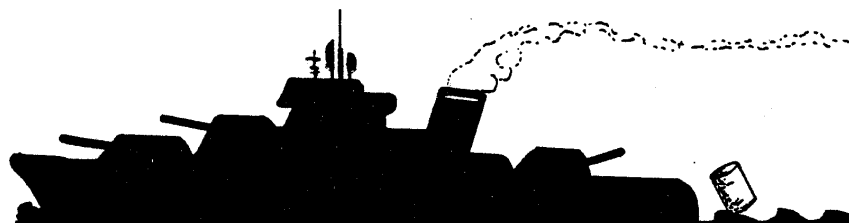
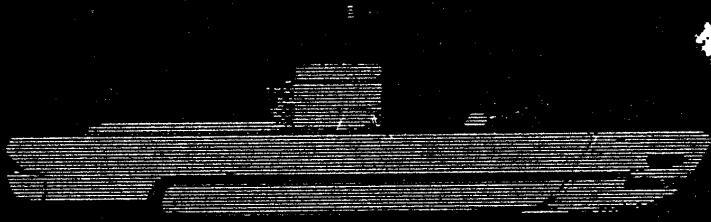


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DESTROYER™



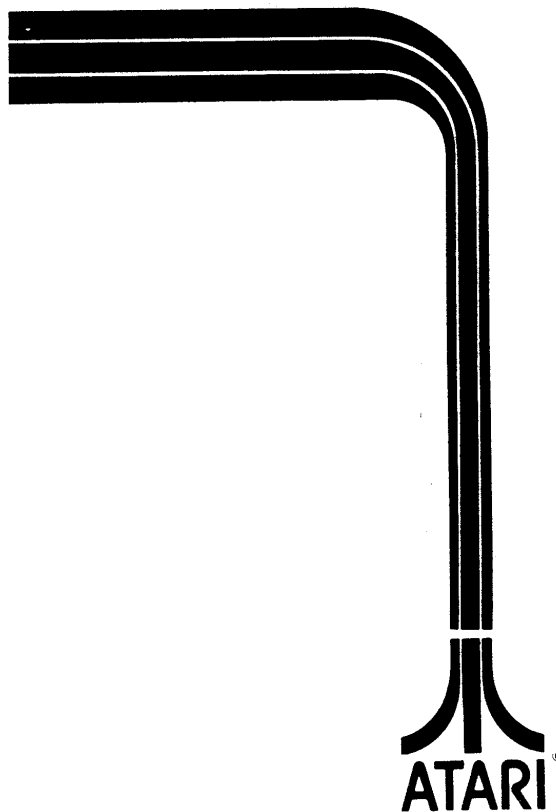
Operation, Maintenance and Service Manual
Complete with Illustrated Parts Catalog

DESTROYER[™]

Operation, Maintenance and Service Manual

Complete with Illustrated Parts Catalog

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A Warner Communications Company 

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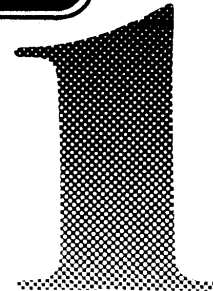
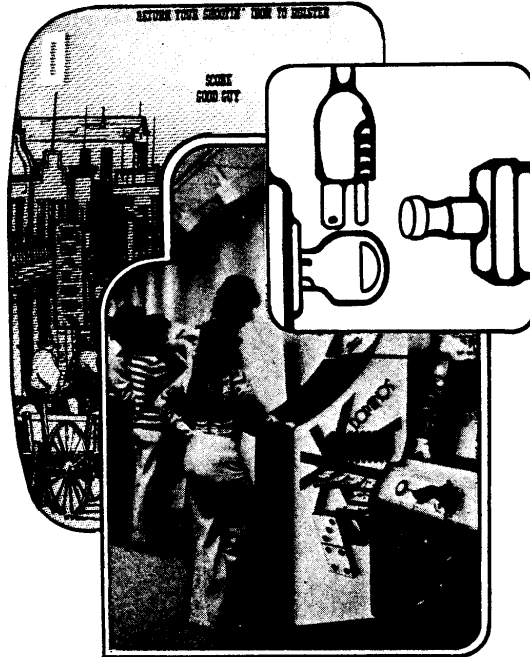
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LOCATION SETUP

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.

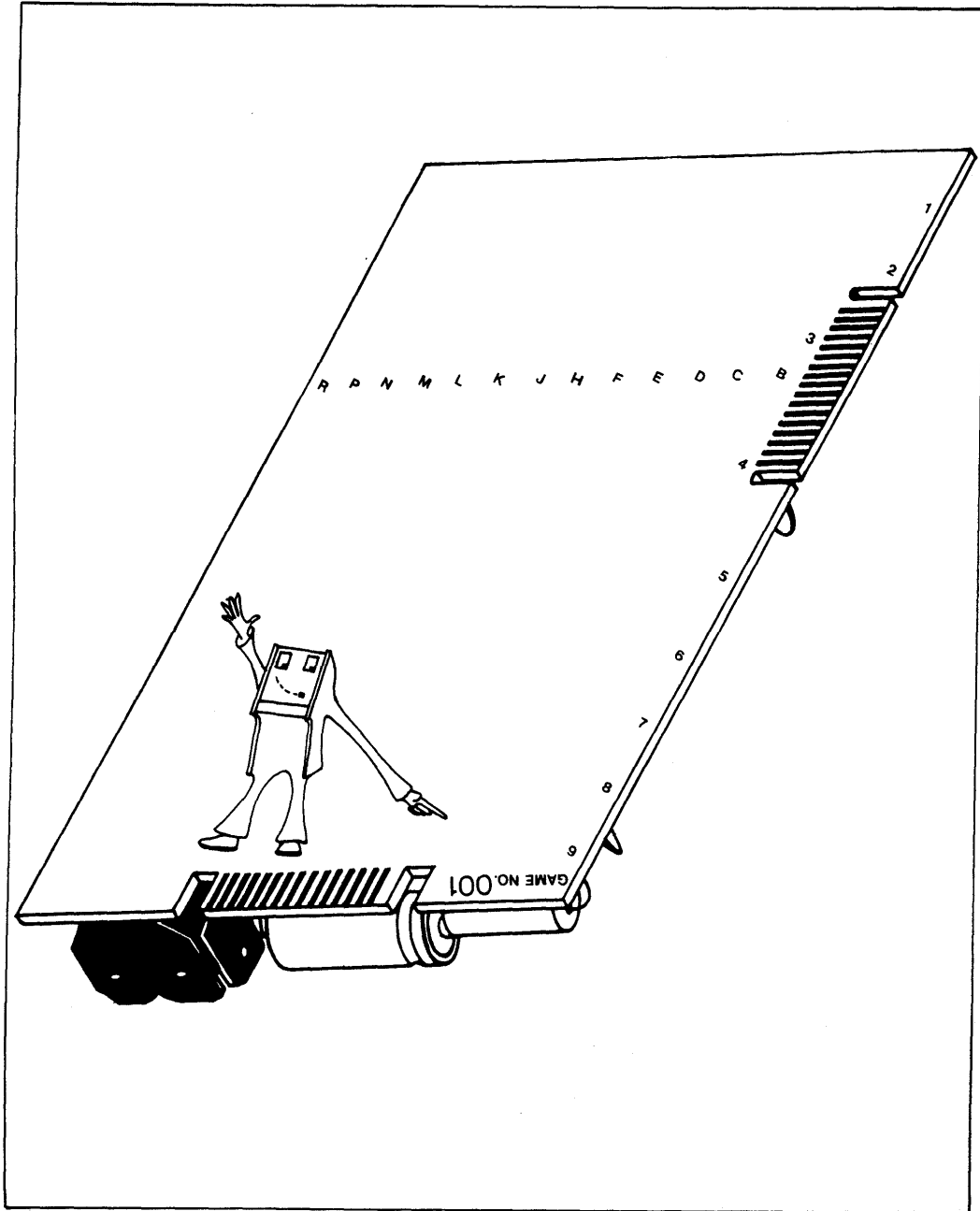


Figure 1-1 Location of Serial Number on Game PCB

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.

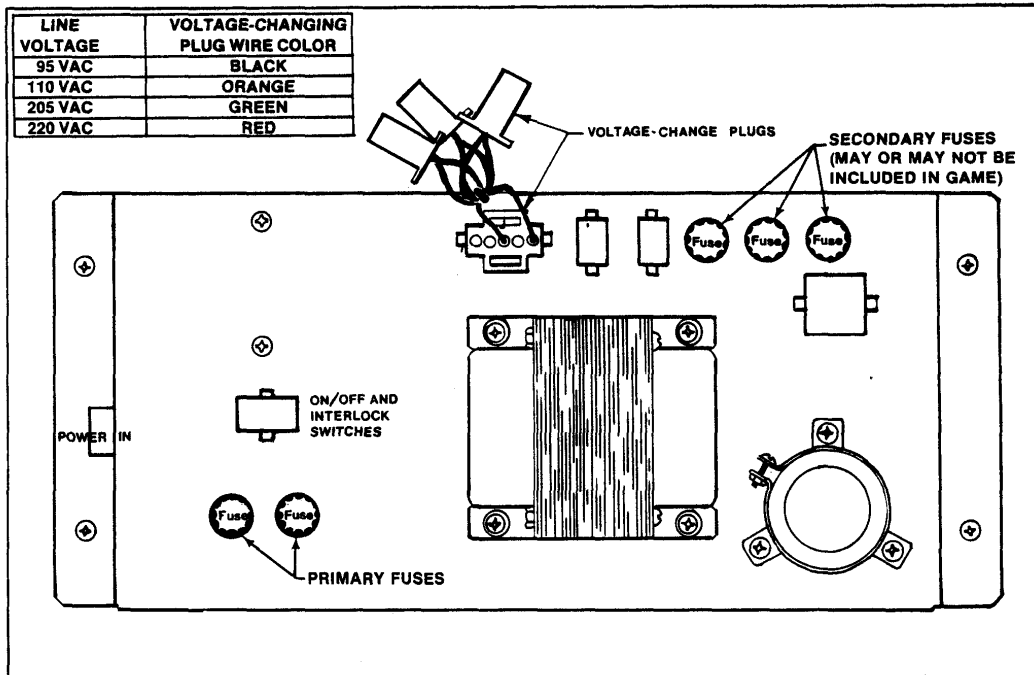


Figure 1-2 Location of Voltage-Changing Plugs on the Power Supply

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

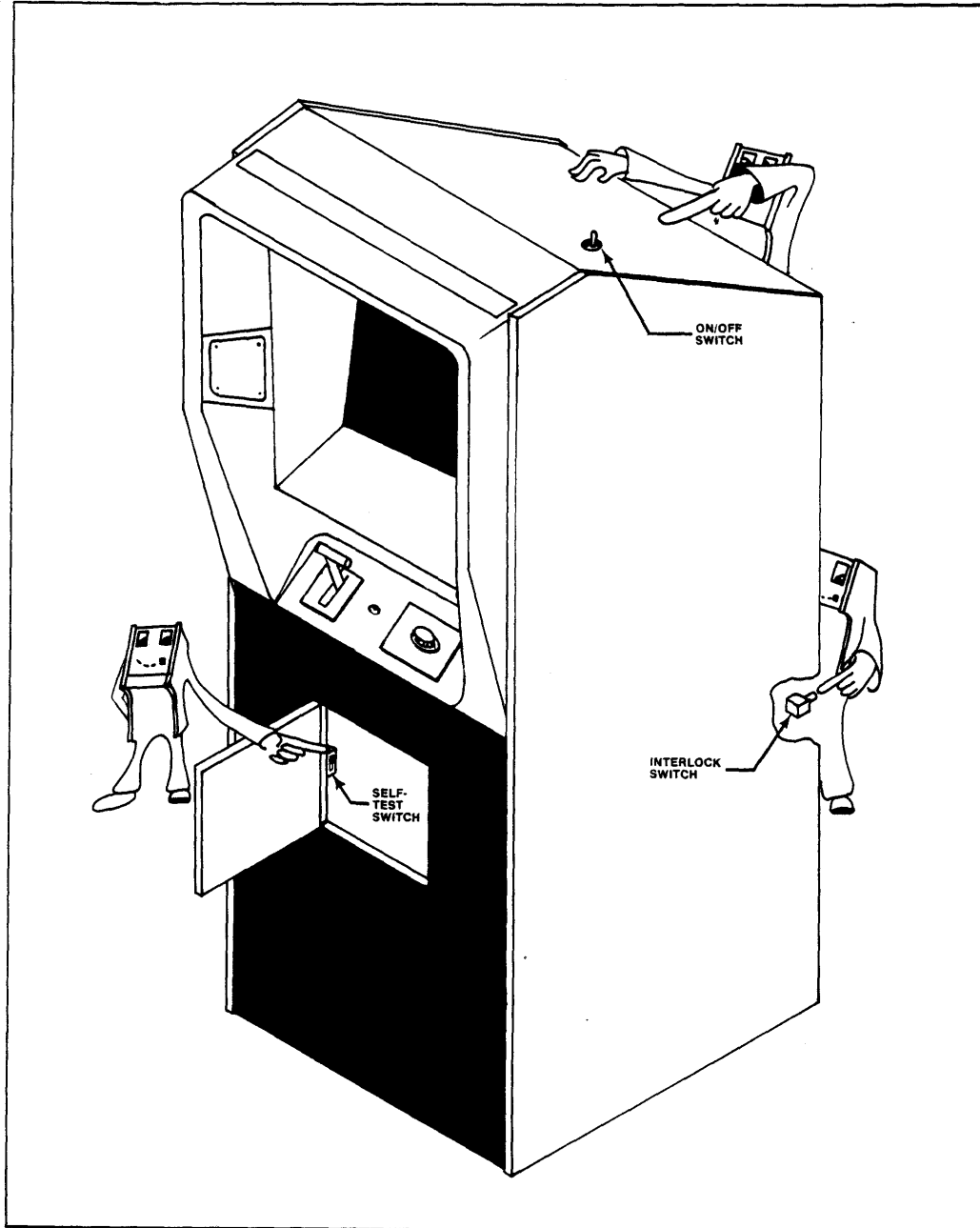


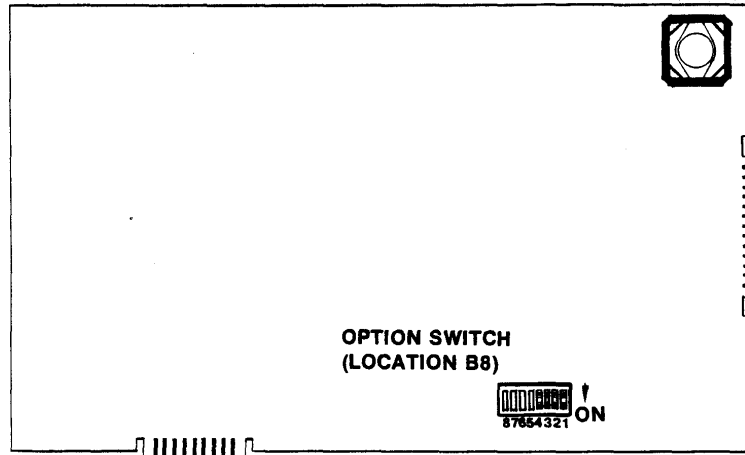
Figure 1-3 Location of Power On/Off and Interlock Switches

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.

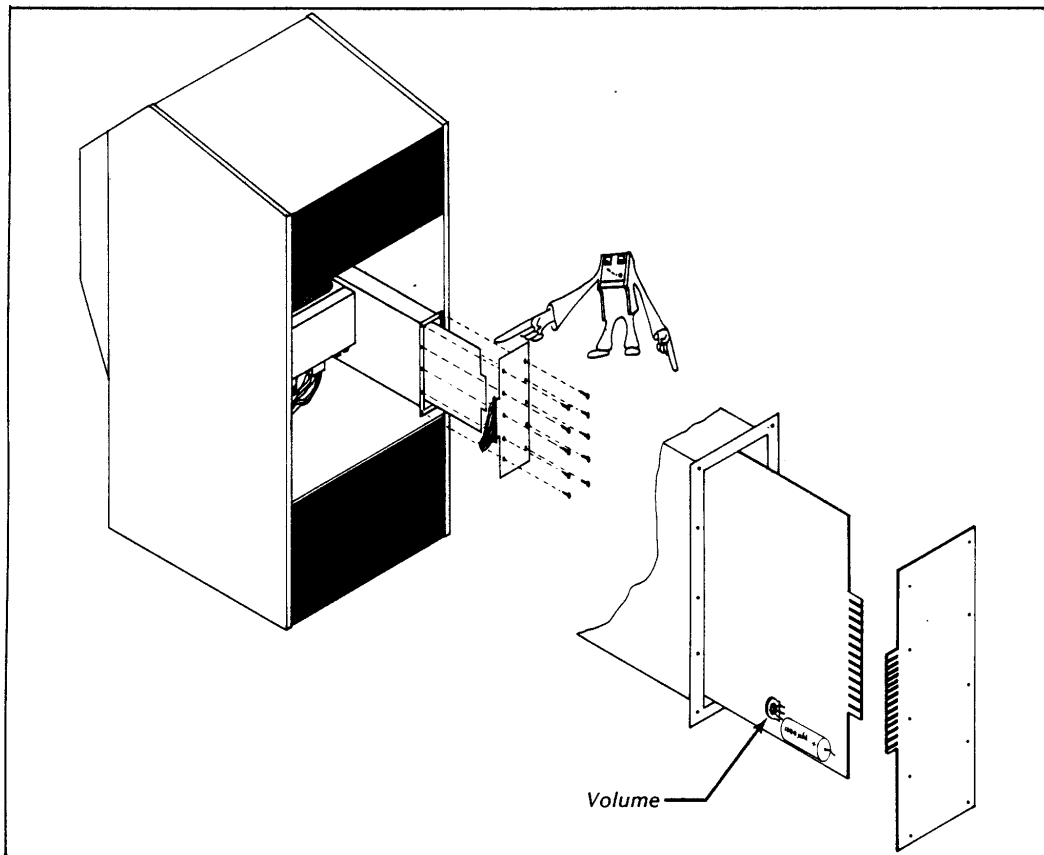


Figure 1-4 Location of Volume Adjustment



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

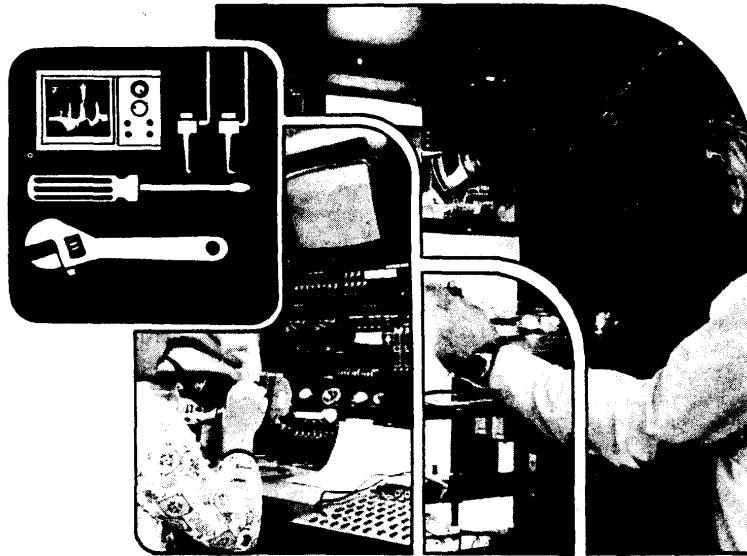
This mode begins when the START button is pressed and ends when the game is over. During this mode all controls and sounds are active. The player sets the depth at which charges explode by rotating the DEPTH-RELEASE CONTROL. Depth is indicated on the screen by a dashed horizontal line (called "the cursor"). 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.

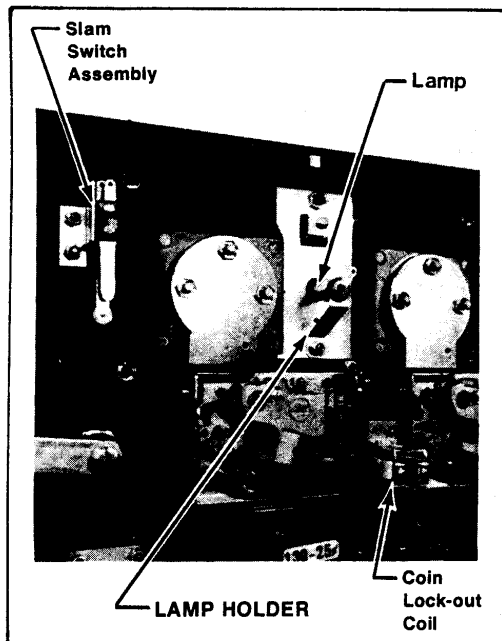


Figure 3-1 Coin Door Assembly

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

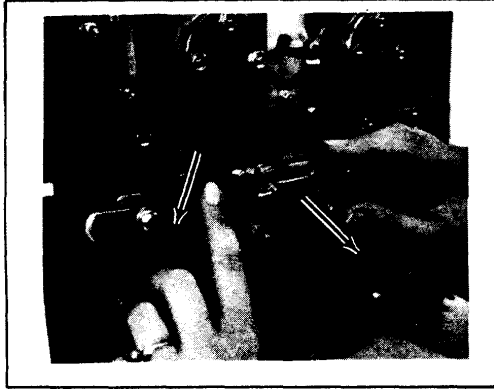


Figure 3-3 Removal of Coin Mechanism

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.

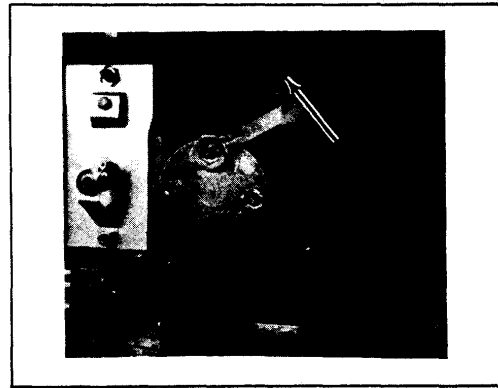


Figure 3-5 Removal of Plate Covering Rear of Coin Slot

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.

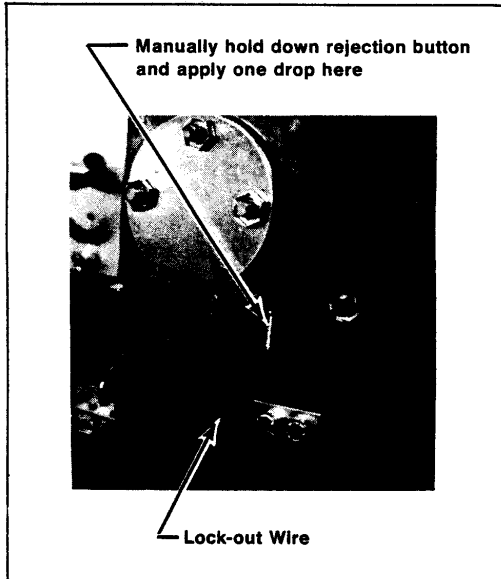


Figure 3-6 Close-Up View of Lubrication Point

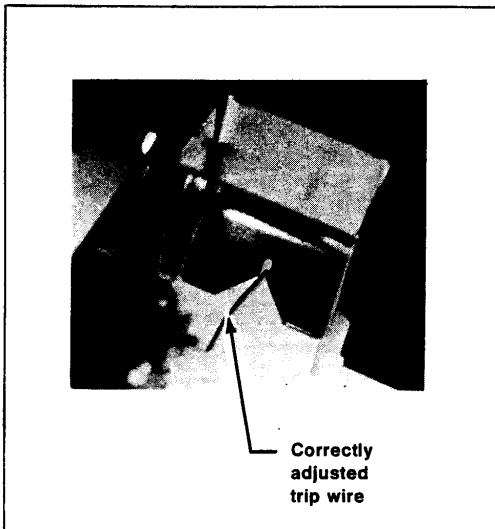


Figure 3-7 Detail View of Coin Switch and Trip Wire

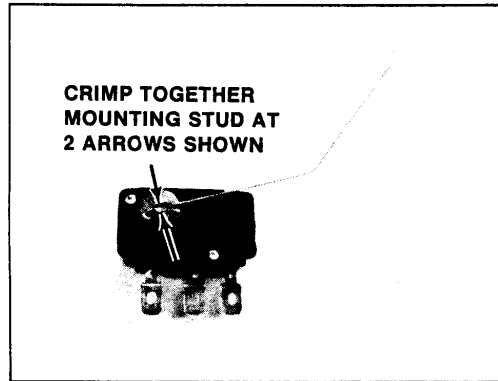


Figure 3-8 Securing the Coin Switch Trip Wire

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.

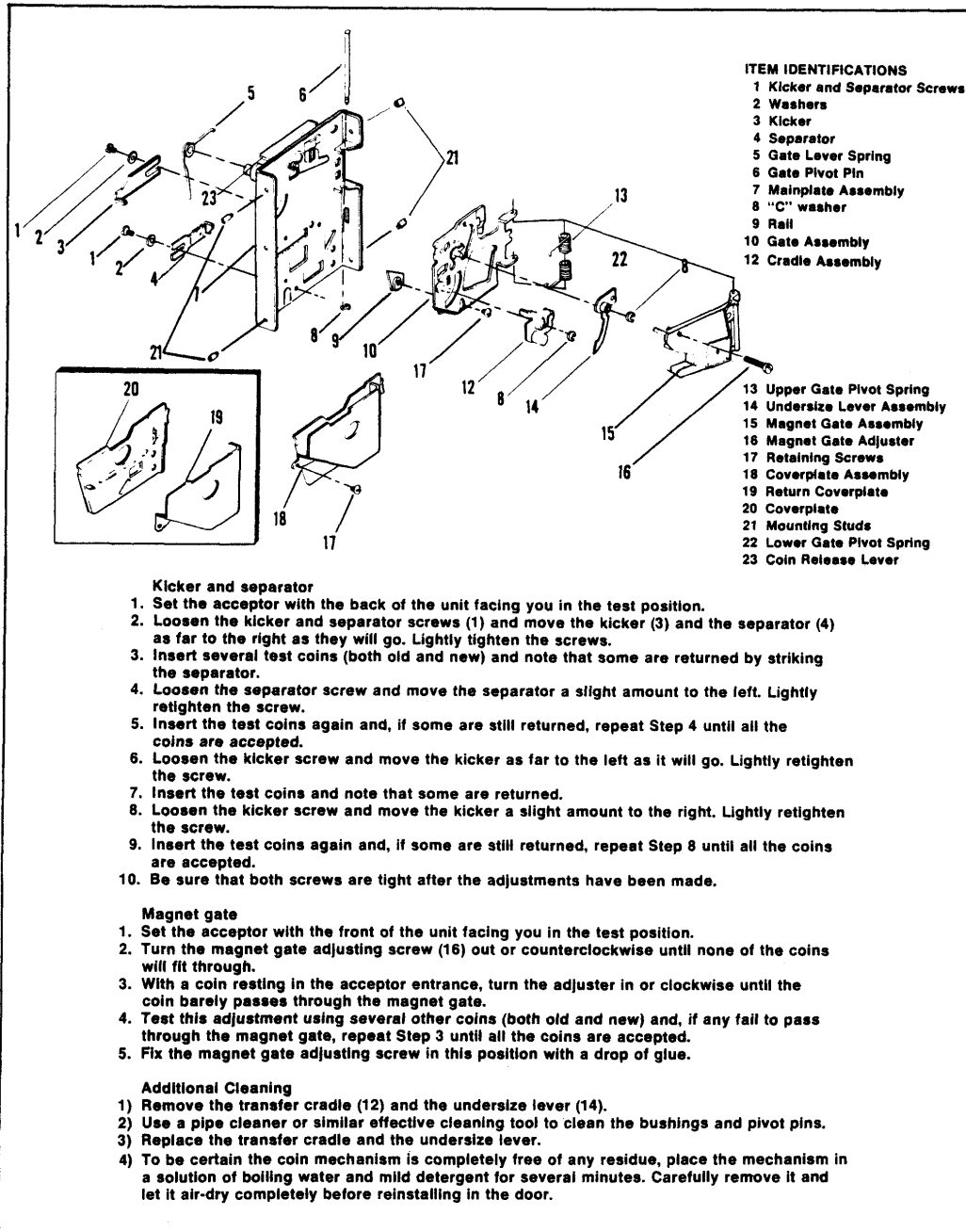
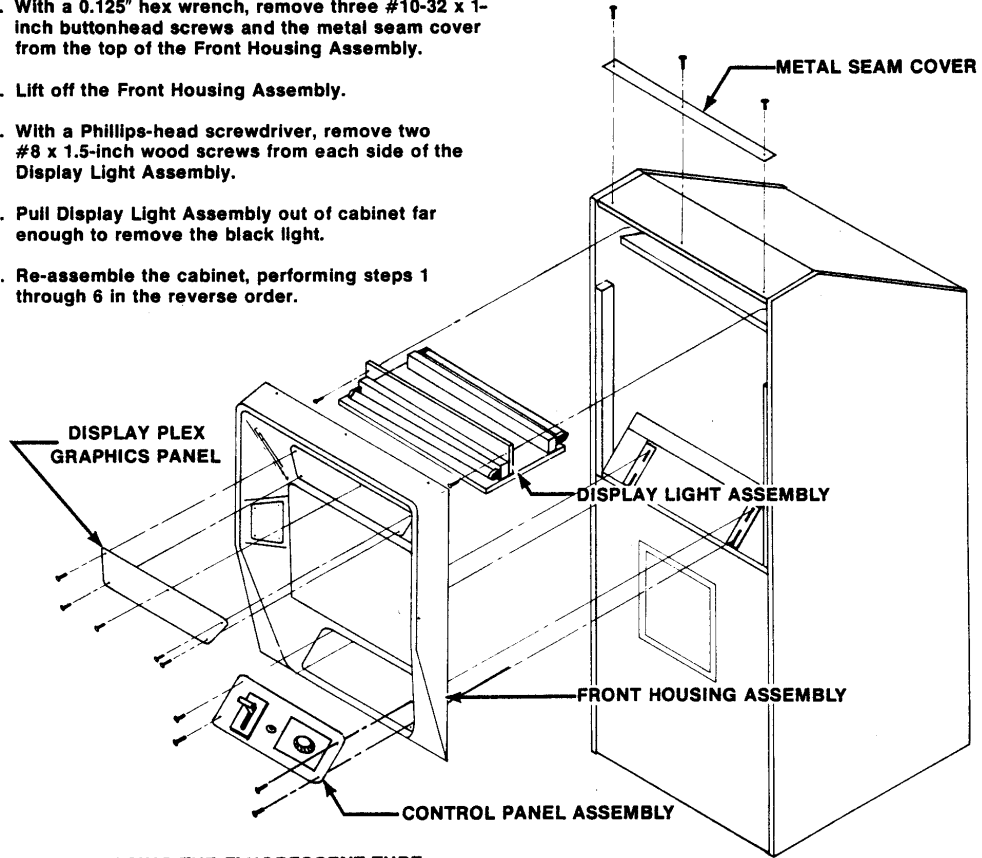


Figure 3-9 Adjustments on Coin Mechanism

REPLACING THE BLACK LIGHT TUBE

Remove the Front Housing Assembly as follows:

1. Reach through the coin door and remove four $\frac{1}{4}$ -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

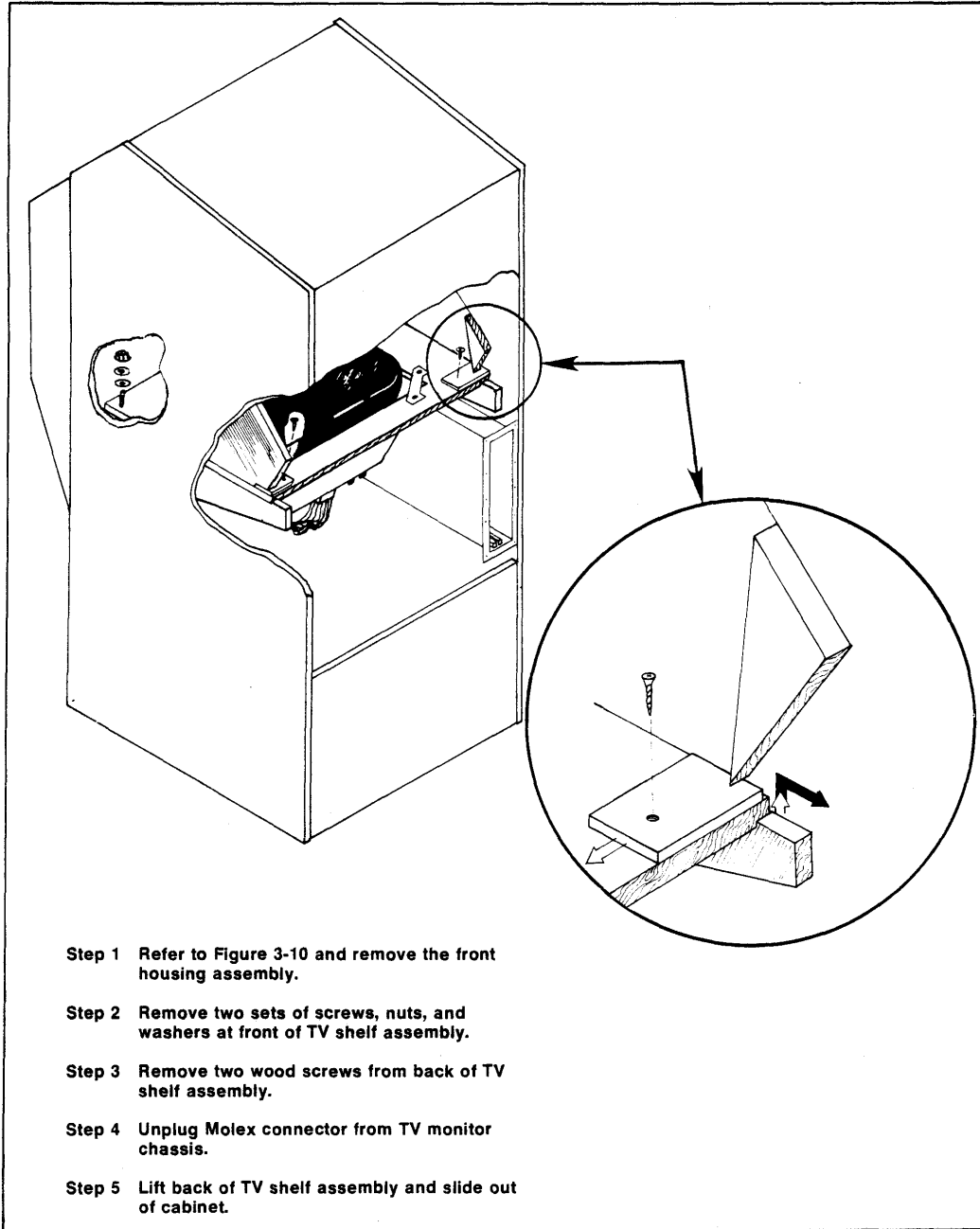
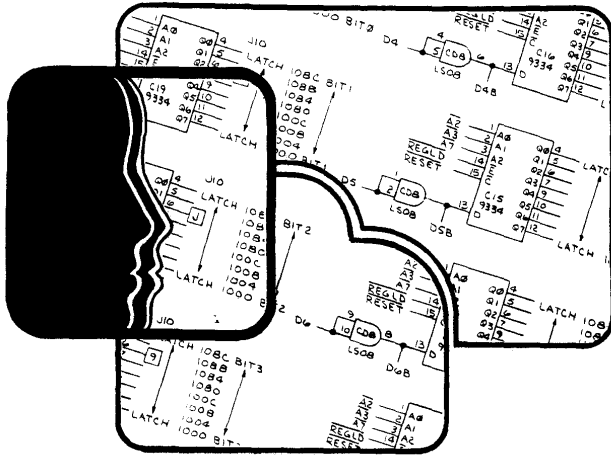


Figure 3-11 Removal of TV Monitor

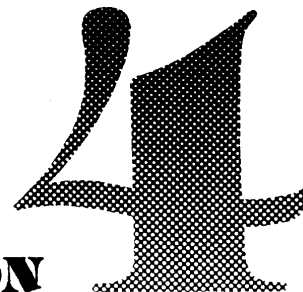


A. GENERAL INFORMATION

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

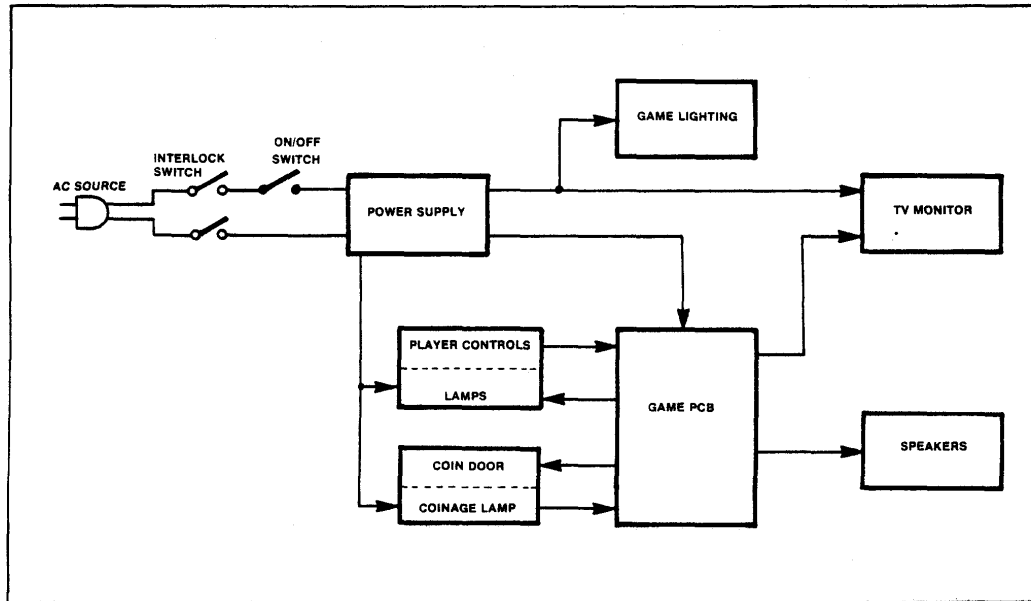


Figure 4-1 Destroyer Game Block Diagram

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

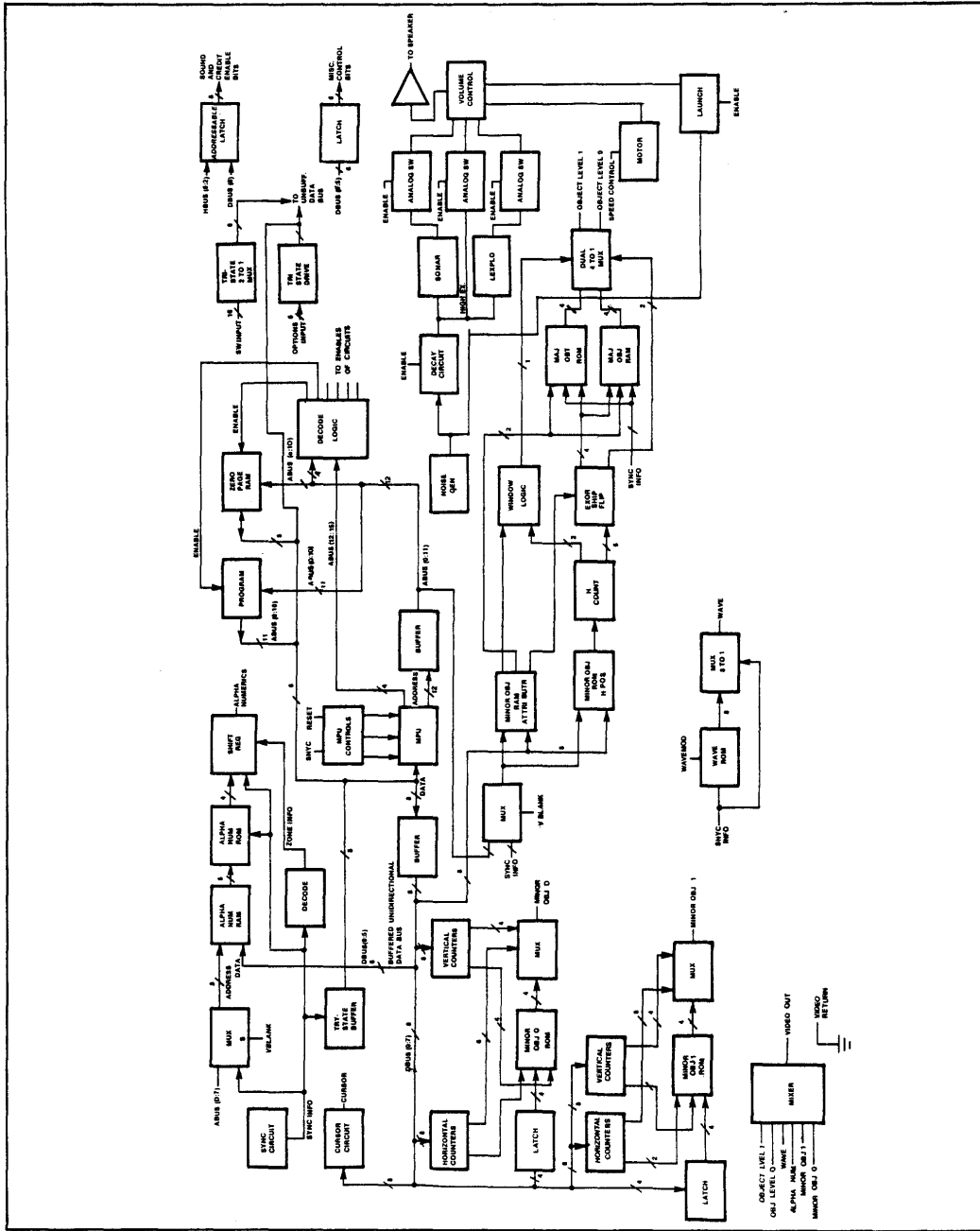


Figure 4-2 Destroyer Game PCB Block Diagram

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 $\overline{\text{MAJOR}}\text{OBJSEL}$ (major object select) is gated

with ABUS0 and $\overline{\text{WRITE}}$ 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 $\overline{\text{SWRD}}$ (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 $\overline{\text{VBLANK}}$, 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.

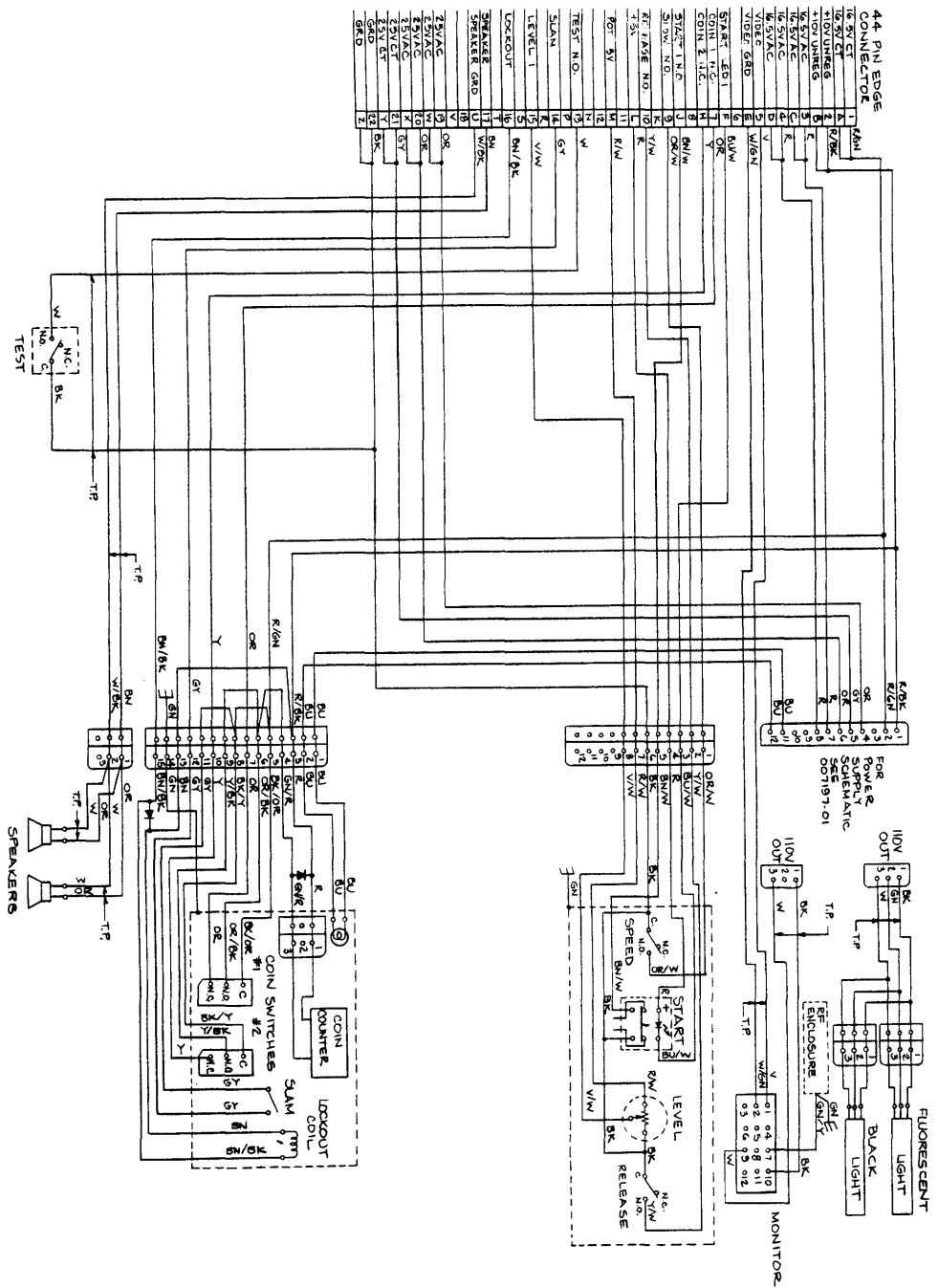


Figure 4-3 Destroyer Game Harness Diagram

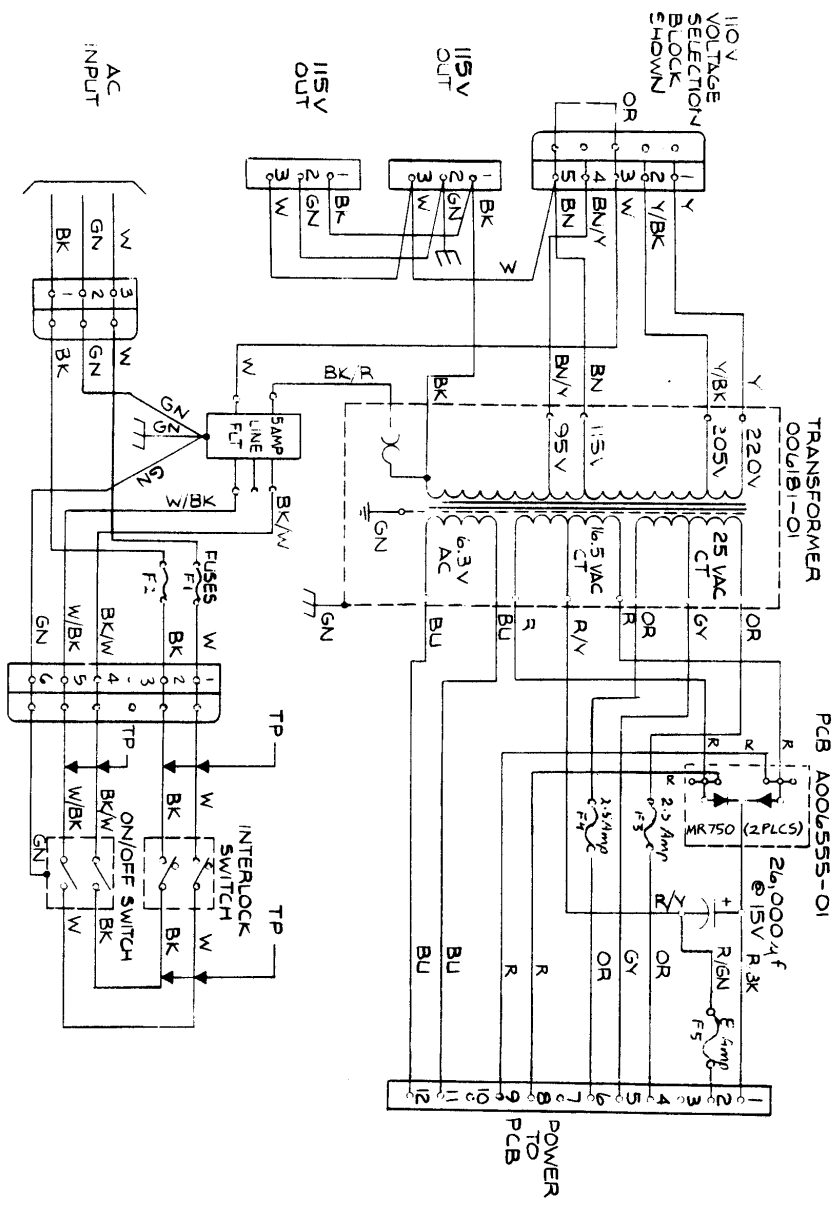


Figure 4-4 Destroyer Power Supply Schematic

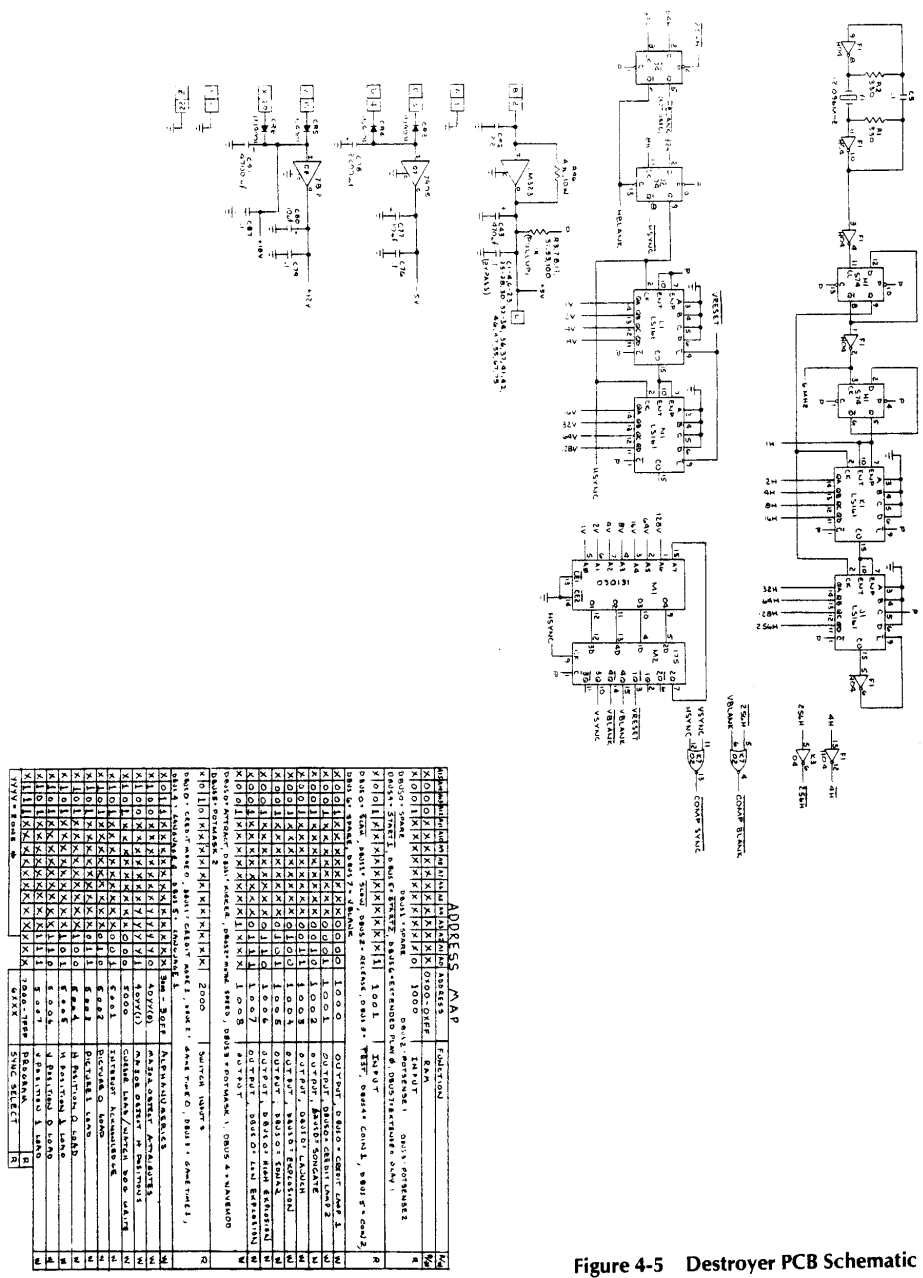


Figure 4-5 Destroyer PCB Schematic Diagram Sheet 1 of 5

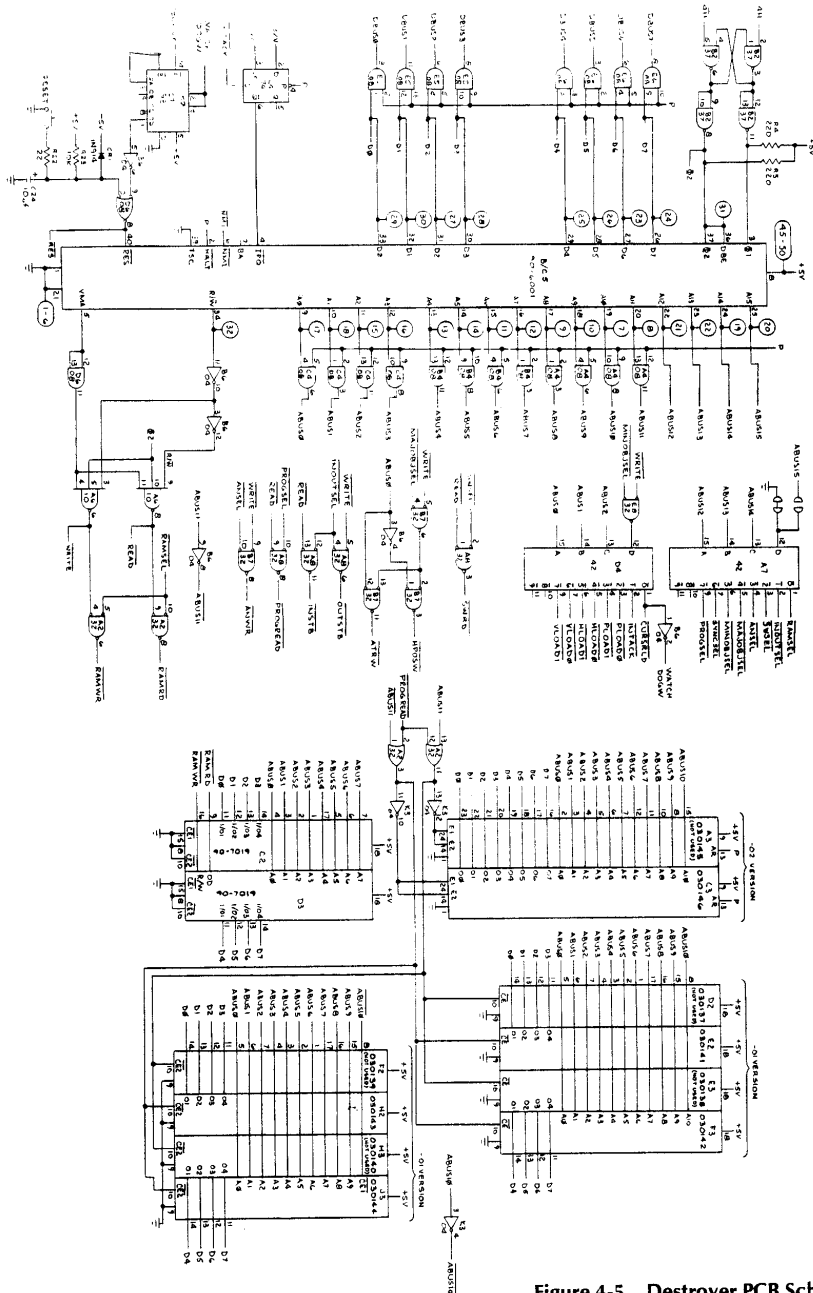


Figure 4-5 Destroyer PCB Schematic Diagram
Sheet 2 of 5

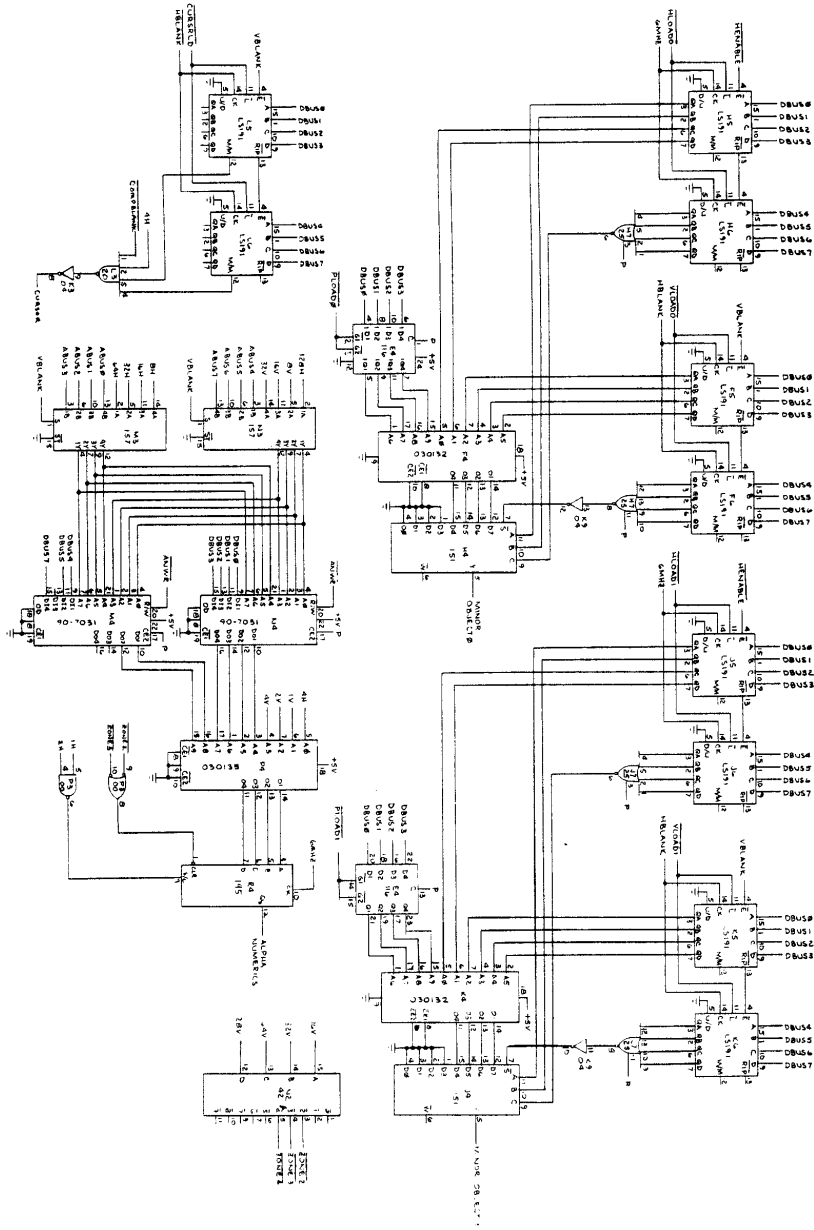


Figure 4-5 Destroyer PCB Schematic Diagram
Sheet 3 of 5

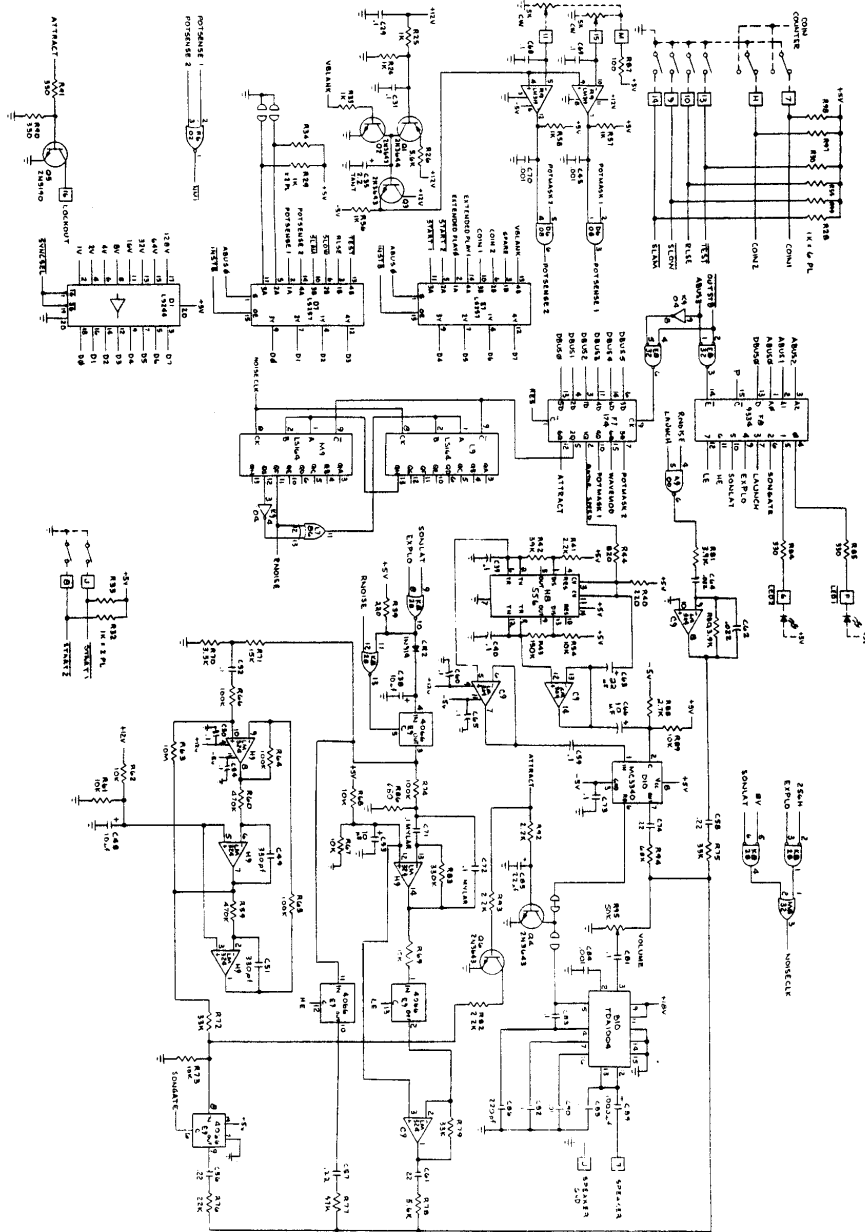


Figure 4-5 Destroyer PCB Schematic Diagram
Sheet 4 of 5

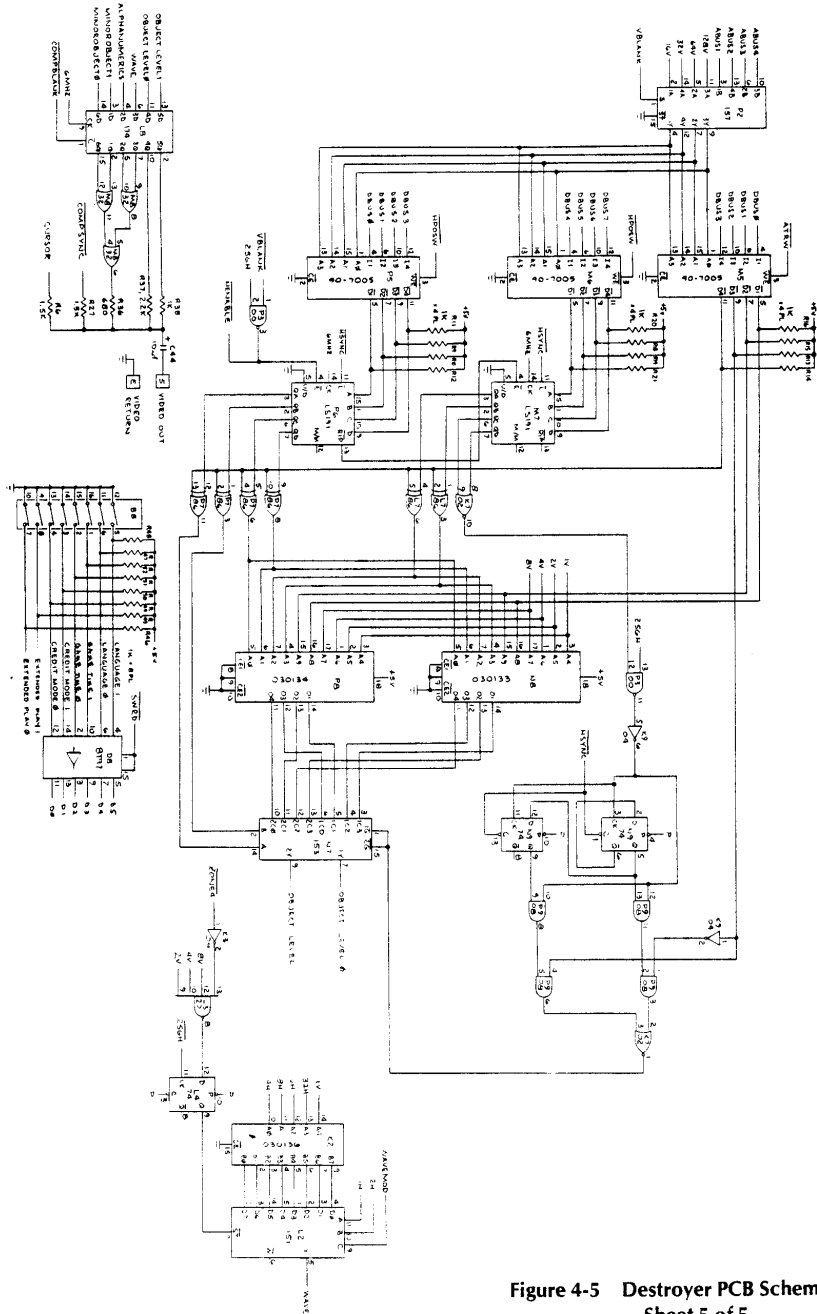


Figure 4-5 Destroyer PCB Schematic Diagram
Sheet 5 of 5

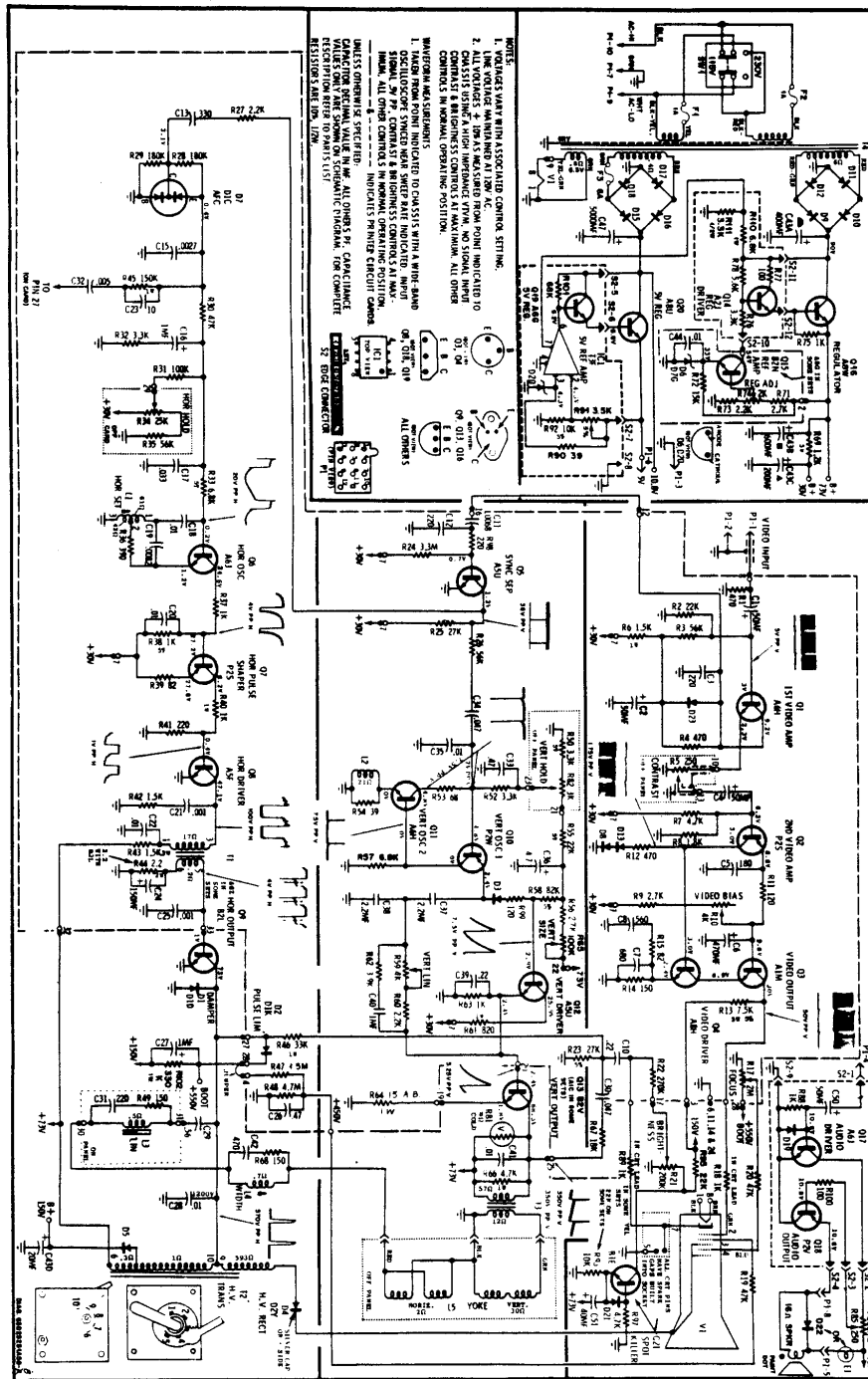


Figure 4-6 Motorola TV Monitor Schematic

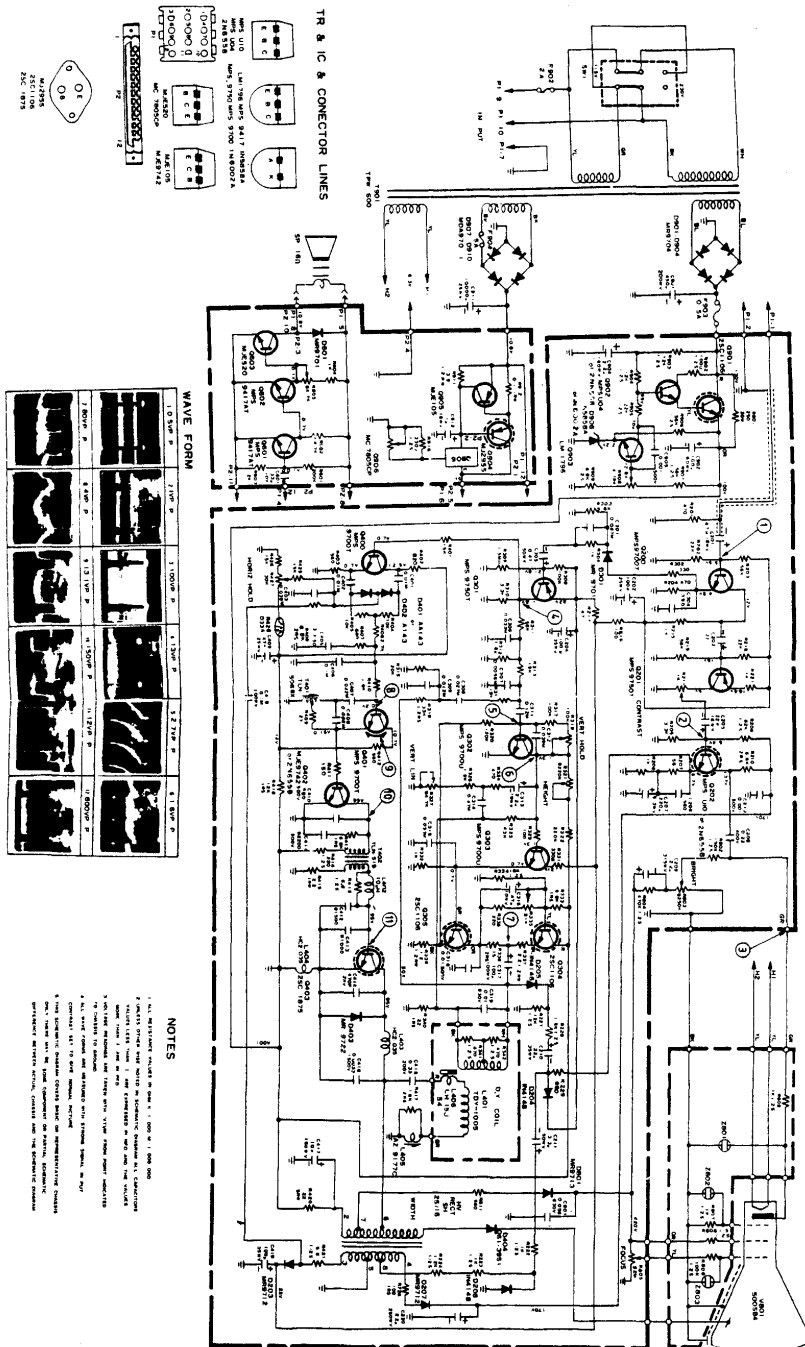
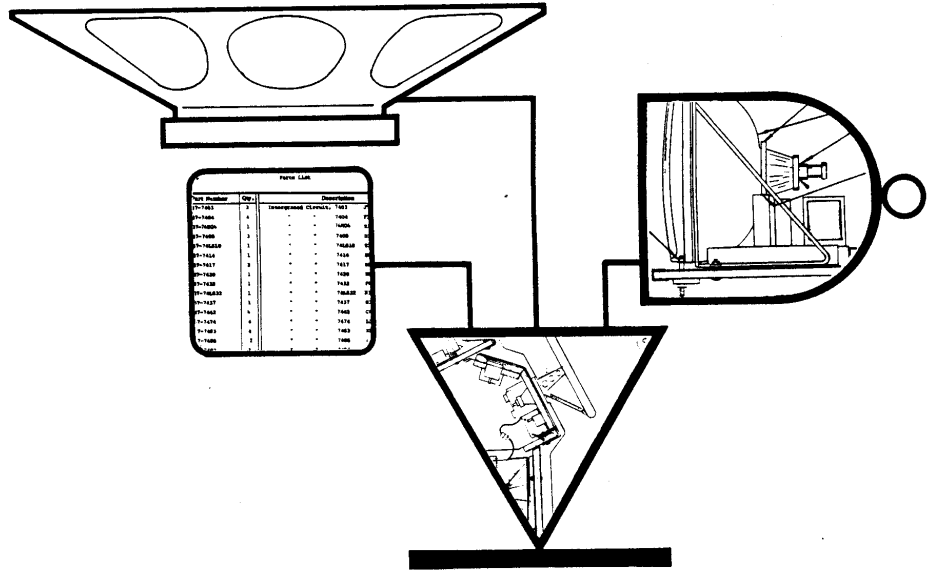


Figure 4-6 TEC TV Monitor Schematic



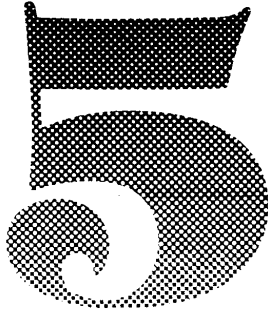
ILLUSTRATED PARTS CATALOG

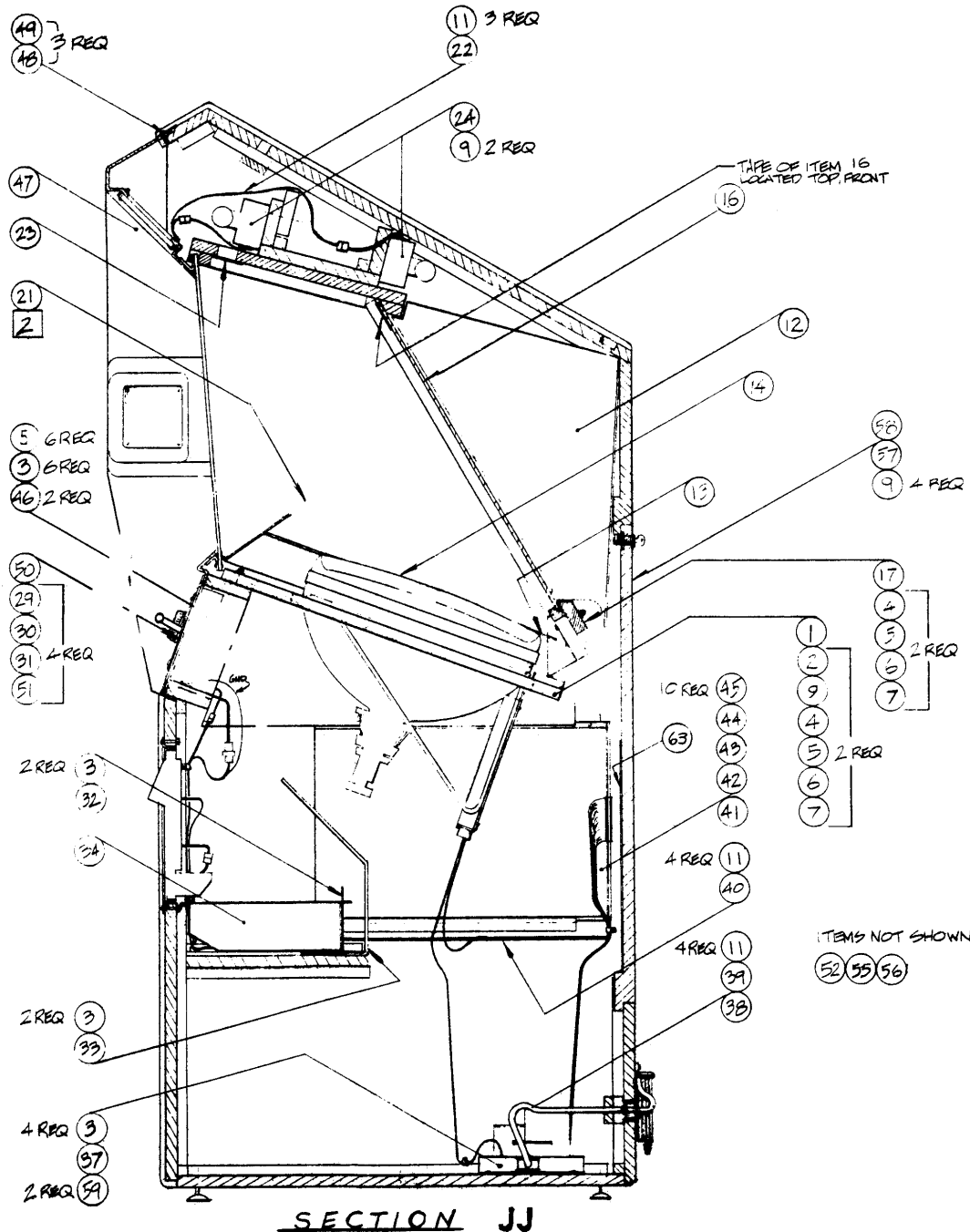
The purpose of this Chapter is to provide you with the necessary information for ordering replacement parts for the Destroyer Game.

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.





ITEMS NOT SHOWN:
 (52) (55) (56)

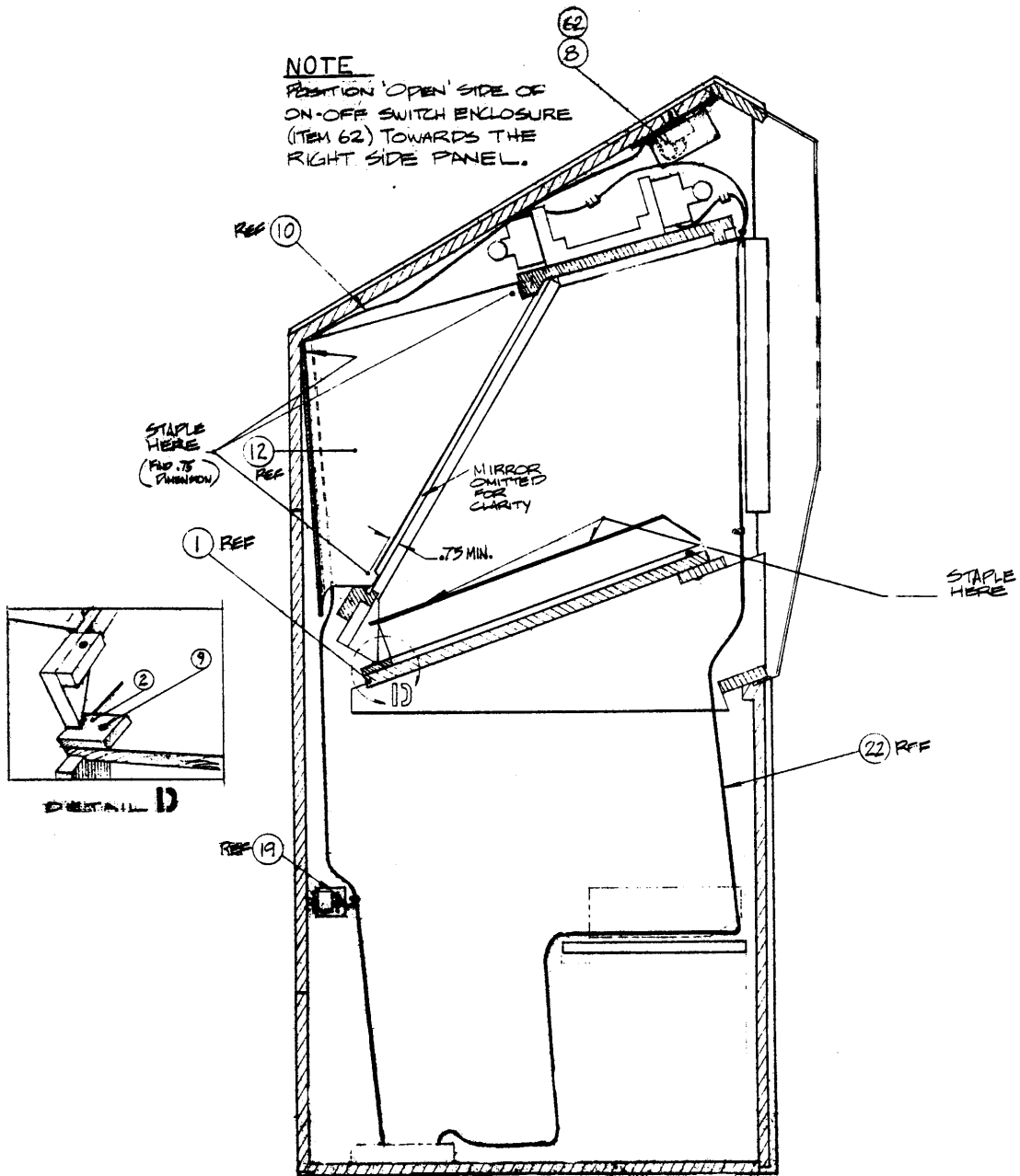


Figure 5-1 Destroyer Final Assembly

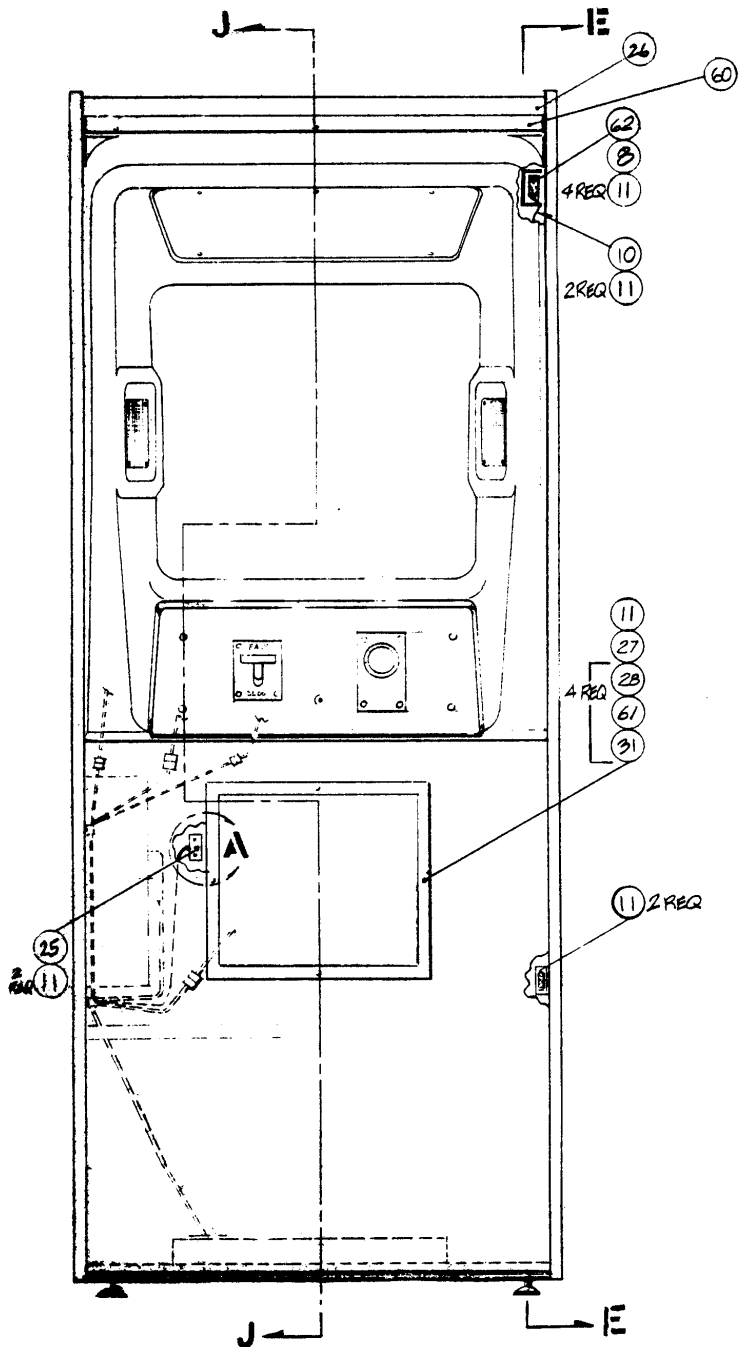


Figure 5-1 Destroyer Final Assembly



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, 1/4" |
| 31 | 75-015S | 8 | Washer, Flat 1/4" |
| 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 #1/4-20 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 | #1/4-20 Nylon Lock Nuts |
| 62 | 009992-01 | 1 | On/Off Switch Enclosure |
| 63 | ST-106 | 1 | Self Test Chart |

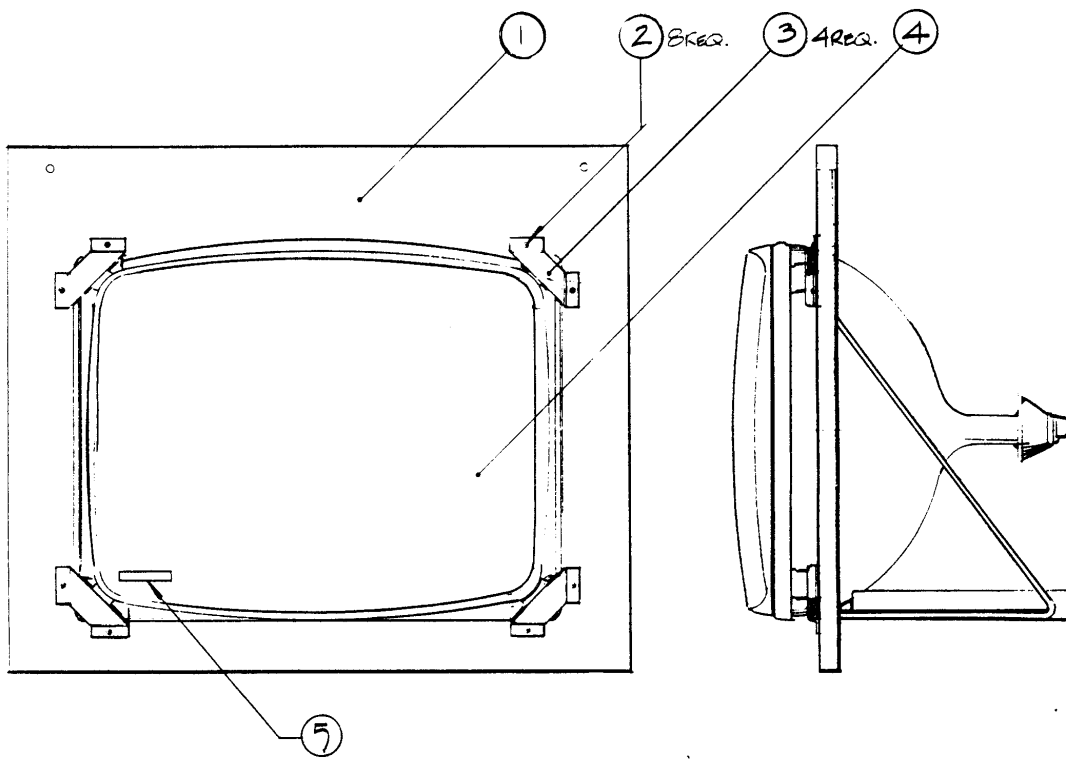


Figure 5-2 TV Shelf Assembly



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 |

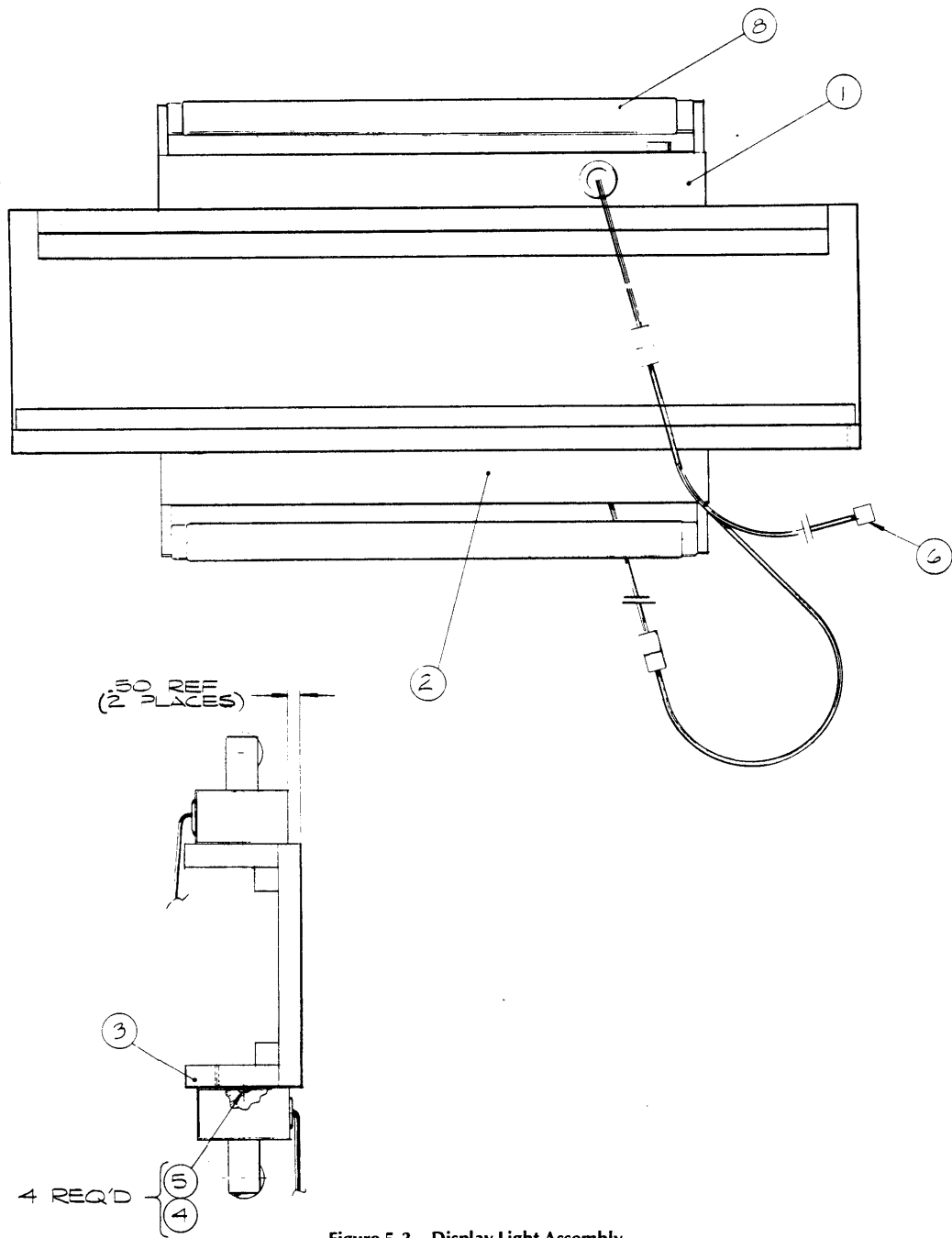



Figure 5-3 Display Light Assembly



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 | 75-0105 | 4 | Washer Flat, #10 |
| 6 | A009270-01 | 1 | Fluorescent Light Harness |
| 7 | | | |
| 8 | 70-306 | 1 | Fluorescent Tube 18" (F15 T8/BL) |

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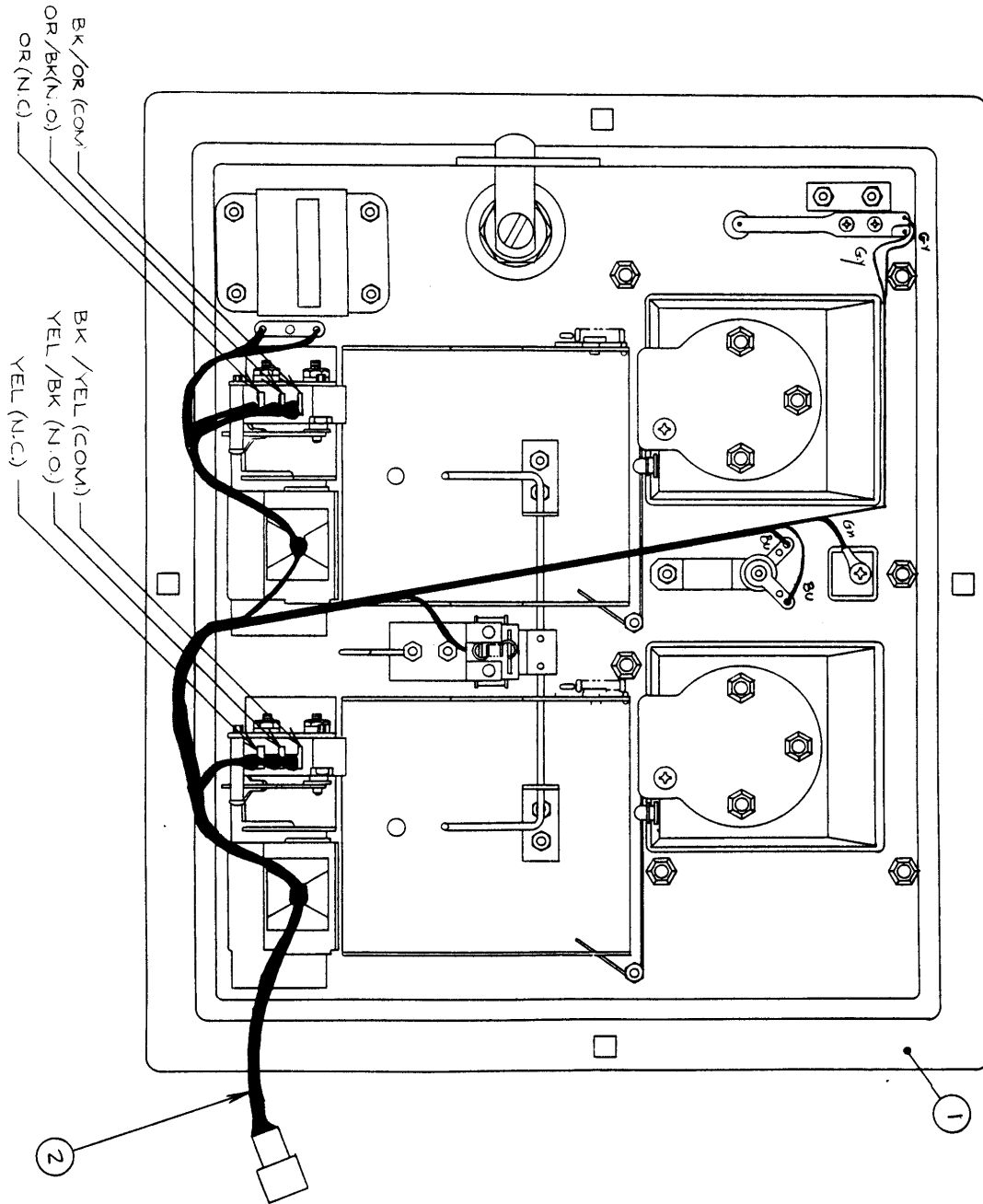


Figure 5-4 Coin Door Final Assembly



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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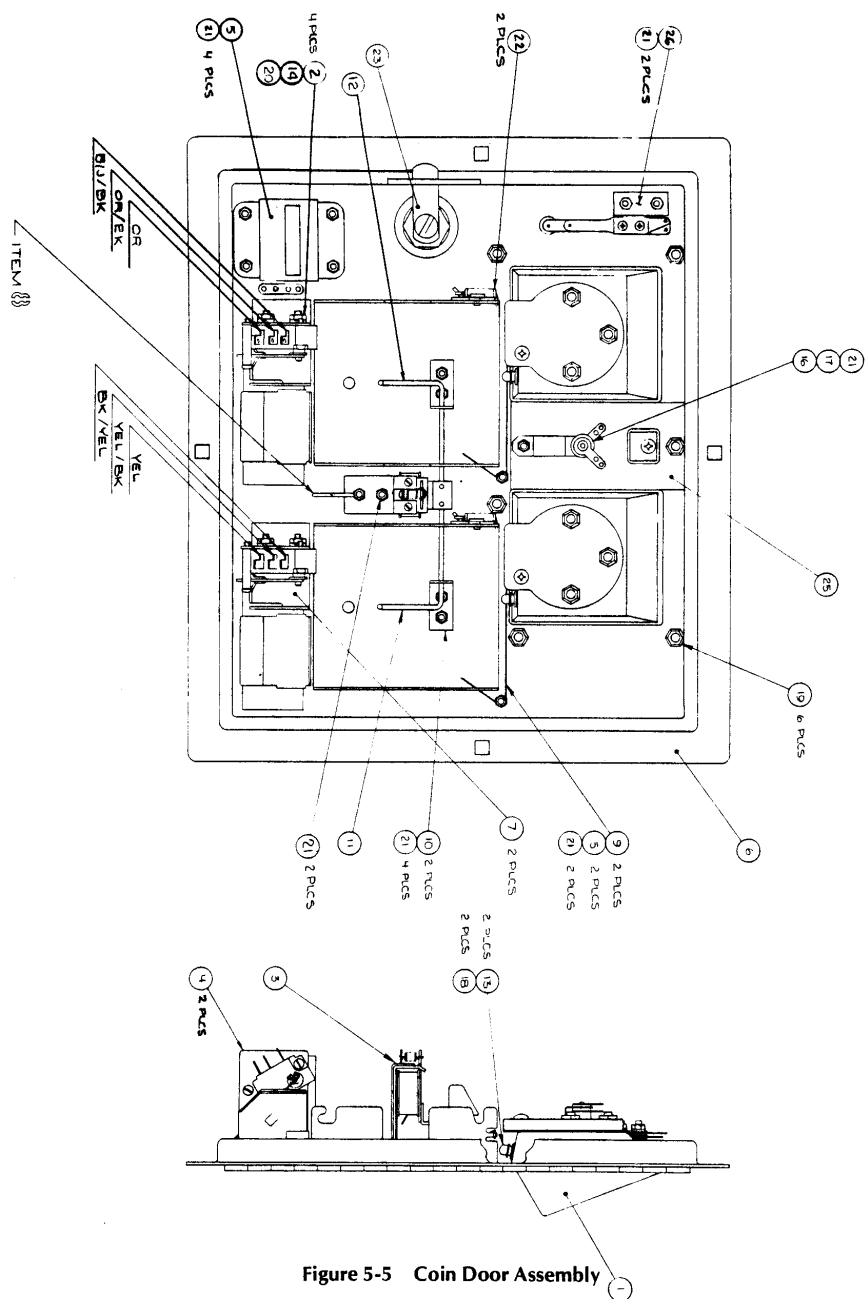


Figure 5-5 Coin Door Assembly

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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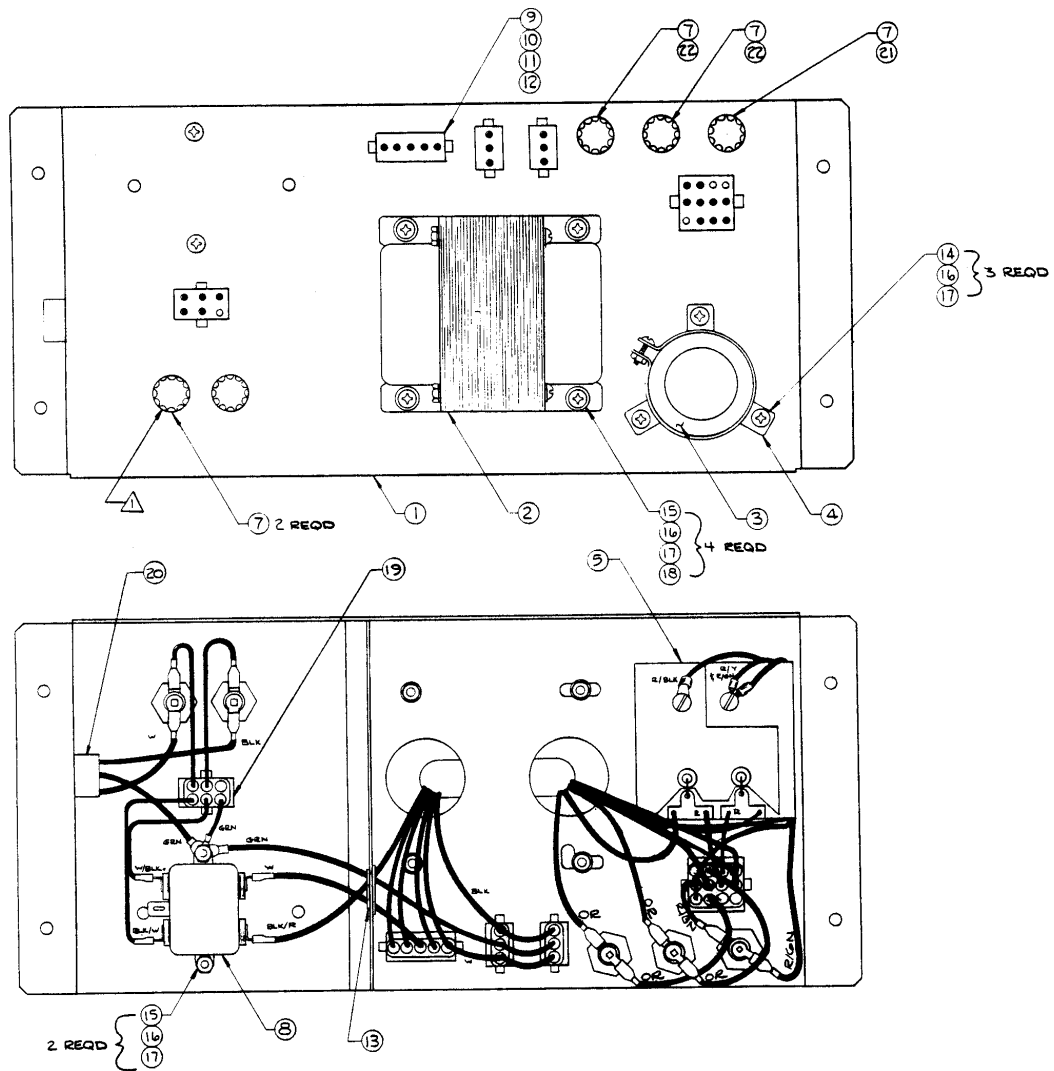


Figure 5-6 Power Supply Assembly



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 26,000µf @ 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 ½" Lg. |
| 15 | 72-1812S | 6 | Screw Pan Hd., #8-32 x ¾" 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, 2½ AMP, 125V, Slow Acting |

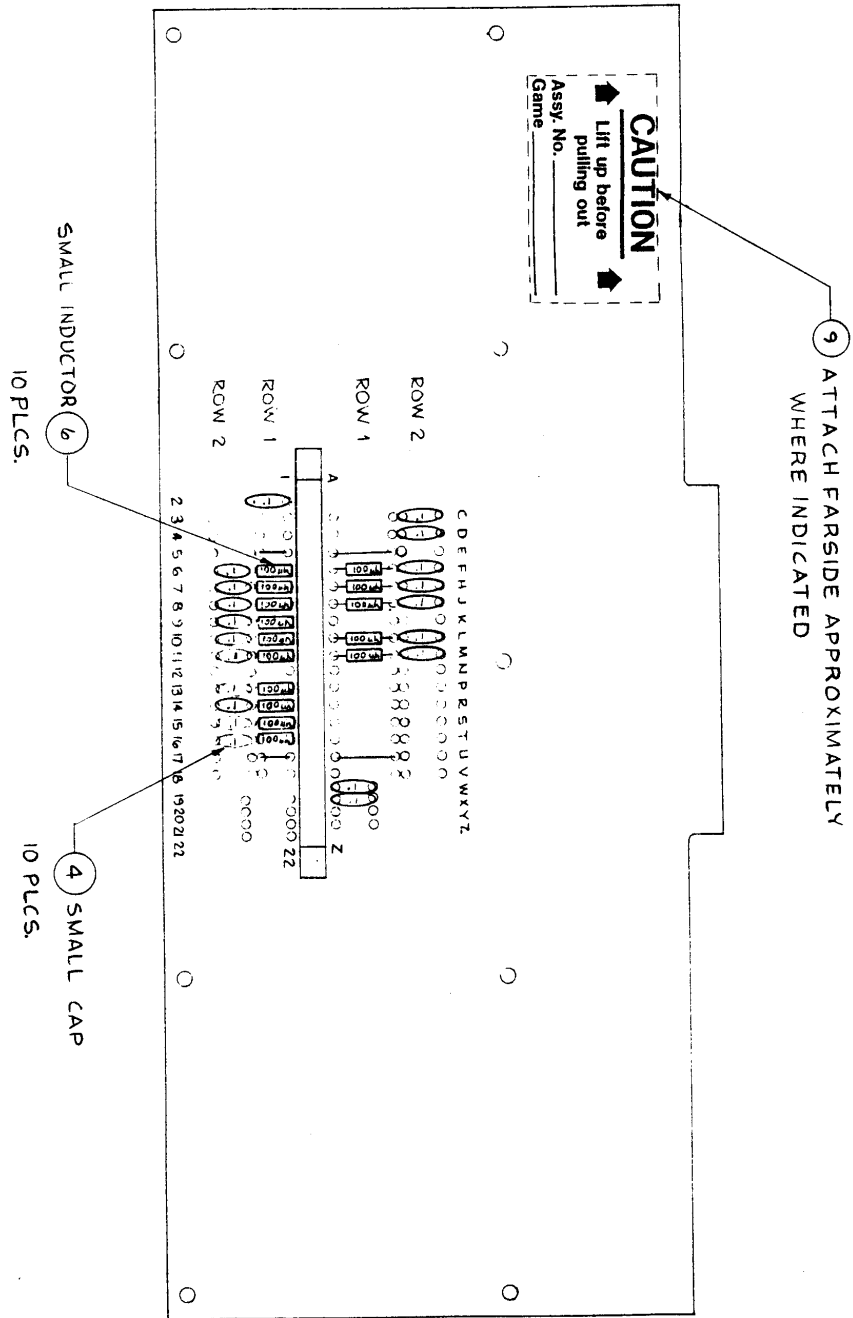


Figure 5-7 RF Shield PCB Assembly



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 |

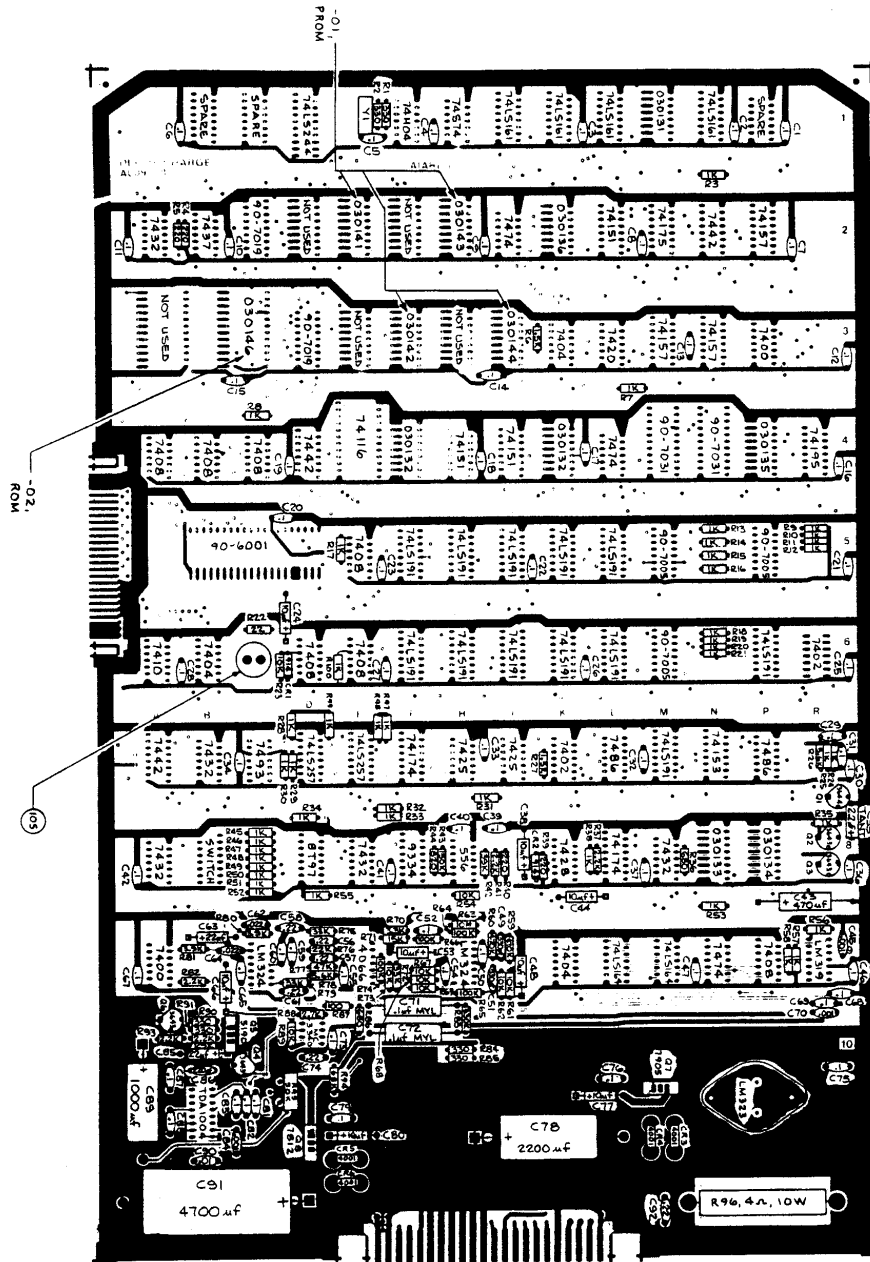


Figure 5-8 Destroyer Game PCB Assembly



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 |



Figure 5-8 Destroyer Game PCB Assembly

| Item | Part Number | Qty. | Description |
|------|-------------|------|--|
| 23 | 10-5582 | 2 | Resistor, Carbon Comp., 1%, 1W, 5.8K Ohm R26, R4 |
| 24 | 10-5691 | 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, 72 |
| 35 | 24-250106 | 8 | " Elec., 25V, 10 " C24, 28, 44, 48, 51, 66, 77, 80 |
| 36 | 24-250226 | 2 | " " " " 22 " C63, 65 |
| 37 | 24-250667 | 1 | " " " " 470 " C43 |
| 38 | 24-250108 | 1 | " " " " 1000 " C89 |
| 39 | 24-250228 | 1 | " " " " 2200 " C78 |
| 40 | 24-250678 | 1 | " " " " 4700 " C91 |
| 41 | 27-250102 | 3 | " Cer. Disc, " .001 " C45, 70, 84 |
| 42 | 27-250223 | 2 | " " " " .022 " C62, 64 |
| 43 | 27-250103 | 1 | " " " " .01 " C90 |
| 44 | 27-250224 | 4 | " " " " .22 " C56-58, 61, 74, 92 |
| 45 | 27-250104 | 60 | " " " " .1 " C1-23, 27-34, 36, 37, 39-43, 46, 47, 50, 52, 44, 51, 59, 60, 65, 67-69, 72, 74, 76, 79, 81-83, 87, 88 |
| 46 | 28-101221 | 1 | " Dipped Mica, 100V, 220 pf C86 |
| 47 | 28-101331 | 1 | " " " " 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 M2 |
| 87 | 37-74LS191 | 12 | " 74LS191 P5, R5, J5, R5, L5, 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 | 37-8797 | 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 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 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, 6-32 x 1/4, CR85 |
| 108 | 74-014 | 2 | Washer, Flat, #6 |
| 109 | 74-016 | 2 | Washer, Lock, Int. Star, #6 |
| 110 | 74-916C | 2 | Nut, Hex, 6-32, CR85 |
| 111 | | | |
| 112 | | | |
| 113 | | | |
| 114 | 74-06001 | 1 | Heatsink (for LM323) |
| 115 | 09470-04 | 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 | 33-2M3664 | 1 | Transistor, 2M3664 Q1 |
| 58 | 34-2M3663 | 4 | " 2M3663 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 | 37-7406 | 3 | " 7404 R3, R6, R9 |
| 66 | 37-74H04 | 1 | " 74H04 P1 |
| 67 | 37-7408 | 7 | " 7408 AA, BA, CA, 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 AE, B7, AB, EB, H8 |
| 73 | 37-7437 | 1 | " 7437 R2 |
| 74 | 37-7442 | 3 | " 7442 M2, D4, A7 |
| 75 | 37-7474 | 3 | " 7474 J2, L4, M9 |
| 76 | 37-74874 | 1 | " 74874 M1 |
| 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 M7 |
| 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-6 C2, D3 |
| 132 | 90-7031 | 2 | " 2101A-6 M4, M4 |
| 133 | | | |
| 134 | | | |
| 135 | | | |
| 136 | 030131-01 | 1 | Depth Charge Sync PROM M1 |
| 137 | 030132-01 | 2 | " " Minor Objects F4, K4 |
| 138 | 030133-01 | 1 | " " Major Objects 1 NA |
| 139 | 030134-01 | 1 | " " Major Objects 2 PA |
| 140 | 030135-01 | 1 | " " Alphametrics P4 |
| 141 | 030136-01 | 1 | " " Waves X2 |
| 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 7000 L0 H2 |
| 148 | 030144-01 | 1 | " " PROM 7000 H1 J3 |
| 149 | | | |

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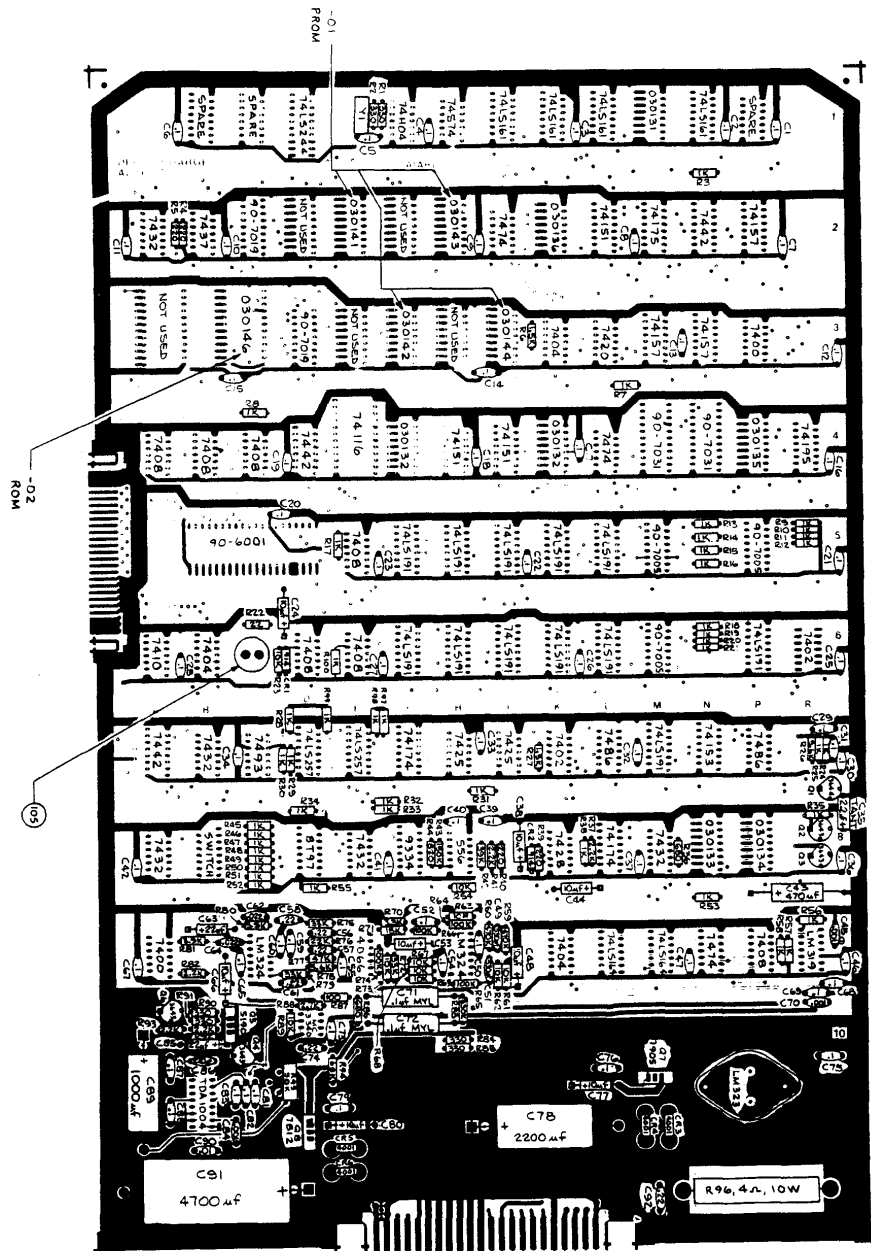


Figure 5-8 Destroyer Game PCB Assembly



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%, 1W, 5.6K Ohm R26,R8 |
| 24 | 10-5681 | 2 | " " " " " 680 " R36,R6 |
| 25 | 10-5687 | 1 | " " " " " 48K " R94 |
| 26 | 10-5421 | 1 | " " " " " 420 " R44 |
| 27 | | | |
| 28 | | | |
| 29 | 19-315503 | 1 | Tripart, 50K Ohm R95 |
| 30 | 19-809400 | 1 | Resistor, Wirewound, 10W, 4 Ohm R96 |
| 31 | | | |
| 32 | | | |
| 33 | | | |
| 34 | 21-101104 | 2 | Capacitor, Mylar, 100V, .1 uf C71,C2 |
| 35 | 24-250106 | 8 | " Elec., 25V, 10 " C24,R4,44,48,53,66,77,80 |
| 36 | 24-250226 | 2 | " " " " 22 " C83,85 |
| 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 | " Car. Disc., .001 " C45,70,84 |
| 42 | 27-250213 | 2 | " " " " .012 " C42,64 |
| 43 | 27-250103 | 1 | " " " " .01 " C90 |
| 44 | 27-250224 | 6 | " " " " .22 " C56,58,61,74,92 |
| 45 | 27-250104 | 60 | " " " " .1 " C1-23,25-34,36,37,39-42,46,47,50,52,54,55,59,60,55,67-69,73,75,76,79,81-83,87,88 |
| 46 | 28-101221 | 1 | " Dipped Mica, 100V, 220 pf C86 |
| 47 | 28-101331 | 2 | " " " " 330 " C49,51 |
| 48 | 29-010 | 1 | " Tent., Elec., 10V, 2.2 of C35 |
| 49 | | | |
| 50 | | | |

| Item | Part Number | Qty. | Description |
|------|-------------|------|---|
| 86 | 37-74175 | 1 | IC, 74175 H2 |
| 87 | 37-74LS191 | 12 | " 74LS191 F5,H5,J5,K5,L5,M6,M6,M6,K6,L6,M6,M7 |
| 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 | 62-001 | 1 | Switch, Momentary, SPST |
| 106 | 64-118PIT | 1 | " 8-Position DIP, SPST x 8 R8 |
| 107 | 72-1609C | 2 | Screw, Pan Hd, Phil, 4-32 x 1/2, CR85 |
| 108 | 75-016 | 2 | Washer, Flat, #6 |
| 109 | 75-056 | 2 | Washer, Lock, Int. Star, #6 |
| 110 | 75-916C | 2 | Nut, Hex, 4-32, CR85 |
| 111 | | | |
| 112 | | | |
| 113 | | | |
| 114 | 78-06001 | 1 | Heatink (for LM323) |
| 115 | QO9470-01 | 1 | " (for TDA1004) |
| 116 | 78-13016 | AR | Cement (for TDA1004 Heatink) |
| 117 | 78-16005 | 1 | Slipad (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 | 34-2M3190 | 1 | " 2M3190 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 | 37-74004 | 1 | " 74004 F1 |
| 67 | 37-7408 | 7 | " 7408 A4,B4,C4,E5,56,86,99 |
| 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,B8,H8 |
| 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 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,M4,J4 |
| 81 | 37-74153 | 3 | " 74153 R7 |
| 82 | 37-74157 | 1 | " 74157 P2,N3,N3 |
| 83 | 37-74LS161 | 4 | " 74LS161 J1,K1,L1,M1 |
| 84 | 37-74LS164 | 2 | " 74LS164 L3,M9 |
| 85 | 37-74174 | 2 | " 74174 F7,L8 |

| Item | Part Number | Qty. | Description |
|------|-------------|------|--------------------------------|
| 121 | 79-42040 | 1 | Socket, 40-Pin, Med. 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,M6 |
| 131 | 90-7019 | 2 | " 2111A-4 C2,D3 |
| 132 | 90-7031 | 2 | " 2101A-4 H4,M4 |
| 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 H8 |
| 139 | 030134-01 | 1 | " " Major Objects 2 F8 |
| 140 | 030135-01 | 1 | " " Alphanumeric F4 |
| 141 | 030136-01 | 1 | " " Waves K2 |
| 142 | | | |
| 143 | | | |
| 144 | | | |
| 145 | | | |
| 146 | | | |
| 147 | | | |
| 148 | 030146-01 | 1 | Depth Charge ROM C3 |

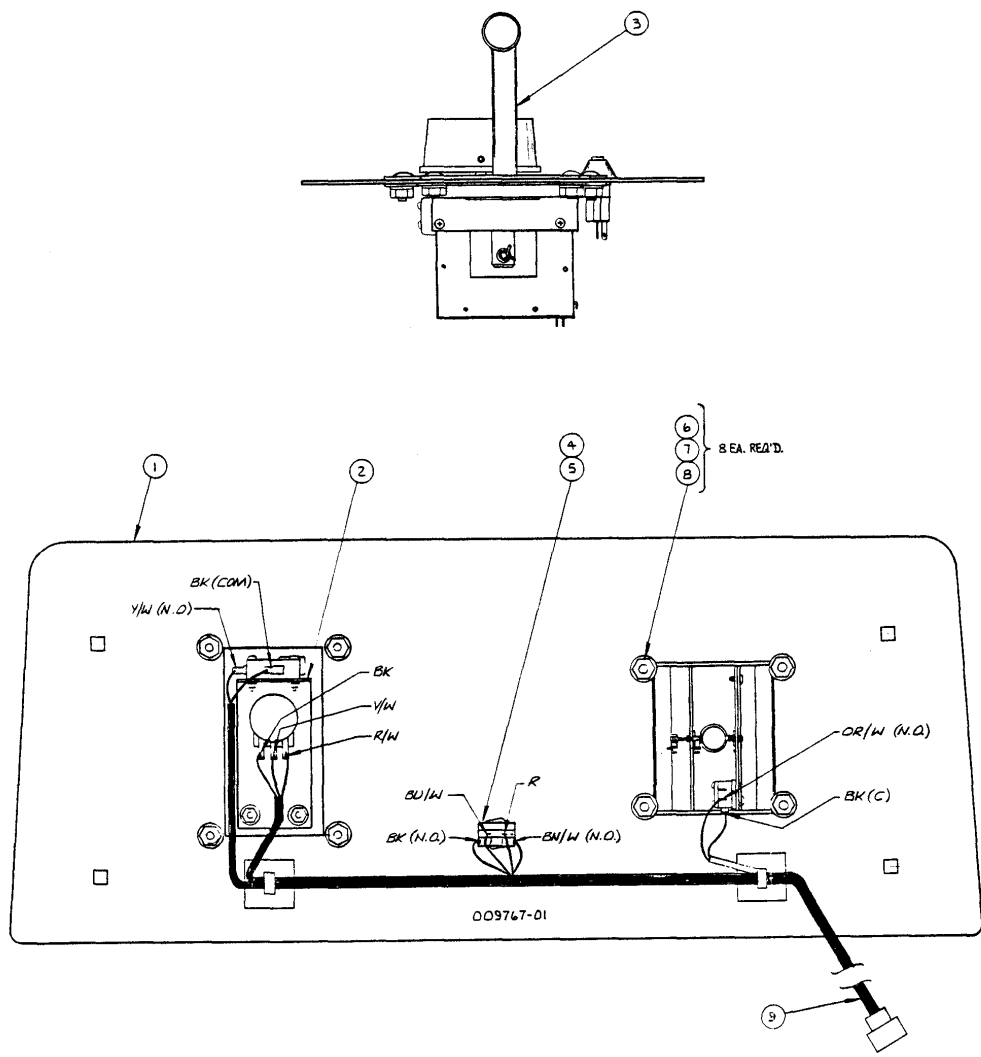


Figure 5-9 Control Panel Assembly



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 |

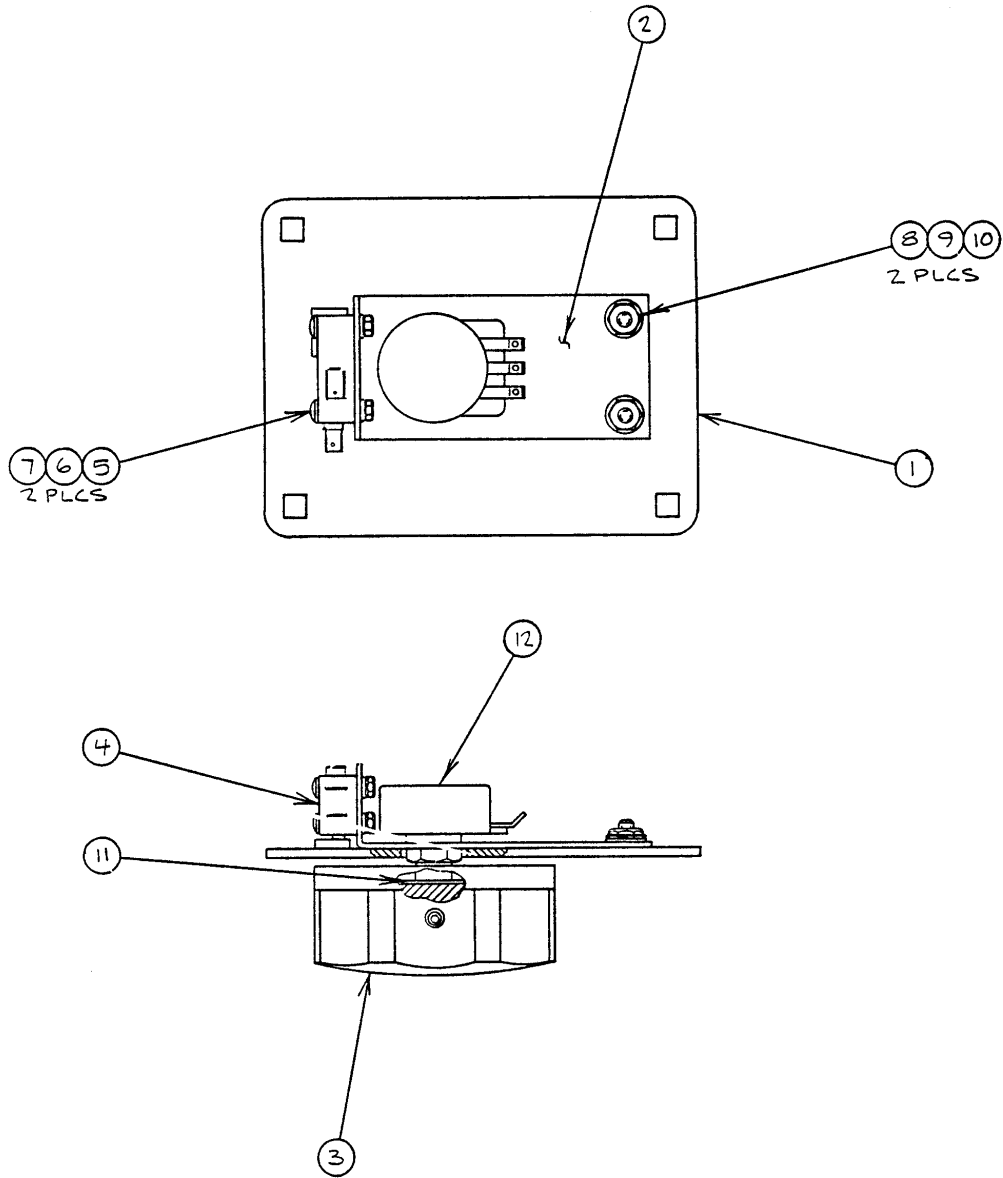


Figure 5-10 Switch Assembly



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 # $\frac{1}{2}$ Wide |
| 12 | 19-9011 | 1 | Pot 5K, Slip Clutch |
| | | | * Acceptable Substitutes 65-091A, 65-101A, 65-11A, 65-041C |

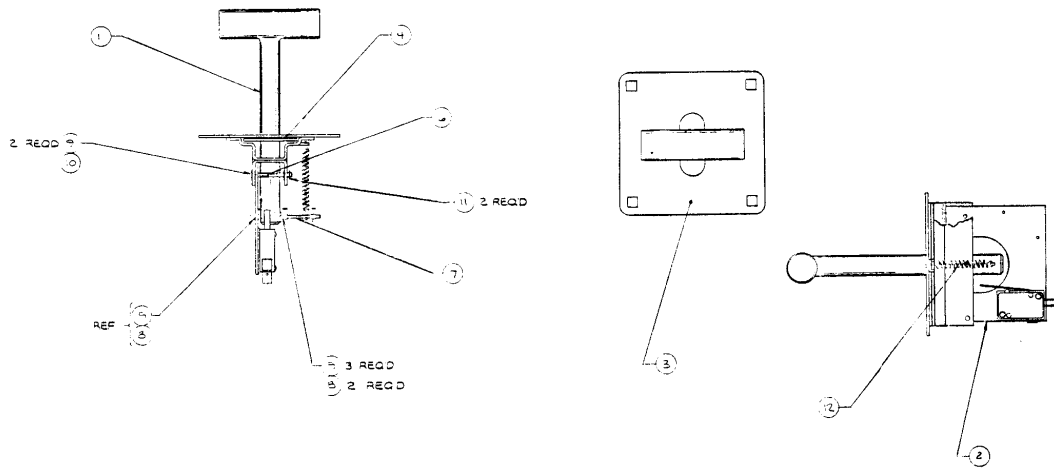


Figure 5-11 Shift Assembly



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) |