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DESTROYER™



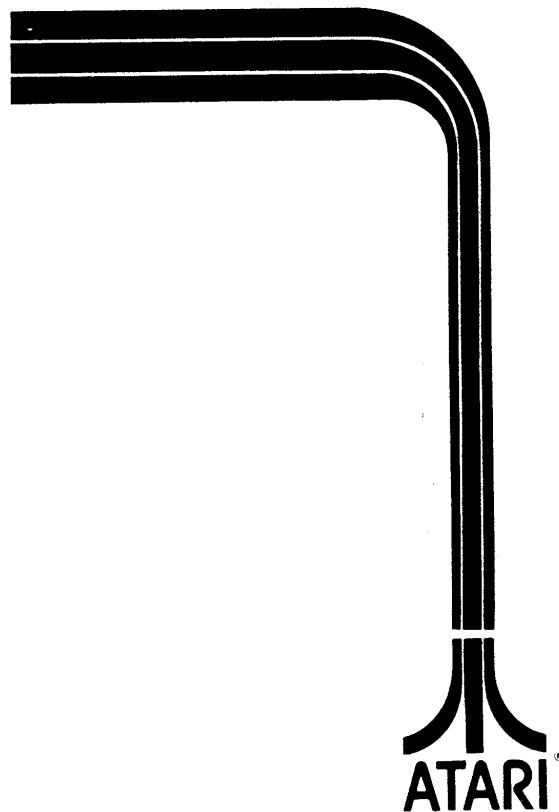
Operation, Maintenance and Service Manual
Complete with Illustrated Parts Catalog

DESTROYERTM

Operation, Maintenance and Service Manual

Complete with Illustrated Parts Catalog

ATARI INC
1265 BORREGAS AVENUE
P.O. BOX 9027
SUNNYVALE, CALIFORNIA 94086
408/745-2000 • TELEX 35-7488



A Warner Communications Company 

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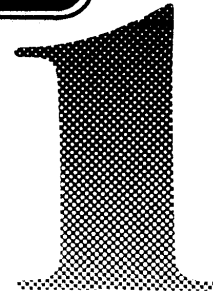
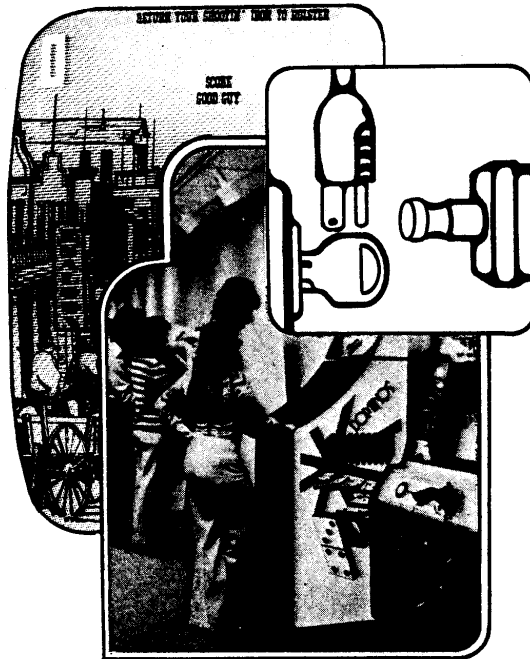
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LOCATION SETUP

A. INTRODUCTION

Atari's Destroyer™ is a one player computer controlled game that simulates anti-submarine warfare. The object of the game is to sink as many submarines as possible. A player controls the speed of the destroyer, the time at which the depth charges are released, and the depth at which depth charges explode. Point value of submarines depends on both the speed and the depth at which the submarines travel.

As the owner of Destroyer, you have certain options available in the game. The options include: the number of coins necessary to play the game, how long the game will last, and whether or not extended play is awarded. These options are selected by removing the game printed circuit board from the metal RF box and setting the desired switches.

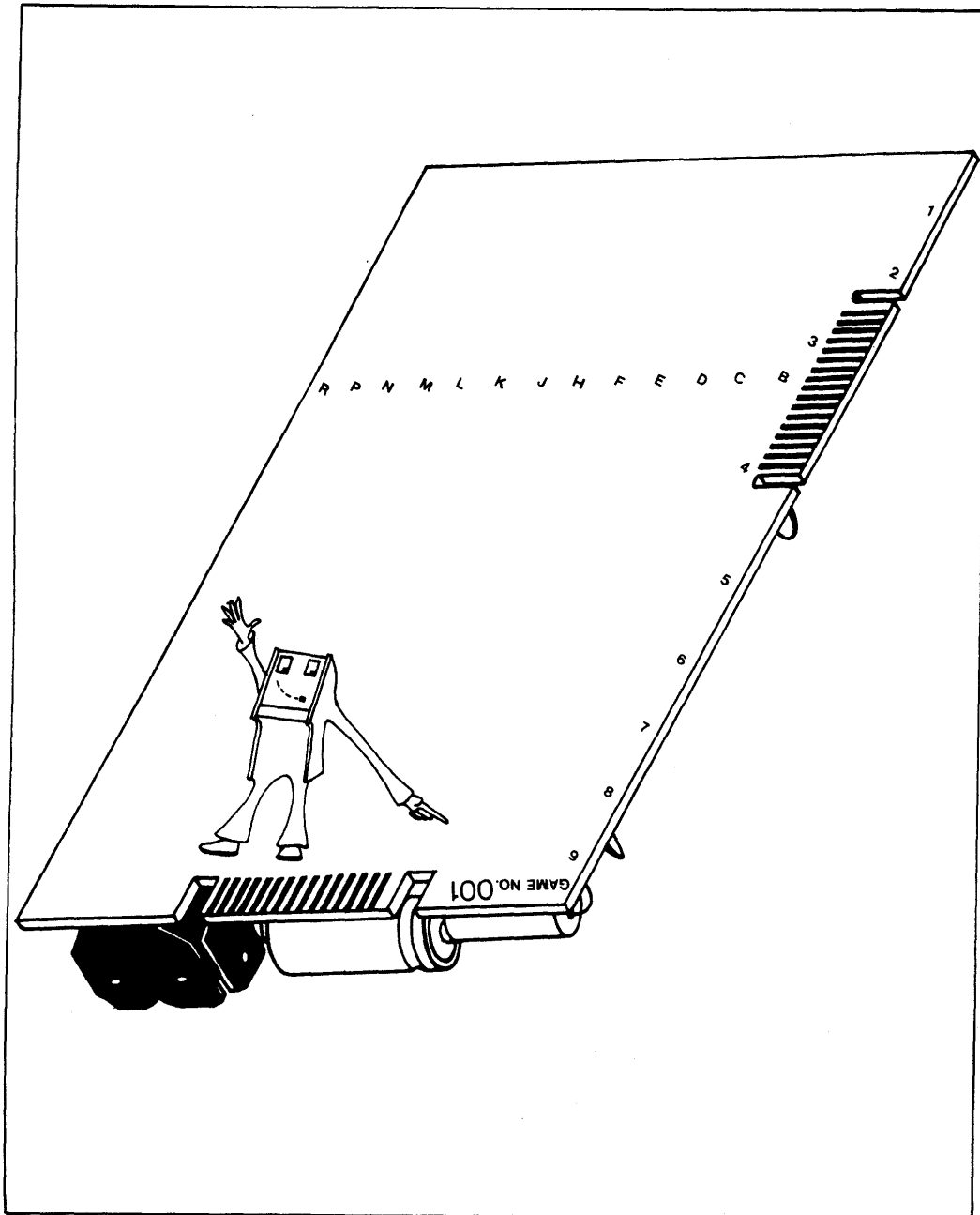


Figure 1-1 Location of Serial Number on Game PCB

Destroyer, like all recent Atari video games, has a self-test feature that tests approximately 75% of the game's circuitry. By energizing the self-test feature, you can determine whether the game is operating properly.

B. GAME INSPECTION

Your new Destroyer game is manufactured by Atari with the intent of being ready to play right out of the shipping carton. However, we need your cooperation in supplying the last touch of quality control. Therefore, please follow the procedures below to ensure that you are getting the quality of game that you expect from Atari.

1. Examine the external parts of the game cabinet for dents, chips, or broken parts. If you have purchased this game as a new unit, make sure that it looks new.
2. Unlock and open the rear access door. Examine the inside of the game cabinet for anything that appears broken or out of place.

C. LOCATION OF SERIAL NUMBER

The serial number for Destroyer is located on a metallic label in the upper left-hand corner of the back of the game cabinet. This serial number also appears in the corner (common to both edge connectors) on the back of the PCB inside the game cabinet. See Figure 1-1.

D. INSTALLATION REQUIREMENTS

All special requirements for installing the game are listed as follows:

Power Requirements:

Atari ships Destroyer for domestic operation on 110 VAC, rated at approximately 150 watts. The game can be changed to operate at 95 VAC, 205 VAC, or 220 VAC by unplugging the Molex connector plug (see Figure 1-2 for location of plug), and plugging in another Molex connector plug.

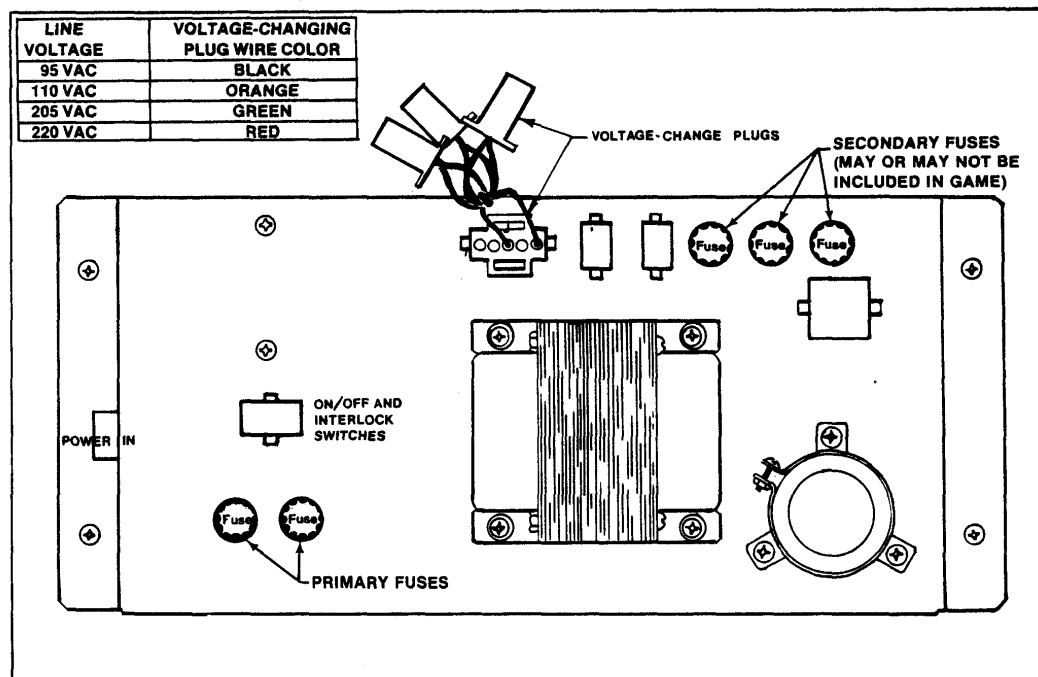


Figure 1-2 Location of Voltage-Changing Plugs on the Power Supply

Temperature Range:

Location and storage temperature ranges should be no lower than zero degrees Celsius (32 degrees Fahrenheit), and no higher than 49 degrees Celsius (120 degrees Fahrenheit).

Humidity Range:

Relative humidity at the game location or storage area should not exceed 95%.

Location Space Required:

Destroyer requires a minimum of 185 centimeters (73 inches) of vertical clearance, a minimum of 75 centimeters (29.5 inches) of width clearance, and 152 centimeters (60 inches) of depth clearance. Depth clearance includes a minimum of 61 centimeters (24 inches) of player space.

Type of Power Cord:

Atari has added a strain relief power cord to Destroyer. The advantage of the strain relief cord is that, if tripped over, the cord will break off. Tripping over a non-strain relief cord may result in ripping out the inside of the game.

E. INTERLOCK AND POWER ON/OFF SWITCHES

To minimize the hazard of electrical shock while you are working inside the game cabinet, an interlock switch has been installed at the rear access door. This switch removes all power from the game while the access door is open.

To help you conserve energy, a power on/off switch has been installed on the right side of the top panel, near the front of the game cabinet. See Figure 1-3 for location of switches.

Please check for the proper operation of the rear access interlock switch by performing the following:

1. Unlock and open the rear access door.
2. Plug the AC power cord into a 110-volt source. (If the voltage is less than 100 VAC, make sure that the voltage plug is changed to the black plug.)
3. Set the power on/off switch to the on position by flipping the toggle switch toward the front of the game cabinet.
4. Close the rear access door. Within approximately thirty seconds the TV monitor should display a picture.

5. Slowly open the rear access door until the TV monitor picture disappears. The TV monitor picture should disappear when the rear access door is opened to less than one-inch at the top of the door.
6. Close and lock the rear access door. If the results of Step 5 are satisfactory, then the interlock switch is operating properly. If not satisfactory, check to see if the switch is broken from its mounting or stuck in the on position.

F. SELF-TEST PROCEDURE IN TABLE 1-1

Destroyer will test itself and provide data to communicate with you that the game's circuitry and controls are working properly. We suggest that you do the Destroyer self-test procedure each time you empty the coins from the game's cash box.

There are two tests performed with the self-test switch on. The first test is done completely by the Destroyer computer. In this test, the computer displays the alpha-numeric character set, determines if its memory is ok, and then displays a code for the game time setting. The second test requires you to activate each switch to determine if they are operating properly. A third test is performed with the self-test switch off. In this test, you determine if the depth control and cursor are operating properly.

Perform the self-test by following the instructions in Table 1-1.

G. OPERATOR OPTIONS IN TABLE 1-2

At this time, decide what options are best suited for your location of the Destroyer game. The coinage options on Destroyer are free play, 2 games per coin, 1 game per coin, or 2 coins per game. Destroyer also has a time option for a 50-second, a 75-second, a 100-second, or a 125-second game. A free play mode may also be set for demonstration.

Set the options of the game as described in Table 1-2. Refer to Table 1-2 for the location of the option controls.

H. FOREIGN LANGUAGE TRANSLATION

Translation of the English language, used on the TV monitor display, is easily accomplished by adding two read-only memories (ROMs). These ROMs provide translation into German, French, and Spanish. After adding these ROMs, the option

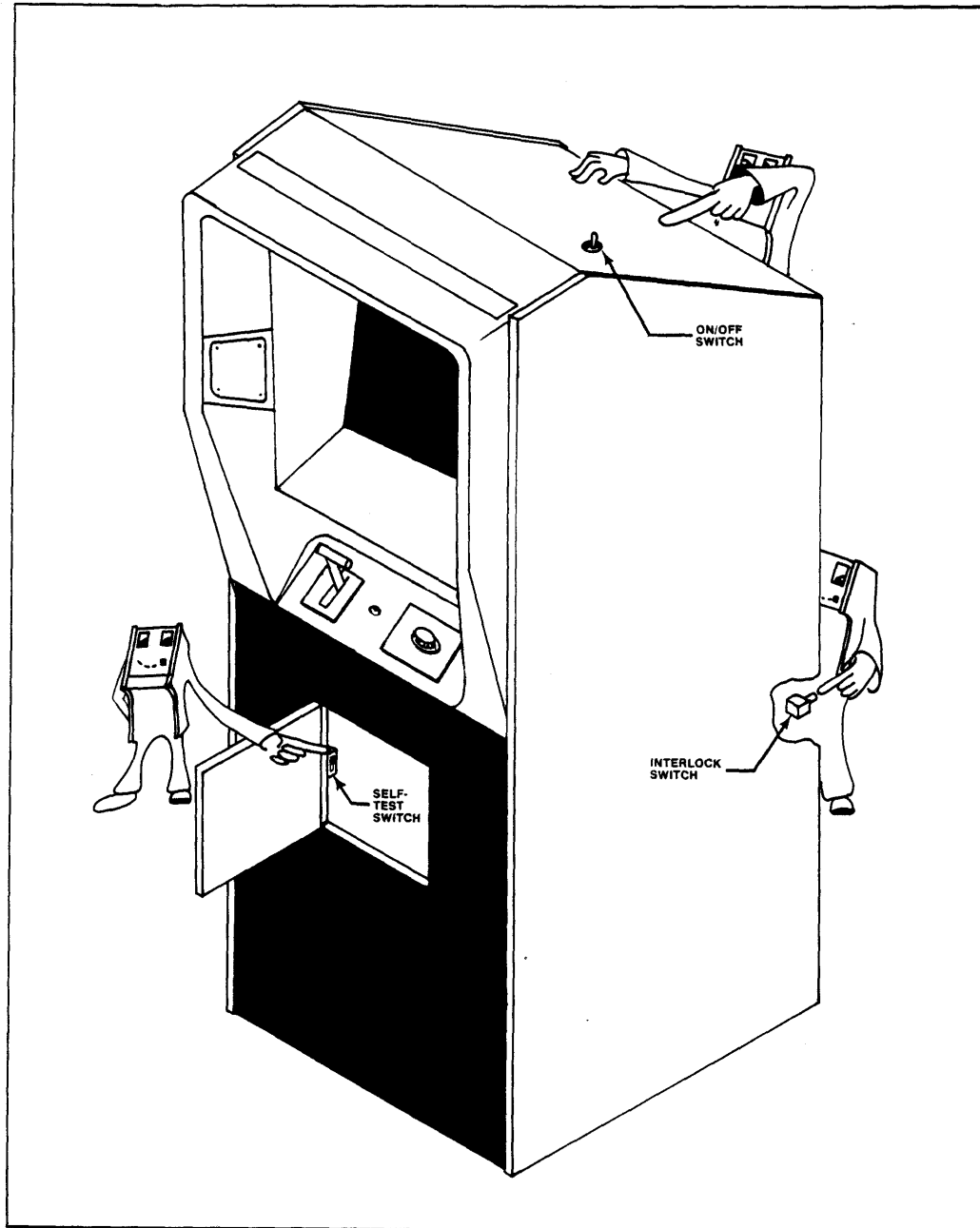


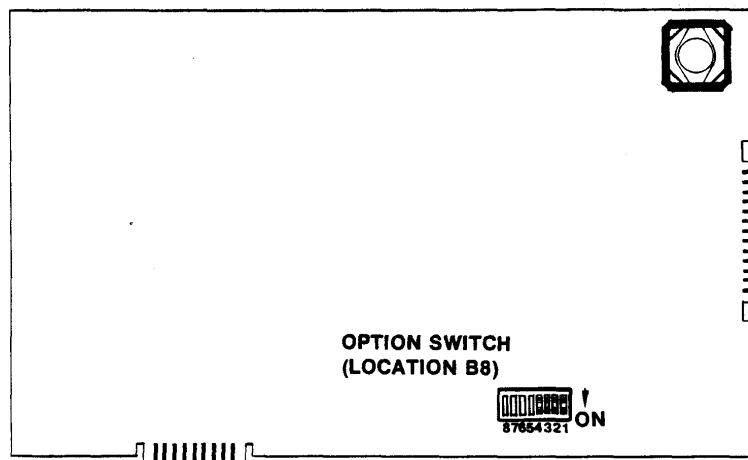
Figure 1-3 Location of Power On/Off and Interlock Switches

Table 1-1 Destroyer Self-Test

Test	Instruction	Results if Test Passes	Results if Test Fails
1	Unlock and open the coin door. Set self-test slide switch (located inside and to the left of the coin door) to the <i>on</i> position.	<p>Top displayed line on TV monitor is numeric characters 0 through 9, displayed twice.</p> <p>Second displayed line on TV monitor is Alphabetic characters A through Z.</p> <p>Third displayed line on TV monitor is RAM OK ROM OK.</p> <p>Fourth displayed line on TV monitor is a single digit indicating the setting of the game timer as follows: 0 = 50 second game 1 = 75 second game 2 = 100 second game 3 = 125 second game</p>	<p>One or more numeric character is missing.</p> <p>One or more alphabetic characters is missing.</p> <p>Third displayed line on TV monitor is BAD RAM and/or BAD ROM.</p>
2	<p>Press START pushbutton.</p> <p>Move DESTROYER SPEED CONTROL from one position to the other and back again.</p> <p>Press the DEPTH-RELEASE CONTROL.</p> <p>Trip the left then the right coin acceptor trip wire.</p> <p>Close contacts of the coin door slam switch.</p>	<p>Sonar ping sound is heard each each time the START pushbutton is pressed.</p> <p>Sonar ping sound is heard each time the DESTROYER SPEED CONTROL is moved to FAST and each time it is moved to SLOW.</p> <p>Sonar ping sound is heard each time the DEPTH-RELEASE CONTROL is pressed.</p> <p>Sonar ping sound is heard each time a coin acceptor trip wire is tripped.</p> <p>Sonar ping sound is heard each time the slam switch contacts are closed.</p>	<p>No sound is heard.</p> <p>No sound is heard.</p> <p>No sound is heard.</p> <p>No sound is heard.</p> <p>No sound is heard.</p>
3	Set self-test slide switch to off position. Trip one of the coin acceptor trip wires for a game credit. Rotate knob marked ROTATE TO SET DEPTH OF CHARGE fully clockwise, then fully counterclockwise.	Dashed horizontal line moves up when knob is rotated in one direction and down when rotated in the other direction.	Dashed horizontal line does not move or is not present at all.

Table 1-2 Option Switch Settings

Option	Option Switch Settings					
	1	2	3	4	7	8
Free Play			ON	ON		
2 Plays per Coin			ON	OFF		
1 Coin Per Play			OFF	ON		
2 Coins Per Play			OFF	OFF		
50-Second Game	ON	ON				
75-Second Game	ON	OFF				
100-Second Game	OFF	ON				
125-Second Game	OFF	OFF				
No Extended Play					ON	ON
Extended Play for 1500 points					OFF	ON
Extended Play for 2500 points					ON	OFF
Extended Play for 3500 points					OFF	OFF



switches must be set for the proper language translation. See Table 1-3 for the proper option switch settings.

Table 1-3 Language Option Switch Settings

Language	Option Switch Setting	
	5	6
German	OFF	OFF
French	ON	OFF
Spanish	OFF	ON
English	ON	ON

The translation ROMs are available through Atari Customer Service. In your order, please include the serial number of your Destroyer game. Contact Atari Customer Service at the following address:

Atari Customer Service
2175 Martin Avenue
Santa Clara, California 95050

I. VOLUME CONTROL

If volume is incorrect for your location, remove the game PCB and adjust the volume to your desire. See Figure 1-4 for the location of volume control.

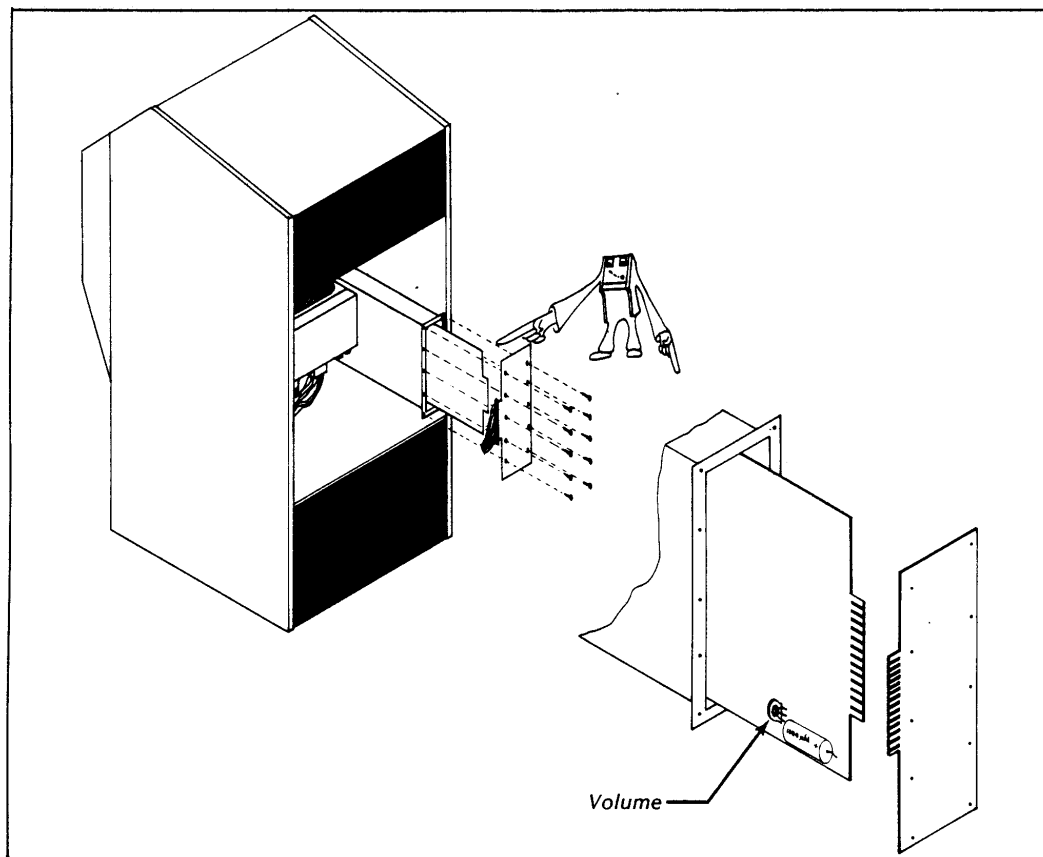


Figure 1-4 Location of Volume Adjustment



During game play, Destroyer operates in one of four modes: attract, ready-to-play, play mode, or game over mode.

A. ATTRACT MODE

The attract mode begins with the application of power and ends when the proper amount of coins are accepted. During this mode the most recent score appears in the upper left, the high score since power on appears in the upper right. The appropriate coin and extended play messages appear in the middle of the screen, according to the options you have selected. All controls and sounds are inactive during this mode. The submarines and the destroyer appear as in game play.

B. READY-TO-PLAY MODE

This mode begins when the proper number of coins are accepted, and ends when the START button is pressed. During this mode, the message PRESS START appears, coin messages disappear, the ships freeze on the screen and the depth control is enabled so that the player is familiar with it before the game starts.

C. PLAY MODE

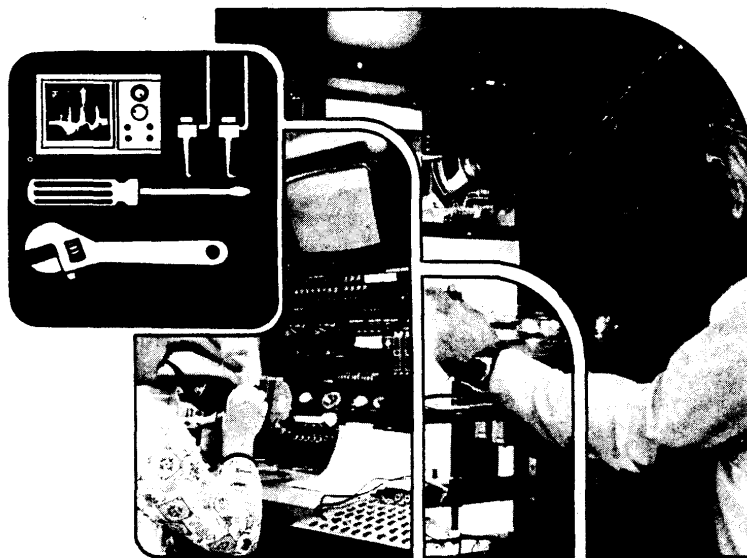
This mode begins when the START button is pressed and ends when the game is over. During this mode all controls and sounds are active. The player sets the depth at which charges explode by rotating the DEPTH-RELEASE CONTROL. Depth is indicated on the screen by a dashed horizontal line (called "the cursor"). Depth charges are released by pushing the DEPTH-RELEASE CONTROL. Once the depth charges are released, the depth cannot be reset. In other words, the charges always explode at whatever depth the cursor was set at when the charges were released. A direct hit is not necessary since the shock wave

from a near miss will crush the submarine's hull. The speed of the destroyer may be controlled by the DESTROYER SPEED CONTROL lever. The control has a SLOW and a FAST position that result in a distinctive change in the rate at which the Destroyer moves across the TV monitor. The engine sound changes accordingly.

When a depth charge explodes without hitting a submarine, a low "boom" sound is heard. When a sub is hit the explosion quality changes to cue the player (along with the explosion scene) that a submarine has been hit. Sonar pings are heard any time explosions aren't active. Points are displayed where the submarine was hit, after each explosion scene.

D. GAME OVER MODE

When the game ends, the words GAME OVER appear on the screen for approximately four seconds. Then, if there is credit, the machine enters the ready-to-play mode. If there is no credit the machine enters the attract mode.

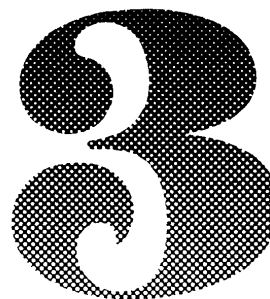


MAINTENANCE AND ADJUSTMENTS

Due to its solid-state electronic circuitry, this Atari unit should require very little maintenance and only occasional adjustment. Information given in this chapter and elsewhere in this manual is intended to cover most servicing situations that may be encountered at the game site. The procedures given are in sufficient detail to be understood by a person with moderate technical background.

If reading through this manual does not lead to solving a specific maintenance problem, you can reach Atari's Customer Service Department by telephone Monday through Friday, from 7:30 a.m. to 4 p.m. Pacific Time. From California, Alaska and Hawaii, call (408) 984-1900; from the remaining 47 states call (800) 538-6892 (toll-free).

If you are interested in gaining more information on video game technology, especially the electronics, we recommend reading the Video Game Operator's Handbook, manual number TM-043. This book is available from Atari, Inc., Attn. Customer Service Department, 2175 Martin Avenue, Santa Clara, CA 95050 for \$5 each, or from your distributor.



A. CLEANING

The exteriors of game cabinets and plex panels may be cleaned with any non-abrasive household cleaner. If desired, special coin machine cleaners that leave no residue can be obtained from your distributor. Do *not* dry-wipe the plex panels because any dust can scratch the surface and result in fogging the plastic.

B. COIN MECHANISM

Components On Coin Door

Figure 3-1 shows the back side of the coin door assembly where the game's two coin mechanisms are mounted. Included is the lock-out coil assembly; the lock-out wires are connected to this assembly but are hidden behind the coin mechanisms. During the attract mode the microcomputer energizes the lock-out coil, causing the lock-out wires to retract far enough to allow genuine coins to reach the coin box. But during the ready-to-play mode when the LED is lit, and during the play mode (and also when AC power to the game has been turned off), the lock-out coil is de-energized, causing the lock-out wires to move out far enough to divert coins over to the return chute.

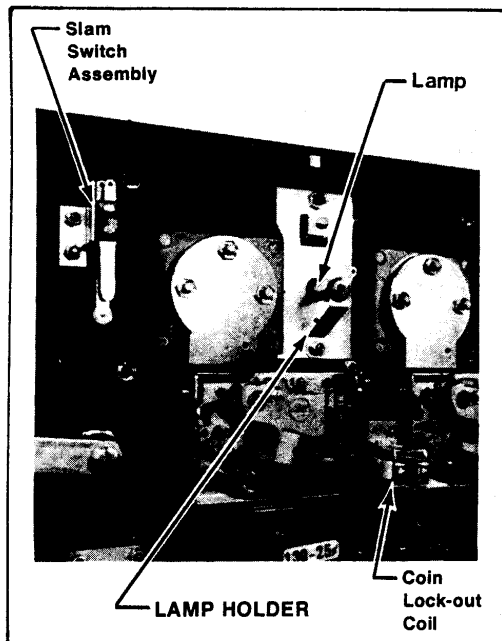


Figure 3-1 Coin Door Assembly

Directly below each coin mechanism is a secondary coin chute and a coin switch with a trip wire extending out to the front edge of the chute. When the trip wire is positioned correctly, a coin passing down the secondary chute and into the coin box will momentarily push the trip wire down and cause the switch contacts to close.

Also shown in the photograph is a slam switch assembly. It has been included to discourage any players who might try to obtain free game plays by violently pounding on the coin door to momentarily close the contacts on a coin switch. The slam switch contacts connect to the microcomputer system, which will ignore coin switch signals whenever the slam switch contacts are closed.

Access to Coin Mechanisms

To remove jammed coins, and for maintenance cleaning, each magnet gate assembly can be hinged open without removing it from the door, as shown in Figure 3-2. Or, if necessary, each coin mechanism can be entirely removed from the door merely by pushing down on a release lever and simultaneously tilting the mechanism back, then lifting it up and out. This is shown in Figure 3-3.



Figure 3-2 Hinging Open the Magnet Gate Assembly

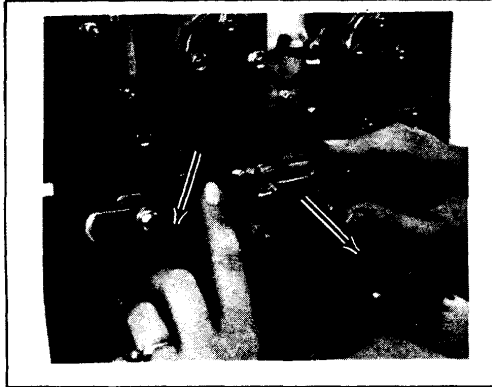


Figure 3-3 Removal of Coin Mechanism

Cleaning of Coin Paths

CAUTION

The use of an abrasive (such as steel wool or a wire brush) or a lubrication on a coin mechanism will result in a rapid buildup of residue.

By talking to many operators, we have found that the best method of cleaning a coin mechanism is by using hot or boiling water and a mild detergent. A toothbrush may be used for those stubborn buildups of residue. After cleaning, flush thoroughly with hot or boiling water, then blow out all water with compressed air.

Figure 3-4 shows the surfaces to clean inside the coin



Figure 3-4 Surfaces to Clean Inside the Coin Mechanism

mechanism. These include the inside surface of the mainplate, and the corresponding surface of the gate assembly. There may also be metal particles clinging to the magnet itself. To remove these you can guide the point of a screwdriver or similar tool along the edge of the magnet.

If coins are not traveling as far as the coin mechanisms, you will need to clean the channel beneath the coin slot. To gain access to this channel, use a $\frac{3}{8}$ -inch wrench and remove all three nuts that secure the cover plate (refer to Figure 3-5). Removing the plate will provide access to the entire channel.

Also clean the inside surfaces of the secondary coin chutes, but when doing this be careful not to damage or bend the trip wires on the coin switches.

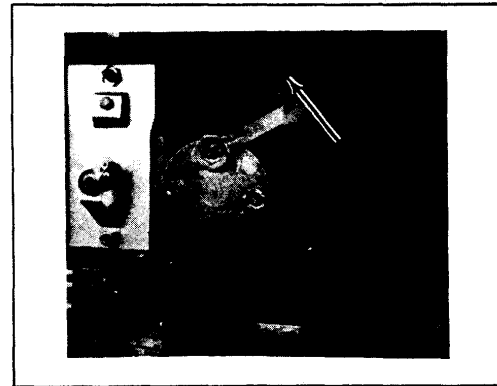


Figure 3-5 Removal of Plate Covering Rear of Coin Slot

Lubrication

Do *not* apply lubrication to the coin mechanisms. The only points that may need lubrication (and only rarely) are the shafts of the scavenger buttons (coin rejection buttons) where they pass through the coin door. Apply only one drop of light machine oil, and be positive that no oil drops down onto a coin mechanism. Figure 3-6 shows this lubrication point.

Adjustment of Coin Switch Trip Wire

In order for a coin switch to operate reliably when a coin travels down the secondary coin chute, the rest position of its trip wire should be as shown in Figure 3-7. Use extreme care when handling or touching these wires.

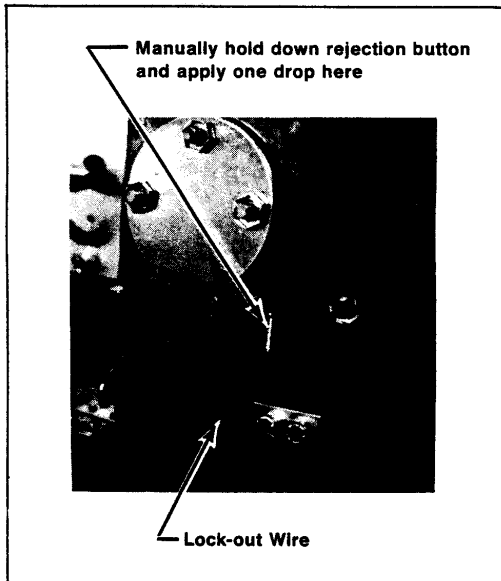


Figure 3-6 Close-Up View of Lubrication Point

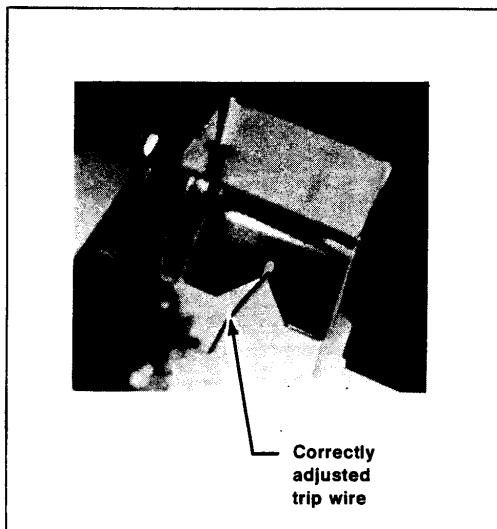


Figure 3-7 Detail View of Coin Switch and Trip Wire

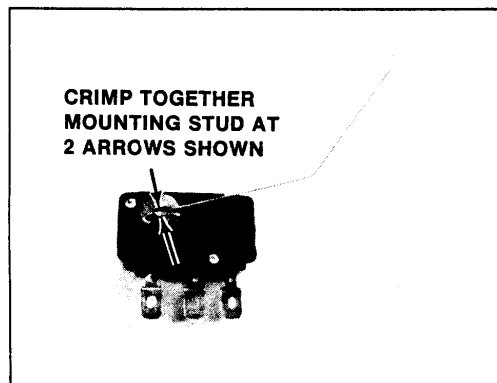


Figure 3-8 Securing the Coin Switch Trip Wire

Three problems can occur with trip wires—they can be too long, too short, or become loosened and fall off.

With a wire that is too long, you may have a problem of it catching on the opening in the cash box as a coin is accepted. You can cut off the end of the wire in small increments, making sure it still extends slightly through the "V" of the coin chute.

If the trip wire is too short (either by wrong adjustment or by being cut off too much), coins may slip by the wire without tripping it, and *no* credits will be given. The solution is to carefully bend and straighten out the wire to lengthen it. If you cannot straighten it sufficiently, contact your distributor to order another trip wire.

If the wire is loose and falls off its mounting stud, it will also cause *no* credits to be given. Secure the wire by crimping together both ends of the brass-colored mounting stud with a pair of pliers (see Figure 3-8). If you should ever need to remove the trip wire, the two halves of the mounting stud can be separated with a small screwdriver.

Mechanical Adjustments on Coin Mechanism

Coin mechanisms are adjusted prior to shipment from the factory and normally will retain these adjustments for many months. If, due to wear or other causes, it becomes necessary to make new adjustments, remove the coin mechanism from the coin door. Then take it to a clean, well lighted area where it can be placed in a vertical position on a level surface (such as a bench top). Besides a screwdriver, you will

need several coins, including both new and old, worn ones. Figure 3-9 shows an exploded view of the mechanism and gives procedures for adjusting the kicker, separator, and the magnet gate. These adjustments should only be done by someone with experience in servicing coin mechanisms and who understands their operation.

General Troubleshooting Hints

The first action is to look for jammed coins. After these have been removed, examine the coin path for presence of foreign material or loose objects (such as chewing gum, small metallic objects, paper wads, etc.). In cases where game usage is heavy, it may be necessary to clean the entire coin path periodically, in order to prevent build-up of contaminants that can hinder the movement of coins through the mechanisms. Also confirm that the trip wire on each coin switch is intact, and is properly adjusted. If troubles still persist, check the conditions and positions of the lock-out wires, and the mechanical adjustments on the coin mechanisms, before suspecting the electronics. If a coin mechanism rejects genuine coins, try to readjust it. If this is not successful, then replace it with a working mechanism.

C. FUSE REPLACEMENT

Destroyer contains four fuses, two on the power supply assembly and two on the TV monitor assembly. These fuses are all easily accessible through the

rear access door. Replace fuses only with the same type of fuse as follows:

TV Monitor Fuses: 3AG 1-amp slow-blow, 250 volts

Power Supply Fuses: 3AG 2-amp slow-blow, 250 volts

D. LAMP REPLACEMENT

Cabinet lighting is done with an eighteen-inch fluorescent tube. The bezel is lighted with an eighteen-inch black light tube. Both the fluorescent and black light are mounted in one lamp assembly. To remove the lamp assembly, follow the instructions in Figure 3-10.

E. REMOVING THE CONTROL PANEL

Removing the Control Panel Assembly can easily be accomplished through the coin door by removing four ¼-20 wing nuts, split lock washers and flat washers at each corner of the Control Panel Assembly. Remove the Control Panel Assembly.

F. REMOVING THE TV MONITOR

The TV monitor in Destroyer may be easily replaced. This is accomplished by opening the rear access door, unplugging the Molex connector from the monitor, removing the securing screws, and sliding the monitor out the back door. See Figure 3-11 for the location of the securing screws on the monitor.

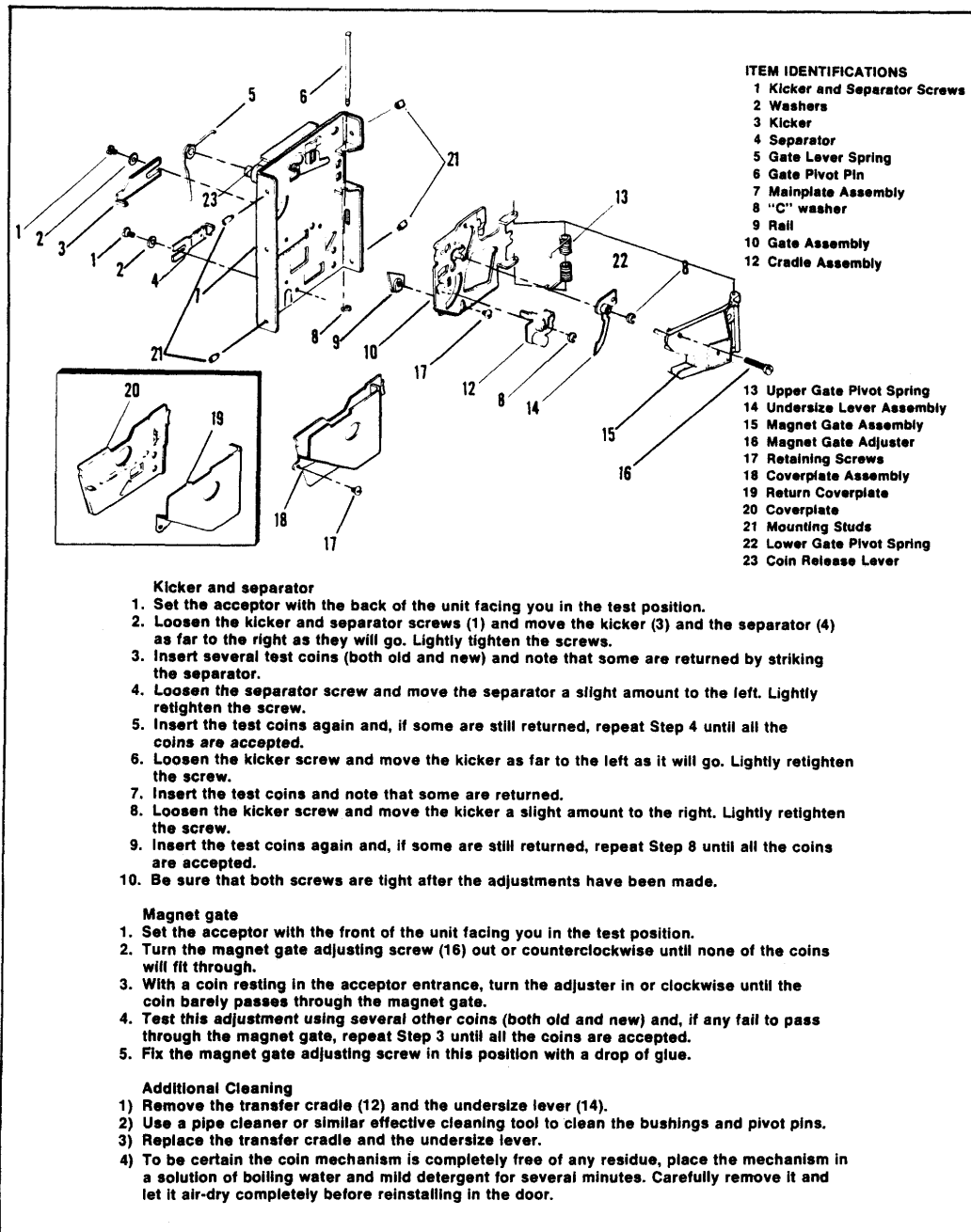
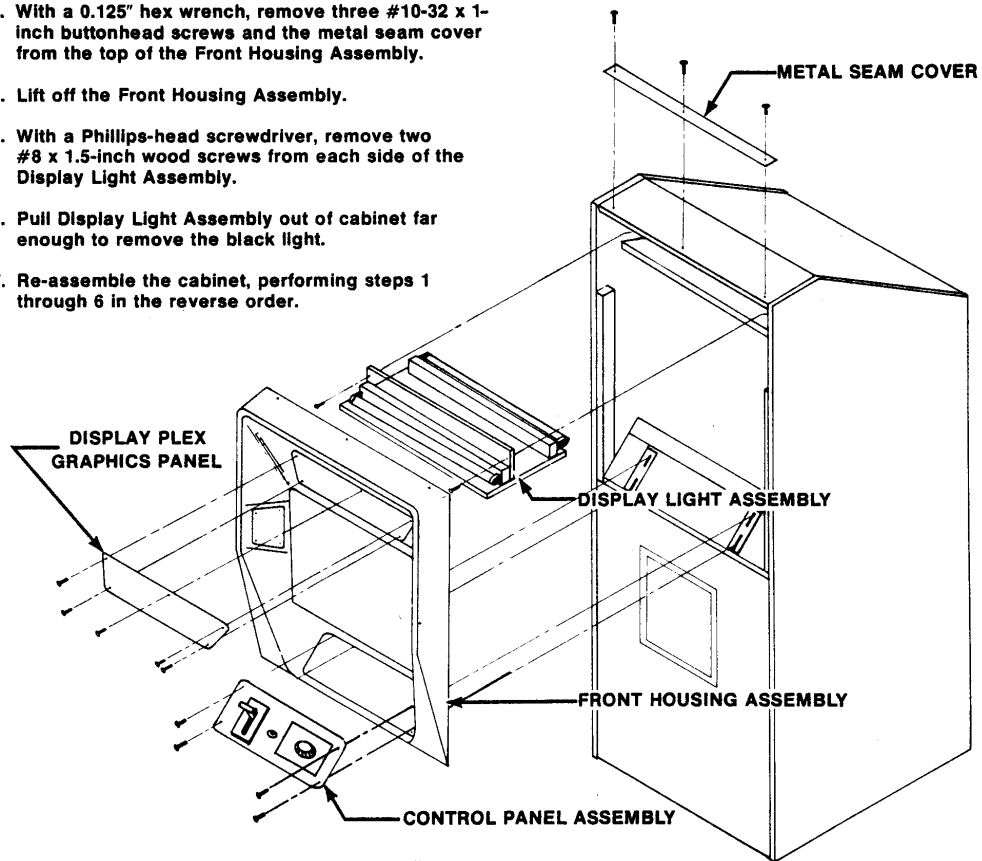


Figure 3-9 Adjustments on Coin Mechanism

REPLACING THE BLACK LIGHT TUBE

Remove the Front Housing Assembly as follows:

1. Reach through the coin door and remove four 1/4-20 wing nuts, one at each corner of the Control Panel Assembly.
2. Disconnect the harness connector from the Control Panel Assembly, then remove the Control Panel Assembly.
3. With a 0.125" hex wrench, remove three #10-32 x 1-inch buttonhead screws and the metal seam cover from the top of the Front Housing Assembly.
4. Lift off the Front Housing Assembly.
5. With a Phillips-head screwdriver, remove two #8 x 1.5-inch wood screws from each side of the Display Light Assembly.
6. Pull Display Light Assembly out of cabinet far enough to remove the black light.
7. Re-assemble the cabinet, performing steps 1 through 6 in the reverse order.



REPLACING THE FLUORESCENT TUBE

1. Remove the Display Plex Graphics Panel by using a 0.125-inch hex wrench to unscrew five #10-32 x 1-inch socket head screws.
2. Remove the fluorescent tube.

Figure 3-10 Removing the Cabinet Light Assembly

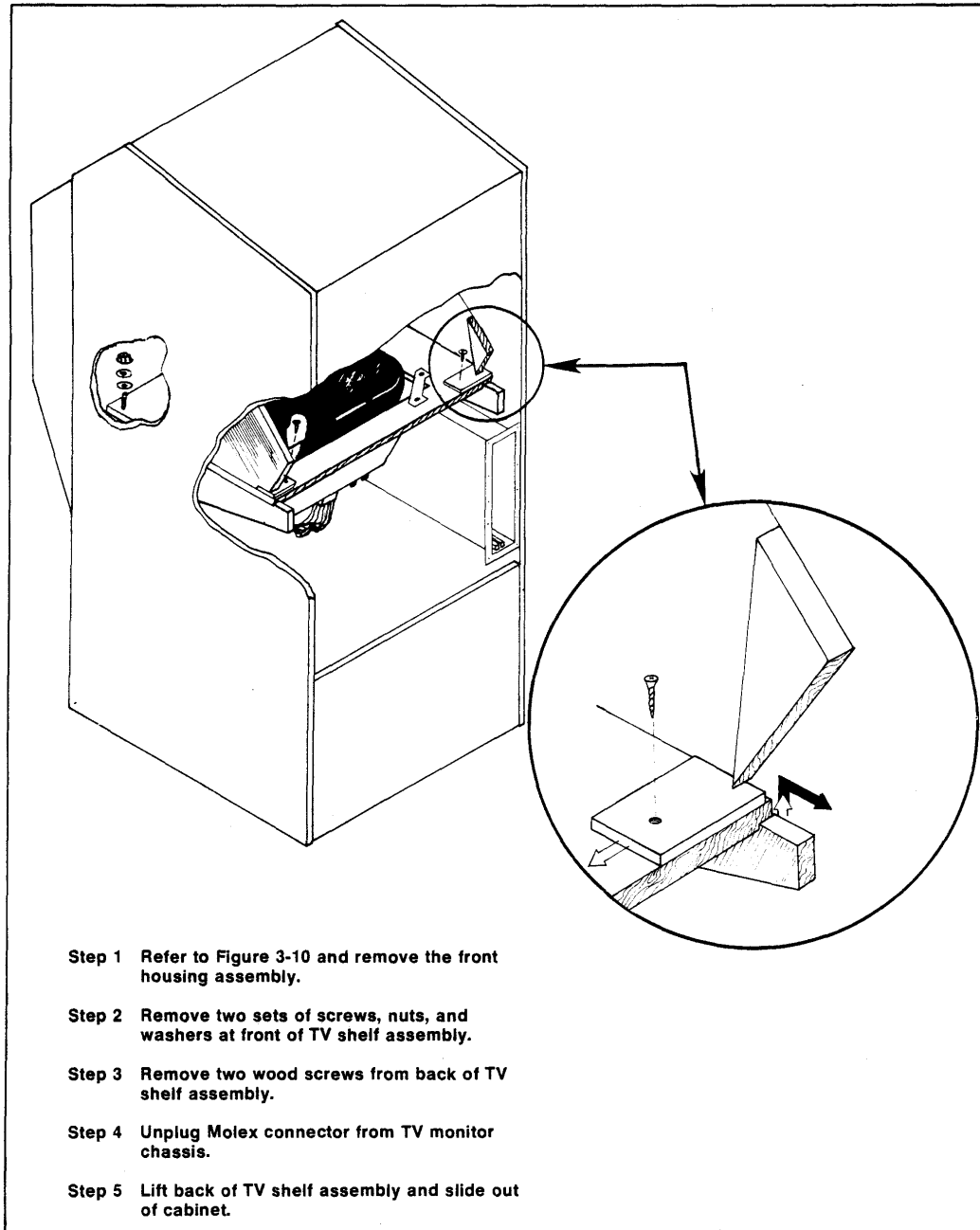
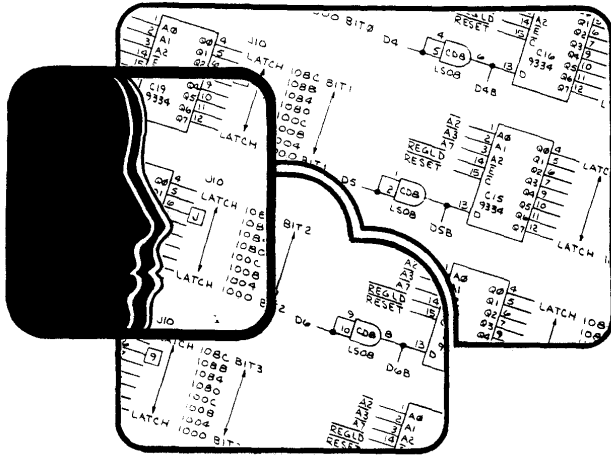


Figure 3-11 Removal of TV Monitor

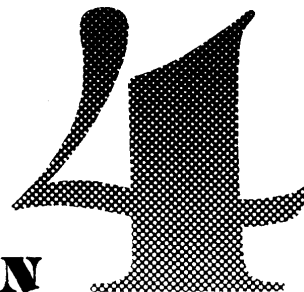


A. GENERAL INFORMATION

The block diagram of Figure 4-1 shows the major controls, circuits and outputs of the game. Figure 4-2 is a block diagram of the Destroyer game PCB.

The game's television monitor is a self-contained transistorized unit. Because the composite video signal sent to the monitor differs in many respects from the signal derived from commercial TV broadcasts, the picture appearing on the screen is unlike that of a home TV set and the monitor does not produce any sound.

The game's composite video signal is made to produce only four video levels instead of the more or less continuous shades of grey seen on a home TV screen. The background of the picture is black video level only, but game objects may use any of the four video levels.



THEORY OF OPERATION

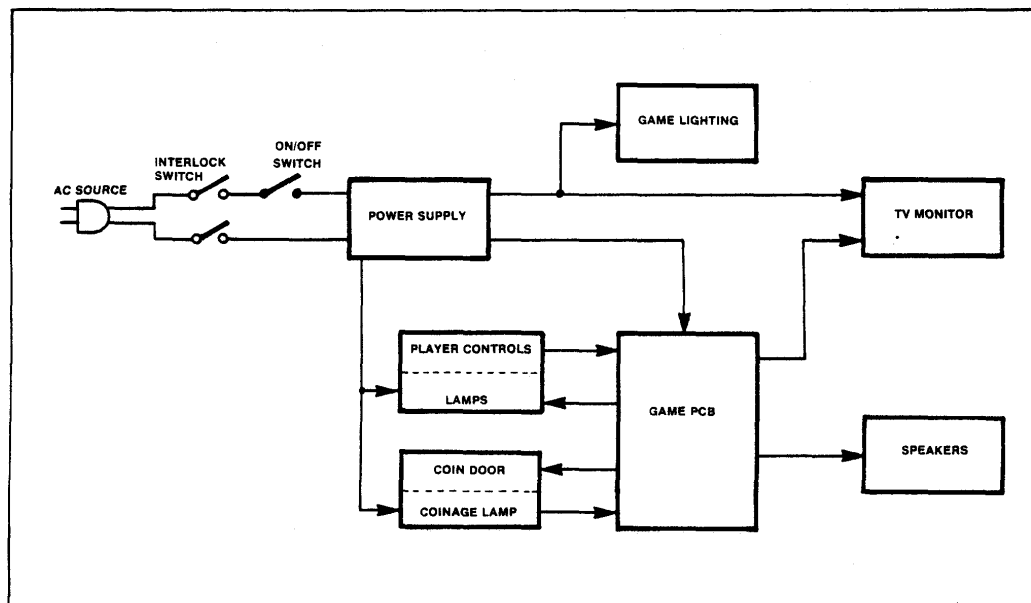


Figure 4-1 Destroyer Game Block Diagram

On the game PCB schematic diagram, Figure 4-5, the symbol "P" (appearing at various inputs of integrated circuit devices) indicates a connection of +5 volts DC through a pullup resistor. For easy reference, the game PCB is divided into grid sections. Along the short side of the board these sections are identified by letters A through R (skipping letters G, I, O and Q because they may be easily confused with the numbers 6, and 0 respectively). Along the long side of the board the numbers 1 through 12 are used. For example, sheet 1 of Figure 4-5 illustrates the type-7474 flip-flop, J2 at the lower left of the drawing. This device J2 will be found at coordinates J and 2 on the PCB.

Figure 4-3 is a harness diagram of the entire Destroyer game. This figure illustrates how all electrical and electronic assemblies are electrically connected together.

B. POWER SUPPLIES (lower left corner of sheet 1 Figure 4-5)

The two AC voltage inputs to the board come from the 25 VAC and 16.5 VAC center-tapped secondary windings of the power transformer inside the Power Supply Assembly. The +5 volt regulated supply provides V_{cc} for most of the board's integrated

circuits. The +12 volt and -5 volt regulated supplies provide lower-current voltages for analog circuitry on the game PCB. The unregulated +18 volts connects to the audio driver stage for the game's audio output.

C. CRYSTAL OSCILLATOR AND TV SYNC COUNTDOWN CHAINS

A 12.096-MHz crystal oscillator (sheet 1 of Figure 4-5) generates the basic clock frequency that is divided down to produce the TV synchronization signals. The signals used to produce a TV monitor raster consisting of 262 horizontal lines at a horizontal frequency of 15,750 Hz (256H). Synchronized with line 240 is a vertical blanking pulse that occurs for the duration of 22 more horizontal scans, resulting in the total number of 262 lines per picture frame.

Besides being used for the TV raster, the TV timing signals are also used in the motion circuits, in the alphanumeric display circuit, in the microcomputer clock and in various other places on the board.

D. MICROCOMPUTER

The microcomputer is the control center for the action of the circuitry that makes up the game. The microprocessing unit (MPU) sends out addresses on its address bus and accepts data or outputs data onto

the data bus. When the MPU is reset, by receiving first a low level and then a high level on its RESET line, it outputs addresses that cause the program memory to put data onto the data bus. The MPU reads this data and uses it to address the main program.

The main program instructs the MPU to execute operations and at which address to execute them. This controls the flow of data on the bus and "reads" inputs and "writes" to outputs. Data may flow into the MPU from program memory, "zero page" (read/write) random-access memory (RAM), and from tri-state input multiplexers at D7 and E7, or tri-state drivers from the option switches.

Data may flow out of the MPU to zero-page RAMS, to alphanumeric RAMS N4 and M4, input latches of picture ROMS, output latches, to the inputs of the minor object counters, and major object RAMS. The 16 address bus lines are labeled ABUS. The 8 data bus lines are labeled DBUS.

For purposes of timing in the program, the interrupt request (IRQ) line of the MPU is strobed 4 times per picture frame. The non-maskable interrupt (NMI) line is strobed when valid potentiometer (player's depth control) data is present (see I/O section).

E. ADDRESS MAP (Schematic Sheet 1)

The address map is provided as a troubleshooting aid for the technician using Atari's Computer Test Fixture CTF-1. This map lists all the addresses in both binary and hexadecimal form, for enabling game circuitry. With the CTF-1 test fixture and the accessory diagnostic board, a technician can address a suspect circuit and troubleshoot the circuit while it is in an address loop.

F. INPUT/OUTPUT

Digital Output

The digital outputs of the MPU consist of the unbuffered data and address lines. The data BUS is buffered by AND gates E5 and E6. The address bus is buffered by AND gates A4, B4 and C4. This buffering provides more power to the signals and does not change the information content.

The BUS lines 0, 1, 2, 12, 13 and 14 are decoded by address decoders A7 and D4. These decoders provide signals for enabling the appropriate circuits. For example MAJORSEL (major object select) is gated

with ABUS0 and WRITE to write the position RAMS in the major object circuitry. Address decoding for other functions is similar.

Inputs

Digital inputs are enabled by their own decoder signals. For example, inputs for the option switches are enabled by the signal SWRD (switch read) that strobes tri-state buffer D8.

Analog inputs come from the player's depth control potentiometer. The voltage is compared by comparator R9 (LM319) to a voltage ramp provided by a discrete analog circuit that conditions the VBLANK signal. When the ramp voltage exceeds the input voltage an NMI (non-maskable interrupt) signal is generated. The computer then reads the VSYNC data functions from tri-state line receiver D1 to tell where the cursor should be located.

G. MINOR OBJECT CIRCUIT

There are 2 identical minor object circuits. Minor object pictures are stored in ROMs F4 and K4. Minor objects consist of depth charge pictures, charge explosion pictures, and post-explosion score pictures. Counters H5 and H6 (J5 and J6) are loaded with horizontal position information, and counters F5 and F6 (K5 and K6) are loaded with vertical position information. The top four bits of each counter are combined by NOR gates at H7 (J7) to provide "window" signals within which picture information is enabled. The low bits of these counters address ROM F4 (K4) and multiplexer H4 (J4) to provide serial picture data to the video summer. Latch E4 contains the code for which object is to be displayed.

H. MAJOR OBJECT CIRCUIT

Picture information for the destroyer, submarines, and submarine explosion is stored in ROMs P8 and N8. The ROM information is multiplexed by multiplexer N7 to provide serial video data. Four levels of video are provided by combining object level 1 and object level 0 in the video summing network. During VBLANK, multiplexer P2 allows the MPU to address picture RAM M5 and horizontal position RAMs M6 and P5, while data is written into the RAMs. During VBLANK, vertical sync functions address the RAMs. The ADDRESS at which the horizontal position data is stored, determines which of 15 vertical position bands the pictures displayed. Exclusive OR GATES at L7 and P7, controlled by D4 of M5 control the direction in which the subs and destroyer point. D1 and D2 of M5 choose which picture is displayed and D3 decides which scan window to enable.

I. ALPHANUMERICS

During VBLANK, the MPU loads RAMs N4 and M4 with data at the address locations from multiplexers N3 and M3. During VBLANK, vertical and horizontal sync functions address the RAMs. Due to decoder N2 and gate P3, the alphanumerics can only appear in special zone on the TV monitor.

J. VIDEO OUTPUT

Video output is synchronized to 6 MHz by latch L8, then fed into a resistive summing network to produce the multi-level video out signal.

K. WAVE GENERATOR

Wave information stored in ROM K2 is allowed to appear only on the two lines specified by the inputs to multiplexer L2. These two lines of information are changed in such a fashion to resemble moving waves.

L. AUDIO

Only one sound at a time can be produced. Sonar ping, low and high explosion all share the

white noise, amplitude-modulated with a decaying envelope, generated at pin 3 of E9. Sonar ping is generated by a bandpass filter comprised of 3 operational amplifiers of H9. Sonar ping is gated out at pin 9 of E9 by SONGATE. Low explosion is generated by a bandpass comprised of the remaining operational amplifier of H9. It is gated out by LE (low explosion). High explosion is a sum of low explosion and unbandpassed white noise. It is gated out by HE (high explosion). Motor sound is produced by the triangle waved output from half of the 556 timer H8, then amplitude modulated by the other half of the 556 through D10. Depth charge launch sound is gated and filtered random noise. The Attract mode signal turns off all sounds, except the sonar ping sound. Sonar ping is at a reduced volume during the Attract mode. This sound may be eliminated during the Attract mode by opening the solder pad between the collector of the 2N3643 transistor and pin 6 of D10 and soldering the jumper pad between the transistor and pin 5 of B10.

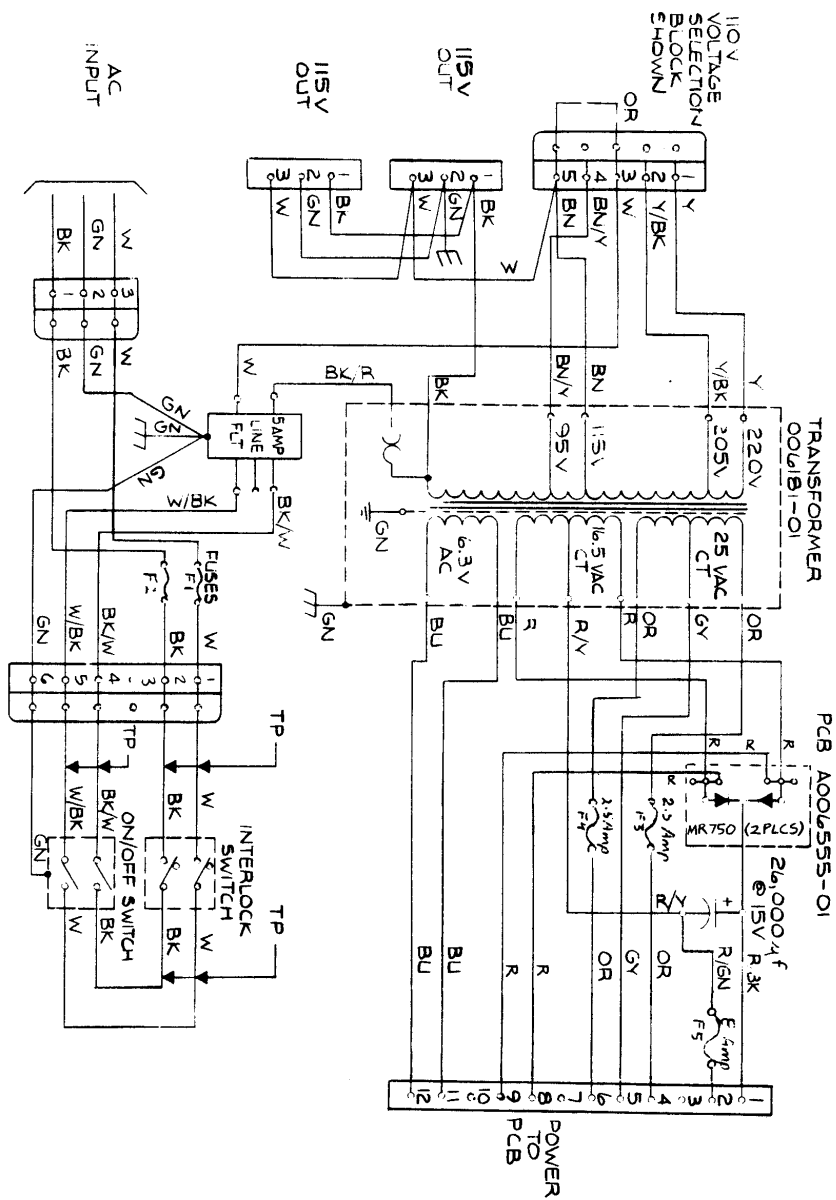


Figure 4-4 Destroyer Power Supply Schematic

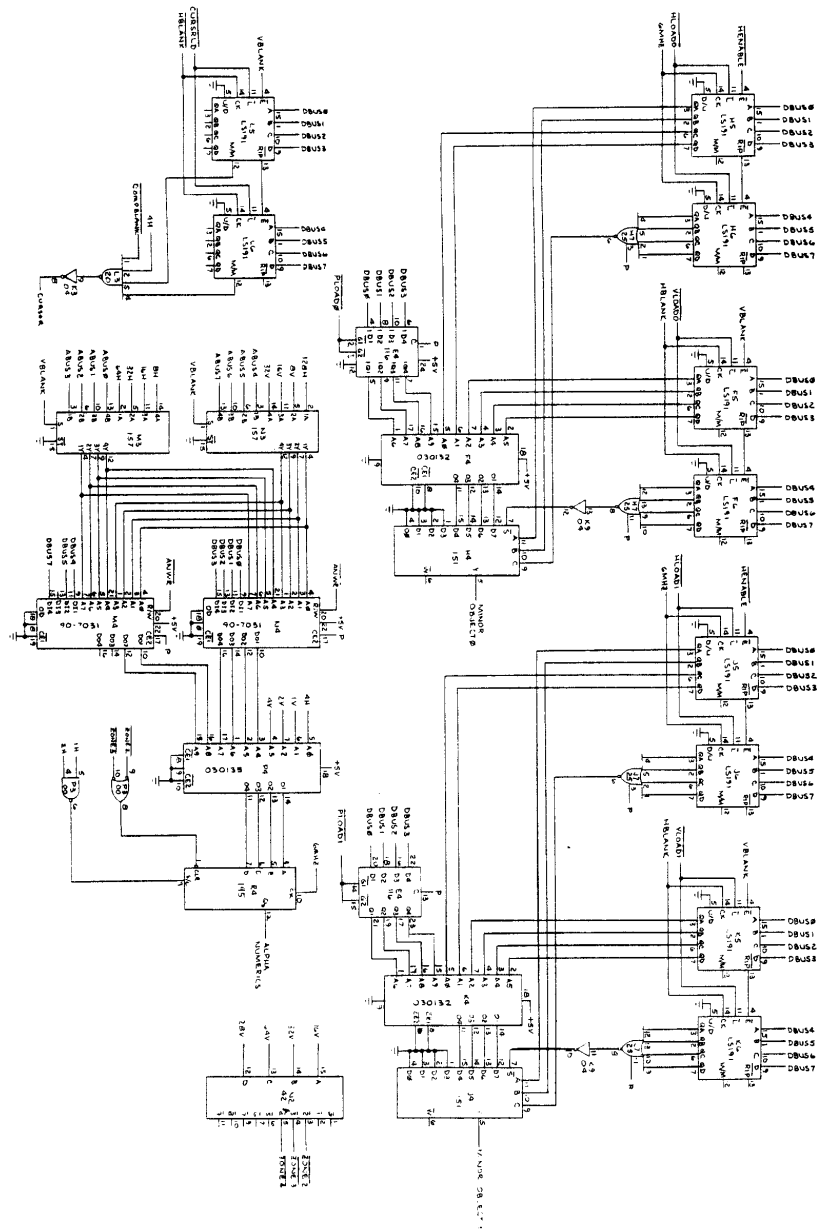
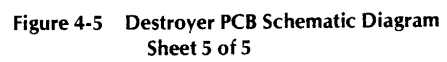
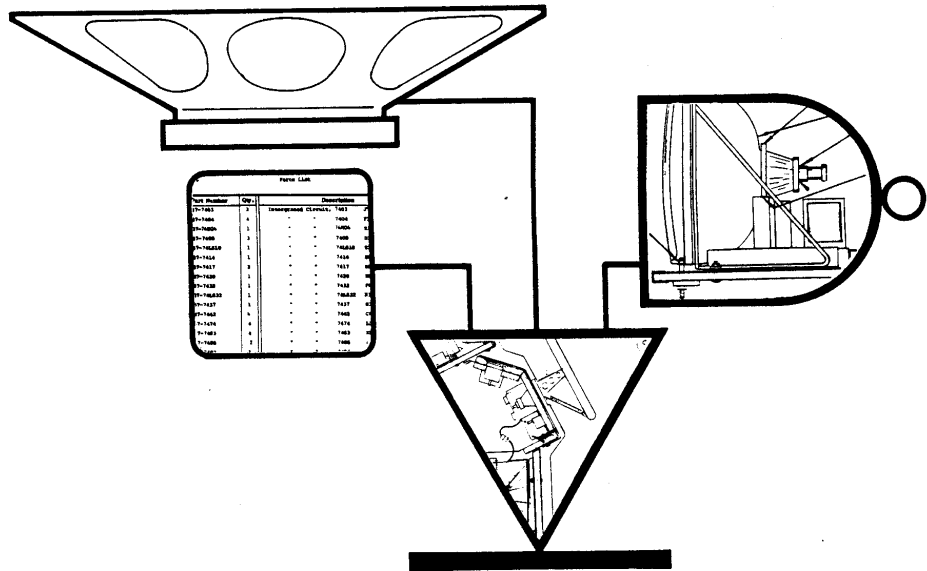


Figure 4-5 Destroyer PCB Schematic Diagram
Sheet 3 of 5



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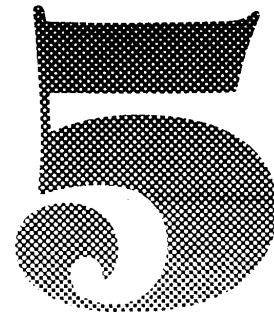
ILLUSTRATED PARTS CATALOG

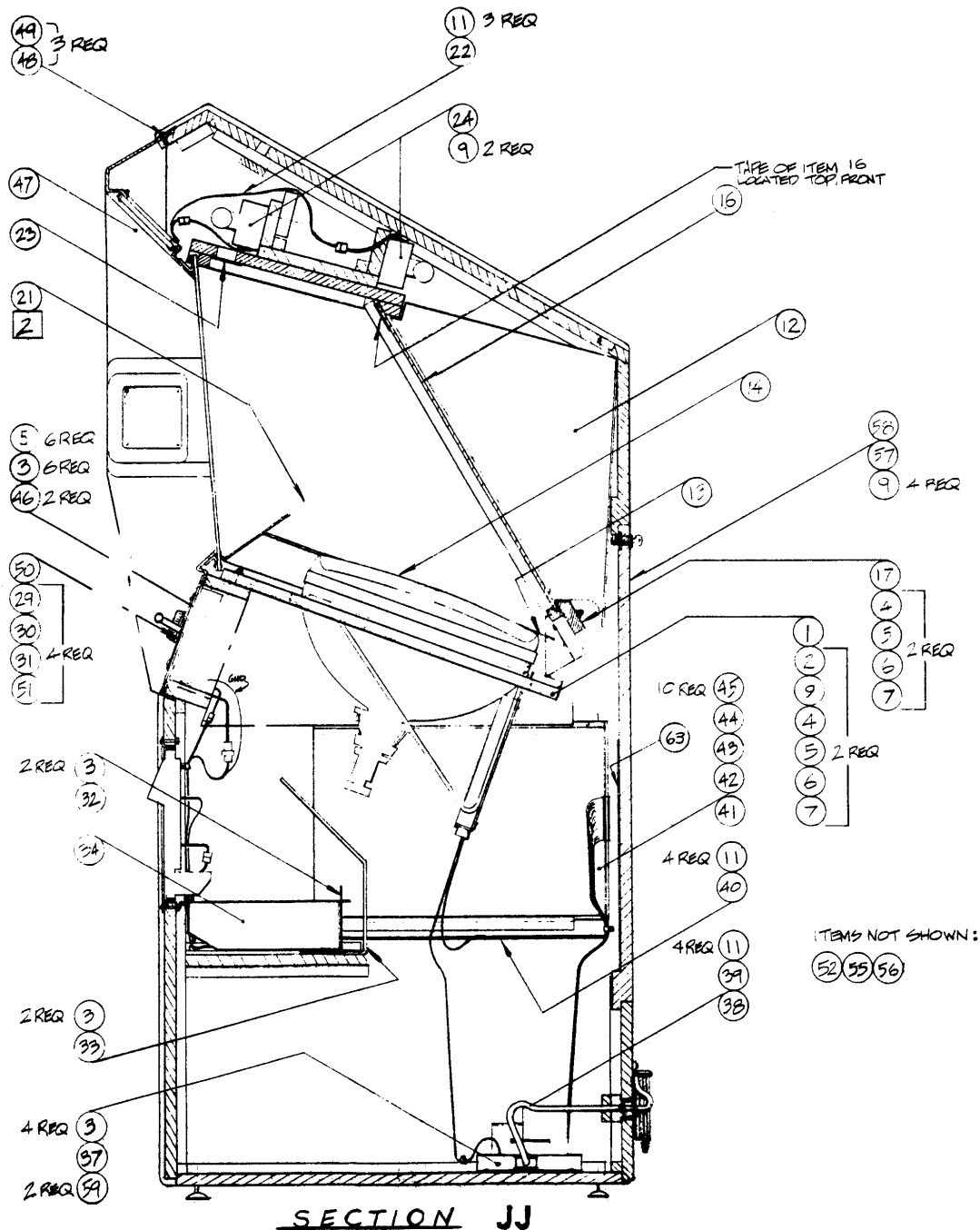
The purpose of this Chapter is to provide you with the necessary information for ordering replacement parts for the Destroyer Game.

When ordering parts from your distributor, give the part number, part name, applicable figure number of this list, and the serial number of your Destroyer 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 Destroyer game.

If there are any questions about this list, please contact Atari's Customer Service Department by telephone Monday through Friday, from 7:30 a.m. to 4 p.m. Pacific Time. From California, Alaska and Hawaii, call (408) 984-1900, from the remaining 47 states call (800) 538-6892 (toll-free).

Your game will include either the Motorola or TEC monitor, depending on their availability during production.





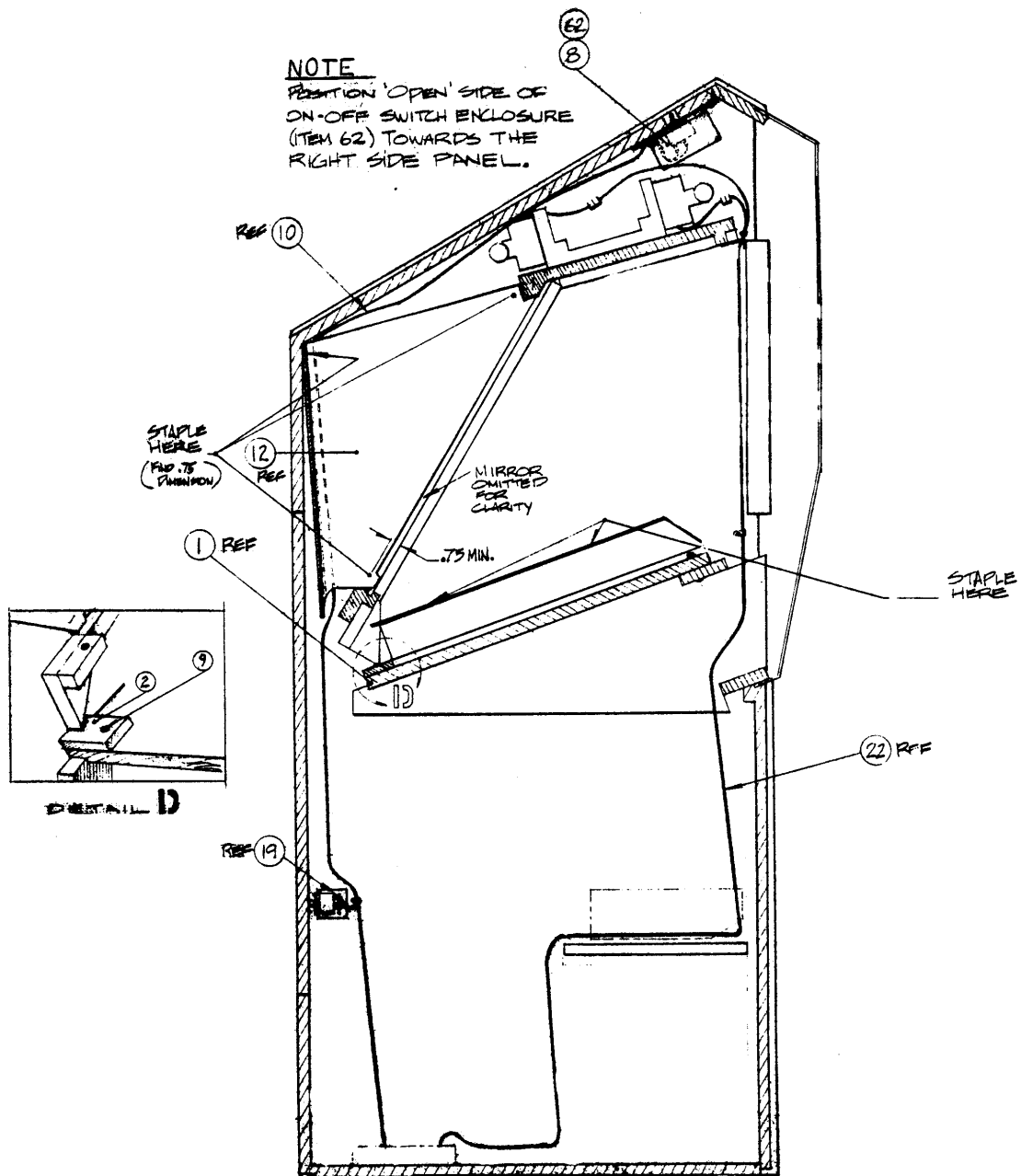


Figure 5-1 Destroyer Final Assembly

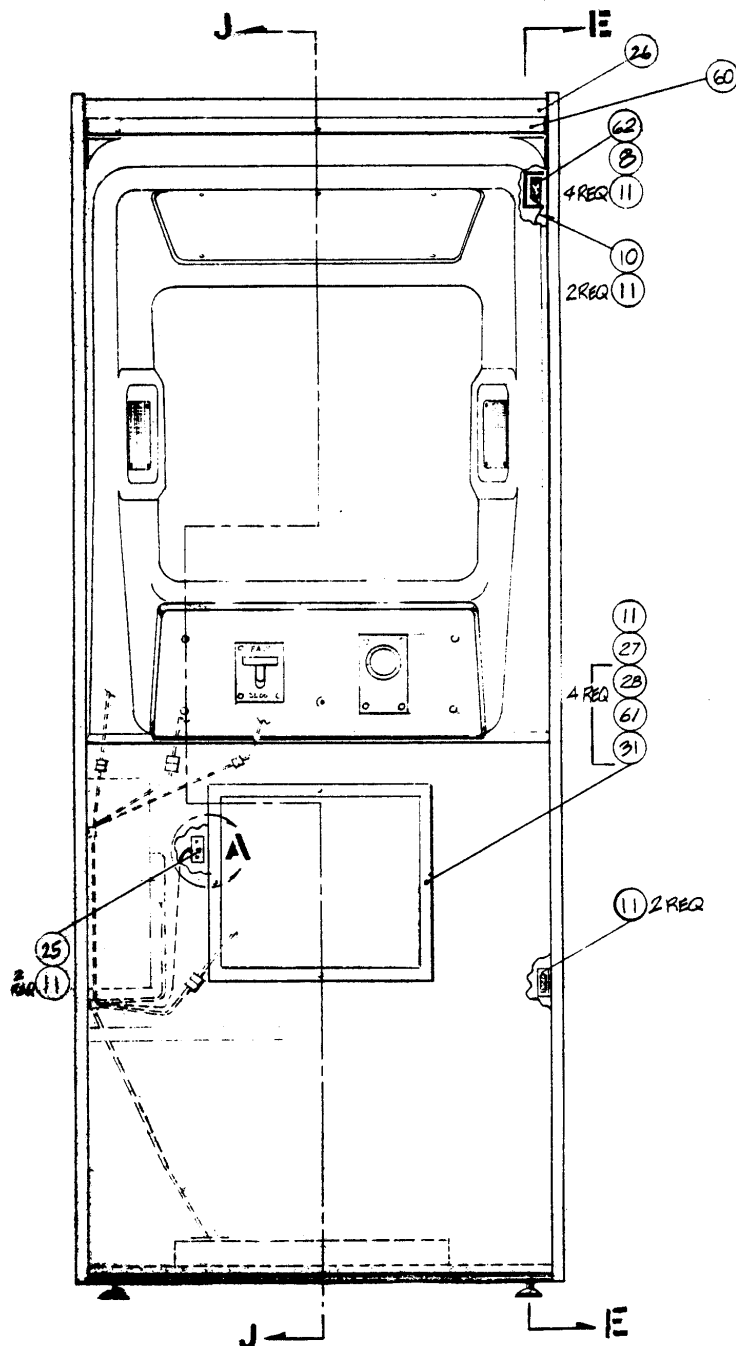


Figure 5-1 Destroyer Final Assembly



Figure 5-1 Destroyer Final Assembly

Item	Part Number	Qty.	Description
1	A008577-01	1	TV Shelf Assy - See Figure 5-2
2	009264-01	2	Block TV Tray
3	72-6812	14	Screw, SM. #8 x 3/4 Lg., Phil Pan Hd.
4	75-010S	4	#10 Washer Flat
5	75-040	10	#10 Washer, Split-Lock
6	75-5132N	4	Bolt, Carriage, #10-24 x 2.00 Lg.
7	75-911S	4	#10-24 Nut, Hex
8	A009511-01	1	Power Switch & Harness Assy
9	82-1824	8	Wood Screw, #8 x 1.50" Lg. Flat Hd. Phil
10	A009013-01	1	Power Switch Harness
11	72-6610	25	Screw, SM., Pan Hd., Phil., #6 x 5/8" Lg.
12	009773-01	1	Rear Bezel W/Graphics
13	008572-01	1	Monitor Mask
14	009763-01	1	Vacuum Formed Overlay W/Graphics
15			
16	A009341-01	1	Mirror/Tape Assembly
17	A008557-01	1	Mirror Tie-Down Panel Assy
18			
19			
20			
21	009774-01	1	Front Bezel, with Graphics
22	A009270-01	Ref	Flourescent Light Harness
23	78-67032	A/R	Black Photo Tape
24	A008568-01	1	Display Light Assembly - See Figure 5-3
25	A006548-01	1	Slide Switch Assembly
26	A009770-02	1	Cabinet Assembly with Graphics
27	A009083-01	1	Coin Door Final Assembly - See Figure 5-4
28	75-5516B	4	Bolt, Carriage, #4-20 x 1.00" Lg, Black
29	75-935S	4	Nut, Wing 4-20
30	75-045	4	Washer Split Lock, 4
31	75-015S	8	Washer, Flat 4"
32	006870-01	1	Bracket, Coin Box
33	009343-01	1	Yoke Shield
34	A007902-01	1	Cash Box Assembly
35			
36			
37	A007197-01	1	Power Supply Assembly (B) - See Figure 5-6
38	A007784-01	1	Power Cord Assembly
39	78-25001	1	Screw Down Tie Wrap



Figure 5-1 Destroyer Final Assembly

Item	Part Number	Qty.	DESCRIPTION
40	A030114-01	1	Main Harness
41	A009626-02	1	R.F. Shield Box Assembly
42	A009775-01	1	R.F. Shield PCB Assembly - See Figure 5-7
43	A009528-01	1	Destroyer Game PCB Assembly - See Figure 5-8
44	72-6808	1	Screw, SM., Pan., Hd., Phil., #8 x 1/4" Lg.
45	72-6608	10	Screw, SM., Pan., Hd., Phil., #6 x 1/4" Lg.
46	001638-01	2	Bracket Panel MTG
47	A009760-01	1	Front Housing Assembly
48	82-8016	3	Screw, Button Hd. Socket Cap, 10-32 x 1.00" Lg.
49	75-99090006	3	Well Nut, Blind Hole Fastener, 10-32
50	A009766-01	1	Control Panel Assembly - See Figure 5-9
51	75-5516B	4	Bolt Carriage #4-20 x 1.00" Lg., Black
52	TM-106	1	Operation, Maintenance and Service Manual
53			
54			
55	006305-01	1	Printed Poly Bag
56	A006683-XX	1	Shipping Container Assembly
57	A006647-02	1	Rear Door Assembly W/Lock
58	005233-01	1	Rear Door Seal
59	46-201202	2	Fuse, 2 AMP
60	009345-01	1	Seam Cover
61	75-990505S	4	#4-20 Nylon Lock Nuts
62	009992-01	1	On/Off Switch Enclosure
63	ST-106	1	Self Test Chart

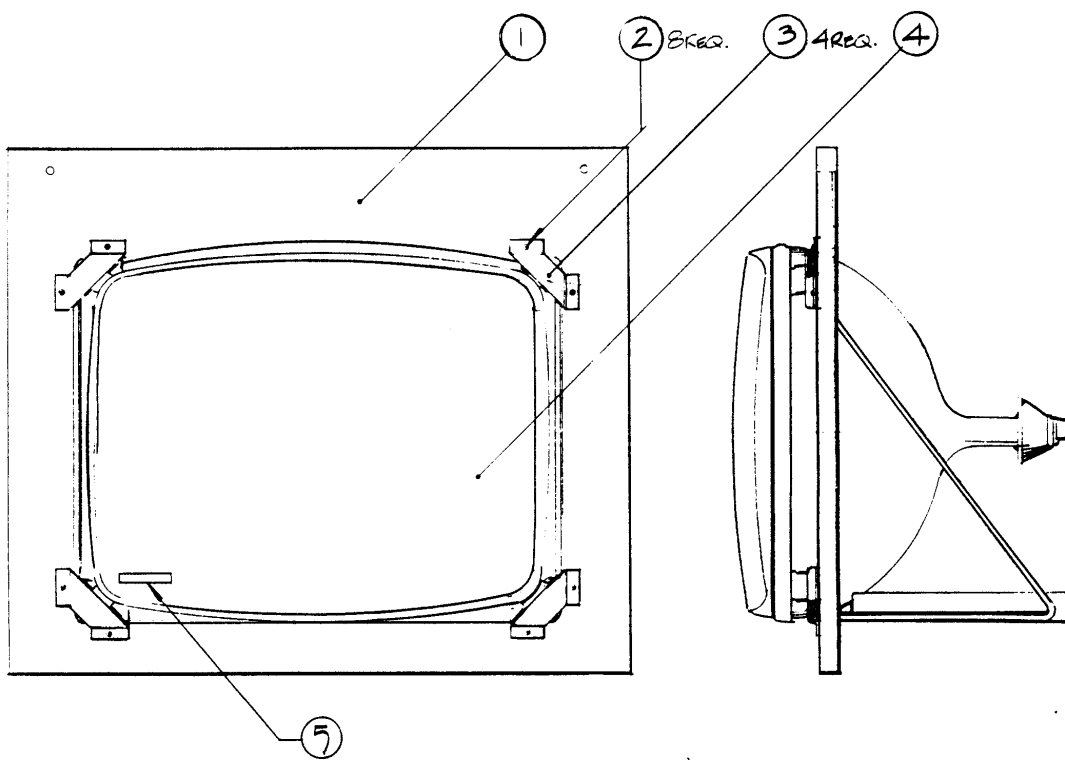


Figure 5-2 TV Shelf Assembly



Figure 5-2 TV Shelf Assembly

Item	Part Number	Qty.	Description
1	008556-01	1	T.V. Shelf
2	72-6812	8	Screws, Self Tapping, #8 x 3/4 Phil. Pan Hd
3	005594	4	Monitor Tie Down
4	92-032 or 92-030	1	23-inch TV Monitor, Motorola Model M7000-155 23-inch TV Monitor, TEC Model TM-623
5	006319-02	1	Copyright Decal

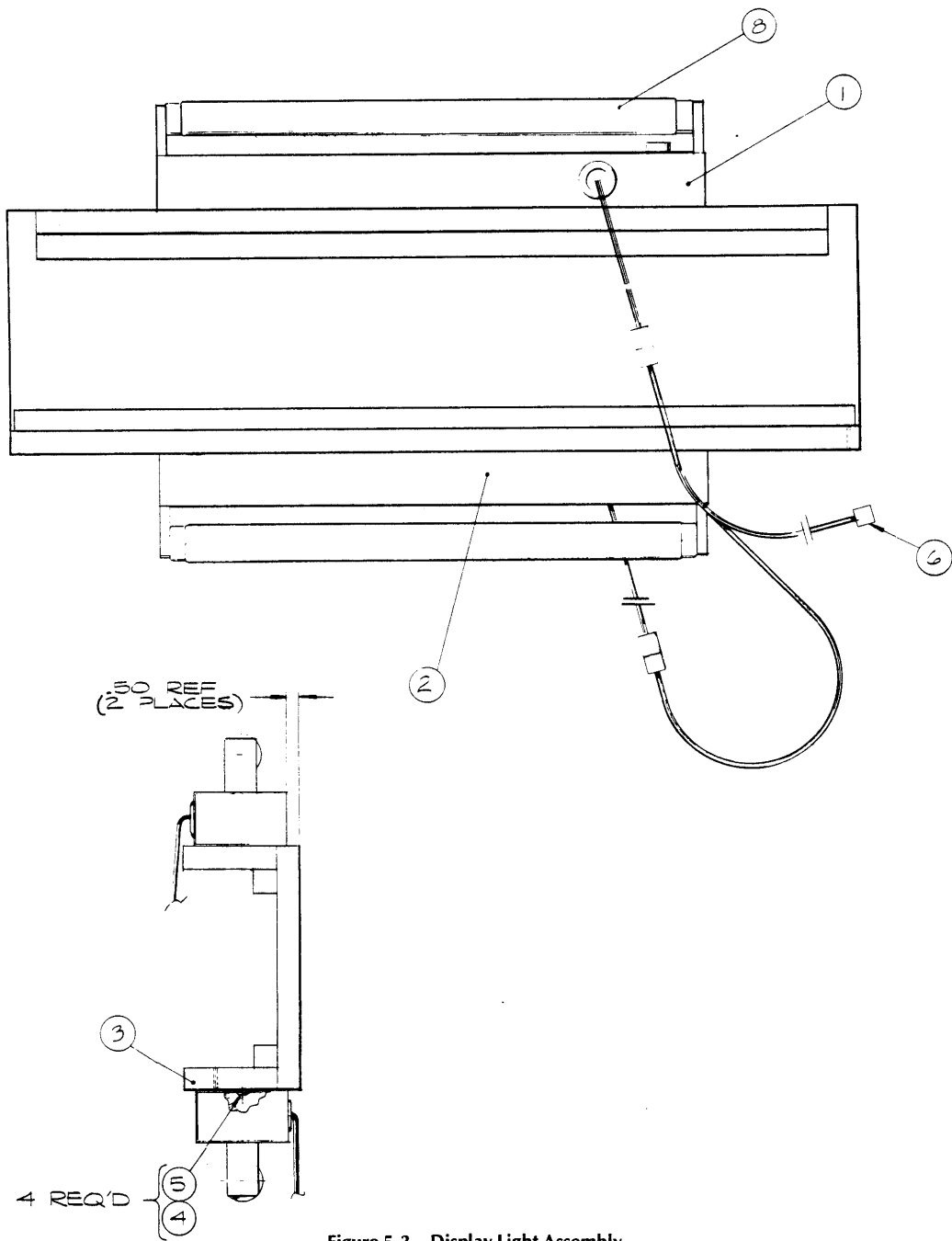


Figure 5-3 Display Light Assembly



Figure 5-3 Display Light Assembly

Item	Part Number	Qty.	Description
1	A008860-01	1	Black Light Assembly 18"
2	A005495-01	1	18-Inch Fluorescent Light Assembly
3	A008561-01	1	Light Mount Assembly
4	72-6812	4	#8 x 3/4" S.M. Screw
5	75-010S	4	Washer Flat, #10
6	A009270-01	1	Fluorescent Light Harness
7			
8	70-306	1	Fluorescent Tube 18" (F15 T8/BL)

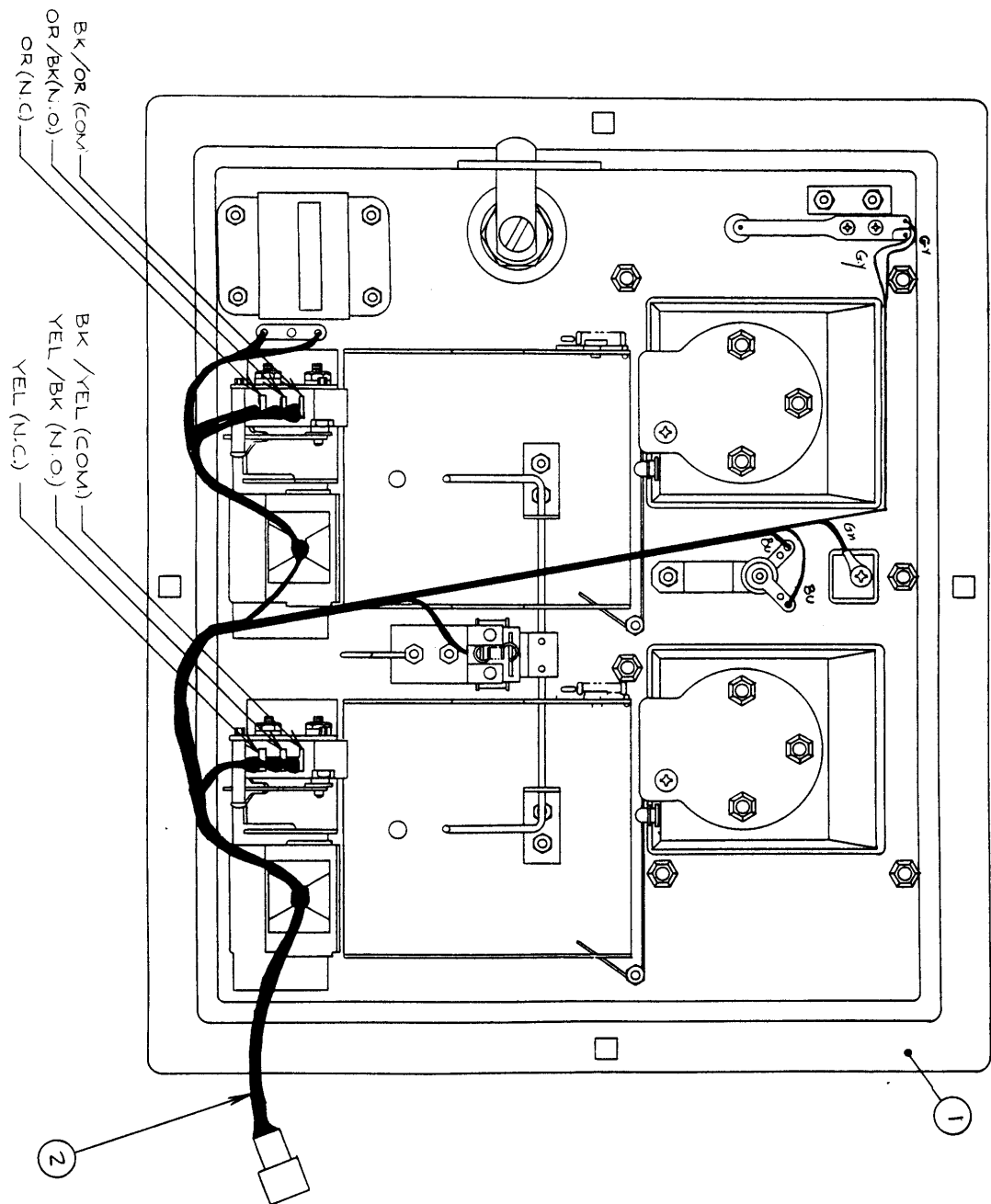


Figure 5-4 Coin Door Final Assembly



Figure 5-4 Coin Door Final Assembly

Item	Part Number	Qty.	Description
1	A006794-01	1	Coin Door Assy. for American Quarter Only -See Figure 5-5
	A006794-02	Ref.	Coin Door Assy. for Belgian 5 Francs Only -See Figure 5-5
	A006794-03	Ref.	Coin Door Assy. for German Mark Only -See Figure 5-5
	A006794-04	Ref.	Coin Door Assy. for Swedish Krona Only -See Figure 5-5
	A006794-05	Ref.	Coin Door Assy. for Japanese 100 Yen Only -See Figure 5-5
	A006794-06	Ref.	Coin Door Assy. for English 10 Pence Only -See Figure 5-5
	A006794-07	Ref.	Coin Door Assy. for Australian 20-Cent Piece Only - See Figure 5-5
2	A006921-01	1	Harness Assembly

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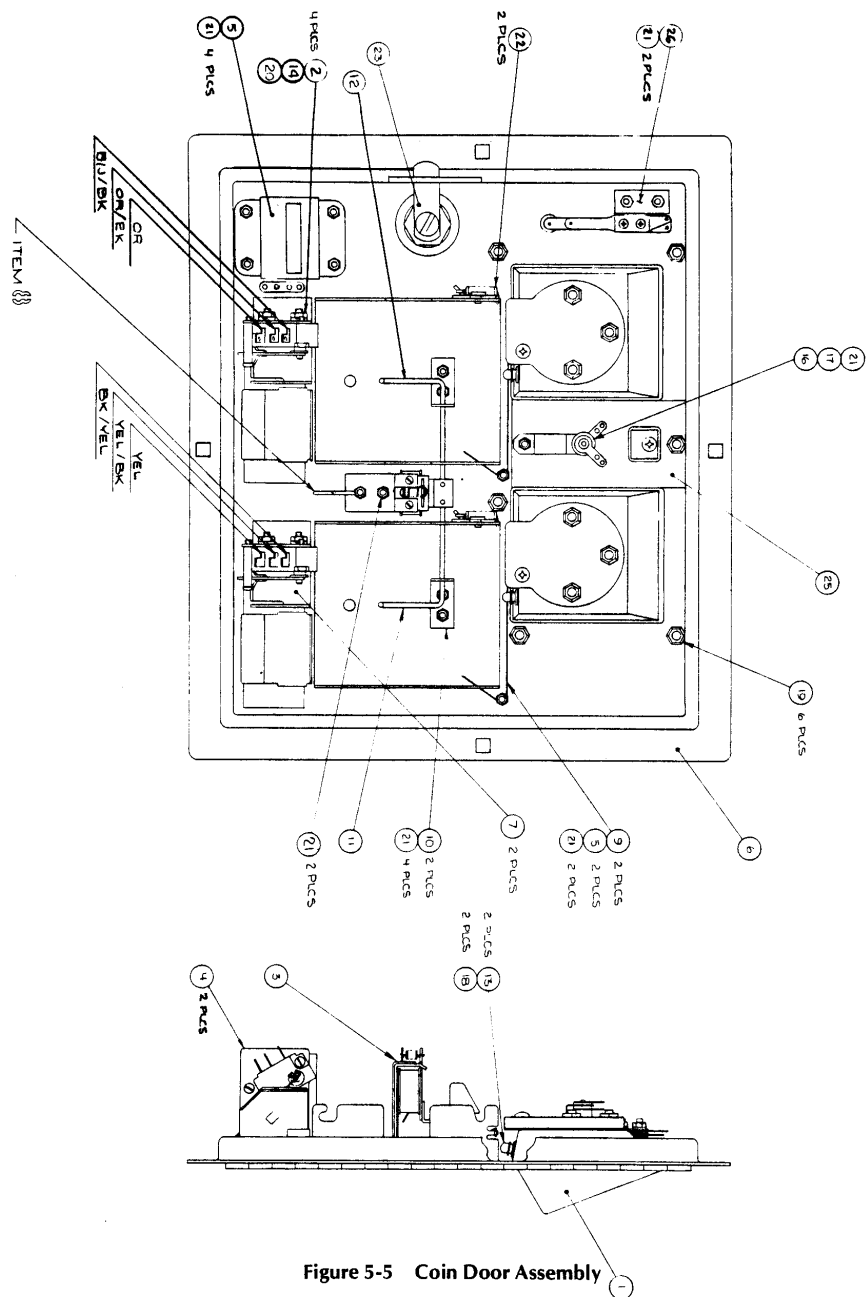


Figure 5-5 Coin Door Assembly

Figure 5-5 Coin Door Assembly



Item	Part Number	Qty.	Description
1	A007637-01	1	Front Bezel Assy. - Used only on -01 Coin Door Assy.
	A007637-02	Ref.	Front Bezel Assy. - Used only on -02 Coin Door Assy.
	A007637-03	Ref.	Front Bezel Assy. - Used only on -03 Coin Door Assy.
	A007637-04	Ref.	Front Bezel Assy. - Used only on -04 Coin Door Assy.
	A007637-05	Ref.	Front Bezel Assy. - Used only on -05 Coin Door Assy.
	A007637-06	Ref.	Front Bezel Assy. - Used only on -06 Coin Door Assy.
	A007637-07	Ref.	Front Bezel Assy. - Used only on -07 Coin Door Assy.
2	75-9165	4	Nut 6-32
3	A007639-01	1	Coin Lock-Out Assembly
4	A007640-01	2	Coin Switch Assembly
5	A002465-01	1	Coin Counter Assembly
6	004320-01	1	Coin Door Weldment
7	004341-01	2	Secondary Coin Chute
8	004344-01	1	Key Loop
9	004340-01	2	Spring-Return
10	004337-01	2	Bracket, Wire Form
11	004338-01	1	Lock-Out, Wire Form, R.H.
12	004336-01	1	Lock-Out, Wire Form, L.H.
13	004326-01	2	Button, Scavenger
14	75-046	4	Lock Washer, #6
15	006904-01	2	Spacer
16	007359-01	1	Lamp Socket
17	70-11-47	1	Lamp
18	73-3008	2	Retaining "C" Ring, Truarc #5103-25
19	75-9914001	6	Self-Threading Nut, Tinnerman #SR188006
20	75-026S	4	Washer #6
21	75-00516	13	Kepnut, Style 842, Stl., 6-32
22	008629-01	2	Spring
23	71-2118	1	Lock Assembly, Hudson Lock
24	71-1225CU	2	Coin Mechanism for American Quarter only
	71-125FB	Ref.	Coin Mechanism for Belgian 5 Francs Only
	71-121MG	Ref.	Coin Mechanism for German Mark only
	71-121KS	Ref.	Coin Mechanism for Swedish Krona Only
	71-12100YJ	Ref.	Coin Mechanism for Japanese 100 Yen Only
	71-1210PE	Ref.	Coin Mechanism for English 10 Pence Only
	71-1220CA	Ref.	Coin Mechanism for Australian 20-Cent Piece only
25	007753-01	1	Plate, Anti-Probe
26	A007638-01	1	Switch Assembly - Slam

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Figure 5-6 Power Supply Assembly

Item	Part Number	Qty.	Description
1	A009266-01	1	Power Supply Base Weldment Assembly
2	A006886-01	1	Transformer Termination Assembly "Type B"
3	29-053	1	Cap., Sprague Electrolytic 26,000 μ f @ 15V
4	78-70501SC	1	Brkt., Cap. Mtg. Sprague #4586-48
5	A006555-01	1	P.C. Board Rectifier
6			
7	79-4411004	5	Fuse Holder, Panel Mounting
8	41-2003	1	Filter, Power Line, 5 AMP
9	A006958-01	A/R	Volt Sel Block 95V
10	A006958-02	"	Volt Sel Block 110V
11	A006958-03	"	Volt Sel Block 205V
12	A006958-04	"	Volt Sel Block 220V
13	78-2708	1	Grommet, Plastic
14	72-1808S	3	Screw Pan Hd., #8-32 x $\frac{1}{2}$ " Lg.
15	72-1812S	6	Screw Pan Hd., #8-32 x $\frac{3}{4}$ " Lg.
16	75-038	9	Washer, Lock, External Star #8
17	75-918S	9	Nut Hex #8
18	75-018S	4	Washer Flat #8
19	A007192-01	1	Power Switch Termination
20	A007444-01	1	Power In Harness
21	46-203801	1	Fuse, 8 AMP, 125V, 3 AG Fast Acting
22	46-201251	2	Fuse, 2 $\frac{1}{2}$ AMP, 125V, Slow Acting

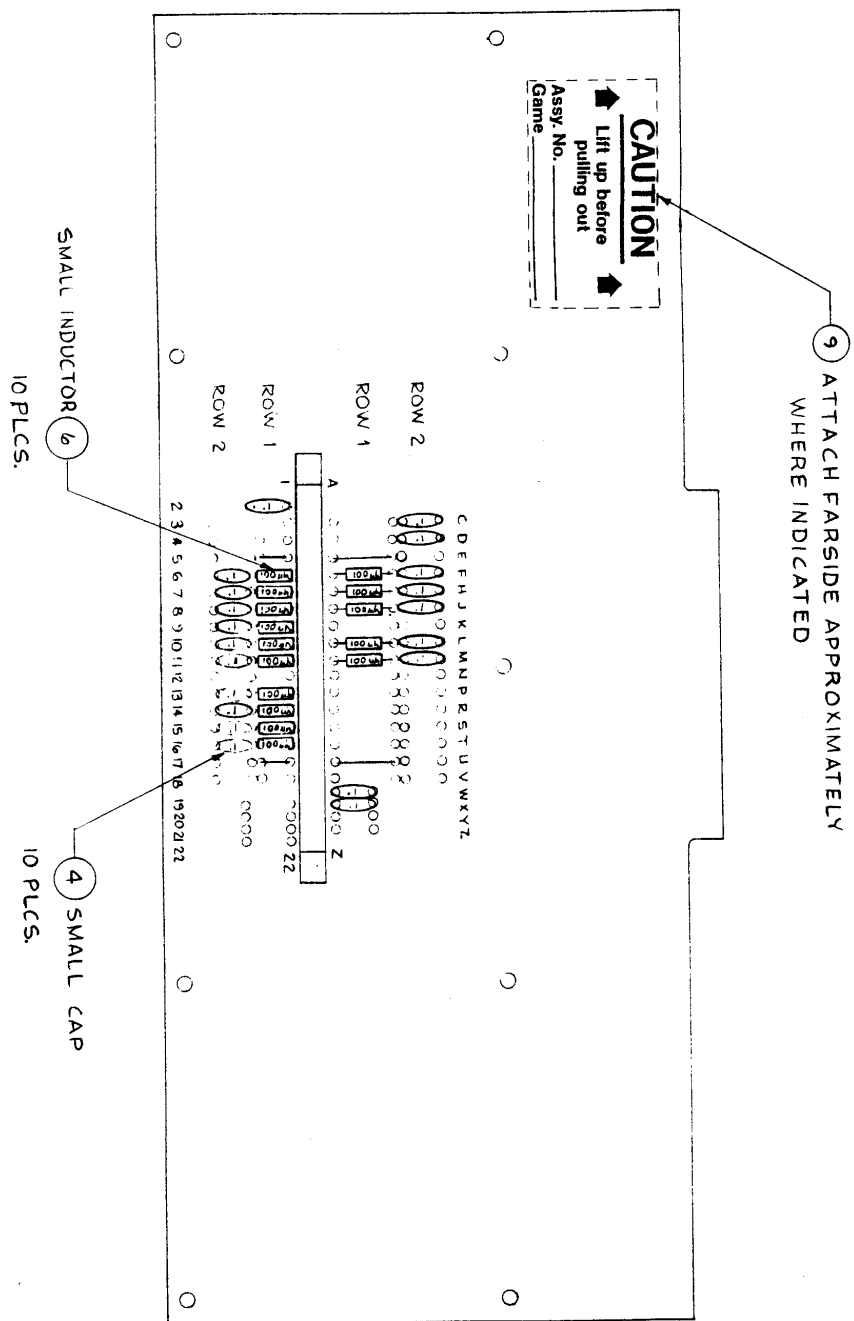


Figure 5-7 RF Shield PCB Assembly



Figure 5-7 RF Shield PCB Assembly

Item	Part Number	Qty.	Description
1	006549-01	1	P. C. Board
2	79-517222	1	Connector, 44 Pin P. C. Mount
3	27-250104	10	Cap., Cer Disc, .1uf, 25V
4	27A-250104	10	Cap., Cer Disc, .1uf, 25V (Small) (Bottom Row)
5	41-3003	5	Inductor, 100uh,(Large)
6	41-3004	10	Inductor, 100uh (Small) (Bottom Row)
7	52-003	2	Jumper, .60 Centers
8	52-004	2	Jumper, .30 Centers
9	009468-01	1	Decal, R. F. Shield Label



Figure 5-8 Destroyer Game PCB Assembly

Item	Part Number	Qty.	Description
1	009529-01	1	P.C. Board
2	10-5101	1	Resistor, Carbon Comp., 5%, $\frac{1}{4}$ W, 100 Ohm R87
3	10-5102	44	" " " " " 1K " R3,7-21,24,25 28-35,38,45- 53,55-58,97- 100
4	10-5103	9	" " " " " 10K " R23,54,61,62, 67-69,73,89
5	10-5104	4	" " " " " 100K " R64-66,74
6	10-5106	1	" " " " " 10M " R63
7	10-5152	2	" " " " " 1.5K " R6,27
8	10-5153	1	" " " " " 15K " R71
9	10-5154	1	" " " " " 150K " R43
10	10-5220	1	" " " " " 22 " R22
11	10-5221	4	" " " " " 220 " R4,5,39,40
12	10-5222	5	" " " " " 2.2K " R37,41,82,92, 93
13	10-5223	1	" " " " " 22K " R76
14	10-5272	1	" " " " " 2.7K " R88
15	10-5331	6	" " " " " 330 " R1,2,84,85,90, 91
16	10-5332	1	" " " " " 3.3K " R70
17	10-5333	3	" " " " " 33K " R72,75,79
18	10-5334	1	" " " " " 330K " R83
19	10-5392	2	" " " " " 3.9K " R80,81
20	10-5393	1	" " " " " 39K " R42
21	10-5473	1	" " " " " 47K " R77
22	10-5474	2	" " " " " 470K " R59,60


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Figure 5-8 Destroyer Game PCB Assembly

Item	Part Number	Qty.	Description
23	10-5562	2	Resistor, Carbon Comp., 1%, 1W, 5.6K Ohm R26,R8
24	10-5681	2	" " " " " 680 " R36,R6
25	10-5682	1	" " " " " 68K " R94
26	10-5821	1	" " " " " 820 " R44
27			
28			
29	19-315503	1	Trimpot, 50K Ohm R95
30	19-805W4P0	1	Resistor, Wirewound, 10W, 4 Ohm R96
31			
32			
33			
34	21-101104	2	Capacitor, Mylar, 100V, .1 uF C71,C72
35	24-250106	8	" Elec., 25V, 10 " C24,C8,44,48,53,66,77,80
36	24-250226	2	" " " " 22 " C63,65
37	24-250647	1	" " " " 470 " C43
38	24-250108	1	" " " " 1000 " C89
39	24-250228	1	" " " " 2200 " C78
40	24-250478	1	" " " " 4700 " C91
41	27-250102	3	" Cer. Disc, " .001 " C45,C70,R4
42	27-250223	2	" " " " .022 " C62,64
43	27-250103	1	" " " " .01 " C90
44	27-250224	4	" " " " .22 " C56,C8,61,74,92
45	27-250104	60	" " " " .1 " C1,C23,C24,34,36,37,39,41,46,47,50,52,54,57,59,60,64,67,69,73,74,76,79,81,83,87,88
46	28-101221	1	" Dipped Mica, 100V, 220 pF C86
47	28-101331	2	" " " " 330 " C49,C1
48	29-010	1	" Tant., Elec., 10V, 2.2 uF C35
49			
50			

Item	Part Number	Qty.	Description
86	37-74175	1	IC, 74175 M2
87	37-74LS191	12	" 74LS191 P5,R5,J5,R3,LS5,P6,R6,J6,K6,L6,P6,M7
88	37-74195	1	" 74195 R4
89	37-74LS244	1	" 74LS244 D1
90	37-74LS257	2	" 74LS257 D7,E7
91	37-RT97	1	" RT97 D8
92	37-9334	1	" 9334 P8
93	37-4066	1	" 4066 E9
94	37-556	1	" 556 R8
95	37-MC3340	1	" MC3340 D10
96	37-LM319	1	" LM319 R9
97	37-LM324	2	" LM324 C9,H9
98	37-LM323	1	Regulator, LM323
99	37-7812	1	" 7812 Q8
100	37-7905	1	" 7905 Q7
101	37-TDA1004	1	Audio Amp TDA1004 B10
102			
103			
104			
105	42-001	1	Switch, Momentary, SPST
106	44-119P1T	1	" 8-Position DIP, SPST x 8 B8
107	72-140MC	2	Screw, Pan Hd, Phil, 6-32 x 1/4, CR85
108	74-014	1	Washer, Flat, #6
109	74-016	2	Washer, Lock, Int. Star, #6
110	74-914C	2	Nut, Hex, 6-32, CR85
111			
112			
113			
114	74-06001	1	HeatSink (for LM323)
115	09-470-04	1	" (for TDA1004)
116	74-13016	AR	Cement (for TDA1004 HeatSink)
117	74-16001	1	Silpad (for LM323)
118			
119			
120			

Item	Part Number	Qty.	Description
51			
52	31-1M914	2	Diode, 1M914 CR1,2
53	31-1M4001	4	" 1M4001 CR3-6
54			
55			
56			
57	33-2M3644	1	Transistor, 2M3644 Q1
58	34-2M3643	4	" 2M3643 Q2-4,6
59	34-2M5190	1	" 2M5190 Q5
60			
61			
62			
63	37-7400	2	IC, 7400 P3,A9
64	37-7402	2	" 7402 R6,R7
65	37-7404	3	" 7404 R3,R6,R9
66	37-74H04	1	" 74H04 P1
67	37-7408	7	" 7408 AA,B4,C4,E5, D6,R6,P9
68	37-7410	1	" 7410 A6
69	37-7420	1	" 7420 L3
70	37-7425	2	" 7425 R7,J7
71	37-7428	1	" 7428 R8
72	37-7432	5	" 7432 A2,B7,A8,E8, R8
73	37-7437	1	" 7437 R2
74	37-7442	3	" 7442 R2,D4,A7
75	37-7474	3	" 7474 J2,L4,M9
76	37-74874	1	" 74874 R1
77	37-7486	2	" 7486 L7,P7
78	37-7493	1	" 7493 C7
79	37-74116	1	" 74116 R4
80	37-74151	3	" 74151 L2,M4,J6
81	37-74153	1	" 74153 R7
82	37-74157	3	" 74157 P2,M3,M3
83	37-74LS161	4	" 74LS161 J1,K1,L1,M1
84	37-74LS164	2	" 74LS164 L9,M9
85	37-74174	2	" 74174 P7,L8

Item	Part Number	Qty.	Description
121	79-42040	1	Socket, 40-Pin, Neu. Insertion
122			
123			
124			
125	90-102	1	Crystal, 12.086 Mhz V1
126			
127			
128			
129	90-6001	1	Microprocessor, MC6800L R/C5
130	90-7005	3	RAM, 81255 H5,P5,M6
131	90-7019	2	" 2111A-4 C2,D3
132	90-7031	2	" 2101A-4 M4,M6
133			
134			
135			
136	030131-01	1	Depth Charge Sync PROM H1
137	030132-01	2	" " Minor Objects F4,K4
138	030133-01	1	" " Major Objects 1 H4
139	030134-01	1	" " Major Objects 2 P4
140	030135-01	1	" " Alphametrics F4
141	030136-01	1	" " Waves K2
142			
143			
144			
145	030141-01	1	Depth Charge PROM 7800 L0 E2
146	030142-01	1	" " PROM 7800 H1 F3
147	030143-01	1	" " PROM 7C00 L0 H2
148	030144-01	1	" " PROM 7C00 H1 J3
149			

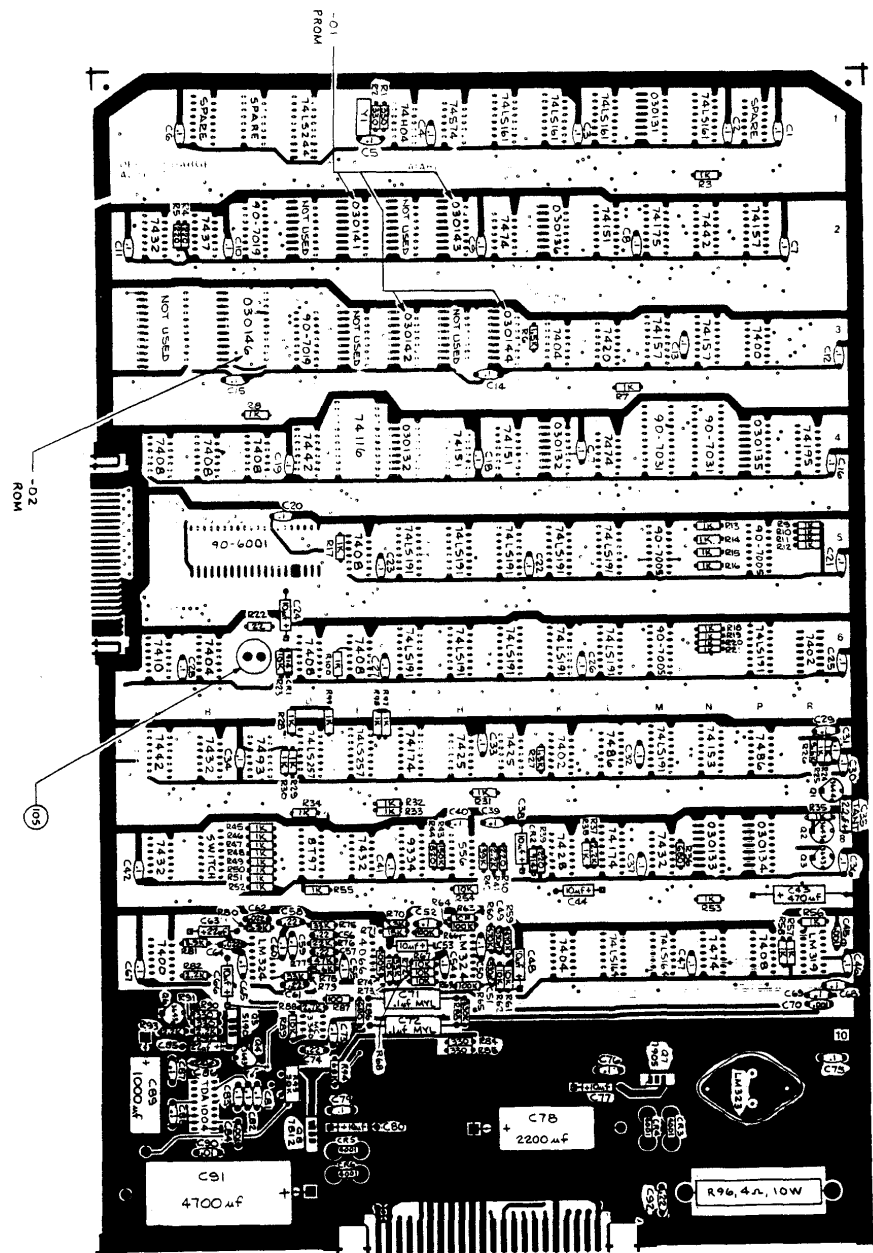


Figure 5-8 Destroyer Game PCB Assembly



Figure 5-8 Destroyer Game PCB Assembly

Item	Part Number	Qty.	Description
1	009529-01	1	P.C. Board
2	10-5101	1	Resistor, Carbon Comp., 5%, $\frac{1}{2}W$, 100 Ohm R87
3	10-5102	44	" " " " " 1K " R3,7-21,24,25,28-35,38,45-53,55-58,97-100
4	10-5103	9	" " " " " 10K " R23,54,61,62,67-69,73,89
5	10-5104	4	" " " " " 100K " R64-66,74
6	10-5106	1	" " " " " 10M " R63
7	10-5152	2	" " " " " 1.5K " R6,27
8	10-5153	1	" " " " " 15K " R71
9	10-5154	1	" " " " " 150K " R43
10	10-5220	1	" " " " " 22 " R22
11	10-5221	4	" " " " " 220 " R4,5,39,40
12	10-5222	5	" " " " " 2.2K " R37,41,82,92,93
13	10-5223	1	" " " " " 22K " R76
14	10-5272	1	" " " " " 2.7K " R88
15	10-5331	6	" " " " " 330 " R1,2,84,85,90,91
16	10-5332	1	" " " " " 3.3K " R70
17	10-5333	3	" " " " " 33K " R72,75,79
18	10-5334	1	" " " " " 330K " R83
19	10-5392	2	" " " " " 3.9K " R80,81
20	10-5393	1	" " " " " 39K " R42
21	10-5473	1	" " " " " 47K " R77
22	10-5474	2	" " " " " 470K " R59,60

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Figure 5-8 Destroyer Game PCB Assembly

Item	Part Number	Qty.	Description
23	10-5562	2	Resistor, Carbon Comp., 5%, W, 5.6K Ohm R26,78
24	10-5681	2	" " " " " 680 " R36,86
25	10-5682	1	" " " " " 48K " R94
26	10-5421	1	" " " " " R20 " R44
27			
28			
29	19-31593	1	Trimpot, 50K Ohm R95
30	19-80940P0	1	Resistor, Wirewound, 10W, 4 Ohm R96
31			
32			
33			
34	21-101104	2	Capacitor, Mylar, 100V, .1 uf C71,72
35	24-250106	8	" Elec., 25V, 10 " C24,28,44, 48,52,66, 77,80
36	24-250226	2	" " " 22 " C83,85
37	24-250447	1	" " " 470 " C43
38	24-250108	1	" " " 1000 " C89
39	24-250228	1	" " " 2200 " C78
40	24-250478	1	" " " 4700 " C91
41	27-250102	3	Car. Disc, " .001 " C45,70,84
42	27-250223	2	" " " .022 " C42,64
43	27-250103	1	" " " .01 " C90
44	27-250224	6	" " " .22 " C56,58,61, 74,92
45	27-250104	60	" " " .1 " C1-13,25- 34,36,37, 39-42,46, 47,50,52, 54,55,59, 60,65,67- 69,73,75, 76,79,81- 83,87,88
46	28-101221	1	" Dipped Mica, 100V, 220 pf C86
47	28-101331	2	" " " 330 " C49,51
48	29-010	1	Tant., Elec., 10V, 2.2 uf C35
49			
50			

Item	Part Number	Qty.	Description
86	37-74175	1	IC, 74175 H2
87	37-74LS191	12	" 74LS191 P5,85,J5,K5, L5,P6,P6,J6, K6,L6,P6,H7
88	37-74195	1	" 74195 R4
89	37-74LS264	1	" 74LS264 D1
90	37-74LS257	2	" 74LS257 D7,E7
91	37-8797	1	" 8797 D8
92	37-9334	1	" 9334 F8
93	37-4066	1	" 4066 E9
94	37-556	1	" 556 H8
95	37-MC3340	1	" MC3340 D10
96	37-LM319	1	" LM319 X9
97	37-LM324	2	" LM324 C9,H9
98	37-LM323	1	Regulator, LM323
99	37-7812	1	" 7812 D6
100	37-7905	1	" 7905 Q7
101	37-TDA1004	1	Audio Amp TDA1004 R10
102			
103			
104			
105	42-001	1	Switch, Momentary, SPST
106	44-118PIT	1	" 8-Position DIP, SPST x 8 R8
107	72-140MC	2	Screw, Pan Hd, Phil, 4-32 x 1/2, CR85
108	73-016	2	Washer, Flat, #6
109	73-056	2	Washer, Lock, Int. Star, #6
110	73-916C	2	Nut, Hex, 4-32, CR85
111			
112			
113			
114	78-06001	1	HeatSink (for LM323)
115	009470-01	1	" (for TDA1004)
116	78-13016	AR	Cement (for TDA1004 HeatSink)
117	78-16005	1	Slipad (for LM323)
118			
119			
120			

Item	Part Number	Qty.	Description
51			
52	31-18914	2	Diode, 18914 CR1,2
53	31-184001	4	" 184001 CR3-6
54			
55			
56			
57	33-283644	1	Transistor, 283644 Q1
58	34-283643	4	" 283643 Q2-4,6
59	34-285190	1	" 285190 Q5
60			
61			
62			
63	37-7400	2	IC, 7400 P3,A9
64	37-7402	2	" 7402 R6,E7
65	37-7404	3	" 7404 R3,R6,R9
66	37-74004	1	" 74004 F1
67	37-7408	7	" 7408 A4,84,C4,E5, 56,86,P9
68	37-7410	1	" 7410 A6
69	37-7420	1	" 7420 L3
70	37-7425	2	" 7425 R7,J7
71	37-7428	1	" 7428 R8
72	37-7432	5	" 7432 A2,87,A8,E8, H8
73	37-7437	1	" 7437 R2
74	37-7442	3	" 7442 R2,D4,A7
75	37-7474	3	" 7474 J2,L4,H9
76	37-74874	1	" 74874 H1
77	37-7486	2	" 7486 L7,P7
78	37-7493	1	" 7493 C7
79	37-74116	1	" 74116 R4
80	37-74151	3	" 74151 L2,H4,J4
81	37-74153	1	" 74153 W7
82	37-74157	3	" 74157 P2,N3,N3
83	37-74LS161	4	" 74LS161 J1,K1,L1,M1
84	37-74LS164	2	" 74LS164 L9,H9
85	37-74174	2	" 74174 P7,L8

Item	Part Number	Qty.	Description
121	79-42040	1	Socket, 40-Pin, Mod. Insertion
122			
123			
124			
125	90-102	1	Crystal, 12.094 Mhz Y1
126			
127			
128			
129	90-6001	1	Microprocessor, MC68001 R/C5
130	90-7005	3	RAM, 82525 H5,P5,H6
131	90-7019	2	" 2111A-4 C2,D3
132	90-7031	2	" 2101A-4 H4,H4
133			
134			
135			
136	030131-01	1	Depth Charge Snd PRGM H1
137	030132-01	2	" " Minor Objects F6,K4
138	030133-01	1	" " Major Objects 1 R8
139	030134-01	1	" " Major Objects 2 P8
140	030135-01	1	" " Alphametrics K4
141	030136-01	1	" " Waves K2
142			
143			
144			
145			
146			
147			
148			
149	030144-01	1	Depth Charge ROM C3

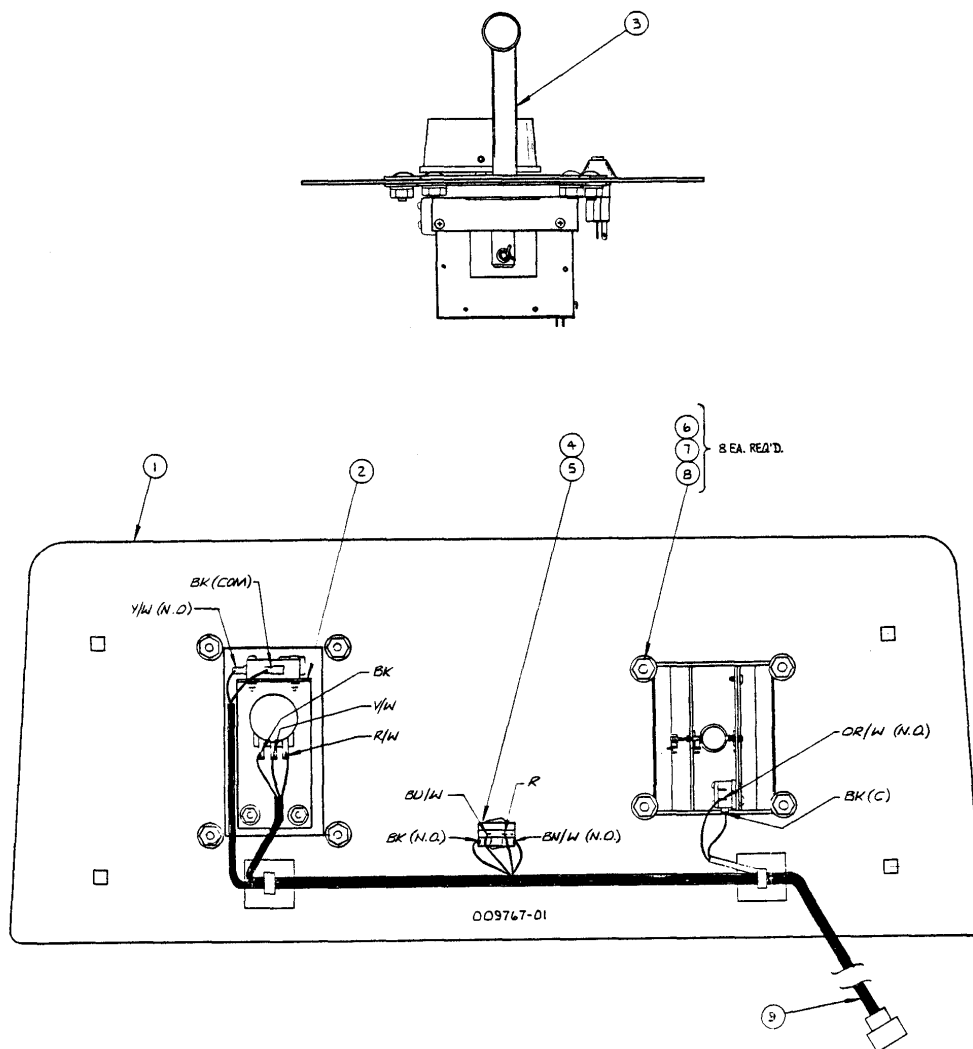


Figure 5-9 Control Panel Assembly



Figure 5-9 Control Panel Assembly

Item	Part Number	Qty.	Description
1	009767-01	1	Control Panel with Graphics
2	A030118-01	1	Switch Assy - See Figure 5-10
3	A007547-02	1	Shift Assy - See Figure 5-11
4	001856-01	1	Bushing, Alum.
5	62-002	1	Switch, LED, Lighted
6	75-5116B	8	Carriage Bolt, #10-24 x 1.00 Lg (Black)
7	75-010S	8	#10 Washer, Flat
8	75-040	8	#10 Washer, Split-Lock
9	A030115-01	1	Control Panel Harness

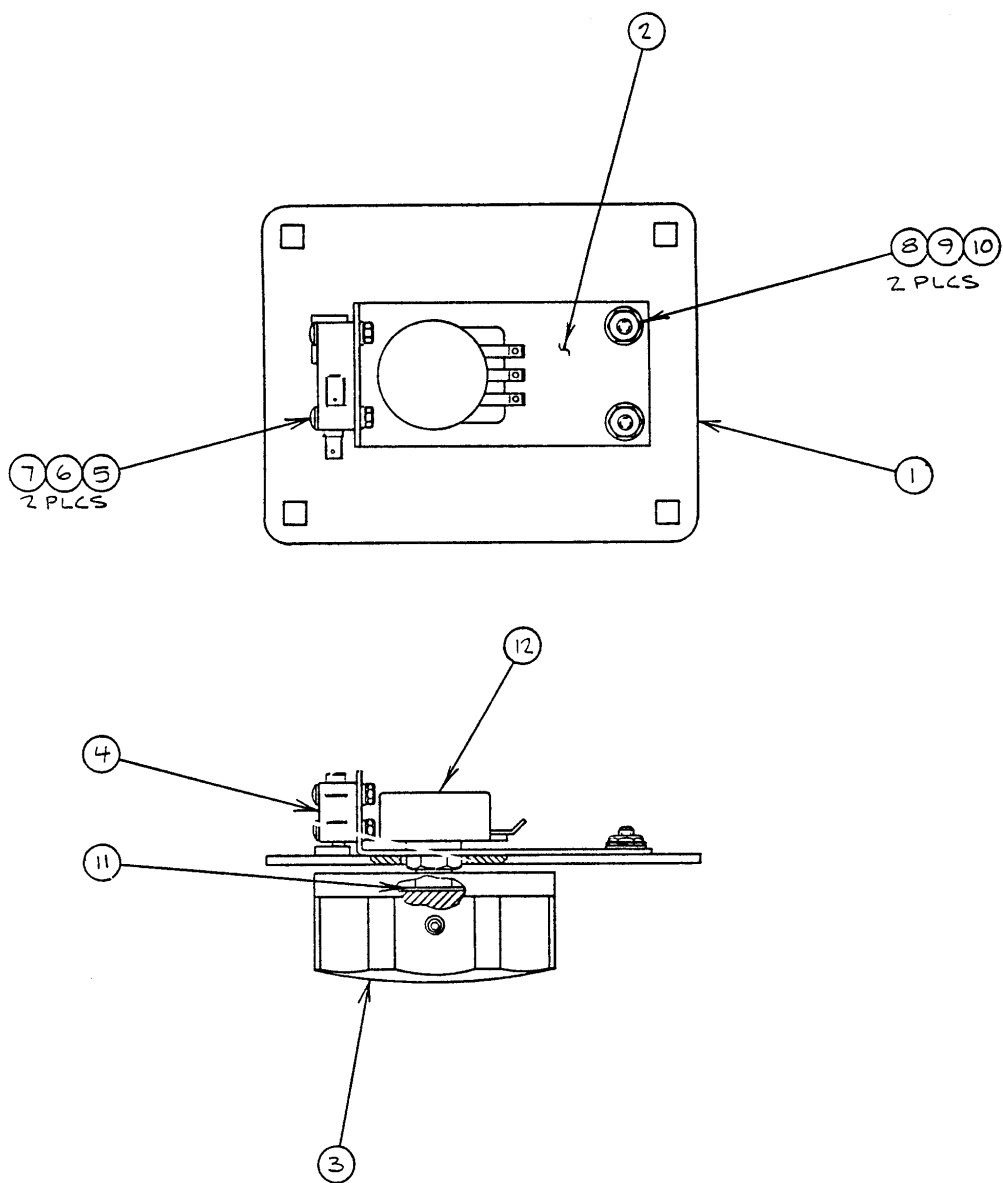


Figure 5-10 Switch Assembly



Figure 5-10 Switch Assembly

Item	Part Number	Qty.	Description
1	030116-01	1	MTG Plate
2	030117-01	1	Flat Spring
3	73-830	1	Knob
4	*65-081A	1	Micro Switch*
5	72-1410C	2	Machine Screw 4-40 x .62 Lg.
6	75-054	2	Lock Washer Int. Tooth #4
7	75-914S	2	Hex Nut #4-40
8	75-918S	2	Hex Nut #8-32
9	75-028S	2	Flat Washer #8
10	75-048	2	Split Lock Washer #8
11	75-015S	1	Flat Washer #1/4 Wide
12	19-9011	1	Pot 5K, Slip Clutch
			<p>* Acceptable Substitutes 65-091A, 65-101A, 65-11A, 65-041C</p>

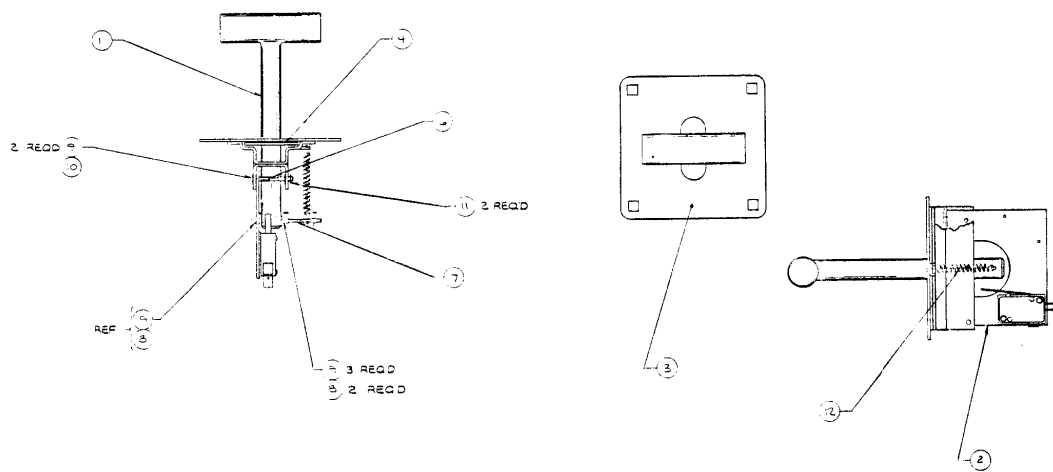


Figure 5-11 Shift Assembly



Figure 5-11 Shift Assembly

Item	Part Number	Qty.	Description
1	A007480-01	1	Shaft Assy
2	A007534-01	1	Switch/Bracket Assy
3	A007188-01	1	Shift Bracket Weldment
4	007396-01	1	Plate Slider
5	007535-01	3	Retainer, Compression
6	007373-01	1	Shaft
7	007372-01	1	Spring Pin
8	75-014	2	Flat Washer #4
9	75-2804S	2	Machine Screw 8-32 x 1/4" Lg.
10	75-048	2	Split Lock Washer #8
11	73-3002	2	Retaining Ring #Z3-2
12	78-3001025	1	Spring (LEE #LE-D45D-4)