

Parts and Operating Manual



Bally

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WARNING

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

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a CLASS A computing device pursuant to SUBPART J of PART 15 of FCC RULES, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

ELECTRICAL BULLETIN: FOR ALL APPARATUS COVERED BY THE CANADIAN STANDARDS ASSOCIATION (CSA) STANDARD C22.2 NO. 1, WHICH EMPLOYS A SUPPLY CORD TERMINATED WITH A POLARIZED 2-PRONG ATTACHMENT PLUG.

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Kozmik Krooz'r

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.

Introduction

Your NEW GAME is for one or two players. There is ONLY one model: the "UPRIGHT". When the two player mode is selected on the Upright model, the players take turns at the controls to guide their player through the game course.

When playing this game, you are the controlling force. It is up to you to direct your player successfully through the game course. Your job is to give guidance and provide offensive and defensive strategy to enable your player to overcome all obstacles.

Your opponents will use every trick in the book, and may even invent a few new ones, to overcome your various strategies and eliminate your player(s). You really have to keep a close eye on them at all times.

As your skill level increases, you will notice that your opponent's offensive abilities greatly increase. Any advantages you once had at the beginning of the game will gradually be reduced until they are completely gone.

Bonus players may or may not be awarded depending on the options the game owner has selected. The point values of all items are listed below.

Major Features

Your game has been provided with a new improved Power Chassis designed to help reduce electrical interference with other equipment.

It is also equipped with a detailed self-diagnostic package. This includes the following abilities: 1) The game has OWNER/OPERATOR selected variable levels of difficulty so game play can be tailored to player skill level in his area; 2) There is a 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 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 can return **ALL** information in the Bookkeeping mode to zero and/or all operator selected options back to factory recommended settings; and 3) 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** and survive as long as possible while constantly improving your skills and advancing to the highest rack that you can. As you do this, each following rack of the game will have more and greater obstacles for you to overcome, and will in general be harder to complete.

| DESCRIPTION | POINTS AWARDED | NOTES |
|--------------------|-----------------------|----------------------|
| RAM SHIP | 100 | |
| SHOOTER SHIP | 200 | |
| STRIKE SHIP | 200 | |
| SCOUT SHIP | 300 | |
| SPEED DEMON | 2500 | APPEARS IN ALL RACKS |
| SPACE MINE | 100 | |
| FORMATION FIGHTER | 100 | |
| MINE LAYER | 200 | |
| SPY SHIP | 300 | |

Assigned Point Values

I. 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.
 - UPRIGHT MODELS ONLY:** In order to help prevent easy theft of your game, you may wish to remove the Caster Wheel Assemblies from the bottom of your cabinet at this time.
4. Install the four levelers, one at each corner of the cabinet.
 - Level the cabinet
5. After you have installed the game's Leg Levelers, if desired, you may now install the game's FOOTSTOOL. See Figure 1-1. This is accomplished by:

- MAKING SURE NO POWER IS GOING TO THE GAME.**
 - Removing the FOOTSTOOL mounting hardware from its bag.
 - Install the FOOTSTOOL'S Leg Levelers and set them to approximately the same height as those you just installed to each of the game cabinet's corners.
 - Open the coin box door.
 - Install the FOOTSTOOL mounting bolts and washers as shown below.
- NOTE:** The FOOTSTOOL is equipped with one factory installed "T" nut for **EACH** mounting bolt.
- Start all four FOOTSTOOL mounting bolts into their respective "T" nuts **BEFORE** tightening.
 - Tighten the four FOOTSTOOL mounting bolts **EVENLY!**
 - Close the coin door and make any final adjustments necessary to the FOOTSTOOL'S Leg Levelers so that they will solidly support the weight of anyone who stands on the FOOTSTOOL.

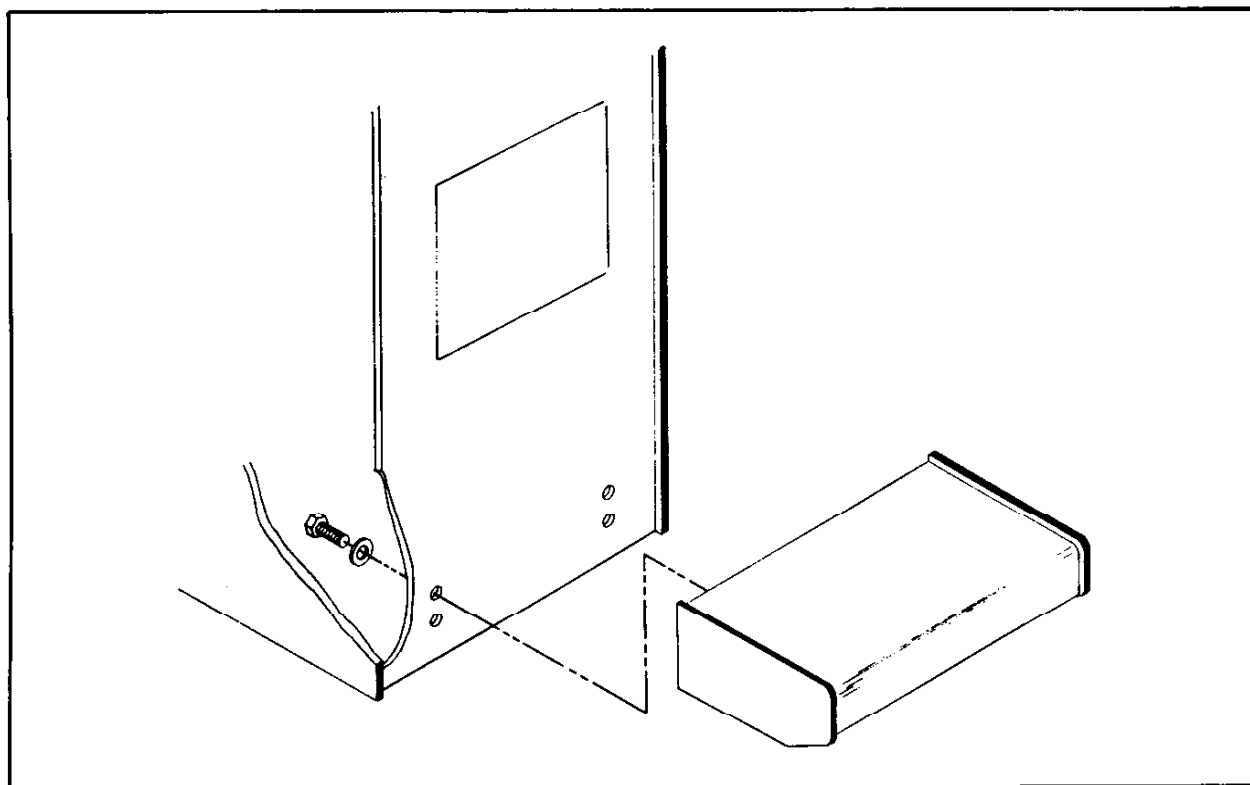


Figure 1-1 Installing the Footstool

6. Open the cabinet and inspect the inside of the game for any signs of damage. See Figure 1-2.

- 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 1-2. 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 1-2.

- Check all major subassemblies to be sure they are mounted securely. These are called out in Figure 1-2.

Power supply.

Control panel.

T.V. monitor.

Other P.C.B.'s and/or P.C.B. rack, etc.

Power Chassis Assembly.

- 7. Make a note of any problems that can't be easily corrected.

- 8. Call your distributor and/or service man about your problem list.

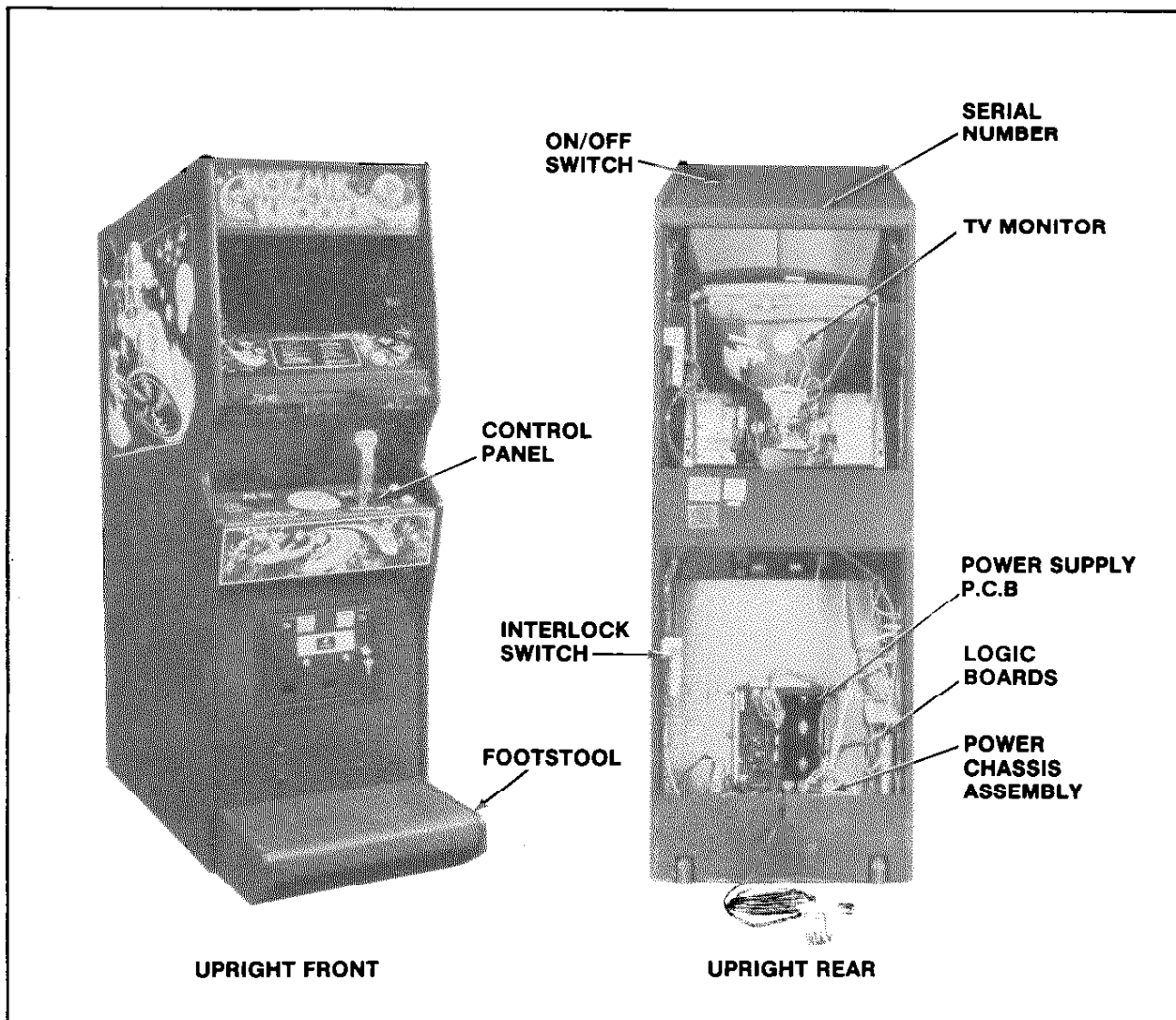


Figure 1-2 Location of Serial No., Interlock Switch, & Major Sub-Assemblies

INSTALLATION

1. Location requirements:

- Power:**
 - Domestic 110 V @ 60 Hz
 - Foreign 200 V to 240 V @ 50 Hz
- Temperature:** 32° to 100° F (0° to 38° C)
- Humidity:** Not over 95% relative
- Space required:**
 - Upright 25"x40" (63x102cm)
- Game height:**
 - Upright 72" (183cm)

2. Voltage Selection:

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

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

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

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

- 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 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 1-2. 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 models).

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

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

If the switch is found to be bad, turn the game off, unplug it, and replace the interlock switch. When done, plug the game back into the wall outlet, close the access door, and turn the game back on.

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

When the interlock switch is working properly and turns the power to the game off, power may be restored to the game with the access door(s) open. Take hold of the interlock switch plunger and **gently** pull it out to its fully extended position. **THIS IS TO BE USED ONLY FOR SERVICING THE GAME.** See Figure 1-3.

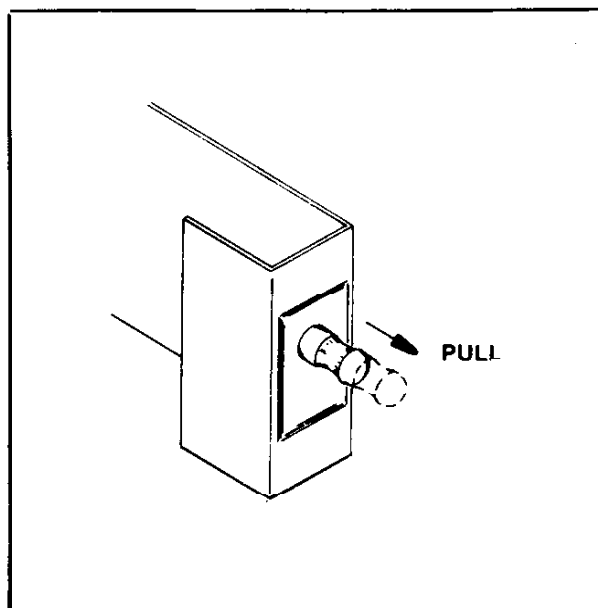


Figure 1-3 Interlock Switch Operation

SELF-TEST

Your new game will Self-Test itself to see if it has any bad parts. The information it receives while testing itself will be shown on the T.V. monitor. Some information can also be heard through the game's speaker system. See the SELF-TEST 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 1-4.

The game volume control pot is just inside the cabinet, not far from the coin door frame. There is only one pot. For adjustment, it may be reached through the coin door.

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 (↺).

OPTION SWITCH SETTINGS

To change the most common option switch 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 not far from 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.)

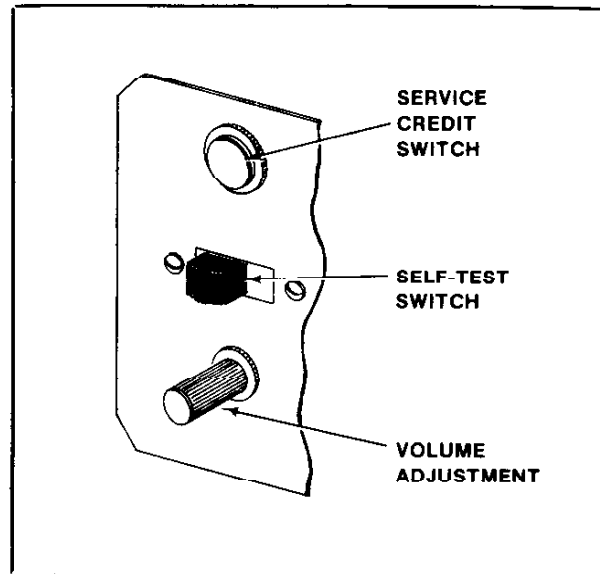


Figure 1-4 Game Volume Adjustment Control

The P.C. Board option switch settings, and what they will make the game do are shown in Figure 1-6. These switches are **MAINLY INTENDED** for use by a technician who is checking and/or performing tests on the game. See Figure 1-5 for option switch locations.

NOTE: In order to set the option switches located on the game's P.C. Boards, these Boards need not be removed from their card rack.

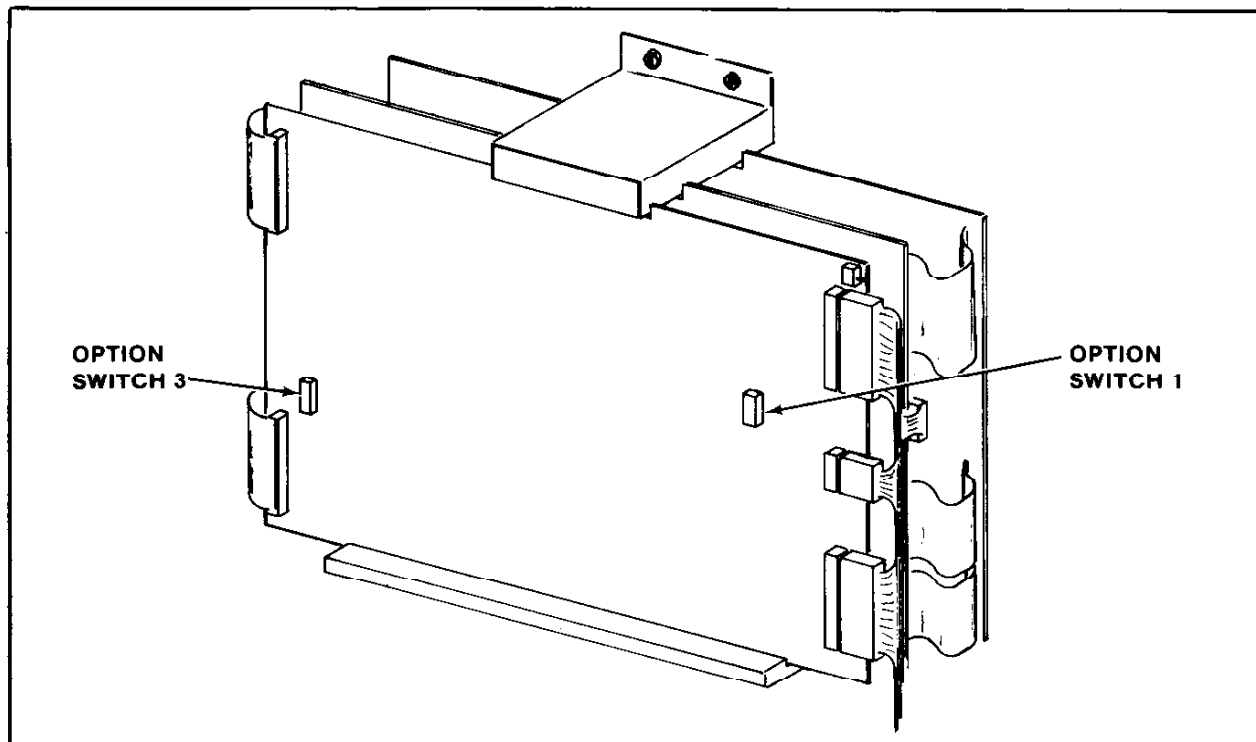


Figure 1-5 Option Switch Locations

| KOZMIK KROOZ'R | |
|---|---|
| OPTION SWITCH SETTINGS | |
| SWITCH NO. 1 — AT B3 — LOCATED ON SOUND I/O P.C. BOARD | |
| DURING GAME PLAY: | SW#1 SW#2 SW#3 SW#4 SW#5 SW#6 SW#7 SW#8 SW#9 SW#10 NOT NOT NOT NOT NOT NOT NOT NOT USED USED USED USED USED USED USED USED |
| COCKTAIL TABLE UPRIGHT | ON OFF |
| FREEZE VIDEO **NORMAL OPERATION | ON OFF |
| SWITCH NO. 3 — AT D14 — LOCATED ON SOUND I/O P.C. BOARD | |
| **NORMAL OPERATION SOUND I/O DIAGNOSTIC MODE | SW#1 SW#2 SW#3 SW#4 OFF ON |
| **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 |
| * NO EFFECT IF SW#1 OF SWITCH NO. 3 IS IN THE "OFF" POSITION. ** INDICATES FACTORY RECOMMENDED SETTINGS. | PART NO. M051-00639-A014 |

THE REMAINDER OF YOUR NEW GAME'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 YOUR MANUAL.

Figure 1-6 Option Switch Settings

II. Game Operation

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 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 Menue on the monitor screen.
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 game is 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 Menue 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 2-1.

1. It is easy to select what category you want to enter. By following the ON SCREEN instructions, the Cursor at the left of the screen can be moved UP or DOWN until it is in front of the category you want to test.
2. After the Cursor has been positioned, follow the ON SCREEN instructions again, and the monitor screen will display the test category you have selected.

NOTE: There is one exception to this. If you select the "PRE-SET" category on the Self-Test Mode Menue, 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**.

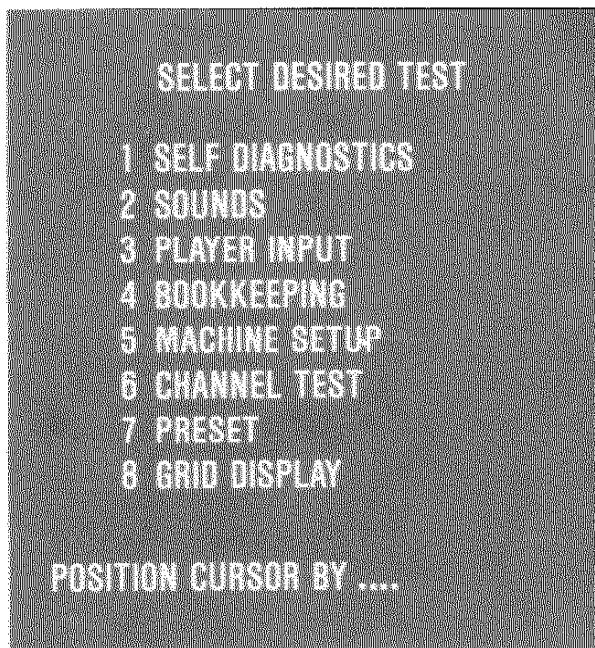


Figure 2-1 Self-Test — Menue

- 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 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 an exit message. If you do not exit, 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 2-1a.

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

During the PLAYER INPUT section of the Self-Test mode, the game will give a display which looks like that shown in Figure 2-1b.

- 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.

During the BOOKKEEPING section of the Self-Test mode, the game will give a display which looks like that shown in Figure 2-1c.

- 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 2-1d and 2-1e respectively.

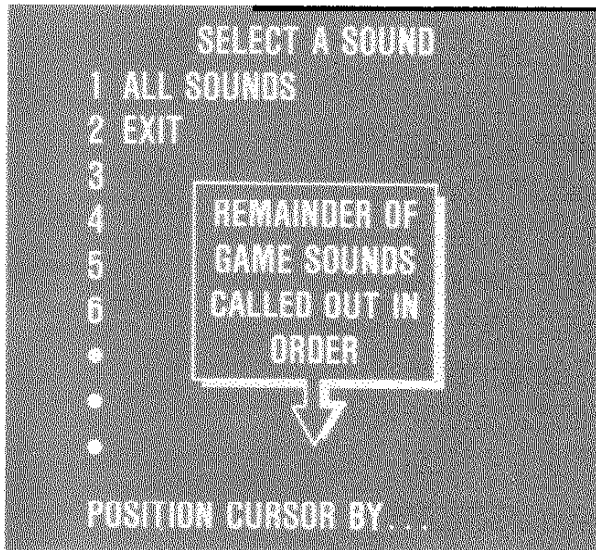


Figure 2-1a Self-Test — Sounds

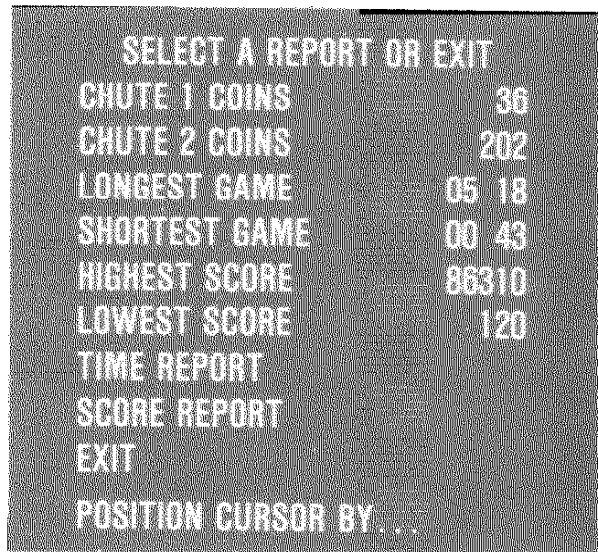


Figure 2-1c Self-Test — Bookkeeping

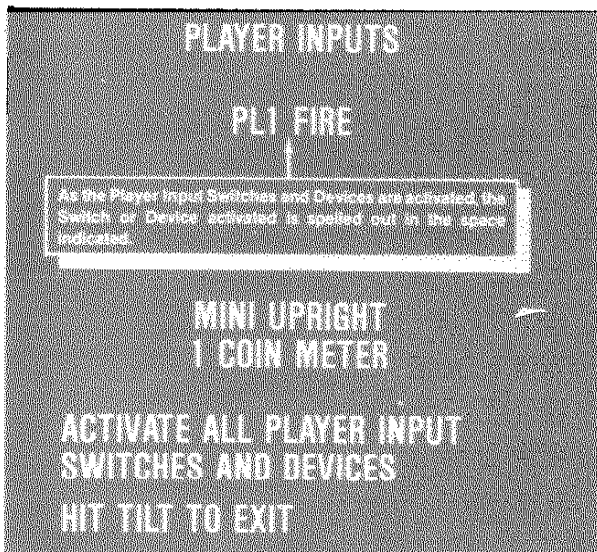


Figure 2-1b Self-Test — Player Inputs

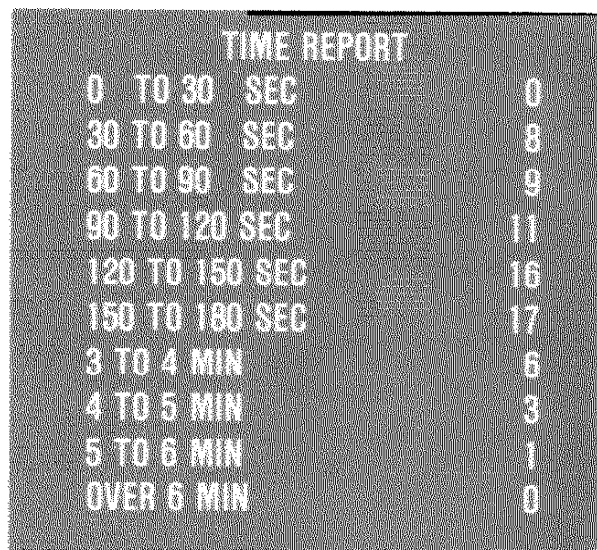


Figure 2-1d Self-Test — Time Report

| SCORE REPORT | |
|----------------------|----|
| 0 TO 5000 PTS | 14 |
| 5000 TO 10000 PTS | 13 |
| 10000 TO 20000 PTS | 24 |
| 20000 TO 40000 PTS | 16 |
| 40000 TO 70000 PTS | 3 |
| 70000 TO 100000 PTS | 1 |
| 100000 TO 150000 PTS | 0 |
| 150000 TO 200000 PTS | 0 |
| 200000 TO 250000 PTS | 0 |
| OVER 250000 PTS | 0 |

Figure 2-1e Self-Test — Score Report

During the SETUP OPTIONS section of the Self-Test mode, the game will give a display which looks similar to that shown in Figure 2-1f.

- 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.

| SETUP OPTIONS | |
|-----------------------|--|
| COIN CHUTE 1 | |
| *1 COINS FOR | |
| *1 CREDITS | |
| COIN CHUTE 2 | |
| *1 COINS FOR | |
| *1 CREDITS | |
| *1 CREDITS FOR | |
| *3 BASES* | |
| 1ST EXTRA BASE AT | |
| *20000 POINTS | |
| ADDITIONAL BASE EVERY | |
| *20000 POINTS | |
| *3 DIFFICULTY LEVEL | |

* = Factory recommended settings.

Figure 2-1f Self-Test — Set-Up Options

DIFFICULTY LEVEL EXPLANATION:

The Difficulty Level setting has a range of 1 to 9. With 1 being the easiest level of play and 9 being the most difficult level of play. We recommend that a setting of 3 be used as a beginning point.

Game play can then be made **MORE** difficult or **LESS** difficult, according to the skill levels attained by the players in your area.

CHANNEL TEST:

During the CHANNEL TEST section of the Self-Test mode, the game will give a display which looks like that shown in Figure 2-1g.

- 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 exited. It then goes back to the Self-Test Mode Menu.

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 exited. 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.

| CHANNEL TEST | |
|--------------|--|
| CHANNEL 1 | |
| CHANNEL 2 | |
| CHANNEL 3 | |
| CHANNEL 4 | |
| CHANNEL 5 | |
| CHANNEL 6 | |

Figure 2-1g Self-Test — Channel Test

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.)

CROSS HATCH PATTERN:

A cross hatch pattern is shown on the screen when power is first turned on to the game, when the TILT Switch is actuated, and 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 exit at the GRID DISPLAY to return to the Self-Test Mode Menu.

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 2-2.

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.

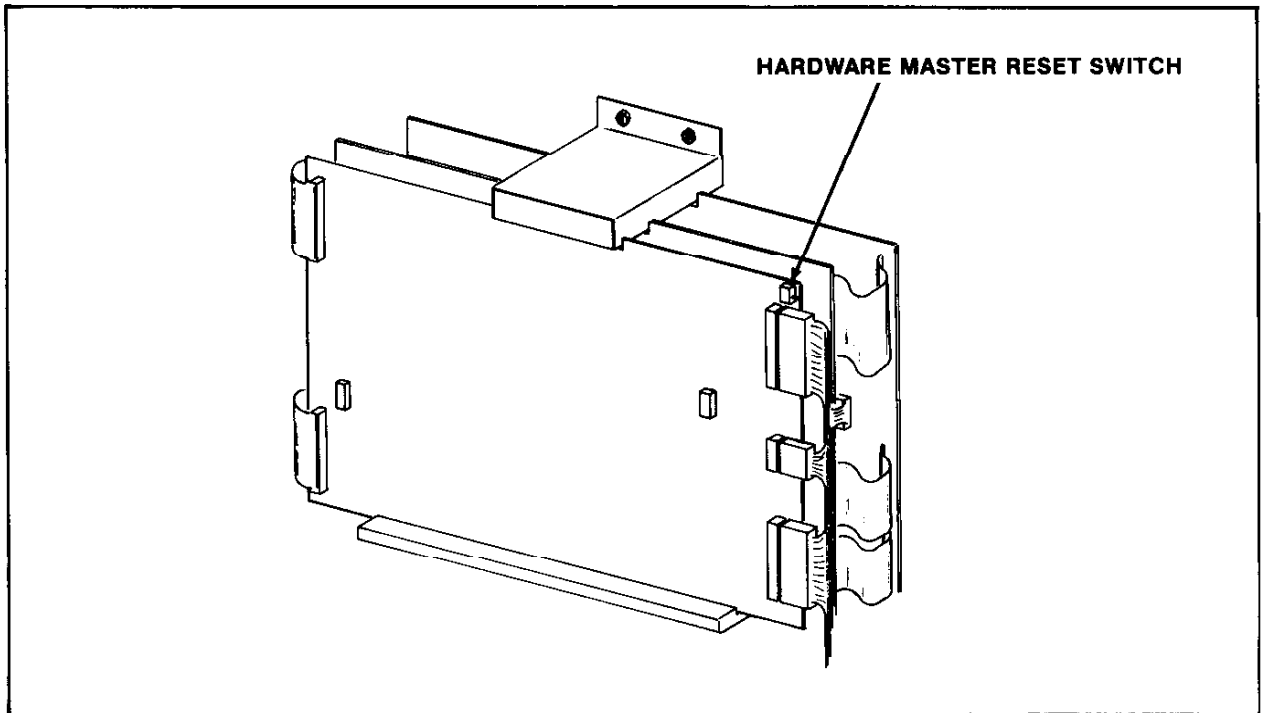
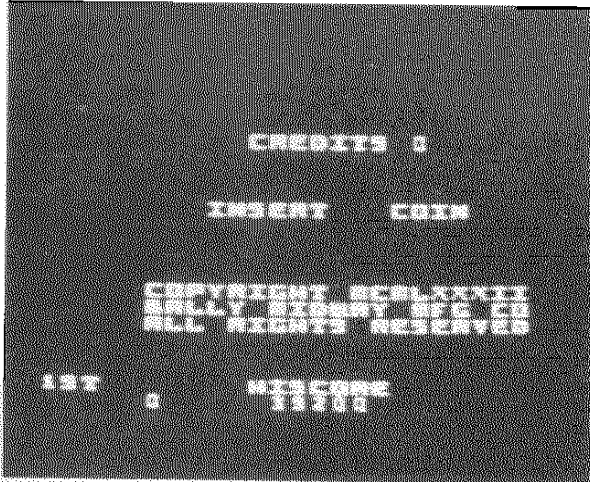


Figure 2-2 Location of Hardware Master Reset Switch

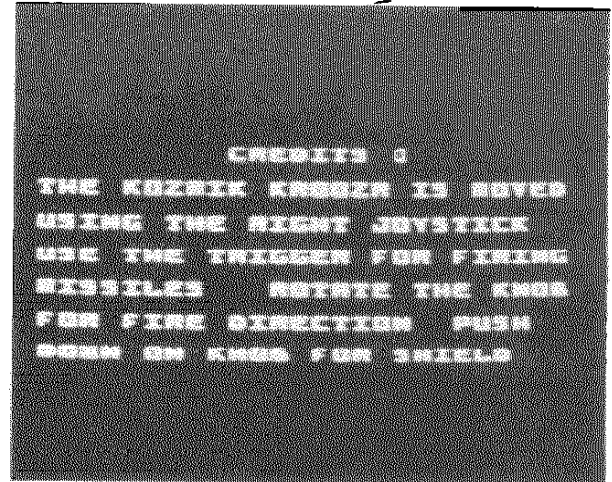
ATTRACT MODE

1. The Attract mode starts:

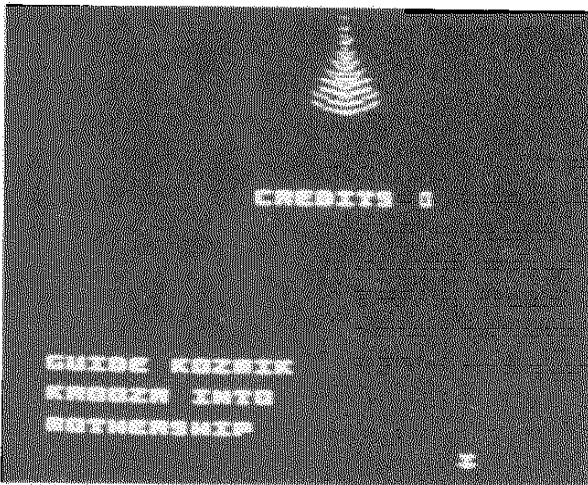
- Just after power has been turned on to the game. (Self-Test switch is in the "OFF" position.)
- After a Self-Test has been completed and there are no more credits left in the game's memory.
- After a play has been finished, the score was not high enough to put the game into the High Score/Initial mode,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



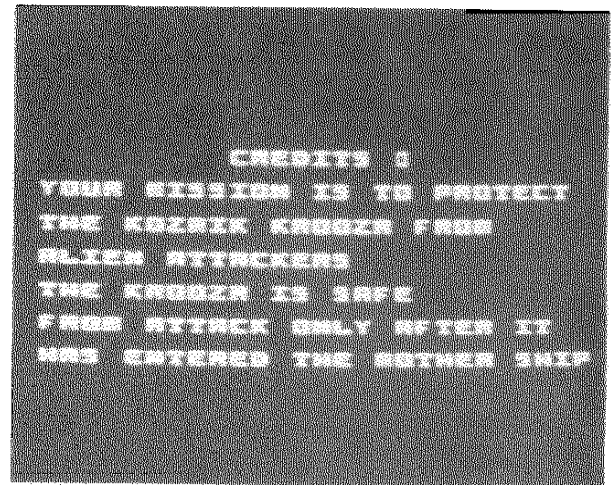
Attract Mode Display 1



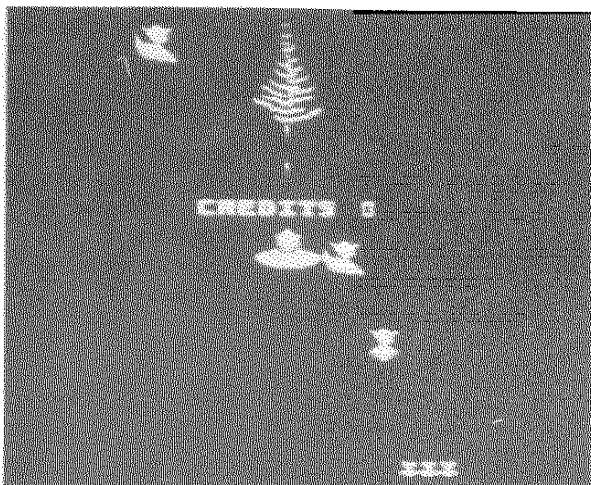
Attract Mode Display 4



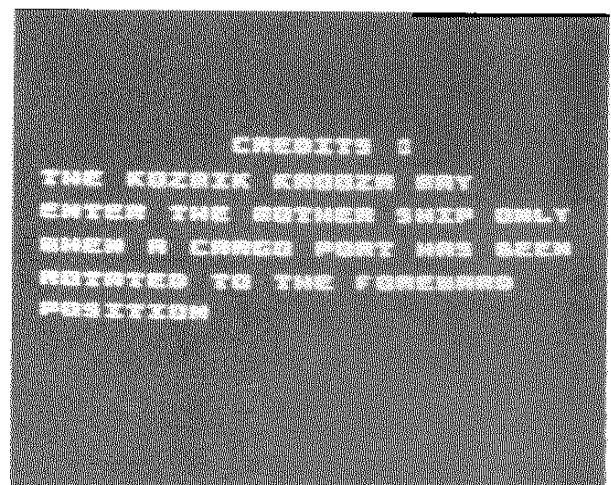
Attract Mode Display 2



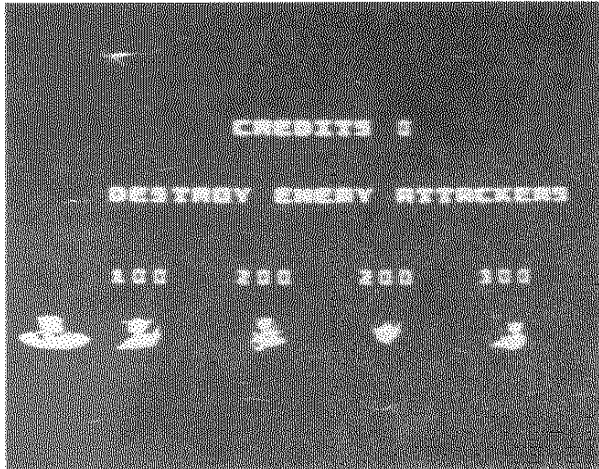
Attract Mode Display 5



Attract Mode Display 3

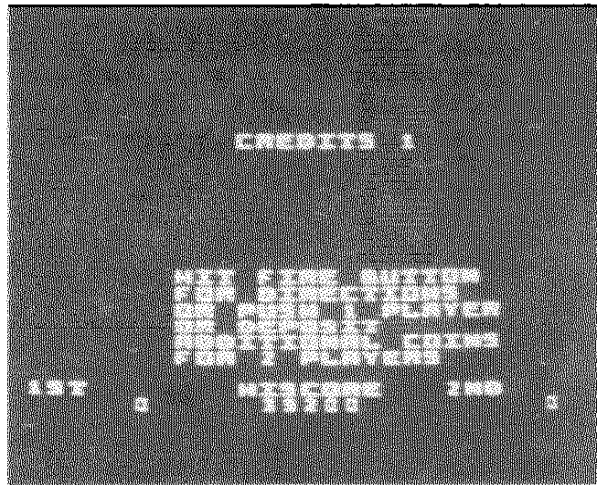


Attract Mode Display 6

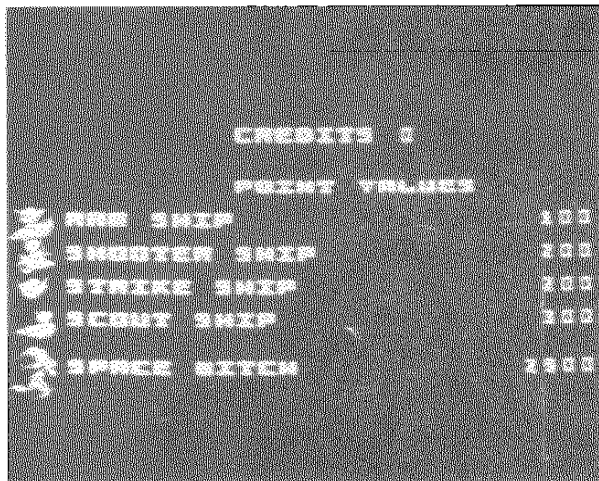


Attract Mode Display 7

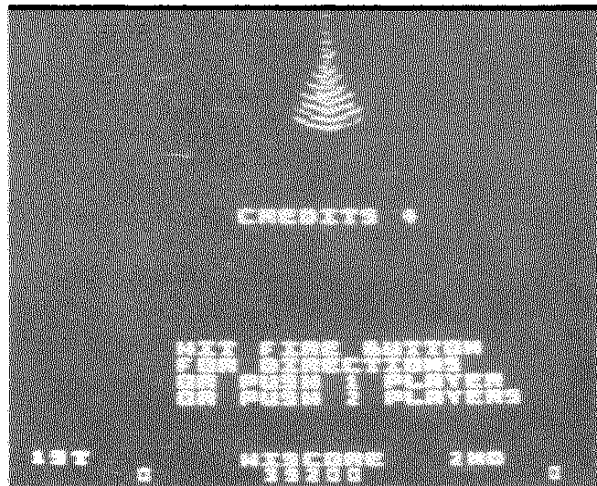
□ No matter where the game is in the Attract mode sequence, it will immediately go to the following display as soon as a game has been paid for.



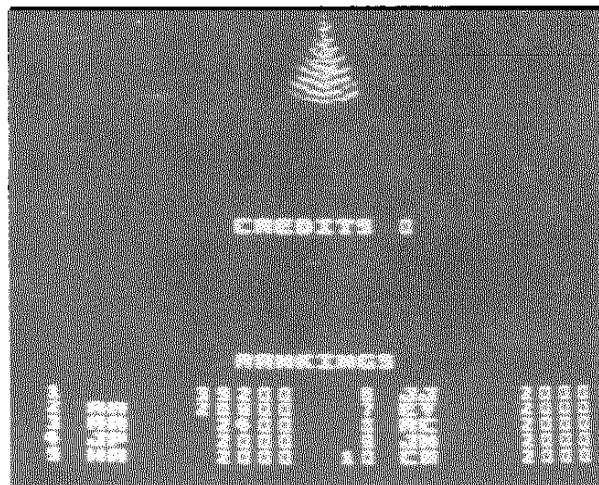
Ready to Play Mode Display 1



Attract Mode Display 8



Ready to Play Mode Display 2



Attract Mode Display 9

READY-TO-PLAY MODE

1. The Ready-To-Play mode starts when enough coins have been accepted for a 1 or 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 above displays **centered** on the monitor screen.
4. If no START button is pressed, the displays will remain indefinitely as shown above.

PLAY MODE

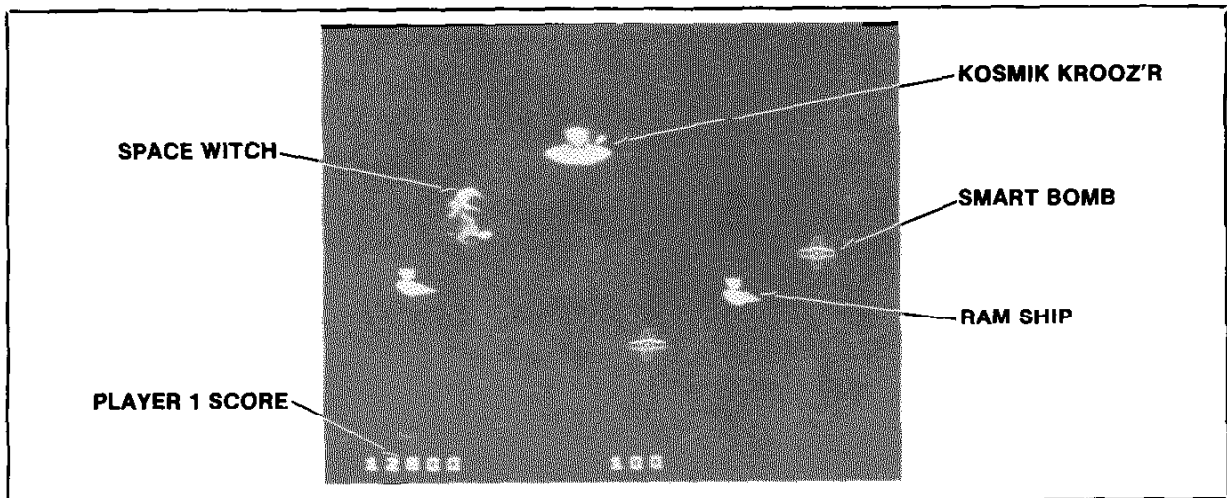
1. The Play mode begins when either the "1 PLAYER" or "2 PLAYER" start button is pressed.
2. The Play mode ends when all of your SHIPS have been eliminated. When this happens, "GAME OVER" is written across the center of the monitor screen.
3. **ON THE SCREEN:** The game is made up of 20 racks which increase in difficulty as you go along. After the 20th rack has been completed, the game repeats the basic format for rack #1 but adds some additional obstacles that were not there the first time you played it.

At the beginning of each rack, the game tells which player is up.

Also indicated in each rack is that rack's number, the number of players (1 or 2), a running total of the player's score(s), time left on shield, and the highest game score to date.

4. **PLAY BEGINS:** Your SHIP appears at the bottom of the screen, after all other objects have appeared. Play then begins for your SHIP. Your SHIP is protected for the first few seconds after it has appeared. This is indicated by its flickering image — protection ends when the image solidifies.
5. **ENEMY SHIPS/MINES/SPEED DEMONS, ETC.:** Initially, you will experience only one type of attacker at any one time per rack. In later racks, you will have several different types of attackers per rack coming at you at any one time. The characteristics of each attacker are different. All the Enemy SHIPS/MINES/SPEED DEMONS, ETC. listed in the scoring table will eventually appear during the game course. Certain ones only appear in the higher, more difficult, racks; and/or, if you spend too much time in any one rack. As your abilities improve, you'll find out which these are.

6. **BLACK HOLE:** The BLACK HOLE is one of those little surprises I was telling you about above. It appears if you should spend too much time in any one rack — or — when your skills have improved enough to reach the upper racks. When it latches on to your SHIP, it will take it all over the screen for about 15 seconds. During this time you still are able to fire your SHIP'S weapon and to use your shield, but you have **NO** control over your direction on the screen.
7. **SMART BOMBS:** These appear randomly as atom-like shapes and move randomly over the screen. While doing this they alternate colors between green and blue. If shot when they are green, they will explode and wipe out everything on the screen EXCEPT your SHIP. If shot when they are blue, nothing happens. Also, touching them with your SHIP at any time will cause **NO** problems.
8. **MISSILE FIRE:** This is done by pulling the trigger of your joy stick. Pull and release — one missile is fired. Pull and hold — four missiles are fired — short pause — four more missiles are fired, and so on.
9. **MISSILE AIMING:** Rotating the knob on the left side of the control panel will aim your SHIP'S launcher in any of 8 directions.
10. **SHIELD:** Your SHIP'S shield is activated by pushing down on the MISSILE AIMING knob. The shield does not last very long so be careful how you use it. It can only be recharged by guiding your SHIP inside the mother ship through one of its rotating ports. Your shield time is displayed at the bottom center of the screen.
11. **SHIP:** Your SHIP can move LEFT, RIGHT, UP, and DOWN on the screen. Its movements are controlled by the joy stick on the game's control panel.



Display of "On-Screen" Graphics During Game Play

12. **KOZMIK JUNK YARD:** This is a **BONUS RACK**. It appears every fifth rack (5th, 10th, 15th, 20th, etc.). You **CANNOT** loose a SHIP here. There are four parts scattered throughout the junk yard for you to pick up before the time limit runs out. If you get all four, you can get an extra SHIP awarded to you.

There are hazards in the junk yard that can slow you down. The chief one of these is the trails of space turbulence caused by passing asteroids. You cannot maneuver across them. There is also a talking inhabitant of the junk yard that will detect your presence and bend your ear if you get too close to his residence. And once this happens, you won't be able to get away until he's done talking.

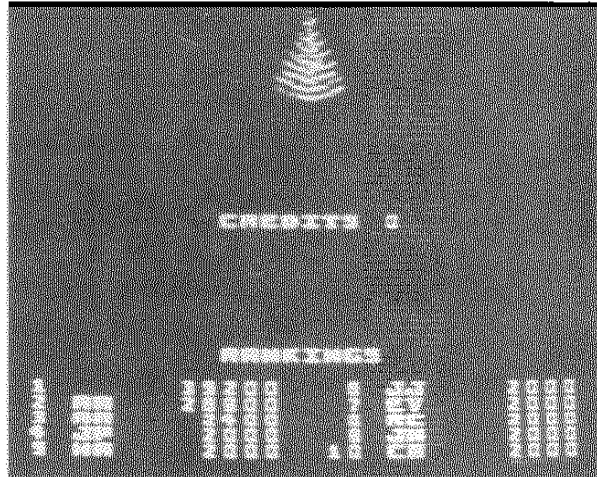
13. **BONUS SHIPS:** These can be awarded to the player as he reaches or passes certain pre-selected point values. This feature is adjustable by the game's Owner/Operator.
14. **PLAY ENDS:** When your last SHIP is eliminated, "GAME OVER" is written across the center of the monitor screen.
15. **HIGH SCORE/INITIAL MODE:** 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.



High Score/Initial Mode

Follow the ON-SCREEN instructions to enter your initials next to your score in the league of the best ten players to date.

When you've printed out your last initial, move the cursor opposite the "END" word and activate the same control you did to enter your initials. This tells 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. See below.



Rankings Display

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).

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

TWO PLAYER OPERATION

The Upright 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.

1. The players must take turns at the controls.
2. Your turn lasts until:
 - A. Your SHIPS are ALL eliminated.
 - B. Your SHIPS have ALL entered the mother ship.

SHIP ELIMINATED — OTHERS REMAINING IN RESERVE

- The game stops and your next SHIP is displayed on the screen.
- Game play then resumes for you.

YOUR LAST SHIP ENTERS THE MOTHER SHIP

- Your SHIPS are returned to you and bonus points for each returned SHIP are displayed on screen.
- Next, the game indicates the other PLAYER is up, that player's pattern and SHIP appear on the monitor screen, and game play begins for that PLAYER.
- This PLAYER'S turn will last until either ALL his SHIPS are eliminated or until they all enter the mother ship.

SHIP ELIMINATED — NO OTHERS REMAINING IN RESERVE

- Game displays: "PLAYER ____" "GAME OVER" on the monitor screen.
- Next, if your score was high enough, the game will go into the HIGH SCORE/INITIAL mode. After this, it will indicate that the remaining PLAYER is up, that player's pattern and SHIP appear on the monitor screen, and game play begins for him.
- If your score was not high enough to cause the game to go into the HIGH/SCORE INITIAL mode, it will indicate that the remaining PLAYER is up, that player's pattern and SHIP appear on the monitor screen, and game play begins for him.

LAST PLAYER'S SHIP ELIMINATED — NO OTHERS REMAINING IN RESERVE

- Game displays: "PLAYER ____" "GAME OVER" on the monitor screen.
- Next, if your score was high enough, the game will go into the HIGH SCORE/INITIAL mode and then either 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).
- If your score was not high enough to cause the game to go into 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).

III. Maintenance and Repair

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

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

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

CLEANING

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

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

FUSE REPLACEMENT

This game contains several fuses located as shown in Figure 3-1.

1. UPRIGHT MODEL:

As viewed from the back, facing the cabinet, with the rear access door(s) removed; the fuses are located on the Power Chassis and the Power Supply P.C. Board.

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

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

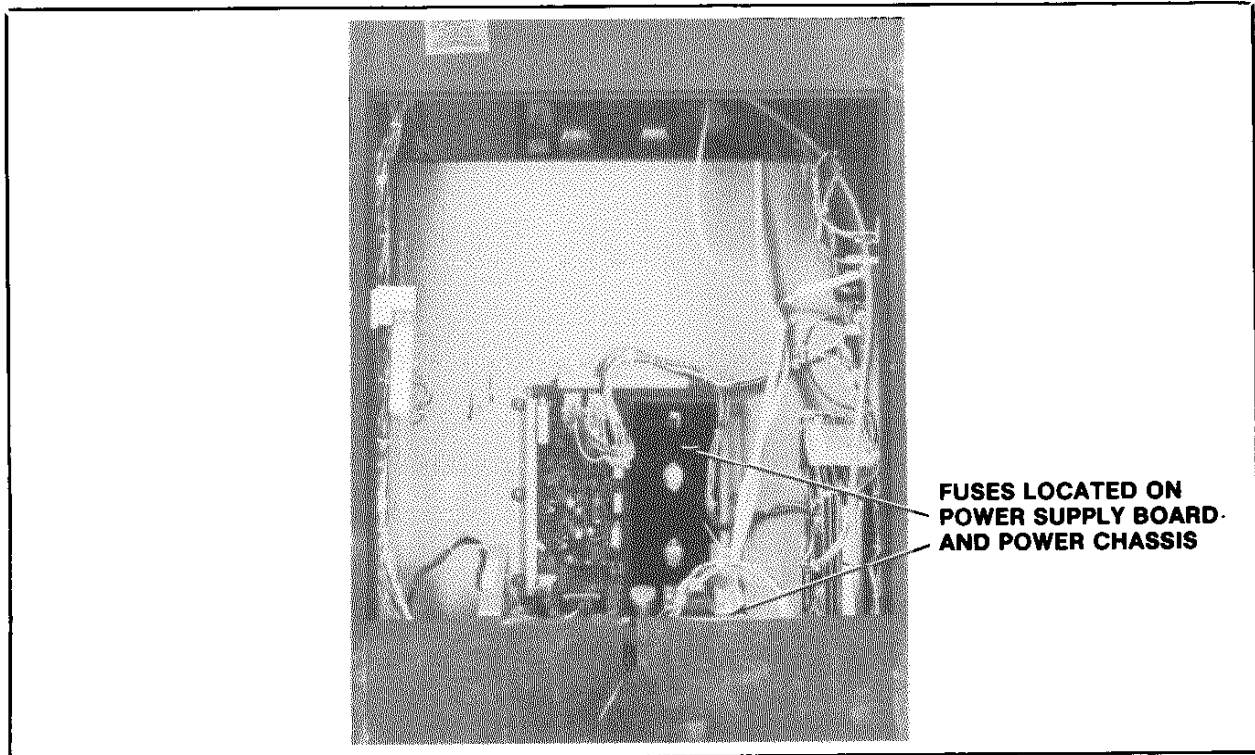


Figure 3-1 Location of Fuses

OPENING THE CONTROL PANEL

1. UPRIGHT MODEL: See Figure 3-2.

- The control panel is held in place by a nylon retaining strap and three latches, one on each side and one in the center at its back edge.

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 and nylon retaining strap behind it.

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

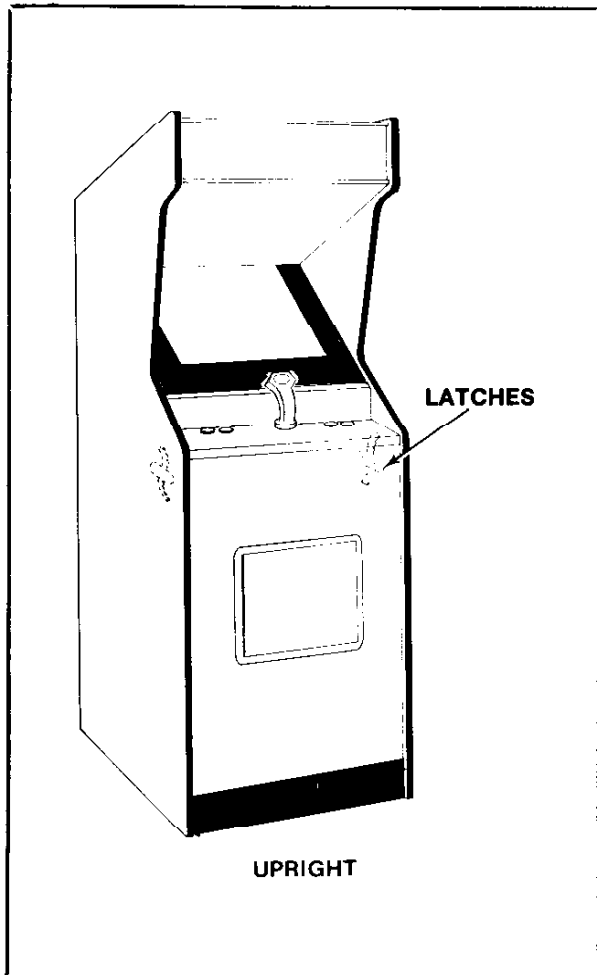


Figure 3-2 Opening the Control Panel

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:

- Turn the power to the game off and remove the screws which secure the glass clamping plate in position. See Figure 3-3.

- 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.

- To reinstall the main-display-glass and glass clamping plate, reverse this procedure.

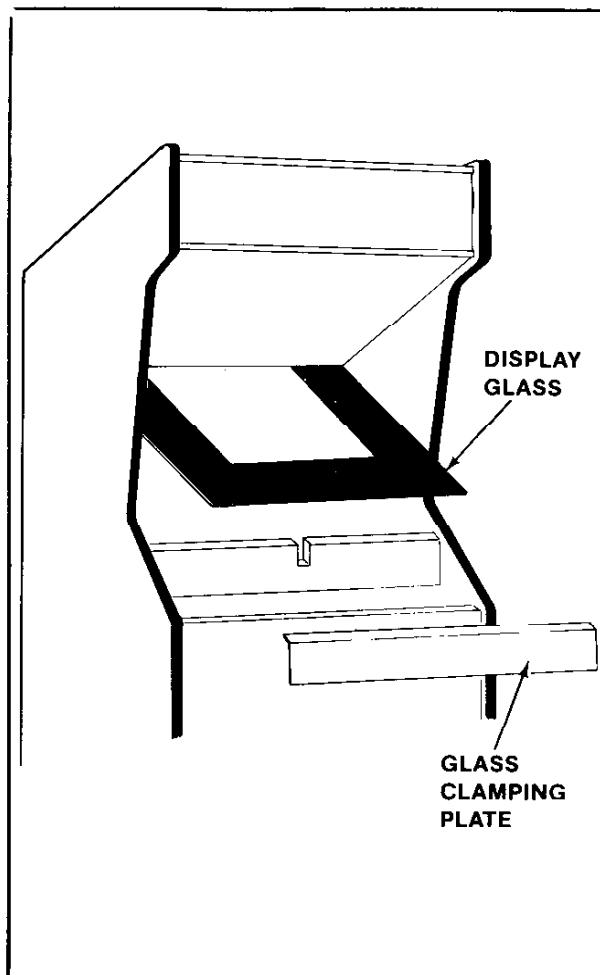


Figure 3-3 Removing the Main-Display-Glass & T.V. Bezel

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 3-4.

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

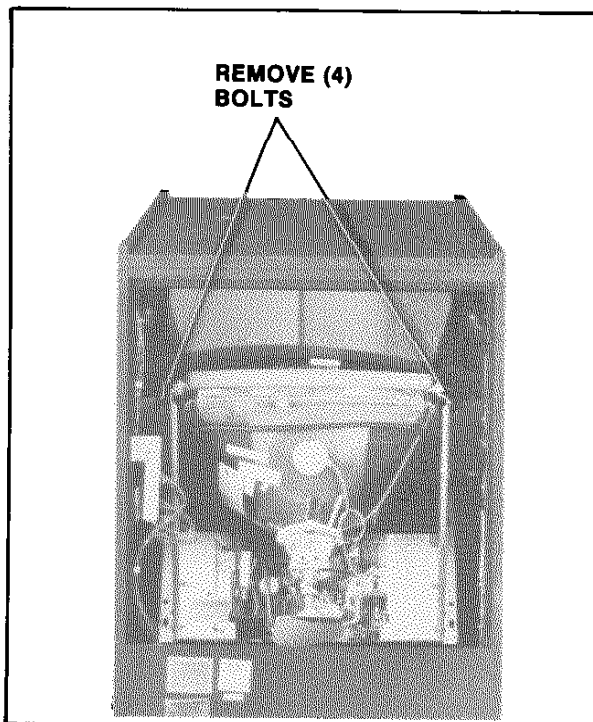


Figure 3-4 Removing the Monitor

- The monitor mounting bars slide on top of and against two metal guides mounted to the cabinet's right and left sides. The monitor is removed by sliding it out the back of the cabinet. See Figure 3-4.
- To reinstall the T.V. monitor, reverse this procedure.
- After replacing the T.V. monitor, be sure to run the game Self-Test.

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

1. **UPRIGHT MODEL:** See Figure 3-4.

- Turn the power to the game off.
- Unlock and open the rear access door(s).
- 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. support(s) indicated in Figure 3-5, and slide the linear power supply board out the back of the cabinet.
- To reinstall the above P.C.B.'s, reverse this procedure.

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.

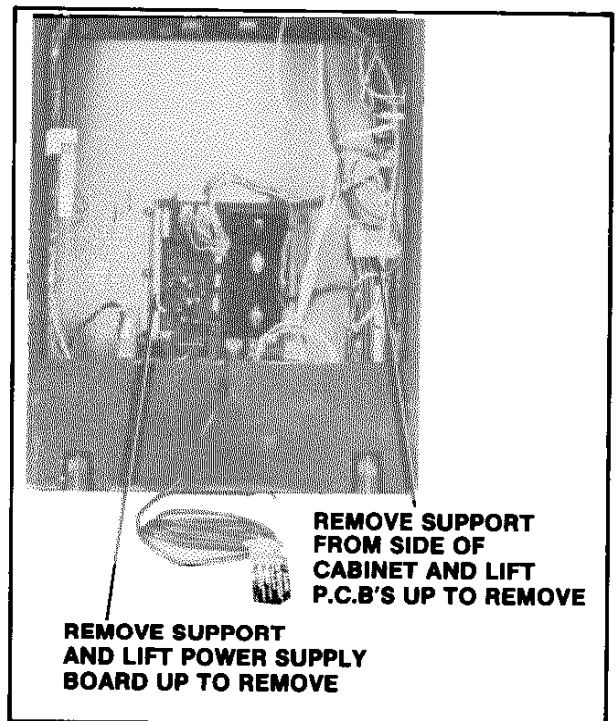


Figure 3-5 Removing the P.C.B.'s

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 3-6.
Remove the top bracket and slide up the attraction panel. This exposes the speakers, fluorescent tube, and their mountings.
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 light tube starter. See Figure 3-7.

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

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

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

- Removing the speaker(s):
The attraction panel **MUST** be removed first. This will enable you to reach all the necessary areas where cables **MUST** be disconnected.
Disconnect the speaker(s) from all their cabling.
Remove the screws which secure the speaker grill to the cabinet.

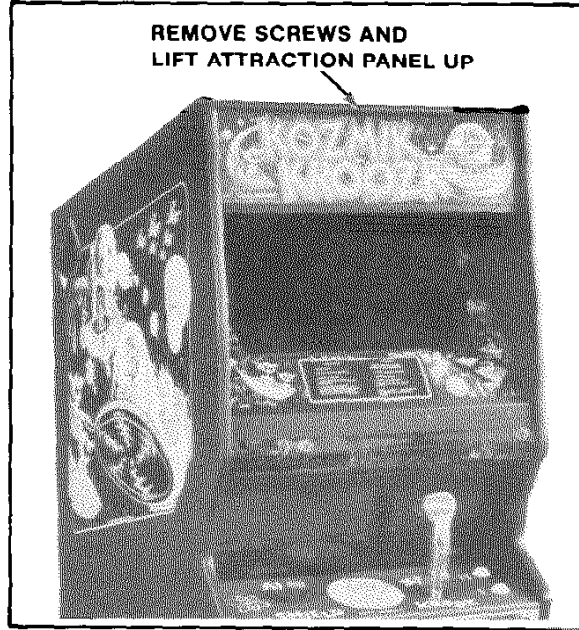


Figure 3-6 Opening the Attraction Panel

The speaker attachment nuts and bolts may now be removed and the speaker(s) taken out of the cabinet through the hole in the front of the game where the attraction panel was mounted.

To reinstall the speaker(s) and speaker grill, reverse this procedure.

- Replacement of the fluorescent tube mounting bracket assembly.
Disconnect it from its power cable.
Remove the screws which secure it to the cabinet.
To reinstall the fluorescent tube mounting bracket, reverse this procedure.

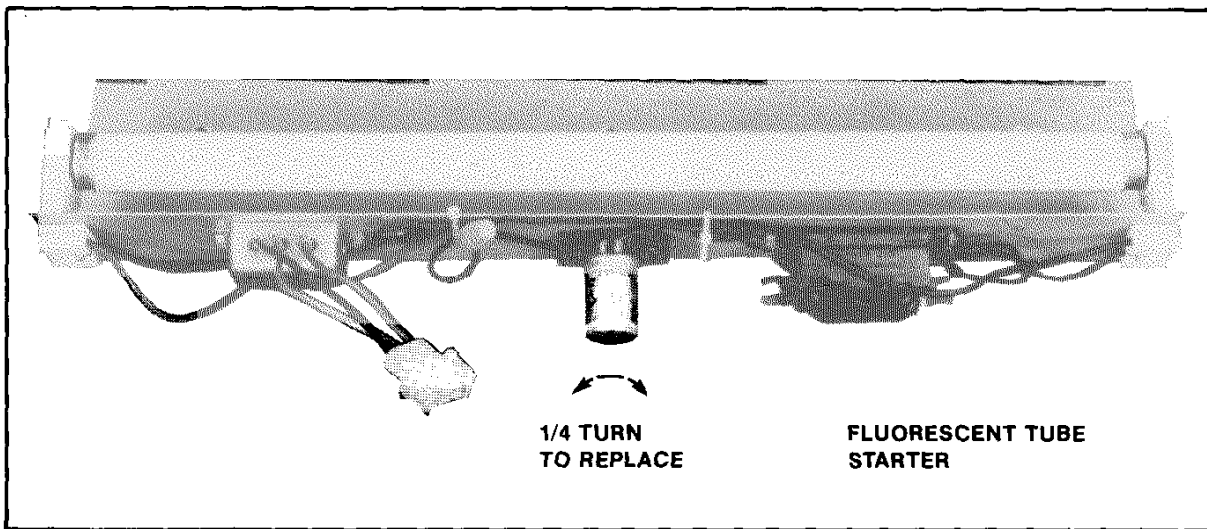


Figure 3-7 Replacing Fluorescent Tube Starter

SERVICING THE BLACK LIGHT ABOVE CONTROL CONSOLE

1. UPRIGHT MODEL:

- Turn the power to the game off and remove the screws which secure the glass clamping plate in position. See Figure 3-8

Lift out the glass clamping plate.

Remove the screws which secure the bottom of the black light shield to the front service panel.

BE SURE you support the black light shield as you remove these screws so it will not fall on the floor. The black light tube may be replaced at this time. BE CAREFUL NOT TO DROP IT.

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

To reinstall the black light shield, reverse this procedure.

- Replacing the black light tube starter. See Figure 3-7.

NOTE: The main-display-glass **MUST** be removed in order to do this. See "Upright Model" procedure.

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

Grasp the starter (it is on the back of the mounting bracket, just inside the frame for the main-display-glass), give it a quarter turn, and remove it from its socket.

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

SERVICING THE FLUORESCENT LIGHT BEHIND THE FRONT SERVICE PANEL

- Remove the front service panel.

Turn the power to the game off.

NOTE: In order to do this, the following items **MUST** be removed first, in this order, to make room: 1) the main-display-glass glass clamping plate; 2) the black light shield; and 3) the control panel. See the appropriate sections of this manual for removal instructions.

Remove the screws at the top of the front service panel which secure it to the cabinet.

Tilt it back to clear the black light and lift it up and out as shown in Figure 3-8.

To reinstall the front service 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 black light tube starter. See Figure 3-7.

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

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

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

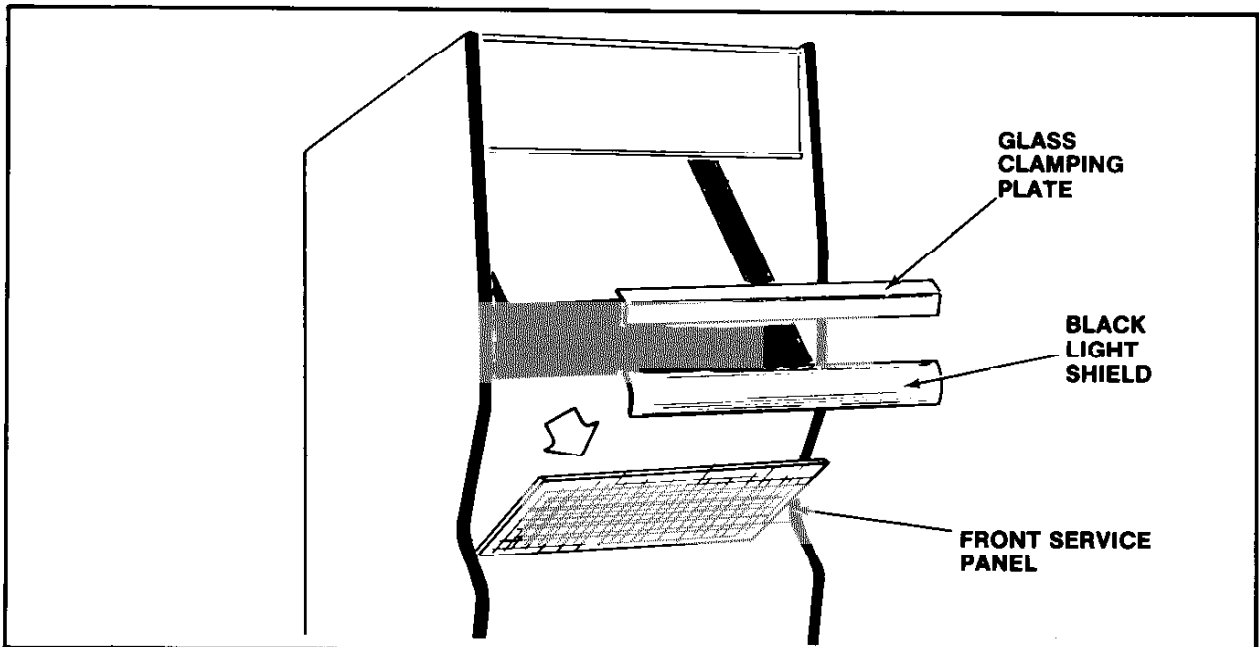
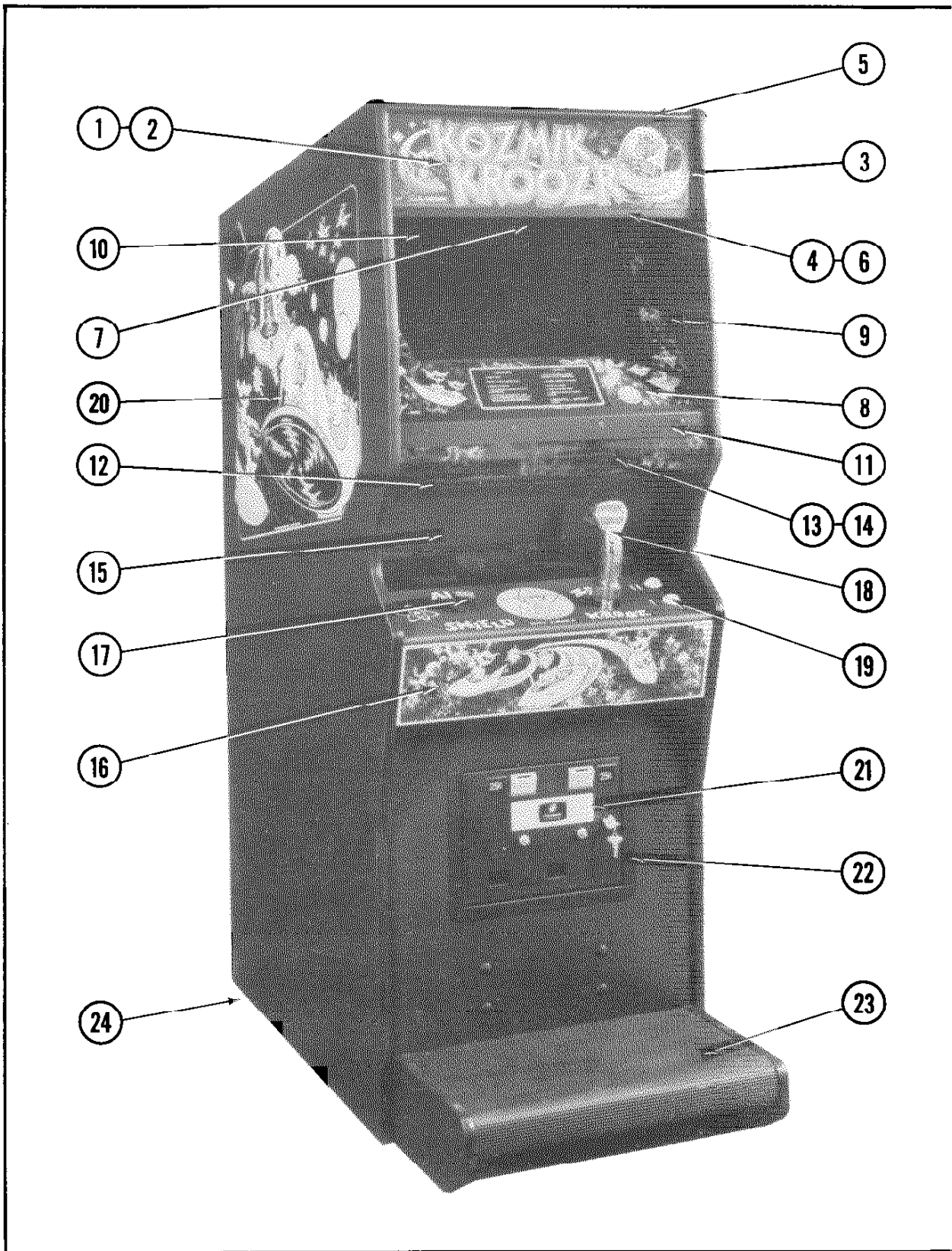


Figure 3-8 Servicing Center Auxiliary Lighting

IV. Illustrated Parts Breakdown

NO. 639 — KOZMIK KROOZ'R — FRONT



NO. 639 — KOZMIK KROOZ'R — FRONT — PARTS LIST

ORDER BY PART NUMBER ONLY

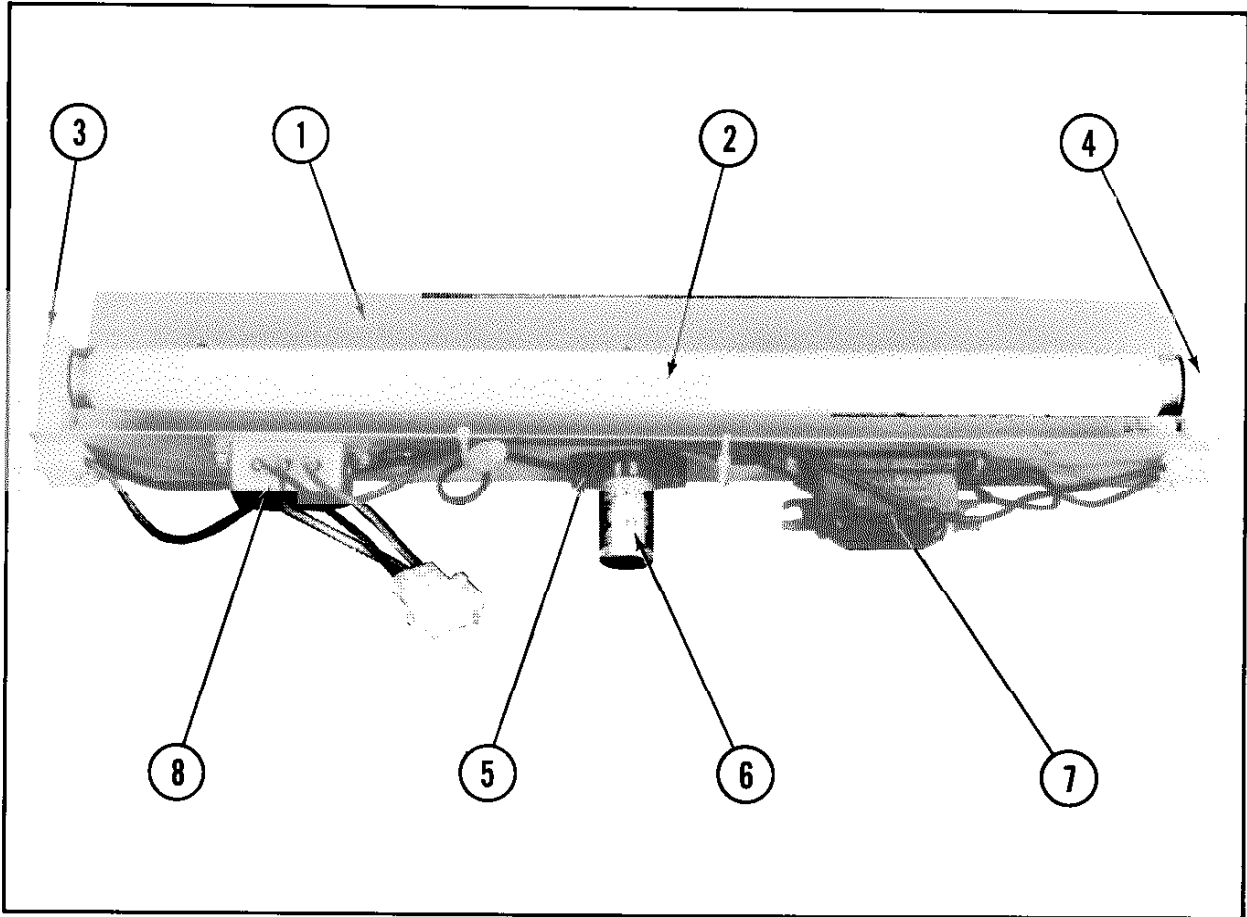
| ITEM | PART NO. | DESCRIPTION |
|-----------------|-----------------|--|
| 1 | 0639-00909-00XF | DISPLAY HEADER |
| 2 | A639-00030-0000 | HEADER FLUOR. LIGHT ASSY. |
| 3 | 0537-00903-0066 | GLASS CHANNEL — 5-7/8" LG. (2 REQ'D.) |
| 4 | 0537-00903-0004 | GLASS CHANNEL — 22-1/4" LG. |
| 5 | 0574-00903-0100 | HEADER RETAINING BRKT. |
| 6 | 0639-00111-00XF | RETAINER GRILL |
| 7 | 0017-00101-0138 | #8 x 5/8 TORX TAMPER RESISTANT BLK. SCR. (16 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.) |
| 8 | A639-00055-0000 | SPEAKER CABLE ASSY. |
| | 0639-00907-00XF | MAIN VIEWING GLASS |
| 9 | 0537-00903-0068 | GLASS CHANNEL — 17" LG. (2 REQ'D.) |
| 10 | 0537-00903-0034 | GLASS CHANNEL — 23" LG. |
| 11 | 0639-00102-00XF | DISPLAY GLASS RETAINER BRKT |
| 12 | 0639-00100-00XF | LAMP PROTECTOR MTG. BRKT. |
| 13 | 0639-00902-0000 | LAMP PROTECTOR |
| | 0017-00101-0138 | #8 x 5/8 TORX TAMPER RESISTANT BLK. SCR. (10 REQ'D.) |
| | A639-00031-0000 | BLACK LIGHT ASSY. |
| | A639-00054-0000 | ACCESS PANEL ASSY. |
| 16 | A639-00041-0000 | OVERLAY TO WELDMENT ASSY. |
| | A639-00042-0000 | CONTROL SHELF WELDMENT ASSY. |
| | 0639-00919-0000 | DECORATIVE OVERLAY |
| | 0639-00124-0100 | CONTROL SHELF MTG. BRKT. — LEFT |
| | 0639-00124-0200 | CONTROL SHELF MTG. BRKT. — RIGHT |
| | 0555-00901-0000 | PLASTIC LOCATING PIN (4 REQ'D.) |
| | 0017-00009-0534 | BASSICK CLAMP (3 REQ'D.) |
| | 0017-00101-0141 | #8 x 11/16 UNSLOT. HEX HD. SCR. (12 REQ'D.) |
| | 0639-00127-0000 | CONTROL SHELF LOCK BRKT. |
| | 17 | A639-00034-0000 |
| A639-00043-0000 | | OPTICAL ENCODER DISC ASSY. |
| 18 | A628-00032-0000 | GRIP W/SWITCH ASSY. |
| | A639-00023-0000 | ANALOG CONTROL ASSY. |
| | A089-00020-0000 | CONTROL GRIP CABLE ASSY. — 16" LG. |
| | A639-00008-0000 | CONTROL SHELF CABLE ASSY. |
| 19 | 0017-00042-0260 | PUSH BUTTON ASSY. — WHITE (2 REQ'D.) |
| | 0017-00032-0093 | PUSH BUTTON SWITCH W/HOLDER (2 REQ'D.) |
| | 0017-00103-0054 | 5/8-11 PAL NUT (2 REQ'D.) |
| 20 | 0639-00920-0200 | DECAL — LEFT SIDE |
| | 0639-00920-0100 | DECAL — RIGHT SIDE (NOT SEEN) |
| 21 | A090-00300-11BK | U.S.A. 25¢ DOUBLE COIN DOOR ASSY. |
| | A982-00015-0000 | COIN DOOR CABLE ASSY. |

NO. 639 — KOZMIK KROOZ'R — FRONT — PARTS LIST (Continued)

ORDER BY PART NUMBER ONLY

| ITEM | PART NO. | DESCRIPTION |
|------|--|---|
| 22 | 0090-00002-04BK 0017-00101-0121 0950-00004-0000 A950-00006-0000 0950-00105-0000 0950-00104-0000 0950-00101-0000 0950-00900-0000 0950-00103-0000 0017-00101-0142 0017-00104-0014 0017-00103-0018 | LARGE COIN DOOR FRAME #6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME) COIN BOX ASSEMBLY COIN BOX CRADLE ASSY. COIN BOX COVER COIN BOX HANDLE COIN DEFLECTOR (2 REQ'D.) LARGE PLASTIC COIN BOX COIN BOX DIVIDER — OPTIONAL 1/4-20 x 1-3/8 BLACK RND. HD. BOLT (4 REQ'D.) 7/8" DISH WASHER (4 REQ'D.) 1/4-20 HEX NUT (4 REQ'D.) |
| 23 | A639-00032-0000 0639-00910-0000 | STEP STOOL ASSY. STEP STOOL MAT |
| 24 | 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. 639 — KOZMIK KROOZ'R — UPRIGHT
HEADER FLUORESCENT LIGHT ASSY. & BLACK LIGHT ASSY.**

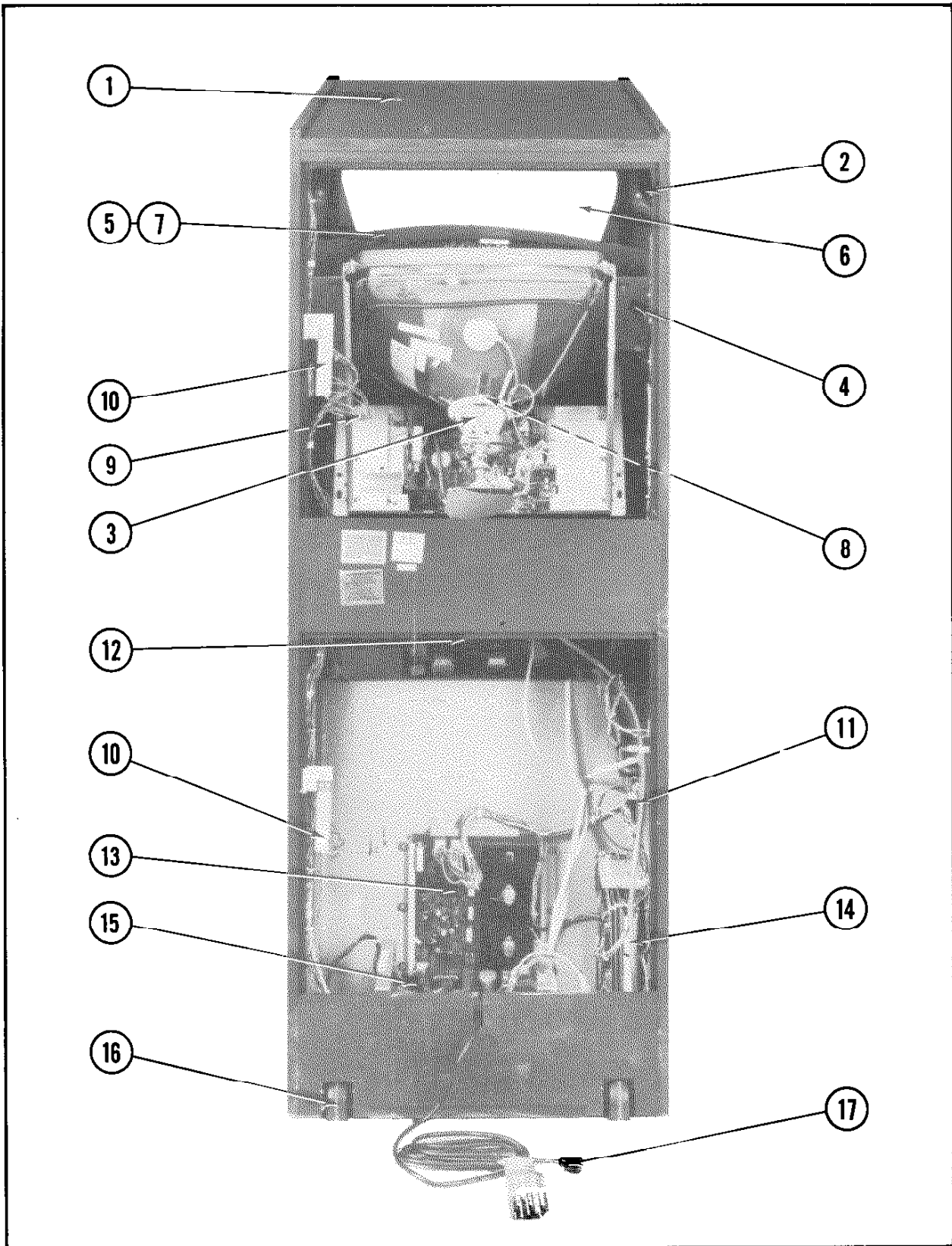


**NO. 639 — KOZMIK KROOZ'R — UPRIGHT
HEADER FLUORESCENT LIGHT ASSY. & BLACK LIGHT ASSY. — PARTS LIST**

ORDER BY PART NUMBER ONLY

| ITEM | PART NO. | DESCRIPTION |
|------|-----------------|--|
| 1 | 0639-00113-0000 | HEADER FLUORESCENT BRKT. |
| 1 | 0639-00107-0000 | BLACK LIGHT BRKT. |
| 2 | 0017-00003-0043 | 18" COOL WHITE FLUOR. LIGHT LAMP |
| 2 | 0017-00003-0095 | 18" BLACK LIGHT LAMP |
| 3 | 0017-00003-0445 | LAMP LOCKS (2 REQ'D.) |
| 4 | 0017-00031-0036 | FLUORESCENT SOCKET (2 REQ'D.) |
| 5 | 0017-00003-0412 | FLUORESCENT STARTER HOLDER W/LEADS |
| | 0017-00101-0573 | #6-32 x 1/2 PHIL. RND. HD. M.S. (4 REQ'D.) |
| | 0017-00104-0009 | #6 EXT. WASHER (4 REQ'D.) |
| 6 | 0017-00003-0019 | FLUORESCENT STARTER |
| 7 | 0017-00003-0026 | BALLAST |
| | 0017-00101-0598 | #8-32 x 5/16 SLT. HEX HD. SCR. (4 REQ'D.) |
| 8 | A961-00042-0000 | LINE FILTER ASSY. |

NO. 639 — KOZMIK KROOZ'R — REAR ACCESS

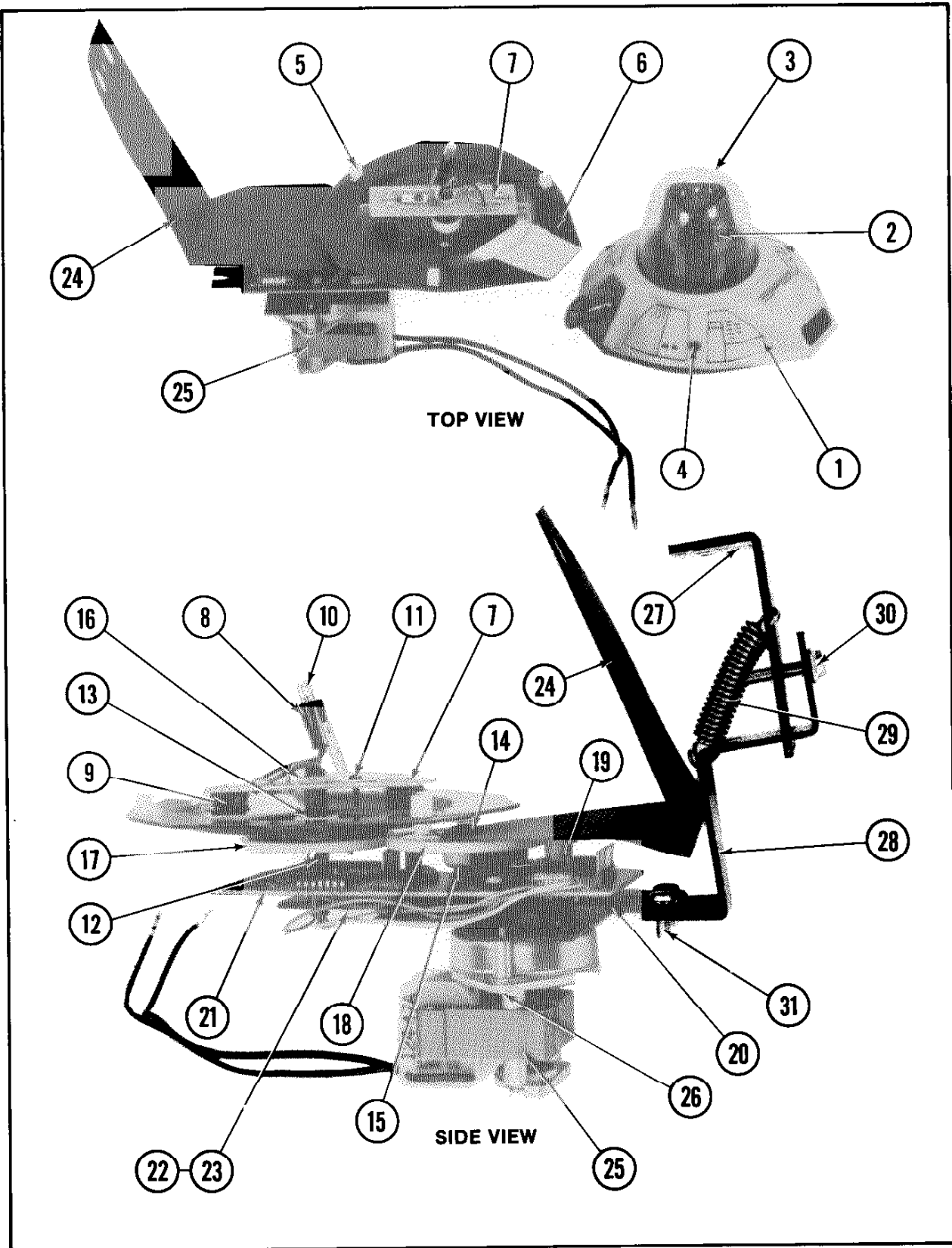


NO. 639 — KOZMIK KROOZ'R — REAR ACCESS — PARTS LIST

ORDER BY PART NUMBER ONLY

| ITEM | PART NO. | DESCRIPTION | |
|------------------------------|-----------------|--|--------------------------|
| 1 | A945-00038-0000 | ON-OFF SWITCH & PLATE ASSY. | |
| 2 | 0894-00913-0000 | RECESSED HAND LIFT (2 REQ'D.) | |
| 3 | 0017-00101-0138 | #8 x 5/8 TORX TAMPER RESISTANT BLK. SCR. (12 REQ'D.) | |
| | 0017-00003-0339 | ELECTROHOME — 19" COLOR DUAL SYNC HORIZ. MTG. MONITOR (OR) | |
| 3 | 0017-00003-0439 | WELLS-GARDNER — 19" COLOR DUAL SYNC HORIZ. MTG. MONITOR (OR) | |
| 3 | 0017-00003-0454 | ZENITH — 19" COLOR DUAL SYNCH HORIZ. MTG. MONITOR | |
| 4 | 0550-00100-0000 | MONITOR RAIL (2 REQ'D.) | |
| | 0555-00901-0000 | PLASTIC LOCATING PIN (4 REQ'D.) | |
| | 0017-00101-0141 | #8 x 11/16 UNSLOT HEX HD. M.S. (8 REQ'D.) | |
| | 0017-00102-0066 | 1/4-20 x 3/4 UNSLOT. HEX HD. BOLT (4 REQ'D.) | |
| | 0017-00104-0014 | 7/8" DISH WASHER (4 REQ'D.) | |
| | 0639-00908-0000 | MONITOR BEZEL | |
| 6 | 0639-00901-0000 | CURVED GLASS MIRROR | |
| | 0639-00112-00XF | MIRROR HOLD DOWN BRKT. (2 REQ'D.) | |
| 7 | 0639-00905-0000 | DEEP SPACE SCENERY | |
| 8 | A639-00045-0000 | SHIP ASSEMBLY — NOT SEEN | |
| | A639-00039-0000 | ADJUSTMENT BRKT. ASSY. | |
| 9 | A639-00037-0000 | SPOT LIGHT ASSY. — NOT SEEN (2 REQ'D.) | |
| 10 | A088-00016-0000 | INTERLOCK SWITCH & SPRING BRKT. ASSY. (2 REQ'D.) | |
| 11 | A084-90509-C000 | SOLID STATE RELAY P.C. BOARD ASSY. | |
| 12 | A082-90910-E000 | DUAL POWER AMP P.C. BRD. ASSY. | |
| 13 | 0017-00042-0014 | 1/8" SNAP BUSHING (4 REQ'D.) | |
| | 0017-00101-0751 | #5-40 x 1/4 PHL. RND. HD. M.S. (4 REQ'D.) | |
| | A082-90412-D000 | POWER SUPPLY P.C. BOARD 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.) | |
| | 0317-00102-0000 | P.C. MTG. BRACE BRKT. (4 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.) | |
| | 14 | A639-00005-0000 | CARD RACK W/BOARDS ASSY. |
| | | A084-90010-A639 | C.P.U. P.C. BOARD ASSY. |
| | A084-91399-A639 | VIDEO/GENERATOR P.C. BOARD ASSY. | |
| | A084-91483-A639 | SOUND I/O P.C. BOARD ASSY. | |
| | A639-00060-0000 | SHIELD & BARRIER ASSY. | |
| | A639-00059-0000 | INNER SHIELD & SPACER ASSY. | |
| | A639-00061-0000 | OUTER SHIELD & SPACER ASSY. | |
| | 0017-00101-0134 | #6-32 x 1/4 PHIL. RND. HD. M.S. (8 REQ'D.) | |
| | 0017-00101-0153 | #6-32 x 1" PHIL. RND. HD. M.S. (4 REQ'D.) | |
| 15 | A945-00020-0000 | POWER CHASSIS ASSY. — 125VA., 115V. | |
| 16 | A961-00007-0000 | CASTER ASSY. (2 REQ'D.) | |
| 17 | A945-00019-0000 | LINE CORD ASSY. | |
| ADDITIONAL PARTS LIST | | | |
| | A097-00008-0000 | BACK DOOR LOCK ASSY. (2 REQ'D.) | |
| | 0017-00009-0490 | 5-5/8" SQR. VENT GRILL — BACK DOOR (4 REQ'D.) | |
| | A639-00010-0000 | MASTER CABLE W/BRKT. ASSY. | |
| | A639-00012-0000 | HIGH VOLTAGE CABLE ASSY. | |
| | A941-00008-0000 | LOW VOLTAGE CABLE ASSY. | |
| | A337-00018-0000 | VIDEO SIGNAL CABLE ASSY. | |

NO. 639 — KOZMIK KROOZ'R — SHIP ASSEMBLY

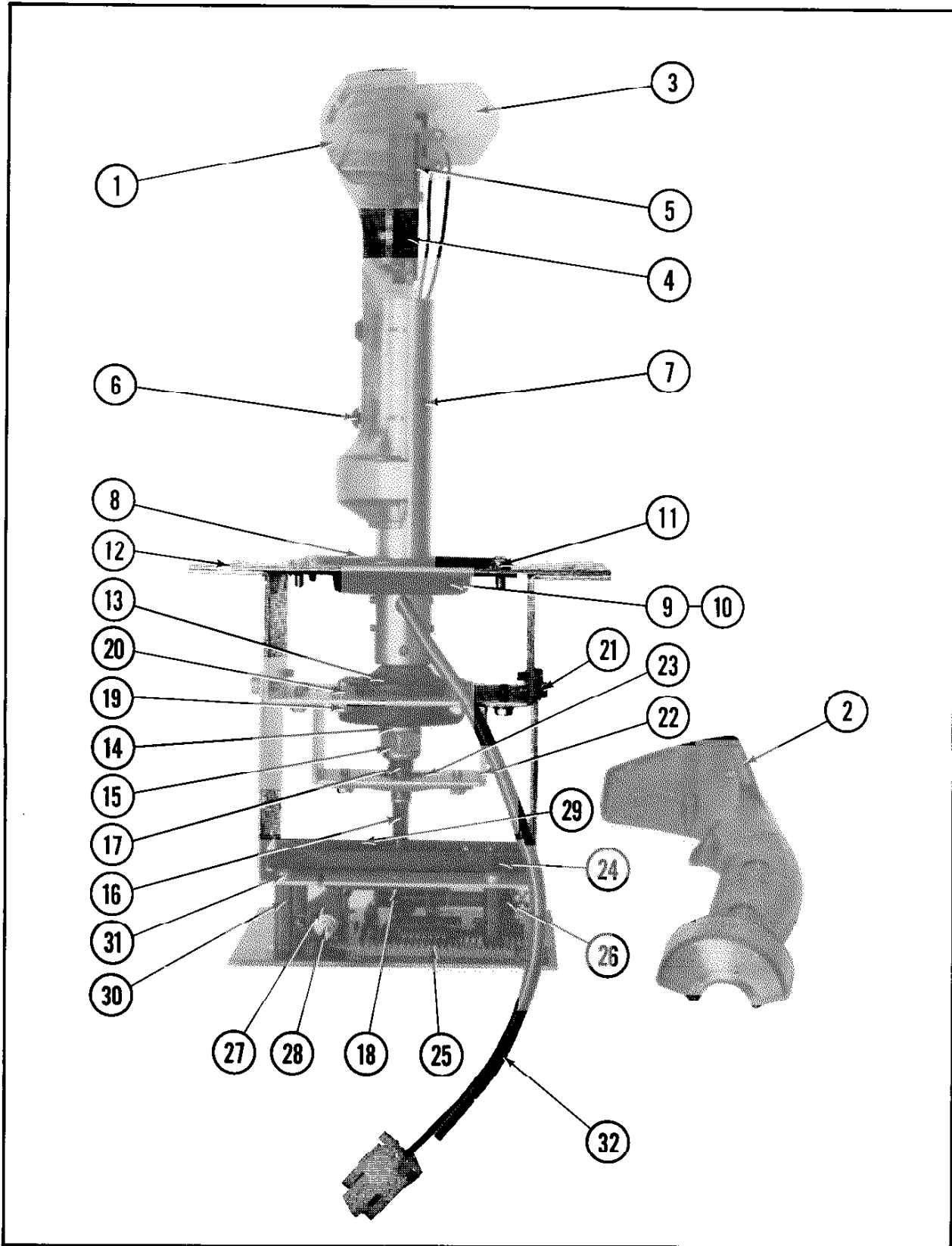


NO. 639 — KOZMIK KROOZ'R — SHIP ASSEMBLY — PARTS LIST

ORDER BY PART NUMBER ONLY

| ITEM | PART NO. | DESCRIPTION |
|-------------|-----------------|--|
| 1 | 0639-00918-0000 | KOZMIK KROOZ'R |
| 2 | 0639-00929-0000 | COCKPIT |
| | 0639-00927-0000 | DECAL (3 REQ'D.) |
| 3 | 0639-00912-0000 | CANOPY |
| | A639-00051-0000 | KOZMIK KROOZ'R BODY ASSY. (FIRST 3 ITEM NO'S.) |
| 4 | 0017-00101-0159 | #4 x 1/2 PHIL. RND. HD. BLACK SCREW (3 REQ'D.) |
| 5 | 0017-00042-0327 | PLASTIC GROMMET (3 REQ'D.) |
| 6 | 0639-00917-0000 | KOZMIK KROOZ'R MTG. BASE |
| 7 | A080-91478-B639 | LAMP P.C. MTG. BOARD |
| 8 | 0017-00031-0051 | WEDGE BASE SOCKET W/LEAD |
| 9 | 0017-00031-0046 | WEDGE BASE SOCKET (2 REQ'D.) |
| 10 | 0017-00003-0463 | WEDGE BASE LAMP — 14V. (3 REQ'D.) |
| 11 | 0017-00101-0001 | #4 x 1/4 PHIL. PAN HD. SCR. (4 REQ'D.) |
| 12 | 0639-00710-00XF | SPINDLE |
| 13 | 0017-00100-0031 | 5/16" E-RING (2 REQ'D.) |
| 14 | 0017-00100-0025 | 1/4" E-RING (2 REQ'D.) |
| 15 | 0017-00104-0094 | PLASTIC FLAT WASHER (3 REQ'D.) |
| 16 | 0017-00103-0069 | 5/16-24 HEX NUT (2 REQ'D.) |
| 17 | 0639-00914-0000 | GEAR |
| 18 | A639-00047-0000 | GEAR & FLAG ASSY. |
| 19 | A639-00038-0000 | ADAPTOR ASSY. |
| 20 | A639-00040-0000 | MTG. BRKT. ASSY. |
| 21 | A084-91434-D639 | SENSOR P.C. BRD. ASSY. |
| 22 | 0017-00042-0326 | PLASTIC GROMMET (2 REQ'D.) |
| 23 | 0017-00101-0014 | #6 x 1/2 SLT. HEX HD. SCR. (2 REQ'D.) |
| 24 | 0639-00923-0000 | P.C. BRD. SHIELD |
| 25 | A639-00056-0000 | MOTOR & CONNECTOR ASSY. |
| 26 | 0017-00101-0528 | #5-40 x 3/4 PHIL. RND. HD. M.S. (2 REQ'D.) |
| 27 | 0639-00118-00XF | MTG. BRKT. |
| 28 | 0639-00121-00XF | ADJUSTER |
| 29 | 0010-00603-0000 | EXTENSION SPRING (2 REQ'D.) |
| 30 | 0017-00101-0665 | #10-32 x 7/8 UNSLOT. HEX HD. WHZ. BOLT. |
| 31 | 0017-00101-0656 | #10-32 x 1/2 SLT. PAN HD. SCREW (2 REQ'D.) |
| | A639-00039-0000 | ADJUSTMENT BRKT. ASSY. (ITEMS 27 THRU 31) |

NO. 639 — KOZMIK KROOZ'R — ANALOG CONTROL ASSY.

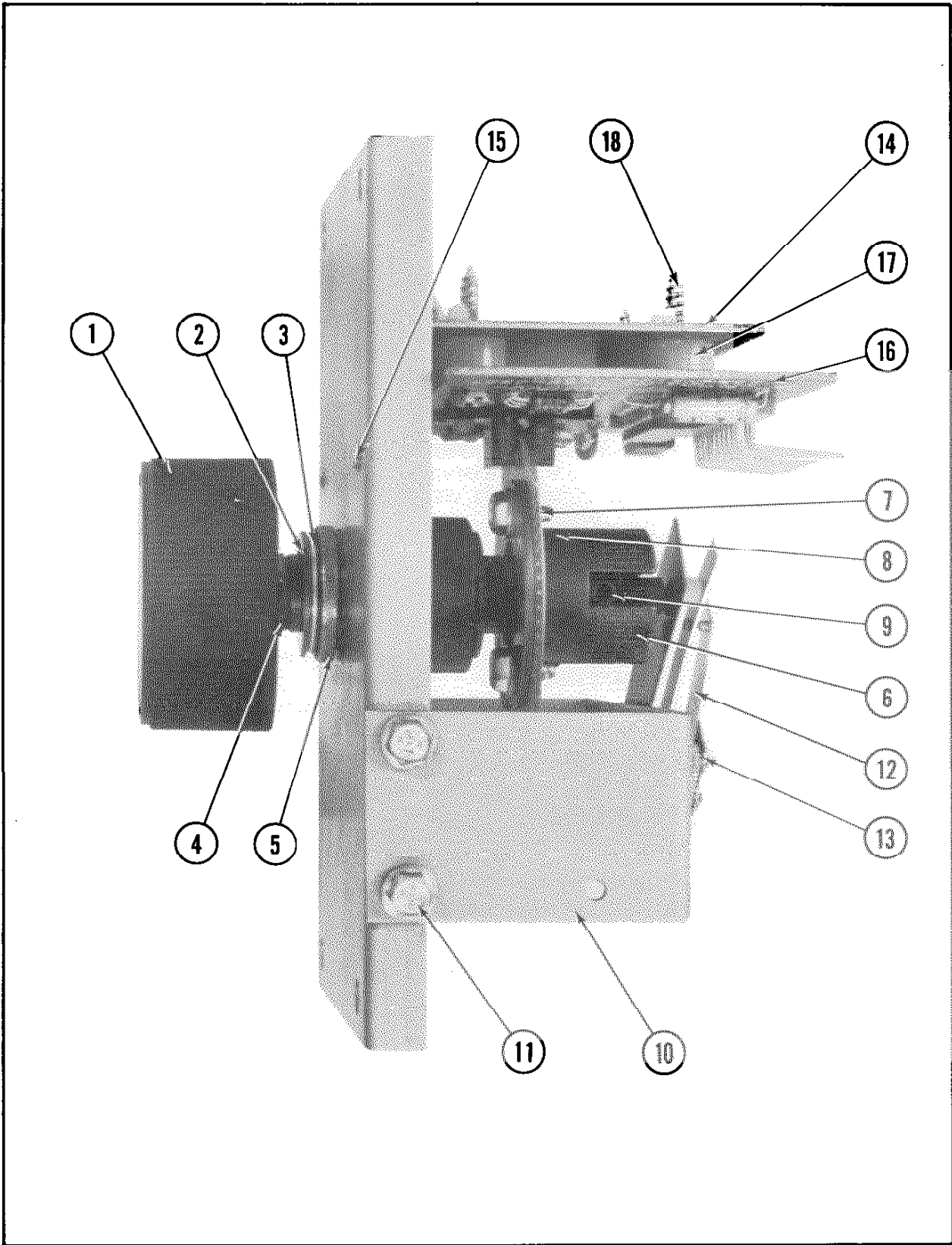


NO. 639 — KOZMIK KROOZ'R — ANALOG CONTROL ASSY. — PARTS LIST

ORDER BY PART NUMBER ONLY

| ITEM | PART NO. | DESCRIPTION |
|------|-----------------|--|
| 1 | 0873-00900-0400 | CONTROL GRIP — LEFT |
| 2 | 0873-00900-0300 | CONTROL GRIP — RIGHT |
| 3 | 0639-00926-0000 | LENS |
| 4 | 0628-00906-0000 | TRIGGER |
| 5 | A628-00028-0000 | LEAF SWITCH ASSY. |
| | 0020-00202-0000 | SWITCH PLATE |
| | 0017-00101-0528 | #5-40 x 3/4 PHIL. RND. HD. M.S. (2 REQ'D.) |
| | 0873-00123-00XF | SWITCH MTG. BRKT. |
| | 0017-00101-0083 | #4-20 x 3/8 PHIL. PAN HD. SCR. (2 REQ'D.) |
| 6 | 0017-00101-0149 | #10-32 x 3/8 TORX TAMPER RESISTANT BUTTON HD. SCREW (5 REQ'D.) |
| 7 | A639-00025-0000 | TUBING & PIVOT PIN — PINNING ASSY. |
| | 0628-00921-0000 | SLEEVE — NOT SEEN |
| 8 | 0628-00904-0000 | SLIDE |
| 9 | 0873-00113-00XF | BUMPER MTG. BRKT. |
| 10 | 0639-00903-0000 | BUMPER — 8 POSITION |
| 11 | 0017-00101-0615 | #8-32 x 3/8 SLT. PAN HD. M.S. (4 REQ'D.) |
| 12 | A639-00020-0000 | CENTERING BRKT. WELD ASSY. |
| 13 | 0628-00905-0000 | GROMMET |
| 14 | 0017-00104-0034 | FLAT WASHER |
| 15 | 0017-00103-0082 | 7/16-14 NYLON INSERT LOCKING NUT |
| 16 | 0639-00700-00XF | ACTUATING PIN |
| 17 | 0873-00706-00XF | PIVOT BUSHING |
| 18 | 0017-00100-0015 | 5/32 E-RING |
| 19 | 0017-00101-0799 | #10-32 x 3/8 SLT. HEX HD. SCREW (4 REQ'D.) |
| 20 | 0017-00103-0081 | #10-32 HEX NUT W/SEMS (4 REQ'D.) |
| 21 | 0017-00101-0598 | #8-32 x 5/16 SLT. HEX HD. SCR. (10 REQ'D.) |
| 22 | 0639-00108-0000 | WEAR PLATE BRKT. |
| 23 | 0639-00906-0000 | WEAR PLATE |
| 24 | A639-00013-0000 | SLIDE & MTG. BRKT. RIVET ASSY. |
| 25 | A084-91458-E000 | ANALOG JOYSTICK P.C. BRD. ASSY. |
| 26 | A639-00014-0000 | ACTUATING BRKT. ASSY. — UPPER |
| 27 | A639-00015-0000 | ACTUATING BRKT. ASSY. |
| 28 | 0069-264XX-XBYX | CORE (2 REQ'D.) |
| | 0017-00103-0002 | #4-40 HEX NUT (2 REQ'D.) |
| 29 | 0010-00268-0000 | EXTENSION SPRING (2 REQ'D.) |
| 30 | 0639-00701-00XF | P.C. MTG. POST (1 REQ'D.) |
| 31 | 0017-00101-0755 | #6-32 x 5 SLT. PAN HD. M.S. (8 REQ'D.) |
| 32 | A089-00020-0000 | CONTROL GRIP CABLE ASSY. — 16" LG. |
| | 0010-00266-0100 | SPRING EXTENSION STRAIN RELIEF |
| | 0017-00021-0299 | 2 PIN CONNECTOR |

NO. 639 — KOZMIK KROOZ'R — KNOB & SHAFT — ENCODER DISC ASSY.

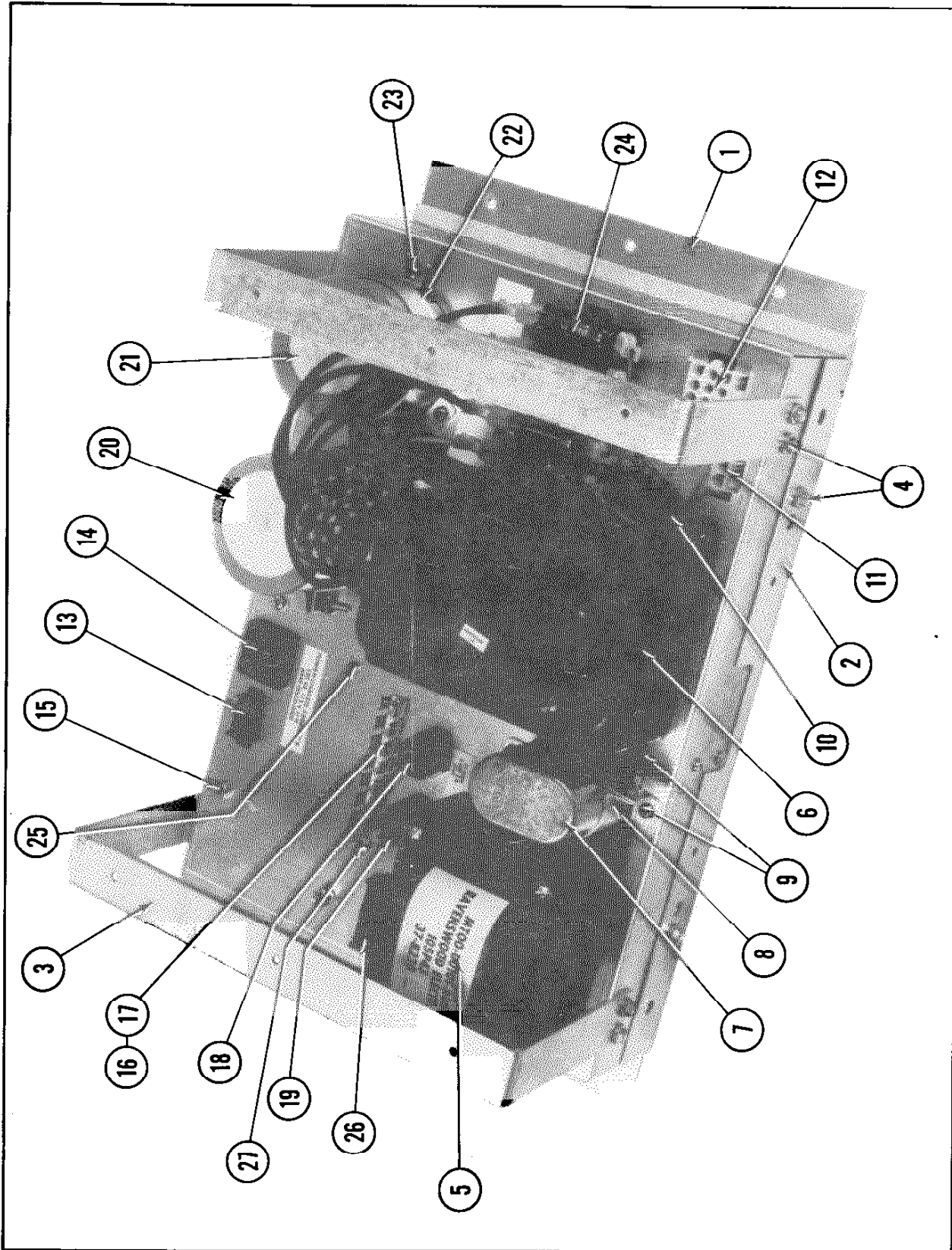


NO. 639 — KOZMIK KROOZ'R — KNOB & SHAFT — ENCODER DISC ASSY. — PARTS LIST

ORDER BY PART NUMBER ONLY

| ITEM | PART NO. | DESCRIPTION |
|------|-----------------|--|
| 1 | A639-00034-0000 | KNOB & SHAFT ASSY. |
| | 0639-00925-0000 | KNOB INSERT LABEL |
| 2 | 0017-00100-0050 | 1/2" E-RING (2 REQ'D.) |
| 3 | 0017-00104-0045 | FLAT WASHER |
| 4 | 0017-00104-0079 | PLASTIC WASHER |
| 5 | A639-00035-0000 | BEARING TO BUSHING ASSY. |
| 6 | 0639-00704-00XF | MAIN SHAFT |
| 7 | A639-00048-0000 | SENSOR DISC ASSY. |
| 8 | 0017-00101-0791 | #8-32 x 1/4 HEX CUP SET SCREW (2 REQ'D.) |
| 9 | 0639-00705-00XF | STOP STUD |
| | 0639-00911-0000 | ROLLER SLEEVE |
| 10 | 0639-00114-0000 | SWITCH MTG. BRKT |
| 11 | 0017-00101-0124 | #6 x 1/4 UNSLOT. HEX HD. M.S. (4 REQ'D.) |
| 12 | A639-00058-0000 | LEAF SWITCH ASSY. |
| 13 | 0020-00202-0000 | SWITCH PLATE |
| | 0017-00101-0527 | #5-40 x 5/8 PHIL. RND. HD. SCR. (2 REQ'D.) |
| 14 | 0531-00106-0000 | P.C. MTG. BRKT. |
| 15 | 0017-00101-0586 | #8-32 x 3/16 SLT. PAN HD. M.S. (2 REQ'D.) |
| 16 | A084-91482-A000 | OPTICAL ENCODER P.C. BRD. ASSY. |
| 17 | 0017-00042-0072 | PLASTIC GROMMET (4 REQ'D.) |
| 18 | 0017-00101-0018 | #6 x 3/4 SLT. HEX HD. WD. SCR. (4 REQ'D.) |

KOZMIK KROOZ'R — POWER CHASSIS ASSY. — 125VA., 115V.

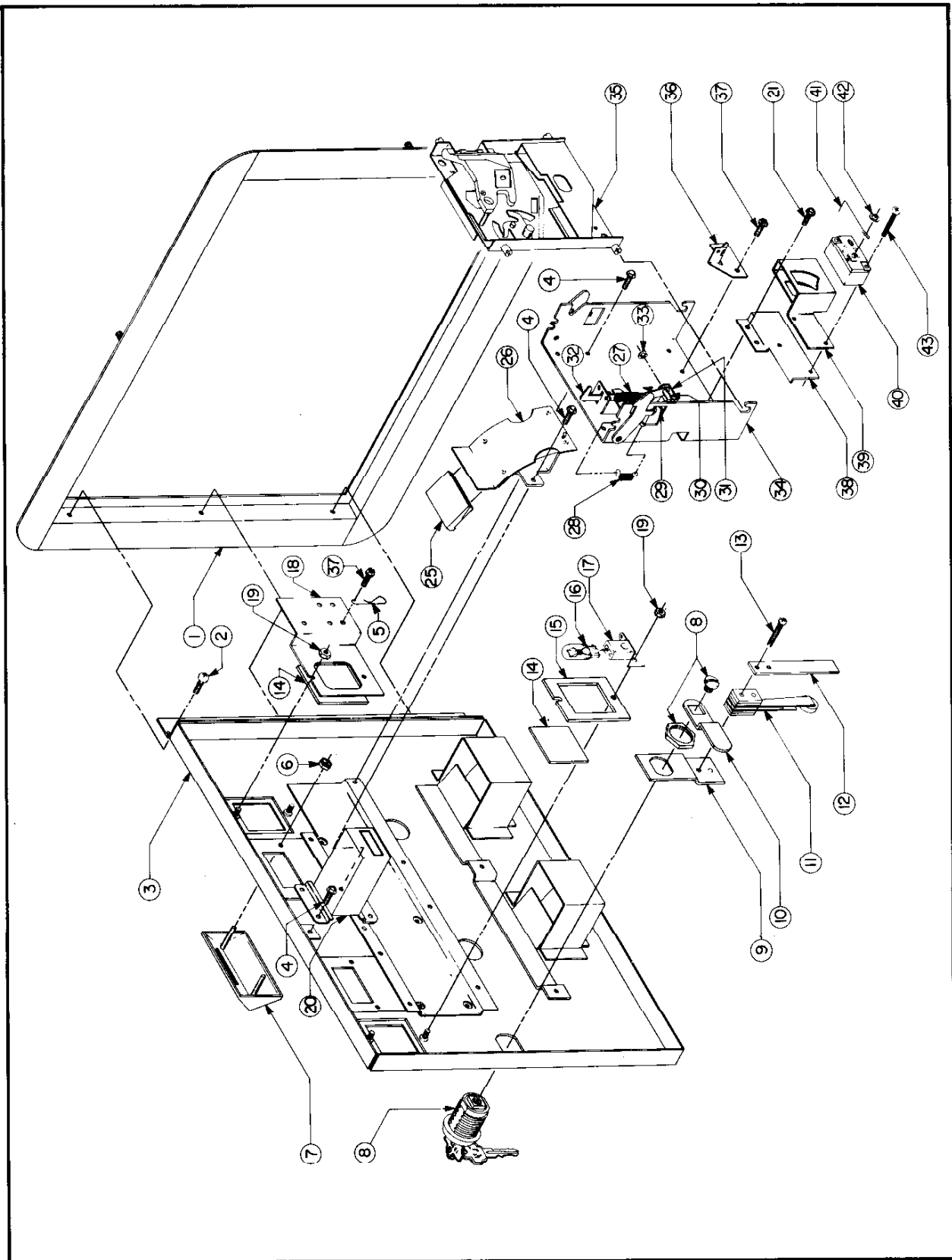


KOZMIK KROOZ'R — POWER CHASSIS ASSY. — 125 VA., 115V. — PARTS LIST

ORDER BY PART NUMBER ONLY

| ITEM | PART NO. | DESCRIPTION |
|------|-----------------|---|
| 1 | 0945-00104-00XF | CHASSIS |
| 2 | A945-00029-0000 | MTG. PLATE & BARRIER ASSY. |
| 3 | 0945-00107-01XF | STRAP (2 REQ'D.) |
| 4 | 0017-00101-0123 | #8 x 1/4 UNSLOT. HEX HD. SCR. (12 REQ'D.) |
| 5 | MT00-00101-A000 | ISOLATION TRANSFORMER W/O SHIELD ASSY. — 115V., 50/60 HZ. |
| | 0017-00103-0061 | #8-32 HEX NUT W/SEMS (4 REQ'D.) |
| 6 | MT00-00099-A000 | POWER TRANSFORMER ASSY. — 115V., 60 HZ. |
| | 0017-00103-0084 | #6-32 HEX NUT W/SEMS (4 REQ'D.) |
| 7 | 0175-181T4-GXJK | CAPACITOR — 3.5 M.F., 440V. |
| 8 | 0017-00009-0535 | CLAMP |
| | 0017-00101-0565 | #6-32 x 7/16 SLT. PAN HD. SCR. |
| | 0017-00103-0084 | #6-32 HEX NUT W/SEMS |
| 9 | 0017-00101-0067 | #6 x 3/8 PHIL. PAN HD. SCR. (11 REQ'D.) |
| | 0945-00103-00XF | PARTITION — LOCATED UNDER CHASSIS (NOT SEEN) |
| 10 | 0945-00902-0000 | SNAP BUSHING (3 REQ'D.) |
| 11 | 0017-00021-0297 | 2 POSITION CONNECTOR |
| 12 | A945-00030-0100 | CONNECTOR & CABLE ASSY. #1 |
| 13 | A945-00030-0200 | CONNECTOR & CABLE ASSY. #2 |
| 14 | A945-00021-0000 | CONVENIENCE OUTLET ASSY. |
| 15 | 0017-00101-0573 | #6-32 x 1/2 PHIL. RND. HD. SCR. (2 REQ'D.) |
| | 0017-00103-0084 | #6-32 HEX NUT W/SEMS (2 REQ'D.) |
| | A945-00025-0000 | FILTER ASSEMBLY — 125V. — UNDER CHASSIS (NOT SEEN) |
| 16 | 0017-00021-0510 | TERMINAL STRIP |
| 17 | 0017-00101-0140 | #4-40 x 5/16 PHIL. PAN HD. SCR. (2 REQ'D.) |
| 18 | 0017-00003-0263 | SLO-BLO FUSE — 4A., 250V. |
| 19 | 0017-00003-0005 | FUSE — 2A., 250V. |
| | 0017-00003-0444 | QUICK CONN. FUSEHOLDER (2 REQ'D.) — FOR ABOVE FUSES |
| 20 | 0945-00816-1902 | CAPACITOR — 100,000 M.F. |
| 21 | 0945-00816-1901 | CAPACITOR — 55,000 M.F. |
| | 0017-00104-0107 | #10 FLAT WASHER (4 REQ'D.) |
| | 0017-00103-0081 | #10-32 HEX NUT W/SEMS (4 REQ'D.) |
| 22 | 0017-00009-0422 | CLAMP (2 REQ'D.) |
| | 0017-00101-0758 | #8-32 x 3/4 PHIL. RND. HD. SCREW (2 REQ'D.) |
| | 0017-00103-0061 | #8-32 HEX NUT W/SEMS (2 REQ'D.) |
| 23 | 0017-00101-0067 | #6 x 3/8 PHIL. PAN HD. SCR. (6 REQ'D.) |
| 24 | 0945-00904-0000 | 5 POSITION FUSE HOLDER |
| | 0017-00003-0263 | SLO-BLO FUSE — 4A., 250V. |
| | 0017-00003-0217 | SLO-BLO FUSE — 2.5A., 250V. (2 REQ'D.) |
| | 0017-00003-0007 | SLO-BLO FUSE — 3A., 250V. (2 REQ'D.) |
| | 0945-00903-0000 | FUSE HOLDER BARRIER |
| | A945-00022-0000 | HEATSINK & DIODE ASSY. |
| | 0017-00101-0067 | #6 x 3/8 PHIL. PAN HD. SCR. (2 REQ'D.) |
| 25 | 0017-00101-0780 | #6 x 1/2 PHIL. PAN HD. SCREW (2 REQ'D.) |
| | 0017 00021-0629 | 5 POSITION TERMINAL STRIP — (UNDER CHASSIS) |
| | A945-00019-0000 | LINE CORD ASSY. — 115V. (NOT SHOWN) |
| 26 | A945-00030-0500 | CONNECTOR & CABLE ASSY. |
| 27 | 0017-00101-0660 | #10-32 x 3/4 PAN HD. SCREW |
| | 0017-00104-0107 | #10 FLAT WASHER |
| | 0017-00103-0081 | #10-32 HEX NUT W/SEMS |

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 | 0090-00002-04BK | DOUBLE ENTRY COIN DOOR FRAME |
| 2 | 0017-00101-0121 | #6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.) |
| 3 | A090-00073-02BK | DOUBLE ENTRY COIN DOOR W/DRESS PLATE |
| 4 | 0017-00101-0123 | #8 x 1/4 UNSLOT. HEX HD. SCREW (12 REQ'D.) |
| 5 | 0017-00007-0019 | KEY HOOK |
| 6 | 0017-00103-0059 | PUSH NUT (4 REQ'D.) |
| 7 | 0090-00912-0000 | COIN ENTRY PLATE — 25¢ (2 REQ'D.) |
| 8 | A097-00005-0000 | DOOR LOCK & KEY W/SCREW & NUT (OR) |
| 8 | A097-00006-0000 | DOOR LOCK & KEY W/SCREW & NUT |
| 9 | 0090-00128-00XF | DOOR TILT SWITCH BRKT. |
| 10 | 0017-00005-0225 | DOOR CAM |
| 11 | A090-00095-0000 | DOOR TILT SWITCH |
| 12 | 0090-00126-03XF | SWITCH BACK-UP PLATE |
| 13 | 0017-00101-0525 | #5-40 x 9/16" PHIL. HD. M.S. (2 REQ'D.) |
| | A090-00096-0000 | DOOR TILT SWITCH & BRKT. ASSY. (ITEMS 9 & 11 THRU 13) |
| 14 | 0090-00903-9500 | 25¢ WINDOW (2 REQ'D.) |
| 15 | 0090-00143-00XF | COIN PLEX RETAINER |
| 16 | 0017-00003-0219 | 12 VOLT LAMP — G.E. #194 (2 REQ'D.) |
| 17 | 0017-00031-0048 | WEDGE SOCKET W/BRKT. (2 REQ'D.) |
| 18 | A090-00100-0000 | BRKT. ASSY. |
| 19 | 0017-00103-0084 | #6-32 HEX NUT W/SEMS (4 REQ'D.) |
| 20 | A090-00089-0000 | COIN METER W/DIODE |
| 21 | 0017-00101-0124 | #6 x 1/4 UNSLOT. HEX HD. SCR. (4 REQ'D.) |
| 25 | 0090-00911-0000 | INSULATOR (2 REQ'D.) |
| 26 | A090-00112-0000 | COIN CHUTE & 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 | 0090-00182-00XF | REJECT LEVER |
| 33 | 0017-00100-0018 | E-RING |
| | A090-00088-0000 | REJECT LEVER ASSY. (2 REQ'D.) (ITEMS 30 THRU 33) |
| 34 | A090-00105-0000 | COIN ACCEPTOR FRAME ASSY. (2 REQ'D.) |
| 35 | 0017-00005-0003 | COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.) (OR) |
| 35 | 0017-00005-0211 | COIN ACCEPTOR W/ANTI STRING DEVICE (2 REQ'D.) (OR) |
| 35 | 0017-00005-0214 | COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.) |
| 36 | A090-00064-0000 | ANTI-PENNY DEVICE |
| 37 | 0017-00101-0099 | #6 x 1/4 SLT. HEX HD. M.S. (2 REQ'D.) |
| 38 | 0090-00162-00XF | COIN SWITCH MTG. BRKT. |
| 39 | 0017-00005-0203 | COIN SWITCH CHUTE |
| 40 | 0017-00005-0195 | COIN SWITCH |
| 41 | 0010-00599-0000 | COIN SWITCH WIRE |
| 42 | 0017-00007-0015 | PUSH-ON RING |
| | A090-00059-0400 | COIN SWITCH & WIRE ASSY. (ITEMS 40 THRU 42) |
| 43 | 0017-00101-0147 | #4-40 x 3/4 PHIL. PAN. HD. M.S. (2 REQ'D.) |
| | A090-00077-0000 | COIN GUIDE & SWITCH ASSY. (ITEMS 38 THRU 43) |

V Technical Troubleshooting

Introduction

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

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

General Suggestions

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

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

Harness Component Troubleshooting

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

NO GAME CREDIT

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

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

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

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

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

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

Transformer and Line Voltage Problems

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

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

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

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

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

HARNESS PROBLEMS

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

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

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

MALFUNCTIONING CONTROLS

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

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

A Glossary of Microprocessor Terms

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

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

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

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

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

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

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

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

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

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:

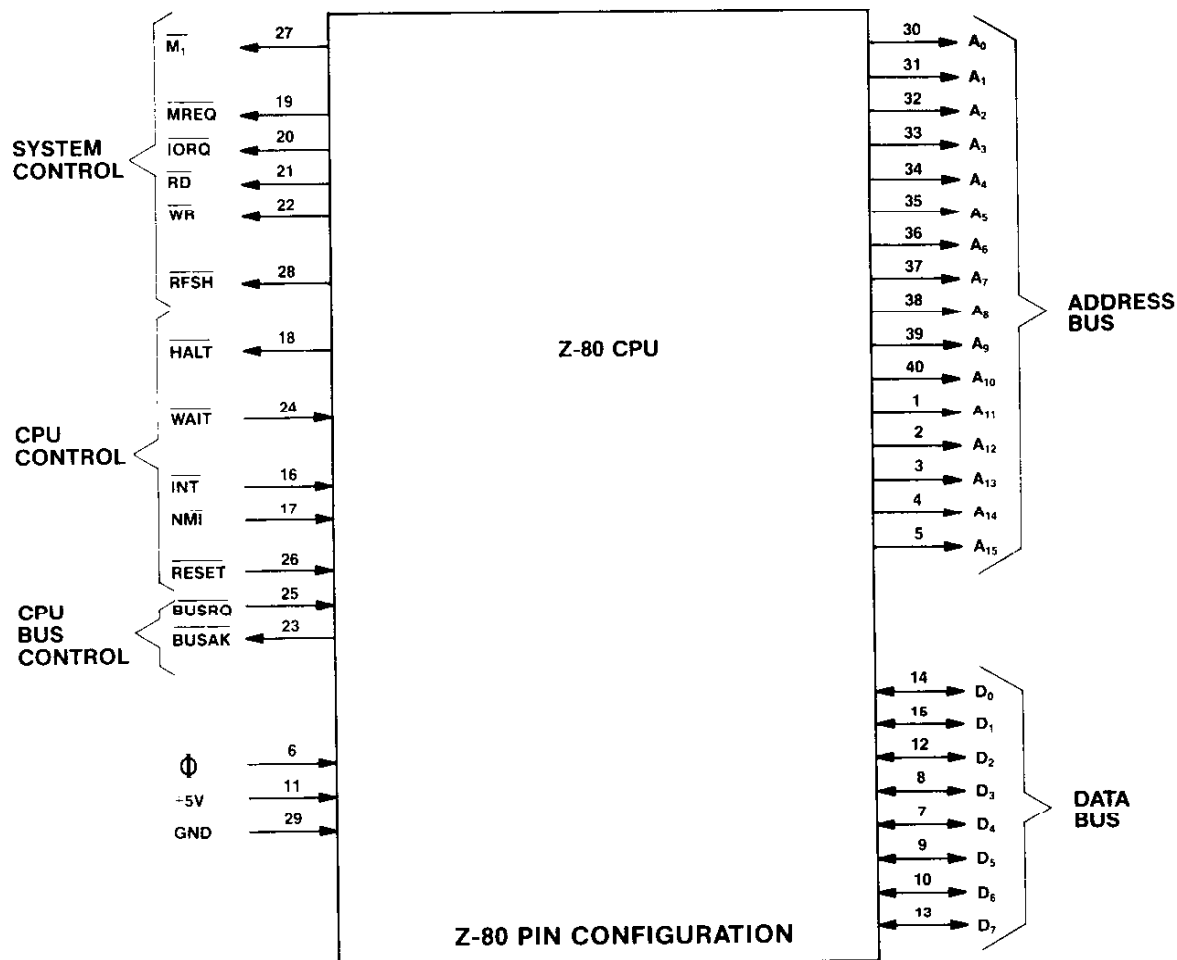
| | |
|-----------------------------|--|
| Add | Left or right shifts or rotates (arithmetic and logical) |
| Subtract | Increment |
| Logical AND | Decrement |
| Logical OR | Set bit |
| Logical Exclusive OR | Reset bit |
| Compare | Test bit |

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

CLK

(Clock)

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

**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 | # | * | * | # | * | # | # | * |
| SUPER C.P.U. P.C. BOARD | | | | | | | | | |
| JUMPER OPTIONS FOR PROGRAM ROMS ONLY | | | | | | | | | |
| MANUFACTURER | EPROM NO. | JW#2 | JW#4 | JW#5 | JW#6 | JW#7 | JW#18 | JW#19 | |
| MOTOROLA | 68764 | # | # | * | # | * | * | # | |
| | 68766 | # | # | * | # | * | * | # | |
| T. I. | 2564 | # | # | * | # | * | * | # | |
| INTFI | 2764 | * | * | # | * | # | # | * | |
| JUMPER OPTIONS FOR BACKGROUND ROMS ONLY | | | | | | | | | |
| MANUFACTURER | EPROM NO. | JW#10 | JW#11 | JW#12 | JW#13 | JW#14 | JW#15 | JW#16 | JW#17 |
| MOTOROLA | 68764 | * | # | * | # | * | # | # | * |
| | 68766 | * | # | * | # | * | # | # | * |
| T. I. | 2564 | * | # | * | # | * | # | # | * |
| INTEL | 2764 | # | * | # | * | # | * | * | # |
| 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.
= LEAVE JUMPER WIRES IN 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 SUPER C.P.U. P.C. Board used in the MCR II System has 19 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 wire's number. If there is **NO ""*""** under a jumper wire's number, **THAT PARTICULAR JUMPER WIRE IS NOT TO BE CUT.**

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 Manual

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 a 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 "SYMPTOM — 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 Bally 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.
- C. Vertical linearity or damper control needs adjustment.

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 (neck Board).
- D. Color circuits.
- E. Video input jack.
- F. Defective picture tube

6. Picture not bright enough:

- A. Weak emission from picture tube.

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).
- B. Bad component in monitor's power supply.

10. Small picture and/or poor focus:

- A. Low B+ voltage (power supply trouble).

11. Vertical rolling:

- A. Vertical oscillator in the IC, vertical sync. transistor, or circuit.
- B. No sync from logic board.
- C. Three pin sync. jack is loose or plugged in wrong.

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.

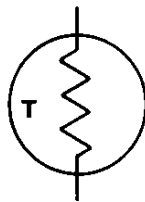
- C. Defective high voltage disabling circuit.

- D. Crack(s) somewhere on main chassis board.

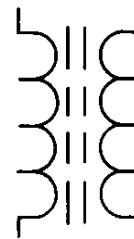
24. Can't adjust purity or convergence:

- A. Use a degausser to demagnetize the picture tube carefully following your degausser's instructions.
- B. Picture tube defective.
- C. Nearby equipment is electromagnetically interfering.
- D. The poles of the earth are pulling off the purity — see "A" above.
- E. Poor focus or width of picture.
- F. Make sure you have the correct CRT number for that brand of monitor.

Guide To Schematic Symbols



THERMISTOR
(POLARITY DOESN'T MATTER)



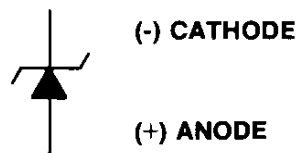
IRON CORE TRANSFORMER
(SUCH AS A FLYBACK)



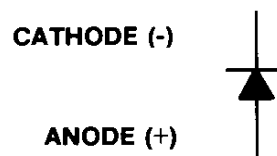
INDUCTOR, COIL, CHOKe
(POLARITY DOESN'T MATTER)



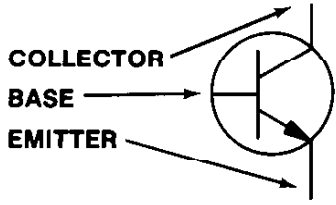
FUSE
(POLARITY DOESN'T MATTER)



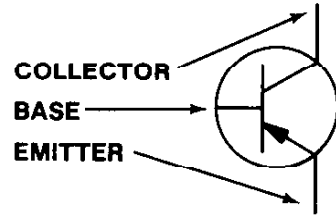
ZENER DIODE



DIODE



NPN TRANSISTOR



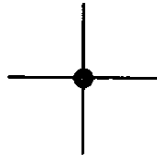
PNP TRANSISTOR



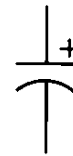
VARIABLE RESISTOR, POT, CONTROL
(POLARITY DOESN'T MATTER)



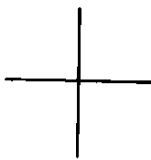
RESISTOR
(POLARITY DOESN'T MATTER)



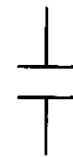
LINES ARE CONNECTED



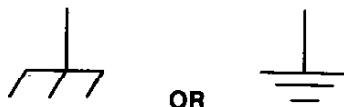
ELECTROLYTIC CAPACITOR



LINES ARE NOT CONNECTED



CAPACITOR
(POLARITY DOESN'T MATTER)



GROUND

Troubleshooting

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

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

Always remember that a monitor can bite like a snake. Even when it is turned off, capacitors hold voltage and will discharge it to you should you be touching chassis ground. The picture tube or CRT, itself, is a giant capacitor, so avoid the flyback anode plug hole. With the monitor on, the power supply circuit and/or the flyback, which puts out at least 23,000 volts, **CAN BE KILLERS!!** Avoid handling power transistors (usually output transistors) or ICs, 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.

IMPORTANT! The side brackets of the monitor are chassis ground as is the aquadag, the picture tube's dark conductive coating. **BUT**, on the ZENITH MONITOR there are metallic mounting parts which **ARE NOT** chassis ground. Discharging the CRT to these will damage the monitor!

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" (K4806) or 19" (K4906, K4956) color monitor uses an integrated circuit for its sync section. An Electrohome 13" or 19" color monitor uses an integrated circuit IC501 for its sync section. The Zenith monitor (CD19MXRF06) also uses an IC for the sync processing. Wells Gardner uses HA11423, Electrohome uses HA11244, and Zenith uses 221-175 (their part number). **These ARE NOT interchangeable!** The idea is all the same. The output to the vertical amplifying transistors for all monitors must form a sawtooth wave form, sort of like a bunch of pyramids, racing through the yoke's vertical coils at 60 times a second.

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

anything from the vertical output section on back to the oscillator.

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

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

THE FLYBACK TRANSFORMER (OR HIGH VOLTAGE UNIT) —

The picture tube needs high voltage to light up, and the power supply can't meet this demand. The flyback transformer receives current alternating at about 15,750 times per second from the horizontal output transistor. The "flyback" jacks up its input voltage and puts out a higher voltage alternating at the same speed. But, in your "flyback" there are diodes that chop up the alternating voltage to make it a smooth DC output just like in the power supply. This is what goes through that thick red wire to your picture tube. **THIS AREA HAS ABOUT 24,000 VOLTS ON IT AND IT CAN KILL YOU!!**

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

COLOR CIRCUITS —

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

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

Wells Gardner and Electrohome monitors. Zenith monitors have all three: red, blue and green.

The Wells Gardner and Electrohome monitor have another variable resistor in their emitter part of their color output transistors. These "cutoff controls" vary the amount of A.C. signal that the transistor amplifies and sends to the cathodes of the picture tube. The Zenith monitor has its cutoff controls in the interface section to vary the amount of signal going to the output transistors. The more signal, the more color.

If you think this is confusing, here is another little hitch. The Electrohome and Zenith monitors both have the actual A.C. picture information signal going through the emitters of the color output transistors. The Wells Gardner has the A.C. signal going to the base of the transistors. The blanking and beam limiting signals which come from the blanking and beam limiting transistors in the interface section go into the color output transistor base in the Electrohome and Zenith monitors, but enters into the emitter of the Wells Gardner monitor's color output transistor. Should you feel adventurous enough to look at this signal on an oscilloscope, it should look like a square.

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 turns off the horizontal oscillator. Since the horizontal oscillator doesn't work, the horizontal output transistor has nothing to feed the "flyback" which in turn has nothing to feed the picture tube. The monitor will be silent, have no picture, and will appear to be off. **But don't be fooled.** There is still that excessive amount of voltage coming from the power supply. To find out, check at pin two of Wells Gardner's IC501 and emitter of X04 for the Electrohome monitor. Check the 95 volt test point (located near the "flyback") for the Zenith monitor. The Wells Gardner monitor doesn't use this circuit, but an open in the horizontal section could cause the monitor to appear off, yet still have power supply voltage flying around. Here are the voltages you should receive:

Wells Gardner = 130VDC
Electrohome = 120VDC
Zenith = 95VDC

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) —

ATTENTION! For information on picture tube replacement types, go to the last section, "PICTURE TUBE INTERCHANGEABILITY".

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

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

The cathodes are next, and again they emit electrons to turn on the tube phosphors, making it glow. A defective cathode may cause the particular color it handles to be missing.

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 is to find the manufacturer's name or model number printed on the chassis or chassis base. But what if the monitor was in a Texas dust storm or buried in volcanic ash and this information is no longer there? Fear not! Each monitor has its own peculiarities and the following should help to identify them:

The **ELECTROHOME** G07-904 (19") and G07-902 (13") have their horizontal and vertical processing IC hidden under a silver can. A shiny metal top behind the "VERTICAL HEIGHT" and "HORIZONTAL FREQUENCY" control prove this is an Electrohome monitor.

The **WELLS GARDNER** K4906 (19") and K4806 (13") have their horizontal and vertical processing IC out in the open directly behind the "VERTICAL HOLD" control.

The **ZENITH** C019MXRF06 (19") monitor has its horizontal and vertical processing IC way in back by the picture tube. The monitor also has large white cables going from the main board to the neck board.

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

K4906 (2nd TYPE) — This monitor's identifying tags have **RED** ink printed on a white background. There **IS** a Vertical Damping Control next to the Vertical Hold Control. The Damping Control provides a few more lines on the top of the monitor screen (monitor viewed as a normal T.V. would be) for any video game that may need these lines to fit the picture on the screen. Moving the Control may distort the top part of your picture (or the side, depending on the game and how the monitor is mounted) so go ahead and move it if you are having this type of problem. To accommodate this new feature, there are a few circuit changes.

ONE MAJOR DIFFERENCE BETWEEN THESE TWO VERSIONS OF THE K4906 IS THE YOKE. They look the same but notice the part numbers:

K4906 **WITHOUT** the Damper Control: 2021111201

K4906 **WITH** the Damper Control: 2021111258

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

Picture distortion.

Excessive brightness.

Too much or too little vertical picture size.

CONTROLS YOU MAY NOT TOUCH

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

On the Wells Gardner monitor, brightness is adjusted by the "BLACK LEVEL" Control which is right next to the Horizontal Frequency Control. Under the Focus Control is the "SCREEN" Control which you **DO NOT** touch. Yes, this control does adjust the brightness,

but it is used to set the CRT bias and is adjusted at the factory. When Wells Gardner sets it, they mark the position with a black mark on the knob. If you move it, be sure to realign the mark and **THEN** set the **BLACK LEVEL** Control to the brightness you desire. So, other than the **SCREEN** control, you may adjust any of the controls.

The Zenith monitor has a 95 volt adjustment control. It is green and located behind the jack labeled 3D3. To discourage you from moving it, Zenith has placed a little glue on top of this control.

Parts Interchangeability

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

1. You **CAN** swap any resistor between monitors that has the same resistance, wattage rating, and tolerance.
2. You **CAN** swap any capacitor between monitors that has the same capacitance and voltage rating.
3. You **CAN** swap many of the parts between the 19" and the 13" versions of each manufacturer's monitor. **BUT**, be certain to compare the manufacturers' part numbers to be positive the parts you want to interchange are identical. **BE SURE** you have read the section **DIFFERENCES BETWEEN MONITORS** which was covered earlier.
4. You **MAY BE ABLE** to swap picture tubes between monitors. In the past you could swap any picture tube, but due to rampant engineering changes and new monitor models being introduced, you would need a computer to keep track of what could be swapped. For more information on this subject, go to "PICTURE TUBE INTERCHANGEABILITY".
5. You **CANNOT** change any part that is a **safety part**, one that is shaded in gray on the schematic; it **MUST** be **IDENTICAL** to the original. **To do otherwise IS DANGEROUS.** For instance, the 13 inch Electrohome (G07-902) monitor "flyback" looks identical to the 19 inch Electrohome (G07-904) monitor "flyback". In fact, there is even a 19 inch Electrohome (G07-905) monitor (which is an obsolete model) with a similar looking "flyback". **NONE OF THESE ARE INTERCHANGEABLE!!**
6. You **CAN** change any of the parts between the G07-904 and G07-907. They're essentially the same monitor except that the G07-907 has a vertically mounted picture tube.

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

Picture Tube Interchangeability

13" MONITORS

There are currently two 13" monitors being used: the Wells Gardner K4806 and the Electrohome G07-902. The picture tubes used are NOT interchangeable. The pins on the neck of the CRT will not fit in the socket should you use the wrong CRT.

Here is a chart for all the 13" color monitors Bally Midway uses.

| | | | |
|---------------|---------|---|----------|
| ELECTROHOME | G07-902 | — | 370ESB22 |
| WELLS GARDNER | K4806 | — | 370KSB22 |

19" MONITORS

Here it gets a little tricky. All of the picture tubes will fit no matter which is used. But if you use the wrong one, you will have problems with purity and/or dynamic convergence.

Purity trouble means that the color won't be true. If you turn up the color control for one color, instead of seeing that solid color it will show blotches or blobs of other colors on the screen.

Trouble with dynamic convergence means that there will be color fringing around solid lines at the edges of the screen.

The only way to ensure that you avoid these problems is to get the right picture tube or the right substitute.

Here is a list of the 19" monitors and the **CORRECT** CRT numbers.

ALL ELECTROHOME G07-904 —

- 19VMNP22 RCA
- 19VMJP22 RAULAND
- 510UJB22 HITACHI

WELLS GARDNER K4906 —

- 19VLTP22 RCA
- 19VMLP22 ZENITH
- 19VMKP22 PHILLIPS

ZENITH CD19MXRF06 —

- 19VMLP22 ZENITH
- 19VLTP22 RCA
- 19VMKP22 PHILLIPS

The factory recommended CRT type could change in the future for one reason or another, but the listed picture tubes will work. As a matter of fact, you can call another picture tube company to see if they have a replacement number to recommend...but caveat emptor — let the buyer beware.

Notes

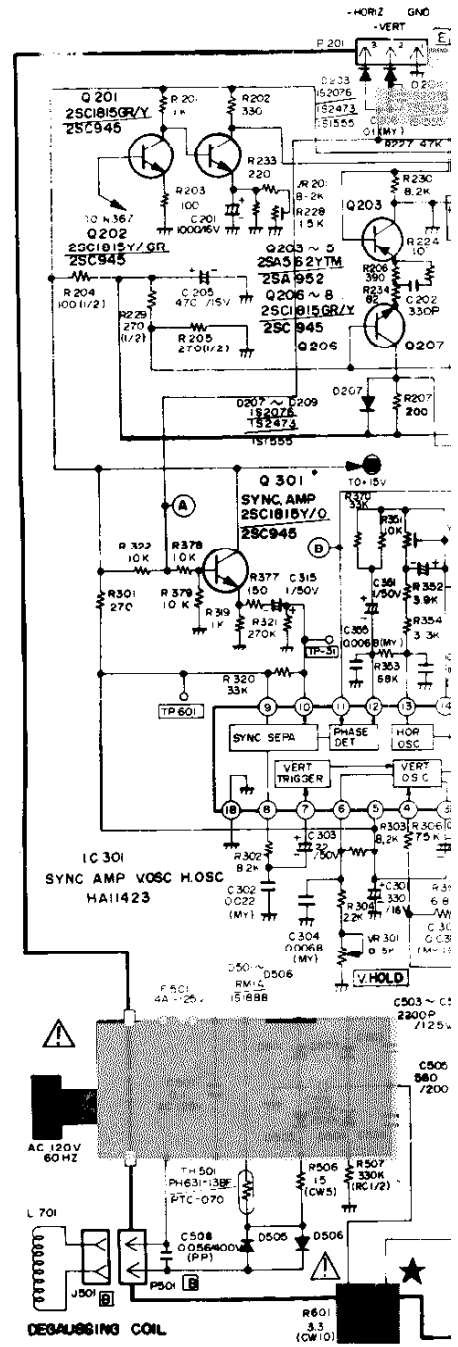
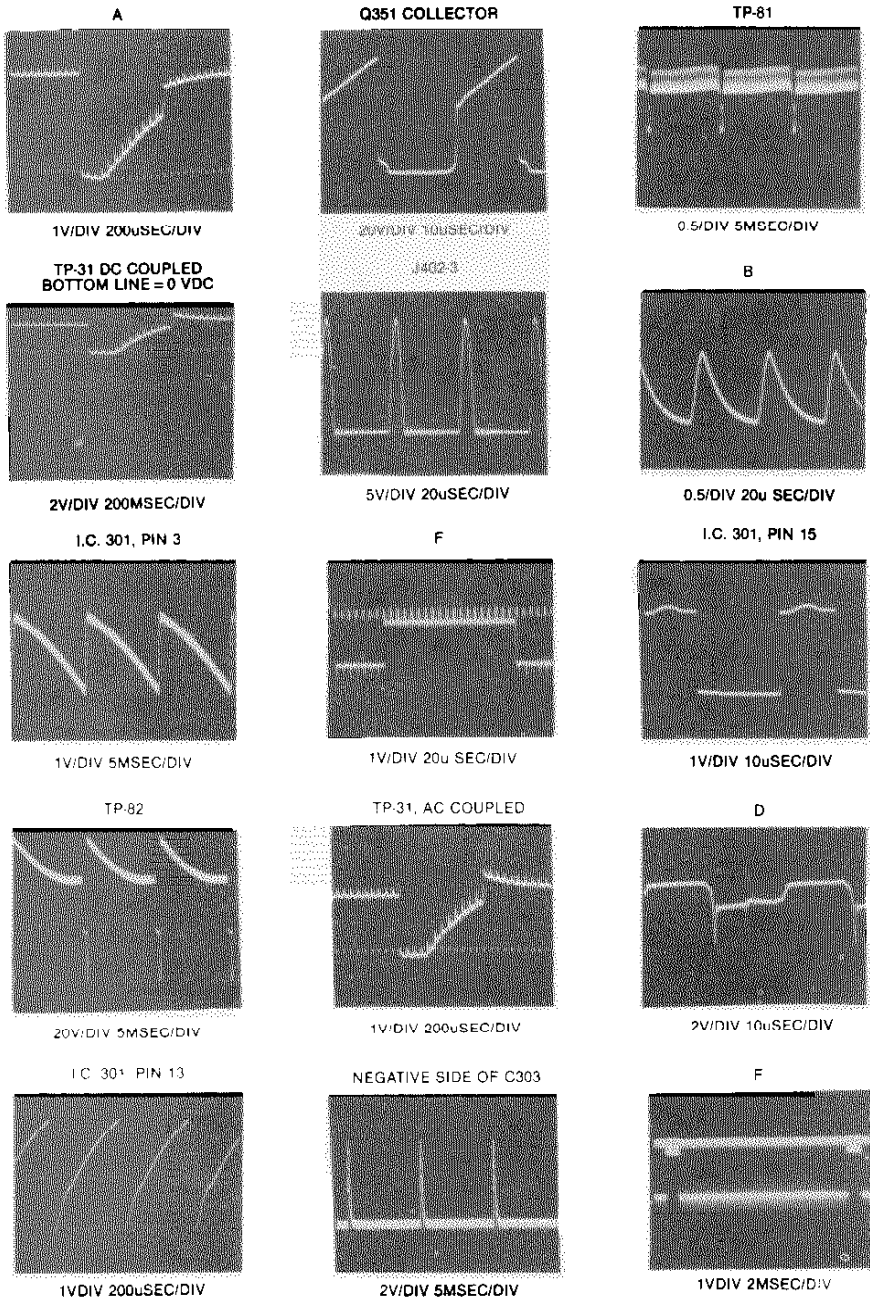
Monitor Schematics

19" COLOR MONITOR SC MODELS 19K4901, 19K490

Power Supply Voltage and Symbols

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

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



IR SCHEMATIC DIAGRAM

19K4906, 19K4951, 19K4956

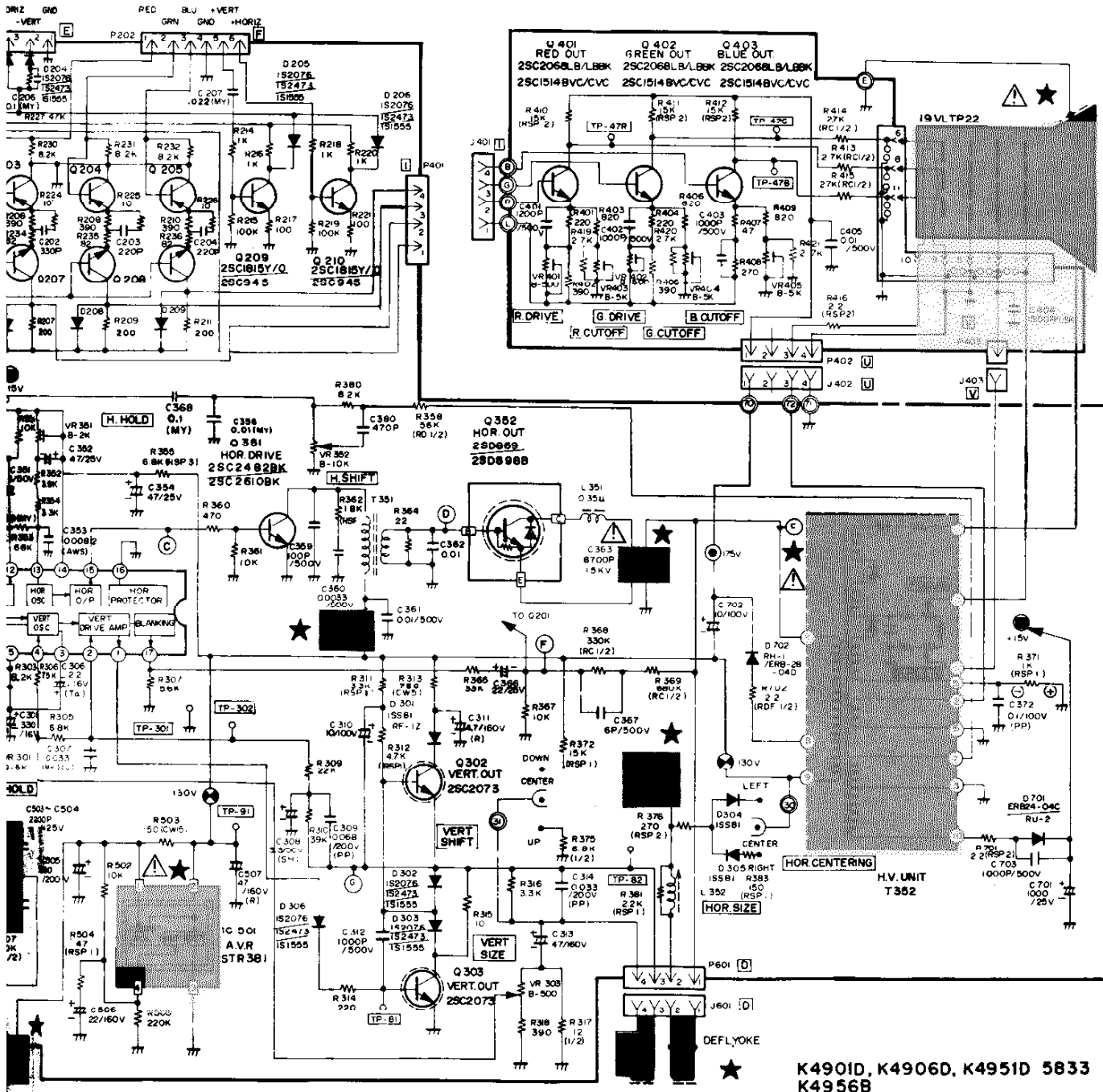


CAUTION: FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.
AVERTISSEMENT: POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

OSCILLOSCOPE WAVEFORM PATTERN

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

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



K4901D, K4906D, K4951D 5833
K4956B

REPLACEMENT PARTS LIST

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

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

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

MAIN BOARD

| Ref. No. | Part No. | Description | Ref. No. | Part No. | Description |
|------------------|--------------|------------------------------|--------------------------|--------------|------------------------------|
| RESISTORS | | | RESISTORS (CONT.) | | |
| R201 | 203X6500-645 | 1K Ohm, 5%, 1/4W Carbon | R369 | 203X5602-329 | 680K Ohm, 5%, 1/2W Comp. |
| R202 | 203X6500-523 | 30 Ohm, 5%, 1/4W Carbon | R370 | 203X6501-002 | 33K Ohm, 5%, 1/4W Carbon |
| R203 | 203X6500-405 | 100 Ohm, 5%, 1/4W Carbon | R371 | 203X9014-584 | 1K Ohm, 5%, 1W Metal Oxide |
| R204 | 203X6700-327 | 100 Ohm, 5%, 1/2W Carbon | R372 | 203X9101-119 | 12K Ohm, 5%, 1W Metal Oxide |
| R205 | 203X6700-421 | 270 Ohm, 5%, 1/2W Carbon | R375 | 203X6700-763 | 6.8K Ohm, 5%, 1/2W Carbon |
| R206 | 203X6500-540 | 390 Ohm, 5%, 1/4W Carbon | R376 | 203X9104-404 | 270 Ohm, 5%, 2W Metal Oxide |
| R207 | 340X2201-934 | 200 Ohm, 5%, 1/4W Carbon | R377 | 203X6500-447 | 150 Ohm, 5%, 1/4W Carbon |
| R208 | 203X6500-540 | 390 Ohm, 5%, 1/4W Carbon | R378 | 203X6500-886 | 10K Ohm, 5%, 1/4W Carbon |
| R209 | 340X2201-934 | 200 Ohm, 5%, 1/4W Carbon | R379 | 203X6500-886 | 10K Ohm, 5%, 1/4W Carbon |
| R210 | 203X6500-540 | 390 Ohm, 5%, 1/4W Carbon | R380 | 203X6500-865 | 8.2K Ohm, 5%, 1/4W Carbon |
| R211 | 340X2201-934 | 200 Ohm, 5%, 1/4W Carbon | R381 | 203X6500-724 | 2.2K Ohm, 5%, 1W Metal Oxide |
| R214 | 203X6500-645 | 1K Ohm, 5%, 1/4W Carbon | R383 | 203X9014-387 | 150 Ohm, 5%, 1W Metal Oxide |
| R215 | 203X6501-126 | 100K Ohm, 5%, 1/4W Carbon | R502 | 203X6500-886 | 10K Ohm, 5%, 1/4W Carbon |
| R216 | 203X6500-645 | 1K Ohm, 5%, 1/4W Carbon | R503 | 204X1700-535 | 150 Ohm, 5%, 15W Metal Oxide |
| R217 | 203X6500-405 | 100 Ohm, 5%, 1/4W Carbon | R504 | 203X9014-267 | 47 Ohm, 5%, 1W Metal Oxide |
| R218 | 203X6500-645 | 1K Ohm, 5%, 1/4W Carbon | R505 | 203X6501-209 | 2.2K Ohm, 5%, 1/4W Carbon |
| R219 | 203X6501-126 | 100K Ohm, 5%, 1/4W Carbon | R506 | 203X9104-105 | 15 Ohm, 5%, 2W Metal Oxide |
| R220 | 203X6500-645 | 1K Ohm, 5%, 1/4W Carbon | R507 | 203X5602-185 | 330K Ohm, 5%, 1/2W Comp. |
| R221 | 203X6500-405 | 100 Ohm, 5%, 1/4W Carbon | Δ ★ R601 | 204X1625-058 | 3.3 Ohm, 5%, 10W WW |
| R222 | 203X6500-762 | 3.3 Ohm, 5%, 1/4W Carbon | R701 | 203X9105-141 | 2.2 Ohm, 5%, 2W Metal Oxide |
| R224 | 203X6500-169 | 10 Ohm, 5%, 1/4W Carbon | R702 | 203X6206-441 | 2.2 Ohm, 5%, 1/2W Carbon |
| R225 | 203X6500-169 | 10 Ohm, 5%, 1/4W Carbon | VR201 | 204X2070-072 | 2K Ohm-B Semi-Fixed |
| R226 | 203X6500-169 | 10 Ohm, 5%, 1/4W Carbon | VR301 | 204X2070-084 | 5K Ohm-B Semi-Fixed |
| R227 | 203X6501-044 | 47K Ohm, 5%, 1/4W Carbon | VR303 | 204X2070-055 | 500 Ohm-B Semi-Fixed |
| R228 | 203X6500-645 | 1K Ohm, 5%, 1/4W Carbon | VR351 | 204X2070-072 | 2K Ohm-B Semi-Fixed |
| R229 | 203X6700-421 | 270 Ohm, 5%, 1/2W Carbon | VR352 | 204X2070-072 | 2K Ohm-B Semi-Fixed |
| R230 | 203X6500-863 | 8.2K Ohm, 5%, 1/2W Comp. | | | |
| R231 | 203X6500-863 | 8.2K Ohm, 5%, 1/2W Comp. | | | |
| R232 | 203X6500-863 | 8.2K Ohm, 5%, 1/2W Comp. | | | |
| R233 | 203X6500-468 | 180 Ohm, 5%, 1/4W Carbon | | | |
| R234 | 340X2820-934 | 82 Ohm, 5%, 1/4W Carbon | | | |
| R235 | 340X2820-934 | 82 Ohm, 5%, 1/4W Carbon | | | |
| R236 | 340X2820-934 | 82 Ohm, 5%, 1/4W Carbon | | | |
| R301 | 203X6500-508 | 270 Ohm, 5%, 1/4W Carbon | C201 | 203X0014-088 | 1000 uF, 16V, Electrolytic |
| R302 | 203X6500-863 | 8.2K Ohm, 5%, 1/4W Carbon | C202 | 202X7200-064 | 330 pF, 500V, Ceramic |
| R303 | 203X6500-863 | 8.2K Ohm, 5%, 1/4W Carbon | C203 | 202X7200-043 | 220 pF, 500V, Ceramic |
| R304 | 203X6500-724 | 2.2K Ohm, 5%, 1/4W Carbon | C204 | 202X7200-043 | 220 pF, 500V, Ceramic |
| R305 | 203X6500-842 | 6.8K Ohm, 5%, 1/4W Carbon | C205 | 203X0014-076 | 470 uF, 16V, Electrolytic |
| R306 | 203X6003-201 | 7.5K Ohm, 2%, 1/4W Carbon | C206 | 203X1810-149 | 0.1 uF, 125V Mylar |
| R307 | 203X6500-825 | 5.6K Ohm, 5%, 1/4W Carbon | C207 | 349X2232-109 | .022 uF, 100V Mylar |
| R309 | 203X6500-965 | 22K Ohm, 5%, 1/4W Carbon | C301 | 203X0014-065 | 330 uF, 50V Electrolytic |
| R310 | 203X6500-988 | 39K Ohm, 5%, 1/4W Carbon | C302 | 203X1600-563 | 0.033 uF, 50V Mylar |
| R311 | 203X6500-762 | 3.3K Ohm, 5%, 1/4W Carbon | C303 | 203X0629-037 | 3.3 uF, 50V Electrolytic |
| R312 | 203X9014-741 | 4.7K Ohm, 5%, 1/4W Carbon | C304 | 203X1600-366 | 0.068 pF, 50V Mylar |
| R313 | 204X1450-537 | 1K Ohm, 5%, 5W Carbon | C306 | 203X0412-012 | 2.2 uF, 16V Tantal |
| R314 | 203X6500-481 | 220 Ohm, 5%, 1/4W Carbon | C307 | 203X1600-634 | 0.033 uF, 50V Mylar |
| R315 | 203X6500-169 | 10 Ohm, 5%, 1/4W Carbon | C308 | 203X0025-174 | 3.3 uF, 50V Electrolytic |
| R316 | 203X6500-762 | 3.3K Ohm, 5%, 1/4W Carbon | C309 | 203X1207-100 | 0.068 uF, 100V PP |
| R317 | 203X6700-107 | 12 Ohm, 5%, 1/2W Carbon | C310 | 203X0629-061 | 10 uF, 100V Electrolytic |
| R318 | 203X6500-540 | 390 Ohm, 5%, 1/4W Carbon | C311 | 203X0041-025 | 10 uF, 160V Electrolytic |
| R319 | 203X6500-645 | 1K Ohm, 5%, 1/4W Carbon | C312 | 202X7050-248 | 1000 pF, 500V Ceramic |
| R320 | 203X6501-002 | 33K Ohm, 5%, 1/4W Carbon | C313 | 203X0040-052 | 47 uF, 160V Electrolytic |
| R321 | 203X6501-224 | 270K Ohm, 5%, 1/2W Carbon | C314 | 203X1201-265 | 0.033 uF, 200V PP |
| R322 | 203X6500-886 | 10K Ohm, 5%, 1/4W Carbon | C315 | 203X0629-023 | 1 uF, 50V Electrolytic |
| R351 | 203X6500-886 | 10K Ohm, 5%, 1/4W Carbon | C351 | 203X0629-023 | 1 uF, 50V Electrolytic |
| R352 | 203X6500-785 | 3.9K Ohm, 5%, 1/4W Carbon | C352 | 203X0619-045 | 47 uF, 25V Electrolytic |
| R353 | 203X6501-086 | 68K Ohm, 5%, 1/4W Carbon | C353 | 203X1190-015 | 0.0082 pF, 50V Mylar-PP |
| R354 | 203X6500-762 | 3.3K Ohm, 5%, 1/4W Carbon | C354 | 203X0619-045 | 47 uF, 25V Electrolytic |
| R355 | 203X9205-143 | 6.8K Ohm, 5%, 3W Metal Oxide | C355 | 203X1600-366 | 0.068 pF, 50V Mylar |
| R358 | 203X5601-878 | 56K Ohm, 5%, 1/2W Carbon | C356 | 202X7050-483 | 0.01 uF, 500V Ceramic |
| R360 | 203X6500-561 | 470 Ohm, 5%, 1/4W Carbon | C359 | 202X8065-606 | 100 pF, 500V Ceramic |
| R361 | 203X6500-886 | 10K Ohm, 5%, 1/4W Carbon | C360 | 202X7050-366 | 0.0033 pF, 500V Ceramic |
| R362 | 203X9014-045 | 1.8K Ohm, 5%, 1W Metal Oxide | C361 | 202X7050-483 | 0.01 uF, 500V Ceramic |
| ★ R363 | 204X1527-751 | 3.9K Ohm, 5%, 7W Metal Oxide | C362 | 202X7203-032 | 0.01 uF, 50V Ceramic |
| R364 | 203X6500-246 | 22 Ohm, 5%, 1/4W Carbon | Δ ★ C363 | 203X1270-911 | 8700 pF, 1.5 KV PP |
| R365 | 203X6501-002 | 33K Ohm, 5%, 1/4W Carbon | ★ C365 | 203X1201-265 | 0.33 uF, 200V PP |
| R367 | 203X6500-886 | 10K Ohm, 5%, 1/4W Carbon | C366 | 203X0019-026 | 22 uF, 25V Electrolytic |
| R368 | 203X5602-185 | 330K Ohm, 5%, 1/2W Comp. | C367 | 202X8065-162 | 6 pF, 500V Ceramic |
| | | | C368 | 202X7203-032 | 0.01 uF, 50V Ceramic |
| | | | C372 | 203X1207-125 | 0.1 uF, 100V PP |

MAIN BOARD (CONT.)

| Ref. No. | Part No. | Description |
|---------------------------|--------------|---------------------------|
| CAPACITORS (CONT.) | | |
| C380 | 202X7200-087 | 470 uF, 500V Ceramic |
| △ C501 | 203X1810-149 | 0.1 uF, 125V Mylar |
| △ C502 | 202X7050-282 | 1500 pF, 500V Ceramic |
| △ C503 | 202X7810-214 | 2200 pF, 125V Ceramic |
| △ C504 | 202X7810-214 | 2200 pF, 125V Ceramic |
| C505 | 203X0220-075 | 560 uF, 200V Electrolytic |
| C506 | 203X0040-034 | 22 uF, 160V Electrolytic |
| C507 | 203X0041-057 | 47 uF, 160V Electrolytic |
| C701 | 203X0019-092 | 1000 uF, 25V Electrolytic |
| C702 | 203X0634-061 | 10 uF, 100V Electrolytic |
| C703 | 202X7050-248 | 1000 pF, 500V Ceramic |

SEMICONDUCTORS

| | | |
|--------|--------------|------------------------------|
| D203 | 201X2010-159 | Diode, IS2076-27 |
| D204 | 201X2010-159 | Diode, IS2076-27 |
| D205 | 201X2010-159 | Diode, IS2076-27 |
| D206 | 201X2010-159 | Diode, IS2076-27 |
| D207 | 201X2010-159 | Diode, IS2076-27 |
| D208 | 201X2010-159 | Diode, IS2076-27 |
| D209 | 201X2010-159 | Diode, IS2076-27 |
| D301 | 201X2010-165 | Diode, ISS81 |
| D302 | 201X2010-159 | Diode, IS2076-27 |
| D303 | 201X2010-159 | Diode, IS2076-27 |
| D304 | 201X2120-009 | Diode, RH-IV |
| D305 | 201X2120-009 | Diode, RH-IV |
| D306 | 201X2010-159 | Diode, IS2076-27 |
| △ D501 | 201X3120-216 | Diode, RM-1AV |
| △ D502 | 201X3120-216 | Diode, RM-1AV |
| △ D503 | 201X3120-216 | Diode, RM-1AV |
| △ D504 | 201X3120-216 | Diode, RM-1AV |
| D505 | 201X3120-216 | Diode, RM-1AV |
| D506 | 201X3120-216 | Diode, RM-1AV |
| D701 | 201X2130-234 | Diode, RU-2V |
| D702 | 201X2120-009 | Diode, RH-1V |
| Q201 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q202 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q203 | 200X4056-260 | Transistor (PNP) 2SA562-Y-TM |
| Q204 | 200X4056-260 | Transistor (PNP) 2SA562-Y-TM |
| Q205 | 200X4056-260 | Transistor (PNP) 2SA562-Y-TM |

| Ref. No. | Part No. | Description |
|-------------------------------|--------------|-------------------------------|
| SEMICONDUCTORS (CONT.) | | |
| Q206 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q207 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q208 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q209 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q210 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q301 | 200X3181-523 | Transistor (NPN) 2SC1815GR |
| Q302 | 200X3207-306 | Transistor (NPN) 2SC2073LBGL2 |
| Q303 | 200X3207-306 | Transistor (NPN) 2SC2073LBGL2 |
| Q351 | 200X3248-217 | Transistor (NPN) 2SC2482BK |
| Q352 | 200X4589-802 | Transistor (NPN) 2SD898B |
| IC301 | 200X2300-033 | IC HA11423 |
| △ ★ IC501 | 200X2600-183 | IC STR381 |

TRANSFORMERS & COILS

| | | |
|----------|--------------|-------------------------|
| L351 | 201X4710-134 | Coil, (RF Choke) |
| L352 | 201X5000-083 | Coil, Horiz. Size |
| L701 | 611X0004-007 | Coil, Adg. |
| T351 | 202X1300-080 | Transformer, Hnr. Drive |
| △ ★ T352 | 200X9720-301 | HV-Unit M-11 |

MISCELLANEOUS

| | | |
|--------|--------------|----------------------|
| △ F501 | 204X7120-073 | Fuse, 4 Amp. 125V |
| J402 | 206X5008-632 | Recep W Wire 3P-M-BG |
| P201 | 204X9600-466 | Plug, PWB 3P-J |
| P202 | 204X9601-477 | Plug, PWB 6P-Q |
| P401 | 204X9600-298 | Plug, PWB 4P-B |
| P501 | 204X9600-249 | Plug, PWB 2P-B |
| P601 | 204X9600-304 | Plug, PWB 4P-C |
| TH501 | 201X0100-112 | Thermistor |

FINAL ASSEMBLY PARTS

| | |
|------------------|--------------------------------|
| △ ★ 88X0138-506 | 19VLT22 Pix Tube |
| 205X9800-158 | Lateral/Purity Assembly |
| △ ★ 202X1111-201 | Yoke Deflection |
| 204X9301-255 | CRT Socket |
| 291X5004-262 | Automatic Degaussing Coil Unit |

NECK BOARD

RESISTORS

| | | |
|-------|--------------|-----------------------------|
| R401 | 203X6000-729 | 220 Ohm, 5% 1/4W Carbon |
| R402 | 203X6500-540 | 390 Ohm, 5% 1/4W Carbon |
| R403 | 203X6000-661 | 820 Ohm, 5% 1/4W Carbon |
| R404 | 203X6000-729 | 220 Ohm, 5% 1/4W Carbon |
| R405 | 203X6500-540 | 390 Ohm, 5% 1/4W Carbon |
| R406 | 203X6000-661 | 820 Ohm, 5% 1/4W Carbon |
| R407 | 203X6000-729 | 470 Ohm, 5% 1/4W Carbon |
| R408 | 203X6000-998 | 270 Ohm, 5% 1/4W Carbon |
| R409 | 203X6000-661 | 820 Ohm, 5% 1/4W Carbon |
| R410 | 203X9104-824 | 15K Ohm, 5% 2W M.O. Forming |
| R411 | 203X9104-824 | 15K Ohm, 5% 2W M.O. Forming |
| R412 | 203X9104-824 | 15K Ohm, 5% 2W M.O. Forming |
| R413 | 203X6000-998 | 2.7K Ohm, 5% 1/2W Comp. |
| R414 | 203X6000-998 | 2.7K Ohm, 5% 1/2W Comp. |
| R415 | 203X6000-998 | 2.7K Ohm, 5% 1/2W Comp. |
| R416 | 203X9105-154 | 2.2 Ohm, 5% 2W Metal Oxide |
| R419 | 203X6500-741 | 2.7K Ohm, 5% 1/4W Carbon |
| R420 | 203X6500-741 | 2.7K Ohm, 5% 1/4W Carbon |
| R421 | 203X6500-741 | 2.7K Ohm, 5% 1/4W Carbon |
| VR401 | 204X2115-014 | 500 Ohm, -B Semi-Fixed |
| VR402 | 204X2115-014 | 500 Ohm, -B Semi-Fixed |
| VR403 | 204X2115-006 | 5K Ohm, -B Semi-Fixed |
| VR404 | 204X2115-006 | 5K Ohm, -B Semi-Fixed |
| VR405 | 204X2115-006 | 5K Ohm, -B Semi-Fixed |

CAPACITORS

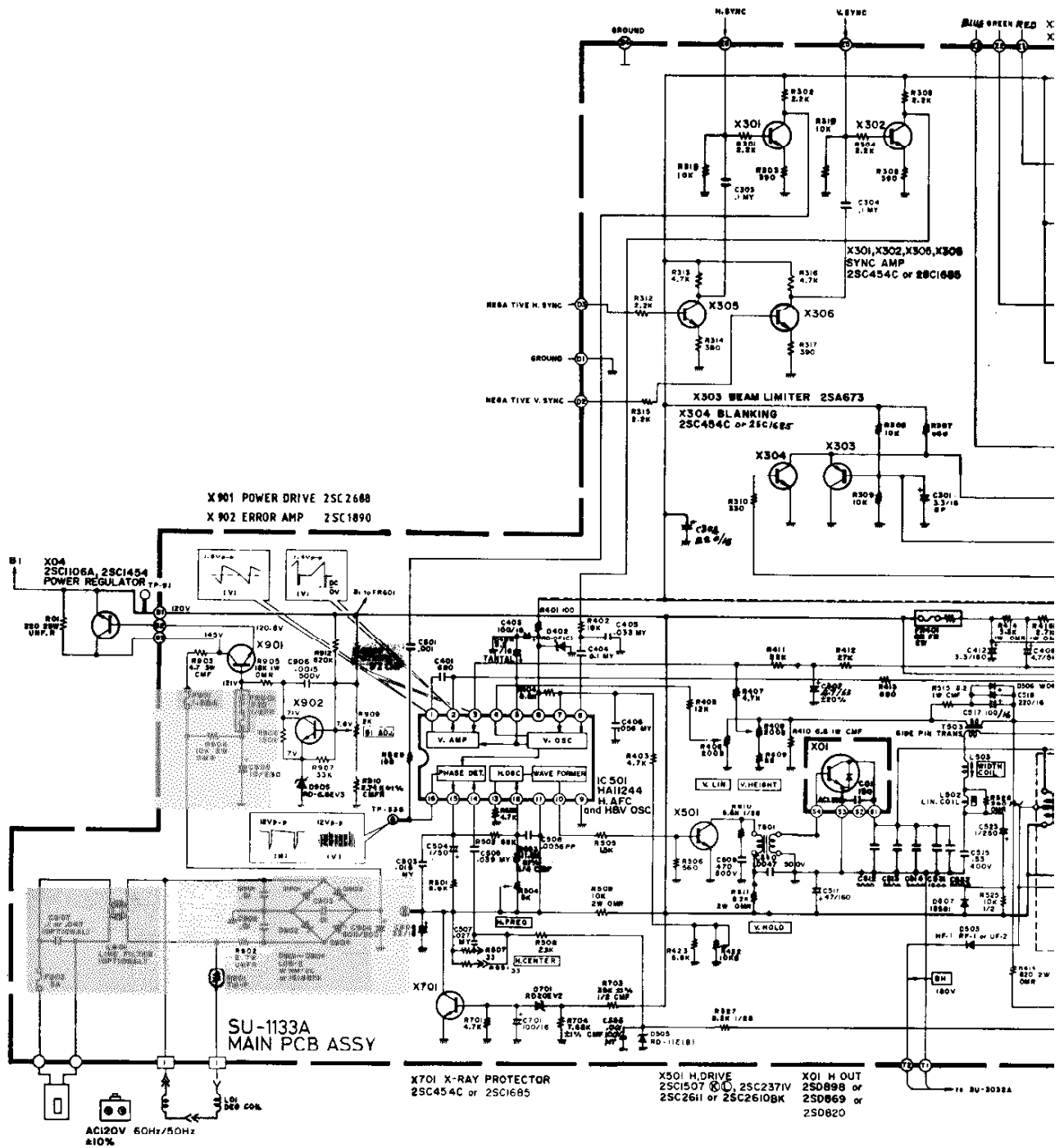
| | | |
|------|--------------|------------------------|
| C401 | 202X7050-269 | 1200 pF, 500V Ceramic |
| C402 | 202X7050-248 | 1000 pF, 500V Ceramic |
| C403 | 202X7050-248 | 1000 pF, 500V Ceramic |
| C404 | 202X7050-282 | 1500 pF, 1.5KV Ceramic |
| C405 | 202X7050-483 | 0.01 uF, 500V Ceramic |

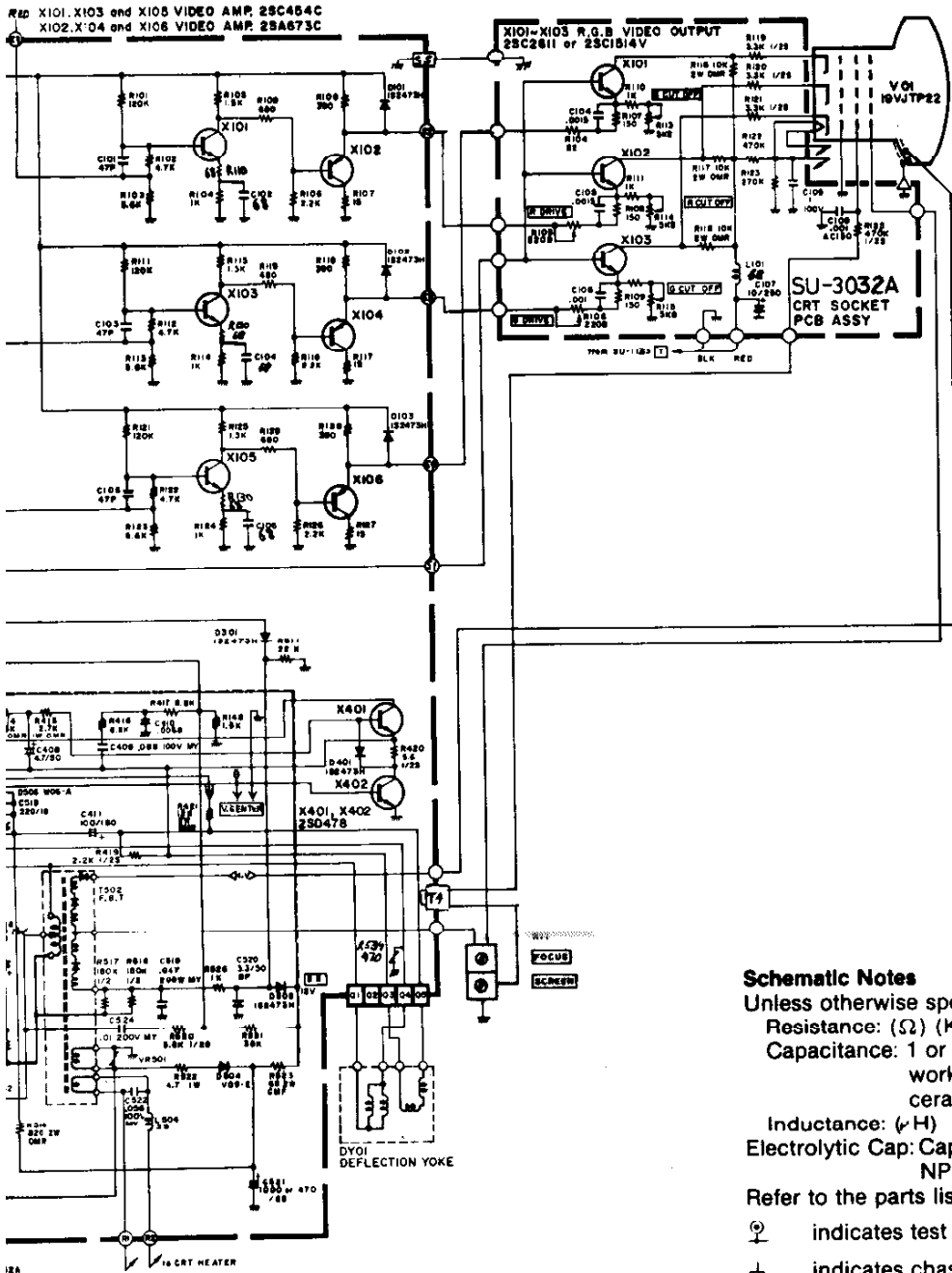
SEMICONDUCTORS

| | | |
|------|--------------|----------------------------|
| Q401 | 200X3206-800 | Transistor (NPN) 2SC2068LB |
| Q402 | 200X3206-800 | Transistor (NPN) 2SC2068LB |
| Q403 | 200X3206-800 | Transistor (NPN) 2SC2068LB |

MISCELLANEOUS

| | | |
|------|--------------|-------------------|
| J401 | 206X5009-296 | RECEP W Wire 4P-E |
| P402 | 204X9600-254 | Plug, PWB 3P-A |
| P403 | 204X9600-981 | Plug, Pin 1P-D |
| P701 | 204X9601-020 | Plug, PWB 4P-E |





Schematic Notes

Unless otherwise specified
 Resistance: (Ω) (K→KΩ, M→MΩ), 1/4 (W) carbon resistor
 Capacitance: 1 or higher → (pF), less than 1 → (μF)
 working voltage → 50 (V)
 ceramic capacitor

Inductance: (μH)
 Electrolytic Cap: Capacitance Value (μF)/working voltage (V),
 NP → non-polar (or bipolar) electrolytic cap.

- Refer to the parts list for additional component information.
- ⊕ indicates test point connection
 - ⊔ indicates chassis ground unless otherwise specified
 - Hz indicates cycles per second
- For **safety** purposes (and continuing reliability)
 ⚠ replace all components marked with safety symbol with identical type.
 NOTE: FR → fusible resistor

00-4147-04
 G07-CB0

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

REPLACEMENT PARTS LIST—ELECTROHOME 19" MONITOR

Components identified by the 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

| | | |
|---------|---|-----------------------------|
| C R | : | Carbon Resistor |
| Comp. R | : | Composition Resistor |
| OM R | : | Oxide Metal Film Resistor |
| V R | : | Variable Resistor |
| MF R | : | Metal Film Resistor |
| CMF R | : | Coating Metal Film Resistor |
| UNF R | : | Nonflammable Resistor |
| F R | : | Fusible Resistor |

Capacitor

| | | |
|-----------|---|--|
| C Cap. | : | Ceramic Capacitor |
| M Cap. | : | Mylar Capacitor |
| E Cap. | : | Electrolytic Capacitor |
| BP E Cap. | : | Bi-Polar (or Non-Polar) Electrolytic Capacitor |
| MM Cap. | : | Metalized Mylar Capacitor |
| PP Cap. | : | Polypropylene Capacitor |
| MPP Cap. | : | Metalized PP Capacitor |
| PS Cap. | : | Polystyrol Capacitor |
| Tan. Cap. | : | Tantal Capacitor |

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

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

SERVICE REPLACEMENT PARTS LIST

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

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

| Symbol | Description | Part Number |
|----------|---|--------------------|
| | Picture Tube 19" | 17-7198-03 |
| Δ | Δ Deflection Yoke | A29779-D=21-141-01 |
| | PC Magnet | A75034-B=29-32-01 |
| Δ | Δ Flyback Transf. | A29951-B |
| Δ | 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- $\frac{3}{4}$ | 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 |
|--------|--------------------------------------|--------------|
| | Degaussing Coil | 21-1007-30 |
| D911, | | |
| D912 | 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 Retardant Term. Strip 4 Lug | 34-492-09 |

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

Resistors

| Symbol | Description | Part Number |
|--------|---|-------------|
| R3105 | V R 200 | QVZ3234-022 |
| R3106 | V R 200 | QVZ3234-022 |
| R3113 | V R 5K | QV73234-053 |
| 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 |
| R3121 | 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 |

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

| Coils | | |
|-----------------|----------------|-------------|
| Symbol | Description | Part Number |
| L3101 | Peaking Coil | QQL043K-101 |
| Semi-conductors | | |
| 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

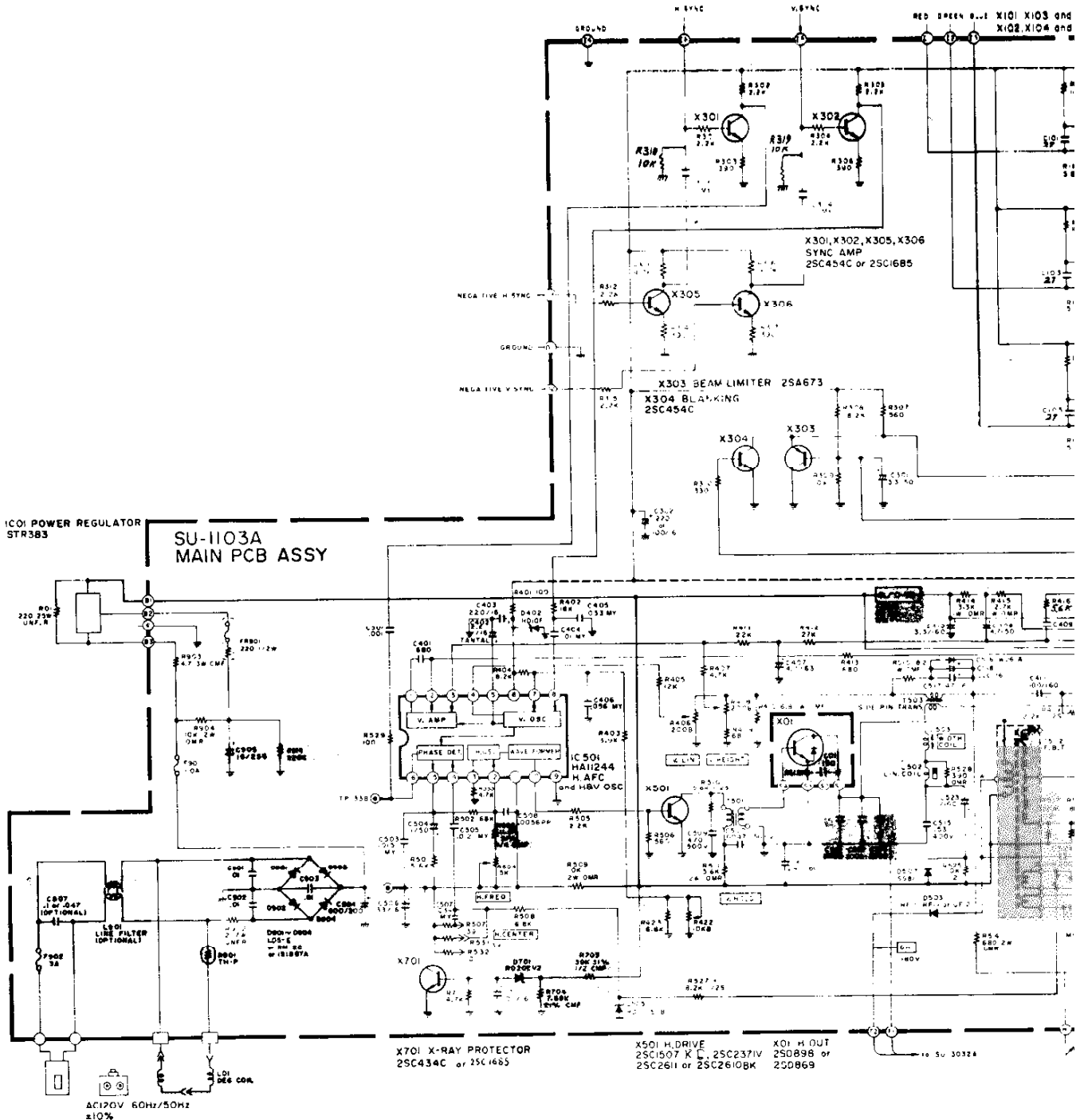
| Symbol | Description | Part Number |
|---------|--------------------|--------------|
| R1406 | V R 200Ω | QVZ3230-002 |
| R1408 | V R 200Ω | QVZ3230-002 |
| R1410 | CMF R 6.8Ω1W J | QRX019J-6R8 |
| R1414 | OM R 3.3KΩ1W J | QRG019J-332 |
| R1415 | OM R 2.7KΩ1W J | QRG019J-272 |
| R1421 | OM R 12KΩ2W J | QRG026J-123Z |
| R1422 | V R 10KΩ | QVZ3230-014 |
| △FR1401 | △F R 68Ω2W K | QRH024K-680M |
| △R1503 | △CMF R 11.8KΩ½W+1% | QRV142F-1182 |
| R1504 | V R 5KΩ | QVZ3230-053 |
| R1509 | OM R 10KΩ2W J | QRG026J-103Z |
| R1512 | OM R 8.2KΩ2W J | QRG026J-822Z |
| R1514 | OM R 820Ω2W J | QRG026J-821Z |
| R1515 | CMF R 8.2Ω1W J | QRX019J-8R2 |
| R1522 | CMF R 4.7Ω1W J | QRX019J-4R7 |
| R1523 | OM R 68Ω2W J | QRG026J-680Z |
| R1528 | OM R 390Ω1W J | QRG019J-391 |
| R1534 | ZN R | ERZ-C05ZK471 |
| VR1501 | ZN R | ERZ-C05ZK271 |
| △R1703 | △CMF R 39Ω½W+1% | QRV122F-3902 |
| △R1704 | △CMF R 7.68KΩ½W+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 2.74KΩ½W+1% | QRV142F-274I |
| △FR1901 | △F R 220Ω½W K | QRH124K-221M |

Capacitors

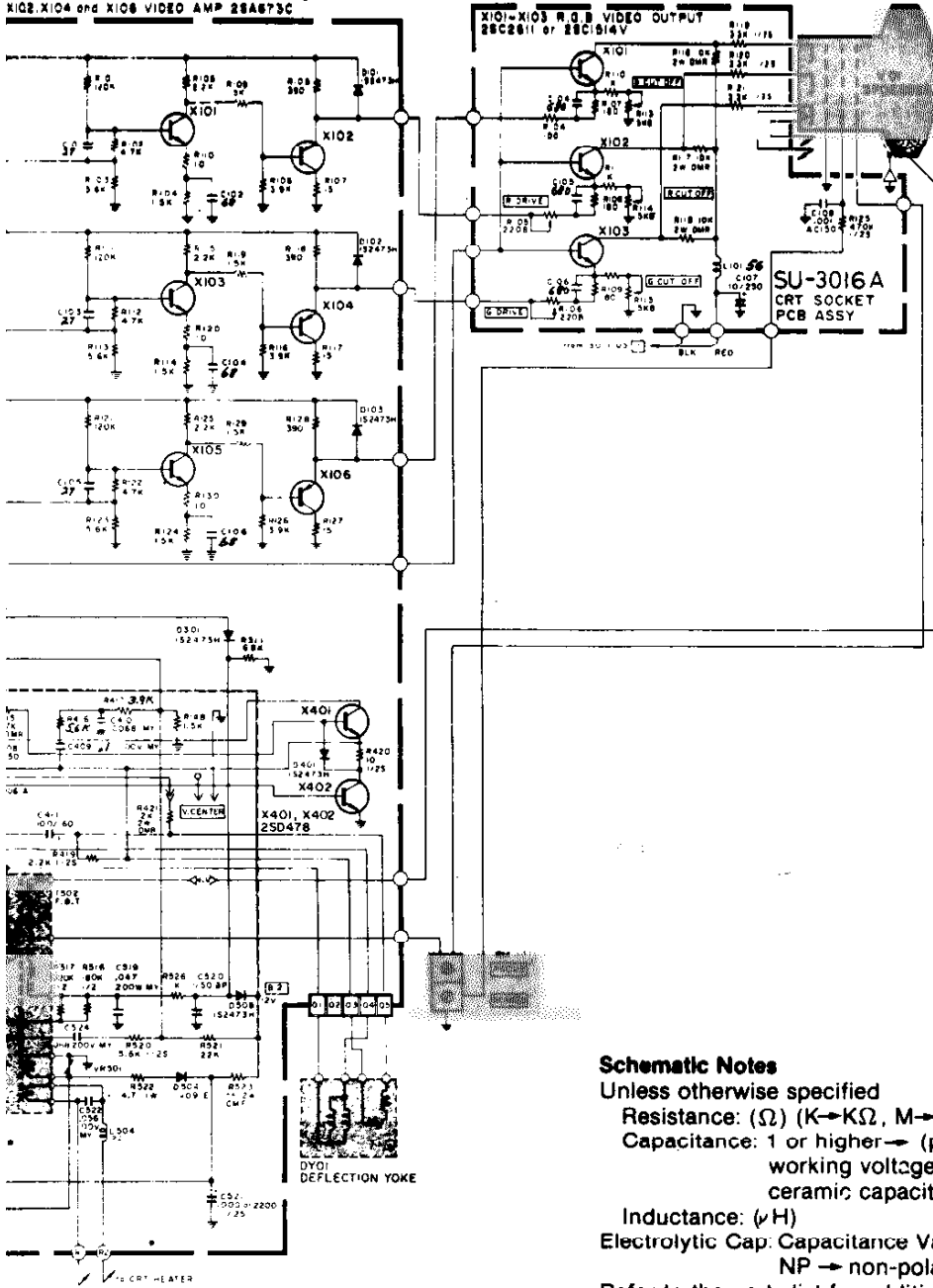
| Symbol | Description | Part Number |
|--------|---------------------------|---------------|
| C1301 | BPE Cap. 3.3uF 50V A | QCN611IA-335Z |
| C1402 | Tan Cap. 2.2uF 16V K | QEE51CK-225B |
| C1407 | E Cap. 4.7uF 6.3V A | QEW51JA-475 |
| C1411 | E Cap. 100uF 160V A | QEW52CA-107 |
| C1412 | E Cap. 3.3uF 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 |

Main PCB Ass'y (SU-1133A) Parts List (Cont.)

| Coils | | |
|-----------------|--------------------|------------------|
| Symbol | Description | Part Number |
| L1502 | Linearity 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 |
| Semi-conductors | | |
| 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 |



X101, X103 and X105 VIDEO AMP 28C484C or 28C1685
 X102, X104 and X106 VIDEO AMP 28A673C



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

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

| | | |
|---------|---|-----------------------------|
| C R | : | Carbon Resistor |
| Comp. R | : | Composition Resistor |
| OM R | : | Oxide Metal Film Resistor |
| V R | : | Variable Resistor |
| MF R | : | Metal Film Resistor |
| CMF R | : | Coating Metal Film Resistor |
| UNF R | : | Nonflammable Resistor |
| F R | : | Fusible Resistor |

Capacitor

| | | |
|-----------|---|---|
| C Cap. | : | Ceramic Capacitor |
| M Cap. | : | Mylar Capacitor |
| E Cap. | : | Electrolytic Capacitor |
| BP E Cap. | : | Bi-Polar (or Non-Polar) Electrolytic Capacitor |
| MM Cap. | : | Metalized Mylar Capacitor |
| PP Cap. | : | Polypropylene Capacitor |
| MPP Cap. | : | Metalized PP Capacitor |
| 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-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 13" | 370ESB22(E) |
| Δ DY01 | Δ Deflection Yoke | C29123-V |
| | PC Magnet | A76366-A |
| | Wedge | C30006 |
| | Δ Flyback Transf. | A19183-A |
| Δ R11 | Δ Focus V R | A46606-A |
| Δ R05 | UNF Resistor 220 Ω .25W. K | QRF258K-221 |
| Δ C04 | Δ C Capacitor 150pF, A C1.5KV | QCZ0101-005 |
| X01 | Si. Transistor | 2SD869 |
| IC01 | IC Regulator | STR383 |
| L01 | Degaussing Coil | 21-1007-31 |
| | 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

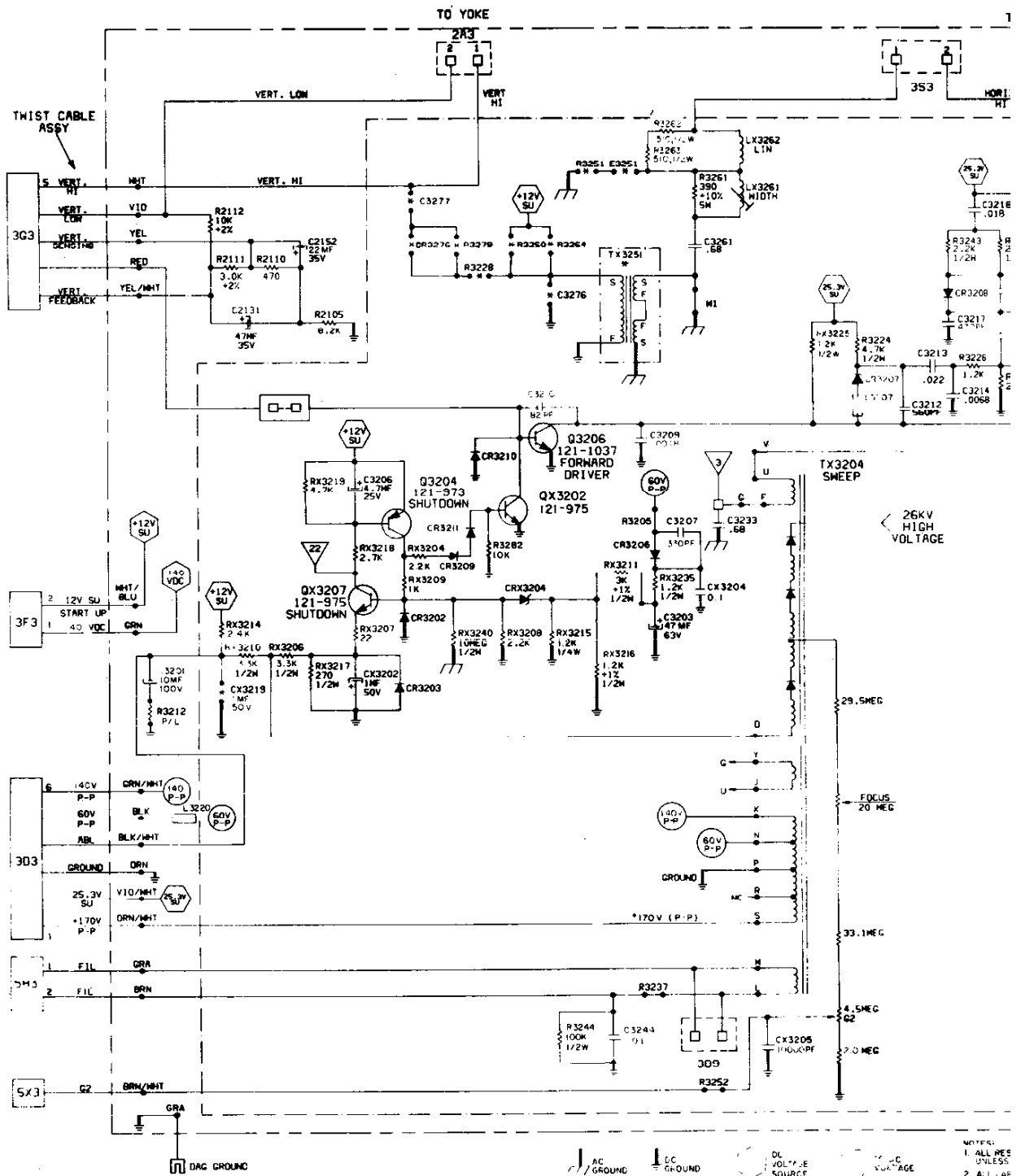
| Resistors | | Part Number |
|-----------------|---|--------------|
| Symbol | Description | |
| R1406 | V R 200 Ω | QVZ3230-022 |
| R1408 | V R 200 Ω | QVZ3230-022 |
| R1410 | CMF R 6.8 Ω 1W J | QRX019J-6R8 |
| R1414 | OM R 3.3K Ω 1W J | QRG019J-332 |
| R1415 | OM R 2.7K Ω 1W J | QRG019J-272 |
| R1421 | 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 11.8 Ω $\frac{1}{2}$ W +1% | QRV142F-1182 |
| R1504 | V R 5K Ω | QVZ3230-053 |
| R1509 | OM R 10K Ω 2W J | QRG029J-103 |
| R1511 | OM R 5.6K Ω 2W J | QRG029J-562 |
| R1514 | OM R 680 Ω 2W J | QRG029J-681 |
| R1515 | CMF R 8.2 Ω 1W J | QRX019J-8R2 |
| R1522 | CMF R 4.7 Ω 1W J | QRX019J-4R7 |
| R1523 | OM R 56 Ω 2W J | QRG029J-560 |
| R1528 | OM R 390 Ω 1W J | QRG019J-391 |
| R1534 | ZN R | ERZ-C05ZK471 |
| VR1501 | ZN R | ERZ-C05DK271 |
| Δ R1703 | Δ CMF R 39K Ω $\frac{1}{2}$ W +1% | QRV122F-3902 |
| Δ R1704 | Δ CMF R 7.68K Ω $\frac{1}{2}$ W +1% | QRV142F-7681 |
| Δ R1901 | Δ Posistor | A75414 |
| R1902 | UNF R 2 Ω 7W K | QRF076K-2R0 |
| R1903 | CMF R 5.6 Ω 3W J | QRX039J-5R6 |
| R1904 | OM R 10K Ω 2W J | QRG026J-103Z |
| Δ FR1901 | Δ F R 220 Ω $\frac{1}{2}$ W K | QRH124K-221M |

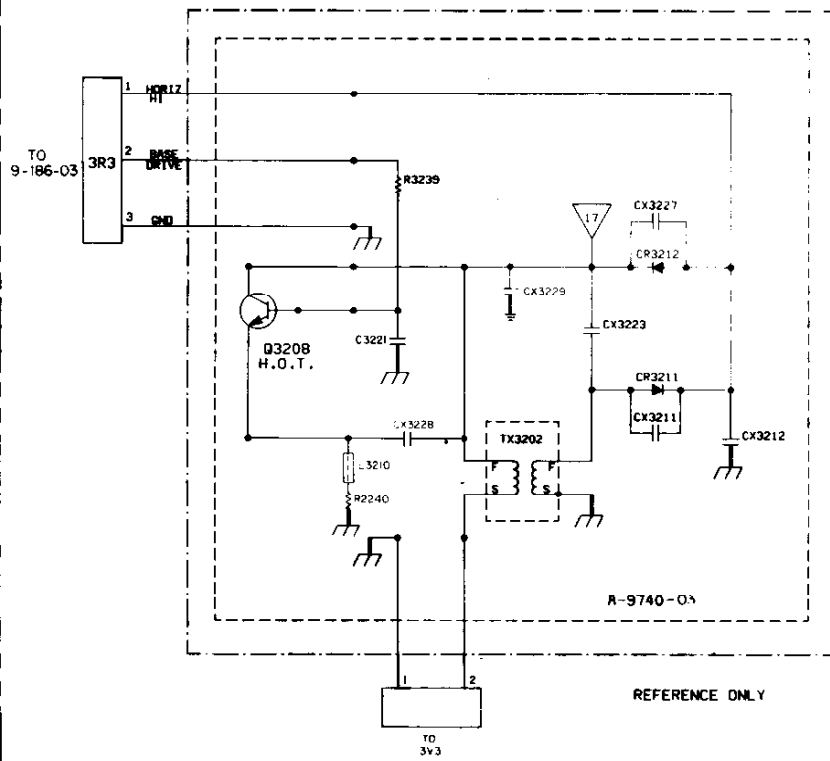
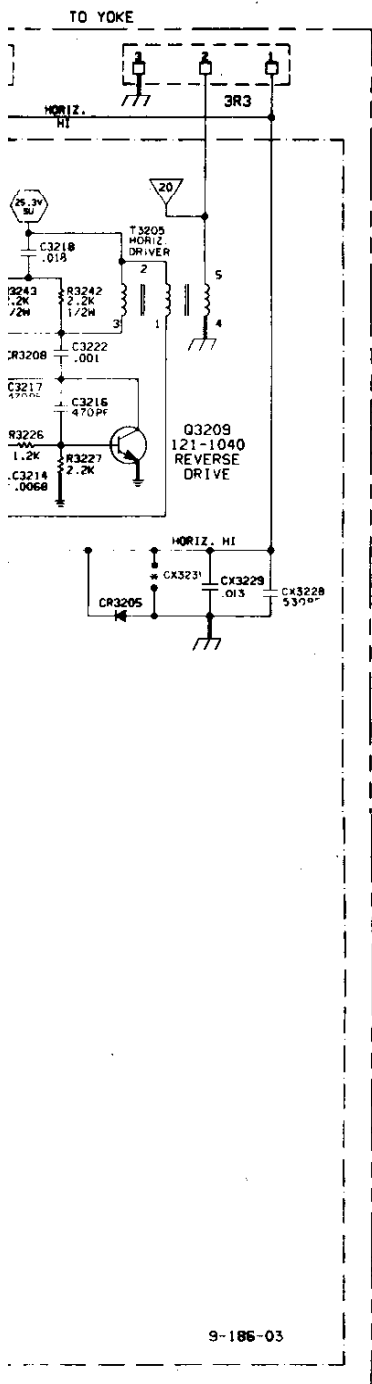
Main P.C.B. Ass'y (SU-1103A) Parts List

| Capacitors | | |
|-----------------|---------------------------|--------------|
| Symbol | Description | Part Number |
| C1402 | Tan. Cap. 2.2uF 16V K | QEE51CK-225B |
| C1411 | E Cap. 100uF 160V A | QEW52CA-107 |
| C1412 | E Cap. 3.3uF 160V A | QEW52CA-335 |
| C1508 | PP Cap. 5800pF 50V J | QFP31HJ-562 |
| C1511 | E Cap. 47uF 160V A | QEW52CA-476S |
| △C1512 | △PP Cap. 2000pF DC1500V J | QFZ0082-202 |
| △C1513 | △PP Cap. 2000pF DC1500V J | QFZ0082-202 |
| △C1514 | △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 |
| △C1907 | △MM Cap. 0.1uF AC150V Z | QFZ9008-104 |
| Coils | | |
| Symbol | Description | Part Number |
| L1501 | Peaking Coil | A75360-6 |
| L1502 | Linarty Coil | A39934 |
| L1503 | Width Coil | C30380-A |
| L1504 | Heater Choke | C30333-A |
| L1901 | Line Filter | A39475-J |
| Transformers | | |
| Symbol | Description | Part Number |
| T1501 | Hor. Drive Transf. | A46022-BM |
| T1503 | Side Pin Transf. | C39050-A |
| Semi-conductors | | |
| 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 | D20EV2 |
| △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 200Ω | QVZ3234-022 |
| R3106 | V R 200Ω | QVZ3234-022 |
| R3113 | V R 5KΩ | QVZ3234-053 |
| R3114 | V R 5KΩ | QVZ3234-053 |
| R3115 | V R 5KΩ | QVZ3234-053 |
| R3116 | OM R 10KΩ2W J | QRG029J-103 |
| R3117 | OM R 10KΩ2W J | QRG029J-103 |
| R3118 | OM R 10KΩ2W J | QRG029J-103 |
| R3119 | Comp. R 3.3KΩ½W K | QRZ0039-332 |
| R3120 | Comp. R 3.3KΩ½W K | QRZ0039-332 |
| R3121 | Comp. R 3.3KΩ½W K | QRZ0039-332 |
| Capacitors | | |
| Symbol | Description | Part Number |
| C3107 | E Cap. 10uF 250V A | QEW52EA-106 |
| C3108 | C Cap. 1000pF DC1400V P | QCZ9001-102M |
| Coils | | |
| Symbol | Description | Part Number |
| L3101 | Peaking coil | QQL043K-101 |
| Semiconductors | | |
| Symbol | Description | Part Number |
| X3101 | Si. Transistor | 2SC2611 |
| X3102 | Si. Transistor | 2SC2611 |
| X3103 | Si. Transistor | 2SC2611 |
| Miscellaneous | | |
| Symbol | Description | Part Number |
| △ | CRT Socket | A75522 |





SCHEMATIC FOR
9-186-03
SWEEP BOARD
RGB COLOR MONITOR

| | | |
|--|------------|-------|
| ZENITH RADIO CORP. CHICAGO, ILL. | ISSUE B | 9-186 |
|--|------------|-------|

M051-00087-A021

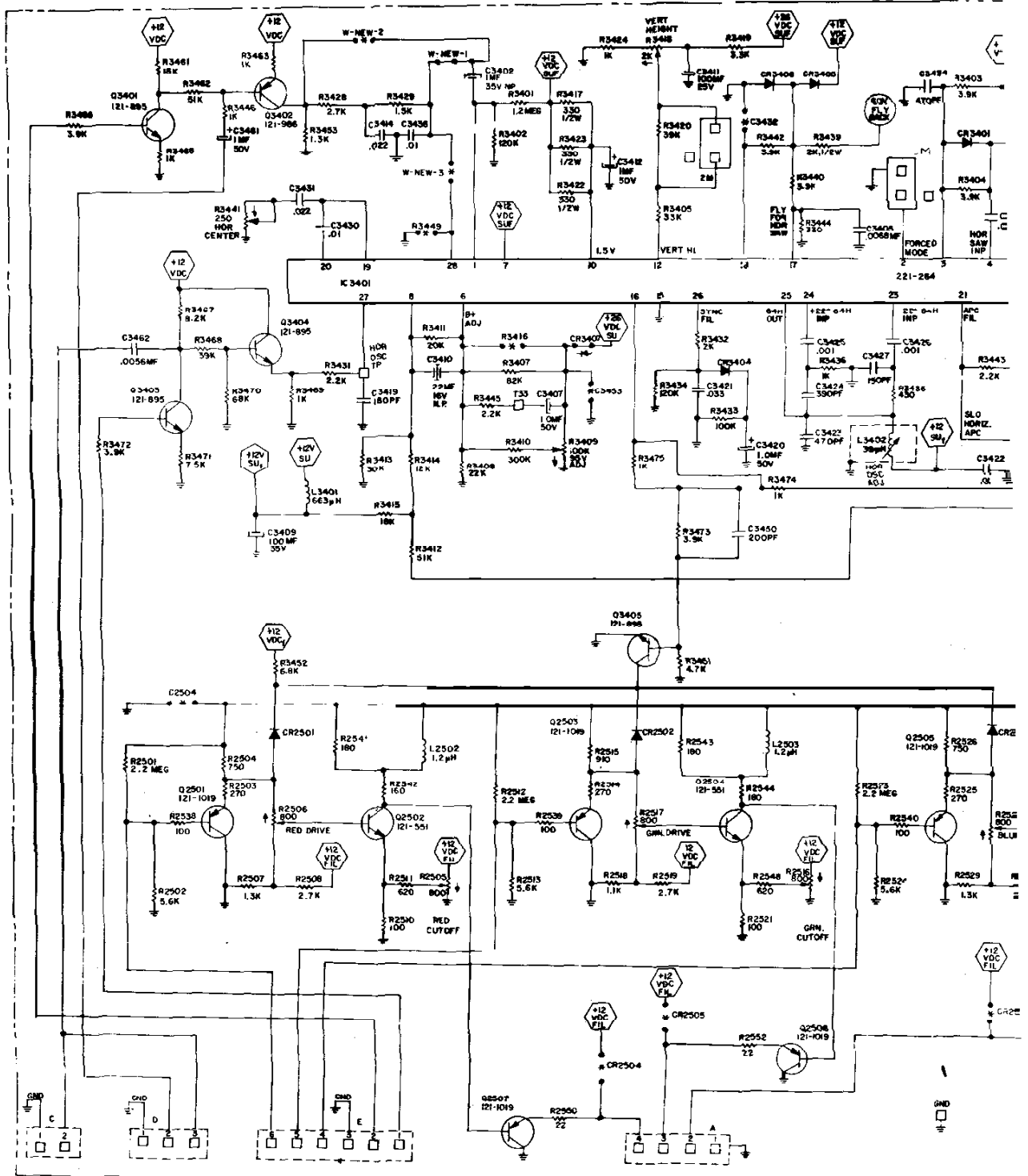
NOTES:
1. ALL RESISTORS ARE 1/4 WATT FILM 1% TOLERANCE UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

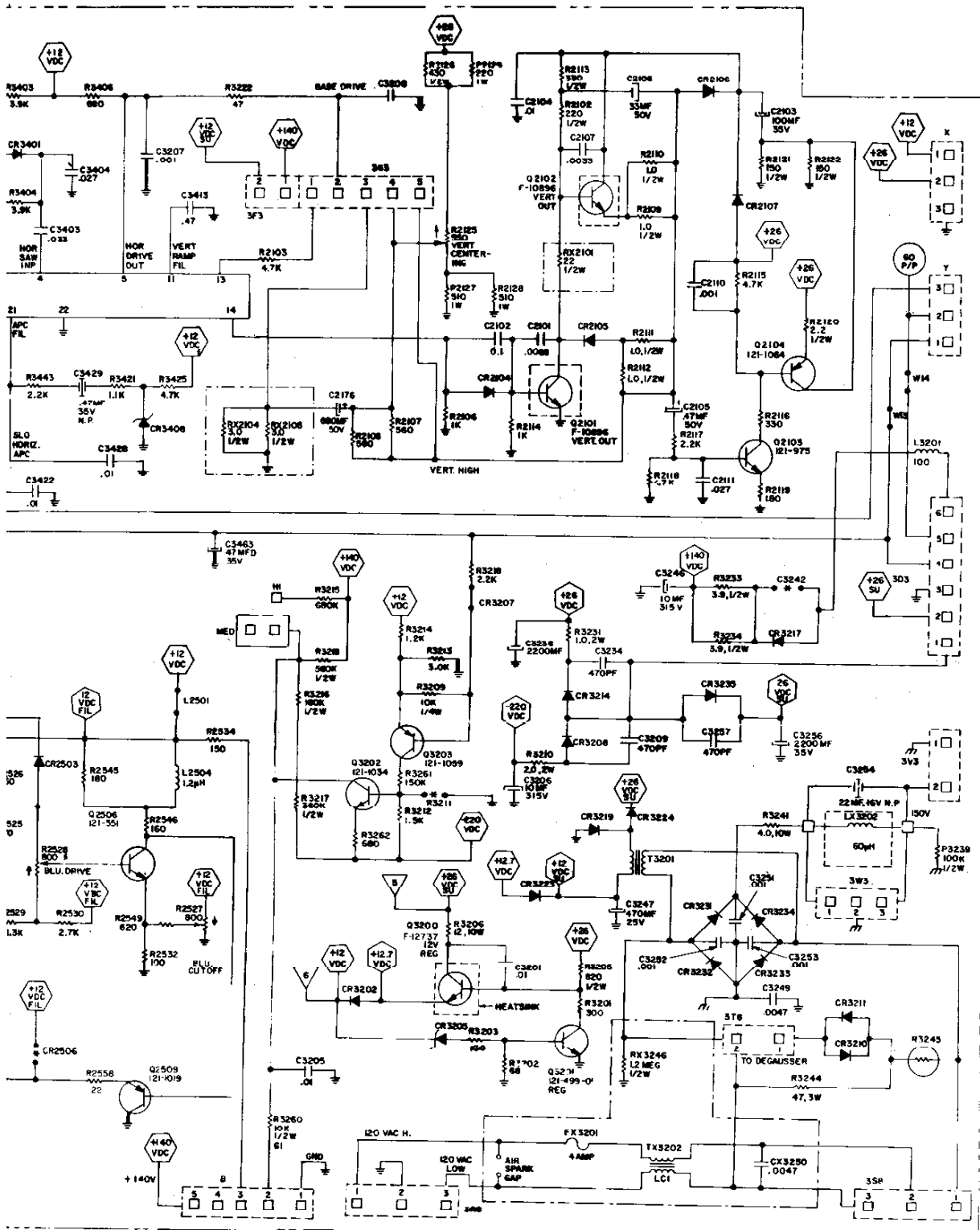
NOTES: (USED WITH CIRCUIT REFERENCE DESIGNATORS)
A. P/V - SEE PARTS LIST FOR APPLICABLE USAGE.
B. ● - ● - JUMPER WIRE USED INSTEAD.
C. -●-●- PROVISION ON PRINTED CIRCUIT BOARD.

SWEEP BOARD (9-186-03)

| Ref. No. | Part No. | Description | Ref. No. | Part No. | Description |
|-----------------------|-------------|------------------------------------|---------------------------------|-------------|-------------------------------------|
| CAPACITORS | | | TRANSFORMERS & COILS | | |
| C2131 | 22-7508 | 47 MF, 35V, +20% Electrolytic | L3207 | 149-454 | Core, Ferrite Bead |
| C2152 | 22-7508-01C | 22 MF, 35V, ±20% Electrolytic | L3220 | F-13834 | Core & Sleeving Assy. (149-509-01) |
| C3201 | 22-7410-05 | 10 MF, 100V, ±20% Electrolytic | LX3261 | 20-3976 | Coil Width |
| CX3202 | 22-7710-01C | 1 MF, 50V, +50%–10% Electrolytic | LX3262 | 20-3975 | Coil, Linearity, with 205-271 Hot M |
| C3203 | 22-7711-08C | 47 MF, 63V, +50%–10% Electrolytic | T3205 | 95-3344 | Transformer, Horizontal Driver |
| CX3204 | 22-7773-24A | 0.1 MF, 100V, ±5% Polyester | TX3204 | 95-3581-01 | Transformer, Sweep |
| CX3205 | 22-7523-01 | 0.01 MF, 2KV, ±20% Disc | | | |
| C3206 | 22-7708-04C | 4.7 MF, 25V, +50%–10% Electrolytic | | | |
| C3207 | 22-5665 | 330 PF, 1000V, ±10% Disc | | | |
| C3209 | 22-7242 | 0.0018 MF, 200V, +10% Disc | R2105 | 63-9921-94 | 8.2K Ohm, ±5% 1/4W Film |
| C3211 | 22-7777-20B | 0.047 MF, 200V, ±10% Polyester | R2110 | 63-9921 64 | 470K Ohm, ±5% 1/4W Film |
| C3212 | 22-7234 | 560 PF, 500V, ±10% Disc | R2111 | 63-9919-83 | 3K Ohm, ±2% 1/4W Film |
| C3213 | 22-7775-16A | 0.022 MF, 100V, ±20% Polyester | R2112 | 63-9919-96 | 10K Ohm, ±2% 1/4W Film |
| C3214 | 22-7775-10A | 0.0068 MF, 100V, ±20% Polyester | RX3204 | 63-9921-80 | 2.2K Ohm, ±5% 1/4W Film |
| C3216 | 22-5664 | 470 PF, 500V, ±20% Disc | RX3206 | 63-7805 | 3.3K Ohm, ±5% 1/2W Carbon |
| C3217 | 22-5684 | 470 PF, 500V, ±20% Disc | RX3207 | 63-9921-32 | 22 Ohm, ±5% 1/4W Film |
| C3218 | 22-7774-15C | 0.018 MF, 100V, ±10% Polyester | RX3208 | 63-10235-80 | 2.2K Ohm, ±5% 1/4W Film |
| C3222 | 22-7742-10 | 0.001 MF, 50V, ±10% Axial | RX3209 | 63-10235-72 | 1K Ohm, ±5% 1/4W Film |
| CX3228 | 22-6466 | 530 PF, 3KV, ±10% Disc | RX3210 | 63-7805 | 3.3K Ohm, ±5% 1/2W Carbon |
| CX3229 | 22-7672-07 | 0.013 MF, 1.6KV, ±5% Polypropylene | RX3211 | 63 10810 07 | 3K Ohm, ±1% 1/2W Film |
| C3233 | 22-7728 | 0.68 MF, 200V, ±10% Polyester | RX3214 | 63-10233-81 | 2.2K Ohm, ±2% 1/4W Film |
| C3244 | 22-7566-24 | 0.1 MF, 250V, ±10% Polyester | RX3216 | 63-10810-06 | 1.2K Ohm, ±1% 1/2W Film |
| C3261 | 22-7683-01 | 0.68 MF, 200V, ±5% Polypropylene | RX3217 | 63-7760 | 270 Ohm, ±5% 1/2W Carbon |
| SEMICONDUCTORS | | | RX3215 | 63-10235-98 | 12K Ohm, ±5% 1/4W Film |
| CR3202 | 103-142-01 | Diode, Low Voltage | RX3218 | 63-10235-82 | 2.7K Ohm, ±5% 1/4W Film |
| CR3203 | 103-330A | Diode, Low Voltage | RX3219 | 63-10235-88 | 4.7K Ohm, ±5% 1/4W Film |
| CRX3204 | 103 308A | Diode, Zener | R3224 | 63-9946-88 | 4.7K Ohm, ±5% 1/2W Film |
| CR3205 | 103-305 | Diode, Damper | R3225 | 63-10836-68 | 680 Ohm, ±5% 2W Wire Wound |
| CR3206 | 103-284A | Diode, Low Voltage | R3226 | 63-10235-74 | 1.2K Ohm, ±5% 1/4W Film |
| CR3207 | 103-295-01A | Diode, Low Voltage | R3227 | 63-10235-80 | 2.2K Ohm, ±5% 1/4W Film |
| | | (used with 149-454) | RX3235 | 63-10810-06 | 1.2K Ohm, ±1% 1/2W Film |
| CR3208 | 103-295-01A | Diode, Low Voltage | RX3240 | 53-10657-04 | 10 Meg Ohm, ±20% 1/2W Carbon |
| CR3209 | 103-142-01 | Diode, Low Voltage | R3242 | 63-10243-80 | 2.2K Ohm, ±5% 1/2W Film |
| CR3210 | 103-142-01 | Diode, Low Voltage | R3243 | 63-10243-80 | 2.2K Ohm, ±5% 1/2W Film |
| CR3211 | 103-142-01 | Diode, Low Voltage | R3244 | 63-7868 | 100K Ohm, ±5% 1/2W Carbon |
| QX3202 | 121-975 | Transistor, NPN | R3261 | 63-10444-86 | 390 Ohm, ±10% 5W Wire Wound |
| QX3204 | 121-973 | Transistor, PNP, Shutdown | R3262 | 63-10565-65 | 510 Ohm, ±10% 1/2W Film |
| Q3206 | 121-1037 | Transistor, NPN, Forward Driver | R3263 | 63-10565-65 | 510 Ohm, ±10% 1/2W Film |
| QX3207 | 121-975 | Transistor, NPN, Shutdown | R3282 | 63-10235-96 | 10K Ohm, ±5% 1/4W Film |
| Q3209 | 121-1040 | Transistor, NPN, Reverse Driver | | | |

**ZENITH MONITOR — SWEEP BOARD
REPLACEMENT PARTS LIST**





SCHEMATIC FOR
9-227-01
RGB COLOR MONITOR
(MAIN BOARD)

ZENITH
RADIO CORP. C
CHICAGO, ILL

9-227

M051-00087-A024

ZENITH MONITOR — MAIN BOARD REPLACEMENT PARTS LIST

| Board 9-227 -01 | | Ref. No. | Part No. | Description |
|-----------------------|---|----------|-------------|--|
| RESISTORS | | | | |
| X | X | RX2101 | 63-10565-32 | 22 Ohm, ±5%, 1/2W Film |
| X | X | R2102 | 63-10243-56 | 220 Ohm, ±5%, 1/2W Film |
| X | X | R2103 | 63-10235-88 | 4.7K Ohm, ±5%, 1/2W Film |
| X | X | RX2104 | 63-10243-11 | 3 Ohm, ±5%, 1/2W Film |
| X | X | RX2105 | 63-10243-11 | 3 Ohm, ±5%, 1/2W Film |
| X | X | R2106 | 63-10235-72 | 1K Ohm, ±5%, 1/4W Film |
| X | X | R2107 | 63-10235-66 | 560 Ohm, ±5%, 1/4W Film |
| X | X | R2108 | 63-10235-66 | 560 Ohm, ±5%, 1/4W Film |
| X | X | R2109 | 63-10565 | 1 Ohm, ±5%, 1/2W Film |
| X | X | R2110 | 63-10565 | 1 Ohm, ±5%, 1/2W Film |
| X | X | R2111 | 63-10565 | 1 Ohm, ±5%, 1/2W Film |
| X | X | R2112 | 63-10565 | 1 Ohm, ±5%, 1/2W Film |
| X | X | R2113 | 63-10243-60 | 330 Ohm, ±5%, 1/2W Film |
| X | X | R2114 | 63-10235-72 | 1K Ohm, ±5%, 1/4W Film |
| X | X | R2115 | 63-10235-88 | 4.7K Ohm, ±5%, 1/4W Film |
| X | X | R2116 | 63-10235-60 | 330 Ohm, ±5%, 1/4W Film |
| X | X | R2117 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| X | X | R2118 | 63-10235-88 | 4.7K Ohm, ±5%, 1/4W Film |
| X | X | R2119 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| X | X | R2120 | 63-10565-08 | 2.2 Ohm, ±5%, 1/2W Film |
| X | X | R2121 | 63-10243-52 | 150 Ohm, ±5%, 1/2W Film |
| X | X | R2122 | 63-10243-52 | 150 Ohm, ±5%, 1/2W Film |
| X | X | R2125 | 63-9023-02 | 550 Ohm, ±20%, Control-Rotary Single-GRA |
| | X | R2126 | 63-10243-66 | 560 Ohm, ±5%, 1/2W Film |
| X | | R2126 | 63-10243-53 | 160 Ohm, ±5%, 1/2W Film |
| | X | R2127 | 63-10243-69 | 750 Ohm, ±5%, 1W Carbon |
| X | | R2128 | 63-10243-66 | 560 Ohm, ±5%, 1/2W Film |
| | X | R2128 | 63-6058 | 510 Ohm, ±5%, 1W Carbon |
| | X | R2129 | 63-10243-65 | 510 Ohm, ±5%, 1/2W Carbon |
| X | | R2501 | 63-10236-28 | 220K Ohm, ±5%, 1/4W Film |
| | X | R2501 | 63-10236-52 | 2.2 Meg Ohm, ±5%, 1/4W Film |
| X | X | R2502 | 63-10235-90 | 5.6K Ohm, ±5%, 1/4W Film |
| X | | R2503 | 63-10235-56 | 220 Ohm, ±5%, 1/4W Film |
| | X | R2503 | 63-10235-58 | 270 Ohm, ±5%, 1/4W Film |
| X | | R2504 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| | X | R2504 | 63-10235-69 | 750 Ohm, ±5%, 1/4W Film |
| X | | R2505 | 63-10857-11 | 5K Ohm, Control-Rotary Single-RED |
| | X | R2505 | 63-10857-27 | 800 Ohm, Control-Rotary Single-Red Cut-Off |
| X | | R2506 | 63-10857-30 | 1K Ohm, Control-Rotary Single-Yellow |
| | X | R2506 | 63-10857-27 | 800 Ohm, Control-Rotary Single-Red Drive |
| X | | R2507 | 63-10235-76 | 1.5K Ohm, ±5%, 1/4W Film |
| | X | R2507 | 63-10235-75 | 1.3K Ohm, ±5%, 1/4W Film |
| | X | R2508 | 63-10235-93 | 7.5K Ohm, ±5%, 1/4W Film |
| X | | R2508 | 63-10235-82 | 2.7K Ohm, ±5%, 1/4W Film |
| X | | R2509 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| X | | R2510 | 63-10235-50 | 120 Ohm, ±5%, 1/4W Film |
| | X | R2510 | 63-10235-48 | 100 Ohm, ±5%, 1/4W Film |
| X | | R2511 | 63-10235-74 | 1.2K Ohm, ±5%, 1/4W Film |
| | X | R2511 | 63-10235-67 | 620 Ohm, ±5%, 1/4W Film |
| X | | R2512 | 63-10236-28 | 220K Ohm, ±5%, 1/4W Film |
| | X | R2512 | 63-10236-52 | 2.2 Meg Ohm, ±5%, 1/4W Film |
| X | X | R2513 | 63-10235-90 | 5.6K Ohm, ±5%, 1/4W Film |
| X | | R2514 | 63-10235-56 | 220 Ohm, ±5%, 1/4W Film |
| | X | R2514 | 63-10235-58 | 270 Ohm, ±5%, 1/4W Film |
| X | | R2515 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| | | R2515 | 63-10235-71 | 910 Ohm, ±5%, 1/4W Film |
| X | | R2516 | 63-10857-32 | 5K Ohm, Control-Rotary Single-Green |
| | X | R2516 | 63-10857-25 | 800 Ohm, Control-Rotary Single-Green Cut-Off |
| X | | R2517 | 63-10857-30 | 1K Ohm, Control-Rotary Single-Yellow |
| | X | R2517 | 63-10857-25 | 800 Ohm, Control-Rotary Single-Green Drive |
| X | | R2518 | 63-10235-76 | 1.5K Ohm, ±5%, 1/4W Film |

| Board 9-227 -01 | | Ref. No. | Part No. | Description |
|------------------------------|---|----------|-------------|---|
| RESISTORS (Continued) | | | | |
| X | | R2518 | 63-10235-73 | 1.1K Ohm, ±5%, 1/4W Film |
| | X | R2519 | 63-10235-93 | 7.5K Ohm, ±5%, 1/4W Film |
| | X | R2519 | 63-10235-82 | 2.7K Ohm, ±5%, 1/4W Film |
| | X | R2520 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| | X | R2521 | 63-10235-50 | 120 Ohm, ±5%, 1/4W Film |
| | X | R2521 | 63-10235-48 | 100 Ohm, ±5%, 1/4W Film |
| | X | R2522 | 63-10235-74 | 1.2K Ohm, ±5%, 1/4W Film |
| | X | R2523 | 63-10236-28 | 220K Ohm, ±5%, 1/4W Film |
| | X | R2523 | 63-10236-52 | 2.2 Meg Ohm, ±5%, 1/4W Film |
| | X | R2524 | 63-10235-90 | 5.6K Ohm, ±5%, 1/4W Film |
| | X | R2525 | 63-10235-56 | 220 Ohm, ±5%, 1/4W Film |
| | X | R2525 | 63-10235-58 | 270 Ohm, ±5%, 1/4W Film |
| | X | R2526 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| | X | R2526 | 63-10235-69 | 750 Ohm, ±5%, 1/4W Film |
| | X | R2527 | 63-10857-31 | 5K Ohm, Control-Rotary Single-Blue |
| | X | R2527 | 63-10857-26 | 800 Ohm, Control-Rotary Single-Blue Cut-Off |
| | X | R2528 | 63-10857-30 | 1K Ohm, Control-Rotary Single-Yellow |
| | X | R2528 | 63-10857-26 | 800 Ohm, Control-Rotary Single-Blue Drive |
| | X | R2529 | 63-10235-76 | 1.5K Ohm, ±5%, 1/4W Film |
| | X | R2529 | 63-10235-75 | 1.3K Ohm, ±5%, 1/4W Film |
| | X | R2530 | 63-10235-93 | 7.5K Ohm, ±5%, 1/4W Film |
| | X | R2530 | 63-10235-82 | 2.7K Ohm, ±5%, 1/4W Film |
| | X | R2531 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| | X | R2532 | 63-10235-50 | 120 Ohm, ±5%, 1/4W Film |
| | X | R2532 | 63-10235-48 | 100 Ohm, ±5%, 1/4W Film |
| | X | R2533 | 63-10235-74 | 1.2K Ohm, ±5%, 1/4W Film |
| | X | R2534 | 63-10235-52 | 150 Ohm, ±5%, 1/4W Film |
| | X | R2535 | 63-10235-52 | 150 Ohm, ±5%, 1/4W Film |
| | X | R2536 | 63-10235-52 | 150 Ohm, ±5%, 1/4W Film |
| | X | R2537 | 63-10235-52 | 150 Ohm, ±5%, 1/4W Film |
| | X | R2538 | 63-10235-56 | 220 Ohm, ±5%, 1/4W Film |
| | X | R2538 | 63-10235-48 | 100 Ohm, ±5%, 1/4W Film |
| | X | R2539 | 63-10235-56 | 220 Ohm, ±5%, 1/4W Film |
| | X | R2539 | 63-10235-48 | 100 Ohm, ±5%, 1/4W Film |
| | X | R2540 | 63-10235-56 | 220 Ohm, ±5%, 1/4W Film |
| | X | R2540 | 63-10235-48 | 100 Ohm, ±5%, 1/4W Film |
| | X | R2541 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| | X | R2542 | 63-10235-53 | 160 Ohm, ±5%, 1/4W Film |
| | X | R2543 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| | X | R2544 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| | X | R2545 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| | X | R2546 | 63-10235-53 | 160 Ohm, ±5%, 1/4W Film |
| | X | R2548 | 63-10235-67 | 620 Ohm, ±5%, 1/4W Film |
| | X | R2549 | 63-10235-67 | 620 Ohm, ±5%, 1/4W Film |
| | X | R2550 | 63-10235-32 | 22 Ohm, ±5%, 1/4W Film |
| | X | R2552 | 63-10235-32 | 22 Ohm, ±5%, 1/4W Film |
| | X | R2554 | 63-10235-32 | 22 Ohm, ±5%, 1/4W Film |
| | X | R3201 | 63-10235-59 | 300 Ohm, ±5%, 1/4W Film |
| | X | R3202 | 63-10235-44 | 68 Ohm, ±5%, 1/4W Film |
| | X | R3203 | 63-10235-52 | 150 Ohm, ±5%, 1/4W Film |
| | X | R3205 | 63-7781 | 820 Ohm, ±5%, 1/2W Carbon |
| | X | R3206 | F-11851 | 12 Ohm, ±10%, 10W Resistor & Splice Assy. |
| | X | R3206 | 63-10460-50 | 12 Ohm, ±10%, 10W Wirewound |
| | X | R3210 | 63-10420-31 | 2 Ohm, ±5%, 2W Wirewound |
| | X | R3212 | 63-10235-76 | 1.5K Ohm, ±5%, 1/4W Film |
| | X | R3213 | 63-10235-83 | 3K Ohm, ±5%, 1/4W Film |
| | X | R3213 | 63-10235-86 | 3.9K Ohm, ±5%, 1/4W Film |
| | X | R3214 | 63-10235-74 | 1.2K Ohm, ±5%, 1/4W Film |
| | X | R3215 | 63-10244-38 | 560K Ohm, ±5%, 1/2W Film |
| | X | R3215 | 63-10244-40 | 680K Ohm, ±5%, 1/2W Film |
| | X | R3216 | 63-10244-25 | 160K Ohm, ±5%, 1/2W Film |
| | X | R3217 | 63-10244-33 | 360K Ohm, ±5%, 1/2W Film |
| | X | R3218 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film |
| | X | R3219 | 63-10244-38 | 560K Ohm, ±5%, 1/2W Film |

MAIN BOARD (Continued)

| Board | | Ref. No. | Part No. | Description | Ref. No. | Part No. | Description |
|------------------------------|--------------|----------|-------------|---|------------------|-------------|-------------------------------------|
| 9-227 | 9-227 -01 | | | | | | |
| RESISTORS (Continued) | | | | | | | |
| X | X | R3222 | 63-10235-40 | 47 Ohm, ±5%, 1/4W Film | C2101 | 22-7775-10A | 0.0068 MF, 100V ±20% Polyester |
| X | X | R3231 | 63-9982 | 1 Ohm, ±10%, 2W Wirewound | C2102 | 22-7775-24A | 0.1 MF, 100V ±20% Polyester |
| X | X | R3233 | 63-10565-14 | 3.9 Ohm, ±5%, 1/2W Film | C2103 | 22-7709-09C | 100 MF, 35V +50%-10% Electrolytic |
| X | X | R3234 | 63-10565-14 | 3.9 Ohm, ±5%, 1/2W Film | C2104 | 22-7613-24D | 0.01 MF, 50V ±10% Disc |
| X | X | R3239 | 63-10244-20 | 100K Ohm, ±5%, 1/2W Film | C2105 | 22-7390-02 | 0.47 MF, 50V ±20% Electrolytic |
| X | X | R3241 | 63-8246 | 4 Ohm, 10W Wirewound | C2106 | 22-7710-07C | 33 MF, 50V +50%-10% Electrolytic |
| X | X | R3244 | 63-10840-40 | 47 Ohm, ±5%, 3W Film, Tin Oxide | C2107 | 22-7615-03D | 0.0033 MF, 50V +80%-10% Disc |
| X | X | R3245 | 63-10710A | Thermistor | C2110 | 22-7742-10 | 0.001 MF, 50V ±10% Polyester |
| X | X | RX3246 | 63-10657-03 | 1.2 Meg Ohm, ±20%, 1/2W Carbon | C2111 | 22-7774-17A | 0.027 MF, 100V ±10% Polyester |
| | X | R3260 | 63-10243-96 | 10K Ohm, ±5%, 1/2W Film | C2176 | 22-7725 | 680 MF, 50V +100%-10% Electrolytic |
| | X | R3261 | 63-10244-24 | 150K Ohm, ±5%, 1/4W Film | C2501 | 22-7621-42C | 220 PF, 50V ±5% Disc |
| | X | R3262 | 63-10235-68 | 680 Ohm, ±5%, 1/4W Film | C2502 | 22-7621-42C | 220 PF, 50V ±5% Disc |
| X | X | R3401 | 63-10236-46 | 1.2 Meg Ohm, ±5%, 1/4W Film | C2503 | 22-7621-42C | 220 PF, 50V ±5% Disc |
| X | X | R3402 | 63-10236-22 | 120K Ohm, ±5%, 1/4W Film | C3201 | 22-7775-24A | 0.1 MF, 100V ±20% Polyester |
| X | X | R3403 | 63-10235-86 | 3.9K Ohm, ±5%, 1/4W Film | C3204 | 22-7603 | 4.7 MF, 315V +100%-10% Electrolytic |
| X | X | R3404 | 63-10235-86 | 3.9K Ohm, ±5%, 1/4W Film | C3205 | 22-3512 | 0.01 MF, 1KV +40%-20% Disc |
| X | X | R3405 | 63-10236-08 | 33K Ohm, ±5%, 1/4W Film | C3206 | 22-7603-01A | 10 MF, 315V +100%-10% Electrolytic |
| X | X | R3406 | 63-10235-68 | 680 Ohm, ±5%, 1/4W Film | C3207 | 22-7742-10 | 0.001 MF, 50V ±10% Axial |
| X | X | R3407 | 63-10236-18 | 82K Ohm, ±5%, 1/4W Film | C3208 | 22-7742-10 | 0.001 MF, 50V ±10% Axial |
| X | X | R3408 | 63-10236-04 | 22K Ohm, ±5%, 1/4W Film | C3209 | 22-7395 | 470 PF, 500V ±5% Disc |
| X | X | R3409 | 63-10857-17 | 100K Ohm, Control-Rotary Single-Green | C3234 | 22-7395 | 470 PF, 500V ±5% Disc |
| X | X | R3410 | 63-10236-31 | 300K Ohm, ±5%, 1/4W Film | C3236 | 22-7861-14 | 2200 MF, 35V ±20% Electrolytic |
| X | X | R3411 | 63-10236-03 | 20K Ohm, ±5%, 1/4W Film | C3246 | 22-7603-01A | 10 MF, 315V +100%-10% Electrolytic |
| X | X | R3412 | 63-10236-13 | 51K Ohm, ±5%, 1/4W Film | C3247 | 22-7860-12 | 470 MF, 25V ±20% Electrolytic |
| X | X | R3413 | 63-10236-07 | 30K Ohm, ±5%, 1/4W Film | C3249 | 22-7431-06 | 0.0047 MF, ±20% Disc |
| X | X | R3414 | 63-10235-98 | 12K Ohm, ±5%, 1/4W Film | CX3250 | 22-7431-06 | 0.0047 MF, ±20% Disc |
| X | X | R3415 | 63-10236-02 | 18K Ohm, ±5%, 1/4W Film | C3251 | 22-7811 | 0.001 MF, 1KV ±10% Disc |
| X | X | R3417 | 63-10243-60 | 330 Ohm, ±5%, 1/2W Film | C3252 | 22-7811 | 0.001 MF, 1KV ±10% Disc |
| X | X | R3418 | 63-10857-08 | 2K Ohm, Control-Rotary Single-Yellow | C3253 | 22-7811 | 0.001 MF, 1KV ±10% Disc |
| X | X | R3419 | 63-10235-84 | 3.3K Ohm, ±5%, 1/4W Film | C3254 | 22-7404-06 | 22 MF, 16V ±20% Electrolytic |
| X | X | R3420 | 63-10236-10 | 39K Ohm, ±5%, 1/4W Film | C3256 | 22-7508-05B | 2200 MF, 35V +50%-10% Electrolytic |
| X | X | R3421 | 63-10235-73 | 1.1K Ohm, ±5%, 1/4W Film | C3257 | 22-7395 | 470 PF, 500V ±5% Disc |
| X | X | R3422 | 63-10243-60 | 330 Ohm, ±5%, 1/2W Film | C3401 | 22-7613-24D | 0.01 MF, 50V ±10% Disc |
| X | X | R3423 | 63-10243-60 | 330 Ohm, ±5%, 1/2W Film | C3402 | 22-7406-01 | 1.0 MF, 35V ±20% Electrolytic |
| X | X | R3424 | 63-10235-72 | 1K Ohm, ±5%, 1/4W Film | C3403 | 22-7773-18A | 0.033 MF, 100V ±5% Polyester |
| X | X | R3425 | 63-10235-88 | 4.7K Ohm, ±5%, 1/4W Film | C3404 | 22-7773-17A | 0.027 MF, 100V ±5% Polyester |
| X | X | R3428 | 63-10235-82 | 2.7K Ohm, ±5%, 1/4W Film | C3405 | 22-7775-10A | 0.0068 MF, 100V ±20% Polyester |
| X | X | R3429 | 63-10235-76 | 1.5K Ohm, ±5%, 1/4W Film | C3407 | 22-7710-01A | 1.0 MF, 50V +50%-10% Electrolytic |
| X | X | R3431 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film | C3409 | 22-7709-09C | 100 MF, 35V +100%-10% Electrolytic |
| X | X | R3432 | 63-10235-55 | 200 Ohm, ±5%, 1/4W Film | C3410 | 22-7404-06A | 22 MF, 16V ±20% Electrolytic NP |
| X | X | R3432 | 63-10235-79 | 2K Ohm, ±5%, 1/4W Film | C3411 | 22-7708-09 | 100 MF, 25V +50%-10% Electrolytic |
| X | X | R3433 | 63-10236-20 | 100K Ohm, ±5%, 1/4W Film | C3412 | 22-7710-01C | 1.0 MF, 50V +50%-10% Electrolytic |
| X | X | R3434 | 63-10236-22 | 120K Ohm, ±5%, 1/4W Film | C3413 | 22-7562-32 | 0.47 MF, 100V ±5% Polyester |
| X | X | R3435 | 63-10235-63 | 430 Ohm, ±5%, 1/4W Film | C3414 | 22-7774-16A | 0.022 MF, 100V ±10% Polyester |
| X | X | R3436 | 63-10235-72 | 1K Ohm, ±5%, 1/4W Film | C3419 | 22-7751-39 | 180 PF, 50V ±5% Axial |
| X | X | R3439 | 63-10243-79 | 2K Ohm, ±5%, 1/2W Film | C3420 | 22-7710-01C | 1.0 MF, 50V +50%-10% Electrolytic |
| X | X | R3440 | 63-10235-86 | 3.9K Ohm, ±5%, 1/4W Film | C3421 | 22-7773-18B | 0.033 MF, 100V ±5% Polyester |
| X | | R3441 | 63-10857 | 100 Ohm, Control-Rotary Single-Horizontal Center | C3422 | 22-7613-24D | 0.01 MF, 50V ±10% Disc |
| | X | R3441 | 63-10857-02 | 250 Ohm, Control-Rotary Single-Horizontal Center | C3423 | 22-7613-08D | 470 PF, 50V ±10% Disc |
| X | X | R3442 | 63-10235-86 | 3.9K Ohm, ±5%, 1/4W Film | C3424 | 22-7742-05 | 390 PF, 50V ±10% Axial |
| X | X | R3443 | 63-10235-65 | 510 Ohm, ±5%, 1/4W Film | C3425 | 22-7742-10 | 0.001 MF, 50V ±10% Axial |
| X | X | R3443 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film | C3426 | 22-7742-10 | 0.01 MF, 50V ±10% Axial |
| X | X | R3444 | 63-10235-60 | 330 Ohm, ±5%, 1/4W Film | C3427 | 22-7647-35C | 150 PF, ±10% Axial |
| X | X | R3445 | 63-10235-80 | 2.2K Ohm, ±5%, 1/4W Film | C3428 | 22-7774-12 | 0.01 MF, 100V ±10% Polyester |
| X | X | R3446 | 63-10235-72 | 1K Ohm, ±5%, 1/4W Film | C3428 | 22-7774-20A | 0.047 MF, 100V ±10% Polyester |
| X | X | R3449 | 63-10235-76 | 1.5K Ohm, ±5%, 1/4W Film | (on 01 version) | | |
| X | X | R3451 | 63-10235-88 | 4.7K Ohm, ±5%, 1/4W Film | C3429 | 22-7405-04 | 4.7 MF, 25V ±20% Electrolytic NP |
| X | X | R3452 | 63-10235-92 | 6.8K Ohm, ±5%, 1/4W Film | C3429 | 22-7406 | 0.47 MF, 35V ±20% Electrolytic NP |
| X | X | R3453 | 63-10235-75 | 1.3K Ohm, ±5%, 1/4W Film | (on -01 version) | | |
| X | X | R3461 | 63-10236 | 15K Ohm, ±5%, 1/4W Film | C3430 | 22-7613-24D | 0.01 MF, 50V ±10% Disc |
| X | X | R3462 | 63-10236-13 | 51K Ohm, ±5%, 1/4W Film | C3431 | 22-7774-16A | 0.022 MF, 100V ±10% Polyester |
| CAPACITORS | | | | | | | |
| | | | | | C3434 | 22-7742-06 | 470 PF, 50V ±10% Axial |
| | | | | | C3436 | 22-7613-24C | 0.01 MF, 100V ±10% Disc |
| | | | | | C3450 | 22-7739-29A | 0.27 MF, 100V ±10% Polyester |
| | | | | | C3450 | 22-7619-41C | 200 PF, 50V ±5% Disc |
| | | | | | (on -01 version) | | |
| | | | | | C3461 | 22-7710-01C | 1.0 MF, 50V +50%-10% Electrolytic |
| | | | | | C3462 | 22-7710-01C | 1.0 MF, 50V +50%-10% Electrolytic |
| | | | | | C3462 | 22-7739-09 | 0.0056 MF, 100V ±10% Polyester |
| | | | | | (on -01 version) | | |
| | | | | | C3463 | 22-7508 | 47 MF, 35V ±20% Electrolytic |

MAIN BOARD (Continued)

| Ref. No. | Part No. | Description |
|----------|----------|-------------|
|----------|----------|-------------|

SEMICONDUCTORS

| | | |
|-----------------|-------------|----------------------------------|
| CR2104 | 103-142-01 | Diode, Low Voltage |
| CR2105 | 103-254-01 | Diode, Low Voltage |
| CR2106 | 103-254-01 | Diode, Low Voltage |
| CR2107 | 103-254-01 | Diode, Low Voltage |
| CR2501 | 103-142-01 | Diode, Low Voltage |
| CR2502 | 103-142-01 | Diode, Low Voltage |
| CR2503 | 103-142-01 | Diode, Low Voltage |
| CR3202 | 103-330A | Diode, Low Voltage |
| CR3205 | 103-303-01 | Diode, Zener 10V 1W |
| CR3206 | 103-254-01 | Diode, Low Voltage |
| CR3208 | 103-326A | Diode, Low Voltage |
| CR3210 | 103-254-01 | Diode, Low Voltage |
| CR3211 | 103-254-01 | Diode, Low Voltage |
| CR3214 | 103-284-A | Diode, Low Voltage |
| CR3217 | 103-326A | Diode, Low Voltage |
| CR3219 | 103-330A | Diode, Low Voltage |
| CR3223 | 103-330A | Diode, Low Voltage |
| CR3224 | 103-330A | Diode, Low Voltage |
| CR3231 | 103-315-06A | Diode |
| CR3232 | 103-315-06A | Diode |
| CR3233 | 103-315-06A | Diode |
| CR3234 | 103-315-06A | Diode |
| CR3235 | 103-284A | Diode, Low Voltage |
| CR3401 | 103-142-01 | Diode, Low Voltage |
| CR3404 | 103-143-01 | Diode, Low Voltage |
| CR3405 | 103-142-01 | Diode, Low Voltage |
| CR3406 | 103-142-01 | Diode, Low Voltage |
| CR3408 | 103-279-14 | Diode, Zener 6.8V 1/2W |
| Q2101 | F-10896 | Transistor & Heat Sink Assy |
| Q2102 | F-10896 | Transistor & Heat Sink Assy |
| Q2103 | 121-975 | Transistor NPN |
| Q2104 | 121-1064 | Transistor PNP |
| Q2501 | 121-1019 | Transistor PNP |
| Q2502 | 121-895 | Transistor NPN |
| Q2502 | 121-551 | Transistor NPN |
| (on-01 version) | | |
| Q2503 | 121-1019 | Transistor PNP |
| Q2504 | 121-895 | Transistor NPN |
| Q2504 | 121-551 | Transistor NPN |
| (on-01 version) | | |
| Q2505 | 121-1019 | Transistor PNP |
| Q2506 | 121-895 | Transistor NPN |
| Q2506 | 121-551 | Transistor NPN |
| (on-01 version) | | |
| Q2507 | 121-1019 | Transistor |
| Q2508 | 121-1019 | Transistor |
| Q2509 | 121-1019 | Transistor |
| Q3200 | F-12737 | Transistor & Heat Sink Assy. |
| Q3201 | 121-499-01 | Transistor NPN Regular Feed Back |
| Q3202 | 121-1034 | Transistor NPN |
| Q3203 | 121-1059 | Transistor PNP |
| Q3401 | 121-895 | Transistor NPN |
| Q3402 | 121-986 | Transistor PNP |
| Q3403 | 121-985 | Transistor NPN |
| Q3404 | 121-895 | Transistor NPN |
| Q3405 | 121-895 | Transistor NPN |

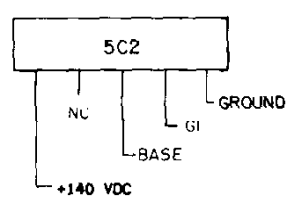
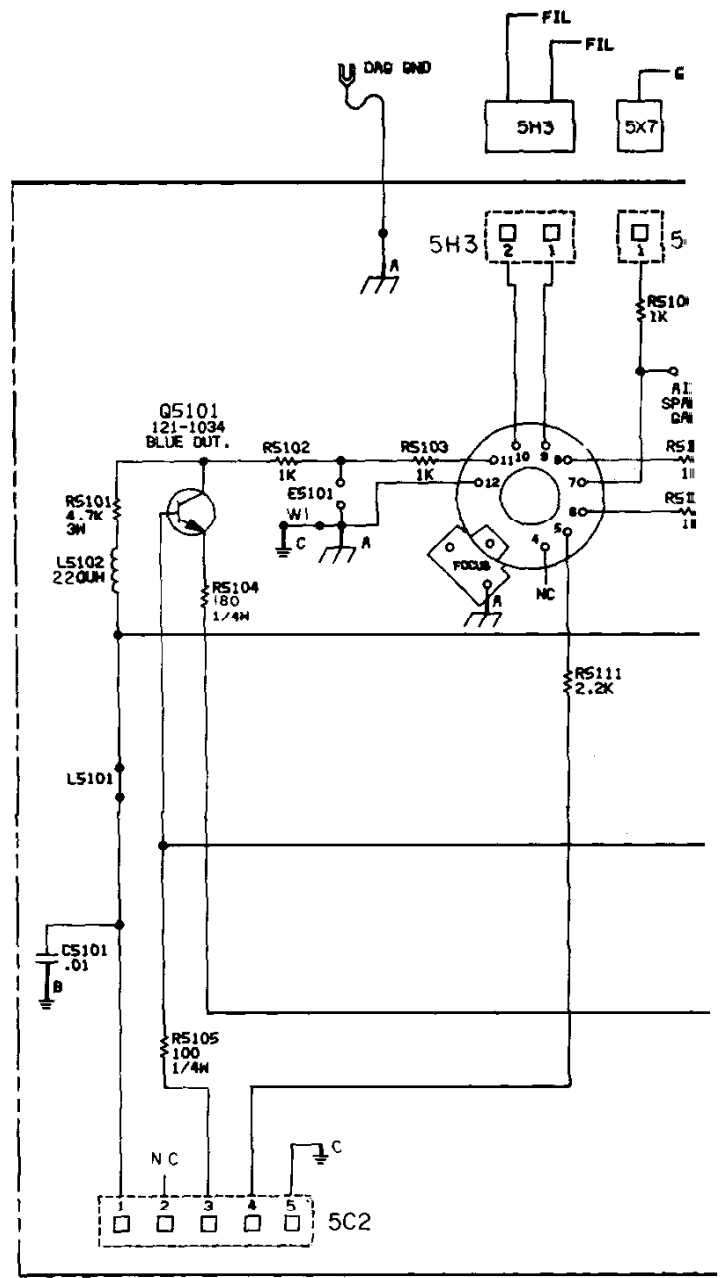
TRANSFORMERS & COILS

| | | |
|-----------------|------------|-------------------------|
| L2502 | 20-3887-01 | Coil Peaking 1.2 UH |
| L2503 | 20-3887-01 | Coil Peaking 1.2 UH |
| L2504 | 20-3887-01 | Coil Peaking 1.2 UH |
| I 3201 | 20-2021 | Coil Peaking 100 UH |
| LX3202 | 95-3501-01 | Transformer Choke 60 UH |
| L3401 | 20-3831 | Coil Peaking 663 UH |
| L3402 | 20-3998 | Coil Peaking 39 UH |
| L3402 | 20-4026 | Coil Turnable 39 UH |
| (on-01 version) | | |

ZENITH MONITOR — CRT SOCKET BOARD REPLACEMENT PARTS LIST

CRT SOCKET (9-155-10)

| Ref. No. | Part No. | Description |
|---------------------------------|-------------|-----------------------------------|
| CAPACITORS | | |
| C5101 | 22-4671 | 0.01 MF, 1.5KV, +80%—20% Disc |
| C5102 | 22-3512 | 0.01 MF, 1KV, +40%—10% Disc |
| TRANSFORMERS & COILS | | |
| L5102 | 20-3887-28E | 220 MH Peaking |
| L5103 | 20-3887-28E | 220 MH Peaking |
| L5104 | 20-3887-28E | 220 MH Peaking |
| SEMICONDUCTORS | | |
| Q5101 | F7510 | Transistor, NPN, Video Out, Blue |
| Q5102 | F7510 | Transistor, NPN, Video Out, Red |
| Q5103 | F7510 | Transistor, NPN, Video Out, Green |
| RESISTORS | | |
| R5101 | 63-10840-88 | 4.7K Ohm, ±5%, 3W Film |
| R5102 | 63-7785 | 1K Ohm, ±10%, 1/2W Carbon |
| R5103 | 63-7785 | 1K Ohm, ±10%, 1/2W Carbon |
| R5104 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| R5105 | 63-10235-48 | 100 Ohm, ±5%, 1/4W Film |
| R5106 | 63-7785 | 1K Ohm, ±10%, 1/2W Carbon |
| R5107 | 63-7785 | 1K Ohm, ±10%, 1/2W Carbon |
| R5108 | 63-7785 | 1K Ohm, ±10%, 1/2W Carbon |
| R5109 | 63-7785 | 1K Ohm, ±10%, 1/2W Carbon |
| R5110 | 63-7785 | 1K Ohm, ±10%, 1/2W Carbon |
| R5111 | 63-7799 | 2.2K Ohm, ±10%, 1/2W Carbon |
| R5112 | 63-10840-88 | 4.7K Ohm, ±5%, 3W Carbon |
| R5113 | 63-10840-88 | 4.7K Ohm, ±5%, 3W Carbon |
| R5114 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| R5115 | 63-10235-54 | 180 Ohm, ±5%, 1/4W Film |
| MISCELLANEOUS | | |
| 5A2 | 86-799 | Stake Connector 4/.156 |
| 5C2 | 86-799 | Stake Connector 4/.156 |
| 5H3 | 86-799 | Stake Connector 2/.156 |
| 5X7 | 86-799 | Stake Connector 1/.312 |
| | A-10008 | CRT Socket |



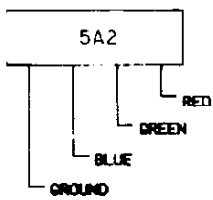
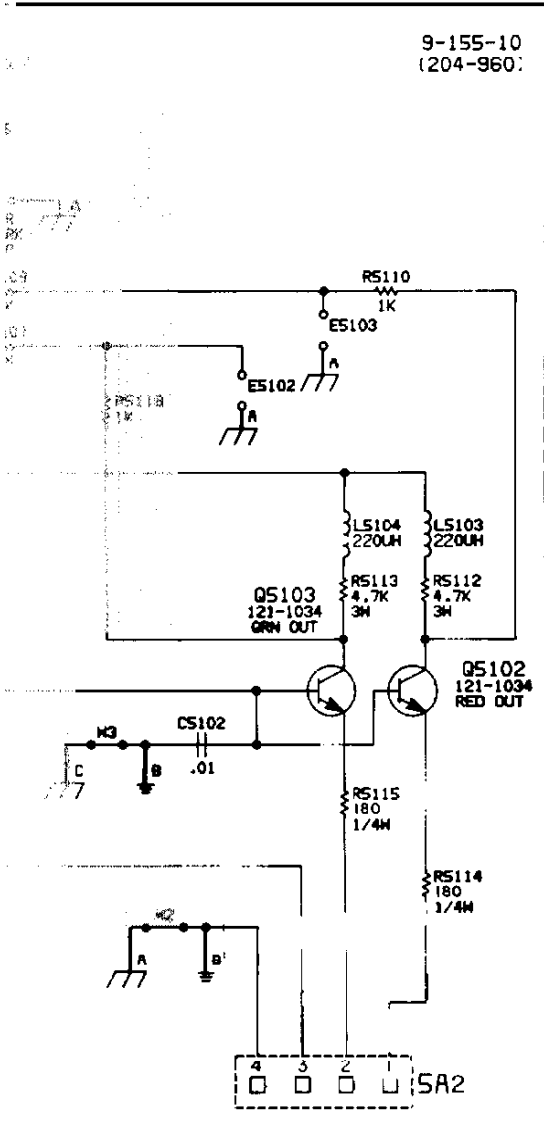
.156 CENTERS

NOTE:
1. ALL RESISTORS ARE 1/2WATT UNLESS SPECIFIED.

NOTES: (USED WITH CIRCUIT REFERENCE)
A. P/L = SEE PARTS LIST FOR APPLIC.
B. —●—●— = JUMPER WIRE USED INST.
C. —●—●— = PROVISION ON PRINTED



9-155-10
(204-960)

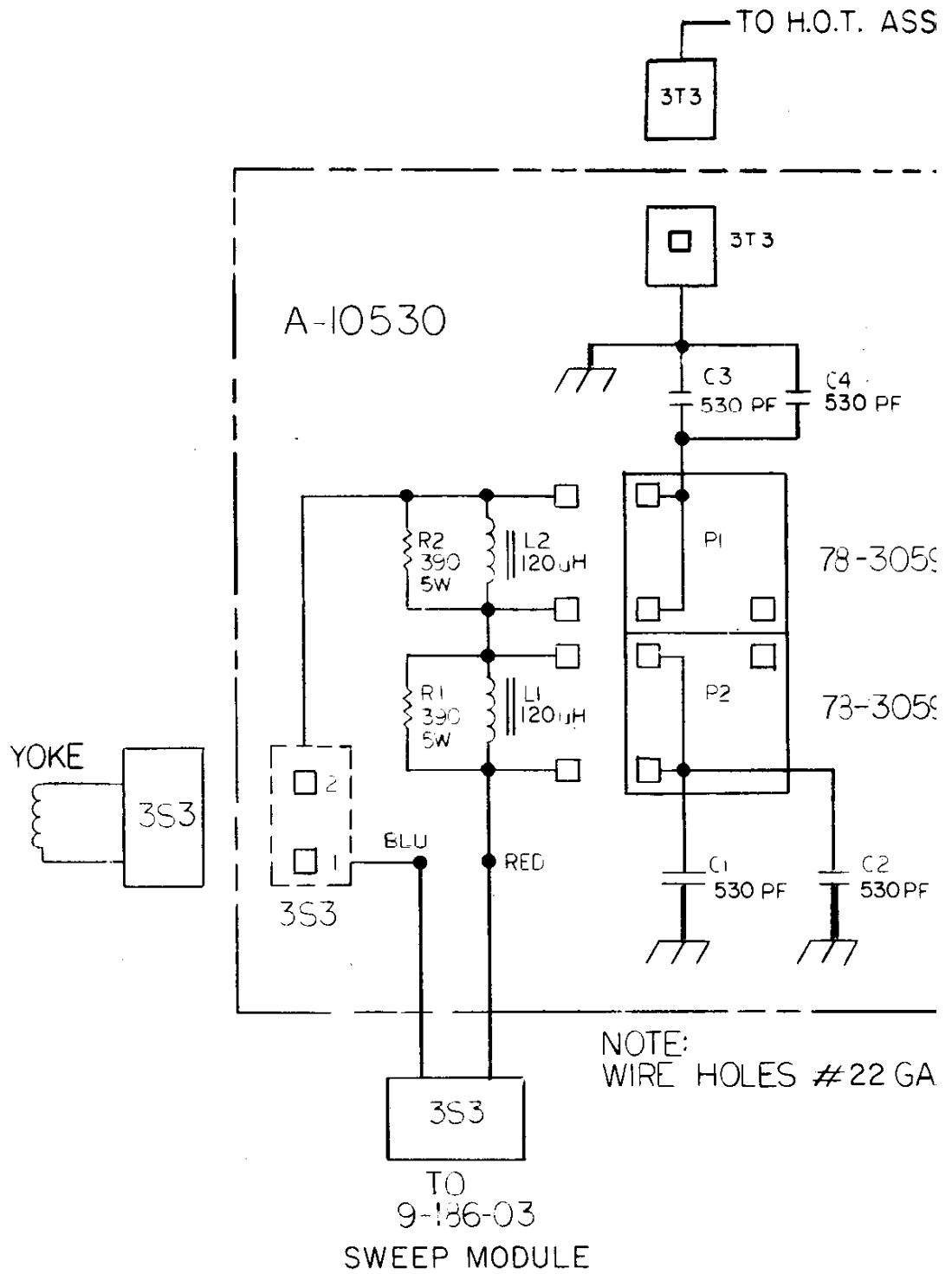


SEE OTHERWISE

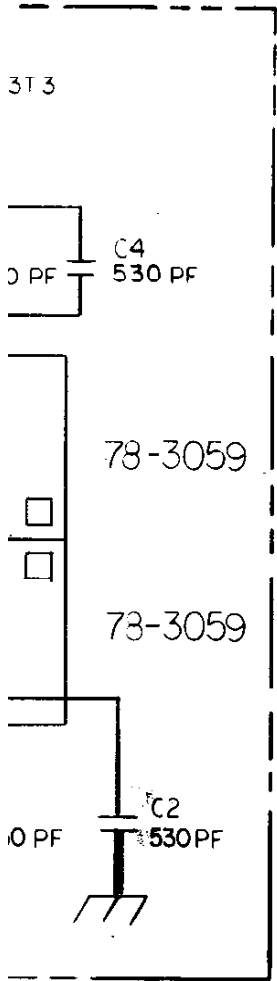
M051-00087-A022

REPLACE DESIGNATORS)
SLICABLE USAGE.
INSTEAD,
TED CIRCUIT BOARD.

| | | |
|-------------------|--------|--|
| SCHEMATIC FOR | | |
| 9-155-10 | | |
| RGB COLOR MONITOR | | |
| CRT SOCKET BOARD | | |
| ZENITH | 155-10 | |
| RADIO CORP. | | |
| CHICAGO, ILL. | | |



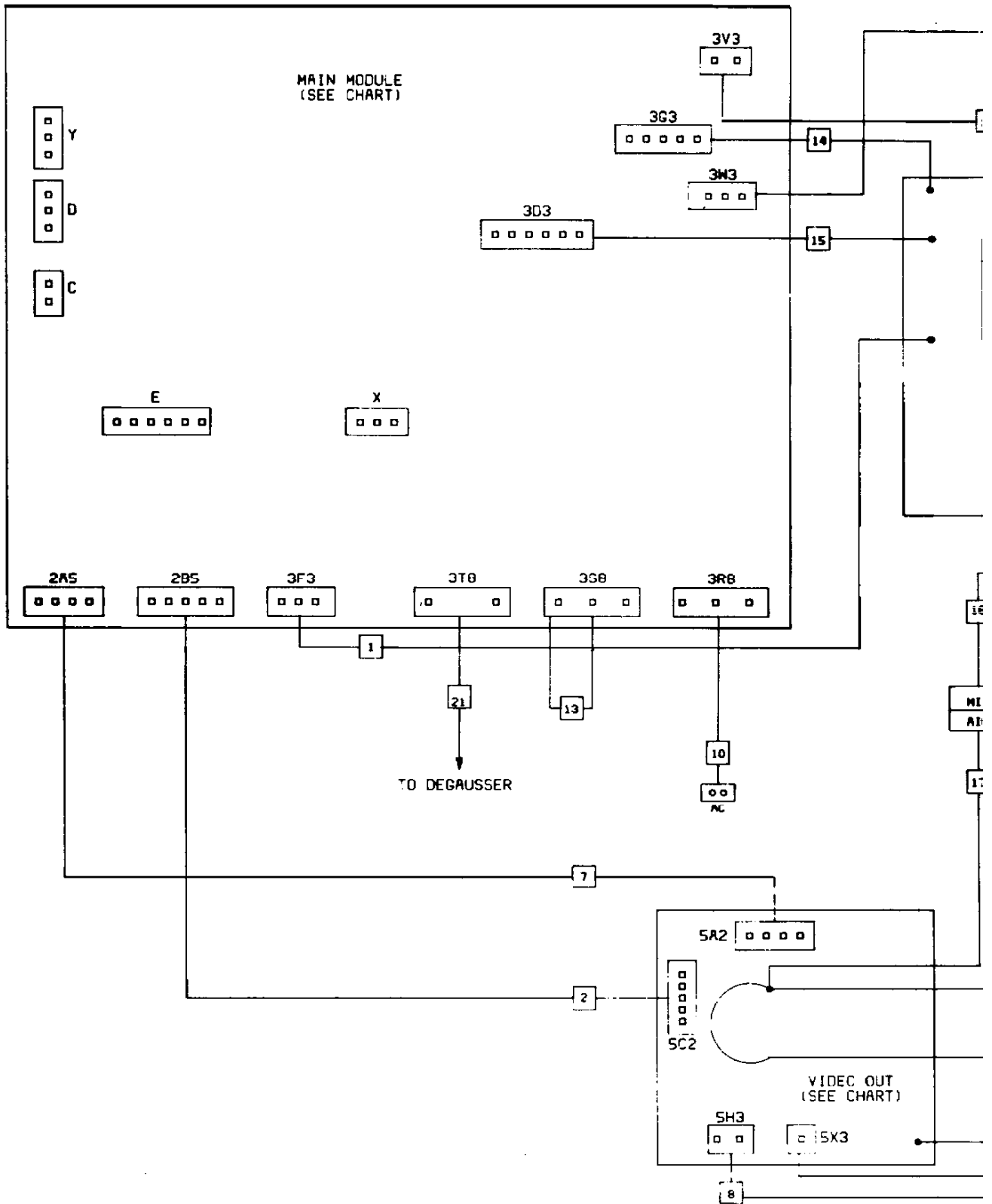
·TO H.O.T. ASSY

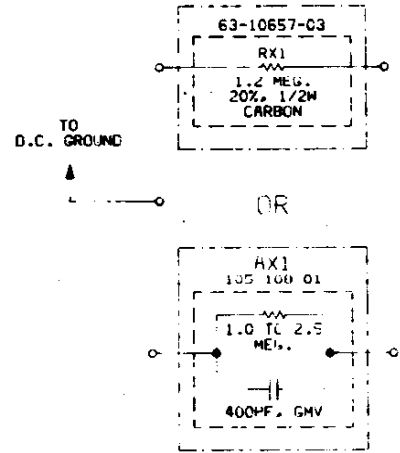
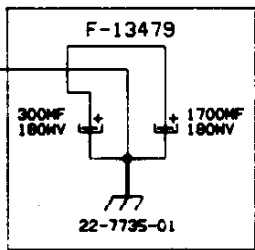
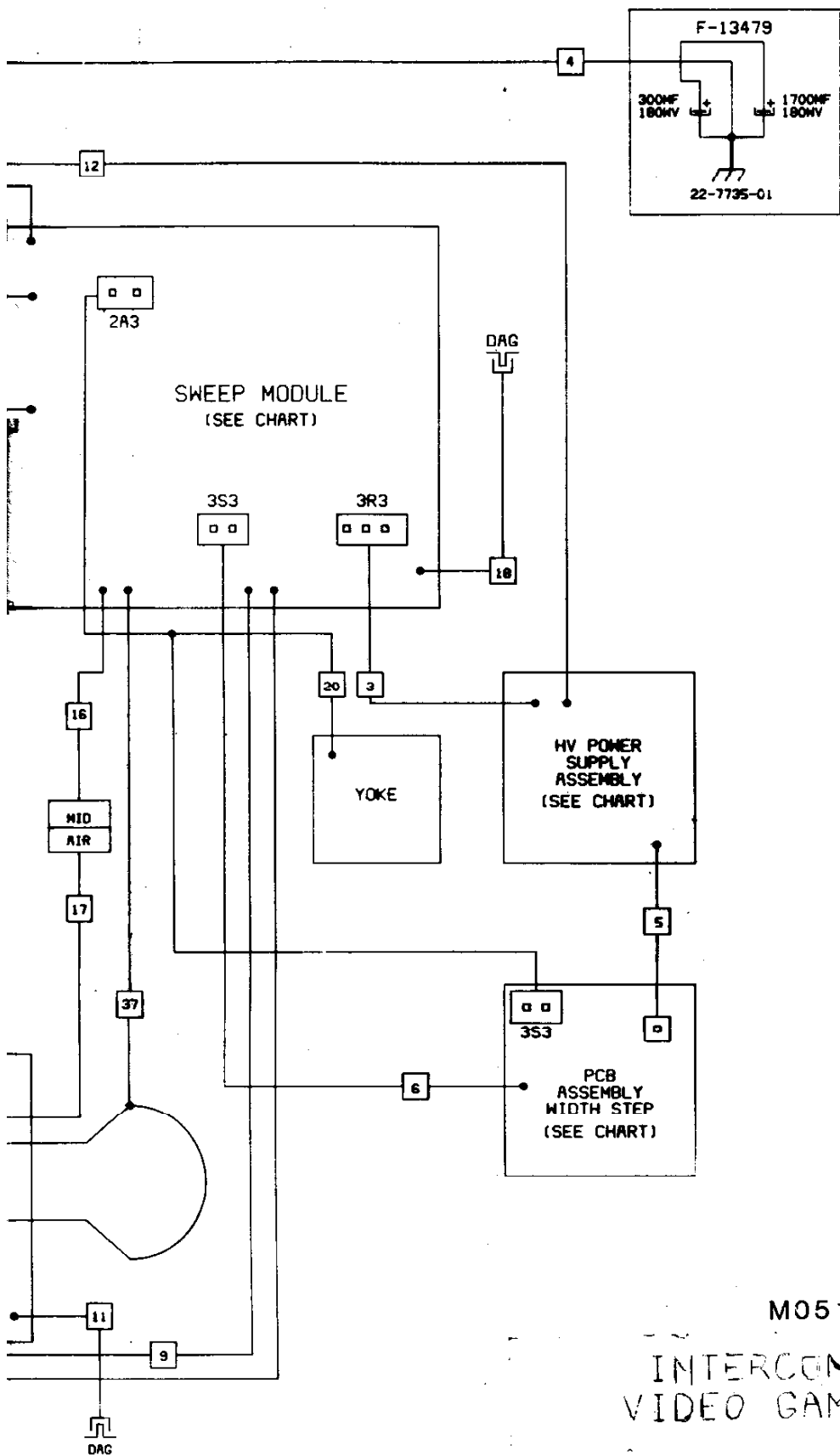


LES #22 GA.

M051-00087-A023

| | | |
|--|------------|---------|
| SCHEMATIC FOR A-10530 WIDTH STEP ASSY. | | |
| ZENITH RADIO CORP. CHICAGO, ILL. | ISSUE B | A-10530 |





IMPORTANT SAFETY NOTICE

WHEN SERVICING THIS CHASSIS, UNDER NO CIRCUMSTANCES SHOULD THE ORIGINAL DESIGN BE MODIFIED OR ALTERED WITHOUT PERMISSION FROM THE ZENITH RADIO CORPORATION. ALL COMPONENTS SHOULD BE REPLACED ONLY WITH TYPES IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT, AND THEIR PHYSICAL LOCATION, WIRING AND LEAD DRESS MUST CONFORM TO ORIGINAL LAYOUT UPON COMPLETION OF REPAIRS.

SPECIAL CIRCUITS ARE ALSO USED TO PREVENT SHOCK AND FIRE HAZARD. THESE AREAS ARE SHADED ON THE SCHEMATIC FOR EASY IDENTIFICATION. THE LETTER "X" INCLUDED IN THE ITEM NUMBER DESIGNATES SPECIAL FAILURE COMPONENTS IN THESE AREAS WHICH ARE REQUIRED TO MAINTAIN SAFE PERFORMANCE. NO DEVIATIONS ARE ALLOWED WITHOUT PRIOR APPROVAL BY THE PRODUCT SAFETY ENGINEERING DEPARTMENT.

THIS CIRCUIT DIAGRAM MAY OCCASIONALLY DIFFER FROM THE ACTUAL CIRCUIT USED. THIS MAY BE IMPLEMENTATION OF THE LATEST SAFETY AND PERFORMANCE IMPROVEMENT CHANGES INTO THE SET IS NOT DELAYED UNTIL THE NEW SERVICE LITERATURE IS PRINTED.

M051-00087-A025

INTERCONNECT FOR VIDEO GAME MONITOR

ZENITH
RADIO CORP.
CHICAGO, ILL.

ISSUE

24-78

VII. Coin Door Maintenance

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

Metal mechanisms only:
COIN MECHANISMS, INC.
817 Industrial Drive
Elmhurst, IL 60126
Phone (312) 279-9150

Metal and Plastic mechanisms:
COINCO COIN ACCEPTORS, INC.
860 Eagle Drive
Bensenville, IL 60106
Phone (312) 766-6781

COIN DOOR MAINTENANCE

METAL COIN ACCEPTOR MECHANISMS

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

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

3. Remove the coin acceptor mechanism as shown in Figure 5-1.

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

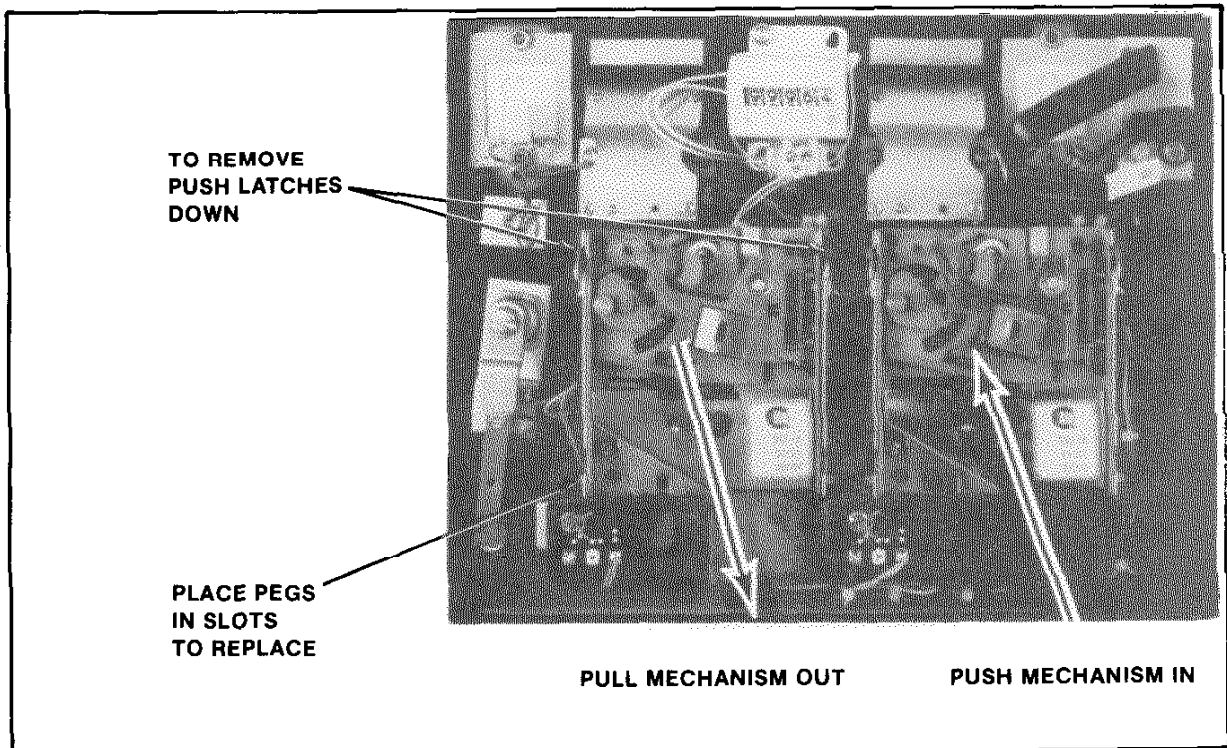


Figure 5-1 Removing and Replacing the Coin Acceptor

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

CAUTION: BE CAREFUL NOT TO BURN YOURSELF.

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

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

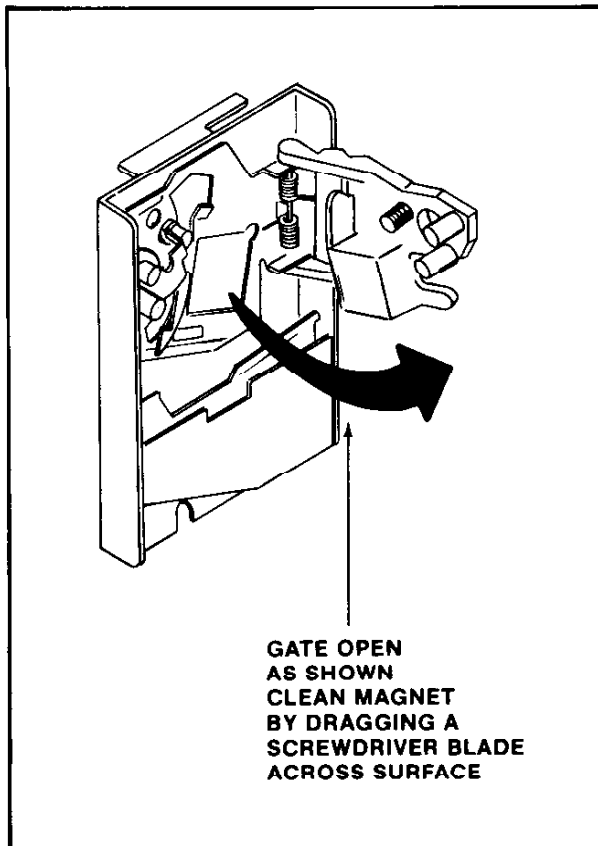


Figure 5-2 Cleaning the Metal Coin Acceptor

7. To lubricate the coin acceptor:
 - Use **ONLY** powdered graphite and put it **ONLY** on the moving parts of the coin acceptor. These parts are called out in Figure 5-3.
 - Be extremely careful to keep the powdered graphite away from paths that are traveled by the coins.

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

8. Check the coin chute for obstructions such as: paper, gum, etc.
9. Reinstall the coin acceptor to the coin door. See Figure 5-1.
 - Place the two pegs at the coin acceptor's base into their retaining slots.
 - Now push the top of the coin acceptor toward the coin door until it snaps in place and is held there by the two spring loaded latches.
10. Close and lock the coin door.

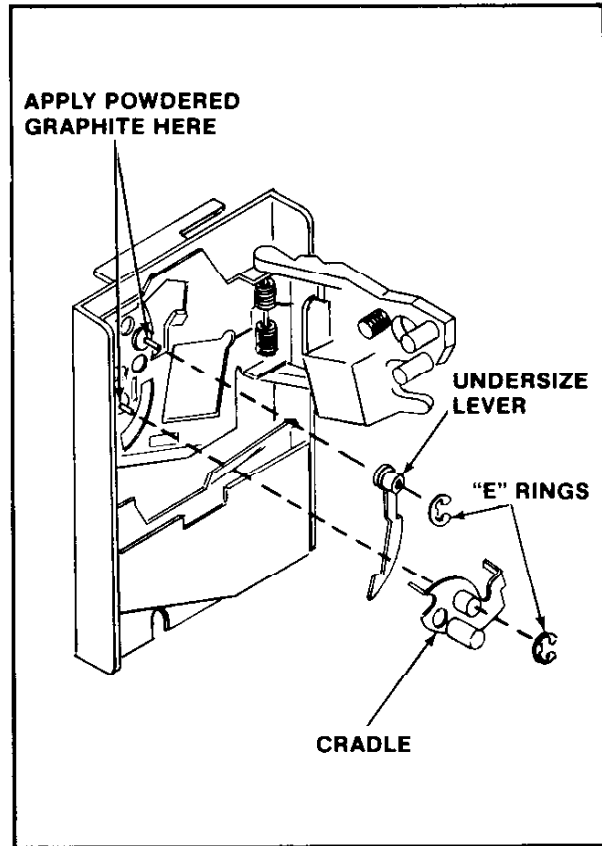


Figure 5-3 Lubricating the Metal Coin Acceptor

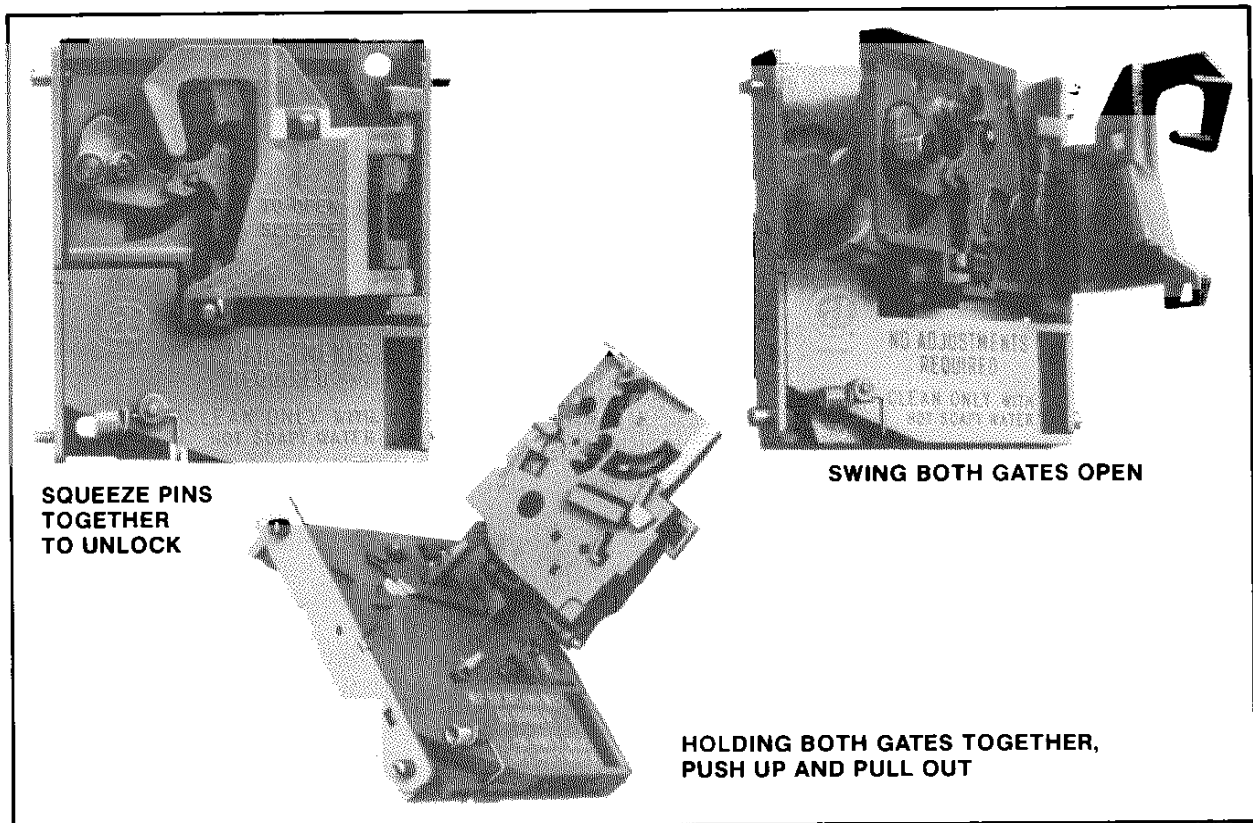


Figure 5-4 Opening the Plastic Coin Acceptor

PLASTIC COIN ACCEPTOR MECHANISMS

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

1. **Make sure the power to the game is off.**
2. Unlock and open the coin door.
3. Remove the coin acceptor mechanism(s) as shown in Figure 5-1.
 - Push down on the two spring loaded latches.
 - While holding the latches down, pull the top of the acceptor mechanism toward you.
 - Release the latches and lift out the mechanism.
4. Squeeze the two pins indicated in Figure 5-4 together to open the mechanism and break it down into its three basic parts.
 - Clean the mechanism in hot soapy water. It never rusts.
 - Rinse the mechanism in clean hot water and allow it to dry.
 - Reassemble the mechanism (it never needs lubrication).
5. Check the coin chute for obstructions such as: paper, gum, etc.
6. Reinstall the coin acceptor to the coin door. See Figure 5-5.
 - Place the two pegs at the coin acceptor's base into their retaining slots.
 - Now push the top of the coin acceptor toward the coin door until it snaps in place and is held there by the two spring loaded latches.
7. Close and lock the coin door.

NOTE: See Figure 5-6 for instructions on how to set the plastic coin acceptor mechanisms to either accept or reject Canadian quarters.

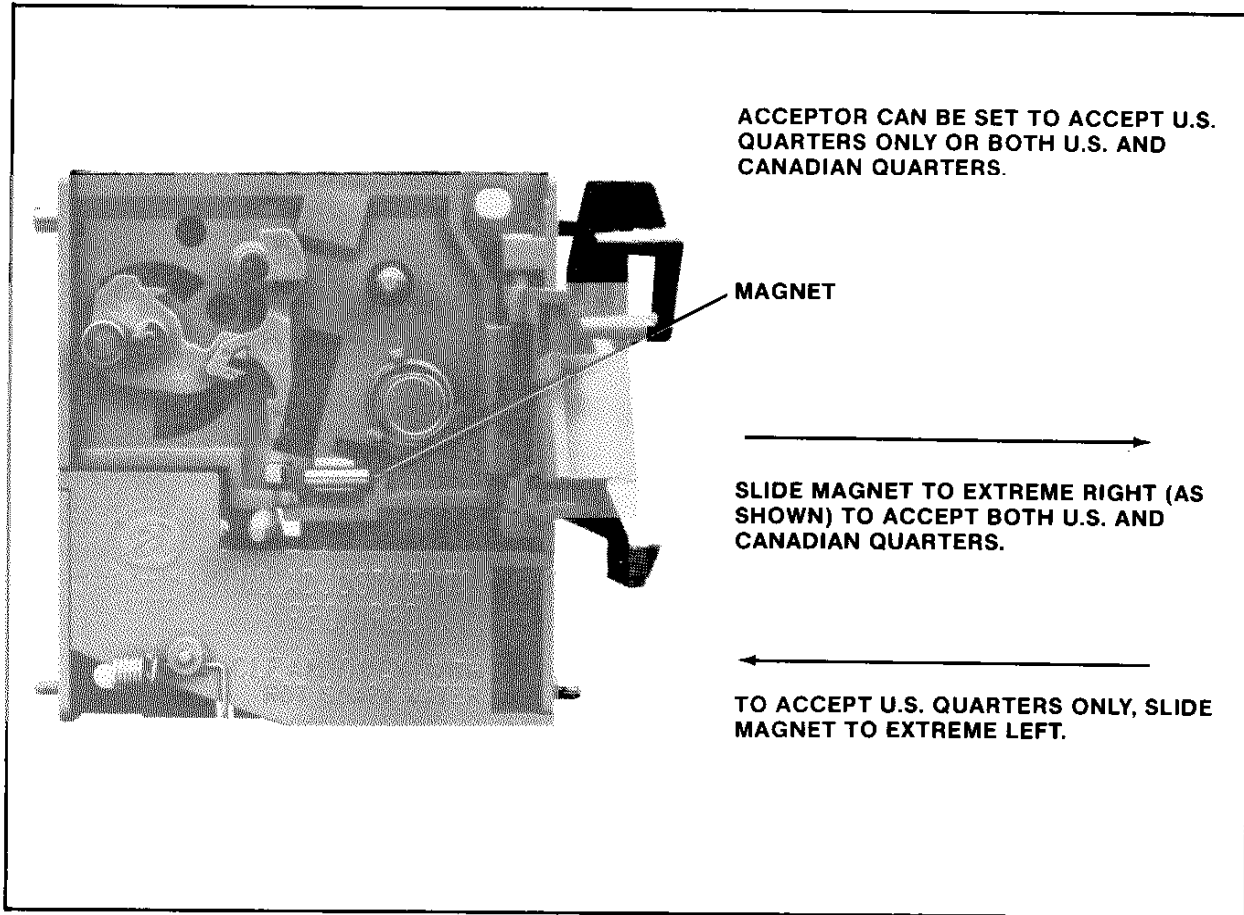
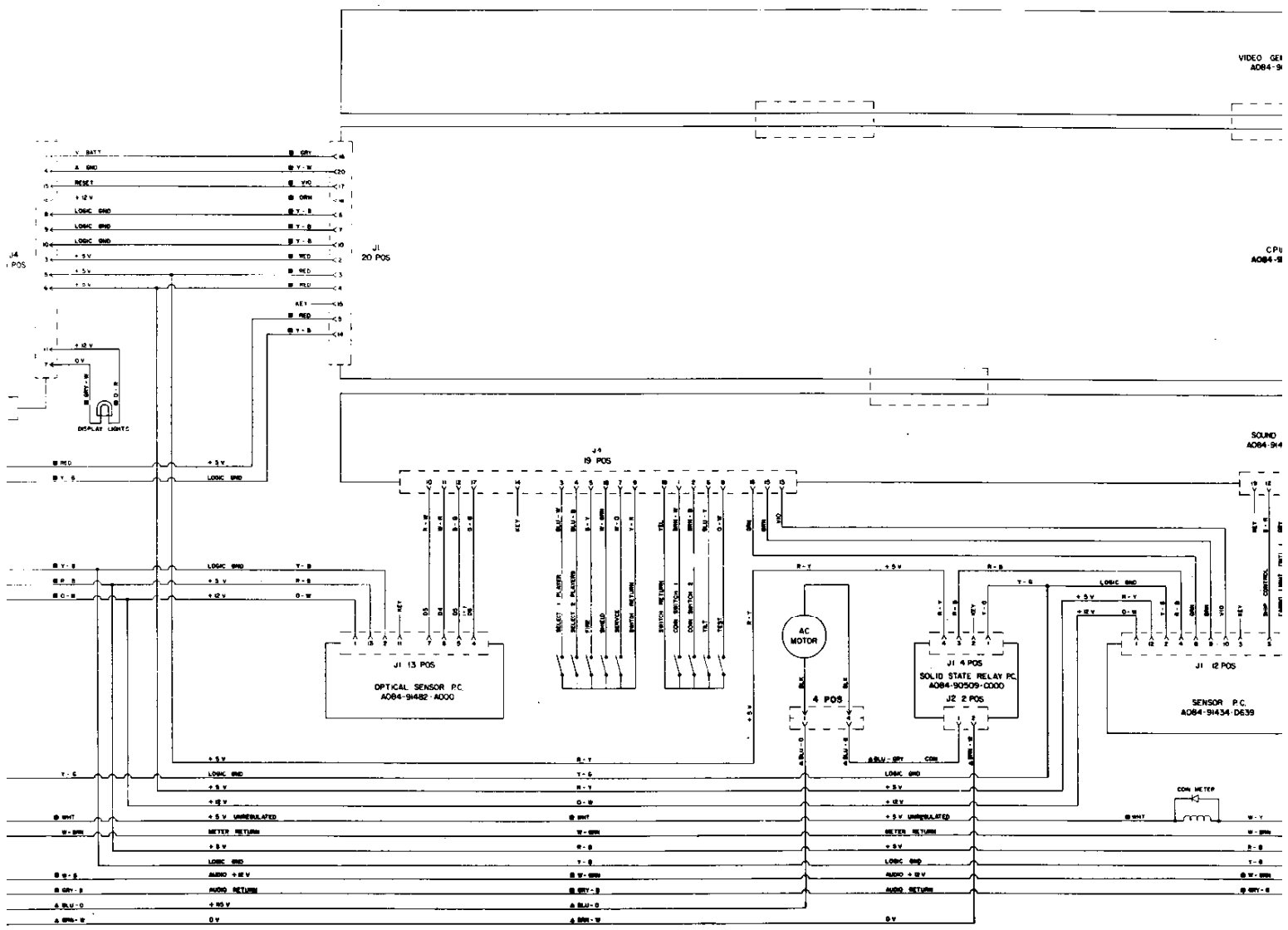


Figure 5-5 Changing the Plastic Coin Acceptor to Accept American or Canadian Quarters

VIII. Schematics & Wiring Diagrams



VIDEO GE1
A084-91

CPU
A084-92

SOUND
A084-94

| DESIGNATION * | DESCRIPTION |
|---------------|----------------------|
| C101 | 4700uf AX. ELECT. |
| C102 | 470uf AX. ELECT. |
| C103 | .1uf AX. CER. |
| C104 | .1uf AX. CER. |
| C105 | 47pf AX. CER. |
| C106 | 470uf AX. ELECT. |
| C107 | 100uf RD. TANT. |
| C108 | .1uf RD. TANT. |
| C109 | 4.7uf RD. TANT. |
| C110 | .1uf AX. CER. |
| C111 | .1uf AX. CER. |
| C201 | .01uf MYLAR |
| C202 | .033uf MYLAR |
| C203 | .01uf MYLAR |
| C204 | .047uf MYLAR |
| C205 | 820pf AX. CER. |
| C206 | .01uf AX. CER. |
| C207 | 0.082uf MYLAR |
| | |
| | |
| | |
| CP1 | .1uf AX. CER. |
| | |
| | |
| | |
| R101 | 18ohm 5W W/RES. SPA: |
| R102 | 68ohm 1/2W 5% |
| R104 | 10ohm 5W W/RES. SPAC |
| R105 | 27ohm 1/4W 5% |
| R106 | 270ohm 1/4W 5% |
| R107 | 6.2K 1/4W 5% |
| | |
| | |
| | |
| | |
| R109 | 1K 1/4W 5% |
| R110 | .16ohm 15W W/REG SPA |
| R111 | 6.8ohm 1/2W 5% |
| R112 | 68ohm 1/2W 5% |
| R113 | 1.2K 1/4W 5% |
| R114 | 47ohm 1/4W 5% |
| R115 | 160ohm 1/4W 5% |

DESIGNATION LIST

| DESCRIPTION | DESIGNATION | DESCRIPTION |
|--------------|-------------|----------------|
| 1 AX. ELECT. | R117 | 560ohm 1/4W 5% |
| 1 AX. ELECT. | R118 | 150ohm 2W |
| AX. CER. | R201 | 270ohm 1/4W 5% |
| AX. CER. | R202 | 1.2K 1/4W 5% |
| AX. CER. | R203 | 1.1M 1/4W 5% |
| 1 AX. ELECT. | R204 | 3.3M 1/4W 5% |
| 1 RD. TANT. | R205 | 10M 1/4W 5% |
| D. TANT. | R206 | 100K 1/4W 5% |
| RD. TANT. | R207 | 33K 1/4W 5% |
| AX. CER. | R208 | 2M 1/4W 5% |
| X. CER. | R209 | 1M 1/4W 5% |
| MYLAR | R210 | 1.2M 1/4W 5% |
| MYLAR | R211 | 75K 1/4W 5% |
| MYLAR | R212 | 75K 1/4W 5% |
| AX. CER. | R213 | 220K 1/4W 5% |
| AX. CER. | R214 | 3.9K 1/4W 5% |
| MYLAR | R215 | 1.2K 1/4W 5% |
| | R216 | 82ohm 1W 10% |
| | R217 | 270ohm 1/4W 5% |
| | R218 | 110K 1/4W 5% |
| | R219 | 68ohm 1/2W 5% |

VR101,102 100ohm POT

AX. CER.

W WIRE SPACER
1/2W 5%
H WIRE SPACER
1/4W 5%
1/4W 5%
4W 5%

| | |
|------|--------|
| D101 | A15F |
| D102 | A15F |
| D103 | A15F |
| D104 | A15F |
| D105 | A15F |
| U106 | 1N4001 |
| D201 | 1N4148 |
| D202 | 1N4148 |
| D203 | 1N4148 |
| D204 | 1N4001 |
| D205 | 1N4001 |

1.5%
W WIRE SPACER
1/2W 5%
1/2W 5%
1/4W 5%
1/4W 5%

| | |
|------|--------|
| Q102 | 2N2905 |
| Q105 | 2N2905 |
| Q201 | 2N4401 |

| | |
|----|-----------|
| U1 | LM305 REG |
| U2 | LM305 REG |
| U3 | LM3900 |
| U4 | 1N28 |
| U6 | 555 |

L101 22uH INDUCTOR

B101 BATTERY 3.6VDC 60DEG C

F1 3 RA S BLO FUSE

FC1A,1B FUSE CLIP

FE1,2 FERRITE BEAD

TW1 TIE WRAP

| | |
|----|--------------------------------|
| 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) |

LB1 FUSE TAG

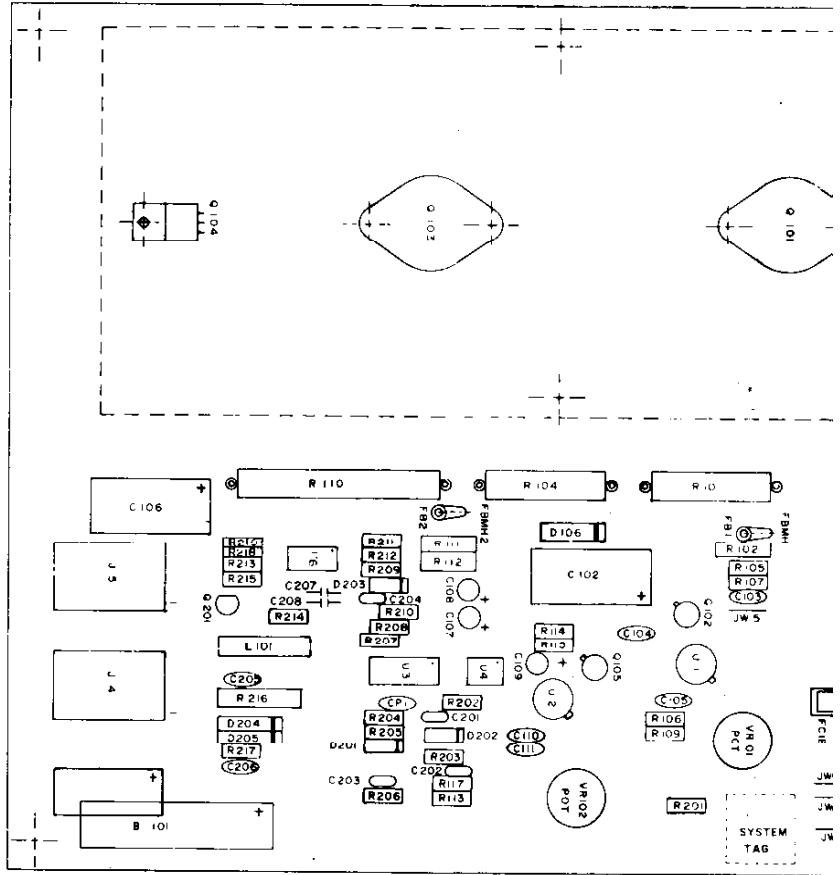
LB2 SYSTEM TAG

HSA1 HEAT SINK ASS'Y 1

MHSA1 MOUNTING HARD WARE (HEAT SINK)
2 SCREW
4 WASHER
2 HEXNUT

JW1 5 JUMPER WIRE

FBMH1,2 FERRITE BEAD MOUNTING HARDWARE

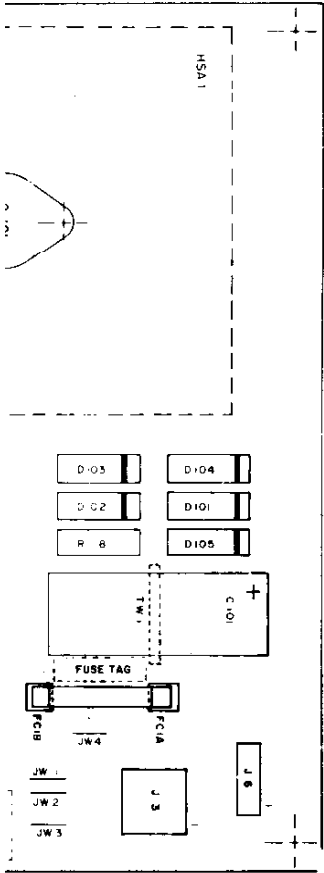


PROJ. ENG.: L. DEKKER

| MIDWAY | | FRANKLIN | |
|-------------------------------|---------|-----------------|---|
| DATE | 5/14/82 | REV | 1 |
| BY | sd | APP | |
| CHECKED | | DATE | |
| APPROVED | | DATE | |
| FULL | | NO. REV. PER. | |
| ASSEMBLY DRAWING I25VA PWRSPY | | | |
| A082-90412-D000 | | M051-009 | |

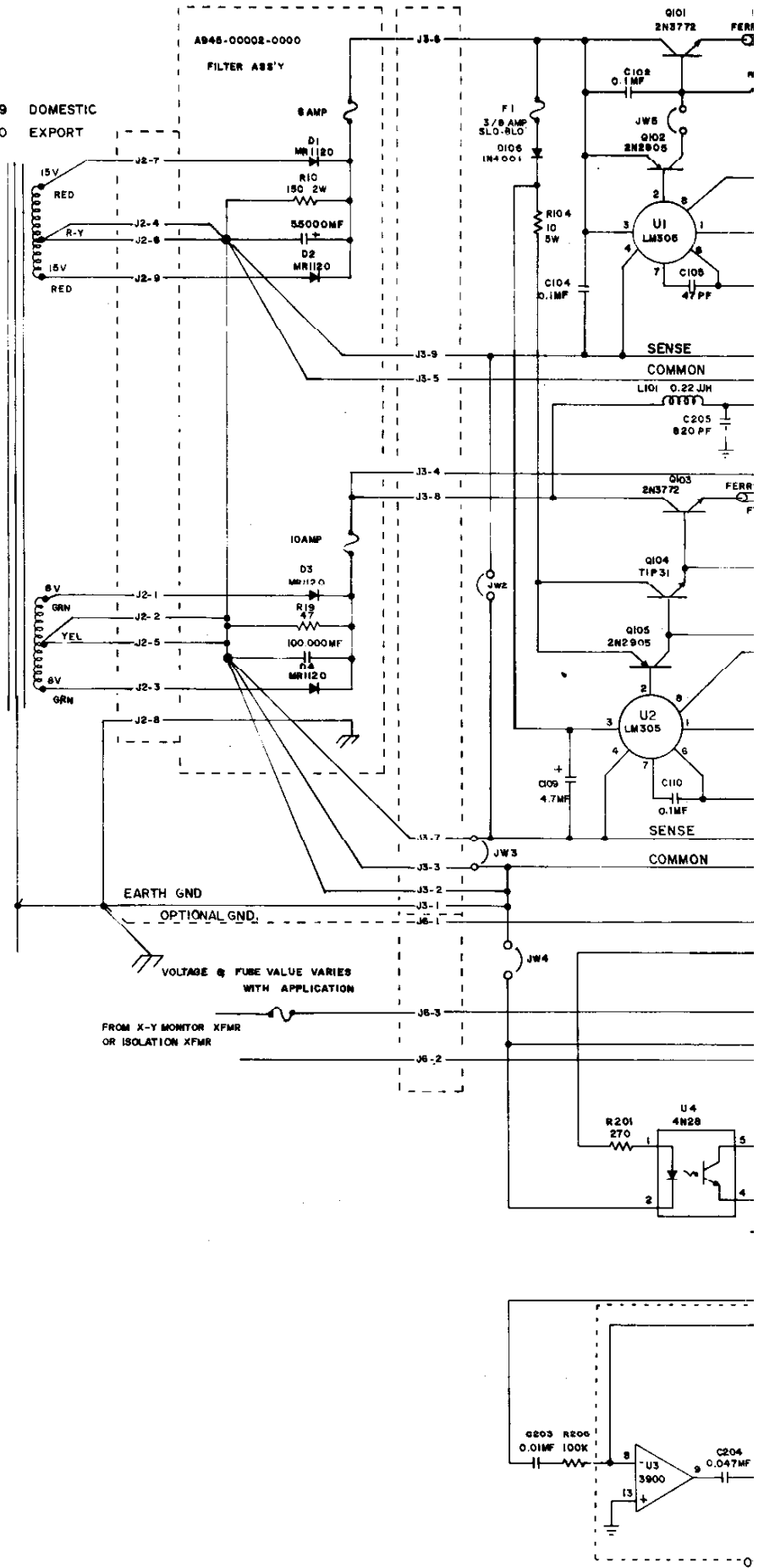
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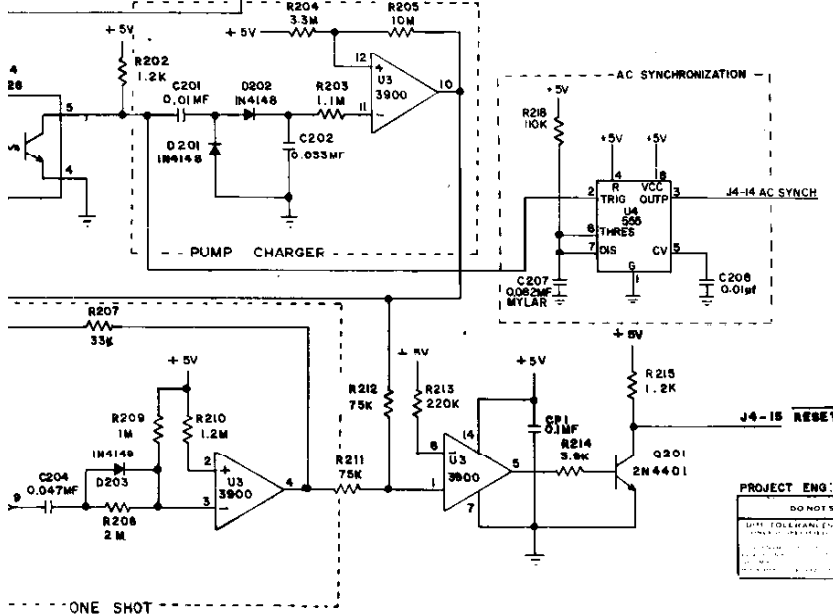
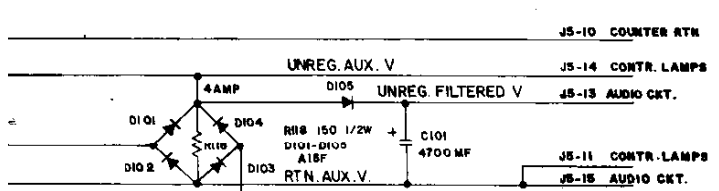
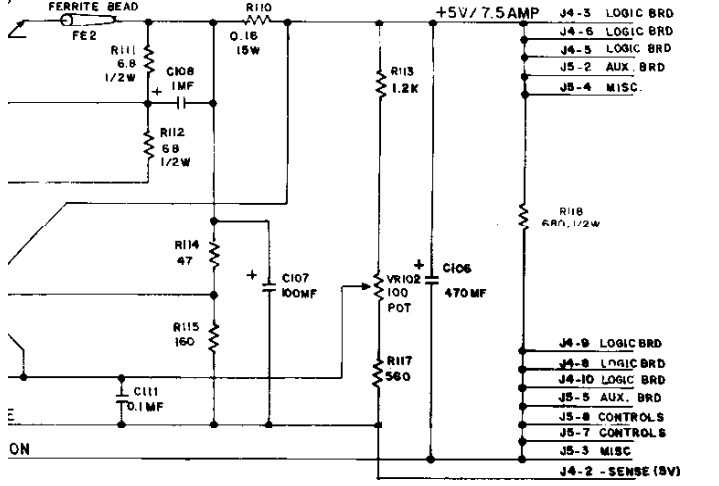
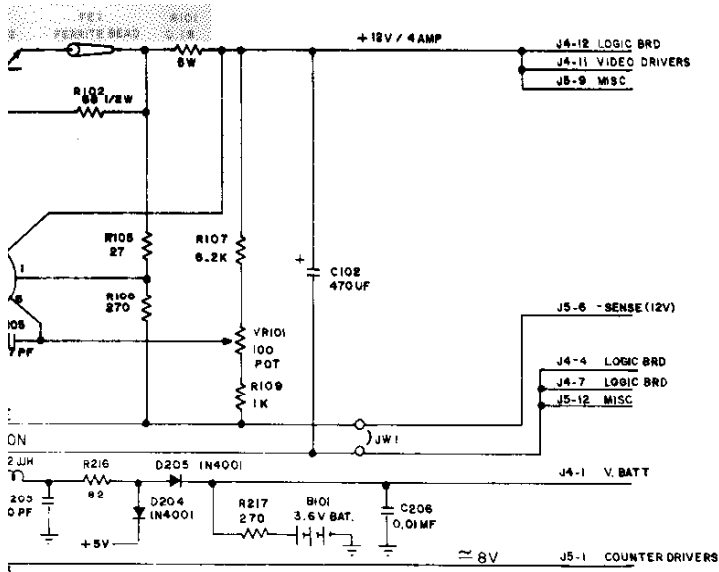
| DESCRIPTION | Qty | DESIGNATION | PART |
|---|-----|----------------------------|------------------|
| 47pf AX. CER. | 1 | C105 | 0945-00811-0100 |
| 820pf AX. CER. | 1 | C205 | 0945-00816-0400 |
| 01uf AX. CER. | 2 | C206,208 | 0945-00C16-0100 |
| 01uf MYLAR | 2 | C201,203 | 0945-00C16-0200 |
| 033uf MYLAR | 1 | C202 | 0945-00A16-0500 |
| 047uf MYLAR | 1 | C204 | 0945-00B16-0300 |
| 0.082uf AX. CER. | 1 | C207 | 0945-00B16-1900 |
| 1uf AX. CER. | 5 | C103,104,110,111, CP1 | 0945-00811-0200 |
| 1uf RAD. TANT | 1 | C108 | 0915-00811-0300 |
| 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 | 0062-04703-1XXX |
| 10ohm 5W 5% | 1 | R104 | 0945-00812-0100 |
| 27ohm 1/4W 5% | 1 | R105 | 0062-088B3-1XXX |
| 47ohm 1/4W 5% | 1 | R114 | 0062-086B3-1XXX |
| 68ohm 1/2W 5% | 3 | R102,112,219 | 0062-098D3-1XXX |
| 82ohm 1W 10% | 1 | R216 | 0062-104F5-1XXX |
| 100ohm 2W 5% | 1 | R110 | 0945-00A12-0200 |
| 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 |
| 110K 1/4W 5% | 1 | R210 | 0062-277B3-1XXX |
| 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 |
| LM305 REG. | 2 | U1,2 | 0945-00813-0100 |
| 555 | 1 | U6 | 0929-00810-4500 |
| LM3900 | 1 | U3 | 0945-00813-0200 |
| 4N28 | 1 | U4 | 0945-00813-0300 |
| 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 |
| BATTERY 3.6VDC 60DEG-C | 1 | B10 | 0017-00003-0377 |
| FUSE 3/8A S-BLO | 1 | F1 | 0945-00808-0400 |
| FUSE CLIP | 2 | FC1A,1B | 0017-00003-0214 |
| TE WRAP | 1 | TW1 | 0945-00814-0300 |
| FERRITE BEAD | 2 | FB1,2 | 0017-00009-0225 |
| 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-U000 |
| HEAT SINK ASS'Y (SEE HS ASS'Y DRAWING "NR NOTE") | 1 | HSA1 | A945-00008-0000 |
| 4-40X10 SLT RND | 2 | MH HSA1A,2A | 0017-00101-00727 |
| 4-40 HEX NUT | 2 | MH HSA1E,2E | 0017-00103-0002 |
| WSH 4-120-.250-018 | 4 | MH HSA1B,1D MH HSA2B,2D | 0017-00104-0071 |
| 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 |
| 22AWG T & R BARE 2.5" | 5 | JW1-5 | 0151-00087-0000 |



AY MFG. CO.
NEW YORK, N.Y.
-00945-B006

MT 89 DOMESTIC
MT 90 EXPORT



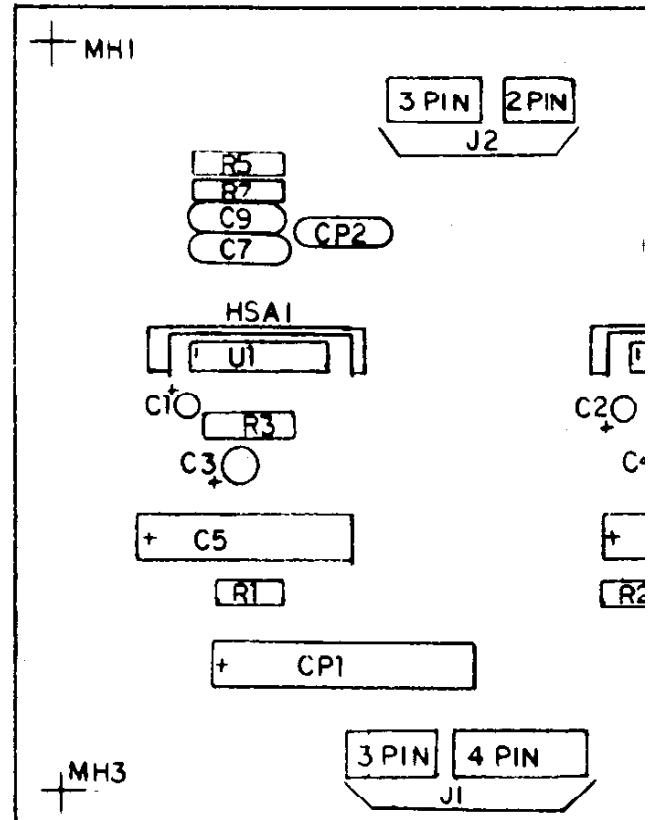


| | | | |
|------------------------|--------------|--|------------------|
| PROJECT ENG. L. DEKKER | | DATE: SATAN/PULLOW | MIDWAY MFG. CO. |
| DO NOT SCALE DWG | | FULL | TRANS IN PR. 111 |
| DESIGNER: M.M. | DATE: 5/3/82 | POWER SUPPLY 125VA W/CKT SUPPORT A082-90412-D000 | M051-00945-0007 |

ONE SHOT

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 | 3 " " " |
| HSA1,2 | HEATSINK ASSY. |
| MH1-MH4 | HEYCO BUSHING |

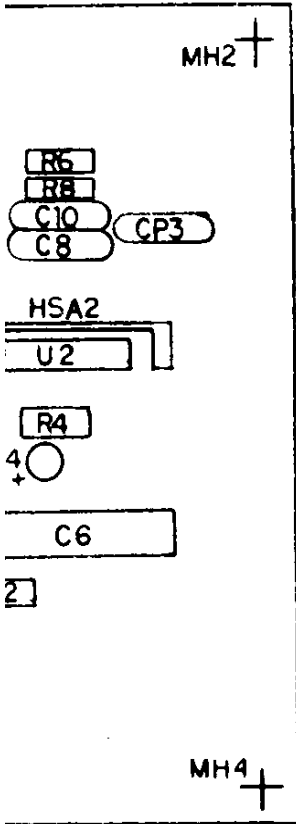


PROJECT ENG. C. MEDNICI

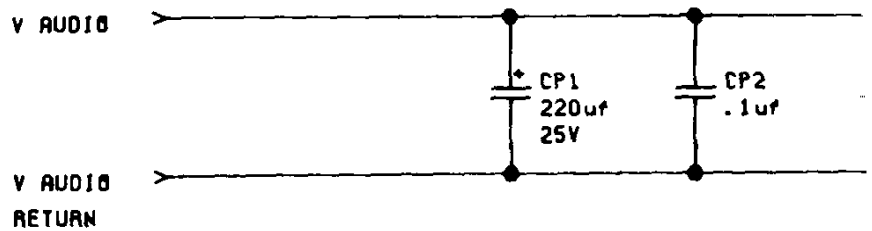
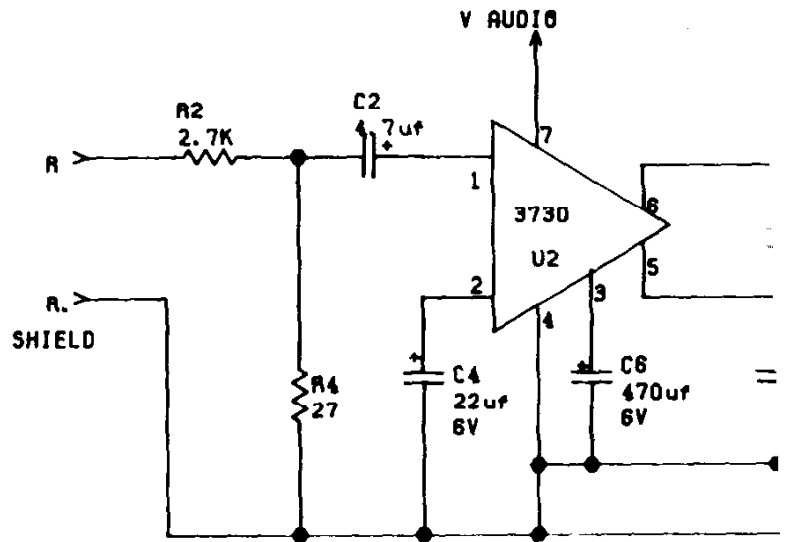
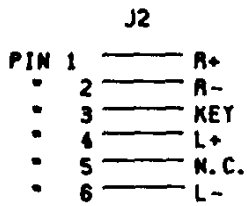
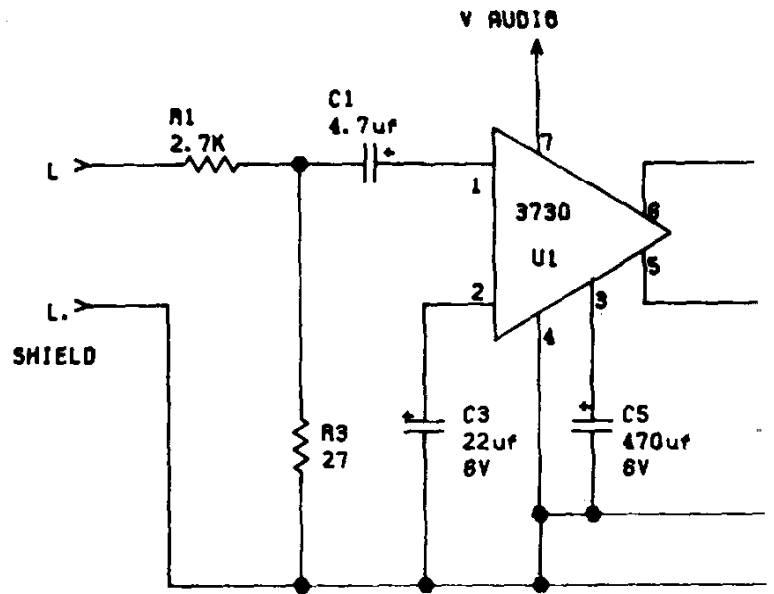
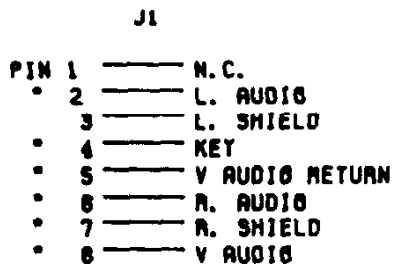
| DIM. TOLERANCES | | FIRST USED ON | |
|-----------------------|-----------------|------------------|--------|
| UNLESS OTHERWISE SPEC | | TRON | |
| CONCENTRICITY T.I.R. | 002 | DPN | TJK |
| FRACTIONAL | $\pm 1/64$ | MECH. CHK | MAT'L |
| DECIMAL | ± 005 | FLEC. CHK | FINISH |
| HOLE DIA. | + 002 - 000 | (. / 1 /) | |
| ANGLE | $\pm 1/2^\circ$ | DO NOT SCALE DWG | |

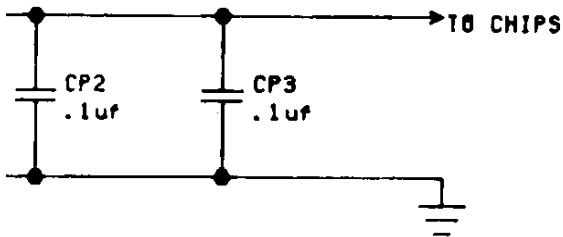
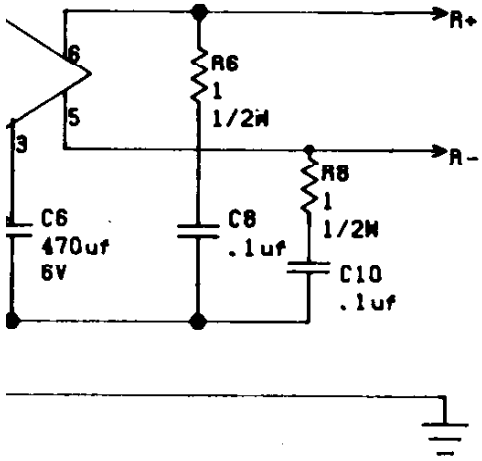
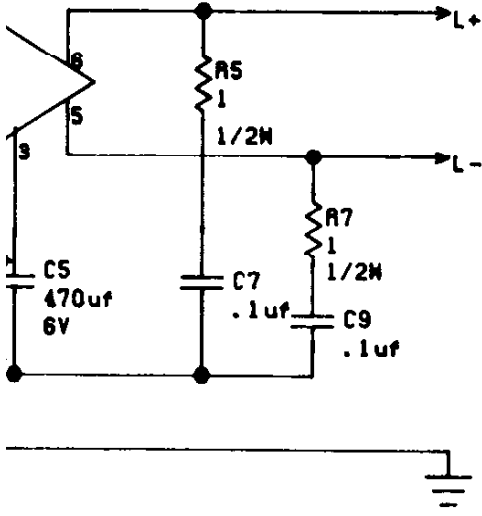
CROSS REFERENCE LIST

| 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 |
| 1Ω 1/2w 5% | 4 | R5-R8 | 0062-02603-1XXX |
| 27Ω 1/4w " " | 2 | R3,R4 | 0062-06803-1XXX |
| 27K " " | 2 | R1,R2 | 0062-19903-1XXX |
| MB3730 | 2 | U1,U2 | 0066-188XX-XX4X |
| 2 PIN STRT.KKI56 | 1 | J2 | 3000-16367-0200 |
| 3 " " " | 2 | J1,J2 | 3000-16367-0300 |
| 4 " " " | 1 | J1 | 3000-16367-0400 |
| HEATSINK ASSY. | 2 | HSA1, HSA2 | A986-00010-E000 |
| HEYCO BUSHING | 4 | MH1-MH4 | 0017-00042-0014 |
| PC BOARD | 1 | | A080-90910-E000 |



| | | | | | |
|--------|--|---|--|--|--|
| K | | THIS DWG. IS CONFIDENTIAL & PROPERTY OF MIDWAY MFG. CO. | | | |
| DATE | | SCALE | | MIDWAY MFG. CO. <small>FRANKLIN PK., IL. 60131 A BALLY CO.</small> | |
| 9-1-82 | | FULL | | | |
| | | DUAL PWR. AMP. ASSY A080-90910-E000 | | REVISIONS PART NO. M051-00986-E010 | |





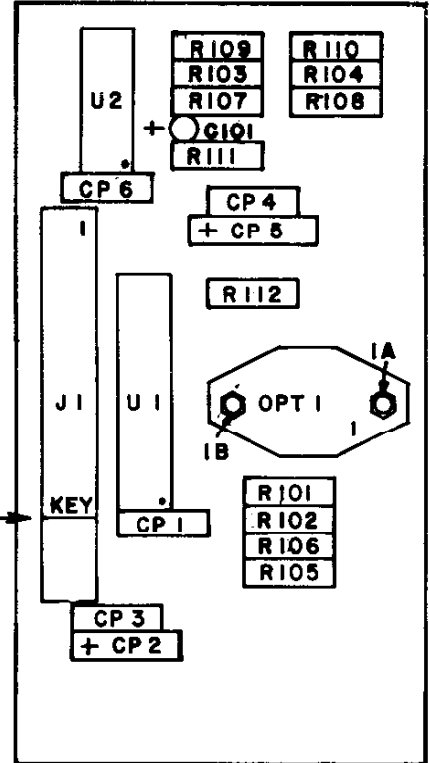
| | | | |
|---------------------------------|--|----------------------------|--|
| REVISIONS | | MIDWAY MFG. CO. | |
| | | FRANKLIN PK. ILL. | |
| USED ON TRON | | PART NO. | |
| NO. REQ'D | | M051-00986-E011 | |
| SCALE | | SCHEMATIC, DUAL POWER AMP, | |
| NONE | | A082-90910-E000 | |
| HEAT TREAT | | MATERIAL | |
| | | FINISH | |
| DO NOT SCALE DWG. | | DATE 9/1/82 | |
| DIM TOLERANCES UNLESS SPECIFIED | | DRN <i>SKL</i> | |
| CONCENTRICITY F R .003 | | CHK | |
| FRACTIONAL .1764 | | | |
| DECIMAL .005 | | | |
| HOLE DIA + .002 .000 | | | |

DESIGNATION LIST

| <u>DESIGN. NO.</u> | <u>DESCRIPTION</u> |
|--------------------|--|
| C101 | 4.7 μ f TANT 16V RAD. |
| CP 1 | .01 μ f 50V AX. CER. |
| CP 2 | 10 μ f 16V AX. ELECT. |
| CP 3 | .01 μ f 50V AX. CER. |
| CP 4 | .01 μ f 50V AX. CER. |
| CP 5 | 10 μ f 16V AX. ELECT. |
| CP 6 | .01 μ f 50V AX. CER. |
| R101 | 4.7K 1/4W 5% |
| R102 | 4.7K 1/4W 5% |
| R103 | 200K 1/4W 5% |
| R104 | 200K 1/4W 5% |
| R105 | 6.2K 1/4W 5% |
| R106 | 120 ohm 1/4W 5% |
| R107 | 30 K 1/4W 5% |
| R108 | 91 K 1/4W 5% |
| R109 | 200K 1/4W 5% |
| R110 | 200K 1/4W 5% |
| R111 | 4.7 K 1/4W 5% |
| R112 | 6.2 K 1/4W 5% |
| OPT 1 | OPTICAL SENSOR |
| U 1 | 74LS491 |
| U 2 | LM 339 |
| J 1 | 13 PIN KK-156 RT. ANGLE (PIN 11 OMITTED) |

MHOPT IA,IB PLASTIC RIVET RND. HD.

A082-91482-A000 P.C.B.



IA, IB — MH OPT IA, IB.

| | | | |
|----------------------------------|------------------|------------|--|
| PROJECT ENG. JOHN BOYDSTON | | | USE |
| DO NOT SCALE DWG. | | HEAT TREAT | SCALE |
| DIM. TOLERANCES UNLESS SPECIFIED | | MAT'L. | ASSY DRAWING OPTICAL SENSOR A082-91482-A A084-91482-A |
| CONCENTRICITY T.Y.R. .003 | DRW. <i>C.V.</i> | FINISH | |
| FRACTIONAL 1/64 | CKD. <i>Q/BB</i> | | |
| DECIMAL005 | DATE 2/17/83 | | |
| HOLE DIA. +.002-.000 | | | NO. 1 |

CROSS REFERENCE LIST

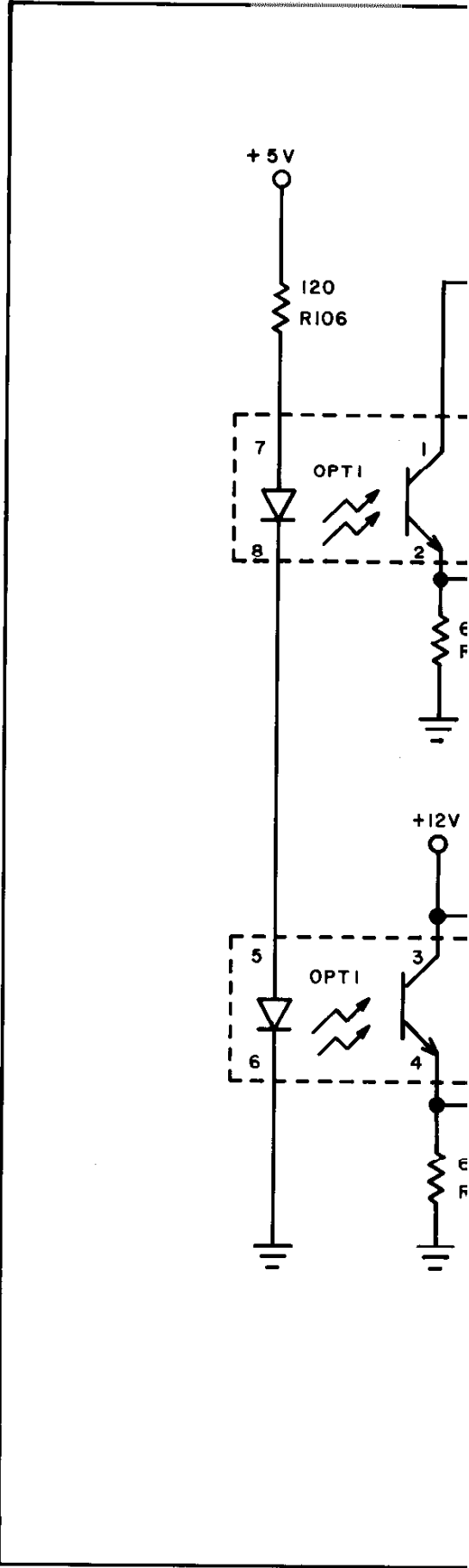
| <u>DESCRIPTION</u> | <u>QTY</u> | <u>DESGN. NO.</u> | <u>PART NO.</u> |
|--|------------|-------------------|-----------------|
| .01 μ f 50V AX. CER. | 4 | CP1,3,4,6. | 0628-00800-0100 |
| 4.7 μ f 16V RAD. TANT. | 1 | C101 | 0628-00800-0200 |
| 10 μ f 16V AX. ELECT. | 2 | CP 2,5 | 0628-00800-0300 |
| 120 ohm 1/4W 5% | 1 | R106 | 0062-116B3-1XXX |
| 4.7K 1/4W 5% | 3 | R101,102,111. | 0062-211B3-1XXX |
| 6.2K 1/4W 5% | 2 | R105,112 | 0062-217B3-1XXX |
| 30 K 1/4W 5% | 1 | R107 | 0062-249B3-1XXX |
| 91 K 1/4W 5% | 1 | R108 | 0062-273B3-1XXX |
| 200 K 1/4W 5% | 4 | R103,104,109,110. | 0062-289B3-1XXX |
| 74LS491 | 1 | U 1 | 0628-00803-2700 |
| LM 339 | 1 | U 2 | 0628-00803-2900 |
| OPTICAL SENSOR | 1 | OPT 1 | 0628-00804-0100 |
| 13 PIN KK-156 (RT. ANGLE PIN 11 OMITTED) | 1 | J 1 | 3000-16387-1311 |
| PLASTIC RIVET RND. HD. 2 | 2 | MH OPT 1A,1B. | 0017-00072-0091 |
| P.C.B. | 1 | | A082-91482-A000 |

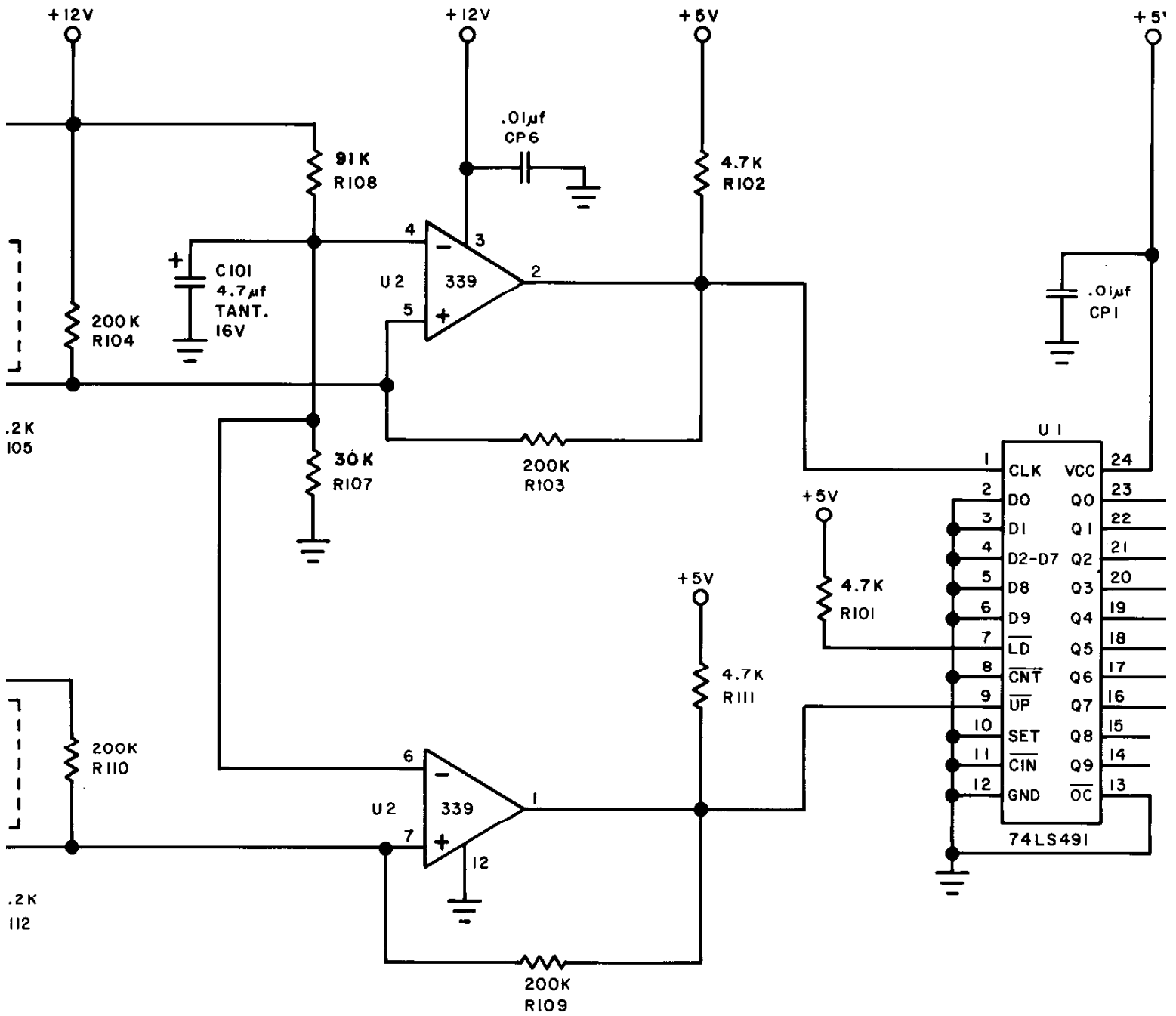
A
5

1.

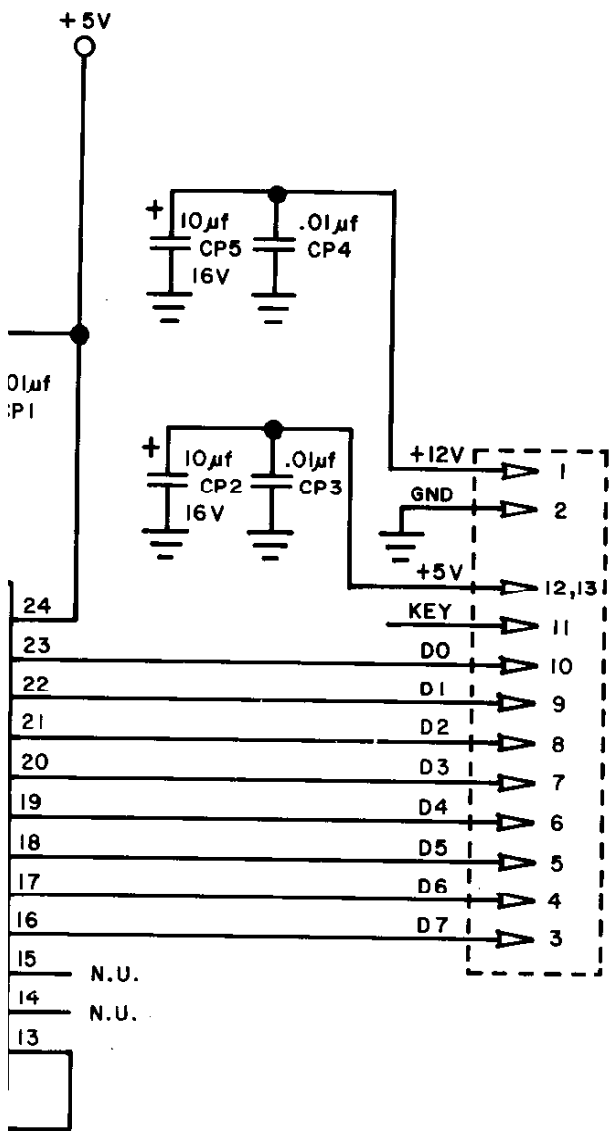
| REVISIONS | | |
|-----------|--|--|
| | | |
| | | |
| | | |
| | | |

| | |
|--|---|
| USED ON KOZMIK KROOZ'R | <i>Bally</i> / MIDWAY MFG. CO. FRANKLIN PK. ILL. |
| NO. REQ'D PER | |
| DRAWING AL SENSOR -91482-A000 -91482-A000 | PART NO. M051 - 00114 - A022 |





| | | | |
|----------------------------------|--|-------------------|-----------|
| PROJECT ENG: JOHN BOYDSTON | | | USED 0 KO |
| DO NOT SCALE DWG. | | HEAT TREAT | SCALE |
| NO. REQ'D | | SCHEMATIC DRAWING | |
| OPTICAL SENSOR | | A082-91482-AOC | |
| A084-91482-AOC | | | |
| DIM. TOLERANCES UNLESS SPECIFIED | | DRN. C.L. | MAT'L. |
| CONCENTRICITY TYP. 0.03 | | CKD. JBB | FINISH |
| FRACTIONAL 1/64 | | DATE 2/17/83 | |
| DECIMAL 0.005 | | | |
| HOLE DIA. +.002 0.000 | | | |



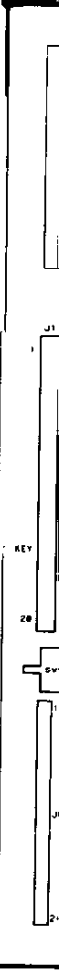
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REVISIONS

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|----------------------------------|---|
| KOZMIK KROOZ'R 1 PER | <i>Bally</i> / MIDWAY MFG. CO. FRANKLIN PK. ILL. |
| DRAWING SOR -A000 -A000 | PART NO. M051 - 00114 - A023 |

DESIGNATION LIST

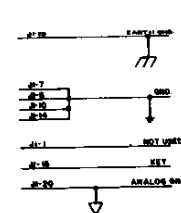
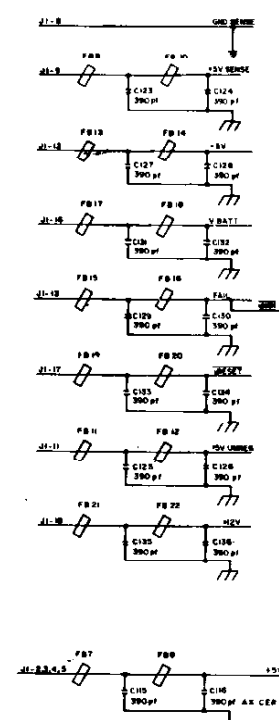
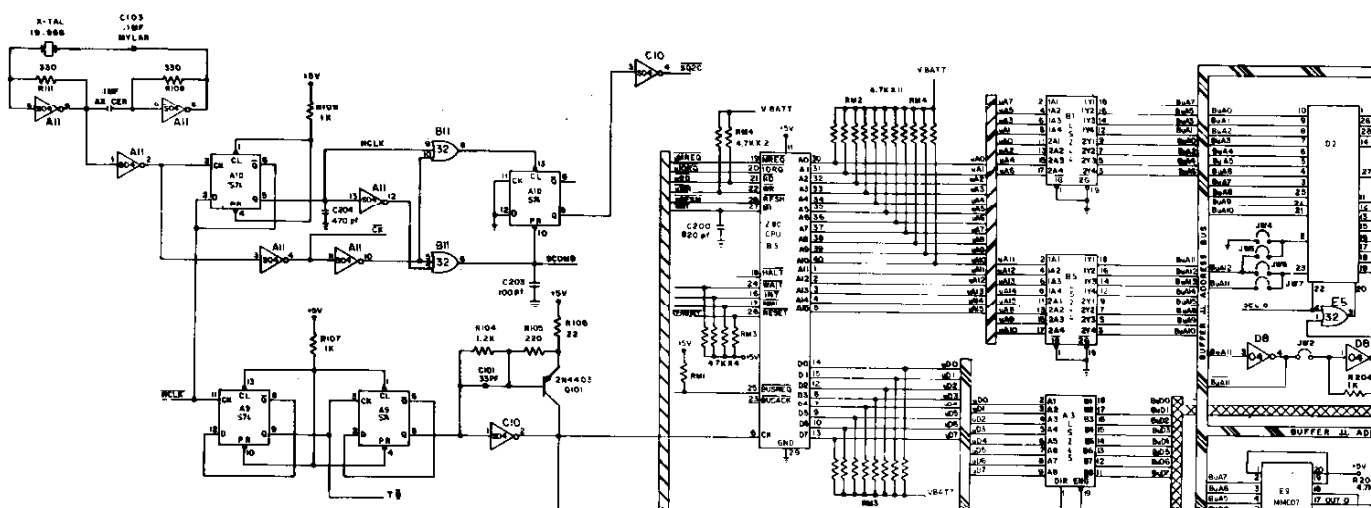
| <u>DESIGNATION</u> | <u>DESCRIPTION</u> | <u>DESIGNATION</u> | <u>DESCRIPTION</u> | <u>DESIGNATION</u> | <u>DESCRIPTION</u> |
|--------------------|----------------------|--------------------|--------------------|---------------------------|-----------------------|
| C101 | 33PF AX CER | R201 | 1K OHM " " | F1 | 4053 |
| C102 | 0.1UF AX CER | | | F2 | 4017 |
| C103 | 0.1UF MYLAR | R203-R207 | 1K OHM " " | F3 | 74LS245 |
| C104 | 390PF AX CER. | R208,R209 | 4.7KOHM " " | F4,F5 | 74LS273 |
| C105 - C110 | 47 PF AX CER | RM1 | 4.7K 6 PIN S.I.P. | F6 | 6116 |
| C111 - C114 | 820 PF AX CER | RM2, RM3 | 4.7K 10 PIN S.I.P. | F7 | 74LS174 |
| C121-C137 | 390 PF AX CER. | RM4 | 4.7K 6 PIN S.I.P. | F8, F9 | 74LS157 |
| C200 | 820 PF AX CER | | | F10 | 93419 |
| C201, C202 | 390 PF AX CER | | | | |
| C203 | 100 PF AX CER | D101 | IN5817 | | |
| C204 | 470 PF AX CER. | D102 | 4148 | G1 | 74LS153 |
| C206 | 100 PF AX CER. | | | G2 | 74LS273 |
| | | Q101 | 2N4403 | G3 | EPROM |
| CP1 | 470UF 16V ELECT.AX. | Q102 | 2N4123 | G4 | EPROM |
| CP2-CP7 | 0.01UF 50V AX CER. | Q103-Q108 | MPSA70 | G5 | 74LS273 |
| CP8 | 10UF 25V AX. TANT. | | | G6 | 74LS153 |
| CP9 - CP14 | 0.01UF 50V AX. CER. | A1 | 74LS161 | G7 | 74LS99 |
| CP15 | 470UF 16V ELECT. AX. | A2 | 74LS367 | G8 | 74LS174 |
| CP16 - CP20 | 0.01UF 50V AX. CER. | A3 | 74LS245 | G9, G10 | 74LS157 |
| CP21 | 10UF | A5 | 7474 | G12 | CUSTOM IC |
| CP22-CP28 | 0.01UF | A10 | 74S74 | | V-T GEN. |
| CP29 | 10UF | A11 | 74S04 | FB7- FB32 | FERRITE BEAD |
| CP30 - CP37 | 0.01UF | A12 | H-T | | |
| CP38 | 10UF | B1 | 74LS244 | ICSA12 | 8PIN IC SOCKET |
| CP39 - CP50 | 0.01UF | B2 | CMOS RAM | ICSA12A | 16PIN " " |
| CP51 | 10UF | B3 | MK3882 | ICSB2 | 24PIN " " |
| CP52 - CP57 | 0.01UF | B5 | MK3880 | ICSB3 | 28PIN " " |
| CP58 | 470UF 16V ELECT. AX. | B6 | 74LS244 | ICSB5 | 40PIN " " |
| CP59 - CP64 | 0.01UF | B7 | 74LS133 | ICSB12 | 20PIN " " |
| CP65 | 470UF | B8 | 74LS32 | ICSD2, D3, D4, D5, D6, D7 | 28PIN " " |
| CP66 | 0.1UF 50V AX. CER. | B9 | 74S04 | | |
| | | B10 | 74LS74 | ICSE3 | 20PIN " " |
| R101 | 4.7K OHM 1/4W CRBN. | B11 | 74LS32 | ICSF8 | 24PIN " " |
| R102 | 1K OHM " " | B12 | V & H-T | ICSF10 | 28PIN " " |
| R104 | 1.2K OHM " " | | | | |
| R105 | 220 OHM " " | C8 | 74LS08 | ICSG11 | 28PIN " " |
| R106 | 22 OHM " " | C9 | 74LS74 | ICSG12 | 20PIN " " |
| R107 | 1K OHM " " | C10 | 74S04 | ICSG12A | 8PIN " " |
| R108 | 330 OHM " " | | | | |
| R109 | 1K OHM " " | C11, C12 | 74LS20 | J1A | KK156 RT. ANGLE 5PIN |
| R111 | 330OHM " " | | | J1 | KK156 " " 14 PIN |
| R112 | 4.7KOHM " " | D2 | EPROM | J2A | KK100 RT. ANGLE 2 PIN |
| R116 | 1K OHM " " | D3 | EPROM | J2 | KK100 " " 8 PIN |
| R117, R118 | 560 OHM " " | D4 | EPROM | J3, J4, J5, J6, J7 | KK100 " " 24PIN |
| R119 | 100 OHM " " | D5 | EPROM | JW1-JW19 | ZERO OHM RESISTORS |
| R120 | 820 OHM " " | D6 | EPROM | | |
| R121 | 470 OHM " " | D7 | EPROM | SW1 | SWITCH P.C MOUNTING |
| R123 | 510 OHM " " | D8 | EPROM | | |
| R124 | 1K OHM " " | D10-D12 | 74LS04 | XTAL | 19,968 MHZ CRYSTAL |
| R125 | 2K OHM " " | | 74LS157 | | |
| R126, R127 | 10 OHM " " | E3 | NVR CONTROLLER | BB1, BB2 | BUS BAR |
| R128 | 470 OHM " " | E4, E5 | 74LS32 | | |
| R129 | 1K OHM " " | E6 | 74LS138 | J3, J4, J5, J6, J7 | FLEX-PAC JUMPER |
| R130 | 510 OHM " " | E7 | 74LS86 | A080 - 90010 - F000 | SUPER CPU BOARD |
| R131 | 2K OHM " " | E8 | 74LS27 | | |
| R133, R134 | 10 OHM " " | E9 | 74LS04 | | |
| R135 | 470 OHM " " | | | | |
| R136 | 510 OHM " " | | | | |
| R137 | 1K OHM " " | | | | |
| R138 | 2K OHM " " | | | | |
| R140, R141 | 10 OHM " " | | | | |



CROSS REFERENCE LIST

| QTY | DESIGNATION | PART NOS | DESCRIPTION | QTY | DESIGNATION | PART NOS |
|-----|--|-----------------|------------------------------|-----|--------------------|-----------------|
| 1 | C101 | 0986-00800-0300 | 74LS161 | 1 | A1 | 0986-00803-1003 |
| 6 | C105-C110 | 0986-00800-2800 | 74LS174 | 2 | F7,G8 | 0986-00803-9600 |
| 2 | C203,C206 | 0986-00800-1000 | 74LS244 | 2 | B1,B6 | 0986-00803-0800 |
| 20 | C104,C121-C137,C201,C202 | 0986-00800-3000 | 74LS245 | 2 | A3,F3 | 0986-00803-0900 |
| 1 | C204 | 0986-00800-3502 | 74LS273 | 4 | F4,F5,G2,G5 | 0986-00803-1001 |
| 5 | C111-C114,C200 | 0986-00800-3501 | 74LS367 | 1 | A2 | 0986-00803-2200 |
| 56 | CP2-CP7,CP9-CP14,CP16-CP20, CP22-CP28,CP30-CP37, CP39-CP50,CP52-CP57, CP59-CP64 | 0986-00800-2200 | MK3380 | 1 | B5 | 0986-00803-7800 |
| 1 | C103 | 0986-00800-0100 | MK3382 | 1 | B3 | 0986-00803-7700 |
| 2 | C102,CP66 | 0986-00800-0200 | 4017 | 1 | F2 | 0986-00803-8700 |
| 5 | CP8,CP21,CP29,CP38,CP51 | 0986-00800-3400 | 4053 | 1 | F1 | 0986-00803-2000 |
| 4 | CP1,CP15,CP58,CP65 | 0986-00800-3300 | CMOS RAM | 1 | B2 | 0986-00803-8100 |
| 6 | R126,R127,R133,R134, R140,R141 | 0062-051B3-1XXX | 6116 | 1 | F6 | 0986-00803-1008 |
| 1 | K106 | 0062-065B3-1XXX | 93419 | 1 | F10 | 0986-00803-2600 |
| 1 | R119 | 0062-110B3-1XXX | H-T GEN. | 1 | A12 | 0986-00803-8900 |
| 1 | R195 | 0062-133B3-1XXX | V-T GEN. | 1 | G12 | 0986-00803-9000 |
| 2 | R108,R111 | 0062-144B3-1XXX | V-H GEN. | 1 | B12 | 0986-00803-8100 |
| 3 | R121,R128,R135 | 0062-156C3-1XXX | MISC CUSTOM | 1 | G11 | 0986-00803-9200 |
| 3 | R123,R130,R136 | 0062-169B3-1XXX | NVR CONTROLLER | 1 | E3 | 0986-00803-3200 |
| 2 | R117,R118 | 0062-162B3-1XXX | EPROM | 1 | U2 | |
| 1 | R120 | 0062-174B3-1XXX | EPROM | 1 | D3 | |
| 13 | R102,R107,R109,R116, R124,R129,R137,R201, R203-R207 | 0062-179B3-1XXX | EPROM | 1 | D4 | |
| 1 | R104 | 0062-183B3-1XXX | 8 PIN IC SOCKET | 2 | D5 | |
| 3 | R125,R131,R138 | 0062-193B3-1XXX | 16 PIN " " | 2 | D6 | |
| 4 | R101,R112,R208,R209 | 0062-211B3-1XXX | 20 PIN " " | 3 | D7 | |
| 2 | RM1, RM4 | 0986-00804-2400 | 24 PIN " " | 2 | G3 | |
| 2 | RM2, RM3 | 0986-00804-4800 | 28 PIN " " | 10 | G4 | |
| 1 | D101 | 0986-00801-0300 | 40 PIN " " | 1 | | |
| 1 | D102 | 0986-00801-0100 | FERRITE BEADS | 26 | | |
| 1 | Q101 | 0986-00802-0200 | KK100 RT. ANGLE 2 PIN CONN. | 1 | J2A | 0986-00804-4200 |
| 1 | Q102 | 0986-00802-0100 | KK156 RT. ANGLE 5 PIN CONN. | 1 | J2 | 0986-00804-4300 |
| 6 | Q103-Q108 | 0986-00802-0300 | KK156 RT. ANGLE 14 PIN CONN. | 1 | J1A | 0986-00804-4400 |
| 3 | A11, B9, C10 | 0986-00803-0400 | KK100 RT. ANGLE 24 PIN CONN. | 5 | J1 | 0986-00804-4500 |
| 2 | D8, E9 | 0986-00803-1007 | ZERO OHM RESISTORS | 19 | J3,J4,J5,J6,J7 | 0986-00804-4700 |
| 1 | C8 | 0986-00803-1006 | | | JW1-JW19 | 0986-00804-4000 |
| 2 | C11,C12 | 0986-00803-1004 | SWITCH PC MOUNTING | 1 | SW1 | 0986-00804-3100 |
| 1 | E8 | 0986-00803-9500 | 19.966MHZ CRYSTAL | 1 | XTAL | 0986-00804-4900 |
| 4 | B8, B11, E4, E5 | 0986-00803-0600 | BUS BAR | 2 | BB1, BB2 | 0986-00804-4100 |
| 1 | A9 | 0986-00803-1009 | FLEX-PAC | 5 | J3, J4, J5, J6, J7 | 0986-00804-4800 |
| 1 | A10 | 0986-00803-1500 | | | | |
| 2 | B10, C9 | 0986-00803-1005 | | | | |
| 2 | E7, G7 | 0986-00803-9900 | | | | |
| 1 | B7 | 0986-00803-1002 | | | | |
| 1 | E6 | 0986-00803-1900 | | | | |
| 2 | G1, G6 | 0986-00803-1000 | | | | |
| 7 | D10, D11, D12, F8, F9, G9, G10 | 0986-00803-9700 | | | | |

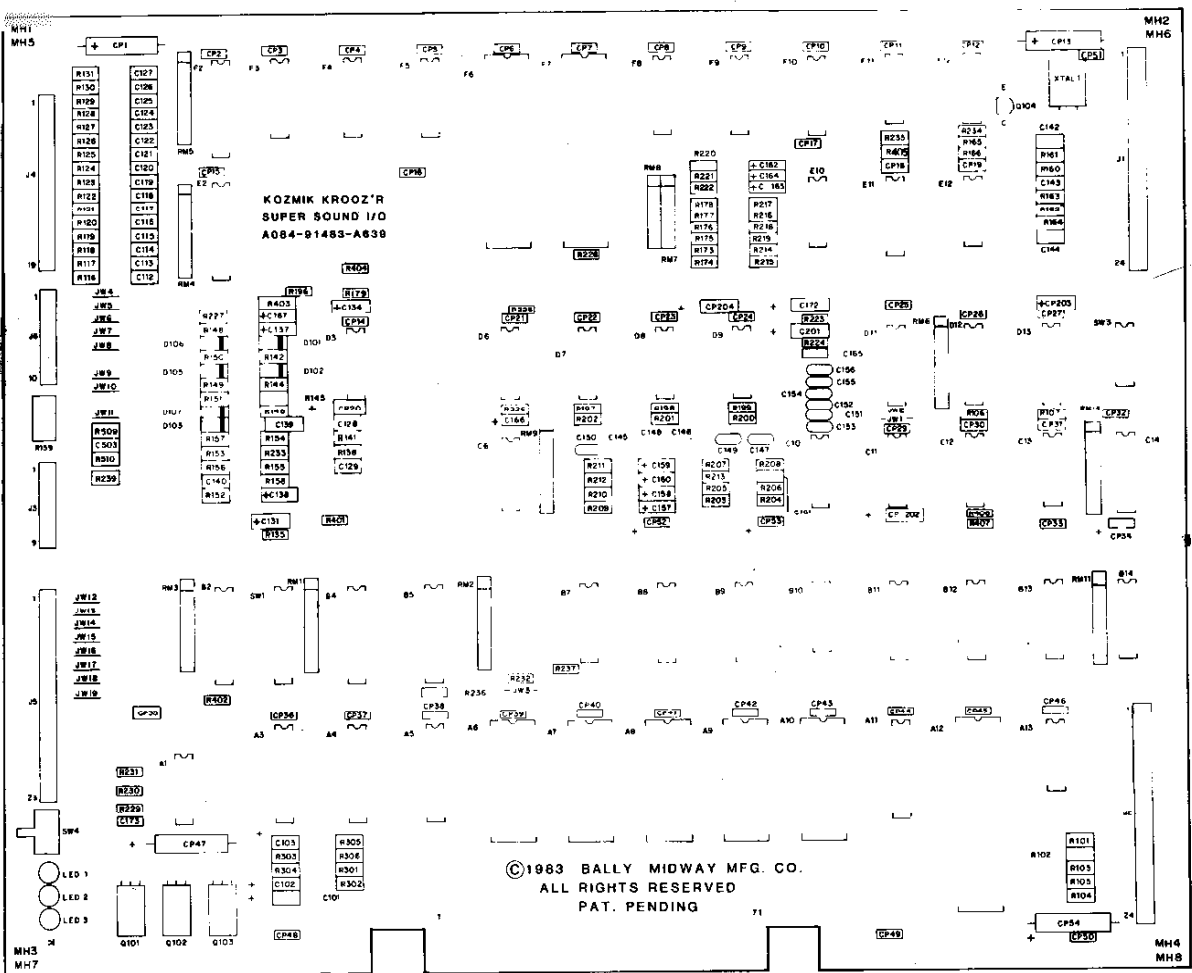
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|------------------------------|-------------|------------------------|---------------------------------------|---|--|
| PROJECT ENG A. GOSH | | USED ON KOZMIK KROOZ'R | | MIDWAY MFG. CO. <small>FRANKLIN PA. U.S.A.</small> | |
| DATE: 02/18/83 | SCALE: FULL | NO REQ'D | 1 PER | | |
| SUPER CPU BOARD ASSY DWG. | | | PART NO M051 - 00639 - A036 | | |
| A082-90010-G000 | | | | | |



| 72 PIN TEST CONNECTOR | | J2 | | J3 | | J4 | | J5 | | J6 | | J7 | |
|-----------------------|--------|----------|-----------|----------|----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| 1 L GND | 25 +5V | 49 GND | 65 L GND | 81 A GND | 97 L GND | 113 GND | 129 L GND | 145 GND | 161 L GND | 177 GND | 193 L GND | 209 GND | 225 L GND |
| 2 +5V | 26 +5V | 50 GND | 66 L GND | 82 A GND | 98 L GND | 114 GND | 130 L GND | 146 GND | 162 L GND | 178 GND | 194 L GND | 210 GND | 226 L GND |
| 3 L GND | 27 GND | 51 GND | 67 GND | 83 GND | 99 GND | 115 GND | 131 GND | 147 GND | 163 GND | 179 GND | 195 GND | 211 GND | 227 GND |
| 4 +5V | 28 +5V | 52 GND | 68 GND | 84 GND | 100 GND | 116 GND | 132 GND | 148 GND | 164 GND | 180 GND | 196 GND | 212 GND | 228 GND |
| 5 +5V | 29 GND | 53 GND | 69 GND | 85 GND | 101 GND | 117 GND | 133 GND | 149 GND | 165 GND | 181 GND | 197 GND | 213 GND | 229 GND |
| 6 N.U. | 30 GND | 54 GND | 70 GND | 86 GND | 102 GND | 118 GND | 134 GND | 150 GND | 166 GND | 182 GND | 198 GND | 214 GND | 230 GND |
| 7 +5V | 31 GND | 55 GND | 71 GND | 87 GND | 103 GND | 119 GND | 135 GND | 151 GND | 167 GND | 183 GND | 199 GND | 215 GND | 231 GND |
| 8 +5V | 32 GND | 56 GND | 72 +5V | 88 GND | 104 GND | 120 GND | 136 GND | 152 GND | 168 GND | 184 GND | 200 GND | 216 GND | 232 GND |
| 9 +5V | 33 GND | 57 GND | 73 CLNCTL | 89 GND | 105 GND | 121 GND | 137 GND | 153 GND | 169 GND | 185 GND | 201 GND | 217 GND | 233 GND |
| 10 +5V | 34 GND | 58 GND | 74 GND | 90 GND | 106 GND | 122 GND | 138 GND | 154 GND | 170 GND | 186 GND | 202 GND | 218 GND | 234 GND |
| 11 +5V | 35 GND | 59 GND | 75 GND | 91 GND | 107 GND | 123 GND | 139 GND | 155 GND | 171 GND | 187 GND | 203 GND | 219 GND | 235 GND |
| 12 +5V | 36 GND | 60 GND | 76 GND | 92 GND | 108 GND | 124 GND | 140 GND | 156 GND | 172 GND | 188 GND | 204 GND | 220 GND | 236 GND |
| 13 GND | 37 GND | 61 GND | 77 GND | 93 GND | 109 GND | 125 GND | 141 GND | 157 GND | 173 GND | 189 GND | 205 GND | 221 GND | 237 GND |
| 14 GND | 38 GND | 62 GND | 78 GND | 94 GND | 110 GND | 126 GND | 142 GND | 158 GND | 174 GND | 190 GND | 206 GND | 222 GND | 238 GND |
| 15 +5V | 39 GND | 63 GND | 79 L GND | 95 GND | 111 GND | 127 GND | 143 GND | 159 GND | 175 GND | 191 GND | 207 GND | 223 GND | 239 GND |
| 16 +5V | 40 GND | 64 GND | 80 GND | 96 GND | 112 GND | 128 GND | 144 GND | 160 GND | 176 GND | 192 GND | 208 GND | 224 GND | 240 GND |
| 17 +5V | 41 GND | 65 GND | 81 L GND | 97 GND | 113 GND | 129 GND | 145 GND | 161 GND | 177 GND | 193 GND | 209 GND | 225 GND | 241 GND |
| 18 +5V | 42 GND | 66 GND | 82 GND | 98 GND | 114 GND | 130 GND | 146 GND | 162 GND | 178 GND | 194 GND | 210 GND | 226 GND | 242 GND |
| 19 +5V | 43 GND | 67 GND | 83 L GND | 99 GND | 115 GND | 131 GND | 147 GND | 163 GND | 179 GND | 195 GND | 211 GND | 227 GND | 243 GND |
| 20 +5V | 44 GND | 68 GND | 84 GND | 100 GND | 116 GND | 132 GND | 148 GND | 164 GND | 180 GND | 196 GND | 212 GND | 228 GND | 244 GND |
| 21 +5V | 45 GND | 69 GND | 85 L GND | 101 GND | 117 GND | 133 GND | 149 GND | 165 GND | 181 GND | 197 GND | 213 GND | 229 GND | 245 GND |
| 22 +5V | 46 GND | 70 GND | 86 GND | 102 GND | 118 GND | 134 GND | 150 GND | 166 GND | 182 GND | 198 GND | 214 GND | 230 GND | 246 GND |
| 23 +5V | 47 GND | 71 L GND | 87 GND | 103 GND | 119 GND | 135 GND | 151 GND | 167 GND | 183 GND | 199 GND | 215 GND | 231 GND | 247 GND |
| 24 | 48 GND | 72 +5V | 88 GND | 104 GND | 120 GND | 136 GND | 152 GND | 168 GND | 184 GND | 200 GND | 216 GND | 232 GND | 248 GND |

DESIGNATION LIST

| <u>DESIGNATION</u> | <u>DESCRIPTION</u> | <u>DESIGNATION</u> | <u>DESCRIPTION</u> | <u>DESIGNATION</u> | <u>DESCRIPTION</u> |
|--------------------|-------------------------|--------------------|-------------------------|--------------------|-----------------------------------|
| C101-C103 | 10MF 25V AX TANT | R197-R202 | 5.6K OHM 1/4W 5% CARBON | IC13 | 7427 |
| C112-C127 | .1MF 50V AX. CER. | R203-R208 | 33K " " " " | "C14 | 74LS367 |
| C128-C129 | 47PF 50V AX. CER. | R209-R211 | 13K " " " " | "D3 | LM3900 |
| C131 | 10MF 25V AX. TANT. | R213 | 27K " " " " | "D6 | 74LS02 |
| C134 | 1MF 20V AX. TANT. | R214-R219 | 33K " " " " | "D7-D9 | MC14016 |
| C137 | 1MF " " " | R220-R222 | 13K " " " " | "D11 | 74190 |
| C138 | 10MF 25V AX. TANT. | R224 | 27K " " " " | "D12 | PROMSB2A |
| C139 | .047MF 100V MYLAR | R225,R226 | 4.7K " " " " | "D13 | 74166 |
| C140 | .01MF 50V AX. CER. | R227 | 1K " " " " | "E2 | 74LS244 |
| C142 | 100PF 50V AX. CER. | R228 | 4.7K " " " " | "E10 | MC3403 |
| C143 | .1MF 50V AX. CER. | R231 | 300 " " " " | "E11 | 74161 |
| C144 | 33PF 50V AX. CER. | R232 | 4.7K " " " " | "E12 | 74126 |
| C145-C156 | .0022MF 100V 10% MYLAR | R233 | 3K " " " " | "F2 | 74LS244 |
| C157-C159 | 1MF 20V AX. TANT | R234,R235 | 4.7K " " " " | "F3-F5 | 74LS191 |
| C161 | 330PF 50V AX. CER. | R239 | 100 " " " " | "F6,F7 | AY-3-8910 |
| C162-C164 | 1MF 20V AX. TANT. | R301-R306 | 2.7K " " " " | "FB-F10 | 74LS191 |
| C165 | 330PF 50V AX. CER. | R401 | 1K " " " " | "F11 | 7474 |
| C166,C167 | 10MF 25V AX. TANT | R402 | 4.7K " " " " | "F12 | 74S04 |
| C172 | 10MF 25V AX. TANT | R403-R404 | 33K " " " " | | |
| C173 | .01MF 50V AX. CER. | R405-R407 | 4.7K " " " " | | |
| C503 | .1MF 50V AX. CER. | R509 | 220 " " " " | | |
| | | R510 | 2.7K " " " " | | |
| CP1 | 470MF 16V AX. ELECT. | | | ICSA6-ICSA10 | 24 PIN IC SOCKET |
| CP2-CP12 | .01MF 50V AX. CER. | | | " A12 | 40PIN " " |
| CP13 | 470MF 16V AX. ELECT. | RM1 | 4.7K OHM 10 PIN S.I.P. | " D12 | 16 PIN " " |
| CP14-CP19 | .01MF 50V AX. CER. | RM2-RM5 | 2.7K " " 10 PIN S.I.P. | " F6,F7 | 40PIN " " |
| CP20 | 10MF 25V AX. TANT | RM7 | 4.7K " " 8 PIN S.I.P. | | |
| CP21-CP27 | .01MF 50V AX. CER. | RM8 | 820 " " 8 PIN S.I.P. | J1,J2 | 24 PIN KK100 RT. ANGLE CONN. |
| CP29-CP33 | .01MF 50V AX. CER. | RM9 | 1.8K " " 10 PIN S.I.P. | J3 | 9 PIN KK100 RT. ANGLE W/ 4 OMIT |
| CP34 | 10MF 25V AX. TANT | RM14 | 4.7K " " 10 PIN S.I.P. | J4 | 19 PIN KK100 RT. ANGLE W/ 14 OMIT |
| CP35-CP49 | .01MF 50V AX. CER. | | | J5 | 23 PIN KK100 RT. ANGLE W/ 19 OMIT |
| CP47 | 470MF 16V AX. ELECT. | | | J6 | 10 PIN KK100 RT. ANGLE W/ 8 OMIT |
| CP48-CP51 | .01MF 50V AX. CER. | D101-D103 | IN4148 | | |
| CP52,CP53 | 10MF 25V AX. TANT. | D105-D107 | IN4148 | JW1,JW2,JW4-JW19 | JUMPER WIRE |
| CP54 | 470MF 16V AX. ELECT. | | | | |
| CP202-CP204 | 10MF 25V AX. TANT. | | | LED 3 | YELLOW LED |
| R101-R107 | 4.7K OHM 1/4W 5% CARBON | Q101-Q103 | TIP110 | | |
| R116-R131 | 220 " " " " | Q104 | 2N4403 | | |
| R135 | 33K " " " " | ICA1 | 7406 | | |
| R138 | 180K " " " " | " A3,A4 | 74LS273 | | |
| R141 | 180K " " " " | " A5 | 74LS374 | SW1 | 10 POSITION DIP |
| R142 | 100K " " " " | " A6 | 1K X 8 RAM | SW3 | 8 " " " |
| R144, R145 | 620K " " " " | " A7 | ROM/EPROM 0 | SW4 | PUSH BUTTON S.W. |
| R146 | 10K " " " " | " A8 | " " 1 | | |
| R148 | 100K " " " " | " A9 | " " 2 | | |
| R149,R150 | 620K " " " " | " A10 | " " 3 | | |
| R151 | 10K " " " " | " A11 | 74LS245 | XTAL 1 | 16 MHZ CRYSTAL |
| R152 | 1MEG " " " " | " A12 | 2-80 CPU | | |
| R153 | 1K " " " " | " A13 | 74LS08 | MHQ101-MHQ103 | SNAP |
| R154 | 1MEG " " " " | " B2,B4,B5 | 74LS244 | MH1 - MH4 | SPACER |
| R155,R156 | 10K " " " " | " B7,B8 | 74LS138 | MH5 - MH8 | 6-32 X 6 M.S. |
| R157,R158 | 1.2K " " " " | " B9 | 74LS670 | | |
| R160,R161 | 330 " " " " | " B10 | 74LS32 | | |
| R162 | 220 " " " " | " B11 | 74LS670 | | |
| R163 | 1.2K " " " " | " B12,B13 | 74LS138 | A080 - 91483-A639 | SUPER SOUND I/O BOARD |
| R164 | 22 " " " " | " B14 | 74LS174 | | |
| R165,R166 | 4.7K " " " " | " C6 | 7407 | | |
| R173-R178 | 5.6K " " " " | " C10 | MC3403 | | |
| R179 | 24K " " " " | " C11 | 74LS04 | | |
| R196 | 24K " " " " | " C12 | MC14024 | | |



DESCRIPTION

33PF 50V 5% AX. CER
 47 PF 50V AX. CER
 100PF 50V 5% AX. CER
 330PF 50V AX. CER.
 .0022 MF 100V 10% MYLAR
 .047 MF 100V MYLAR
 .01MF 50V AX. CER

.1MF 50V AX. CER.
 1MF 20V AX. TANT.
 10MF 25V AX. TANT.

470 MF 16V AX. ELECT.

22 OHM 1/4W 5% CARBON
 100 " " " "
 220 " " " "
 300 " " " "
 330 " " " "
 1K " " " "
 1.2K " " " "
 2.7K " " " "
 3K " " " "
 4.7K " " " "

5.6K " " " "
 10K " " " "
 13K " " " "
 24K " " " "
 27K " " " "
 33K " " " "

100K " " " "
 180K " " " "
 620K " " " "
 1MEG " " " "

820 OHM 8PIN S.I.P.
 1.8K " 10PIN S.I.P.
 2.7K " 10PIN S.I.P.
 4.7K " 8 PIN S.I.P.
 4.7K " 10PIN S.I.P.

1N4148

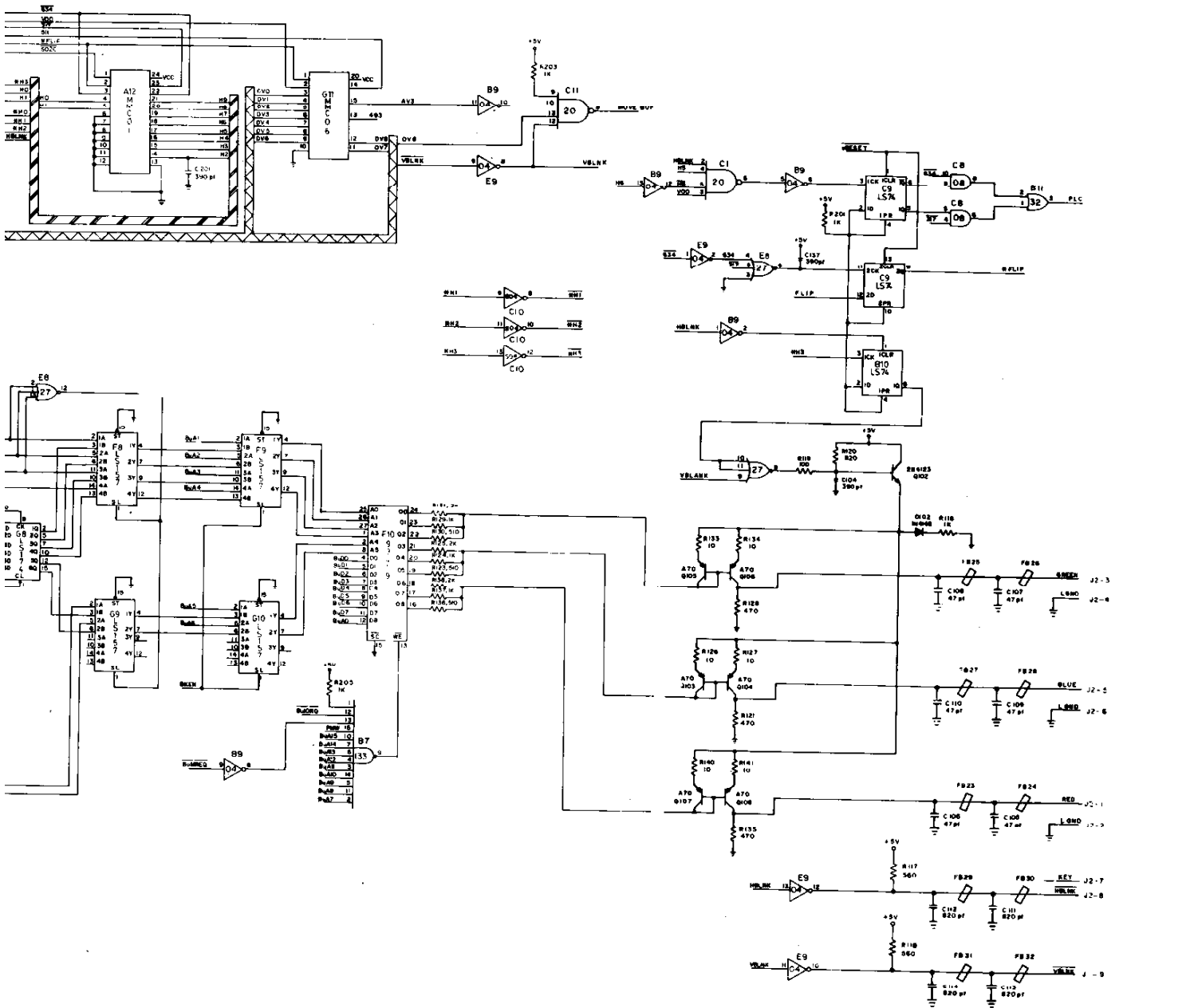
2N4403
 TIP 110

74LS02
 74LS04
 74S04
 7406
 7407

CROSS REFERENCE LIST

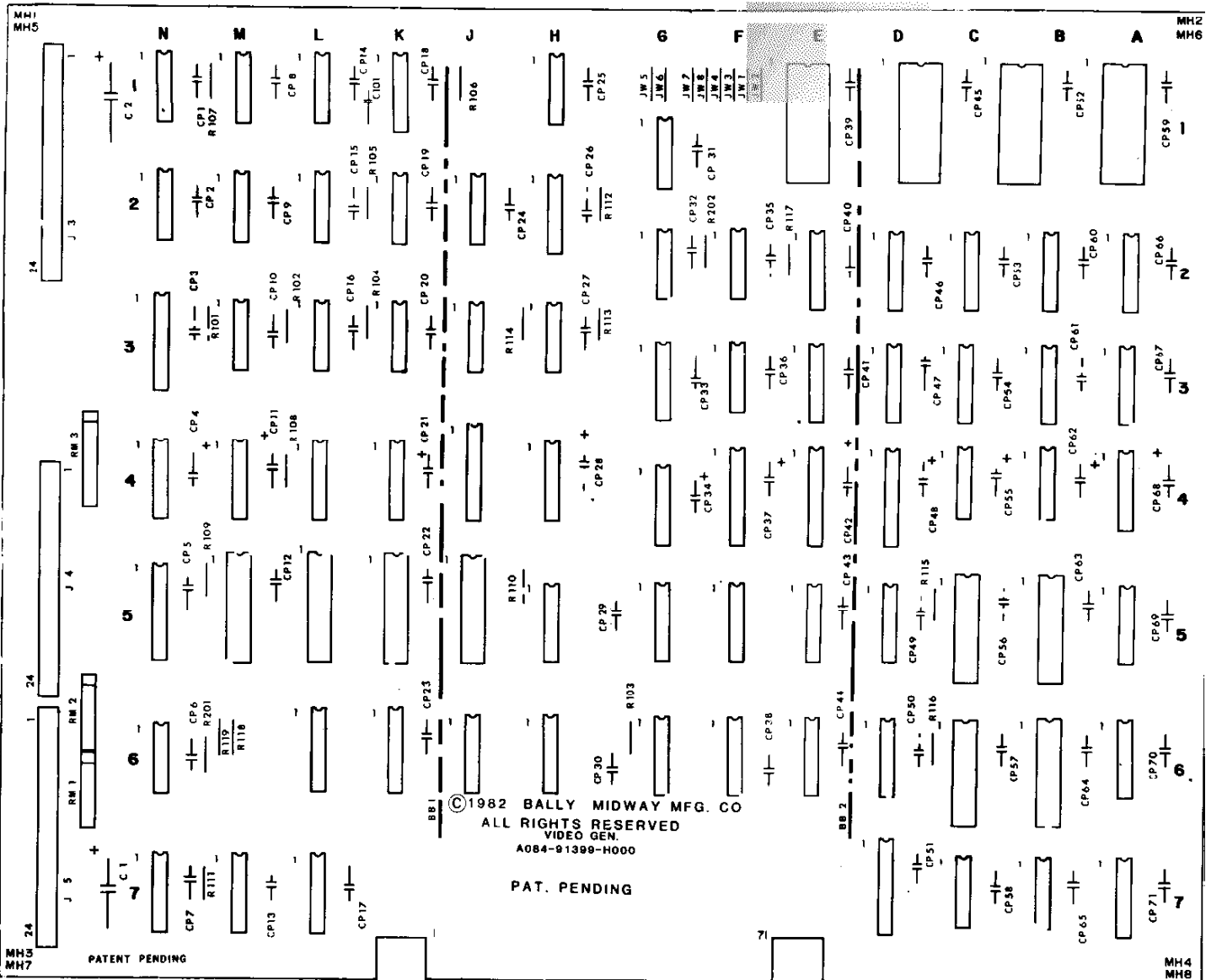
| <u>QTY</u> | <u>DESIGNATION</u> | <u>PART NOS.</u> | <u>DESCRIPTION</u> | <u>QTY</u> | <u>DESIGNATION</u> | <u>PART NOS.</u> |
|------------|--|------------------|-----------------------------------|------------|----------------------|----------------------------|
| 1 | C144 | 0986-00800-0900 | 74LS08 | 1 | IC A13 | 0986-00803-7300 |
| 2 | C128, C129 | 0900-00000-2000 | 7427 | 1 | " C13 | 0986-00803-7200 |
| 1 | C142 | 0986-00800-1000 | 74LS32 | 1 | " B10 | 0986-00803-6100 |
| 2 | C161, C165 | 0986-00800-1300 | 7474 | 1 | " F11 | 0986-00803-6700 |
| 12 | C145-C156 | 0986-00800-1200 | 74126 | 1 | " E12 | 0986-00803-6800 |
| 1 | C139 | 0986-00800-2600 | 74LS138 | 4 | " B7, B8, B12, B13 | 0986-00803-6500 |
| 47 | CP2-CP12, CP14-CP19, CP21-CP27, CP29-CP33, CP35-CP46, CP48-CP51, C140, C173 | 0986-00800-2000 | 74161 | 1 | " D11 | 0986-00803-5100 |
| 18 | C112-C127, C143, C503 | 0986-00800-1100 | 74166 | 1 | " D13 | 0986-00803-5300 |
| 8 | C134, C137, C157-C159, C162-C164 | 0986-00800-1400 | 74LS174 | 1 | " B14 | 0986-00803-7500 |
| 15 | CP34, CP52-CP53, CP202-CP204, CP20, CP200-CP200 | 0986-00800-0700 | 74190 | 1 | " D11 | 0986-00803-9400 |
| 4 | C101-C103, C131, C138, C166, C167, C172 CPI, CPI3, CP47, CP54 | 0986-00800-2700 | 74LS191 | 6 | " F3-F5, F8-F10 | 0986-00803-5600 |
| 1 | R164 | 0062-06383-1XXX | 74LS244 | 5 | " B2, B4, B5, E2, F2 | 0986-00803-4800 |
| 1 | R230 | 0062-11083-1XXX | 74LS245 | 1 | " A11 | 0986-00803-6400 |
| 18 | R116-R131, R162, R509 | 0062-13383-1XXX | 74LS273 | 2 | " A3, A4 | 0986-00803-4700 |
| 1 | R231 | 0062-14183-1XXX | 74LS367 | 1 | " C14 | 0986-00803-7000 |
| 2 | R160, R161 | 0062-14483-1XXX | 74LS374 | 1 | " A5 | 0986-00803-4600 |
| 3 | R153, R227, R401 | 0062-17983-1XXX | 74LS670 | 2 | " B9, B11 | 0986-00803-6300 |
| 3 | R157, R158, R163 | 0062-18383-1XXX | AY-3-8910 | 2 | " F6, F7 | 0986-00803-8500 |
| 7 | R301-R306, R510 | 0062-19983-1XXX | LM3900 | 1 | " D5 | 0986-00803-4900 |
| 1 | R233 | 0062-20183-1XXX | MC3403 | 2 | " C10, E10 | 0986-00803-5000 |
| 19 | R101-R107, R165, R166, R225, R226, R228, R232, R234, R235, R402, R405-R407 | 0062-21183-1XXX | MC14016 | 3 | " D7-D9 | 0986-00803-6200 |
| 12 | R173, R178, R197, R202 | 0062-21583-1XXX | MC14024 | 1 | " C12 | 0986-00803-7100 |
| 4 | R146, R151, R155, R156 | 0062-22783-1XXX | PROM SB2-A | 1 | " D12 | 0986-00803-8200 |
| 6 | R209-R211, R220-R222 | 0062-23383-1XXX | RAMK X 8 | 1 | " A6 | 0986-00803-8000 |
| 2 | R179, R196 | 0062-24583-1XXX | ROM/EPROM 0 | 1 | " A7 | |
| 2 | R213, R224 | 0062-24783-1XXX | " " 1 | 1 | " A8 | } EPROM/ROM OPTIONS KIT |
| 15 | R135, R203-R208, R214-R219, R403-R404 | 0062-25183-1XXX | " " 2 | 1 | " A9 | |
| 2 | R142, R148 | 0062-27583-1XXX | " " 3 | 1 | " A10 | |
| 2 | R138, R141 | 0062-28783-1XXX | Z-80 (3880) | 1 | " A12 | |
| 4 | R144, R145, R149, R150 | 0062-31383-1XXX | 16 PIN IC SOCKET | 1 | ICSD12 | 0986-00803-5500 |
| 2 | R152, R154 | 0062-32383-1XXX | 24 PIN " " | 5 | ICSA6-ICSA10 | 0986-00804-1400 |
| 1 | RM8 | 0986-00805-0800 | 40 PIN " " | 3 | ICSA12, ICSF6, ICSF7 | 0986-00804-1600 |
| 1 | RM9 | 0986-00805-0600 | 3 PIN KK 100 RT. ANGLE W/4 OMIT | 1 | J3 | 3000-16366-09C |
| 4 | RM2-RM5 | 0986-00805-0500 | 10 PIN KK 100 RT. ANGLE W/8 OMIT | 1 | J6 | 3000-16366-10C |
| 1 | RM7 | 0986-00805-0400 | 19 PIN KK 100 RT. ANGLE W/14 OMIT | 1 | J4 | 3000-16366-190 |
| 2 | RM1, RM4 | 0986-00805-0300 | 23 PIN KK 100 RT. ANGLE W/19 OMIT | 1 | J5 | 3000-16366-230 |
| 6 | D101-D103, D105-D107 | 0986-00801-0200 | 24 PIN KK 100 RT. ANGLE | 2 | J1, J2 | 0986-00804-41 |
| 1 | Q104 | 0986-00802-0500 | JUMPER WIRE | 10 | JW1, JW2, JW4-JW19 | 0986-00804-40C |
| 3 | Q101-Q103 | 0986-00802-0400 | YELLOW LED | 1 | LED 3 | 0986-00804-20C |
| 1 | D6 | 0986-00803-7400 | 8 POSITION DIP SW. | 1 | SW3 | 0986-00805-09C |
| 1 | C11 | 0986-00803-6900 | 10 POSITION DIP SW. | 1 | SW1 | 0986-00805-10C |
| 1 | F12 | 0986-00803-6600 | PB SWITCH | 1 | SW4 | 0986-00804-17C |
| 1 | A1 | 0986-00803-7600 | 16 MHZ CRYSTAL W/3RD LEAD | 1 | XTAL 1 | 0986-00805-110 |
| 1 | C6 | 0986-00803-5900 | SNAPS | 3 | MHQ101-MHQ103 | 0017-00007-013 |
| | | | SPACER | 4 | MH1-MH4 | 0986-00702-001 |
| | | | 6-32 X 6 M. S. | 4 | MH5-MH8 | 0017-00101-015 |
| | | | SUPER SOUND I/O BOARD | 1 | | A080-91483-A |

| | | | | | |
|-------------------------|---|-----------------------------|--|--|--|
| PROJECT ENG. C. MEDNICK | | USED ON KOZMIK KROOZ'R | | REVISIONS | |
| SCALE FULL | | NO REQ'D PER | | <i>Billy</i> / MIDWAY MFG. CO. FRANKLIN, KY 40317 | |
| DATE 02/21/83 | ASSEMBLY DRAWING SUPER SOUND I/O P.C. BOARD A084-91483-A639 | PART NO. M051-00639-A035 | | | |



| | | | | | | | |
|----------|--|---------------------------|--|-----------------|--|-----------------|--|
| A. CHOZI | | NONE | | NONE | | NONE | |
| 03/01/83 | | SCHEMATIC DRWG SI/PER CPU | | A082-90010-G000 | | MOSI-00986-G014 | |

CONN.



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 VIDEO GEN.
 A084-91399-H000

PAT. PENDING

MH1
MH5

MH3
MH7

MH2
MH6

MH4
MH8

PATENT PENDING

CROSS REFERENCE LIST

| DESCRIPTION | Q'TY | DESIGNATION | PART NO. |
|----------------------------|------|---|--|
| 100 PF 50V AX. CER. | 1 | CT01 | 0986-00800-1000 |
| .01 μ f 50V AX. CER. | 60 | CP1-3, CP5-10, CP12-20, CP22-27, CP29-33, CP35, 36, CP38-41, CP43-47, CP49-54, CP56-61, CP63-67, CP69-71. CP4, 11, 21, 28, 34, 37, CP42, 48, 55, 62, 68. | 0986-00800-2500 |
| 10 μ f 25 V AX. TANT. | 11 | CP1, 2 | 0986-00800-2400 |
| 100 μ f 25V AX. ELECT. | 2 | CP1, 2 | 0986-00800-1800 |
| 1 K 1/4 W CRBN. FLM. | 21 | R101-119, 201, 202. | 0062-17983-1XXX |
| 1 K 8 PIN SIP | 2 | RM1, 2. | 0986-00804-1100 |
| 1 K 10 PIN SIP | 1 | RM3 | 0986-00804-1000 |
| 2114-2 | 2 | K6, L6. | 0986-00803-2300 |
| 7400 | 1 | F2 | 0986-00803-2800 |
| 7404 | 1 | N6 | 0986-00803-8300 |
| 74S04 | 1 | F3 | 0986-00803-3100 |
| 7408 | 1 | L2 | 0986-00803-3200 |
| 74LS20 | 2 | G2, L1 | 0986-00803-3400 |
| 7427 | 1 | N2 | 0986-00803-3500 |
| 7430 | 5 | J2, J3, K2, M1, N1 | 0986-00803-3600 |
| 7432 | 1 | M2 | 0986-00803-4400 |
| 74LS32 | 4 | B4, 7, C4, 7. | 0986-00803-3700 |
| 7474 | 2 | K3, L3 | 0986-00803-4500 |
| 74S74 | 2 | H3, M3 | 0986-00803-4100 |
| 74LS86 | 2 | G1, H1 | 0986-00803-4200 |
| 74LS157 | 18 | A2, 3, 4, 5, 6, 7, D5, 6, E5, 6, F5, 6, G6, H6, J6, L7, M7, N7. | 0986-00803-2400 |
| 74161 | 3 | K1, K4, M4. | 0986-00803-2500 |
| 74174 | 2 | H2, 5 | 0986-00803-2600 |
| 74175 | 1 | H4 | 0986-00803-2700 |
| 74LS194 | 8 | B2, 3, C2, 3, D2, 3, E2, 3. | 0986-00803-2900 |
| 74LS245 | 1 | N5 | 0986-00803-3000 |
| 74LS273 | 4 | D4, 7, J4, N3 | 0986-00803-3800 |
| 74LS283 | 5 | G3, 4, 5, L4, N4, | 0986-00803-3900 |
| 74LS374 | 2 | E4, F4 | 0986-00803-4000 |
| 93422 | 4 | J5, K5, L5, M5 | 0986-00804-0800 |
| 93422 | 4 | B5, B6, C5, C6 | 0986-00803-101C |
| EPROM | 1 | A1 (VGA) | } ROM/EPROM OPTIONS KIT 0639-00803-0009 |
| EPROM | 1 | B1 (VGB) | |
| EPROM | 1 | C1 (VGC) | |
| EPROM | 1 | D1 (VGD) | |
| JUMPER WIRE | 8 | JW1-8 | 0986-00805-0200 |
| BUSS BAR | 2 | BB1, 2 | 0986-00804-0900 |
| P.C. BOARD | 1 | | A080-91399-E000 |
| 24 PIN RIGHT ANGLE CONN. | 3 | J3, 4, 5 | 0986-00804-4700 |
| 28 PIN SOCKET | 4 | ICSA1, B1, C1, D1 | 0986-00804-0300 |
| 22 PIN SOCKET | 8 | ICSB5, 6, C5, 6, J5, K5, L5, M5 | 0986-00804-0700 |
| 18 PIN SOCKET | 2 | ICS K6 L6 | 0986-00804-0600 |
| PC BD SPACER | 4 | PCMHI-PCMH4 | 0986-00701-00XF |
| PC MTG SCREW | 4 | PCMH5-PCMH8 | 0017-00101-0339 |

MH2
MH6

1
CP59

2
CP66

3
CP67

4
CP68

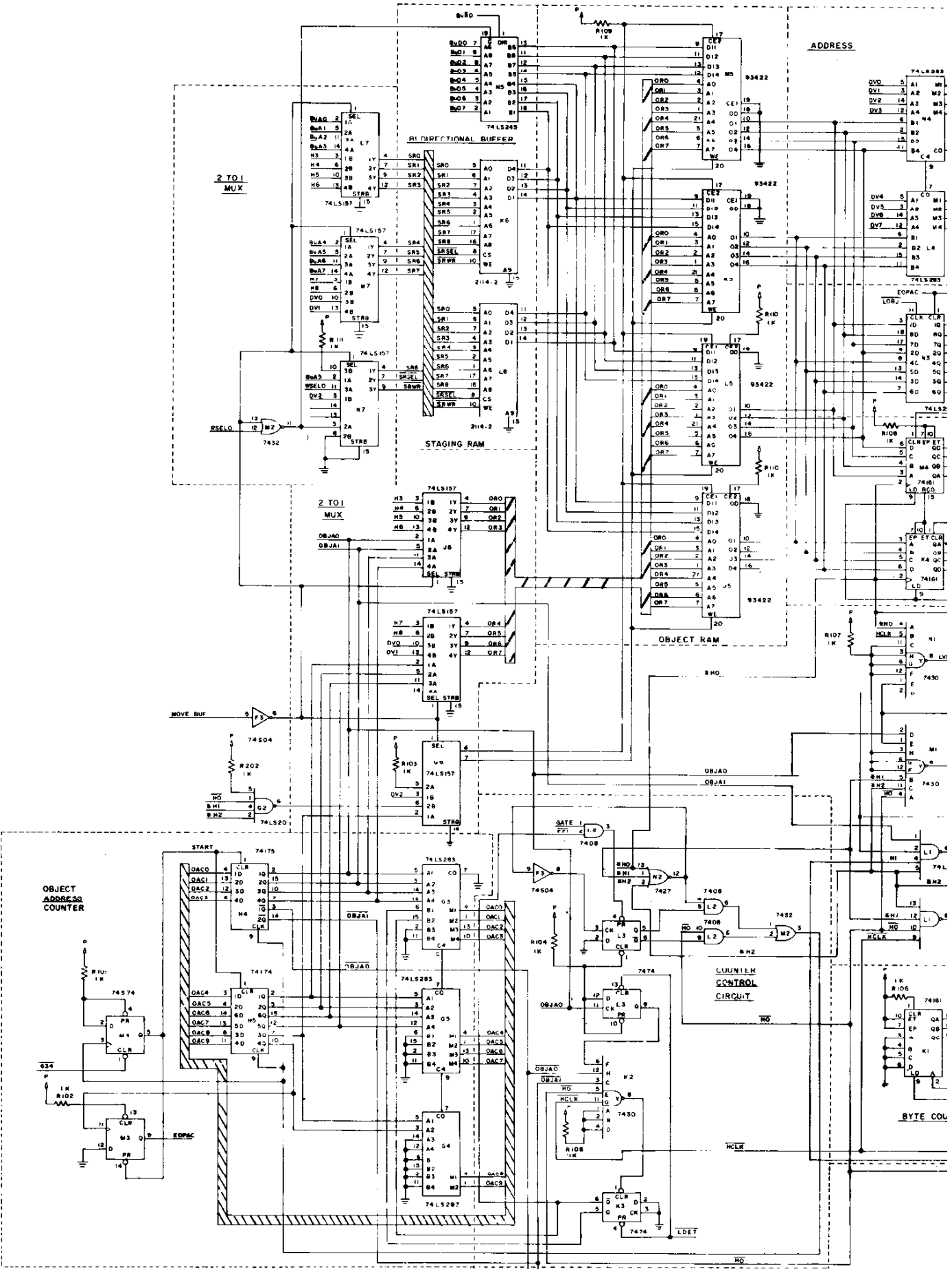
5
CP69

6
CP70

7
CP71

MH4
MH8

| | | | | | |
|---------------------------------|----------|------------------------|-------------------------------|--|-----------------|
| PROJECT ENG. A. GOSH | | USED ON KOZMIK KROOZ'R | | REVISIONS. | |
| DONOR/DATE DWG | | HEAT TREAT | SCALE | Bally / MIDWAY MFG. CO. FRANKLIN PK ILL | |
| | | | FULL | NO REQ'D | ONE PER |
| DIM TOLERANCES UNLESS SPECIFIED | | HEAT'L | VIDEO GENERATOR P.C. ASSY DWG | | PART NO |
| DATE | 02/18/83 | FINISH | A082-91399-H000 | | M051-00639-A034 |



2 TO 1
MUX

BI-DIRECTIONAL BUFFER

STAGING RAM

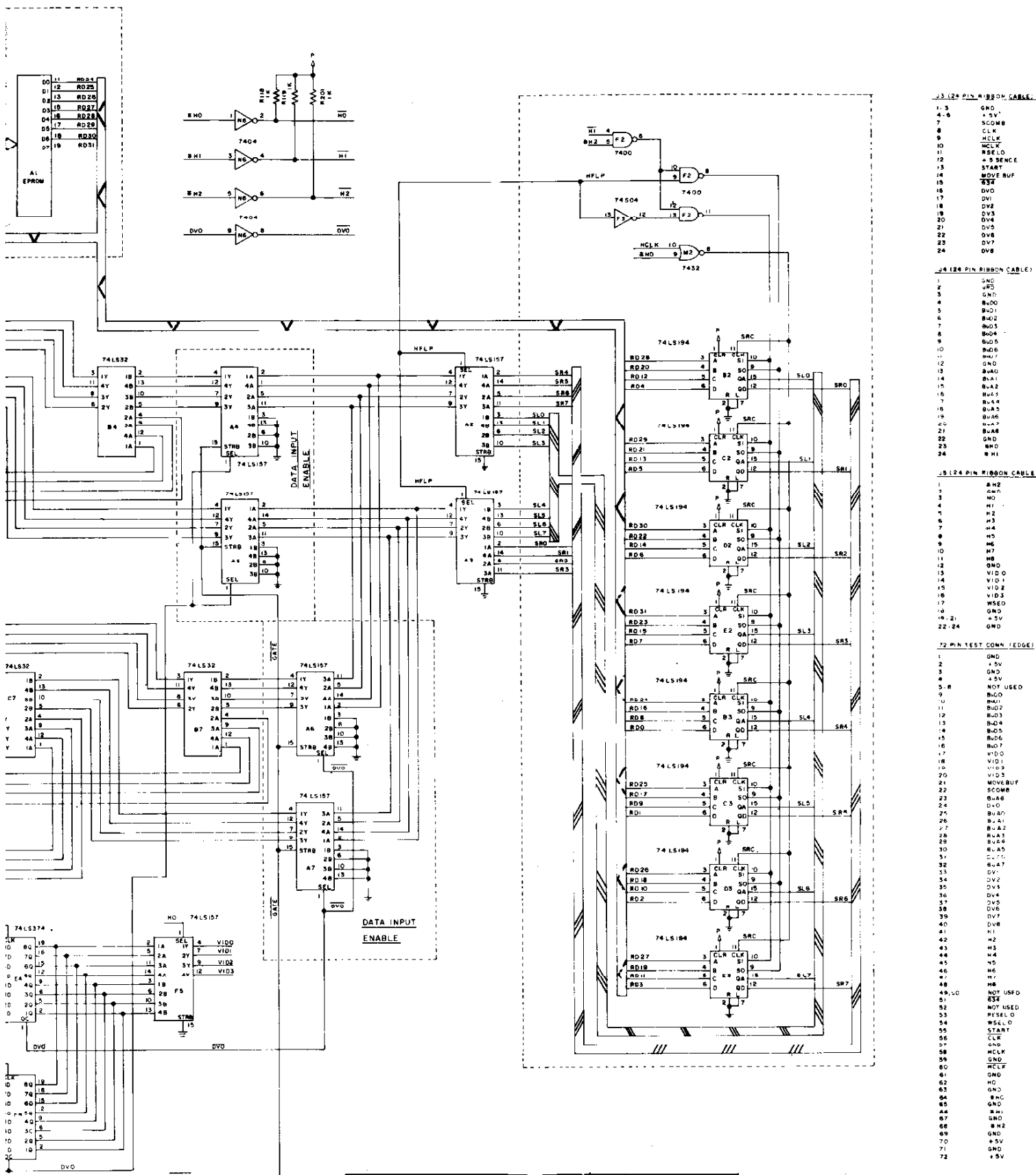
2 TO 1
MUX

OBJECT RAM

OBJECT
ADDRESS
COUNTER

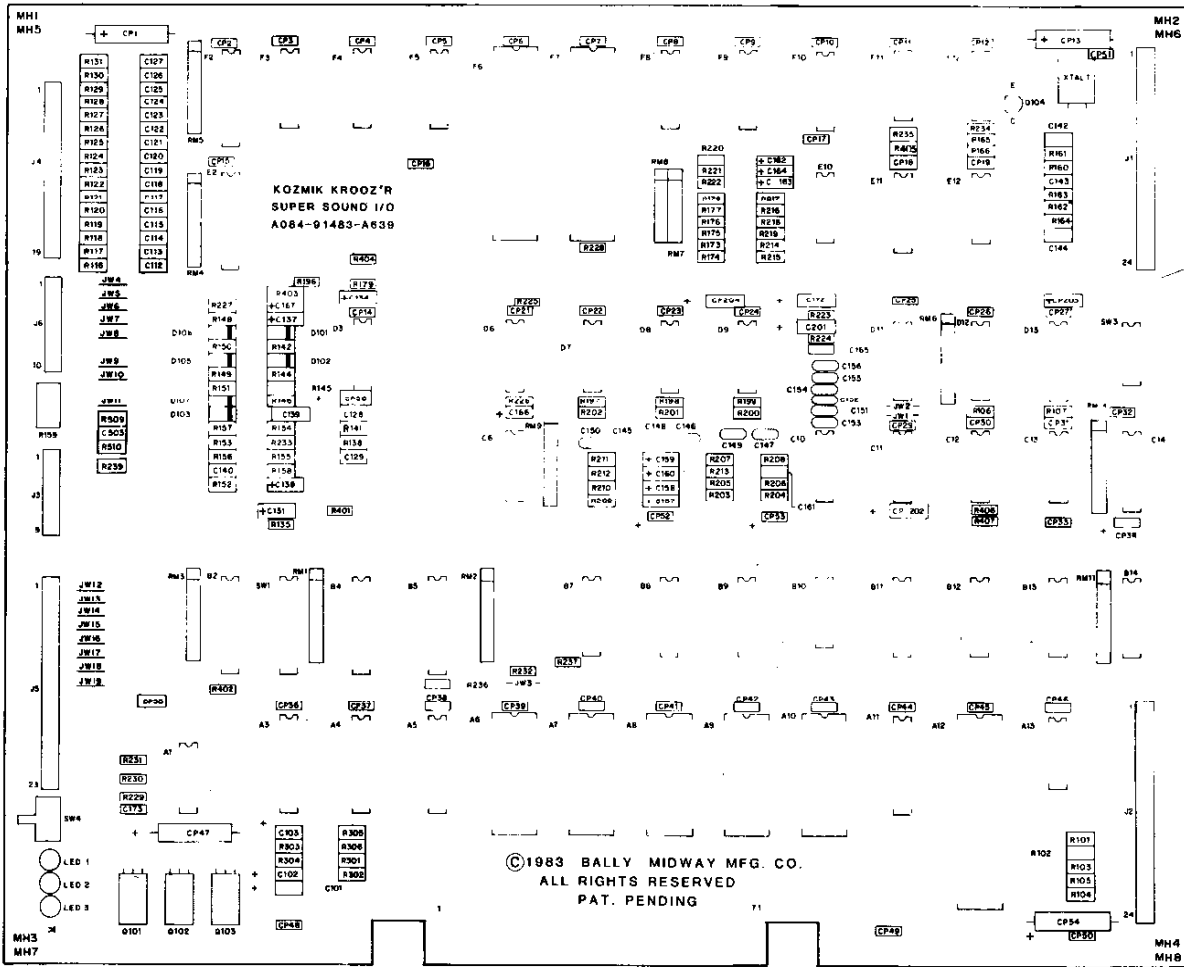
ADDRESS
CONTROL
CIRCUIT

BYTE COL



| | | | | | |
|------------------------|------|---------------|-------------------|------|----|
| PROJECT ENG. A. CHASEN | DATE | NO. OF SHEETS | REV. NO. | DATE | BY |
| | | | | | |
| SCHEMATIC VIDEO GEN. | | | MDS1-00986 - 0005 | | |
| A086-91399-H941 | | | | | |

NOTE ALL PINS +5V



DESCRIPTION

- 33PF 50V 5% AX. CER
- 47 PF 50V AX. CER.
- 100PF 50V 5% AX CER
- 330PF 50V AX. CER.
- .0022MF 100V 10% MYLAR
- .047 MF 100V MYLAR
- .01MF 50V AX. CER.

- 1MF 50V AX. CER.
- 1MF 20V AX. TANT.
- 10MF 25V AX. TANT.

470 MF 16V AX. ELECT.

- 22 OHM 1/4W 5% CARBON
- 100 " " " "
- 220 " " " "
- 300 " " " "
- 330 " " " "
- 1K " " " "
- 1.2K " " " "
- 2.7K " " " "
- 3K " " " "
- 4.7K " " " "

- 5.6K " " " "
- 10K " " " "
- 13K " " " "
- 24K " " " "
- 27K " " " "
- 33K " " " "

- 100K " " " "
- 180K " " " "
- 620K " " " "
- 1MEG. " " " "

- 820 OHM 8PIN S.I.P.
- 1.8K " 10PIN S.I.P.
- 2.7K " 10PIN S.I.P.
- 4.7K " 8 PIN S.I.P.
- 4.7K " 10PIN S.I.P.

IN4148

2N4405
TIP 110

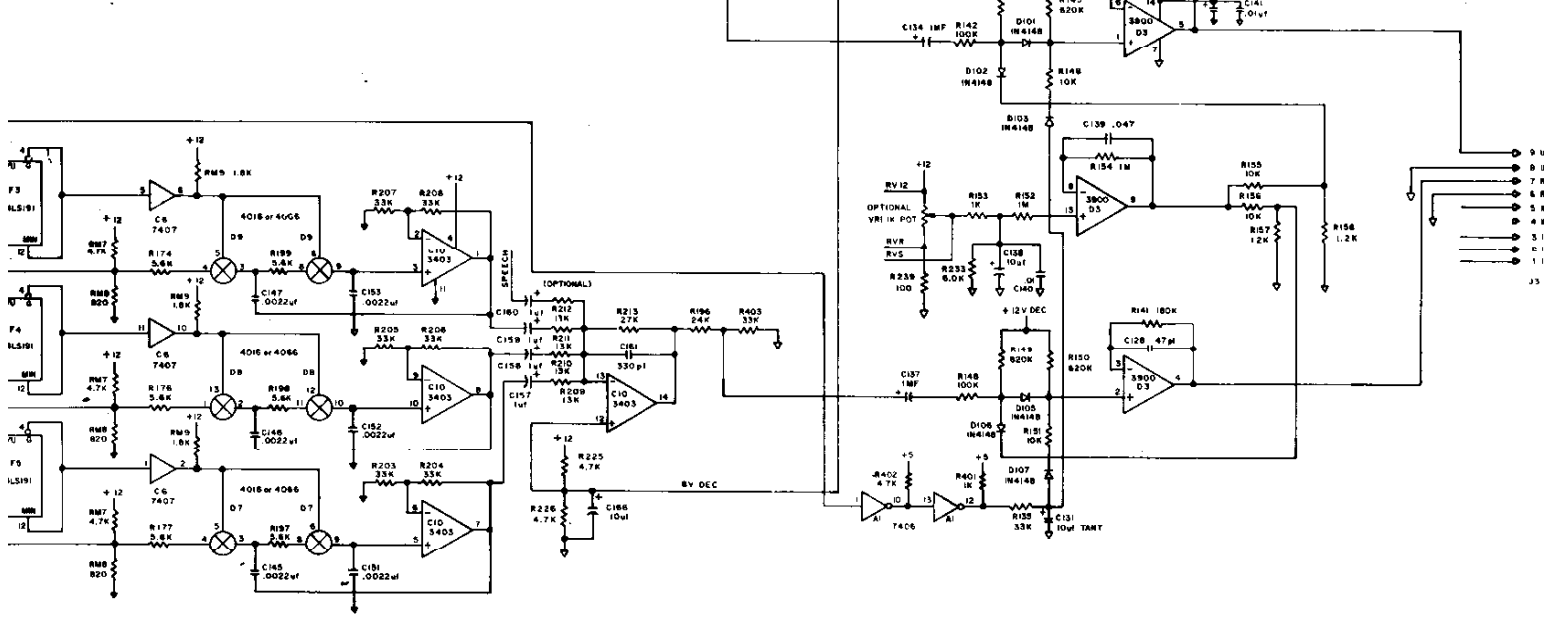
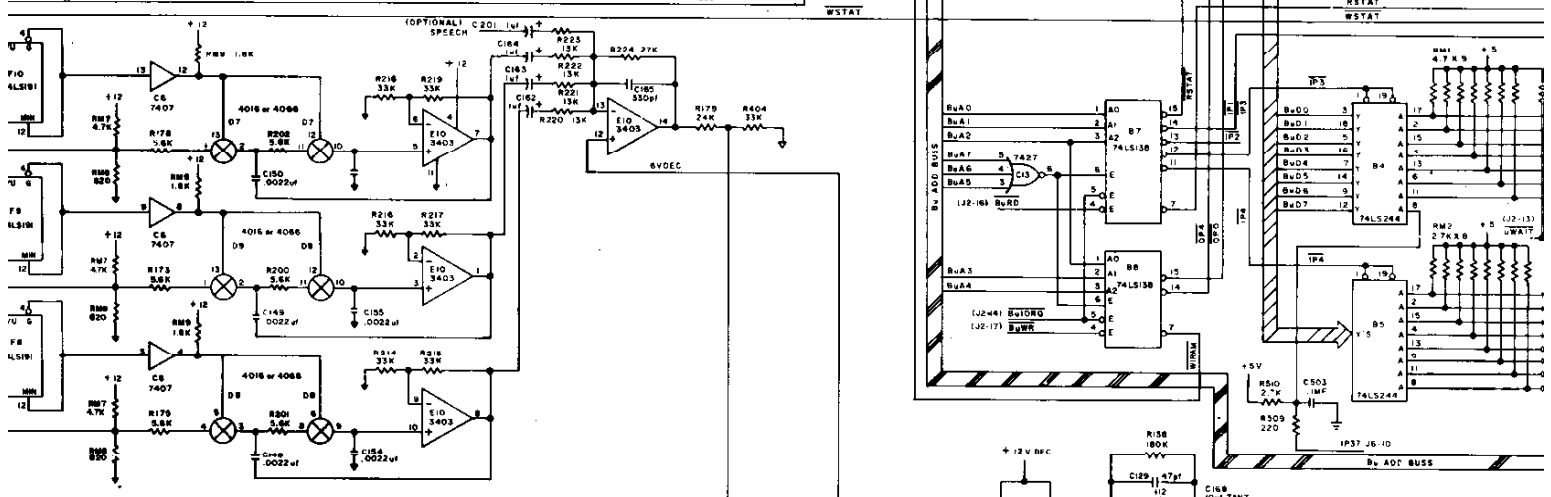
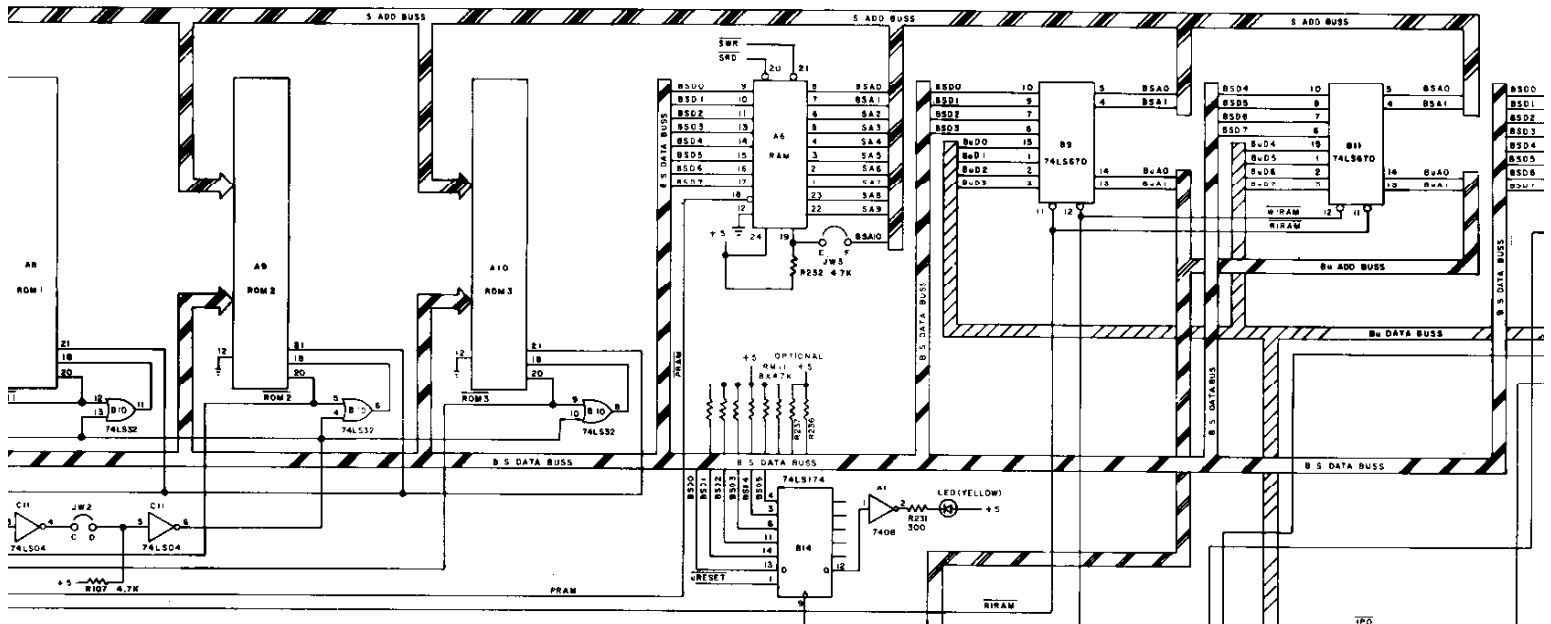
- 74LS02
- 74LS04
- 74S04
- 7406
- 7407

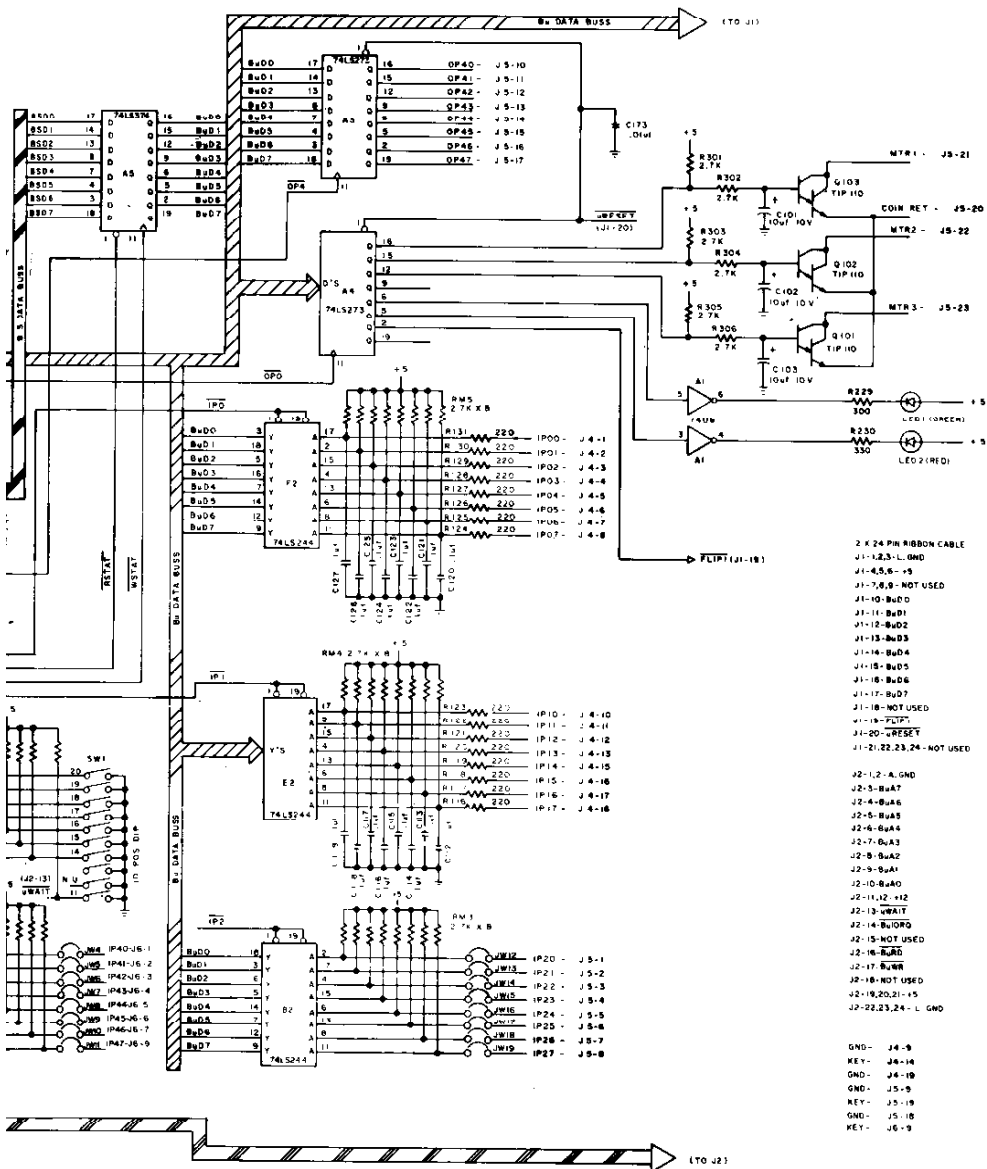
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CROSS REFERENCE LIST

| QTY | DESIGNATION | PART NOS. | DESCRIPTION | QTY | DESIGNATION | PART NOS. |
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| 1 | C144 | 0986-00800-0900 | 74LS08 | 1 | IC A:3 | 0986-00803-73J0 |
| 2 | C128,C129 | 0986-00800-2800 | 7427 | 1 | " C13 | 0986-00803-7200 |
| 1 | C142 | 0986-00800-1000 | 74LS32 | 1 | " B10 | 0986-00803-6100 |
| 2 | C161,C165 | 0986-00800-1300 | 7474 | 1 | " F11 | 0986-00803-6700 |
| 12 | C145-C156 | 0986-00800-1200 | 74126 | 1 | " E12 | 0986-00803-6800 |
| 1 | C139 | 0986-00800-2600 | 74LS138 | 4 | " B7,B8,B12,B13 | 0986-00803-6500 |
| 47 | CP2-CP12,CP14-CP19, CP21-CP27,CP29-CP33, CP35-CP46,CP48-CP51, C140, C173 | 0986-00800-2000 | 74161 | 1 | " E11 | 0986-00803-5100 |
| | | | 74166 | 1 | " D13 | 0986-00803-5300 |
| | | | 74LS174 | 1 | " B14 | 0986-00803-7500 |
| | | | 74190 | 1 | " D11 | 0986-00803-9400 |
| 18 | C112 -C127,C143,C503 | 0986-00800-1100 | 74LS191 | 6 | " F3-F5,F8-F10 | 0986-00803-5600 |
| 8 | C134,C137,C157-C159,C162-C164 | 0986-00800-1400 | 74LS244 | 5 | " B2,B4,B5,E 2,F2 | 0986-00803-4800 |
| 15 | CP34,CP52-CP53,CP202-CP204,CP20, C101-C103,C131,C136,C166,C167,C172 | 0986-00800-0700 | 74LS245 | 1 | " A11 | 0986-00803-6400 |
| | | | 74LS273 | 2 | " A3, A4 | 0986-00803-4700 |
| 4 | CP1,CP13,CP47,CP54 | 0986-00800-2700 | 74LS367 | 1 | " C14 | 0986-00803-7000 |
| | | | 74LS374 | 1 | " A5 | 0986-00803-4600 |
| | | | 74LS670 | 2 | " B9,B11 | 0986-00803-6300 |
| 1 | R164 | 0062-06383-1XXX | AY-3-8910 | 2 | " F6,F7 | 0986-00803-8500 |
| 1 | R239 | 0062-11083-1XXX | LM3900 | 1 | " D3 | 0986-00803-4900 |
| 18 | R116 -R131,R162,R509 | 0062-13383-1XXX | MC3403 | 2 | " C10,E10 | 0986-00803-5000 |
| 1 | R231 | 0062-14183-1XXX | MC14016 | 3 | " D7-D9 | 0986-00803-6200 |
| 2 | R160-R161 | 0062-14483-1XXX | MC14024 | 1 | " C12 | 0986-00803-7100 |
| 3 | R153,R227,R401 | 0062-17983-1XXX | PROMSB2-A | 1 | " D12 | 0986-00803-8200 |
| 3 | R157,R158,R163 | 0062-18383-1XXX | RAM1K X 8 | 1 | " A6 | 0986-00803-8000 |
| 7 | R301-R306,R510 | 0062-19983-1XXX | ROM/EPROM 0 | 1 | " A7 | } EPROM/ROM } OPTIONS KIT |
| 1 | R233 | 0062-20183-1XXX | " " 1 | 1 | " A8 | |
| 19 | R101-R107,R165,R166,R225,R226, R228,R232,R234,R235,R402, R405-R407 | 0062-21183-1XXX | " " 2 | 1 | " A9 | |
| | | | " " 3 | 1 | " A10 | |
| | | | Z-80(3880) | 1 | " A12 | 0986-00803-5500 |
| 12 | R173-R178, R197-R202 | 0062-21583-1XXX | 16 PIN IC SOCKET | 1 | ICSD12 | 0986-00804-1400 |
| 4 | R146,R151,R155,R156 | 0062-22783-1XXX | 24 PIN " " | 1 | ICSA6-ICSA10 | 0986-00804-1600 |
| 6 | R209-R211,R220-R222 | 0062-23383-1XXX | 40 PIN " " | 5 | ICSA12,ICSF6,ICSF7 | 0986-00804-1500 |
| 2 | R179,R196 | 0062-24583-1XXX | 9 PIN KK 100 RT. ANGLE W/4 OMIT | 1 | J3 | 3000-16366-0901 |
| 2 | R213,R224 | 0062-24783-1XXX | 10 PIN KK 100 RT. ANGLE W/8 OMIT | 1 | J6 | 3000-16366-1001 |
| 15 | R135,R203-R208, R214-R219,R403-R404 | 0062-25183-1XXX | 19 PIN KK 100 RT. ANGLE W/14 OMIT | 1 | J4 | 3000-16366-1901 |
| 2 | R142,R148 | 0062-27583-1XXX | 23 PIN KK 100 RT. ANGLE W/19 OMIT | 1 | J5 | 3000-16366-2301 |
| 2 | R138,R141 | 0062-28783-1XXX | 24 PIN KK 100 RT. ANGLE | 2 | J1,J2 | 0986-00804-4700 |
| 4 | R144,R145,R149,R150 | 0062-31383-1XXX | JUMPER WIRE | 18 | JW1,JW2,JW4-JW19 | 0986-00804-4000 |
| 2 | R152,R154 | 0062-32383-1XXX | YELLOW LED | 1 | LED 3 | 0986-00804-2000 |
| 1 | RM8 | 0986-00805-0800 | 8 POSITION DIP SW | 1 | SW3 | 0986-00805-0900 |
| 1 | RM9 | 0986-00805-0600 | 10 POSITION DIP SW. | 1 | SW1 | 0986-00805-1000 |
| 4 | RM2 -RM5 | 0986-00805-0500 | PB SWITCH | 1 | SW4 | 0986-00804-1700 |
| 1 | RM7 | 0986-00805-0400 | | | | |
| 2 | RM1,RM4 | 0986-00805-0300 | | | | |
| 6 | D101-D103,D105-D107 | 0986-00801-0200 | 16 MHZ CRYSTAL W/3RD LEAD | 1 | XTAL 1 | 0986-00805-1100 |
| 1 | D104 | 0986-00802-0500 | SNAPS | 3 | MHQ101-MHQ103 | 0017-00007-0134 |
| 3 | Q101-Q103 | 0986-00802-0400 | SPACER | 4 | MH1-MH4 | 0986-00702-00XF |
| 1 | D6 | 0986-00803-7400 | 6-32 X 6 M.S. | 4 | MH5-MH8 | 0017-00101-0153 |
| 1 | C11 | 0986-00803-6900 | SUPER SOUND I/O BOARD | 1 | | A080-91483-A639 |
| 1 | F12 | 0986-00803-6600 | | | | |
| 1 | A1 | 0986-00803-7600 | | | | |
| 1 | C6 | 0986-00803-5900 | | | | |

| | | | | | |
|-------------------------|------------|------------------------|----------------------------|---|--|
| PROJECT ENG. C. MEDNICK | | USED ON KOZMIK KROOZ'R | | REVISIONS | |
| DATE | HEAT TREAT | SCALE | NO. REO'D I PER | Bally MIDWAY MFG. CO. FRANKLIN, PA. U.S.A. | |
| DATE | DATE | DATE | DATE | PART NO. | |
| 02/21/83 | | | | M051 - 00639 - A 035 | |
| ASSEMBLY DRAWING | | | SUPER SOUND I/O P.C. BOARD | | |
| A084-91483-A639 | | | | | |





- 2 X 24 PIN RIBBON CABLE
- J1-1,2,3-L GND
 - J1-4,5,6-+5
 - J1-7,8,9-NOT USED
 - J1-10-B#D0
 - J1-11-B#D1
 - J1-12-B#D2
 - J1-13-B#D3
 - J1-14-B#D4
 - J1-15-B#D5
 - J1-16-B#D6
 - J1-17-B#D7
 - J1-18-NOT USED
 - J1-19-FLTP#1
 - J1-20-RESET
 - J1-21,22,23,24-NOT USED
 - J2-1,2-A, GND
 - J2-3-B#A7
 - J2-4-B#A6
 - J2-5-B#A5
 - J2-6-B#A4
 - J2-7-B#A3
 - J2-8-B#A2
 - J2-9-B#A1
 - J2-10-B#A0
 - J2-11,+12
 - J2-13-VWAIT
 - J2-14-B#I0R0
 - J2-15-NOT USED
 - J2-16-B#A5
 - J2-17-B#A6
 - J2-18-NOT USED
 - J2-19,20,21-+5
 - J2-22,23,24-L GND
 - GND- J4-9
 - KEY- J4-14
 - GND- J4-19
 - GND- J5-9
 - KEY- J5-19
 - GND- J5-18
 - KEY- J6-9
- 72 PIN TEST CONN
- 1-L GND
 - 2-+5
 - 3-L GND
 - 4-+5
 - 5-+12
 - 6-A GND
 - 7-+12
 - 8-NOT USED
 - 9-B#D0
 - 10-B#D1
 - 11-B#D2
 - 12-B#D3
 - 13-B#D4
 - 14-B#D5
 - 15-B#D6
 - 16-B#D7
 - 17-S00
 - 18-S01
 - 19-S02
 - 20-S03
 - 21-S04
 - 22-S05
 - 23-S06
 - 24-S07
 - 25-B#A0
 - 26-B#A1
 - 27-B#A2
 - 28-B#A3
 - 29-B#A4
 - 30-B#A5
 - 31-B#A6
 - 32-B#A7
 - 33-S#A0
 - 34-S#A1
 - 35-S#A2
 - 36-S#A3
 - 37-S#A4
 - 38-S#A5
 - 39-S#A6
 - 40-S#A7
 - 41-S#A8
 - 42-S#A9
 - 43-S#A10
 - 44-S#A11
 - 45-S#A12
 - 46-S#A13
 - 47-S#A14
 - 48-S#A15
 - 49-S#M1
 - 50-S#M2
 - 51-S#M3
 - 52-S#USACK
 - 53-S#RD
 - 54-S#WR
 - 55-RESET
 - 56-+5
 - 57-CLKCTL
 - 58-S#S
 - 59-S#E
 - 60-S#ORD
 - 61-B#I0R0
 - 62-S#WRG
 - 63-S#USREQ
 - 64-S#FSH
 - 65-L GND
 - 66-S#A17
 - 67-L GND
 - 68-S#A17
 - 69-NOT USED
 - 70-+5
 - 71-L GND
 - 72-+5

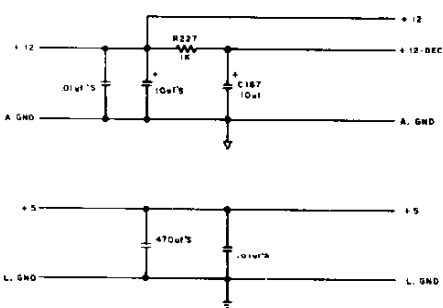
* USED ON VERSION W/PANNING
 NOT USED ON VERSION W/PANNING

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

NOTE

| ROW JUMPER OPTIONS | JW1 | JW2 |
|--------------------|-----|-----|
| EPROM/ROM | | K |
| 2032 COMPATIBILITY | | K |
| RTSC COMPATIBILITY | A | |

- 0 L AUDIO
- 8 L SHIELD
- 7 R AUDIO
- 6 R SHIELD
- 5 N.U.
- 4 KEY
- 3 RV12
- 2 RV5
- 1 RV8



| | | | | | | | |
|--------------------------------|--|---------------|--|-----------------|--|---------|--|
| PROJECT ENG J JARON | | DESIGNER | | CHECKED | | DATE | |
| SUPER SOUND I/O KOZMIK KROOZ'R | | SCHEMATIC DWG | | ALU9-91483-A639 | | PART NO | |
| NO 00639 | | REV | | DATE | | BY | |
| NO 00639 | | REV | | DATE | | BY | |
| NO 00639 | | REV | | DATE | | BY | |

DESIGNATION LIST

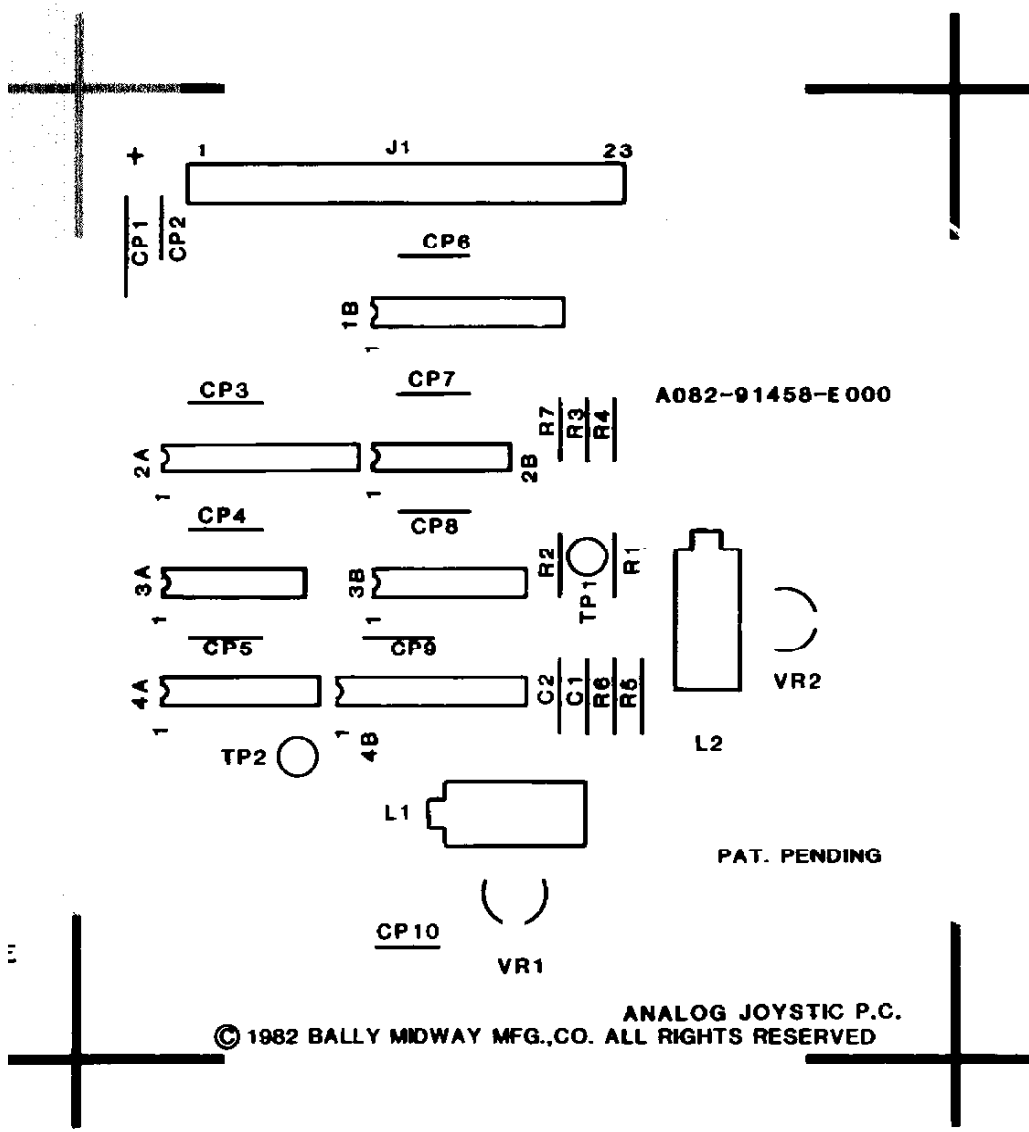
| <u>DESIGNATION NO.</u> | <u>DESCRIPTION</u> |
|------------------------|---|
| C1, C2 | 100 pf AX. CER 50 V |
| CPI | 10 μ f AX. ELECT. 16V |
| CP2 - CP10 | .01 μ f AX. CER. 50V |
| R1 | 43 ohm 1/4 W 5% |
| R2 | 1.3 K " " 2% |
| R3, R4 | 2.7 K " " 5% |
| R5 | 43 " " 5% |
| R6 | 1.3 K " " 2% |
| R7 | 2.7 K " " 5% |
| VR1, VR2 | 100 ohm POT 1/8 W |
| IC 2A | 74 LS 244 |
| " 3A | 74393 |
| " 4A | 4040 B |
| " 1B | 74 LS 244 |
| " 2B | 74393 |
| " 3B | 4040 B |
| " 4B | 74 SC240 |
| L1, L2 | 10-40 μ H COIL |
| J1 | 23 PIN KK-100 RT. ANGLE PIN 18 OMITTED |
| A080-91458-E000 | ANALOG JOYSTIC P.C. |

CROSS REFERENCE

DESCRIPTION QTY

| | |
|----------------------|---|
| 100 pf AX. CER. 50V | 2 |
| .01 μf AX. CER. 50V | 9 |
| 10 μf AX. ELECT. 16V | 1 |
| 43 ohm 1/4 W 5% | 2 |
| 1.3 K " " 2% | 2 |
| 2.7 K " " 5% | 3 |
| 100 " POT 1/8 W | 2 |
| 74 LS 244 | 2 |
| 74 393 | 2 |
| 4040 B | 2 |
| 74 SC 240 | 1 |
| 10-40 μH COIL | 2 |
| 23 PIN KK-100 RT. | 1 |
| ANGLE PIN 18 OMITTED | |

ANALOG JOYSTIC P.C. 1



A082-91458-E 000

PAT. PENDING

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ANALOG JOYSTIC P.C.

| | | | |
|----------------------------------|------------------|---------------------------|-------------------|
| PROJECT ENG: J. BOYDSTON | | | USED ON KOZMK KRO |
| DO NOT SCALE DWG. | | HEAT TREAT | SCALE FULL |
| NO. REQ'D 1 PER | | ASSY. DWG., ANALOG JOYSTI | |
| A082-91458-E000 | | A084-91458-E000 | |
| DIM. TOLERANCES UNLESS SPECIFIED | | DATE | |
| CONCENTRICITY T/R .003 | DRN. <i>TBB</i> | 03/02/83 | |
| FRACTIONAL 1/64 | CHKD. <i>QBB</i> | | |
| DECIMAL .005 | | | |
| MOLE DIA + .002 .000 | | | |

REFERENCE LIST

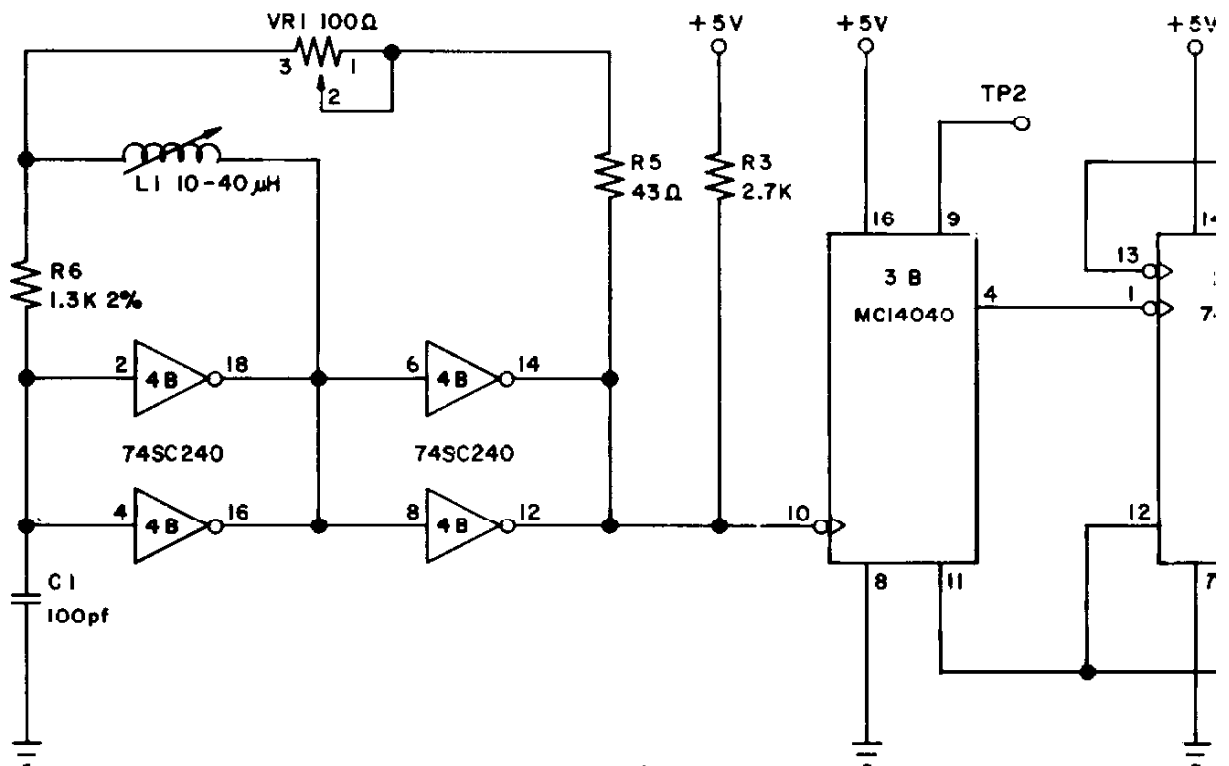
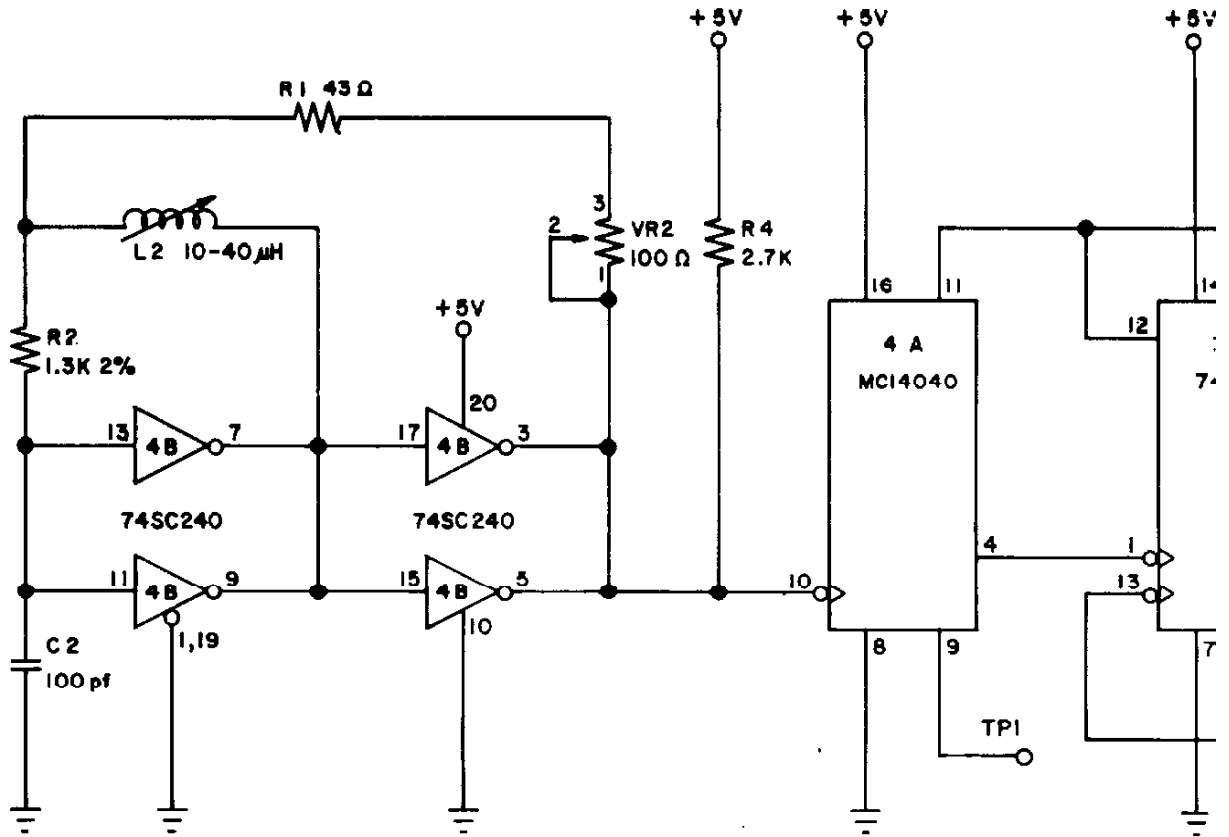
| <u>DESIG. NO.</u> | <u>PART NO.</u> |
|-------------------|-----------------|
| C1, C2 | 0639-00800-0003 |
| CP2 - CP10 | 0628-00800-0100 |
| CPI | 0628-00800-0300 |
| R1, R5 | 0062-083B3-1XXX |
| R2, R6 | 0062-185B2-1XXX |
| R3, R4, R7 | 0062-199B3-1XXX |
| VR1, VR2 | 0639-00804-0004 |
| IC 1B, 2A | 0639-00803-0003 |
| " 2B, 3A | 0639-00803-0005 |
| " 3B, 4A | 0639-00803-0004 |
| " 4B | 0639-00803-0006 |
| L1, L2 | 0639-00804-0003 |
| J1 | 3000-16366-2302 |
| | A080-91458-E000 |

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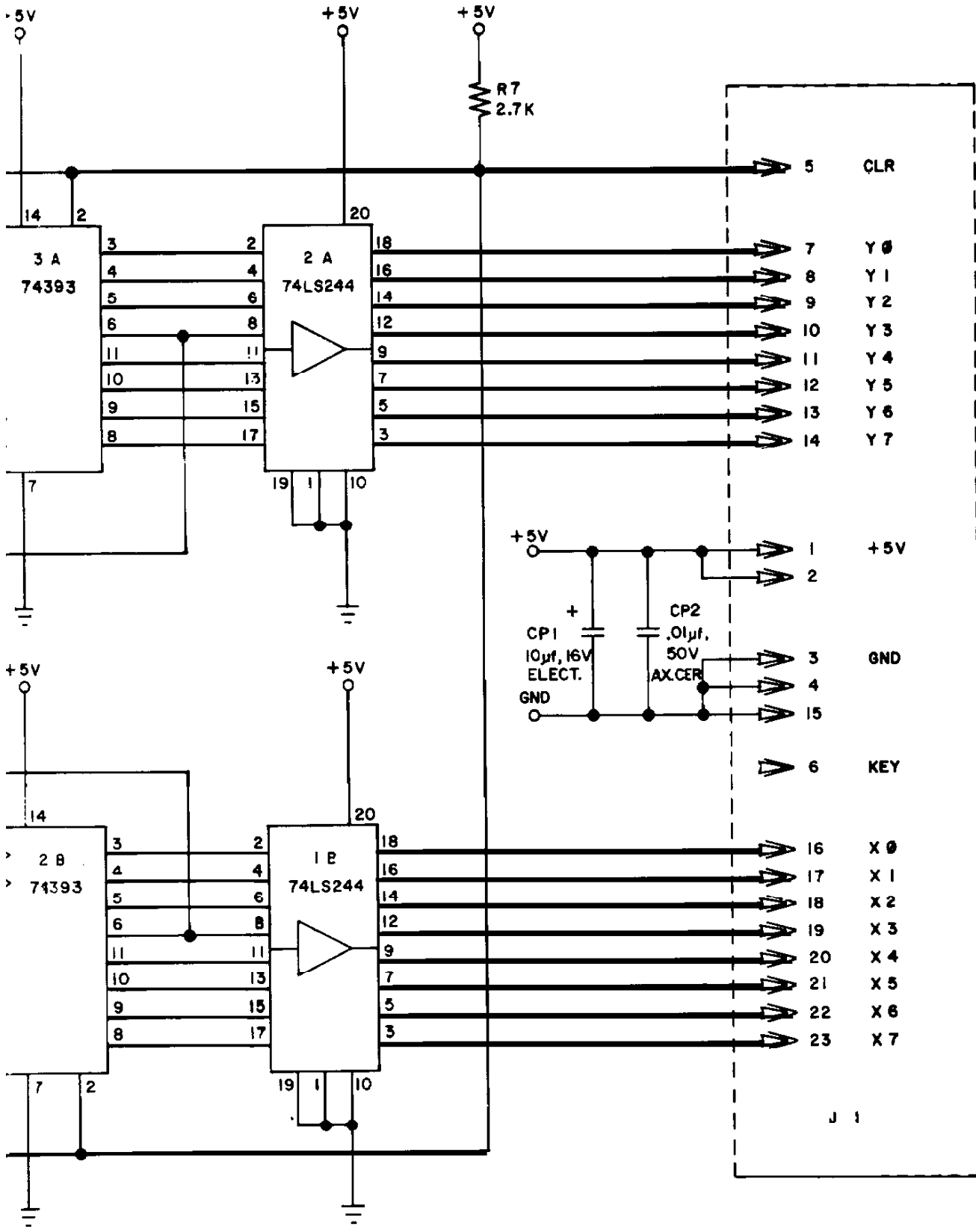
REVISIONS

| | |
|---------|--|
| KROOZ'R | <i>Bally</i> / MIDWAY MFG. CO. FRANKLIN PK. ILL. |
|---------|--|

| | |
|---------------------------|---------------------------------|
| MYSTIC P.C. 000 000 | PART NO. M051 - 00986 - E023 |
|---------------------------|---------------------------------|



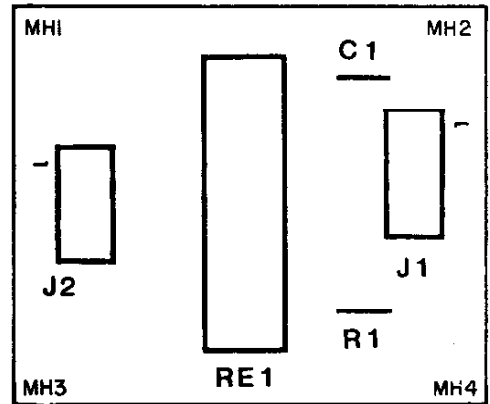
| PROJECT ENG. JOHN BOYDSTON | | DATE | SCALE |
|----------------------------------|-----------|------|----------|
| DO NOT SCALE DWG | | DATE | SCALE FU |
| DIM. TOLERANCES UNLESS SPECIFIED | DES. C.L. | DATE | SCHEI |
| CONCENTRICITY ± 0.005 | CHK. JBB | DATE | |
| FRACTIONAL ± 0.005 | DATE | DATE | |
| DECIMAL ± 0.005 | DATE | DATE | |
| HOLE DIA + 0.02 0.005 | DATE | DATE | |
| | DATE | DATE | |



| | | |
|------------------------------------|-----------------|--|
| USED ON KOZMIKKROOZ'R | | <i>Bally</i> / MIDWAY MFG. CO. FRANKLIN PK ILL. |
| FULL | NO. REQ'D 1 PER | |
| CHEMATIC DWG, ANALOG JOYSTIC P.C. | | PART NO |
| A082-91458-E000 A084-91458-E000 | | M051-00986-E024 |

DESIGNATION LIST

| <u>DESIGNATION NO.</u> | <u>DESCRIPTION</u> |
|------------------------|--|
| C1 | .01 μ f AX. CER. 50V |
| R1 | 1.5 K ohm 1/4 W 5% |
| RE1 | SOLID STATE RELAY |
| J1 | 4 PIN KK-156 STR. CONN. PIN 3 OMITTED |
| J2 | CABLE CONNECTION |
| PCMH1-PCMH4 | P.C. MTG HDRW |
| A080-90509-C000 | P.C. BOARD |



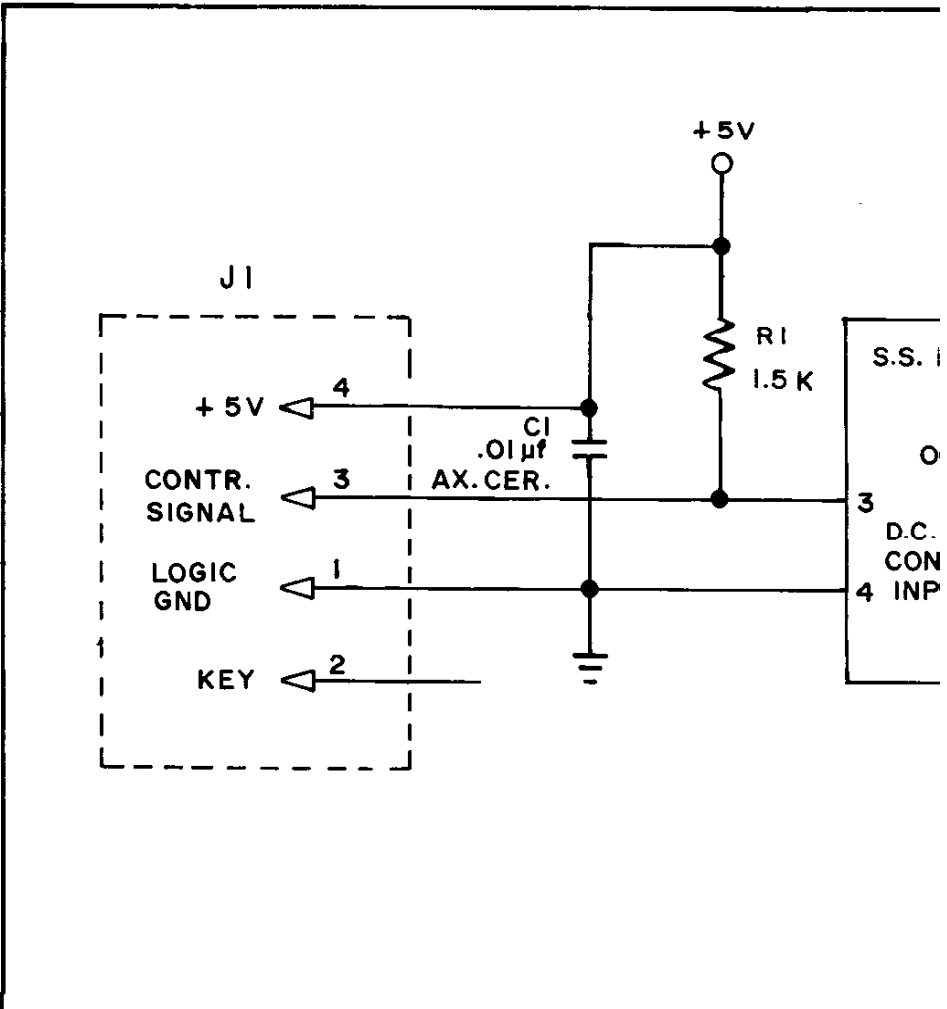
| | | |
|-------------------------------------|-----------------|-------|
| PROJECT ENG: J. BOYDSTON | | |
| DO NOT SCALE DWG | | HEAT |
| DIM. TOLERANCES UNLESS SPECIFIED | DRN. <i>TBB</i> | MAT' |
| CONCENTRICITY TYP. 0.01 | CKD. | FINIS |
| FRACTIONAL 1/16 | DATE 02/28/83 | |
| DECIMAL .005 | | |
| HOLE DIA + .002 .000 | | |

CROSS REFERENCE LIST

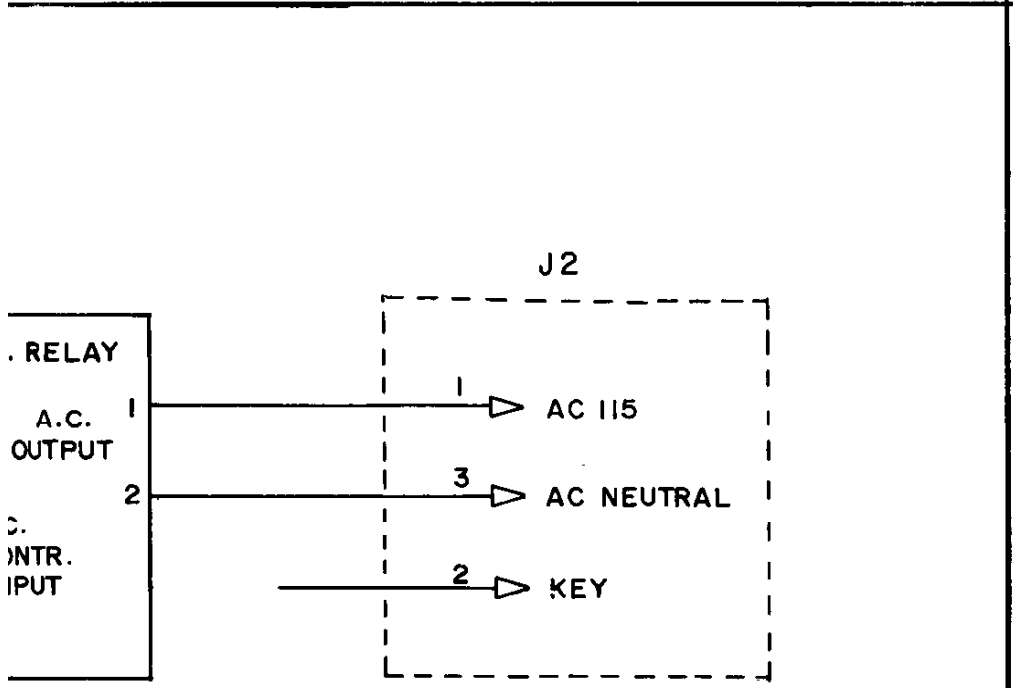
| <u>DESCRIPTION</u> | <u>QTY</u> | <u>DESIGNATION NO.</u> | <u>PART NO.</u> |
|---|------------|------------------------|-----------------|
| .01 μ f AX CER 50V | 1 | C1 | 0628-00800-0100 |
| 1.5 K ohm 1/4 W 5% | 1 | R1 | 0062-18783-1XXX |
| SOLID STATE RELAY | 1 | RE1 | 0639-00804-0002 |
| 4 PIN KK-156 STR.CONN. PIN 3 OMITTED | 1 | J1 | 3000-16367-0410 |
| CABLE CONNECTION | 1 | J2 | A639-00024-0000 |
| P.C. MTG HDRW | 4 | PCMHI - PCMH4 | 0017-00042-0320 |
| P.C. BOARD | 1 | _____ | A080-90509-C000 |

REVISIONS

| | | | | | |
|------------|--|--|--|-------------------------|--|
| HEAT TREAT | | SCALE | | USED ON KOZMIK KROOZ' R | <i>Bally</i> / MIDWAY MFG. CO. FRANKLIN PK ILL |
| | | FULL | | NO. REQ'D 1 PER | |
| MAT'L | | ASSEMBLY DWG SOLID STATE RELAY P.C. A082-90509-C000 A084-90509-C000 | | | PART NO. |
| FINISH | | | | | M051 - 00114 - C019 |



| | | | | |
|---|----------------|------------|--|--------|
| PROJECT ENG: J. BOYDSTON | | HEAT TREAT | | SCALE |
| DO NOT SCALE DWG. | | | | FULL |
| DIM. TOLERANCES UNLESS SPECIFIED CONCENTRICITY T/R .003 FRACTIONAL 1/64 DECIMAL005 HOLE DIA +.002 .000 | DRN. <i>JB</i> | MAT'L. | | A A |
| | CKD. | FINISH | | |
| | DATE 02/28/83 | | | |
| | | | | |



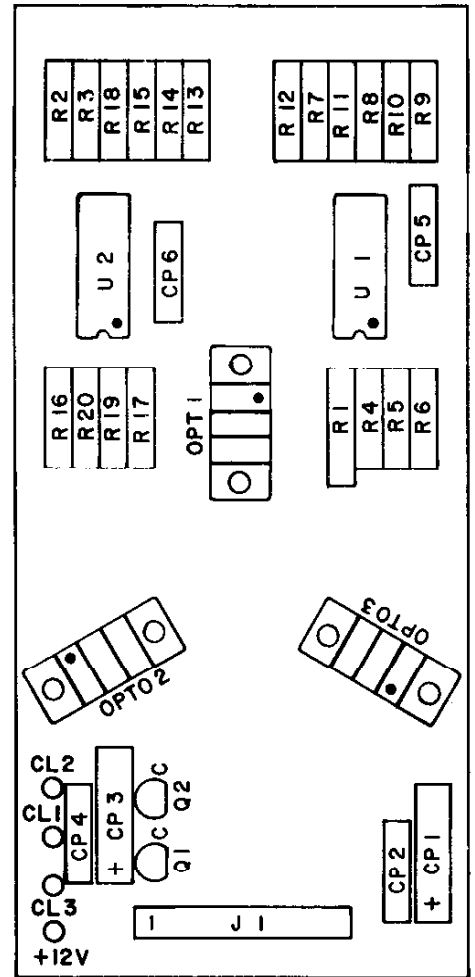
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REVISIONS

| | | |
|---|-----------------|--|
| USED ON KOZMIK KROOZ'R | | <i>Bally</i> / MIDWAY MFG. CO. FRANKLIN PK. ILL |
| LL | NO. REQ'D 1 PER | |
| SCHEMATIC DWG S. S. RELAY P.C. A082-90509-C000 A084-90509-C000 | | PART NO. M051-00114-C018 |

DESIGNATION LIST

| <u>DESIGNATION NO.</u> | <u>DESCRIPTION</u> |
|------------------------|--------------------------------|
| CP 1 | 10 μ f 16V AX. ELECT. |
| CP 2 | .01 μ f 50V AX. CER. |
| CP 3 | 10 μ f 16V AX. ELECT. |
| CP 4-6 | .01 μ f 50V AX. CER. |
| R 1 | 390 Ω 1/2W 5% CRBN FILM |
| R 2 | 100K 1/4W " " |
| R 3 | 20K " " " |
| R 4-6 | 3.3K " " " |
| R 7-12 | 1M " " " |
| R 13-16 | 10K " " " |
| R 17 | 1.3K " " " |
| R 18 | 10K " " " |
| R 19 | 1.3K " " " |
| R 20 | 3.3K " " " |
| Q 1,2 | 2N2222A TRANSISTOR |
| U 1 | LM339 |
| U 2 | 7407 |
| OPT01-3 | OPTICAL SENSOR |
| J 1 | KK-100 VERT 12 PIN |
| | PLASTIC RIVET |
| A080-91434-D639 | P.C. BOARD |

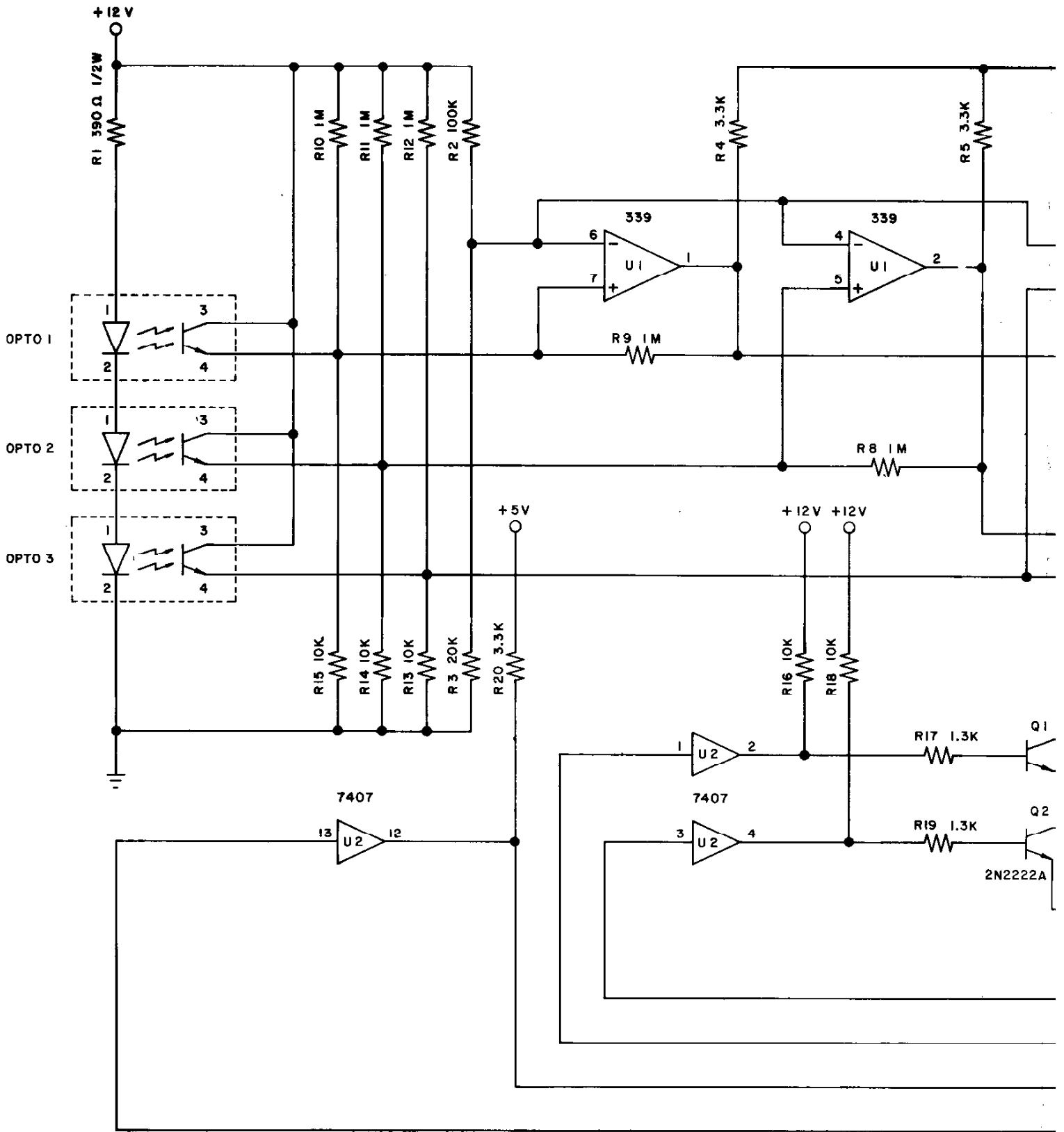


| | | | |
|---|-----------------|---------------|----------------------|
| PROJECT ENG: JOHN BOYDSTON | | HEAT TREAT | SCALE FUL |
| DO NOT SCALE DWG | | MAT'L. | ASSY SENS A084 |
| DIM. TOLERANCES UNLESS SPECIFIED | | FINISH | |
| DIM. ENTIRELY IN INCHES FRACTIONAL 1/16 DECIMAL .005 HOLE DIA. +.002 000 | | DATE 03/02/83 | |
| DRN. <i>CV</i> | CKD. <i>JPB</i> | | |

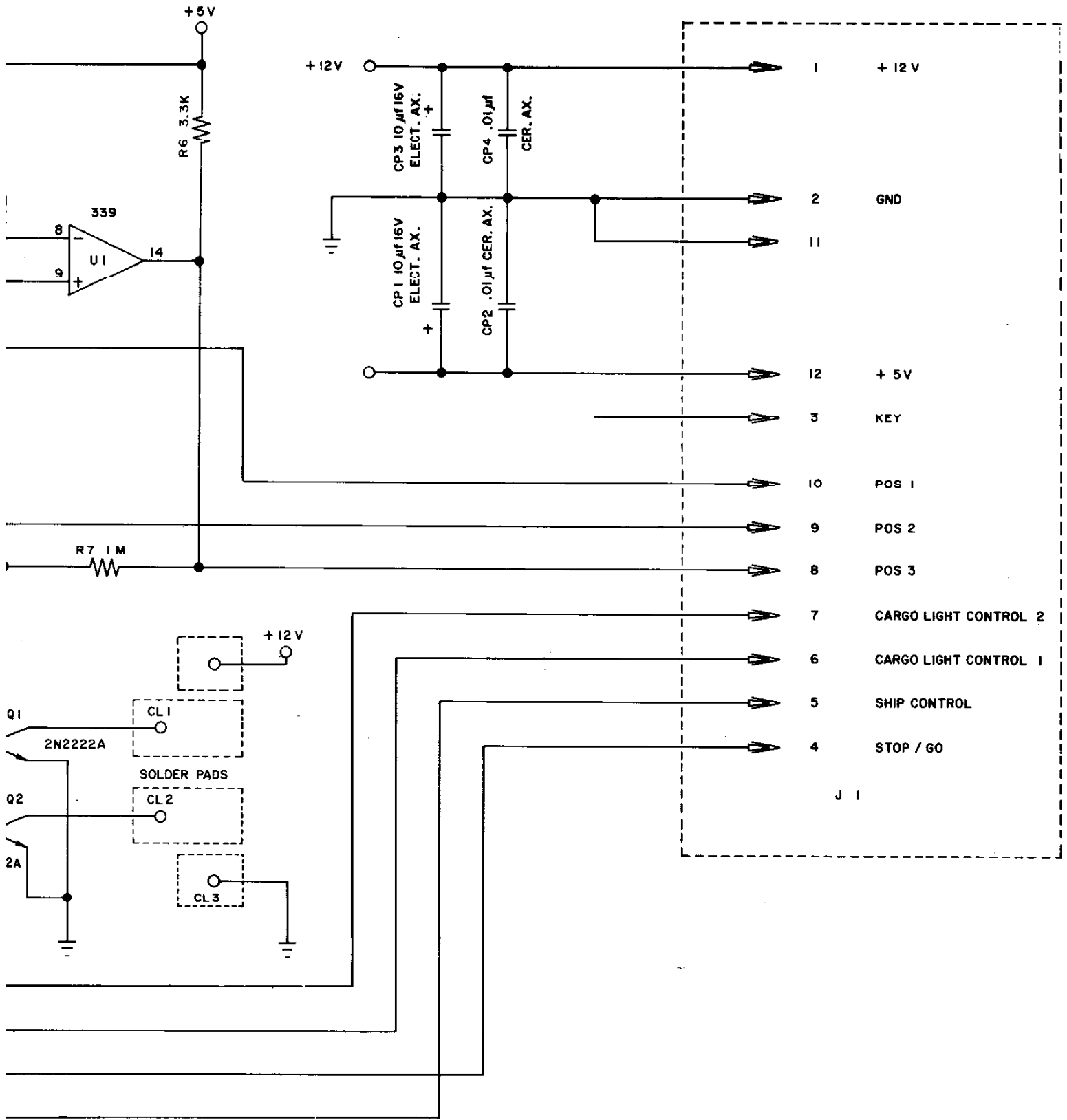
CROSS REFERENCE LIST

| <u>DESCRIPTION</u> | <u>Q'ty</u> | <u>DESIGNATION NO.</u> | <u>PART NO.</u> |
|--------------------------------|-------------|------------------------|-----------------|
| .01 μ f 50V AX. CER. | 4 | CP2,4-6. | 0639-00800-0002 |
| 10 μ f 16V AX. ELECT. | 2 | CPI,3. | 0639-00800-0001 |
| 390 Ω 1/2W 5% CRBN FILM | 1 | R 1 | 0062-150D3-1XXX |
| 1.3 K 1/4W " " | 2 | R 17,19. | 0062-185B3-1XXX |
| 3.3 K " " " " | 4 | R 4-6,20. | 0062-203B3-1XXX |
| 10 K " " " " | 5 | R 13-16,18. | 0062-227B3-1XXX |
| 20 K " " " " | 1 | R 3 | 0062-241B3-1XXX |
| 100 K " " " " | 1 | R 2 | 0062-275B3-1XXX |
| 1 M " " " " | 6 | R 7-12. | 0062-323B3-1XXX |
| 2N2222A TRANSISTOR | 2 | Q 1,2. | 0639-00802-0001 |
| LM339 | 1 | U 1 | 0639-00803-0002 |
| 7407 | 1 | U 2 | 0639-00803-0001 |
| OPTICAL SENSOR | 3 | OPTO 1-3. | 0639-00804-0001 |
| KK-100 VERT 12 PIN | 1 | J 1 | 3000-16364-1201 |
| PLASTIC RIVET RND.HD | 6 | _____ | 0017-00072-0091 |
| P C BOARD | 1 | _____ | A080-91434-D639 |

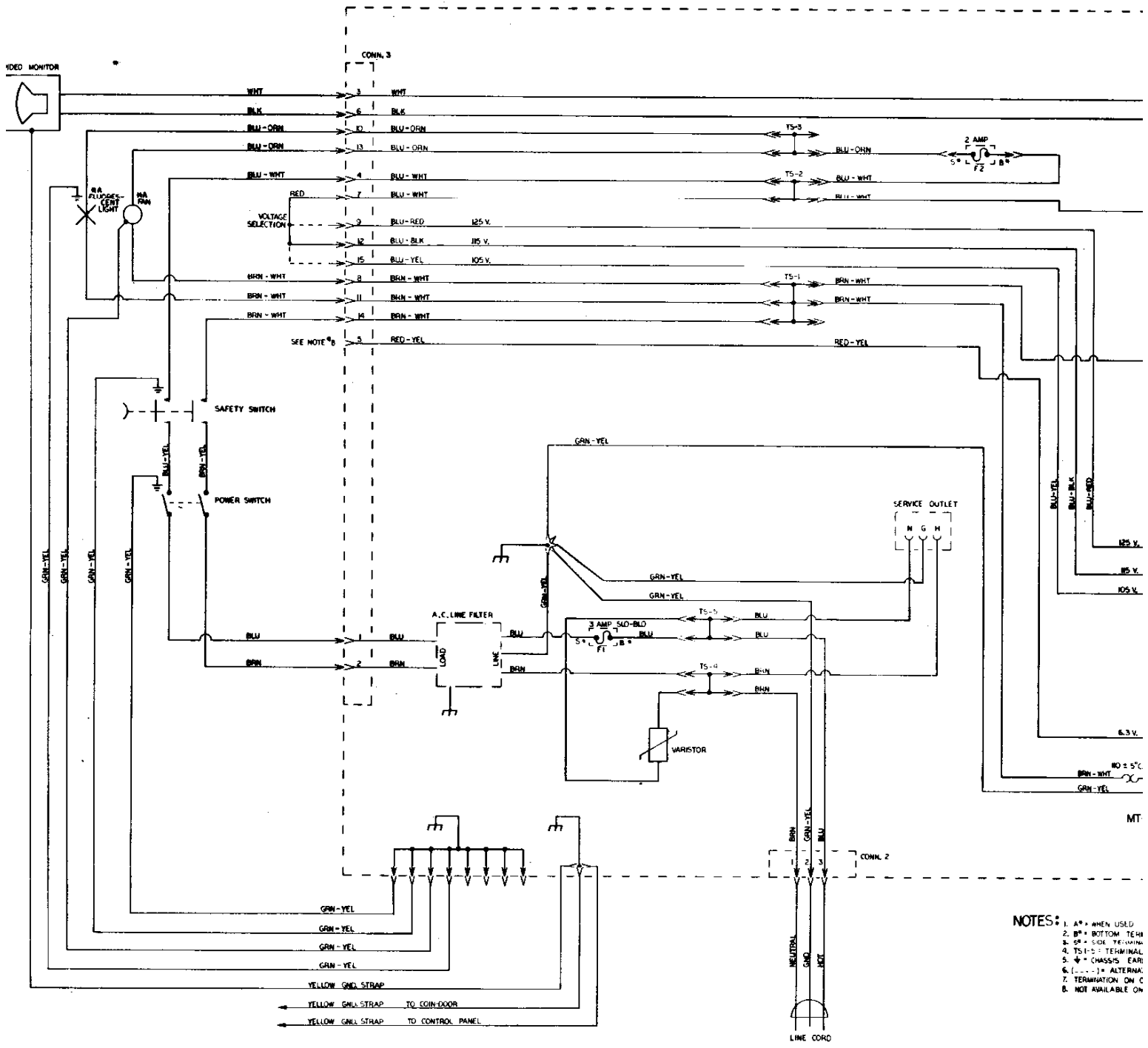
| | | |
|--|------------------------|--|
| | USED ON KOZMIK KROOZ'R | <i>Bally</i> / MIDWAY MFG. CO. FRANKLIN PK. ILL. |
| FULL | NO. REQ'D 1 PER | |
| ASSY DRAWING SENSOR P.C. A084-91434-D639 | | PART NO. M051 - 00639 - D006 |



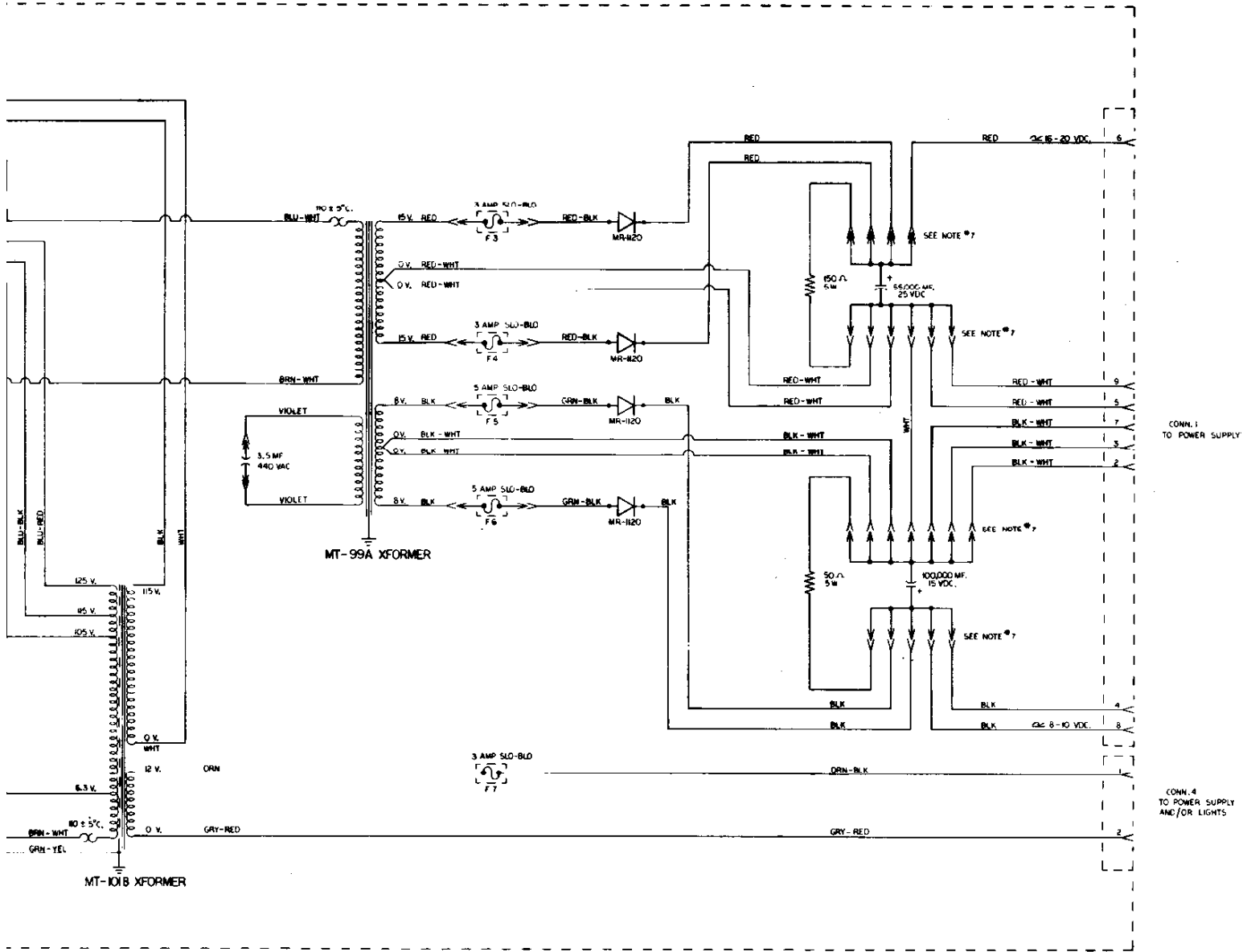
| PROJECT ENG: JOHN BOYDSTON | | HEAT TREAT | SCALE |
|----------------------------------|--------------------|------------|------------------------|
| DO NOT SCALE DWG. | | | |
| DIM. TOLERANCES UNLESS SPECIFIED | DRAWN <i>C.L.</i> | DATE | SCHEM SENSC A084 |
| CONCENTRICITY T.Y. 0.01 | CHECKED <i>JBB</i> | DATE | |
| FRACTIONAL .176 | | | |
| DECIMAL .176 | | | |
| MOLE DIA ±.002 0.00 | DATE 02/28/83 | | |



| | | |
|---------------------|-----|---|
| USED ON MOTHER SHIP | | Bally / MIDWAY MFG. CO. FRANKLIN PK. ILL. |
| NO. REQ'D | PER | |
| SCHEMATIC DRAWING | | PART NO. |
| INSOR P.C. | | M051-00639-D007 |
| 1084-91434-D639 | | |



- NOTES:**
1. A* = WHEN USED
 2. B* = BOTTOM TERM
 3. S* = SIDE TERMINAL
 4. TS-1-B = TERMINAL
 5. * = CHASSIS EARTH
 6. (...) = ALTERNATE
 7. TERMINATION ON C
 8. NOT AVAILABLE ON



- 1. A* - WHEN USED
- 2. B* - BOTTOM TERMINAL
- 3. S* - SIDE TERMINAL
- 4. TS1-5 - TERMINAL BARRIER STRIP POSITIONS
- 5. ⚡ - CHASSIS EARTH GND.
- 6. (...) - ALTERNATE COLOR
- 7. TERMINATION ON CAPACITOR POST
- 8. NOT AVAILABLE ON MT-101A

POWER CHASSIS
 125 VA 115V 60 Hz.
 * A9HS - 00020 - 0000

MIDWAY MFG. CO.
 1001 W. BELMONT AVE.
 FRANKLIN PARK, ILL. 60131

Bally

MIDWAY MFG. CO.

10601 W. Belmont Avenue
Franklin Park, Illinois 60131
Telephone (312) 451-9200



May 3, 1983

S E R V I C E B U L L E T I N

GAMES: WACKO, KOZMIK KROOZ'R, JOURNEY, ETC.

SUBJECT: ALL GAMES USING 125VA POWER CHASSIS

1. The power schematic in the Parts & Operating Manual has an error regarding fuse locations.
2. The schematic should read as follows:
 - F3 - should read F6 (3 Amps.)
 - F4 - should read F5 (3 Amps.)
 - F5 - should read F4 (5 Amps.)
 - F6 - should read F3 (5 Amps.)
3. The label on the Power Chassis is correct.

Andy Ducay
Technical Service Manager

AD/dd