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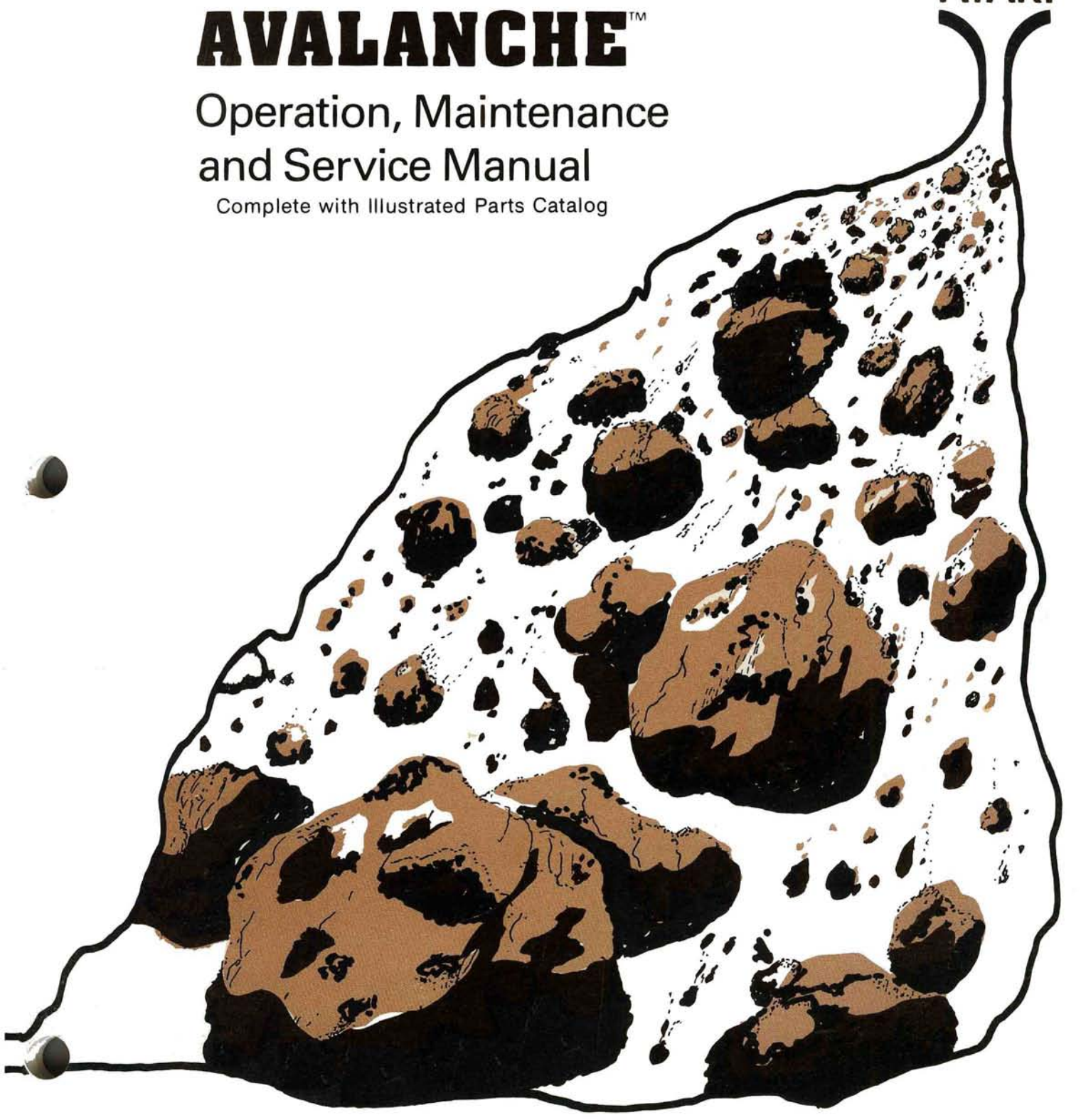
ATARI®

AVALANCHE™

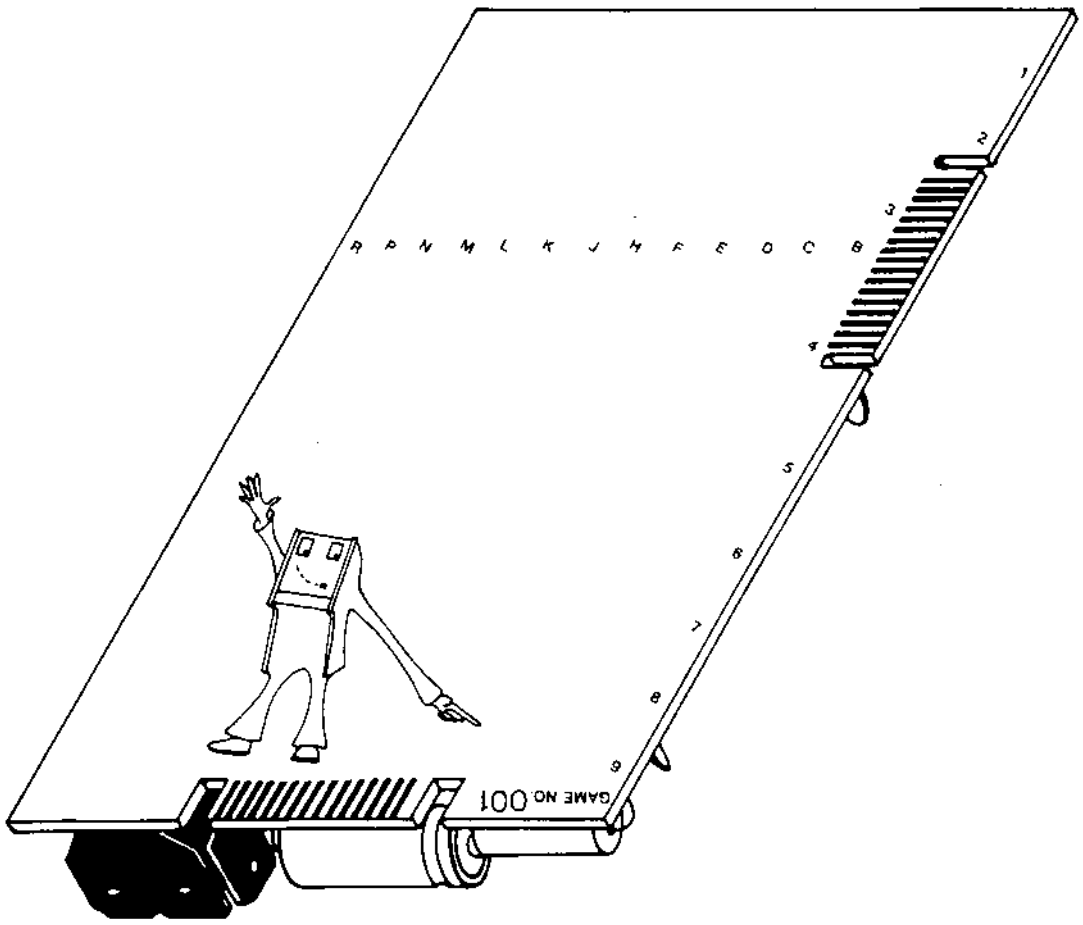
Operation, Maintenance and Service Manual

Complete with Illustrated Parts Catalog



GAME SERIAL NUMBER LOCATION

Your game's serial number is stamped on the circuit (back) side, bottom right corner, of the printed circuit board—see the illustration below. The *same* number is also stamped on the TV monitor chassis and on the label located on the rear of the game cabinet. Please mention this number whenever calling your distributor for service.



AVALANCHE™

Operation, Maintenance and Service Manual

Complete with Illustrated Parts Catalog

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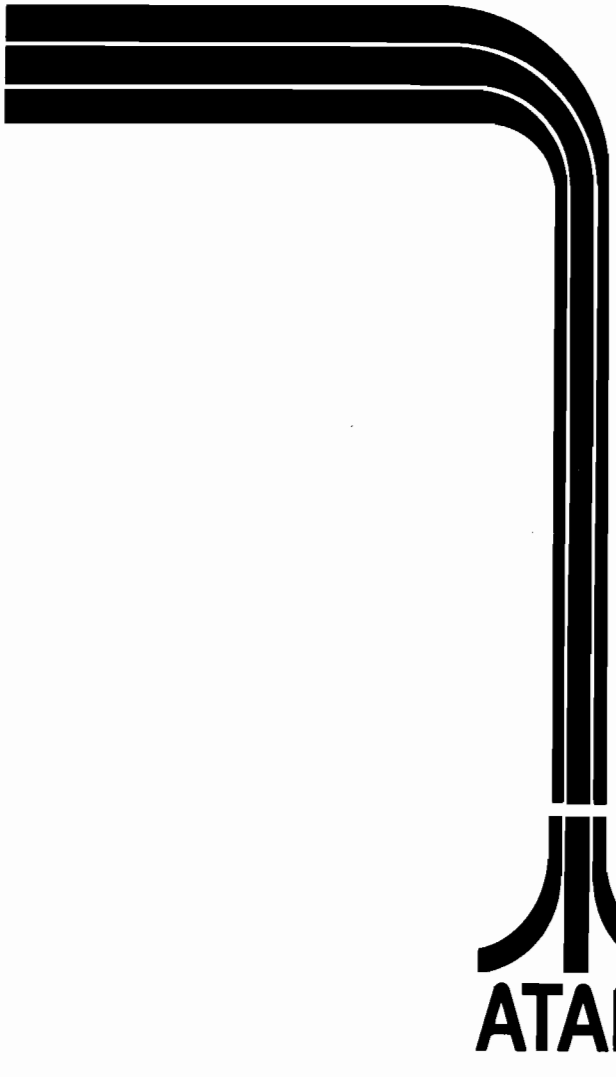

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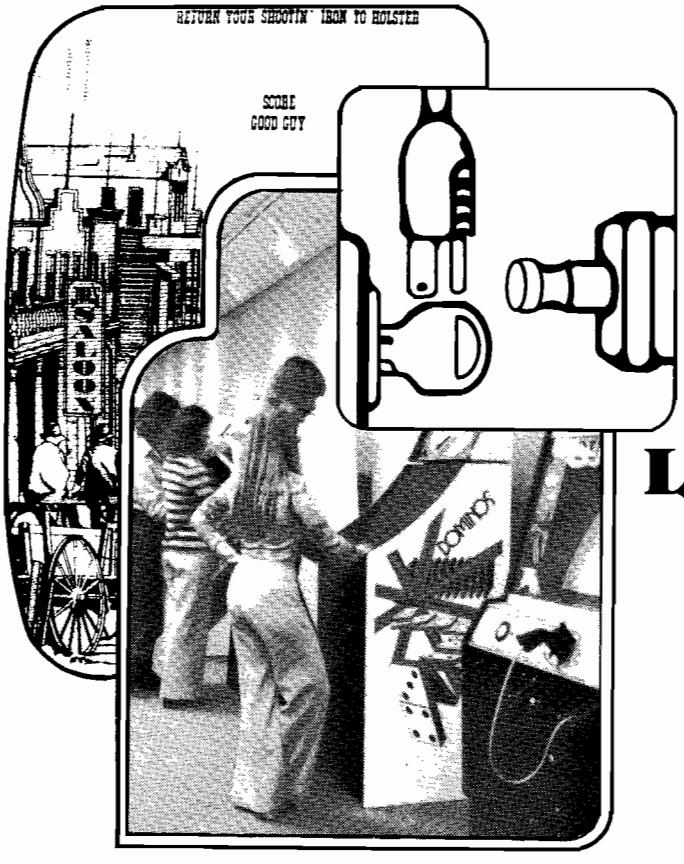


LOCATION SETUP

A. INTRODUCTION

Avalanche™ is a one- or two-player game developed by Atari. The game is contained in a distinctively styled upright cabinet which is illustrated with brightly colored graphics to enhance player appeal. A 23-inch TV monitor is mounted in the top front of the cabinet, with the monitor viewing screen tilted slightly from a vertical position. Player-operated controls are mounted directly below the TV monitor on the front of the game cabinet.

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

The object of the Avalanche game is to accumulate a high score by catching the "rocks" as they fall on the TV viewing screen. This is done by operating the paddle knob (potentiometer) on the player control panel. The degree of difficulty increases as the game progresses. The rocks become smaller while falling faster; the paddles decrease in size and decrease in number. For a detailed description of game play see Chapter 2.

B. GAME INSPECTION

Your new Avalanche game is manufacured by Atari with the intent of being ready to play right out of the shipping carton. Your cooperation is needed to supply the final touch of quality control. Please follow the procedures below to ensure that your game is in perfect condition.

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

2. After determining that the game has been received in good condition, unlock and open the rear access door. Carefully inspect the interior and verify that:

   - All plug-in connectors are firmly seated.
   - All integrated circuits in sockets on the game printed circuit board are firmly seated.
   - The fuses are all seated in their holders.
   - No harness wires are disconnected.
   - 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 speakers, the fluorescent light, and the player controls. Also, be sure the TV monitor is secure in its mounting.

C. LOCATION OF SERIAL NUMBER

The serial number for Avalanche is located on a metallic label in the upper left-hand corner on 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 the inside front cover of this manual.

D. INSTALLATION REQUIREMENTS

Power Requirements and Line Voltage Selection

Avalanche is shipped for operation at 110 VAC, 60 Hz. Power consumption is approximately 150 watts. However, if your local voltage is not 110 volts, follow this procedure. You must select one of four connectors at the power supply and plug it into the voltage selection socket. Figure 1-1 shows the four connectors with one of them plugged in. The plugs are identified by wire color as listed in this figure. Note that there are two basic operating voltages — 110 VAC, 60 Hz, and 220 VAC, 50 Hz, with provisions for low line voltage in each case. To insure proper operation, measure line voltage. If voltage is consistently below 100 V (for 110 VAC lines) or below 210 V (for 220 VAC lines), use the low-voltage connections. Use the black plug for low 110 VAC lines and the green plug for low 220 VAC lines.

Temperature Range

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

Humidity Range

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

Location Space Requirements

The game requires a minimum of:

- 166 centimeters (65½ inches) of vertical space.
- 64 centimeters (25¼ inches) of width clearance.
- 68 centimeters (27 inches) of depth clearance.
- 61 centimeters (24 inches) of player space.

Type of Power Cord

Atari has added a strain relief power cord to Avalanche. The advantage of this type of power cord is that, if pulled accidentally, the strain relief will hold the cord in place at the cabinet wall. The plastic strain relief "cushions" the impact of the shock and prevents the cord from pulling the wires out of the harness connector. Check the power cord assembly periodically for damage.

LINE VOLTAGE	VOLTAGE-CHANGING PLUG WIRE COLOR
95 VAC	BLACK
110 VAC	ORANGE (installed at factory)
210 VAC	GREEN
220 VAC	RED

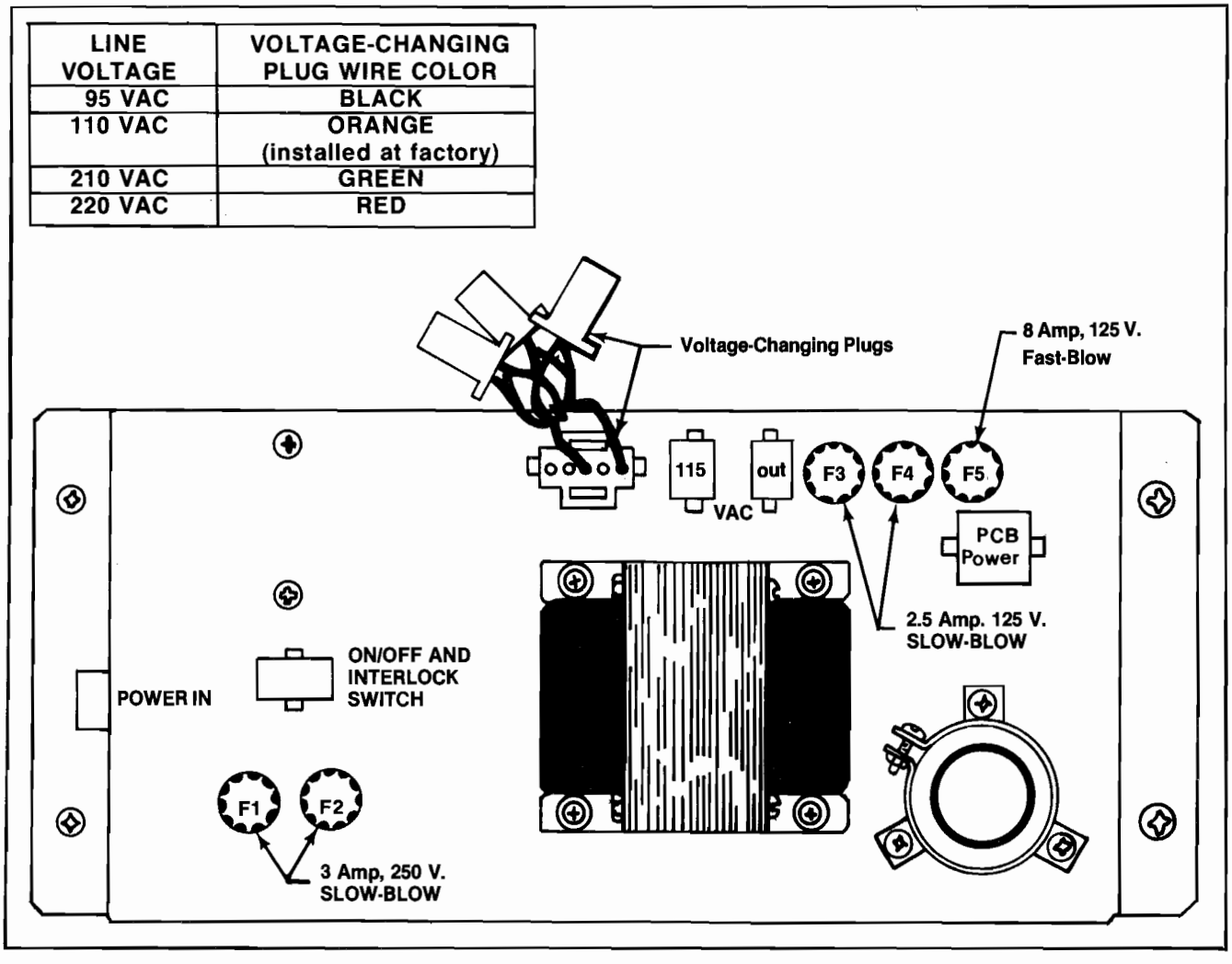


Figure 1-1 Location of Voltage-Changing Plugs on the Power Supply

E. INTERLOCK AND POWER ON/OFF SWITCHES

To minimize the hazard of electrical shock while you are working inside the game cabinet, interlock switches have been installed at the rear access doors. This switch removes all power from the game while the access door is open. 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 game so that it can be turned off during closed periods. The switch is hidden on the back of the cabinet at the top, as shown in Figure 1-3.

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 110-volt source. (If voltage is consistently less than 110 VAC, make sure that you change the voltage plug 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 30 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

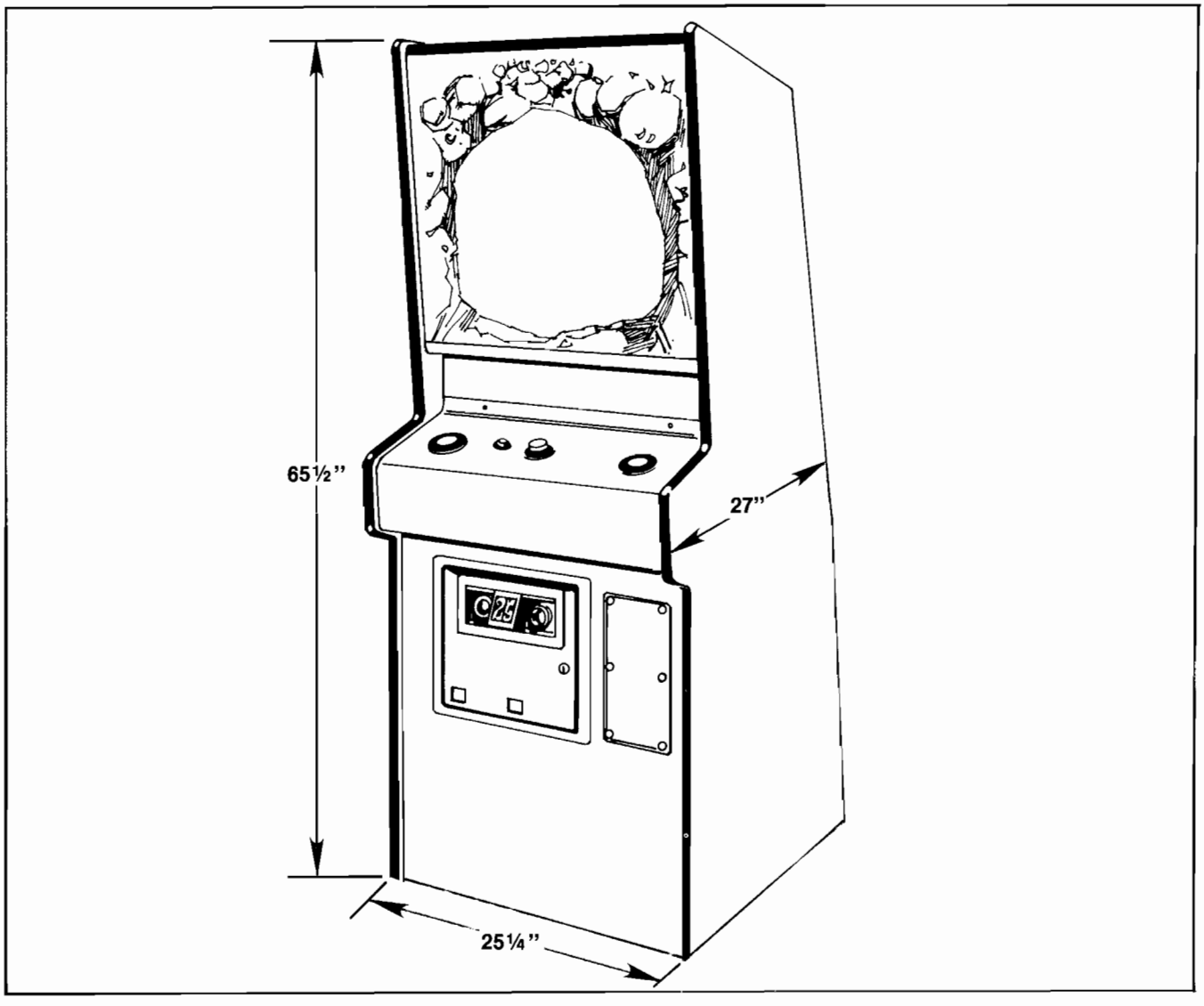


Figure 1-2 Location Space Requirements

should disappear when the rear access door is opened less than one inch from the top.

6. If the results of Step 5 are satisfactory, the interlock switch is operating properly. If the picture does not disappear as described, 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.

F. VOLUME CONTROL

If volume is incorrect for your location, open the coin door and adjust the volume control. See Figure 1-4 for location of the volume control.

G. SELF-TEST PROCEDURE

Avalanche will test itself and provide data to demonstrate that the game's circuitry and controls are working properly. This procedure uses the TV monitor and the speakers; no additional equipment is required. *See Figure* 1-4 *for location of the self-test switch.* To start the procedure over from the beginning, turn the switch off, then on again. This will return the test to Step 1 and can be done at any time during the procedure. See Table 1-1 for further details and instructions on the self-test. We suggest that you run the self-test procedure each time the coin box is emptied.

H. OPERATOR OPTIONS

Options of the Avalanche game offer maximum player appeal for each game location. These options are

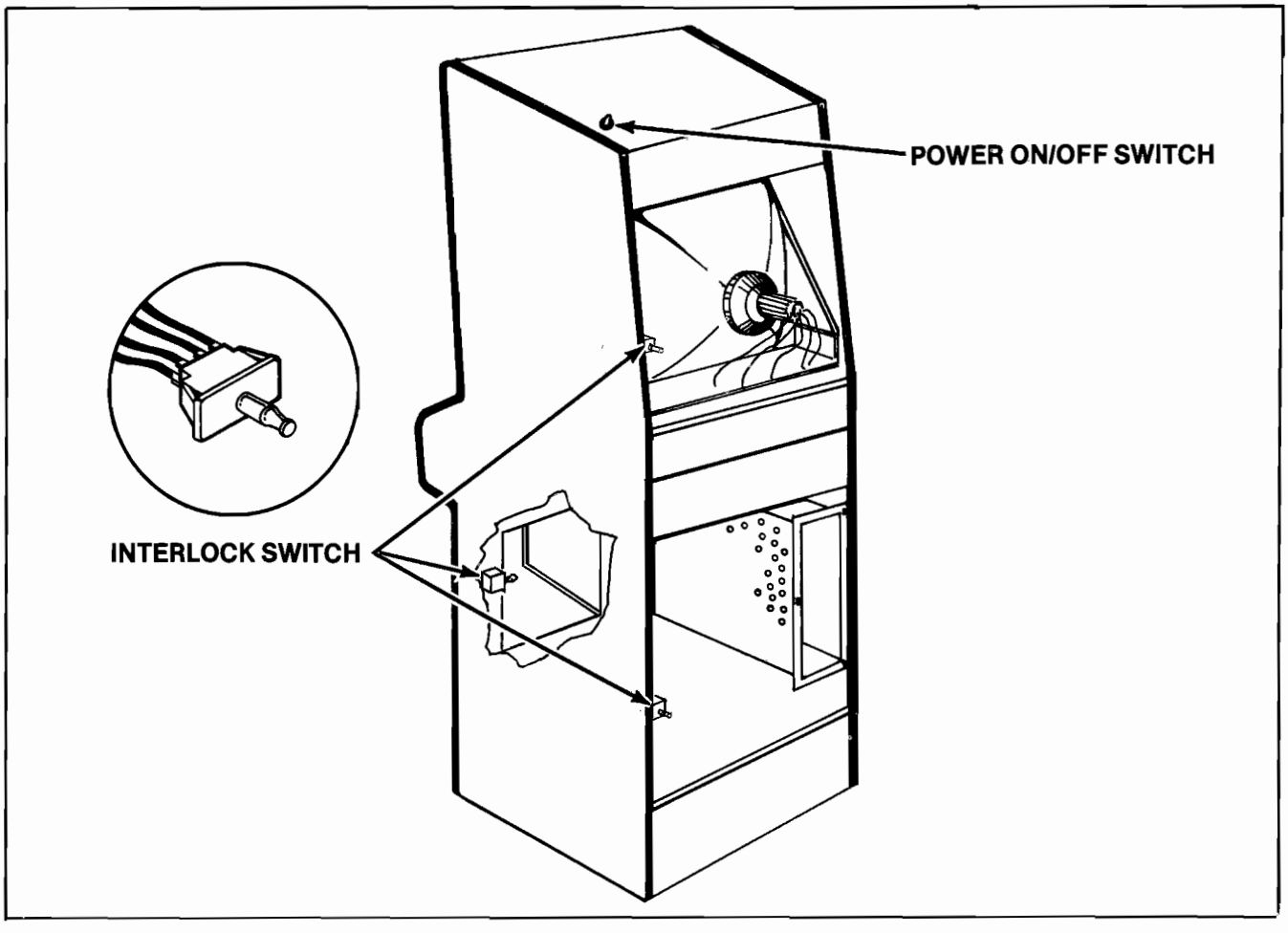


Figure 1-3 Location of Interlock and Power On/Off Switches

listed in Table 1-2. They are preset for a certain game setup during production. To determine how the switches have been set for your game, compare the TV monitor viewing screen during the attract mode with some of the information in Table 1-2.

To change the toggle positions of the switch assembly and set the desired options, the printed circuit board (PCB) must be removed according to the following procedure:

1. Unplug the game. Unlock and open the lower rear door assembly.
2. Locate the radio frequency (RF) shield assembly immediately inside the cabinet on the right. See Figure 1-5. (It is an aluminum box with small holes.) On one end of the box is a printed circuit board (PCB) with an edge connector coming from the edge of the board.
3. Remove the five pan-head Phillips screws from each of the long sides (total of three screws) of the RF shield assembly.

   IMPORTANT: To prevent damage to the capacitors on the rear side of the PCB, move the board about ¼ inch toward the edge connector (same direction as the two arrows on the small white label). Then pull the RF board out toward yourself. Never yank the RF board straight out of the metal box. (See Figure 1-5 for caution label identification.)
4. Carefully remove the PCB from the RF shield assembly.
5. Set the switches for the desired options, as shown in Table 1-2.
6. Reinstall the PCB following Steps 1 through 4 in reverse order. Do not force or bend the printed circuit board. Before reinstalling, always inspect the printed circuit board for damage. Close and lock the rear access door.
7. Plug in the game and verify options functions by playing it.

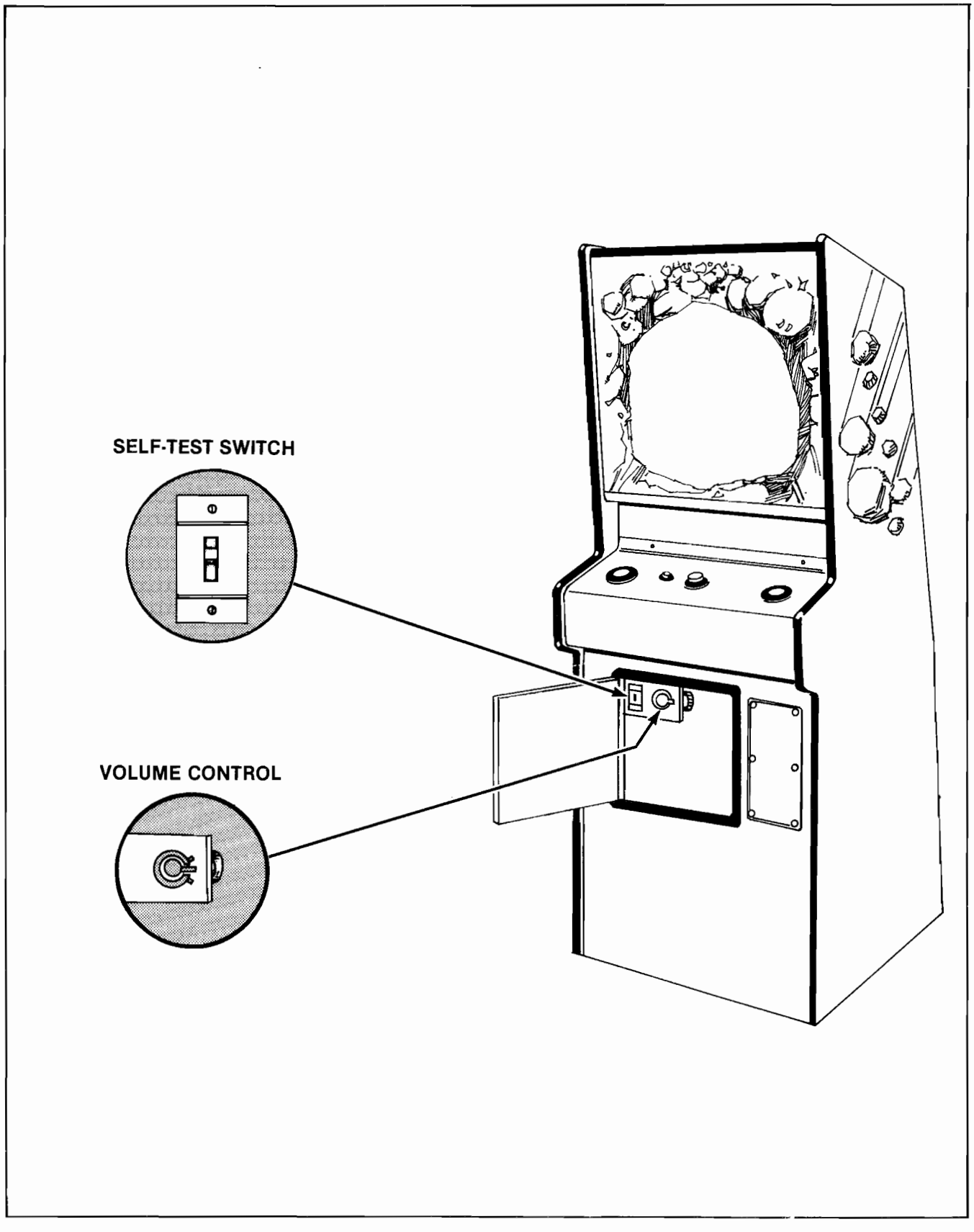


Figure 1-4 Location of Volume Control and Self-Test Switch

TABLE 1-1 SELF-TEST

TEST	INSTRUCTION	RESULTS IF TEST PASSES	RESULTS IF TEST FAILS
* 1.	Unlock & open the coin door. Set the self-test slide switch (located inside the opening, above and slightly to the right.) See Figure 1-3. RAM and ROM test will follow.	TV monitor becomes white for about one second, then becomes black for one second. Immediately following, the message **RAM OK** **ROM OK** is displayed at the top of the TV screen. This means the RAM and ROM were checked, and both tested correctly.	If the RAM does not check correctly, the screen will display the message: **RAM BAD** If the ROM is at fault, the number of the bad ROM is displayed on the screen. For example, if ROM 0 and 3 are bad, the message **ROM 03**
		Below the **RAM OK** message, **ROM OK**	appears on the screen. There are four ROMs programmed into Avalanche. They are 0, 1, 2, and 3.
		a two-digit alphanumeric combination appears. This hexadecimal number is used to test the paddle knob (potentiometer) range. (See Test 2.)	NOTE TO TECHNICIAN: ROM 0, 1, 2, and 3 indicate a malfunction in the first, second, third, or fourth 1K bytes of the ROMs.
	The next phase of the self-test checks the lights, buttons, switches, and horizontal position control. This phase of the self-test will "loop" or repeat itself until the switch is turned off.	All three buttons (LED Serve switch and both Player Start buttons) remain lit.	One or more of the buttons are not lit.
2.	Turn the paddle knob (potentiometer) slowly from one end of its range to the other.	The horizontal position control is read and its value is displayed in hexadecimal numbers below the RAM/ROM message. These numbers will increase or decrease evenly with no skips in the series. The value of the control should range from approximately 40 to ≥ B8. It is normal for these numbers to vary slightly from time to time.	Numbers in the series will be skipped. This indicates the potentiometer is "noisy" and must be cleaned with a tuner cleaner.
3.	Press the Serve button, and the One Player Start and Two Player Start buttons. Trip the right & left coin switch wires.	A "ping" or "bleep" sound occurs each time a button is pressed. The same sound occurs each time a coin switch wire is tripped.	No sound indicates a stuck or broken switch, or an open or shorted harness.

* *The first phase of the self-test procedure checks the memory, both RAM (random-access memory), and ROM (read-only memory). The second phase checks sound, lights, pushbuttons, coin detection and horizontal potentiometer control.*

TABLE 1-2 OPERATOR OPTIONS

OPTION		8-TOGGLE SWITCH ON GAME PCB Toggle No: 1 2 3 4 5 6 7 8
Game Language		
German		OFF OFF
Spanish		ON OFF
French		OFF ON
English		ON ON
Game Cost		
Two Plays Per Coin		OFF OFF
One Coin Per Player		ON OFF
Two Coins Per Play		OFF ON
Free Play		ON ON
Misses Allowed Per Game	Points Required for Extended Play	
3 misses	450 points	ON
5 misses	750 points	OFF
No Extended Play		ON
Extended Play Enabled		OFF

NOT USED

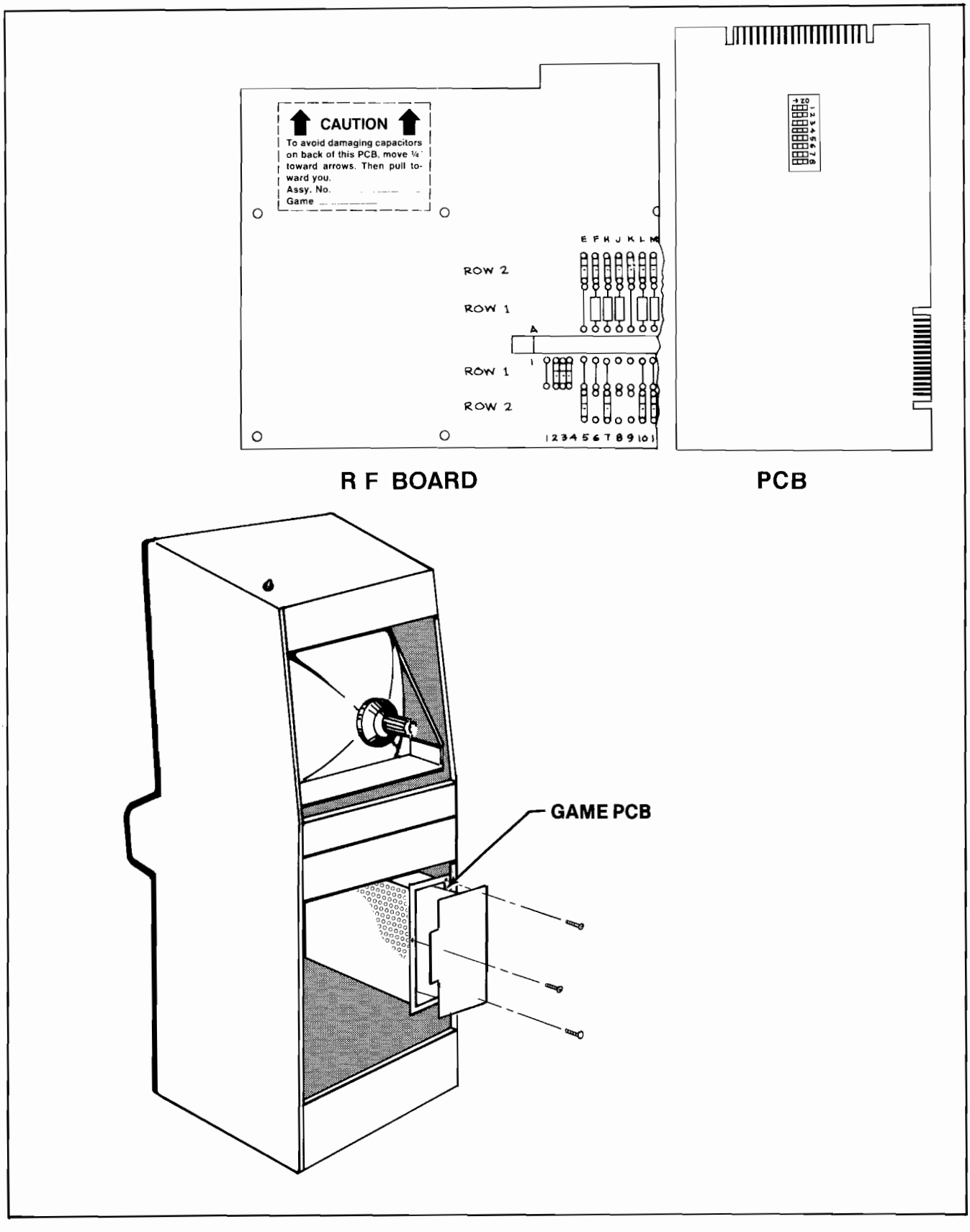


Figure 1-5 Option DIP Switches on Game PCB

GAME PLAY

Avalanche has three modes of operation:

- Attract — power applied or game has ended.
- Ready-to-Play — coins accepted.
- Play — after one of the Start buttons is activated.

A. ATTRACT MODE (See Figure 2-1)

The attract mode begins when power is applied to the game and the power switch is turned on. (The power on/off switch is located at the top rear of the cabinet, as shown in Figure 1-2.) This mode also occurs at the end of every game. When the proper amount of coins clear the coin acceptor, the attract mode ends.

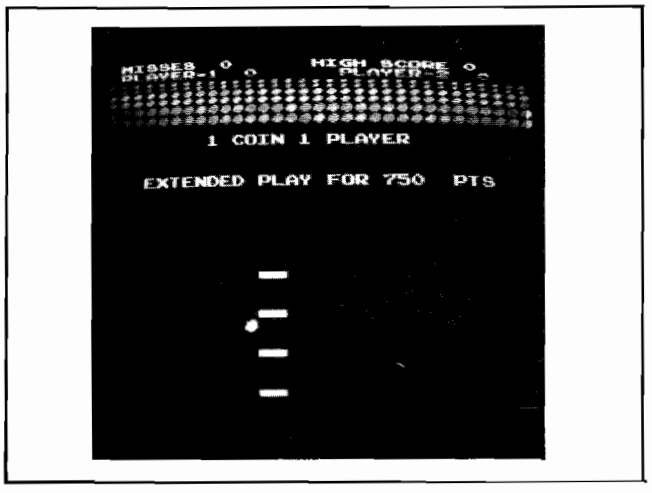


Figure 2-1 Attract Mode

During the attract mode the TV screen shows rocks falling and being caught by four paddles (one on top of the other), moving horizontally across the screen. The TV screen displays the previous game score or scores, the standing *HIGH SCORE*, the point total required for extended play, and the game cost or cost per game. The message, *MISSES 3 or MISSES 5* is displayed at the upper left corner of the screen, depending on which option has been selected. (See Table 1-2 in Chapter 1.) The player controls and game sounds are inactive during this mode.

B. READY-TO-PLAY MODE (See Figure 2-2)

When the correct amount of coins clears the coin acceptor, the ready-to-play mode is initiated. The TV monitor display no longer shows the rocks falling or the four paddles moving to catch the rocks. The coin message and the extended play message remain on the screen along with the previous game score or scores. *MISSES* (upper left corner of the screen) resets to 0.

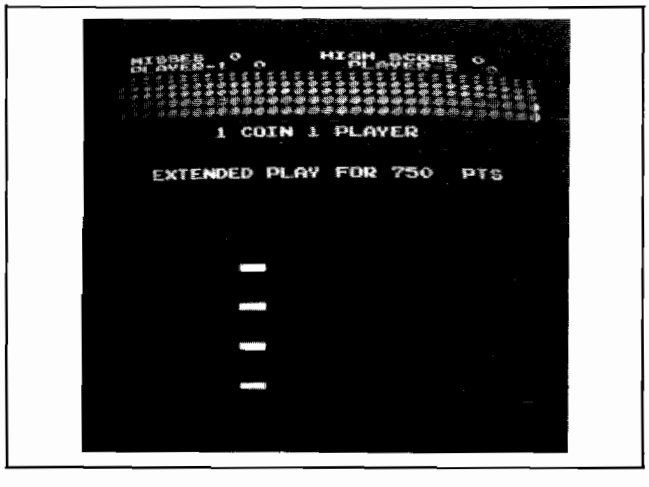


Figure 2-2 Ready-to-Play Mode

The *ONE PLAYER START* button will light if there is credit for one game. Both start buttons will light if there is credit for two or more games. Only the start buttons on the control panel will activate during the ready-to-play mode.

C. PLAY MODE

The play mode begins when one of the player start buttons is pressed. If the *ONE PLAYER START* button is activated, its light stays on for the remainder of the game and the light for the *TWO PLAYER START* button automatically goes out. If the *TWO PLAYER START* button is activated (provided sufficient credit has been granted), the opposite occurs.

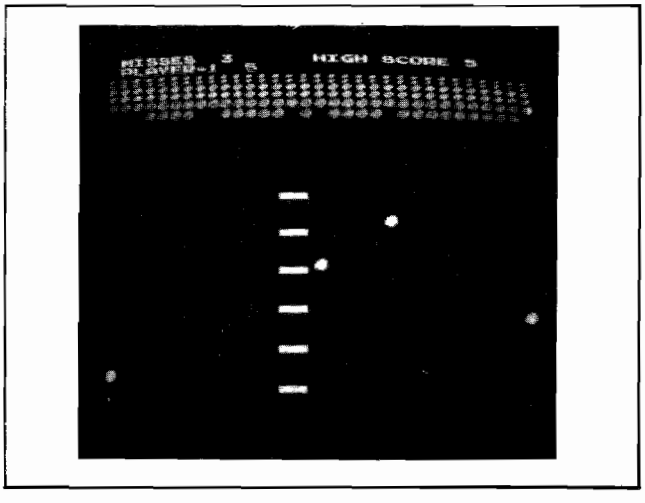


Figure 2-3 Play Mode

When a one-player game is started, the *PLAYER-2* score disappears from the screen, and the *PLAYER-1* score flashes on and off. The *SERVE* button also blinks on and off until it is pressed, at which time it stays on until a miss occurs. It then blinks again until pressed. After game play begins the *PLAYER-1* score remains stationary on the screen, except between turns when it flashes on and off again.

When a two-player game is started, both player scores are displayed on the TV screen and the *PLAYER-1* score flashes first. After the first player misses, the *PLAYER-2* score flashes. Each player score remains stationary after the SERVE button is pressed. This pattern is repeated for each turn. The SERVE button characteristics are the same as for a one-player game.

Each time the *SERVE* button is activated, rocks begin falling from the top of the screen. If the *SERVE* button is not pressed within five seconds, the rocks begin falling automatically. The object of the game is to catch as many rocks as possible with any of the pad-

dles for a high score. This must be done before any rock reaches the playfield bottom.

In the beginning of each game there are six rows of rocks and six paddles. The first row of rocks are worth one point each; the last row are worth six points each, with the rows in between worth two, three, four, and five points each, ranging from large to small rocks respectively. See below.

Whenever a rock hits one of the paddles, the rock disappears and the appropriate amount of points are registered for that player's score. As each row of rocks disappears, one more paddle is eliminated. The paddles become smaller until only one small paddle remains and one small row of rocks remain. If any of the rocks reach the bottom of the playfield, a miss is recorded (upper left corner of the TV screen), the game momentarily freezes, and then progresses to the next turn. The degree of difficulty increases as the game progresses, since the rocks become smaller and the paddles decrease in number and size. The rocks fall at a faster rate as the game continues. However, the number of points awarded for each catch or hit also increases.

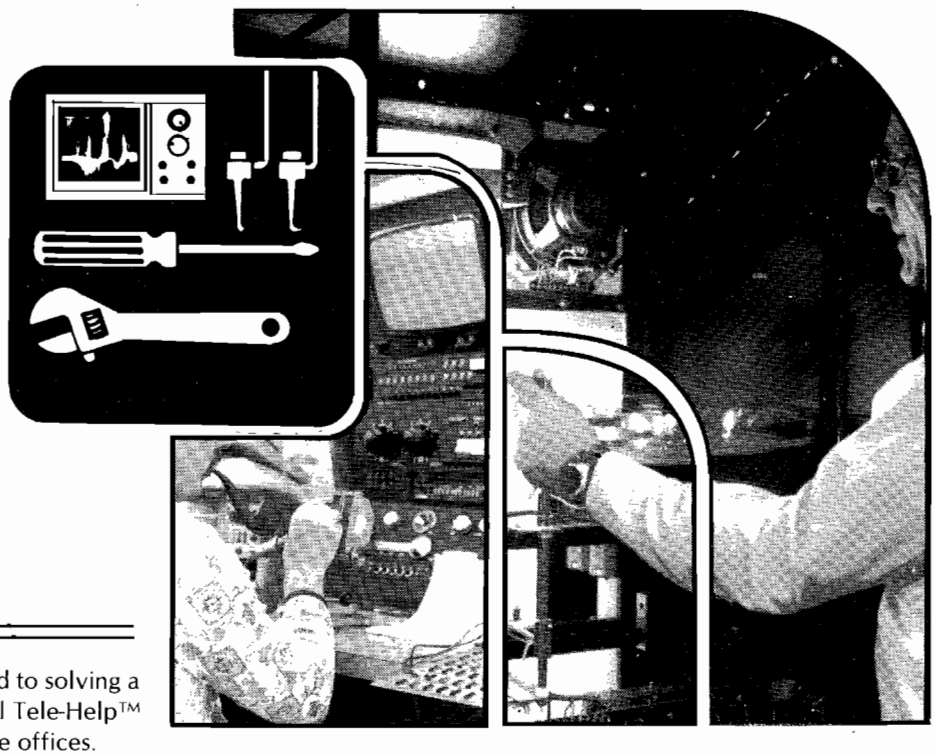
In the beginning of each game (whether a one or two player), misses are set at 0. When a miss occurs (or when each player misses in a two-player game), the count goes to 1, then 2 and so on until the game ends. The game can be set for three or five misses. See Table 1-2, Operator Options, in Chapter 1.

If a player catches all of the rocks, the playfield is refilled with a new set of rocks. Game play is continuous during this transition, and the number of misses remaining for the game stays the same. Rather than starting with six large paddles, the player is given three large paddles when the playfield is reset with rocks. As the rocks are caught and disappear, the paddles gradually are reduced in size and number. If all of the rocks are again caught, the playfield is reset and the player is given two large paddles to start with. The paddles again are reduced in size and number as the rocks are caught. The playfield will reset with rocks once more, this time starting with one paddle which gradually is reduced in size. A player's score after catching all of the rocks for the first time would be 687. The highest possible score then would be 2748 (687 x 4 filled-up playfields).

Extended play for Avalanche is optional. See Table 1-2, Operator Options, in Chapter 1. If extended play is enabled and the game is set for three misses, an additional game is granted when the player scores a minimum of 450 points. If the game is set for five misses, extended play (an additional game) is granted for a minimum of 750 points. When this occurs the video is "flashed" at a fast rate and the words *EXTENDED PLAY* replace the *GAME OVER* message. The flashing continues for approximately five seconds, after which the player can play another game.

At the end of every game the TV screen freezes for about five seconds while the words *GAME OVER* flash on and off in the middle of the screen.

Each game function for Avalanche is accompanied by a distinctive electronic sound. These sounds range from low- to high-pitched noises. In addition, the sound of an "avalanche" of falling rocks is heard continuously throughout each game. The avalanche sound increases in intensity as the game progresses; the smaller the rocks become the more high-pitched the game sounds become when the rocks are caught.



MAINTENANCE AND ADJUSTMENTS

NOTE

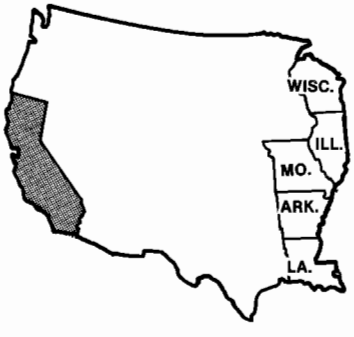
If reading through this manual does not lead to solving a specific maintenance problem, you can call Tele-Help™ at the following two Atari Customer Service offices.

WEST and CENTRAL U.S.A.

Atari Coin-Op Customer Service
1344 Bordeaux Drive, Sunnyvale, CA 94086
Telex 17-1103
(Monday - Friday, 7:30 - 4:00 pm Pacific Time)

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

From anywhere else in this area, dial toll-free (800) 538-1611



EAST U.S.A.

Atari Inc.
New Jersey Customer Service Office
46 Colonial Drive, Piscataway, NJ 08854
Telex 37-9347
(Monday - Friday, 8:30 - 5:00 pm Eastern time)

From New Jersey dial (201) 981-0490

From anywhere else in this area, dial toll-free (800) 631-5374

A. CLEANING

The exteriors of game cabinets and Plexiglas® 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 acrylic plastic 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. Powering the game causes the lock-out wires to retract far enough to allow genuine coins to reach the coin box. When AC power to the game has already been turned off, the lock-out coil is de-energized, causing the lock-out wires to move out far enough to divert coins to the return chute.

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 defeat 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.

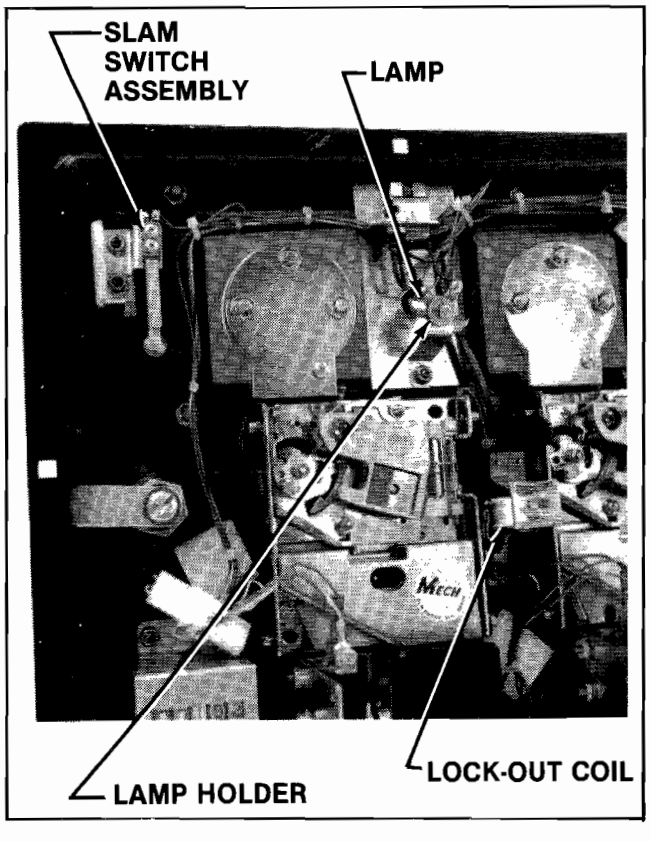


Figure 3-1 Coin Door Assembly

Plexiglas® is a registered trademark of Rohm & Haas Company.

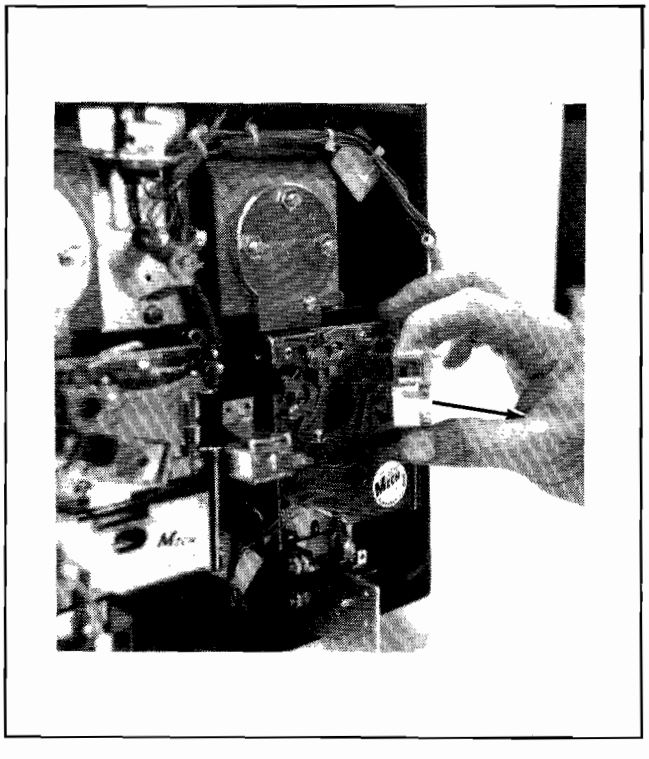


Figure 3-2 Hinging Open the Magnet Gate Assembly

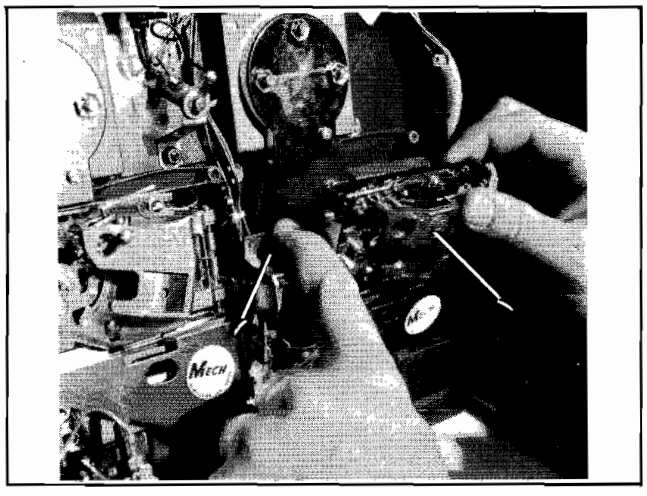


Figure 3-3 Removal of Coin Mechanism

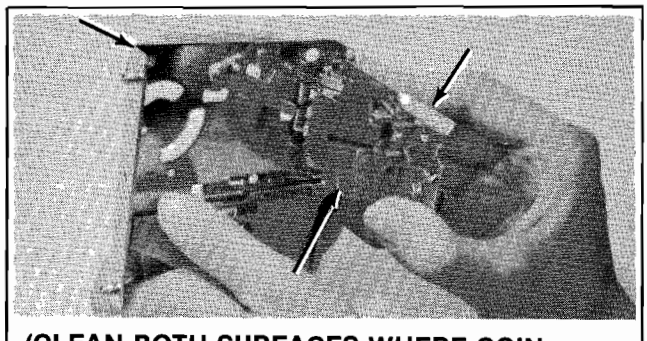
Cleaning of Coin Paths

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 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.



(CLEAN BOTH SURFACES WHERE COIN ENTERS THE MECHANISM, AS WELL AS THE MAGNET)

Figure 3-4 Surfaces to Clean Inside the Coin Mechanism

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 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.

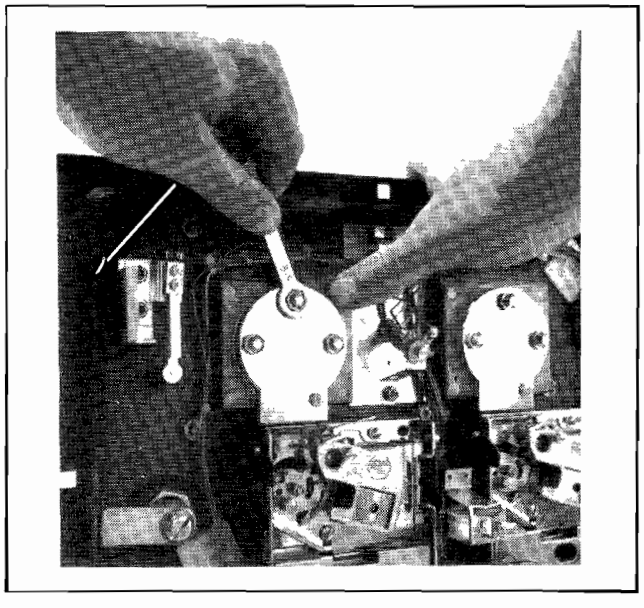


Figure 3-5 Removal of Plate Covering Rear of Coin Slot

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.

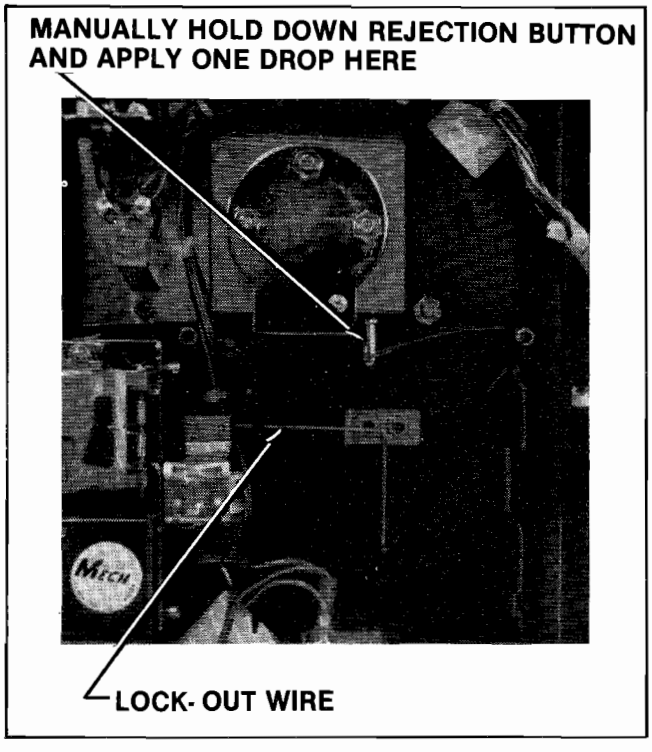


Figure 3-6 Close-Up View of Lubrication Point

In Figure 3-7 you will note that the coin switch trip wire is oriented into the "V" of the secondary coin chute. The wire should extend to only about 1/8" beyond the chute.

A retaining clip holds the wire onto the switch actuating stud. If you should lose a retaining clip, all is not lost. Just crimp the switch actuating stud over the trip wire with a pair of pliers.

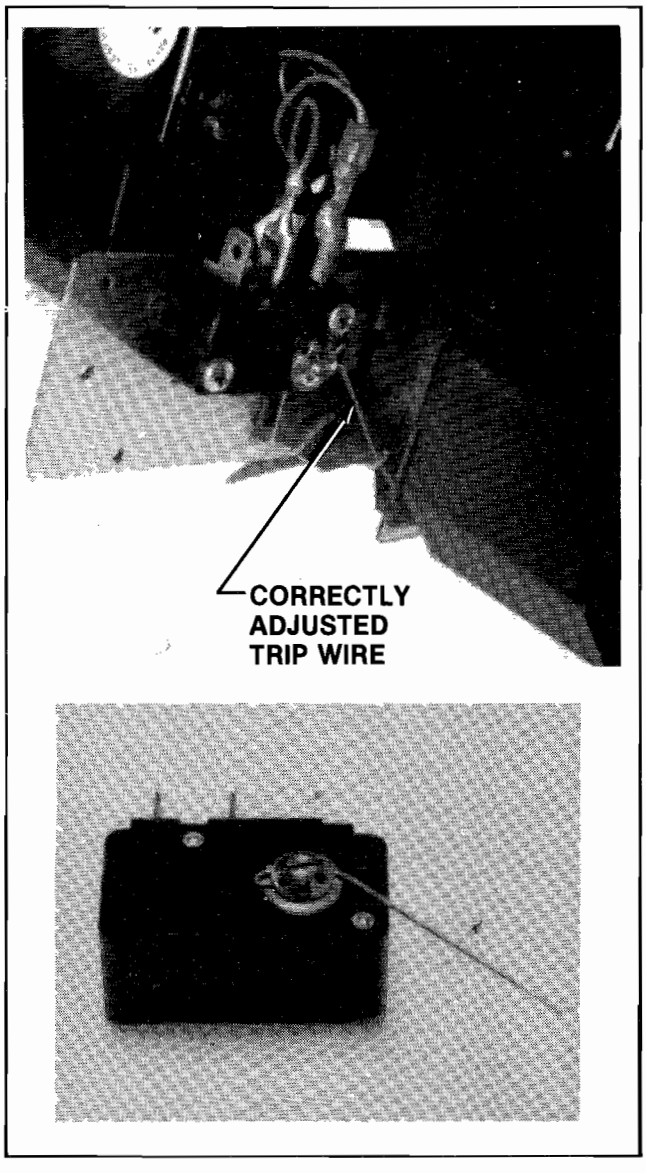


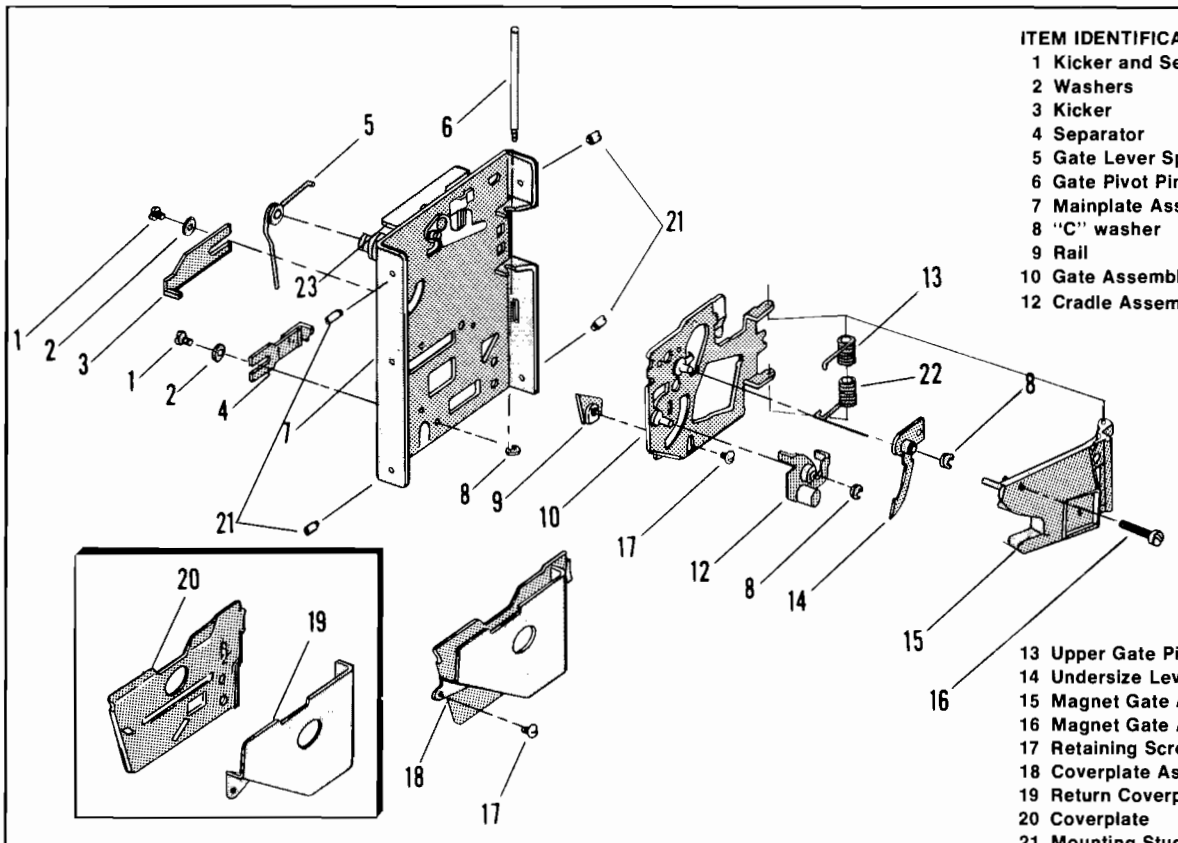
Figure 3-7 Detail View of Coin Switch and Trip Wire

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 3-8 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 experienced 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



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 boiling water for several minutes. Carefully remove it and let it air-dry completely before reinstalling in the door.

Figure 3-8 Adjustments on Coin Mechanism

rejects genuine coins, try to readjust it. If this is not successful, then replace it with a working mechanism.

C. TV MONITOR ADJUSTMENTS

CAUTION

For best results be sure the game has been turned on for a while before making any TV monitor adjustments.

NOTE

The TV monitor adjustments are accessible through the rear door panel of the game cabinet. 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 should 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, home television set, except that the volume adjustment has no effect. Instead, the game produces its sound in circuits separate from the TV monitor. Figure 3-10 shows the location of the adjustments on both TV monitors used by Atari. Your game contains a TV monitor manufactured to Atari specifications by either Motorola or TEC Video electronics.

When making 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.

HORIZ HOLD (Horizontal Hold) or 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 pictured.

VERT HOLD (Vertical Hold)—This needs adjustment only if the picture appears to be rolling up or down the screen. Adjust for a stable, centered picture.

D. TV MONITOR REMOVAL (See Figure 3-10)

Remove three screws (button-head socket cap #10-32) at the top edge of the cabinet and remove the Plexiglas® retainer. Slide the Plexiglas shield

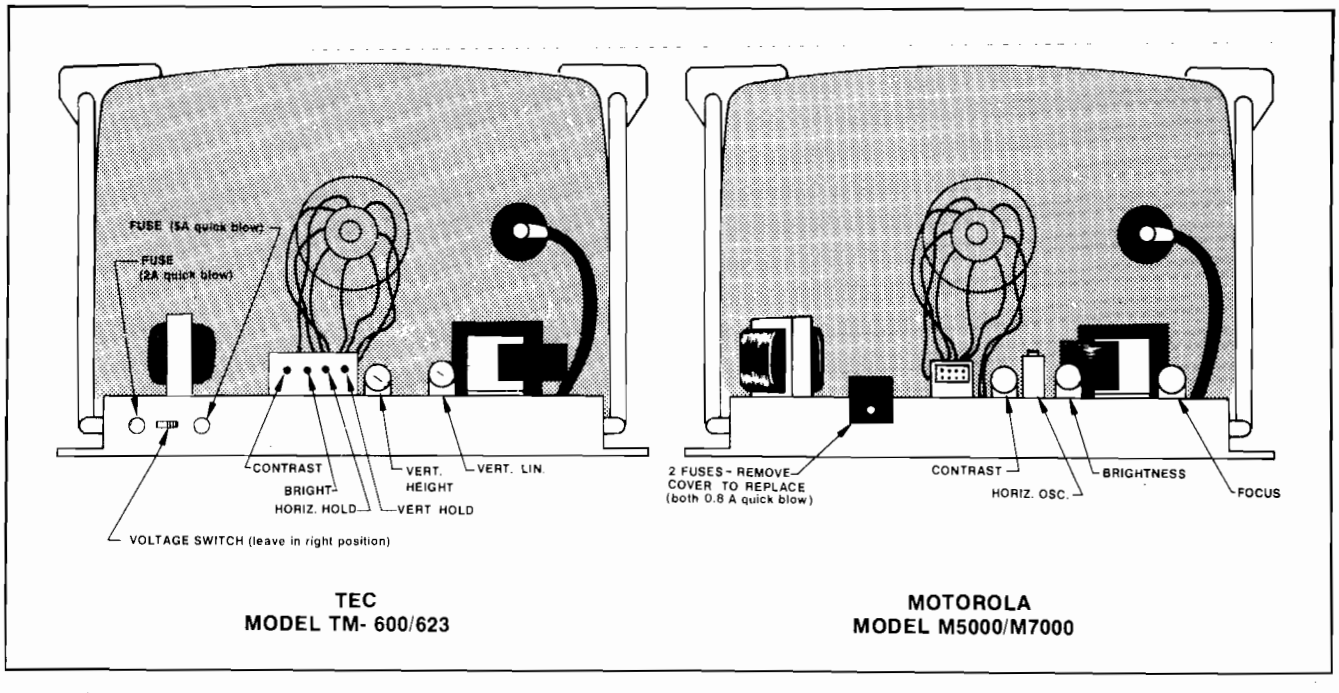


Figure 3-9 Locations of Adjustments on TV Chassis

out through the top of the cabinet, and remove the smoked Plexiglas screen which is immediately behind the shield. Next remove the cardboard bezel. At the back of the cabinet, remove the upper service panel door (four wood screws, #8 x 1½"). Remove the four carriage bolts (10-24 x 2.00" lg.) that secure the monitor to the TV shelf assembly. Disconnect the TV monitor harness and slide the monitor out through the front of the cabinet.

E. FUSE REPLACEMENT

Avalanche contains seven fuses, five on the power supply assembly in the lower part of the cabinet and two on the TV monitor assembly. Power supply fuses are accessible through the lower rear door assembly. TV fuses are accessible through the upper service panel door. Replace fuses only with the same type as follows:

TEC TM-600/623 Monitors:
3AG 2-amp and 0.5-amp quick-blow, 250 volts
Motorola M5000/M7000 Monitors:
3AG 0.8-amp quick-blow, 250 volts
Power Supply:
Fuses F1 and F2—3AG 3-amp slow-blow, 250 volts
Fuses F3 and F4—3AG 2.5-amp slow-blow, 125 volts
Fuse F5—3AG 8-amp fast-blow, 125 volts

F. LAMP REPLACEMENT (See Figure 3-10)

Avalanche contains an 18-inch fluorescent lamp inside the top of the game cabinet assembly. To replace the lamp, remove the Plexiglas® retainer, shield, and screen as described in Section D of this chapter (TV Monitor Removal). The fluorescent tube can now be pulled straight out of the cabinet and replaced.

G. LICON SERVE SWITCH AND START SWITCH REPLACEMENT (See Figure 3-11)

LICON Serve Switch

The *SERVE* button on the control panel contains an LED (light-emitting diode) switch. To replace the switch follow this procedure:

1. Unplug the power cord.
   Unlock and open the coin door.
   Unlock and remove the lower rear door (for better interior lighting).
2. Remove all wires from the suspected switch.
3. Turn the switch counterclockwise while holding the cone-shaped nut on the outside of the game cabinet.
4. Install a new switch using the reverse procedure.
5. Reconnect the harness wires.
   Plug in the power cord.
   Close and lock both doors.

Start Switches

The *ONE PLAYER* and *TWO-PLAYER START* buttons on the control panel are backlighted by two #47 lamps. The switch itself is a Cherry switch with gold-plated contacts.

To replace the START button:

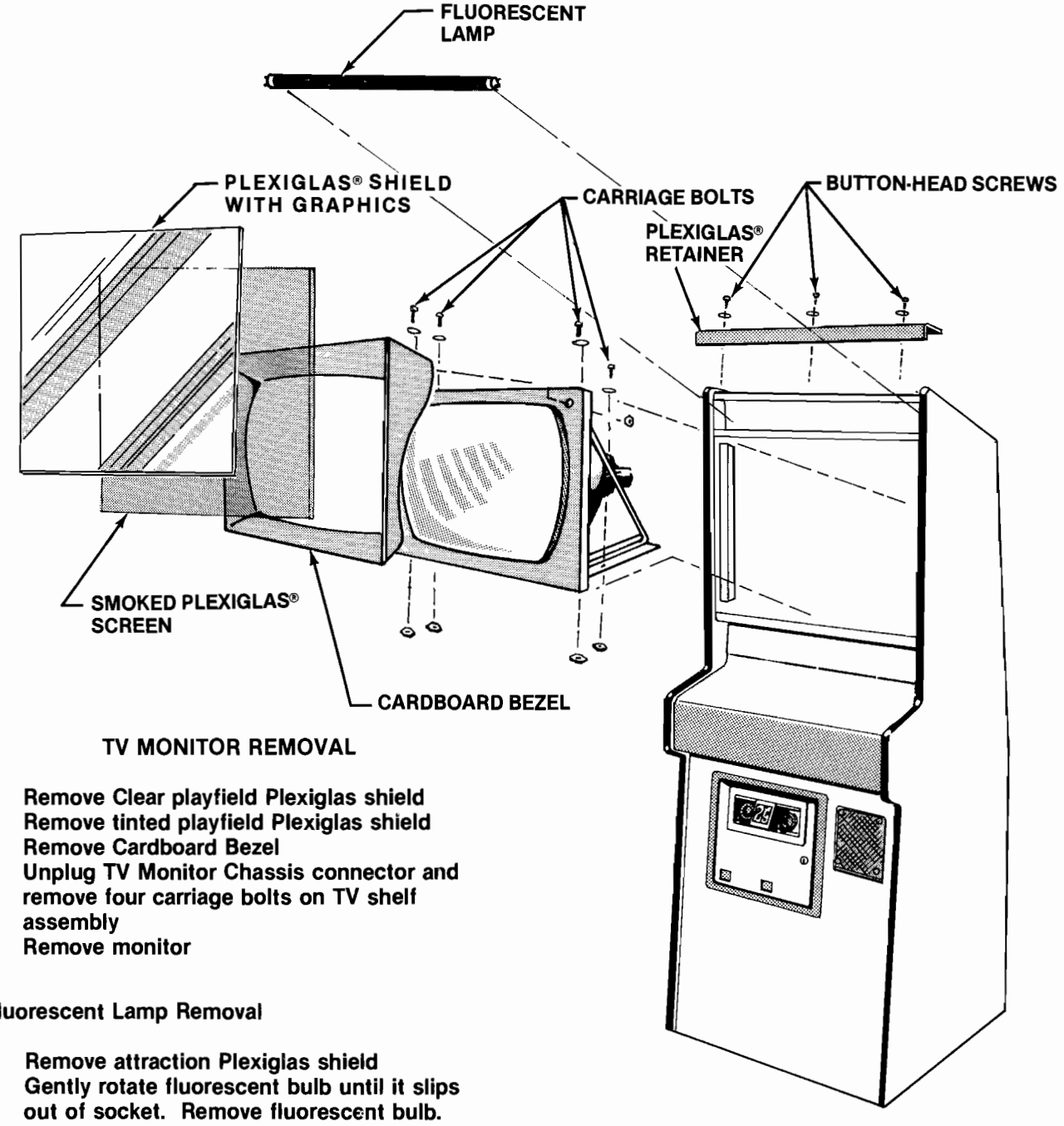
1. Unplug the power cord.
   Unlock and open the coin door.
   Unlock and remove the lower rear door assembly.
2. Reach in through the rear door and remove all wires from the suspected switch.
3. Remove the four screws which secure two plates to the control panel.
4. Reach in through the coin door. Squeeze both sides of the switch and pull out.
5. Replace the switch using the reverse procedure (switch part #62-020).

To replace a START switch lamp:

1. Reach in through the rear door and loosen the lamp mounting screws.
2. Remove the faulty lamp and replace with a new #47.
3. Plug in the power cord.
   Close and lock both doors.

H. PADDLE KNOB (POTENTIOMETER)

The paddle knob on the control panel is a potentiometer made with resistive carbon material. After frequent use of carbon material begins rubbing off the potentiometer. This results in a fine dust which causes electronic noise and causes the paddles not to move smoothly. Also, during the self-test procedure the hexadecimal numbers do not count evenly. (See Chapter 1 for details on the self-test procedure.)



TV MONITOR REMOVAL

1. Remove Clear playfield Plexiglas shield
2. Remove tinted playfield Plexiglas shield
3. Remove Cardboard Bezel
4. Unplug TV Monitor Chassis connector and remove four carriage bolts on TV shelf assembly
5. Remove monitor

Fluorescent Lamp Removal

6. Remove attraction Plexiglas shield
7. Gently rotate fluorescent bulb until it slips out of socket. Remove fluorescent bulb.

Figure 3-10 TV Monitor and Fluorescent Lamp Removal

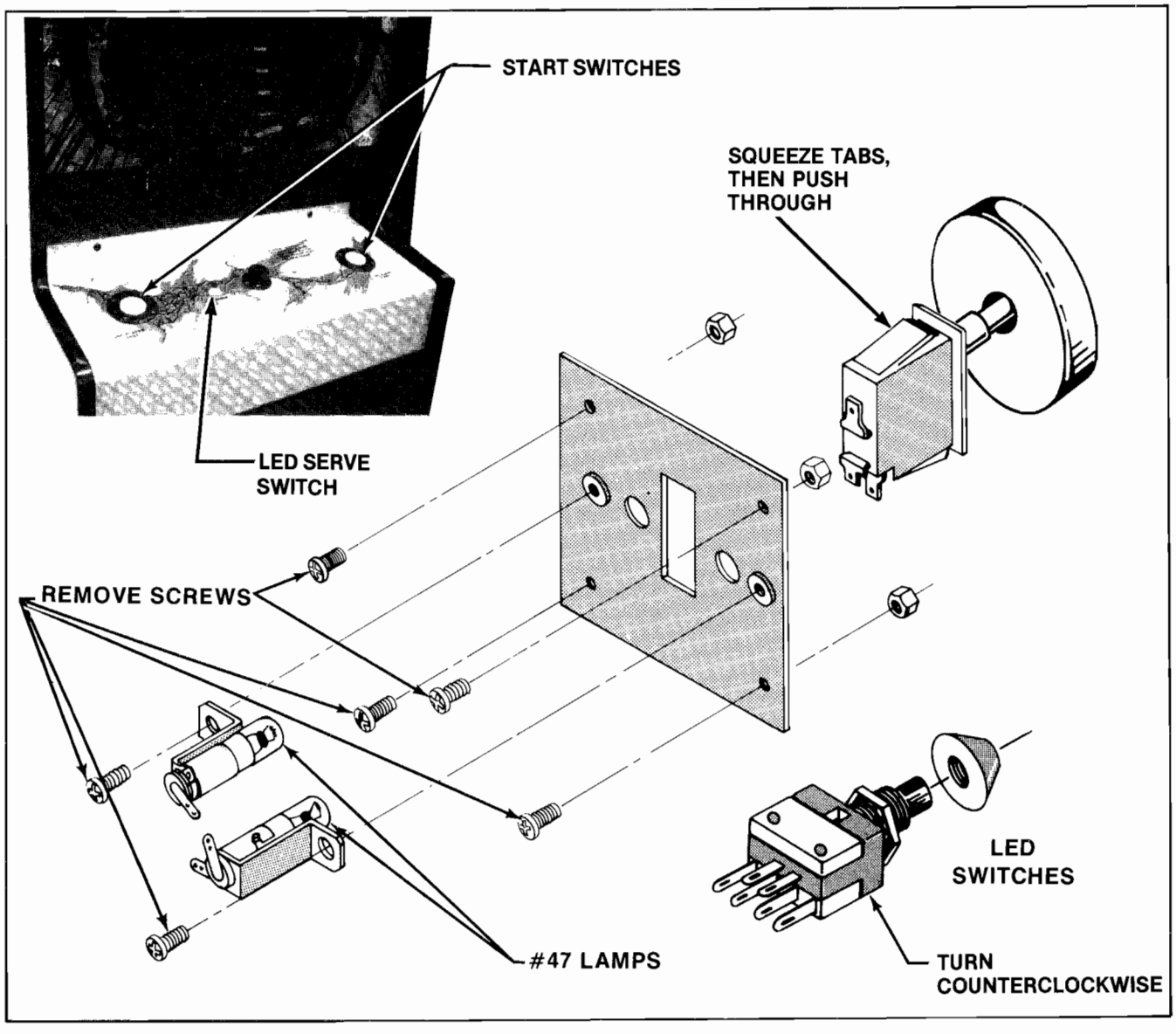
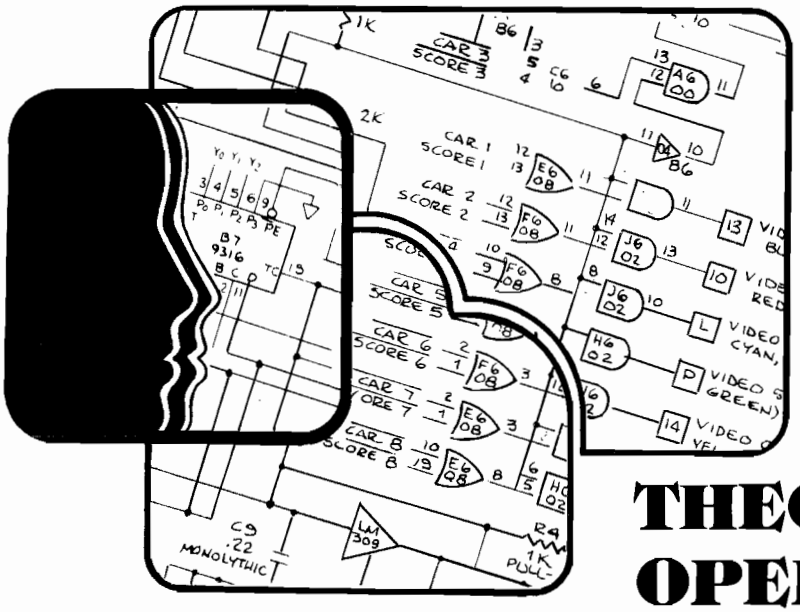


Figure 3-11 LICON and Button Switch Replacement



THEORY OF OPERATION

A. GENERAL INFORMATION

The PCB block diagram of Figure 4-1 illustrates the major circuit blocks and their related controls—either on the board or remote. The input/output lines are also shown. Figure 4-2 is a general overview of the Avalanche game.

The game has a solid-state, self-contained television monitor which produces a picture quite unlike that of your home television screen. For example the broadcast signal arriving at your home television set is translated into a different video level as compared to the game video signal from the game PCB. The sound is generated by logic located on the PCB.

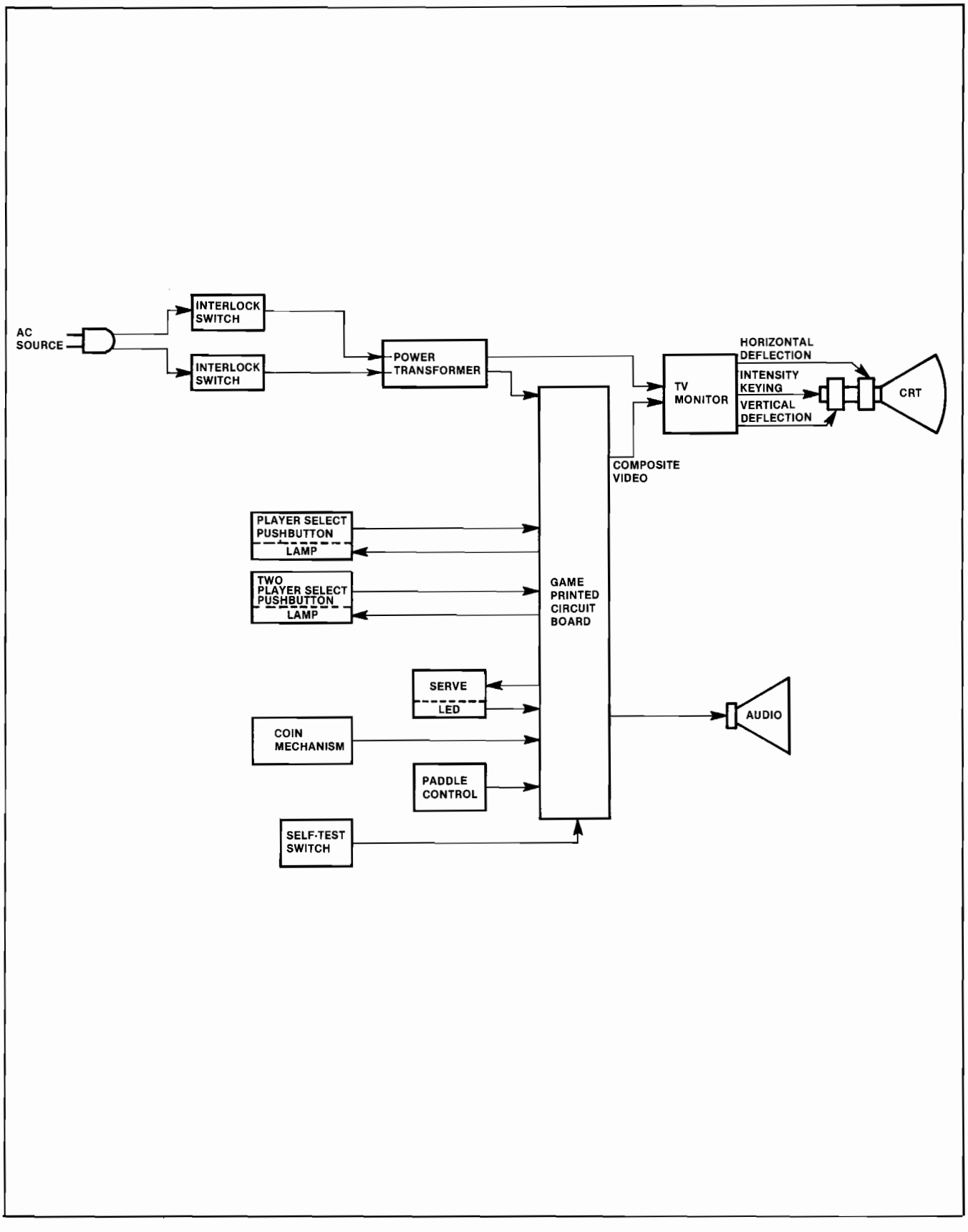


Figure 4-1 General Block Diagram of Avalanche Game

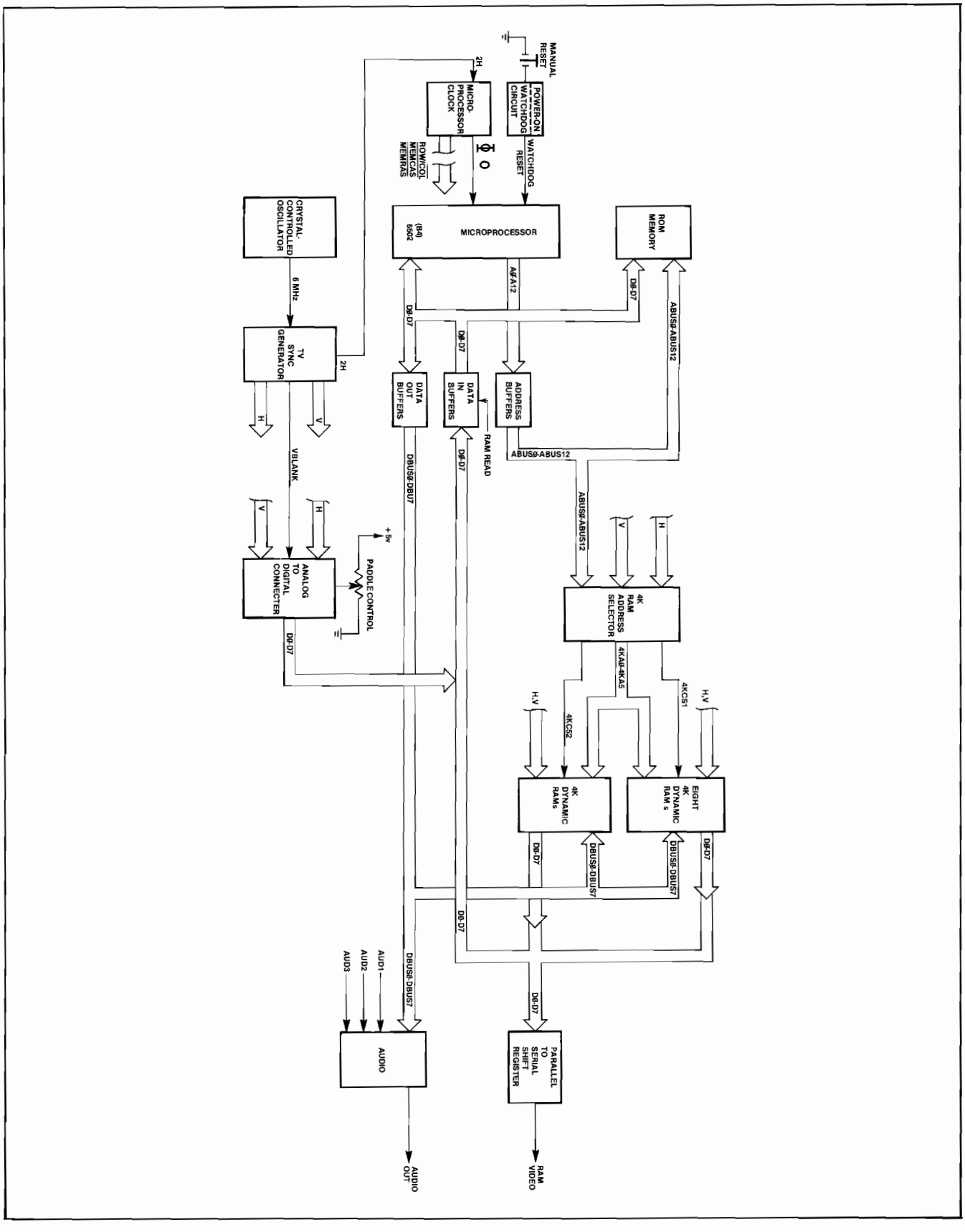


Figure 4-2 Functional Block Diagram of the Avalanche PCB

The composite video signal from the PCB is comprised of only two video levels instead of the more or less continuous shade of grey seen on a home television screen. The background of the picture is black video and the game objects are white video levels.

On the game PCB schematic diagram of Figure 4-4, the symbol "P" (appearing at various inputs of integrated circuit devices) indicates a connection of +5 volts DC through a pull-up resistor.

For easy location reference, the board is divided into sections. These sections are identified by letters A through M (skipping letters G, I, O and Q 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 9. The letters and numbers create a grid, and all ICs are located on the PCB along the grid lines.

Located at L9 is an LM323 regulator mounted in a large black heatsink and next to it is a 4-ohm, 10-watt resistor. These components produce a good deal of heat during normal operation. The temperature is not extreme, but sensitive skin may burn to the touch.

The harness schematic of Figure 4-3 illustrates how all the electrical and electronic assemblies are electrically connected.

B. POWER SUPPLY (See Figure 4-4, Sheet 1 of 4)

The PCB receives +10 volts unregulated and 25 VAC from the power supply chassis. The +10 volts is developed off-board and regulated by the LM323 to a stable +5 volts DC. This +5 volts DC is distributed throughout the board to power all circuits except the audio output. The 25 VAC input is rectified through diodes CR4 and CR5, filtered by capacitor C74 and supplied to the audio output circuit as unregulated +18 volts. This 18 volts is regulated by a three-terminal device 7812 (Q8) to develop +12 volts DC. The 25 VAC is also rectified through diodes CR2 and CR3, and regulated to −5 volts DC by the 7905 (Q7).

At 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 PCB is +5 volts DC.

C. CRYSTAL-CONTROLLED OSCILLATOR AND TV SYNC GENERATOR (See Figure 4-4, Sheet 1 of 4)

The crystal-controlled oscillator generates a 12Mhz clock frequency (specifically 12.096 Mhz) that is used to produce all of the operating frequencies required of the game PCB.

The oscillator output (12 Mhz) is divided by the divide-by-two circuit to develop two 6 Mhz signals (designated as 6 Mhz and $\overline{6Mhz}$). The horizontal sync counters H1 and J1 are driven at 6 Mhz, which provide horizontal synchronizing pulses 1H through 256H. The HBLANK and HSYNC signals are developed in flip-flop K1. HSYNC is the clock input for the vertical counters J2 and K2 that provide the vertical synchronizing pulses IV through 128V. VBLANK AND VSYNC are developed by a specially coded ROM (read-only memory), K3.

The horizontal and vertical synchronization signals are used to produce a TV monitor raster made up of 252 horizontal lines at a frequency of 15,750 Hz (256H). Synchronized with line 0 is a vertical blanking pulse that occurs for the duration of 22 more horizontal scans followed by 240 lines of active video. The resulting total is 262 lines per frame.

D. MICROPROCESSOR CLOCK (See Figure 4-4, Sheet 2 of 4)

The microprocessor clock $\Phi\overline{0}$ is a result of the PCLOCK signal—generated by 2H. The 2H bit is shifted by a 16-bit shift register comprised of devices M7 and L7, at frequency of 12 Mhz. On the Q10 output of device L7 (pin 5) the PCLOCK clocks a divide-by-two circuit (B5) which enters the MPU chip (B4) on pin 37 $\Phi\overline{0}$.

A PCLEAR signal insures that $\Phi\overline{0}$ has the proper phase relationship with the ROW/$\overline{COL}$, $\overline{MEMCAS}$ and $\overline{MEMRAS}$ signals generated by the 16-bit shift register M7 and L7.

E. MICROCOMPUTER

The microcomputer consists of read-only memory (ROM), random-access memory (RAM), and the microprocessor. The microprocessor controls the microcomputer operations through a 16-bit address bus that addresses the program ROMs. Address lines ABUS0 through ABUS12 are multiplexed with the data signals to address the dynamic 4K RAMs. An 8-bit bi-directional data bus provides a path for transferring data between

the microprocessor and the various memories. A special watchdog circuit makes certain that the microcomputer functions properly.

Address lines ABUS0 through ABUS12 are buffered to eliminate signal loading. These buffered address lines address the program ROMs (C/D2, D/E2, E2, C/D3, D/E3 and E3 for the -01 version and A2, B2 and C2 for the -02 version). The direct non-buffered address lines from the microprocessor are A13-A15.

F. MICROPROCESSOR (See Figure 4-4, Sheet 2 of 4)

The 6502 microprocessor (B4) is externally clocked at Φ0 by the Q output of latch B5 on each PCLOCK pulse. The Φ0 clock also generates the 02 and 02 output clocks of the MPU.

The 6502 is a 64K-bit address-memory-mapped microprocessor device consisting of a 16-line address bus (ABUS0-ABUS15) and an 8-bit bi-directional data bus (D0-D7). The NMI is the only interrupt signal other than the direct reset input from the watchdog counter. When the RESET input goes low, the program counter is reset and started at a meaningful address.

To better understand the microprocessor (MPU) refer to Table 4-1 for a complete description of the data, address and control signals to the MPU. Only those control lines used are discussed.

G. MICROPROCESSOR WATCHDOG (See Figure 4-4, Sheet 2 of 4)

Watchdog is an external monitoring system that resets the program execution back to its initial sequence. This is accomplished by a watchdog statement, incorporated into program memory, that results in a WATCHDOG RESET pulse at the output of the address decoder.

The watchdog circuit is a 7490 counter. In normal operation the circuit is pulsed once each TV picture frame by the VBLANK pulse. If nine frames occur without a WATCHDOG RESET pulse, the counter resets the microprocessor. This prevents random electronic static from upsetting the game operation. The power-on circuit or the hardware for reset presets the counter, which in turn initializes the microprocessor and starts the attract-mode sequence.

H. PADDLE CONTROL (See Figure 4-4, Sheet 1 of 4)

The paddle control is a linear clutched pot which is connected to the inverting input (pin 6) of comparator device K6. The control functions as the variable input to an analog-to-digital (A/D) converter circuit comprised of devices Q10, Q11, K6, Q3, M6 and J3.

A positive voltage ramp is generated by one-fourth of device K6 (pin 10) when FET Q10 is switched on by

TABLE 4-1 Microprocessor Input/Output Signal Descriptions

Signal Name	Function
D0-D7	
A0-A15	These sixteen lines are uni-directional MPU address lines to supporting memory (i.e., RAMs and ROMs) and I/O.
RESET	This input line, when low, resets the MPU from either a power down or a high-going QD output from the watchdog counter. The contents of locations FFFC/FFFD in memory are loaded into the MPU program counter to point the start of a reset sequence.
$\overline{\text{NMI}}$	This input when going low indicates a non-maskable interrupt sequence. After the MPU concludes the current sequence, it will then proceed to the NMI sequence.
Φ0	System clock input.
R/W	This output is the Read and Write signal line which indicates the direction of the data transfers on the MPU data bus.
Φ2	MPU system clock output.

VBLANK pulse. When Q10 switches off, the voltage at pin 10 of K10 begins to rise as the capacitor C46 charges. This voltage continues to rise for the duration of the frame.

The voltage ramp is then buffered by voltage follower K6 (pin 12) finally to enter the non-inverting input of K6 (pin 5). As the paddle is moved, the wiper voltage of the 5K ohm pot varies from +5 volts to 0 volts; therefore the voltage at pin 6 varies accordingly. The voltage at K6 pin 5 is the result of the synchronous VBLANK pulse. The VBLANK pulse occurs at every vertical retrace for a duration of approximately 1.4 Msec everytime throughout the game.

When the paddle control wiper and the ramp voltage to the comparator (K6) cross, a pulse is generated that clocks the 8-bit latch J3. This device latches the eight inputs 1V to 128V corresponding to the time the clock input is pulsed by comparator K6. The outputs of J3 (D0-D7) are then read by the microprocessor during an IN2 pulse. This data is effectively the digital conversion of the analog pot voltage.

I. RAM MEMORY (See Figure 4-4, Sheet 3 of 4)

The game memory consists of a 64K-bit dynamic RAM memory. This memory is comprised of sixteen 4,096 x 1bit (4Kx1bit) dynamic RAM devices, located at A6-J6 and A7-J7. These sixteen RAMs are then divided equally into groups of eight. Each group of eight may be selected individually by the 4KCS1 or 4KCS2 chip selects. The byte serial data RAM inputs (DBUS0-DBUS7) are buffered data bus out lines which originate from the microprocessor data bus outputs (D0-D7). Address information is strobed into the ROM memory address by the MEMCAS and MEMRAS signals. The data is permanently stored in memory by the low-going MEMWE Signal.

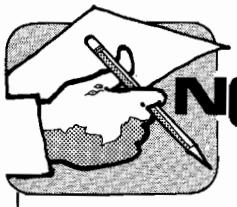
The data outputs (RAM 0-7) of each group of eight are both tied together. Parallel RAM 0-7 lines are converted to serial data (video signal) by shift register E5. These lines are connected to the microprocessor bi-directional data bus lines via the tri-state gates F5 and H5 when enabled by a RAM READ pulse.

J. ROM MEMORY (See Figure 4-4, Sheet 4 of 4)

The ROM memory permanently contains program data such as the score display, audio level, "rock" display pattern and self-test routines. The ROM devices are programmed by Atari, Inc. and are field replaceable.

K. VIDEO (See Figure 4-4, Sheet 3 of 4)

The composite video signal is generated by the output of RAMs A7 through J7 and A6 through J6 (Figure 4-4, Sheet 3 of 4). The parallel video data (DOUT) of each RAM is tied to an 8-bit parallel-to-serial shift register E5. The serial output RAM data is switched to a positive or negative video signal by Exclusive OR gate K5. The video signal is then clocked into the M1 latch by the 6Mhz clock signal. Each time a COMP BLANK signal occurs low, it resets the M1 latch (Figure 4-4, Sheet 1 of 4). The video signal is held low until the COMP BLANK signal returns to a high. This allows the M1 latch to blank the video signal.



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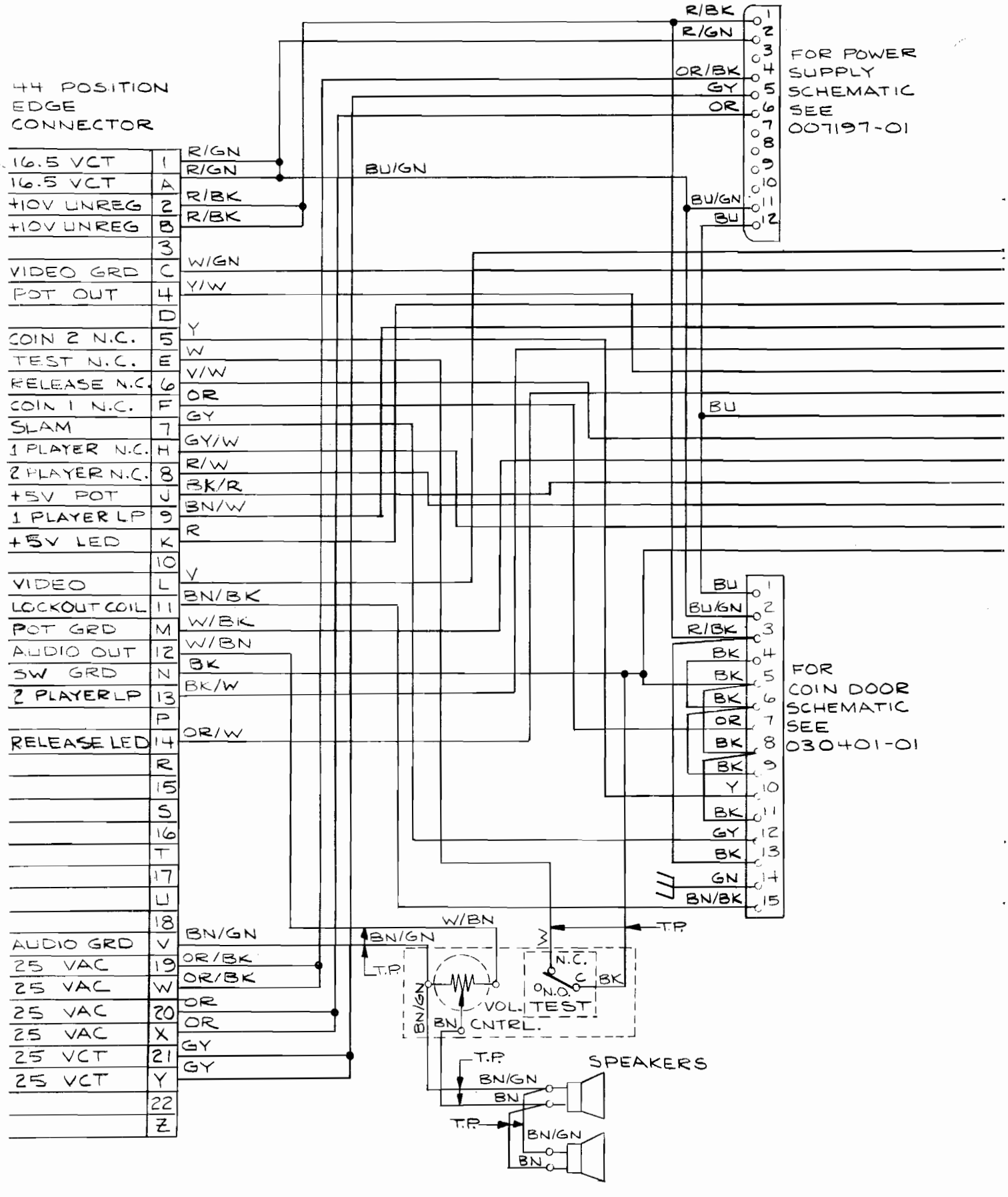
44 POSITION EDGE CONNECTOR
16.5 VCT 1 R/GN
16.5 VCT A R/GN
+10V UNREG 2 R/BK
+10V UNREG B R/BK
3
VIDEO GRD C W/GN
POT OUT 4 Y/W
D
COIN 2 N.C. 5 Y
TEST N.C. E W
RELEASE N.C. 6 V/W
COIN 1 N.C. F OR
SLAM 7 GY
1 PLAYER N.C. H GY/W
2 PLAYER N.C. 8 R/W
+5V POT J BK/R
1 PLAYER LP 9 BN/W
+5V LED K R
10
VIDEO L V
LOCKOUT COIL 11 BN/BK
POT GRD M W/BK
AUDIO OUT 12 W/BN
SW GRD N BK
2 PLAYER LP 13 BK/W
P
RELEASE LED 14 OR/W
R
15
S
16
T
17
U
18
AUDIO GRD V BN/GN
25 VAC 19 OR/BK
25 VAC W OR/BK
25 VAC 20 OR
25 VAC X OR
25 VCT 21 GY
25 VCT Y GY
22
Z
R/BK 1
R/GN 2
3
OR/BK 4
GY 5
OR 6
7
8
9
10
BU/GN 11
BU 12
FOR POWER SUPPLY SCHEMATIC SEE 007197-01
BU/GN
BU
BU 1
BU/GN 2
R/BK 3
BK 4
BK 5
BK 6
OR 7
BK 8
BK 9
Y 10
BK 11
GY 12
BK 13
GN 14
BN/BK 15
FOR COIN DOOR SCHEMATIC SEE 030401-01
W/BN
BN/GN
T.P.
T.P.
BN/GN
N.C.
C
N.O.
BK
VOL. CNTRL.
TEST
BN
T.P.
SPEAKERS
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BN
T.P.
BN/GN
BN

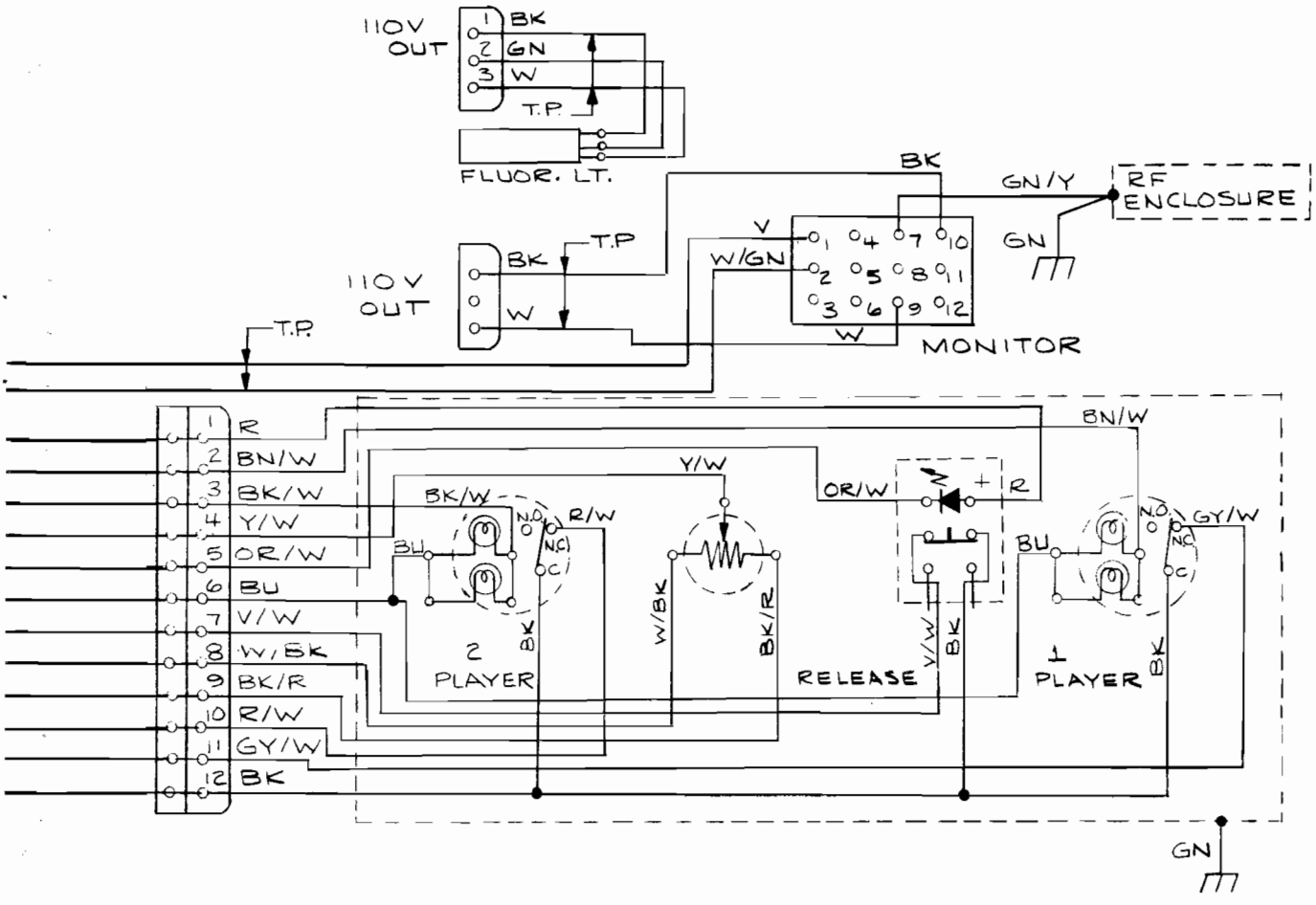
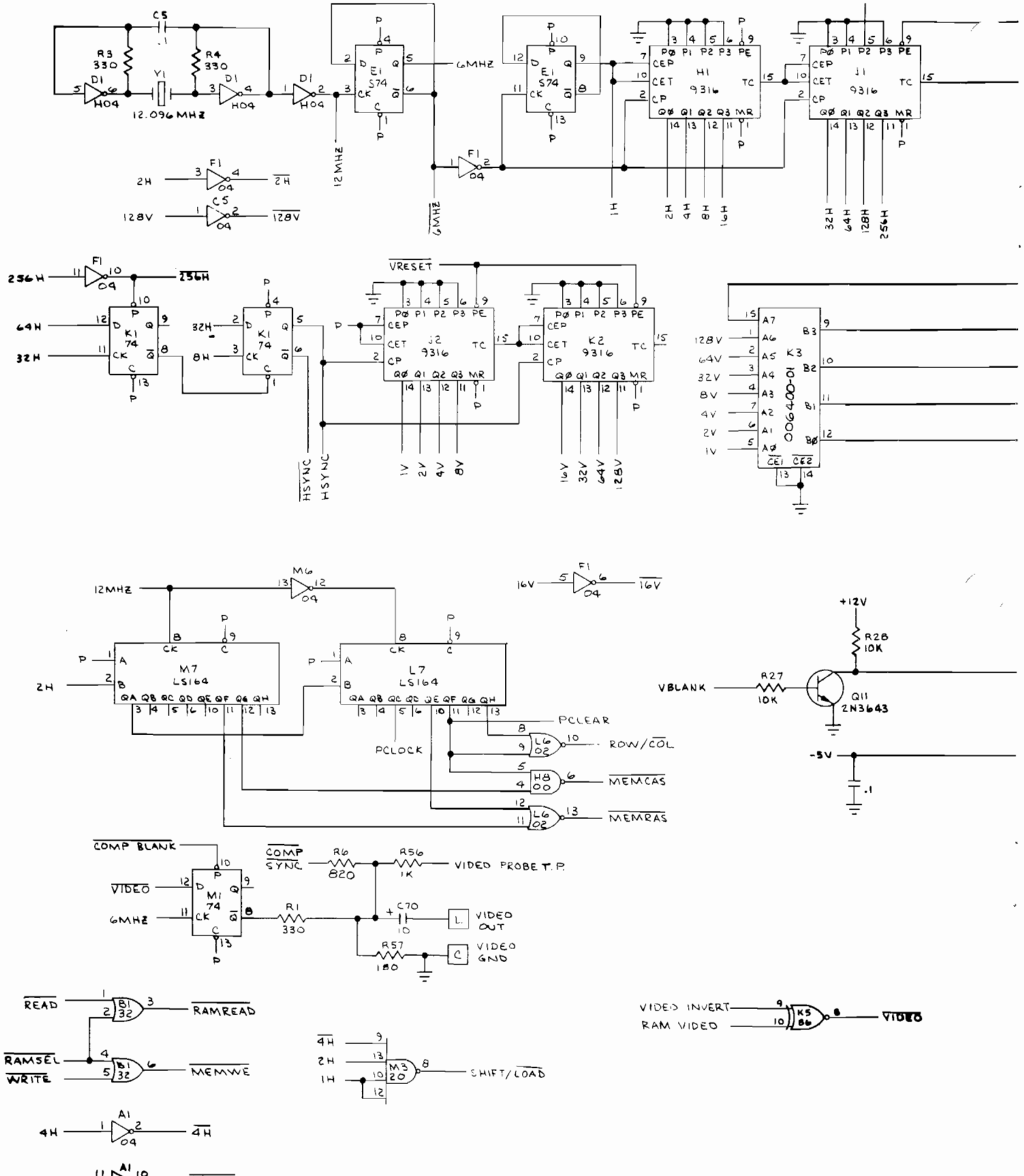
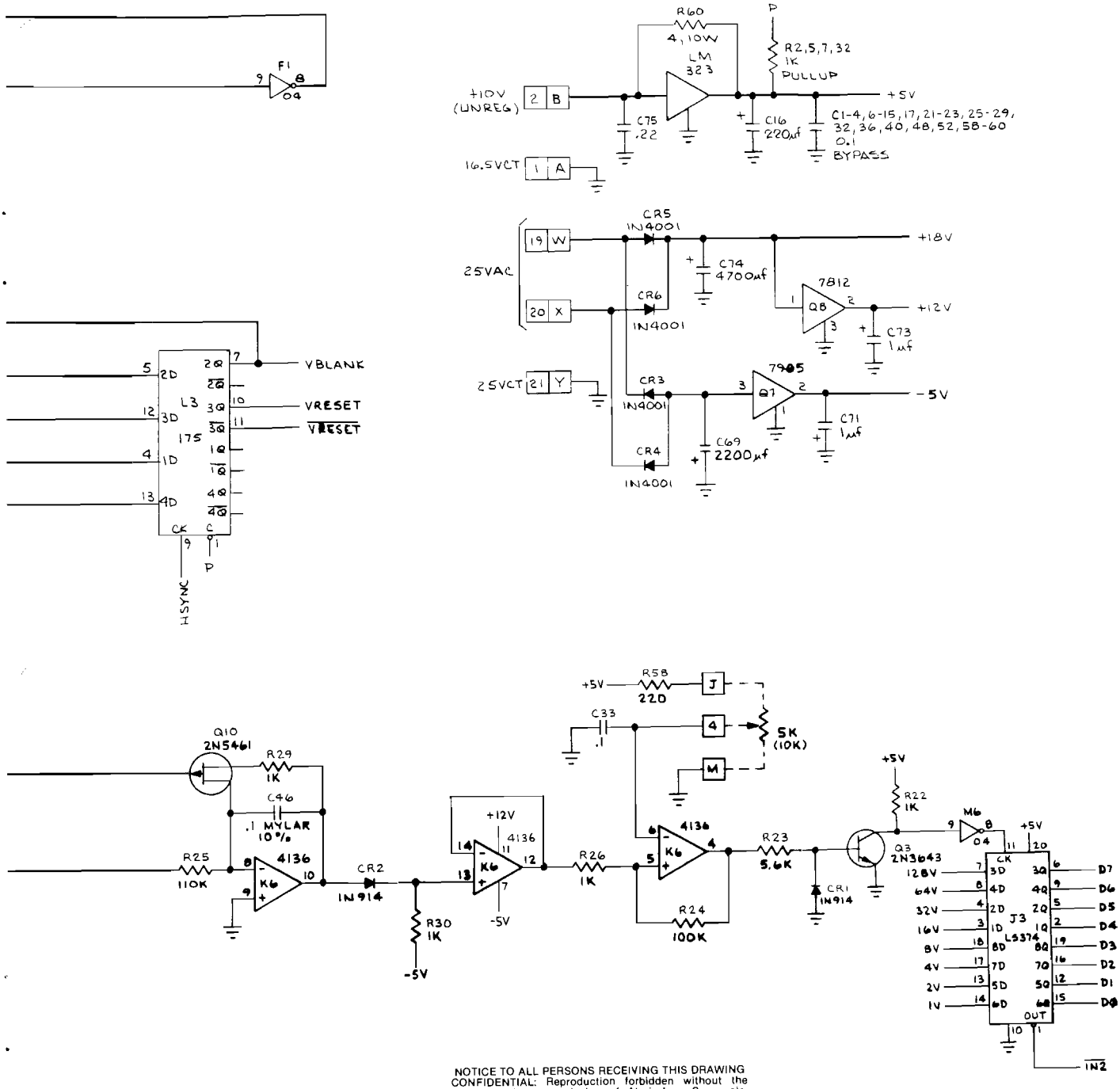


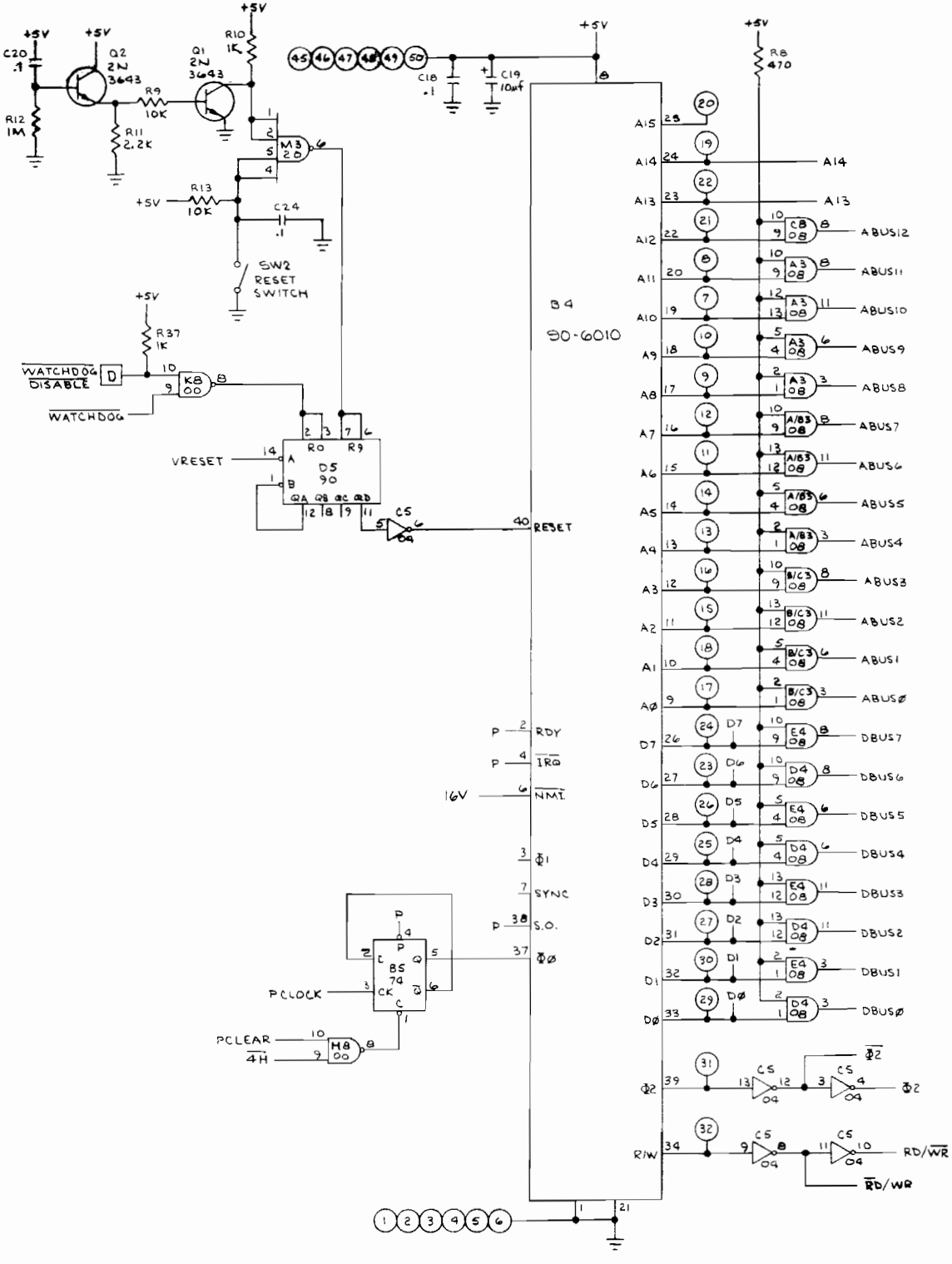
Figure 4-3 Harness Schematic Diagram


C5
.1
R3
330
R4
330
Y1
12.096 MHZ
D1
H04
12MHZ
6MHZ
F1
04
2H
128V
256H
64H
32H
8H
K1
74
S74
E1
J2
K2
9316
H1
J1
VRESET
HSYNC
1V
2V
4V
8V
16V
32V
128V
K3
006400-01
M6
M7
LS164
L7
LS164
PCLEAR
PCLOCK
ROW/COL
MEMCAS
MEMRAS
+12V
R28
10K
R27
10K
VBLANK
Q11
2N3643
-5V
.1
COMP BLANK
COMP SYNC
VIDEO
M1
R6
820
R56
1K
VIDEO PROBE T.P.
R1
330
C70
10
VIDEO OUT
R57
180
VIDEO GND
READ
RAMREAD
RAMSEL
WRITE
MEMWE
B1
32
4H
A1
ABUS10
VIDEO INVERT
RAM VIDEO
K5
86
VIDEO
M3
20
SHIFT/LOAD



SYNC. RAM CONTROL, POWER, POT READING

Figure 4-4 Avalanche PCB Schematic Diagram A (Sheet 1 of 4)


+5V
C20 .1
Q2 2N 3693
Q1 2N 3693
R10 1K
R9 10K
R12 1M
R11 2.2K
M3 20
R13 10K
C24 .1
SW2 RESET SWITCH
R37 1K
WATCHDOG DISABLE
WATCHDOG
K8 00
D5 90
VRESET
RESET
C5
C18 .1
C19 10uf
R8 470
B4
90-6010
A15
A14
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
ABUS12
ABUS11
ABUS10
ABUS9
ABUS8
ABUS7
ABUS6
ABUS5
ABUS4
ABUS3
ABUS2
ABUS1
ABUS0
D7
D6
D5
D4
D3
D2
D1
D0
DBUS7
DBUS6
DBUS5
DBUS4
DBUS3
DBUS2
DBUS1
DBUS0
RDY
IRQ
NMI
16V
Φ1
SYNC
S.O.
ΦØ
PCLOCK
PCLEAR
4H
Φ2
R/W
RD/WR

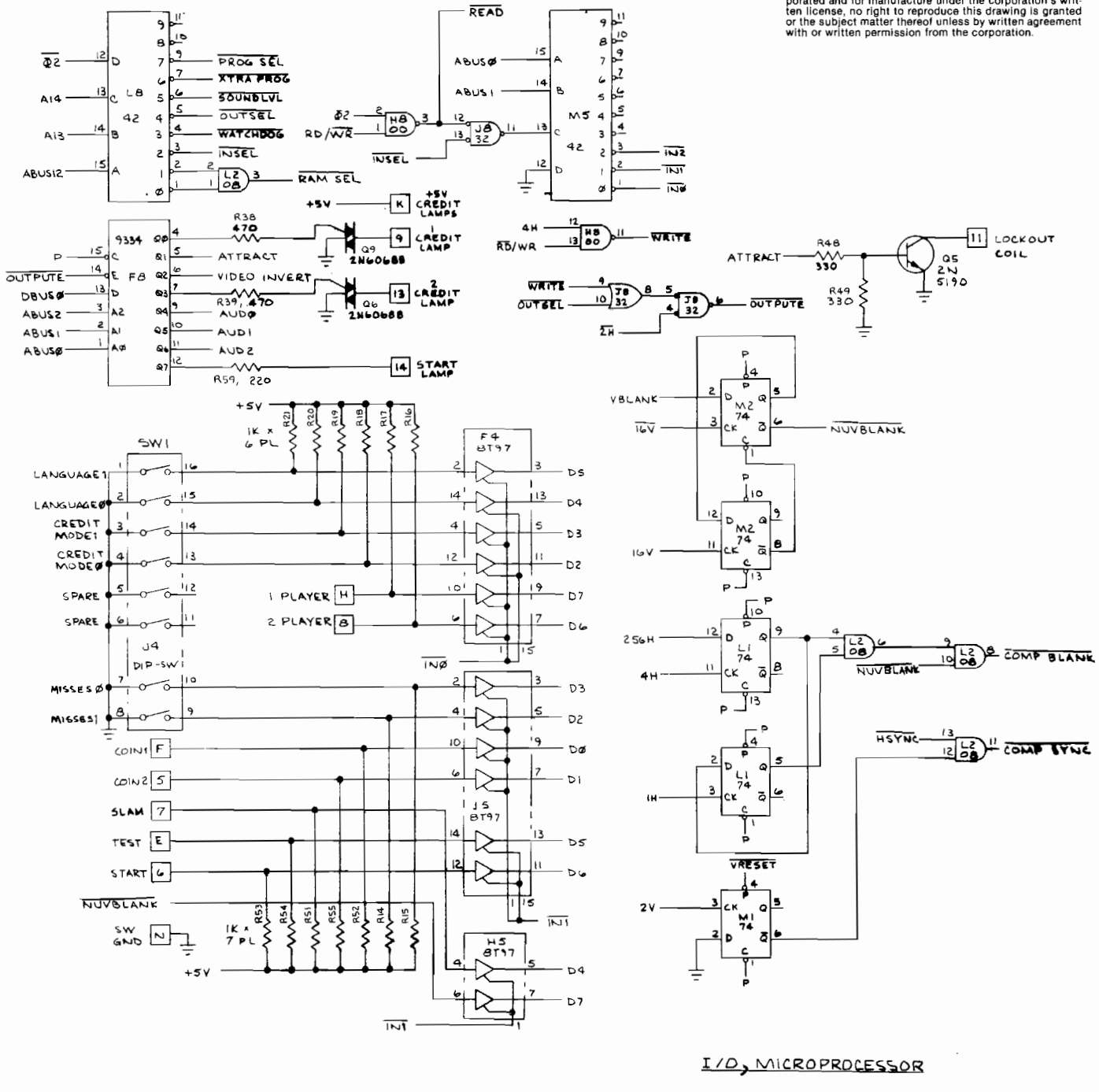
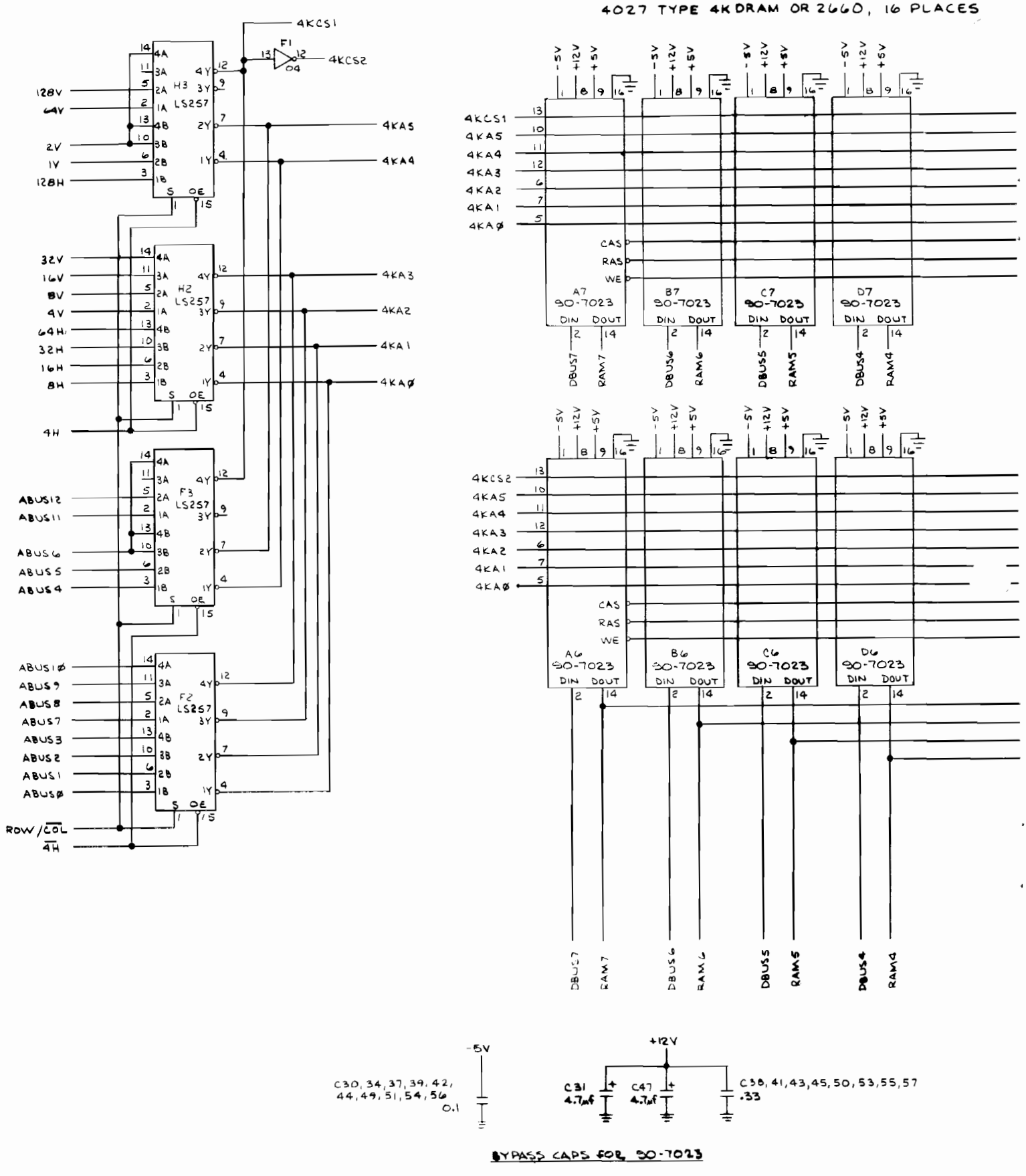


Figure 4-4 Avalanche PCB Schematic Diagram A (Sheet 2 of 4)


4027 TYPE 4K DRAM OR 2660, 16 PLACES
4KCS1
4KCS2
F1
74
128V
64V
2V
1V
128H
32V
16V
8V
4V
64H
32H
16H
8H
4H
ABUS12
ABUS11
ABUS6
ABUS5
ABUS4
ABUS10
ABUS9
ABUS8
ABUS7
ABUS3
ABUS2
ABUS1
ABUS0
ROW/COL
4H
H3 LS257
H2 LS257
F3 LS257
F2 LS257
4KA5
4KA4
4KA3
4KA2
4KA1
4KA0
-5V
+12V
+5V
CAS
RAS
WE
A7 30-7023
B7 30-7023
C7 30-7023
D7 30-7023
A6 30-7023
B6 30-7023
C6 30-7023
D6 30-7023
DIN
DOUT
DBUS7
RAM7
DBUS6
RAM6
DBUS5
RAM5
DBUS4
RAM4
C30, 34, 37, 39, 42, 44, 49, 51, 54, 56
0.1
C31
4.7µf
C47
4.7µf
C38, 41, 43, 45, 50, 53, 55, 57
.33
BYPASS CAPS FOR 30-7023

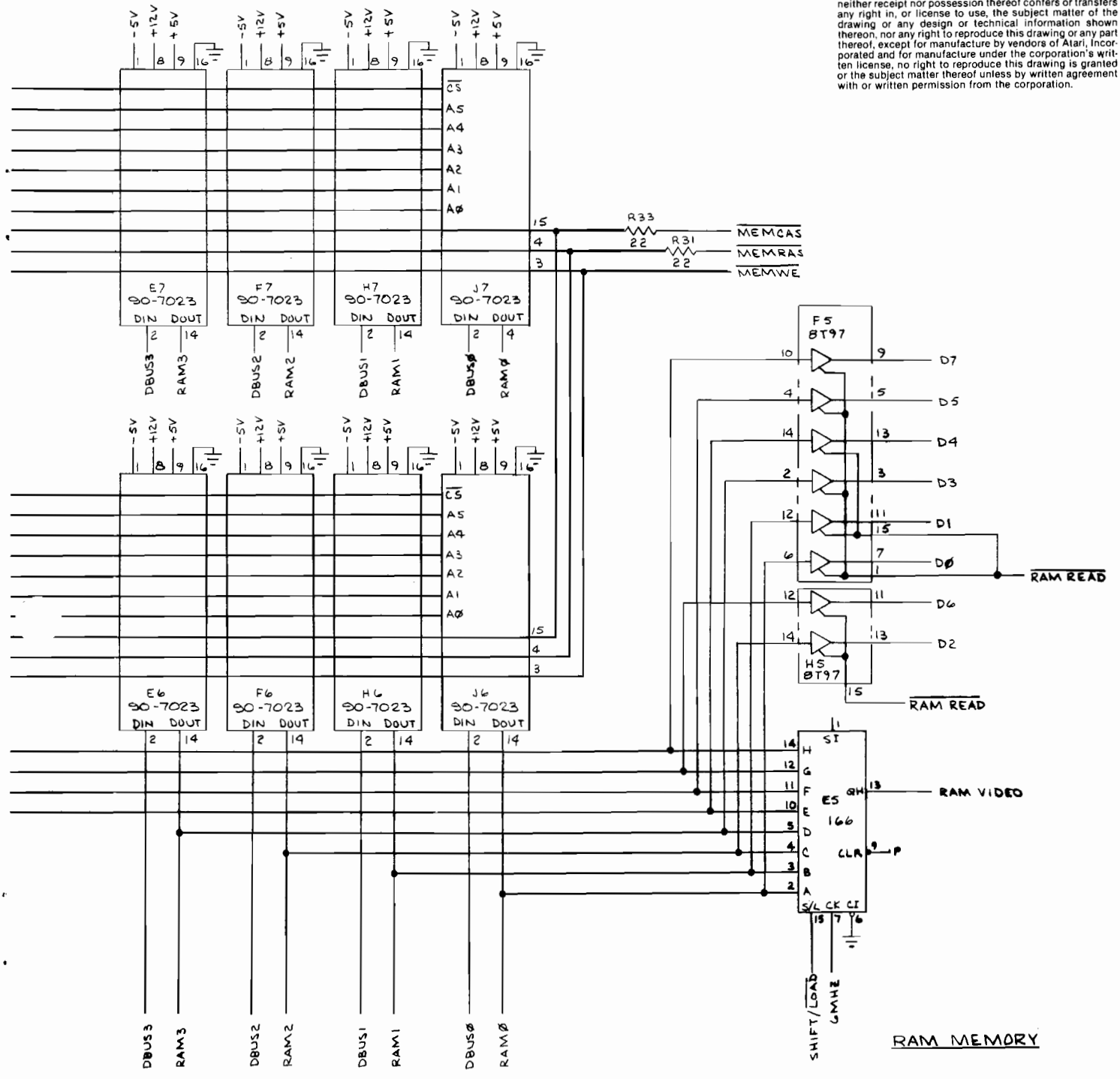
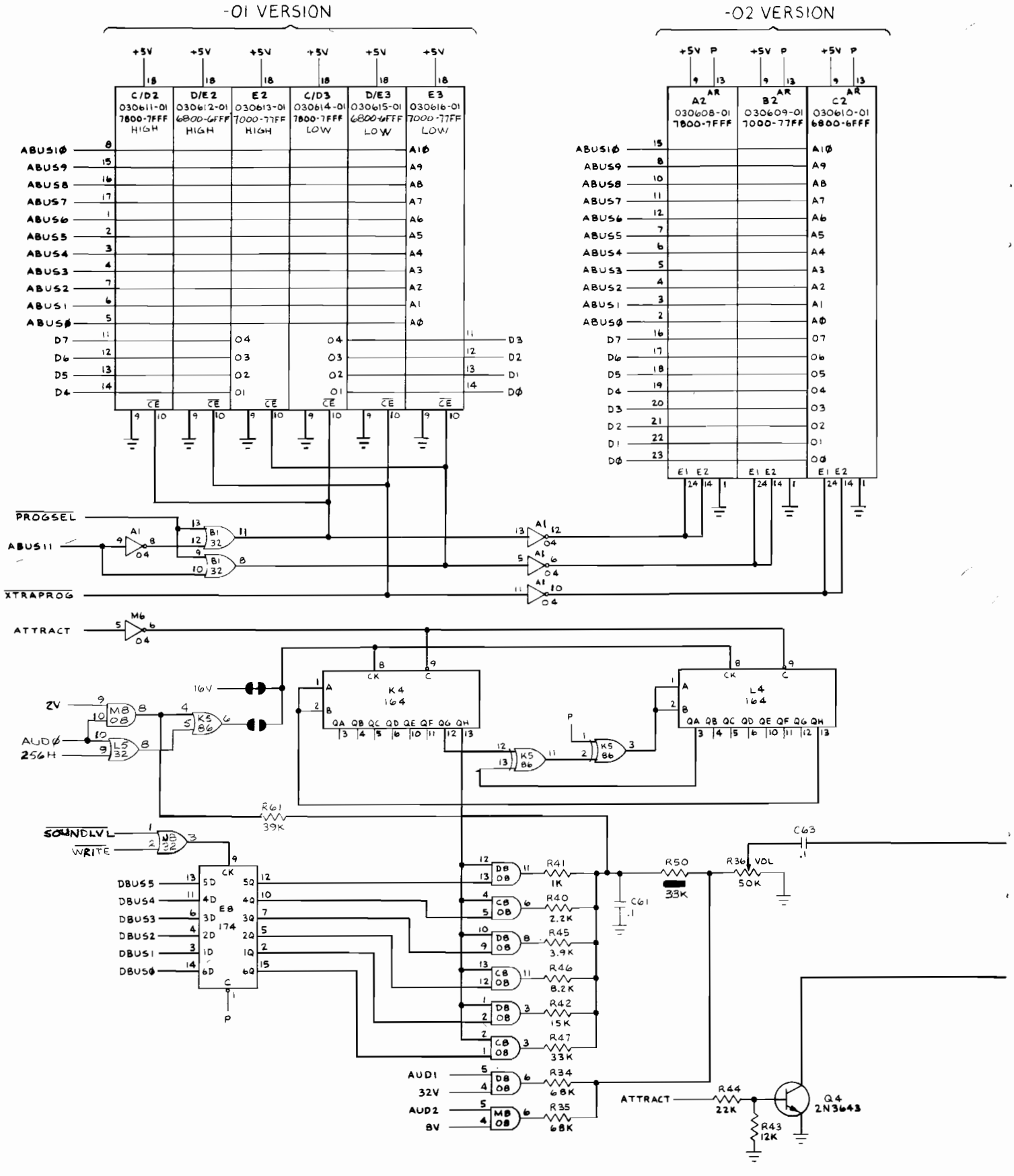
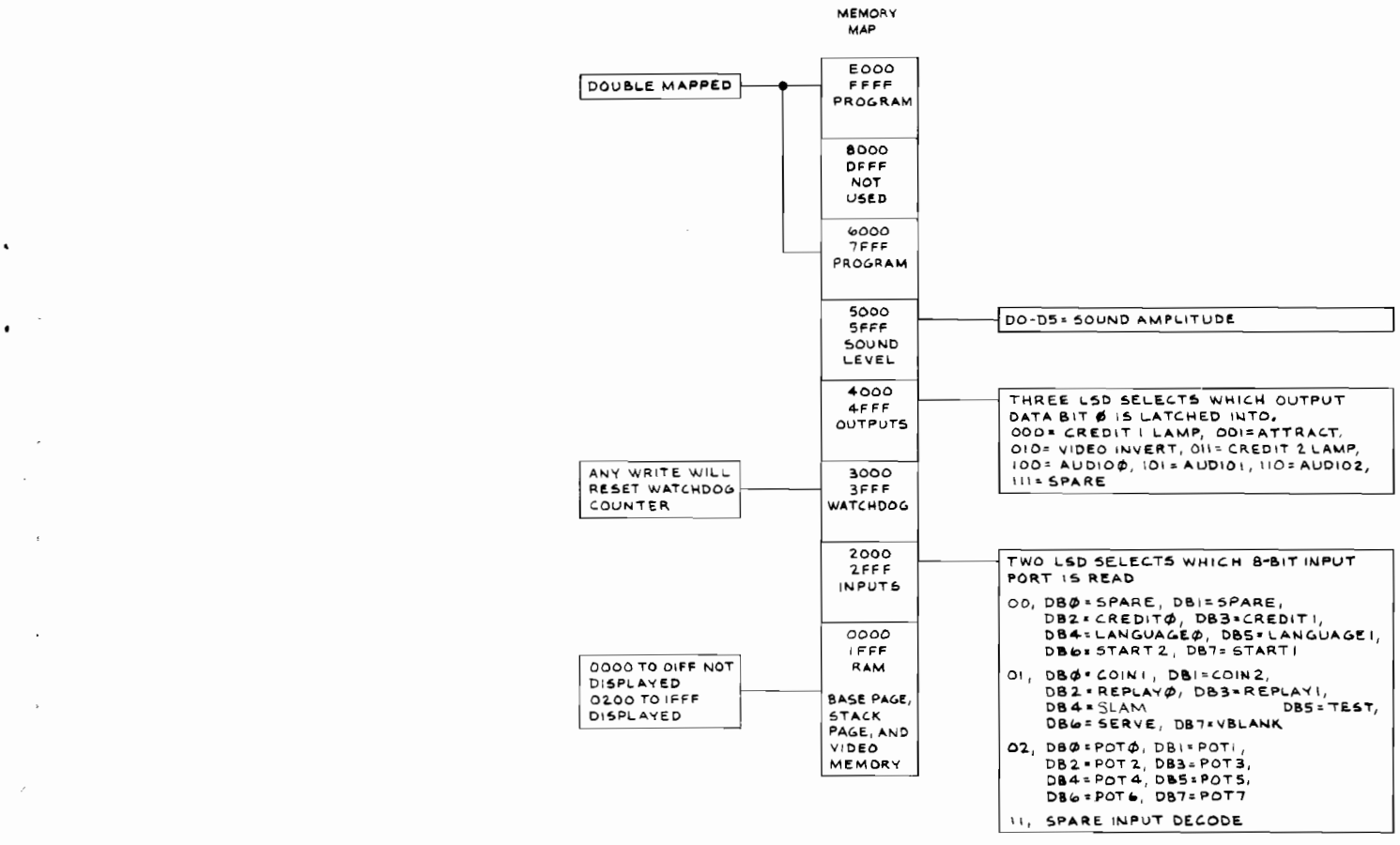
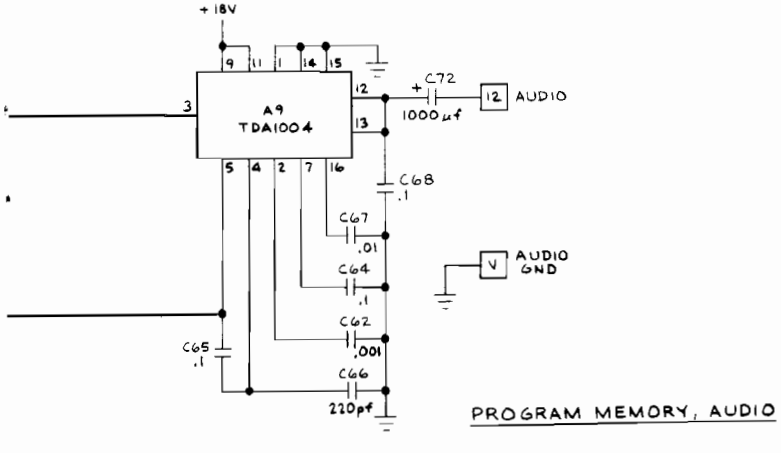


Figure 4-4 Avalanche PCB Schematic Diagram A (Sheet 3 of 4)

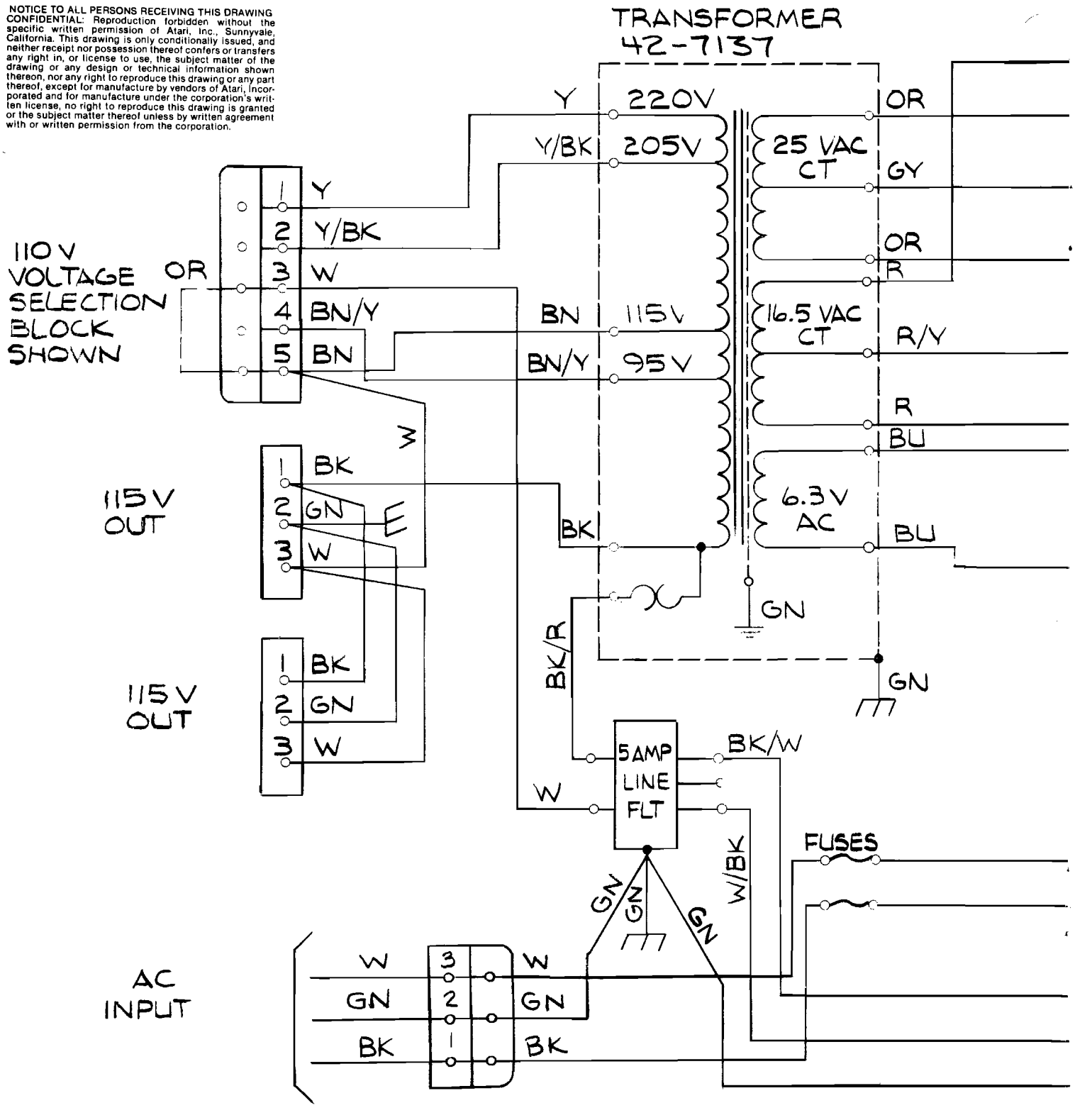

-01 VERSION
-02 VERSION
C/D2 030611-01 7800-7FFF HIGH
D/E2 030612-01 6800-6FFF HIGH
E2 030613-01 7000-77FF HIGH
C/D3 030614-01 7800-7FFF LOW
D/E3 030615-01 6800-6FFF LOW
E3 030616-01 7000-77FF LOW
A2 AR 030608-01 7800-7FFF
B2 AR 030609-01 7000-77FF
C2 AR 030610-01 6800-6FFF
+5V
ABUS10
ABUS9
ABUS8
ABUS7
ABUS6
ABUS5
ABUS4
ABUS3
ABUS2
ABUS1
ABUS0
D7
D6
D5
D4
D3
D2
D1
D0
PROGSEL
ABUS11
XTRAPROG
ATTRACT
ZV
AUD0
256H
16V
K4 164
L4 164
SOUNDLVL
WRITE
DBUS5
DBUS4
DBUS3
DBUS2
DBUS1
DBUS0
R61 39K
R41 1K
R40 2.2K
R45 3.9K
R46 8.2K
R42 15K
R47 33K
R50 33K
R36 VOL 50K
C63 .1
C61 .1
AUD1
32V
AUD2
8V
R34 68K
R35 68K
R44 22K
R43 12K
Q4 2N3643





PROGRAM MEMORY, AUDIO

Figure 4-4 Avalanche PCB Schematic Diagram A (Sheet 4 of 4)



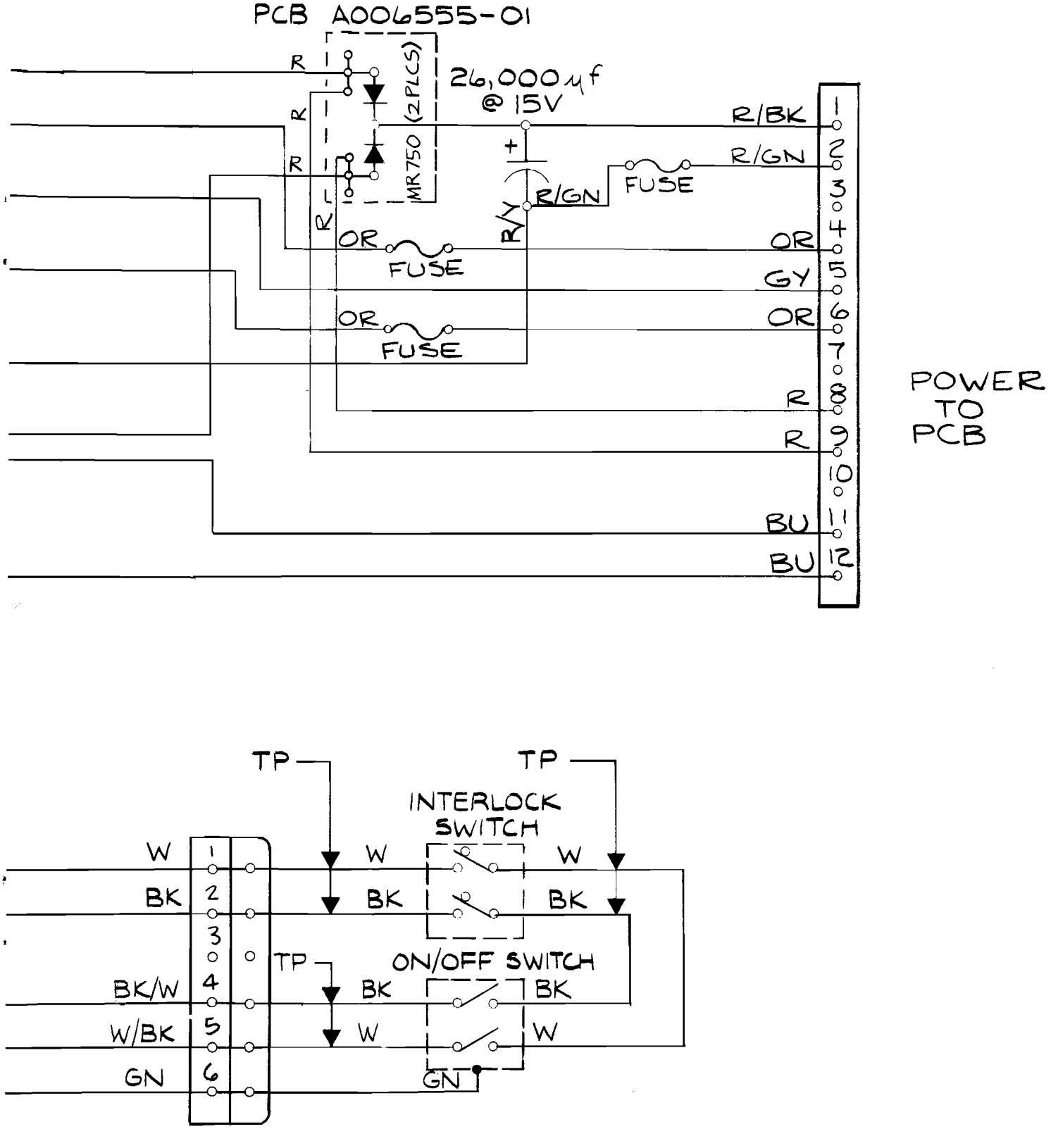


Figure 4-5 Type B Power Supply Schematic Diagram
007197-01 C

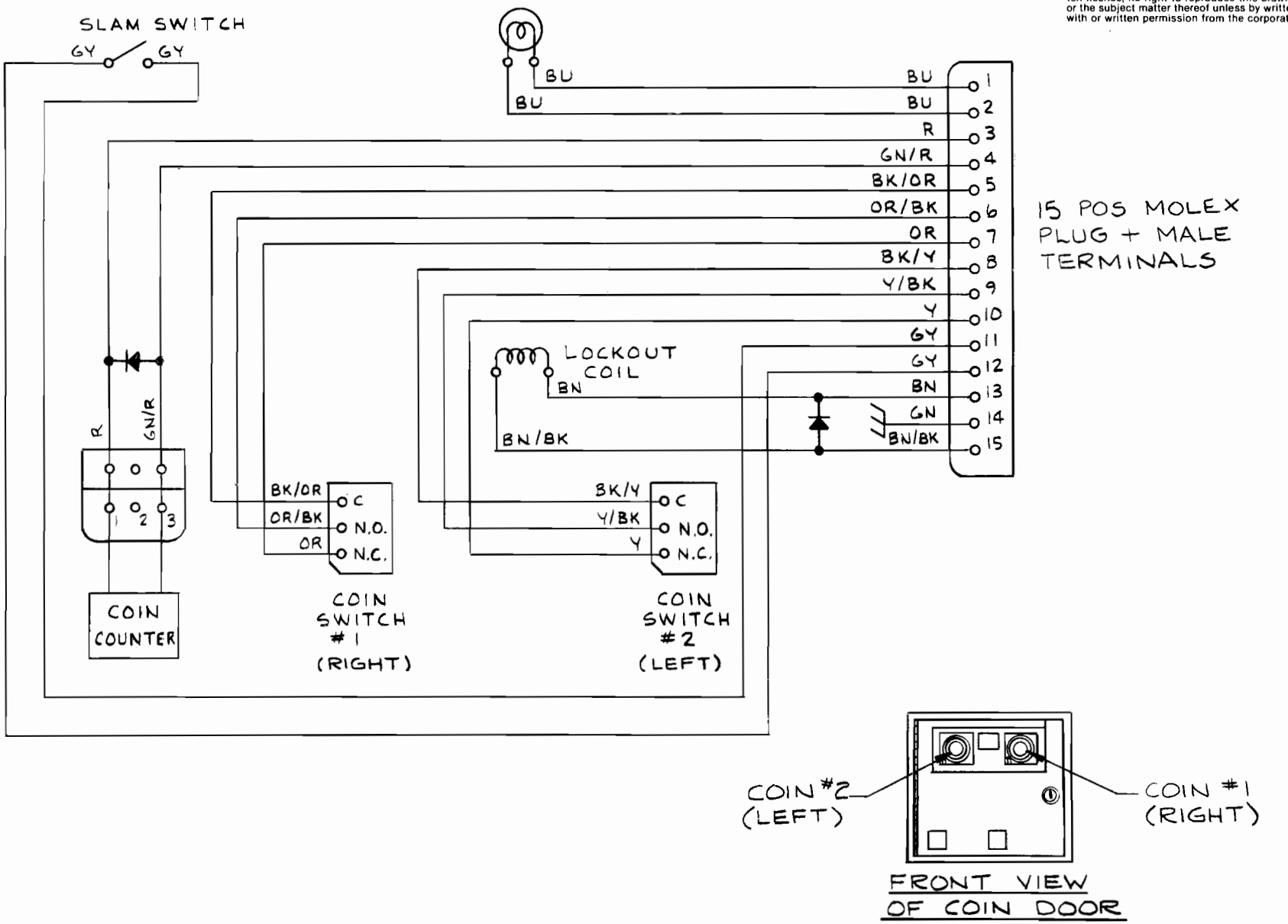
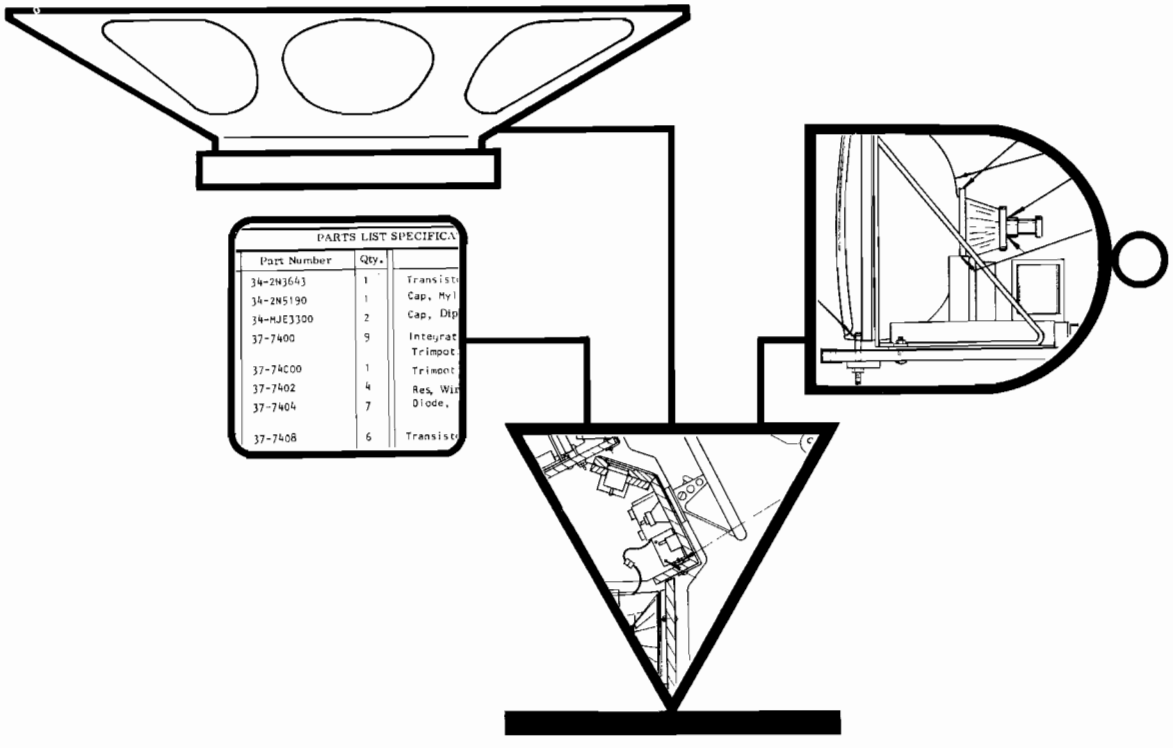


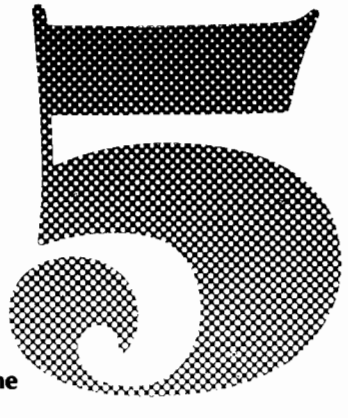
Figure 4-6 Coin Door Schematic 030401-01 B



ILLUSTRATED PARTS CATALOG

The purpose of this chapter is to provide you with the necessary information for ordering replacement parts for the Avalanche game.

When ordering parts from your distributor, give the part number, part name, applicable figure number of this catalog, and the serial number of your Avalanche 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.



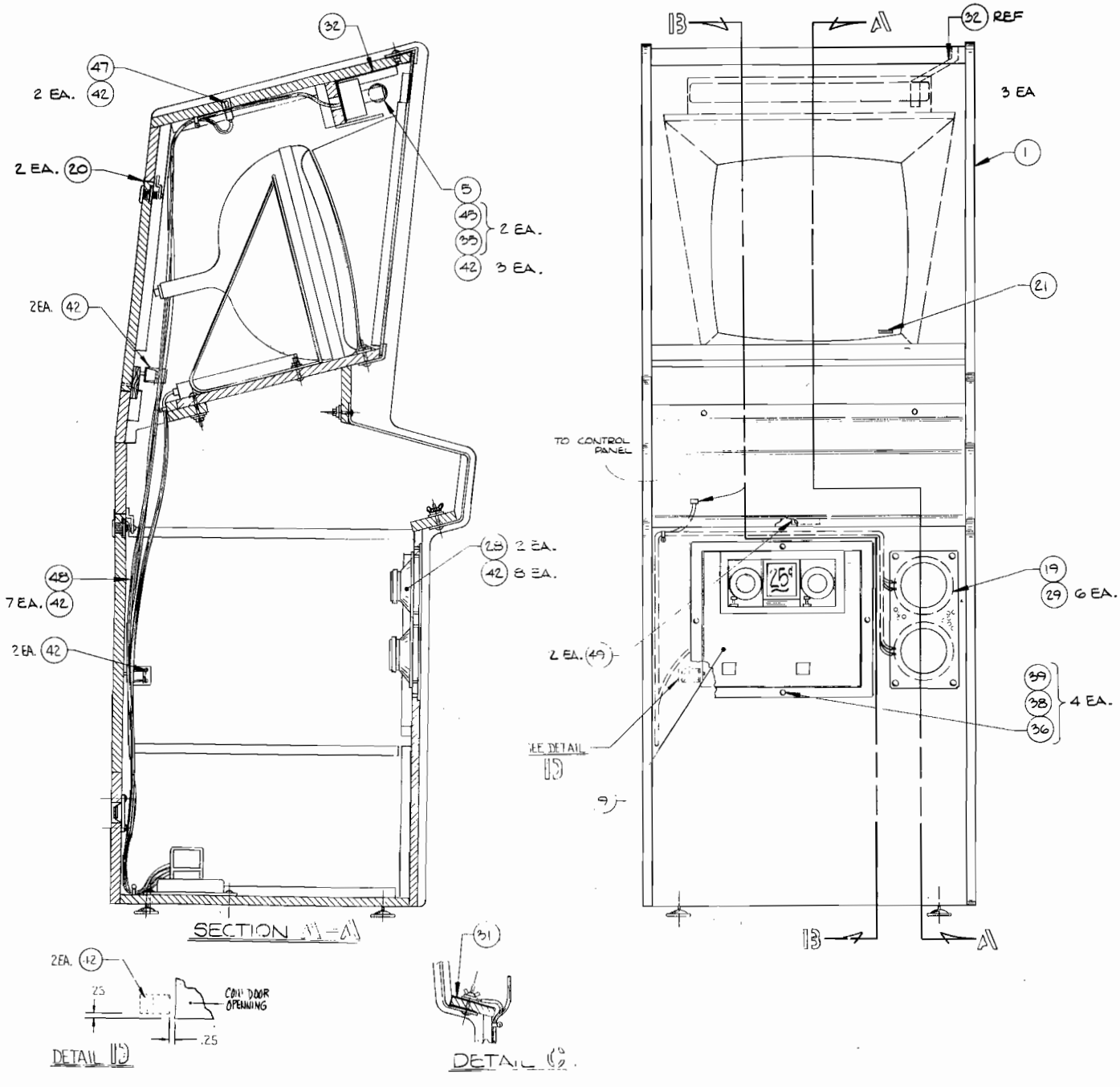


Figure 5-1 Final Assembly A030500-01

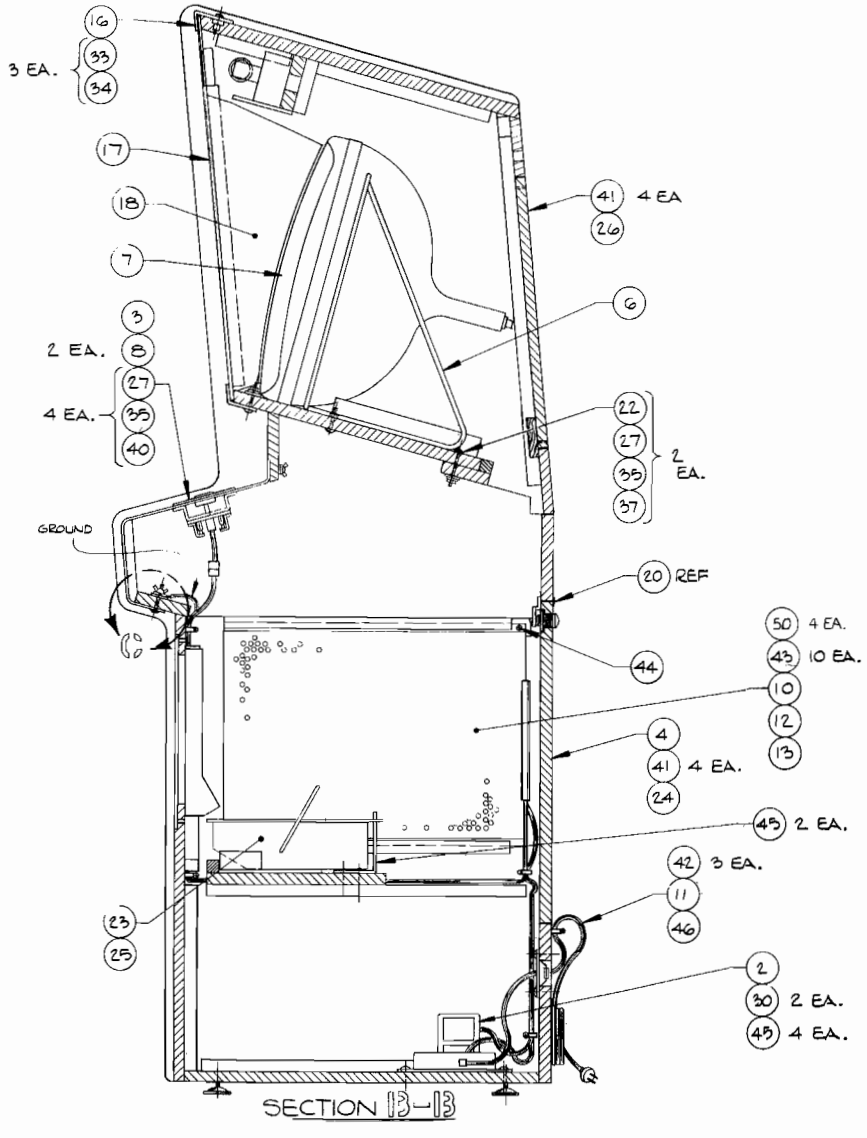


Figure 5-1 Final Assembly A030500-01

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Figure 5-1 Final Assembly Parts List

Item	Part Number	Qty.	Description
1	A030501-01	1	Cabinet Assy with Graphics
2	A007197-01	1	Power Supply Assy, Type B
3	A030502-01	1	Control Panel Assy
4	A006877-02	1	Lower Rear Door Assy
5	A006917-01	1	Flourescent Light Assy
6	A030838-01	1	T.V. Shelf Assy
7	A030504-01	1	Decal Location Diagram Assembly
8	75-5120B	2	Carriage Bolts, #10-24 x 1.25 Lg
9	A009083-01	1	Coin Door Assembly
10	A009262-04	1	R.F. Shield Box Assembly(15½"Long)
11	A007784-01	1	Power Cord Assy, Strain Relief
12	A030727-01	1	R.F. Shield PC BD Assembly
13	A030572-01	1	P.C. Board Assy, Avalanche
14	006305-01	1	Printed Poly Bag
15	TM-096	1	Operation, Maintenance and Service Manual, Complete with Illustrated Parts Catalog
16	006873-01	1	Retainer, Plexglass
17	030311-01	1	Plexiglas, Shield W/Graphics
18	009010-02	1	Bezel, Cardboard
19	009011-01	1	Speaker, Grill Cover
20	005233-01	2	Rear Door Seal
21	006319-02	1	Copyright Decal
22	75-5132N	2	Carriage Bolts, #10-24 x 2.00" Lg"
23	A007902-01	1	Cash Box Assembly
24	ST-096	1	Self Test Chart
25	006870-01	1	Coin Box Bracket
26	A030453-01	1	Assy, Rear Door, Upper Service Panel
27	75-040	6	Washers, Split Lock, #10
28	48-004	2	Speakers, 5 inch
29	73-77004	6	Rivets, 3/16" O.D. x .68 Lg (.250 x .500 Grip)
30	46-201302	2	Fuses, 3 AMP
31	78-6601216	1	Alum. Foil, 1" Wide x 5" Long
32	78-6601216	1	Alum. Foil, 1" Wide x 12" Lg. (Approx.)
33	82-8016	3	Screws, Button Hd. Socket Cap. #10-32 x 1.00 Lg.
34	75-99090006	3	Wellnuts, Blind Hole Fastener #10-32
35	75-010S	8	Washers, Flat, #10
36	75-5516B	4	Carriage Bolts, #¼-20 x 1.00 Lg (Black)
37	75-911S	2	Hex Nuts, #10-24
38	75-015S	4	Washers, Flat #¼
39	75-990505S	4	Hex Nuts, #¼-20, Nylon Locking

Figure 5-1 Final Assembly
Parts List

Item	Part Number	Qty.	DESCRIPTION
40	75-931S	4	Wing Nuts, #10-24
41	82-1824	8	Wood Screws, #8 x 1½" Lg. Ft. Hd. Phil.
42	72-6610	27	Screws, S.M. Pan Hd. Phil. #6 x 5/8 Lg.
43	72-6608	12	Screws, S.M. Pan Hd. Phil. #6 x ½ Lg.
44	72-6808	1	Screws, S.M. Pan Hd. Phil. #8 x ½ Lg.
45	72-6812	8	Screws, S.M. Pan Hd. Phil. #8 x 3/4 Lg.
46	78-25001	1	Screw Down Tie Wraps
47	A032562-01	1	Power Switches & Harness Assy
48	A030690-02	1	Volume Control & Main Harness Assy
49	72-6810	2	Screw, SM Pan Hd Phil #8 X 5/8" Lg.
50	78-24007	4	Cable Tie, Heat Stabilized

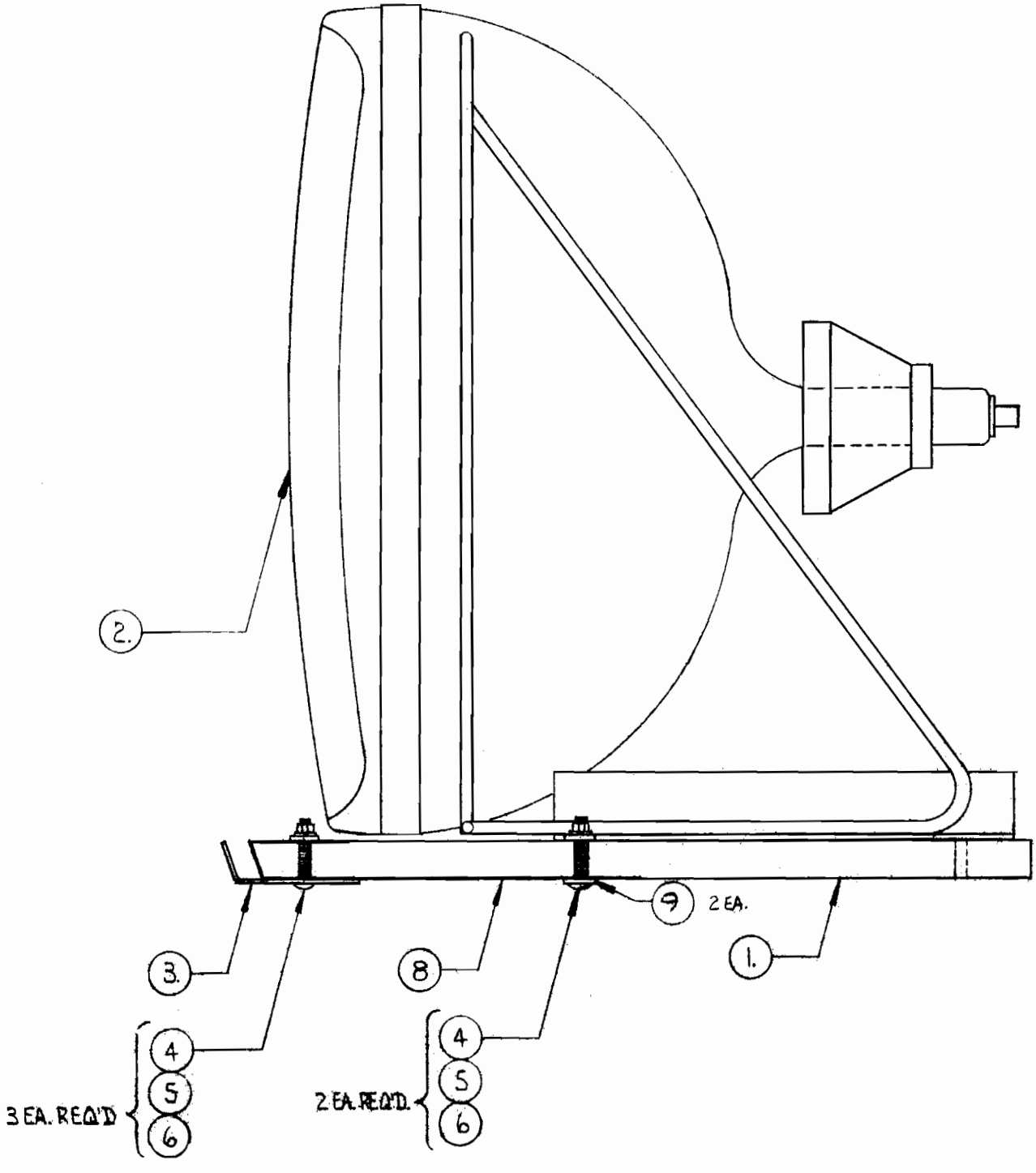

Figure 5-2 TV Shelf Assembly A030836-01

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Figure 5-2 TV Shelf Assembly
Parts List

Item	Part Number	Qty.	Description
1	030834-01	1	T.V. Mounting Board
2	92-033	1	T.V. Monitor, 23"
3	006874-01	1	Plexiglas Retainer
4	75-5120B	5	Carriage Bolts, #10-24 X 1¼ Lg.
5	75-040	5	Washers, Split-Lock, #10
6	75-010S	5	Washers, Flat, #10
7	75-911S	5	Hex Nuts, #10-24
8	78-6601216	1	Alum. Foil, 1" Wide X 10" Lg. (Approx.)
9	75-015S	2	Flat Washer, #¼

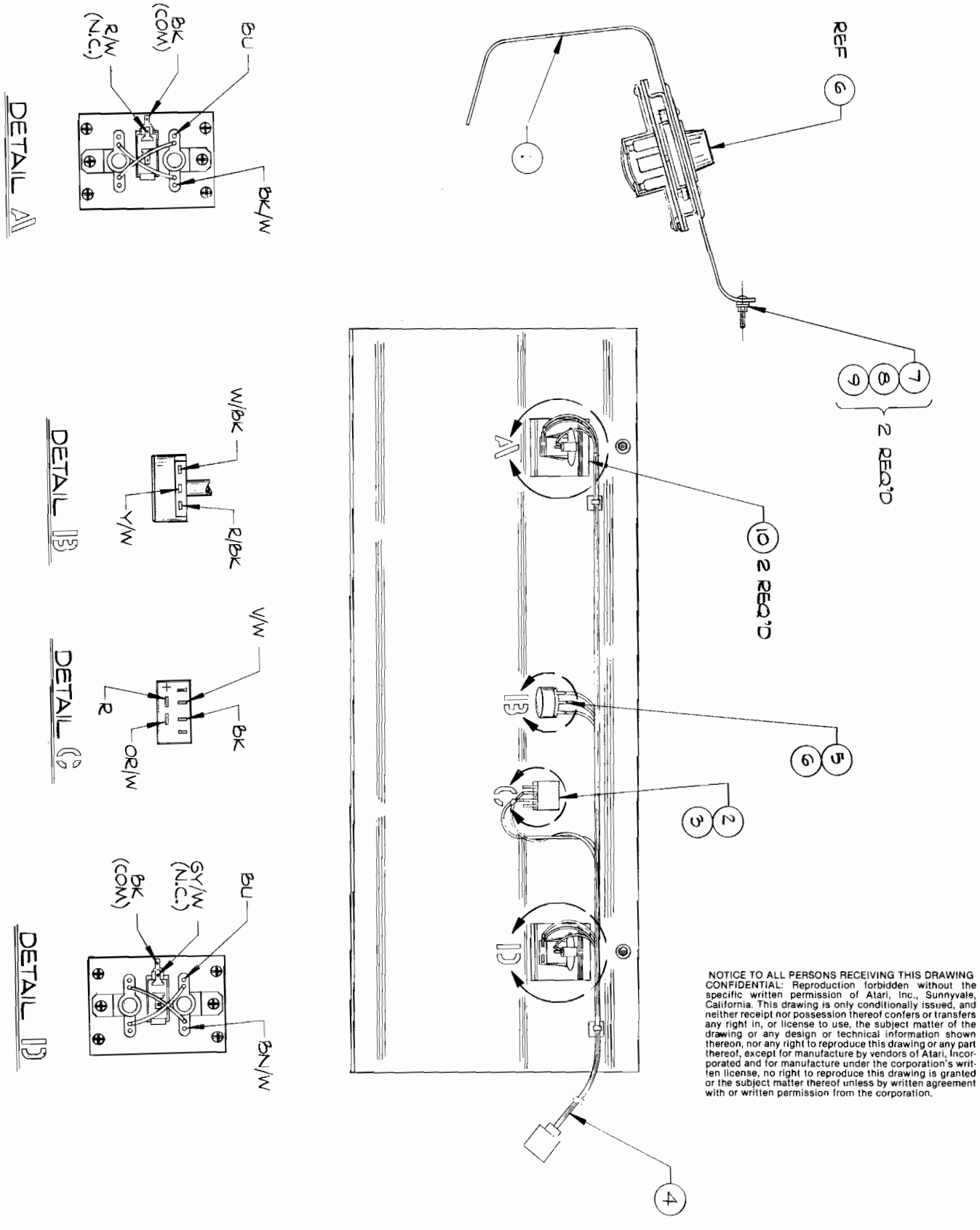

Figure 5-3 Control Panel Assembly A030502-01

Figure 5-3 Control Panel Assembly Parts List

Item	Part Number	Qty.	Description
1	030310-01	1	Control Panel W/Graphics
2	001856-01	1	Bushing, Alum.
3	62-002	1	Led Switch, Lighted
4	A030691-01	1	Control Panel Harness Assembly
5	19-9022	1	Pot, 5K, Slip Clutch
6	73-812	1	Knob, Black W/Skirt
7	75-5120BX	2	Carriage Bolts, #10-24 X 1.25" Lg., Black
8	75-040	2	Lockwasher, #10, Split
9	75-911S	2	Hex Nuts, #10-24
10	A007357-01	2	Start Button Assembly (With Lights)

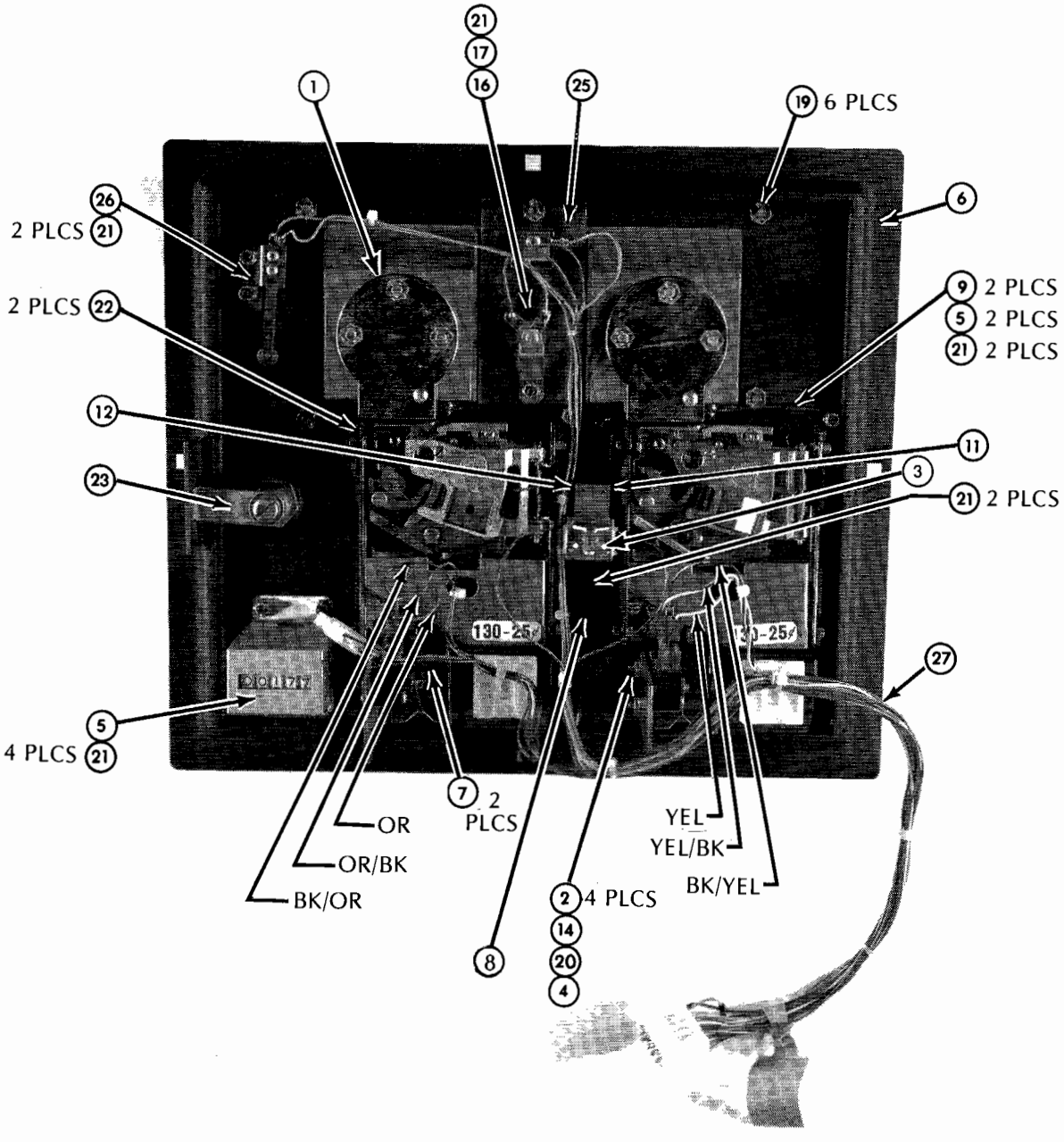

Figure 5-4 Coin Door Assembly A009083-01 C

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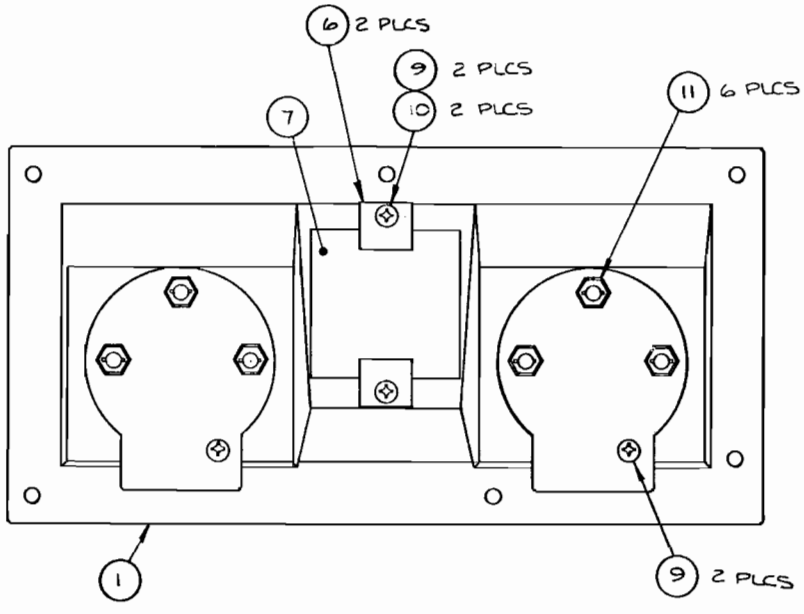
Figure 5-4 Coin Door Assembly Parts List

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. See Figure 5-5
2	75-9165	4	Nut, 6-32
3	A030362-01	1	Coin Lock-Out Assembly, See Figure 5-6
4	A007640-01	2	Coin Switch Assembly, See Figure 5-7
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
	71-1205FF	Ref.	Coin Mechanism for German Mark Only
	71-1201MG	Ref.	Coin Mechanism for Swedish Krona Only
	71-1201KS	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
27	A006921-01	1	Harness Assembly



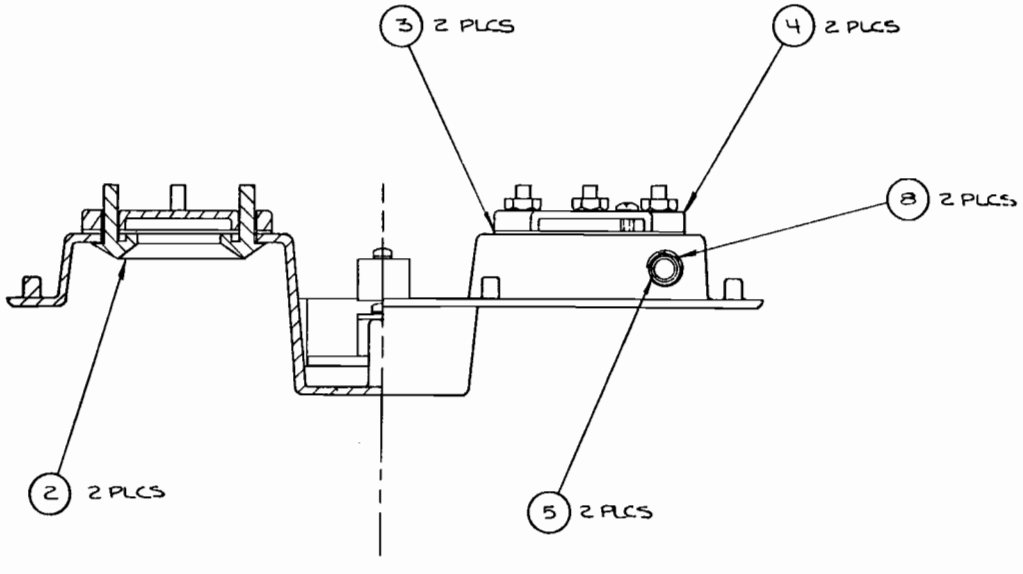


Figure 5-5 Front Bezel Assembly A007637-01 thru -07 D

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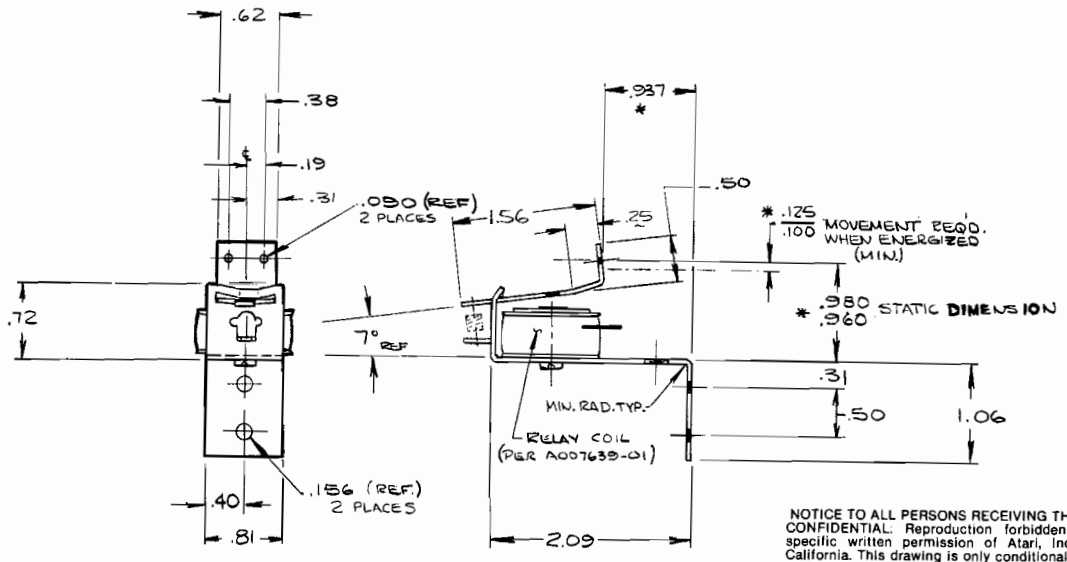
Figure 5-5 Front Bezel Assembly
Parts List

Item	Part Number	Qty.	Description
1	004328-01	1	Bezel
2	See below	2	Ring
3	004331-01	2	Coin Shield
4	004332-01	2	Primary Coin Chute
5	004327-01	2	Bearing, Scavenger Button
6	004329-01	2	Clamp, Price Plate
7	See Below	1	Price Plate
8	73-3009	2	Retaining "C" Ring, Truarc #5103-37
9	72-1604S	4	Mach. Scr., 6-32 x ¼ Lg. Pan Hd., Phil
10	75-046	2	Washer, #6, Split-Lock
11	75-9914001	6	Self-Threading Nut, Tinnerman #SR188006

DASH NO	ITEM 2	ITEM 7	DENOMINATION
-01	004330-01	004343-01	25¢
-02	004330-01	004343-06	5 FR
-03	009153-01	004343-04	1 DM
-04	004330-01	004343-03	1 KR
-05	009520-01	004343-05	100 Y
-06	007752-01	004343-02	10 P
-07	007752-01	004343-07	20¢ AUST.



NOTES:

1. Dimensions shown are dim's req'd. to interchange & replace relay
   with existing equipment in field and production.
2. Break & deburr all sharp corners.
3. Dimensions taken from tooled part.
   Dimensions with * are specified dims. required in tooling by Engineering to have part interchange with prior buyout part.
4. Coil data: 10 VDC ± 2, 50 Ω resistance current 200 ma maximum.
5. Manufacturer: Coin Mech, Inc.

DETAIL OF RELAY COIL (A007639-01)

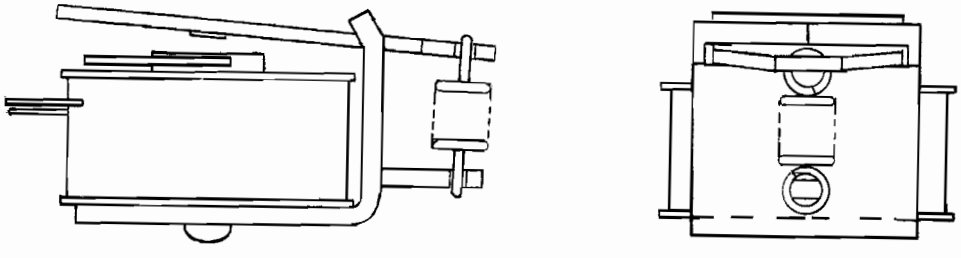
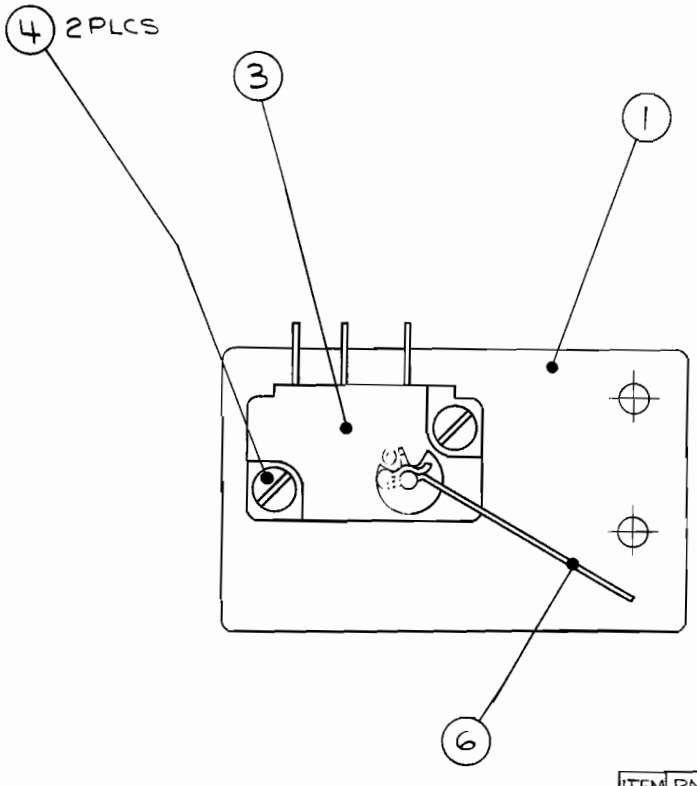
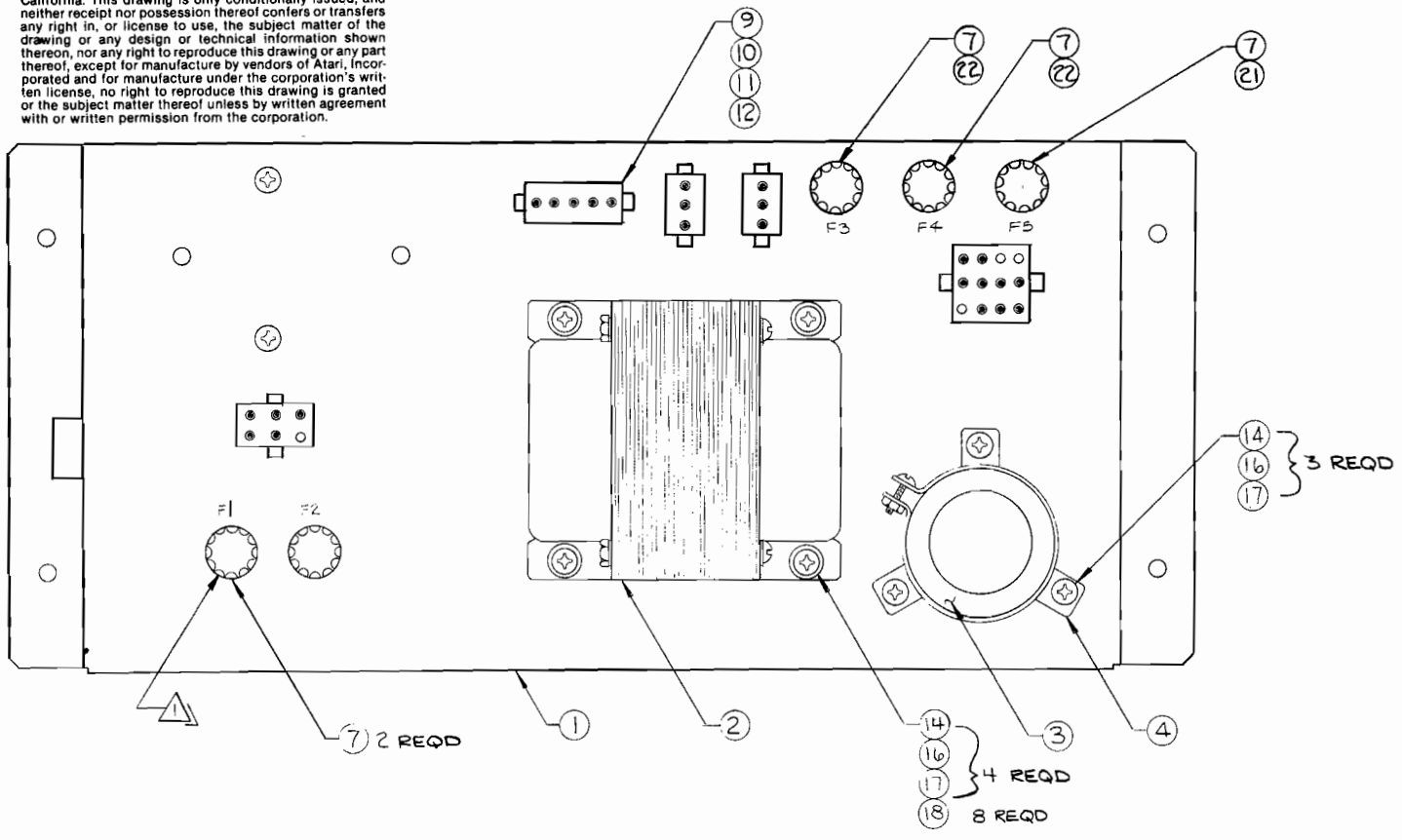


Figure 5-6 Coin Lockout Assembly A030362-01 A



ITEM	PART NO.	DESCRIPTION	QTY
1	004342-01	SWITCH MTG PLATE	1
2			
3	65-441C	SWITCH, OMRON C-5G3-3	1
4	72-HA 4412	SCR, MS, #4-40 x 3/4 LG ROLL TIGHT SELF TAPPING	2
5			
6	008824-01	WIREFORM, CHERRY	1

Figure 5-7 Coin Switch Assembly A007640-01 D



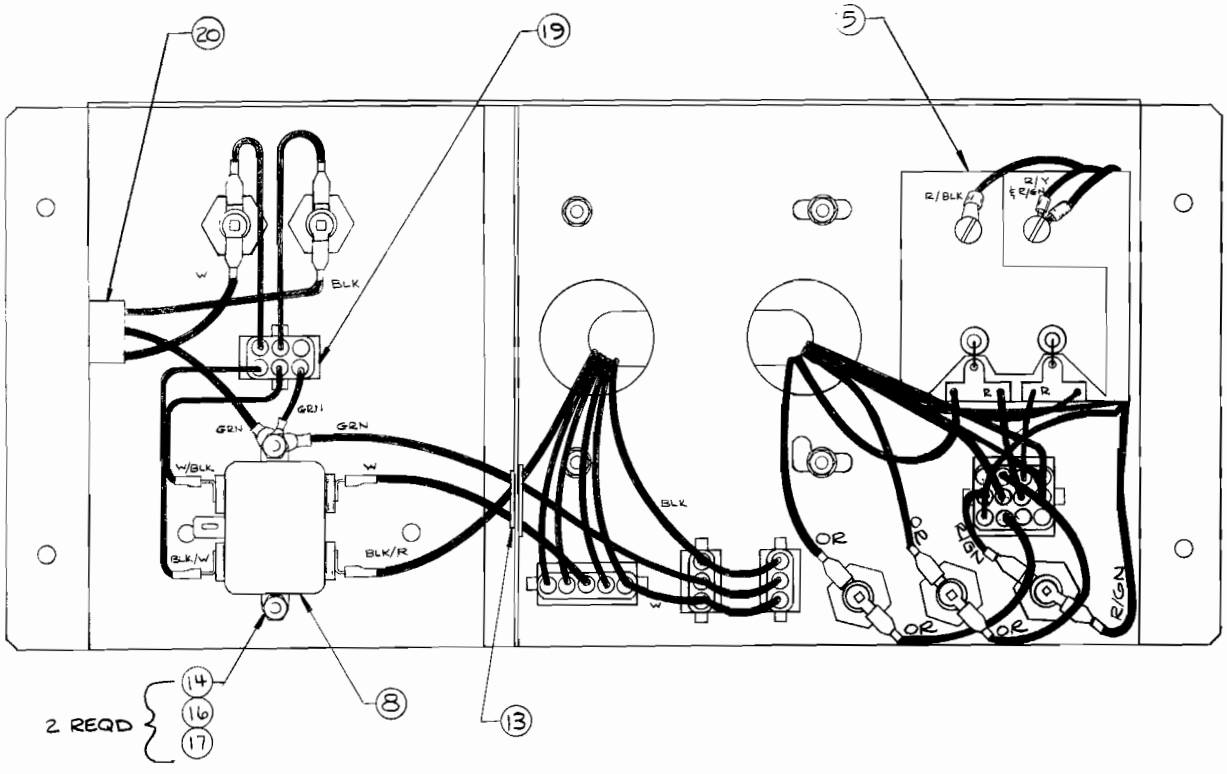


Figure 5-8 Type B Power Supply
A007197-01 H

Figure 5-8 Type B Power Supply Parts List

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	72-1810S	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	8	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

DWG NO.	FL LIGHT SIZE	HARNESS LENGHTH	SEE NOTE
-01	18 IN.	100 IN.	
-02	24 IN.	100 IN.	
-03	18 IN.	70 IN.	
-04	24 IN.	70 IN.	
-05	18 IN.	82 IN.	
-06	24 IN.	82 IN.	
-07	18 IN.	100 IN.	1
-08	24 IN	100 IN.	1
-09	18 IN	82 IN.	1
-10	24 IN	82 IN.	1
-11	18 IN	18IN	

DWG NO.	FL LIGHT SIZE	HARNESS LENGTH	SEE NOTE
-12	24 IN.	18 IN.	

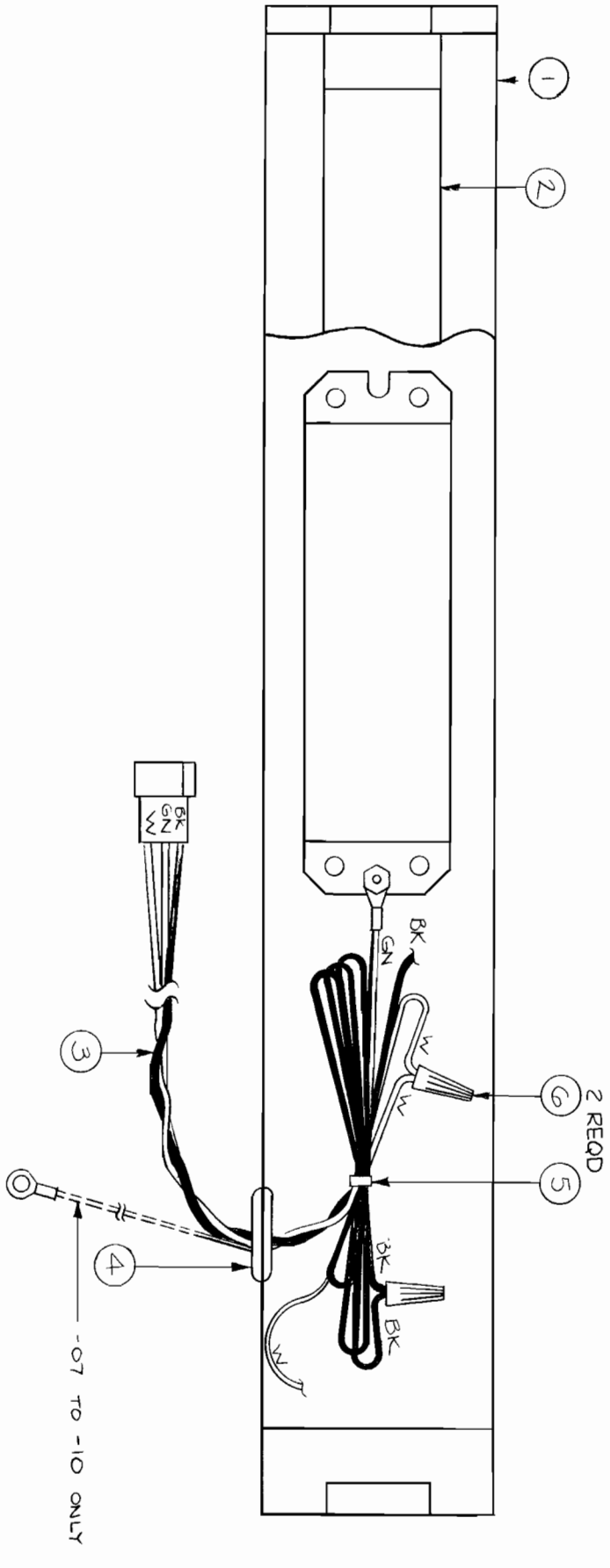


Figure 5-9 Type A Fluorescent Light Assembly A006917-01 D

Figure 5-9 Type A Fluorescent Light Assembly Parts List

Item	Part Number	Qty.	Description
1	93-104	1	Gibson Fluorescent Fixture 18 inch
2	70-303	1	Fluorescent Tube 18 inch (or Equivalent)
3	A006916-01	1	Fluorescent Light Harness, 100"
4	78-2652	1	Grommet, Rubber
5	78-24001	A/R	Tie Wrap
6	79-561816	2	Wire Nut, Ideal 71-B

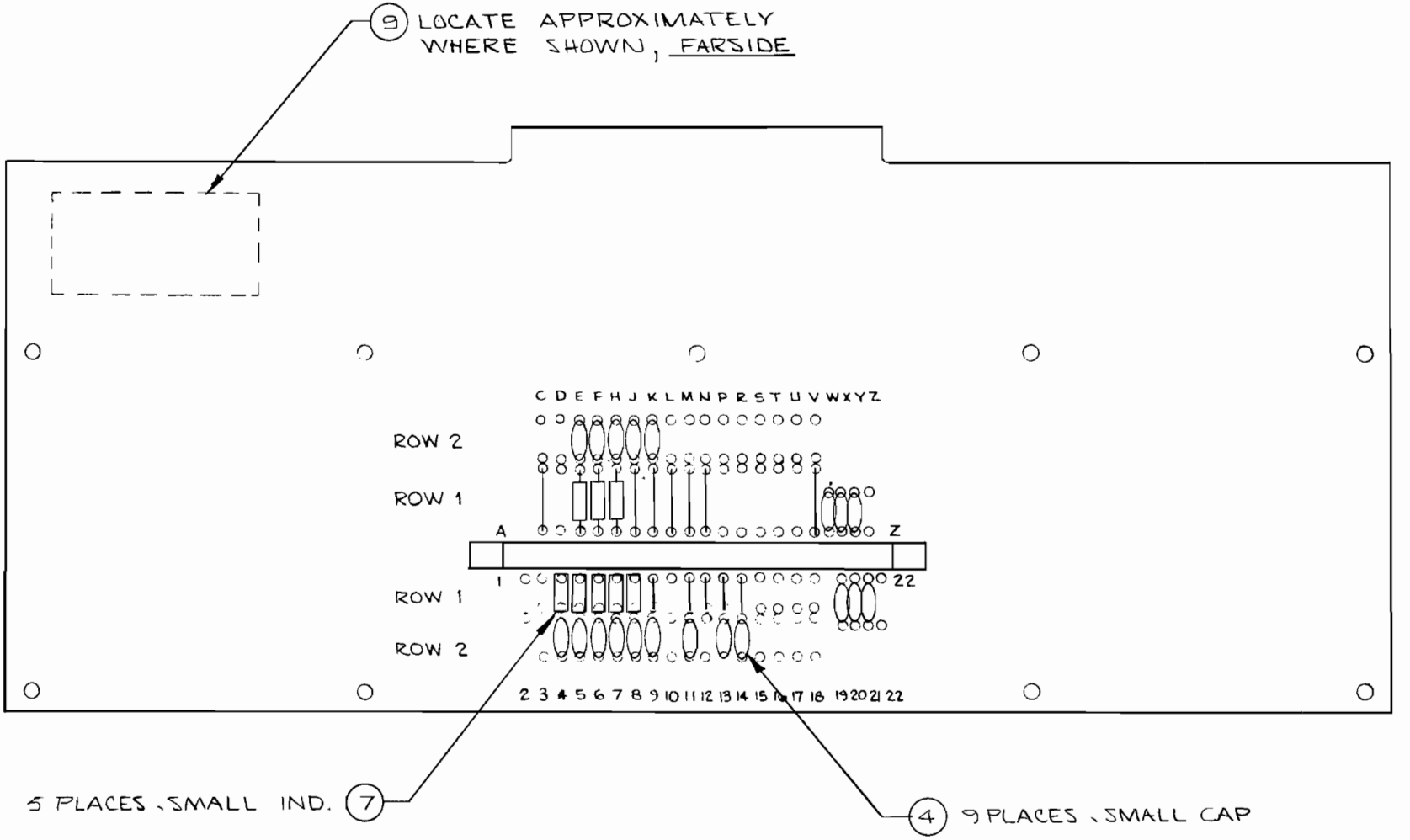


Figure 5-10 RF Shield Board Assembly A030727-01 A

Figure 5-10 RF Shield Board Assembly
Parts List

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	11	Cap, Cer Disc, 0.1uf, 25V
4	27-A250104	9	Cap, Cer Disc, 0.1uf, 25V (Small, Bottom Row)
5	41-3003	3	Inductor, 100uh
6	41-3004	5	Inductor, 100uh (Small, Bottom Row)
7	52-003	7	Jumper, .60 Centers
8	52-004	5	Jumper, .30 Centers
9	009468-01	1	Decal, R.F. Shield Label

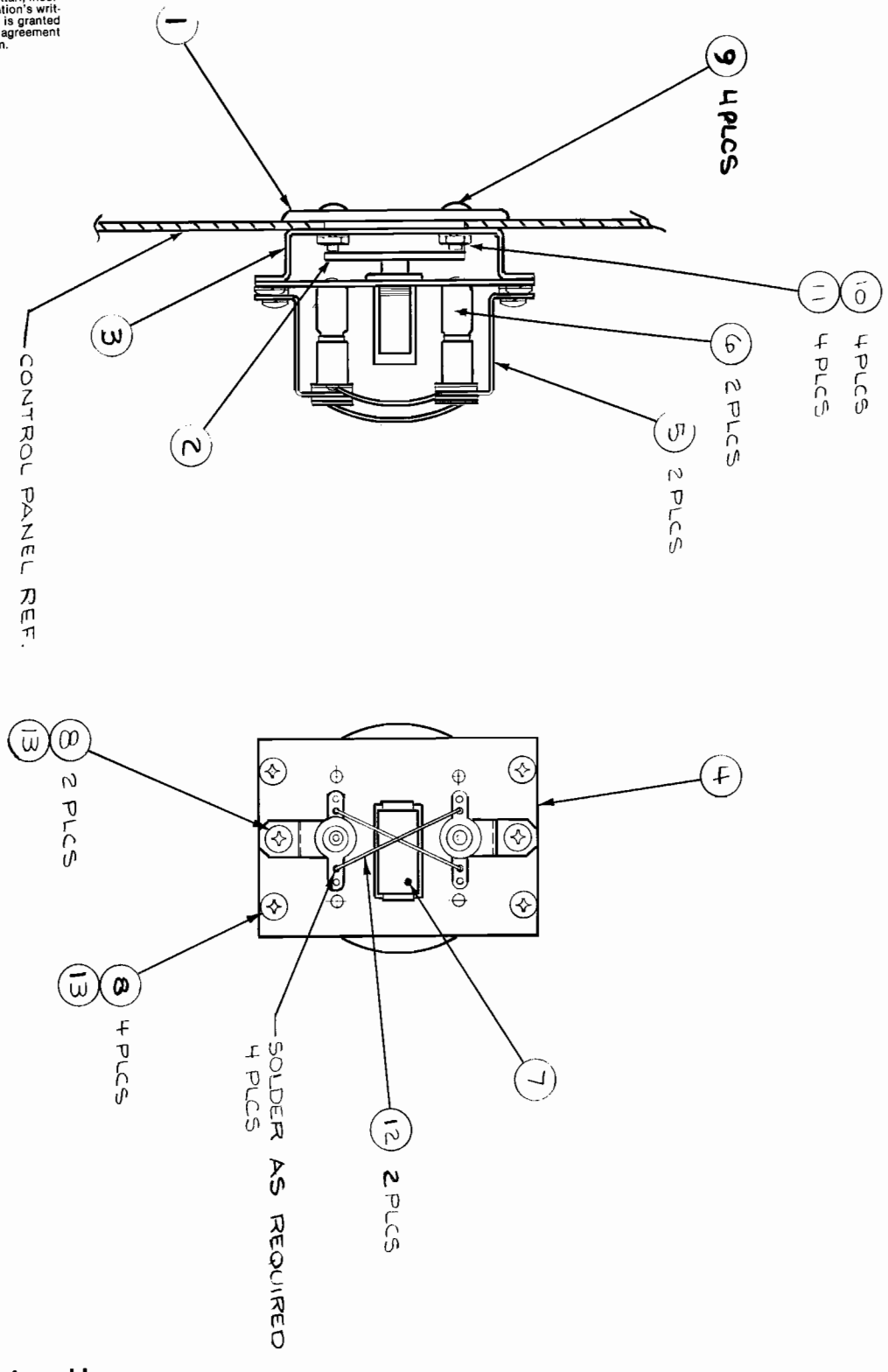


Figure 5-11 Start Button Assembly A007357-01 D

Figure 5-11 Start Button Assembly Parts List

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 $\frac{3}{16}$ Lg, Pan Hd, Phil.
9	82-8808	4	Screw, Button hd socket 8-32x $\frac{1}{2}$ 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

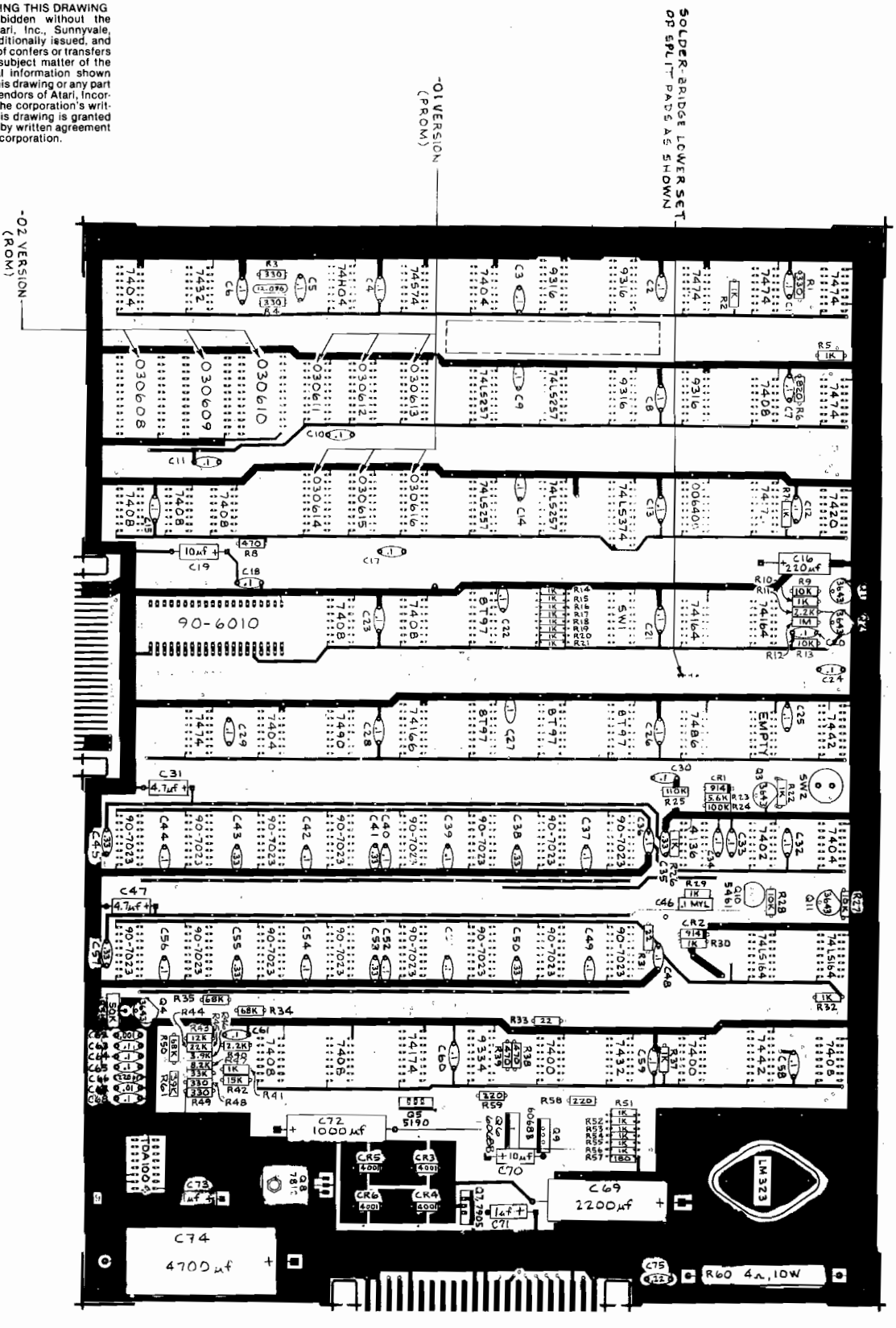


Figure 5-12 Avalanche PCB Assembly A030572-01 A

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Figure 5-12 Avalanche PCB Assembly
Parts List
-01 Version

Item	Part Number	Qty.	Description	
1	030574-01	1	P.C. Board	
2	10-5220	2	Res, Carbon, 5%, ¼W, 22 OHM	R31,33
3	10-5181	1	" " " " 180 "	R57
4	10-5331	5	" " " " 330 "	R1,3,4,48,49
5	10-5471	3	" " " " 470 "	R8,38,39
6	10-5102	25	" " " " 1K "	R2,5,7,10,14-22,26, 29,30,32,37,41,51-56
7	10-5222	2	" " " " 2.2K "	R11,40
8	10-5392	1	" " " " 3.9K "	R45
9	10-5562	1	" " " " 5.6K "	R23
10	10-5822	1	" " " " 8.2K "	R46
11	10-5103	4	" " " " 10K "	R9,13,27,28
12	10-5123	1	" " " " 12K "	R43
13	10-5153	1	" " " " 15K "	R42
14	10-5223	1	" " " " 22K "	R44
15	10-5333	2	" " " " 33K "	R47, 50
16	10-5683	2	" " " " 68K "	R34,35
17	10-5104	1	" " " " 100K "	R24
18	10-5114	1	" " " " 110K "	R25
19	10-5105	1	" " " " 1M "	R12
20	19-315503	1	Trimpot, 50K OHM	R36
21	19-805W4P0	1	Res, Wirewound, 10W, 4 OHM	R60
22	10-5821	1	Res, Carbon, 5%, ¼W, 820 OHM	R6
23	10-5393	1	Res, Carbon, 5%, ¼W, 39K OHM	R61
24	10-5221	2	" " " " 220 "	R58,59
25	21-101104	1	Cap, Mylar, 100V, .1uf	C46
26	24-250105	2	" Elec., 25V, 1uf	C71,73
27	24-250475	2	" " " 4.7uf	C31,47
28	24-250106	2	" " " 10uf	C19,70
29	24-250227	1	" " " 220uf	C16
30	24-250108	1	" " " 1000uf	C72
31	24-250228	1	" " " 2200uf	C69
32	24-250478	1	" " " 4700uf	C74
33	27-250102	1	" Cer. Disc, 25V, .001uf	C62
34	27-250103	1	" " " " .01uf	C67
35	27-250334	9	" " " " .33uf	C35,38,41,43,45,50, 53,55,57
36	27-250224	1	" " " " .22uf	C75

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Figure 5-12 Avalanche PCB Assembly
Parts List
-01 Version

Item	Part Number	Qty.	DESCRIPTION	
37	27-250104	51	Cap, Cer. Disc, 25V, .luf	C1-15,17,18,20-30, 32-34,36,37,39, 40,42,44,48,49, 51,52,54,56,58- 61,63-65,68
38	28-101221	1	" Dipped Mica, 100V, 220pf	C66
39				
40				
41				
42	31-1N914	2	Diode, 1N914	CR1,2
43	31-1N4001	4	Diode, 1N4001	CR3-6
44				
45				
46	34-2N6068A	2	Thyrister, 2N6068A	Q6,9
47	39-2N5461	1	Transistor, 2N5461	Q10
48	34-2N3643	5	Transistor, 2N3643	Q1-4,11
49	34-2N5190	1	Transistor, 2N5190	Q5
50	37-7400	2	Integrated Circuit 7400	H8,K8
51	37-7402	1	" " 7402	L6
52	37-7404	4	" " 7404	A1,F1,C5,M6
53	37-74H04	1	" " 74H04	D1
54	37-7408	9	" " 7408	L2,A3,A/B3,B/C3, D4,E4,C8,D8,M8
55	37-74166	1	" " 74166	E5
56	37-7420	1	" " 7420	M3
57	37-7432	1	" " 7432	B1
58	37-7442	2	" " 7442	M5,L8
59	37-7474	5	" " 7474	K1,L1,M1,M2,B5
60	37-74S74	1	" " 74S74	E1
61	37-7486	1	" " 7486	K5
62	37-7490	1	" " 7490	D5
63	37-74164	2	" " 74164	K4,L4
64	37-74LS164	2	" " 74LS164	L7,M7
65	37-74174	1	" " 74174	E8
66	37-74175	1	" " 74175	L3
67	37-74LS257	4	" " 74LS257	F2,H2,F3,H3
68	37-74LS374	1	" " 74LS374	J3
69	37-TDA1004	1	Audio AMP TDA1004	A9
70	37-4136	1	Integrated Circuit 4136	K6
71	37-8T97	4	" " 8T97	F4,F5,H5,J5
72	37-9316	4	" " 9316	H1,J1,J2,K2
73	37-9334	1	" " 9334	F8
74	37-LM323	1	Regulator, LM323	
75	37-7812	1	" 7812	Q8
76	37-7905	1	" 7905	Q7
77				
78				
79				
80				
81				
82	62-001	1	Switch, SPST, MOM	SW2
83	66-118PIT	1	Switch, SPST, X8, DIP	SW1
84	72-1608C	2	Screw, Pan Hd., Ph., 6-32 X ¼ Lg. Cres	
85	75-016	2	Washer, Flat, #6	
86	75-056	2	Washer, Lock, Int. Star, #6	

Item	Part Number	Qty.	DESCRIPTION	
87	75-916C	2	Nut, Hex, #6-32 Cres	
88	72-1408C	1	Screw, Pan Hd., Ph., 4-40 X ¼ Lg. Cres	
89	75-014	1	Washer, Flat, #4	
90	75-054	1	Washer, Lock, Int. Star, #4	
91	75-914S	1	Nut, Hex, #4-40 Cres	
92	78-16006	1	Silpad	
93	78-06001	1	Heatsink (LM323)	
94	009470-01	1	Heatsink (TDA1004)	
95	78-13016	AR	Cement (TDA1004 Heatsink)	
96	78-16005	1	Silpad (LM323)	
97				
98				
99				
100	79-42040	1	Socket, 40 PIN, Med. Insertion	B4
101				
102				
103	90-102	1	Crystal, 12.096 MHZ	Y1
104				
105				
106	90-6010	1	Microprocessor	B4
107	90-7023	16	RAM, 7023	A6,B6,C6,D6,E6,F6, H6,J6,A7,B7,C7,D7, E7,F7,H7,J7
108	006400-01	1	Sync Prom	K3
109	030611-01	1	Prom 7800-7FFF High	C/D2
110	030612-01	1	" 6800-6FFF High	D/E2
111	030613-01	1	" 7000-77FF High	E2
112	030614-01	1	" 7800-7FFF Low	C/D3
113	030615-01	1	" 6800-6FFF Low	D/E3
114	030616-01	1	" 7000-77FF Low	E3
115				
116				
117				

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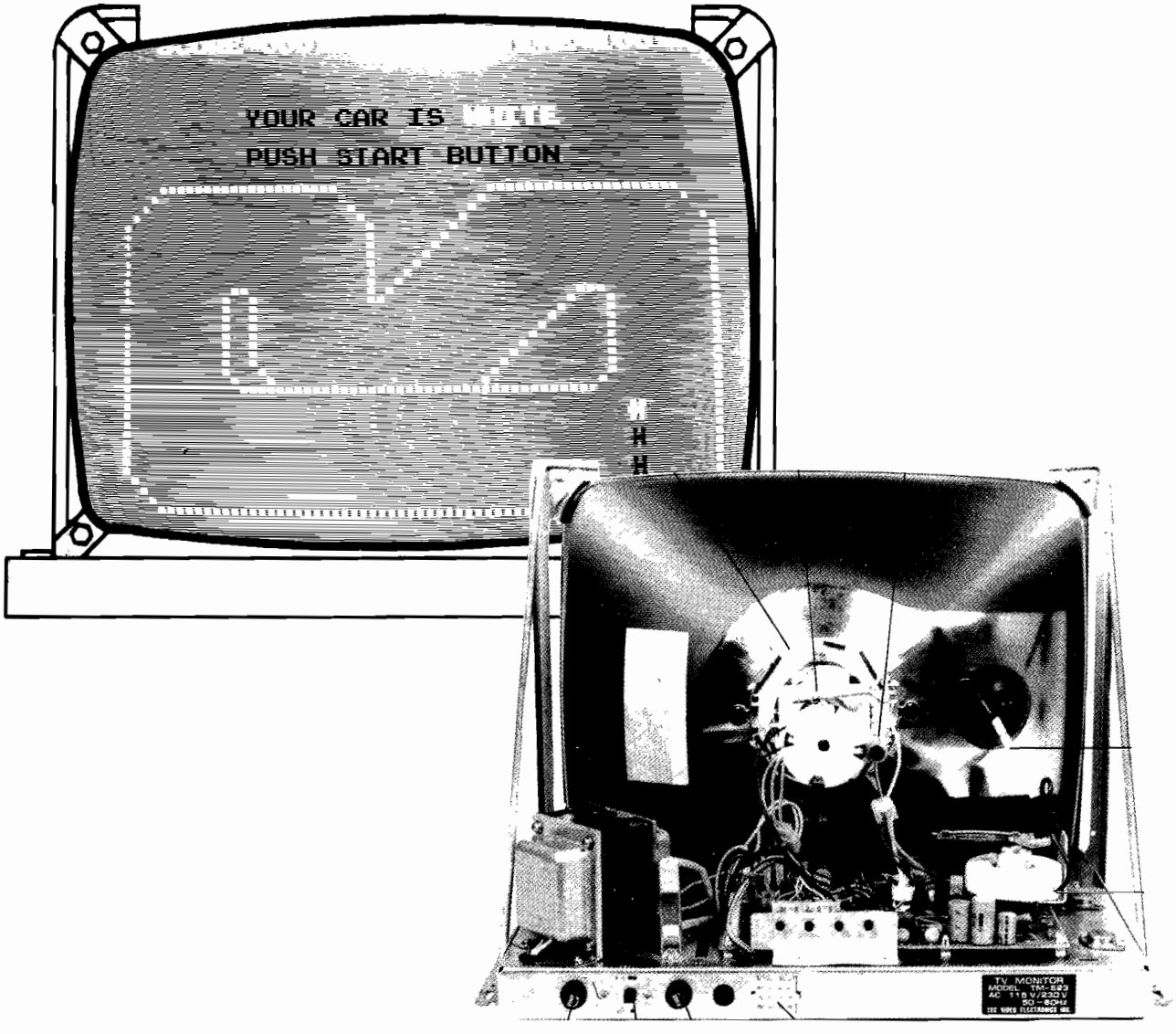
Figure 5-12 Avalanche PCB Assembly
Parts List
-02 Version

Item	Part Number	Qty.	Description	
1	030574-01	1	P.C. Board	
2	10-5220	2	Res, Carbon, 5%, ¼W, 22 OHM	R31,33
3	10-5181	1	" " " " 180 "	R57
4	10-5331	5	" " " " 330 "	R1,3,4,48,49
5	10-5471	3	" " " " 470 "	R8,38,39
6	10-5102	25	" " " " 1K "	R2,5,7,10,14-22,26,29,30,32,37,41,51-56
7	10-5222	2	" " " " 2.2K "	R11,40
8	10-5392	1	" " " " 3.9K "	R45
9	10-5562	1	" " " " 5.6K "	R23
10	10-5822	1	" " " " 8.2K "	R46
11	10-5103	4	" " " " 10K "	R9,13,27,28
12	10-5123	1	" " " " 12K "	R43
13	10-5153	1	" " " " 15K "	R42
14	10-5223	1	" " " " 22K "	R44
15	10-5333	2	" " " " 33K "	R47,50
16	10-5683	2	" " " " 68K "	R34,35
17	10-5104	1	" " " " 100K "	R24
18	10-5114	1	" " " " 110K "	R25
19	10-5105	1	" " " " 1M "	R12
20	19-315503	1	Trimpot, 50K OHM	R36
21	19-805W4P0	1	Res, Wirewound, 10W, 4 OHM	R60
22	10-5821	1	Res, Carbon, 5%, ¼W, 820 OHM	R6
23	10-5393	1	Res, Carbon, 5%, ¼W, 39K OHM	R61
24	10-5221	2	" " " " 220 "	R58,59
25	21-101104	1	Cap, Mylar, 100V, .1uf	C46
26	24-250105	2	" Elec., 25V, 1uf	C71,73
27	24-250475	2	" " " 4.7uf	C31,47
28	24-250106	2	" " " 10uf	C19,70
29	24-250227	1	" " " 220uf	C16
30	24-250108	1	" " " 1000uf	C72
31	24-250228	1	" " " 2200uf	C69
32	24-250478	1	" " " 4700uf	C74
33	27-250102	1	" Cer. Disc, 25V, .001uf	C62
34	27-250103	1	" " " " .01uf	C67
35	27-250334	9	" " " " .33uf	C35,38,41,43,45,50,53,55,57
36	27-250224	1	" " " " .22uf	C75

Figure 5-12 Avalanche PCB Assembly
Parts List
-02 Version

Item	Part Number	Qty.	DESCRIPTION	
37	27-250104	51	Cap, Cer. Disc, 25V, .1uf	C1-15,17,18,20-30, 32-34,36,37,39, 40,42,44,48,49, 51,52,54,56,58- 61,63-65,68
38	28-101221	1	" Dipped Mica, 100V, 220pf	C66
39				
40				
41				
42	31-1N914	2	Diode, 1N914	CR1,2
43	31-1N4001	4	Diode, 1N4001	CR3-6
44				
45				
46	31-2N6068B	2	Thyrister, 2N6068B	Q6,9
47	39-2N5461	1	Transistor 2N5461	Q10
48	34-2N3643	5	Transistor, 2N3643	Q1-4,11
49	34-2N5190	1	Transistor, 2N5190	Q5
50	37-7400	2	Integrated Circuit 7400	H8,K8
51	37-7402	1	" " 7402	L6
52	37-7404	4	" " 7404	A1,F1,C5,M6
53	37-74H04	1	" " 74H04	D1
54	37-7408	9	" " 7408	L2,A3,A/B3,B/C3, D4,E4,C8,D8,M8
55	37-74166	1	" " 74166	E5
56	37-7420	1	" " 7420	M3
57	37-7432	1	" " 7432	B1
58	37-7442	2	" " 7442	M5,L8
59	37-7474	5	" " 7474	K1,L1,M1,M2,B5
60	37-74S74	1	" " 74S74	E1
61	37-7486	1	" " 7486	K5
62	37-7490	1	" " 7490	D5
63	37-74164	2	" " 74164	K4,L4
64	37-74LS164	2	" " 74LS164	L7,M7
65	37-74174	1	" " 74174	E8
66	37-74175	1	" " 74175	L3
67	37-74LS257	4	" " 74LS257	F2,H2,F3,H3
68	37-74LS374	1	" " 74LS374	J3
69	37-TDA1004	1	Audio AMP TDA1004	A9
70	37-4136	1	Integrated Circuit 4136	K6
71	37-8T97	4	" " 8T97	F4,F5,H5,J5
72	37-9316	4	" " 9316	H1,J1,J2,K2
73	37-9334	1	" " 9334	F8
74	37-LM323	1	Regulator, LM323	
75	37-7812	1	" 7812	Q8
76	37-7905	1	" 7905	Q7
77				
78				
79				
80				
81				
82	62-001	1	Switch, SPST, MOM	SW2
83	66-118PIT	1	Switch, SPST, X8, DIP	SW1
84	72-1608C	2	Screw, Pan Hd., Ph., 6-32 X ¼ Lg. Cres	
85	75-016	2	Washer, Flat, #6	
86	75-056	2	Washer, Lock, Int. Star, #6	

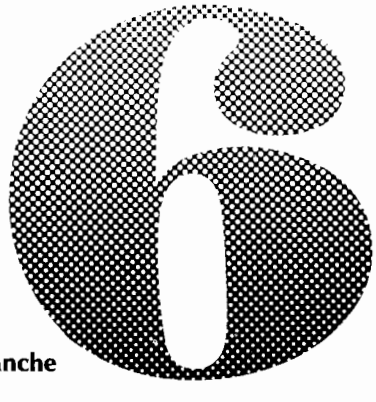
Item	Part Number	Qty.	DESCRIPTION	
87	75-916C	2	Nut, Hex, #6-32 Cres	
88	72-1408C	1	Screw, Pan Hd., Ph., 4-40 X ¼ Lg. Cres	
89	75-014	1	Washer, Flat, #4	
90	75-054	1	Washer, Lock, Int. Star, #4	
91	75-914S	1	Nut, Hex, #4-40 Cres	
92	78-16006	1	Silpad	
93	78-06001	1	Heatsink (LM323)	
94	009470-01	1	Heatsink (TDA1004)	
95	78-13016	AR	Cement (TDA1004 Heatsink)	
96	78-16005	1	Silpad (LM323)	
97				
98				
99				
100	79-42040	1	Socket, 40 PIN, Med. Insertion	B4
101				
102				
103	90-102	1	Crystal, 12.096 MHZ	Y1
104				
105				
106	90-6010	1	Microprocessor	B4
107	90-7023	16	RAM, 7023	A6,B6,C6,D6,E6,F6, H6,J6,A7,B7,C7,D7, E7,F7,H7,J7
108	006400-01	1	Sync Prom	K3
109				
110				
111				
112				
113				
114				
115	030608-01	1	Rom 7800-7FFF	A2
116	030609-01	1	" 7000-77FF	B2
117	030610-01	1	" 6800-6FFF	C2



TV MONITOR SERVICING INFORMATION

This chapter provides servicing information taken from the Motorola and TEC service manuals. Each manual has been reprinted by permission of the respective monitor manufacturer.

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



MOTOROLA
Service Manual

CAUTION

No work should be attempted on any exposed monitor chassis by anyone not familiar with servicing procedures and precautions.

A. GENERAL INFORMATION

This manual contains information on the M5000/M7000 monitor series and the +5 volt logic power supply. The M5000 uses a 19-inch CRT and the M7000 uses a 23-inch CRT. All CRTs are of the magnetic deflection type with integral implosion protection.

All monitor power supplies are capable of producing both +73 and +12 volts regulated from either 115-volt or 230-volt AC input to the transformer primary. All monitor variations described herein require a composite video input signal.

Input and output connections for the monitors are made through a 12-pin connector plug located at the rear of the chassis. Inputs consist of composite video, audio, and 115/220 volt AC three-wire.

All monitors employ: four stages of video amplification, a two-stage sync separator, a two-stage vertical integrator, a four-stage horizontal sweep circuit, a three-stage vertical sweep circuit, a one-stage spot kill, a one stage blanking amplifier; and a regulated, full-wave bridge power supply.

Model Breakdown Chart

Model	Video Input	19" CRT	23" CRT
M5000-155	Composite	X	
M7000-155	Composite		X

SAFETY WARNING

CAUTION

No work should be attempted on an exposed monitor chassis by anyone not familiar with servicing procedures and precautions.

1. Safety procedures should be developed by habit so that technicians rushed with repair work automatically take precautions.

2. A good practice, when working on any unit, is to first ground the chassis and to use only one hand when testing circuitry. This will avoid the possibility of carelessly putting one hand on chassis or ground and the other on an electrical connection which could cause a severe electrical shock.

3. Extreme care should be used in *handling the picture tube* as rough handling may cause it to implode due to atmospheric pressure (14.7 lbs. per sq. in.). Do not nick or scratch glass or subject it to any undue pressure in removal or installation. When handling, safety goggles and heavy gloves should be worn for protection. Discharge picture tube by shorting the anode connection to chassis ground (not cabinet or other mounting parts). When discharging, go from ground to anode or use a well-insulated piece of wire. When servicing or repairing the monitor, if the cathode ray tube is replaced by a type of tube other than that specified under the Motorola Part Number as original equipment in this Service Manual, then avoid prolonged exposure at close range to unshielded areas of the cathode ray tube. Possible danger of personal injury from unnecessary exposure to X-ray radiation may result.

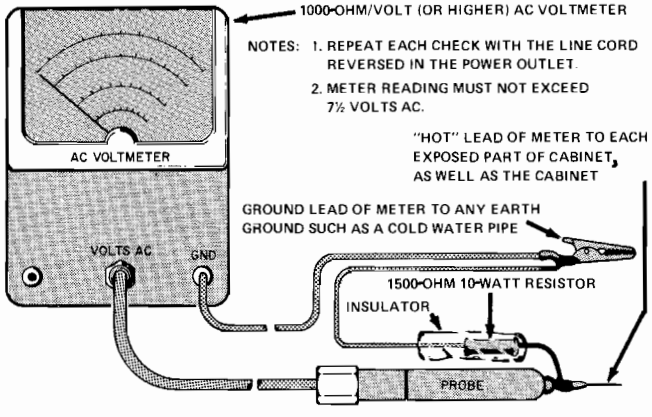
4. An *isolation transformer* should always be used during the servicing of a unit whose chassis is connected to one side of the power line. Use a transformer of adequate power rating as this protects the serviceman from accidents resulting in personal injury from electrical shocks. It will also protect the chassis and its components from being

MOTOROLA Data Products CAROL STREAM, ILLINOIS 60187
PART NO. 68P25253A47

damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

5. Always *replace protective devices,* such as fishpaper, isolation resistors and capacitors and shields after working on the unit.

6. *Before returning a serviced unit,* the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock. *Do not use a line isolation transformer when making this test.*



Voltmeter Hook-up for Safety Check

In addition to practicing the basic and fundamental electrical safety rules, the following test, which is related to the minimum safety requirements of the Underwriters Laboratories, should be performed by the service technician before any unit which has been serviced is installed in a game again.

A 1000-ohm-per-volt AC voltmeter is prepared by shunting it with a 1500-ohm, 10-watt resistor. The safety test is made by contacting one meter probe to any portion of the unit exposed to the operator such as the cabinet trim, hardware, controls, knobs, etc., while the other probe is held in contact with a good "earth" ground such as a cold water pipe.

The AC voltage indicated by the meter must not exceed 7½ volts. A reading exceeding 7½ volts indicates that a potentially dangerous leakage path exists between the exposed portion of the unit and earth ground. Such a unit represents a potentially serious shock hazard to the operator.

The above test should be repeated with the power plug reversed, when applicable.

Never reinstall a monitor which does not pass the safety test until the fault has been located and corrected.

Table 6-1 Motorola Monitor Electrical Specifications

	MODEL M5000-155	MODEL M7000-155
PICTURE TUBE	19" measured diagonally (48.2 cm); 184 sq. inch viewing area (1188 sq. cm); 114° deflection angle; integral implosion protection; P4 phosphor standard	23" measured diagonally (58.4 cm); 282 sq. inch viewing area (1820 sq. cm); 110° deflection angle; integral implosion protection; P4 phosphor standard
POWER INPUT	115/230 VAC, 110 Watts (nominal); 60 Hz provision for 230 VAC, 50 Hz	
FUSES	M5000-155, M7000-155—0.8A	
+73 VOLT SUPPLY	Electronically regulated over AC inputs from 103 VAC to 130 VAC, or 260 VAC to 260 VAC	
VIDEO INPUT	0.5 Volts to 2.5 Volts P/P maximum, composite for 50V at CRT	
RESOLUTION	500 lines at picture center	
LINEARITY	Within 3%, measured with standard EIA ball chart and dot pattern	

Table 6-1 Motorola Monitor Electrical Specifications

HIGH VOLTAGE	17KV (nominal)	
HORIZONTAL BLANKING INTERVAL	11 microseconds typical (includes retrace and delay)	
SCANNING FREQUENCY	Horizontal: 15,750 Hz±500 Hz; Vertical: 50/60 Hz	
ENVIRONMENT	Operating temperature: 10°C to 55°C (ambient) Storage Temperature: −40°C to +65°C Operating Altitude: 10,000 ft. maximum (3048 meters) Designed to comply with applicable DHEW rules on X-Radiation CSA certified for use in coin-operated amusements in a combustible enclosure UL listed under specification 1410 (electronic components)	
TYPICAL DIMENSIONS	14.11" H, 18.18" W, 14.83" D (35.8 x 46 x 37.6 cm)	16.72" H, 21.56" W, 16.18" D (42.4 x 54.7 x 41 cm)

Specifications subject to change without notice.

B. SERVICE NOTES

Circuit Tracing

Component reference numbers are printed on the top and bottom of the three circuit cards to facilitate circuit tracing. In addition, control names are also shown and referenced on the schematic diagram in this manual.

Transistor elements are identified as follows: E—Emitter, B—Base, C—Collector.

Component Removal

Removing components from an etched circuit card is facilitated by the fact that the circuitry (copper foil) appears on one side of the circuit card only and the component leads are inserted straight through the holes and are not bent or crimped.

It is recommended that a solder extracting gun be used to aid in component removal. An iron with a temperature-controlled heating element would be desirable since it would reduce the possibility of damaging the circuit card foil due to over-heating.

The nozzle of the solder extracting gun is inserted directly over the component lead and when sufficiently heated, the solder is drawn away, leaving the lead free from the copper foil. This method is particularly suitable in removing multi-terminal components.

CRT Replacement

Use extreme care in handling the CRT, as rough handling may cause it to implode due to high vacuum pressure. Do not nick or scratch glass or subject it to any undue pressure in removal or installation. Use goggles and heavy gloves for protection. In addition, be sure to disconnect the monitor from all external voltage sources.

1. Discharge CRT by shorting 2nd anode to ground; then remove the CRT socket, deflection yoke and 2nd anode lead.

2. Remove CRT from the front of the chassis by loosening and removing four screws, one in each corner of the CRT.

Adjustments

A non-metallic tool is recommended when performing the following adjustments.

Regulator Adjustment

NOTE

Misadjustment of the +73 volt regulator or the horizontal oscillator may result in damage to the horizontal output transistor or pulse-limiter diode. The following procedure is recommended to insure reliable operation.

1. Connect the monitor to an AC line supply; then adjust supply to 120 volts (240 volts in some applications).

2. Apply test signal to proper input. Signal should be of same amplitude and sync rate as when monitor is in service.

3. Adjust HOR. SET coil L1 until display is stable.

4. Connect a DC digital voltmeter or equivalent precision voltmeter to the emitter of the regulator output transistor, Q17, or any +73 volt test point.

5. Adjust the 73V ADJUST. control, R93, for an output of +73 volts. *Do not* rotate the control through its entire range; damage to the monitor may result.

6. When adjustment is complete, the AC line supply can be varied between 103 and 130 volts AC to check for proper regulator operation. With the regulator operating properly, changes in display size should be negligible.

Horizontal Hold/Oscillator Adjustment

Adjust the core of HOR. SET coil L1 until the horizontal blanking lines are vertical or the CRT display is stable (synced).

Vertical Height/Linearity Adjustment

1. Connect a test generator whose output is similar to the display signal normally used.

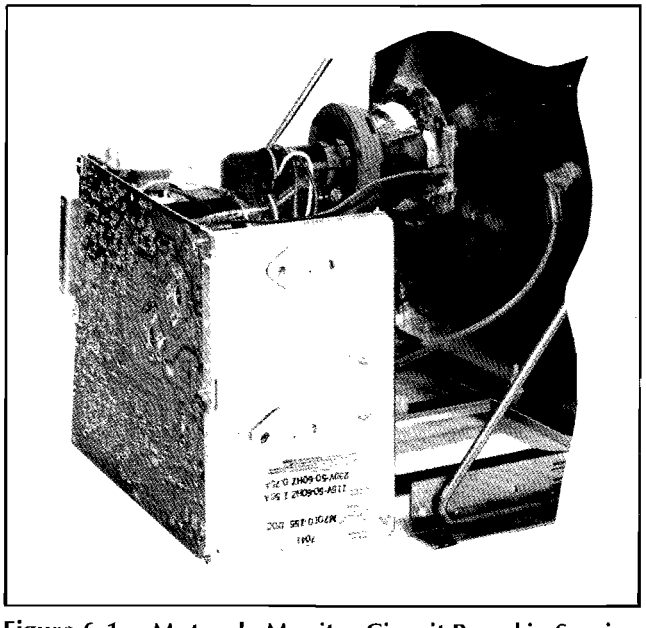


Figure 6-1 Motorola Monitor Circuit Board in Service Position

2. Rotate the vertical size control, R60, until the smallest display is obtained.

3. Adjust the vertical linearity control, R64, until the top and bottom of the test pattern is equally spaced.

4. Readjust R60 until the desired display height is obtained.

5. Readjust R64, if necessary, as in Step 2 above.

Focus Adjustment

The best overall focus of the display is obtained by adjusting the focus control, R42, for best focus at a point which is near the center and approximately 1/3 down from the top of the display.

Monitor Servicing

The monitor circuit board may be installed in a service position to provide easier access to the circuit foil when servicing the monitor (see Figure 6-1).

C. THEORY OF OPERATION

Power Supply

The power supplies are transformer-operated, full-wave, regulated supplies which maintain constant output voltages for input line variations of 103 volts AC to 130 volts AC, or 206 volts AC to 260 volts AC. Regulation of the output voltages is accomplished by using positive feedback through the integrated circuit reference amplifier.

+73 Volt Supply (See Figures 6-3, 6-4)

When the +73 volt supply attempts to increase, the voltage at pin 3 of IC1 will increase, while the voltage at pin 2 remains constant due to D20. The increasing voltage at pin 3 will cause the output voltage of the reference amplifier (pin 6) to increase the forward bias of Q19. The collector voltage of Q19, forward bias of Q18, and the base current of Q17 will all decrease. The resultant proportional increase of Q17 collector-to-emitter voltage will cancel the attempted output voltage increase.

When the +73 volt supply bus attempts to decrease; the voltage at pin 3 of IC1 will decrease while the voltage at pin 2 remains constant. The decreasing voltage at pin 3 will cause the reference amplifier output voltage at pin 6 to decrease the forward bias of Q19. The collector voltage of Q19, the forward bias of Q18 and the base current of Q17 will increase. The collector-to-emitter voltage of Q17, which is in series

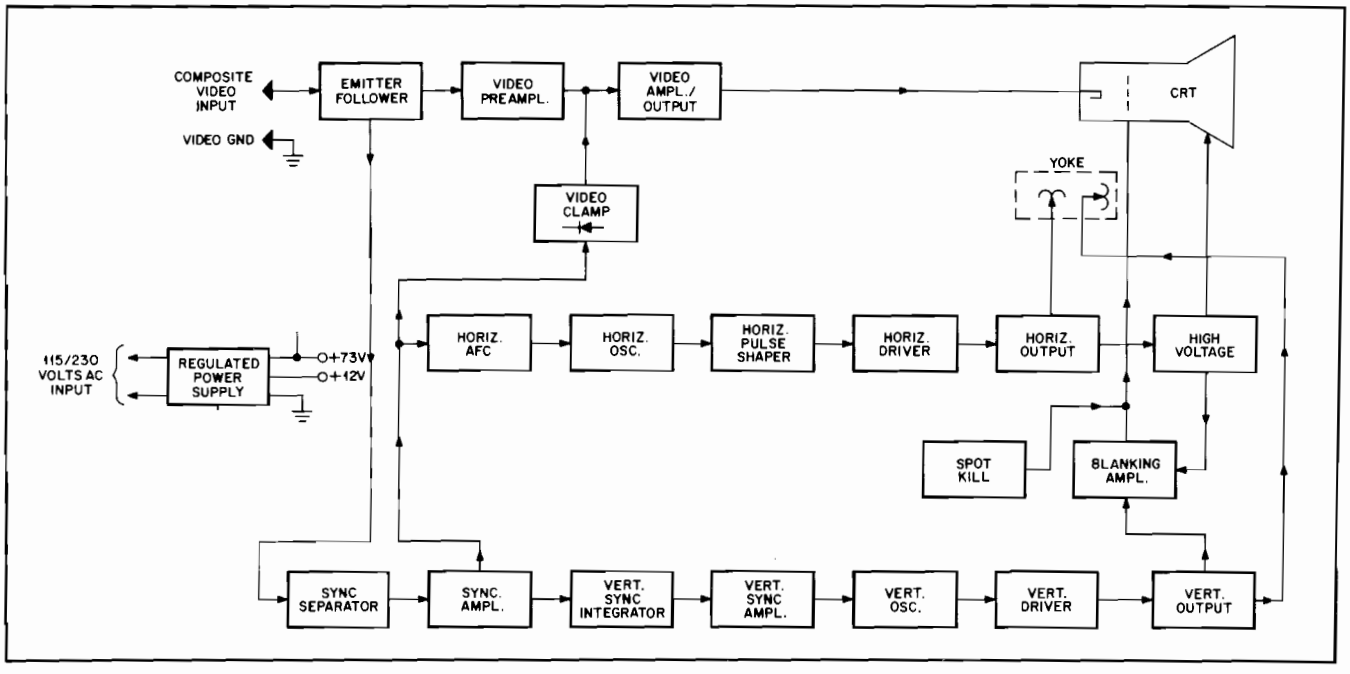


Figure 6-2 Motorola Monitor Block Diagram

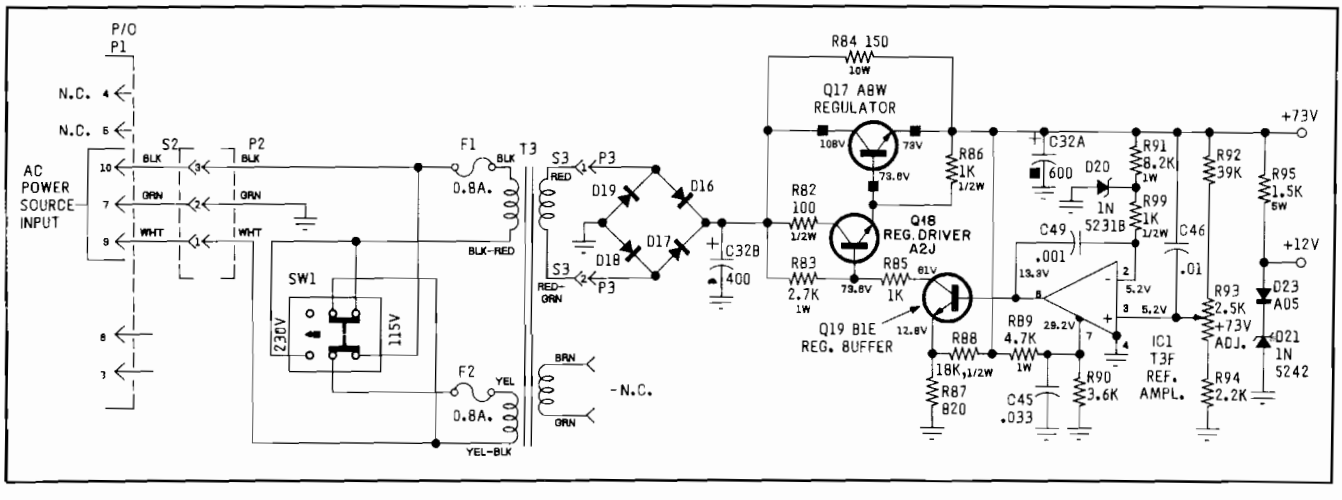


Figure 6-3 +73 Volt Supply Circuit

with the output, will decrease proportionally to the attempted decrease in the outbut bus.

Resistor R84 shunts a portion of the output current around Q17 so less power is dissipated within the device. Resistor R82 is the current-limiting resistor for Q18, and R86 controls the leakage current of Q17. Resistors R83 and R85 are the collector load for Q19, and R88 and R87 provide an emitter voltage for Q19 within the range of IC1's output voltage variations. Capacitor C45 filters high frequency variations from the voltage at pin 7 of IC1, and C49 is a Miller-effect capacitor which eliminates instability.

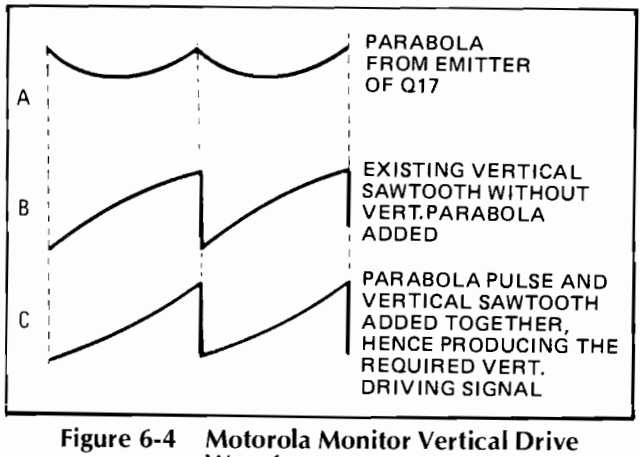


Figure 6-4 Motorola Monitor Vertical Drive Waveform

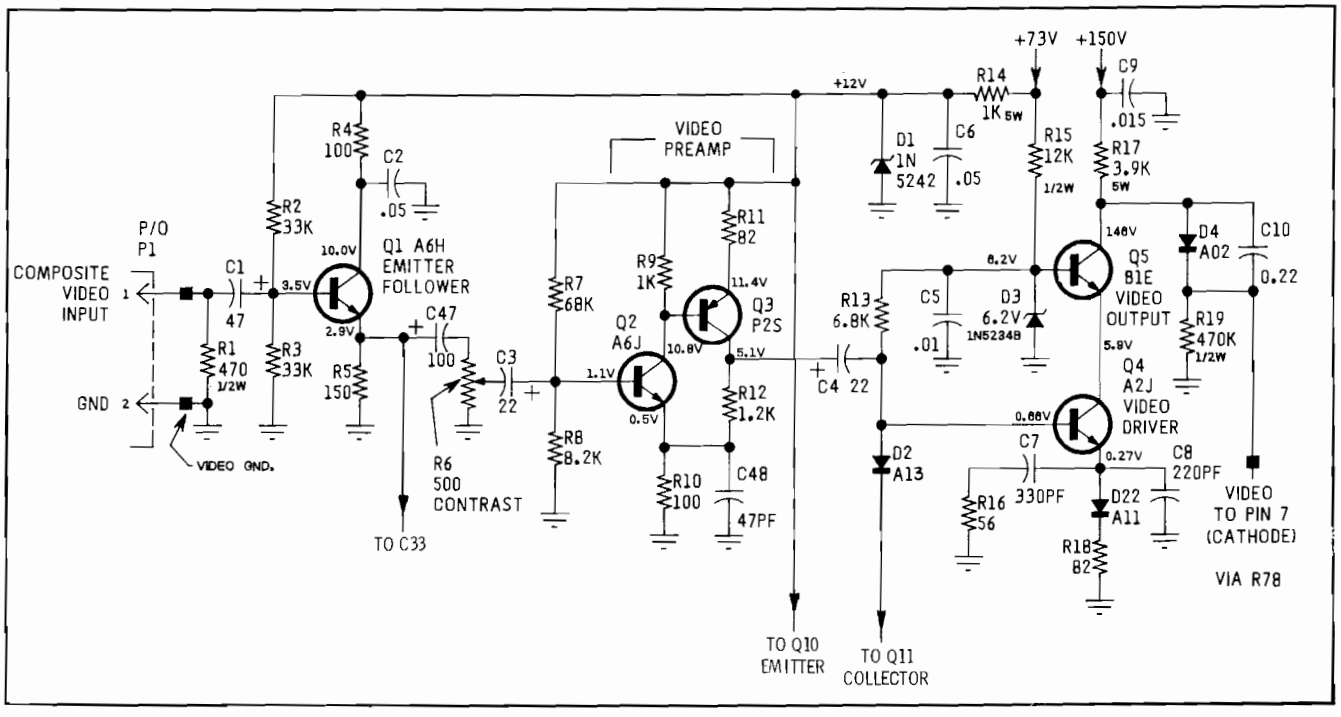


Figure 6-5 Motorola Monitor Video Amplifiers and Output Circuit

Capacitor C32A filters horizontal frequency variations from the output bus.

Resistor R91 provides bias current for D20, and the value of R99 presents an impedance from pin 2 of IC1 to AC ground (through D20). Capacitor C46 couples high frequency voltage variations, which occur at the output bus, back to pin 3—preventing oscillations for proper operation of the reference amplifier. Resistors R92, R93, and R94 provide voltage division such that the adjustment of R93 can be set equal to the voltage of pin 2 of IC1. Resistor R95 provides bias current for D21 and also provides the +12 volt output. Diode D23 is necessary to temperature-compensate for variations within D21. Capacitor C32B filters AC variations from the output of the full-wave bridge.

Video Amplifiers and Output (See Figure 6-5)

The composite video signal is coupled to the emitter-follower Q1 through the input connector P1 and capacitor C1. Transistor Q1 is a buffer stage which matches the impedance of the signal source to the video preamplifer and the sync separator stages. Resistor R1 is a terminating resistor for the video signal source, and resistors R2, R3, R4, and R5 form the biasing network for the stage. Capacitor C2 bypasses higher video frequencies to ground. The composite video signal is coupled from the emitter of Q1 to the sync separator Q10 through C33 and to the contrast control R6 through C47.

The contrast control varies the amplitude and couples the composite video signal to the base of Q2 through capacitor C3. Transistors Q2 and Q3 are complimentary, direct-coupled, common emitter amplifiers. The voltage gain (approximately 12) of the preamplifier stage is controlled by the feedback arrangement of R9, R10, R11, and R12. Resistors R7 and R8 provide the base bias voltage for Q2. Capacitor C48 is used for high-frequency peaking.

The output of the video preamplifier stage is coupled to the video output stage through capacitor C4. Diode D2 clamps the video signal to approximately +0.7 volts (DC restoration) when a sync pulse turns on the sync amplifier Q11. The video output stage is connected in a cascade configuration. Transistor Q4 is a common emitter amplifier and Q5 is connected in a common base arrangement. Capacitors C7, C8, and resistor R16 are used for high-frequency compensation, and resistor R18 controls the gain of the stage to approximately 47. Diode D3 maintains the base of Q5 at +6.2 volts, while capacitor C5 filters the video signal variations from the base voltage. Resistor R13 provides a DC bias path for D2, and R19 and D4 are used to limit the current through the CRT.

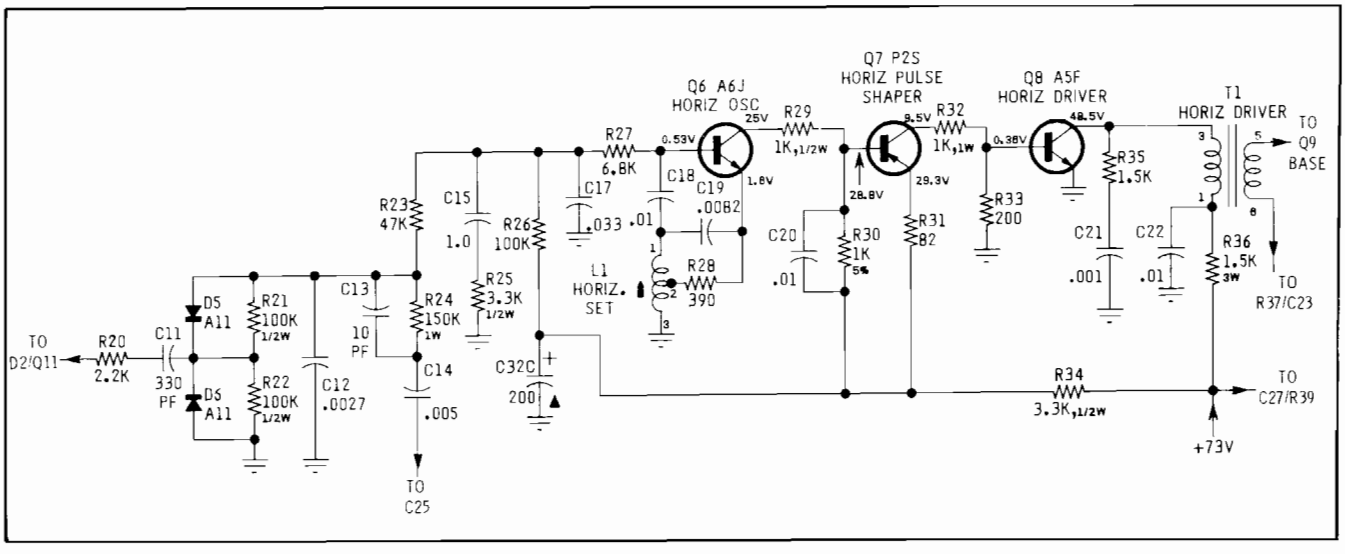


Figure 6-6 Motorola Monitor Horizontal Deflection Circuit

Capacitor C10 AC-couples the video from the collector of Q5 to the cathode of the CRT if D4 turns off due to high beam currents. Resistor R17 is the collector load for Q5, and R15 provides the bias current for the zener diode D3. Capacitors C9 and C6 filter video frequencies from the +150 volt and +12 volt supplies. Resistor R14 and zener diode D1 are used to supply +12 volts for Q1, Q2, and Q3.

D. HORIZONTAL DEFLECTION CIRCUITS (See Figure 6-6)

Phase Detector (See Figure 6-7)

The phase detector consists of two diodes (D5 and D6) in a keyed clamp circuit. Two inputs are required to generate the required output, one from the horizontal sync amplifier, Q11, and one from the horizontal output circuit, Q9. The required output must be of the proper polarity and amplitude to correct phase differences between the input horizontal sync pulses and the horizontal time base.

The horizontal output (Q9) collector pulse is integrated into a sawtooth by R24 and C12. During horizontal sync time, diodes D5 and D6 conduct, which shorts C12 to ground. This effectively clamps the sawtooth on C12 to ground at sync time. If the horizontal time base is in phase with the sync (waveform A), the sync pulse will occur when the sawtooth is passing through its AC axis, and the net charge on C12 will be zero (waveform B). If the horizontal time base is lagging the sync, the sawtooth on C12 will be clamped to ground at a point negative from the AC axis. This will result in a positive DC charge on C12 (waveform C). The positive polarity causes the horizontal oscillator to speed up and correct the phase lag. Likewise, if the horizontal time base is leading the sync, the sawtooth on C12 will be clamped at a point positive from its AC axis. This results in a net negative charge on C12 which is the required polarity to slow the horizontal oscillator (waveform D).

Components R23, C15, R25 and C17 comprise the phase detector filter. The bandpass of this filter is chosen to provide correction of horizontal oscillator phase without ringing or hunting. Capacitor C13 times the phase detector for correct centering of the picture on the raster.

Horizontal Oscillator

The horizontal oscillator employs the principles of the Hartley-type oscillator. Its operating frequency is sensitive to its DC base input voltage, thus permitting the frequency of the oscillator to be varied by the output voltage of the phase detector. The main frequency-determining components are L1, C19, and R28. The oscillator operates as a switch being biased alternately into saturation and cut-off. The initial forward starting bias is supplied via R26.

Horizontal Pulse Shaper and Driver

The horizontal pulse shaper Q7 serves as a buffer stage between the horizontal oscillator and driver. Capacitor C20 and resistor R30 combine to shape the input waveform to the required duty cycle of 50%, which is necessary to drive the horizontal output stage.

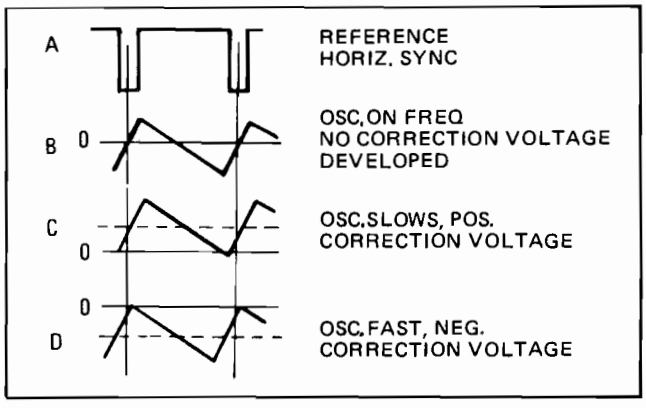


Figure 6-7 Motorola Monitor Horizontal Deflection Waveforms

The horizontal driver Q8 operates as a switch to driving horizontal output transistor Q9 through T1. Because of the low impedance drive and fast switching times, very little power is dissipated in Q8.

Resistor R35 and capacitor C21 provide damping to suppress ringing in the primary of T1 when Q8 goes into cut-off. Resistor R36 is used for limiting current in the collector of Q8, and C22 filters the horizontal frequency variations from the DC side of the transformer primary.

Horizontal Output (See Figure 6-8)

The secondary of T1 provides the required low drive impedance for Q9. Resistor R37 limits current in the base of Q9, while capacitor C23 provides additional reverse bias to keep Q9 turned off during the horizontal retrace pulse. Transistor Q9 operates as a switch which once each horizontal time period connects the supply voltage across the parallel combination of the horizontal deflection yoke and the primary of T2. The required sawtooth deflection current through the horizontal yoke is formed by the L-R time constant of the yoke and output transformer primary. The horizontal retrace pulse charges C27 through D8 to provide operating voltage for G2 of the CRT. Momentary transients at the collector of Q9, should they occur, are limited to the voltage on C27, since D8 will conduct if the collector voltage exceeds this value.

The damper diode D7 conducts during the period between retrace and turn-on of Q9 to reduce retrace overshoot; capacitor C28 is the retrace tuning capacitor. Capacitor C25 blocks DC from deflection yoke. Components R38 and C26 are damping components for the width and linearity coils. Capacitor C32D is charged through D10, developing the video output supply voltage.

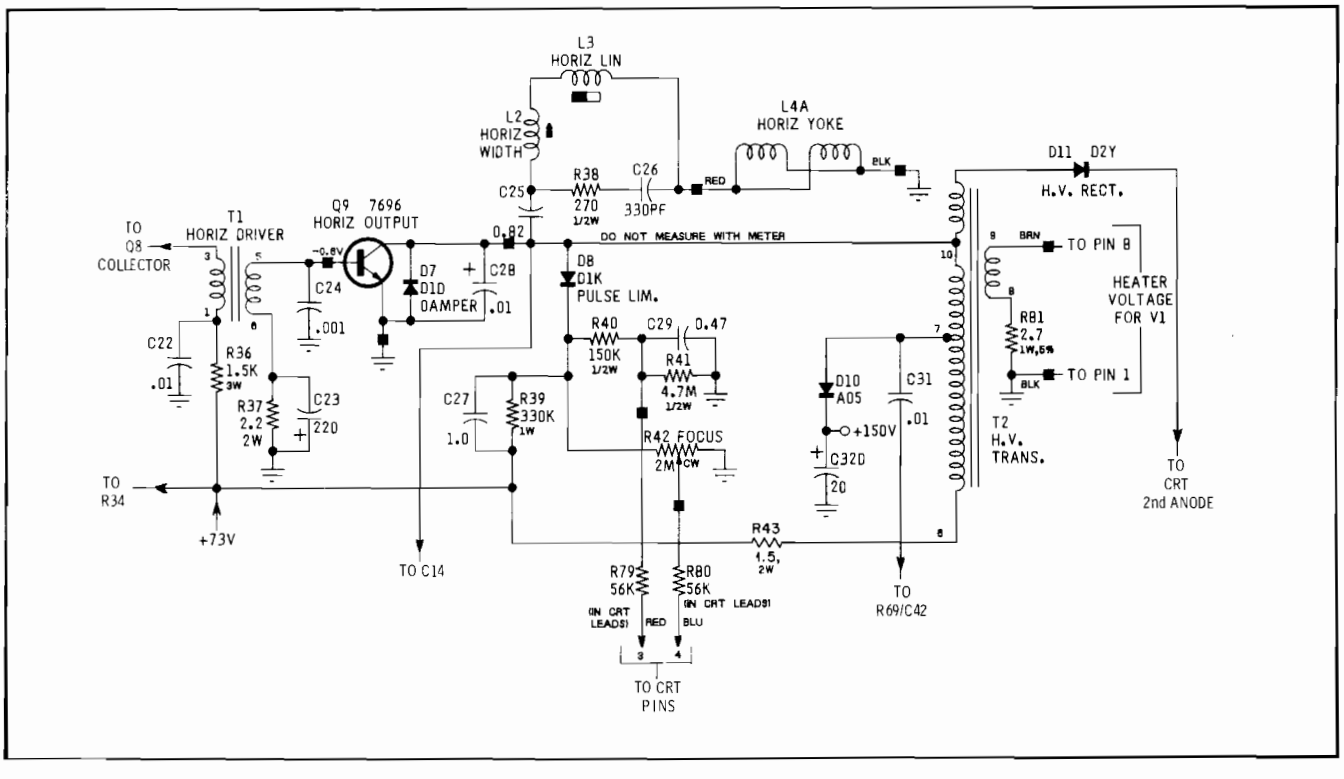


Figure 6-8 Motorola Monitor Horizontal Output Circuit

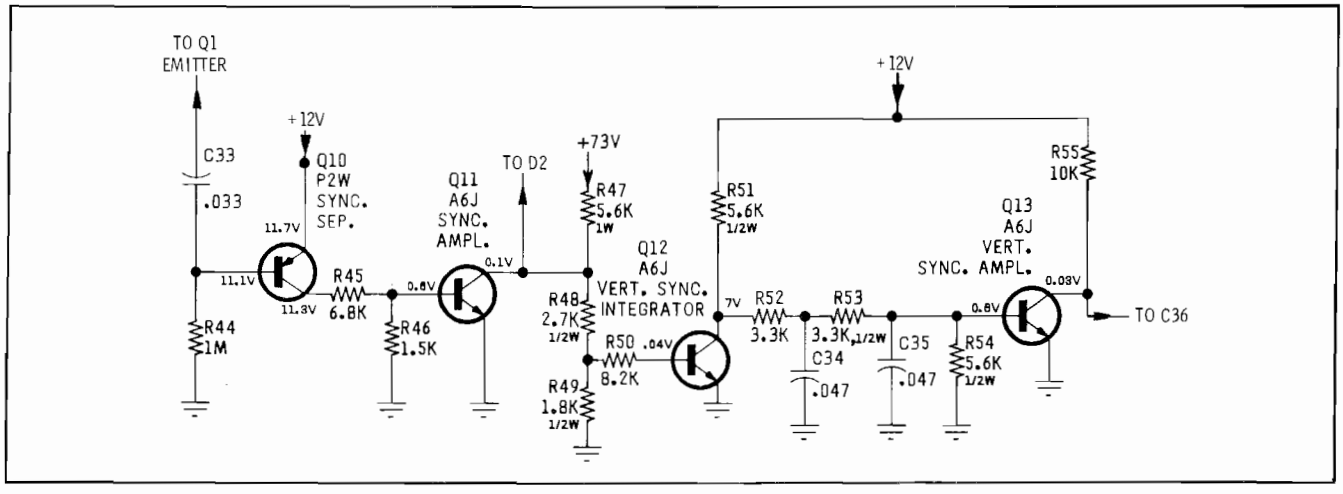


Figure 6-9 Motorola Monitor Sync Circuit

Sync Circuits (See Figure 6-9)

The video signal is coupled from the emitter of Q1 to the base of Q10 through C33. The negative-going sync tips turn on Q10 and are clamped to the value of the base voltage due to the base-emitter diode junction. The video information within the composite video signal, however, is less negative and Q10 remains off between each sync tip. Therefore, the waveform at the collector of Q10 will contain only the composite sync pulse information.

Resistors R45 and R46 provide base bias for Q11. The composite sync pulses are amplified and inverted by Q11 where they are coupled to the vertical sync integrator Q12, the horizontal phase detector, and the video clamp diode D2. Resistors R47, R48, and R49, are the collector load for Q11, and also provide base bias for Q12. Resistor R50 limits current through the base-emitter junction of Q12, and R51 is its collector load. Components R52, C34, R53, C35, and R54 form a double integrator which removes the horizontal pulses from the composite sync signal, leaving the vertical pulses to be amplified by Q13 and coupled to the vertical oscillator.

Vertical Oscillator and Output (See Figure 6-10)

The vertical oscillator is a relaxation oscillator and operates at a free-running frequency that is set by

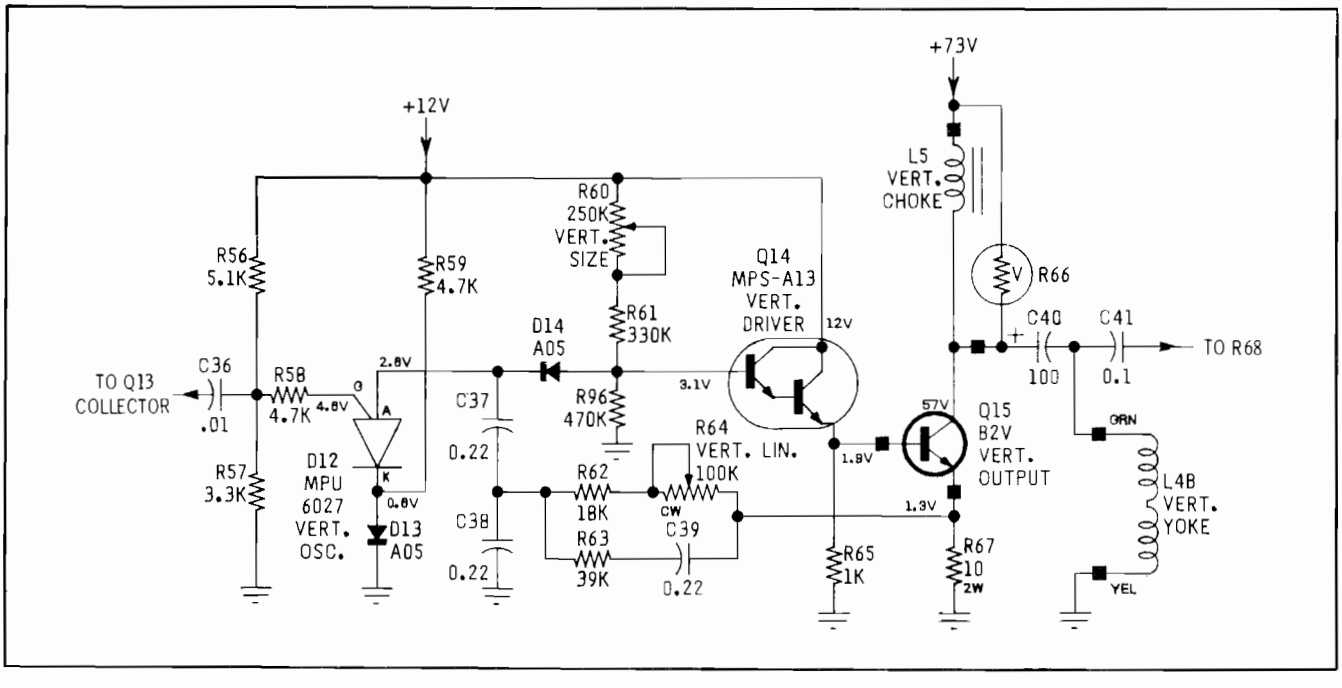


Figure 6-10 Motorola Monitor Vertical Oscillator Circuit

the value of resistors R56 and R57. The series combination of C37 and C38 charges through D14, R61, and R60, until D12 turns on. This occurs when the anode voltage of D12 exceeds the gate voltage by approximately 1.0 volt. When D12 conducts, C37 and C38 are discharged to nearly zero volts; then D12 turns off and the cycle repeats. The value of R61 and the setting of R60 determines the amplitude of the waveform.

Diode D14 provides a small incremental voltage above ground to overcome the forward base-emitter drop of Q14; D13 provides temperature compensation for the output stage. Resistor R96 provides a constant oscillator load for variations in input impedance of Q14. Transistor Q14 is an emitter-follower used to transform the high impedance drive sawtooth to a low impedance drive for Q15.

The vertical choke L5 acts as a current source during linear scan time and provides a high-voltage pulse to aid retrace when Q15 shuts off. To limit this pulse to a safe value, a varistor, R66, is connected across the choke.

Since the impedance of the choke decreases when the collector current of Q15 increases, severe vertical non-linearity will result unless some compensation is employed.

Resistors R64 and R62 couple the emitter voltage of Q15 to the junction of C37 and C38. This path is resistive, and the waveform coupled back will be integrated by C38. This results in a pre-distortion of the drive sawtooth. This is done to compensate for the non-linear charging of C37, C38 and the changing impedance of C5. An additional feedback path through R63 and C39 serves to optimize the drive waveshape for best linearity. Capacitor C40 couples the signal to the vertical yoke winding and blocks DC.

Spot Kill (See Figure 6-11)

The spot kill circuitry is used to reduce the effect of the electron beam concentrating on one area of the CRT after the monitor is turned off. The circuitry is accomplished by raising the arm of potentiometer R73 to the +150 volt level and, therefore, increasing the brightness to maximum to dissipate the high-voltage charge that normally remains in the CRT.

When the monitor is operating, transistor Q20 is on and its collector is near zero volts. Capacitor C44 charges through the base-emitter junction of Q20 and R97. Resistor R72 provides the base bias voltage required to keep Q20 on. When the monitor is turned

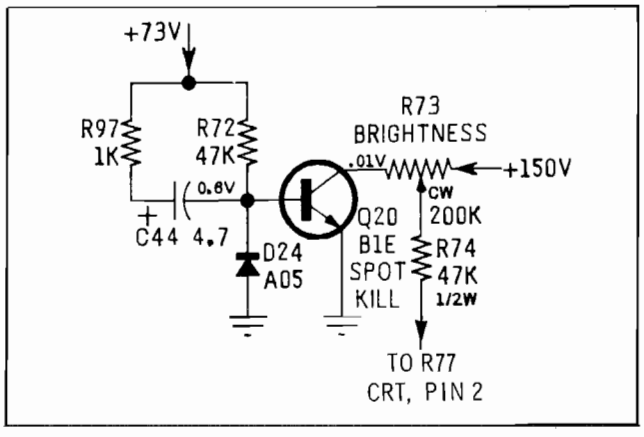


Figure 6-11 Motorola Monitor Spot Killer Circuit

off, the falling +73 volts is coupled to the base of Q20 to turn off the transistor causing its collector voltage to rise to approximately +150 volts. Diode D24 prevents the negative voltage swing at the base of Q20 from exceeding the reverse voltage rating of the transistor.

Blanking Amplifier (see Figure 6-12)

The blanking amplifier combines both the vertical and horizontal retrace pulses to turn off the electron beam in the CRT once every horizontal line and once every vertical field.

Capacitor C41 couples the vertical retrace pulses and capacitor C31 couples the horizontal retrace pulses to the blanking amplifier. Resistor R68 determines the amplitude of the vertical pulses, while R69 determines the amplitude of the horizontal pulses. Capacitor C42 bypasses R69 to couple the leading and trailing edges of the horizontal retrace pulses to the amplifier. Resistor R70 allows C41 to discharge when the retrace pulses swing below zero volts. Diode D15 prevents the retrace overshoot from exceeding the reverse voltage rating of Q20. Resistor R71 permits Q20 to turn off between retrace pulses, while R75 and R76 provide the collector voltage for Q20. Capacitor C43 couples the blanking pulses to the control grid of the CRT.

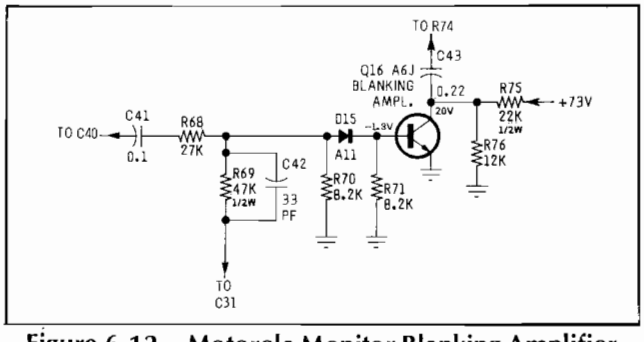


Figure 6-12 Motorola Monitor Blanking Amplifier Circuit

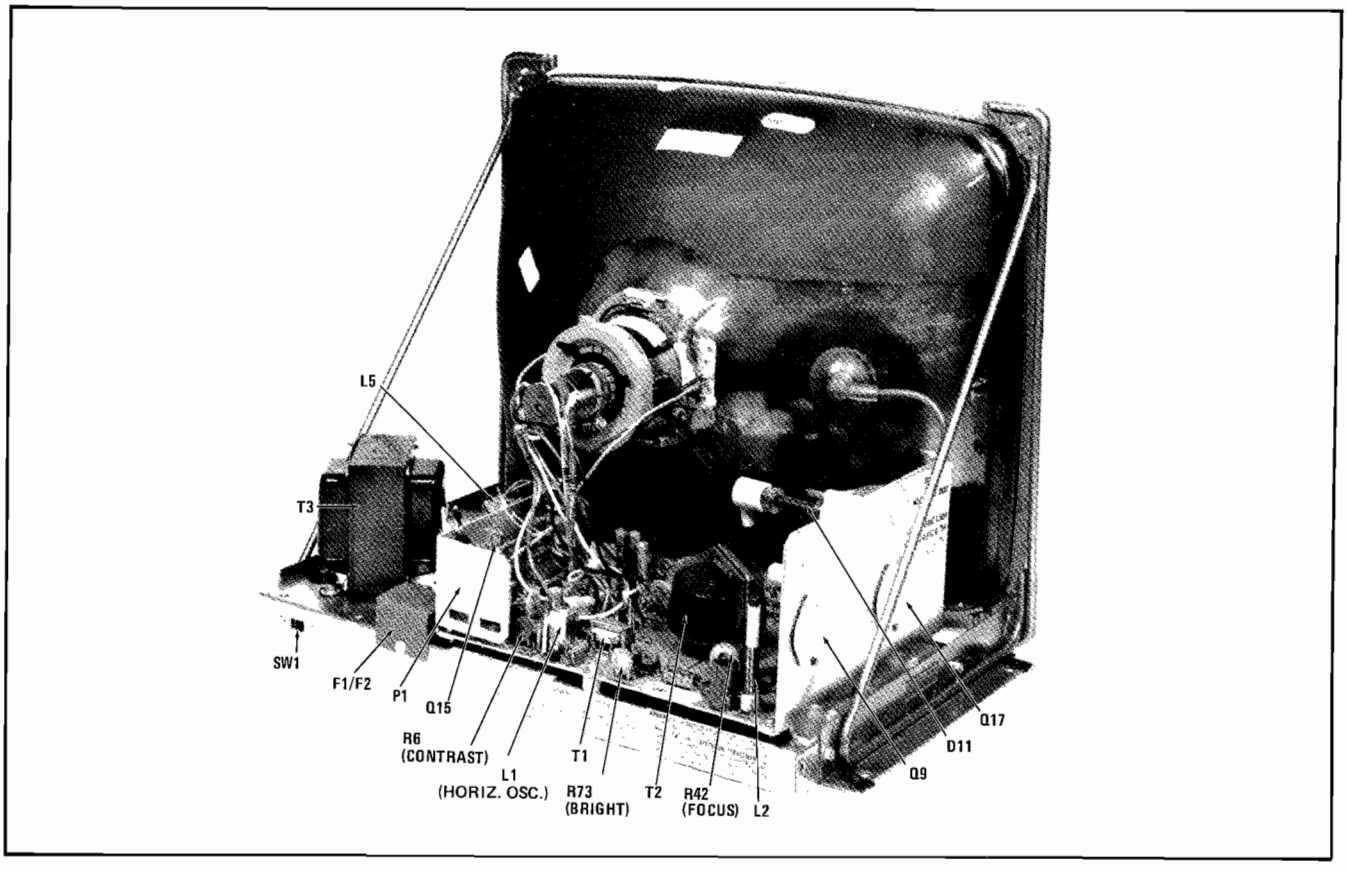


Figure 6-13 Motorola Monitor Chassis Rear View —Component Location

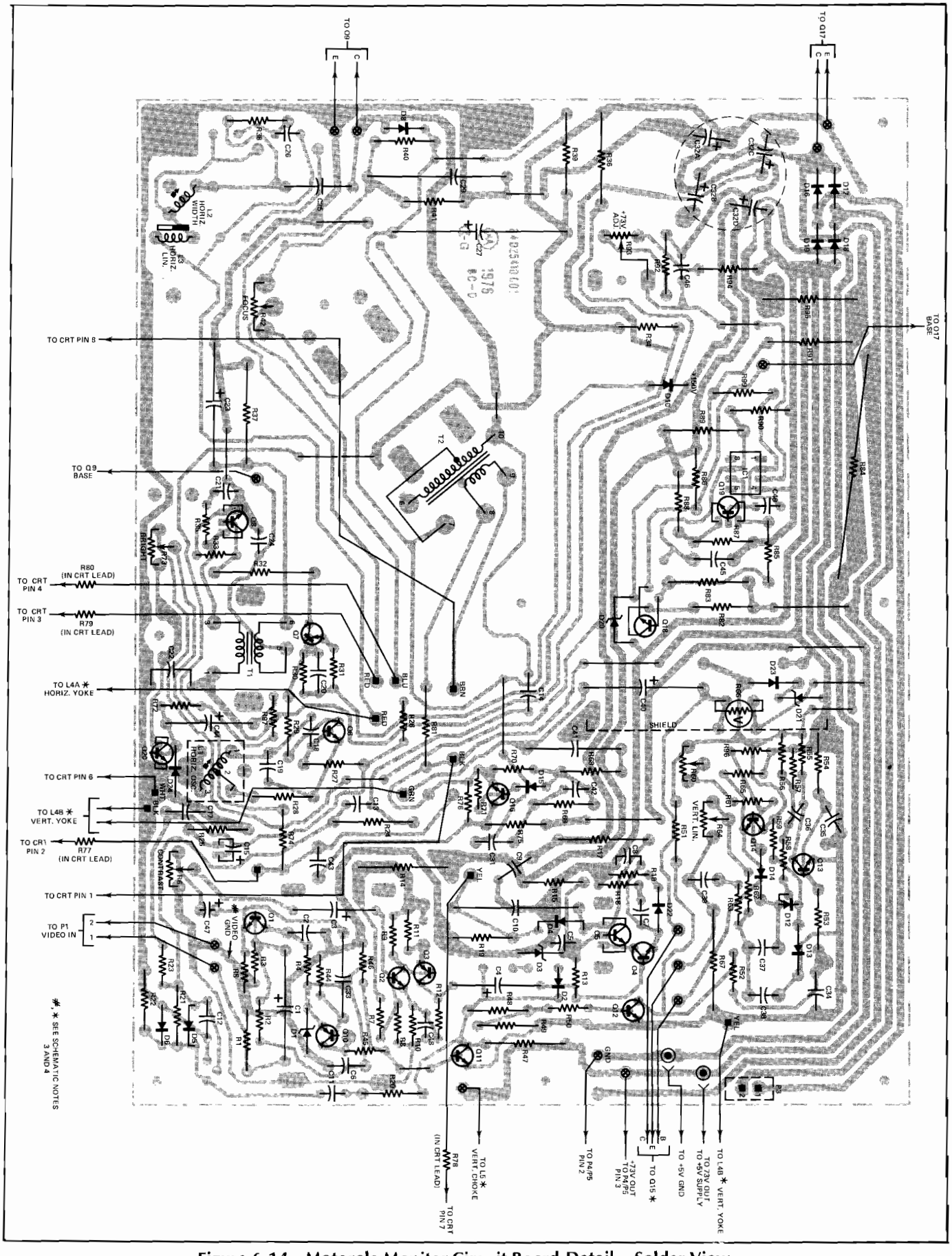


Figure 6-14 Motorola Monitor Circuit Board Detail—Solder View

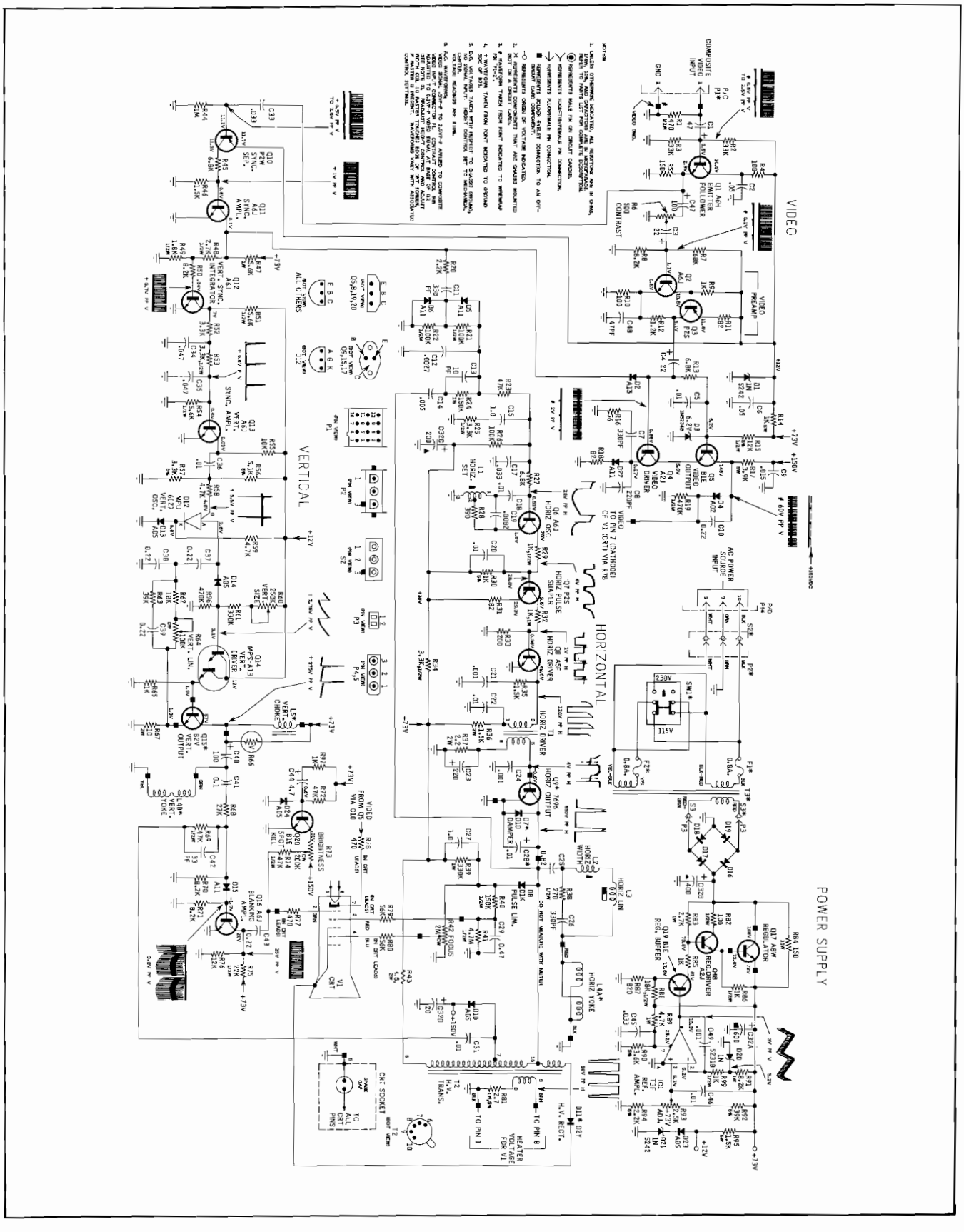


Figure 6-15 Motorola Monitor Schematic Diagram

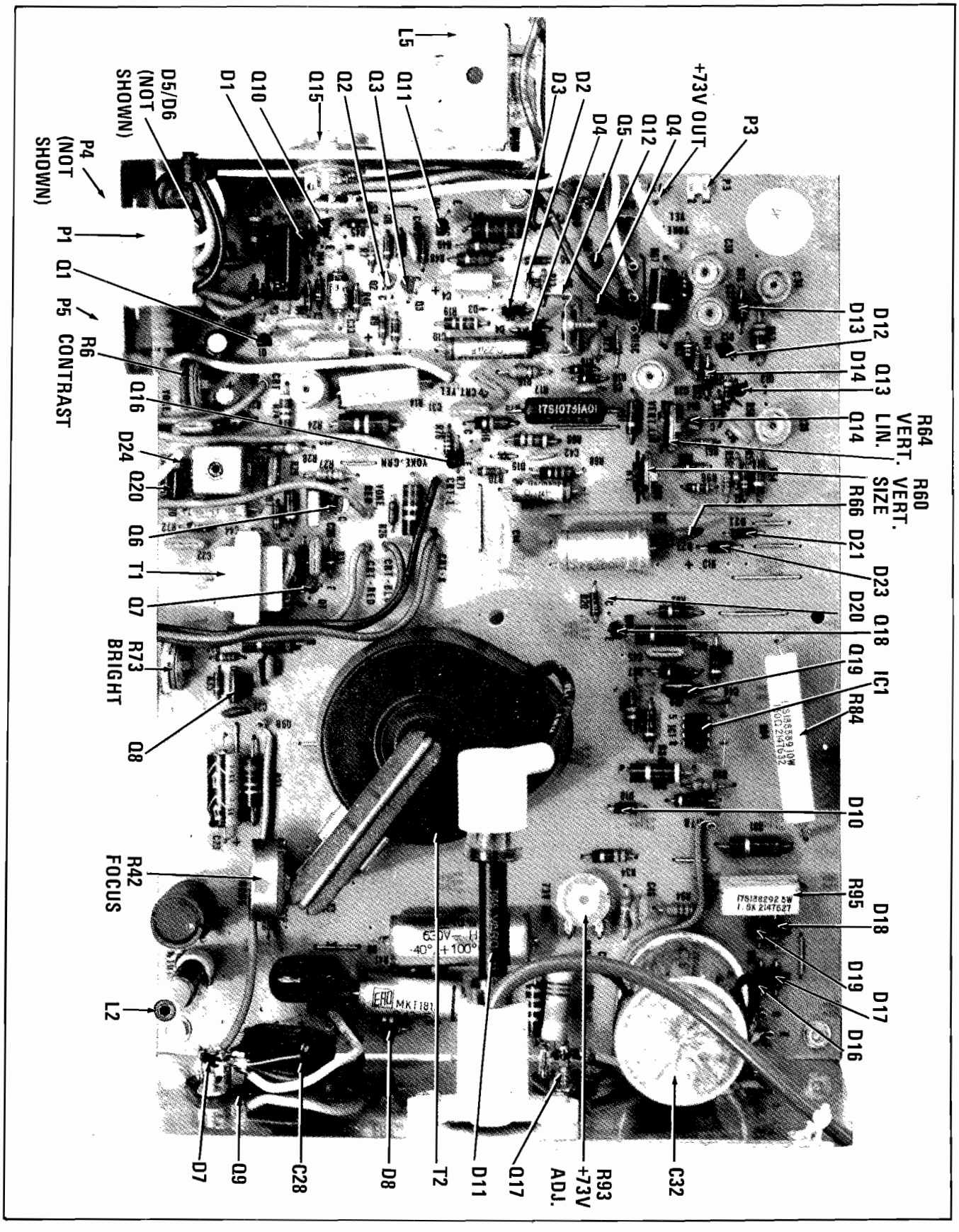


Figure 6-16 Motorola Monitor Circuit Board Detail—Component Location

Table 6-2 Motorola Replacement Part Numbers

REF. NO.	PART NUMBER	DESCRIPTION
Capacitors: All values are in Microfarads unless otherwise noted.		
C1	23S10255A27	47, 50V; Lytic
C2	21S135660	.05, +80–20, Z5V, 50V; Cer. Disc.
C3, C4	23S187A26	22, 25V; Lytic
C5	21S180E60	.01, +80–20; Z5V, 50V; Cer. Disc.
C6	21S135660	.05, +80–20, Z5V, 50V; Cer. Disc.
C7	21S131625	330pf, 10%, X5F, 500V; Cer. Disc.
C8	21S180B87	220pf, 10%, X5F, 500V; Cer. Disc.
C9	8S10191B99	.015, 10%, 250V; Poly.
C10	8S10212B18	0.22, 10%, 400V; Mtlz. Poly.
C11	21S131625	330pf, 10%, X5F, 500V; Cer. Disc.
C12	21S180C41	.0027, 10%, Z5F, 500V; Cer. Disc.
C13	21S180C02	10pf, 10%, N150, 500V; Cer. Disc.
C14	21S180D34	.005, 20%, Z5F, 1KV; Cer. Disc.
C15	23S10229A32	1.0, 16V; Lytic
C17	8S10191B90	.033, 10%, 250V; Poly.
C18	8S10299B28	.01, 10%, 100V; Polycarb.
C19	8S10299B29	.0082, 10%, 100V; Polycarb.
C20	8S10191B98	.01, 10%, 250V; Poly.
C21	21S180B51	.001, 10%, X5F, 500V; Cer. Disc.
C22	8S10191B98	.01, 10%, 250V; Poly.
C23	23S10255B50	150, 10V; Lytic
C24	21S180B51	.001, 10%, X5F, 500V; Cer. Disc.
C25	8S10299B27	0.82, 10%, 200V; Mtlz. Polycarb.
C26	21S131625	330pf, 10%, X5F, 500V; Cer. Disc.
C27	8S10212A11	1.0, 10%, 630V; Mtlz. Poly.
C28	8S10571A06	.01, 5%, 1200V; Polyprop. Foil
C29	8S10212B53	0.47, 10%, 630V; Mtlz. Poly.
C31	8S10191B98	.01, 10%, 250V; Poly.
C32	23S10255B73	20/200, 400/125, 600/100, 200/50; Lytic
C33	8S10191A51	.033, 10%, 160V; Poly.
C34, C35	8S10191A32	.047, 10%, 250V; Poly.
C36	21S180E60	.01, +80–20, Z5V, 50V; Cer. Disc.
C37, 38, 39	8S10191B67	0.22, 10%, 250V; Poly.
C40	23S10255A60	100, 63V; Lytic
C41	8S10212B16	0.1, 20%, 400V; Mtlz. Poly.
C42	21S180C82	0.33, 10%, N150, 500V; Cer. Disc.
C43	8S10191B67	0.22, 10%, 250V; Poly.
C44	23S10255B28	4.7, 100V; Lytic
C45	8S10191B90	.033, 10%, 250V; Poly.
C46	21S132492	.01, +80–20, Z5V, 100V; Cer. Disc.
C47	23S10255B63	100, 10V; Lytic
C48	21S180D56	47pf, 10%, N750, 100V; Cer. Disc.
C49	21S180B51	.001, 10%, X5F, 500V; Cer. Disc.
Diodes:		
D1	48S10813A03	Diode, Silicon, Zener; IN5242
D2	48D67120A13	Diode; A13
D3	48S10813A01	Diode, Silicon, Zener; IN5234B
D4	48S191A02	Rectifier, Silicon; 91A02
D5, D6	48D67120A11	Diode; A11
D7	48S134921	Diode, Damper; D1D
D8	48S134978	Diode, Pulse Lim; D1K
D10	48S191A05	Rectifier, Silicon; 91A05
D11	48S137114	Rectifier, H.V., D2Y
D12	48S137638	Vert. Osc.; MPU6027
D13, D14	48S191A05	Rectifier, Silicon; 91A05
D15	48D67120A11	Diode; A11
D16, D17, D18, D19	48S191A05	Rectifier, Silicon; 91A05
D20	48S10813A02	Diode, Silicon, Zener; 1N5231B
D21	48S10813A03	Diode, Silicon, Zener; 1N5242
D22	48D67120A11	Diode; A11
D23, D24	48S191A05	Rectifier, Silicon; 91A05

Table 6-2 Motorola Replacement Part Numbers

Ref. No.	Part No.	Description
Fuses:		
F1, F2	65S138269	Fuse, 0.8A–250V
Integrated Circuits:		
IC1	51S10732A01	Ref. Ampl.; T3F
Coils/Chokes:		
L1	24C25448A01	Coil, Horiz. Osc.
L2	24D25603A09	Coil, Horiz. Width
L3	24D25248A14	Coil, Horiz. Lin.
L4	24D25261A09	Coil, Defl. (M5000-155, M5010-155)
L4	24D25261A10	Coil, Defl. (M7000-155, M7010-155)
L5	25D25221C12	Choke, Vertical
Transistors:		
Q1	48S137171	Emitter Follower; A6H
Q2	48S137172	Video Pre-Ampl.; A6J
Q3	48S137127	Video Pre-Ampl.; P2S
Q4	48S134952	Video Driver; A2J
Q5	48S137476	Video Output; B1E
Q6	48S137172	Horiz. Osc.; A6J
Q7	48S137127	Horiz. Pulse Shaper; P2S
Q8	48S137093	Horiz. Driver; A5F
Q9	48S137570	Horiz. Output; B2L
Q10	48S137173	Sync Separator; P2W
Q11	48S137172	Sync Ampl.; A6J
Q12	48S137172	Vert. Sync Integrator; A6J
Q13	48S137172	Vert. Sync Ampl.; A6J
Q14	48S137639	Vert. Driver; MPS A13
Q15	48S137596	Vert. Output; B2V
Q16	48S137172	Blanking Ampl.; A6J
Q17	48S137368	Regulator; A8W
Q18	48S134952	Reg. Driver; A2J
Q19	48S137476	Reg. Buffer; B1E
Q20	48S137476	Spot Kill; B1E
Resistors/Controls:		
NOTE: Only power or special resistors are listed. Use the description when ordering standard values of fixed resistors up to 2 watts.		
R6	18D25245A27	Control, Contrast; 500
R14	17S135204	100, 10%, 5W
R17	17S10731A01	3.9K, 5%, 5W
R36	17S10130B07	1.5K, 10%, 3W
R42	18D25218A14	Control, Focus; 2M
R60	18D25245A29	Vert. Size; 250K
R64	18D25245A31	Vert. Lin.; 100K
R66	6S10201A04	Varistor, 1 ma, 120V, 0.5W
R73	18D25245A28	Control, Brightness; 200K
R84	17S135589	150, 10%, 10W
R93	18D25245A21	Control, +73V out Adj.; 2.5K
R95	10731A03	1.5K, 10%, 5W
Switches:		
SW1	40S10624A07	Switch, Slide; D.P. D.T.
Transformers:		
T1	25D25221A05	Horiz.Driver
T2	24D25240B23	H.V. Transformer
T3	25D25239B20	Transformer, Power (M5010-155, M7010-155)
T3	25D25239B30	Transformer, Power (M5000-155, M7000-155)
Misc. Electrical Parts:		
V1	96S241A01	19"–CRT; Type 19VARP4 (M5000/M5010)
V1	96S10848A01	23"–CRT; Type M22VATP4 (M7000/ M7010)
Mechanical Parts:		
	9B25456A01	Block, Fuse (F1, 2)
	42D25158C01	Clamp, Defl. Coil
	26S10251A08	Heat Sink (Q5)
P1	15S10183A69	Housing, Connector; Female (12-Contact, Less Contacts)
	39S10184A67	Contact, Plug; 5 Req'd M5000/M7000, 9 Req'd; M5010/M7010
P2	15S10183A82	Housing, Connector; Male (3-Contact, Less Contacts), M5000/M7000
P2	15S10183A81	Housing, Connector; Female (3-Contact, Less Contacts), M5010/M7010
	39S10184A67	Contact, Plug; 3 Req'd for P2
P3	28S10586A35	Header, Connector; 2-Contact

Table 6-2 Motorola Replacement Part Numbers

REF. NO.	PART NUMBER	DESCRIPTION	REF. NO.	PART NUMBER	DESCRIPTION
P4, P5	15S10183B12	Housing, Connector; Female (3-Contact, Less Contacts) M5010/ M7010		14B25459A01	Insulator, Fuse Cover (F1, 2)
				14A562353	Insulator, Mica (Q9, Q15, Q17)
	39S10184A84	Contact, Plug; 3 ea. Req'd for P5, M5010/ M7010		14C25230A01	Insulator, Molded (On D11 Body)
				14S10157A30	Insulator, Nylon (2-Req'd.); Mtg. P.C. Board
S2	15S10183A81	Housing, Connector; Female (3-Contact, Less Contacts), M5000/M7000		14S10550A02	Insulator, Transistor Cover (Q9, Q15, Q17)
S2	15S10183A82	Housing, Connector; Male (3-Contact, Less Contacts), M5010/M7010		3S136050	Screw, Tpg; 6-20x½ CLU Pan (Mtg. Q9, Q15, Q17 and D11 Socket)
	39S10184A64	Contact, Receptacle; 3 Req'd. for S2		9D25470A01	Socket, CRT; Incl's. R77, R78, R79, R80
S3	15S10183A94	Housing, Connector; Female (2-Contact, Less Contacts)		9D25201A01	Socket, H.V. and CRT Anode
				9C63825A03	Socket, Power Transistor Q9, Q15, Q17)
	39S10184A72	Contact, Receptacle; 3 Req'd. for S3		41D65987A01	Spring Special; CRT Aquadag Gnd.

TEC VIDEOELECTRONICS INC.
SERVICE MANUAL

A. GENERAL

TM-600 and TM-623 is a television monitor for video games. It is designed for operation either from a power supply of 115 volts/50–60 Hz AC or 230 volts/ 50–60 Hz AC. The complete monitor incorporates a picture tube, an integrated circuit, 20 silicon transistors, 18 silicon diodes, 2 germanium diodes, and a high-voltage selenium diode.

This model is equipped with 5V/3A power supply for the operation of the TTL control board and operation of double-pulse-type AFC circuit to obtain a stable picture.

B. SPECIFICATIONS

Power Supply Input
115 volts/230 volts 50–60 Hz ±10%

Power Consumption
60 watts

Video input
0.5 volts composite P/P for 100 volts
2.5 volts P/P maximum
Sync negative at input

Picture Tube
19" (500 mm), 114° deflection for Model TM-600
23" (584.2 mm), 114° deflection for Model TM-623
Integral implosion protection

High Voltage
18 KV nominal at 0 microamperes beam current

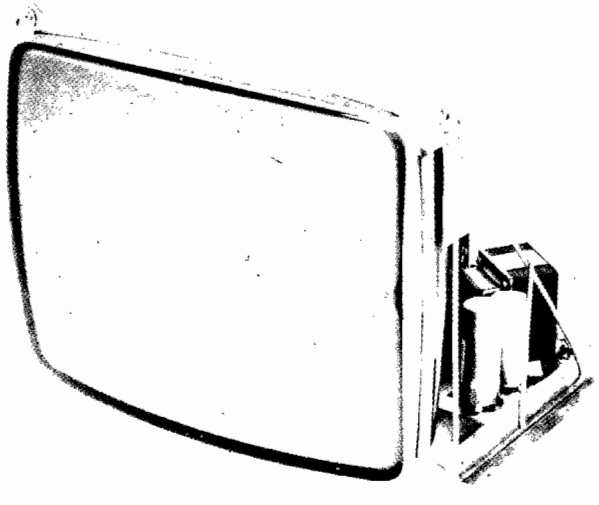
Horizontal Retrace Time
12 microseconds maximum

Resolution
500 lines minimum at picture center

Scanning Frequency
Horizontal: 15.750 Hz ±500 Hz
Vertical: 50–60 Hz

Tone Burst Amplifier
5 watts peak output with TTL drive at nominal line, fully adjustable. 4 watts peak output at low line.

Environment
Operation: Maximum ambient temperature 50°C (122°F)
Storage: Temperature range from −40°C to +65°C



Model TM-600 and TM-623 Monitors

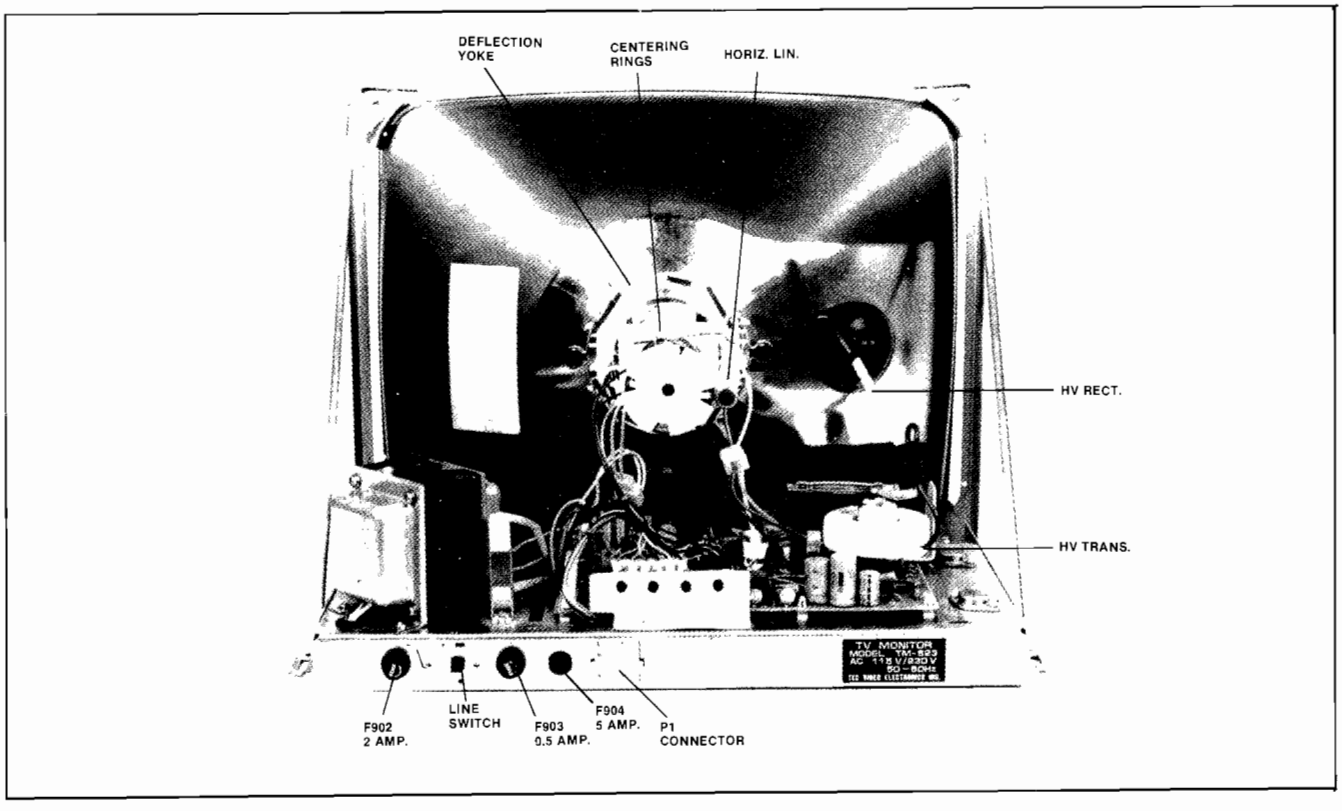


Figure 6-17 TEC Monitor Chassis, Rear View

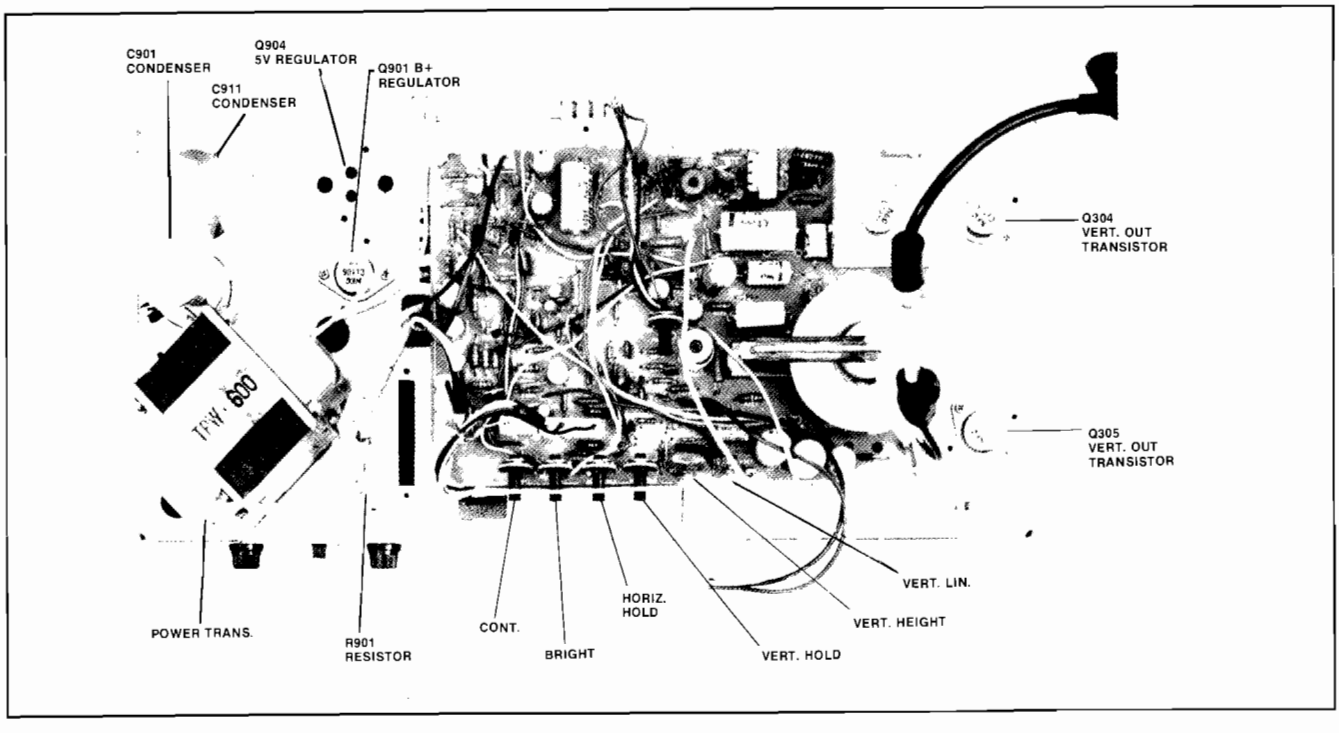


Figure 6-18 TEC Monitor Chassis, Top View

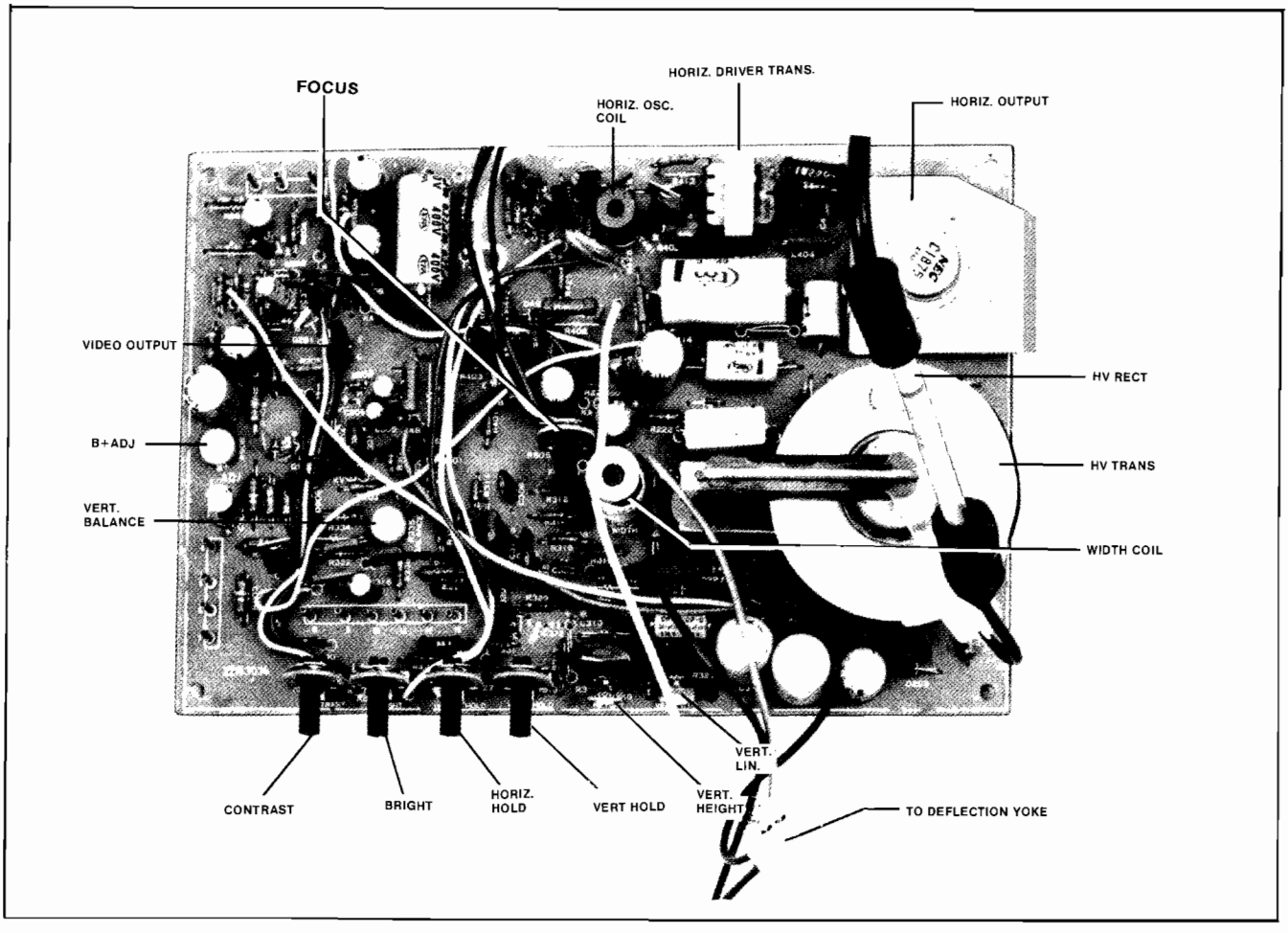


Figure 6-19 TEC Monitor Printed Circuit Board, Top View

Table 6-3 TEC Monitor Replacement Parts Numbers

Ref. No.	Part No.	Description	
Electrical Parts:			
PCB1	2215303600	Main PCB	
A801	485TM60003	CRT PCB	
Transistor and IC:			
Q200	5310500202	MPS9700T or MPS834	1st Video Amp
Q201	5310500261	MPS9750T or MPS4356	2nd Video Amp
Q202	5310500410	2N6558 or MPSU-10	Video Output
Q301	5310500261	MPS9750T or MPS4356	Sync Separator
Q302	5310500201	MPS9700U or MPS834	Vert Osc
Q303	5300500201	MPS9700U or MPS834	Vert Amp
Q304 Q305	4310400030	2SC1106 or 2N6307	Vert Output
Q400	5310500202	MPS9700T or MPS834	Phase Inv
Q401	5310500202	MPS9700T or MPS834	Horiz Osc
Q402	5310500410	2N6558 or MJE9742 or 2N4354	Horiz Amp
Q403	5310400040	2SC1875 or MJ205	Horiz Output
*Q901	5310400030	2SC1106 or MJ3430	Power Regulator

Table 6-3 TEC Monitor Replacement Parts Numbers

Ref. No.	Part No.	Description	
Q902	5310500410 or 5310500070	2N6558 MPS-U04	Regulator Amp
Q903	5310500280	LM1796 or MPS-D01	Reference Amp
Q904	5310500450	MJ2955	5V Regulator
CRT and Diode:			
* V801	5380000060	500SB4	CRT
D203	5340200280	MR9712 or IN4004	Silicon Diode L. V. Rectifier
D204	5340200430	IN4148 or IN4002	Silicon Diode Blanking Clip
D205	5340200430	IN4148 or IN4002	Silicon Diode Blanking Clip
D206	5340200430	IN4148 or IN4002	Silicon Diode Blanking Clip
D207	534020280	MR9712 or IN4004	200V Rect
D301	5340200260	MR-9701	Rectifier Silicon Diode
D401	5340100040	AA143	Phase Det
D402	5340100040	AA143	Phase Det
D403	5340200300	MR9722	Damper
*D404	5340400120	TV20-2K80J or HS30/lb	H.V. Rectifier
D801	5340200290	MR9713	400V Rectifier
D901	5340200270	MR9704 or IN4005	Rectifier Silicon Diode
D902	5340200270	MR9704 or IN4005	Rectifier Silicon Diode
D903	5340200270	MR9704 or IN4005	Rectifier Silicon Diode
D904	5340200270	MR9704 or IN4005	Rectifier Silicon Diode
D906	5340300220 or 5340300310	IN5858A IN6002A	Zener Diode
D907, D908, D909, D910	5340200690	MDA970-1	Rectifier
Coils and Trans:			
*L401	589515015	TDY1005	D.Y. Coil
L402	589512015	HCH1005	Horiz Choke Coil
L403	589512012	HC2-035	Choke Coil
L404	589512012	HC2-035	Choke Coil
L405	589514013	AZ-9177DM	Width Coil
L406	589514016	LH-15J54	Lin Coil

Ref. No.	Part No.	Description	
T401	589514015	TLN-506BX	Horiz Osc
T402	589518012	TLN-519	Horiz Drive
* T403	589517017	TFB-1006AS	F.B.T.
* T901	589519021	TPW-600	Power Trans
Resistors			
R201	RD-4L471J	470 ohm J ¼ W	
R202	RD-4L223J	22 K ohm J ¼ W	
R203	RD-4L563J	56 K ohm J ¼ W	
R204	RD-4L471J	470 ohm J ¼ W	
R205	RD-4L332J	3.3 K ohm J ¼ W	
R206	RD-2L823J	82 K ohm J ½ W	
R207	RD-4L560J	56 ohm J ¼ W	
R208	RD-4L102J	1 K ohm J ¼ W	
R210	RS-029562J	5.6 K ohm J 2 W	
R215	RD-42101J	1 K ohm J ¼ W	
* R216	RD-4L101J	100 ohm J ¼ W	
* R217	RD-4L470J	47 ohm J ½ W	
R218	RD-4L223J	22 K ohm J ¼ W	
R219	RD-4L563J	56 K ohm J ¼ W	
R220	RD-4L102J	1 K ohm J ¼ W	
R221	RD-4L102J	1 K ohm J ¼ W	
R222	RD-2L102J	1 K ohm J ½ W	
R223	RD-2L102J	1 K ohm J ½ W	
R224	RD-2L122J	1.2 K ohm J ½ W	
* R226	RS01P101J	100 ohm J 1 W	
R227	RD-2L123J	12 K ohm J ½ W	
R228	RD-2L105J	1.5 K ohm J ½ W	
R229	RD-4M681J	680 ohm J ¼ W	
R302	RD-4M331J	330 ohm J ¼ W	
R303	RD-4L562J	5.6 K ohm J ¼ W	
R304	RD-4M102J	1 K ohm J ¼ W	
R308	RD-4M104J	100 K ohm J ¼ W	
R309	RD-4M155T	1.5 M ohm J ¼ W	
R310	RD-4M332J	3.3 K ohm J ¼ W	
R311	RD-4M563J	56 K ohm J ¼ W	
R312	RD-4L182J	1.8 K ohm J ¼ W	
R313	RD-4L153J	15 K ohm J ¼ W	
R314	RD-4L183J	18 K ohm J ¼ W	
R315	RD-4L203J	20 K ohm J ¼ W	
R316	RS-2P333J	33 K ohm J ½ W	
R327	RD-4L104J	100 K ohm J ¼ W	
R320	RD-4L124J	120 K ohm J ¼ W	

Table 6-3 TEC Monitor Replacement Parts Numbers

Ref. No.	Part No.	Description
R322	RD-4L224J	220 K ohm J ¼ W
R323	RD-4L433J	43 K ohm J ¼ W
R324	RD-4L471J	470 ohm J ¼ W
R326	RD-4L152J	1.5 K ohm J ¼ W
R339	RD-4L101J	100 ohm J ¼ W
R331	RD-4M331J	330 ohm J ¼ W
R332	RD-4L102J	1 K ohm J ¼ W
R333	RS01P682J	6.8 K ohm J 1 W
R334	RD-2L183J	18 K ohm J ½ W
R336	RD-4L221J	220 ohm J ¼ W
R337	5160122901	2.2 ohm J ½ W
R338	RS-2P150J	15 ohm J ½ W
R339	5160112901	1.2 ohm J ½ W
R340	RS01P220T	22 ohm J 1 W
R401	RD-4L153J	15 K ohm J ¼ W
R402	RD-4L821J	820 ohm J ¼ W
R403	RD-4M561J	560 ohm J ¼ W
R404	RD-4M103J	10 K ohm J ¼ W
R405	RD-4M103J	10 K ohm J ¼ W
R406	RD-4L272J	2.7 K ohm J ¼ W
R407	RD-4L681J	680 ohm J ¼ W
R408	RS02P682J	4.7 K ohm J ½ W
R419	RD-4L270J	27 ohm J ¼ W
R410	RD-4L182J	1.8 K ohm J ¼ W
R411	RD-4L151J	150 ohm J ¼ W
R412	RD-4L561J	560 ohm J ¼ W
R413	RS01P682J	6.8 K ohm J 1 W
R414	RD-2L221J	220 ohm J ½ W
R415	5160122903	2.2 ohm J 1 W
R416	RD-2L569J	5.6 ohm J ½ W
R417	RS02P182J	1.8 K ohm J 2 W
R418	RS01P123J	12 K ohm J 1 W
*R420	RX05P220J	22 ohm J 5 W
*R421	RD-2L569J	5.6 ohm J ½ W
R422	RD-4L153J	47 ohm J 1 W
R425	RD-4L153J	15 K ohm J ¼ W
R426	55337153	15 K ohm J ¼ W
R802	RD-2L154J	150 K ohm J ½ W
R804	RD-2L474J	470 K ohm J ½ W
R811	RD-2L561J	2MΩJ ½ W
*R901	RX20P251J	250 ohm J 20 W
R902	RD-2L101J	1 K ohm J ½ W
R903	RD-2L123J	12 K ohm J ½ W
R904	RD-2L123J	12 K ohm J ½ W
R905	RD-2L223J	22 K ohm J ½ W
R906	RD-2L563J	56 K ohm J ½ W
R907	RD-2L563J	56 K ohm J ½ W
R909	RD-2L682J	6.8 K ohm J ½ W
Controls:		
R211	553102005E	1 K ohm Contrast
R319	553104005B	100 K ohm Vert. Hold
R321	553124008B	220 K ohm Vert. Height
R327	553472008B	4.7 K ohm Vert. Linearity
R335	553102007B	1 K ohm Vert. Balance
R427	553303005B	30 K ohm Horiz Hold
R803	553254005B	250 K ohm Bright
R805	553205005B	2 M ohm Focus
R908	553472007B	4.7 K ohm B+ADJ
Capacitors:		
C201	CE2G1C470	47 mF 16V
C202	CE2G1F101	100 mF 25V
C203	CE2G1C220	22 mF 16V
C204	CE2G1H101	100 mF 35V
C205	CE2G1C220	22 mF 16V
C206	C1SL1H561K	560 pF K 50V
C207	CE2G0J221	220 mF 6.3V
C208	5270322401	0.22 mF M 400V
C209	CE2G2F229	2.2 mF 315V
C210	CE2G1H220	22 mF 35V
C211	CE2G1H339	3.3 mF 50V
C213	CK1F2H102K	0.001 mF 500V
C220	CE2G2F220	2.2 mF 250V
C301	CQ1M1H473K	0.047 mF K 50V
C304	CK1B1H391K	470 pF K 50V
C305	CE2G1H478	0.47 mF 50V
C306	56405333	0.033 mF K 50V
C307	CQ1M1H562K	0.0056 mF K 50V
C308	CQ1M1H273K	0.027 mF K 50V
C309	CQ1M1H123K	0.012 mF K 50V
C311	CQ1M1H124K	0.12 mF K 50V
C312	CQ1M1H392K	0.0039 mF K 50V
C313	DS5D1C229M	2.2 mF 16V
C314	CQ1M1H474J	0.47 mF 50V
C315	CQ1M1H333K	0.033 mF K 50V
C316	CF2G1A470	47 mF 10V

Table 6-3 TEC Monitor Replacement Parts Numbers

Ref. No.	Part No.	Description	
C317	CE2G2A101	100 mF	100V
C318	CK1E2H103K	0.01 mF	500V
C319	5270310301	0.01 mF	630V
C401	CQ1M1H103K	0.01 mF K	50V
C402	CQ1M1H103K	0.01 mF K	50V
C403	CQ1M1H393K	0.039 mF K	50V
C404	CK1B2H151	150 mF	500V
C405	CE2G1H339	3.3 mF	50V
C406	CQ1M1H104K	0.1 mF K	50V
C407	CQ1M1H223K	0.022 mF J	50V
C408	CQ1M1H683K	0.068 mF J	50 V
C409	CE2G1F470	47 mF	25V
C410	CK1B2H681K	680 pF K	500V
C411	CK1B2H222K	0.0022 mF K	500V
C412	CK1B1H152K	0.0015 mF K	50V
C413	CK1B1H102K	0.001 mF K	50V
*C414	CK1B3D471K	470 pF K	2KV
C415	CQ1M2A104K	0.1 mF K	100V
*C416	5270333201	0.0033 mF	1.5KV
C417	CE2G2C100	10 mF	160V
C418	5270333401	0.33 mF K	200V
C419	56635101	100 mF	35V
C420	56625471	470 mF	25V
C801	5270356302	0.056 mF K	630V
*C901	5240700400	450 mF	200V
C902		100 mF	160 V
C904	F2G2C229	2.2 mF	160V
C905	CK1F2H102K	0.001 mF	500V
C911	56625105	10000 mF	25V
C912	56616018	1 mF	16V
Discharge Gaps:			
Z801, Z802, Z803	599030001	EGP-H751A	
Switches:			
*SW-1	PE13-1567	115V/230V Power Line Slide Switch	

Ref. No.	Part No.	Description
Fuses:		
*F902	6990620011	250V 2 Amp.
*F903	5990610013	250V 0.5 Amp.
F904	5990630010	30V 5 Amp.
Mechanical Parts:		
*K001	22-463020	Mate-N-Lock Connector (AMP)
	60085005	Edge Collector (Molex)
	S-A3915	Transistor Socket (SMK)
	*TM60085001	Fuse Holder
or	*TM60085001	Fuse Holder
K005	1-380826-0	Stand-Off Fastener (AMP)
P401	PE19-1569	4P Plug Assy. (Yoke Line)
P402	PE19-1570	4F Recep Assy (Yoke Line)
P403	PE19-1571	3P Connector Assy. (Video Input)
A621	PE19-1572	4P Connector Assy. (Q901 Line)
A631	PE19-1573	6P Connector Assy. (Q304/Q305 Line)
P406	PE19-1574	2P Plug Assy. (Heater Line)
P407	PE19-1575	2P Recep Assy. (Heater Line)
TE901	PE19-1576	Terminator, 6 Pin
E001	135431015	Ground Plate
F001	22-164001	Frame
H003	5432001-1	Plate Heat Sink A
Q403D	54320011	Plate Heat Sink C

NOTE

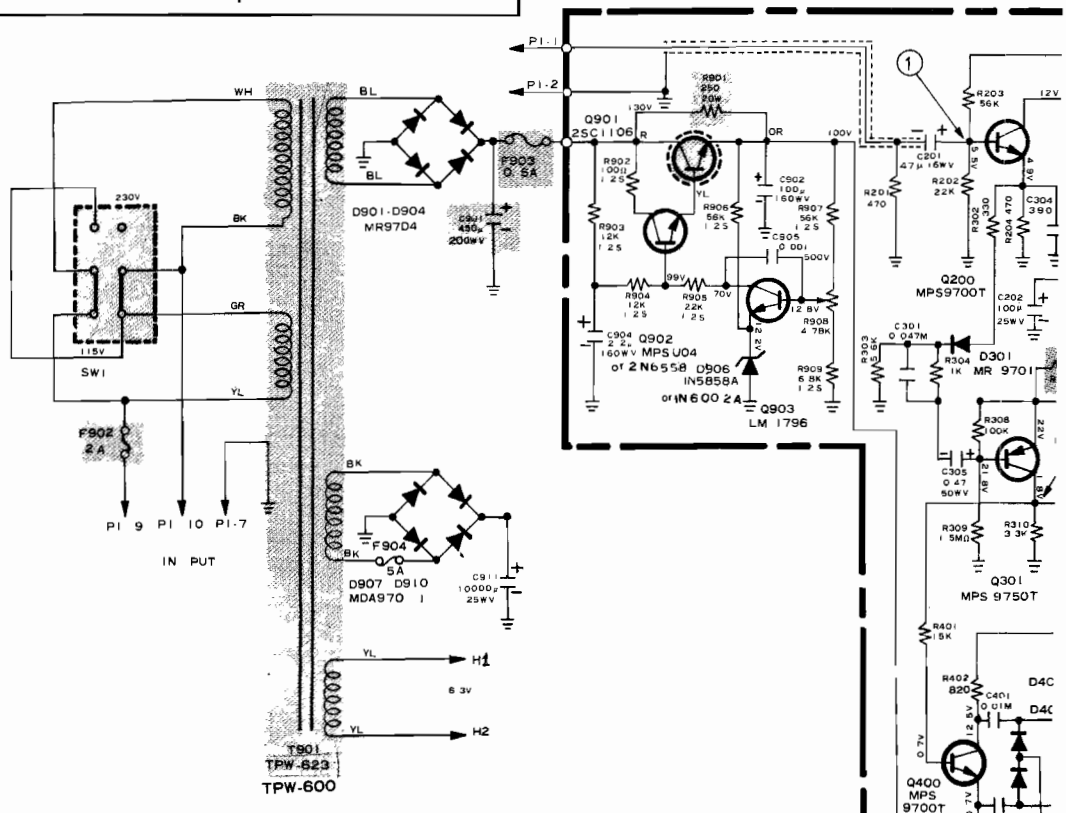
1. Design and specifications are subject to change without notice.
2. J—Indicates ± 5% tolerance
   K—Indicates ±10% tolerance
   M—Indicates ±20% tolerance

WARNING

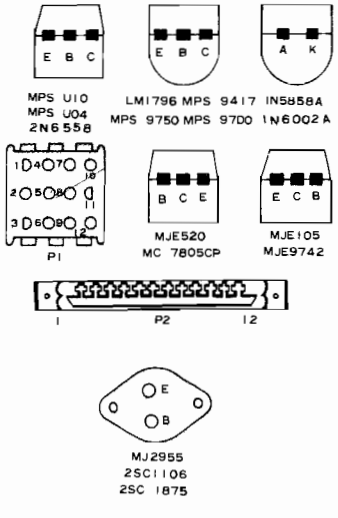
Safety-Critical Components

Components marked with an asterisk (*) on the parts list and with gray shading in the schematic have special characteristics important for safety.

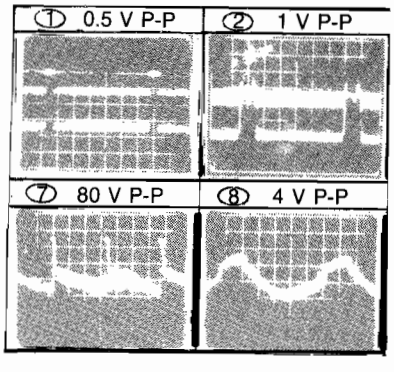
You may create shock, fire, or other hazards by using a replacement that does not have the same characteristics as the recommended part.



TR, IC, and Connector Lines

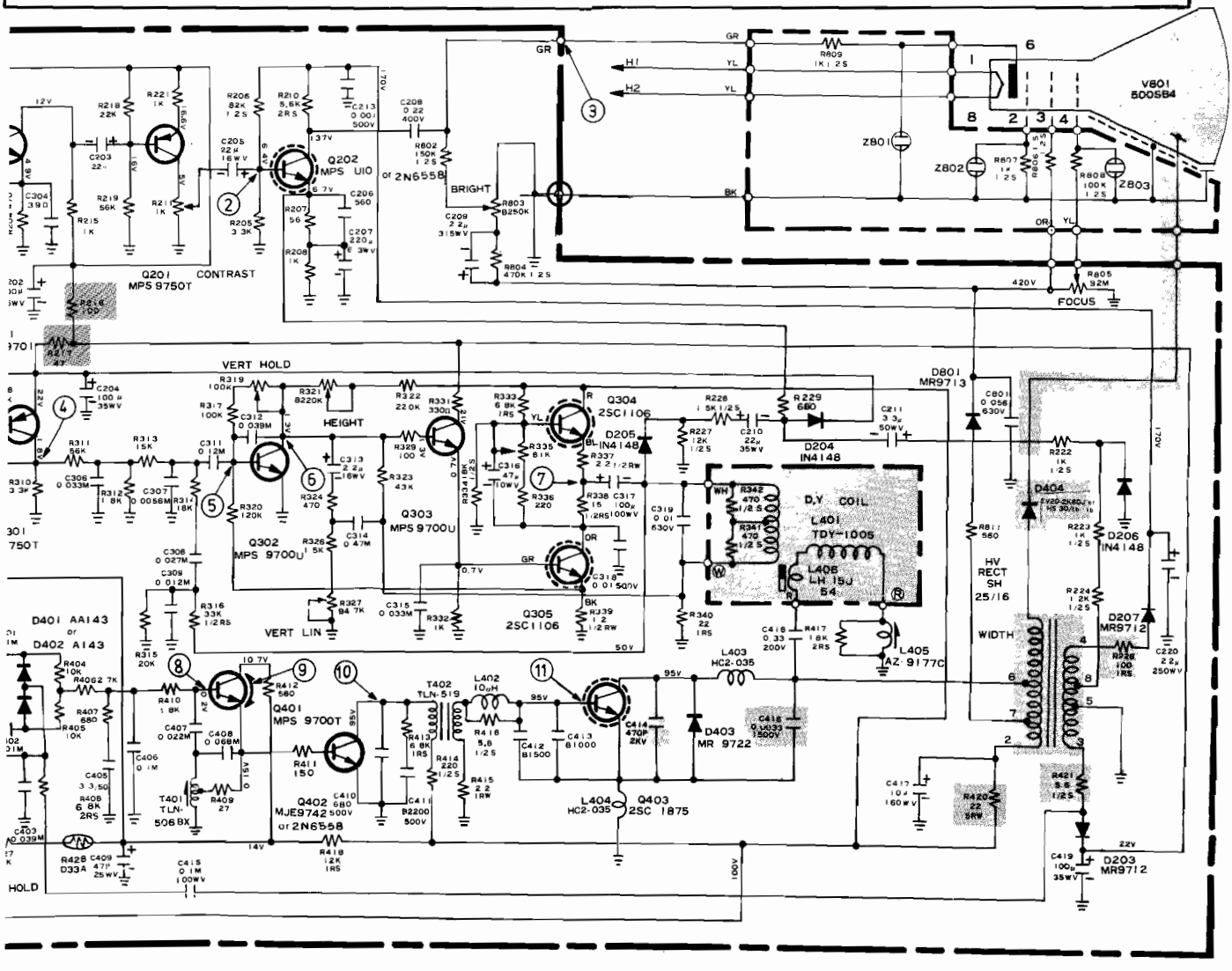


WAVE FORMS



NOTES

1. Unless otherwise specified, all resistance values are in ohms.
2. Unless otherwise specified, in the schematic diagram all capacitor values less than 1 are expressed in mfd, and values more than 1 are in pfd.
3. Voltage readings are taken with VTVM from point indicated on chassis to ground.
4. All waveforms are measured with strong signal input and contrast set to give normal picture.
5. This schematic diagram covers basic or representative chassis only. There *may* be some differences between actual components on chassis and the schematic diagram.



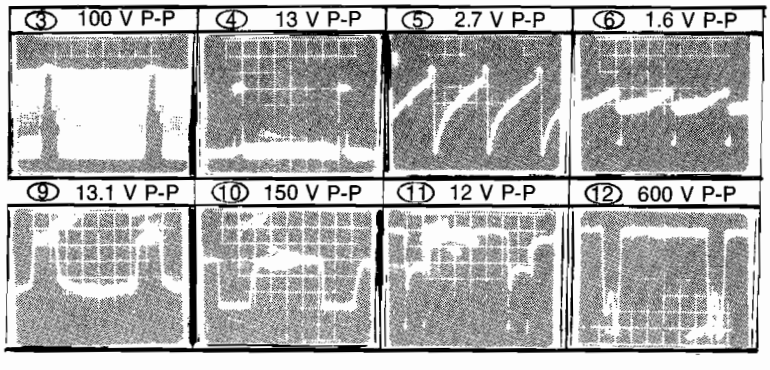
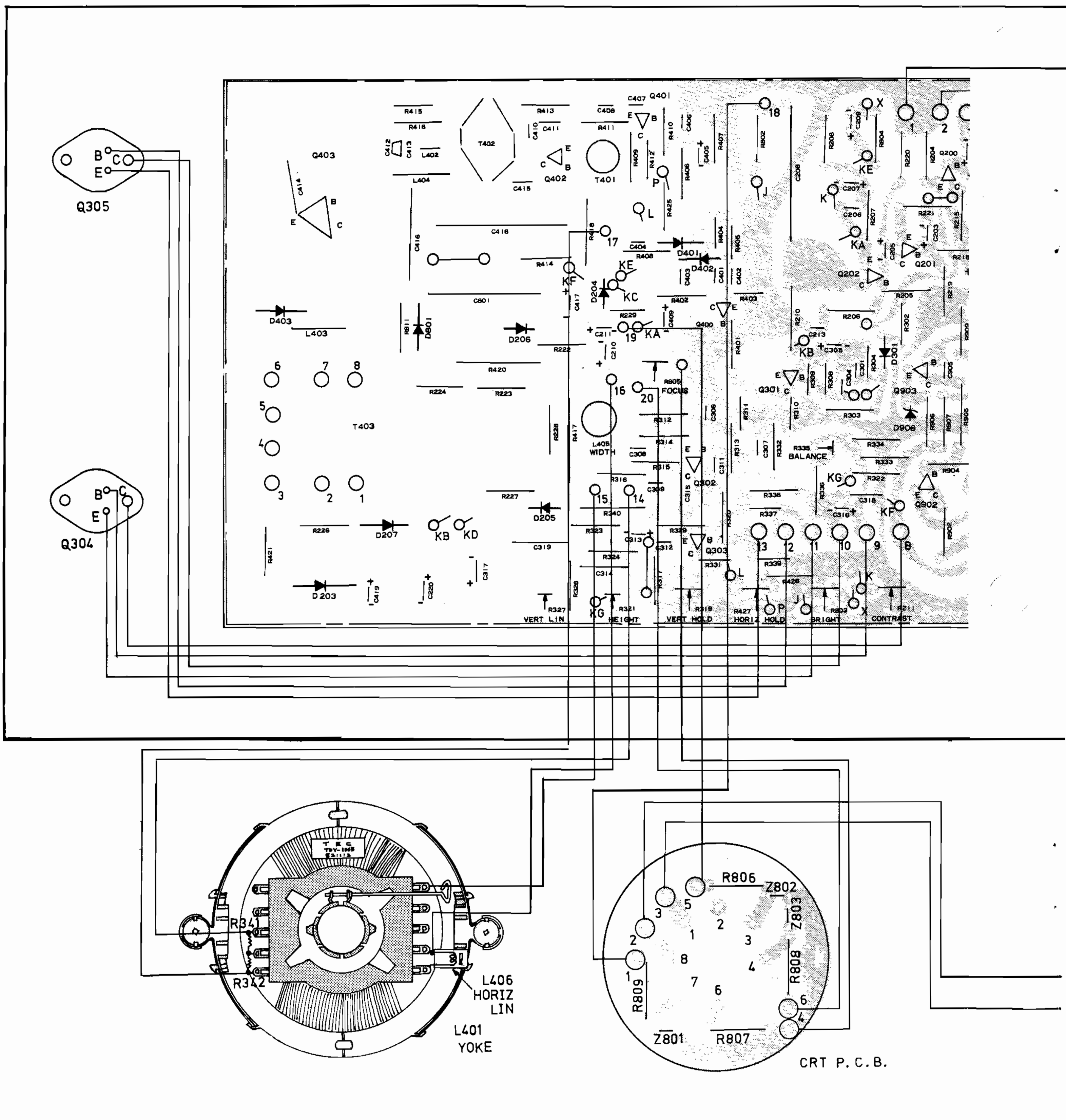
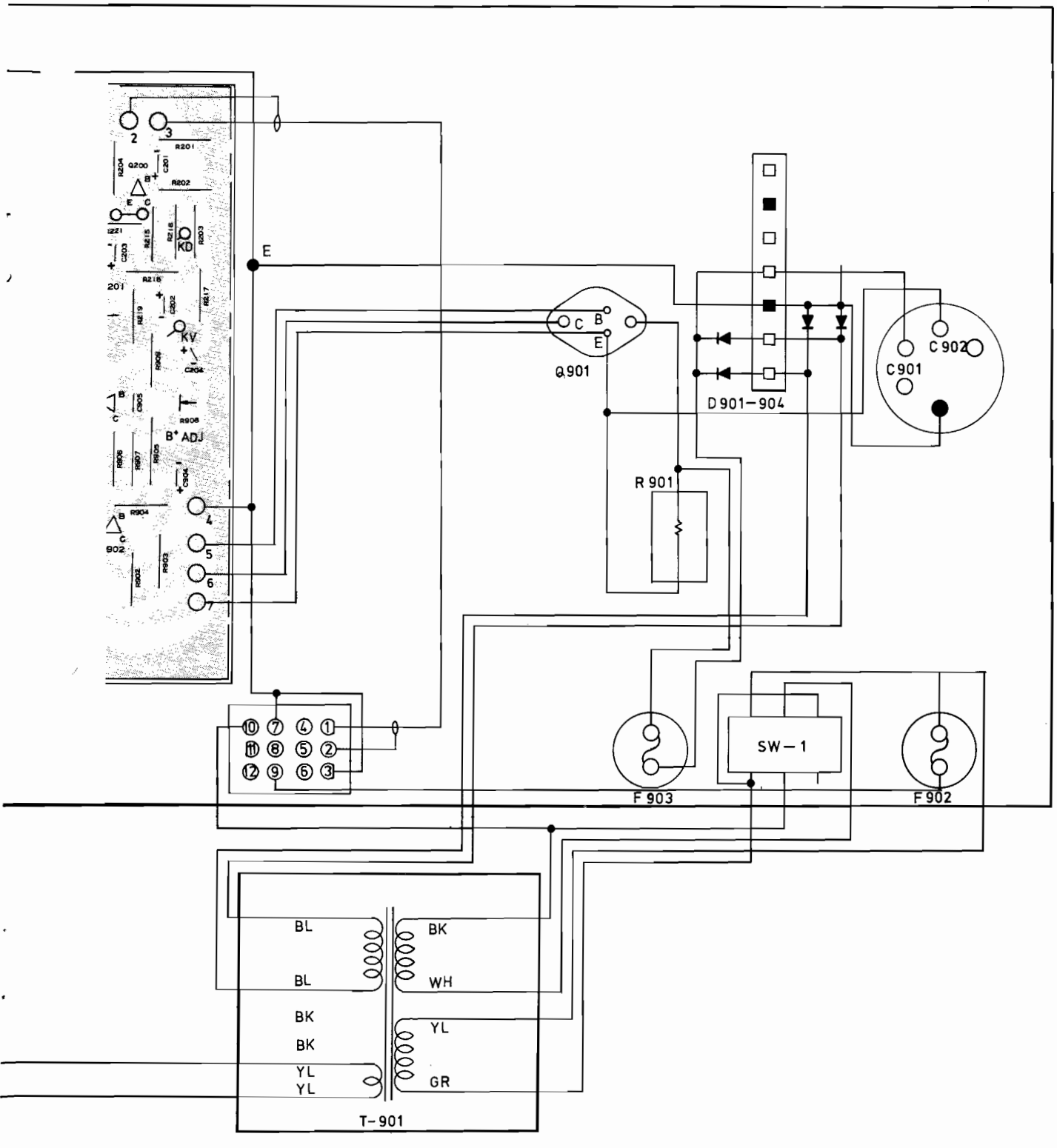


Figure 6-20 TEC Monitor Schematic Diagram


Q305
Q304
T403
L405 WIDTH
R905 FOCUS
R335 BALANCE
VERT LIN
HEIGHT
VERT HOLD
HORIZ HOLD
BRIGHT
CONTRAST
L406 HORIZ LIN
L401 YOKE
R806
Z802
Z803
R808
R809
Z801
R807
CRT P.C.B.



BOTTOM VIEW

Figure 6-21 TEC Monitor Wiring Diagram

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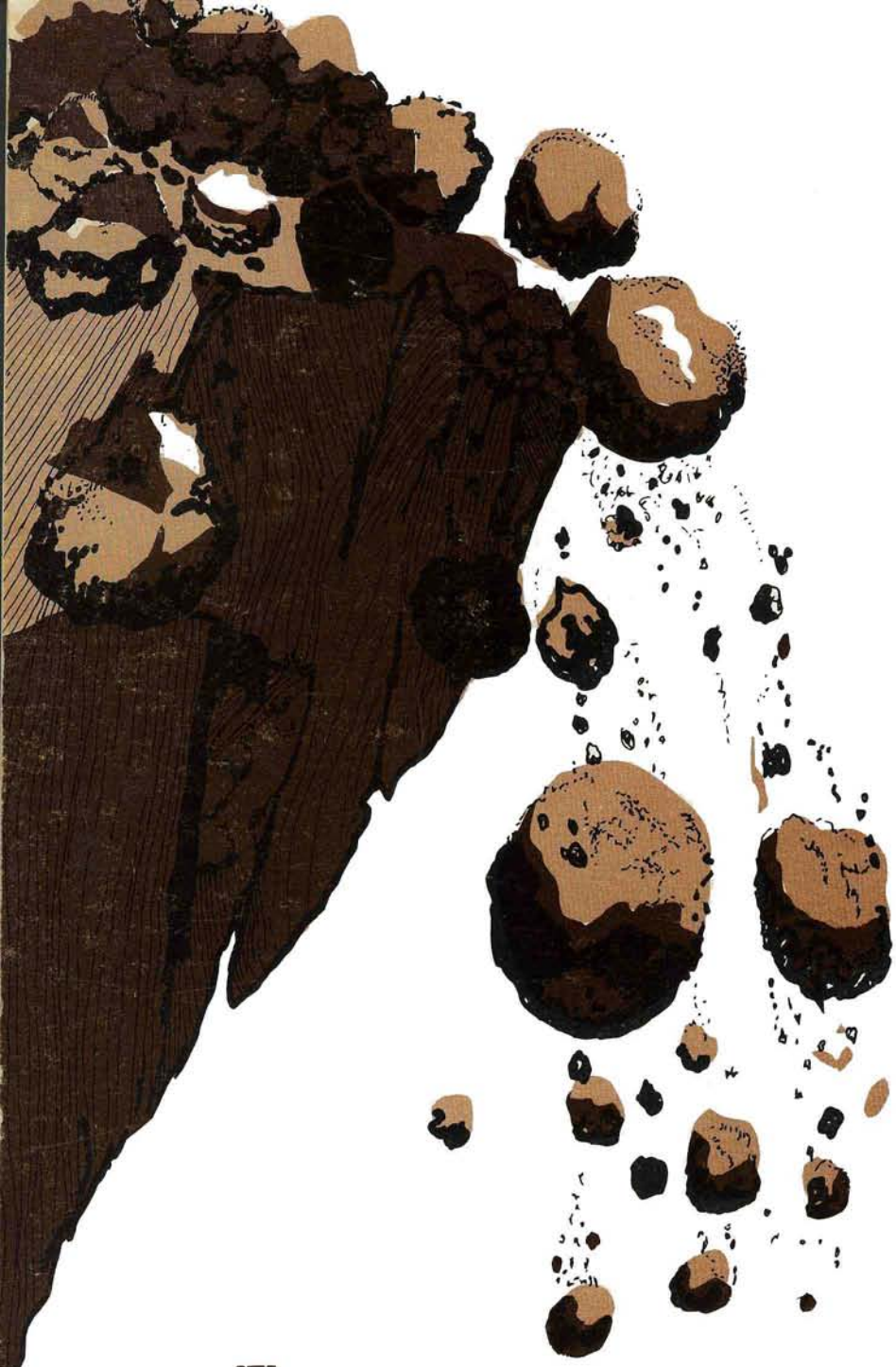

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