Apple Lisa Computer Technical Repair Information

APPLE LISA COMPUTER REPAIR INFO

Part 1 of 2

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Lisa/Macintosh XL Do-it-yourself Guide

Many people believe that Lisas and Macintosh XL's are exactly the same computer. In truth, Lisas and XL's only look the same. There are two different models in the series. The Macintosh XL (a.k.a. Lisa 2/10) is the newest model. Since there are differences between the models, it's important to determine which Lisa/Mac XL you own before beginning any upgrade or repair work.

Identifying the Models

This section lists the official hardware configurations. Hardware means a specific combination of drives, boards, and so on. By identifying what hardware is inside the box, you can easily determine which model of the Lisa you own. Table 1 provides a checklist. The next section provides illustrated disassembly instructions so that you can match your particular hardware configuration against the list.

> **Lisa 2:** The Lisa 2 has one 3.5-inch 400K disk drive, different disk drive controller circuitry, and a redesigned front panel to accommodate the single 3.5-inch drive opening. A 400K floppy controller, labeled the "Lisa Lite Adapter," is mounted inside the disk drive cage. The System I/O board is socketed for an AMD 9512 arithmetic processor. It has nickel-cadmium battery backup for the real time clock. One 512K memory board is standard. The mother board has a mouse connector, two serial connectors, and an external parallel connector. The power supply is rated 1.2 A.

> **Lisa 2/10:** The Lisa 2/10 has a completely different mother board. The mouse connector is different. There's no external parallel connector on the back of the computer. Instead, there's an internal parallel connector and a 10MB internal hard drive. An interrupt switch has been added. The system

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I/O board is also different. There's no socket for the AMD 9512 coprocessor. There's no nickel-cadmium battery backup for the real time clock. The disk drive controller is different. An extra chip on the I/O board replaces the Lisa Lite Adapter which was formerly located in the drive cage. The disk drive cabling is different. The wiring harness is different. The power supply is different. One megabyte of RAM is standard. If you have Lisa 05 disks, a 10MB internal hard drive, no Lisa Lite card, no external parallel connector, and a 1.8-A 110/220V power supply, yours is at least a Lisa 2/10.

Macintosh XL: The Macintosh XL is exactly the same as a Lisa 2/10. Only the sticker on the box, the operating system, and the instruction manuals are different. Instead of Lisa 05, the bundled 05 is Macintosh System software and MacWorks XL, a Lisa program which allows 64K Macintosh ROM emulation. If you have MacWorks XL instead of Lisa 05 disks, a 10MB internal hard drive, no Lisa Lite card, and a 1.8-A power supply, yours is probably a Macintosh XL.

Regardless of which model you own, all Lisa/XL's are easily repaired. The next two sections show how to get a dead Lisa going again. The section after that shows how to turn it into a super deluxe, big-screen Macintosh Plus.

Table 1 Hardware Configuration Checklist

This sample table reflects a fully upgraded Lisa 2/5

Item	Check	Model#/Notes
400K internal floppy		
800K internal floppy	✔	Sony# MPF-51W
Lite adapter	✔	Apple# 620-149
Internal hard drive	✔	Sun 20MB SCSI
1.2-A power supply		
1.8-A power supply	✔	Jumpered for 110 V AC
System 1/0 board	✔	Apple# 620-0117 (Lisa 2/5)
CPU board	✔	Apple# 620-0119
Memory 1 board	✔	Apple# 620-0112 (512K)
Memory 2 board	✔	Apple# 620-0112 (512K)
Screen kit transformer	✔	Properly installed
ROM version	✔	3A/A8 (XL screen kit)

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Lisa/XL Disassembly Procedure

All Lisa/XL models are built on the same chassis and come apart the same way, without tools. Before beginning, shut down the Lisa (if it's on) and physically disconnect the power cord from the back of the computer. To remove the front panel place your hands along the bottom edge, feel for the two finger grips, and push up gently as shown in Figure 1. Pushing up disengages two plastic tabs, swings the front panel forward, and opens a safety switch in the lower left corner of the chassis. If the computer is on, removing the front panel will immediately turn it off. Since this is not the recommended way to power down, always remember to Save your work and Shut Down before removing the panel.

The disk-drive assembly is held in place by a spring-loaded knurled nut as shown in Figure 2. To remove the entire disk-drive cage, loosen the nut until it springs free and then pull straight back. The cage slips out easily. Normally, the wiring harness is just long enough to allow you to set the assembly down in front of the computer. Take care not to snag or overextend the drive cables. As shown in Figure 3, there's not much slack!

Figure 1 To remove the front panel, feel for the finger grips at the bottom edge and push up gently.

Once the drive cage is out, note whether the floppy drive ribbon cable is routed to a connector at the back of the cage or whether it's connected to a Lisa Lite Adapter mounted in the lower left-rear portion of the drive cage. A Lite Adapter indicates that the computer is a Lisa 2. Direct connection suggests a Mac XL. You can remove the internal disk drive by tilting the drive cage forward
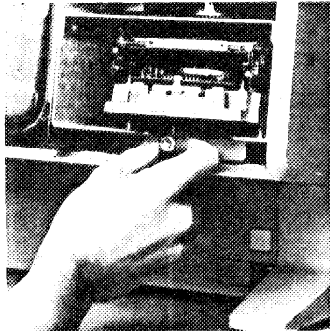
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Figure 2 To remove the entire disk drive cage, loosen this retaining nut until it springs free and then pull straight back.
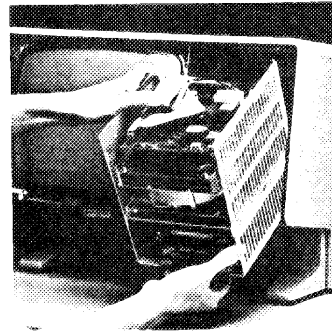
Figure 3 When removing the disk drive assembly take care not to snag or overextend the drive cables. There's not much slack!

and loosening four screws at the bottom. Hard drives, when present, are held by five or six screws along the side.

400K Sony drives are identified by part numbers beginning with OAD34V. 800K Sony drives are identified by part numbers beginning with MPF51W. You might also find an 800K Chinnon or Fujitsu drive in a Lisa. Original 10MB Widget drives are marked "Apple computer." Other internal hard drives might be marked "Fujitsu," "Kalok," "Miniscribe," or "Seagate", etc. For reference, write down the make and model numbers of whatever drives you find.

The rear panel is held on by two thumbscrews. Turning the thumbscrew counterclockwise disengages a metal retaining tab. Note that it's not necessary to remove the thumbscrews. With a little loosening, you can pull the rear panel back and lift it away. This procedure is shown in Fig. 4.

Removing the rear panel opens a second safety switch in the upper right-hand corner of the computer located on the power-supply. If the computer is on, removing the rear panel also turns
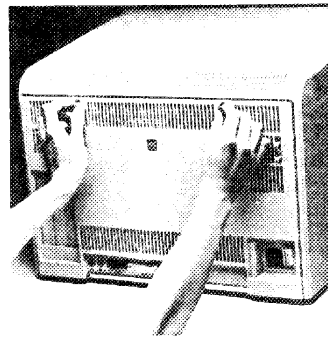
Figure 4 To remove the rear panel, first disconnect the power cord and all peripheral cables, then turn the thumb-screws counterclockwise, pull slightly, and lift at an angle.

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it off. Safety switches protect the computer as well as the operator. It's possible to defeat safety switches (the cap of a ball point pen works well) but be careful. Removing cards without turning the power off first is a surefire way to destroy them.

Note that pressing the on/off switch or removing the covers (engaging the safety switches) does not remove all power to the computer. The only way power can be completely removed is by unplugging the line cord.
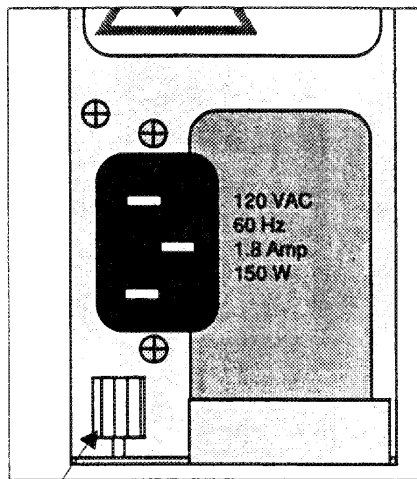
Figure 5 To remove the power supply, loosen the finger nut and pull straight back. Note that the nut is located approximately 1/2 inch from the edge of the chassis.

The power supply is attached by a second spring loaded, knurled nut as shown in Figure 5. Once you loosen the nut it may take considerable force to remove the supply. This is normal because of a tight-fitting tongue and socket connector. If the connector fits loosely, the operating voltages might fluctuate and the computer would be subject to intermittent operation.

Fortunately, it's very well made. When you need to remove the power supply, loosen the finger nut (until it springs free) and pull straight back. When you need to replace the power supply, push it in 1/4 inch past the resistance point, until the center of the nut is located approximately 1/2 inch from the edge of the chassis.

As shown in Figure 6, 1.8-A (ampere) power supplies are identified by part number 699-0189. 1.2-A power supplies are identified by part number 620-6103. Both supplies are marked "120 V AC 150 W," but the 1.8-A model is actually a manual switching dual voltage (110/220-V AC) model, and it's also 50% stronger!

Here are the figures: Power = Voltage x Current. Substituting Lisa 2 /10 to Mac XL power supply values: 120 V AC
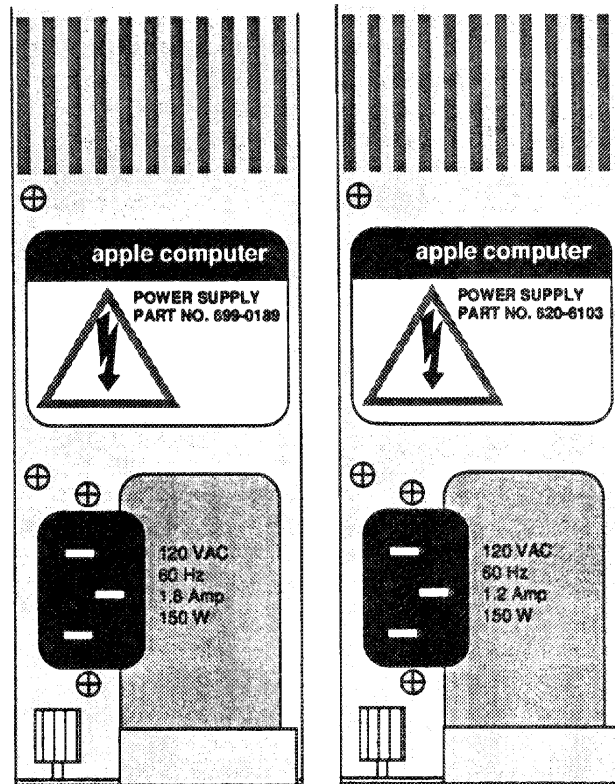
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Figure 6 Lisa/Mac XL power supplies—external views. 1.8-A Lisa 2/10 to Mac XL power supply (left), and 1.2-A Lisa 2/5 power supply (right) are both marked "150W," but the 1.2A model is actually a dual voltage model, and it's 50% stronger!

x 1.8 A = 216 W (44% over specification). Substituting Lisa 2/5 power supply values: 120 V AC x 1.2 A = 144 W (4% under specification).

So how can both models be marked 150 W? The acceptable input voltage specified in the Lisa 2 literature is 90 V AC to 130 V AC. Substituting 90 V AC (the low limit) into the Lisa 2/10 to Mac XL supply's formula (90 V AC x 1.8 A) lowers its relatively high rating to 162 W. Substituting 130 V AC (the high limit) into the Lisa supply's formula (130 V AC x 1.2 A) raises its relatively low rating to 156 W. Since both figures exceed 150 W,

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that presumably explains the identical ratings. Nevertheless, the Lisa 2/10 to Mac XL supply is notably superior.

When the original 1 .2-A Lisa 2/5 supply is used with an internal hard drive and a Macintosh XL Screen Kit (described at the end of this chapter), audible transformer ringing results, horizontal retrace lines become noticeable, and a slight screen flicker is introduced. Installing the 1 .8-A Lisa 2/10 to Mac XL supply eliminates all of that.

The 1.8-A Lisa 2/10 to MacXL supply is also a dual voltage model. 110 to 220-V AC conversion is made by moving two jumpers at the bottom of the board, as shown in Figure 7.

These differences make a very important point. If you only remember one thing from this: Always confirm specifications by making your own calculations.
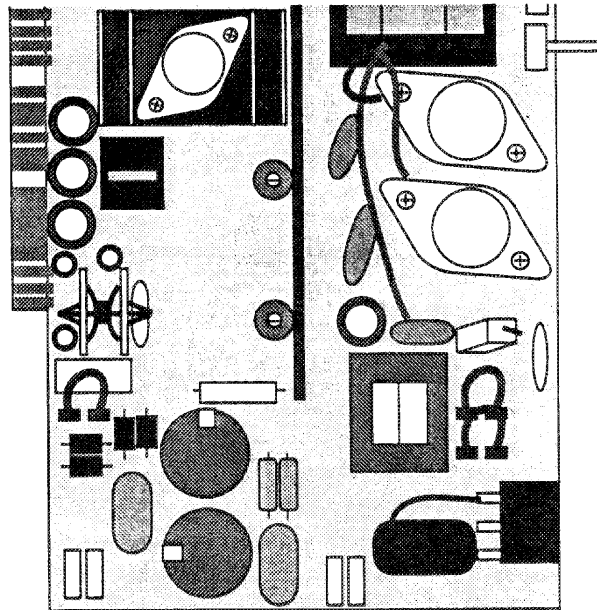

Figure 7 Lisa 2/10 to Mac XL power supply—110- to 220-V AC conversion (1.8 A model, only) is made by moving two jumpers at the bottom of the circuit board.

The card cage is a removable rack for the Lisa's circuit cards. It's also held by tight-fitting tongue and socket connectors. To remove it, disconnect all peripheral cables from the back of the
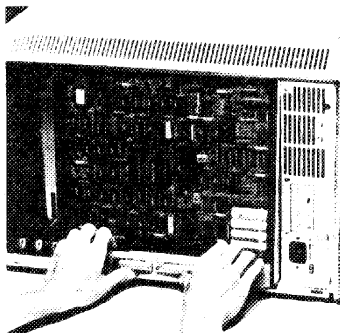
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Figure 8 To remove the card cage, brace your thumbs and pull straight back.

computer, brace your thumbs underneath and pull straight back as shown in Figure 8.

The mother board is fixed to the bottom of the cage and there may be three or four removable cards (depending on how much memory you have) arranged vertically, from back to front, as shown in Table 2.

Table 2 Replaceable circuit cards

Card	Lisa Part#	XL Part#	Color Code
System I/O	620-0117	620-142	Red & brown
CPU	620-0119	620-0119	Blue & brown
Memory 1	620-0112	620-0112	Yellow & brown
Memory 2	620-0112	620-0112	Yellow & brown

Note that part numbers beginning with 620 refer to a complete circuit card (defined as a plug-in circuit board with all the parts on it), not an empty board,which is always referred to by another number beginning with 820. All four cards fit into tongue and socket connectors on the mother board. To remove a card, loosen the color coded bails and pull straight up. The four cards slip in and out easily, and the design makes it impossible to reinstall them backwards; although, it's very easy to get confused. Note that the CPU card faces backward, while the System I/O card faces forward. If the CPU card offers the least bit of resistance when you try to put it in, it means you're holding it wrong. Don't force anything! Check the color codes as illustrated in Figure 9.

The Memory cards and the CPU card on Lisas and Mac XL's **are** interchangeable. The System I/O cards are not (The XL I/O card will work in a Lisa but a Lisa I/O card will not work in an XL). Physically, they fit, but electrically there are problems with disk-drive control. If you just bought a used Lisa, or if you're

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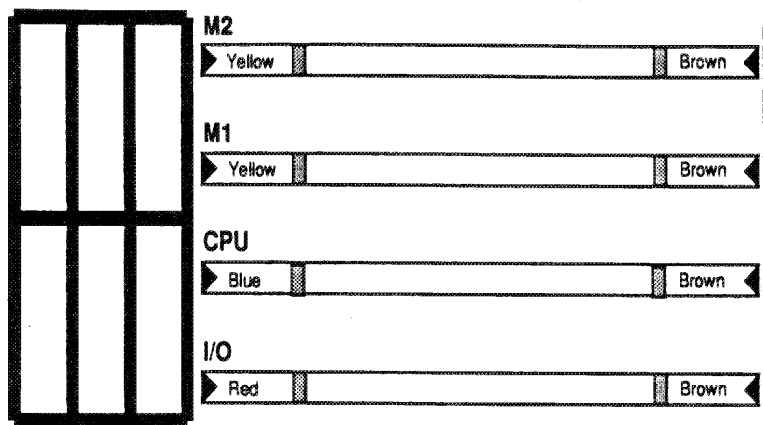
Figure 9 Top view of the Lisa/XL card cage. Bail colors indicate proper orientation.

restoring a Lisa and can't seem to get it going, it's important to check for the correct System I/O card. The differences are shown in Figures 10 and 11. ROM differences on the I/O may also be present if you have upgraded you computer with a 800K floppy drive. If a screen modification kit is present in your computer the

Figure 10 The Lisa I/O card. Note the battery pack (lower right) and the AMD 9512 coprocessor socket (upper right).

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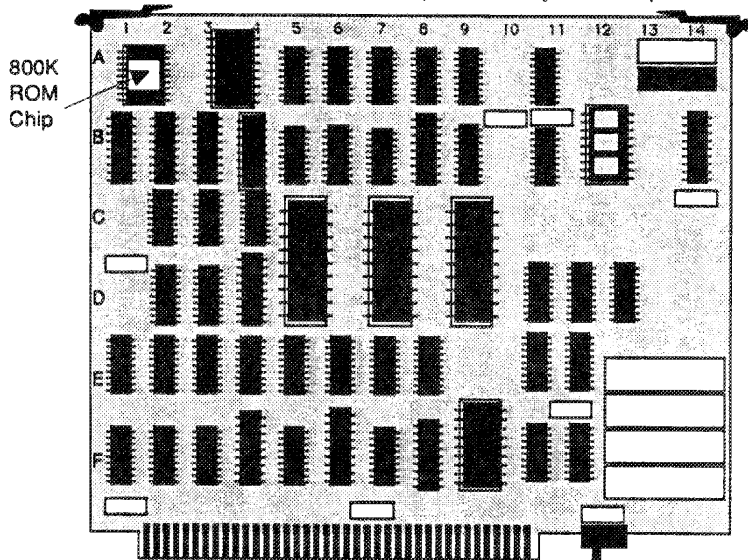CPU card will have a different chip. If you are going to replace the CPU card and you are using the Lisa Office System, you will need to switch Video State ROM chips. If you fail to do this your Office System will not work because it is specially coded to that chip.

While the card cage is out, peek inside the chamber and find the two hidden screw holes on the underside of the top cover as shown in Figure 13. When you need to remove the top cover, use a #2 Phillips-head screwdriver to loosen the screws until they dangle, then slide the cover forward and lift straight up. Both screws are permanently attached to the chassis. You don't have to worry about them falling out.

Once you've determined that the hardware configuration is correct, the Lisa's automatic startup tests will tell you if everything is working OK. It's important to verify the hardware setup before proceeding, because if the wrong boards are in your machine, the test results may be invalid.

Automatic Startup Tests

Every time you turn on the Lisa, it runs an exhaustive series of tests in the following sequence:

ROM Checksum

If the ROM Checksum fails, the computer hangs. When the CRT warms up, the screen may appear blank or it may display random patterns. These symptoms indicate a problem with the ROM chips, which are on the CPU board at locations D13 and D14. There are several things to check before ordering new ROMs:

1. Make sure the chips are oriented correctly. The notches should be pointing up. There were several ROM versions. Someone could have tried to install new ROMs, put them in backwards, and given up at that point.
2. Make sure they're in the right sockets. If you have a stock Lisa with "H" ROMs, part number 341-0176-H should be in the socket at D14, part number 341-0175-H should be in the socket at D13. If you have a modified Lisa with "3A" ROMs, part
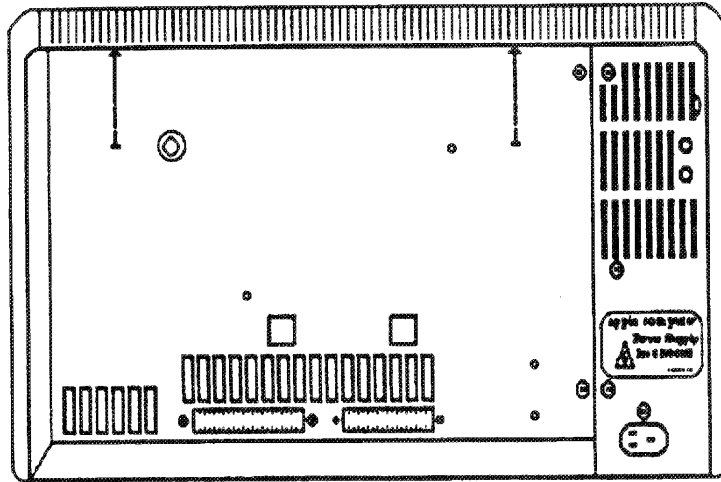
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Figure 13 The top cover is removed by loosening two hidden screws attached to the roof of the chamber. Both screws are permanently attached to the chassis. They won't fall out!

number 341-0346 should be in the socket at D14, part number 341-0347 should be in the socket at D13. Any other part numbers indicate old (buggy) ROMs. Replace these on principle. It's usually not necessary to buy ROMs separately. The latest 3A ROMs are included with the XL Screen Kit, a video upgrade described later in this chapter.
3. Make sure there are no bent pins on the ROMs.
4. Make sure both chips are fully seated.

If you find any one of the above problems, pull the chips, replace them, reorient them, and/or straighten the pins as necessary.

MMU Register Test

An initial failure of the MMU Register Test causes an endless loop. When the CRT warms up, it'll be blank. Other failures display error code 40 and show a cross over the CPU board icon. (Refer to Table 3.) Both symptoms indicate a problem in the memory

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not to touch the contacts with your fingers. It's best to keep them oil-free.

Preliminary Memory Test

The startup ROM uses the first 2K of memory. If there's a problem with the first 2K, the speaker beeps twice and the computer hangs with a random display on the screen. This indicates a problem with the memory card in slot 1, the slot closest to the middle of the card cage. Verify by removing the card and trying again. So long as there's a second card in slot 2, the slot closest to the edge of the card cage, the computer will still boot, and, assuming that card's OK, testing will continue.

VIA Test

VIA is an acronym for Versatile Interface Adapter. The Lisa uses two 40-pin 6522A chips, the same chip used on other Macs. The chip at D7 (marked "keyboard") provides keyboard logic, a real time clock, and mouse control; the chip at DS (marked "parallel port") controls the parallel port. Both chips are labeled and socketed. If this test fails with a cross over the I/O board icon and error code 50 (keyboard VIA problem) or error code 51 (parallel port VIA problem), here's what to do:

1. Make sure the suspect VIA chip is installed. On a used or surplus Lisa, someone might have pulled it!
2. Make sure it's oriented correctly. The notch should be pointing up.
3. Make sure there are no bent pins on the chip.
4. Make sure the chip is fully seated.
5. If that doesn't turn up anything, it's worth trying a new VIA chip before scrapping the board.

The VIA test may also fail with a cross over the I/O board icon an error code 58, indicating an I/O access problem or with a cross over the I/O board icon and error code 41, indicating an I/O decode problem. In either case:

1. Make sure the CPU board is seated firmly.
2. Check for any obvious bad solder joints.

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3. Make sure the 68000 is oriented correctly. The notch should be pointing up.
4. Make sure there are no bent pins on the 68000.
5. Make sure it's fully seated.
6. Make sure it's an 8-MHz 68000. Someone may have tried substituting a faster CPU. The OEM part is marked MC68000G8.

If that doesn't turn up anything, it's worth trying a new 68000 before scrapping the board.

I/O Board Tests

I/O is an acronym for Input/Output. If both input devices (the keyboard and mouse) are connected, the speaker emits a single click. Otherwise, you're alerted (by an icon and a series of tones) that they're not connected. The click or the input device alert completes the kernel tests. Up to this point, only two or three seconds will have passed since the power button was pushed. Next, the Lisa runs module tests. When the screen warms up, you'll see a Startup Module Test Display as shown in Figure 15.
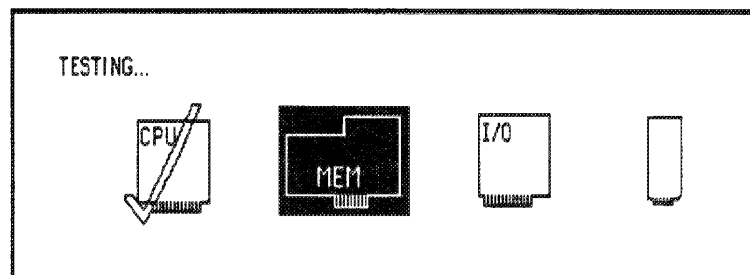

Figure 15 The Startup Module Test Display.

As each module passes, it's marked with a check mark. Errors result in a cross over the module with an error code underneath. A complete list of error codes is given in Table 3.

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Table 3 Startup Error Codes

Code	Icon	Symptom	Solution
N/A	Drive opening	No diskette	Insert disk
23	Diskette	Unreadable diskette	Reformat disk
38	Diskette	No startup file on diskette	Install system
39	Diskette	Drive ROM can't keep up	Wrong drive ROM?
40	CPU card	Memory management problem *	
41	CPU card	Selection logic problem	*CPU card missing?
42	CPU card	Video circuit problem	*
43	CPU card	Parity circuit problem	*
44	Lisa	Unexpected NMI interrupt	
45	Lisa	Bus error	
46	Lisa	Address error	
47	Lisa	Unexpected exception	
48	Lisa	Illegal instruction	
49	Lisa	Line 1010 or 1111 trap	
50	I/O board	Keyboard VIA error	6522A chip? *
51	I/O board	Parallel VIA error	6522A chip? *
52	I/O board	I/O COPS error	COPS chip? *
53	I/O board	Keyboard COPS error	COPS chip? *
54	I/O board	Clock error	*
55	I/O board	Serial port A problem	Z 8530 chip? *
56	I/O board	Serial port B problem	Z 8530 chip? *
57	I/O board	Disk controller problem	Lite Adapter? *
58	I/O board	I/O board access error	*
59	I/O board	I/O COPS error	*
60	I/O board	I/O or keyboard error	*
70	Memory board	Read/write error	
71	Memory board	Parity error	
75	Internal HD	System files are damaged	Reinstall System
75	External HD	System files are damaged	Reinstall System
75	Floppy disk	System files are damaged	Reinstall System
75	Expansion card	System files are damaged	Reinstall System
80	Internal HD	Drive cable is disconnected	Check cable
80	External HD	Drive cable is disconnected	Check cable
81	Internal HD	No response from drive	Adjust solenoid?
81	External HD	No response from drive	
82	Internal HD	Drive doesn't answer	
82	External HD	Drive doesn't answer	
83	Internal HD	Other drive problem	
83	External HD	Other drive problem	
84	Internal HD	Boot blocks are damaged	Low level format?
84	External HD	Boot blocks are damaged	Low level format?
85	Internal HD	Drive can't keep up	

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* Clean gold fingers and reseat the board.

"Lisa Repair Sun 16 .pict" 201 KB 1998-10-28 dpi: 72h x 72v pix: 327h x 572v

disk, defined as any disk containing System and Finder files. It's simple.

The Lisa/Mac XL boot procedure is more complicated, because Lisas were designed to run multiple operating systems (Lisa Office System, Lisa Pascal Workshop, MacWorks XL, MacWorks Plus, etc.). That capability precludes putting half of any particular operating system in ROM. Instead, 100% of whatever OS you choose to run has to be loaded from disk. In practice, the allowable operating systems are permanently installed on one of seven partitioned hard disks, where they load automatically, according to modifiable startup preferences, upon completion of the module tests. If your Lisa or Macintosh XL is equiped with a SCSI hard disk, Macworks Plus must be loaded from a floppy disk to recognize your SCSI drive.

If you own a SCSI drive, there's no hard disk connected, or if it's powered down, two buttons appear on the Lisa/XL screen instead. **To load MacWorks from a floppy** (as might be necessary on the repair bench), click the "Startup From. . ." button, insert a MacWorks 3.0, MacWorks XL, or MacWorks Plus disk, then click the disk drive icon. If you boot MacWorks 3.0 or MacWorks XL, 64K ROM emulation will load into RAM. If you boot MacWorks Plus, 128K ROM emulation will load into RAM. Upon completion, the MacWorks disk kicks out, and the familiar blinking 3.5-inch floppy disk icon appears. If you have a SCSI drive, the system on your drive will load. From that point forward, the machine will operate just like any other Macintosh.

One Caveat: Following through with inappropriate versions of the System and Finder will crash the machine. Acceptable System/Finder combinations for use with MacWorks 3.0 and MacWorks XL include 2.0/4.1 and 3.2/5.3. These are the exact same limitations that 512K Macs have. Additionally, you must load the System and Finder from an MFS (Macintosh File System) disk. HFS (Hierarchical File System) disks are not recognizable on any Mac under the 64K ROMs.

MacWorks Plus version 1.07 or greater requires at least System/Finder 6.02/6.1. In this case, previous versions of the System and Finder result in a crash. The important thing to remember is that system crashes of this nature have nothing to do with the hardware. Once you get to the blinking floppy disk icon, you can assume that the machine is OK. If your computer restarts after this point, the problem is most likely with the system folder. It may also fail if you only have 512K RAM installed.

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Lisa/Mac XL Test Diskette

The Lisa/Mac XL test diskette tests the electronic components in the Lisa/Mac XL system. This test will determine if any of the electronic boards or devices are defective and need to be replaced.

To start the test, insert the test diskette and turn on the computer. Shortly after the computer is turned on you will hear a soft click. When you hear the click, press the space bar a few times. The next screen that will appear will be the "startup from" screen. Startup from the floppy drive by pressing the ⌘ 2 keys.

The next screen will show the version of the Lisa/Mac XL test you are using as well as the the release date of that version. If you have a screen modification kit you must use the Mac XL/Lisa screen modification kit diagnostics version 1.0. If you do not have a screen modification kit you must use Lisa/Mac XL Test Release 3.0. This screen will then disappear and the following screen will appear.

Lisa/Mac XL Test will test all the electronics in the system, including the following:

| CPU board |
| Memory Boards |
| I/O Boards Diskette Drive (Optional) |
| Profile (Optional) |

Overnight

Short

Turn Off

The complete system check will take approximately 40-minutes if you select the short test or 12-hours if you select the overnight test. If you don't want to test this system, click Turn Off.

Selecting either the overnight or short test will then give you a new screen asking you if you want to test the diskette drive, continue to the next item to test or turn off. After the test of the drive or if you select continue the next screen will give you the same options except this will be to test the hard drive.

When the test of the hard drive is complete or continue is selected, the computer will start the test of the CPU Board. You

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can terminate this test by holding down the apple key and typing a period. the computer will then procede to check the memory boards and the I/O board. The screen will flash or flicker during these three tests. Do not be alarmed. This is normal to check the different components and their functions.

When all components have been checked and all is working properly your screen will appear as follows.

LISA/MAC XL TEST HAS VERIFIED THAT THIS SYSTEM IS WORKING PROPERLY.

If you would like to run the tests again, click Retest.

Retest

If you would like to exit Lisa/Mac XL test, click Turn Off.

Turn Off

Select either Retest or Turn Off. If you select Turn Off, the screen will dim and after about fifteen seconds and the computer will turn itself off. You can then turn the computer on and begin normal operation. If the test did detect an error with one or more of the boards you would see a message indicating which board or device is causing the error and needs to be replaced.

Built-in Service Mode

In addition to the automatic startup tests, the Lisa has built-in service mode. Some tests are easy to figure out. Adjust Video, for example, puts up a 1/2 inch reverse video crosshatch.

Here's how to enter the built-in service mode:

1. If the computer is on, turn it off. Wait a few seconds, then without inserting a startup floppy disk, turn the computer on again.
2. At the end of the kernel test (when you hear the first click), hit any key except Caps Lock. Hitting a key interrupts the normal startup procedure and turns on the Startup From mode.
3. At the end of the module test (when you hear the second click), hold down the Apple key and press the 2 key.

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4. Since there's no floppy disk in the disk drive, the Lisa beeps three times and presents you with an error box. Ignore it!
5. Hold down the Apple key and press the s key. S presumably stands for service. Case is irrelevant. Pressing S, or s, will engage the service mode as shown in Figure 16.

Note that the numerical shortcut keys for the menu items don't require pressing the Apple key. If you'd rather not use the mouse, just press the numerical keys (all by themselves) to engage the tests. Press and, if necessary, hold down the Return key to return to the main menu. Press 7, not Apple Q, to Quit. Press the Reset button at the back of the computer to exit an endless loop.
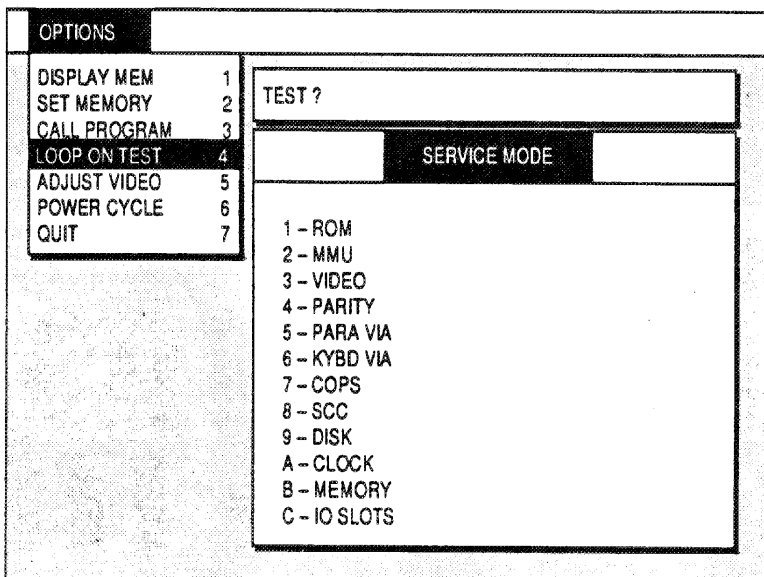


```
OPTIONS

DISPLAY MEM     1    TEST ?
SET MEMORY      2
CALL PROGRAM    3
LOOP ON TEST    4              SERVICE MODE
ADJUST VIDEO    5
POWER CYCLE     6
QUIT            7     1 – ROM
                     2 – MMU
                     3 – VIDEO
                     4 – PARITY
                     5 – PARA VIA
                     6 – KYBD VIA
                     7 – COPS
                     8 – SCC
                     9 – DISK
                     A – CLOCK
                     B – MEMORY
                     C – IO SLOTS
```

Figure 16 The Lisa's built-in service mode. Use with caution!

Warning! The Power Cycle & Loop On Test presume a stock hardware configuration. They should not be used with a modified Lisa 2 or a Macintosh XL. Running the Power Cycle test with an 800K disk drive upgrade will cause the disk drive test to fail. Running the Power Cycle test on a Lisa 2/5 with an internal hard drive

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upgrade could wipe out the boot blocks on the hard disk. On start-up, you'll get a cross over the hard disk icon with error code 84. You'll still be able to boot from a floppy, and the hard disk will mount, but in order to boot from the hard drive again, you may have to remove it, and send it out for a low level format. Use with extreme caution!

Summary of the Diagnostics Routines

The Lisa's built-in diagnostic routines display various icons accompanied by error codes pointing to particular electronic components. In practice, electronic failures are seldom seen. The most common problems result from mechanical failures, especially with the disk drives. The next section tells how to deal with them.

Mechanical Problems with the 3.5 Inch Disk Drive

Just like its Macintosh counterpart, the Lisa's 400K 3.5-inch disk drive is subject to the following failures:

1. Eject mechanism makes eject noises but disks don't come out.
2. Eject mechanism fails to operate (doesn't make any eject noises at all) when rebooting after a System crash.
3. Grinding noises get louder and louder. Disks become unreadable.

The first failure indicates a lubrication problem. The second failure indicates the presence of an OEM 400K Mac drive. The third failure indicates a dirty stepper cam, a dirty head, and/or a clogged pressure pad. If disks don't read properly, try cleaning the heads.

The Sun 800K floppy is a little different. If your drive continually ejects, remove pins 9 and 20 from the drive cable. If your drive seems to be moving abnormally slow, check for an 800K ROM on the I/O board.

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Drive Makes Eject Noises but Disks Fail to Eject

When the drive makes eject noises but the disks don't come out it usually means that the grease on the eject mechanism has solidified. To fix it, all you have to do is disassemble the eject mechanism and change the grease. Here's the complete procedure:

1. Disconnect the computer's power cord from the wall outlet.
2. Remove the disk drive cage as shown in Figures 1 to 3.
3. Disconnect all data and power cables from the installed drives.
4. Remove the internal disk drive by tilting the drive cage forward and loosening four Phillips-head screws at the bottom. Use a #1 Phillips-head screwdriver. Support the drive with one hand as shown in Figure 17.
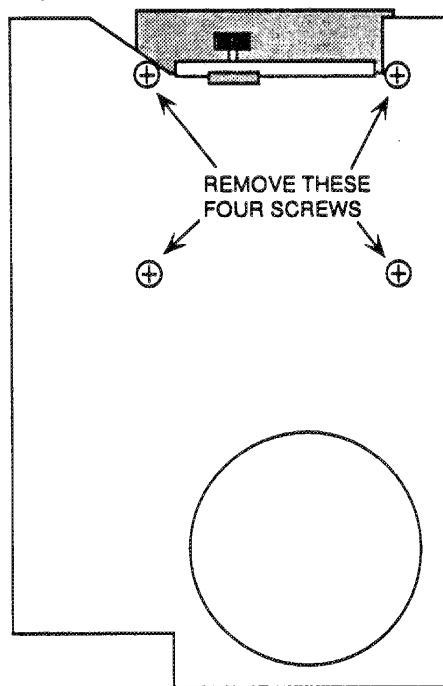

REMOVE THESE
FOUR SCREWS

Figure 17 Lisa disk drive removal.

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5. Use a small 1/8-inch slotted screwdriver to remove the C-ring shown in Figure 18.
6. Rotate the drive such that the disk opening is facing down and the eject motor is facing up. Use a small 1/8-inch slotted screwdriver to remove a single black flat-head screw behind the eject motor. Remove the top cover.
7. Rotate the drive such that the circuit board is facing up. As shown in Figure 19, use a small 1/8-inch slotted screwdriver to remove four gold-colored flat-head screws mounted beneath the circuit board.
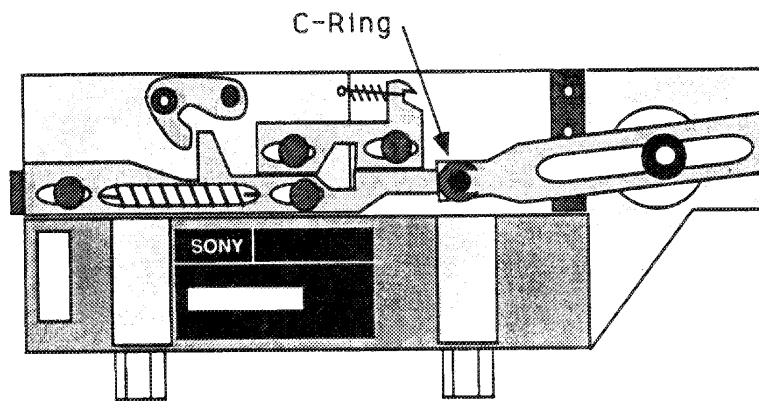

Figure 18 C-ring removal.

8. As shown in Figure 13-20, disengage the disk carrier mechanism from the chassis.
9. With clean paper towels, wipe up as much of the old sticky grease as you can. The more you wipe up now, the less you'll have to dissolve later.
10. Set up a disposable aluminum tray as shown in Figure 21. Hold the eject mechanism over the tray and spray the remaining grease away with WD-40.
11. Work the levers back and forth as shown in Figure 22. Arrows are shown on the release points. Work these points back and forth and respray as necessary until all of the old grease is gone.
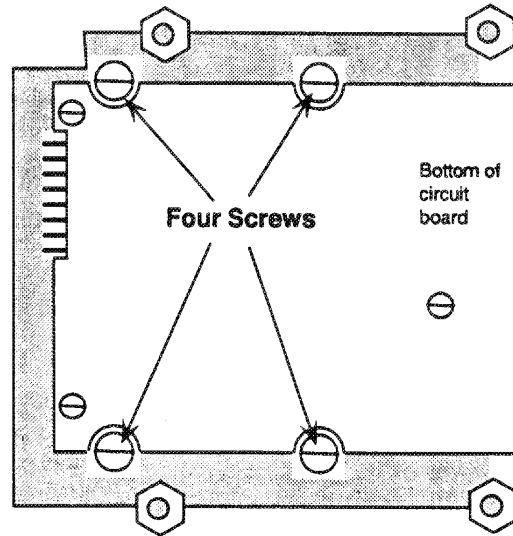
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Figure 19 Carrier mechanism screw locations.

Note that the three additional gold-colored screws on top of the circuit board do not have to be removed.
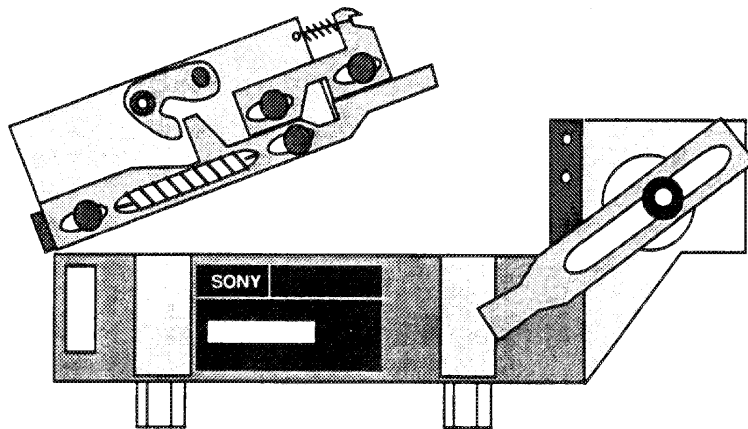

Figure 20 Carrier mechanism removal.

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