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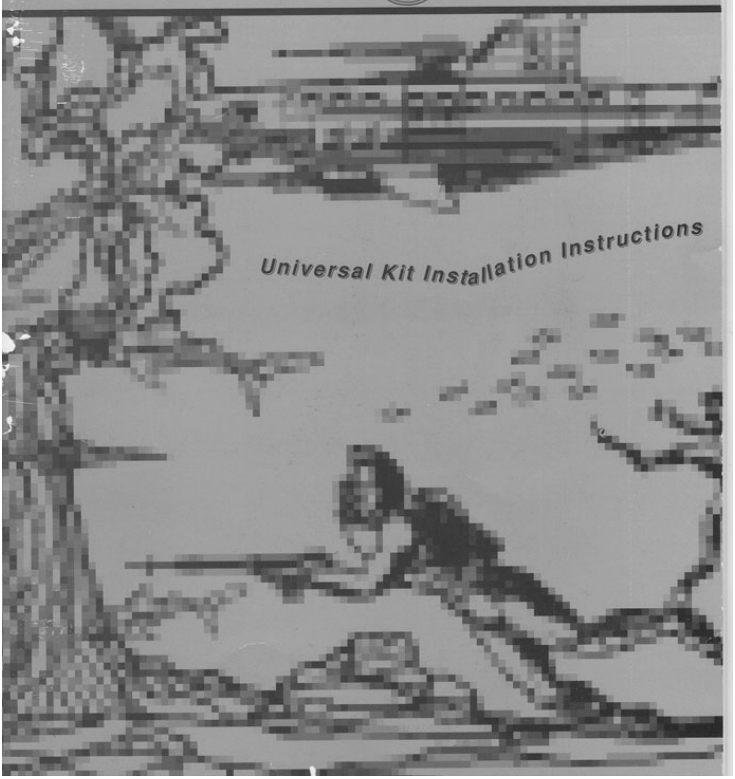
ATARI
GAMES

ThunderJaws



Universal Kit Installation Instructions

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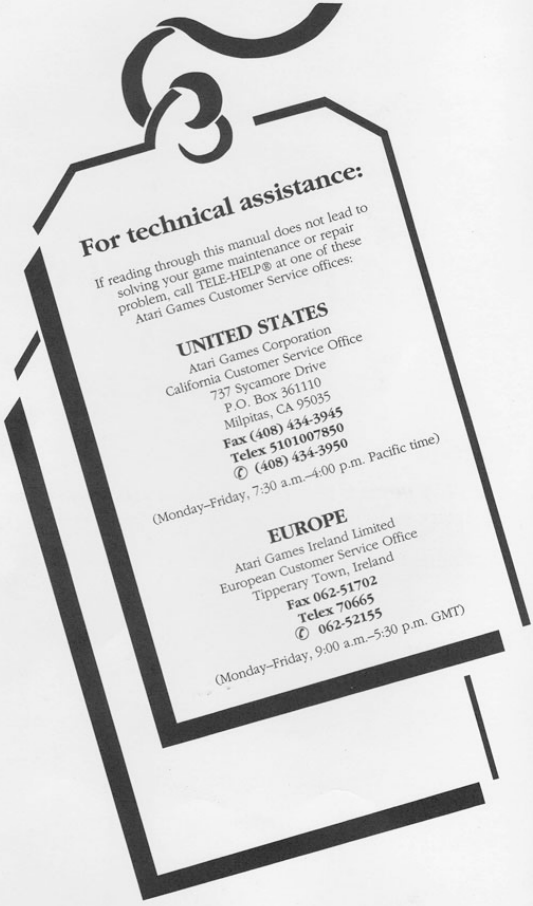
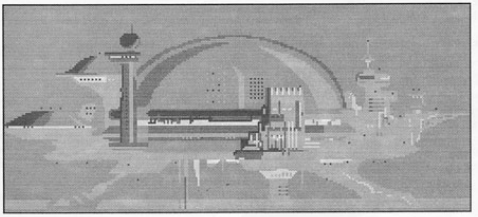


ATARI
GAMES

ThunderJaws™

Universal Kit Installation Instructions



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Notice Regarding Non-Atari® Parts

WARNING

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

You may void the game warranty (printed on the inside back cover of this manual) if you do any of the following:

- Substitute non-Atari parts in the game.
- Modify or alter any circuits in the game by using kits or parts *not* supplied by Atari Games Corporation.

NOTE

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of Federal Communications Commission (FCC) Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area or modification to this equipment is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference. If you suspect interference from an Atari game at your location, check the following:

- All ground wires in the game are properly connected as shown in the game wiring diagram.
- The power cord is properly plugged into a grounded three-wire outlet.
- On games provided with an Electromagnetic Interference (EMI) ground cage, be sure that the game printed-circuit boards (PCBs) are properly installed on the EMI ground cage and that the end board is securely installed with **all** screws in place and tightened.

If you are still unable to solve the interference problem, please contact Customer Service at Atari Games Corporation. See the inside front cover of this manual for service in your area.

Contents

Illustrations

Tables

Safety Summary

The following safety precautions apply to all game operators and service personnel. Specific warnings and cautions will be found in this manual whenever they apply.

WARNING

Properly Ground the Game. Players may receive an electrical shock if this game is not properly grounded! To avoid electrical shock, do not plug in the game until it has been inspected and properly grounded. This game should only be plugged into a grounded three-wire outlet. If you have only a two-wire outlet, we recommend you hire a licensed electrician to install a three-wire grounded outlet. If the control panel is not properly grounded, players may receive an electrical shock! After servicing any part on the control panel, check that the grounding wire is firmly secured to the inside of the control panel. After you have checked this, lock up the game.

AC Power Connection. Before you plug in the game, be sure that the game's power supply can accept the AC line voltage in your location. The line voltage requirements are listed in the first chapter of this manual.

Disconnect Power During Repairs. To avoid electrical shock, disconnect the game from the AC power before removing or repairing any part of the game. If you remove or repair the video display, be very careful to avoid electrical shock. High voltages continue to exist even after power is disconnected in the display circuitry and the cathode-ray tube (CRT). Do not touch the internal parts of the display with your hands or with metal objects! Always discharge the high voltage from the CRT before servicing it. Do this after you disconnect it from the power source. First, attach one end of a large, well-insulated, 18-gauge jumper wire to ground. Then momentarily touch the free end of the grounded jumper wire to the CRT anode by sliding the wire under the anode cap. Wait two minutes and do this again.

Use Only Atari Parts. To maintain the safety of your Atari game, use only Atari parts when you repair it. Using non-Atari parts or modifying the game circuitry may be dangerous, and could injure you and your players.

Handle the CRT With Care. If you drop the CRT and it breaks, it may implode! Shattered glass from the implosion can fly six feet or more.

Use the Proper Fuses. To avoid electrical shock, use replacement fuses which are specified in the parts list for this game. Replacement fuses must match those replaced in fuse type, voltage rating, and current rating. In addition, the fuse cover must be in place during game operation.

CAUTION

Properly Attach All Connectors. Make sure that the connectors on each printed circuit board (PCB) are properly plugged in. The connectors are keyed to fit only one way. If they do not slip on easily, do not force them. If you reverse a connector, it may damage your game and void your warranty.

Ensure the Proper AC Line Frequency. Video games manufactured for operation on 60 Hz line power (used in the United States) must not be operated in countries with 50 Hz line power (used in Europe). If a 60 Hz machine operates on 50 Hz line power, the fluorescent line ballast transformer will overheat and cause a potential fire hazard. Check the product identification label on your machine for the line frequency required.

ABOUT NOTES, CAUTIONS, AND WARNINGS

In Atari publications, notes, cautions and warnings have the following meaning:

NOTE — A highlighted piece of information.

CAUTION — Equipment and/or parts can be damaged or destroyed if instructions are not followed. You will void the warranty on Atari printed-circuit boards, parts thereon, and video displays if equipment or parts are damaged or destroyed due to failure of following instructions.

WARNING — Players and/or technicians can be killed or injured if instructions are not followed.

CHAPTER 1

Installation

How to Use This Manual

This manual provides information for installing, testing, and troubleshooting the ThunderJaws™ Universal kit. The manual is divided into the following chapters: ■ Chapter 1 describes how to install the ThunderJaws kit in your cabinet and the ThunderJaws game play. Also included is the template for drilling the holes into the control panel. ■ Chapter 2 describes the self-test and how to use the self-test screens. ■ Chapter 3 contains troubleshooting and maintenance procedures. ■ Chapter 4 contains parts illustrations and the kit parts list. ■ Chapter 5 contains the schematics for the ThunderJaws game PCB and JSA Audio II PCB.

WARNING

To avoid electrical shock, unplug the cabinet while installing the kit. After installation, plug the game only into a grounded 3-wire outlet.

Cabinet Equipment Requirements

Table 1-1 lists the equipment required in the cabinet into which you are installing the ThunderJaws kit.

Table 1-1 Equipment Requirements

Equipment	Specification
Video Display	Color RGB monitor
	Separate positive horizontal and vertical sync or negative composite sync
	Horizontal mounting
	Horizontal frequency: 15.750 KHz
	Vertical frequency: 60 Hz
	Video input: 1V to 3V peak-to-peak positive polarity
Control Panel	Metal only
Speaker	8 Ω, 5 W or 10 W
Coin Counter Mechanism	+5 VDC or +12 VDC
Power Cord	Three-conductor with ground
Power Supply	+5 VDC ± 0.25V @ 3.0 amps +12 VDC @ 1.0 amp –5 VDC @ 1.0 amp (Optional)

CAUTION

Do not unplug or plug in the ThunderJaws game printed-circuit board (PCB) edge connector while the power is on. You could seriously damage the PCB.

Tools Required

- Two C-clamps
- Drill with a 1/4-inch drill bit, a 1 3/4-inch hole cutter (or a 1 3/4-inch chassis punch), and a 1 3/16-inch hole cutter (or a 1 3/16-inch chassis punch)
- Phillips screwdriver
- Flat-blade screwdriver
- Socket wrench set and ratchet
- 1/4-20 hex wrench
- Wire cutters and strippers
- Straight edge
- Squeegee
- X-ACTO™ knife
- Fast-ons (if you are installing a new JAMMA harness)

Inspecting the Kit

Check to see that you have all the parts listed in the kit parts list in Table 1-2. If any part is missing or damaged, contact your distributor with the ThunderJaws kit serial number, part number and description of the missing or damaged parts, and date received.

Table 1-2 Kit Contents List

Part No.	Description	Quantity
038158-01	Product I.D. Label	1
039450-01	FCC Compliance Label	1
047205-01	Attraction Shield	1
047209-01	Control Panel Cover	1
047805-01	Control Panel Decal	1
047806-01	Side Panel Decal	2
047806-02	Poster	1
047807-01	Attraction Panel Film	1
047809-01	19-Inch Bezel With Graphics	1
141026-001	.50-Inch I.D. Split Ferrite Bead	2
160044-001	Snap-Action Switch	4
175014-1040	#10 Flat Washer	12
177010-240	#10-24 Hex. Polymer Locknut	12
178032-002	#10-24 Wire & Cable Tie	1
178237-001	Red Button Assembly	2
178237-005	Blue Button Assembly	2
178265-001	Nylon L-Style Standoff	3
178283-003	"Start/Fire" Indicator Plate	2
178283-004	"Jump" Indicator Plate	2
72-6612S	#6 x 3/4-Inch-Long. Type PH, Cross-Recessed Type-AB Screw	3
75-5112B	#10-24 x 3/4-Inch-Long Black Carriage Bolt	12
A040933-03	8-Way Joystick Assembly	2
A046501-01	JAMMA Harness Assembly	1
A047872-01	ThunderJaws PCB Board Set Assembly	1
TM-349	ThunderJaws Universal Kit Installation Instructions	1

(Packaging materials are not listed)

Preparing the Cabinet for the Kit Installation

1. Turn off power to the game.
2. Remove the following from the cabinet:
   - Old PCB(s).
   - Game harness, if it is not Japan Amusement Machinery Manufacturers Association (JAMMA)-compatible.
   - Control panel decals, labels, and controls.
   - Side decals, graphics, and adhesive. If the cabinet sides are damaged, repair them before putting on the new decals.
   - Video display shield, display bezel, attraction shield, and marquee.
3. Wipe down and vacuum the cabinet. Paint the cabinet, if required.

Assembling the Control Panel

To assemble the control panel, you need a copy of the installation template (see Figure 1-3) and the following parts from the kit:

- Clear cover for the control panel
- Control panel decal
- Two blue buttons
- Two red buttons
- Four snap-action switches
- Two "START/FIRE" button indicator plates
- Two "JUMP" button indicator plates
- Two joystick assemblies
- Twelve #10-24 x 1-inch-long carriage bolts, flat washers, and locknuts

1. Measure your control panel to find out what size the decal and cover should be. Cut the control panel decal and cover to fit.

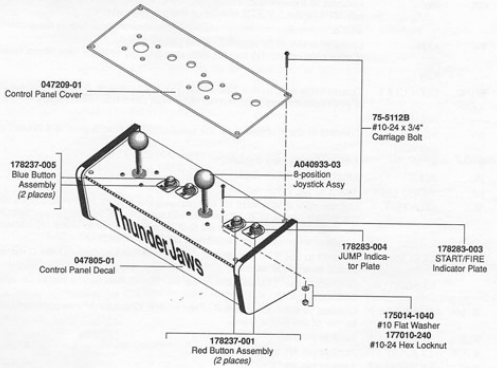


Figure 1-1 Assembling the Control Panel

2. Clamp the control panel cover to the control panel.
3. Drill four corner holes through the control panel and the control panel cover. Use a 1/4-inch drill bit.
4. Install four carriage bolts and locknuts through the holes to hold the cover and the control panel together.
5. Cut the holes in the cover and panel using a 1 3/16-inch hole cutter for the button holes and a 1 3/4-inch hole cutter for the joystick knob holes. Use a 1/4-inch drill bit to drill the mounting holes for the joysticks.
6. Disassemble the control panel and the control panel cover.
7. Install the control panel decal on the control panel. Use a sharp knife and cut out the holes for the controls in the decal.
8. Install the cover on the control panel with four carriage bolts, washers, and locknuts.

Table 1-3 JAMMA Pin and Wire Connections

Pin	Wire Color	Signal	Instructions
Component Side			
1	BN	GND	Connect to the 5V RTN (GND) terminal on the power supply. However, if you have 12V RTN, connect *one* of the BN wires at pin 1, 2, A, or B to the 12V RTN terminal.
2	BN	GND	Same as pin **1**.
3	R	+5V	Connect to the +5V terminal on the power supply. However, if your power supply has a +SENSE terminal, connect *one* of the R wires at pin 3, 4, C, or D to +SENSE instead of +5V.
4	R	+5V	Same as pin **3**.
5	OR	–5V	Connect to the –5V terminal of the power supply. If -5V is not available, connect to the 12V RTN or the 5 V RTN (GND) or leave it unconnected. *NOTE: If you do not have (or use) –5V, the maximum power to the speaker will be reduced.*
6	Y	+12V	Connect to the +12V terminal of the power supply. If your coin counter(s) require 12V, also connect to the + side of the coin counter(s).
7		**Key**	
8	BU/W	COIN CTR 1	Connect this wire to one side of the 12V coin counter. *Note: Do not use 24V counters.* If your counter requires 5V, connect a wire from the +5V terminal on the power supply.
9		Not used	
10	BN	SPKR +	Connect to the + terminal on the speaker. (This wire is part of a twisted pair.)
11		Not used	
12	R	RED	Attach to the video display.
13	BU	BLUE	Attach to the video display.
14	BK	VIDEO GND	Attach to the video display.
15	W	SELF-TEST	Use this wire if you want an external self-test switch. However, the kit already has a self-test switch on the PCB. *(If you connect an external self-test switch, switch off the switch on the PCB. Connect the wire to the N.O. terminal on the external self-test switch. Connect the common terminal of the switch to a BK/W wire (GND).)*
16	Y	LT COIN	Connect to the N.O. terminal of the left coin switch. Connect the common terminal of the switch to a BK/W wires.
17		LT START	Connect to the N.O. terminal of the left start button (if you install an optional start button).
18	W/BN	LT JOYST UP	Connect to the N.O. terminal of the switch. Connect the common terminal of the switch to one of the BK/W wires.
19	W/R	LT JOYST DN	Same as pin **18**.
20	W/OR	LT JOYST LT	Same as pin **18**.
21	W/Y	LT JOYST RT	Same as pin **18**.
22	W/GN	FIRE/START 1	Connect this wire to the N.O. terminals of the left FIRE/START switch. Connect the common terminals of the switches to one of the BK/W wires.
23	W/BU	JUMP 1	Connect this wire to the N.O. terminal of the left JUMP switch. Connect the common terminal of the switch to one of the BK/W wires.
24	W/V	Not used	

Table 1-3 JAMMA Wire Connections, Continued

Pin	Wire Color	Signal	Instructions
25	W/GY	Not used	
26	V	Not used	
27	BK/W	GND	Connect one of the BK/W wires at pin 27, 28, e, and f to the negative sense terminal of the power supply (if it exists) and one to the common terminals of the coin switches. Connect two of these wires to the common terminals of the control switches on the control panel.
28	BK/W	GND	Same as pin **27**.
Solder Side			
A	BN	GND	Connect to the 5V RTN (GND) terminal on the power supply. However, if you have 12V RTN, connect *one* of the BN wires at pin 1, 2, A, or B to the 12V RTN terminal.
B	BN	GND	Same as pin **A**.
C	R	+5V	Connect to the +5V terminal on the power supply. However, if your power supply has a +SENSE terminal, connect *one* of the R wires at pin 3, 4, C, or D to +SENSE instead of +5V.
D	R	+5V	Same as pin **C**.
E	OR	–5V	Connect to the –5V terminal of the power supply. If –5V is not available, connect to the 12V RTN or the 5 V RTN (GND) or leave it unconnected. *NOTE: If you do not have (or use) –5V, the maximum power to the speaker will be reduced.*
F	Y	+12V	Connect to the +12V terminal of the power supply.
H		**Key**	
J	V/W	COIN CTR 2	Connect this wire to one side of the second 12V coin counter. Clip R13 on the JSA Audio II PCB if you use a second coin counter. *Note: Do not use 24V counters.* If your counter requires 5V, connect a wire from the +5V terminal on the power supply. Also clip R24 on the game PCB.
K		Not used	
L	W	SPKR–	Connect to the – terminal on the speaker. (This wire is one of a twisted pair.)
M		Not used	
N	GN	GREEN	Attach to the video display.
P	BN	$\overline{\text{COMPSYNC}}$	Attach to the video display.
R		Not used	
S		Not used	
T	OR	RT COIN	Connect to the N.O. terminal of the right coin switch. Connect the common terminal of the switch to a BK/W wire.
U		Not used	
V	Y/BN	RT JOYST UP	Connect to the N.O. terminal of the switch. Connect the common terminal of the switch to one of the BK/W wires.
W	Y/R	RT JOYST DN	Same as pin **V**.
X	Y/OR	RT JOYST LT	Same as pin **V**.
Y	Y/W	RT JOYST RT	Same as pin **V**.
Z	Y/GN	FIRE/START 2	Connect this wire to the N.O. terminal of the right FIRE/START switch. Connect the common terminal of the switch to one of the BK/W wires.
a	Y/BU	JUMP 2	Connect this wire to the N.O. terminal of the right JUMP switch. Connect the common terminal of the switch to one of the BK/W wires.
b	Y/V	Not used	
c	Y/GY	Not used	
d	GY/W	Not used	
e	BK/W	GND	Connect one of the BK/W wires at pin 27, 28, e, or f to the negative sense terminal of the power supply (if it exists) and one to the common terminals of the coin switches. Connect two of these wires to the common terminals of the control switches on the control panel.
f	BK/W	GND	Same as pin **e**.

9. Install the buttons with the "START/FIRE" or "JUMP" indicator plate under each button. Install the blue player control buttons on the left and the red player control buttons on the right. (See Figure 1-1.) Install the joysticks with the carriage bolts, washers, and locknuts.

Connecting the JAMMA Harness

1. If your game does not already have a JAMMA harness, install the JAMMA harness in the cabinet.
2. Install the split beads on the JAMMA harness as close to the edge connector as possible. Hold the beads on the harness with the tie wraps included in the kit.

CAUTION

You must install the split beads included in the kit on the JAMMA harness to meet FCC requirements.

3. Using Table 1-3, *JAMMA Pin and Wire Connections*, for wiring information, connect the JAMMA harness to existing component harnesses. Use crimp splices or butt soldering.

WARNING

Do not simply tie the wires together. If you do, you could cause intermittent problems, loose connections, oxidation, or a fire.

Connecting Power Wires

1. Connect the wires on the JAMMA harness to the wires for the power supply, as shown in Table 1-3. The ThunderJaws kit requires +5V and +12V. If -5V is available, it should be used too. Tie off any other voltage wires on the power supply besides +5V, -5V, and +12V.
   There is more than one wire for each voltage in the JAMMA harness. Use more than one wire for each voltage (connecting them as described in Table 1-3) so that the edge connector does not overload and burn.

Connecting Video Display Wires

NOTE

The JAMMA harness provides only negative composite sync. If your video display requires separate positive sync, see Chapter 3 for alternative wiring.

Connect the wires designated for the red, green and blue video guns along with the sync and ground wires, according to Table 1-3.

Connecting Coin Door Wires

1. Connect the wires on the JAMMA harness to the coin switches and meter according to Table 1-3.
2. Connect one terminal of the door lamps to one of the BK/W wires. Connect the other terminal of the door lamps to the R wire supplying +5V.

NOTE

***Do not** use –5V for the coin door lamps. The –5V is required for audio. If you do not have (or use) –5V, the maximum power to the speaker will be reduced.*

Some games have separate power supply outputs for the coin door lamps. If you choose to use these outputs, make sure you connect both terminals of each lamp to the terminals on the power supply.

Connecting the Control Wires

Connect the joystick harnesses and the button harnesses to the JAMMA harness according to the information in Table 1-3.

Grounding the Cabinet

Find the ground lead (green) of the 115V input power line. Connect this lead in daisy-chain fashion to a bare metal part of the coin door, the control panel, the video display, and the power supply. **This is required for the safety of the players.** This AC ground must be of #18 AWG wire or larger.

Checking the JAMMA Connections

Before plugging in the game PCB, turn on the power to the game, and check +5 Volts on pins 3, 4, C, and D of the JAMMA connector; +12 Volts on pins F and 6; and –5 Volts on pins E and 5. Check that the video display and the attraction lamp have power.

Now turn off the power to the game.

Installing the ThunderJaws Game PCB

1. After you have checked the power on the JAMMA connector, above, install the ThunderJaws game PCB in the cabinet. Use the nylon standoffs and four #6-32 screws in the kit.
2. Connect the JAMMA connector to the PCB.
3. Turn on the power to the game. Check that the game PCB functions. If a video picture is not present, see Chapter 3.

4. Bundle the loose wires together with tie wraps, and secure all wiring harnesses away from the PCB.

Installing the Bezel, Labels, Decals, and Attraction Assembly

The kit parts are shown assembled in a cabinet in Figure 1-2.

Installing the Display Bezel

Find the cardboard display bezel (part no. 047809-01). Measure the size of the existing display bezel and cut the new display bezel to size, if necessary.

Installing the Product ID and FCC Label

Place the product ID label (part no. 038158-01) and FCC label (part no. 039450-01) on the back of the cabinet.

Installing the Side Panel Decals

Find the side panel decals. Wet the left and right side panels of the cabinet with slightly soapy water. Then position the decals as shown in Figure 1-2. Remove any wrinkles in the artwork using a squeegee. Allow the sides to dry.

Installing the Attraction Assembly

Find the ThunderJaws attraction shield and the attraction film. Using the existing shield as a template, cut the shield and film to size, if necessary. Install them on the cabinet as shown in Figure 1-2.

Setting the Coin and Game Options

Set the coin and game options in the self-test. See Chapter 2 for information about the option settings.

Game Play

This section of the manual describes the theme of the ThunderJaws game and the game play features.

Introduction

The beautiful, brilliant, but quite insane Madam Q has devised a plot to destroy the surface of the Earth and leave her underwater city intact. She has created an army of genetically mutated humans and bionic warriors to protect her labs, bases and city and to carry out her mad schemes.

You are a member of a underwater special forces unit and have been selected to infiltrate Madam Q's headquarters and stop her demented plans before she can destroy the world.

The only known operation of Madam Q's vast underwater empire is a research station located on Paradise Island in the South Pacific. You will be taken there to begin your mission. You are directed to take this station, shut it down, and learn as much as possible about the whereabouts of other parts of Madam Q's empire...good luck!

Game Play

One or two players can enter the game at any time with ThunderJaws' buy-in and game continuation features. In a one-player game, if a player "dies", he can add coins to continue, and he will be restarted at the last checkpoint completed. To start or continue a two-player game, the second player will be flown in on a jet pack to join (or rejoin) player one.

Controls consist of one eight-position joystick and two buttons per player ("Fire/attack" and "Jump"). In the swimming mode, Fire shoots the current weapon and Jump gives an extra flipper boost.

In the surface waves the player is in a walking mode and the controls have a variety of movements. Fire shoots the current weapon or attacks the enemy hand-to-hand. Fire with the joystick in the up position will fire the weapon at a 45° angle upwards. On the surface levels, the Jump button allows the player to jump over objects to the left or right. With the joystick in the up position, Jump will make the player jump higher and reach upper walkways; with the joystick down, the player can jump to lower walkways. The joystick can also be used in front of levers to activate playfield animations and to climb up and down ladders.

Players can retrieve air tanks (in the water) and first-aid kits (on the surface) for extra health. Flashing special weapons can provide extra fire power. The special weapons include the Uzi, Flamethrower, Super-Seeker, Explosive Bolt, and Triple Shot.

As the game begins, players are dropped off underwater by a mini-sub outside a coral reef which borders Paradise Island. Players must fight Madame Q's divers and cybernetic sharks that guard the entrance to her lab.

Upon gaining entrance to the underwater city, players shed their scuba gear and find themselves

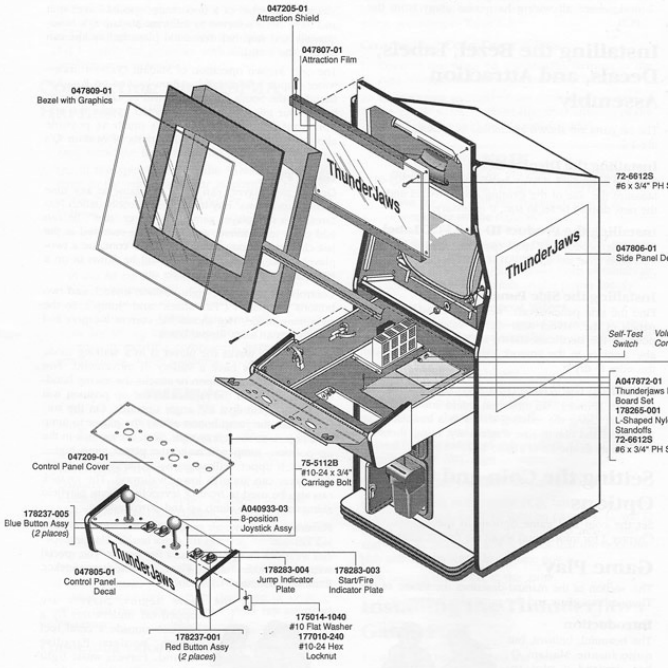


Figure 1-2 ThunderJaws Kit Parts Installed in a Cabinet

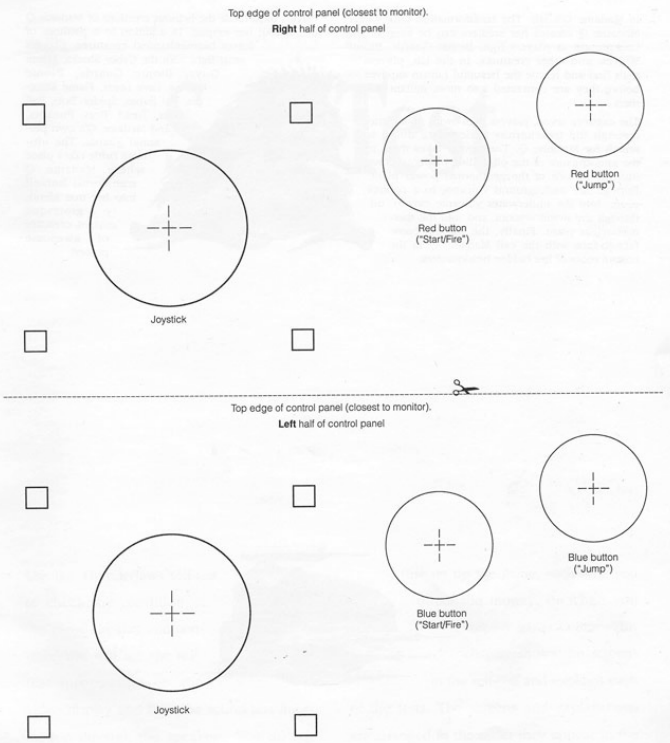
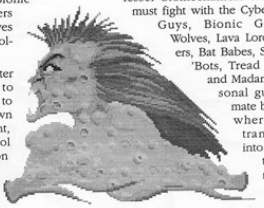


Figure 1-3 Control Panel Template

in Madame Q's lab. The transformation tank where Madame Q creates her soldiers can be seen in the background as players fight Bionic Guards, Bionic Wolves, and other creatures. In the lab, players must find and rescue the beautiful human captives before they are converted into more mutant soldiers.

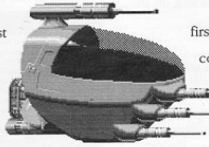
The captives saved, players then swim underwater through the treacherous toxic waste dump to search for Madame Q. Their quest takes them to the infrastructure of the oil drilling platform, down into the bowels of the geothermal power plant, through the underground volcano, to a control room, into the underwater volcanic cavern, on through the monitor room, and into the thermonuclear plant. Finally, the players come face-to-face with the evil Madame Q in the control room of her hidden headquarters.



Players must battle the heinous creations of Madame Q throughout her empire. In addition to a plethora of lesser biomechanical creatures, players must fight with the Cyber Sharks, Manta Guys, Bionic Guards, Bionic Wolves, Lava Lords, Flame Dancers, Bat Babes, Spider 'Bots, Rail 'Bots, Tread 'Bots, Punkers, and Madame Q's own personal guards. The ultimate battle takes place where Madame Q transforms herself into her true identity: a grotesque mutant creature of awesome power!

CHAPTER 2

Self-Test



Use the ThunderJaws self-test to check the condition of the game circuitry and controls. You will see the self-test information on the video display and hear the sound test information through the speakers. You do not need any additional equipment to perform the self-test. Perform the self-test when you first set up the game, each time you collect the money, or when you suspect game failure. This chapter shows the screens in the self-test and explains each of the tests. The screens and explanations are arranged in the order they appear in the self-test. Table 2-1 lists all the self-test screens and their purposes.

Table 2-1 Summary of the Self-Test Screens

Select Test Menu
Statistics
Game Options
Coin Options
Sound Board Test
Switch Test
Complete RAM Test
Video RAM (looping)
Color RAM (looping)
Common RAM—Video ONLY (looping)
Common RAM—Secondary ONLY (looping)
Common RAM—BOTH processors (looping)
All RAM (re-start)
Exit RAM tests
Complete ROM Test
Dual Playfield Test
Motion Object Test
Alphanumeric Test
Color Test
Purity Test
Red Color Purity
Green Color Purity
Blue Color Purity
White Color Purity
Grey Color Purity
Convergence Test
White Convergence
Violet Convergence
Green Convergence

Entering and Exiting the Self-Test

To enter the self-test, turn on the self-test switch on the game PCB. Exit the self-test by switching off the self-test switch at any time.

Select Test Menu

Choose which test or screen you want to see from this menu, shown in Figure 2-1. Move up and down the menu using the left joystick. Choose the screen by pressing the left fire button.

Statistics

Use the information shown on the statistics screen (see Figure 2-2) to keep track of your game use and maximize your profits. Record the information on the ThunderJaws statistics page in the back of this manual.

The statistics are collected from the last time the statistics were cleared. You can clear the statistics by pressing the left Jump button.

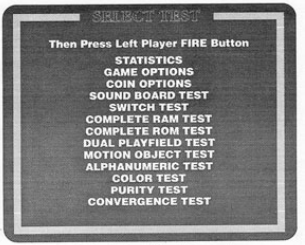


Figure 2-1 Select Test Menu Screen

- *Left Coins* shows the number of coins counted in the left coin mechanism.
- *Right Coins* shows the number of coins counted in the right coin mechanism.
- *New Games* shows the number of unique games played. A unique game is counted from the moment the first player started to the time the last player quit, regardless of how many times the game was continued.
- *Cont Games* shows the number of games that players continued.
- *Total Games* shows the sum of new and continued games.
- *0 Plyr Min* is the number of minutes the game was idle.
- *1 Plyr Min* is the number of minutes the game was played by one player.

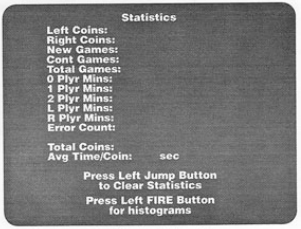


Figure 2-2 Statistics Screen

- *2 Plyr Min* is the number of minutes the game was played by two players.
- *L Plyr Min* is the number of minutes the game was played by the left player.
- *R Plyr Min* is the number of minutes the game was played by the right player.
- *Error Count* shows the number of errors counted in the erasable memory. If you have an error count, the statistics may be wrong. If you consistently have errors counted for several weeks, replace the EEROM at 12C.
- *Total Coins* is the number of coins put into both coin mechanisms.
- *Average Time Per Coin* shows the result of dividing the total time (1 and 2 player minutes) by the total number of coins (left and right coins).

Game Options

Check and select the game options on this screen, shown in Figure 2-3.

To move through the options, push the left joystick up or down. Change the option highlighted in red. The factory default settings are shown in lime green. To change a setting, move the left joystick right or left. To save the new settings, press the left fire button. This returns you to the menu screen. If you want to keep the original setting, although you have changed it, press the right fire button. This brings back the original setting. Use the left fire button to return to the menu screen.

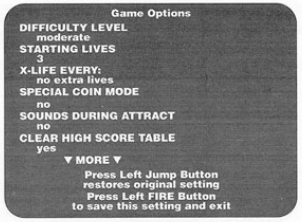


Figure 2-3 Game Options Screen

> **NOTE**
>
> *The word* More *appears at the bottom of the screen to indicate more options. Push the left joystick down to see the rest of the options.*

The game options, with defaults, are shown and explained in Table 2-2.

Coin Options

Check and select the coin options on this screen, shown in Figure 2-4.

To move through the options, push the left joystick up or down. Change the option highlighted in red. The factory default settings are shown in lime green. To

Table 2-2 Game Option Settings

Option	Settings		Explanation
Difficulty Level	Easy	Moderate ✦	
	Hard	Hardest	
Starting Lives	2,	3 ✦, 4, 5	
Extra Life Every:	10,000 points	25,000 points	
	50,000 points	No extra lives ✦	
Special Coin Mode	Yes		2 credits to start, 1 credit to continue
	No ✦		No special cost to start
Sounds During Attract	Yes ✦	No	Lets you turn the sound on or off in the attract mode.
Clear High Score Table	Yes	No ✦	Lets you manually clear the high-score table.
Auto Clear High Score Table	Yes ✦	No	If set to *yes*, clears the high-score table periodically.
Restore Factory Options	Yes	No ✦	Lets you set all the game options to the factory options or lets you use your own settings. Make sure you set this to *no* to use your own chosen settings.

✦ *Manufacturer's recommended settings*

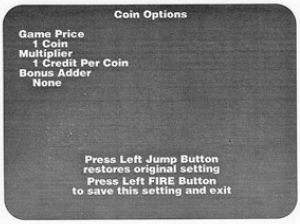


Figure 2-4 Coin Options Screen

change a setting, move the left joystick right or left. To save the new settings, press the left fire button. This returns you to the menu screen. If you want to keep the original setting, although you have changed it, press the right fire button. This brings back the original setting. Use the left fire button to return to the menu screen.

The coin option settings, with defaults, are shown and explained in Table 2-3.

Sound Board Test

The sound test indicates the condition of the sound effects circuit on the game PCB. The sound test screen appears in Figure 2-5.

Use the left joystick to select the sound and press the left jump button to listen to it. (You could have numerous sounds playing simultaneously, depending on which ones you select.) You can also see the state of the two coin mechanism switches in this test: "0" indicates off, and "1" indicates on or closed.

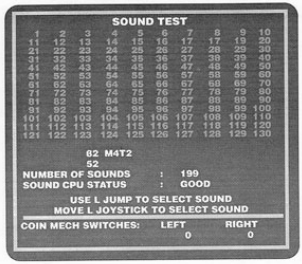


Figure 2-5 Sound Test Screen

Pressing the right jump button stops all sounds, and pressing the left fire button returns you to the menu screen.

Switch Test

The switch test screen is shown in Figure 2-6. Test the buttons and joysticks. As you use each control, highlighting appears around its name on the screen. If the highlighting does not appear, check the connections, switches, and coin mechanism.

Table 2-3 Coin Option Settings

Option	Settings	Explanation
Game Price	1 coin ✦ 2 coins 3 coins 4 coins	The number of coins required for one credit.
Multiplier	1 credit per coin ✦ 2 credits per coin 3 credits per coin ... 8 credits per coin	The number of coins each coin counts as in either coin mechanism.
Bonus Adder	None ✦ 2 coins give 1 extra coin 4 coins give 1 extra coin 4 coins give 2 extra coins 5 coins give 1 extra coin 3 coins give 1 extra coin Free Play (for demonstration mode)	Lets you choose bonus coins, no bonus, or free play.

✦ *Manufacturer's recommended settings*

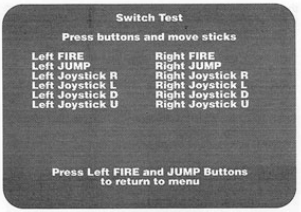


Figure 2-6 Switch Test Screen

Press the left fire and jump buttons simultaneously to return to the menu screen.

Complete RAM Test

Use this selection screen, shown in Figure 2-7, to choose which RAM test you want to perform. Use the different tests according to Table 2-4.

If you get an error in any of the RAM tests, see Table 2-5 for more information. If you have serious RAM problems, you may see only a colored screen. If this happens, see Table 3-5.

To choose a test, move the box to the test name and press the left fire button. For all of the looping RAM tests, holding down the Fire button will cause the test to end when the current loop is completed. For some of these tests, this could take as long as several minutes. When the test ends, the screen will display the number of errors detected. Pressing the Fire button again will return you to the RAM test selection screen.

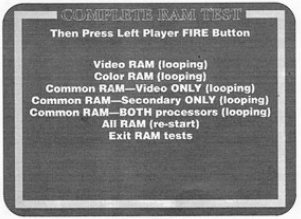


Figure 2-7 Complete RAM Test Screen

Table 2-4 When to Run the RAM Tests

Problem	Type of Test	Location of RAMs Tested
Playfield is erratic or looks wrong.	Video RAM	6/7H, 8H
Motion objects are erratic or not working properly.	Video RAM	
Colors look wrong.	Color RAM	6C, 7C

Table 2-5 Bad RAM Location by Error Address

Error Address	RAM Location High	Low
3F0000	6/7H	8H
3E0000	7C	6C

Return to the menu screen by moving the box to the words *Exit RAM Tests*, then press the left fire button to return to the menu screen.

Selecting the *Common RAM—Secondary Only* or the *Common RAM—Both* test will also perform a communications test with the secondary processor before actually testing the RAM. If the message *ERROR: NO COMMUNICATION WITH P2* is displayed, there is a problem with either the common RAM on the secondary processor circuitry itself. If you have already successfully run the *Common RAM—Video ONLY* test, then the problem lies with the secondary processor. If the *Video ONLY* test also fails, the problem is probably with the common RAM itself.

Complete ROM Test

The ROM test screen is shown in Figure 2-8. The ROM checksums appear. If the game has no ROM errors,

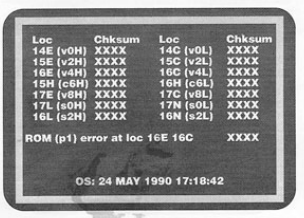


Figure 2-8 Complete ROM Test Screen

you are asked to return to the menu screen by pressing the left fire button.

The location and checksum of each ROM are displayed on the screen. The data in parentheses indicates which processor the ROM is connected to (v = video, s = secondary, and c = common), its address range in 10000 hex (0, 2, 4, 6, and 8 indicate 00000 through 80000), and whether this is the high or low (H or L) data byte.

If the game does have ROM errors, the ROM test screen will remain until the ROM error information is complete, as shown in Figure 2-8. The ROM error test takes a few seconds.

The locations of the bad ROMs are indicated on the screen. Press the left fire button to return to the menu screen.

As part of the ROM test, the game also performs a communications test with the secondary processor. If the message *ERROR: NO COMMUNICATIONS WITH P2* is displayed, the checksums for the secondary processor ROMs will not be reported. You should run the RAM tests *Common RAM—Video ONLY, —Secondary ONLY,* and *BOTH* to determine the cause of the failure.

If you think you have a ROM error, but the screens show no messages, see Table 3-3 for information about the locations of various ROM functions.

Dual Playfield Test

The dual playfield test screen, shown in Figure 2-9, tests the transparency, movement, and color of various objects on both playfields.

Pressing either of the two right two buttons allows you to switch to a new rear and front playfield picture. Pressing the left jump button brings the rear playfield to the front, or sends the front playfield to the rear.

Use the left joystick to move the front playfield, and the right joystick to move the rear playfield. Press the left fire button to return to the menu screen.

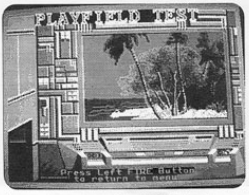


Figure 2-9 Dual Playfield Test Screen

Motion Object Test

The motion object test screen, shown in Figure 2-10, tests the movement and color of various game objects.

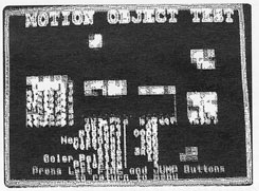


Figure 2-10 Motion Object Test Screen

Choose an object with the right joystick. Use the left joystick to move the object. Press the left fire button to go to the menu screen.

Alphanumerics Test

The alphanumerics test, shown in Figure 2-11, checks the condition of the alphanumerics in the game.

In the ROM at 4M are eight separate banks of alphanumeric stamps. Pressing the left jump button cycles through all eight of these banks.

If you see an error on the screen, check the EPROM at 4M. Press the left fire button to go to the menu screen.

Figure 2-11 Alphanumerics Test Screen

Color Test

This test indicates the dynamic range of the video display color circuit. The screen is shown in Figure 2-12.

The screen should show four bands (white, red, green, and blue from top to bottom), ranging from dark to

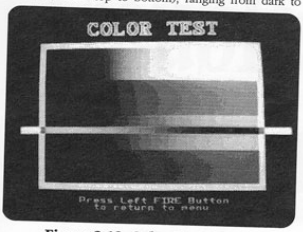


Figure 2-12 Color Test Screen

bright, left to right. In addition, you can use the left joystick to move a thin horizontal band that "stains" or inverts the video level of whatever area it is positioned over.

If the screen does not match this description, adjust the video display as described in the video display manual. Pressing the right jump button toggles the screen between 32 and 64 color levels. Pressing the left jump button alternately removes and shows the border, horizontal band, and text.

Return to the menu screen by pressing the left fire button.

Color Purity Test

The color purity test has five screens. Each screen is a rectangle of color. The first screen, shown in Figure 2-13, is red. The other screens, which you can see by pressing the left jump button, are green, blue, white, and gray.

These screens show the adjustment of the color purity of the video display. Each screen should display a rectangle of color, with no curving at the corners, no unevenness of color, and no lines in the display.

If the screens are not correct, adjust the video display as described in the video display manual.

Return to the menu screen by pressing the left fire button.

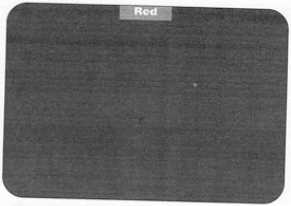


Figure 2-13 Color Purity Test Screen

Convergence Test

The convergence test has three screens: first white, then violet, and finally green. The white screen is shown in Figure 2-14. To see the violet and green

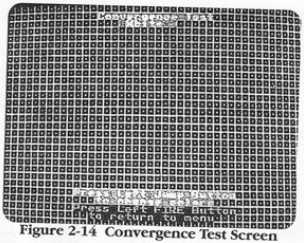


Figure 2-14 Convergence Test Screen

screens, press the left jump button. If necessary, move the grid pattern by moving the left joystick. Press the left fire button to go to the menu screen.

Check the following on the screens:

- The grid lines should be straight within 3.0 mm and the lines should not pincushion or barrel.
- The convergence of the lines on the violet and white screens should be within 2.0 mm.

If these screens do not meet these criteria, adjust the video display as described in the video display manual.

NOTES

CHAPTER 3

Troubleshooting and Maintenance

This chapter contains troubleshooting tables and repair procedures for your ThunderJaws game. The chapter has two parts. The first part contains three troubleshooting tables. The first table has general troubleshooting information, the second table contains the voltage levels and test points on the game printed-circuit board (PCB), and the last table describes ROM-caused problems with specific ROMs to check and replace. The last part of the chapter has information about connecting the video display if it requires separate positive sync, repair information for the joystick assembly, and locations of the RAMs and ROMs on the game PCB.

Table 3-1 Troubleshooting Table

Problem	Suggested Action
Coin Don't Register	1. Check the wiring to the coin mechanism. 2. Check the voltage to the + side of the mechanism. 3. Test the coin mechanisms with the sound test screen in the self-test.
Game Play Problem	1. Check the harness and connectors. 2. Perform the self-test. 3. Check the voltage levels on the PCB. See Table 3-2, *Voltage Inputs and Test Points.* 4. Check *What ROM Problems Look Like,* Table 3-3, for specific ROM problems. See Figure 3-1 for ROM locations.
Joystick Problem	1. Has the joystick been lubricated with white lithium grease? If not, lubricate it. 2. Check the harness and connectors. 3. Check the switches on the joystick. 4. If you took the joystick apart, have you reassembled it correctly? 5. Make sure all the parts on the joystick are in good repair. Repair or replace parts.
Sound Problem	1. Is the speaker volume turned up? 2. Check the voltage on the JAMMA connector. 3. Check the wiring from the PCB to the speaker. 4. Check the voltage level to the PCB. See Table 3-2, *Voltage Inputs and Test Points.* 5. Replace the speaker.
Video Display Problem	
Sync problems.	Does your display need separate positive sync? See the *Video Display Sync Problems* section in this chapter.
Screen is dark.	1. Is the game plugged in? 2. Is the game turned on? 3. Are the connections good? 4. Is the line fuse good? 5. Is the display brightness turned up? 6. Are the solder connections on the line filter and transformer good? 7. Is the JAMMA connector on the PCB tightly connected? 8. Check all of the items below. If you answer *no* to any question, you have a problem with the video display, not with the game circuitry. See your video display service manual. a. Do you have power to the video display? b. Are the video display's filaments lit? c. Do you have high voltage to the video display? 9. Is the voltage level to the video display PCB correct? (Power voltage is 100 VAC or 110 VAC, depending on the type of video display. Video signal voltage is 0.5 to 3.5 Volts.) 10. If the level is not correct, check the connectors and the harness.
Only a colored screen appears.	You probably have a serious RAM problem. See Table 3-5, *Colored Screens Indicating Bad RAMs.*
Display area wavers or is too small.	1. Do you have voltage to the video display PCB? 2. Do you have high voltage to the video display?
Picture is wavy.	1. Is the monitor ground connected to the monitor? 2. Are the sync inputs connected properly? Does your monitor need a separate positive sync? See the *Video Display Sync Problems* section in this chapter.
Picture is upside down.	Switch the horizontal or vertical yoke wires on the display. **WARNING:** Avoid high-voltage electrical shock. High voltages continue to exist even after power is disconnected in the display circuitry and the CRT. Discharge the high voltage from the CRT before servicing it. See the instructions on page iv.
Convergence, purity or color problems.	Use the screens in the self-test to adjust the video display.
Picture is not centered.	Use the centering procedures in your video display manual. If that does not center it, read the section *Horizontal Shifting,* on page 3-3.

Table 3-2 Voltage Inputs and Test Points on the PCBs

Voltage	Test Point or LED	Source and Purpose
		ThunderJaws Game PCB:
+5 ± 0.25 VDC	$V_{cc}1$	Logic power from the switching power supply.
	CR1 LED	Lights when 5 V is applied to the PCB and the reset (RST) jumper is open.
		JSA Audio II PCB:
	CR5 LED	Lights when the +12 V supply is good.
	CR4 LED	Lights when the –5 V supply is good.
	CR3 LED	Lights when the +5 V supply is good.
+12V	+V0P (pin 4 of LM324)	+12 V from the switching power supply. Positive supply for the analog circuitry.
–5V	–V0P (pin 11 of LM324)	–5V from the switching power supply (if connected). Negative supply for the analog circuitry.

Table 3-3 What ROM Problems Look Like

Problem	ROM Causing the Problem	Check the ROM at:
Program works but the motion objects or playfield are wrong.	Graphics	1P–17P, 1R–17R, 1S–17S
Garbage on screen; program doesn't work.	Program ROMs	14C–17C, 14E–17E, 16L, 17L, 1N, 3N, 16N, 17N
No sound.	Audio ROM	1B on JSA Audio II PCB
Erratic or wrong ADPCM sounds	ADPCM ROMs	7D–7K

Video Display

Sync Problems

Some video displays cannot use the composite negative sync that is on the JAMMA connector. The ThunderJaws kit includes a standard Atari Games video connector (located at 4A) that provides separate positive sync. Refer to Table 3-4 and make the appropriate connections for your video display.

For other problems, see the video display manual that came with your game.

Table 3-4 Atari Games Video Connector Pin Assignments

Pin	Signal
1	Red
2	GND
3	Key
4	Green
5	GND
6	Blue
7	GND
8	GND
9	Negative composite sync
10	Positive V sync
11	Positive H sync

Joystick Assembly

The joystick is shown in Figure 3-1. If you want to repair the joystick, disassemble it by removing the E-ring at the bottom of the shaft and removing the screws.

ROMs and RAMs

If you have think you have bad ROMs or RAMs, preform the ROM or RAM test in the self-test. If you see only a colored screen and cannot enter the self-test, see Table 3-5. If you have a ROM problem, see Table 3-3. For the location of all the ROMs and RAMs on the game PCB, see Figure 4-3.

Table 3-5 Color Assignments for RAM Errors Encountered

Color	RAM
Red	Video
Black	Color or Common
Anything else	VAD chip or associated video circuits

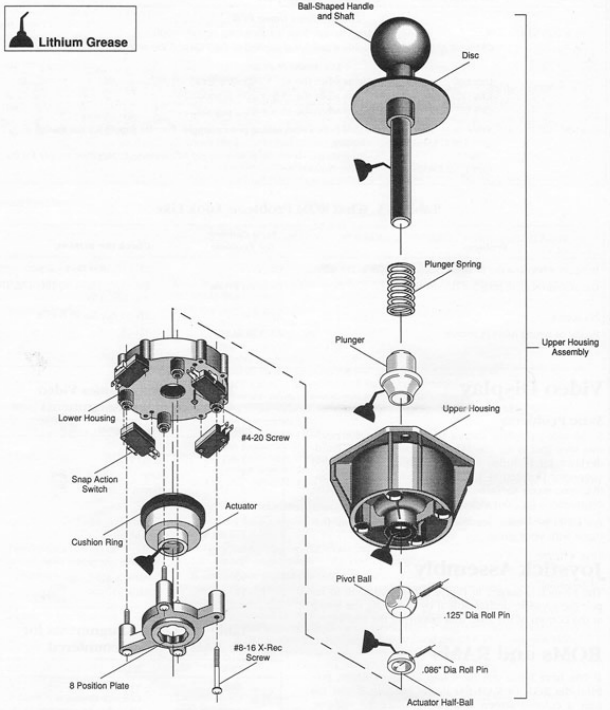


Figure 3-1 Maintaining the Joystick Assembly

CHAPTER 4

Parts Illustrations

This chapter provides information you need to order parts for your game. When you order parts, give the part number, part name, the number of this manual, and the serial number of your game. With this information, we can fill your

order rapidly and correctly. We hope this will create less downtime and more profit from your games. Atari Games Customer Service phone numbers are listed on the inside front cover of this manual.

Figure 4-1 ThunderJaws Kit Parts List A047800-01 A

Part No.	Description
047205-01	Attraction Shield
047209-01	Control Panel Cover
047805-01	Kit Control Panel Decal
047806-01	Side Panel Decal
047806-02	Poster
047807-01	Attraction Panel Film
047809-01	19-Inch Bezel With Graphics
141026-001	.50-Inch I.D. Split Ferrite Bead
160044-001	Snap-Action Switch
175014-1040	#10 Flat Washer
177010-240	#10-24 Hex. Polymer Locknut
178032-002	#10-24 Wire & Cable Tie
178237-001	Red Button Assembly
178237-005	Blue Button Assembly
178265-001	Nylon L-Style Standoff
178283-003	Plastic Start/Fire Indicator Plate
178283-004	Plastic Jump Indicator Plate
72-6612S	#6 x 3/4-Inch-Long. Type PH, Cross-Recessed Type-AB Screw
75-5112B	#10-24 x 3/4-Inch-Long Black Carriage Bolt
A040933-03	8-Way Joystick Assembly
A046501-01	JAMMA Harness Assembly
A047872-01	ThunderJaws PCB Board Set Assembly. Consists of the following items:
A047364-01	ThunderJaws Game PCB Assembly (see Figure 4-3)
A047184-04	JSA Audio II PCB Assembly (see Figure 4-4)
177000-536	6-32 Nylon Nut
178278-616	#6 Threaded PCB Support Standoff
TM-349	ThunderJaws Universal Kit Installation Instructions

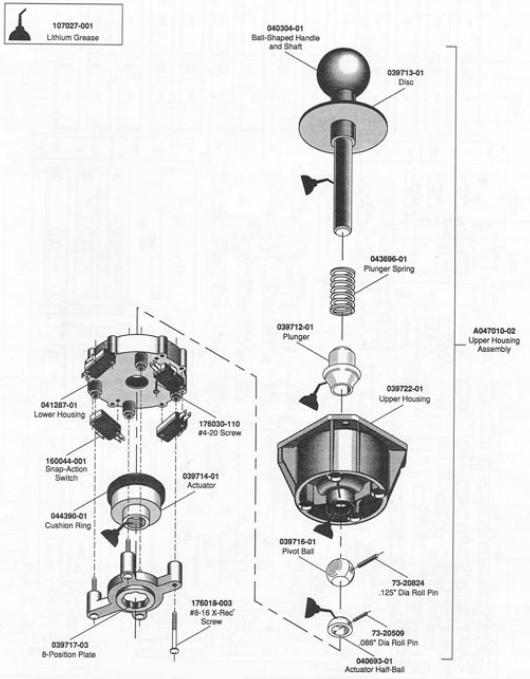


Figure 4-2 Microswitch Joystick Assembly
A040933-03 B

Part No.

047205-0
047209-0
047805-0
047806-0

047806-0
047807-0
047809-0
141026-0

160044-0
175014-
177010-
178032-

178237-
178237-
178265-
178283-

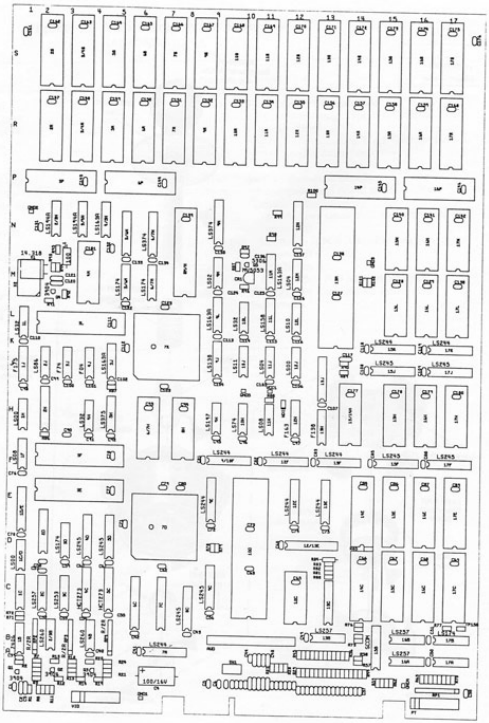


Figure 4-3 ThunderJaws Game PCB Assembly
A047364-01 D

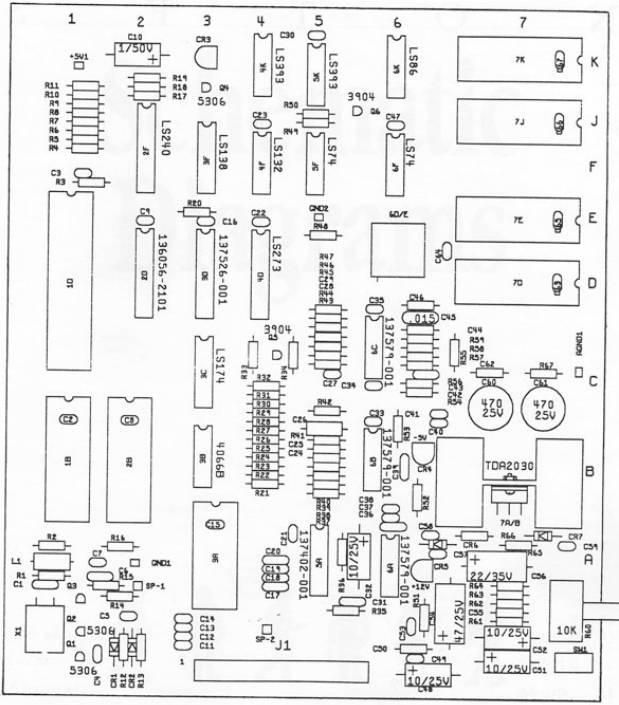
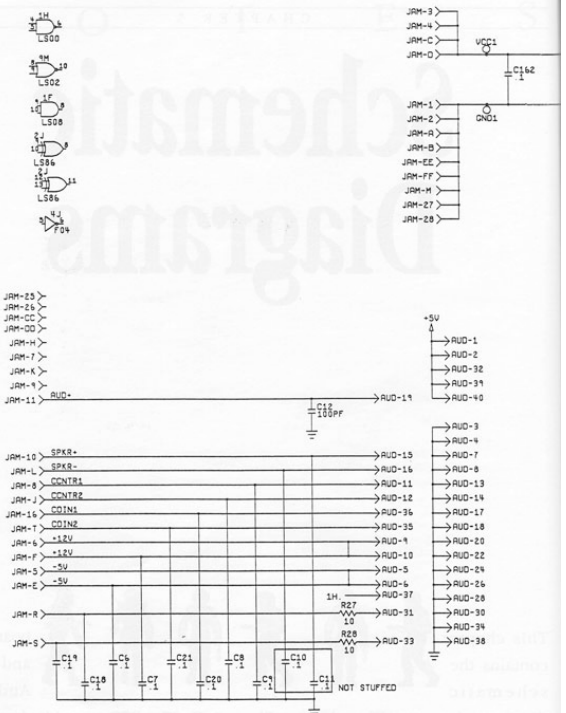


Figure 4-4 JSA Audio II PCB Assembly
A047184-04 A

CHAPTER 5

Schematic Diagrams

This chapter contains the schematic diagrams for your ThunderJaws™ universal kit. The schematics are of the ThunderJaws game printed-circuit board (PCB) and the JSA Audio II PCB. (The PCB assembly drawings are illustrated in Chapter 4, *Parts Illustrations.)*



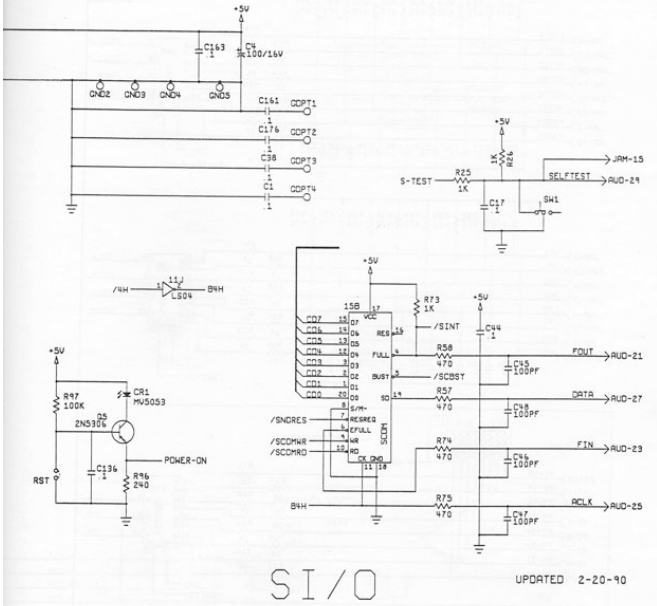
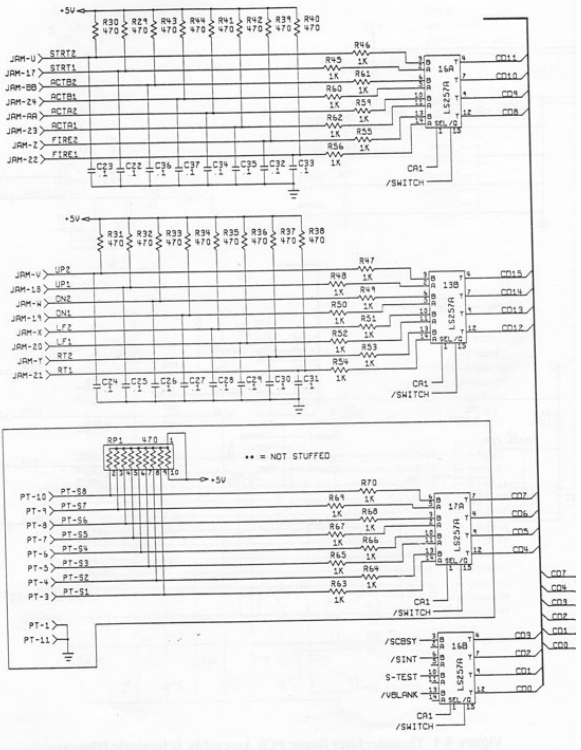


Figure 5-1 ThunderJaws Game PCB Assembly Schematic Diagram

047363-01 A



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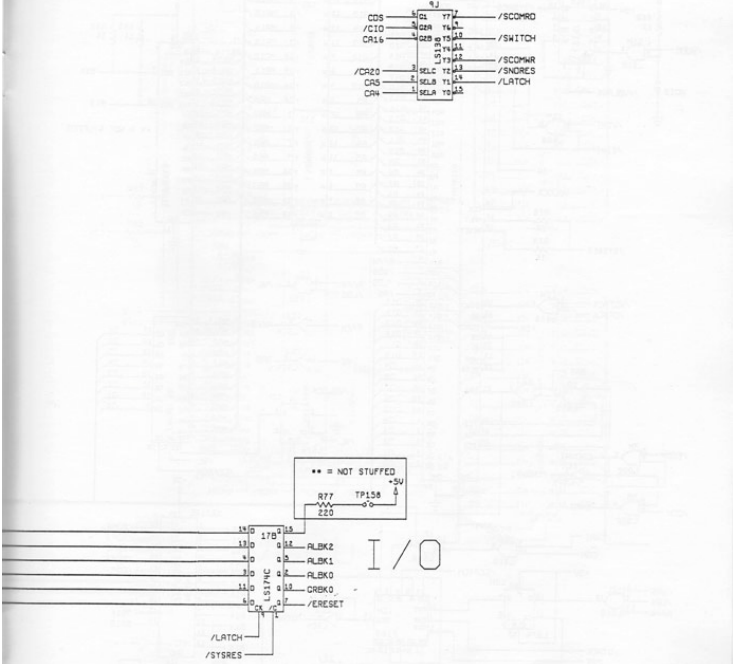
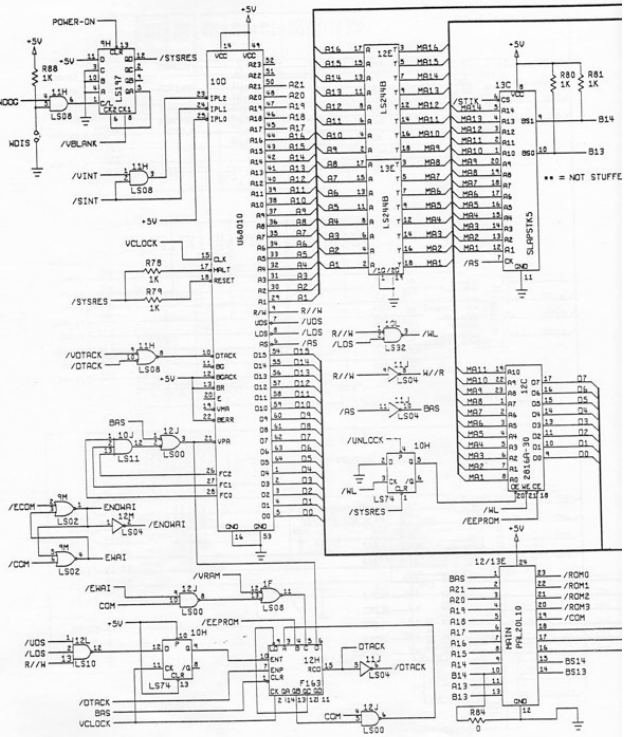


Figure 5-1 ThunderJaws Game PCB Assembly Schematic Diagram

047363-01 A



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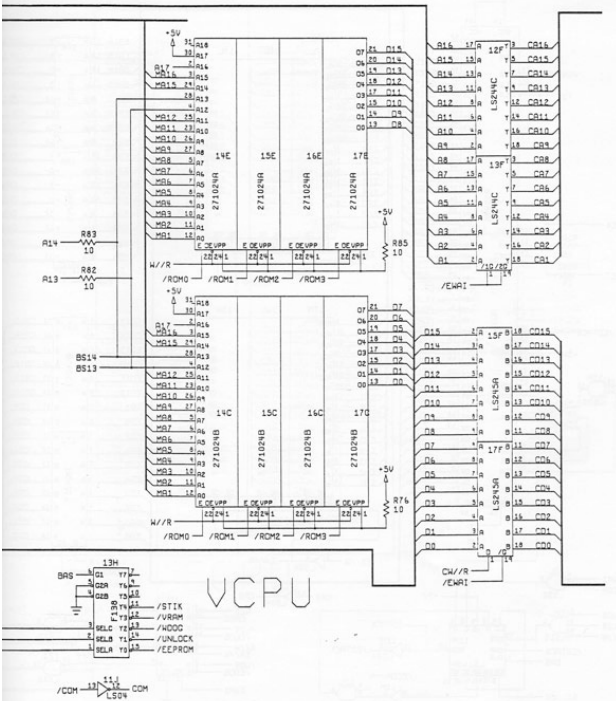
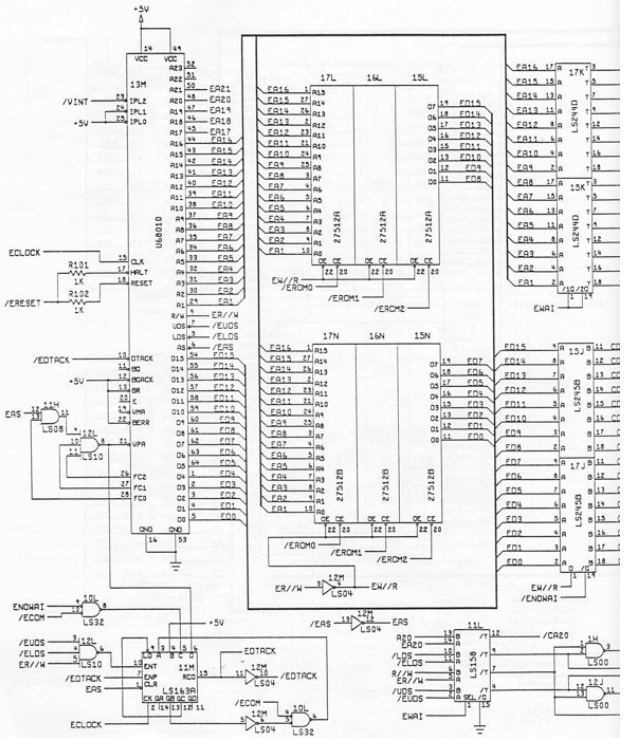


Figure 5-1 ThunderJaws Game PCB Assembly Schematic Diagram

047363-01 A



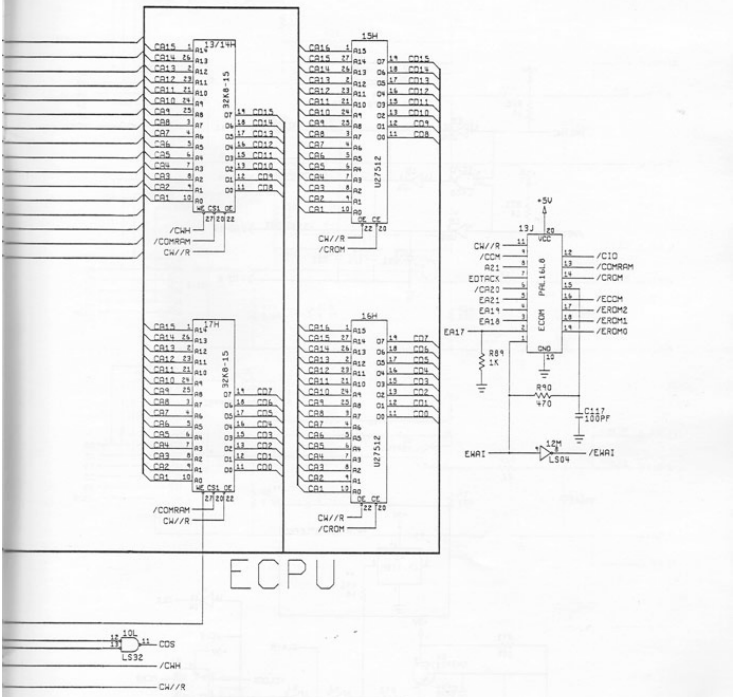
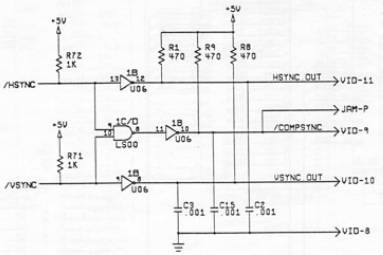
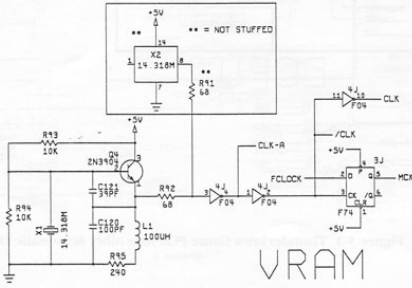


Figure 5-1 ThunderJaws Game PCB Assembly Schematic Diagram

047563-01 A



** NOT STUFFED



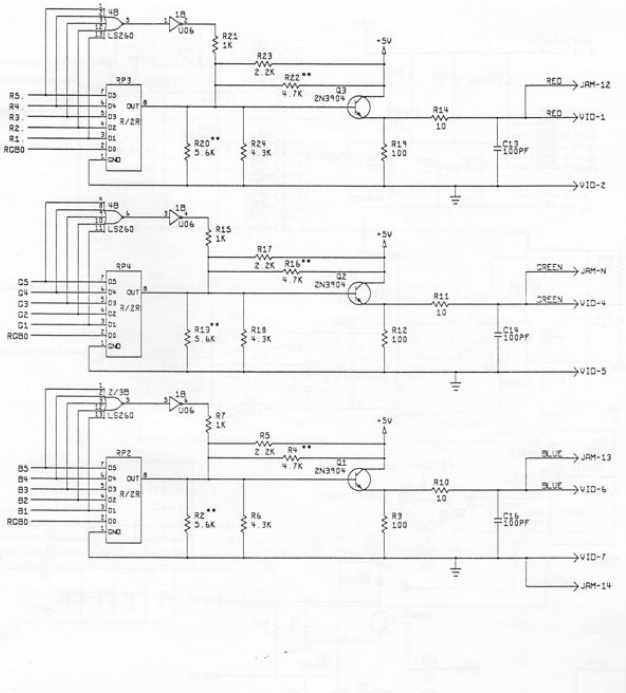
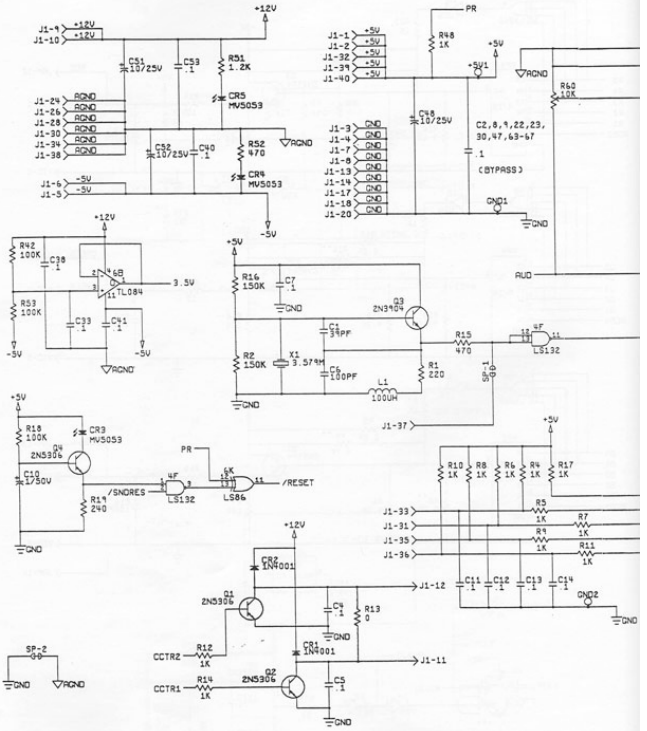


Figure 5-1 ThunderJaws Game PCB Assembly Schematic Diagram

047503-01 A



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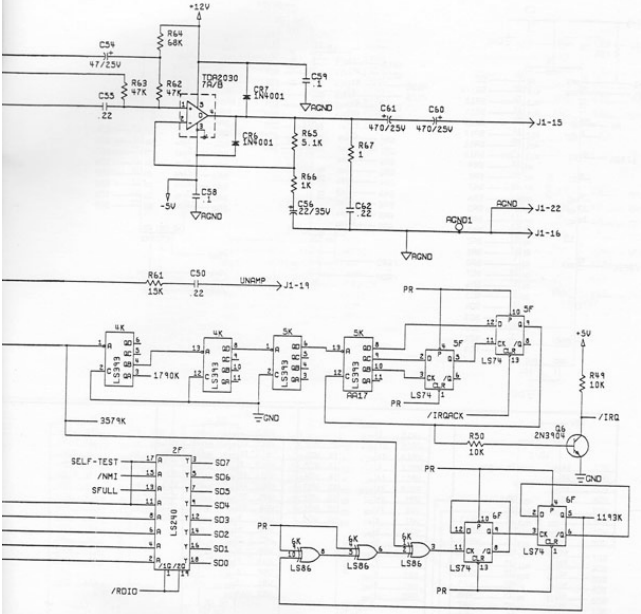
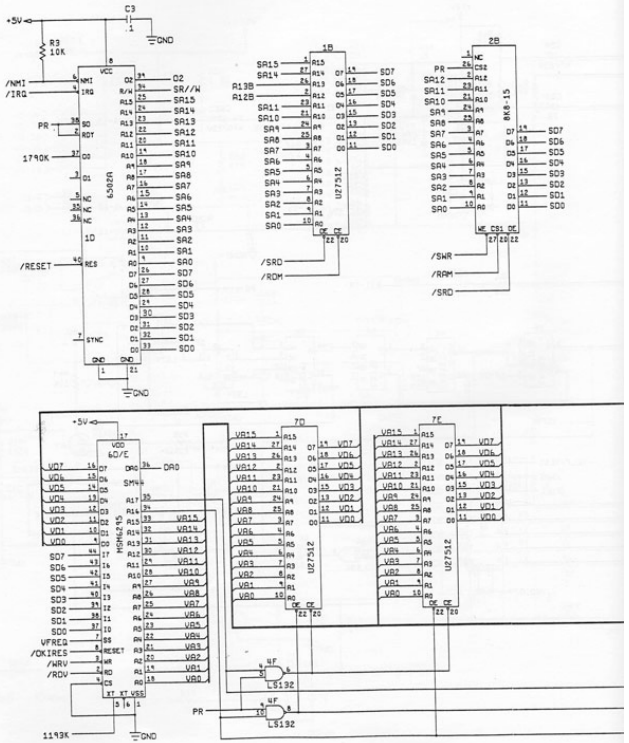


Figure 5-2 JSA Audio II PCB Assembly Schematic Diagram

046487-01 A



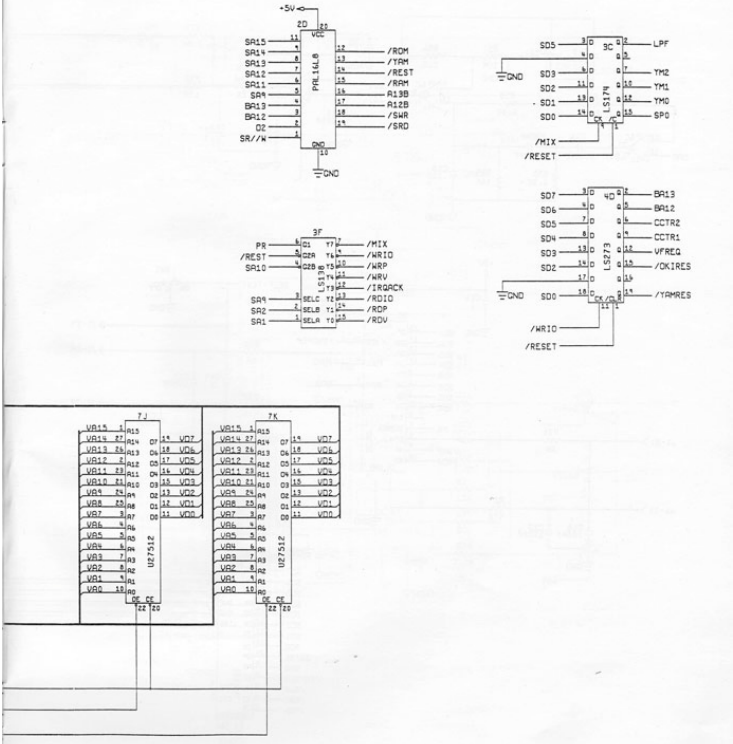
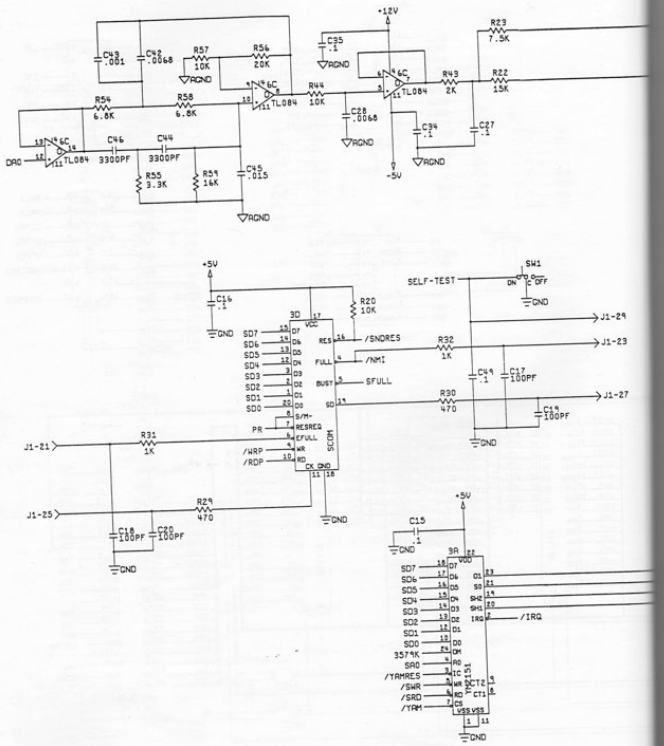


Figure 5-2 JSA Audio II PCB Assembly Schematic Diagram

046487-01 A



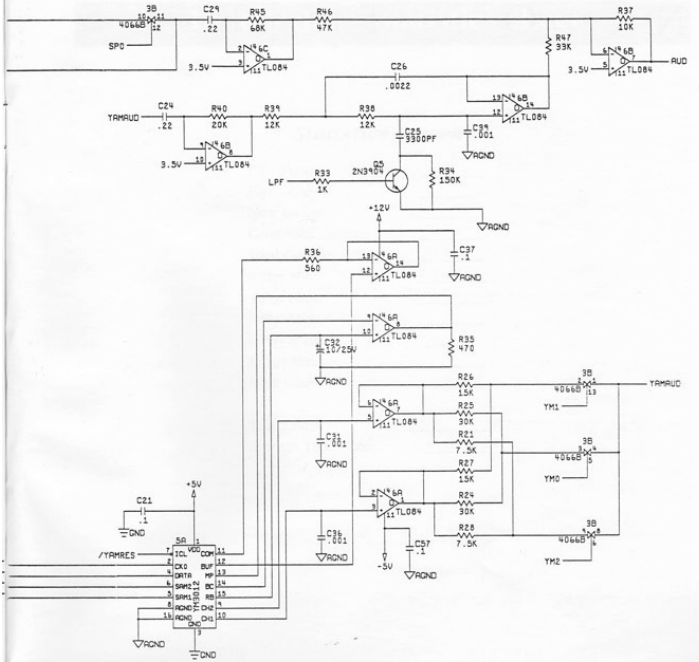


Figure 5-2 JSA Audio II PCB Assembly Schematic Diagram

046487-01 A

ThunderJaws Statistics Sheet

Statistics Screen

Plyr 0 Coins:	_____
Plyr 1 Coins:	_____
New Games:	_____
Continued Games:	_____
Total Games:	_____
0 Plyr Mins:	_____
1 Plyr Mins:	_____
2 Plyr Mins:	_____
L Plyr Mins:	_____
R Plyr Mins:	_____
Error Count:	_____
Total Coins:	_____
Average Time/Coin:	_____

ATARI GAMES

Warranty

Seller warrants that its printed-circuit boards and parts thereon are free from defects in material and workmanship under normal use and service for a period of ninety (90) days from date of shipment. Seller warrants that its video displays and laser-video disc players (in games supplied with displays and video-disc players) are free from defects in material and workmanship under normal use and service for a period of thirty (30) days from date of shipment. None of the Seller's other products or parts thereof are warranted.

If the products described in this manual fail to conform to this warranty, Seller's sole liability shall be, at its option, to repair, replace, or credit Buyer's account for such products which are returned to Seller during said warranty period, provided:

(a) Seller is promptly notified in writing upon discovery by Buyer that said products are defective;

(b) Such products are returned prepaid to Seller's plant; and

(c) Seller's examination of said products discloses to Seller's satisfaction that such alleged defects existed and were not caused by accident, misuse, neglect, alteration, improper repair, installation, or improper testing.

In no event shall Seller be liable for loss of profits, loss of use, incidental or consequential damages.

Except for any express warranty set forth in a written contract between Seller and Buyer which contract supersedes the terms herein, this warranty is expressed in lieu of all other warranties expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose, and of all other obligations or liabilities on the Seller's part, and it neither assumes nor authorizes any other person to assume for the Seller any other liabilities in connection with the sale of products by Seller.

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ATARI GAMES

Supplement to the Thunder Jaws™ Kit Manual (TM-349)

Please replace the "Coin Options" section (page 2-4) of the Thunder Jaws™ Manual with this page.

Coin Options

The coin options are explained below. The settings, with defaults, are shown in Table 2-3.

- *Coin Mode* is the number of coins required for one credit.
- *Right/Left Mech Multiplier* is the number of coins each coin counts as in the coin mechanisms.
- *Bonus Adder* lets you choose bons coins, no bonus, or free play.

Table 2-3 Coin Option Settings

Option	Settings
Coin Mode	1 coin 1 credit✦
	2 coins 1 credit
	3 coins 1 credit
	4 coins 1 credit
Right Mech Multiplier	1 coin counts as 1 coin✦
	4 coins count as 1 coin
	5 coins count as 1 coin
	6 coins count as 1 coin
Left Mech Multiplier	1 coin counts as 1 coin✦
	1 coin countas as 2 coins
Bonus Adder	No Bonus Adder✦
	2 coins give 1 extra coin
	4 coins give 1 extra coin
	4 coins give 2 extra coins
	5 coins give 1 extra coin
	3 coins give 1 extra coin
	Free Play (for demonstration mode)

✦ Manufacturer's recommended settings

SER. NO. JAN0316

ROM Test

If the message "ROM (p2) error at loc 16L 16N XXXX" appears during this test instead of the message "ALL ROMS OK", it should be IGNORED! This message is indicating that two UNUSED locations are bad (there are NO parts stuffed into locations 16L and 16N).