

Form No. 0636-00300-0000

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Lazarian

IMPORTANT NOTE

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

I. Introduction

LAZARIAN is a one or a two player game. There are three models: the "UPRIGHT", "MINI", and "COCK-TAIL TABLE". When the two player mode is selected on the Upright or Mini model, the players take turns at the controls to fly their space fighter(s) through the game course. If you have purchased the Cocktail Table model of this game, the rules of play are the same. The only **difference** is that in the two player mode of the Cocktail Table game, the picture flips to face you when it's your turn.

When playing this game, you are the pilot of a space fighter stationed in various places to rescue one of your stranded ships and to defend your sector of space against any and all types of hazards.

In the first phase of the first mission of game play, one of your sister ships is in trouble and sending out an SOS. It is completely surrounded by meteors which are held in a tight circle around it by separate interlocking force fields. Your task is to shoot the force fields as they turn yellow which causes them to release that particular meteor. You must release **ALL** the meteors **BEFORE** you will be able to rescue your sister ship.

After rescuing your sister ship, you must then avoid the meteorites coming at you and destroy all the meteors circling around you **BEFORE** your fuel runs out. This will enable you to advance to the next phase of the first mission.

If you accomplished all of the above, your space ship is refueled and you are sent out on the second phase of your first mission — to rescue another ship which is in distress at the top left corner of your monitor's screen. To do this, you must face and surmount severil different kinds of deadly obstacles while working your way through the four different levels of the tunnel. Again, you must do this **BEFORE** your fuel runs out.

When you have completed this latest rescue mission, your ship is refueled once more and you must face the one-eyed space leviathan in the third phase of your first mission. The only way to destroy it is by shooting its eye. This is not easy, to say the least. And again, you **MUST** do this **BEFORE** your fuel is exhausted.

As your skill level increases, and you advance farther and farther into the game, each successive mission becomes harder and harder to complete.

A bonus ship (this is switch selectable) may be awarded to you as you reach or pass a certain preselected point value. Each item which can be shot has an assigned point value as listed in Figure 1-1.

Major New Features

One new feature of your LAZARIAN game is the ability of your space ship to fire to the left, right, up, or down, giving you greatly increased fire power. Another new feature of your LAZARIAN game which will increase your ship's fire power to an even greater degree is the addition of optional switch selectable Laser Fire: Normal Manual Laser Fire (Laser fires as fast as you can press the FIRE buttons), and Automatic Rapid Laser Fire (Laser fires at a high rate for as long as any of the FIRE buttons are held down).

Game Objective

The object of the game is to **HAVE FUN** and survive as long as possible while constantly improving your skills and destroying as many of the enemy as you can. As you do this, each successive mission will be harder to complete.

SCORING TABLE

FIRST PHASE OF EACH MISSION					
OBJECT POINT VALUE					
LIBERATED METEOR DESTROYED METEOR	VARIABLE — 10 TO 100 POINTS EACH VARIABLE — 10 TO 100 POINTS EACH				
SECOND PHASE OF EACH	H MISSION				
OBJECT	POINT VALUE				
ALIENS IN FIRST TUNNEL LEVEL FORTS IN SECOND TUNNEL LEVEL ALIENS IN THIRD TUNNEL LEVEL DISTRESSED SISTER SHIP RESCUED	70 POINTS EACH 70 POINTS EACH 70 POINTS EACH 1000 POINTS				
THIRD PHASE OF EACH MISSION					
OBJECT	POINT VALUE				
PIECES OF LEVIATHAN ALIENS IN THIS RACK LEVIATHAN'S EYE RELEASED 1ST, 2ND, & 3RD LASER HITS ON EYE 4TH LASER HIT ON EYE (DESTROYS IT)	5 POINTS EACH 70 POINTS EACH 1000 POINTS 500 POINTS EACH 1000 POINTS				

Figure 1-1 Assigned Point Values

II. Location and Setup

INSPECTION

- 1. Remove the game from its shipping crate.
- 2. Inspect the entire outside of it for any signs of damage.
 - □ Any scratches?, dents?, cracks?
 - □ Any broken controls?
 - □ Any broken glass or plastic?
 - Just look it over closely and make a note of any signs of damage.
- 3. Remove the shipping cleats from the bottom of the cabinet.
 - UPRIGHT MODELS ONLY: In order to help prevent easy theft of your game, you may wish to remove the Caster Wheel Assemblies from the bottom of your cabinet at this time.
- 4. Install the four levelers, one at each corner of the cabinet.
 - Level the cabinet.
- 5. Open the cabinet and inspect the inside of the game for any signs of damage. See Figure 2-1.
 - □ Also check to make sure all plug-in connectors on the wire harness are firmly seated.

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

- Replug any connectors found unplugged. DO NOT FORCE PLUGS ONTO CONNECTORS. DO NOT FORCE PLUGS TOGETHER. If it won't go on easily, assuming the keys are lined up, it either does not belong there or is damaged.
- Make sure all printed circuit boards (P.C.B.'s) are firmly seated in their connectors. See Figure 2-1. These connectors are also keyed. The P.C.B.'s will only go into them one way without being damaged.
- □ Note the location of the game's serial number. See Figure 2-1.
- Check all major subassemblies to be sure they are mounted securely. These are called out in Figures 2-1 & 2-2.
 Power supply.
 Control panel(s).
 - T.V. monitor.

Other P.C.B.'s and/or P.C.B. rack, etc. Power supply filter assembly.

- Transformer board assembly.
- 6. Make a note of any problems that can't be easily corrected.
- 7. Call your distributor and/or service man about your problem list.

INSTALLATION

1. Location requirements:

- □ **Power:** Domestic 110 V @ 60 Hz Foreign 200 V to 240 V @ 50 Hz
- □ Temperature: 32° to 100° F (0° to 38° C)
- □ Humidity: Not over 95% relative

□ Space required:

Upright	29" x 25" (73cm x 63cm)
Mini	20" x 24" (50cm x 60cm)
Cocktail	32" x 22" (81cm x 55cm)

□ Game height:

Jpright	68''	(170cm)
Vini	61"	(153cm)
Cocktail	29"	(73cm)

2. Voltage Selection:

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

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

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

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

- □ To help prevent the possibility of getting an electric shock while working inside the game cabinet, interlock switches have been installed at each cabinet access door (this **DOES NOT** include the coin door in the Upright and Mini models).
- □ When any access door is opened, the interlock switch installed there turns off all power to the game.
- □ Check each interlock switch for proper operation.

After checking the line voltage in your area and determining that the input wires to the main power supply transformer of your game are connected properly — or — after obtaining a solution to your over or under voltage problem from your distributor and/or your service man, plug the game into your A.C. wall outlet.



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



Figure 2-2 Major Sub-Assys. (cont. from Fig. 2-1)

The game ON/OFF switches for all models are located as shown in Figure 2-1. Turn the game on and allow it to warm up a few minutes.

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

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

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

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

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

When the interlock switch is working properly and turns the power to the game off, power may be restored to the game with the access door(s) open. Take hold of the interlock switch plunger and **gently** pull it out to its fully extended position. THIS IS TO BE USED **ONLY** FOR SERVICING THE GAME. See Figure 2-3.



Figure 2-3 Interlock Switch Operation

GAME VOLUME ADJUSTMENT

CONTROL. See Figure 2-4.

The volume control pot is located on the Sound board. This is a somewhat smaller P.C. Board than the main game P.C. Board. It may be reached through the coin door on the UPRIGHT models and through the rear access door on the MINI models. On the COCK-TAIL TABLE models, you will have to open the table top to reach it.

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

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



Figure 2-4 Game Volume Adjustment Control

OPTION SWITCH SETTINGS

To change the option switch settings, you DO NOT have to take the CPU board out of the game. They can be easily reached through the rear access door on the Upright and Mini models. On the Cocktail Table model, you do have to open the table top to reach them.

When changing any options, ALWAYS check the results by playing the game to be sure the switches have worked properly and that no switches were accidentally moved that were not meant to be. (These switches are small and this can happen.)

The option switch settings and what they will make the game do are shown in Figure 2-6. See Figure 2-5 for option switch locations.



Figure 2-5 Option Switch Locations

LA	LAZARIAN								
OPTION SWITCH SETTINGS									
DIP SV	NITCH	SW-							<u> </u>
COINS PER PLAY 2 COINS 1 PLAY *1 COIN 1 PLAY 1 COIN 2 PLAYS 1 COIN 3 PLAYS	SW#1 ON OFF ON ON	SW# ON ON OFF	2 SW# NO USE	#3 \$ T D	SW#4 NOT JSED	SW#5	SW#6	SW#7	SW#8
NUMBER OF SHIPS PER PLAY 2 SHIPS *3 SHIPS 4 SHIPS 5 SHIPS	SW#1	SW#	2 SW#	‡3 S	SW#4	SW#5 ON OFF ON OFF	SW#6 ON ON OFF OFF	SW#7	SW#8
Si		E				_			
*CALIBRATION GRID NOT DISPLAYED CALIBRATION GRID DISPLAYED	SW#1	SW#	2 SW#	3 5	SW#4	SŴ#5	SW#6	SW#7 ON OFF	SW#8
"TEST" COLLISION DETECTION DISABLE *"GAME" COLLISION DETECTION NORMAL									ON OFF
DIP SV	итсн	SW-2	2						
LASER FIRING CONTROL NORMAL FIRE *RAPID FIRE	SW#1 NOT USED	SW# ON OFF	2 SW#	3 5	SW#4	SW#5	SW#6	SW#7	SW#8
MONITOR CONTROL * NORMAL OPERATION FREEZE THE PICTURE		SW#	2 SW # ON OFF	3 S -	SW#4	SW#5	SW#6	SW#7	SW#8
DIFFICULTY LEVEL EASY GAME *MEDIUM GAME DIFFICULT GAME VERY DIFFICULT GAME		SW#	2 S₩#	3 S	ON OFF ON OFF	SW#5 ON ON OFF OFF	SW#6	SW#7	SW#8
BONUS SHIPS AWARDED AT: NO BONUS SHIP AWARDED 10,000 POINTS — ONE SHIP ONLY *14,000 POINTS — ONE SHIP ONLY 18,000 POINTS — ONE SHIP ONLY		SW#2	2 SW#	3 S	SW#4	SW#5	SW#6 ON OFF ON OFF	SW#7 ON ON OFF OFF	SW#8

*INDICATES FACTORY RECOMMENDED SETTINGS.

PART NO. M051-00636-A011

Figure 2-6 Option Switch Settings

III. Game Operation

LAZARIAN is a one or a two player game with a color T.V. monitor.

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

CALIBRATION MODE

To put the game into its CALIBRATION MODE the game MUST be "ON". Then slide **SW#7** of SWITCH PACK SW-1 to the "OFF" position (on UPRIGHT and MINI models, this Switch can be reached through the rear access doors — on COCKTAIL TABLE models, you will have to open the table top to reach it). At this time the game will display a GRID PATTERN on the monitor screen. This may be used for making any one of the number of adjustments to the game.

This GRID PATTERN will remain on the monitor screen until the above **SW#7** of SWITCH PACK SW-1 is returned to the "ON" position.

ATTRACT MODE

- 1. The Attract mode starts:
 - □ Just after power has been turned on to the game.
 - After a play has been finished, the score was not high enough to put the game into the High Score/Initial mode, and there are no more credits left in the game's memory.
 - □ After the High Score/Initial mode when there are no more credits left in its memory.
 - □ The next display in the series lists the five highest scoring individuals that have played the game to date.

03540	UEL STORE	High Score	00000 Player 2
2	TODAYS H	IGH SCORES	
	LUU DAV SIL SAW YER	00000 00000 00000 00000 00000	
MOVI RIGH PRES LETT	E CONTRO T TO SELE S FIRE BU ERS	L LEVER LEF CT LETTERS TTON TO INS	T OR ERT
		CI	REDIT 00

□ When a game(s) has been paid for, the only difference in the game display is that the first display of the Attract Mode changes to that shown below:

PUSH START BUTTON
MIDWAY MFG. CO. 1981 ZACCARIA

READY-TO-PLAY MODE

- 1. The Ready-To-Play mode starts when enough coins have been accepted for a 1 or a 2 player game.
- 2. The Ready-To-Play mode ends when either the "1 PLAYER" or the "2 PLAYER" push button is pressed.
- 3. In the Ready-To-Play mode, the game will give the above display in place of the first display of the Attract mode.
- 4. If no START button is pressed, the game will continue to run its Attract mode sequence of displays with the modified first display as shown above.

PLAY MODE

- 1. The Play mode begins when either the "1 PLAYER" or the "2 PLAYER" start button is pressed.
- 2. The Play mode ends when all of your space ships have been destroyed. When this happens, "GAME OVER" is written across the center of the monitor screen.
- 3. The game is made up of individual missions with three repeating phases each: two distressed space ships which it is your task to rescue (each rescue being more difficult than the one before) and a space leviathan (monster) which you must destroy. This sequence repeats throughout the

game. However, each time you go through it, it will be more difficult to complete than the last time you went through it.

The increased level of difficulty is accomplished by such means as shortening the range of your lazer and speeding up the timing of events within each phase of a mission. For instance, the period of time that any force field will stay yellow in the first phase of a mission is shortened.

After you complete each phase of the mission, your space ship moves to the point on the screen where it has to be to begin the next phase of the mission.

4. In the first phase of the first mission of game play, one of your sister ships is in trouble and sending out an SOS. It is completely surrounded by meteors which are held in a tight circle around it by separate interlocking force fields. Your task is to shoot the force fields as they turn yellow which causes them to release that particular meteor. You must release ALL the meteors BEFORE you will be able to rescue your sister ship. When the last meteor is released, your space ship is given another full load of fuel for completion of the rescue.

After rescuing your sister ship, you must then avoid the meteorites coming at you and destroy all the meteors circling around you **BEFORE** your fuel runs out. This will enable you to advance to the next phase of the first mission.

If you accomplished all of the above, your space ship is refueled and you are sent out on the second phase of your first mission — to rescue another ship which is in distress at the top left corner of your monitor's screen. To do this, you must face and surmount several different kinds of deadly obstacles while working your way through the four different levels of the tunnel. Again, you must do this **BEFORE** your fuel runs out.

When you have completed this latest rescue mission, your ship is refueled once more and you must face the one-eyed space leviathan in the third phase of your first mission. The only way to destroy it is by shooting its eye. This is not easy, to say the least. Because when your lazer first touches the leviathan's eye, it escapes from the dying monster. The escaped eye then moves about the monitor's screen in varying patterns and must be hit four times by your lazer before it will explode and die. Your space ship is also NOT given another full load of fuel upon the escape of the eve from the dying leviathan so you have LESS fuel to complete the mission and kill the eye. And again, you MUST do this **BEFORE** your fuel is completely exhausted in order to be able to advance to the next mission.

After completing the third phase of any mission — destroying the leviathan's eye, the screen is cleared, "GO FOR NEXT MISSION" is displayed

centered on monitor screen, the screen is then cleared again.

As your skill level increases, and you advance farther and farther into the game, each successive mission becomes harder and harder to complete.

When your **last** space ship is destroyed, the words "GAME OVER" are displayed **centered** on the monitor screen. (AT THIS POINT, SEVERAL DIF-FERENT THINGS CAN HAPPEN DEPENDING ON WHAT YOUR SCORE WAS AND WHETHER OR NOT THERE ARE CREDITS STILL REMAIN-ING IN THE GAME'S MEMORY.)

If you are still in the 1st MISSION when your **last** space ship was destroyed, the game will give you the opportunity to continue the game from the point where you lost this **last** space ship by displaying the following message on the screen.



This option is not offered by the game if your **last** space ship is lost in any MISSION beyond the 1st. If you lose your last space ship in a MISSION beyond the 1st, you must start your next game at the beginning of the 1st MISSION again.

If your score was high enough to be one of the five best scores, the game will go into the High Score/Initial mode immediately. If your score is not high enough to cause the game to go into the High Score/Initial mode, it will either go to the Attract mode (if there are no more credits left in its memory) or into the Ready-To-Play mode (if there are still credits left in its memory).

HIGH SCORE/INITIAL MODE:

In the High Score/Initial mode the game gives a display which looks like the following:

03540 Player 1	FUEL		05790 High Score	00000 Player 2
	TODAYS H	IGH	SCORES	
	LUU DAV SIL SAW YER		00 00 00 00 00	
MO RIG PRI LET	VE CONTRO GHT TO SELE ESS FIRE BU ITERS	L LEV CT L TTOP	VER LEFT ETTERS. N TO INSE CRE	OR RT DIT 00
		-		

When in the High Score/Initial mode, YOUR SCORE has been positioned in its proper order among the other four high scores. The space at the left of your score is where you enter your initials. There will be an "A" in the first space and the other two spaces will be blank.

By moving the controller stick to the right, the letter can be made to sequence forward through the alphabet: "A", "B", "C", "D", etc. By moving the controller stick to the left, the letter can be made to sequence backward through the alphabet: "Z", "Y", "X", "W", etc.

When you reach your initial, release the controller and push any of the FIRE buttons. Your first initial is frozen in place and an "A" now appears in what was the blank space to the right of your first initial. You enter your second (and third) initial in the same manner as you did your first initial. If you do not wish to put your initials opposite your score, just press any of the FIRE buttons three times. Three "A"'s will appear opposite your score.

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

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

TWO PLAYER OPERATION

The Upright, Mini, and Cocktail Table models all have two player operation.

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

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

SPACE SHIP DESTROYED — OTHERS REMAIN-ING IN RESERVE

- □ All movement stops.
- □ Next, the screen is cleared and the following display shown **centered** on the monitor screen:



□ The screen is cleared again and play begins for the other player.

SPACE SHIP DESTROYED — NONE REMAINING IN RESERVE

- □ All movement stops and screen is cleared.
- Game displays "GAME OVER".
- Next, if your score was high enough to be one of the five best scores, the game will go into the High Score/Initial mode presentation immediately.
- □ After you have entered your initials, the screen is cleared and the following display shown **centered** on the monitor screen:



- The screen is cleared again and play begins for the other player.
- If your score was not high enough to cause the game to go into the High Score/Initial mode, it will go right to the above display, the screen will be cleared, and play will begin for the other player.

IV. Maintenance and Repair

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

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

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

CLEANING

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

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

FUSE REPLACEMENT

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

1. UPRIGHT MODEL:

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

2. MINI MODEL:

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

3. COCKTAIL TABLE MODEL:

As viewed from the coin door side of the cabinet, with the monitor tilted open to one side; the fuses are located on the Transformer and Power Supply Board Assemblies.

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

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



Figure 4-1 Location of Fuses

OPENING THE CONTROL PANEL. See Figure 4-2.

1. UPRIGHT MODEL:

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

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

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

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

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

□ To remove the control panel:

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

Cradling the control panel between yourself and the cabinet, disconnect it from its cabling. The control panel is now free and can be removed.

□ To reinstall the control panel, reverse this procedure.

2. MINI MODEL:

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

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

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

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

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

- □ To remove the control panel:
- Raise it up and tilt it toward you until you can see the cable behind it.

Cradling the control panel between yourself and the cabinet, disconnect it from its cabling. The control panel is now free and can be removed.

□ To reinstall the control panel, reverse this procedure.



Figure 4-2 Opening the Control Panel — Upright & Mini



Figure 4-3 Opening the Cocktail Game

3. COCKTAIL TABLE MODEL:

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

Turn power to the game off.

Open the coin box door and release the two latches indicated in Figure 4-3.

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

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

Grasp the table top at "A" and open it as indicated in Figure 4-3.

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

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

To remove the control panel(s):
 Disconnect it from its cabling.

The control panel is now free and can be removed.

□ To reinstall the control panel, reverse this procedure.



Figure 4-4 Removing the Control Panel — Cocktail

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

1. UPRIGHT MODEL: See Figure 4-5.

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

- □ **Turn the power to the game off** and remove the control panel. This frees the main-display-glass so it can be lifted up.
- By putting your finger in the hole in the middle of the main-display-glass support, you can lift it up and out.
- Loosen the screws which secure the T.V. bezelglass-clamps in place.
 Move the clamps to the side and the bezel glass

may be removed. Remove the above mentioned screws and the bezel with four bezel-glass-clamps may be removed.

□ To reinstall the T.V. bezel assembly and the main-display-glass, reverse this procedure.



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

2. MINI MODEL:

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

- Turn the power off to the game and remove the control panel.
- □ Remove the screws which secure the glass clamping plate.
- □ Lift out the class clamping plate. This frees the main-display-glass so it can be lifted up.
- By putting your finger in the hole in the middle of the main-display-glass support, you can lift it up and out.
- □ Remove the screws which secure the T.V. bezel assembly and lift it out.

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

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



Figure 4-6 Removing Main Display Glass & T.V. Bezel — Mini

3. COCKTAIL TABLE MODEL: See Figure 4-7.

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

- □ Remove the screws which secure the table top glass clamps in place.
- □ Remove the table top glass.
- □ Loosen the screws which secure the T.V. bezelglass-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, simply reverse this procedure.



Figure 4-7 Removing Top Glass & T.V. Bezel — Cocktail

T.V. MONITOR REPLACEMENT

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

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

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

- 1. UPRIGHT MODEL: See Figure 4-8.
 - □ Turn power off to the game.
 - □ Open the rear access door.
 - □ Completely disconnect the T.V. monitor from all its cabling. DON'T FORGET THE CHASSIS GROUND WIRE.

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

With the removal of only four bolts, the T.V. monitor and its mounting channels will be loose.

The monitor mounting channels slide on top of and against two metal guides mounted to the cabinet's right and left sides. The monitor is removed by sliding it out the back of the cabinet. See Figure 4-8.

- □ To reinstall the T.V. monitor, reverse this procedure.
- □ After replacing the T.V. monitor, be sure to run the game Self-Test.
- 2. MINI MODEL: See Figure 4-9.
 - \Box Turn the power off to the game.
 - □ Open the rear access door.
 - □ Completely disconnect the T.V. monitor from all its cabling. DON'T FORGET THE CHASSIS GROUND WIRE.

Before removing the T.V. monitor, the maindisplay-glass and bezel **MUST** be removed. See above "Mini Model" procedure.

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

CAUTION: BE SURE to support the T.V. monitor from the rear while removing the four bolts so it will not fall out of the cabinet. The monitor is removed by supporting it and pulling straight back as shown in Figure 4-9.

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

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

- 3. COCKTAIL TABLE MODEL: See Figure 4-11.
 - □ Turn the power off to the game.
 - □ Open the coin box door and release the two latches indicated in Figure 4-10.



Figure 4-8 Removing Monitor — Upright

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

- □ Once the latches are released, unhook them from their latch plates.
- □ Grasp the table top at "A" and open it as indicated in Figure 4-10.

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



Figure 4-9 Removing Monitor — Mini



Figure 4-10 Opening the Cocktail Game

- □ Remove the screws which hold the table top glass clamps in place.
- □ Remove the table top glass.
- □ Lift out the T.V. bezel assembly.
- Completely disconnect the T.V. monitor from all its cabling. DON'T FORGET THE CHASSIS GROUND WIRE.
- □ Remove the screws holding the T.V. monitor chassis to the "L" by the door hinge(s). See Figure 4-11.
- Close the Cocktail Table and re-latch it.
- □ Remove the screws which secure the T.V monitor mounting brackets to the edges of the slot cut in the table top. See Figure 4-11.
- Pry up the end of each monitor mounting bracket with a screwdriver or similar tool until you can grasp them both.
- □ Lift the T.V. monitor straight up and out of the table top being VERY CAREFUL not to bump the neck of the picture tube.
- □ To reinstall the T.V. monitor assembly, reverse this procedure.
- □ Be sure to check the clearance of the "L" brackets BEFORE setting the monitor into the table top.
- □ After replacing the T.V. monitor, be sure to run the game Self-Test.

Figure 4-11 Removing Monitor — Cocktail

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

- 1. UPRIGHT MODEL: See Figure 4-12.
 - □ Turn the power to the game off.
 - □ Unlock and open the rear access door (game board) and the coin door (sound board).
 - Disconnect the game board from all its cabling.
 - Disconnect the sound board from all its cabling.
 - □ Remove the indicated P.C.B. supports and lift the above P.C.B.'s out the cabinet.

Figure 4-12 Removing P.C.B.s — Upright

- Disconnect the power supply board from all its cabling, remove the P.C.B. supports indicated in Figure 4-12, and slide it out the back of the cabinet.
- □ To reinstall the above P.C.B.'s, reverse this procedure.

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

Figure 4-13 Removing P.C.B.s — Mini

Figure 4-14 Removing P.C.B.s — Cocktail

2. MINI MODEL: See Figure 4-13.

□ Turn the power off to the game.

- □ Unlock and open the rear access door.
- □ Disconnect the game board from all its cabling.
- Disconnect the sound board from all its cabling.
- □ Remove the indicated P.C.B. supports and lift the above P.C.B.'s out of the cabinet.
- □ Disconnect the power supply board from its cabling, remove the P.C.B. supports indicated in Figure 4-13, and slide it out the back of the cabinet.
- □ To reinstall the above P.C.B.'s, reverse this procedure.
- 3. COCKTAIL TABLE MODEL: See Figure 4-14.

□ Turn the power off to the game.

□ Open the cabinet:

Open the coin box door and release the two latches indicated in Figure 4-10.

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

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

□ Grasp the table top at "A" and open it as indicated in Figure 4-10.

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

□ To remove the power supply board. See Figure 4-14.

Disconnect it from all its cabling.

Remove the two smallest P.C.B. supports.

Once these are removed, the power supply can be lifted out the top of the cabinet.

To reinstall the power supply board, reverse this procedure.

□ To remove the game and Sound boards. See Figure 4-14.

Disconnect the game board from all its cabling. Disconnect the sound board from all its cabling.

 Remove the indicated P.C.B. supports and lift the above P.C.B.'s out of the cabinet.
 To reinstall the game and sound boards, reverse this procedure.

OPENING THE ATTRACTION PANEL:

1. UPRIGHT MODEL: See Figure 4-15.

□ Turn the power to the game off.

- □ Opening the attraction panel:
 - Remove the screws which secure the top bracket in place. (They are on its top side.) See Figure 4-15.

Remove the top bracket and slide up the attraction panel. This exposes the attraction panel fluorescent light tube and its mounting bracket assembly.

To reinstall the attraction panel, reverse this procedure.

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

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

□ Replacing the fluorescent light tube starter. See Figure 4-16.

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

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

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

Replacement of the fluorescent tube mounting bracket assembly.

Be sure the power is off to the game.

Disconnect it from its power cable.

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

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

□ Replacing the speaker.

Be sure the power is off to the game.

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

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

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

Reverse this procedure to reinstall the speaker.

Figure 4-15 Opening the Attraction Panel — Upright

- 2. MINI MODEL: See Figure 4-17.
 - □ Turn the power off to the game.
 - Remove the screws from the top and bottom of the formed attraction panel.
 - Remove the formed attraction panel by pulling it straight away from the cabinet. This exposes the attraction panel light bulbs and their mounting board.

Figure 4-16 Replacing Fluorescent Tube Starter

□ To service the light bulbs and their mounting board:

Turn the power to the game back on so you can see which bulbs are burnt out.

Mark the burnt out bulbs and turn the power to the game back off again.

To replace the burnt out bulbs, grasp them gently and pull straight out.

The new bulbs are gently pushed into the empty sockets.

To completely replace the light bulb mounting board:

Open the cabinet rear access door and unplug the mounting board from its power cable.

Remove the screws that hold the mounting board to the cabinet.

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

To reinstall the above removed items, reverse this procedure.

□ To replace the speaker.

Be sure the power is off to the game.

Disconnect the speaker from its cabling.

Remove the nuts and bolts securing the speaker.

Slide the speaker out through the rear access door.

To reinstall the speaker, simply reverse this procedure.

3. THE COCKTAIL MODE HAS NO BACK-LIT AT-TRACTION PANEL.

Figure 4-17 Opening the Attraction Panel — Mini

V Illustrated Parts Breakdown

NO. 636 - LAZARIAN UPRIGHT - HEADER FLUORESCENT FIXTURE ASSY. - PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	0505-00105-0000	
	0033-00103-0000	18" COOL WHITE FLUORESCENT LAMP
3	0017-00003-0445	LAMP LOCKS (2 REQ'D.)
4	0017-00031-0036	FLUORESCENT SOCKET (2 REQ'D.)
5	0017-00003-0412	FLUORESCENT STARTER HOLDER W/WIRE LEADS
	0017-00101-0573	#6-32 x 1/2 PHIL. RND. HD. M.S. (4 REQ'D.)
	0017-00104-0009	#6 EXT. WASHER (4 REQ'D.)
6	0017-00003-0019	FLUORESCENT STARTER
7	0017-00003-0026	BALLAST
	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCREW (4 REQ'D.)
	A961-00042-0000	LINE FILTER ASSY. (NOT SHOWN)

NO. 636 - LAZARIAN UPRIGHT - FRONT - PARTS LIST

ORDER BY PART NUMBER ONLY

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ITEM	PART NO.	DESCRIPTION			
1	0636-00900-00XF	DISPLAY HEADER			
	0537-00903-0058	GLASS CHANNEL 6-15/16 (2 REQ'D.)			
2	0636-00102-00XF	RETAINING BRKT. (2 REQ'D.)			
	0017-00101-0138	#8 x 5/8 TORX TAMPER RESISTANT SCREWS (6 REQ'D.)			
	0017-00009-0522	LONG ARM KEY T-20 (FOR ABOVE SCREW)			
3	A595-00011-0000	HEADER FLUORESCENT LIGHT ASSY			
4	0017-00009-0393	BLACK SPEAKER GRILLE W/SLOTS			
	0017-00003-0430	6" x 9" SPEAKER 4 OHM 10W.			
	0017-00101-0136	#8-32 x 1-1/4 CARRIAGE BOLT (4 REQ'D.)			
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)			
5	0508-00900-0000	T.V. BEZEL			
6	0508-00905-0000	T.V. PLEXI-GLASS (GRAYLITE #31) — 17-3/8" x 13-1/4" x 1/8"			
	0508-00901-0000	PLEXI-GLASS CLIPS (4 REQ'D.)			
	0017-00101-0017	#6 x 1/2 SLT. HEX HD. SCREW (4 REQ'D.)			
7	0636-00901-00XF	MAIN VIEWING GLASS			
	0508-00108-0000	GLASS STOP BRKT. — CABINET REAR			
	0017-00101-0027	#8 x 3/4 SLT. HEX HD. SCREW (3 REQ'D.)			
8	0636-00904-00XF	REAR SCENERY			
9	0636-00905-0000	FRONT DECAL			
10	0636-00906-0100	LEFT SIDE DECAL			
	0636-00906-0200	RIGHT SIDE DECAL			
11	A636-00006-0000	STRIKE TO CONTROL PANEL ASSY.			
	0961-00115-00XF	STRIKE (2 REQ'D.)			
	0017-00101-0620	#8-32 x 1/2 CARRIAGE BOLT (10 REQ'D.)			
	0017-00103-0061	#8-32 HEX NUT W/SEMS (12 REQ'D.)			
	0017-00009-0033	LATCH CLAMP (3 REQ'D.)			
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. SCREW (6 REQ'D.)			
	0550-0010,1-0100	CONTROL SHELF MTG. BRKT. — RIGHT			
	0550-00101-0200	CONTROL SHELF MTG. BRKT LEFT			
	0555-00901-0000	LOCATING PIN (4 REQ'D.)			
12	0636-00903-0000	CONTROL SHELF OVERLAY — DECORATIVE			
13	A557-00006-0000	CONTROL ASSY.			
14	0017-00032-0093	PUSH BUTTON SWITCH W/HOLDER (4 REQ'D.)			
	0017-00042-0299	YELLOW/RED SQUARE PUSH BUTTON ASSY. (4 REQ'D.)			
	0017-00103-0054	5/8-11 PAL NUT (4 REQ'D.)			
15	0017-00032-0051	SMALL RED PUSH BUTTON SWITCH (2 REQ'D.)			
16	A090-00300-10BK	U.S.A. 25¢ COIN DOOR ASSY.			
17	0090-00002-04BK	LARGE COIN DOOR FRAME			
	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCREW (3 REQ'D.)			
		(MOUNTS COIN DOOR TO FRAME)			
18	0935-00906-0100	KICK PLATE — 23" LONG			
19	0017-00102-0048	3/8-16 x 2" LEG LEVELERS (4 REQ'D.)			
	0017-00103-0026	3/8-16 LEG LEVELER NUTS (4 REQ'D.)			

NO. 636 - LAZARIAN UPRIGHT - REAR ACCESS - PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	A088-00013-0000	ON/OFF SWITCH AND BRKT. ASSY.
2	0894-00916-0000	PLASTIC PULL AND VENT (2 REQ'D.)
3	0017-00003-0339	ELECTROHOME 19" COLOR DUAL SYNC.
		HORIZ. MTG. MONITOR (OR)
3	0017-00003-0439	WELLS GARDNER 19" COLOR DUAL SYNC.
		HORIZ. MTG. MONITOR
4	0636-00101-0000	MONITOR RAIL (2 REQ'D.)
	0017-00102-0006	1/4-20 x 3/4 SQR. NECK BOLT (4 REQ'D.)
	0017-00104-0014	7/8 DISH WASHER (4 REQ'D.)
	0017-00103-0018	1/4-20 HEX NUT (4 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT HEX HD. SCREW (8 REQ'D.)
	0555-00901-0000	LOCATING PIN (4 REQ'D.)
5	0508-00900-0000	
6	A088-00015-0000	INTERLOCK SWITCH AND BRKT. ASSY.
7	A082-90421-B000	POWER SUPPLY PCB ASSY.
8	A084-91419-C636	
	0624-00902-0100	
	0624-00902-0500	P.C. SUPPORT BRKT. 6-1/2" LG. (4 REQ'D.)
9 10	AU84-90911-E030	SOUND BOARD ASSY.
10	A004-91421-0000	MONITOD INTEDEACE POADD ASSY
10	A064-91422-B030	CASTED ASSV (2 DECID)
12	A901-00007-0000	
	0901-00109-0000	PLASTIC WHEEL (2 BEO'D)
	0017-00042-0200 0894-00702-00XF	SHAFT (2 BEO'D)
	0017-00100-0037	3/8'' F-RING (2 REQ'D.)
13	A950-00004-0000	COIN BOX ASSY.
	A950-00006-0000	COIN BOX CRADLE ASSY.
	0950-00105-0000	COIN BOX COVER
	0950-00104-0000	COIN BOX HANDLE
	0950-00101-0000	COIN DEFLECTOR (2 REQ'D.)
	0950-00900-0000	LARGE PLASTIC CASH BOX
	0017-00101-0142	1/4-20 x 1-3/8 RND. HD. BOLT (4 REQ'D.)
	0017-00104-0014	7/8 DISH WASHER (4 REQ'D.)
	0017-00103-0018	1/4-20 HEX NUT (4 REQ'D.)
14	A508-00023-0000	3 COND. LINE CORD ASSY.
		ADDITIONAL PARTS LIST
	A636-00013-0000	TRANSFORMER BOARD ASSY.
	A097-00009-0000	BACK DOOR LOCK ASSY.
	0017-00009-0490	5-5/8" SQR. VENT GRILLE (4 REQ'D.)
	3010-03003-0000	GROUNDING CLIP
	A636-00014-0000	VIDEO SIGNAL CABLE ASSY.
	A636-00017-0000	VIDEO SIGNAL ADAPTOR CABLE ASSY.
	A636-00018-0000	AUDIO ADAPTOR CABLE ASSY.
	A636-00012-0000	CONTROL SHELF CABLE ASSY.
	A636-00010-0000	MASTER CABLE ASSY.
	A636-00016-0000	COIN DOOR CABLE ASSY.
	A636-00015-0000	HIGH VOLTAGE CABLE ASSY.
	A641-00011-0000	
		I.V. BEZEL MIG. BKKI. (2 REQ'D.)
	0017-00101-0027	#0 X 3/4 3L1. NEX NU. SUREW (3 KEQ'U.)

NO. 641 - LAZARIAN MINI - FRONT - PARTS LIST

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION	
1	0641-00901-00XE		
·] '	0537-00903-0060	GLASS CHANNEL $4-1/2''$ (2 BEQ'D)	
2	0574-00100-00XF	HEADER BETAINING BEKT (2 BEQ'D)	
	0017-00101-0138	#8 x 5/8 TOBX TAMPER RESISTANT SCREWS (8 BEO'D)	
	0017-00009-0522	LONG ABM KEY T-20 (FOR ABOVE SCREW)	
3	A574-00007-0000	INSERT ASSY	
Ŭ	0017-00031-0030	WEDGE BASE LAMP SOCKET (5 BEQ'D)	
	0017-00003-0219	#194 LAMP 14V., 27A. (5 REQ'D.)	
4	0017-00009-0393	BLACK SPEAKER GRILLE W/SLOTS	
	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W.	
	0017-00101-0127	#8-32 x 1-1/2 CARRIAGE BOLTS (4 REQ'D.)	
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)	
5	0641-00900-00XF	VIEWING GLASS	
	0537-00903-0056	GLASS CHANNEL 14-1/2" (2 REQ'D.)	
6	A555-00016-0000	GLASS CLAMPING PLATE	
7	0641-00100-0000	CONTROL SHELF PLATE	
	0641-00902-0000	CONTROL SHELF OVERLAY	
	0017-00101-0620	#8-32 x 1/2 CARRIAGE BOLT (8 REQ'D.)	
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)	
	0550-00101-0100	CONTROL SHELF MTG. BRKT. — RIGHT	
	0550-00101-0200	CONTROL SHELF MTG. BRKT. — LEFT	
	0555-00901-0000	PLASTIC LOCATING PIN (8 REQ'D.)	
	0017-00009-0033	LATCH CLAMP (2 REQ'D.)	
	0961-00115-00XF	STRIKE (2 REQ'D.)	
	0017-00101-0141	#8 x 11/16 UNSLOT HEX HD. SCREW (16 REQ'D.)	
8	0017-00032-0051	RED SWITCH BUTTON (2 REQ'D.)	
9	0017-00032-0093	PUSH BUTTON SWITCH W/HOLDER (4 REQ'D.)	
	0017-00042-0299	YELLOW/RED SQUARE PUSH BUTTON ASSY. (4 REQ'D.)	
	0017-00103-0054	5/8-11 PAL NUT	
10	A557-00006-0000	CONTROL ASSY.	
	A090-00300-10BK		
12	0090-00002-04BK		
13			
14		3/0-10 X Z LEGI LEVELERO (4 REGIDI) 2/9 16 LEGI EVELED NUTS (4 DECIDI)	
	0017-00103-0020		

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NO. 641 - LAZARIAN MINI - REAR ACCESS - PARTS LIST

ITEM	PART NO.	DESCRIPTION	
1	0017-00003-0430	6" x 9" SPEAKER 4 OHM 10W	
2	0931-00903-0000	T.V. BEZEL	
	0934-00905-0000	PLEXI-GLASS	
	A961-00026-0000	BEZEL MTG. BRKT. ASSY.	
3	0017-00003-0340	ELECTROHOME — 13" COLOR DUAL SYNC.	
		HORIZ, MTG. MONITOR (OR)	
3	0017-00003-0435	WELLS GARDNER — 13" COLOR DUAL SYNC.	
		HORIZ. MTG. MONITOR	
	0555-00100-0000	MONITOR MTG. BRKT. (2 REQ'D.)	
4	A088-00015-0000	INTERLOCK SWITCH & BRKT. ASSY.	
5	A950-00006-0000	COIN BOX CRADLE ASSY.	
	0950-00105-0000	COIN BOX COVER	
	0950-00104-0000	COIN BOX HANDLE	
	0950-00101-00XF	COIN DEFLECTOR (2 REQ'D.)	
	0950-00900-0000		
	0017-00101-0142	1/4-20 x 1-3/8 RND. HD. BOLI (4 REQ'D.)	
	0017-00104-0014	1/8 DISH WASHER (4 REQ'D.)	
<u> </u>	0017-00103-0018	1/4-20 HEX NUT (4 REQ'D.)	
0	A082-90421-B000	POWER SUPPLY P.C. ASSY.	
'	AU64-91419-C636		
	0624-00902-0100		
÷	0624-00902-0500		
8	A084-90911-F636	SOUND BOARD ASSY	
9	A084-91422-B636	MONITOR INTERFACE P.C. ASSY	
10	A084-91421-C636	DIODE P.C. ASSY.	
11	A088-00013-0000	ON/OFF SWITCH & BRKT. ASSY.	
12	0017-00009-0490	5-5/8" SQR. VENT GRILLE (4 REQ'D.)	
		ADDITIONAL PARTS LIST	
	A097-00009-0000	BACK DOOR LOCK ASSY.	
	A641-00012-0000	CONTROL SHELF CABLE ASSY.	
	A641-00007-0000	MASTER CABLE ASSY.	
	A636-00014-0000	VIDEO SIGNAL CABLE ASSY.	
	A636-00017-0000	VIDEO SIGNAL ADAPTOR CABLE ASSY.	
	A636-00018-0000	AUDIO ADAPTOR CABLE ASSY.	
	A641-00006-0000	HIGH VOLTAGE CABLE ASSY.	
	A641-00011-0000	LOW VOLTAGE CABLE ASSY.	
	A574-00015-0000	INSERT CABLE ASSY.	
	A636-00016-0000	COIN DOOR CABLE ASSY.	
	A508-00023-0000	3 COND. LINE CORD	

NO. 646 - LAZARIAN COCKTAIL - FRONT - PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	0017-00009-0499	COVER GLASS — 32" x 22" x 1/4"
	0646-00900-0000	ARTWORK UNDERLAY
2	0775-00104-00XF	GLASS CLIPS (8 REQ'D.)
	0017-00101-0117	#8 x 5/8 PHIL. TRS. HD. SCREW (16 REQ'D.)
3	0508-00905-0000	T.V. PLEXI-GLASS (GRAYLITE #31) — 17-3/8" x 13-1/4" x 1/8"
4	0557-00900-0000	T.V. BEZEL
5	A646-00004-0100	CONTROL SHELF ASSY PLAYER #1
6	A646-00004-0200	CONTROL SHELF ASSY. — PLAYER #2
7	0017-00009-0393	BLACK SPEAKER GRILLE W/SLOTS (2 REQ'D.)
	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W.
	0017-00101-0136	#8-32 x 1-1/4 CARRIAGE BOLT (8 REQ'D.)
1 1	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
8	A090-00300-10BK	U.S.A. 25¢ COIN DOOR ASSY.
9	0090-00002-02BK	LARGE COIN DOOR FRAME
i !	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCREW (3 REQ'D.)
	1	(MOUNTS COIN DOOR TO FRAME)
10	0017-00102-0048	3/8-16 x 2" LEG LEVELERS (4 REQ'D.)
	0017-00103-0026	3/8-16 LEG LEVELER NUTS (4 REQ'D.)

NO. 646 - LAZARIAN COCKTAIL - INTERIOR ACCESS - PARTS LIST

ITEM	PART NO.	DESCRIPTION	
	0017-00003-0450	WELLS GARDNER — 19" COLOR DUAL SYNC	
		HORIZ. MTG. MONITOR	
2	A557-00004-00XF	MONITOR MTG. BRKT. ASSY. (2 REQ'D.)	
	0017-00101-0127	#8-32 x 1-1/2 CARRIAGE BOLT (4 REQ'D.)	
	0017-00104-0037	#8 FLAT WASHER (4 REQ'D.)	
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)	
	0017-00102-0002	1/4-20 x 1/2 SLT. HEX HD. BOLT (4 REQ'D.)	
	0017-00102-0052	1/4-20 x 1 UNSLOT HEX FLAT HD. BOLT (4 REQ'D.)	
	0017-00104-0014	7/8 DISH WASHER (8 REQ'D.)	
3	0921-00107-00XF	STRIKE (2 REQ'D.)	
	0017-00101-0769	#10 x 3/4 SLT. HEX HD. SCREW (4 REQ'D.)	
	0017-00009-0033	LATCH CLAMP (2 REQ'D.)	
	0017-00101-0141	#8 x 11/16 UNSLOT HEX HD. SCREW (4 REQ'D.)	
4	0017-00009-0514	2-1/2" HINGE (2 REQ'D.)	
	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.)	
	0017-00101-0639	#8-32 x 1-1/4 CARRIAGE BOLT (4 REQ'D.)	
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)	
5	0557-00900-0000	BEZEL	
6	0646-00102-01XF	CONTROL SHELF PLAYER #1	
7	0646-00102-02XF	CONTROL SHELF PLAYER #2	
8	0510-00101-00XF	BOTTOM PAN (2 REQ'D.)	
9	A557-00006-0000	CONTROL ASSY. (2 REQ'D.)	
	A646-00012-0100	CONTROL SHELF CABLE ASSY. — PLAYER #1	
	A646-00012-0200	CONTROL SHELF CABLE ASSY. — PLAYER #2	
10	0017-00042-0306	RED/YELLOW PUSH BUTTON ASSY. (8 REQ'D.)	
	A646-00006-0000	SWITCH MTG. BRKT. ASSY. (2 REQ'D.)	
	A646-00007-0000	SWITCH ASSY. (8 REQ'D.)	
	0017-00103-0054	5/8-11 PAL NUT	
11	0017-00032-0051	SMALL RED BUTTON SWITCH (2 REQ'D.)	
		PLAYER #1 PANEL ONLY	
12	0930-00104-0000	CONTROL PANEL LOCATING BRKT. (4 REQ'D.)	
	0017-00101-0025	#8 x 1/2 SLT. HEX HD. SCREW (16 REQ'D.)	
13	0930-00904-0000	LIGHT SHIELD (2 REQ'D.)	
14	0017-00031-0044	WEDGE BASE LAMP SOCKET (4 REQ'D.)	
	0017-00003-0219	#194 LAMP 14V., .27A. (4 REQ'D.)	
	0017-00101-0555	#6-32 x 5/16 SLT. HEX HD. SCREW (4 REQ'D.)	
15	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W.	
16	A646-00009-0000	TRANSFORMER BOARD ASSY.	
17	A082-90421-B000	POWER SUPPLY PC ASSY.	
18	A084-91419-C636	GAME LOGIC BOARD ASSY.	
	0624-00902-0100	P.C. SUPPORT BRKT. 12" LG. (4 REQ'D.)	
	0624-00902-0300	P.C. SUPPORT BRKT. 2-1/2" LG.	
	0624-00902-0500	P.C. SUPPORT BRKT. 6-1/2" LG. (3 REQ'D.)	
19	A084-90911-E636	SOUND BOARD ASSY.	
20	A084-91421-C636	DIODE P.C. ASSY.	
21	A084-91422-B636	MONITOR INTERFACE P.C. BOARD ASSY.	
15 16 17 18 19 20 21	0017-00003-0219 0017-00101-0555 0017-00003-0430 A646-00009-0000 A082-90421-B000 A084-91419-C636 0624-00902-0100 0624-00902-0500 A084-90911-E636 A084-91421-C636 A084-91422-B636	 #194 LAMP 14V., .27A. (4 REQ'D.) #6-32 x 5/16 SLT. HEX HD. SCREW (4 REQ'D.) 6" x 9" SPEAKER 4 OHM, 10W. TRANSFORMER BOARD ASSY. POWER SUPPLY PC ASSY. GAME LOGIC BOARD ASSY. P.C. SUPPORT BRKT. 12" LG. (4 REQ'D.) P.C. SUPPORT BRKT. 2-1/2" LG. P.C. SUPPORT BRKT. 6-1/2" LG. (3 REQ'D.) SOUND BOARD ASSY. DIODE P.C. ASSY. MONITOR INTERFACE P.C. BOARD ASSY. 	

NO. 646 — LAZARIAN COCKTAIL — INTERIOR ACCESS — PARTS LIST (Continued)

ORDER BY PART NUMBER ONLY

ITEM	PART NO.	DESCRIPTION
		ADDITIONAL PARTS LIST
	A775-00013-0000 0151-00081-0000 0775-00110-00XF 0749-00106-00XF 0017-00101-0347 0017-00104-0009 0017-00103-0005	FAN ASSEMBLY 4" FAN FAN PLATE VENT SCREEN #6-32 x 1/2 R.H.M.S. (4 REQ'D.) #6 EXT. WASHER (4 REQ'D.) #6-32 HEX NUT (4 REQ'D.)
	0017-00103-0005 0017-00101-0026 A088-00013-0000 A927-00019-0000 A962-00005-0000 0962-00101-0000 0017-00101-0628 0017-00104-0022 0017-00103-0061 A088-00014-0000 A646-00010-0000 A646-00014-0000	 #6-32 HEX NUT (4 REQ'D.) #8 x 5/8 SLT. HEX HD. SCREW (4 REQ'D.) ON/OFF SWITCH & BRKT. ASSY. COIN BOX ASSY. COIN BOX COVER ASSY. COIN BOX SIDE CHANNEL ASSY. — SHORT COIN BOX SIDE CHANNEL — SHORT COIN BOX SIDE CHANNEL — SHORT #8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.) #8 WASHER (4 REQ'D.) #8-32 HEX NUT W/SEMS (4 REQ'D.) INTERLOCK SWITCH & BRKT. ASSY. HIGH VOLTAGE SHIELD — FORMED MASTER CABLE ASSY. LOW VOLTAGE CABLE ASSY.
	A636-00016-0000 A636-00014-0000 A636-00017-0000 A636-00018-0000 A927-00005-0000 A508-00023-0000	COIN DOOR CABLE ASSY. VIDEO SIGNAL CABLE ASSY. VIDEO SIGNAL ADAPTOR CABLE ASSY. AUDIO ADAPTOR CABLE ASSY. HIGH BASE LEG KIT ASSY. — OPTIONAL 3 COND. LINE CORD ASSY.

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LAZARIAN TRANSFORMER BOARD ASSY. — PARTS LIST (NO PHOTOGRAPH)

PART NO.	DESCRIPTION
MT00-00092-0000 MT00-00087-0000 MT00-00091-0000 MT00-00093-0000 0720-00001-0200 0720-00001-0200 0720-00001-0300 0017-00003-0002 0017-00003-0004 0017-00003-0261 A151-00079-0000 A508-00037-0000 0017-00003-0064 3010-13106-0000 0017-00021-0370 3000-17246-0500 3000-17246-1000 3000-17246-1100	TRANSFORMER — UPRIGHT & MINI POWER TRANSFORMER 120/240V. — UPRIGHT & MINI SHIELDED TRANSFORMER 115/220V. — COCKTAIL ONLY TRANSFORMER W/MAGNETIC SHIELD — COCKTAIL ONLY 2 POSITION FUSE CLIP ASSY. (1 REQ'D. U/R & C/T, 2 REQ'D. MINI) 3 POSITION FUSE CLIP ASSY. — UPRIGHT & COCKTAIL SLO BLO FUSE 1/2A., 250V. — UPRIGHT & COCKTAIL SLO BLO FUSE 2A., 250V. (3 REQ'D. U/R & MINI, 2 REQ'D. C/T) SLO BLO FUSE 2-1/2A., 250V. (1 REQ'D. MINI, 2 REQ'D. C/T) SLO BLO FUSE 1-1/2A., 250V. — UPRIGHT 115V. CONVENIENCE OUTLET 2 LEAD TRANSFORMER BOARD FILTER ASSY. 3 COND. LINE CORD TERMINAL STRIP MALE CONNECTOR — 5 PAIR GROUND STRAP 5-1/2" — UPRIGHT GROUND STRAP 36" — UPRIGHT GROUND STRAP 48" — MINI GROUND STRAP 48" — MINI
3010-04237-0100 3000-17246-0200 3010-04044-0000	GROUND STRAP — MINI GROUND STRAP — COCKTAIL GROUND STRAP — 3" — COCKTAIL
	PART NO. MT00-00092-0000 MT00-00087-0000 MT00-00091-0000 MT00-00093-0000 0720-00001-0200 0720-00001-0300 0017-00003-0002 0017-00003-0004 0017-00003-0261 A151-00079-0000 A508-00037-0000 0017-00003-0064 3010-13106-0000 0017-00021-0370 3000-17246-0500 3000-17246-1000 3000-17246-1100 3000-17246-0200 3010-04237-0100

LAZARIAN - CONTROL ASSEMBLY - ALL VERSIONS - PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	A932-00022-0000	BALL & SHAFT ASSEMBLY
2	0017-00100-0025	1/4" E-RING
3	0921-00702-0000	STOP SPACER
4	0921-00902-0000	SLIDE PLATE
5	A557-00005-0000	SPOT WELD ASSEMBLY
6	0017-00101-0637	#8-32 x 1" CARRIAGE BOLT (4 REQ'D.)
7	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
8	0932-00902-0000	GROMMET
9	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. M.S. (10 REQ'D.)
10	0962-00904-0000	SLEEVE
11	0017-00101-0527	#5-40 x 5/8 SLT. RND. HD. SCR. (8 REQ'D.)
12	0020-00202-0000	SWITCH PLATE (4 REQ'D.)
13	A932-00009-0000	SWITCH ASSEMBLY (4 REQ'D.)
14	A921-00009-0000	STOP PLATE & SWITCH BRKT. ASSY.
15	0927-00908-0000	WEAR PLATE
16	0921-00700-0000	ACTUATOR

FRONT DOOR ASSEMBLY - U.S.A. 25¢

ITEM	PART NO.	DESCRIPTION	
1	0090-00002-02BK	DOUBLE ENTRY COIN DOOR FRAME	
2	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.)	
3	A090-00073-02BK	DOUBLE ENTRY COIN DOOR W/DRESS PLATE	
4	0017-00101-0123	#8 x 1/4 UNSLOT. HEX HD. SCREW (4 REQ'D.)	
5	0017-00007-0019	KEY HOOK	
6	0017-00101-0552	#6-32 x 1/4 CARRIAGE BOLT (4 REQ'D.)	
7	0090-00117-03XF	COIN ENTRY PLATE — 25¢ (2 REQ'D.)	
8	A097-00005-0000	DOOR LOCK & KEY W/SCREW & NUT (OR)	
8	A097-00006-0000	DOOR LOCK & KEY W/SCREW & NUT	
9	0090-00128-00XF	DOOR TILT SWITCH BRKT.	
10	0017-00005-0041	DOOR CAM	
11	A090-00096-0000	DOOR TILT SWITCH	
12	0090-00126-01XF	SWITCH BACK-UP PLATE	
13	0017-00101-0525	#5-40 × 9/16" PHIL. HD. M.S. (2 REQ'D.)	
	A090-00096-0000	DOOR TILT SWITCH & BRKT. ASSY. (ITEMS 9 & 11 THRU 13)	
14	0090-00903-9500		
15	0090-00143-00XF		
16	0017-00003-0219	12 VOLT LAMP G.E. #194 (2 REQ'D.)	
	0017-00031-0048		
19	0017-00103-0084	#6-32 HEX NUT W/SEMS (4 REQ'D.)	
20	A090-00089-0000		
21	0017-00101-0124	#6 X 1/4 UNSLOT. HEX HD. SCR. (8 REQ'D.)	
22	0017-00032-0051	PUSH BUTTON SWITCH	
23	0017-00032-0007		
24	0017-00072-0034		
25	A000 00082 0100	COIN COUNTER MIG. BRKT. TEST SWITCH & POKT ASSY (ITEMS 00 THOU 05)	
26	A090-00082-0100	COIN CHUTE & TOP ASSY (2 DEC'D)	
20	A090-00087-0000 0010-00134-0000	SPRING	
27	0010-00134-0000	SPRING	
20	0017-0007-0083		
30	0090-00129-00XF	PIVOT POST	
31	0090-00167-00XF	PIVOT I EVER	
32	0093-00155-00XF	BEJECT LEVER	
33	0017-00100-0018	F-BING	
	A090-00088-0000	REJECT LEVER ASSY. (2 REQ'D.) (ITEMS 30 THRU 33)	
34	A090-00085-0000	COIN ACCEPTOR FRAME ASSY. (2 REQ'D.)	
35	0017-00005-0003	COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.) (OR)	
35	0017-00005-0211	COIN ACCEPTOR W/ANTI STRING DEVICE (2 REQ'D.) (OR)	
35	0017-00005-0214	COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.)	
36	A090-00064-0000	ANTI-PENNY DEVICE	
37	0017-00101-0099	#6 x 1/4 SLT, HEX HD, M.S. (2 REQ'D.)	
38	0090-00162-00XF	COIN SWITCH MTG. BRKT.	
39	0017-00005-0203	COIN SWITCH CHUTE	
40	0017-00005-0195	COIN SWITCH	
41	0010-00599-0000	COIN SWITCH WIRE	
42	0017-00007-0132	PUSH-ON RING	
	A090-00059-0400	COIN SWITCH & WIRE ASSY. (ITEMS 40 THRU 42)	
43	0017-00101-0698	#4-40 x 3/4 SLT. RND. HD. M.S. (2 REQ'D.)	
	A090-00077-0000	COIN GUIDE & SWITCH ASSY. (ITEMS 38 THRU 43)	

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.
- 2. 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.
- 4. For increased throughput the Z80A operating at a 4 MHZ clock rate offers the user significant speed advantages.

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

1. CPU (Central Processing Unit)

2. Memory

3. Interface Circuits to peripheral devices

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

General Purpose Registers

There are two matched sets of general purpose registers, each set containing six 8-bit registers that may be used individually as 8-bit registers or as 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:

or right shifts tates (arithmetic ogical)
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ement
bit
et bit
bit

Instruction Register and CPU Control

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

Z-80 CPU Pin Description

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

A₀-A₁₅ (Address Bus)

Tri-state output, active high. A_0 - A_{15} constitute a 16bit 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.

$D_0 - D_7$

(Data Bus)

Tri-state input/output, active high. D_0 - D_7 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. 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. \overline{WR} indicates that the CPU data bus holds valid data to be stored in the addressed memory or I/O device.

RFSH (Refresh)

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

HALT

(Halt state)

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

WAIT

(Wait)

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

INT

(Interrupt Request)

Input, active low. The Interrupt Request signal is generated by I/O devices. A request will be honored at the end of the current instruction if the internal software controlled interrupt enable flip-flop (IFF) is enabled and if the BUSRQ signal is not active. When the CPU accepts the interrupt, an acknowledge signal (IORQ during 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 = 00H

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.

IX Schematics and Wiring Diagrams

LAZARIAN GAME LOGIC BOARD DEVICES

(P.C. A084-91419-C636)

Chip		Chip	
Number	Function	Number	Function
74LS00	Quad 2 Input NAND	74LS174	Hex D Type Flip-Flop
74LS02	Quad 2 Input NOR	74LS244	Octal Buffer — Tri State
74LS04	Hex Inverter	74LS245	
7406	Hex Inverter Buffers/Drivers	or 8T245	Octal Bus Transceiver
74LS08	Quad 2 Input AND	74LS283	4 Bit Binary Full Adder
74LS10	Triple 3 Input NAND	74LS373	Octal D Type Latches — Common Enable
74LS14	Hex Schmitt-Trigger Inverters	74LS374	Octal D Type Flip-Flop — Common Clock
74LS21	Dual 4 Input AND	2650	8 Bit CPU
74LS26	Quad 2 Input NAND — High Voltage	2732	4K x 8 EPROM
74LS27	Triple 3 Input NOR	2716	2K x 8 EPROM
74LS32	Quad 2 Input OR	2636	Programmable Video Interface
74LS74	Dual D Type Flip-Flop	2114	1K x 4 RAM
74LS85	4 Bit Magnitude Comparator	N82S100	Field Programmable Logic Array
74LS86	Quad 2 Input Exclusive — OR	2621	Universal Sync. Generator
74LS90	Decade Counter	CA3081	Transistor Array — NPN
74LS112	Dual J-K Flip-Flop	40097	Hex Buffer — Tri State — CMOS
74LS125	Quad Buffer — Tri State		
74LS139	Dual 2 to 4 Line Decoder		
74LS155	Decoder/Demultiplexer — Totem Pole		ADDITIONAL DEVICES
74LS156	Decoder/Demultiplexer — Open Collector	14.318	Xtal
74LS157	Quad 2 to 1 Line Multiplexer	BC548	NPN Transistor
74LS161	4 Bit Binary Counter	BC337	NPN Transistor
74LS164	8 Bit Parallel Output Shift Register	1N4148	Diode
74166	8 Bit Shift Register Parallel/Serial Input	1N4004	Diode

LAZARIAN SOUND BOARD DEVICES

(P.C. A084-90911-E636)

Function

Chip Number	Function
74S04	Hex Inverters
7406	Hex Inverters Buffers/Drivers
74LS156	Decoder/Demultiplexer — Open Collector
74LS161	4 Bit Binary Counter
74LS374	Octal D Type Flip-Flops
4016	Quad Bilateral Switches — CMOS
TMS3615	Organ Tone Generator
SN76477	Complex Sound Generator
TDA 1010A	6 Watt Audio Power Amplifier
4.0000	Xtal
BC557	Transistor PNP
1N4148	Diode
1N4004	Diode

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9-2

C'OC IUMIT RUTANT RI26 ID OHM I/4W 5% CR8 HSAI HEATSINK ASSY. CIOI 0.47mit RD TANT 35V RI27 IK IK HEATSINK ASSY. CIO2 470mit AX ELEC RI28 6.2 K HEATSINK ASSY. CIO3 470mit AX ELEC RI28 6.2 K HEATSINK ASSY. CIO4 250,000mit AX ELEC RI28 IK HEATSINK ASSY. CIO3 4.7 mit RD TANT 35V RI28 ISO UHM 2W 10% THERMAL COMPOUND CIO6, CIO7 0.1 mit RI32 ISO UHM 2W 10% THERMAL COMPOUND	
C104 25,000 mf AX ELE C 2-4-40 HEX NUT C105 4.7 mf RD TANT 35V C106, C107 0.1 mf R132 150 UHM 2W 10% C C C C C C C C C C C C C C C C C C C	1
CIII 0.1m/ CII3 40,000m/ AX ELEC CII4 470m/ AX ELEC CII5 2200m/ AX ELEC 25V	1 J MHHSA (A.18.10, 1 IE 1
FI FUSE, I/4A. SLO-BLO Image: State of the state of	1
	0
R100 100 0HM I/4W 5% CRB JI 2 POS KK:I56 R101 470 " JI, J2 5 POS " R102 0.18 OHM I5W 5% 9100, 0101 2N3772 JI 13 POS " JI R103 0.16 OHM I5W 5% 9100, 0101 R104 R6 OHM I/2W 5% CRB 9102, 0104 R105 270 "	MMHSA 24, 29, 20, 28
) B 1
R113 1.2K ONM 1/4W 5% CR0 R114 560	
TWI, TW2 TIE WRAP TW3, TW4 TIE WRAP	
R120 1.2K Orm 1/4W 5% CR8	· · · · · · · · · · · · · · · · · · ·
FBI,FB2 FERRITE BEAD LBI TAG,FUSE 1/4 A.SLO-BLO R124 25 OHM 5W 10% FBMHI,FBMH2 FERRITE BEAD MTG HDRY LB2 TAG,FUSE I AMP ¥ NOTE: RS-RESISTOR SPACER R125 68 OHM 1/2W 5% CRB 2-20G SOL.D WIRE LB3 TAG, PWR. SPLY.I.D.	

				NEX 1910MS
PROJ. ENG: J. JARON			Con LAZARIAN	MIDWAY MFG. CO.
BO NOT THALF UND		FULL	*** *****1(ONE)PER	FRANKLIN PR ILL
tint the than to an Stat	***	ASSEMBE	LY DRAWING MEDIU	M. *****
6/22/82	1 The C	170 VA PW	R SUPPLY 421-COOO	M051-00945-A031

CROSS REFERENCE LIST

DESCRIPTION	QTY	DESIG. NOS.	PART NOS.
47 pt		C117	0945-00811-0100
01.01	5	CIOS. CIO7. CHI	0945-0084-0200
	•	CIIO , CI2I	0945-00811-0200
0 47 uf RD TANT 35 V	I I	C 101	0945-00816-1100
47 JF RD TANT 35 V	1	C 105	0945-00811-0400
470 JFRD TANT	2	C 02. CH4	0945-00816-1000
2200 HAX. ELEC. 25V		C115	0945-00816-1300
4700 uf AX.ELEC.25 V 25000 uf AX ELEC	1	C116 C104	0945-00811-0700
40000 #F AX. ELEC.	1	C113	0945 00816 -1800
16 OHM 15W 5%	1	R103	0945-00815-0100
18 " 5 W 5%	ŧ	RIO2	0945-00815-0200
10 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4	1	R126 R105	0062 - 05183 - 1XXX 0062 - 0658 4 - 1XXX
25 " 5W 10%	i i	R124	0945 - 00815 - 1000
68 " 1/2 W 5%	3	RI04, RI25, RI34	0062 - 09803 - IXXX
100 1/4W 5% CRB	1	. R 100	0062-098D3-IXXX
150 2 2 4 10% 270 1/4 W 5%	1	R132 R106	0945-00812-0200 0062-13885-1888
			0001 .3003 .12.1
470 0HM 1/4W 5%	1	RIQI	0062-15683-1111
łK "	2	R127, R129	0062-17983-1111
12K""	2 .	R113, R120	0062-18383-1XXX
6.2 K OHM1/4W 5%	I.	R128	0062-217 83-IXXX
IOO UHM POT	3	VR (00, VR 10), VR 102	0945-00814-0000
AISF SOV SA DIODE	7	D110, 0111, D112, D113 D114, D115, D116	3, 0945-00804-0200
IN 4001	3	D:03, DIO8, DIO9	0945-00804-0300
MR 750	2	DIO6, DIO7	0945-00804-0800
24 2805	2	0102 0104	
2N 3772	2	0100,0101	0945-00808-0100
I M 305	2	U2.U5	0945-00818-0100
2# 500	-		0040-00813-0100
FERRITE BEAD Ferrite MTG Hardware	2	F01, F02 F8MHI, F8MH2	0017-00009-0225
206 SOLID WIRE	2	FBMHI,FBMH2	0017-00033-0139
HEAT SINK ASSY	1	HSA I	A945-00008-0100
HEAT SINK MIG HARDWARE		MHHS A	
4-40 X IO SLT RND	2	HSAI	0017-001D1 -0727
WSH,4,120-250-018 4-40 HEX NJT	• 2	HSAI	0017-00104-0071
THERMAL COMPOUND	#AS REQD	HSAI	0017-00009-0204
FUSE, 1/4 A SLO-BLO	ı	Fi	0017-00003-0446
FUSE, IAMP	1	F2	0017-00003-0001
FUSE CLIP W/STOP	4	F1, F2	0017-00003-0214
2 POS KK-ISG CONN	1	JI	3000-16387-0200
5 POS " " 6 POS " - "	2	J:,J2 J2	3000 - 16 38 7-0500
13 POS " "	i i	JI	3000-16387-1300
22 AWG 2 1/2 IN	3	JWI, JW2, JW3	0151 - 000 87 -0000
TIE WRAP 7 5/8 IN	2	TW3, TW4	0945-00814-0205
TIE WRAP 10 3/4 IN.	2	TW1, TW2	0945-00814-0400
TAG, FUSE 1/4 A.SLO-8LO	;	L 8 I	M051-00945-AD2D
TAG, FUSE LAMP	4	LB2	M051-00945-A021
140, FWR SPLT 1.0,	•	L 03	MU31-UU945-A022
70 VA PWR. SPLY PC	1		A 080 -9042 I-C000

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RESET 4

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		DWAY MFG. CO.	
	R SUPPLY TO VA "	FRANKLIN PR).LL	
A082-904	21-C000	M051-00945-A032	
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DESIGNATION DESCRIPTION

DESIGNATION LIST

64	1000 BE CER 1000	DESIGNA	HON LIS		
CI	LUE CER DIEC				
6.9					
CR	IOUE ELECTROL MELO	DECIONATION	DESCRIPTION		
64	OUNE CER DIRG		MEGWINE LINE	DESIGNATION	DESCRIPTION
<u> </u>		1028	FPROM		
CR	TOOPP CER. Diac	1626	EPROM	ICIZO	741500
67	IOORE CER DIAG	ICOF	2036	ICIZC	741804
CB	TOOPP OER. DISC	10.26	741.5244	ICIED	741374
	SOUPP CER. DISC	IC2H	74LS174	ICIZE	7415157
CIO	LOOOPF CER. DISC	ICEI	40097	ICIEF	2114
CH-CI3	100 PF CER DISC	1091	741 891	ICIZH	741385
CIA	IOOUE ELECTROLYTIC	ICPM	741 504	ICIEI	741880
CI5-C28	330PF CER DISC		176001		7413203
C23	IOO UF ELECTROLYTIC	1031	EPROM	IC I Z M	7408
C24	-IUF CER. DISC	ICSC	EPROM	ICI 3A	74LS112
C 28	IOOUF ELECTROLYTIC	ICSE	2636	IC138	74L874
C36	IUF CER. DISC	IC3A	741.5245	ICI3 C	74L\$90
C27	100UF ELECTROLYTIC	ICSN	7418374	ICISD	74L\$157
C28	IUF CER. DISC	1631	40097	ICI 3 E	7418157
C29	330 PF CER. DISC			ICI3F	2114
C30-C45	IUF CER. DISC	1046	7418139	IC136	ST 2 45
¥ C98	22 PF CER. DISC	IG4H	7418874	ICI3H	74LS86
- CIOO	IOOPF CER. DISC	1641	7418374	IC131	74L\$85
	A 7 K 1/4 H A K	1 G4M	3081	ICIBL	74 LS283
RU		ICSB	EPROM	ICI3M	7406
RI2	4.7K * +	ICSC	EPROM	1014 6	741 5112
R13-R14	4700 "	ICSE	2636	10178	741802
R15-217	1K * *	IC5F6	74L5156	10140	741.516
RI8-R 19	2.2K " "	1056	74L832		74LS16
R20	4.7%* "	IC5H	74L\$374		741 8157
REI	2.2K " "	1051	74L\$374	ICIAE	2114
R22-R27	4.74 "			10146	741 8244
R28-R34	2.28."			ICIAN	741 586
R35-R42	470." "	ICOB	EPROM	1041	741 585
R43	4.7K *		EPROM.		FPROM
R44-R48	IK " "	ICOE	2014	ICIAN	74188
R47	2.2K" "	10050	7416188	ICIAN	741532
R48	4.7.6 "	10070	741 6186	10144	
R49	2.2K "		7410100	1 CI 5 B	74LS260
R50	4.7K *	- RG@1	146914	10150	74LS161
R51	2.2K " "			1 C I 5 D	74LS161
R52	4.7K " "			1C15E	74LS157
R53	2.24 * *	IC78	EPROM	1C15 F	2114
R54	4.7K *	1676	EPROM	10156	74LS373
R55	2.2K * *	IC7E	2114	1 C I S H	74L566
R56-R57	4.7K *	IC7F	74LSI0	1C15I	74L\$85
R58 - R59	IK	IC7FG	74LS02	L C 15 M	74166
R60-R6I	2704"	1076	74 L S 139		
RG2	620ª " "	IC7H	74LS04	ICSIIC	14 PIN
R83	IK " *	1671	74L8374	IC328,2C, 78,20,68,60	24 PIN
R64	OPEN	IC7M	74LS14	58, 34, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36	
R65-R66	620 I/4W 5%	ICAE	741 502	86.106.116.141	_
R 67	270 " "	ICAE	741 5164	ICSION	26 PIN
R68	IK " "	1086	EPROM	100.00 25	
R69	3.3K " "	ICBH	741 532	103 50,22,	40 1 14
R70- R7 I	100 n *	ICAL	741.5374	36, 75	
R 72	3.3K "				
R73-R74	IK " "			JI	2 POS. KK106 GUNN.
R 75	3.3K" "	ICSC	2650	JI	
R76	4.7K * *	IC9D	74LS08	JO	Z PUS. K RIUU LUNN.
R77	K- " "	IC9E	74LS04	JZ, J7	3P03."
R78	470a" "	IC9F	74166	JZ, J6	- 4POS "
R 79	100 g." "	ICSH	74LS32	15	SPOS.
R 80	2.2 K " "	IC9I	74 LS04	13	0FUS."
R 81	2700 "	ICOL	74L\$10	J4	7P05.
R 82	4.7K			j4	12005 "
P83 RM I	2.2K	ICIOB	7415244	13,00	
RM 2	2 2 K 4 5 10 3.1.2	ICIOC	74LS244	J F	ITFU3.
RM3		ICIOE	74LS125		
	A A A A L IN STE	ICIOF	74166	JWI-JWI2	JUMPER WIRE
		10106	EPROM		
DI-DI7	IN4 48	ICIOH	74 LS27	SWI-SW2	8 POS. DIP SW.
018-020	IN4004	10101	74 L SI74		
021	IN4146	ICIOL	74LS263		
01-03	86337	ICIOM	825100		
		10.1.0		•	
44-48	86548		77504		
			2921		
		ICIID	746514		
		1011P	74166		
		10110	241 000		
		ICINE ICINE	· /4L586		
		1011	74L5157		
* LOCATEN	ON PINS OF T OF LOUGH		74LS283		
		1611	7705		

		U.		
DESCRIPTION	QUANTITY		DESIGNATION	PART NOS
2POS. KKI56 STR. CON	N. 1		JI	3000-18367-0200
9POS. "	• •		JI	3000-16367-0900
2 POS, KK 100 STR. CO	NN. I		JG	3000-18437-0200
3POS. "	* 2	۰.	J2, J7	3000-16437-0300
4P05. "	* 2		J2,J6	3000-16437-0400
5POS. "	• •		15	3000-16437-0500
6P05. "	• •		JJ	3000-16437-0600
7 POS. "	• •		J4	3000-16437-0700
IIPOS."	• 1		J4	3000-16437-1100
12 POS."	* 2		J3,J5	3000-16437-1200
14 POS."	• •		J7	3000-16437-1400
JUMPER WIRE	. 12		JWI-JWI2	0017-00033-8373
8 POS DIP SW	2		SWI-SW2	0636-00804-0200
14318 MHZ CRYSTAL	1		XTAL	0636-00004-0100

PROJ. ENG, : J. JAR	ON			REVISIONS
-			USED ON LAZARIAN	MIDWAY MEG. CO.
DD NOT SCALE DWG	HEAT TREAT	FULL	NO. REO'D ONE (1)	FRANKLIN PK. ILL.
DIM. TOLERANCES	PINISH		NT LAYOUT DRAWING GIC BOARD	M051 -00636 -C005
HOLE DIA + 443 HOLE 6/	24 /82	A084-81	419-0636	

9-6

CROSS	<u>s Refer</u>	RENCE LIST	
DESCRIPTION	QUANTITY	DESIGNATION	PART NOS.
22 PF CER. DISC	I I	C98	0636-00800-0400
100 PF" "	5	C7,CI I-CIS, CIOO	0635-00800-0800
330PF" "	11 1	C8,C8,C15-C22,C29	0636-00800-0700
.0IUF ,"	1	C4	0636-00800-0500
.1UF " "	20	CI, C24, C26, C28, C30-C45	0636-00800-0300
IOUF ELECTROLYTIC	1		0636-00800-0200
1000	-	014.023,020,027	0436-00600-0100
1000 1/4W 5%	3	R70,R71,R79	0636-00805-0100
270 " "	4	R80-R61, R67, R81	0636-00805-0300
470 "	<u>n</u>	R13-R14 .R35-R42,R78	0636-00805-0400
820 " "	3	R62,R65,R66 B16-B17, B44-B44 958-B59	0635-00805-0500
	13	R65,R66,R73-R74,R77	
2. 2K" "	17	RI8-R19, R 21, R 28-R34,	0636-00805-0700
		R47, R40, R51, R53, R55,	
3.3K" "	3	R69,872,875	0636-00805-0800
4.7K" "	27	RI-RIO,RI2,R20,R22-R27,	0638-00905-0900
		R56,R57,R76,R82	
2.2K 9 PIN S.I.P. 3.3K "	1		0636-00805 - 1200
IOK " "	i	RMI	0636-00605-1000
IN4004	3	018-020	0636-00801-0100
IN4146	6	DI-DI7,D21	0638-00801-0200
BC337	3	91-93	0636-00602-0100
0.340	0	44-24	0030-00002-0200
74LS00	1	128	0636 00803 0600
74LS02	3	7FG. 8E,14B	0636-00603-0700
74L304 74504		2M,/H,9E,91,12C	0636-00803-3000 4
7408	3	11M,12M,13M	0636-00603-2400
74LS08	1	90	0636-00803-0900
741310	2	7 F, 9L	0636-00803-1000
741514	2	2L	0636-00603-0200
741 527	2	8 F, IOH	0636-00803-1200
74L\$32	4	56, 8H,9H, 14N	0636-00603-1300
74L\$74. 741 c.85	2	120,138	0636-00803-1400
74LS86	5	11H, 12H, 13H, 14H, 15H	DG36-00803-0500
74L\$90	i	13 C	0636-00803-2500
74LSH2	2	13A,14A	0636-00803-0400
7415120	2	46.76	0636-00803-1500
74LS155	ī	66	0636 - 00803- 0300
74L \$156	2	5FG, 6FG	0636- 00803- 2700
74LS157	6	11 L 12E, 13D	0636-00803-1600
74LSI6I	4	14C,14D,15C,15D	0636- 00803-1700
74LS164	L	8F	0636-00803-1800
74166	5	9FJOFJIF,14M,15M	0636-00803-6300
74LSI74 741 5244	4	26,108,100,149	0636-00803-2000
74L\$260	i	158	0636-00803-2800
74 L S 283	4	10L, 11L, 12L, 13L	0636-00803-2100
74LS373 7415374	 R	156 3H.4H.4T.5H.	0636-00803-2200
	-	51,61,71,81	
2114	6	6E,7E,12F,13F,	0636-00603-3800
26.21	1	14F, 15F 11 C	0636-00803-6200
2636	3	2E,3E,5E	0836-00803-3600
2650	I	90	0636-00803-3500
3081	I I	4M	0636- 00603- 3200
40097	2	21,31	0636-00803-3400
625100 87345 (74) 8345)	1	10M 36 136	0836-00603-3100
61243 (1423243)	-		
EPROM	Ļ	28	0636-00603-4800
EPROM	!	38	0636-00803-4900
EPROM	i	68	0636-00603-5100
EPROM	i.	7B	0636-00603-5200
EPROM	1	20	0636-00803-5300
EPROM		30 50	0836-00603-5500
EPROM	i i	6 C	0636-00603-5600
EPROM	I.	70	0636-00803-5700
EPROM	!	66	0636-00803-5600
EPROM	i I	116	0838-00603-6000
EPROM	i	14L	0836-00803-6100
4PINIC SOCKET	1	ICSIIC	0636- D0604-2600
24 PIN "	14	ICS 28, 20,38,30,58,	0636-00804-2900
		50, 68, 60, 78, 70, 89,	4
~		109.119.141	

DESIGNATION

UI U3 U4 -- U5

U6 U7 U8 U9 --- U13 U14

UI5 – UI6

U17 — U20 MHHS ICSU3 - U5 J2

J3

JI

J4 JWI-JW3

JW4 MHHS

MHHS

MHHS MHHS

AS REQ.

XTALI

MHI - MH4

CR	os	S	REF	ER

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SIGNATION	DESCRIPTION	L_	
CI-C4	IMF CER. DISC.		
C5 C6	IOOMF AX, ELEC.		
C7	IOOOPF CER. D	ISC.	
68	IOOOMF RD. ELEC	.	
CIO	IOOOMFRD ELEC	2.	
C13	IOOMF AX. ELE	C. 1	
C14 C15	JMFCER. DISC. 330PF CER. DI	SC.	
CIB	6-8MF TANT.	•	
C17 CIR	IOMF TANT. OIMF CER. DIS	C.	
CI9	IMF CER. DISC		
C20	OIMF CER. DISC	2	
C22	O47MF POLY	ISC.	
C23	INF CER. DISC).	
C24 C25	4.7MF TANT		
C 26	IOMF TANT	•	
C27-C28	IMF CER. DISC		
C30	IMF CER. DISC		
C 31	1000 MF RD. ELE	с.	
C32-C39 C40	OIMF CER DISC.	C.	
· R1	100K OHM 1/4W	15%	
R6	IOK "	v	
R7		-	
RIG-R9 RIG-RII	6-8K " IK "	•	
RI2	4.7 *	H .	
RI3 RI4RI5	330K " 470 "		
RI6RI7	4-7K	•	
RI8-RI9	2·2K "		
R22	4.7K "		
R23	220K"		
R25	150K "		
R26	33K "		
R27 R28	47K "	*	
R29	82K *	•	
R 30 R 31	270R" B-8K"		
R33	IK "	и	
R34R35 R 36	4-7K " iOK "	-	
R37-R39	4-7K *	14	
R40	27K +	-	
. K41	15K "		
R43	4-7K "	•	
R44	6-8K "		
R46	12K "	•	
R47	47K "	-	
R49	IK "		
R50	47K "		
R51 852-853	12K "		
R54	27K "		
R55-R79	IK " 29K "	*	
R81	22K "	**	
R 82		64 84	
RUJ			
VRI	IOK POT.		
01-02 03-04	IN4148		
D5	IN4148		
91	BC 557		

DESCRIPTION TDA 1010 76477 TMS 3615 74504 74L5161 74L5156 7406 4016
74LS156
74L\$374
HEATSINK 28 pin IC Socket
2 PIN CONNECTOR
3" "
4 "
I4" "
JUMPER WIRE
HEATSINK MTG. HRDW
SCREW, 5 40 X 6
WSH 6 145-313-019
NUT, 5-40 HET
HEATSINK COMPOUND
4MHZ CRYSTAL
SNAPBUSHINGS, 1/8

e 🖡

DESCRIPTIC	<u>DN</u>	QUANTITY
330 pf CER. [DISC.	I I
1000 pf	*	2
.01m1 .047mf POL	Y.	3
Imf CER. DIS	SC.	21
imf RD TAN	т	I
4.7mf TANT		1
6.8mf""		9
IOOMT AX. EL	ECT.	2
1000 mf RO. EI	ECT.	3
4.7 OHM 1/44	15%	L
470 "	41 11	2
IK		30
2.2K"	н	2
3.9K"		1
4.7K"		9
6.8K"		5
8.2K"		
12K "		2
15K "		i
22K "		4
27K 33K "		2
47K "	n	5
68K "	N N	1
82K	n	1
120K "	4	1
150K "	H	L
220K" 270K"		•
330K *	•	i
4016		ı
74 5 04		L
7406		5
7415161		1
74LS374		4
76477		
T MS 3615		2
IOK POT		
1011101	`	
IN4148		3
BC557		1
4 MH7		1
HEATSINK		i
28 PIN IC SOC	KET	3
2 PIN CONNE	CTOR	1
4"		i
14"	-	1
JUMPER WIRE		3
HEATSINK MT	G. HRDW.	
SCREW, 5-40	X 6	1
NUT, 5-40 H	EX	1
HEATSINK CON	POUND	AS REQ.
SNAPBUSHIN	S,1/8	4
LAZARIAN SN	D. BHD. P.C.	I

PROJ. ENG.:	J. JARON	
DO NOT SC	HEAT TRE	
DIM. TOLERANCES	URN SEL	MATL
CONCENTRICITY TIR 003 FRACTIONAL 1/64	СКО.	FINISH
DECIMAL	ant 6/10 / 82	2

9-8

DESIGNATION C15 C7, C21 C18, C 20, C40 C 22 C1-C4, C6, C9, C14, C19, C23, C25, C27, C28, C30, C32-C39 C24 C 29 C 24 C 16 C 17, C 26 C 5, C 13 C8, CIO, C31 C8, CIO, C31 RI2 RI4, RI5 R7, RI0, RI1 R33, R49, R55-R79 R16, R19 R80 R80 R16, R17, R22, R34-R35, R37-R39, R43 R8, R9, R31, R44, R63 R45 R45 R6, R36, R48, R82 R46, R51 R46,R51 R42 R41,R52,R53,R81 R40,R54 R5,R26 R20,R21,R27,R47,R50 R29 R1 R25 R25 R24 R23 R30 R13 U 14 U6 U9 – U13 U8, U15, U16 U7 U17 – U20 U3 U 1 U4,U5 VRI 03, D4 DI, D2, 05 91 XSTAL Mihins ICS U3 –U5 J2 J3 J1 J4 JWI-JW3 JW4 MHHS MHHS MHHS MHHS MHHS

MHI-MH4

PART NOS.
0636-00800-0900
0636-00800-1000 0636-00800-1100
0636-00800-1200 0636-00800-1300
0636 - 00800-1400
0636-00800-1600 0636-00800-1700
0636-00800-1800
0062 - 04283-1XXX
0062 - 15683 - 1XXX 0062 - 17983 - 1XXX
0062-19583-1XXX
0062-20783-IXXX
0062-21183-1333
0062-21983-IXXY
0062 - 22383-IXXX 0062 - 22783-IXXX
0062-23183-IXXX
0062-24383-IXXX
0062-24783-IXXX 0062-25183-IXXX
0062-25983-IXXX
0062-26783-1XXX
0062 - 27583-IXXX 0062 - 27983-IXXX
0062-28383-1XXX
0062-29183-1XXX 0062-29583-1XXX
0062-29983-IXXX
0636 - 00803 - 3900 0636 - 00803 - 4400
0636 - 00803 -4100
0636 -00803 - 4300
0636 - 00803 - 4000 0636 - 00803 - 4600
0636 -00803 -4700
0636 - 00805 - 3500
0636 - 00801 - 0300
0636 - 00801 - 0400
0636 - 00804 - 1900
0636-00804-2000
0636-00804-1400
0636- 00804- 1500
0636- 00804- 1700
0017 - 00033 - 0368 0017 - 00033 - 0389
0017- 00101- 0821
0017 - 00104 - 0009 0017 - 00103 - 0003
0017 - 00042 - 0014 A080 - 90911 - E636

				REVISIONS
		USED ON LAZARIAN		DWAY MEG. CO.
AT	SCALE	NO REQ'D ONE (1)	7	FRANKLIN PK. ILL.
	LAZ AR	LAZARIAN SOUND BOARD		RT NO.
		COMPONENT DRAWING		051 -00636 -E007

.

FIDE	ENTIAL	PROPERTY OF MIDWAY MEG. CO.	
32	BCALE	MIDWAY MFG.CO.	
		LAZARIAN SOUND BOARD SCHEMATIC A084 - 90911-E 636	РАТ НО. МО51-00636-E008

CROSS REFERENCE LIST

1

I

1

4

MHI-MH4	SNAPBUSHINGS	MF3A20	5
J 2	2 POS. CONN. 4 " "	MH3 + HPSA 20	ן בייני בייני
J]	3 POS. CONN. 5 " "	+ R6 93 R9 300 1 " c3 + c9 370 0 " "	2
QI - Q3	MPS A 20	ZPIN CI2 C6 IK II II RI2 R3 IK II II II II II II II II II III IIII IIIII IIIII IIIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	3
		J2 SPIN 3.3K " "	3
R12	270 Ω ""		3
R7-R9 R10-R11	IK " 300Ω" "		•
R4- R6	3.3K ""		1
RI - R3	6.8K 1/4W 5%		3
C,13	15 MF 20V 20%		3
C10- C12	22PF 50V 5%		3
C4- C6 C7- C9	INF 50V		3
CI - C3	IOMF IGV		QUANTITY
DESIGNATION	DESCRIPTION		

PROJ. ENG. : J.	JARON		USED ON LAZA
DO NOT SCALE DWG	HEAT TREAT	FULL	NO REQ'D 1(0)
DIM TOLERANCES UNLESS SPECIFIED DRN SOL CONCENTRICITY TIR 003 FRACTIONAL 1/64 DECIMAL 005 HOLE DIA + 002 000 DATE 5/27/82	FINISH	LAZARIAN ASSEN A084-	MONITOR INTE ABLY DRAWIN 91422 - B636

MONITOR INTERFACE P.C. BD.

3 POS. CONN.

5 POS. CONN.

2 POS. CONN.

4 POS. CONN.

SNAPBUSHINGS

9-10

12

A080-91422-B6

0017-00042-00

3000-16387-05 JI J2 3000-16387 - 02 J2 3000-16387-04

- 0636-00802-04 Q1-Q3 JI 3000-16387-03
- 0636-00800-23(C10 - C12C13 0636-00800-22 RI - R30062-21983-1XX 0062-20383-IX X R4- R6 R7- R9 0062-179B3-1XX 0062-141B3-1XX RIO-RII R12 0062-138B3-1X)

PART NOS.

0636-00800-210

0636-00800-200 0636-00800-210

DESIGNATION

CI - C3

C4 - C6

C7 - C9

MHI-MH4

DESIGNATION	DESCRIPTION	
DI-DIS	184004	
JI	2P05. KK156 14P05. ""	
J 2	3 POS. K K 156 11 POS. " "	
J 3	5 POS. K K 156 8 POS. " "	
J 4	4POS. KK 156 7POS. " "	
MHI-MH4	SNAP BUSHING	

SNAP BUSH

PROJ. ENG .: J. JARON

9-12

CROSS REFERENCE LIST

L	QTY.	LOCATION	PART NOS.
	16	D1-D16	0064-030XX-XXXX
B	I	JI	3000-16387-0200
	F	J2	3000-16387-0300
H	ł	J4	3000-16387-0400
N	i t	J3	3000-16387-0600
N	I	J4	3000-16387-0700
0	I	- J3	3000-16387-0800
4	1	J2	3000-16387-1100
•	I	JI	3000-16387-1400
NG	4	MHI - MH4	.0017-00042-0014

