**Apple Technician Guide**

# MacBook Pro (15-inch, Mid 2010)

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# Manual Updates

## Update 15 December 2010

Troubleshooting
- Symptom Charts: Display: Backlight Issue/No Backlight: Changed last two steps in Deep Dive to include F9800 fuse-check procedure.

## Update 11 June 2010

Troubleshooting
- General Troubleshooting: Common Reset Procedures: Resetting the System Management Controller (SMC): Updated step 3 to clarify LED behavior on the MagSafe connector; deleted statement that resetting the SMC requires resetting the date and time.

## Update 14 May 2010

Basics
- Overview: Added new section "Keycap Replacement."

Troubleshooting
- Symptom Charts: Input/Output Devices: Built-In Keyboard Does Not Work Properly: Changed fist step in Action column of Deep Dive to refer to Keycap Replacement articles HT4002 and HT4003.
- Symptom Charts: Input/Output Devices: Specific Keys Don't Work: Changed last step in Quick Check column to refer to Keycap Replacement articles HT4002 and HT4003.

Take Apart
- Right Speaker/Subwoofer: Added note about inspecting top and bottom snubbers.
- Top Case: Added note about transferring black plastic standoff to new case.

## Update 20 April 2010

Updated ASD and AHT numbers in Basics Overview chapter.

## Apple Technician Guide Introduced 13 April 2010

# Feedback

We want your feedback to help improve this and future Technician Guides!

Please email any comments to:

**smfeedback3@apple.com**

Apple Technician Guide

**Basics**

MacBook Pro (15-inch, Mid 2010)

# Overview

**Specifications**

The MacBook Pro (15-inch, Mid 2010) computer features a 2.4, 2.53, or 2.66 GHz Intel dual core processor. For full technical specifications, refer to AppleCare Tech Specs:
**http://support.apple.com/specs/**

## Battery Precaution and Tool

This computer contains an internal-only battery that is serviceable by Apple-authorized service providers only. Tamper-proof screws are employed to prevent customers from attempting to remove it.  **Note**: Before you begin any procedure, disconnect the battery from the logic board. Failure to do so could damage the computer.

To remove the security screws holding the battery in place, you will need a special tool, a large tri-lobe #0 screwdriver, Apple part number 922-8991, available through GSX.
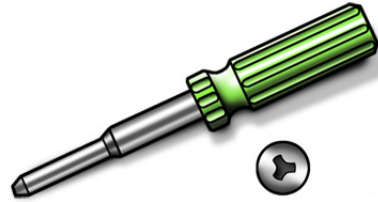
## The Glass Panel

**Warning:** The glass panel for this model is not a serviceable part. If the glass is broken or scratched, replace the display assembly. Attempting to remove the glass can permanently shatter the display face and damage other parts.

To clean the glass panel, use the Apple polishing cloth (922-8245) and iKlear Apple Polish or Brillianize anti-static spray cleaning solution. Alternatively, IPA (isopropyl alcohol) can be used.

## Keycap Replacement

Service packages of 78 replacement keycaps are now available in the U.S. and Canada (U.S. version keyboard only) for designated MacBook and MacBook Pro computers. The packages allow you to replace individual keycaps rather than the entire top case.

There are four different keycap packages, based on the color of the key and the type of keyboard (version D and S).

| Part number | Key color | Keyboard |
|---|---|---|
| 922-9277 | Black | Version D |
| 922-9279 | Black | Version S |
| 922-9278 | White | Version D |
| 922-9280 | White | Version S |

For step-by-step instructions, refer to the relevant support article: **"MacBook/MacBook Pro: Black Keycap Replacement" (HT4002)** or **"MacBook: White Keycap Replacement" (HT4003)**.

For an overview of the differences among keycap procedures, refer to **"MacBook/MacBook Pro: Keycap Replacement Matrix" (HT4001)**.

## Required Tools

**Caution:** To prevent scratches or other cosmetic damage to the computer housing, use a soft cloth as a protective layer when removing and installing the external screws.

The following tools are required to service the computer:
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetic Phillips #00 screwdriver
- Magnetic Phillips #000 screwdriver (preferably with a long handle)
- Torx T6 screwdriver
- Large tri-lobe screwdriver, for battery removal (Apple part number 922-8991)
- Black stick (Apple probe tool, part number 922-5065) or other nonconductive nylon or plastic flatblade tool
- Thermal grease (Apple thermal compound syringe)
- Alcohol wipes
- Foam wedge fixture for display assembly removal (part number 922-8779)
- Kapton tape
- Tweezers, ESD safe, extra fine points, for flat cable replacement

Refer to Knowledge Base article "Hand Tools for Desktop and Portable Repairs--AP/CA/EU/JP/LA/US" to purchase tools:

**http://docs.info.apple.com/article.html?artnum=500200**

In addition, the following software programs are required for troubleshooting:
- Apple Service Diagnostic (ASD), version 3S136
- Apple Hardware Test, version 3A186

# Serial Number Location

## System Serial Number on Bottom Case

Turn over the computer to see the system serial number etched on the bottom case.
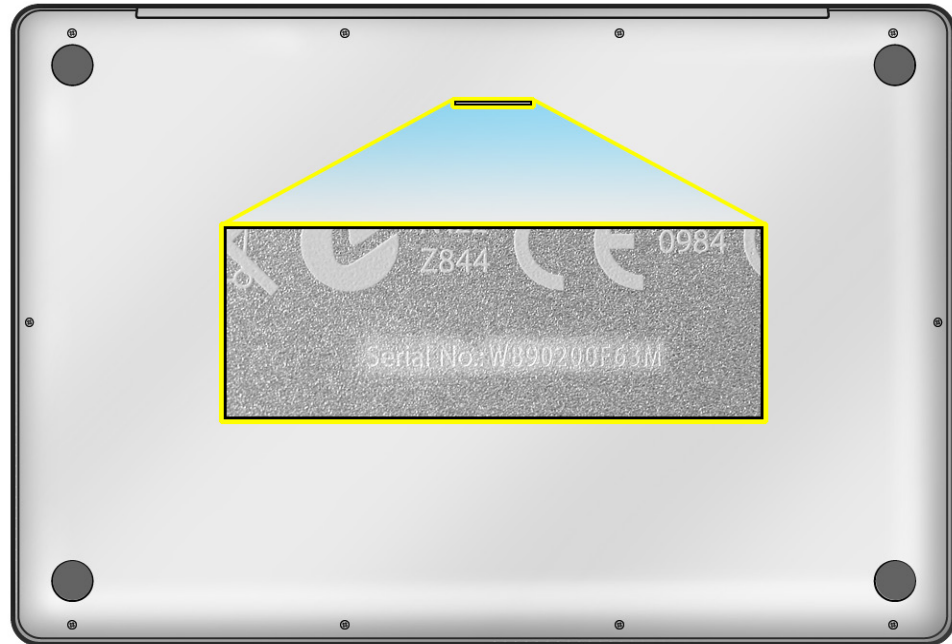


## Bar Code Serial Numbers on Memory Bracket

Additional bar code serial numbers are available inside the bottom case on the bracket that holds the memory DIMMs. The first number (13 alphanumeric characters) is for the logic board; the second number (11 alphanumeric characters) is the system serial number for the computer.
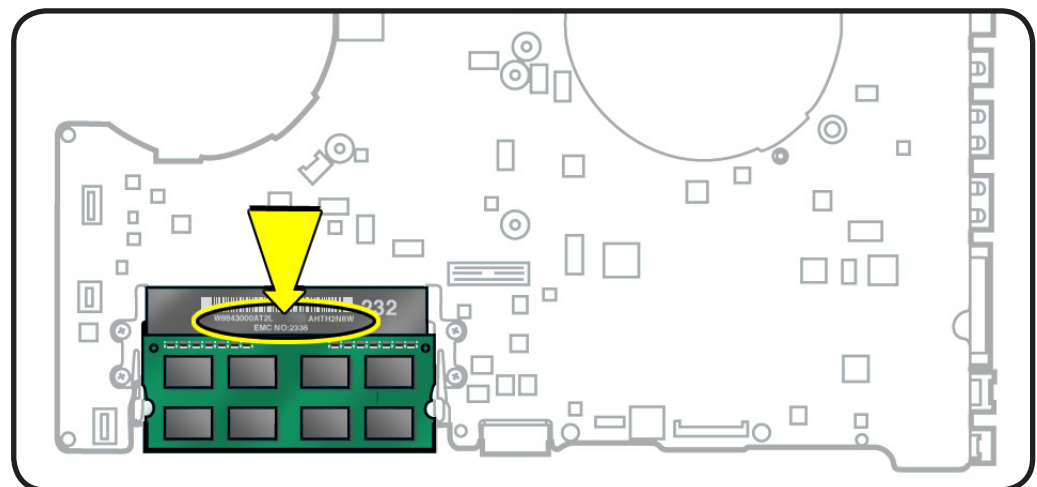
## Transferring the System Serial Number

When replacing a bottom case, retain the customer's bottom case until the repair is complete. Before installing the replacement bottom case, use a fine-tip permanent marker to write the original system serial number legibly in uppercase box letters directly onto the inside of the new bottom case.

**CAUTION: Take great care in deciphering the small typeface of the etched serial number on the bottom case. You might need a magnifying glass to see it clearly. It is imperative that you transfer the correct alphanumeric characters. Keep in mind that Apple serial numbers always use the numbers 1 and 0 instead of the Roman letters "I" and "O."**

W8915XXX2XK
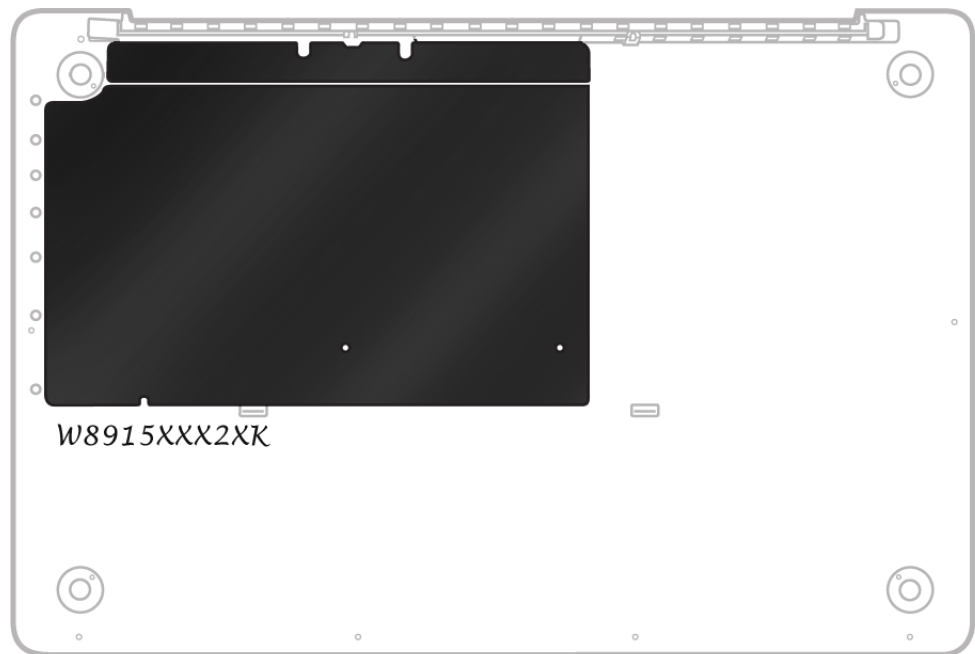
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# Troubleshooting

## MacBook Pro (15-inch, Mid 2010)

# General Troubleshooting

## Update System Software

**Important**: Whenever possible before beginning troubleshooting, ensure the latest software and firmware updates have been applied.

## Apple Service Diagnostics

Run Apple Service Diagnostic to determine if any of the thermal sensors are malfunctioning. Replace any failing sensors. See chart below for correlation between error code and part.

| Name | Location |
| --- | --- |
| TC0D | Logic Board |
| TC0P | Logic Board |
| TG0D | Logic Board |
| TG0H | Logic Board |
| TG0P | Logic Board |
| TG0T | Logic Board |
| Th2H | Logic Board |
| TN0D | Logic Board |
| TN0P | Logic Board |
| Tm0P | Logic Board |
| Ts0P | Trackpad flex |
| TB0T | Battery pack |
| TB1T | Battery pack |
| TB2T | Battery pack |
| TB3T | Battery pack |

## Test Points

There is no silkscreen text on final production logic boards. Test points mentioned in troubleshooting charts are solely for reference.

## Troubleshooting Theory

For general information on troubleshooting theory, refer to:

http://service.info.apple.com/service_training/en/006/troubleshoot/index.php?page=intro

## Hardware vs. Software

For information on how to isolate a hardware issue from a software issue, refer to:

TS1394—Mac OS X: Troubleshooting installation and software updates <**http://support.apple.com/kb/TS1394**>

HT2956—Troubleshooting Mac OS X installation from CD or DVD <**http://support.apple.com/kb/HT2956**>

For information on how to troubleshoot a software issue, refer to:

HT1199—Mac OS X: How to troubleshoot a software issue <**http://support.apple.com/kb/HT1199**>

## Clamshell Service Diagnostic Read Me

Isolating video and wireless issues in portable computers can be time consuming and confusing. The Clamshell Service Diagnostic (CSD) is a new diagnostic tool that checks Apple's latest portable computers for the presence of AirPort, Bluetooth, LCD and Ambient Light Sensor (ALS) to assist you in quickly making a failure determination.

Troubleshooting benefits of using CSD include:
- Quick way (less than 1 minute) to determine if clamshell-related modules (AirPort, Bluetooth, LCD and ALS) are electrically connected without taking apart the system.
- Results of CSD can help pinpoint if any clamshell cables may need to be reseated to logic board.
- Diagnostic results can help isolate a video or wireless issue to either the clamshell or the logic board, to avoid unnecessary replacements of these components.

CSD checks for the presence of the computer's:
- AirPort
- Bluetooth
- LCD
- ALS

CSD does not check for the presence of the computer's:
- iSight camera
- externally connected hardware components (such as USB or FireWire devices)

CSD does not check for issues with the OS X or other software-related problems such as application or extension conflicts.

## Emerging Issues

For the latest on troubleshooting issues, refer to Global Service Exchange (GSX) and reference Service Source, Knowledge Base and the Service News tabs for product specific information.

## Functional Overview

Refer to this diagram for symptoms related to MacBook Pro (15-inch, Mid 2010) logic board connectors.



**Keyboard Backlight:**
-no keyboard backlight illumination

**Camera + Camera LED +Ambient Light Sensor:**
-no camera function,
-no LED when camera is on,
-no keyboard illlumination (when ALS is covered by hand)

**Sata Optical Drive:**
-no optical drive visible on Sata bus,
-no boot from optical drive

**Right Speaker & subwoofer:**
-no sound from right speaker or woofer,
-distorted right or center sound

**AirPort/Bluetooth antennas:**
-poor/no AirPort reception,
-unable to reliably pair Bluetooth devices

**AirPort/Bluetooth card:**
-any of these communications failing,
-no startup (if AirPort cable is shorted)

**Ram:**
-no boot,
-freezes,
-kernel panic,
-video artifacts when integrated GPU is used (shared ram)

**Sata Hard Drive + Infrared receiver + Sleep LED indicator:**
-no hdd visible on Sata bus,
-no boot from hd,
-no sleep LED status,
-no infrared reception,
-no power on (shorting SMC)

**Battery :**
-not running when battery only,
-no power on (without a correct model of AC adapter present)

**Trackpad + trackpad button thermal sensor:**
-no cursor movement,
-no click action,
-unit running slow (no trackpad thermal sensor input)

**Keyboard + Power On button:**
-no power on (without shorting pads on logic board),
-dead keys

**Fan:**
-intermittent shutdown,
-freezes when too hot,
-noisy fan

**LCD + LCD Backlight:**
-poor / no video on internal LCD,
-no LCD backlight

**Magsafe connector (underneath mlb):**
-no power on,
-no battery charge

**Battery indicator LEDs + battery level button + magnetic sleep sensor:**
-no battery error indication,
-no battery level while charging,
-no battery level shown when button pressed,
-no sleep when clamshell closed,
-no video on internal display (sleep sensor stuck)

**Microphone**
-no internal microphone sound input

**Left speaker**
-no left sound,
-distorted left sound

*Connectors located on the opposite side of the MLB:*

# Block Diagram

Refer to this diagram to see how modules are interrelated.

## Liquid Contact Indicators

Liquid contact indicators (LCI) have been added to specific locations on current Mac portables to help determine if systems have been damaged by liquid. The sensors are visible only when the bottom case and some of the modules have been removed. Normally represented by small white dots, the LCIs turn red when they have come in contact with liquid, such as from an accidental spill.

For more information, refer to support article HT3400: "About liquid contact indicators (LCI) on portable computers." **http://support.apple.com/kb/HT3400**

## Common Reset Procedures

When a reset procedure is required for troubleshooting, follow the applicable steps:

### Resetting the System Management Controller (SMC)

To reset power management via the SMC chip:

1. If the computer is on, turn it off by choosing Shutdown from the Apple () menu.

2. Connect the power adapter to the computer and to a working power source.

3. **Important**: Use the keys on the left side of the keyboard. On the built-in keyboard, press Shift-Control-Option along with the power button once.

   **Note:** When the LED on the MagSafe connector is orange, resetting the SMC will change it to green for a few seconds, indicating that SMC was correctly reset.

4. Wait 5 seconds and press the power button to restart the computer. **Note**: If bottom case is removed, you may alternately reset the SMC by disconnecting the power adapter and the main battery, and holding the power button down for five seconds.

For more information:

**http://www.apple.com/support**

HT3964—Apple Portables: Resetting the System Management Controller (SMC) <**http://support.apple.com/kb/HT3964**>

## Resetting the Parameter RAM (PRAM)

To reset PRAM,

1. If the computer is on, turn it off.

2. Locate the following keys on the keyboard: Command, Option, P, and R. You will need to hold these keys down simultaneously in Step 4.

   **Note:** If the keyboard does not have an Option key, use the Alt key instead.

3. Turn on the computer.

4. Press and hold the Command-Option-P-R keys.

   **Important:** You must press this key combination before the gray screen appears.

5. Hold the keys down until the computer restarts and you hear the startup sound for the second time.

6. Release the keys.

For more information:

   **http://www.apple.com/support**

   HT1379—Apple Portables: Resetting the PRAM <**http://support.apple.com/kb/HT1379**>

## Starting Up in Safe Mode

A Safe Boot is a special way to start Mac OS X when troubleshooting. To start up into Safe Mode (Safe Boot),

1. Make sure the computer is shut down.

2. Press the power button.

3. Immediately after you hear the startup tone, press and hold the Shift key.

   **Note:** The Shift key should be held as soon as possible after the startup tone but not before.

4. Release the Shift key when you see the screen with the gray Apple and progress indicator (looks like a spinning gear). During startup, "Safe Boot" appears on the Mac OS X startup screen. To leave Safe Mode, restart the computer normally, without holding down any keys during startup.

For more information:

   **http://www.apple.com/support**

   HT1564—What is Safe Boot, Safe Mode? <**http://support.apple.com/kb/HT1564**>

   TS1884—Safe Boot take longer than normal startup
   <**http://support.apple.com/kb/TS1884**>

## Display Issue: Pixel Anomalies

When displaying a single color over the screen area, the LCD panel might show one or more pixels that are not properly lit. To determine if the display has an acceptable number of pixel anomalies, follow the steps below:

1. Set the display image to one of the following colors: all-white, all-red, all-green, all-blue, or all-black display. Knowledge Base article 112125: "**Service Diagnostics Matrix**," has the LCD Tester Diagnostic Utility that will generate these patterns on the screen.

2. Using a jeweler's loupe, pocket microscope, or other magnifying device, identify and count each pixel anomaly:

   Bright subpixel anomaly = subpixel that is always on

   Dark subpixel anomaly = subpixel that is always off

3. The number of acceptable pixel anomalies for this computer is:

| Bright | Up to 3 |
|---|---|
| Dark | Up to 5 |
| Combination | Up to 7 |

4. If the number of subpixel anomalies exceeds the acceptable number shown above, replace the LCD panel display assembly. Numbers outside the acceptable range would be

| Bright | 4 or more |
|---|---|
| Dark | 6 or more |
| Combination | 8 or more |

5. If the number of subpixel anomalies is acceptable, explain to the customer that the pixel anomalies are within specifications, and no repair is necessary.

**Important:** Do not release the specifications to customers. Instead, inform them that a certain number of subpixel anomalies are considered acceptable, and these factors apply to all manufacturers using LCD technology—not just Apple products.

When speaking with customers, please use the following explanation:

- Active-matrix LCD technology uses rows and columns of addressable locations (pixels) that render text and images on screen. Each pixel location has three separate subpixels (red, green, and blue) that allow the image to be rendered in full color. Each subpixel has a corresponding transistor responsible for turning the subpixel on or off.
- There are typically millions of these subpixels on an LCD display. For example, the LCD panel used in the Apple Cinema HD display is made up of 2.3 million pixels and 6.9 million red, green, and blue subpixels. Occasionally, a transistor does not work perfectly, which may result in the affected subpixel being turned on (bright) or turned off (dark). With the millions of subpixels on a display, it is quite possible to have a low number of faulty transistors on an LCD. Therefore, a certain number of subpixel anomalies are considered acceptable. Rejecting all but perfect LCD panels would significantly increase the retail price for products using LCD displays. These factors apply to all manufacturers using LCD technology—not just Apple products.

# Symptom Charts

Follow the steps in the order indicated below. If an action resolves the issue, retest the system to verify. **Note**: A compilation of Quick Check tables is available at **http://service.info.apple. com/QRS/en/quickreference.pdf.**

**Note:** There is no silkscreen text on final production logic boards. The photos shown with test points are from pre-production units and are solely for reference.

## Startup and Power Issues

### No Power

Unlikely cause: display assembly, speakers, optical drive, hard drive

### Quick Check

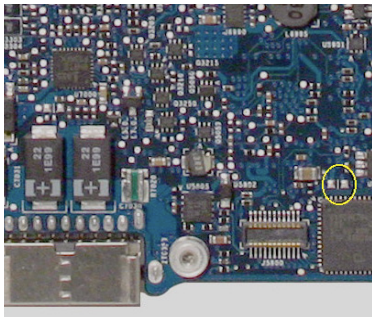| Symptom | Quick Check |
|---------|-------------|
| **No Power / Dead Unit**<br>• No power<br>• No image<br>• No startup chime<br>• No fan or hard drive spin<br>• No reset sound from optical drive<br>• No sleep LED activity<br>• No light if Caps Lock pressed<br>• Non-operational | 1. Verify AC power presence with MagSafe LED indicating on or charge state.<br>2. Verify battery status as being partly charged, charging with AC power.<br>3. Reset SMC.<br>4. Run Battery Diagnostic Utility. |

### Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Isolate peripherals as cause. Disconnect all peripherals and external devices and verify unit starts. | Yes | Suspect peripherals as cause. Reconnect each one at a time, verifying unit operation as external device is reinstalled. | |
| | No | Go to step 2 | |

| | | | | |
|---|---|---|---|---|
| **2.** Reset SMC (remove all system power for 1 minute), and verify unit starts. Can system start up after SMC reset. | Yes | Corrupt SMC state preventing power on. Issue resolved with SMC reset. | |
| | No | Go to step 3 | |
| **3.** Will system power up with battery only? Check battery level LED indicator for status of battery charge or battery use error. Inspect battery connector for burn marks or damaged pins if substituting a known-good battery to verify starting on battery. | Yes | System can start up from known-good battery. Original battery possibly at fault or needs to be charged. Verify original battery functionality and charge; then verify AC adapter functionality. Go to step 4. | **P11** |
| | No | System will not power using known-good battery only. Go to step 5 | |
| **4.** Customer battery may be run down, or not recognized. Verify customer battery in a known-good system is recognized and accepting a charge. Confirm customer battery is not consumed nor defective. | Yes | Battery is recognized, charging and health is good. Return to test unit with customer battery and AC adapter power. Go to step 6. | |
| | No | Replace customer battery for not charging (P10) or not recognized (P11). Customer to purchase a replacement battery if consumed. | **P10** or **P11** |
| **5.** Inspect battery cable connection at logic board and reseat if necessary. Replace battery if battery cable is damaged or burned. Verify if the system powers on from a charged battery. | Yes | Battery power restored, retest unit with customer battery and AC adapter power. Go to step 6. | |
| | No | Logic board is expected to power on with battery only. Inspect and test power on key. Go to step 10. | |
| **6.** Inspect MagSafe power adapter. Verify AC adapter is correct wattage, compatible with product and works on known-good computer. | Yes | Power adapter is good, go to step 7 | |
| | No | Release stuck pin(s). Replace adapter if it is not working, or if it has wire damage or burned pins. | **P14** |

| | | | |
|---|---|---|---|
| **7.** Inspect MagSafe port on computer for physical damage, debris or metal fragments attracted to magnetic connector. Verify if MagSafe connector is clean and free from defects. | Yes | Go to step 8 | |
| | No | Clean port assembly. Replace MagSafe board if necessary. | **X03** |
| **8.** Verify adapter status LED turns on green then orange indicating power and battery charge in progress. A green LED can indicate a full battery, removal of battery or battery not recognized. | Yes | System starts and has power. MagSafe LED indicates power is flowing to logic board. Verify customer battery will also charge. Review battery health to ensure customer satisfaction. | **P11** |
| | No | AC power is down or battery is not charging. Go to step 9 | |
| **9.** Verify power from adapter is present on logic board. Remove system battery, use AC power only. Reseat or test known-good MagSafe cable to achieve power for logic board. | Yes | Logic board has power adapter energy to start system. MagSafe cable reseat or replacement resolved issue. If still no system power on indications, go to step 10 | **X03** |
| | No | AC adapter power not going to logic board power supplies. Replace logic board. | **M21** |
| **10.** Remove two screws on metal cable cover to access keyboard connector and plug a known good powered AC adapter.<br><br>-Try to power system using top case power key. If no power on, reseat keyboard flex cable to logic board and retest.<br><br>If no power on , short the two pads (as illustrated) and verify if system powers on.<br><br>- If no power on, the power key may be stuck. Disconnect keyboard cable and try shorting the two pads again. Verify if system powers on. | Yes | Power on key works fine, issue resolved. | |
| | | Power on key works after keyboard cable is reseated. Issue resolved. | |
| | | Power on key was stuck, had to disconnect keyboard cable to be able to power on by shorting pin 5 to ground. Replace top case for stuck power on key. | **K05** |
| | No | No logic board power on when shorting power button pads on logic board. Replace logic board. | **M01** |

## Won't Start Up

Unlikely cause: display assembly, speakers, fan, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Power but No start up**<br>• No startup chime, some video activity, Apple logo, startup spin dial<br>• Startup chime with possible beep tones.<br>• Fan, hard drive spin or optical drive reset sound<br>• Sleep LED is on , blinking or went out<br>• Caps Lock LED toggles when pressed | 1. Reset SMC.<br>2. Verify startup process passes initial memory checks – no beep errors or flashing sleep LED indicators. Display activity is starting up.<br>3. Clear PRAM. Verify starts up from user drive.<br>4. Connect known-good external bootable device and press Alt key during startup then select external startup device to bring up system for diagnostics.<br>5. Verify presence and status of user hard drive. Use Disk Utility to repair drive and file permissions. |

### Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Reset SMC and Clear PRAM to set default startup device to internal hard disk drive (HDD). | Yes | User hard drive bootable, issue resolved default settings. | |
| | No | Customer system not starting up. Go to step 2 | |
| 2. Verify if system is indicating a memory error with a repeated 1 or 3 flashes sequence of sleep LED or beep tones (if sound is enabled). | Yes | Troubleshoot memory issues. Go to step 3 | |
| | No | Continue with startup sequence verification. Go to step 4 | |
| 3. Reseat customer memory and/or swap in known-good memory to isolate bad memory and replace defective parts. | Yes | Customer memory defective and replaced. Continue to verify startup process. Go to step 4 | **X02** |
| | No | Should known-good memory fail in one or more slots, replace logic board. | **M07** |

| | | | |
|---|---|---|---|
| **4.** Hold the Alt (Option) key during startup and verify there is a bootable hard drive shown in Startup Manager. Choose customer hard drive. Verify if system can start up from this drive. | Yes | System starting up from customer hard drive. Startup issue resolved. | |
| | No | Customer hard drive not present or does not start up from this drive. Continue to find bootable device. Go to step 5. | |
| **5.** Insert product OS install disc in optical drive. Install disc is bootable and should be present in Startup Manager. Verify if system can start up from OS install disc. | Yes | Starts up from optical drive - customer hard drive not yet bootable. Go to step 8. | |
| | No | Computer has no internal bootable devices. Test external startup devices. Go to step 6. | |
| **6.** Boot from a known-good bootable copy of product OS on a USB drive or network server to start up and verify internal mass storage devices are available using System Profiler and Disk Utility. | Yes | System started up from external device and reports data regarding internal SATA devices. Go to step 7. | |
| | No | No startup devices available. Replace logic board | **M02** |
| **7.** Troubleshoot optical drive cable connection, optical cable failure or optical drive failure step by step:<br>**-**Reseat optical drive cable and retest,<br>**-**Replace with known-good optical drive cable and retest,<br>**-**Test with known-good optical drive. | Yes | Cable reseat solved issue. Continue to verify hard drive issues. Go to step 8. | |
| | | Defective optical drive cable found and replaced. Continue to verify hard drive issues. Go to step 8. | **X03** |
| | | Defective optical drive found and replaced. Continue to verify hard drive issues. Go to step 8. | **J03** |
| | No | Replace logic board | **M19** |
| **8.** Use Disk Utility loaded from OS install disc to verify if hard drive is available on device list. Verify if customer hard drive is listed in Disk Utility. | Yes | Customer hard drive available for inspections and repair. Go to step 10. | |
| | No | Hard drive not present, troubleshoot hard drive and cable. Go to step 9. | |

| | | | |
|---|---|---|---|
| 9. Troubleshoot hard drive cable connection, cable failure or drive failure step by step: <br> -Reseat hard drive cable and retest, <br> -Replace with known-good hard drive cable and retest, <br> -Test with known-good hard drive. | Yes | After SATA cable is reseated, customer hard drive visible in Disk Utility. Go to step 10. | |
| | | Defective hard drive SATA cable found and replaced. Customer hard drive is now visible in Disk Utility. Go to step 10. | **X03** |
| | | Suspect customer hard drive defective. Attempt OS restore. Go to step 10. | |
| | No | Known-good hard drive and known-good hard drive cable used, but still no hard drive seen. Replace logic board | **M19** |
| 10. Boot system with Shift Key down. Verify if system boots in Safe Mode. | Yes | Go to software troubleshooting article | |
| | No | Go to step 11 | |
| 11. Use Disk Utility to repair customer hard drive and repair permissions if system OS found on hard drive. Verify if hard drive is bootable after software repairs. | Yes | OS on customer hard drive repaired, issue resolved. | |
| | No | Hard drive not bootable, perhaps missing OS. Go to step 12 | |
| 12. Use Disk Utility to partition customer hard drive with one GUID partition then restore Mac OS from product OS install disc. Verify if hard drive is bootable after OS instal. | Yes | Customer hard drive now starts up from new OS image. Issue resolved | |
| | No | Replace hard drive. | **H02** |

## Intermittent Shutdown

Unlikely cause: hard drive, optical drive

### Troubleshooting Shutdown Issues

Before troubleshooting shutdown issues, always do the following:

- Run the available Apple diagnostics to check for cause of previous shutdown(s). Running ASD also helps isolate any abnormal value reading from a thermal, voltage, or current sensor or from a fan speed meter.
- Collect all available information from the user on shutdown details: periodicity, power state when issue happens, running applications, running time before shutdown.

**User-related shutdowns**

A computer shutdown may be caused by user operation. Shutting down the computer (by selecting the Shut Down menu, by pressing the power button for at least 4 seconds, or by programming a timed shutdown in the Energy Saver preferences) should not be considered as a failure unless the power button or the magnetic sleep sensors are found to be defective.

Suggested steps for troubleshooting:
- Reset SMC.
- Check Energy Saver preferences settings.
- Test top case button and magnetic sleep sensor operation and secure connection to logic board.

**Activity-related system shutdowns**

These shutdowns are linked to system settings, devices drivers, applications, or operating system freezes.
- System could not finish the standard shutdown process and had to force shutdown.
- An installed watchdog detected that an application did not respond within the specified time. (This watchdog can be enabled in Mac OS X Server Energy Saver preferences.)

Suggested steps for troubleshooting:
- Check the system logs and activity monitor utility for clues on the freezing process.
- Check for available software and firmware updates for installed device drivers, applications, or operating system.
- Start the system from a known-good and up-to-date bootable drive for issue reproduction.

**Power-related system shutdowns**

These shutdowns are due to power management, poor connections or defective power sources.
- External or battery power source was removed.
- Battery went empty while computer was on.
- Battery went empty while computer was asleep.

Suggested steps for troubleshooting:
- Reset SMC.
- Check that AC cable, AC adapter and battery connections are secure to logic board.
- Verify battery and power adapter sources using the Battery and Adapter test utility.

**Hardware-related system shutdown**

These shutdowns are due to temperature, voltage, current, fan speed or other hardware-related sensor values going out of range.
- One of the temperature sensors reached a specified temperature limit.
- One of the voltage sensors reached a specified voltage limit.
- One of the current sensors reached a specified current limit.

Suggested steps for troubleshooting:

- Check all sensors connections and values using Apple Service Diagnostics and other available Apple Service utilities.
- Confirm correct Apple-branded battery and power adapter are installed.
- Check for abnormal battery temperature.
- Check fan(s) operation.
- Confirm cleanliness of heatsink fins and air flows.
- Confirm heatsink is correctly seated on logic board and thermal material is present.

## Quick Check

| Symptom | Quick Check |
|---|---|
| **Intermittent shutdown**<br>• Powers off during startup<br>• Powers off with desktop use | 1. Collect details from customer on shutdown occurrence and system configuration when it happens (on battery, when running for a while, frequency of shutdowns, running applications, shutdown repeatability). If shutdown can be easily reproduced, check next steps:<br><br>2. Verify battery charge status<br><br>3. Check AC adapter MagSafe connector and connection with system<br><br>4. Reset SMC and PRAM<br><br>5. Start up with shift key down for safe mode<br><br>6. Startup from known-good bootable device<br><br>7. Run ASD for sensors + thermal tests |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Activity related shutdowns: Reset SMC and PRAM and verify that shutdown issue still happens. | Yes | Check with known-good bootable drive: go to step 2 | |
| | No | Shutdown cause was related to SMC or Pram programmed shutdown settings or corruption, and was resolved by reverting them to default settings. | |

| | | | | |
|---|---|---|---|---|
| **2.** Booting from known-good bootable drive , verify that shutdown issue still happens. | Yes | Go to Power related shutdowns on step 3 | |
| | No | Shutdown events do not happen on known-good OS. Reinstall Mac OS on customer hard drive, update OS with latest version and check if any firmware update is available. | |
| **3.** Power related shutdowns : verify that shutdown issue can ONLY be reproduced with user's battery and AC adapter. | Yes | Intermittent power issue means checking user's AC cable for intermittent connection, checking user's battery and AC adapter health, | |
| | No | Issue also happens with known-good battery and AC adapter. Go to step 4 | |
| **4.** Reset SMC and PRAM, then verify if shutdown symptoms does not happen anymore. | Yes | Shutdown cause was related to SMC or Pram settings or corruption, and was resolved by reverting them to default settings. | |
| | No | Shutdown event still occurs. Go to step 5. | |
| **5.** Check system running on battery only. Use known-good charged battery. Verify if shutdown/reset/sleep issues disappear when known-good battery is used without AC adapter. | Yes | Recharge customer battery and retest. Check for customer battery health in Apple System Profiler or run Battery & Adapter Test utility, and replace battery if its health is reported bad or consumed. | **P09** |
| | No | Symptoms unchanged - Go to step 6 | |
| **6.** Check with known-good AC adapter source only Remove battery and use known-good AC adapter. Verify if the shutdown/reset/ sleep issues disappear with known-good adapter. | Yes | Faulty user's AC adapter. Replace user's AC adapter if AC cable and duckhead were confirmed good. | **P14** |
| | No | Symptoms unchanged - Go to Hardware-related shutdowns on step 7 | |

| | | | |
|---|---|---|---|
| **7.** Hardware-related shutdowns: Run ASD and verify if a sensor failure is reported. | Yes | -If a temperature or a fan sensor failure is reported, go to step 8<br><br>-If a voltage or a current sensor failure is reported in ASD with known good AC adapter and batteries, replace logic board. | **M23** |
| | No | Setup ASD to loop test suite for burn in tests and go to step 7. If no failure is found after burn in tests, return unit to customer for no failure found. | |
| **8.** Verify if a thermal sensor or fan failure is reported in ASD. | Yes | -If fan not running failure, check for fan cable seating and retest. If same failure after retest replace fan with known-good fan and retest. If issue does not happen with known-good fan, replace user's fan.<br><br>-If an over temp failure reported, check for cause of over temp, like obstructed vent, dust in heatsink fin, clogged fan and retest. If still failing replace part where sensor is located (logic board, battery, or trackpad) according to the sensor location table . Go to step 9 | **X22**<br><br><br><br><br><br>**M23**<br>**P17**<br>**K99** |
| | No | Replace Thermal module Go to step 9 | **X10** |
| **9.** Isolate if issue solved Verify if shutdown/issue does not happen anymore after part exchange. | Yes | Issue fixed | |
| | No | Replace logic board with corresponding symptom:<br>-if for thermal error cause<br>-if for other cause | **M18**<br>**M08** |

## No Video/Bad Video

Unlikely cause: hard drive, optical drive, top case, battery, power adapter

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Power, but No Video**<br>• Power<br>• No video<br>• Fan, hard drive spin, or optical drive reset sound<br>• Sleep LED is on or went on<br>• Light if Caps Lock pressed | 1. Reset SMC.<br>2. Reset PRAM.<br>3. If no startup chime, verify with known-good memory.<br>4. Verify with external monitor.<br>5. Press Alt key on startup.. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Characterize video issue<br>Define if the issue is a bad image with backlight OR a no video issue.<br>Verify if some image, even distorted, is visible. | Yes | Bad image quality, go to step 5 | |
| | No | No image seen or no backlight, go to Step 2 | |
| 2. Isolate Peripherals as cause<br>Disconnect all peripherals, external devices, and display adapters if present, and verify if video is displayed. | Yes | Suspect peripherals as cause. Reconnect one at a time, verifying unit operation at each stage | |
| | No | Go to Step 3 | |
| 3. Adjust Brightness<br>Power-on unit , attempt to adjust brightness to maximum using brightness (F1/F2) keys and verify if video is displayed. | Yes | Video displayed - Brightness set to minimum, panel backlight was inadvertently turned off. If backlight returns to low check for stuck F1 key on keyboard. | |
| | No | Go to Step 4 | |
| 4. Reset SMC and verify if system video is displayed. | Yes | Corrupt SMC State preventing video. | |
| | No | Go to Step 5 | |

| | | | |
|---|---|---|---|
| **5.** Reset PRAM. If no action, use external keyboard with same sequence. Verify if system video is displayed. | Yes | Invalid or Corrupt PRAM contents affecting video output | |
| | No | Go to step 6 | |
| **6.** Connect External video Connect known-good VGA/ DVI adapter to known-good display, press power button and close display to force main screen startup on external video. Verify if video is correct when displayed from external display. | Yes | Video correct on external display. Research available firmware and software updates, retest.<br><br>If returning with software already updated, go to Step 7 | |
| | No | Replace logic board with according symptom code: -no video -bad/distorted video | **M03** **M04** |
| **7.** Isolate LCD display detection Disconnect external monitor and reopen display and restart unit. Verify if sleep LED indicator goes off after internal LCD has been detected. | Yes | Sleep LED goes off when LCD detected. -If still no video then Go to step 8, -If video present, but with defect, go to step 9 | |
| | No | Internal LCD not detected. Run Clamshell Service Diagnostic utility and check for LCD panel presence. If not found, reseat LVDS cable connection on logic board and retest. If sleep led still does not go off after cable is reseated, go to step 10 | |
| **8.** Check for sleep sensor condition. If display assembly sleep sensor is stuck in a closed state, video will appear on internal display temporarily, until the OS sleeps the system. Disconnect BIL/ sleep cable and restart unit without external display. Verify if system starts up with video on internal display stays on and does not go into sleep mode. | Yes | Sleep sensor was stuck or had shorted cable. Replace BIL/ sleep sensor cable. | **X13** |
| | No | Symptoms unchanged. Go to step 9 | |

| 9. Check for No Backlight Condition. Power on unit. Using a lamp or bright light source, inspect for faint image, and verify if a faint image can be seen. | Yes | Logo image visible - check LVDS cable and inspect for damage near clutches: . if damaged, replace display assembly and go to step 11 . if cable is not damaged, run Clamshell Service Diagnostic utility and check for LCD panel presence, If not found, reseat LVDS cable and retest, then go to step 11 | **L09** |
|---|---|---|---|
| | No | If symptom continues, go to step 10. | |
| 10. Verify with Known good display assembly Connect known-good display assembly to system. | Yes | System is functioning with known-good display assembly Replace display assembly if following symptom reporting: - had no power issue - had incorrect/missing colors - had blank video - had distorted / blurred video - had vertical/horizontal lines - had noise/unstable flickering - had dim backlight - had bad spot(s)/pixels - had no backlight - could not change resolution | **L01** **L02** **L03** **L04** **L05** **L06** **L07** **L08** **L09** **L10** |
| | No | Symptoms unchanged. Replace logic board. | **M03** |
| 11. Verify with reseated backlight cable or replaced display assembly Verify if unit now has video and backlight. | Yes | Issue was only due to damaged display assembly or unseated cable. | |
| | No | Previous display cable damaged the logic board. Replace logic board. | **M25** |

## Battery Isn't Recognized or Won't Charge

Unlikely cause: display assembly, speakers, optical drive, hard drive, trackpad

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Battery isn't recognized or won't charge**<br>• AC adapter<br>• No MagSafe LED indicator<br>• No orange charge indication<br>• Battery status LEDs:<br> - single chase<br> - all flash<br> - no LED | **1.** Check battery level and test AC power.<br>**2.** Reset SMC by pressing the (left) Shift-Control-Option keys along with the power button once.<br>**3.** Test system, using Battery Diagnostic Utility. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Verify if the MagSafe LED goes from green to amber when connected to the system. | Yes | Battery is recognized and charging. Go to step 6 | |
| | No | LED is green, Battery may be full or not recognized. Go to step 2 | |
| | | LED was on momentarily then went out. Go to No Power for system (M01) | |
| **2.** When the Battery status button is pressed, verify if any of the lights comes on. | Yes | Go to step 3 | |
| | No | Go to step 11 | |
| **3.** When battery level button is pressed, verify if battery status indicates a fully charged battery with all LEDs on. | Yes | Customer battery charged, check health. Go to step 13. | |
| | No | Go to step 4 | |
| **4.** Verify if battery status indicates the battery is not recognized with a single LED on that chases back and forth 5 times. | Yes | Go to step 8 and tag battery as a possible P11 candidate. | **(P11)** |
| | No | Go to step 5 | |

| | | | |
|---|---|---|---|
| **5.** Verify if battery status indicates the battery is recognized but not charging with all LEDs blinking. | Yes | Go to step 8 and tag battery as a possible P10 candidate | **(P10)** |
| | No | Go to step 6 | |
| **6.** Verify if battery status indicates battery charge and flash the next level 5 times. | Yes | Customer battery charging, check battery condition.  Go to step 13 | |
| | No | Flashing first LED only, go to step 7 | |
| | | No battery status LEDs on, go to step 11 | |
| **7.** Verify if battery status indicates a low battery with a LED flashing rapidly indicating initial charging of battery. | Yes | Allow customer battery to charge to 1 LED on before checking battery condition. Go to step 13. | |
| | No | Go to step 8 | |
| **8.** Test with a known-good battery.  Verify if battery is recognized and charging. | Yes | Replace customer battery (P10 not charging or P11 not recognized) | **P10 or P11** |
| | No | Go to step 9 | |
| **9.** Inspect customer battery contacts and battery cable connector, and verify any trace of corrosion or obstructions. | Yes | Clear obstructions or replace the battery if cable if corroded and recheck.. | **X03** |
| | No | Go to step 10 | |
| **10.** Reseat battery harness at logic board connector, and retest. Verify if battery is recognized and charging. | Yes | Issue resolved by cable reseat. Check battery condition, go to step 13 | |
| | No | Replace logic board | **M20** |
| **11.** Battery status LEDs not working - inspect for any button stuck or cable disconnected at logic board and reset SMC. | Yes | LED status now working. Go to step 3. | |
| | No | Go to step 12. | |
| **12.** Remove system battery status indicator ,and test with known-good battery status indicator assembly. Verify if LEDs now indicate a correct battery level. | Yes | Replace customer battery LED indicator assembly. Go to step 3 | **X03** |
| | No | Replace customer logic board. | **M20** |

| | | | |
|---|---|---|---|
| **13.** Open Apple System Profiler and click on the Power Tab on the left. Verify if the battery cycles amount is over 1000 cycle counts. | Yes | Battery has been consumed, and customer will need to purchase a replacement. | |
| | No | Go to step 14. | |
| **14.** Vefiy that battery is less than a year old. | Yes | Go to step 16 | |
| | No | Battery warranty expired, go to step 15 | |
| **15.** Considering the age of the battery greater than one year old, verify if the health of the battery is "Good" according to System Profiler. | Yes | Battery is in good health and out of 1 year warranty coverage. Battery should continue to function until consumed. | |
| | No | Battery is consumed after warranty coverage. Customer to purchase a new battery. | |
| **16.** For batteries still covered by warranty, verify if the health of the battery is "Good." | Yes | Battery functioning normal. Go to step 17. | |
| | No | Battery has premature capacity loss. Replace customer battery. | **P08** |
| **17.** With battery charge greater than 20% verify if battery supports system operation without AC connected. | Yes | Customer battery is good | |
| | No | Go to step 18 | |
| **18.** Test with a known-good battery.  Verify if a known-good battery supports battery-only operation. | Yes | Replace customer battery for will not run system on battery alone | **P12** |
| | No | Replace logic board | **M20** |

# Kernel Panic/System Crashes

Unlikely cause: Battery, Power Adapter

## Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Memory Issues/Kernel panic and freezes**<br>• Display notice of system kernel panic during start up and desktop use.<br>• System freeze during use.<br>• System freeze upon wake from sleep. | 1. Reset SMC and clear PRAM<br>2. Remove suspect external devices.<br>3. Verify user memory is Apple-approved memory, and memory configuration matches memory installed.<br>4. Start up with shift key down for safe mode.<br>5. Startup from known-good bootable device<br>6. Check panic.log info for crash cause<br>7. Run AHT for sensors test |

## Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Isolate Peripherals as cause. Disconnect all peripherals, external devices, and display adapters if present and verify if issue does not happen anymore. | Yes | Suspect peripherals as cause. Reconnect one at a time, verifying unit operation at each stage | |
| | No | Go to Step 2 | |
| 2. Reset SMC and clear PRAM then verify if unit starts without panic issues. | Yes | Issue resolved with default startup settings. | |
| | No | Go to step 3 | |
| 3. Boot in Safe Mode with Shift key down, and check for recent kernel panic data in panic log.<br><br>Open Panic.log file on hard drive and check for affected interface that crashed. If unit still crashes during startup, you will need to take out disk to a good system to access the file. Verify if kernel panic dependency is not linked to an I/O interface. | Yes | Kernel Panic is not a system I/O related device. Go to step 5 | |
| | No | I/O device related crash, go to step 4 | |

| | | | |
|---|---|---|---|
| **4.** Remove I/O device where possible to pinpoint faulty device:<br><br>- Disconnect camera cable from display assembly (for, camera, and Ambient Light Sensor). Camera cable can be disconnected without affecting startup and test.<br><br>- Disconnect AirPort/Bluetooth card to isolate AirPort/Bluetooth functionality.<br><br>- Disconnect optical drive cable to isolate optical drive.<br><br>- Disconnect hard drive cable to isolate hard drive.<br><br>-Memory cards can be removed, relocated, or tested with known-good memory. Because system will run on one card, this is a useful test for finding bad memory or bad memory slot.<br><br>If issue remains after testing I/O device, replace with known-good part(s) to confirm issue resolved. | Yes | System starts up when I/O device removed, replace affected I/O device or module containing it.:<br><br>-If Camera cable connection is crashing system, replace clamshell assembly for damaged Camera/ALS cable.<br><br>-If AirPort /BlueTooth card presence is crashing system, replace AirPort/BlueTooth flex cable and retest. If issue still happens with new cable, replace AirPort /BlueTooth card<br><br>-If optical drive presence is crashing system, replace optical drive cable and retest. If issue remains try with known-good optical drive. If still issue, replace optical drive.<br><br>-If hard drive presence is crashing system, replace hard drive cable and retest. If issue remains, try with known-good hard drive. If still issue, replace hard drive.<br><br>-Reseat memory or replace suspect memory with known-good Apple memory. | **L14**<br><br><br>**X03**<br><br>**N13**<br><br><br>**X03**<br><br>**J03**<br><br><br>**X03**<br><br>**H01**<br><br><br>**X01** |
| | No | Symptoms unchanged, go to step 5 | |
| **5.** Start up from optical drive or known-good OS.<br>Attempt to start up with original or product install disc, or from an external hard drive with product OS installed, and verify if system starts without kernel panic. | Yes | Kernel panics cease running alternate OS. Run ASD/DiskUtility to repair and test hard drive. If repair attempts fail, repartition hard drive and reinstall OS. Replace hard drive if restore fails. | **H03** |
| | No | Symptoms unchanged, go to Step 6 | |

| | | | |
|---|---|---|---|
| **6.** Disconnect display assembly and test with known-good display assembly or external monitor. Verify if system now starts up without kernel panic/ freeze. | Yes | Replace display assembly. | **L14** |
| | No | Go to step 7 | |
| **7.** Check for thermal values and fan running speed<br>Run ASD to check for fan and sensors test, and verify if ASD does not report any overtemp, failing sensor, or fan. | Yes | No thermal fail detected - Replace logic board with matching symptom:<br><br>- If hang or freeze<br><br>- If Kernel Panic/system crashes | **M05**<br><br>**M06** |
| | No | If sensor test failed, reseat sensor connections on logic board and retest. If still failing, replace sensor or part where it is located (top case, display, other) :<br>If top case sensor failed<br>If display sensor failed<br>If logic board sensor failed<br>If fan test failed, replace fan.<br>If overtemp , replace heatsink. | **X99**<br>**L14**<br>**M18**<br>**X03**<br>**X10** |

## Battery Run Time Too Short

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Battery Run Time Too Short**<br><br>Battery runs out of power very quickly (less than two hours) | 1. Check if the battery is covered under a repair extension program. Use the "Portable Computer Battery Screening Process for Apple Service Providers" (**Knowledge Base CP165**).<br><br>2. Verify no applications have runaway processes with the CPU. See "Runaway applications can shorten battery runtime" (**Knowedge Base TS1473**).<br><br>3. Use "Apple Portables: Battery Life" (**Knowledge Base HT1466**) to screen for short battery run time. If replaced for run time too short, regardless of warranty coverage, use symptom code **P09** if replaced. |

# Won't Run on Power Adapter Alone

Unlikely cause: RAM, display assembly, hard drive, optical drive, top case, speakers, camera, microphone

## Quick Check

| Symptom | Quick Check |
|---|---|
| **Won't Run on Power Adapter Alone**<br><br>Runs on battery but not on power adapter only. | 1. Verify proper wattage adapter is being used.<br>2. Check for dirty or stuck pins on the MagSafe connectors, both on the adapter and the computer.<br>3. Connect the AC adapter to known-good power source.<br>4. Verify power cord or plug is properly attached to AC adapter and MagSafe cable is not damaged.<br>5. Reset SMC by pressing the (left) Shift-Control-Option keys along with the power button once. |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. With battery removed, verify if a known-good AC adapter starts up ,runs the system and shows MagSafe LED status. | Yes | Confirm user's AC adapter as bad and replace. | **P14** |
| | No | Verify MagSafe board cable seating to logic board. Go to step 2 | |
| 2. Verify if a known-good power adapter's LED light up either green or amber. | Yes | SMC on logic board senses AC power adapter. Go to step 3 | |
| | No | Replace the MagSafe board. Go to step 3. | |
| 3. Disconnect battery and verify if the unit also runs on a known-good power adapter. | Yes | Issued resolved. | **X03** |
| | No | Replace logic board.. | **M01** |

## Power Adapter Issue

Unlikely cause: logic board, RAM, display assembly, hard drive, optical drive, top case, speakers, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Power Adapter Issue**<br>• No power<br>• No Power LED<br>• Non-operational<br>• Stuck /broken pin | 1. Connect AC adapters MagSafe connector to the computer. The LED on the connector should be green or amber.<br><br>2. Verify power cord, or plug, is firmly attached to AC adapter.<br><br>3. Verify AC power source is supplying AC power.<br><br>4. Check for dirty or stuck pins on the MagSafe connectors, both on the adapter and the computer. Use and cleaning of power adapter with MagSafe<br><br>5. Reset SMC by pressing the (left) Shift-Control-Option keys along with the power button once. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Verify if the MagSafe LED is green or amber while connecting a known-good AC adapter on customer system. | Yes | SMC on logic board senses AC power adapter and enabled power. Go to step 4. | |
| | No | Verify MagSafe interconnect board is connected to logic board. Go to step 2 | |
| 2. Verfiy that the unit runs on a known-good AC power adapter only. | Yes | Issued resolved. | **P99** |
| | No | Replace the MagSafe interconnect board. Go to step 3. | |
| 3. Verify the MagSafe LED is green or amber while connecting known-good power adapter on customer system. | Yes | Bad MagSafe interconnect board. Issue resolved. | **X03** |
| | No | Go to step 4 | |

| 4. Verify if the customer power adapter have stuck or bent pins on the MagSafe connector end. | Yes | Replace power adapter. | **P15** |
| | No | Go to step 5 | |
| 5. Verify if the cable or duckhead have visible damage. | Yes | Replace cable or duckhead. | **P16** |
| | No | Go to step 6 | |
| 6. Verify that LED on MagSafe connector is displaying both green (if battery charged) and orange (when charging). | Yes | Verify adapter with known-good unit and customer unit and troubleshoot source of error | |
| | No | Replace power adapter. | **P03** |

## Noise / Hum / Vibration

Unlikely cause: RAM, display assembly, top case, camera, microphone, battery

### Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Noise / Hum / Vibration** <br><br> Computer or AC adapter emits a noise or vibration. | 1. Verify and reproduce the source of the noise from the computer / adapter with the customer. <br><br> 2. If the AC adapter is the source of the noise disconnect and try a known-good adapter. (A small amount of hum or vibration is normal with AC adapters.) |

### Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Verify if the use of a known-good AC adapter eliminates the noise/vibration. | Yes | Replace AC adapter. | **P04** |
| | No | Go to step 2 | |
| 2. Verify if the noise is heard through the speakers and / or connected headphones. | Yes | Go to step 3 | |
| | No | Go to step 4 | |

| 3. Disconnect any peripheral devices, cards, or cables attached to the unit. Verify the noise is gone. | Yes | Check for possible ground loop. | |
|---|---|---|---|
| | No | Go to step 6 | |
| 4. Locate the source of the noise. Verify if the noise comes from the optical drive usage. | Yes | Check with a different media disc. Possible issue with disc label or out of balance media. If not related to media, and noise is above normal level, replace optical drive. | **J04** |
| | No | Go to step 5 | |
| 5. Verify if the noise comes from the hard drive. | Yes | It is normal for drives to produce noise when they spin up or the heads move. Replace drive if noise is above normal levels. | **H06** |
| | No | Go to step 6 | |
| 6. Verify if the noise is coming from the fan. | Yes | The fan(s) are generally running in a slow mode, but may accelerated when intensive processing is required (calculation, 3D gaming, or screen saver animation). If still beyond expected sound level, check for interference of fan with other mechanical element of system (foam, bracket, shield) before replacing a noisy fan. | **X03** |
| | No | Go to step 7. | **P04** |
| 7. Noise maybe related to interference from other electrical devices operating near the computer, or on the same AC power source. Verify if noise is gone when operating in a different location on a different AC circuit. | Yes | Perhaps operating the unit with a surge suppressor will eliminate or reduce the noise. Change location of use or limit use of other device that is inducing the noise. | |
| | No | Replace logic board. | **M99** |

## Burnt Smell / Odor

Unlikely cause: Enclosure

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Burnt Smell / Odor**<br><br>Computer or power adapter emits an odor or smell of smoke. | 1. Disconnect the battery and AC adapter from the computer.<br><br>2. Attempt to identify the source of the odor. Visual clues are component damaged like capacitor chip popped or burn marks. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Verify if the source of the odor has been identified. | Yes | Replace the affected part. | **P08** |
| | No | Go to step 2 | |
| 2. Verify if there are any burn marks visible on components. | Yes | Replace the affected part. | **P08** |
| | No | Go to step 3 | |
| 3. Refer to **Liquid Contact Indicators**. Verify if any of the liquid spill sensors turned red. | Yes | For more information, refer to Knowledge Base article **http://support.apple.com/kb/HT3400**: "About Liquid contact indicators (LCI) on portable computers. | |
| | | Go to step 4 | |
| 4. Verify if the computer is operating normally. | Yes | This could be related to normal operation. Also check for accidental damage cause using Knowledge Base article **http://support.apple.com/kb/CP161** ". | |
| | No | Please refer to best related troubleshooting section. If after inspecting the unit you feel there is a possible safety issue with the computer or AC adapter, please notify Apple. | |

## Battery Leaking or Swollen

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Battery Leaking or Swollen** <br>• Trackpad button does not work <br>• Battery pack case has opened. <br>• Bottom cover cannot be reinstalled | 1. Check if the battery is covered under a repair extension program. Reference: MacBook, MacBook Pro (15-inch) or MacBook Pro (17-inch) with swollen battery article (**Knowledge Base TS2358**). <br><br> 2. Use the "Portable Computer Battery Screening Process for Apple Service Providers" (**Knowledge Base CP165**) and use "Battery pack is visibly deformed" case under section 2E. Use symptom code **P13**. |

## Uncategorized Symptom

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Uncategorized Symptom** <br><br> Unable to locate appropriate symptom code | Verify if existing symptom code applies to the issue reported by the customer. If not, document reported symptom and send feedback to **smfeedback@apple.com** stating that a suitable symptom code could not be found. |

# Communications

## Ethernet Port/Device Issue

Unlikely cause: power adapter, battery, speakers, optical drive, hard drive, fan, camera, microphone, top case, display assembly, AirPort card

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Ethernet Port/Device Issue**<br>• No Ethernet device present<br>• Unable to access network resources<br>• Ethernet device shows no connection<br>• Ethernet device unable to get an IP address<br>• Slow network performance | 1. Check the network cable for damage, try a known good Ethernet cable – CAT5 or better recommended for 100Mbps+ connections.<br>2. Check Ethernet ports on Mac and wall/switch for dust, debris, damage or bent pins.<br>3. Ensure distance from networking infrastructure is less than 300 feet / 105 meters.<br>4. Verify port, cable and network hardware with a known good system. Isolate firewall, MAC address filtering or hardware access control devices.<br>5. Check system logs. Isolate OS by starting up from original product install media (10.6.x) or compatible known good Mac OS. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Visually inspect Ethernet connector to ensure all pins will make physical contact with CAT5 network cable. | Yes | Ethernet interface contacts are good. Go to step 2. | |
| | No | Pins are damaged or bent flat, replace logic board. | **M10** |
| 2. Isolate OS by booting from original install media. Verify Network Link status active by using Network Utility on install DVD.  If the Ethernet interface (en0) Link Status is inactive, recheck physical connect and link activity indicator on hub/switch. | Yes | Ethernet interface (en0) Link Status is active, go to step 3. | |
| | No | If connection is OK on known-good system, replace logic board. | **M10** |

| | | | |
|---|---|---|---|
| **3.** Verify if IP address is listed for the Ethernet interface in System Preferences/Network. Connect computer to network with known-good DHCP IP allocation, ensuring static DHCP maps or MAC address filtering is not preventing address allocation. Note: DHCP allocation may not be instantaneous depending on network. Retest and verify if you obtain a valid IP address.. | Yes | Go to step 4. | |
| | No | If connection is OK on known-good system, replace logic board. | **M10** |
| **4.** Verify connection by using Network Utility to ping another connected computer on the same subnet. Ensure the target computer's IP address is valid, on the same subnet and powered on. Ensure no MAC address filtering or hardware access control devices are present. Use a simple hub/switch environment. Verify if ping operation succeeds.. | Yes | Go to step 5 | |
| | No | If the symptoms do not change, replace the logic board. | **M10** |
| **5.** Verify Ethernet performance and reliability by starting up from a known-good OS install, and downloading a large file from a web site or file server. | Yes | If there is no performance or connectivity issue isolated solely to the system under test, the problem may be the network environment. No repair is necessary. | |
| | No | If there are connection dropouts or poor performance not seen on a known-good test system, replace the logic board. | **M10** |

## AirPort/Bluetooth: Defective Wireless Devices

Unlikely cause: power adapter, battery, speakers, optical drive, hard drive, fan, camera, microphone, top case

**Caution**: When testing an AirPort/Bluetooth card connections, wait at least 5 seconds after shutdown before touching the AirPort/Bluetooth flex cable connections to card and to the logic board .Waiting less before touching could damage the AirPort/Bluetooth card.

### Quick Check

| Symptom | Quick Check |
|---|---|
| **AirPort or Bluetooth: Defective Wireless Devices** <br> • Unable to join networks or pair devices <br> • Card not available or recognized <br> • Intermittent device or connection dropouts | 1. Open System Preferences and make sure AirPort or Bluetooth is turned on and (for AirPort) that a network is selected. <br><br> 2. Ensure available software and firmware updates have been applied. <br><br> 3. Reset PRAM <br><br> 4. (AirPort) Using System Profiler,/AirPort channel list, check that installed AirPort card model supports the Base Station channel. <br><br> 5. (AirPort) Check that base station is not using unsupported connection or encryption protocols. <br><br> 6. (AirPort) Check for nearby interference sources such as microwave ovens or cordless phones (**Knowledge Base HT1365**) <br><br> 7. (AirPort) Check the number of users trying to use AirPort in the area for possible network congestion. <br><br> 8. (Bluetooth) Test with known-good Bluetooth device. <br><br> 9. Isolate OS by booting from original install media (10.6.x). Attempt to connect to base station (AirPort) or pair with wireless keyboard (Bluetooth).. |

**Deep Dive**

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Open System Profiler, check to see if AirPort and Bluetooth are recognized. | Yes | If AirPort and Bluetooth interfaces are detected in System Profiler:<br>- for Airport-related issues ensure that MAC address filtering is not enabled on the base station, and go to step 5.<br>- for Bluetooth-related issues ensure that target devices are set to discoverable, and go to step 8. | |
| | No | If AirPort or Bluetooth interfaces are not detected in System Profiler, go to step 2. | |
| **2.** Reseat both AirPort/Bluetooth flex cable connections to the card and to logic board and verify if card is seen in Apple System Profiler. | Yes | Loose flex cable connections to logic board or card side. Issue resolved | |
| | No | Replace AirPort/Bluetooth flex cable and go to step 3.. | **X03** |
| **3.** With replaced AirPort/ Bluetooth flex cable, verify if card is seen in Apple System Profiler. | Yes | Defective AirPort/Bluetooth flex cable. Issue resolved | |
| | No | Replace AirPort/Bluetooth card and go to step 4.. | **N18** |
| **4.** With replaced AirPort/ Bluetooth flex cable and card, verify if card is seen in Apple System Profiler. | Yes | Defective AirPort/Bluetooth flex card. Issue resolved | |
| | No | Replace logic board and retest. | **M11** |
| **5.** (AirPort) Check that antenna connections to the AirPort card are not reversed or loose. Reseat both AirPort antennas connections and verify if the issue is fixed. | Yes | Loose connections or crossed antenna. | |
| | No | Check antenna for signs of damage or wear. If issue persists, go to step 6. | |

| | | | |
|---|---|---|---|
| **6.** (AirPort) Try a known-good Bluetooth/Airport card and verify if it fixes the issue. | Yes | Replace customer's Bluetooth/Airport card. | **N14** |
| | No | Continue to use known-good Bluetooth/Airport card, go to step 7. | |
| **7.** (AirPort) Install a known-good display clamshell to test with known-good AirPort antennas Verify if it fixes the issue. | Yes | Replace customer's display clamshell (Airport antennas are part of display clamshell) and reinstall original Bluetooth/Airport card. | **L16** |
| | No | Issue is not hardware related. Retest with known-good system software. | |
| **8.** (Bluetooth) Install a known-good Bluetooth/Airport card. Enable Bluetooth and verify if Bluetooth connection issue is fixed | Yes | Replace customer Bluetooth/Airport card. | **N15** |
| | No | Replace top case (Bluetooth antenna is part of top case) and reinstall original Bluetooth/Airport card. | **X03** |

## No/Poor Wireless Signal

Unlikely cause: power adapter, battery, speakers, optical drive, hard drive, fan, camera, microphone, top case

### Quick Check

| Symptom | Quick Check |
|---|---|
| **No/Poor Wireless Signal**<br>• Unable to find networks<br>• Intermittent connection dropouts<br>• Slow transfer speeds | 1. Check for nearby interference sources in the 2.4/5GHz range such as microwave ovens and cordless phones (**Knowledge Base HT1365**).<br><br>2. Check that computer is within base station range – move closer to base station.<br><br>3. Base station checks:<br>a.    Base station is not set to low-power transmission mode<br>b.    Base station is not using unsupported connection and encryption protocols<br>c.    Check for possible Wi-Fi channel overlap (nearby base stations using adjacent channel)<br><br>4. Isolate OS by booting from original install media (10.6.x). Attempt to connect to base station. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Open System Profiler, check to see if AirPort card is recognized under Network: AirPort Card. | Yes | Use Software Update to make sure that all AirPort software and firmware updates have been applied. Ensure base station is not using MAC address filtering or creating a hidden network. Go to step 2.. | |
| | No | If AirPort/Bluetooth card is not detected, go to  previous Symptom table - AirPort/Bluetooth - Defective wireless devices. | |

| 2. | Verify if both antennas connections to the AirPort card are not reversed or loose. Reseat antennas connections. | Yes | Loose connections or crossed antenna | |
| | | No | Check antenna for reversed connections or signs of damage or wear. If issue persists, go to step 3. | |
| 3. | Install a known-good AirPort/ Bluetooth card , retest and verify if issue is fixed. | Yes | Replace user's AirPort/ Bluetooth card. | **N18** |
| | | No | Continue to use known good AirPort/Bluetooth card, go to step 4. | |
| 4. | Install a known-good display clamshell to test with known-good AirPort antenna Verify if it fixes the issue. | Yes | Replace customer's display clamshell (AirPort antennas are part of display clamshell) and reinstall original Bluetooth/Airport card. | **L16** |
| | | No | Issue is not hardware related. Retest with known-good system software. | |

## Bluetooth Wireless Input Device Loses Connection

Unlikely cause: display assembly, speaker assembly, optical drive, hard drive

### Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Bluetooth Wireless Input Device Loses Connection** | Check Bluetooth input device has fully charged batteries. Check with known-good Bluetooth input device Check that all system and device available software and firmware updates have been applied. |

### Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| **1.** System Profiler should list a Bluetooth radio device under system hardware. Verify if Bluetooth device info is available. | Yes | Bluetooth radio present, verify Bluetooth preference settings, go to step 2. | |
| | No | Go to Symptom - AirPort/ Bluetooth - Defective wireless devices | |
| **2.** System Preferences has a Bluetooth panel. Ensure Bluetooth is enabled and discoverable. Ensure that a known-good Bluetooth device is on, in close range and in discoverable mode. Verify if available Bluetooth devices are listed in pairing window. | Yes | Choose known-good device and establish a connection. Go to step 3. | |
| | No | Attempt Bluetooth repair, go to step 5. | |
| **3.** Verify if computer can pair reliably with the known-good Bluetooth input device. | Yes | Pairing verified, connect with user's device, go to step 4 | |
| | No | Attempt Bluetooth repair, go to step 5. | |
| **4.** Verify if computer can pair reliably with user's Bluetooth device. | Yes | Connection established, Continue testing for connection loss, go to step 8. | |
| | No | Check for available software updates for both computer & user's Bluetooth device. | |

| | | | |
|---|---|---|---|
| **5.** Reseat Bluetooth antenna connector on AirPort/Bluetooth card and retest. Verify if Bluetooth is enabled and can pair with a known-good device. | Yes | Loose Bluetooth antenna connection. | |
| | No | Go to step 6. | |
| **6.** Install and test a known-good Bluetooth/Airport card and retest. Verify that Bluetooth is enabled and can pair with a known-good device. | Yes | Replace user's Bluetooth/Airport card. | **N15** |
| | No | Go to step 7. | |
| **7.** Continue to actively test with a known-good Bluetooth device to determine if there is a disconnect. Do not allow computer to sleep during this test. Verify if link is lost during test. | Yes | Check for software update, 2.4 GHz radio interference or device low battery. If still losing link, replace customer's top case (Bluetooth antenna is part of top case) and reinstall original Bluetooth/Airport card. | **X03** |
| | No | Known-good device passed, test with user's Bluetooth device. | |
| **8.** Continue to test user's Bluetooth device to determine if there is a disconnect. Do not allow computer to sleep during this test. If link is lost during start up, turn on System Preferences: Bluetooth: Advanced: "Open Bluetooth Setup Assistant at start up when no input device is present". Verify if link is lost during test. | Yes | Check for software update, 2.4 GHz radio interference, device low battery or user's device features list for explanation. | |
| | No | User's device not losing connection. Issue not repeatable or resolved. | |

# AirPort Card: Kernel Panic

Unlikely cause: power adapter, battery, speakers, optical drive, hard drive, fan, camera, microphone, top case

## Quick Check

| Symptom | Quick Check |
|---|---|
| **AirPort Card: Kernel Panic**<br>• Kernel panic on boot<br>• Kernel panic or freezing while attempting to connect to Wi-Fi networks<br>• Kernel panic while transferring data on Wi-Fi networks. | 1. Isolate OS by booting from original install media (10.6.x). Attempt to connect to Wi-Fi network.<br><br>2. Use Software Update to make sure all AirPort software and firmware updates have been applied. |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Use Software Update to make sure all AirPort/Bluetooth software and firmware updates have been applied. Ensure MAC address filtering is not enabled on the base station. Verify if kernel panic issue is resolved. | Yes | Software issue. | |
| | No | Go to step 2. | |
| 2. Reseat both AirPort/Bluetooth flex cable connections to card and to logic board. Verify if kernel panic is resolved. | Yes | Go to step 4. | |
| | No | Go to step 3. | |
| 3. Isolate AirPort/Bluetooth card by disconnecting the AirPort/Bluetooth flex cable from logic board. Verify if kernel panic is resolved. | Yes | Go to step 4. | |
| | No | Go to Kernel Panic / System Crashes. | |
| 4. Connect and test with a known-good AirPort/Bluetooth flex cable. Verify if kernel panic is resolved. | Yes | Replace AirPort/Bluetooth flex cable. | **X03** |
| | No | Go to step 5. | |
| 5. Connect and test with a known-good AirPort/Bluetooth card. Verify if kernel panic is resolved. | Yes | Replace user's AirPort/Bluetooth card. | **N13** |
| | No | Replace logic board | **M11** |

# Wireless Performance Issue / Slow Connection

Unlikely cause: power adapter, battery, speakers, optical drive, hard drive, fan, camera, microphone, top case

## Quick Check

| Symptom | Quick Check |
|---|---|
| **Wireless Performance Issue / Slow Connection**<br>• Slow or stalled data transfers<br>• Intermittent connection dropouts | 1. Check for nearby interference sources in the 2.4/5GHz range such as microwave ovens or cordless phones (**Knowledge Base HT1365**)<br><br>2. (AirPort) Check the number of users trying to use AirPort in the area for possible network congestion. Move closer to base station to improve signal reception.<br><br>3. (Bluetooth) Move devices closer together.<br><br>4. Check wireless performance with a known-good system/device.<br><br>5. (AirPort) Wireless base station checks:<br>a. Base station is not set to low-power transmission mode.<br>b. Base station is not set to a slower protocol mode (802.11b).<br>c. Check for possible Wi-Fi channel overlap (nearby base stations using adjacent channel).<br><br>6. Isolate OS by booting from original install media (10.6.x). Attempt to connect to base station (AirPort) or pair with wireless keyboard (Bluetooth)<br><br>7. Use Software Update to make sure all AirPort and Bluetooth software and firmware updates have been applied. |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Inspect the display clutch barrel for damage. AirPort antennas are located in display clutch barrel area. | Yes | Record damage: Proceed to possibly repair damaged parts, go to step 2 | |
| | No | No visible damage, go to step 2 | |

| | | Yes/No | Action | Code |
|---|---|---|---|---|
| **2.** | Turn off Bluetooth.  Retest AirPort performance. Refer to **Knowledge Base TS1809**. Verify if performance issue is fixed. | Yes | Possible AirPort interference from the Bluetooth card. Change AirPort base station channel. (**Knowledge Base TS1809**.) | |
| | | No | -If AirPort-related issue, go to step 3.  -If Bluetooth-related issue, go to step 6. | |
| **3.** | (AirPort) Verify if antennas connections to the AirPort card are not reversed or loose. Reseat AirPort antenna connections and verify if performance issue is fixed. | Yes | Loose connection or crossed antenna. Issue resolved. | |
| | | No | If the connectors are secure, antennas connections not reversed and show no signs of damage or wear, go to step 4 | |
| **4.** | (AirPort) Try a known-good AirPort/Bluetooth card and verify if performance issue is fixed. | Yes | Replace user's AirPort/Bluetooth card. | **N14** |
| | | No | Continue to use known good AirPort/Bluetooth card, go to step 5. | |
| **5.** | (AirPort) Install a known-good display clamshell and verify if performance issue is fixed. | Yes | Replace user's Display clamshell (AirPort antennas are part of display clamshell) and reinstall original AirPort/Bluetooth card. | **L16** |
| | | No | Tested with confirmed parts. Performance issue is not hardware related. Retest with known-good system software. | |
| **6.** | (Bluetooth) Verify if Bluetooth antenna connection to the AirPort/Bluetooth card is not loose. Reseat antenna connection and verify if performance issue is fixed. | Yes | Loose Bluetooth antenna connection. Issue resolved. | |
| | | No | Go to step 7. | |
| **7.** | (Bluetooth) Try a known-good AirPort/Bluetooth card and verify if performance issue is fixed. | Yes | Replace user's AirPort/Bluetooth card. | **N14** |
| | | No | Replace user's top case (Bluetooth antenna is part of top case) and reinstall original AirPort/Bluetooth card. | **X03** |

## Wireless Input Device Doesn't Pair

Unlikely cause: display assembly, logic board, optical drive, hard drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Wireless Input Device Doesn't Pair**<br>• Can't get the system to recognize the Bluetooth keyboard or mouse | 1. Check Bluetooth System Preference is set to Discoverable.<br>2. Check Bluetooth device has fully charged batteries.<br>3. Check for Bluetooth software updates for both the device and Mac OS X.<br>4. If the Bluetooth pairs with no problems, probe about potential interference issue at user's site. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. System Profiler should list Bluetooth radio device under system hardware. Verify if Bluetooth device is available. | Yes | Bluetooth radio present, verify Bluetooth preference settings, go to step 2. | |
| | No | Attempt Bluetooth repair, go to step 5. | |
| 2. System Preferences has a Bluetooth panel. Ensure that Bluetooth is enabled and discoverable. Ensure that known-good Bluetooth device is on, in close range and discoverable mode. Verify if available Bluetooth input devices are listed in pairing window. | Yes | Choose known-good BlueTooth device and establish a connection. Go to step 3. | |
| | No | Attempt Bluetooth repair, go to step 5. | |
| 3. Verify if system can pair and works reliably with a known-good Bluetooth input device. | Yes | Pairing verified, connect with user's device, go to step 4. | |
| | No | Attempt Bluetooth repair, go to step 5. | |
| 4. Verify if Bluetooth is pairing with user's Bluetooth device. | Yes | Issue resolved. | |
| | No | Check for SW update for both System and user input device. | |

| 5. Verify if Bluetooth antenna connection to the AirPort/ Bluetooth card is not loose. Reseat antenna connection and verify if pairing issue is fixed. | Yes | Loose Bluetooth antenna connection. Issue resolved. | |
| | No | Go to step 6. | |
| 6. (Bluetooth) Install a known-good AirPort/BlueTooth card and verify if pairing issue is fixed. | Yes | Replace user's AirPort/ Bluetooth card. | **N15** |
| | No | Replace user's top case (Bluetooth antenna is part of top case) and reinstall original AirPort/Bluetooth card. | **X03** |

## Uncategorized Symptom

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Uncategorized Symptom**<br><br>Unable to locate appropriate symptom code | Verify if existing symptom code applies to  the issue reported by the user. If not, document reported symptom and send feedback to **smfeedback@apple. com** stating that a suitable symptom code could not be found. |

# Display

## Display Anomalies

### Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Display Anomalies**<br>• Incorrect/missing colors<br>• Distorted/blurred image<br>• Pixel anomalies<br>• Vertical/horizontal lines<br>• Non-uniform brightness<br>• Image flicker<br>• Image persistence | 1. Check display preferences for use of custom display profile.<br>2. Check brightness setting.<br>3. Check for Software Updates.<br>4. Clean glass panel while checking for dust/debris.<br>5. Go to Deep Dive: General |

### Deep Dive: General

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Verify if user's issue is incorrect/missing colors. | Yes | Go to **Incorrect/Missing Colors Deep Dive**. | |
| | No | Go to step 2. | |
| 2. Verify if user's issue is distorted/blurred image. | Yes | Go to **Distorted/Blurred Image Deep Dive**. | |
| | No | Go to step 3. | |
| 3. Verify if user's issue is bright or dark pixel anomalies. | Yes | Go to **Pixel Anomalies Deep Dive**. | |
| | No | Go to step 4. | |
| 4. Verify if user's issue is vertical or horizontal lines. | Yes | Go to **Vertical/Horizontal Lines Deep Dive**. | |
| | No | Go to step 5. | |
| 5. Verify if user's issue is non-uniform brightness. | Yes | Go to **Non-uniform Brightness Deep Dive**. | |
| | No | LCD functioning OK. | |

## Deep Dive: Incorrect/Missing Colors

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Verify display is listed in the System Profiler's Graphics/Displays device tree. | Yes | This ensures color profile can be matched with LCD. Go to step 2. | |
| | No | Check for correct LCD identification. Go to step 4 | |
| **2.** Verify System Preferences Display Profile is valid for display being tested. Color profile should be set to Color LCD, user may have created an off-color calibration setting. | Yes | If display profile is valid and the colors are still incorrect or missing go to step 3. | |
| | No | Set System Preferences: Displays: Color to Color LCD and retest. | |
| **3.** Verify if the glass panel is free of contaminants. | Yes | Go to step 4. | |
| | No | Clean glass panel using approved method. Retest. | |
| **4.** Run Clamshell Service Diagnostic utility and check for LCD panel presence. If not found, reseat and check that LVDS cable is secure to the logic board. Verify if colors are restored. | Yes | Loose LVDS cable connection. Issue resolved. | |
| | No | Go to step 5. | |
| **5.** Set desktop pattern in System Preferences to 'Solid Gray Light'. Verify if incorrect/missing color issue affects entire display. | Yes | Test needed with a known-good display. Go to step 7. | |
| | No | Go to step 6. | |
| **6.** Set up display under test side by side with another known good display showing the same image. Verify if issue is noticeably worse on the user's display being tested. | Yes | Test needed with a known-good display, Go to step 7 | **L02** |
| | No | Small variations in color uniformity are normal and do not warrant replacement or repair of the display. | |
| **7.** Substitute a known-good display assembly to test logic board internal video output. Verify if normal video is restored. | Yes | Replace user's display assembly. | **L02** |
| | No | Replace logic board. | **M04** |

## Deep Dive: Distorted/Blurred Image
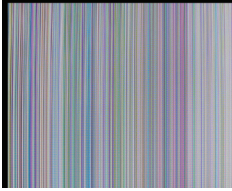
| Check | Result | Action | Code |
|---|---|---|---|
| 1. Sample image illustrates loss of LVDS data signals to LCD or a defective LCD panel, Inspect & reseat LVDS cable connection looking for damaged or bent pins. Verify if image is restored with the reseated cable connection. | Yes | Issue due to loose connection. Display issue resolved. | |
| | No | Go to step 2. | |
| | | If logic board connector is damaged, replace logic board. | **M24** |
| 2. Substitute a known good display clamshell to test logic board internal video output. Verify if normal video is restored. | Yes | Replace user's display assembly. | **L04** |
| | No | Replace logic board. | **M04** |

## Deep Dive: Pixel Anomalies
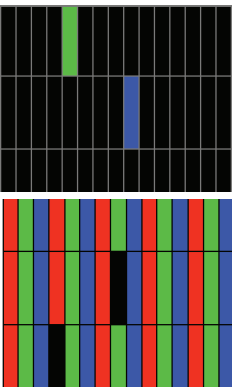
| Check | Result | Action | Code |
|---|---|---|---|
| 1. Determine if "defects" are dust/debris on surface of glass panel. | Yes | Clean glass panel. | |
| | No | Go to step 2. | |
| 2. Determine if bright pixel defects exceed the acceptable number. See **Display Issue: Pixel Anomalies**. | Yes | Replace display assembly. | **L08** |
| | No | LCD meets bright pixel defect specifications. Go to step 3. | |
| 3. Determine if dark pixel defects exceed the acceptable number. See **Display Issue: Pixel Anomalies**. | Yes | Replace display assembly. | **L08** |
| | No | LCD meets dark pixel defect specifications. Go to step 4. | |
| 4. Determine if the combination of bright/dark pixel defects exceed the acceptable number. See **Display Issue: Pixel Anomalies**. | Yes | Replace display assembly. | **L08** |
| | No | Explain to user that LCD is within specifications. Do not replace display assembly. | |

## Deep Dive: Vertical/Horizontal Lines
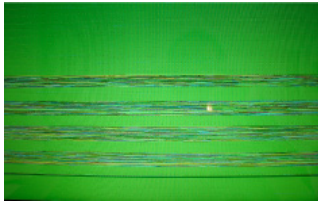




| Check | Result | Action | Code |
|---|---|---|---|
| 1. Horizontal lines may be related to a failing RAM module. Verify if video issue only happens AFTER the Apple logo and the spinning wheel has appeared. | Yes | Issue only happens AFTER Apple logo and spinning wheel appears. Go to step 2. | |
| | No | Issues happens since startup. Go to step 5. | |
| | | | |
| 2. Start with shift key down (safe mode) to disable system extensions. Verify if issue still happens when booting in safe mode. | Yes | Go to step 5. | |
| | No | No video issue when booting in safe mode. Go to step 3. | |
| 3. Isolate with only one memory module installed , then with the other one. Test with known-good memory. Verify if issue only happens with specific RAM module(s). | Yes | Replace affected RAM module. | X02 |
| | No | Go to step 4 | |
| 4. Isolate with one known-good memory module installed in one of the memory slots. Repeat by testing in the other memory slot with known-good memory module. Verify if issue only happens with specific memory slot on logic board. | Yes | Replace logic board. | M07 |
| | No | Go to step 5 | |
| 5. Run Clamshell Service Diagnostic utility and check for LCD panel info. If not found, reseat the LVDS cable to the logic board video output. Verify if normal video is restored. | Yes | Issue resolved by reseating loose LVDS cable.. | |
| | No | Go to step 6 | |
| 6. Connect external compatible DisplayPort display (or DisplayPort adapter and display). Verify if correct video appears on external display. | Yes | Go to step 7. | |
| | No | Replace logic board | M04 |
| 7. Substitute a known-good display assembly module to test logic board LVDS video output. Verify if normal video is restored. | Yes | Replace display assembly module. | L05 |
| | No | Replace logic board. | M04 |

## Deep Dive: Non-uniform Brightness

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Determine if brightness uniformity issue is visible after display has warmed up for 15 minutes. | Yes | Go to step 2. | |
| | No | Display backlight can take several minutes to stabilize. | |
| 2. Check LVDS cable connection to logic board and verify if brightness issue disappeared.. | Yes | Reseated LVDS cable solved the backlight control. Issue resolved | |
| | No | Got to step 3 | |
| 3. Determine if variation in uniformity appears excessive when compared to another similar unit. | Yes | Replace display assembly. | **L07** |
| | No | Explain to user that LCD appears to meet specifications. | |

# Defective Camera / Built-in iSight Not Operating Correctly

## Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Defective Camera**<br>• Camera not detected<br>• No green LED for camera<br>• Excessive blooming<br>• Poor white balance<br>• Poor focus<br>• Green image<br>• Image distortion | 1. Check for Software Updates.<br><br>2. Verify camera lens and glass panel are clear of contaminants. |

## Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Launch System Profiler and confirm that "Built-in iSight" is listed under USB High-Speed Bus. | Yes | Camera recognized. Go to step 3 | |
| | No | Go to step 2. | |
| 2. Run Clamshell Service Diagnostic utility and check for all devices presence. If not found, inspect and reseat camera cable on logic board. Verify if iSight becomes listed in System Profiler.:USB devices | Yes | Camera recognized. Go to step 3. | |
| | No | Go to step 4. | |
| 3. Launch PhotoBooth. Verify if camera's green LED is on, and that image appears normal. | Yes | Issue resolved.. | |
| | No | Go to step 4. | |
| 4. Substitute a known-good display assembly to test logic board camera connection. Verify if iSight camera operates properly. | Yes | Replace display assembly. | **L17** |
| | No | Replace logic board. | **M13** |

# Blank / No Video

Unlikely cause: Power adapter, speakers, ODD/HDD, fan, microphone, top case

## Quick Check

| Symptom | Quick Check |
|---|---|
| **Blank / No Video**<br>• No video<br>• No backlight | 1. Check brightness setting<br><br>2. Attach known-good supported external display.<br><br>3. Boot from Mac OS X install DVD that came with computer. |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Verify boot chime present when system restarted. Reset SMC and clear PRAM if necessary for proper start up. Verify if LCD video is present. | Yes | Go to step 3. | |
| | No | Go to step 2. | |
| **2.** Connect known-good supported external display. Verify if image appears on external display when system is booted. | Yes | External display detected by system. Go to step 3. | |
| | No | Go to No Video symptom code flow. | |
| **3.** Verify if LCD backlight is on by looking for faint glow from display when viewed in darkened room with brightness adjusted to full. | Yes | Video signal from system to external video is OK, LCD backlight is on. Go to step 5. | |
| | No | Go to step 4. | |
| **4.** Shine bright (low heat) flashlight into the front of LCD. Verify if an image is being displayed. | Yes | Image present but backlight is not on. Check logic board connections. Go to step 5. | |
| | No | Go to No Video symptom code flow. | |
| **5.** Run Clamshell Service Diagnostic utility and check for LCD panel presence. If not found, reseat LVDS cable connection to logic board and check that connection is secure. Verify if image is restored by reseating LVDS connection | Yes | Loose LVDS connection. Issue resolved. | |
| | No | Continue to test with known-good display assembly. Go to step 6. | |

| | | | |
|---|---|---|---|
| **6.** Substitute with a known-good display assembly and verify if LCD video works. | Yes | Replace user's clamshell assembly. | **L03** |
| | No | No video with known-good clamshell assembly. Replace logic board | **M03** |

## Backlight Issue / No Backlight

Unlikely cause: Power adapter, battery, speaker, ODD/HDD, fan microphone, top case

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Backlight Issue / No Backlight**<br>• Display not illuminated<br>• Flashing, unstable or non uniform background lighting<br>• Poor backlight at some or all settings | Check that brightness setting is above minimum. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Connect external display, clear PRAM to set brightness to default level and verify if Color LCD is listed in the System Profiler's Graphics/Displays device tree or using the Clamshell Service Diagnostic utility . | Yes | Internal LCD panel detected by system. Go to step 3. | |
| | No | Go to step 2. | |
| **2.** Reseat the LVDS cable at the logic board. Verify again that LCD is listed in System Profiler or Clamshell Service Diagnostic utility. | Yes | Display panel detected by system. Go to step 3. | |
| | No | Go to step 4. | |
| **3.** Darken room and verify backlight by detecting if any glow is emitted from the display | Yes | Backlight operating. Go to step 5. | |
| | No | Go to step 4. | |

| 4. | Inspect LVDS connectors and cable under magnification for pinched cables and damaged or bent pins. Do any connections appear to be defective? | Yes | - Defective LVDS cable. Replace display assembly.<br>- Defective LVDS connector on logic board. Replace logic board. | **L09**<br><br>**M25** |
|----|---|---|---|---|
| | | No | If connections are OK and secure and the display is still blank, go to step 5. | |
| 5. | Remove logic board and locate F9800 fuse on board. For fuse locations, see **kBase #TS3600**. Using an **ohmmeter**, determine if fuse is burned out. | Yes | Fuse was probably burned out by a short in display cable or connection. Replace both<br>- display assembly AND<br>- logic board. | **L09**<br>**M25** |
| | | No | Replace customer's display assembly. Go to step 6. | **L09** |
| 6. | Verify that display and backlight operations are restored. | Yes | Issue resolved. | |
| | | No | Backlight issue persists. Replace logic board and reinstall original display assembly. | **M25** |

## Noise / Unstable Flickering

Unlikely cause: battery

### Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Noise / Unstable Flickering**<br>• Image flicker<br>• Audible noise | 1. Verify known-good source sound file not causing speaker distortion. |

### Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Verify if user's issue is due to video flickering coming from display. | Yes | Suspected flickering issue, go to step 2. | |
| | No | Audible noise issue, go to step 5. | |
| 2. Verify display listed in the System Profiler's Graphics/Displays device tree is not disappearing intermittently (refresh System Profiler to observe). | Yes | Power and LCD panel ID are OK. Go to step 3. | |
| | No | Go to No Video symptom code flow. | |
| 3. Inspect and reseat the LVDS cable connection between clamshell and logic board. Also test if brightness setting is a contributing factor. Verify if flickering has stopped. | Yes | Loose LVDS cable connection. Issue resolved. | |
| | No | Go to step 4. | |
| 4. Substitute a known good display assembly to test internal logic board video output. Verify if flickering issue has disappeared. | Yes | Replace clamshell assembly. | **L06** |
| | No | Replace logic board. | **M04** |
| 5. Verify if source of the noise is the electrical as opposed to mechanical. Audio noise should not be a concern now that LCD components are all solid state devices including LED backlights. | Yes | Noises that are not audible from the normal user position are considered acceptable. Return unit to the user. | |
| | No | Noise from another source. Go to Noise/Hum/vibration Symptom table. | |

## Mechanical/Physical Damage

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Mechanical/Physical Damage**<br>• Broken glass<br>• Broken hinge<br>• Stripped screw/head<br>• Stripped screw boss<br>• Dent or scratch to chassis | 1. Determine damage caused by user/technician environment, accidental damage, or abuse.<br><br>2. Inform user/technician the failures are not covered by Apple warranties. Refer to **http://www.apple.com/legal/warranty** |

## Cosmetic Defects

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Cosmetic Defects**<br>• Cracked LCD<br>• Scorched or melted LCD<br>• LCD impact damage | 1. Determine damage caused by user/technician environment, accidental damage, or abuse.<br><br>2. Inform user/technician the failures are not covered by Apple warranties. Refer to **http://www.apple.com/legal/warranty** |

## Uncategorized Symptom

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Uncategorized Symptom**<br><br>Unable to locate appropriate symptom code | Verify whether existing symptom code applies to the issue reported by the user. If not, document reported symptom and send feedback to **smfeedback@apple.com** stating that a suitable symptom code could not be found. |

# Mass Storage

## Hard Drive Read/Write Issue

Unlikely cause: LCD, speakers, fan, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Hard Drive Read/Write Issue Bad Sector/Defective Drive Formatting Issue**<br>• Cannot save documents<br>• Read/Write error message<br>• Hang when accessing or saving data | 1. Boot from Install DVD. Verify S.M.A.R.T. status of drive using Disk Utility.<br><br>2. Repair disk using Disk Utility.<br><br>3. Erase disk and reinstall Mac OS using Installer. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Start up from Restore DVD and launch Disk Utility. Verify if hard drive is available for Disk Utility to repair. | Yes | Go to step 2. | |
| | No | Go to step 3. | |
| **2.** Repair disk and permissions using Disk Utility and verify if hard drive was repaired successfully. | Yes | Restart computer. Go to step 6. | |
| | No | If computer has not been verified with a known-good hard drive, go to step 3; otherwise, go to step 7. | |
| **3.** Reseat hard drive cable on logic board and drive ends and retest. If issue persists, substitute a known-good bootable hard drive, and verify if system starts up to desktop. | Yes | Reinstall user's drive, go to step 2. | |
| | No | Continue to use known-good bootable hard drive to determine root cause. Go to step 4. | |

| 4. After reseating hard drive flex cable connections, verify if known-good hard drive boot to desktop. | Yes | Reinstall user's drive, go to step 2 | |
| | No | Suspect hard drive flex cable, go to step 5. | |
| 5. Replace hard drive flex cable and verify if system boots to desktop with known-good hard drive. | Yes | Reinstall user's drive, go to step 2. | **X03** |
| | No | Replace logic board. | **M19** |
| 6. Verify if user's hard drive starts up successfully after Disk Utility disk and authorizations repairs. | Yes | Issue resolved. | |
| | No | Repair or replace hard drive, go to step 7. | |
| 7. Partition, erase & install Mac OS on user's hard drive.  Verify if OS install completes without error and that system starts up successfully.<br>Note: If media verification fails at beginning of install, suspect optical media or optical drive. | Yes | Issue resolved | |
| | No | Hard drive appears to be defective, go to step 8. | |
| 8. Replace user's hard drive. Verify if drive formats correctly with a GUID partition map and installs Mac OS  without errors. | Yes | Issue resolved. | **H01** |
| | No | SATA cable verified or replaced and new hard drive installed, replace logic board. | **M19** |

## Hard Drive Not Recognized/Not Mounting

Unlikely cause: LCD, speakers, fan, camera, microphone, AirPort

### Quick Check

| Symptom | Quick Check |
| --- | --- |
| **Hard Drive Not Recognized/ Mount**<br>**Drive No Boot**<br>• Flashing question mark<br>• Boots to grey screen<br>• Boots to blue screen | 1. Use a known-good mouse.  A stuck mouse button will not allow boot.<br>2. Boot from Install DVD.  Verify S.M.A.R.T. status of drive using Disk Utility.<br>3. Repair disk using Disk Utility.<br>4. Erase disk and reinstall Mac OS using Installer. |

**Deep Dive**

| Check | Result | Action | Code |
|-------|--------|--------|------|
| **1.** Boot from Restore DVD and launch Disk Utility. Verify if hard drive is available for Disk Utility to repair. | Yes | Go to step 2. | |
| | No | Go to step 3. | |
| **2.** Verify if Disk Utility mounts drive and repairs disk and permissions successfully. | Yes | Restart computer, go to step 6. | |
| | No | - If computer has not been verified with a known-good hard drive, go to step 3; -Otherwise, go to step 7. | |
| **3.** Reseat hard drive flex cable on logic board and drive ends and retest. If issue persists, substitute a known-good bootable hard drive, and verify if computer starts up to desktop. | Yes | Reinstall user drive, go to step 2. | |
| | No | Continue to use known-good bootable hard drive to determine root cause. Go to step 4. | |
| **4.** After reseating hard drive flex cable connections, verify if known-good hard drive starts up to desktop. | Yes | Reinstall user drive, go to step 2. | |
| | No | Suspect hard drive flex cable, go to step 5. | |
| **5.** Replace hard drive flex cable, retest with known-good bootable hard drive and verify if system starts up to desktop. | Yes | Install user drive, go to step 2. | **X03** |
| | No | Replace logic board. | **M19** |
| **6.** Verify if user's hard drive start up successfully. | Yes | Issue resolved. | |
| | No | Restore or replace user's hard drive, go to step 7. | |
| **7.** Partition, erase & install Mac OS on user's hard drive. Verify if OS install completes without error and that system starts up successfully. | Yes | Issue resolved. | |
| | No | Hard drive appears to be defective. Go to step 8. | |
| **8.** Replace user's hard drive. Does drive format correctly with a GUID partition map and install Mac OS without errors. | Yes | Issue resolved. | **H01** |
| | No | Hard drive and flex cable replaced without success, replace logic board. | **M19** |

# Hard Drive Noisy

Unlikely cause: LCD, speakers, fan, camera, microphone

## Quick Check

| Symptom | Quick Check |
|---|---|
| **Hard Drive Noisy**<br>• Noise during start up<br>• Noise during operation<br>• Noise when drive is copying or saving data | 1. Start up from Install DVD. Verify S.M.A.R.T. status of hard drive and repair disk using Disk Utility.<br>2. Verify if any available firmware updates are available for the installed drive.<br>3. Check for reported noise and compare with Knowledge Base article "Apple Portables: Hard Drives and Noise "<br>**http://support.apple.com/kb/TS2354** |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Boot from Restore DVD and launch Disk Utility. Verify if hard drive is available for Disk Utility to repair. | Yes | Go to step 2. | |
| | No | Go to Drive not recognized/ mount symptom table. | |
| 2. Repair disk and permissions using Disk Utility and verify it completed successfully. | Yes | Restart computer. Go to step 3. | |
| | No | Go to step 4. | |
| 3. Run all available software and firmware updates and verify if the system is still noisy. | Yes | Remove hard drive and start up from external drive to test fan noise. Go to step 6. | |
| | No | Issue resolved. | |
| 4. Erase disk and reinstall Mac OS using Installer. Verify if install process completed. | Yes | Restart computer. Go to step 3. | |
| | No | Replace hard drive. Go to step 5. | **H06** |

| 5. After installing new hard drive, verify if the system is still noisy. | Yes | Remove hard drive and start up from external drive to test fan noise. Go to step 6. | |
| | No | Issue resolved. | |
| 6. After removing hard drive, verify if the system is still noisy. | Yes | Fan noise or optical drive noise likely to be the cause. See ODD Noisy symptom table and Fan failures/Thermal symptom table. | |
| | No | Go to step 7. | |
| 7. Install a known-good hard drive and verify if the noise level is similar to user's hard drive. | Yes | Hard drive noise level is similar to a known-good drive and does not require replacement. Reinstall user drive. | |
| | No | Replace hard drive. Go to step 5. | **H06** |

## Optical Drive Won't Accept/Reject Media

Unlikely cause: LCD, speakers, fan, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Optical Drive Won't Accept/ Reject Media**<br>• Cannot insert a disc into the drive<br>• Cannot eject a disc placed into the drive | 1. Use Apple System Profiler ATA section to see if the optical drive appears. If not, see Optical Drive Not Recognized symptom table,<br><br>2. Restart computer and hold down mouse button or keyboard eject key to cycle optical drive.<br><br>3. Check for available firmware and software updates.<br><br>4. Inspect optical drive slot for obstructions |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Verify if optical drive is listed in the System Profiler device tree for serial-ATA devices. | Yes | Optical drive has power, inspect disc acceptance. Go to step 5. | |
| | No | Inspect hardware. Go to step 2 | |
| 2. Verify all connections between logic board, flex cable, and optical drive are secure. Visually inspect cables and connectors for any debris, damage, or bent pins. Verify if optical drive is now listed in System Profiler. | Yes | Optical drive has power, inspect disc acceptance. Go to step 5. | |
| | No | Replace any damaged optical drive cable and retest. If connections are good and with no visible cable damage, go to step 3. | **X03** |
| 3. Reseat optical cable on logic board and drive ends and retest. If issue persists, replace optical drive cable with a known good one. Verify if optical drive is now listed in System Profiler. | Yes | Replaced user optical drive cable. Issue resolved. | **X03** |
| | No | Go to step 4. | |
| 4. Install and test a known-good optical drive with replacement flex cable. Verify if optical drive is now listed in System Profiler. | Yes | Replaced user optical drive. Issue resolved. | **J01** |
| | No | Replace the logic board. ) | **M19** |
| 5. Inspect optical drive slot for disc insert/eject. Verify if there is clearance for disc use. | Yes | Go to step 6. | |
| | No | Replace damaged optical drive or top case that interferes with disc use. | **J01** **(J05)** **X13** |
| 6. Insert known-good optical media and test user's optical drive for acceptance of disc. Verify if optical media is read. | Yes | Go to step 7. | |
| | No | Media is ejected as soon as inserted : Replace the optical drive. (Mechanical damage to optical drive, if found) Go to step 9. | **J03** **(J06)** |

| 7. Verify if optical media mounts on desktop. | Yes | Go to Eject Test step 8. | |
|---|---|---|---|
| | No | Go to Optical Drive Read/ Write Data Error symptom table. | |
| 8. Verify if optical media is ejected properly from optical drive. | Yes | Issue resolved. | |
| | No | Replace optical drive or top case that interferes with disc ejection. Go to step 9.. | **J02** **X13** |
| 9. With replacement parts , verify if optical media is now recognized. | Yes | Issue resolved. | |
| | No | Replace optical drive. If drive has already been replaced, then replace logic board. | **J03** **M19** |

## Optical Drive Read/Write Data Error

Unlikely cause: LCD, speakers, fan, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Optical Drive Read/Write Data Error** <br>• Errors when writing optical media. <br>• Errors when reading optical media. <br>• Hang when accessing or preparing to write data. | 1. Test optical media in another drive of the same type in same type of machine to rule out media issue. <br><br>2. Check with known-good discs like the Install discs that came with the computer. <br><br>3. For write issues, check with known-good media that performs well in another computer and optical drive of the same type. <br><br>4. Check both CD and DVD media. If only one type of media is producing errors, there is a laser issue. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Verify if media is free to spin without optical drive scraping edge or surface of media. | Yes | Go to step 2. | |
| | No | Replace optical drive. | **J03** |

| | | | |
|---|---|---|---|
| **2.** According to optical drive model, verify if drive can read all supported types of known-good optical media (CD , DVD, etc) | Yes | Go to step 6 | |
| | No | Reading CD only or DVD only indicates a laser issue, replace optical drive. | **J03** |
| | | Optical drive cannot read any media reliably, go to step 3. | |
| **3.** Reseat optical cable on logic board and drive ends and retest. If issue persists, replace optical drive cable with a known good one.  Verify if optical drive now performs the desired read/write operations. | Yes | Replace user optical drive cable. Issue resolved. | **X03** |
| | No | Go to step 4. | |
| **4.** Install and test a known-good optical drive with replacement flex cable.  Verify if optical drive now performs the desired read/write operations. | Yes | Replace user optical drive. Issue resolved. | **J01** |
| | No | Replace logic board | **M19** |

## Optical Drive Not Recognized/Mount

Unlikely cause: LCD, speakers, fan, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Optical Drive Not Recognized/ Mount** <br> • Discs inject and eject, but do not appear in Finder | **1.** Use Apple System Profiler ATA section to see if the optical drive appears. <br><br> **2.** Serial-ATA section of Apple System Profiler will show any media inserted. <br><br> **3.** Check Finder Preferences: General and make sure "CD's, DVD's and iPods" is checked under "Show these items on the Desktop." <br><br> **4.** Check both CD and DVD media. If only one type of media is recognized, there might be a laser related issue. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Verify that optical drive is listed in the device tree for SATA devices in System Profiler. | Yes | Issue resolved. | |
| | No | Go to step 2. | |
| 2. Check that both connections of the optical drive flex cable between logic board and optical drive are secure. Visually inspect cables and connectors for any debris, damage, or bent pins. Verify if optical drive is now listed in System Profiler. | Yes | Issue resolved. | |
| | No | Replace any damaged cables and retest. If connections are good and with no visible cable damage, go to step 3. | **X03** |
| 3. Replace optical drive cable with a known good one. Verify if optical drive is now listed in System Profiler. | Yes | Replace user optical drive cable. Issue resolved. | **X03** |
| | No | Go to step 4. | |
| 4. Install and test a known-good optical drive with replacement flex cable. Verify if optical drive is now listed in System Profiler. | Yes | Replace user optical drive. Issue resolved. | **J01** |
| | No | Replace the logic board. | **M19** |

## Optical Drive Noisy

Unlikely cause: LCD, speakers, fan, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Optical Drive Noisy**<br>• Noise during boot<br>• Noise during operation<br>• Noise when drive is copying or writing data | 1. Test optical media in another drive of the same type in same type of computer to rule out media issue.<br>2. Check with known-good discs. Install discs that came with the computer.<br>3. Check to see if noise occurs without media in the drive. If so, check for hard drive and fan caused noise.<br>4. Check for available firmware /software updates. |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Verify if optical drive is constantly seeking or cycling eject mechanism without an optical disc installed. Optical drive should perform only one reset sequence and rest idle, ready for media. | Yes | Replace optical drive if continuous activity occurs with no disc installed. | **J04** |
| | No | Continue and verify with media, go to step 2. | |
| 2. Insert known good data CD. Check that media is free to spin without optical drive scraping edge or surface of media. Verify disc does not exceed maximum thickness specification. | Yes | Internal mechanical interference is affecting rotational spin of media, replace optical drive. | **J04** |
| | No | Continue and verify with media, go to step 3. | |
| 3. Initial disc handling noise is normal. Disc spinning and head seek indicates disc is mounting to desktop. Seek noise should settle down once mounted. Verify if noise is above normal level and related to seek activity. | Yes | Replace optical drive. | **J04** |
| | No | Go to step 4. | |
| 4. Disc spin should cease 30 seconds after mounting data CD on OS desktop. Verify if the noise is related to disc spin. | Yes | Go to step 5. | |
| | No | Go to step 6. | |
| 5. Remove the optical drive and check for correct seating of the brackets on the optical drive and in the top case. Reinstall drive in unit and retest. Verify if drive is still noisy. | Yes | Go to step 6. | |
| | No | Issue resolved. Optical drive was not properly mounted in enclosure. (Possible physical damage to optical drive.) | (J05) |
| 6. Eject known good data optical media. Disc handling noise should be one pop of disc from motor hub and a motor gear sound driving disc out of optical drive. Verify if noise is above normal level and related to disc eject activity or multiple eject attempts. | Yes | Replace optical drive. | **J02** |
| | No | Go to step 7. | |

| 7. Disc spin should cease 30 seconds after mounting optical media on desktop. Media may be mounting on a defective internal spindle hub. Verify if the noise is related to disc spin. | Yes | Replace optical drive. | J04 |
| | No | Noise does not appear to be related to optical drive. | |

## Optical Drive Not Performing to Specs

Unlikely cause: LCD, speakers, fan, camera, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Optical Drive Not Performing to Specs**<br><br>Read or write speeds slower than expected. | 1. Test optical media in another drive of the same type in same type of computer to rule out media issue.<br><br>2. Check with known-good discs—Install discs that came with the computer.<br><br>3. For disc write issues, check with known-good media that performs well in another computer and drive of the same type.<br><br>4. Check both CD and DVD media. If only one type of media is producing errors, there might be a laser related issue. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Check drive model and supported media types, and verify if optical drive can read all supported optical media types. | Yes | Go to step 5 | |
| | No | Reading CD only or DVD only indicates laser issue, replace optical drive. | J03 |
| | | Optical drive cannot read any media reliably. Go to step 2. | |
| 2. Reseat cable connections at logic board and optical drive. Verify if media is now recognized and reads reliably. | Yes | Reseat resolved issue. | X03 |
| | No | Go to step 3. | |

| 3. Disconnect optical drive by lifting SATA cable at logic board and connecting a known-good drive. Verify if media is now recognized and reads reliably. | Yes | SATA port functional, reconnect user's optical drive & SATA cable. Go to step 4. | |
|---|---|---|---|
| | No | Replace logic board. | **M19** |
| 4. Install and test with replacement optical drive flex cable. Verify if media is now recognized and reads reliably. | Yes | Cable change resolved issue. | **X03** |
| | No | Replace optical drive. (Mechanical damage to optical drive, if found) | **J03 (J05)** |
| 5. Test write data to compatible optical media  Verify burned media is recognized and reads reliably. | Yes | Issue resolved. | |
| | No | Replace optical drive. (Mechanical damage to optical drive, if found) | **J03 (J06)** |

## Uncategorized Symptom

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Uncategorized Symptom**  Unable to locate appropriate symptom code | Verify if existing symptom code applies to  the issue reported by the user. If not, document reported symptom and send feedback to **smfeedback@apple. com** stating that a suitable symptom code could not be found. |

# Input/Output Devices

## USB Port Does Not Recognize Known Devices

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **USB Port Does Not Recognize Known Devices**<br><br>USB-wired keyboard/mouse or USB flash drive not recognized | 1. Check the for latest software update.<br><br>2. Use Apple System Profiler to verify the computer recognizes the USB bus.<br><br>3. Test port with known good Apple keyboard or mouse.<br><br>4. Verify any USB hubs have sufficient power. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Reset SMC and clear PRAM. Verify if USB device is recognized. | Yes | Issue resolved. | |
| | No | Go to step 2. | |
| 2. Verify if USB device is receiving power from USB port. Note: first device to need >500mA will get 1000mA, all others will be limited to <500mA | Yes | Go to step 3. | |
| | No | Replace logic board. | **M15** |
| 3. Verify if the latest Mac-compatible available driver for this USB device is installed. | Yes | Go to step 4. | |
| | No | Obtain Mac-compatible USB driver. | |
| 4. Verify if USB device is working on a known-good similar computer. | Yes | Replace logic board. | **M15** |
| | No | Obtain service for the defective USB device. | |

## Built-in Keyboard Does Not Work Properly

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Built-in Keyboard Does Not Work Properly**<br>• Keystrokes not recognized<br>• Locks up<br>• Displayed characters don't match | 1. In System Preferences: International: Input Menu, enable Keyboard Viewer. Select Show Keyboard Viewer from the Input Menu in the menu bar. Test the keyboard.<br><br>2. Confirm correct keyboard layout is selected.<br><br>3. Update to the latest system software.<br><br>4. Press Caps Lock. If the Caps Lock light goes on it indicates at least a partial connection to the main logic board. |

### Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. If specific keys are not working, confirm if they are physically broken. | Yes | Refer to **MacBook/ MacBook Pro: Black Keycap Replacement" (HT4002)** or **"MacBook: White Keycap Replacement" (HT4003)**. If a keycap kit is available for this model, order kit and replace affected key(s).<br><br>Go to step 4. | |
| | | If a keycap kit is not available for this model, replace complete top case.<br><br>Go to step 4. | **K01** |
| | No | Go to step 2. | |
| 2. Reseat keyboard flex cable to logic board and verify that all keys are functional. | Yes | Issue resolved. | **X99** |
| | No | Go to step 3. | |
| 3. Disconnect and verify that keyboard flex cable is in good condition (no delamination or torn cable end, no missing or cracked tracks). | Yes | Go to step 4. | |
| | No | Replace top case. Go to step 5. | **K01** |

| 4. Reseat cable and check that flex cable end is fully inserted and aligned with connector on logic board, and that connector lock is closed. Verify that keyboard now functions properly. Reseat cable and verify with ASD that all keys are functional. | Yes | Issue resolved. | **K01** |
|---|---|---|---|
| | No | Replace top case. Go to step 5. | |
| 5. Verify that all keys are functional using ASD. | Yes | Issue resolved. | **K01** |
| | No | Replace logic board. | **M15** |

## Specific Keys Don't Work

Unlikely cause: power adapter, battery, speakers, LCD, ODD/HDD, fan, microphone

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Specific Keys Don't Work**<br>• Keycap broken<br>• Key switch broken<br>• Sticky key<br>• Key pressed not recognized | 1. Determine if damage caused by user/technician environment, accidental damage, or abuse.<br><br>2. Inform user/technician the failures are not covered by Apple warranties. Refer to **http://www.apple.com/legal/warranty**<br><br>3. Inspect keycap to remove debris trapped under it.<br><br>4. If the keycap is loose, check if clasp is still intact and reattach it.<br><br>5. Refer to **"MacBook/MacBook Pro: Black Keycap Replacement" (HT4002)** or **"MacBook: White Keycap Replacement" (HT4003)**. If a keycap kit is available for this model, order kit and replace affected key(s). If a kit is not available, replace complete top case (code **K01**). |

# Built-in Trackpad Does Not Work

## Quick Check

| Symptom | Quick Check |
|---|---|
| **Built-in Trackpad Does Not Work**<br>• Cursor does not move.<br>• Select button of trackpad inoperable<br>• Multiple touch features inoperable | 1. Check for environmental factors such as humidity, hand lotion or jewelry. Check if user is touching the trackpad simultaneously with both hands.<br><br>2. Clean the trackpad surface (with the computer powered off) using a clean, dry, lint-free cloth.<br><br>3. Make sure all software and firmware updates have been applied. |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. In System Preferences: Universal Access, turn off special Keyboard and Mouse & Trackpad settings. Set for normal use, enable and test multiple touch features. Verify if trackpad works now. | Yes | Settings issue resolved. | |
| | No | Go to step 2 | |
| 2. Verify if you see the Apple Internal Keyboard/Trackpad continuously listed on USB in Apple System Profiler. | Yes | Go to step 5. | |
| | No | Go to step 3. | |
| 3. Reseat the trackpad flex cable to the logic board. Verify if trackpad works now. | Yes | Loose cable. Issue resolved. | |
| | No | Go to step 4. | |
| 4. Verify if the trackpad connector on the logic board is damaged. | Yes | Replace logic board. | **M24** |
| | No | Go to step 5. | |
| 5. Does the cursor move correctly when trackpad is used ? Clean trackpad surface and verify trackpad is moving cursor on screen. | Yes | Go to step 6 | |
| | No | Test with known-good trackpad. Go to step 7 | |
| 6. Does the trackpad button click? Verify trackpad alignment is proper and click-depth set screw is at factory setting. | Yes | Test with known-good trackpad. Go to step 7 | |
| | No | Go to step 7 | |

| 7. Verify if a known-good trackpad works. | Yes | Replace user trackpad according to symptom found.<br>-No Mouse/trackpad response | K02 |
| | | -Trackpad cursor not tracking properly | K12 |
| | | -Trackpad click button issues | K13 |
| | No | Replace logic board. | M16 |

## Built-in Keyboard Has Dim or No Keyboard Backlight

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **Built-in Keyboard Has Dim or No Backlight**<br>• In darkened room, keyboard backlight does not come on or is dim. | 1. Make sure this computer model has a keyboard backlight option by checking the configuration label in the battery bay.<br>2. Make sure that keyboard backlight is turned on and brightness turned up.<br>3. Block the ambient light sensor to simulate darkened room. |

### Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Cover the Ambient Light Sensor located near camera. Verify if the display dims | Yes | Ambient light sensor is working. Go to step 2. | |
| | No | Go to step 3. | |
| 2. Cover the ambient light sensor again and press the F6 keyboard key. Verify if keyboard backlight works. | Yes | Issue resolved. | |
| | No | Go to step 4. | |

| | | | | |
|---|---|---|---|---|
| 3. In the Apple System Profiler, verify if you can you see the USB camera listed. | Yes | The Ambient Light Sensor shares its connection to logic board with camera and is likely correctly connected. If issue persists, replace display assembly. | | **L14** |
| | No | Go to step 6 | | |
| 4. Check keyboard backlight cable and connector for damage and reseat keyboard backlight connection to the logic board.  Verify if the keyboard backlight now works. | Yes | Issue resolved. | | |
| | No | Go to step 5 | | |
| 5. Cover the Ambient Light Sensor located near camera and press the F6 keyboard key .Measure the voltage between pin 4 and pin 2 of the keyboard backlight connector. Verify if voltage is present. | Yes | Replace top case. | | **K10** |
| | No | Replace logic board. | | **M99** |
| 6. Check camera cable and connector for damage and reseat the camera cable connection to the logic board. Verify if the Ambient Light Sensor functionality now works. | Yes | Ambient Light Sensor functional. Retest for keyboard backlight functionality. | | |
| | No | Replace top case and go to step 7. | | **K10** |
| 7. With replaced top case verify if the Ambient Light Sensor now works. | Yes | Ambient Light Sensor functional. Retest for keyboard backlight functionality. | | |
| | No | Replace logic board | | **M23** |

## Built-in Keyboard Is Not Recognized

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Built-in Keyboard Is Not Recognized**<br>• Keystrokes not recognized | 1. Reset SMC.<br><br>2. Press Caps Lock. If the Caps Lock light comes on that indicates at least a partial connection to the logic board.<br><br>3. In System Preferences: International: Input Menu, enable Keyboard Viewer. Select Show Keyboard Viewer from the Input Menu in the menu bar. Test the keyboard. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. In Apple System Profiler do you see "Apple Internal Keyboard/Trackpad" listed under USB hardware devices? | Yes | Go to step 3. | |
| | No | Go to step 2. | |
| 2. Reset SMC and verify if Apple Internal Keyboard/Trackpad is now seen in the USB devices list of Apple System Profiler. | Yes | Go to step 3. | |
| | No | Replace logic board. | **M15** |
| 3. If built-in keyboard is not recognized, verify if trackpad is still functional | Yes | Go to step 4. | |
| | No | Go to Built-In Trackpad Does not Work" symptom table. | |
| 4. Disconnect and verify if keyboard flex cable is in good condition (no delamination or torn cable end, no missing or cracked tracks). | Yes | Go to step 5. | |
| | No | Replace top case. Go to step 6. | **K11** |
| 5. Reseat cable and check that keyboard flex cable end is fully inserted and aligned with connector on logic board, and that connector lock is closed. Verify if keyboard now functions properly. | Yes | Issue resolved. | |
| | No | Replace top case. Go to step 6. | **K11** |

| | Yes | Issue resolved. | |
|---|---|---|---|
| 6. Verify if all keys are functional using ASD. | No | Replace logic board. | **M15** |

## Built-in Trackpad Does Not Track Properly

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Built-in Trackpad Does Not Track Properly**<br>• Cursor movement is random, uneven, or jumpy.<br>• Cursor hangs or stalls along path. | 1. Check for environmental factors such as humidity, hand lotion or jewelry. Check if user is touching the trackpad simultaneously with both hands.<br><br>2. Clean the trackpad surface (with the computer off) using a clean, dry, lint free cloth.<br><br>3. Make sure all software and firmware updates have been applied.<br><br>4. If the issue occurs when system is running from power adapter, use a grounded power cord. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. In System Preferences: Universal Access, turn off special Keyboard and Mouse & Trackpad settings. Verify if trackpad works now. | Yes | Settings issue resolved. | |
| | No | Go to step 2. | |
| 2. Verify if you see the Apple Internal Keyboard/Trackpad continuously listed under USB in Apple System Profiler. | Yes | Trackpad communicating to system. Go to step 6 | |
| | No | Go to step 3 | |
| 3. Verify if the trackpad looks damaged. | Yes | Test with known-good trackpad. Go to step 6. | |
| | No | Go to step 4 | |
| 4. Reseat the trackpad flex cable on the logic board. Verify if the trackpad works now. | Yes | Loose cable. Issue resolved. | |
| | No | Go to step 5 | |

| | | | |
|---|---|---|---|
| **5.** Verify if the trackpad connector on the logic board is damaged. | Yes | Replace logic board. | **M24** |
| | No | Go to step 6. | |
| **6.** Replace with known-good trackpad and verify if it works. | Yes | Replace user defective trackpad. | **K02** |
| | No | Replace logic board. | **M16** |

## Apple Remote Inoperable

Unlikely cause:  LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Apple Remote Inoperable**<br>• Remote is not recognized. | 1. The computer is on and awake.<br>2. Check with known-good remote on user's computer and the user's remote on known-good computer<br>3. Remote is used within 30 feet of the computer and unobstructed line-of-sight to the IR window.<br>4. Clean the IR window.<br>5. Open System Preferences: Security pane. Verify if "Disable remote control infrared receiver" is not checked.<br>6. In Security pane,  if "Unpair" button is active, press it and pair the Apple Remote. See "Pairing your Apple Remote with your computer" (**Knowledge Base HT1619**). |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Open Photo Booth or iChat's Video Preview window.  Point Apple Remote at the built-in iSight camera, press any button on the remote, and verify if (as seen through the camera) there is a faint blinking light on the remote. | Yes | Apple Remote is working.  Go to step 2. | |
| | No | Replace the remote's battery. Go to step 2. | |

| 2. Verify if you can pair the Apple Remote with a known-good system. | Yes | Go to step 3. | |
|---|---|---|---|
| | No | Replace the Apple Remote. Go to step 3. | **X04** |
| 3. Go in Security settings of System Preferences. Uncheck the "Disable remote control infrared receiver" if checked, and verify if Apple Remote now works. | Yes | Issue resolved. | |
| | No | Check and reseat the HD/IR/Sleep LED cable connection at logic board. Go to step 4. | |
| 4. Verify if the Apple Remote now works. | Yes | Issue resolved. | |
| | No | Replace the HD/IR/Sleep LED cable. Go to step 5. | **X03** |
| 5. Verify if the Apple Remote now works. | Yes | Issue resolved. | |
| | No | Replace logic board. | **M15** |

## Built-in Speaker Has No Audio

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Built-in Speaker Has No Audio**<br><br>Can't hear any audio from within the machine. | 1. Make sure all software updates have been applied.<br><br>2. Check in System Preferences: Sound: Output that sound output is set to "Internal Speakers". and balance is set to center.<br><br>3. Use the F12 volume key to set the sound to maximum.<br><br>4. Reset PRAM. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Remove any externally-connected speakers and verify if System Preferences: Sound: Output current setting is set to "Internal Speakers". | Yes | Internal Audio-out port is selected. Go to step 3. | |
| | No | "External Speakers" or "Digital Out" reported. Go to step 2. | |

| | | | |
|---|---|---|---|
| **2.** Play some music and plug known-good headphones /speakers in the audio output jack .Verify if you get audio through the external headphones/speakers. | Yes | Go to step 3 | |
| | No | Replace logic board. | **M09** |
| **3.** Unplug headphone/speakers and verify if you now get audio through internal speakers .Cycle this plug /unplug operation several times and verify if audio gets back each time to the Internal speakers. | Yes | Issue resolved. | |
| | No | Check left and right speakers connections to logic board. -If disconnected, reseat connectors. -If damaged or missing, replace affected speaker. - Otherwise, go to step 4. | **X08** |
| **4.** Replace with known-good internal speakers. Verify if you now get audio through internal speakers. | Yes | Replace affected user's speaker Issue resolved. | **X08** |
| | No | Replace logic board. | **M09** |

## Distorted Sound from Internal Speaker

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Distorted Sound from Internal Speaker**<br>• Distorted audio | **1.** Reset PRAM.<br><br>**2.** Adjust sound output and level in System Preferences: Sound: Output, and use the Balance to locate a left, right, or woofer speaker distortion source.<br><br>**3.** Compare the same sound and same settings against another unit to make sure the sound is actually distorting. |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Compare internal speakers with a pair of headphones and verify if the distortion is similar on both headphones and internal speakers. | Yes | Audio source or gain issue. Reset PRAM, adjust sound level in System Preferences: Sound: Output, and retest with known-good audio source and external speakers. Go to step 5. | |
| | No | Internal speaker issue. Go to step 2. | |
| 2. Use the Sound Output system preference to adjust Balance and test the left and right speakers. If lower bass notes are distorted, the right speaker/subwoofer assembly is likely to be defective. Verify if all speakers are free from distortion, and sounding clear and loud. | Yes | Issue resolved. | |
| | No | Adjust volume to test full range of volume settings. Go to step 3. | |
| 3. Verify if affected speaker cable is properly seated and free from damage. | Yes | Go to step 4. | |
| | No | Reseat speaker cable or replace damaged speaker. Go to step 5. | **X09** |
| 4. Verify if affected speaker membrane is free from dust or debris, and speaker membrane is not deformed/damaged. | Yes | Go to step 5. | |
| | No | Clean any dust or debris. Go to step 5. If membrane is damaged, replace the speaker(s). | **X09** |
| 5. Verify if speaker enclosure is not damaged, is correctly installed in system, and does not create unneeded vibration when sound is played. | Yes | Speaker housing installation is good. Go to step 6. | |
| | No | Properly install/ replace affected speaker. Go to step 6. | |
| 6. Verify if internal speakers no longer produces distorted sound. | Yes | Issue resolved. | |
| | No | Replace logic board. | **M09** |

## Audio: Microphone

Unlikely cause: LCD display, power supply, hard drive, optical drive, fans

### Quick Check

| Symptoms | Quick Check |
|---|---|
| **Audio: Microphone**<br>• Microphone not working<br>• Microphone audio garbled<br>• No sound | 1. Launch System Preferences and select Sound/Input options. Verify that the sound input option is set to system's "internal microphone".<br><br>2. Launch System Preferences and select Sound/Input options. Verify that the 'Input Volume' setting is not set at the minimum level.<br><br>3. Launch System Preferences and select Sound/Input options. Verify that 'Input Level' indicator moves when speaking into the microphone. |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Verify if boot chime is present when system is powered ON. Note: make sure audio output preferences are not set to mute | Yes | Go to step 2 | |
| | No | Reset Pram and retest. | |
| 2. Check that no cable is inserted into the external sound input AND output ports. Launch System Preferences and select Sound/Input options. Verify if "Internal Microphone" is proposed and selected.. | Yes | Go to step 3. | |
| | No | If "External Microphone" input is proposed in Sound Input preferences, replace logic board. | **M09** |
| 3. Launch System Preferences and select Sound/Input options. Verify if 'Input Volume' is set above minimum sensitivity. | Yes | Go to step 4. | |
| | No | Set 'Input Volume' slider to the middle position. Retest. | |

| 4. Launch System Preferences and select Sound input options. Verify if 'Input Level' indicator moves when speaking into the microphone. | Yes | Microphone and audio input functioning. Go to step 6. | |
|---|---|---|---|
| | No | Suspect bad microphone or connection. Remove logic board and check that microphone is present on left speaker assembly, that cable and connector are free from damage, that connector is correctly seated to logic board . Reassemble and retest. If issue persist, replace microphone assembly. Go to step 5. | **X19** |
| 5. Record sound sample using Garageband or QuickTime Player. Verify if sound quality of sound sample is normal during playback. | Yes | Microphone circuitry OK. Return system to user. | |
| | No | Replace logic board | **M09** |

## SD (Secure Digital) Memory Card Will Not Insert Into Slot

Unlikely cause: LCD, logic board, hard drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **SD Memory Card will not insert into SD Slot**<br><br>SD Memory Card does not fully seat into the slot<br><br>Slot door does not open completely | 1. The SD memory card must be a 32 mm by 24 mm by 2.1 mm. You can also use thinner cards, such as MultiMediaCards (MMC).<br><br>2. Clear any obstruction in the slot. |

**Deep Dive**

| Check | Result | Action | Code |
|---|---|---|---|
| **1.** Check if a known-good SD card fits in slot. | Yes | Ask customer to replace defective or out-of-spec SD card. | |
| | No | Loosen all logic board screws and insert known-good SD card. Again go to step 2. | |
| **2.** Does memory card now fit in SD slot? | Yes | Tighten back the logic board screws and go to step 3. | |
| | No | Replace logic board and retest. | **M17** |
| **3.** Does SD card now eject and insert without issue? | Yes | Issue resolved by logic board alignment. | |
| | No | Replace logic board. . | **M17** |

## SD (Secure Digital) Memory Card Not Recognized By System

Unlikely cause: LCD, logic, optical drive, hard drive

**Quick Check**

| Symptom | Quick Check |
|---|---|
| **SD Memory Card is not recognized by the system**.<br><br>Card does not show up on the desktop or in System Profiler | **1.** Check correct drivers are installed for the customer's SD card type. Standard SD memory cards are supported by OS Software, but other may require specific driver software to be used.<br><br>**2.** Verify with known good SD Memory card if issue remains. |

**Deep Dive**

| Check | Result | Action | CSC |
|---|---|---|---|
| **1.** Verify if SD card inserts correctly. | Yes | Go to step 2. | |
| | No | Go to Symptom table "SD Memory card Will Not Insert Into Slot." | |
| **2.** Verify if the SD card shows up on the desktop or in System Profiler. | Yes | Go to step 3 | |
| | No | Check if a known-good SD Memory card can read and write correctly on system. -If yes, redirect customer to SD card vendor for faulty/ unsupported card. -If no, replace logic board for damaged SD card slot. | **M17** |
| **3.** Unlock the customer SD Card and verify if it can be read and written on system. | Yes | System is functional. | |
| | No | Check if a known-good SD Memory card can read and write correctly on system. If yes, redirect customer to SD card vendor for faulty/ unsupported card. If no, replace logic board for damaged SD card slot. | **M17** |

# Camera Issues

Unlikely cause: battery, top case, hard drive, optical drive, fan, speakers, microphone

**Quick Check**

| Symptoms | Quick Check |
|---|---|
| **Camera Issues**<br>• Camera not detected<br>• No green LED for camera<br>• Excessive blooming<br>• Poor White Balance<br>• Poor Focus<br>• Green image<br>• Image distortion | **1.** Launch System Profiler and confirm that built-in iSight camera are visible.<br><br>**2.** Verify camera lens and glass panel are clean and free of contaminants. Use provided cleaning cloth to clean glass panel if needed.<br><br>**3.** Launch PhotoBooth to verify if the green indicator LED near the camera lens turns on and that the image quality is acceptable. |

**Deep Dive**

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Verify if he Built-in iSight camera is available in the Apple System Profiler USB list of devices. | Yes | Camera recognized. Go to step 2 | |
| | No | Inspect and reseat camera cable connection on logic board. Go to step 2.. | |
| 2. Launch PhotoBooth. Verify if acquired image appears normal. | Yes | iSight camera functioning. Go to step 3 | |
| | No | Clean glass for dust presence. Go to step 3 | |
| 3. Launch PhotoBooth. Verify if green LED near camera lens turns ON and image appears normal. | Yes | iSight camera functioning. Obtain additional information from user. Return system to user. | |
| | No | Replace Display clamshell (camera and cable are part of clamshell) Go to step 4. | **L17** |
| 4. Launch PhotoBooth. Verify if green LED near camera lens turns ON and image appears normal. | Yes | iSight camera functioning. Issue resolved | |
| | No | Replace logic board. . | **M13** |

# FireWire Port Not Recognizing Known Devices

Unlikely cause: LCD, logic, optical drive, hard drive

**Quick Check**

| Symptom | Quick Check |
|---------|-------------|
| **FireWire Port is not recognizing known devices**<br><br>Attached FireWire device like digital camera or mass storage drive not recognized by the system | 1. Check for latest software update.<br>2. Use Apple System Profiler to verify the computer recognizes the FireWire bus.<br>3. Test port by connecting to another computer using FireWire Target Disk Mode.<br>4. Verify the FireWire cable is good.<br>5. Verify a self powered FireWire device is getting power |

## Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| After resetting SMC, verify if the FireWire Port recognized. | Yes | Issue resolved. | |
| | No | FireWire port is defective.. Replace main logic board. | **M12** |

## Uncategorized Symptom

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Uncategorized Symptom**<br><br>Unable to locate appropriate symptom code | Verify if existing symptom code applies to the issue reported by the customer. If not, document reported symptom and send feedback to **smfeedback@apple** stating that a suitable symptom code could not be found. |

# Mechanical Issues: Thermals and Enclosure

## Reset/Power Button Stuck

Unlikely cause: LCD, hard drive, optical drive

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Reset/Power Button Stuck**<br>• System will not power on<br>• System sounds bootROM unlock tone during startup<br>• System automatically starts up repeatedly | 1. Diagnose stuck button with SMC keyboard reset sequence<br><br>2. Check for issue occurrence on battery and on AC power<br><br>3. If on battery only, check battery using Battery Diagnostic Utility |

### Deep Dive

| Check | Result | Action | Code |
|---|---|---|---|
| 1. Reset SMC using keyboard 3 keys and power-on key. MagSafe LED can verify SMC reset. Momentary stop of battery charging will indicate SMC reset, orange LED will go green momentarily then return to orange. | Yes | Keyboard reset works while holding 3 keys and toggling power-on key, multiple press and release of power-on key works to show power-on key not stuck or fixed. | |
| | No | SMC keyboard reset not working, suggests power-on key is open circuit or stuck down. Go to step 2. | |
| 2. Remove battery and AC power for 30 seconds to perform a manual SMC reset. Apply AC power. Verify if power-on key works when pressed. | Yes | SMC restored from power removal sequence. Power-on key now working properly. | |
| | No | Power-on key stuck or open. Go to step 3. | |

| | | | |
|---|---|---|---|
| **3.** Inspect keyboard flex cable for loose or damaged connections.<br><br>Align and reseat the keyboard flex cable on logic board connector.<br><br>Verify if power key now works correctly. | Yes | Cable reseat restored power-on key operation. | |
| | No | Power-on key still appears to be stuck or open. Go to step 4. | |
| Remove two screws on metal cable cover to access keyboard connector.<br><br>-Plug known good powered AC adapter.<br><br>-Try to power system using power key<br><br>-If system does not power on, use a conductive tool to short power-on pads on logic board (see image on left) . Make sure you don't touch any other pins .<br>- Verify if system powers on. | Yes | System powers on suggesting top case power on key circuit is open. Replace top case for open power-on key. | **X14** |
| | No | Power-on key circuit appears to be closed suggesting a stuck power-on key. Go to step 5. | |
| **4.** Disconnect the internal keyboard flex cable from logic board and use a conductive tool to short power-on pads on logic board (see image on left) Make sure you don't touch any other pins.<br>Verify if system powers on. | Yes | Shorting power-on pads starts the system. Replace top case due to stuck power-on key. | **X14** |
| | No | Go to symptom table: No power/ not booting | |

# System Runs Hot

Unlikely cause: LCD, hard drive, optical drive

## Quick Check

| Symptom | Quick Check |
|---------|-------------|
| **System Runs Hot**<br>• System feels very warm<br>• Fan(s) not working<br>• Fan(s) are full on | 1. Verify the computer operating on a flat, hard surface and the vents are not blocked.<br><br>2. Verify the computer is not running hotter than expected for normal operation. If possible, compare to a similarly configured computer.<br><br>3. Reset SMC.<br><br>4. Inspect fan performance<br><br>5. Run thermal sensor test. |

## Deep Dive

| Check | Result | Action | Code |
|-------|--------|--------|------|
| 1. Verify if the system is running as expected (compared to similar system). | Yes | Use "Apple Portables: Operating Temperature" (**Knowledge Base HT1778**) to inform user it is operating normally. | |
| | No | Go to step 2. | |
| 2. Verify if there are runaway applications. See "Runaway applications can shorten battery run time" (**Knowledge Base TS1473**). | Yes | Check with the vendor for compatibility and software update. | |
| | No | Go to step 3. | |
| 3. Fans are typically on at minimum speed. Perform SMC reset and verify if the fans are running properly. | Yes | Go to step 5. | |
| | No | Fan(s) not running or always running at full speed. Go to step 4. | |
| 4. Reseat fan connection to logic board or test a known-good fan. Replace any fan which is not spinning or replace logic board which is not spinning a known-good fan. Verify if fan(s) are working properly. | Yes | Reseating or replacing bad fan resolved issue. Replace logic board if it does not work with known-good fan. | **X99 or M18** |
| | No | Go to step 5. | |

| | | | |
|---|---|---|---|
| **5.** Verify if the heatsink is installed properly with no damage to heat fins. | Yes | Go to step 7. | |
| | No | Replace missing screws or damaged heatsink. Go to step 6. | **X10** |
| **6.** Verify if the system is running as expected. | Yes | Heatsink installed incorrectly. Issue resolved. | |
| | No | Go to step 7. | |
| **7.** Heatsink thermal grease possibly missing or improperly installed during previous repair. Verify if correct thermal grease is present. | Yes | Replace heatsink with correct thermal grease type and retest. Go to step 8 | |
| | No | Replace heatsink with correct thermal grease type and retest. | **X10** |
| **8.** Run ASD tests for sensor monitoring. | Yes | Thermal module or other sensor reseat resolved issue. | |
| | No | Replace logic board if sensor error detected.  Go to step 9. | **M23** |
| **9.** After logic board replacement, verify if the computer is running as expected. | Yes | Bad logic board.  Issue resolved. | |
| | No | Use minimum configuration troubleshooting to isolate the issue. | |

## Uncategorized Symptom

### Quick Check

| Symptom | Quick Check |
|---|---|
| **Uncategorized Symptom** <br><br> Unable to locate appropriate symptom code | Verify if existing symptom code applies to  the issue reported by the user. If not, document reported symptom and send feedback to **smfeedback@apple. com** stating that a suitable symptom code could not be found. |

**Apple Technician Guide**

**Take Apart**

MacBook Pro (15-inch, Mid 2010)

# General Information

## Connector Types on Logic Board

On the logic board are six types of connectors, each requiring special handling. Make sure you read these tips before disconnecting and installing the connectors.

### Vertical Insertion (JST)

- Use black stick under cable to remove.
- Keep connector level to board when disconnecting and reconnecting.
- Press evenly when reconnecting or connector can be tipped up and not fully seated.
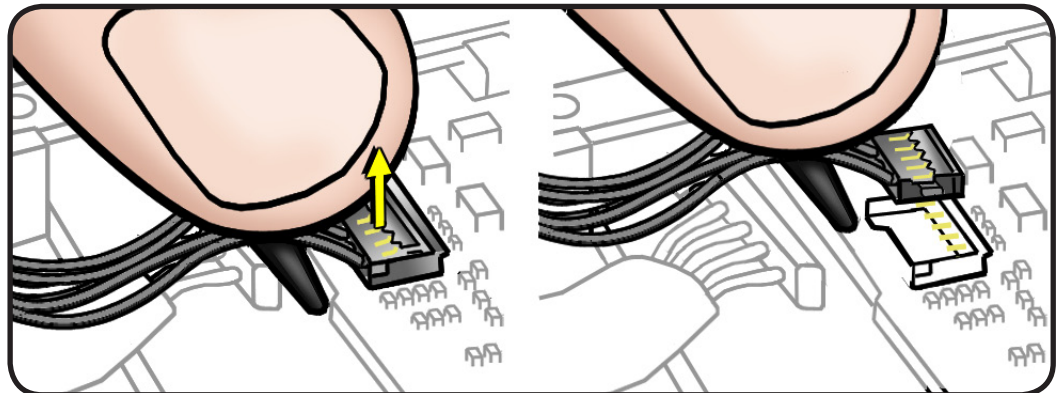
Examples:
- fan cable
- left speaker on underside of board

### Locking Lever

- Flip up lever 90 degrees for cable removal.
- Slide connector into receptacle. Use tweezers if necessary.
- Lock down lever after inserting cable.
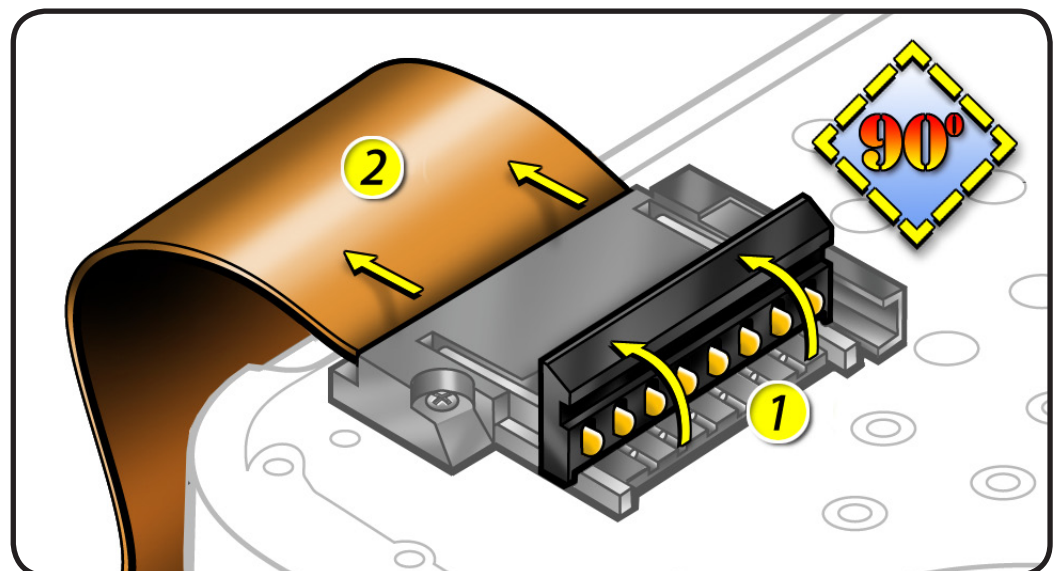
Examples:
- IR/SIL flex cable
- keyboard flex
- backlight flex cable

## Horizontal Install

- Pull connector, not cable, to remove.
- Slide connector into receptacle on same horizontal plane as board.

Examples:

- MagSafe cable on underside of board
- battery power cable on underside of board
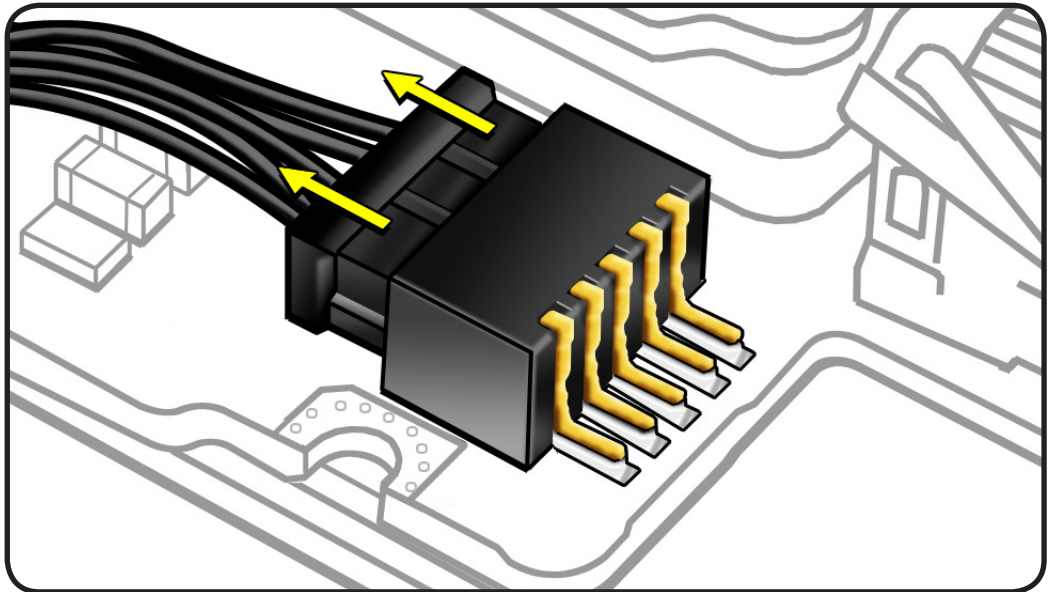


## Thin, Multi-Pin Horizontal Insert

- Use fingernails or tweezers to remove evenly.
- Slide connector into receptacle on same horizontal plane as board.

Example:

- LVDS cable with lock bar
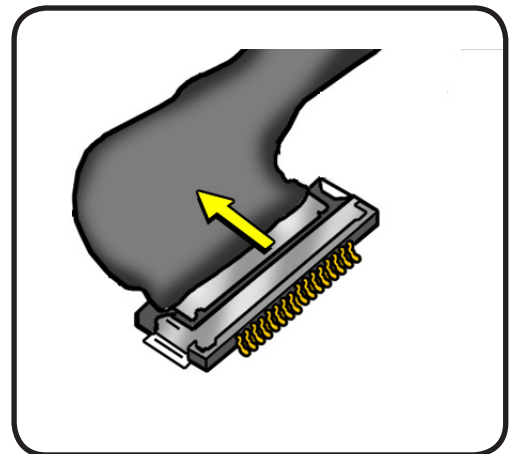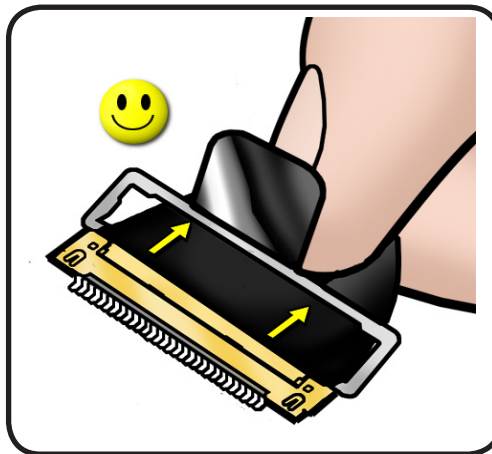
**Replacement Caution:**
When connecting cables, make sure they are fully connected.
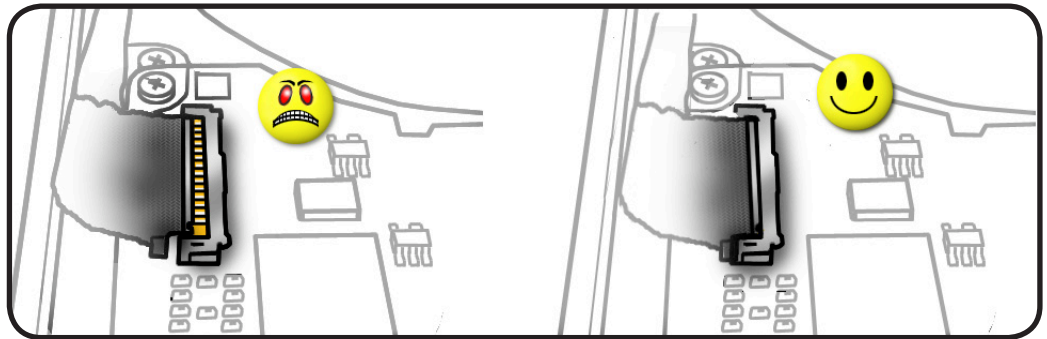


**Low-Profile Solid Platform Flex**

- Use black stick and gentle rocking motion to release tension to remove cable.
- Keep connector level to board and press evenly on platform to install.

Examples:
- optical drive flex cable
- trackpad flex cale
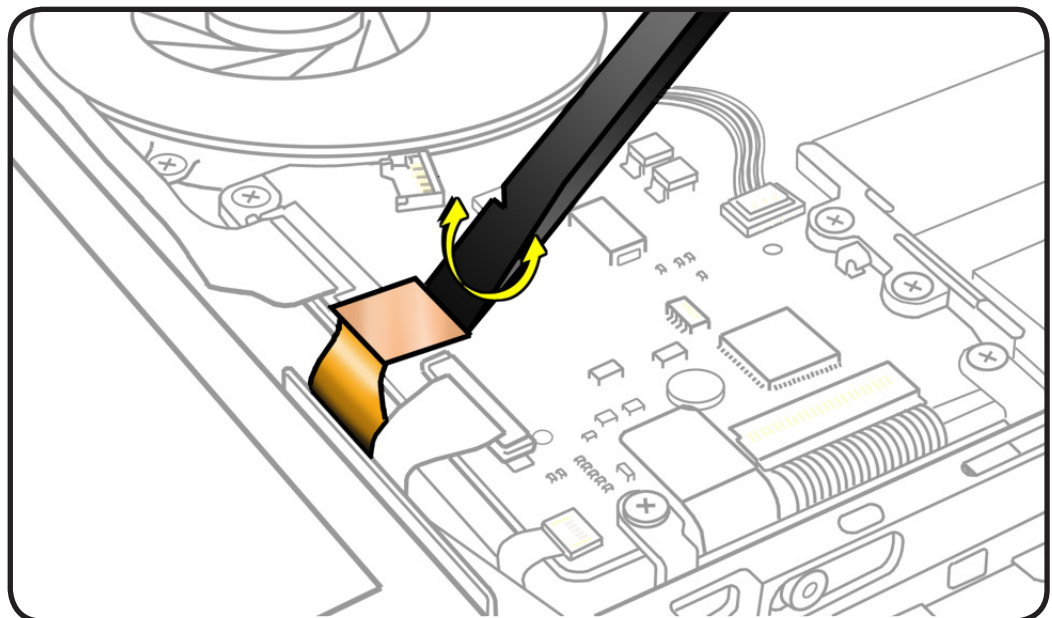
## Battery Precaution

This computer contains an internal-only battery that is serviceable by Apple-authorized service providers only. Tamper-proof screws are employed to prevent customers from attempting to remove it. Before you begin any procedure, disconnect the battery from the logic board. Failure to do so could damage the computer.
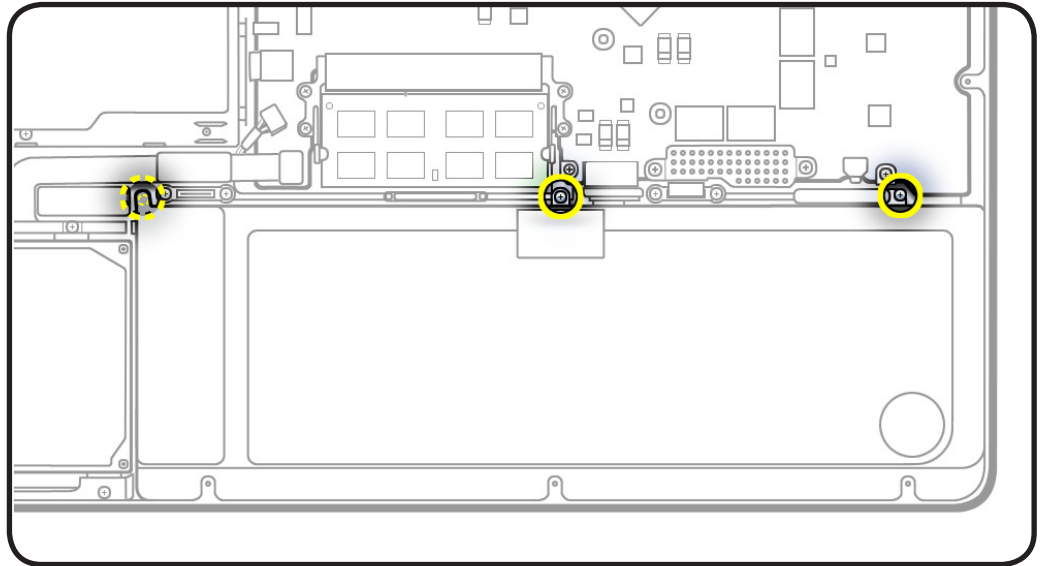
## Battery Removal Tool

To remove the security screws holding the battery in place, you will need a special tool, a large tri-lobe screwdriver, Apple part number 922-8991, available through GSX.
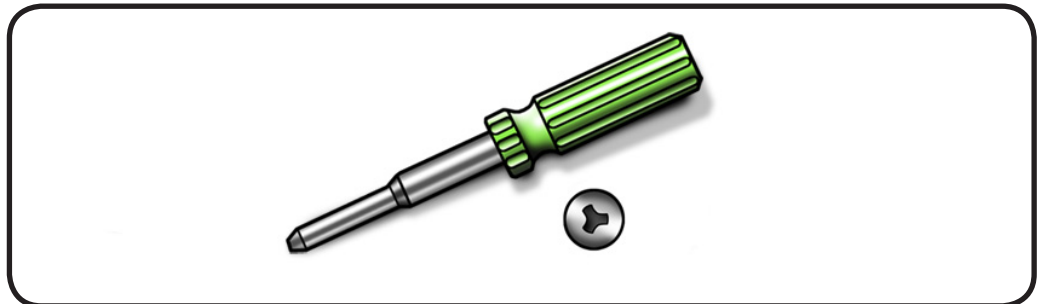
## Icon Legend

The following icons are used in this chapter:

| Icon | Meaning |
|------|---------|
|  | Warning or Caution |
|  | Check mark; make sure you do this |

## Temperature Concerns

The normal operating temperature of this computer is well within national and international safety standards. Nevertheless, customers may be concerned about the generated heat. To prevent an unneeded repair, you can compare a customer's computer to a running model, if available, at your repair site. For more information on temperature concerns and customer perception, refer to Knowledge Base article 30612 "Apple Portables: Operating Temperature."

http://docs.info.apple.com/article.html?artnum=30612

## Replacement Steps

When there are no replacement steps listed, replace parts in the exact reverse order of the Removal procedure.

## Note About Images in This Guide

Because a pre-production model was used for the illustrations in this manual, you may notice small differences between the image pictured and the computer you are servicing. Although the appearance may differ, the steps and sequence are the same, except where noted.

## Screw Sizes

Screw sizes are approximate and represent the length of the screw.

# Bottom Case

## First Steps



Warning:
- Shut down computer.
- Wait 10 minutes
- Unplug all cables.
- Put on ESD strap.
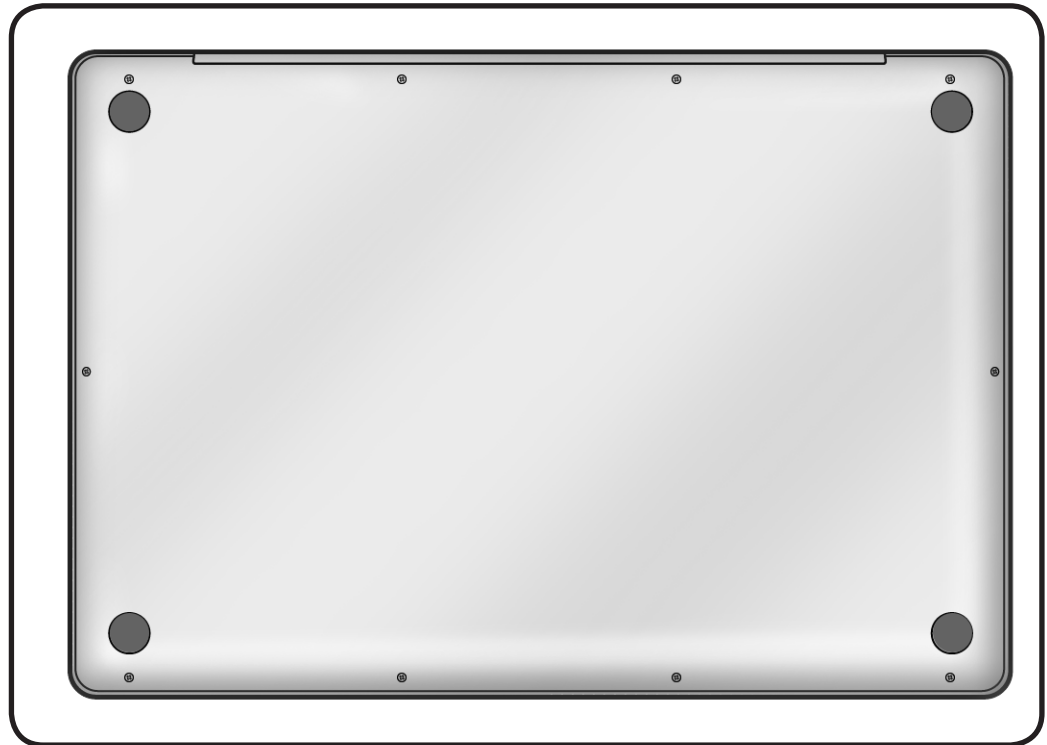


## Tools
Clean, soft, lint-free cloth

- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
- Black stick
- Magnifying glass



⊕ # 00
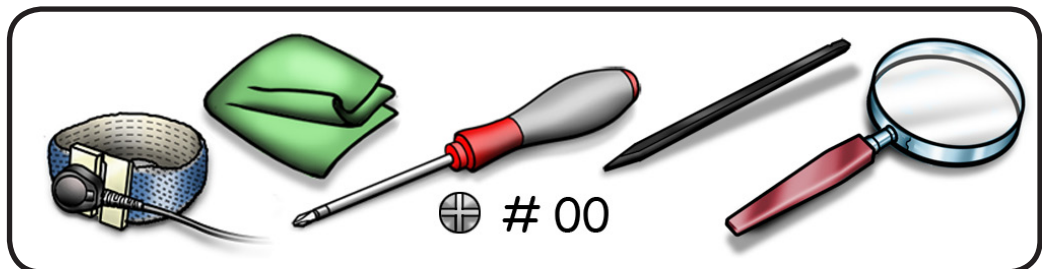
## Removal

**Caution**: To prevent scratches, use a protective cloth.
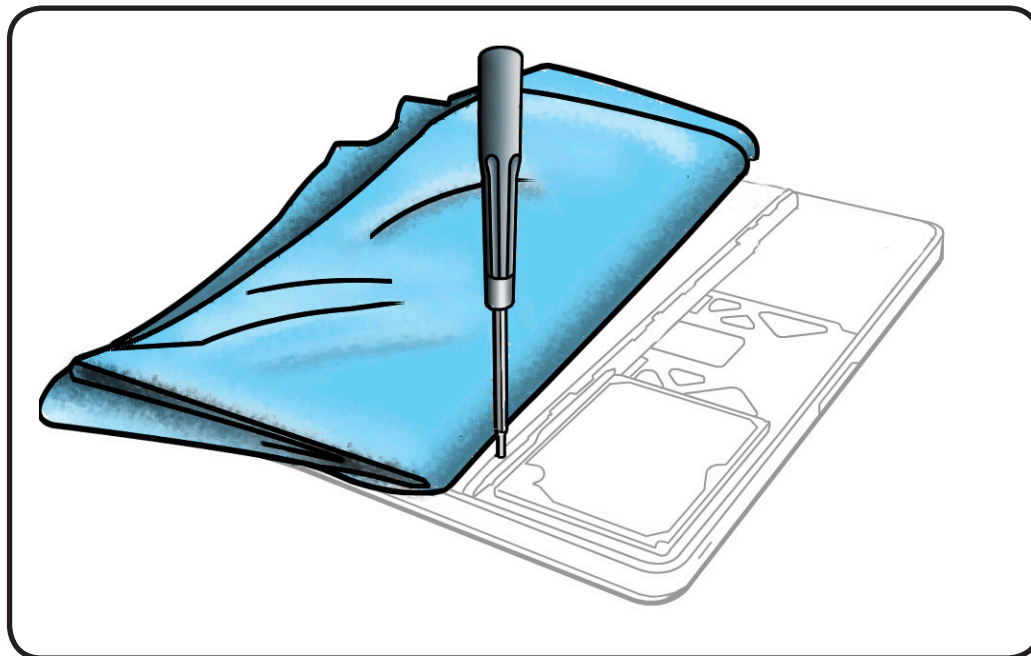


1   **Important:** The screws at the sides and front of the computer must be removed and installed at an angle.
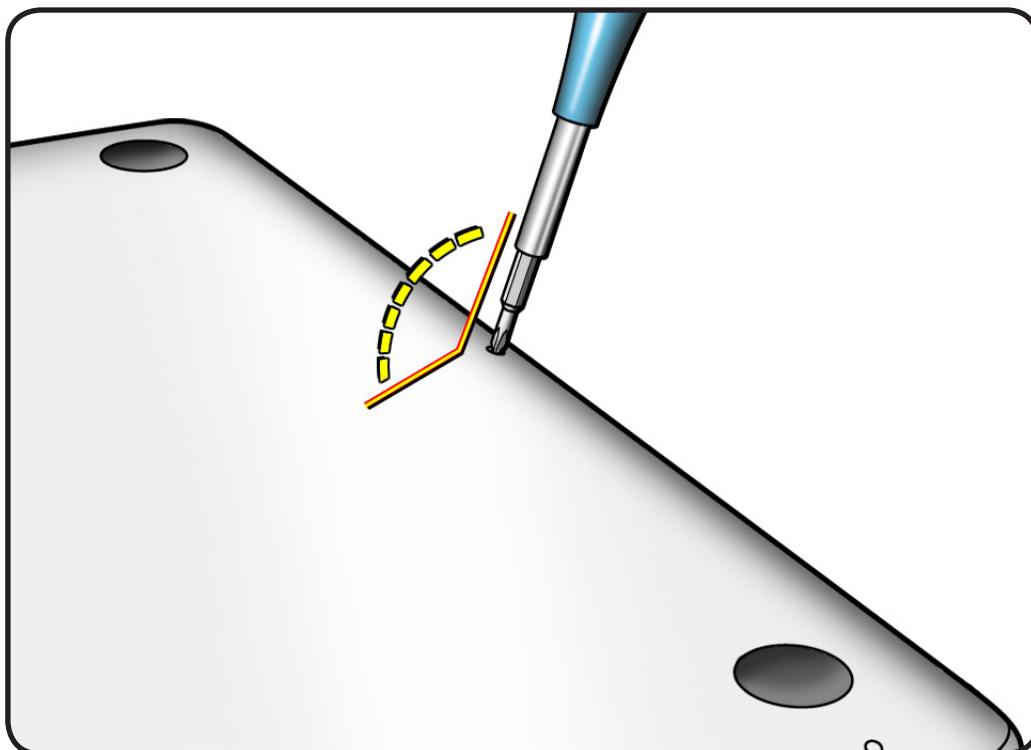
**2** Remove 10 screws:

- 3 (14 mm) 922-8985
- 7 (3.3 mm) 922-9334

**Replacement Note:** Install screws in the order shown.
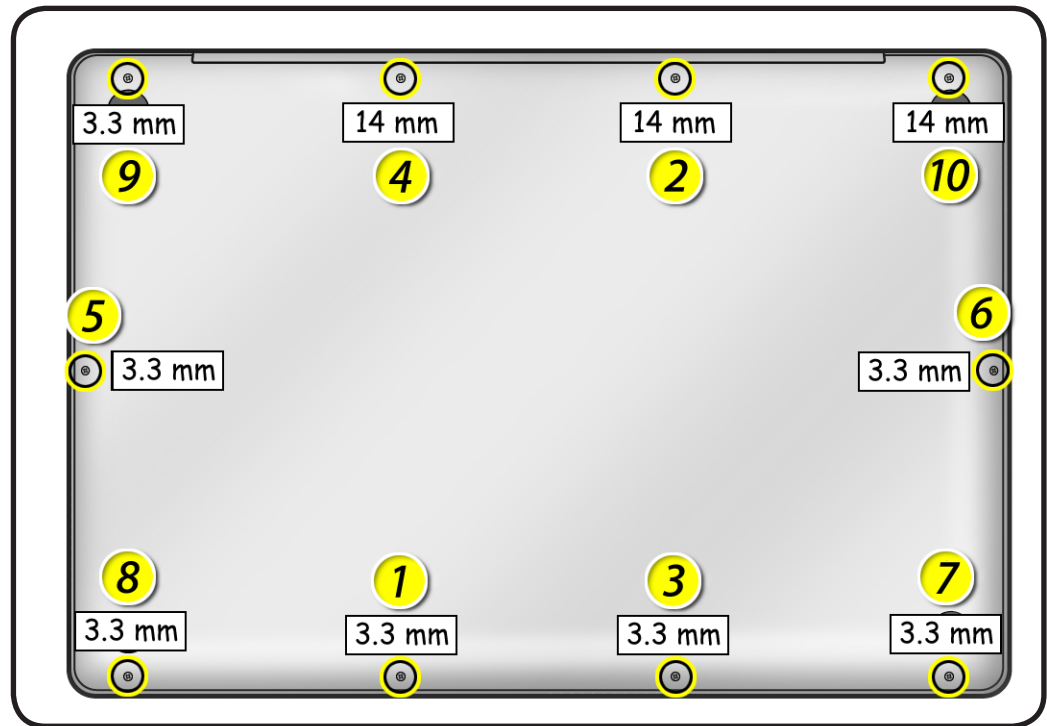


**3** Use black stick to loosen and remove bottom case.

## Replacement

**1** When replacing a bottom case, retain the customer's bottom case until the repair is complete. Before installing the replacement bottom case, write the system serial number on the inside of the new bottom case. You might need a magnifying glass to read it. Refer to "**Transferring the System Serial Number**."

W8915XXX2XK
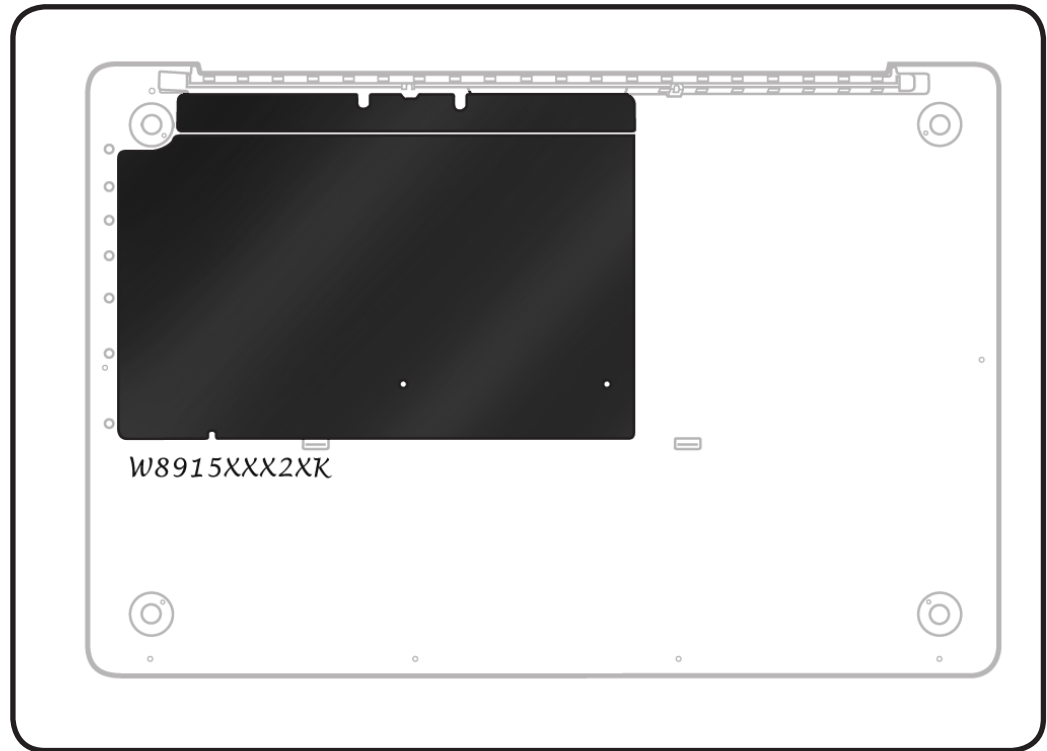
**2** Install bottom case so that 2 clips snap onto top case.
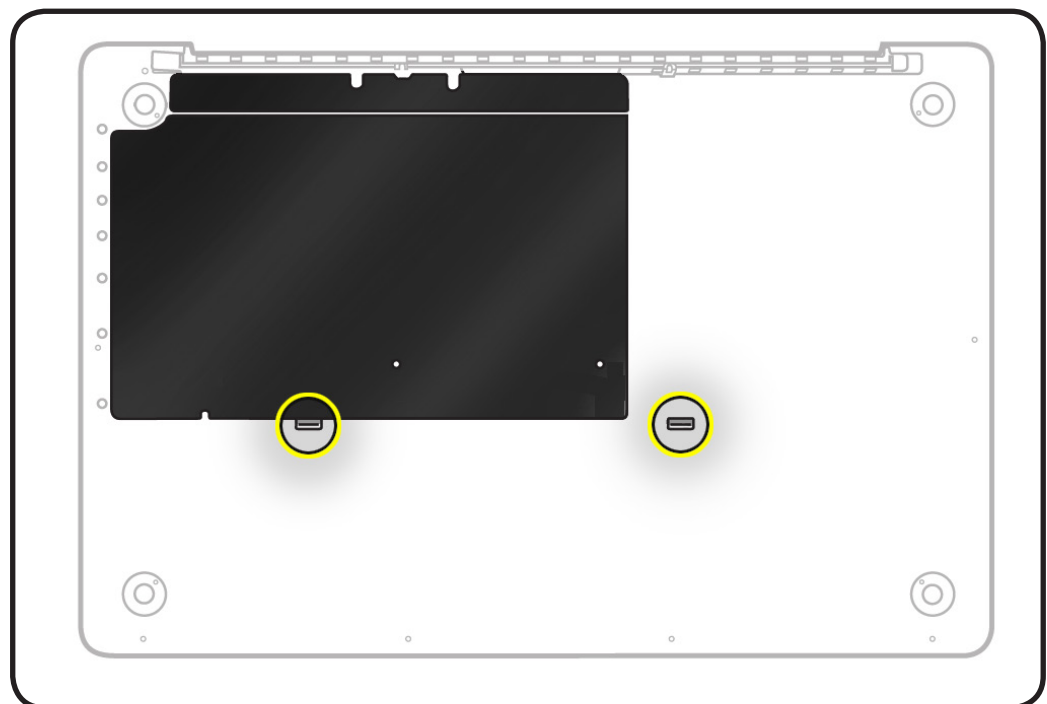
# Battery

## First Steps

Remove:
• Bottom case
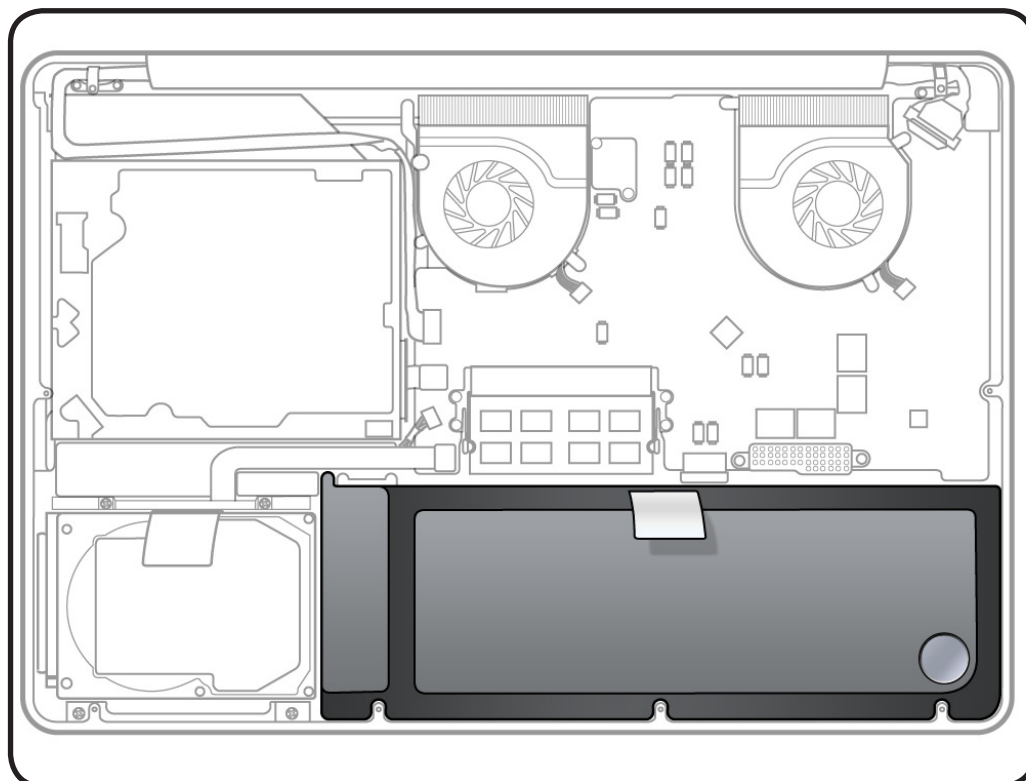


## Tools
• Clean, soft, lint-free cloth
• ESD wrist strap and mat
• Black stick
• Large tri-lobe #0 screwdriver (922-8991)
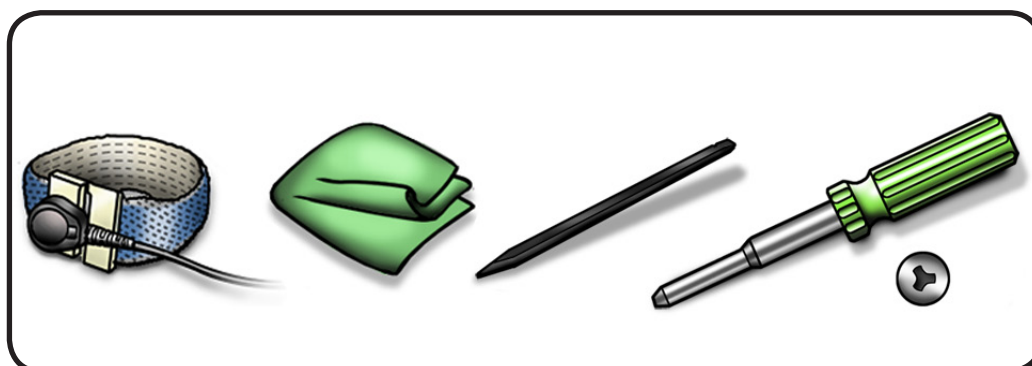
# Removal

**1** Remove 3 (5.5 mm) 922-9321 trilobe screws.
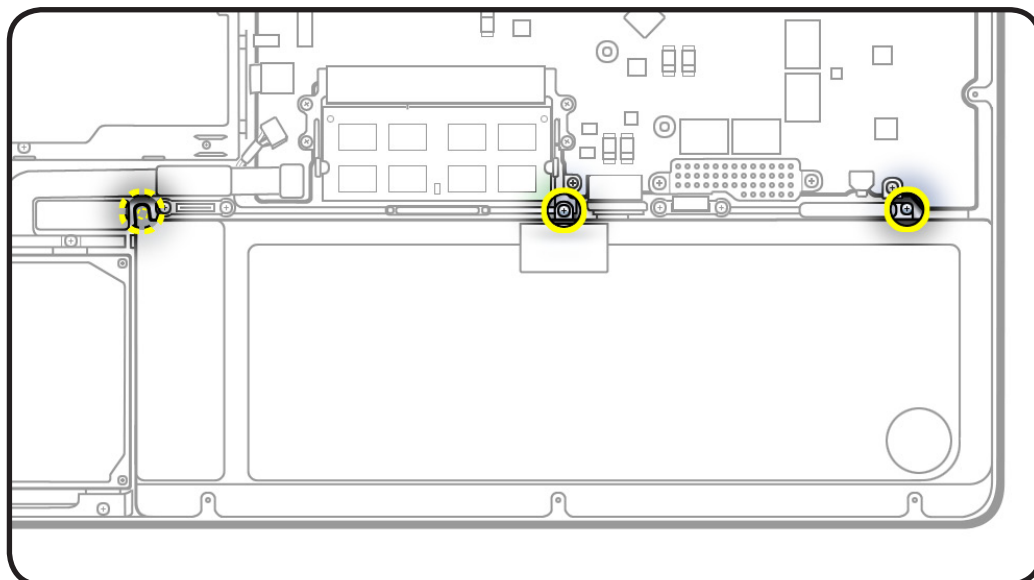
**2** Pull battery tab up and forward a short distance to access the battery cable.
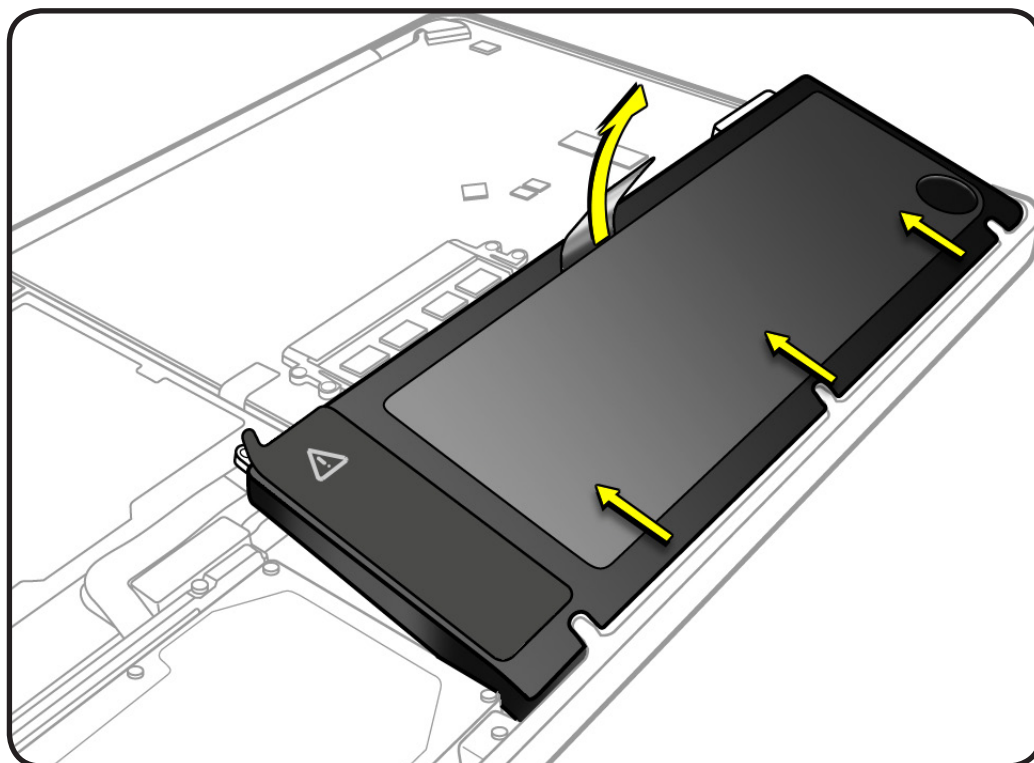
**3** Using a black stick, pry cable from logic board connector.
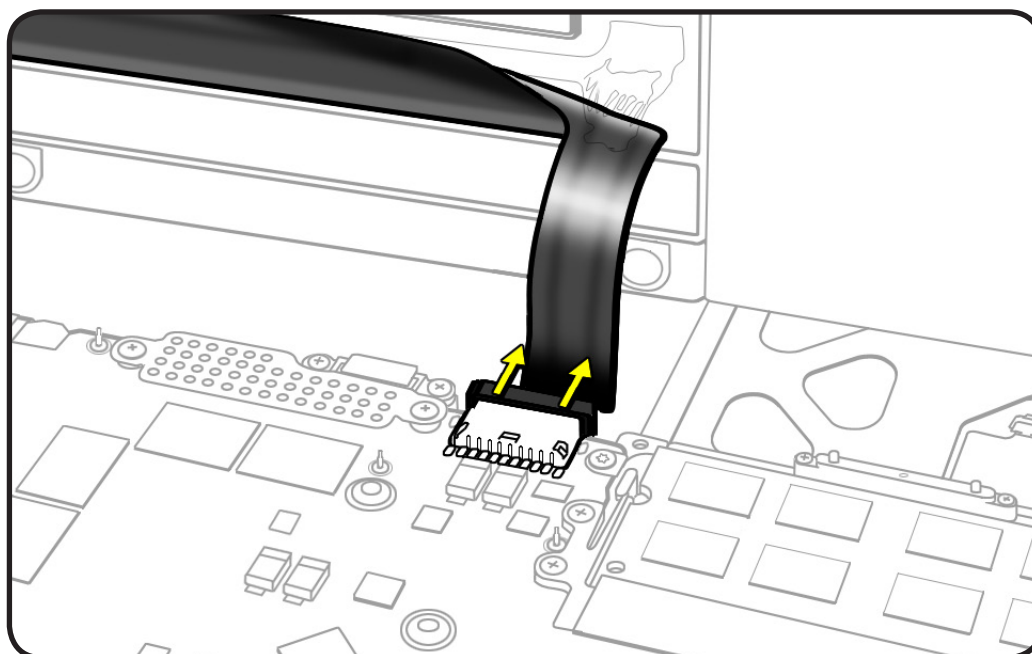
## Replacement

**1** Slide front edge of battery under 3 tabs.

**2** Connect battery cable and install 3 trilobe screws in order shown.
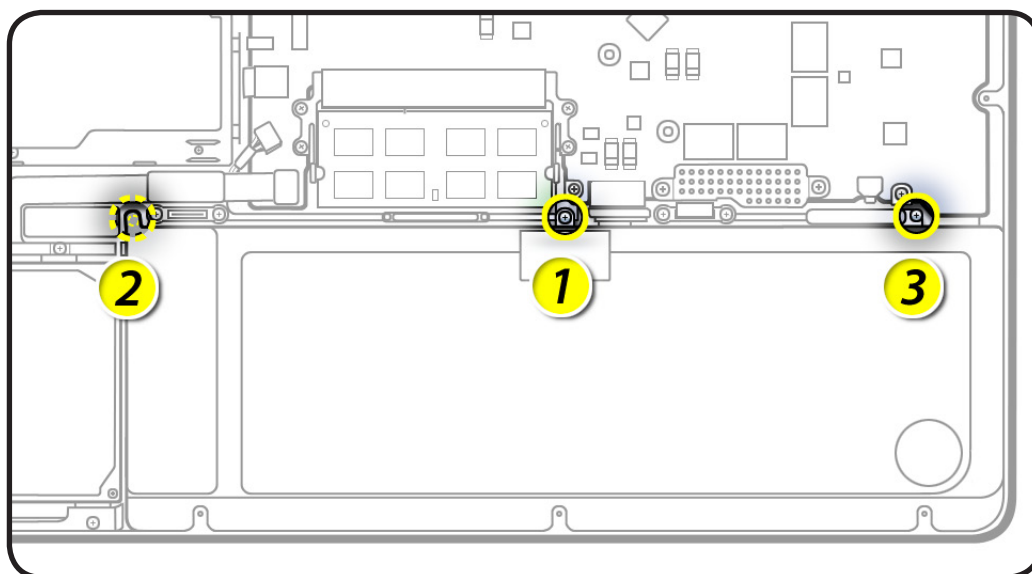
**Note**: If installing a new battery, attach the new battery label (refer to battery label inbox instructions).
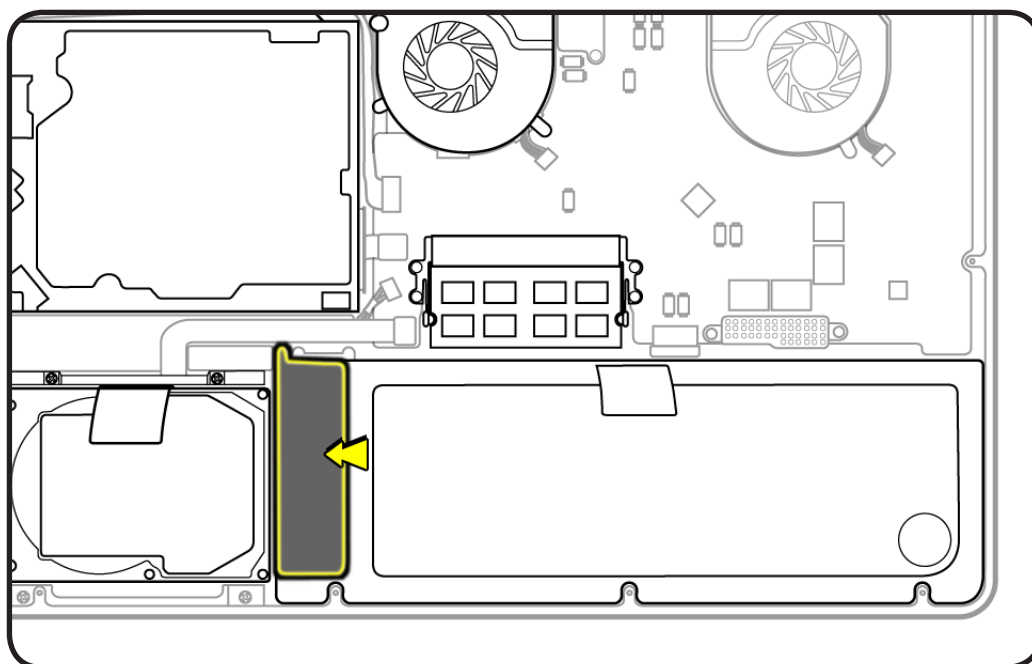
**3**   Press battery indicator light button to check charge level.
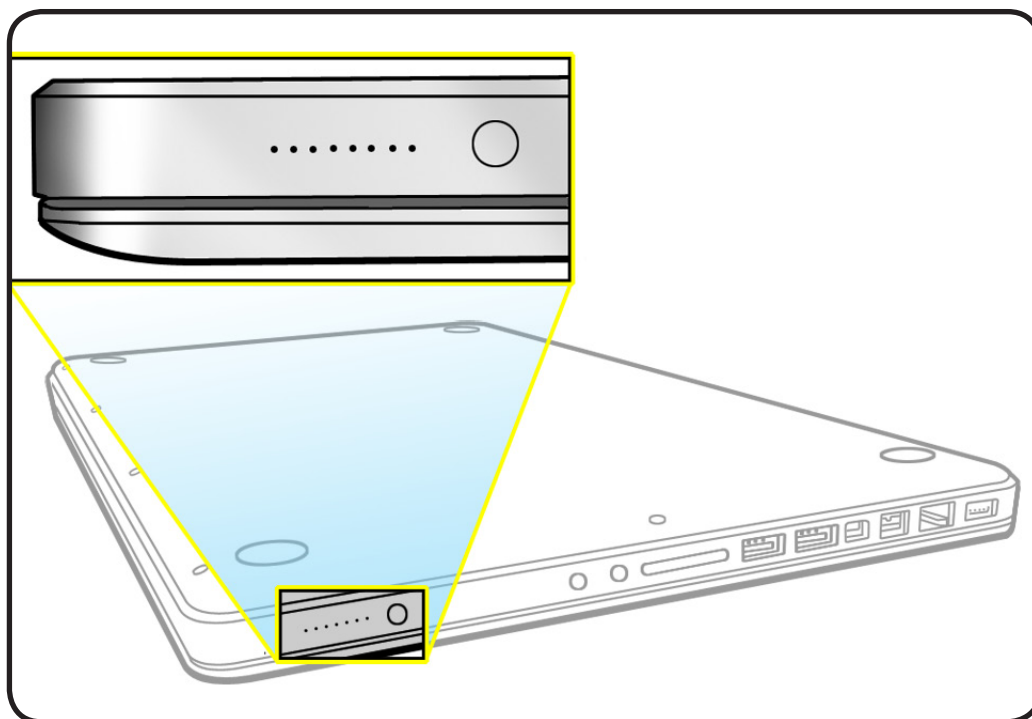
# Hard Drive and Bracket

## First Steps

Remove:
- Bottom case
- Battery

**Caution**: Make sure data is backed up before removing the hard drive.
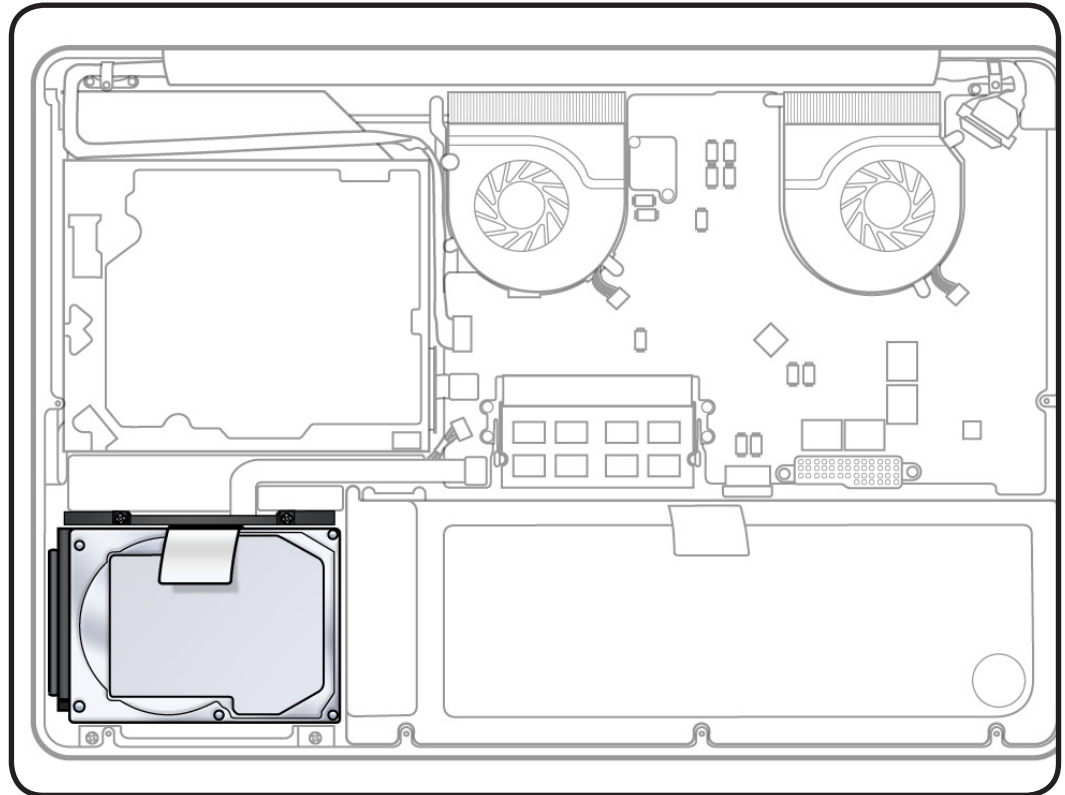
## Tools
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
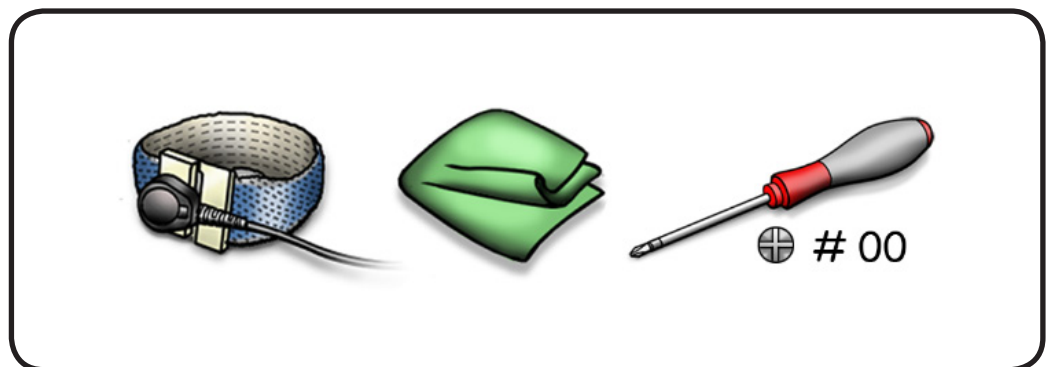
# Removal

**1** Loosen 2 captive screws to remove bracket.
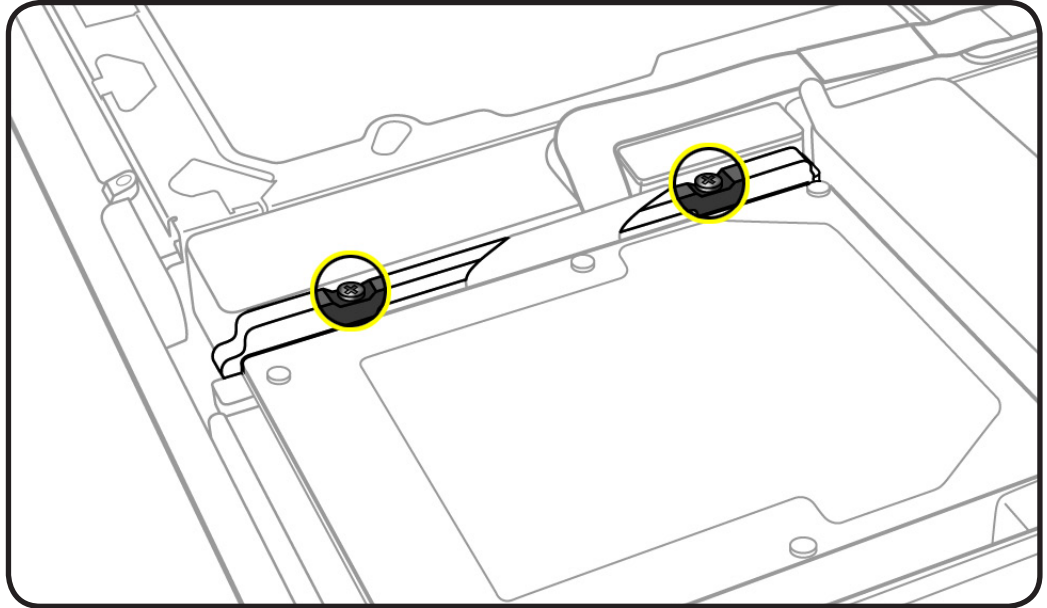


**2** Lift out bracket.

**Replacement Note:** Make sure 2 rubber grommets are included in bracket before installing it.
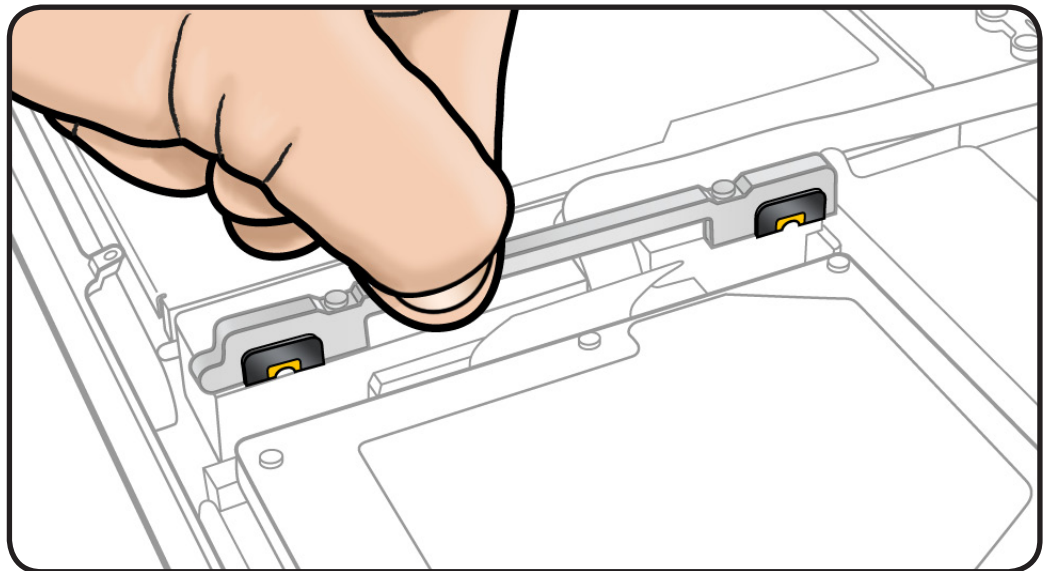
**3** Use pull tab to tilt hard drive out.
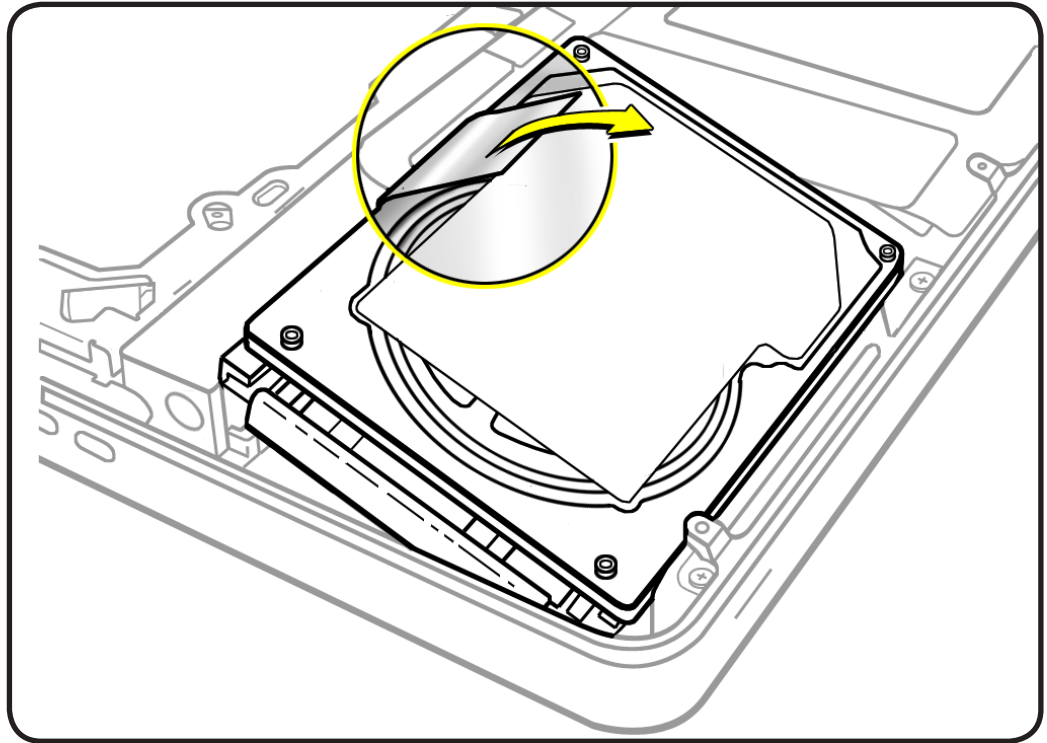


**4** Hold hard drive by the sides only.

**5** Disconnect hard drive connector.
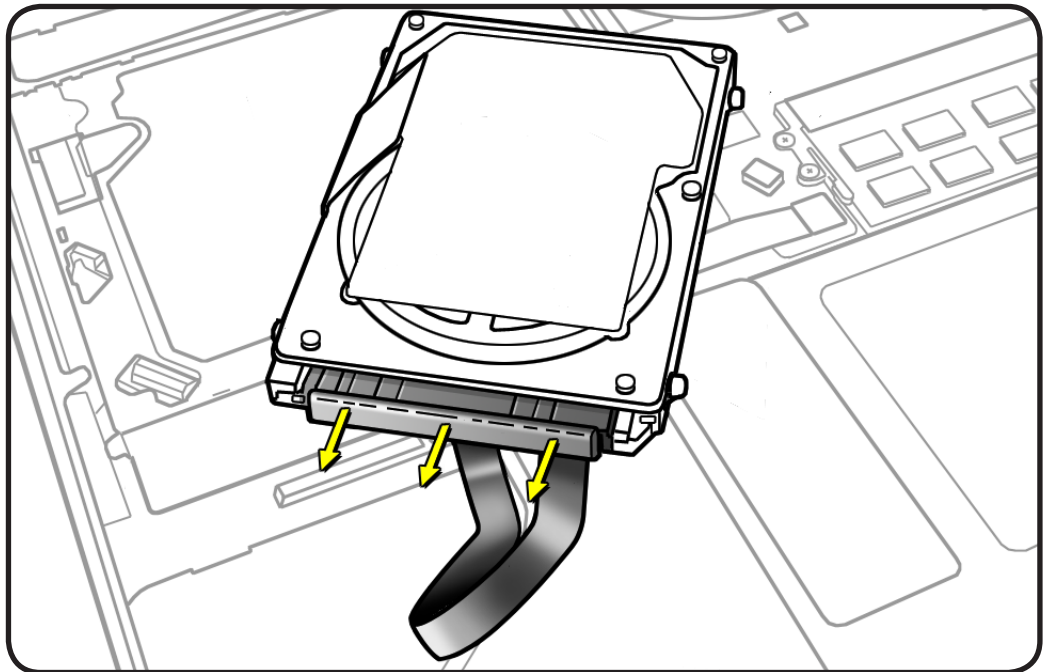
**6** Follow safe handling:

· Do not press drive

· Do not touch
  connector
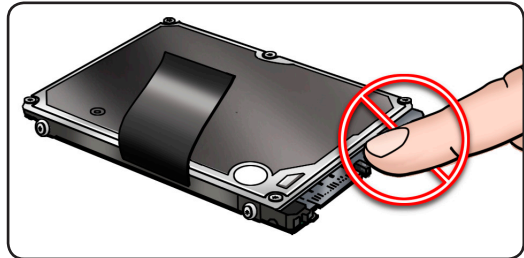
· Do not touch circuitry
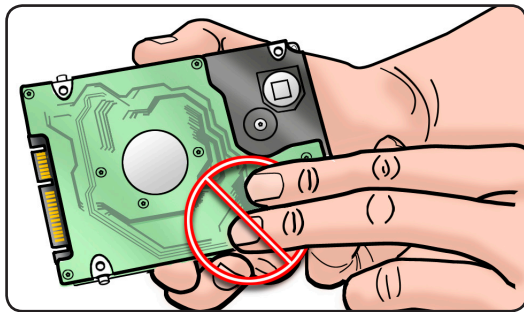
## Replacement

**1** Touch a metal surface to discharge static electricity.
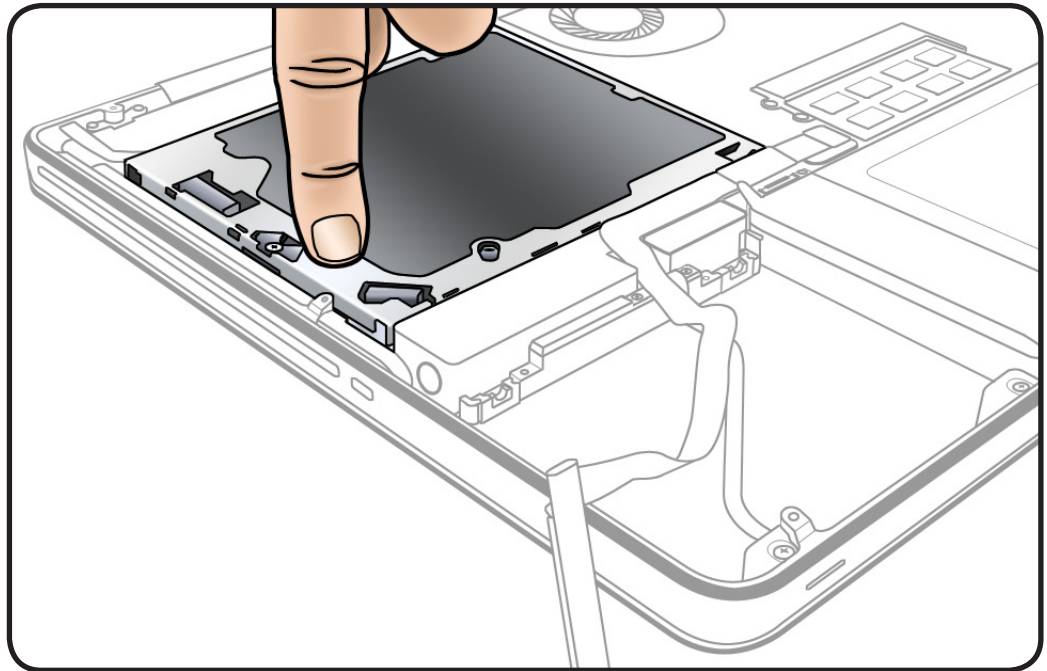


**2** Make sure 4 Torx T6 mounting screws are installed on the drive.

If your replacement drive does not have mounting screws, transfer them from the old drive. (Screws are not offered separately.)
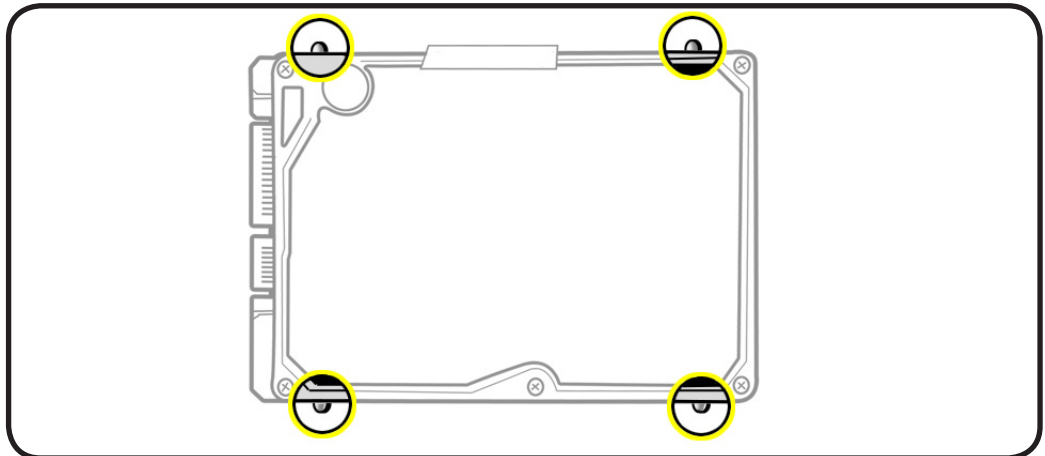
**3** Attach connector and insert hard drive at an angle making sure mounting screws are inserted into front bracket.

**4** Replace bracket and tighten 2 captive screws.
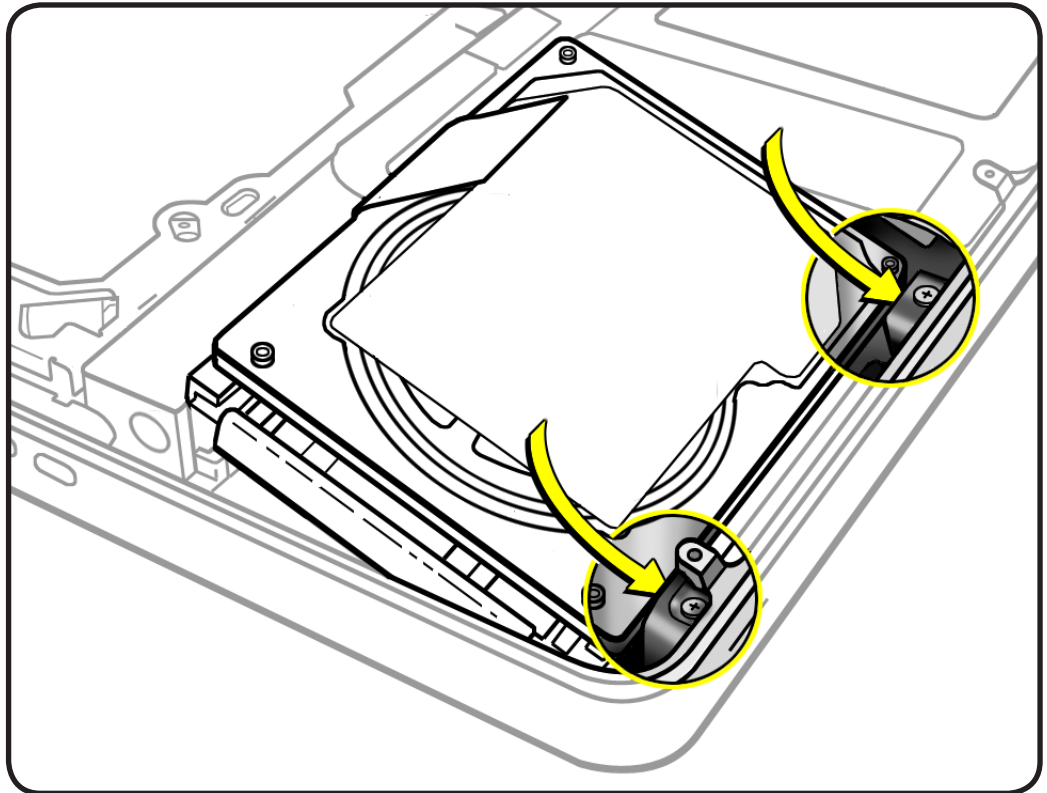
## Reinstalling Software That Came with the Computer

Use the software install discs that came with the computer to reinstall Mac OS X and any applications that came with the computer. Choose either "Archive and Install," which saves the existing files and settings, or "Erase and Install," which erases all the data.

**Important:** Apple recommends backing up data on the hard disk before restoring software. Because the "Erase and Install" option erases the hard disk, you should back up essential files before installing Mac OS X and other applications. Apple is not responsible for any lost data.

## Installing Mac OS X

To install Mac OS X, follow these steps:

1. Back up essential files.

2. Make sure power adapter is connected and plugged in.

3. Insert the Mac OS X Install DVD that came with the computer.

4. Double-click Install Mac OS X.

5. Follow the onscreen instructions.

   **Note:** To restore Mac OS X on the computer to the original factory settings, click Options in the "Select a Destination" pane of the Installer, and then select "Erase and Install." If you choose "Erase and Install," you will see a message reminding you to use the Applications Install DVD to reinstall the bundled applications that came with the computer.

6. Whent the installation is complete, click Restart.

7. Follow the prompts in the Setup Assistant to set up the user account.

## Installing Applications

If you reinstall Mac OS X on the computer and select the "Erase and Install" option, you must reinstall the applications that came with the computer, such as the iLife applications.

To install applications that came with the computer, follow these steps:

1. Make sure power adapter is connected and plugged in.

2. Insert the Applications Install DVD that came with the computer.

3. Double-click Install Bundled Software.

4. Follow the onscreen instructions.

5. When the installation is complete, click Close.

# Hard Drive/IR/Sleep Indicator Cable

## First Steps

Remove:
- Bottom case
- Battery
- Hard drive

**Caution**: Make sure data is backed up before removing the hard drive.
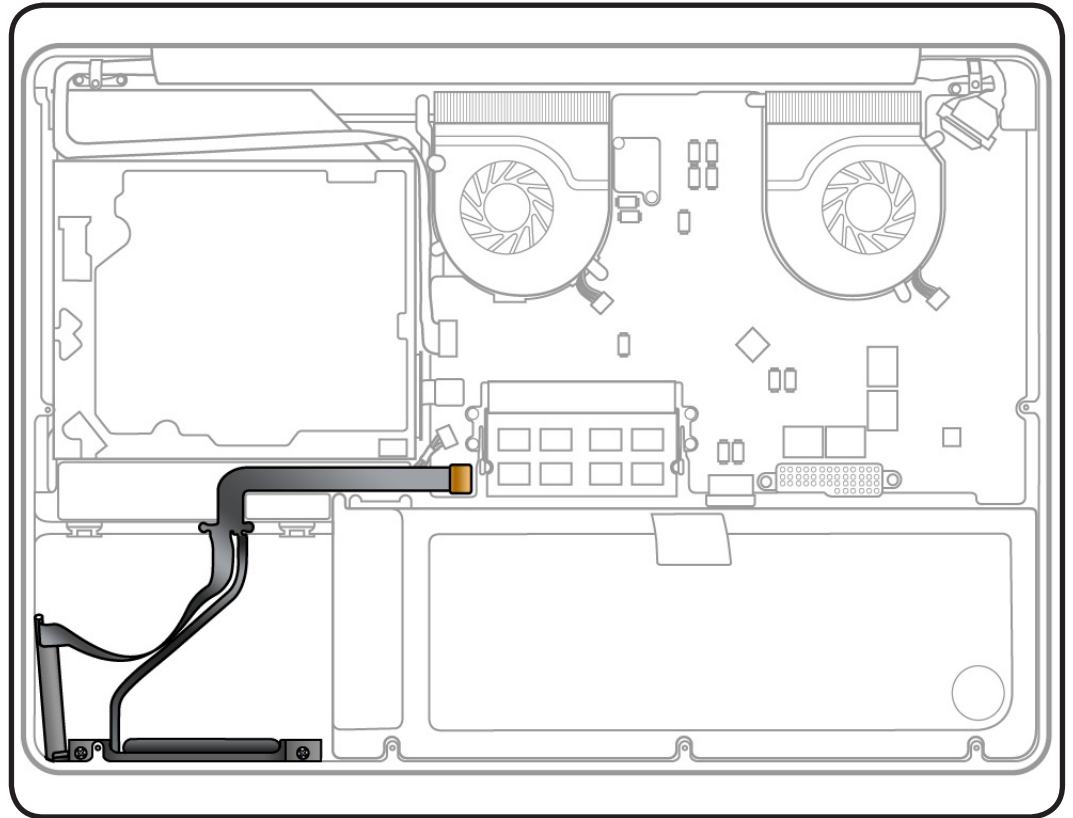
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
- Magnetized Phillips #00 screwdriver
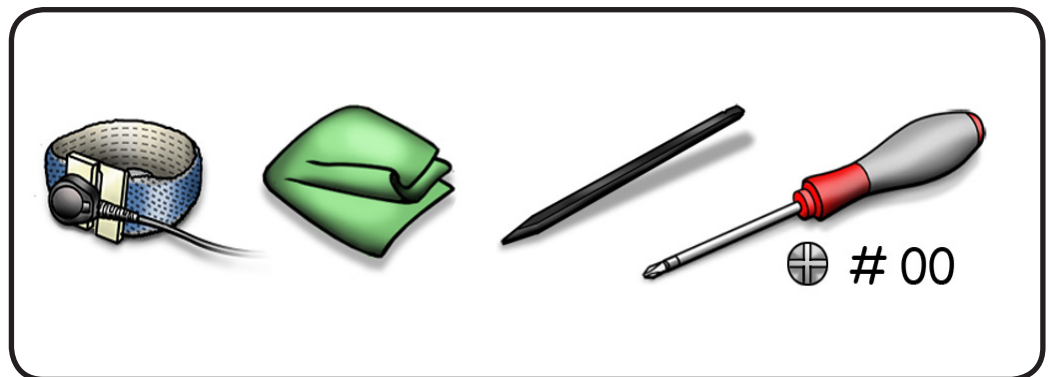
## Removal

1  **Caution**: The cable is fragile; be careful when disconnecting and removing the it.

2  Use black stick to disconnect cable from connector on logic board and carefully pry cable from top of speaker.

3  Remove 4 screws:
   - 2 (2.6 mm) 922-9036 on cable
   - 2 (8.9 mm) 922-9105 on front bracket

   **Replacement Note:** Make sure rubber gaskets are installed on front bracket before reinstalling 2 screws.

4  Carefully peel up cable from top case.

   **Replacement Note:** Press cable so it lies flat in top case.

2.6 mm  2.6 mm

8.9 mm  8.9 mm
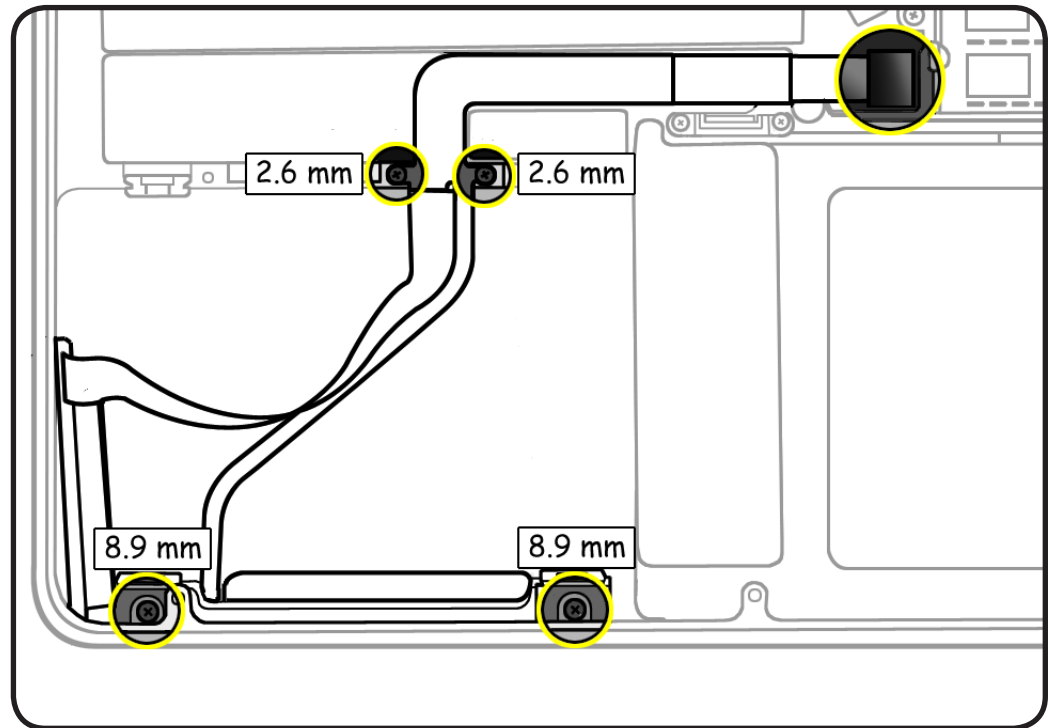
# Memory

## First Steps

Remove:
- Bottom case
- Battery

**Caution**: Avoid touching anything other than the memory area.
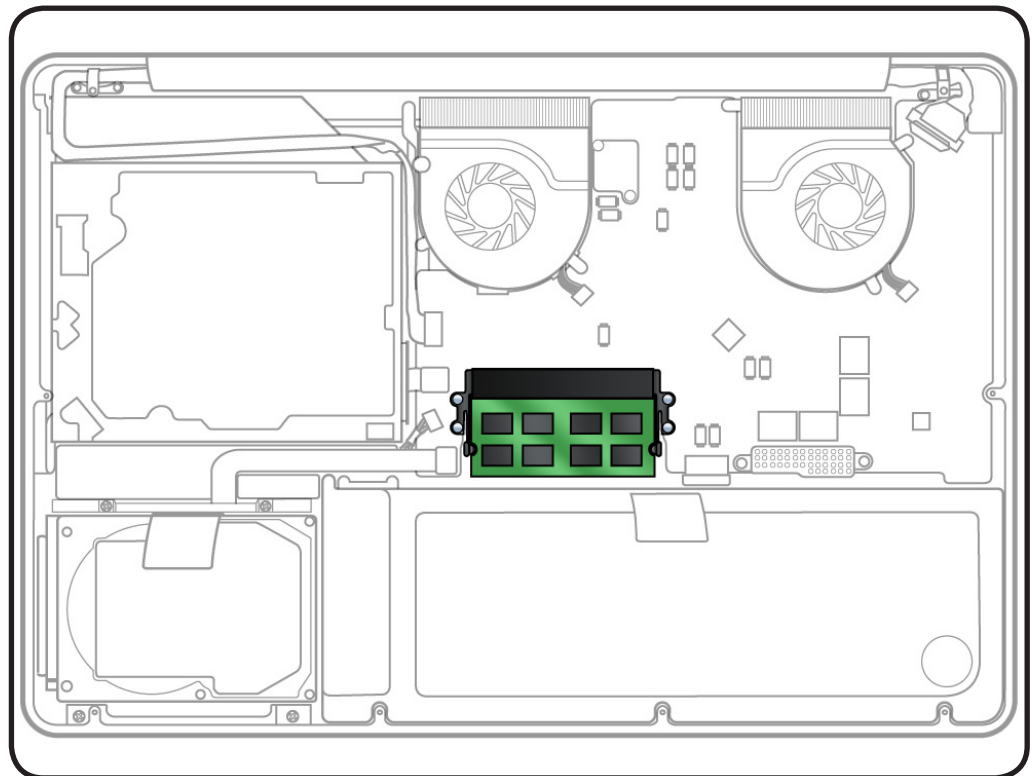
## Tools
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
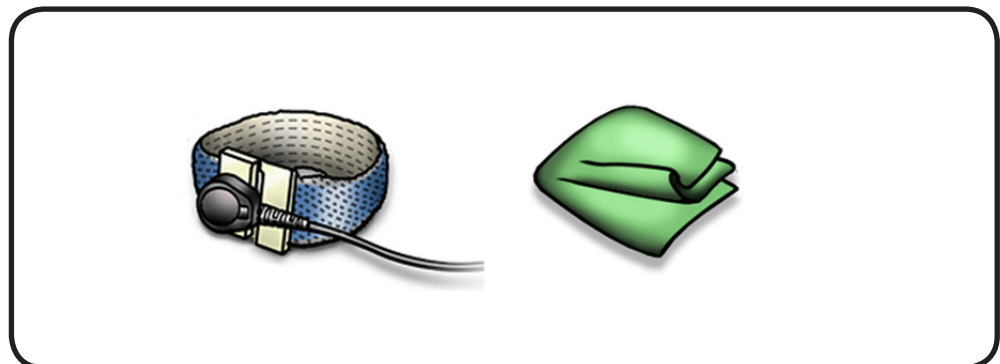
## Memory Information

Memory cards must be:
- 1.18 inch (30 mm)
- 2 GB or 4 GB
- 204-pin
- PC-8500 DDR3, 1066 MHz RAM

This computer comes with a minimum of 4 GB of 1066 GHz Double Data Rate (DDR3) Synchronous Dynamic Random-Access Memory (SDRAM) installed. Both memory slots can accept an SDRAM module that meets the specifications listed. The slots are stacked on the logic board under the bottom case. For best performance, memory should be installed as pairs with an equal memory card in each slot. The maximum amount of memory for this computer is 8 GB, with a 4 GB DIMM installed in each slot.

## Removal

**1** Push 2 ejection levers outward until the memory pops up at an angle.

Make sure you see the half-circle notches on the memory card. If not, press the ejection levers again.



**2** Remove memory card from the slot.

**3** Hold the card by the edges.

**4** Do not touch the gold connectors.
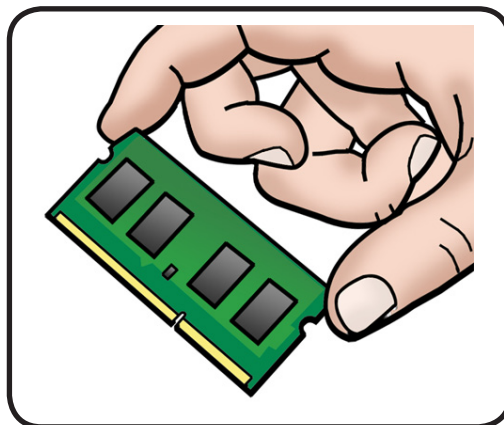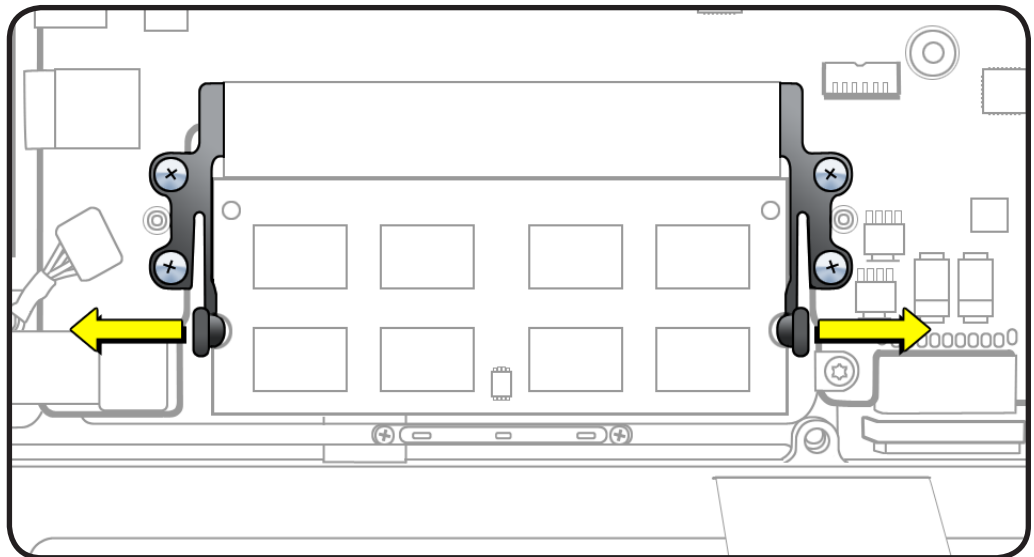
# Replacement

**1**  Install cards at an angle. If installing just one card, install it in lower slot.

**2**  Press card down. You will hear a click when inserted correctly.

**3**  If you installed additional memory, check that the computer recognizes it.
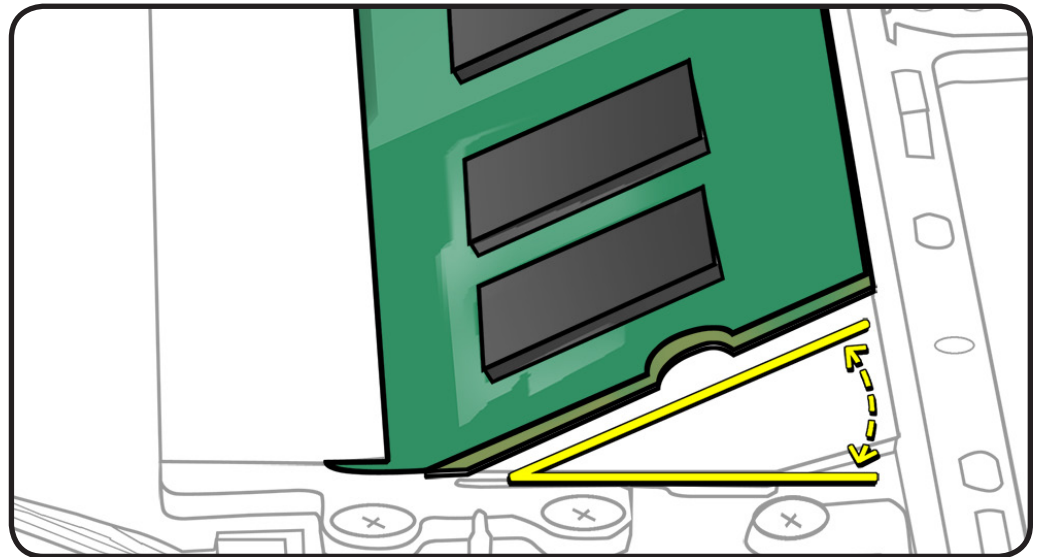
# AirPort/Bluetooth Flex Cable

## First Steps

Remove:
• Bottom case
• Battery
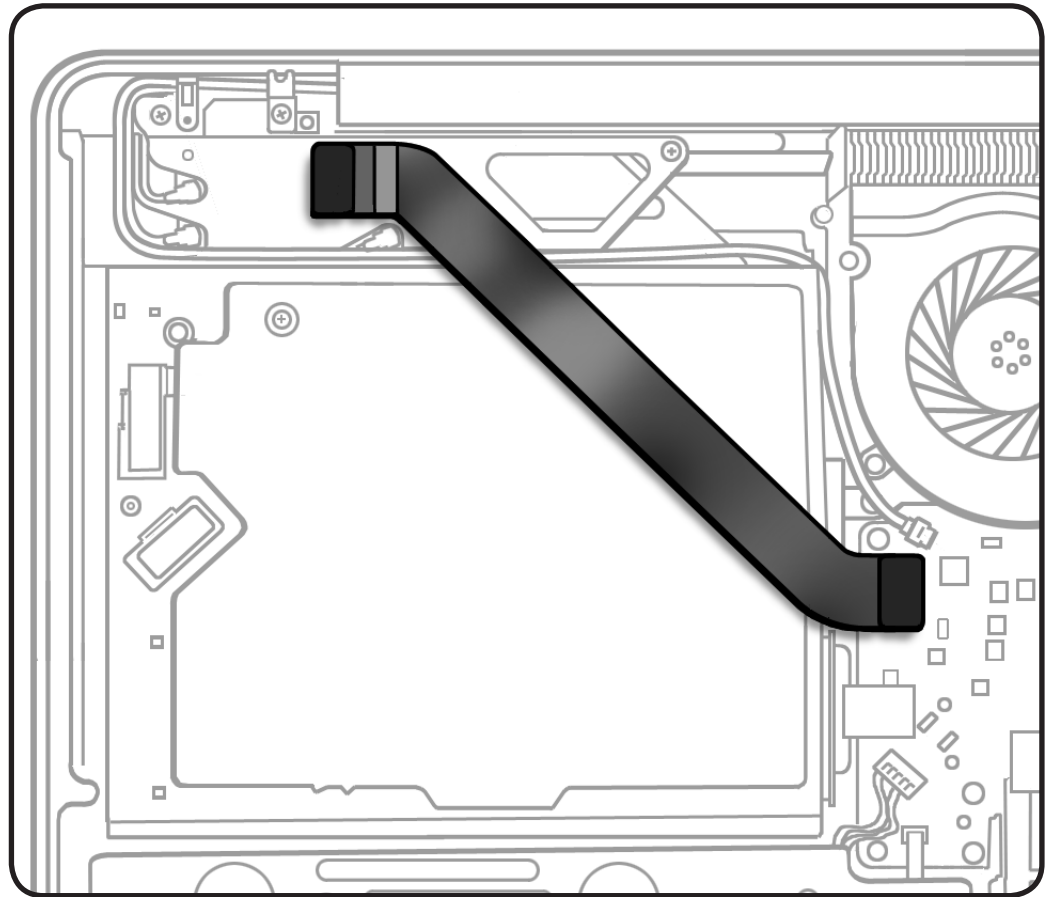
## Tools
• Clean, soft, lint-free cloth
• ESD wrist strap and mat
• Black stick

## Removal

**1**  Disconnect both ends of flex cable.

**2**  Remove cable from bottom case.
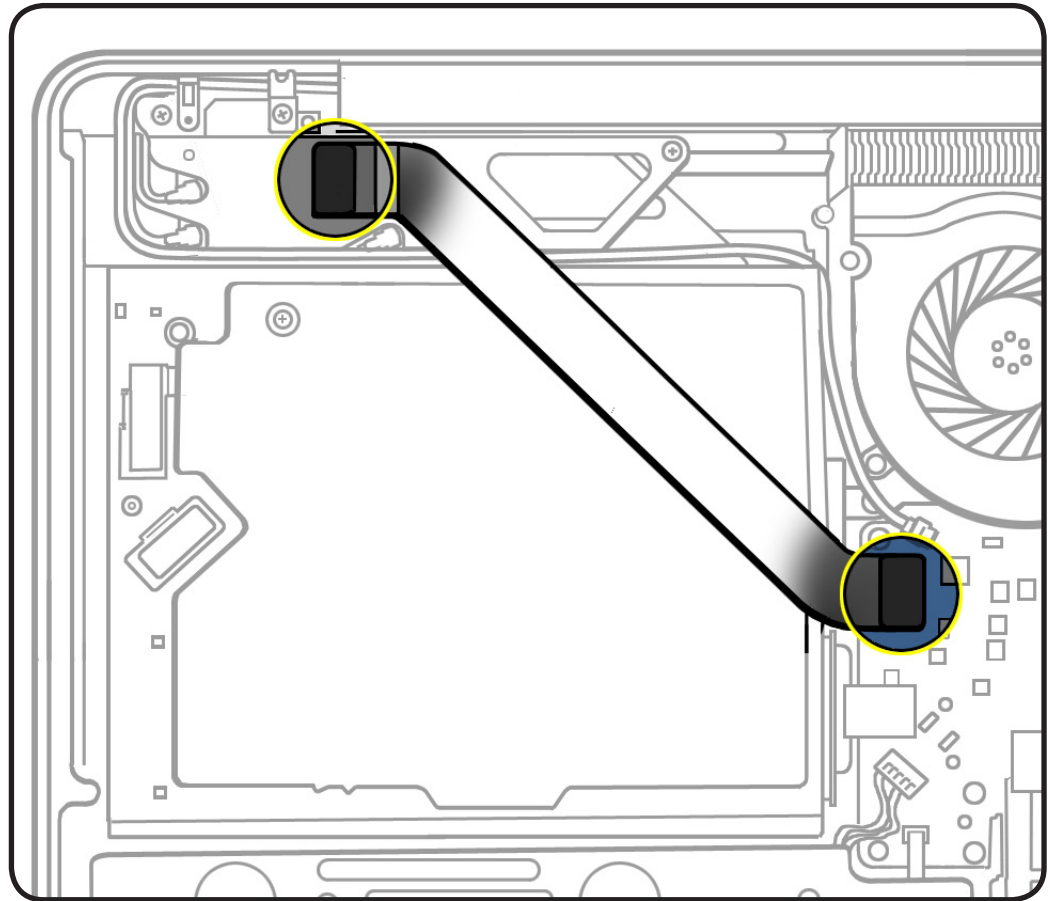
# AirPort/Bluetooth Card With Holder

## First Steps
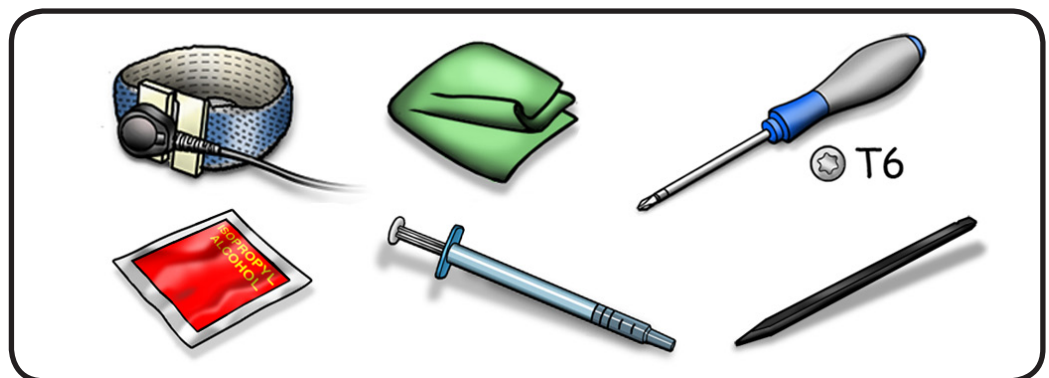
Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
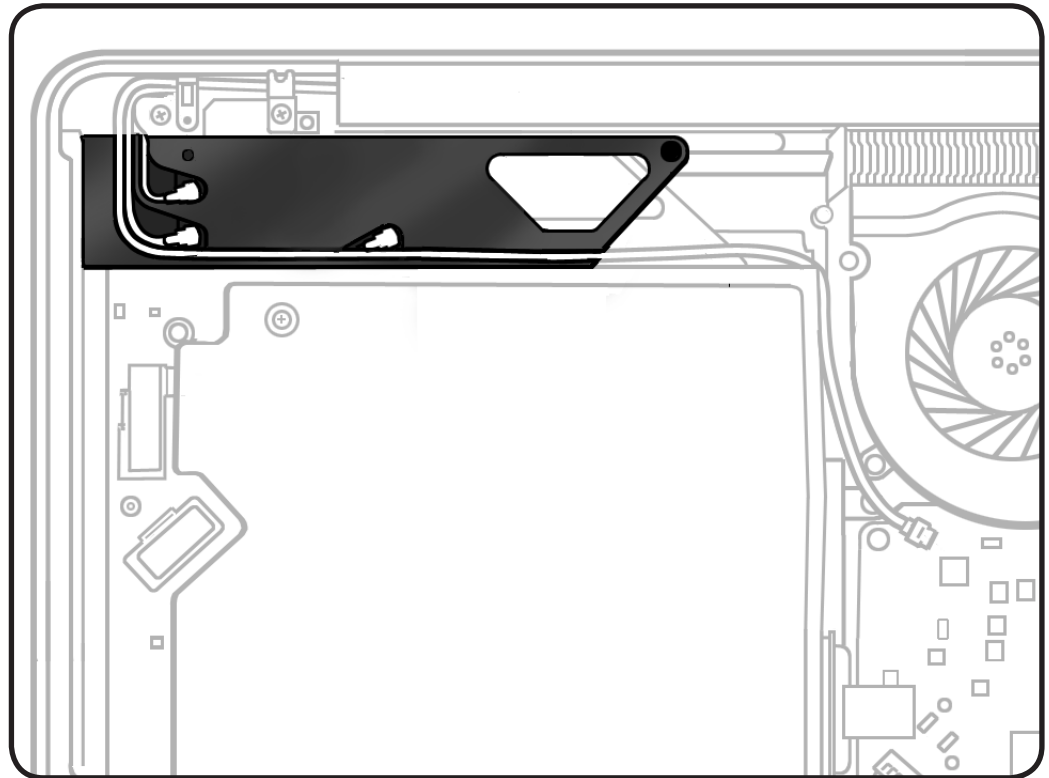


## Tools
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
- Needlenose pliers or tweezers
- Black stick (1 or 2)
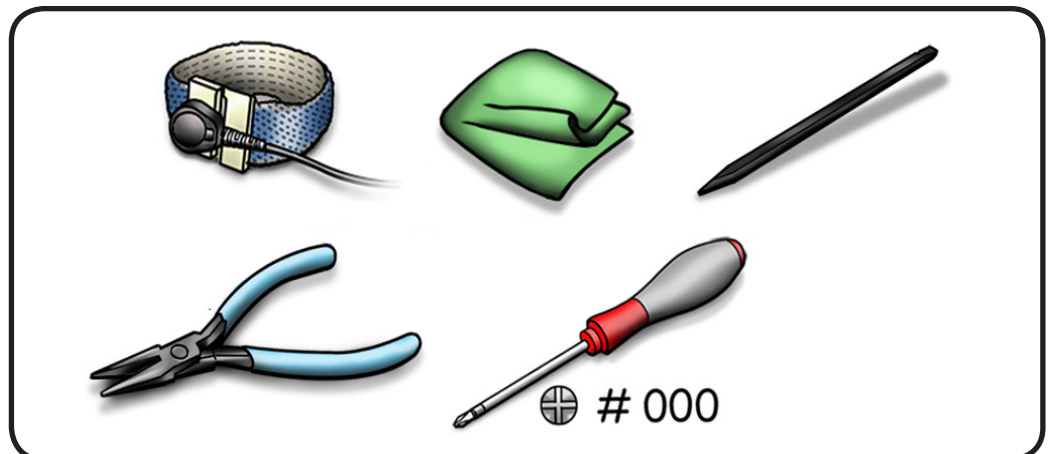
## Removal

**1** Disconnect camera cable from logic board.
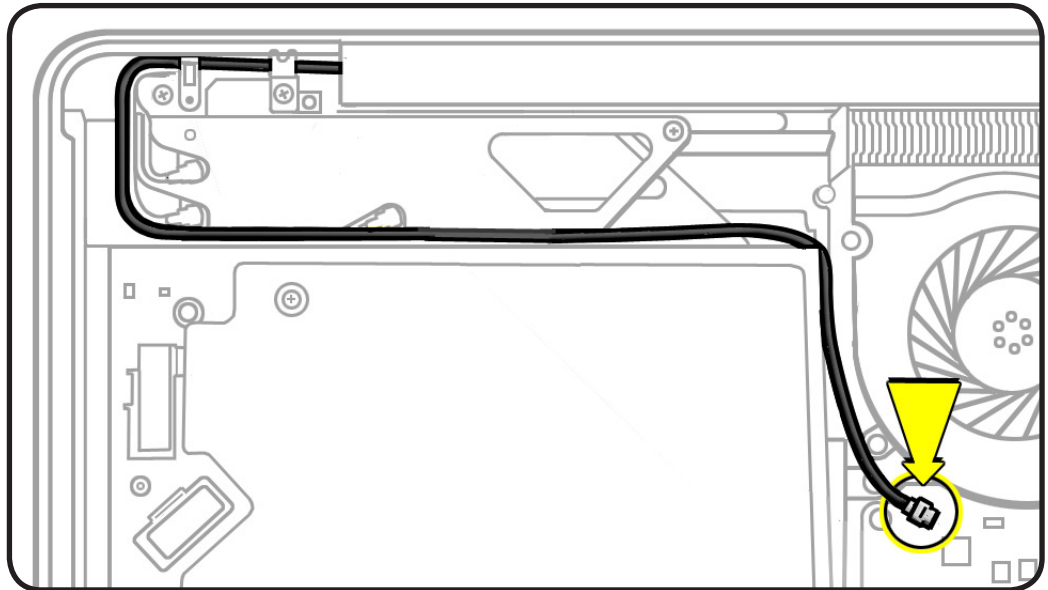


**Note:** When disconnecting camera cable, use two black sticks (or one black stick, alternating sides) to disconnect cable evenly.
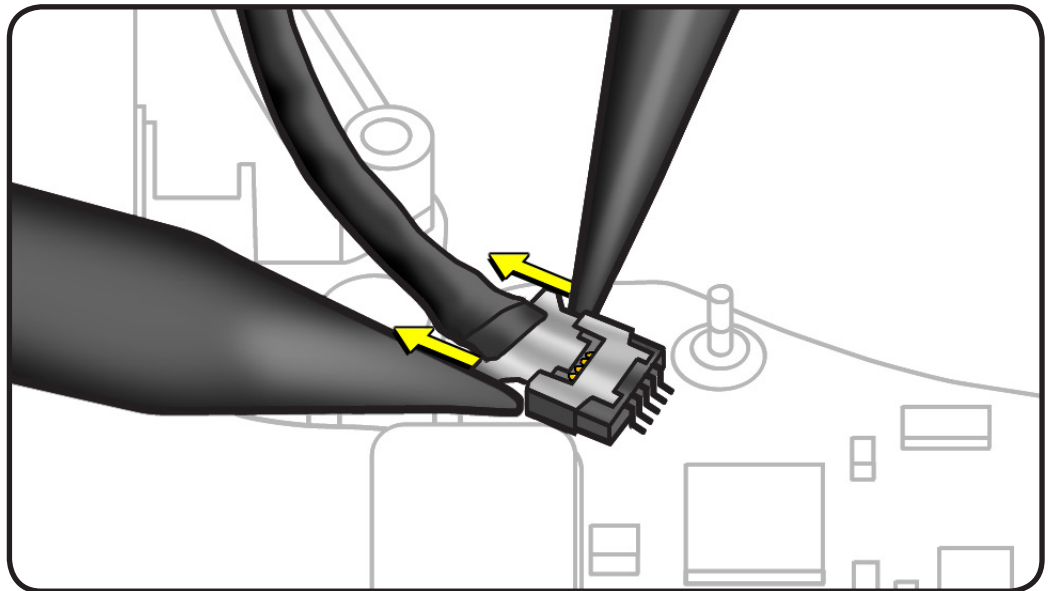
**2** Remove 2 screws:

- 1 (8.1 mm) 922-9107
- 1 (3.5 mm) 922-8974
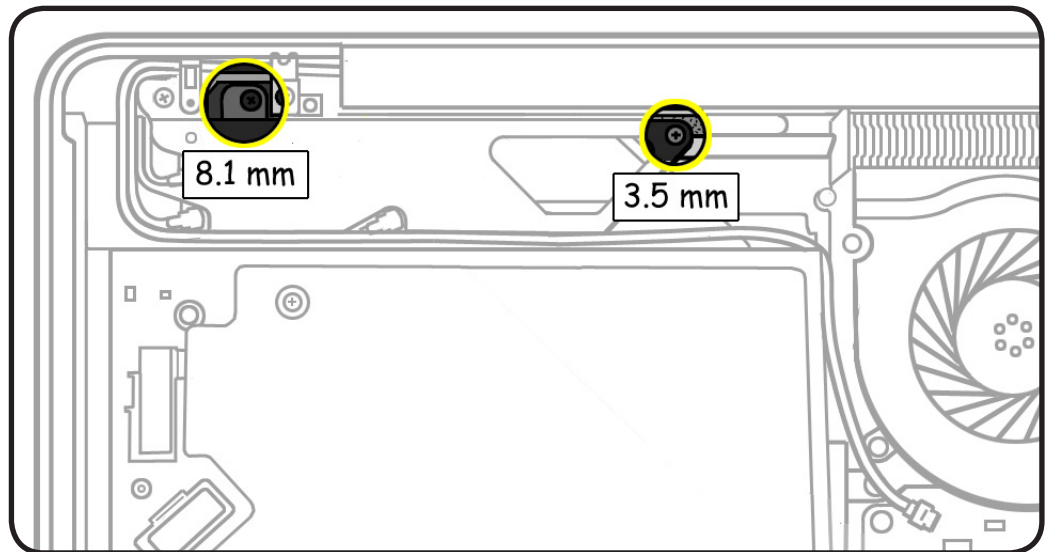


**3** If you are removing AirPort/Bluetooth card from holder, disconnect Bluetooth cable and 2 AirPort cables from card.
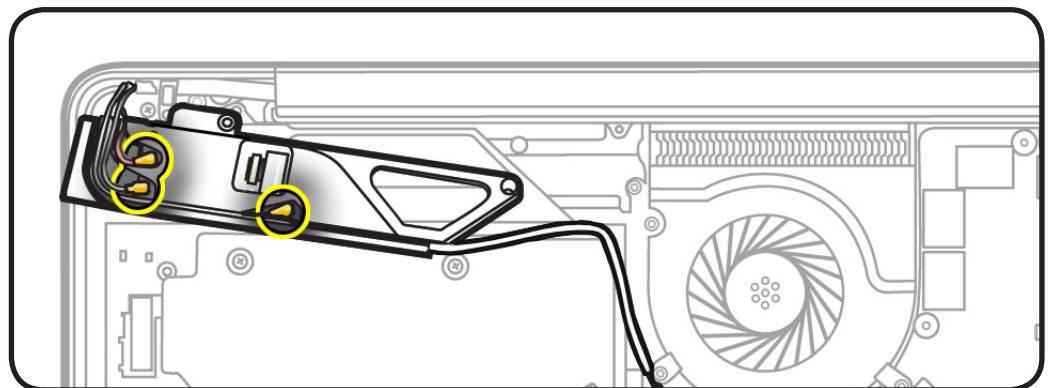


**Note:** Use needlenose pliers or tweezers to lift metal connector of each cable straight up
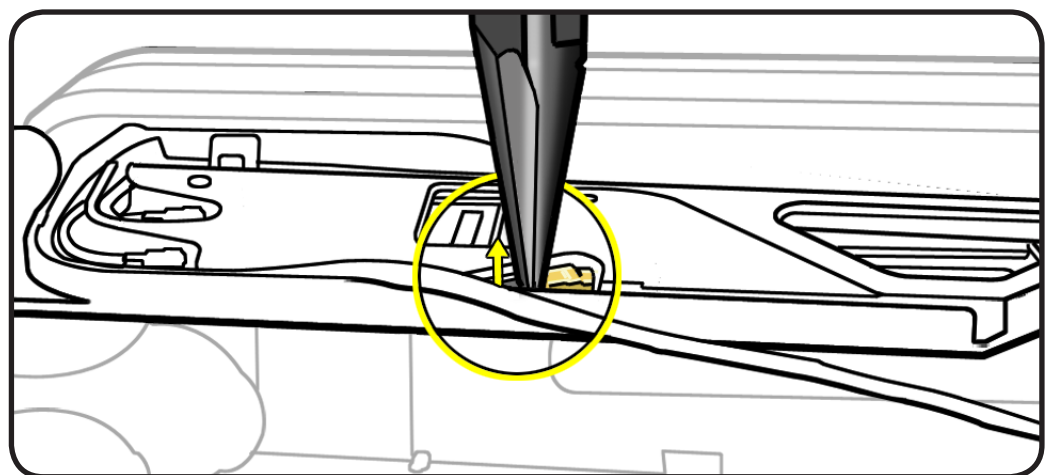
**4** Rotate card holder back from bottom case.
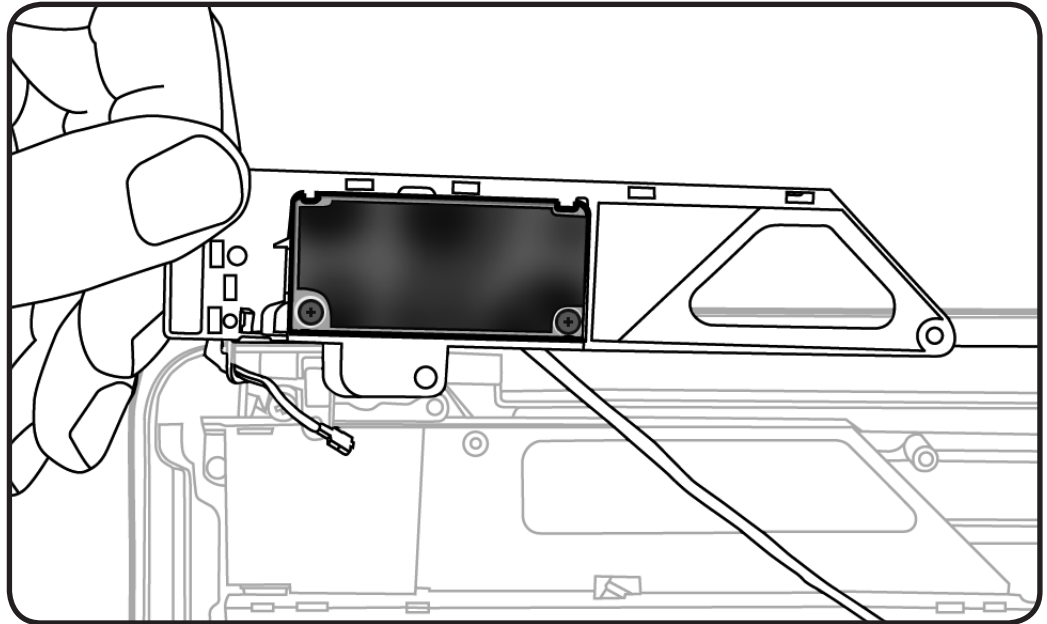


**5** To remove card from holder, remove 2 (2.5 mm) 922-9200 screws and lift card from holder.
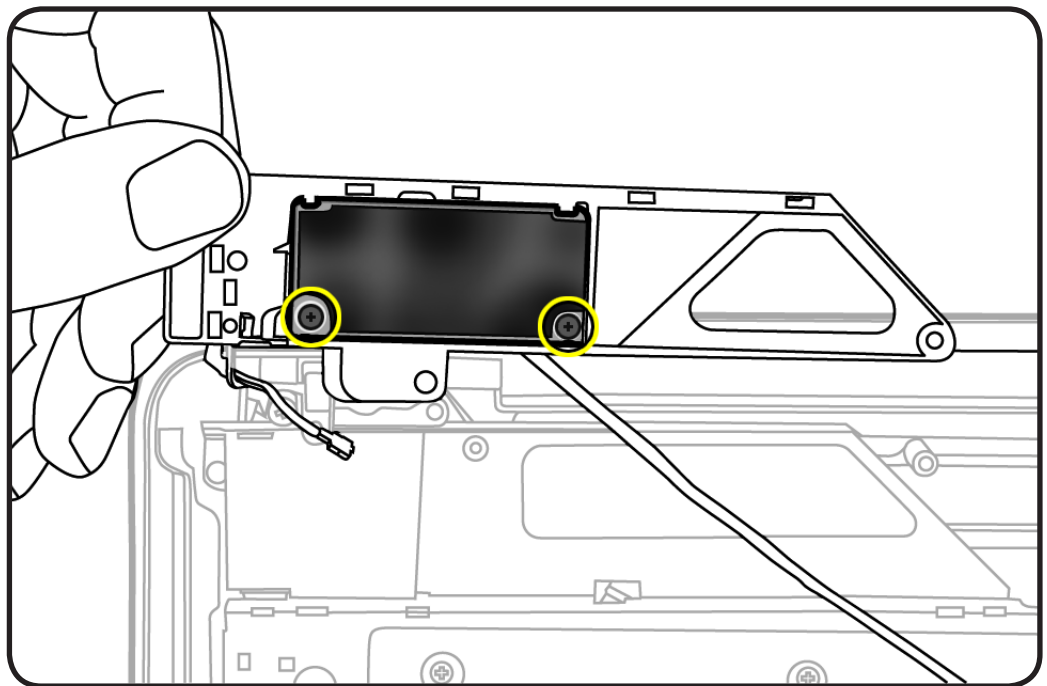
**6** If you are removing card holder from top case, use a black stick or needlenose pliers to pry cables from the holder's channels, and remove card holder from case.
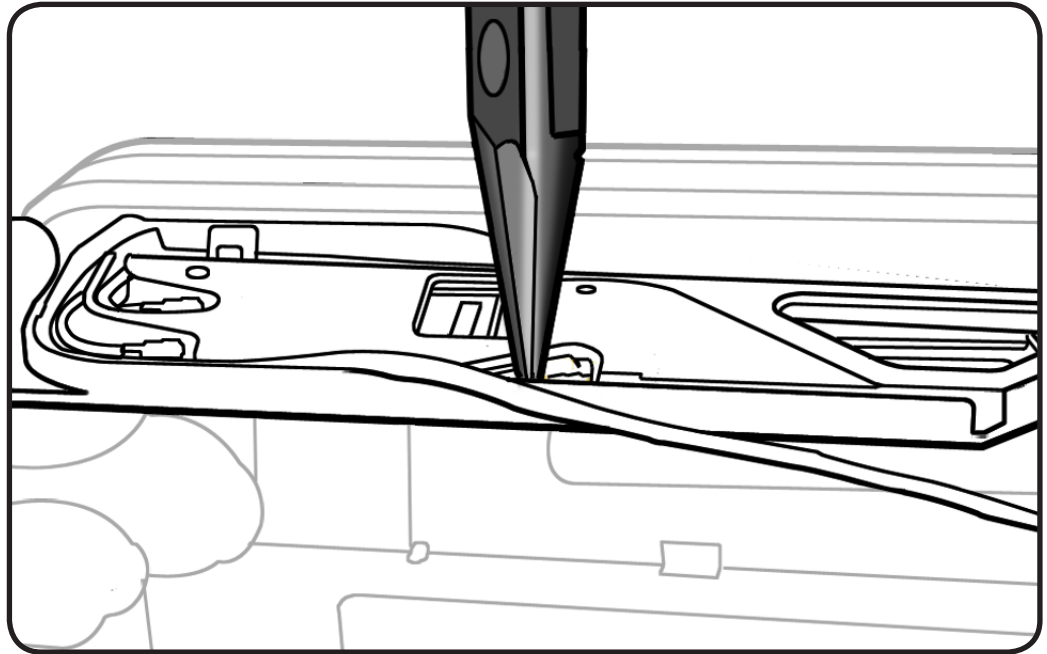
**Replacement Note:** Reroute cables in cardholder as shown.
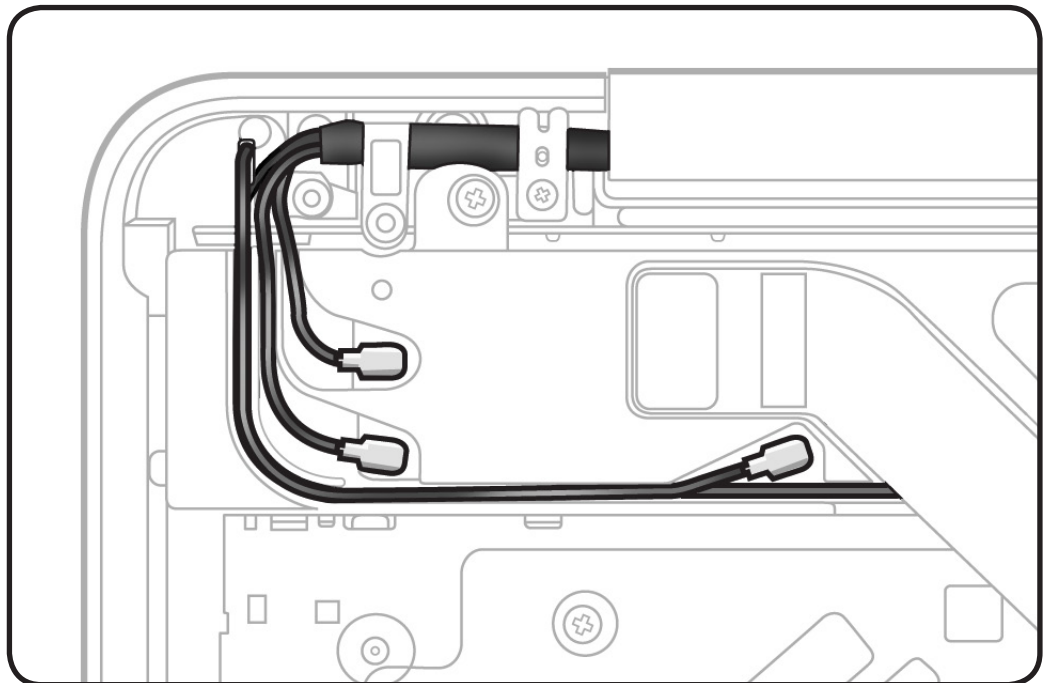
**Replacement Note:** Make sure tab on holder inserts under edge of black bracket on inside of top case.
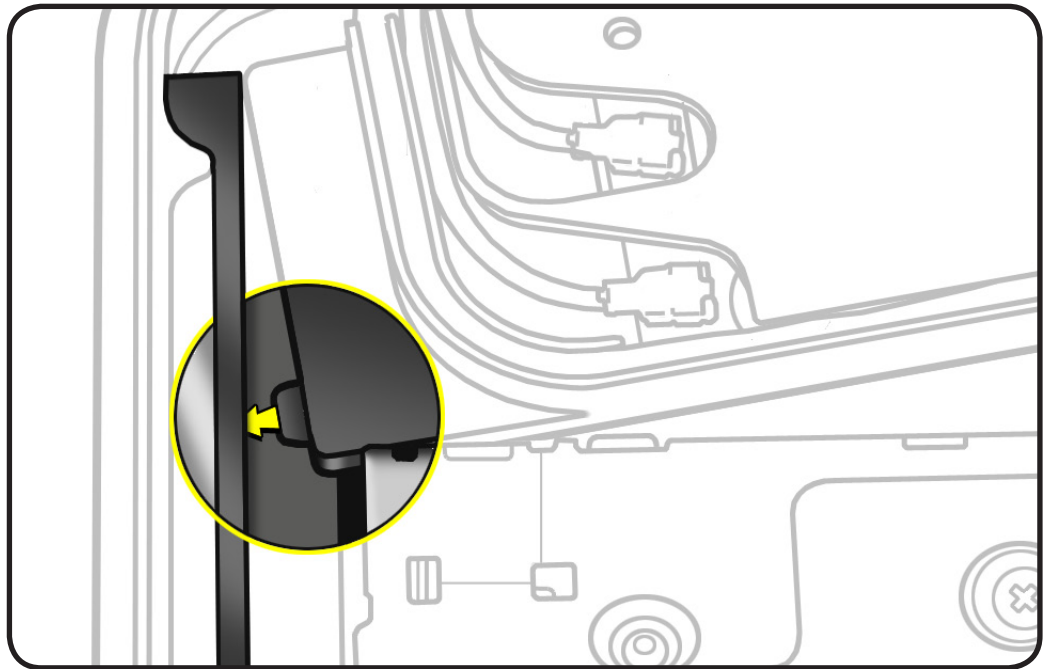
# Optical Drive

## First Steps

Do the following:
- Remove bottom case
- Remove battery
- Remove AirPort/ Bluetooth flex cable
- Rotate AirPort/ Bluetooth card holder back from bottom case

**Caution**: The optical drive is very fragile. Handle by the sides only.
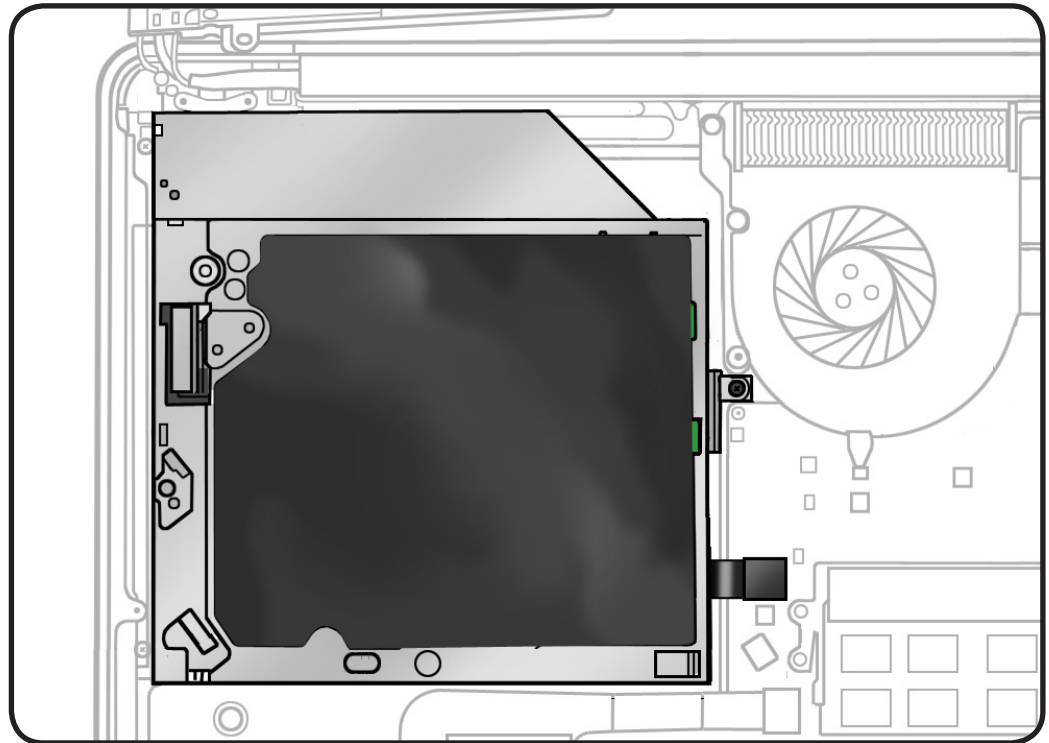
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
- Black stick
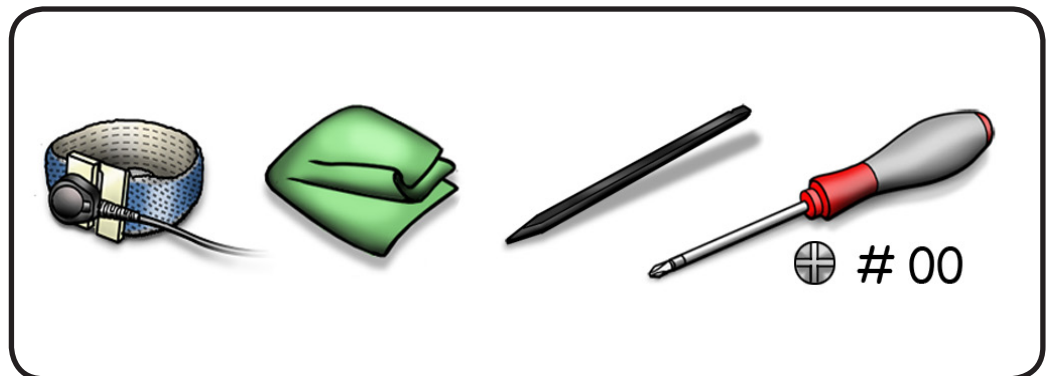
# Removal

**1** Remove 3 (3 mm) 922-8719 screws.
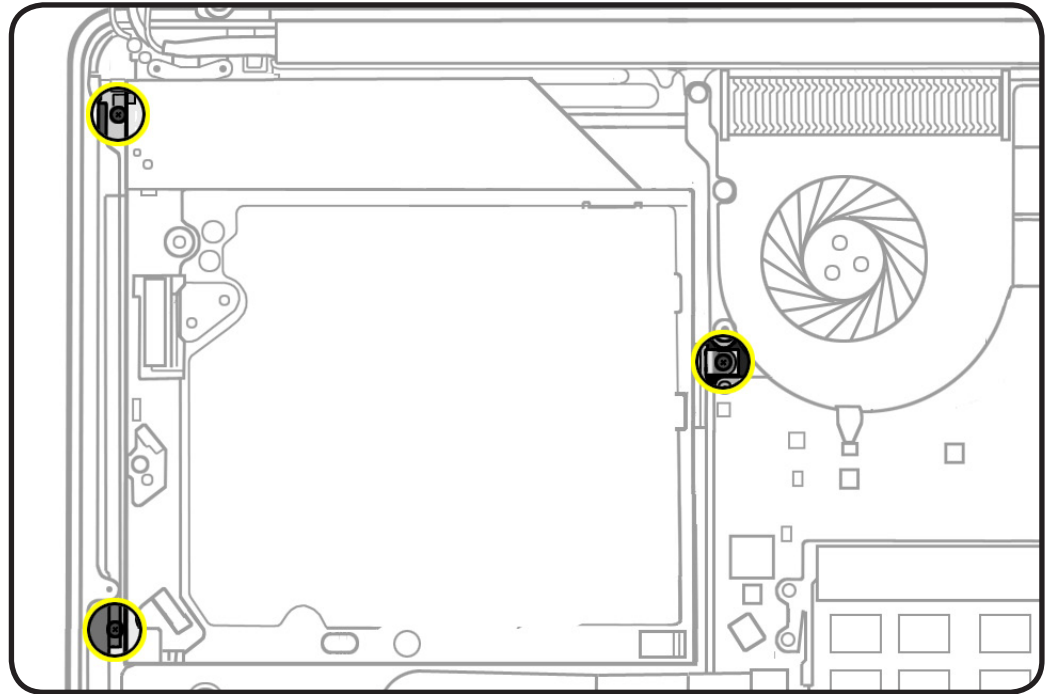


**2** With a black stick, carefully pry optical cable straight up and off logic board.



**Important Replacement Note:** Install flex cable vertically onto logic board connector. Failure to do so could bend logic board pins and cause the system not to detect a disc when inserted.

**3** Tilt optical drive up, pull it back far enough to clear camera cable guide, and remove drive from bottom case.
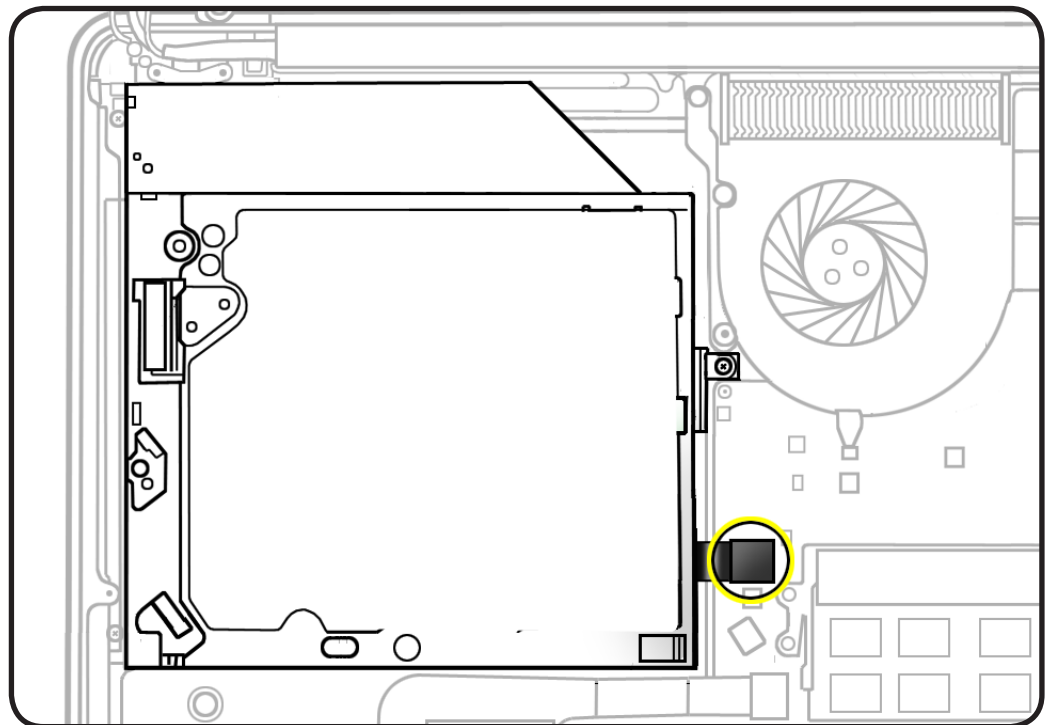
# Optical Drive Data Cable

## First Steps

Do the following:
- Remove bottom case
- Remove battery
- Remove AirPort/
  Bluetooth flex cable
- Rotate AirPort/
  Bluetooth card holder
  back from bottom case
- Remove optical drive

**Caution**: The optical drive is very fragile. Handle by the sides only.
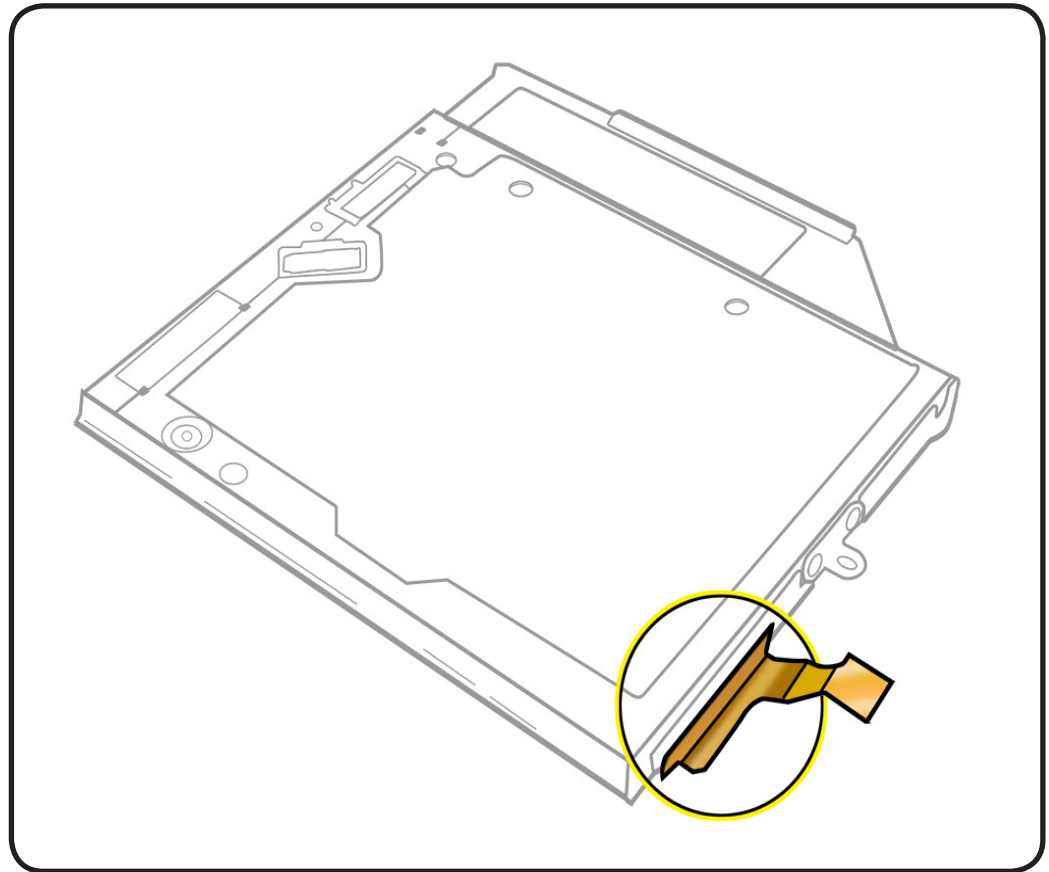
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
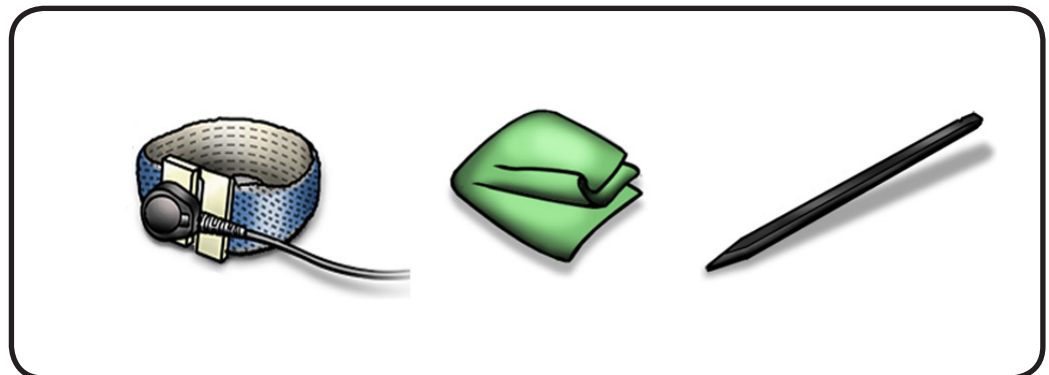
## Removal

With a black stick or fingernail, carefully wiggle flex cable off optical drive.
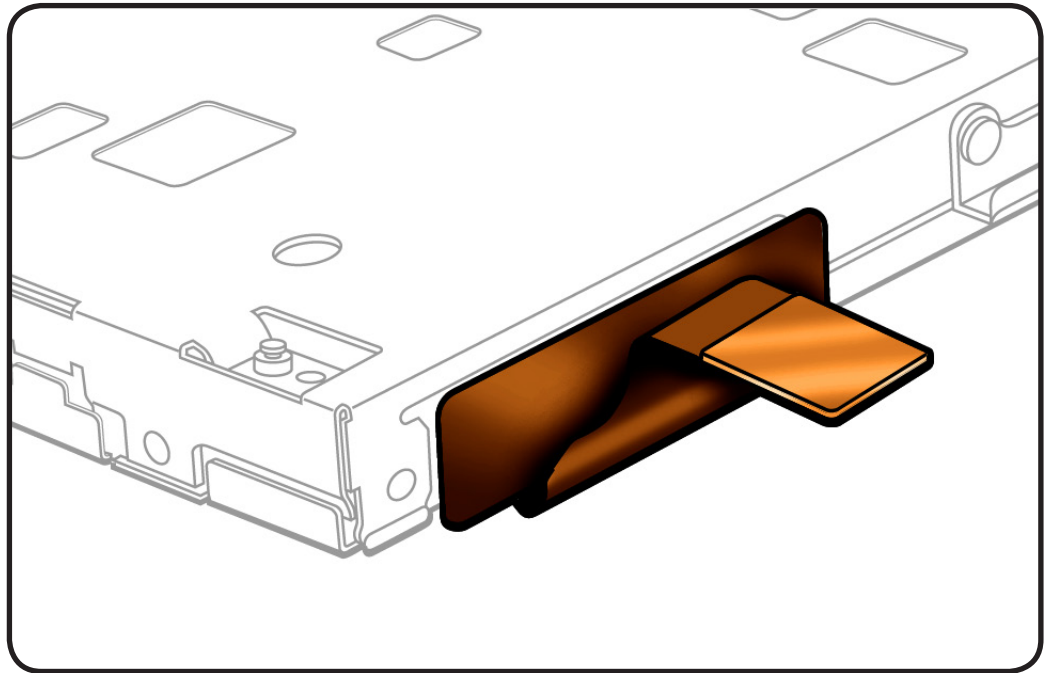
# Camera Cable Guide

## First Steps

Do the following:
- Remove bottom case
- Remove battery
- Remove AirPort/ Bluetooth flex cable
- Rotate AirPort/ Bluetooth card holder back from bottom case
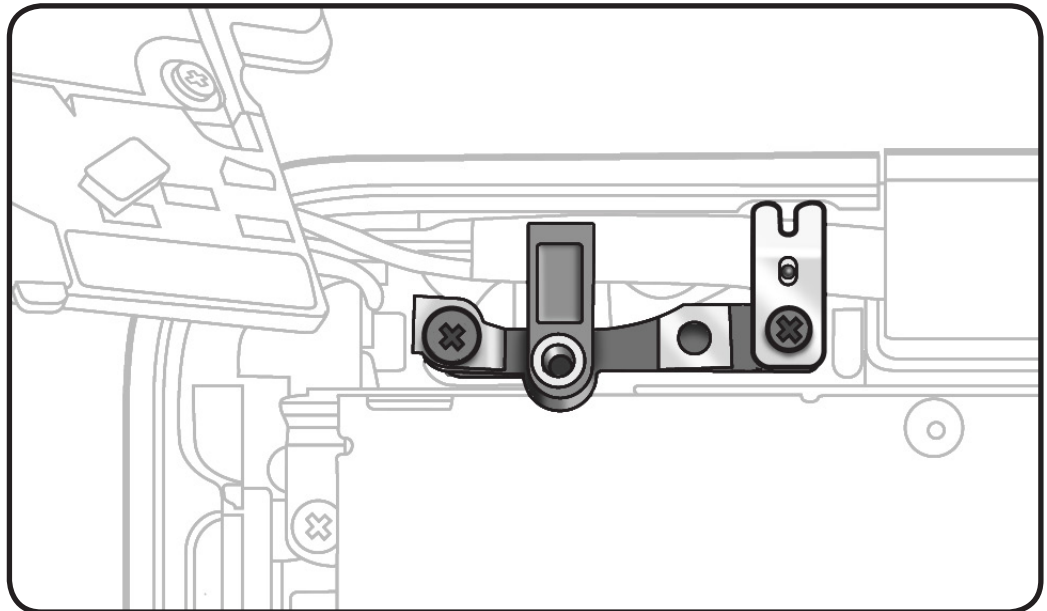
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
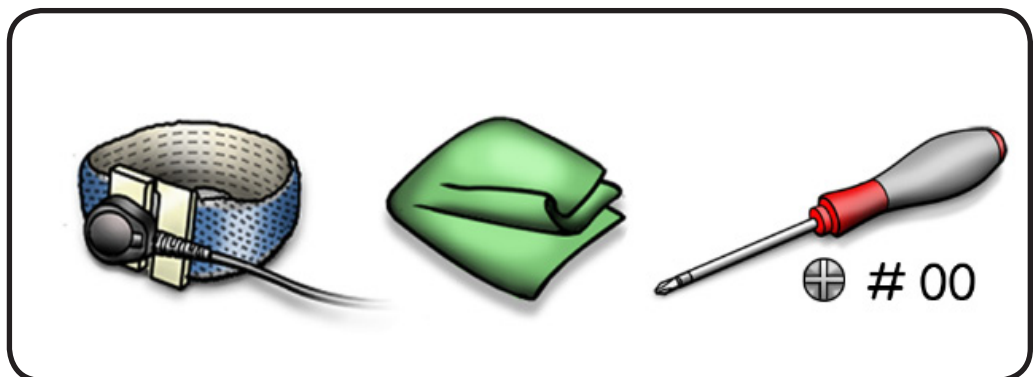
# Removal

**1** Remove 8.1 mm (922-9107) screw.

**2** Remove cable guide assembly from case.



**Important:** When removing the camera cable guide, do NOT remove the screw that secures the guide's grounding clip. The clip is delicate and should remain with the guide. If the clip is damaged, install a new cable guide.
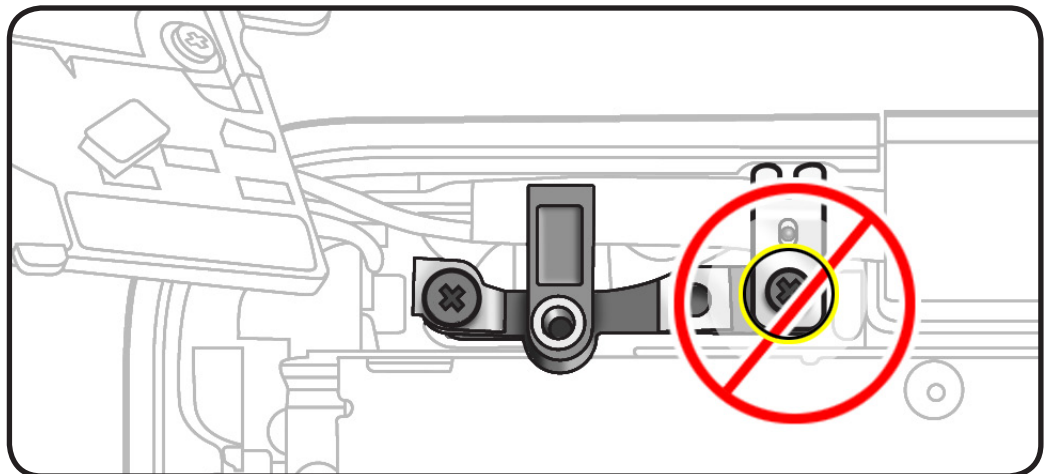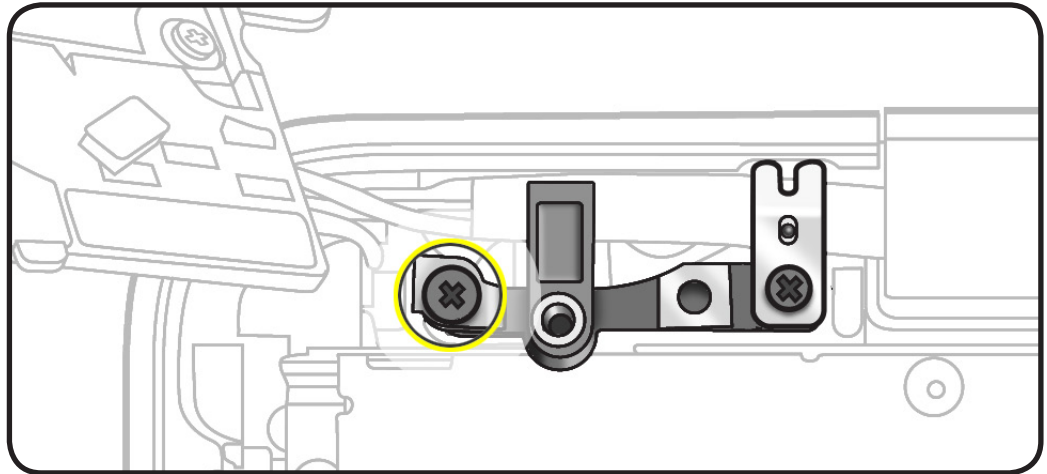


**Replacement Note:** Be sure to anchor ground tab when reinstalling cable guide. Check that
- guide's clamp secures camera cable
- ground tab attached to cable is positioned on top of holder's screw hole
- screw holes align
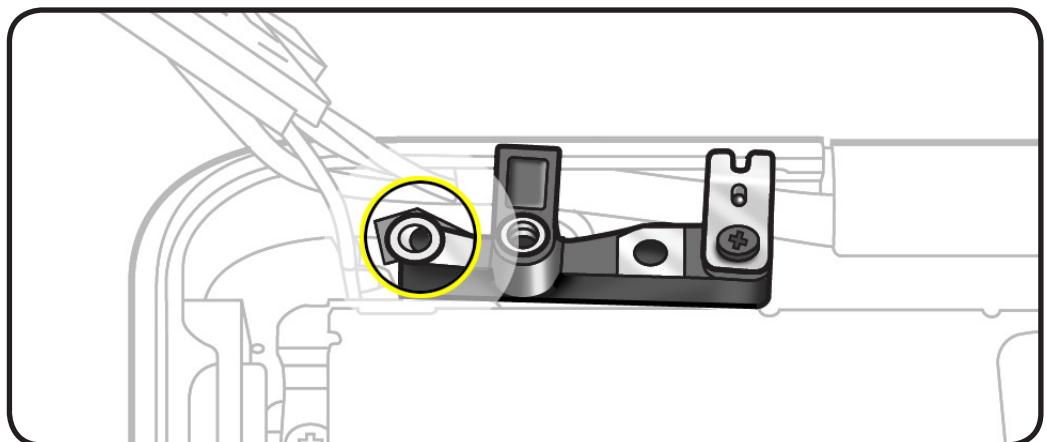
**Replacement Note:** Be sure grounding clip fingers contact the top case.
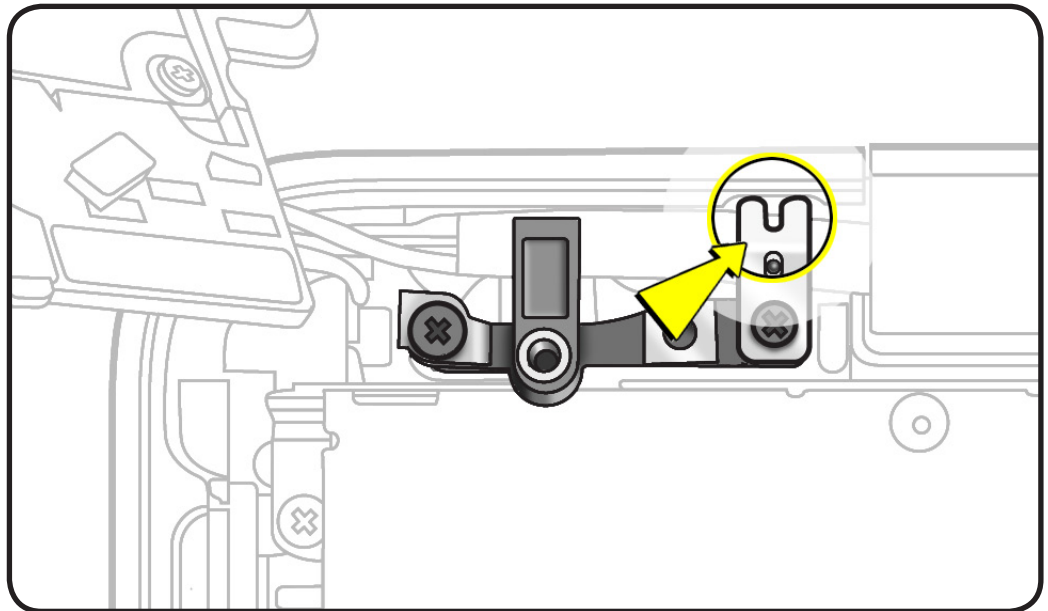
# LVDS Cable Guide

## First Steps

Remove:
- Bottom case
- Battery
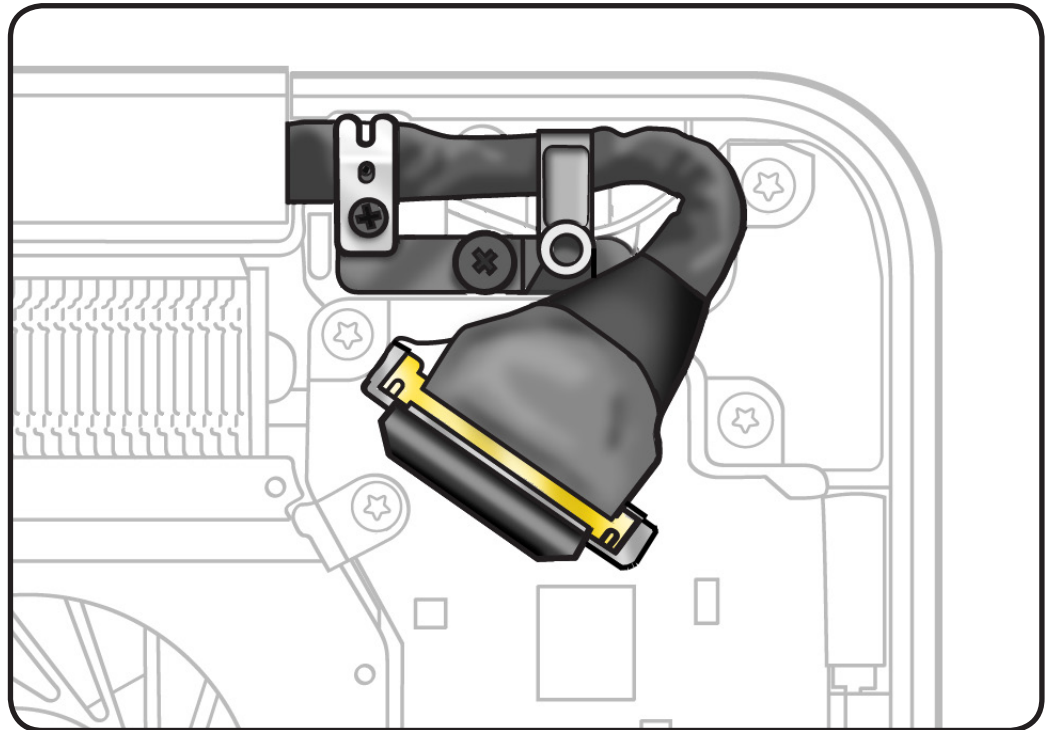


## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
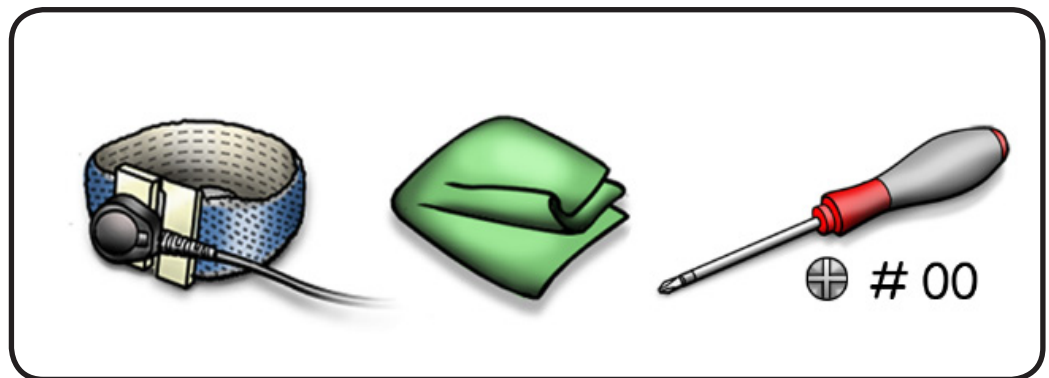
# Removal

**1** Remove 6.5 mm (922-8645) screw.

**Replacement Note:** Be sure to anchor the ground tab when reinstalling the screw.

**2** Remove cable guide assembly from case.
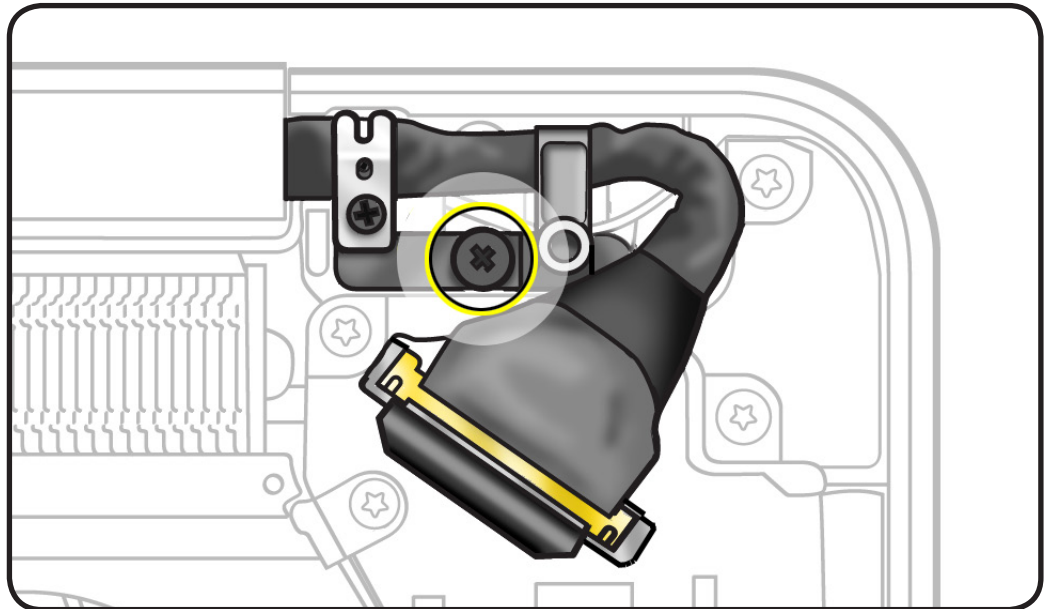


**Important:** When removing the LVDS cable guide, do NOT remove the screw that secures the guide's grounding clip. The clip is delicate and should remain with the guide. If the clip is damaged, install a new cable guide.
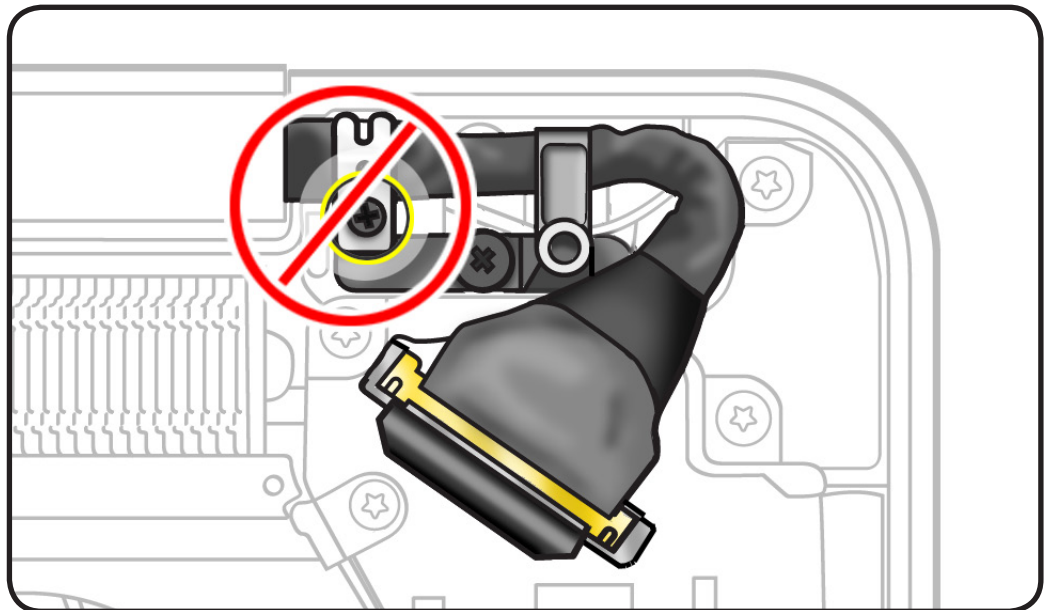
**Replacement Note:** Be sure grounding clip fingers contact the top case.
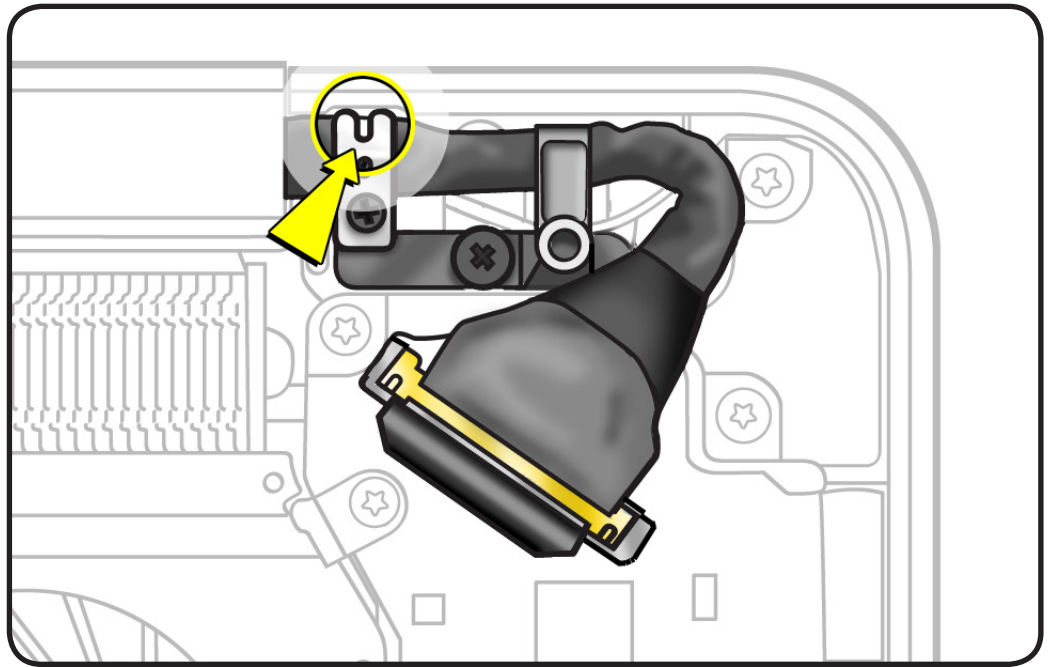
# Display Assembly

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- AirPort/Bluetooth card holder
- Camera cable guide
- LVDS cable guide
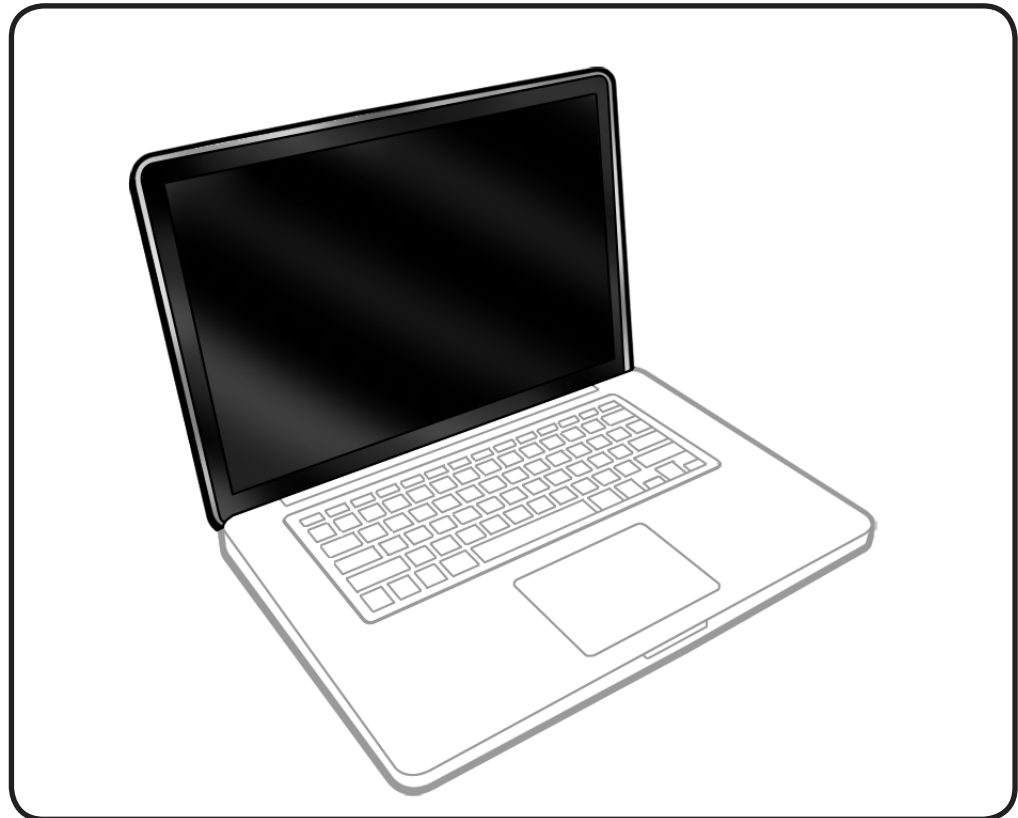


## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Torx T6 screwdriver
- Foam wedge fixture
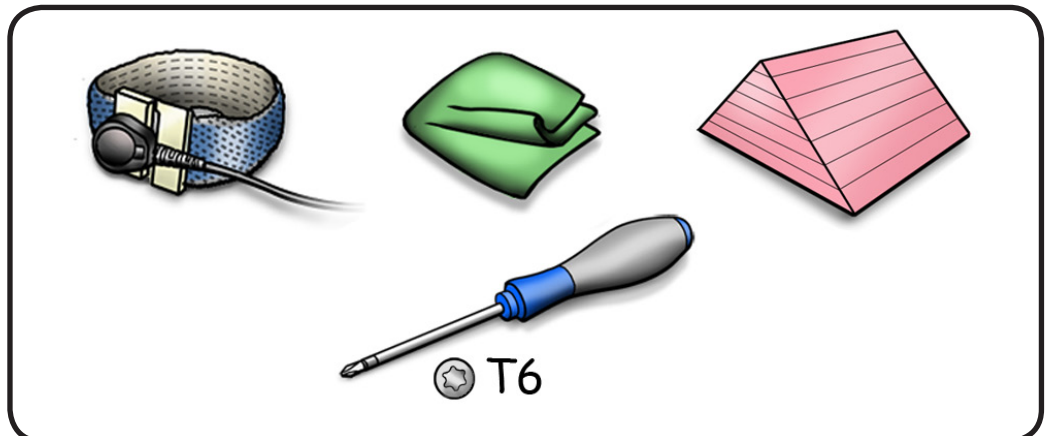
## Removal

**Caution:** Do not pull on the black tab or the LVDS lock bar. Pulling on the tab to remove the LVDS cable will likely result in the metal LVDS lock bar being torn off the cable body. This bar is only to be used to disengage the lock from the LVDS connector. A broken lock bar results in a display assembly replacement.
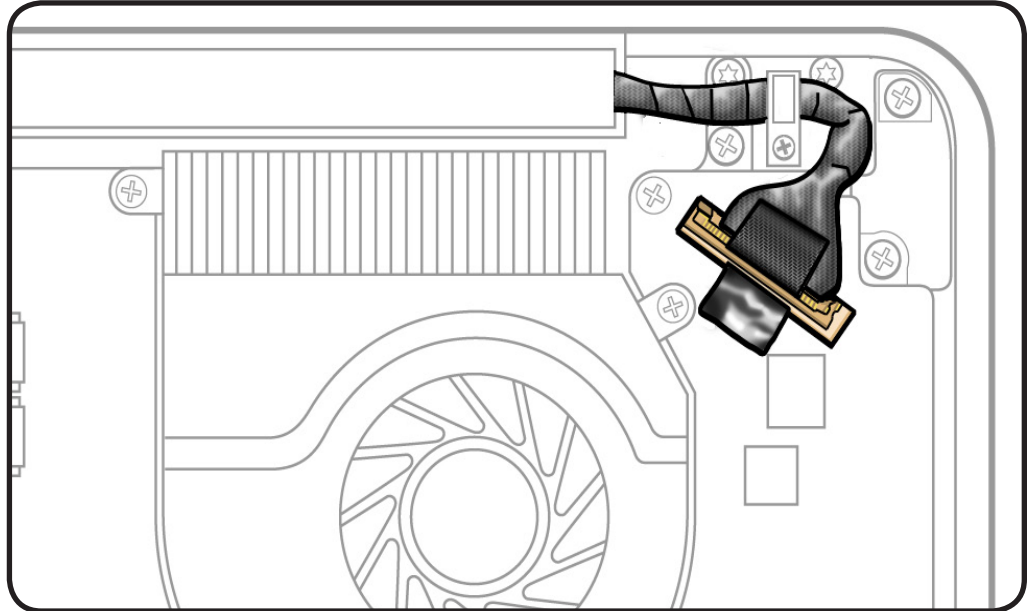
1   Peel EMI gasket off top of LVDS cable, toward the fan
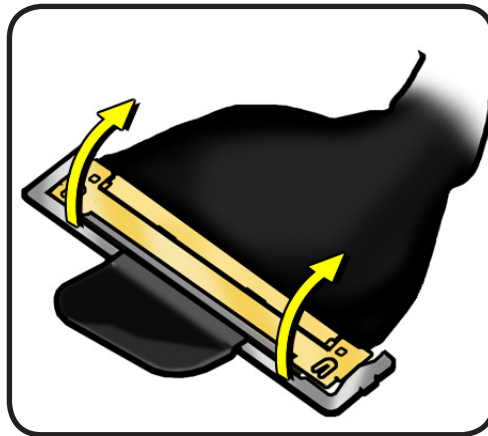
2   To disconnect LVDS cable, grasp black tab and gently swing LVDS lock bar up and back to unlock the cable.
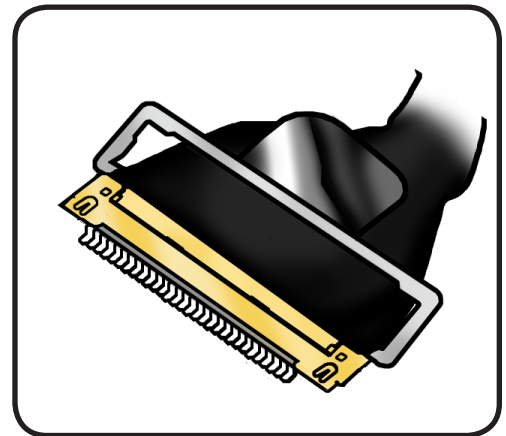
3   Slide cable out of connector by pulling the cable. Do not pull the black tab or lock bar.
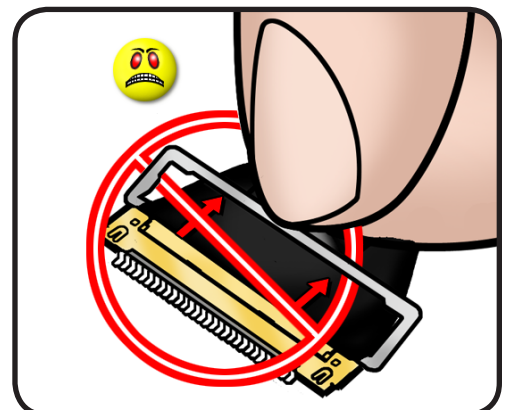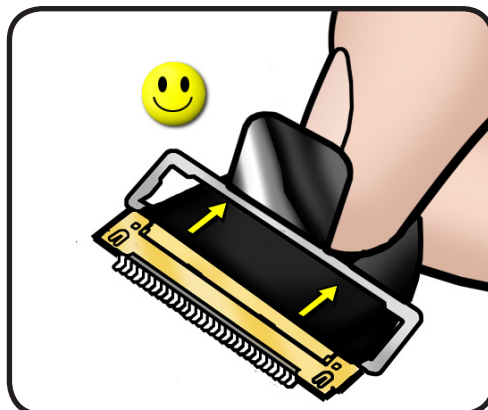
**4** Open the display to 90 degrees, and place the computer on the foam wedge service fixture.

**5** Remove 6 (5.3 mm) 922-8646 Torx T6 screws.

**6** Separate display assembly from top case.
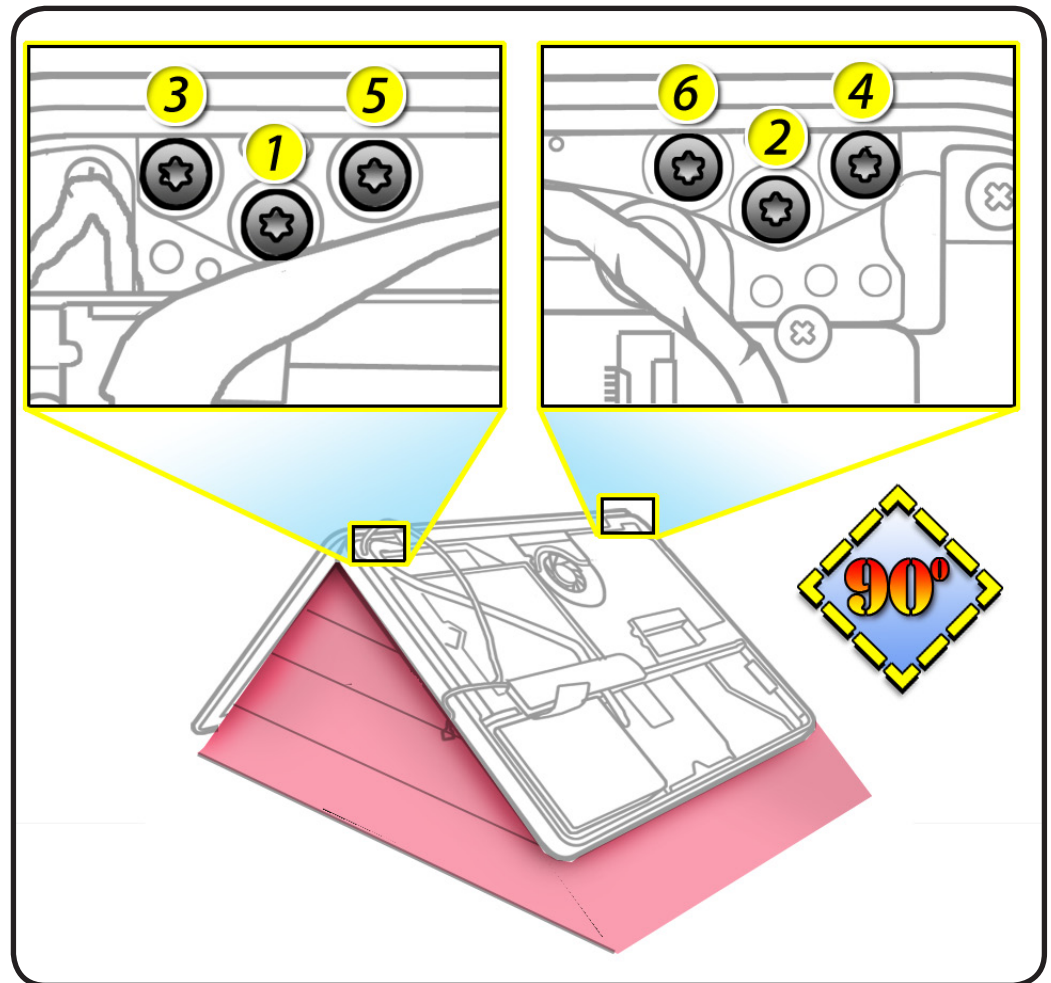
# Display Clutch Cover

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- AirPort/Bluetooth card holder
- Camera cable guide
- LVDS cable guide
- Display assembly
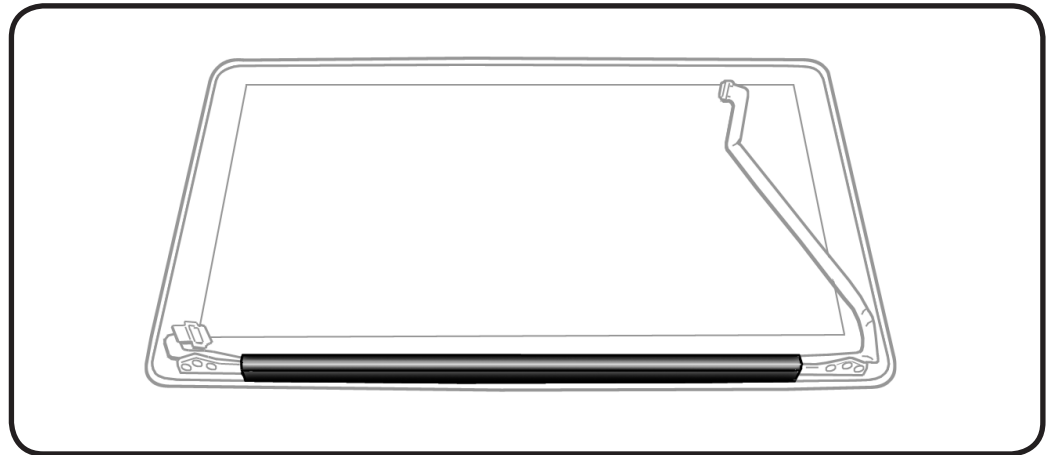


## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
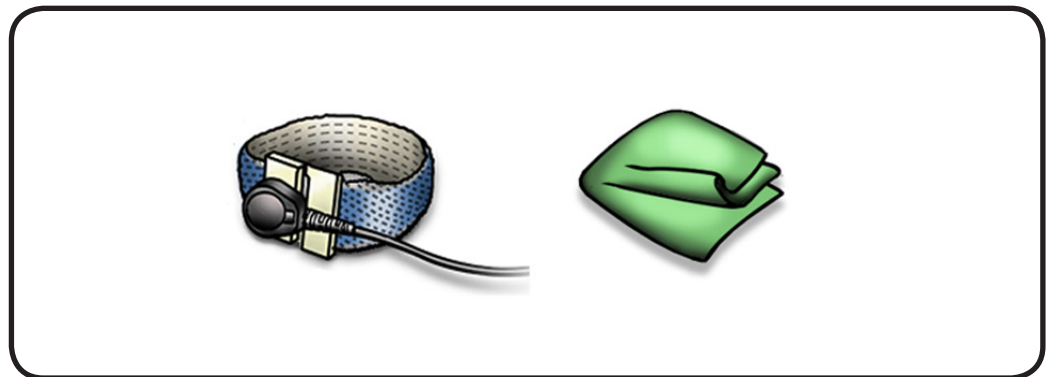
## Removal

**1** Cover display face with clean, soft cloth.
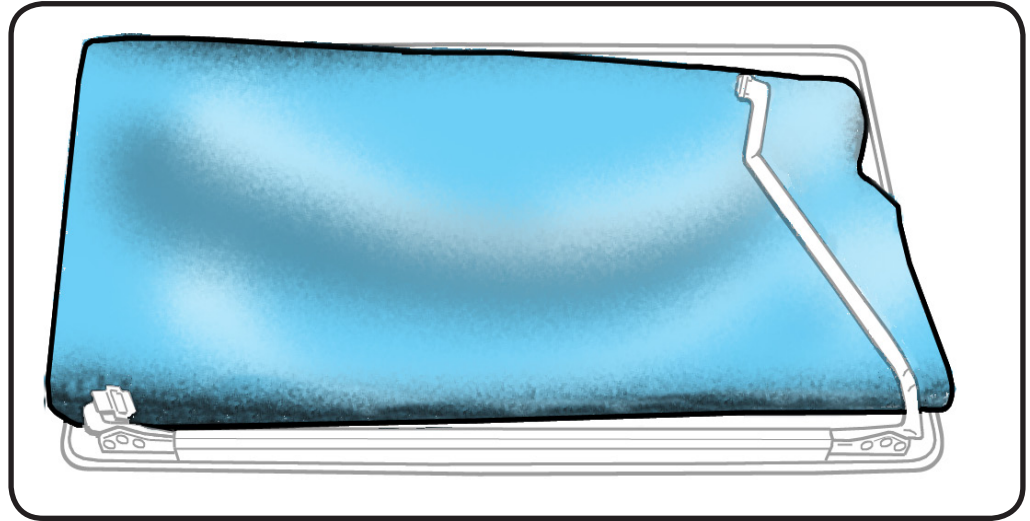


**2** Holding left hinge, slide clutch cover 1/4 inch (6.35 mm) away from the LVDS cable.
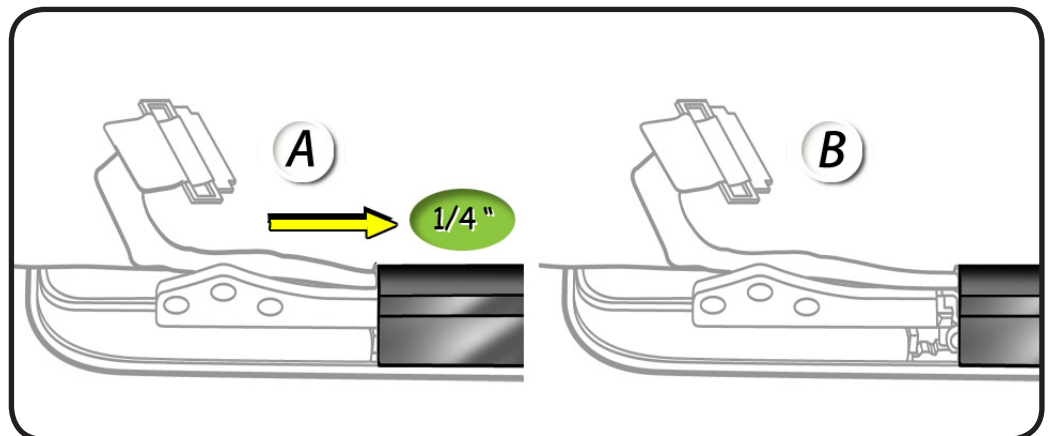


**3** Press down on clutch cover to loosen 4 hooks inside.
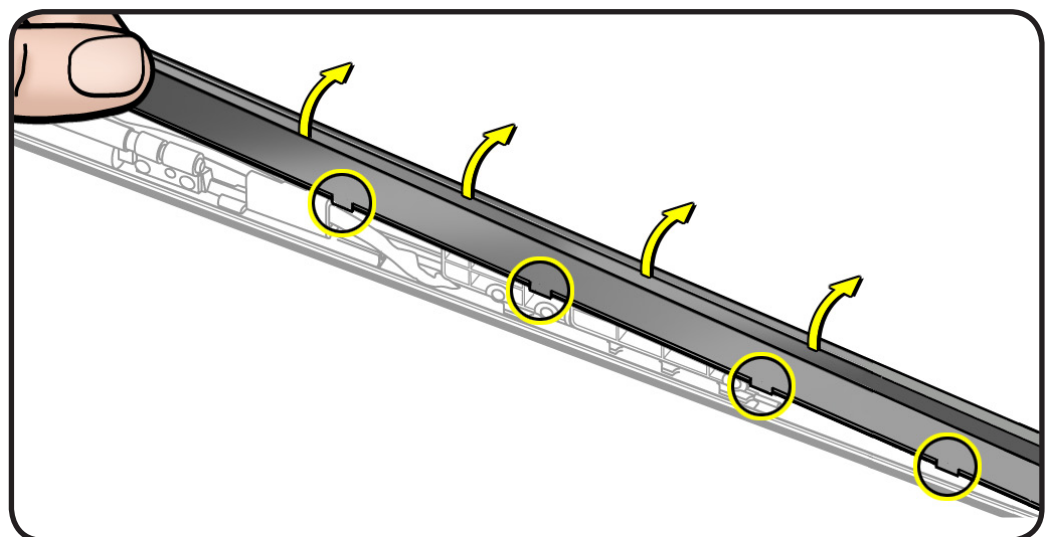
**4** Tilt up end of clutch cover as you roll it toward display face.

**5** Remove clutch cover.
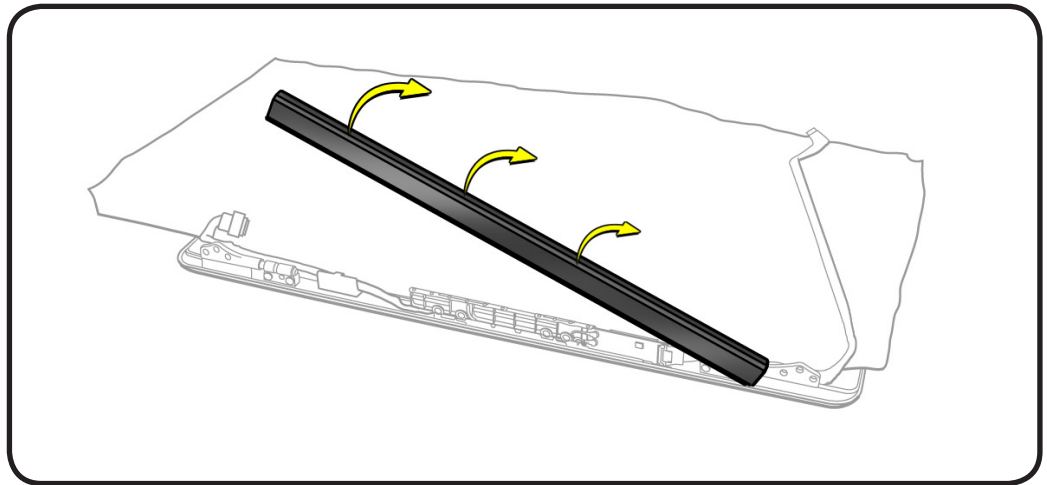


## Replacement

**1** Note shape of clutch cover:
- flat at bottom
- curved at top

**2** Make sure flat edge is at bottom of display.
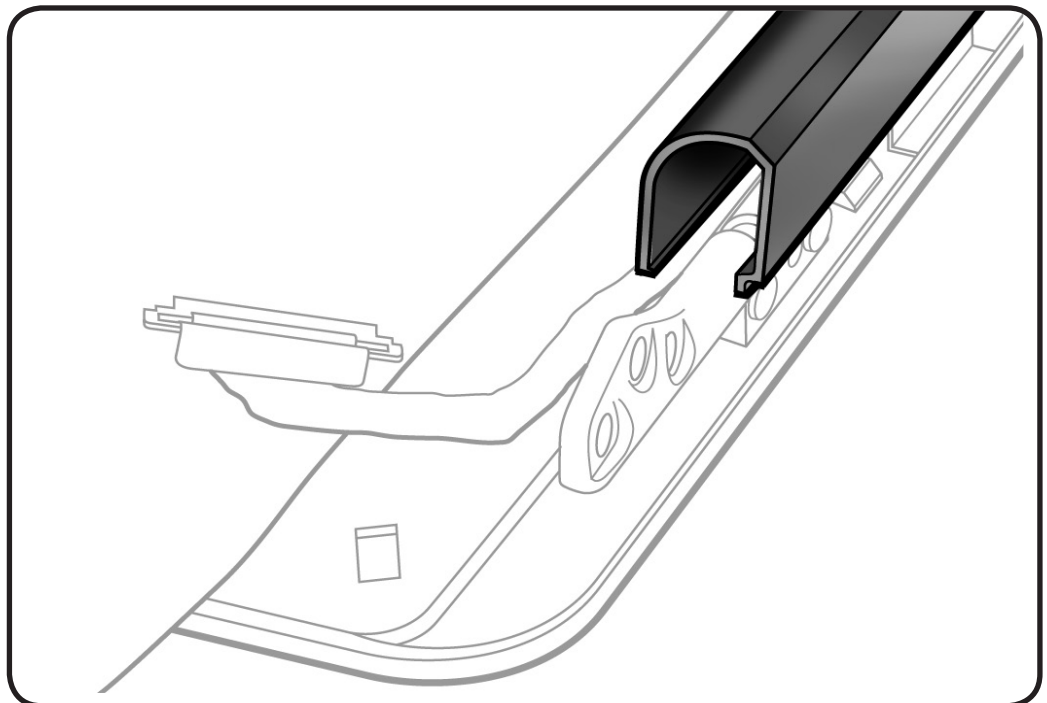
**3** Position clutch cover onto end with longer cable.

**4** Lower clutch cover onto display assembly.

**5** Listen for snapping sound as hooks engage.

**6** Check for good fit. Avoid:
- gaps
- bulges
- pinched cables
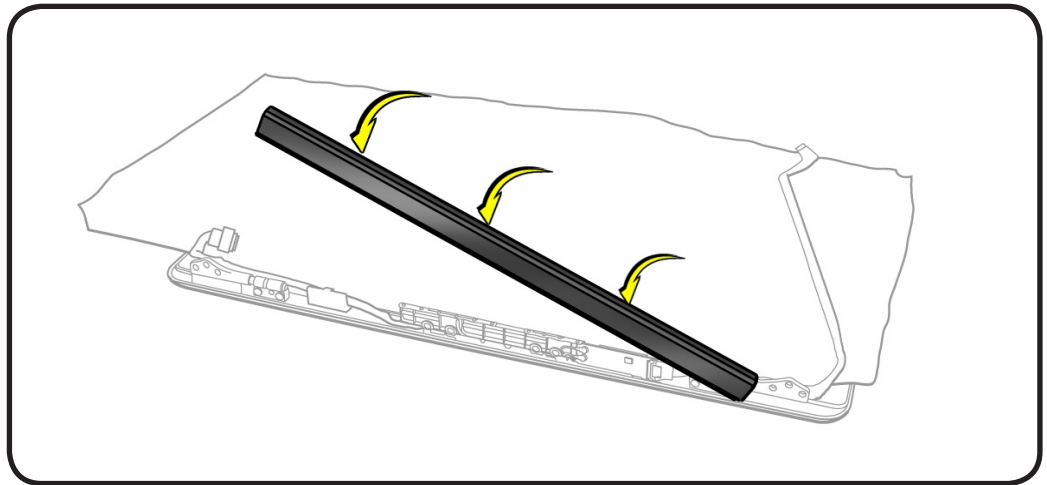
# Right Speaker / Subwoofer

## First Steps

Do the following:

- Remove bottom case
- Remove battery
- Remove AirPort/ Bluetooth flex cable
- Rotate AirPort/ Bluetooth card holder back from bottom case
- Remove optical drive
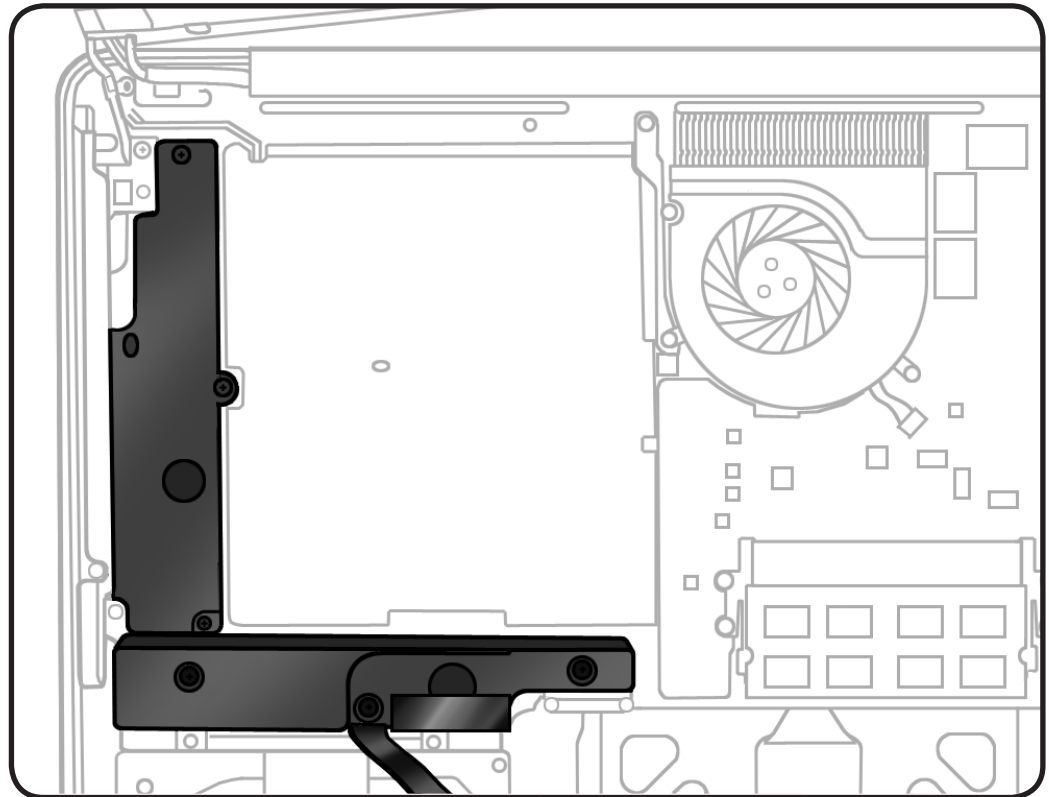


## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
- Magnetized Phillips #00 screwdriver
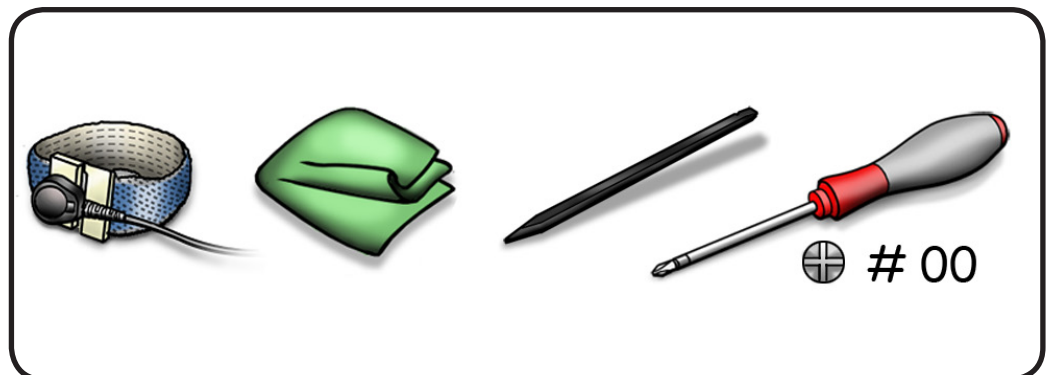
## Removal

**1** Using black stick, disconnect hard drive/IR/sleep indicator cable from logic board.

**2** Carefully pry cable from top of speaker assembly and bend back toward hard drive.
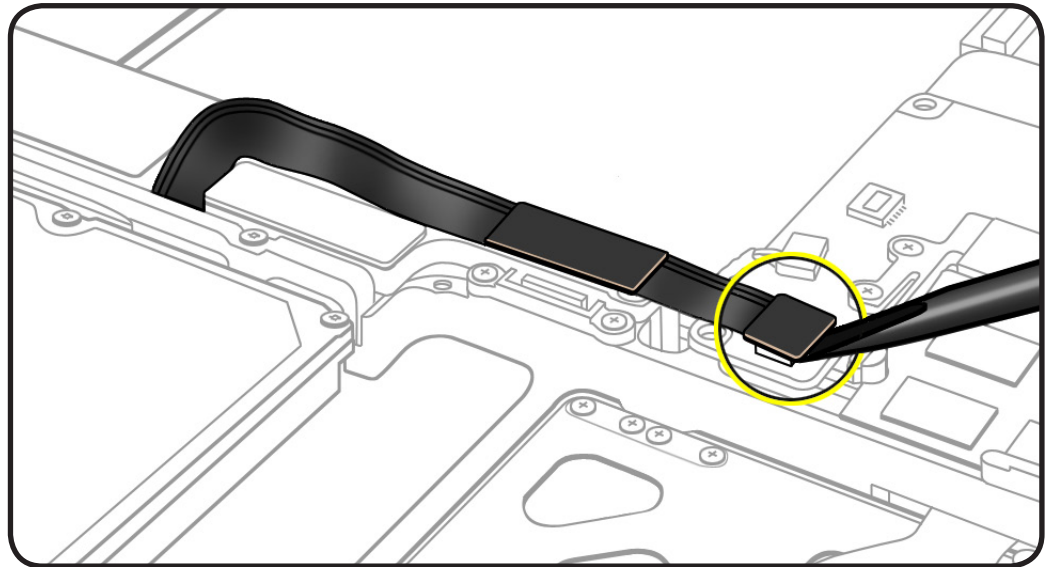


**3** Disconnect speaker cable from logic board.

**Note:** To disconnect, place black stick under cable and lift straight up.
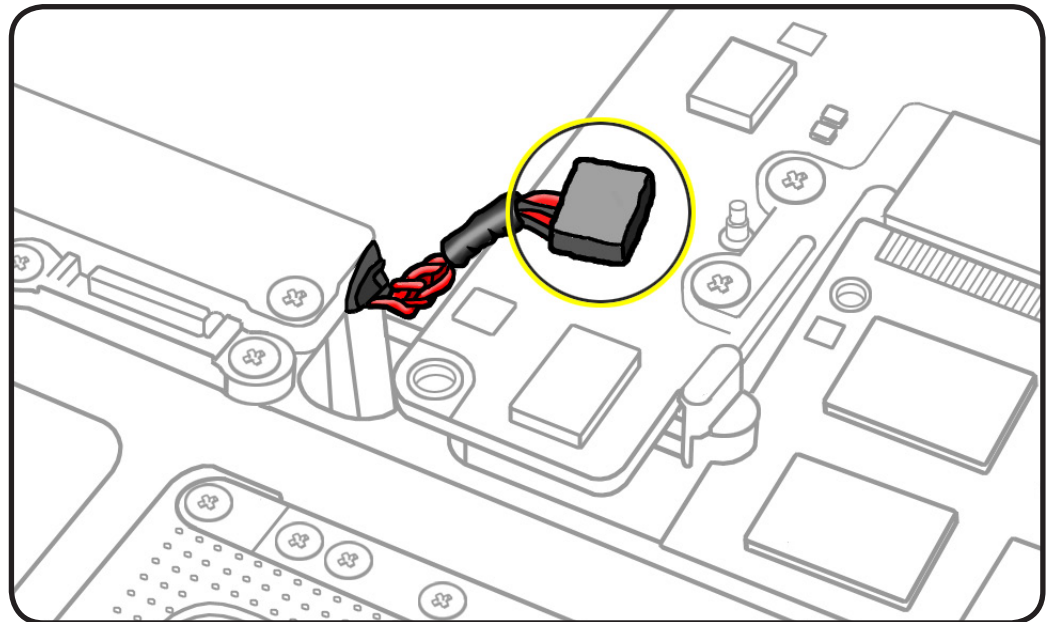
**4** Remove 6 screws:
- 2 (3 mm) 922-9095
- 1 (2.4 mm) 922-9094
- 2 (12.1 mm) 922-9466
- 1 (7.8 mm) 922-9467

**5** Remove speaker assembly from top case.

3 mm

2.4 mm

3 mm

7.8 mm

12.1 mm

12.1 mm
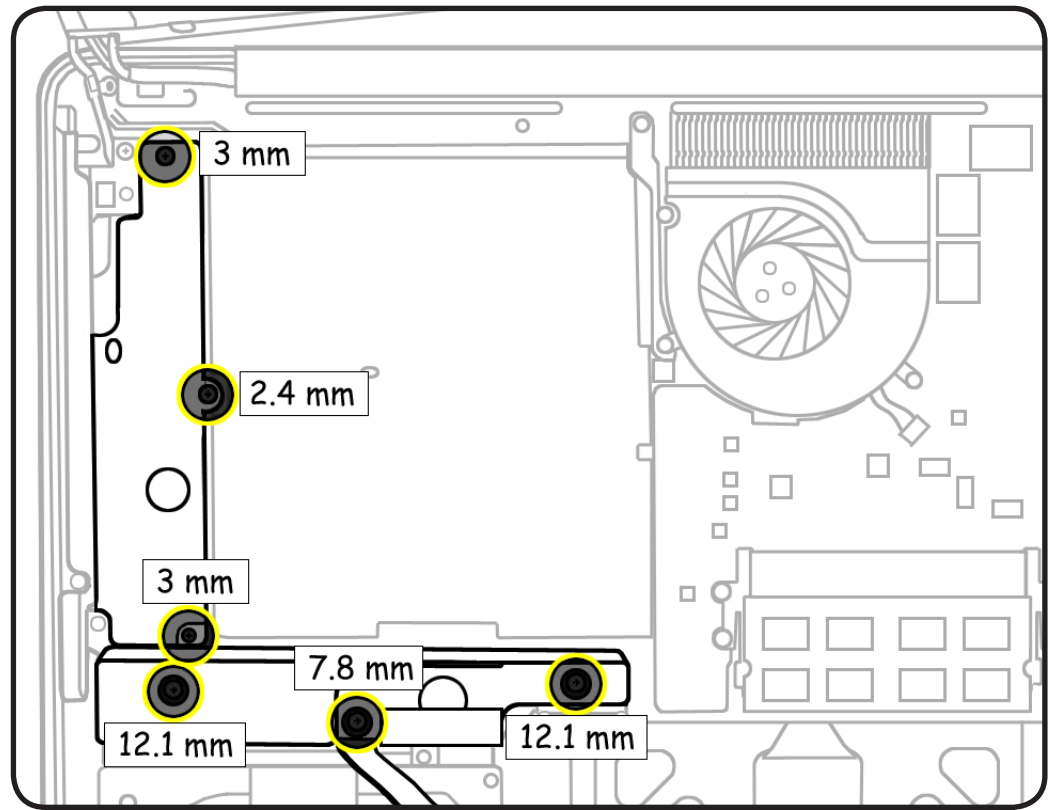
**Note:** The right speaker/subwoofer is made up of two sections connected by a narrow, twisted-wire cable. Be careful not to damage the cable when removing and reinstalling the part
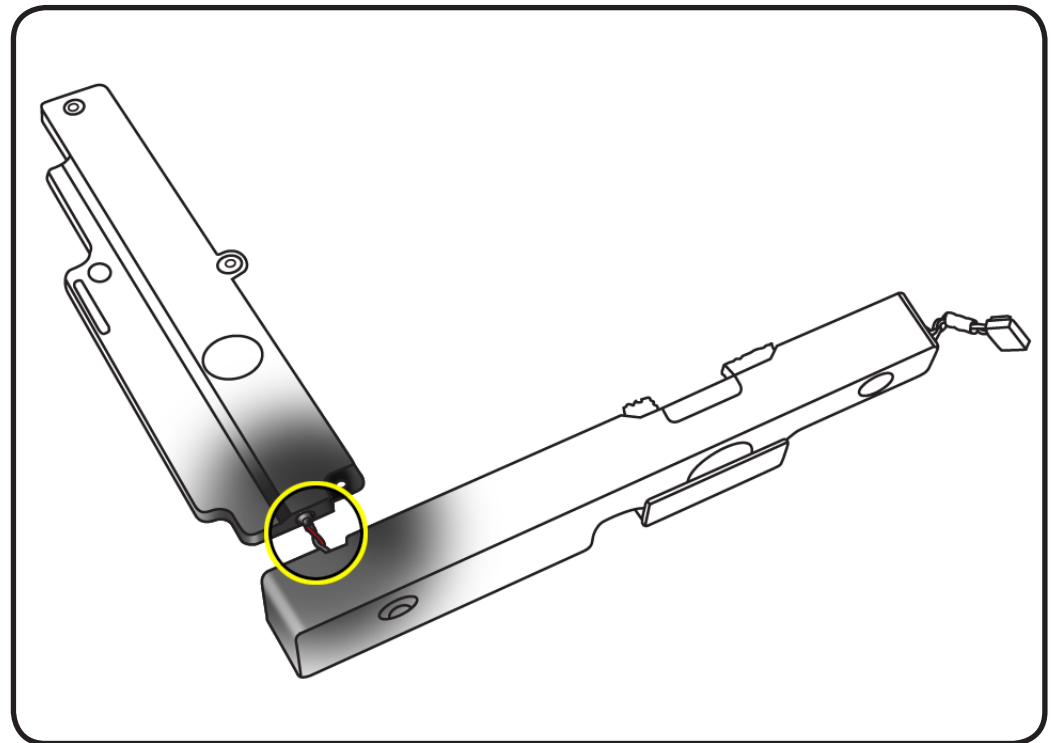
**Reassembly Note:** Inspect the top and bottom rubber snubbers associated with the three large speaker screws. The snubbers are used for vibration damping. If any snubber is damaged, replace it with a new, corresponding top snubber (922-9502) or bottom snubber (922-9503).
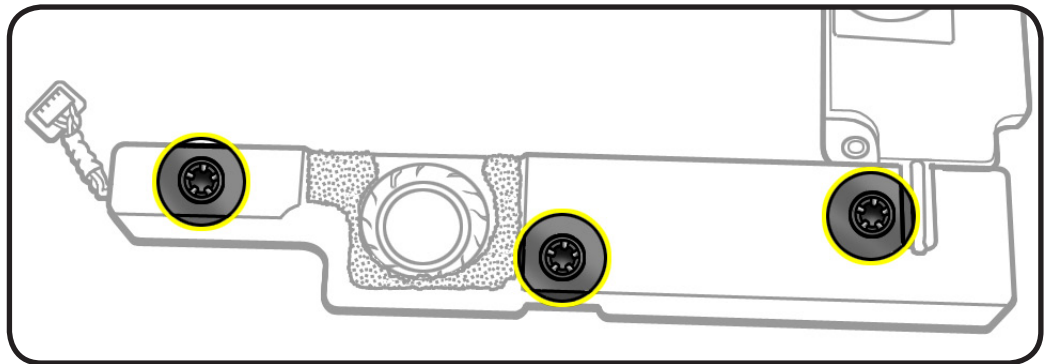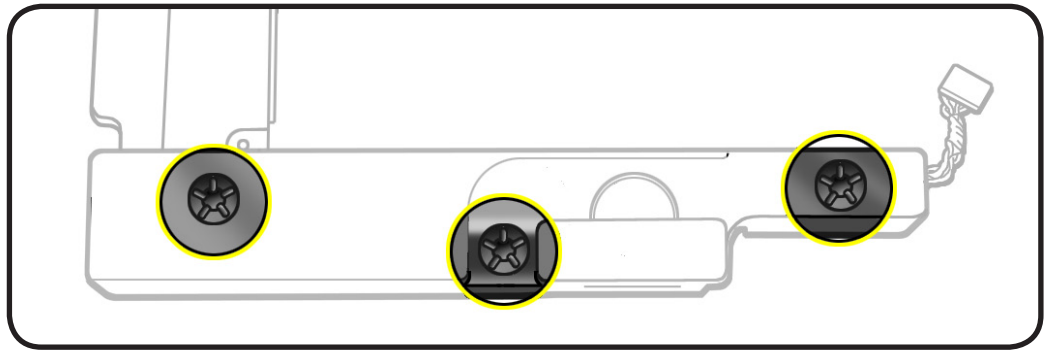
**Reassembly Note:** Replace screws in the order indicated.
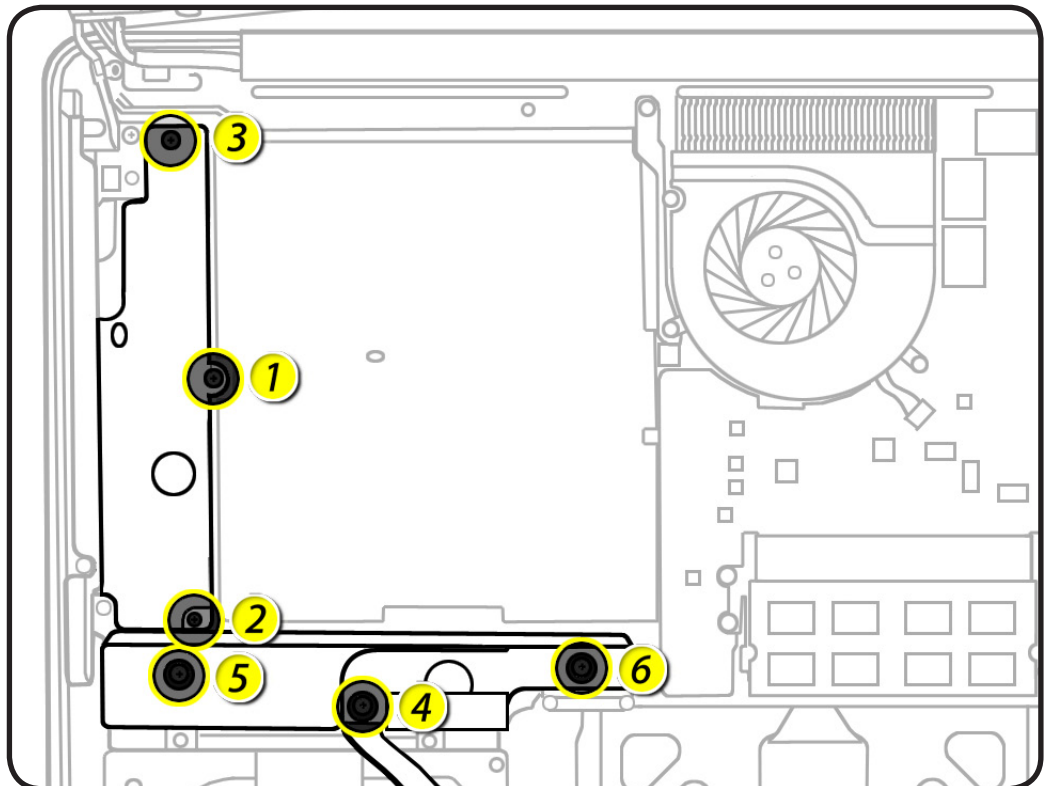
# Fan, Right

## First Steps

Remove:
- Bottom case
- Battery
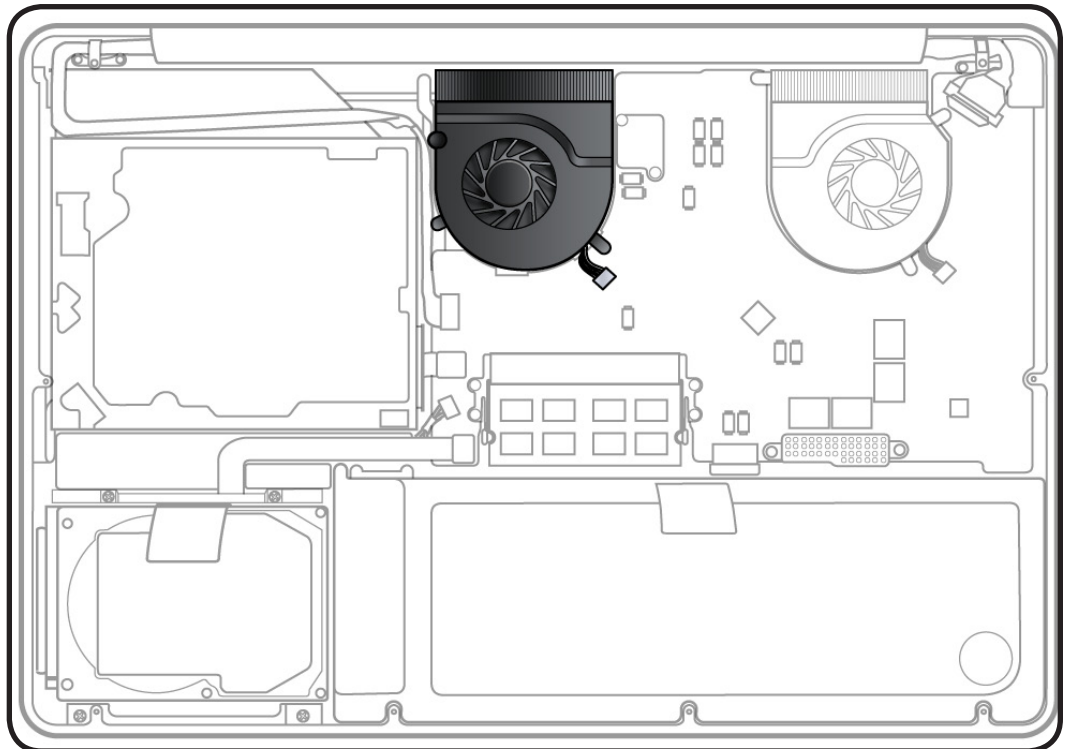
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
- Torx T6 screwdriver
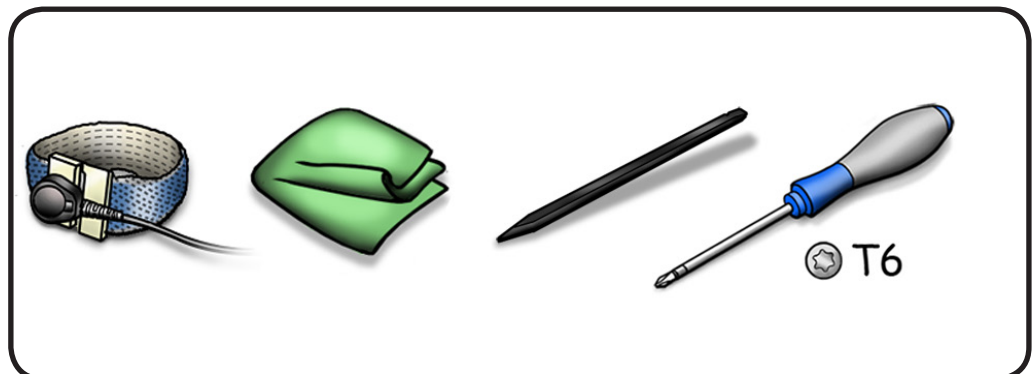
## Removal

**1** Use a black stick to disconnect fan cable.

**2** Remove 3 (3.0 mm) 922-9108 Torx T6 screws.

**3** Lift fan out of top case.
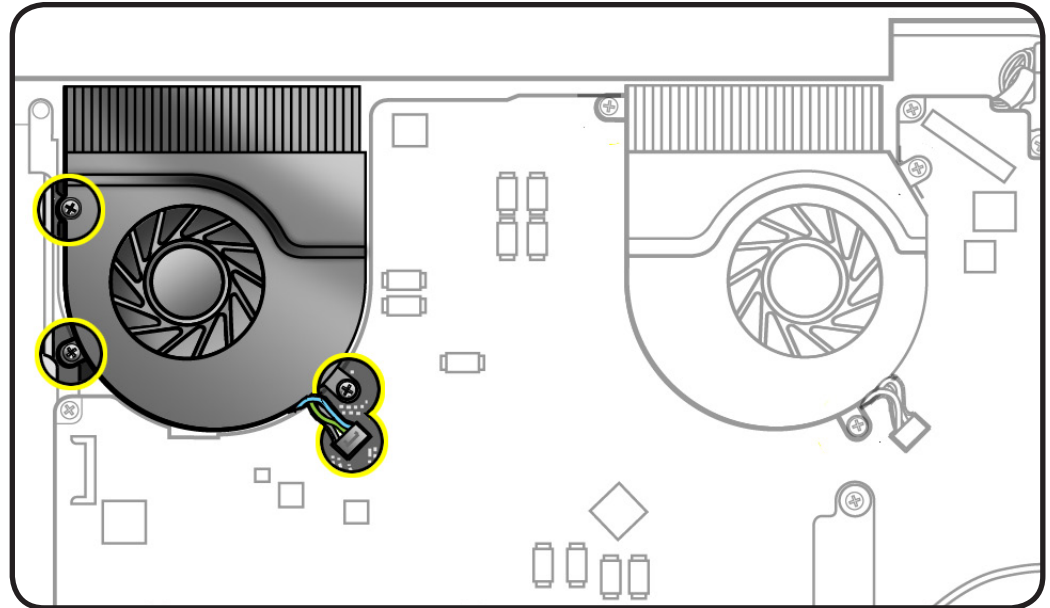
# Fan, Left

## First Steps

Remove:
- Bottom case
- Battery
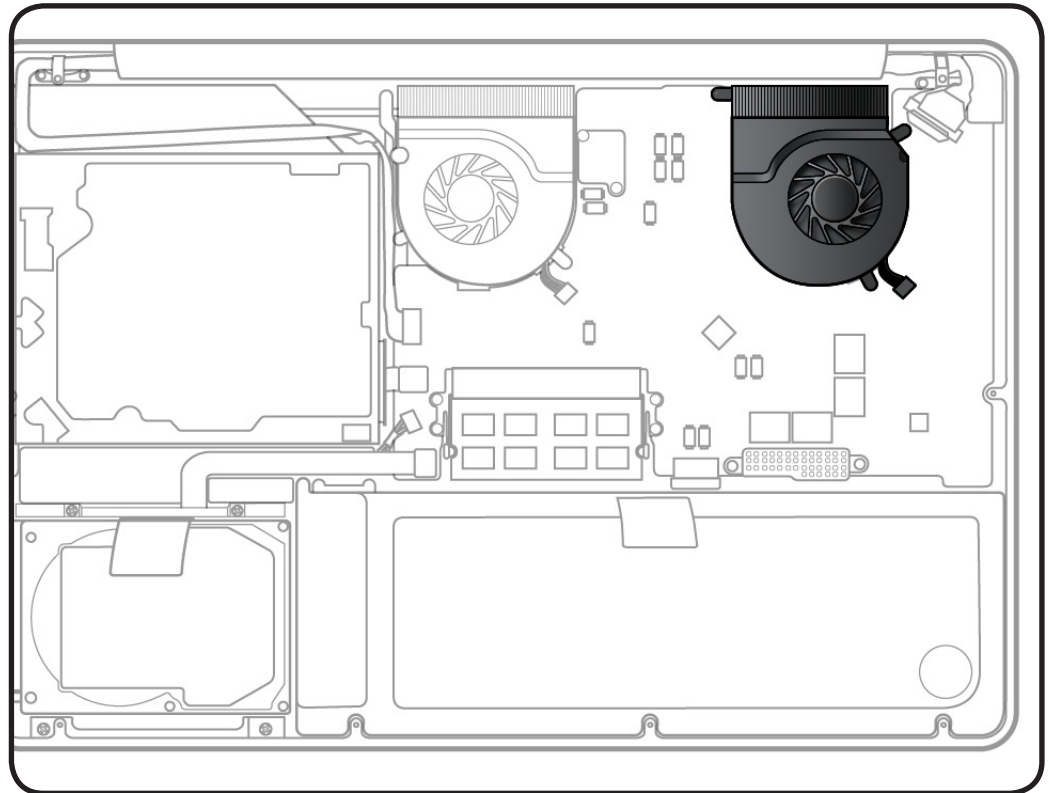
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
- Torx T6 screwdriver
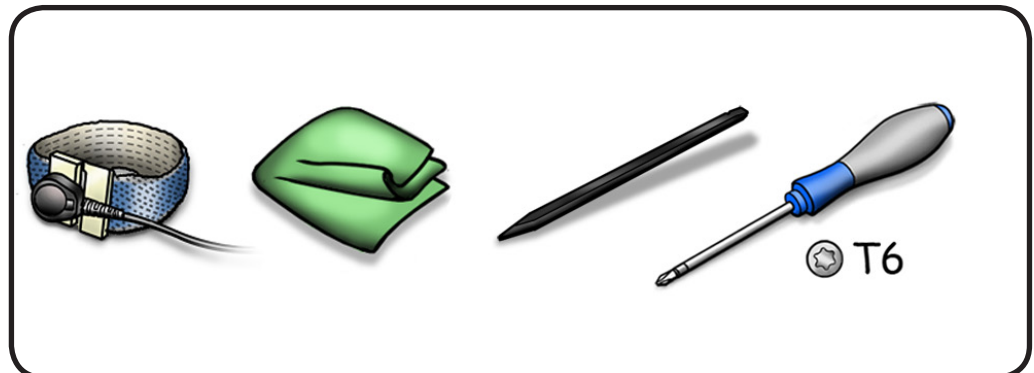
## Removal

**1**  Use a black stick to pry fan cable from logic board.

**2**  Remove 3 (3.0 mm) 922-9108 Torx T6 screws.
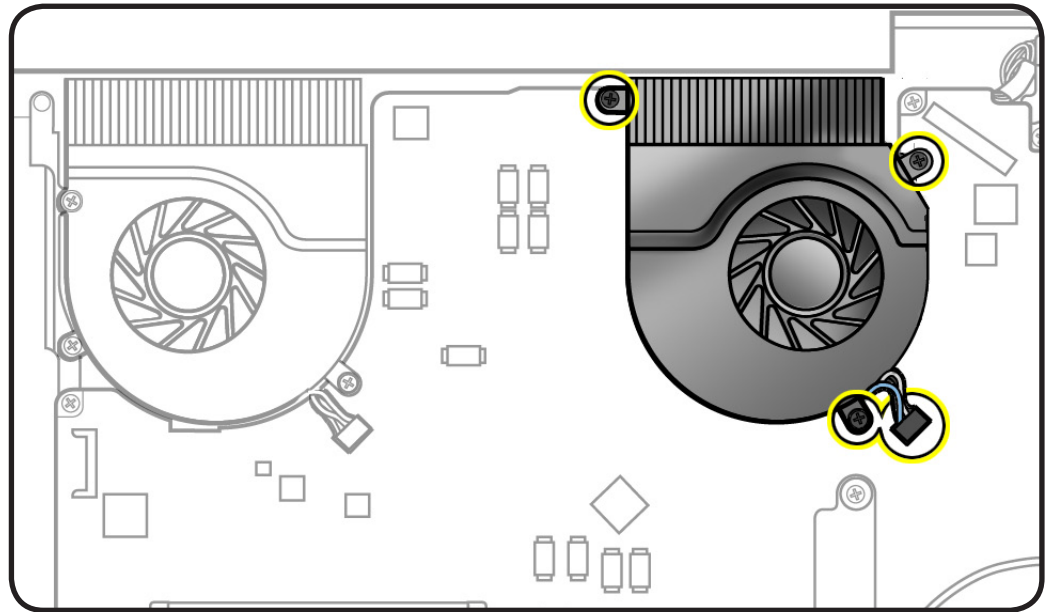
# Logic Board

## First Steps
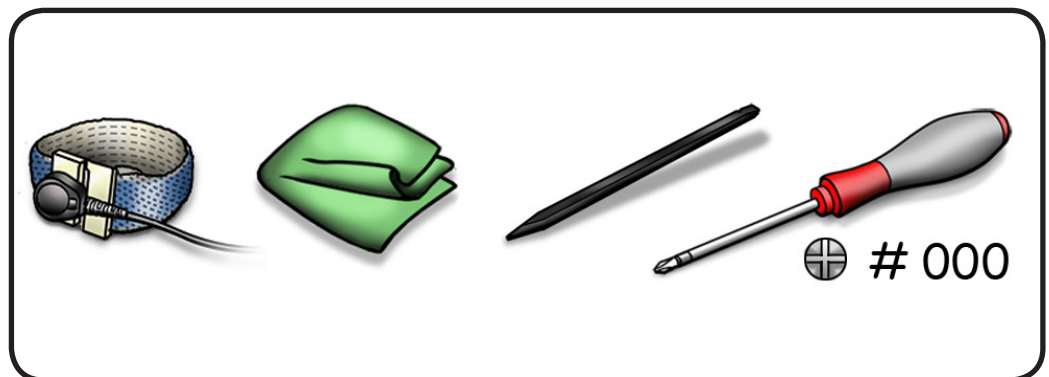
Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- Right fan
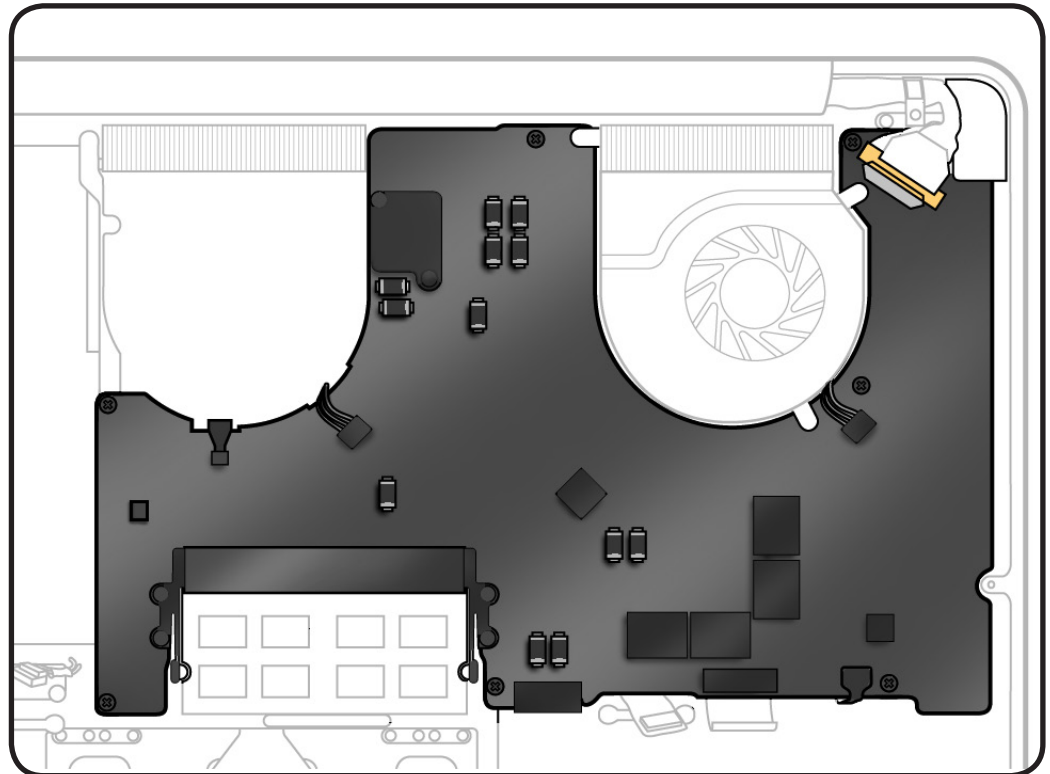
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Torx T6 screwdriver
- Black stick
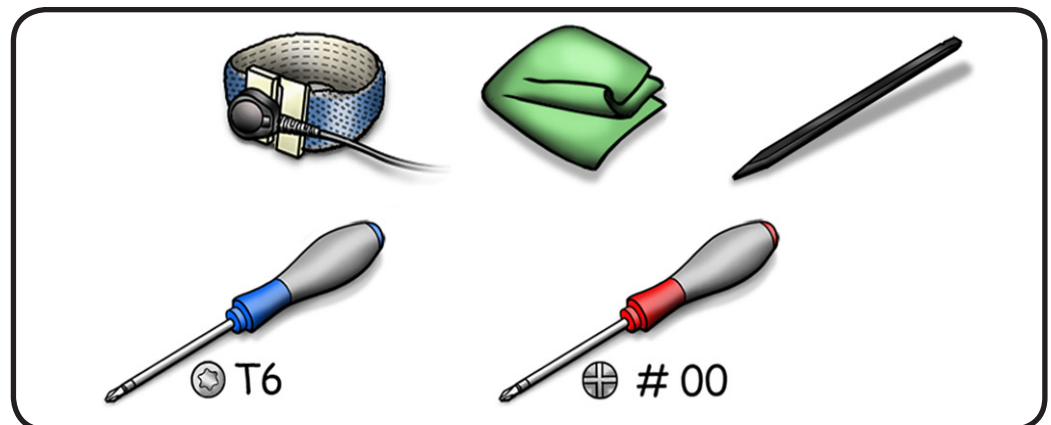
## Removal

**Caution:** The LVDS cable/ lock bar is very fragile; handle with care. A broken lock bar results in a display assembly replacement.

**1**  Peel EMI gasket off the top of LVDS cable, pull towards the fan.
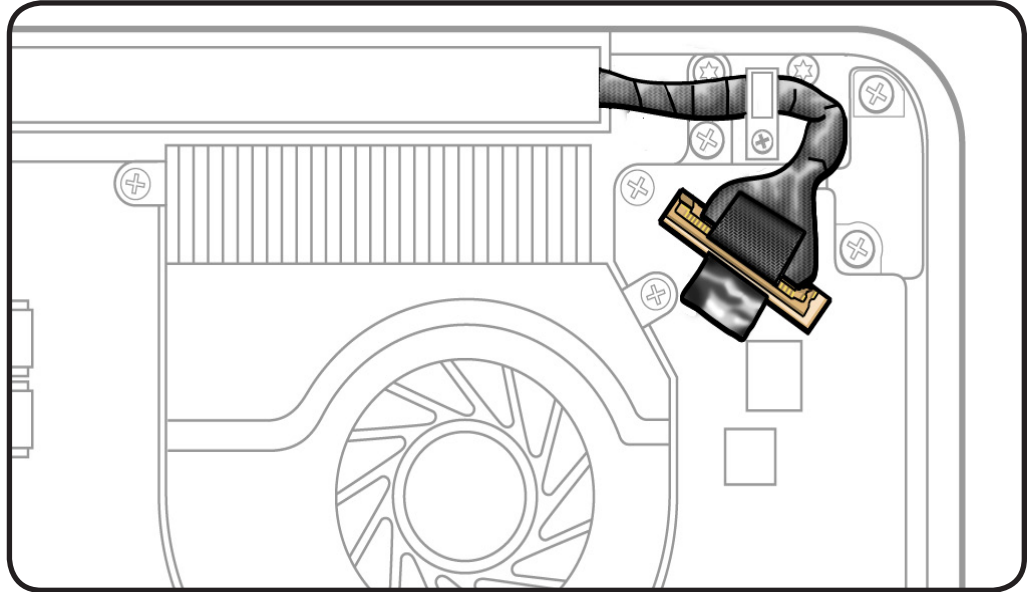
**2**  To disconnect LVDS cable, grasp black tab and gently swing LVDS lock bar up and back to unlock the cable.
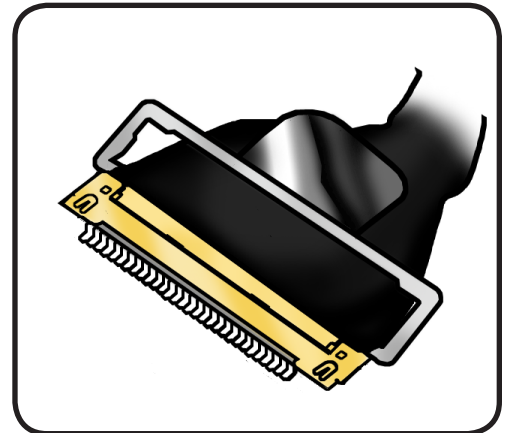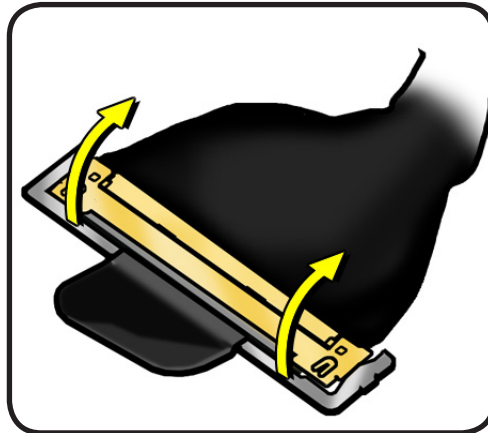
**3**  Slide cable out of connector by pulling the cable. Do not pull the black tab or lock bar.
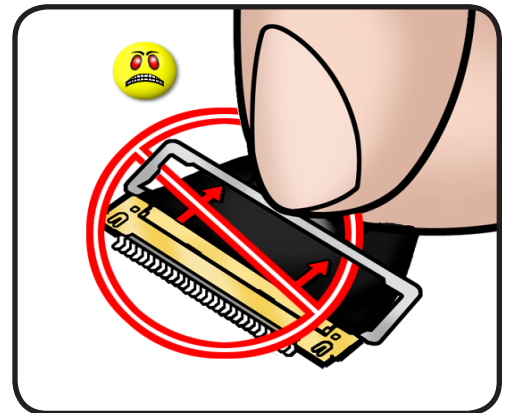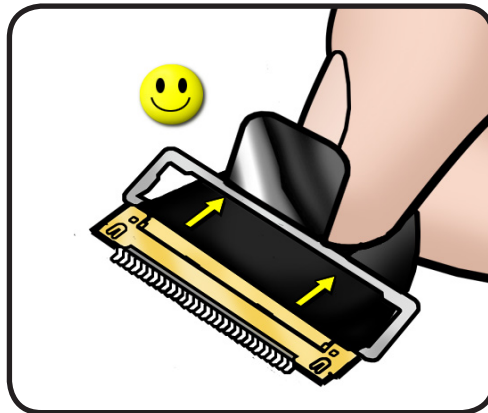
**4** Remove 2 (1.2 mm) 922-9037 screws, and remove cable cover.
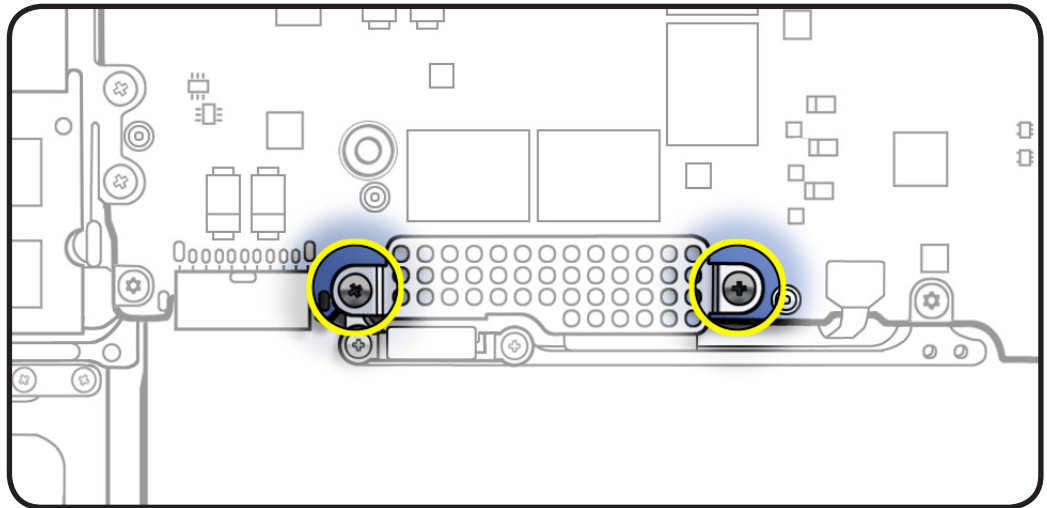


**5** **Caution:** Referring to "**Connector Types**," carefully disconnect 8 more cables in the order shown:

(1) keyboard backlight

(2) camera cable

(3) optical drive

(4) right speaker

(5) hard drive/IR/sleep

(6) trackpad flex

(7) keyboard

(8) battery indicator
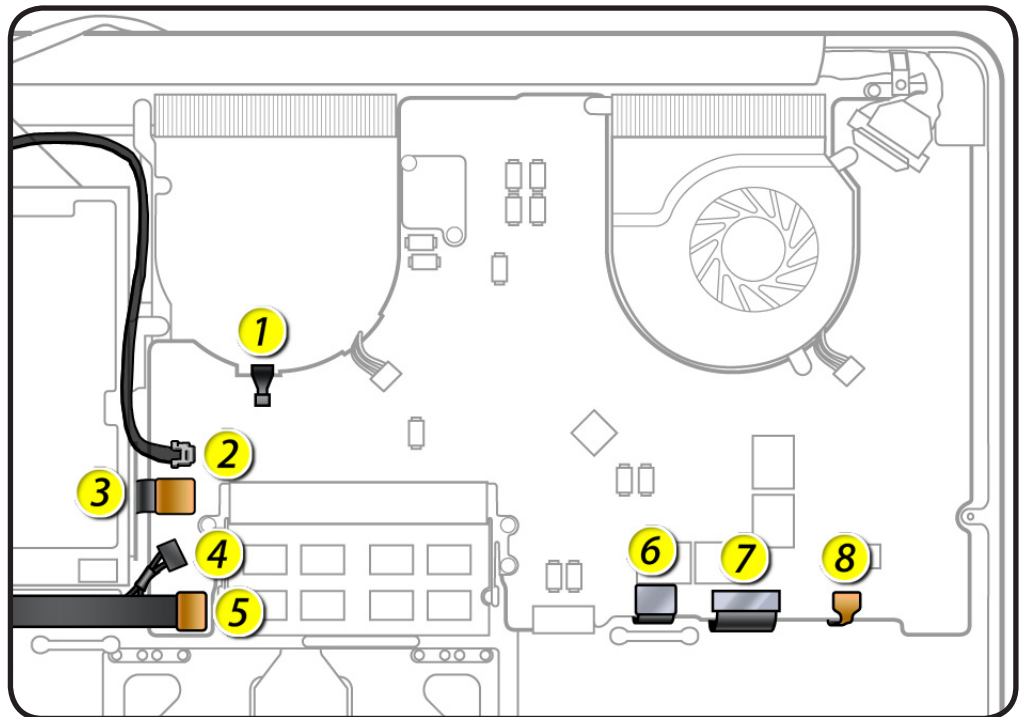
**6** Remove 7 (3.0 mm) 922-9108 Torx T6 screws.
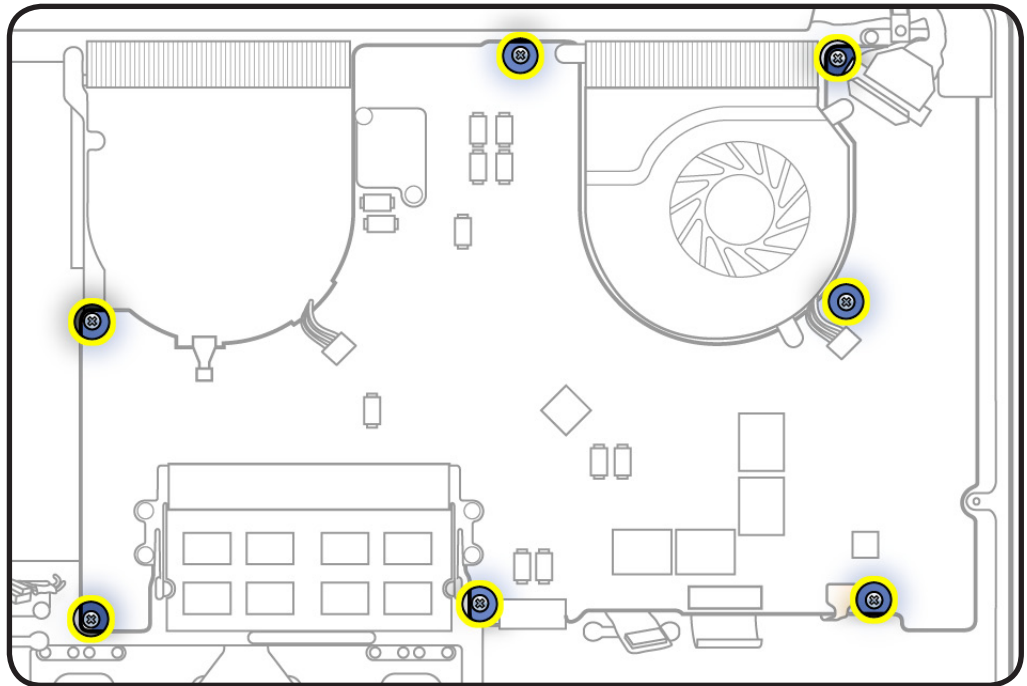
**7** Pull board away from ports.

**8** Tilt board vertically and on the underside disconnect the magsafe board cable.

**9** Lift logic board from top case.

**Note:** Do not remove the left speaker, microphone, and heatsink if reinstalling the same logic board.

**Replacement Note:** If replacing the logic board with a new one, transfer the following:
- left speaker
- microphone
- heatsink
- left fan
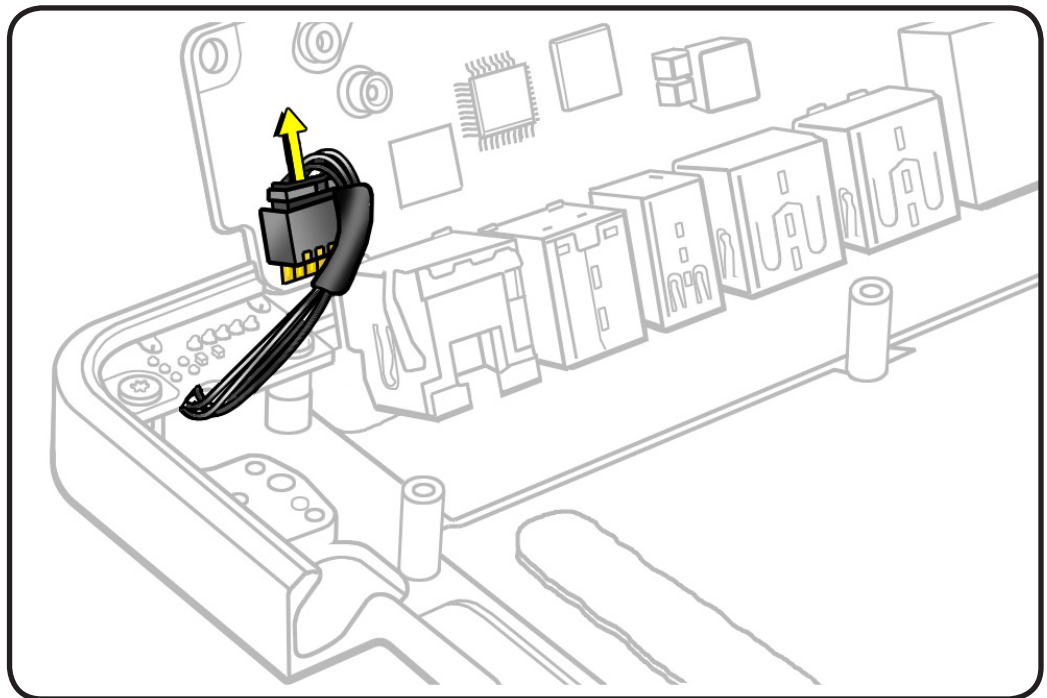
# Replacement

**1**  Connect the MagSafe cable on the underside.

**2**  Replace 7 T6 screws in order shown.

**3**  Connect **8 logic board** cables.

**4**  Replace cable cover.

**5**  Reconnect LVDS cable.

**6**  Install memory.
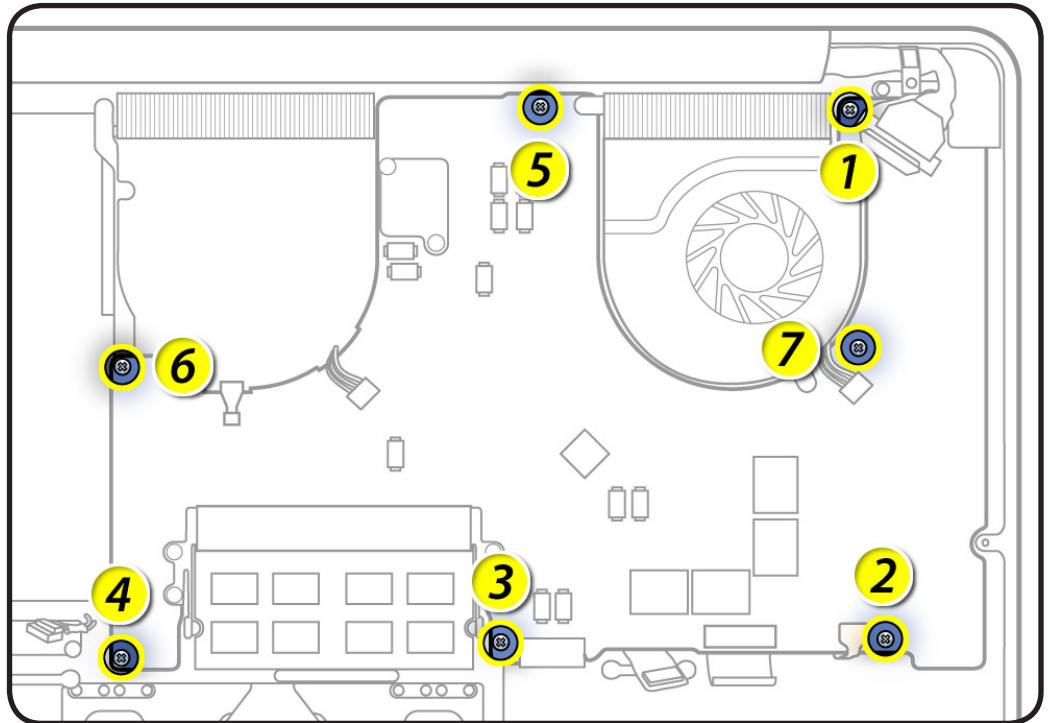
# Heatsink

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- Right fan
- Logic board
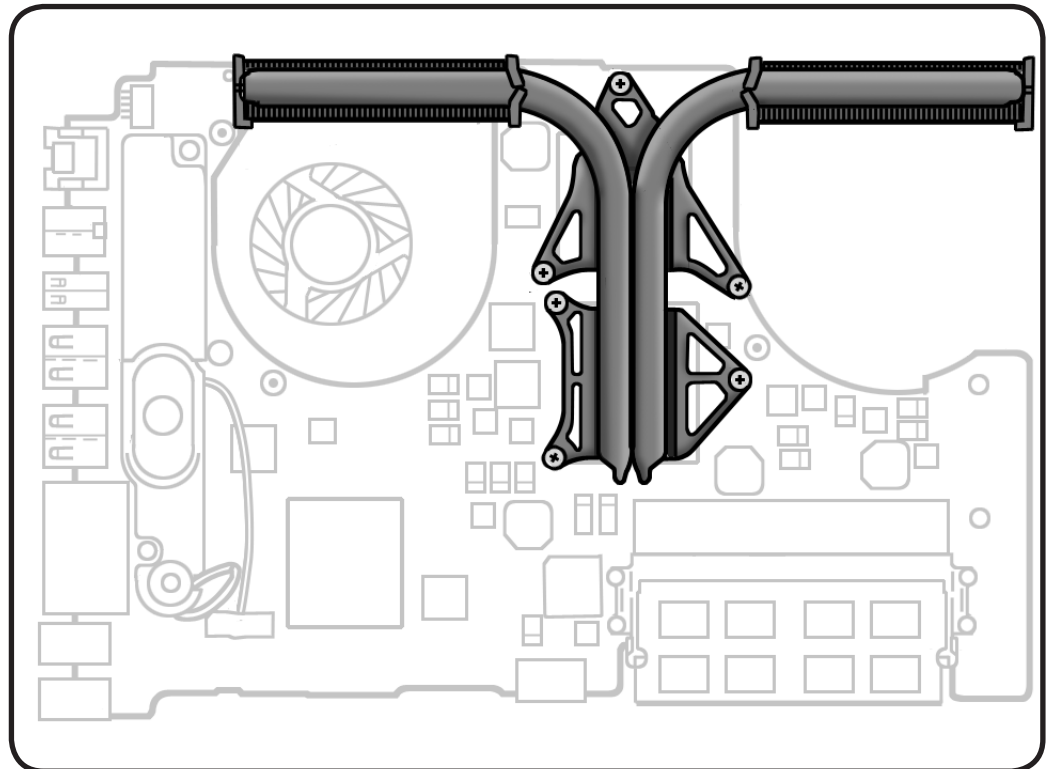


## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Torx T6 screwdriver
- Thermal grease syringe
- Alcohol pads
- Black stick

## Removal

**1** Remove 6 (8 mm) 922-9328 Torx T6 screws.

**2** Keeping heatsink parallel to logic board, gently wiggle the heatsink to loosen the bond to the board.

**Caution**: Hold heatsink by edges, not by the heat pipes.

**3** Lift heatsink from logic board.

**4** With a black stick, scrape off thermal grease and use alcohol pad to clean thermal pads and microprocessors.
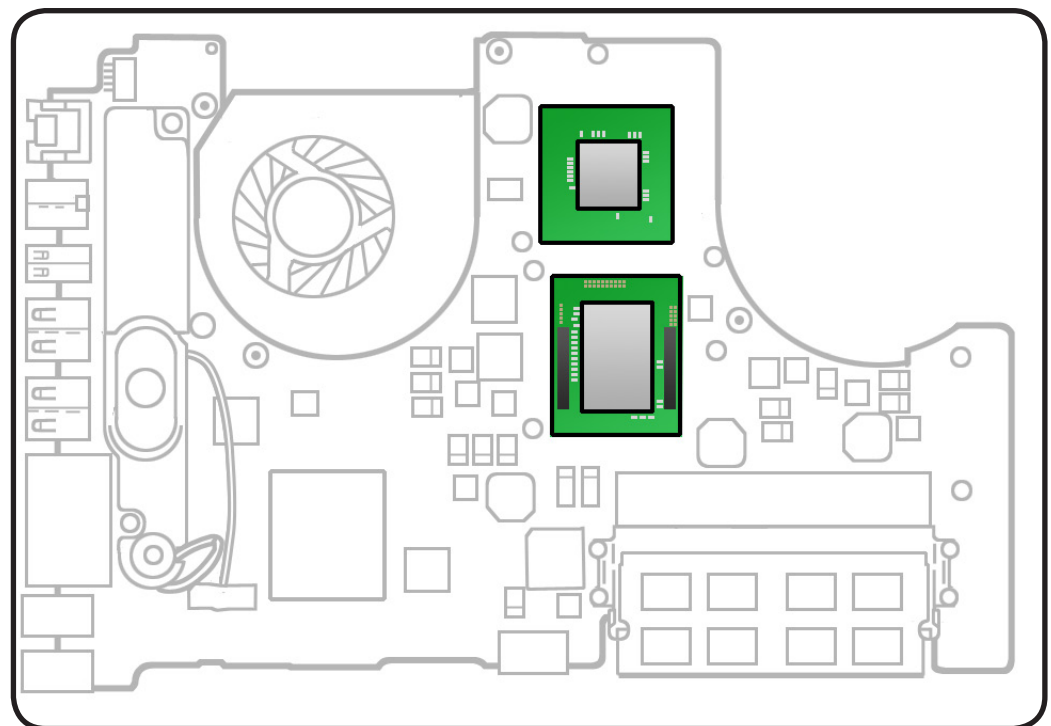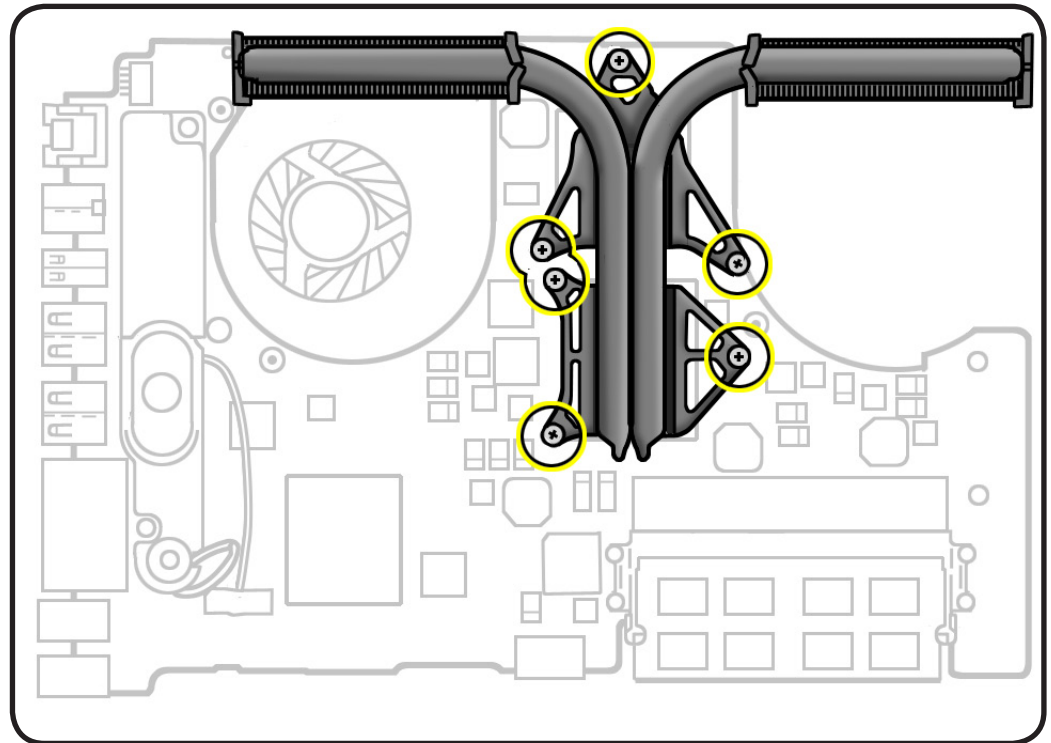
## Replacement

**Important:** New heatsinks include pre-applied thermal grease. Follow steps 1-2 only if re-installing the original heatsink.

**1** Use a pen to mark the syringe in thirds.

**Caution**: The syringe contains enough thermal grease for 3 microprocessors.
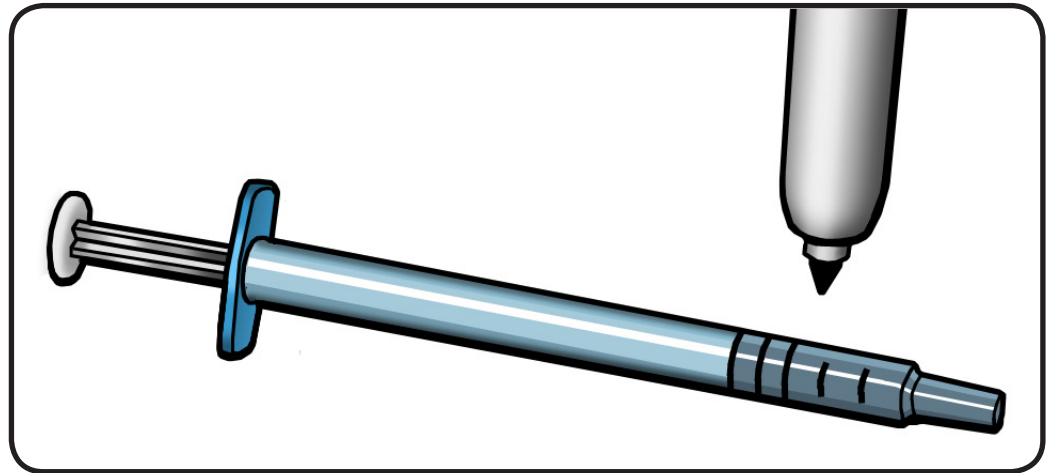
**2** Inject 1/3 of grease on the center of each microprocessor.

**3** Lower the heatsink over the logic board.

**4** Install heatsink screws in the order shown, 1/2 way first, then tighten the rest of the way.
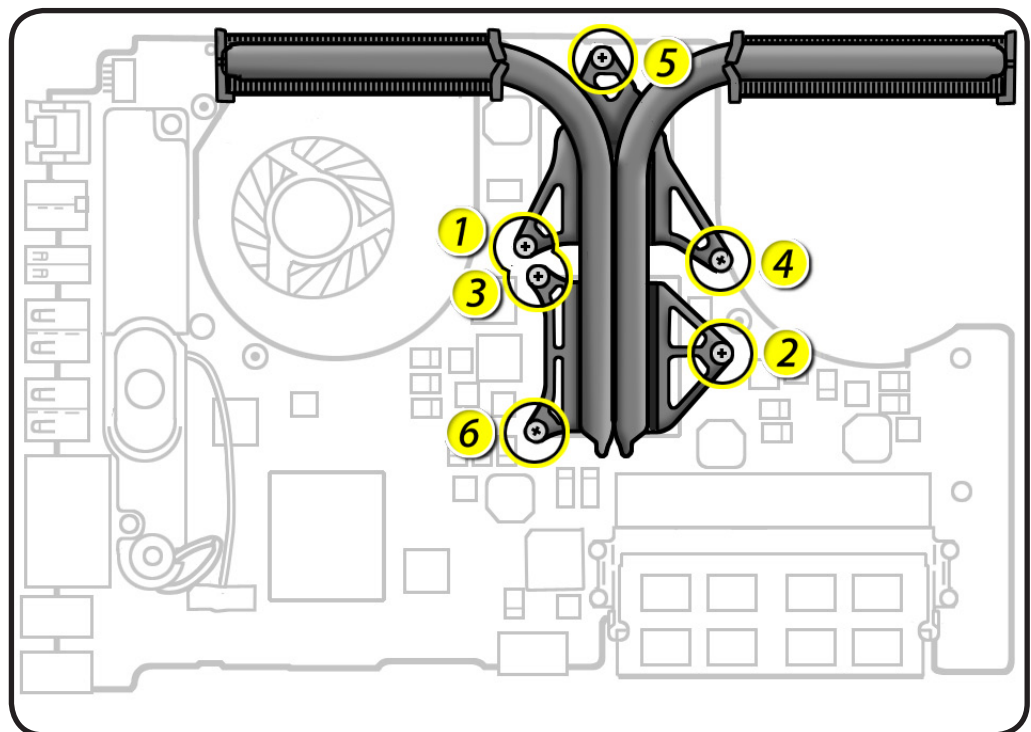
# Trackpad

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- Right fan
- Logic board

**Trackpad Kit 922-9306**
includes:
- trackpad
- 8 flexure screws
- 1 T6 set screw
- 2 metal flexures
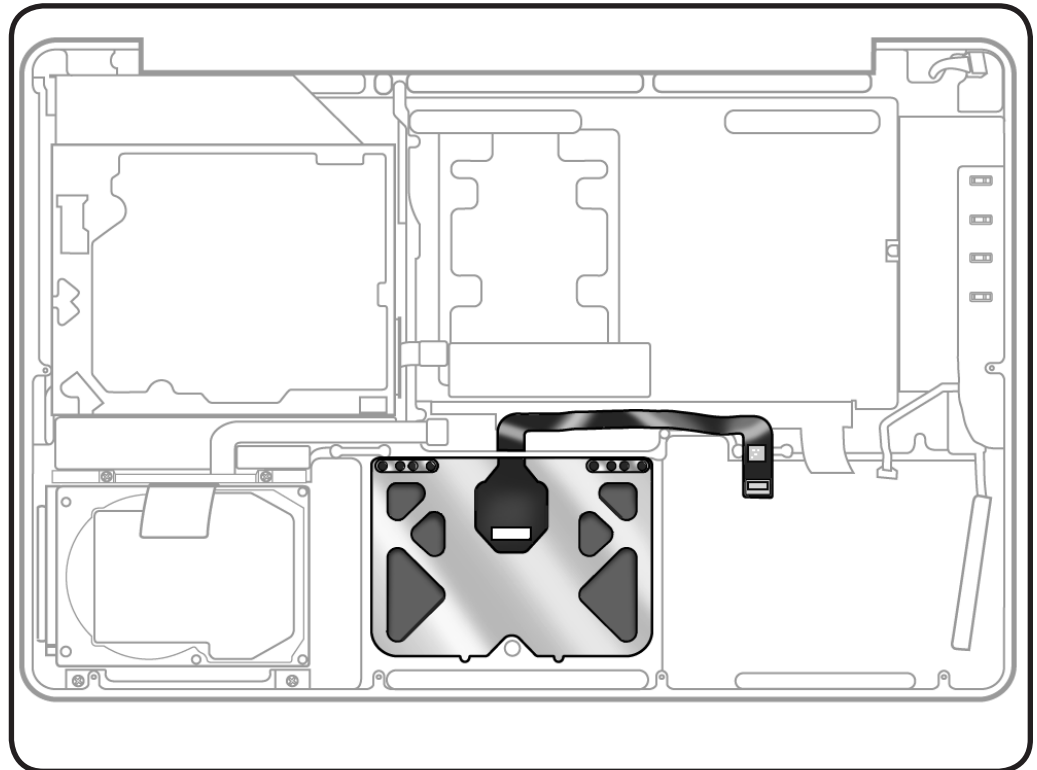


## Tools

- ESD wrist strap and mat
- Sticky (Post-It) notes
- Black stick
- Magnetized Phillips #000 screwdriver
- Magnetized Torx T6 screwdriver
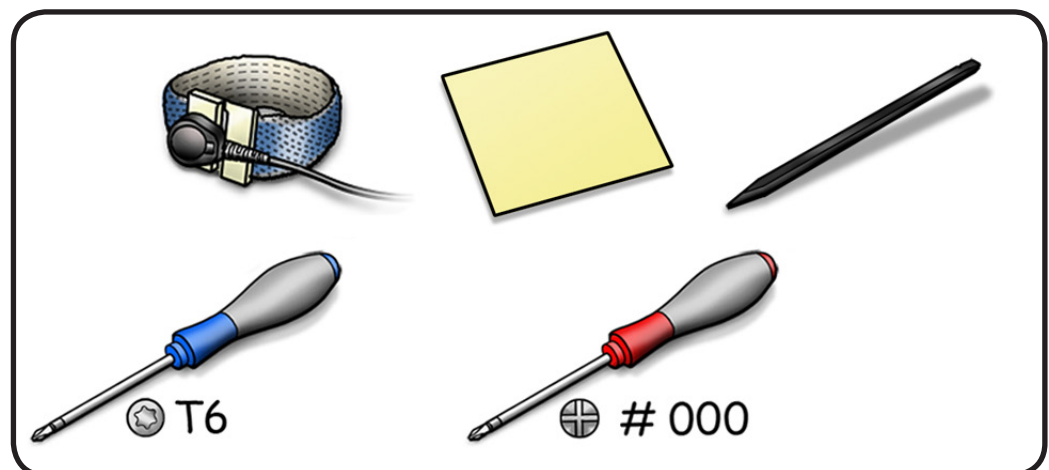
## Removal

**1** Carefully peel up trackpad flex cable from top case.
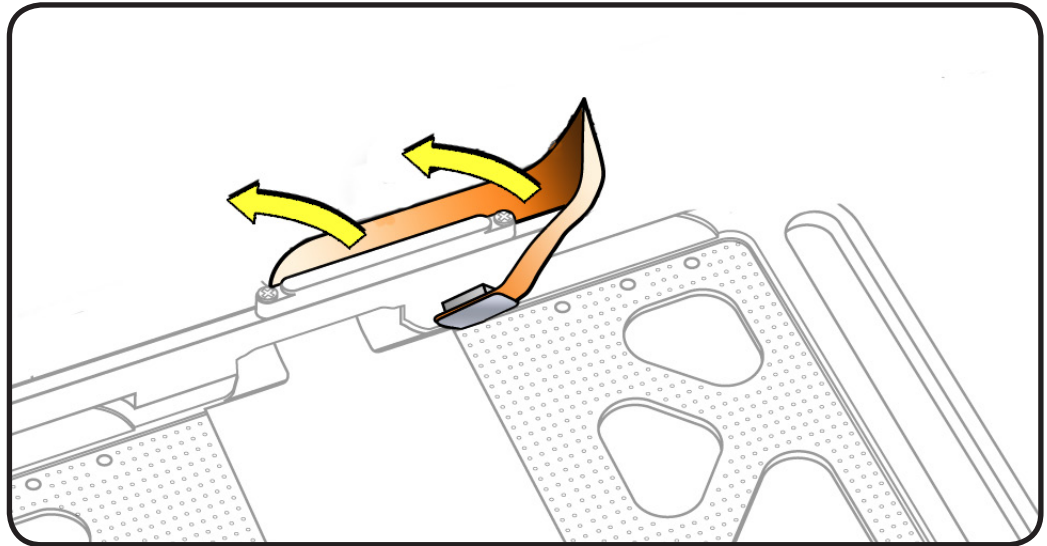


**2** Remove 8 screws (included in new trackpad assembly 922-9306 and also offered separately):
- 4 (0.9 mm) 922-9256 (silver-colored)
- 4 (1.1 mm) 922-9461 (black)

  Discard old screws; they lose their ability to hold securely if reused.

**3** Remove 1 Torx T6 set screw. Discard old screw. (New set screw comes only with trackpad assembly.)

**4** Remove and dispose of 2 metal flexures (thin metal pieces); they are matched to each individual trackpad by thickness.



1.1 mm   1.1 mm          1.1 mm   1.1 mm

0.9 mm     0.9 mm        0.9 mm     0.9 mm
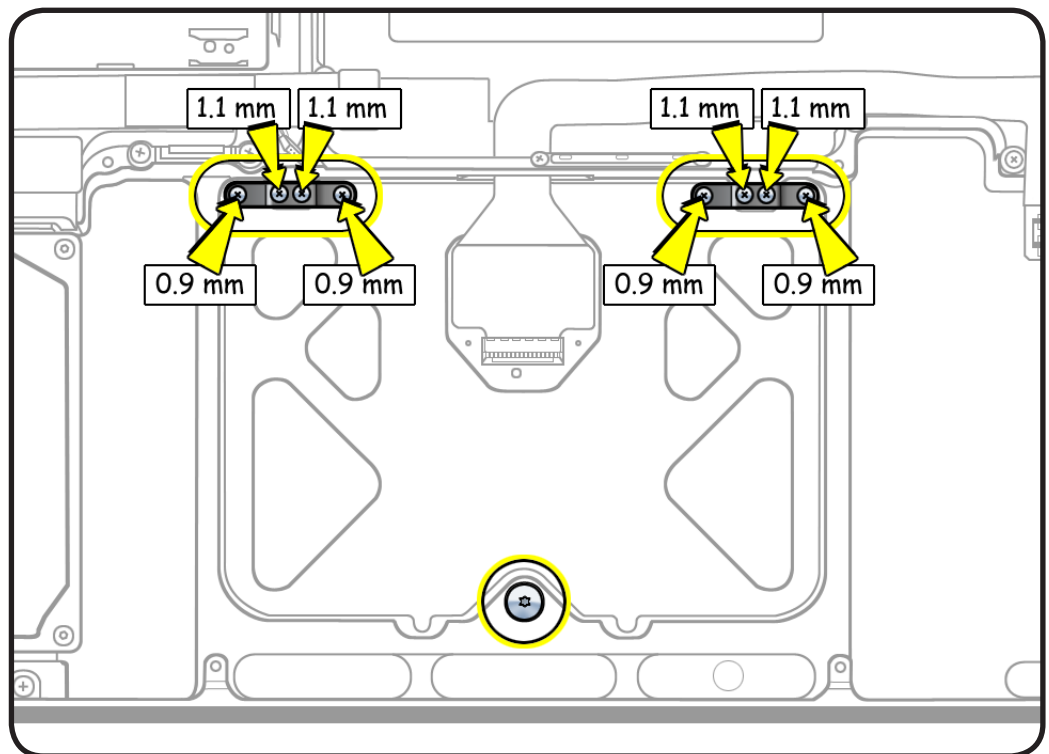
**5**  Support trackpad and
flex cable as trackpad
drops down out of
top case.
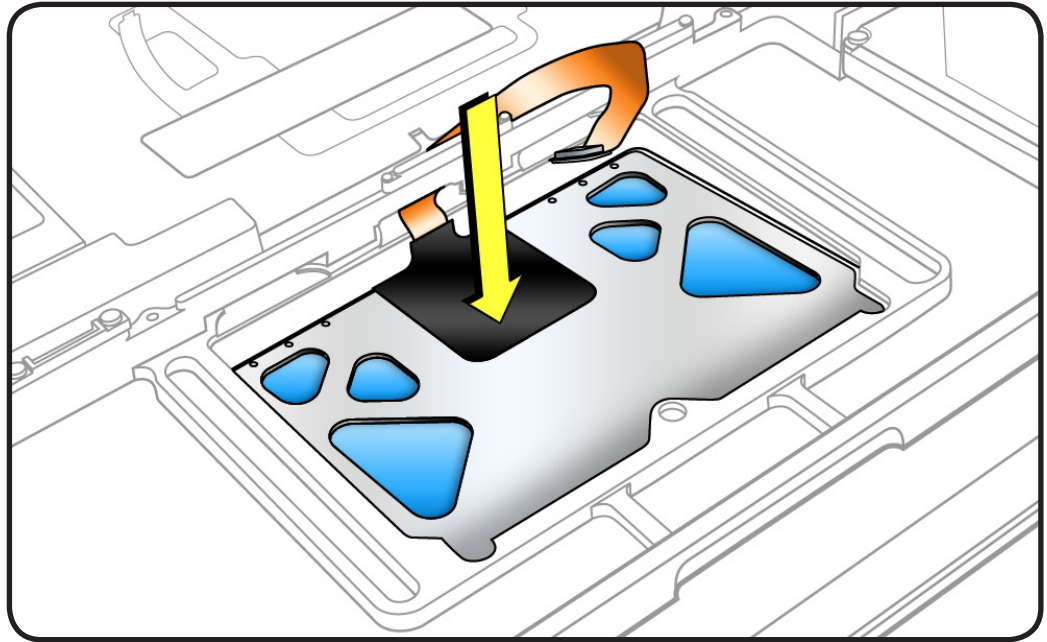
**6**  Spiral trackpad down
and away from top
case, taking care to
route flex cable
through opening.
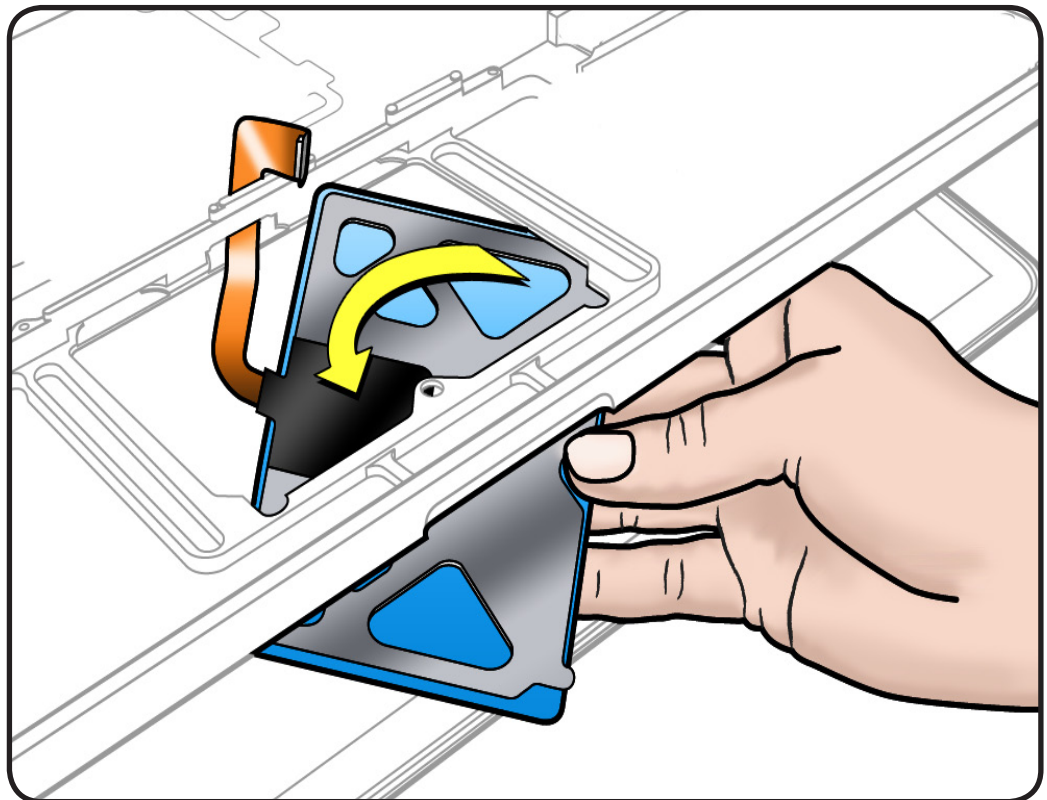
# Replacement

**1** Route flex cable through opening.

**2** Spiral and pivot trackpad into place.

**Important:** Minimize rubbing edges of trackpad against top case while installing. This could cause invisible cracks to form in the glass of the trackpad.
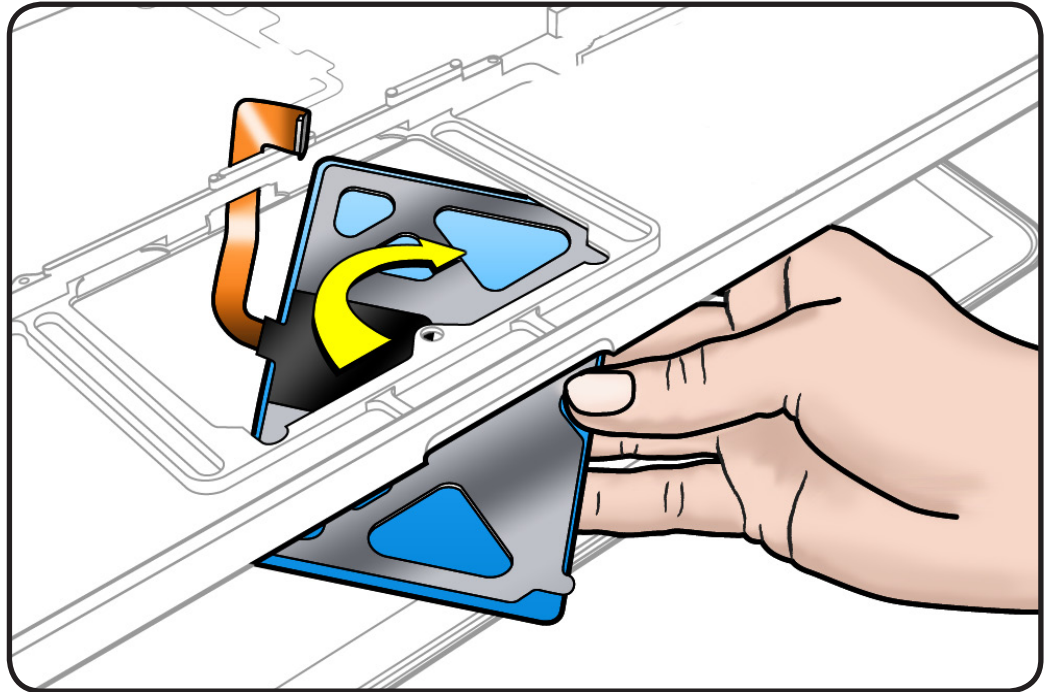


**3** Loosely insert 8 screws into new flexures. Tighten a little.
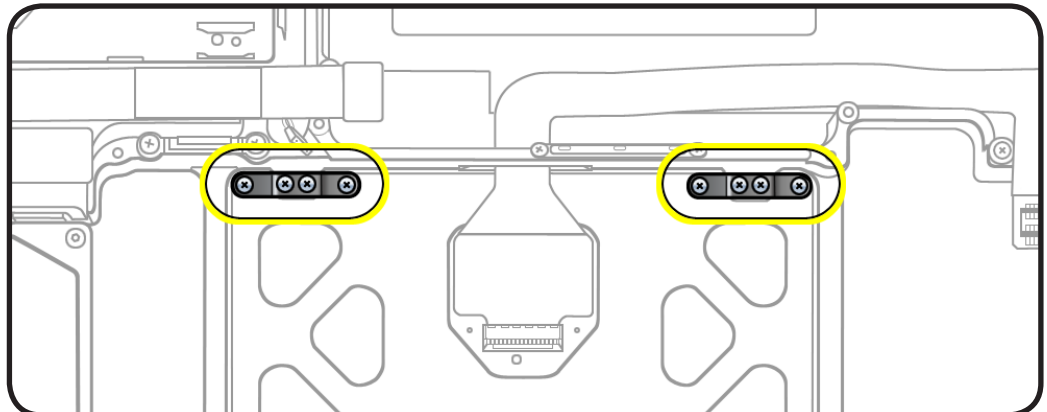
**4** On the palm rest, insert one sticky (Post-It) note into gap on each of the four sides of trackpad.
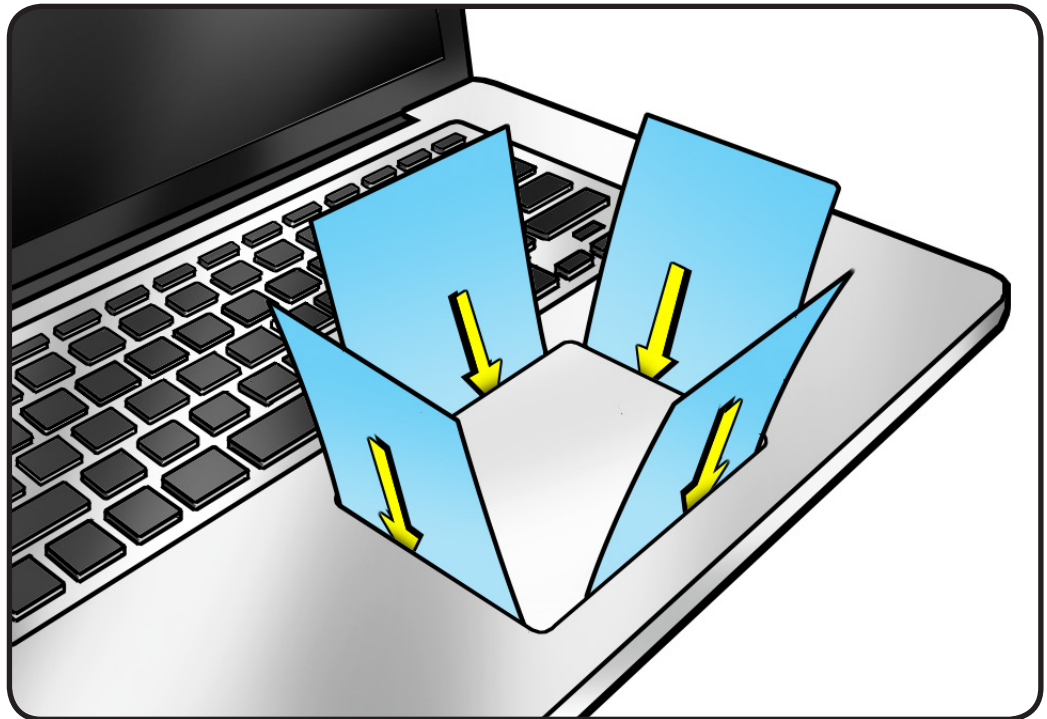


**5** Fold sticky notes over so that top case can be laid flat.
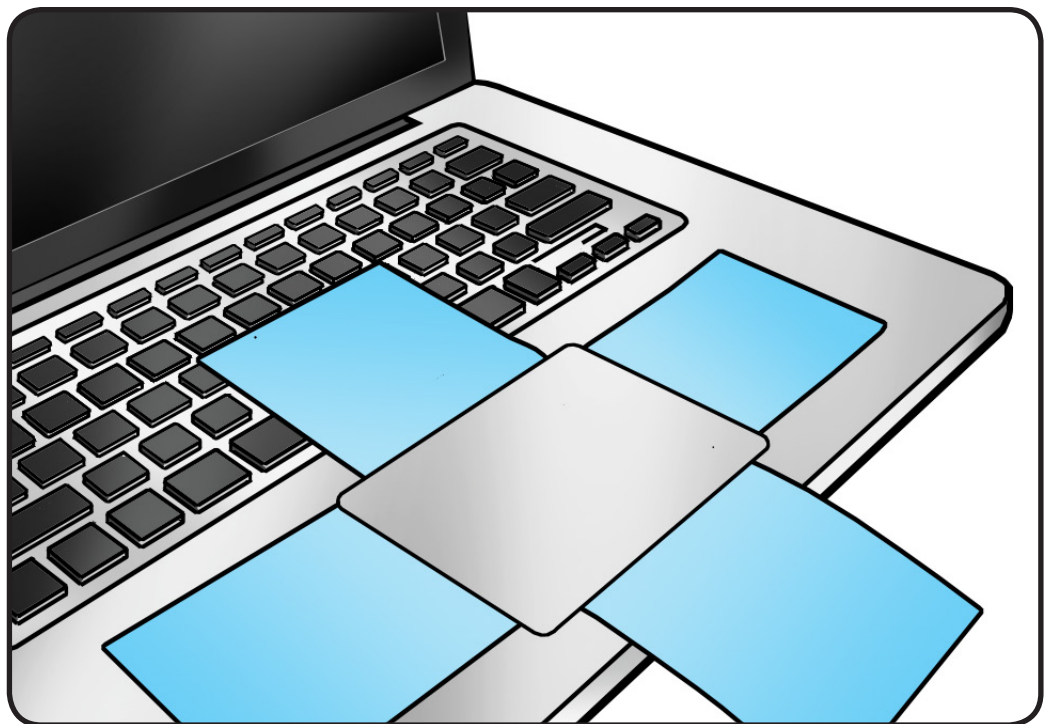
**6** Turn top case over. Tighten screws at flexures.

**7** Check that gaps between trackpad and top case are even on all sides. If not, loosen screws and adjust.
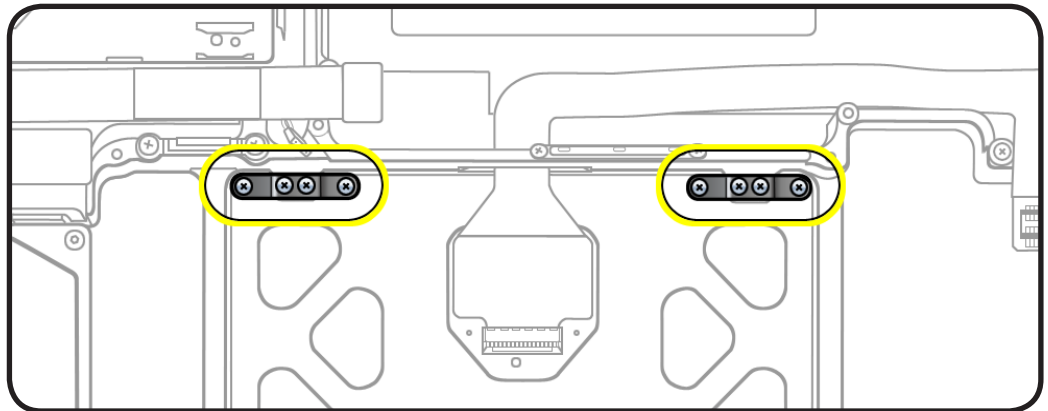
**8** Replace 1 T6 set screw.

**9** Slowly turn set screw in small increments until trackpad has a normal clicking motion.
   **Important:** Do not overtighten set screw or you may damage trackpad.

**10** Press trackpad flex cable into place on top case.
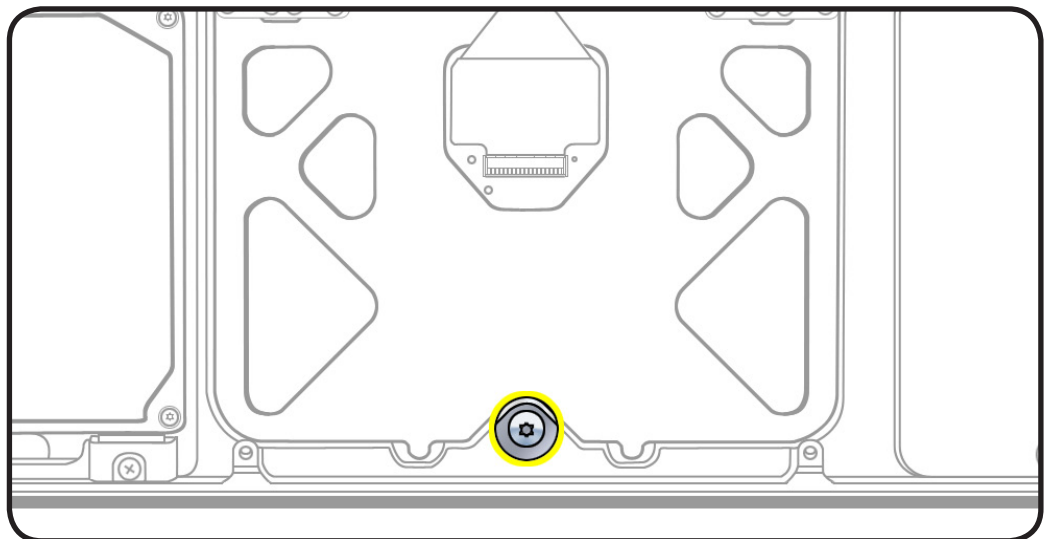
# Left Speaker

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- Right fan
- Logic board



## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetic Phillips #00 screwdriver



# ⊕ # 00
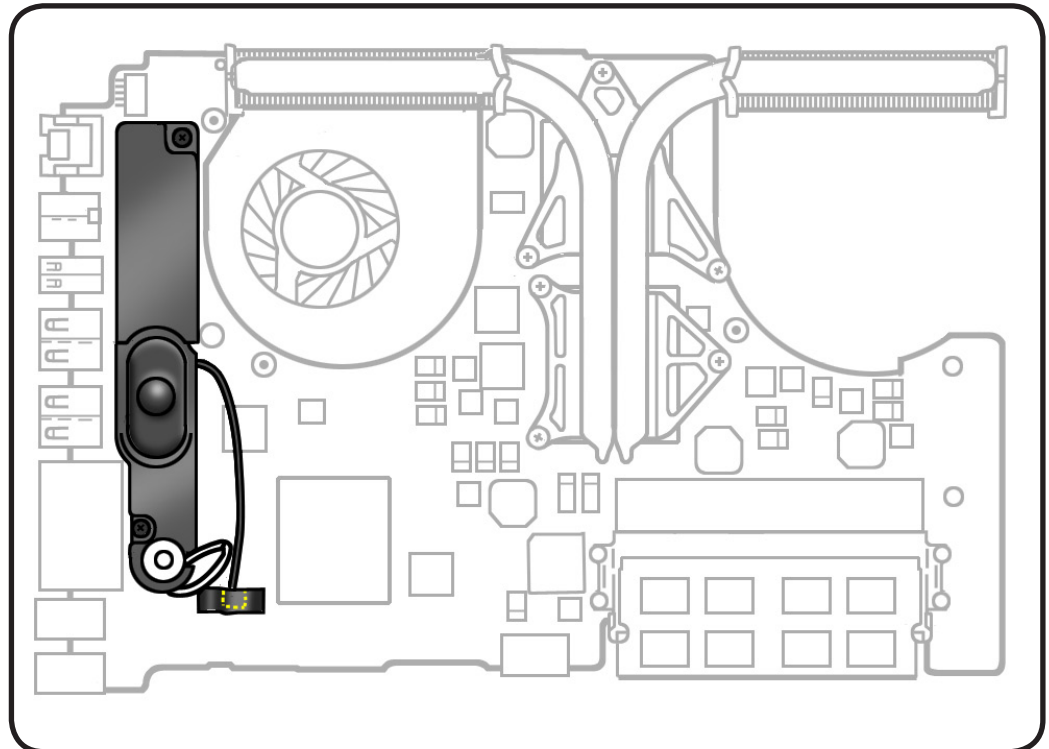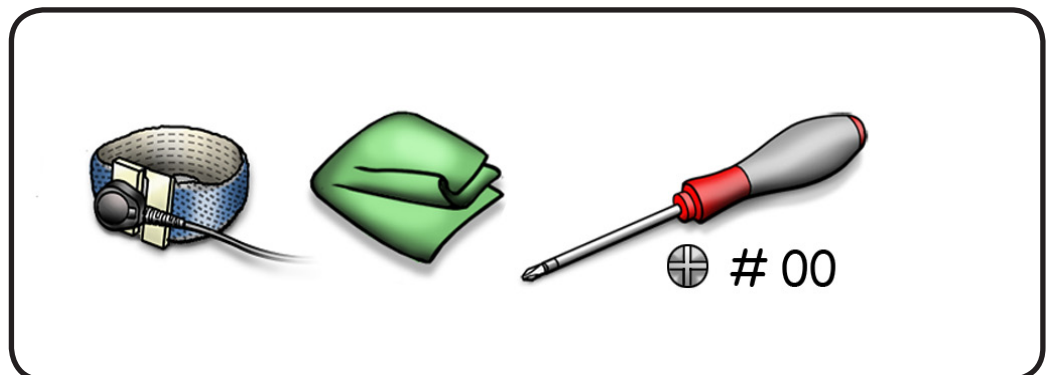
# Removal

**1** Carefully peel back tape and disconnect speaker cable from logic board.
**Replacement Note:** Be sure to replace the tape covering the speaker cable. If you cannot reuse the original tape, use a piece of Kapton tape.

**2** Remove 2 (4.5 mm) 922-8744 screws.
**Note**: Do not touch the soft speaker cone.
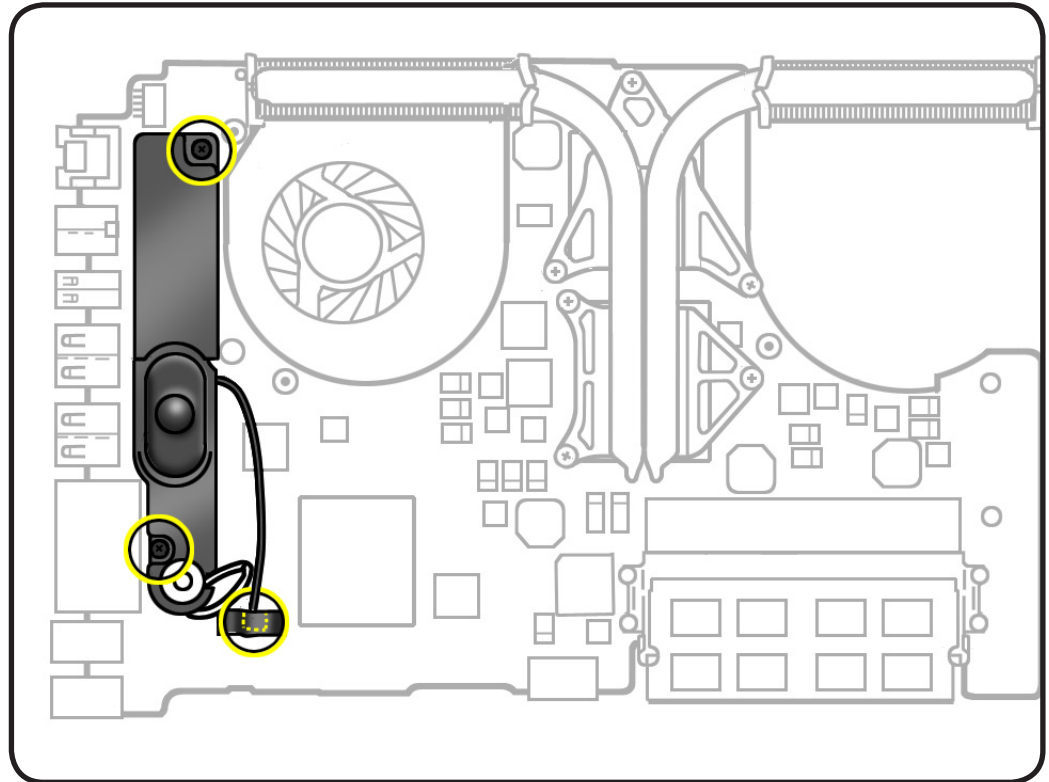
**3** Disconnect microphone cable from logic board.

**4** Remove speaker and microphone from top case.

**Replacement Note:** If you are replacing the speaker, transfer microphone to replacement speaker before installing new speaker.
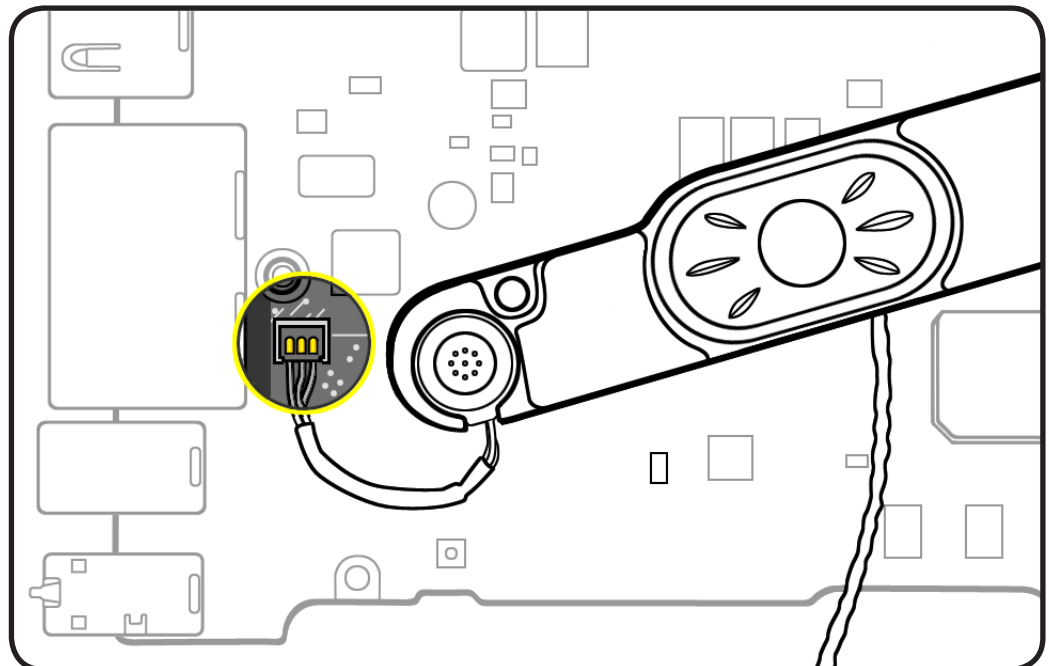
# Microphone

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- Right fan
- Logic board
- Left speaker
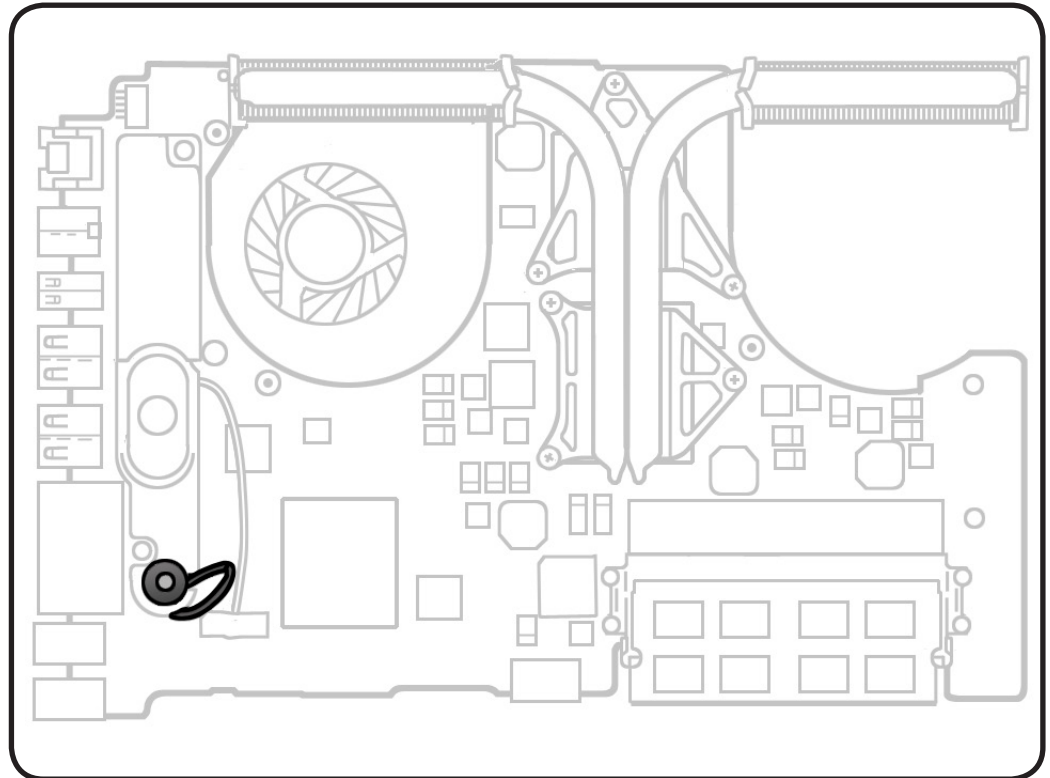


## Tools
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
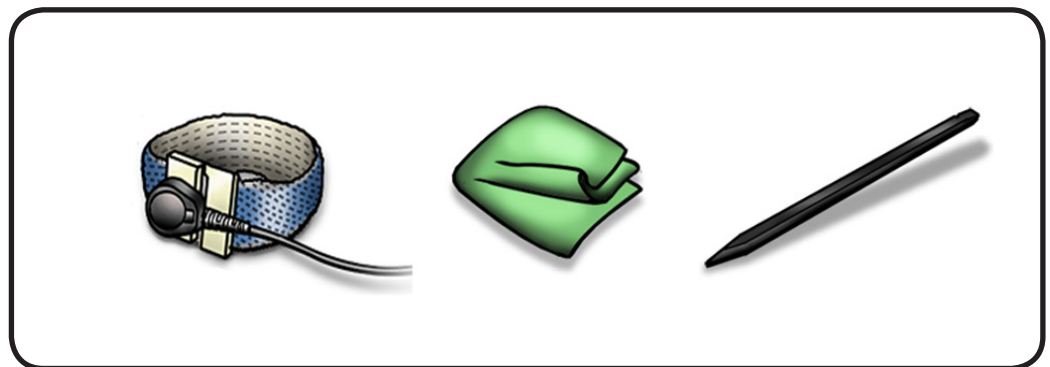
## Removal

Use black stick to pry microphone cable from speaker assembly.
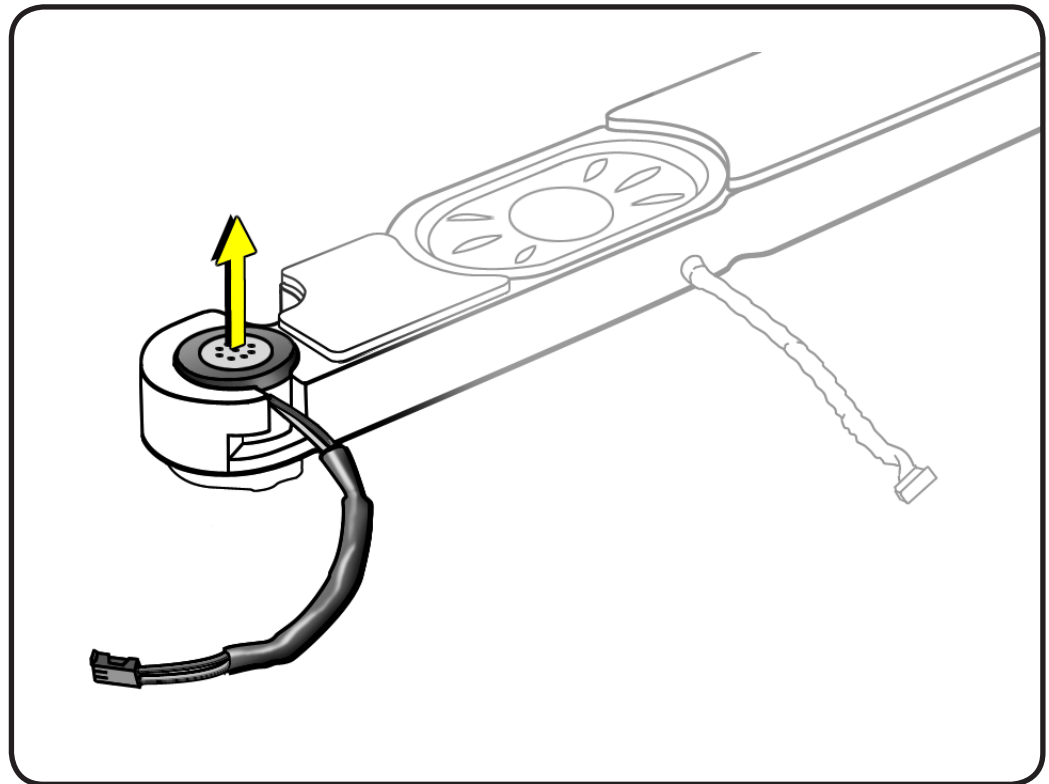
# MagSafe Board

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- Right fan
- Logic board
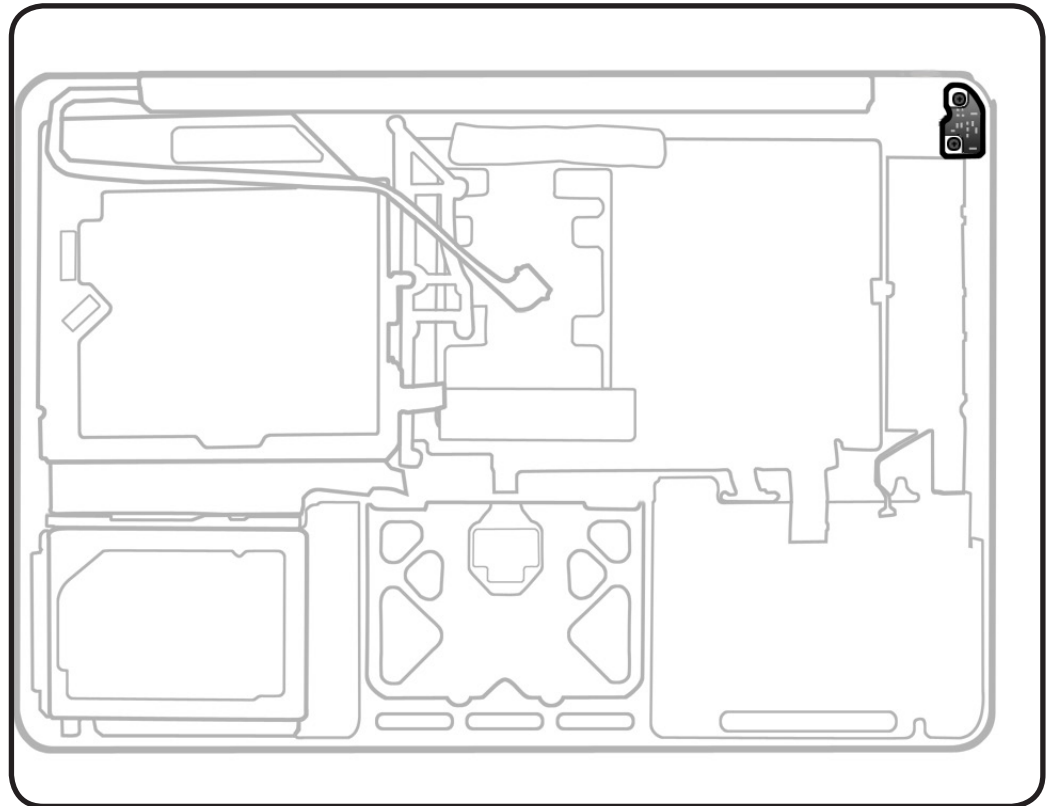


## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Torx T6 screwdriver
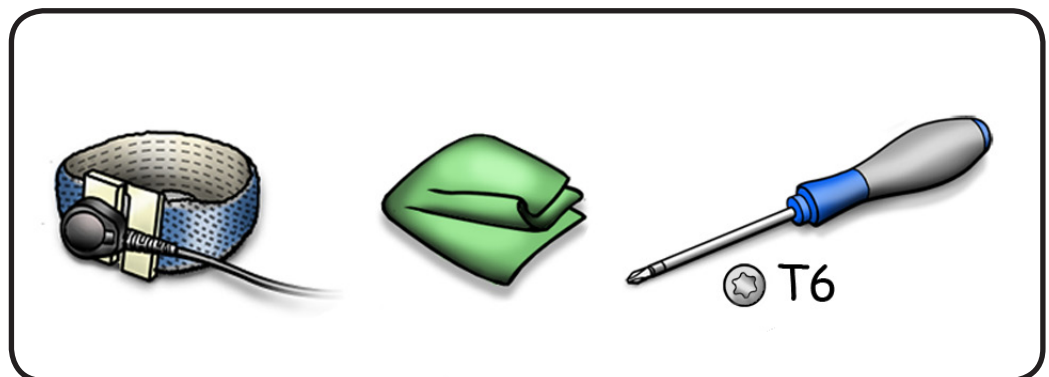
## Removal

**1** Remove 2 (7.5 mm) 922-9042 Torx T6 screws.

**2** Remove MagSafe board from case.
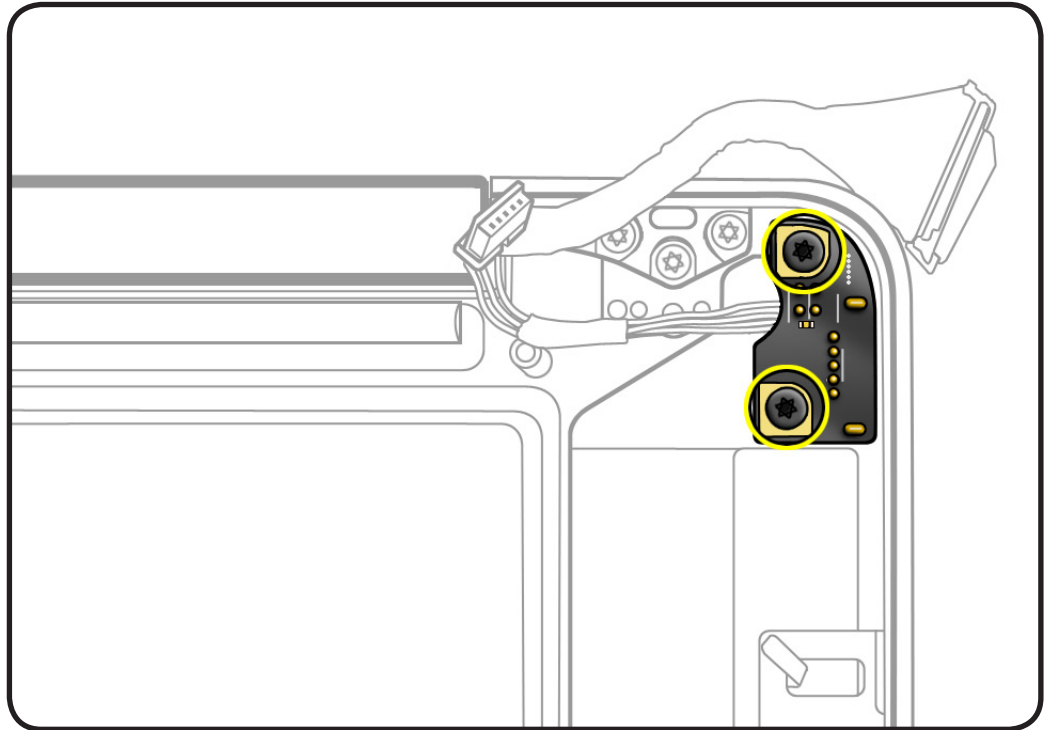


**Replacement Note:** After installing the MagSafe screws, check the port connection by plugging in a disconnected power adapter cable. If the MagSafe port is off center, the cable will not plug in securely, and you must reinstall the MagSafe board.
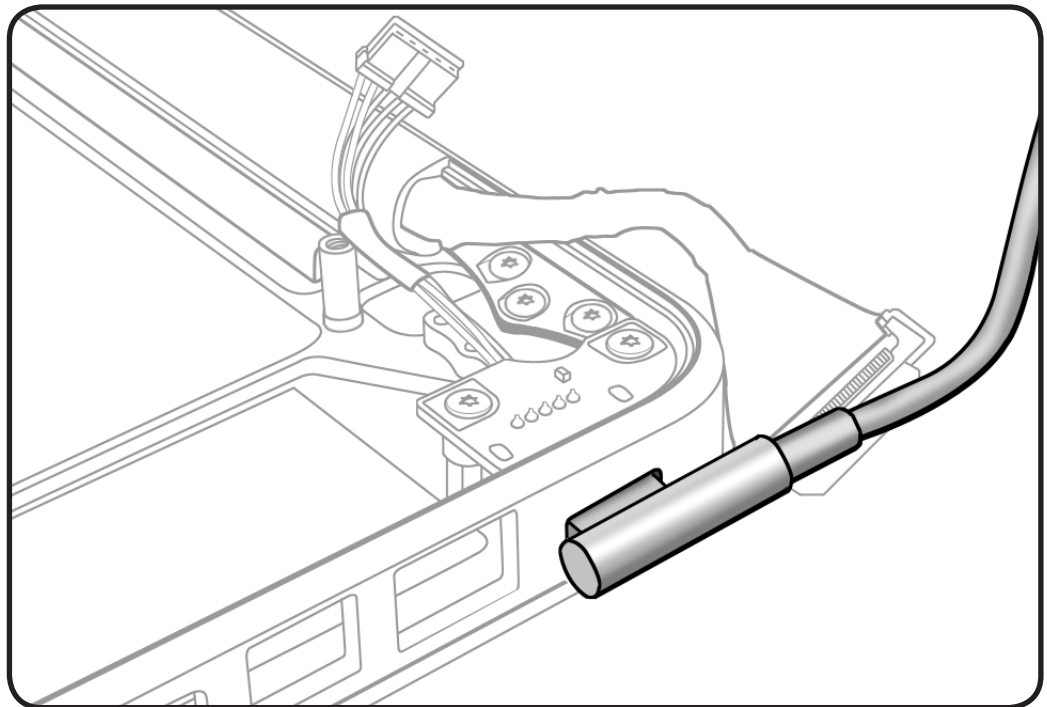
# Battery Indicator Light Cable and Board

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- Right fan
- Logic board
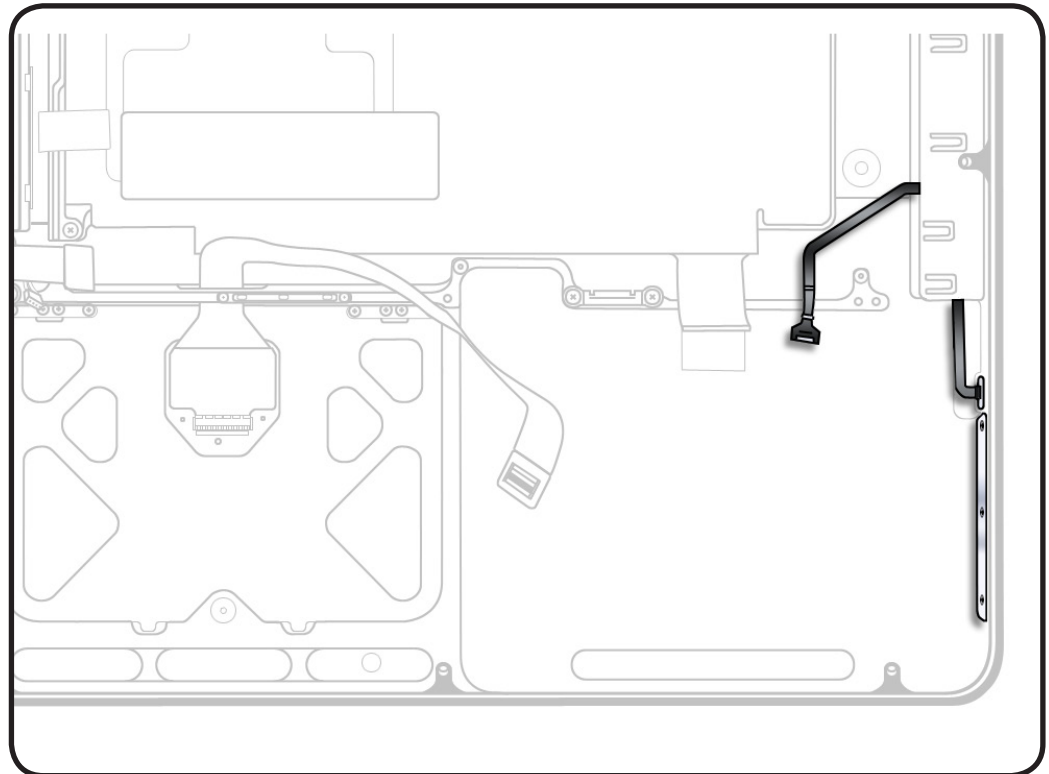


## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #000 screwdriver
- Black stick



⊕ # 000

## Removal

**1** Place tape over battery button on outside of top case to prevent losing the button.

**2** Remove 3 (1.8 mm) 922-9069 screws.
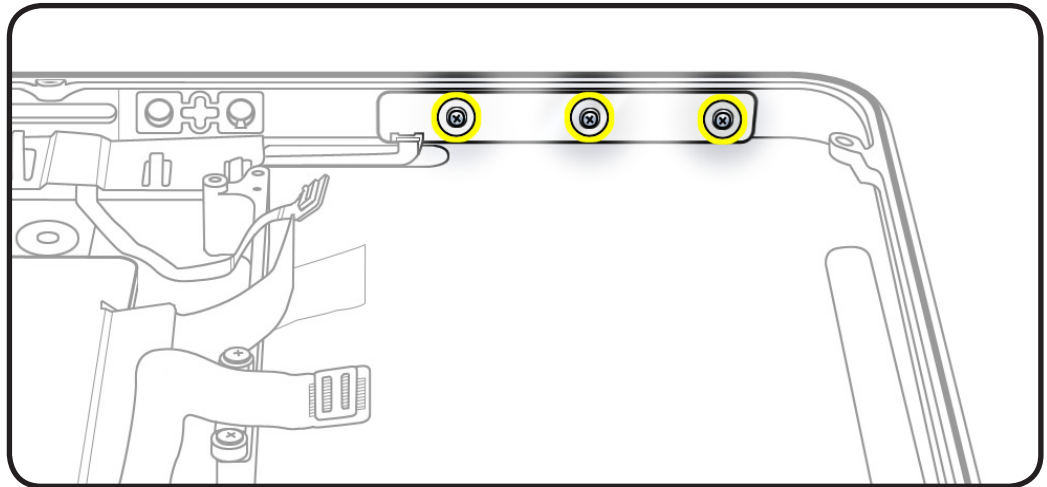
**3** Using a black stick, pry back the EMI spring shield to access the BIL cable.

**Note**: If replacing the BIL board, discard the bent EMI spring shield. Install new shield that came with BIL assembly.

**4** Peel the cable off the top housing.
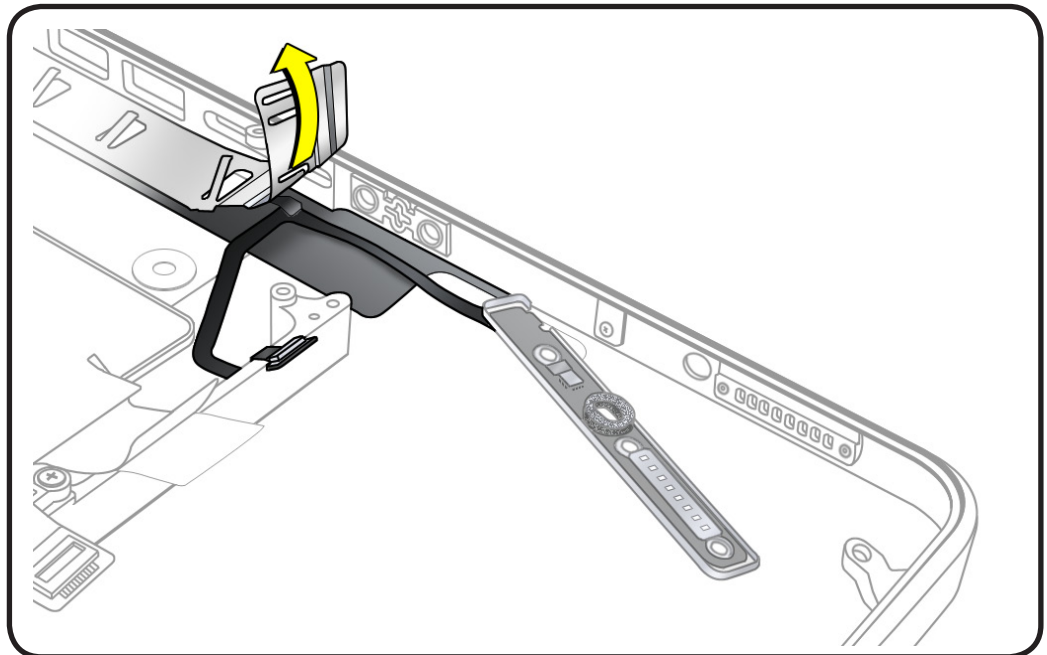
**Replacement Note:**
Before replacing the BIL board, check that:
- the long rubber gasket is assembled on top of the LEDs
- the BIL button is installed in the top case
- the EMI spring shield is installed

# Center Bracket

## First Steps

Do the following:
- Remove bottom case
- Remove battery
- Remove AirPort/
  Bluetooth flex cable
- Rotate AirPort/
  Bluetooth card holder
  back from bottom case
- Remove optical drive
- Remove right fan
- Remove logic board
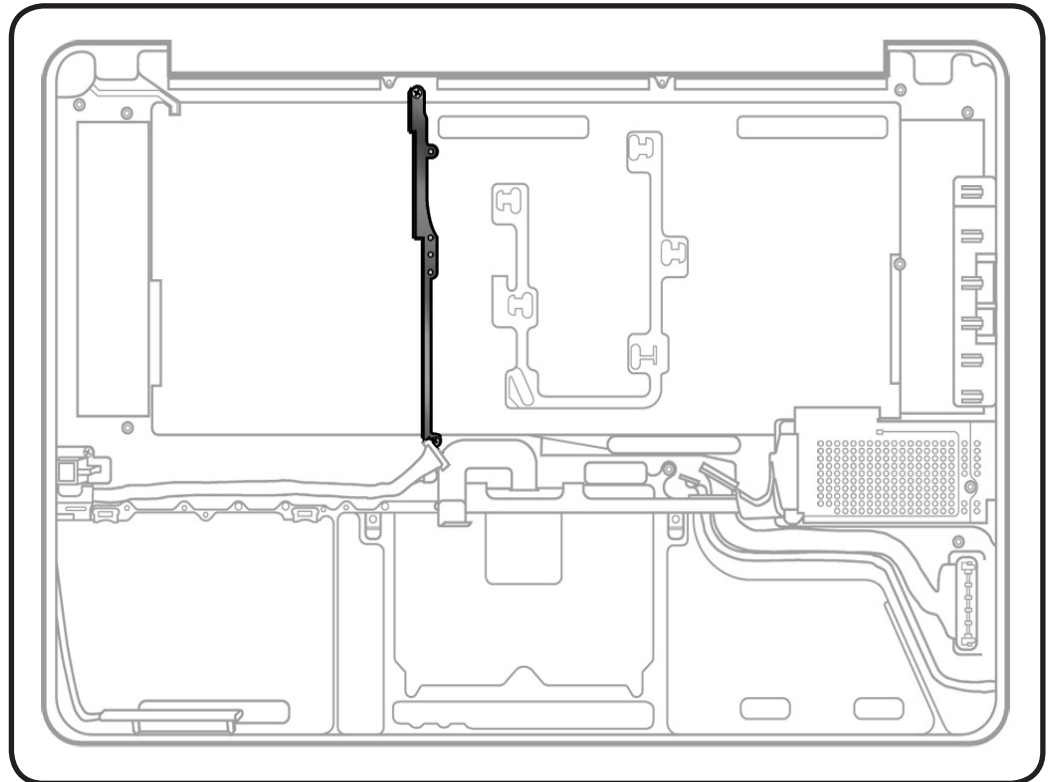
## Tools

- Clean, soft, lint-free
  cloth
- ESD wrist strap and
  mat
- Magnetized Phillips
  #00 screwdriver
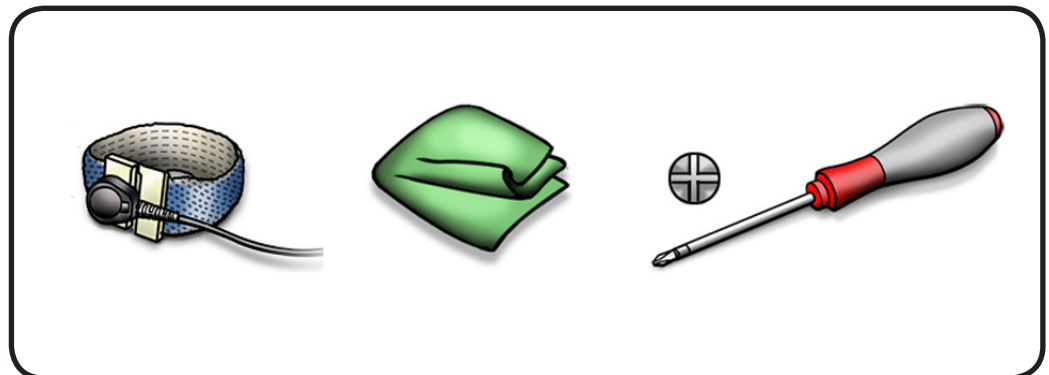
## Removal

**1** Remove 2 screws:

- 1 (9.5 mm) 922-8648
- 1 (6.2 mm) 922-8725

**2** Remove center bracket.
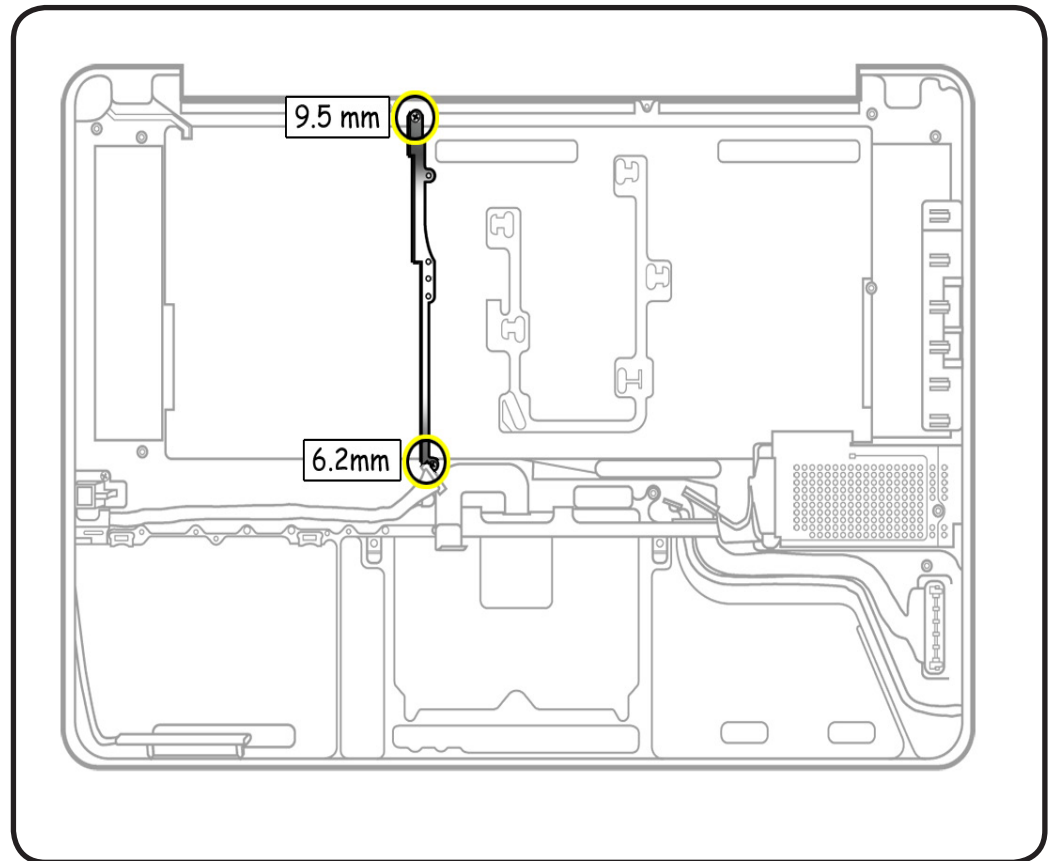
# Top Case

## First Steps

Remove:
- Bottom case
- Battery
- AirPort/Bluetooth flex cable
- AirPort/Bluetooth card holder
- Hard drive
- Hard drive/IR/sleep indicator cable
- Memory
- Camera cable guide
- LVDS cable guide
- Optical drive
- Right speaker
- Right fan
- Logic board
- Display assembly
- MagSafe board
- Center bracket
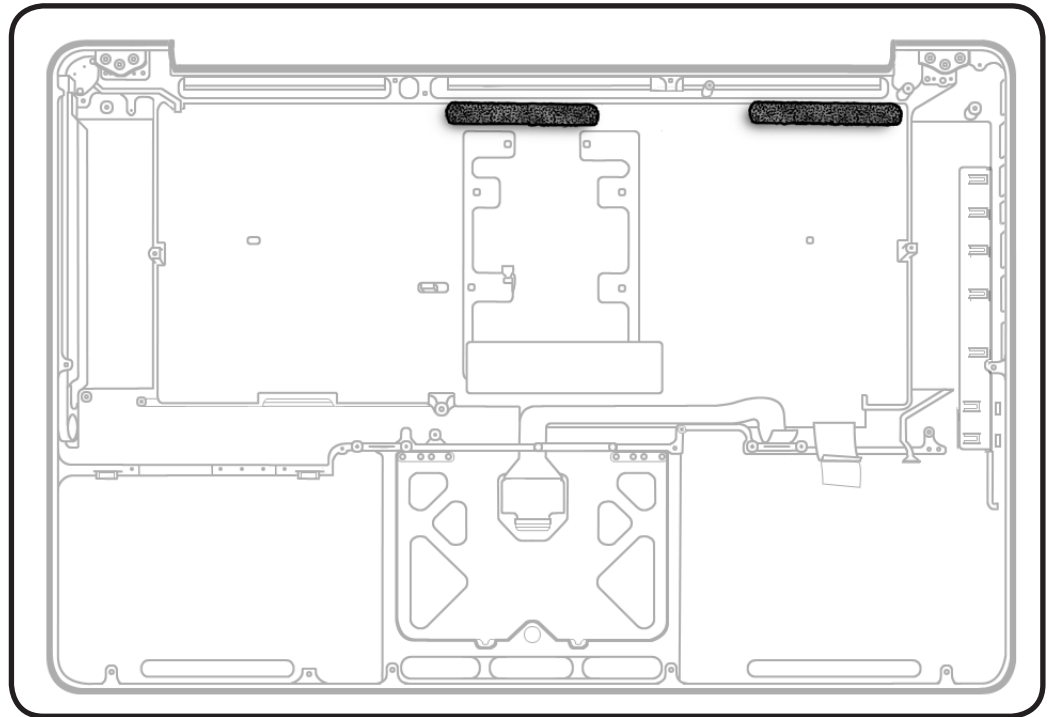
## Tools

- Clean, soft, lint-free cloth
- ESD wrist strap
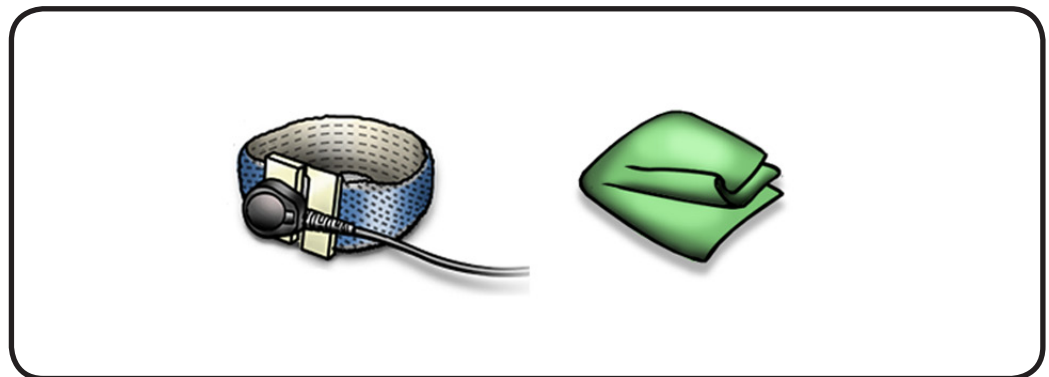
# Removal

With the first steps completed, the top case with keyboard is the remaining part.
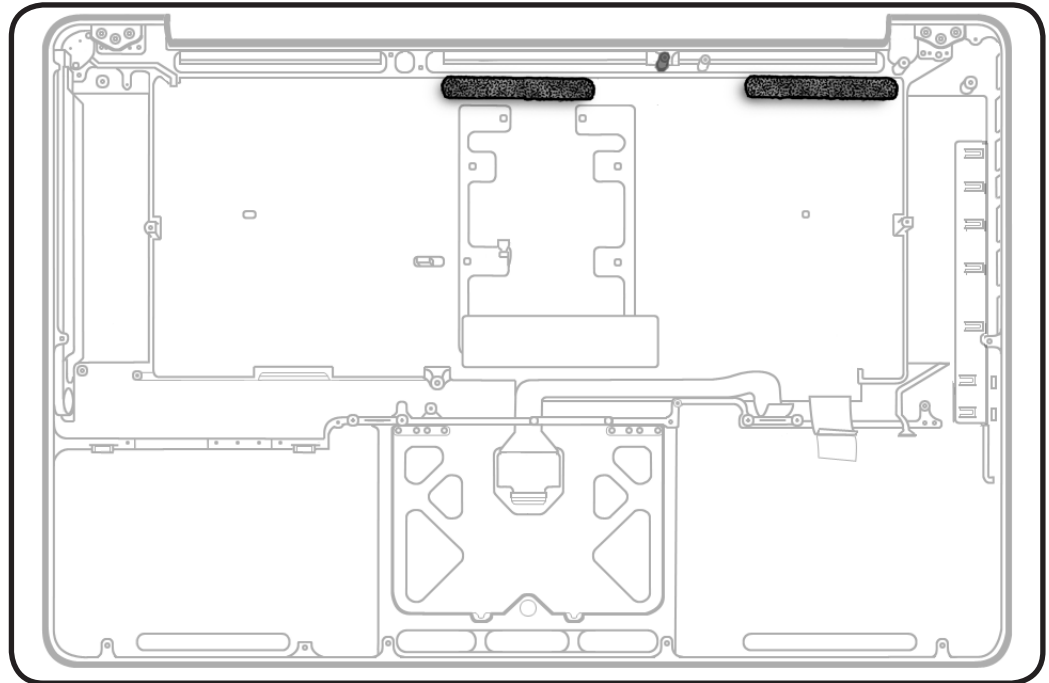
**Replacement Note:** Three small foam pads are included with the new top case. Before reassembling the case, install the two narrow pads as illustrated. Discard the third pad.

Install the longer foam pad on the left, as illustrated.

2mm Longer
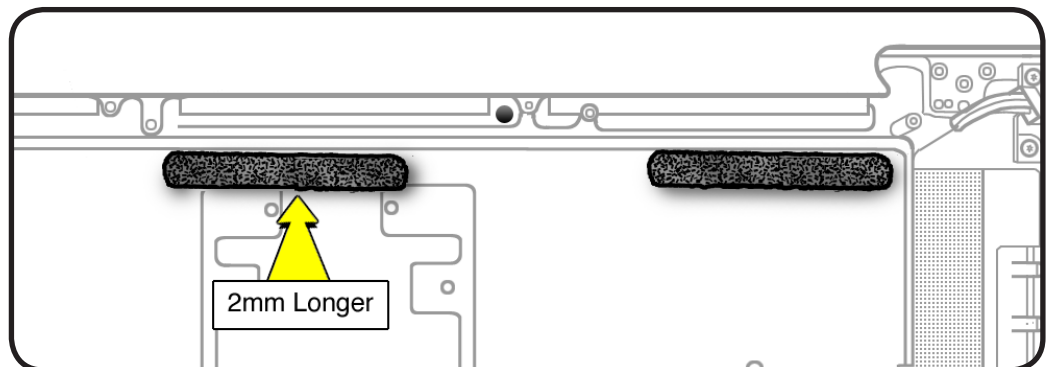
**Replacement Note:** If the new top case does not include a black plastic standoff installed above the foam pads as illustrated, transfer the standoff from the original case to the new case.
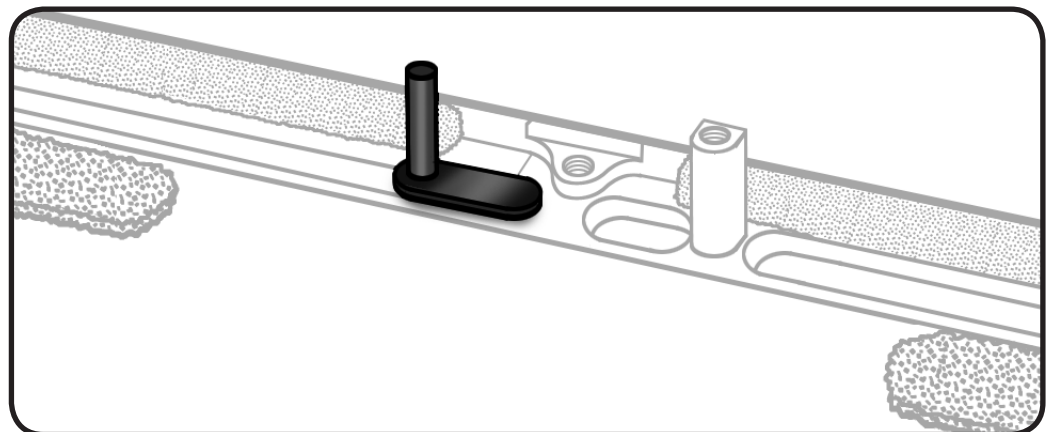
**Replacement Note:**
Transfer the following 2 parts to the new top case before transferring the logic board:

- Center bracket
- MagSafe board

**Apple Technician Guide**

**Views**

**MacBook Pro (15-inch, Mid 2010)**

# Exploded Views

## Main Assembly 1

Logic Board
661-5566, 2.4 GHz
661-5479, 2.53 GHz
661-5480, 2.66 GHz

Right Speaker/Subwoofer
922-9308

Left Speaker
922-9309

Heatsink
922-9311

Microphone
922-9031

Center Bracket
922-9315

MagSafe Board
922-9307

Camera Cable Guide
922-9318

Battery Indicator Light (BIL)
922-9033

Battery
661-5476, US/Canada
FE661-5476, Far East
J661-5476, Japan
ZM661-5476, Multilingual

LVDS Cable Guide
922-9317

Top Case with Keyboard
and Trackpad
(includes Bluetooth Antenna Bd.)
661-5481, US
Note: Regional topcases
have the same base part
number, but they include
a language code prefix
(e.g., F661-5481 for French)

Trackpad
922-9306

## Main Assembly 2

Bottom Case
922-9316

Flex Cable, AirPort/Bluetooth
922-9296

AirPort/Bluetooth Card
661-5515, US/Canada/Latin America
J661-5515, Japanese
KH661-5515, Korean
PA661-5515, PAL Pacific
Z661-5515, Euro
ZM661-5515, Rest of World

Card Holder, Air Port/Bluetooth
922-9325

Right Fan
922-8702

Left Fan
922-8703

Optical Drive, Super
661-5467

Flex Cable, Optical Drive
922-9032

Memory
661-5475, 2 GB
661-5482, 4 GB

Bracket, Rear Hard Drive
922-9087

Hard Drive
661-5461, 5400, 320 GB
661-5462, 5400, 500 GB
661-5463, 7200, 500 GB
661-5464, SSD, 128 GB
661-5465, SSD, 256 GB
661-5466, SSD, 512 GB

Cable, Hard Drive/IR/
Sleep Indicator
922-9314

Flex Protector, Keyboard Cable
922-9045

## Main Assembly 3

Display Clutch Cover ———————
922-9324

——————— Display Assembly
(includes AirPort Antenna Bd.)
661-5483, Glossy
661-5477, Hi-Res Glossy
661-5478, Hi-Res Anti-Glare
(without glass)

# External Views

**Front View**

## Port View
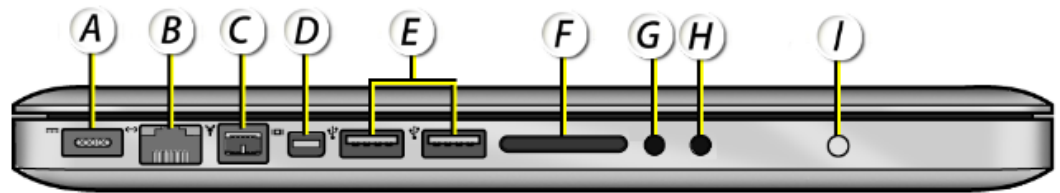
A - MagSafe Power

B - Gigabit Ethernet

C - FW 800

D - Mini DisplayPort

E - USB 2.0

F - SD Card Slot

G - Audio In

H - Audio Out

I - Battery Indicator Light Button

# Screw Locations

**Note:** All screws require a Phillips #00 screwdriver, except where noted.

## Bottom Case

**3** (14 mm) **922-8985**

**7** (3.3 mm) **922-9334**

| | |
|---|---|
| 3.3 mm | 14 mm | 14 mm | 14 mm |
| 3.3 mm | | | 3.3 mm |
| 3.3 mm | 3.3 mm | 3.3 mm | 3.3 mm |
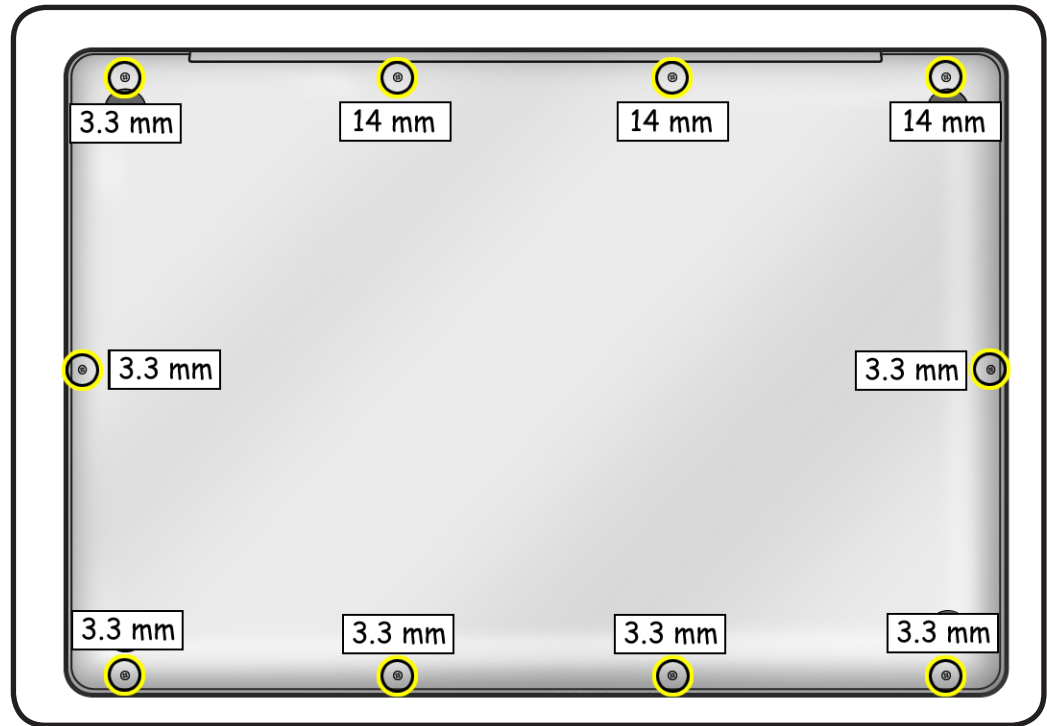
## Battery

**3** (5.5 mm) **922-9321**
trilobe security screws
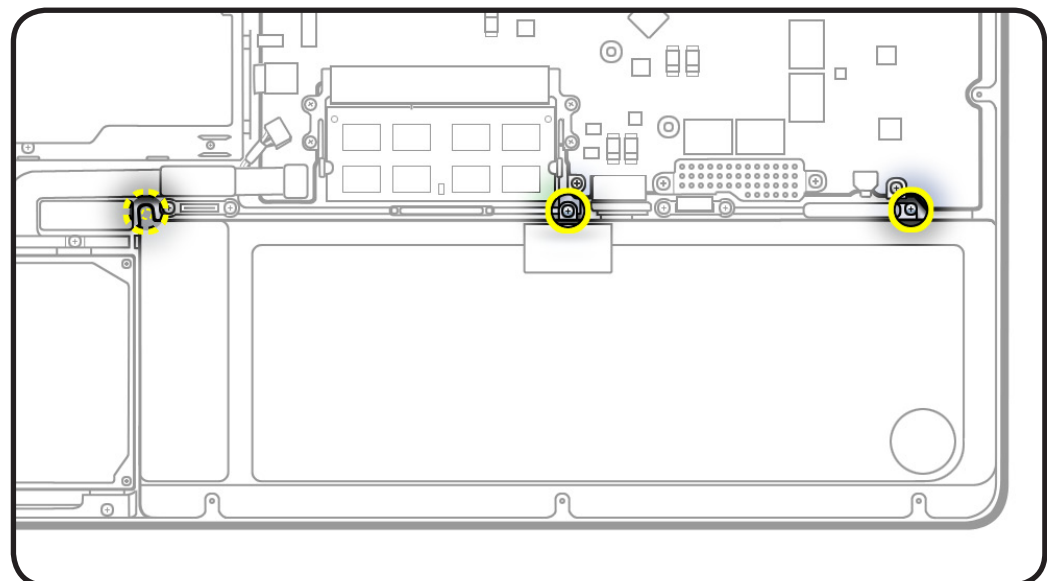
## Hard Drive/IR/ Sleep Indicator Cable

**2** (2.6 mm) **922-9036** on cable

**2** (8.9 mm) **922-9105** on front bracket
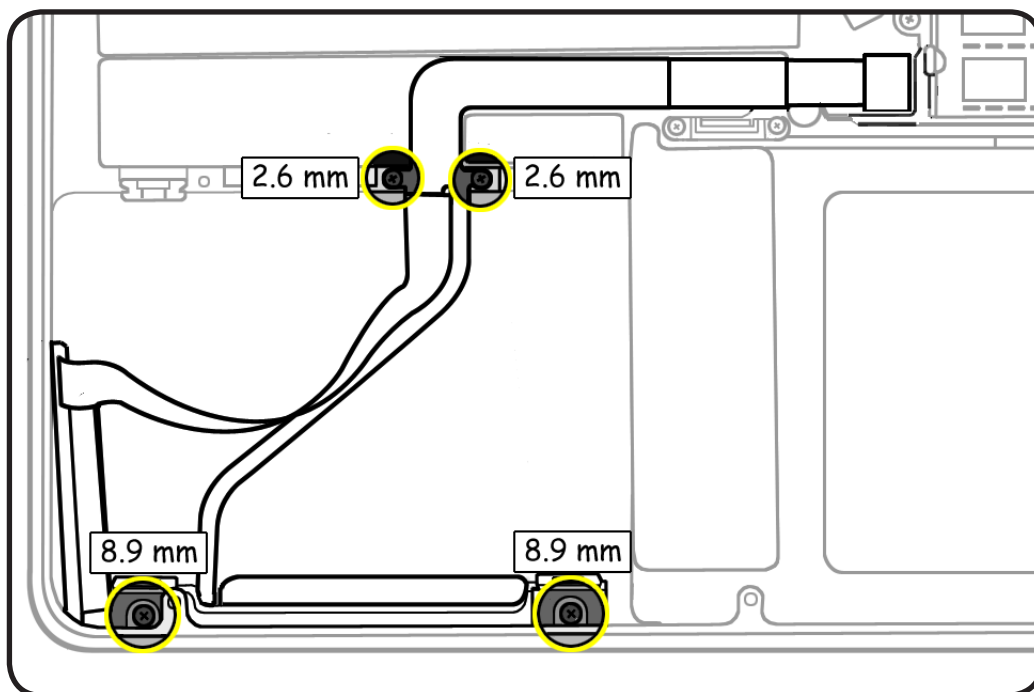


## Optical Drive

**3** (3 mm) **922-8719**
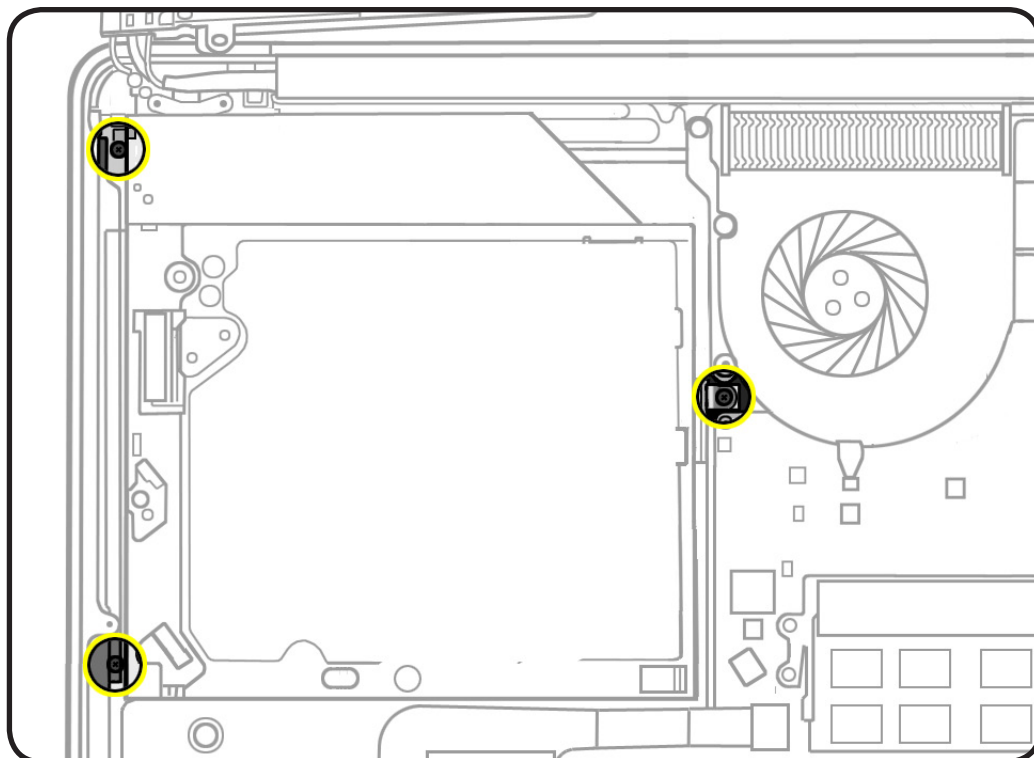
## AirPort/Bluetooth Card Holder

**1** (8.1 mm) **922-9107**

**1** (3.5 mm) **922-8974**
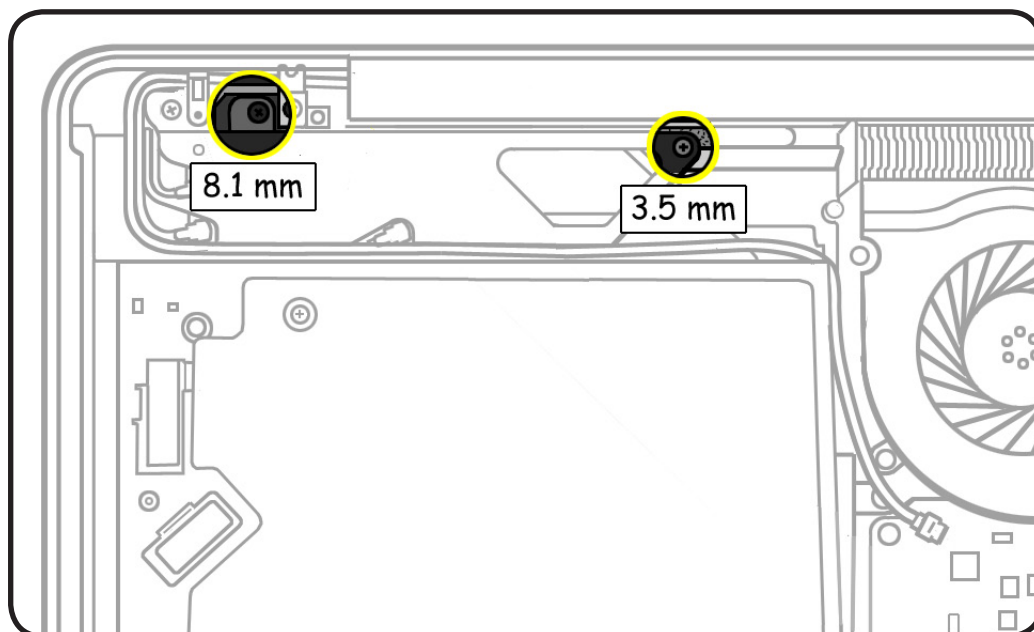


## AirPort/Bluetooth Card

**2** (2.5 mm) 922-9200
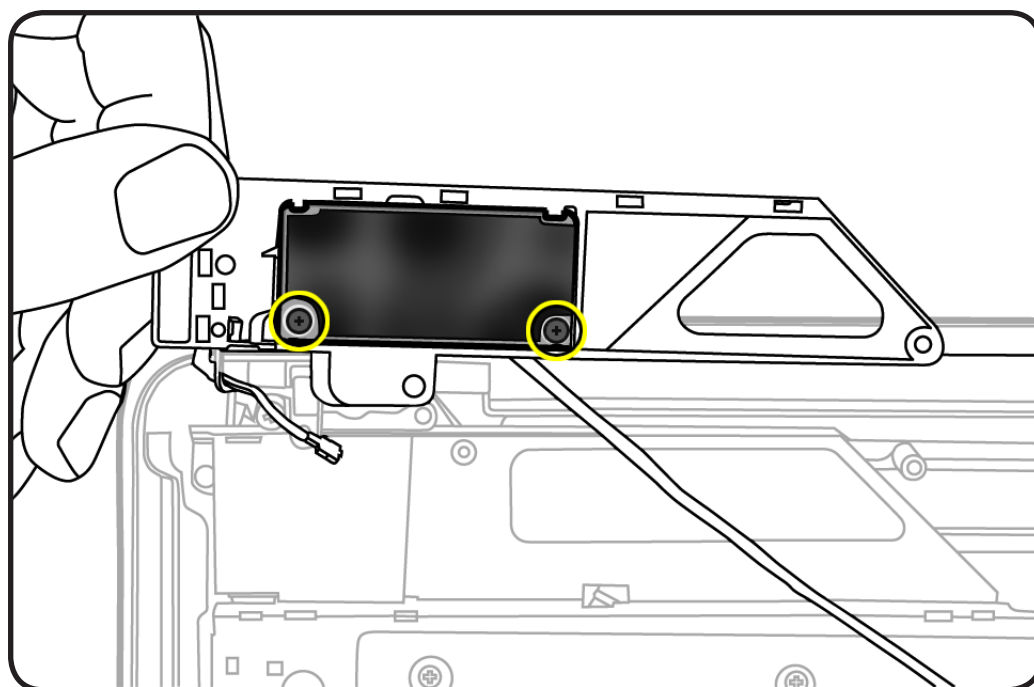
## Camera Cable Guide

**1** (8.1 mm) **922-9107**
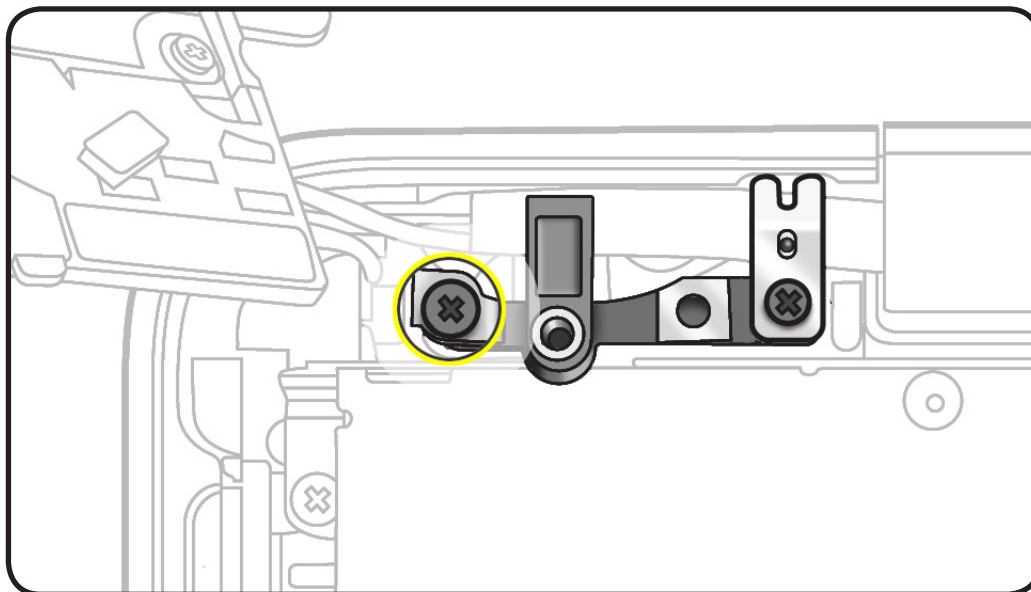


## LVDS Cable Guide

**1** (6.5 mm) **922-8645**
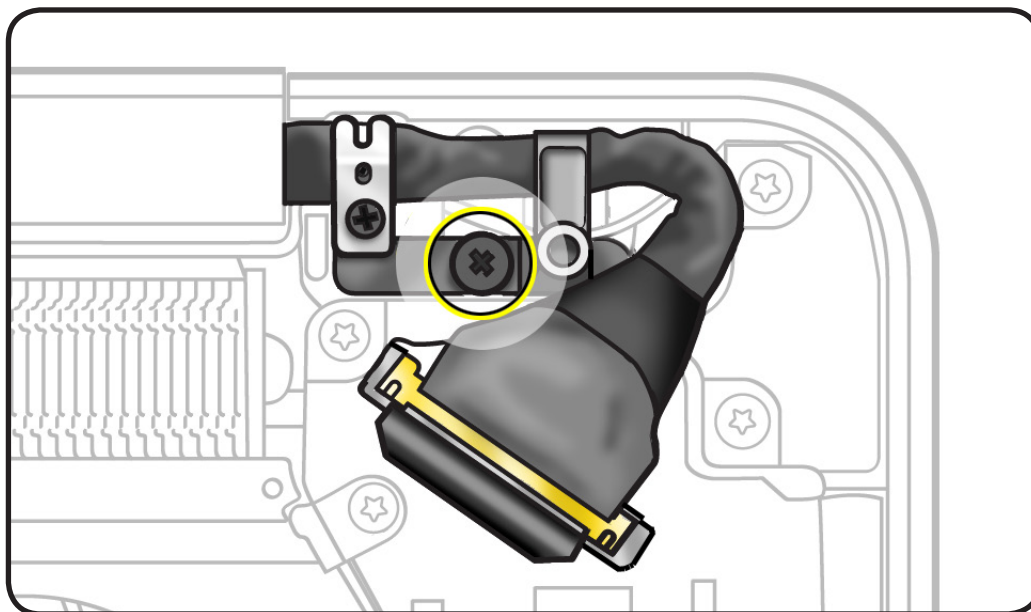
## Display Assembly

**6** (5.3 mm) **922-8646**
Torx T6 screws
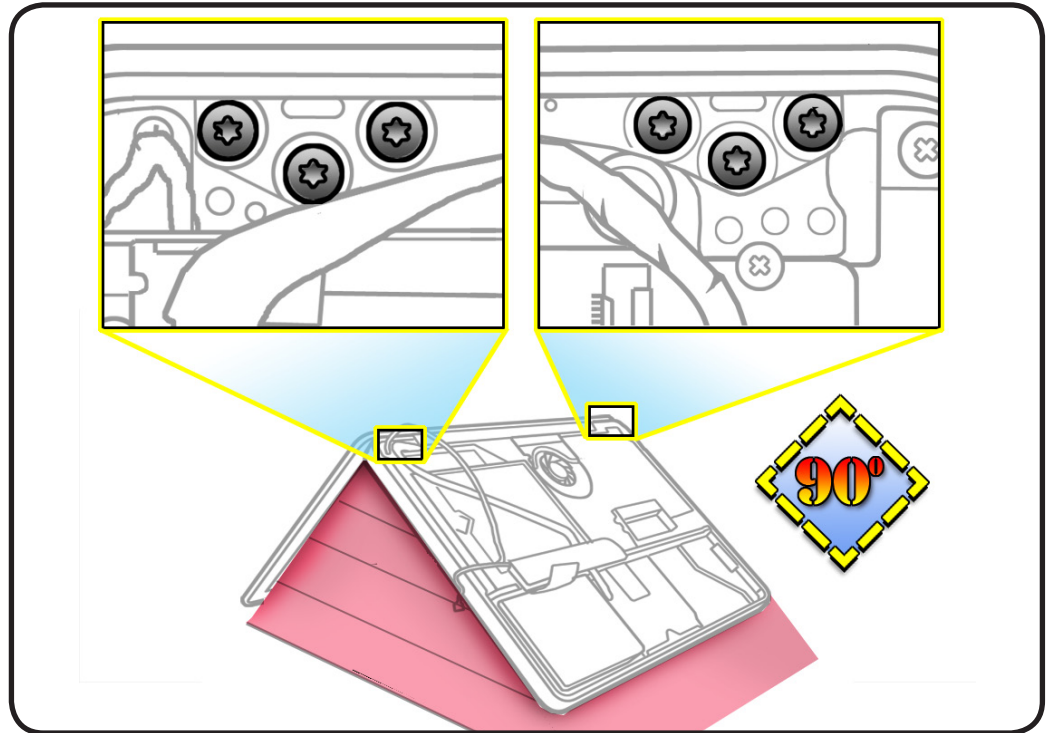


## Right Speaker/ Subwoofer

**2** (3 mm) **922-9095**

**1** (2.4 mm) **922-9094**

**2** (12.1 mm) **922-9466**
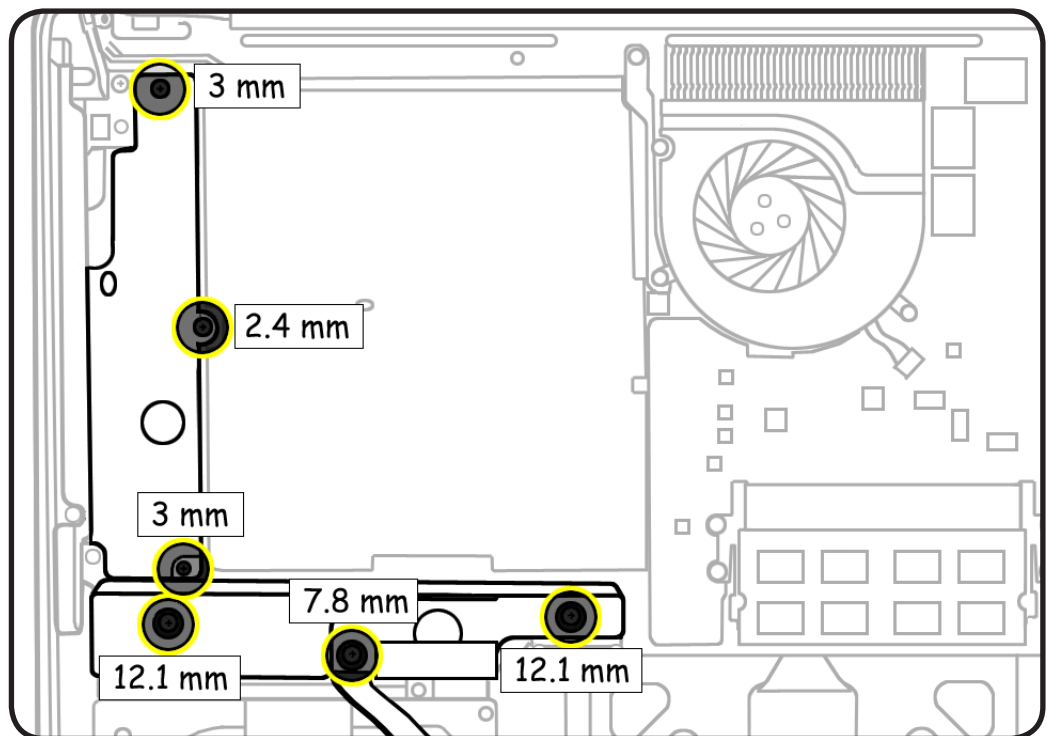
**1** (7.8 mm) **922-9467**

## Right/Left Fans

**6** (3.0 mm) **922-9108**
Torx T6 screws
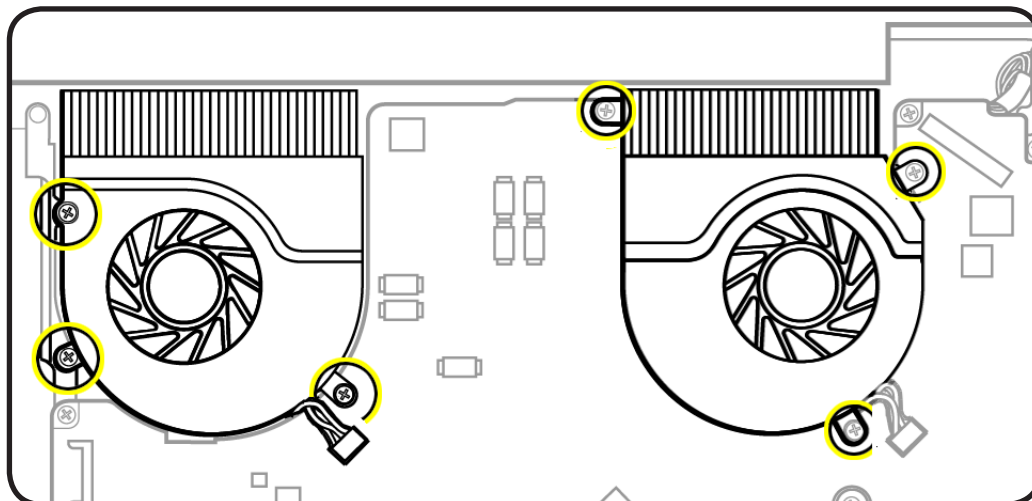


## Logic Board

**2** (1.2 mm) **922-9037**
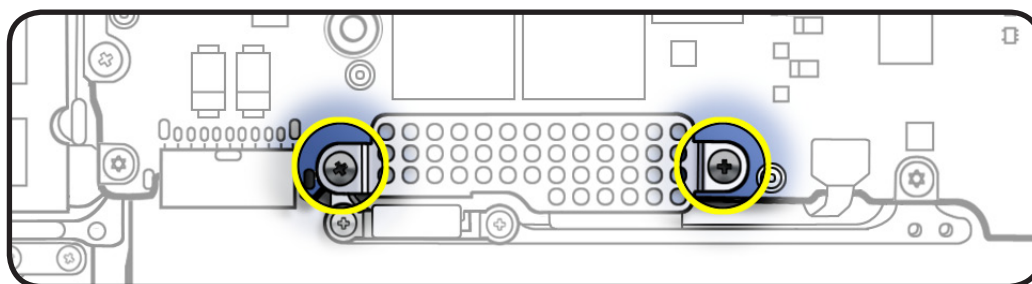


**7** (3.0 mm) **922-9108**
Torx T6 screws
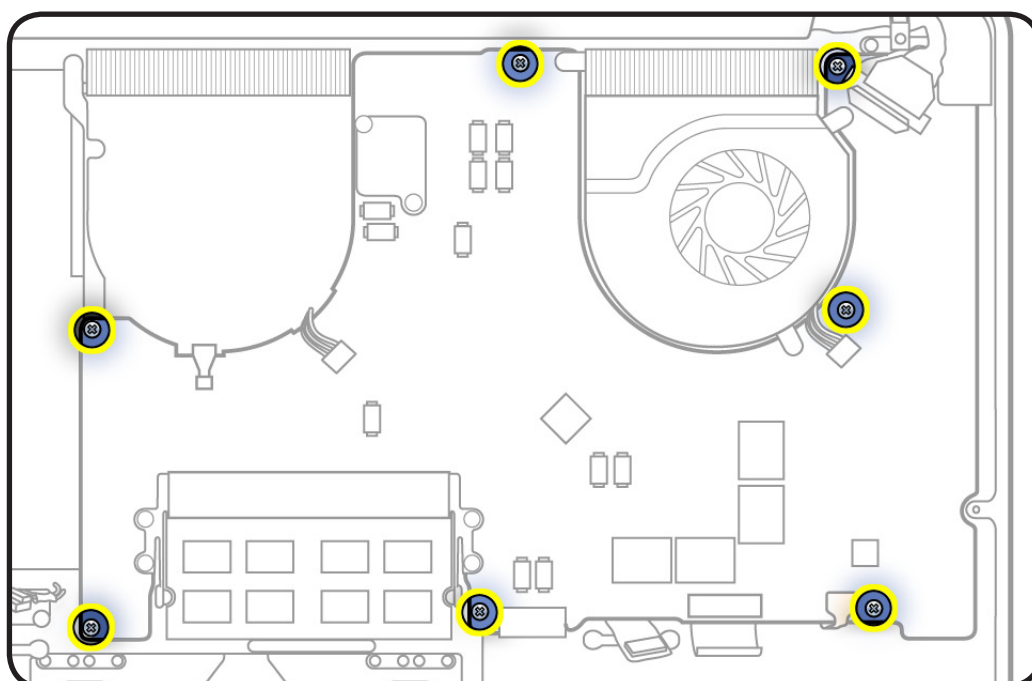
## Heatsink

**6** (8 mm) **922-9328**
Torx T6 screws
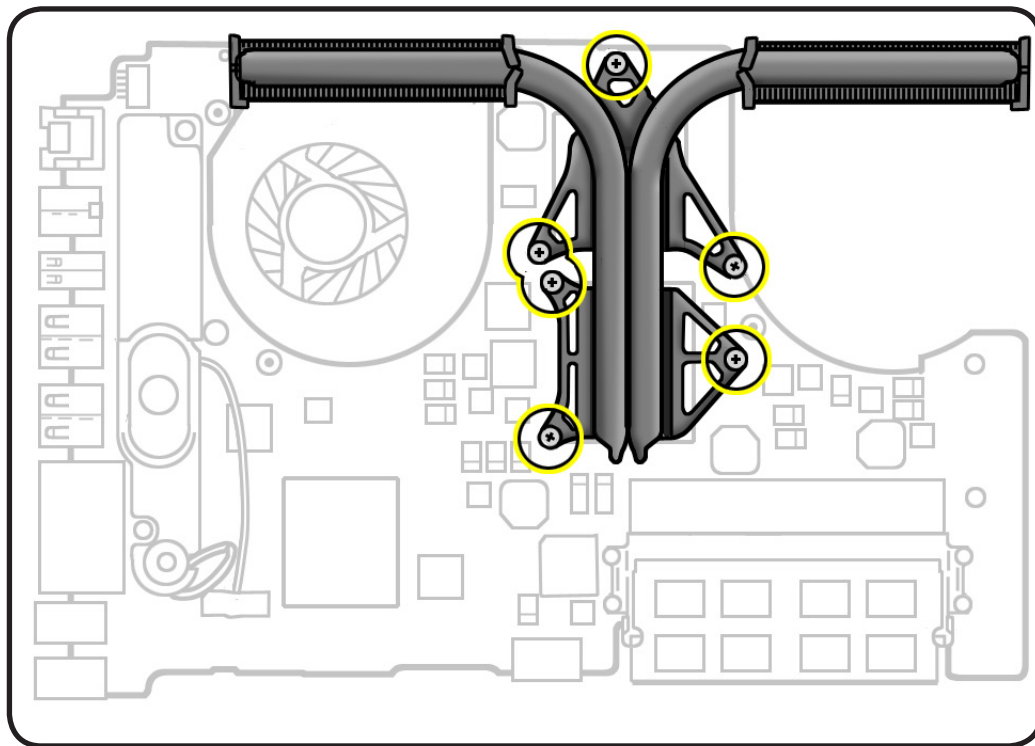


## Left Speaker

**2** (4.5 mm) **922-8744**
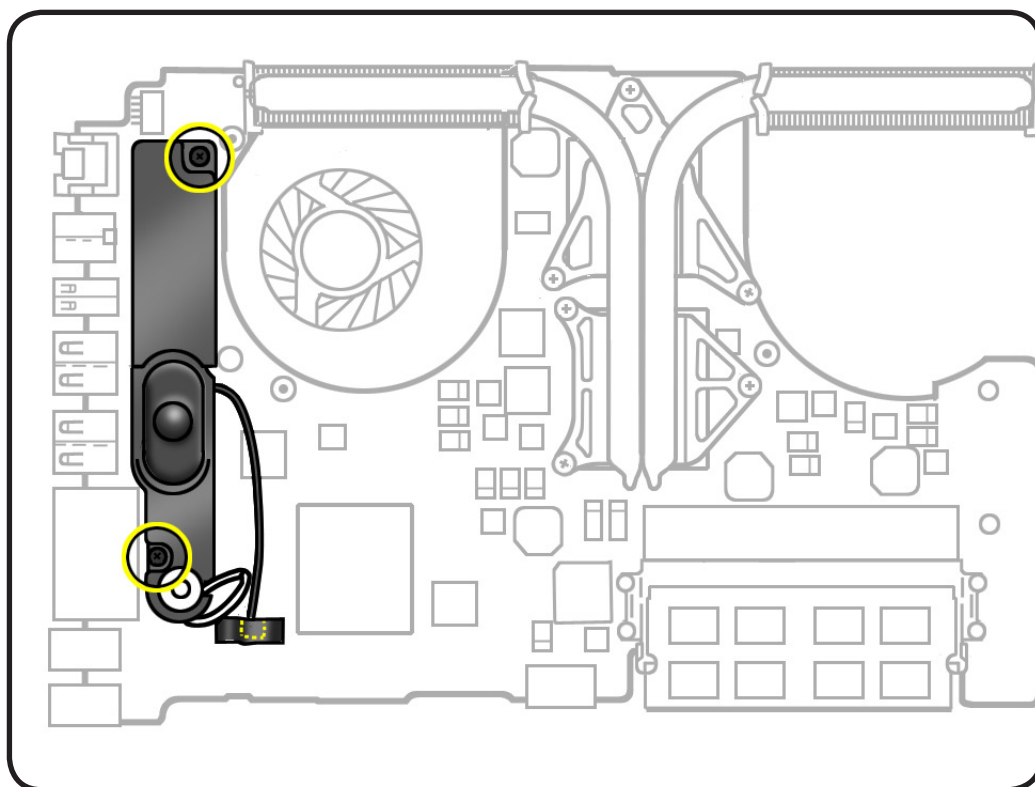
## Trackpad

**4** (0.9 mm) **922-9256** (silver-colored)

**4** (1.1 mm) **922-9461** (black)

**1** set screw (available only as part of trackpad assembly **922-9306**)
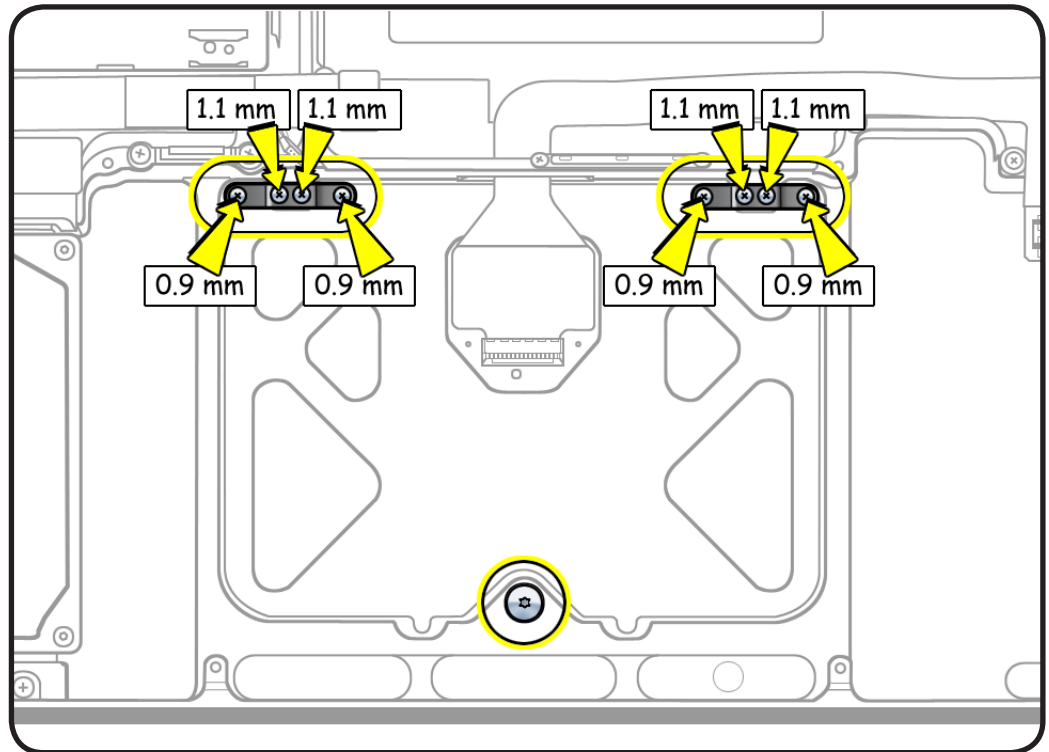


## MagSafe Board

**2** (7.5 mm) **922-9042** Torx T6 screws
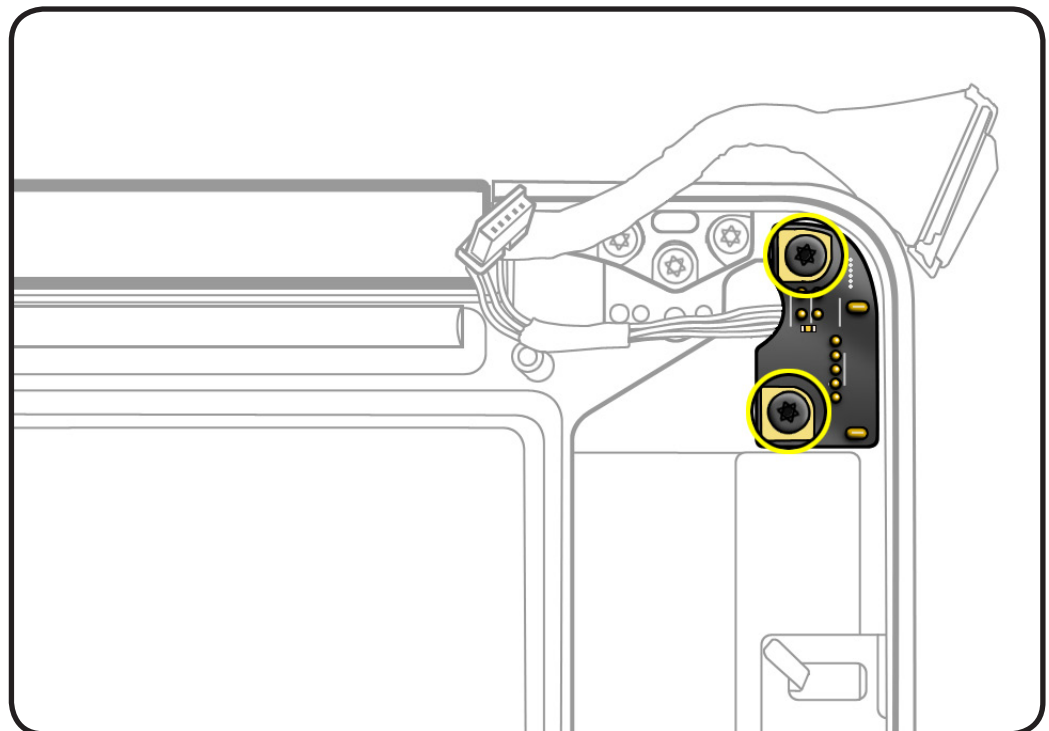
## Battery Indicator Light Board

**3** (1.8 mm) **922-9069**
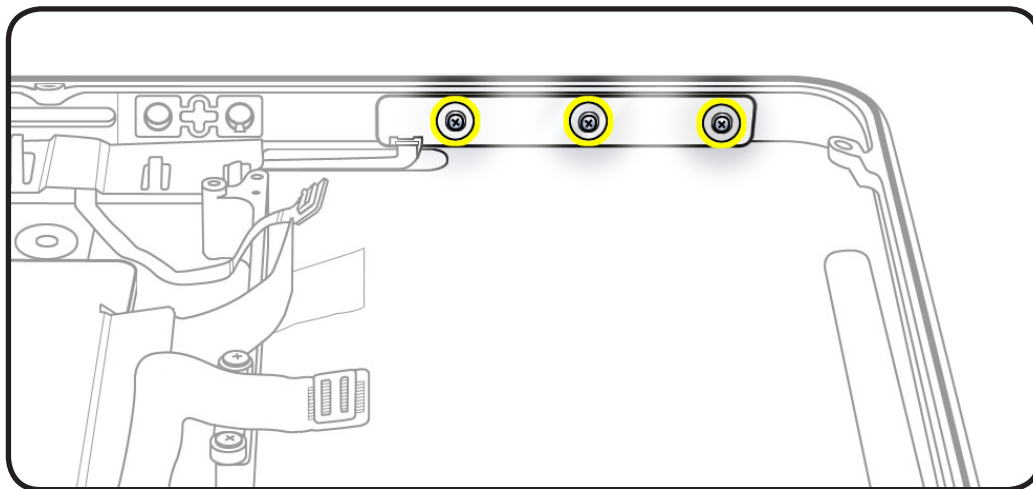


## Center Bracket

**1** (9.5 mm) **922-8648**

**1** (6.2 mm) **922-8725**

9.5 mm

6.2mm

# Screw Chart

| 922-8645<br>Phillips #00<br><br>LVDS cable guide (1) | 922-8646<br>Torx 6<br><br>Display assembly hinge to top case (6) | 922-8648<br>Phillips #00<br><br>Center bracket to top case (1) |
|---|---|---|
| 922-8719<br>Phillips #00<br><br>Optical drive (3) | 922-8725<br>Phillips #00<br><br>Center bracket to top case (1) | 922-8744<br>Phillips #00<br><br>Left speaker to logic board (2) |
| 922-8974<br>Phillips #00<br><br>AirPort/Bluetooth card holder (1) | 922-8985<br>Phillips #00<br><br>Bottom case to top case (3) | 922-9036<br>Phillips #00<br><br>HD/IR/sleep cable to top of right. speaker (2) |
| 922-9037<br>Phillips #00<br><br>Logic board cable cover (2) | 922-9042<br>Torx 6<br><br>MagSafe board (2) | 922-9069<br>Phillips #00<br><br>Battery indicator light board (3) |

| 922-9094<br>Phillips #00<br><br>Right speaker (1) | 922-9095<br>Phillips #00<br><br>Right speaker (2) | 922-9105<br>Phillips #00<br><br>HD/IR/sleep cable on front bracket (2) |
| --- | --- | --- |
| 922-9107<br>Phillips #00<br><br>AirPort/Bluetooth card holder (1), camera cable guide (1) | 922-9108<br>Torx 6<br><br>Logic board (7), right fan (3), left fan (3) | 922-9200<br>Phillips #00<br><br>AirPort/Bluetooth card (2) |
| 922-9256<br>Phillips #00<br><br>Trackpad, silver-colored (4) | 922-9321<br>Tri-lobe security<br><br>Battery (3) | 922-9328<br>Torx 6<br><br>Heatsink (6) |
| 922-9334<br>Phillips #00<br><br>Bottom case to top case (7) | 922-9461<br>Phillips #00<br><br>Trackpad, black (4) | 922-9466<br>Phillips #00<br><br>Right speaker (2) |
| 922-9467<br>Phillips #00<br><br>Right speaker (1) | | |