

MIDWAY'S

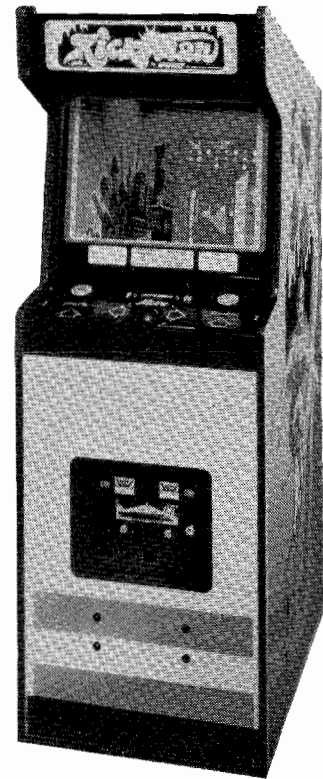
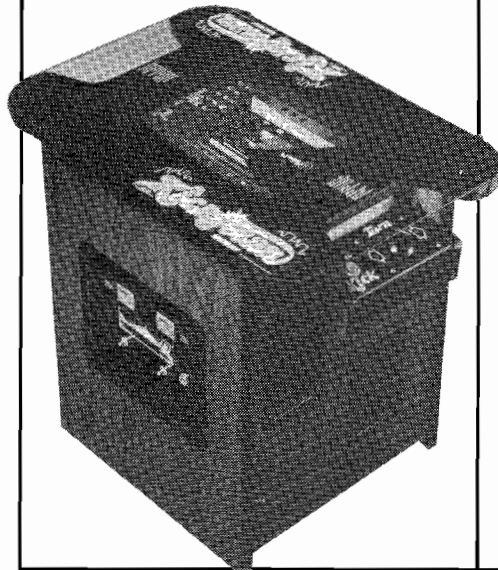


Parts and Operating Manual



No. 513 MINI

No. 515 COCKTAIL



No. 968 UPRIGHT



MIDWAY MFG. CO.

A BALLY COMPANY

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

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Kick-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

KICK-MAN is a one or a two player game. There are three models: the "UPRIGHT", "MINI", and "COCKTAIL TABLE". The Upright and Mini models have been designed for either **RIGHT** or **LEFT** hand use. When the two player mode is selected on the Upright or Mini model, the players take turns at the controls to take the Clown 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, the Clown is under **YOUR** control. **YOU** make him move back and forth across the screen to Kick, Pop, or Catch the falling balloons. Whether he catches them or pops them depends on what rack you are in.

These balloons are displayed in groups, called "racks", across the top of the screen. The first rack is made up of 16 balloons. The second and all future racks are made up of 24 balloons each.

The balloons are assembled in a random order and are dropped in a random order by the game. **YOU** position the Clown under the falling balloons to either catch them on his head or pop them with the pin in his hat.

If you miss the balloon and are close enough, you can **KICK** it back up in the air again and give yourself another chance to get under it before it hits the ground. If a balloon does hit the ground, the Clown falls off his unicycle and you give up one player. When your **NEXT** player appears, he will begin with **NO** balloons on his head. **YOU MUST START OVER AGAIN FROM THE BEGINNING TO STACK UP BALLOONS FOR POINTS.**

As your skill level increases, the number of fast falling balloons is increased (BLUE — fastest falling; RED — medium; and YELLOW — slowest falling), the balloons will begin to fall at an angle — not straight down as in earlier racks, and as you kick one balloon up — sometimes another begins its fall (you then have **TWO** balloons in the air at the **SAME** time). However, you can **NEVER** have **MORE** than two balloons in the air at the **SAME** time.

Bonus Clowns are awarded to you periodically throughout the game as you reach or pass certain preselected point values. Each balloon and rack identifier symbol has an assigned point value as listed in Figure 1.

Major New Features

There are several major new features in your KICK-MAN game; 1) During regular play, you can kick a missed balloon back up in the air numerous times and give yourself another chance to get under it to build up a full stack of eight balloons; 2) If you miss a balloon or catch a bomb when you are in a **CHALLENGE** rack, causing the Clown to fall off his unicycle, you **ARE NOT PENALIZED ONE PLAYER** — all that is lost are the balloons that were stacked on the Clown's head; 3) The **PAC-MAN** will appear three times in the 2nd rack and two times in the 3rd and **EVERY** succeeding rack when the Difficulty Level option is at the factory recommended setting. As the **PAC-MAN** eats the balloons on the Clown's head, you are awarded the bonus points for these balloons right then. This means your Clown does not have to get a full stack of

eight balloons before you are awarded the bonus points for them. 4) PAC-MAN BONUS AND SUPER BONUS: A PAC-MAN BONUS (anywhere from 200 to 1600 points) is awarded to the player for each PAC-MAN caught on **YOUR** Clown's head in any one rack. If at the end of that rack, **ALL** PAC-MEN are still on top of your Clown's head, a "PAC-MAN SUPER BONUS" of 1600 points is also added to your score; 5) There is a completely new and easy-to-use diagnostic package featuring: a complete ROM/RAM check with bad chip location information read out on the monitor screen; the capability to check each of the game's 24 different sounds **INDIVIDUALLY**; provision for checking each control and switch **SEPARATELY**; a full function Bookkeeping mode; an entire options list that can be set from the front console with **NO NEED** to crawl inside the back of the cabinet and look for tiny switches located on P.C. boards; a sound system test; and a "PRE-SET"

category that returns **ALL** information in the Bookkeeping mode to zero and all operator selected options back to factory recommended settings; and 6) The game is equipped with a rechargeable battery so that it won't forget where it was the night before at closing — even if you turn it off. It will "remember" this information for up to two weeks.

Game Objective

The object of the game is to **HAVE FUN** while constantly increasing your skill as you play, catching as many balloons as possible each time to get the highest score.

DESCRIPTION	FALL RATE		POINTS AWARDED
BLUE BALLOON	FAST		15
RED BALLOON	MEDIUM		10
YELLOW BALLOON	SLOW		5
		APPEARS IN	
RACK IDENTIFIERS		RACK NO.	
INKY (BLUE GHOST)	FAST	3	25
PINKY (PINK GHOST)	FAST	4	25
CLYDE (ORANGE GHOST)	FAST	5	25
BLINKY (RED GHOST)	FAST	6 and UP	25

Figure 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. Remove the four leg levelers from the coin box and install them, 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.
 - Also check to make sure all plug-in connectors on the wire harness are firmly seated.

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

- 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. See Figure 2. 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.
- Check all major subassemblies to be sure they are mounted securely. These are called out in Figure 2 & 3.
 - Power supply.
 - Control panel(s).
 - T.V. monitor.
 - Other P.C.B.'s and/or P.C.B. rack, etc.
 - Power supply filter assembly.
 - Transformer board assembly.

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.

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 32" (64 x 82cm)

Mini 20" x 29" (51 x 74cm)

Cocktail 32" x 22" (82 x 56cm)

Game height:

Upright 72" (183cm)

Mini 60" (153cm)

Cocktail 29" (74cm)

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.

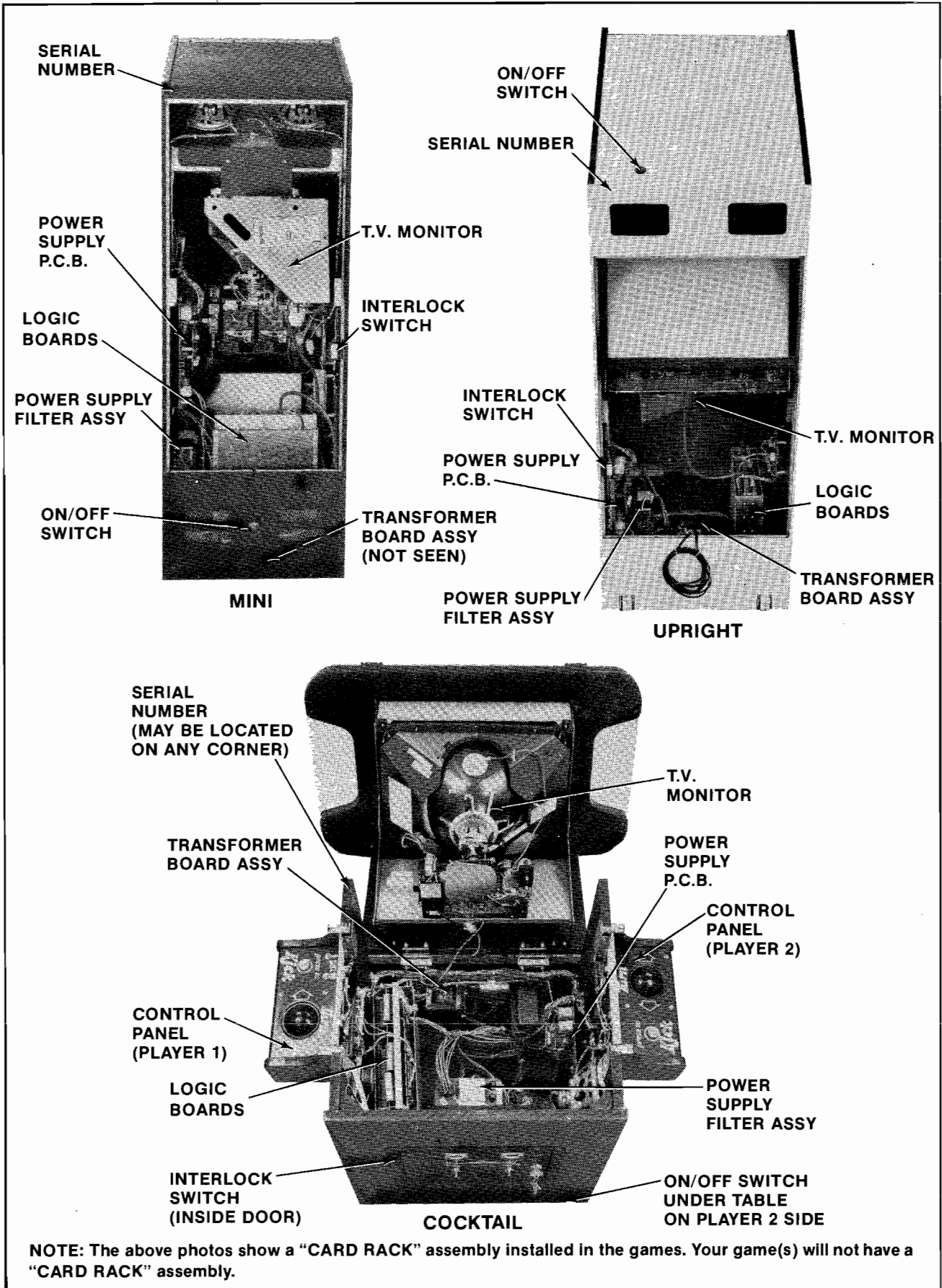


Figure 2 Location of serial number, interlock switch, ON/OFF switch & major sub-assemblies

3. Interlock and power ON/OFF switches. See Figure 2.

- 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 and Mini 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 all models are located as shown in Figure 2. 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 and Mini 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.



Figure 3 Major sub-assemblies (cont. from Fig. 2)

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 4.

SELF-TEST:

Your new game will Self-Test itself to see if it has any bad parts. The information it receives while testing 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 5.

The game volume control pot is located just inside the cabinet on the right side of the coin door frame.

There is only one pot. For adjustment, it may be reached through the coin door on **ALL** models.

To make the sounds louder, turn the pot clockwise as you face it (↻).

To make the sounds **less** loud, turn the pot counter-clockwise as you face it (↺).

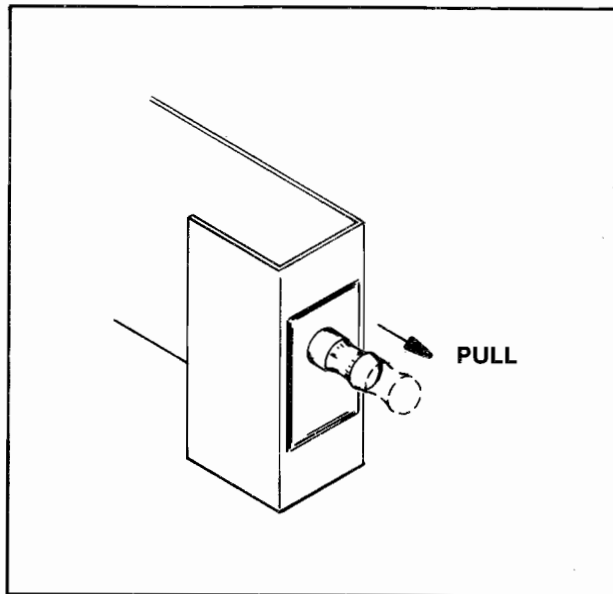


Figure 4 Interlock switch operation

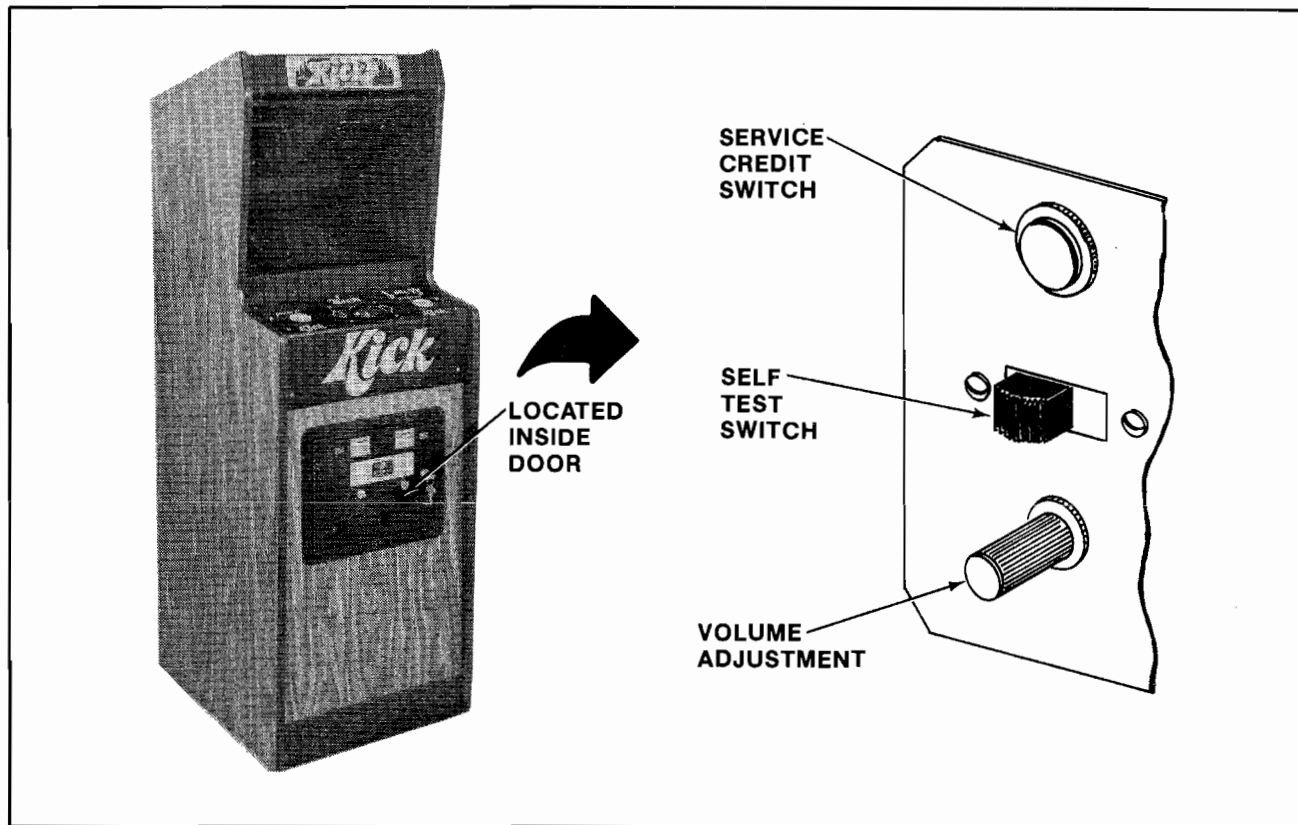


Figure 5 Location of volume control, self test switch & service credit switch

Figure 6 Option switch settings

SWITCH NO. 1 — AT B3 — LOCATED ON SOUND I/O P.C. BOARD										
DURING GAME PLAY: PLAY MUSIC DO NOT PLAY MUSIC	SW#1 ON OFF	SW#2 NOT USED USED	SW#3 NOT USED USED	SW#4 NOT USED USED	SW#5 NOT USED USED	SW#6 NOT USED USED	SW#7 NOT USED USED	SW#8 NOT USED USED	SW#9 NOT USED USED	SW#10 NOT USED USED
MINI COCKTAIL TABLE							ON OFF			
FREEZE VIDEO NORMAL OPERATION										ON OFF
SWITCH NO. 3 — AT D 14 — LOCATED ON SOUND I/O P.C. BOARD (These switches for in shop test use only!)										
NORMAL OPERATION SOUND I/O DIAGNOSTIC MODE	SW#1 OFF ON	**SW#2	**SW#3	**SW#4						
NORMAL OPERATION RAM/ROM TEST INDICATES TEST RESULTS VIA YELLOW LED ON SOUND I/O BOARD: FAST FLASH = BAD ROM SLOW FLASH = BAD RAM		OFF ON								
NORMAL OPERATION OSCILLATOR TEST			OFF ON							
NORMAL OPERATION FILTER TEST				OFF ON						

THE REMAINDER OF KICK-MAN'S MOST COMMON OPTION SETTINGS ARE CONDUCTED DURING THE **MACHINE SETUP** PORTION OF THE SELF-TEST MODE AND WILL BE COVERED IN DETAIL IN THAT SECTION OF THIS MANUAL.

* THIS SWITCH **NOT USED ON UPRIGHT MODELS.**

**NO EFFECT IF SW#1 OF SWITCH NO. 3 IS IN THE "OFF" POSITION.

OPTION SETTINGS:

To change the most common option settings, you **DO NOT** have to take the game apart or go into the cabinet and hunt for tiny switches on P.C. boards. These most common options can be changed from the main console of the game while it is in the Self-Test mode. The Self-Test switch is located just inside the cabinet on the right side of the coin door frame as you face it.

When changing any options, ALWAYS perform the Self-Test and play the game to be sure the ones selected are working properly. Of course, when you must change one of the switches that is located on one of the game's P.C. boards, it is also recommended that you perform the Self-Test 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 P.C. Board option switch settings, and what they will make the game do are shown in Figure 6. See Figure 6a for option switch locations.

NOTE: In order to set the option switches located on the games P.C. Boards, these Boards **MUST** be removed from their card rack.

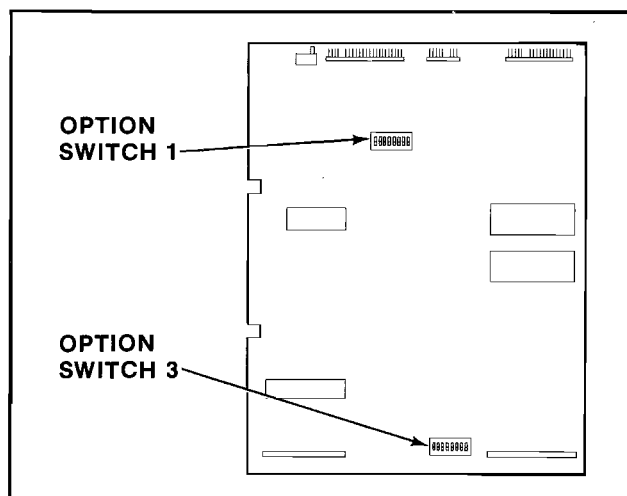


Figure 6a Option switch location

Game Operation

KICK-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 in Figure 7.

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

SELF-TEST MODE

The Self-Test mode is a special mode for checking game play statistics as well as 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 NOT** cause the game to erase any CREDITS it has in its memory when the Self-Test mode is entered.

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 (the Self-Test switch is located just inside the cabinet on the right side of the coin door frame as you face it). When this is done, the game will react as follows:

1. If the game is in the Attract mode when the Self-Test switch is moved to the "ON" position, it will finish the sequence and then go into the Self-Test mode. This is illustrated by the display of the Self-Test Mode Menu on the monitor screen.

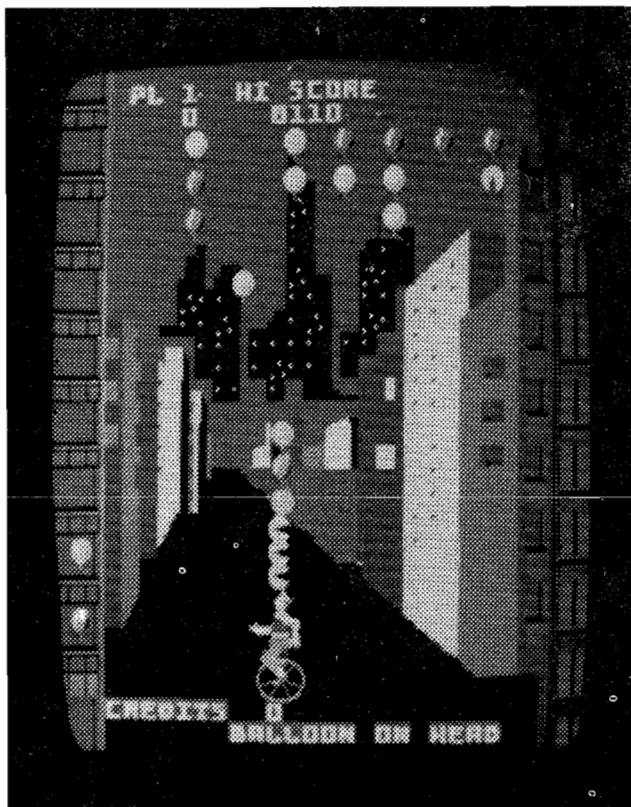


Figure 7 Game operation

2. If the game is in the Ready-To-Play mode or the Play mode when the Self-Test switch is slid to the "ON" position, it **WILL NOT** go into the Self-Test mode until **AFTER** the player's Clown has fallen off his last unicycle (the game **MUST** be over). At this point, the game will go into the Self-Test mode. Again, this is illustrated by the display of the Self-Test Mode Menu on the monitor screen.
3. The fastest way to enter the Self-Test mode is to slide the Self-Test switch to the "ON" position and then activate the "TILT" switch located on the back side of the coin door just below the lock mechanism. The game will then **IMMEDIATELY** go into the Self-Test mode.

The Self-Test mode has eight (8) major categories as illustrated by Figure 8.

1. It is easy to select what category you want to enter. By holding down the ONE or the TWO player button, the Balloon at the left of the screen can be moved UP and DOWN (i=UP) and (ii=DOWN), until it is in front of the category you want to test. Release the button at this time.
2. After the Balloon has been positioned, depress either "KICK" button on the console and the monitor screen will display the test category you have selected.

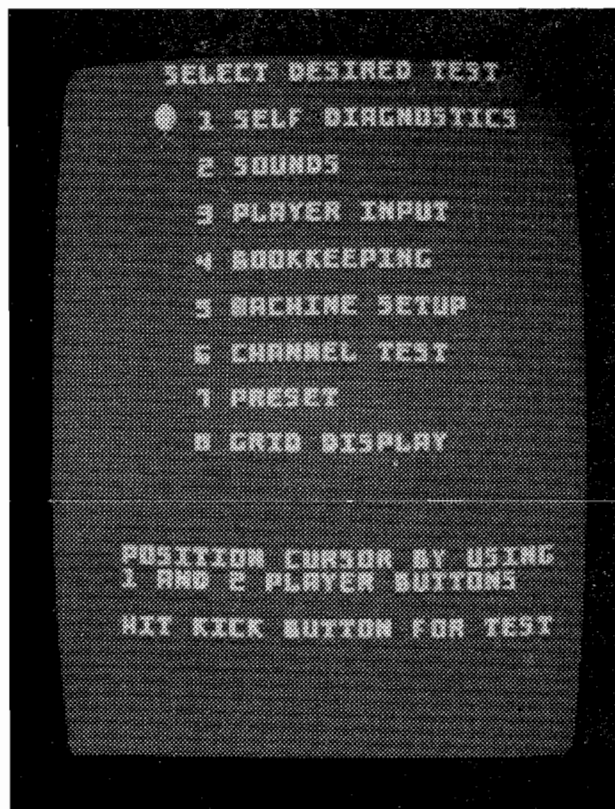


Figure 8 Self test display

NOTE: There is one exception to this. If you position the Balloon in front of the "PRE-SET" category on the Self-Test Mode Menu, when you press the "KICK" button on the console — EVERYTHING, I repeat — **EVERYTHING**, including **ALL** information in the "BOOKKEEPING" mode and **ALL operator selected options**, will be set back to zero "0" and to the factory recommended settings — **respectively**.

- Once you are **IN** one of the Self-Test mode categories, FOLLOW THE **ON-SCREEN INSTRUCTIONS TO COMPLETE THE TEST**.
3. The next group of Figures (8a through 8h) show the **CORRECT** screen presentation for **EACH** category of the Self-Test mode.

During the SELF DIAGNOSTICS section of the Self-Test mode, you will **first** see a cross hatch pattern on the screen for about 1/2 second. **Second**, you will see a lot of different colored bars shown on the monitor screen. These bars will be UNpainted one at a time from the top down. **Third**, you will see the screen painted Red, Blue, and Green in bars from the top down. **Fourth**, all the different colored bars you saw "**Second**" are displayed again. And **fifth**, the different colored bars are replaced by this message: "**HIT KICK BUTTON TO EXIT**". If the Kick button is not hit, the test will repeat itself. This feature was

designed into the game to enable over-night testing for an intermittent hardware problem.

If the SELF DIAGNOSTICS find one or more bad ROM or RAM chips: instead of going through what is described above, the game will give you a written message as to which parts are bad. This message includes their I.D.'s and their P.C. Board locations.

During the SOUNDS section of the Self-Test mode, the game will give a display which looks like that shown in Figure 8a.

- In this category, each of the game's 24 separate sounds can be checked individually in any order — or — you can tell the game to check them all in order — 3 through 26.

During the PLAYER INPUT section of the Self-Test mode, the game will give a display which looks like that shown in Figure 8b.

- In this category, each of the game's player operated controls — including the coin switches on the back side of the coin door — may be checked individually. A game sound will be heard as each switch/control is actuated. If no game sound is heard, that switch/control is either not working, miswired, or disconnected. Check it out thoroughly.

As the Player Input Switches and Devices are activated, the Switch or Device activated is spelled out in the blank space above "PLAY MUSIC".

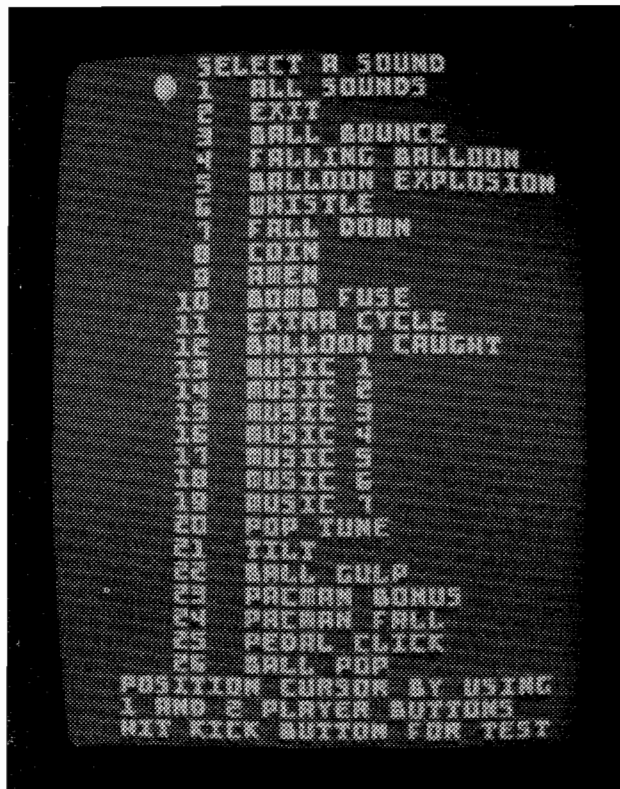


Figure 8a Self Test — Sounds

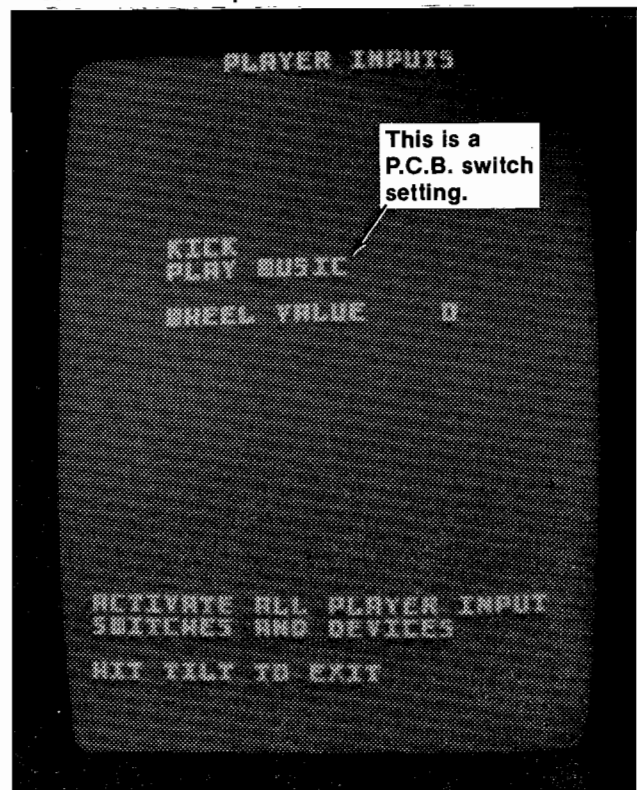


Figure 8b Self Test — Player Input

During the BOOKKEEPING section of the Self-Test mode, the game will give a display which looks like that shown in Figure 8c.

- In this category, a basic bookkeeping function is performed. And with the selection of the "TIME REPORT" and the "SCORE REPORT", detailed breakdowns of game times and scores may be obtained.

In the TIME REPORT and SCORE REPORT sections of the BOOKKEEPING mode, the game will give displays which look like those shown in Figures 8d and 8e respectively.

During the SETUP OPTIONS section of the Self-Test mode, the game will give a display which looks like that shown in Figure 8f.

- In this category, all common game options may be changed from the control console: coins per credit, credits per base, bonus base(s) awarded at, difficulty level — and so on.

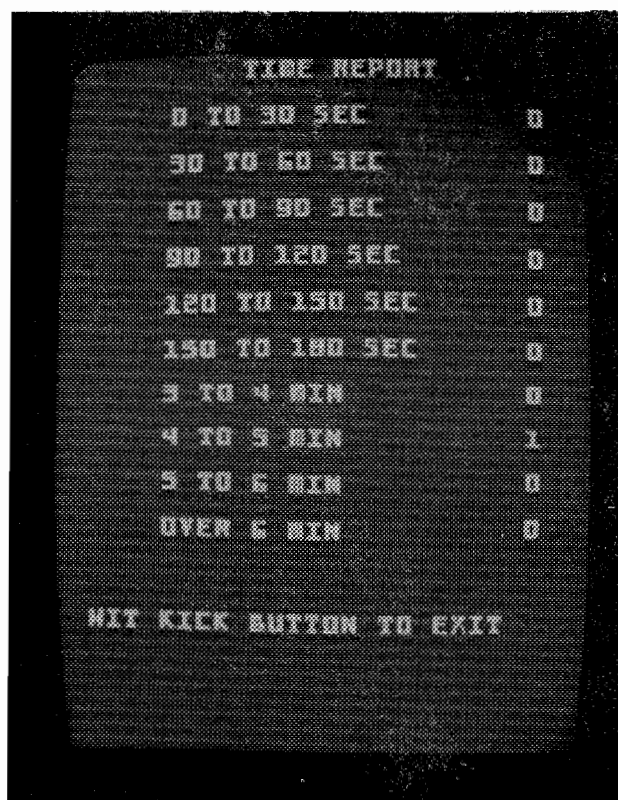


Figure 8d Self Test — Time Report

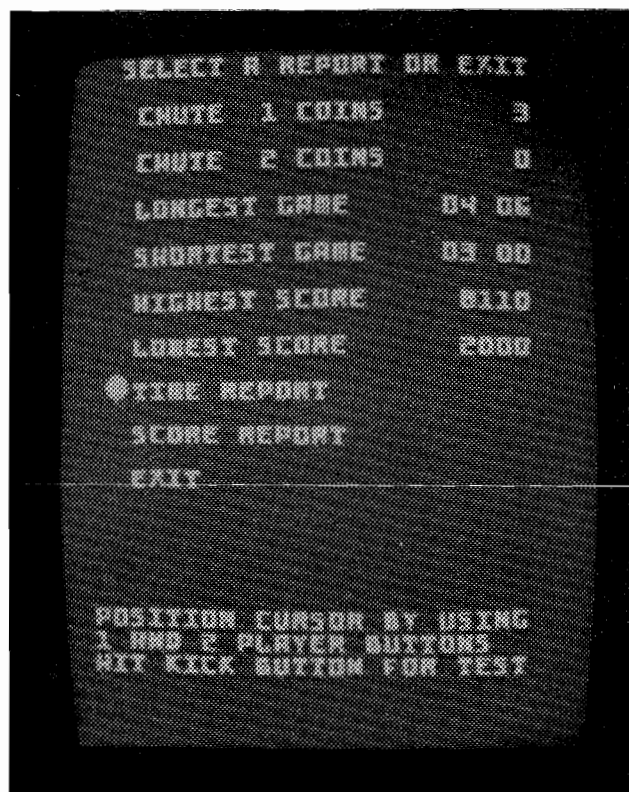


Figure 8c Self Test — Bookkeeping

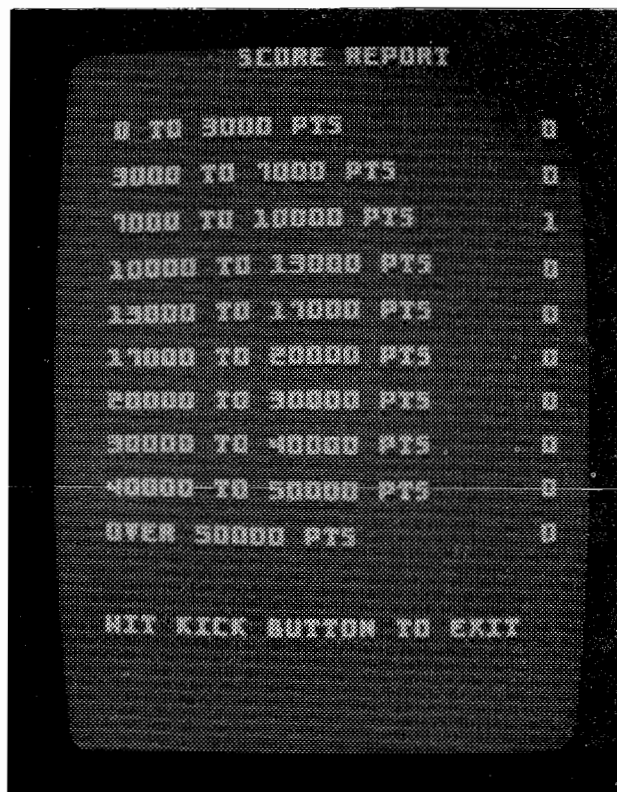
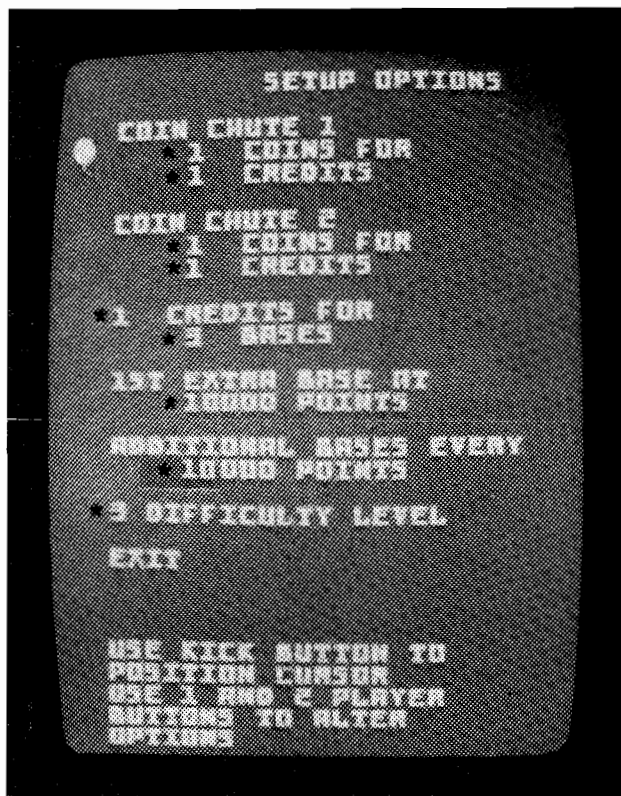


Figure 8e Self Test — Score Report



* = Factory recommended settings.

Figure 8f Self Test — Setup Options

DIFFICULTY LEVEL EXPLANATION: SEE FIGURE 8g.

The Difficulty Level setting has a range of 1 to 9. The following Figure 8g shows what effect this option has on the game.

DIFFICULTY LEVEL SETTING	1ST RACK IN WHICH YOU CAN HAVE 2 BALLOONS IN THE AIR AT THE SAME TIME	**NUMBER OF PAC-MEN THAT CAN APPEAR IN RACK 2 AT EACH SETTING
1	4	4
2	4	4
*3	*4	*3
4	3	3
5	3	3
6	3	2
7	2	2
8	2	2
9	2	2

* = FACTORY RECOMMENDED SETTINGS

** = THE NUMBER OF PAC-MEN IN EACH SUCCEEDING RACK IS REDUCED BY 1 UNTIL YOU ARE DOWN TO TWO PAC-MEN PER RACK. THESE WILL BE THERE FROM THAT POINT ON.

Figure 8g Difficulty Level Explanation

During the CHANNEL TEST section of the Self-Test mode, the game will give a display which looks like that shown in Figure 8h.

- In this category, the game conducts a test of its SOUND SYSTEM.

Once you enter the CHANNEL TEST section of the Self-Test mode, the game automatically tests Channels 1 through 6 giving a tone for each one as it checks it. After the 6th Channel is tested, the game automatically repeats the test until the Kick button is hit. It then goes back to the Self-Test Mode Menu.

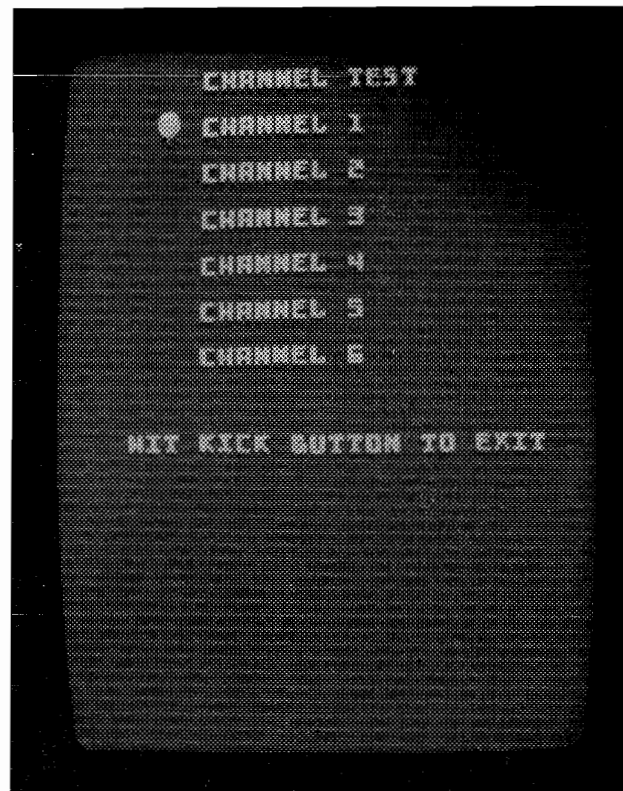


Figure 8h Self Test — Channel Test

During the GRID DISPLAY section of the Self-Test mode, the game shows a white cross hatch pattern on the monitor screen. This is for alignment and/or test purposes. This pattern will remain on the monitor screen until the Kick button is hit. The game will then go back to the Self-Test Mode Menu.

To leave the Self-Test mode, simply slide the Self-Test switch to the "OFF" position at **ANY** time. The game will then run through the ROM/RAM test display after which normal game functions will return to the monitor screen.

5. RACK ADVANCE:

The game can be made to advance through the various racks by beginning a game **and THEN** sliding the Self-Test switch to the "ON" position. After this has been done, each time you depress the ONE PLAYER BUTTON the game will advance one rack.

When you reach the desired rack, slide the Self-Test switch to the "OFF" position. (If you leave the Self-Test switch in the "ON" position, the game will go into the Self-Test mode when you are finished playing the rack you "advanced" to.)

6. CROSS HATCH PATTERN: SEE FIGURE 9.

A cross hatch pattern is shown on the screen when power is first turned on to the game, when the TILT Switch is actuated, during the "SELF DIAGNOSTIC" portion of the Self-Test mode, and during the "GRID DISPLAY" portion of the Self-Test mode.

This pattern may be kept on the screen for adjustment purposes as described earlier.

When you are finished using the cross hatch pattern, simply hit the Kick button to return to the Self-Test Mode Menu.

7. HARDWARE MASTER RESET SWITCH:

There are two of these little red switches, one on the Sound I/O Board and one on the CPU Board, located as shown in Figure 10.

The function of each of these switches — when pressed — is to make the game think it has **JUST** been turned on. They set up an "initial power-up" condition.

We **DO NOT** recommend that you indiscriminately press **EITHER** of these switches. They should **ONLY** be used if there is a major problem encountered while testing the P.C. Boards.

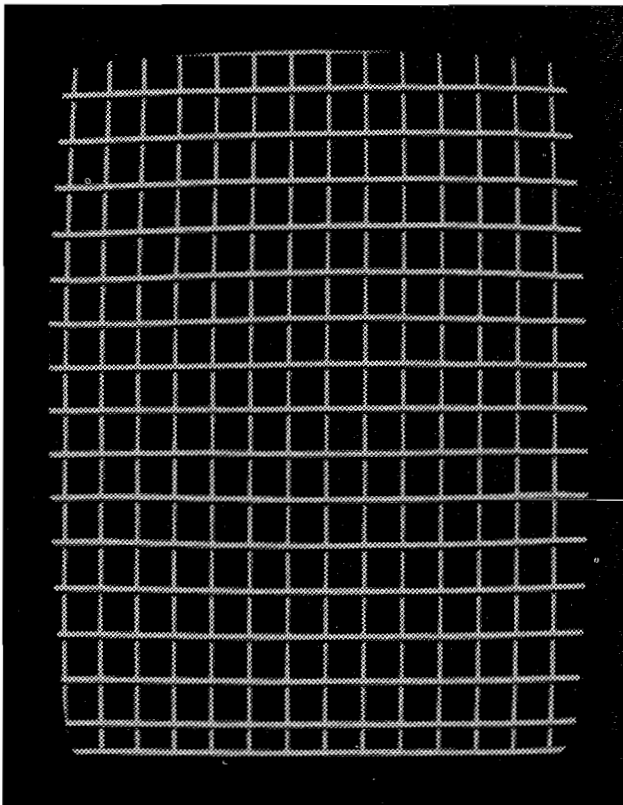


Figure 9 Cross hatch pattern

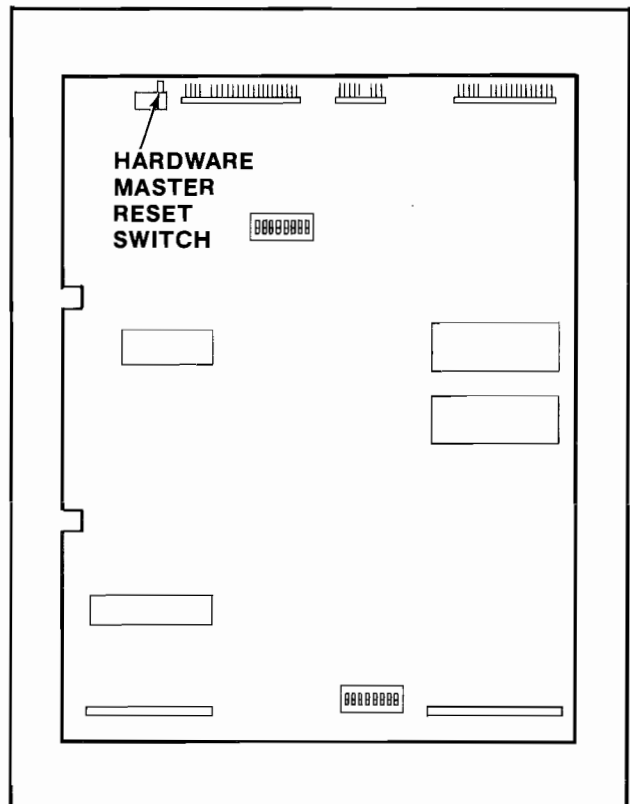
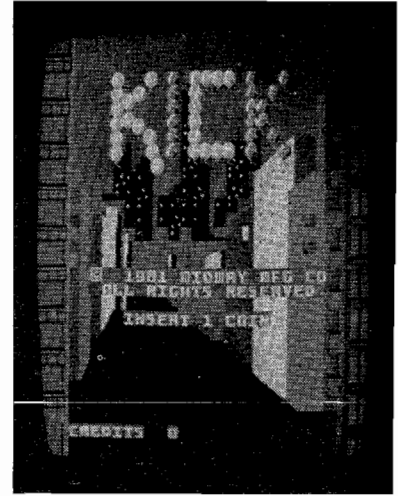


Figure 10 Location of hardware master reset switch

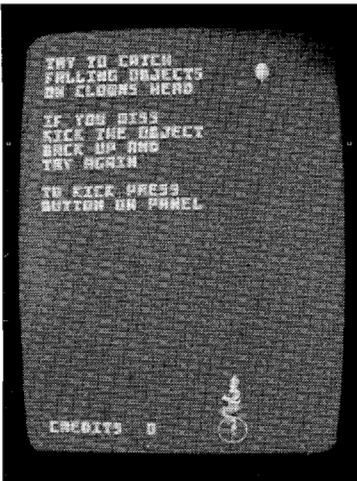
ATTRACT MODE

1. The Attract mode starts:

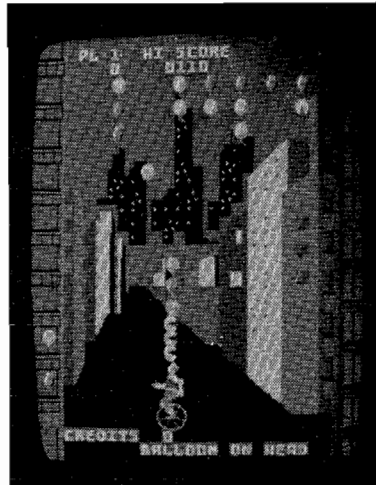
- Just after power has been turned on to the game. (Self-Test switch is in the "OFF" position.)
- After a Self-Test has been completed and there are no more credits left in the game's memory.
- After a play has been finished, the score was not high enough to put the game into the High Score/Initial mode, and there are no more credits left in the game's memory.
- After the High Score/Initial mode when there are no more credits left in its memory.
- In the Attract mode, the game will give the following **respective** displays **centered** on the monitor screen:



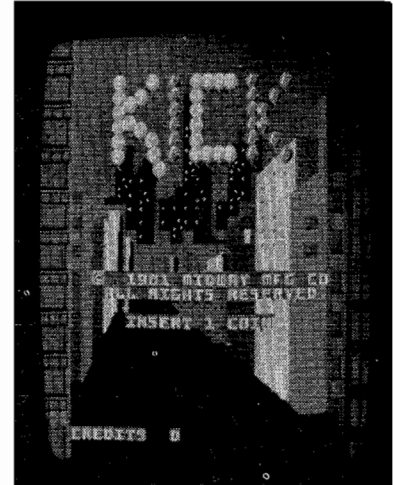
DISPLAY #1



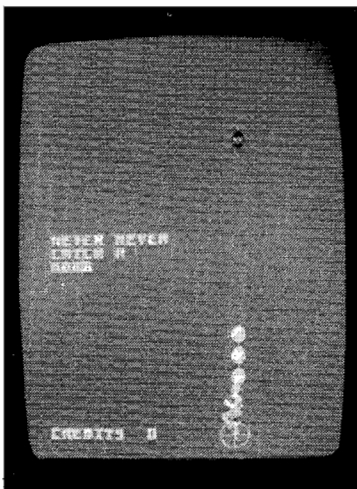
DISPLAY #2



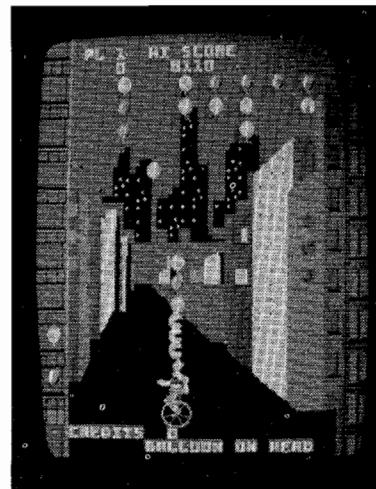
DISPLAY #3



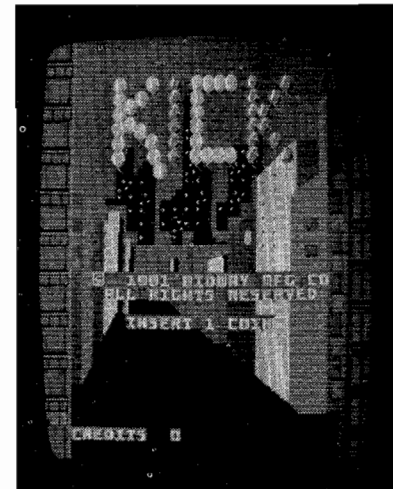
DISPLAY #4



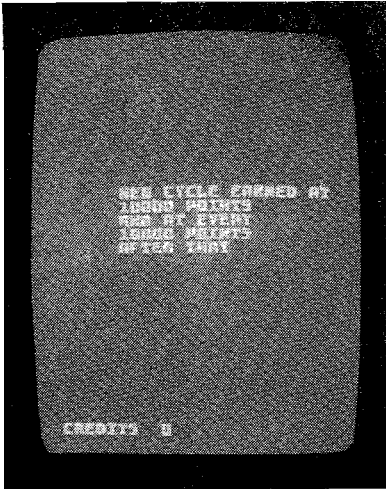
DISPLAY #5



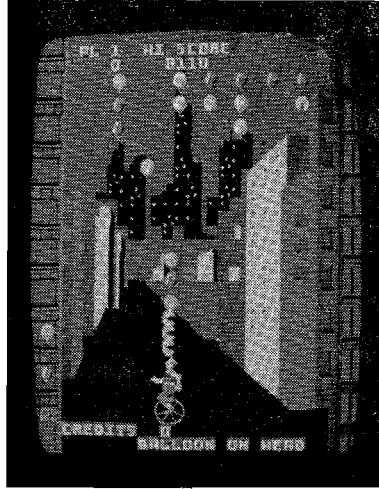
DISPLAY #6



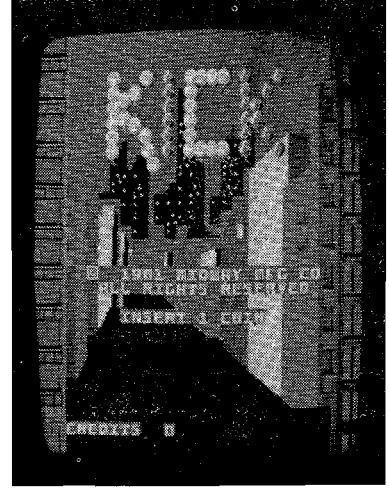
DISPLAY #7



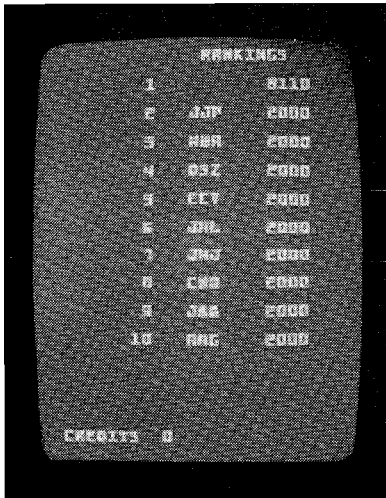
DISPLAY #8



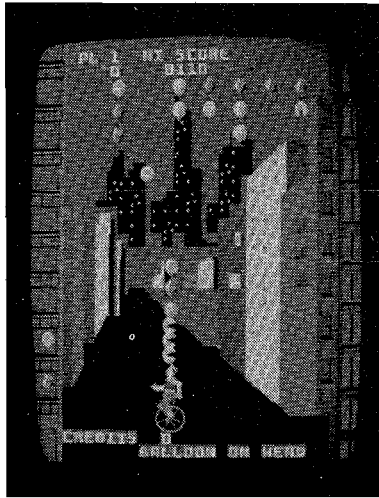
DISPLAY #9



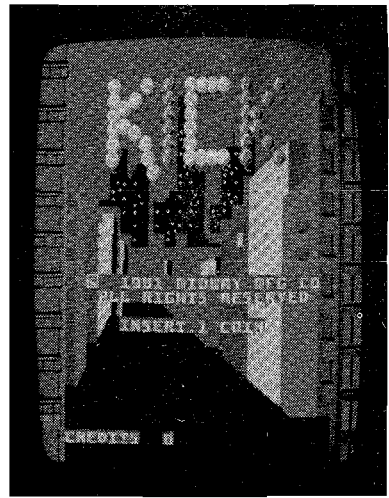
DISPLAY #10



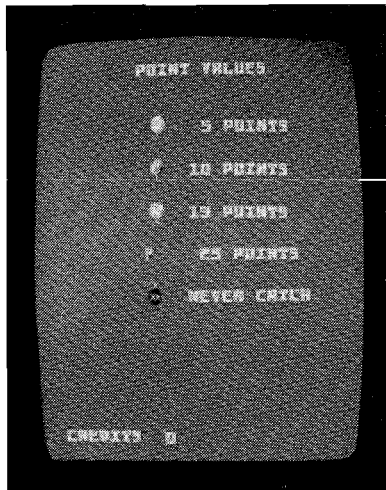
DISPLAY #11



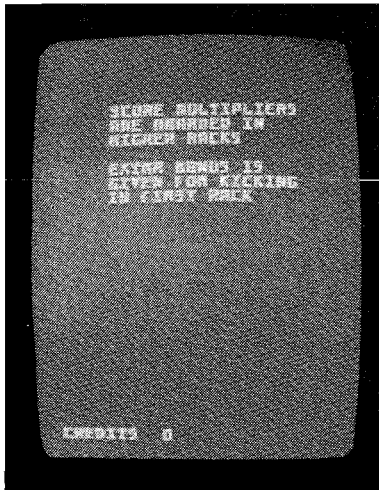
DISPLAY #12



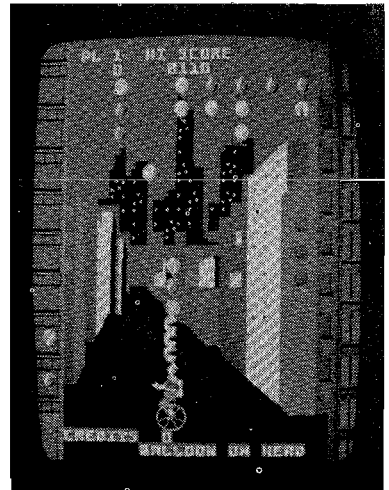
DISPLAY #13



DISPLAY #14

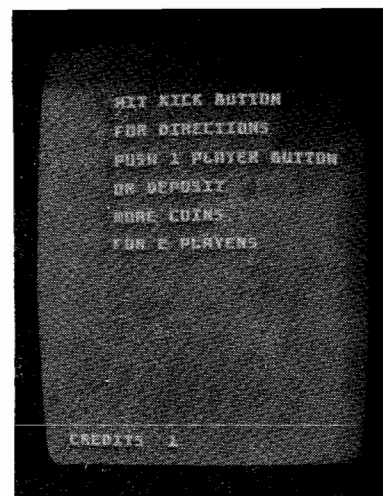


DISPLAY #15

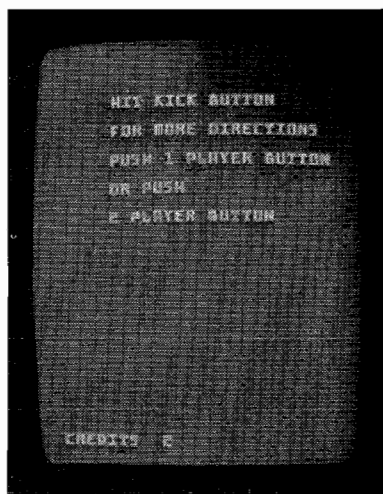


DISPLAY #16

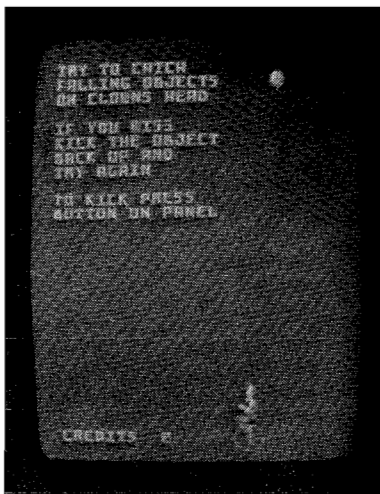
- No matter where the game is in the Attract mode sequence, it will immediately go to the following display as soon as a game has been paid for. It will hold this display on the monitor screen until the "1 PLAYER" or the "2 PLAYER" start button is pushed.



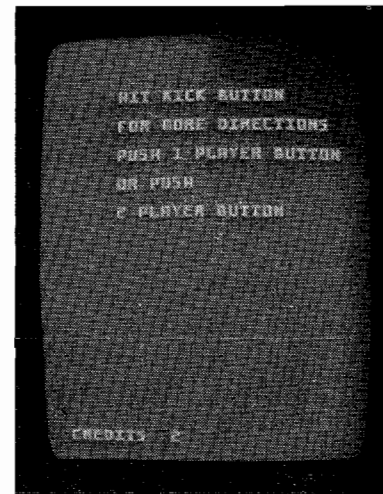
DISPLAY #1



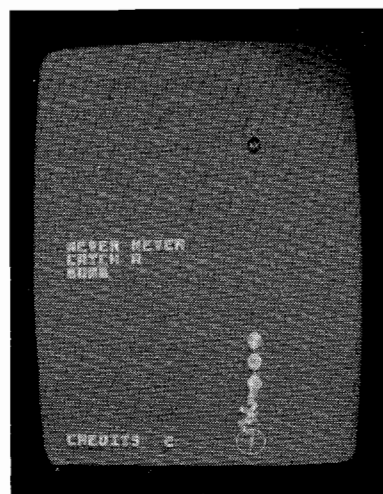
DISPLAY #2



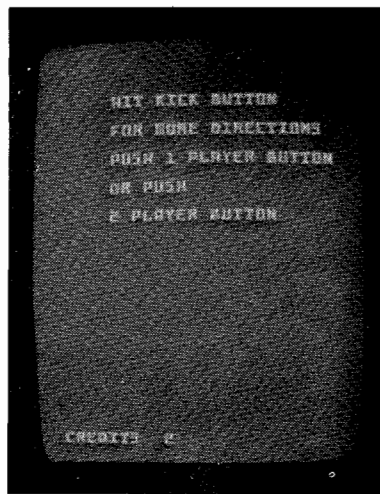
DISPLAY #3



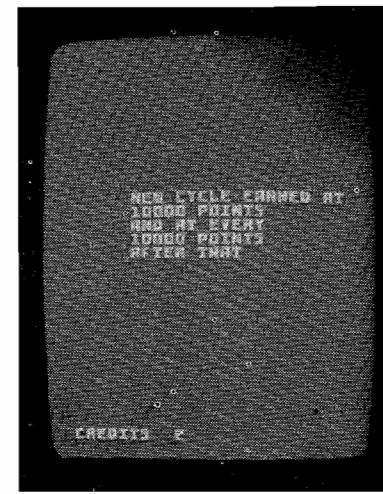
DISPLAY #4



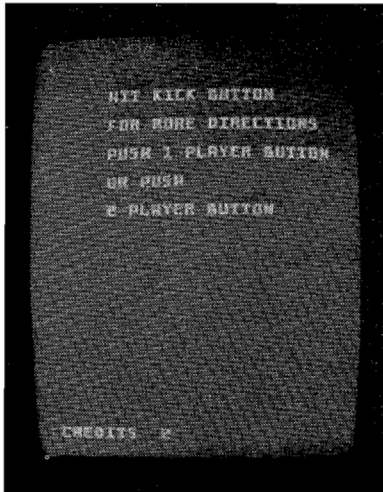
DISPLAY #5



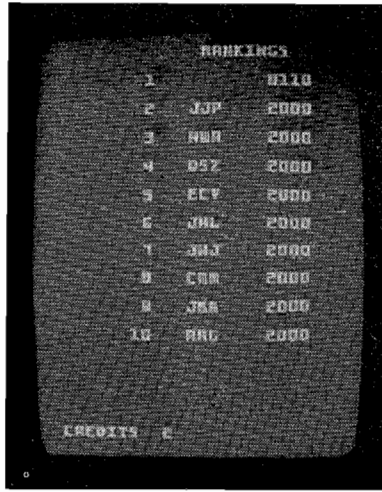
DISPLAY #6



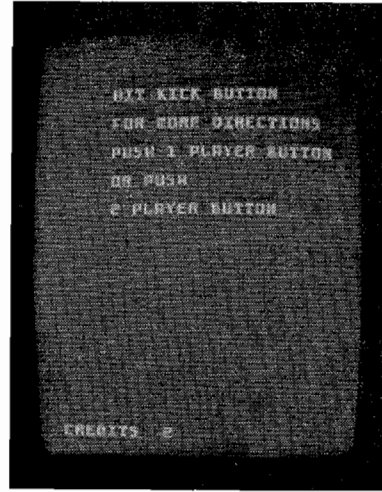
DISPLAY #7



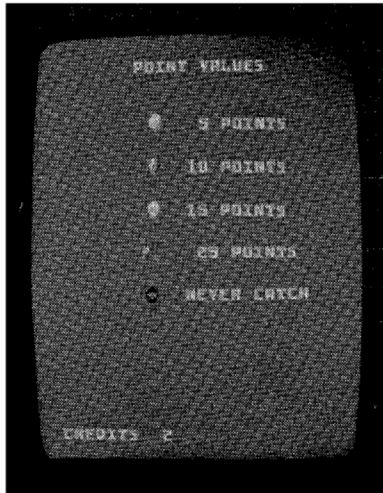
DISPLAY #8



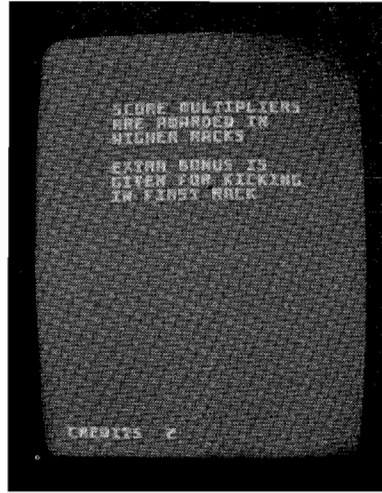
DISPLAY #9



DISPLAY #10



DISPLAY #11



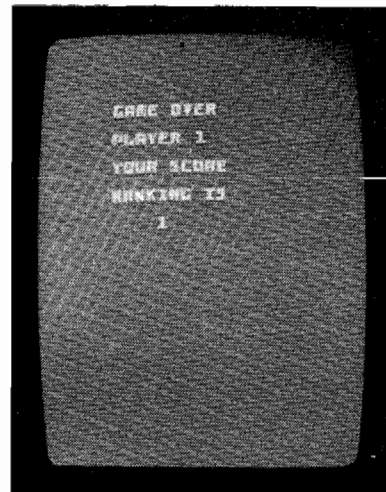
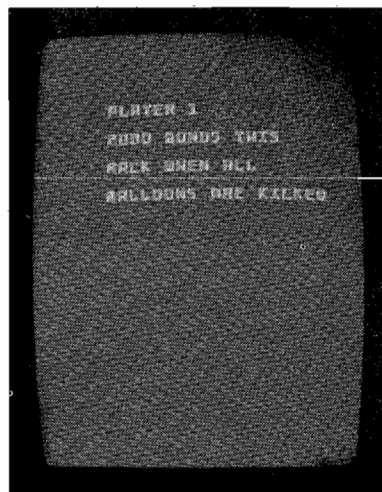
DISPLAY #12

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 the previous displays **centered** on the monitor screen.
4. If no START button is pressed, the game will hold the above "Instruction Message" display on the screen indefinitely.

PLAY MODE

1. The Play mode begins when either the "1 PLAYER" or the "2 PLAYER" start button is pressed. When this happens, the following is displayed **centered** on the monitor screen.
2. The Play mode ends when you have no more Clowns left to catch the falling balloons. When this happens, the following is displayed **centered** on the monitor screen.



3. The game is made up of groups of balloons, called "racks" which are displayed across the top of the screen. These balloons drop in a random order and you move your Clown back and forth to get under them and catch or pop each one as it comes down. Whether or not your Clown will catch or pop the balloons depends on what rack you are in.

The racks of balloons that are displayed one at a time at the top of the screen are made up of PAC-MEN, BLUE BALLOONS, RED BALLOONS, YELLOW BALLOONS, and various rack identifier symbols. Depending on what rack you are playing in, the rack identifier symbols are: 1st and 2nd racks — NONE USED, 3rd rack — INKY, 4th rack — PINKY, 5th rack — CLYDE, 6th and ALL succeeding racks — BLINKY.

RATE OF FALL: The BLUE BALLOONS are the fastest falling ones and the YELLOW BALLOONS are the slowest. The RED BALLOONS fall at a speed that is in between the fastest and slowest speeds mentioned above. All rack identifier symbols fall at the same rate as the BLUE BALLOONS.

PAC-MAN: The PAC-MAN will not appear at all in the 1st rack. At the recommended factory settings, he will appear three times in the 2nd rack and two times per rack from the 3rd rack on.

NOTE: The number of PAC-MEN that appear from the 2nd rack on is operator selectable by adjusting the game's level of difficulty. This is done in the "MACHINE SETUP" category of the Self-Test mode. This same level of difficulty adjustment also varies the number of the first rack at which you can have two balloons in the air at the **SAME** time (when you KICK a missed balloon, another one sometimes begins its fall as the KICKED balloon starts on its way back up).

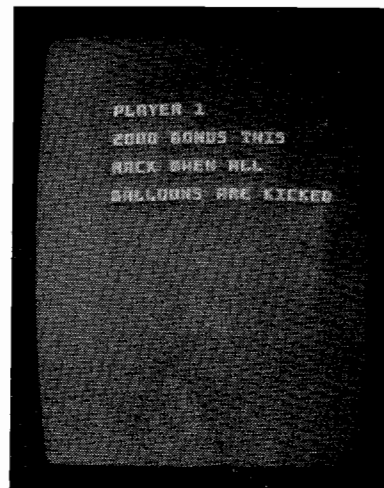
Normally, the bonus points for the balloons your Clown catches on his head would not be added to your score until your Clown had caught a full stack of eight. But, when the PAC-MAN drops and you position your Clown under him, he will eat all the balloons on your Clown's head and add their bonus point values to your score at the same time — right then and there. You also get a bonus of from 200 to 1600 points for caught PAC-MEN. However, if your Clown should not happen to have any balloons stacked on his head when a PAC-MAN falls, you can kick the PAC-MAN right back up with the balloons again where he will stay for a while before falling again. In this way, you can save your PAC-MEN for later use when you already have some balloons stacked on your Clown's head.

If you should miss a falling PAC-MAN and he hits the ground, this will cause your Clown to fall off his unicycle and you will lose one player. However, you **DO NOT** lose this "missed" PAC-MAN. When your next Clown and unicycle appear, the "missed" PAC-MAN will also reappear back in his spot among the balloons at the top of the screen.

If you have caught one or more PAC-MEN on your Clown's head and you miss a falling object **OF ANY TYPE**, allowing it to hit the ground and causing your Clown to fall off his unicycle, you lose the PAC-MEN and the chance of getting a "SUPER PAC-MAN BONUS" of 1600 points **in this rack**. You also lose the bonus points for any balloons and/or rack identifier symbols caught up to the time when your Clown fell.

PAC-MAN BONUS POINT SCORING: In a 4 PAC-MAN rack, the 1st PAC-MAN on your Clown's head is worth 200 PAC-MAN BONUS POINTS, the 2nd PAC-MAN on your Clown's head is worth 400 PAC-MAN BONUS POINTS, the 3rd PAC-MAN on your Clown's head is worth 800 PAC-MAN BONUS POINTS, and the 4th PAC-MAN on your Clown's head is worth 1600 PAC-MAN BONUS POINTS. If all 4 PAC-MEN are still on your Clown's head when the last balloon or rack identifier is eaten, you are awarded an additional PAC-MAN SUPER BONUS of 1600 points. However, if you caught 1 PAC-MAN on your Clown's head, received your 200 PAC-MAN BONUS POINTS, and then fall off your unicycle — losing the caught PAC-MAN and any balloons that were on your Clown's head at the time of the fall, **THE NEXT PAC-MAN YOU CATCH WILL THEN BE CONSIDERED THE 1st PAC-MAN ON YOUR CLOWN'S HEAD BY THE GAME AND YOU WILL ONLY RECEIVE 200 PAC-MAN BONUS POINTS FOR HIM.**

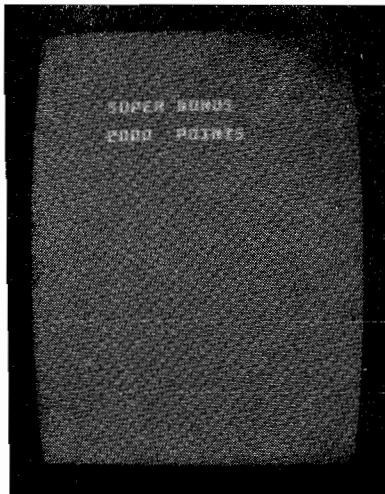
4. **FIRST RACK PLAY:** Just after you push the 1 or 2 player button, the message displayed below is shown **centered** on the monitor screen:



Then the game setting, your Clown, and the balloons appear on the monitor screen and play begins. The 1st rack contains only 16 balloons. They are mostly Yellow (slow falling) with a few Red (medium falling) ones mixed in.

In this rack, the balloons are popped by the pin in the Clown's hat when you position him under one of the descending balloons. At the same time as it is popped, the balloon's point value is added to your score. If you kick the balloon and then pop it, its point value **plus** its bonus point value will be added to your score when the balloon is popped.

If **ALL** the balloons in the first rack were **kicked** and **then** popped, the game gives this message **centered** on the monitor screen.

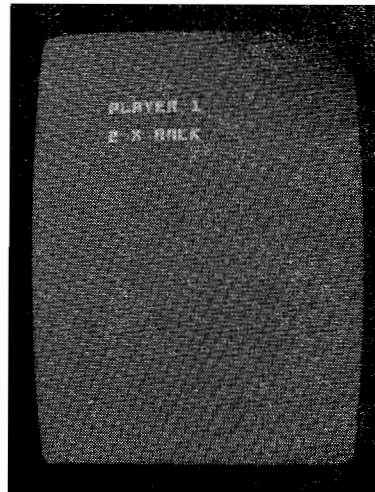


These points are then added to your score and the next rack appears on the screen.

5. **SECOND RACK PLAY:** The 2nd rack begins with 24 balloons. They are mostly Yellow and Red with a few Blue (fast falling) ones mixed in. Also mixed in with the balloons are at least two PAC-MEN. There could be more depending on where the "DIFFICULTY LEVEL" option is set. Refer to Figure 8g.
6. **CHALLENGING RACKS:** The CHALLENGING RACKS occur **between** racks 2 and 3, 4 and 5, 6 and 7, 8 and 9, etc. Play begins with balloons and an occasional bomb being thrown out of the buildings to the right and left of the Clown. **You** have to make the Clown catch the balloons. But **never NEVER** catch a bomb or it will blow your Clown off his unicycle and you will lose all the bonus points for the balloons you caught up to that time. If your Clown misses a balloon and lets it touch the ground, he will also fall off his unicycle and you lose all the bonus points for the balloons he caught until he fell. However, you **DO NOT** lose a Clown when he falls of his unicycle in a CHALLENGING RACK as you would when he falls off it during normal play.

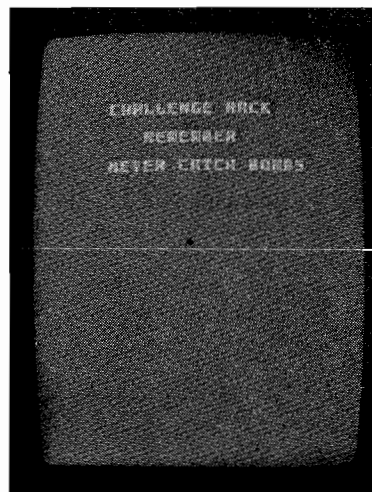
Your Clown **MUST** catch eight balloons to get **ANY** of the bonus points for the balloons caught in the CHALLENGING RACK. After the eighth balloon is caught, the Clown will pop all eight and their bonus point values will be added to your score.

7. When you catch the last balloon of a rack, the game gives the message shown below.



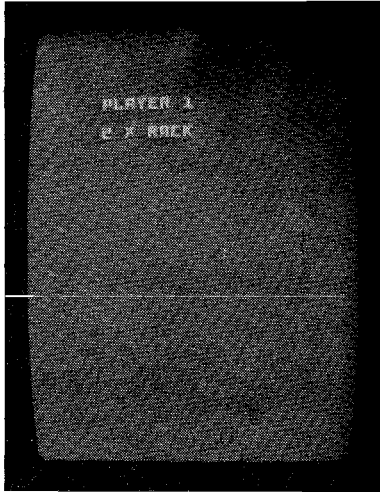
In this way, the game tells you which player — NUMBER 1 or NUMBER 2 — is being advanced to the next rack and what the number of the bonus multiplier is for that next rack. The bonus multipliers range from 2 to 5.

The only exception to this would be when the next RACK is a CHALLENGING RACK. When this is the case, you will see this message displayed **centered** on the monitor's screen:



The CHALLENGING RACKS are described above.

After each CHALLENGING RACK is over, the game gives the message below displayed **centered** on the monitor screen:

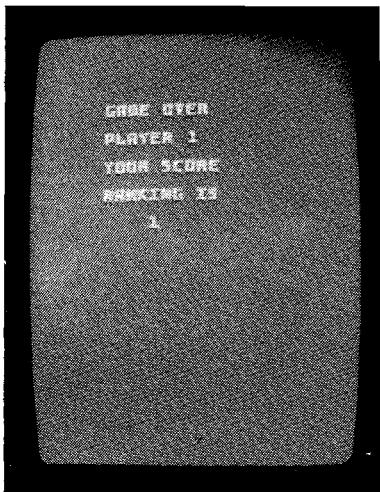


Then your Clown and the next rack of balloons appear on the monitor screen and play begins.

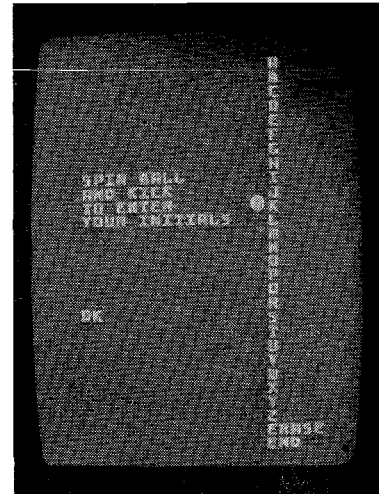
8. As you improve your skills and become better and better at the game, advancing into the more difficult racks, you will see only two PAC-MEN per rack, an ever increasing number of Blue balloons which will fall at an angle instead of straight down, and when you "KICK" a missed balloon, another sometimes begins its fall right away (you then have **TWO** balloons in the air at the **SAME** time). However, you can **NEVER** have **MORE** than two balloons in the air at the **SAME** time.

When you miss a balloon and it hits the ground causing your Clown to fall off his unicycle, assuming you have at least one reserve unicycle left, your Clown and a new unicycle appear in the center of the monitor screen, the circus music starts to play, and play begins anew.

When you miss a balloon and your Clown falls off his **LAST** unicycle, these words are displayed **centered** on the monitor screen as shown below.



If your score was high enough to become one of the ten best scores, the game will go into the High Score/Initial mode immediately after the above display. If your score is not high enough to cause the game to go into the High Score/Initial mode, it will either go to the Attract mode (if there are no more credits left in its memory) or into the Ready-To-Play mode (if there are still credits left in its memory). In the High Score/Initial mode the game gives a display which looks like that shown below.



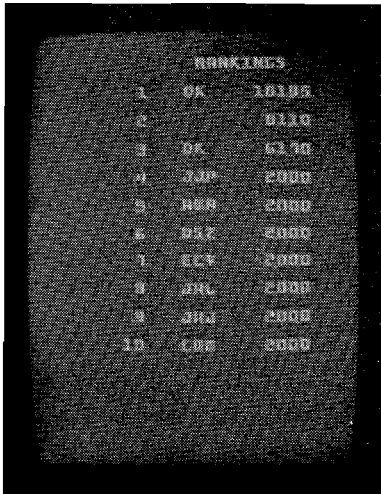
By spinning the controller ball to the right, you can make the balloon move down the alphabet: "A", "B", "C", "D", etc. By moving the controller ball to the left, you can make the balloon move up the alphabet: "Z", "Y", "X", "W", etc.

When you reach your initial, stop the rotation of the controller ball and push the KICK button. Your initial is printed out below the on-screen instructions. If you do not wish to put your initials opposite your score, just press the KICK button three times. Three "A" 's will appear below the on-screen instructions. Or — you can push either the 1 or 2 PLAYER button to leave this mode immediately.

NOTE: If you make a mistake, you can erase the wrong letter by positioning the balloon opposite the "ERASE" word at the bottom of the line of alphabet characters and pressing the KICK button. Then simply go back and print out the correct letter.

When you've printed out your last initial, move the balloon opposite the "END" word and press the KICK button to tell the game you are through printing out your initials. The game will then give the following RANKINGS display showing your score opposite your ranking and your initials.

NOTE: If you don't tell the game you are through printing out your initials as instructed above, the game will automatically go into the RANKINGS display after a short wait.



After the High Score/Initial mode, the game will either go to the Attract mode (if there are no more credits left in its memory) or into the Ready-To-Play mode (if there are still credits left in its memory).

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

TWO PLAYER OPERATION

The Upright, Mini, and Cocktail Table models all 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.

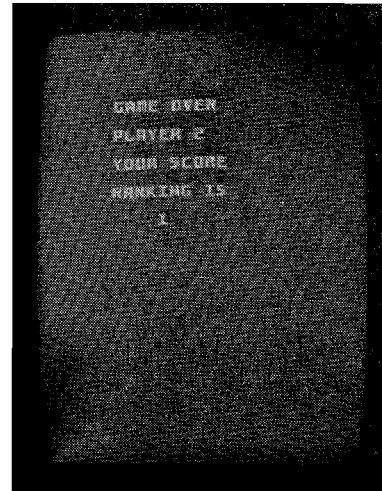
- In the Upright and Mini models, the players must take turns at the controls.
- In the Cocktail Table model, each player has his own set of individual controls. The picture will flip to face you when it is your turn. (When it is not your turn, your set of controls will have **NO** effect on the game.)
- Your turn lasts until your Clown falls off his unicycle. At this point, the game will do one of several things depending on whether or not the fallen Clown was riding your last unicycle or if you still have others remaining in reserve.

FALLEN CLOWN — UNICYCLES REMAINING IN RESERVE

- The game stops and the other player's Clown and balloons appear on the screen.
- Next, "PLAYER __ UP" is displayed at right middle of the monitor screen and game play begins for the other player.

FALLEN CLOWN — NO UNICYCLES REMAINING IN RESERVE

- Game displays:



- After the above display, if your score was high enough, it goes to the "HIGH SCORE/INITIAL" mode.
- After this mode, the other player's Clown, balloons, and "PLAYER __ UP" appear on the monitor screen. Play then begins for the other player.
- If your score was **NOT** high enough to cause the game to go into the "HIGH SCORE/INITIAL" mode, the game will just display the other player's Clown, balloons, and "PLAYER __ UP" on the monitor screen. Then play begins for the other player.

III. Maintenance and Repair

Your KICK-MAN 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 **CAN NOT** 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 11.

1. UPRIGHT MODEL:

As viewed from the back, facing the cabinet, with the rear access door removed; the fuses are located on the Mech. Panel and the Power Supply Board.

2. MINI MODEL:

As viewed from the back, facing the cabinet, with the rear access door removed; the fuses are located on the Mech. Panel and the Power Supply Board.

3. 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 Mech. Panel and the Power Supply Board.

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 monitor manufacturer) and/or the T.V. Troubleshooting Section of this manual for further information.

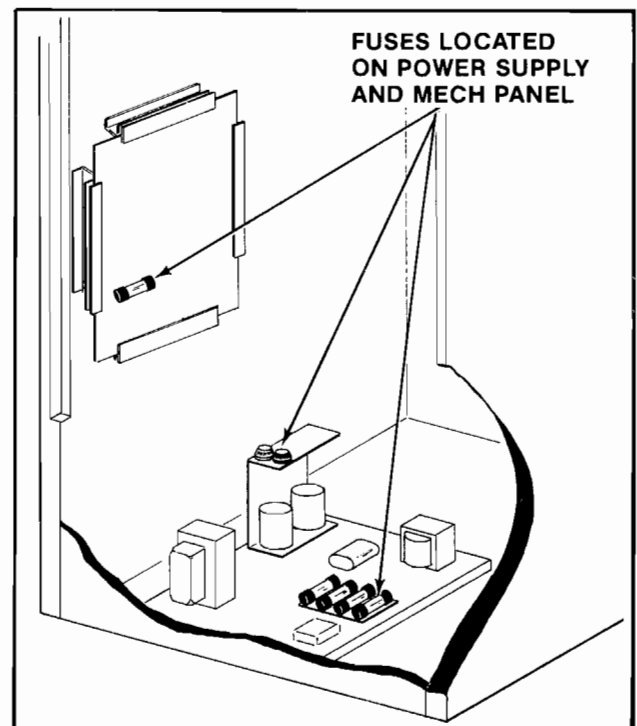


Figure 11 Location of fuses

OPENING THE CONTROL PANEL

1. UPRIGHT MODEL: SEE FIGURE 12.

- The control panel is held in place by two latches, one on the left side and one on the right side of the cabinet.

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 front 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.
The control panel is now free and can be removed.
- To reinstall the control panel, reverse this procedure.

2. MINI MODEL: SEE FIGURE 13.

- The control panel is held in place by two latches, one on the right side, and one on the left side of the cabinet.

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.
The control panel is now free and can be removed.
- To reinstall the control panel, reverse this procedure.

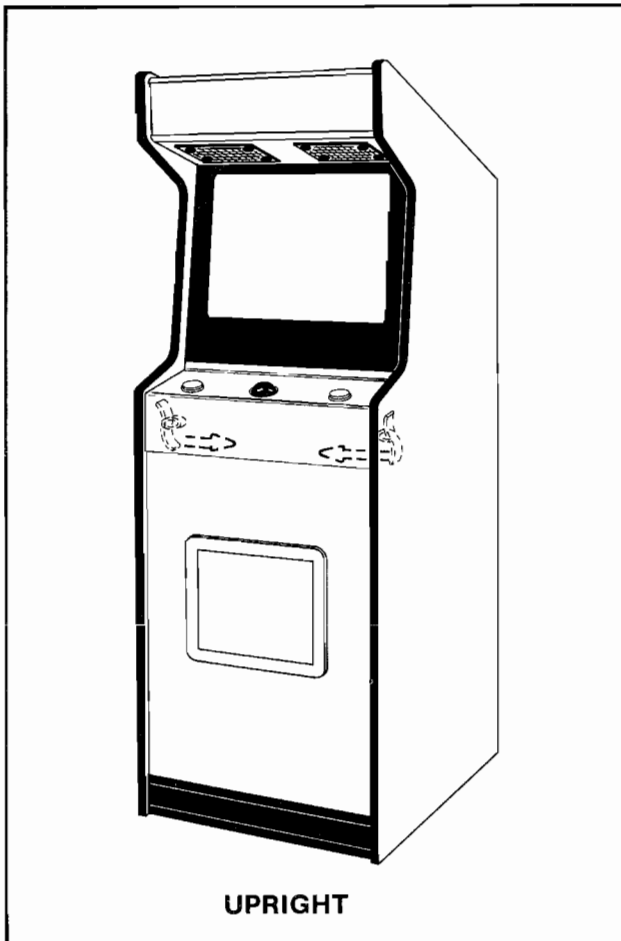


Figure 12 Removing control panel - Upright game

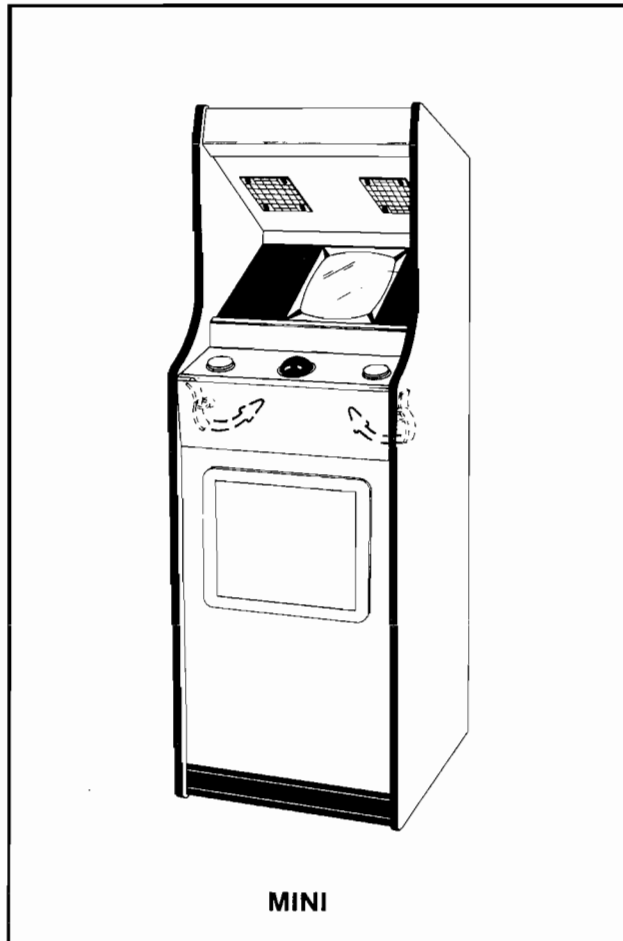


Figure 13 Removing control panel — Mini game

3. 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 14.

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

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

Grasp the table top at "A" and open as is indicated in Figure 14.

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 15.

- 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.

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

1. UPRIGHT MODEL:

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.
- Grasp the main-display-glass in the bottom center, lift up slightly and pull it toward you about an inch, let it down just far enough so you can get hold of its top edge with your other hand and lift it out of the game. See Figure 16.
- Remove the screws which secure the T.V. bezel assembly in place.
- The T.V. bezel assembly is now free and can be slid out of the cabinet. See Figure 17.
- To reinstall the T.V. bezel assembly and the main-display-glass, reverse this procedure.

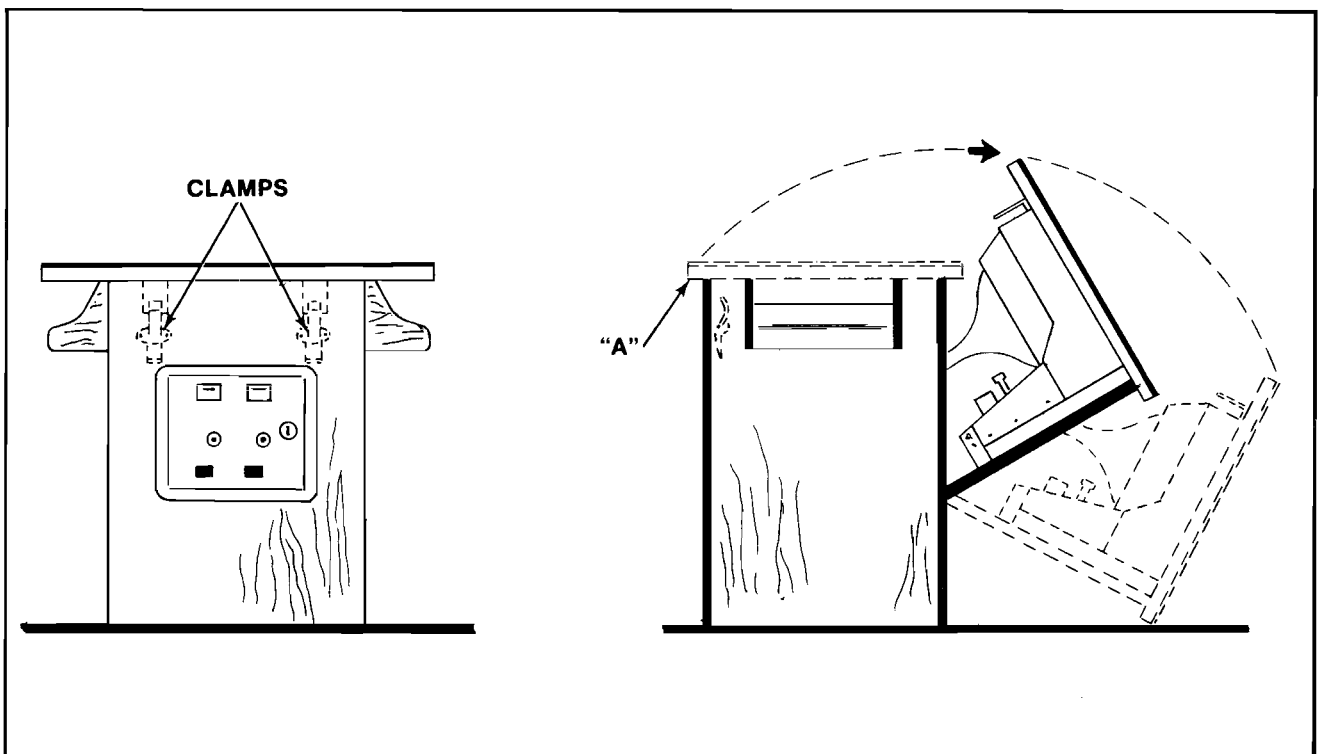


Figure 14 Opening Cocktail game

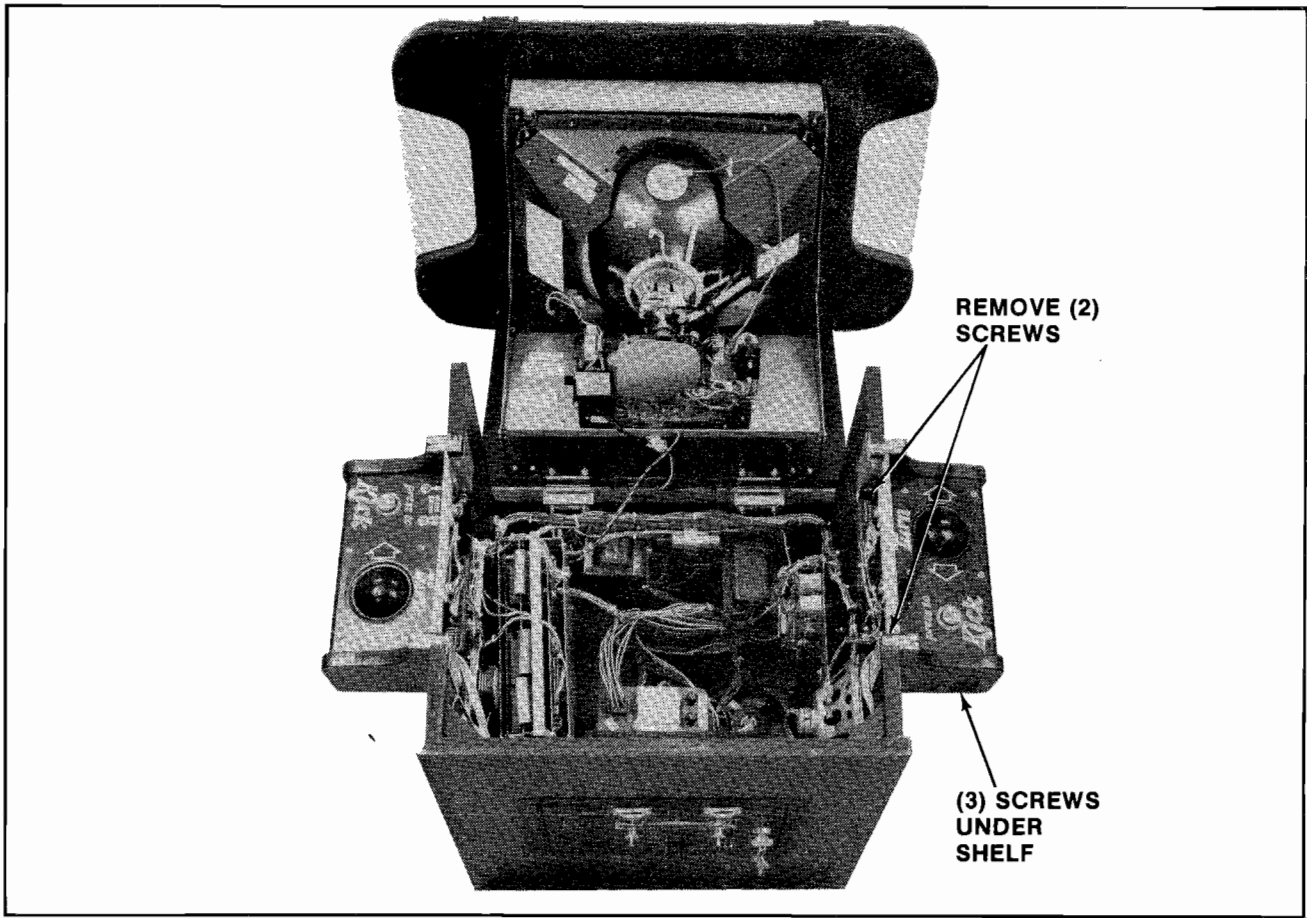


Figure 15 Removing control panel — Cocktail game

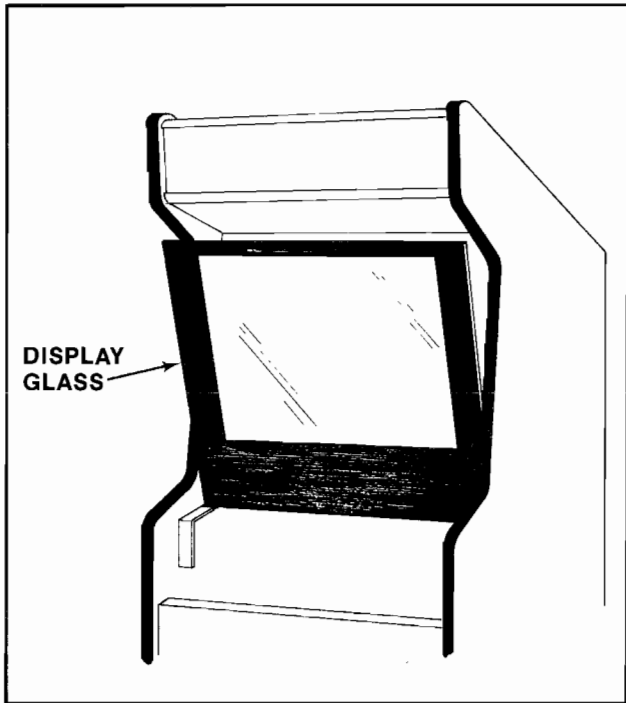


Figure 16 Removing display glass — Upright game

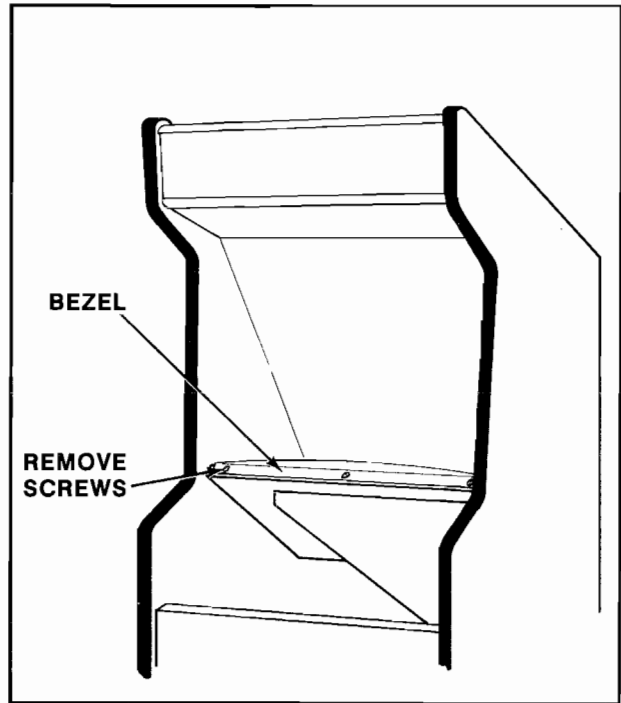


Figure 17 Removing bezel — Upright game

2. MINI MODEL:

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

- Turn the power off to the game and remove the control panel.
- Remove the screws which secure the glass clamping plate. See Figure 18.
- Lift out the glass clamping plate. 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 18.
- Remove the screws which secure the T.V. bezel assembly and lift it out. See Figure 19.

NOTE: Use the hole in the center of the main-display-glass support to grasp it.

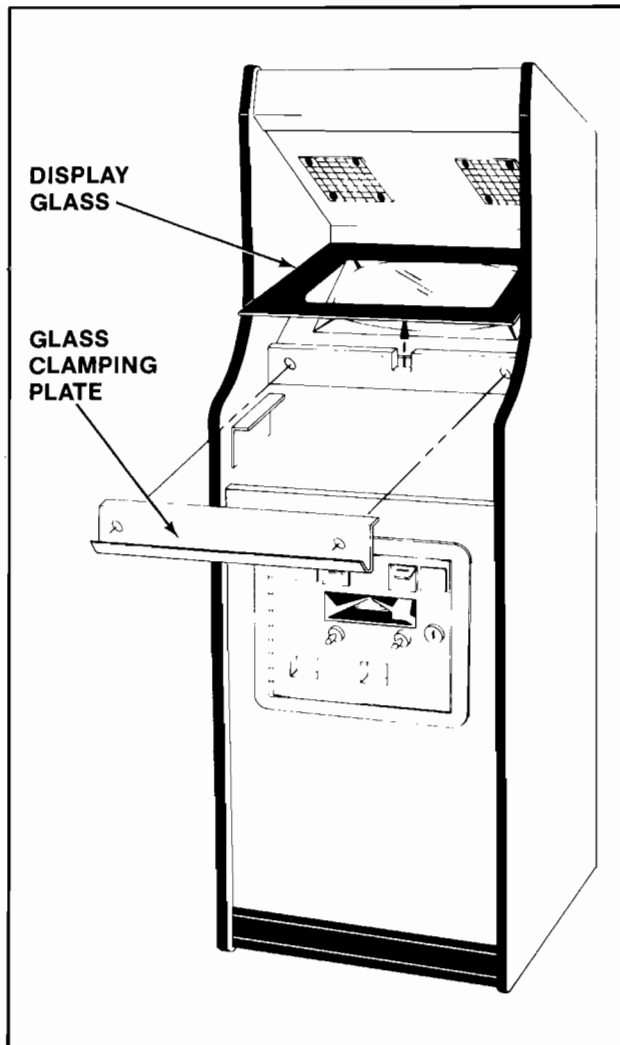


Figure 18 Removing display glass — Mini game

- Reverse this procedure to reinstall the T.V. bezel assembly and the main-display-glass.

3. COCKTAIL TABLE MODEL:

NOTE: This may be done with the table top in the closed or the open 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.
- Lift out the T.V. bezel assembly.
- To reinstall the T.V. bezel assembly and the table top glass, simply reverse this procedure.

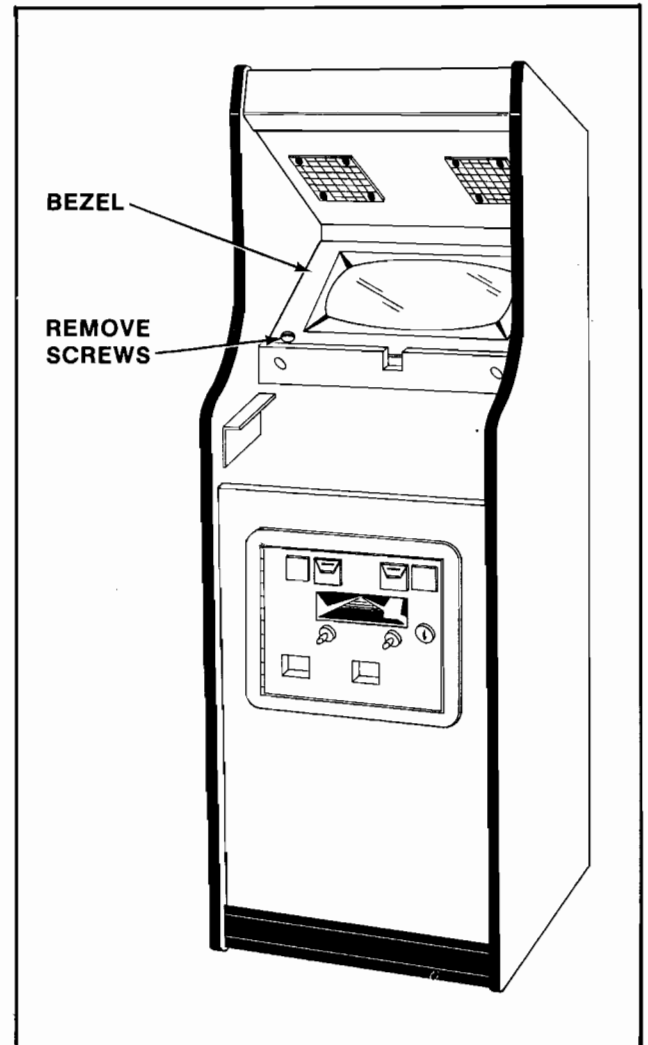


Figure 19 Removing bezel — Mini game

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 20.

- 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 and bezel must be removed. See above "Upright Model" procedure.
- With the removal of only four bolts, the T.V. monitor and its mounting board will be loose.

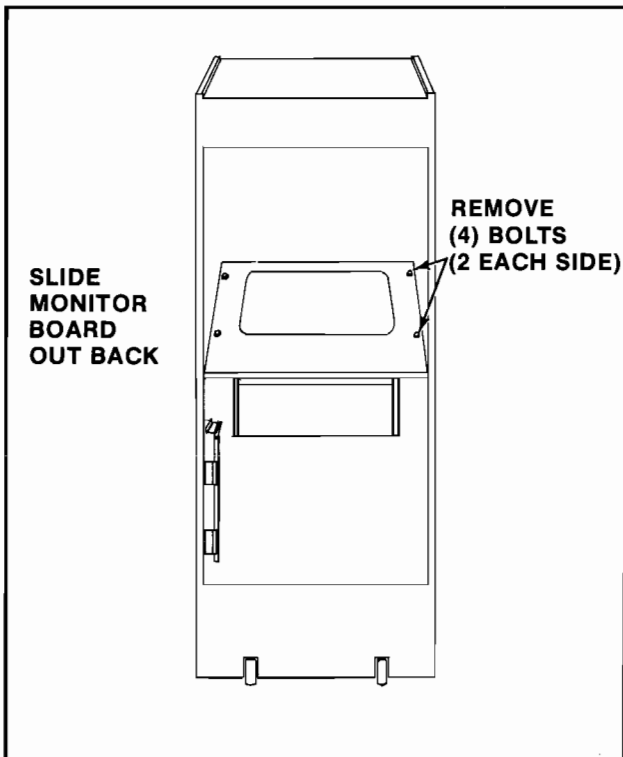


Figure 20 Removing monitor — Upright game

- The monitor mounting board slides 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.
- To reinstall the T.V. monitor, reverse this procedure.
- After replacing the T.V. monitor, be sure to run the game Self-Test.

2. MINI MODEL: SEE FIGURE 21.

- Turn the 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 and bezel must be removed. See above "Mini Model" procedure.
- With the removal of only four bolts, the T.V. monitor will be loose.

CAUTION: BE SURE to support the T.V. monitor from the rear while removing the four bolts so it will not fall out of the cabinet.

- The monitor is removed by supporting it and pulling straight back. (BE CAREFUL not to hit monitor on its rear support bracket.)
- To reinstall the T.V. monitor, reverse this procedure.
- After replacing the T.V. monitor, be sure to run the game Self-Test.

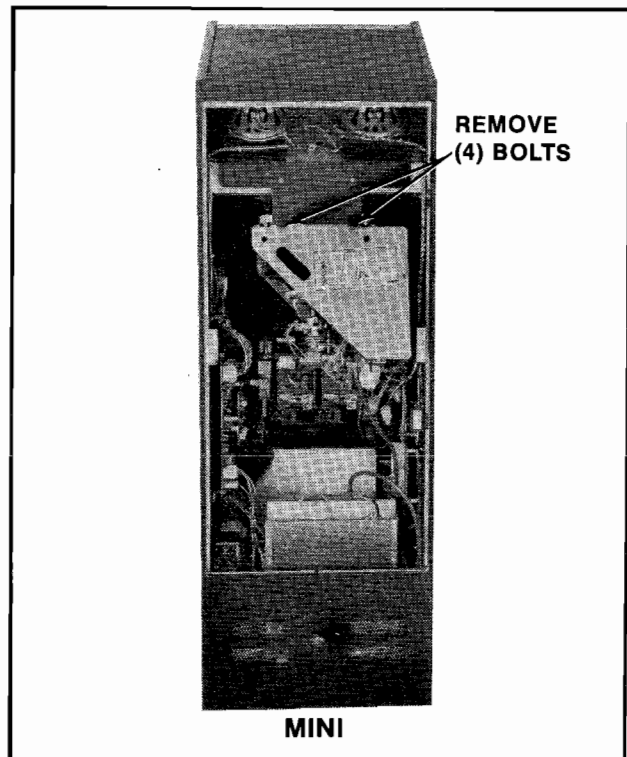


Figure 21 Removing monitor — Mini game

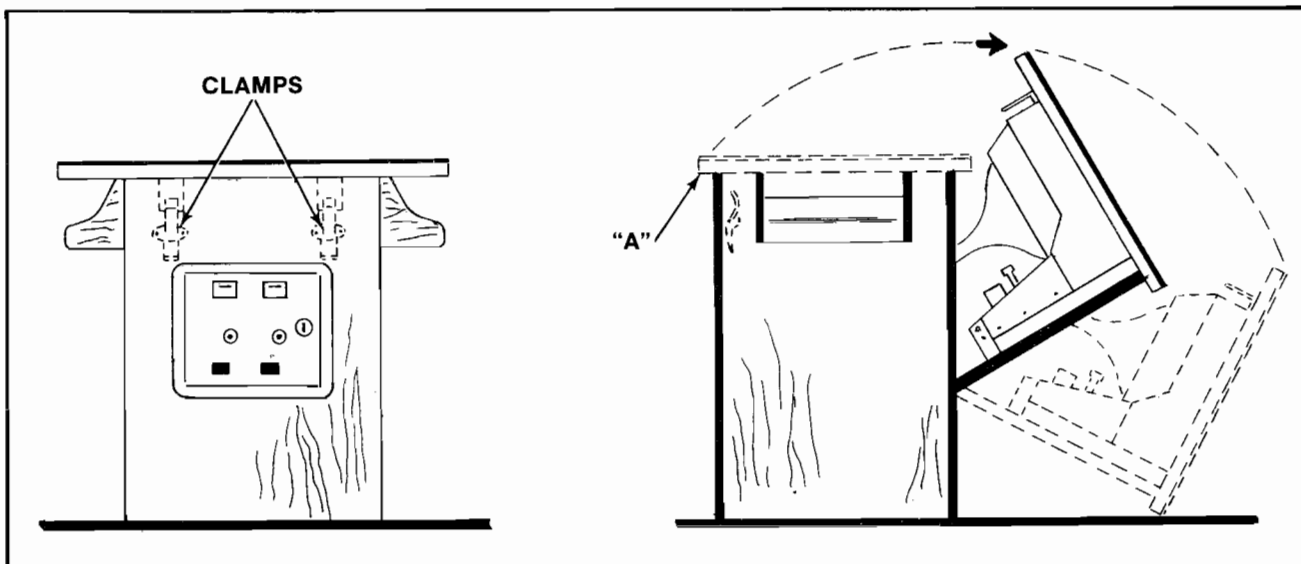


Figure 22 Opening Cocktail game

3. COCKTAIL MODEL:

- Turn the power off to the game.
- Open the coin box door and release the two latches indicated in Figure 22.

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

Once the latches are released, unhook them from their latch plates.

- Grasp the table top at "A" and open it as indicated in Figure 22.

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 23.
- 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 23.
- 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 assembly 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.

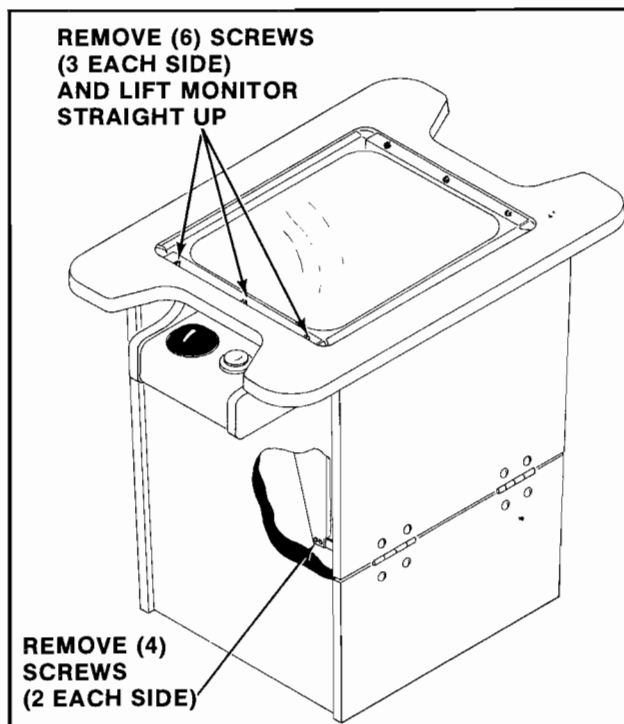


Figure 23 Removing monitor — Cocktail game

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

1. UPRIGHT MODEL. SEE FIGURE 24.

- Turn the power to the game off.
- Unlock and open the rear access door.
- Disconnect all cabling from the P.C. boards and lift them out of their card rack.
- Disconnect the linear power supply board from all its cabling, remove the P.C.B. supports indicated in Figure 24, and slide the linear power supply board out the back of the cabinet.
- To reinstall the above P.C.B.'s, reverse this procedure.

2. MINI MODEL. SEE FIGURE 24.

- Turn the power off to the game.
- Unlock and open the rear access door.
- Disconnect all cabling from the P.C. boards and lift them out of their card rack.
- Disconnect the linear power supply board from all its cabling, remove the P.C.B. supports indicated in Figure 24, and slide the linear power supply board out the back of the cabinet.
- To reinstall the above P.C.B.'s, reverse this procedure.

3. COCKTAIL TABLE MODEL. SEE FIGURE 24.

- Turn the power off to the game.
- Open the cabinet:
Open the coin box door and release the two latches indicated in Figure 22.

NOTE: P.C.B.'s are all keyed and will **ONLY** fit into their connectors 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.

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

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

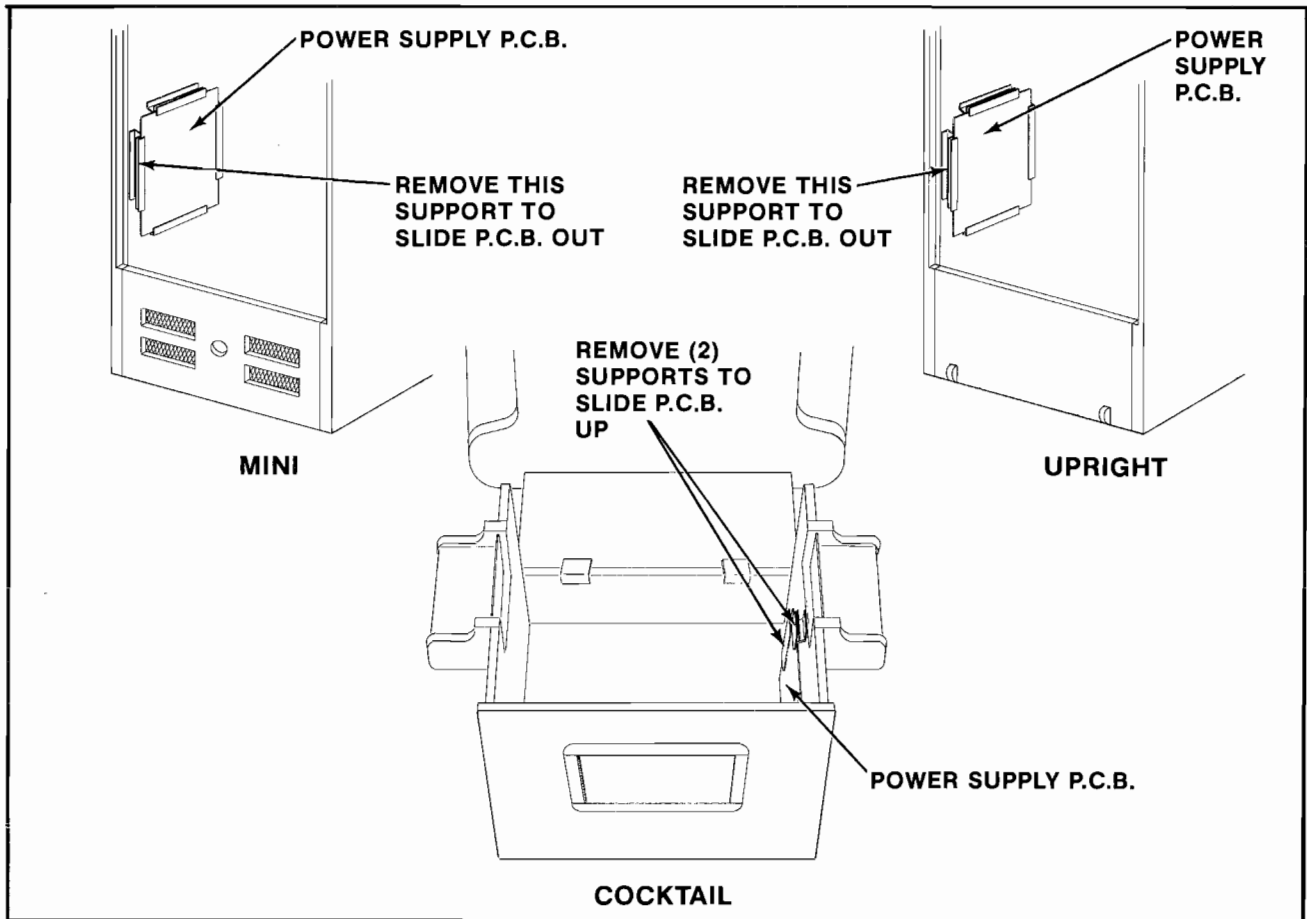


Figure 24 Replacing power supply P.C.B. — All versions

- Grasp the table top at "A" and open it as indicated in Figure 22.

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

- Remove the linear power supply board. See Figure 24.
Disconnect it from all its cabling.
Remove the two smallest P.C.B. supports.
Once these are removed, the linear power supply can be lifted out the top of the cabinet.
To reinstall the linear power supply board, reverse this procedure.
- To remove the P.C. boards from the card rack. See Figure 25.
Disconnect them from ALL their cabling.
The P.C. boards are now free and can be slid from their rack.
To reinstall the P.C. boards, reverse this procedure.

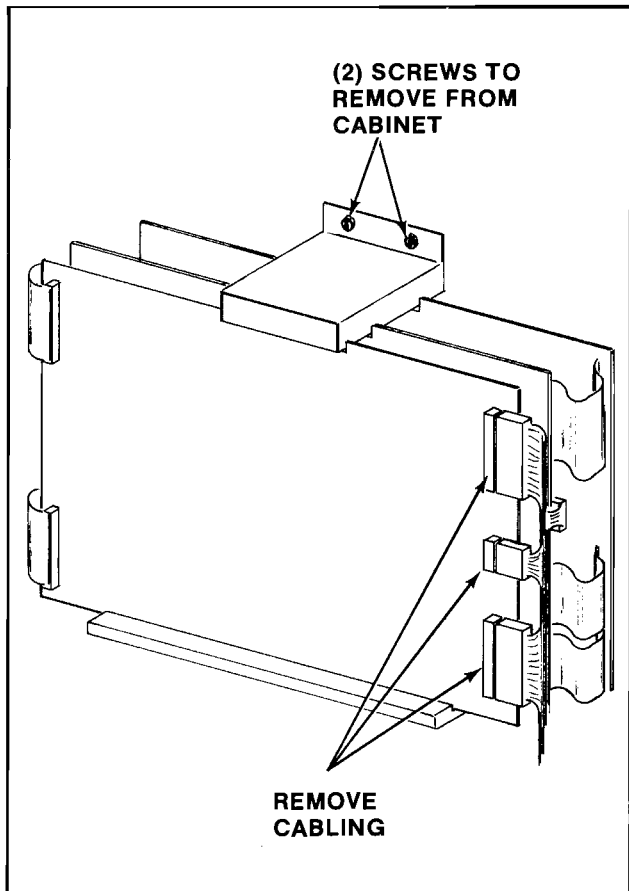


Figure 25 Replacing card rack P.C.B.'s —
All versions

OPENING THE ATTRACTION PANEL:

1. UPRIGHT MODEL:

- 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 26.
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 27.
Be sure the power to the game has been turned off.

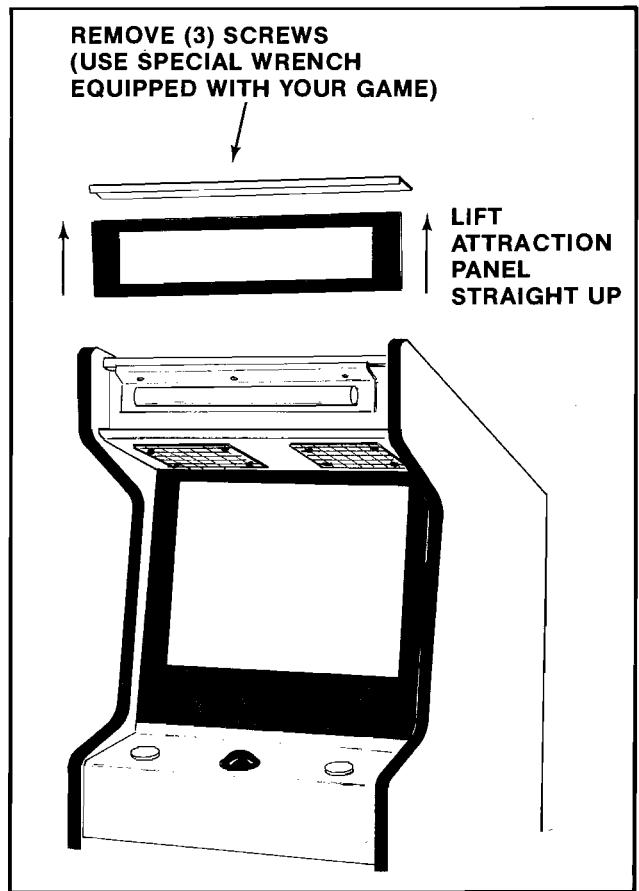


Figure 26 Removing attraction panel —
Upright game

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. See Figure 28.

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 it's power cable on anything.

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

- Replacing the speaker. See Figure 29.

Be sure the power is off to the game.

Remove the attraction panel and disconnect the speaker from it's 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.

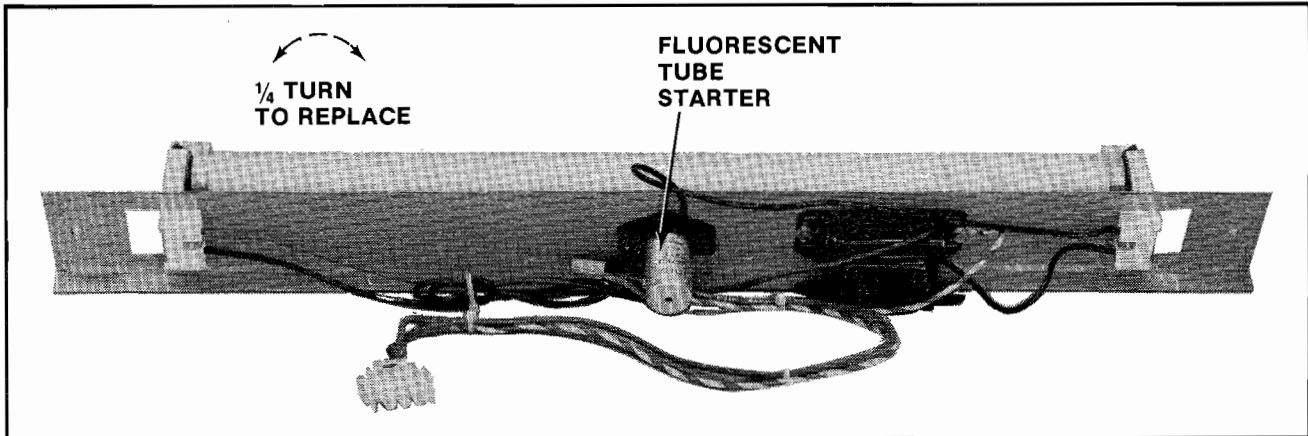


Figure 27 Replacing fluorescent starter — Upright game

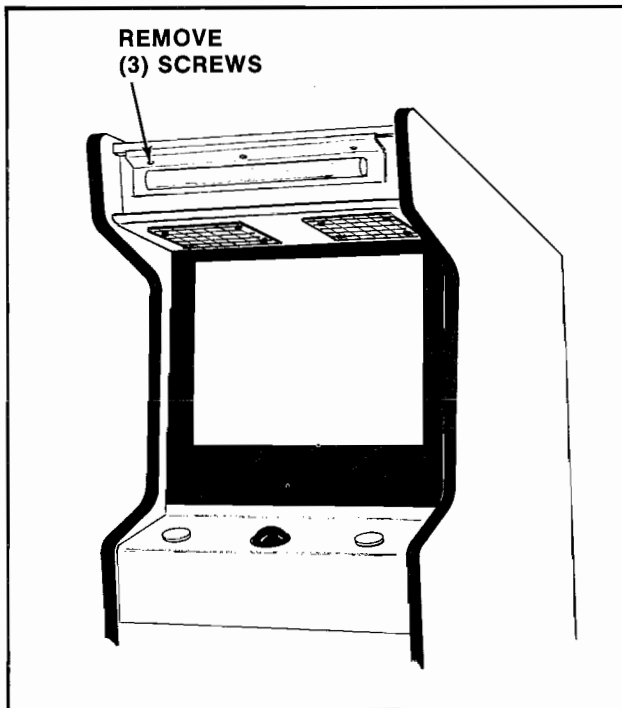


Figure 28 Replacing fluorescent light mounting bracket — Upright game

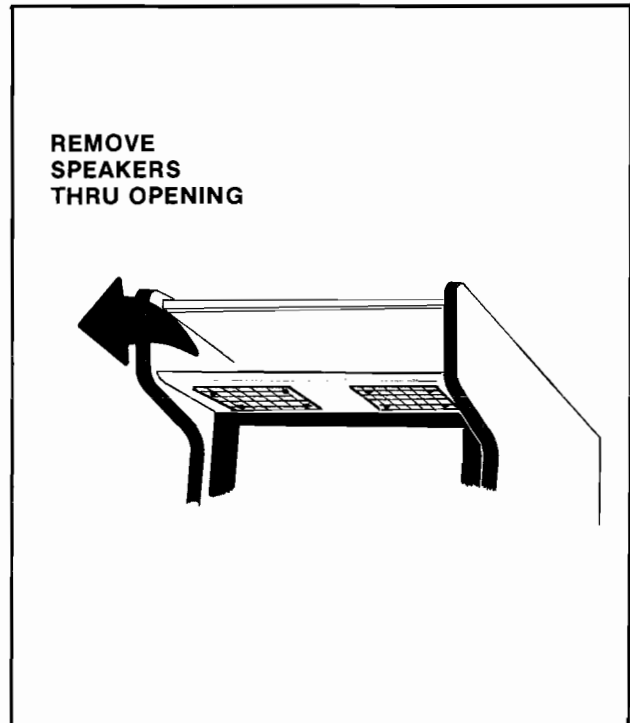


Figure 29 Replacing speaker — Upright game

2. MINI MODEL. SEE FIGURE 30.

- **Turn the power off to the game.**
- Remove the screws from the top and bottom of the formed attraction panel.
- Remove the formed attraction panel by pulling it straight away from the cabinet. This exposes the attraction panel light bulbs and their mounting board.
- To service the light bulbs and their mounting board:
Turn the power to the game back on so you can see which bulbs are burnt out.
Mark the burnt out bulbs and turn the power to the game back off again.
To replace the burnt out bulbs, grasp them gently and pull straight out.
The new bulbs are gently pushed into the empty sockets.
- To completely replace the light bulb mounting board:

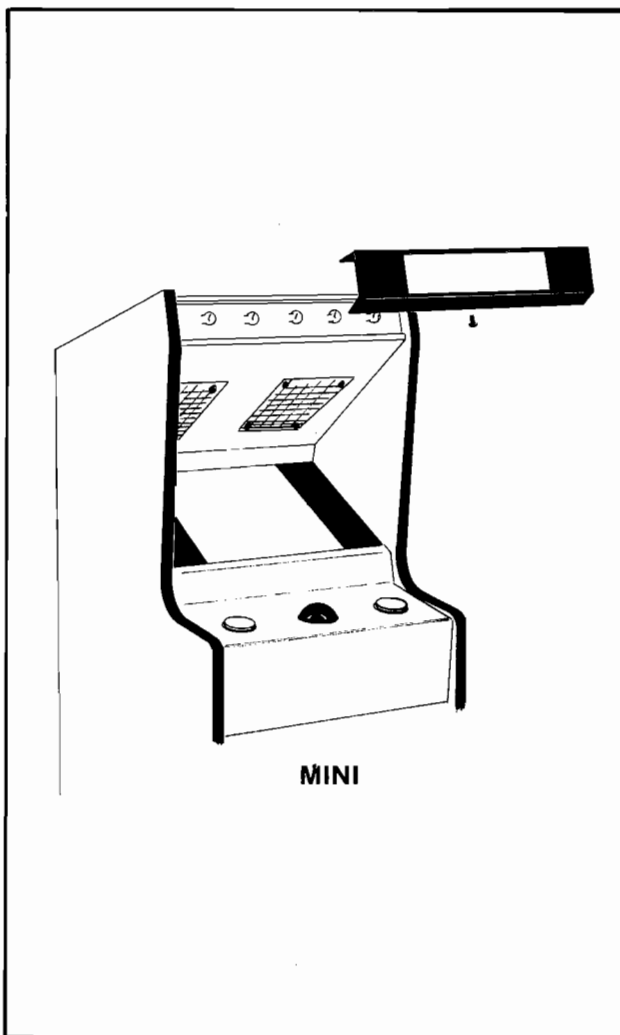


Figure 30 Removing attraction panel — Mini game

Open the cabinet rear access door and unplug the mounting board from its power cable. Remove the screws that hold the mounting board to the cabinet.

Gently slide the mounting board out the front of the cabinet being careful not to catch its cable on anything.

To reinstall the above removed items, reverse this procedure.

- To replace the speaker. See Figure 31.
Be sure the power is off to the game.
Disconnect the speaker from its cabling. Remove the nuts and bolts securing the speaker.
Slide the speaker out through the rear access door.
To reinstall the speaker, simply reverse this procedure.

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

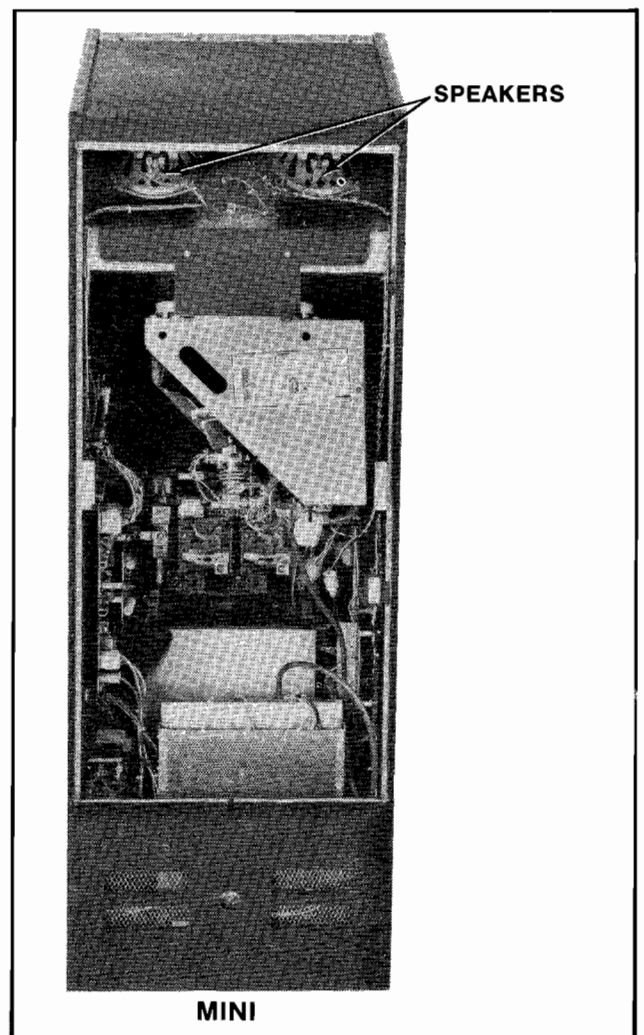


Figure 31 Replacing speaker — Mini game

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 32.
 - 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.
4. Clean the magnet of all foreign particles. See Figure 33.
 - 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.)

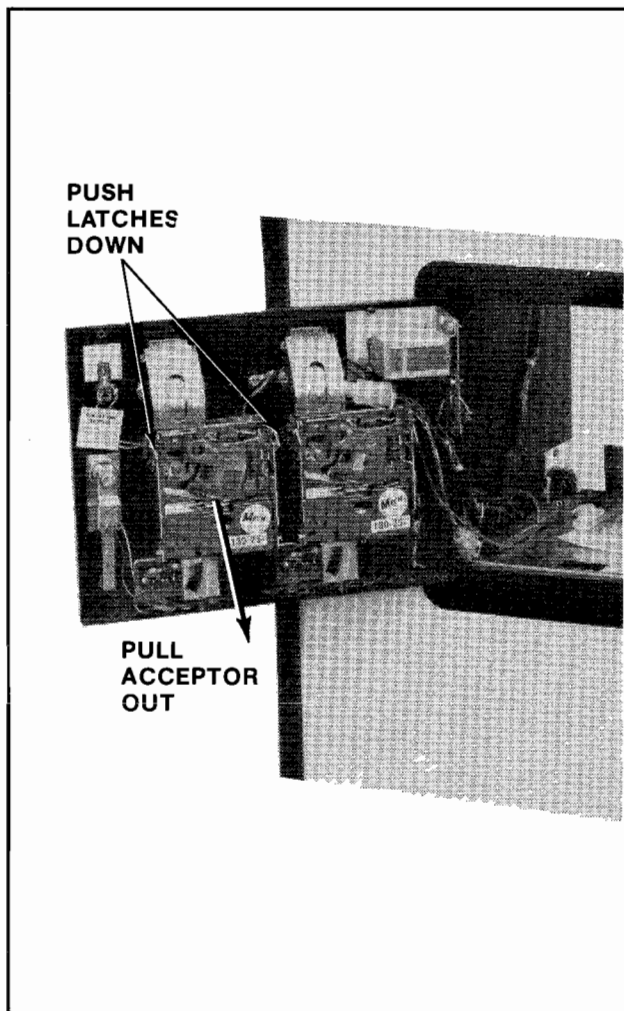


Figure 32 Removing coin acceptor

- 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.

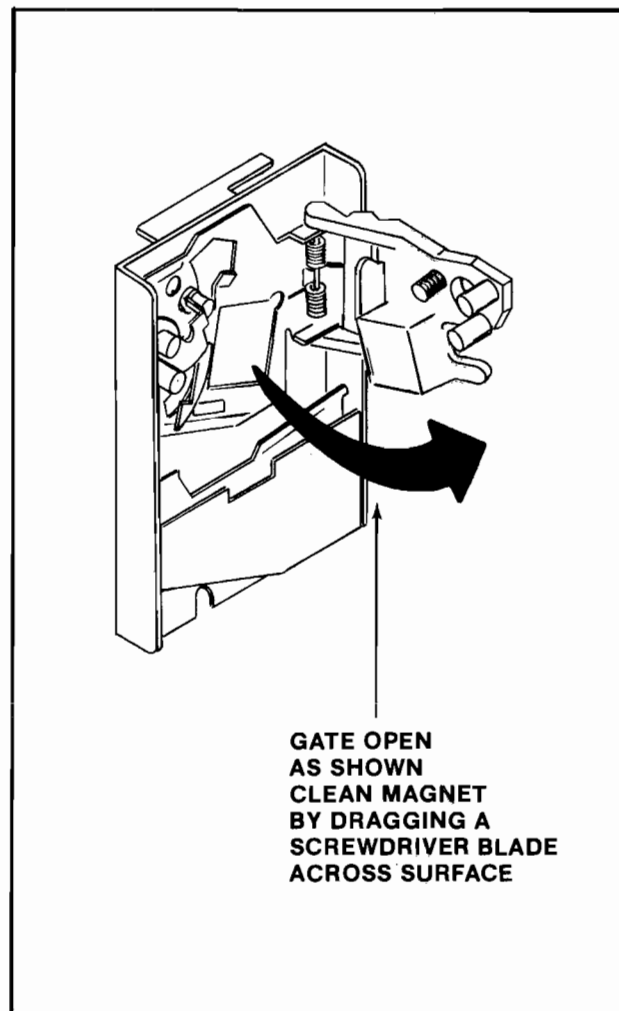


Figure 33 Opening the metal coin acceptor

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 34.
- 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 35.
- 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.

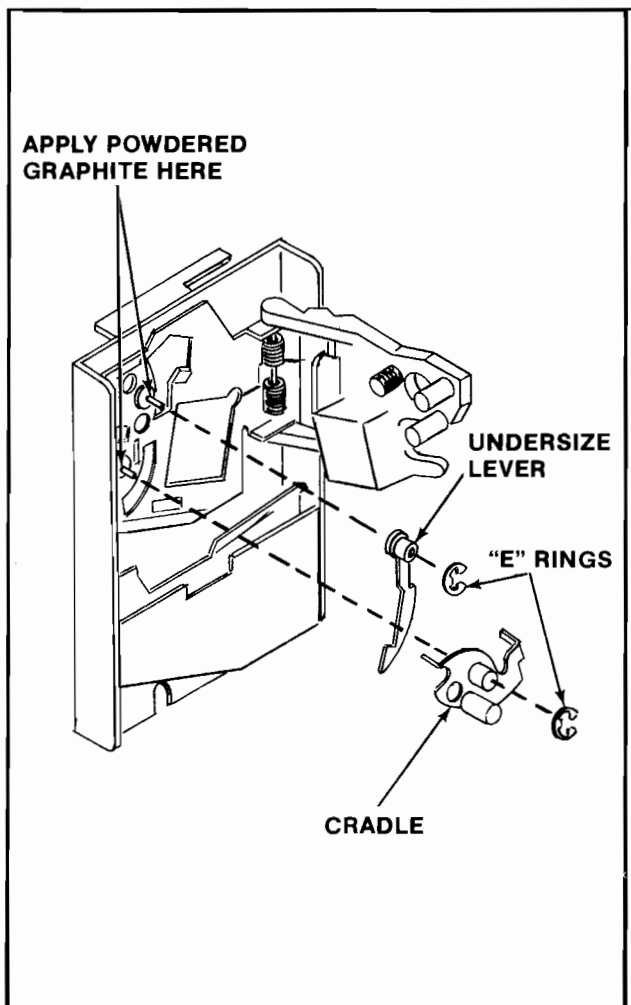


Figure 34 Lubricating the metal coin acceptor

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 32.
 - 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 36 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).

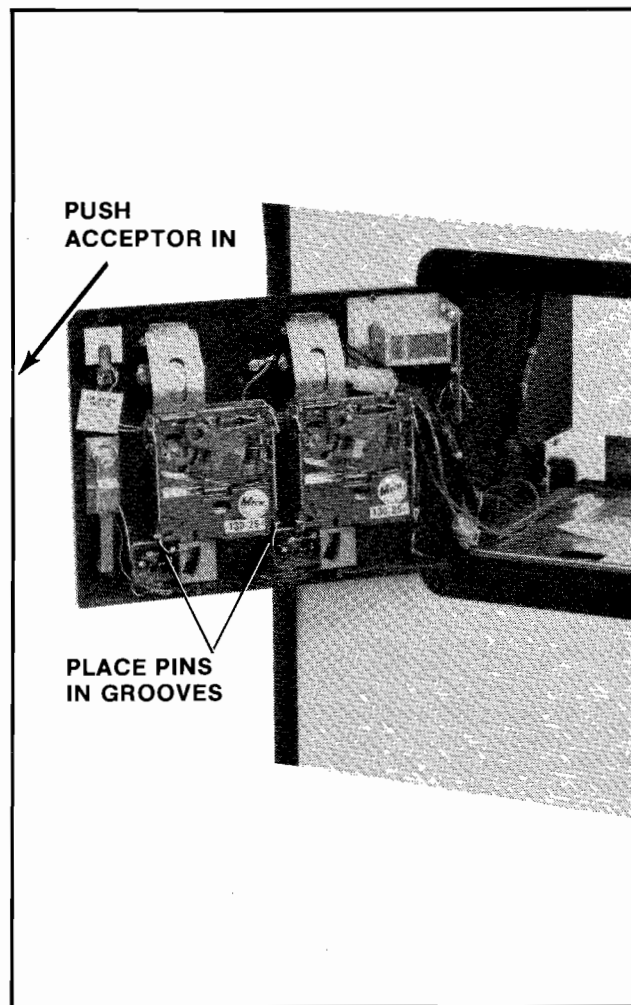
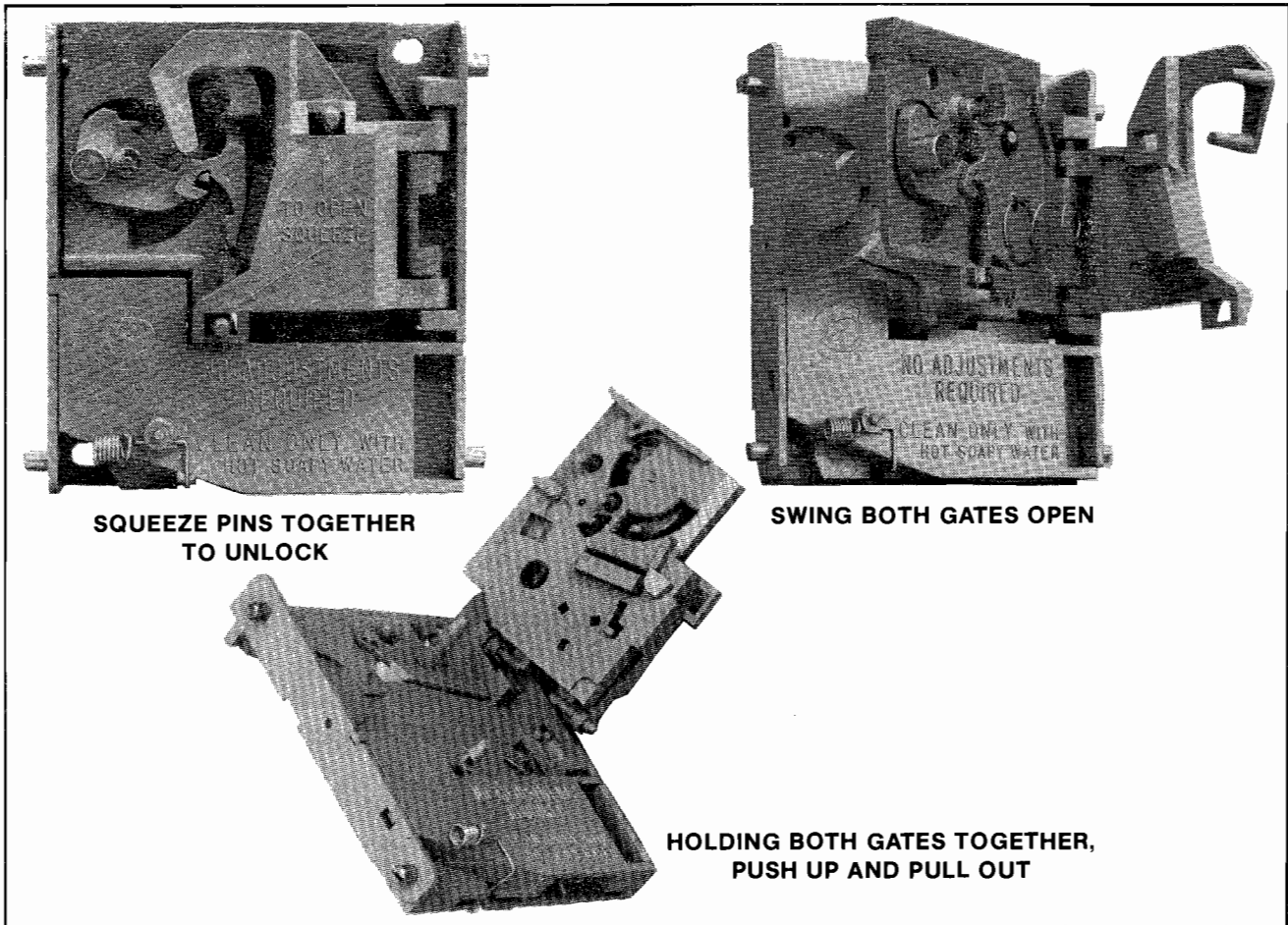


Figure 35 Reinstalling coin acceptor



SQUEEZE PINS TOGETHER TO UNLOCK

SWING BOTH GATES OPEN

HOLDING BOTH GATES TOGETHER, PUSH UP AND PULL OUT

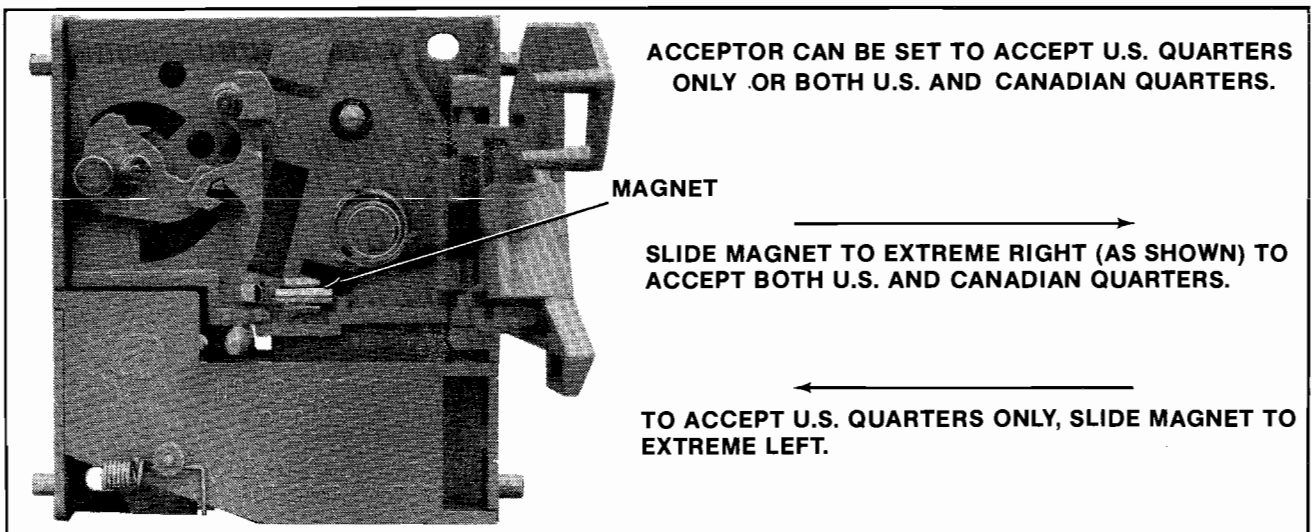
Figure 36 Opening the plastic coin acceptor

5. Check the coin chute for obstructions such as: paper, gum, etc.
6. Reinstall the coin acceptor to the coin door. See Figure 35.
 - 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 coin door.

NOTE: See Figure 37 for instructions on how to set the plastic coin acceptor mechanisms to either accept or reject Canadian quarters.



ACCEPTOR CAN BE SET TO ACCEPT U.S. QUARTERS ONLY OR BOTH U.S. AND CANADIAN QUARTERS.

MAGNET

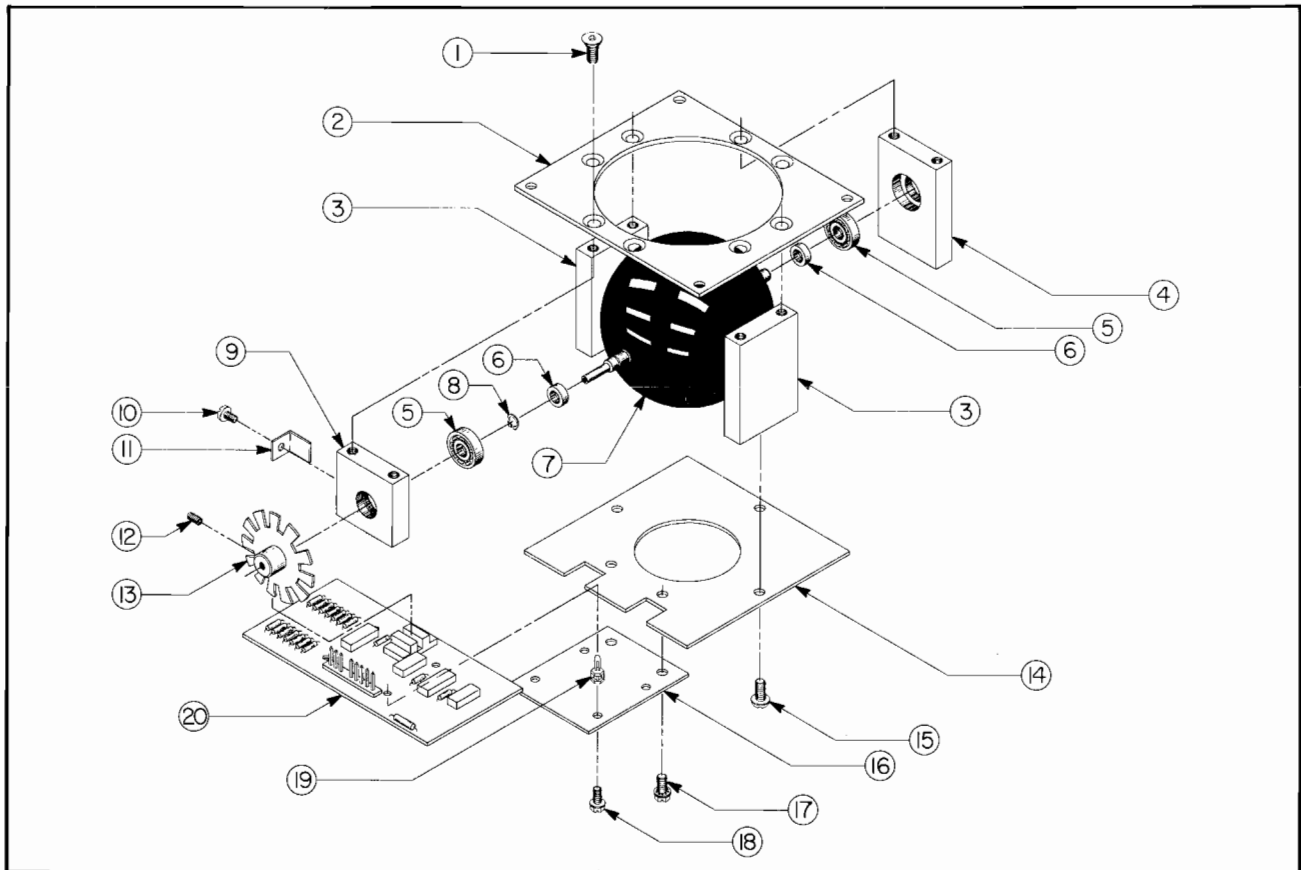
SLIDE MAGNET TO EXTREME RIGHT (AS SHOWN) TO ACCEPT BOTH U.S. AND CANADIAN QUARTERS.

TO ACCEPT U.S. QUARTERS ONLY, SLIDE MAGNET TO EXTREME LEFT.

Figure 37 Changing the plastic coin acceptor to accept American or Canadian quarters

IV Illustrated Parts Breakdown

KICK-MAN — ALL VERSIONS — BALL CONTROL ASSEMBLY

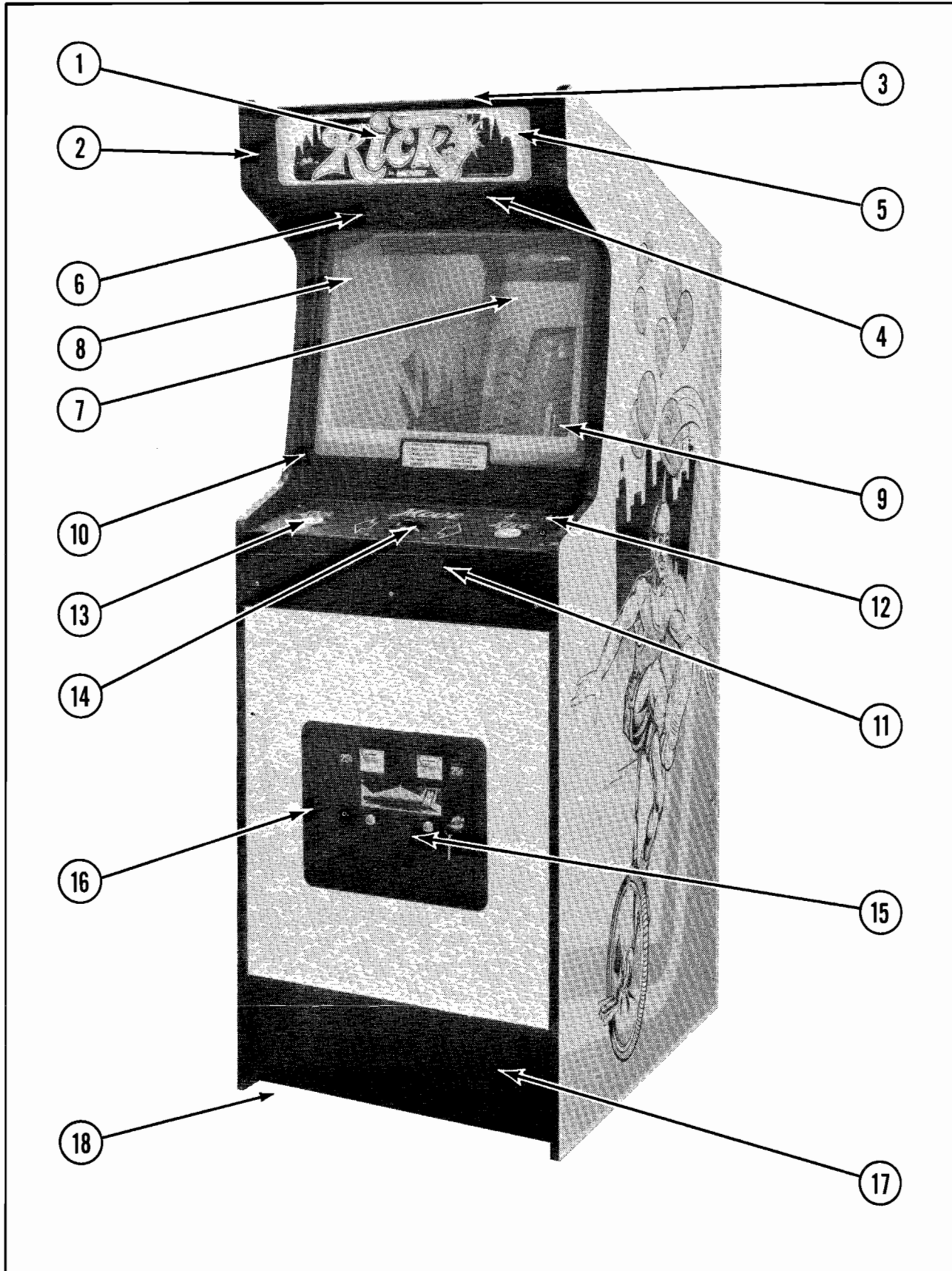


KICK-MAN — ALL VERSIONS — BALL CONTROL ASSEMBLY — PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0017-00101-0120	#10-24 x 1/2 FLAT HD. M.S. (8 REQ'D.)
2	0515-00100-0000	TOP PLATE
3	0515-00703-0000	SIDE POST (2 REQ'D.)
4	0515-00702-0000	POST
5	0017-00006-0080	ROLLER BEARING (2 REQ'D.)
6	0515-00705-0000	SPACER (2 REQ'D.)
7	A515-00013-0000	BALL & SHAFT ASSY.
8	0017-00100-0114	1/4" RETAINING RING
9	0515-00701-0000	SHORT POST
10	0017-00101-0593	#8-32 x 1/4 SLT. PAN HD. EXT. M.S.
11	0515-00101-0000	BEARING RETAINER
12	0017-00101-0302	#6-32 x 3/16 SET SCREW (2 REQ'D.)
13	A643-00010-0000	BUSH & DISC. ASSY.
14	0515-00103-0000	BOTTOM PLATE
15	0017-00101-0119	#10-24 x 1/2 BUT. HEX HD. M.S. (3 REQ'D.)
16	0515-00102-0000	P.C. MTG. PLATE
17	0017-00101-0599	#8-32 x 5/16 SLT. HEX HD. SCR. W/SEMS (2 REQ'D.)
18	0017-00101-0099	#6 x 1/4 SLT. HEX HD. SCR. (4 REQ'D.)
19	0017-00007-0143	1/4 SPACER (4 REQ'D.)
20	A082-91391-C000	BINARY ANGLE DECODER P.C. ASSY.

NO. 968 — KICK-MAN UPRIGHT — FRONT

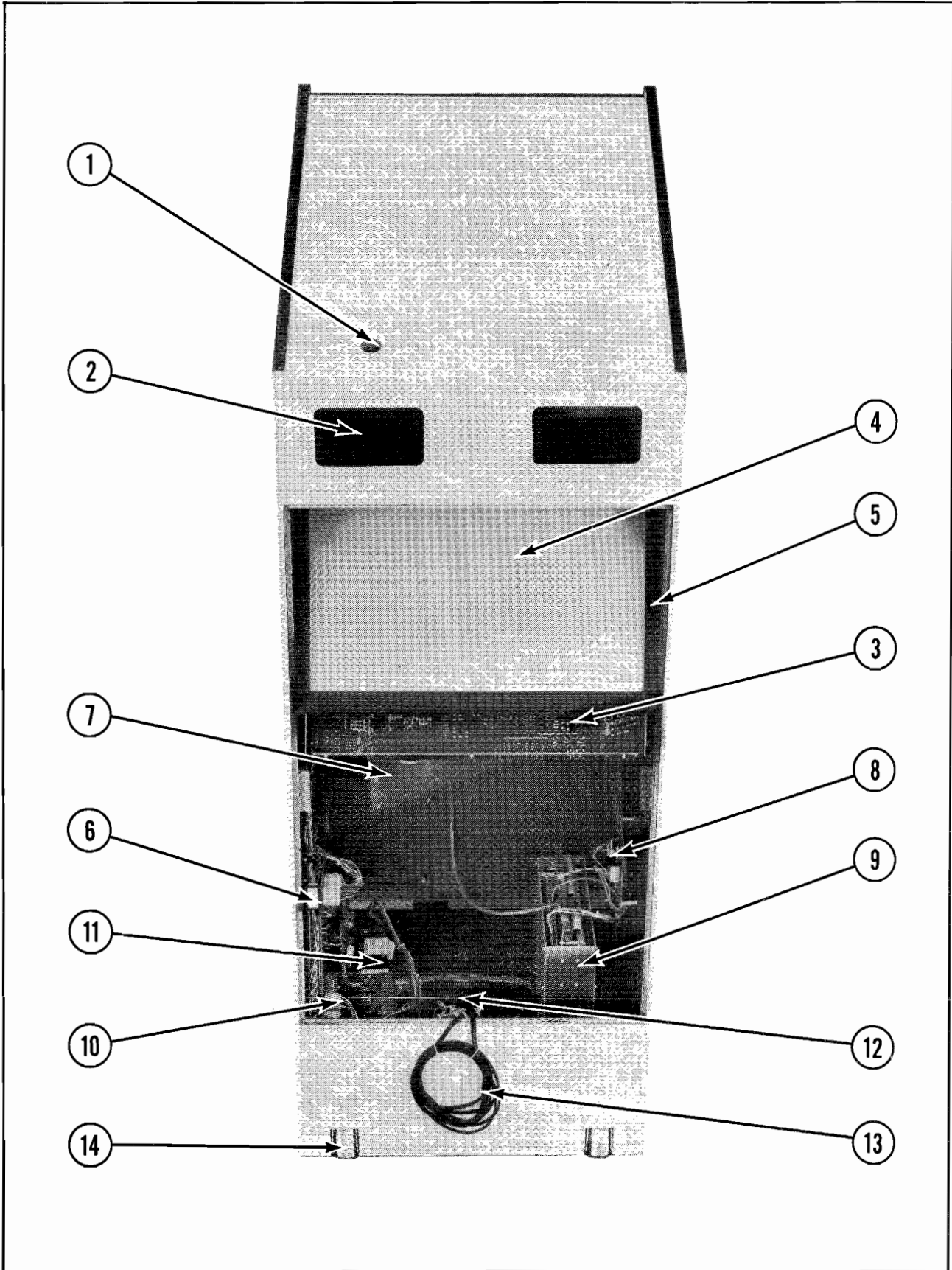


NO. 968 — KICK-MAN UPRIGHT — FRONT — PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0968-00904-00XF	UPPER DISPLAY PLEXI — 22-13/16" x 5-31/32" x 3/16"
2	0537-00903-0044	GLASS CHANNEL — 5" LG. (2 REQ'D.)
3	0968-00102-00XF	GLASS RETAINER BRKT. — UPPER
4	0968-00106-00XF	GLASS RETAINER BRKT. — BOTTOM
	0017-00101-0138	#8 x 5/8 TORX TAMPER RESISTANT BLK. SCR. (6 REQ'D.)
	0017-00009-0522	LONG ARM KEY T-20 (FOR ABOVE SCREW)
5	A595-00011-0000	HEADER LIGHT ASSY.
6	0017-00009-0393	BLACK SPEAKER GRILLE W/SLOTS (2 REQ'D.)
	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W. (2 REQ'D.)
	0017-00101-0127	#8-32 x 1-1/2 CARRIAGE BOLT (8 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
7	0968-00901-0000	MIRROR — 22-13/16" x 24-1/8" x 3/16"
8	0968-00908-0200	SIDE SCENERY CARD — LEFT
	0968-00908-0100	SIDE SCENERY CARD — RIGHT (NOT SEEN)
9	0968-00900-00XF	MAIN VIEWING GLASS — 22-13/16" x 21-5/16" x 3/16"
10	0537-00903-0049	GLASS CHANNEL — 17-3/4" LG. (2 REQ'D.)
	0629-00902-0800	GLASS LIFT CHANNEL — 20" LG.
11	0968-00122-00XF	CONTROL PLATE
	0017-00101-0620	#8-32 x 1/2 CARRIAGE BOLT (8 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
	0961-00115-00XF	STRIKE (2 REQ'D.)
	0017-00009-0033	LATCH CLAMP (2 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT HEX HD. M.S. (8 REQ'D.)
	0555-00901-0000	PLASTIC LOCATING PIN (8 REQ'D.)
	0550-00101-0100	CONTROL SHELF MTG. BRKT. — RIGHT
	0550-00101-0200	CONTROL SHELF MTG. BRKT. — LEFT
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (8 REQ'D.)
12	0017-00032-0051	RED BUTTON SWITCH W/HARDWARE (2 REQ'D.)
13	0017-00032-0100	ILLUMINATED P.B. SWITCH — AMBER (2 REQ'D.)
14	A515-00014-0000	CONTROL ASSY.
15	A090-00300-08BK	U.S.A. 25¢ COIN DOOR ASSY.
	A968-00017-0000	COIN DOOR CABLE ASSY.
16	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)
17	0935-00906-0200	KICK PLATE — 22-7/8" LG.
18	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.)

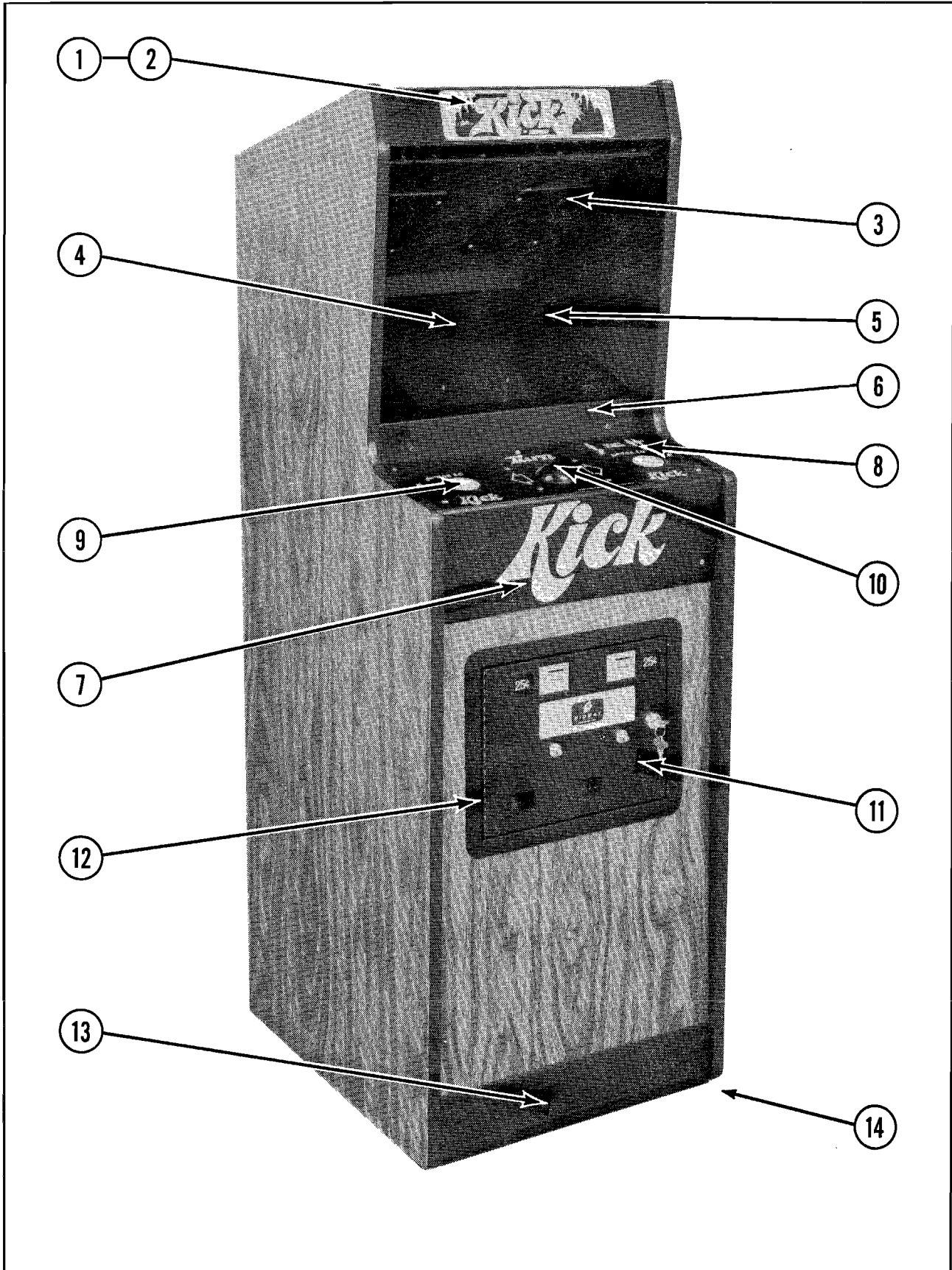
NO. 968 — KICK-MAN UPRIGHT — REAR ACCESS



NO. 968 — KICK-MAN UPRIGHT — REAR ACCESS — PARTS LIST
ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	A088-00013-0000	ON-OFF SWITCH & BRKT. ASSY.
2	0894-00913-0000	RECESSED HAND LIFT (2 REQ'D.)
	0017-00101-0138	#8 x 5/8 TORX TAMPER RESISTANT SCR. (12 REQ'D.)
3	0968-00906-0000	MONITOR MASK
4	0968-00901-0000	MIRROR — 22-13/16" x 24-1/8" x 3/16"
5	0968-00503-0000	MIRROR LOCKING CLEAT (2 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (4 REQ'D.)
6	A088-00015-0000	INTERLOCK SWITCH & BRKT. ASSY.
7	0017-00003-0339	ELECTROHOME — 19" COLOR DUAL SYNC HORIZ. MTG. MONITOR (OR)
7	0017-00003-0401	WELLS-GARDNER — 19" COLOR DUAL SYNC HORIZ. MTG. MONITOR
	A968-00006-0000	MONITOR SUPPORT RAIL ASSY. (2 REQ'D.)
	0017-00102-0012	1/4-20 x 1-1/4 UNSLOT. HEX FLAT HD. BOLT (8 REQ'D.)
	0017-00104-0014	7/8 DISH WASHER (8 REQ'D.)
	0017-00103-0018	1/4-20 HEX NUT (8 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (8 REQ'D.)
	0017-00104-0046	7/8" FLAT WASHER (8 REQ'D.)
	0968-00909-0000	LARGE MONITOR SHIELD — FISH PAPER
8	A082-90910-D000	DUAL POWER AMP P.C. ASSY. — MCR2
9	A968-00019-0000	CARD RACK W/P.C. BOARDS ASSY.
10	A082-90412-B000	125 VA. POWER SUPPLY P.C. ASSY.
	0624-00902-0100	P.C. SUPPORT BRKT. — 12" LG. (2 REQ'D.)
	0624-00902-0500	P.C. SUPPORT BRKT. — 6-1/2" LG. (2 REQ'D.)
	0017-00042-0255	#8 x 11/16 UNSLOT. HEX HD. M.S. (10 REQ'D.)
	0017-00104-0037	#8 FLAT WASHER (10 REQ'D.)
11	A945-00002-0000	125 VA FILTER ASSY.
12	A968-00024-0000	TRANSFORMER BOARD ASSY.
13	A508-00023-0000	LINE CORD CABLE ASSY.
14	A961-00007-0000	CASTER ASSY. (2 REQ'D.)
	0961-00109-0000	WHEEL BRKT. (2 REQ'D.)
	00017-00042-0255	PLASTIC WHEEL (2 REQ'D.)
	0894-00702-00XF	SHAFT (2 REQ'D.)
	0017-00100-0037	3/8 E-RING (2 REQ'D.)
ADDITIONAL PARTS LIST		
	A515-00021-0000	MULTIFUNCTION SWITCH & BRKT. ASSY.
	A097-00008-0000	BACK DOOR LOCK ASSY.
	0017-00009-0490	5-5/8 SQR. BACK DOOR VENT GRILLE
	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	1/4-22 x 1-3/8 RND. HD. BOLT BLK. (4 REQ'D.)
	0017-00104-0014	7/8 DISH WASHER (4 REQ'D.)
	0017-00103-0018	1/4-20 HEX NUT (4 REQ'D.)
	A968-00027-0000	MASTER CABLE ASSY.
	A968-00025-0000	HIGH VOLTAGE CABLE ASSY.
	A968-00026-0000	LOW VOLTAGE CABLE ASSY.
	A968-00028-0000	CONTROL SHELF CABLE ASSY.
	A968-00029-0000	VIDEO SIGNAL CABLE ASSY.
	A866-00049-0000	LINE CORD ASSY.
	0968-00126-0000	MONITOR BOARD BRKT. (2 REQ'D.)
	0017-00101-0769	#10 x 3/4 SLT. HEX HD. SCR. (8 REQ'D.)

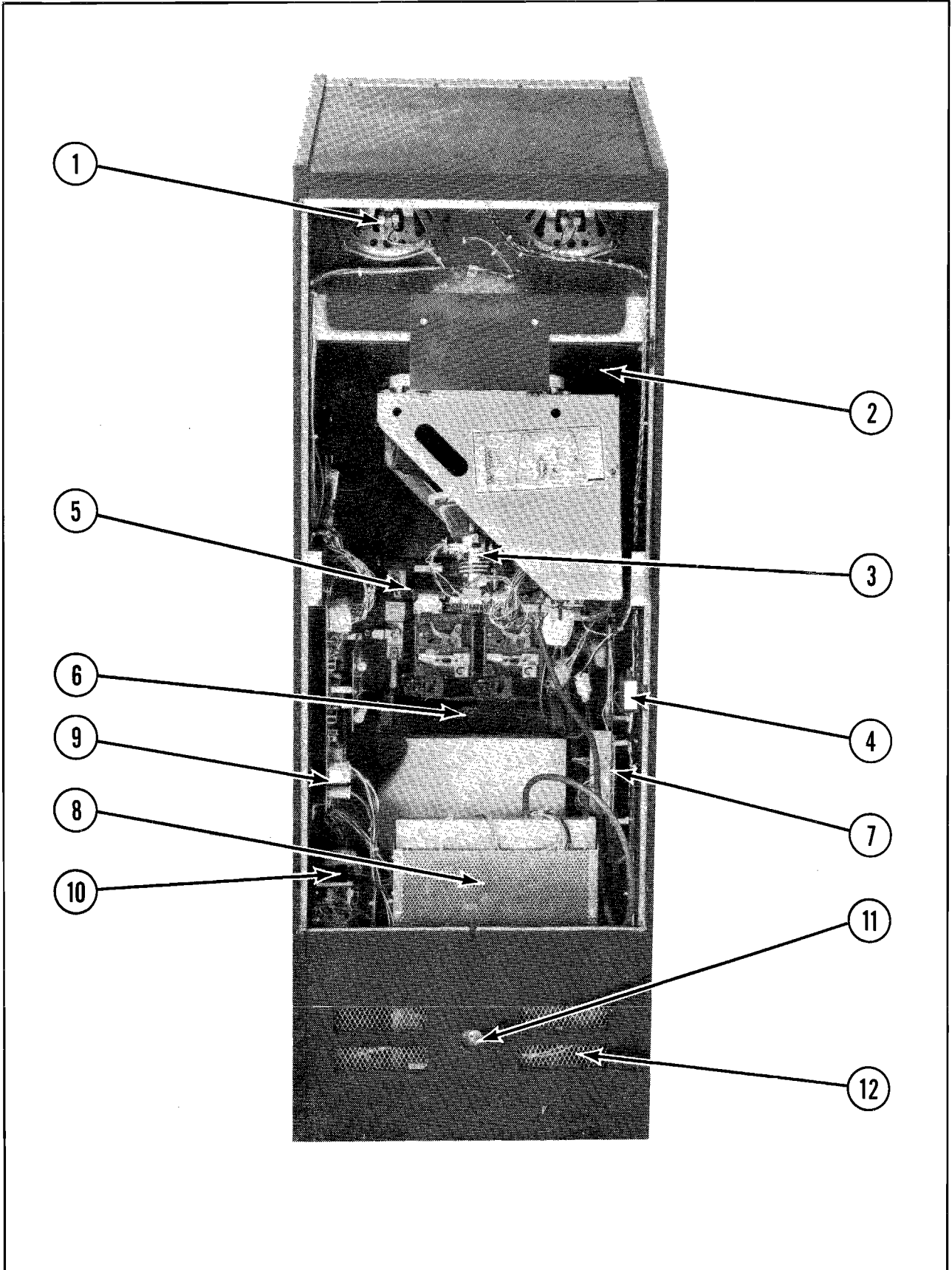
NO. 513 — KICK-MAN MINI — FRONT



NO. 513 — KICK-MAN MINI — FRONT — PARTS LIST
ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0513-00901-00XF 0017-00101-0138 0017-00009-0522	DISPLAY PANEL #8 x 5/8 TORX TAMPER RESISTANT SCREW (8 REQ'D.) LONG ARM KEY T-20 (FOR ABOVE SCREW)
2	A926-00010-0000 0017-00031-0030 0017-00003-0219	INSERT DISPLAY ASSY. WEDGE BASE LIGHT SOCKET (5 REQ'D.) #194 LAMP 14V., .27A. (5 REQ'D.)
3	0017-00009-0393 0017-00003-0430 0017-00101-0127 0017-00103-0061	BLACK SPEAKER GRILLE W/SLOTS (2 REQ'D.) 6" x 9" SPEAKER 4 OHM, 10W. (2 REQ'D.) #8-32 x 1-1/2 CARRIAGE BOLT (8 REQ'D.) #8-32 HEX NUT W/SEMS (8 REQ'D.)
4	0513-00902-00XF	FRONT GLASS — 17-13/16" x 14-13/16" x 3/16"
5	0537-00903-0056	GLASS CHANNEL — 14-1/2" LG. (2 REQ'D.)
6	A555-00016-0000 0017-00101-0138	GLASS CLAMPING PLATE ASSY. #8 x 5/8 TORX TAMPER RESISTANT SCREW (8 REQ'D.)
7	0513-00100-00XF 0017-00101-0620 0017-00103-0061 0555-00101-0100 0555-00101-0200 0555-00901-0000 0017-00009-0033 0961-00115-00XF 0017-00101-0141	CONTROL PLATE #8-32 x 1/2 CARRIAGE BOLT (8 REQ'D.) #8-32 HEX NUT W/SEMS (8 REQ'D.) CONTROL SHELF MTG. BRKT. — RIGHT CONTROL SHELF MTG. BRKT. — LEFT PLASTIC LOCATING PIN (6 REQ'D.) LATCH CLAMP (2 REQ'D.) STRIKE (2 REQ'D.) #8 x 11/16 UNSLOT. HEX HD. M.S. (16 REQ'D.)
8	0017-00032-0051	RED SWITCH BUTTON (2 REQ'D.)
9	0017-00032-0100	ILLUMINATED P.B. SWITCH — AMBER (2 REQ'D.)
10	A515-00014-0000	CONTROL ASSEMBLY
11	A090-00300-08BK	U.S.A. 25¢ COIN DOOR ASSY.
12	0090-00002-04BK 0017-00101-0121	LARGE COIN DOOR FRAME #6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME)
13	0935-00906-0400	KICK PLATE — 17-15/16" LG.
14	0017-00102-0048 0017-00103-0026	3/8-16 x 2" LEG LEVELERS (4 REQ'D.) 3/8-16 LEG LEVELER HEX NUTS (4 REQ'D.)

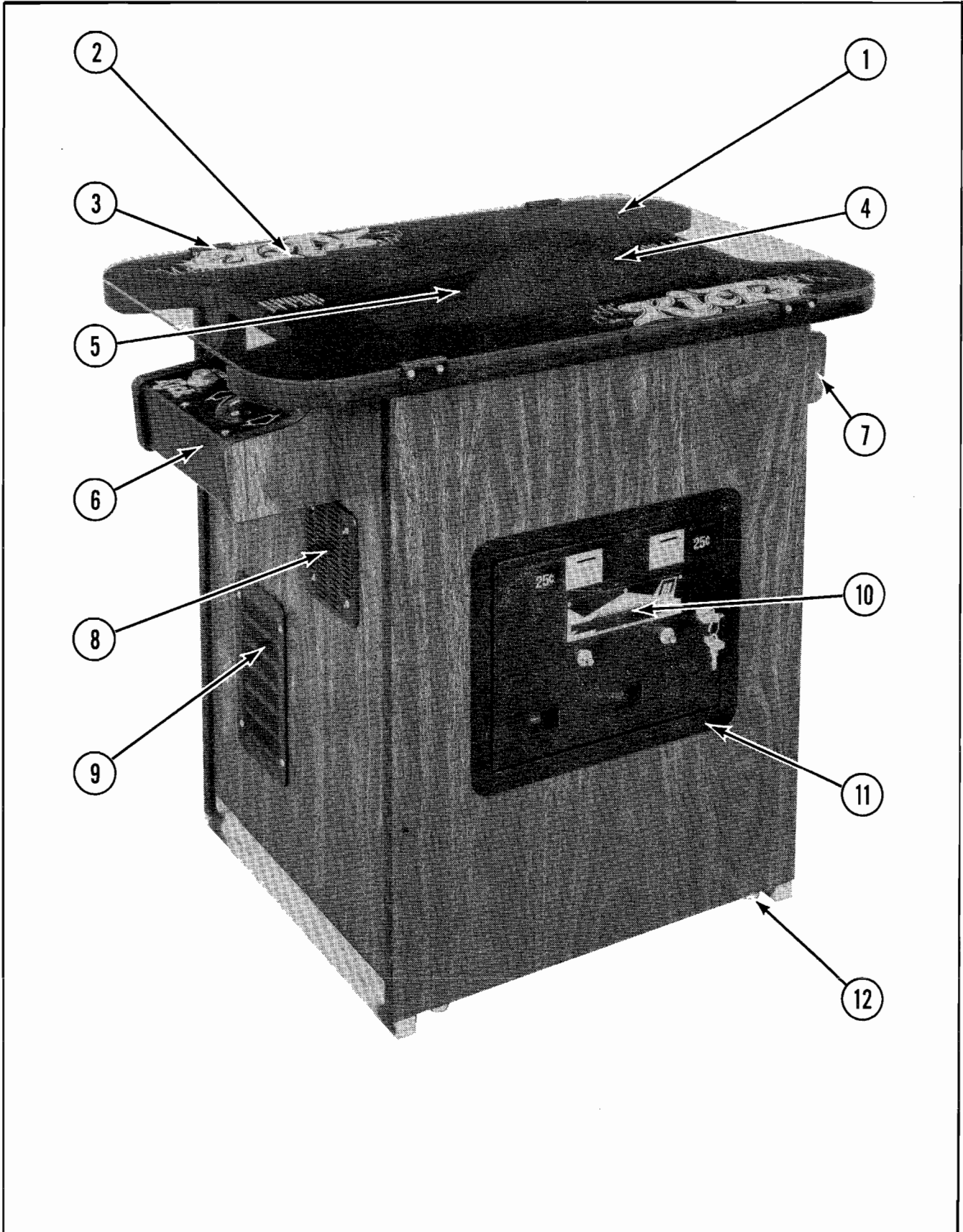
NO. 513 — KICK-MAN MINI — REAR ACCESS



NO. 513 — KICK-MAN MINI — REAR ACCESS — PARTS LIST
ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W. (2 REQ'D.)
2	0513-00900-0000	T.V. BEZEL
	A961-00026-0000	BEZEL MTG. BRKT. ASSY. (2 REQ'D.)
3	0017-00003-0340	13" DUAL SYNC COLOR MONITOR — ELECTRO HOME (OR)
3	0017-00003-0396	13" DUAL SYNC COLOR MONITOR — WELLS-GARDNER
	A926-00012-00XF	T.V. MTG. BRKT. ASSY.
	0513-00101-0000	MONITOR MTG. BRKT.
	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.)
	0017-00104-0026	#8 FLAT WASHER (4 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
4	A088-00015-0000	INTERLOCK SW. & BRKT. ASSY.
5	A090-00300-08BK	U.S.A. 25¢ COIN DOOR ASSY.
6	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	1/4-22 x 1-3/8 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.)
7	A082-90910-D000	DUAL POWER AMP P.C. ASSY. — MCR2
8	A513-00016-0000	MECH. CARD RACK W/P.C. BRD'S. ASSY.
	A513-00009-0000	TRANSFORMER BOARD ASSY. — NOT SEEN (LOCATED ON CABINET BASE)
9	A082-90412-B000	125 VA. POWER SUPPLY P.C. ASSY.
	0624-00902-0100	P.C. SUPPORT BRKT. — 12" LG. (2 REQ'D.)
	0624-00902-0300	P.C. SUPPORT BRKT. — 2-1/2" 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. (12 REQ'D.)
	0017-00104-0037	#8 FLAT WASHER (12 REQ'D.)
10	A945-00002-0000	125 VA. FILTER ASSY.
11	A088-00013-0000	ON-OFF SWITCH & BRKT. ASSY.
12	0017-00009-0490	5-5/8" SQ. VENT GRILL (2 REQ'D.)
		ADDITIONAL PARTS LIST
	A515-00021-0000	MULTIFUNCTION SW. & BRKT. ASSY.
	A097-00008-0000	BACK DOOR LOCK ASSY.
	0926-00904-0000	PLASTIC PROTECTIVE BUBBLE — BACK DOOR
	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (10 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (10 REQ'D.)
	3000-17246-1000	GROUND STRAP
	A513-00007-0000	CONTROL SHELF CABLE ASSY.
	A513-00012-0000	MASTER CABLE ASSY.
	A968-00029-0000	VIDEO SIGNAL CABLE ASSY.
	A513-00010-0000	HIGH VOLTAGE CABLE ASSY.
	A513-00011-0000	LOW VOLTAGE CABLE ASSY.
	A866-00049-0000	LINE CORD ASSY.

NO. 515 — KICK-MAN COCKTAIL — FRONT

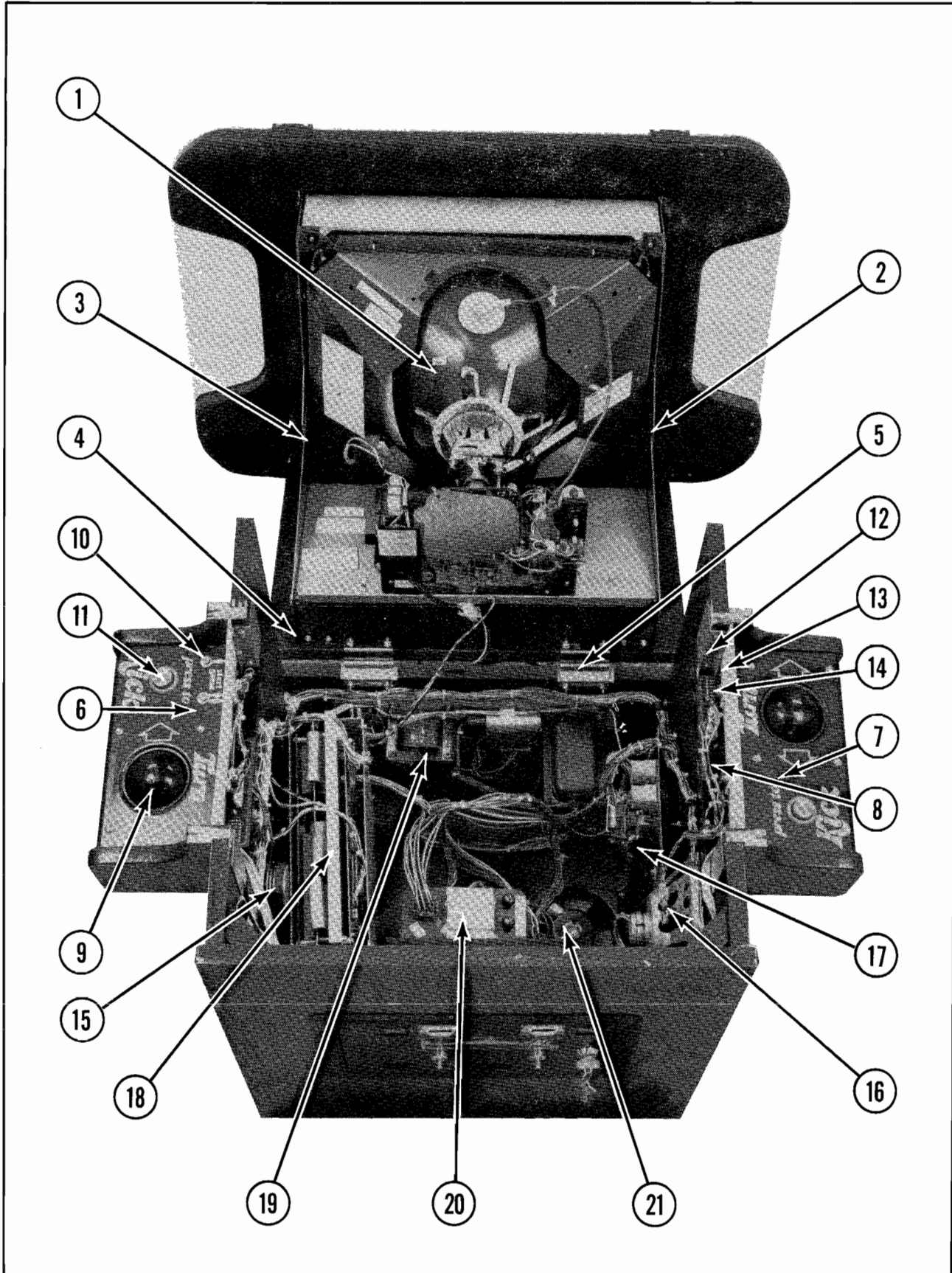


NO. 515 — KICK-MAN COCKTAIL — FRONT — PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0017-00009-0499	COVER GLASS — 32" x 22" x 1/4"
2	0515-00901-0000	ARTWORK UNDERLAY
3	0775-00104-00XF	GLASS CLIP (8 REQ'D.)
	0017-00101-0117	#8 x 5/8 PHIL. TRS. HD. SCR. (16 REQ'D.)
4	0557-00900-0000	T.V. BEZEL
5	0508-00905-0000	SMOKED PLEXI — 17-3/8" x 13-1/4" x 1/8"
	0508-00901-0000	PLEXI-GLASS CLIPS (4 REQ'D.)
	0017-00101-0017	#6 x 1/2 SLT. HEX HD. BLK. SCR. (4 REQ'D.)
6	A515-00006-0000	CONTROL SHELF ASSY. — PLAYER #1
7	A515-00006-0100	CONTROL SHELF ASSY. — PLAYER #2
8	0017-00009-0482	SPEAKER GRILLE — SMALL
	0017-00003-0431	4" SQR. SPEAKER — 4 OHM, 10W.
9	0017-00009-0393	BLACK SPEAKER GRILLE W/SLOTS (3 REQ'D.)
	0017-00003-0430	6" x 9" SPEAKER — 4 OHM, 10W.
	0017-00101-0136	#8-32 x 1-1/4 CARRIAGE BOLT (16 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (16 REQ'D.)
10	A090-00300-06BK	U.S.A. 25¢ COIN DOOR ASSY.
11	0090-00002-02BK	LARGE COIN DOOR FRAME
	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME)
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. 515 — KICK-MAN COCKTAIL — REAR ACCESS



NO. 515 — KICK-MAN COCKTAIL — REAR ACCESS — PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0017-00003-0339	ELECTROHOME — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR
2	A515-00019-0000	MONITOR SUPPORT ASSY. — LEFT
3	A515-00019-0100	MONITOR SUPPORT ASSY. — RIGHT
4	0017-00101-0109	#8 x 5/16 UNSLOT. HEX HD. BOLT (6 REQ'D.)
	0927-00101-00XF	SUPPORT ANGLE (2 REQ'D.)
5	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. M.S. (4 REQ'D.)
	0017-00009-0514	2-1/2" HINGE (2 REQ'D.)
	0017-00101-0639	#8-32 x 1-1/4 CARRIAGE BOLT (4 REQ'D.)
6	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
	0515-00106-00XF	CONTROL PLATE — PLYR. #1
	0515-00106-01XF	CONTROL PLATE — PLYR. #2
7	0017-00101-0620	#8-32 x 1/2 CARRIAGE BOLT (8 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
	0017-00101-0341	#6 x 1/4 PHIL. TRS. HD. SCR. (6 REQ'D.)
	0510-00101-00XF	BOTTOM PAN (2 REQ'D.)
8	A515-00014-0000	CONTROL ASSY. (2 REQ'D.)
9	0017-00032-0051	SMALL RED BUTTON SWITCH W/HARDWARE (2 REQ'D.)
10	0017-00042-0257	YELLOW PUSH BUTTON ASSY. (2 REQ'D.)
	0017-00032-0093	PUSH BUTTON SWITCH W/HOLDER (2 REQ'D.)
11	0017-00103-0054	5/8-11 PAL NUT (2 REQ'D.)
	0930-00104-0000	PANEL LOCATING BRKT. (4 REQ'D.)
	0017-00101-0025	#8 x 1/2 SLT. HEX HD. M.S. (16 REQ'D.)
12	0930-00904-0000	LIGHT SHIELD (2 REQ'D.)
13	0017-00031-0044	WEDGE BASE LAMP SOCKET (4 REQ'D.)
	0017-00003-0219	#194 LAMP 14V., .27A. (4 REQ'D.)
	0017-00101-0555	#6-32 x 5/16 SLT. HEX HD. M.S. (4 REQ'D.)
14	0017-00003-0431	4" SQR. SPEAKER 4 OHM, 10W.
15	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W.
16	A082-90412-B000	125 VA. POWER SUPPLY
	0624-00902-0100	P.C. SUPPORT BRKT. — 12" LG.
	0624-00902-0500	P.C. SUPPORT BRKT. — 6-1/2" LG. (3 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (10 REQ'D.)
	0017-00104-0031	#8 FLAT WASHER (10 REQ'D.)
	A513-00016-0000	MECH. CARD RACK W/BOARDS ASSY.
	A515-00009-0000	TRANSFORMER BOARD ASSY.
17	A945-00002-0000	125 VA. FILTER ASSY.
18	A775-00013-0000	FAN ASSEMBLY
	0151-00081-0000	4" FAN
	0775-00110-00XF	FAN PLATE
	0749-00106-00XF	VENT SCREEN
	0017-00101-0347	#6-32 x 1/2 R.H.M.S. (4 REQ'D.)
	0017-00104-0009	#6 EXT. WASHER (4 REQ'D.)
	0017-00103-0005	#6-32 HEX NUT (4 REQ'D.)
	0017-00101-0026	#8 x 5/8 SLT. HEX HD. M.S. (4 REQ'D.)

NO. 515 — KICK-MAN COCKTAIL — REAR ACCESS — PARTS LIST (cont'd)

ORDER BY PART NUMBER ONLY

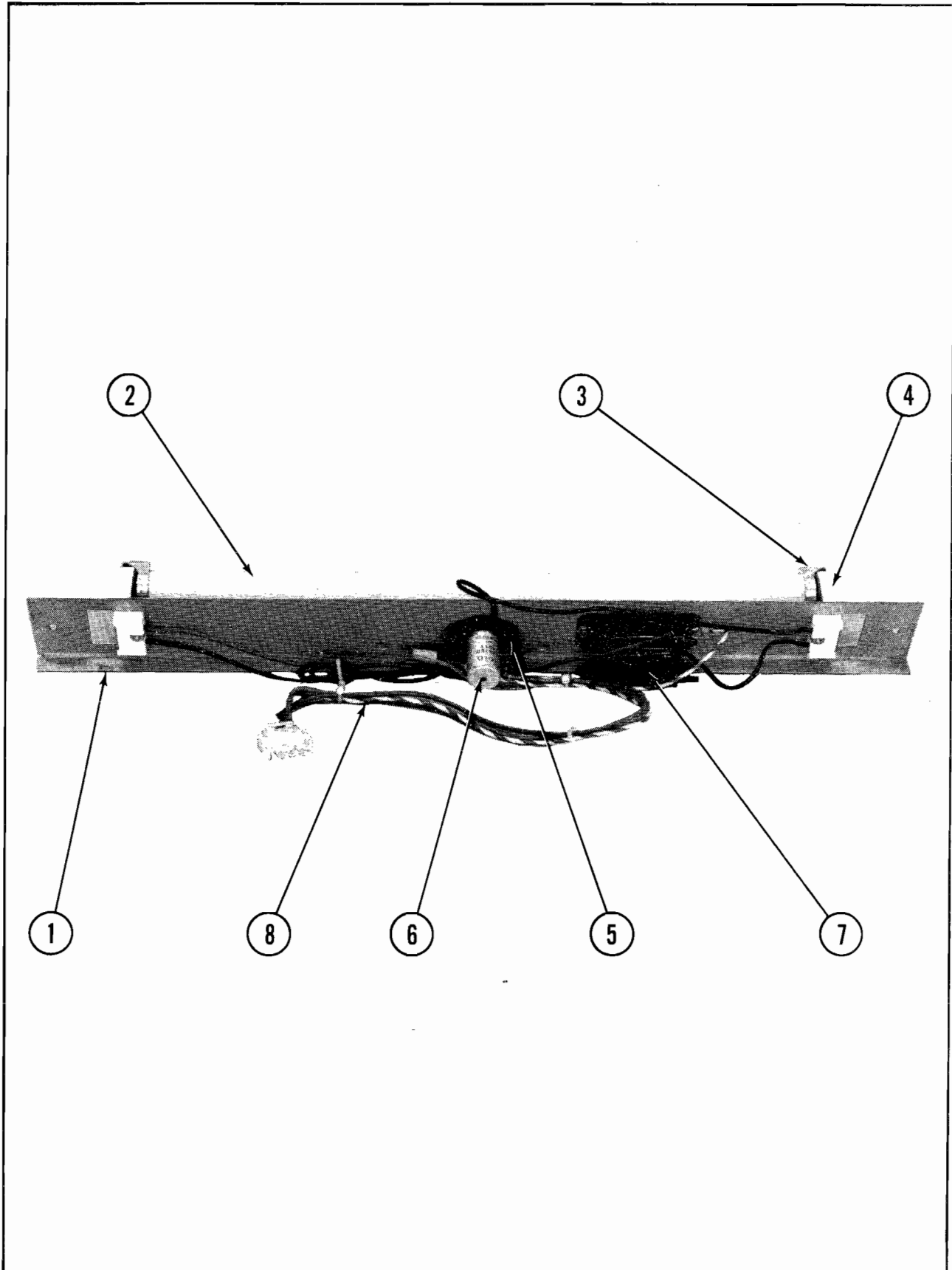
ADDITIONAL PARTS LIST	
A082-90910-D000	DUAL POWER AMP P.C. ASSY. — MCR 2
A088-00014-0000	INTERLOCK SWITCH & BRKT. ASSY.
A515-00021-0000	MULTIFUNCTION SWITCH BRKT. ASSY.
A927-00008-0000	ON/OFF SWITCH ASSY.
0610-00132-00ZN	STRIKE (2 REQ'D.)
0017-00009-0033	LATCH CLAMP (2 REQ'D.)
0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (8 REQ'D.)
A927-00019-0000	COIN BOX ASSY.
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 WASHER (4 REQ'D.)
0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
0927-00907-0000	HIGH VOLTAGE SHIELD
A515-00012-0000	MASTER CABLE ASSY.
A515-00011-0000	HIGH VOLTAGE CABLE ASSY.
A515-00010-0000	LOW VOLTAGE CABLE ASSY.
A515-00007-0000	CONTROL SHELF CABLE ASSY. — PLYR. #1
A515-00007-0100	CONTROL SHELF CABLE ASSY. — PLYR. #2
A515-00022-0000	VIDEO SIGNAL CABLE ASSY.
A968-00017-0000	COIN DOOR CABLE ASSY.
A927-00005-0000	LEG KIT ASSY. (HIGH BASE) — OPTIONAL (INCLUDES 4 LEGS & HARDWARE)
A866-00049-0000	LINE CORD ASSY.

KICK-MAN — ALL VERSIONS — NOT SHOWN — PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
		TRANSFORMER BOARD ASSEMBLY
	MT00-00089-A000	POWER TRANSFORMER — 115V., 60 HZ (UPRIGHT & MINI)
	MT00-00092-0000	TRANSFORMER (UPRIGHT & MINI)
	MT00-00093-0000	TRANSFORMER W/MAGNETIC SHIELD (COCKTAIL ONLY)
	MT00-00096-0000	POWER TRANSFORMER — 100/125V., 60 HZ (COCKTAIL ONLY)
	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.)
	0017-00104-0026	#8 1/2" FLAT WASHER (4 REQ'D.)
	0017-00103-0008	#8-32 HEX NUT (4 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. M.S. (22 REQ'D.)
	0720-00001-0400	4 POSITION FUSE CLIP ASSY. (UPRIGHT & COCKTAIL)
	0720-00001-0300	3 POSITION FUSE CLIP ASSY. (MINI ONLY)
	0017-00003-0004	SLO-BLO FUSE — 2A., 250V. (2 REQ'D.)
	0017-00003-0217	SLO-BLO FUSE — 2-1/2A., 125V.
	0017-00003-0002	SLO-BLO FUSE — 1/2A., 250V. (UPRIGHT & COCKTAIL)
	A945-00005-0000	CAPACITOR ASSY. — 60HZ
	0017-00003-0379	CAPACITOR CLAMP
	A508-00037-0000	NOISE FILTER ASSY. — 2 LEAD
	3010-13106-0000	TERMINAL STRIP
	0017-00021-0370	MALE CONNECTOR — 5 TAB
	3000-17246-0200	.350 WIDE GROUND STRAP (COCKTAIL ONLY)
	3000-17246-0300	.350 WIDE GROUND STRAP (COCKTAIL & MINI)
	3000-17246-0500	5.50 x .350 WIDE GROUND STRAP (MINI & UPRIGHT)
	3000-17246-0900	48.00 x .350 WIDE GROUND STRAP (UPRIGHT ONLY)
	3010-03003-0000	GROUNDING CLIP
		CARD RACK W/BOARDS ASSY.
	A084-90908-A968	SOUND BOARD ASSY.
	A084-90009-A968	C.P.U. BOARD ASSY. (UPRIGHT)
	A084-90009-A513	C.P.U. BOARD ASSY. (MINI & COCKTAIL)
	A084-91399-A968	VIDEO GENERATOR BOARD ASSY. (UPRIGHT)
	A084-91399-A513	VIDEO GENERATOR BOARD ASSY. (MINI & COCKTAIL)
	0017-00042-0208	P.C. BOARD SPACER SUPPORT — 1-1/8" LG. (4 REQ'D.)
	0017-00042-0287	P.C. BOARD SPACER SUPPORT — 5/8" LG. (4 REQ'D.)
	0017-00101-0085	#6 x 5/16 SLT. HEX HD. M.S. (8 REQ'D.)
	0968-00511-0000	BASE CARD RACK SUPPORT — BLOCK
	0017-00101-0033	#8 x 1-1/4 SLT. HEX HD. M.S. (2 REQ'D.)
	0017-00104-0031	#8 WASHER (2 REQ'D.)
	0968-00510-0000	TOP CARD RACK SUPPORT — BLOCK
	0968-00125-0000	SUPPORT BRKT. TO CABINET SIDE
	0017-00101-0014	#6 x 1/2 SLT. HEX HD. SCREW (2 REQ'D.)

NO. 968 — KICK-MAN UPRIGHT — HEADER FLUORESCENT FIXTURE ASSY.

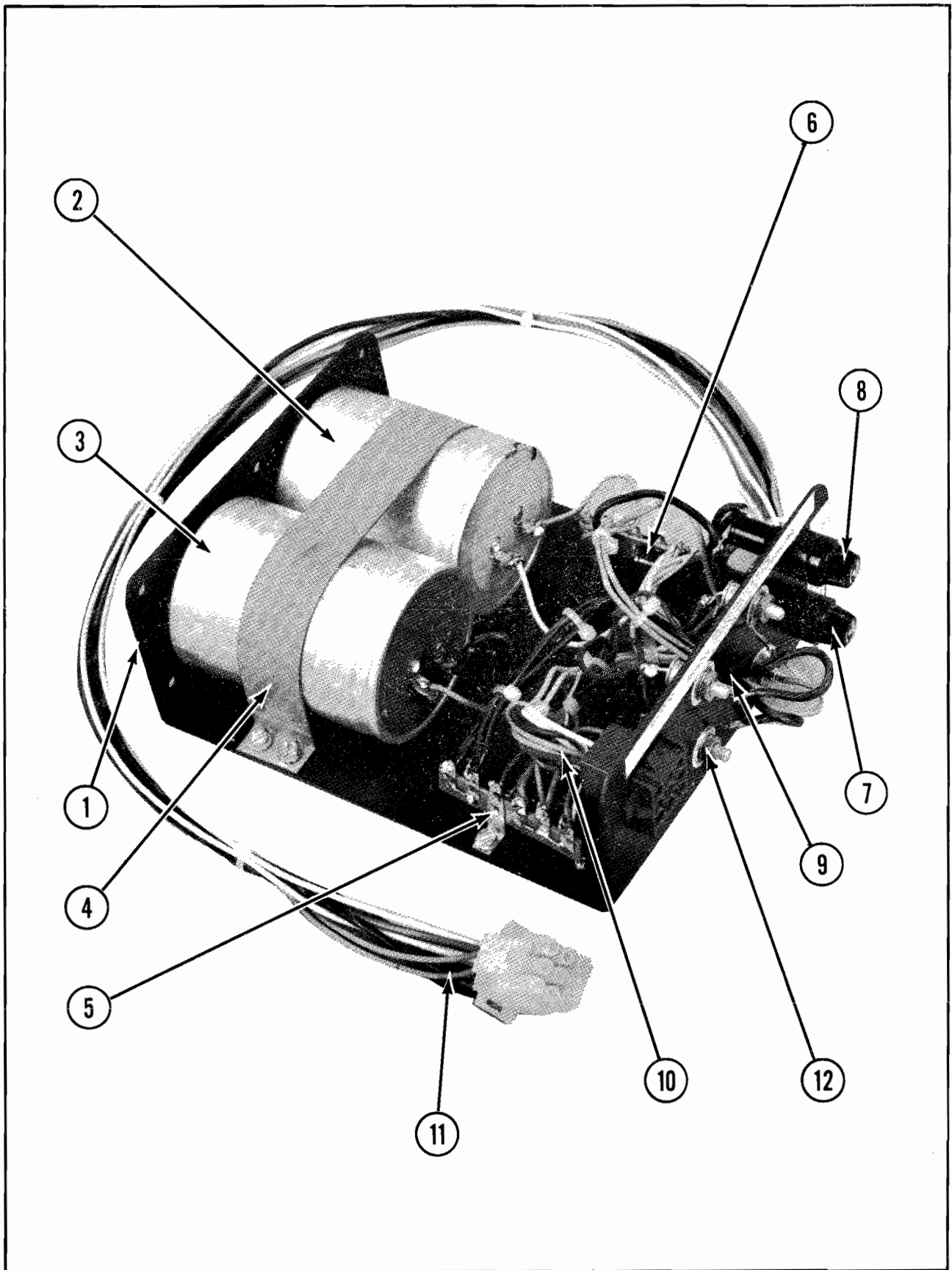


NO. 968 — KICK-MAN UPRIGHT — HEADER FLUORESCENT FIXTURE ASSY. — PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0595-00105-0000	FLUORESCENT BRKT.
2	0017-00003-0043	18" COOL WHITE FLUOR. LAMP
3	0017-00021-0005	FLUORESCENT LOCKS (2 REQ'D.)
4	0017-00031-0036	FLUORESCENT SOCKET (2 REQ'D.)
5	0017-00003-0412	FLUOR. STARTER HOLDER W/WIRE 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	FLUOR. STARTER
7	0017-00003-0026	BALLAST
	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCR. (4 REQ'D.)
8	A508-00017-0000	FLUORESCENT CABLE ASSY.
	A961-00042-0000	LINE FILTER ASSY. — NOT SHOWN

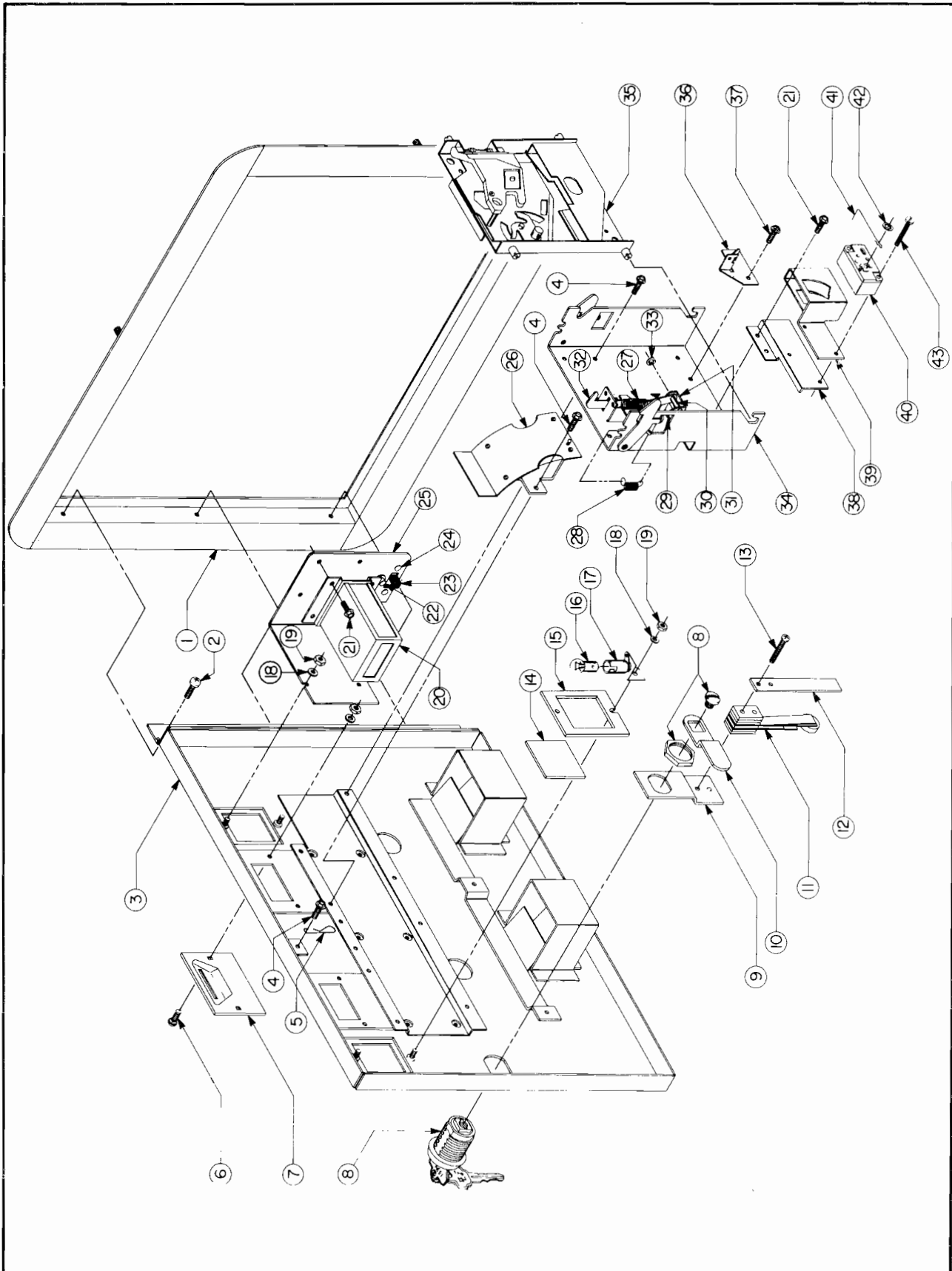
FILTER ASSY.



FILTER ASSY. — PARTS LIST
ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0945-00101-00XF	CHASSIS
2	0945-00803-0100	CAPACITOR — 55000MF — 25V.
3	0945-00803-0200	CAPACITOR — 100000MF — 15V.
4	0945-00100-0000	CAPACITOR STRAP
	0017-00101-0555	#6-32 x 5/16 SLT. HEX HD. SCR. (4 REQ'D.)
5	0017-00021-0539	5 POSITION TERMINAL STRIP (2 REQ'D)
	0017-00101-0510	#4-40 x 1/2 SLT. PAN HD. SCR. (4 REQ'D.)
	0017-00104-0087	#4 FLAT WASHER (4 REQ'D.)
	0017-00104-0071	#4 EXT. TOOTH WASHER (4 REQ'D.)
	0017-00103-0002	#4-40 HEX NUT (4 REQ'D.)
6	0062-122H7-1XXX	RESISTOR — 150 OHM, 2W.
	0062-086H7-1XXX	RESISTOR — 47 OHM, 2W. — LOCATED ON OPPOSITE TERMINAL STRIP
7	0017-00003-0008	FUSE — 6AMP — 120V.
8	0017-00003-0174	FUSE — 10 AMP — 32V.
	0017-00003-0433	FUSE HOLDER (2 REQ'D.)
9	0017-00041-0008	RUBBER GROMMET
10	A089-00007-0000	FILTER CABLE ASSY. #2
11	A089-00006-0000	FILTER CABLE ASSY. #1
12	0945-00804-0100	DIODE — 12A. — 50V. (4 REQ'D.)
	0017-00103-0086	#10-32 HEX NUT (4 REQ'D.)
	0017-00021-0484	SOLDER LUG (4 REQ'D.)
	0017-00104-0107	#10 FLAT WASHER (4 REQ'D.)
	0017-00009-0510	INSULATOR (8 REQ'D.)
	0017-00042-0283	BUSHING (4 REQ'D.)
	0945-00900-0000	DIODE FORMED FISHPAPER COVER — NOT SHOWN

FRONT DOOR ASSEMBLY — U.S.A. 25¢



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

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
1	0090-00002-02BK	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 (4 REQ'D.)
5	0017-00007-0019	KEY HOOK
6	0017-00101-0552	#6-32 x 1/4 CARRIAGE BOLT (4 REQ'D.)
7	0090-00117-03XF	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	A090-00071-0000	DOOR TILT SWITCH
12	0090-00126-01XF	SWITCH BACK-UP PLATE
13	0017-00101-0528	#5-40 x 3/4" PHIL. HD. M.S. (2 REQ'D.)
	A090-00004-0000	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. #1895 (2 REQ'D.)
17	0017-00031-0048	BAYONET SOCKET W/BRKT. (2 REQ'D.)
18	0017-00104-0002	#6 SPLIT LOCK WASHER (8 REQ'D.)
19	0017-00103-0087	#6-32 HEX NUT (8 REQ'D.)
20	A090-00057-0000	COIN METER
21	0017-00101-0124	#6 x 1/4 UNSLOT. HEX HD. SCR. (8 REQ'D.)
22	0017-00032-0051	PUSH BUTTON SWITCH
23	0017-00032-0007	SLIDE SWITCH
24	0017-00072-0034	STEEL OVAL HD. RIVET
25	0090-00173-0000	COIN COUNTER MTG. BRKT.
	A090-00082-0000	TEST SWITCH & BRKT. ASSY. (ITEMS 23 THRU 25)
26	A090-00087-0000	COIN CHUTE & TOP 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	0093-00155-00XF	REJECT LEVER
33	0017-00100-0018	E-RING
	A090-00088-0000	REJECT LEVER ASSY. (2 REQ'D.) (ITEMS 30 THRU 33)
34	A090-00085-0000	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	0017-00007-0132	PUSH-ON RING
	A090-00059-0400	COIN SWITCH & WIRE ASSY. (ITEMS 40 THRU 42)
43	0017-00101-0698	#4-40 x 3/4 SLT. RND. HD. M.S. (2 REQ'D.)
	A090-00077-0000	COIN GUIDE & SWITCH ASSY. (ITEMS 38 THRU 43)

V Technical Troubleshooting

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.

HARNES 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 micro-circuits 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).

Introduction to the Z-80 CPU

The term "microcomputer" has been used to describe virtually every type of small computing device designed within the last few years. This term has been applied to everything from simple "microprogrammed" controllers constructed out of TTL MSI up to low end minicomputers with a portion of the CPU constructed out of TTL LSI "bit slices." However, the major impact of the LSI technology within the last few years has been with MOS LSI. With this technology, it is possible to fabricate complete and very powerful computer systems with only a few MOS LSI components.

The Zilog Z-80 family of components can be configured with any type of standard semiconductor memory to generate computer systems with an extremely wide range of capabilities. For example, as few as two LSI circuits and three standard TTL MSI packages can be combined to form a simple controller. With additional memory and I/O devices a computer can be constructed with capabilities that only a minicomputer could previously deliver.

New products using the MOS LSI microcomputer are being developed at an extraordinary rate. The Zilog Z-80 component set has been designed to fit into this market through the following factors:

1. The Z-80 is fully software compatible with the popular 8080A CPU.
2. Existing designs can be easily converted to include the Z-80.
3. The Z-80 component set is at present superior in both software and hardware capabilities to any other microcomputer system on the market today.
4. For increased throughput the Z80A operating at a 4 MHz clock rate offers the user significant speed advantages.

Microcomputer systems are extremely simple to construct using Z-80 components. Any such system consists of three parts:

1. **CPU (Central Processing Unit)**
2. **Memory**
3. **Interface Circuits to peripheral devices**

The CPU is the heart of the system. Its function is to obtain instructions from the memory and perform the desired operations. The memory is used to contain instructions and in most cases data that is to be processed. For example, a typical instruction sequence may be to read data from a specific peripheral device, store it in a location in memory, check the parity and write it out to another peripheral device. Note that the Zilog component set includes the CPU and various general purpose I/O device controllers, while a wide range of memory devices may be used from any source. Thus, all required components can be connected together in a very simple manner with virtually no other external logic.

General Purpose Registers

There are two matched sets of general purpose registers, each set containing six 8-bit registers that may be used individually as 8-bit registers or as 16-bit register pairs by the programmer. One set is called BC, DE and HL while the complementary set is called BC', DE' and HL'. At any one time the programmer can select either set of registers to work with through a single exchange command for the entire set. In systems where fast interrupt response is required, one set of general purpose registers and an accumulator/flag register may be reserved for handling this very fast routine. Only a simple exchange command need be executed to go between the routines. This greatly reduces interrupt service time by eliminating the requirement for saving and retrieving register contents in the external stack during interrupt or subroutine processing. These general purpose registers are used for a wide range of applications by the programmer. They also simplify programming, especially in ROM based systems where little external read/write memory is available.

Arithmetic & Logic Unit (ALU)

The 8-bit arithmetic and logical instructions of the CPU are executed in the ALU. Internally the ALU communicates with the registers and the external

data bus on the internal data bus. The type of functions performed by the ALU include:

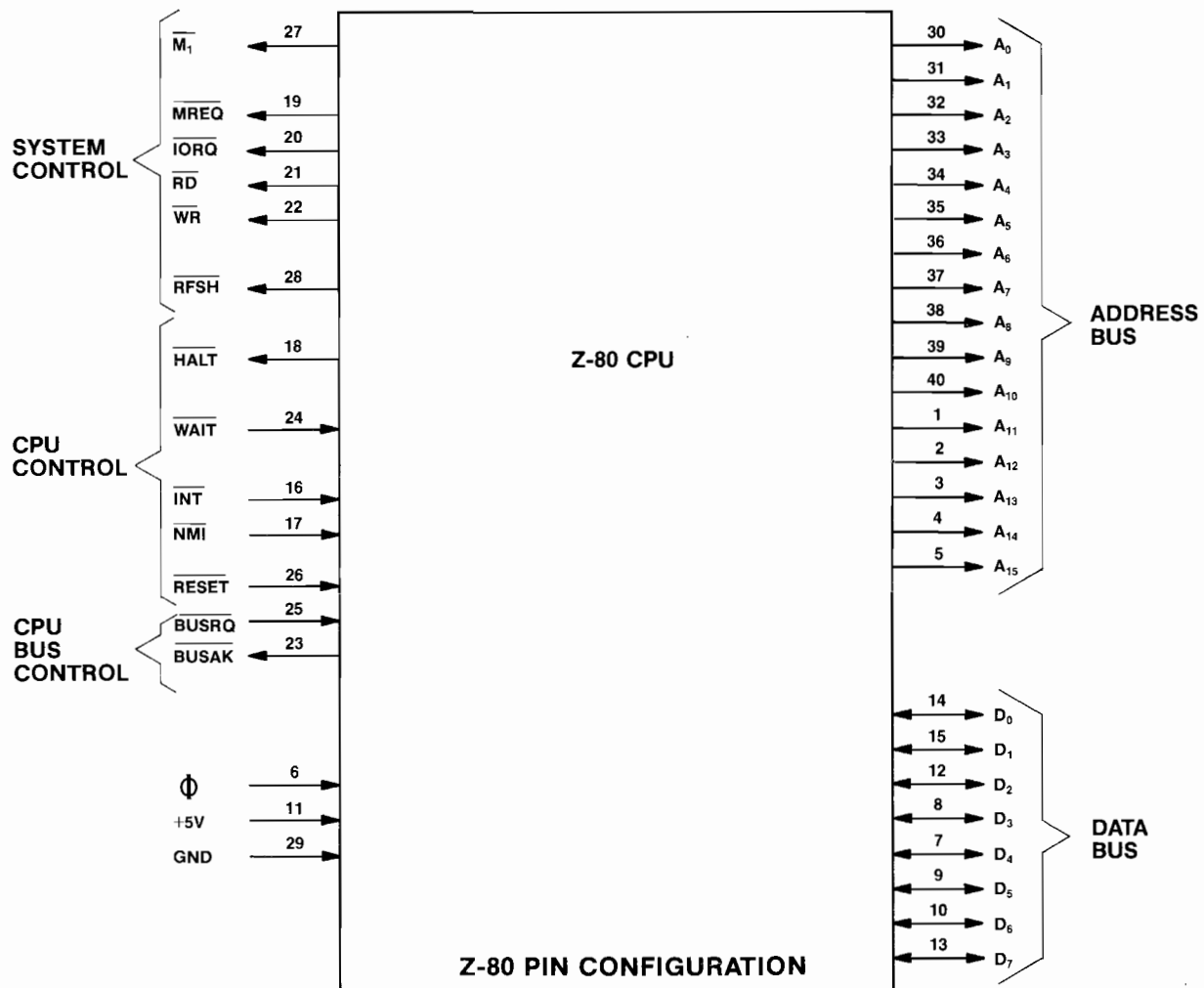
Add	Left or right shifts or rotates (arithmetic and logical)
Subtract	Increment
Logical AND	Decrement
Logical OR	Set bit
Logical Exclusive OR	Reset bit
Compare	Test bit

Instruction Register and CPU Control

As each instruction is fetched from memory, it is placed in the instruction register and decoded. The control sections performs this function and then generates and supplies all of the control signals necessary to read or write data from or to the registers, control the ALU and provide all required external control signals.

Z-80 CPU Pin Description

The Z-80 CPU is packaged in an industry standard 40 pin Dual In-Line Package. The I/O pins are shown in the below figure and the function of each is described.



A₀-A₁₅**(Address Bus)**

Tri-state output, active high. A₀-A₁₅ constitute a 16-bit address bus. The address bus provides the address for memory (up to 64K bytes) data exchanges and for I/O device data exchanges. I/O addressing uses the 8 lower address bits to allow the user to directly select up to 256 input or 256 output ports. A₀ is the least significant address bit. During refresh time, the lower 7 bits contain a valid refresh address.

D₀-D₇**(Data Bus)**

Tri-state input/output, active high. D₀-D₇ constitute an 8-bit bidirectional data bus. The data bus is used for data exchanges with memory and I/O devices.

M₁**(Machine Cycle one)**

Output, active low. M₁ indicates that the current machine cycle is the OP code fetch cycle of an instruction execution. Note that during execution of 2-byte op-codes, M₁ is generated as each op code byte is fetched. These two byte op-codes always begin with CBH, DDH, EDH or FDH. M₁ also occurs with IORQ to indicate an interrupt acknowledge cycle.

MREQ**(Memory Request)**

Tri-state output, active low. The memory request signal indicates that the address bus holds a valid address for a memory read or memory write operation.

IORQ**(Input/Output Request)**

Tri-state output, active low. The IORQ signal indicates that the lower half of the address bus holds a valid I/O address for a I/O read or write operation. An IORQ signal is also generated with an M₁ signal when an interrupt is being acknowledged to indicate that an interrupt response vector can be placed on the data bus. Interrupt Acknowledge operations occur during M₁ time while I/O operations never occur during M₁ time.

RD**(Memory Read)**

Tri-state output, active low. RD indicates that the CPU wants to read data from memory or an I/O device. The addressed I/O device or memory should use this signal to gate data onto the CPU data bus.

WR**(Memory Write)**

Tri-state output, active low. WR indicates that the CPU data bus holds valid data to be stored in the addressed memory or I/O device.

RFSH**(Refresh)**

Output, active low. RFSH indicates that the lower 7 bits of the address bus contain a refresh address for dynamic memories and the current MREQ signal should be used to do a refresh read to all dynamic memories.

HALT**(Halt state)**

Output, active low. HALT indicates that the CPU has executed a HALT software instruction and is awaiting either a non maskable or a maskable interrupt (with the mask enabled) before operation can resume. While halted, the CPU executes NOP's to maintain memory refresh activity.

WAIT**(Wait)**

Input, active low. WAIT indicates to the Z-80 CPU that the addressed memory or I/O devices are not ready for a data transfer. The CPU continues to enter wait states for as long as this signal is active. This signal allows memory or I/O devices of any speed to be synchronized to the CPU.

INT**(Interrupt Request)**

Input, active low. The Interrupt Request signal is generated by I/O devices. A request will be honored at the end of the current instruction if the internal software controlled interrupt enable flip-flop (IFF) is enabled and if the BUSRQ signal is not active. When the CPU accepts the interrupt, an acknowledge signal (IORQ during M₁ time) is sent out at the beginning of the next instruction cycle. The CPU can respond to an interrupt in three different modes that are described in detail in section 5.4 (CPU Control Instructions).

NMI**(Non-Maskable Interrupt)**

Input, negative edge triggered. The non maskable interrupt request line has a higher priority than INT and is always recognized at the end of the current instruction, independent of the status of the interrupt enable flip-flop. NMI automatically forces the Z-80 CPU to restart to location 0066H. The program counter is automatically saved in the external stack so that the user can return to the program that was interrupted. Note that continuous WAIT cycles can prevent the current instruction from ending, and that a BUSRQ will override a NMI.

RESET

Input, active low. RESET forces the program counter to zero and initializes the CPU. The CPU initialization includes:

- 1) Disable the interrupt enable flip-flop

- 2) Set Register I = 00H
- 3) Set Register R = 00H
- 4) Set Interrupt Mode 0

During reset time, the address bus and data bus go to a high impedance state and all control output signals go to the inactive state.

BUSRQ
(Bus Request)

Input, active low. The bus request signal is used to request the CPU address bus, data bus and tri-state output control signals to go to a high impedance state so that other devices can control these buses.

When BUSRQ is activated, the CPU will set these buses to a high impedance state as soon as the current CPU machine cycle is terminated.

BUSAK
(Bus Acknowledge)

Output, active low. Bus acknowledge is used to indicate to the requesting device that the CPU address bus, data bus and tri-state control bus signals have been set to their high impedance state and the external device can now control these signals.

Single phase TTL level clock which requires only a 330 ohm pull-up resistor to +5 volts to meet all clock requirements.

**KICK-MAN
MCR II SYSTEM
P.C. BOARD JUMPER OPTIONS**

VIDEO GENERATOR P.C. BOARD									
MANUFACTURER	EPROM NO.	JW#1	JW#2	JW#3	JW#4	JW#5	JW#6	JW#7	JW#8
MOTOROLA	68764		*	*		*	*	*	*
	68766		*	*		*	*	*	*
INTEL	2764	*			*		*	*	
T. I.	2564		*	*		*			*
C.P.U. P.C. BOARD									
MANUFACTURER	EPROM NO.	JW#1	JW#2	JW#3	JW#4	JW#5	JW#6	NOTE: JUMPER OP- TION FOR PROGRAM ROMs ONLY.	
NUMEROUS MFR'S	2532	*		*	*		*		
NUMEROUS MFR'S	2732	*		*	*	*			
SOUND I/O P.C. BOARD									
MANUFACTURER	EPROM NO.	JW#1	JW#2						
NUMEROUS MFR'S	2532	*							
NUMEROUS MFR'S	2732		*						

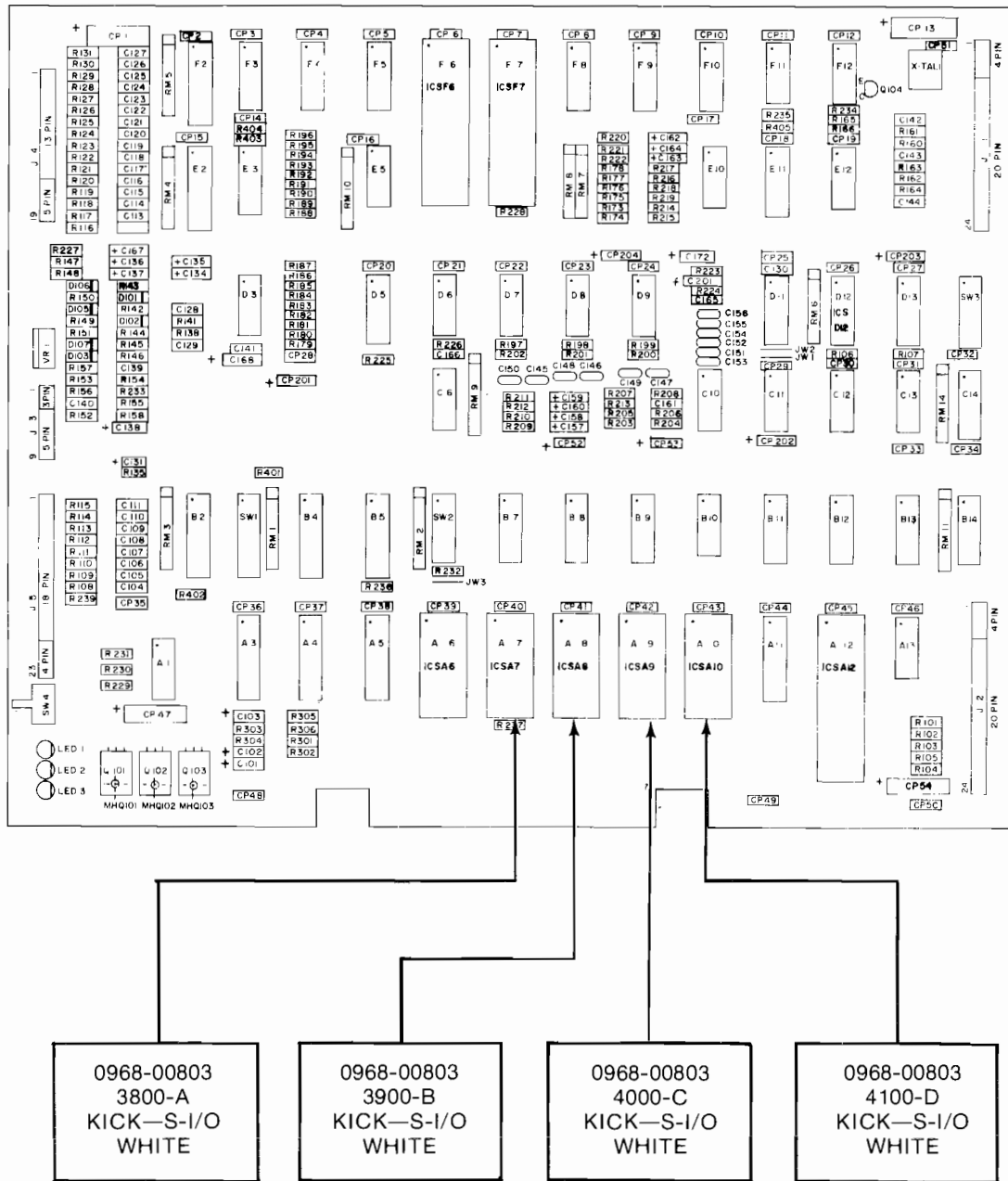
* = CUT JUMPER WIRES WHERE THIS SYMBOL "*" APPEARS.

The above table illustrates the fact that the Video Generator P.C. Board used in the MCR II System has 8 jumper wires, the C.P.U. P.C. Board used in the MCR II System has 6 jumper wires, and the Sound I/O P.C. Board used in the MCR II System has 2 jumper wires.

All of the above Boards can be used with a variety of different **SETS of EPROM chips**. However, these EPROMS are not all made by the same manufacturer and do have some internal differences. So, in order to make them function properly in their respective P.C. Boards, certain jumper wires on these Boards have to be cut.

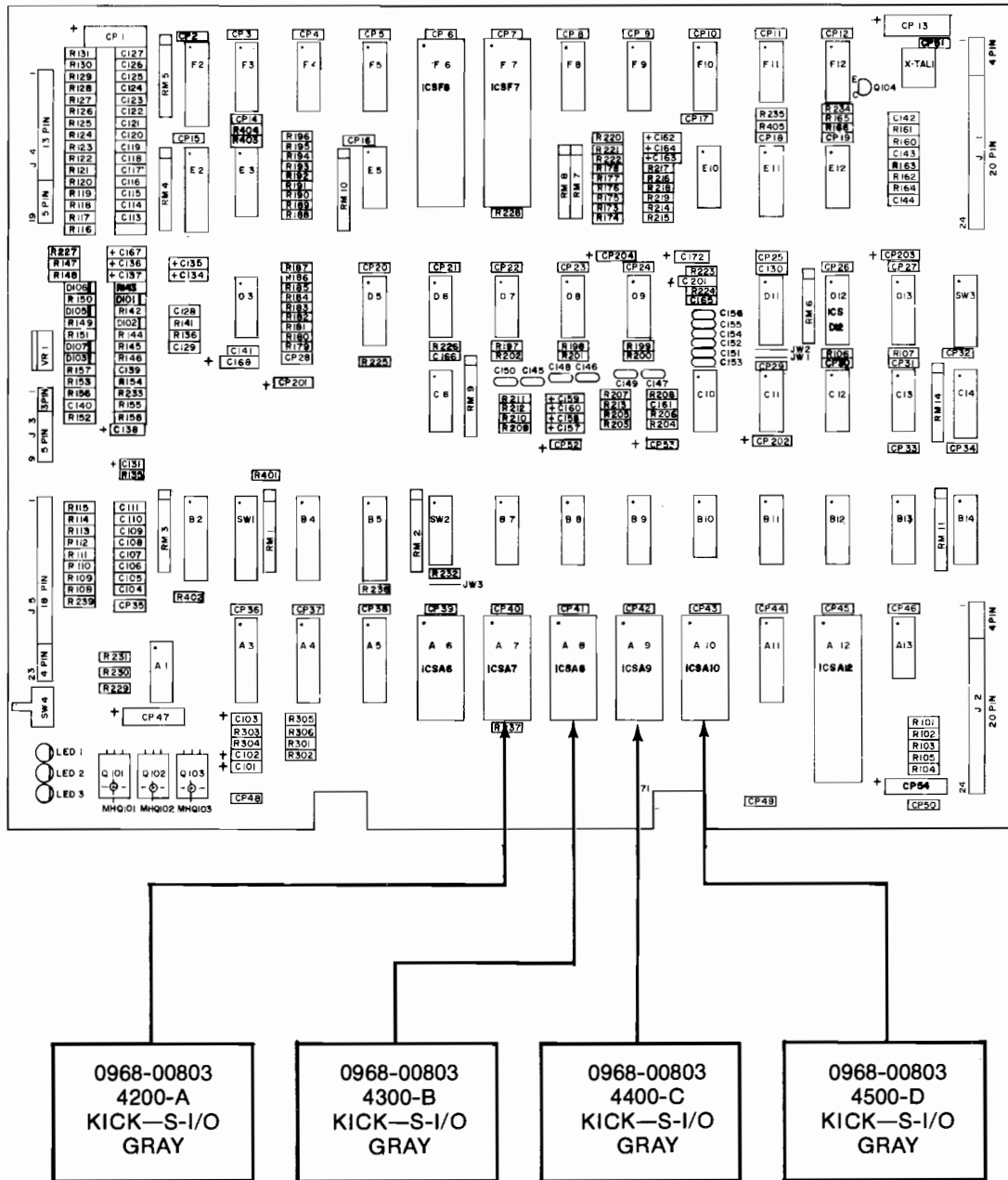
The above table tells you which jumpers to cut (depending on which EPROM set you're going to use) by showing a "*" under that jumper wires number. If there is **NO** "*" under a jumper wires number, **THAT PARTICULAR JUMPER WIRE IS NOT TO BE CUT.**

KICK-MAN — ALL MODELS SOUND I/O BOARD EPROMS VERSION NO. 1



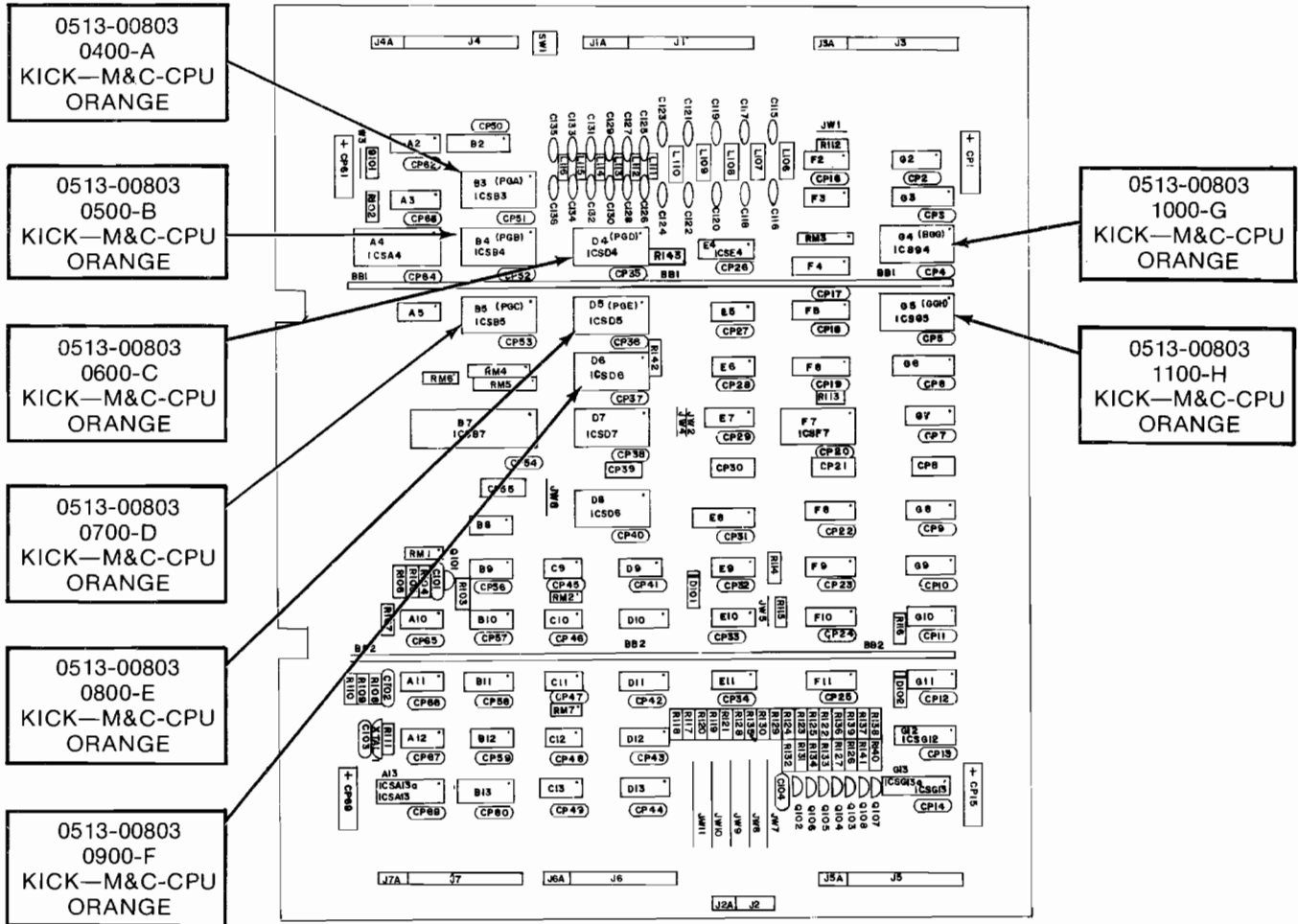
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN — ALL MODELS SOUND I/O BOARD EPROMS VERSION NO. 2



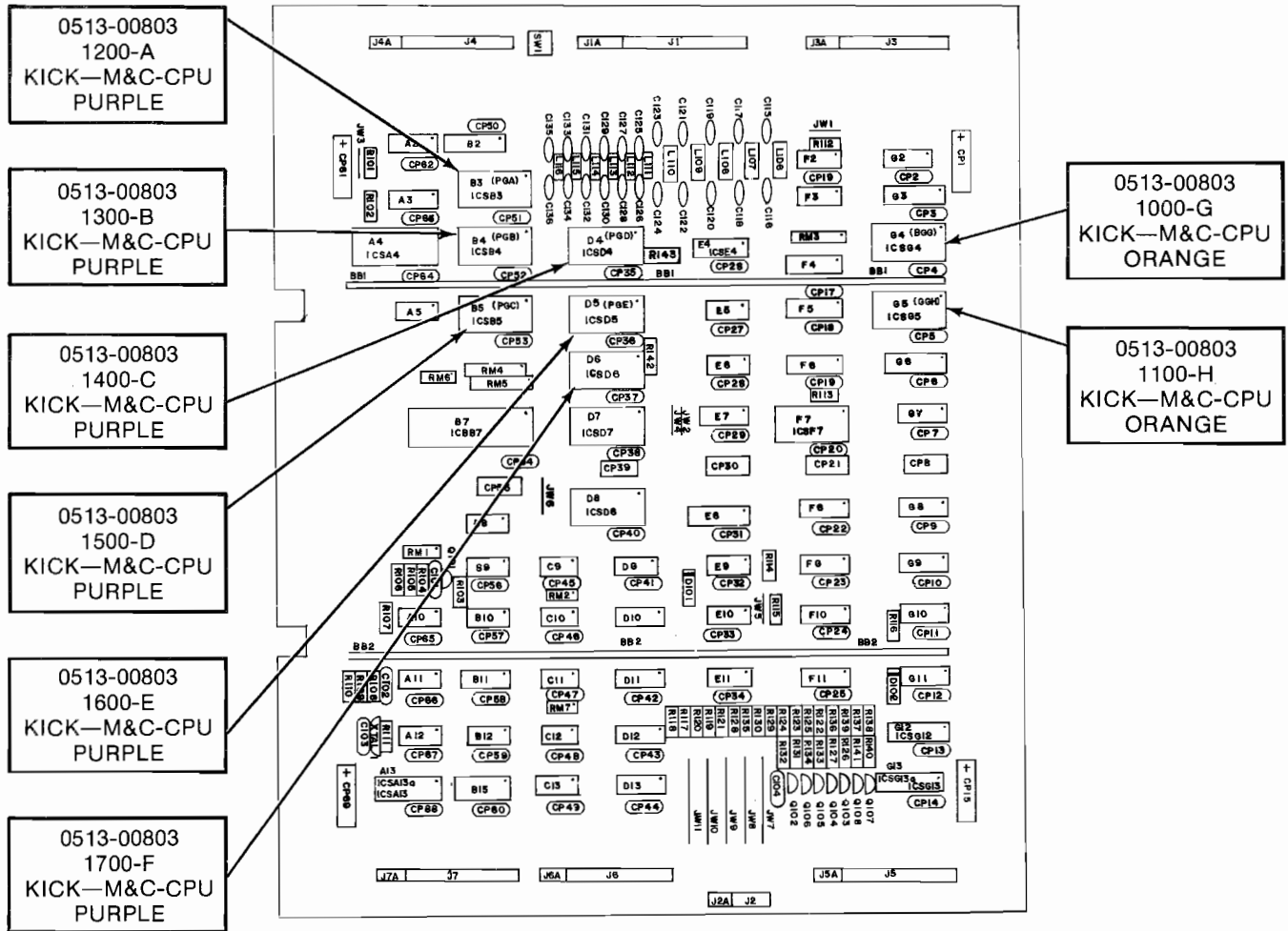
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN MINI AND COCKTAIL CPU EPROMS VERSION NO. 1



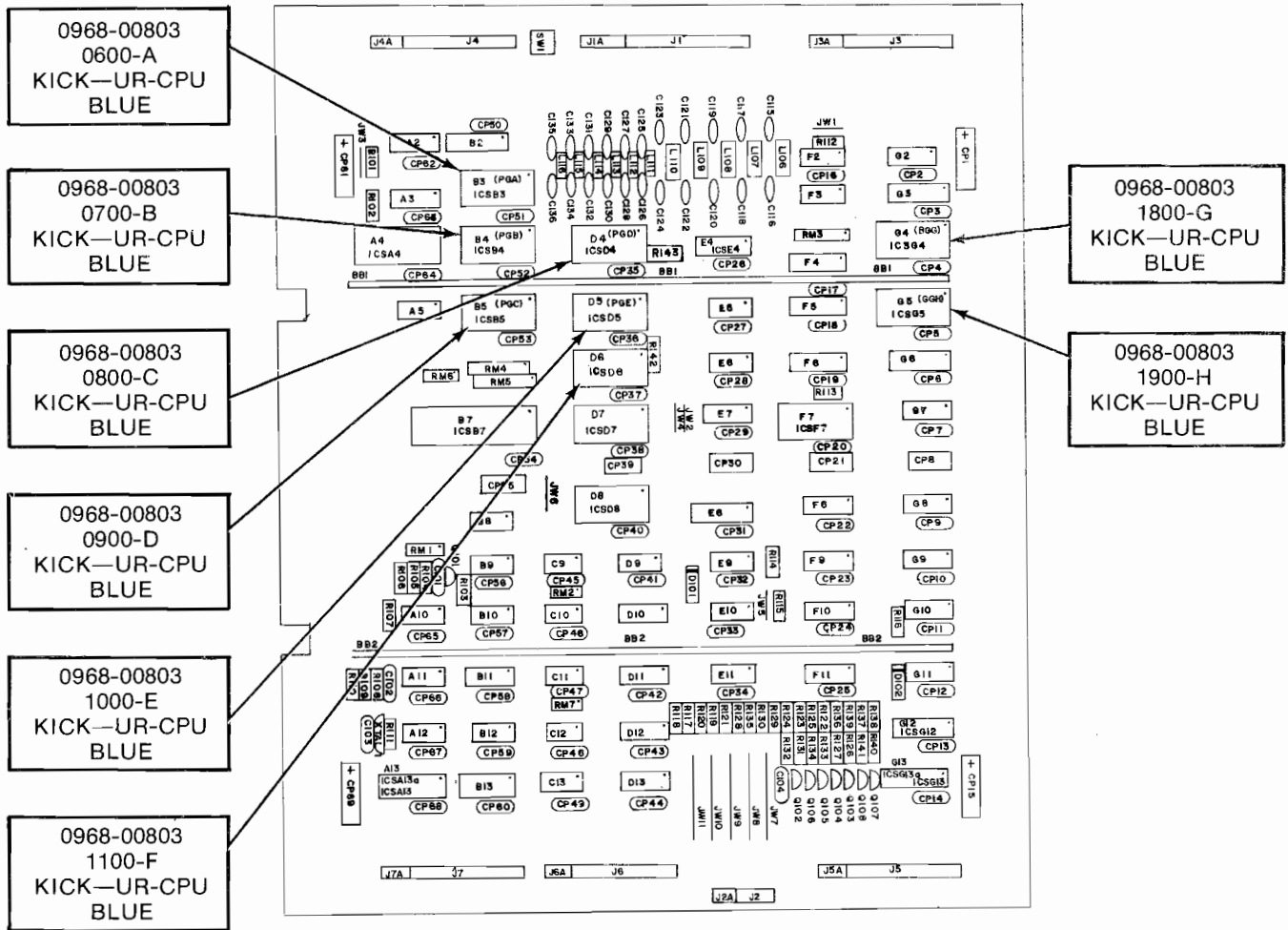
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN MINI AND COCKTAIL CPU EPROMS VERSION NO. 2



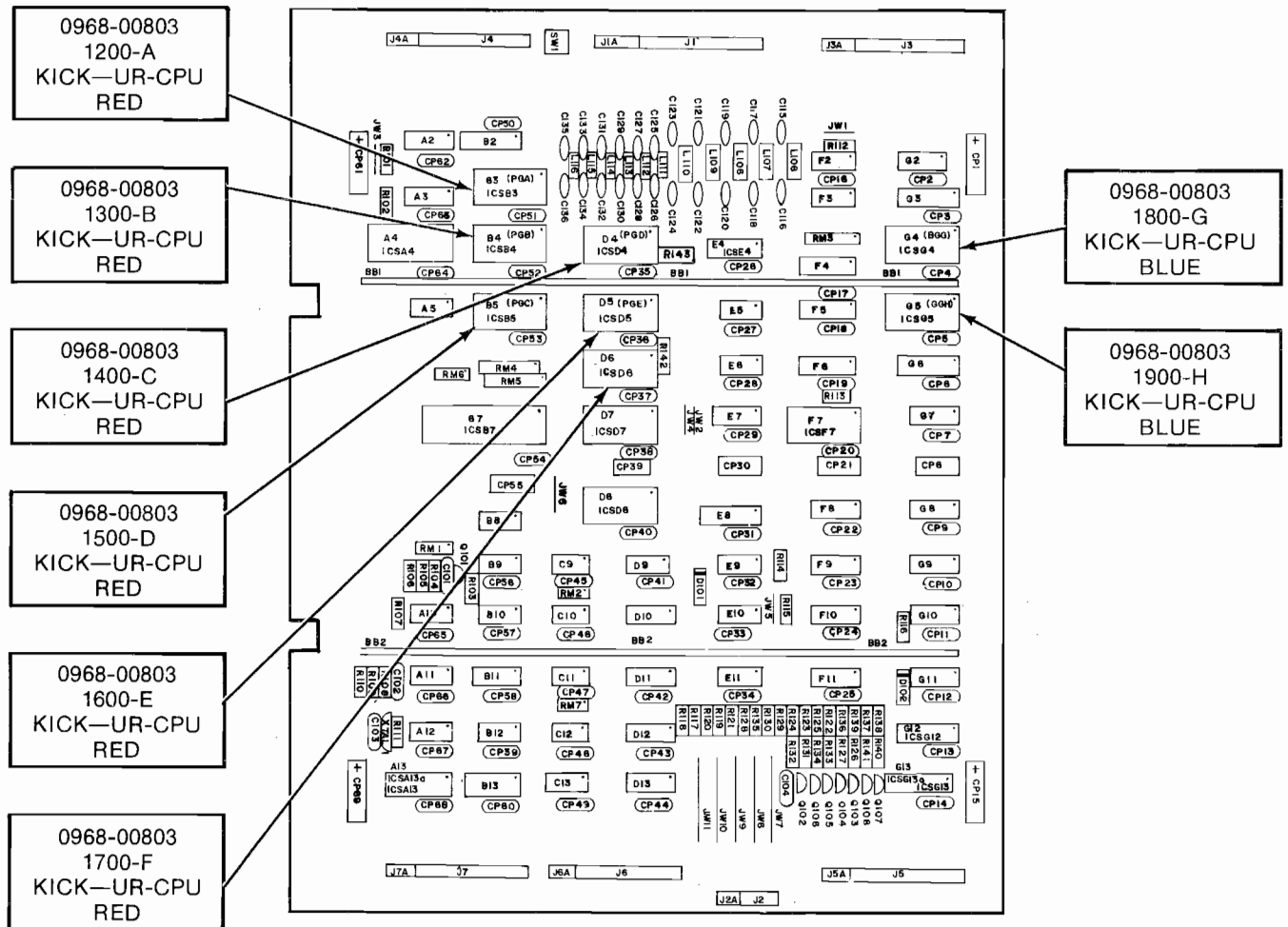
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN UPRIGHT CPU EPROMS VERSION NO. 1



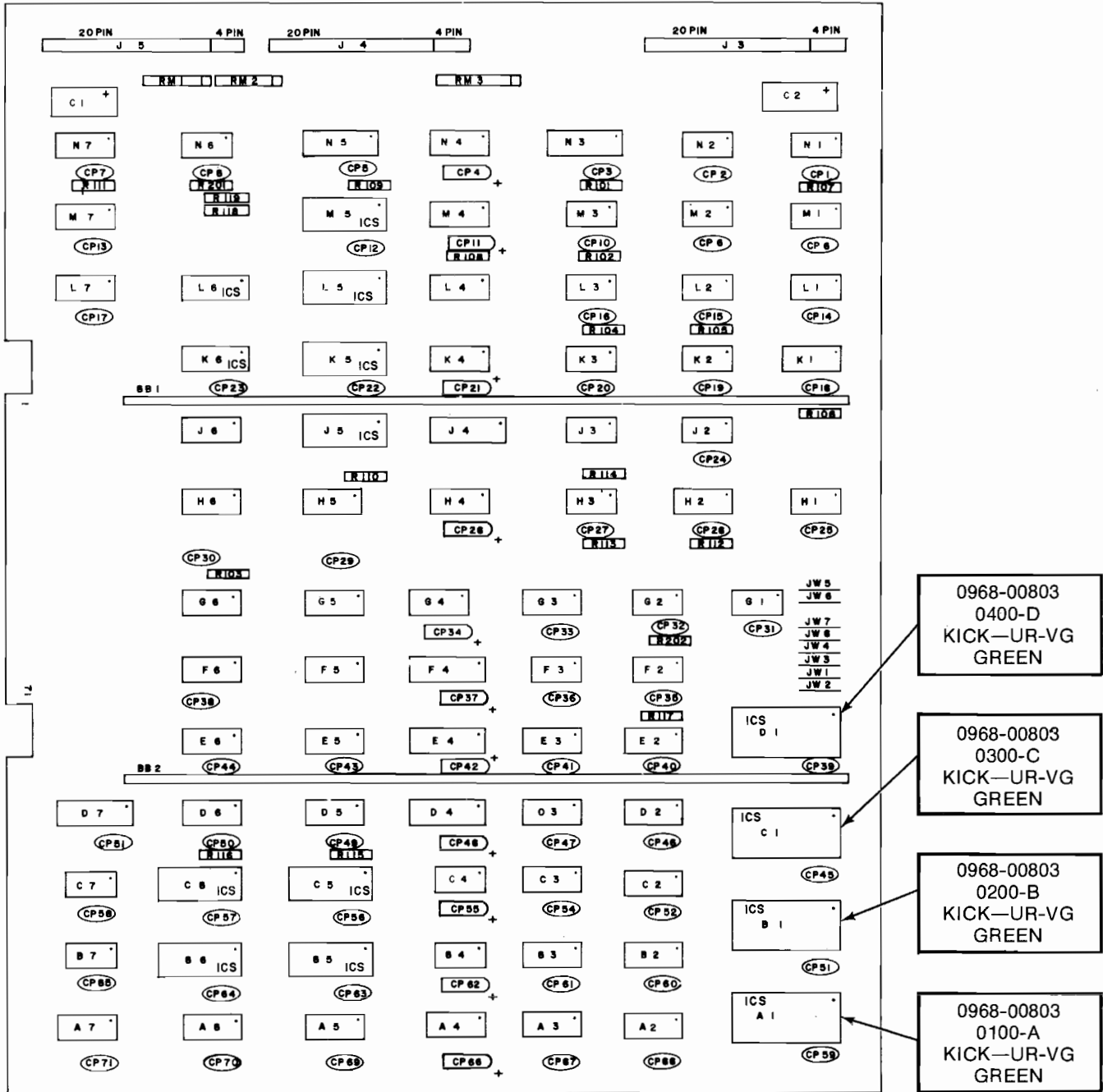
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN UPRIGHT CPU EPROMS VERSION NO. 2



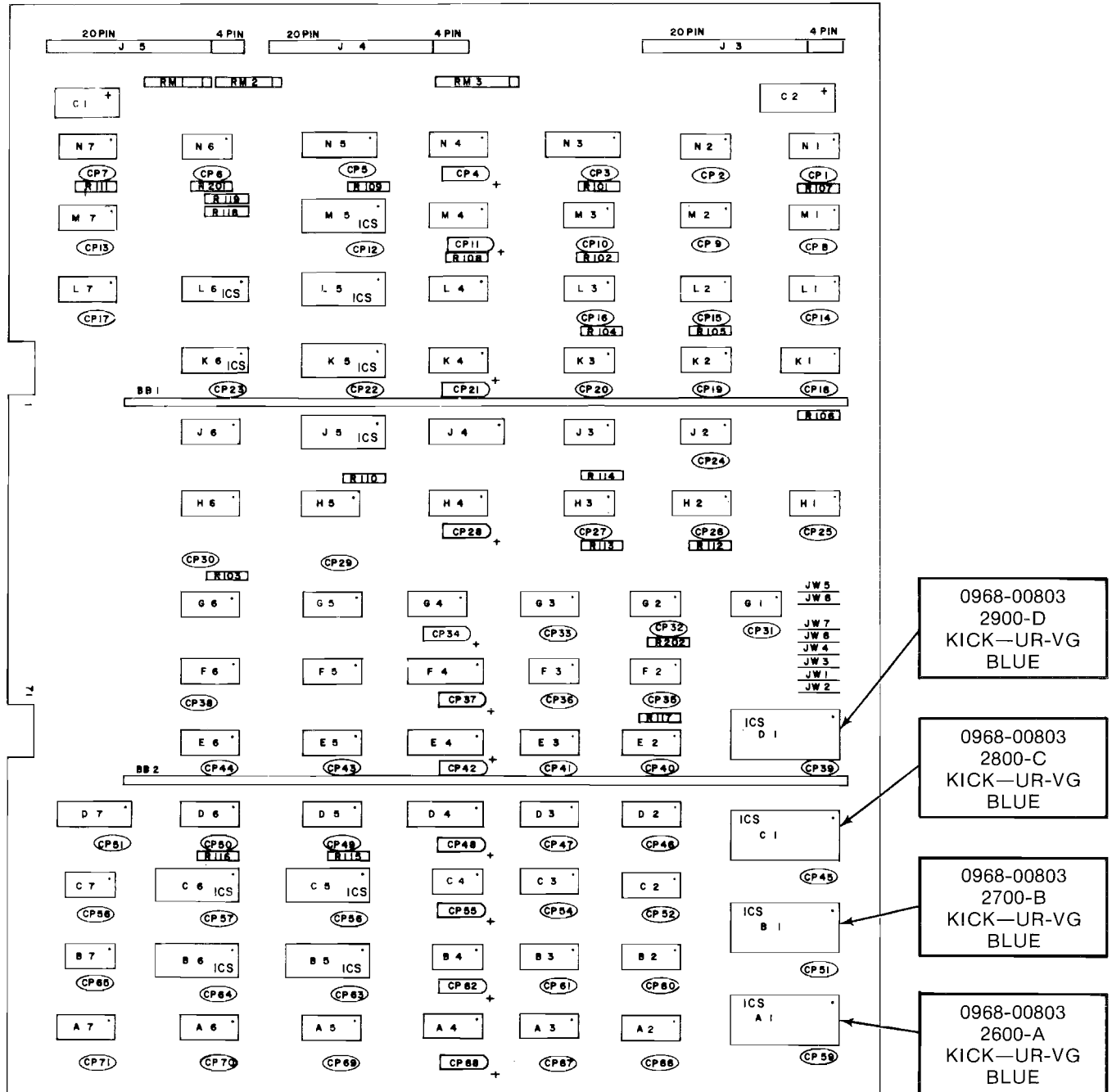
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN UPRIGHT VID. GEN. EPROMS VERSION NO. 1



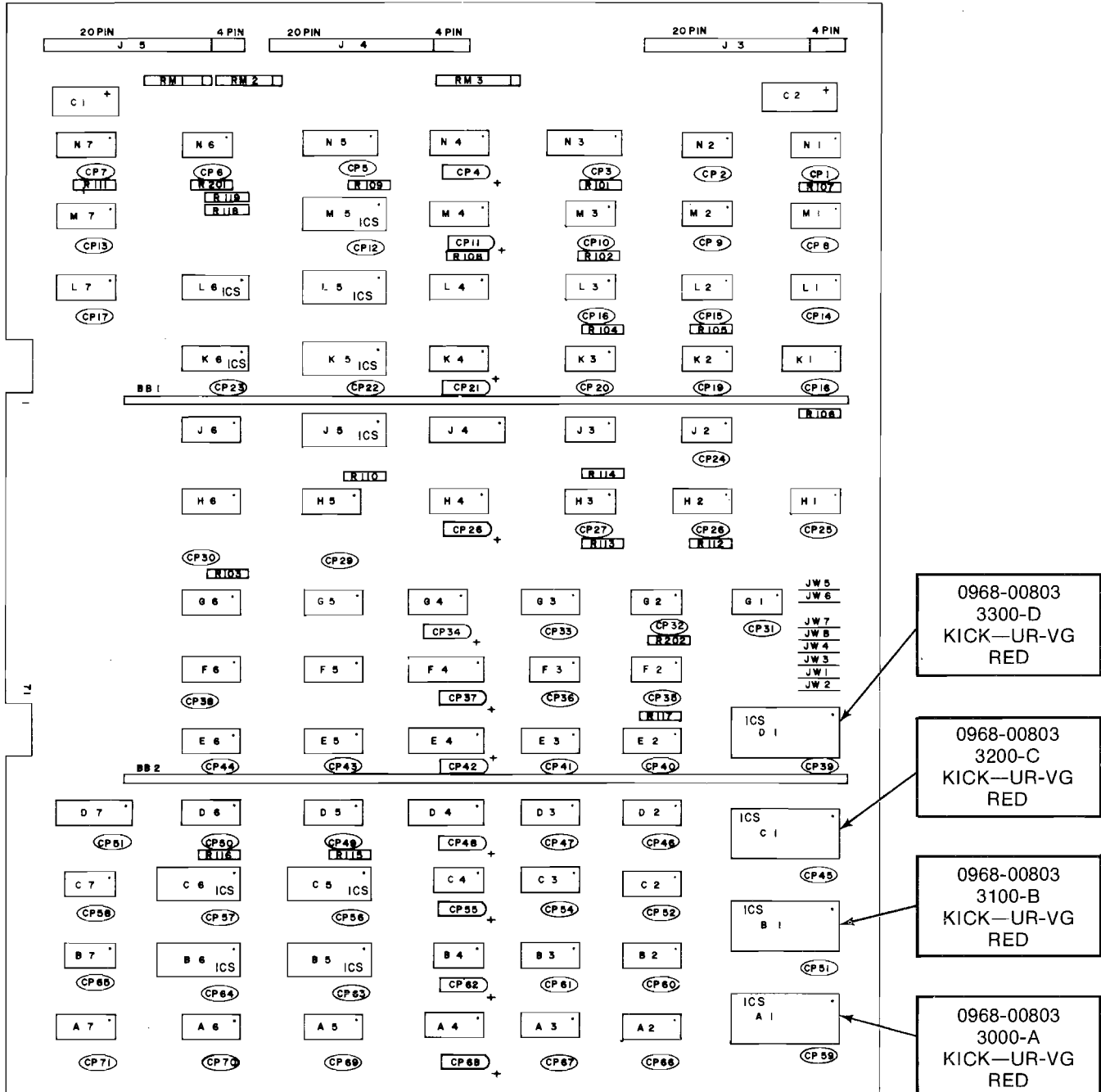
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN UPRIGHT VID. GEN. EPROMS VERSION NO. 2



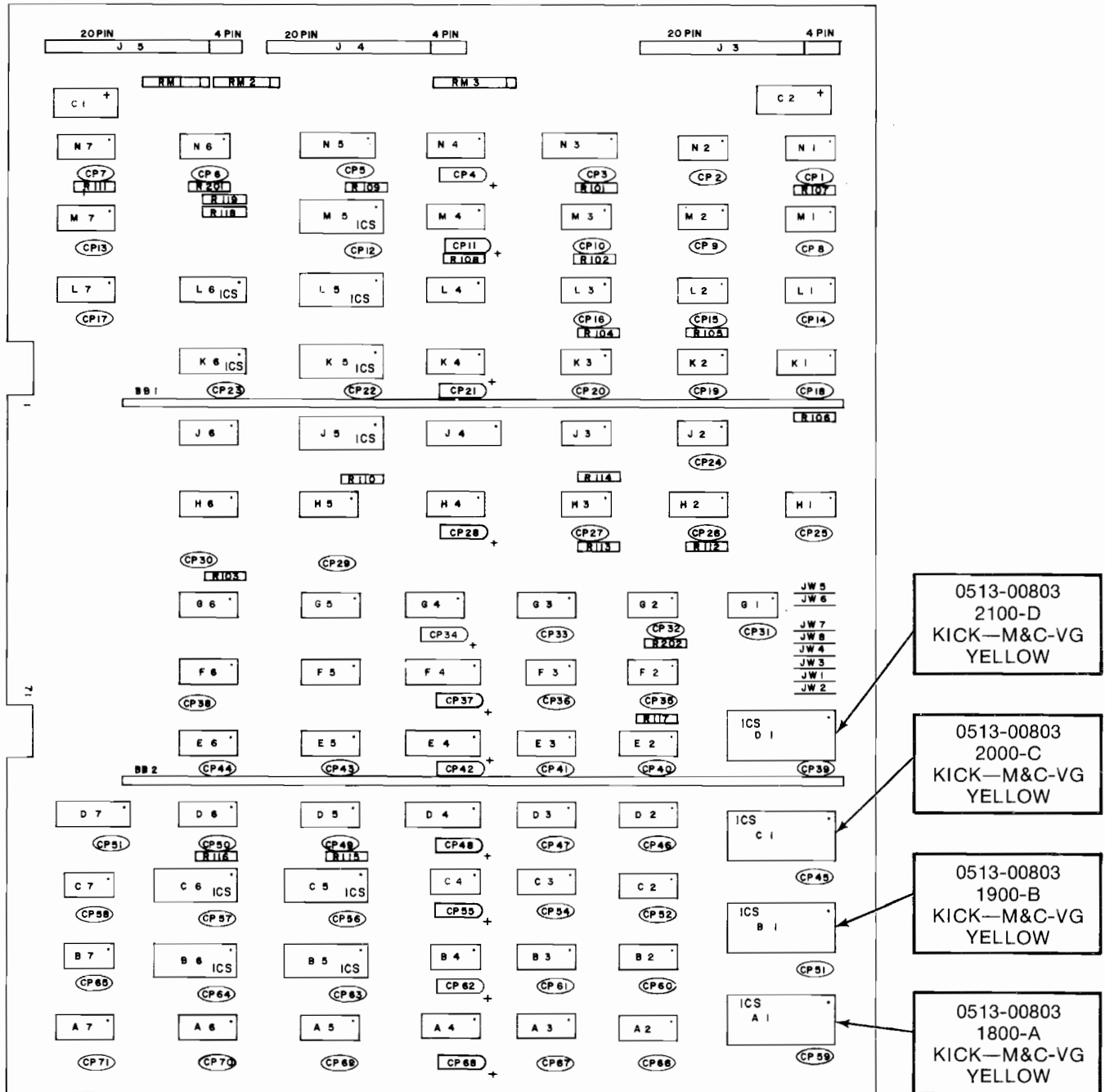
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN UPRIGHT VID. GEN. EPROMS VERSION NO. 3



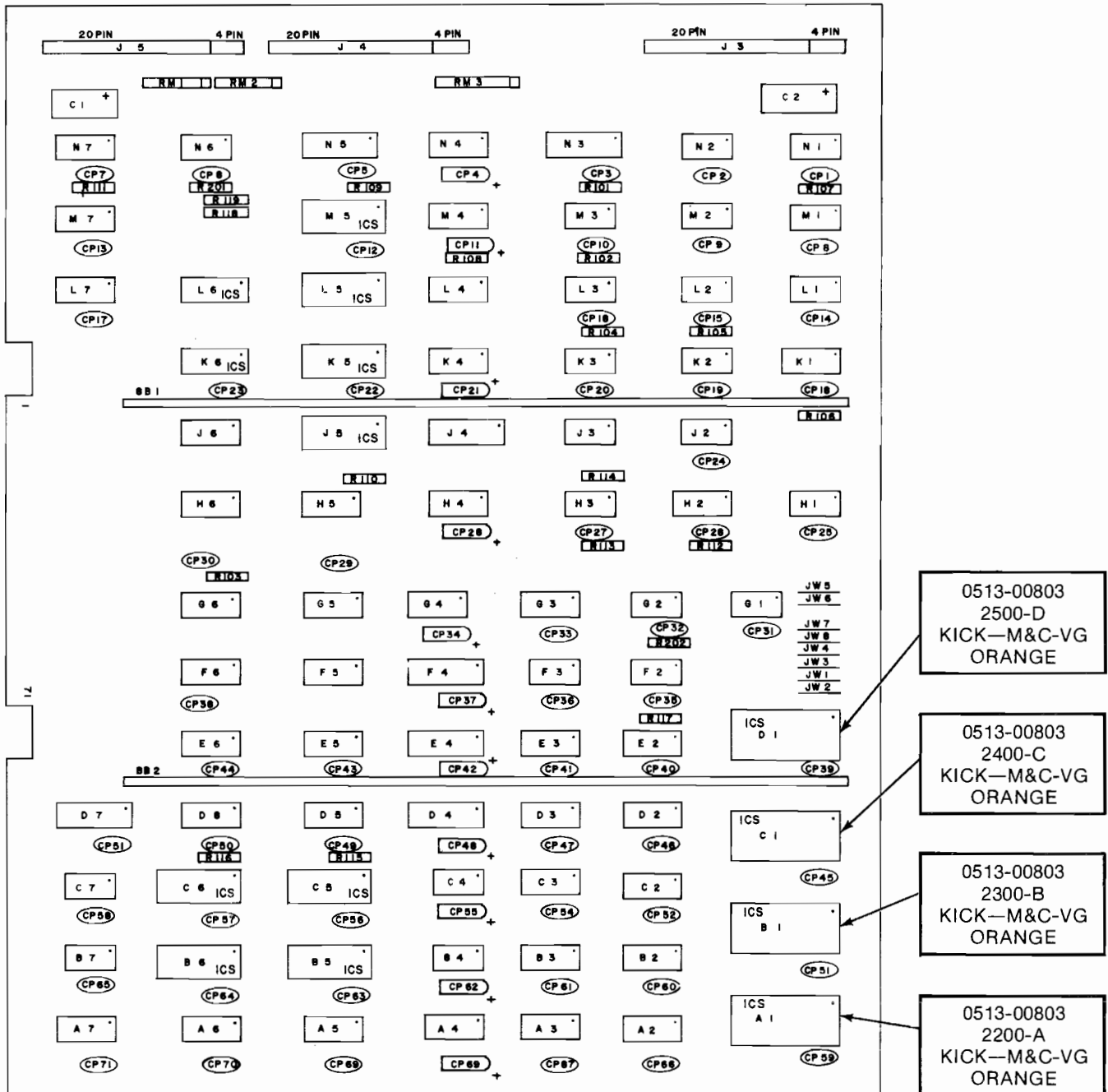
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN MINI AND COCKTAIL VID. GEN. EPROMS VERSION NO. 1



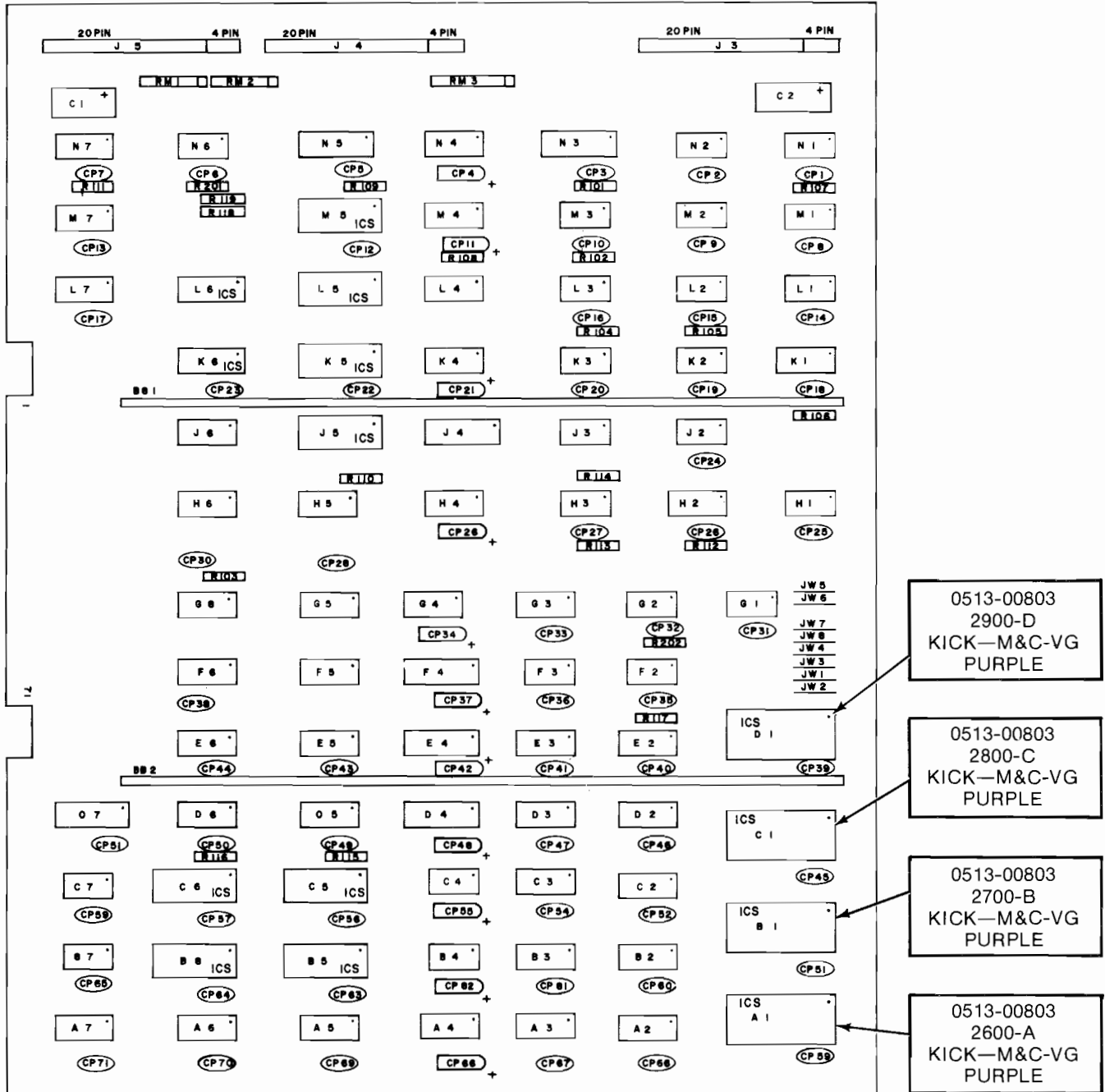
The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN MINI AND COCKTAIL VID. GEN. EPROMS VERSION NO. 2



The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

KICK-MAN MINI AND COCKTAIL VID. GEN. EPROMS VERSION NO. 3



The above **EPROM COMBINATIONS** (indicated by **LABEL NUMBER AND COLOR**) are the **ONLY** ones that will enable this P.C. BOARD to **FUNCTION PROPERLY!!**

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

VI T.V. Monitor

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:

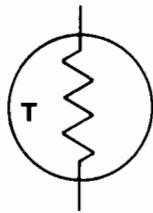
- A. Problem in the power supply: Check fuse, transistors, open fusible resistor.
- B. Shorted horizontal output transistor.

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

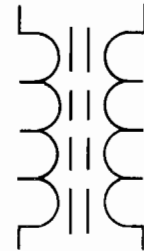
24. Can't adjust purity or convergence:

- 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.

Guide To Schematic Symbols



THERMISTOR
(POLARITY DOESN'T MATTER)



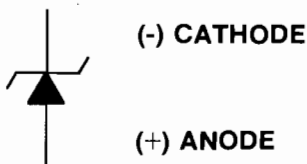
IRON CORE TRANSFORMER
(SUCH AS A FLYBACK)



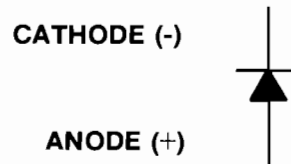
INDUCTOR, COIL, CHOKE
(POLARITY DOESN'T MATTER)



FUSE
(POLARITY DOESN'T MATTER)



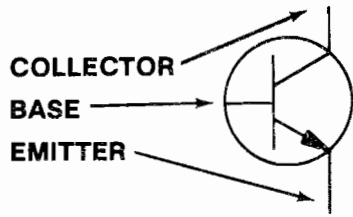
ZENER DIODE



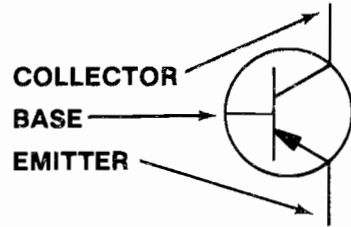
CATHODE (-)

ANODE (+)

DIODE



NPN TRANSISTOR



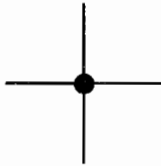
PNP TRANSISTOR



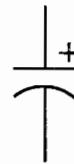
VARIABLE RESISTOR, POT, CONTROL
(POLARITY DOESN'T MATTER)



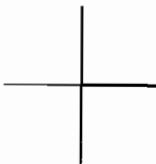
RESISTOR
(POLARITY DOESN'T MATTER)



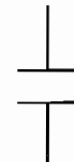
LINES ARE CONNECTED



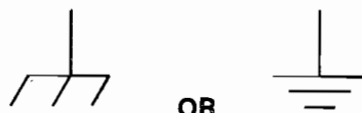
ELECTROLYTIC CAPACITOR



LINES ARE NOT CONNECTED



CAPACITOR
(POLARITY DOESN'T MATTER)



OR
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.

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" or 19" color monitor uses transistors for its sync section. An Electrohome 13" or 19" color monitor uses an integrated circuit IC501 for its sync section. The idea is all the same. The output to the vertical amplifying transistors for all monitors must be a sawtooth wave form, sort of like a bunch of pyramids, racing to 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. Again, Wells Gardner uses transistors for the horizontal oscillator, and Electrohome uses the other side of IC501. Still, the effect is the same. 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 oscillators frequencies 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 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 the emitter on TR502 of the Wells Gardner monitors; or the emitter of X04 for the Electrohome monitor. Here are the voltages you should receive:

Wells Gardner = 127VDC
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 circuits 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.

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 see if there are two circuit boards rising up from the chassis toward the picture tube neck. In other words, they stand up, or are perpendicular to the chassis, with a black plastic bracket holding them in place. This is a description of a Wells Gardner monitor. They use separate boards for main chunks of circuitry. Therefore, you have a "power board" (the power supply), an "interface board" (the interface section), and a "horizontal/vertical board" (for the deflection circuitry). Still, there are a few parts on the chassis, but most can be found on the board. An Electrohome monitor has no

separate boards, except for the neck board, and just has a flat chassis.

Another good way to determine which monitor you have is to check the transistor call out numbers that are printed on the chassis next to the part. For instance, on the neck board, one of the color output transistors is TR401. If you look through the schematics or the parts lists, you will find TR401 in the Wells Gardner literature. On the other hand, the neck board transistor may say X101. X101 can be found in the Electrohome literature. So, all Wells Gardner transistor call outs begin with TR, and Electrohome transistor call outs start with an "X".

Parts Interchangeability

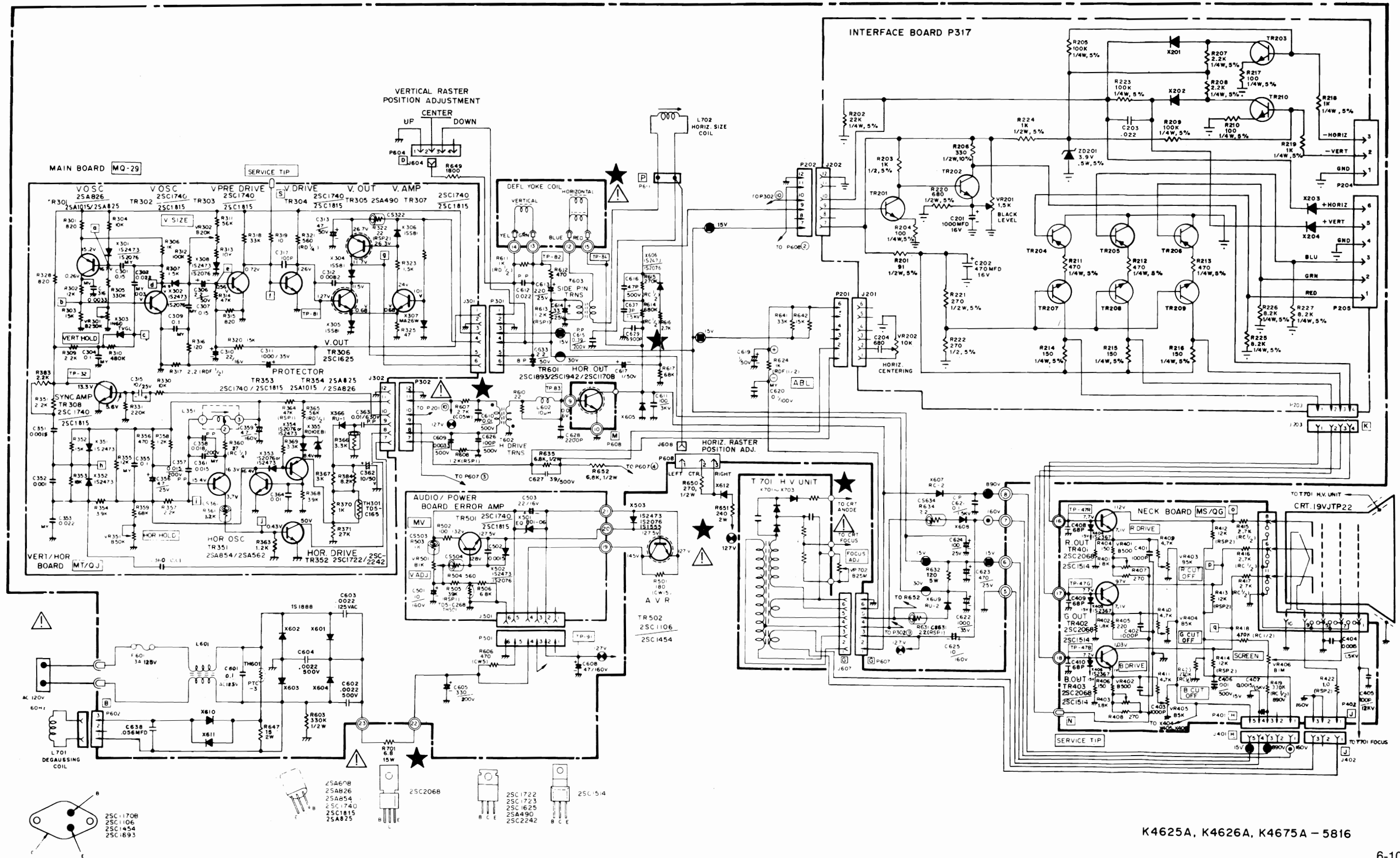
Some parts can be interchanged on all of the monitors. Here are the rules:

1. You **CAN** swap the voltage regulator TR502 or X01 on any Wells Gardner or Electrohome 19 inch monitor. You **CAN NOT** swap the voltage regulator on the 13 inch Wells Gardner or Electrohome (G07-902) since the Electrohome uses an integrated circuit for the power supply.
2. You **CAN** swap any resistor between monitors that has the same resistance, wattage rating, and tolerance.
3. You **CAN** swap any capacitor between monitors that has the same capacitance, and voltage rating.
4. You **CAN** swap any 19 inch picture tube on the monitors.
5. You **CAN NOT** 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 (G07-904) 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.

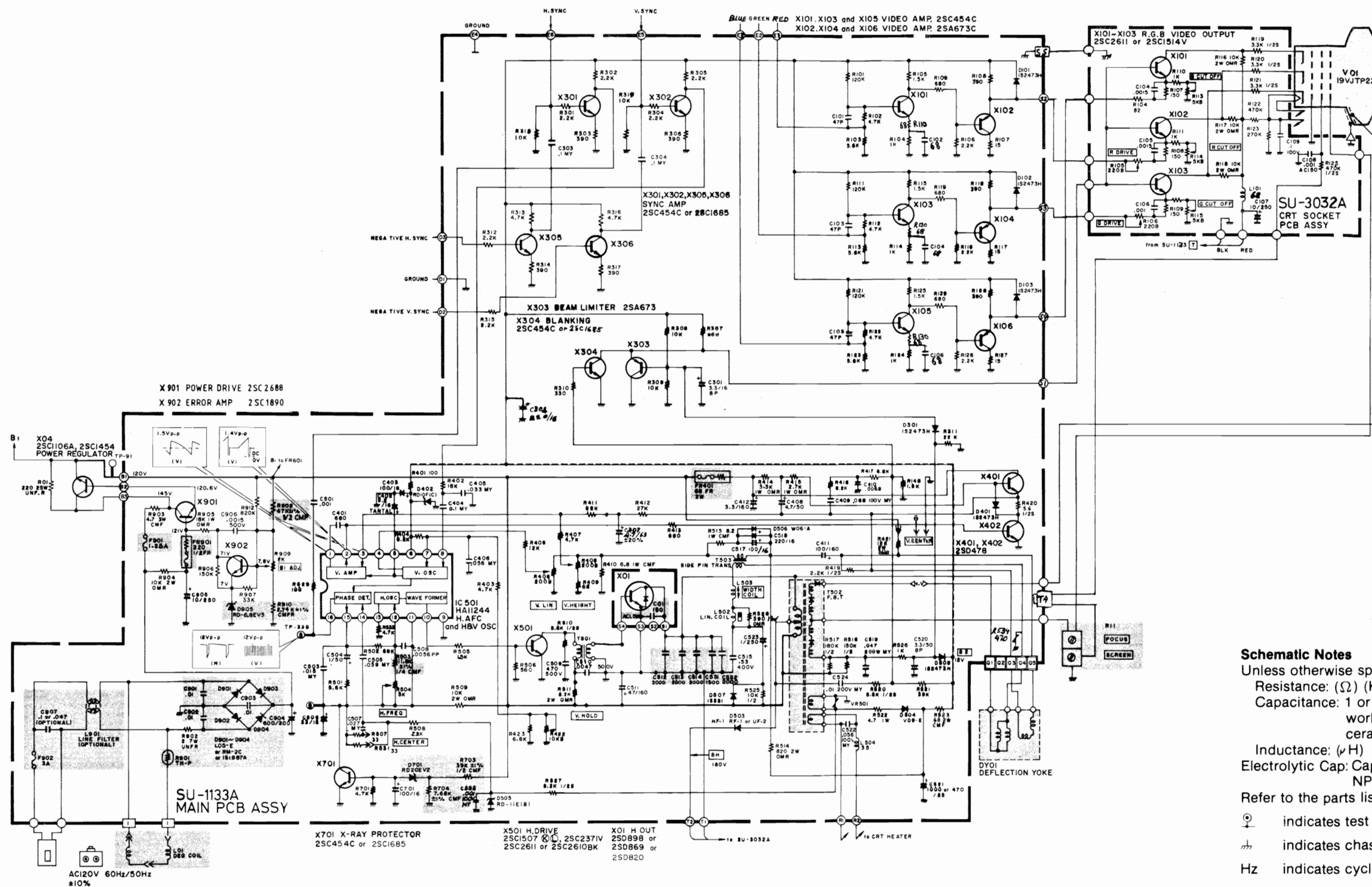
If there is any doubt about what parts can be swapped between each manufacturer's 19 inch and 13 inch models, compare the manufacturer's part number between each one. If they match up, they are the same part.

WELLS-GARDNER 19" COLOR MONITOR SCHEMATIC DIAGRAM

MO51-00087-A012



K4625A, K4626A, K4675A - 5816



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

REPLACEMENT PARTS LIST - ELECTROHOME 19" MONITOR

Components identified by the Δ 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
Δ	Picture Tube 19"	17-7198-03
Δ	Deflection Yoke	A29779-D = 21-141-01
Δ	PC Magnet	A75034-B = 29-32-01
Δ	Flyback Transf.	A29951-B
Δ	HVR	A46600-A
R05	UNF Resistor 220 Ω , 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 Ω , 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
Symbol	Description	
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 Ω 2W J	QRG029J-103
R3117	OM R 10K Ω 2W J	QRG029J-103
R3118	OM R 10K Ω 2W J	QRG029J-103
R3119	Comp. R 3.3K Ω $\frac{1}{2}$ W K	QRZ0039-332
R3120	Comp. R 3.3K Ω $\frac{1}{2}$ W K	QRZ0039-332
C3121	Comp. R 3.3K Ω $\frac{1}{2}$ 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

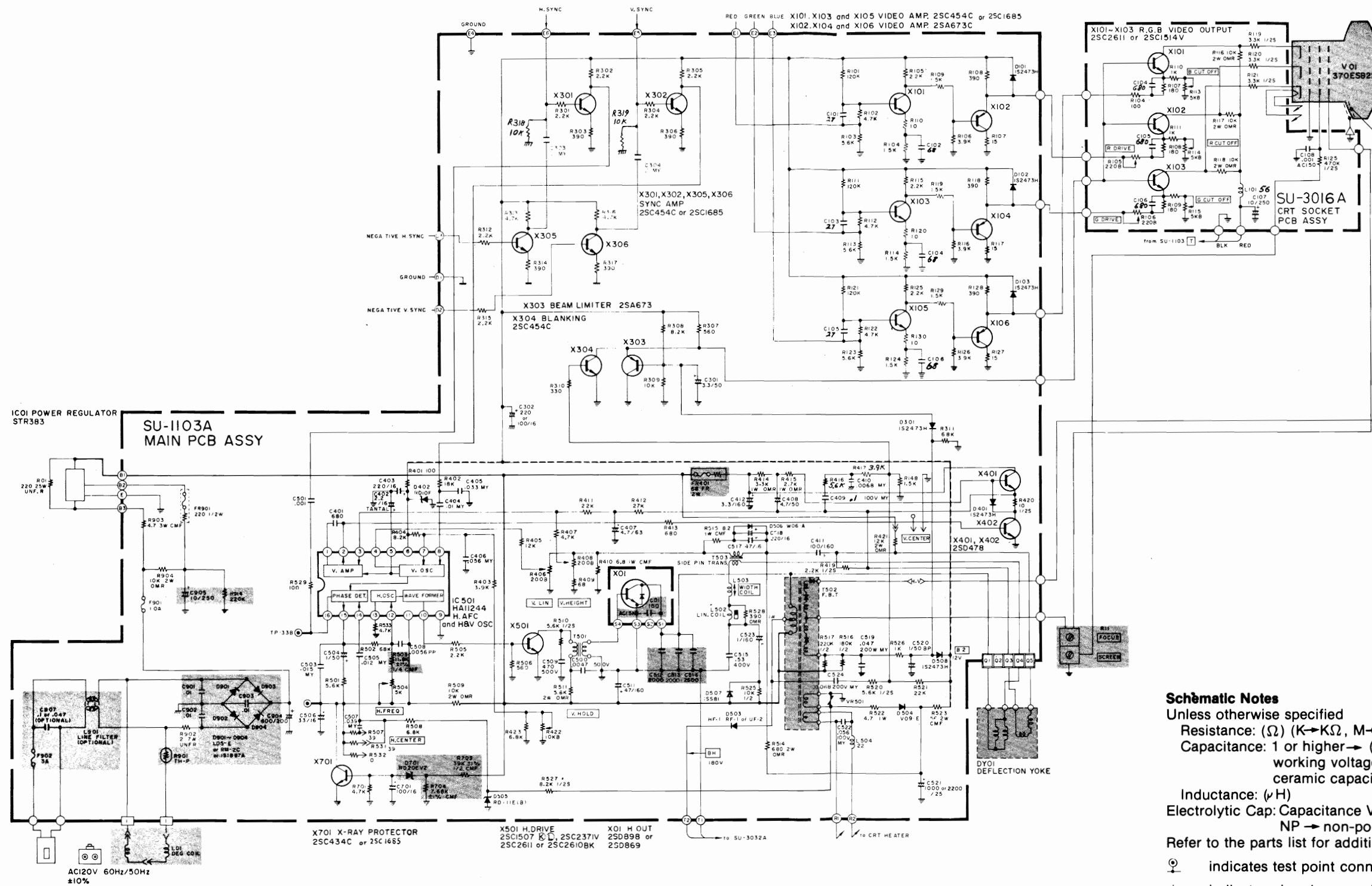
Main PCB Ass'y (SU-1133A) Parts List**Resistors**

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 11.8KΩ ¼W +1%	QVZ3230-053
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 7.68KΩ ¼W +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 2.74KΩ ¼W +1%	QRV142F-2741
△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

Coils		
Symbol	Description	Part Number
L1502	Linarity Coil	A39835
L1503	Width Coil	C30380-A
L1504	Heater Choke	C30445-A
Transformers		
Symbol	Description	Part Number
T1501	Hor. Drive Transf.	A46022-BM
T1503	Side Pin Transf.	C39050-A
Semiconductors		
Symbol	Description	Part Number
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
Miscellaneous		
Symbol	Description	Part Number
△F1901	△Fuse 1.25A	QMF53U1-1R25S
△F1902	△UL Fuse 3A	QMF66U1-3R0S



Schematic Notes

- Unless otherwise specified
- Resistance: (Ω) (K \rightarrow K Ω , M \rightarrow M Ω), 1/4 (W) carbon resistor
- Capacitance: 1 or higher \rightarrow (pF), less than 1 \rightarrow (μ F) working voltage \rightarrow 50 (V) ceramic capacitor
- Inductance: (μ H)
- Electrolytic Cap: Capacitance Value (μ 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
- \perp 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 ($\text{---} \text{---}$)

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 Δ 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
Δ V01	Δ Picture Tube	370ESB22(E)
Δ DY01	Δ Deflection Yoke	C29123-V
	PC Magnet	A76366-A
	Wedge	C30006
	Δ Flyback Transf.	A19183-A
	Δ Focus V R	A46606-A
Δ R11	UNF Resistor 220 Ω , 25W. K	QRF258K-221
Δ R05	Δ C Capacitor 150 pF, AC1.5KV	QCZ0101-005
Δ C04	Si. Transistor	2SD869
X01	IC Regulator	STR383
IC01	Degaussing Coil	21-1007-31
L01	Degaussing Coil Pin Terminal (2)	34-708-01
	Degaussing Coil Pin Terminal Housing	34-709-01
	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	Description	Part Number
Symbol		
R1406	V R 200 Ω	QVZ3230-022
R1408	V R 200 Ω	QVZ3230-022
R1410	CMF R 6.8 Ω 1W J	QRX019J-6R8
R1414	OM R 3.3K Ω 1W J	QRG019J-332
R1415	OM R 2.7K Ω 1W J	QRG019J-272
R1421	OM R 12K Ω 2W J	QRG029J-123
R1422	V R 10K Ω	QVZ3224-014H
Δ FR1401	Δ F R 68 Ω 2W K	QRH024K-680M
Δ R1503	Δ CMF R 11.8K Ω $\frac{1}{4}$ W +1%	QVZ3230-053
R1504	V R 5K Ω	QRG029J-103
R1509	OM R 10K Ω 2W J	QRG029J-562
R1511	OM R 5.6K Ω 2W J	QRG029J-681
R1514	OM R 680 Ω 2W J	QRX019J-8R2
R1515	CMF R 8.2 Ω 1W J	QRX019J-4R7
R1522	CMF R 4.7 Ω 1W J	ORG029J-560
R1523	OM R 56 Ω 2W J	ORG019J-391
R1528	OM R 390 Ω 1W J	ERZ-C05ZK471
R1534	ZN R	ERZ-C05DK271
VR1501	ZN R	QRV122F-3902
Δ R1703	Δ CMF R 39K Ω $\frac{1}{2}$ W +1%	QRV142F-7681
Δ R1704	Δ CMF R 7.68K Ω $\frac{1}{4}$ W +1%	A75414
Δ R1901	Δ Posistor	QRF076K-2R0
R1902	UNF R 2 Ω 7W K	QRX039J-5R6
R1903	CMF R 5.6 Ω 3W J	QRG026J-103Z
R1904	OM R 10K Ω 2W J	QRH124K-221M
Δ FR1901	Δ F R 220 Ω $\frac{1}{2}$ W K	

Capacitors	Description	Part Number
Symbol		
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
Δ C1512	Δ PP Cap. 2000pF DC1500V J	QFZ0082-202
Δ C1513	Δ PP Cap. 2000pF DC1500V J	QFZ0082-202
Δ C1514	Δ 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
Δ C1907	Δ MM Cap. 0.1uF AC150V Z	QFZ9008-104

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

Semiconductors

Symbol	Description	Part Number
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	RJ20EV2
△D1901	△Si. Diode	1S1887A
△D1902	△Si. Diode	1S1887A
△D1903	△Si. Diode	1S1887A
△D1904	△Si. Diode	1S1887A

Miscellaneous

Symbol	Description	Part Number
△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 200 Ω	QVZ3234-022
R3106	V R 200 Ω	QVZ3234-022
R3113	V R 5K Ω	QVZ3234-053
R3114	V R 5K Ω	QVZ3234-053
R3115	V R 5K Ω	QVZ3234-053
R3116	OM R 10K Ω 2W J	QRG029J-103
R3117	OM R 10K Ω 2W J	QRG029J-103
R3118	OM R 10K Ω 2W J	QRG029J-103
R3119	Comp. R 3.3K Ω ½W K	QRZ0039-332
R3120	Comp. R 3.3K Ω ½W K	QRZ0039-332
R3121	Comp. R 3.3K Ω ½W 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

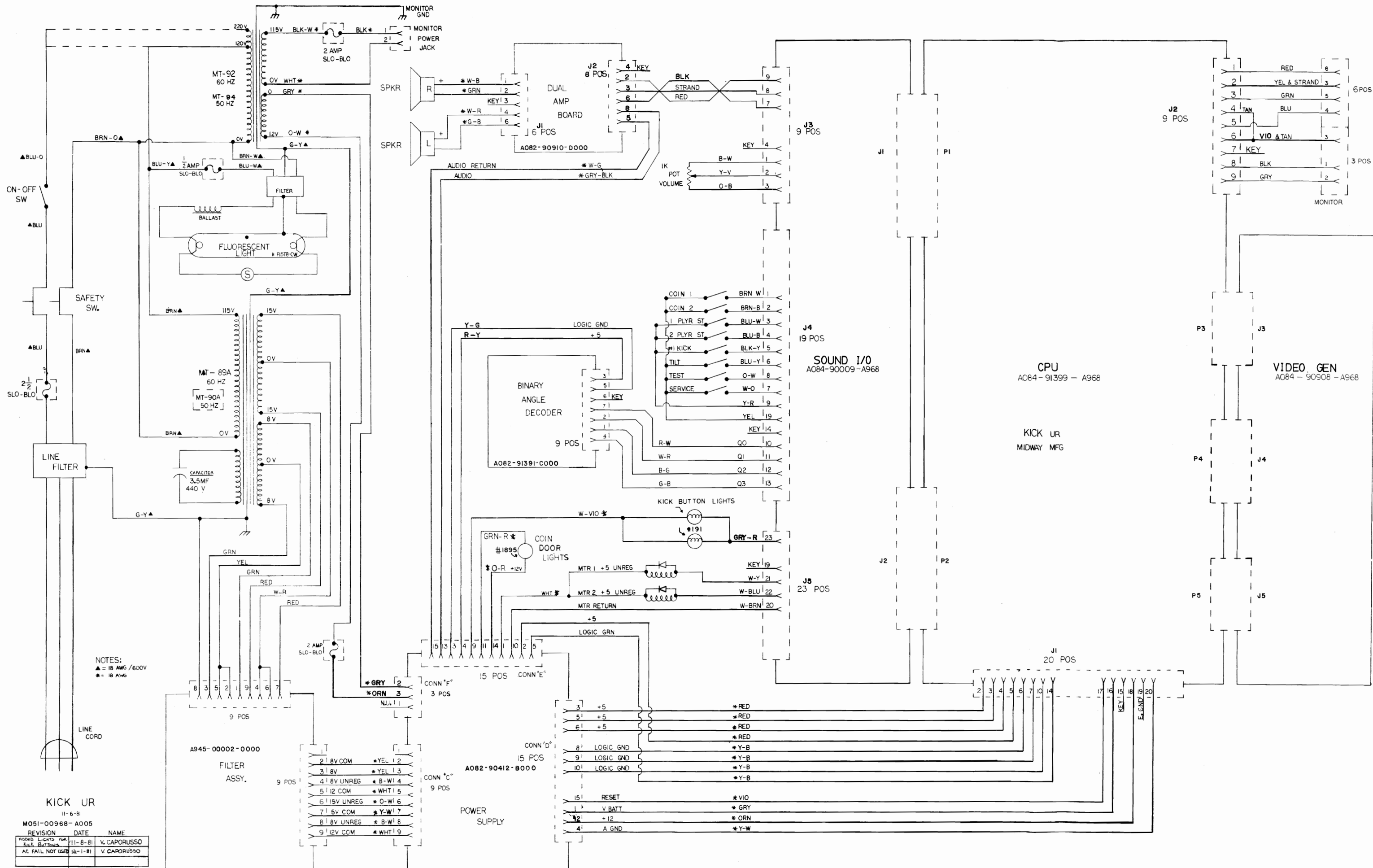
Semiconductors

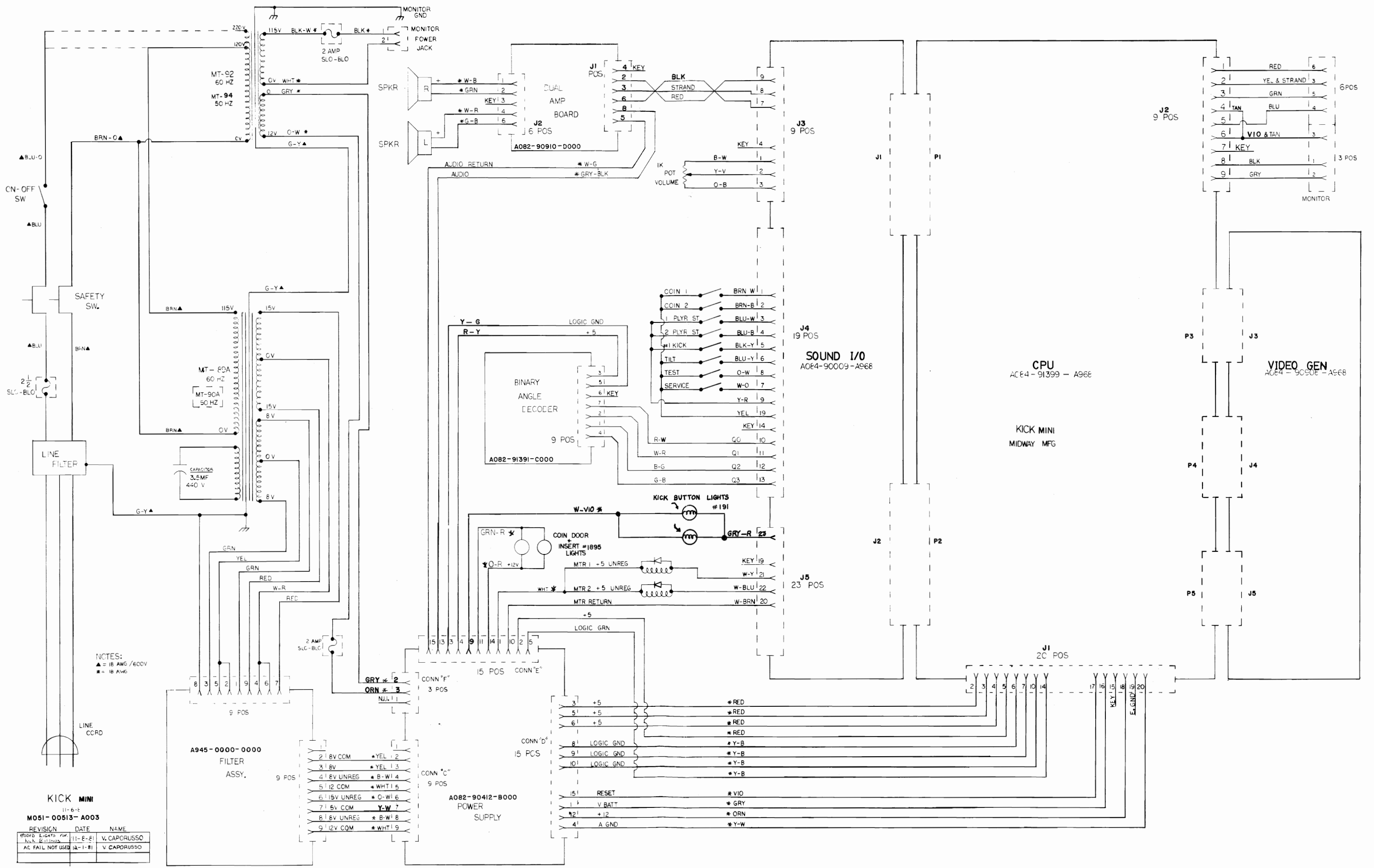
Symbol	Description	Part Number
X3101	Si. Transistor	2SC2611
X3102	Si. Transistor	2SC2611
X3103	Si. Transistor	2SC2611

Miscellaneous

Symbol	Description	Part Number
△	△ CRT Socket	A75522

VII Schematics and Wiring Diagrams

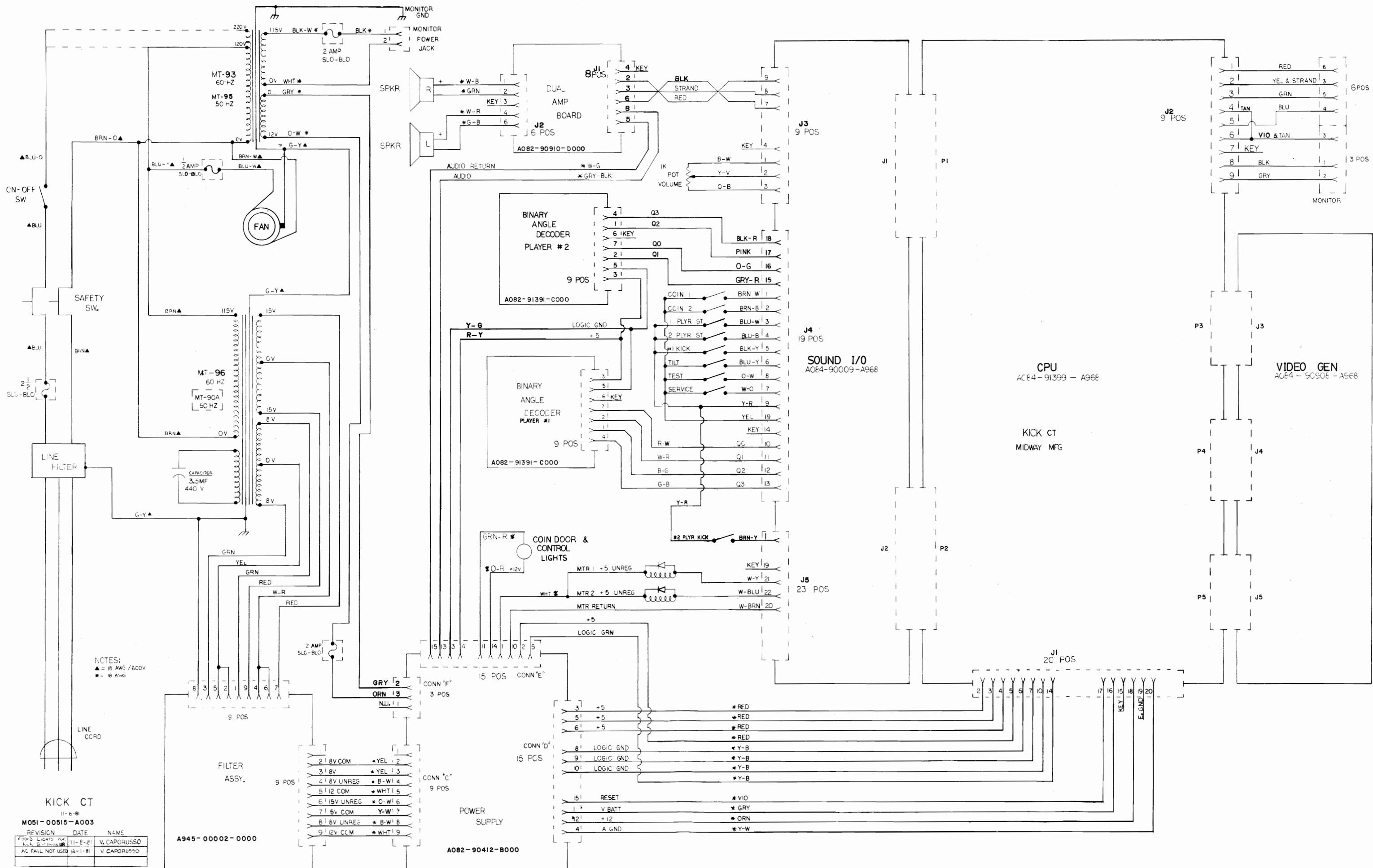




NOTES:
 ▲ = 18 AWG / 600V
 * = 18 AWG

KICK MINI
 11-6-81
 M051-00513-A003

REVISION	DATE	NAME
Model Lights for kick mini	11-8-81	V. CAPORUSSO
AC FAIL NOT USED	12-1-81	V. CAPORUSSO



NOTES:
 ▲ = 18 AWG / 600V
 ● = 18 AWG

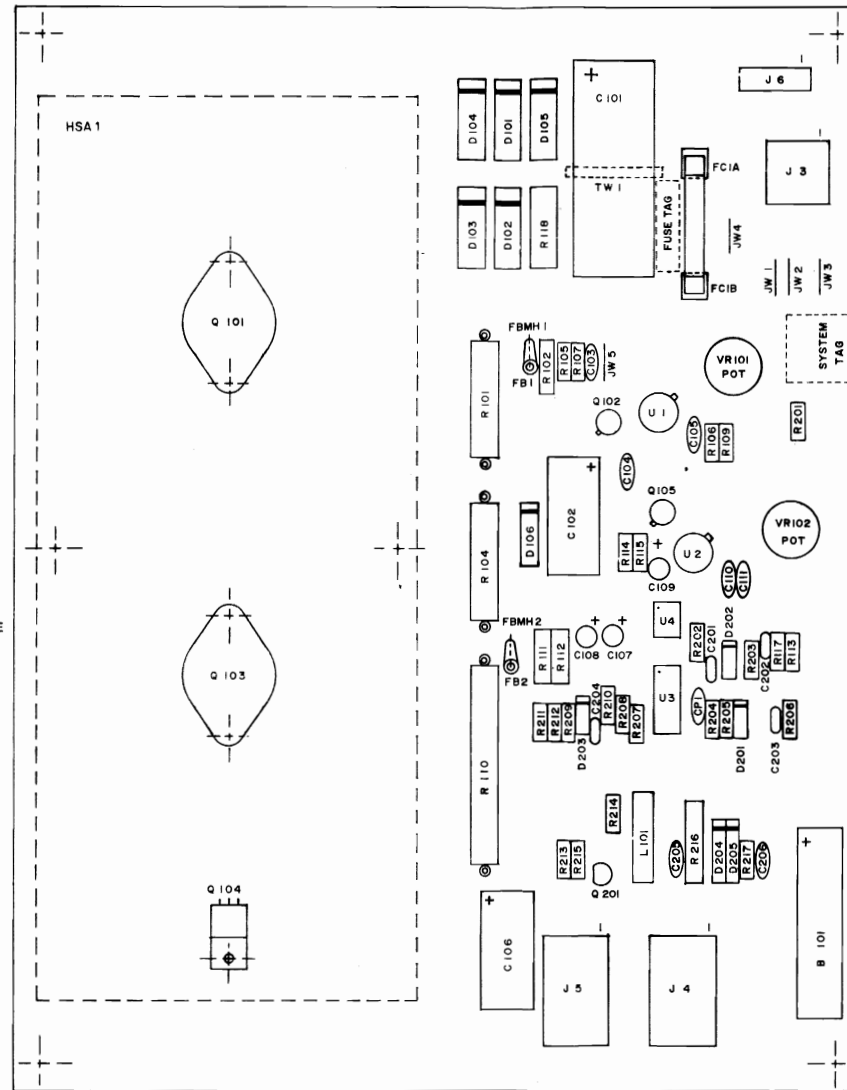
KICK CT
 11-6-81

M051-00515-A003

REVISION	DATE	NAME
1	11-6-81	V. CAPORUSSO
2	12-1-81	V. CAPORUSSO

DESIGNATION LIST

DESIGNATION #	DESCRIPTION	DESIGNATION #	DESCRIPTION
C101	470uf AX. ELECT.		
C102	470uf AX. ELECT.	Q102	2N2905
C103	.1uf AX. CER.	Q105	2N2905
C104	.1uf AX. CER.	Q201	2N4401
C105	47pf AX. CER.		
C106	470uf AX. ELECT.		
C107	100uf RD. TANT.		
C108	1uf RD. TANT.	U1	LM305 REG.
C109	4.7uf RD. TANT.	U2	LM305 REG.
C110	.1uf AX. CER.	U3	LM3900
C111	.1uf AX. CER.	U4	4N28
C201	.01uf MYLAR	L101	.22uH INDUCTOR
C202	.033uf MYLAR	B101	BATTERY 3.6VDC 60DEG-C
C203	.01uf MYLAR	F1	3/8A S-BLO FUSE
C204	.047uf MYLAR	FC1A,1B	FUSE CLIP
C205	820pf AX. CER.	FE1,2	FERRITE BEAD
C206	.01uf AX. CER.	TW1	TIE WRAP
CP1	.1uf AX. CER.	J3	9PIN P.C. MOUNT CONN.(MALE)
		J4	15PIN P.C. MOUNT CONN.(FEMALE)
		J5	15PIN P.C. MOUNT CONN.(MALE)
		J6	3PIN P.C. MOUNT CONN.(MALE)
R101	.18ohm 5W W/RES. SPACER		
R102	68ohm 1/2W 5%		
R104	10ohm 5W W/RES. SPACER		
R105	27ohm 1/4W 5%	LB1	FUSE TAG
R106	270ohm 1/4W 5%	LB2	SYSTEM TAG
R107	6.2K 1/4W 5%		
R109	1K 1/4W 5%	HSA1	HEAT SINK ASS'Y 1
R110	.16ohm 15W W/RES. SPACER	MHSA1	MOUNTING HARD WARE(HEAT SINK)
R111	6.8ohm 1/2W 5%		2-SCREW
R112	68ohm 1/2W 5%		4-WASHER
R113	1.2K 1/4W 5%		2-HEXNUT
R114	47ohm 1/4W 5%		
R115	160ohm 1/4W 5%		
R117	560ohm 1/4W 5%	JW1-5	JUMPER WIRE
R118	150ohm 2W	FBMH1,2	FERRITE BEAD MOUNTING HARDWARE
R201	270ohm 1/4W 5%		
R202	1.2K 1/4W 5%		
R203	1.1M 1/4W 5%		
R204	3.3M 1/4W 5%		
R205	10M 1/4W 5%		
R206	100K 1/4W 5%		
R207	33K 1/4W 5%		
R208	2M 1/4W 5%		
R209	1M 1/4W 5%		
R210	1.2M 1/4W 5%		
R211	75K 1/4W 5%		
R212	75K 1/4W 5%		
R213	220K 1/4W 5%		
R214	3.9K 1/4W 5%		
R215	1.2K 1/4W 5%		
R216	82ohm 1W 10%		
R217	270ohm 1/4W 5%		
VR101,102	100ohm POT		
D101	A15F		
D102	A15F		
D103	A15F		
D104	A15F		
D105	A15F		
D106	1N4001		
D201	1N4148		
D202	1N4148		
D203	1N4148		
D204	1N4001		
D205	1N4001		



CROSS REFERENCE LIST

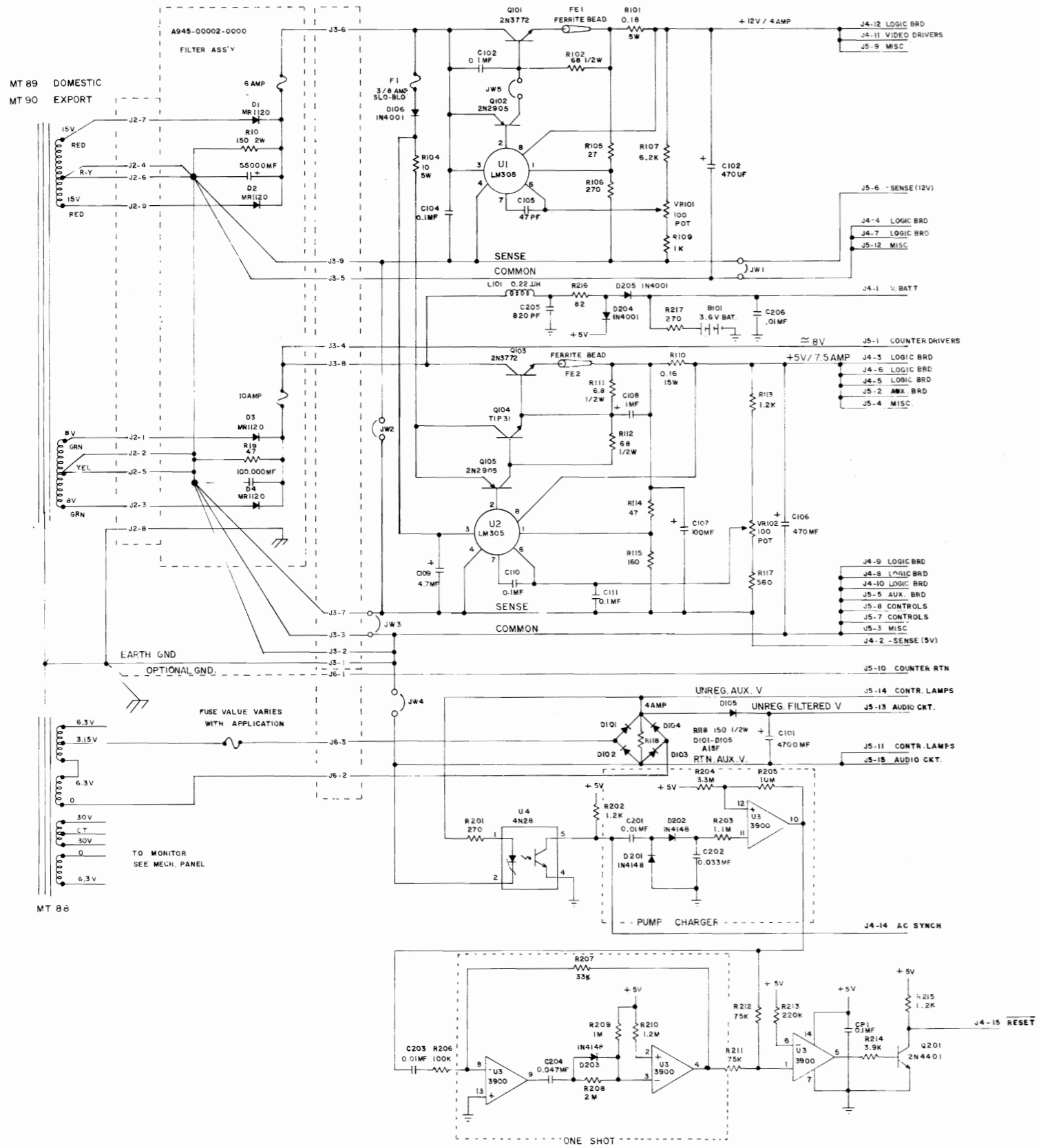
DESCRIPTION	Q'ty	DESIGNATION #	PART #
3PIN P.C. MOUNT CONN. (MALE)	1	J6	0017-00021-0443
9PIN P.C. MOUNT CONN.(MALE)	1	J3	0017-00021-0425
15PIN P.C. MOUNT CONN.(FEMALE)	1	J4	0017-00021-0441
15PIN P.C. MOUNT CONN.(MALE)	1	J5	0017-00021-0440
22 AWG T & R BARE 2.5"	5	JW1-5	0151-00087-0000

CROSS REFERENCE LIST

DESCRIPTION	Q'ty	DESIGNATION #	PART #
47pf AX. CER.	1	C105	0945-00811-0100
820pf AX. CER.	1	C205	0945-00816-0400
.01uf AX. CER.	1	C206	0945-00816-0100
.01uf MYLAR	2	C201,203	0945-00816-0200
.033uf MYLAR	1	C202	0945-00816-0500
.047uf MYLAR	1	C204	0945-00816-0300
.1uf AX. CER.	5	C103,104,110,111, CP1	0945-00811-0200
1uf RAD. TANT	1	C108	0945-00811-0300
4.7uf RAD. TANT	1	C109	0945-00811-0400
100uf RAD. TANT	1	C107	0945-00811-0500
470uf AX. ELECT.	2	C102,106	0945-00816-0600
470uf AX. ELECT.	1	C101	0945-00811-0700
.16ohm 15W 5%	1	R110	0945-00815-0100
.18ohm 5W 5%	1	R101	0945-00815-0200
6.8ohm 1/2W 5%	1	R111	0062-047D3-1XXX
10ohm 5W 5%	1	R104	0945-00812-0100
27ohm 1/4W 5%	1	R105	0062-068B3-1XXX
47ohm 1/4W 5%	1	R114	0062-086B3-1XXX
68ohm 1/2W 5%	2	R102,112	0062-098D3-1XXX
82ohm 1W 10%	1	R216	0062-104F5-1XXX
150ohm 2W 5%	1	R118	0945-00812-0200
160ohm 1/4W 5%	1	R115	0062-124B3-1XXX
270ohm 1/4W 5%	3	R106,201,217	0062-138B3-1XXX
560ohm 1/4W 5%	1	R117	0062-162B3-1XXX
1K 1/4W 5%	1	R109	0062-179B3-1XXX
1.2K 1/4W 5%	3	R113,202,215	0062-183B3-1XXX
3.9K 1/4W 5%	1	R214	0062-207B3-1XXX
6.2K 1/4W 5%	1	R107	0062-217B3-1XXX
33K 1/4W 5%	1	R207	0062-251B3-1XXX
75K 1/4W 5%	2	R211,212	0062-269B3-1XXX
100K 1/4W 5%	1	R206	0062-275B3-1XXX
220K 1/4W 5%	1	R213	0062-291B3-1XXX
1M 1/4W 5%	1	R209	0062-323B3-1XXX
1.1M 1/4W 5%	1	R203	0062-325B3-1XXX
1.2M 1/4W 5%	1	R210	0062-327B3-1XXX
2M 1/4W 5%	1	R208	0062-337B3-1XXX
3.3M 1/4W 5%	1	R204	0062-347B3-1XXX
10M 1/4W 5%	1	R205	0062-371B3-1XXX
100ohm POT	2	VR101,102	0945-00814-0000
A15F RECTIFIER	5	D101-105	0945-00804-0200
1N4001	3	D106,204,205	0945-00804-0300
1N4148	3	D201-203	0945-00804-0500
2N2905	2	Q102,105	0945-00808-0300
2N4401	1	Q201	0945-00804-0400
LM305 REG.	2	U1,2	0945-00813-0100
LM3900	1	U3	0945-00813-0200
4N28	1	U4	0945-00813-0300
BATTERY 3.6VDC 60DEG-C	1	B101	0017-00003-0377
FUSE 3/8A S-BLO	1	F1	0945-00808-0400
FUSE CLIP	2	FC1A,1B	0017-00003-0214
TIE WRAP	1	TW1	0945-00814-0300
FERRITE BEAD	2	FB1,2	0017-00009-0225
FERRITE MOUNTING HDW.			
FERRITE MOUNTING HDW.	2	FBMH1,2	0017-00033-0139
.22uH INDUCTOR	1	L101	0945-00814-0200
FUSE TAG	1		M051-00945-A004
SYSTEM TAG	1		M051-00945-A009
P.C.B.	1		A080-90412-B000
HEAT SINK ASS'Y	1	HSA1	A945-00008-0000
(SEE HS ASS'Y DRAWING "SEE NOTE")			
4-40 X 10 SLT RND	2	MHSA1A, 2A	0017-00101-00727
4-40 HEX NUT	2	MHSA1E, 2E	0017-00103-0002
WSH 4-120-.250-018	4	MHSA1B,1D	0017-00104-0071
		MHSA2B,2D	

PROJ. ENG : L. DEKKER
M051-00945-B006

DO NOT SCALE DWG	HEAT TREAT	SCALE	USED ON	KICK	MIDWAY MFG. CO. FRANKLIN PK. ILL.
DIM TOLERANCES UNLESS SPECIFIED:	DRAWN	MAT'L	NO REQ'D	1PER	
FRAC TIONAL	DATE	FINISH	PWR SPLY 125VA W/CKT SPRT A082-90412-B000		PART NO M051-00945-B006



PROJECT ENG. L. DEKKER	MCR II	MIDWAY MFG. CO.
DATE 12-14-81	FULL	1 PER
	SCHMATIC DRAWING	M051-0945-0007
	128VA POWER SUPPLY	
	A082-90412-8000	

DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
C1, 2	100 μ f AX. ELECT	IC A 1	EPROM	IC H 1	74 LS 86
CP1-3, 5-10	.01 μ f AX. CER.	IC A 2	74 LS157	IC H 2	74174
CP12-20, 22-27,		IC A 3	74 LS157	IC H 3	74LS 74
CP29-33, 35, 36,		IC A 4	74 LS157	IC H 4	74175
CP38-41, 43-47,		IC A 5	74 LS157	IC H 5	74174
CP49-54, 56-61,		IC A 6	74 LS157	IC H 6	74 LS157
CP63-67, 69-71,		IC A 7	74 LS157		
CP4, 11, 21, 28, 34,	10 μ f 25V AX. TANT.	IC B 1	EPROM	IC J 2	74 LS 30
CP37, 42, 48, 55,		IC B 2	74 LS194	IC J 3	7430
CP62, 68,		IC B 3	74 LS194	IC J 4	74 LS273
RI01-119, 201, 202,	1 K 1/4W 5%	IC B 4	74 LS32	IC J 5	422
RM1, 2	8PIN 1K SIP	IC B 5	422	IC J 6	74 LS157
RM 3	10PIN 1K SIP	IC B 6	422		
		IC B 7	74LS32		
		IC C 1	EPROM	IC K 1	74161
		IC C 2	74 LS194	IC K 2	7430
		IC C 3	74 LS194	IC K 3	7474
		IC C 4	74 LS32	IC K 4	74161
		IC C 5	422	IC K 5	422
		IC C 6	422	IC K 6	2114-2
		IC C 7	74 LS 32		
		IC D 1	EPROM	IC L 1	74 LS 20
		IC D 2	74 LS194	IC L 2	7408
		IC D 3	74 LS194	IC L 3	7474
		IC D 4	74 LS273	IC L 4	74 LS283
		IC D 5	74 LS157	IC L 5	422
		IC D 6	74 LS157	IC L 6	2114-2
		IC D 7	74 LS273	IC L 7	74 LS157
		IC E 2	74 LS194	IC M 1	7430
		IC E 3	74 LS194	IC M 2	7432
		IC E 4	74 LS374	IC M 3	74 S 74
		IC E 5	74 LS157	IC M 4	74161
		IC E 6	74 LS157	IC M 5	422
				IC M 7	74 LS157
		IC F 2	7400	IC N 1	7430
		IC F 3	74 S 04	IC N 2	7427
		IC F 4	74 LS 374	IC N 3	74 LS273
		IC F 5	74 LS157	IC N 4	74 LS283
		IC F 6	74 LS157	IC N 5	74 LS245
				IC N 6	7404
		IC G 1	74 LS 86	IC N 7	74 LS157
		IC G 2	74 LS 20		
		IC G 3	74 LS 283	ICS A1, B1, C1, D1	28PIN IC SOCKET
		IC G 4	74 LS 283	ICS B5, 6, C5, 6,	22PIN IC SOCKET
		IC G 5	74 LS 283	J5, K5, L5, M5,	
		IC G 6	74 LS157	ICS K6, L6,	18PIN IC SOCKET
				J3, 4, 5,	20PIN AND 4PIN SOCKET
				JW1-8	JUMPER WIRE
				BB1, 2	BUSS BAR

DESIGNATION LIST

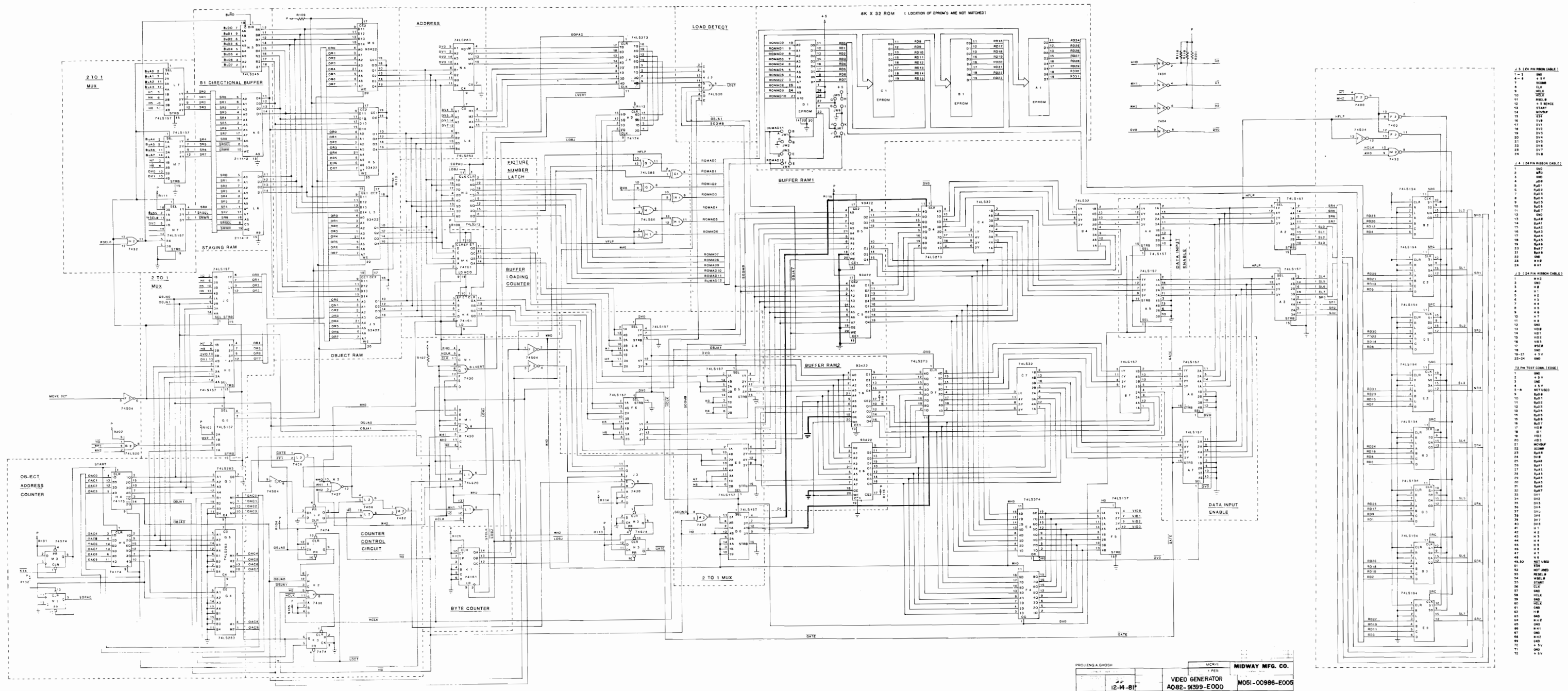


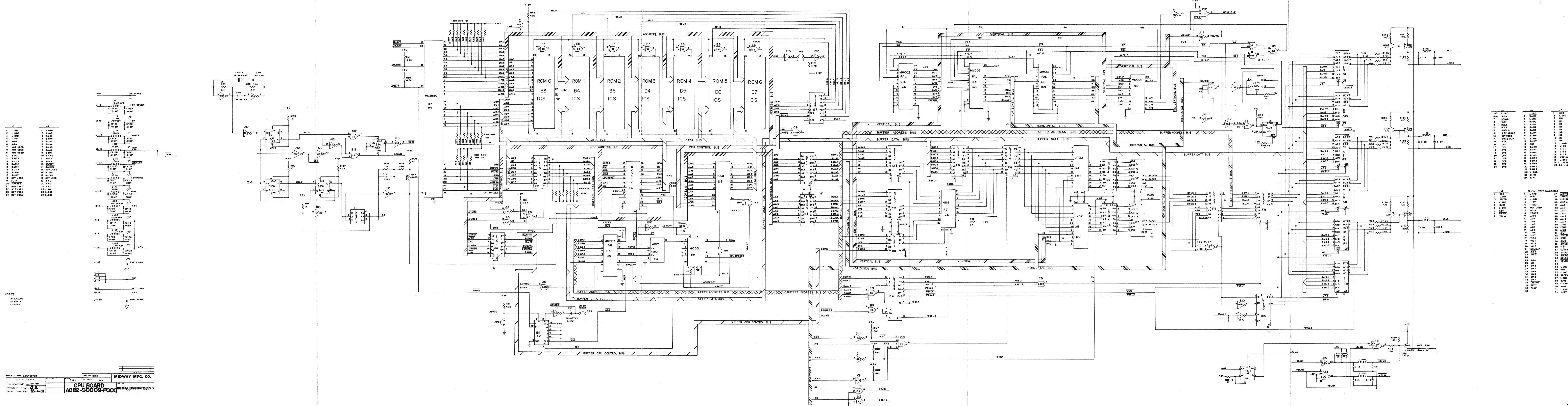
CROSS REFERENCE LIST

Q'TY	DESCRIPTION	DESIGNATION	PART NO.
60	.01 μ f 50V AX. CER.	CP1-3, CP5-10, CP12-20, CP22-27, CP29-33, CP35, 36, CP38-41, CP43-47, CP49-54, CP56-61, CP63-67, CP69-71,	0986-00800-2500
11	10 μ f 25 V AX. TANT.	CP4, 11, 21, 28, 34, 37, CP42, 48, 55, 62, 68.	0986-00800-2400
2	100 μ f 25 V AX. ELECT.	C1, 2,	0986-00800-1800
21	1 K 1/4 W CRBN. FLM.	RI01-119, 201, 202.	0062-17983-1XXX
2	1 K 8 PIN SIP	RM1, 2,	0986-00804-1100
1	1 K 10 PIN SIP	RM 3	0986-00804-1000
2	2114-2	K6, L6,	0986-00803-2300
1	7400	F 2	0986-00803-2800
1	7404	N 6	0986-00803-8300
1	74S04	F 3	0986-00803-3100
1	7408	L 2	0986-00803-3200
2	74LS20	G2, L 1	0986-00803-3400
1	7427	N 2	0986-00803-3500
4	7430	J3, K2, M1, N1	0986-00803-3600
1	74LS30	J 2	0986-00803-4300
1	7432	M 2	0986-00803-4400
4	74LS32	B4, 7, C4, 7,	0986-00803-3700
2	7474	K3, L3	0986-00803-4500
2	74S74	H3, M3	0986-00803-4100
2	74LS86	G1, H1	0986-00803-4200
18	74LS157	A2, 3, 4, 5, 6, 7, D5, 6, E5, 6, F5, 6, G6, H6, J6, L7, M7, N7,	0986-00803-2400
3	74161	K1, K4, M4,	0986-00803-2500
2	74174	H2, 5	0986-00803-2600
1	74175	H4	0986-00803-2700
8	74LS194	B2, 3, C2, 3, D2, 3, E2, 3,	0986-00803-2900
1	74LS245	N5	0986-00803-3000
4	74LS273	D4, 7, J4, N3	0986-00803-3800
5	74LS283	G3, 4, 5, L4, N4,	0986-00803-3900
2	74LS374	E 4, F 4	0986-00803-4000
8	93422	B5, 6, C5, 6, J5, K5, L5, M5	0986-00804-0800
1	EPROM	A1 (V G A)	0968-00803-3400 KICK UPRIGHT OULY
1	EPROM	B1 (V G B)	
1	EPROM	C1 (V G C)	
1	EPROM	D1 (V G D)	
8	JUMPER WIRE	JW1-8	0986-00805-0200
2	BUSS BAR	BB1, 2	0986-00804-0900
1	P.C. BOARD	A080-91399-E000	A080-91399-E000
3	4 PIN SOCKET	J3, 4, 5	0986-00804-0400
3	20 PIN SOCKET	J3, 4, 5	0986-00804-0500
4	28 PIN SOCKET	ICS A1, B1, C1, D1	0986-00804-0300
8	22 PIN SOCKET	ICS B5, 6, C5, 6, J5, K5, L5, M5	0986-00804-0700
2	18 PIN SOCKET	ICS K6, L6	0986-00804-0600
1	VIDEO GENERATOR		A080-91399-F000

PROJ. ENG. ATISH GHOSH

DO NOT SCALE DWG		DATE	SCALE	USED ON	KICK	REVISIONS	
DIM TOLERANCES UNLESS SPECIFIED:		DATE	SCALE	NO RECD	I PER	MIDWAY MFG. CO.	
ASSEMBLY DRAWING		DATE	SCALE			FRANKLIN PK ILL	
VIDEO GENERATOR P.C.		DATE	SCALE			PART NO.	
A082-91399-F000		DATE	SCALE			M051-00968-A016	
12/11/81		DATE	SCALE				





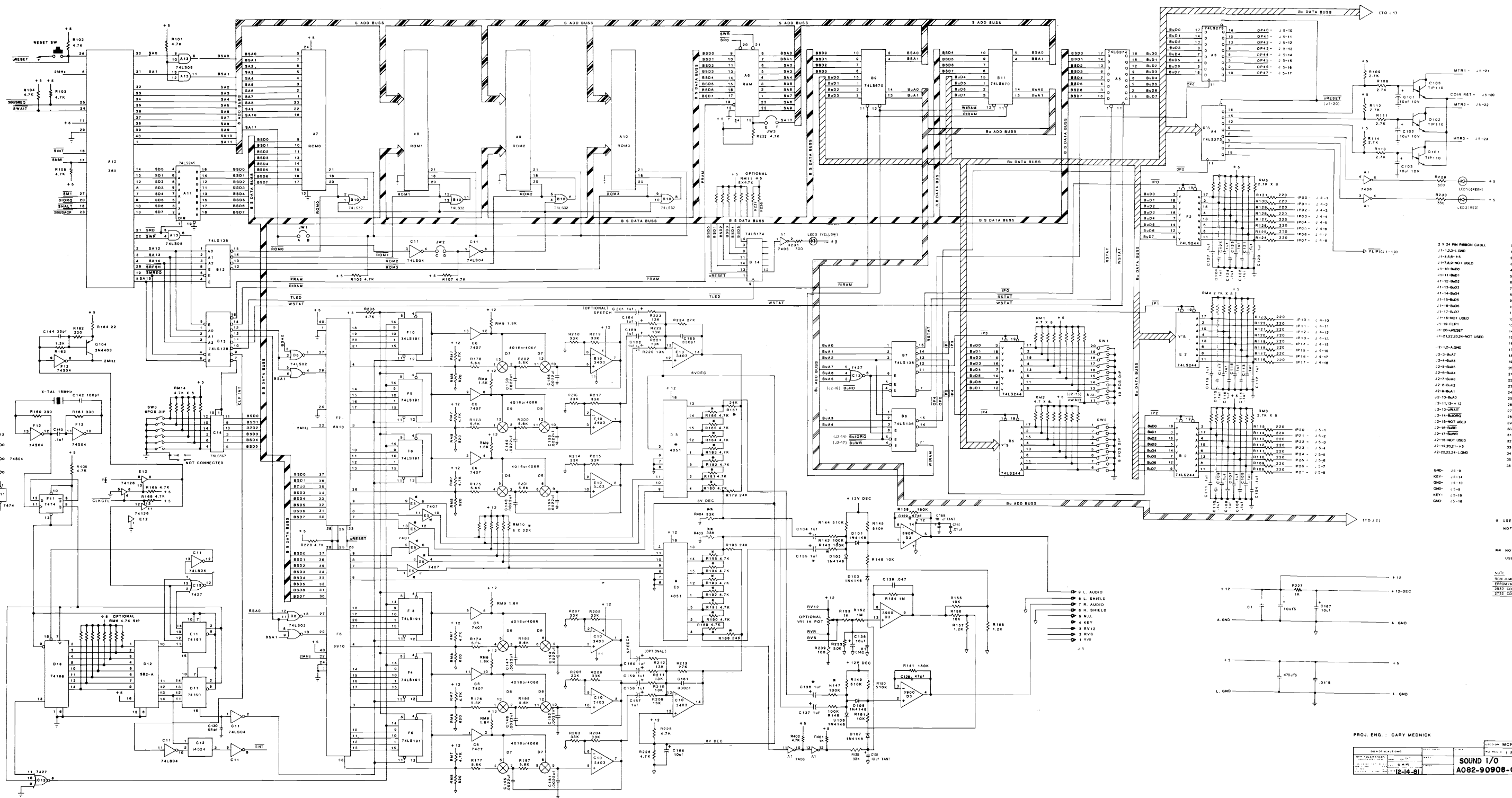
NOTES

1-3 ANALOG
4-EARTH
L-LOGIC

1	L AND
2	L AND
3	L AND
4	+5V
5	+5V
6	+5V
7	NOT USED
8	NOT USED
9	NOT USED
10	RA01
11	RA02
12	RA03
13	RA04
14	RA05
15	RA06
16	RA07
17	RA08
18	NOT USED
19	RA09
20	RA10
21	NOT USED
22	NOT USED
23	L AND
24	NOT USED

PROJECT ENG. J. BOYDSTON	REV. 1	DATE 10/1/77
CPU BOARD	NO. 1	PER 1 PER
A082-9009-F000	NO. 1	PER 1 PER
NO. 14-81	NO. 1	PER 1 PER

1	L AND	17	RA17
2	+5V	18	L AND
3	SCOMP	19	L AND
4	IC1	20	RA18
5	RA01	21	RA19
6	RA02	22	RA20
7	RA03	23	RA21
8	RA04	24	RA22
9	RA05	25	RA23
10	RA06	26	RA24
11	RA07	27	RA25
12	RA08	28	RA26
13	RA09	29	RA27
14	RA10	30	RA28
15	RA11	31	RA29
16	RA12	32	RA30
33	RA31	34	RA32
35	RA33	36	RA34
37	RA35	38	RA36
39	RA37	39	RA37
40	RA38	40	RA38
41	RA39	41	RA39
42	RA40	42	RA40
43	RA41	43	RA41
44	RA42	44	RA42
45	RA43	45	RA43
46	RA44	46	RA44
47	RA45	47	RA45
48	RA46	48	RA46
49	RA47	49	RA47
50	RA48	50	RA48
51	RA49	51	RA49
52	RA50	52	RA50
53	RA51	53	RA51
54	RA52	54	RA52
55	RA53	55	RA53
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63	RA61	63	RA61
64	RA62	64	RA62
65	RA63	65	RA63
66	RA64	66	RA64
67	RA65	67	RA65
68	RA66	68	RA66
69	RA67	69	RA67
70	RA68	70	RA68
71	RA69	71	RA69
72	RA70	72	RA70



2 X 24 PIN DIMM CABLE

J1-13-14-GND	1-1-GND	72-PIN TEST CONN
J1-15-16-GND	2-1-5	37-SAK
J1-17-18-NOT USED	3-L-GND	38-SAK
J1-19-20-GND	4-1-5	40-SAT
J1-21-22-GND	5-1-12	41-SAK
J1-23-24-GND	6-1-4-GND	42-SAO
J1-25-26-GND	7-1-12	43-SA10
J1-27-28-GND	8-NOT USED	44-SA11
J1-29-30-GND	9-10G	45-SA12
J1-31-32-GND	10-101	46-SA13
J1-33-34-GND	11-102	47-SA14
J1-35-36-GND	12-103	48-SA15
J1-37-38-GND	13-104	49-SAW
J1-39-40-GND	14-105	50-SAW
J1-41-42-GND	15-106	51-SAW
J1-43-44-GND	16-107	52-SAW
J1-45-46-GND	17-108	53-SAW
J1-47-48-GND	18-109	54-SAW
J1-49-50-GND	19-110	55-SAW
J1-51-52-GND	20-111	56-SAW
J1-53-54-GND	21-112	57-CLOCK
J1-55-56-GND	22-113	58-SAW
J1-57-58-GND	23-114	59-SAW
J1-59-60-GND	24-115	60-SAW
J1-61-62-GND	25-116	61-SAW
J1-63-64-GND	26-117	62-SAW
J1-65-66-GND	27-118	63-SAW
J1-67-68-GND	28-119	64-SAW
J1-69-70-GND	29-120	65-SAW
J1-71-72-GND	30-121	66-SAW
J1-73-74-GND	31-122	67-SAW
J1-75-76-GND	32-123	68-SAW
J1-77-78-GND	33-124	69-SAW
J1-79-80-GND	34-125	70-1-5
J1-81-82-GND	35-126	71-L-GND
J1-83-84-GND	36-127	72-1-5

* USED ON VERSION W/PANNING
 NOT USED ON VERSION W/PANNING

** NOT USED ON VERSION W/PANNING
 USED ON VERSION W/PANNING

NOTE

NON-COMPATIBLE	1	2
ERROR ROW	1	2
TEST COMPATIBILITY	1	2
2752 COMPATIBILITY	1	2

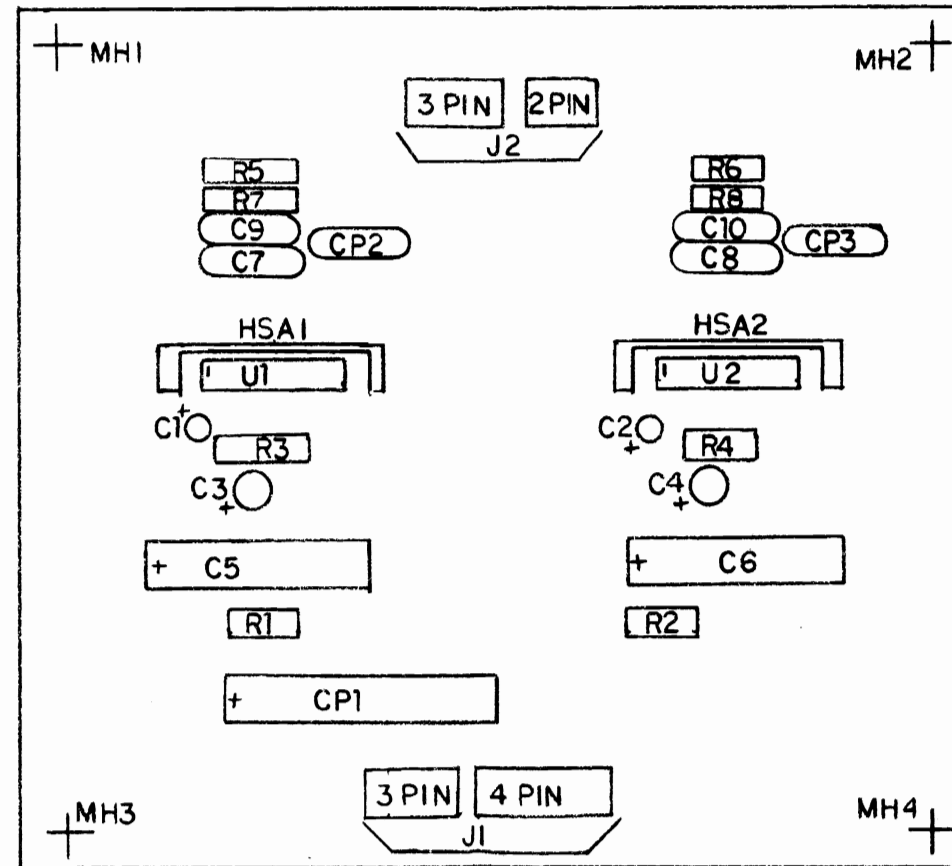
PROJ. ENG. - CARY MEDNICK

REV. 1	REV. 2	REV. 3	REV. 4	REV. 5	REV. 6	REV. 7	REV. 8	REV. 9	REV. 10

MIDWAY MFG. CO.
 SOUND I/O
 A082-50908-6000
 MOSI D0S3 G000

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C1,C2	4.7mf 25v rd.tant.
C3,C4	22mf 6v " "
C5,C6	470mf 6v ax.elect.
C7-C10	.1mf 50v ax.cr.
CP1	220mf 25v ax.elect.
CP2,CP3	.1mf 50v ax.cr.
R1,R2	2.7K Ω 1/4w 5% CRBN.
R3,R4	27 Ω " " "
R5-R8	1 Ω 1/2w " "
U1,U2	MB3730
J1	3 PIN STRT. KK156
J2	4 " " " "
HSA1,2	HEATSINK ASSY.
MH1-MH4	HEYCO BUSHING



CROSS REFERENCE LIST

DESCRIPTION	QTY	DESIGNATION	PART NO.
.1mf 50v ax.cr.	6	C7-C10, CP2,CP3	0986-00800-1100
4.7mf 25v rd.tant.	2	C1,C2	0986-00800-3100
22mf 6v " "	2	C3,C4	0986-00800-1600
220mf 25v ax.elec.	1	CP1	0986-00800-3200
470mf 6v " "	2	C5,C6	0986-00800-1700
1 Ω 1/2w 5%	4	R5-R8	0062-026D3-1XXX
27 Ω 1/4w " "	2	R3,R4	0062-068B3-1XXX
2.7K " "	2	R1,R2	0062-199B3-1XXX
MB3730	2	U1,U2	0066-188XX-XX4X
2 PIN STRT, KK156	1	J2	3000-16367-0200
3 " " " "	2	J1,J2	3000-16367-0300
4 " " " "	1	J1	3000-16367-0400
HEATSINK ASSY.	2	HSA1, HSA2	0986-00804-1800
HEYCO BUSHING	4	MH1-MH4	0017-00042-0014
PC BOARD	1		A080-90910-D000

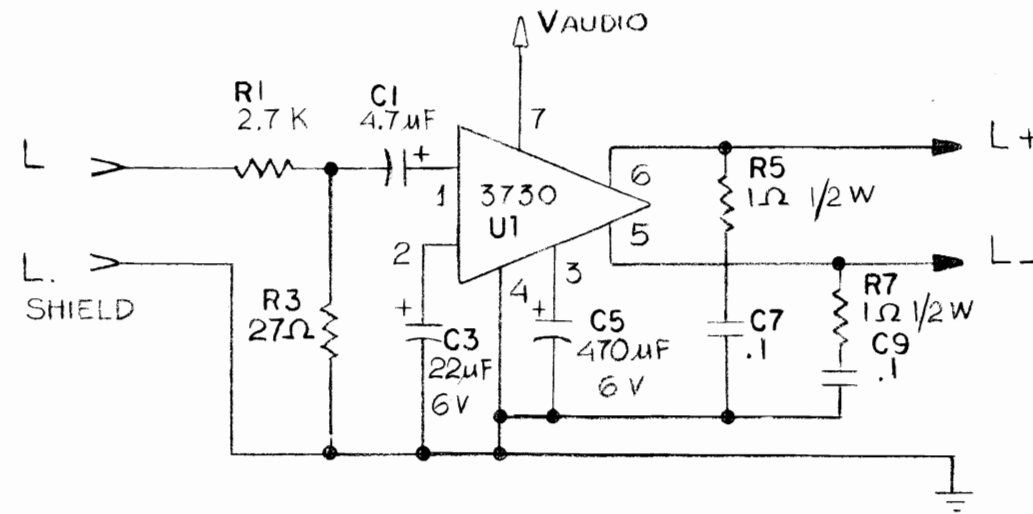
PROJECT ENG. C. MEDNICK

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

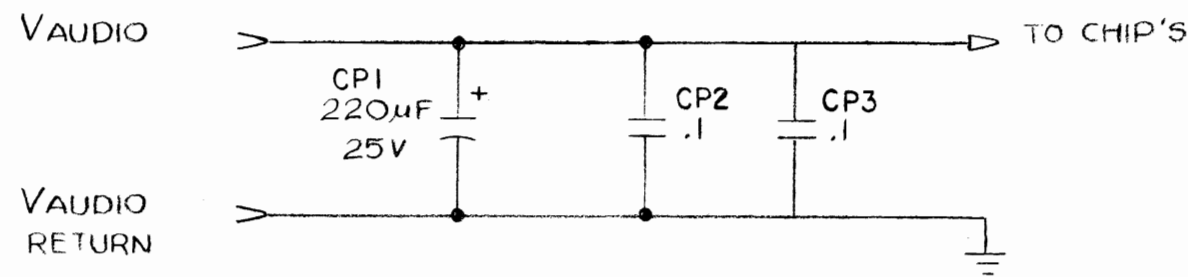
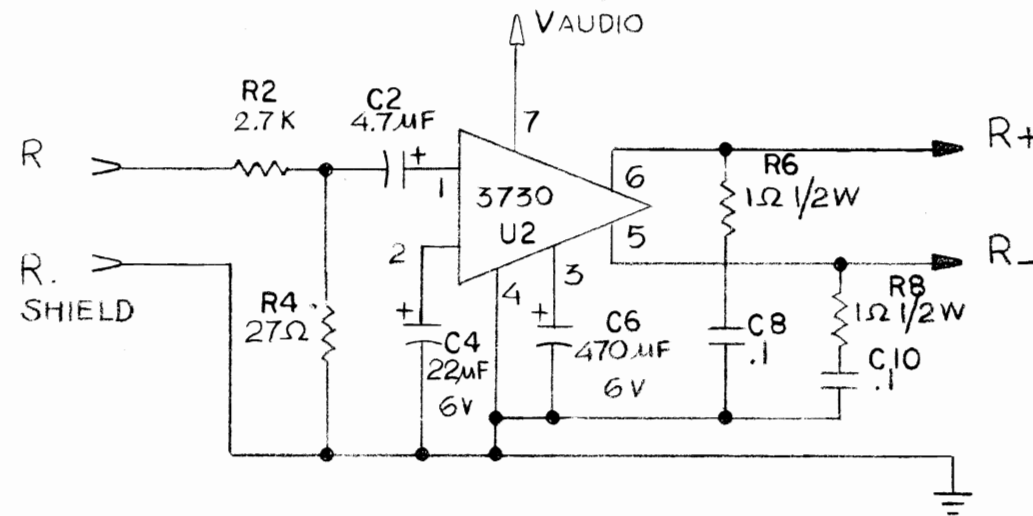
M051-00986-D010

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 KICK	DRN TJK	DATE 12-14-81	SCALE FULL	<div style="font-size: 12px; font-weight: bold; margin-bottom: 5px;"> MIDWAY MFG. CO. FRANKLIN PK., IL. 60131 A BALLY CO. </div> <div style="font-size: 14px; font-weight: bold; margin-bottom: 5px;"> DUAL PWR. AMP. ASSY </div> A082-90910-D000	
	MECH. CHK. 	MAT'L. 	REVISIONS			
	ELEC. CHK. C.M.M.	FINISH 	PART NO. M051-00986-D010			
	M051-00986-D010					

J1	
PIN 1	NC.
" 2	L. AUDIO
" 3	L. SHIELD
" 4	KEY
" 5	VAUDIO RETURN
" 6	R. AUDIO
" 7	R. SHIELD
" 8	V AUDIO



J2	
PIN 1	R +
" 2	R -
" 3	KEY
" 4	L +
" 5	N.C.
" 6	L -



PROJECT ENG. C MEDNICK

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	MCR II	
DRN	T.V.T	DATE 12-14-81
MECH CHK	MAT'L	SCALE FULL
ELEC. CHK.	FINISH	
C.W.M.		

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

DUAL PWR AMP
A082-90910-D000

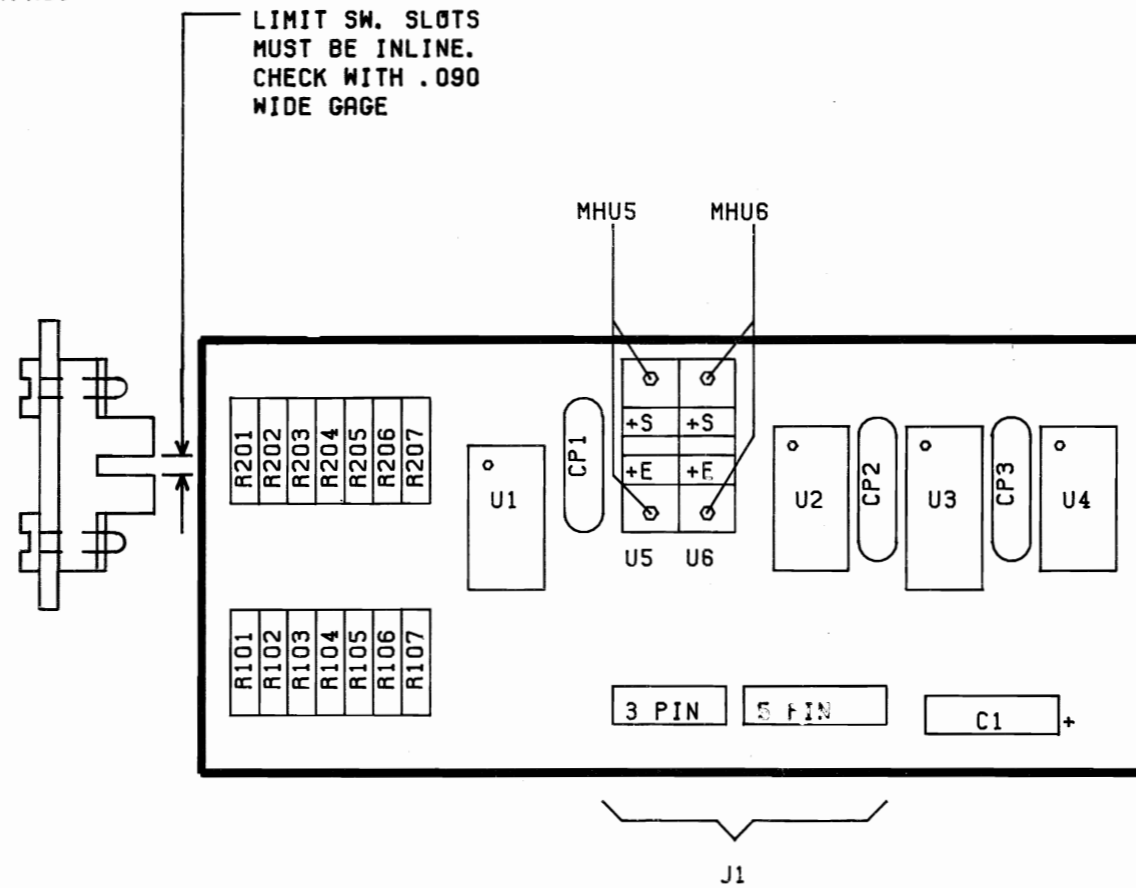
REVISIONS	
PART NO.	M051-00986-D011

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C1	10uf 25v TANT. AX.
CP1-CP3	.1uf 50v AX. CER. BYPASS
R101, 201	820 ohm
R102, 202	10 K
R103, 203	200 K
R104, 204	240 K
R105, 205	1 meg. ohm
R106, 206	1 K
R107, 207	200 ohm
U1	LM3900
U2	7474
U3	74191
U4	7414
U5, U6	OPTICAL LIMIT SW. KK-156 VERT. (3, 5)
J1	KK-156 VERT. (3, 5)
MHU5, MHU6	(4) 5-40 SCREW (2) PLATE NUT
P. C. 1	A080-91391-C000

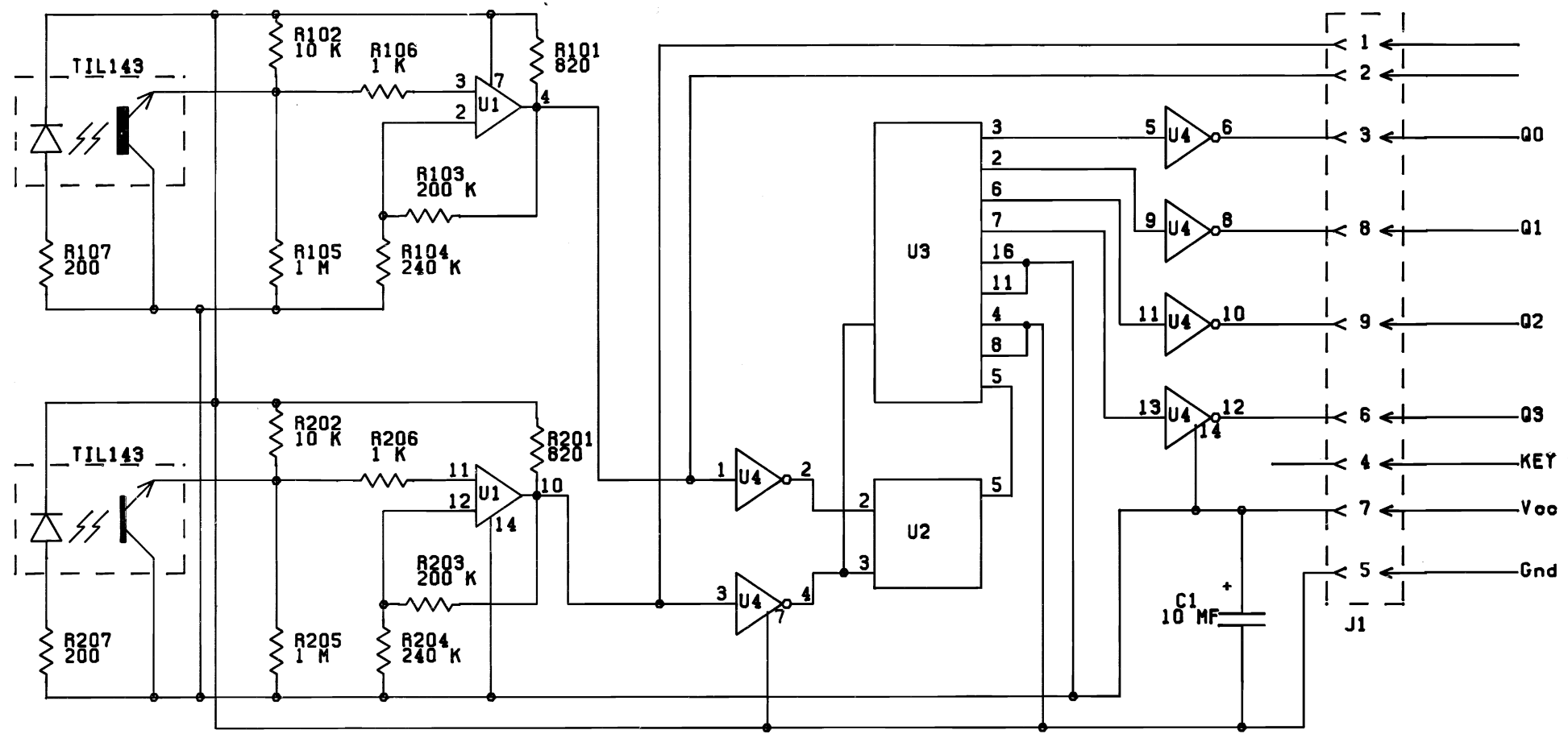
CROSS REFERENCE LIST

DESCRIPTION	Q'TY	DESIGNATION	PART NO.
10uf 25v TANT. AX.	1	C1	0968-00800-0200
.1uf 50v AX. CER.	3	CP1-CP3	0968-00800-0100
200 ohm	2	R107, 207	0062-13083-1XXX
820 ohm	2	R101, 201	0062-17483-1XXX
1 K	2	R106, 206	0062-17983-1XXX
10 K	2	R102, 202	0062-22783-1XXX
200 K	2	R103, 203	0062-28983-1XXX
240 K	2	R104, 204	0062-29383-1XXX
1 meg. ohm	2	R105, 205	0062-32383-1XXX
7414	1	U4	0968-00804-0200
7474	1	U2	0968-00804-0300
74191	1	U3	0968-00804-0400
LM3900	1	U1	0968-00804-0500
OPTICAL LIMIT SW. KK-156 VERT. 3 PIN	2	U5, U6	0968-00804-0100
KK-156 VERT. 5 PIN	1	J1	3000-16387-0300
KK-156 VERT. 5 PIN	1	J1	3000-16387-0500
5-40 SCREW	4	MHU5, MHU6	0017-00101-0084
PLATE NUT	2	MHU5, MHU6	0643-00112-0080
P. C. BOARD	1		A080-91391-C000



PROJECT ENG. C. MEDNICK

CKD.	DO NOT SCALE DWG.		REVISIONS
DRAWN TJK	DATE 12/14/81	USED ON KICK	MIDWAY MFG. CO. FRANKLIN PK. ILL.
heat treat	scale full	NO. REQ'D 1 PER	
mat'l.	BINARY ANGLE DECODER ASSMB. DRWG.		PART NO.
finish	A082-91391-C000		M051-00968-C003



NOTES
 U1-LM3900
 U2-7474
 U3-74191
 U4-7414

PROJECT ENG: C.MEDNICK

CKD.	DO NOT SCALE DWG.		REVISIONS
DRN. TJK	DATE 8/26/81	USED ON KICK	MIDWAY MFG. CO. FRANKLIN PK. ILL.
heat treat	scale FULL	NO. REQ'D 1 PER	
mat'l.	BINARY ANGLE DECODER SCHEMATIC A082-91391-C000		PART NO.
finish			M051-00968-C004

Chip Number**Function**

MB8416	Ram 2K x 8
6116LP-4	Ram 2K x 8
9860-07AXN-AXHD	PROM 82S123 (SB2-A)
Z-80 CTC	Counter timer circuit
0066-313BX-XXQX (MMC01)	H-T generator - custom
0066-314BX-XXQX (MMC02)	V-T generator - custom
0066-315BX-XXQX (MMC03)	Misc. V & H circuits - custom
0066-316BX-XXQX (MMC06)	Misc. TTL circuits - custom
0066-322BX-XXQX (MMC04)	NVR controller - custom
AY-3-8910 (8910)	Sound generator
LM3900	Quad operational amplifier
MC3403	Quad operational amplifier

Misc. Components

16.00 & 19.9 MHZ	Z-TAL
2N4123	Transistor NPN
2N4403	Transistor PNP
MPSA70	Transistor PNP
TIP110	Transistor NPN

Kick-Man Logic Boards Integrated Circuits**Chip Number****Function**

7400	Quad 2 input Nand
74LS02	Quad 2 input Nor
74LS04	Hex inverter
7406	Hex inverter open collector
7407	Hex buffer open collector
74LS08	Quad 2 input And
74LS20	Dual 4 input Nand
7427	Triple 3 input Nor
74LS30	8 input Nand
74LS32	Quad 2 input Or
74LS74	Dual "D" Flip-Flop
74LS86	Quad 2 input exclusive Or
7489	64 bit ram 16 x 4
74126	Quad buffer tri-state
74LS138	3 to 8 line decoder
74LS153	Dual 4 to 1 line multiplexer
74LS155	Dual 2 to 4 line decoder
74LS157	Quad 2 to 1 line multiplexer
74160	4 bit decade counter
74161	4 bit binary counter
74166	8 bit shift register
74LS174	Hex "D" Flip-Flop
74175	Quad "D" Flip-Flop
74LS191	Up/down binary counter
74LS194	8 bit shift register
74LS244	Octal buffer tri-state
74LS245	Octal buss transceiver
74LS273	Octal "D" Flip-Flop
74LS283	4 bit full adder
74LS367	Hex buss driver
74LS374	Octal "D" Flip-Flop tri-state
74LS670	4 x 4 register files
4017	Decade counter/divider
14016	Quad analog switch
14024	7 stage ripple counter
14053	Triple 2 channel analog multiplexer
Z80	CPU 2.5 MHz
Z80A	CPU 4 MHz
D780C	CPU 2.5 MHz
D780C-1	CPU 4 MHz
TMS2564	8K x 8 EPROM
MBM2732	4K x 8 EPROM
HN462532	4K x 8 EPROM
2114	Ram 1K x 4
93422	Ram 256 x 4
M58725	Ram 2K x 8
4801AN-90	Ram 1K x 8
4118A-4	Ram 1K x 8