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Diagnostics

Diagnostics

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Apple Service Toolkit 2

Course Description

The Diagnostics course describes the diagnostic software tools that Apple supplies to its customers and authorized service facilities, how these diagnostic tools differ, and how each of the tools can be used most effectively in troubleshooting and servicing Apple products.

This course is part of the ACMT 2016 curriculum and is used to prepare for the Mac Service Certification Exam (MAC-16A).

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Lesson Objectives

Upon completion of this course you should be able to:

- Identify the different stages of troubleshooting and service where diagnostic tools are useful.
- Describe the purpose of specified diagnostic tools.
- Correctly identify the diagnostic tool most appropriate to a given troubleshooting scenario.

Audience	Prerequisites	Time Required	You will need...
Service Technicians	Successful completion of the Apple Service Fundamentals exam	30 minutes	No additional materials or equipment

ℹ️ Your course is organized by chapters and pages. Chapters are sections you see on the side navigation. Pages are now found within a chapter. You can navigate pages by clicking the grey radio buttons at the bottom of a window.

⚠️ **Access to Diagnostic Software**

Apple Service Toolkit (AST 1) and Apple Service Toolkit 2 (AST 2) are available only to persons working at Apple-authorized service facilities.

Diagnostics

Customer Diagnostics

Apple Diagnostics and Apple Hardware Test are tools for diagnosing problems with your computer's internal hardware, such as the logic board, memory, and wireless components. OS X also includes a tool that provides a summary of information about the computer.

Apple Diagnostics or Apple Hardware Test?

The tool you use depends on your Mac model and OS X version.

- If the Mac was released after June 2013, use Apple Diagnostics, which is built into the Mac.
- If the Mac was released in 2012 or earlier and has OS X v10.8.4 or later, use Apple Hardware Test, which is built into the Mac.
- If the Mac was released in 2012 or earlier and has OS X v10.8.4 or earlier, use the system software disc or USB flash drive that came with the Mac.

To see which version of OS X you have, choose Apple menu > About This Mac.

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Apple Diagnostics

See Apple Support article, HT202731: Using Apple Diagnostics, for more details on using Apple Diagnostics. See Apple Support article, HT203747: Apple Diagnostics: Reference codes, to find more information on codes generated in Apple Diagnostics.

Apple Hardware Test

See Apple Support article, HT201257: Using Apple Hardware Test, for more details on using Apple Hardware Test.

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Diagnostics

Customer Diagnostics

System Information

System Information is a tool in OS X that provides details about the computer including the model, version of OS X running on the computer, and the devices that are connected to the computer. In some earlier versions of OS X, this app is referred to as "System Profiler".

To run System Information, open the app from the Utilities folder of the Applications folder or hold down the Option key while choosing System Information or System Profiler from the Apple menu.

See Apple Support article, HT203001: OS X: About System Information and System Profiler, for more details on using System Information.

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Apple Service Toolkit (AST 1)

Using Apple Service Toolkit (AST 1)

Apple Service Toolkit (AST) is a diagnostic suite provided by Apple to Apple-authorized service facilities. AST is a customer-facing diagnostic tool. Tests found within Apple Service Toolkit can be run in the customer's presence and the results screen can be shown to the customer.

To use AST, Diagnostic Gateway (DG) software runs on a dedicated Intel-based Mac using OS X Server v10.6 or later and provides tools to triage computers via NetBoot. The results of the tests run in AST are recorded as log files. It is used on Mac computers that predate the iMac (21.5-inch, Mid 2014).

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Apple Service Toolkit (AST 1)

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Components

Mac Resource Inspector (MRI) is a quick triage tool that checks for the presence of hardware and reports sensor readings. Sensors are located on a variety of parts, including cables, fans, storage devices, power supply, display panel, and logic board. Use MRI to help isolate failures and avoid unnecessary part replacements.

Notebook Adapter Diagnostic (NAD) reports the condition of Intel-based Mac notebook power adapters.

Storage Diagnostic verifies basic functionality of internal Apple storage devices using a suite of Apple engineering-approved tests and checks.

Test Patterns Tool (TPT) generates test patterns to help to identify bright and dark pixel anomalies and foreign materials in LCD panels in Apple displays and Mac computers.

Video System Test (VST) is used to test MacBook Pro (15-inch, Late 2010) computers for intermittent display freeze issues in situations where the computer has completed all MRI tests.

Video System Test (VST) is used to test iMac (27-inch, Mid 2011) computer for intermittent display issues.

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Apple Service Toolkit (AST 1)

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Image Persistence Test verifies image persistence issues on internal IPS displays in Apple desktop and portable computers, using consistent testing parameters.

Cooling System Diagnostic (CSD) evaluates thermal sensors, fans, and heat sinks in 2011 and later MacBook Pro, iMac, and MacBook Air computers. It will both confirm correct operation and help diagnose a service issue. CSD is useful for assisting users with questions about fan noise.

Audio Input and Output Test determines whether a series of tones created by the computer's speakers can be detected via the built-in microphone.

Trackpad Diagnostic Test provides interactive testing of trackpads. It tests the left, center, and right click on the trackpad. It also tests the entire trackpad surface for touch input acceptance.

Keyboard Diagnostic Test provides interactive testing of each key on a keyboard. It requires a technician to individually press each key as a part of the testing and identifies failed keys.

Trackpad Keyboard Mapper is a tool required when replacing the trackpad on some newer Apple products. The trackpad in certain models contains important keyboard layout information, and Trackpad Keyboard Mapper verifies and re-programs this information.

Server Bit Setter (SBS) makes sure Mac mini and Mac Pro with OS X Server continue to be identified as servers after a logic board or backplane board replacement.

Blank Board Serializer appears automatically when a unit under test requires a serial number and is initiated by holding N when the computer is restarted.

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Apple Service Toolkit 2 (AST 2)

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Apple Service Toolkit 2 (AST 2) helps you provide world class service by diagnosing and fixing customer issues more quickly and accurately. AST 2 is accessed via GSX.

⚠ Service technicians should continue to use AST 1.5.12 or later to triage and verify repairs on all Mac computers released prior to iMac (21.5-inch, Mid 2014).
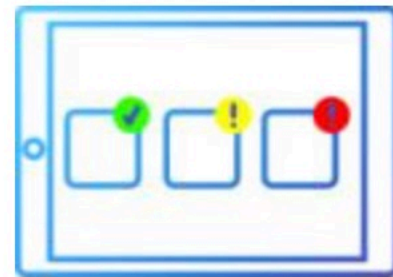
Diagnostics

Apple Service Toolkit 2 (AST 2)

Cloud-based. Moving diagnostics to the Cloud, Apple will be able to update diagnostics quickly and centrally. Every time you run a diagnostic, you will run the most up-to-date version.

Wireless. When using EFI diagnostics (such as MRI), you will be able to do so wirelessly.

All diagnostics in one system. For supported products, technicians will be able to run all AST diagnostics (like MRI, Storage Diagnostic, Cooling System Diagnostic) and Full Service Diagnostics (FSD) using AST 2.

Many devices, one interface. Using the Diagnostic Console (a web application on a Mac or iPad), technicians will be able to run diagnostics wirelessly on many devices at the same time. Technicians will be able to see the live status of all units under test and share diagnostic results as they complete. Having diagnostic results on their Diagnostic Console also means that technicians can run diagnostics on devices with no video.

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AST 2 Diagnostic Suites

EFI

- **Mac Resource Inspector** - Provides a quick health check of hardware and software.
- **Memory** - Tests each memory location using multiple read/write algorithms.
- **Display Anomalies** - Assists in the identification of pixel anomalies in LCD panels.
- **Power Adapter** - Tests the functionality of power adapters.

OS

- **Cooling System** - Verifies that the cooling system can dissipate heat under heavy system load.
- **Graphics and Display** - Verifies the functionality of the graphics system in an OS X environment.
- **Trackpad** - Assists in verifying the touch and button functionality of the trackpad.
- **Storage** - Verifies the presence and functionality of internal Apple storage devices.
- **System Stress** - Simulates heavy usage to verify computer functionality under stress.
- **Audio** - Tests whether the microphone can detect computer-generated sound.
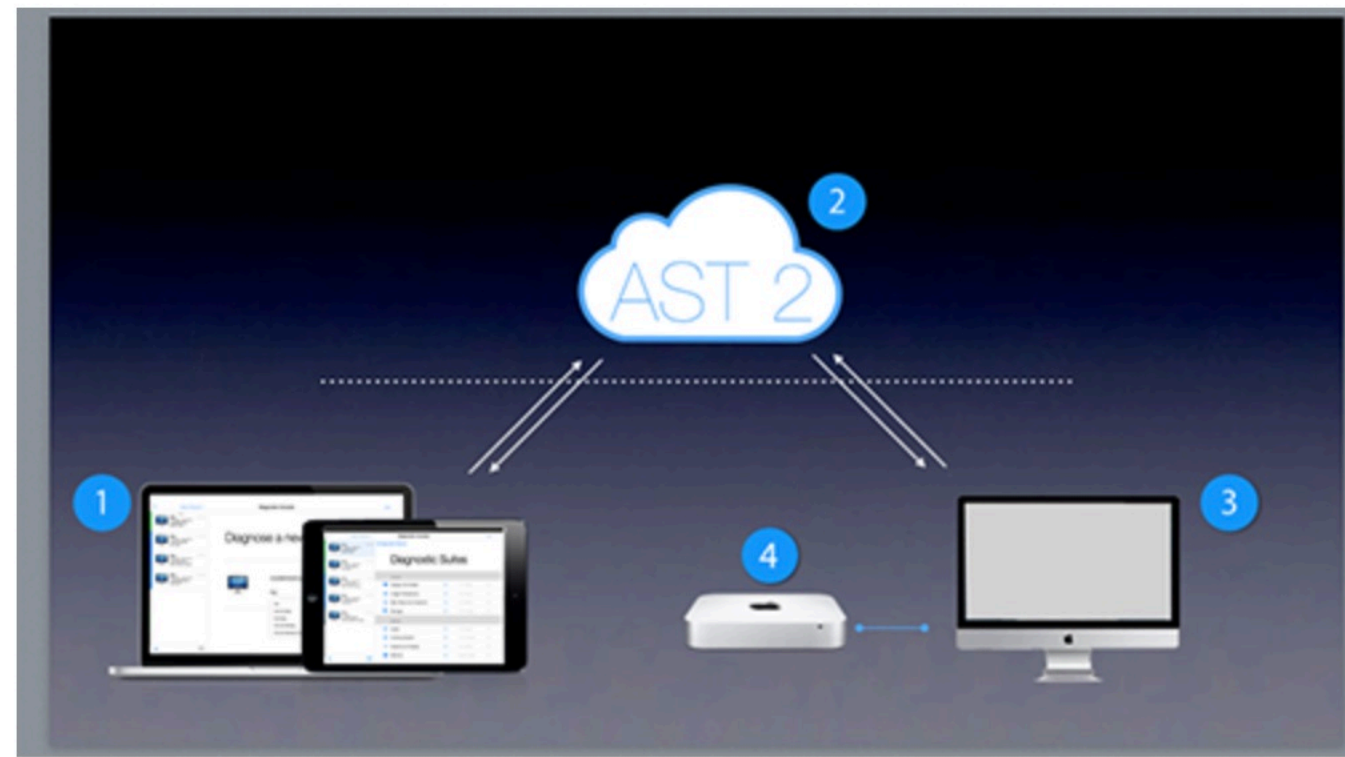
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AST 2 Components

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1. Diagnostic Console (a Mac or iPad)
2. Internet access to AST 2 cloud-based server
3. Unit under test that is compatible with AST 2
4. Local NetBoot Server (with OS-based diagnostics)

All AST 2 components function via Ethernet or Wi-Fi.

Diagnostics

When to Use Specific Diagnostics

Knowing which diagnostic to use and when to use it is a skill every technician must practice throughout the triage, troubleshooting, and repair verification process. Here are Apple's recommendations for correct diagnostic use.

Initial troubleshooting - Demonstrate for the customer how to use Apple Diagnostics to have support at his or her fingertips. Apple Diagnostics provides a reference code that can be used by Apple and service technicians to provide additional troubleshooting.

Triage with the customer - If presented by the customer, look up the Apple Diagnostic reference code in GSX to determine the potential issue. Run AST/MRI to get a complete view of the computer system health and pinpoint specific hardware issues. You may use AST's visual display to discuss results with the customer.

Repair Technician Triage - In case another technician ran AST/MRI initially, the technician doing the repair runs AST/MRI to be familiar with the state of the computer. This will help to pinpoint which aspect of the repair needs to be performed. Additionally, FSD can be used to isolate hardware issues using user-interactive tests during this step.

Post part installation - Run AST/MRI to verify the new components are installed and connected properly. AST/MRI will also verify that other components were properly reconnected after assembly.

Repair is complete - Run FSD for detailed testing to verify the repair. This is especially important to avoid repeat repairs, verify an intermittent issue has been resolved, verify the new part has resolved the issue, and no new issues have been introduced.

Customer pickup - Run AST/MRI for the customer to demonstrate the successful resolution of the issue. This is optional, depending on whether the customer requests it and time permits.

When ordering certain parts - Some Mac parts can only be ordered if there is a failed diagnostic result on record. The required diagnostic will vary according to the type of part.

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Summary

Having completed this course, you should be able to

- Identify the different stages of troubleshooting and service where diagnostic tools are useful.
- Describe the purpose of specified diagnostic tools.
- Correctly identify the diagnostic tool most appropriate to a given troubleshooting scenario.

This concludes the Diagnostics course. For other courses in the ACMT 2016 curriculum, see Apple Support article, HT205332: AppleCare Service Certifications, or search for ACMT 2016 in ATLAS.

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