

## SATAN'S HOLLOW

General Instructions



#### GENERAL INSTRUCTIONS

#### **FOR**

#### SATANS HOLLOW

#### INSTALLATION

- 1. Unlock and open the coin box door.
- 2. Remove four (4) "CABINET LEVELING LEGS" from inside the coin box.
- 3. Tip the cabinet to the side and remove the shipping cleats from its bottom.
  - \* Locate the threaded holes one in each corner and install the "CABINET LEVELING LFGS" in them.
  - ° Level the cabinet.
  - ° When finished, the cabinet should be stable in the upright position.
- 4. Plug the game into a standard A.C. wall outlet ONLY!

--WARNING----

Game **MUST** be properly grounded.

- 5. The power ON/OFF switch is located:
  - " UPRIGHT MODEL:

On top of the cabinet toward the back.

" MINI MODEL:

In the center of the cabinet back just below the rear access

door.

° COCKTAIL TABLE MODEL:

Underneath the cabinet on Player No. 2's side.

#### LINE VOLTAGE SAFETY INTERLOCK SWITCHES

Line voltage SAFETY INTERLOCK SWITCHES have been provided for your protection. The locations of these SAFETY INTERLOCK SWITCHES are:

1. UPRIGHT MODEL: Inside the rear of the cabinet on the right side of the rear access door.

- 2. MINI MODEL: Inside the rear of the cubinet on the right side of the rear access door.
- 3. COCKTAIL TABEL: Inside the cabinet on the hinge side of the coin door.

When the cabinet access door(s) are secured in place, the SAFETY INTERLOCK SWITCH plunger(s) are in a fully depressed condition. The game circuit can function normally.

When any cabinet access door(s) are opened, the SAFETY INTERLOCK SWITCH plunger(s) are in a partially extended condition. This isolates the game circuit from the line voltage.

To restore power to the game circuit with the access door(s) open, gently pull the SAFETY INTERLOCK SWITCH plunger(s) out to the fully extended condition. THIS IS TO BE USED FOR SERVICING THE GAME ONLY!

#### SELF-TEST

A slide switch is provided to make the game run a "Self-Test" on itself. The SELF-TEST SWITCH is located just inside the cabinet on the right side of the coin door frame as you face it.

To put the game into the Self-Test mode; turn the game ON and let it warm up for a few minutes. Then slide the SELF-TEST SWITCH to the ON position and actuate the "TILT" switch on the back side of the coin door just below the door lock to obtain the Self-Test-Menue display on the monitor screen.

When in the Self-Test mode, the monitor screen will display the results of certain test functions the game has run on itself. (These will be discussed in more detail later.)

#### TO SERVICE THE CONTROL PANEL(S)

#### 1. UPRIGHT MODEL:

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

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

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

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

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

° To remove the control panel:

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

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

The control panel is now free and can be removed.

° To reinstall the control panel, reverse this procedure.

#### 2. MINI MODEL:

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

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

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

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

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

° To remove the control panel:

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

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

The control panel is now free and can be removed.

° To reinstall the control panel, reverse this procedure.

#### 3. COCKTAIL TABLE MODEL:

° Each control panel is held in place by several screws, two on the inside of the cabinet and three along the bottom edge of the control panel.

Turn the power off to the game.

Open the coin box door and release the two latches on the inside of the cabinet up next to the table top.

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

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

Grasp the table top in the center above the coin door lifting up and to the side to tilt it open.

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

Remove the screws which secure the control panel in place.

° To remove the control panel(s):

Disconnect it from its cabling.

The control panel is now free and can be removed.

° To reinstall the control panel(s), reverse this procedure.

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

#### 1. UPRIGHT MODEL:

- NOTE: In order to do this, the control panel MUST be removed first. See the "UPRIGHT MODEL" procedure.
- ° Turn the power to the game off and remove the control panel. This frees the main-display-glass so it can be lifted up.
- ° By putting your finger in the hole in the middle of the main-display-glass support, you can lift it up and out.
- ° Remove the screws which secure the T.V. bezel assembly in place (front and back).
- ° The T.V. bezel assembly is now free and can be slid out of the cabinet.
- ° To reinstall the T.V. bezel asssembly and the main-display-glass, reverse this procedure.

#### 2. MINI MODEL:

- NOTE: In order to do this, the control panel  $\underline{\text{MUST}}$  be removed first. See the "MINI MODEL" procedure.
- ° Turn the power to the game off and remove the control panel.
- ° Remove the screws which secure the glass clamping plate.
- ° Lift out the glass clamping plate. This frees the main-display-glass so in 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.
- ° Remove the screws which secure the I.V. bezel assembly and lift it out.

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

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

#### 3. COCKTAIL TABLE MODEL:

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

- ° Remove the screws which secure the table top glass clamps in place.
- ° Remove the table top glass.
- ° Loosen the screws which secure the T.V. bezel-glass-clamps in place.

Move the clamps to the side and the bezel glass may be removed.

Remove the screws which secure the bezel assembly to the table top and the bezel with four bezel-glass-clamps may be removed.

° To reinstall the T.V. bezel assembly and the table top glass, reverse this procedure.

#### VOLUME CONTROL POT

The volume control pot is located just inside the cabinet on the  $\overline{\text{RIGHI}}$  side of the coin door frame. For adjustment, it may be reached through the coin door on  $\overline{\text{ALL}}$  models.

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

To make the sounds less loud, turn the pot counterclockwise ( ) as you face it.

#### **VOLTAGE CONTROL POTS**

The voltage control pots are located on the Linear Power Supply P. C. Board. They are preset at the factory and **SHOULD NOT** be tampered with at all unless the distributors service department is contacted first.

#### SELF-TEST

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 (Self-Test switch located just inside cabinet on right side of coin door frame). 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 players last Missile Launcher has been lost (the game MUST be over). At this point, the game will go into the Self-Test mode. Again, this is illustrated by the display of the Self-Test Mode 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 catagories as illustrated by the following Figure of the Self-Test Mode Menue as it should appear on the monitor screen.

- 1. It is easy to select what catagory you want to enter. By moving the Control Stick left or right, the Cursor at the left of the screen can be moved UP and DOWN, (left=UP) and (right=DOWN), until it is in front of the catagory you want to test. Release the Control Stick at this time.
- 2. After the Cursor has been positioned, depress either "SHIELD" button on the console and the monitor screen will display the test catagory you have selected.
  - NOTE: There is one exception to this. If you position the Cursor in fornt of the "PRE-SET" catagory on the Self-Test Mode Menue, when you press the "SHIELD" button on the console - EVERYTHING, I repeat EVERYTHING ; including ALL information in the "BOOKKEEPING" mode, and ALL operator selected options, will be set back to zero "O" and to the factory recommended settings respectively.
  - Once you are IN one of the Self-Test mode catagories, FOLLOW THE ON-SCREEN INSTRUCTIONS TO COMPLETE THE FEST.
- 3. The next group of Figures show the CORRECT screen presentation for EACH catagory of the Self-Test mode.

The first display of the Self-Test mode is the Self-Test-Mode-Menue. It should look like this:

#### SELECT DESIRED TEST

- 1 SELF DIAGNOSTICS
- 2 SOUNDS
- 3 PLAYER INPUT
- 4 BOOKKEEPING
- 5 MACHINE SETUP
- 6 CHANNEL TEST
- 7 PRESET
- 8 GRID DISPLAY

#### (MENUE - CONTINUED)

## POSITION CURSOR BY MOVING CONTROL HANDLE

#### HIT SHIELD BUTTON FOR TEST

During the SELF DIAGNOSTICS section of the Self-Test mode, you will first see a cross hatch pattern on the screen for about 1/2 second. Second, you will see a lot of different colored bars shown on the monitor screen. These bars will be UNpainted one at a time from the top down. Third, you will see the screen painted Red, Blue, and Green in bars from the top down. Fourth, all the different colored bars you saw "Second" are displayed again. And fifth, the different colored bars are replaced by this message: "HIT SHIELD BUTTON TO EXIT".

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.

During the SOUNDS section of the Self-Test mode, the game will give a display which looks like the following:

#### SELECT A SOUND

ALL SOUNDS

2	EXIT
3	
	FLAME SOUND
4	SHIELD SOUND
5	BASE EXPLOSION
6	MISSILE RELEASE
7	BOMB
8	DIVER RELEASE
9	STEAL BASE
10	FIRE BALL
11	MUSIC 1
12	MUSIC 2
13	MIKE HIT
14	TARGET HIT
15	COIN
16	EXTRA BASE
17	BRIDGE BEGIN
18	BRIDGE COMPLETE
19	TILT
20	10000 BONUS FLAC
21	BRIDGE PICK UP
22	1000 BONUS FLAG
23	FLY BONUS FLAG
	. E. Bonco i End

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POSITION CURSOR BY MOVING CONTROL HANDLE

HIT SHIELD BUTTON FOR TEST

During the PLAYER INPUT section of the Self-Test mode, the game will give a display which looks like the following:

As the Player Input
Switches and Devices
are activated, the Switch
or Device activated is
spelled out in the blank
space indicated at right.

1 COIN METER

ACTIVATE ALL PLAYER INPUT SWITCHES AND DEVICES

HIT TILT TO EXIT

During the BOOKKEEPING section of the Self-Test mode, the game will give a display which looks like the following:

SELECT A REPORT OR EXIT
CHUTE 1 COINS
CHUTE 2 COINS
LONGEST GAME
SHORTEST GAME
HIGHEST SCORE
LOWEST SCORE
TIME REPORT
SCORE REPORT
EXIT

POSITION CURSOR BY MOVING CONTROL HANDLE

HIT SHIELD BUTTON FOR TEST

In the TIME REPORT and SCORE REPORT sections of the BOOKKEEPING mode, the game will give displays which look like the following:

	TIME	REPORT		SCORE REPORT
0	TO	30 SEC	0	TO 5000 PTS
30	TO	60 SEC	5000	TO 10,000 PTS
60	TO	90 SEC	10,000	TO 20,000 PTS

#### (TIME REPORT AND SCORE REPORT - CONTINUED)

90	, TO	120 SEC	20,000	TO	40,000	PTS	
120	TO	150 SEC	40,000	TO	70,000	PTS	
150	TO	180 SEC	70,000	TO.	100,000	PTS	
3	TO	4 MIN	100,000	TO	150,000	PTS	
4	ТО	5 MIN	150,000	TO	200,000	PTS	
5	.T0	6 MIN	200,000	TO	250,000	PTS	
	OVER	6 MIN		0VER	250,000	PTS	

HIT SHIELD BUTTON TO EXIT HIT SHIELD BUTTON TO EXIT

During the SETUP OPTIONS section of the Self-Test mode, the game will give a display which looks like the following:

SETUP OPTIONS

\* = Factory recommended settings.

COIN CHUTE 1 \*1 COINS FOR \*1 CREDITS

COIN CHUTE 2 \*1 COINS FOR \*1 CREDITS

\*1 CREDITS FOR \*3 BASES

\*2 CREDITS FOR \*7 BASES

EXTRA BASE AT \*30,000 PTS

\*3 DIFFICULTY LEVEL

EXIT

USE SHIELD BUTTON TO POSITION CURSOR USE 1 AND 2 PLAYER BUTTONS TO ALTER **OPTIONS** 

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.

During the CHANNEL TEST section of the Self-Test mode, the game will give a display which looks like the following:

#### CHANNEL TEST

CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4
CHANNEL 5

#### HIT KICK BUTTON TO EXIT

CHANNEL 6

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

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

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 then return to the monitor screen.

SATANS HOLLOW									
OPTION SWITCH SETTINGS									
////////////////////SWITCH NO.	1 - AT B 3 - LOCATED ON SOUND I/O P.C. BOARD/////////	////							
2 COIN METERS *** 1 COIN METER	SW#1 SW#2 SW#3 SW#4 SW#5 SW#6 SW#7 SW#8 SW#9 SY ON NOT NOT NOT NOT NOT NOT OFF USED USED USED USED USED USED USED	₩#10							
MINI / UPRIGHT COCKTAIL TABLE	ON OFF								
FREEZE VIDEO  *** NORMAL OPERATION		ON OFF							
//////////////////////SWITCH NO. 3	3 - AT D 14 - LOCATED ON SOUND I/O P.C. BOARD////////	////							
*** NORMAL OPERATION SOUND I/O DIAGNOSTIC MODE	SW#1 **SW#2 **SW#3 **SW#4   ON   ON   ON   ON   ON   ON   ON   O								
*** NORMAL OPERATION RAM/ROM TEST INDICATES TEST RESULTS VIA YELLOW L E D ON SOUND I/O BOARD: FAST FLASH = BAD ROM SLOW FLASH = BAD RAM	OFF ON								
*** NORMAL OPERATION OSCILLATOR TEST	OFF ON	<b>-</b>							
*** NORMAL OPERATION FILTER TEST	OFF ON								
* THIS SWITCH NOT USED ON ( ** NO EFFECT IF SW#1 OF SWI *** INDICATES FACTORY RECOMM	TCH NO. 3 IS IN THE "OFF" POSITION. M051-00941-A011								

THE REMAINDER OF SATANS HOLLOW'S MOST COMMON OPTION SETTINGS ARE CONDUCTED DURING THE MACHINE SETUP PORTION OF THE SELF-TEST MODE. SIMPLY FOLLOW THE ON-SCREEN INSTRUCTIONS TO MAKE ANY ADJUSTMENTS YOU FEEL ARE NECESSARY.

MCR II SYSTEM									
Р.	C. BOARD J	UMP	E R	0 P	T I O I	<u> </u>			
//////////////////////////////////////	//////////////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	*	#	#	*	#	*	*	#
т. І.	2564	#	*	*	#	*	#	#	*
///////////////////////////////////////	//////C.P.U. P	. с.	В 0	A R D/	/////	/////	/////	111111	/////
MANUFACTURER	EPROM NO.	JW#1	JW#2	JW#3	J₩#4	JW#5	JW#6	NOT JUMPE	
NUMEROUR MFR'S	2532	*	#	*	*	#	*		F0R
NUMEROUS MFR'S	2732	*	#	*	*	*	#	ROMs	
111111111111111111111111111111111111111	///S O U N D I / O	Р.	С.	B 0 A	R D//	/////	/////	//////	11111
MANUF ACTURER	EPROM NO.	JW#1	JW#2						
NUMEROUS MFR'S	2532	*	#						
NUMEROUS MFR'S	2732	#	*						

<sup>\* =</sup> CUT JUMPER WIRES WHERE THIS SYMBOL "\*" APPEARS.

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

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

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

<sup># =</sup> LEAVE JUMPER WIRES IN WHERE THIS SYMBOL "#" APPEARS.

**V** Technical Troubleshooting

## **Troubleshooting**

### Introduction

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

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

## General Suggestions

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

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

## Harness Component Troubleshooting

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

#### NO GAME CREDIT

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

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

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

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

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

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

## Transformer and Line Voltage Problems

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

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

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

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

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

#### 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.
- Existing designs can be easily converted to include the Z-80.
- The Z-80 component set is at present superior in both software and hardware capabilities to any other microcomputer system on the market today.
- 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 16bit 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:

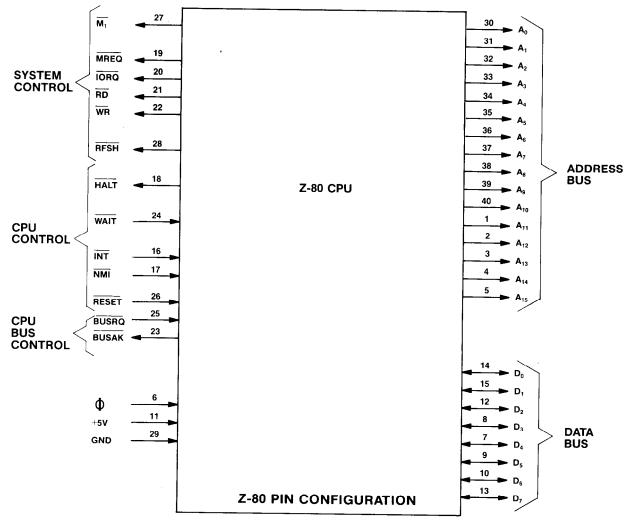
Add	Left or right shifts or rotates (arithmetic and logical)
Subtract	Increment
Logical AND	Decrement
Logical OR	Set bit
Logical Exlusive OR	Reset bit
Compare	Test bit

## 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.



## A<sub>0</sub>-A<sub>15</sub> (Address Bus)

Tri-state output, active high.  $A_0$ - $A_{15}$  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.  $A_0$  is the least significant address bit. During refresh time, the lower 7 bits contain a valid refresh address.

#### D<sub>0</sub>-D<sub>7</sub> (Data Bus)

Tri-state input/output, active high. D<sub>0</sub>-D<sub>7</sub> constitute an 8-bit bidirectional data bus. The data bus is used for data exchanges with memory and I/O devices.

#### $M_1$

#### (Machine Cycle one)

Output, active low.  $\overline{M_1}$  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,  $\overline{M1}$  is generated as each op code byte is fetched. These two byte op-codes always begin with CBH, DDH, EDH or FDH.  $\overline{M1}$  also occurs with  $\overline{IORQ}$  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  $M_1$  time while I/O operations never occur during  $M_1$  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 Iow. 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  $M_1$  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 = 00н
- 3) Set Register R = 00н
- 4) Set Interrupt Mode 0

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

#### PLEASE NOTE:

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

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

OUR STAFF AND OUR DISTRIBUTORS STAND READY TO HELP YOU!

**THANK YOU** 

VI T.V. Monitor

# Color T.V. Monitor

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

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

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

If you want to attempt to repair your monitor, it would be a good idea to read this whole section beginning to end before starting. **Pay attention to all warnings**  and take them seriously. The more equipment you have the better, but a low cost Volt-Ohm-Milliameter can often do the trick. Here are the steps to take:

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

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

## **Symptom Diagnosis**

#### 1. Insufficient width or heighth:

- 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 CIR-CUIT DEFECT).
  - Bad yoke.
  - · Open width coil.
  - Open part in horizontal output section.

## 2. Picture spread out too far or crushed in certain areas:

- A. Horizontal or vertical output transistor.
- B. Bad component in output circuitry.

#### 3. Line too close with black spacing:

A. Problem in vertical section causing poor linearity.

#### 4. Poor focus and convergence:

- A. Bad high voltage transformer ("flyback") or control.
- B. Focus voltage wire not connected to neckboard terminal.

#### 5. Colors missing; check:

- A. Interface color transistors.
- B. Color output transistors.
- C. Cracked printed circuit board.
- D. Color circuits.
- E. Video input jack.

#### 6. Picture not bright enough:

A. Weak emission from picture tube. (Turn horizontal sync off frequency and put brightness all the way up for about 15 minutes. Occasionally this cures the problem.)

#### 7. Silvery effect in white areas; check:

- A. Beam current transistors.
- B. Weak picture tube emission.

#### 8. Too much brightness with retrace lines; check:

- A. Beam limiter transistors.
- B. Brightness and/or color blanking control set too high.

#### Increasing brightness causes an increase in size and poor focus.

A. Weak high voltage rectifier or regulation (high voltage unit).

#### 10. Small picture and/or poor focus:

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

#### 11. Vertical rolling:

- A. Vertical oscillator transistor, IC, or circuit.
- B. No sync from logic board.

#### 12. Horizontal line across center:

- A. Vertical output circuit is dead (see symptom No. 1. A.).
- B. Vertical oscillator is not putting out the right wave form.

#### 13. Picture bends:

- A. Horizontal sync needs adjusting.
- B. Magnetic or electromagnetic interference.

#### 14. Flashing picture, visable 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.

#### 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:

- 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. Wavey picture — (power supply defect); check:

A. Transistors, diodes, electrolytic capacitors in the power supply.

#### 21. Moving bars in picture:

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

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

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

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

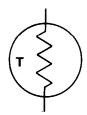
- A. Problem in the power supply: Check fuse, transistors, open fusible resistor.
- B. Shorted horizontal output transistor

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

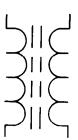
#### 24. Can't adjust purity or convergence:

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

## **Guide To Schematic Symbols**



THERMISTOR
(POLARITY DOESN'T MATTER)



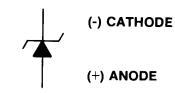
(SUCH AS A FLYBACK)



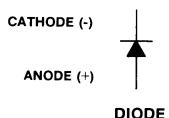
INDUCTOR, COIL, CHOKE (POLARITY DOESN'T MATTER)

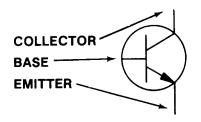


**FUSE** .(POLARITY DOESN'T MATTER)

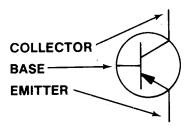


**ZENER DIODE** 





**NPN TRANSISTOR** 



PNP TRANSISTOR



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



RESISTOR (POLARITY DOESN'T MATTER)



**LINES ARE CONNECTED** 



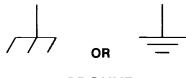
**ELECTROLYTIC CAPACITOR** 



LINES ARE NOT CONNECTED



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



**GROUND** 

## **Troubleshooting**

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

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

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

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

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

Resistors are checked with an ohmeter 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

#### 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 iack(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 assmebled like an orderly jigsaw puzzle, but so fast that you can't see the electron beams for each color painting the picture on the screen. This will all become clear soon. For now, we will follow the 60 cycle component of the sync as it goes on its journey to the deflection yoke.

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

A Wells Gardner 13" or 19" color monitor uses transistors for its sync section. An Electrohome 13" or 19" color monitor uses an integrated circuit IC501 for its sync section. The idea is all the same. The output to the vertical amplifying transistors for all monitors must be a sawtooth wave form, sort of like a bunch of pyramids, racing to the yoke's vertical coils at 60 times a second.

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

The horizontal section is very similar with a few exceptions. The horizontal wave shape is more like a square and has a frequency of 15,750 cycles a second. Again, Wells Gardner uses transistors for the horizontal oscillator, and Electrohome uses the other side of IC501. Still, the effect is the same. If the oscillator isn't going at the correct speed, the picture may move sideways, start to slant, or tear up with slanted thin figures. With both the vertical and horizontal of all monitors, there are variable resistors that change the speed of the oscillators up and down. This way you have controls that can make the correct frequencies to keep the electronic jigsaw puzzle nicely locked in place. If you're driving in a car and next to you someone else is driving their car at exactly the same speed, it will appear that they are not moving. And this is why the sync frequency and the oscillators frequencies must match, so the picture doesn't appear to move.

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

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

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

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

#### COLOR CIRCUITS

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

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

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

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

#### PROTECTION CIRCUIT —

To protect the high voltage section against voltages that are too high coming from the power supply which could cause X-rays to be emitted from the "flyback", a circuit senses the higher power supply voltage, and using a transistor, turns off the horizontal oscillator. Since the horizontal oscillator doesn't work, the horizontal output transistor has nothing to feed the "flyback" which in turn has nothing to feed the picture tube. The monitor will be silent, have no picture, and will appear to be off. **But don't be fooled.** There is still that excessive amount of voltage coming from the power supply. To find out, check the emitter on TR502 of the Wells Gardner monitors; or the emitter of X04 for the Electrohome monitor. Here are the voltages you should receive:

Wells Gardner = 127VDC Electrohome = 120VDC

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

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

#### THE PICTURE TUBE (OR CRT) —

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

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

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

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

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

## Differences Between Monitors

The easiest way to identify the brand of monitor you are working with, assuming you can't find the brand name written on it anywhere, is to see if there are two circuit boards rising up from the chassis toward the picture tube neck. In other words, they stand up, or are perpendicular to the chassis, with a black plastic bracket holding them in place. This is a description of a Wells Gardner monitor. They use separate boards for main chunks of circuitry. Therefore, you have a "power board" (the power supply), an "interface board" (the interface section), and a "horizontal/vertical board" (for the deflection circuitry). Still, there are a few parts on the chassis, but most can be found on the board. An Electrohome monitor has no

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

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

## Parts Interchangeability

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

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

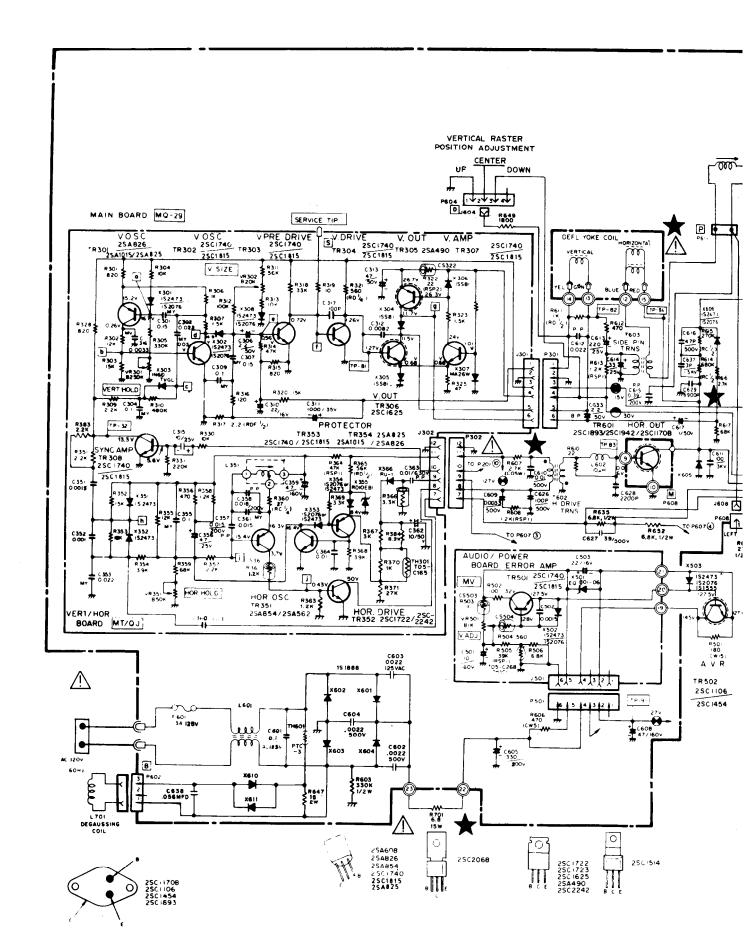
#### 4. PICTURE TUBES:

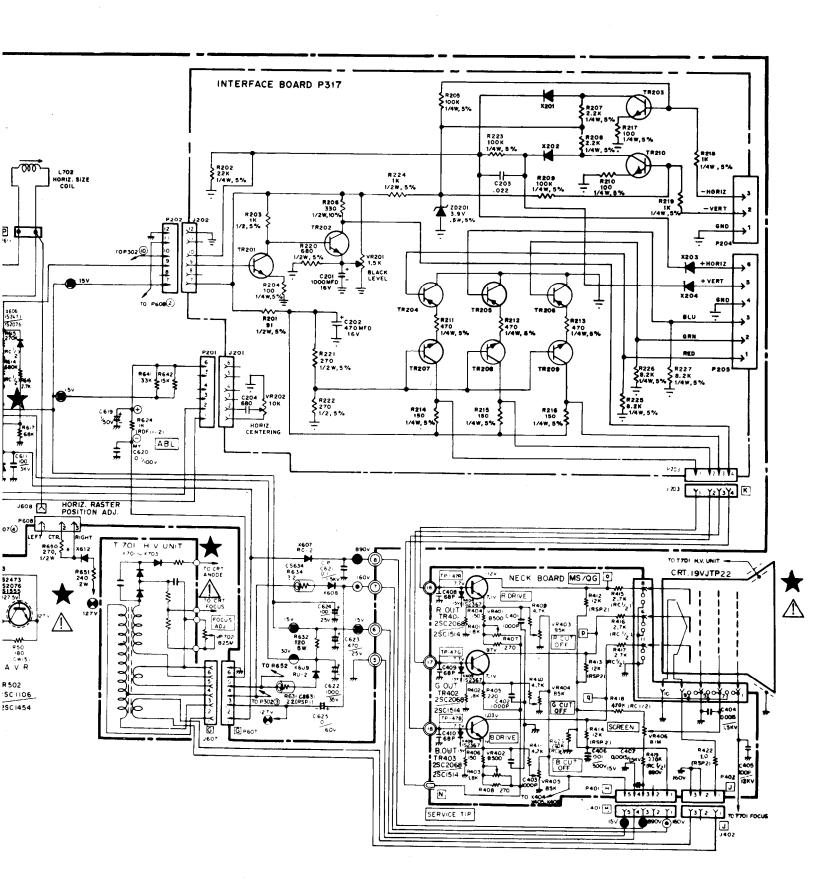
Due to the fact that "ELECTROHOME" is now (October, 1981) using a picture tube with an **internal shield**, these picture tubes can be used in EITHER "WELLS GARDNER" or "ELECTROHOME" monitors.

However, a "WELLS GARDNER" picture tube can **ONLY** be used in a "WELLS GARDNER" monitor. It will not function properly if installed in an "ELECTROHOME" monitor. The picture purity will be off.

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

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





#### **NECK BOARD (MS/QG)**

RES	SISTORS			
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
203X6500-709	1.8k Ohm ± 5% 1/8W Carbon			
203X6500-709	1.8k Ohm ± 5% 1/8W Carbon	C403	202X7000-2 <b>47</b>	1000 pF, 50V, 10% Ceramic
		C404	202X7110-0 <b>19</b>	1500 pF, 2kV ± 10% Ceramic
				100 pF, 12kV, ± 10% Ceramic
				.01 uF, 500V, ± 10% Ceramic
			202X7110-01 <b>9</b>	1500 pF, 2kV ± 10% Ceramic
				68 pF, 50V, ± 10% Ceramic
				68 pF, 50V, ± 10% Ceramic
		C410	202X8000-550	68 pF, 50V, ± 10% Ceramic
203X6500-800				
203X9104-809			CEMICO	UDUCTORS
203X9104-809			SEMICO	ADOCIONS
203X9104-809	12k Ohm ± 5% 2.0W Metal Oxide			
203X5601-313	2.7k Ohm ± 10% 1/2W Comp.	TR401	200X3206-800	Transistor, 2SC2068, 2SC151
			200,0200,000	(R output)
203X5601-313		TR402	20073206-800	Transistor, 2SC2068, 2SC1514
203X5602-254		111702	200/0200-000	(G output)
203X5602-185	330k Ohm ± 10% 1/2W Comp.	TD402	20072200 200	
203X9105-117	1.0 Ohm ± 10% 2W Metal Oxide	111403	200X3206-800	Transistor, 2SC2068, 2SC1514
203X5102-155	270k Ohm ± 5% 1/4W Carbon	V.10.1		(B output)
204X2115-014	500 Ohm Varistor R Drive			Diode, IS2367 (protector)
204X2115-014	500 Ohm Varistor B Drive			Diode, IS2367 (protector)
204X2115-006	5k Ohm Varistor R Cutoff	X406	201X2100-126	Diode, IS2367 (protector)
204X2115-006	5k Ohm Varistor G Cutoff			
204X2115-006	5k Ohm Varistor B Cutoff			
204X2000-025	1M Ohm Varistor Screen			ELL ANEONO
			MISC	ELLANEOUS
CAPA	CITORS	.1401	20675003,720	Socket, 5 Pin
				Socket, 3 Pin
202X7000-247	1000 pF, 50V, 10% Ceramic			Plug, 5 Pin
				Plug, 3 Pin
	203X9104-809 203X9104-809 203X9104-809 203X5601-313 203X5601-313 203X5602-254 203X5602-254 203X5602-185 203X9105-117 203X5102-155 204X2115-014 204X2115-006 204X2115-006 204X2115-006 204X2115-006	203X6500-447 203X6500-481 203X6500-447 203X6500-447 203X6500-508 270 Ohm ± 5% 1/8W Carbon 203X6500-508 270 Ohm ± 5% 1/8W Carbon 203X6500-508 270 Ohm ± 5% 1/8W Carbon 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon 203X9104-809 12k Ohm ± 5% 2.0W Metal Oxide 203X95601-313 2.7k Ohm ± 10% 1/2W Comp. 203X5601-313 2.7k Ohm ± 10% 1/2W Comp. 203X5602-254 470k Ohm ± 10% 1/2W Comp. 203X5602-185 203X5602-185 203X5105-117 1.0 Ohm ± 10% 1/2W Comp. 203X5602-155 270k Ohm ± 10% 1/2W Comp. 203X5105-117 1.0 Ohm ± 10% 1/2W Comp. 203X5105-117 1.0 Ohm ± 10% 1/2W Comp. 203X5105-117 500 Ohm Varistor R Drive 204X2115-006 5k Ohm Varistor B Drive 5k Ohm Varistor B Cutoff 204X2115-006 5k Ohm Varistor B Cutoff 204X2115-006 5k Ohm Varistor B Cutoff 1M Ohm Varistor Screen	203X6500-447 150 Ohm ± 5% 1/8W Carbon C406 203X6500-481 220 Ohm ± 5% 1/8W Carbon C406 203X6500-447 150 Ohm ± 5% 1/8W Carbon C407 203X6500-508 270 Ohm ± 5% 1/8W Carbon C409 203X6500-508 270 Ohm ± 5% 1/8W Carbon C409 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon C410 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon C410 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon C410 203X9104-809 12k Ohm ± 5% 2.0W Metal Oxide 203X9104-809 12k Ohm ± 5% 2.0W Metal Oxide 203X9104-809 12k Ohm ± 5% 2.0W Metal Oxide 203X5601-313 2.7k Ohm ± 10% 1/2W Comp. TR401 203X5601-313 2.7k Ohm ± 10% 1/2W Comp. TR402 203X5602-254 470k Ohm ± 10% 1/2W Comp. TR402 203X5602-185 330k Ohm ± 10% 1/2W Comp. TR403 203X5602-185 330k Ohm ± 10% 1/2W Comp. TR403 203X5602-155 270k Ohm ± 5% 1/4W Carbon X404 204X2115-014 500 Ohm Varistor B Drive X405 204X2115-006 5k Ohm Varistor B Cutoff 204X2115-006 5k Ohm Varistor B Cutoff 204X2115-006 5k Ohm Varistor Screen  CAPACITORS  202X7000-247 1000 pF, 50V, 10% Ceramic P401	203X6500-447 150 Ohm ± 5% 1/8W Carbon C405 202X7150-018 203X6500-481 220 Ohm ± 5% 1/8W Carbon C407 202X7110-019 203X6500-508 270 Ohm ± 5% 1/8W Carbon C408 202X8000-550 203X6500-508 270 Ohm ± 5% 1/8W Carbon C409 202X8000-550 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon C410 202X8000-550 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon C410 202X8000-550 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon C410 202X8000-550 203X6500-800 4.7k Ohm ± 5% 1/8W Carbon 203X9104-809 12k Ohm ± 5% 2.0W Metal Oxide 203X9104-809 12k Ohm ± 5% 2.0W Metal Oxide 203X9104-809 12k Ohm ± 5% 2.0W Metal Oxide 203X5601-313 2.7k Ohm ± 10% 1/2W Comp. TR401 200X3206-800 203X5601-313 2.7k Ohm ± 10% 1/2W Comp. TR402 200X3206-800 203X5602-254 470k Ohm ± 10% 1/2W Comp. TR402 200X3206-800 203X5602-185 330k Ohm ± 10% 1/2W Comp. 203X5602-185 330k Ohm ± 10% 1/2W Comp. TR403 200X3206-800 203X5102-155 270k Ohm ± 5% 1/4W Carbon 204X2115-014 500 Ohm Varistor R Drive 204X2115-006 5k Ohm Varistor R Drive 204X2115-006 5k Ohm Varistor B Cutoff 204X2100-126 204X2100-126 204X2000-025 1M Ohm Varistor Screen MISC

#### **△★ 297X2000-072 HIGH VOLTAGE ASSEMBLY (T701)**

▲★R701 VR702 X701 X702 X703	204X1625-058 204X3901-125	3.3 Ohm, ± 10% 10W WW Resistor Focus Control Diode (SI HV) Diode (SI HV) Part of T701
X703		Diode (St HV) 🍠

### FINAL ASSEMBLY PARTS

△ ★88X-0129-506	19VJTP22 Pix Tube
38A5554-000	Assy. Purity Shid/Degaussing
205X9800-256	Lateral/Purity Assembly
△★ 202X1110-810	Yoke, Deflection
208X2000-946	CRT Socket
297X2000-072	HV Unit (1701)
6A0397	Plug, Line Cord
9A2753-003	Decaussing Coll (I 701)

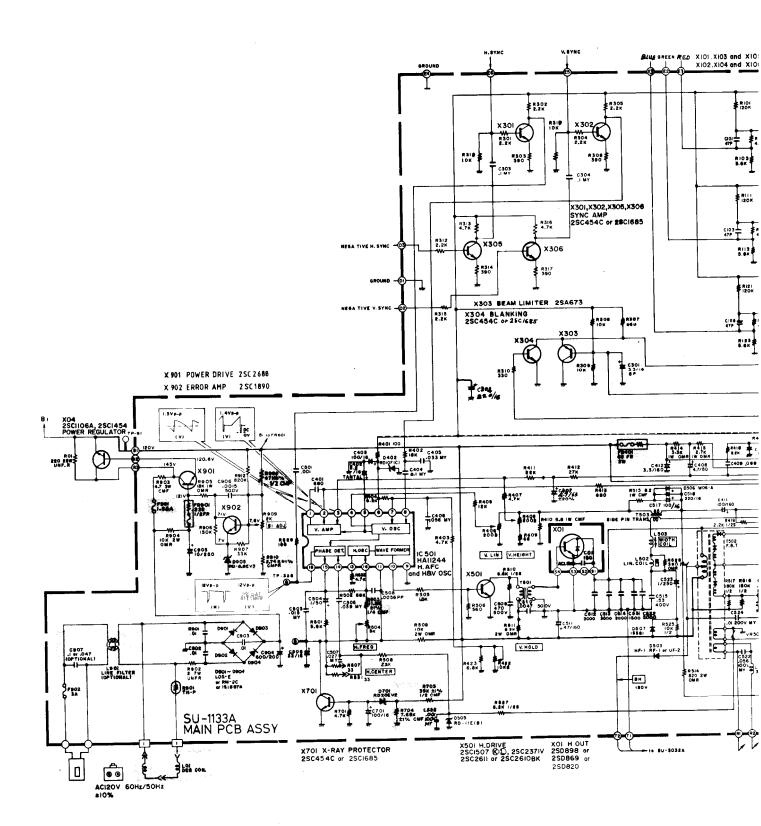
### INTERFACE BOARD (P305)

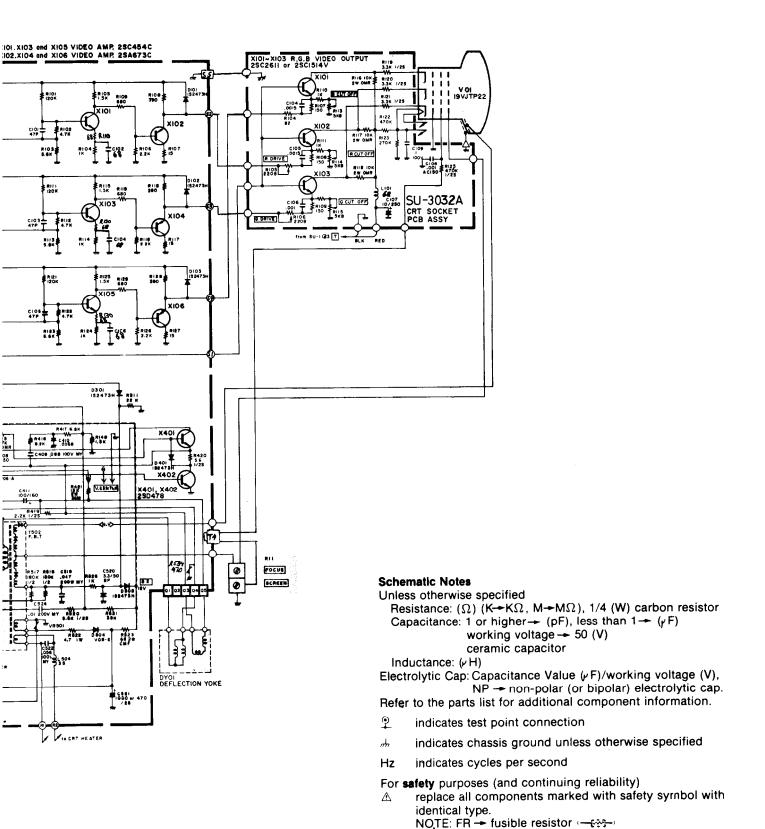
(MODEL 19K4606)

RESISTORS			SEMICONDUCTORS			
R201 R203 R204 R206 R207 R208	340X3910-934 340X3102-934 340X2101-934 340X331-944 340X3102-934 340X7152-934	91 Ohm, 5%, 1/2W Carbon 1k Ohm, 5%, 1/2W Carbon 100 Ohm, 5%, 1/4W Carbon 330 Ohm, 10%, 1/2W Carbon 1k Ohm, 5%, 1/2W Carbon 1.5k Ohm, 5%, 1/4W Carbon	TR201 TR202 TR203 TR204 TR205 TR206	86X0121-001 86X0121-001 86X0121-001 86X0066-001 86X0066-001 86X0066-001	Transistor (NPN) Transistor (NPN) Transistor (NPN) Transistor (PNP) Transistor (PNP) Transistor (PNP)	
R209 R210 R211 R212 R213 R214	340X2101-934 340X3102-934 340X2331-934 340X2331-934 340X2331-934 340X2201-934	100 Ohm, 5%, 1/4W Carbon 1k Ohm, 5%, 1/2W Carbon 330 Ohm, 5%, 1/4W Carbon 330 Ohm, 5%, 1/4W Carbon 330 Ohm, 5%, 1/4W Carbon 200 Ohm, 5%, 1/4W Carbon	TR207 TR208 TR209 ZD201 ZD202	86X0121-001 86X0121-001 86X0121-001 66X0040-018 66X0040-019	Transistor (NNP) Transistor (NPN) Transistor (NPN) Diode, Zener, 6.8v, 5%, 0.5W Diode, Zener, 3.9v, 5%, 0.5W	
R215 R216 VR201	340X2201-934 340X2201-934 40X0590-017	200 Ohm, 5%, 1/4W Carbon 200 Ohm, 5%, 1/4W Carbon 1.5k Ohm, Black Level Control	J201 J202	MISCE 204X9300-958 204X9300-958	Socket, 6 Pin Socket, 6 Pin	
C201	CAF 45X0524-038	PACITORS  1000 uF, 16V Electrolytic	J203 P201 P202 P203 P205	206X5019-207 204X9601-195 204X9601-195 204X9600-845 6A0393-006	Socket, 4 Pin Plug, 6 Pin Plug, 6 Pin Plug, 4 Pin Plug, 6 Pin	

#### **VERT/HOR BOARD (MT/QJ)**

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
	RES	SISTORS		CAPACITOR	S (CONT.)
R301	203X6500-628	820 Ohm, ± 5%, 1/8W Carbon	C313	203X0025-087	47 uF, 50V Electrolytic
R302	203X6500-902	12k Ohm, ± 5%, 1/8W Carbon 15k Ohm, ± 5%, 1/8W Carbon	C315 C316	203X0015-082 203X1100-220	10 uF, 25V Electrolytic 3300 uF, 50V, ± 10% Mylar
R303 R304	203X6500-927 203X6500-886	10k Ohm, ± 5%, 1/8W Carbon	C317	202X8000-616	100 pF, 50V, ± 10% Ceramic
R305	203X6501-241	330k Ohm, ± 5%, 1/8W Carbon	C351	202X7000-281	1500 pF, 50V, ± 10% Ceramic
R306	203X6500-645	1k Ohm, ± 5%, 1/8W Carbon	C352	202X7000-247	1000 pF, 50V, ± 10% Ceramic
R307	203X6500-689	1.5k Ohm, ± 5%, 1/8W Carbon	C353	203X1100-573	0.022 uF, 50V, ± 10% Mylar
R309	203X6500-724	2.2k Ohm, ± 5%, 1/8W Carbon	C355 C356	203X1100-858 203X0015-105	0.1 uF, 50V, ± 10% Mylar 4.7 uF, 25V Electrolytic
R310 R311	203X6501-285 203X6501-065	470k Ohm, ± 5%, 1/8W Carbon 56k Ohm, ± 5%, 1/8W Carbon	C357	203X1201-013	0.015uF, 200V ± 10% PP
R312	203X6501-126	100k Ohm. ± 5%, 1/8W Carbon	C358	203X1201-034	0.018 uF, 200V, ± 10% PP
R313	203X6001-326	10k Ohm, ± 5%, 1/8W Carbon	C359	203X0040-013	4.7 uF, 160V Electrolytic
R314	203X6501-044	47k Ohm, ± 5%, 1/8W Carbon	C360	202X7000-482	0.01 uF, 50V, ± 10% Ceramic
R315	203X6500-628	820 Ohm, ± 5%, 1/8W Carbon	C361	203X1100-509 203X0025-058	0.015 uF,*50V, ± 10% Mylar 10 uF, 50V Electrolytic
R316	203X6500-420 203X6206-441	120 Ohm, ± 5%, 1/8W Carbon 2.2 Ohm, ± 5%, 1/2W Carbon	C362 C363	203X0025-038 203X1205-487	0.01 uF, 630V, ± 10% PP
R317 R319	203X6500-169	100 Ohm, ± 5%, 1/8W Carbon	C364	202X7000-482	0.01 uF, 50V, ± 10% Ceramic
R320	203X6500-927	15k Ohm, ± 5%, 1/8W Carbon			, ,
R321	203X6700-509	560 Ohm, ± 5%, 1/2W Carbon		051110	ONDUCTORS
R322	203X9100-121	22 Ohm, ± 5%, 2W M.O.		SEMIC	ONDUCTORS
R323	203X6500-689	1.5K Ohm, ±5%, 1/8W Carbon	TD201	200X4082-614	Transistor, 2SA826Q
R324	203X6500-988 203X6500-326	27k Ohm, ± 5%, 1/8W Carbon 47 Ohm, ± 5%, 1/8W Carbon	TR301 TR302	200X4062-014 200X3174-006	Transistor, 2SC1740Q
R325 R328	203X6500-528	820 Ohm, ± 5%, 1/8W Carbon	TR303	200X3174-006	Transistor, 2SA1740Q
R330	203X6500-886	10k Ohm, ± 5%, 1/8W Carbon	TR304	200X3174-006	Transistor, 2SC1740Q
R331	203X6501-209	220k Ohm, ± 5%, 1/8W Carbon	TR305	200X4049-081	Transistor, 2SA490YLBGLI
R351	203X6500-724	2.2k Ohm, ± 5%, 1/8W Carbon	TR306	200X3162-538	Transistor, 2SC1625YLBGLI
R352	203X6500-927	15k Ohm, ± 5%, 1/8W Carbon	TR307	200X3174-014	Transistor, 2SC1740R
R353	203X6500-944	18k Ohm, ± 5%, 1/8W Carbon 3.9k Ohm, ± 5%, 1/8W Carbon	TR308 TR351	200X3174-006 200X4085-415	Transistor, 2SC1740Q Transistor, 2SA854Q
R354 R355	203X6500-783 203X6500-302	12k Ohm, ± 5%, 1/8W Carbon	TR352	200X3172-208	Transistor, 2SC1722BKS
R356	203X6509-561	470 Ohm, ± 5%, 1/8W Carbon	TR353	200X3174-006	Transistor, 2SC1740Q
R357	203X6500-724	2.2k Ohm, ± 5%, 1/8W Carbon	TR354	200X4082-614	Transistor, 2SA826Q
R358	203X6500-666	1.2k Ohm, ± 5%, 1/8W Carbon	X301	201X2010-144	Diode, (SI) IS2473-T72
R359	203X6501-088	68k Ohm, ± 5%, 1/8W Carbon	X302	201X2010-144 200X8000-026	Diode, (SI) IS2473-T72 Diode, (GE), IN60TVGL
R360	203X5500-471 203X6000-998	27 Ohm, ± 5%, 1/4W Comp. 1,2k Ohm, ± 5%, 1/8W Carbon	X303 X304	200X8010-165	Diode (SI) ISS81
R361 R363	203X6500-996 203X6500-666	1.2k Ohm, ± 5%, 1/8W Carbon	X305	201X2010-165	Diode (SI) ISS81
R364	203X9014-988	47k Ohm, ± 5%, 1W M.O.	X306	201X2010-165	Diode (SI) ISS81
R365	203X6700-989	56k Ohm, ± 5%, 1/2W Carbon	X307	200X8010-102	Diode (SI) MA26W
R366	203X6001-148	3.3k Ohm, ±5%, 1/8W Carbon	X308	200X8010-094	Diode (SI) IS2473
R367	340X2222-734	2.2k Ohm, ± 5%, 1/2W Carbon	X351	201X2010-144	Diode (SI) IS2473-T72
R368	203X6500-785	3.9k Ohm, ± 5%, 1/8W Carbon 3.3k Ohm, ± 5%, 1/4W Carbon	X352 X353	201X2010-144 201X2010-144	Diode (SI) IS2473-T72 Diode (SI) IS2473-T72
R369 R370	203X6500-762 302X6100-961	1k Ohm, ± 5%, 1/4W Carbon	X353 X354	201X2010-144 201X2010-144	Diode (SI) IS2473-T72
R371	203X6104-751	2.7k Ohm, ± 5%, 1/4W Carbon	X355	200X8220-851	Diode (Zener) RD10EBI
VR301	204X2122-093	Varistor, 250K Ohm, Vert. Hold	X366	200X8100-130	Diode (HS) RU-1 0.3 US
VR302	204X2114-065	Varistor, 20K Ohm, Vert. Size			
VR351	204X2114 059	Varistor, 50K Ohm, Hor. Hold		MISCI	ELLANEOUS
	CA	PACITORS	1004	00470000 000	Speket & Die
			J301 J302	204X9300-958 204X9300-958	Socket, 6 Pin Socket, 6 Pin
C301	203X1100-928	0.15 uF, 50V, ± 10% Mylar	P301	204X9601-195	Plug, 6 Pin
C302	203X1100-573	0.022 uF, 50V, ± 10% Mylar	P302	204X9601-195	Plug, 6 Pin
C304	203X1100-858 203X0025-026	0.1 uF, 50V, ± 10% Mylar 2.2 uF, 50V, Electrolytic	TH301	201X0000-534	Thermistor
C306 C307	203X0025-026 203X1100-928	0.15 uF, 50V, ± 10% Mylar			
C309	203X1100-858	0.1 uF, 50V, ± 10% Mylar		TRANSFO	RMERS & COILS
C310	203X0010-011	22 uF, 16V Electrolytic		INANSFO	MINENS & COILS
C311 C312	203X0020-099 202X7000-469	1000 uF, 35V Electrolytic 0.0082 uF, 50V, ± 10% Ceramic	L351	201X5200-091	Coll, Horiz. Osc.
		POWER BO	ARD (MV	Λ	
		TOWER DO	יוון טוואכ	' '	
	R	ESISTORS	C503 C551	203X0010-011 203X0005-046	22 uF, 16V Electrolytic 220 uF, 10V Electrolytic
R501 R502 R503	204X1725-052 203X6000-608 203X6000-960	180 Ohm, ± 10%, 15W WW 100 Ohm, ± 5%, 1/8W Carbon 1k Ohm, ± 5%, 1/8W Carbon		SEMI	CONDUCTORS
R504	203X6000-879	560 Ohm, ± 5%, 1/8W Carbon	TR501	200X3174-006	Transistor, 2SC1740Q
R505	203X9014-965	39k Ohm, ± 5%, 1W M.O.	△★TR502	200X3145-404	Transistor, 2SC1454
R506	203X6500-842	6.8k Ohm, ± 5%, 1/8W Carbon	TR551	200X3172-305	Transistor, 2SC1723
R551 VR501	203X6500-420 204X2050-001	120 Ohm, ± 5%, 1/8W Carbon Varistor Vert. Adj.	X501 X502	201X2230-042 201X2010-144	Diode, (SI) Zener EQB01-06V Diode, (SI) IS2473-T72
		APACITORS		MISO	CELLANEOUS
C501	203X0040-020	10 uF, 160V Electrolytic	J501	204X9300-958	Socket, 6 Pin
C502	202X7000-281	1500 pF, 50V, ± 10% Ceramic	P501 TH501	204X9601-195 201X0000-618	Plug, 6 Pin Thermistor
			111301	20170000010	THOMAS OF





00-4147-04 G07-CB0

Parts identification on circuit boards:

e.g. SU1126A (R107 = R1107) SU3030A (R113 = R3113)

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

Symbol	Description	Part Number
-	Picture Tube 19"	17-7198-03
$\Delta$	<b>⚠Deflection Yoke</b>	A29779-D = 21-141-01
	PC Magnet	A75034-B = 29-32-01
$\Delta$	<b>∆Flyback Transf.</b>	A29951-B
$\overline{\mathbf{\Lambda}}$	ΔHVR	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-%	31-610818-06
SC	Screw ¼ x ¾ 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 Retardent 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	QVZ3234-053
R3114	V R 5K	QVZ3234-053
R3115	V R 5K	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
C3121	Comp. R 3.3KΩ½W K	QRZ0039-332
Capacitors		
Symbol	Description	Part Number
C3107	E Cap. 10uF 250V A	QEW53EA-106
C3108	C Cap. 1000pF DC1400V P	
20100	0 Cap. 1000pr DC1400V P	QCZ9001-102M
Coils		
Symbol	Description	Part Number
L3101	Peaking Coil	QQL043K-101
	·	G G C - 101

# **REPLACEMENT PARTS LIST - ELECTROHOME 19" MONITOR**

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

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

### **Abbreviations for Resistors and Capacitors**

Resistor		Capacitor	
Comp. R : OM R : V R : MF R : CMF R : UNF R :	Carbon Resistor Composition Resistor Oxide Metal Film Resistor Variable Resistor Metal Film Resistor Coating Metal Film Resistor Nonflammable Resistor Fusible Resistor	M Cap : E Cap. : BP E Cap. : MM Cap. : PP Cap. : MPP Cap. : PS Cap : PS Cap : Cap. : PS Cap : Cap. : PS Cap : Cap. : PS Cap : Cap : PS Cap	Ceramic Capacitor Mylar Capacitor Electrolytic Capacitor Bi-Polar (or Non-Polar) Electrolytic Capacitor Metalized Mylar Capacitor Polypropylene Capacitor Metalized PP Capacitor Polystyrol Capacitor 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
Main P.C.B. Ass'y
CRT Socket P.C.B. Ass'y
Purity Shield Ass'y

Part Number SU-1133A SU-3032A 07-220083-03

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

Symbol	Description	Part Number
·	Picture Tube 19"	17-7198-03
$\mathbf{\Lambda}$		A29779-D = 21-141-01
	PC Magnet	A75034-B = 29-32-01
$\Delta$	<b>∆</b> Flyback Transf.	A29951-B
$\overline{\mathbb{A}}$	ΔHVR	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-%	31-610818-06
SC	Screw ¼ x ¾ 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 Retardent 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	QVZ3234-053
R3114	V R 5K	QVZ3234-053
R3115	V R 5K	QVZ3234-053
R3116	OM R $10 \mathrm{K} \Omega 2 \mathrm{W} \mathrm{J}$ .	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
C3121	Comp. R 3.3KΩ½W K	QRZ0039-332
Capacitors		
Symbol	Description	Part Number
C3107	E Čap. 10uF 250V A	QEW53EA-106
C3108	C Cap. 1000pF DC1400V P	QCZ9001-102M
Coils		
Symbol	Description	Part Number
L3101	Peaking Coil	QQL043K-101

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

Miscellaneous Symbol Description

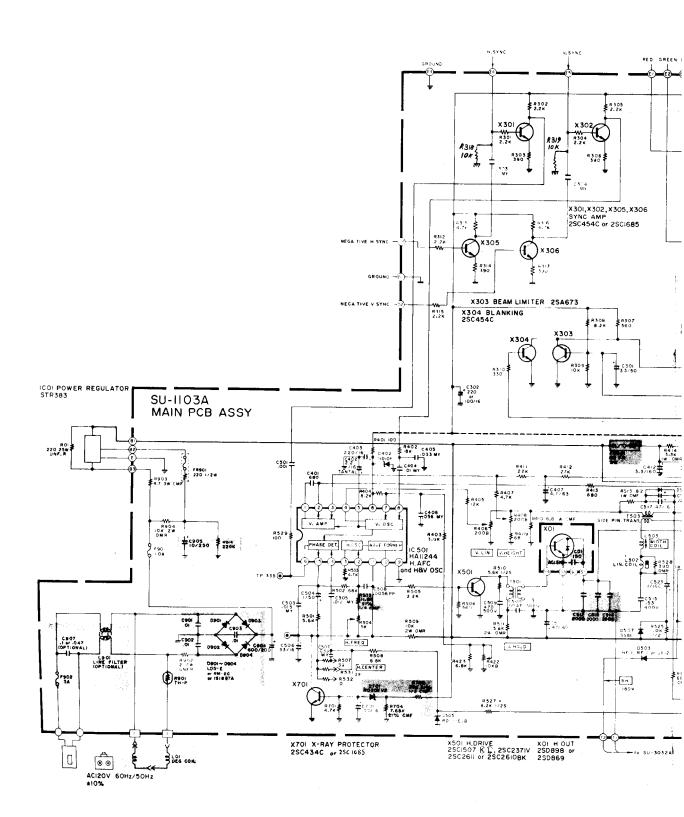
⚠CRT Socket Part Number A76068

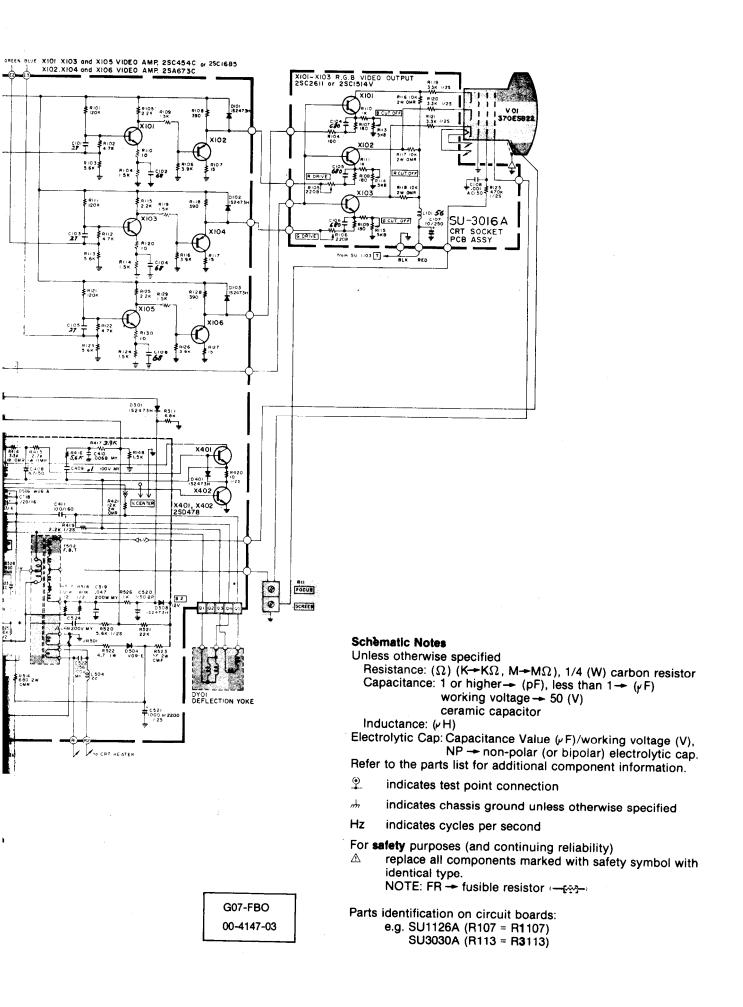
# Main PCB Ass'y (SU-1133A) Parts List

Resistors			
Symbol	Description		Part Number
R1406	V R	200Ω	QVZ3230-002
R1408	V R	200Ω	QVZ3230-002
R1410	CMF R	6.8 Ω1W J	QRX019J-6R8
R1414	OM R	3.3K Ω1W J	QRG019J-332
R1415	OM R	2.7K Ω1W J	QRG019J-272
R1421	OM R	12KΩ2W J	QRG026J-123Z
R1422	· V R	10K Ω	QVZ3230-014
<b>∆FR1401</b>	ΔF R	68Ω2W K	QRH024K-680M
<b></b> ∆R1503	<b>∆CMF</b> R	11.8KΩ¼W +1%	QRV142F-1182
R1504	V R	5K Ω	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	390 Ω1W J	QRG019J-391
R1534	ZN R		ERZ-C05ZK471
VR1501	ZN R		ERZ-C05DK271
<b></b> ⚠R1703	<b>∆</b> CMF R	39Ω½W +1%	QRV122F-3902
<b>∆</b> R1704		7.68KΩ¼W +1%	QRV142F-7681
<b>∆</b> R1901	<b>⚠</b> 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
<b>∆</b> Q1908		47Ω½W +1%	QRV122F-470Z
<b>∆</b> R1909	V R	2ΚΩ	QVP5A0B-023E
R1910		2.74K Ω¼W +1%	QRV142F-274I
<b></b> AFR1901	<b>∆</b> F <b>R</b>	220Ω½W K	QRH124K-221M
Capacitors			
Symbol	Description		Part Number
C1301	BPE Can 3	COLE SOV A	OEN61H4-3357

Capacitors		
Symbol	Description	Part Number
C1301	BPE Cap. 3.3uF 50V A	QEN61HA-335Z
C1402	Tan. Cap. 2.2uF 16V K	QEE51CK-225B
C1407	E Cap. 4.7uF 6.3V A	QEW51JA-475
C1411	E Cap. 100uF 160V A	QEW52CA-107
C1412	E Cap. 3.3uF 160V A	QEW52CA-335
C1508	PP Cap. 5600uF 50V J	QFP31HJ-562
<b>∆</b> C1512	<b>⚠PP</b> Cap. 2000pF DC1500V J	QFZ0082-202
<b>∆</b> C1513	<b>⚠PP</b> Cap. 2000pF DC1500V J	QFZ0082-202
<b>∆</b> C1514	<b>△PP</b> 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
<b>∆</b> C1531		QFZ0082-202
<b>∆</b> C1532	<b>⚠PP</b> Cap. 1500pF DC1500V J	QFZ0082-152
C1904	Е Сар.	QEY0034-001
C1905	E Cap. 10uF 250V A	QEW52EA-106

Coils		
Symbol	Description	Part Number
L1502	Linarity Coil	A39835
L1503	Width Coil	C30380-A
L1504	Heater Choke	C30445-A
L 1004	Tidator Oriono	000+40-A
Transformers		
Symbol	Description	Part Number
T1501	Hor. Drive Transf.	A46022-BM
T1503	Side Pin Transf.	C39050-A
Comionaduatem		
Semiconductors	Description	Don't Manuface
Symbol	Description	Part Number
IC1501	IC	HA11244
X1101	Si. Transistor	2SC1685(R)
X1102	Si. Transistor	2SA673(Č)
X1103	Si. Transistor	2SC1685(R)
X1104	Si. Transistor	2SA673(C)
X1105	Si. Transistor	2SC1685(R)
X1105 X1106	Si. Transistor	2SA673(C)
	Si. Transistor	
X1301		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 Si. Diode	
D1301	Si. Diode	1SZ473H
		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
AD1901	∆Si. Diode	1S1887A
\D1902	∆Si. Diode	1S1887A
AD1903	∆Si. Diode	1S1887A
D1904	∆Si. Diode	1S1887A
∆D1905	AZener Diode	RD6.8EV3
Missollanso		
Miscellaneous Symbol	Description	Part Number
∆F1901	ΔFuse 1.25A	
		QMF53U1-1R25S
∆F1902	<b>∆UL Fuse 3A</b>	QMF66U1-3R0S





### REPLACEMENT PARTS LIST - ELECTROHOME 13" MONITOR

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

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

### Abbreviations for Resistors and Capacitors

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

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

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

Symbol	Description	Part Number
	Main P.C.B. Ass'y	SU-1103A
	CRT Socket P.C.B. Ass'y	SU-3016A
Outside of the P.C.B. Symbol	Ass'y Description	Part Number
∆V01	APicture Tube	
<b>ADY</b> 01	⚠ Deflection Yoke	370ESB22(E) C29123-V
AB131	PC Magnet	A76366-A
	Wedge	C30006
		A19183-A
<b>∆</b> R11	ÆFocus V R	A46606-A
<b></b> ∆R05	UNF Resistor 220 $\Omega$ , 25W. K	QRF258K-221
<b>∆C04</b>	△C Capacitor 150 pF, AC1.5KV	QCZ0101-005
X01	Si. Transistor	2SD869
IC01	IC Regulator	STR383
L01	Degausing Coil	21-1007-31
	Degausing Coil Pin Terminal (2)	34-708-01
	Degausing 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 10-1/2 Pix Tube Mtg. (4)	31-631018-08
WA	Pyramidal Lockwasher (4)	33-255-01
	Clip P.C.B. Support (2)	33-629-02
	Ground Lug	34-33-04
CH	Chassis Base	38-452-01

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

Resistors		
Symbol	Description	Part Number
R1406	V R 200Ω	QVZ3230-022
R1408	V R 200Ω	QVZ3230-022
R1410	CMF R 6.8Ω1W J	QRX019J-6R8
R1414	OM R 3.3KΩ 1W J	QRG019J-332
R1415	OM R 2.7KΩ1W J	QRG019J-272
R1421	OM R 12KΩ2W J	QRG029J-123
R1422	V R 10KΩ	QVZ3224-014H
<b></b> AFR1401	<b>Δ</b> F R 68Ω2W K	QRH024K-680M
<b>△R1503</b>	ΔCMF R 11.8KΩ¼W +1%	QRV142F-1182
R1504	V R 5KΩ	QVZ3230-053
R1509	OM R 10KΩ2W J	QRG029J-103
R1511	OM R 5.6KΩ2W J	QRG029J-562
R1514	OM R 680Ω2W J	QRG029J-681
R1515 R1522	CMF R 8.2 Ω1W J CMF R 4.7 Ω1W J	QRX019J-8R2
R1523	OM R 56Ω2W J	QRX019J-4R7 ORG029J-560
R1528	OM R 390Ω1W J	ORG019J-391
R1534	ZN R	ERZ-C05ZK471
VR1501	ZN R	ERZ-C05DK271
<b>∆R1703</b>	ΔCMF R 39K Ω½W +1%	QRV122F-3902
<b></b> ♣R1704	ΔCMF R 7.68KΩ¼W +1%	QRV142F-7681
<b>∆</b> R1901	△Posistor	A75414
R1902	UNF R 2Ω7W K	QRF076K-2R0
R1903	CMF R 5.6Ω3W J	QRX039J-5R6
R1904	OM R 10KΩ2W J	QRG026J-103Z
<b> ⚠FR1901</b>	<b>Δ</b> F R 220Ω½W K	QRH124K-221M
Capacitors		
Capacitors		
Symbol	Description	Part Number
• • • • • • • • • • • • • • • • • • •	<b>Description</b> Tan. Cap. 2.2uF 16V K	Part Number QEE51CK-225B
Symbol	-	
Symbol C1402	Tan. Cap. 2.2uF 16V K	QEE51CK-225B
Symbol C1402 C1411 C1412 C1508	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J	QEE51CK-225B QEW52CA-107
Symbol C1402 C1411 C1412 C1508 C1511	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S
Symbol C1402 C1411 C1412 C1508 C1511 △C1512	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A ⚠PP Cap. 2000pF DC1500V J	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A ⚠PP Cap. 2000pF DC1500V J ⚠PP Cap. 2000pF DC1500V J	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202
Symbol C1402 C1411 C1412 C1508 C1511 △C1512 △C1513 △C1514	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A ⚠PP Cap. 2000pF DC1500V J ⚠PP Cap. 2000pF DC1500V J ⚠PP Cap. 2500pF DC1500V J	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-202 QFZ0087-534 QEN61HA-105Z
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap.	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap.	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905 ⚠C1907	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905 ⚠C1907 Colls Symbol	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905 ⚠C1907  Colls Symbol L1501	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905 ⚠C1907  Colls Symbol L1501 L1502	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6 A39934
Symbol C1402 C1411 C1412 C1508 C1511	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z  Description Peaking Coil Liniarty Coil Width Coil	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6 A39934 C30380-A
Symbol C1402 C1411 C1412 C1508 C1511	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z  Description Peaking Coil Liniarty Coil Width Coil Heater Choke	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6 A39934 C30380-A C30333-A
Symbol C1402 C1411 C1412 C1508 C1511	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z  Description Peaking Coil Liniarty Coil Width Coil	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6 A39934 C30380-A
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905 ⚠C1907  Colls Symbol L1501 L1502 L1503 L1504 L1901  Transformers	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z  Description Peaking Coil Liniarty Coil Width Coil Heater Choke Line Filter	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6 A39934 C30380-A C30333-A A39475-J
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905 ⚠C1907  Colls Symbol L1501 L1502 L1503 L1504 L1901  Transformers Symbol	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z  Description Peaking Coil Liniarty Coil Width Coil Heater Choke Line Filter  Description	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6 A39934 C30380-A C30333-A A39475-J  Part Number
Symbol C1402 C1411 C1412 C1508 C1511 ⚠C1512 ⚠C1513 ⚠C1514 C1515 C1520 C1524 C1904 C1905 ⚠C1907  Colls Symbol L1501 L1502 L1503 L1504 L1901  Transformers	Tan. Cap. 2.2uF 16V K E Cap. 100uF 160V A E Cap. 3.3uF 160V A PP Cap. 5600pF 50V J E Cap. 47uF 160V A  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2000pF DC1500V J  ⚠PP Cap. 2500pF DC1500V J  PP Cap. 0.53uF DC1200V K BPE Cap. 1uF 50V A M Cap. 0.1uF 200V K E Cap. E Cap. 10uF 250V A  ⚠MM Cap. 0.1uF AC150V Z  Description Peaking Coil Liniarty Coil Width Coil Heater Choke Line Filter	QEE51CK-225B QEW52CA-107 QEW52CA-335 QFP31HJ-562 QEW52CA-476S QFZ0082-202 QFZ0082-202 QFZ0082-252 QFZ0067-534 QEN61HA-105Z QFM72DK-682M QEY0034-001 QEW52EA-106 QFZ9008-104  Part Number A75360-6 A39934 C30380-A C30333-A A39475-J

Semiconductors	Procede No.	Part Number
Symbol	Description I.C.	HA11244
IC1501		2SC1685(R)
X1101	Si. Transistor	2SA673(C)
X1102	Si. Transistor	2SC1685(R)
X1103	Si. Transistor	2SA673(C)
X1104	Si. Transistor	2SC1685(R)
X1105	Si. Transistor	_ , ,
X1106	Si. Transistor	2SA673(C)
X1301	Si. Transistor	2SC1685(R)
X1302	Si. Transistor	2SC1685(R)
X1303	Si. Transistor	2SA673(C)
X1304	Si. Transistor	2SC1685(R)
X1305	Si. Transistor	2SC1685(R)
X1401	Si. Transistor	2SD478
X1402	Si. Transistor	2SD478
X1501	Si. Transistor	2SC2610BK
X1701	Si. Transistor	2SC1685(P-S)
D1101	Si. Diode	W06A
D1102	Si. Diode	W06A
D1103	Si. Diode	W06A
D1301	Si. Diode	1S2473H
D1401	Si. Diode	1S2473H
D1402	Zener Diode	RD10F(C)
D1503	Si. Diode	HF-1
D1504	Si. Diode	V09E
D1505	Zener Diode	RD11E(B)
D1506	Si, Diode	W06A
D1507	Si. Diode	1SS81
D1508	Si. Diode	1S2473H
∆D1701	∧Zener Diode	RD20EV2
<b>∆</b> D1901	∕t Si. Diode	1S1887A
∆D1901 <b></b> ∆D1902	∕\Si. Diode	1S1887A
∆D1902 ∧D1903	∆Si. Diode	1S1887A
公D1903 ▲D1904	∆Si. Diode	1S1887A
(77D) 190 <del>4</del>	<u> </u>	
Miscellaneous	December 1	Part Number
Symbol	Description	QMF53U1-1R0S
<u> </u>	∱Fuse 1A	QMF66U1-3R0S
<b></b> ∆F1902	<b>∆UL Fuse 3A</b>	Q.(1) 000 / 01 00

# 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	ν κ 5ΚΩ	QVZ3234-05 <b>3</b>
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		Maria Maria Sara
Symbol	Description	Part Number
Δ	⚠ CRT Socket	A75522

# VII. Coin Door Maintenance

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

Metal mechanisms only: COIN MECHANISMS, INC. 817 Industrial Drive Elmhurst, IL 60126 Phone (312) 279-9150 Metal and Plastic mechanisms: COINCO COIN ACCEPTORS, INC. 860 Eagle Drive Bensenville, IL 60106 Phone (312) 766-6781

#### **COIN DOOR MAINTENANCE**

#### METAL COIN ACCEPTOR MECHANISMS

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

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

- 3. Remove the coin acceptor mechanism as shown in Figure 7-1.
  - ☐ Push down on the two spring loaded latches.
  - ☐ While holding the latches down, pull the top of the coin acceptor mechanism toward you.
  - ☐ Release the latches and lift out the coin acceptor mechanism.

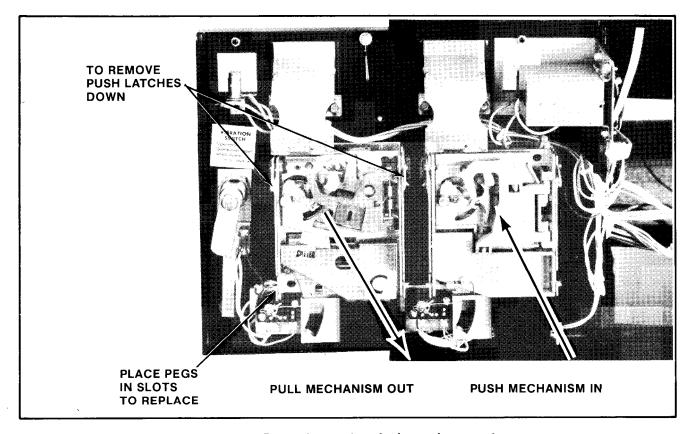


Figure 7-1 Removing and replacing coin acceptor

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

# CAUTION: BE CAREFUL NOT TO BURN YOURSELF.

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

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

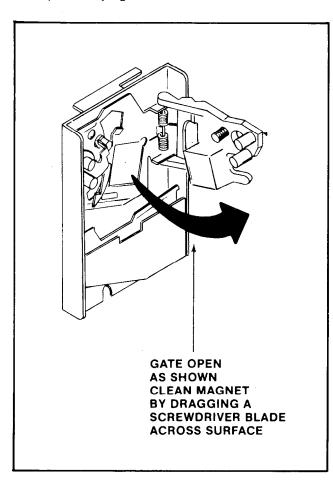


Figure 7-2 Cleaning the metal coin acceptor

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

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

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

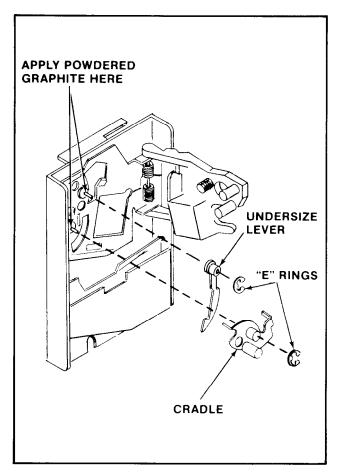


Figure 7-3 Lubricating the metal coin acceptor

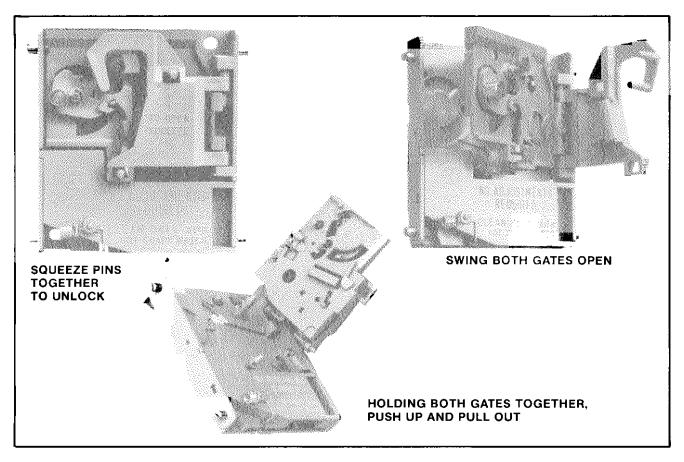


Figure 7-4 Opening the plastic coin acceptor

#### PLASTIC COIN ACCEPTOR MECHANISMS

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

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

- ☐ Reassemble the mechanism (it never needs lubrication).
- 5. Check the coin chute for obstructions such as: paper, gum, etc.
- Reinstall the coin acceptor to the coin door. See Figure 7-5.
  - ☐ Place the two pegs at the coin acceptor's base into their retaining slots.
  - □ Now push the top of the coin acceptor toward the coin door until it snaps in place and is held there by the two spring loaded latches.
- 7. Close and lock the coin door.

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

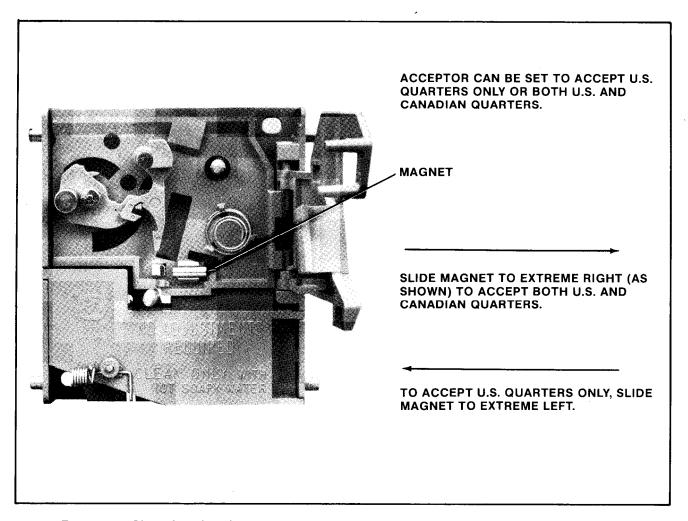
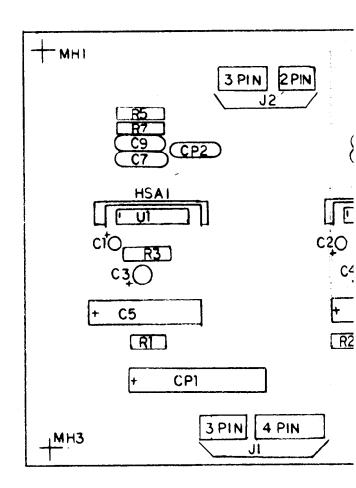
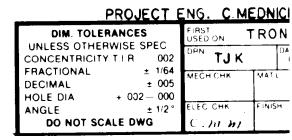


Figure 7-5 Changing the plastic coin acceptor to accept American or Canadian quarters.

# DESIGNATION LIST

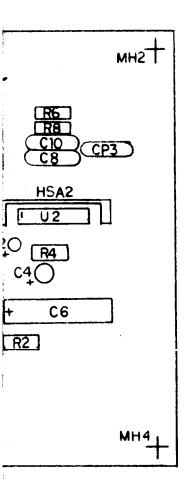
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C1,C2 C3,C4 C5,C6 C7-C10 CP1 CP2,CP3	4,7 mf 25v rd.tant. 22 mf 6v !! !! 470 mf 6v ax.electl mf 50v ax.elect. 220 mf 25v ax.electl mf 50v ax.cr.		
RI,R2 R3,R4 R5-R8	2.7KΩ 1/4w 5% CRBN; 27Ω '' '' 1Ω 1/2w '' ''		
U 1,U <b>2</b> JI J2	MB3730 3 PIN STRT KKI56 4 '' ''		
HSA1,2 MH1-MH4	2 " " " "  HEATSINK ASSY  HEYCO BUSHING		



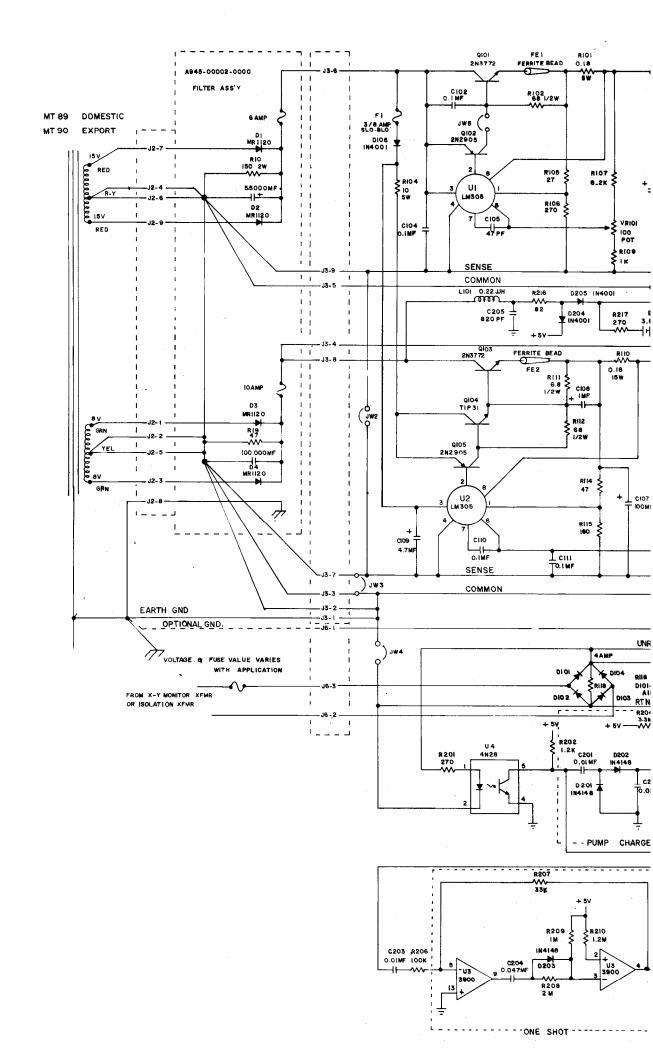


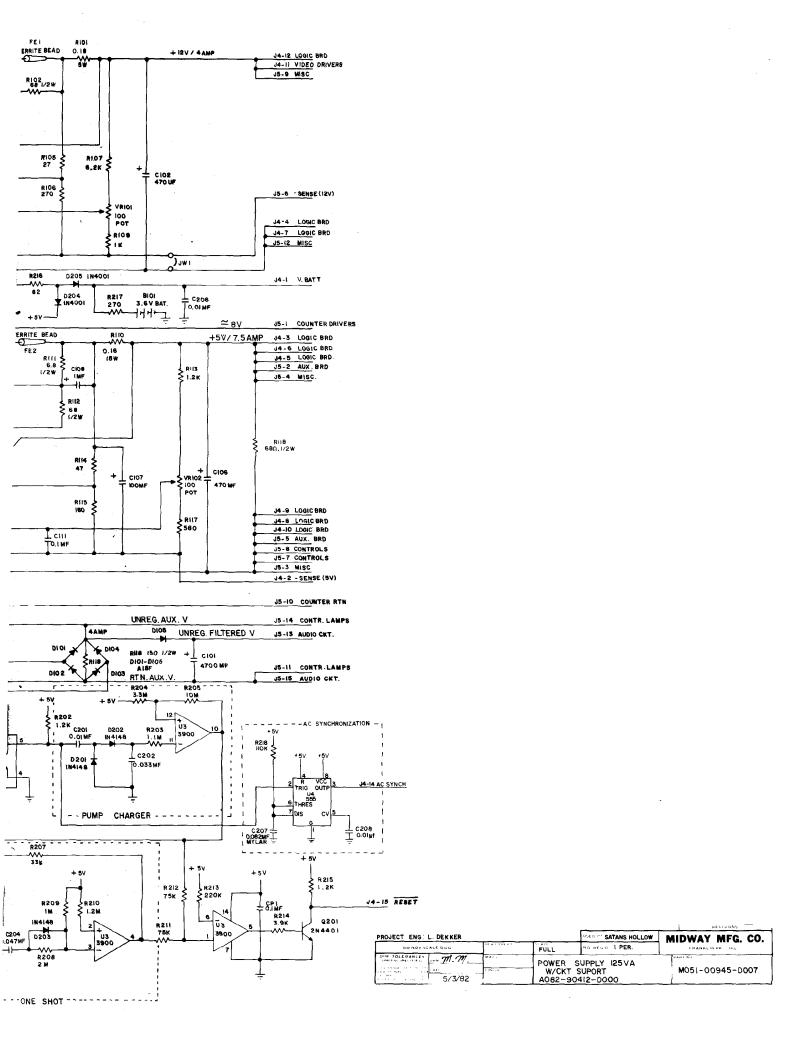
# CROSS REFERENCE LIST

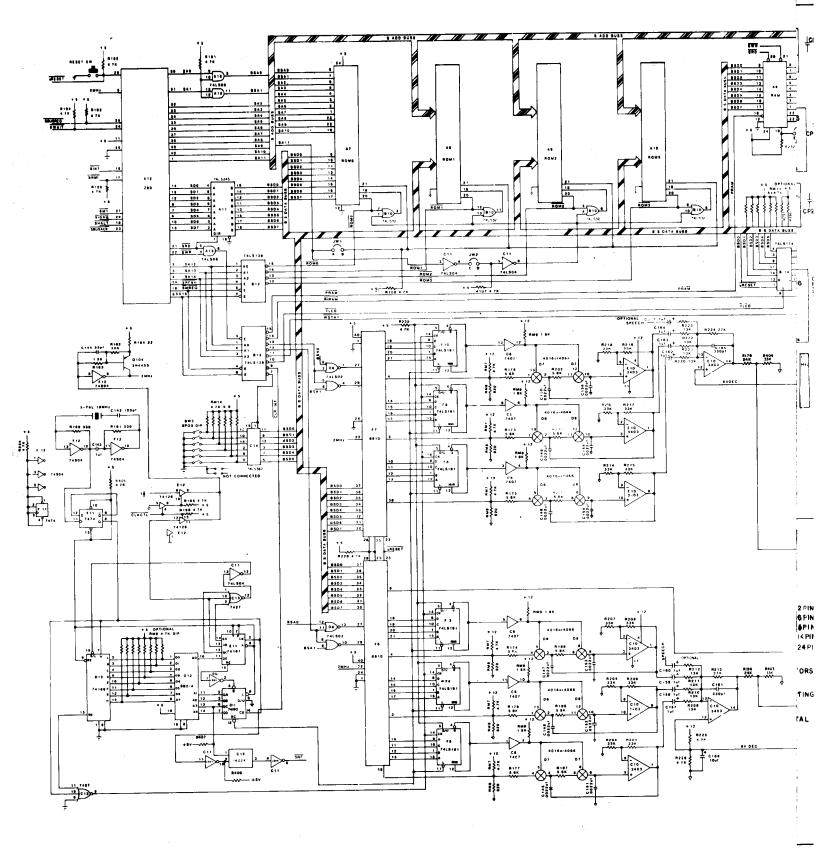
DESCRIPTION C	λT Y	DESIGNATION	PART NO.
,1mf 50v ax.cr	6	C7-C10, CP2,CP3	0986-008001100
4.7 mf 25v rd.tant 22 mf 6v 220mf 25v ax blec 470mf 6v	2	CI,C2 C3,C4 CPI C5,C6	0986-00800-3100 0986-00800-1600 0986-00800-3200 0986-00800-1700
1Ω1/2w 5% 27Ω1/4w 27K	4 2 2	R5-R8 R3,R4 R1, R2	0062-026D3-1XXX 0062-068B3-1XXX 0062-199B3-1XXX
MB3730	2	U1,U2	0066-188xx-xx4x
2 PIN STRT KKI56 3 '' '' '' 4 '' '' ''	1 2 1	J2 J1,J2 J1	3000-16367-0200 3000-16367-0300 3000-16367-0400
HEATSINK ASSY.	2	HSAI, HSA2	A986-00010-E000
HEYCO BUSHING	4	MHI-MH4	0017-00042-0014
PC BOARD	1		A080-90910-E000

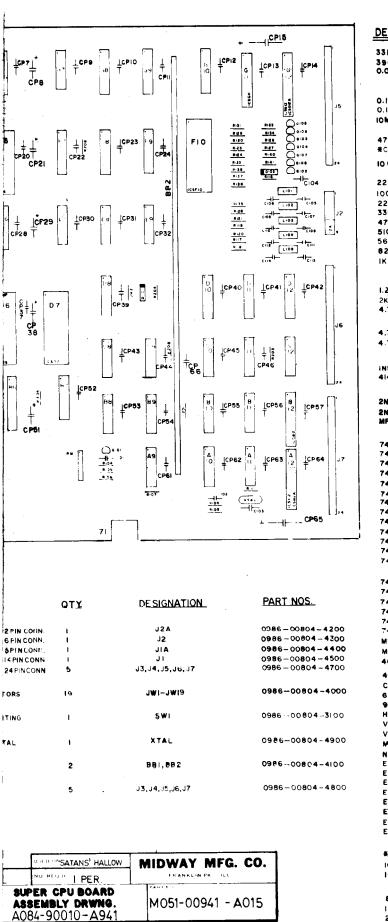


NICK	THIS DWG IS	CONFIDENTIAL & PROPERTY OF MIDWAY MFG. CO.			
ON 9-1-82	SCALE FULL	MIDWAY MFG. CO. FRANKLIN PK., IL. 60131 A BALLY CO			
174.	IL OFF	DUAL PWR. AMP. ASSY	•		
VISH		A080-90910-E000	M051-00986-E010		



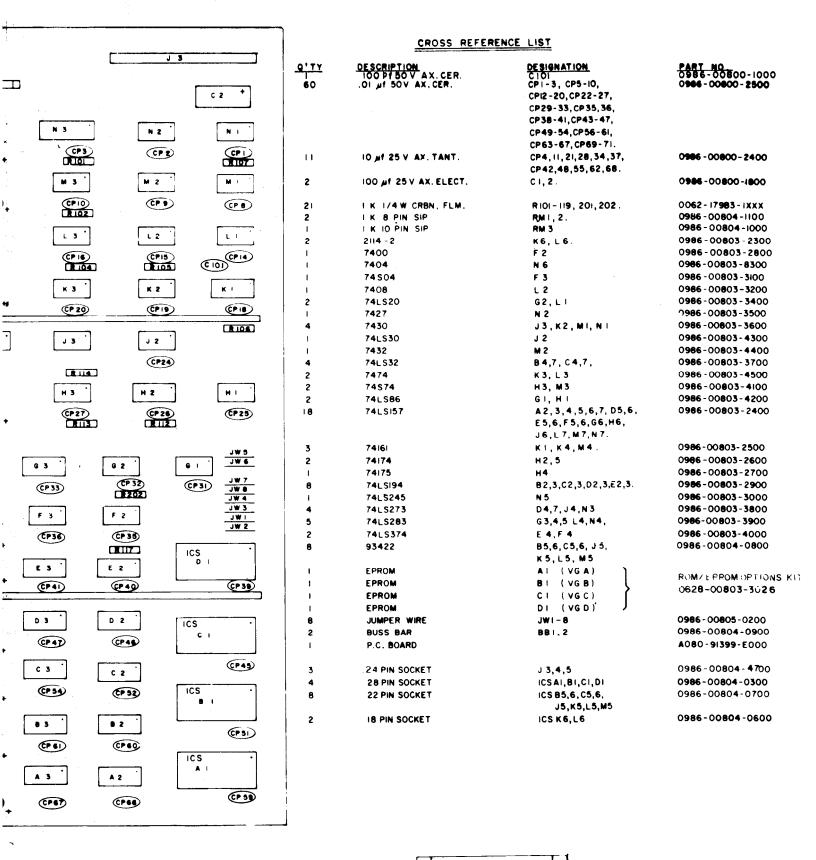




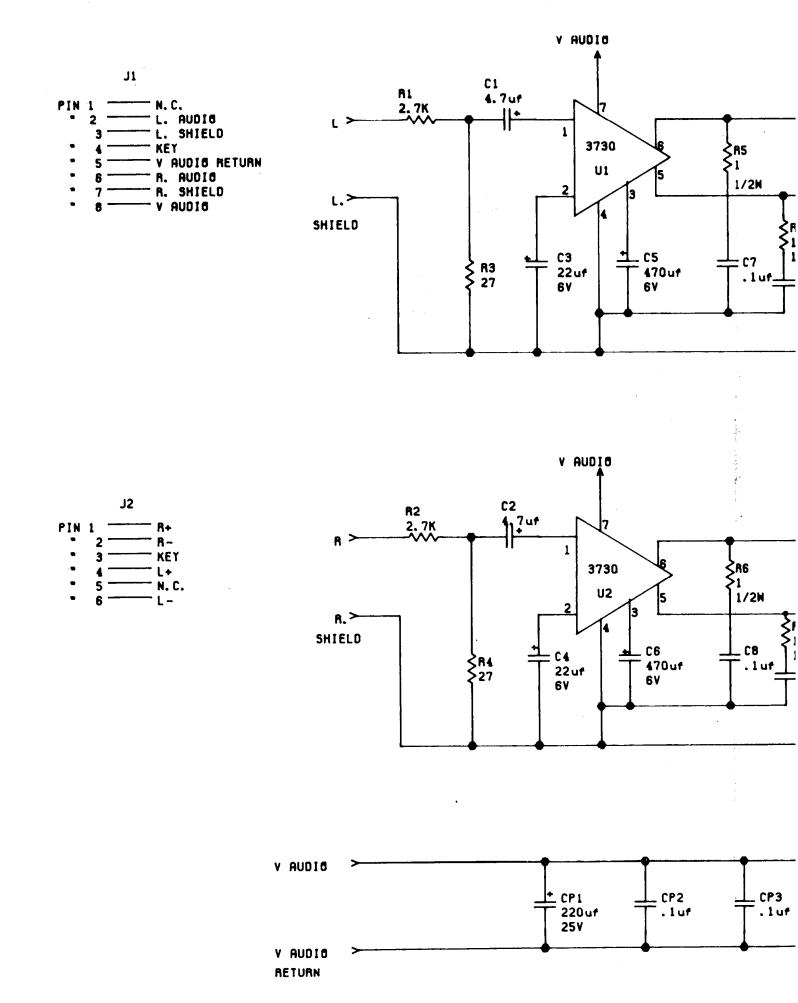


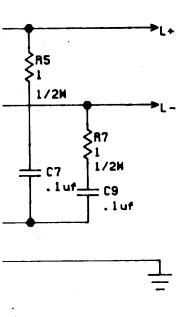
	CROSS REFER	ENCE LIST	
DESCRIPTION	QTY.	DESIGNATION	PART NOS.
33PF SOV AX. CER.	<del></del>	C101	0986-00800-0300
390PF 50VAX.CER.	2	C104,C200	0986-00800-3000
0.01UF 50V AX.CER.	78	CP2-CP7, CP9-CP14,CP16-CP20, CP22-CP28, CP30-CP37, CP39-CP50, CP52-CP57,	0986-00800-2200
		CP39-CP50, CP52*CP57, CP59*CP64, C115*C136	
O.IMF IOOV MYLAR O.IMF 50V AX, CER.	 2	C103 C102-CP66	0986-00800-0100
IOMF 25VAX. TANT	5	CP8,CP21,CP29,CP38	0986-00800-3400
·		CP5I	0986-00800-3300
470UF 16V AX. ELECT #CI05-CI14	r. 4 SEE NOTE	CPI,CPI5,CP58,CP65	0386 00000 3300
IO OHM I/4W CRBN.	6	RI26,RI27,RI33 9134,	0062-05IB3-IXXX
		RI40,RI4' RI06	0062-063B3-1XXX
22 OHM " "	! !	RII9	0062-11083-1XXX
220 OHM" "	l	R105	0062-13383-IXXX
330 OHM " " 470 OHM " "	2	RIO8,RIII RI21,RI28,RI35	0062-14483-IXXX 0062-15683-IXXX
510 OHM " "	3	R123, R130,R136	0062-159B3-IXXX
560 OHM " " "	2	RH7,RH8 RI20	0062-16283-1XXX 0062-17483-1XXX
IK OHM " "	13	R102,R107,R109,R116,	0062-17983-IXXX
		R124, R129, R137, R201, R203-R207	
1.2K OHM" "	1	R104	0062-18383-1XXX
2K OHM " "	3 4	R125,H(3),R(38	0062 - 193 B3 - IXXX 0062 - 211 B3 - IXXX
4.7K OHM" "	•	RIOI,RII2,R208,R209	0002- 211B3-1AAA
4.7K GPINS.I.P.	2	RMI,RM4	0986-00804-2400
4.7K TOPIN SILP	2	RM2,RM3	0986-00804-4600
iN5817 4148	! !	DIO2	0986-00801-0300 0986-00801-0100
4140	,	0.02	0000 0000 0.00
2N4403	1	Q101	0986-00802-0200
2N4123	1	Q102	0986-00802-0100
MPSA70	6	Q103-Q108	N986 - 00802-0300
74504	3	AII, 89,CIO	0986- 00803-0400
74LS04	2	D8,E9 C8	0986- 00803-1007 0986- 00803-1006
74LS08 74LS20	2	C11,C12	0986-00803-1004
74LS27	1	. EB	0986 - 00803-9500
74LS32 74S74	<b>4</b> 2	88,811,E4,E5 A9,AIO	0986 - 00803-0600 0986 - 00803-1500
74LS74	2	B10,C9	0986-00803-1005
74LS86 74LS133	2 !	E7,G7 B7	0986 - 00803-9900 0980 - 00803-1002
74LSI38	i	E6	0986-00803-1900
74LSI53 74LSI57	2 7	G1, <b>G</b> 6	0986-00803-1000 0986-00803-9700
7423137	•	D10, D11, D12, F8, F9, G9, G10	
74LS[6]	1	A1 F7,G8	0986 - 00803-1003 0986 - 00803-9800
74L 5174 74L 5244	2 2	91,B6	0986-00803-0800
74L5245	2	A3,F3	0986-00803-0900 0986-00803-1001
74LS273 74LS367	4	F4,F5,G2,G5 A2	0986-00803-2200
MK 3380	1	B5	0986-00803-7800 0986-00803-7700
MK3382	1	B3 F2	0986-00803-7700
4017		FI	0986-00803-2000
4053 CMOS RAM	! •	82	0986-00803-8100
6116	!	<b>F6</b> F10	0986-00803-1008 0986-00803-9600
93419 H-T GEN.	1	A12	098600803-8900
V-T GEN	i	G <b>!2</b> B12	0986-00803-9100
VEH GEN. MISC. CUSTOM	<b>!</b> <b>∳</b>	GII	0986-00803-9200
NVR CONTROLLER	i i	E3 \	0986-00804-3200
EPROM EPROM	. 1	D2 D3	
EPROM	ì	D4 ROM/EPROM	0628 - 00803 - 0100
EPROM EPROM	1	D5 OPTIONS KIT	0020 00003 0.0
EPROM	i	07	
EPROM EPROM	1	G3 /	
EPROM	•		
# SEE NOTE	5	L101-L105	****
IOUH WW	5 6	LIO 6 - LIIO LIII — LIIG	0986-00804-0200 0986-00804-3300
TOUR MOLDED	<del>U</del>	5 S.I.	1111 00004 000 <b>p</b>
8 PIN IC SOCKET		ICSAI2,ICSGI2	0986-00804-3600
16 PIN " "	2	ICSAIZA, ICSGIZA ICSBIZ, ICSE3,	0986-00804-3700 0986-00804-3800
20PIN " "	3	ICSGII	
24 PIN" "	2	ICSB2, ICSF6	0986-00804-3400 0986-00804-3900
28 PIN " "	10	ICSB3, ICSD2, ICSD3, ICSD4.	0300-00004-3300
		ICSD5, ICSD6, ICSD7, ICSF10,	
		ICSG3,ICSG4, ICSB5	098600804-3500
40PIN "	1	10.900	0000 0000 4-0000

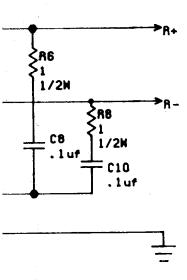
CO		DESIGNATIO	N LIST						·
CO   100	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION		J 5		<u> </u>	
Color   Colo	C1,2		. •	74   0 00				7	( RM 5 1
S	C 101	100 pfAX.CER.		_				-	<u></u>
C   A   C   FROM   C   A   FALSES   C	l					C			
C   A	•	7				<del></del>	<del></del>		
C   N						N 7	N 6		N 4
C   2   2   74,5300   2   2   74,5300   2   2   2   2   2   2   2   2   2			1C H 6	74 LS 157		(CPT)	(CP 6)	CP5	CP4
C   2   2   2   2   2   2   2   2   2							TREE TO THE PARTY OF THE PARTY	0.00	+
C J J F450   C J J J F450   C J J J F450   C J J F450			IC J 2	74 LS 30			RUB	M 5	M 4
CPST, 42, 48, 59, 10, 129 AXT, TANT.  CPSC, 48, 11, 12, 129 AXT, TANT.  CPSC, 48, 11, 129 AXT, TANT.  CPSC, 48, 11, 12, 129 AXT, TANT.  CPSC, 48, 11, 12, 129 AXT, TANT.  CPSC, 48, 11, 129 AXT, TANT.  CPSC, 48, 11, 129 AXT, TANT.  CPSC, 48, 11, 12			IC J 3			<b>M</b> 7		ıcs	
CPST, 42, 48, 59, 10, 129 AXT, TANT.  CPSC, 48, 11, 12, 129 AXT, TANT.  CPSC, 48, 11, 129 AXT, TANT.  CPSC, 48, 11, 12, 129 AXT, TANT.  CPSC, 48, 11, 12, 129 AXT, TANT.  CPSC, 48, 11, 129 AXT, TANT.  CPSC, 48, 11, 129 AXT, TANT.  CPSC, 48, 11, 12						CP13		(PIZ	CPII +
C   K   7466   C					į				LRIDAL
RIO-199,201,202, 1 K 1/4 W 574		55, TOJUT 254 MALTMAT.		7423137			L 6 ICS	L 5	4
RIO-119,201,702, IX 1/4W 5% (C X 3 7474   C			IC K I	74161		(P17)			
MMILZ BPN IK SIP IG K 6 214-2  MMIS IOPN IK SIP IG K 6 214-2  IG L 1 74.520  IG L 2 746.597  IG L 3 74.5207  IG L 4 74.5207  IG L 5 74.5307  IG L 6 214-2  IG L 7 74.5307  IG L 7 74.5307  IG L 7 74.5307  IG M 1 7430  IG M 2 7432  IG M 2 7430  IG M 3 74.5307  IG M 3 74.5307  IG M 3 74.5307  IG M 4 74.5017  IG M 5 74.5307  IG M 7 74.53				7430	با				
MBILZ BPN IK SIP IC 6 6 214-2  MN 3 IOPN IK SIP IC 6 6 214-2  IC A 1 EPROW IC L3 744.520  IC A 2 74.53157 IC L4 74.5283  IC A 3 74.53157 IC L5 8422  IC A 6 74.53157 IC L5 8422  IC A 6 74.53157 IC L7 84.5157  IC A 7 74.53157 IC L7 84.5157  IC B 1 EPROW IC M 3 74.5574  IC B 2 74.53194 IC M 5 822  IC B 3 74.53194 IC M 7 74.53157  IC B 4 74.53194 IC M 7 74.53157  IC B 7 74.53194 IC M 7 74.53157  IC B 7 74.53194 IC M 7 74.53157  IC B 8 7 74.53194 IC M 7 74.53157  IC B 8 7 74.53194 IC M 7 74.53157  IC B 8 7 74.53194 IC M 7 74.53157  IC B 9 8 822  IC C 1 EPROW IC M 8 822  IC C 2 74.53194 IC M 7 74.53157  IC M 7 74.5325  I		202, I K 1/4W 5%		7474			K 6 ICS	K 5 ICS	K 4
Mail 2 Benn IK SIP	[					-			CP2I)+
IC A   TALSSS   IC N   TALSS   IC		ADIN I K SIP					or crzy	(FZZ)	
C L 1	*		IC K 6	2114-2					
IC A 1 FROM 1C L 2 7408  IC A 2 74(15)77	RM 3	IOPIN I K SIP	:	<b>-</b> 45-			J •	J 5 ICS	
C									
C		E00011							
IC A 3 74 LS157							H •	_ " -	
IC A 4 74LS157 IC L 6 2114-2									CP 20
IC A 5 74 L 5167 IC A 7 74 L 5167 IC B 1 74 N 1							(230)		•
IC A 6 74 LS187  IC M 1 74 S 0  IC M 2 74 S 2  IC M 3 74 S 194  IC M 3 74 S 194  IC M 3 74 S 194  IC M 4 74 LS 187  IC M 5 74 LS 194  IC M 5 74 LS 194  IC M 7 74 LS 195  IC M 7 74 LS 273  IC M			IC L 7	74 LS 157				CP29)	
C M   7430   C M   7430   C M   7430   C M   744516   C M   7445157   C M   744516   C M   745								<u> </u>	
C   B   EPRON	IC A 7	74 L\$157	IC MI	7430			9.6	G 5	g 4
C B   C PROM   C M 5									CP34 )
IC B 2 74 LS194			IC M 3	74 S 74					+
C   B   2		_					F 6	F 5	F 4
C					7		ĹJ		
C   B   5	*	=	1C M 7	74 LS 157	<u> </u>		<b>CP30</b>		CP 37
C   B   6   422					-				
C B 7							E 6	£ 5	E 4
IC C I EPROM IC N 4 74 LS 283 IC C 2 74 LS 194 IC C 3 74 LS 194 IC C 4 74 LS 32 IC C 5 422 IC C 6 422 IC C 6 422 IC C 7 74 LS 194 IC D 1 EPROM IC D 2 74 LS 194 IC D 3 74 LS 194 IC D 3 74 LS 194 IC D 4 74 LS 273 IC D 5 74 LS 197 IC D 6 74 LS 197 IC D 7 74 LS 273 IC D 7 74 LS 273 IC D 7 74 LS 273 IC D 8 74 LS 197 IC D 7 74 LS 273 IC D 8 74 LS 197 IC D 9 74 LS 197 IC D 7 74 LS 273 IC D 8 74 LS 197 IC D 7 74 LS 273 IC D 8 74 LS 197 IC D 7 74 LS 273 IC C 8 74 LS 197 IC E 7 74 LS 197 IC E 8 74 LS 197 IC E 8 74 LS 197 IC E 9 74 LS 293 IC G 9 74 LS 293		74LS32			لــم		BB 2 CP44	(P43)	CP42)+
IC C   EPROM					1				
C C 2	Ī <u>.</u> . <u>.</u>	500011	•						
C C 2						0 7	D 6	D 5	D 4
C C 5   422						CPAI	CP50	CP 49	CP48
C C C S   422							(Aug.)	1115	· · · · · ·
IC C 6	1C C 5								C 4
IC C 7 74LS 32 ICSAI,BI,CI,DI. 28PIN IC SOCKET  IC D 1 EPROM  IC D 2 74LS 194  IC D 3 74 LS 194  IC D 4 74 LS 273  IC D 6 74 LS 157  IC D 6 74 LS 157  IC E 7 74 LS 194  IC E 7 74 LS 194  IC E 7 74 LS 197  IC E 6 74 LS 157  IC E 7 74 LS 157							c c ics	lcs	L
IC D   EPROM   IC D 2		74 LS 32	ICS AI, BI, CI, DI.	28PIN IC SOCKET		CP50	(P 57)	(P56)	CP 55
IC D 2	IC D I	EPROM							
IC D 3			ICS 85.6. C5.6	22PIN IC SOCKET		8 7		8.5	8 4
IC D 4 74 LS 273 IC D 5 74 LS 157 IC D 6 74 LS 157 IC D 7 74 LS 273  IC E 2 74 LS 194 IC E 3 74 LS 194 IC E 4 74 LS 157 IC E 5 74 LS 157 IC E 6 74 LS 157 IC E 7 74 LS 157 IC E 7 74 LS 157 IC E 8 74 LS 157 IC E 8 74 LS 157 IC E 9 74 LS 157 IC F 9 74 LS 203 IC G 1 74 LS 203 IC G 2 74 LS 203 IC G 3 74 LS 203 IC G 4 74 LS 203						L	ICS	103	
IC D 5			•			CP 65)	CP64	(P63)	+
IC D 7 74 LS 273  IC E 2 74 LS 194 IC E 3 74 LS 194 IC E 4 74 LS 374 IC E 5 74 LS 157 IC E 6 74 LS 157 IC F 2 7400 IC F 3 74 S 04 IC F 5 74 LS 157 IC F 6 74 LS 157 IC F 6 74 LS 157 IC F 6 74 LS 157 IC F 74 LS 283 IC G 1 74 LS 86 IC G 2 74 LS 283 IC G 3 74 LS 283 IC G 4 74 LS 283			IC3 K6, L6.	IBPIN IC SOCKET					
IC E 2 74 LS 194 IC E 3 74 LS 194 IC E 4 74 LS 374 IC E 5 74 LS 157 IC E 6 74 LS 157 IC F 2 7400 IC F 3 74 S 04 IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 204 IC G 3 74 LS 205 IC G 4 74 LS 2083			<b>, -</b>			A 7	A 6	A 5	A 4
IC E 2 74 LS 194 IC E 3 74 LS 194 - IC E 4 74 LS 374 IC E 5 74 LS 157 IC E 6 74 LS 157 IC F 2 7400 IC F 3 74 S 04 IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 20 IC G 2 74 LS 20 IC G 3 74 LS 283 IC G 4 74 LS 283		202.0			1			-	[C0.60]
IC E 3						(CP 71)	(CP 70)	CP 559	+
IC E 4 74 LS 374 IC E 5 74 LS 157 IC E 6 74 LS 157 IC E 6 74 LS 157 IC F 2 7400  JWI-8 JUMPER WIRE  IC F 3 74 S 04 IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 157 IC F 6 74 LS 157  BBI, 2 BUSS BAR  IC G 1 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 283 IC G 4 74 LS 283			J3,4,5	24 PIN SOCKET					
IC E 5 74 LS 157 IC E 6 74 LS 157  IC F 2 7400									
IC F 2 7400 JWI-8 JUMPER WIRE  IC F 3 74 S 04 IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 157 BBI, 2 BUSS BAR  IC G 1 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283									
IC F 2 7400 JWI-8 JUMPER WIRE  IC F 3 74 S 04 IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 157  BBI, 2 BUSS BAR  IC G 1 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283	A contract of the contract of								PROJ. ENG.
IC F 2 7400 IC F 3 74 S 04 IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 157 BBI, 2 BUSS BAR  IC G I 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283									
IC F 3 74 S 04 IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 157 BBI, 2 BUSS BAR  IC G 1 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283	10 F 2	7400	J <b>W</b> 1-8	JUMPER WIRE					
IC F 4 74 LS 374 IC F 5 74 LS 157 IC F 6 74 LS 157  BBI, 2 BUSS BAR  IC G 1 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283									
IC F 5 74 LS 157  BBI, 2 BUSS BAR  IC G 1 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283									DONOTSC
BBI, 2 BUSS BAR  IC G I 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283	a.	74 LS 157							NOTE SPECIFIE
IC G I 74 LS 86 IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283	IC F 6	74 LS 157							- Land 1997
IC G 2 74 LS 20 IC G 3 74 LS 293 IC G 4 74 LS 283			BB1, 2	BUSS BAR					
IC 'G 2 74 LS 20 IC G 3 74 LS 283 IC G 4 74 LS 283	IC <b>G I</b>	74 LS 86							
IC G 4 74 LS 283		74 LS 20							
II									
IC G 5 74 LS 283	IC G 5	74 LS 283							

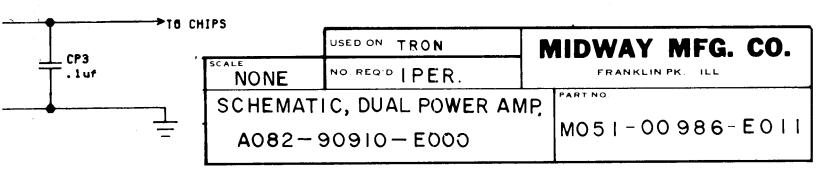


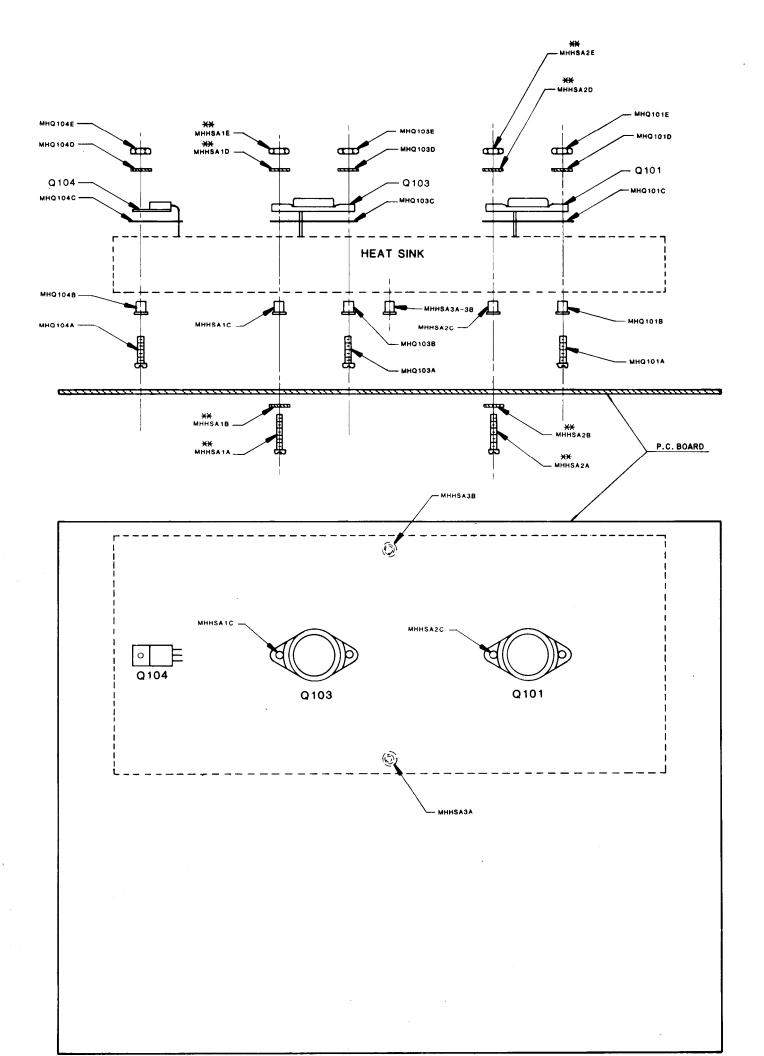
G. ATISH GE	HOSH			REVISIONS
			USED ON SATANS HOLLOW	MIDWAY MFG. CO.
T SCALE DWG		NONE	NO REGO I PER	FRANKLIN PK ILL
\$\frac{1}{A} \frac{3}{3}\$	- 1815it	ASS'Y DI VIDEO GE	RAWING ENERATOR P.C 1399-A941	M051-00941-A007











### **DESIGNATION LIST**

N3772 XSTR
N3772 XSTR
'IP31
IEAT SINK

MH HSA1C SHOULDER WSH

MH HSA2C SHOULDER WSH

MH HSA3A,3B SHOULDER WSH MHQ101A 4-40X8 SLT PAN SHOULDER WSH MHQ101C INSL TO-3 MHQ101D WSH 4-40-.250-018 MHQ101E 4-40 HEX NUT MHQ103A 4-40X8 SLT PAN MHQ103B SHOULDER WSH MHQ103C INSL TO-3 MHQ103D WSH 4-120-.250-018 MHQ103E 4-40 HEX NUT MHQ104A 4-40X8 SLT PAN MHQ104B SHOULDER WSH

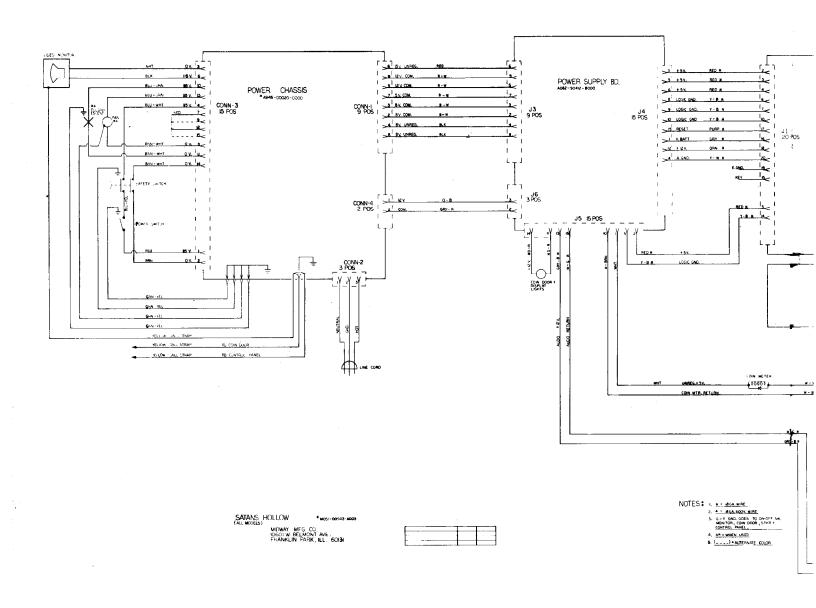
### CROSS REFFERENCE LIST

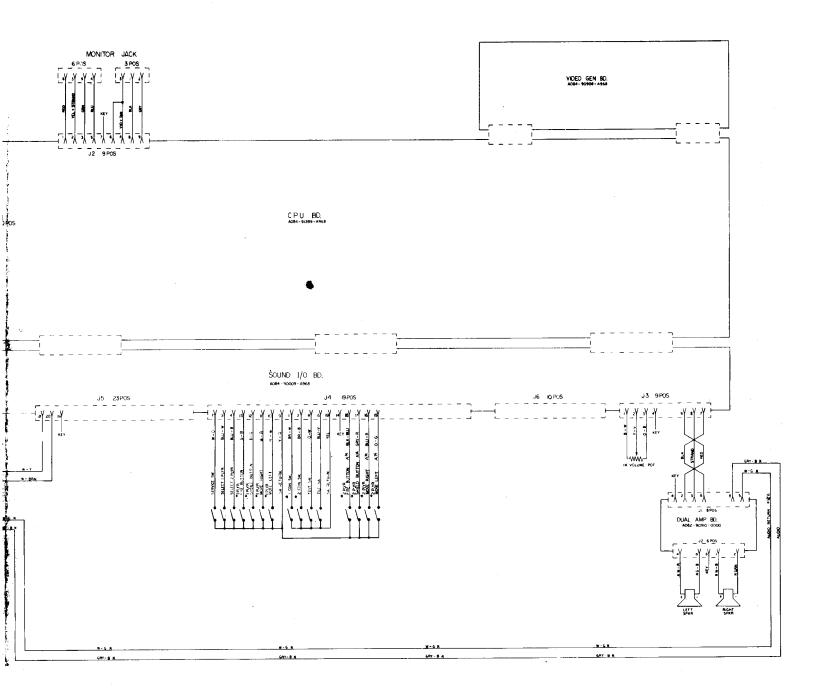
DESCRIPTION	Q'ty	DESIGNATION ≠	PART ≠
2N3772 XSTR	2	Q101,103	0945-00808-0100
TIP31	ī	Q104	0945-00808-0100
HEAT SINK	· i	HS1	0945-00808-0200
	·		0845-00806-0000
4-40X8 SLT PAN	3	MHQ101A	0017-00101-0510
	•	MHQ103A	0017-00101-0510
		MHQ104A	
WSH 4-120250-018			
WSH 4-120250-018	· <b>3</b>	MHQ101D	0017-00104-0071
		MHQ103D	
		MHQ104D	
SHOULDER WSH	7	MH HSA1C,2C	0945-00807-0000
		MH HSA3A,3B	
		MHQ101B	
		MHQ103B	
		MHQ104B	
INSL TO-3	2	MHQ101C	0945-00809-0300
		MHQ103C	
INSL TO-220	1	MHQ104C	0945-00809-0600
A AC HEY MIT	_		
4-40 HEX NUT	3	MHQ101E	0017-00103-0002
		MHQ103E	
		MHQ104E	

### \*\* NOTE

\*\* THIS ASSOCIATED HARDWARE IS ON POWER SUPPLY BOM AND SHOWN HERE ONLY FOR REFFERENCE.

PROJ. ENG; L. DEKKER			USI DICN KICK	MIDWAY MFG. CO.	
DO NOT SCALE DWG	THAT TREAT	SCALE	NO HERD FRANKLIN PK ILL		
DIM TOLERANCES DAN C.L.  ONCINIONAL TOLERANCE	MAT L FINISH	HEAT SI	NK ASS'Y DRAWING	M051 - 00945 - A008	





DESIGNATION LIST , CPI DESCRIPTION DESIGNATION DESCRIPTION DESIGNATION R131 . F6 F 7 CIDI-C103 IOME 25V AX TANT 4.7K TO PIN S.I.P. CI04-CI27 JIMF SOV AX. CER. RM2-RM5 2.7K TO PIN S.I.P. C+38-C129 47PF 50V AX. CER. 4 7K RM7 8 PIN S.I.P. 0131 IOMF 25V AX. TANT RMB 820 OHM C134, C137 द्रम्स IMF 20V AX TANT CPIES RM9 1.8K . . IOMF 25V AX. TANT. R122 R121 R120 R118 RMI4 4.7K 10 C139 .047 MF 100V MYLAR 0.40 OIMF SOV AX. CER C142 100PF 50V AX. CER DIOI-DIO3 IN4148 ua. C143 IMF SOVAX. CER. DI05-DIQ7 IN4148 0144 33PF 50V AX. CER R501 R502 R503 R104 A505 C501 R106 R507 C502 R508 C145-C156 .0022MF :00V 10% MYLAR Q101-Q103 TIPIIO C (57-C)59 IMF 20V AX. TANT Ø Q104 2N4403 0161 330 PF 50V AX. CER RI 42 BIO C162-C164 C165 IMF 20V AX TANT 33 OPF 50 V AX. CER ıd R164 R165 R166 C166, C167 IOMF 25V AX. TANT AIBI 172 RIB7 DIO3 RIB7 RIB3 RIB6 C140 RIB2 IOMF 25V AX TANT CP20 ICAL 7406 R197 #202 1 CIGH C173 OIMF 50V AX. CER " A4 CI...8 R141 74LS273 R509 C503 R154 R233 R155 R158 P159 0501-0509 " A5 .IMF 50V AX.CER. 74LS374 CISO CRS C N211 (+ R(38) " A6 8510 KX8 RAM " A7 ROM/EPROM O CPI 470MF I6V AX.ELECT R210 " A8 CP2-: PI2 OIMF SOV AX CER " A9 [F401] CP13 CP14-CP19 470MF I6V AX. ELECT " АЮ OIME SOV AX CER " All 74LS245 CP20 IOMF 25V AX. TANT " Al 2 Z-80 CPU OIMF 50V AX. CER. (305) (306) (307) " A13 74LS08 CP29-CP33 " R2.84.85 7415244 RII4 **CP34** IOMF 25VAX TANT " B7, 88 74LSI38 CP35-CP46 JOIMF 50V AX. CER. C50 "B9 74LS670 CP47 470MF16V AX ELECT. "BIO 74LS32 CP48-CP5I OIMF 50V AX. CER R237 R2 12 "BII 74LS670 CP52,CP53 IOMF 25V AX TANT "BI2,BI3 R402 74LS138 CP54 470MF I6V AX. EL ECT. " BI4 CP39 **CP40** 74LS174 CP202-CP204 IOMF 25V AX. TANT A6 10 06 "CIO 7407 P231 RIOI-RIO7 4.7K OHM !/4W 5 % CARBON MC3403 M230 23 RI Q8-RI31 220 OHM" "CII 74LS04 R229 " C12 MC14024 "CI3 RI38, RI41 180K 7427 R306 R306 R301 R302 CP47 [CIO3] R303 R304 C102 C101 "CI4 R142 10.0 K 74L\$367 0 1601 R144, R145 "D3 LM3900 620K R146 OK "D6 "D7-D9 74LS02 L E0 2 O LED 3 100K MC14016 R149, R150 " DII 620K 74190 RI5I "DI2 PROMS82A IMEG "D13 74166 R153 łΚ "E2 74LS244 RI54 MEG MC3403 74161 "E10 RI55, RI56 IOK "EII RI57, RI58 1.2K "E12 74126 CROSS REFER R160.R161 330 OHM "F2 74LS244 RI62 2200HM "F3-F5 74LSI91 RI63 1.2 K "F6,F7 AY-3-8910 DESCRIPTION R164 QIY 22 OHM "F8-FI0 74LSI91 RI65,RI66 4 7K 7474 R173-R178 "F12 74504 RI79, RI96 24K 33PF 50V 5% AX.CER 47 PF 50V AX.CER 100PF 50V 5% AX.CER ICSA6-ICSAIO 24PIN IC SOCKET 330PF 50V AX. CER. , A12 40PIN" 5.6K RI97-R202 1/4 W 5% CARBON .0022MF 100V 10% MYLAR 12 DIZ 16 PIN" R203-R208 33K .047MF 100V MYLAR F6,F7 40 PIN' R209-R211 13K DIME SOV AX CER 47 27K 24 PIN KKIOO RT. ANGLE CONN. R214 - R219 33K JI,J2 ₹220-R222 13 K J3 5 PIN KKIOO" IMF 50V AX. CER. 34 R224 3 PIN KKIOO IMF 20V AX, TANT R225,**R226** 13 PIN KKIOO J4 IOMF 25V AX. TANT. 15 R227 5 PIN KKIOO R228 4.7K J5 IBPIN KKIOO" 470 MF IGV AX- ELECT £231 300 OHM 4 PIN KKIOO R232 4.7K J6 7 PIN KK100 22 OHM 1/4W 5% CARBON R233 3K · KKIOO 100 OHM R234.R235 4.7K 220 OHM " R239 100 OHM 300 OHM R301-R306 2.7K 330 OHM R401 4.7K ١K R402 JWI, JW2 JUMPER WIRE 1.2K R403-R404 33K OHM R405-R407 4.7K LED 3 YELLOW LED 3K R501-R509 220 OHM" 19 4.76 R510 2.7K

IO POSITION DIP

PUSH BUT TON S.W.

16 MHZ CRYSTAL

SNAP

SWI

SW3

5 W 4

XTAL I

MHQIQI-MHQIQ3

12

۱5

2

10K

24K

100K 180K 620K

IMEG

