Operation, Maintenance and Service Manual
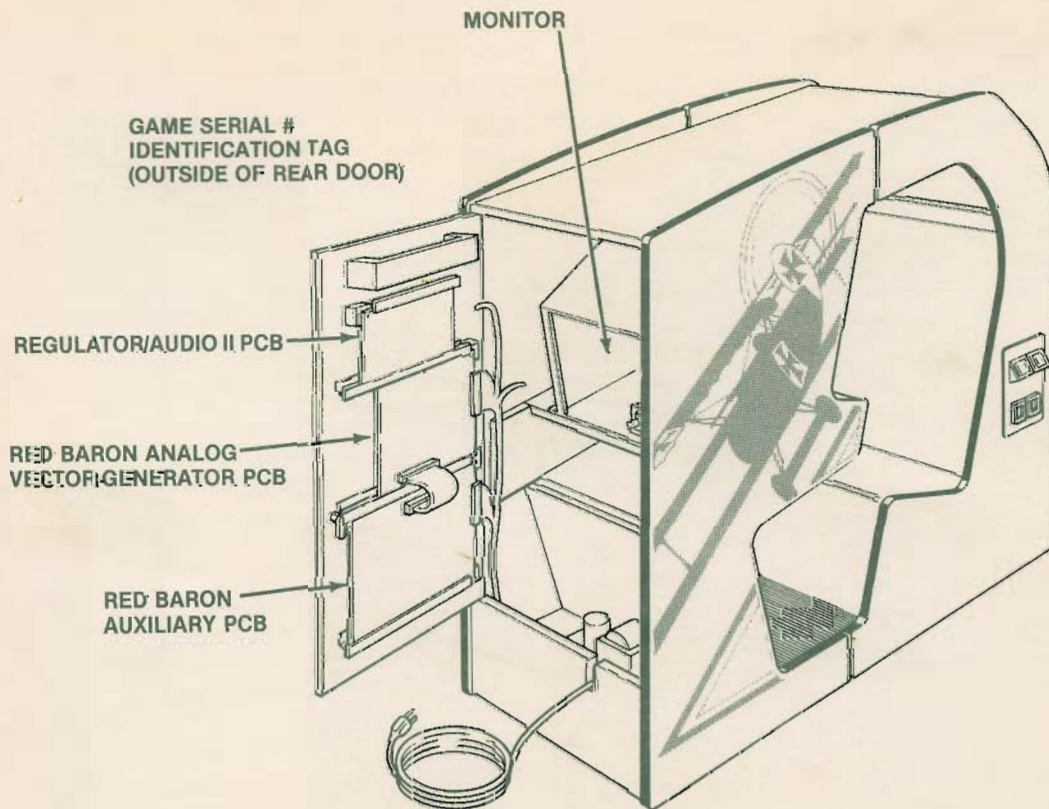
Complete with Illustrated Parts Lists

ATARI®

SIT-DOWN

Red Baron™

MONITOR

GAME SERIAL #
IDENTIFICATION TAG
(OUTSIDE OF REAR DOOR)

REGULATOR/AUDIO II PCB

RED BARON ANALOG
VECTOR-GENERATOR PCB

RED BARON
AUXILIARY PCB
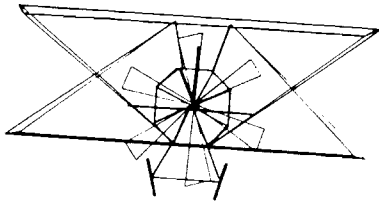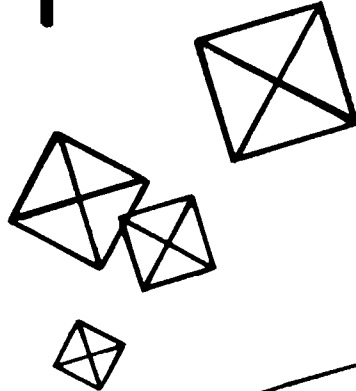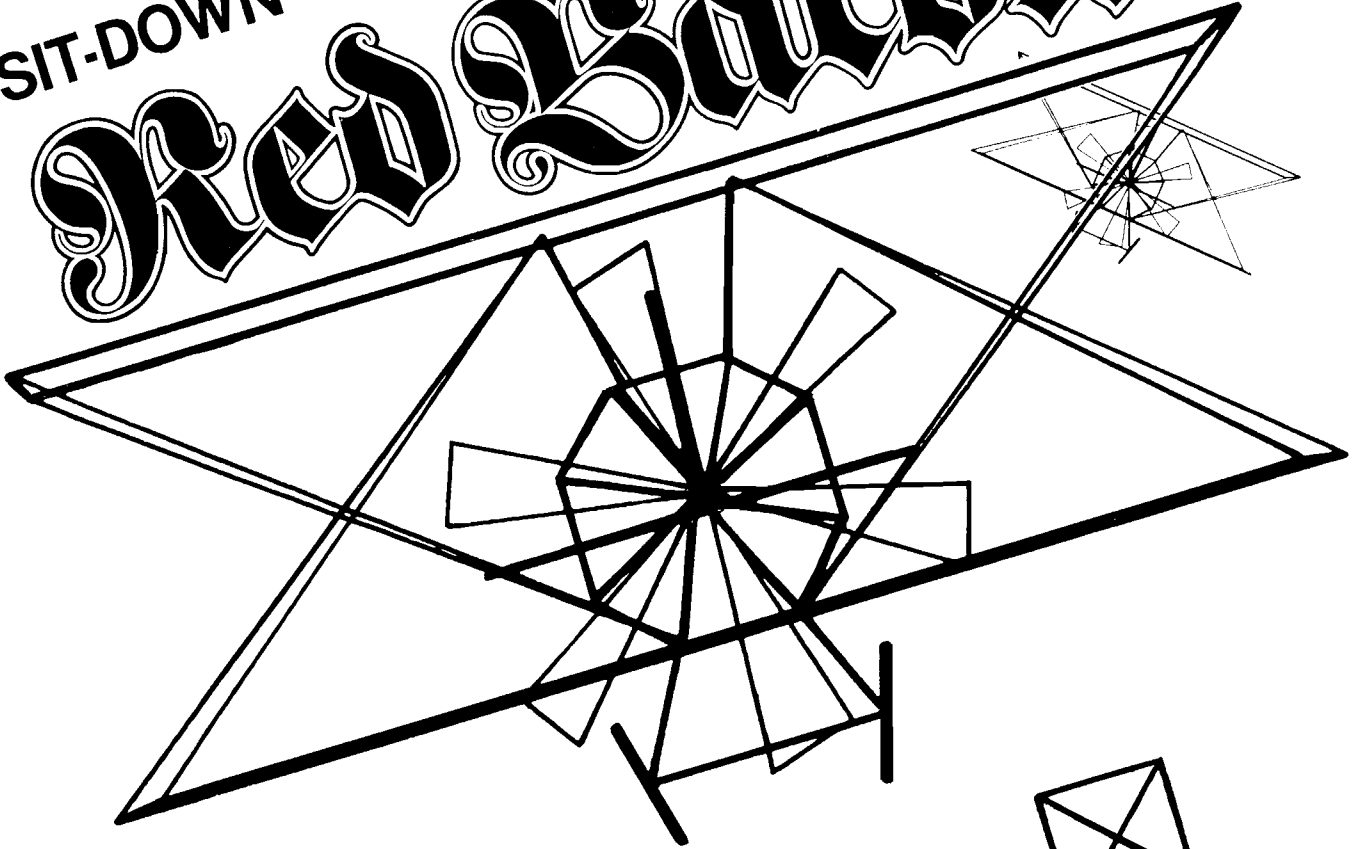
GAME SERIAL NUMBER LOCATION

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 monitor, Regula-
tor/Audio II PCB, Red Baron™ Analog Vector-Generator PCB, and the Auxiliary
PCB. Please mention this number whenever calling your distributor for ser-
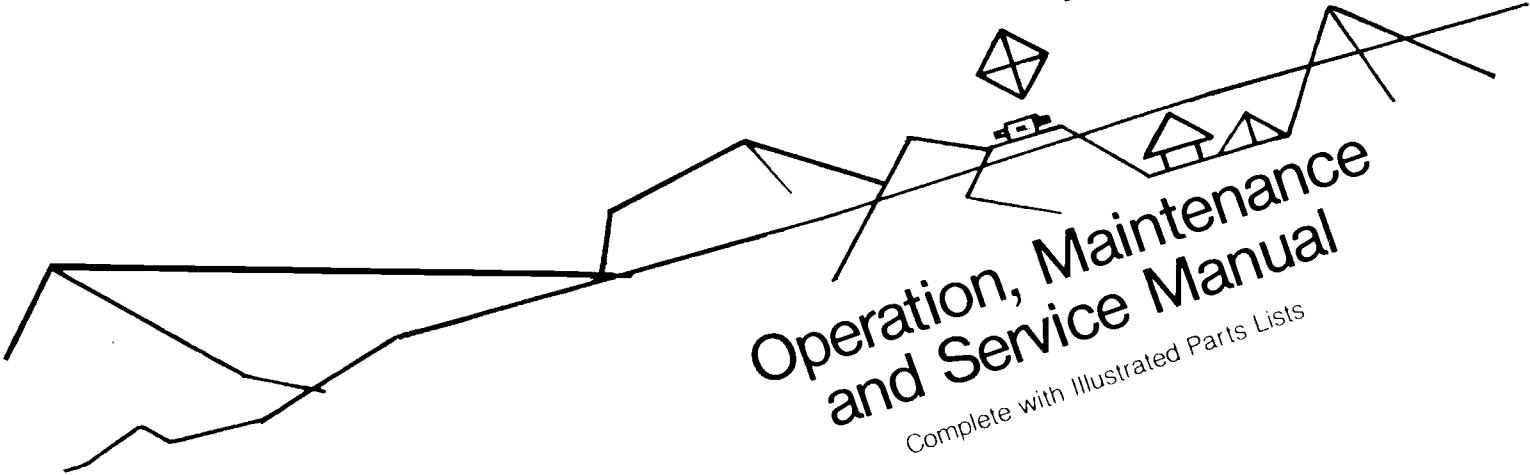vice.

SIT-DOWN

Red Baron™

Operation, Maintenance and Service Manual
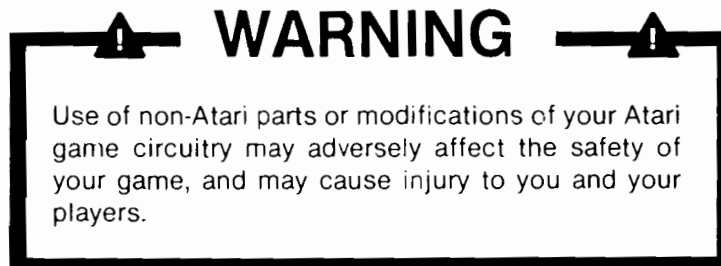
Complete with Illustrated Parts Lists

Lithographed in the U.S.A.   **3K**

Notice Regarding Non-Atari Parts

⚠ WARNING ⚠

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

Atari, Inc.'s warranty (printed on the inside back cover of this manual) may be voided, if you do any of the following:

1.) you substitute non-Atari parts in your coin-operated game, or

2.) you modify or alter any circuits in your Atari game by using kits or parts **not** supplied by Atari.

Not only may the use of any non-Atari parts void your warranty, but any such alteration may also adversely affect the safety of your game, and may cause injury to you and your players.

Table of Contents

List of Illustrations

— NOTE —

If reading through this manual does not lead to solving a certain maintenance problem, call Tele-Help® at the Atari Customer Service office in your geographical area, as shown below.

WEST and CENTRAL U.S.A.

Parts for all Atari customers in the U.S.A. Game sales and service

Atari, Inc.
California Customer Service Office
1105 N. Fair Oaks Avenue
P. O. Box 427, Sunnyvale, CA 94086
Telex 17-1103
(Monday–Friday, 7:30–4:00 pm Pacific Time)

☎ From California, Alaska or Hawaii
(408) 745-2900

☎ From anywhere else in this area
toll-free (800) 538-1611
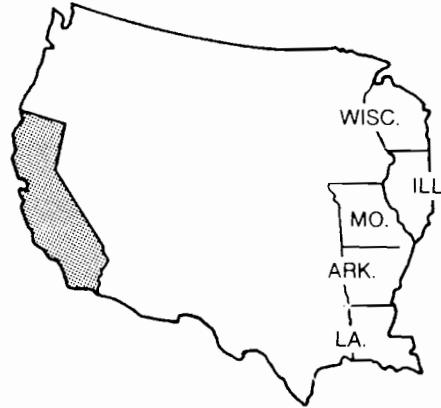
EAST U.S.A.

Game sales and service only

Atari, Inc.
New Jersey Customer Service Office
Cottontail Lane, Somerset, NJ 08873
Telex 37-9347
(Monday–Friday, 7:30–4:00 pm Eastern time)

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(201) 469-5993

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Game sales and service

Atari Ireland Limited
European Customer Service Office
Tipperary Town, Ireland
Telex 8165
(Monday–Friday, 9:00–6:00 pm GMT)

☎ 062-52155
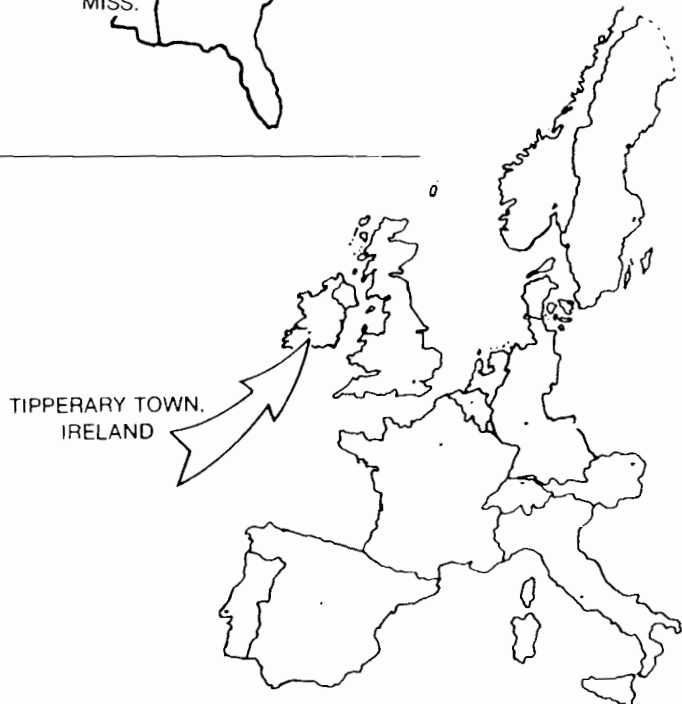
Location Setup
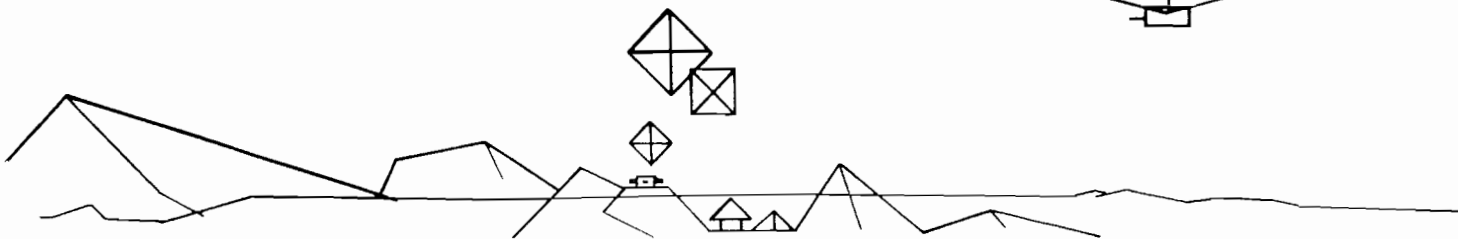
A. New Features

The Red Baron™/Sit-Down game has five new features. Even if you are familiar with Atari games, you should note these important differences. The new features are:

- **Gimbal-Type Joystick Control.** This new heavy-duty control provides a realistic simulation of an aircraft control. The X- and Y-direction motions are measured by two potentiometers mounted on this control.

- Red Baron includes a newly designed **power supply assembly.** This power supply has a larger transformer to handle the increased power requirements of the expanded game circuitry.

- Red Baron's **new sit-down cabinet design** provides a total environment for players. Despite its arcade size, the game is easily moved by one person, due to its swivel casters. All three PCBs are very easily accessible; they are mounted on the inside of the hinged rear door.

- **Game Circuitry.** Atari's 3-dimensional X-Y game circuitry has been expanded into two interconnected printed-circuit boards (PCBs)—the Red Baron Analog Vector-Generator and the Auxiliary PCBs. The circuitry produces more lines on the screen at a faster rate, thus creating a smoother screen image.

The circuitry also has non-volatile memory for part of the high score table. This means that even if power is removed from the game, the three highest scores will permanently stay in memory. To erase these scores follow the instructions in Figure 6, Self-Test Procedure.

In addition, Red Baron is the first Atari game to have a self-adjusting game difficulty feature. For more details on this feature, see Section *F. Game Play,* in this manual.

- A **utility coin switch** is installed on a bracket inside the front access door. The switch allows the operator to give a free play to a player. After pressing this switch, close the access door very quickly, so the game does not reset. When the coin counter options are set as suggested in Figure 9, the coin counter will not trip from this switch.

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:

⚠ — WARNING: — ⚠
SHOCK HAZARD

Connect this game only to a grounded 3-wire outlet. If you have only a 2-wire outlet, we recommend you hire a licensed electrician to install a grounded outlet. **Players may receive an electric shock if** this game is not properly grounded!

REGULATOR/
AUDIO II PCB

AUXILIARY PCB

ANALOG VECTOR-
GENERATOR PCB

X-Y
MONITOR

MONITOR SHIELD

GIMBAL-TYPE
JOYSTICK CONTROL

FRONT WINDOW

UTILITY COIN
SWITCH

POWER SUPPLY

REAR ACCESS DOOR

START SWITCH

CONTROL
PANEL

DOUBLE
COIN ACCEPTOR

FRONT ACCESS DOOR

Figure 1   Overview of Game

B. Game Inspection

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

```
┌──────────────── NOTE ────────────────┐
│        Do not plug the game in yet!        │
└──────────────────────────────────────┘
```

1. Examine the exterior of the game cabinet for dents, chips, or broken parts.

2. Remove the two screws that were used as extra security to seal the rear access door. (During shipment these screws help reduce vibration of the PCB components on the door.) Unlock and open this access door, as well as the small front access door; inspect the interior of the game as follows:
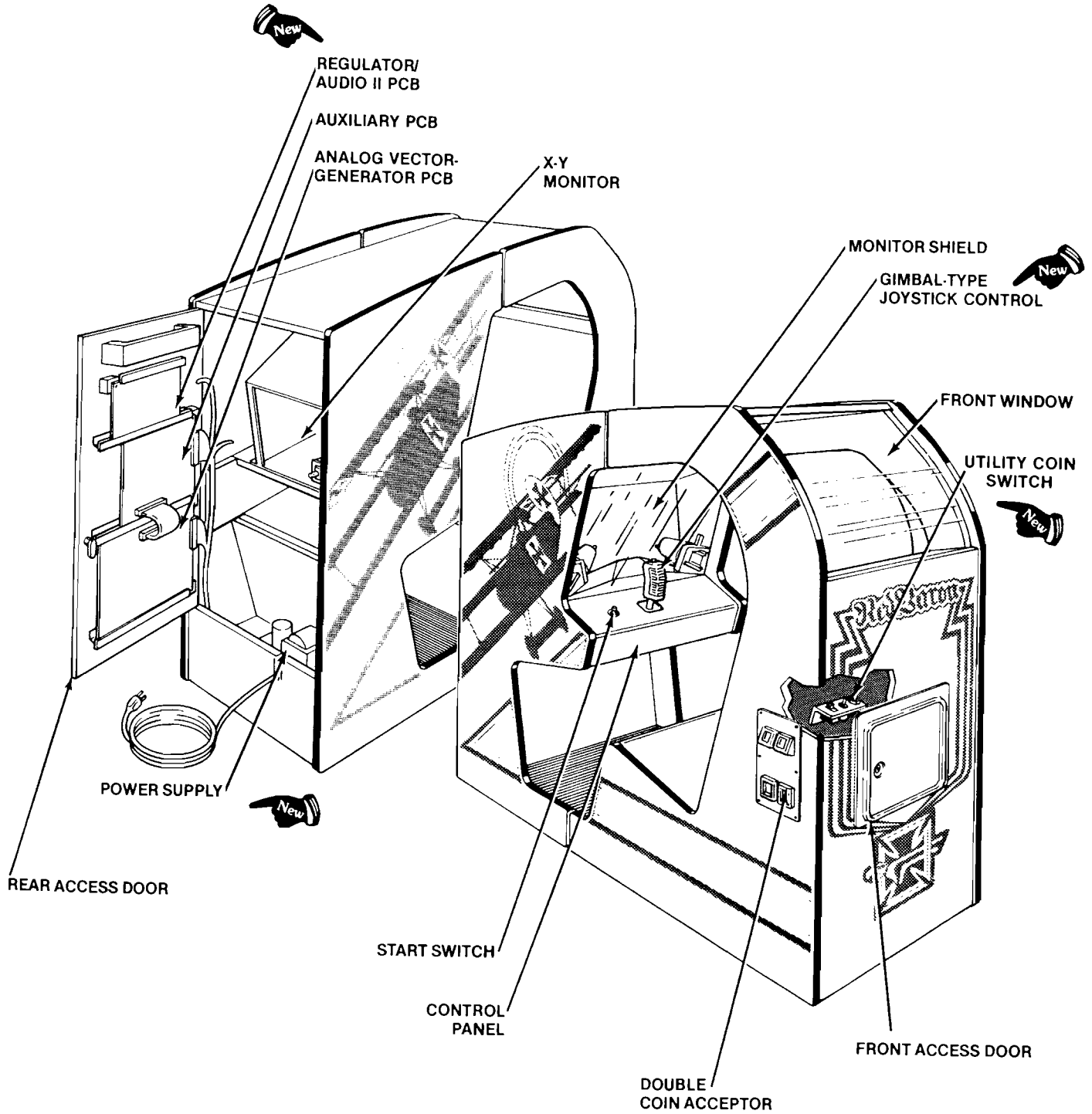
   - Check that all plug-in connectors (on the game harness) are firmly seated. Replug any connectors found unplugged. DON'T FORCE CONNECTORS TOGETHER. The connectors are keyed so they only go on in the proper orientation. **A reversed edge connector will damage a PCB** and will void your warranty.

   - Check that all plug-in integrated circuits on the Red Baron™ Analog Vector-Generator PCB are firmly seated in their sockets.

   - Remove the tie-wrap that holds the coiled power cord on the inside cabinet wall. Check the cord for any cuts or dents in the insulation. Place the square black metal strain-relief plate in the wood slot at the bottom of the rear door opening.

```
┌──▲── WARNING ──▲──┐
│ To avoid possible unpleasant electrical │
│ shock, do not touch internal parts of the │
│ monitor with your hands or metal objects │
│ held in your hands!                        │
└────────────────────────────────────────┘
```

   - 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 Red Baron Analog Vector-Generator PCB, Auxiliary PCB, Regulator/Audio II PCB and monitor are all identical. A drawing of the serial numbered components 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, joystick control, and monitor for secure mounting.

3. Remove the game from the pallet. Roll the game to its final location. Now tilt it slightly onto one side and partly unscrew the two cabinet-leveling legs that are off the floor. Lower the game and tilt it onto the other side; unscrew those two legs. You may have to do some adjustment to level the cabinet.

C. Game Installation

Figure 2   Installation Requirements

Power   263 watts maximum
Temperature   0 to 38°C (32 to 100°F)
Humidity   Not over 95% relative
Space Required   66 × 164½ cm (26 × 64¾ in.)
Game Height   152½ cm (60 in.)

1. Voltage Selection

This game has two possible power supplies: the domestic or international power supply. The domestic power supply operates on one line voltage range: 105 to 135 VAC. The international power supply has four colored voltage selection plugs and operates on the line voltage of almost any country in the world.

Before plugging in your game, check your power supply. If the supply doesn't have voltage selection plugs and a connector at J3 (see Figure 3), then the game operates on any voltage from 105 to 135 VAC. If the supply has the colored voltage selection plugs, make sure that the voltage selection plug on the power supply is correct for your location's line voltage. Check the wire color on the plug and see if it is correct per Figure 3.

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 rear access door and one is behind the small front access door. These switches remove all AC line power from the game circuitry when either door is opened.

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

● Be sure the front and rear access doors are closed.

● Plug the AC line power cord into an AC outlet.

● Set the power on/off switch to the "on" position. Within 30 seconds the monitor should display a picture.

● Slowly open the rear access door. The monitor picture should disappear when the door is opened approximately 2.5 cm (1 inch). Close and lock this door and repeat this step with the small front access door.

● If the results of the preceding step are satisfactory, the interlock switches are operating properly. If the 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.

⚠ — WARNING — ⚠

Fuse cover must be in place during game operation.
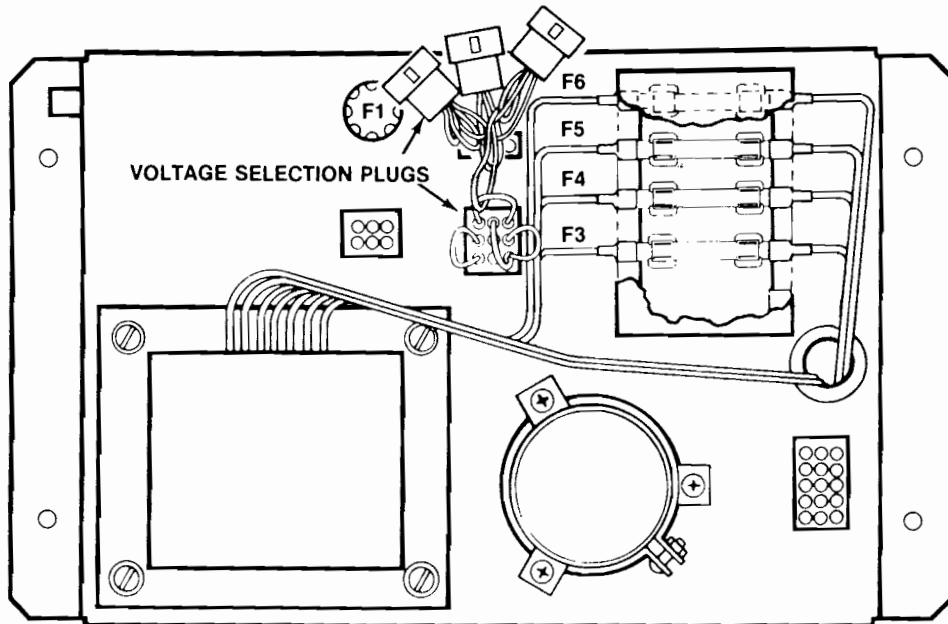
Line Voltage Range	Plug Color
90-110 VAC (100)	Violet
105-135 VAC (120)	Yellow
200-240 VAC (220)	Blue
220-260 VAC (240)	Brown

Figure 3   International Voltage Plug Selection

SAFETY
INTERLOCK
SWITCH

SWITCH
COVER

ON
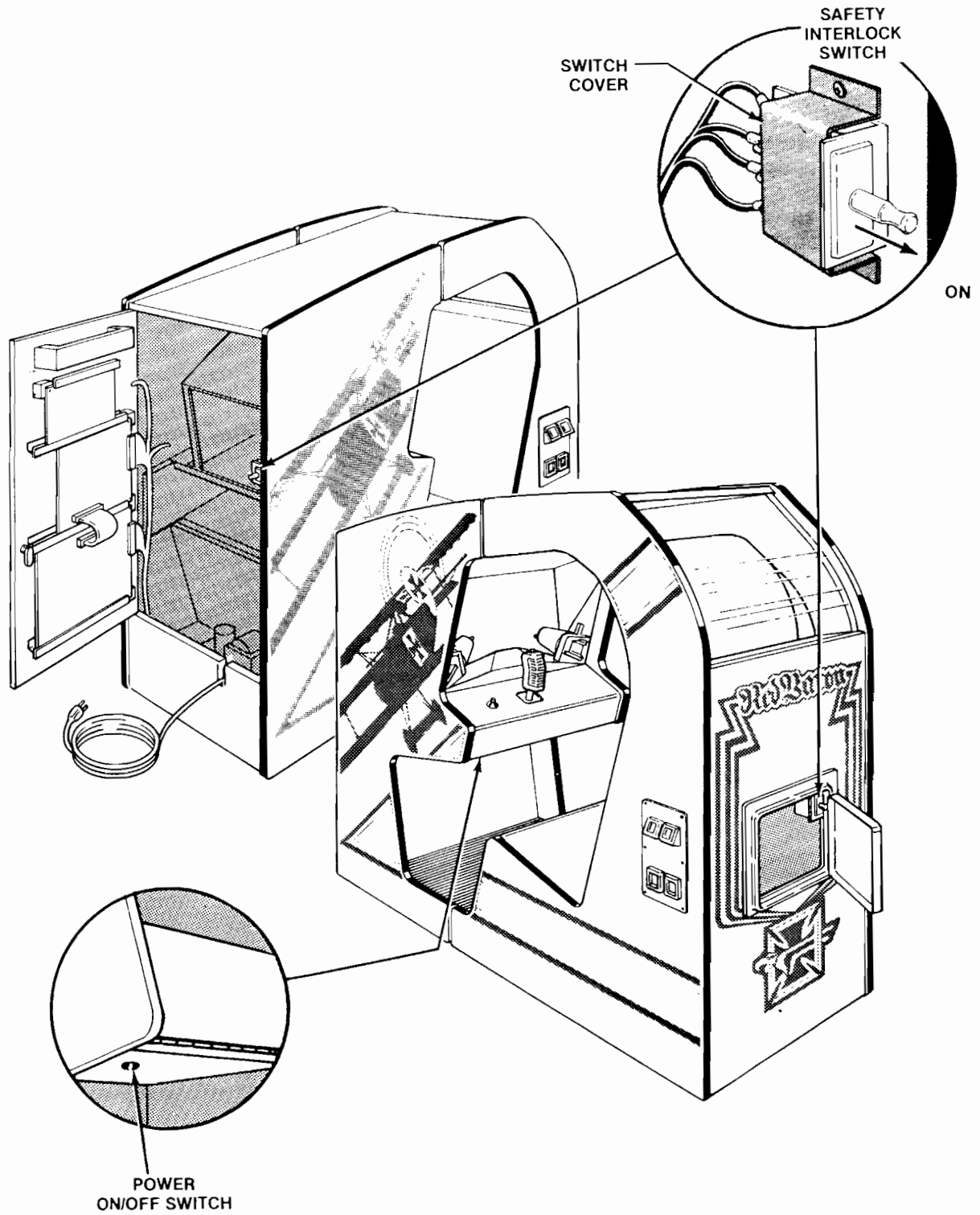
POWER
ON/OFF SWITCH

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 monitor, the light-emitting diode in the start switch, 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.

RED BARON ANALOG
VECTOR-GENERATOR PCB

OPERATOR
OPTION
SWITCHES

OFF

ON

SELF-TEST
SWITCH

VOLUME INCREASE:
TURN CLOCKWISE

New

UTILITY COIN
SWITCH
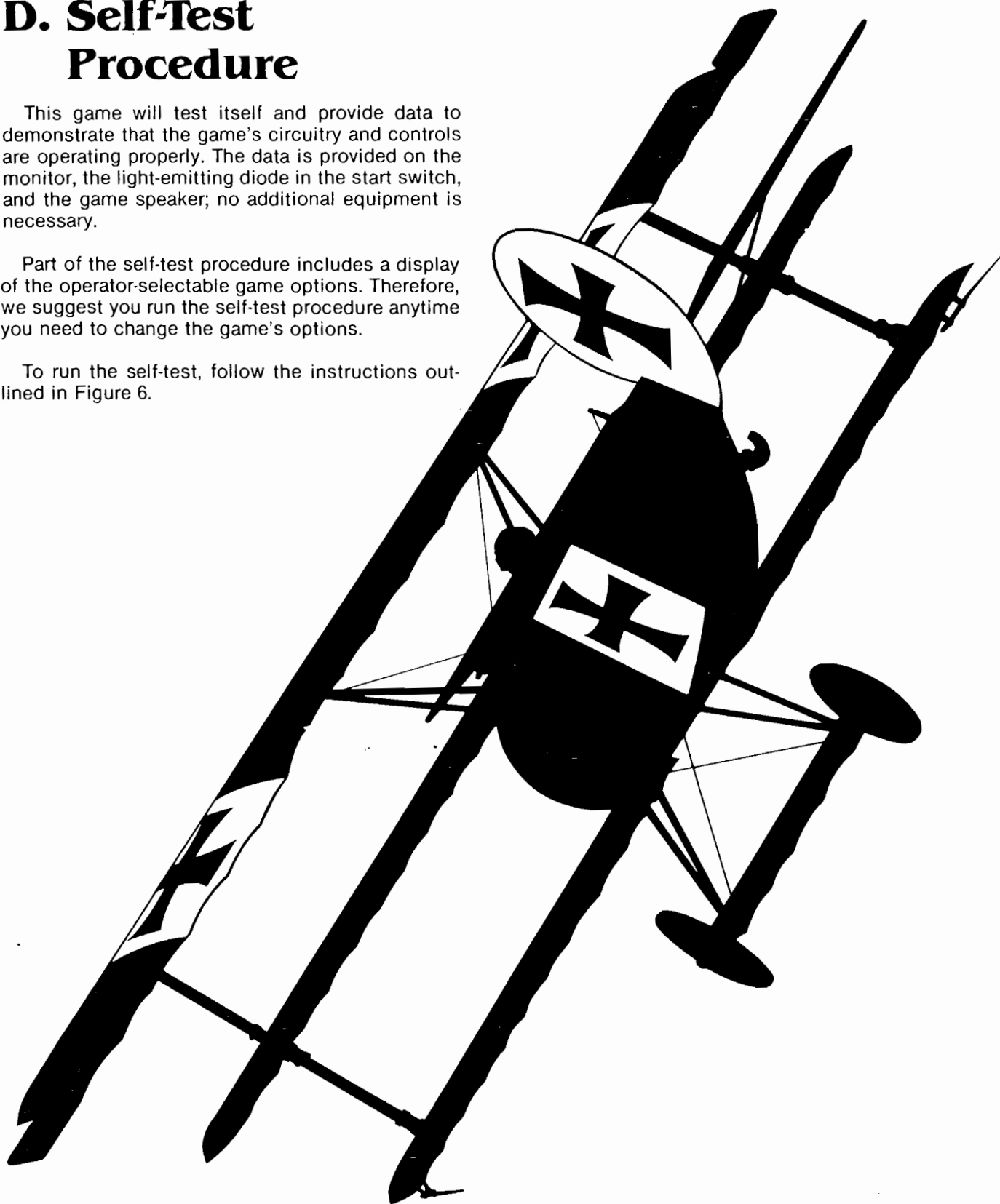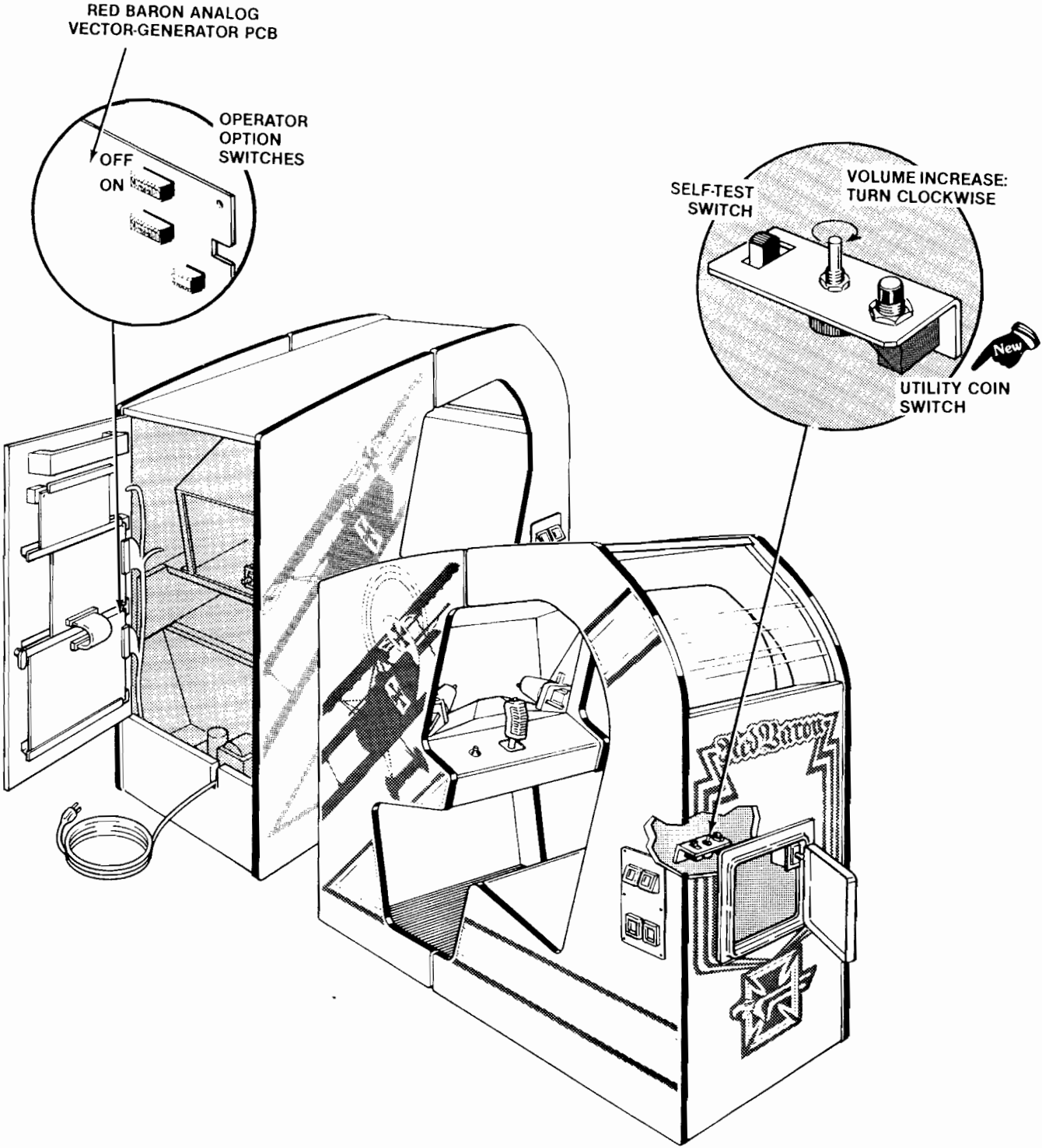
**Figure 5   Location of Self-Test Switch,
Volume Control and Option Switches**

Figure 6 Self-Test Procedure

Instruction	Results if Test Passes	Results if Test Fails

1. Set self-test switch to **on** position (see Figure 5).

After about 10-12 seconds, the monitor displays the picture below. No sounds are produced.

RAM FAILURE is indicated by a sequence of 1 to 10 tones. You will hear a short low tone and a short flash on the LED start pushbutton for each good RAM chip, and a long high tone accompanied by a long pulse on the start pushbutton for a failing RAM chip. The test stops with the first failing RAM-chip pair (example: J2 and H2 are a pair). To restart the sequence, press the reset pushbutton on the Red Baron™ Analog Vector-Generator PCB, or set the self-test switch to **off**, then again to the **on** position. Identify the bad RAM chip with the table below. Example: four short low tones followed by a long high tone indicates failure of RAM at location B2.

Long High Tone:	Bad RAM Chip Location on Analog Vector-Generator PCB:
1st	J2
2nd	H2
3rd	A2
4th	A1
5th	B2
6th	B1
7th	C2
8th	C1
9th	D2
10th	D1

ROM/PROM FAILURE is indicated by two columns of numbers on the left side of the screen. The number in the left column indicates the location of the failing ROM/PROM(s). Identify the bad ROM/PROM with the table immediately below.

Ignore the hexadecimal numbers in the right column on the screen.

Displayed No.:	Bad PROM Chip Location:	Printed-Circuit Board:
0	B/C3 or F/H3*	
1	A3 or E3	
2	E1	
3	F/H1	
4	J1	Analog Vector-Generator PCB
5	K1	
6	L/M1	
7	N1	
8	P1**	
9	C0***	Auxiliary PCB

*If this PROM is bad, you will hear a continuous low tone, and the program may be unable to display a screen image.

**If this PROM is bad, self-test will not work (screen may be blank or may display "garbage").

***If you replace this part, **you must erase** this ROM before locking up the game (see instruction 5 in this self-test procedure). Otherwise the self-test will continue to display *9*.

MATH BOX FAILURE is indicated by a single letter displayed in the upper right corner of the display. Math-box failure is explained in the Signature Analysis Procedure, on the Red Baron™ schematic Sheet 1, Side B. Identify the failure with the table below.

Displayed Letter	Failure
T	Time out error
H	Data error—high byte
L	Data error—low byte

AVERAGE GAME TIME IN SECONDS

LEFT COIN MECH MULTIPLIER

RIGHT COIN MECH MULTIPLIER

SWITCH TOGGLE 8

SWITCH TOGGLE 1

SWITCH AT P10 (TOP ONE)

SWITCH AT M10 (BOTTOM ONE)

DISPLAY OF COMPLETE CHARACTER SET

PHOTO ABOVE SHOWS AN EXAMPLE ONLY

[Self-test is continued on next page]

Figure 6   Self-Test Procedure, continued

Instruction	Results if Test Passes	Results if Test Fails
2. Activate start switch, fire switch, slam switch, and utility and coin switches.*	As switch activates, you'll hear a beep. As switch deactivates, you'll hear another beep.	You will not hear a beep for the defective switch.
3. Move joystick forward and backward.	The lower left number on the screen will increase with backward motion, and decrease with forward motion. (Ignore any flickering of numbers.)	Incorrect progression of numbers indicates potentiometer harness wires were connected incorrectly. No number displayed indicates potentiometer is bad or harness wires are loose.
4. Move joystick to the right and left.	The lower right number on the screen will increase with rightward motion, and decrease with leftward motion.	

5.   Erasing the High Score Table (optional)
The current three highest scores are held in permanent memory, even if the game is unplugged. If you want to erase these scores, simplultaneously press the start and fire buttons. The *ERASING* message at the center right of the screen will then be displayed for several seconds, until the entire table is erased. The average game time data will also be erased.

6. When satisfied with test, set self-test switch to **off** position.

---

*Activate coin switches by inserting at least one coin in each coin slot. You will not trip the coin counters as long as you are in self-test.

9
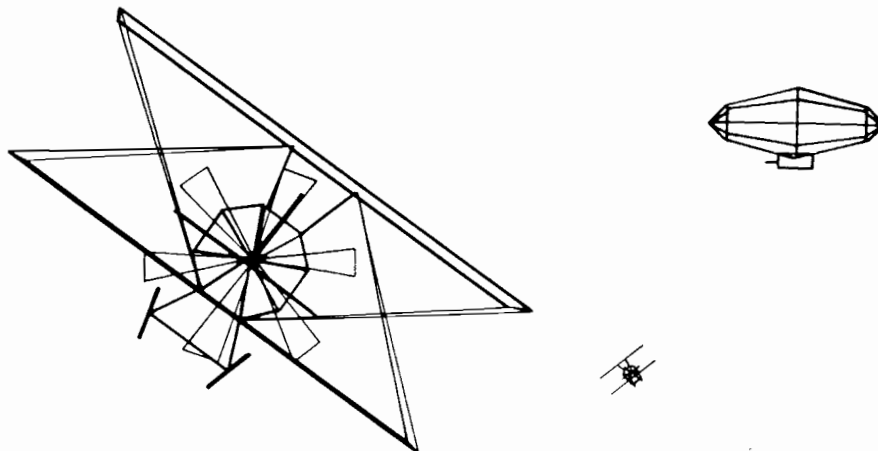
E. Option Switch Settings

1. Bonus Play Feature

The program in Red Baron™ offers a bonus play for certain combinations of coins inserted. This bonus feature is operator-selectable, meaning you may choose to offer it or not.

For example, 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¢ you could require for one game. Various other bonuses are available (see Figure 8).

2. Coin Mechanism Multipliers

The Atari coin acceptor mount for this game is available with about a dozen different mechanisms. You may have both mechanisms accept the same or different denominations.

Regardless of the type of mechanism you install, you must correctly set the "multipliers" for each mech on the game PCB. 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¢/$1 coin acceptor, you will probably want to set the left and right option-switch multipliers at × 1/ × 4.

You can set these multipliers with toggles 3 thru 5 on the Red Baron™ PCB switch assembly at location M10. For exact settings of these toggles, refer to Figure 8.

3. Examples of Game Price Settings

Figure 8 explains the options, giving twelve examples of the most common U.S. situations. The toggles mentioned are all in the switch at location M10; they **only** relate to game price, coin mechanism multipliers, and the bonus credit for multiple quarters or the $1.00 coin. You should set the toggles relating to other functions as you see fit, although Figures 7, 8, and 9 provide "$" signs indicating Atari's recommendations.

Figure 7 Game Option Settings

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

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 Red Baron™ Analog Vector-Generator PCB is mounted in place.

| | | | | | | | | | Toggle Settings of 8-Toggle Switch on Red Baron PCB *(at P10)* (TOP switch when PCB is in game) |
8	7	6	5	4	3	2	1		Option
						Off	Off		English **$**
						Off	On		Spanish
						On	Off		French
						On	On		German
									Bonus airplane granted at:
				Off	Off				2,000, 10,000 and 30,000 points
				Off	On				4,000, 15,000 and 40,000 points **$**
				On	Off				6,000, 20,000 and 50,000 points
				On	On				No bonus airplanes
		Off	Off						2 airplanes per game
		Off	On						3 airplanes per game **$**
		On	Off						4 airplanes per game
		On	On						5 airplanes per game
	Off								1-play minimum **$**
	On								2-play minimum
Off									Self-adjusting game difficulty feature turned off
On									Self-adjusting game difficulty feature turned on **$**

$ *Manufacturer's suggested settings*

Figure 7   Game Option Settings, continued

		Airplanes per game:			
	Bonus airplane granted at:	2	3	4	5
If self-adjusting game difficulty feature is turned on, the program strives to maintain the following average game lengths (in seconds):	2,000, 10,000 and 30,000 points	90	105	120	135
	4,000, 15,000 and 40,000 points	75	90 $	105	120
	6,000, 20,000 and 50,000 points	60	75	90	105
	No bonus airplanes	45	60	75	90

$ Manufacturer's suggested settings

Figure 8   Game Price Settings

The white block below contains Atari's suggested settings. All numbers 1 thru 8 are toggle settings on the 8-toggle switch at location M10, on the Red Baron™ Analog Vector-Generator PCB (the **CENTER** switch assembly).

50¢ PER PLAY:

		No bonus				Bonus $1.00 = 3 plays				Bonus $.50 = 1 play $.75 = 2 plays $1.00 = 3 plays			
Straight 25¢ Mechs	(1)	8 Off	7 Off	6 Off	5 Off	(3)	8 Off	7 On	6 On	5 Off	(4)	8 Off	7 Off	6 On	5 Off
		4 Off	3 Off	2 On	1 On		4 Off	3 Off	2 On	1 On		4 Off	3 Off	2 On	1 On
25¢/$1.00 Mechs	(1)	8 Off	7 Off	6 Off	5 Off	(3)	8 Off	7 On	6 On	5 Off	(4)	8 Off	7 Off	6 On	5 Off
		4 Off	3 On	2 On	1 On	(5)	4 Off	3 On	2 On	1 On	(5)	4 Off	3 On	2 On	1 On

25¢ PER PLAY:

		No bonus				Bonus $.50 = 3 plays				Bonus $1.00 = 5 plays			
Straight 25¢ Mechs	(2)	8 Off	7 Off	6 Off	5 Off	(6)	8 Off	7 Off	6 On	5 Off	(6)	8 Off	7 On	6 Off	5 Off
	(6)	4 Off	3 Off	2 On	1 Off	(7)	4 Off	3 Off	2 On	1 Off	(7)	4 Off	3 Off	2 On	1 Off
25¢/$1.00 Mechs	(2)	8 Off	7 Off	6 Off	5 Off	(6)	8 Off	7 Off	6 On	5 Off	(6)	8 Off	7 On	6 Off	5 Off
	(6)	4 Off	3 On	2 On	1 Off	(7)	4 Off	3 On	2 On	1 Off	(7)	4 Off	3 On	2 On	1 Off

Circled numbers refer to game pricing labels you should use with each situation (labels are illustrated on following page).

Figure 8   Game Price Settings, continued

For your information, we have defined below the switch settings for those options relating to game price, coin mechanism multipliers, and bonus play. This information is useful in case you need to temporarily set the Red Baron™ game on free play, or if you have German coin mechanisms in your door.

8	7	6	5	4	3	2	1	Option
								Toggle Settings of 8-Toggle Switch on Red Baron PCB *(at M10)*. CENTER switch when PCB is in game
						Off	Off	Free play
						Off	On	1 coin* for 2 plays
						On	Off	1 coin* for 1 play
						On	On	2 coins* for 1 play $
				Off	Off			Right coin mech × 1 $
				Off	On			Right coin mech × 4
				On	Off			Right coin mech × 5
				On	On			Right coin mech × 6
			Off					Left coin mech × 1 $
			On					Left coin mech × 2
Off	Off	Off						No bonus coins $
Off	Off	On						For every 2 coins* inserted, game logic adds 1 more coin*
Off	On	Off						For every 4 coins* inserted, game logic adds 1 more coin*
Off	On	On						For every 4 coins* inserted, game logic adds 2 more coins*
On	Off	Off						For every 5 coins* inserted, game logic adds 1 more coin*
On	Off	On						For every 3 coins* inserted, game logic adds 1 more coin*

*In the U.S., a "coin" is defined as 25¢. In Germany a "coin" is 1 DM.

$ Manufacturer's suggested settings

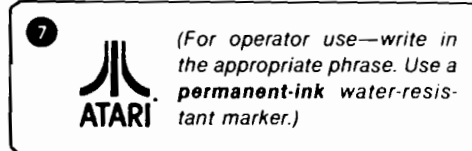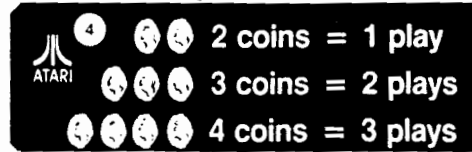To achieve bonus plays, all coins must be inserted before pressing start button.

Figure 9   Coin Counter Option Settings

[These toggles determine which coin mechanisms activate which counters]

Toggle Settings of 4-Toggle Switch on Game PCB (L11)				Two coin acceptors in the coin door:	Two coin acceptors and a push-button utility coin switch in the game:	Three coin acceptors in the coin door:
4	3	2	1			
		On	On	Both acceptors activate all coin counters simultaneously.	*Do not use this setting.*	All 3 are same denomination and they activate all coin counters simultaneously.
Not Used	Not Used	Off	On	Both acceptors activate 2 counters separately.	*Do not use this setting.*	Left and center acceptor activate one coin counter; right acceptor activates another coin counter.
		On	Off	Both acceptors activate all coin counters simultaneously.	Utility coin switch will not activate a coin counter, if you do not hook up a separate counter. Both acceptors activate both coin counters simultaneously.	Left acceptor activates one coin counter; center and right acceptor activate another coin counter. *Not for any currently designed 3-mech coin door.*
		Off	Off	Both acceptors activate 2 counters separately.	Utility coin switch will not activate a coin counter, if you do not hook up a separate counter. Left and right acceptors activate 2 coin counters separately. $	Left, center and right acceptors activate 3 coin counters separately.

$ *Manufacturer's suggested setting*

F. Game Play

Atari's Red Baron™ game is a one-player game with an X-Y or vector-generator monitor. The game depicts a first-person's view from a World War I biplane cockpit. The player's goal is to destroy as many enemy biplanes, blimps, tanks, pillboxes, pyramids and buildings as possible.

Players can maneuver their airplanes with the joystick control. Moving the joystick in its four directions creates a sensation of diving, climbing, or banking to the left or right.

The game has five possible modes of operation: Attract, Ready-to-Play, Play, High Score Initial, and Self-Test. Self-test 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.

1. Attract Mode

The attract mode begins when power is applied to the unit, after a play or high score initial mode, or after self-test. This mode is continuous and is only interrupted when a play is paid for and accepted or when in self-test. In this mode, the monitor displays three possible pictures.

One of the pictures displays a typical game play sequence, with a view looking out of the airplane cockpit at the horizon and mountains below. The player's propellor is almost always visible at the center bottom of the screen during this phase.

Enemy biplanes swoop towards the player's airplane and eventually overtake it. The *VALUE* message at the top center of the screen indicates the current number of points a player can earn for shooting the enemy biplane. The value ranges from 70 to 300 points, and decreases as the enemy plane comes closer to the player.

Blimps also appear in this scene. The blimps, tanks, and pillboxes may be firing shells at the player. If hit, the player sees a bullet picture on the windshield, and the scenery spins around, indicating that the player has crashed.

The second picture displayed during this mode will only appear if no credits remain in the game. The screen shows the *RED BARON* banner pulled by a plane traveling towards the left. The propellor usually at the bottom of the screen disappears during this phase.

The third picture shows the three to seven highest scores and their matching initials. If you erase the special "permanent" memory (see Figure 6, Self-Test Procedure), then this table will not appear on the screen. The table is redeveloped from scores of subsequent games.

2. Ready-to-Play Mode

This mode begins when sufficient coins are accepted for a game. It ends when the START pushbutton is pressed. When this mode begins, the message *PRESS START* flashes in the center of the screen. The displayed pictures are otherwise the same as those shown in the attract mode.

Operators may choose one- or two-play minimums by selecting one of the option switch settings on the game PCB (see Figure 7, Game Option Settings). If you select the two-play minimum and a player inserts enough money for only one play, the message *2 PLAYS MINIMUM* flashes on the screen until the required number of coins is inserted.

3. Play Mode

The play mode begins when the start pushbutton is pressed. The mode ends when the player's last airplane is lost.

Players can score various points for shooting the different objects; the point values for each are silk-screened on the control panel. As mentioned earlier in Section *1, Attract Mode,* the value for enemy planes can vary. Point values for all other objects remain fixed.

The game starts with a slow enemy biplane appearing on the screen; the first four planes are relatively passive. As game time progresses, the player's biplane speed increases and the enemy planes become more evasive.

After four airplane "attacks", the player will see various objects on the ground. Later on, to provide challenge, the tanks, pillboxes, and blimps will start shooting at the player. If the player gets a very high score, the planes themselves will finally start shooting at the player.

One of the new operator-selectable features of Red Baron™ is its self-adjusting game difficulty. Figure 7 shows the option switch settings that determine an average game time in seconds. During self-test, the monitor displays the player's average game time in seconds.

The game program accumulates an average of the last 32 games' lengths. If the accumulated average exceeds the operator-selected average, at the beginning of the next game the computer makes the play harder. The logic does so by increasing the speed of the player's airplane and enemy airplanes. In essence, this feature adjusts the difficulty to establish a consistent average game time.

The average is stored in the non-volatile memory—as are the top three scores on the high score table. Therefore, if you select this game difficulty option, you need not worry that the average will be "lost" if you turn off the game each night.

4. High Score Initial Mode

At the beginning of this mode, player instructions appear near the upper center of the screen, and A _ _ appears below them. Players enter initials one character at a time.

Pressing the fire button a third time causes the initials and game score to transfer to the high score table. This table contains a maximum of seven scores and appears during the attract and ready-to-play modes.
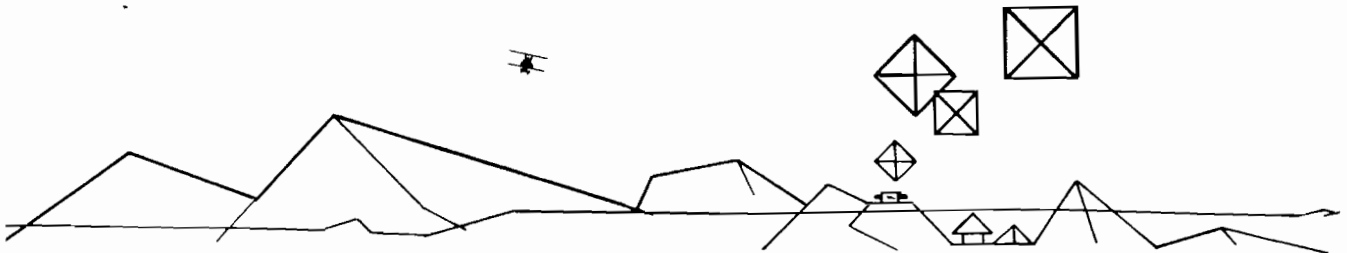
Maintenance
and Repair
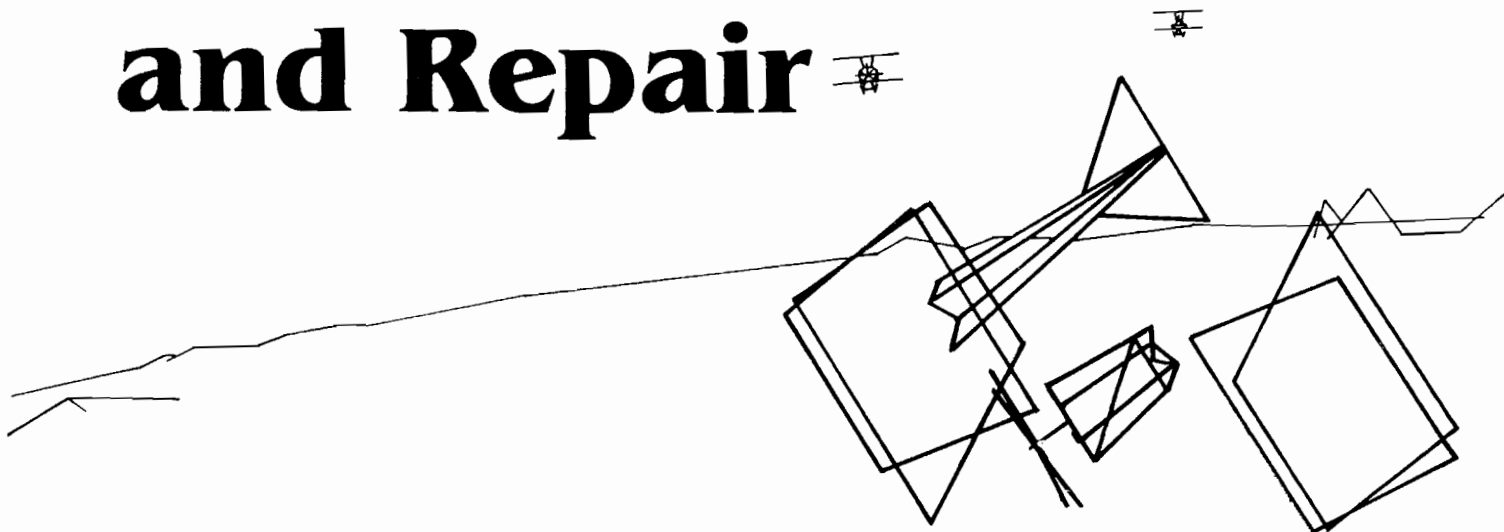
All games require certain maintenance to keep them in good working order. Clean, properly maintained games will attract players and earn more profits.

The most important maintenance item is running the self-test every time you collect money from the coin box. Just looking at a game will not tell you if the gimbal-type joystick control or light-emitting-diode switch is broken, or if the LED has 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 joystick control—for details see *Section C, Part 2.*

2
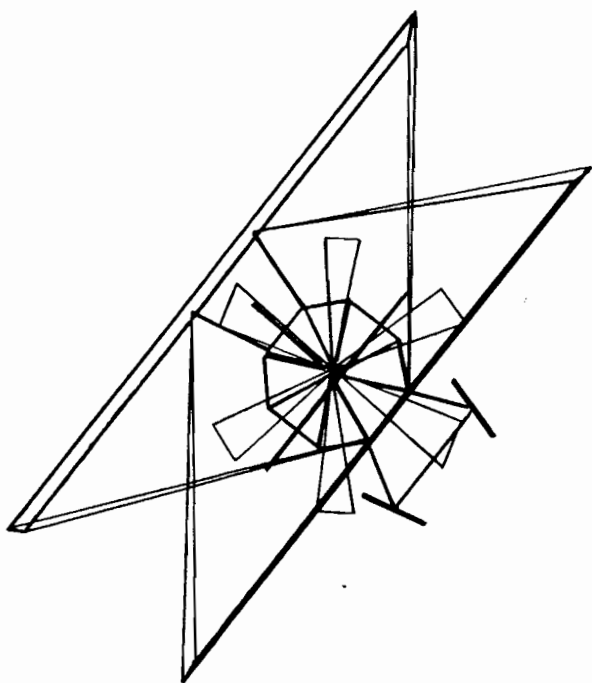
A. Cleaning

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 dust can scratch the surface and result in fogging the plastic.

B. Fuse Replacement

This game contains five fuses—all on the power supply assembly (not including the monitor fuses). Replace fuses only with the same type as listed in Figure 22 of this manual. See the Electrohome Quadrascan™ X-Y monitor manual (TM-146) or the Wells-Gardner monitor manual (TM-164) for the monitor fuse data.

C. Opening the Control Panel

Prior to repairing or replacing any item on the control panel, unplug the game. Then open the rear access door.

Reach underneath the monitor (above the speaker) and remove both sets of carriage bolts, wing nuts, flat and lock washers, located on the underside of the control panel (see Figure 10). Walk around to the player's seat, lift up on the control panel, and tilt it towards you.

1. LED Start Switch Replacement

The light-emitting diode (LED) switch on the control panel has a very low failure rate. In case the switch should ever be suspect, first test it per the description that follows. To replace the switch, refer to Figure 10.

- Remove the wires from the suspected switch.
- Set multimeter to ohms scale. Set ohms scale to R × 1, then zero the meter.
- Connect multimeter leads to appropriate LED switch contacts (see Figure 10 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.

To remove LED switch:

- Remove all wires from the faulty switch.
- Turn the switch counterclockwise (as viewed from inside of control panel) while holding the black cone-shaped nut on the outside of the control panel.
- Install a new switch using the reverse procedure.
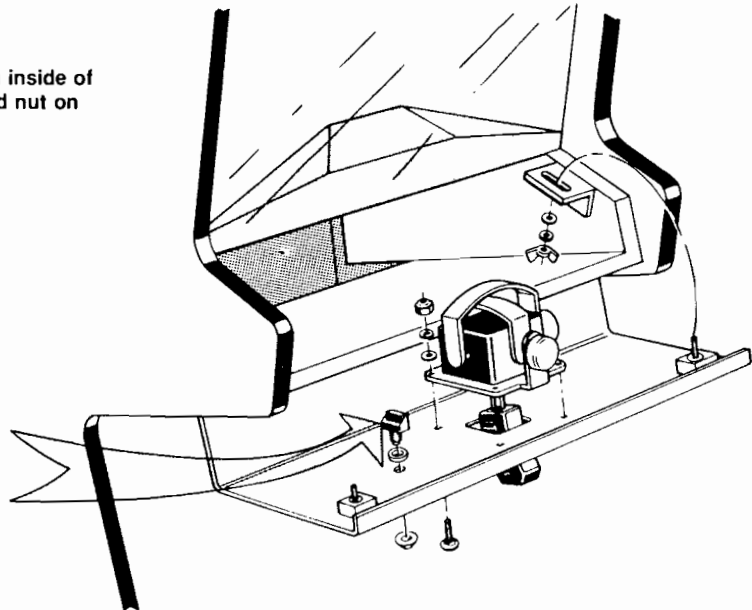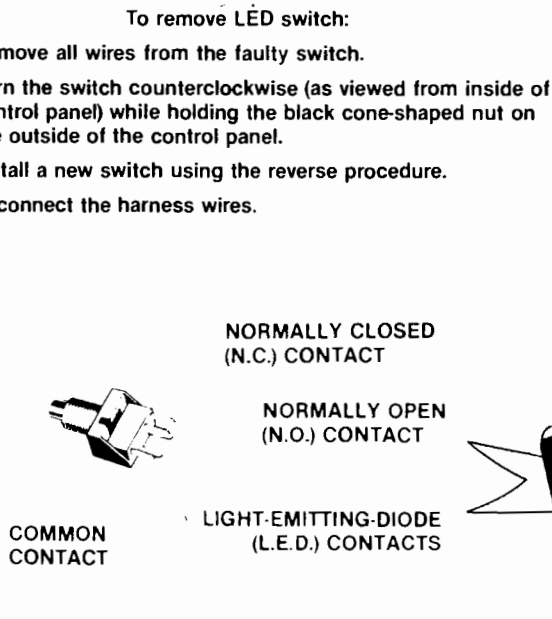- Reconnect the harness wires.

Figure 10   Opening the Control Panel

2. Joystick Maintenance and Repair

Normal maintenance involves lubricating four parts in the joystick control approximately every six months (this requires removing the control). First open the control panel as described previously. Then unplug the "quick-disconnect" connectors on the two potentiometers, as well as the connector for the fire switch.

From the inside of the control panel, remove the four flat and lock washers, hex nuts and carriage bolts that mount the joystick onto the control panel.

Then open up the joystick control assembly by removing the four flat washers, hex nuts, and long screws (see Figure 11). At this point, most of the parts should become disassembled.

For lubrication, use only Nyogel 779 lubricant (Atari part no. 178027-001). Lubricate the following parts inside the control:

- The ball pinned to the shaft and the ends of the pivot pins that protrude from the ball.
- The insides of the two black linkages, located on the potentiometer shafts.
- The insides of the two gimbals, where the bottom of the shaft wears against them.
- The four holes on the sides of the pivot ball housings, where the gimbals are attached.

To replace the bellows, remove both gimbals and the bellows cap. Slide the bellows off the bottom of the shaft and over the harness wires. Slide the new bellows up over the harness and shaft.

Reassemble the joystick control, and then reinstall it in the control panel. Reconnect the harness wires as shown in the following diagram: **make sure the right colors go to the tabs on the potentiometers and the fire switch.**

Repairs on the control handle would probably only involve replacement of potentiometers, the fire switch or the centering bellows.

Figure 11   Joystick Maintenance and Repair

PIVOT BALL HOUSINGS

PIVOT PIN
LUBRICATE HERE

POTENTIOMETER

LUBRICATE HERE
(4 PLACES)

LINKAGES
LUBRICATE HERE

CENTERING
BELLOWS

BELLOWS CAP

INNER GIMBAL

OUTER GIMBAL

LUBRICATE HERE

TIE-WRAP

SLEEVING
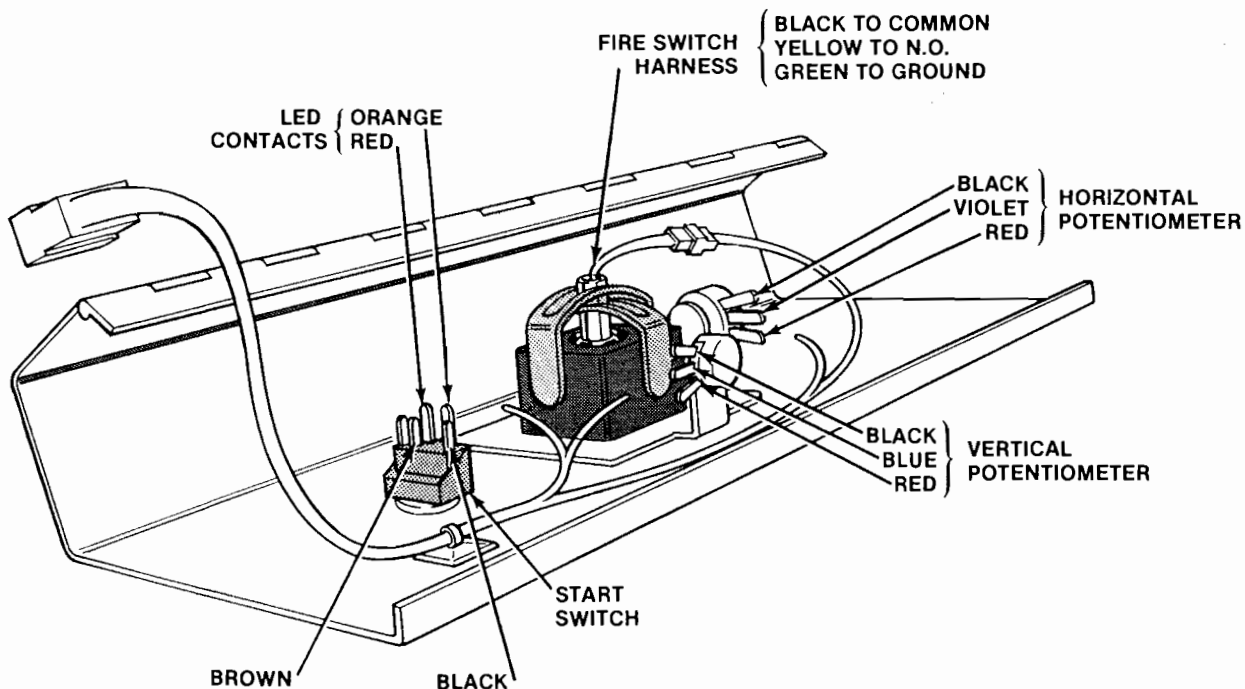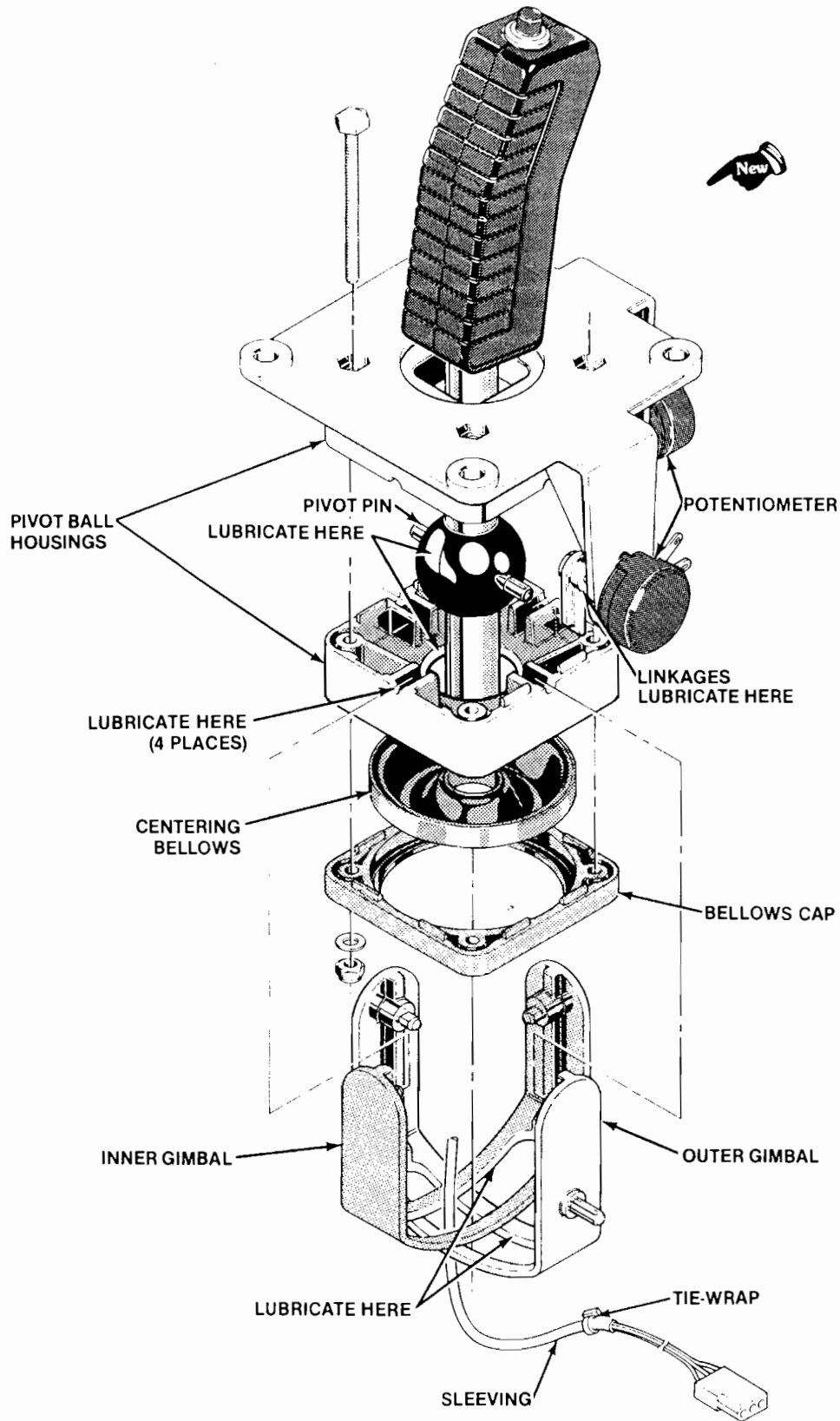
Figure 11 Joystick Maintenance and Repair, continued

D. Monitor Removal

If you should need to remove the Quadrascan™ X-Y monitor, follow steps 1 thru 3 as listed on this page. Refer to Figure 12.

1. **Be sure the game is unplugged from its wall outlet!** Open the rear access door and unplug the monitor harness connector—it is easily accessible right behind monitor.

2. Remove the four sets of carriage bolts, flat and split lock washers, and hex nuts that hold down the metal chassis of the monitor.

3. Carefully slide the monitor chassis out the back of the game.

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

Figure 12   Monitor Removal

E. Printed-Circuit Board Removal

You may wish to remove the Red Baron™ Analog Vector-Generator printed-circuit board (PCB), Auxiliary PCB or the Regulator/Audio II PCB for service or inspection. To do this, refer to Figure 13 and proceed as follows:

1. Open the rear access door.

2. Locate the securing screws and fiber washers that hold down the PCB in its slots, and remove them. (Each PCB has two sets of this fastening hardware.)

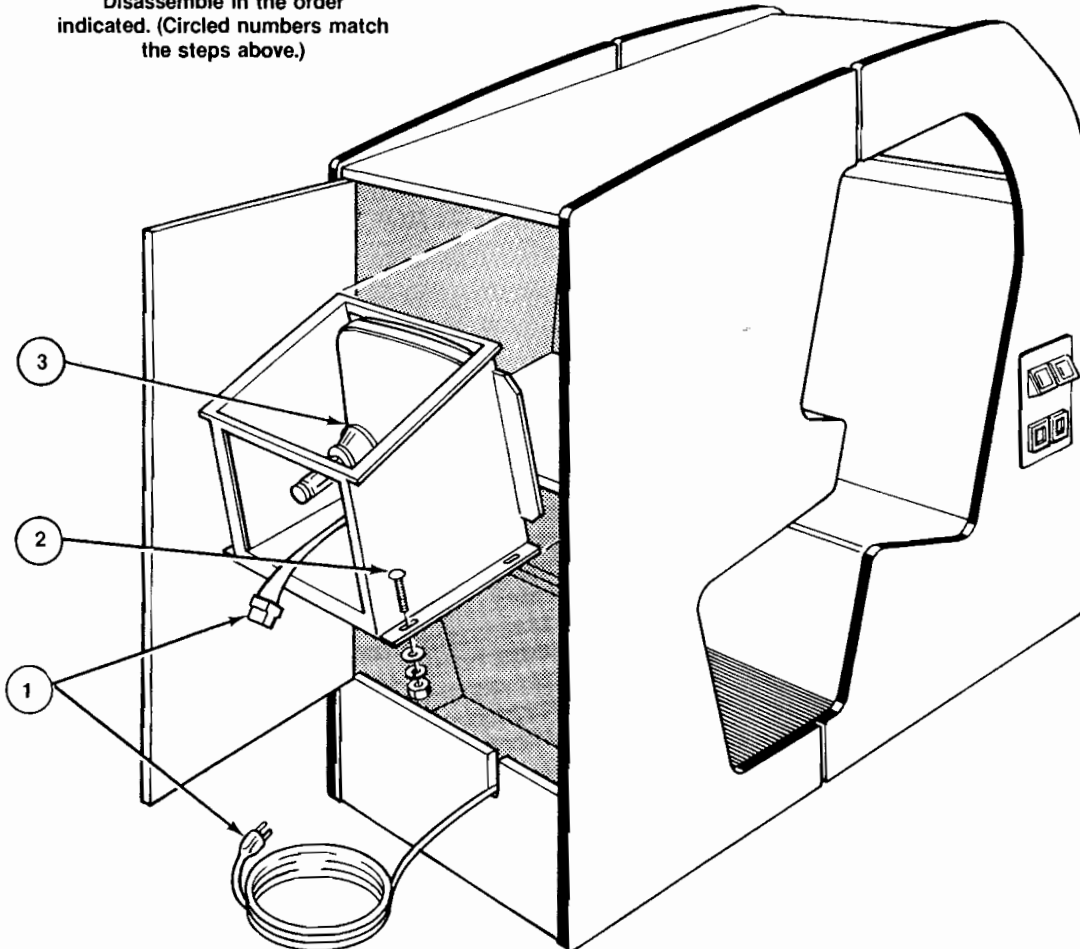3. If you are removing the Analog Vector-Generator or Auxiliary PCB, first remove the two tie wraps that fasten the edge connector to either PCB. Then unplug the edge connector. If you are removing the Regulator/Audio II PCB, simply disconnect the five small harness connectors on this board.

4. Carefully slide the PCB straight out of its slots and towards your left. 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 the PCB** and will void the warranty.

6. Replace the securing screws and fiber washers in the PCB. Reinstall the tie-wraps used to secure the edge connectors to the PCBs. Close and lock the rear access door.

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 the 4- or 8-toggle DIP switches). Unless you are a qualified technician, *do not turn any of the knobs near the Analog Vector-Generator PCB's lower right corner. Also do not turn the small knobs on the Regulator/Audio II PCB.*
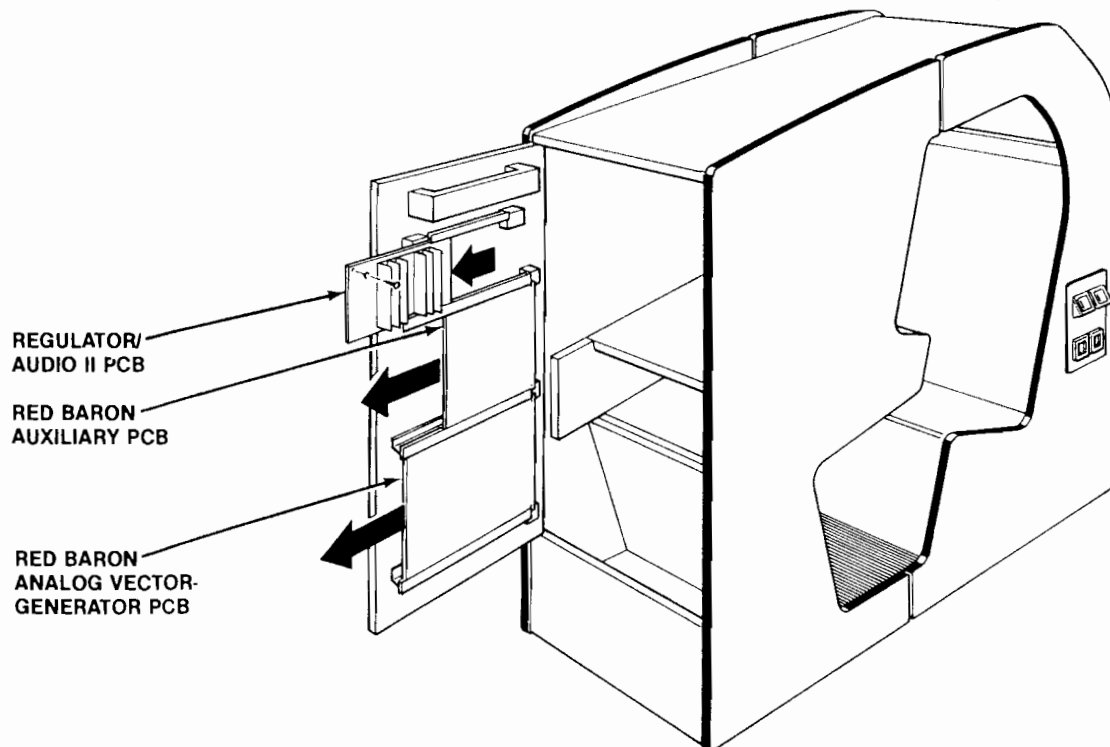

REGULATOR/AUDIO II PCB

RED BARON AUXILIARY PCB

RED BARON ANALOG VECTOR-GENERATOR PCB

Figure 13   Printed-Circuit Board Removal

F. Game Operation

With this manual you received three large sheets that contain the wiring and schematic diagrams for the Red Baron™/Sit-Down 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.

Atari's Red Baron is a microprocessor-controlled game. The microprocessor is contained on the Analog Vector-Generator PCB. This board receives switch and potentiometer inputs from the control panel and coin acceptors. These inputs are processed by the Analog Vector-Generator PCB and output to the monitor, Regulator/Audio II PCB, and control panel.

The monitor is an X-Y monitor. Therefore, the monitor receives signals for the X, Y and Z axes. Since the location of the beam in the monitor is totally controlled by the X- and Y-axis outputs of the Analog Vector-Generator PCB, this board does not contain a standard sync circuit. The X- and Y-axis inputs to the monitor step in increments of 1024 steps for the X (horizontal) axis, and 768 steps for the Y (vertical) axis. The Z axis merely controls the intensity of the beam.

The Regulator/Audio II PCB performs two functions: 1) it regulates the voltages from the power supply to ±5 VDC and ±12 VDC, and 2) it amplifies the audio output from the Auxiliary PCB.

Specifically, the +5 VDC from the Regulator/-Audio II PCB provides most logic power to the Analog Vector-Generator and Auxiliary PCBs; ±22 VDC is regulated on the Analog Vector-Generator PCB to produce ±15 and +5 VDC (the latter for the digital-to-analog converters); and +22 VDC provides power for the audio output of the Auxiliary PCB. The audio output from the Regulator/Audio II PCB directly drives the game speaker and is controlled by the volume control, mounted inside the small front access door.

The Power Supply is the source of all voltages in the game. These voltages are protected by four fuses in the fuse block on the power supply chassis. The primary winding of the power supply transformer is protected by the cartridge-type fuse in the power supply chassis.

Figure 14 illustrates the distribution of power in this game. Figure 15 illustrates the distribution of signals.

MONITOR

SAFETY INTERLOCK
SWITCH

SAFETY INTERLOCK
SWITCH

CONTROL PANEL

ON/OFF SWITCH

COIN ACCEPTORS

REGULATOR/AUDIO II PCB

AUXILIARY PCB

+ 12 VDC
+ 5 VDC
– 5 VDC
+ 22 VDC
– 22 VDC

+ 5 VDC

ANALOG VECTOR·
GENERATOR PCB

10.6 VAC
36 VAC
60 VAC
6.1 VAC

LINE VOLTAGE

+ 5 VDC
LINE VOLTAGE
10.6 VDC
6.1 VAC

POWER CORD

POWER SUPPLY
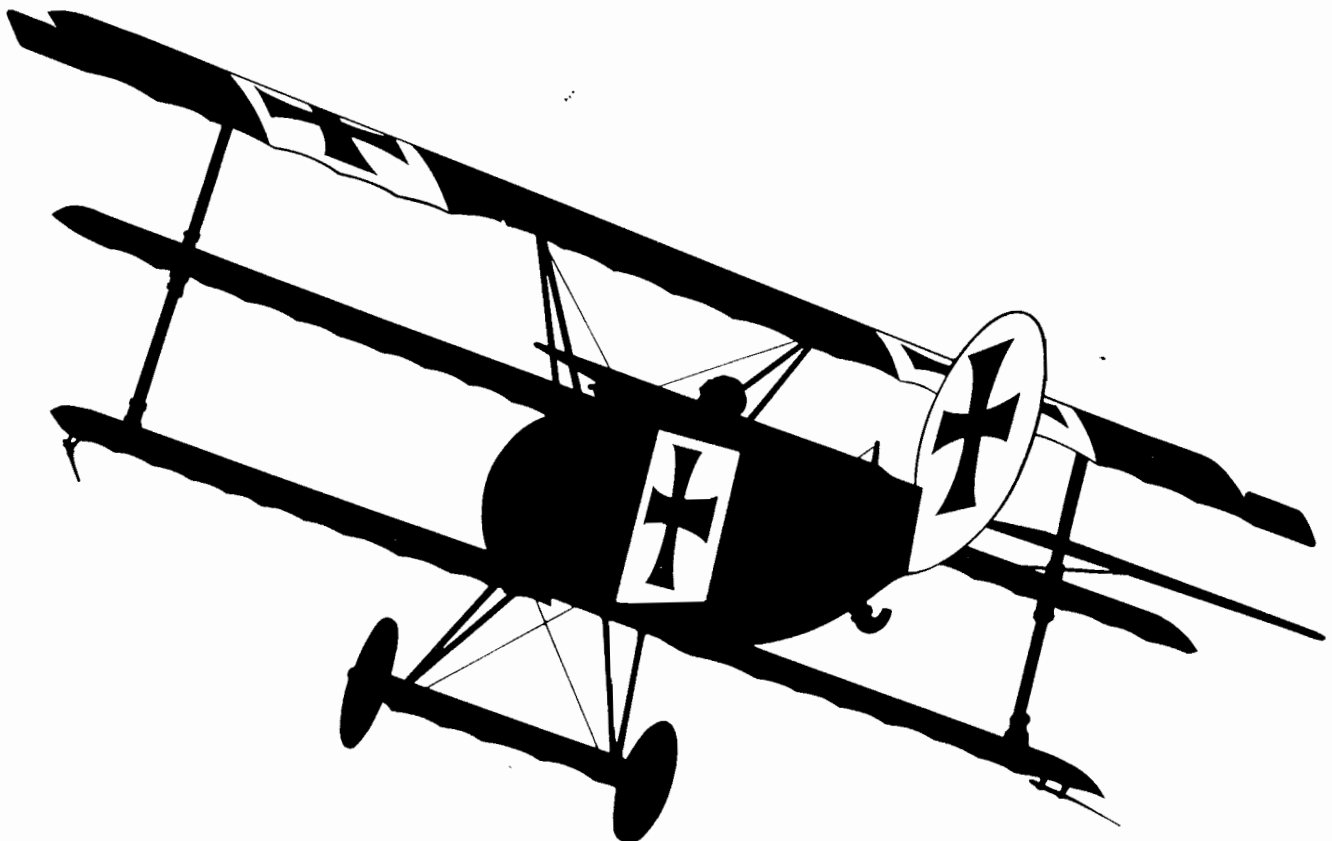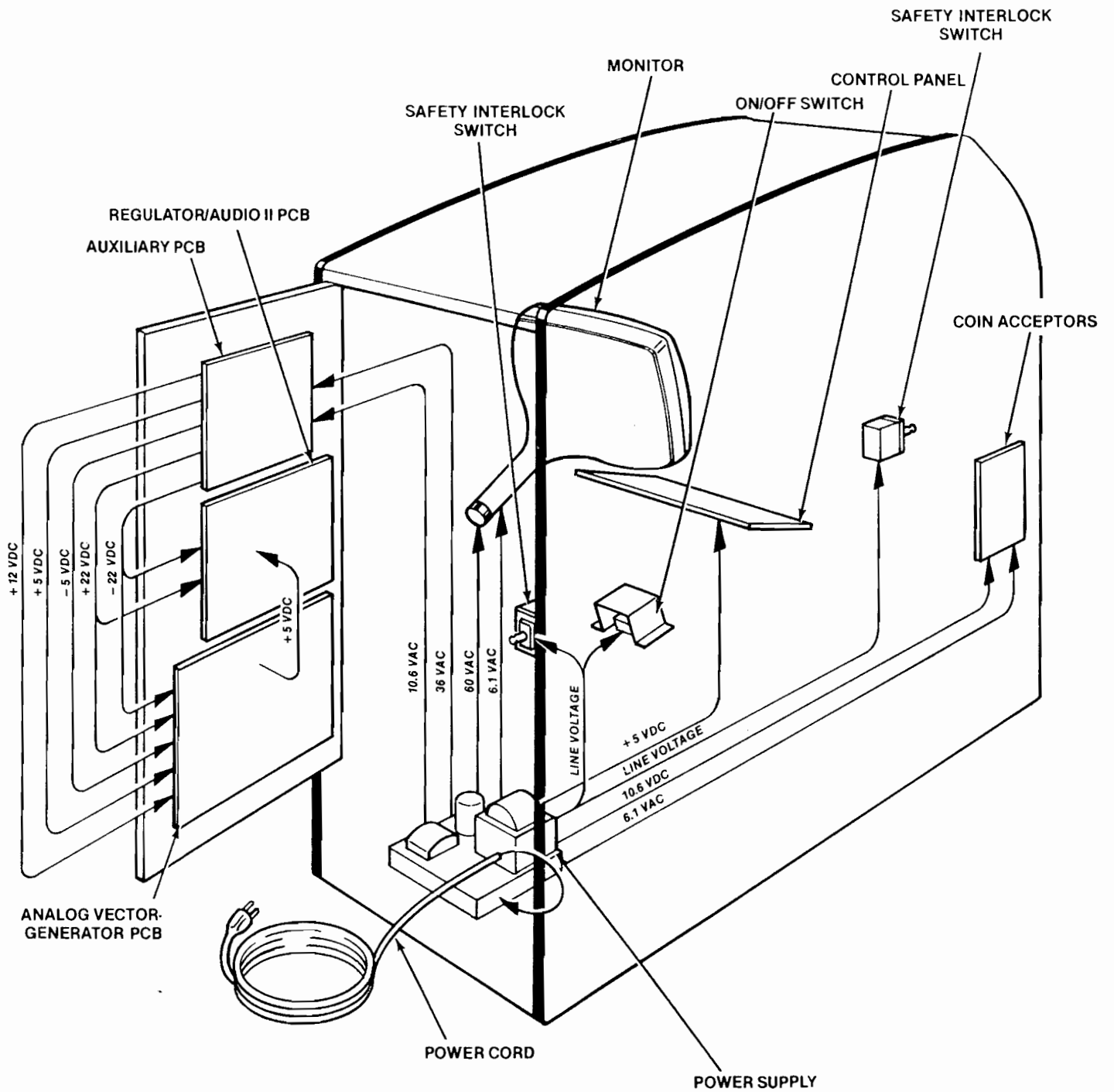
Figure 14   Power Distribution

22

CONTROL PANEL

UTILITY SWITCH,
VOLUME CONTROL
& SELF-TEST SWITCH

MONITOR

COIN ACCEPTORS

AUXILIARY PCB

SPEAKER

COIN
COUNTER

REGULATOR/AUDIO II PCB

AUDIO OUTPUT 1

AUDIO OUTPUT 2

SPEAKER 1 & 2

RESET

HORIZONTAL

VERTICAL

FIRE

START

START LED

X OUTPUT

Y OUTPUT

Z OUTPUT

VOLUME OUT

COIN

SELF-TEST

COIN COUNT

COIN L

COIN R

SPEAKER 1 & 2

ANALOG VECTOR-
GENERATOR PCB
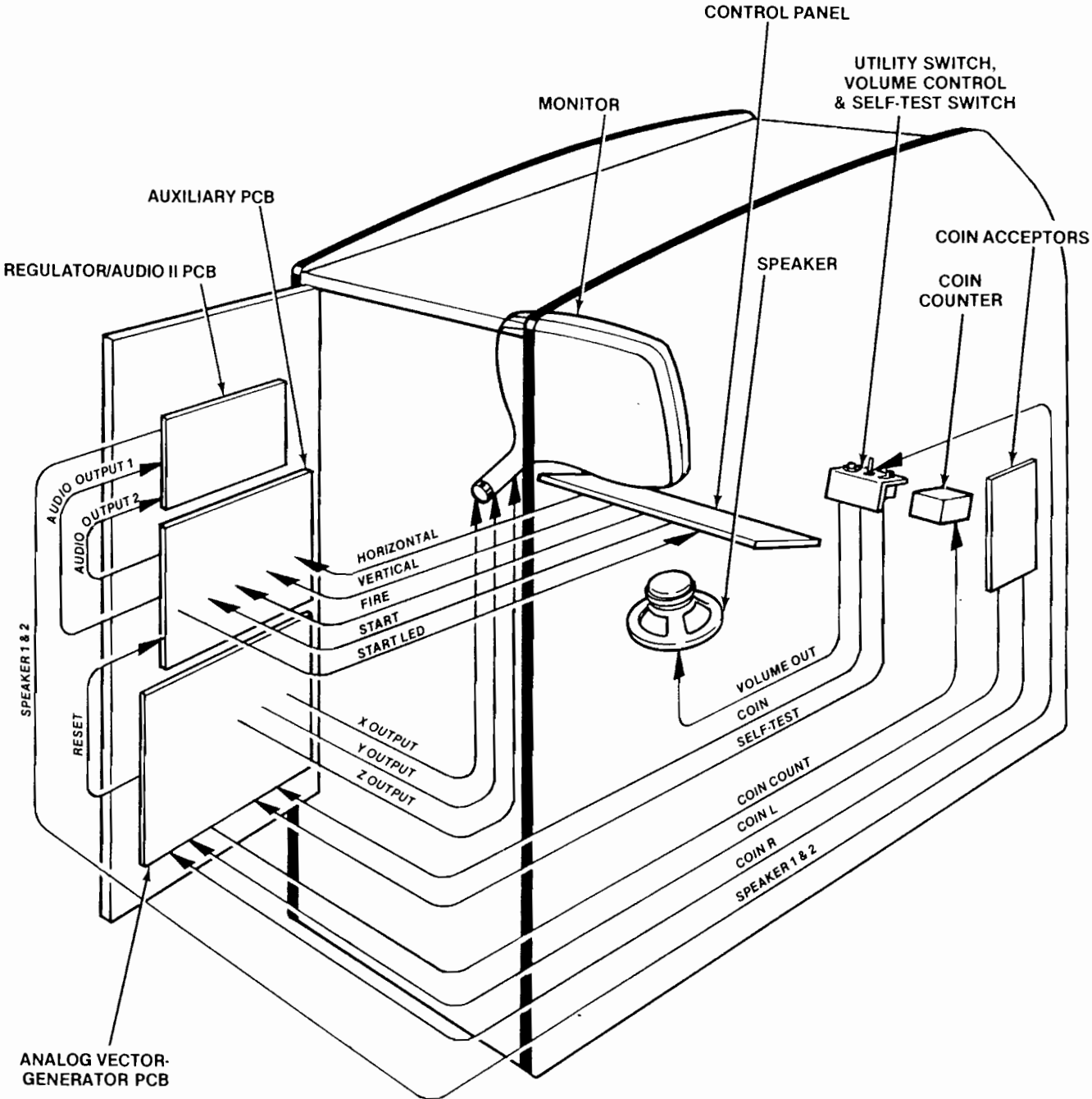
Figure 15   Signal Distribution

Illustrated Parts Lists
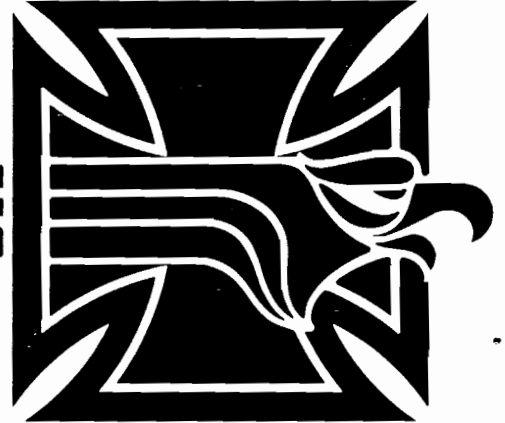
This chapter provides you with the necessary information for ordering replacement parts for your Red Baron™/Sit-Down game. Please note that, for simplicity, **common hardware has been deleted** from most of these parts lists. This includes screws, nuts, washers, bolts, etc.

The parts lists are 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 190000-.

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

035851-01
(Hinge)

92-047 or 92-050
(Monitor)

A036992-01
(Main Harness)

035745-03
(10-In. PCB Retainer)

Regul./Audio II PCB—
see Figure 19

037074-01
(Rear Door)

Auxiliary PCB—
see Figure 20

A036247-01
(PCB Interconnector)

71-2110
(Lock)

034536-03
(Vibr. Damper)

Analog Vect.-Gener. PCB—
see Figure 21

035745-02
(18-In. PCB Retainer)

A034841-08,
A034863-08,
or A035989-08
(Power Cord)

Power Supply Assy.—
see Figure 22

006450-01
(On/Off Sw.
Mounting Plate)

61-162A
(On/Off Sw.)

009992-01 .
(On/Off Sw. Cover)

005419-01
(Grille)

48-009
(Speaker)

Figure 16   Cabinet-Mounted Assemblies
A037051-xx   B

035465-01
(Mon. Bezel)

037086-01
(Retainer)

037090-01
(Overlay)

002728-01
(Ctrl.-Pnl. Brkt.)

037087-01
(Front Window)

035462-01
(Mon. Shield)

69-001
(Self-Test Sw.)

A036320-01
(Vol./Self-Test/Coin Assy.)

Joystick Assy.—
see Figure 18

19-9032
(Vol. Ctrl.)

037095-01
(Cowling)

62-041
(Coin Sw.)

Control-Panel Assy.—
see Figure 17

007882-02
(Interl. Sw. Cover)

A036189-01
(Interl. Sw./Brkt. Assy.)

037083-01
(Rbr. Matting)

99-10114
(Access Door)

A037052-02
(Cabinet Assy.)

036262-01
(Coin Box Brkt.)

A002465-01
(Coin Counter)

037084-01
(Coin Box)

Coin Acceptor—
see Figure 23

178023-001
(Caster)

037085-01
(Coin Box Lid)

78-3201
(Leg)

Schematics, Self-Test Label & Manuals—
see parts list on next page

Figure 16 Cabinet-Mounted Assemblies
A037051-xx   B

Figure 16   Cabinet-Mounted Assemblies, continued
Parts List

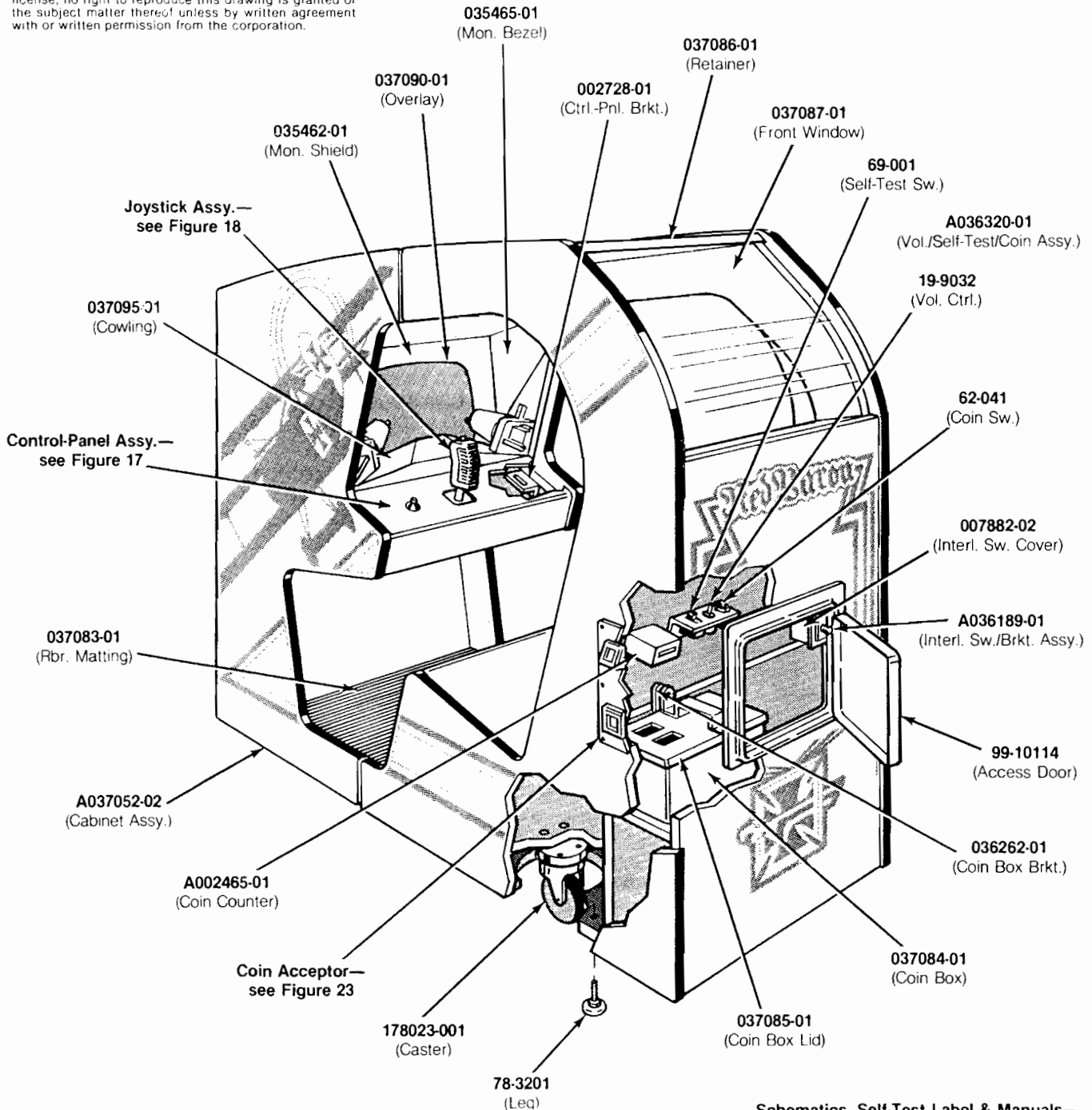| Part No.	Description
A002465-01	Coin Counter
A034631-01	Power On/Off Switch Assembly
A034841-08	U.S. Strain-Relief Power Cord
A034863-08	German Strain-Relief Power Cord
A035989-08	Australian Strain-Relief Power Cord
A036189-01	Interlock Switch/Bracket Assembly *(modified for safety)*
A036247-01	Printed-Circuit-Board Interconnector
A036320-01	Volume/Self-Test/Coin Switch Assembly *(includes bracket)*
A036992-01	Main Harness Assembly
A037052-02	Wood Cabinet Assembly with Pallet *(includes swivel casters)*
	The following seven items are the technical information supplements to this game:
DP-171-01	Red Baron™/Sit-Down Schematic Drawings *(Sheet 1)*
DP-171-02	Red Baron/Sit-Down Schematic Drawings *(Sheet 2)*
DP-171-03	Red Baron/Sit-Down Schematic Drawings *(Sheet 3)*
ST-171	Label with Self-Test Procedure and Option Switch Settings
TM-151	Instruction and Service Manual for Electrohome G05-802/805 Quadrascan™ X-Y Monitor
TM-164	Service Manual for Wells-Gardner 15- and 19-Inch X-Y Monitors
TM-171	Red Baron/Sit-Down Operation, Maintenance and Service Manual
02-305007	7/8-Inch Black Plastic T-Molding *(at top of seat back)*
02-305010	¾-Inch Black Plastic T-Molding *(used throughout except on seat back)*
19-9032	50-Ohm, 12½-Watt, Wirewound Rheostat *(volume control)*
48-009	8-Inch 8-Ohm 8-Watt Round High-Fidelity Speaker
61-162A	DPST Power On/Off Toggle Switch
62-041	SPDT Momentary-Contact Pushbutton Utility Coin Switch with Black Cap
69-001	DPDT Slide Switch *(for self-test)*
71-2110	Panel Cartridge Lock Mechanism *(for rear door)*
75-9910N0	5/8-11 Steel Stamped Nut *(for utility coin switch)*
78-24012	5-Inch Beaded Nylon Tie-Wrap *(for PCB edge connector)*
78-3201	Cabinet-Leveling Leg
92-047 *or*	Electrohome 19-Inch X-Y Monitor, *or*
92-050	Wells-Gardner 19-Inch X-Y Monitor
99-10114	Metal Front Access Door
002728-01	Control-Panel Mounting Bracket
005419-01	Speaker Grille
006450-01	On/Off Switch Mounting Plate
007882-02	Interlock Switch Cover
009992-01	On/Off Switch Cover
034536-03	Foam Vibration Damper *(for all three PCBs)*
035462-01	Monitor Shield with Graphics
035465-01	Cardboard Monitor Bezel with Graphics *(includes two guns)*
035745-02	18-Inch Plastic PCB Retainer
035745-03	10-Inch Plastic PCB Retainer
035851-01	Hinge for Rear Door
036262-01	Coin Box Bracket
036321-01	Bracket for Volume/Self-Test/Coin Switch Assembly
036686-01	Sheet of Game Pricing Labels
037074-01	Rear Door *(includes PCB retainers, but no lock or hinges)*
037083-01	Corrugated Rubber Floor Matting
037084-01	Coin Box
037085-01	Coin Box Lid
037086-01	Retainer for Front Window
037087-01	Bronze-Colored Front Window
037090-01	Blue Monitor Overlay
037095-01	Cardboard Cowling Bezel with Graphics
178023-001	4-Inch Diameter Swivel Caster

**Figure 17   Control Panel Assembly
A037057-01   A**

Part No.	Description
A036948-01	Control Panel Harness Assembly
A037096-01	Control Panel with Graphics
62-039	SPDT Momentary-Contact Pushbutton Start Switch with Red Light-Emitting Diode
75-07054	Flat Nylon Washer, 0.470-Inch Inside Diameter × 0.968-Inch Outside Diameter × 0.075-Inch Thick
77-9910W0	#15/32-32 Steel Stamped Nut
033127-01	Black Molded Switch Bushing
037077-01	Control Panel Spacer

178027-001
(Lubricant—
not shown)

72-8614
(Screw)

72-5240
(Screw)

036276-01
(Bezel)

036953-01
(Plate)

62-043
(Switch)

036961-01
(Shaft)

036279-03
(Pivot Ball)

A036958-01
(Shaft Assy.)

73-21232
(Pin)

036995-01, -02
(Ctrl. Handle)

036952-01
(Housing)

036963-01
(Slide Plate)

A036281-02
(Bellows)

036954-01
(Mount. Plate)

036955-01
(Cap)

75-010S
(Washer)

72-8406
(Screw)

75-940S
(Hex Nut)

19-9026
(Resistor)

036956-02
(Outer Gimbal)

036956-01
(Inner Gimbal)

036957-01
(Linkage)

75-07020
(Washer)

**Figure 18   Gimbal-Type Joystick Assembly
A036951-01   A**

30

Figure 18   Gimbal-Type Joystick Assembly
Parts List

Part No.	Description
A036281-02	Centering Bellows
A036958-01	Shaft Assembly with Fire Switch Harness *(includes pivot ball, pivot shaft and slotted pin)*
036276-01	Bezel for Fire Pushbutton
036279-03	Pivot Ball
036952-01	Pivot Ball Housing *(two of these required per handle)*
036953-01	Square Control Plate
036954-01	Mounting Plate
036955-01	Bellows Cap
036956-01	Inner Gimbal
036956-02	Outer Gimbal
036957-01	Gimbal Linkage
036961-01	Pivot Shaft
036963-01	Slide Plate
035995-01	Control Handle *(right half)*
035995-02	Control Handle *(left half)*
19-9026	5K Ohm, ± 20%, 2¼ W Variable Resistor
62-043	SPST Pushbutton Switch with Red Non-Lighting Cap *(used as fire switch)*
72-5240	#10-32 x 2½-Inch Hex-Head Steel Machine Screw
72-8406	#4-40 x 3/8-Inch Hex Cap-Head Steel Machine Screw
72-8614	#6-32 x 7/8-Inch Hex Socket-Head Steel Machine Screw
73-21232	3/16-Inch Diameter x 2-Inch Long Slotted Pin
75-010S	#10 Zinc-Plated Steel Flat Washer
75-07020	3/8-Inch Flat Washer
75-940S	#10-32 Steel Self-Locking Polymer Hex Nut
178027-001	Nyogel 779 Lubricant

Figure 19   Regulator/Audio II PCB Assembly
A035435-02   C

Figure 19 Regulator/Audio II PCB Assembly
Parts List

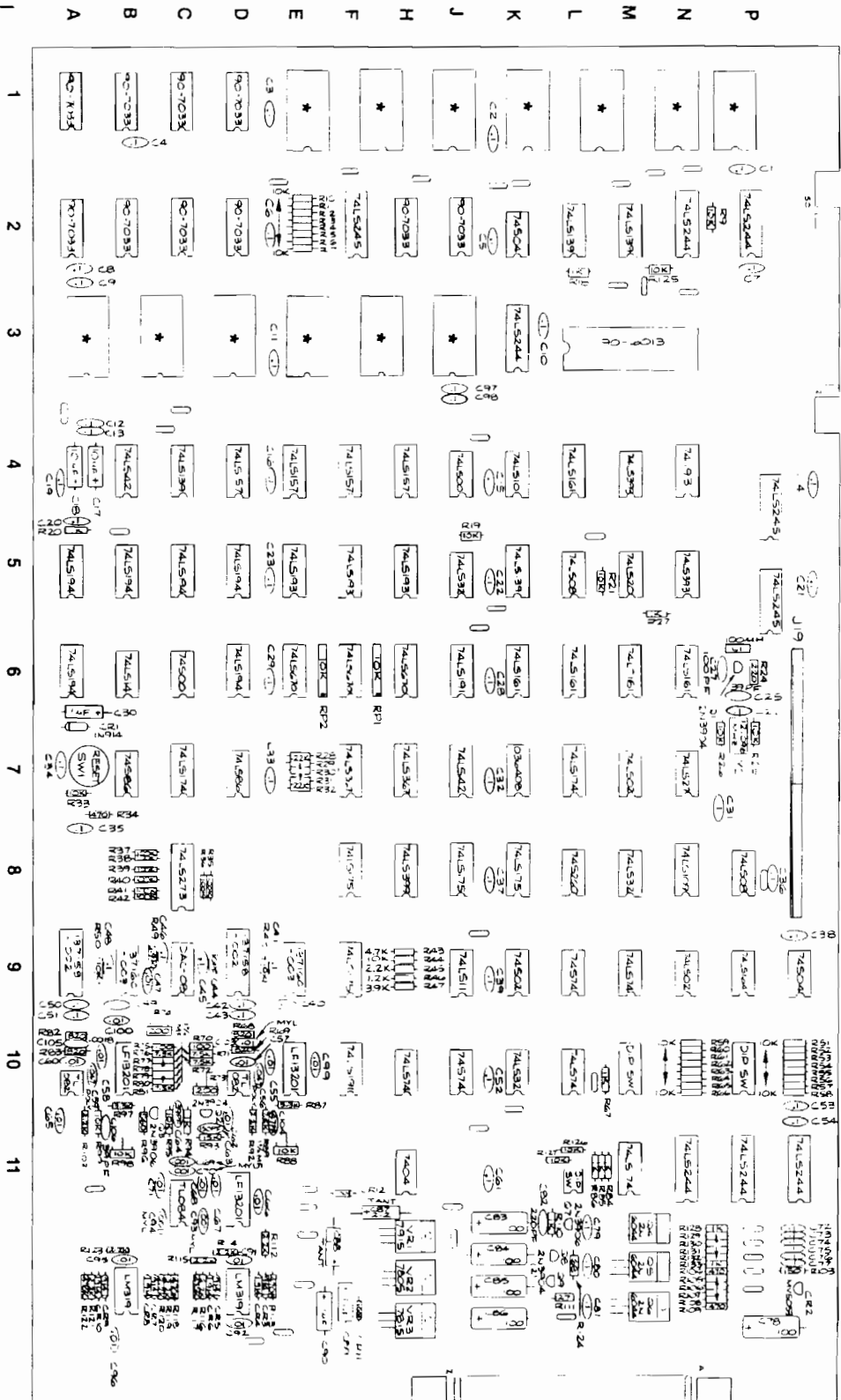| Part No.	Description (Reference Designations and Locations in Bold)
12-52P7	2.7 Ohm, ± 5%, 1W Resistor **(R5)**
16-54PO	4 Ohm, ±5%, 5W Wirewound Resistor **(R25)**
19-100P1015	.1 Ohm, ± 3%, 7W Wirewound Resistor **(R24)**
19-315102	1K Ohm Vertical PCB-Mounting Cermet Trimpot **(R8)**
24-250108	1000 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)**
29-088	.1 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C3, 11, 20, 21)**
31-1N4002	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-Inch Cross-Recessed Pan-Head Corrosion-Resistant Steel Machine Screw
75-F60405	#6-32 × ¼-Inch Binder-Head Nylon Screw
75-99516	#6-32 Nut/Washer Assembly
78-16008	Thermally Conductive Compound **(Q3)**
78-16014	Thermally Conductive Silicon Insulator **(Q2, 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)**
122002-102	.001 uf Ceramic-Disc Minimum 25V Radial-Lead Capacitor **(C2, 7, 16)**
122004-224	.22 uf Ceramic-Disc 25V Capacitor **(C6, 8, 15, 17)**
100015-103	.01 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C5, C14)**
137151-002	Type TDA2002A 8W Linear Audio Amplifier Integrated Circuit **(Q5, 7)**

**Figure 20   Red Baron™ Auxiliary PCB Assembly
A036305-01   A**

Figure 20   Red Baron™ Auxiliary PCB Assembly
Parts List

Part No.	Description (Reference Designations and Locations in Bold)
C012294-01	Audio I/O N-Channel MOS/LSI Custom Chip **(B2)**
12-5821	820 Ohm, ±5%, 1 W Resistor **(R39)**
21-101103	.01 uf, ±10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor **(C8)**
21-101104	.1 uf, ±10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor **(C21, 22, 32)**
21-101153	.015 uf, ±10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor **(C12)**
24-250106	10 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C30, 50, 52)**
24-250107	100 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C46)**
24-250226	22 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C5)**
24-250476	47 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C53)**
24-250477	470 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C35, 43)**
24-350106	10 uf Aluminum Electrolytic Fixed Axial-Lead 35V Capacitor **(C54)**
24-350476	47 uf Aluminum Electrolytic Fixed Axial-Lead 35V Capacitor **(C53)**
24-500105	1 uf Aluminum Electrolytic Fixed Axial-Lead 50V Capacitor **(C36, 37, 51)**
28-101101	100 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor **(C27)**
29-006	1 uf, ±10%, 35V Tantalum Capacitor **(C48)**
29-088	.1 uf Ceramic-Disc Radial-Lead 25V Capacitor **(C1-4, 6, 7, 9-11, 14, 18-20, 23, 25, 26, 28, 29, 31, 33, 38, 39-42, 44, 45, 49, 55, 56)**
31-1N100	100V Type-1N100 Switching Diode **(CR6, 7)**
31-1N914	75V Type-1N914 Switching Diode **(CR1, 2, 4)**
32-1N5235	6-8V 500mW Type-1N5235 Zener Diode **(CR5)**
34-2N3643	60V 300mW Type-2N3643 NPN Transistor **(Q1, 2)**
37-LM324	Type-LM324 Integrated Circuit **(K4, K5)**
37-1408	Type-1408 Digital-to-Analog-Converter Integrated Circuit **(B4)**
37-4066	Type-4066 Analog Switch Integrated Circuit **(J5)**
37-555	Type-555 Timer Integrated Circuit **(J0, K2)**
37-74LS00	Type-74LS00 Integrated Circuit **(A4, J4)**
37-74LS02	Type-74LS02 Integrated Circuit **(D3, C5)**
37-74LS04	Type-74LS04 Integrated Circuit **(D5)**
37-74LS08	Type-74LS08 Integrated Circuit **(F3)**
37-74LS32	Type-74LS32 Integrated Circuit **(C4)**
37-74LS74	Type-74LS74 Integrated Circuit **(D4)**
37-74LS139	Type-74LS139 Integrated Circuit **(B5)**
37-74LS161	Type-74LS161 Integrated Circuit **(C1, D1)**
37-74LS164	Type-74LS164 Integrated Circuit **(E4, F4)**
37-74LS174	Type-74LS174 Integrated Circuit **(A0)**
37-74LS175	Type-74LS175 Integrated Circuit **(H0)**
37-74LS191	Type-74LS191 Integrated Circuit **(A3, B3)**
37-74LS244	Type-74LS244 Integrated Circuit **(E0)**
37-74LS273	Type-74LS273 Integrated Circuit **(E3)**
37-74LS374	Type-74LS374 Integrated Circuit **(F0, B1)**
37-74S08	Type-74S08 Integrated Circuit **(K3)**
37-74109	Type-74109 Integrated Circuit **(C3)**
37-7815	+15V Voltage Regulator **(VR2)**
37-7915	–15V Voltage Regulator **(VR1)**
38-MV5053	Type-MV5053 Red Light-Emitting Diode **(CR3)**

[Continued on next page]

Figure 20   Red Baron™ Auxiliary PCB Assembly, continued
Parts List

Part No.	Description (Reference Designations and Locations in Bold)
41-3003	100 uH, ± 10%, Hot-Molded Plastic Fixed R.F. Choke **(L1-4)**
79-42C16	16-Contact Medium-Insertion-Force Integrated Circuit Socket **(A1, A5, E1, F1, H1, J1, K1, L1)**
79-42C22	22-Contact Medium-Insertion-Force Integrated Circuit Socket **(C0)**
79-42C40	40-Contact Medium-Insertion-Force Integrated Circuit Socket **(B2, C/D2, E2, F/H2, J2)**
81-4302	Nylon Snap-In Fastener
020670-01	Test Point
036174-01	Programmable Read-Only Memory **(A1)**
036175-01	Programmable Read-Only Memory **(E1)**
036176-01	Programmable Read-Only Memory **(F1)**
036177-01	Programmable Read-Only Memory **(H1)**
036178-01	Programmable Read-Only Memory **(J1)**
036179-01	Programmable Read-Only Memory **(K1)**
036180-01	Programmable Read-Only Memory **(L1)**
036464-01	Programmable Read-Only Memory **(A5)**
100015-103	.01 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C34)**
110000-102	1K Ohm, ± 5%, ¼W Resistor **(R1, 4, 12, 17, 19, 21-23, 33, 37, 43, 64-72)**
110000-103	10K Ohm, ± 5%, ¼W Resistor **(R7-9, 11, 31, 32, 46-63)**
110000-104	100K Ohm, ± 5%, ¼W Resistor **(R29)**
110000-151	150 Ohm, ± 5%, ¼W Resistor **(R35, 44)**
110000-152	1.5K Ohm, ± 5%, ¼W Resistor **(R34)**
110000-153	15K Ohm, ± 5%, ¼W Resistor **(R27)**
110000-221	220 Ohm, ± 5%, ¼W Resistor **(R20)**
110000-222	2.2K Ohm, ± 5%, ¼W Resistor **(R16, 40)**
110000-223	22K Ohm, ± 5%, ¼W Resistor **(R28, 36, 38)**
110000-273	27K Ohm, ±5%, ¼W Resistor **(R30)**
110000-333	33K Ohm, ±5%, ¼W Resistor **(R6, 26)**
110000-334	330K Ohm, ±5%, ¼W Resistor **(R25)**
110000-391	390 Ohm, ±5%, ¼W Resistor **(R45)**
110000-392	3.9K Ohm, ±5%, ¼W Resistor **(R15)**
110000-471	470 Ohm, ±5%, ¼W Resistor **(R13, 41, 42)**
110000-473	47K Ohm, ±5%, ¼W Resistor **(R2)**
110000-562	5.6K Ohm, ±5%, ¼W Resistor **(R5, 10, 18)**
110000-681	680 Ohm, ±5%, ¼W Resistor **(R24)**
110000-683	68K Ohm, ±5%, ¼W Resistor **(R3)**
110000-822	8.2K Ohm, ±5%, ¼W Resistor **(R14)**
122000-225	2.2 uf, ± 20%, 35V Tantalum Capacitor **(C47)**
122004-224	.22 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C13, 15-17, 24)**
137002-001	Type-74S86 Integrated Circuit **(H4)**
137003-001	Type-74S03 Integrated Circuit **(J3)**
137004-001	Transistor Array **(C/D2, E2, F/H2, J2)**
137161-001	Read-Only Memory **(C0)** Note: If you replace this part, **you must erase** this ROM before locking up the game. See Figure 6, Self-Test Procedure, in this manual for instructions. If you do not erase the ROM, the self-test will show the ROM to be "defective" by displaying the number **9** on the screen.
179010-001	12-Pin PCB Header **(J16, J17)**

* Program memory components—
see parts list on next page.

Figure 21   Red Baron™ Analog Vector-Generator PCB Assembly
A036949-01 and -02   A

Figure 21   Red Baron™ Analog Vector-Generator PCB Assembly
Parts List

Memory-Component Equivalents (Locations Shown in Bold):

-01 P.C. Boards		-02 P.C. Boards	
037005-01	(A3)		
		037007-01	(A3)
037003-01	(E3)		
037004-01	(B/C3)		
		037006-01	(B/C3)
037002-01	(F/H3)		

Remainder of Memory Components:

Part No.	Description	(Locations in Bold)
036995-01	Read-Only Memory	(P1)
036996-01	Read-Only Memory	(N1)
036997-01	Read-Only Memory	(L/M1)
036998-01	Read-Only Memory	(K1)
036999-01	Read-Only Memory	(J1)
037000-01	Read-Only Memory	(F/H1)
037001-01	Read-Only Memory	(E1)

Figure 21   Red Baron™ Analog Vector-Generator PCB Assembly, continued
Parts List

⚠️   **WARNING**   ⚠️

Although this PCB may closely resemble Battlezone™ and other
X-Y game PCBs, it is **not** interchangeable with them. Attempting
to use this Red Baron™ PCB in any other game **may cause a fire!**

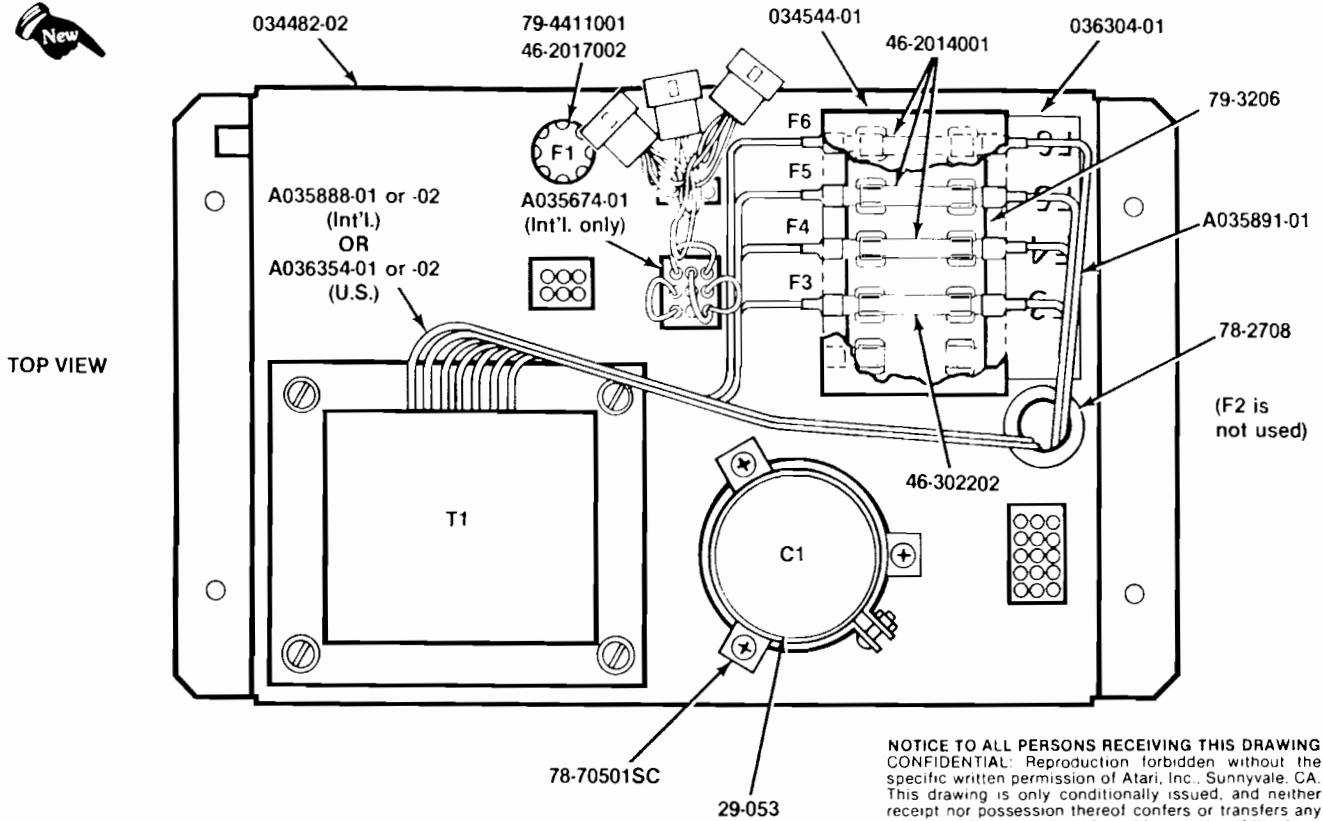| Part No.	Description (Reference Designations and Locations in Bold)
	A035742-01 and -02, Rev. C
19-007	10K Ohm, ± 20%, 1¼ W 8-Pin Dual-Inline-Package Resistor Network **(RP1, RP2—use only if board has 74LS170s or 74LS670s at locations E6, F6, H6)**
19-315103	10K Ohm Vertical PCB-Mounting Cermet Trimpot **(R88, 98)**
19-315201	200 Ohm Vertical PCB-Mounting Cermet Trimpot **(R73, 74)**
21-101102	.001 uf, ± 10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor **(C69, 70, 93, 94)**
21-101103	.01 uf, ± 10%, Radial-Lead Epoxy-Dipped 100V Mylar Capacitor **(For -02 PCB Assy. only: C103)**
24-250106	10 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C17, 18)**
24-250107	100 uf Aluminum Electrolytic Fixed Axial-Lead 25V Capacitor **(C78, 83-86)**
24-500105	1 uf Aluminum Electrolytic Fixed Axial-Lead 50V Capacitor **(C30, 89, 90)**
27-102182	.0018 pf, ± 10%, Radial-Lead Ceramic-Disc 1000V Capacitor **(For -01 PCB Assy. only: C103; For -02 PCB Assy. only: C105)**
28-101100	10 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor **(C44)**
28-101101	100 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor **(C27)**
28-101151	150 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor **(C63)**
28-101221	220 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor **(C82)**
28-101390	39 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor **(C25, 64, 106)**
28-101470	47 pf Radial-Lead Epoxy-Dipped 100V Mica Capacitor **(C104)**
29-006	1 uf, ± 10%, 35V Tantalum Capacitor **(C88)**
29-088	.1 uf Ceramic-Disc 25V Radial-Lead Capacitor **(C1-16, 19-23, 26, 28, 29, 31-41, 45, 46, 50-54, 61, 72-77, 79-81, 97, 98. Also, for -01 PCB Assy. only: C40, 41, 48, 49. For -02 PCB Assy. only: C42, 43, 50, 51)**
31-1N100	100V Type-1N100 Switching Diode **(CR11, 12)**
31-1N914	75V Type-1N914 Switching Diode **(CR1, 3-10)**
33-2N3906	Type-2N3906 PNP Switching and Amplifying Transistor **(Q3, 7)**
34-2N3904	Type-2N3904 NPN 60V 1-Watt Transistor **(Q1, 2, 8, 9)**
34-2N6044	Type-2N6044 Darlington NPN Transistor **(Q4-6)**
37-LM319	Type-LM319 Integrated Circuit **(B12, D12)**
37-TL082CP	Type-TL082 Integrated Circuit **(A10, D10)**
37-13201	Type-LF13201 Integrated Circuit **(B10, D11, E10)**
37-347	Type-TL084 Integrated Circuit **(C11)**
37-74LS00	Type-74LS00 Integrated Circuit **(J4)**
37-74LS02	Type-74LS02 Integrated Circuit **(N9, M7)**
37-74LS08	Type-74LS08 Integrated Circuit **(L5, P8)**
37-74LS10	Type-74LS10 Integrated Circuit **(K4)**
37-74LS14	Type-74LS14 Integrated Circuit **(B6)**
37-74LS20	Type-74LS20 Integrated Circuit **(M5)**
37-74LS27	Type-74LS27 Integrated Circuit **(N7)**

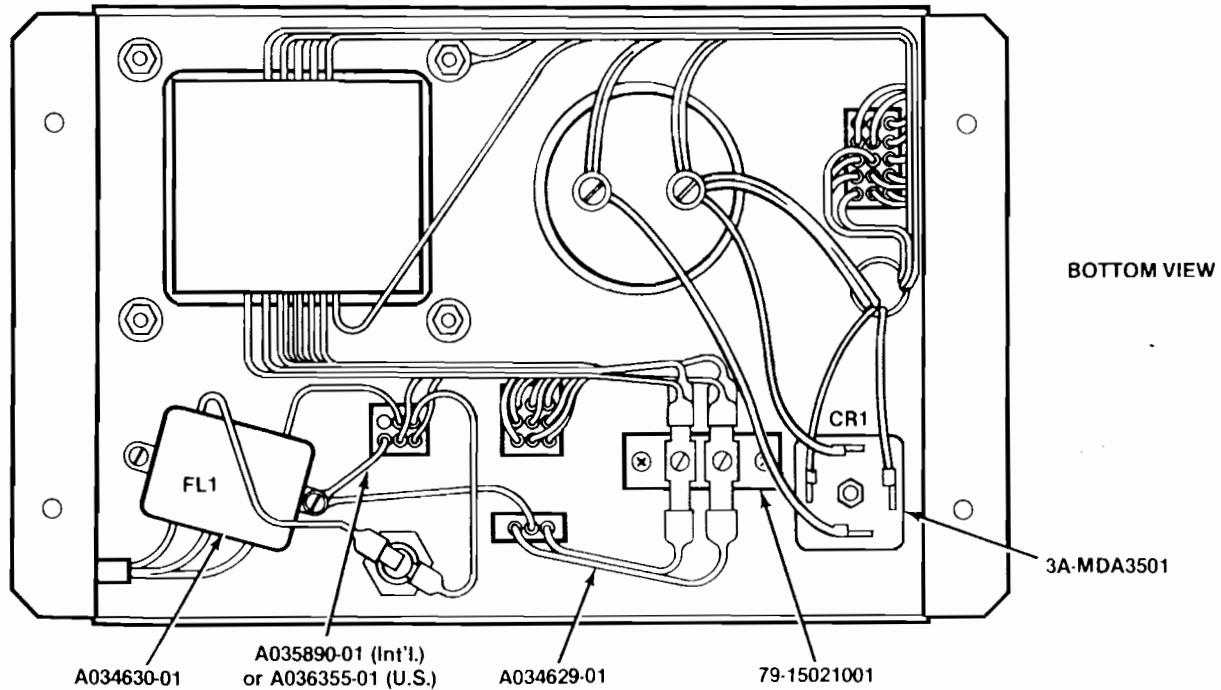# Figure 21   Red Baron™ Analog Vector-Generator PCB Assembly, continued
Parts List

Part No.	Description (Reference Designations and Locations in Bold)

A035742-01 and -02, Rev. C

Part No.	Description
37-74LS32	Type-74LS32 Integrated Circuit **(J5, K10, M8)**
37-74LS42	Type-74LS42 Integrated Circuit **(B4, J7)**
37-74LS74	Type-74LS74 Integrated Circuit **(H10, L10, M9)**
37-74LS86	Type-74LS86 Integrated Circuit **(D7)**
37-74LS109	Type-74LS109 Integrated Circuit **(N8)**
37-74LS139	Type-74LS139 Integrated Circuit **(C4, K5, M2)**
37-74LS157	Type-74LS157 Integrated Circuit **(D4, E4, F4, H4)**
37-74LS161	Type-74LS161 Integrated Circuit **(K6, L4, L6, M6, N6)**
37-74LS164	Type-74LS164 Integrated Circuit **(P9)**
37-74LS174	Type-74LS174 Integrated Circuit **(C7, L7, M11)**
37-74LS175	Type-74LS175 Integrated Circuit **(F8, F9, J8, K8)**
37-74LS191	Type-74LS191 Integrated Circuit **(F10, J6)**
37-74LS193	Type-74LS193 Integrated Circuit **(E5, F5, H5)**
37-74LS194	Type-74LS194 Integrated Circuit **(A5, A6, B5, C5, D5, D6)**
37-74LS244	Type-74LS244 Integrated Circuit **(K3, N2, P2, N11, P11, R11)**
37-74LS245	Type-74LS245 Integrated Circuit **(F2, R4/5, R5)** *Acceptable substitute is part no. 37-8304B.*
37-74LS273	Type-74LS273 Integrated Circuit **(C8)**
37-74LS367	Type-74LS367 Integrated Circuit **(F7, H7)**
37-74LS393	Type-74LS393 Integrated Circuit **(M4, N5)**
37-74LS399	Type-74LS399 Integrated Circuit **(H8)**
37-74LS670	Type-74LS670 Integrated Circuit **(E6, F6, H6)** *Acceptable substitute is part no. 37-74LS170.*
37-74S00	Type-74S00 Integrated Circuit **(C6)**
37-74S02	Type-74S02 Integrated Circuit **(K9)**
37-74S04	Type-74S04 Integrated Circuit **(K2, R9)**
37-74S74	Type-74S74 Integrated Circuit **(J10, L9)**
37-74S260	Type-74S260 Integrated Circuit **(L8)**
37-7404	Type-7404 Integrated Circuit **(H11)**
37-74193	Type-74193 Integrated Circuit **(N4)**
37-7805	+ 5V Voltage Regulator **(VR2)**
37-7815	+ 15V Voltage Regulator **(VR3)**
37-7915	− 15V Voltage Regulator **(VR1)**
38-MV5053	Type-MV5053 Light-Emitting Diode **(CR2)**
41-3004	100 uH, ± 10%, Hot-Molded Plastic Fixed R.F. Choke **(L1)** *Acceptable substitute is part no. 41-3003.*
62-001	SPST Momentary Pushbutton Switch **(SW1)**
66-114P1T	4-Station Single-Throw, Dual-Inline-Package Bit Switch **(L11)**
66-118P1T	8-Station Single-Throw, Dual-Inline-Package Bit Switch **(M10, P10)**
79-42C24	24-Contact Medium-Insertion-Force Integrated Circuit Socket **(A3, B/C3, D3, E1, E3, F/H1, F/H3, J1, J3, K1, L/M1, N1, P1)**
79-42C40	40-Contact Medium-Insertion-Force Integrated Circuit Socket **(L/M/N3)**
81-4302	Nylon Snap-In Fastener
90-102	12.096 MHz, ± .005%, Crystal **(Y2)**
90-6013	Microprocessor **(L/M/N3)**
90-7033	Random-Access Memory **(A1, A2, B1, B2, C1, C2, D1, D2, H2, J2)**
020670-01	Test Point
036408-01	Programmable Read-Only Memory **(K7)**

Figure 21 Red Baron™ Analog Vector-Generator PCB Assembly, continued
Parts List

Part No.	Description (Reference Designations and Locations in Bold)

A035742-01 and -02, Rev. C

100015-103	.01 uf Ceramic-Disc Minimum 25V Radial-Lead Capacitor **(C47, 55, 57, 58, 60, 62, 65-68, 71, 91, 92, 95, 96, 99, 100)**
110000-101	100 Ohm, ±5%, ¼W Resistor **(R70, 75)**
110000-102	1K Ohm, ±5%, ¼W Resistor **(R18, 20, 27, 67, 84-86, 94, 110, 128-133)**
110000-103	10K Ohm, ±5%, ¼W Resistor **(R9-17, 19, 21, 25, 26, 33, 44, 51-66, 95, 99, 125-127.** *In addition, for -01 PCB Assy. only:* **R48, 50, 69)**
110000-104	100K Ohm, ±5%, ¼W Resistor **(R35-42)**
110000-122	1.2K Ohm, ±5%, ¼W Resistor **(R46)**
110000-151	150 Ohm, ±5%, ¼W Resistor **(R103)**
110000-153	15K Ohm, ±5%, ¼W Resistor **(R93)**
110000-221	220 Ohm, ±5%, ¼W Resistor **(R24)**
110000-222	2.2K Ohm, ±5%, ¼W Resistor **(R45, 92, 102, 112, 114-116, 119-121, 123)**
110000-223	22K Ohm, ±5%, ¼W Resistor **(R28-32)**
110000-270	27 Ohm, ±5%, ¼W Resistor **(R111)**
110000-332	3.3K Ohm, ±5%, ¼W Resistor **(R87, 97)**
110000-392	3.9K Ohm, ±5%, ¼W Resistor **(R47, 49)**
110000-471	470 Ohm, ±5%, ¼W Resistor **(R34, 104-109)**
110000-472	4.7K Ohm, ±5%, ¼W Resistor **(R43)**
110000-474	470K Ohm, ±5%, ¼W Resistor **(R113, 117, 118, 122)**
110000-561	560 Ohm, ±5%, ¼W Resistor **(R96)**
110000-680	68 Ohm, ±5%, ¼W Resistor **(R124)**
110000-681	680 Ohm, ±5%, ¼W Resistor *(For -02 PCB Assy. only:* **R83)**
110000-821	820 Ohm, ± 5%, ¼W Resistor *(For -02 PCB Assy. only:* **R68, 69, 82)**
110003-752	7.5K Ohm, ±1%, 1/8W Metal-Film Resistor **(R71, 72, 76-81, 89)**
121007-473	.047 uf, ±10%, Radial-Lead Epoxy-Dipped 100V Polycarbonate Capacitor **(C56, 59)**
122000-225	2.2 uf, ±10%, 35V Tantalum Capacitor **(C87)**
137002-001	Type 74S86 Integrated Circuit **(B7)**
137149-001	Type 74LS11 Integrated Circuit **(J9)**
137159-001	Type DAC-08 Digital-to-Analog Converter **(C9)**
137158-002 OR	Type AM6012ADC Digital-to-Analog Converter *(For -02 PCB Assy. only:* **A9, D9)** OR
137160-003	Type MC3410 Digital-to-Analog Converter *(For -01 PCB Assy. only:* **B9, E9)**
179014-012	12-Pin PCB Header **(J19)**

TOP VIEW

034482-02

A035888-01 or -02
(Int'l.)
OR
A036354-01 or -02
(U.S.)

79-4411001
46-2017002

A035674-01
(Int'l. only)

034544-01

46-2014001

036304-01

79-3206

A035891-01

78-2708

(F2 is
not used)

F6
F5
F4
F3
F1

T1

C1

46-302202

78-70501SC

29-053

BOTTOM VIEW

FL1

CR1

3A-MDA3501

A034630-01

A035890-01 (Int'l.)
or A036355-01 (U.S.)

A034629-01

79-15021001

**Figure 22   Power Supply Assemblies for X-Y Games
A035892-01 (International) A   /   A036353-01 (U.S.) A**

Figure 22   Power Supply Assemblies for X-Y Games
Parts List

Part No.	Description (Reference Designations in Bold)
A034629-01	A.C. Harness Assembly
A034630-01	RFI Filter Assembly **(FL1)**
A035674-01	Voltage Plug Assembly *(set of four plugs—for international power supply only)*
A035888-01 or -02	Transformer Assembly—*international only* **(T1)**
A035890-01	Power Harness Assembly *(international only)*
A035891-01	Fuse Harness Assembly
A036354-01 or -02	Transformer Assembly—*U.S. only* **(T1)**
A036355-01	Power Harness Assembly *(U.S. only)*
29-053	26,000 uf 15 VDC Electrolytic Capacitor **(C1)**
3A-MDA3501	Bridge Rectifier, Type MDA 3501 **(CR1)**
46-2014001	4-Amp. 125 V 3AG Slow-Blow Glass Cartridge-Type Fuse **(F4, F5, F6)**
46-2017002	7-Amp. 250 V 3AG Slow-Blow Glass Cartridge-Type Fuse **(F1)**
46-302202	20-Amp. 250 V 3AB Slow-Blow Ceramic Cartridge-Type Fuse **(F3)**
78-2708	Nylon Type 6/6 Hole Bushing with 5/8-Inch Inside Diameter × 55/64-Inch Outside Diameter × ¼-Inch Thick
78-70501SC	2-Inch Diameter Capacitor Mounting Bracket
79-15021001	2-Circuit Single-Row Terminal Block
79-3206	5-Position 3AG Fuse Block with ¼-Inch Quick-Disconnect Terminals
79-4411001	Panel-Mounting Non-Indicating 3AG Cartridge-Type Fuse Post
034482-02	Power Supply Chassis
034544-01	Fuse Block Cover
036304-01	Label for Fuse Values

99-15001 thru 99-15012
(Ret. Button)

99-15038
(Bezel for Button)

99-15052
(Spring for Button)

99-15051
(Lamp Holder)

99-15056
(Screw for Bezel)

99-15026
(Coin Inlet)

99-15040
(Lever)

99-15039
(Bezel for Cover)

99-15025
(Coin Inlet)

99-15036
(Cover)

PART OF
99-15041

99-15055
(Retng. Screw)

99-15041
(Lockout Coil)

99-15053
(Lockt. Coil Spring)

99-15054
(Pivot for Lever)

99-15027
(Coin Ret. Box)

99-15030
(Lockout Flap)

99-15028
(Coin Ret. Box)

99-15037
(Sw. Adjuster)

99-15056
(Screw for Bezel)

99-15060
(Sw. Cover)

99-15029
(Bracket)

99-15042
(Switch)

A036597-01
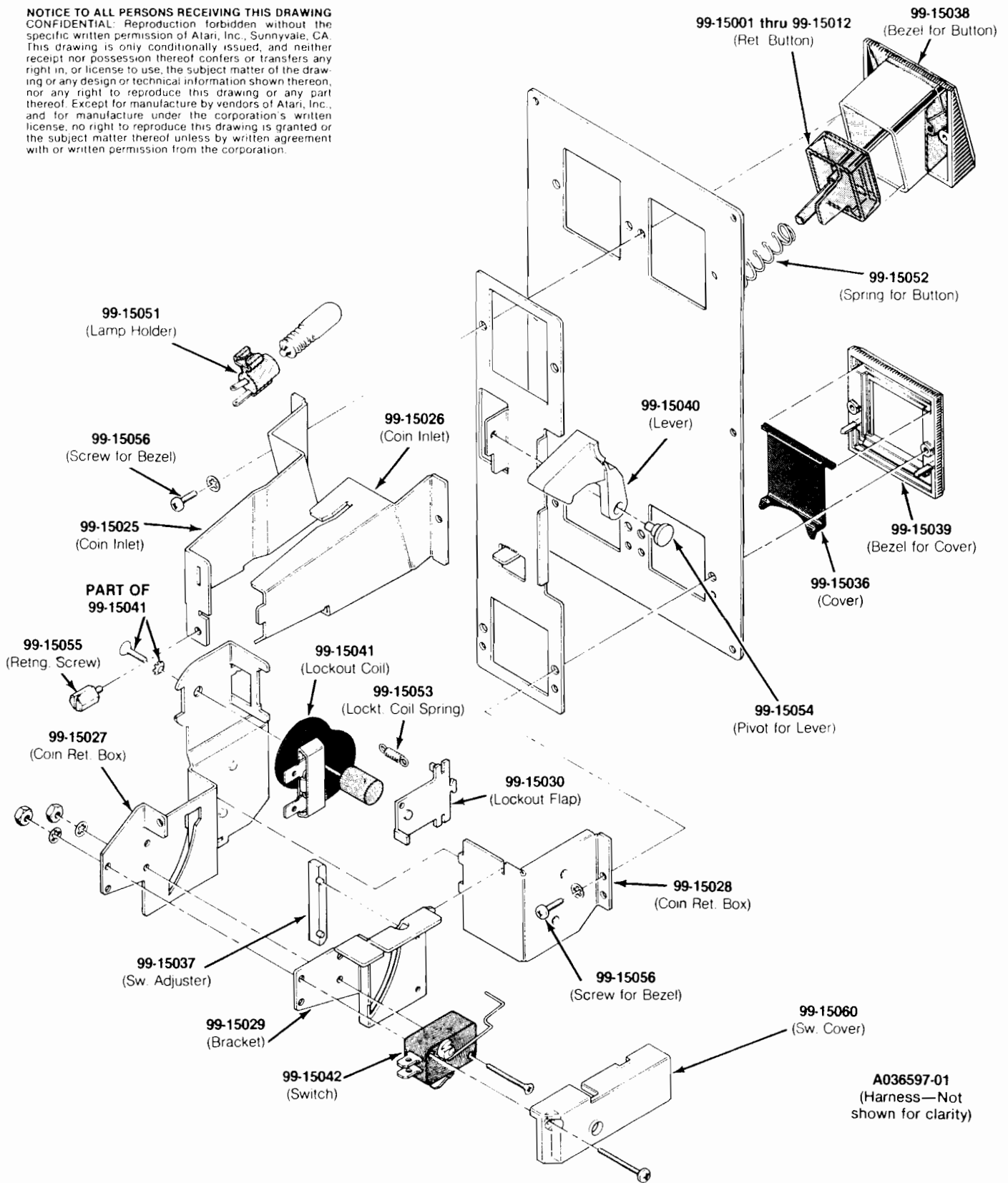(Harness—Not
shown for clarity)

Figure 22   Double Coin Acceptor/Mount Assembly
A036693-xx   A

Figure 22   Double Coin Acceptor/Mount Assembly, continued
Parts List

Part No.	Description
A036597-01	Double Coin Acceptor Harness Assy.
99-15001	Coin Return Button with U.S. 25¢ Price Plate
99-15002	Coin Return Button with U.S. $1 Price Plate
99-15003	Coin Return Button with German 1 DM Price Plate
99-15004	Coin Return Button with German 2 DM Price Plate
99-15005	Coin Return Button with German 5 DM Price Plate
99-15006	Coin Return Button with Belgian 5 Fr Price Plate
99-15007	Coin Return Button with French 1 Fr Price Plate
99-15008	Coin Return Button with Japanese 100 Yen Price Plate
99-15009	Coin Return Button with British 10 Pence Price Plate
99-15010	Coin Return Button with Australian 20¢ Price Plate
99-15011	Coin Return Button with Italian 100 Lire Price Plate
99-15012	Coin Return Button with U.S. 50¢ (2 × 25¢) Price Plate
99-15025	Left Half of Coin Inlet
99-15026	Right Half of Coin Inlet
99-15027	Side Plate of Coin Return Box
99-15028	Base Plate of Coin Return Box
99-15029	Switch Bracket
99-15030	Flap for Lockout Coil (U.S. 25¢)
99-15036	Coin Return Cover
99-15037	Switch Adjuster
99-15038	Bezel for Coin Return Button
99-15039	Bezel for Coin Return Cover
99-15040	Coin Return Lever
99-15041	Lockout Coil
99-15042	Coin Switch for U.S. 25¢
99-15051	Lamp Holder
99-15052	Spring for Coin Return Button
99-15053	Spring for Lockout Coil
99-15054	Pivot for Coin Return Lever
99-15055	Retaining Screw
99-15056	Screw for Both Bezels
99-15060	Switch Cover

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POSTAGE WILL BE PAID BY ADDRESSEE

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P. O. Box 427
Sunnyvale, California 94086

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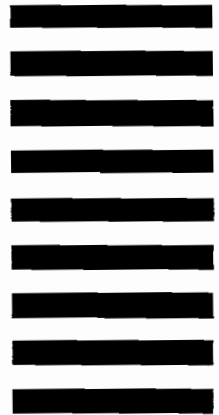
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