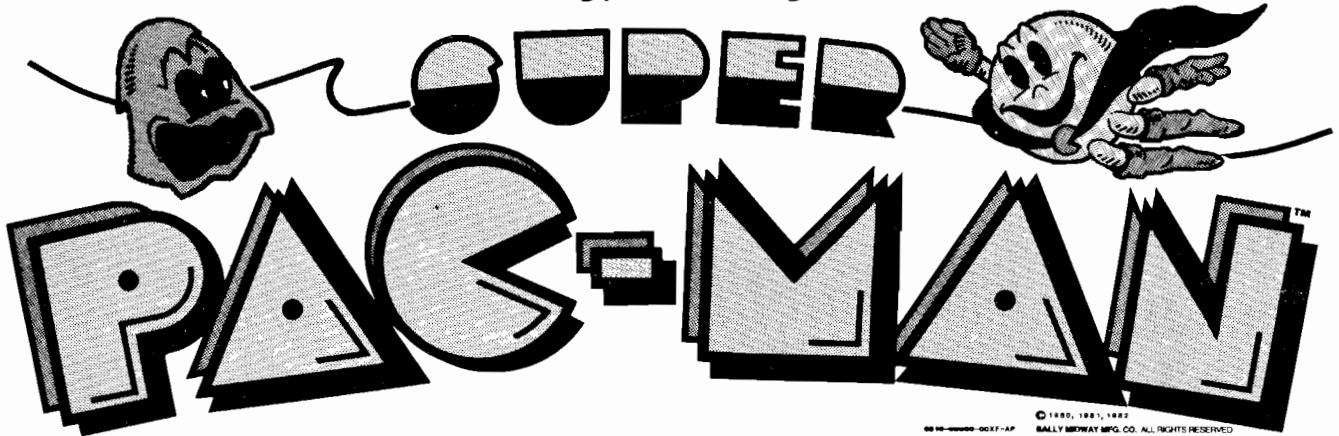
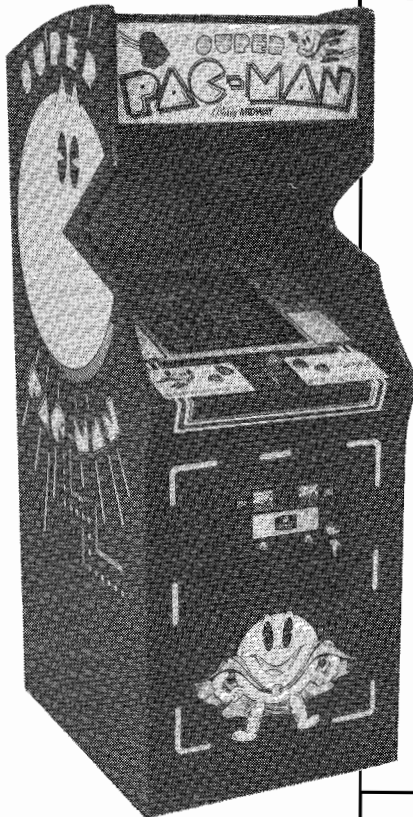


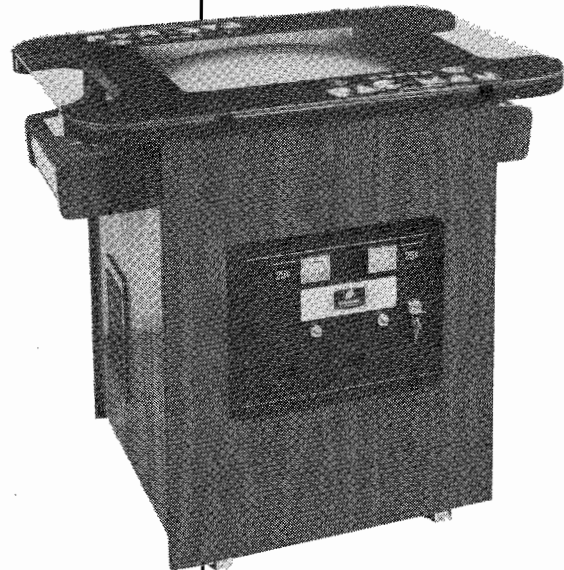
Bally/Midway's



Parts and  
Operating Manual



NO. 316 UPRIGHT



NO. 317 COCKTAIL

*Bally*

MIDWAY MFG. CO.

10750 W. Grand Avenue  
Franklin Park, Illinois 60131  
U.S.A.



Phone: (312) 451-1360

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**WARNING**

**THIS GAME MUST BE GROUNDED. FAILURE TO DO SO MAY RESULT IN DESTRUCTION TO ELECTRONIC COMPONENTS.**

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# Super Pac-Man

## IMPORTANT NOTE

DO NOT plug in your new game yet. Before you do anything to your game, we recommend that you read SECTIONS I and II of this manual completely. It will not take more than a few minutes and it may be very helpful.

## I. Introduction

SUPER PAC-MAN is a one or a two player game. There are two models: the "UPRIGHT" and "COCKTAIL TABLE". When the two player mode is selected on the Upright model, the players take turns at the controls to guide their player through the game course. If you have purchased the Cocktail Table model of this game, the rules of play are the same. The only **difference** is that in the two player mode of the Cocktail Table game, the picture flips to face you when it's your turn.

When playing this game, you are in complete control of SUPER PAC-MAN. He will go wherever you tell him to. And he just loves to eat all the different maze objects (APPLES, BANANAS, DOUGHNUTS, HAMBURGERS, etc.). However, he doesn't like the four ghosts, BLINKY (red), PINKY (pink), INKY (turquoise), and CLYDE (amber) because they feel the same way about him as he does about the maze objects.

BLINKY, PINKY, INKY, and CLYDE are four **VERY SMART** ghosts. They move very fast and seem to have a sixth sense which always lets them know exactly where SUPER PAC-MAN is in the maze. They never give up in their pursuit of him. One of their favorite tricks is to divide and try to trap him between them. You really have to keep an eye on them.

But SUPER PAC-MAN can turn the tables on these four ghosts for short periods of time during each maze. All he has to do is let them get fairly close in their pursuit of him and then eat one of the POWER DOTS that every maze has in it. When this happens, it causes the four ghosts to turn blue with fright no matter where they are in the maze. This is because they know that when he eats a POWER DOT it gives SUPER PAC-MAN the ability to eliminate them. However, he can **ONLY** eliminate them for as long as they are blue.

The ghosts will only stay blue for a few seconds after SUPER PAC-MAN eats a POWER DOT. But they do give a warning **BEFORE** they turn back to their original colors — they start to flash.

As your skill level increases, the four ghosts speed up their pursuit of SUPER PAC-MAN and they stay blue for **shorter and shorter** periods of time after he eats a POWER DOT until, in the VERY high number mazes, they do not turn blue at all.

Bonus players (this is switch selectable) can be awarded to you as you reach or pass certain pre-selected point values. The assigned point values for all items that can be eaten are as listed in Figure 1-1.

## Major Features

A major new feature of your SUPER PAC-MAN game is that there are two SUPER POWER DOTS in each maze that, when eaten, will cause your PAC-MAN to turn into a SUPER PAC-MAN. SUPER PAC-MAN can go anywhere within the maze and eat anything that can be eaten. Nothing can stop him.

## Game Objective

The object of the game is to **HAVE FUN** and survive as long as possible while constantly improving your skills, eating as many maze objects as you can, and eliminating as many ghosts as possible. As you do this, each following maze will be harder and harder to complete.

OBJECT EATEN	POINT VALUE
APPLES .....	10 POINTS EACH
BANANAS .....	20 POINTS EACH
DOUGHNUTS .....	30 POINTS EACH
HAMBURGERS .....	40 POINTS EACH
????? .....	VARIABLE 50 TO 160 POINTS EACH
KEYS .....	50 POINTS EACH
POWER DOTS .....	100 POINTS EACH
SUPER POWER DOTS .....	200 POINTS EACH
1ST GHOST .....	200 POINTS
2ND GHOST .....	400 POINTS
3RD GHOST .....	800 POINTS
4TH GHOST .....	1600 POINTS

Figure 1-1 Assigned Point Values



## II. Location and Setup

### INSPECTION

1. Remove the game from its shipping crate.
2. Inspect the entire outside of it for any signs of damage.
  - Any scratches?, dents?, cracks?
  - Any broken controls?
  - Any broken glass or plastic?
  - Just look it over closely and make a note of any signs of damage.
3. Remove the shipping cleats from the bottom of the cabinet.
4. Install the four levelers, one at each corner of the cabinet.
  - Level the cabinet.
5. Open the cabinet and inspect the inside of the game for any signs of damage. See Figure 2-1.
  - Also check to make sure all plug-in connectors on the wire harness are firmly seated.
  - Replug any connectors found unplugged. **DO NOT FORCE PLUGS ONTO CONNECTORS. DO NOT FORCE PLUGS TOGETHER.** If it won't go on easily, assuming the keys are lined up, it either does not belong there or is damaged.
  - Make sure all printed circuit boards (P.C.B.'s) are firmly seated in their connectors. These connectors are also keyed. The P.C.B.'s will only go into them one way without being damaged.
  - Note the location of the game's serial number. See Figure 2-1.
  - Check all major subassemblies to be sure they are mounted securely. These are called out in Figure 2-1.
    - Power supply.
    - Control panel(s).
    - T.V. monitor.
    - Other P.C.B.'s and/or P.C.B. rack, etc.
    - Power Chassis.
6. Make a note of any problems that can't be easily corrected.
7. Call your distributor and/or service man about your problem list.

**NOTE: ALL connectors or plugs are keyed so they will only go together when all pins are properly lined up.**

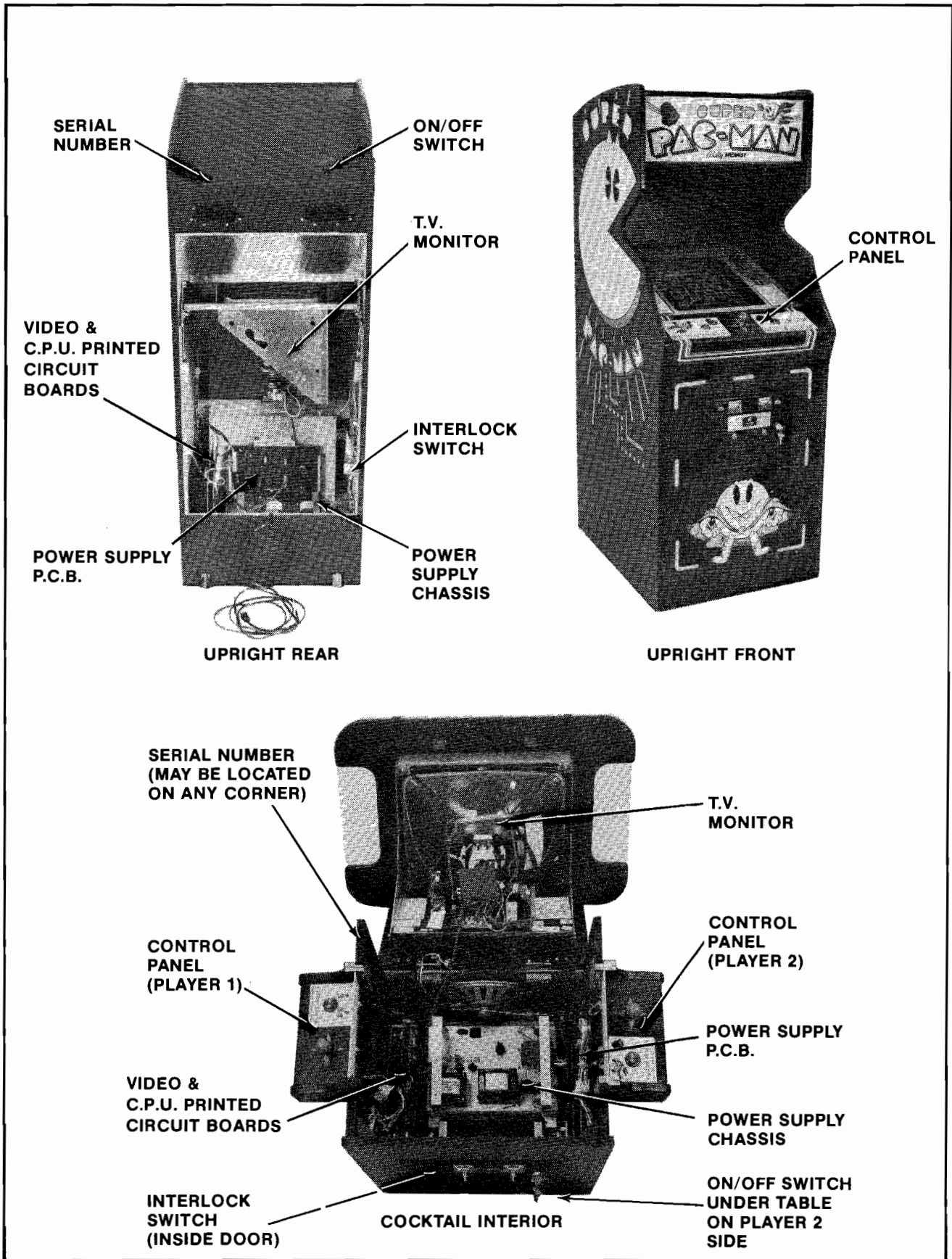


Figure 2-1 Location of Serial No., Interlock Switch, On/Off Switch, & Major Sub-Assemblies

## INSTALLATION

### 1. Location requirements:

- Power:**
  - Domestic 110 V @ 60 Hz
  - Foreign 200 V to 240 V @ 50 Hz
- Temperature:** 32° to 100°F (0° to 38° C)
- Humidity:** Not over 95% relative
- Space required:**
  - Upright 25" x 33" (63 x 84cm)
  - Cocktail 32" x 22" (81 x 55cm)
- Game height:**
  - Upright 68" (170cm)
  - Cocktail 29" (73cm)

### 2. Voltage Selection:

Your game is designed to work properly on the line voltage where you are located. Check your line voltage with a meter to determine what its value is. Then check the power input wires to the main power supply transformer on your game to be sure they are connected to taps which correspond to your line voltage value.

If the power input wires to the main power supply transformer are not connected to taps which correspond to your local line voltage, move them to the proper taps.

If the line voltage in your area falls outside the upper or lower limits of the range of inputs covered by the main power supply transformer, **DO NOT PLUG YOUR GAME IN** until you have talked with your distributor and/or service man and obtained a solution to this problem. Otherwise you could damage your game.

### 3. Interlock and power ON/OFF switches: See Figure 2-1.

- To help prevent the possibility of getting an electric shock while working inside the game cabinet, interlock switches have been installed at each cabinet access door (this **DOES NOT** include the coin door in the Upright models).
- When any access door is opened, the interlock switch installed there turns off all power to the game.
- Check each interlock switch for proper operation. After checking the line voltage in your area and determining that the input wires to the main power supply transformer of your game are connected properly — or — after obtaining a solution to your over or under voltage problem from your distributor and/or your service man, plug the game into your A.C. wall outlet. The game ON/OFF switches for both models are located as shown in Figure 2-1. Turn the game on and allow it to warm up a few minutes.

Slowly open each access door to the game (this **does not** include the coin door on the Upright models).

As the door is opened approximately 1" (2.54cm) the power to the game should go off (the T.V. monitor, all the lights, and all sounds will stop).

If this does not happen, check the interlock switch by this door to see if it has broken loose from its mounting or if it is stuck in the "ON" position.

If the switch is found to be bad, turn the game off, unplug it, and replace the interlock switch.

When done, plug the game back into the wall outlet, close the access door, and turn the game back on.

After the game has warmed up, repeat the above interlock switch test.

When the interlock switch is working properly and turns the power to the game off, power may be restored to the game with the access door(s) open. Take hold of the interlock switch plunger and **gently** pull it out to its fully extended position. **THIS IS TO BE USED ONLY FOR SERVICING THE GAME.** See Figure 2-2.

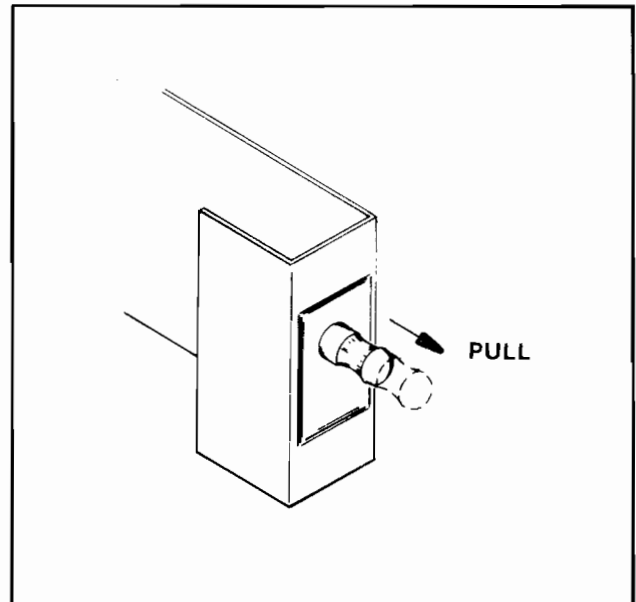


Figure 2-2 Interlock Switch Operation

## SELF-TEST

Your new game will Self-Test itself to see if it has any bad parts. The information it receives while testing itself will be shown on the T.V. monitor. Some information can also be heard through the game's speaker system. See the GAME OPERATION section for a more detailed description of this function.

When there is a bad result according to the Self-Test, call your distributor and/or service man to have the trouble fixed unless it is something you can do yourself (such as replace a bad RAM or ROM chip).

## GAME VOLUME ADJUSTMENT CONTROL

See Figure 2-3.

The game volume control pot is located on the game CPU board assembly. There is only one pot. For adjustment, it may be reached through the rear access door on the Upright models. On the Cocktail Table models, you will have to open the table top to reach it.

To make the sounds louder, turn the pot in a clockwise direction ( ↻ ).

To make the sounds **less** loud, turn the pot in a counterclockwise direction ( ↺ ).

## OPTION SWITCH SETTINGS

To change the option switch settings, you **DO NOT** have to take the Main Game CPU Board out of the

game. They can be easily reached through the rear access door on the Upright models. On the Cocktail Table model, you do have to open the table top to reach them.

When changing any options, **ALWAYS** put the game into the Self-Test mode, make your changes, check the results on the monitor screen, take the game out of the Self-Test mode, and play the game to be sure the switches have worked properly and that no switches were accidentally moved that were not meant to be. (These switches are small and this can happen.)

The option switch settings and what they will make the game do are shown in Figure 2-4. See Figure 2-3 for option switch locations.

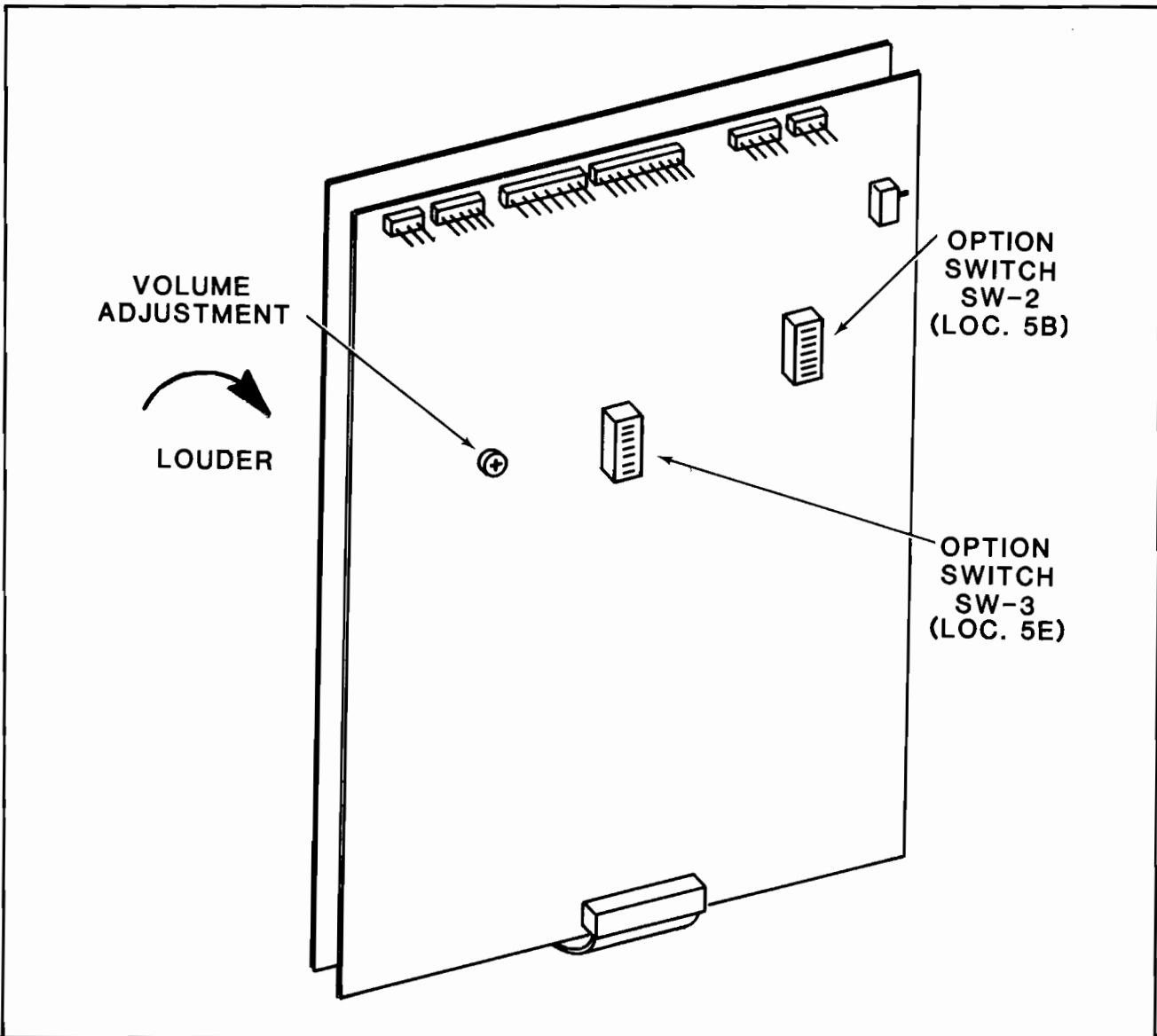


Figure 2-3 Game Volume Adjustment Control & Option Switch Location

<b>SUPER PAC-MAN</b>	
<b>OPTION SWITCH SETTINGS</b>	
<b>DIP SWITCH SW-2 AT LOCATION 5B</b>	
<b>DIFFICULTY LEVEL SETTINGS — “R1” IS THE EASIEST AND “RB” IS THE MOST DIFFICULT</b>	
RANK “R0”—STANDARD LEVEL OF DIFFICULTY	SW#1 SW#2 SW#3 SW#4 SW#5 SW#6 SW#7 SW#8 OFF OFF OFF OFF
RANK “R1”—EASIEST LEVEL OF DIFFICULTY	ON OFF OFF OFF
RANK “R2”	OFF ON OFF OFF
RANK “R3”	ON ON OFF OFF
RANK “R4”	OFF OFF ON OFF
RANK “R5”	ON OFF ON OFF
RANK “R6”—GRADUATED LEVELS OF DIFFICULTY	OFF ON ON OFF
RANK “R7”	ON ON ON OFF
*RANK “R8”—FACTORY SETTING	OFF OFF OFF ON
RANK “R9”	ON OFF OFF ON
RANK “RA”	OFF ON OFF ON
RANK “RB”—HARDEST LEVEL OF DIFFICULTY	ON ON OFF ON
RANK “RC”—EASIEST <b>AUTO</b> DIFFICULTY SETTING	OFF OFF ON ON
RANK “RD”	ON OFF ON ON
RANK “RE”	OFF ON ON ON
RANK “RF”—HARDEST <b>AUTO</b> DIFFICULTY SETTING	ON ON ON ON
<b>SOUND</b>	
*SOUND NO SOUND	SW#1 SW#2 SW#3 SW#4 SW#5 SW#6 SW#7 SW#8 OFF ON
<b>SCREEN</b>	
*NORMAL OPERATION FREEZE VIDEO	SW#1 SW#2 SW#3 SW#4 SW#5 SW#6 SW#7 SW#8 OFF ON
*INDICATES FACTORY RECOMMENDED SETTINGS	PART NUMBER MO51-00316-C012

Figure 2-4 Option Switch Settings

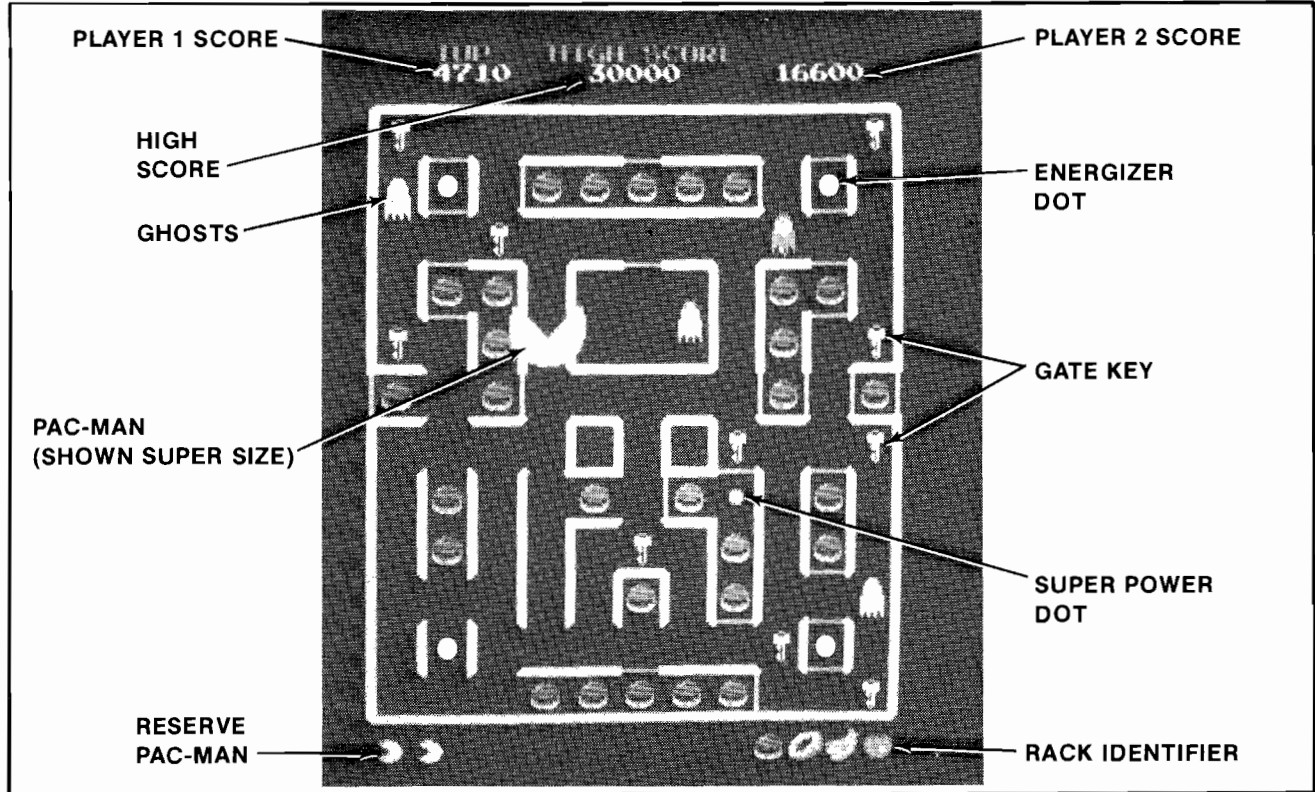
<b>SUPER PAC-MAN</b>									
<b>OPTION SWITCH SETTINGS</b>									
<b>DIP SWITCH SW-3 AT LOCATION 5E</b>									
<b>COINS PER CREDIT — COIN SWITCH 1</b>									
*1 COIN	1 CREDIT	<b>SW#1</b>	<b>SW#2</b>	<b>SW#3</b>	<b>SW#4</b>	<b>SW#5</b>	<b>SW#6</b>	<b>SW#7</b>	<b>SW#8</b>
1 COIN	2 CREDITS	OFF	OFF	OFF					
1 COIN	3 CREDITS	ON	OFF	OFF					
1 COIN	6 CREDITS	OFF	ON	OFF					
1 COIN	7 CREDITS	ON	ON	OFF					
2 COINS	1 CREDIT	OFF	OFF	ON					
2 COINS	3 CREDITS	ON	OFF	ON					
3 COINS	1 CREDIT	OFF	ON	ON					
3 COINS	1 CREDIT	ON	ON	ON					
<b>BONUS SUPER PAC-MEN AWARDED AT THE FOLLOWING POINT VALUES:</b>									
<b>BEGAN WITH 1, 2 OR 3 SUPER PAC-MEN</b>	<b>BEGAN WITH 5 SUPER PAC-MEN</b>	<b>SW#1</b>	<b>SW#2</b>	<b>SW#3</b>	<b>SW#4</b>	<b>SW#5</b>	<b>SW#6</b>	<b>SW#7</b>	<b>SW#8</b>
*1st S P-M 30000	1st S P-M 30000			OFF	OFF	OFF			
2nd S P-M 100000	2nd S P-M 100000								
1st S P-M 30000	1st S P-M 30000			ON	OFF	OFF			
2nd S P-M 80000	2nd S P-M 120000								
1st S P-M 30000	1st S P-M 40000			OFF	ON	OFF			
2nd S P-M 120000	2nd S P-M 120000								
1st S P-M 30000	1st S P-M 30000			ON	ON	OFF			
AND EVERY 80000	AND EVERY 100000								
1st S P-M 30000	1st S P-M 40000			OFF	OFF	ON			
AND EVERY 100000	AND EVERY 120000								
1st S P-M 30000	<b>ONLY</b>			ON	OFF	ON			
AND EVERY 120000	1st S P-MP 100000								
<b>ONLY</b>	<b>ONLY</b>			OFF	ON	ON			
1 S P-M AT 30000	1 S P-M AT 40000								
<b>NO BONUS SHIPS GIVEN WITH THIS SETTING</b>				ON	ON	ON			
<b>DETERMINES NUMBER OF SUPER PAC-MEN PLAYER BEGINS GAME WITH:</b>									
*3 SUPER PAC-MEN		<b>SW#1</b>	<b>SW#2</b>	<b>SW#3</b>	<b>SW#4</b>	<b>SW#5</b>	<b>SW#6</b>	<b>SW#7</b>	<b>SW#8</b>
1 SUPER PAC-MAN								OFF	OFF
2 SUPER PAC-MEN								ON	OFF
5 SUPER PAC-MEN								OFF	ON
								ON	ON
*INDICATES FACTORY RECOMMENDED SETTINGS					<b>PART NUMBER MO51-00316-C012</b>				

Figure 2-4 Option Switch Settings (cont.)

# III. Game Operation

SUPER PAC-MAN is a one or a two player game with a color T.V. monitor. The game gives a display which has all the parts shown below.

The game has five possible modes of operation: ATTRACT, READY-TO-PLAY, PLAY, HIGH SCORE/INITIAL, and SELF-TEST.



Identification of "On Screen" Graphics During Play

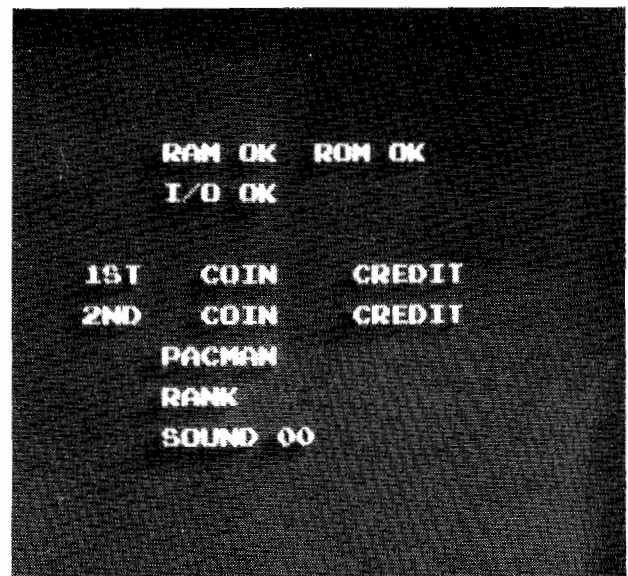
## SELF-TEST MODE

The Self-Test mode is a special mode for checking the game switches and computer functions. It is the easiest and best way to check for proper operation of the entire game.

**NOTE:** Putting the game into Self-Test will cause it to **erase** any CREDITS on the game from its memory.

You may begin a Self-Test at any time by sliding the Self-Test switch to the "ON" position after the power to the game is on. When this is done the game will react as follows:

1. First, you will see random moving multicolored patterns on the screen.
2. Immediately following this, a rightside up test display is shown on the monitor screen. This will remain until you set the Self-Test switch back to the "OFF" position. This test display is shown at right.



Self-Test — Menu

3. If a bad ROM or RAM chip is found by the game's internal check system during the Self-Test, the game indicates this to you by showing the location code of the bad chip(s) on the SCREEN. The following table translates the chip location codes into the actual position on the game's P.C. Boards.

RAM TEST INDICATIONS AND THEIR MEANINGS		
INDICATION	MEANING	CHIP LOCATION
RAM OK	NO RAM IS OUT OF ORDER	
RAM 1	RAM 1 on VIDEO PCB is no good	2E
RAM 2	RAM 2 on VIDEO PCB is no good	2H
RAM 3	RAM 3 on VIDEO PCB is no good	2K
RAM 4	RAM 4 on VIDEO PCB is no good	2J
RAM 5	RAM 5 on C P U PCB is no good	3K
RAM 6	RAM 6 on C P U PCB is no good	3L
RAM 7	RAM 7 on C P U PCB is no good	2D

ROM TEST INDICATIONS AND THEIR MEANINGS		
INDICATION	MEANING	CHIP LOCATION
ROM OK	NO ROM IS OUT OF ORDER	
ROM 1	ROM 1 on C P U PCB is no good	1C
ROM 2	ROM 2 on C P U PCB is no good	1B
ROM 3	ROM 3 on C P U PCB is no good	1K

I/O TEST INDICATIONS AND THEIR MEANINGS		
INDICATION	MEANING	CHIP LOCATION
I/O OK	NO BIT IS OUT OF ORDER	
I/O 1	BIT C P U 1 is out of order	4F
I/O 2	BIT C P U 2 is out of order	4C

4. To check your game function switches and buttons (coin counter switches, TEST CREDIT button, 1 PLAYER and 2 PLAYER buttons): activate each one while the game is in the Self-Test mode. You should hear a game sound for each activation. If you do not hear it, the switch/button is either not working, miswired, or disconnected. Check it out thoroughly.
5. RANK is a difficulty level setting with "R1" being the easiest and "RB" being the most difficult level of play. "RC" through "RF" are AUTO difficulty level settings with "RC" being the easiest and "RF" the hardest setting. In "AUTO" the game measures the player's skill level and **AUTOMATICALLY** gets harder as his/her skill level improves.

6. When finished with the Self-Test mode, slide the Self-Test switch back to the "OFF" position.
- A cross hatch pattern appears on the monitor screen for about 2 seconds.
  - If you wish to keep this test pattern on the monitor screen for further use, slide Self-Test switch back to the "ON" position after the cross hatch appears and before it disappears.
  - When finished with the cross hatch pattern, set the Self-Test switch to the "OFF" position.
  - Normal game functions will now return to the monitor screen.

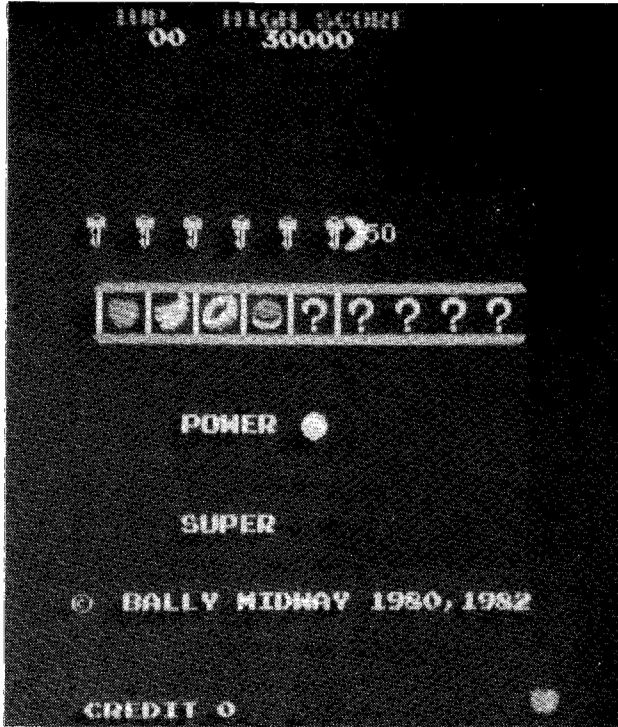


# ATTRACT MODE

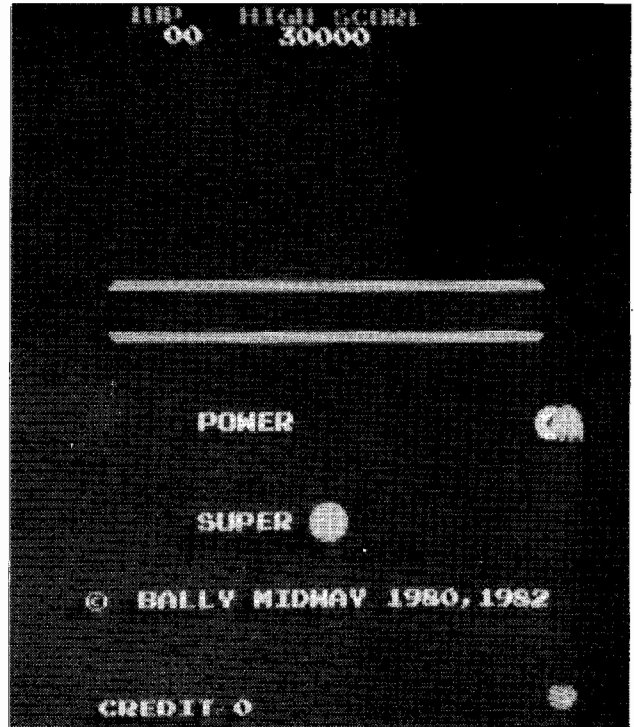
1. The Attract mode starts:

- Just after power has been turned on to the game. (Self-Test switch is in the "OFF" position.)
- After a Self-Test has been completed. (Performing a Self-Test sets the credits in the game's memory to zero "0".)

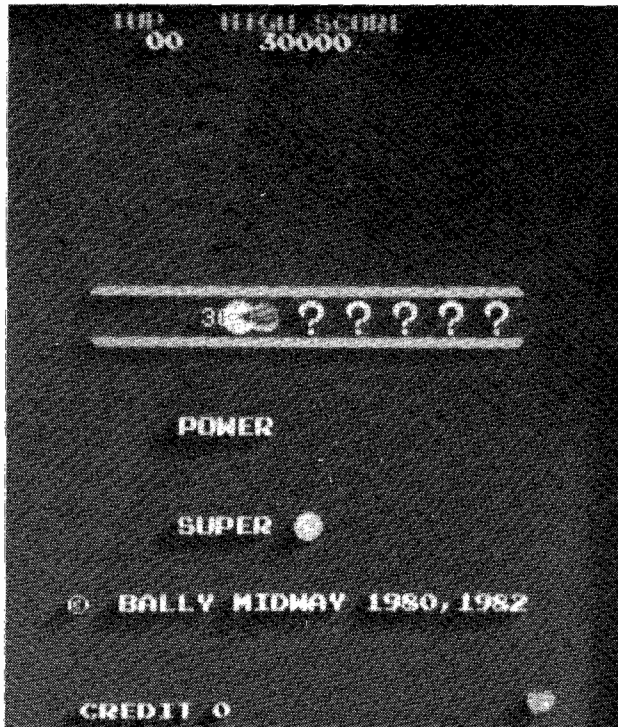
- After a play has been finished and there are no more credits left in the game's memory.
- In the Attract mode, the game will give the following displays **centered** on the monitor screen:



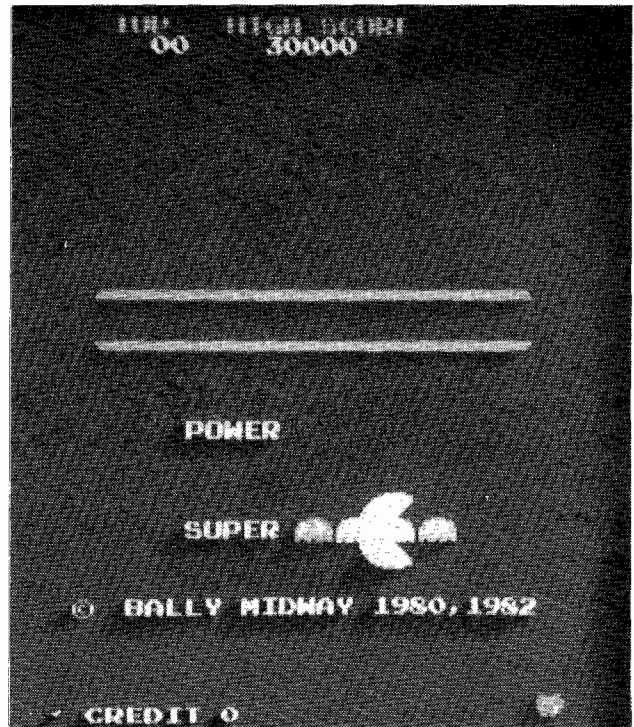
Attract Mode Display 1



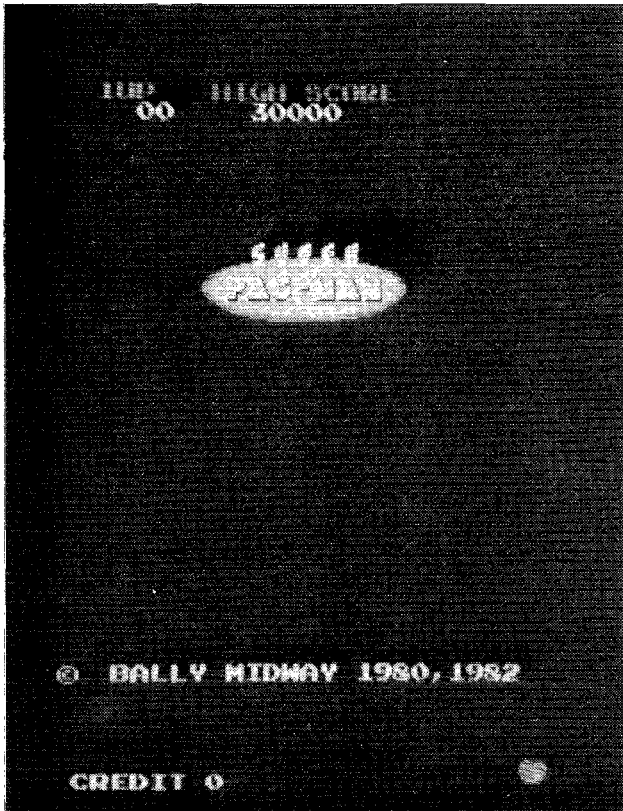
Attract Mode Display 3



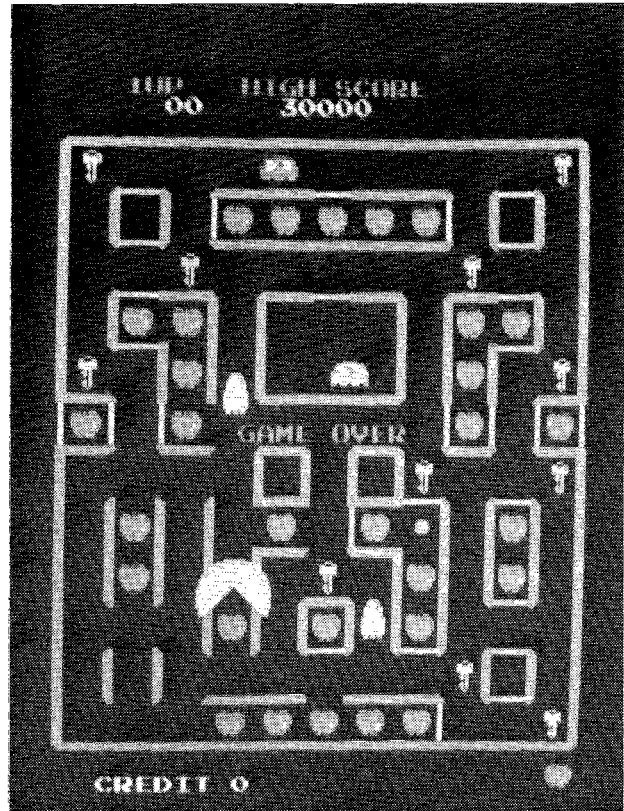
Attract Mode Display 2



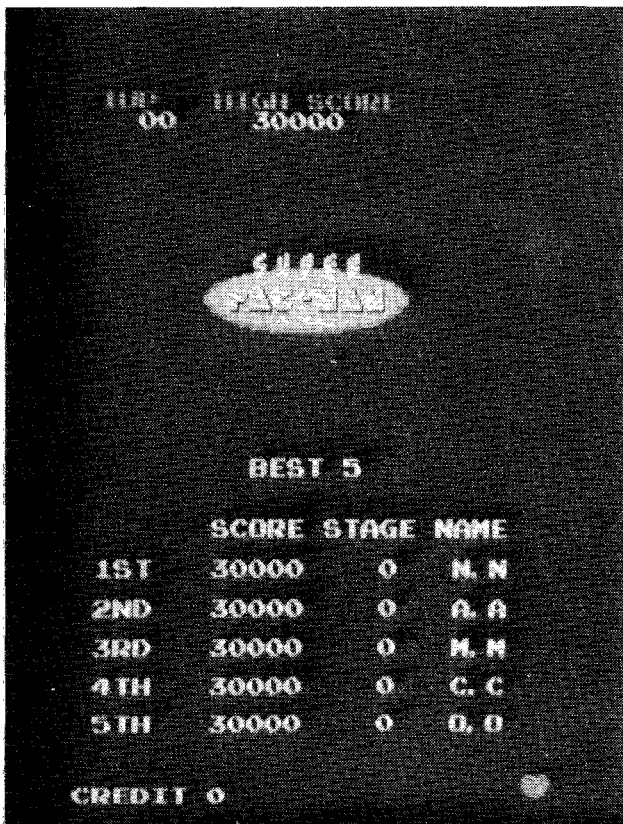
Attract Mode Display 4



Attract Mode Display 5

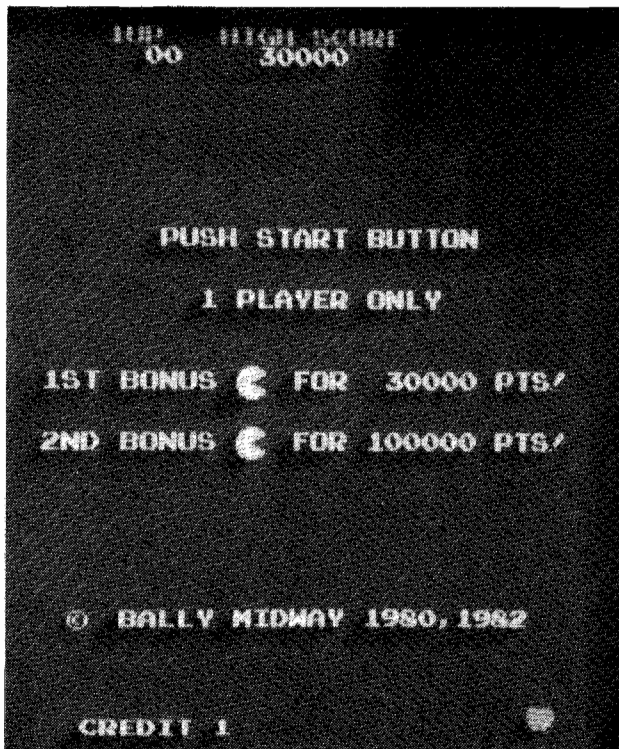


Attract Mode Display 7

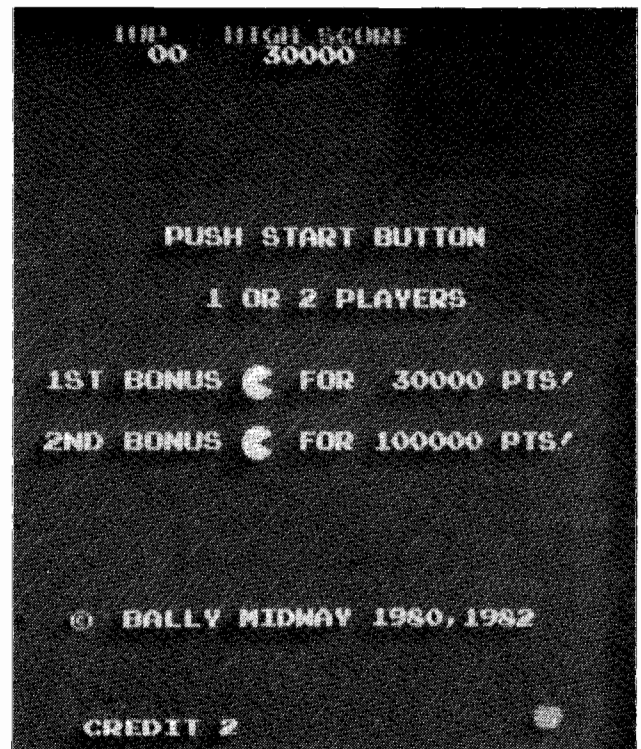


Attract Mode Display 6

- No matter where the game is in the Attract mode sequence, it will immediately go to the following display as soon as a game has been paid for. It will hold this display on the monitor screen until the "1 PLAYER" or "2 PLAYER" start button is pushed.



Ready to Play Mode Display 1



Ready to Play Mode Display 2

## READY-TO-PLAY MODE

1. The Ready-To-Play mode starts when enough coins have been accepted for a 1 or a 2 player game.
2. The Ready-To-Play mode ends when either the "1 PLAYER" or the "2 PLAYER" push button is pressed.
3. In the Ready-To-Play mode, the game will give one of the above displays **centered** on the monitor screen.
4. If no START button is pressed, the game will hold this display on the screen indefinitely.

## PLAY MODE

1. The Play mode begins when the "1 PLAYER" or the "2 PLAYER" start button is pressed. "STAGE 1" "10 PTS" is displayed and then "PLAYER \_\_\_ READY!" is displayed below the "GHOST HOUSE" on the screen.
2. The Play mode ends when your last SUPER PAC-MAN has been eliminated. When this happens, "PLAYER \_\_\_ GAME OVER" is written across the center of the monitor screen (below the "GHOST HOUSE").
3. The game consists of a single maze with side exits. The items that your SUPER PAC-MAN wants to eat are located in maze corridors with locked doors at every possible entrance to them. You must direct your PAC-MAN to eat the KEYS

positioned around the maze in order to gain access to these sealed corridors. The only other way he can get at the food he wants to eat is to eat the KEY that opens the door to one of the two SUPER POWER DOTS in each maze and then eat that SUPER POWER DOT.

When he does this, your PAC-MAN grows to SUPER size and can munch his way through all the locked doors in the maze. YOU can give YOUR Pac-Man SUPER SPEED while he is SUPER size by pressing the SUPER SPEED button on the control panel. He will now move through the maze at a **much faster** pace. However, you will find that he is harder to steer when he is traveling at this SUPER SPEED and you will also notice that he stays SUPER size for a much shorter period of time when traveling at SUPER SPEED.

4. At the beginning of each game, SUPER PAC-MAN appears right below the center of the "GHOST HOUSE" while the four ghosts appear at the "GHOST HOUSE". BLINKY appears outside the doors and PINKY, INKY, and CLYDE appear inside the "GHOST HOUSE".
5. When play begins, BLINKY (who'd love to eliminate him) immediately begins looking for SUPER PAC-MAN (who immediately begins eating KEYS just as fast as he can). As time passes, PINKY, INKY, and CLYDE (who'd also love to eliminate him) leave the "GHOST HOUSE" one at a time and begin looking for SUPER PAC-MAN — who is still busily eating KEYS and maze food just as fast as YOU can steer him to them.

But with all four ghosts chasing him, it is not as easy to eat the KEYS and maze food (without being eliminated by a ghost) as it was earlier in the game. And BLINKY, PINKY, INKY, and CLYDE are four **VERY SMART** ghosts. For instance, they will divide up two, three, or four ways to try to trap SUPER PAC-MAN between them, in a corner, or even in one of the tunnels. You've really got to watch them! It seems like they always have some sneaky new trick up their sheets.

However, if they get too close, SUPER PAC-MAN can always eat one of the flashing POWER DOTS. When this happens, it causes all four ghosts to turn blue with fright no matter where they are in the maze. This is because they know that when he eats a POWER DOT it gives SUPER PAC-MAN the ability to eliminate them. But, he can **ONLY** eliminate them for as long as they are blue. And they will only stay blue for a short period of time. But the ghosts do give a warning **BEFORE** they turn back to their original colors — they start to flash.

When SUPER PAC-MAN eliminates a blue ghost, its point value appears on the monitor screen at the place where the ghost was eliminated while at the same time being added to your score, and the ghost disappears — all except for its eyes. The eyes go back to the "GHOST HOUSE" where they get another body of their original color. This done, they leave the "GHOST HOUSE" again and take up their pursuit of SUPER PAC-MAN once more.

When he eats the last item of any particular maze: all movement stops immediately, the maze flashes and disappears. Next, the game displays "STAGE \_\_\_" "\_\_\_ PTS" and the next maze appears. All the players are in the new maze when it appears. The words "PLAYER \_\_\_ READY!" are also there — right below the "GHOST HOUSE". After a second or two passes, the words "PLAYER \_\_\_ READY!" disappear and play begins.

You **MUST** eat all the food in any particular maze in order to advance to the next one.

The maze identifier symbols appear at the bottom edge of the monitor screen.

As your skill level increases, the four ghosts speed up their pursuit of your SUPER PAC-MAN and they stay blue for **shorter and shorter** periods of time after he eats a POWER DOT until, in the high number mazes, they do not turn blue at all.

Bonus players (this is switch selectable) can be awarded to you as you reach or pass certain preselected point values. The assigned point values for all items that can be eaten are as listed in Figure 1-1.

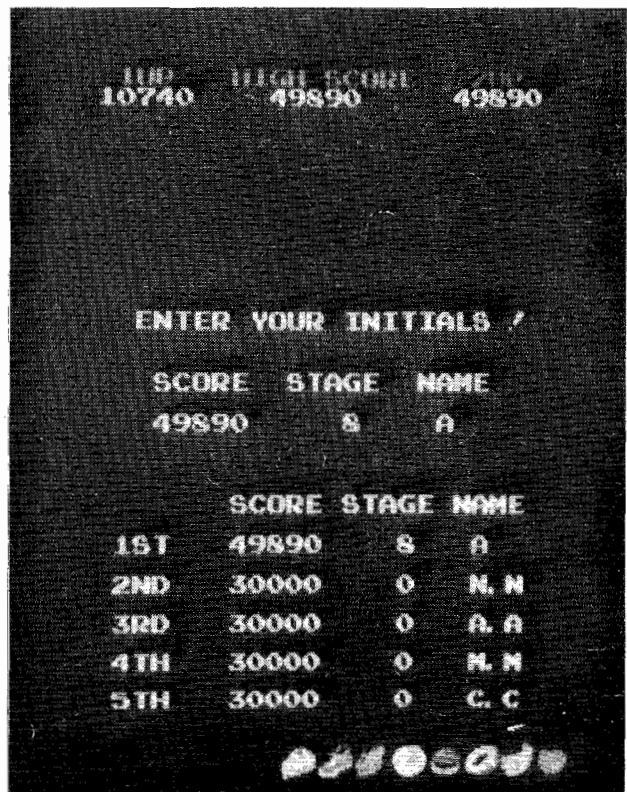
When one of the ghosts happen to eliminate one of your SUPER PAC-MEN, assuming you have at least one remaining in reserve, the maze disappears. Next, the game displays "STAGE \_\_\_" "\_\_\_

PTS" and the maze re-appears. All the players are in the new maze when it reappears. The words "PLAYER \_\_\_ READY!" are also there — right below the "GHOST HOUSE". After a second or two passes, the words "PLAYER \_\_\_ READY!" disappear and play begins anew.

When one of the ghosts eliminates your **LAST** SUPER PAC-MAN, the words "GAME OVER" are displayed below the "GHOST HOUSE", your score is displayed under "1 UP", and in addition, if your score was the highest on this game to date, it will also be displayed under "HIGH SCORE" at the top center of the monitor screen and go into the HIGH SCORE/INITIAL MODE. If your score was **NOT** the highest but was still one of the best five scores to date, the game will then also go into the HIGH SCORE/INITIAL MODE. After this the game will then either go into the Ready-To-Play mode (if there are still credits left in its memory) or into the Attract mode (if there are no more credits left in its memory).

If your score was not high enough to cause the game to go into the HIGH SCORE/INITIAL MODE, it will then either go into the Ready-To-Play mode (if there are still credits left in its memory) or into the Attract mode (if there are no more credits left in its memory).

Most of the above holds true in the "2 PLAYER" mode also. But there are a few minor differences.



High Score/Initial Mode

## TWO PLAYER OPERATION

The Upright and Cocktail Table models both have two player operation.

In the two player mode, the rules of play are the same as in the single player mode. There are some additional rules, however.

1. In the Upright model, the players must take turns at the controls.
2. In the Cocktail Table model, each player has his own set of individual controls. The picture will flip to face you when it is your turn. (When it is not your turn, your set of controls will have **NO** effect on the game.)
3. Your turn lasts until one of the ghosts eliminates your SUPER PAC-MAN. At this point, the game will do one of several things depending on whether or not the eliminated SUPER PAC-MAN was your last or if you still have others remaining in reserve.

### SUPER PAC-MAN ELIMINATED — OTHERS REMAINING IN RESERVE

- The chase stops.
- Next, the game displays "STAGE \_\_\_" "\_\_\_ PTS", the screen display changes to the screen display of the other player, it displays "PLAYER \_\_\_ READY!" under the "GHOST HOUSE" at the same time one of the other player's reserve SUPER PAC-MAN appears.
- After a second or two passes, the words "PLAYER \_\_\_ READY!" disappear and play begins for the other player.

### SUPER PAC-MAN ELIMINATED — NO OTHERS REMAINING IN RESERVE

- Game displays the words "PLAYER ONE" or "PLAYER TWO" "GAME OVER" below the "GHOST HOUSE".
- Your final score is displayed under "1 UP" or "2 UP", depending upon which player you were. In addition, if your score was the highest on this game to date, it will also be displayed under "HIGH SCORE" at the top center of the monitor screen and go into the HIGH SCORE/INITIAL MODE. If your score was **NOT** the highest but was still one of the best five scores to date, the game will then also go into the HIGH SCORE/INITIAL MODE. After this the game will display "STAGE \_\_\_" and "\_\_\_ PTS". The other player's maze appears along with the words "PLAYER \_\_\_ READY!" under the GHOST HOUSE. After a few moments, the words "PLAYER \_\_\_ READY!" disappear and play begins for the other player.

If your score was not high enough to cause the game to go into the HIGH SCORE/INITIAL MODE, it will then display "STAGE \_\_\_" and "\_\_\_ PTS". The other player's maze appears along with

the words "PLAYER \_\_\_ READY!" under the GHOST HOUSE. After a few moments, the words "PLAYER \_\_\_ READY!" disappear and play begins for the other player.

- After the **last** player's **LAST** SUPER PAC-MAN has been eliminated, if his score was not high enough to cause the game to go into the HIGH SCORE/INITIAL MODE, it will then either go into the Ready-To-Play mode (if there are still credits left in its memory) or into the Attract mode (if there are no more credits left in its memory).



# IV. Maintenance and Repair

Your **NEW** game needs certain types of maintenance to keep it in good working order. **CLEAN**, well **MAINTAINED** games **attract players** and **EARN MORE PROFITS**.

The most important thing for you to remember is to run the Self-Test **EVERY TIME** you collect money from the coin box. **JUST LOOKING** at your game **WILL NOT** tell you if all its controls and inside parts are working correctly. The Self-Test will inform you whether or not your game is working the way it should.

The second most important thing you should remember is to clean the outside of the game and coin acceptor mechanisms on a regular basis.

## CLEANING

The outside of the game cabinet plus the metal can be cleaned with any non-abrasive household cleaner. However, the front of the T.V. monitor tube and **both sides** of all other glass and plastic on or in the game **MUST** be cleaned with anti-static cleaner **ONLY**. For cleaning the coin acceptors: hot soapy water may be used on the plastic ones and any household cleanser may be used on the metal ones. If you wish, special coin machine cleaners that leave no residue may be purchased from your distributor.

DO NOT dry-wipe any of the plastic panels. This is because any dust that was on them can scratch their surfaces. If this has happened, anyone looking through this type of damaged plastic would feel he was looking at the game through a fog. This fogging damage **CANNOT** be repaired or reversed. The **ONLY** solution is to **replace** the damaged piece of plastic.

## FUSE REPLACEMENT

This game contains several fuses located as shown in Figure 4-1.

### 1. UPRIGHT MODEL:

As viewed from the back, facing the cabinet, with the rear access door removed; the fuses are located on the Power Chassis Assembly.

### 2. COCKTAIL TABLE MODEL:

As viewed from the coin door side of the cabinet, with the monitor tilted open to one side; the fuses are located on the Power Chassis Assembly.

Replace fuses **ONLY** with the type and size listed in the Illustrated Parts Breakdown Section of this manual.

See the T.V. Monitor Manual (available on request from your distributor or the monitor manufacturer) and/or the T.V. Troubleshooting Section of this manual for information on these fuses.

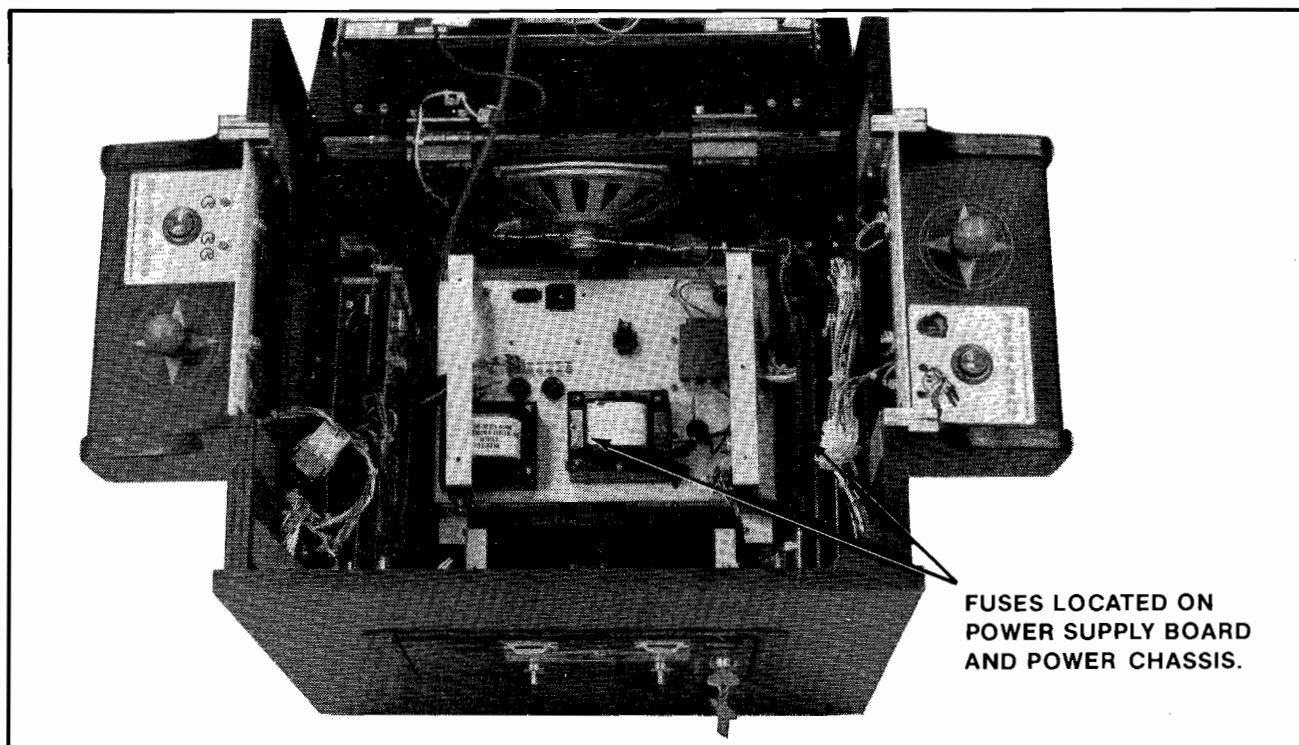


Figure 4-1 Location of Fuses

**OPENING THE CONTROL PANEL.** See Figure 4-2.

**1. UPRIGHT MODEL:**

- The control panel is held in place by three latches, one on the left side, one on the right side, and one on the front center.

They are spring loaded to provide constant positive pressure on their latch plates.

They can be reached through the coin door **AFTER turning power to the game off.**

To release the latches, lift up and toward the center of the control panel.

Once they are released, unhook them from their latch plates.

- To remove the control panel:

Raise it up and tilt it toward you until you can see the cable behind it.

Cradling the control panel between yourself and the cabinet, disconnect it from its cabling and nylon retaining strap.

The control panel is now free and can be removed.

- To reinstall the control panel, reverse this procedure.

**2. COCKTAIL TABLE MODEL:**

- Each control panel is held in place by several screws, two on the inside of the cabinet and three

along the outside bottom edge of the control panel.

**Turn power to the game off.**

Open the coin box door and release the two latches indicated in Figure 4-4

**CAUTION: The right hand latch is very close to the HIGH VOLTAGE on the monitor.**

Once they're released, unhook them from their latch plates.

Grasp the table top at "A" and open it as indicated in Figure 4-4.

**CAUTION: Due to the weight of the monitor, EXTREME CARE MUST be taken when opening the cabinet.**

Remove the screws which secure the control panel in place. See Figure 4-3.

- To remove the control panel(s):

Disconnect it from its cabling.

The control panel is now free and can be removed.

- To reinstall the control panel, reverse this procedure.

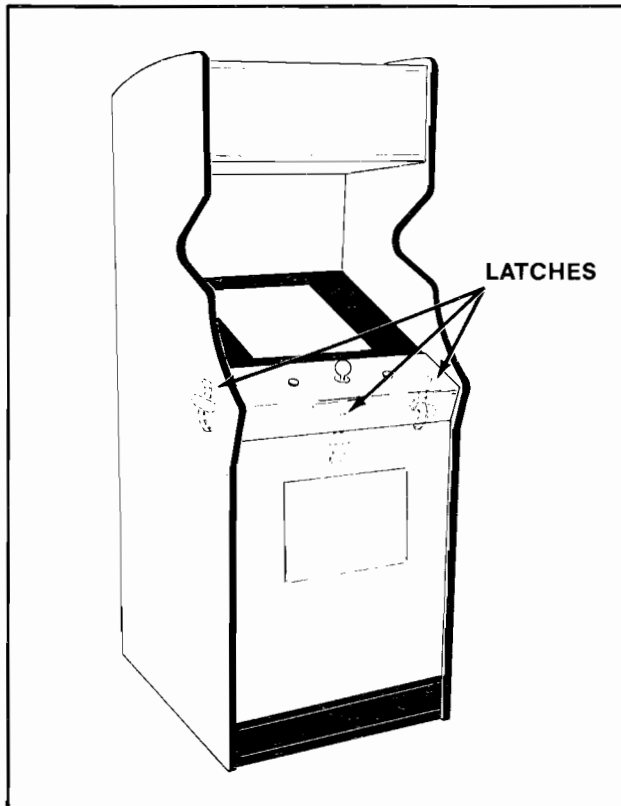


Figure 4-2 Opening the Control Panel — Upright

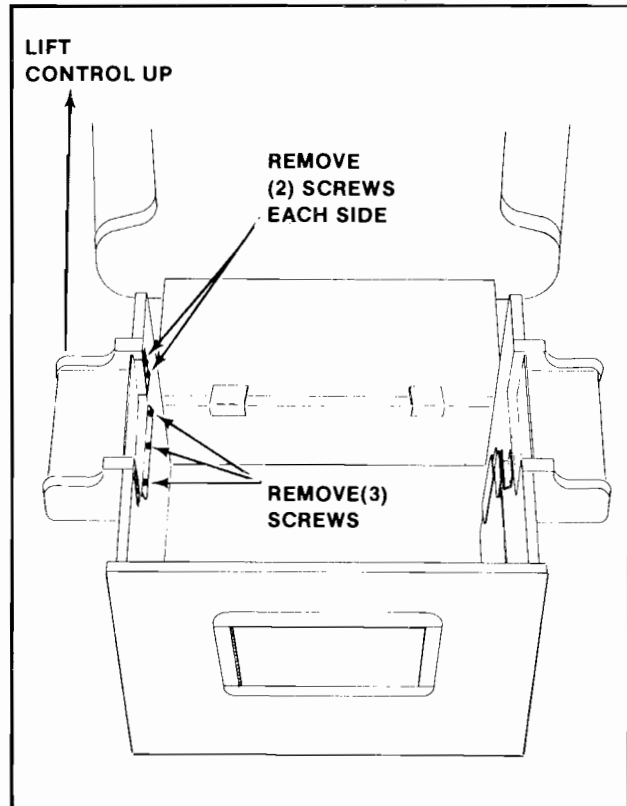


Figure 4-3 Removing the Control Panel — Cocktail



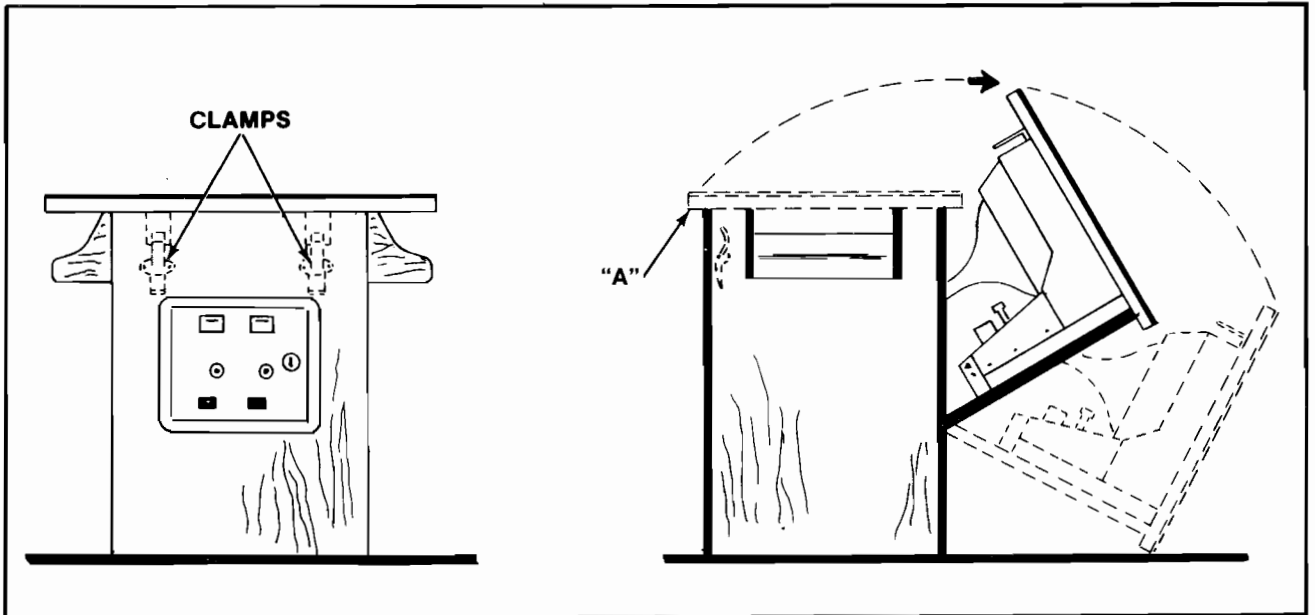


Figure 4-4 Opening the Cocktail Game

## REMOVAL OF THE MAIN-DISPLAY-GLASS AND/OR THE T.V. BEZEL ASSEMBLY

1. UPRIGHT MODEL: See Figure 4-5.

**NOTE:** In order to do this, the control panel **MUST** be removed first. See the "Upright Model" procedure.

- Turn the power to the game off and remove the control panel.
- This frees the main-display-glass so it can be lifted up.
- By putting your finger in the hole in the middle of the main-display-glass support, you can lift it up and out. See Figure 4-5.
- Loosen the screws which secure the T.V. bezel-glass-clamps in place.  
Move the clamps to the side and the bezel glass may be removed.  
Remove the above mentioned screws and the bezel with four bezel-glass-clamps may be removed.
- To reinstall the T.V. bezel assembly and the main-display-glass, reverse this procedure.

2. COCKTAIL TABLE MODEL: See Figure 4-6.

**NOTE:** This may be done with the table top in the open or the closed position. If you decide to open the table top, **TURN THE POWER TO THE GAME OFF FIRST.**

- Remove the screws which secure the table top glass clamps in place.
- Remove the table top glass.

- The bezel may now be removed.
- To reinstall the T.V. bezel and the table top glass, reverse this procedure.

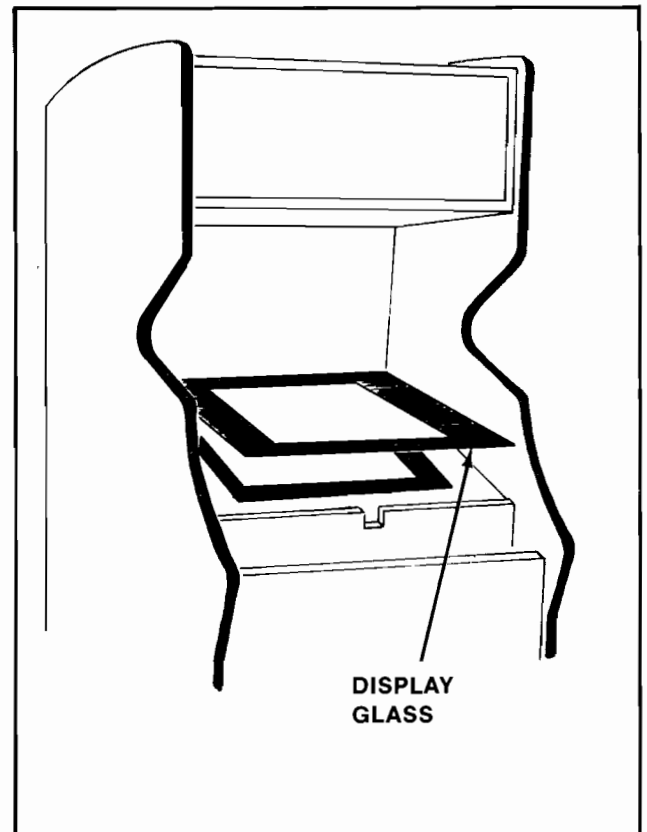


Figure 4-5 Removal of Main Display Glass & T.V. Bezel — Upright

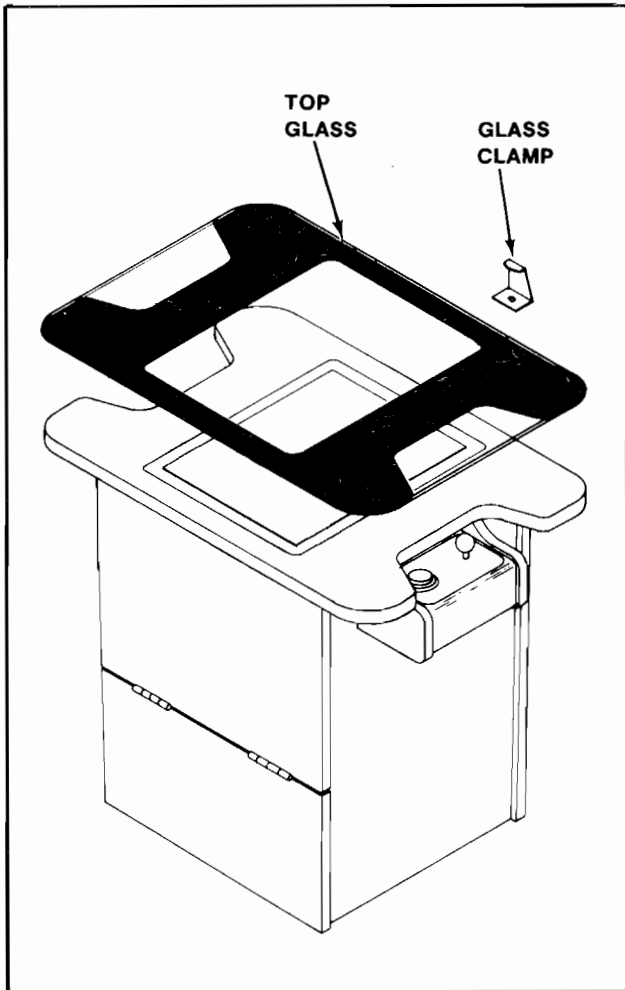


Figure 4-6 Removing Top Glass — Cocktail

## T.V. MONITOR REPLACEMENT

**CAUTION:** High voltages may exist in any television unit, even with the power disconnected. Use **EXTREME CAUTION** and do not touch electrical parts or the T.V. yoke area with your hands or with metal objects held in your hands!

In addition, **BE SURE TO USE HEAVY GLOVES** when handling the monitor. You could cut your hands on the metal T.V. chassis without such protection.

**DANGER:** The T.V. monitor **DOES NOT** contain an isolation transformer on its chassis (it is mounted instead on the floor of the cabinet). When servicing the monitor on a test bench, **YOU MUST ISOLATE THE MONITOR FROM AC VOLTAGE WITH AN ISOLATION TRANSFORMER.**

1. **UPRIGHT MODEL:** See Figure 4-7.

- Turn power off to the game.
- Open the rear access door.
- Completely disconnect the T.V. monitor from all its cabling. **DON'T FORGET THE CHASSIS GROUND WIRE.**

Before removing the T.V. monitor, the main-display-glass **MUST** be removed. See above "Upright Model" procedure.

With the removal of only four bolts, the T.V. monitor will be loose.

The monitor mounting channels slide on top of and against two metal guides mounted to the cabinet's right and left sides. The monitor is removed by sliding it out the back of the cabinet. See Figure 4-7.

To reinstall the T.V. monitor, reverse this procedure.

After replacing the T.V. monitor, be sure to run the game Self-Test.

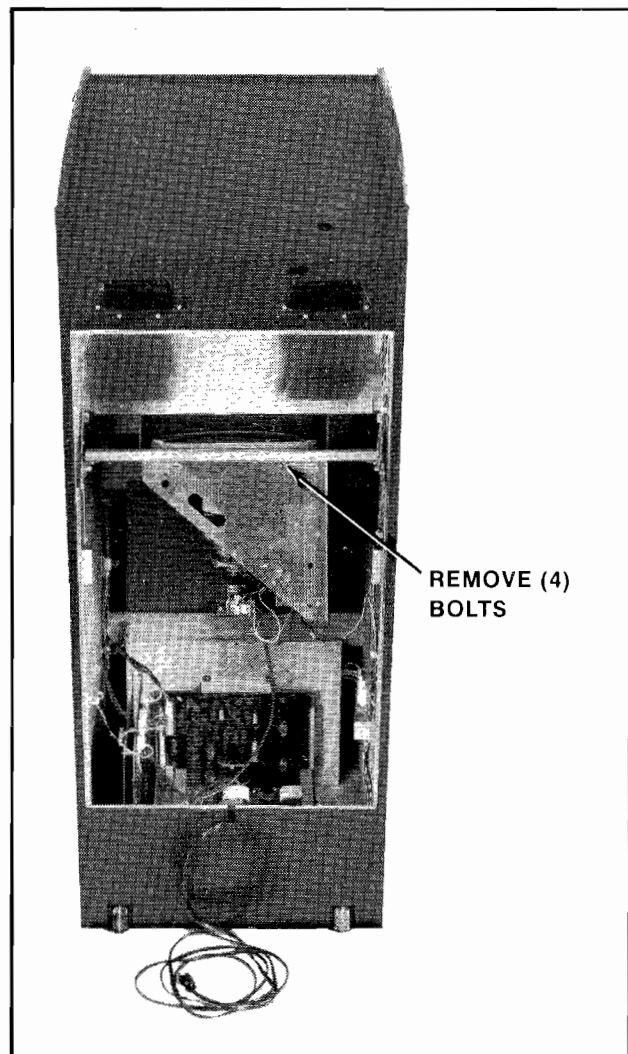


Figure 4-7 Removing Monitor — Upright

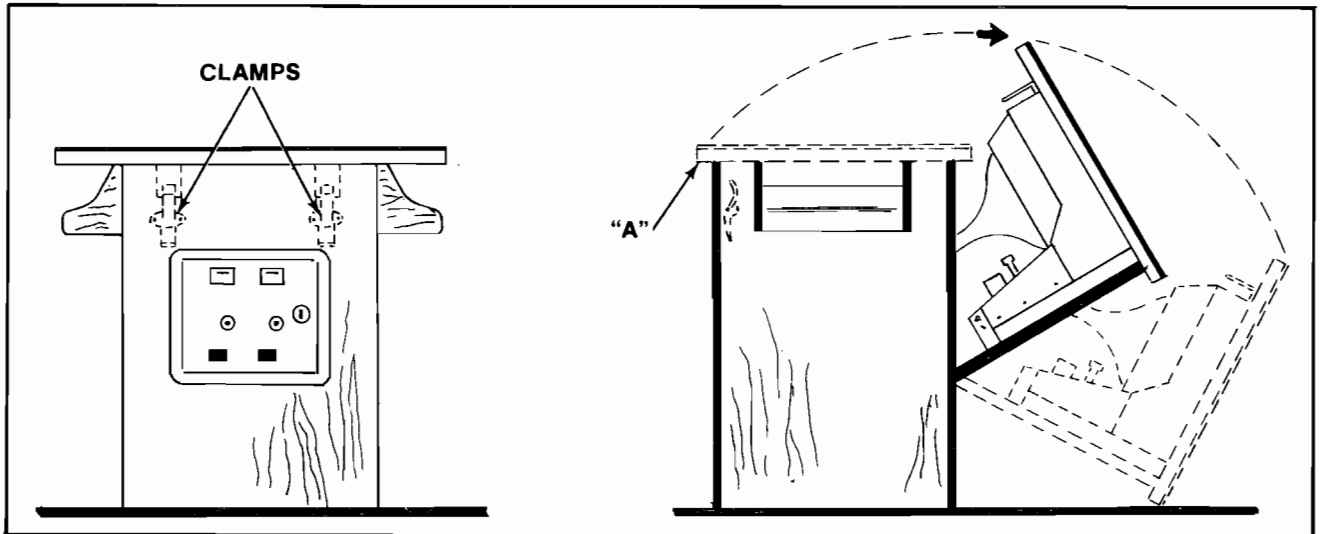


Figure 4-8 Opening the Cocktail Game

2. **COCKTAIL TABLE MODEL:** See Figure 4-9.

- Turn power off to the game.
- Open the coin box door and release the two latches indicated in Figure 4-8.

**CAUTION: The right hand latch is very close to the HIGH VOLTAGE on the monitor.**

- Once the latches are released, unhook them from their latch plates.
- Grasp the table top at "A" and open it as indicated in Figure 4-8.

**CAUTION: Due to the weight of the monitor, EXTREME CARE MUST be taken when opening the cabinet.**

- Remove the screws which hold the table top glass clamps in place.
- Remove the table top glass.
- Lift out the T.V. bezel assembly.
- Completely disconnect the T.V. monitor from all its cabling. **DON'T FORGET THE CHASSIS GROUND WIRE.**
- Remove the screws holding the T.V. monitor chassis to the "L" brackets by the door hinge(s). See Figure 4-9.
- Close the Cocktail Table and re-latch it.
- Remove the screws which secure the T.V. monitor mounting brackets to the edges of the slot cut in the table top. See Figure 4-9.
- Pry up the end of each monitor mounting bracket with a screwdriver or similar tool until you can grasp them both.
- Lift the T.V. monitor straight up and out of the table top being VERY CAREFUL not to bump the neck of the picture tube.

- To reinstall the T.V. monitor, reverse this procedure.
- Be sure to check the clearance of the "L" brackets BEFORE setting the monitor into the table top.
- After replacing the T.V. monitor, be sure to run the game Self-Test.

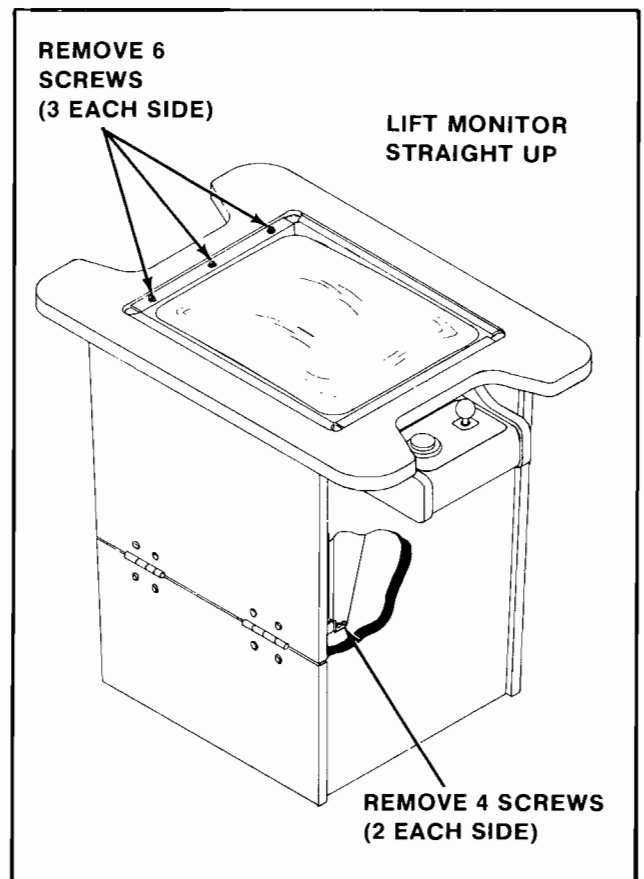


Figure 4-9 Removing Monitor — Cocktail

## PRINTED CIRCUIT BOARD (P.C.B.) REPLACEMENT

### 1. UPRIGHT MODEL: See Figure 4-10.

- Turn the power to the game off.
- Unlock and open the rear access door.
- Disconnect the Main Game Logic Board from all its cabling.
- Disconnect the Auxiliary Game Logic Board from the Main Game Logic Board.
- Remove the P.C.B. clamps indicated in Figure 4-10 and slide the Main Game Logic Board out the back of the cabinet.
- CAREFULLY** pop the Auxiliary Game Logic Board off its four snap-in mounting posts and lift it out the back of the cabinet.
- To reinstall the above P.C.B.'s, reverse this procedure.

**NOTE:** All P.C.B. connectors are keyed and will **ONLY** fit one way without forcing them. The plugs on the cable harness which connect it to the P.C.B.'s are also keyed and will **ONLY** go onto their connectors one way without forcing them.

### 2. COCKTAIL TABLE MODEL: See Figure 4-11.

- Turn the power off to the game.

- Open the cabinet:  
Open the coin box door and release the two latches indicated in Figure 4-8.

**CAUTION: The right hand latch is very close to the HIGH VOLTAGE on the monitor.**

Once they're released, unhook them from their latch plates.

- Grasp the table top at "A" and open it as indicated in Figure 4-8.

**CAUTION: Due to the weight of the monitor, EXTREME CARE MUST be taken when opening the cabinet.**

- To remove the Main and Auxiliary Game Logic Boards. See Figure 4-11.

Disconnect the Auxiliary Game Logic Board from the Main Game Logic Board.

Remove the P.C.B. clamps indicated in Figure 4-11 and slide the Main Game Logic Board out of the cabinet.

**CAREFULLY** pop the Auxiliary Game Logic Board off its four snap-in mounting posts and lift it out of the cabinet. See Figure 4-11.

To reinstall the above P.C.B.'s, reverse this procedure.

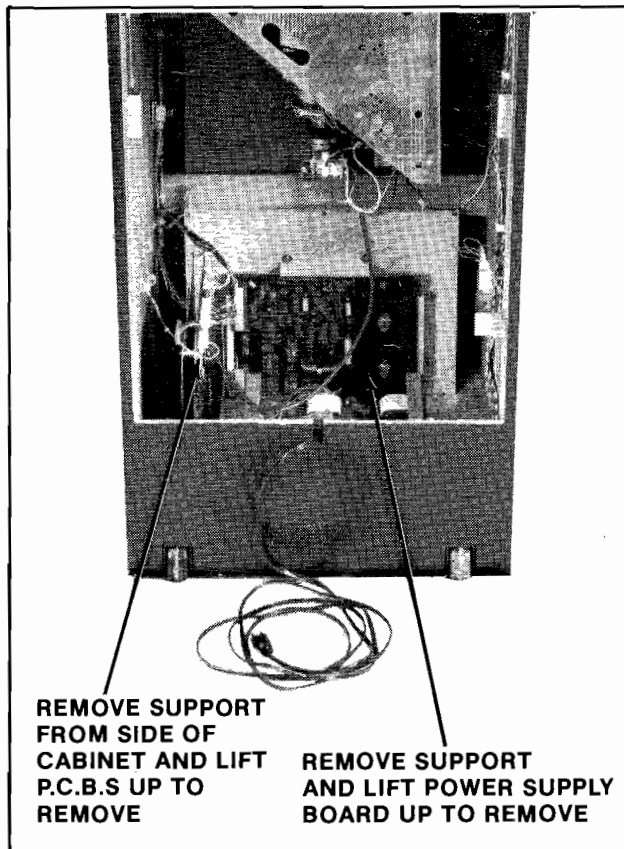


Figure 4-10 Replacing P.C.B.s — Upright

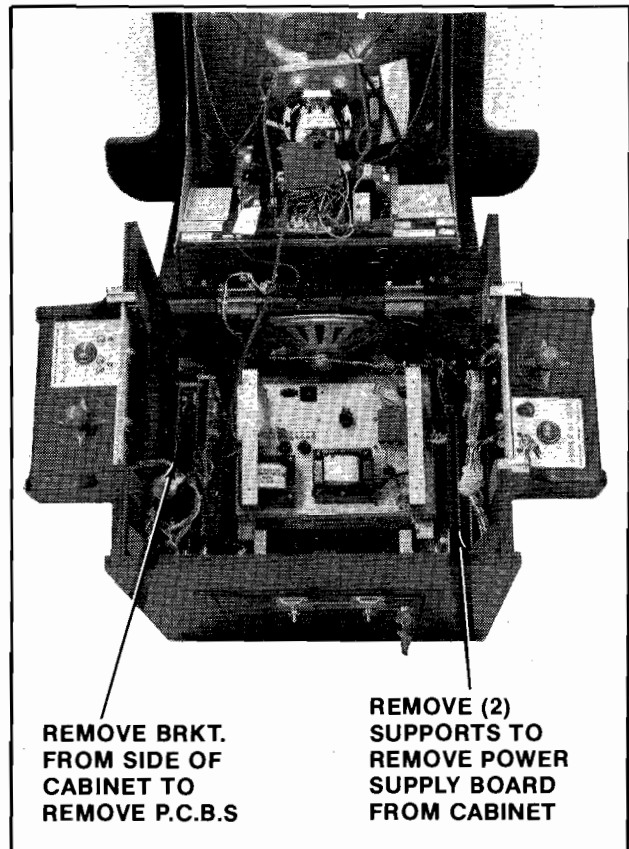


Figure 4-11 Replacing P.C.B.s — Cocktail

## OPENING THE ATTRACTION PANEL

1. **UPRIGHT MODEL:** See Figure 4-12.

Turn the power to the game off.

Opening the attraction panel:

Remove the screws which secure the top bracket in place. (They are on its top side.) See Figure 4-12.

Remove the top bracket and slide up the attraction panel. This exposes the attraction panel fluorescent light tube and its mounting bracket assembly. To reinstall the attraction panel, reverse this procedure.

The fluorescent light tube may be replaced at this time. **BE CAREFUL NOT TO DROP IT.**

**WARNING: If you drop a fluorescent tube and it breaks, IT WILL IMplode! Shattered glass can fly six (6) feet or more from the implosion. Use care when replacing any fluorescent tube.**

Replacing the fluorescent tube starter. See Figure 4-13.

**Be sure the power to the game has been turned off.**

Grasp the starter (it is on the back of the mounting bracket), give it a quarter turn, and remove it from its socket.

To replace the fluorescent light tube starter, reverse this procedure.

Replacement of the fluorescent tube mounting bracket assembly.

**Be sure the power is off to the game.**

Disconnect it from its power cable.

Remove the screws at its right and left hand sides which secure it and gently slide it out the front of the cabinet, being careful not to catch its power cable on anything.

To reinstall the fluorescent tube mounting bracket assembly, reverse this procedure.

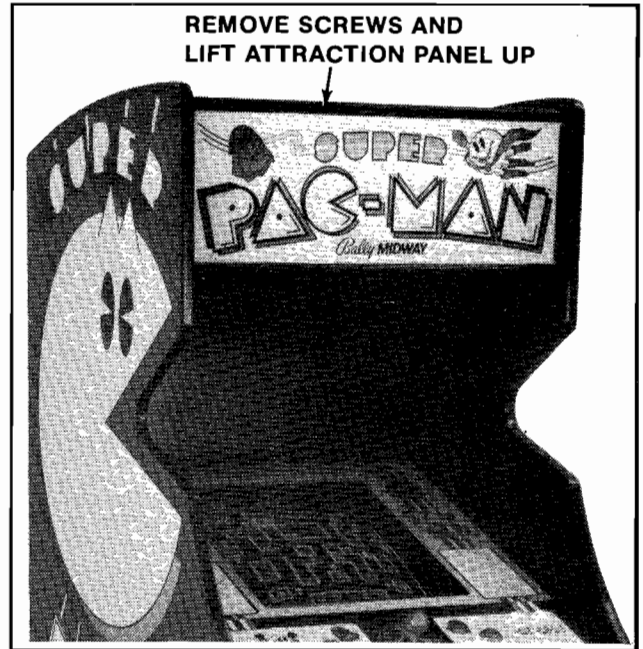


Figure 4-12 Opening the Attraction Panel — Upright

Replacing the speaker.

**Be sure the power is off to the game.**

Remove the attraction panel and disconnect the speaker from its cabling.

Remove the nuts and bolts which secure the speaker and speaker grill in place and set them and the speaker grill aside.

Once the bolts which secure the speaker in place are removed, the speaker may be removed through the opening where the attraction panel was.

Reverse this procedure to reinstall the speaker.

2. **THE COCKTAIL TABLE MODEL HAS NO BACK-LIT ATTRACTION PANEL.**

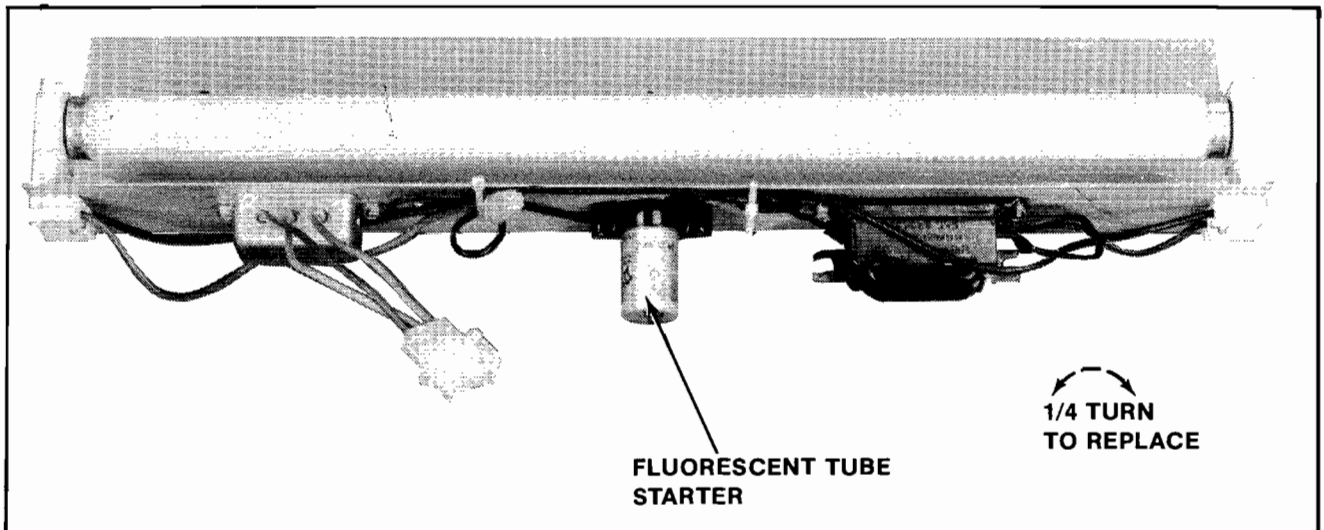
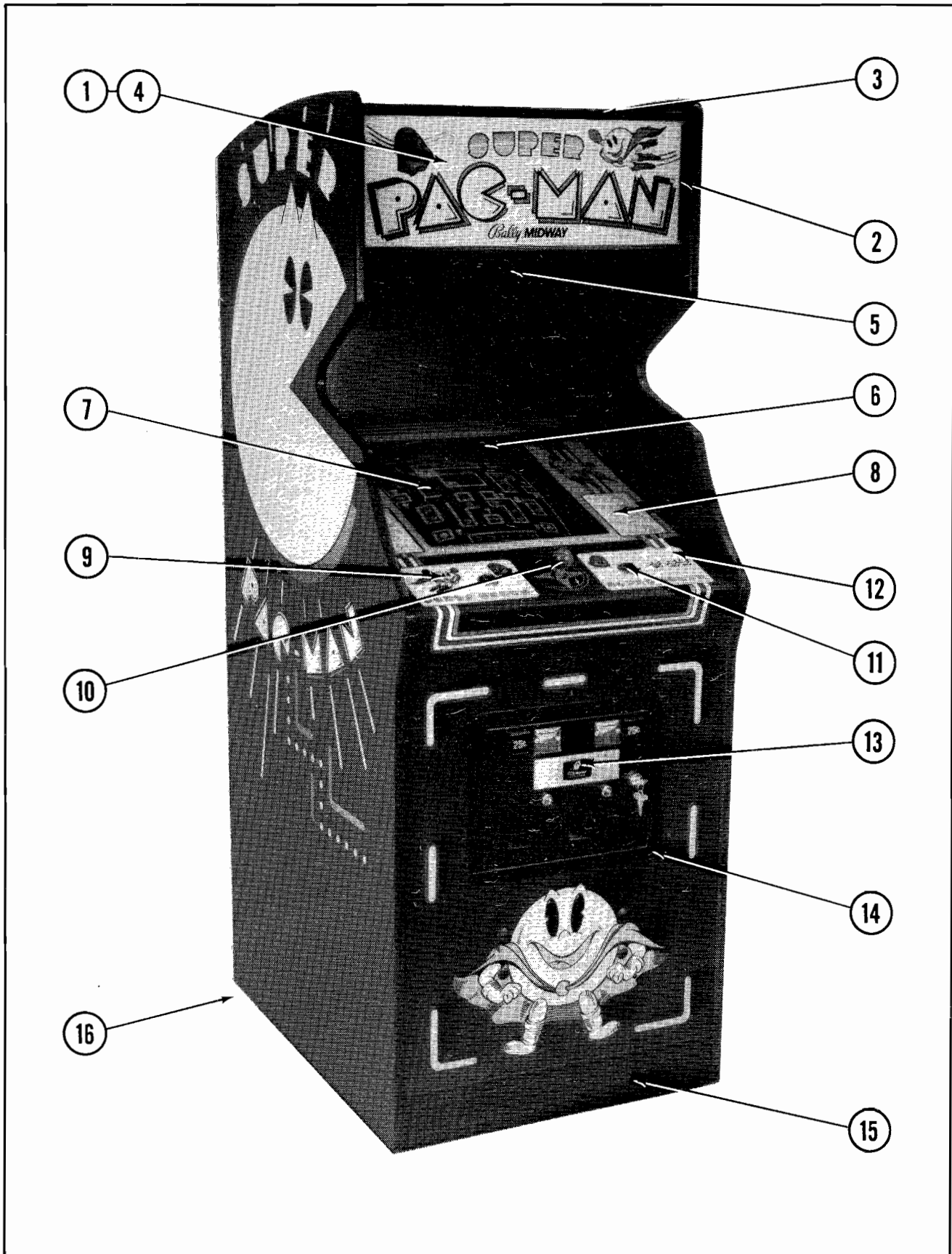


Figure 4-13 Replacing Fluorescent Tube Starter — Upright



## **V Illustrated Parts Breakdown**

NO. 316 — SUPER PAC-MAN — UPRIGHT — FRONT



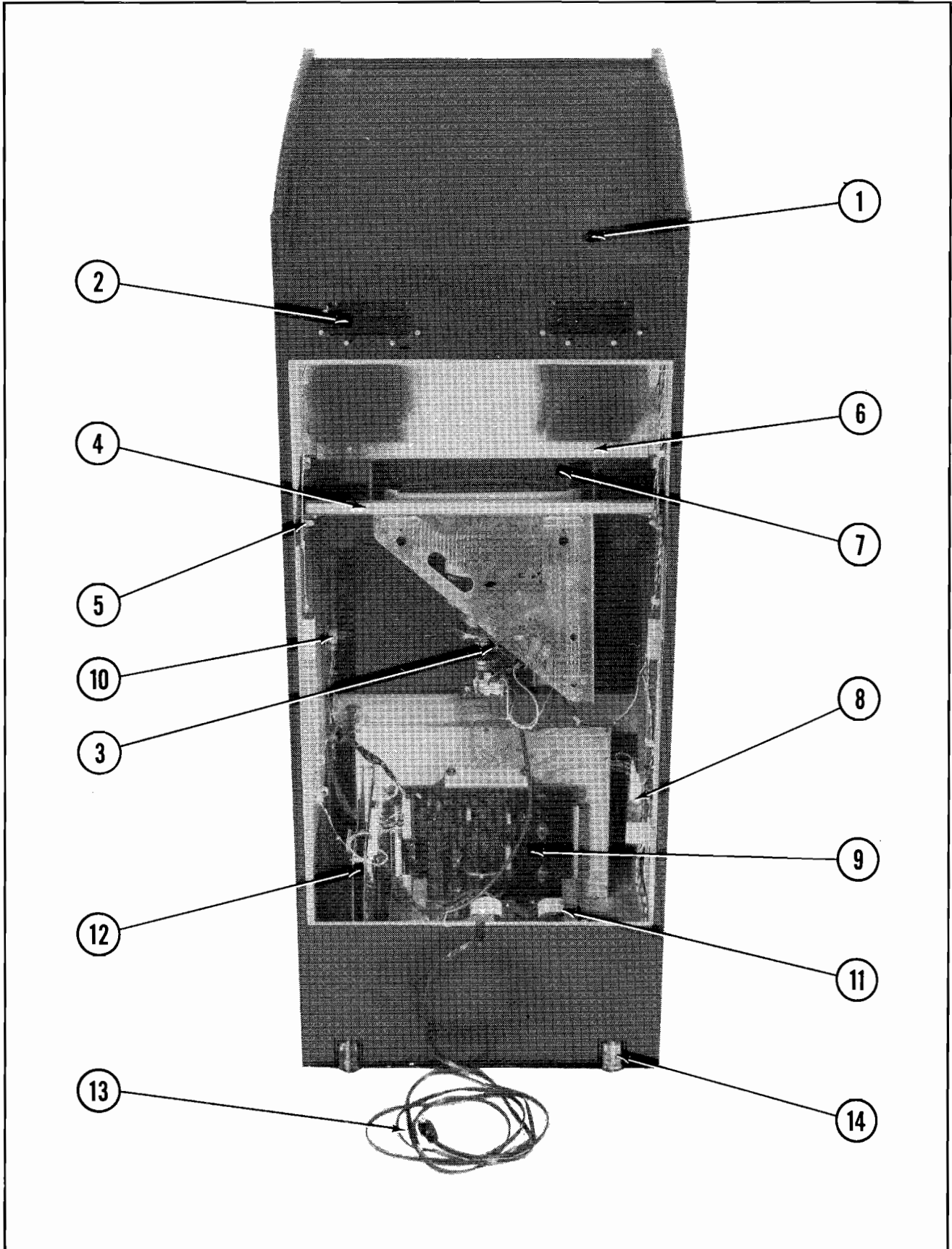


**NO. 316 — SUPER PAC-MAN — UPRIGHT — FRONT — PARTS LIST**

*ORDER BY PART NUMBER ONLY*

<b>ITEM</b>	<b>PART NO.</b>	<b>DESCRIPTION</b>
1	0316-00900-00XF	HEADER DISPLAY PLEXI
2	0537-00903-0057	GLASS CHANNEL — 7-5/8" LG. (2 REQ'D.)
3	0574-00903-0100	HEADER RETAINER BRKT. (2 REQ'D.)
	0017-00101-0138	#8 x 5/8 TORX TAMPER RESISTANT SCR. (6 REQ'D.)
	0017-00009-0522	LONG ARM KEY T-20 (FOR ABOVE SCREW)
4	A595-00011-0000	HEADER LIGHT ASSY.
5	0017-00009-0393	BLACK SPEAKER GRILL W/SLOTS
	0017-00003-0259	6" x 9" SPEAKER — 8 OHM, 7W.
	0017-00101-0127	#8-32 x 1-1/2 CARRIAGE BOLT (4 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
6	0508-00900-0000	19" T.V. BEZEL
7	0508-00905-0000	PLEXI
	0508-00901-0000	PLEXI-GLASS CLIPS (4 REQ'D.)
	0017-00101-0017	#6 x 1/2 BLK. SLT. HEX HD. SCREW (4 REQ'D.)
8	0316-00901-00XF	MAIN VIEWING GLASS
	0508-00108-0000	GLASS STOP BRKT.
	0017-00101-0027	#8 x 3/4 SLT. HEX HD. M.S. (3 REQ'D.)
9	A316-00012-0000	CONTROL SHELF PLATE WELD ASSY.
	0316-00902-0000	CONTROL SHELF OVERLAY — DECORATIVE
	0941-00103-0100	CONTROL SHELF MTG. BRKT. — RIGHT
	0941-00103-0200	CONTROL SHELF MTG. BRKT. — LEFT
	0555-00901-0000	PLASTIC LOCATING PIN (4 REQ'D.)
	0017-00009-0534	BASSICK CLAMP (3 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. SCR. (10 REQ'D.)
	0316-00903-0000	CONTROL SHELF STRAP
10	A982-00017-0000	CONTROL ASSEMBLY
	A316-00005-0000	CONTROL SHELF CABLE ASSY.
11	0017-00042-0256	PUSH BUTTON ASSY. — RED (2 REQ'D.)
12	0017-00042-0260	PUSH BUTTON ASSY. — WHITE (2 REQ'D.)
	0017-00032-0093	PUSH BUTTON SWITCH W/HOLDER (4 REQ'D.)
	0017-00103-0054	5/8-11 PAL NUT (4 REQ'D.)
13	A090-00300-11BK	U.S.A. 25¢ DOUBLE COIN DOOR ASSY.
	A982-00015-0000	COIN DOOR CABLE ASSY.
14	0090-00002-04BK	LARGE COIN DOOR FRAME
	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME)
15	0935-00906-0100	KICK PLATE — 23" LG.
16	0017-00102-0048	3/8-16 x 2" LEG LEVELERS (4 REQ'D.)
	0017-00103-0026	3/8-16 LEG LEVELER HEX NUTS (4 REQ'D.)

NO. 316 — SUPER PAC-MAN — UPRIGHT — REAR ACCESS



**NO. 316 — SUPER PAC-MAN — UPRIGHT — REAR ACCESS — PARTS LIST**

*ORDER BY PART NUMBER ONLY*

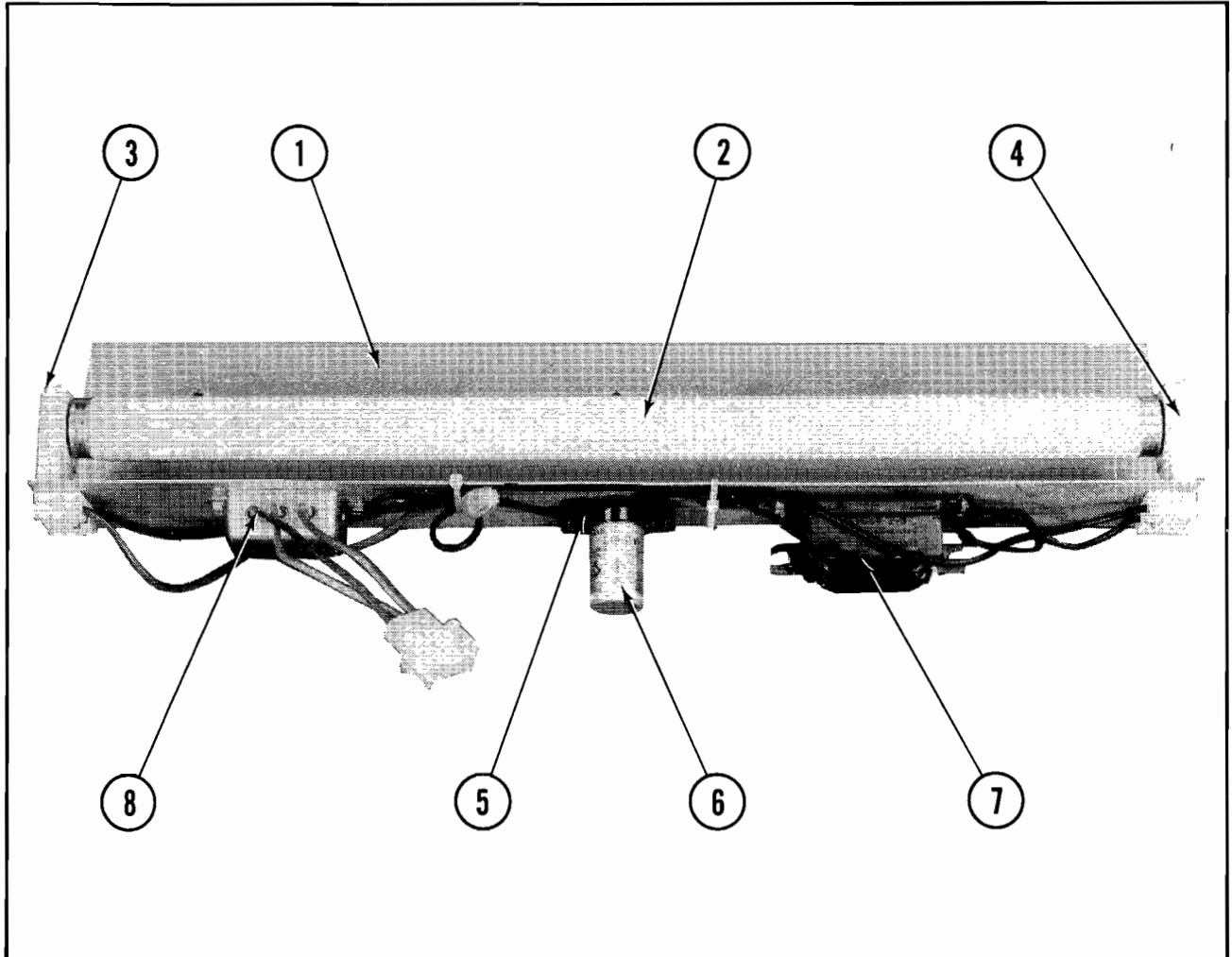
ITEM	PART NO.	DESCRIPTION
1	A945-00038-0000	ON-OFF SWITCH & PLATE ASSY.
2	0894-00916-0000	RECESSED HAND PULL & VENT (2 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (8 REQ'D.)
3	0017-00003-0339	ELECTROHOME — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR (OR)
3	0017-00003-0439	WELLS-GARDNER — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR
4	0508-00102-0000	MONITOR MTG. CHANNEL (2 REQ'D.)
5	0595-00104-0000	MONITOR RAIL (2 REQ'D.)
	0017-00102-0066	1/4-20 x 3/4 UNSLOT. HEX HD. BOLT (4 REQ'D.)
	0017-00104-0014	7/8" DISH WASHER (4 REQ'D.)
	0555-00901-0000	PLASTIC LOCATING PIN (4 REQ'D.)
	0866-00120-0000	CHASSIS BRACE
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (4 REQ'D.)
6	0508-00108-0000	GLASS STOP BRACKET
7	0508-00900-0000	19" T.V. BEZEL
8	A088-00016-0000	INTERLOCK SWITCH & SPRING BRKT. ASSY.
9	A082-90427-A000	POWER SUPPLY P.C. BOARD ASSY.
	0624-00902-0100	P.C. SUPPORT BRKT. — 12" LG. (3 REQ'D.)
	0624-00902-0500	P.C. SUPPORT BRKT. — 6-1/2" LG. (2 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (15 REQ'D.)
	0017-00104-0037	#8 WASHER (15 REQ'D.)
10	A082-91109-A000	CREDIT MULT. BYPASS P.C.B. ASSY.
	0017-00042-0014	1/8" SNAP BUSHING (4 REQ'D.)
	0017-00101-0751	#5-40 x 1/4 PHIL. HD. M.S. (4 REQ'D.)
11	A945-00036-0002	POWER CHASSIS ASSY. — 70VA, 115V.
12	A317-00015-0000	CARD RACK HOLDER W/BOARDS ASSY.
	A084-91435-D316	VIDEO BOARD P.C. ASSY.
	A084-91436-F316	CPU BOARD P.C. ASSY.
	A317-00014-0000	CARD RACK HOLDER & STOP ASSY.
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (4 REQ'D.)
	0017-00009-0478	NYLON GUIDE (6 REQ'D.)
	0317-00101-0000	CARD RACK BRACE BRKT.
	0017-00101-0124	#6 x 1/4 UNSLOT. HEX HD. M.S. (2 REQ'D.)
13	A945-00019-0000	LINE CORD ASSY. — 115V.
14	A961-00007-0000	CASTER ASSY. (2 REQ'D.)
	0961-00109-0000	WHEEL BRKT. (2 REQ'D.)
	0017-00042-0255	PLASTIC WHEEL (2 REQ'D.)
	0894-00702-00XF	SHAFT (2 REQ'D.)
	0017-00100-0037	3/8" E-RING (2 REQ'D.)

**NO. 316 — SUPER PAC-MAN — UPRIGHT — REAR ACCESS — PARTS LIST (Continued)**

*ORDER BY PART NUMBER ONLY*

ITEM	PART NO.	DESCRIPTION
		<b>ADDITIONAL PARTS LIST</b>
	A950-00004-0000	COIN BOX ASSY.
	A950-00006-0000	COIN BOX CRADLE ASSY.
	0950-00105-0000	COIN BOX COVER
	0950-00104-0000	COIN BOX HANDLE
	0950-00101-0000	COIN DEFLECTOR (2 REQ'D.)
	0950-00900-0000	LARGE PLASTIC CASH BOX
	0017-00101-0142	1/4-20 x 1-3/8 BLACK RND. HD. BOLT (4 REQ'D.)
	0017-00104-0014	7/8" DISH WASHER (4 REQ'D.)
	0017-00103-0018	1/4-20 HEX NUT (4 REQ'D.)
	A151-00098-0000	BACK DOOR LOCK ASSY.
	0017-00009-0490	5-5/8" SQR. VENT GRILL (4 REQ'D.) — BACK DOOR
	0950-00103-0000	COIN BOX DIVIDER — OPTIONAL
	A333-00012-0000	CREDIT SWITCH & BRKT. ASSY.
	A316-00011-0000	MASTER CABLE/BRKT./DIODE ASSY.
	A316-00010-0000	LOW VOLTAGE CABLE ASSY.
	A316-00009-0000	HIGH VOLTAGE CABLE ASSY.
	A316-00016-0000	VIDEO SIGNAL CABLE ASSY.
	A316-00017-0000	AUDIO ADAPTOR CABLE ASSY.

**NO. 316 — SUPER PAC-MAN — UPRIGHT — HEADER FLUORESCENT LIGHT ASSY.**

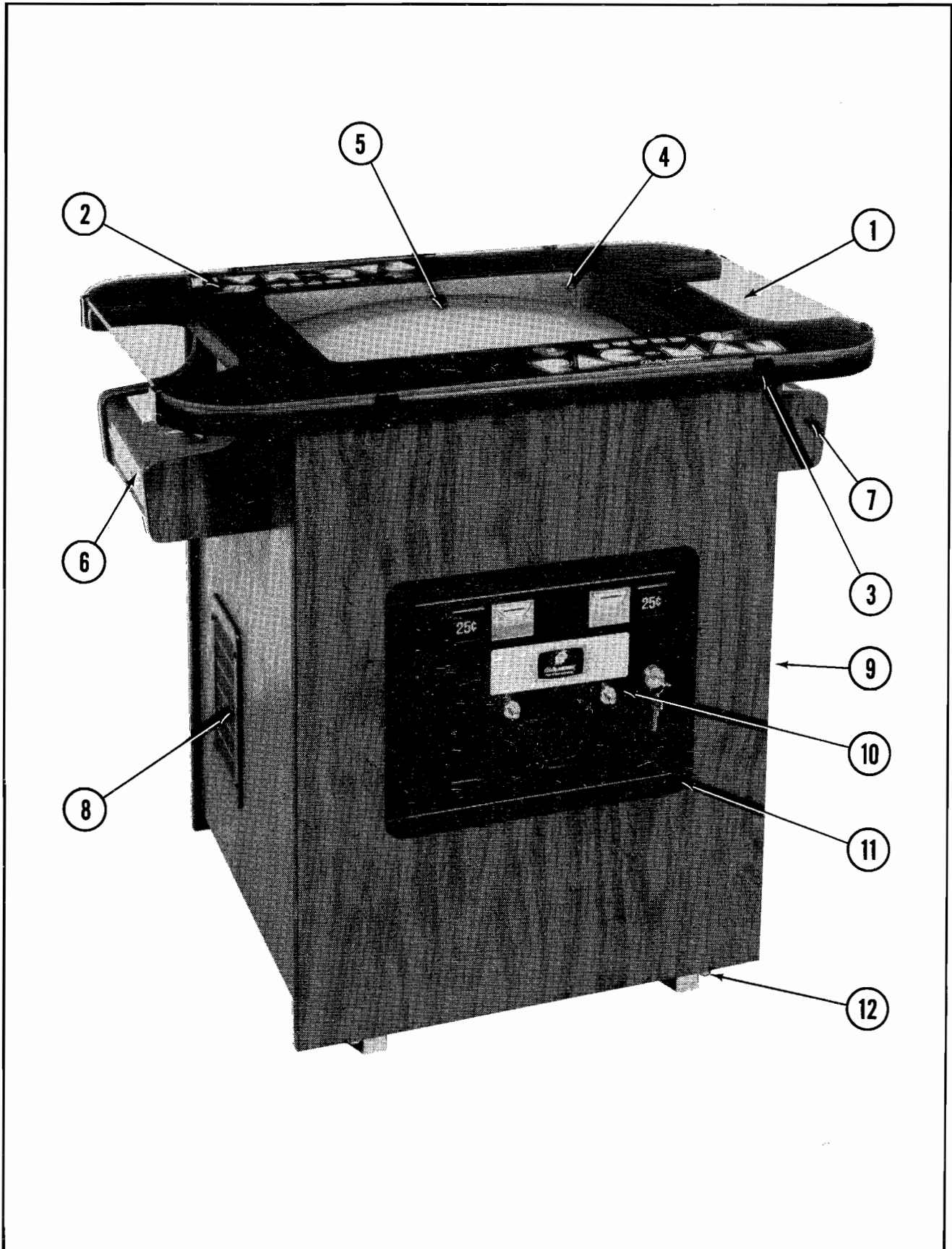


**NO. 316 — SUPER PAC-MAN — UPRIGHT — HEADER FLUORESCENT LIGHT ASSY. — PARTS LIST**

*ORDER BY PART NUMBER ONLY*

ITEM	PART NO.	DESCRIPTION
1	0595-00105-0000	FLUORESCENT BRKT.
2	0017-00003-0043	18" COOL WHITE FLUORESCENT LAMP
3	0017-00003-0445	LAMP LOCKS (2 REQ'D.)
4	0017-00031-0036	FLUORESCENT SOCKET (2 REQ'D.)
5	0017-00003-0412	FLUORESCENT STARTER HOLDER W/LEADS
	0017-00101-0573	#6-32 x 1/2 PHIL. RND. HD. M.S. (4 REQ'D.)
	0017-00104-0009	#6 EXT. WASHER (4 REQ'D.)
6	0017-00003-0019	FLUORESCENT STARTER
7	0017-00003-0026	BALLAST
	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCR. (4 REQ'D.)
8	A961-00042-0000	LINE FILTER ASSY.

NO. 317 — SUPER PAC-MAN — COCKTAIL — FRONT

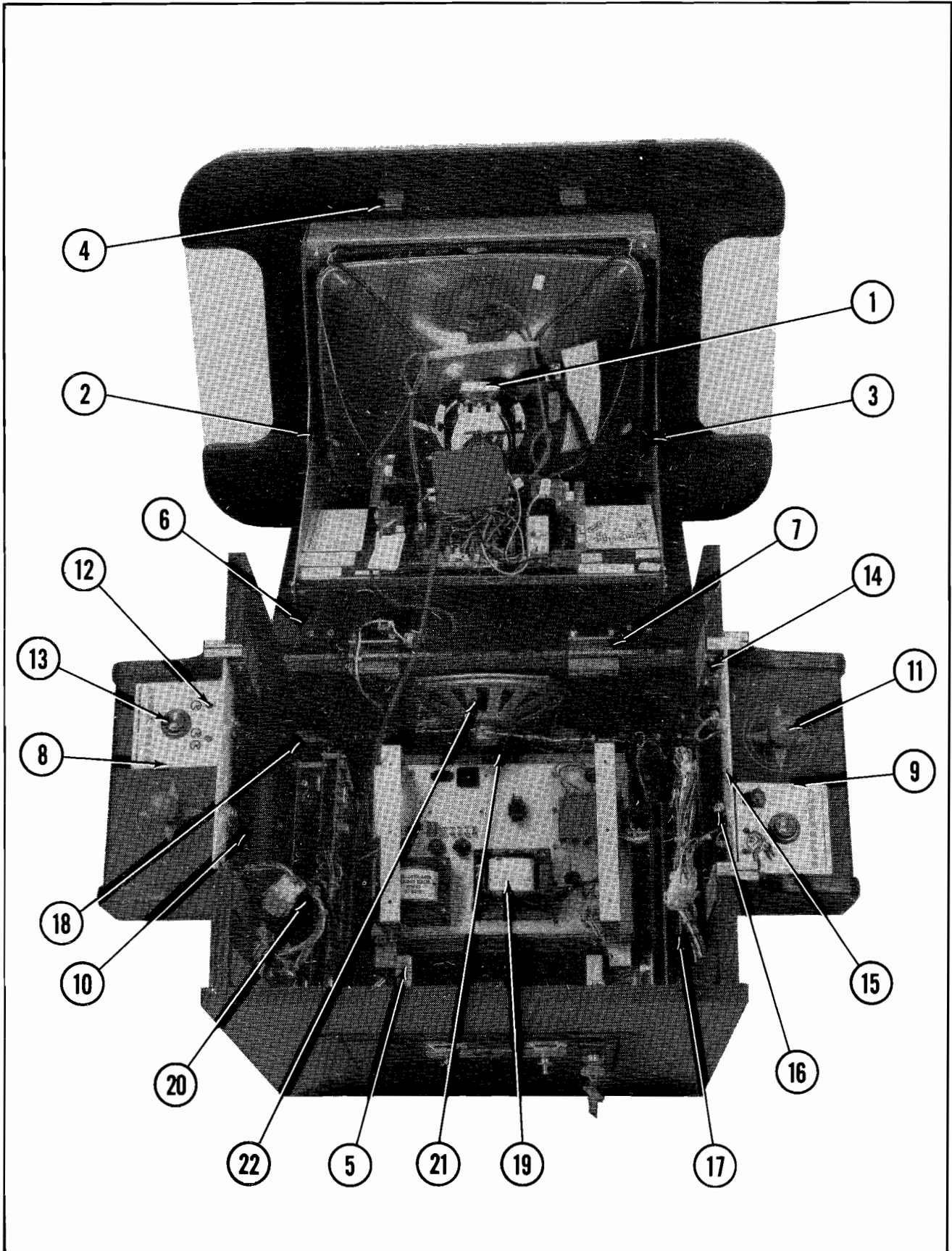


**NO. 317 — SUPER PAC-MAN — COCKTAIL — FRONT — PARTS LIST**

*ORDER BY PART NUMBER ONLY*

<b>ITEM</b>	<b>PART NO.</b>	<b>DESCRIPTION</b>
1	0017-00009-0499	COVER GLASS — 32" x 22" x 1/4"
2	0317-00900-0000	DECORATIVE ARTWORK UNDERLAY
3	0775-00104-00XF	GLASS CLIPS (8 REQ'D.)
	0017-00101-0117	#8 x 5/8 BLK. PHIL. TRS. HD. SCR. (8 REQ'D.)
4	0557-00900-0000	T.V. BEZEL
	0508-00106-0000	BEZEL MTG. BRKT.
5	0333-00905-0000	DIFFUSER
	0508-00901-0000	PLEXI-GLASS CLIPS (4 REQ'D.)
6	A317-00009-0100	CONTROL SHELF ASSY. — PLAYER #1
7	A317-00009-0200	CONTROL SHELF ASSY. — PLAYER #2
8	0017-00009-0393	BLACK SPEAKER GRILL W/SLOTS (2 REQ'D.)
9	0017-00009-0482	SPEAKER GRILL (NOT SEEN)
	0017-00003-0187	6" x 9" SPEAKER — 8 OHM, 9W.
	0017-00101-0137	#8-32 x 1" CARRIAGE BOLT (8 REQ'D.)
	0017-00101-0127	#8-32 x 1-1/2 CARRIAGE BOLT (4 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (12 REQ'D.)
10	A090-00300-11BK	U.S.A. 25¢ DOUBLE COIN DOOR ASSY.
	A982-00015-0000	COIN DOOR CABLE ASSY.
11	0090-00002-04BK	LARGE COIN DOOR FRAME
	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME)
	A927-00019-0000	COIN BOX ASSEMBLY
	A962-00004-0000	COIN BOX COVER ASSY.
	A962-00005-0000	COIN BOX SIDE CHANNEL ASSY. — SHORT
	0962-00101-0000	COIN BOX SIDE CHANNEL — SHORT
	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.)
	0017-00104-0022	#8 FLAT WASHER (4 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
12	0017-00102-0048	3/8-16 x 2" LEG LEVELERS (4 REQ'D.)
	0017-00103-0026	3/8-16 LEG LEVELER HEX NUTS (4 REQ'D.)

NO. 317 — SUPER PAC-MAN — COCKTAIL — INTERIOR ACCESS





NO. 317 — SUPER PAC-MAN — COCKTAIL — INTERIOR ACCESS — PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0017-00003-0339	ELECTROHOME — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR (OR)
1	0017-00003-0439	WELLS-GARDNER — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR
2	A515-00019-0000	MONITOR SUPPORT ASSY. — LEFT
3	A515-00019-0100	MONITOR SUPPORT ASSY. — RIGHT
	0017-00101-0109	#8 x 5/16 UNSLOT. HEX HD. BOLT (6 REQ'D.)
4	0610-00132-00ZN	STRIKE (2 REQ'D.)
5	0017-00009-0534	BASSICK CLAMP (2 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (8 REQ'D.)
6	0927-00101-00XF	SUPPORT ANGLE (2 REQ'D.)
	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCREW (4 REQ'D.)
7	0017-00009-0514	2-1/2" HINGE (2 REQ'D.)
	0017-00101-0136	#8-32 x 1-1/4 CARRIAGE BOLT (8 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
8	0317-00901-0100	DECORATIVE OVERLAY PLAYER #1
9	0317-00901-0200	DECORATIVE OVERLAY PLAYER #2
	A302-00015-0000	CONTROL PANEL WELDMENT ASSY. (2 REQ'D.)
10	0510-00101-00XF	BOTTOM PAN (2 REQ'D.)
	0017-00101-0341	#6 x 1/4 PHIL. TRS. HD. SCR. (6 REQ'D.)
11	A334-00015-0000	CONTROL ASSY. (2 REQ'D.)
	A317-00010-0100	CONTROL SHELF CABLE ASSY. — PLAYER #1
	A317-00010-0200	CONTROL SHELF CABLE ASSY. — PLAYER #2
12	0017-00032-0106	SMALL BUTTON SWITCH ASSY. W/HARDWARE (2 REQ'D.)
13	0017-00042-0304	PUSH BUTTON ASSY. — RED (2 REQ'D.)
	0017-00032-0093	PUSH BUTTON SWITCH W/HOLDER (2 REQ'D.)
	0017-00103-0054	5/8-11 PAL NUT (2 REQ'D.)
14	0930-00104-0000	CONTROL PANEL LOCATING BRKT. (4 REQ'D.)
	0017-00101-0025	#8 x 1/2 SLT. HEX HD. M.S. (16 REQ'D.)
15	0930-00904-0000	LIGHT SHIELD (2 REQ'D.)
16	0017-00031-0044	WEDGE BASE LAMP SOCKET (4 REQ'D.)
	0017-00003-0219	#194 WEDGE LAMP — 14V., .27A. (4 REQ'D.)
	0017-00101-0555	#6-32 x 5/16 SLT. HEX HD. M.S. (4 REQ'D.)
17	A082-90427-A000	POWER SUPPLY P.C. BOARD ASSY.
	0624-00902-0100	P.C. SUPPORT BRKT. — 12" LG.
	0624-00902-0500	P.C. SUPPORT BRKT. — 6-1/2" LG. (2 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (7 REQ'D.)
	0017-00104-0037	#8 FLAT WASHER (7 REQ'D.)
18	A082-91109-A000	CREDIT MULT. BYPASS P.C. BRD. ASSY.
	0017-00042-0014	1/8" SNAP BUSHING (4 REQ'D.)
	0017-00101-0751	#5-40 x 1/4 PHIL. RND. HD. M.S. (4 REQ'D.)
19	A945-00036-0000	POWER CHASSIS ASSY. — 70VA., 115V.
	0942-00102-0000	POWER CHASSIS MTG. BRKT. (2 REQ'D.)
20	A317-00015-0000	CARD RACK HOLDER W/BOARDS ASSY.
	A084-91435-D316	VIDEO BOARD P.C. ASSY.
	A084-91436-F316	CPU BOARD P.C. ASSY.
	A317-00014-0000	CARD RACK HOLDER & STOP ASSY.
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (4 REQ'D.)
	0017-00009-0478	NYLON GUIDE (6 REQ'D.)
	0317-00101-0000	CARD RACK BRACE BRKT.
	0017-00101-0124	#6 x 1/4 UNSLOT. HEX HD. M.S. (2 REQ'D.)

**NO. 317 — SUPER PAC-MAN — COCKTAIL — INTERIOR ACCESS — PARTS LIST (Continued)**

*ORDER BY PART NUMBER ONLY*

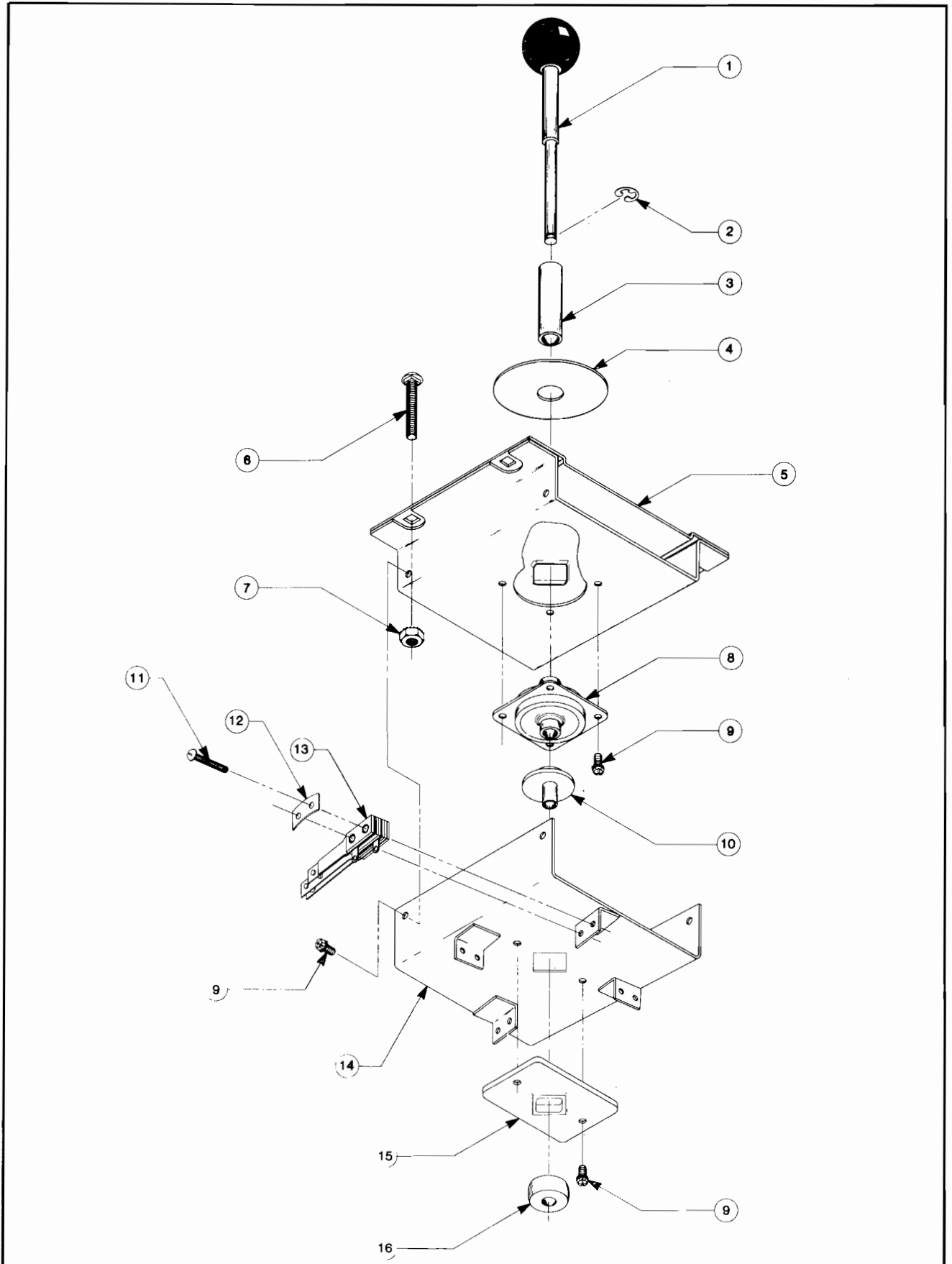
ITEM	PART NO.	DESCRIPTION
21	A775-00013-0000 0151-00081-0000 0775-00110-00XF 0749-00106-00XF 0017-00101-0347 0017-00104-0009 0017-00103-0005 0017-00101-0026	FAN ASSY. 4" FAN FAN PLATE VENT SCREEN #6-32 x 1/2" R.H.M.S. (4 REQ'D.) #6 EXT. WASHER (4 REQ'D.) #6-32 HEX NUT (4 REQ'D.) #8 x 5/8 SLT. HEX HD. SCREW (4 REQ'D.)
22	A775-00018-0000 0017-00003-0187	FAN CABLE ASSY. 6" x 9" SPEAKER — 8 OHM, 9W.
<b>ADDITIONAL PARTS LIST</b>		
	A088-00014-0000 A945-00038-0000 A317-00008-0000 A317-00006-0000 A317-00010-0000 0942-00902-0000 A927-00005-0000 A316-00016-0000 A088-00017-0000	INTERLOCK SWITCH & BRKT. ASSY. ON-OFF SWITCH & PLATE ASSY. MASTER CABLE W/BRKT. ASSY. HIGH VOLTAGE CABLE ASSY. LOW VOLTAGE CABLE ASSY. MONITOR SHIELD HIGH BASE LEG KIT ASSY. — OPTIONAL VIDEO SIGNAL CABLE ASSY. TEST & CREDIT SWITCH & BRKT. ASSY.

**SUPER PAC-MAN — CONTROL ASSEMBLY — ALL VERSIONS — PARTS LIST**

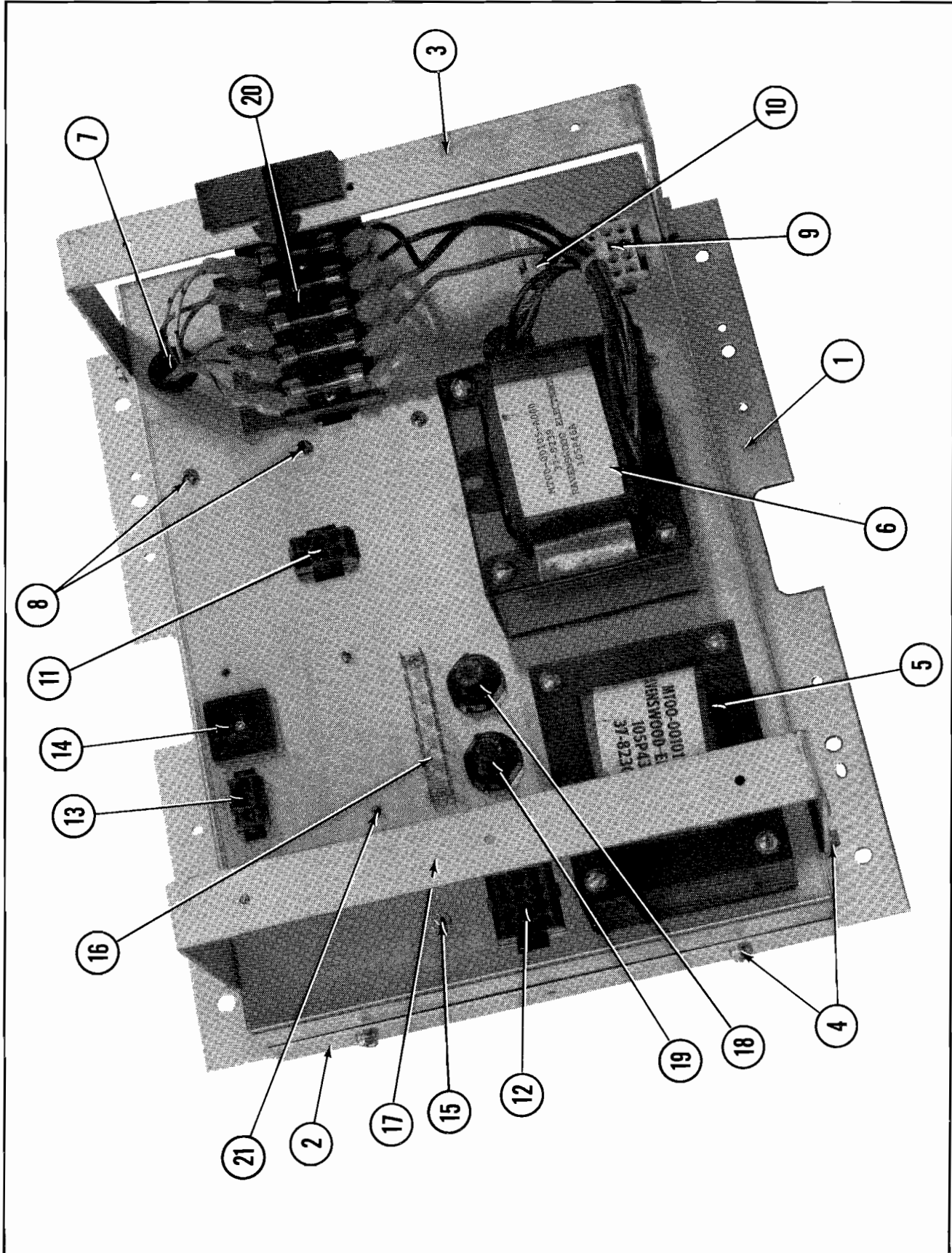
*ORDER BY PART NUMBER ONLY*

ITEM	PART NO.	DESCRIPTION
1	A932-00022-0000	BALL & SHAFT ASSEMBLY
2	0017-00100-0025	1/4 E-RING
3	0921-00702-0000	STOP SPACER
4	0921-00902-0000	SLIDE PLATE
5	A982-00019-0000	PIVOT PLATE WELD ASSY.
6	0017-00101-0637	#8-32 x 1" CARRIAGE BOLT (4 REQ'D.)
7	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
8	0932-00902-0000	GROMMET
9	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. M.S. (10 REQ'D.)
10	0962-00904-0000	SLEEVE
11	0017-00101-0527	#5-40 x 5/8 SLT. RND. HD. SCR. (8 REQ'D.)
12	0020-00202-0000	SWITCH PLATE (4 REQ'D.)
13	A932-00009-0000	SWITCH ASSEMBLY (4 REQ'D.)
14	A932-00012-00XF	STOP PLATE & SWITCH BRKT. ASSY.
15	0932-00905-0000	WEAR PLATE
16	0921-00700-0000	ACTUATOR

SUPER PAC-MAN — CONTROL ASSEMBLY — ALL VERSIONS



SUPER PAC-MAN — POWER CHASSIS ASSY. — 70VA, 115V. — ALL VERSIONS

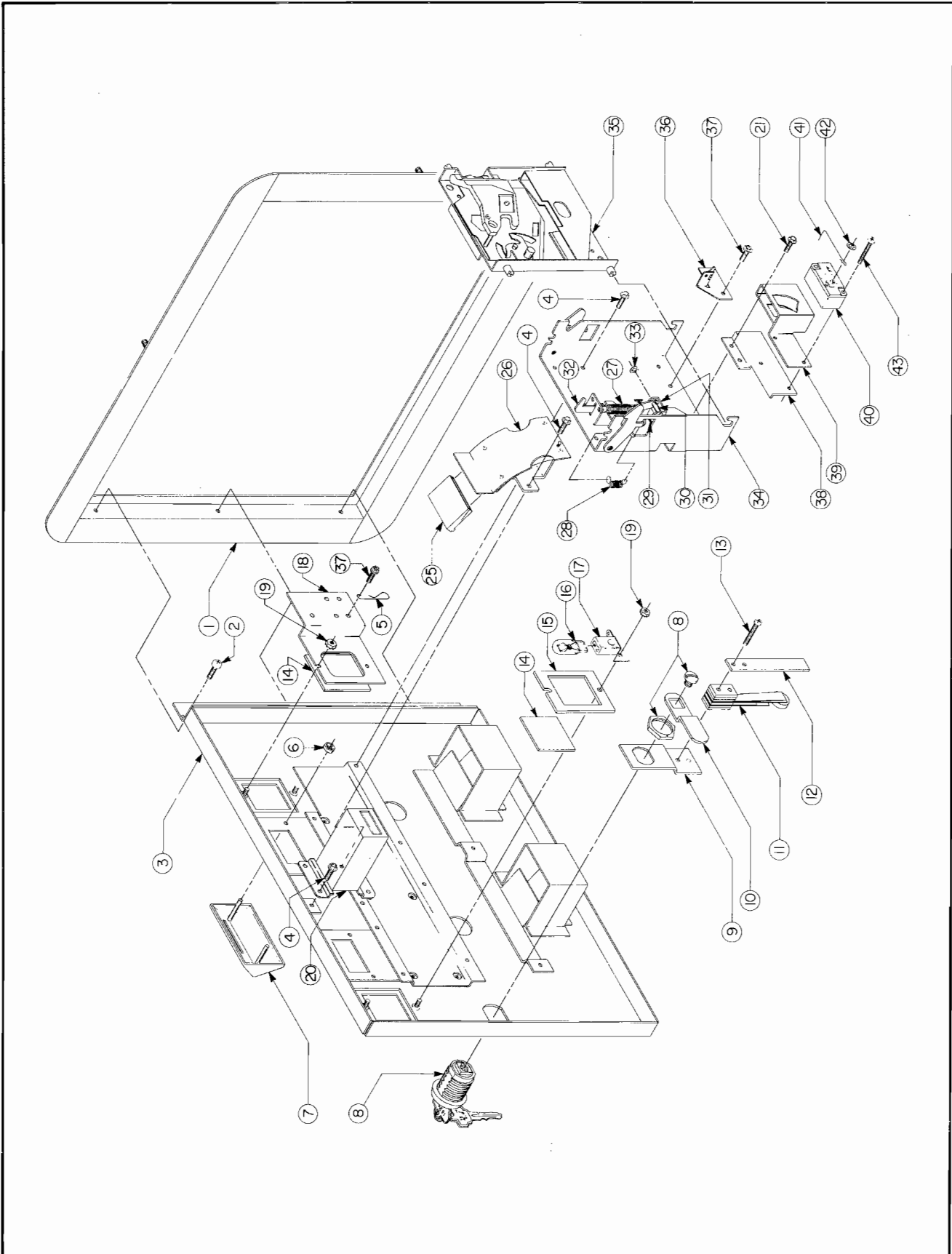


**SUPER PAC-MAN — POWER CHASSIS ASSY. — 70VA, 115V. — ALL VERSIONS — PARTS LIST**

*ORDER BY PART NUMBER ONLY*

ITEM	PART NO.	DESCRIPTION
1	0945-00108-00XF	CHASSIS
2	A945-00029-0000	MTG. PLATE & BARRIER ASSY.
3	0945-00107-01XF	STRAP (2 REQ'D.)
4	0017-00101-0123	#8 x 1/4 UNSLOT. HEX HD. SCR. (12 REQ'D.)
5	MT00-00101-A000	ISOLATION TRANSFORMER W/O SHIELD ASSY. — 115V., 50/60 HZ.
6	0017-00103-0061 MT00-00105-A000	#8-32 HEX NUT W/SEMS (4 REQ'D.) POWER TRANSFORMER W/O SHIELD — 70VA, 115V. (UPRIGHT ONLY)
6	MT00-00105-B000	POWER TRANSFORMER W/SHIELD — 70VA, 115V. (COCKTAIL ONLY)
7	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
8	0945-00902-0000	SNAP BUSHING (3 REQ'D.)
8	0017-00101-0067	#6 x 3/8 PHIL. PAN HD. SCR. (11 REQ'D.)
9	0945-00103-00XF	PARTITION — LOCATED UNDER CHASSIS (NOT SEEN)
9	A945-00030-0400	CONNECTOR & CABLE ASSY.
10	0017-00021-0297	2 POSITION CONNECTOR
11	A945-00030-0300	CONNECTOR & CABLE ASSY.
12	A945-00030-0500	CONNECTOR & CABLE ASSY.
13	A945-00030-0200	CONNECTOR & CABLE ASSY.
14	A945-00021-0000	CONVENIENCE OUTLET ASSY.
15	0017-00101-0573	#6-32 x 1/2 PHIL. RND. HD. SCR. (2 REQ'D.)
15	0017-00103-0084	#6-32 HEX NUT W/SEMS (2 REQ'D.)
16	A945-00025-0000	FILTER ASSY. — 125V. — UNDER CHASSIS (NOT SEEN)
16	0017-00021-0510	TERMINAL STRIP
17	0017-00101-0140	#4-40 x 5/16 PHIL. PAN HD. SCR. (2 REQ'D.)
17	0017-00101-0660	#10-32 x 3/4 SLT. PAN HD. SCREW (NOT SEEN)
17	0017-00104-0107	#10 FLAT WASHER
18	0017-00103-0081	#10-32 HEX NUT W/SEMS
18	0017-00003-0263	SLO-BLO FUSE — 4A., 250V.
19	0017-00003-0005	FUSE — 2A., 250V.
19	0017-00003-0444	FUSE HOLDER — QUICK CONN. (2 REQ'D.) — FOR ABOVE FUSES
20	0945-00904-0000	5 POSITION FUSE HOLDER
20	0945-00908-0000	FUSE BLOCK INSULATOR
20	0017-00003-0217	SLO-BLO FUSE — 2.5A., 250V. (2 REQ'D.)
20	0017-00003-0007	SLO-BLO FUSE — 3A., 250V. (2 REQ'D.)
20	0017-00003-0263	SLO-BLO FUSE — 4A., 250V.
20	0945-00903-0000	FUSE HOLDER BARRIER
21	0017-00101-0067	#6 x 3/8 PHIL. PAN HD. SCREW (2 REQ'D.)
21	0017-00101-0780	#6 x 1/2 PHIL. PAN HD. SCREW (2 REQ'D.)
21	0017-00021-0629	5 POSITION TERMINAL STRIP (UNDER CHASSIS)
21	A945-00019-0000	LINE CORD ASSY. — 115V. (NOT SHOWN)

FRONT DOOR ASSEMBLY — U.S.A. 25¢



**FRONT DOOR ASSEMBLY — U.S.A. 25¢ — PARTS LIST**

*ORDER BY PART NUMBER ONLY*

<b>ITEM</b>	<b>PART NO.</b>	<b>DESCRIPTION</b>
1	0090-00002-04BK	DOUBLE ENTRY COIN DOOR FRAME
2	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.)
3	A090-00073-02BK	DOUBLE ENTRY COIN DOOR W/DRESS PLATE
4	0017-00101-0123	#8 x 1/4 UNSLOT. HEX HD. SCREW (12 REQ'D.)
5	0017-00007-0019	KEY HOOK
6	0017-00103-0059	PUSH NUT (4 REQ'D.)
7	0090-00912-0000	COIN ENTRY PLATE — 25¢ (2 REQ'D.)
8	A097-00005-0000	DOOR LOCK & KEY W/SCREW & NUT (OR)
8	A097-00006-0000	DOOR LOCK & KEY W/SCREW & NUT
9	0090-00128-00XF	DOOR TILT SWITCH BRKT.
10	0017-00005-0041	DOOR CAM
11	A090-00095-0000	DOOR TILT SWITCH
12	0090-00126-03XF	SWITCH BACK-UP PLATE
13	0017-00101-0525	#5-40 x 9/16" PHIL. HD. M.S. (2 REQ'D.)
	A090-00096-0000	DOOR TILT SWITCH & BRKT. ASSY. (ITEMS 9 & 11 THRU 13)
14	0090-00903-9500	25¢ WINDOW (2 REQ'D.)
15	0090-00143-00XF	COIN PLEX RETAINER
16	0017-00003-0219	12 VOLT LAMP — G.E. #194 (2 REQ'D.)
17	0017-00031-0048	WEDGE SOCKET W/BRKT. (2 REQ'D.)
18	A090-00100-0000	BRKT. ASSY.
19	0017-00103-0084	#6-32 HEX NUT W/SEMS (4 REQ'D.)
20	A090-00089-0000	COIN METER W/DIODE
21	0017-00101-0124	#6 x 1/4 UNSLOT. HEX HD. SCR. (4 REQ'D.)
25	0090-00911-0000	INSULATOR (2 REQ'D.)
26	A090-00112-0000	COIN CHUTE & INSULATOR ASSY. (2 REQ'D.)
27	0010-00134-0000	SPRING
28	0010-00181-0000	SPRING
29	0017-00007-0083	1/8 x 1-5/8 ROLL PIN
30	0090-00129-00XF	PIVOT POST
31	0090-00167-00XF	PIVOT LEVER
32	0090-00182-00XF	REJECT LEVER
33	0017-00100-0018	E-RING
	A090-00088-0000	REJECT LEVER ASSY. (2 REQ'D.) (ITEMS 30 THRU 33)
34	A090-00105-0000	COIN ACCEPTOR FRAME ASSY. (2 REQ'D.)
35	0017-00005-0003	COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.) (OR)
35	0017-00005-0211	COIN ACCEPTOR W/ANTI STRING DEVICE (2 REQ'D.) (OR)
35	0017-00005-0214	COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.)
36	A090-00064-0000	ANTI-PENNY DEVICE
37	0017-00101-0099	#6 x 1/4 SLT. HEX HD. M.S. (2 REQ'D.)
38	0090-00162-00XF	COIN SWITCH MTG. BRKT.
39	0017-00005-0203	COIN SWITCH CHUTE
40	0017-00005-0195	COIN SWITCH
41	0010-00599-0000	COIN SWITCH WIRE
42	0017-00007-0015	PUSH-ON RING
	A090-00059-0400	COIN SWITCH & WIRE ASSY. (ITEMS 40 THRU 42)
43	0017-00101-0147	#4-40 x 3/4 PHIL. PAN. HD. M.S. (2 REQ'D.)
	A090-00077-0000	COIN GUIDE & SWITCH ASSY. (ITEMS 38 THRU 43)





# VI Technical Troubleshooting

## Introduction

The most common problems occur in harness components such as the coin acceptor, player controls, interconnecting wiring, etc. The TV monitor and PCB computer cause their share of problems too, but not as much as the harness and its component parts. TV monitor troubleshooting will not be covered here because it is covered in that section of this manual.

As you already know, the PCB computer is a complex device with a number of different circuits. Some circuits remain basically the same among games, but overall there are a great many differences between them. PCB troubleshooting procedures, therefore, can be lengthy and will differ greatly among games. However, some basic Z-80 CPU information is involved in this section.

## General Suggestions

The first step in any troubleshooting procedure is correctly identifying the malfunction's symptoms. This includes not only the circuits or features malfunctioning, but also those still operational. A carefully trained eye will pick up other clues as well. For instance, a game in which the computer functions fail completely just after money was collected may have a quarter shorting the PCB traces. Often, an experienced troubleshooter will be able to spot the cause of the problem even before opening the cabinet.

After all the clues are carefully considered, the possible malfunctioning areas can be narrowed down to one or two good suspects. Those areas can be examined by a process of elimination until the cause of the malfunction is discovered.

## Harness Component Troubleshooting

Typical problems falling in this category are coin and credit problems, power problems and failure of individual features.

### NO GAME CREDIT

For example, your prospective player inserts his quarter and is not awarded a game. The first item to check is if the quarter is returned. If the quarter is returned, the malfunction most certainly lies in the coin acceptor itself. First, use a set of test coins (both old and new) to ascertain that the player's coin is not undersize or underweight. If your test coins are also returned, coin acceptor servicing is indicated. Generally, the cause of this particular problem is a maladjusted magnet gate. Normally, this will mean slightly closing the magnet gate a little by turning the adjusting screw out a bit (see section on coin acceptor for more details).

If the quarter is not returned and there is no game credit, the cause of the malfunction may be in one of several areas. First try operating the coin return button; if the coin is returned, the problem is most likely in the magnet gate. Enlarge the gap according to the coin acceptor service procedures. If this does not cure the problem, remove the coin acceptor, clean it and perform the major adjustment procedure.

If the trapped coin is not returned when the wiper lever is actuated, you may have an acceptor jammed by a slug, gummed up with beer, a jammed coin chute, or mechanical failure of the acceptor mechanism. In this case, first check for the slug that will generally be trapped against the magnet. If so, simply remove the slug and test the acceptor. If the chute is blocked, remove the acceptor and remove the jammed coins. If there is actual failure of the acceptor, remove the unit and repair as indicated in the coin acceptor service procedures.

If the coin is making its way through the acceptor (that is, falling into the coin box), yet there is still no game credit, you either have a mechanical failure of the coin switch or electrical failure of the coin and credit circuits. The first place to begin is by checking the coin switch. Most of these switches are the make/break variety of micro switch, which is checked by testing for continuity between the NO, NC, and C terminals. When not actuated, the NC and C terminals should be continuous and the NO terminal open. When operated, the NO and C terminals should close and the NC should be open. If the coin switch checks out, examine the connections to the terminals to make sure there is good contact. If necessary, use the continuity tester and check from the terminal lug on the switch to the associated PCB trace. This will tell you if there is a continuous line all the way to the credit circuit.

If the coin switch wires do not check out, the problem is in the computer — most likely in the coin and credit circuitry.

If you do get game credit when a coin is deposited, but the game will not start when the start switch is pressed, you may have a problem in the start switch, the interconnecting wiring or in the computer. First check the switch. If the switch is OK, proceed to check the wiring. Again, make sure you go from the terminal lug on the switch to the PCB trace. This way, you will check the terminal contact as well as PCB edge connector contact. If the wiring is continuous, proceed to check the PCB credit circuit. If not, check each section of the wiring, until the discontinuity is located. If the wiring is OK, the problem must lie in the computer.

## Transformer and Line Voltage Problems

Your machine must have the correct line voltage to operate properly. If the line voltage drops too low, a circuit in the computer will disable game credit. The point at which the computer will fail to work will vary some from game to game, but no game will work on line voltage that drops below 105 VAC.

Low line voltage may have many causes. Line voltage normally fluctuates a certain amount during the day as the total usage varies. Peak usage times occur mainly at dawn or dusk, so if your machine's malfunction seems to be related to the time of day, this may be a factor. A large load connected to the same line as the game (such as a large air conditioner or other device with an exceptionally large motor) may drop the line voltage significantly when starting up. This drop can result in an intermittent credit problem. In addition, poor connections in the location wiring, plug, or line cord may also cause a significant drop in power. Cold solder joints in the game's harness, especially in areas like the transformer connections, interlock switch, or fuse block, may also produce the same results, although probably on a more permanent basis.

Sometimes location owners (especially in bars) replace light switches with dimmer rheostats, and the game is sometimes on the same line. Obviously, the voltage available to the game is going to drop dramatically when the dimmer is turned.

In any case, the way to check for correct line voltage is with your VOM. Set the VOM to 250 VAC and stick the probes in the wall receptacle. If it's OK here, check the transformer primary connections. If you do not get 117 VAC, examine the solder joints on the transformer, fuse block, and interlock switch. If you do get 117 VAC, the problem must be either in the transformer, harness connections, or in the PCB power supply.

If you suspect the transformer, check its secondaries with the VOM set to 50 VAC and correlate the readings with the legend on the side of the transformer. The transformer must also be correctly grounded, so check the ground potential as well, especially if there is a hum bar rolling up or down the TV screen.

### HARNESS PROBLEMS

Other harness problems include blowing fuses and malfunctioning controls. The repeating blown-fuse problem can sometimes be quite exasperating to solve, for short circuits have the tendency to occur in areas almost impossible to find. First, try inserting a new fuse, as old fuses age and blow without cause. If the new one also blows, you definitely have a short.

The best way to approach this problem is by turning the power off and disconnecting devices that may be causing the problem, such as the TV, transformer, and PCB. Disconnect the devices by pulling off their connectors, but do not allow them to touch. If necessary, insulate them with small pieces of electrical tape. Then, connect your VOM across the terminals of the fuse block (all electrical power shut off), and set it to one of the resistance scales. This will save blowing a fuse each time you want to check the circuit.

If the VOM reveals that disconnecting the devices removed the short, reconnect the devices one by one until the short returns. The last device connected is the one that is at fault. If the VOM reads a short even after the devices are disconnected, the fault must lie in the harness itself, and only patient exploration will reveal its location. First, carefully examine all the wiring, looking for terminals that may be touching, metal objects such as coins shorting connections or burned insulation. If necessary, use the VOM to check each suspected wire.

### MALFUNCTIONING CONTROLS

One of the most common problems here is a bad potentiometer. Typically, a bad pot will cause the image to jump as it reaches a certain point. The only cure for this one is to install a new pot.

If a feature that is operated by a switch (for example, joysticks, foot pedals, control panel buttons) does not operate at all, check the switch with a VOM or continuity tester to verify its operation. If the switch does not check out, replace it. If the switch is OK, you should suspect the input to the switch from the PCB. In this case, get out the harness and logic schematics and check to see what kind of input it is. In many cases, the input will be +5 VDC. If so, use the VOM to check its presence. Normally, the switch is used to pull a +5 VDC line LOW to GND or to pull a LOW line HIGH. If the PCB output is missing, check the wire length from the PCB. If you find the signal at the PCB trace, the wire length or connection is at fault. If not, begin exploring the PCB using the logic schematics.

# A Glossary of Microprocessor Terms

**MICROPROCESSOR** — one or several microcircuits that perform the function of a computer's CPU. Sections of the circuit have arithmetic and comparative functions that perform computations and executive instructions.

**CPU** — central-processing unit. A computing system's "brain", whose arithmetic, control and logic elements direct functions and perform computations. The microprocessor section of a microcomputer is on one chip or several chips.

**PROM** — programmable read-only memory. User permanently sets binary on-off bits in each cell by selectively fusing or not fusing electrical links. Non-erasable. Used for low-volume applications.

**EPROM** — erasable, programmable, read-only memory. Can be erased by ultraviolet light bath, then reprogrammed. Frequently used during design and

development to get programs debugged, then replaced by ROM for mass production.

**ROM** — read-only memory. The program, or binary on-off bit pattern, is set into ROM during manufacture, usually as part of the last metal layer put onto the chip. Nonerasable. Typical ROM's contain up to 16,000 bits of data to serve as the microprocessor's basic instructions.

**RAM** — random-access memory. Stores binary bits as electrical charges in transistor memory cells. Can be read or modified through the CPU. Stores input instructions and results. Erased when power is turned off.

**LSI** — large scale integration. Formation of hundreds or thousands of so-called gate circuits on semiconductor chips. Very large scale integration (VLS) involves microcircuits with the greatest component density.

**MOS** — metal-oxide semiconductor. A layered construction technique for integrated circuits that achieves high component densities. Variations in MOS chip structures create circuits with speed and low-power requirements, or other advantages (static will damage a MOS chip).



# VII. Coin Door Maintenance

**SPECIAL NOTE:** If you have any questions about the coin acceptors in your game(s), please feel free to contact their manufacturers. Each manufacturer's name is **PROMINENTLY** imprinted on every acceptor mechanism.

Metal mechanisms only:

**COIN MECHANISMS, INC.**  
817 Industrial Drive  
Elmhurst, IL 60126  
Phone (312) 279-9150

Metal and Plastic mechanisms:

**COINCO COIN ACCEPTORS, INC.**  
860 Eagle Drive  
Bensenville, IL 60106  
Phone (312) 766-6781

## COIN DOOR MAINTENANCE

### METAL COIN ACCEPTOR MECHANISMS

Periodically, the metal coin acceptor mechanism(s) must be removed from the coin door and cleaned.

1. **Make sure the power to the game is off.**
2. Unlock and open the coin door.

3. Remove the coin acceptor mechanism as shown in Figure 7-1.

- Push down on the two spring loaded latches.
- While holding the latches down, pull the top of the coin acceptor mechanism toward you.
- Release the latches and lift out the coin acceptor mechanism.

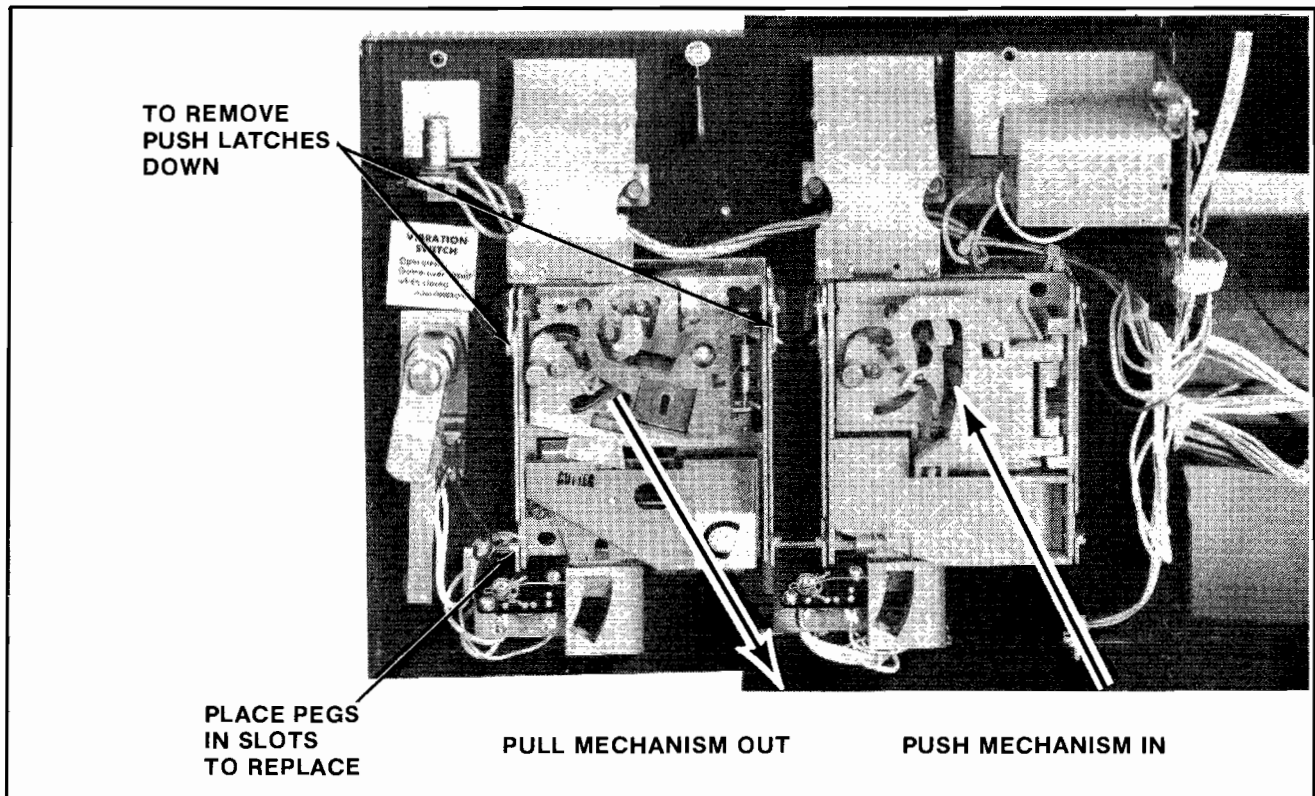


Figure 7-1 Removing and replacing coin acceptor

4. Clean the magnet of all foreign particles. See Figure 7-2.
  - This may be accomplished by swinging the gate open as shown in the above figure.
5. Remove the cradles and undersize levers and clean the bushings. (A pipe cleaner makes a good bushing cleaner.)
  - Also clean the pivot pin.
6. Whenever needed, the coin acceptor should be cleaned with hot water and cleanser in the following manner:
  - Place the coin acceptor in boiling water for about ten minutes.

**CAUTION: BE CAREFUL NOT TO BURN YOURSELF.**

- Next, use a brush and kitchen cleaner to remove all remaining foreign matter from the unit.
- Rinse the coin acceptor in clean boiling water.
- Dry the coin acceptor thoroughly by using filtered compressed air to blow it dry.

**NOTE:** The reason we recommend using boiling water is that it evaporates faster than cold water and speeds drying time.

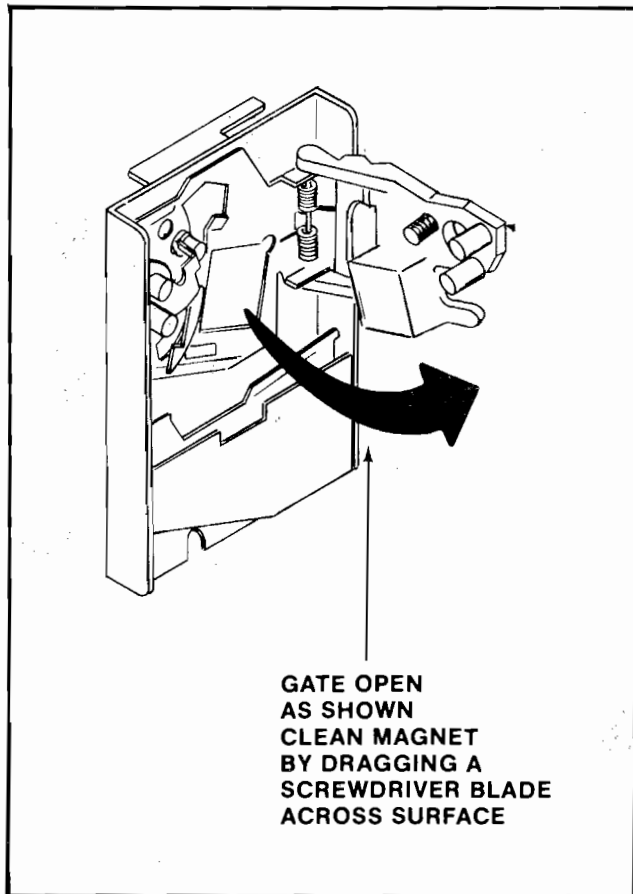


Figure 7-2 Cleaning the metal coin acceptor

7. To lubricate the coin acceptor:
  - Use **ONLY** powdered graphite and put it **ONLY** on the moving parts of the coin acceptor. These parts are called out in Figure 7-3.
  - Be extremely careful to keep the powdered graphite away from paths that are traveled by the coins.

**— WARNING —  
DO NOT USE OIL  
TO LUBRICATE THE  
COIN ACCEPTOR.**

8. Check the coin chute for obstructions such as: paper, gum, etc.
9. Reinstall the coin acceptor to the coin door. See Figure 7-1.
  - Place the two pegs at the coin acceptor's base into their retaining slots.
  - Now push the top of the coin acceptor toward the coin door until it snaps in place and is held there by the two spring loaded latches.
10. Close and lock the coin door.

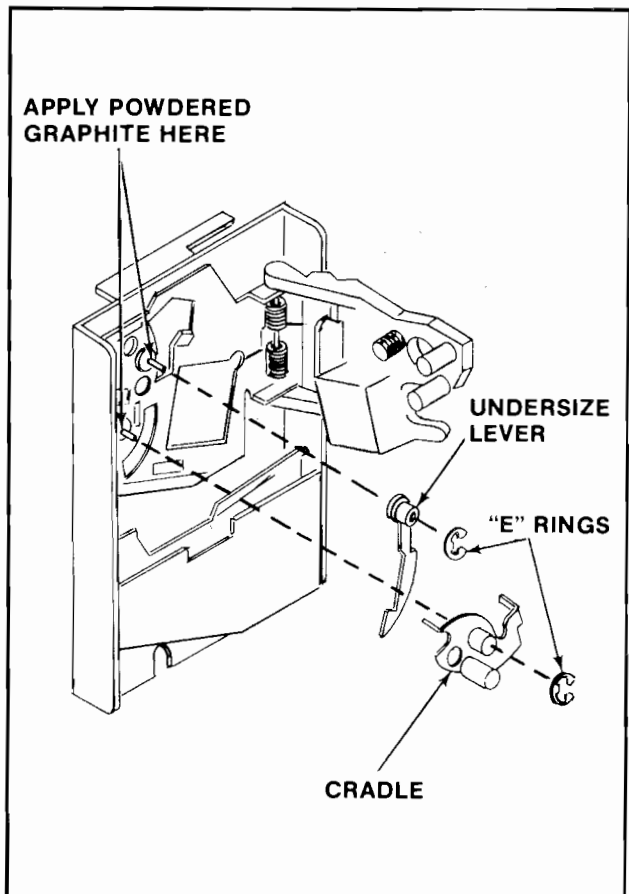


Figure 7-3 Lubricating the metal coin acceptor

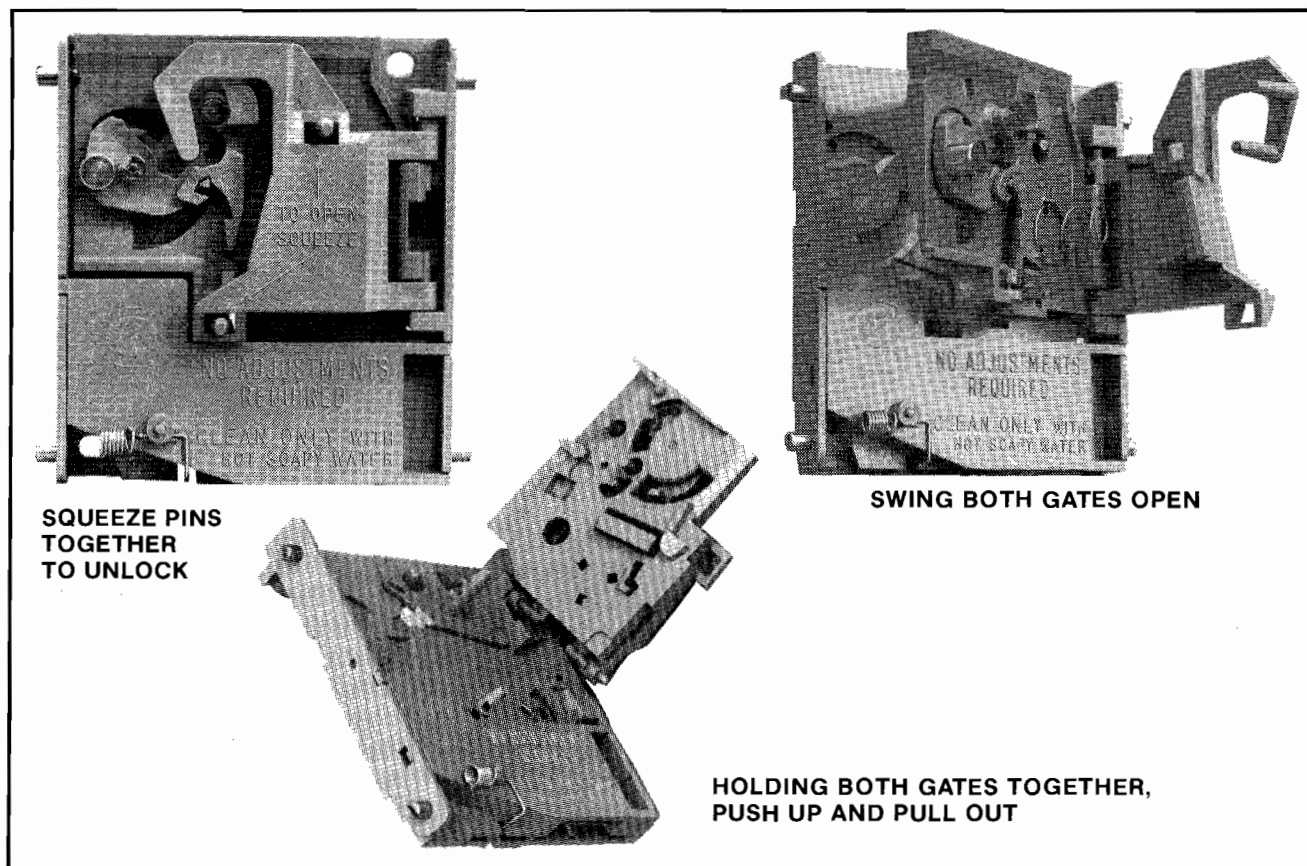


Figure 7-4 Opening the plastic coin acceptor

### PLASTIC COIN ACCEPTOR MECHANISMS

The plastic coin acceptor mechanism(s) must be removed periodically from the coin door and cleaned.

1. **Make sure the power to the game is off.**
2. Unlock and open the coin door.
3. Remove the coin acceptor mechanism(s) as shown in Figure 7-1.
  - Push down on the two spring loaded latches.
  - While holding the latches down, pull the top of the acceptor mechanism toward you.
  - Release the latches and lift out the mechanism.
4. Squeeze the two pins indicated in Figure 7-4 together to open the mechanism and break it down into its three basic parts.
  - Clean the mechanism in hot soapy water. It never rusts.
  - Rinse the mechanism in clean hot water and allow it to dry.

Reassemble the mechanism (it never needs lubrication).

5. Check the coin chute for obstructions such as: paper, gum, etc.

6. Reinstall the coin acceptor to the coin door. See Figure 7-5.

Place the two pegs at the coin acceptor's base into their retaining slots.

Now push the top of the coin acceptor toward the coin door until it snaps in place and is held there by the two spring loaded latches.

7. Close and lock the coin door.

**NOTE:** See Figure 7-6 for instructions on how to set the plastic coin acceptor mechanisms to either accept or reject Canadian quarters.

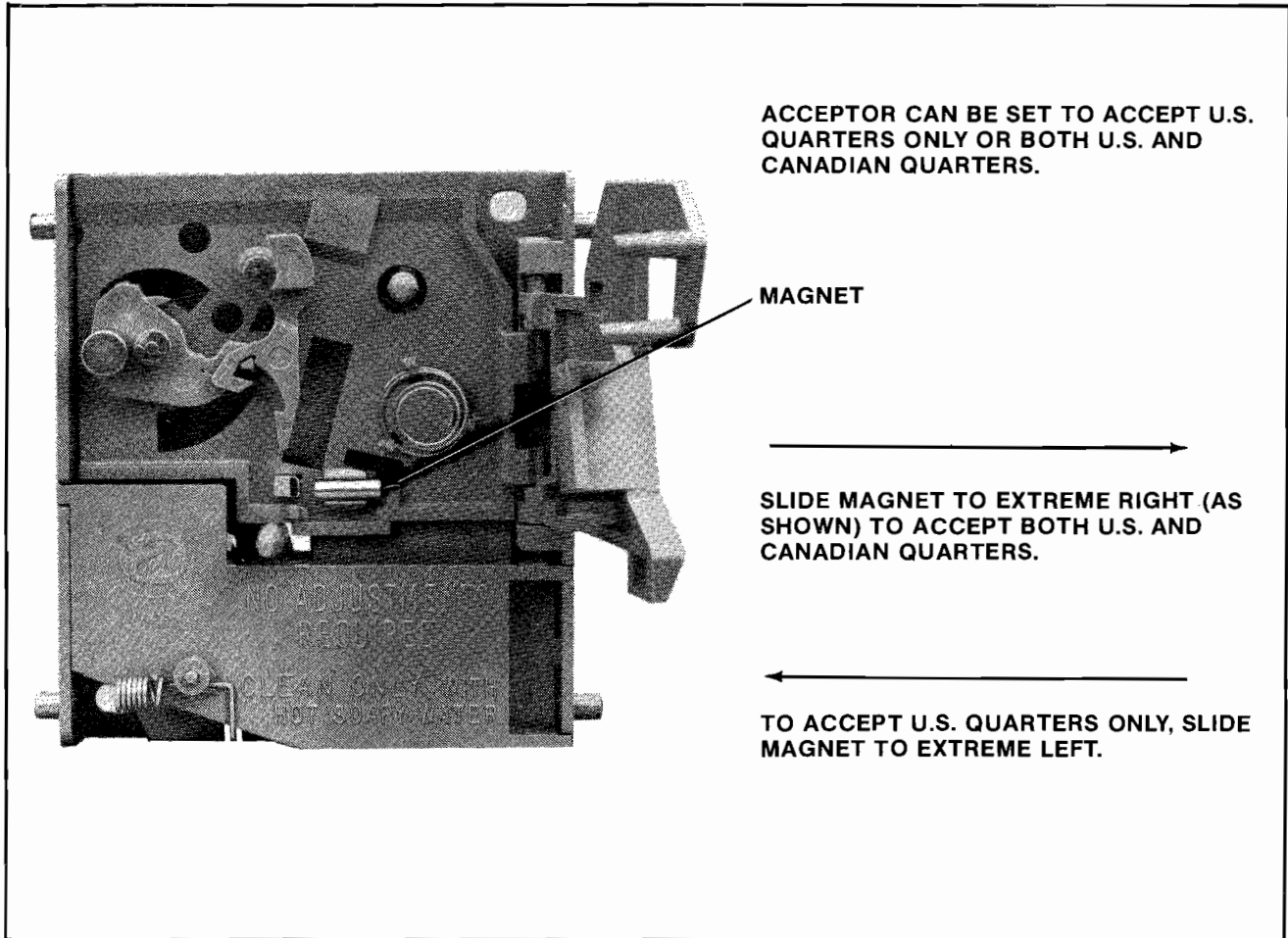


Figure 7-5 Changing the plastic coin acceptor to accept American or Canadian quarters.



**PLEASE NOTE:**

THE INFORMATION CONTAINED IN THIS SECTION IS TOLD IN AN EASY TO UNDERSTAND MANNER AND IS INTENDED TO AID THOSE WITHOUT AN ELECTRONICS DEGREE IN TROUBLESHOOTING AND REPAIRING THEIR GAMES T.V. MONITOR.

IF YOU READ THROUGH THIS SECTION AND STILL HAVE QUESTIONS, PLEASE CONTACT YOUR DISTRIBUTOR OR MIDWAY MANUFACTURING COMPANY AT THE TOLL FREE NUMBER PROVIDED WITH YOUR GAMES PAPERS.

**OUR STAFF AND OUR DISTRIBUTORS STAND READY TO HELP YOU!**

**THANK YOU**

**VIII T.V. Monitor Manual**



# Color T.V. Monitor

## **Introduction:** (How to use this section of your manual.)

This section has been designed to simply familiarize you with one of the more mystical components in your game — the T.V. monitor. If you are an electronics technician who is quite knowledgeable on the subject, you may decide to just go to the schematics and start troubleshooting the defective monitor. But if you are like most people, a monitor is a T.V. set, and that means a complex doo-dad that means big buck repairs. This isn't necessarily so. This section of the manual will acquaint you with the monitor and could just help you repair it if you feel adventurous enough to give it a try. If you have any knowledge of electronics, especially the use of a voltmeter, the repairs you can make are astonishing. Just keep in mind that **ELECTRICITY CAN BE VERY DANGEROUS, SO BE CAREFUL!!**

If you want to understand how a monitor works, just read the "THEORY OF OPERATION" subsection. If you wish, you can follow along with the schematics. The information is presented in a very basic manner but more complete treatment of the subject can be found in the technical sections of bookstores.

If you want to attempt to repair your monitor, it would be a good idea to read this whole section beginning to end before starting. **Pay attention to all warnings**

**and take them seriously.** The more equipment you have the better, but a low cost Volt-Ohm-Milliameter can often do the trick. Here are the steps to take:

1. Find the symptom that matches the problems your monitor has in the "SYSTEM — DIAGNOSIS" subsection. The diagnosis tells the circuit or area the problem may be in and possibly even the actual component causing it.
2. Once you have the circuit that is causing the trouble, read the "TROUBLESHOOTING" subsection to learn the procedure for finding the bad part.
3. Next, go to the schematic section and find the schematic that matches your monitor. It may be helpful to read the "DIFFERENCES BETWEEN MONITORS" subsection if you are unsure of which monitor you have. Use the schematic to see what parts are in the offending circuit.

That really is all there is to it. Just remember that there are some bizarre or rare symptoms not covered, or that a monitor may have two or more different problems that only a genius, the experienced, or an experienced genius can figure out. But be patient, follow safety precautions, and remember that there is also literature available from the monitor companies through your distributor or from Midway Manufacturing Company on request. (There is a toll free number on the back side of the front cover of this manual.)

# Symptom Diagnosis

- 1. Insufficient width or height:**
  - A. Horizontal line (due to VERTICAL CIRCUIT DEFECT).
    - Bad yoke.
    - Bad vertical output section.
    - Open fusible resistor in vertical section.
    - Bad height control.
    - Bad flyback.
  - B. Vertical line (due to HORIZONTAL CIRCUIT DEFECT).
    - Bad yoke.
    - Open width coil.
    - Open part in horizontal output section.
- 2. Picture spread out too far or crushed in certain areas:**
  - A. Horizontal or vertical output transistor.
  - B. Bad component in output circuitry.
- 3. Line too close with black spacing:**
  - A. Problem in vertical section causing poor linearity.
- 4. Poor focus and convergence:**
  - A. Bad high voltage transformer ("flyback") or control.
  - B. Focus voltage wire not connected to neck-board terminal.
- 5. Colors missing; check:**
  - A. Interface color transistors.
  - B. Color output transistors.
  - C. Cracked printed circuit board.
  - D. Color circuits.
  - E. Video input jack.
- 6. Picture not bright enough:**
  - A. Weak emission from picture tube. (Turn horizontal sync off frequency and put brightness all the way up for about 15 minutes. Occasionally this cures the problem.)
- 7. Silvery effect in white areas; check:**
  - A. Beam current transistors.
  - B. Weak picture tube emission.
- 8. Too much brightness with retrace lines; check:**
  - A. Beam limiter transistors.
  - B. Brightness and/or color blanking control set too high.
- 9. Increasing brightness causes an increase in size and poor focus.**
  - A. Weak high voltage rectifier or regulation (high voltage unit).
- 10. Small picture and/or poor focus:**
  - A. Low B+ voltage (power supply trouble).
- 11. Vertical rolling:**
  - A. Vertical oscillator transistor, IC, or circuit.
  - B. No sync from logic board.
- 12. Horizontal line across center:**
  - A. Vertical output circuit is dead (see symptom No. 1. A.).
  - B. Vertical oscillator is not putting out the right wave form.
- 13. Picture bends:**
  - A. Horizontal sync needs adjusting.
  - B. Magnetic or electromagnetic interference.
- 14. Flashing picture, visible retrace lines:**
  - A. Broken neck board.
  - B. Internal short circuit in the picture tube (arcing).
- 15. Unsymmetrical picture or sides of picture:**
  - A. Defective yoke.
- 16. No brightness, power supply operating — No high voltage for the picture tube; check:**
  - A. Horizontal oscillator.
  - B. Horizontal amplifier and output.
  - C. Flyback transformer (high voltage unit).
- 17. No brightness, high voltage present; check:**
  - A. Heater voltage to the tube at the neck board.
  - B. Screen-grid voltage for the tube.
  - C. Focus voltage.
  - D. Grid to cathode picture tube bias.
- 18. No high voltage; check:**
  - A. For AC input to the "flyback".
  - B. Horizontal deflection stages.
  - C. Flyback transformer.
  - D. Yoke.
  - E. Power supply.
- 19. No horizontal and vertical hold; check:**
  - A. Sync transistors and circuit.
  - B. Wires and jack from logic board to the monitor.
- 20. Wavy picture — (power supply defect); check:**
  - A. Transistors, diodes, electrolytic capacitors in the power supply.

**21. Moving bars in picture:**

- A. Ground connector off between monitor and logic boards.
- B. Defect in the power supply (see wavy picture symptom).

**22. Washed out picture (see picture not bright enough):**

- A. Check video signal at the cathode pins with an oscilloscope. If there is about 80 volts peak to peak, the picture tube has weak emission.

**23. Monitor won't turn on:**

- A. Problem in the power supply: Check fuse, transistors, open fusible resistor.
- B. Shorted horizontal output transistor.

- C. Defective high voltage disabling circuit.
- D. Crack(s) somewhere on main chassis board.

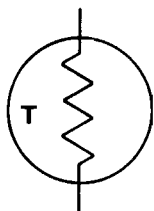
**24. Can't adjust purity or convergence:**

- A. Use a degausser to demagnetize the picture tube carefully following your degausser's instructions.
- B. Picture tube defective.
- C. Metal foreign material is in picture tube shield.
- D. Nearby equipment is electromagnetically interfering.
- E. The poles of the earth are pulling off the purity.
- F. Poor focus or width of picture.

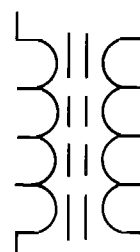
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## Guide To Schematic Symbols



**THERMISTOR**  
(POLARITY DOESN'T MATTER)



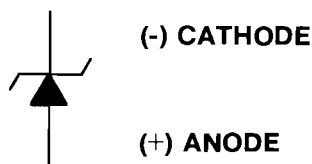
**IRON CORE TRANSFORMER**  
(SUCH AS A FLYBACK)



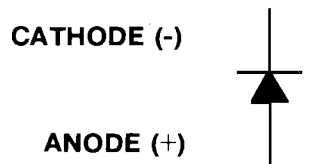
**INDUCTOR, COIL, CHOKE**  
(POLARITY DOESN'T MATTER)



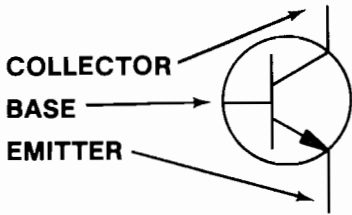
**FUSE**  
(POLARITY DOESN'T MATTER)



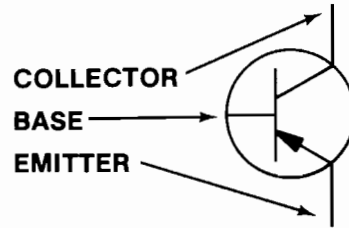
**ZENER DIODE**



**DIODE**



**NPN TRANSISTOR**



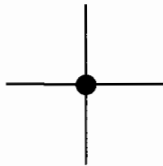
**PNP TRANSISTOR**



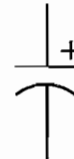
**VARIABLE RESISTOR, POT, CONTROL**  
(POLARITY DOESN'T MATTER)



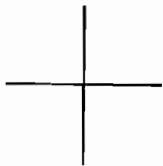
**RESISTOR**  
(POLARITY DOESN'T MATTER)



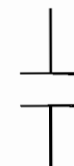
**LINES ARE CONNECTED**



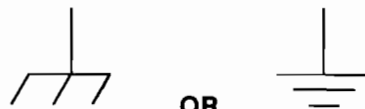
**ELECTROLYTIC CAPACITOR**



**LINES ARE NOT CONNECTED**



**CAPACITOR**  
(POLARITY DOESN'T MATTER)



**GROUND**

# Troubleshooting

Troubleshooting monitors requires experience, patience, **and luck**. The first step is to match the symptom the monitor displays to the diagnosis next to it in the "SYMPTOM-DIAGNOSIS" subsection. This will pinpoint the circuit the problem is probably in, and often the parts to check. Next, the circuit should be visually inspected to see if there are any parts broken, burned, or if something is there that shouldn't be, like a loose screw, etc. Some parts go bad before others and should be checked first. In fact, following is the general order in which parts usually go bad:

1. Semiconductors (like transistors, diodes, and integrated circuits).
2. Fusible resistors.
3. Electrolytic capacitors.
4. Resistors.
5. Capacitors and coils.

Always remember that a monitor can bite like a snake. Even when it is turned off, capacitors hold voltage and will discharge it to you should you be touching chassis ground. The picture tube or CRT, itself, is a giant capacitor, so avoid the flyback anode plug hole. With the monitor on, the power supply circuit and/or the flyback, which puts out at least 18,000 volts, **CAN BE KILLERS!!** Avoid handling power transistors (usually output transistors), yoke terminals, and other high power components when the monitor is on.

## **WARNING:** That picture tube is a bomb!

When it breaks, first it implodes, then it explodes. Large pieces of glass have been known to fly in excess of 20 feet in all directions. **DO NOT** carry it by the long, thin neck. Discharge its voltage to ground by shorting the anode hole to ground. Use a plastic handled screwdriver, connect one end of a wire with an alligator clip at each end to chassis ground and the other end to the metal shaft of the screwdriver. Using **ONE HAND ONLY** (put the other in your pocket) and touching **ONLY** the plastic handle of the screwdriver (**DO NOT TOUCH THE METAL SHAFT**) stick the blade of the screwdriver into the anode hole. Be prepared for a fairly loud pop and a flash. The longer the monitor has been turned off, the smaller the pop and dimmer the flash. But **BE CAREFUL**, picture tubes will hold a very

healthy charge for at least **a week** if not longer. Even after you've discharged it once, it may still carry a residual charge. It's better to be too careful than dead, which is why electronic equipment always carries stickers referring servicing to qualified personnel. Handle the side with the viewing screen against your chest when changing it. **ALWAYS** wear safety goggles when handling the picture tube.

To maintain the safety and performance of the monitor, always use exact replacement parts. For instance, the wrong components in the power supply can cause a fire, or the wrong color transistor may give a funny color to the picture. Service your monitor on a nonconductive firm table like wood, **NOT METAL**, and take off all of your jewelry just in case. With all this in mind, you are ready to begin troubleshooting.

Observe the picture carefully. Try to vary the appropriate control that would most likely affect your particular symptom. For example, if there is poor brightness or no picture, try turning up the brightness or contrast control. If the controls have no effect at all, chances are there is trouble with the control itself, the circuit it controls, or a nearby circuit that may be upsetting voltages. Go to the list of symptoms and determine with the schematic where the bad circuit is.

### **CAUTION:**

**Keep in mind that capacitors hold a charge as can the picture tube (for at least a week and usually longer), and could shock you.**

First, check for obvious visual defects such as broken or frayed wires, solder where it is not supposed to be, missing components, burned components, or cracked printed circuit boards. If everything looks good up to this point, make sure that diodes, electrolytic capacitors, and transistors have their leads connected in the right polarity as shown on the schematic and the circuit board.

Turn on the power and measure the voltages at the leads of the active devices such as tubes, transistors, or integrated circuits. Any voltage that does not come within at least 10% to 15% of the voltage specified on the schematic indicates either a problem with that device or a component connected with it in the circuit. The next step is to use the ohmmeter to narrow down the field of possible offenders.

To test a transistor, one lead of the ohmmeter is placed on the base; and the other lead placed just on the emitter, then on the collector. A normal transistor will read either high resistance (infinite), or little resistance (400 to 900 ohms), depending on the polarity of this type transistor. Then the leads should be switched, one remaining on the base, and the other switched from the emitter to the collector. Now the opposite condition should result: the resistance should be infinite if it was lower when the other lead was on the base. Consistently infinite readings indicate an open, and a short is demonstrated by 0-30 ohms on most of these test readings. Finally, place one lead on the collector, then the other on the emitter. No matter which lead is used, there should be infinite resistance. Any lower reading, such as 50 ohms (which is typical on a bad transistor), indicates a short.

This all sounds pretty confusing, but a little experience on a good transistor will make you an expert in no time. Usually, the lowest ohmmeter setting is used for testing transistors. Once in a great while a transistor may check out good on this test, but may actually be "leaky" or break down only on higher voltages. If in doubt, change it. It is also wise to check the transistor out of the circuit just in case some component in the circuit is affecting the ohmmeter reading.

A diode is tested like a transistor except it only has two leads. Again, there should be high resistance one

way and little resistance the other. If it tests bad, take one lead out of the circuit in case some component is messing up the ohmmeter reading.

**NOTE: DO NOT** leave soldering equipment on the leads too long since all semiconductors, especially integrated circuits, are easily destroyed by heat.

Without special equipment, integrated circuits are checked by verifying the proper DC voltage on the pins and the correct AC wave form using an oscilloscope. **BE CAREFUL:** Shorting their pins can easily destroy them.

Resistors are checked with an ohmmeter and should usually be within ten percent of the value stated on them and on the schematic. You may have to desolder one lead from the printed circuit board. If you wreck the foil on the board, carefully solder a small wire over the break to reconnect the conductive foil.

Capacitors are tricky. Their resistance goes up when checked with an ohmmeter which shows a charging action. As they suck up current from the meter, the voltage goes up and so does the resistance. If you are sure a particular circuit is giving you a problem and everything else checks out O.K., Electrolytic capacitors are prime suspects. Substitute a new one and keep your fingers crossed.

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## Theory of Operation

To understand what goes on inside the monitor, large general groups of circuits will be examined instead of laboriously analyzing the branches and small circuits that make up these groups. This will help avoid confusion and aid in a basic, concrete, knowledge of what makes up a monitor.

### THE POWER SUPPLY —

The AC going to the monitor from the game transformer is just like the voltage and current from your wall outlet. It jumps up and down going positive and negative sixty times a second. But a monitor needs nice, smooth DC; direct current, not alternating. So diodes chop up the AC and a big electrolytic capacitor filters it out to make it even smoother. Since the monitor is a big piece of electronic equipment, with many circuits demanding a lot of power from the power supply, there are also zener diodes and transistors to help maintain a nice, constant, smooth voltage so that the monitor circuits don't jump around. And this is what happens when you see a wavy picture. There is AC creeping

through the power supply, so it must be malfunctioning. If the voltage from the power supply is too low, the other circuits will be starved for power and you may see a small, wavy picture, or none at all.

Some circuits receive voltages that are higher than what the power supply should put out. But they come from the flyback transformer which will be discussed later.

### THE INTERFACE SECTION OF THE CHASSIS —

The interface section of the chassis is fairly easy to identify. It is right by the place where the video jack(s) from the logic board(s) plug into. There are sets of transistors that receive the separate red, green, blue, and sync information from the cables that come from the logic boards. The circuits jack up the voltage and match impedances, or in other words, prepare the logic board outputs for the circuits that will really amplify them for the output devices such as the yoke in the case of the sync, or the picture tube that shows the colors.



An interesting aside is that our sync is composite negative sync. That means two things:

1. The sync is a negative going wave form.
2. There are two pulses going at different speeds over the same wire:
  - a. Vertical wave forms at 60 times per second (or Hertz) and
  - b. Horizontal wave forms at about 15,750 times per second (Hz).

The sync is amplified by a sync amplifier transistor and sent on its way to the oscillators. The sync or timing information will be explained along with the oscillator shortly.

The color information is sent via wires to the neck board where the main amplification occurs. This will also be discussed later.

## VERTICAL AND HORIZONTAL DEFLECTION—

After the sync signal is amplified by the sync amp, it goes to two different sections, the vertical and horizontal circuits. Basically, the sync signals are for timing so the picture doesn't mess up since it is assembled like an orderly jigsaw puzzle, but so fast that you can't see the electron beams for each color painting the picture on the screen. This will all become clear soon. For now, we will follow the 60 cycle component of the sync as it goes on its journey to the deflection yoke.

The 60 cycle pulse goes to the vertical oscillator to make sure this circuit goes back and forth (or oscillates) at 60 times a second. Without this pulse keeping the circuit at the correct speed, it may get lazy and oscillate at 58 cycles or lower, or get ambitious and oscillate at 62 cycles or higher. At the wrong speed, the picture will start to roll up or down.

A Wells Gardner 13" (K4806) or 19" (K4906, K4956) color monitor uses an integrated circuit for its sync section. An Electrohome 13" or 19" color monitor uses an integrated circuit IC501 for its sync section. Wells Gardner uses HA11423 and Electrohome uses HA11244. **These ARE NOT interchangeable!** The idea is all the same. The output to the vertical amplifying transistors for all monitors must form a sawtooth wave form, sort of like a bunch of pyramids, racing through the yoke's vertical coils at 60 times a second.

Along the way to the output transistors, the 60 cycle pulse is shaped and amplified to do the job: the yoke magnetically pushes the electron beam to fill the screen out sideways looking at the screen with the greatest length going up and down. Or viewing the screen sitting like a home television set, the amplified vertical output fills the screen up and down. Watching a monitor like this, seeing only a horizontal line means a problem with the vertical coils of the yoke or anything from the vertical output section on back to the oscillator.

The horizontal section is very similar with a few exceptions. The horizontal wave shape is more like a square and has a frequency of 15,750 cycles a second. Both Wells Gardner and Electrohome use the other side of their respective integrated circuits for the horizontal circuitry. If the oscillator isn't going at the correct speed, the picture may move sideways, start to slant, or tear up with slanted thin figures. With both the vertical and horizontal of all monitors, there are variable resistors that change the speed of the oscillators up and down. This way you have controls that can make the correct frequencies to keep the electronic jigsaw puzzle nicely locked in place. If you're driving in a car and next to you someone else is driving their car at exactly the same speed, it will appear that they are not moving. And this is why the sync frequency and the oscillator's frequency must match, so the picture doesn't appear to move.

The correct wave form is shaped and amplified in the circuitry just like in the vertical section. But the horizontal output transistor is a large power transistor and not only serves to give current to the horizontal yoke windings, it also feeds the flyback transformer.

## THE FLYBACK TRANSFORMER (OR HIGH VOLTAGE UNIT) —

The picture tube needs high voltage to light up, and the power supply can't meet this demand. The flyback transformer receives current alternating at about 15,750 times per second from the horizontal output transistor. The "flyback" jacks up its input voltage and puts out a higher voltage alternating at the same speed. But, in your "flyback" there are diodes that chop up the alternating voltage to make it a smooth DC output just like in the power supply. This is what goes through that thick red wire to your picture tube. **THIS AREA HAS ABOUT 18,000 VOLTS ON IT AND IT CAN KILL YOU!!**

The "flyback" may be dangerous, but it is also generous. It has extra output windings which give voltage to the heater pins of the picture tube, voltage for the vertical deflection circuits, and picture tube screen-grid voltage. So in a way, the high voltage "flyback" is like a second power supply.

## COLOR CIRCUITS —

The color circuits are pretty straight forward. The signals go into the interface section where some amplification and impedance matching occurs. These circuits are pretty sparse and simple. Each color just has two transistors and a diode with some resistors and capacitors. From here, the AC color signal is sent by wires to the neck board.

The color output circuits are on the neck board. The color signals going to the transistors are controlled by two variable resistors called drive controls. There are only two, one for the red and one for the green.

The blue doesn't have one. In the emitter part of each transistor is another variable resistor that is the cut off control. These controls vary the amount of amplified AC signal that goes to the cathodes of the picture tube. The more signal, the more color. The bases of each of these transistors are connected together and are all connected to the blanking and beam limiting transistors which are in the interface section.

The beam limiter helps control the brightness level, and the blanking transistor rapidly turns the picture tube on and off so that retrace lines don't show up on the screen. By turning up the brightness on a good monitor, these four to six retrace lines can be seen slanting diagonally across the picture.

### PROTECTION CIRCUIT —

To protect the high voltage section against voltages that are too high coming from the power supply which could cause X-rays to be emitted from the "flyback", a circuit senses the higher power supply voltage, and using a transistor, turns off the horizontal oscillator. Since the horizontal oscillator doesn't work, the horizontal output transistor has nothing to feed the "flyback" which in turn has nothing to feed the picture tube. The monitor will be silent, have no picture, and will appear to be off. **But don't be fooled.** There is still that excessive amount of voltage coming from the power supply. To find out, check at pin two of Wells Gardner's IC501 and emitter of X04 for the Electrohome monitor. Here are the voltages you should receive:

Wells Gardner = 130VDC  
Electrohome = 120VDC

The best place to measure this voltage on an Electrohome monitor is at a pin marked B1 on the chassis. This is because a 13 inch color Electrohome monitor,

The G07-FB0 or G07-902, has an integrated circuit and very little else in the power supply. Still, there should be 120VDC at B1.

### THE PICTURE TUBE (OR CRT) —

The picture tube or CRT is an output device. In other words, the end result of the circuit's work is displayed by this part. Actually, the output of other circuits is in the neck of the picture tube.

First, there is the heater. The heater boils off electrons from the cathodes so that they (the electrons) shoot up to the screen to excite the phosphors so that the three phosphors emit three colors of light.

The cathodes are next, and again they emit electrons to turn on the tube phosphors, making it glow. The cathode can arc or short to the heater resulting in no picture and a defective picture tube.

Next come the grids. The first grid is grounded. The following grid is the screen grid which receives about 300VDC depending on the brightness setting. The next grid closest to the picture tube screen is the focus grid which gets about one fifth the amount of voltage that is applied to the picture tube anode.

After jetting from the cathode through all these grids, the electrons speed through a mask, a sheet of material with tiny holes, and then excite the tiny dots of phosphor in the inside surface of the picture tube screen. The green electron gun (or cathode and circuitry) spits out electrons which head for the green phosphors only. The same goes for the red and blue guns. The way the phosphor light blends determines the color seen. Should these electron beams become too intense, they may burn the phosphor. With the monitor off, this can be seen as a dark permanent image of the video information on the tube screen.

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## Differences Between Monitors

The easiest way to identify the brand of monitor you are working with, assuming you can't find the brand name written on it anywhere, is to check the color of the suction cup type insulator that houses that dangerous anode plug on the CRT. Both monitors use a red wire but the Wells Gardner anode cup is BLACK while the Electrohome anode cup is LIGHT GRAY. Unfortunately, "call-out-numbers" for parts, circuit layout, and even circuit design are similar enough to confuse the average observer.

Let's say you have an Electrohome that isn't working. No problem. You can scavenge parts from an old broken up one that you may have around.

Now let's say you have a Wells Gardner that isn't working. **STOP!!** This could be a problem. There are 3

different types of Wells Gardner K4900 **SERIES** monitors in the games. Here are ways to identify them.

**K4906 (1st TYPE)** — This monitor's identifying tags have **BLACK** ink printed on a white background. There is **NO** Vertical Damping Control. (This Control would be next to the Vertical Hold Control but this area is jumpered with a small wire instead.

**K4906 (2nd TYPE)** — This monitor's identifying tags have **RED** ink printed on a white background. There **IS** a Vertical Damping Control next to the Vertical Hold Control. The Damping Control provides a few more lines on the top of the monitor screen (monitor viewed as a normal T.V. would be) for any video game that may need these lines to fit the picture on the

screen. Moving the Control may distort the top part of your picture (or the side, depending on the game and how the monitor is mounted) so go ahead and move it if you are having this type of problem. To accommodate this new feature, there are a few circuit changes.

ONE MAJOR DIFFERENCE BETWEEN THESE TWO VERSIONS OF THE K4906 IS THE YOKE.

They look the same but notice the part numbers:

K4906 **WITHOUT** the Damper Control: 2021111201

K4906 **WITH** the Damper Control: 2021111258

Since the companies like to change part numbers at the drop of a hat, the best thing to do is to request whatever part number is written on your yoke. If you should get the wrong yoke, the results will be:

Picture distortion.

Excessive brightness.

Too much or too little vertical picture size.

**K4956 (3rd TYPE)** — This monitor is identical to the K4906 **WITHOUT** the Damper Control **EXCEPT** the picture tube is vertically mounted and there is an additional small P.C. Board mounted on the monitor where the yoke plugs in. This monitor is used on some Cocktail Table games where the picture has to flip for the second player.

Generally speaking, some games flip the picture image via the logic board programming but this monitor is used in games that flip the picture image via generation of a small signal voltage which is sent to the extra P.C. Board on this monitor. This signal voltage causes relays on this extra P.C. Board to flip the picture by reversing the horizontal and vertical signals to the yoke pins.

What kind of problems can this extra P.C. Board cause? If the relays become defective, the picture won't flip. If the P.C. Board gets cracked you may have a horizontal line on the screen, a vertical line on the screen, or maybe just a dot in the center of the screen. Of course, the logic board could be defective and not sending the signal to flip the picture. In any case, some people feel that using relays is cheaper, simpler, and more reliable, so this is an advantage.

## CONTROLS YOU MAY NOT TOUCH

Basically, on the Electrohome monitor, you can move any control you want **EXCEPT** for the B1 control. This sets the power supply voltage (ideally at 120 VDC) and is located right behind VERTICAL HOLD. The 13" Electrohome **DOES NOT** have this control. It may also be wise not to move the VERTICAL LINEARITY since this distorts the picture and is hard to reset perfectly. If you do move it, turn on the Cross Hatch Test Pattern of your game and try to get the squares to the point where they are equal in size by readjusting this Linearity Control.

On the Wells Gardner monitor, brightness is adjusted by the "BLACK LEVEL" Control which is right next to the Horizontal Frequency Control. Under the Focus Control is the "SCREEN" Control which you **DO NOT** touch. Yes, this control does adjust the brightness, but it is used to set the CRT bias and is adjusted at the factory. When Wells Gardner sets it, they mark the position with a black mark on the knob. If you move it, be sure to realign the mark and **THEN** set the BLACK LEVEL Control to the brightness you desire. So, other than the SCREEN control, you may adjust any of the controls.

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# Parts Interchangeability

Some parts can be interchanged on all of the monitors. Here are the rules:

1. You **CAN** swap any resistor between monitors that has the same resistance, wattage rating, and tolerance.
2. You **CAN** swap any capacitor between monitors that has the same capacitance and voltage rating.
3. You **CAN** swap many of the parts between the 19" and the 13" versions of each manufacturer's monitor. **BUT**, be certain to compare the manufacturers' part numbers to be positive the parts you want to interchange are identical. **BE SURE** you have read the section DIFFERENCES BETWEEN MONITORS which was covered earlier.
4. You **CANNOT** swap any picture tubes between monitors!! In the past you could, but Wells Gardner is now using a new monitor. When

ordering a replacement picture tube, **ALWAYS SPECIFY THE PICTURE TUBE NUMBER!**

5. You **CANNOT** change any part that is a **safety part**, one that is shaded in gray on the schematic; it **MUST** be **IDENTICAL** to the original. **To do otherwise IS DANGEROUS.** For instance, the 13 inch Electrohome (G07-902) monitor "flyback" looks identical to the 19 inch Electrohome (G07-904) monitor "flyback". In fact, there is even a 19 inch Electrohome (G07-905) monitor (which is an obsolete model) with a similar looking "flyback". **NONE OF THESE ARE INTERCHANGEABLE!!**
6. You **CAN** change any of the parts between the G07-904 and G07-907. They're essentially the same monitor except that the G07-907 has a vertically mounted picture tube.

If there is any doubt about what parts can be swapped between each manufacturer's 19 inch and 13 inch models, compare the manufacturer's part number between each one. If they match up, they are the same part.



# 19" COLOR MONITOR SCHEMATIC DIAGRAM

## MODELS 19K4901, 19K4906, 19K4951, 19K4956

Power Supply Voltage and Symbols

Symbol	Voltage	Operating Circuit
	15V	Vert. Osc. Sync Blanking CRT Cut-Off
	130V	Horiz. Osc. Horz. Drive Horz. Output Vert. Output
	175V	Video Output

★

**SERVICE TECHNICIAN WARNING**  
**X-RAY RADIATION PRECAUTION:**

THIS PRODUCT CONTAINS CRITICAL ELECTRICAL AND MECHANICAL PARTS ESSENTIAL FOR X-RAY RADIATION PROTECTION. FOR REPLACEMENT PURPOSES, USE ONLY TYPE PARTS SHOWN IN THE PARTS LIST.

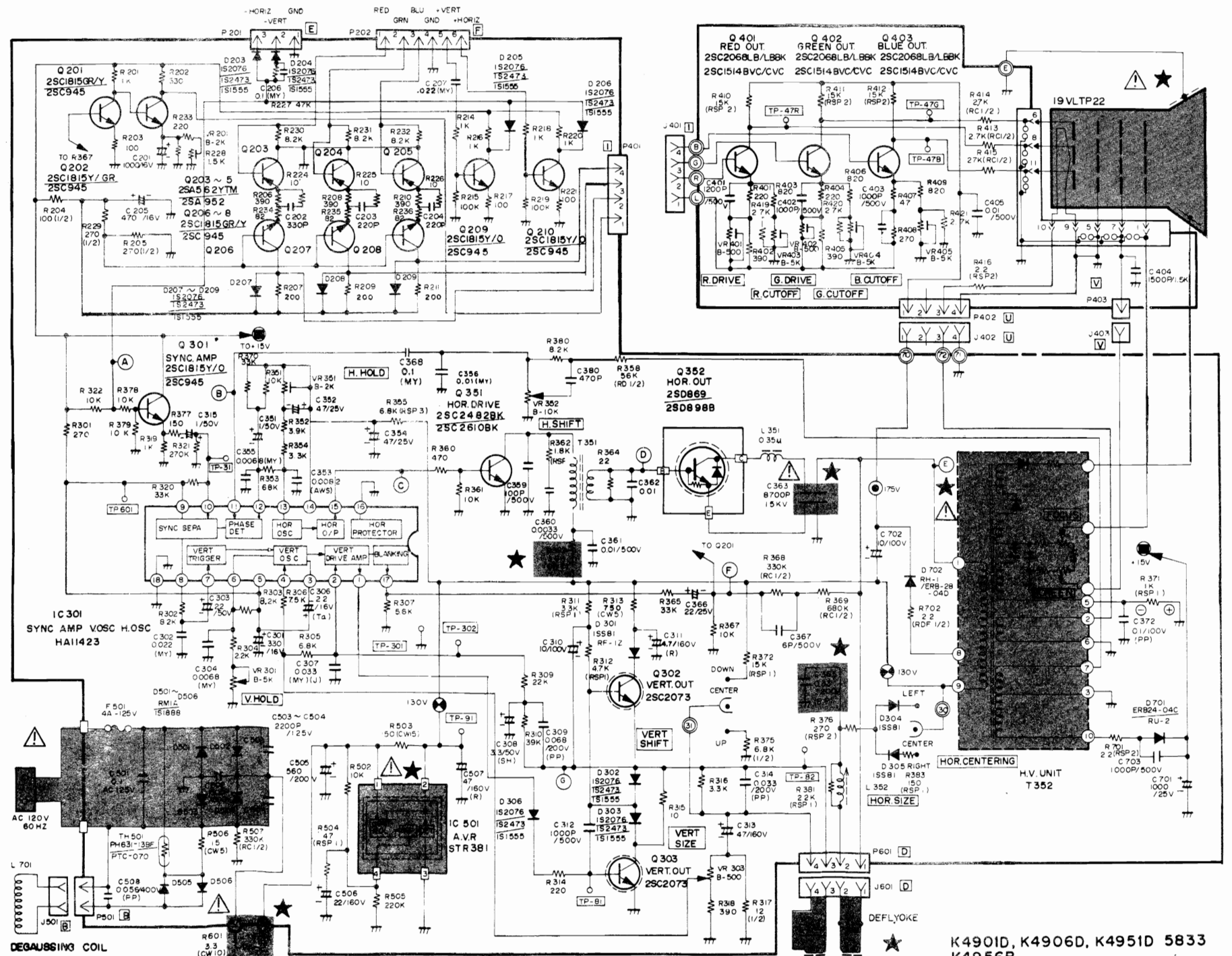
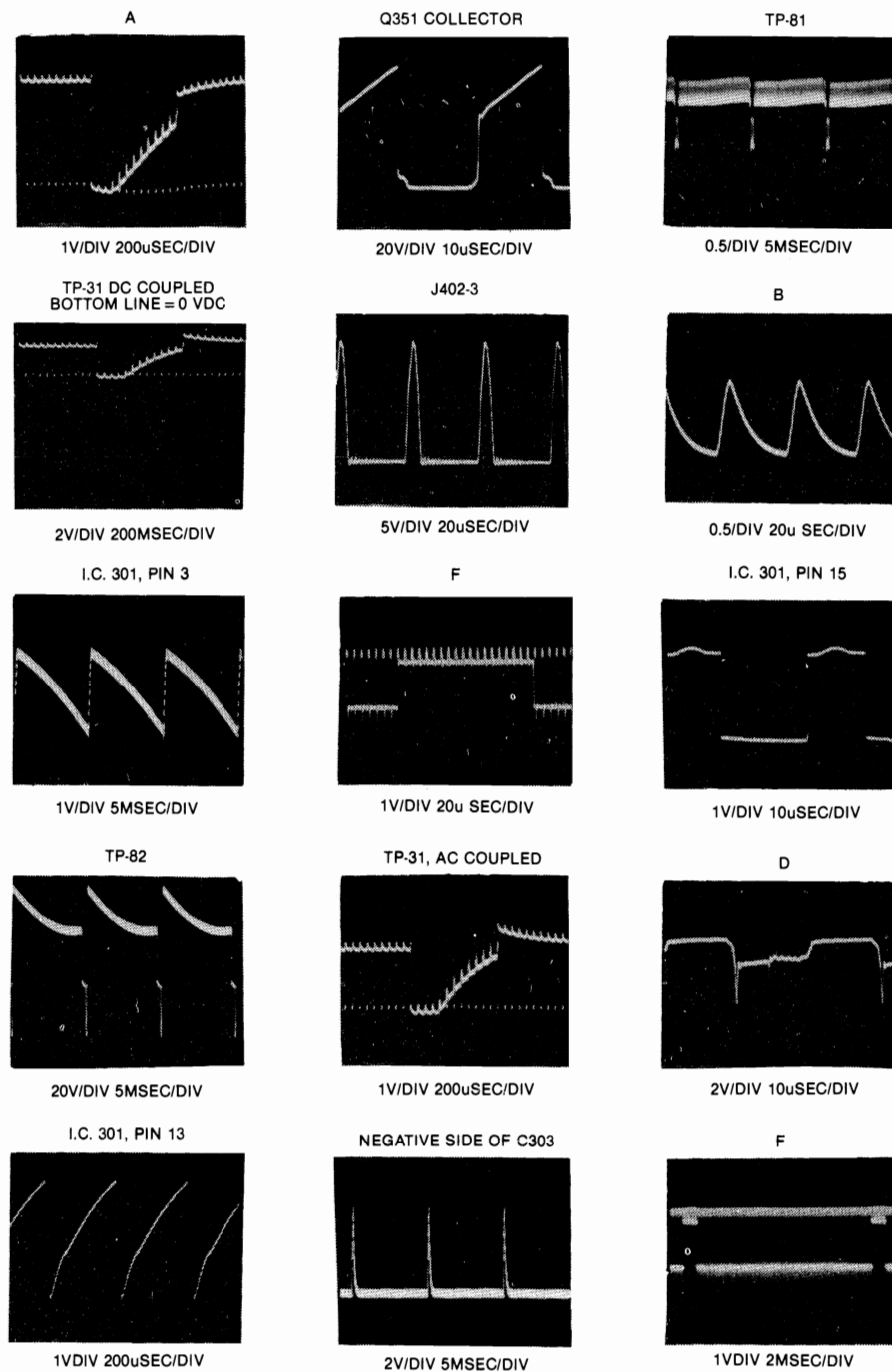
⚠

**CAUTION: FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.**  
**AVERTISSEMENT: POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.**

### OSCILLOSCOPE WAVEFORM PATTERN

The waveforms shown are as observed on the wide band oscilloscope with the monitor turned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak amplitudes.

If the waveforms are observed on the oscilloscope with a poor high frequency response, the corner of the pulses will tend to be more rounded than those shown and the amplitude of any high frequency pulse will tend to be less.



K4901D, K4906D, K4951D 5833  
K4956B

## REPLACEMENT PARTS LIST

This monitor contains circuits and components included specifically for safety purposes.

For continued protection no changes should be made to the original design, and components shown in shaded areas of schematic, or  $\Delta$   $\star$  on parts list should be replaced with exact factory replacement parts.

The use of substitute parts may create a shock, fire, radiation or other hazard. Service should be performed by qualified personnel only.

## MAIN BOARD

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
	<b>RESISTORS</b>				
R201	203X6500-645	1K Ohm, 5%, 1/4W Carbon	R369	203X5602-329	680K Ohm, 5%, 1/2W Comp.
R202	203X6500-523	30 Ohm, 5%, 1/4W Carbon	R370	203X6501-002	33K Ohm, 5%, 1/4W Carbon
R203	203X6500-405	100 Ohm, 5%, 1/4W Carbon	R371	203X9014-584	1K Ohm, 5%, 1W Metal Oxide
R204	203X6700-327	100 Ohm, 5%, 1/2W Carbon	R372	203X9101-119	12K Ohm, 5%, 1W Metal Oxide
R205	203X6700-421	270 Ohm, 5%, 1/2W Carbon	R375	203X6700-763	6.8K Ohm, 5%, 1/2W Carbon
R206	203X6500-540	390 Ohm, 5%, 1/4W Carbon	R376	203X9104-404	270 Ohm, 5%, 2W Metal Oxide
R207	340X2201-934	200 Ohm, 5%, 1/4W Carbon	R377	203X6500-447	150 Ohm, 5%, 1/4W Carbon
R208	203X6500-540	390 Ohm, 5%, 1/4W Carbon	R378	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R209	340X2201-934	200 Ohm, 5%, 1/4W Carbon	R379	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R210	203X6500-540	390 Ohm, 5%, 1/4W Carbon	R380	203X6500-865	8.2K Ohm, 5%, 1/4W Carbon
R211	340X2201-934	200 Ohm, 5%, 1/4W Carbon	R381	203X6500-724	2.2K Ohm, 5%, 1W Metal Oxide
R214	203X6500-645	1K Ohm, 5%, 1/4W Carbon	R383	203X9014-387	150 Ohm, 5%, 1W Metal Oxide
R215	203X6501-126	100K Ohm, 5%, 1/4W Carbon	R502	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R216	203X6500-645	1K Ohm, 5%, 1/4W Carbon	R503	204X1700-535	150 Ohm, 5%, 15W Metal Oxide
R217	203X6500-405	100 Ohm, 5%, 1/4W Carbon	R504	203X9014-267	47 Ohm, 5%, 1W Metal Oxide
R218	203X6500-645	1K Ohm, 5%, 1/4W Carbon	R505	203X6501-209	2.2K Ohm, 5%, 1/4W Carbon
R219	203X6501-126	100K Ohm, 5%, 1/4W Carbon	R506	203X9104-105	15 Ohm, 5%, 2W Metal Oxide
R220	203X6500-645	1K Ohm, 5%, 1/4W Carbon	R507	203X5602-185	330K Ohm, 5%, 1/2W Comp.
R221	203X6500-405	100 Ohm, 5%, 1/4W Carbon	$\Delta$ $\star$ R601	204X1625-058	3.3 Ohm, 5%, 10W WW
R222	203X6500-762	3.3 Ohm, 5%, 1/4W Carbon	R701	203X9105-141	2.2 Ohm, 5%, 2W Metal Oxide
R224	203X6500-169	10 Ohm, 5%, 1/4W Carbon	R702	203X6206-441	2.2 Ohm, 5%, 1/2W Carbon
R225	203X6500-169	10 Ohm, 5%, 1/4W Carbon	VR201	204X2070-072	2K Ohm-B Semi-Fixed
R226	203X6500-169	10 Ohm, 5%, 1/4W Carbon	VR301	204X2070-084	5K Ohm-B Semi-Fixed
R227	203X6501-044	47K Ohm, 5%, 1/4W Carbon	VR303	204X2070-055	500 Ohm-B Semi-Fixed
R228	203X6500-645	1K Ohm, 5%, 1/4W Carbon	VR351	204X2070-072	2K Ohm-B Semi-Fixed
R229	203X6700-421	270 Ohm, 5%, 1/2W Carbon	VR352	204X2070-072	2K Ohm-B Semi-Fixed
R230	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.			
R231	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.			
R232	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.			
R233	203X6500-468	180 Ohm, 5%, 1/4W Carbon			
R234	340X2820-934	82 Ohm, 5%, 1/4W Carbon			
R235	340X2820-934	82 Ohm, 5%, 1/4W Carbon			
R236	340X2820-934	82 Ohm, 5%, 1/4W Carbon			
R301	203X6500-508	270 Ohm, 5%, 1/4W Carbon			
R302	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon			
R303	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon			
R304	203X6500-724	2.2K Ohm, 5%, 1/4W Carbon			
R305	203X6500-842	6.8K Ohm, 5%, 1/4W Carbon			
R306	203X6003-201	7.5K Ohm, 2%, 1/4W Carbon			
R307	203X6500-825	5.6K Ohm, 5%, 1/4W Carbon			
R309	203X6500-965	22K Ohm, 5%, 1/4W Carbon			
R310	203X6500-988	39K Ohm, 5%, 1/4W Carbon			
R311	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon			
R312	203X9014-741	4.7K Ohm, 5%, 1/4W Carbon			
R313	204X1450-537	1K Ohm, 5%, 5W Carbon			
R314	203X6500-481	220 Ohm, 5%, 1/4W Carbon			
R315	203X6500-169	10 Ohm, 5%, 1/4W Carbon			
R316	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon			
R317	203X6700-107	12 Ohm, 5%, 1/2W Carbon			
R318	203X6500-540	390 Ohm, 5%, 1/4W Carbon			
R319	203X6500-645	1K Ohm, 5%, 1/4W Carbon			
R320	203X6501-002	33K Ohm, 5%, 1/4W Carbon			
R321	203X6501-224	270K Ohm, 5%, 1/2W Carbon			
R322	203X6500-886	10K Ohm, 5%, 1/4W Carbon			
R351	203X6500-886	10K Ohm, 5%, 1/4W Carbon			
R352	203X6500-785	3.9K Ohm, 5%, 1/4W Carbon			
R353	203X6501-086	68K Ohm, 5%, 1/4W Carbon			
R354	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon			
R355	203X9205-143	6.8K Ohm, 5%, 3W Metal Oxide			
R358	203X5601-878	56K Ohm, 5%, 1/2W Carbon			
R360	203X6500-561	470 Ohm, 5%, 1/4W Carbon			
R361	203X6500-886	10K Ohm, 5%, 1/4W Carbon			
R362	203X9014-645	1.8K Ohm, 5%, 1W Metal Oxide			
$\star$ R363	204X1527-751	3.9K Ohm, 5%, 7W Metal Oxide	$\Delta$ $\star$ C363	203X1201-265	0.33 uF, 200V PP
R364	203X6500-246	22 Ohm, 5%, 1/4W Carbon	$\star$ C365	203X0019-026	22 uF, 25V Electrolytic
R365	203X6501-002	33K Ohm, 5%, 1/4W Carbon	C366	202X8065-162	6 pF, 500V Ceramic
R367	203X6500-886	10K Ohm, 5%, 1/4W Carbon	C368	202X7203-032	0.01 uF, 50V Ceramic
R368	203X5602-185	330K Ohm, 5%, 1/2W Comp.	C372	203X1207-125	0.1 uF, 100V PP

## RESISTORS (CONT.)

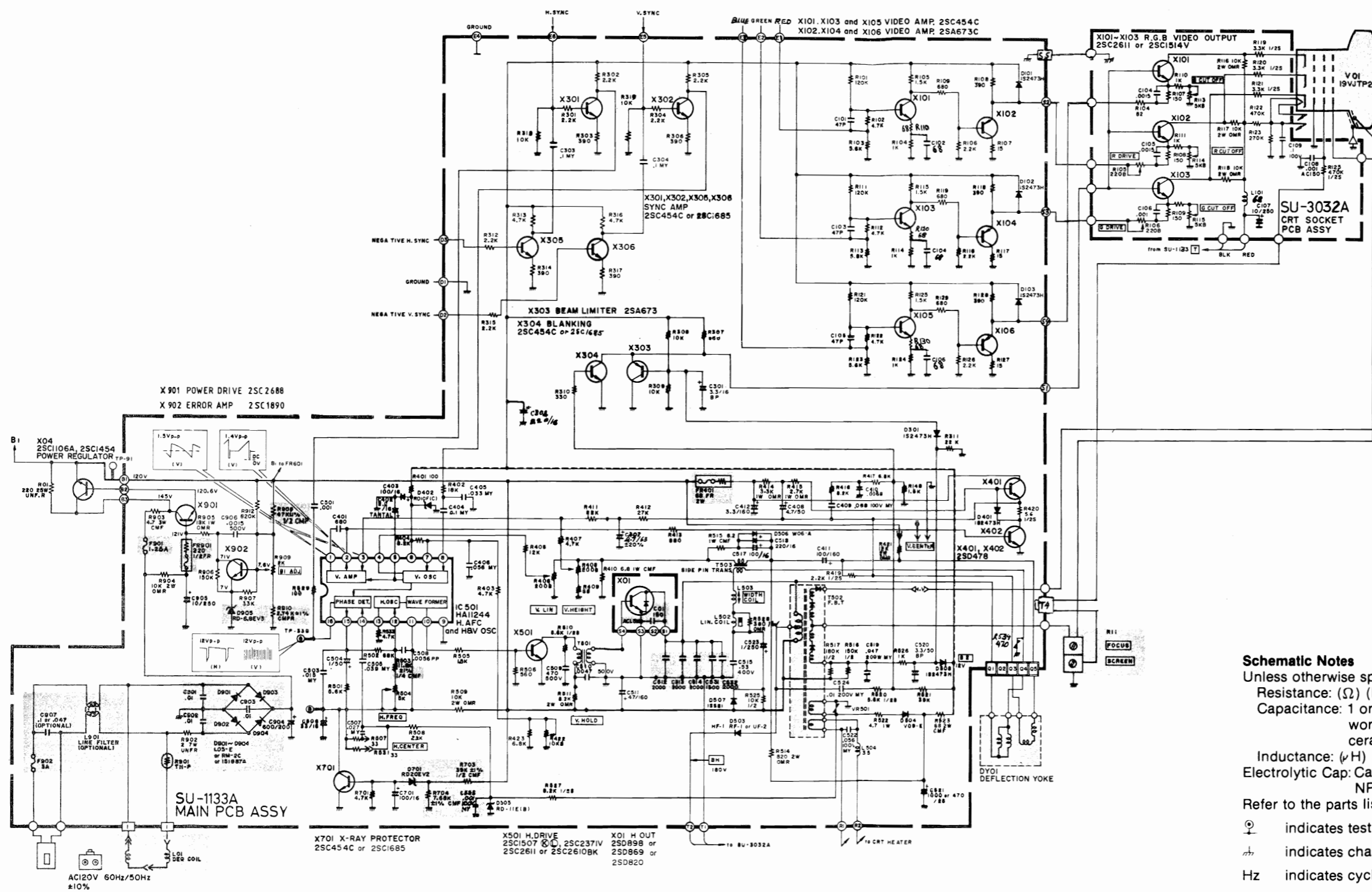
R369	203X5602-329	680K Ohm, 5%, 1/2W Comp.
R370	203X6501-002	33K Ohm, 5%, 1/4W Carbon
R371	203X9014-584	1K Ohm, 5%, 1W Metal Oxide
R372	203X9101-119	12K Ohm, 5%, 1W Metal Oxide
R375	203X6700-763	6.8K Ohm, 5%, 1/2W Carbon
R376	203X9104-404	270 Ohm, 5%, 2W Metal Oxide
R377	203X6500-447	150 Ohm, 5%, 1/4W Carbon
R378	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R379	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R380	203X6500-865	8.2K Ohm, 5%, 1/4W Carbon
R381	203X6500-724	2.2K Ohm, 5%, 1W Metal Oxide
R383	203X9014-387	150 Ohm, 5%, 1W Metal Oxide
R502	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R503	204X1700-535	150 Ohm, 5%, 15W Metal Oxide
R504	203X9014-267	47 Ohm, 5%, 1W Metal Oxide
R505	203X6501-209	2.2K Ohm, 5%, 1/4W Carbon
R506	203X9104-105	15 Ohm, 5%, 2W Metal Oxide
R507	203X5602-185	330K Ohm, 5%, 1/2W Comp.
$\Delta$ $\star$ R601	204X1625-058	3.3 Ohm, 5%, 10W WW
R701	203X9105-141	2.2 Ohm, 5%, 2W Metal Oxide
R702	203X6206-441	2.2 Ohm, 5%, 1/2W Carbon
VR201	204X2070-072	2K Ohm-B Semi-Fixed
VR301	204X2070-084	5K Ohm-B Semi-Fixed
VR303	204X2070-055	500 Ohm-B Semi-Fixed
VR351	204X2070-072	2K Ohm-B Semi-Fixed
VR352	204X2070-072	2K Ohm-B Semi-Fixed

## CAPACITORS

C201	203X0014-088	1000 uF, 16V, Electrolytic
C202	202X7200-064	330 pF, 500V, Ceramic
C203	202X7200-043	220 pF, 500V, Ceramic
C204	202X7200-043	220 pF, 500V, Ceramic
C205	203X0014-076	470 uF, 16V, Electrolytic
C206	203X1810-149	0.1 uF, 125V Mylar
C207	349X2232-109	.022 uF, 100V Mylar
C301	203X0014-065	330 uF, 50V Electrolytic
C302	203X1600-563	0.033 uF, 50V Mylar
C303	203X0629-037	3.3 uF, 50V Electrolytic
C304	203X1600-366	0.068 pF, 50V Mylar
C306	203X0412-012	2.2 uF, 16V Tantal
C307	203X1600-634	0.033 uF, 50V Mylar
C308	203X0025-174	3.3 uF, 50V Electrolytic
C309	203X1207-100	0.068 uF, 100V PP
C310	203X0629-061	10 uF, 100V Electrolytic
C311	203X0041-025	10 uF, 160V Electrolytic
C312	202X7050-248	1000 pF, 500V Ceramic
C313	203X0040-052	47 uF, 160V Electrolytic
C314	203X1201-265	0.033 uF, 200V PP
C315	203X0629-023	1 uF, 50V Electrolytic
C351	203X0629-023	1 uF, 50V Electrolytic
C352	203X0619-045	47 uF, 25V Electrolytic
C353	203X1190-015	0.0082 pF, 50V Mylar-PP
C354	203X0619-045	47 uF, 25V Electrolytic
C355	203X1600-366	0.0068 pF, 50V Mylar
C356	202X7050-483	0.01 uF, 500V Ceramic
C359	202X8065-606	100 pF, 500V Ceramic
C360	202X7050-366	0.0033 pF, 500V Ceramic
C361	202X7050-483	0.01 uF, 500V Ceramic
C362	202X7203-032	0.01 uF, 50V Ceramic
$\Delta$ $\star$ C363	203X1270-911	8700 pF, 1.5 KV PP
$\star$ C365	203X1201-265	0.33 uF, 200V PP
C366	203X0019-026	22 uF, 25V Electrolytic
C367	202X8065-162	6 pF, 500V Ceramic
C368	202X7203-032	0.01 uF, 50V Ceramic
C372	203X1207-125	0.1 uF, 100V PP

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
	<b>CAPACITORS (CONT.)</b>				
C380	202X7200-087	470 uF, 500V Ceramic	Q206	200X3181-523	Transistor (NPN) 2SC1815GR
$\Delta$ C501	203X1810-149	0.1 uF, 125V Mylar	Q207	200X3181-523	Transistor (NPN) 2SC1815GR
$\Delta$ C502	202X7050-282	1500 pF, 500V Ceramic	Q208	200X3181-523	Transistor (NPN) 2SC1815GR
$\Delta$ C503	202X7810-214	2200 pF, 125V Ceramic	Q209	200X3181-523	Transistor (NPN) 2SC1815GR
$\Delta$ C504	202X7810-214	2200 pF, 125V Ceramic	Q210	200X3181-523	Transistor (NPN) 2SC1815GR
C505	203X0220-075	560 uF, 200V Electrolytic	Q301	200X3181-523	Transistor (NPN) 2SC1815GR
C506	203X0040-034	22 uF, 160V Electrolytic	Q302	200X3207-306	Transistor (NPN) 2SC2073LBGL2
C507	203X0041-057	47 uF, 160V Electrolytic	Q303	200X3207-306	Transistor (NPN) 2SC2073LBGL2
C701	203X0019-092	1000 uF, 25V Electrolytic	Q351	200X3248-217	Transistor (NPN) 2SC2482BK
C702	203X0634-061	10 uF, 100V Electrolytic	Q352	200X4589-802	Transistor (NPN) 2SD898B
C703	202X7050-248	1000 pF, 500V Ceramic	IC301	200X2300-033	IC HA11423
			$\Delta$ $\star$ IC501	200X2600-183	IC STR381

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
	<b>SEMICONDUCTORS</b>				
D203	201X2010-159	Diode, IS2076-27	L351	201X4710-134	Coil, (RF Choke)
D204	201X2010-159	Diode, IS2076-27	L352	201X5000-083	Coil, Horiz. Size
D205	201X2010-159	Diode, IS2076-27	L701	611X0004-007	Coil, Adg.
D206	201X2010-159	Diode, IS2076-27	T351	202X1300-080	Transformer, Hor. Drive
D207	201X2010-159	Diode, IS2076-27	$\Delta$ $\star$ T352	200X9720-301	HV-Unit M-11
D208	201X2010-159	Diode, IS2076-27			
D209	201X2010-159	Diode, IS2076-27			
D301	201X2010-165	Diode, ISS81			
D302	201X2010-159	Diode, IS2076-27			
D303	201X2010-159	Diode, IS2076-27	$\Delta$ F501	204X7120-073	Fuse, 4 Amp. 125V
D304	201X2120-009	Diode, RH-IV	J402	206X5008-632	Recep W Wire 3P-M-BG
D305	201X2120-009	Diode, RH-IV	P201	204X9600-466	Plug, PWB 3P-J
D306	201X2010-159	Diode, IS2076-27	P202	204X9601-477	Plug, PWB 6P-Q
$\Delta$ D501	201X3				



**Schematic Notes**  
 Unless otherwise specified  
 Resistance: (Ω) (K→KΩ, M→MΩ), 1/4 (W) carbon resistor  
 Capacitance: 1 or higher → (pF), less than 1 → (μF)  
 working voltage → 50 (V)  
 ceramic capacitor  
 Inductance: (μH)  
 Electrolytic Cap: Capacitance Value (μF)/working voltage (V),  
 NP → non-polar (or bipolar) electrolytic cap.  
 Refer to the parts list for additional component information.  
 ⊙ indicates test point connection  
 ⚡ indicates chassis ground unless otherwise specified  
 Hz indicates cycles per second  
 For **safety** purposes (and continuing reliability)  
 ⚠ replace all components marked with safety symbol with  
 identical type.  
 NOTE: FR → fusible resistor (—/—)

00-4147-04  
 G07-CB0

Parts identification on circuit boards:  
 e.g. SU1126A (R107 = R1107)  
 SU3030A (R113 = R3113)

## REPLACEMENT PARTS LIST - ELECTROHOME 19" MONITOR

Components identified by the  $\Delta$  symbol in the PARTS LIST and on the Schematic have special characteristics important to safety.

DO NOT degrade the safety of the set through improper servicing.

### Abbreviations for Resistors and Capacitors

Resistor		Capacitor	
C R	: Carbon Resistor	C Cap.	: Ceramic Capacitor
Comp. R	: Composition Resistor	M Cap.	: Mylar Capacitor
OM R	: Oxide Metal Film Resistor	E Cap.	: Electrolytic Capacitor
V R	: Variable Resistor	BP E Cap.	: Bi-Polar (or Non-Polar) Electrolytic Capacitor
MF R	: Metal Film Resistor	MM Cap.	: Metalized Mylar Capacitor
CMF R	: Coating Metal Film Resistor	PP Cap.	: Polypropylene Capacitor
UNF R	: Nonflammable Resistor	MPP Cap.	: Metalized PP Capacitor
F R	: Fusible Resistor	PS Cap	: Polystyrol Capacitor
		Tan. Cap.	: Tantal Capacitor

NOTE: When ordering replacement parts please specify the part number as shown in this list including part name, and model number. Complete information will help expedite the order.

Use of substitute replacement parts which do not have the same safety characteristics as specified, may create shock, fire or other hazards. For maximum reliability and performance, all parts should be replaced by those having identical specifications.

### SERVICE REPLACEMENT PARTS LIST

Symbol	Description	Part Number
	Main P.C.B. Ass'y	SU-1133A
	CRT Socket P.C.B. Ass'y	SU-3032A
	Purity Shield Ass'y	07-220083-03

### Outside of the P.C.B. Ass'y

Symbol	Description	Part Number
	Picture Tube 19"	17-7198-03
$\Delta$	Deflection Yoke	A29779-D = 21-141-01
	PC Magnet	A75034-B = 29-32-01
$\Delta$	Flyback Transf.	A29951-B
$\Delta$	HVR	A46600-A
R05	UNF Resistor 220 $\Omega$ ,25W K	QRF258K-221
C04	C Capacitor 150pF, AC1.5KV	QCZ0101-005
X01	Si. Transistor	2SD870
X02	Si. Transistor	2SC1106A
SC	Screw #8- $\frac{3}{8}$	31-610818-06
SC	Screw $\frac{1}{4}$ x $\frac{3}{4}$ Pix Tube Mtg. (4)	31-601418-12
WA	Pyramidal Lock Washer (4)	33-255-01
	Nut Retainer, Pix Tube Mtg. (4)	33-494-01
	Clip — P.C.B. Support	33-629-02
	Standoff	33-670-010R-02
	Wire Terminal (Gnd. Strap)	34-228-03
	Terminal Lug (Gnd.)	34-33-04
	Groundstrap Assy.	34-574-02
	Grounding Spring	35-212-03
	Wire Hook (Gnd. Strap)	35-3053-02
	Purity Shield Holddown Clamp	35-2348-01
	Support Brkt. RH	35-3890-01
	Support Brkt. LH	35-3890-02
	Chassis Base	38-449-02
	Yoke Wedge (3)	39-1233-01

### Purity Shield Ass'y. Parts List

Symbol	Description	Part Number
D911, D912	Degaussing Coil	21-1007-30
	Rectifier 1 Amp 600V (2)	28-22-27
	Pin Terminal (2)	34-708-01
	Pin Terminal Housing	34-709-01
	Purity Shield (2 pcs.)	35-3847-01
	Purity Shield (2 pcs.)	35-3847-02
C911	Capacitor 100nF 10% 400V	48-171544-62
R921	Resistor, Wirewound 33 $\Omega$ , 4W	42-113301-03
	Fire Retardent Term. Strip 4 Lug	34-492-09

### CRT Socket P.C.B. Ass'y (SU-3032A) Parts List

Resistors		Part Number
R3105	V R 200	QVZ3234-022
R3106	V R 200	QVZ3234-022
R3113	V R 5K	QVZ3234-053
R3114	V R 5K	QVZ3234-053
R3115	V R 5K	QVZ3234-053
R3116	OM R 10K $\Omega$ 2W J	QRG029J-103
R3117	OM R 10K $\Omega$ 2W J	QRG029J-103
R3118	OM R 10K $\Omega$ 2W J	QRG029J-103
R3119	Comp. R 3.3K $\Omega$ $\frac{1}{2}$ W K	QRZ0039-332
R3120	Comp. R 3.3K $\Omega$ $\frac{1}{2}$ W K	QRZ0039-332
C3121	Comp. R 3.3K $\Omega$ $\frac{1}{2}$ W K	QRZ0039-332

### Capacitors

Symbol	Description	Part Number
C3107	E Cap. 10uF 250V A	QEW53EA-106
C3108	C Cap. 1000pF DC1400V P	QCZ9001-102M

### Coils

Symbol	Description	Part Number
L3101	Peaking Coil	QQL043K-101



**Semiconductors**

Symbol	Description	Part Number
X3101	Si. Transistor	2SC1514VC
X3102	Si. Transistor	2SC1514VC
X3103	Si. Transistor	2SC1514VC

**Miscellaneous**

Symbol	Description	Part Number
△	△CRT Socket	A76068

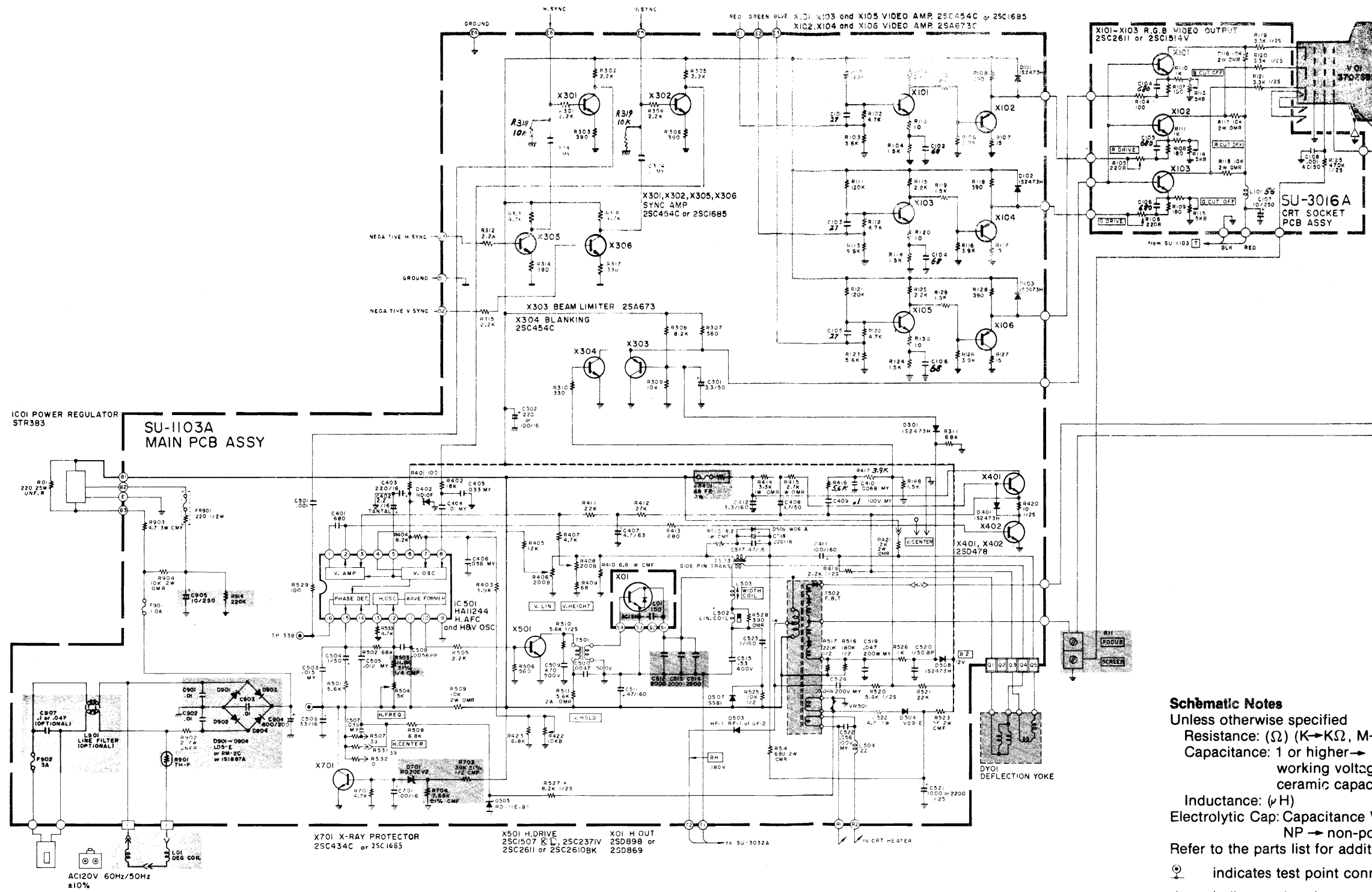
**Main PCB Ass'y (SU-1133A) Parts List****Resistors**

Symbol	Description	Part Number
R1406	V R 200Ω	QVZ3230-002
R1408	V R 200Ω	QVZ3230-002
R1410	CMF R 6.8Ω1W J	QRX019J-6R8
R1414	OM R 3.3KΩ1W J	QRG019J-332
R1415	OM R 2.7KΩ1W J	QRG019J-272
R1421	OM R 12KΩ2W J	QRG026J-123Z
R1422	V R 10KΩ	QVZ3230-014
△FR1401	△F R 68Ω2W K	QRH024K-680M
△R1503	△CMF R 11.8KΩ¼W +1%	QRV142F-1182
R1504	V R 5KΩ	QVZ3230-053
R1509	OM R 10KΩ2W J	QRG026J-103Z
R1512	OM R 8.2KΩ2W J	QRG026J-822Z
R1514	OM R 820Ω2W J	QRG026J-821Z
R1515	CMF R 8.2Ω1W J	QRX019J-8R2
R1522	CMF R 4.7Ω1W J	QRX019J-4R7
R1523	OM R 68Ω2W J	QRG026J-680Z
R1528	OM R 390Ω1W J	QRG019J-391
R1534	ZN R	ERZ-C05ZK471
VR1501	ZN R	ERZ-C05DK271
△R1703	△CMF R 39Ω½W +1%	QRV122F-3902
△R1704	△CMF R 7.68KΩ¼W +1%	QRV142F-7681
△R1901	△Posistor	A75414
R1902	UNF R 2Ω7W K	QRF076K-2R0
R1903	CMF R 4.7Ω3W J	QRX039J-4R7
R1904	OM R 10KΩ2W J	QRG026J-103Z
R1905	OM R 18KΩ1W J	QRG019J-183
△Q1908	△CMF R 47Ω½W +1%	QRV122F-470Z
△R1909	V R 2KΩ	QVP5A0B-023E
R1910	△CMF R 2.74KΩ¼W +1%	QRV142F-274I
△FR1901	△F R 220Ω½W K	QRH124K-221M

**Capacitors**

Symbol	Description	Part Number
C1301	BPE Cap. 3.3uF 50V A	QEN61HA-335Z
C1402	Tan. Cap. 2.2uF 16V K	QEE51CK-225B
C1407	E Cap. 4.7uF 6.3V A	QEW51JA-475
C1411	E Cap. 100uF 160V A	QEW52CA-107
C1412	E Cap. 3.3uF 160V A	QEW52CA-335
C1508	PP Cap. 5600uF 50V J	QFP31HJ-562
△C1512	△PP Cap. 2000pF DC1500V J	QFZ0082-202
△C1513	△PP Cap. 2000pF DC1500V J	QFZ0082-202
△C1514	△PP Cap. 2000pF DC1500V J	QFZ0082-202
C1515	PP Cap. 0.53uF DC1200V J	QFZ0067-534
C1520	BPE Cap. 3.3uF 50V A	QEN61HA-335Z
C1523	E Cap. 1uF 160V A	QEW62CA-105Z
C1524	M Cap. 0.1uF 200V K	QFM720K-104M
△C1531	△PP Cap. 2000pF DC1500V J	QFZ0082-202
△C1532	△PP Cap. 1500pF DC1500V J	QFZ0082-152
C1904	E Cap.	QEY0034-001
C1905	E Cap. 10uF 250V A	QEW52EA-106

<b>Coils</b>		
<b>Symbol</b>	<b>Description</b>	<b>Part Number</b>
L1502	Linearity Coil	A39835
L1503	Width Coil	C30380-A
L1504	Heater Choke	C30445-A
<b>Transformers</b>		
<b>Symbol</b>	<b>Description</b>	<b>Part Number</b>
T1501	Hor. Drive Transf.	A48022-BM
T1503	Side Pin Transf.	C39050-A
<b>Semiconductors</b>		
<b>Symbol</b>	<b>Description</b>	<b>Part Number</b>
IC1501	IC	HA11244
X1101	Si. Transistor	2SC1685(R)
X1102	Si. Transistor	2SA673(C)
X1103	Si. Transistor	2SC1685(R)
X1104	Si. Transistor	2SA673(C)
X1105	Si. Transistor	2SC1685(R)
X1106	Si. Transistor	2SA673(C)
X1301	Si. Transistor	2SC1685(R)
X1302	Si. Transistor	2SC1685(R)
X1303	Si. Transistor	2SA673(C)
X1304	Si. Transistor	2SC1685(R)
X1305	Si. Transistor	2SC1685(R)
X1401	Si. Transistor	2SD478
X1402	Si. Transistor	2SD478
X1501	Si. Transistor	2SC2610BK
X1901	Si. Transistor	2SC2688 (K.L.M.)
X1902	Si. Transistor	2SC1890A (E.F.)
D1101	Si. Diode	W06A
D1102	Si. Diode	W06A
D1103	Si. Diode	W06A
D1301	Si. Diode	1SZ473H
D1401	Si. Diode	1SZ473H
D1402	Zener Diode	RD10F(C)
D1503	Si. Diode	HF-1
D1504	Si. Diode	V09E
D1505	Zener Diode	RD11E(B)
D1506	Si. Diode	W06A
D1507	Si. Diode	1SS81
D1508	Si. Diode	1SZ473H
△D1701	△Zener Diode	RD20EV2
△D1901	△Si. Diode	1S1887A
△D1902	△Si. Diode	1S1887A
△D1903	△Si. Diode	1S1887A
△D1904	△Si. Diode	1S1887A
△D1905	△Zener Diode	RD6.8EV3
<b>Miscellaneous</b>		
<b>Symbol</b>	<b>Description</b>	<b>Part Number</b>
△F1901	△Fuse 1.25A	QMF53U1-1R25S
△F1902	△UL Fuse 3A	QMF66U1-3R0S



**Schematic Notes**

- Unless otherwise specified
- Resistance: ( $\Omega$ ) (K $\rightarrow$ K $\Omega$ , M $\rightarrow$ M $\Omega$ ), 1/4 (W) carbon resistor
- Capacitance: 1 or higher  $\rightarrow$  (pF), less than 1  $\rightarrow$  ( $\mu$ F)
- working voltage  $\rightarrow$  50 (V)
- ceramic capacitor
- Inductance: ( $\mu$ H)
- Electrolytic Cap: Capacitance Value ( $\mu$ F)/working voltage (V), NP  $\rightarrow$  non-polar (or bipolar) electrolytic cap.
- Refer to the parts list for additional component information.
- $\odot$  indicates test point connection
- $\#$  indicates chassis ground unless otherwise specified
- Hz indicates cycles per second
- For **safety** purposes (and continuing reliability)
- $\triangle$  replace all components marked with safety symbol with identical type.
- NOTE: FR  $\rightarrow$  fusible resistor ( $\text{---FR---}$ )

G07-FBO  
00-4147-03

Parts identification on circuit boards:  
e.g. SU1126A (R107 = R1107)  
SU3030A (R113 = R3113)

## REPLACEMENT PARTS LIST - ELECTROHOME 13" MONITOR

Components identified by the  $\Delta$  symbol in the PARTS LIST and on the Schematic have special characteristics important to safety.

DO NOT degrade the safety of the set through improper servicing.

### Abbreviations for Resistors and Capacitors

Resistor		Capacitor	
C R	: Carbon Resistor	C Cap.	: Ceramic Capacitor
Comp. R	: Composition Resistor	M Cap.	: Mylar Capacitor
OM R	: Oxide Metal Film Resistor	E Cap.	: Electrolytic Capacitor
V R	: Variable Resistor	BP E Cap.	: Bi-Polar (or Non-Polar) Electrolytic Capacitor
MF R	: Metal Film Resistor	MM Cap.	: Metalized Mylar Capacitor
CMF R	: Coating Metal Film Resistor	PP Cap.	: Polypropylene Capacitor
UNF R	: Nonflammable Resistor	MPP Cap.	: Metalized PP Capacitor
F R	: Fusible Resistor	PS Cap.	: Polystyrol Capacitor
		Tan. Cap.	: Tantal Capacitor

NOTE: When ordering replacement parts please specify the part number as shown in this list including part name, and model number. Complete information will help expedite the order.

Use of substitute replacement parts which do not have the same safety characteristics as specified, may create shock, fire or other hazards. For maximum reliability and performance, all parts should be replaced by those having identical specifications.

Symbol	Description	Part Number
	Main P.C.B. Ass'y	SU-1103A
	CRT Socket P.C.B. Ass'y	SU-3016A

### Outside of the P.C.B. Ass'y

Symbol	Description	Part Number
$\Delta$ V01	$\Delta$ Picture Tube	370ESB22(E)
$\Delta$ DY01	$\Delta$ Deflection Yoke	C29123-V
	PC Magnet	A76366-A
	Wedge	C30006
	$\Delta$ Flyback Transf.	A19183-A
	$\Delta$ Focus V R	A46606-A
	UNF Resistor 220 $\Omega$ , 25W. K	QRF258K-221
	$\Delta$ C Capacitor 150 pF, AC1.5KV	QCZ0101-005
$\Delta$ R11	Si. Transistor	2SD869
$\Delta$ R05	IC Regulator	STR383
$\Delta$ C04	Degaussing Coil	21-1007-31
X01	Degaussing Coil Pin Terminal (2)	34-708-01
IC01	Degaussing Coil Pin Terminal Housing	34-709-01
L01	Groundstrap Ass'y.	34-697-04
	Groundstrap Wire Terminal	34-228-03
	Groundstrap Spring (2)	35-3560-01
BR	Support Bracket RH	35-3919-01
BR	Support Bracket LH	35-3919-02
SC	SCREW 10- $\frac{1}{2}$ Pix Tube Mtg. (4)	31-631018-08
WA	Pyramidal Lockwasher (4)	33-255-01
	Clip P.C.B. Support (2)	33-629-02
	Ground Lug	34-33-04
CH	Chassis Base	38-452-01

## Main P.C.B. Ass'y (SU-1103A) Parts List

### Resistors

Symbol	Description	Part Number
R1406	V R 200 $\Omega$	QVZ3230-022
R1408	V R 200 $\Omega$	QVZ3230-022
R1410	CMF R 6.8 $\Omega$ 1W J	QRX019J-6R8
R1414	OM R 3.3K $\Omega$ 1W J	QRG019J-332
R1415	OM R 2.7K $\Omega$ 1W J	QRG019J-272
R1421	OM R 12K $\Omega$ 2W J	QRG029J-123
R1422	V R 10K $\Omega$	QVZ3224-014H
$\Delta$ FR1401	$\Delta$ F R 68 $\Omega$ 2W K	QRH024K-680M
$\Delta$ R1503	$\Delta$ CMF R 11.8K $\Omega$ $\frac{1}{4}$ W +1%	QVZ3230-053
R1504	V R 5K $\Omega$	QRG029J-103
R1509	OM R 10K $\Omega$ 2W J	QRG029J-562
R1511	OM R 5.6K $\Omega$ 2W J	QRG029J-681
R1514	OM R 680 $\Omega$ 2W J	QRX019J-8R2
R1515	CMF R 8.2 $\Omega$ 1W J	QRX019J-4R7
R1522	CMF R 4.7 $\Omega$ 1W J	ORG029J-560
R1523	OM R 56 $\Omega$ 2W J	ORG019J-391
R1528	OM R 390 $\Omega$ 1W J	ERZ-C05ZK471
R1534	ZN R	ERZ-C05DK271
VR1501	ZN R	QRV122F-3902
$\Delta$ R1703	$\Delta$ CMF R 39K $\Omega$ $\frac{1}{2}$ W +1%	QRV142F-7681
$\Delta$ R1704	$\Delta$ CMF R 7.68K $\Omega$ $\frac{1}{4}$ W +1%	A75414
$\Delta$ R1901	$\Delta$ Posistor	QRF076K-2R0
R1902	UNF R 2 $\Omega$ 7W K	QRX039J-5R6
R1903	CMF R 5.6 $\Omega$ 3W J	QRG026J-103Z
R1904	OM R 10K $\Omega$ 2W J	QRH124K-221M
$\Delta$ FR1901	$\Delta$ F R 220 $\Omega$ $\frac{1}{2}$ W K	

### Capacitors

Symbol	Description	Part Number
C1402	Tan. Cap. 2.2uF 16V K	QEE51CK-225B
C1411	E Cap. 100uF 160V A	QEW52CA-107
C1412	E Cap. 3.3uF 160V A	QEW52CA-335
C1508	PP Cap. 5600pF 50V J	QFP31HJ-562
C1511	E Cap. 47uF 160V A	QEW52CA-476S
$\Delta$ C1512	$\Delta$ PP Cap. 2000pF DC1500V J	QFZ0082-202
$\Delta$ C1513	$\Delta$ PP Cap. 2000pF DC1500V J	QFZ0082-202
$\Delta$ C1514	$\Delta$ PP Cap. 2500pF DC1500V J	QFZ0082-252
C1515	PP Cap. 0.53uF DC1200V K	QFZ0067-534
C1520	BPE Cap. 1uF 50V A	QEN61HA-105Z
C1524	M Cap. 0.1uF 200V K	QFM72DK-682M
C1904	E Cap.	QEY0034-001
C1905	E Cap. 10uF 250V A	QEW52EA-106
$\Delta$ C1907	$\Delta$ MM Cap. 0.1uF AC150V Z	QFZ9008-104

### Coils

Symbol	Description	Part Number
L1501	Peaking Coil	A75360-6
L1502	Liniarty Coil	A39934
L1503	Width Coil	C30380-A
L1504	Heater Choke	C30333-A
L1901	Line Filter	A39475-J

### Transformers

Symbol	Description	Part Number
T1501	Hor. Drive Transf.	A46022-BM
T1503	Side Pin Transf.	C39050-A

<b>Semiconductors</b>		
<b>Symbol</b>	<b>Description</b>	<b>Part Number</b>
IC1501	I.C.	HA11244
X1101	Si. Transistor	2SC1685(R)
X1102	Si. Transistor	2SA673(C)
X1103	Si. Transistor	2SC1685(R)
X1104	Si. Transistor	2SA673(C)
X1105	Si. Transistor	2SC1685(R)
X1106	Si. Transistor	2SA673(C)
X1301	Si. Transistor	2SC1685(R)
X1302	Si. Transistor	2SC1685(R)
X1303	Si. Transistor	2SA673(C)
X1304	Si. Transistor	2SC1685(R)
X1305	Si. Transistor	2SC1685(R)
X1401	Si. Transistor	2SD478
X1402	Si. Transistor	2SD478
X1501	Si. Transistor	2SC2610BK
X1701	Si. Transistor	2SC1685(P-S)
D1101	Si. Diode	W06A
D1102	Si. Diode	W06A
D1103	Si. Diode	W06A
D1301	Si. Diode	1S2473H
D1401	Si. Diode	1S2473H
D1402	Zener Diode	RD10F(C)
D1503	Si. Diode	HF-1
D1504	Si. Diode	V09E
D1505	Zener Diode	RD11E(B)
D1506	Si. Diode	W06A
D1507	Si. Diode	1SS81
D1508	Si. Diode	1S2473H
△D1701	△Zener Diode	RD20EV2
△D1901	△Si. Diode	1S1887A
△D1902	△Si. Diode	1S1887A
△D1903	△Si. Diode	1S1887A
△D1904	△Si. Diode	1S1887A
<b>Miscellaneous</b>		
<b>Symbol</b>	<b>Description</b>	<b>Part Number</b>
△F1901	△Fuse 1A	QMF53U1-1R0S
△F1902	△UL Fuse 3A	QMF66U1-3R0S

## CRT Socket P.C.B. Ass'y (SU-3016A) Parts List

### Resistors

Symbol	Description	Part Number
R3105	V R 200Ω	QVZ3234-022
R3106	V R 200Ω	QVZ3234-022
R3113	V R 5KΩ	QVZ3234-053
R3114	V R 5KΩ	QVZ3234-053
R3115	V R 5KΩ	QVZ3234-053
R3116	OM R 10KΩ2W J	QRG029J-103
R3117	OM R 10KΩ2W J	QRG029J-103
R3118	OM R 10KΩ2W J	QRG029J-103
R3119	Comp. R 3.3KΩ½W K	QRZ0039-332
R3120	Comp. R 3.3KΩ½W K	QRZ0039-332
R3121	Comp. R 3.3KΩ½W K	QRZ0039-332

### Capacitors

Symbol	Description	Part Number
C3107	E Cap. 10uF 250V A	QEW52EA-106
C3108	C Cap. 1000pF DC1400V P	QCZ9001-102M

### Coils

Symbol	Description	Part Number
L3101	Peaking coil	QQL043K-101

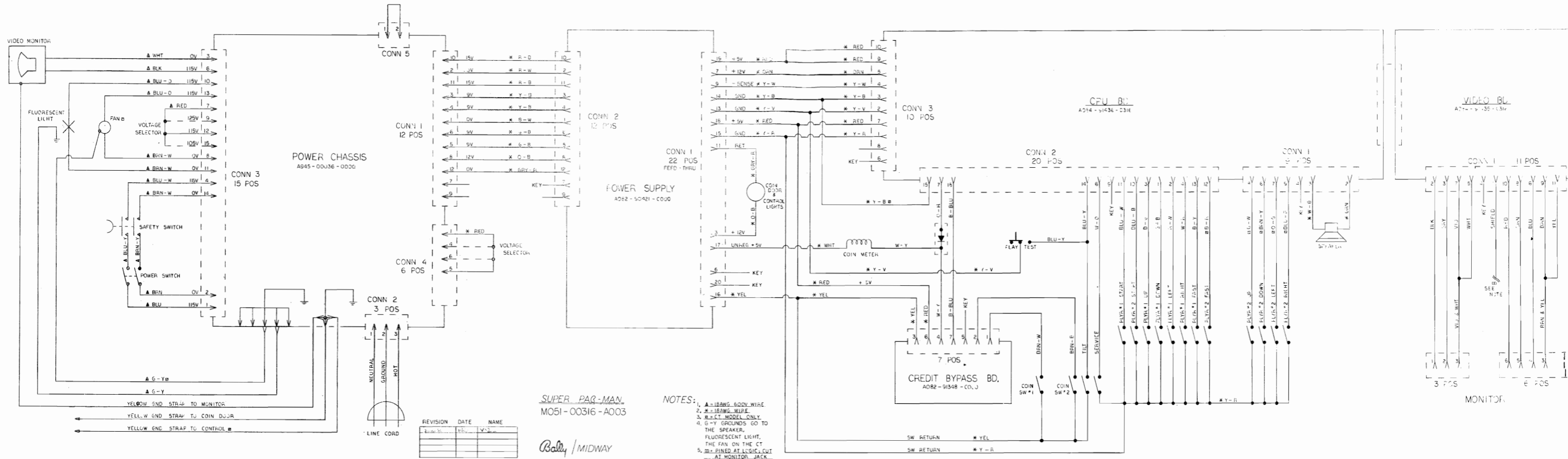
### Semiconductors

Symbol	Description	Part Number
X3101	Si. Transistor	2SC2611
X3102	Si. Transistor	2SC2611
X3103	Si. Transistor	2SC2611

### Miscellaneous

Symbol	Description	Part Number
△	△ CRT Socket	A75522

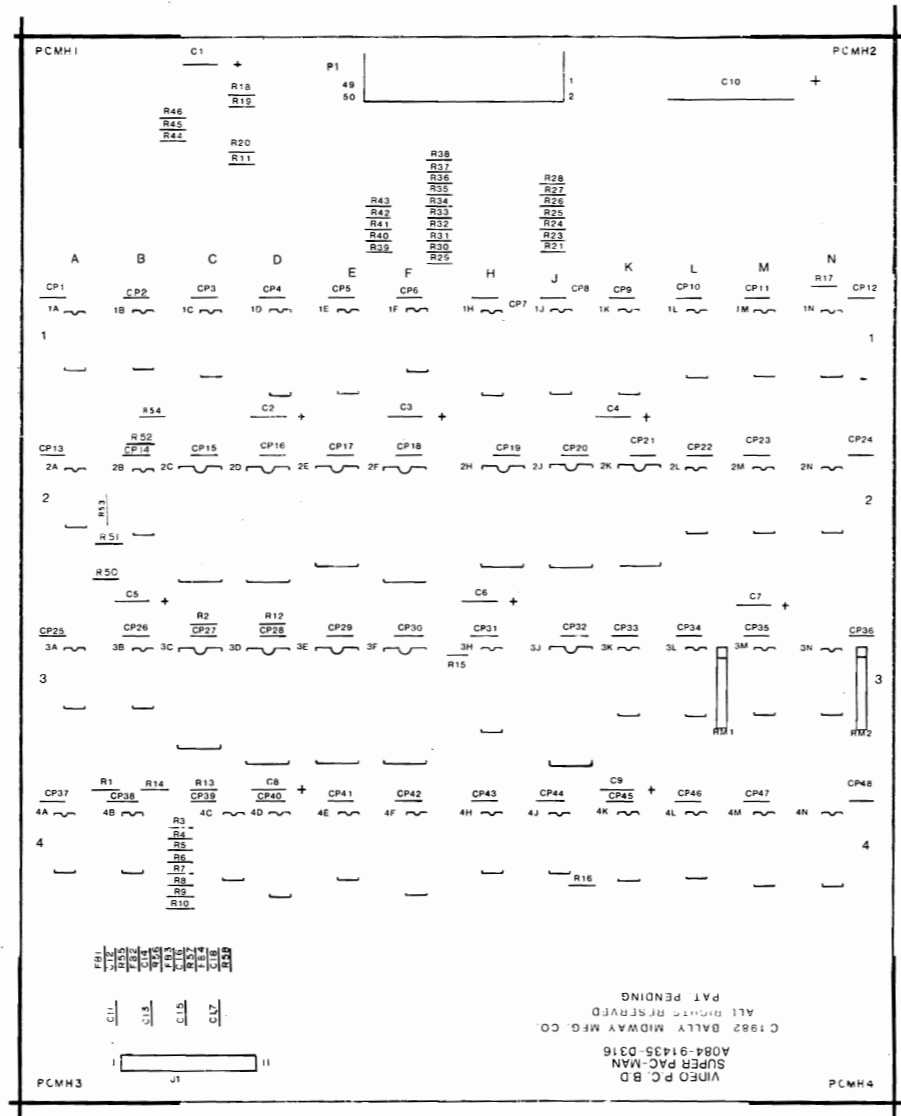
## **IX Schematics and Wiring Diagrams**





# DESIGNATION LIST

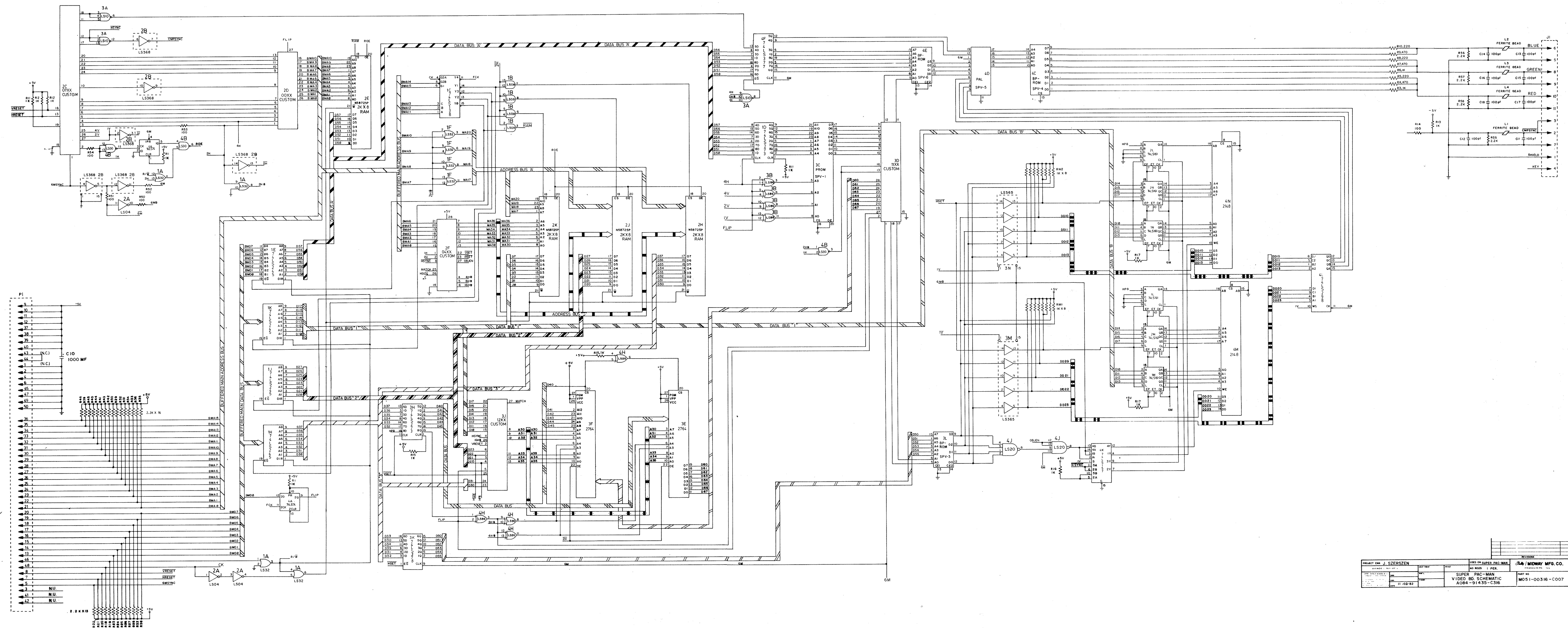
DESIGNATION	DESCRIPTION
C1-C9	1 MF AX. TANT.
C10	470 MF AX. ELEC.
C11, C12	470 PF " CER.
C13-C18	100 PF " "
CPI-CP48	1 MF AX. CER.
R1-R3	1 K OHM 1/4 W 5% CRBN
R4	470 " " " "
R5	220 " " " "
R6	1 K " " " "
R7	470 " " " "
R8	220 " " " "
R9	470 " " " "
R10	220 " " " "
R11-R13	1 K " " " "
R14	100 " " " "
R15-R17	1 K " " " "
R18-R21	2.2 K " " " "
R23-R46	2.2 K " " " "
R50, R51	100 K " " " "
R52	82 " " " "
R53, R54	100 " " " "
R55-R58	2.2 K " " " "
RM1, RM2	1 K 9 POS SIP
IC 1A, 1F	74 LS 32
" 1B	" " 08
" 1C	" " 138
" 1D	" " 273
" 1E, 1H, 1J, 1K	" " 245
" 1L, 1M, 1N	" " 161
" 2A	74 LS 04
" 2B	" " 368
" 2C	07XX CUSTOM IC
" 2D	00XX " "
" 2E, 2H, 2J, 2K	N58725 P
" 2F	04XX CUSTOM IC
" 2L, 2M, 2N	74 LS 161
" 3A	74 LS 10
" 3B	" " 86
" 3C	PROM SPV-1
" 3D	11XX CUSTOM IC
" 3E	
" 3F	PROM SPV-2
" 3H	74 LS 273
" 3J	12XX CUSTOM IC
" 3K	74 LS 378
" 3L	BP-ROM SPV-3 (SPI-4)
" 3M, 3N	74 LS 365
IC 4A	74 LS 74
" 4B	" " 00
" 4C	BP-ROM SPV-4 (SPI-6)
" 4D	PAL SPV-5 (SPI-7)
" 4E	BP-ROM SPV-6 (SPI-5)
" 4F	74 LS 377
" 4H	74 LS 86
" 4J	" " 20
" 4K	" " 157
" 4L	" " 298
" 4M, 4N	2148 STATIC RAM
FBI-FB4	FERRITE BEAD
ICS 2C, 2D, 2F	28 PIN IC SOCKET
" 2E, 2H, 2J, 2K, 3C	24 PIN " "
" 3D, 3F, 3J	28 PIN " "
" 3L	16 PIN " "
" 4C, 4E	16 PIN " "
" 4D	20 PIN " "
PI	50 PIN CONN
J1	11 PIN CONN KK-156
PCMH1-PCMH4	RT ANGLE
A080-91435-D316	SCRW
	SUPER PAC-MAN VIDEO P.C.



HEAT TREAT		SCALE		NO. REQ'D		PER		REVISIONS	
		FULL						MIDWAY MFG. CO.	
MATERIAL		ASSEMBLY DWG				PART NO.			
FINISH		SUPER PACMAN VIDEO P.C.				M051-00316 - D006			
		A084-91435-D316							

# CROSS REFERENCE LIST

DESCRIPTION	QTY	DESIGNATION	PART NO.
100 PF AX. CER.	6	C13-C18	0508-00800-0500
470 PF " "	2	C11-C12	0550-00800-0200
1 MF " "	48	CPI-CP48	0508-00800-0900
1 MF AX. TANT.	9	C1-C9	0835-00814-0100
470 MF AX. ELEC.	1	C10	0550-00800-1300
82 OHM 1/4 W 5% CRBN	1	R52	0062-104B3-1XXX
100 " " " "	5	R14, R50, R51, R53, R54	0062-110B3-1XXX
220 " " " "	3	R5, R8, R10	0062-133B3-1XXX
470 " " " "	3	R4, R7, R9	0062-156B3-1XXX
1 K " " " "	10	R1-R3, R6, R11-R13, R15-R17	0062-179B3-1XXX
2.2 K " " " "	32	R18-R21, R23-R46, R55-R58	0062-195B3-1XXX
1 K 9 POS SIP	2	RM1, RM2	0508-00804-0200
00XX CUSTOM IC	1	IC 2D	0066-001CX-XAPX
04XX " "	1	" 2F	0066-003CX-XAPX
07XX " "	1	" 2C	0066-006CX-XAPX
11XX " "	1	" 3D	0066-018CX-XAPX
12XX " "	1	" 3J	0066-Q19CX-XAPX
74 LS 00	1	IC 4B	0300-00803-0027
74 LS 04	1	" 2A	0300-00803-0029
74 LS 08	1	" 1B	0300-00803-0030
74 LS 10	1	" 3A	0300-00803-0051
74 LS 20	1	" 4J	0300-00803-0052
74 LS 32	2	" 1A, 1F	0300-00803-0031
74 LS 74	1	" 4A	0300-00803-0032
74 LS 86	2	" 3B, 4H	0300-00803-0054
74 LS 138	1	" IC	0300-00803-0033
74 LS 157	1	" 4K	0300-00803-0050
74 LS 161	6	" 1L, 1M, 1N, 2L, 2M, 2N	0300-00803-0044
74 LS 245	4	" 1E, 1H, 1J, 1K	0300-00803-0046
74 LS 273	2	" 1D, 3H	0300-00803-0038
74 LS 298	1	" 4L	0316-00803-0019
74 LS 365	2	" 3M, 3N	0316-00803-0020
74 LS 368	1	" 2B	0300-00803-0004
74 LS 377	1	" 4F	0316-00803-0021
74 LS 378	1	" 3K	0316-00803-0018
BP-ROM SPV-6 (SPI-5)	1	IC 4E	0316-00803-0017
PROM SPV-1	1	" 3C	0316-00803-0014
BP-ROM SPV-3 (SPI-4)	1	IC 3L	0316-00803-0016
PROM SPV-2	1	" 3F	0316-00803-0013
BP-ROM SPV-4 (SPI-6)	1	" 4C	0316-00803-0015
PAL SPV-5 (SPI-7)	1	" 4D	0316-00803-0012
N58725 P	4	IC 2E, 2H, 2J, 2K	0508-00803-2500
2148 STATIC RAM	2	" 4M, 4N	0550-00803-6200
FERRITE BEAD	4	FBI-FB4	0316-00804-0002
16 PIN IC SOCKET	3	ICS 3L, 4C, 4E	0508-00804-0700
20 PIN " "	1	" 4D	0550-00804-2300
24 PIN " "	5	" 2E, 2H, 2J, 2K, 3C	0508-00804-0500
28 PIN " "	6	" 2C, 2D, 2F, 3D, 3F, 3J	0508-00804-0400
50 PIN CONN	1	PI	0300-00804-1104
11 PIN " KK-156	1	J1	3000-16387-1111
RT ANGLE			
SCRW	4	PCMH1-PCMH4	0316-00700-00XF
SUPER PAC-MAN VIDEO P.C.			



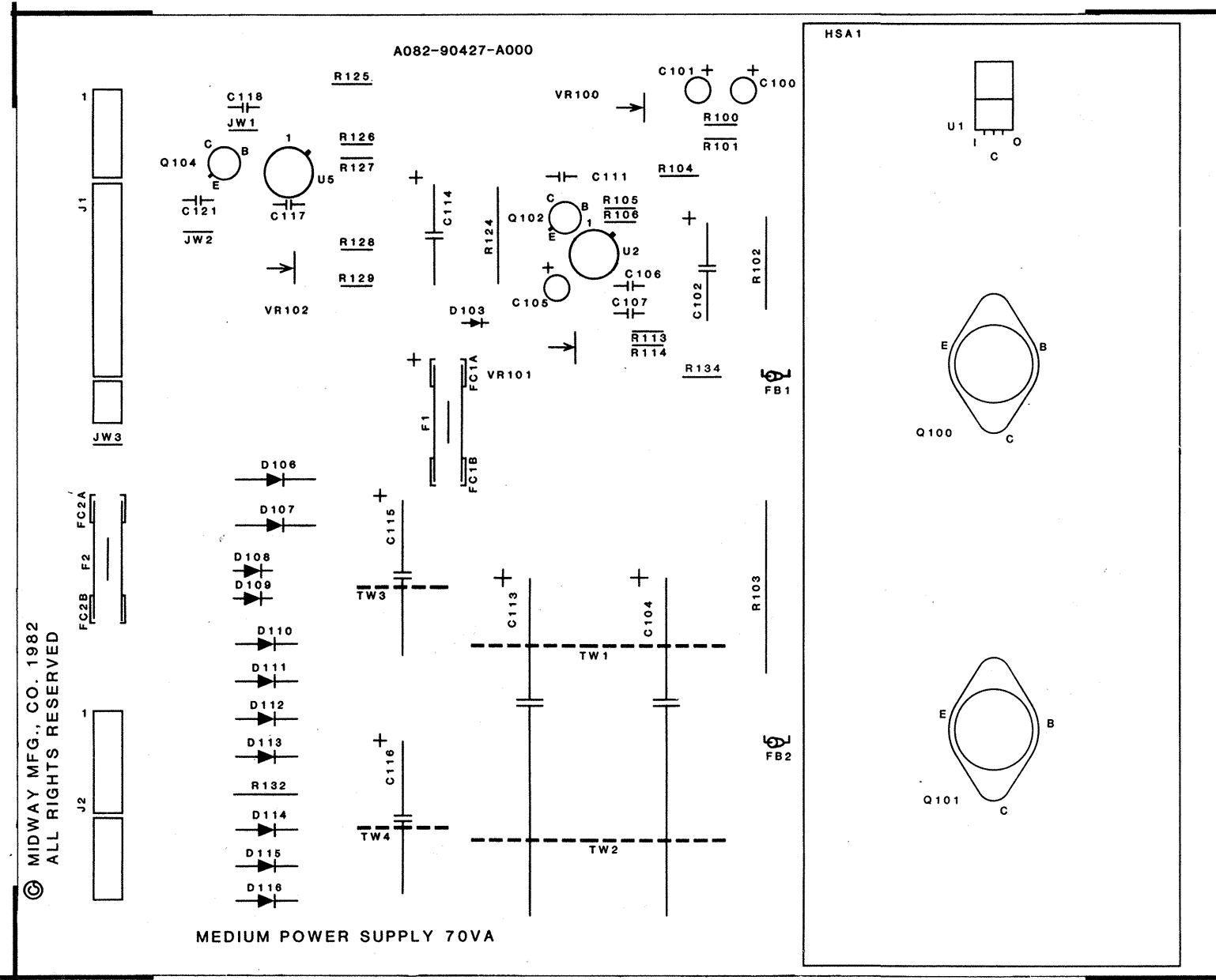
PROJECT ONE - SZERZEN		MIDWAY MFG. CO.	
DATE	REV	NO	REV
11-02-82	1	1	1
SUPER PAC-MAN VIDEO BD. SCHEMATIC		MOSI-00316-C007	
A084-91435-C316			





DESIGNATION LIST

DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
C100	10 µf RD TANT	D103	IN 4001
C101	0.47 µf RD TANT 35V	D106, 107	MR 750
C102	470 µf AX. ELEC.	D108, 109	IN 4001
C104	25,000 µf AX. ELEC.	D110-D116	A15F 50V 5A
C105	4.7 µf RD TANT 35V		
C106, 107	0.1 µf	Q102, Q104	2N2905
C111	0.1 µf		
C113	40,000 µf AX. ELEC.	U2, U5	LM305
C114	470 µf " " "		
C115	2200 µf " " 25V		
C116	4700 µf " " "		
C117	47 pf	FB1, FB2	FERRITE BEAD
C118	0.1 µf	FBMH1, FBMH2	FERRITE BEAD
C121	0.1 µf		MTG HDRW.
			2-20G SOLID WIRE
R100	100 ohm 1/4 W 5% CRBN	HSA1	HEAT SINK ASSY.
R101	470 " " " "	MHSA	HEAT SINK ASSY MTG HDRW
R102	0.18 " 5W " "		2-4-40X10 SLT RND
R103	0.16 " 15W " "		4-WASHER, 4, 120-.250-018
R104	68 " 1/2W " CRBN		2-4-40 HEX NUT
R105	24 " 1/4W " " "		THERMAL COMPOUND
R106	270 " " " " "		
R113	1.2 K " " " " "	F1	FUSE, 1/4A, SLO-BLO
R114	560 " " " " "	F2	FUSE, 1 AMP
R124	25 " 5W 10%	F1, F2	FUSE CLIP W/STOP
R125	68 " 1/2W 5% CRBN		
R126	10 " 1/4W 5% " "		
R127	1 K " " " " "	J1	2 POS. KK-156
R128	6.2 K " " " " "	J1, J2	5 " " " "
R129	1 K " " " " "	J1	13 " " " "
R132	150 " 2W 10%	J2	6 " " " "
R134	68 " 1/2W 5%		
VR 100, 101, 102	100 ohm POT	JW1, JW2, JW3	JUMPER WIRE
		TW1-TW4	TIE WRAP
		LB1	TAG, FUSE 1/4A. SLO-BLO
		LB2	TAG, FUSE 1 AMP
		LB3	TAG, PWR SPLY I. D.

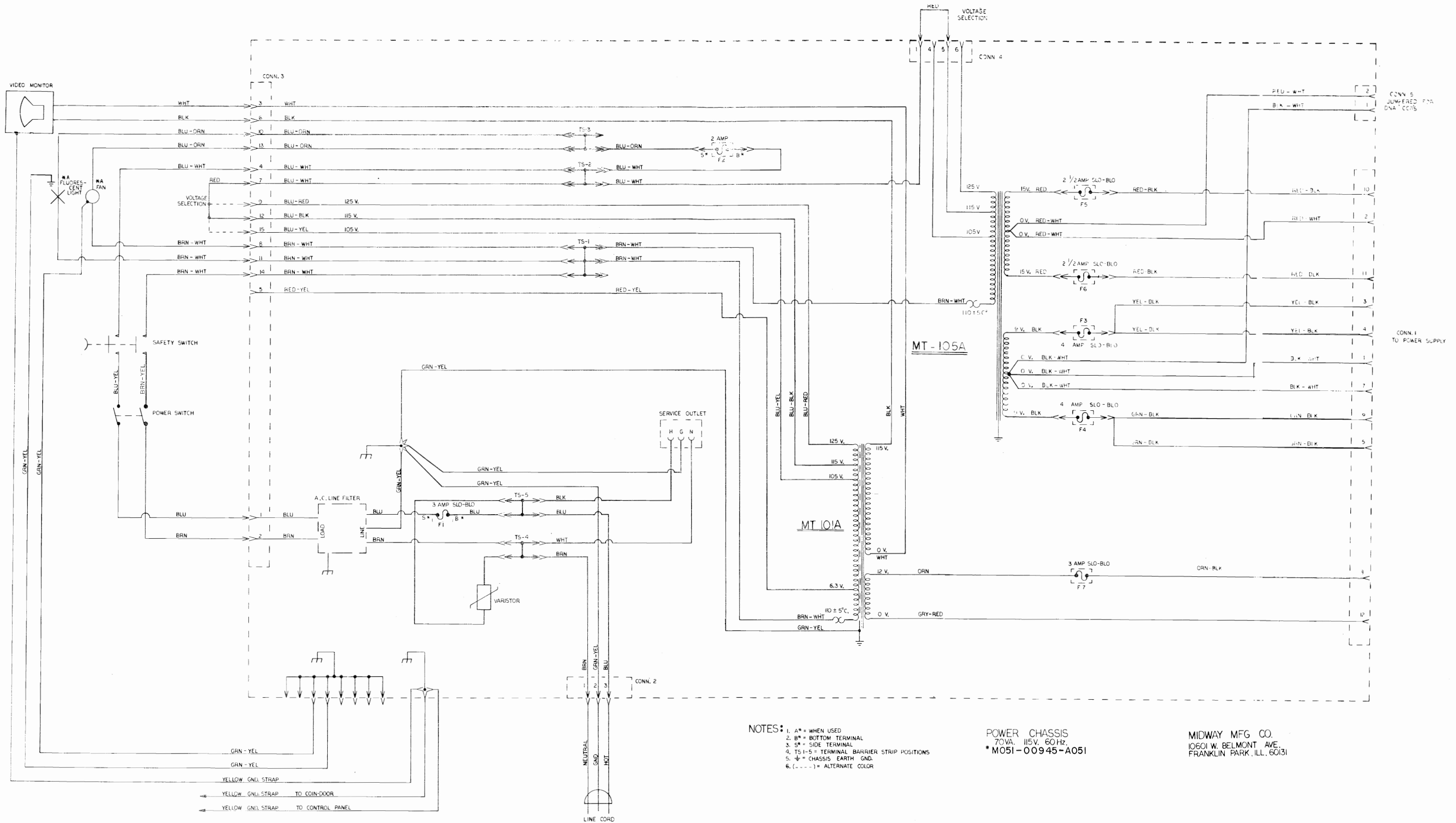


CROSS REFERENCE LIST

DESCRIPTION	QTY	DESIG. NOS.	PART NOS.	DESCRIPTION	QTY	DESIG. NOS.	PART NOS.
47 pf	1	C117	0945-00811-0100				
0.1 µf	5	C106, 107, 111, 118, 121	0945-00811-0200	2N2905	2	Q102, 104	0945-00808-0300
0.47 µf RD TANT 35V	1	C101	0945-00816-1100				
4.7 µf " " "	1	C105	0945-00811-0400	LM 305	2	U2, U5	0945-00813-0100
10 µf " " "	1	C100	0945-00816-1000				
470 µf AX. ELEC.	2	C102, 114	0945-00816-0600	FERRITE BEAD			
2200 µf " " 25V	1	C115	0945-00816-1300	FERRITE MTG. HDRW.			
4700 µf " " "	1	C116	0945-00811-0700				
25,000 µf " " "	1	C104	0945-00816-1700	20G SOLID WIRE	2	FBMH1, FBMH2	0017-00033-0139
40,000 µf " " "	1	C113	0945-00816-1800				
				HEAT SINK ASSY	1	HSA 1	A945-00008-0100
0.16 ohm 15W 5%	1	R103	0945-00815-0100				
0.18 " 5W 5%	1	R102	0945-00815-0200	4-40 X10 SLT RND	2	HSA 1	0017-00101-0727
10 " 1/4W 5% CRBN	1	R126	0062-051B3-1XXX	WSH, 4, 120-.250-018	4	HSA 1	0017-00104-0071
24 " 1/4W " " "	1	R105	0062-065B3-1XXX	4-40 HEX NUT	2	HSA 1	0017-00103-0002
25 " 5W 10%	1	R124	0945-00815-1000				
68 " 1/2W 5%	3	R104, 125, 134	0062-098D3-1XXX	FUSE, 1/4 A SLO-BLO	1	F1	0017-00003-0446
100 " 1/4W 5% CRBN	1	R100	0062-110B3-1XXX	FUSE, 1 AMP	1	F2	0017-00003-0001
150 " 2W 10%	1	R132	0945-00812-0200	FUSE CLIP W/STOP	4	F1, F2	0017-00071-0033
270 " 1/4W 5%	1	R106	0062-138B3-1XXX				
470 " " " " "	1	R101	0062-156B3-1XXX	2 POS. KK-156 CONN.	1	J1	3000-16387-0200
560 " " " " "	1	R114	0062-162B3-1XXX	5 " " " "	2	J1, J2	3000-16387-0500
1 K " " " " "	2	R127, 129	0062-179B3-1XXX	6 " " " "	1	J2	3000-16387-0600
1.2 K " " " " "	1	R113	0062-183B3-1XXX	13 " " " "	1	J1	3000-16387-1300
6.2 K " " " " "	1	R128	0062-217B3-1XXX				
				22 AWG 2 1/2 IN.	3	JW1, JW2, JW3	0151-00087-0000
100 ohm POT	3	VR 100, 101, 102	0945-00814-0000	TIE WRAP 7 5/8 IN.	2	TW3, TW4	0945-00814-0300
				TIE WRAP 10 3/4 IN.	2	TW1, TW2	0945-00814-0400
A15F 50V 5A DIODE	7	D110-D116	0945-00804-0200	TAG, FUSE 1/4 A. SLO-BLO	1	LB1	M051-00945-A020
				TAG, FUSE 1 AMP	1	LB2	M051-00945-A021
IN 4001	3	D103, 108, 109	0945-00804-0300	TAG, PWR SPLY I. D.	1	LB3	M051-00945-A022
MR 750	2	D106, 107	0945-00804-0800	70 VA PWR SPLY RC.	1		A080-90421-C000
				HEAT SINK ASSY	1		0017-00033-0139

PROJECT ENG J. JARON		USED ON BLUEPRINT		REVISIONS	
DO NOT SCALE DIMS	HEAT TREAT	SCALE FULL	NO. REQ'D PER	Bally / MIDWAY MFG. CO. FRANKLIN PK ILL.	
DIM TOLERANCES UNLESS SPECIFIED	MAT'L	ASSY DRWNG. MED PS. 70 VA (A082-90421-C000) A082-90427-A000		PART NO. M051-00945-A031	
DATE 12/2/82	FINISH				

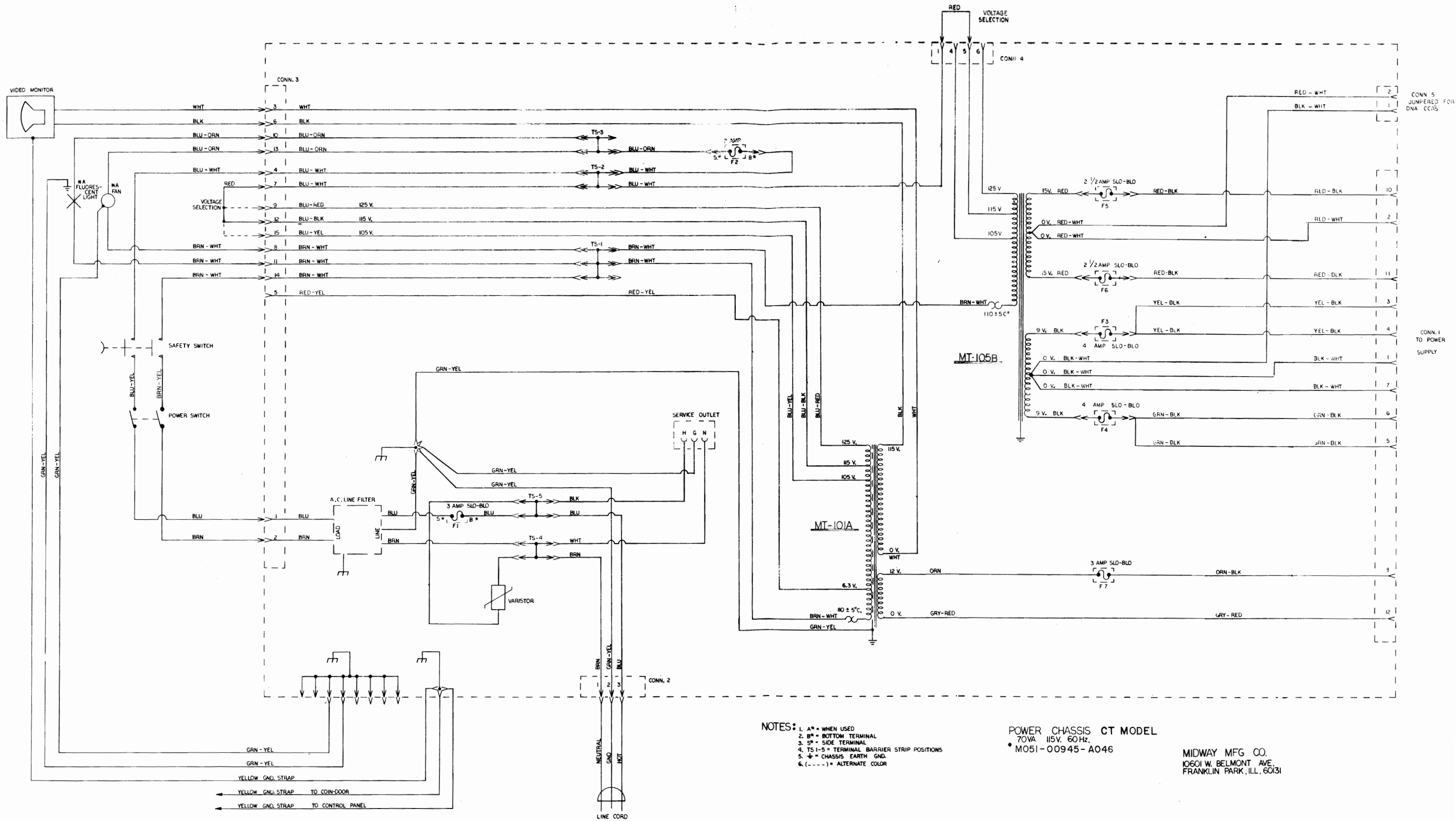




- NOTES:
1. A\* = WHEN USED
  2. B\* = BOTTOM TERMINAL
  3. S\* = SIDE TERMINAL
  4. TS 1-5 = TERMINAL BARRIER STRIP POSITIONS
  5. ⚡ = CHASSIS EARTH GND
  6. (---) = ALTERNATE COLOR

POWER CHASSIS  
 70VA. 115V. 60HZ.  
 \*M051-00945-A051

MIDWAY MFG. CO.  
 10601 W. BELMONT AVE.  
 FRANKLIN PARK, ILL. 60131

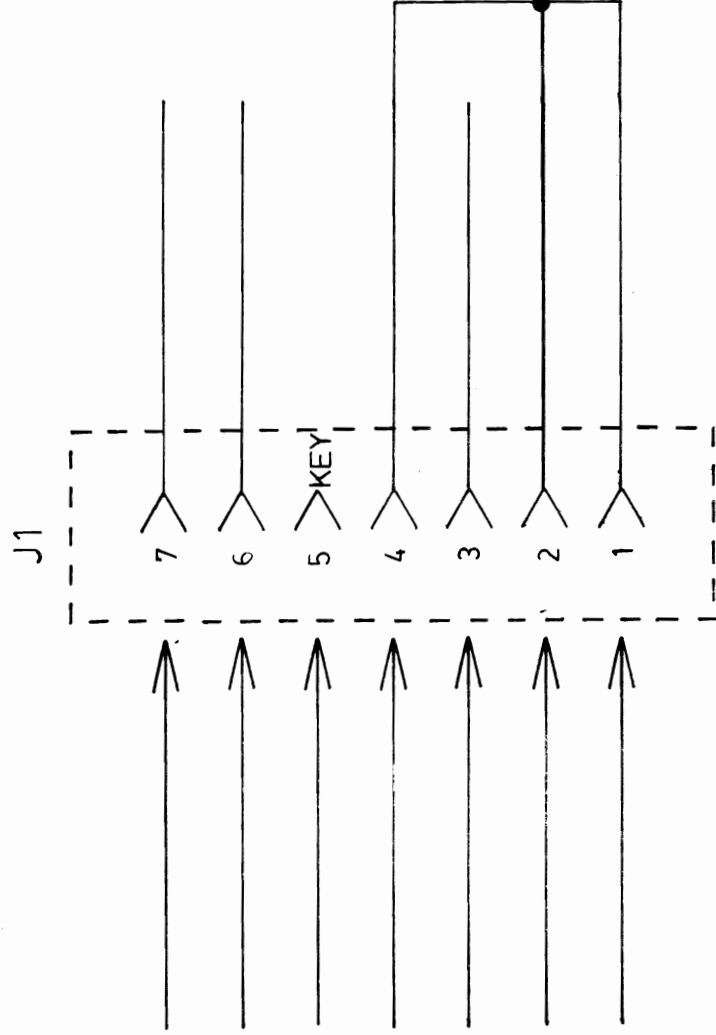


- NOTES:
1. A\* = WHEN USED
  2. B\* = BOTTOM TERMINAL
  3. S\* = SIDE TERMINAL
  4. TS 1-5 = TERMINAL BARRIER STRIP POSITIONS
  5. ⚡ = CHASSIS EARTH GND.
  6. (---) = ALTERNATE COLOR

POWER CHASSIS CT MODEL  
 70VA 115V. 60Hz.  
 \* M051-00945-A046

MIDWAY MFG CO.  
 10601 W. BELMONT AVE.  
 FRANKLIN PARK, ILL. 60131





PROJ. ENG.: J. SZERSZEN

THIS DWG. IS CONFIDENTIAL & PROPERTY OF MIDWAY MFG. CO.

**DIM. TOLERANCES**  
 UNLESS OTHERWISE SPEC.  
 CONCENTRICITY T.I.R. . . . . ± .002  
 FRACTIONAL . . . . . ± .1/64  
 DECIMAL . . . . . ± .005  
 HOLE DIA. . . . . + .002 - .000  
 ANGLE . . . . . ± 1/2°  
**DO NOT SCALE DWG.**

FIRST USED ON  
 DRN *SPH* DATE 8/20/82 SCALE NONE  
 MECH CHK. MATL.  
 ELEC. CHK. FINISH

**MIDWAY MFG. CO.**  
 FRANKLIN PK., IL. 60131 A BALLY CO.

SCHEMATIC DRAWING, CREDIT MULTI.  
 BYPASS P. C. BOARD  
 A082-91109-A000

REVISIONS

PART NO.

M·O·5·1 - 0·0·9·3·2 - A·0·2·8

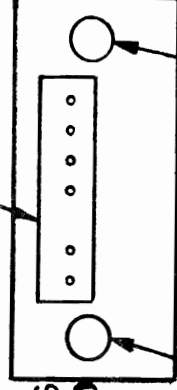
BRUNING · 40 · 07

DESIGNATION LIST

DESIGNATION DESCRIPTION

J1 7 PIN CONN. KK-156 W/PIN 3 REMOVED

PCMHI, PCMH2 1/8" HEYCO NUT



CROSS REFERENCE LIST

DSCRIP. QTY DESIG. PART NOS.

7 PIN CONN. 1 J1 0932-00817-0400  
 KK156 W/  
 PIN3 REMOVED

1/8" HEYCO 2 PCMHI, 0017-00042-0014  
 NUT PCMH2

PC BD 1 — A080-91109-A000

PROJ. ENG = J. SZERSZEN

THIS DWG. IS CONFIDENTIAL & PROPERTY OF MIDWAY MFG. CO.

**DIM. TOLERANCES**  
 UNLESS OTHERWISE SPEC.  
 CONCENTRICITY T.I.R. . . . . ± .002  
 FRACTIONAL . . . . . ± .1/64  
 DECIMAL . . . . . ± .005  
 HOLE DIA. . . . . + .002 - .000  
 ANGLE . . . . . ± 1/2°  
**DO NOT SCALE DWG.**

FIRST USED ON  
 DRN *T&B* DATE 08/18/82 SCALE FULL  
 MECH CHK. MATL.  
 ELEC. CHK. FINISH

**MIDWAY MFG. CO.**  
 FRANKLIN PK., IL. 60131 A BALLY CO.

ASSEMBLY DWG  
 CREDIT MULT. BYPASS PC BD  
 A082-91109-A000

REVISIONS

PART NO.

M·O·5·1 - 0·0·9·3·2 - A·0·2·7

## SUPER PAC-MAN CPU BOARD (P.C. A084-91436-C316)

Chip Number	Function	Chip Number	Function
74LS04	Hex Inverters		
74LS08	Quad 2 Input AND	2764	8K x 8 EPROM
74LS32	Quad 2 Input OR	2732	4K x 8 EPROM
74LS74	Dual D Type Flip-Flop	AM9114	1K x 4 RAM
74109	Dual JK Type Flip-Flop	MBM2148	1K x 4 RAM
74LS138	3 to 8 Line Decoder/Multiplexer	2114	1K x 4 RAM
74LS157	Quad 2 to 1 Line Multiplexer	SP1-1	PAL
74LS158	Quad 2 to 1 Line Multiplexer — Inverted Outputs	SP1-2	PAL
74LS161	4 Bit Binary Counter	SP1-3	256 x 4 PROM M7052
74LS245	Octal Bus Transceivers	18.4320	Crystal
74LS257	Quad 2 to 1 Line Multiplexer — Tri State	MC14066	Quad Bilateral Switches
74LS259	8 Bit Addressable Latches	MB3730	Audio Amplifier
74LS273	Octal D Type Flip-Flop	07XX	Custom Horizontal & Vertical Sync Generator
74LS367	Hex Bus Drivers	15XX	Custom Address Generator
74LS368	Hex Bus Drivers — Inverting	16XX	Custom Bus Controller
MC68A09	CPU	56XX	Custom I/O Ports

## SUPER PAC-MAN VIDEO BOARD (P.C. A084-91435-C316)

Chip Number	Function	Chip Number	Function
74LS00	Quad 2 Input NAND	74LS377	Octal D Type Flip-Flop
74LS04	Hex Inverters	74LS378	Hex D Type Flip-Flop
74LS08	Quad 2 Input AND	2764	8K x 8 EPROM
74LS10	Triple 3 Input NAND	2732	4K x 8 EPROM
74LS20	Dual 4 Input NAND	2148	1K x 4 RAM
74LS32	Quad 2 Input OR	M58725	2K x 8 RAM
74LS74	Dual D Type Flip-Flop	00XX	Custom Address Generator
74LS86	Quad 2 Input XOR	04XX	Custom Address Buffer
74LS138	3 to 8 Line Decoder/Multiplexer	07XX	Custom Horizontal & Vertical Sync Generators
74LS157	Quad 2 to 1 Line Multiplexer	11XX	Custom Bit Shifter
74LS161	4 Bit Binary Counter	12XX	Custom Address Generator
74LS245	Octal Bus Transceivers	SP1-7	PAL
74LS273	Octal D Type Flip-Flop	3160-15AXL-CXPD	256 x 4 PROM
74LS298	Quad 2 Input Multiplexer (With Storage)	3160-15AXL-BXPD	256 x 4 PROM
74LS365	Hex Bus Drivers	3160-03AAC-AXPD	32 x 8 PROM
74LS368	Hex Bus Drivers — Inverted Outputs		