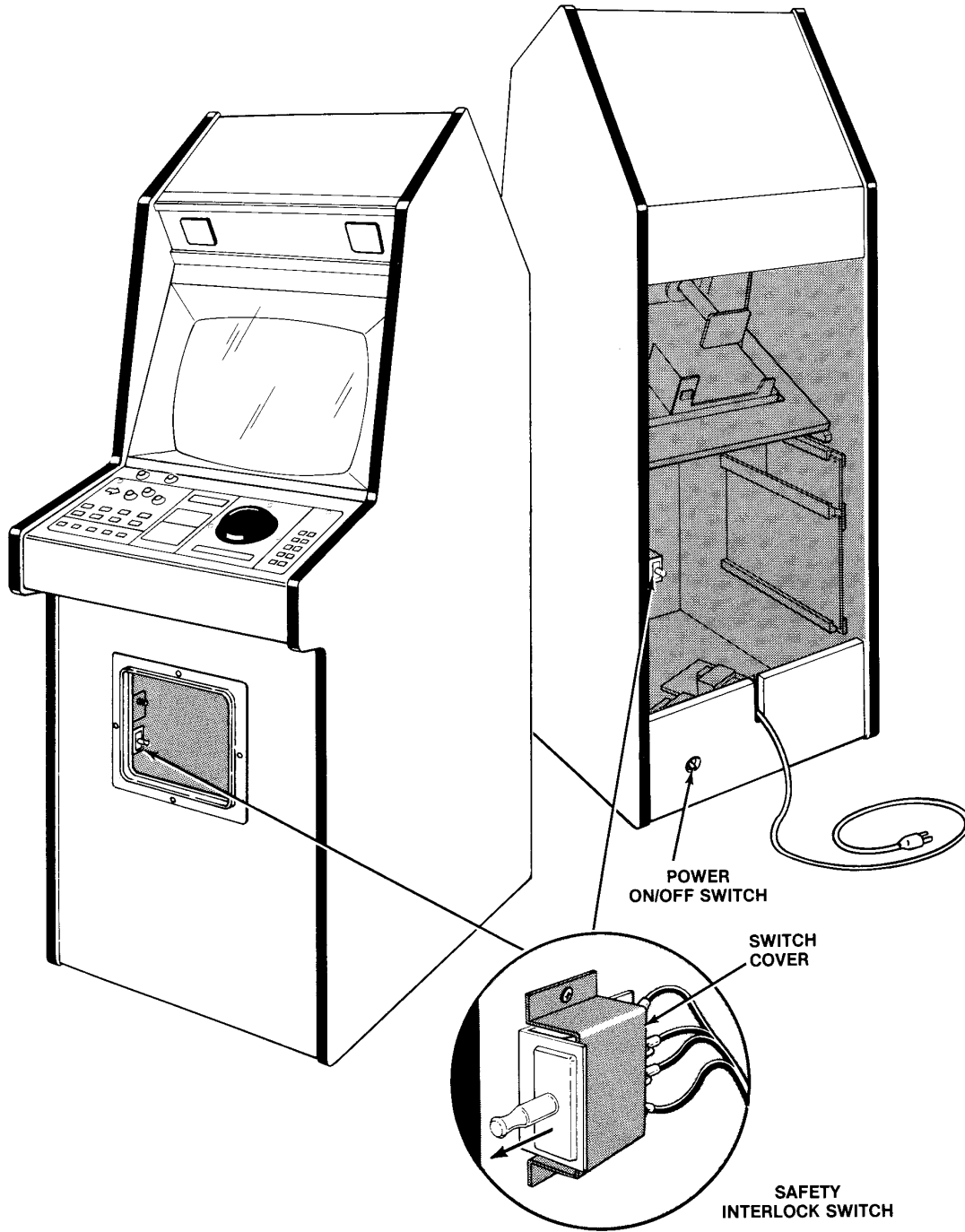


Figure 4 Interlock and Power On/Off Switches

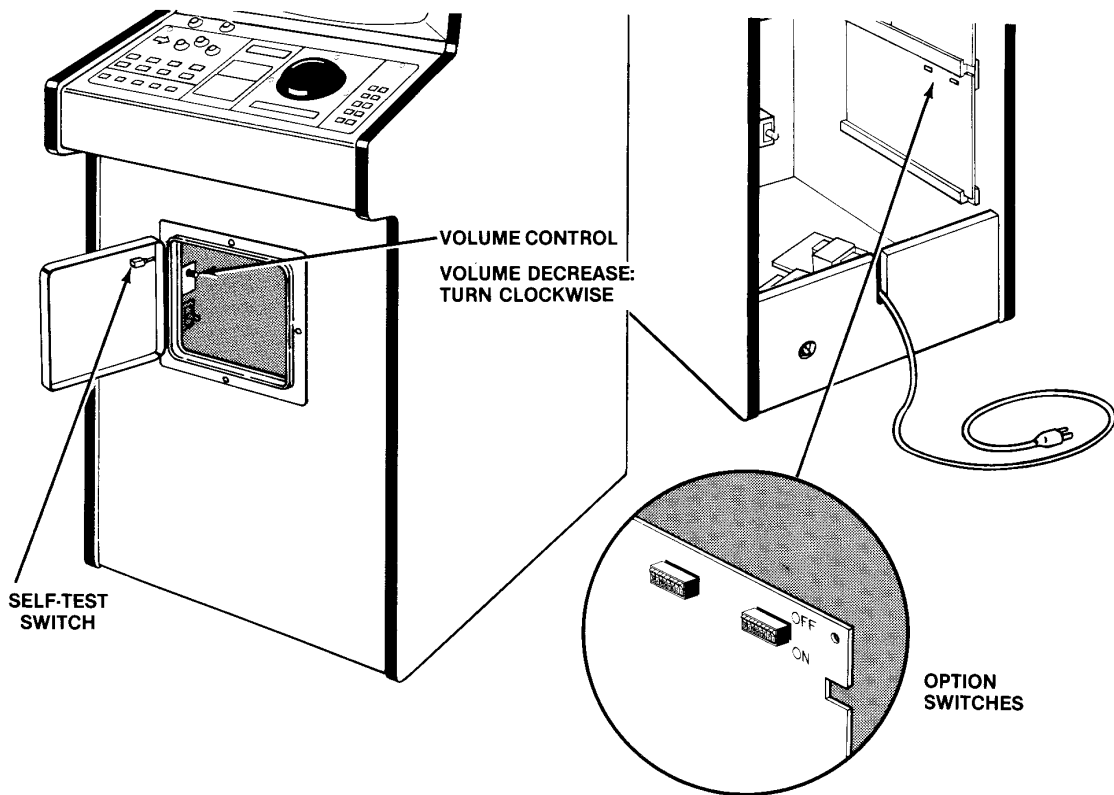


Figure 5 Location of Self-Test Switch, Volume Control and Option Switches

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 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.

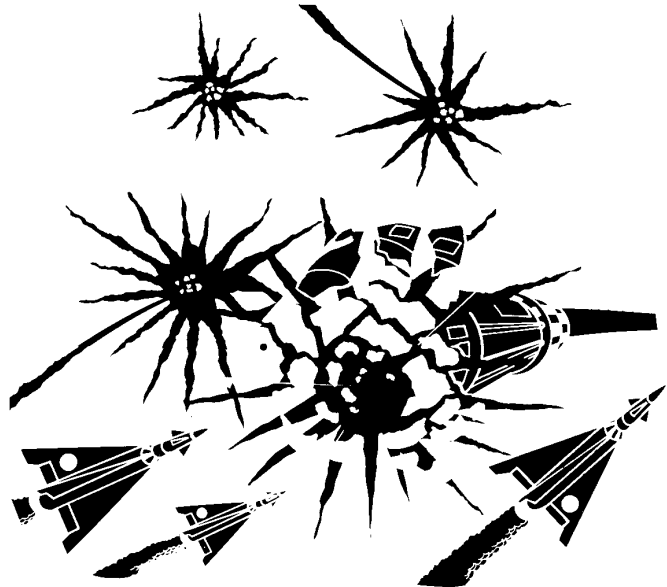


Figure 6 Self-Test Procedure

Instruction	Result if Test Passes	Result if Test Fails
<p>1. Set self-test switch to on position (see Figure 5). Note: entering self-test will set the HIGH SCORE TODAY display to 7500.</p>	<p>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:</p> <pre style="text-align: center;"> ROM OK MAP OK RAM OK + </pre> <p>...plus the options display—see Figure 7 for explanation. Both LED start buttons will also be lighted.</p>	<p>A continuous raspy tone means V BLANK is malfunctioning. Self-test will not continue.</p> <p>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.</p> <p>ROM failure is indicated by BAD ROM; see note 2 below.</p> <p>BAD MAP means bit-mapping hardware has failed.</p> <p>BAD CHIP means custom audio I/O chip at location P8/9 has failed.</p>
<p>2. Roll the Trak Ball control in all directions.</p>	<p>The + moves around on the screen in directions corresponding to Trak Ball control—up to an invisible border along the screen’s edges.</p>	<p>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.</p>
<p>3. Press the following switches:</p> <ul style="list-style-type: none"> ● Coin switch trip wires ● Coin door slam switch ● All three fire switches ● Player start buttons 	<p>A sound is heard as each switch is pressed. The background color also changes.</p>	<p>No sound or color changes are produced when pressing one of these switches: indicates a bad switch, loose harness wires, or loose connector.</p>
<p>4. Set self-test switch to off position.</p>		

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

<i>High beep in series of 8 tones:</i>	<i>Bad chip at location:</i>
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.

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)								Option
8	7	6	5	4	3	2	1	
						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
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
Not			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)								Option
8	7	6	5	4	3	2	1	
						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
Used					☆ On			No bonus credit
					☆ Off			1 bonus credit for 4 successive quarters or a \$1.00 coin \$
			Off					Large Trak-Ball input (switch must be off for proper operation of upright Missile Command game) \$
Not	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 is an "F" if switch 4 (of R8) is off.
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 F 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

☆ This option available only if game PCB has -02 memory installed.

E. 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. **DE-**

FEND 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 push-button 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

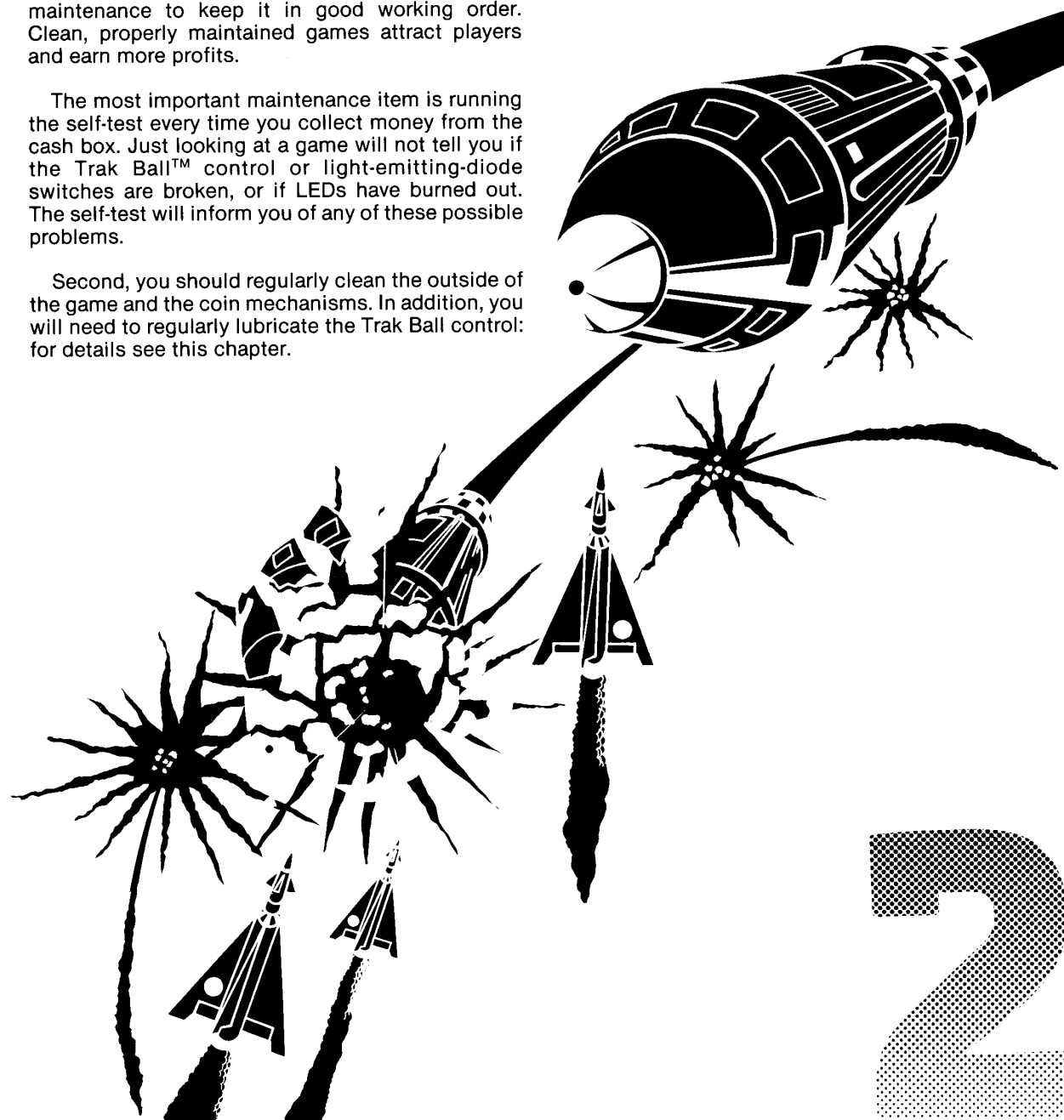
If a player’s score exceeds the minimum on the high score initial list, he or she may put up to three initials on this list at the end of the game. Spinning the Trak Ball control changes the letters (A thru Z and a blank are available). Pressing any fire switch will fix that letter on the screen, and 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

The Missile Command™ 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 the Trak Ball™ control or light-emitting-diode switches are broken, or if LEDs 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 the Trak Ball control: for details see this chapter.



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 any of the acrylic panels, because any dust can scratch the surface and result in fogging the plastic.

B. Fuse Replacement

This game contains six fuses—all on or near the power supply assembly (not including the TV monitor fuses). Replace fuses only with the same type as listed in Chapter 3 of this manual: the single fuse mounted on the floor of the cabinet and the five fuses on the power supply are all described in Figure 23. See the color TV monitor manual, TM-160, for the monitor fuse data.

C. Opening the Control Panel

Prior to repairing or replacing any switch or the Trak Ball™ on the control panel, or prior to removing the TV monitor, unplug the game. Then open the coin door.

Reach through the opening and remove both sets of carriage bolts and lock nuts, located on the underside of the control panel (see Figure 8).

Lift up on the control panel and tilt it towards you. **Be sure that the acrylic TV monitor shield does not fall on you.** The top edge of the control panel acts as a retainer strip for the shield: once the control panel is opened, the shield is free and could slide out by its own weight.

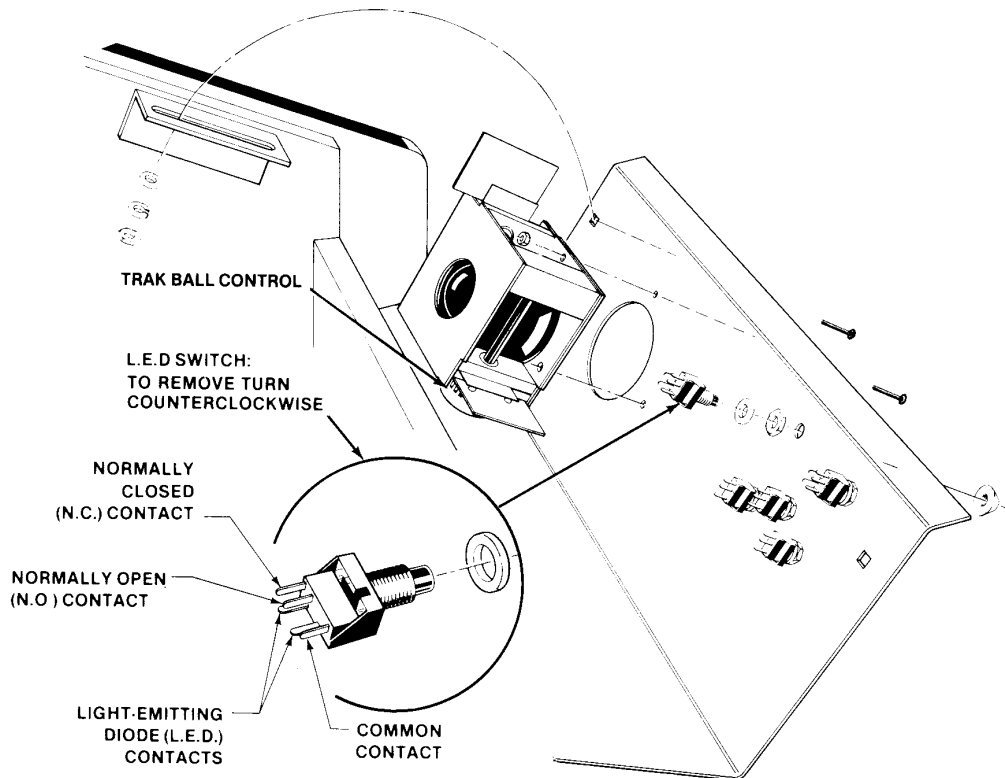


Figure 8 Opening the Control Panel

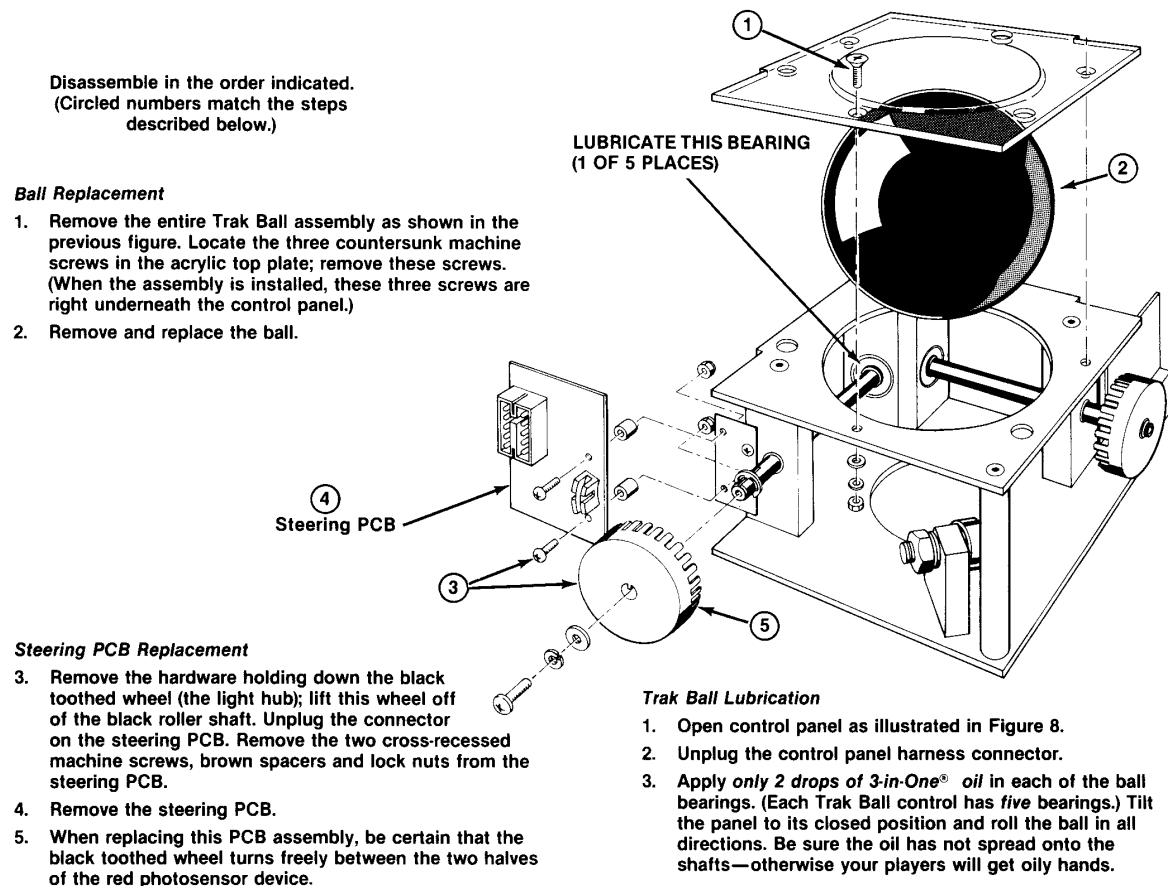


Figure 9 Trak Ball™ Maintenance and Repair

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 $R \times 1$, then zero the meter.
- Connect multimeter leads to appropriate LED switch contacts (see Figure 8 for designation of switch contacts and meter lead placement).
- 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. 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. (The Trak Ball control has five bearings.)

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

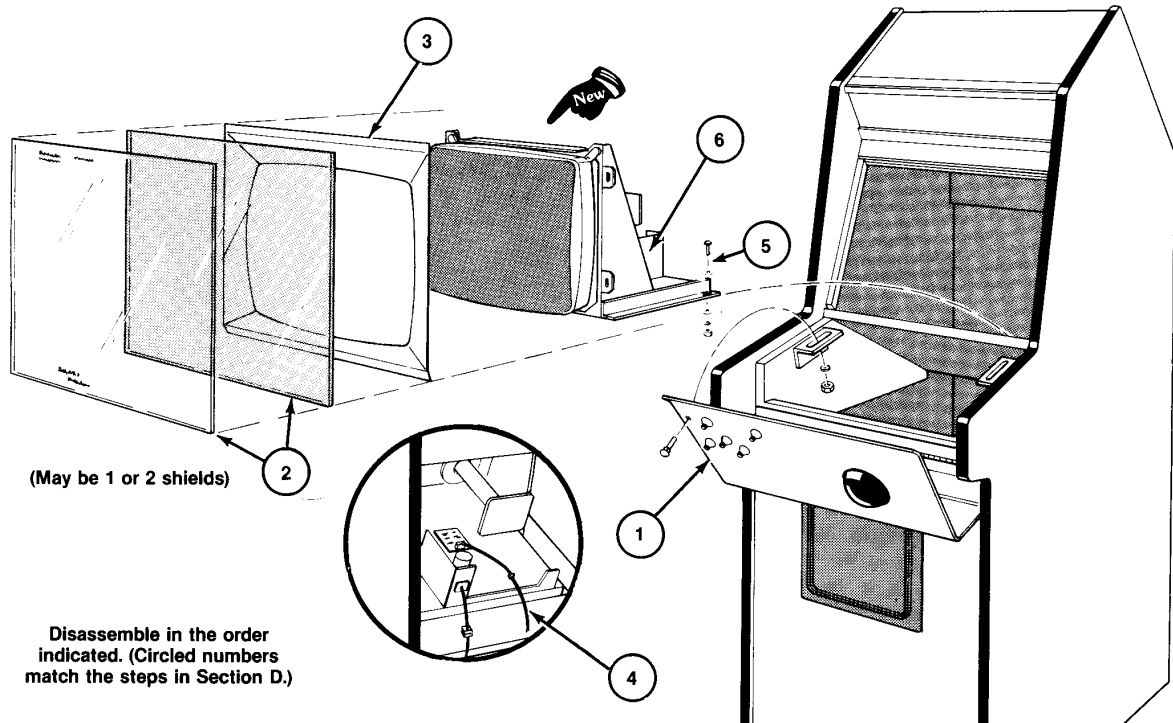


Figure 10 TV Monitor Removal



D. TV Monitor Replacement

CAUTION

High voltages may 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!

In addition, **be sure to use heavy gloves** when handling the monitor. You could cut your hands on the metal TV chassis, without such protection.

If you should need to service or replace the color TV monitor, you must first remove it from the game cabinet. Follow the instructions below, and refer 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. Unlock and remove the access panel. Slightly loosen the wing nuts above the TV monitor (inside the game) that secure the upper retainer strip. Remove the two acrylic TV monitor shields by sliding their lower edges out.
3. Working up from the bottom side corners, carefully pry loose the two side flaps of the colorful cardboard bezel. (A 4-inch strip of double-sided adhesive tape is centered behind both side flaps, flush with each edge.)
4. Open the access panel and unplug the harness connectors for the TV monitor: one is a 2-pin connector in the harness, the other is a 6-pin connector on the monitor's printed-circuit board. **Be extremely careful and never touch the red anode wire or the high-voltage tube on the rear of the monitor!** Then unscrew the green ground wire that is attached to the TV monitor chassis. Also unplug the harness connector for the fluorescent light (located at the left side of the cabinet's rear opening).

5. Remove the four sets of carriage bolts, flat and split lock washers, and hex nuts that hold down the metal TV chassis.
6. Carefully slide the TV monitor chassis out the front of the game. After replacing a monitor, be sure to run the self-test.

! DANGER !

The color TV monitor does not contain an isolation transformer on its chassis (it is mounted instead on the floor of the cabinet). When servicing the color monitor on a test bench, **you must isolate the monitor from AC voltage with an isolation transformer.**

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 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 PCB, first remove the two beaded tie wraps that hold the edge connector to the game PCB's edge. Then unplug the edge connector from 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 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.**

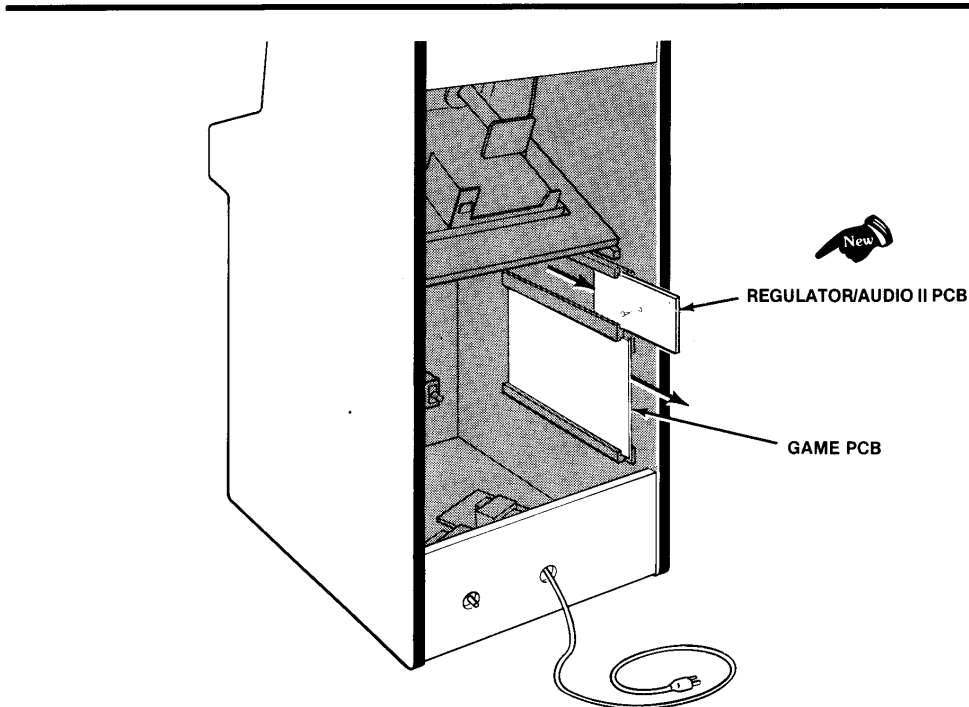


Figure 11 Game and Regulator/Audio II PCB Replacement

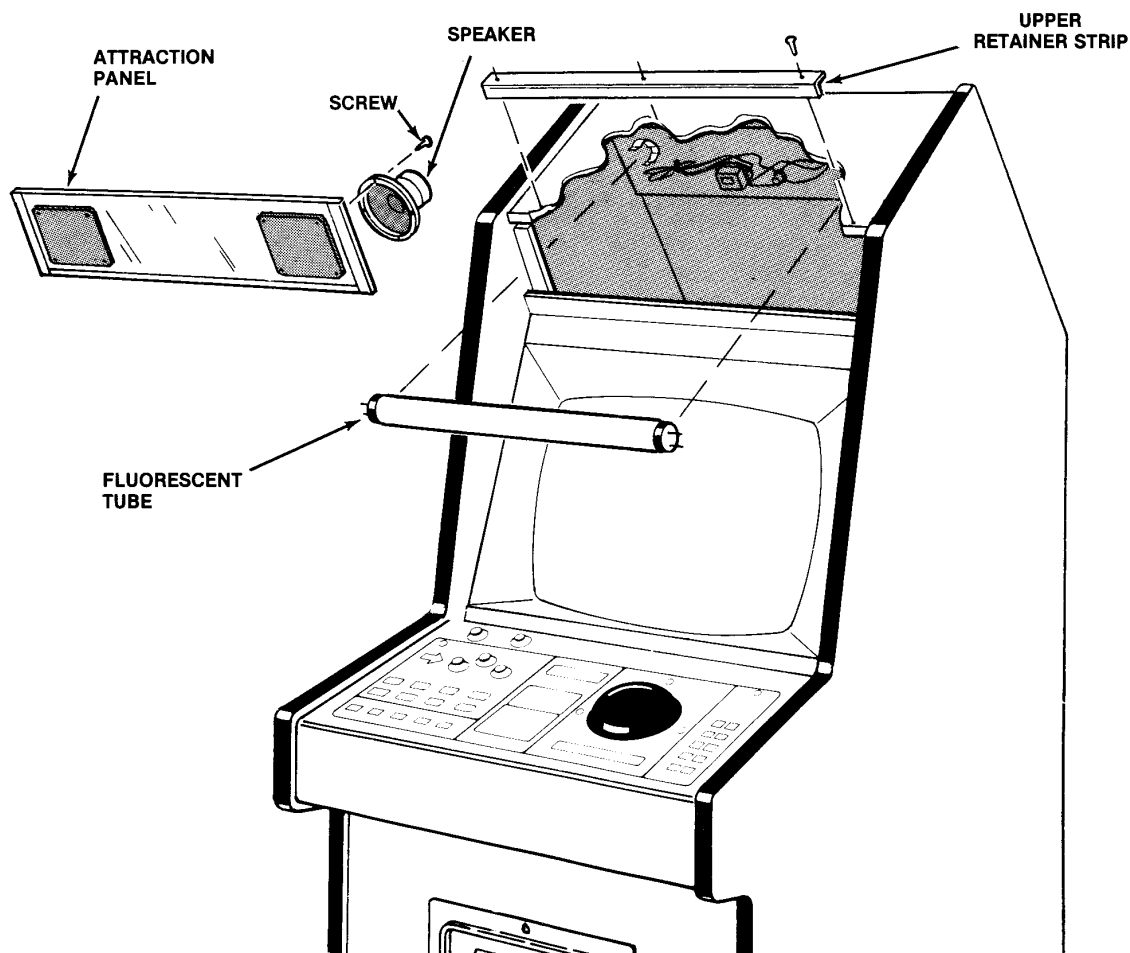


Figure 12 Opening the Attraction Panel

6. Replace the securing screw and fiber washer in the PCB. Reinstall the tie wraps into the edge connector on the PCB. Close and lock the access panel.
7. Check that the operation of the game is correct **by performing the self-test**. This is especially important with any game when you replace a PCB. Normally the **only** adjustments on the Missile Command™ game are option switch changes (made on the 8-toggle DIP switches). Unless you are qualified technician, **do not turn the small knob on the Regulator/Audio II PCB**. For information pertaining to this control, refer to schematic drawings DP-147-01 and -02.



F. Opening the Attraction Panel

Prior to replacing the fluorescent tube behind the attraction panel, you will first have to remove the graphics attraction panel at the top of the Missile Command™ game.

Unplug the game; then remove the three Allen-head screws at the top of the game. They secure the metal retainer strip for the attraction panel. Remove the retainer completely.

Tilt the top of the attraction panel towards you, then lift it up and out of the bottom retainer (see Figure 12).

If you have to replace the attraction panel, you will probably not be able to remove and save the two wood speaker blocks on it. Be sure to order these blocks, in addition to the attraction panel (see parts list in Figure 19).

1. Replacing Speakers

First disconnect the harness plugs for the speakers. Then place the attraction panel on a smooth clean surface, so you don't scratch the acrylic panel. Replace the speaker, then reconnect the harness connectors.

2. Replacing Fluorescent Tube

! WARNING !

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.

First remove the colorful attraction panel as previously described. Then replace the white fluorescent tube by following this procedure (see Figure 12).

- 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.

- Replace with a new tube. Do not snap the tube in vigorously—you may break it, causing an implosion!
- Close up the game by replacing the attraction panel, retainer strip, and three Allen-head screws.

G. Coin Door Repairs

The new Atari coin door has been totally redesigned, as described on page 3 of this manual. For ease of maintenance, the coin door mechanisms require no adjustments. For plastic mechs, use only hot soapy water to clean them: boiling water is not needed nor even recommended, as this would soften the plastic.

To remove any mechanisms, or to replace the small lamps, switches or trip wires, follow the illustrations and instructions given in Figures 13 through 15. To obtain part numbers for ordering purposes, refer to the detailed exploded drawing of the coin door and parts list in Figure 24.

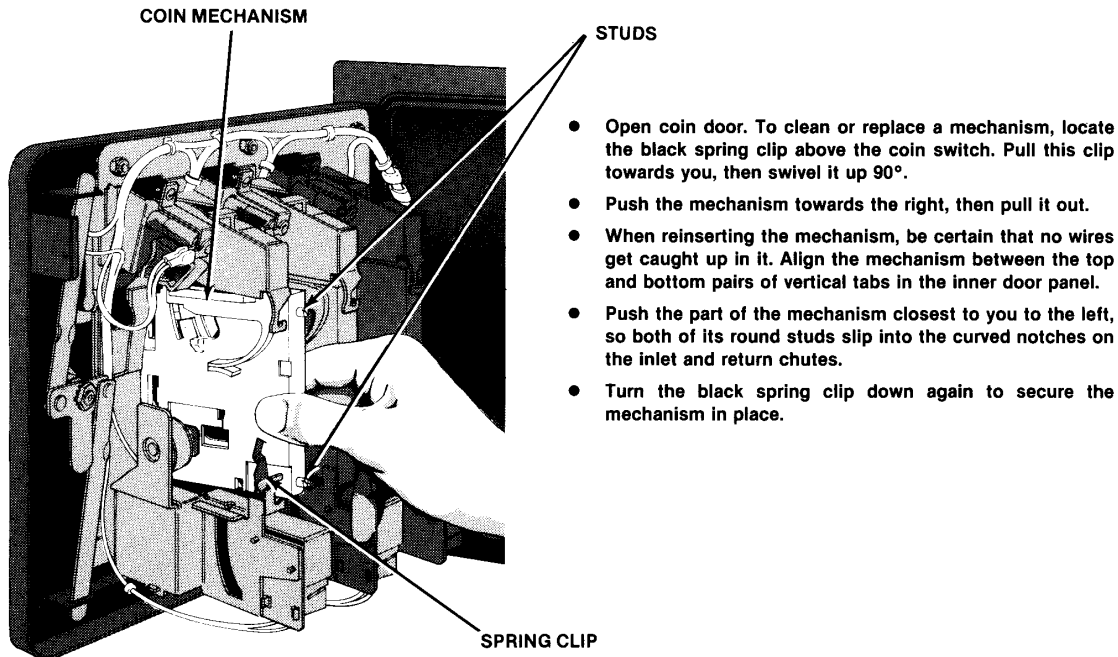
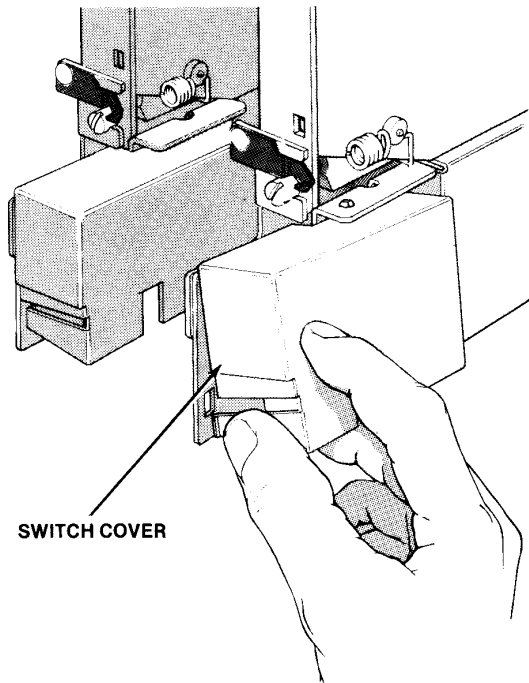


Figure 13 Removing and Reinstalling a Coin Mechanism



- Remove the plastic switch cover by squeezing together its two prongs (just underneath the switch). Tilt the bottom edge of the cover out to the right while pulling towards you and up.
- Unplug the quick-disconnect wires on the switch and lockout coil. Use a longer-style ¼" socket wrench, so you won't damage the trip wire, and remove both nuts that secure the coin return chute onto the inner panel.
- Now hold the return chute subassembly together in one hand, and replace the defective switch.
- The trip wire can be replaced by carefully prying up the black internal-tooth retainer with a small flat screwdriver. Then remove the wire from the brass-colored stud.
- Be sure to replace the wire with another of the proper color (four are available, depending on coin denomination). If the new wire is loose when placed on the stud, squeeze the stud's two halves together with a pair of pliers to secure the wire. Then replace the retainer.
- *Make certain* that the wire projects thru the entire width of the coin slot: otherwise no credits will be granted, even for genuine coins. The wire's normal rest position is against the top of the curved slot.

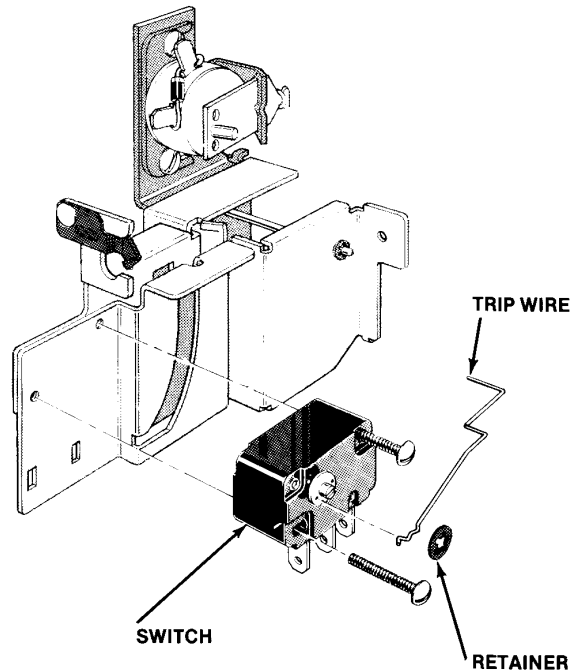
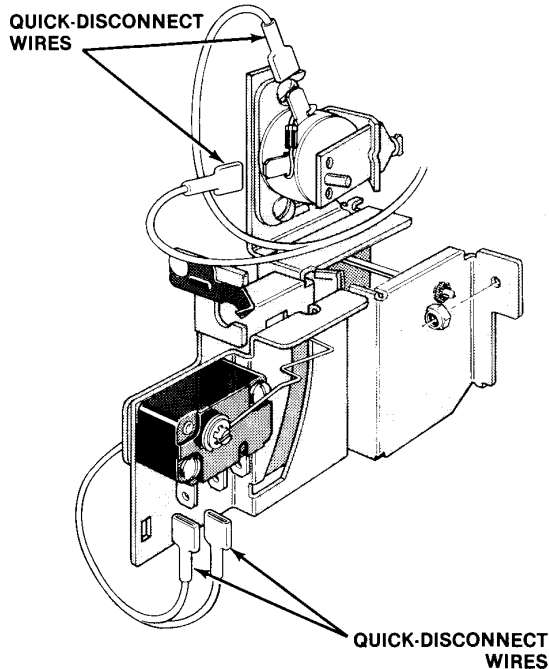
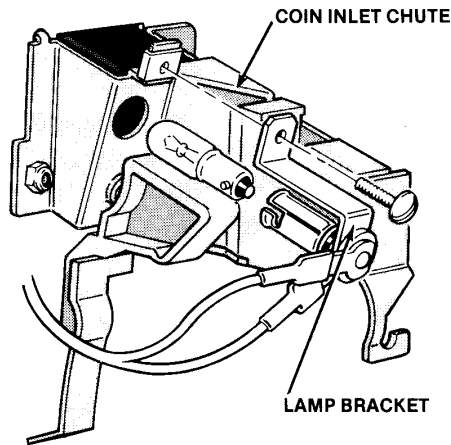


Figure 14 Switch and Trip Wire Replacement

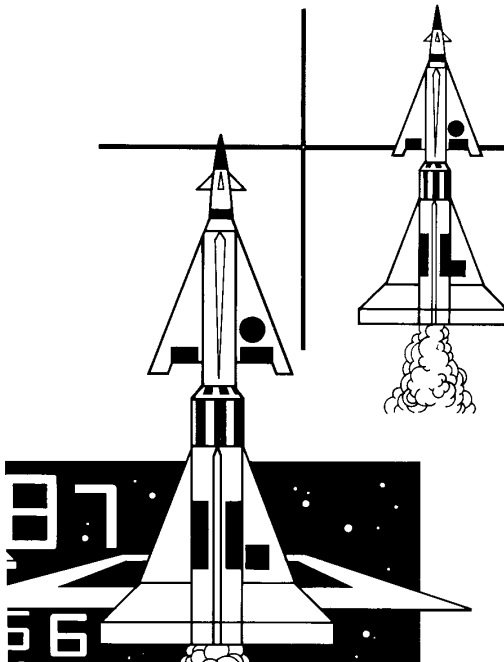


- Remove the screw that secures the lamp and its "Z" bracket to the coin inlet chute.
- Replace the burned-out bulb. Then mount the lamp holder bracket back on the coin inlet chute.

Figure 15 Coin Door Lamp Replacement

H. 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 shows the arrangement of these diagrams. These diagrams include information that explains the functions of the circuits and defines inputs and outputs.

Missile Command™ 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 door. These inputs are processed by the game PCB and output to the TV monitor, Regulator/Audio II PCB, loudspeakers, 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 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 16 illustrates the distribution of power in this game. Figure 17 illustrates the distribution of signals.



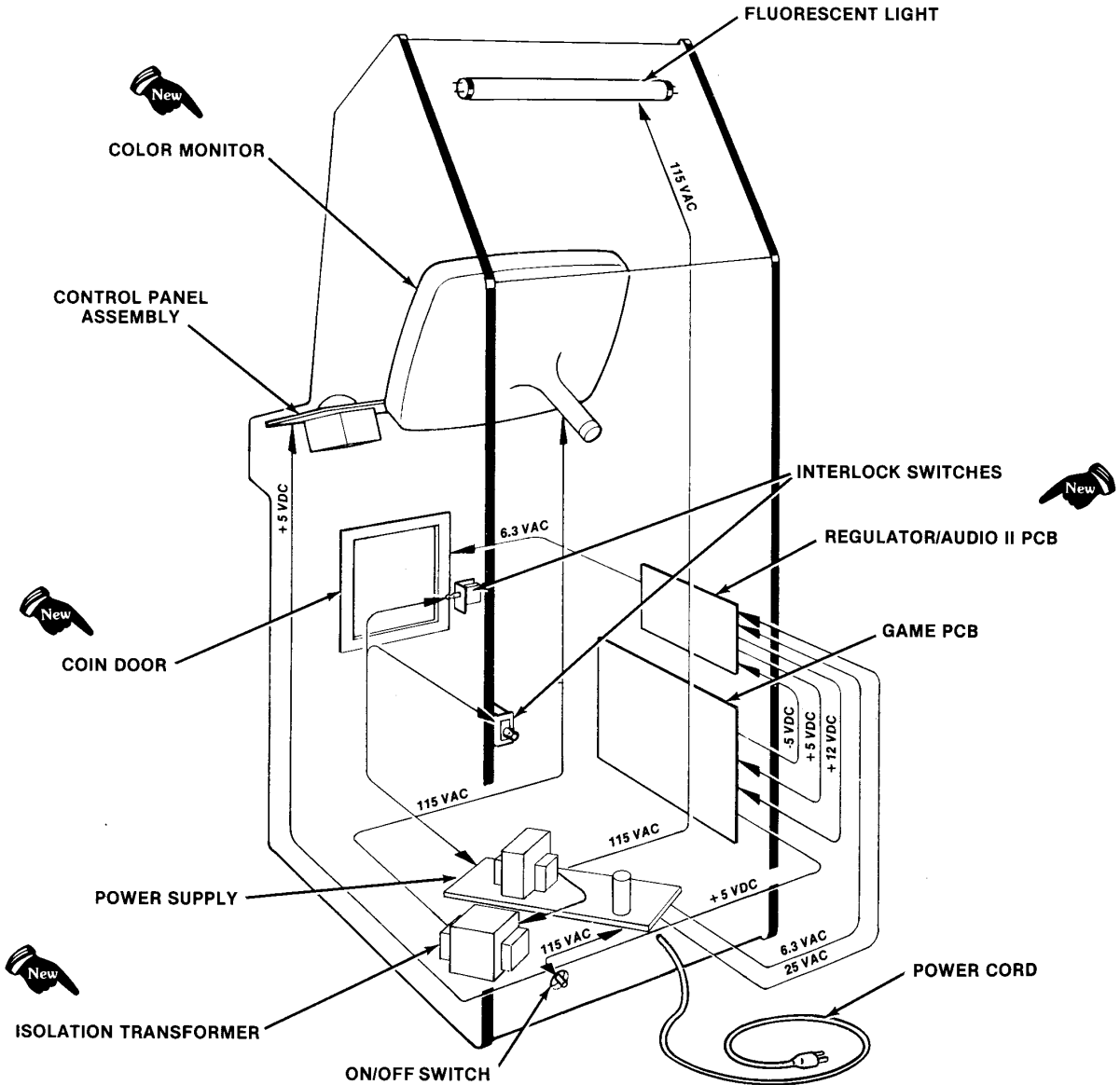


Figure 16 Power Distribution

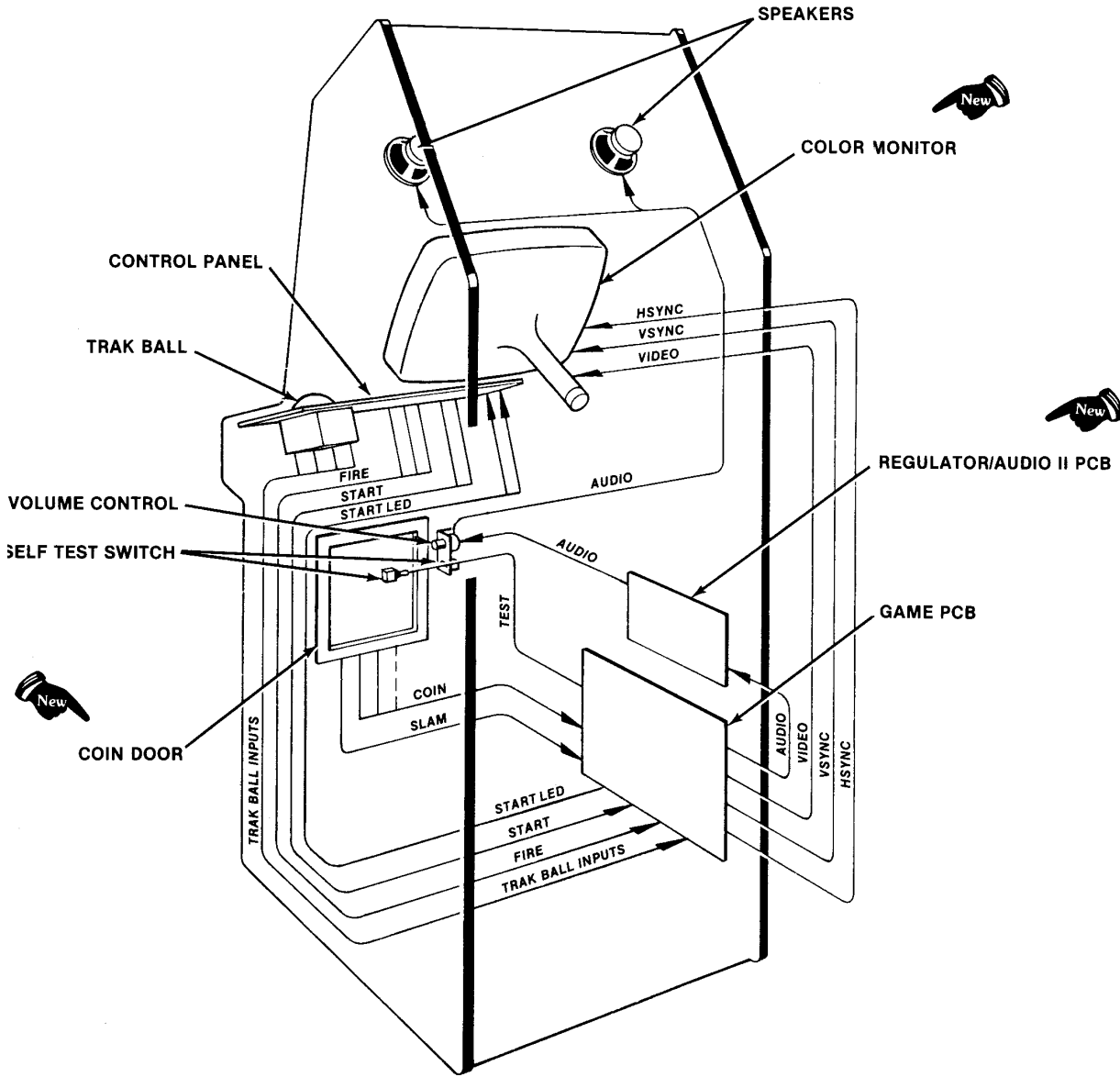


Figure 17 Signal Distribution



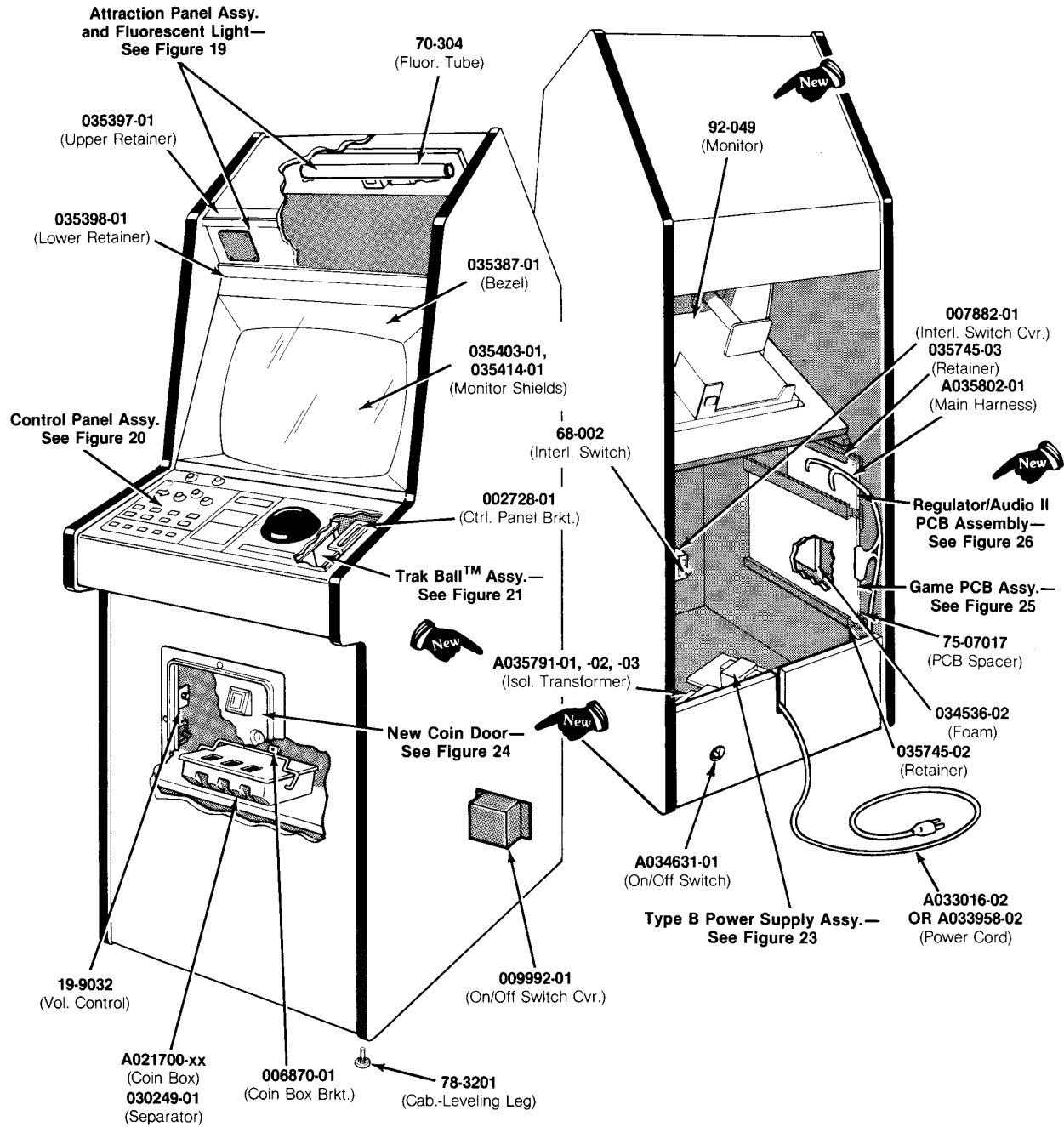
Illustrated Parts Lists

The purpose of this chapter is to provide you with the necessary information for ordering replacement parts for your Atari Missile Command™ 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 alphanumeric 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.

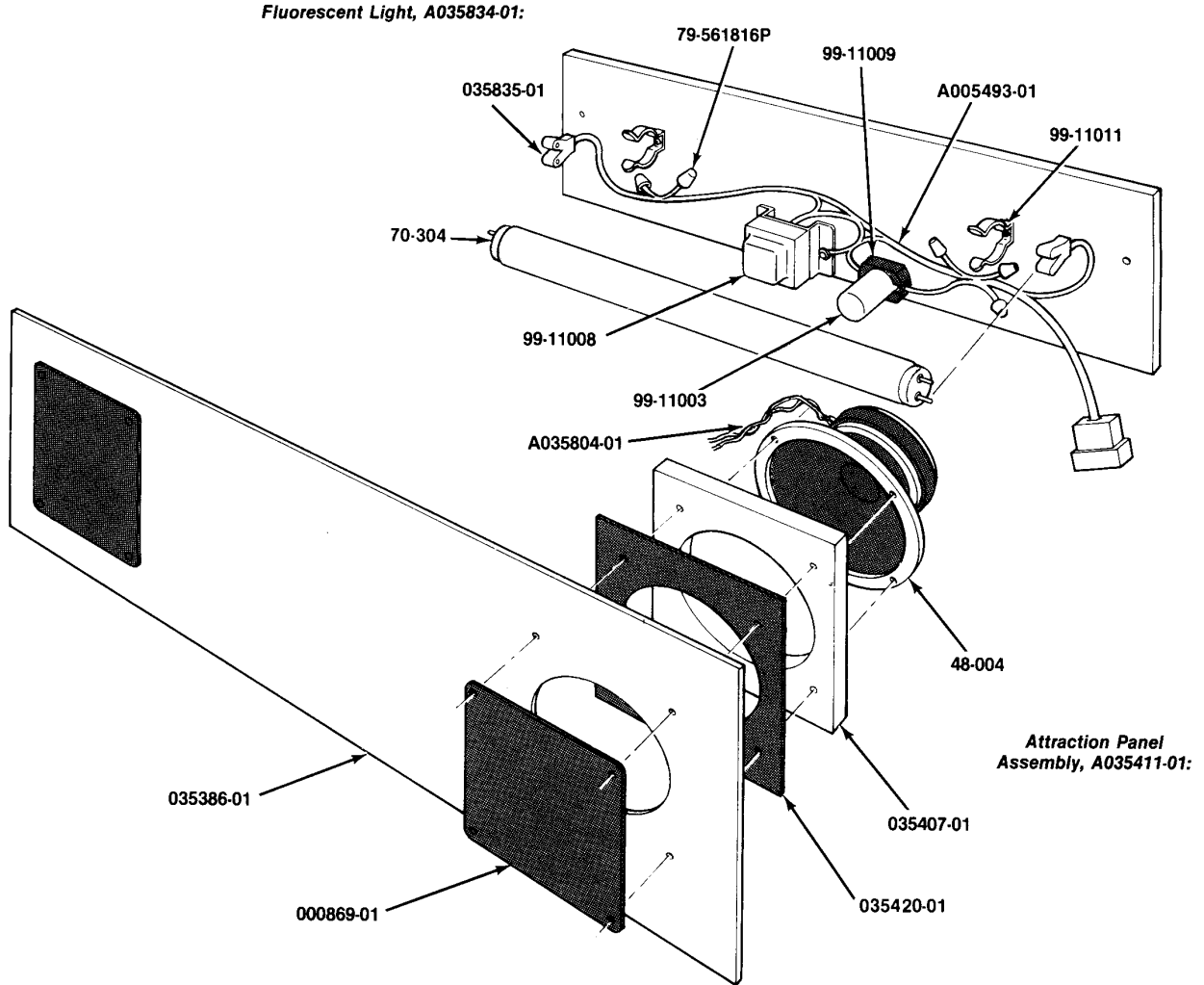
3



**Figure 18 Cabinet-Mounted Assemblies
A035390-xx G**

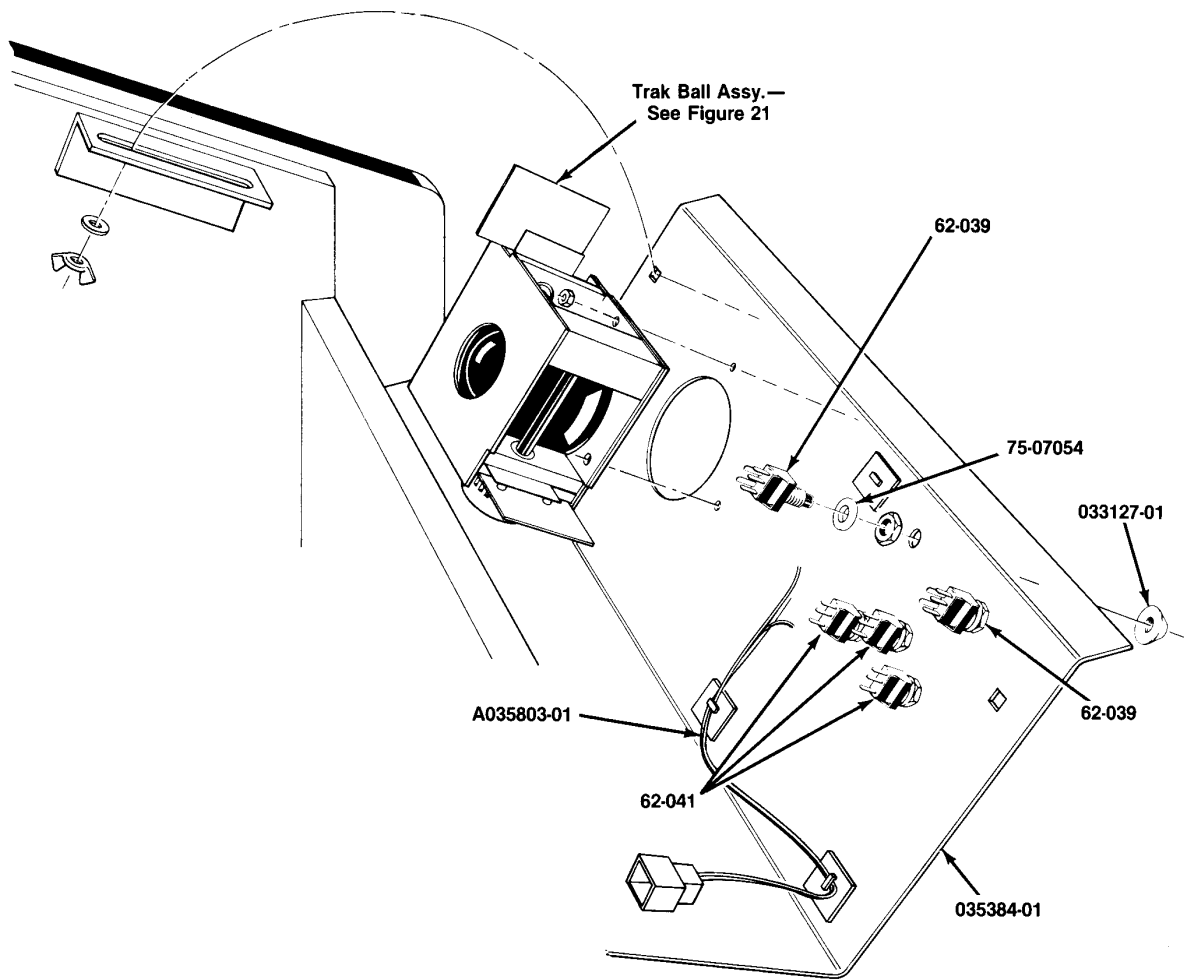
Figure 18 Cabinet-Mounted Assemblies Parts List

Part No.	Description
A002465-01	Coin Counter
A021700-01	Coin Box Assembly <i>(for all the same coins)</i>
A021700-02	Coin Box Assembly <i>(for two different coin denominations—has one separator)</i>
A021700-03	Coin Box Assembly <i>(for three different coin denominations—has two separators)</i>
A033016-02	Strain Relief Power Cord <i>(domestic)</i>
A033958-02	Strain Relief Power Cord <i>(German)</i>
A034631-01	On/Off Switch Assembly
A035791-01, -02 or -03	Isolation Transformer 
A035802-01	Main Harness Assembly <i>(includes on/off switch, 2 interlock switches and their brackets, volume control and its bracket, and single-pole fuse block).</i>
<i>The following four items are the technical information supplements to this manual:</i>	
DP-147-01	Missile Command™ Schematic Drawings <i>(Sheet 1)</i>
DP-147-02	Missile Command™ Schematic Drawings <i>(Sheet 2)</i>
ST-147	Label with Self-Test Procedure and Option Switch Settings
TM-160	Instruction and Service Manual for G07-901 R.G.B. Color Monitor
19-9032	Volume Control
68-002	Interlock Switch Assembly
70-304	18" 15-Watt Cool White Fluorescent Tube
71-2114	Panel Cartridge Lock Mechanism <i>(for access panel)</i>
75-07017	Spacer for Mounting Printed Circuit Boards
78-3201	Cabinet-Leveling Leg
78-24012	5" Beaded Nylon Tie Wrap 
92-049	19" Color TV Monitor
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
034536-02	Foam Vibration Damper for Game PCB
035387-01	Cardboard Bezel
035397-01	Upper Retainer Strip for Monitor Shield
035398-01	Lower Retainer Strip for Monitor Shield
035403-01	1/8-Inch-Thick Acrylic TV Monitor Shield <i>(smoke, no graphics)</i>
035414-01	1/8-Inch-Thick Acrylic TV Monitor Shield <i>(clear, with graphics)</i>
035745-02	18" Plastic PCB Retainer
035745-03	10" Plastic PCB Retainer



**Figure 19 Attraction Panel and Fluorescent Light Assemblies
A035411-01 (A) and A035834-01 (E)
Parts Lists**

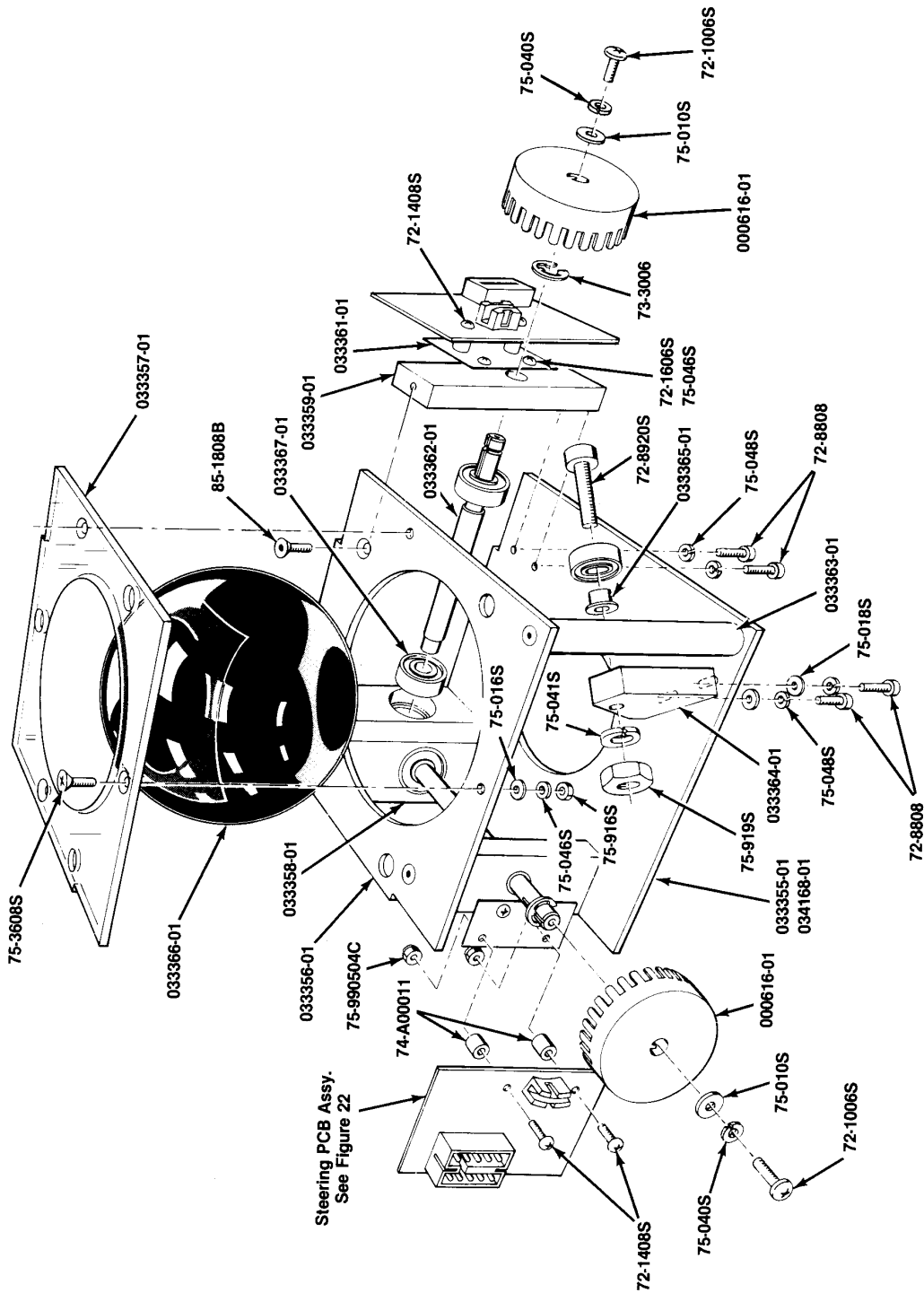
Part No.	Description
<i>Attraction Panel Assembly, A035411-01:</i>	
A035804-01	Speaker Harness Assembly
48-004	5" 8-Ohm 5-Watt High-Fidelity Speaker
000869-01	5" Speaker Grille
035386-01	Acrylic Attraction Panel with Graphics
035407-01	Wood Speaker Block
035420-01	Gasket
<i>Fluorescent Light, A035834-01:</i>	
A005493-01	Fluorescent Light Harness Assembly
70-304	18" 15-Watt Cool White Fluorescent Tube
79-561816P	Spring Connector Wire Nut for 16- to 18-Gauge Wires
99-11003	Starter, Type FS2
99-11008	50/60-Hz Ballast Transformer, with 6"-minimum leads
99-11009	Starter Socket, with 6"-minimum leads
99-11011	1½" Clamp for White Fluorescent Tube
035835-01	12" Y-Lead Connector (2 required per light). Alternate is part no. A036045-01



**Figure 20 Control Panel Assembly
A035406-01 D**

Parts List

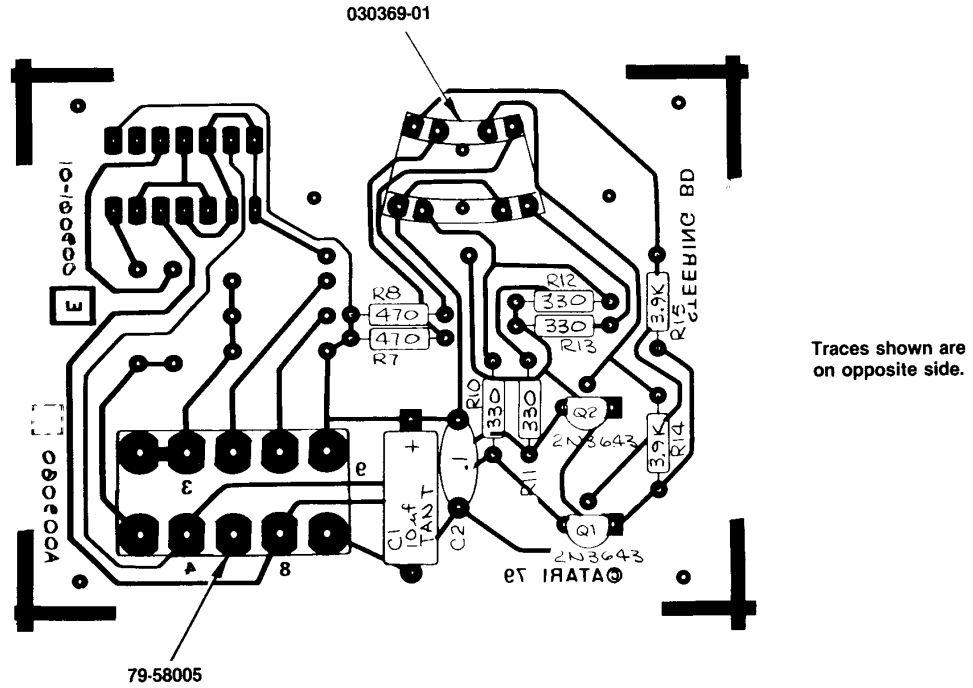
<i>Part No.</i>	<i>Description</i>
A035803-01	Control Panel Harness Assembly
62-039	SPDT Momentary Pushbutton Switch, with Red Cap and Light-Emitting-Diode
62-041	SPDT Black Momentary Pushbutton Switch
75-07054	Nylon Spacer
033127-01	Black Molded Switch Bushing
035384-01	Metal Control Panel with Graphics



**Figure 21 Trak Ball™ Assembly
A033360-01 G**

Figure 21 Trak Ball™ Assembly Parts List

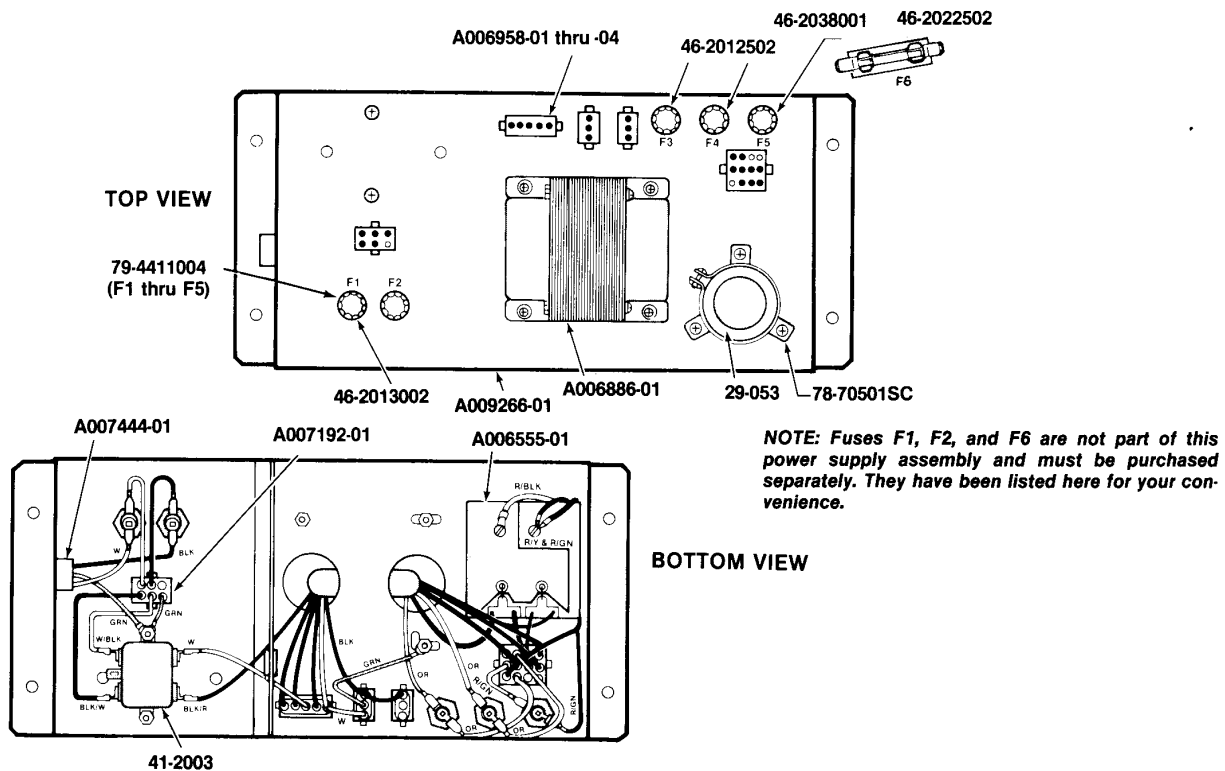
<i>Part No.</i>	<i>Description</i>
72-1006S	#10-32 × 3/8" Cross-Recessed Pan-head Cadmium-Plated Steel Machine Screw
72-1408S	#4-40 × 1/2" Cross-Recessed Pan-Head Cadmium-Plated Steel Machine Screw
72-1606S	#6-32 × 3/8" Cross-Recessed Pan-Head Cadmium-Plated Steel Machine Screw
72-8808	#8-32 × 1/2" Hex Socket-Head Cap Alloy Steel Machine Screw
72-8920S	#3/8-16 × 1 1/4" Hex Socket-Head Cap Alloy Steel Machine Screw
73-3006	Carbon Spring Steel External Retaining Ring, for 3/8" shaft diameter
74-A00011	Phenolic Spacer, 1/8" inside diameter × 1/4" outside diameter × 1/4" long
75-010S	#10 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
75-040S	#10 Steel Split Lock Washer
75-041S	#3/8 Steel Split Lock Washer
75-046S	#6 Zinc-Plated Steel Split Lock Washer
75-048S	#8 Zinc-Plated Steel Split Lock Washer
75-3608S	#6-32 × 1/2" Cross-Recessed Flat-Head Cadmium-Plated Steel Machine Screw
75-916S	#6-32 Standard Cadmium-Plated Steel Machine Hex Nut
75-919S	#3/8-16 Standard Cadmium-Plated Steel Machine Hex Nut
75-990504C	#4-40 Shallow-Pattern Prevailing-Torque Corrosion Resistant Lock Nut
85-1808B	#8-32 × 1/2" Socket Cap Flat Countersunk-Head Black-Oxide Steel Screw
000616-01	Light Hub
033355-01	Base Plate
033356-01	Top Plate
033357-01	Cover Plate (Acrylic)
033358-01	Corner Post
033359-01	End Post
033361-01	Steering PCB Bracket
033362-01	Roller Shaft
033363-01	Cylindrical Post
033364-01	Adjustable Post
033365-01	Spacer
033366-01	Trak Ball™
033367-01	Bearing
034168-01	Label with Lubrication Instructions



**Figure 22 Steering Printed Circuit Board Assembly
A009060-02 C**

Parts List

<i>Part No.</i>	<i>Description (Reference Designations and Locations in Bold)</i>
10-5331	330 Ohm, ± 5%, ¼W Carbon Composition Resistor (R10-13)
10-5392	3.9K Ohm, ± 5%, ¼W Carbon Composition Resistor (R14, 15)
10-5471	470 Ohm, ± 5%, ¼W Carbon Composition Resistor (R7-8)
27-250104	0.1 uf, ± 20%, 25V Ceramic-Disk Radial-Lead Capacitor (C2)
29-046	10 uf, ± 10%, 20V Tantalum Axial-Lead Capacitor (C1)
34-2N3643	Type 2N3643 Switching Transistor (Q1, 2)
79-58005	10-Contact Connector
030369-01	Radial Optical Coupler

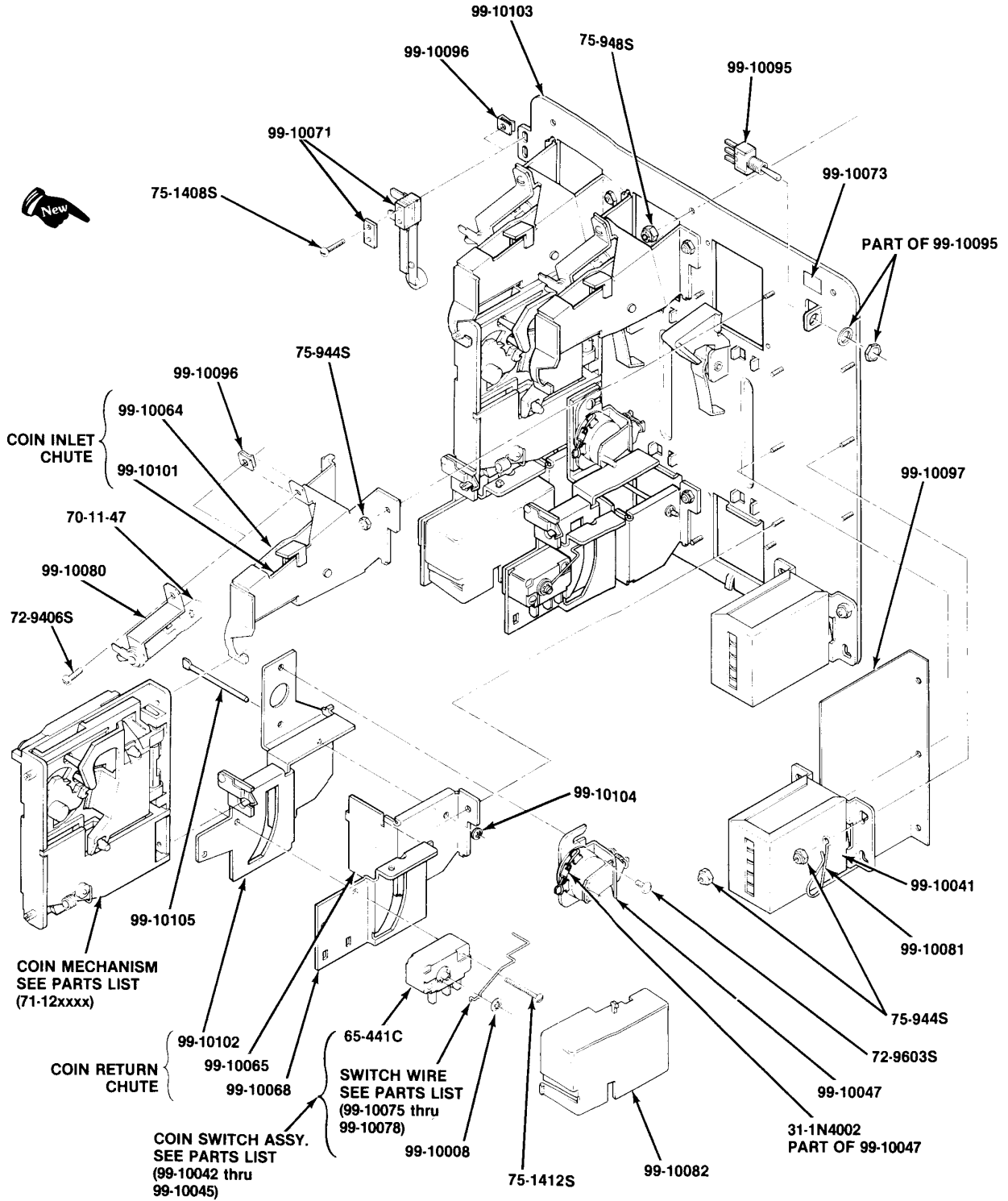


**Figure 23 Type B Power Supply Assembly
A007197-01 M**

Parts List

<i>Part No.</i>	<i>Description (Reference Designations in Bold)</i>
A006555-01	Rectifier P.C. Board Assembly
A006958-01	Voltage Selection Plug (95V—Black)
A006958-02	Voltage Selection Plug (110V—Orange)
A006958-03	Voltage Selection Plug (205V—Green)
A006958-04	Voltage Selection Plug (220V—Red)
A006886-01	Type B Transformer Termination Assembly
A007192-01	Power Switch Termination
A007444-01	Power-In Harness
A009266-01	Power Supply Base Assembly
29-053	26,000 uf 15V Electrolytic Capacitor
41-2003	5-Amp Power Line Filter
46-2012502	2½-Amp, 250-Volt Slow-Acting Type 3AG Fuse (F3, F4)
46-2013002	3-Amp, 250-Volt Slow-Acting Type 3AG Fuse (F1* , F2*)
46-2022502	2½-Amp, 250-Volt Slow-Acting Type 3AG Fuse (F6*). Alternate is part no. 46-2012502.
46-2038001	8-Amp, 125-Volt Normal-Acting Type 3AG Fuse (F5)
78-70501SC	2" Diameter Capacitor Mounting Bracket
79-4411004	Panel-Mounted Non-Indicating 3AG Cartridge-Type Fuse Post (F1-F5)

* Fuses F1, F2, and F6 are not part of this power supply assembly and must be purchased separately. They have been listed here for your convenience.



**Figure 24 New Coin Door
71-10xxxx**

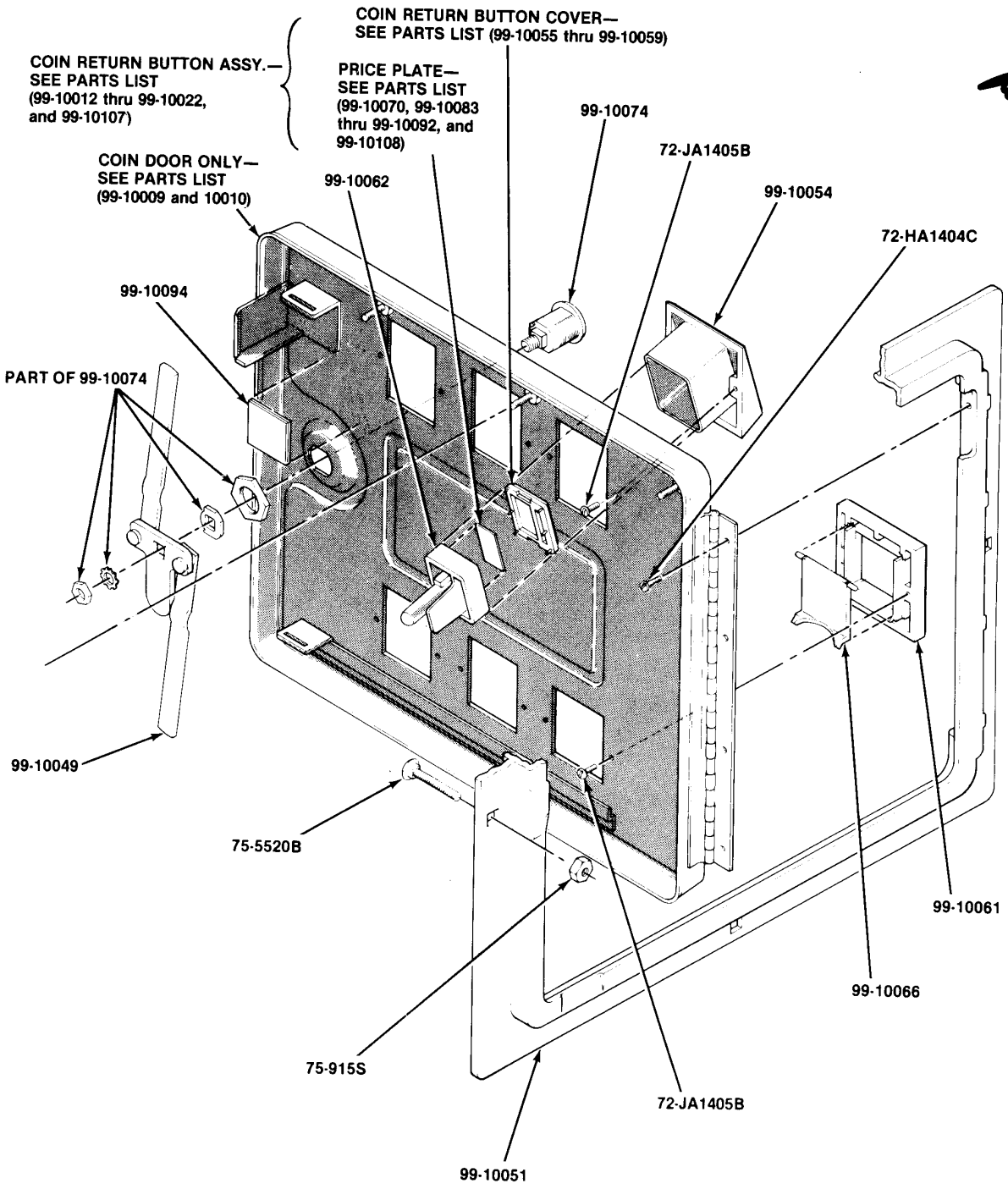


Figure 24 New Coin Door
71-10xxxx

Figure 24 New Coin Door, continued Parts List



<i>Part No.</i>	<i>Description</i>
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	#4x1/4" 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	#1/4-20 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	#4-40x1/2" Slotted pan-head steel machine screw
75-1412S	#4-40x3/4" Slotted pan-head steel machine screw
75-5520B	#1/4-20x1 1/4" 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 24 New Coin Door, continued Parts List

<i>Part No.</i>	<i>Description</i>
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

Figure 25 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 (H7)
37-7408	Type 7408 Integrated Circuit (R2, J6)
37-74S08	Type 74S08 Integrated Circuit (M3)
37-74LS10	Type 74LS10 Integrated Circuit (E3)
37-7410	Type 7410 Integrated Circuit (B5)
37-74LS14	Type 74LS14 Integrated Circuit (D3)
37-7414	Type 7414 Integrated Circuit (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 25 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, $\pm .005\%$, 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, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R1, 2, 4, 13, 16, 21-26, 39, 60, 61, 73, 74, 85, 95, 109-122)
110000-103	10K Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R3, 17-20, 30-38, 66-71, 83, 84, 86-88, 93, 94, 96-100)
110000-152	1.5K Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R79)
110000-220	22 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R46, 47, 82)
110000-221	220 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R72)
110000-222	2.2K Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R76)
110000-332	3.3K Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R56-59, 89-92)
110000-270	27 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R5-12, 27-29)
110000-331	330 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R14, 15, 78)
110000-391	390 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R45, 81)
110000-471	470 Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R40-44, 48-55, 80)
110000-472	4.7K Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R75)
110000-682	6.8K Ohm, $\pm 5\%$, $\frac{1}{4}$ W Resistor (R101-108)
110000-822	8.2K Ohm, $\pm 5\%$, $\frac{1}{4}$ W 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 25 Game PCB Assembly 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	

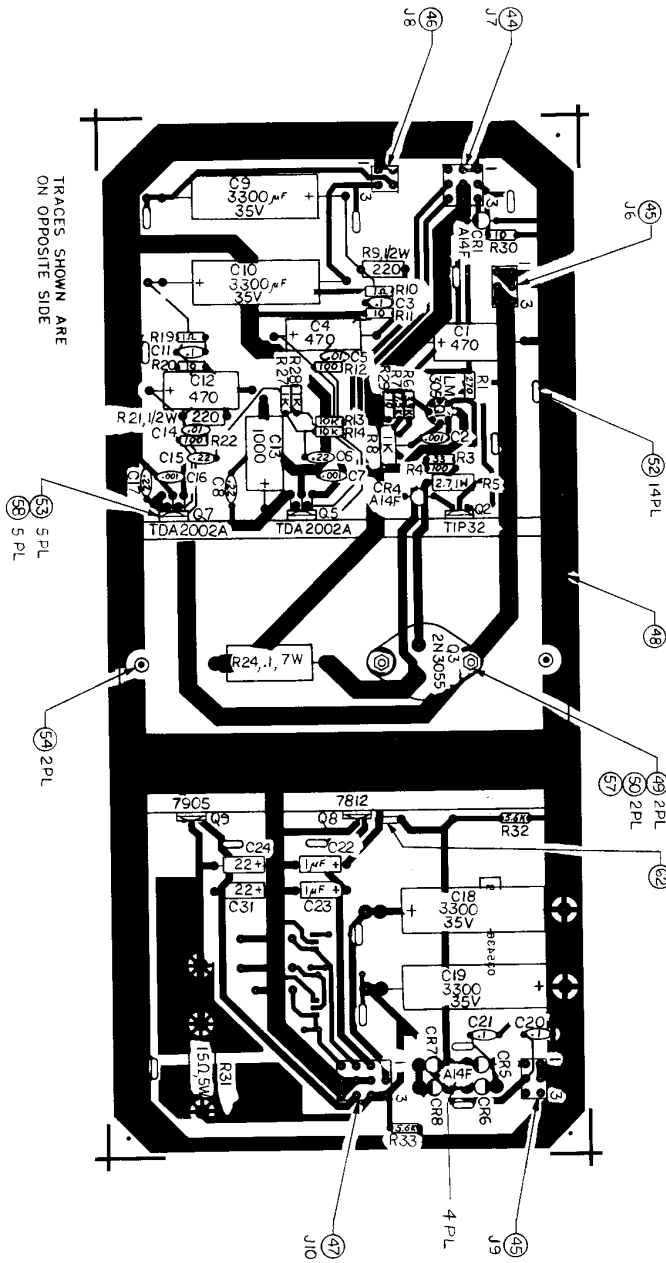


Figure 26 Regulator/Audio II PCB Assembly
A035435-03 B

Figure 26 Regulator/Audio II PCB Assembly Parts List



Part No.	Description (Reference Designations and Locations in Bold)
12-52P7	2.7 Ohm, \pm 5%, 1W Resistor (R5)
19-100P1015	.1 Ohm, \pm 3%, 7W Wirewound Resistor (R24)
19-315102	1K Ohm Vertical PCB-Mounting Cermet Trimpot (R8)
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 25V Radial-Lead Capacitor (C2, 7, 16)
27-250103	.01 uf Ceramic-Disc 25V Radial-Lead Capacitor (C5, 6, 14, 15)
29-088	.1 uf Tantalum 25V 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)
52-004	Teflon-Insulated Solder-Plated Solid Copper PCB-Mounting Jumper Wire with .3" Centers
72-1608C	#6-32 \times 1/2" Cross-Recessed Pan-Head Corrosion-Resistant Steel Machine Screw
75-F60405	#6-32 \times 1/4" 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, J9)
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, \pm 5%, 1/4W Resistor (R10, 19)
110000-100	10 Ohm, \pm 5%, 1/4W Resistor (R11, 20, 29, 30)
110000-101	100 Ohm, \pm 5%, 1/4W Resistor (R4, 12, 22)
110000-102	1K Ohm, \pm 5%, 1/4W Resistor (R27, 28)
110000-103	10K Ohm, \pm 5%, 1/4W Resistor (R13, 14)
110000-271	270 Ohm, \pm 5%, 1/4W Resistor (R1)
110000-330	33 Ohm, \pm 5%, 1/4W Resistor (R3)
110000-392	3.9K Ohm, \pm 5%, 1/4W Resistor (R6)
110000-562	5.6K Ohm, \pm 5%, 1/4W Resistor (R32, 33)
110000-752	7.5K Ohm, \pm 5%, 1/4W Resistor (R7)
110001-221	220 Ohm, \pm 5%, 1/2W Resistor (R9, 21)
116001-150	15 Ohm, \pm 5%, 5W Resistor (R31)
122004-224	.22 uf Ceramic-Disc 25V Radial-Lead Capacitor (C6, 8, 15, 17)
137151-002	Type TDA2002A 8W Linear Audio Amplifier Integrated Circuit (Q5, 7)

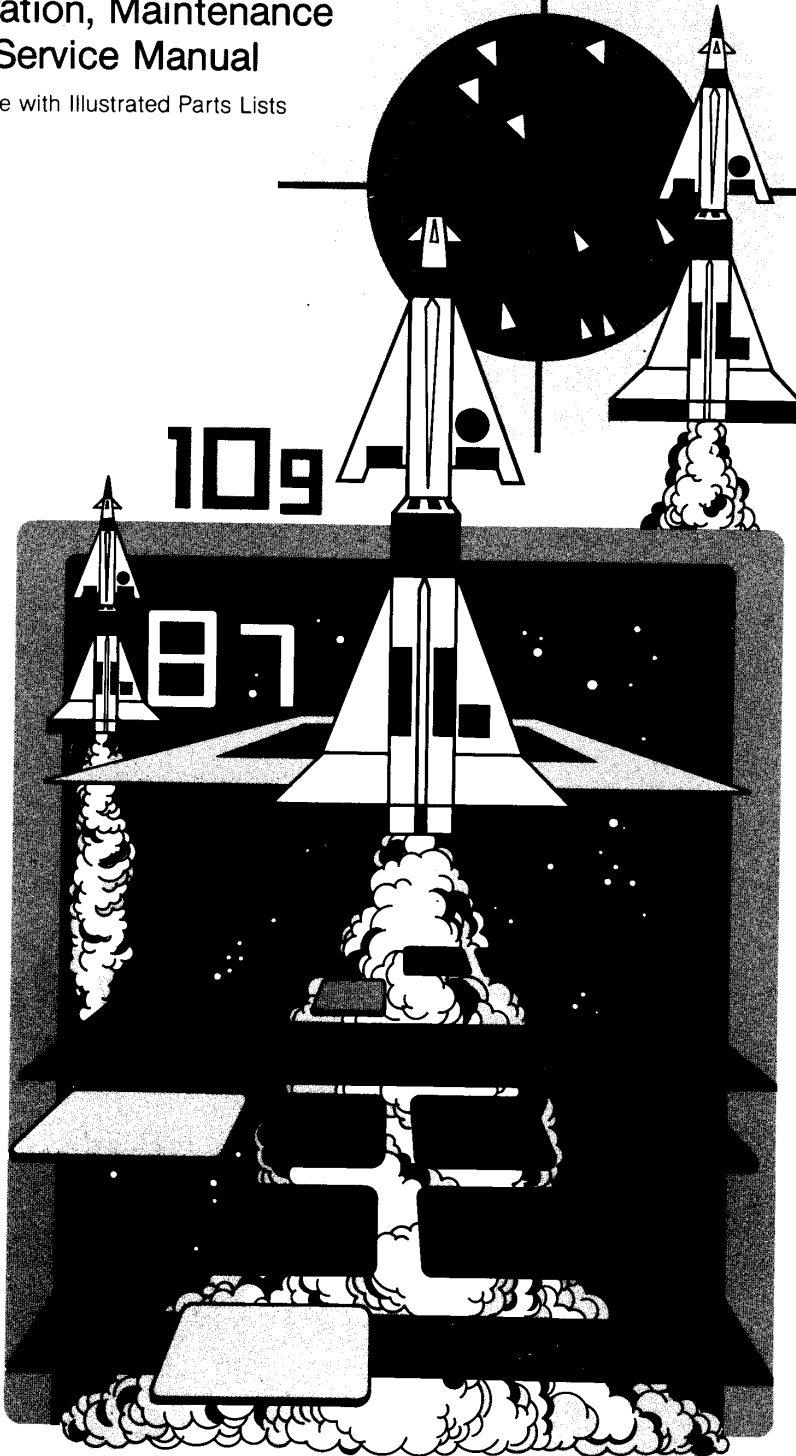


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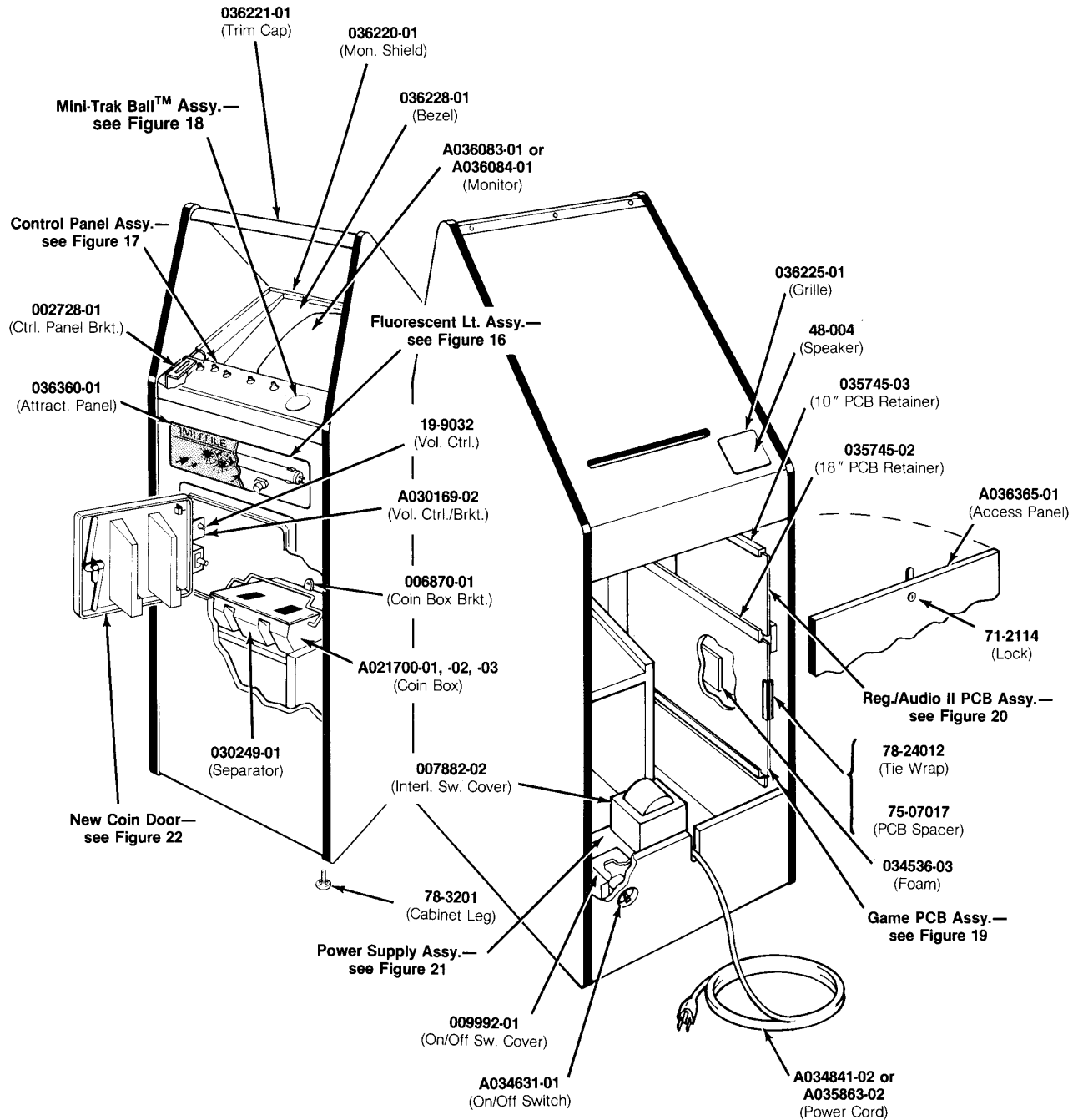
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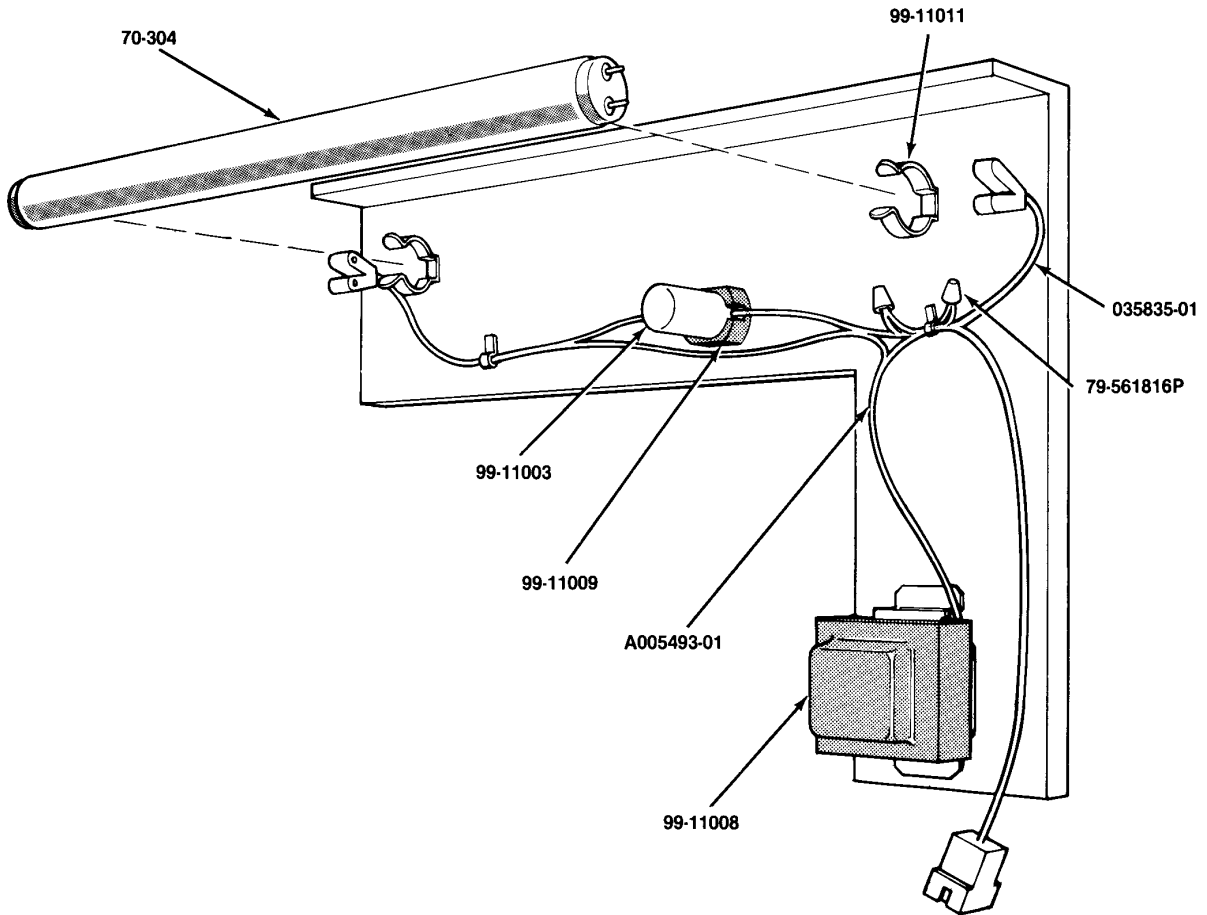
COMMANCHE CARBARET™



**Figure 15 Cabinet-Mounted Assemblies
A06230-xx C**

Figure 15 Cabinet-Mounted Assemblies Parts List

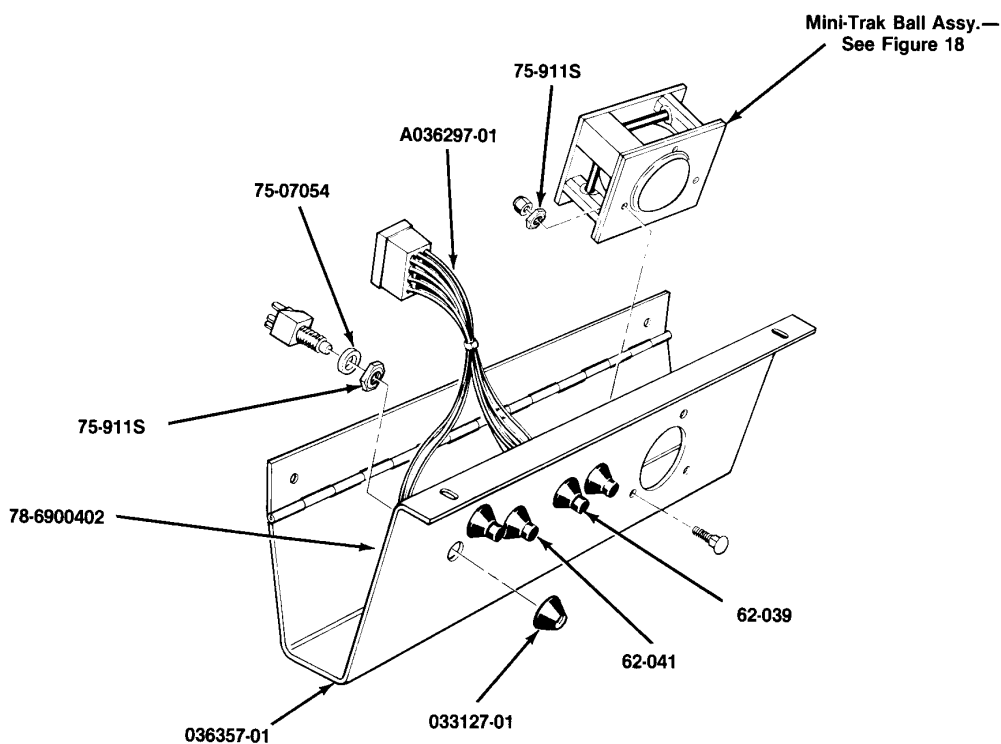
<i>Part No.</i>	<i>Description</i>
A021700-01	Coin Box Assembly <i>(for all the same coins)</i>
A021700-02	Coin Box Assembly <i>(for two different coin denominations—has one separator)</i>
A021700-03	Coin Box Assembly <i>(for three different coin denominations—has two separators)</i>
A030169-02	Volume Control & Bracket Assembly
A034631-01	On/Off Switch Assembly
A034841-02	Strain Relief Power Cord <i>(domestic)</i>
OR	
A034863-02	Strain Relief Power Cord <i>(German)</i>
A036083-01	14-Inch Matsushita Color Monitor Assembly
OR	
A036084-01	14-Inch Sanyo Color Monitor Assembly
A036189-01	Interlock Switch & Bracket Assembly <i>(modified for safety)</i>
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 <i>(for access panel)</i>
75-07017	Spacer for Mounting Printed-Circuit Boards <i>(two per screw)</i>
78-24012	5-Inch Beaded Nylon Tie Wrap <i>(for securing edge connector to Game PCB)</i>
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 <i>(smoke color)</i>
036221-01	Rounded Trim Cap
036225-01	Speaker Grille
036228-01	Cardboard Bezel <i>(for monitor)</i>
036360-01	Attraction Panel with Graphics



**Figure 16 Fluorescent Light Assembly
A036205-01 A**

Parts List

<i>Part No.</i>	<i>Description</i>
A005493-01 70-304	Fluorescent Light Harness Assembly 18" 15-Watt Cool White Fluorescent Lamp
79-561816P 99-11003	Wire Nut for 16- to 18-Guage Wires Fluorescent Lamp Starter
99-11008 99-11009	Ballast Transformer Starter Socket
99-11011	1 1/2" Clamp
035835-01	Y-Lead Connector



**Figure 17 Control Panel Assembly
A036364-01 B**

Parts List

<i>Part No.</i>	<i>Description</i>
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 × 1/4 inch wide × 18½ inches long
033127-01	Black Molded Switch Bushing
036357-01	Control Panel with Graphics

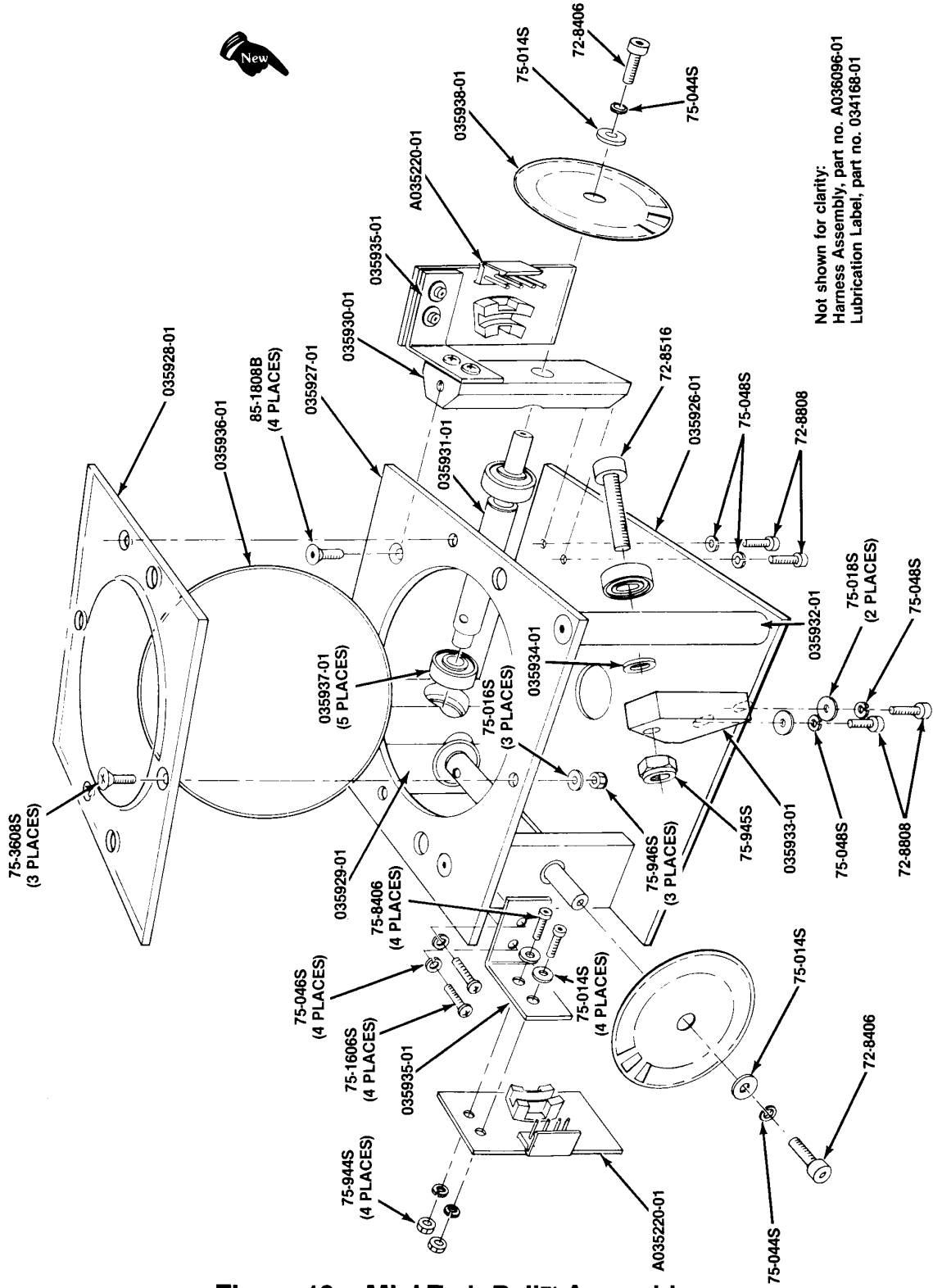
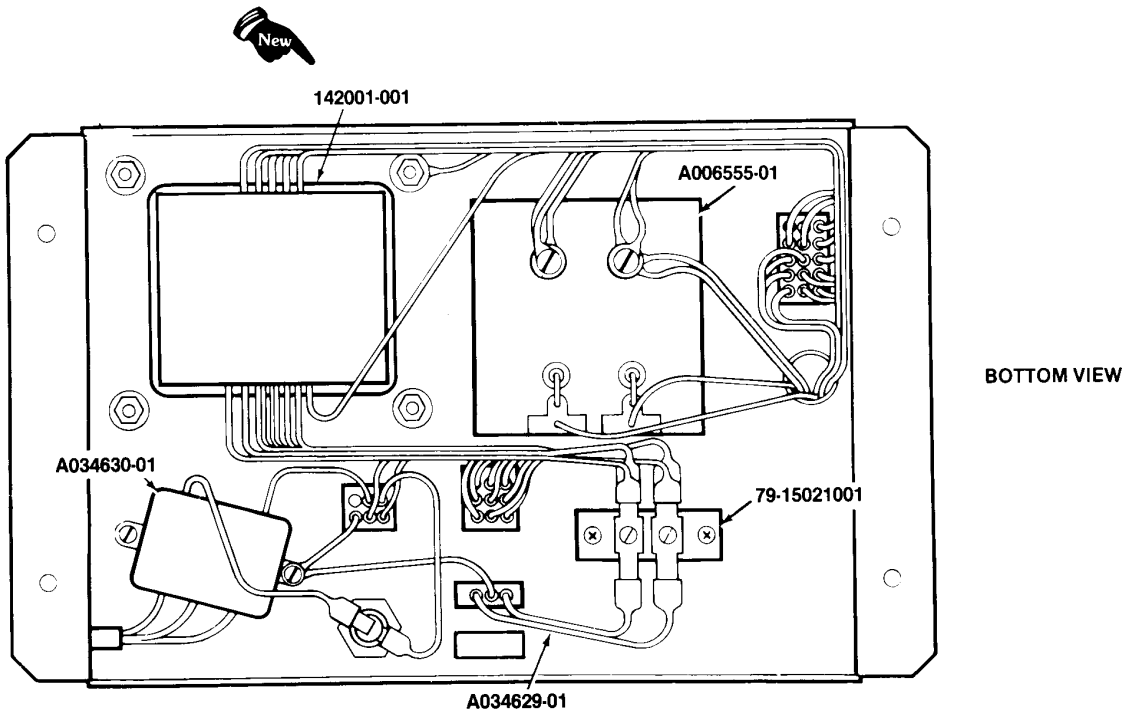
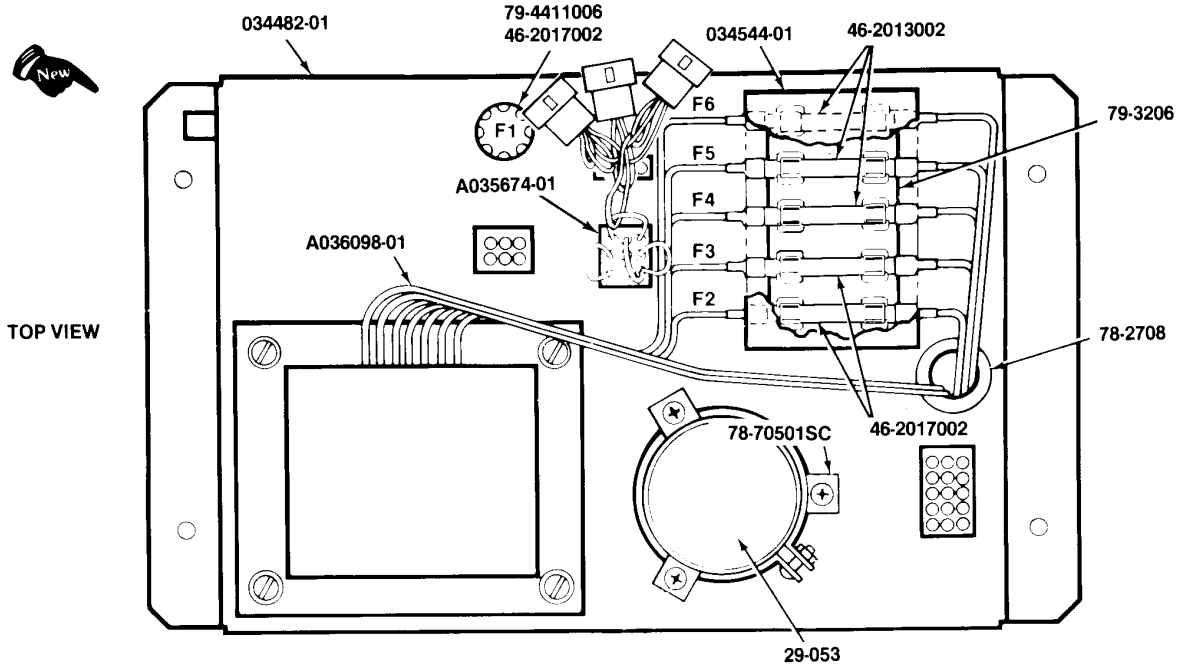


Figure 18 Mini-Trak Ball™ Assembly
A035940-01 A

Figure 18 Mini-Trak Ball™ Assembly Parts List




<i>Part No.</i>	<i>Description</i>
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	1/4-20 × 1" Hex Socket-Head Cap Alloy Steel Machine Screw
72-8808	#8-32 × 1/2" 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	1/4-20 Self-Locking Steel/Polymer Hex Nut
75-946S	#6-32 Self-Locking Steel/Polymer Hex Nut
85-1808B	#8-32 × 1/2" 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 21 Power Supply Assembly for Color Raster-Scan Games
A036099-01 A**

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

<i>Part No.</i>	<i>Description</i>
A006555-01	Rectifier Printed Circuit Board Assembly
A036098-01	Transformer and Harness Assembly <i>(includes Shielded Power Transformer)</i>
A034629-01	AC Harness Assembly
A034630-01	RFI Filter Assembly
A035674-01	Voltage Plug Assembly <i>(set of four plugs)</i>
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 × 1/4" Thick
78-70501SC	2"-Diameter Capacitor Mounting Bracket
79-15021001	2-Circuit Single-Row Terminal Block
79-3206	5-Position 3AG Fuse Block with 1/4" 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 <i>(with isolation windings)</i> 

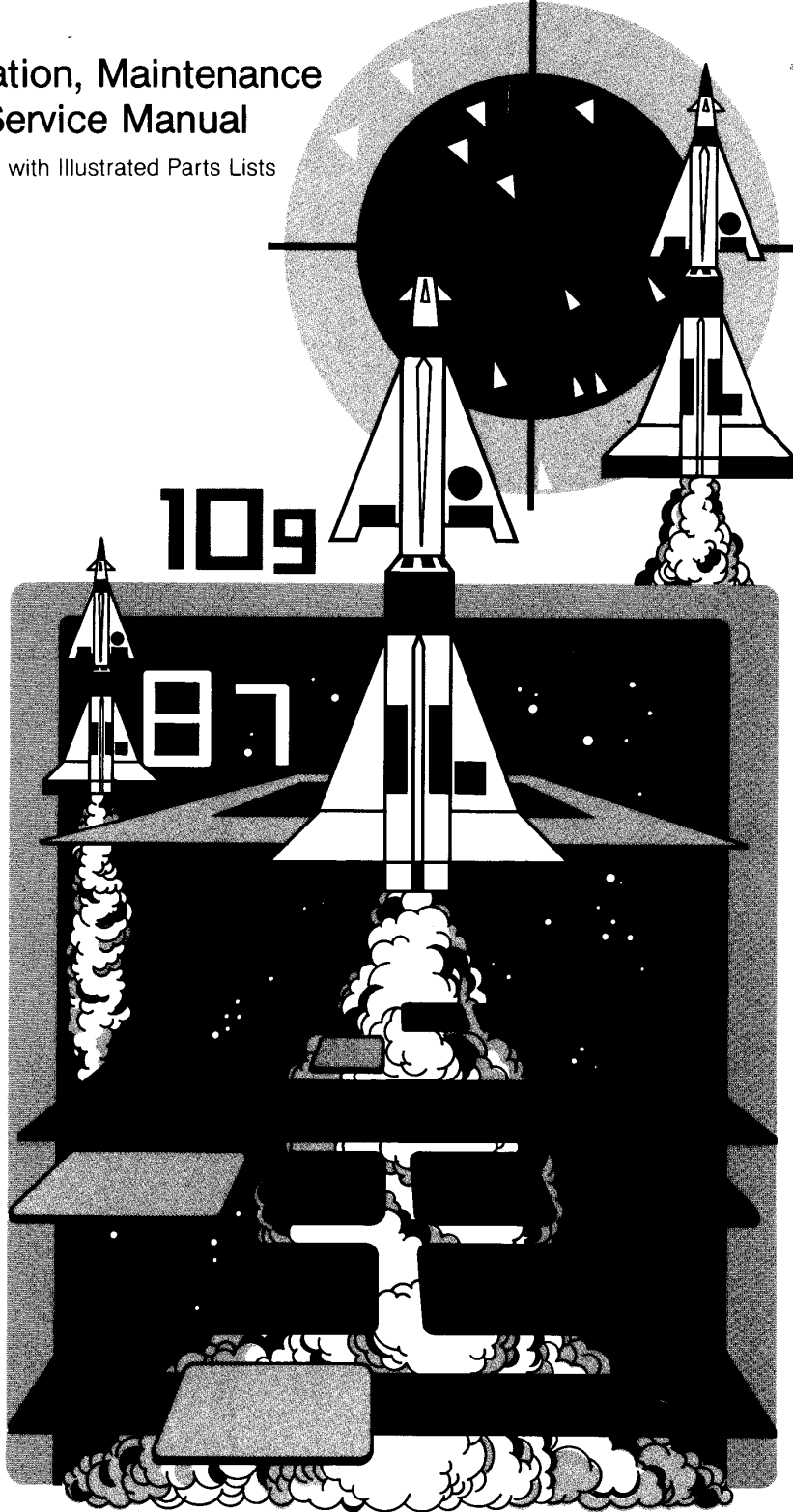


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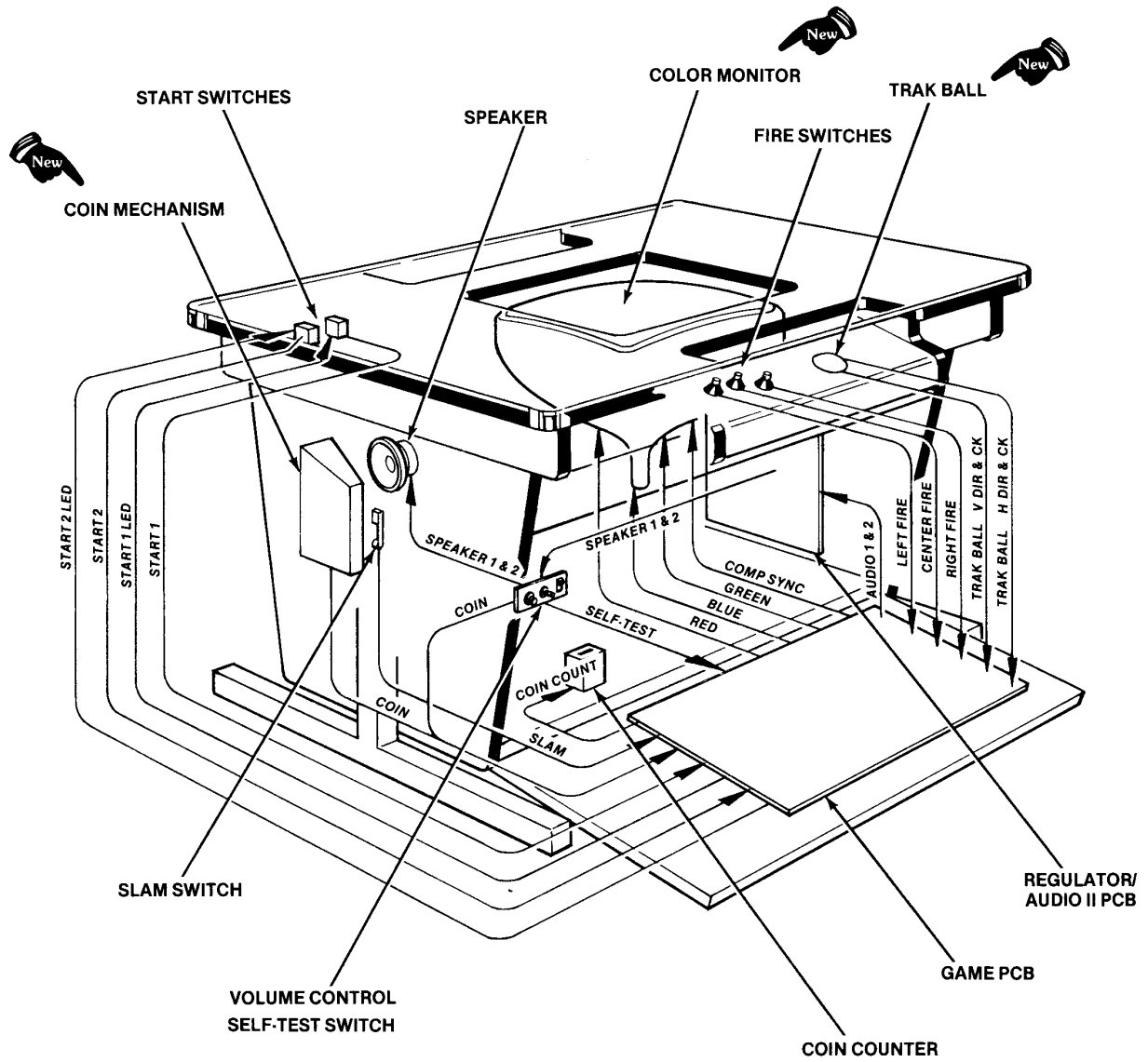
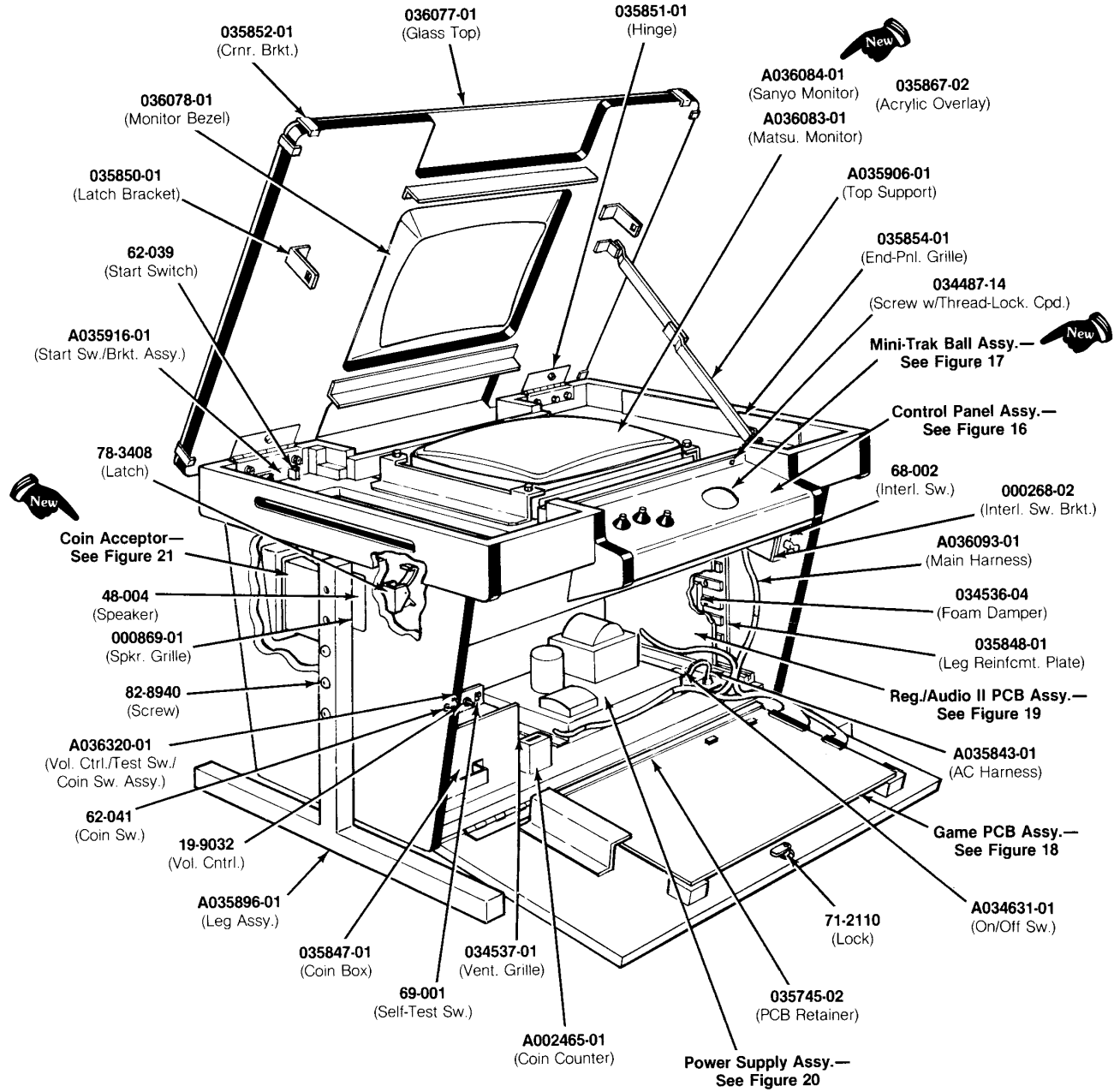


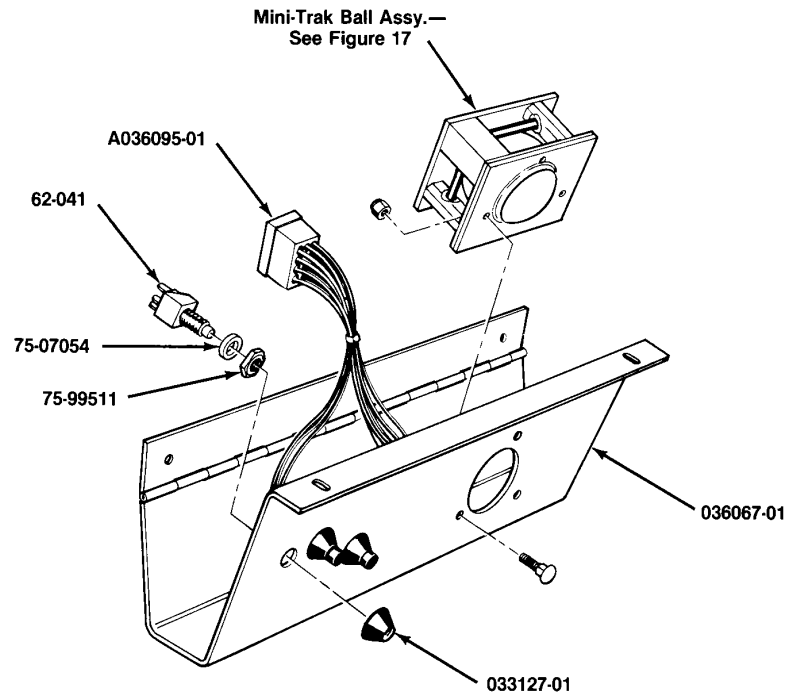
Figure 14 Signal Distribution



**Figure 15 Cabinet-Mounted Assemblies
A036080-xx B**

Figure 15 Cabinet-Mounted Assemblies Parts List

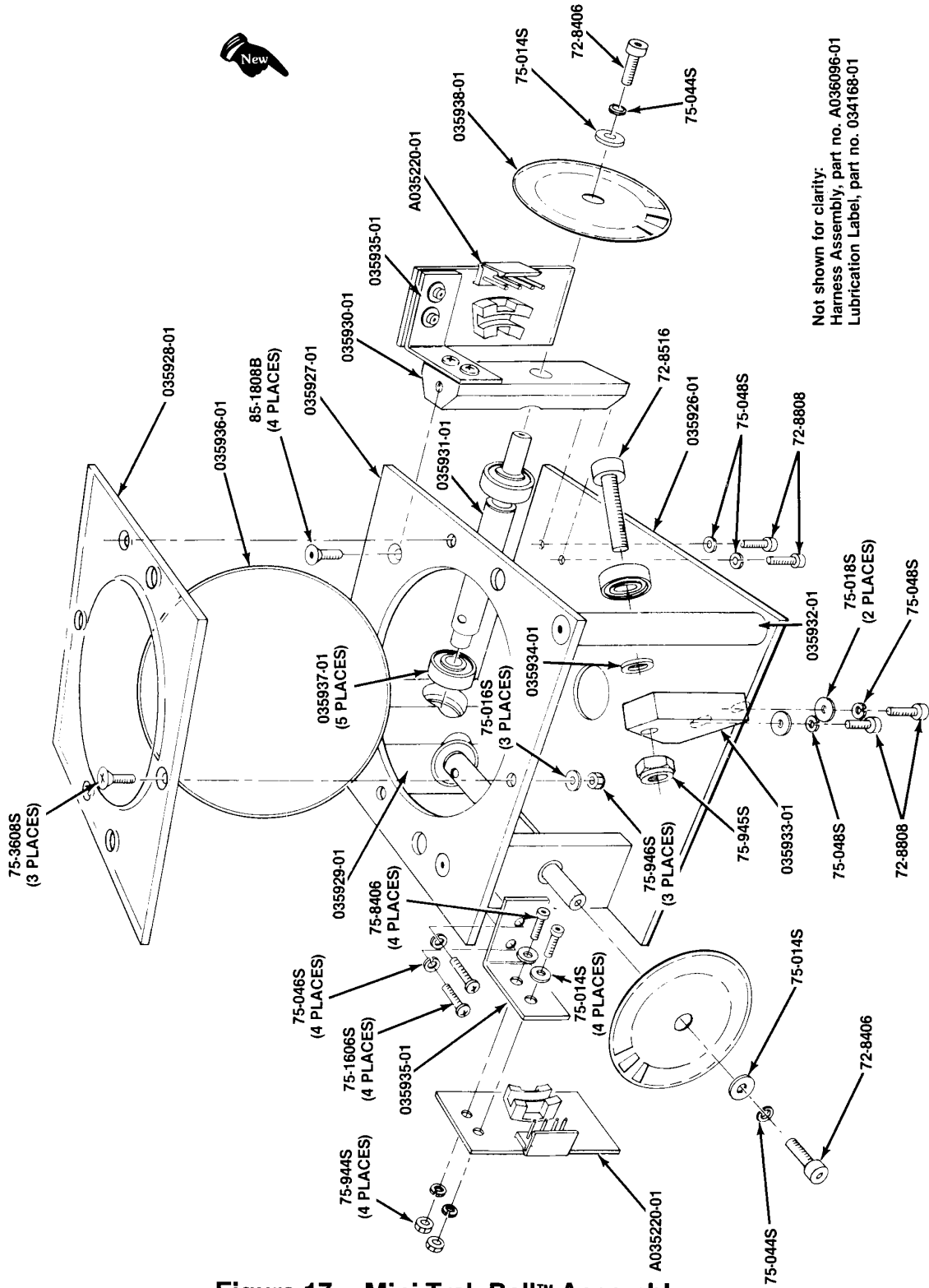
Part No.	Description
A002465-01	Coin Counter
A007638-01	Slam Switch Assembly
A034631-01	15 Amp @ 125V (10 Amp @ 250V) DPDT Toggle Switch
A035843-01	AC Harness Assembly
A035896-01	Leg Assembly
A035906-01	Top Support Assembly
A035916-01	Start Switches/Bracket Assy. <i>(includes switches, stamped nuts, bushings and bracket)</i>
A035992-01	Strain-Relief Power Cord Assembly <i>(for use in USA and Japan)</i>
A036083-01	14" Matsushita Monitor Assembly <i>(includes adapter harness and steel side supports)</i>
A036084-01	14" Sanyo Monitor Assembly <i>(includes steel side supports)</i>
A036093-01	Main Harness
A036320-01	Volume Control/Test Switch/Coin Switch Assembly <i>(includes bracket)</i>
DP-152-01	Sheet 1 of Schematic Drawing Package
DP-152-02	Sheet 2 of Schematic Drawing Package
ST-152	Self-Test Label
TM-152	Technical Manual for Cocktail Missile Command™
TM-153	Manual for Matsushita 14" Color Monitor
TM-157	Manual for Sanyo 14" Color Monitor
19-9032	50-Ohm, 12½-Watt, Wirewound Rheostat <i>(Volume Control)</i>
48-004	16-Ohm, 4-Watt, 4-Inch High-Fidelity Loudspeaker
62-039	SPDT Momentary-Contact Pushbutton Start Switch with Red Light-Emitting Diode
62-041	SPDT Momentary-Contact Pushbutton Coin Switch <i>(for operator convenience)</i>
68-002	30-Amp. Interlock Switch
69-001	DPDT Slide Switch <i>(self-test)</i>
71-2110	Panel Cartridge Lock Mechanism
75-07017	Spacer for Mounting Printed-Circuit Boards
75-9910W0	15/32-32 Steel Stamped Nut <i>(for start switch)</i>
78-24012	5" Beaded Nylon Tie Wrap <i>(for securing edge connector to Game PCB)</i>
78-3408	Spring Draw Latch
78-6900402	Adhesive Foam Tape <i>(for glass top)</i>
82-8940	3/8-16 × 2½" Button-Head Hex Socket Machine-Thread Screw
000268-02	Interlock Switch Mounting Bracket
000869-01	Speaker Grille
007882-02	Interlock Switch Cover
033127-01	Black Molded Polycarbonate Switch Bushing
034487-14	10-32 × 7/8" Button-Head Hex-Head Machine-Thread Screw with Thread-Locking Compound
034536-04	Foam Vibration Damper
034537-01	Ventilation Grille
035745-02	18"-Long Plastic PCB Retainer
035845-01	Coin Box Lid
035847-01	Coin Box
035848-01	Leg Reinforcement Plate
035850-01	Latch Bracket
035851-01	Hinge
035852-01	Corner Bracket
035854-01	End-Panel Grille <i>(2 per game)</i>
035867-02	Bronze-Color Acrylic Overlay
035917-01	On/Off Switch Cover
036077-01	Glass Top with Graphics
036078-01	Cardboard Monitor Bezel



**Figure 16 Control Panel Assembly
A036076-01 A**

Parts List

<i>Part No.</i>	<i>Description</i>
A036095-01	Control Panel Harness Assembly
62-041	Pushbutton Switch with Black Cap (3 per game)
75-07054	Flat Nylon Washer, 0.470" inside diameter × 0.968" outside diameter × 0.075" thick
75-99511	#10-24 Steel Stamped Nut
033127-01	Black Molded Switch Bushing
036067-01	Control Panel with Graphics



**Figure 17 Mini-Trak Ball™ Assembly
A035940-01 A**

Figure 17 Mini-Trak Ball™ Assembly Parts List



<i>Part No.</i>	<i>Description</i>
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	1/4-20 × 1" Hex Socket-Head Cap Alloy Steel Machine Screw
72-8808	#8-32 × 1/2" 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	1/4-20 Self-Locking Steel/Polymer Hex Nut
75-946S	#6-32 Self-Locking Steel/Polymer Hex Nut
85-1808B	#8-32 × 1/2" 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

Regulator/Audio II PCB Schematic (035435-02 B)

The Regulator/Audio PCB has the dual functions of regulating the +5 VDC logic power to the game PCB and amplifying the audio from the game PCB.

Regulator Circuit

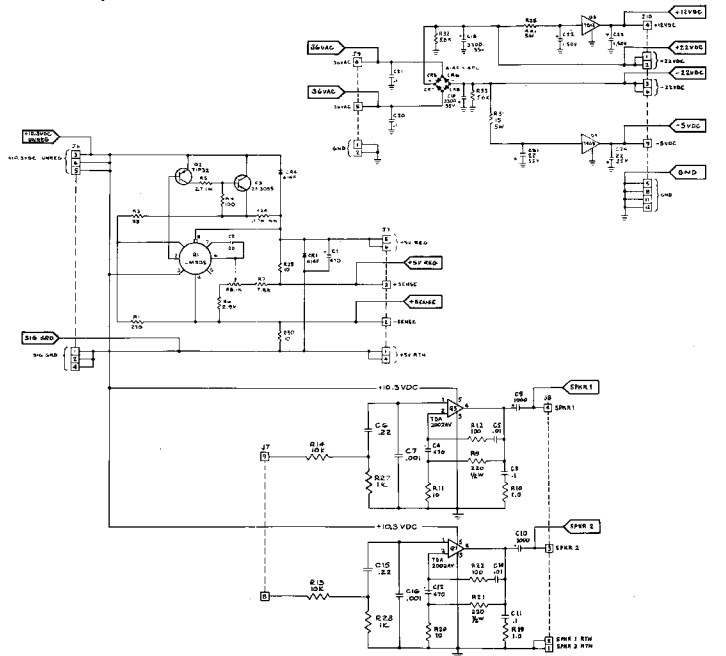
The regulator consists of voltage regulator Q1, current source power transistor Q3 and Q3's bias transistor Q2. The regulator accurately regulates the logic power input to the game PCB by monitoring the voltage through high impedance inputs +SENSE and -SENSE. The inputs are directly from the +5 VDC and ground inputs to the game PCB. Therefore, the regulator regulates the voltage on the game PCB. This eliminates a reduced voltage due to IR buildup on the wire harness between the regulator and the game PCB. Variable resistor R8 is adjusted for the +5 VDC on the game PCB. Once adjusted, the voltage at the input of the game PCB will remain constant at this voltage.

Regulator Adjustment

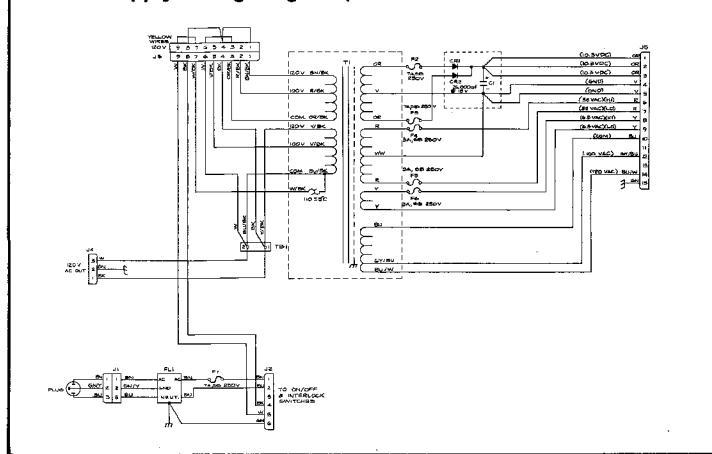
1. Connect a voltmeter between +5 V and GND test points of the game PCB.
2. Adjust variable resistor R8 on the Regulator/Audio PCB for +5 VDC reading on the voltmeter.
3. Connect a voltmeter between +5 V REG and GND on the Regulator/Audio PCB. Voltage reading shall not be greater than +5.5 VDC. If greater, try cleaning edge connectors on both the game PCB and the Regulator/Audio PCB.
4. If cleaning PCB edge connectors doesn't decrease voltage difference, connect minus lead of voltmeter to GND test point of Regulator/Audio PCB and plus lead to GND test point of game PCB. Note the voltage. Now connect minus lead of voltmeter to +5 REG test point on Regulator/Audio PCB and plus lead to +5 V test point on game PCB. From this you can see which harness circuit is dropping the voltage. Troubleshoot the appropriate harness wire or harness connector.

Audio Circuit

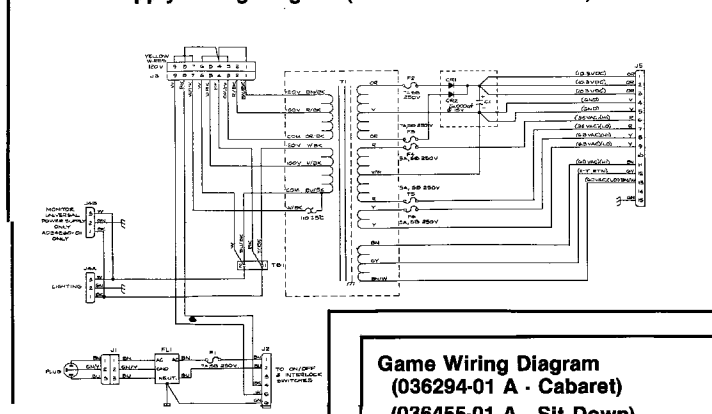
The audio circuit contains two independent audio amplifiers. Each consists of a TDA2002AV amplifier with a gain of ten.



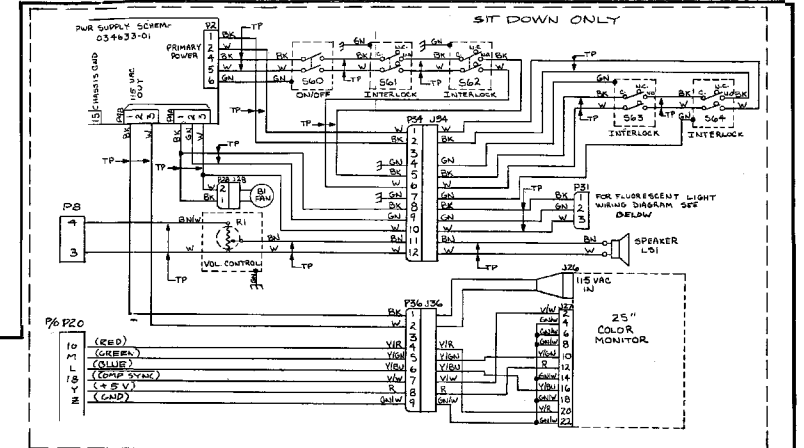
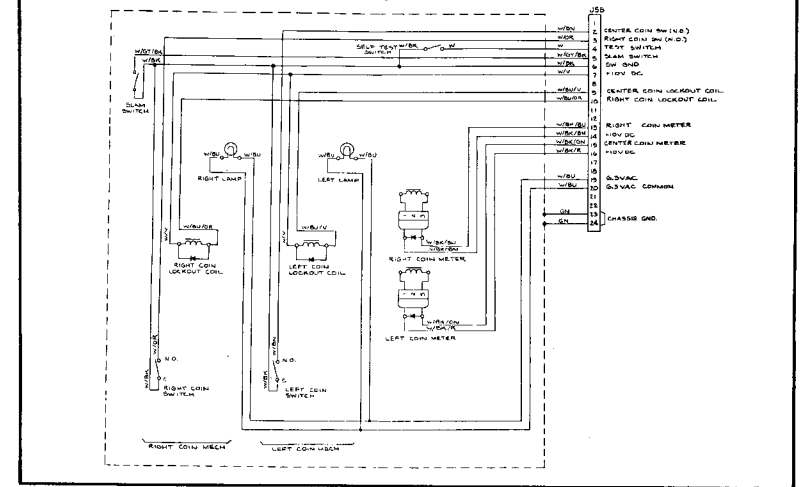
Power Supply Wiring Diagram (036097-01 B Cabaret)



Power Supply Wiring Diagram (034633-01 B Sit Down)



Coin Door Schematic (034988-01 A)



Drawing Package Supplement

to

MISSILE COMMAND™

Operation, Maintenance, and Service Manual

Contents of this Drawing Package

Game Wiring Diagram, Coin Door and Power Supply Microprocessor and Sync Video Generator Input and Output Circuitry

Sheet 1, Side A
Sheet 1, Side B
Sheet 2, Side A
Sheet 2, Side B

DIAGNOSTIC TESTS

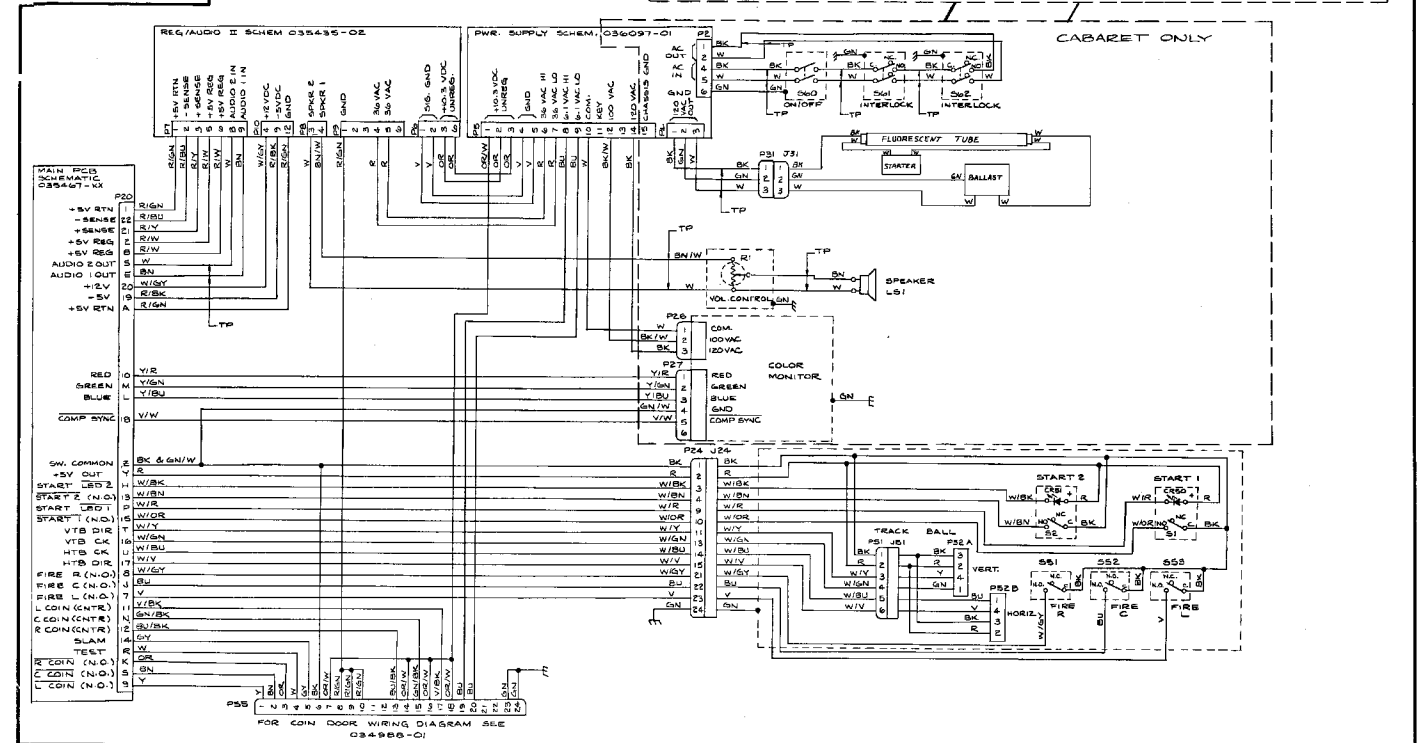
Instruction	Use of Test
1. Set self-test switch to on position. Note: entering self-test will set the HIGH SCORE TODAY display to 7500.	
2. Press alpha base fire button and slam switch simultaneously. Release slam switch first.	A convergence pattern appears on the monitor screen. The background can be many possible colors. If you are going to converge the monitor, black is the color you want. To change background color, press either START button. Do not attempt any convergence adjustments unless you are a qualified color TV technician!
3. Press omega base fire button and slam switch simultaneously. Release slam switch first.	Vertical color bars appear on the screen, to permit color hue and brightness adjustments. Pressing either start button changes the color of the right and left vertical bars. Do not attempt any color hue or brightness adjustments unless you are a qualified color TV technician!
4. Press delta base fire button and slam switch simultaneously.	White screen appears, and tiny black dots trace all the raster lines from top to bottom (takes about 67 seconds). After this, a blue RAM OK message appears on the screen, and the + will reappear. If the message BAD RAM appears and some or all of the digits 1 thru 8, refer to the following to determine the failing RAM chips.
5. Set self-test switch to off position.	Check attract mode display and readjust brightness if necessary.

Test no. 4 display	Bad chip location
BAD RAM 8	H4
BAD RAM 7	N4
BAD RAM 6	M4
BAD RAM 5	L4
BAD RAM 4	K4
BAD RAM 3	J4
BAD RAM 2	H4
BAD RAM 1	F4



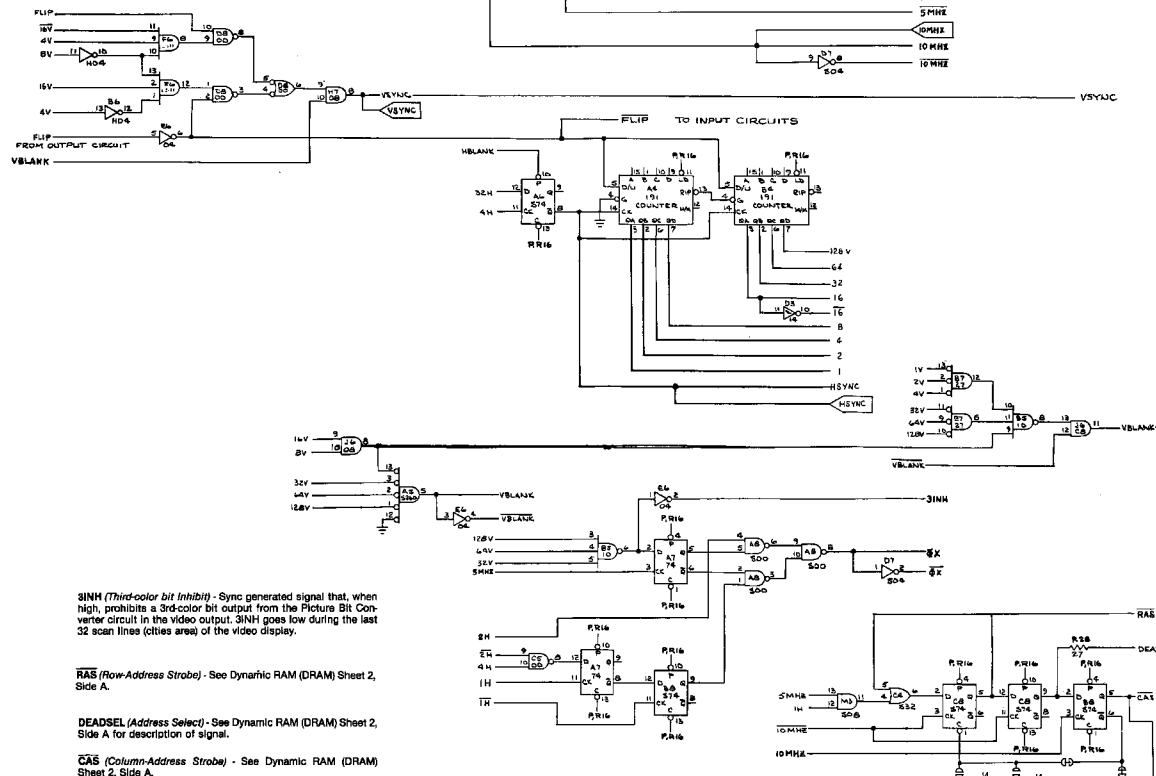
Atari Communications Company

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Sync

FLIP (Video Inverse Enable) - Microprocessor-generated signal clocked by Address Decode **OUT0**, used in Missile Command Cocktail game only. High FLIP reverses count output of vertical sync signal and relocates VSYNC signal, inverting Cocktail game video picture. Cocktail game must have 02 or later Program Memory installed.



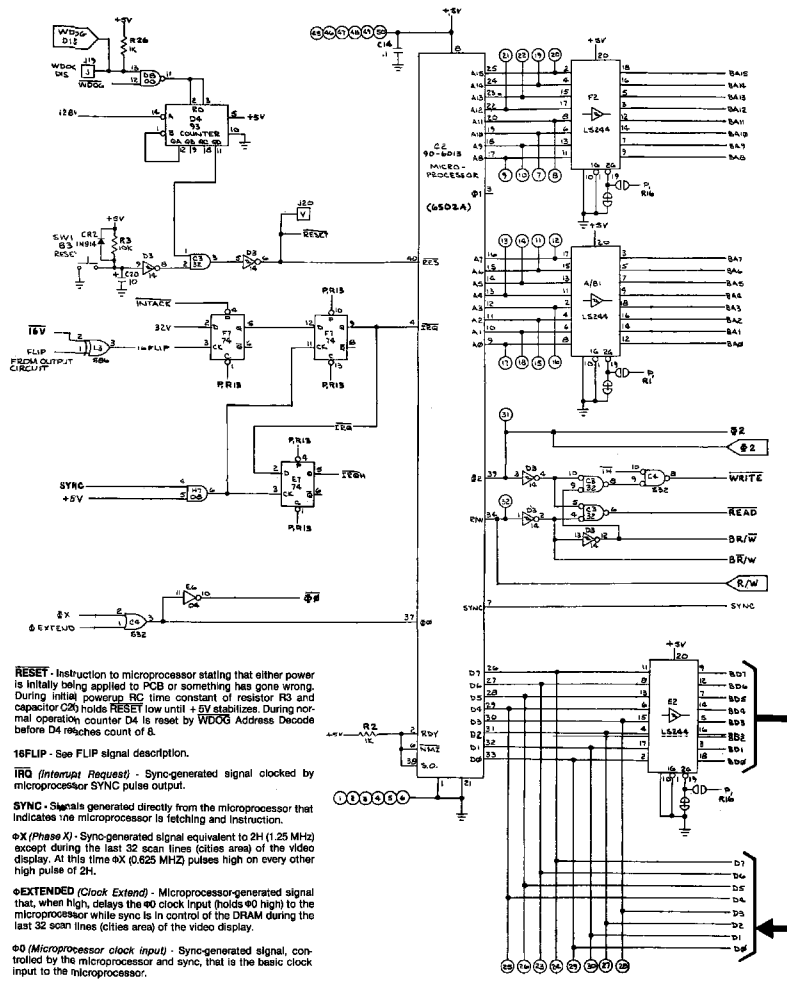
3INH (Third-color bit Inhibit) - Sync generated signal that, when high, prohibits a 3rd-color bit output from the Picture Bit Converter circuit in the video output. 3INH goes low during the last 32 scan lines (cites area) of the video display.

RAS (Row-Address Strobe) - See Dynamic RAM (DRAM) Sheet 2, Side A.

DEADSEL (Address Select) - See Dynamic RAM (DRAM) Sheet 2, Side A for description of signal.

CAS (Column-Address Strobe) - See Dynamic RAM (DRAM) Sheet 2, Side A.

Microprocessor Circuit



RESET - Instruction to microprocessor stating that either power is initially being applied to PCB or something has gone wrong. During initial powerup RC time constant of resistor R3 and capacitor C20 holds RESET low until +5V stabilizes. During normal operation counter D4 is reset by WDOG Address Decode before D4 reaches count of 8.

IRQ (Interrupt Request) - Sync-generated signal clocked by microprocessor SYNC output.

16FLIP - See FLIP signal description.

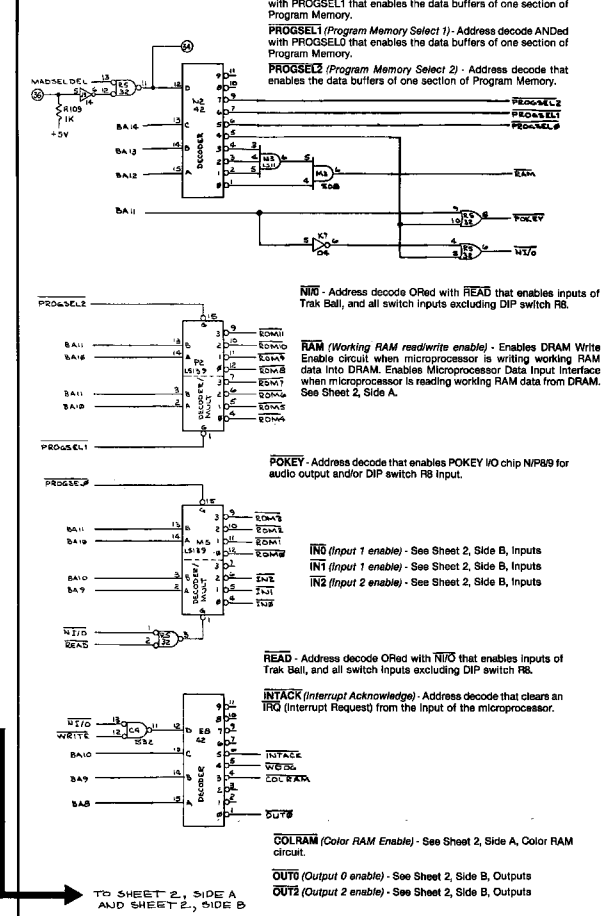
SYNC - Signals generated directly from the microprocessor that indicates the microprocessor is fetching an instruction.

0X (Phase X) - Sync-generated signal equivalent to 2H (1.25 MHz) except during the last 32 scan lines (cites area) of the video display. At this time 0X (0.625 MHz) pulses high on every other high pulse of 2H.

0EXTENDED (Clock Extend) - Microprocessor-generated signal that, when high, delays the 00 clock input (holds 00 high) to the microprocessor while sync is in control of the DRAM during the last 32 scan lines (cites area) of the video display.

00 (Microprocessor clock input) - Sync-generated signal, controlled by the microprocessor and sync, that is the basic clock input to the microprocessor.

Address Decoding



PROGSEL0 (Program Memory Select 0) - Address decode ANDed with PROGSEL1 that enables the data buffers of one section of Program Memory.

PROGSEL1 (Program Memory Select 1) - Address decode ANDed with PROGSEL0 that enables the data buffers of one section of Program Memory.

PROGSEL2 (Program Memory Select 2) - Address decode that enables the data buffers of one section of Program Memory.

RAM (Working RAM readwrite enable) - Enables DRAM Write Enable circuit when microprocessor is writing working RAM data into DRAM. Enables Microprocessor Data Input Interface when microprocessor is reading working RAM data from DRAM. See Sheet 2, Side A.

POKEY - Address decode ORed with READ that enables inputs of Trak Ball, and all switch inputs excluding DIP switch R8.

INTACK (Interrupt Acknowledge) - Address decode that clears an IRQ (Interrupt Request) from the input of the microprocessor.

COLRAM (Color RAM Enable) - See Sheet 2, Side A, Color RAM circuit.

OUT0 (Output 0 enable) - See Sheet 2, Side B, Outputs

OUT1 (Output 1 enable) - See Sheet 2, Side B, Outputs

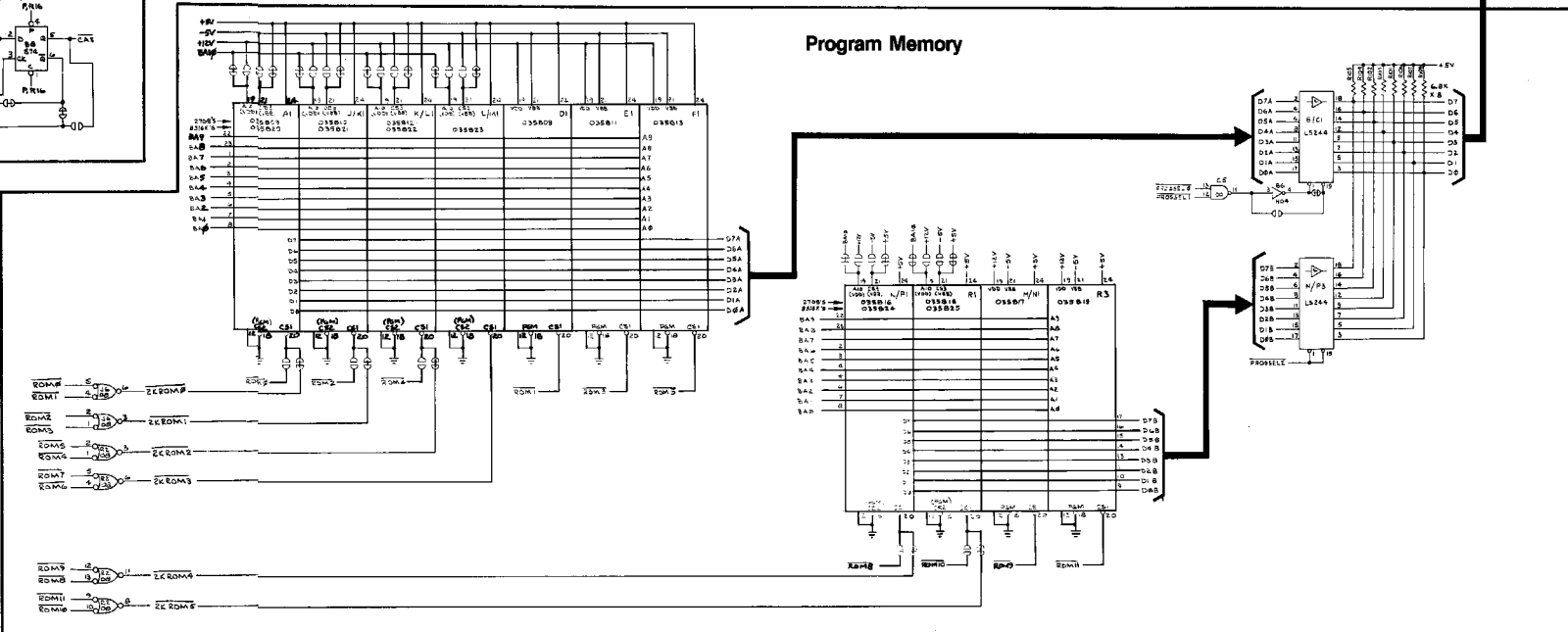
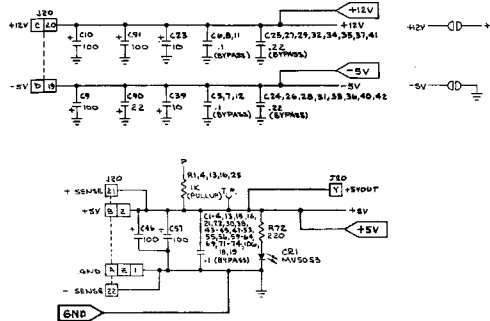
OUT2 (Output 2 enable) - See Sheet 2, Side B, Outputs

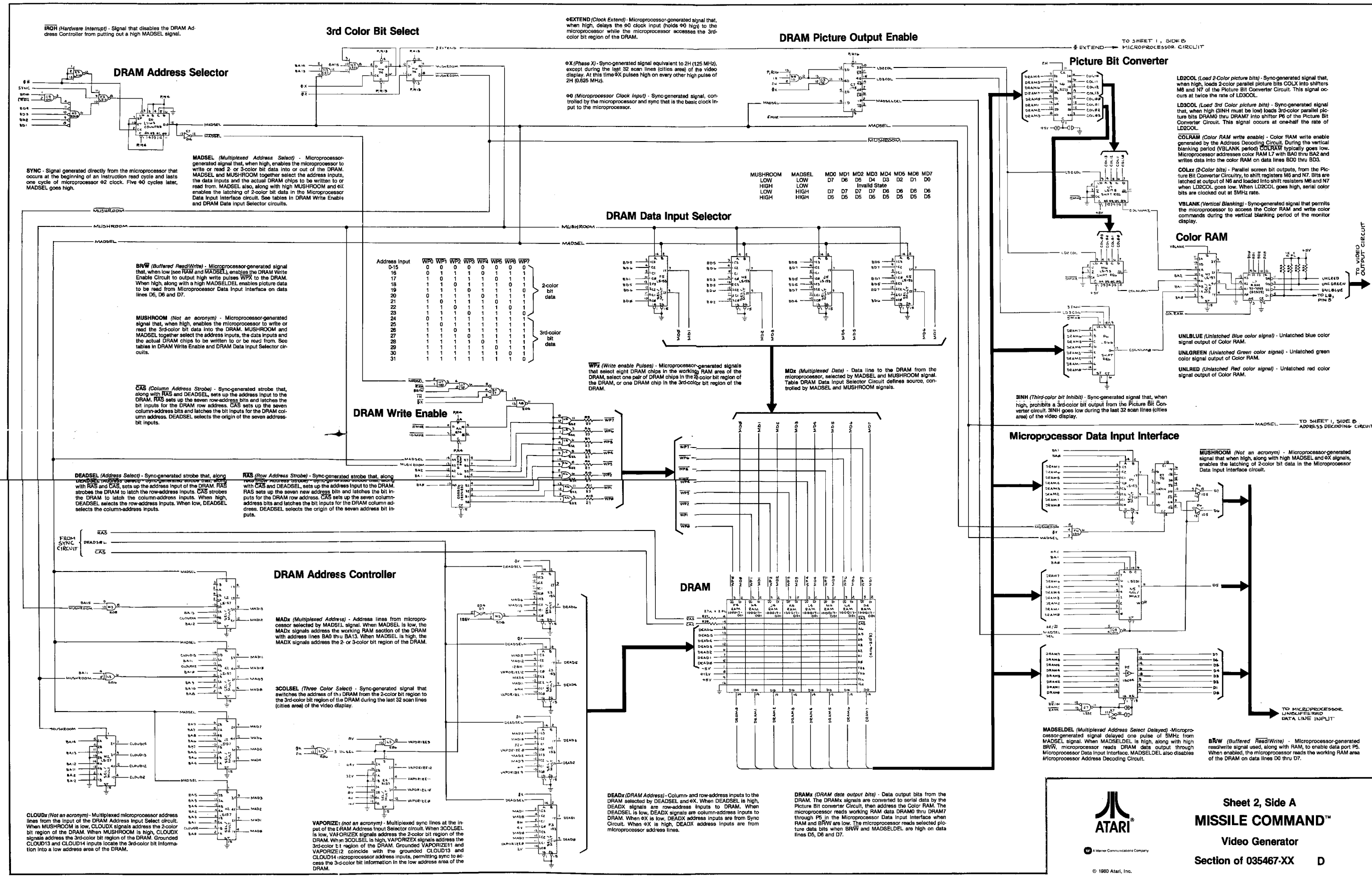
Sheet 1, Side B
MISSILE COMMAND™
 Microprocessor
 Section of 035467-XX D

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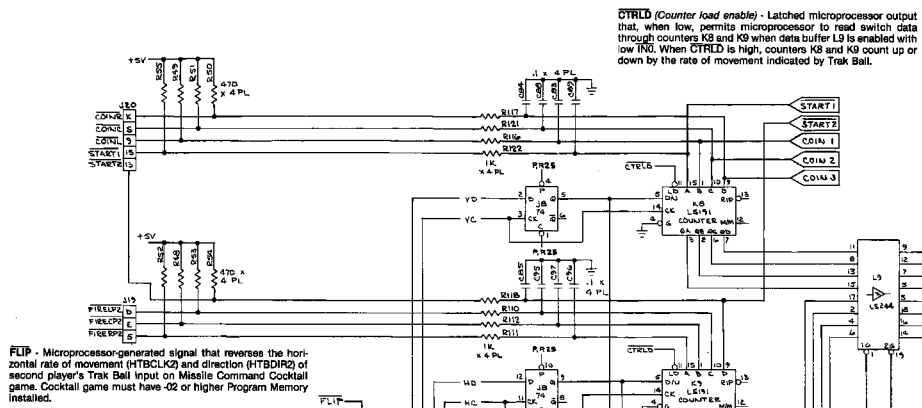


Power Input

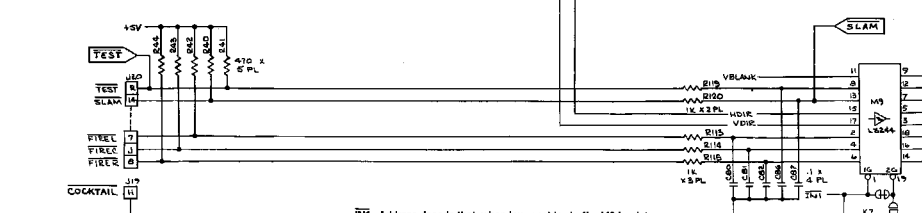
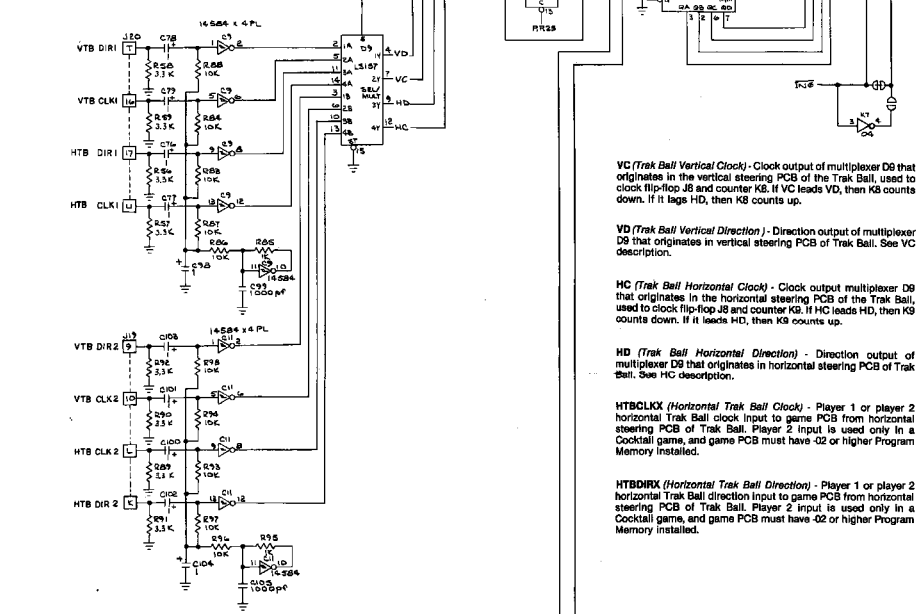




Input Circuits



FLIP - Microprocessor-generated signal that reverses the horizontal rate of movement (HTBCLK2) and direction (HTBDIR2) of second player's Trak Ball input on Missile Command Cocktail game. Cocktail game must have 02 or higher Program Memory installed.



IN1 - Address decode that, when low, enables buffer M9 for data input to the microprocessor of TEST, SLAM, FIRE switches, and Trak Ball vertical and horizontal rate of turn.
IN2 - Address decode that, when low, enables buffer P10 for data input to the microprocessor of switch settings of DIP switch RVG.

CTRLD (Counter load enable) - Latched microprocessor output that, when low, permits microprocessor to read switch data through counters K8 and K9 when data buffer L3 is enabled with low IN0. When CTRLD is high, counters K8 and K9 count up or down by the rate of movement indicated by Trak Ball.

VC (Trak Ball Vertical Clock) - Clock output of multiplexer D6 that originates in the vertical steering PCB of the Trak Ball, used to clock flip-flop J8 and counter K8. If VC leads VD, then K8 counts down. If it lags VD, then K8 counts up.

VD (Trak Ball Vertical Direction) - Direction output of multiplexer D6 that originates in vertical steering PCB of Trak Ball. See VC description.

HC (Trak Ball Horizontal Clock) - Clock output multiplexer D9 that originates in the horizontal steering PCB of the Trak Ball, used to clock flip-flop J9 and counter K9. If HC leads HD, then K9 counts down. If it lags HD, then K9 counts up.

HD (Trak Ball Horizontal Direction) - Direction output of multiplexer D9 that originates in horizontal steering PCB of Trak Ball. See HC description.

HTBCLKX (Horizontal Trak Ball Clock) - Player 1 or player 2 horizontal Trak Ball clock input to game PCB from horizontal steering PCB of Trak Ball. Player 2 input is used only in a Cocktail game, and game PCB must have 02 or higher Program Memory installed.

HTBDIRX (Horizontal Trak Ball Direction) - Player 1 or player 2 horizontal Trak Ball direction input to game PCB from horizontal steering PCB of Trak Ball. Player 2 input is used only in a Cocktail game, and game PCB must have 02 or higher Program Memory installed.

Memory Map for Address Decoding Circuit, Sheet 1, Side B

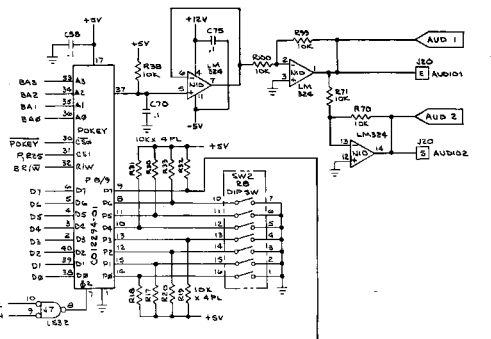
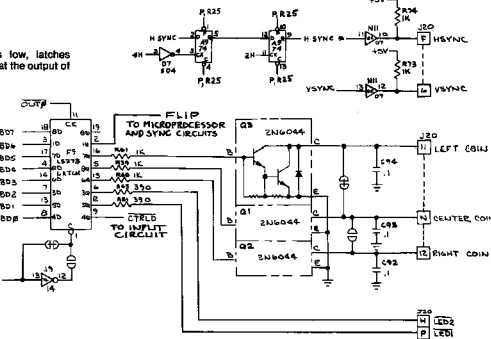
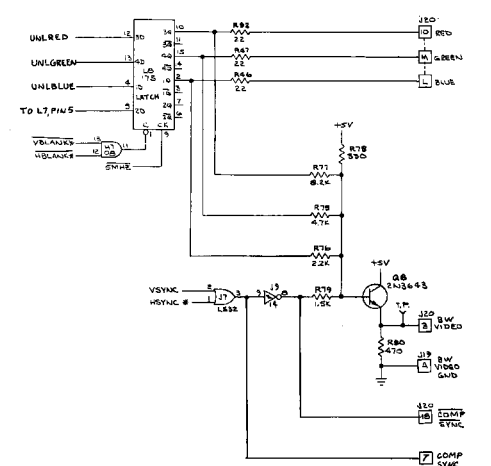
HEXIDECIMAL	ADDRESS																RW	DATA								FUNCTION
	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1		A0	D7	D6	D5	D4	D3	D2	D1	
0000-01FF	0	0	0	0	0	0	0	A	A	A	A	A	A	A	A	A	D	D	D	D	D	D	D	D	D12 Bytes of Working RAM	
0200-06FF	0	0	0	0	0	0	A	A	A	A	A	A	A	A	A	A	D	D	D	D	D	D	D	D	3rd color-bit region of Screen RAM	
0600-06FF	0	0	0	0	1	1	0	0	0	0	A	A	A	A	A	A	D	D	D	D	D	D	D	D	More Working RAM	
06FD-3FFF	0	0	A	A	A	A	A	A	A	A	A	A	A	A	A	A	D	D	D	D	D	D	D	D	2 color-bit region of Screen RAM	
4000-40FF	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	POKEY Ports	
4000	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Right Coin Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Center Coin Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Left Coin Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	1-player Start Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	2-player Start Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	2-player center Fire Switch Input (Cocktail Only)	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	2-player right Fire Switch Input (Cocktail Only)	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Horizontal TRAK BALL displacement if CTRLD latched High	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Vertical TRAK BALL displacement if CTRLD latched High	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Screen Flip	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	Left Coin Counter Output	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	Center Coin Counter Output	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	Right Coin Counter Output	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	2-Player Start LED Output	
4800	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	1-Player Start LED Output	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	CTRLD - If low, read Switches. If high, read TRAK BALL	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	VBLANK read	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	Self-Test Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	SLAM Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Horizontal TRAK BALL Direction Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Vertical TRAK BALL Direction Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	1st-player left Fire Switch Input	
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	1st-player center Fire Switch Input	
4A00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	R	D	D	D	D	D	D	D	Option Switch Inputs	
4B00-4B07	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	Color RAM	
4C00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	Watchdog	
4D00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	W	D	D	D	D	D	D	D	Interrupt Acknowledge	
5000-7FFF	0	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	R	D	D	D	D	D	D	D	Program	

VTB CLKX (Vertical Trak Ball Clock) - Player 1 or player 2 vertical Trak Ball clock input to game PCB from vertical steering PCB of Trak Ball. Player 2 input is used only in Cocktail game, and game PCB must have 02 or higher Program Memory installed.

VTB DIRX (Vertical Trak Ball Direction) - Player 1 or player 2 vertical Trak Ball direction input to game PCB from vertical steering PCB of Trak Ball. Player 2 input is used only in Cocktail game, and game PCB must have 02 or higher Program Memory installed.

IN0 - Address decode that, when low, enables buffer L9 for data input to the microprocessor of COIN switches, START switches, player 2 FIRE switches (for Cocktail game only), or Trak Ball rate of turn information. If CTRLD is low, data is from switches. If high, Data is Trak Ball Information.

Output Circuits



OUT0 - Address decode that, when it goes low, latches microprocessor-buffered data bits DB0 thru DB6 at the output of latch FB.

POKEY (POKEY chip enable) - Address decode that, when low, enables custom IO POKEY chip NIP89 for data input or output. The POKEY chip works in conjunction with the microprocessor. It is the input port for DIP switch R6 and the audio output port. BRW determines the direction of data flow as addressed by BA0 thru BA3.

BRW (Buffered Read/Write) - Microprocessor-generated signal that, when high, allows microprocessor to read POKEY input data from DIP switch R6. When low, allows microprocessor to write to POKEY output.



Sheet 2, Side B
MISSILE COMMAND™
 Input and Output Circuitry
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