Troubleshooting

Apple Products

Introduction

This document presents the troubleshooting strategy that Apple Service recommends as the most efficient way to solve most problems.This document covers

- Troubleshooting Apple products by using systematic steps
- Verifying a successful product repair
- Finding Apple service information

Note: Text that appears in blue and underlined indicates a link to related material. Click the text to view the information.

Systematic Troubleshooting

Systematic troubleshooting is a skill you develop gradually as you gain experience. The more experience you have, the better you will become; in fact, many technicians consider troubleshooting the most rewarding part of their job.

Until you have enough experience to develop your own methods, use the General Troubleshooting Flowchart at the end of this section to guide your troubleshooting.

Basic Troubleshooting Steps

The General Troubleshooting Flowchart lists the following basic troubleshooting steps:

1. Gather information from the customer.
2. Verify the problem (duplicate the symptoms).
3. Try quick fixes.
4. Use appropriate diagnostics.
5. Use systematic fault-isolation procedures, referring to Service Source or Apple Service Guides for product-specific guidance.

6 Research the problem using additional resources such as the Tech Info Library.

7 Escalate if necessary to a technical assistance group.

At any step in this process, you may find the solution to the reported problem. When that happens,

1 Repair or replace the faulty item.

2 Verify the repair by testing the product thoroughly.

3 Inform the user what you have done.

4 Complete whatever administrative tasks your organization requires.

MacTest Pro and Systematic Fault Isolation

The notes to the Troubleshooting Flowchart explain most of these steps. However, two other parts of the process require a little more explanation: MacTest Pro diagnostics and systematic fault isolation.

Diagnostics: MacTest Pro and MTP Emergency

MacTest Pro and MTP Emergency are Apple's major disk-based diagnostic tools. These diagnostic tools are available on four bootable disks and two bootable CDs. In addition, several nonbootable disks are supplied for situations where a CD drive is not available.

Two of the MTP Emergency bootable disks are for 680x0-based Macintosh computers, using System 6.0.8 on an 800K floppy disk, and using System 7.5 on a 1.44 MB floppy disk. Two more bootable disks are supplied for Power Macintosh

computers, using System 7.5.1 for computers with NuBus, and using System 7.5.2 for computers with PCI bus.

The bootable CDs are for 680x0-based and Power Macintosh computers. The MacTest Pro CDs contain:

- MTP Emergency
- The complete MacTest Pro application, its test modules and documentation
- A variety of utility applications for hard drives, displays and printers
- Recently released system enabler files

Because MTP Emergency is distributed on bootable disks and CDs, you can use it even when a SCSI or software problem make it impossible to start up the system from its own hard disk.

Apple Service recommends running the MTP Emergency's "Logic Board, VRAM and RAM" and "System Software" tests as a first step for all CPU system service calls. The "System Software" test can detect and repair many software and directory problems, and the "Logic Board, VRAM and RAM" test checks the most crucial hardware components. If you suspect a hard disk problem, you should also run the MTP Emergency's "Hard Drive" tests.

After the computer passes all of the MTP Emergency tests, run the more comprehensive set of tests supplied with the full MacTest Pro application to be sure that the system is fully functional. This diagnostic application contains CPU-specific tests, as well as test modules for a variety of cards and peripherals.

To assure that you are running with known-good system software, you can boot from the MacTest Pro CD and then launch MacTest Pro. This also allows the diagnostic to check and repair the system software and directory structure on the hard disk. Later, you can boot from the hard drive and launch MacTest Pro from the CD, which will allow you to create and print comprehensive reports from the diagnostic tests.

For hard-to-find intermittent problems, many MacTest Pro tests can be run in looping (continuous testing) mode. When troubleshooting, and when verifying repairs running tests overnight in looping mode is a good way to detect intermittent problems.

For each Apple product you service, you must know how to use the diagnostic tests, and you must know the configuration requirements and limitations of each test. The MacTest Pro User's Guide describes how to use MTP Emergency, the MacTest Pro application, and the test modules. The User's Guide is available in electronic format on the MacTest Pro CD, and is reprinted and redistributed regularly with the diagnostic disks and CDs.

Systematic Fault Isolation

The entire troubleshooting process could be called “systematic fault isolation,” but we are using the term here to mean the specific part of the troubleshooting process that occurs if quick fixes and diagnostics cannot solve the problem—the part where you are “on your own.”

“Systematic fault isolation” means applying your knowledge of the product, its common problems, and the symptoms as you check one possible cause after another, in a logical order.

In general, it makes sense to check for problems in the following order:

1 **User errors:** You will have checked for user errors in the course of gathering information, duplicating the problem, and trying quick fixes. However, keep in mind that the possibility of switches or preferences being set manually, incompatible equipment, and incorrect assumptions on the user's part. Take nothing for granted.

2 **Software-related problems:** Incompatible or damaged software, viruses, INIT and extension conflicts, duplicate System Folders, and other software problems all can cause symptoms that may look like hardware problems. However, replacing hardware won't solve them—and it will cost time and money. Always check for software problems before replacing any hardware. MacTest Pro and MTP Emergency's "System Software" tests can detect and repair many software problems of

this type. See "Checking for Software Problems" and " Checking for Viruses" (later in this section) for other techniques.

3 **Hardware problems:** When you are convinced that the problem is not caused by user error or software, hardware is what's left. The following are some tips.

Simplify the problem. Remove external devices and internal cards (except the video card if needed for display) and test the CPU system by itself. If the problem remains, you have isolated it to the computer itself. If the problem disappears, reinstall the cards and peripherals one by one, until the symptoms reappear. When they do, you have found the culprit—or at least a clue.

Find the "Problem Space." Try to identify the functional area (sometimes called a problem space) that the problem affects. For instance, consider the following functional areas of a typical Macintosh computer:

- Software
- Logic and control
- Memory
- Video
- I/O
- Power

If you can narrow down the problem to, say, the video area, further search the parts that relate to video—the monitor, cables and connectors, video RAM and/or video card (if present), and logic board.

Inspect components, especially mechanical parts and fuses. You may be able to see the cause (a blown fuse, or a visibly damaged chip), or smell it (a burning

smell is often a tip-off), or hear it (grinding noises are seldom a good sign). Sometimes you may be able to test specific modules with a voltmeter or ohmmeter. Service Source and the Apple Service Guides sometimes provide directions for meter-based testing. For all Apple computers, and many cards and peripherals as well, you can run diagnostics.

Use troubleshooting charts. When you've isolated the problem to a single device, and after you've used the available diagnostics, refer to the troubleshooting charts for the device in Service Source or Apple Service Guides.

These charts direct you to swap suspected modules (such as logic board or power supply) for known-good service stock modules. If the swapped-in module does not fix the problem, reinstall the customer's original module and try the next swap listed. A good practice is

to avoid swapping hardware modules as long as possible, since every time you swap a module, you risk damaging the equipment.

Checking for Software Problems

When checking software, work from specific to general. For example, check the file, then the application, and finally the system. Ask yourself (or the user) these questions:

1 Does the problem occur with only one file? If so, the file is corrupt. Try recovering the data with ResEdit or other data-recovery tools. Remind the user to back up data often to protect against file corruption.

2 Does the problem occur with only one application?
- If so, the application has become corrupted and must be reinstalled from the master disks.
- If not, the System file may be corrupted, or there may be multiple System files, or there may be a hard disk problem. Run MacTest Pro's "System Software" and hard disk tests. Eliminate any duplicate System files. Reinstall system software, if necessary.

Note: Once you have gathered enough information to identify the symptoms of the software problem, look for the symptoms and remedies listed in the "Software Troubleshooting" document.

Checking for Viruses

A “virus” is a program that replicates itself and often modifies other programs. When a virus gets into system software, the computer may fail to boot, the system may crash, or the software may work incorrectly. Public bulletin boards and shareware are common sources of virus infection.

To check for a virus, ask users the following questions:

- Did you recently receive software from another user or a common source (for example, a public information service, bulletin board system, or file server) and add the software to your system?
- Did you experience the problem before you obtained that software?
- Do you share files with other users? Are they having similar problems?

Up-to-date virus information is on most online services. Third-party vendors supply virus-detection programs such as SAM Intercept/Virus Clinic and Virex. Free programs include Disinfectant, Virus Detective, and Gatekeeper.

If you do detect a virus, be sure that you find the original source file and eliminate it. Then reinstall all affected system and application software, and dispose of any corrupted data files.

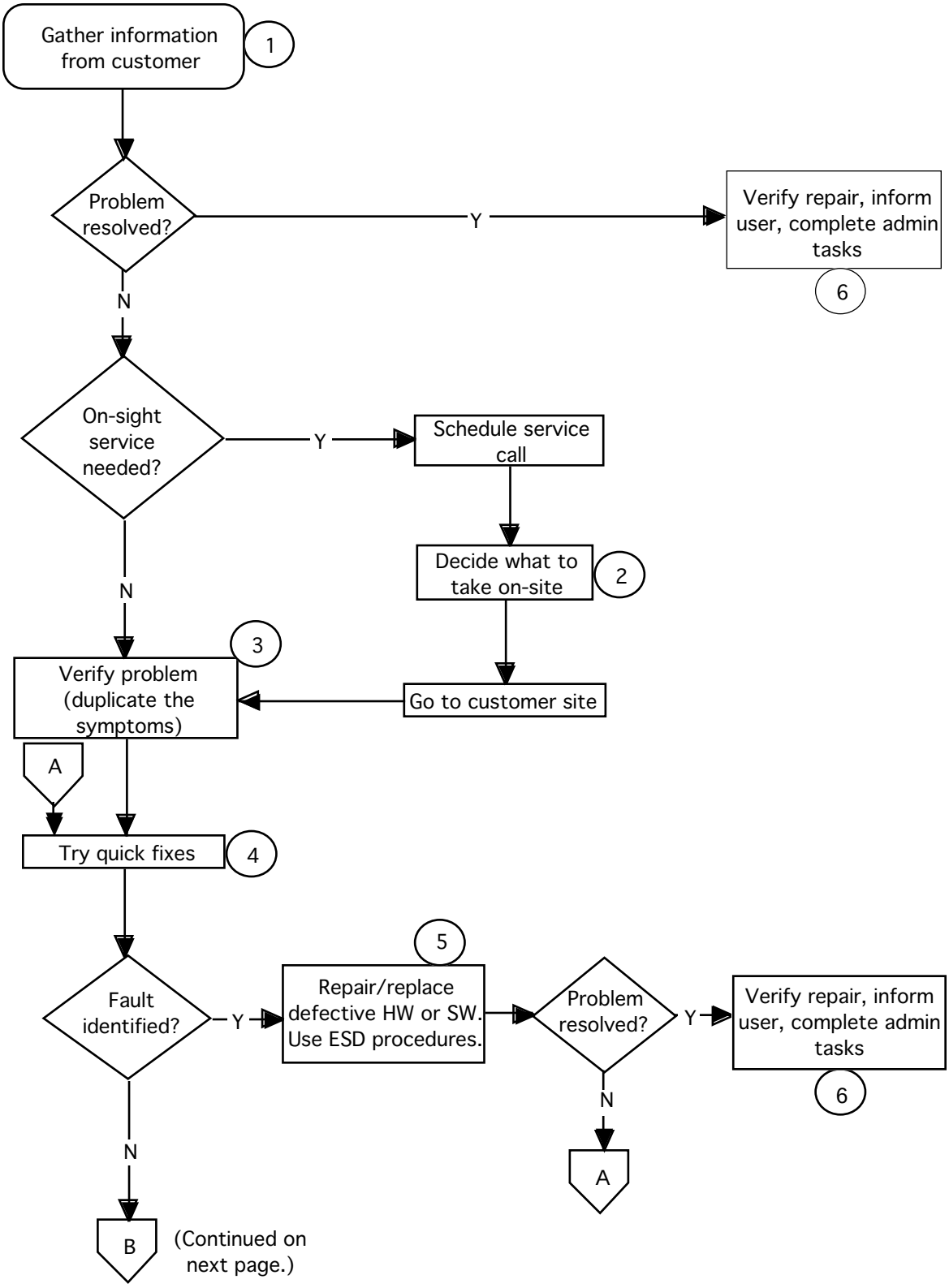
As a technician, you can do the following three things to avoid infecting your diagnostic and utility software disks:

- Use only backup copies of your disks.
- Be sure that your disks are locked before you use them.
- Scan these disks often with up-to-date virus-detection software.

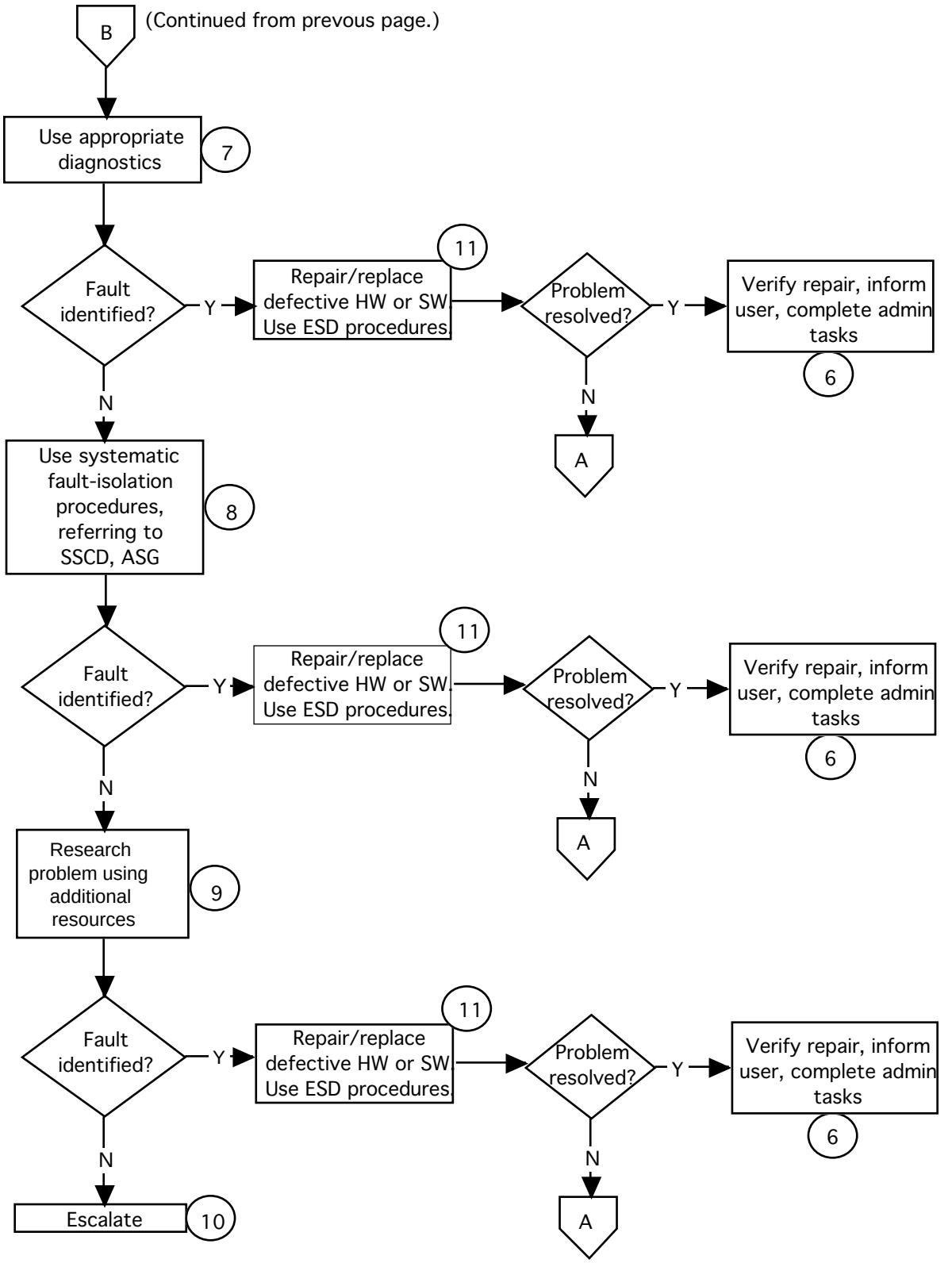
Don’t Forget the Human Factor

When you have been working hard on a problem that has stumped you, it’s a good idea to take a coffee break—or just a break (the coffee is optional). You may be surprised how often a short break can allow you to think of solutions you didn’t see when you were too close to the problem.

General Troubleshooting Flowchart



General Troubleshooting Flowchart (continued)



General Troubleshooting Flowchart Notes

1 In person or by telephone, question the user to find out the following:
- Description of problem symptoms
- What user was doing when problem occurred
- Exact system hardware, Macintosh operating system version, exact versions of software involved
- If software or hardware was recently added or removed
- Environmental conditions (system proximity to heater, window, other electrical devices, and so forth)

Keep these points in mind:

- If the hard disk or operating system is suspect, ask the user to back up all important data. If the user cannot back it up, make a note to back it up yourself.
- Use the appropriate reference materials to guide your telephone troubleshooting (Service Source CD, Apple Service Guides, and so on).
- If the problem is user-caused or easily fixed by reinstalling software, rebuilding the desktop, and so forth, try to resolve the problem over the phone. Also see note 4.

2 Before you travel to a customer's site, determine all hardware and software you may need and obtain it. Take all diagnostics, tools, System disks, and references.

3 Before doing anything else, verify the problem by duplicating the symptoms described. If possible, get the customer to show you what is wrong.

4 If there is no power, try hardware quick fixes, such as
- Checking power source, cable connections, switch settings, compatibilities
- Inspecting hardware for damage (spills, blown fuses, and so on)

If power is present, try quick fixes (depending on the problem), such as
- Adjusting user controls.
- Checking system cables, SCSI IDs, and so on
- Clearing the Parameter RAM (PRAM).
- Trying to boot from MacTest Pro Emergency disk (if not available, use Disk Tools) and running tests. Try this even if a normal boot tone and video are not present. Hard disk or system software problems can sometimes cause these symptoms!
- Booting from the hard disk with extensions/INITs **off**.
- Rebuilding the desktop.

- Checking software compatibility, reinstalling application software, performing a clean install of system software (follow instructions in the "System Clean Install" document).

5 Use Service Source or Apple Service Guides for repair procedure reference.

6 **Verify repair:** For CPUs, run MacTest Pro diagnostics (if possible, run overnight in looping mode). For printers and other peripherals, perform functional testing (that is, exercise the machine thoroughly to verify that it functions normally before returning it to the user).

Inform user: Let the user know what you have done and why. To confirm normal system operation, show the user the MacTest Pro test log (if applicable).

Complete administrative tasks: These may vary according to your company's procedures. Apple strongly recommends the use of the AppleOrder system to process any repair transactions, especially those involving exchange modules, warranty reimbursement, AppleCare, or the Repair Extension program. See "CompTIA Module Symptom Codes" under Quick References.

7 For any device, use built-in diagnostics ("Sad Mac" error codes, printer error LEDs, and so on). Refer to Service Source when interpreting these results.

For CPU systems, boot from MacTest Pro Emergency disk and run the “System Software” and “Logic, VRAM, and RAM” tests. The “System Software” test will detect and repair many software and directory problems. If the system passes all Emergency tests, run full MacTest Pro tests.

If you suspect hard disk drive problems, run the MTP Emergency “Hard Drive” test also, or use Apple HD SC Setup to reinstall hard disk drivers. If the problem is intermittent, run diagnostics overnight in “looping” mode.

8 See the “Systematic Fault Isolation” section in this chapter. Refer to Service Source or appropriate Apple Service Guide for troubleshooting charts or symptom charts for the hardware involved.

9 For answers to specific technical questions not covered in Service Source manuals, try searching in the following additional resources:
- The Tech Info Library, available on the Service Source Companion CD, from Service Source Online, or on AppleLink in the Support folder.
- Service Notices and Hot Issues on Service Source, Service Source Online, or AppleLink)

10 If all else fails,
- Call your technical support group.
- Call Apple's Technical Assistance Center.

11 Use Service Source or Apple Service Guides for repair procedure reference.

Verifying Repairs

Before you return any product to a customer, you must be sure that it is functioning correctly. Sometimes you may fix one problem, only to find that another problem was there as well. You may have swapped the right module, but accidentally left a cable unplugged when reassembling the product. To avoid embarrassment and worse (loss of business), be sure to thoroughly test any product you repair before telling the customer that it's fixed. The following are some tips for verifying repairs.

CPU Systems

Use MacTest Pro to test the entire system, even if you have only repaired one part of the system. If possible, run tests overnight in looping mode, to catch any intermittent problems.

Save MacTest Pro Log

When verifying a repair with MacTest Pro, save the test log. You can show the log to your customer as evidence that you have tested the system thoroughly and that it passed the tests.

Printers and Other Peripherals

If a diagnostic is available for the product, use it!

If no diagnostic is available, do a thorough functional test. That is, exercise the machine thoroughly by using its features. If it is a printer, print the available test pages (see Service Source for information on specific test pages) and also print several pages from a Macintosh computer.

Finding Service Information

This section describes the troubleshooting and service information found in the following resources:

- Service Source
- Apple Service Guides
- Service Price Pages
- Apple Service Training Courses
- Owner's Manuals
- Software Updates

This section also recommends the items to keep in your personal records to build your own troubleshooting reference material. And it outlines an escalation path to follow when troubleshooting an especially difficult problem.

Service Source

The Service Source CD and Service Source Online are your primary references as an Apple technician. Each Service Source manual contains specifications, take apart instructions, and troubleshooting charts for the product it covers.

Service Source includes a Programs section, which contains manuals that describe Apple service programs, including information on warranties, repair policies, and administrative policies. Service Source also includes Program Notices (descriptions of new Apple service programs) and Hot Issues (late-breaking news about specific product problems and recommended solutions).

Apple Service Guides

Apple Service Guides (ASGs) are compact, easy-to-use handbooks that contain the most important technical information about Apple products. When you can't conveniently use Service Source, refer to the Apple Service Guides for technical and troubleshooting information.

Service Price Pages

The Service Price Pages list all service parts that can be ordered for Apple products, along with their part numbers and current prices. The Service Price Pages are updated monthly and sent to all Apple Service subscribers. (You can also find parts prices on AppleOrder, Apple's online ordering system.)

Apple Service Training Courses

When Apple introduces major new releases ("reference releases") of the Mac OS, Apple Service Training produces training courses for home study. These are usually self-paced, computer-based courses that utilize a runtime player and contain practice exercises and tests. Macintosh Troubleshooting and Mac OS 8 courses are currently available in CBT format.

Apple Service Video Courses are also available for many older Apple products that were considered significantly different from a service perspective when introduced. These courses usually consist of a booklet and a videotape covering theory of operations, identification of parts and their functions, take apart, diagnostics, and troubleshooting. Video courses currently are available for most models of LaserWriter printer, for the 100, 200, and 500 series of

PowerBook computers, and for the Apple Color StyleWriter Pro.

Online Services

Currently you can obtain Apple service and support information from two online services: Service Source Online, and the Apple Support pages on the World Wide Web. With an Apple computer, a modem, a telephone line, and internet software (a "web browser," such as Netscape Navigator), you can access information provided in online libraries and bulletin boards 24 hours a day. You also can use electronic mail to send correspondence to Apple Technical Support or others on the network.

Some of the information provided on these services also is contained on the Service Source CD. However, the online information may be more up-to-date, since it can be updated instantly.

Apple Support and Service Source Online require internet access. Apple Support (http://www.info.apple.com/) is accessible from the Apple home page (http://www.apple.com/). Service Source Online (http://service.info.apple.com/) is password protected; passwords are distributed freely with Service Source subscriptions.

You will find the following online resources especially helpful when troubleshooting.

- **Tech Info Library:** The Tech Info Library contains more than 15,000 articles on particular problems involving Apple products, including details about product compatibility (including some non-Apple peripherals and other products), descriptions of known problems and their workarounds or fixes, and other hardware or software information. A powerful electronic search engine helps you find the articles you need.

- **Bulletin boards:** Bulletin boards provide information about service and support, Apple products, and software updates. You can find and download system enabler files, important software tools, system software, and up-to-date information from these boards.
- **Service Parts Database:** Available on Service Source CD and Online. The Online version of this FileMaker Pro database is updated regularly and contains the very latest information about Apple service parts, including part numbers, Warranty information, graphics, and other notes to help identify a part.

Note: The Tech Info Library and Apple Software Updates are also available on the Service Source Companion CDs.

Owner's Manuals

When you need details about setting up and using a product, the best reference is the owner's manual (or "user's guide"). Remember that the product knowledge of most users is limited to what they learn from owner's manuals. If possible, keep the owner's manual for each product and software application you service. You can purchase owner's manuals through the Service Price Pages.

Software Updates

Whenever you receive a software update, you should receive a booklet, a pamphlet, or a disk file labeled “Read Me First” (which provides information about the new version). Save these update documents because they may provide exactly the details you need when trying to isolate troubles.

Personal Records

Your efficiency as a troubleshooter will depend in part on keeping your reference library and personal records up to date and usable. Make a habit of the following practices:

- File product updates and other product announcements in a systematic way, so that you can find the information.
- Update Service Source CD and paper-based manuals immediately after receiving the updates from Apple.
- Document your own work in a “Common Problems” log and in the customers’ files as you complete repair jobs. Write down the information immediately, before you forget important details. If you keep good records of problems you have solved, they can help you solve future problems more quickly.

Escalation Paths

Many service organizations have their own technical support groups, where software and hardware “gurus” can help you solve problems that have stumped you.

If you don’t have a technical support group, or if you’re in a technical support group yourself and are stumped, you can call upon the Apple Technical Support group, and the people on the support line will draw upon all available resources to help you. Resources are limited, and to make most efficient use of the Apple Technical Support group, Apple suggests that you phone them only after you have used all other resources, in this sequence:

1 Use available reference materials, including
   - Owner’s manuals and other in-the-box reference materials for user-level information

- Service Source Parts Database and Service Price Pages for service part numbers and pricing
- Finished-goods price list for model names and numbers
- Service Source CD and Online (http://service.info.apple.com/) for service technical information

2 Refer to bulletin boards and the Apple Support site (http://www.info.apple.com/) on the web. In particular, search the Tech Info Library.

3 If all else fails, call Apple Technical Support at 1-800-919-2775. You must type in your 10-digit Service Provider number when calling. You can find your number on a current Service Repair Order, invoice, or Purchase Order. This should be your last resort.