TM-098
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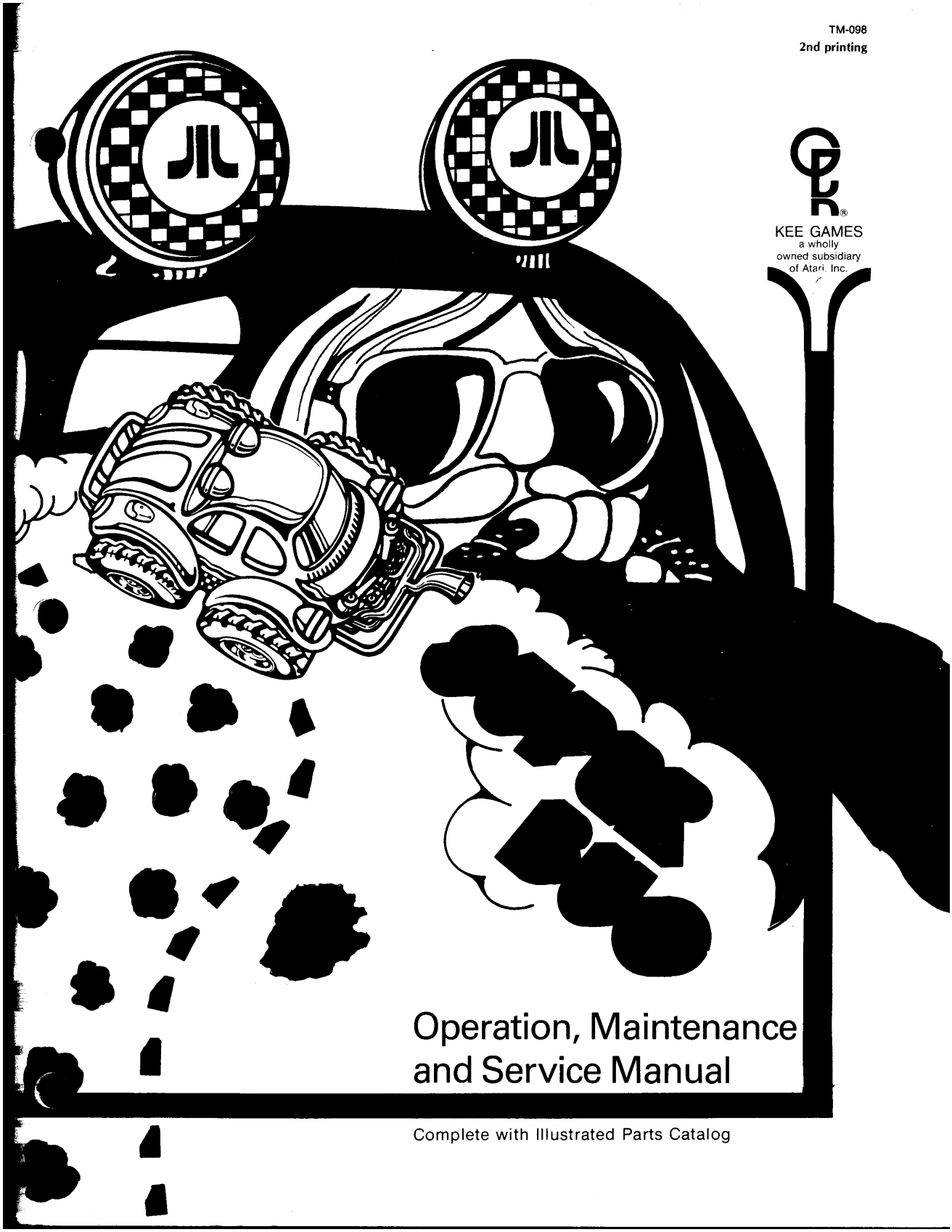

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Operation, Maintenance and Service Manual

Complete with Illustrated Parts Catalog

NOTE

The TV picture will move slightly during the first hour of warm up. The mask on the face of the TV screen should then align with the video Super Bug.

Super Bug

Operation, Maintenance and Service Manual

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P.O. BOX 9027
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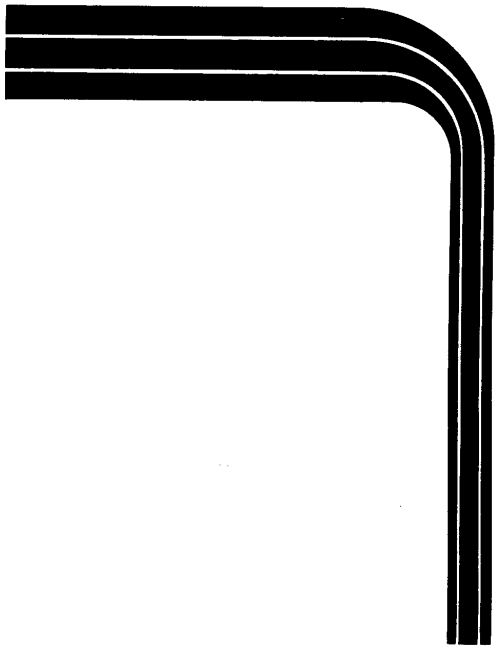

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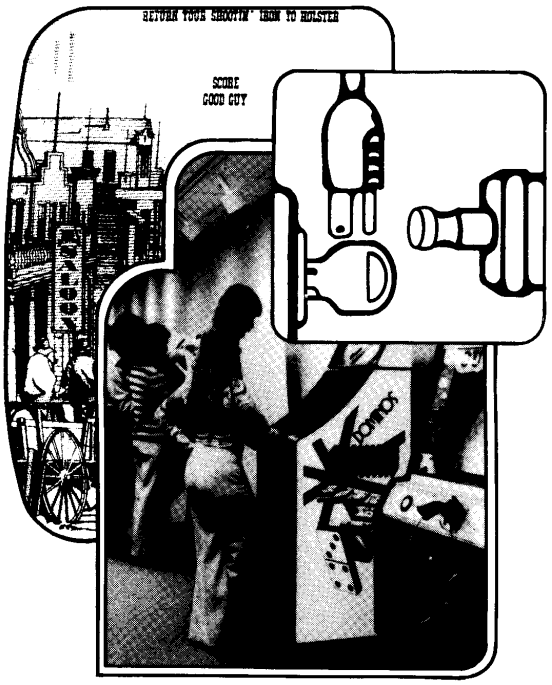


LOCATION SETUP

A. INTRODUCTION

SUPER BUG is a one-player driving game developed by Kee Games. The game is packaged in a distinctively styled upright cabinet that rests directly on the floor. A 23-inch TV monitor is mounted in the top front of the cabinet, with the monitor viewing screen slightly tilted from the vertical. Player-operated controls are mounted directly below the TV monitor viewing screen on the front of the game cabinet. The controls consist of a steering wheel, a four-speed gear shifter, an accelerator foot pedal, a pushbutton for track difficulty, a start pushbutton, and a pushbutton for high score reset.

Two identical coin mechanisms are mounted on the lower front center of the game cabinet, below the steering and shifting controls. Either of these two mechanisms can initiate play. The cash box is located behind a locked access door below the coin mechanisms.

The player's objective is to manipulate the Super Bug along the track in a race against time. The player must avoid sliding in oil pools in the road, or dropping into sand pits, as well as avoiding other cars, while keeping the Super Bug within the boundaries of the road.

Acceleration is as in a real car. Start out in anything but first gear and the car accelerates slowly. Once the car is moving, shifting into progressively higher gears increases the speed of the car. If the car goes into an oil slick or sand pit, it slides, with sound of sliding from the game cabinet speaker. If the car drives into a track boundary, a tree, or another car, a crash sound will be heard from the game cabinet speaker and the TV monitor viewing screen will flash.

B. UNPACKING INSTRUCTIONS

Examination for Shipping Damage

Before shipment from the factory, components and subassemblies of each game are carefully checked for proper operation. However, during shipment some adjustments may have changed or parts may have shaken loose. Upon removing the game from the shipping container, first examine the exterior of the cabinet. Check for dents, chips, or broken parts. Then open the rear access panel and examine the interior of the cabinet. Any shipping damage, such as a dented, cracked or broken cabinet, or sub-assemblies broken or loose, etc. should be reported immediately to the shipper and to Kee Games.

Mechanical Inspection

After determining that the game has been received in good condition, carefully inspect the interior parts and verify that:

(a) All plug-in connectors are firmly seated.

(b) The fuses are all seated in their holders.

(c) No harness wires have become disconnected or pulled loose.

(d) No loose foreign objects are present, especially metal objects that could cause electrical problems.

Be sure all major assemblies are checked. Check the game printed circuit board (PCB), the transformer, the two coin mechanisms, the speaker and fluorescent light, the player controls and the TV monitor chassis.

Do not go on to the remaining paragraphs of this section until the above mechanical inspection has been carefully completed.

C. INSTALLATION REQUIREMENTS FOR SUPER BUG

Requirements for installation of Super Bug are listed in the following paragraphs:

Power Requirements

Atari ships Super Bug 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 for location of plug), and plugging in another Molex connector plug.

Temperature Range

Location and storage temperatures should not be below 0 degrees Celsius (32 degrees Fahrenheit) and no higher than 49 degrees Celcius (120 degrees Fahrenheit).

Humidity Range

Relative humidity for location or storage should be no more than 95%.

Location Space Requirements

Super Bug requires a minimum of 168 centimeters (66 inches) of vertical clearance, a minimum of 65 centimeters (25.5 inches) of width clearance, and 175 centimeters (69 inches) of depth clearance. Depth clearance includes 61 centimeters (24 inches) of player space.

Type of Power Cord

Kee Games has added a strain-relief power cord to Super Bug.

Interlock and Power On/Off Switches

Kee Games has installed two on/off switches, as shown in Figure 2. To minimize the hazard of electric shock while you are working inside the game cabinet, an interlock switch is located at the rear access door. This switch completely removes all power from the game while the rear access door is open.

So that you can conserve energy, a power on/off switch has been added to the power circuit so you can turn the game off during closing hours. This switch is concealed above the accelerator foot pedal.

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

1. Unlock and open the rear access door.

2. Plug the AC power cord into a 110-volt source.

3. Set the power on/off switch to the *on* position by flipping the toggle switch toward the right 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. If the results of Step 5 are OK, then the interlock switch is operating properly. If the picture does not disappear as described in Step 5, check to see if the switch is broken from its mounting or stuck in the *on* position.

7. Close and lock the rear access door.

D. SELF-TEST PROCEDURE

Super Bug will test itself and will communicate with you that the game circuitry and controls are or are not operating properly. We suggest that you do the Super Bug Self-Test Procedure each time you collect the money from the cash box. All you need to do is follow the steps in Table 1. But first, please read the following explanation of the table.

Notice the three column headings of Table 1. The first column, Test Instruction, describes what you should do to make Super Bug test itself. Once you have performed each Test Instruction step, look at the picture on the Super Bug TV monitor and match that picture with the picture in the column labeled *Results if Test Passes*. Then, examine the TV Monitor picture and follow the instructions listed in the col-

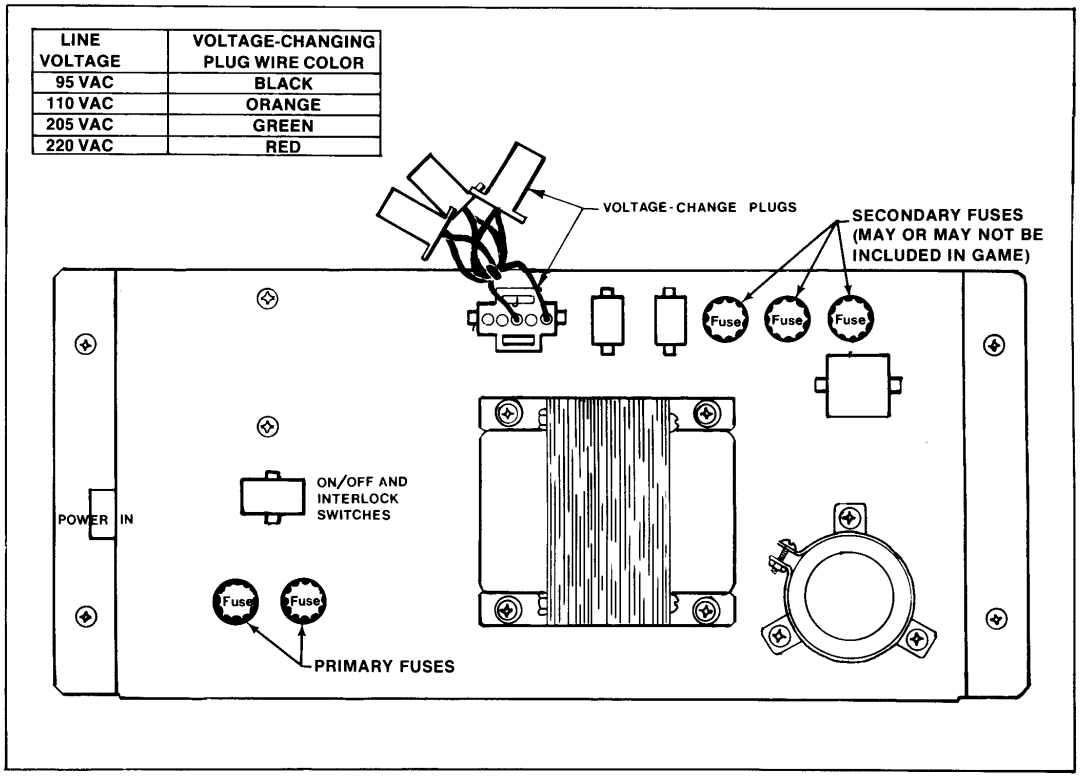


Figure 1 Location of Voltage-Changing Plugs on the Power Supply

umn labeled *Results if Test Fails*. Please note that some of the definitions are quite long.

If at any time you would like to start over again in the self-test mode, just set the Self-Test Switch to *off*, then again in the *on* position. This will begin the self-test mode at Step 1.

E. OPERATOR OPTIONS

At this time it is best to select the game options most suited for your particular location. With the Self-test Switch set to the *off* position and Super Bug in the attract mode, the game may be set for the combinations of options you choose.

To set these options you must remove the Super Bug Printed Circuit Board (PCB) according to the following procedure:

1. Unlock and remove the rear access door.
2. Locate the RF shield in the lower right-hand corner of the cabinet.
3. Remove five #6 x ½-inch small pan-head Phillips screws from each of the long sides (total ten screws) of the RF shield assembly.
4. Slip the Super Bug PCB out of the RF shield assembly.
5. Set the switches for the desired options, as shown in Table 2.
6. Reinstall the Super Bug PCB.
7. Close and lock the rear access door.
8. Verify option functions by playing the game.

All the options except Extended Play are self-explanatory. Extended Play works like this: If a player accumulates the required number of points, the game adds 40 counts to the game timer. The number of points required for each option—liberal, medium or conservative—is a function of the selected game time option. This is explained in Table 3.

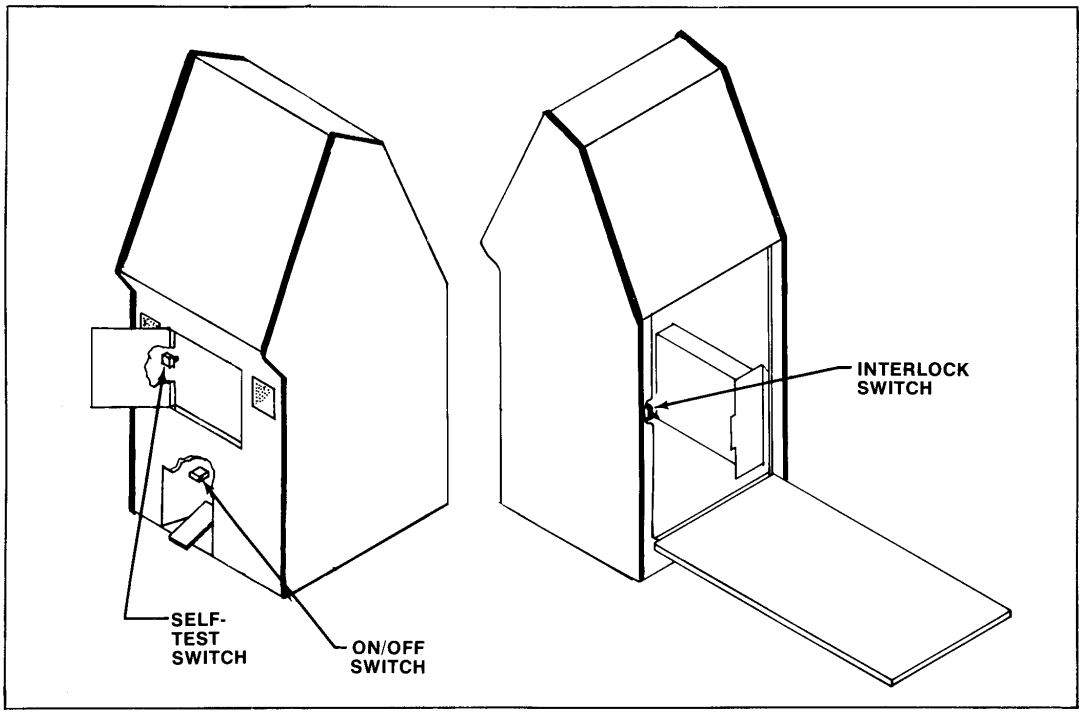


Figure 2 Locations of On/Off, Interlock, and Self-Test Switches

Table 1 Self-Test Procedure

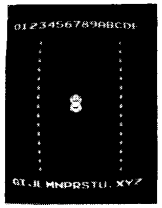
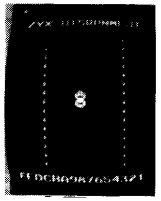
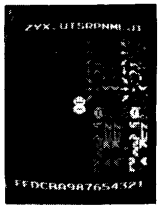
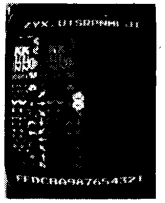
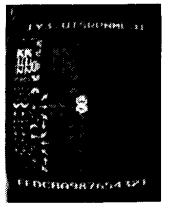
Test Instruction	Results if Test Passes	Results if Test Fails
Set gear shifter to 4th gear position. Unlock and open the Coin Door. Set Self-Test slide switch (located inside and to the left of the Coin Door) to the *on* position.	TV Monitor displays the following in succession:  Picture 1  Picture 2  Picture 3  Picture 4 After the fourth picture, Super Bug motor sound will come on. This is the beginning of the next test. The motor sound will remain on throughout the rest of Self-Test.	Picture 1 and 2: Look for missing or incorrect numbers and/or letters on the top and bottom lines. Don't be concerned if display in center of monitor is different than what is pictured in the Results if Test Passes column. However, Super Bug should always be at the center of the monitor. Picture 3 and 4: In these pictures, focus your attention on one of the three playfield bands (a problem in one will almost always appear in the other two). Check the band to ensure that it is as pictured.  **Playfield Test Picture** In the fourth picture, a zero to the left of the letter Z, and/or a 1, 2, and/or 3 in place of the letters Z, Y, and/or X, respectively, indicates a failure in the memory section of the Super Bug computer. If one or more of these are present, see the following for the failing memory. 0 indicates a failure of RAM chip M1 and/or N1 1 indicates a failure of ROM chip D1 2 indicates a failure of ROM chip C1 3 indicates a failure of ROM chip A1  Memory Failure Picture
Rotate the steering wheel, first to the right (CW), then to the left (CCW).	Motor Sound frequency increases when steering wheel is turned to the right. Motor sound frequency decreases when steering wheel is turned to the left.	No change in motor sound frequency indicates a problem in the harness of the Steering PCB. Check to see if +5VDC is present on pin 9 of the connector to the Steering PCB (accessible through the Coin Door).
Set gear shifter to 1st, 2nd, 3rd, then 4th gear.	Screech sound is present while shifter is in 1st, 2nd, and 3rd gears, but not while in 4th gear (4th gear switches not used).	Constant screech sound, while shifter is in neutral or 4th gear, indicates that one of the eight switches is stuck. Lack of screech sound indicates a bad harness wire or a bad harness connection.
Press START pushbutton, then TRACK SELECT pushbutton.	Screech sound is present while each switch is pressed.	
Trip right coin acceptor wire, then left one.	Screech sound is present while each acceptor trip wire is tripped.	
Close contacts of slam switch (located on upper inside of Coin Door above door lock).	Screech sound is present while slam switch contacts are closed.	

Table 2 Operator Options

Option	Switch Settings as labeled on: DIP switch schematic 8 7	7 6	6 5	5 4	4 3	3 2	2 1	1 0	Result
Game Cost	on	on							Free play
	on	off							Two plays/coin
	off	on							One play/coin
	off	off							one play/two coins
Game Length			on	on					60 seconds
			on	off					90 seconds
			off	on					120 seconds
			off	off					150 seconds
Extended Play					on	on			None
					on	off			Liberal (easy to earn)
					off	on			Medium
					off	off			Conservative (hard to earn)
Game Instruction Language (as displayed on TV screen)							on	on	English
							on	off	French
							off	on	Spanish
							off	off	German

Table 3 Points Required to Earn Extended Play

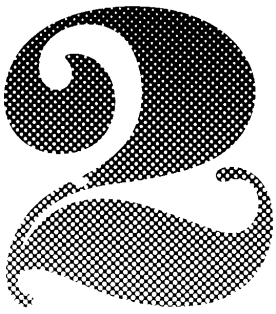
	Game Length Setting			
	60 secs.	90 secs.	120 secs.	150 secs.
Extended Play Option Setting:	Points Required to Earn Extended Play			
Liberal	90	140	190	240
Medium	100	160	220	270
Conservative	120	180	240	300

GAME PLAY

During use, Super Bug can be described as operating in one of three selectable modes: attract, play, or self-test.

A. ATTRACT MODE

The attract mode begins when power is applied to the game. During this mode the monitor picture shows the highest score obtained by a player since the last power-up of the game. The words "GAME OVER" flash on and off. The roadway pylons, trees and road hazards move as if the car is moving along the road.



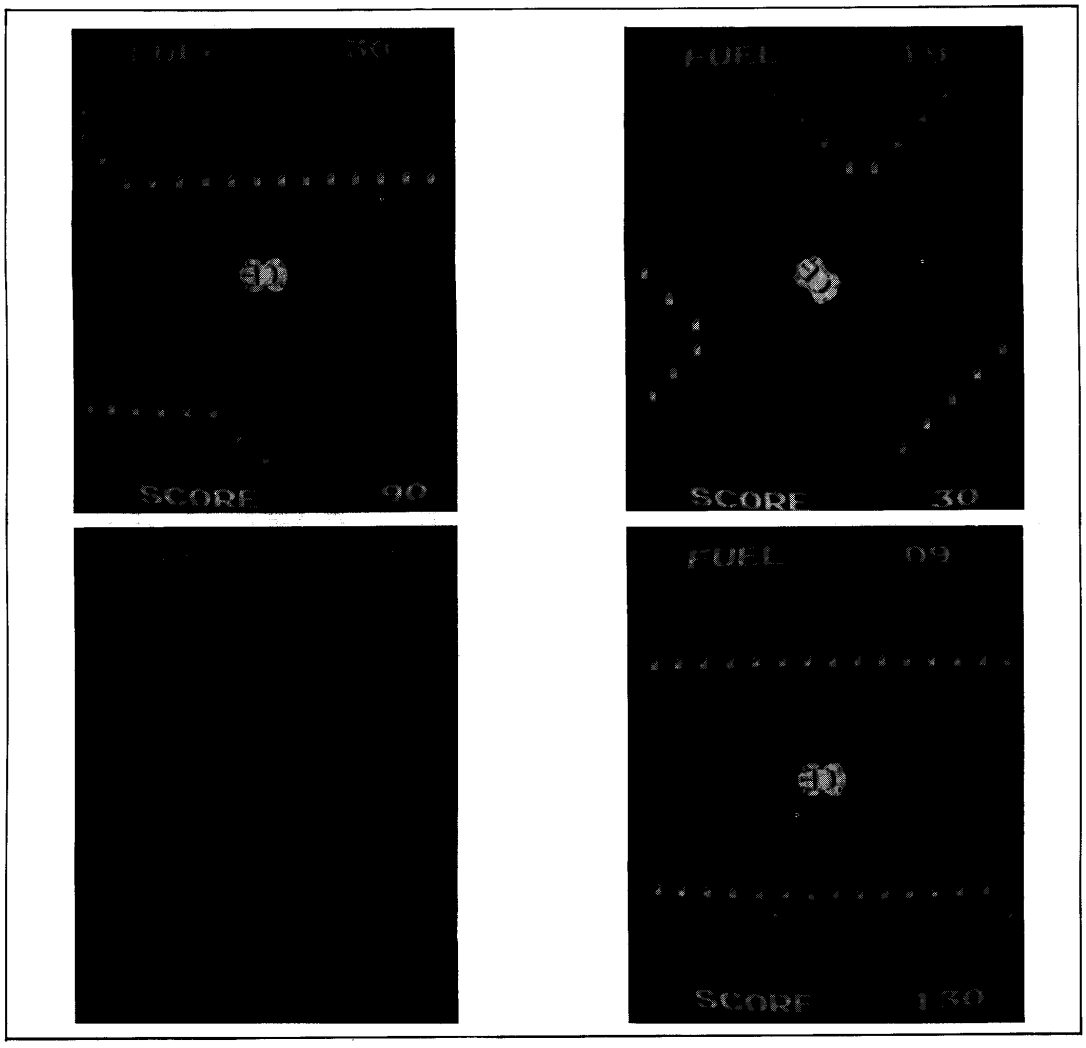


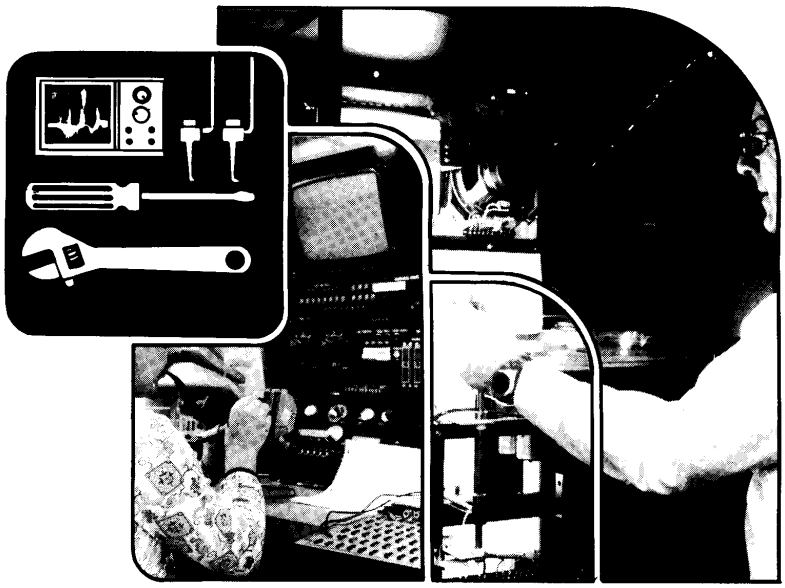
Figure 3 TV Screen During Play Mode

B. PLAY MODE

The TV monitor display during the play mode is shown in Figure 3. During this mode, the TV monitor displays a roadway that advances when the accelerator foot pedal is pressed. Moving the shifter through the gears increases the advancing speed of the roadway. If the car comes in contact with one of the pylons, another car or a tree, the roadway pylons stop advancing, the TV monitor display flashes, and a crash sound comes from the game speaker. If the car drives into an oil spot or sand pit, a skid sound comes from the game speaker and the car appears to slide out of control until it passes through the hazard onto the roadway again.

C. SELF-TEST MODE

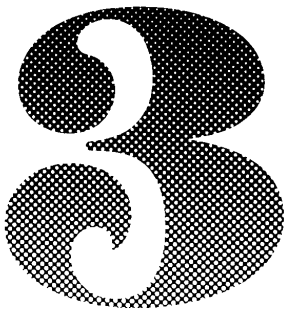
This mode of operation is used by the operator to verify that the game is working properly. This mode is explained in the Installation part of this manual.



MAINTENANCE AND ADJUSTMENTS

Due to its solid-state electronic circuitry, this Kee Games unit requires 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 ability. If reading through the manual does not lead to solving a specific maintenance problem, you can reach Atari's Customer Service Department by telephone Monday through Friday, between the hours of 7:30 a.m to 4:00 p.m. (Pacific Time). From *inside* California, call (408) 984-1900; from *outside* California, 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 $5.00 each, or from your distributor.



A. COIN MECHANISM

Components on Coin Door

Figure 4 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. During the play mode and 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.

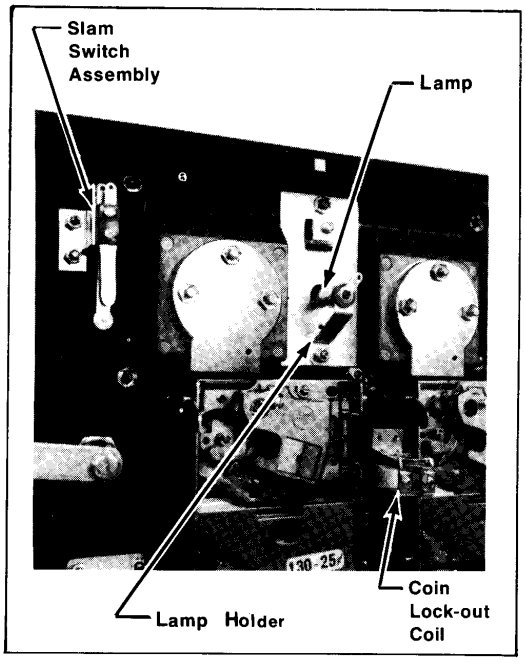


Figure 4 Coin Door Assembly

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 in Figure 4 is a slam switch assembly. It has been included to defeat any players who might try to obtain free game plays by violently pounding on the coin door to momentarily close the contacts on the coin switch. The slam switch contacts connect to the microcomputer system, which will ignore coin switch signals whenever the slam switch contacts are closed.

Figure 5 Hinging Open the Magnet Gate Assembly

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 5. Or, if necessary, each coin mechanism can be entirely removed from the door merely by pulling back on a release lever and simultaneously tilting the mechanism back, then lifting it up and out. This is shown in Figure 6.

Cleaning of Coin Paths

CAUTION

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

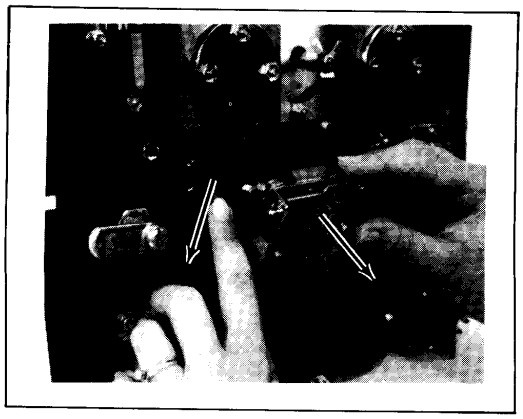


Figure 6 Removal of Coin Mechanism

of residue. After cleaning, flush thoroughly with hot or boiling water, then blow out all water with compressed air.

Figure 7 shows the surfaces to clean inside the coin mechanism. These include the inside surface of

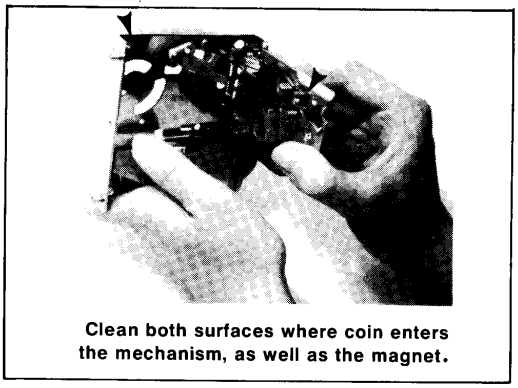


Figure 7 Surfaces to Clean Inside the Coin Mechanism

the mainplate, and the corresponding surface of the gate assembly. There may also be metal particles clinging to the magnet itself. To remove these particles 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 ⅜-inch wrench and remove all three nuts that secure the cover plate (refer to Figure 8). Removing the plate will provide access to the entire channel.

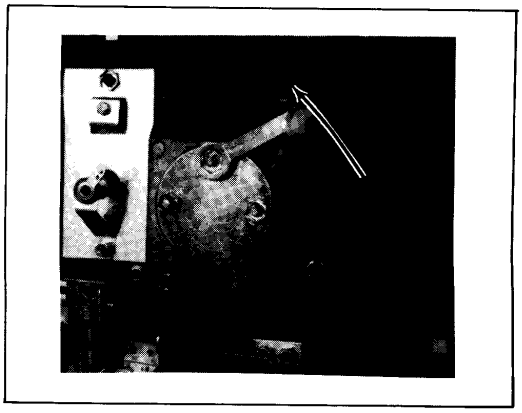


Figure 8 Removal of Plate Covering Rear of Coin Slot

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.

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 9 shows this lubrication point.

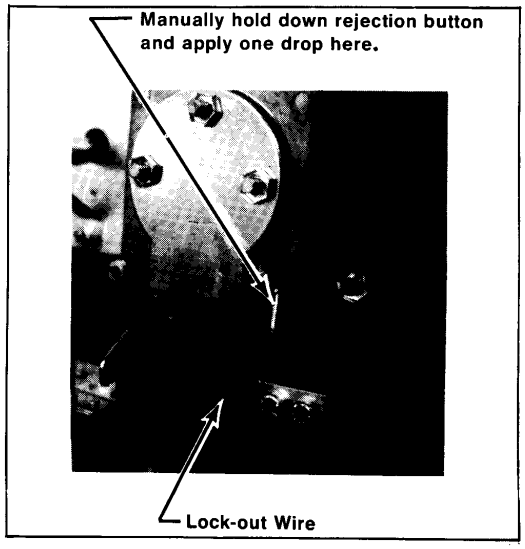


Figure 9 Close-Up View of Lubrication Point

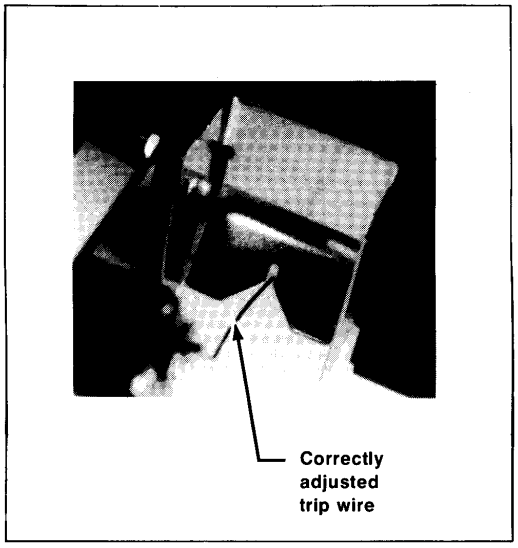


Figure 10 Detail View of Coin Switch and Trip Wire

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 10. Use extreme care when handling or touching these wires.

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 a set of several coins, including both new and old, worn ones. Figure 11 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 who has 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.

B. CLEANING

The exteriors of game cabinets and Plexiglas® panels may be cleaned with any non-abrasive household cleanser. 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, thereby fogging the plastic.

C. ADJUSTMENTS ON TV MONITOR

NOTE

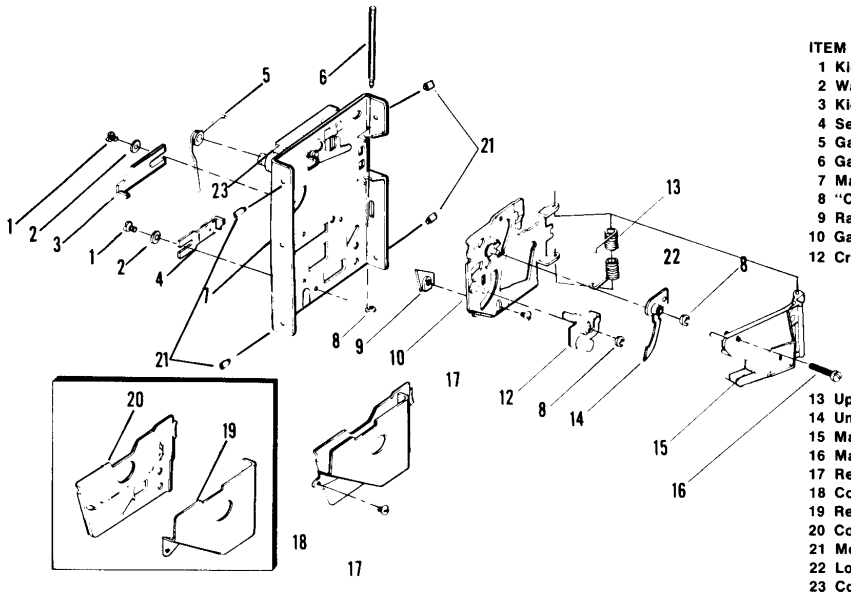
The TV monitor is accessible only from inside the game cabinet and these adjustments have to be done while the game is energized. Therefore only persons familiar with safety measures and repair procedures on electrical equipment should perform them.

The TV monitor need be adjusted only when the picture is distorted or if the contrast or brightness seem out of adjustment.

The monitor's adjustments function like those of a conventional commercial television set, except that the volume adjustment has no effect. Instead the game produces its sound in circuits separate from the TV monitor. Figure 12 shows the location of the adjustments on the rear of the chassis. When making the adjustments, follow these general guidelines:

BRITE (Brightness)—Perform this adjustment before the contrast. Adjust so that the white lines covering the screen just barely disappear, when the brightness is turned up.

CONT (Contrast)—Adjust so that the images are as bright as possible against the dark background without being blurred.



Kicker and separator

1. Set the acceptor with the back of the unit facing you in the test position.
2. Loosen the kicker and separator screws (1) and move the kicker (3) and the separator (4) as far to the right as they will go. Lightly tighten the screws.
3. Insert several test coins (both old and new) and note that some are returned by striking the separator.
4. Loosen the separator screw and move the separator a slight amount to the left. Lightly retighten the screw.
5. Insert the test coins again and, if some are still returned, repeat Step 4 until all the coins are accepted.
6. Loosen the kicker screw and move the kicker as far to the left as it will go. Lightly retighten the screw.
7. Insert the test coins and note that some are returned.
8. Loosen the kicker screw and move the kicker a slight amount to the right. Lightly retighten the screw.
9. Insert the test coins again and, if some are still returned, repeat Step 8 until all the coins are accepted.
10. Be sure that both screws are tight after the adjustments have been made.

Magnet gate

1. Set the acceptor with the front of the unit facing you in the test position.
2. Turn the magnet gate adjusting screw (16) out or counterclockwise until none of the coins will fit through.
3. With a coin resting in the acceptor entrance, turn the adjuster in or clockwise until the coin barely passes through the magnet gate.
4. Test this adjustment using several other coins (both old and new) and, if any fail to pass through the magnet gate, repeat Step 3 until all the coins are accepted.
5. Fix the magnet gate adjusting screw in this position with a drop of glue.

Additional Cleaning

1) Remove the transfer cradle (12) and the undersize lever (14).
2) Use a pipe cleaner or similar effective cleaning tool to clean the bushings and pivot pins.
3) Replace the transfer cradle and the undersize lever.
4) To be certain the coin mechanism is completely free of any residue, place the mechanism in a solution of boiling water and mild detergent for several minutes. Carefully remove it and let it air-dry completely before reinstalling in the door.

Figure 11 Adjustments on Coin Mechanism

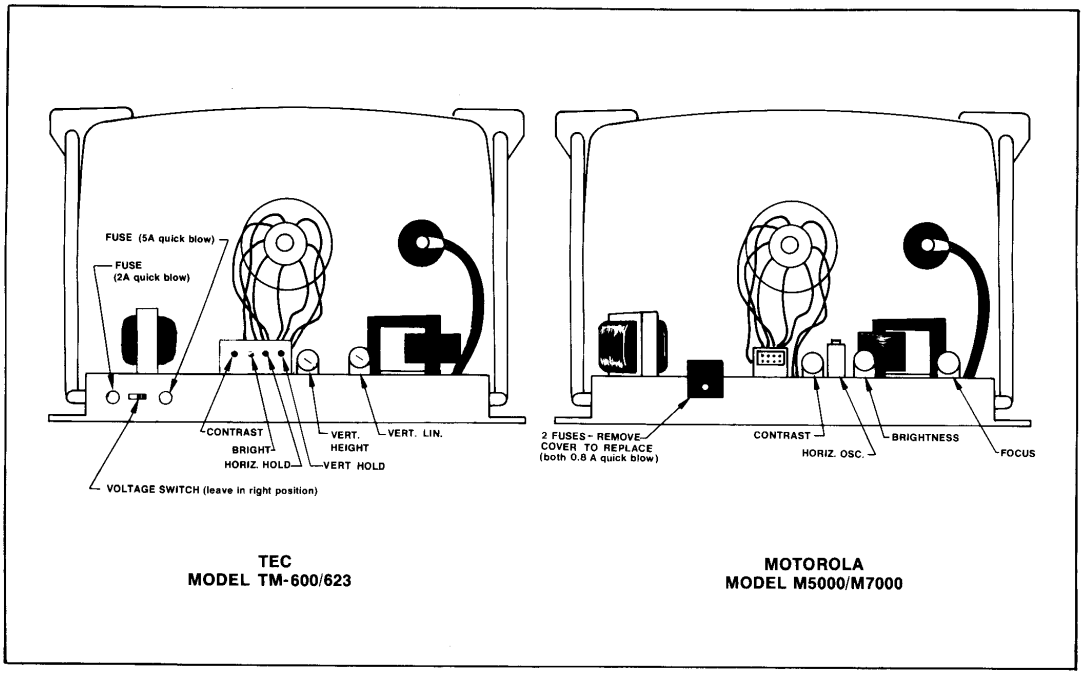


Figure 12 Locations of Adjustments on TV Chassis

HORIZ OSC. (Horizontal Oscillator)—Adjust if the picture is slightly off-center horizontally, if the images appear warped, or if the picture is broken up into a series of diagonal lines. Adjust for a stable, centered picture.

D. TV MONITOR REMOVAL

If the TV monitor proves to be at fault, remove the monitor as shown in Figure 13.

E. FUSE REPLACEMENT

Super Bug 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

F. LAMP REPLACEMENT

Super Bug contains an eighteen-inch fluorescent lamp inside the top of the game cabinet assembly. To replace the lamp, remove the screws from the top Plexiglas retainer, as shown in Figure 14. Lift the attraction panel Plexiglas up and out of the bottom Plexiglas retainer. Replace the fluorescent tube. Replace the attraction panel plex, and the top plex retainer.

G. STEERING PCB REPLACEMENT

If it becomes necessary to replace the steering PCB, use the following procedure:

1. Unlock and remove the rear access door to the game cabinet.

2. Unplug the 10-pin Molex connector from the steering board PCB.

3. With a 7/16-inch wrench, remove the self-locking hexagonal nut and ¼-inch internal tooth starlock washer from the steering wheel axle screw, while a helper holds the steering wheel at the front of the cabinet.

4. Remove the black plastic edge-toothed wheel.

5. Remove the steering PCB by removing two pan-head #2-56 x ½-inch Phillips screws and lifting the board out.

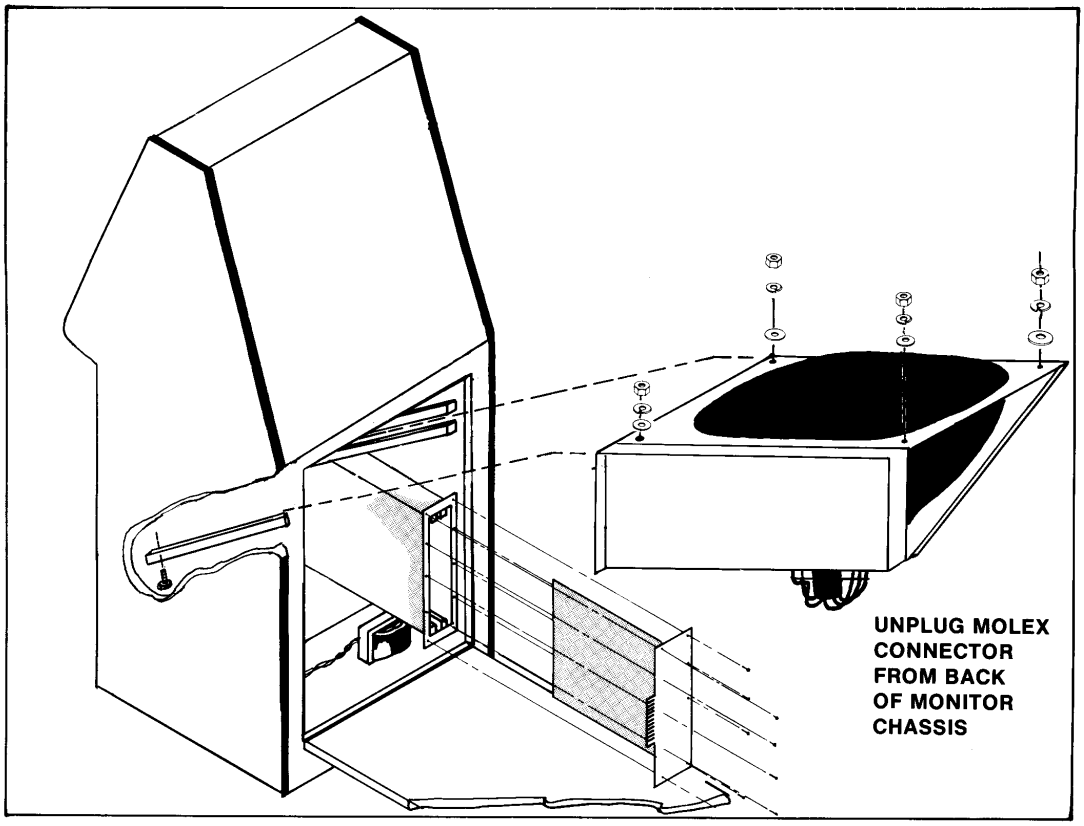


Figure 13 Removal of TV Monitor

6. Before installing the replacement steering PCB, be sure there is a sufficient amount of silicone lubricant on the inner hole of the black plastic edge-toothed wheel.

7. Install the replacement PCB by completing steps 1 through 5 in reverse order.

H. START SWITCH REPLACEMENT

The START pushbutton switch is backlighted by two parallel-wired #47 lamps. The switch itself is a Cherry Switch with gold-plated contacts.

To change a START pushbutton, reach in through the coin door and squeeze both sides of the switch and pull out. Replace switch with Kee Games part number 062-020 switch.

To replace START switch lamps, reach in through the coin door and loosen lamp mounting screws. Remove lamps and replace with #47s.

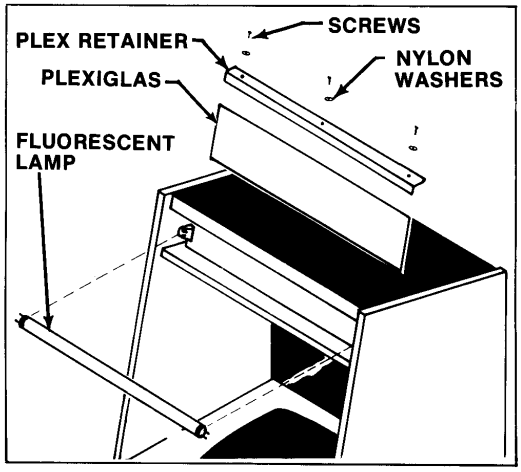


Figure 14 Removal of Fluorescent Lamp

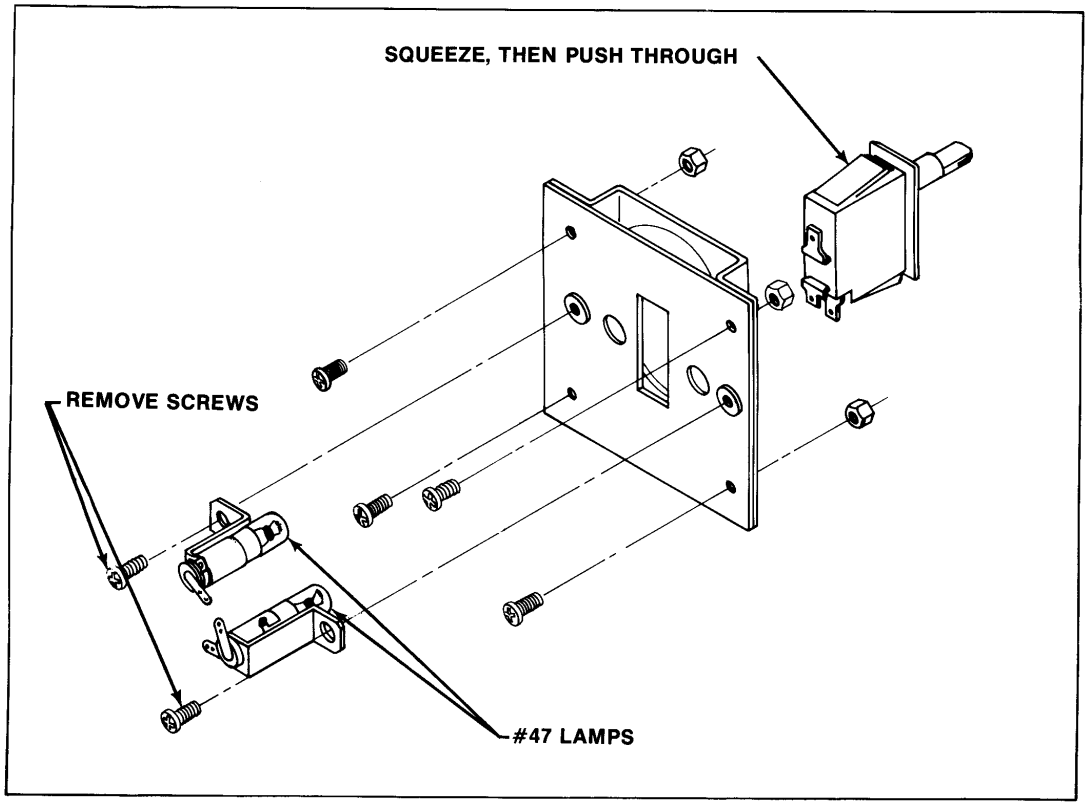
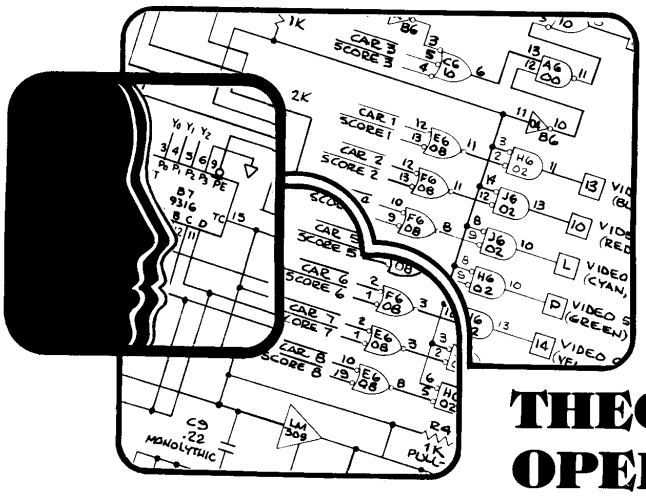


Figure 15 Removal of Start Switch

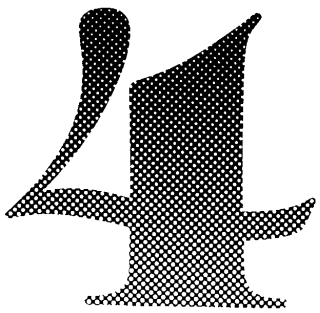


THEORY OF OPERATION

A. SUPER BUG GAME OVERVIEW

Electronically, the Super Bug game consists of a power supply, a TV monitor, a game printed circuit board, and a speaker. Electrically, the Super Bug game consists of a control panel and foot pedal, a coin door, and a fluorescent lamp.

The controlling part of the game is the game printed circuit board (PCB). Since the PCB interfaces with all the assemblies, excluding the fluorescent lamp, the following description of the Super Bug game operation relates primarily to the PCB.



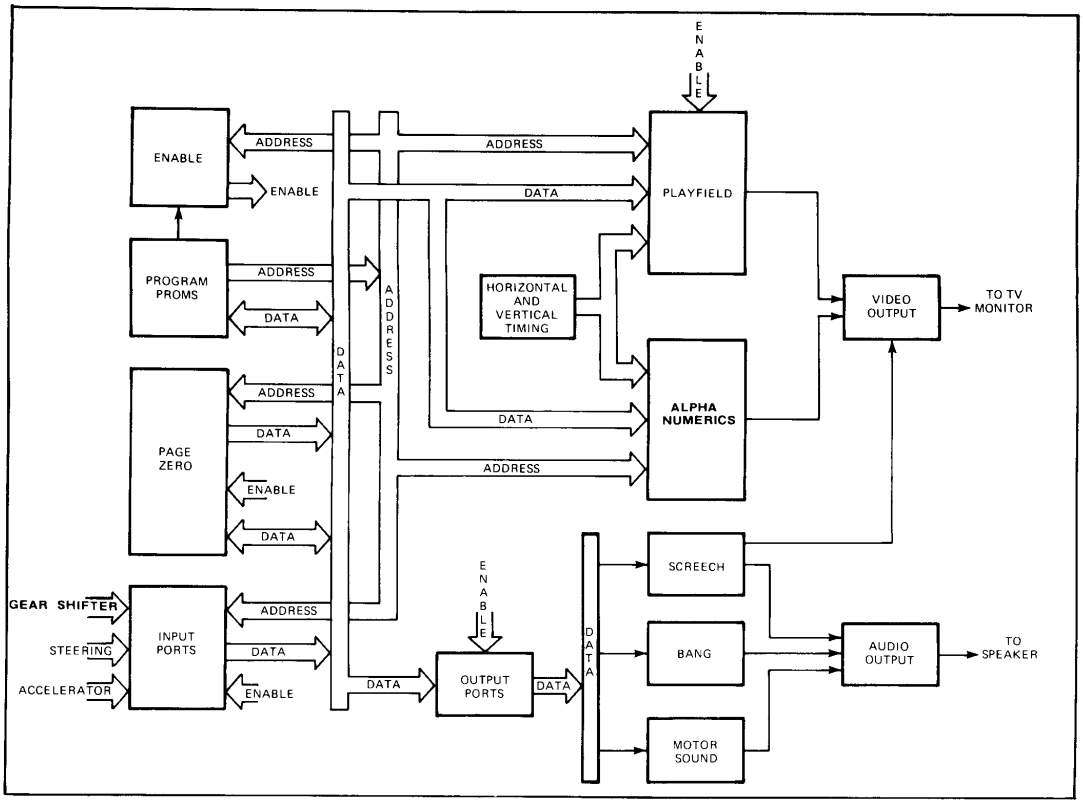


Figure 16 Block Diagram of the Super Bug PCB

B. SUPER BUG PCB OPERATION

The PCB has a microcomputer designed and programmed to perform the functions of the Super Bug game. Figure 16 is a block diagram of the PCB.

For easy reference, the PCB is divided into 130 sections (see Fgure 32 for the game's PCB assembly). These sections are identified by letters A through P (skipping letters G, I, and O because they may be easily confused with numbers 6, 1, and 0, respectively) across the short side of the PCB. Sections are identified along the long side of the PCB by numbers 1 through 10. The letters and numbers create a grid, and all IC's are located on the PCB along the grid lines. For example, to find the main horizontal motion counters N5 and N6 which are shown at the top center of sheet 1 of the schematic, look along the short side of the PCB to letter N, then down the long side to numbers 5 and 6. The two counters are located at the intersection of line N and lines 5 and 6.

At location M/N/P-10 is an LM323 regulator mounted in a large black heatsink, and a 2-ohm, 20-watt resistor. These components produce a good deal of heat during normal operation. The temperature is not extreme, but touching sensitive skin may produce a burn.

Another item we would like to bring to your attention is power distribution on the PCB. On the top of the PCB, *most* of the wide traces are DC ground. On the back of the board the wide trace along the long end of the board in +5 VDC.

PCB Power

The PCB receives its power from the power supply in two voltage levels: 16.5 VAC and 25 VAC (see Figure 18). The 16.5 VAC is rectified off-board and regulated by an LM323 to a stable +5 VDC. The +5 VDC is distributed throughout the board to power all circuits except the audio output. The 25 VAC input is

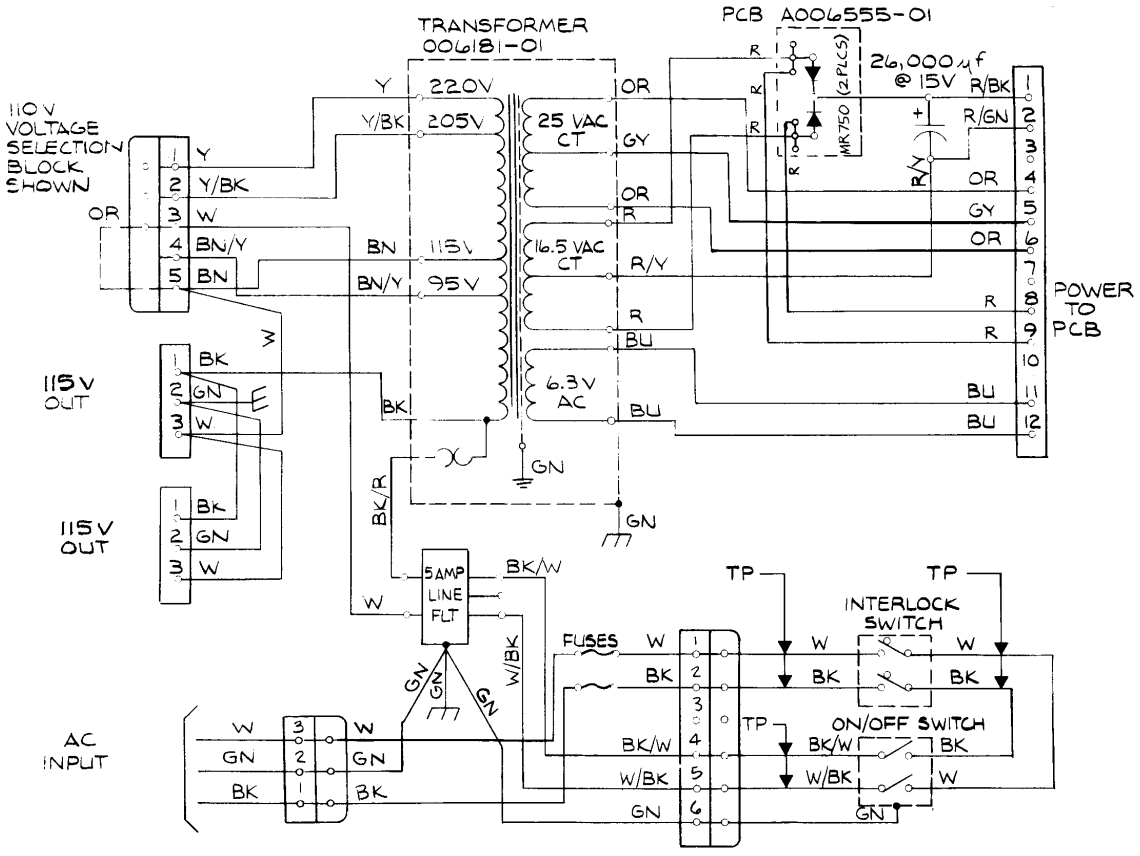


Figure 17 Power Supply Schematic Diagram

rectified through CR2 and 3, filtered by capacitor C33, and supplied to the audio output as unregulated 18 VDC.

The +5 VDC regulated voltage is also supplied through 1K pull-up resistors R1, R2, R4, R5, R21, and R25 for floating or unused inputs. Pull-up voltage is labeled *P* on the schematics.

Microcomputer

The microcomputer consists of the Read-Only Memory (ROM), Random-Access Memory (RAM) used as scratchpad memory, and the microprocessor (see Figure 18). The microprocessor controls the microcomputer through a 16-bit address bus which addresses the ROM, RAM, playfield logic and audio circuits. An 8-bit bi-directional data bus provides a path for transferring data between the microprocessor and the various memories, the switch circuits and the playfield logic. A special watchdog circuit makes sure that the microcomputer functions properly.

Watchdog Circuit

The watchdog circuit is a shift register, a 5-bit twisted-ring counter. In normal operation, the circuit is pulsed once each TV picture frame by the processor, resetting the counter. If five frames occur without a pulse, the counter resets the microprocessor to restart. This prevents random electronic static from upsetting game operation. The power-on hardware, or the PCB reset pushbutton, presets the counter, which in turn initializes the microprocessor and starts the attract sequence.

Circuitry Timing

Clocks for the PCB originate from a 12-MHz crystal-controlled oscillator. The oscillator is divided by two to develop two 6-MHz clocks, designated on the schematic as 6 MHz and $\overline{6\ \text{MHz}}$. The horizontal counters are driven by 6 MHz, which provide the horizontal synchronizing pulses 1H through 256H. The signals HBLANK and HSYNC are developed in flip-flops L7. HSYNC is the clock input for the vertical counters which provide the vertical synchronizing pulses 1V through 128V. VBLANK and VSYNC are developed by a special coded ROM, M6.

Microprocessor clocks $\phi 1$ and $\phi 2$ are developed by dividing 2H by two in flip-flop F4. Inverters E4 provide the necessary voltage levels.

Microcomputer Addressing

The address lines (BA0 through BA15) are buffered to eliminate signal loading. The lower-numbered lines (BA0 through BA9) address the program memory ROMs (E1, E2, H1, H2, and K1, K2). The scratchpad memory (RAM N1 and M1) are addressed by address lines BA0 through BA8.

The higher-numbered address lines (BA10 through BA15) address the address decoders. The address decoder output enables the appropriate memory or logic device.

The LEGIT signal is developed from the phase 2 clock and occurs one-half clock period after the phase 2 clock rises. This signal is used to strobe the TTL and is delayed from the clock to allow the data lines to settle. The VMA signal is an output of the microprocessor which only exists when the microprocessor wants a data transfer. VMA enables the ROM address decoder and is part of the input to develop the System Enable signal.

Super Bug Alphanumerics

Alpha characters and numerics are stored in ROM M3, N3. Each character is traced in a block 16 lines square, at the top of the display on the TV monitor. The PROM inputs are vertical functions 1V, 2V, 4V, 8V, horizontal functions 4H and 8H, and the output of alphanumeric RAM P3. Address lines BA0 through BA4 address the desired character. Lines BA8 and BA10 with SYS EN (System Enable) enable the RAM for writing.

Chip P3 is a 128 x 8 RAM which operates with the microprocessor, accepting data through tri-state buffers M2 and N2. The output of M3 is converted from 4-bit parallel to serial output and clocked out to the video summing gates through shift register L3.

Playfield

The playfield logic is similar to the alphanumeric, although more complicated. The ROM consists of three ICs E5, F5, and H5. To permit rotating the playfield, separate horizontal and vertical counters (C5 and E8, D5 and F8, respectively) are used. These counters can be offset by the processor to create field rotation.

ICs E6 and F6 are the playfield RAM. They are loaded through tri-state devices D6 and H6, which are connected to all eight lines of the data bus. The RAM output accesses ROM pictures and controls the various shades of gray used to make the picture on the TV monitor. There are 48 playfield objects; objects 0 through 7 are things you slide on (oil and sand), objects 16 through 47 are things you crash into (trees,

pylons, cars, and CRUNCH graphics), and objects 8 through 15 (arrows) do not interfere with game progress at all.

Playfield RAM addresses come through multiplexers E7 and F7, allowing the microprocessor to load during V Blanking.

Super Bug Car Picture

The CAR VIDEO output (sheet 3) comes, one bit at a time, from the output of multiplexer K7. This output results in a TV monitor display of the Super Bug car turned in one of 24 possible directions of rotation. However, car picture ROM K6 contains only *four* rotational pictures of the Super Bug car.

By exchanging the horizontal and vertical sync address inputs (J6, K5, L6) to car picture ROM K6, the four rotational pictures from the ROM are increased to eight pictures. By inverting the horizontal and vertical sync inputs (J5, K5, L5) to multiplexers J6, K5, and L6, the eight rotational pictures from ROM K6 are increased to 24 pictures.

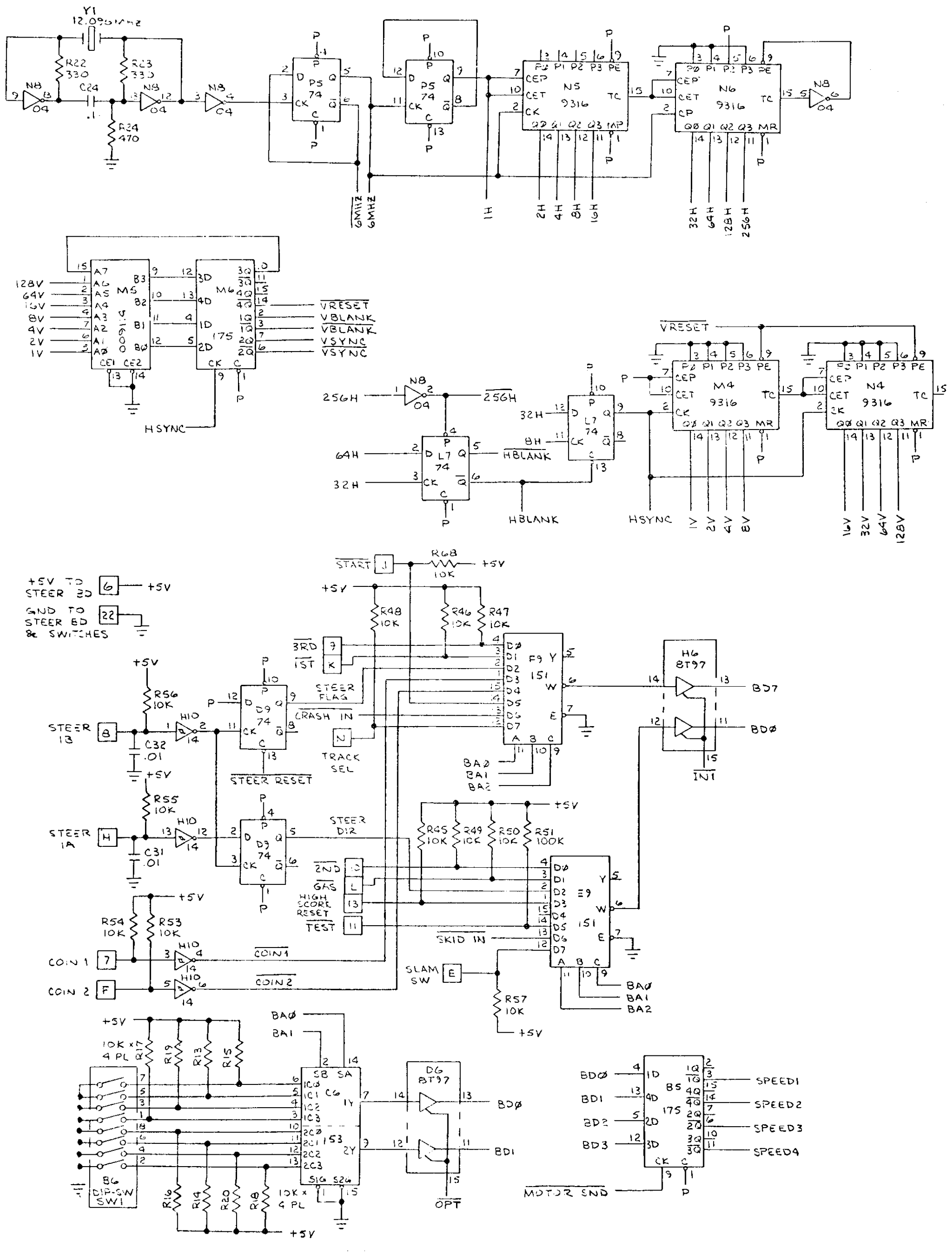
Select inputs R0 and R1 of multiplexer K7 determine the data bit output of car picture ROM K6.

Flip-flops M7 and associated gates produce the timing necessary to enable the car picture to be displayed in the center of the TV monitor.

Audio

The microprocessor puts sound data on the data bus. IC B5 latches data for the frequency of the motor sound. IC D8 latches data for the frequency of the crash sound.

Latch C9 uses address bits BA0 through BA3 to select, on command, the start lamp, the track select and the FLASH signal which inverts the video. C9 also permits the microprocessor to select the ATTRACT signal, which turns the sound on and off.


Y1
12.096 MHz
R22
330
R23
330
C24
.1
R24
470
N8
04
P5
74
N5
9316
N6
9316
6MHz
1H
2H
4H
8H
16H
32H
64H
128H
256H
M5
M6
175
128V
64V
16V
8V
4V
2V
1V
VRESET
VBLANK
VSYNC
HSYNC
256H
L7
74
64H
32H
8H
HBLANK
M4
9316
N4
9316
START
R68
10K
+5V
R48
R46
R47
10K
3RD
1ST
F9
151
H6
8T97
BD7
BDØ
IN1
+5V TO STEER BD
GND TO STEER BD & SWITCHES
STEER 1B
STEER 1A
R56
R55
C32
C31
.01
H10
D9
74
STEER FLAG
CRASH IN
TRACK SEL
STEER RESET
STEER DIR
BAØ
BA1
BA2
R45
R49
R50
R51
100K
2ND
GAS
HIGH SCORE RESET
TEST
SKID IN
E9
151
SLAM SW
R57
R54
R53
COIN 1
COIN 2
COIN1
COIN2
10K x 4 PL
R19
R13
R15
R16
R14
R20
R18
C6
153
D6
8T97
BD1
OPT
B6
DIP-SW
SW1
B5
175
BD2
BD3
SPEED1
SPEED2
SPEED3
SPEED4
MOTOR EN

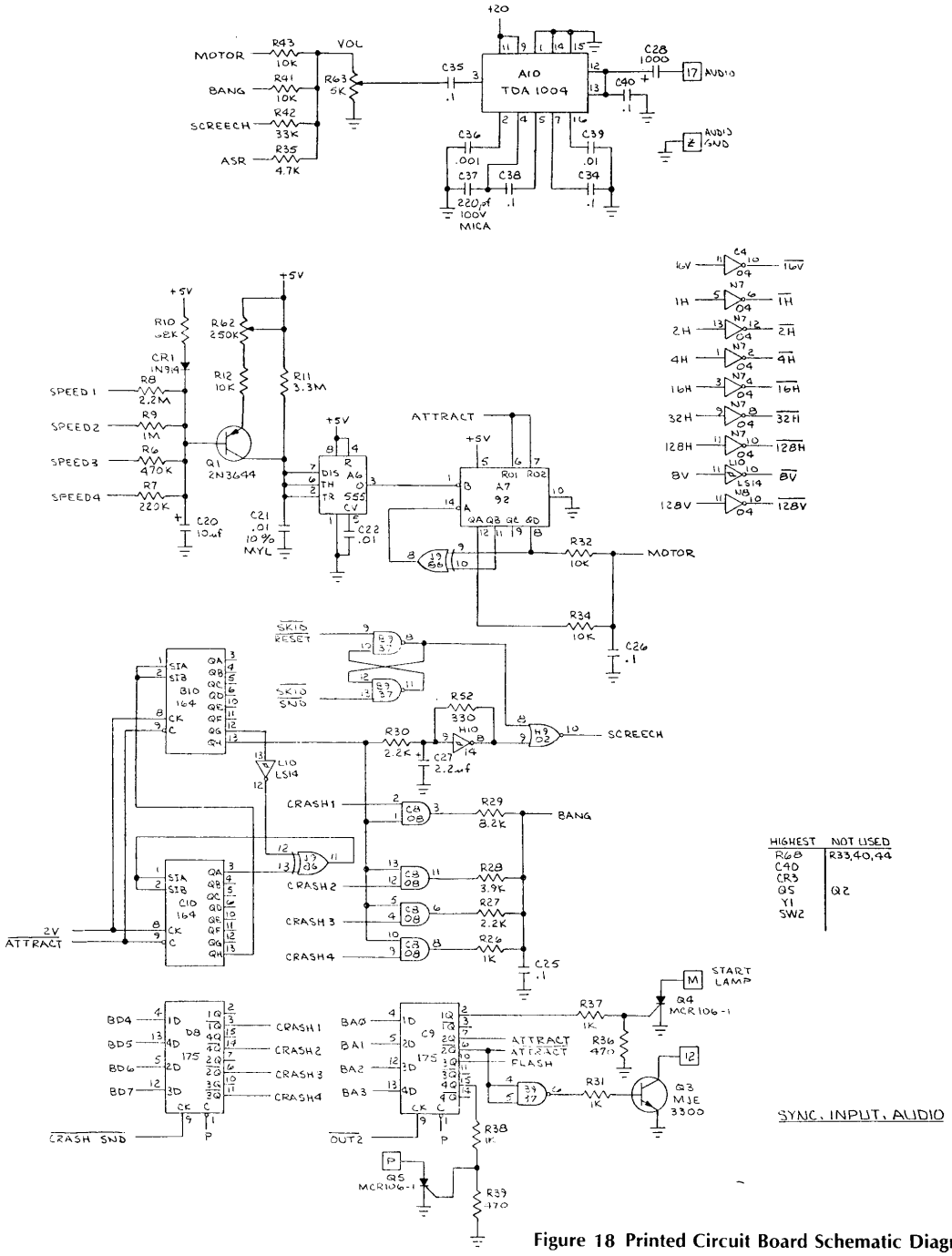
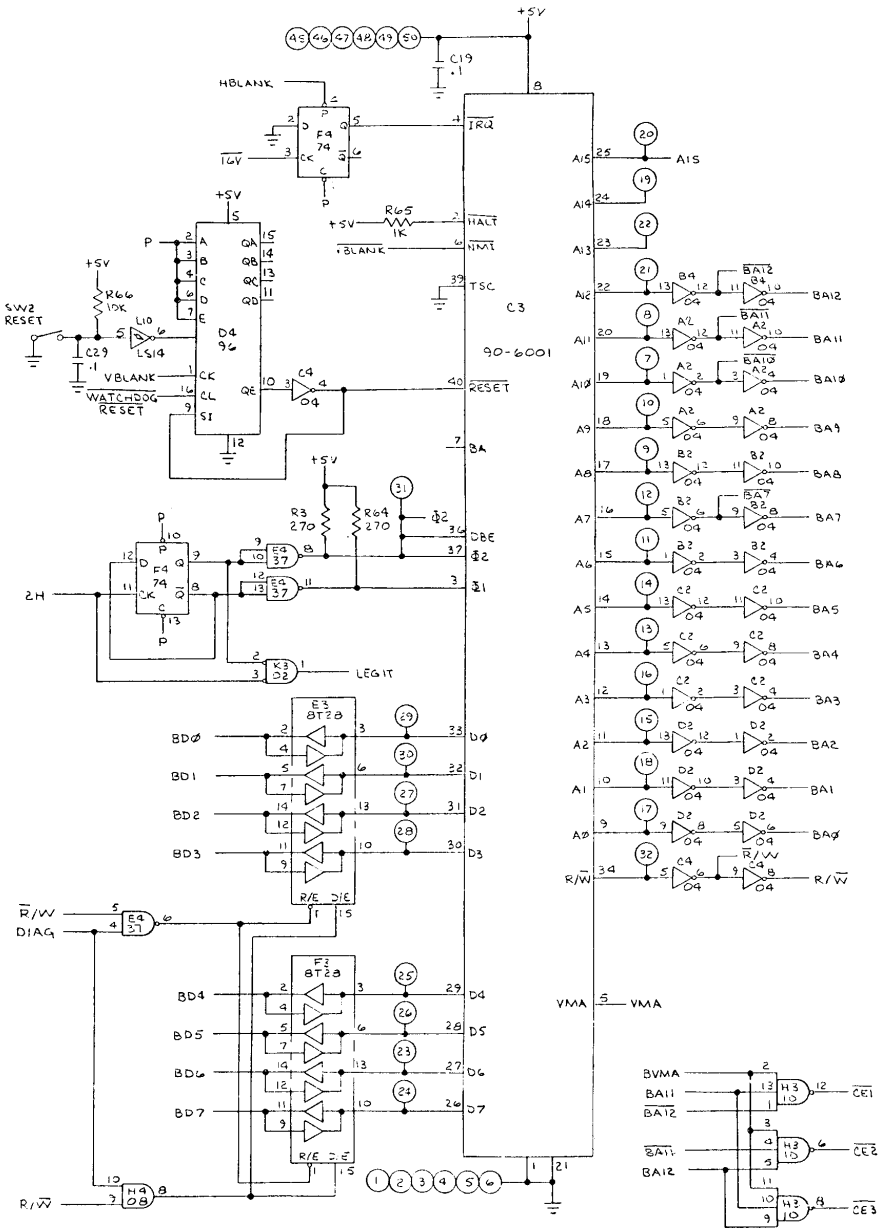


Figure 18 Printed Circuit Board Schematic Diagram
Sheet 1 of 4


+5V
C19
.1
HBLANK
F9
74
IRQ
IRQ
HALT
NMI
TSC
C3
90-6001
R65
1K
+BLANK
SW2
RESET
R66
10K
C29
.1
LS14
VBLANK
WATCHDOG
RESET
D4
96
C4
04
RESET
BA
R3
270
R64
270
Φ2
DBE
Φ2
Φ1
2H
F4
74
E9
37
K3
D2
LEGIT
BD0
BD1
BD2
BD3
F3
8T28
D0
D1
D2
D3
R/E DIR
R/W
DIAG
H9
08
BD4
BD5
BD6
BD7
D4
D5
D6
D7
VMA
A15
A14
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
R/W
B4
A2
B2
C2
D2
BA12
BA11
BA10
BA9
BA8
BA7
BA6
BA5
BA4
BA3
BA2
BA1
BA0
R/W
BVMA
BA11
BA12
BA11
BA12
H3
10
CE1
CE2
CE3

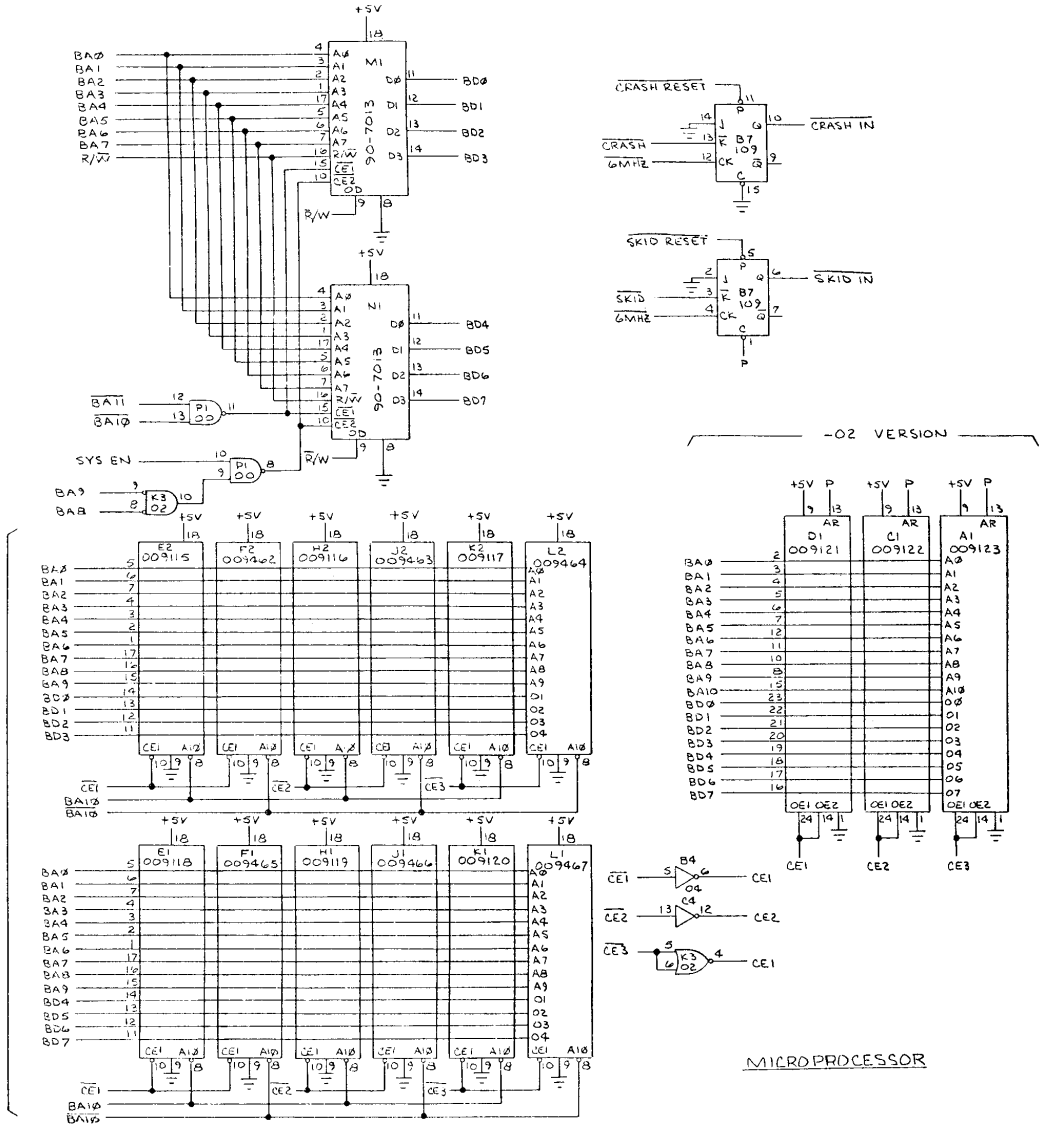
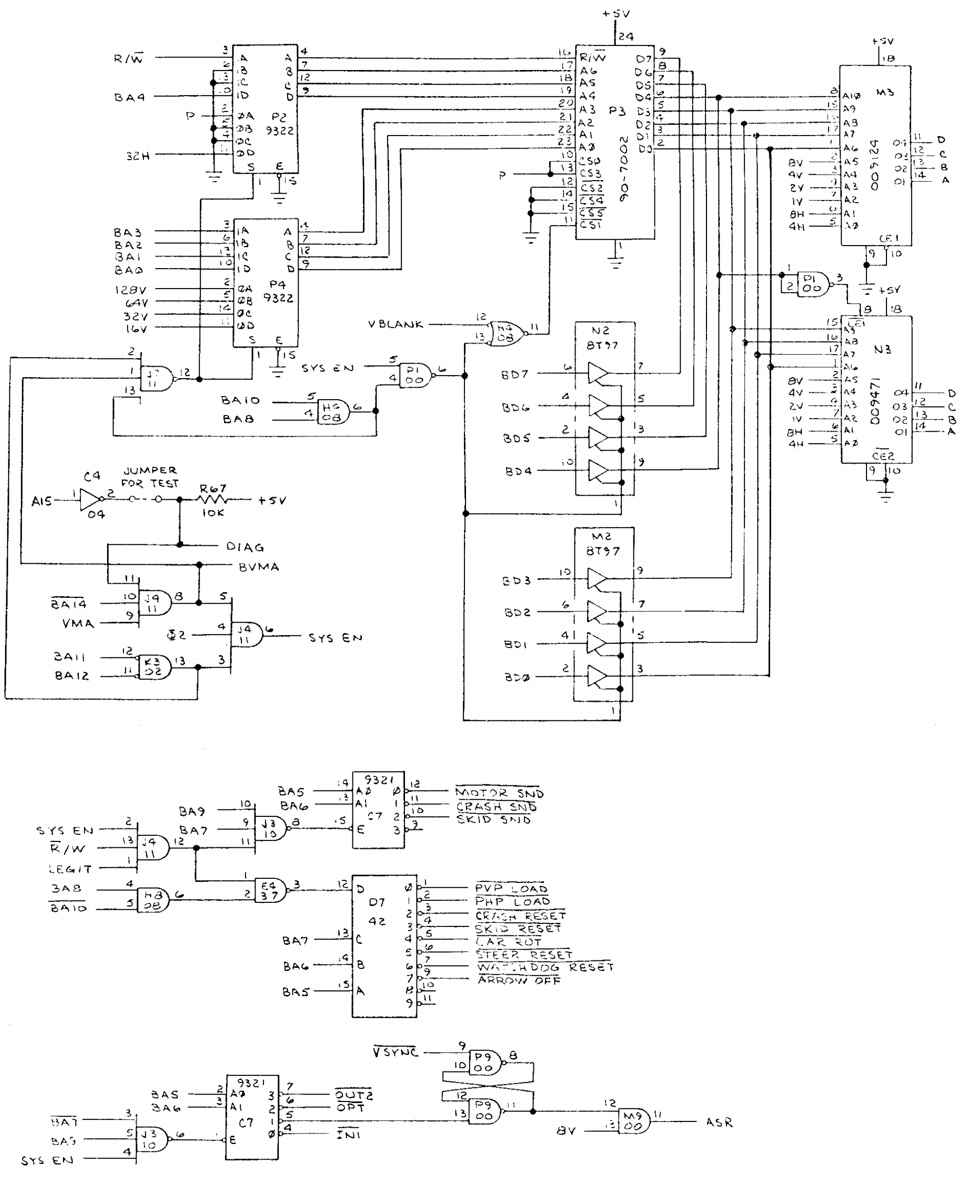


Figure 18 Printed Circuit Board Schematic Diagram
Sheet 2 of 4



+5V
R/W
BA4
P
32H
P2
9322
P4
9322
BA3
BA2
BA1
BA0
128V
64V
32V
16V
P3
90-7002
M3
009124
N3
009471
VBLANK
SYS EN
BA10
BA8
N2
8T97
M2
8T97
BD7
BD6
BD5
BD4
BD3
BD2
BD1
BD0
A15
C4
04
JUMPER FOR TEST
R67
10K
DIAG
BVMA
BA14
VMA
Φ2
SYS EN
BA11
BA12
9321
C7
BA5
BA6
BA9
BA7
MOTOR SND
CRASH SND
SKID SND
R/W
LEGIT
D7
42
PVP LOAD
PHP LOAD
CRASH RESET
SKID RESET
CAR ROT
STEER RESET
WATCHDOG RESET
ARROW OFF
VSYNC
P9
M9
8V
ASR
OUT2
OPT
IN1

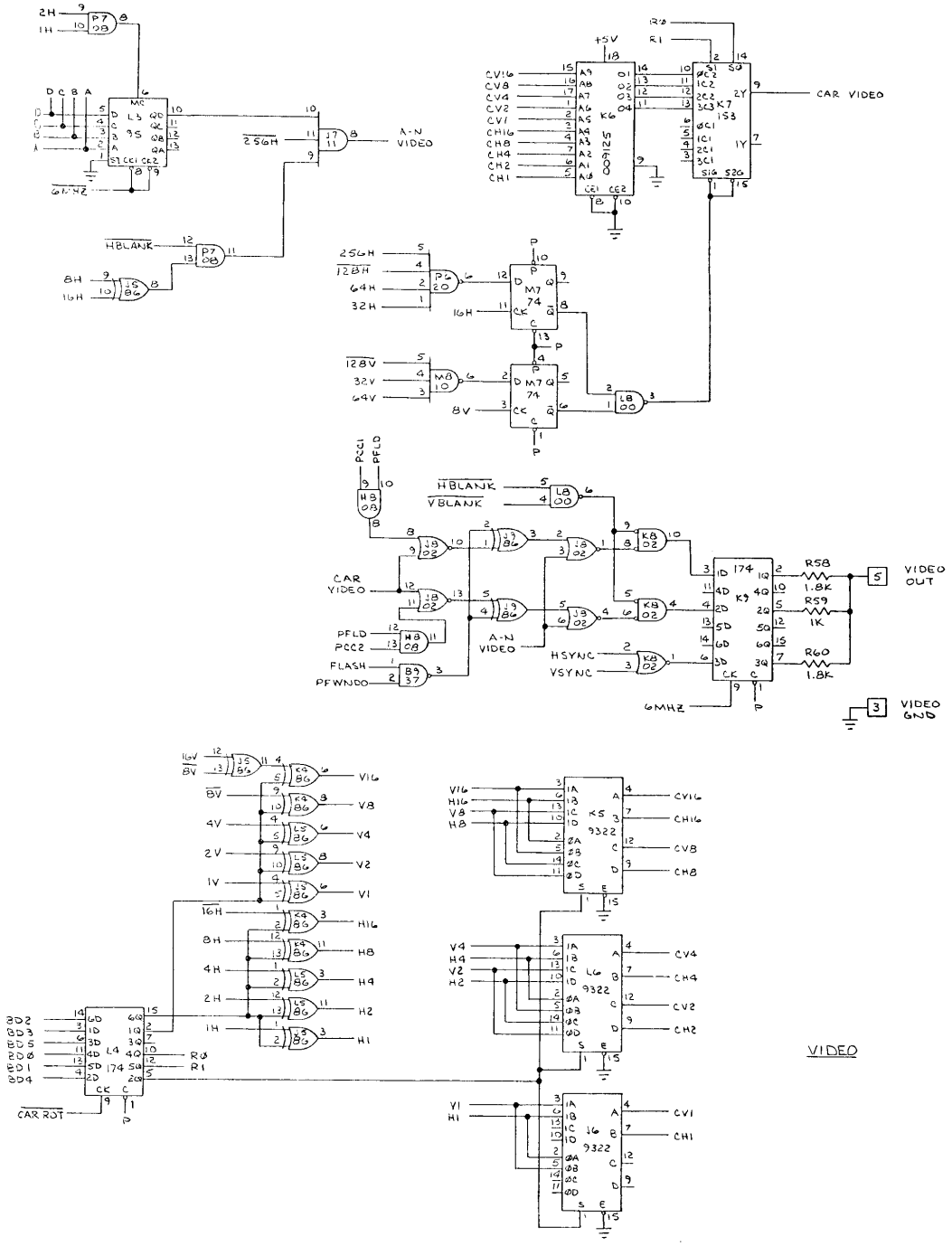
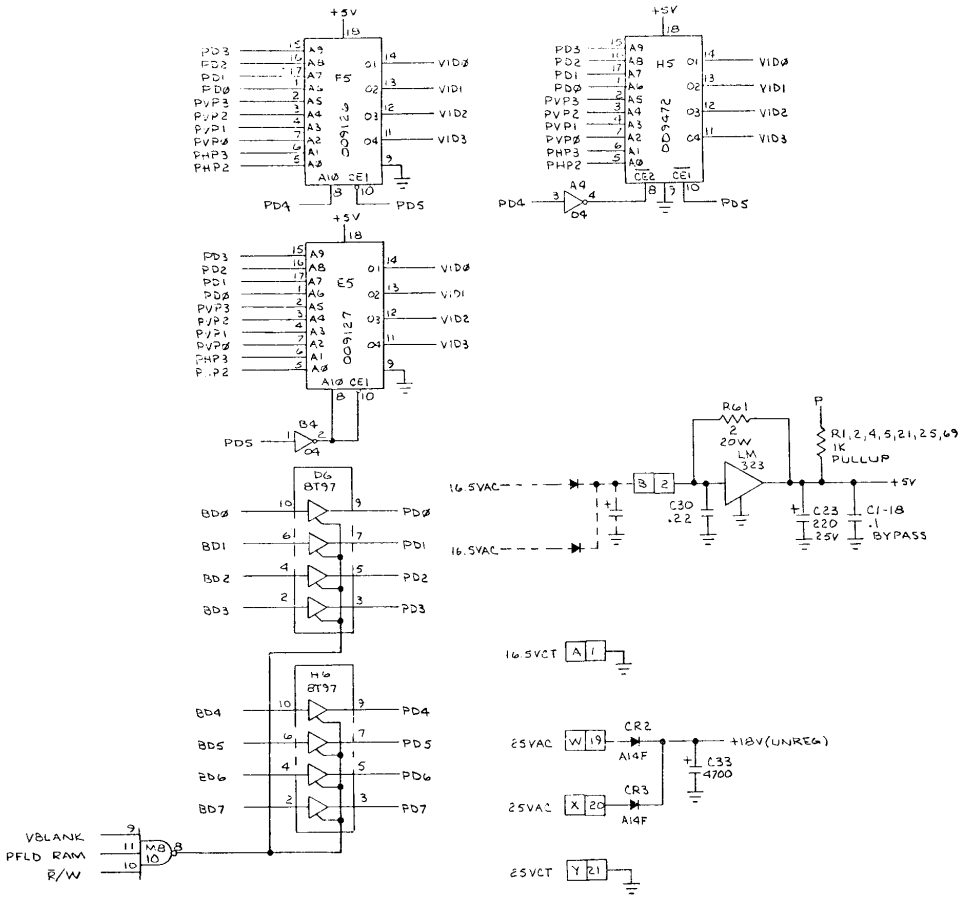
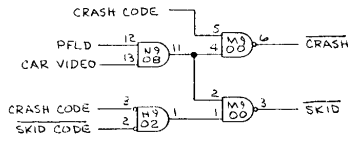


Figure 17 Printed Circuit Board Schematic Diagram
Sheet 3 of 4



PLAYFIELD, POWER



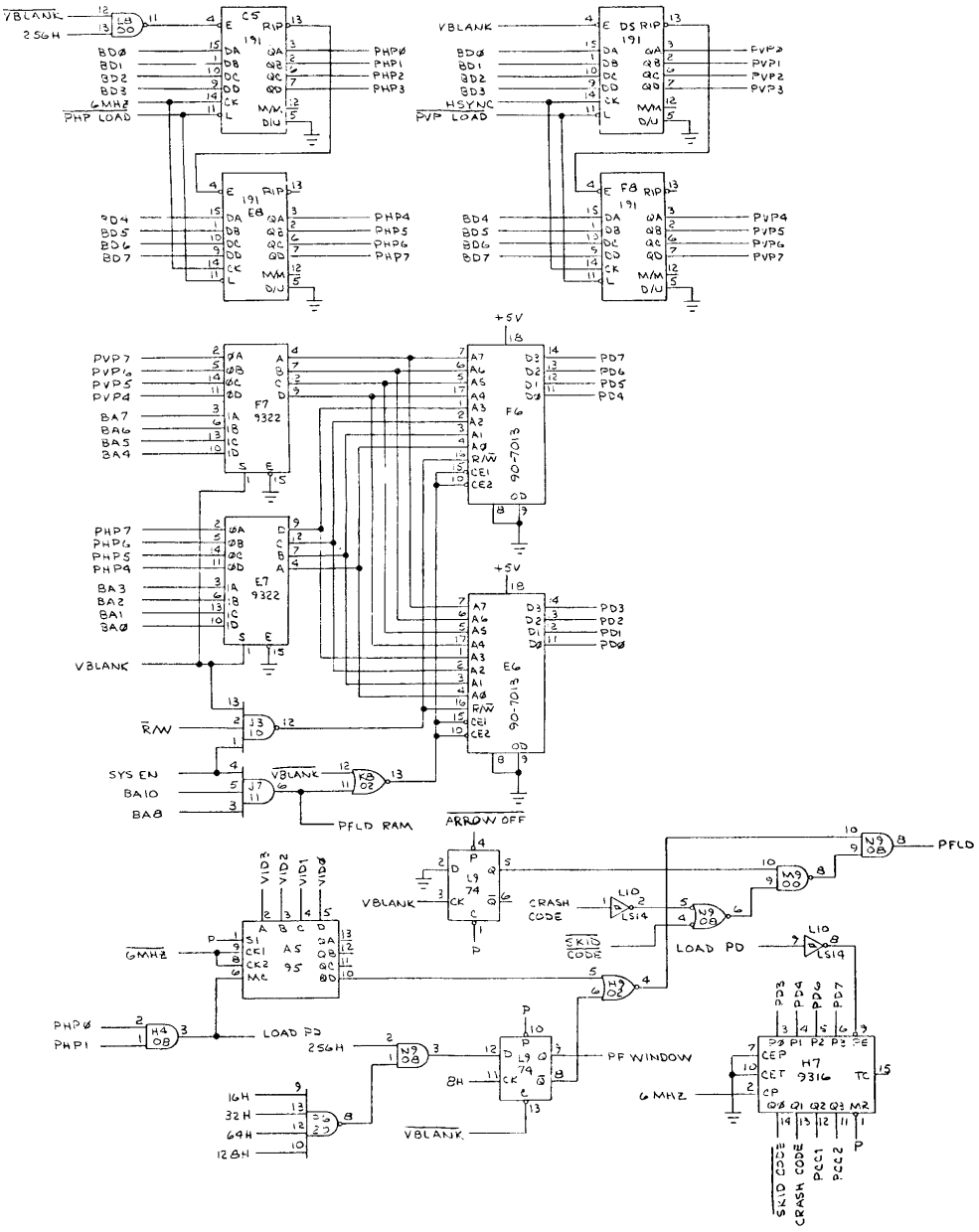
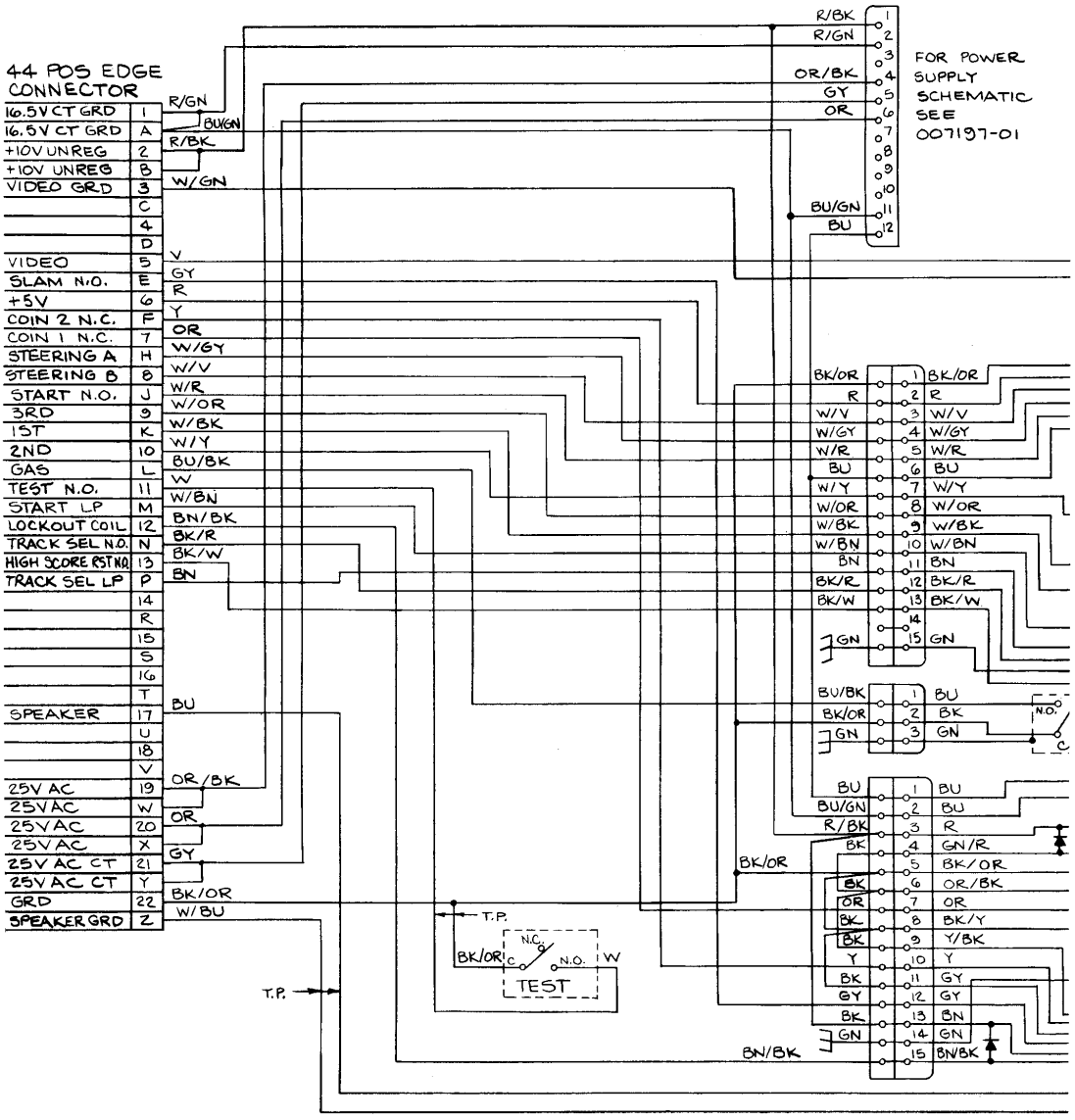


Figure 17 Printed Circuit Board Schematic Diagram
Sheet 4 of 4


44 POS EDGE CONNECTOR
16.5V CT GRD 1
16.5V CT GRD A
+10V UNREG 2
+10V UNREG B
VIDEO GRD 3
C
4
D
VIDEO 5
SLAM N.O. E
+5V 6
COIN 2 N.C. F
COIN 1 N.C. 7
STEERING A H
STEERING B 8
START N.O. J
3RD 9
1ST K
2ND 10
GAS L
TEST N.O. 11
START LP M
LOCKOUT COIL 12
TRACK SEL N.O. N
HIGH SCORE RST NO 13
TRACK SEL LP P
14
R
15
S
16
T
SPEAKER 17
U
18
V
25V AC 19
25V AC W
25V AC 20
25V AC X
25V AC CT 21
25V AC CT Y
GRD 22
SPEAKER GRD Z
R/GN
BU/GN
R/BK
W/GN
V
GY
R
Y
OR
W/GY
W/V
W/R
W/OR
W/BK
W/Y
BU/BK
W
W/BN
BN/BK
BK/R
BK/W
BN
BU
OR/BK
OR
GY
BK/OR
W/BU
T.P.
BK/OR
N.C.
N.O.
W
TEST
R/BK
R/GN
OR/BK
GY
OR
BU/GN
BU
FOR POWER SUPPLY SCHEMATIC SEE 007197-01
BK/OR
R
W/V
W/GY
W/R
BU
W/Y
W/OR
W/BK
W/BN
BN
BK/R
BK/W
GN
BU/BK
BK/OR
GN
BK
GN
N.O.
C
BU
BU/GN
R/BK
BK
BK
OR
BK
BK
Y
BK
GY
BK
GN
GN/R
BK/OR
OR/BK
OR
BK/Y
Y/BK
Y
GY
GY
BN
GN
BN/BK

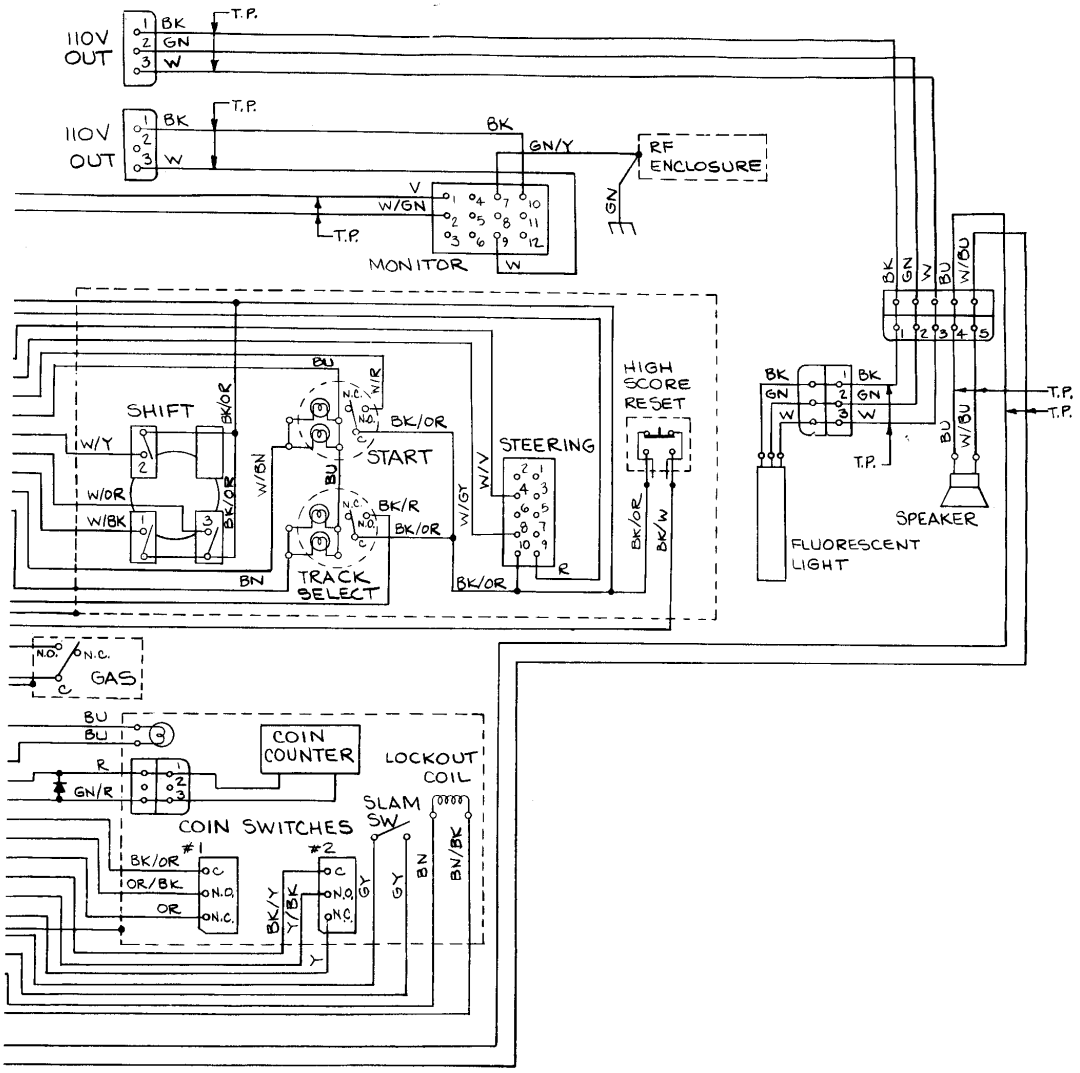


Figure 19 Harness Schematic

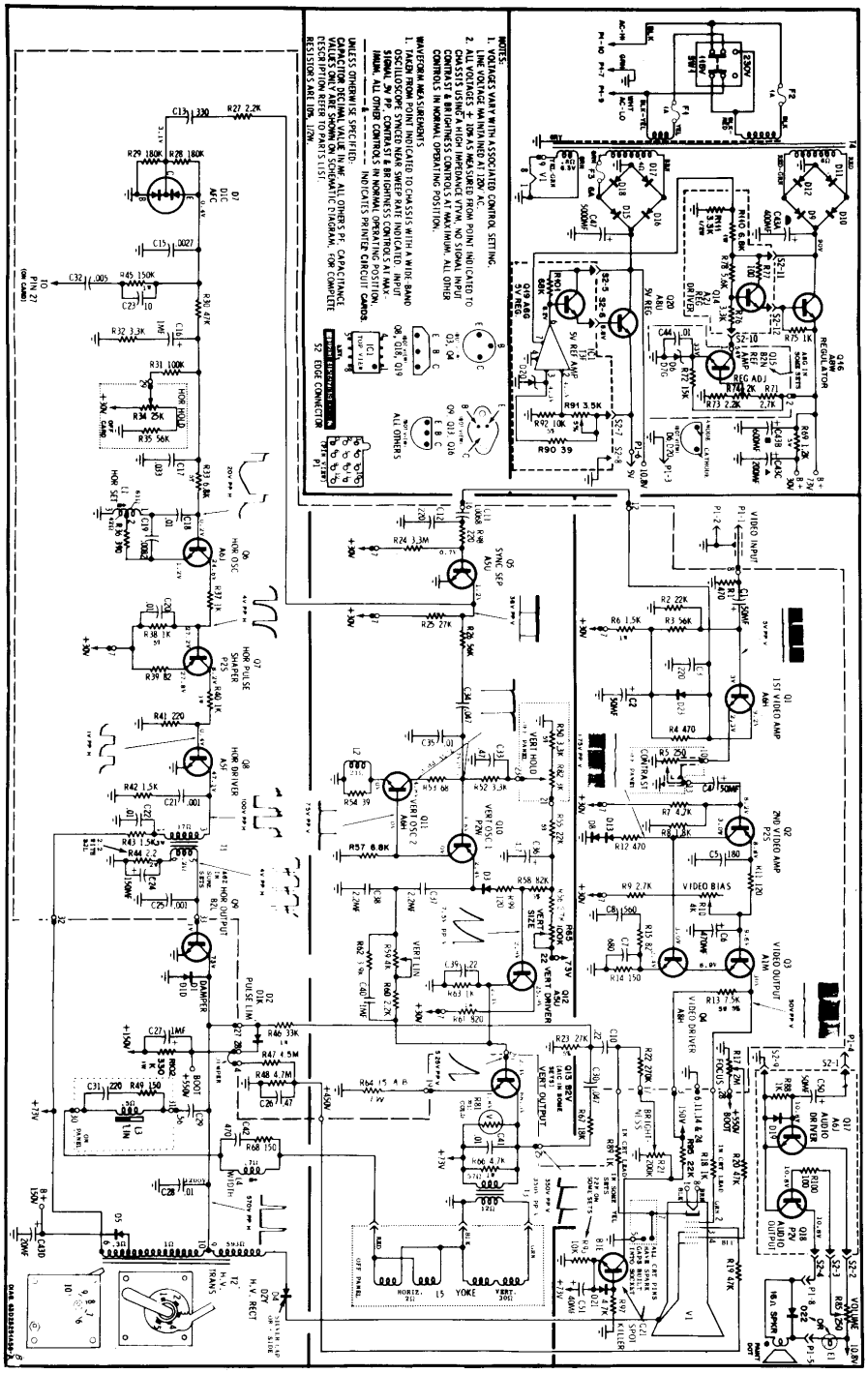


Figure 20 Motorola TV Monitor Schematic

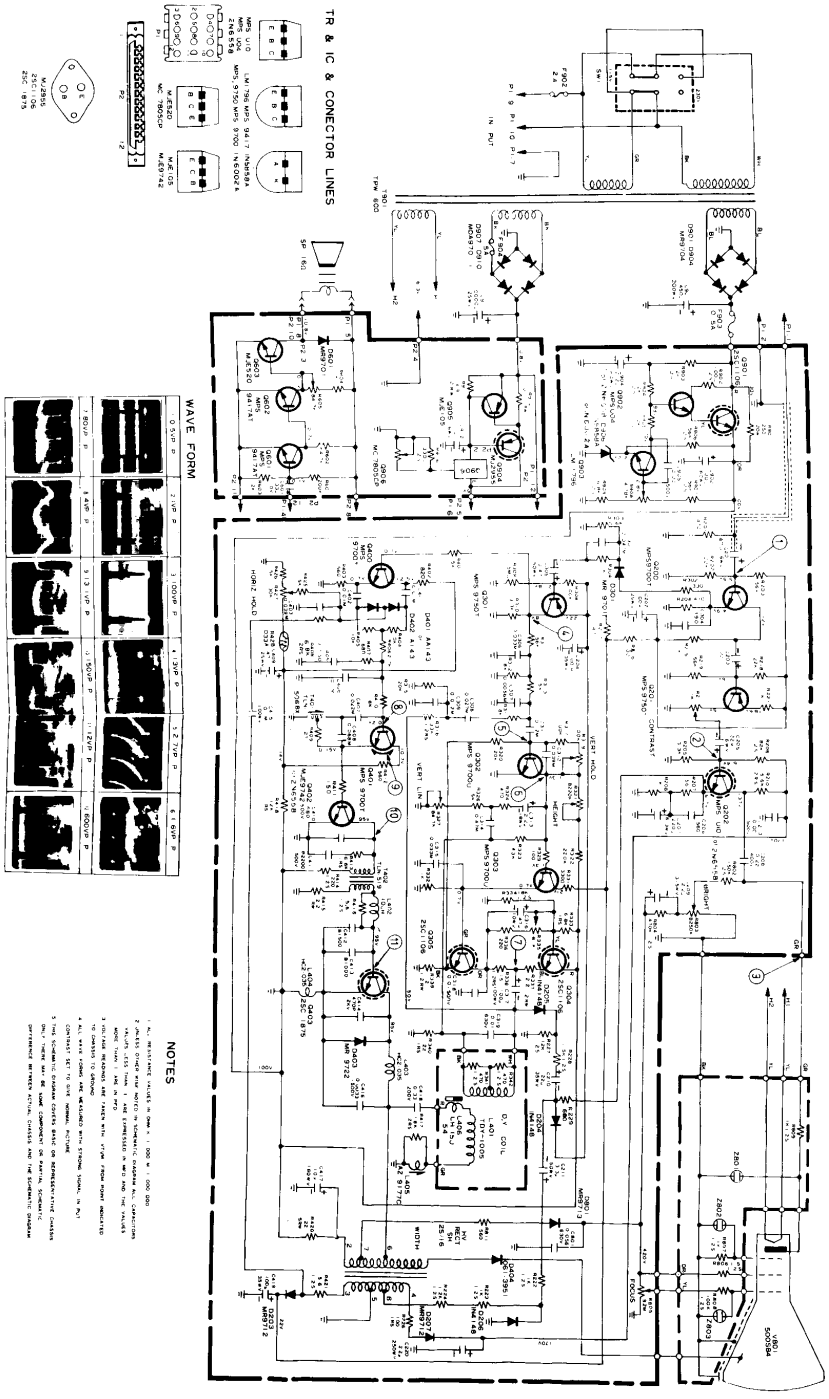
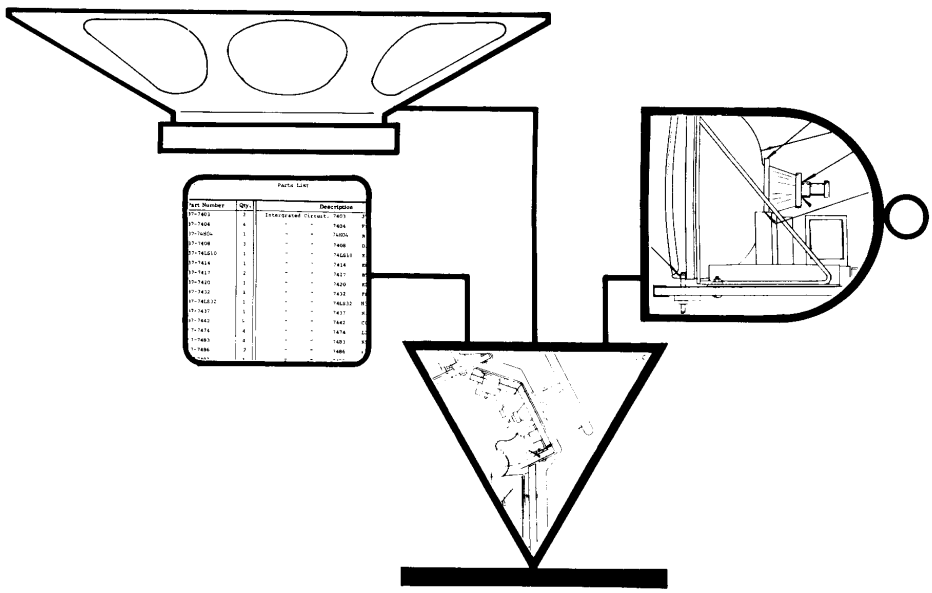


Figure 20 TEC TV Monitor Schematic



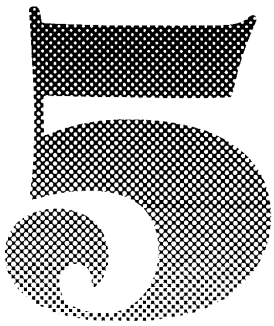
ILLUSTRATED PARTS CATALOG

The purpose of this Chapter is to provide you with the necessary information for ordering replacement parts for the Super Bug 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 **Super Bug** game. This will help to avoid confusion and mistakes in your order. We hope the results will be less downtime and more profit from your game.

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.



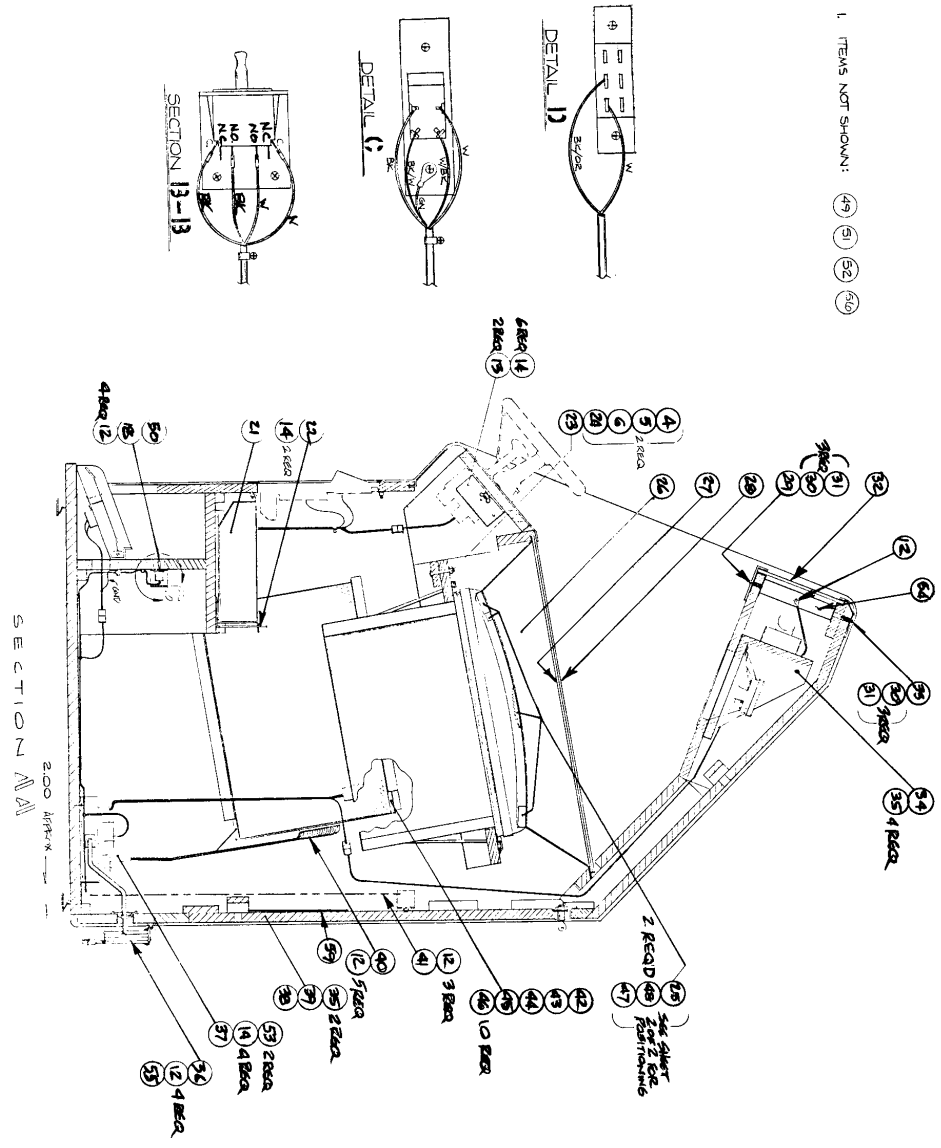


Figure 21 Super Bug Final Assembly A008765-01 B

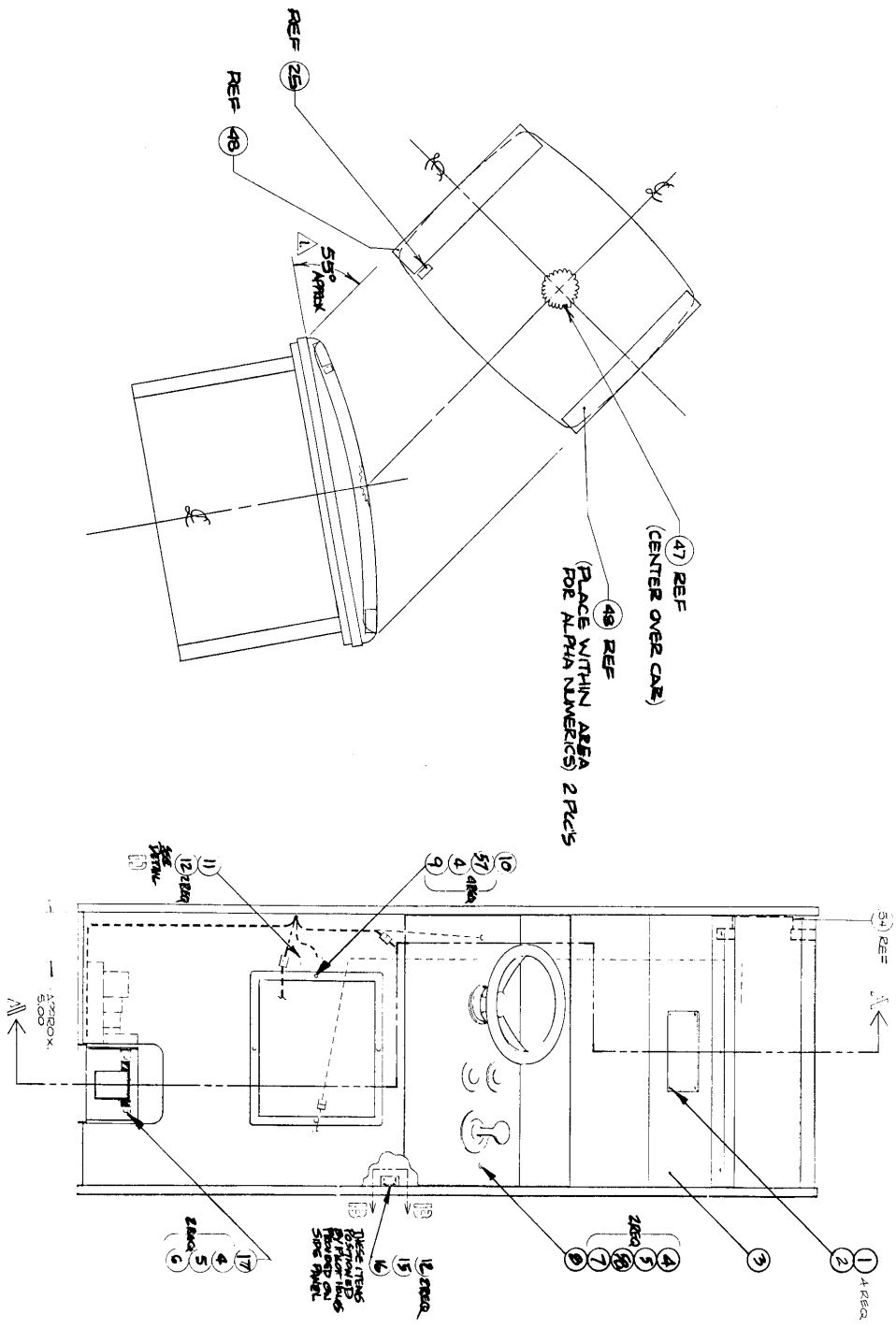


Figure 21 Super Bug Final Assembly A008765-01 B

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Item	Part Number	Qty.	Description
1	73-77004	4	Pop Rivet, 3/16" O.D. x .68" Long
2	005419-01	1	Grill, Speaker
3	A008728-02	1	Cab. Assembly with Graphics
4	75-015S	10	Washer, Flat, ¼"
5	75-045	6	Washer, Split Lock ¼"
6	75-915S	4	Nut, ¼-20, Machine Hexagon
7	75-5524B	2	Bolt, Carriage, #¼-20 x 1.50 Lg., Black
8	A008844-01	1	Control Panel Assembly - See Figure 22
9	75-5516B	4	Bolt, Carriage, #¼-20 x 1.00" Lg. Blk
10	A009083-01	1	Coin Door Assembly - See Figure 26
11	A006548-01	1	Slide Switch Assembly
12	72-6610	21	Screw, Sm., Pan Hd., Phil., #6 x 5/8" Lg.
13	002728-01	2	Bracket, Panel Mtg.
14	72-6812	12	Screw, Sm., #8 x 3/4 Lg. Phil. Pan Hd.
15	68-002	1	AC Power Interlock Switch
16	000268-02	1	Bracket, Switch Mounting
17	A008845-01	1	Single Foot Pedal Assembly, with Harness - See Figure 28
18	A006449-01	1	On-Off Switch Assembly
19			
20			
21	A007902-01	1	Cash Box Assy
22	006870-01	1	Bracket, Coin Box
23	A008766-01	1	T.V. Tray Assembly - See Figure 29
24	75-5532N	2	Bolt, Carriage, #¼-20 x 2.00" Lg.
25	006319-02	1	Copyright Decal (1977)
26	008767-01	1	Bezel, Cardboard
27	008759-02	1	Monitor Plex
28	008760-01	1	Monitor Plex with Graphics
29	003053-01	1	Upper Plex Retainer
30	75-99090006	6	Well Nut, Blind Hole Fastener, 10-32
31	82-8016	6	Screw, Button Hd., Socket Cap, 10-32 x 1.00" Lg.
32	008758-01	1	Display Plex with Graphics
33	008764-01	1	Plex Retainer
34	A005430	1	Display Assembly
35	82-1824	6	Wood Screw, #8 x 1.50" Lg. Flat Hd. Phil.
36	A007784-01	1	Power Cord Assembly
37	A007197-01	1	Power Supply Assembly, Type "B" - See Figure 30
38	A007299-01	1	Rear Door Assembly W/Lock
39	005233-01	1	Rear Door Seal
40	A008769-01	1	Main Harness

Item	Part Number	Qty.	Description
41	A008771-01	1	Power Switch Harness
42	A009262-02	1	R.F. Box Shield Assy - See Figure 31
43	A009154-01	1	R.F. Shield P.C.B. Assembly
44	A007778-01	1	P.C. Board Assembly, (Super Bug)(17.50) - See Figure 32
45	72-6808	1	Screw, Sm., Pan Hd., Phil., #8 x ½" Lg.
46	72-6608	10	Screw, Sm., Pan Hd., Phil., #6 x ½" Lg.
47	008846-01	1	Monitor Overlay, Car
48	005240-09	2	Decal, Color Strips
49	TM-098	1	Tech. Manual
50	007103-01	1	On-Off Switch Cover
51	A009424-XX	1	Shipping Container Assy.
52	006305-01	1	Printed Poly Bag
53.	46-203202	2	Fuses, 3 AG fast acting, 2 amp
54	78-6601216	A/R	Aluminim Foil (Approx. 2 Ft.)
55	78-25001	1	Screw Down Tie Wrap
56		1	
57	75-990505S	4	½-20 Shallow Pattern Lock Nut
58	75-935	2	Wingnut, ½-20
59	ST-098	1	Self Test Chart, Super Bug

Figure 21 Super Bug Final Assembly Parts List

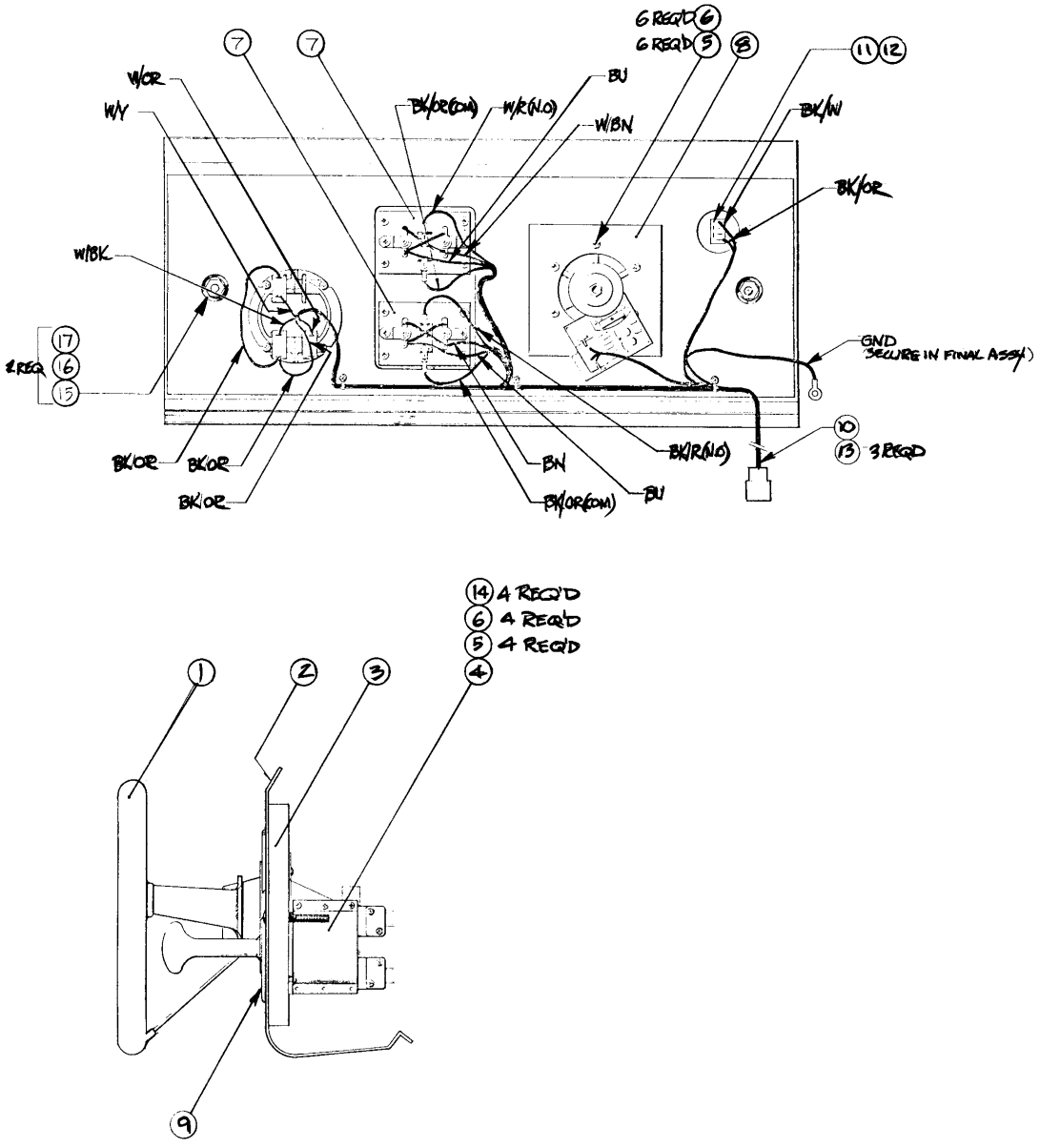

Figure 22 Control Panel Assembly A008844-01 B

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Item	Part Number	Qty.	Description
1	A000598-02	1	Steering Wheel Assembly - See Figure 23
2	008761-01	1	Control Panel W/Graphics
3	008754-01	1	Control Panel Back-Up
4	A000608-03	1	'H' Shift Assembly Less Switch - See Figure 24
5	85-22F112	10	Mach. Screws, #10-24 x 3/4 Lg., Pan Hd. Phil. Type "F"
6	75-040	10	#10 Lock Washer
7	A007357-01	2	Start Button Assembly - See Figure 25
8	000567	1	Bow Washer
9	005255	1	Shift Bezel
10	A008770-01	1	Control Panel Harness
11	001856-01	1	Bezel, Switch
12	62-009	1	Switch, Licon (blk Cap)
13	72-6610	3	Screw, Sm. Pan Hd. Phil., #6 x 5/8" Lg.
14	75-010S	4	Flat Washer #10
15	75-5524B	2	Bolt, Carriage #¼-20x1.50 Lg. Black
16	75-015S	2	Washer, Flat ¼"
17	75-915S	2	Nut, ¼-20, machine hexagon

Figure 22 Control Panel Assembly Parts List

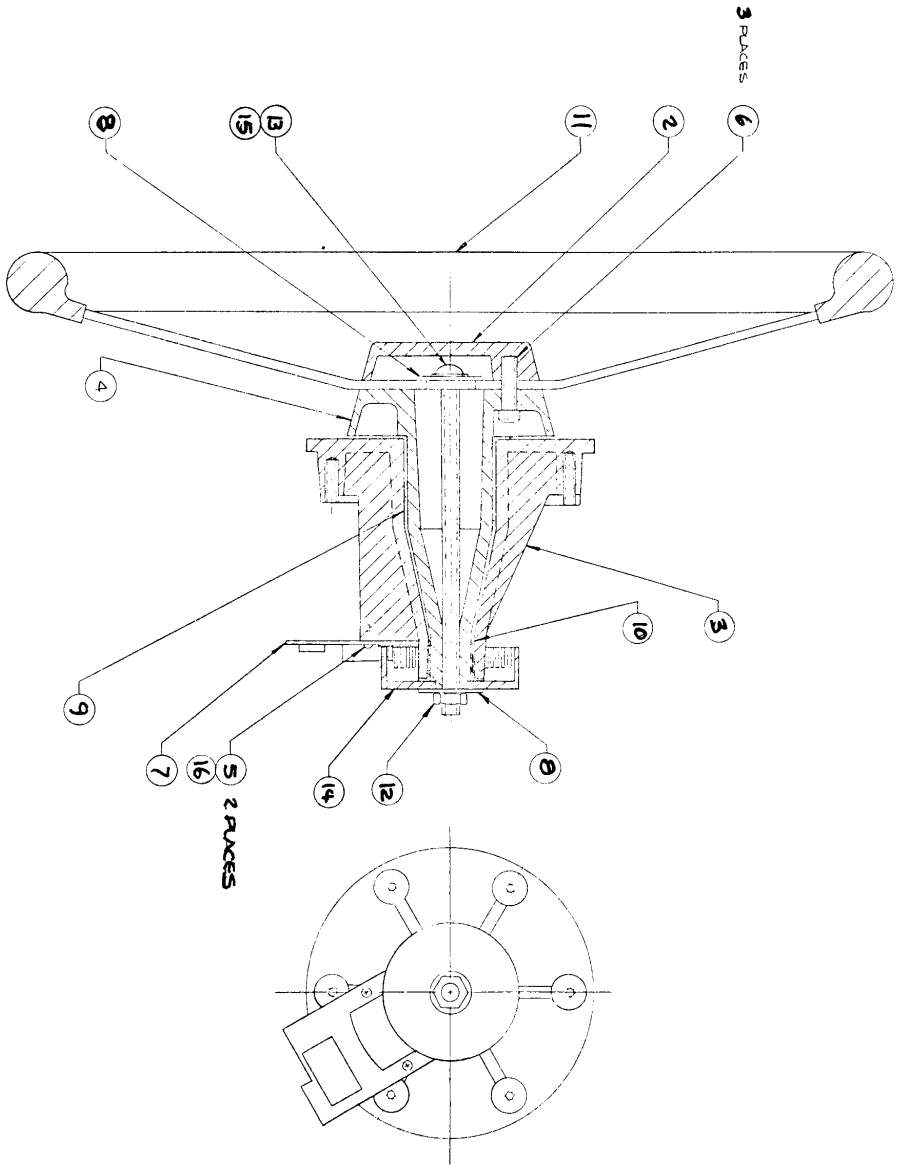

Figure 23 Steering Wheel Assembly A000598-02

Item	Part Number	Qty.	DESCRIPTION
1	A000598-02	Ref	Steering Wheel Assembly
2	002133	1	Cover
3	000605	1	Housing
4	000606	1	Shaft
5	85-22F208	2	SCR SHT Metal #2-56x½ Lg. "F"Type
6	72-7512	3	Mach Scr, ¼-20 x 3/4 Lg, Fillister Hd Slotted
7	A000607	1	Printed Circuit Assembly
8	75-07002	2	Washer, Fender, ¼
9	76-092020	1	Bearing, Thompson (20L20-FK)
10	76-091010	1	Bearing, Thompson (10L10-FK)
11	78-40104	1	Steering Wheel, 10"
12	75-990505 S	1	Nut, ¼-20, Nylon Lock, Shallow Pattern
13	72-9580	1	Mach Scr, ¼-20 x 5 Lg, Truss Hd, Slotted
14	000616	1	Hub Light
15	75-055	1	Washer, ¼" Int. Tooth, Starlock
16	75-042	2	Washer, Split Lock #2

Figure 23 Steering Wheel Assembly Parts List

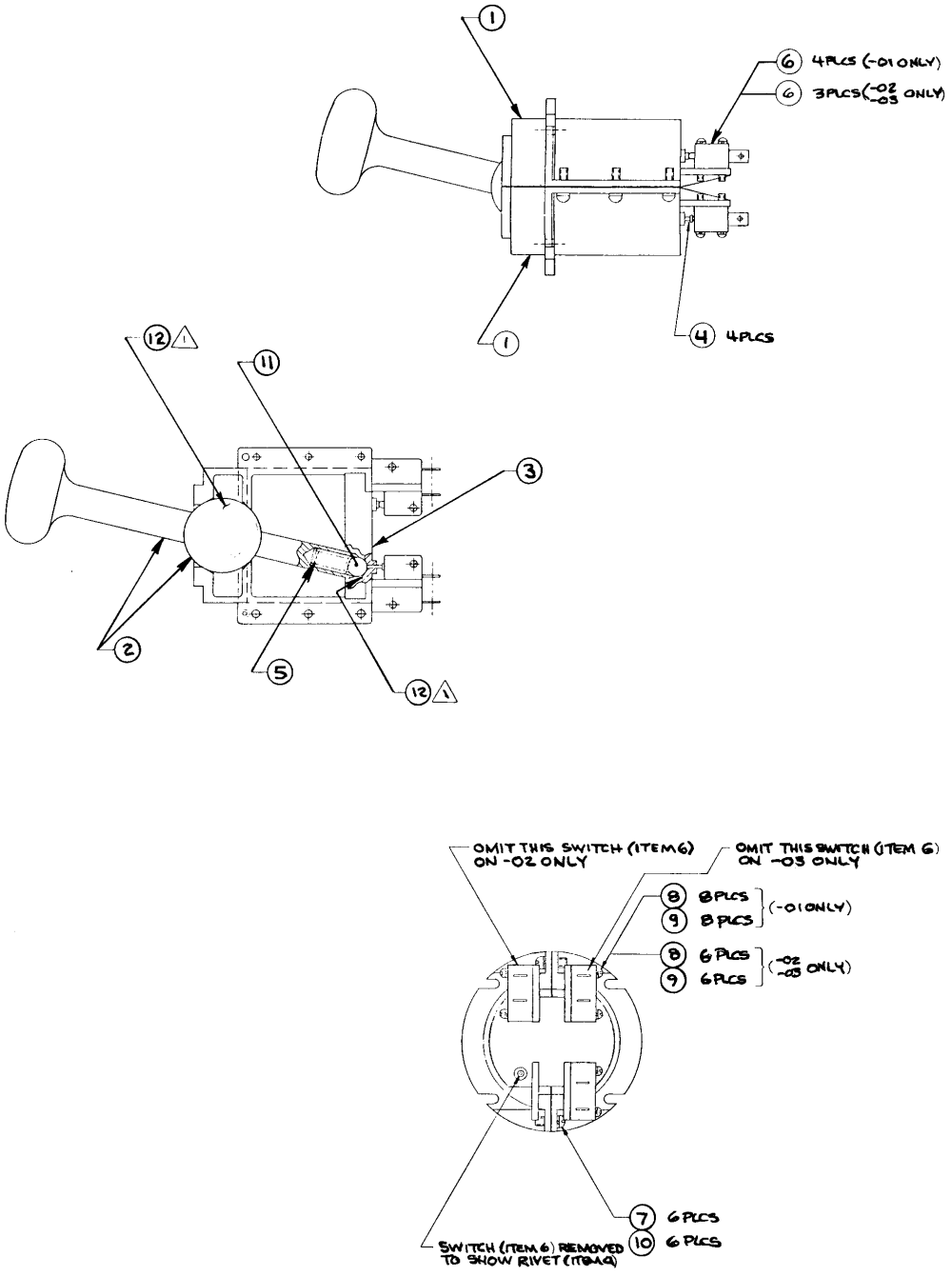

Figure 24 H-Shift Assembly, Less Switch
A000608-03 P

Item	Part Number	Qty.	Description
1	000609-01	2	Shift Housing
2	A000610	1	Handle Assembly
3	000611	1	Shift Detent
4	008994-01	4	Shift Rivets
5	78-3002003	1	Spring, Assoc. Spring Co. (Co. 360-032-1000M)
6	65-021A	3	Switch, Cherry (E18-00M)
7	75-046	6	Washers, #6 Split Lock
8	75-044	6	Washers, #4 Split Lock
9	85-22F412	6	Scr. Mach., 4-40 x 3/4 Lg. Pan Hd., Self Threading Type F
10	85-22F608	6	Scr. Mach., 6-32 x ½ Lg. Pan Hd., Self Threading Type F
11	76-11375S	1	Ball Steel, 3/8 Dia. Bearing Grade
12	78-16002	A/R	Silicone Compound, Dow Corning #5
13	78-33001	1	Clamp, Hose
			NOTE: Item #13, 78-33001, Hose Clamp is to be used only with old Shift Housing P/N 000609 Rev. "D"

Figure 24 H-Shift Assembly, Less Switch, Parts List

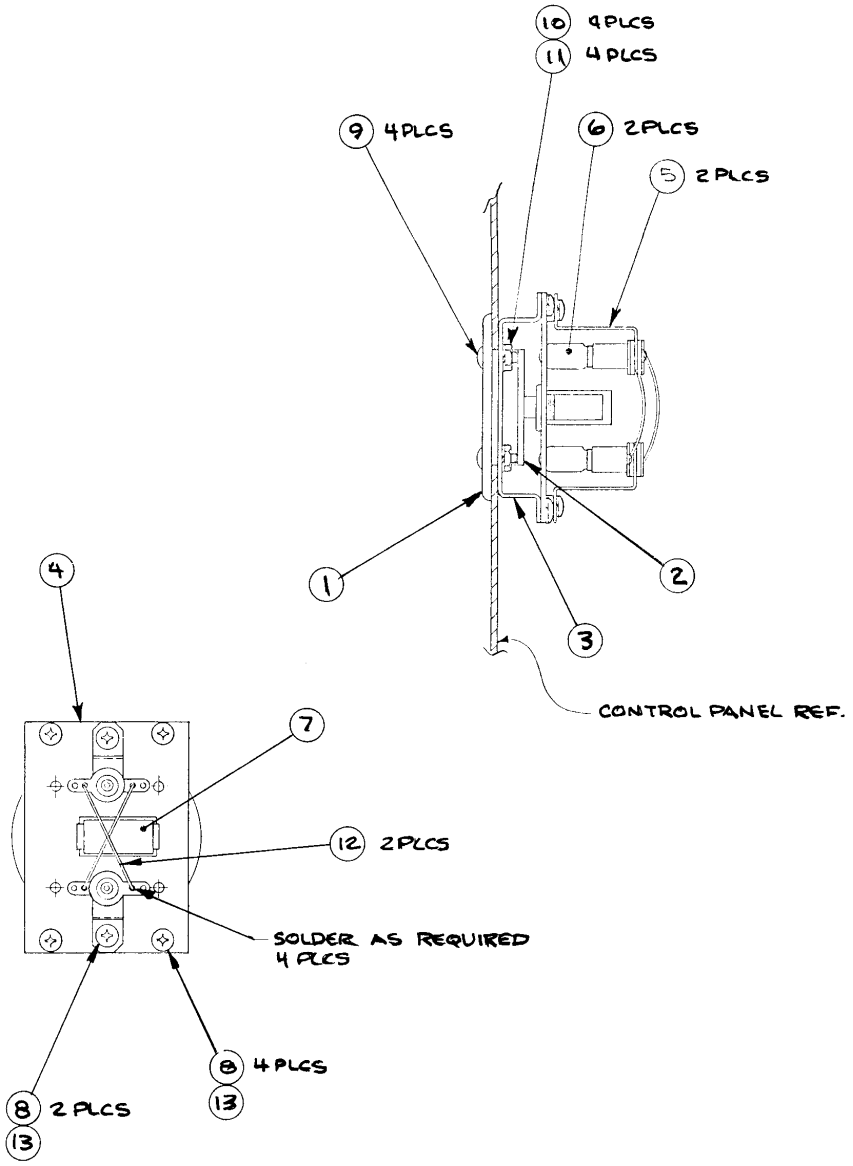

Figure 25 Start Button Assembly A007357-01 D

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Item	Part Number	Qty.	Description
1	006530-01	1	Bezel
2	006535-01	1	Button
3	006532-01	1	Chassis
4	A006533-01	1	Switch Mtg. Plate Assembly
5	79-4317	2	Lamp Socket
6	70-11-47	2	Lamp
7	62-020	1	Switch, Cherry, E68-50A
8	72-1603	6	Mach Screw, 6-32 x 3/16 Lg, Pan Hd, Phil.
9	82-8808	4	Screw, Button hd socket 8-32x ½ lg. Black
10	75-918S	4	Nut, 8-32
11	75-048	4	Washer, #8, Split-Lock
12	004577-19	2	Jumper Wire, Black
13	75-046	6	Washer, Split-Lock #6

Figure 25 Start Button Assembly Parts List

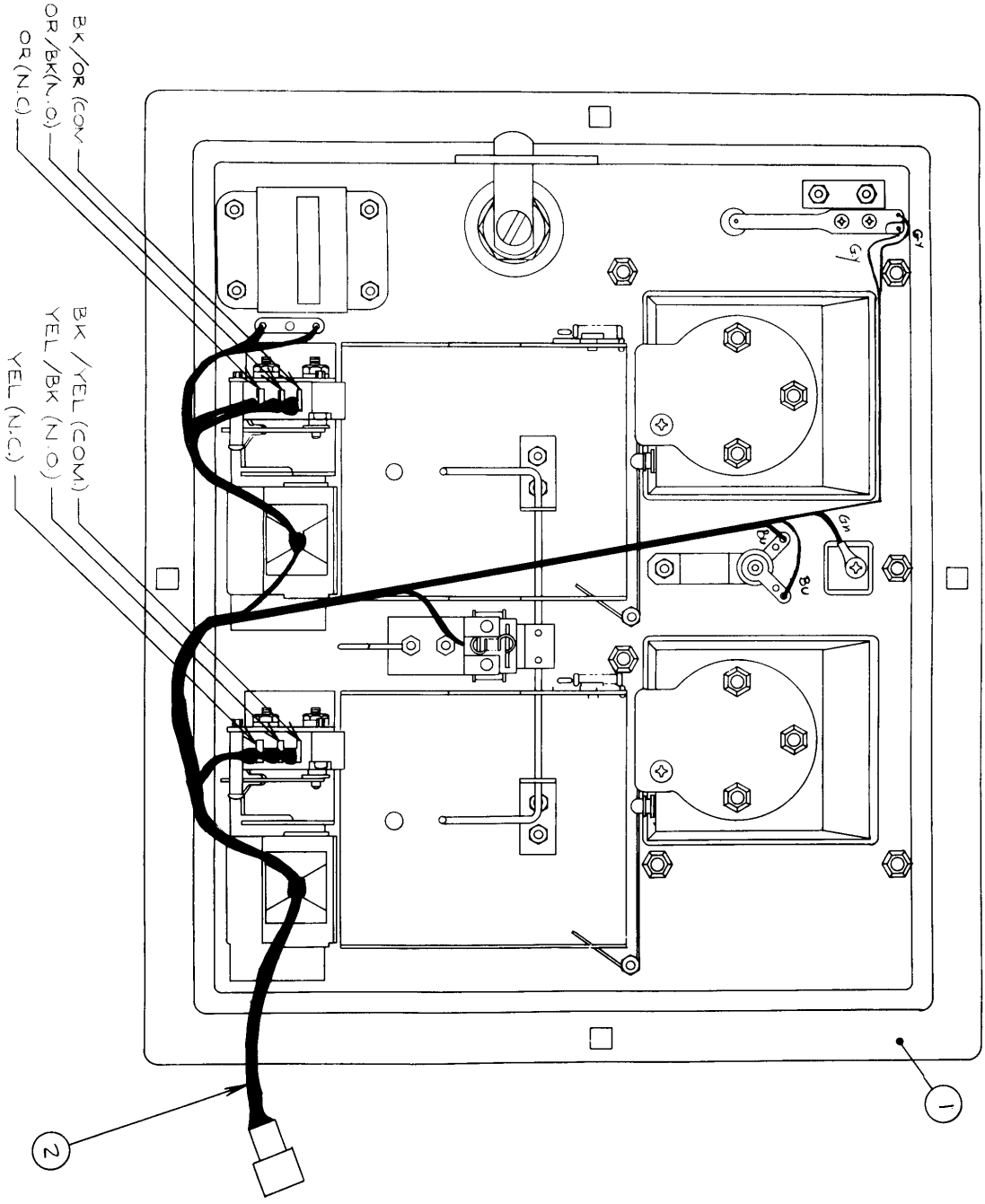

Figure 26 Coin Door Final Assembly A009083-01 through -07

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

Figure 26 Coin Door Final Assembly Parts List

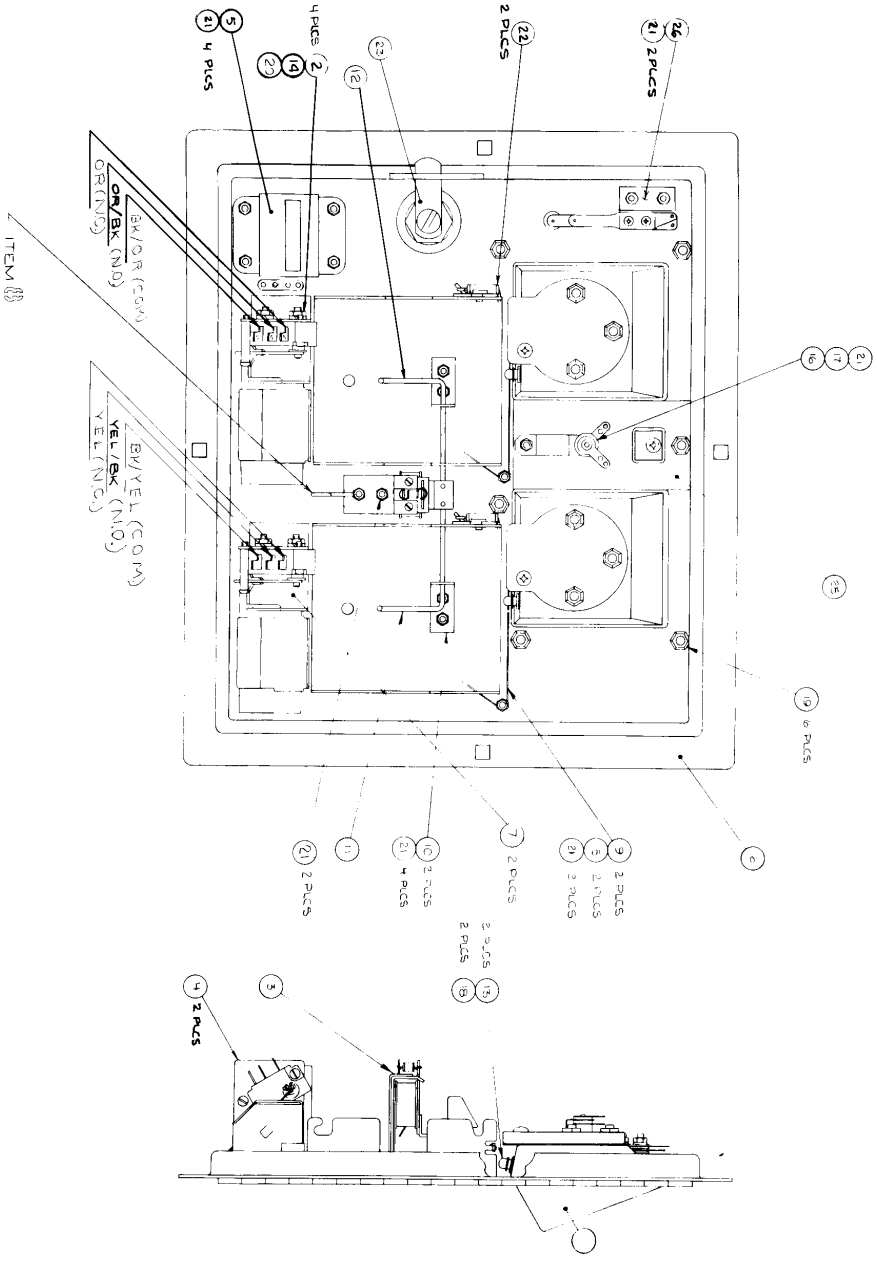

Figure 27 Coin Door Assembly A006794-01 through -07 C

ATARI®

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

Figure 27 Coin Door Assembly Parts List

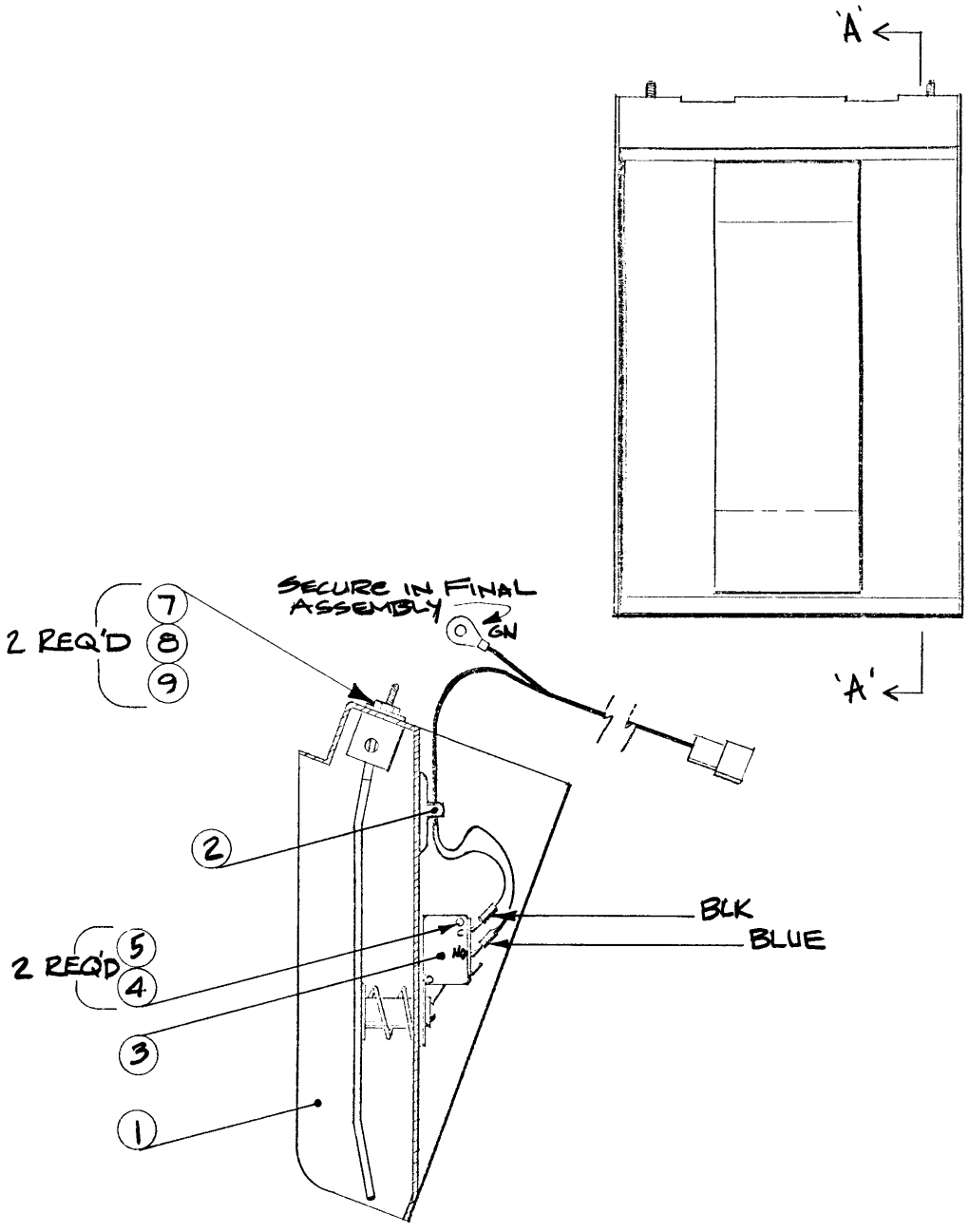

Figure 28 Single Foot Pedal Assembly A008845-01 B

Item	Part Number	Qty.	Description
1	A007183-01	1	Foot Pedal Assembly
2	A008955-01	1	Harness Assembly, Foot Pedal
3	A009804-01	1	Assy, Micro Switch & Bracket
4	75-046	2	Lock Washer #6
5	75-916S	2	Nut, Hex, #6-32
6			
7	75-043	2	Washer, Split-Lock, 5/16"
8	75-915S	2	¼"-20 Hex Nut
9	75-5524B	2	Carriage Bolt, Blk, ¼"-20 x 1.50"

Figure 28 Single Foot Pedal Assembly Parts List

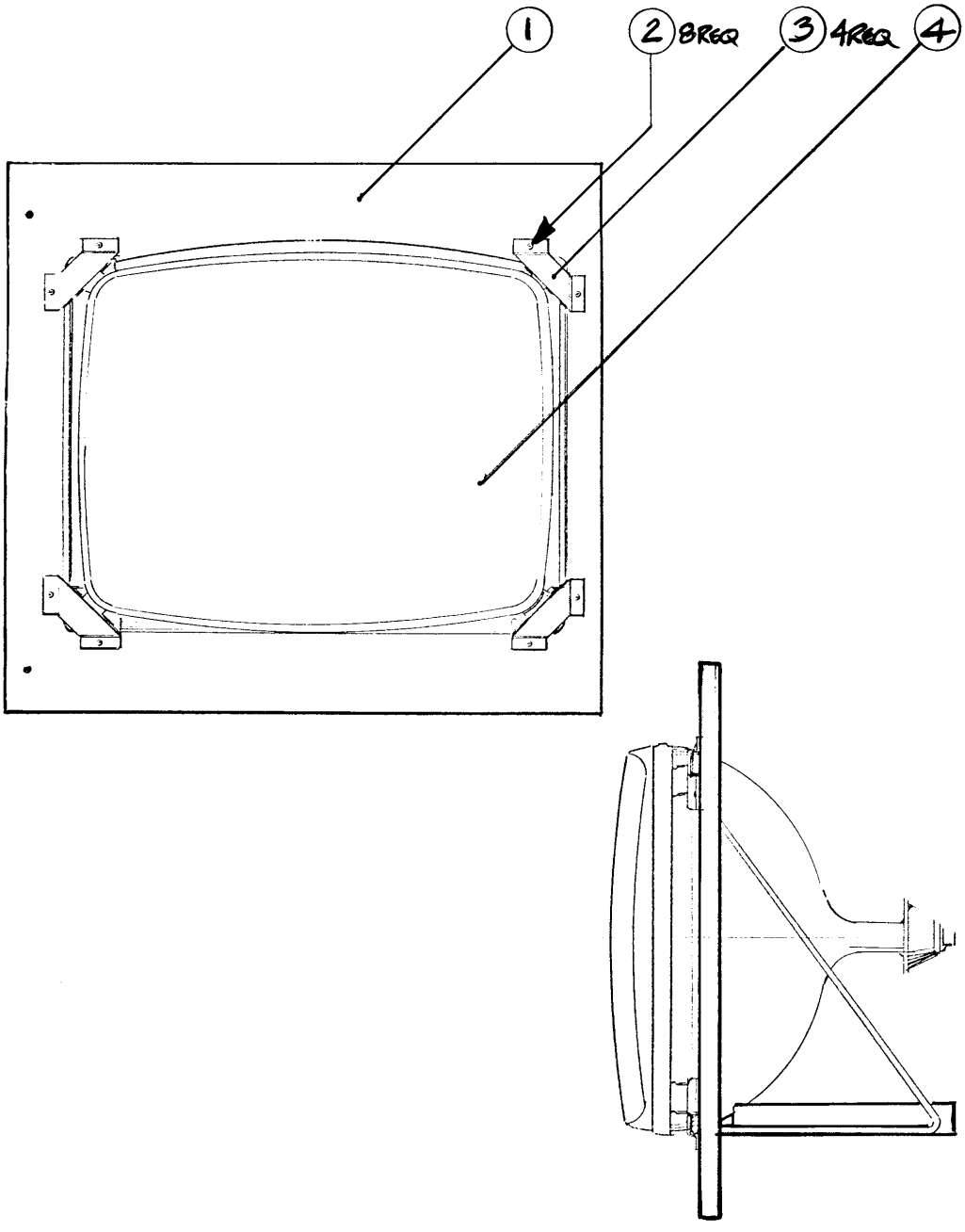

Figure 29 T.V. Tray Assembly A008766-01 B

Item	Part Number	Qty.	Description
1	008755-01	1	T.V. Tray
2	72-6812	8	Screws, Self-Tapping, #8 x 3/4 Phil. Pan Hd.
3	005594	4	Monitor Tie-Down
4	90-032	1	T.V., Motorola 23" (M7000-155) or TEC Model TM-623

Figure 29 T.V. Tray Assembly Parts List

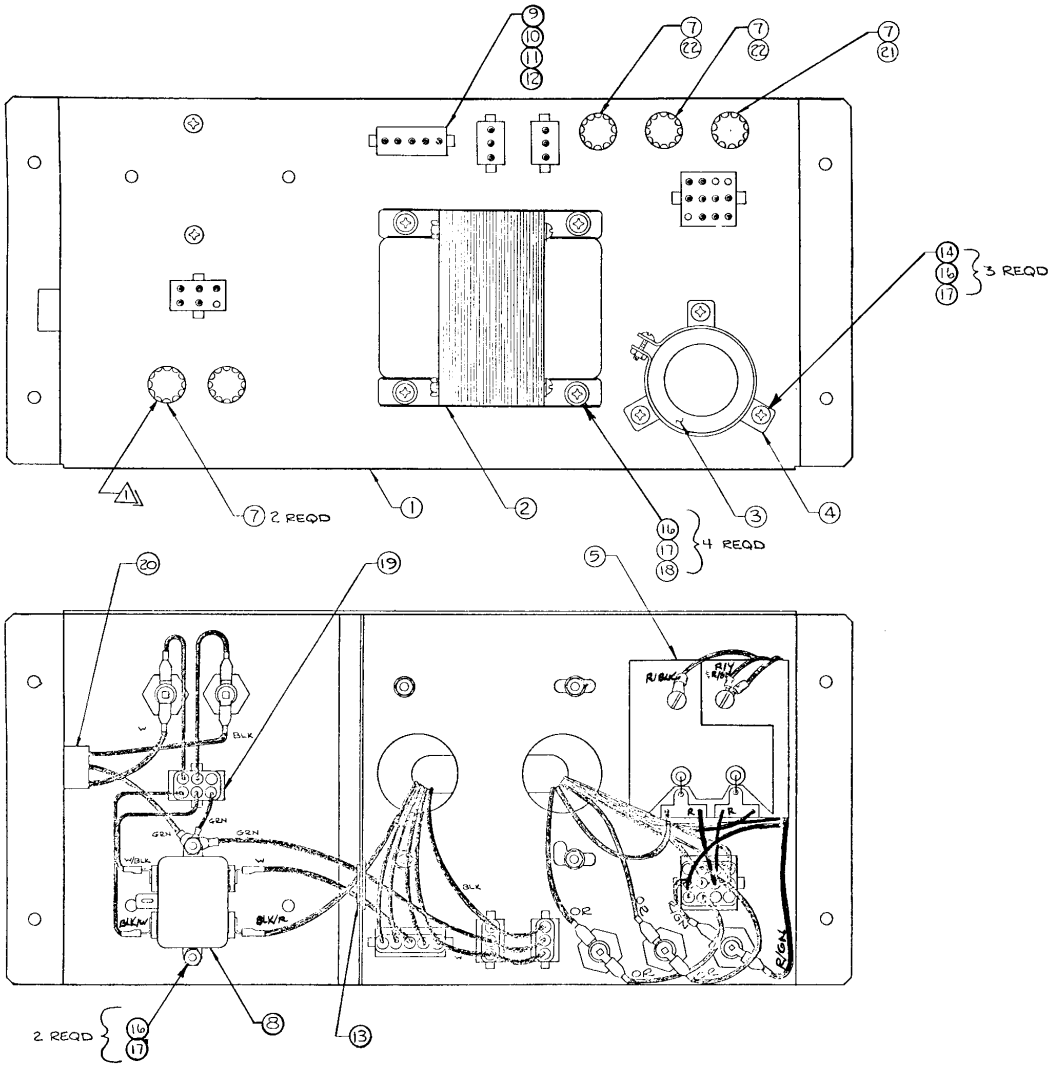

Figure 30 Power Supply Assembly A007197-01 G

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 26,000uf @ 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	72-18105	9	Screw Pan Hd., #8-32 x 5/8" LG.
15			
16	75-048	9	Washer, Split Lock #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 30 Power Supply Assembly Parts List

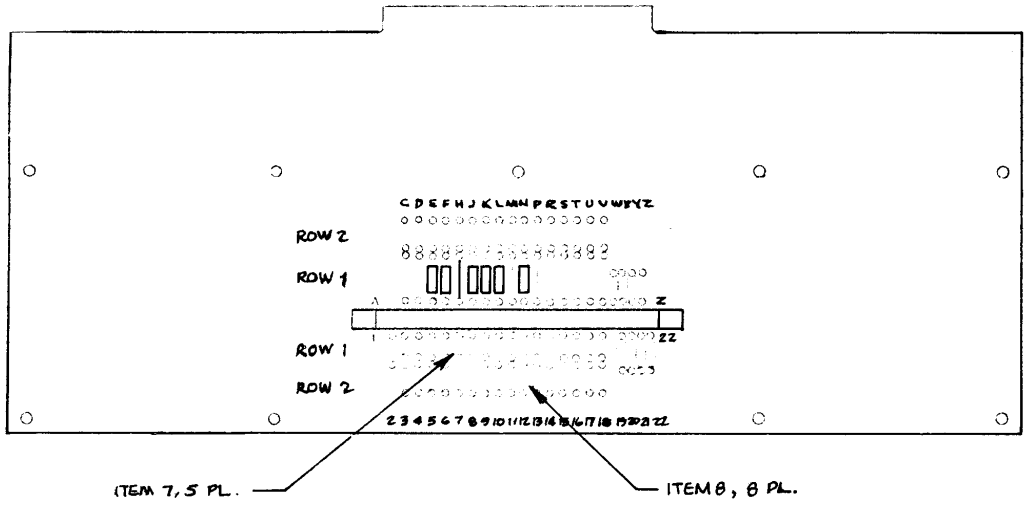

Figure 31 RF Shield PCB Assembly A009154-01 B

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	17	Cap, Cer Disc, 0.1µf, 25V
4	41-3003	6	Inductor, 100µH
5	52-004	6	Jumper, .3 Center
6	52-003	3	Jumper, .6 Center
7	41-3004	5	Inductor, 100µH
8	27-A250104	8	Cap, Cer Disc, 0.1µf, 25V (Bottom Row)

Figure 31 RF Shield PCB Assembly Parts List

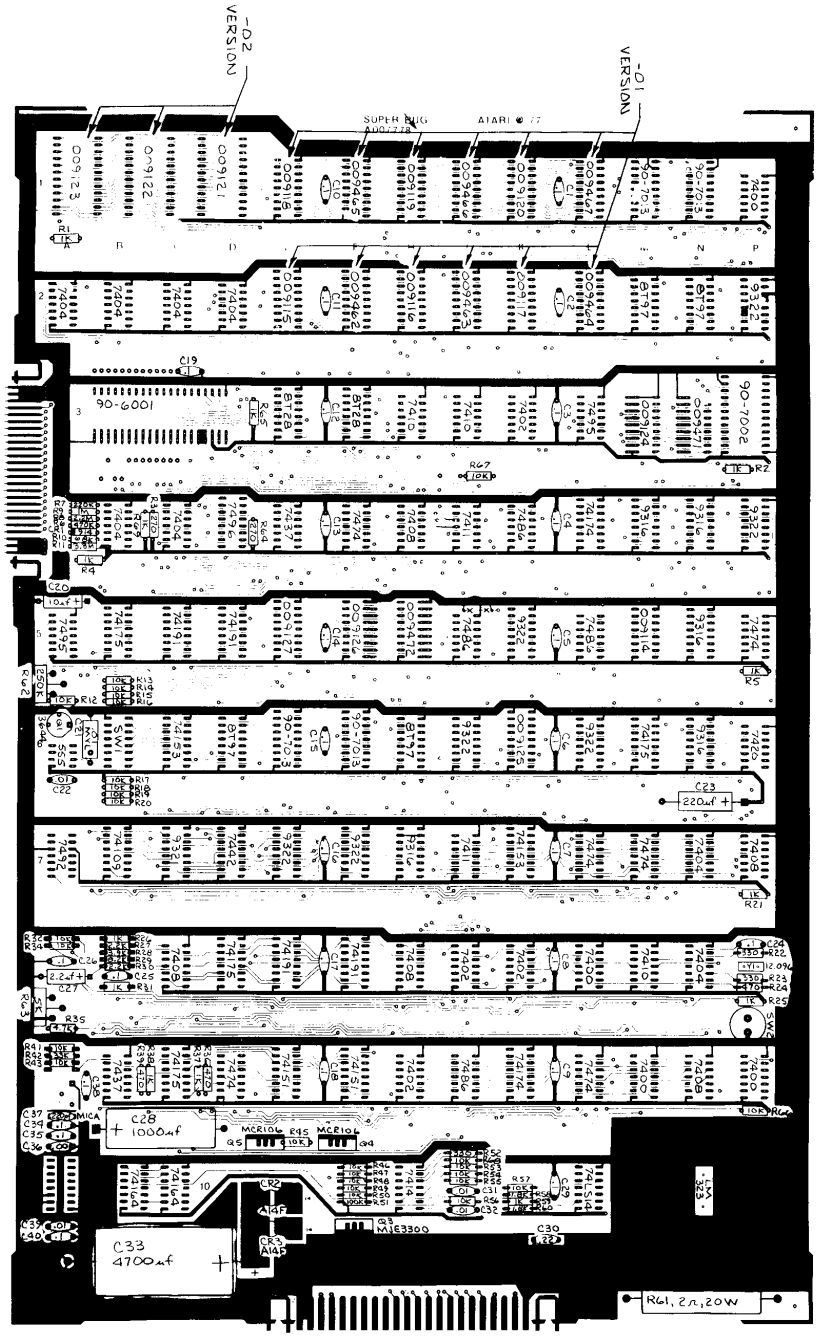

Figure 32 **Super Bug Game PCB Assembly**
A007778-01 & -02

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Item	Part Number	Qty.	Description
1	007779-01	1	P.C. Board
2	10-5102	13	Res., Carbon, 5%, ¼W, 1K OHM R1,2,4,5,21,25,26,31,37, 38,59, 65 ,69
3	10-5103	27	" " " " 10K " R12-20, 32,14, 41, 43, 45-50, 53-57, 66-68
4	10-5104	1	" " " " 100K " R51
5	10-5105	1	" " " " 1M " R9
6	10-5182	2	" " " " 1.8K " R58,60
7	10-5271	2	" " " " 270 " R3, 64
8	10-5222	2	" " " " 2.2K " R27, 30
9	10-5224	1	" " " " 220K " R7
10	10-5225	1	" " " " 2.2M " R8
11	10-5331	3	" " " " 330 " R22, 23, 52
12	10-5333	1	" " " " 33K " R42
13	10-5392	1	" " " " 3.9K " R28
14	10-5335	1	" " " " 3.3M " R11
15	10-5471	3	" " " " 470 " R24, 36, 39
16	10-5472	1	" " " " 4.7K " R35
17	10-5474	1	" " " " 470K " R6
18	10-5683	1	" " " " 68K " R10
19	10-5822	1	" " " " 8.2K " R29
20	19-315502	1	Trimpot 5K OHM R63
21	19-315254	1	Trimpot 250K OHM R62
22	19-8D9W2P0	1	Res., Wirewound 20W, 2 OHM R61
23			
24			
25			

Item	Part Number	Qty.	Description
26	21-101103	1	Cap., Mylar, .01uf 100V C21
27	24-250225	1	" Electrolytic, 2.2uf 25V C27
28	24-250106	1	" " 10uf " C20
29	24-250227	1	" " 220uf " C23
30	24-250108	1	" " 1000uf " C28
31	24-250478	1	" " 4700uf " C33
32	27-250224	1	" Ceramic Disc .22uf " C30
33	27-250102	1	" " .001uf " C36
34	27-250103	4	" " .01uf " C22,31,32,39
35	27-250104	27	" " .1uf " C1-19, 24-26, 29 34, 35, 38, 40
36	28-101221	1	" Dipped Mica, 220pf 100V C37
37			
38			
39			
40	31-A14F	2	Diode, A14F CR2, 3
41	31-1N914	1	Diode, 1N914 CR1
42			
43			
44			
45	33-2N3644	1	Transistor, 2N3644 Q1
46	34-MJE3300	1	" MJE3300 Q3
47	35-MCR106-1	2	SCR MCR106-1 Q4, 5
48			
49			
50			
51	37-7400	4	Intergrated Circuit, 7400 P1, L8, M9, P9,
52	37-7402	4	" 7402 K3, J8, K8, H9,
53	37-7404	8	" 7404 A2, B2, C2, D2, B4, C4, N7, N8
54	37-7408	5	" 7408 B4, P7, C8, H8, N9
55	37-7410	3	" 7410 H3, J3, M8
56	37-7411	2	" 7411 J4, J7
57	37-7414	1	" 7414 H10
58	37-74LS14	1	" 74LS14 L10
59	37-7420	1	" 7420 P6
60	37-7437	2	" 7437 E4, B9
61	37-7442	1	" 7442 D7

A Warner Communications Company

Item	Part Number	Qty.	Description
62	37-7474	6	Intergrated Circuit 7474 F4,P5,L7,M7,D9,L9
63	37-7486	4	" 7486 K4,J5,L5,J9,
64	37-7496	1	" 7496 D4
65	37-7492	1	" 7492 A7
66	37-7495	2	" 7495 L3, H5
67	37-74151	2	" 74151 E9, F9
68	37-74153	2	" 74153 C6, K7
69	37-74164	2	" 74164 B10, C10
70	37-74174	2	" 74174 L4, K9
71	37-74175	4	" 74175 B5,M6,D8,C9
72	37-74191	4	" 74191 C5, D5,E8,F8,
73	37-74109	1	" 74109 B7
74	37-9316	5	" 9316 M4,N4,N5,N6, H7
75	37-9321	1	" 9321 C7
76	37-9322	7	" 9322 P2, P4, K5, J6,L6,E7, F7
77	37-8T28	2	" 8T28 E3, F3
78	37-8T97	4	" 8T97 M2, N2, D6,H6
79	37-555	1	" 555 A6
80	37-LM323	1	Regulator LM323
81	37-TDA1004	1	Op-AMP TDA1004 A10
82			
83			
84			
85	62-001	1	Switch, SPST, Momentary SW2
86	66-118P1T	1	Switch, SPST x 8 Dip SW1
87			
88			
89			
90	72-1608C	2	Screws, Pan Hd., Phil., 6-32 x ½ Lg. Cres
91	75-016	2	Washer, Flat #6
92	75-056	2	Washer, Lock, Int. Star #6
93	75-316C	2	Nut, Hex #6-32 Cres
94			
95			
96			
97	78-06001	1	Heatsink (LM323)
98	78-06022	1	Heatsink (TDA1004)

Item	Part Number	Qty.	Description
99	78-13016	A/R	Cement (TDA1004 Heatsink)
100	78-16005	1	Silpad (LM323)
101			
102			
103			
104	79-42040	1	Socket 40 Pin, Med Insertion C3
105	79-42118	4	Socket 18 Pin M3,N3,F5,H5
106			
107			
108	90-102	1	Crystal, 12.096 MHZ Y1
109			
110			
111			
112	90-6001	1	Intergrated Circuit C3
113	90-7002	1	" P3
114	90-7013	4	" M1, N1, E6, F6
115			
116	009471	1	Super Bug Alpha-Number Prom 2 N3
117	009472	1	" " Playfield Prom 3 H5
118	009114	1	Super Bug Sync Prom M5
119	009115	1	Super Bug Program Prom 1 E2
120	009116	1	" " " " 2 H2
121	009117	1	" " " " 3 K2
122	009118	1	" " " " 4 E1
123	009119	1	" " " " 5 H1
124	009120	1	" " " " 6 K1
125	009124	1	Super Bug Alpha-Number Prom 1 M3
126	009125	1	Super Bug Car Picture Prom K6
127	009126	1	Super Bug Playfield Prom 1 P5
128	009127	1	Super Bug Playfield Prom 2 E5
129	009462	1	Super Bug Program Prom 7 F2
130	009463	1	" " " " 8 J2
131	009464	1	" " " " 9 L2
132	009465	1	" " " " 10 F1
133	009466	1	" " " " 11 J1
134	009467	1	" " " " 12 L1

Figure 32 Super Bug Game PCB Assembly Parts List

ATARI®

Item	Part Number	Qty.	Description
1	307779-01	1	P.C. Board
2	10-5102	13	Res., Carbon, 5%, ¼W, 1K OHM R1,2,4,5,21,25,26,31,37, 38,59, 65 ,69
3	10-5103	27	" " " " 10K " R12-20, 32,34, 41, 42, 45-50, 53-57, 66-68
4	10-5104	1	" " " " 100K " R51
5	10-5105	1	" " " " 1M " R9
6	10-5182	2	" " " " 1.8K " R58,60
7	10-5271	2	" " " " 270 " R3, 64
8	10-5222	2	" " " " 2.2K " R27, 30
9	10-5224	1	" " " " 220K " R
10	10-5225	1	" " " " 2.2M " R8
11	10-5331	3	" " " " 330 " R22, 23, 52
12	10-5333	1	" " " " 33K " R42
13	10-5392	1	" " " " 3.9K " R28
14	10-5335	1	" " " " 3.3M " R11
15	10-5471	3	" " " " 470 " R24, 36, 39
16	10-5472	1	" " " " 4.7K " R25
17	10-5474	1	" " " " 470K " R6
18	10-5683	1	" " " " 68K " R10
19	10-5822	1	" " " " 8.2M " R29
20	19-315502	1	Trimpot 5K OHM R63
21	19-315254	1	Trimpot 250K OHM R62
22	19-80 9W2P0	1	Res., Wirewound 20W, 2 OHM R61
23			
24			
25			

Item	Part Number	Qty.	Description
62	37-7474	6	Intergrated Circuit 7474 F4,F5,L7,M7,D9,L9
63	37-7486	4	" 7486 K4,J5,L5,J9,
64	37-7496	1	" 749 6 D4
65	37-7492	1	" 7492 A7
66	37-7495	2	" 7495 L3, H5
67	37-74151	2	" 74151 E9, F9
68	37-74153	2	" 74153 C6, K7
69	37-74164	2	" 74164 B10, C10
70	37-74174	2	" 74174 L4, K9
71	37-74175	4	" 74175 B5,M6,D8,C9
72	37-74191	4	" 74191 C5, D5,E8,F8,
73	37-74109	1	" 74109 B7
74	37-9316	5	" 9316 M4,N4,N5,N6, H7
75	37-9321	1	" 9321 C7
76	37-9322	7	" 9322 P2, P4, K5, J6,L6,E7, F7
77	37-8T28	2	" 8T28 E3, F3
78	37-8T97	4	" 8T97 M2, N2, D6,H6
79	37-555	1	" 555 A6
80	37-LM323	1	Regulator LM323
81	37-TDA1004	1	Op-AMP TDA1004 A10
82			
83			
84			
85	62-001	1	Switch, SPST, Momentary SW2
86	66-118P1T	1	Switch, SPST x 8 Dip SW1
87			
88			
89			
90	72-1608C	2	Screws, Pan Hd., Phil., 6-32 x ¼ Lg. Cres
91	75-016	2	Washer, Flat #6
92	75-056	2	Washer, Lock, Int. Star #6
93	78-916C	2	Nut, Hex #6-32 Cres
94			
95			
96			
97	78-06001	1	Heatsink (LM323)
98	78-060 22	1	Heatsink (TDA1004)

Item	Part Number	Qty.	Description
26	21-101103	1	Cap., Mylar, .01uf 100V C21
27	24-250225	1	" Electrolytic, 2.2uf 25V C27
28	24-250106	1	" " 10uf " C20
29	24-250227	1	" " 220uf " C23
30	24-250108	1	" " 1000uf " C28
31	24-250478	1	" " 4700uf " C33
32	27-25022 4	1	" Ceramic Disc .22uf " C30
33	27-250102	1	" " .001uf " C36
34	27-250103	4	" " .01uf " C22,31,32,39
35	27-250104	27	" " .1uf " C1-19, 24-26, 29 34, 35, 38, 40
36	28-101221	1	" Dipped Mica, 220pf 100V C37
37			
38			
39			
40	31-A14F	2	Diode, A14F CR2, 3
41	31-1N914	1	Diode, 1N914 CR1
42			
43			
44			
45	33-2N3644	1	Transistor, 2N3644 Q1
46	34-MJE3300	1	" MJE3300 Q3
47	35-MCR106-1	2	SCR MCR106-1 Q4, 5
48			
49			
50			
51	37-7400	4	Intergrated Circuit, 7400 P1, L8, M9, P9,
52	37-7402	4	" 7402 K3, J8, K8, H9,
53	37-7404	8	" 7404 A2, B2, C2, D2, B4, C4, N7, N8
54	37-7408	5	" 7408 H4, P7, C8, H8, N9
55	37-7410	3	" 7410 H3, J3, M8
56	37-7411	2	" 7411 J4, J7
57	37-7414	1	" 7414 H10
58	37-74LS14	1	" 74LS14 L10
59	37-7420	1	" 7420 P6
60	37-7437	2	" 7437 E4, B9
61	37-7442	1	" 7442 D7

Item	Part Number	Qty.	Description
99	78-13016	A/R	Cement (TDA1004 Heatsink)
100	78-16005	1	Silpad (LM323)
101			
102			
103			
104	79-42040	1	Socket 40 Pin, Med Insertion C3
105	79-42118	4	Socket 18 Pin M3, N3, F5, H5
106			
107			
108	90-102	1	Crystal, 12.096 MHZ Y1
109			
110			
111			
112	90-6001	1	Intergrated Circuit C3
113	90-7002	1	Intergrated Circuit P3
114	90-7013	4	Intergrated Circuit M1,N1,E6,F6
115			
116	009471	1	Super Bug Alpha-Number Prom 2 N3
117	009472	1	" " Playfield Prom 3 H5
118	009114	1	Super Bug Sync Prom M5
119	009121	1	Super Bug Program Rom 1 D1
120	009122	1	" " " " 2 C1
121	009123	1	" " " " 3 A1
122	009124	1	Super Bug Alpha-Number Prom 1 M3
123	009125	1	Super Bug Car Picture Prom K6
124	009126	1	Super Bug Playfield Prom 1 F5
125	009127	1	Super Bug Playfield Prom 2 E5

Figure 32 Super Bug Game PCB Assembly Parts List