



Apple Technician Guide



MacBook Pro (15-inch, Mid 2010)

2010-08-05



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Apple
1 Infinite Loop
Cupertino, CA 95014-2084
USA
+ 1 408 996 1010
www.apple.com

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MacBook Pro (15-inch, Mid 2010)

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About This Guide

MacBook Pro (15-inch, Mid 2010)



Manual Updates

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 first 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



Basics

MacBook Pro (15-inch, Mid 2010)



Overview



Specifications

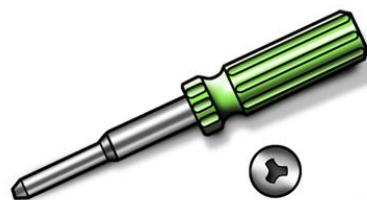
The MacBook Pro (15-inch, Mid 2010) computer features a 2.4, 2.53, or 2.66 GHz Intel dual core processor. For full technical specifications, refer to AppleCare Tech Specs:
<http://support.apple.com/specs/>



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:

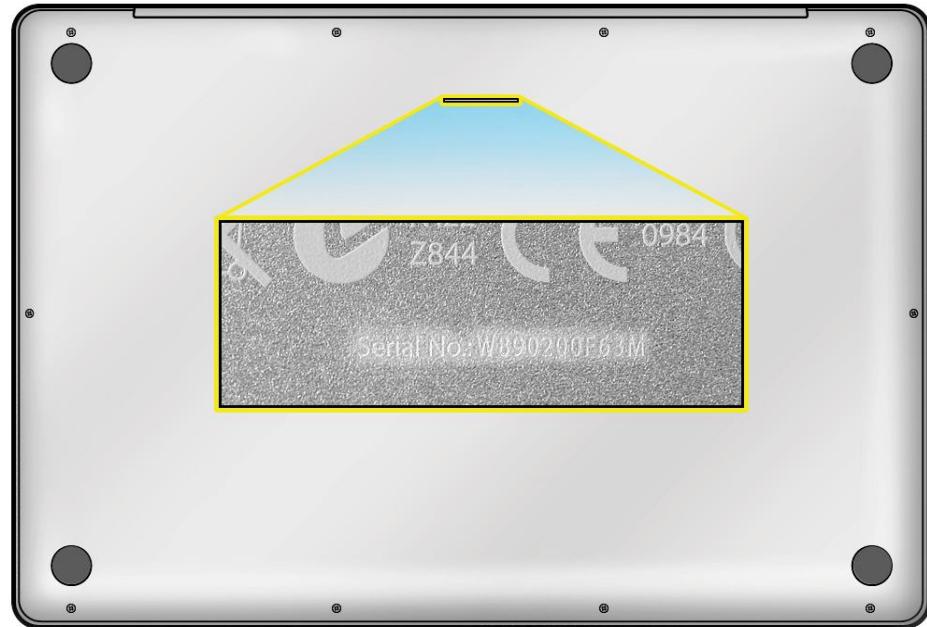
- Apple Service Diagnostic (ASD), version 3S136
- Apple Hardware Test, version 3A186



Serial Number Location

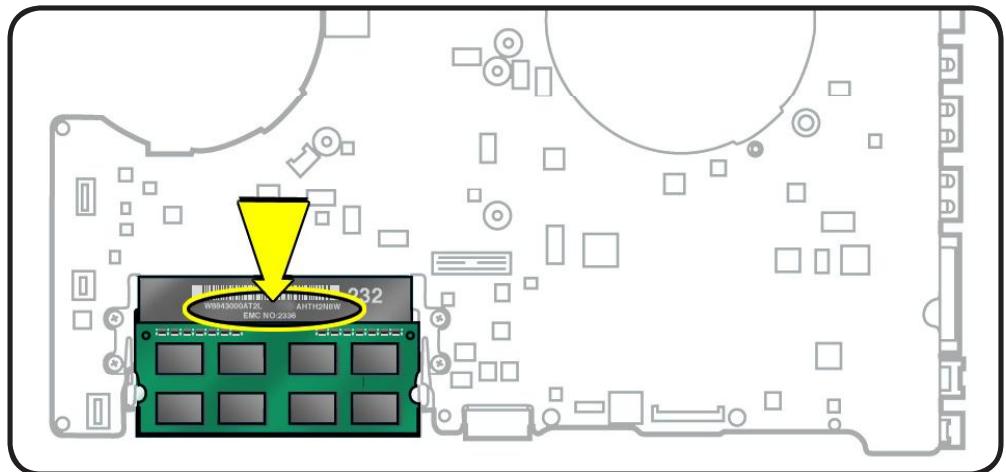
System Serial Number on Bottom Case

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.

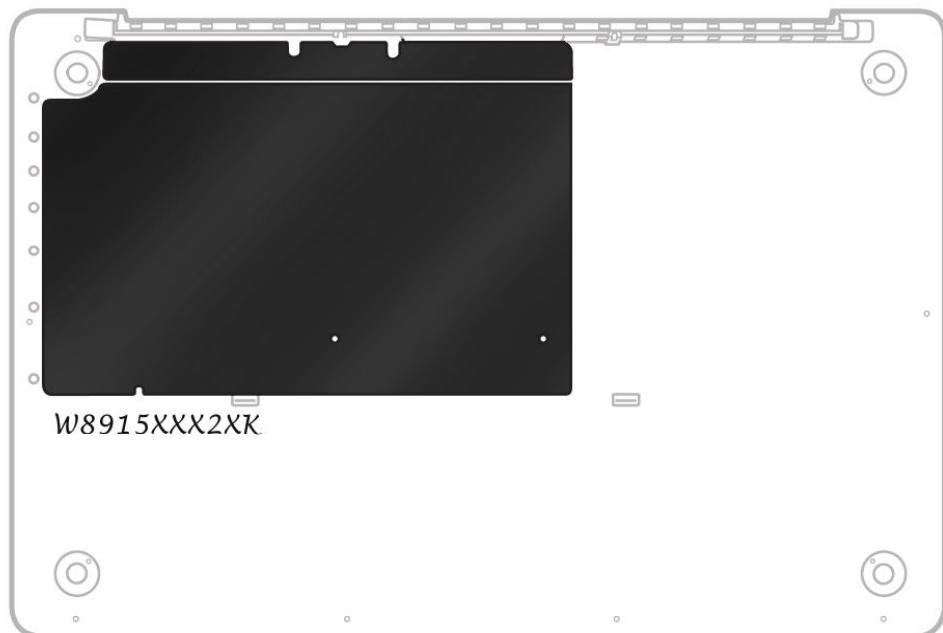




Transferring the System Serial Number

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."





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.

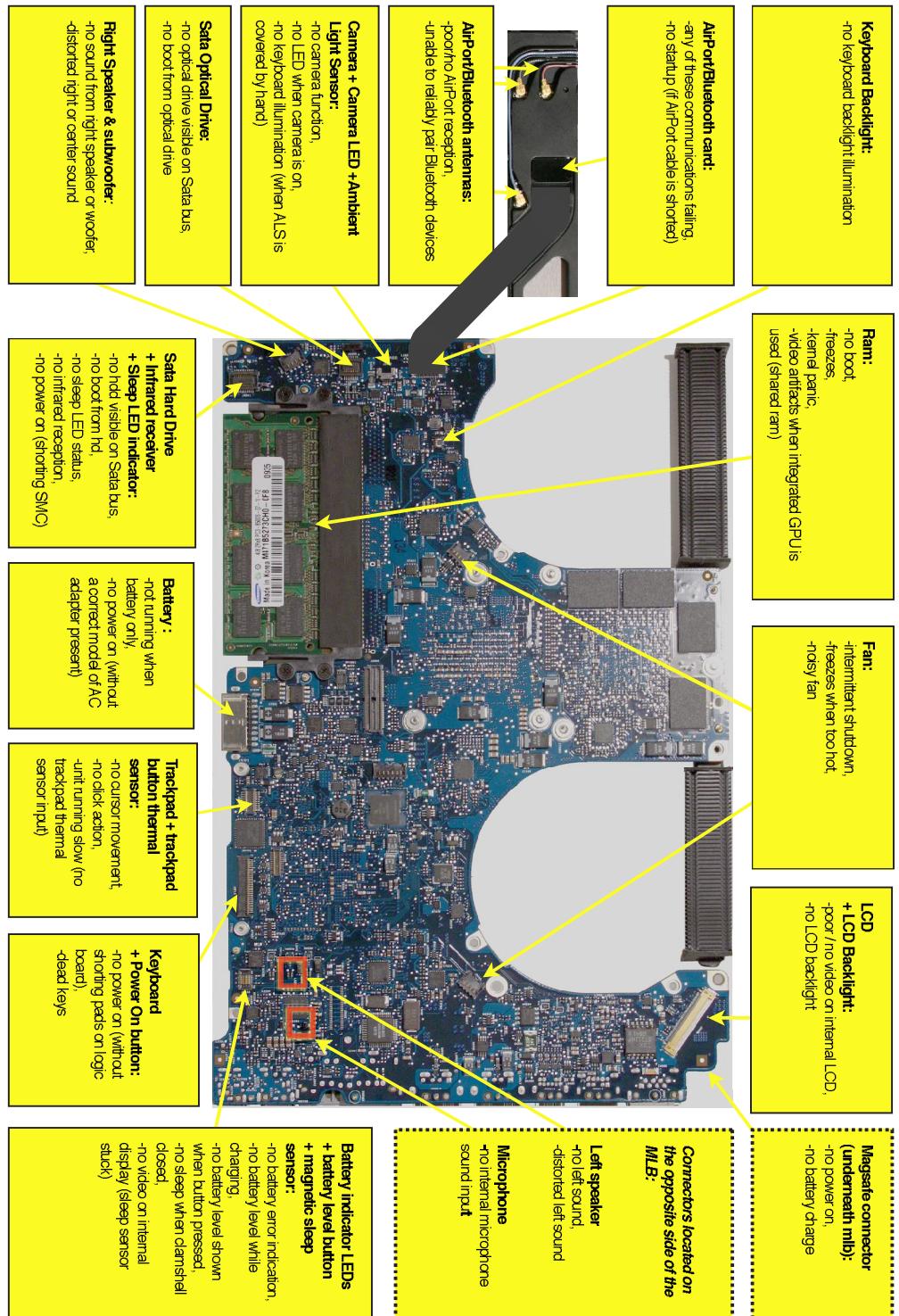
Emerging Issues

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

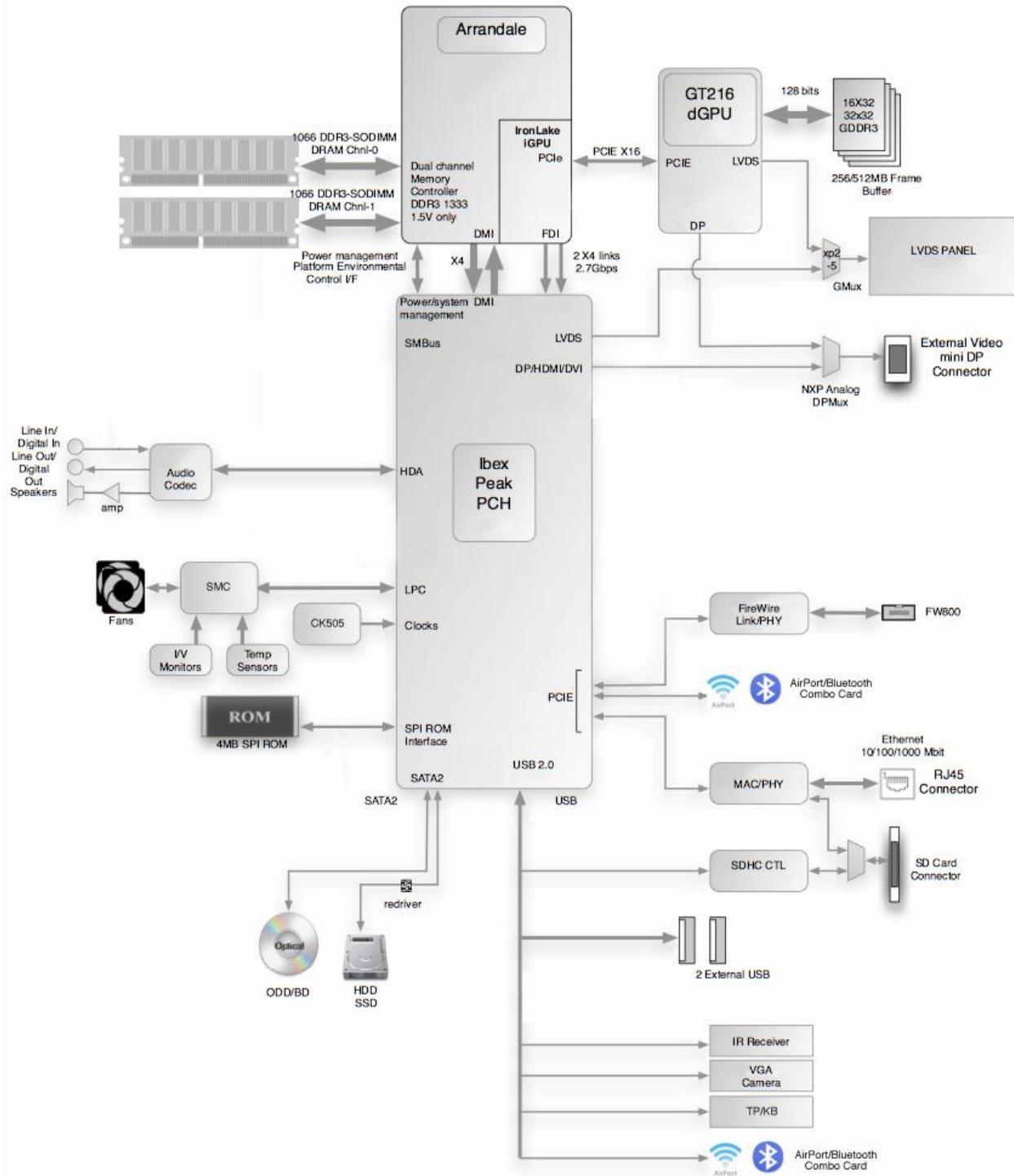
Refer to this diagram for symptoms related to MacBook Pro (15-inch, Mid 2010) logic board connectors.





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>](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 <ul style="list-style-type: none">• No power• No image• No startup chime• No fan or hard drive spin• No reset sound from optical drive• No sleep LED activity• No light if Caps Lock pressed• Non-operational	<ol style="list-style-type: none">1. Verify AC power presence with MagSafe LED indicating on or charge state.2. Verify battery status as being partly charged, charging with AC power.3. Reset SMC.4. Run Battery Diagnostic Utility.

Deep Dive

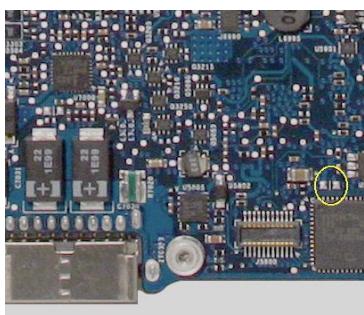
Check	Result	Action	Code
1. Isolate peripherals as cause. Disconnect all peripherals and external devices and verify unit starts.	Yes	Suspect peripherals as cause. Reconnect each one at a time, verifying unit operation as external device is reinstalled.	
	No	Go to step 2	



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. -Try to power system using top case power key. If no power on, reseat keyboard flex cable to logic board and retest. If no power on , short the two pads (as illustrated) and verify if system powers on. - 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 <ul style="list-style-type: none">• No startup chime, some video activity, Apple logo, startup spin dial• Startup chime with possible beep tones.• Fan, hard drive spin or optical drive reset sound• Sleep LED is on, blinking or went out• Caps Lock LED toggles when pressed	<ol style="list-style-type: none">1. Reset SMC.2. Verify startup process passes initial memory checks – no beep errors or flashing sleep LED indicators. Display activity is starting up.3. Clear PRAM. Verify starts up from user drive.4. Connect known-good external bootable device and press Alt key during startup then select external startup device to bring up system for diagnostics.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: -Reseat optical drive cable and retest, -Replace with known-good optical drive cable and retest, -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: -Reseat hard drive cable and retest, -Replace with known-good hard drive cable and retest, -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.	
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 <ul style="list-style-type: none">• Powers off during startup• Powers off with desktop use	<ol style="list-style-type: none">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:2. Verify battery charge status3. Check AC adapter MagSafe connector and connection with system4. Reset SMC and PRAM5. Start up with shift key down for safe mode6. Startup from known-good bootable device7. 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 -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. -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 M23 P17 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: -if for thermal error cause -if for other cause	M18 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 <ul style="list-style-type: none">• Power• No video• Fan, hard drive spin, or optical drive reset sound• Sleep LED is on or went on• Light if Caps Lock pressed	<ol style="list-style-type: none">1. Reset SMC.2. Reset PRAM.3. If no startup chime, verify with known-good memory.4. Verify with external monitor.5. Press Alt key on startup..

Deep Dive

Check	Result	Action	Code
1. Characterize video issue Define if the issue is a bad image with backlight OR a no video issue. 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 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 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. 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.	
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.	M03
	No	Previous display cable damaged the logic board. Replace logic board.	



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 <ul style="list-style-type: none">• AC adapter• No MagSafe LED indicator• No orange charge indication• Battery status LEDs:<ul style="list-style-type: none">- single chase- all flash- no LED	<ol style="list-style-type: none">1. Check battery level and test AC power.2. Reset SMC by pressing the (left) Shift-Control-Option keys along with the power button once.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. Verify 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 <ul style="list-style-type: none">• Display notice of system kernel panic during start up and desktop use.• System freeze during use.• System freeze upon wake from sleep.	<ol style="list-style-type: none">1. Reset SMC and clear PRAM2. Remove suspect external devices.3. Verify user memory is Apple-approved memory, and memory configuration matches memory installed.4. Start up with shift key down for safe mode.5. Startup from known-good bootable device6. Check panic.log info for crash cause7. 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. 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: - Disconnect camera cable from display assembly (for, camera, and Ambient Light Sensor). Camera cable can be disconnected without affecting startup and test. - Disconnect AirPort/Bluetooth card to isolate AirPort/ Bluetooth functionality. - Disconnect optical drive cable to isolate optical drive. - Disconnect hard drive cable to isolate hard drive. -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. 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.: -If Camera cable connection is crashing system, replace clamshell assembly for damaged Camera/ALS cable. -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 -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. -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. -Reseat memory or replace suspect memory with known-good Apple memory.	L14 X03 N13 X03 J03 X03 H01 X01
	No	Symptoms unchanged, go to step 5	
5. Start up from optical drive or known-good OS. 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 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: - If hang or freeze - If Kernel Panic/system crashes	M05 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) : If top case sensor failed If display sensor failed If logic board sensor failed If fan test failed, replace fan. If overtemp , replace heatsink.	X99 L14 M18 X03 X10

Battery Run Time Too Short

Quick Check

Symptom	Quick Check
Battery Run Time Too Short Battery runs out of power very quickly (less than two hours)	<ol style="list-style-type: none">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).2. Verify no applications have runaway processes with the CPU. See "Runaway applications can shorten battery runtime" (Knowledge Base TS1473).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 Runs on battery but not on power adapter only.	<ol style="list-style-type: none">1. Verify proper wattage adapter is being used.2. Check for dirty or stuck pins on the MagSafe connectors, both on the adapter and the computer.3. Connect the AC adapter to known-good power source.4. Verify power cord or plug is properly attached to AC adapter and MagSafe cable is not damaged.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 <ul style="list-style-type: none">• No power• No Power LED• Non-operational• Stuck /broken pin	<ol style="list-style-type: none">1. Connect AC adapters MagSafe connector to the computer. The LED on the connector should be green or amber.2. Verify power cord, or plug, is firmly attached to AC adapter.3. Verify AC power source is supplying AC power.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 MagSafe5. 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. Verify 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 Computer or AC adapter emits a noise or vibration.	<ol style="list-style-type: none">1. Verify and reproduce the source of the noise from the computer / adapter with the customer.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 Computer or power adapter emits an odor or smell of smoke.	<ol style="list-style-type: none">1. Disconnect the battery and AC adapter from the computer.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 <u>Liquid Contact Indicators</u> . 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 <ul style="list-style-type: none">• Trackpad button does not work• Battery pack case has opened.• Bottom cover cannot be reinstalled	<ol style="list-style-type: none">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).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 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 <ul style="list-style-type: none">• No Ethernet device present• Unable to access network resources• Ethernet device shows no connection• Ethernet device unable to get an IP address• Slow network performance	<ol style="list-style-type: none">1. Check the network cable for damage, try a known good Ethernet cable – CAT5 or better recommended for 100Mbps+ connections.2. Check Ethernet ports on Mac and wall/switch for dust, debris, damage or bent pins.3. Ensure distance from networking infrastructure is less than 300 feet / 105 meters.4. Verify port, cable and network hardware with a known good system. Isolate firewall, MAC address filtering or hardware access control devices.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 <ul style="list-style-type: none">• Unable to join networks or pair devices• Card not available or recognized• Intermittent device or connection dropouts	<ol style="list-style-type: none">1. Open System Preferences and make sure AirPort or Bluetooth is turned on and (for AirPort) that a network is selected.2. Ensure available software and firmware updates have been applied.3. Reset PRAM4. (AirPort) Using System Profiler/AirPort channel list, check that installed AirPort card model supports the Base Station channel.5. (AirPort) Check that base station is not using unsupported connection or encryption protocols.6. (AirPort) Check for nearby interference sources such as microwave ovens or cordless phones (Knowledge Base HT1365)7. (AirPort) Check the number of users trying to use AirPort in the area for possible network congestion.8. (Bluetooth) Test with known-good Bluetooth device.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: - for Airport-related issues ensure that MAC address filtering is not enabled on the base station, and go to step 5. - 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 <ul style="list-style-type: none">• Unable to find networks• Intermittent connection dropouts• Slow transfer speeds	<ol style="list-style-type: none">1. Check for nearby interference sources in the 2.4/5GHz range such as microwave ovens and cordless phones (Knowledge Base HT1365).2. Check that computer is within base station range – move closer to base station.3. Base station checks:<ol style="list-style-type: none">a. Base station is not set to low-power transmission modeb. Base station is not using unsupported connection and encryption protocolsc. Check for possible Wi-Fi channel overlap (nearby base stations using adjacent channel)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	<p>Check Bluetooth input device has fully charged batteries.</p> <p>Check with known-good Bluetooth input device</p> <p>Check that all system and device available software and firmware updates have been applied.</p>

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 <ul style="list-style-type: none">• Kernel panic on boot• Kernel panic or freezing while attempting to connect to Wi-Fi networks• Kernel panic while transferring data on Wi-Fi networks.	<ol style="list-style-type: none">1. Isolate OS by booting from original install media (10.6.x). Attempt to connect to Wi-Fi network.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 <ul style="list-style-type: none">• Slow or stalled data transfers• Intermittent connection dropouts	<ol style="list-style-type: none">1. Check for nearby interference sources in the 2.4/5GHz range such as microwave ovens or cordless phones (Knowledge Base HT1365)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.3. (Bluetooth) Move devices closer together.4. Check wireless performance with a known-good system/device.5. (AirPort) Wireless base station checks:<ol style="list-style-type: none">a. Base station is not set to low-power transmission mode.b. Base station is not set to a slower protocol mode (802.11b).c. Check for possible Wi-Fi channel overlap (nearby base stations using adjacent channel).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)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	



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 <ul style="list-style-type: none">• Can't get the system to recognize the Bluetooth keyboard or mouse	<ol style="list-style-type: none">1. Check Bluetooth System Preference is set to Discoverable.2. Check Bluetooth device has fully charged batteries.3. Check for Bluetooth software updates for both the device and Mac OS X.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 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 <ul style="list-style-type: none">• Incorrect/missing colors• Distorted/blurred image• Pixel anomalies• Vertical/horizontal lines• Non-uniform brightness• Image flicker• Image persistence	<ol style="list-style-type: none">1. Check display preferences for use of custom display profile.2. Check brightness setting.3. Check for Software Updates.4. Clean glass panel while checking for dust/debris.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 <u>Incorrect/Missing Colors Deep Dive</u> .	
	No	Go to step 2.	
2. Verify if user's issue is distorted/blurred image.	Yes	Go to <u>Distorted/Blurred Image Deep Dive</u> .	
	No	Go to step 3.	
3. Verify if user's issue is bright or dark pixel anomalies.	Yes	Go to <u>Pixel Anomalies Deep Dive</u> .	
	No	Go to step 4.	
4. Verify if user's issue is vertical or horizontal lines.	Yes	Go to <u>Vertical/Horizontal Lines Deep Dive</u> .	
	No	Go to step 5.	
5. Verify if user's issue is non-uniform brightness.	Yes	Go to <u>Non-uniform Brightness Deep Dive</u> .	
	No	LCD functioning OK.	

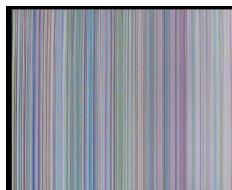


Deep Dive: Incorrect/Missing Colors

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

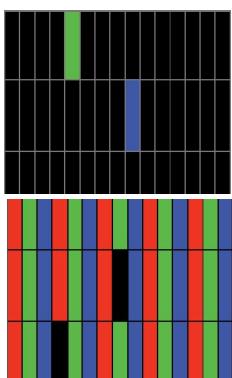


Deep Dive: Distorted/Blurred Image



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 <u>Display Issue: Pixel Anomalies</u> .	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 <u>Display Issue: Pixel Anomalies</u> .	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 <u>Display Issue: Pixel Anomalies</u> .	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 <ul style="list-style-type: none">• Camera not detected• No green LED for camera• Excessive blooming• Poor white balance• Poor focus• Green image• Image distortion	1. Check for Software Updates. 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 <ul style="list-style-type: none">• No video• No backlight	<ol style="list-style-type: none">1. Check brightness setting2. Attach known-good supported external display.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 <ul style="list-style-type: none">• Display not illuminated• Flashing, unstable or non uniform background lighting• 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. Verify if any of the connections appear to be defective.	Yes	- Defective LVDS cable. Replace display assembly. - Defective LVDS connector on logic board. Replace logic board.	L09 M25
	No	If connections are OK and secure and the display is still blank, go to step 5	
5. Substitute a known-good display clamshell to test internal logic board video and backlight power output. Verify if backlight and display functions are operational.	Yes	Replace user's display assembly.	L09
	No	No LED backlight power from logic board. Continue to use known-good clamshell and replace logic board. Go to step 6.	M25
6. Verify if display and backlight operations were restored with known-good display clamshell and replacement logic board.	Yes	Logic board LED backlightht power was probably damaged by user's clamshell assembly cable. Do not reinstall user's clamshell; replace it.	L09
	No	Check functionality of known-good clamshell assembly on known-good computer.	



Noise / Unstable Flickering

Unlikely cause: battery

Quick Check

Symptom	Quick Check
Noise / Unstable Flickering <ul style="list-style-type: none">• Image flicker• 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 <ul style="list-style-type: none">• Broken glass• Broken hinge• Stripped screw/head• Stripped screw boss• Dent or scratch to chassis	<ol style="list-style-type: none">1. Determine damage caused by user/technician environment, accidental damage, or abuse.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 <ul style="list-style-type: none">• Cracked LCD• Scorched or melted LCD• LCD impact damage	<ol style="list-style-type: none">1. Determine damage caused by user/technician environment, accidental damage, or abuse.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 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 <ul style="list-style-type: none">• Cannot save documents• Read/Write error message• Hang when accessing or saving data	<ol style="list-style-type: none">1. Boot from Install DVD. Verify S.M.A.R.T. status of drive using Disk Utility.2. Repair disk using Disk Utility.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. 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 Drive No Boot <ul style="list-style-type: none">• Flashing question mark• Boots to grey screen• Boots to blue screen	<ol style="list-style-type: none">1. Use a known-good mouse. A stuck mouse button will not allow boot.2. Boot from Install DVD. Verify S.M.A.R.T. status of drive using Disk Utility.3. Repair disk using Disk Utility.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 <ul style="list-style-type: none">• Noise during start up• Noise during operation• Noise when drive is copying or saving data	<ol style="list-style-type: none">1. Start up from Install DVD. Verify S.M.A.R.T. status of hard drive and repair disk using Disk Utility.2. Verify if any available firmware updates are available for the installed drive.3. Check for reported noise and compare with Knowledge Base article "Apple Portables: Hard Drives and Noise" 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 <ul style="list-style-type: none">• Cannot insert a disc into the drive• Cannot eject a disc placed into the drive	<ol style="list-style-type: none">1. Use Apple System Profiler ATA section to see if the optical drive appears. If not, see Optical Drive Not Recognized symptom table,2. Restart computer and hold down mouse button or keyboard eject key to cycle optical drive.3. Check for available firmware and software updates.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 <ul style="list-style-type: none">Errors when writing optical media.Errors when reading optical media.Hang when accessing or preparing to write data.	<ol style="list-style-type: none">Test optical media in another drive of the same type in same type of machine to rule out media issue.Check with known-good discs like the Install discs that came with the computer.For write issues, check with known-good media that performs well in another computer and optical drive of the same type.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 <ul style="list-style-type: none">Discs inject and eject, but do not appear in Finder	<ol style="list-style-type: none">1. Use Apple System Profiler ATA section to see if the optical drive appears.2. Serial-ATA section of Apple System Profiler will show any media inserted.3. Check Finder Preferences: General and make sure "CD's, DVD's and iPods" is checked under "Show these items on the Desktop."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 <ul style="list-style-type: none">• Noise during boot• Noise during operation• Noise when drive is copying or writing data	<ol style="list-style-type: none">1. Test optical media in another drive of the same type in same type of computer to rule out media issue.2. Check with known-good discs. Install discs that came with the computer.3. Check to see if noise occurs without media in the drive. If so, check for hard drive and fan caused noise.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 Read or write speeds slower than expected.	<ol style="list-style-type: none">1. Test optical media in another drive of the same type in same type of computer to rule out media issue.2. Check with known-good discs—Install discs that came with the computer.3. For disc write issues, check with known-good media that performs well in another computer and drive of the same type.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 USB-wired keyboard/mouse or USB flash drive not recognized	<ol style="list-style-type: none">1. Check the for latest software update.2. Use Apple System Profiler to verify the computer recognizes the USB bus.3. Test port with known good Apple keyboard or mouse.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 <ul style="list-style-type: none">• Keystrokes not recognized• Locks up• Displayed characters don't match	<ol style="list-style-type: none">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.2. Confirm correct keyboard layout is selected.3. Update to the latest system software.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). Go to step 4.	
		If a keycap kit is not available for this model, replace complete top case. 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 <ul style="list-style-type: none">• Keycap broken• Key switch broken• Sticky key• Key pressed not recognized	<ol style="list-style-type: none">1. Determine if damage caused by user/technician environment, accidental damage, or abuse.2. Inform user/technician the failures are not covered by Apple warranties. Refer to http://www.apple.com/legal/warranty3. Inspect keycap to remove debris trapped under it.4. If the keycap is loose, check if clasp is still intact and reattach it.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 <ul style="list-style-type: none">• Cursor does not move.• Select button of trackpad inoperable• Multiple touch features inoperable	<ol style="list-style-type: none">1. Check for environmental factors such as humidity, hand lotion or jewelry. Check if user is touching the trackpad simultaneously with both hands.2. Clean the trackpad surface (with the computer powered off) using a clean, dry, lint-free cloth.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. -No Mouse/trackpad response -Trackpad cursor not tracking properly -Trackpad click button issues	K02 K12 K13
	No	Replace logic board.	M16

Built-in Keyboard Has Dim or No Keyboard Backlight

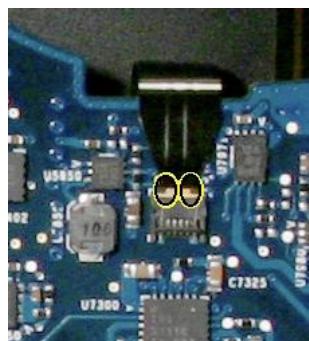
Unlikely cause: LCD, hard drive, optical drive

Quick Check

Symptom	Quick Check
Built-in Keyboard Has Dim or No Backlight <ul style="list-style-type: none">• In darkened room, keyboard backlight does not come on or is dim.	<ol style="list-style-type: none">1. Make sure this computer model has a keyboard backlight option by checking the configuration label in the battery bay.2. Make sure that keyboard backlight is turned on and brightness turned up.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 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 <ul style="list-style-type: none">Keystrokes not recognized	<ol style="list-style-type: none">Reset SMC.Press Caps Lock. If the Caps Lock light comes on that indicates at least a partial connection to the logic board.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



6. Verify if all keys are functional using ASD.	Yes	Issue resolved.	
	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 <ul style="list-style-type: none">• Cursor movement is random, uneven, or jumpy.• Cursor hangs or stalls along path.	<ol style="list-style-type: none">1. Check for environmental factors such as humidity, hand lotion or jewelry. Check if user is touching the trackpad simultaneously with both hands.2. Clean the trackpad surface (with the computer off) using a clean, dry, lint free cloth.3. Make sure all software and firmware updates have been applied.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 <ul style="list-style-type: none">Remote is not recognized.	<ol style="list-style-type: none">The computer is on and awake.Check with known-good remote on user's computer and the user's remote on known-good computerRemote is used within 30 feet of the computer and unobstructed line-of-sight to the IR window.Clean the IR window.Open System Preferences: Security pane. Verify if "Disable remote control infrared receiver" is not checked.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 Can't hear any audio from within the machine.	<ol style="list-style-type: none">1. Make sure all software updates have been applied.2. Check in System Preferences: Sound: Output that sound output is set to "Internal Speakers". and balance is set to center.3. Use the F12 volume key to set the sound to maximum.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 <ul style="list-style-type: none">• Distorted audio	<ol style="list-style-type: none">1. Reset PRAM.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.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 <ul style="list-style-type: none">• Microphone not working• Microphone audio garbled• No sound	<ol style="list-style-type: none">1. Launch System Preferences and select Sound/ Input options. Verify that the sound input option is set to system's "internal microphone".2. Launch System Preferences and select Sound/ Input options. Verify that the 'Input Volume' setting is not set at the minimum level.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.	M09
	No	If "External Microphone" input is proposed in Sound Input preferences, replace logic board.	
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.	



<p>4. Launch System Preferences and select Sound input options. Verify if 'Input Level' indicator moves when speaking into the microphone.</p>	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
<p>5. Record sound sample using Garageband or QuickTime Player. Verify if sound quality of sound sample is normal during playback.</p>	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
<p>SD Memory Card will not insert into SD Slot</p> <p>SD Memory Card does not fully seat into the slot</p> <p>Slot door does not open completely</p>	<ol style="list-style-type: none">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).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. 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. 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	M17
	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.	
3. Unlock the customer SD Card and verify if it can be read and written on system.	Yes	System is functional.	M17
	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.	

Camera Issues

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

Quick Check

Symptoms	Quick Check
Camera Issues <ul style="list-style-type: none">• Camera not detected• No green LED for camera• Excessive blooming• Poor White Balance• Poor Focus• Green image• Image distortion	<ol style="list-style-type: none">1. Launch System Profiler and confirm that built-in iSight camera are visible.2. Verify camera lens and glass panel are clean and free of contaminants. Use provided cleaning cloth to clean glass panel if needed.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 the 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 Attached FireWire device like digital camera or mass storage drive not recognized by the system	<ol style="list-style-type: none">1. Check for latest software update.2. Use Apple System Profiler to verify the computer recognizes the FireWire bus.3. Test port by connecting to another computer using FireWire Target Disk Mode.4. Verify the FireWire cable is good.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 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

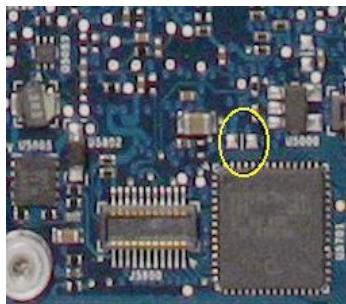
Symptom	Quick Check
Reset/Power Button Stuck <ul style="list-style-type: none">• System will not power on• System sounds bootROM unlock tone during startup• System automatically starts up repeatedly	<ol style="list-style-type: none">1. Diagnose stuck button with SMC keyboard reset sequence2. Check for issue occurrence on battery and on AC power3. 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. Align and reseat the keyboard flex cable on logic board connector. 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. -Plug known good powered AC adapter. -Try to power system using power key -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 . - 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. 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 <ul style="list-style-type: none">• System feels very warm• Fan(s) not working• Fan(s) are full on	<ol style="list-style-type: none">1. Verify the computer operating on a flat, hard surface and the vents are not blocked.2. Verify the computer is not running hotter than expected for normal operation. If possible, compare to a similarly configured computer.3. Reset SMC.4. Inspect fan performance5. 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 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.



Take Apart

MacBook Pro (15-inch, Mid 2010)



General Information

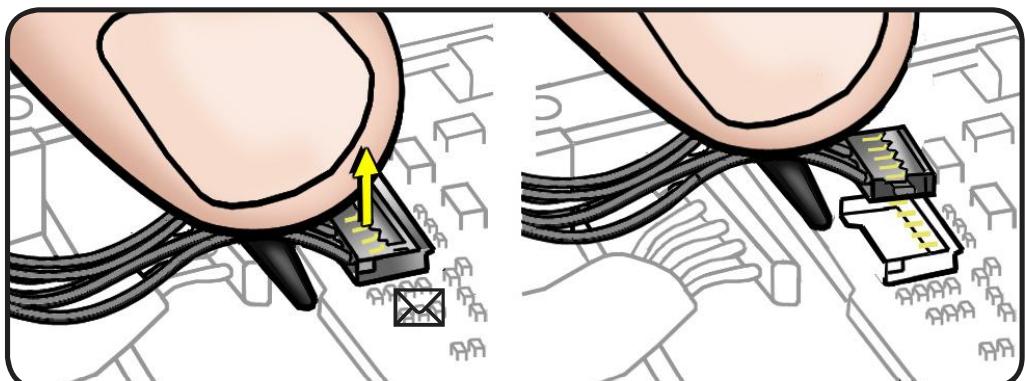
Connector Types on Logic Board

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

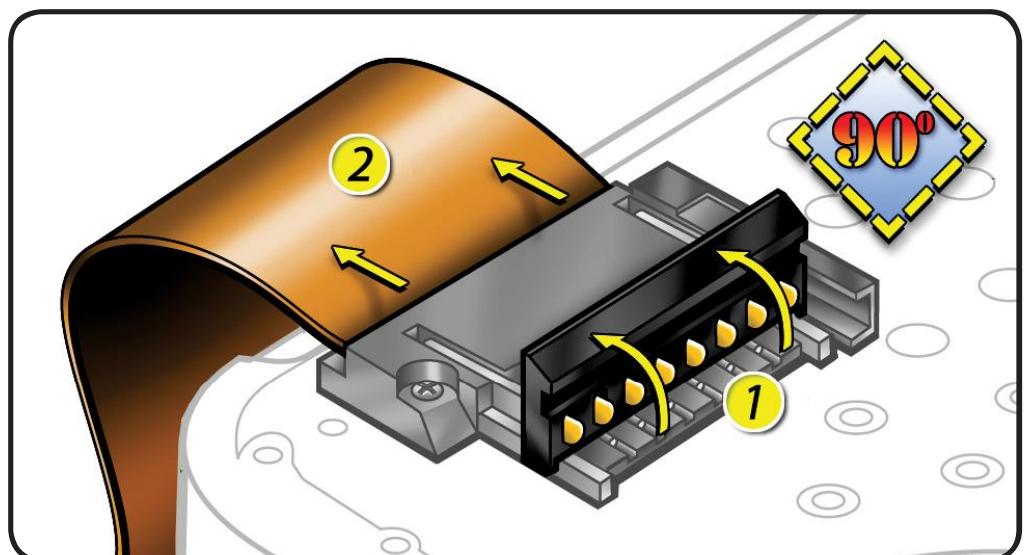


Locking Lever

- 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



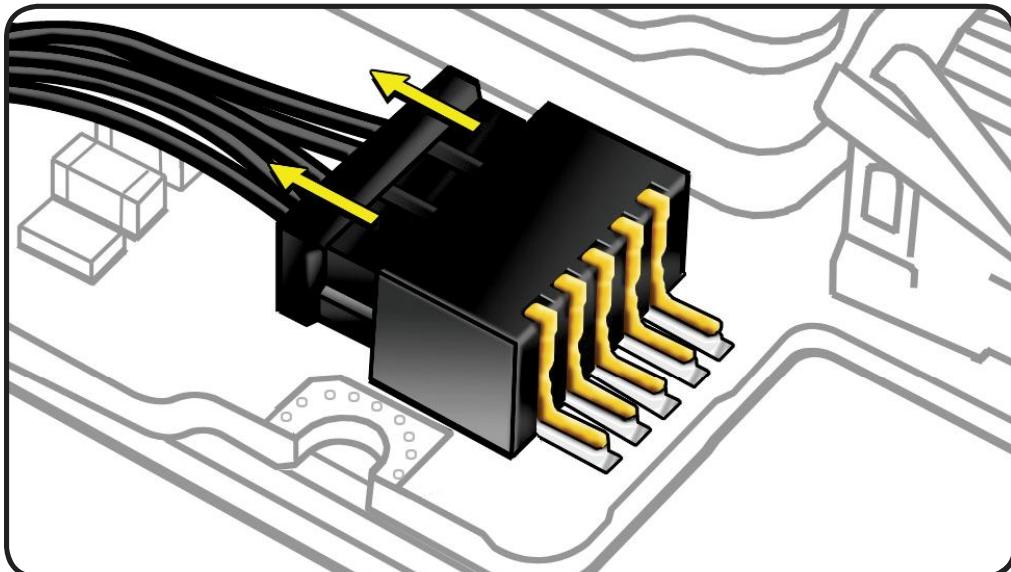


Horizontal Install

- 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

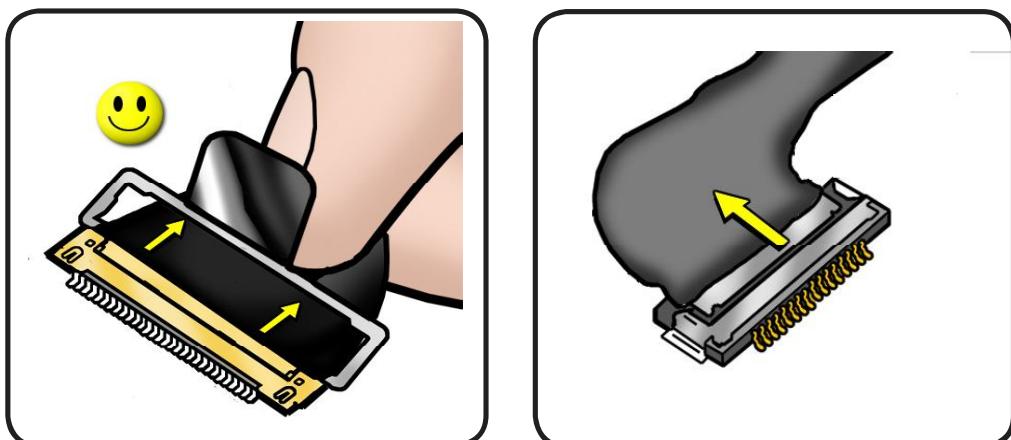


Thin, Multi-Pin Horizontal Insert

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

Example:

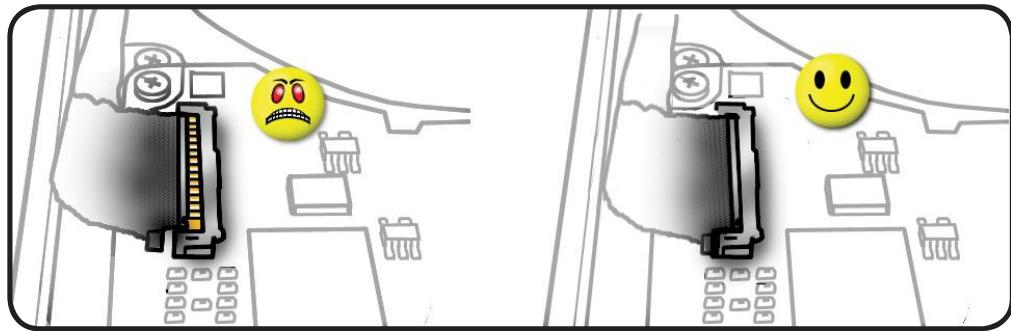
- LVDS cable with lock bar





Replacement Caution:

When connecting cables, make sure they are fully connected.

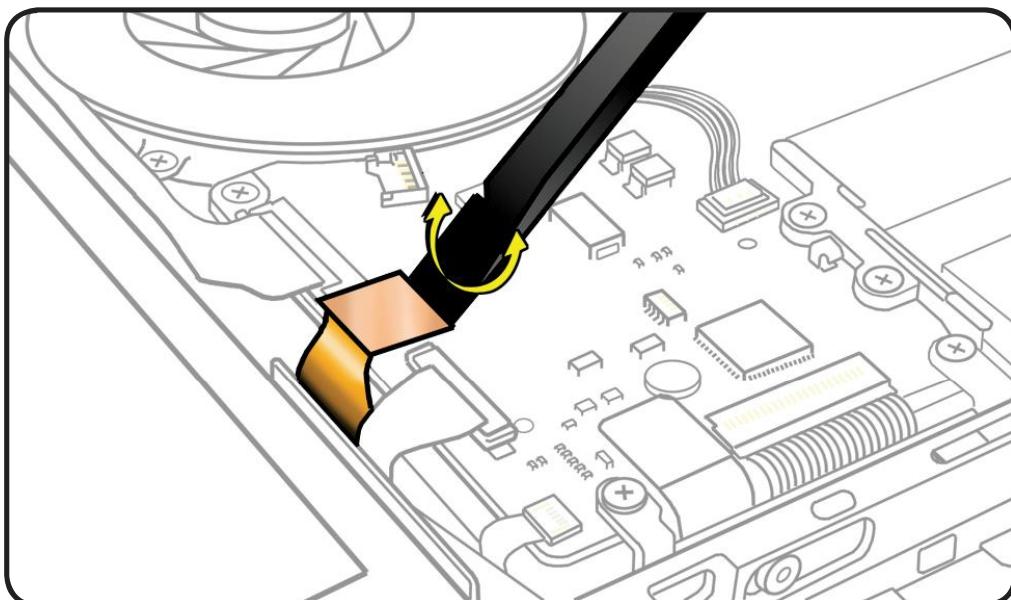


Low-Profile Solid Platform Flex

- 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:

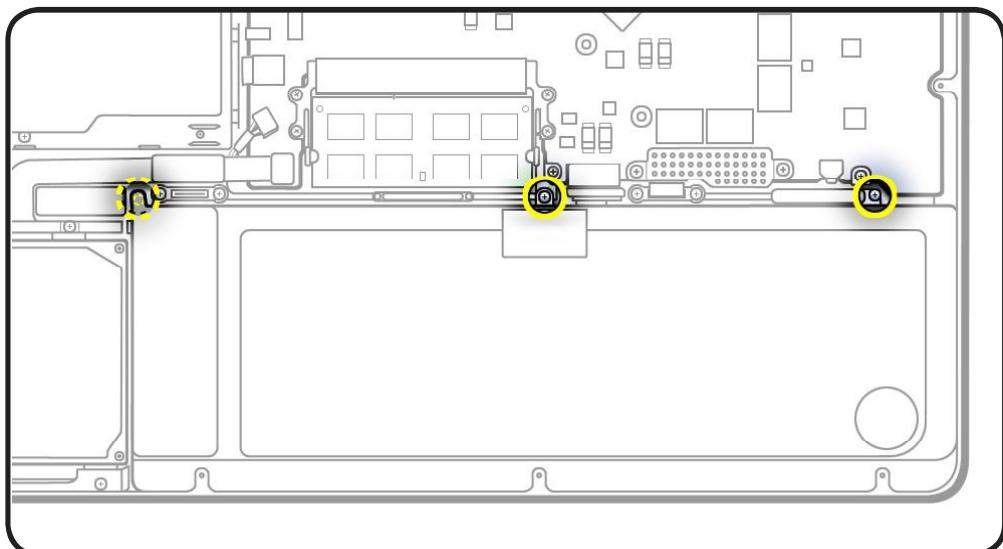
- optical drive flex cable
- trackpad flex cable





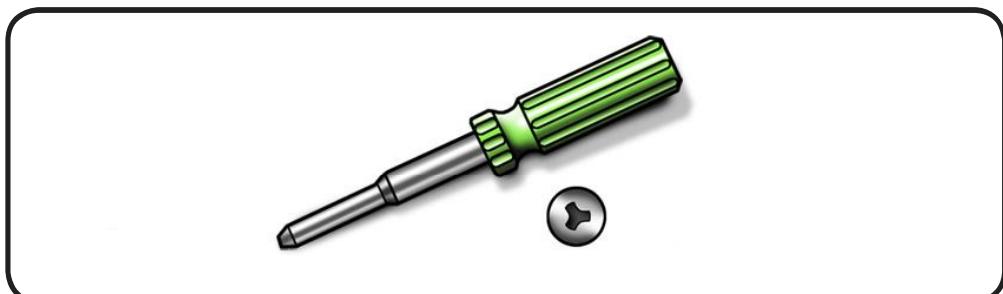
Battery Precaution

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.



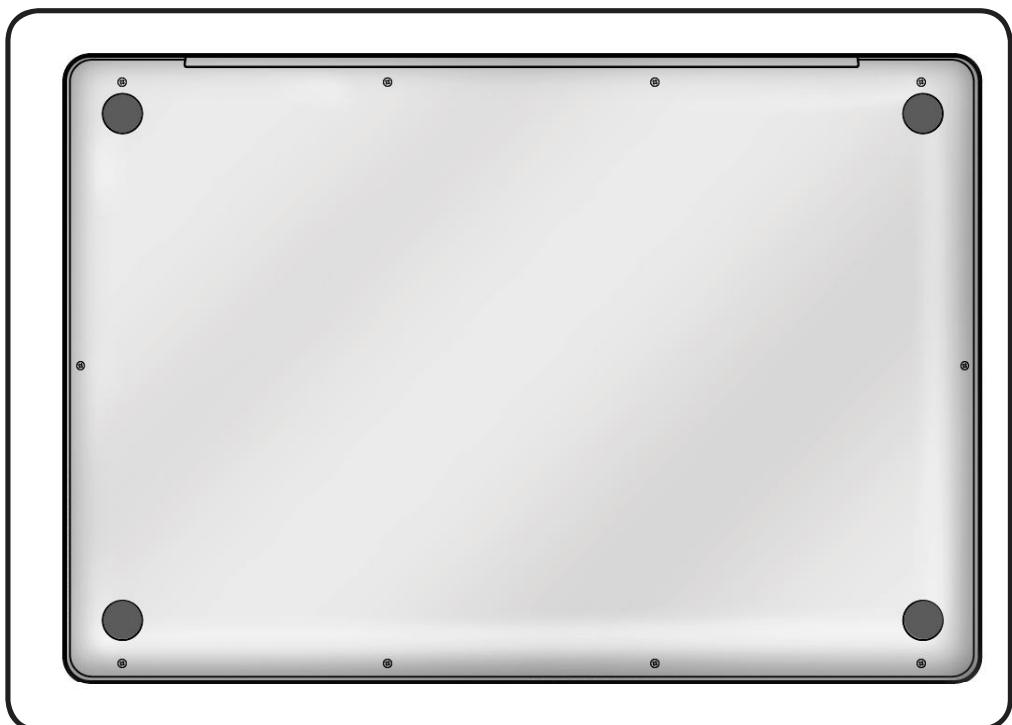
Bottom Case

First Steps



Warning:

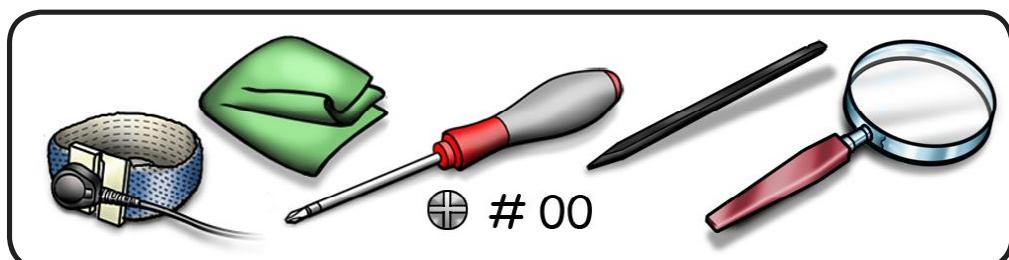
- Shut down computer.
- Wait 10 minutes
- Unplug all cables.
- Put on ESD strap.



Tools

Clean, soft, lint-free cloth

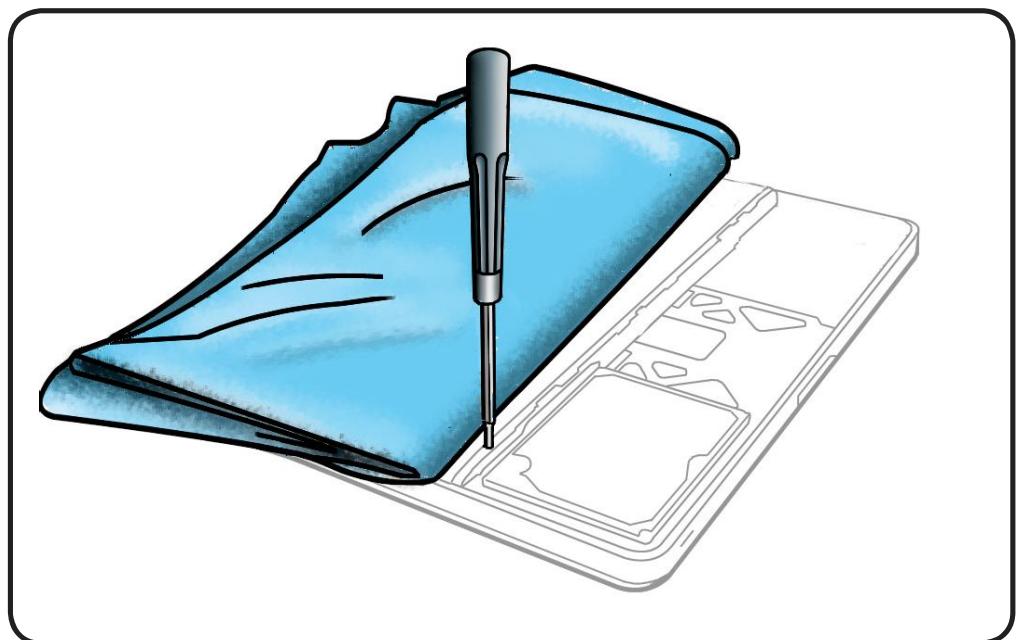
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
- Black stick
- Magnifying glass



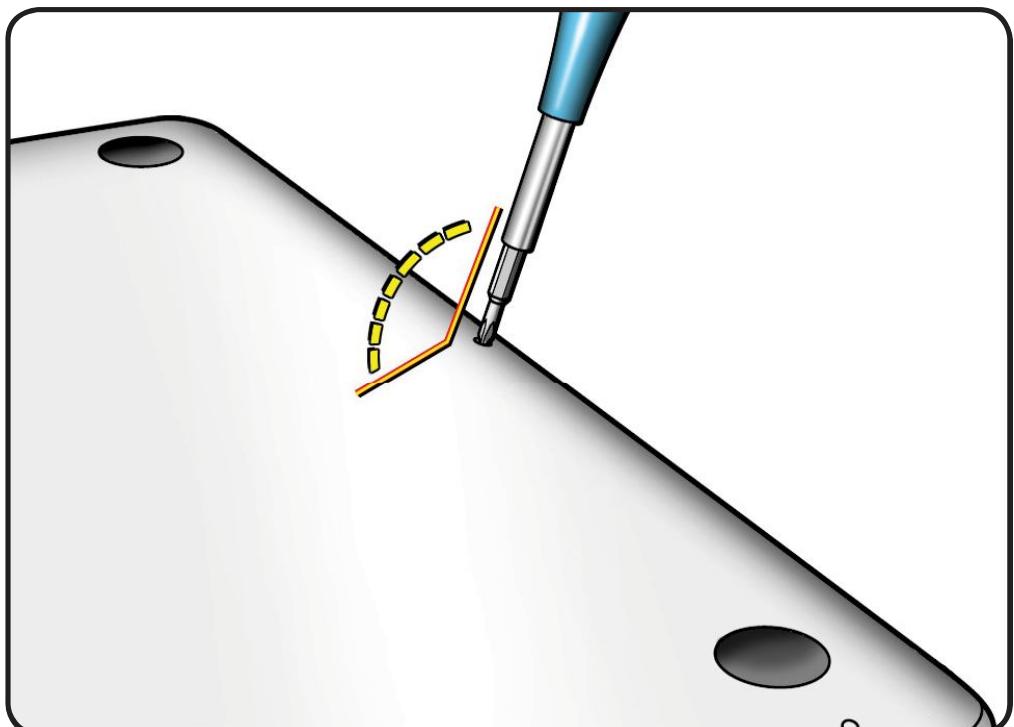


Removal

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.

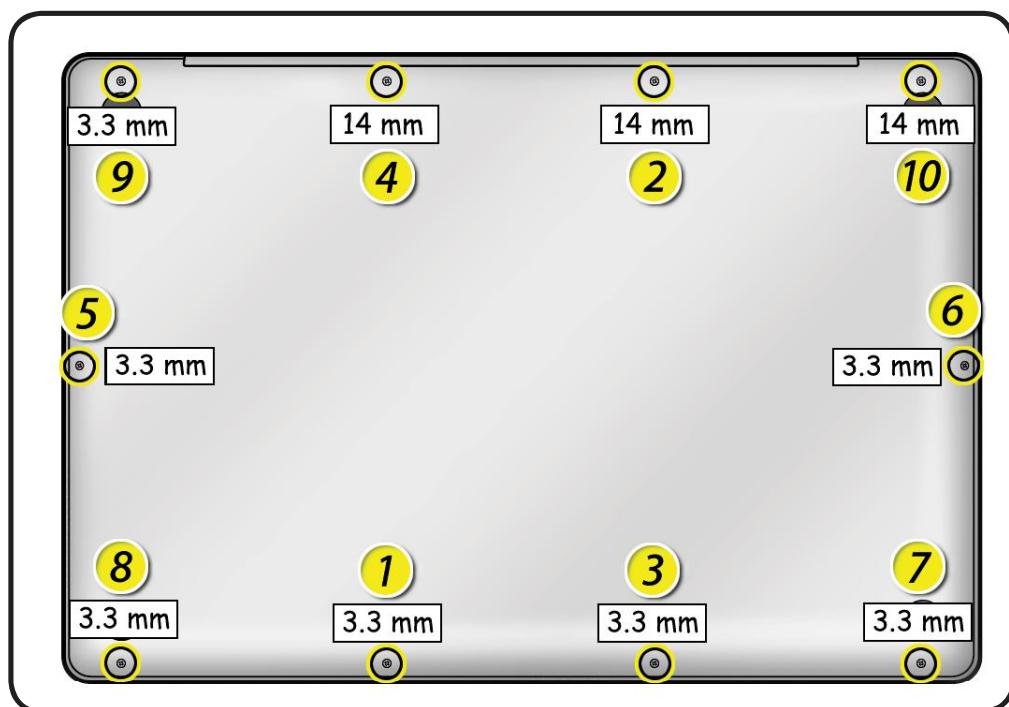




2 Remove 10 screws:

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

Replacement Note: Install screws in the order shown.



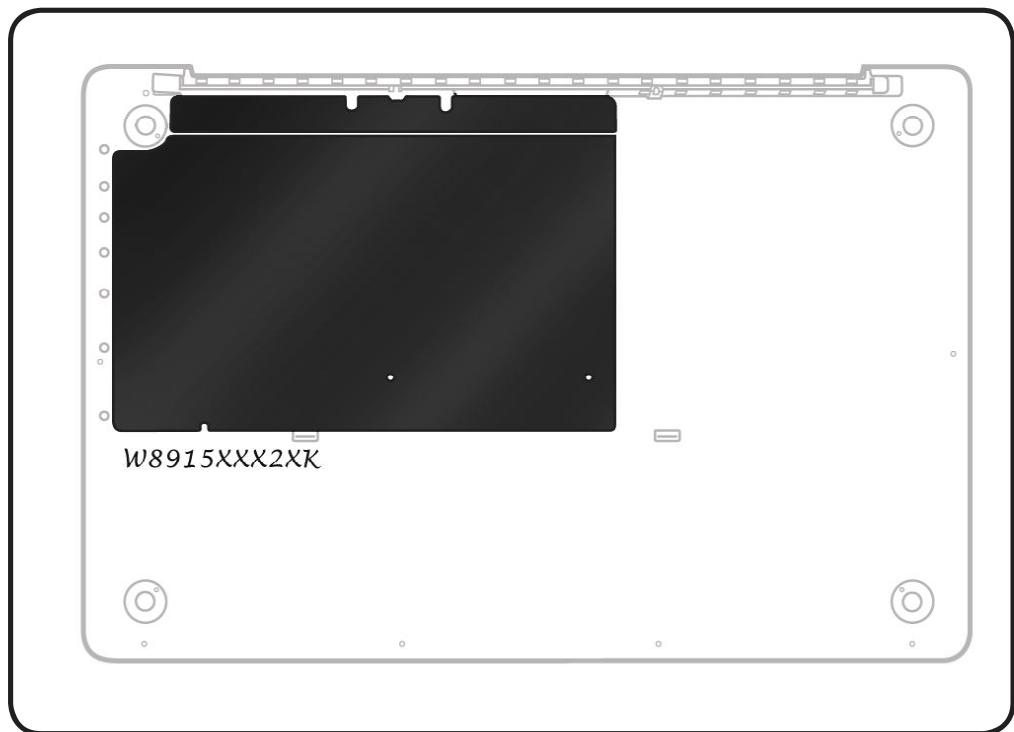
3 Use black stick to loosen and remove bottom case.





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."](#)



- 2 Install bottom case so that 2 clips snap onto top case.



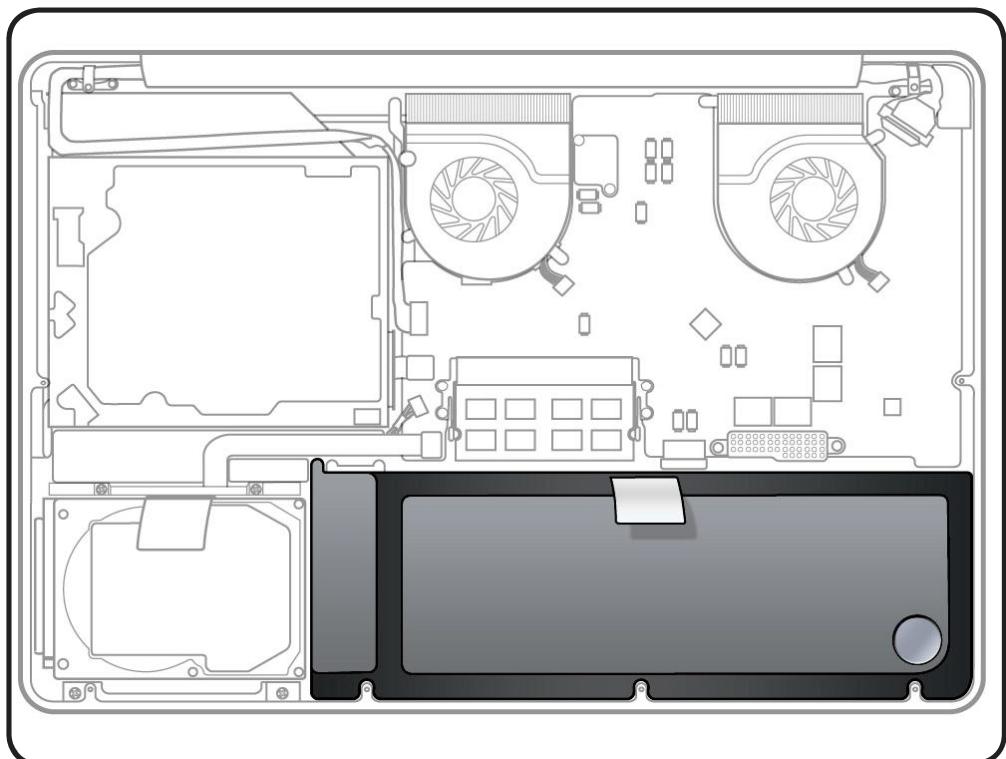


Battery

First Steps

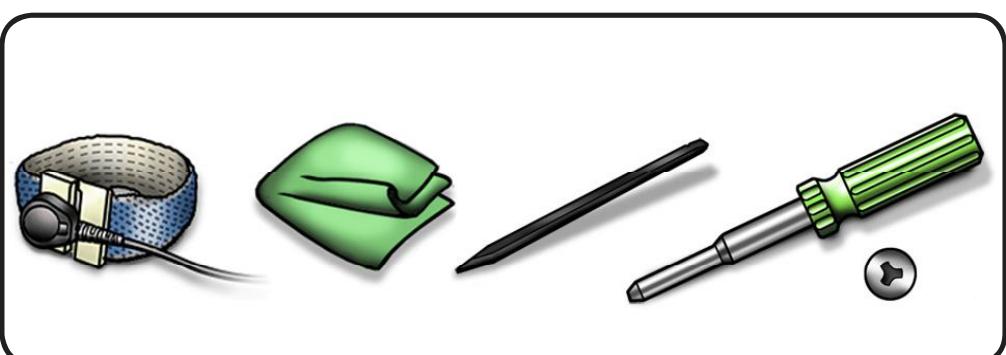
Remove:

- Bottom case



Tools

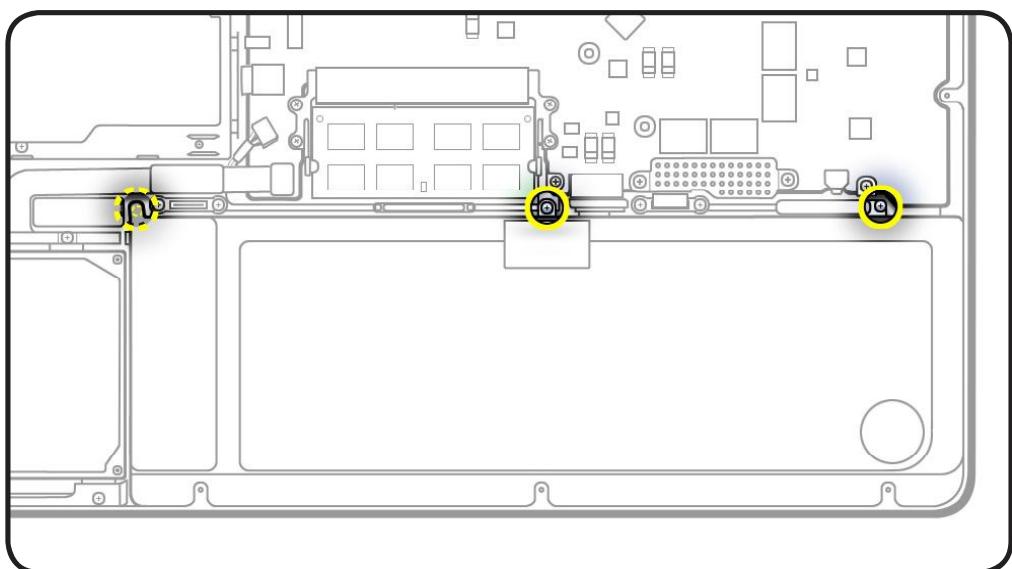
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
- Large tri-lobe #0 screwdriver (922-8991)



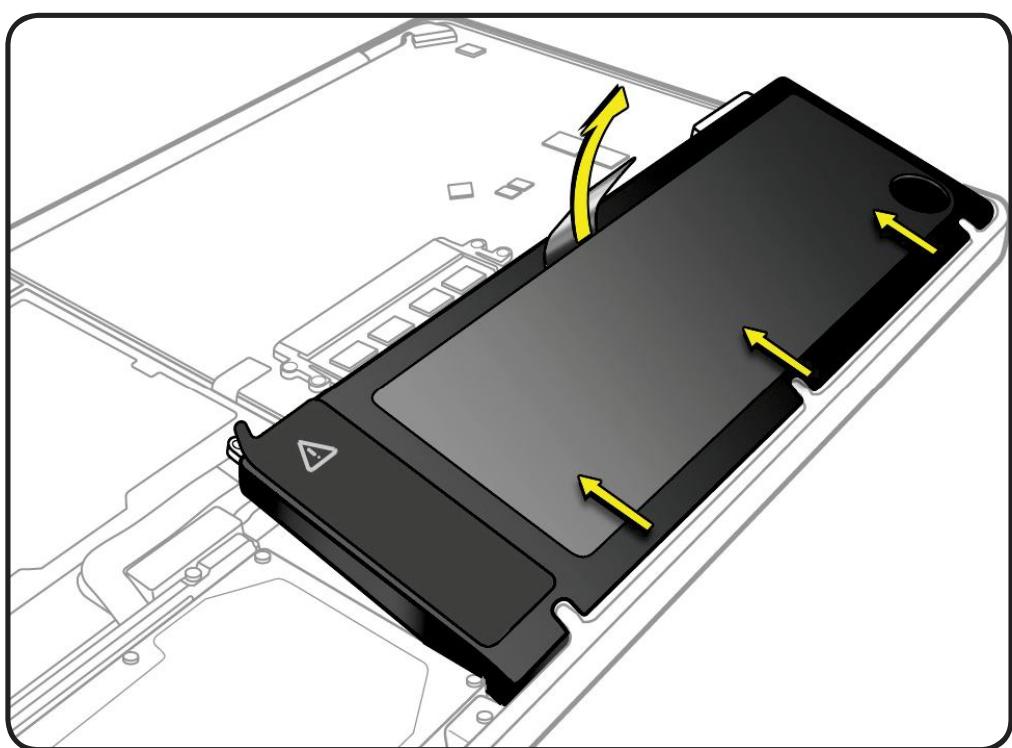


Removal

- 1 Remove 3 (5.5 mm) 922-9321 trilobe screws.

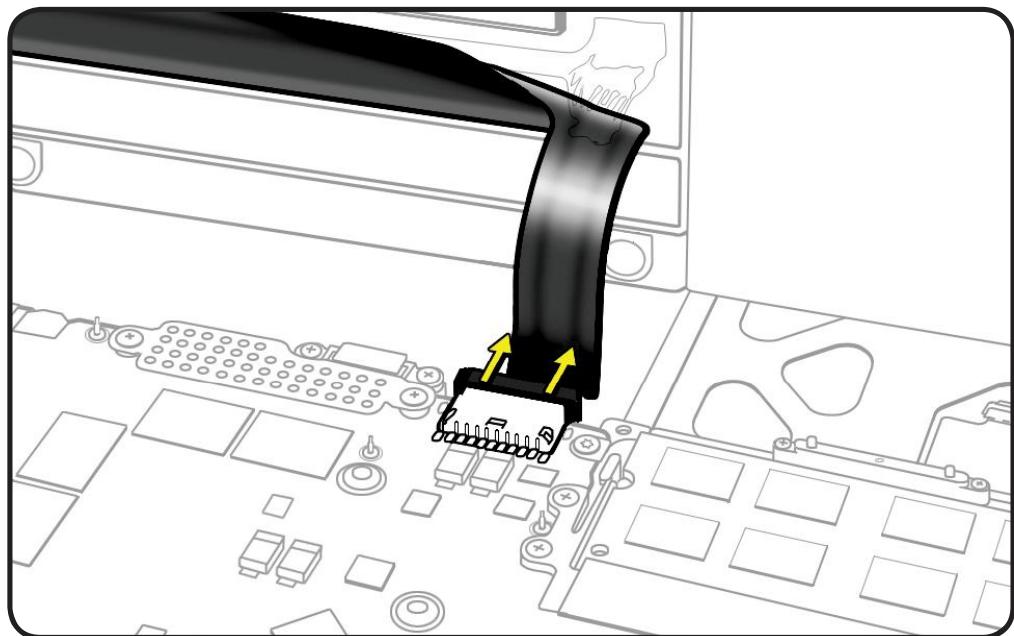


- 2 Pull battery tab up and forward a short distance to access the battery cable.



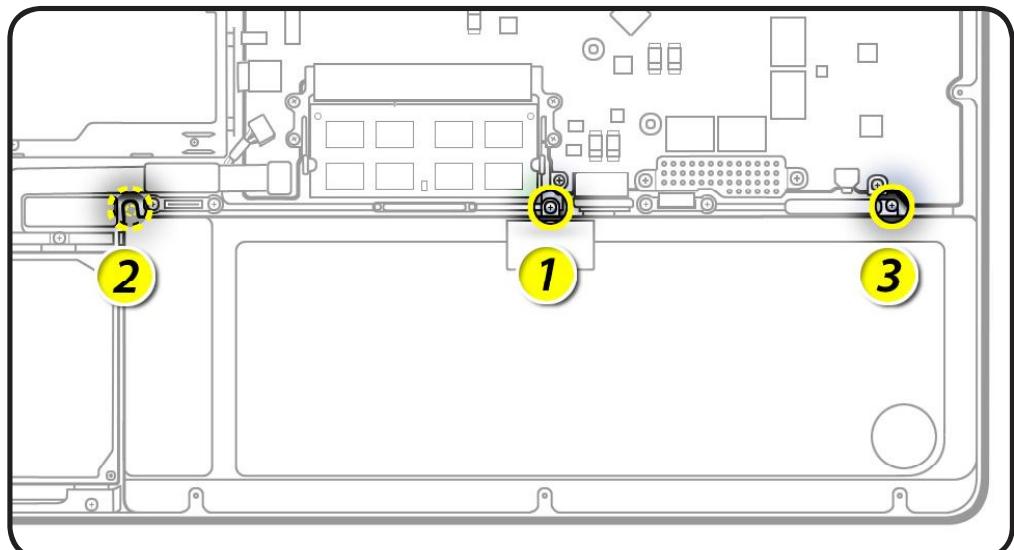


- 3** Using a black stick, pry cable from logic board connector.



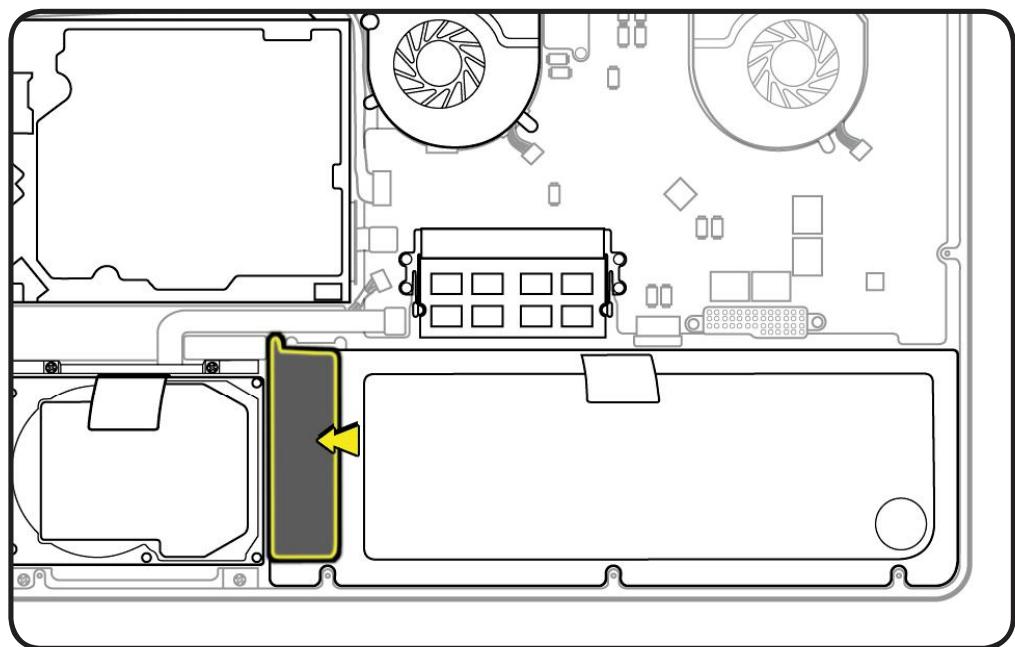
Replacement

- 1** Slide front edge of battery under 3 tabs.
- 2** Connect battery cable and install 3 trilobe screws in order shown.

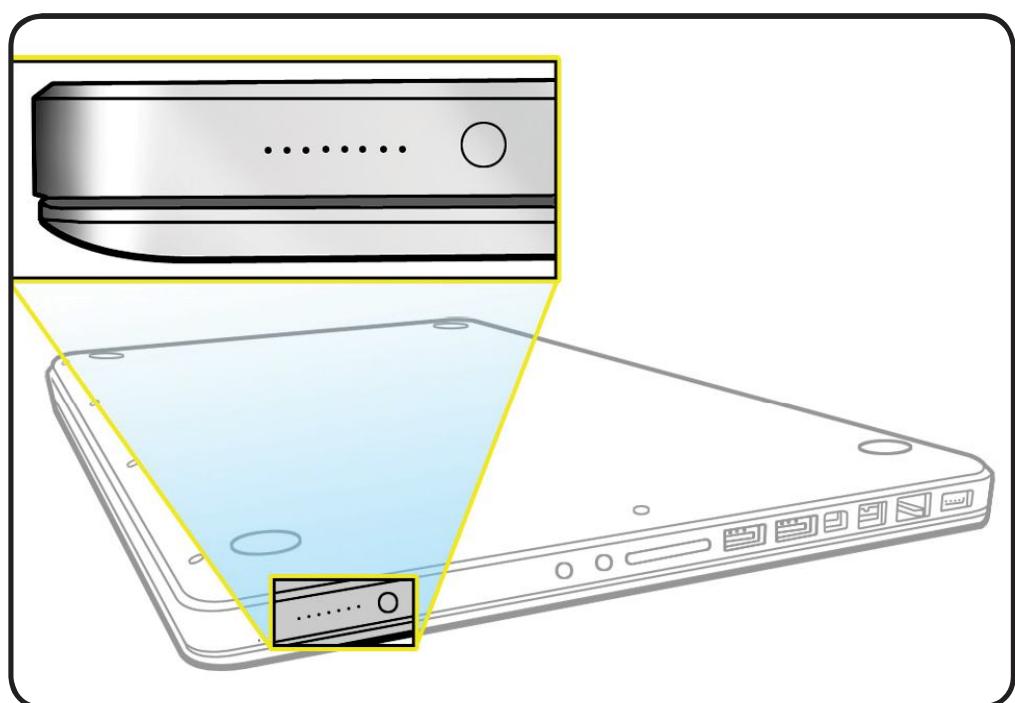




Note: If installing a new battery, attach the new battery label (refer to battery label inbox instructions).



- 3 Press battery indicator light button to check charge level.





Hard Drive and Bracket

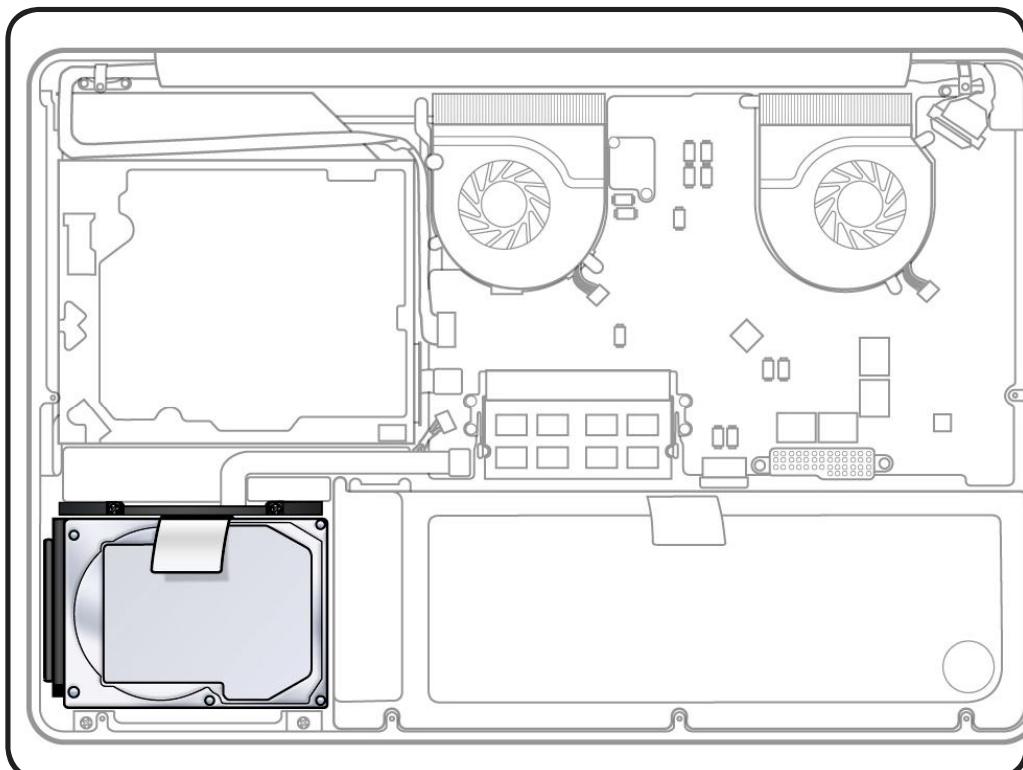
First Steps

Remove:

- Bottom case
- Battery



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



Tools

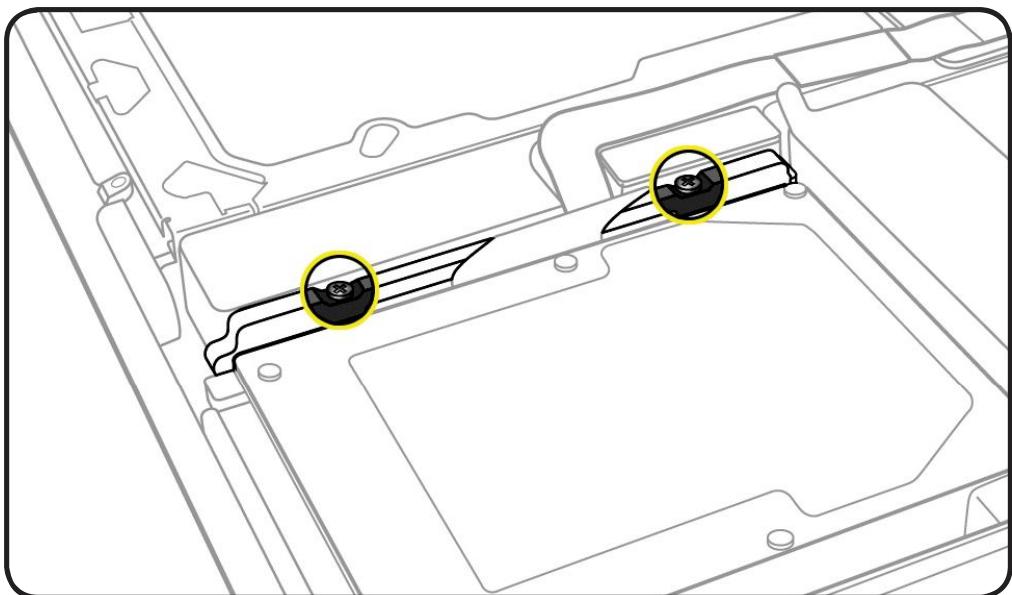
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver





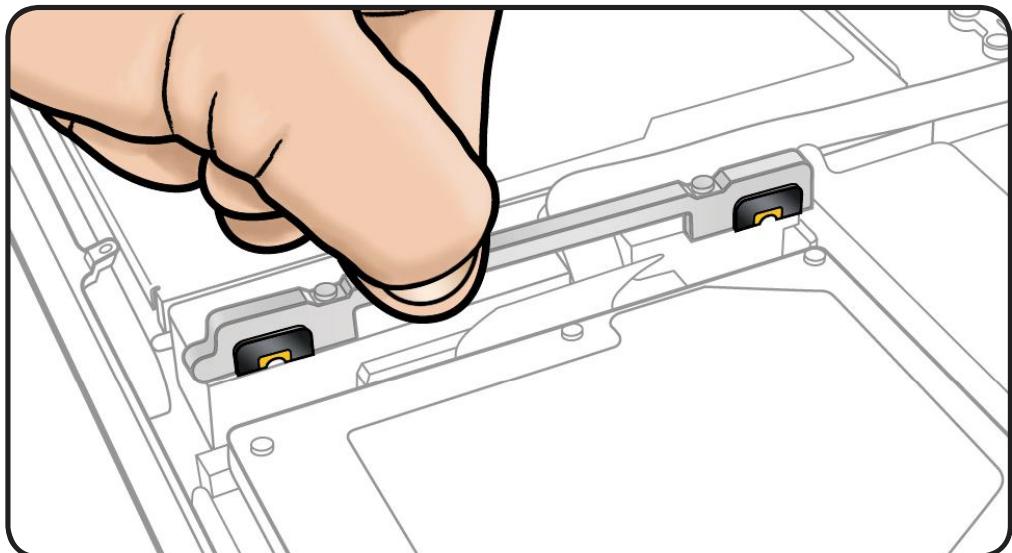
Removal

- 1 Loosen 2 captive screws to remove bracket.



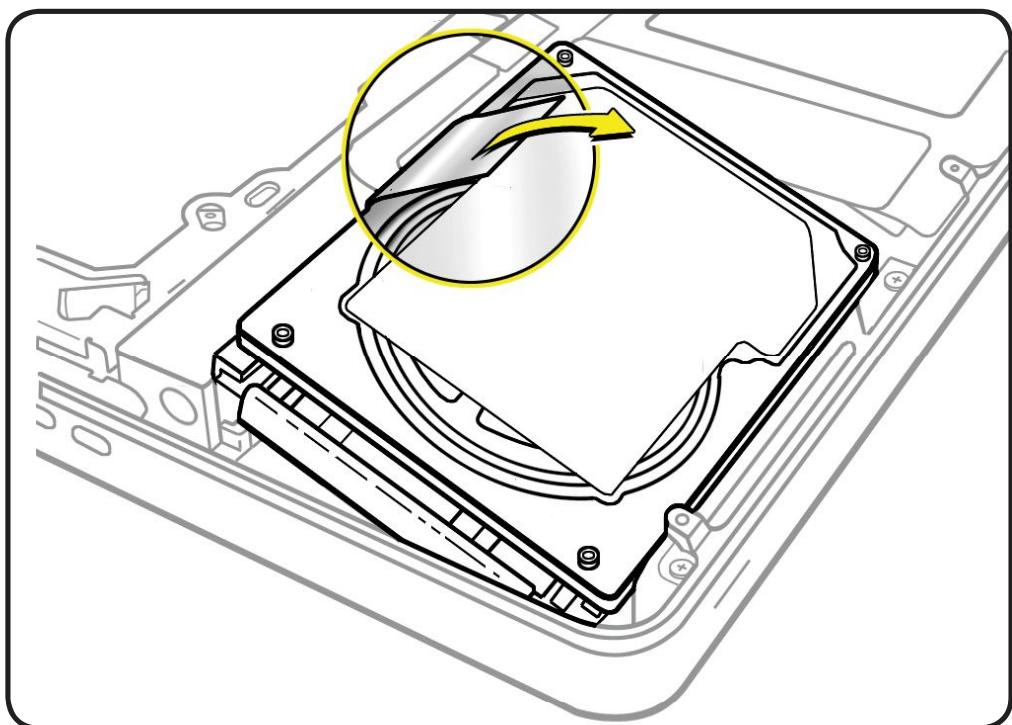
- 2 Lift out bracket.

Replacement Note: Make sure 2 rubber grommets are included in bracket before installing it.



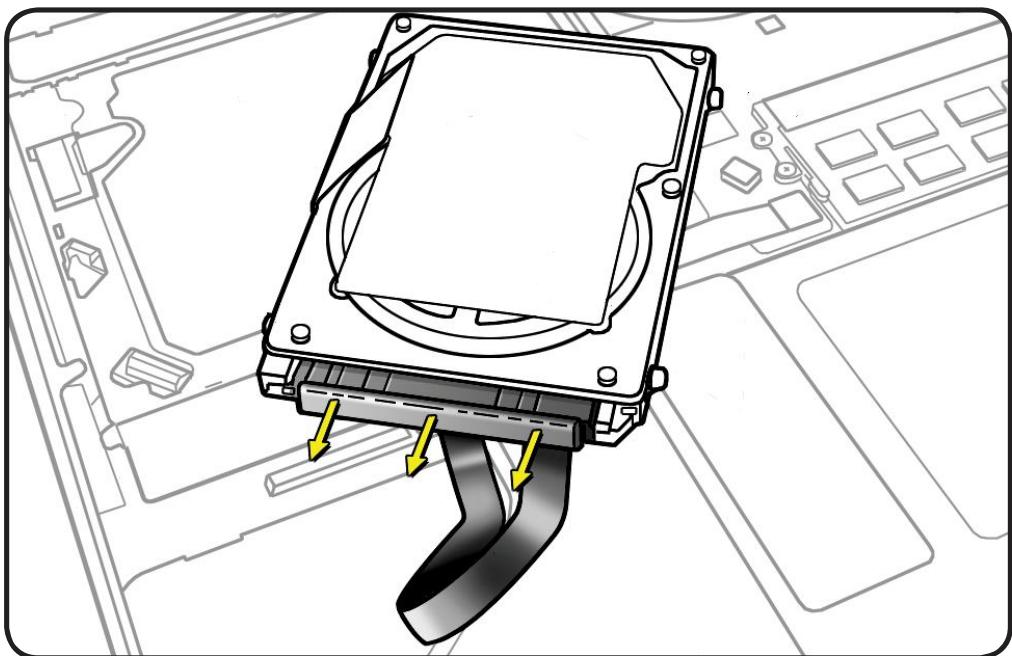


- 3** Use pull tab to tilt hard drive out.



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

- 5** Disconnect hard drive connector.



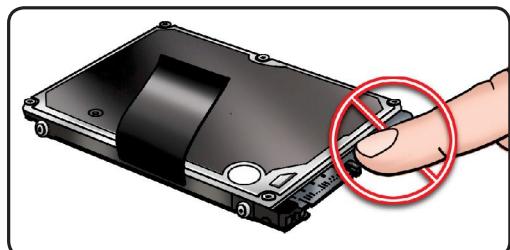


6 Follow safe handling:

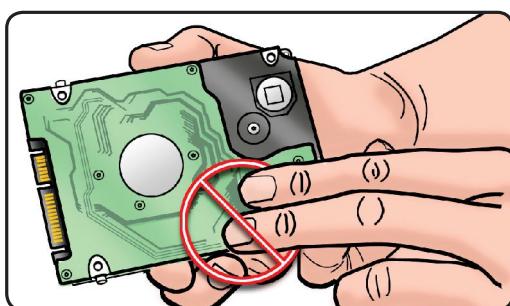
- Do not press drive



- Do not touch connector



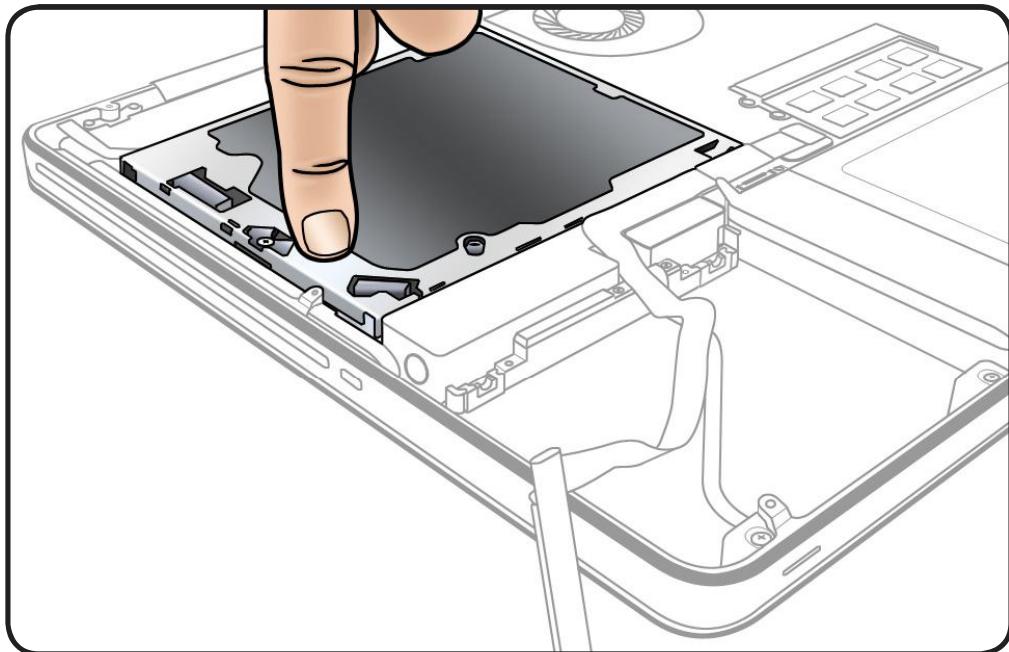
- Do not touch circuitry





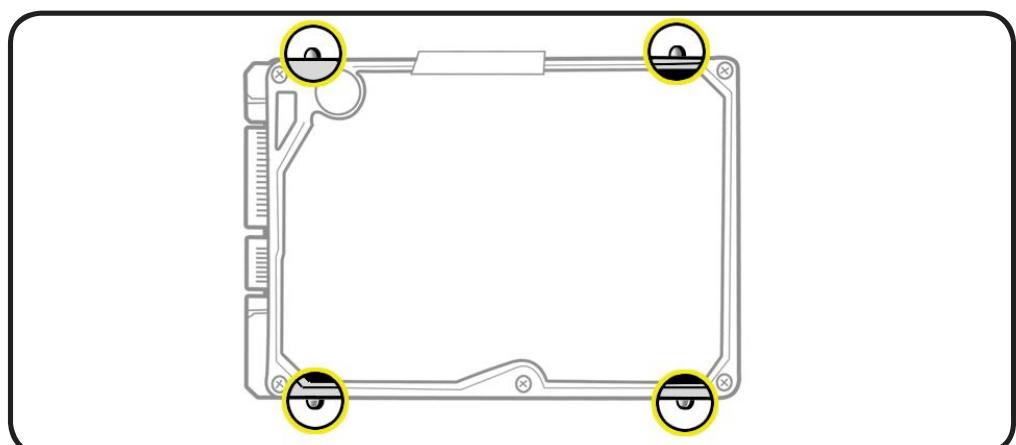
Replacement

- 1 Touch a metal surface to discharge static electricity.

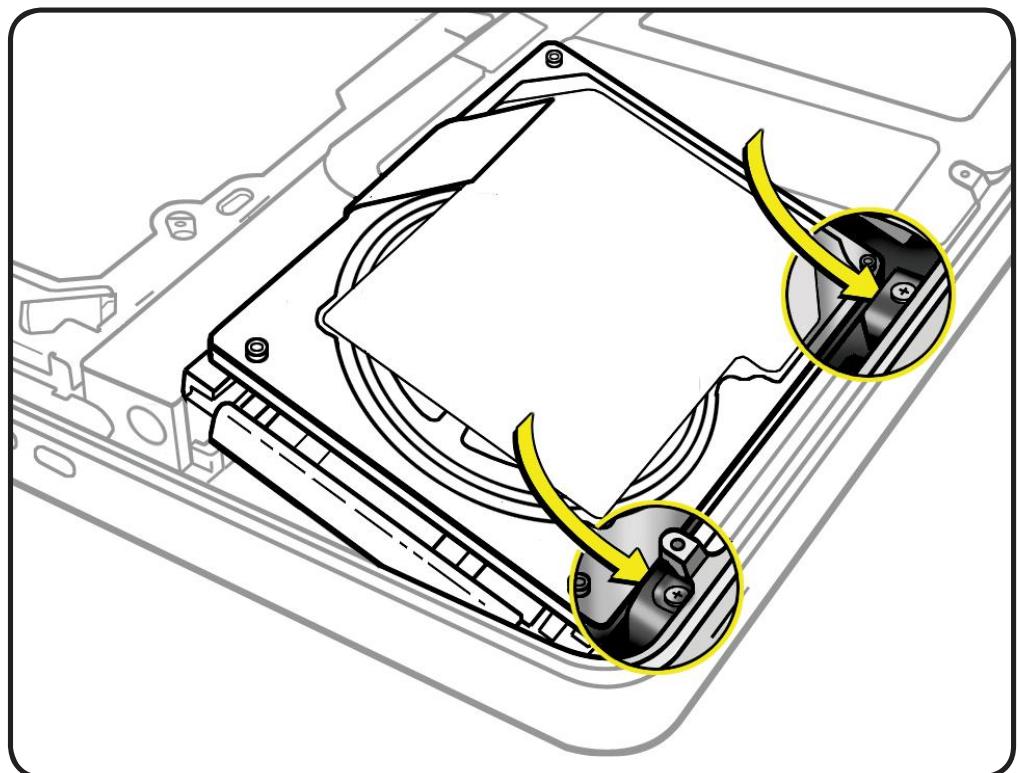


- 2 Make sure 4 Torx T6 mounting screws are installed on the drive.

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. When 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

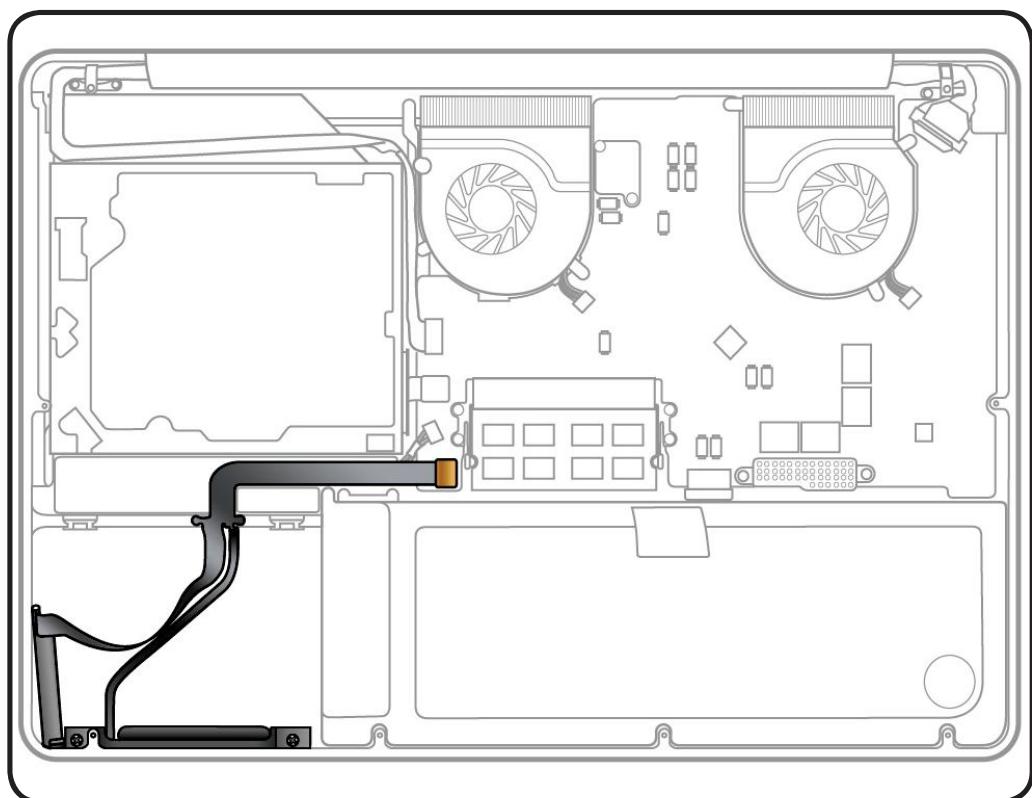
First Steps

Remove:

- Bottom case
- Battery
- Hard drive

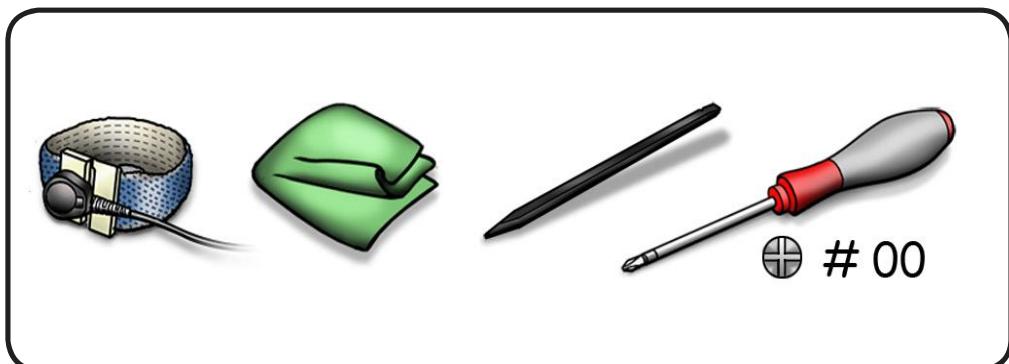


Caution: Make sure data is backed up before removing the hard drive.



Tools

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



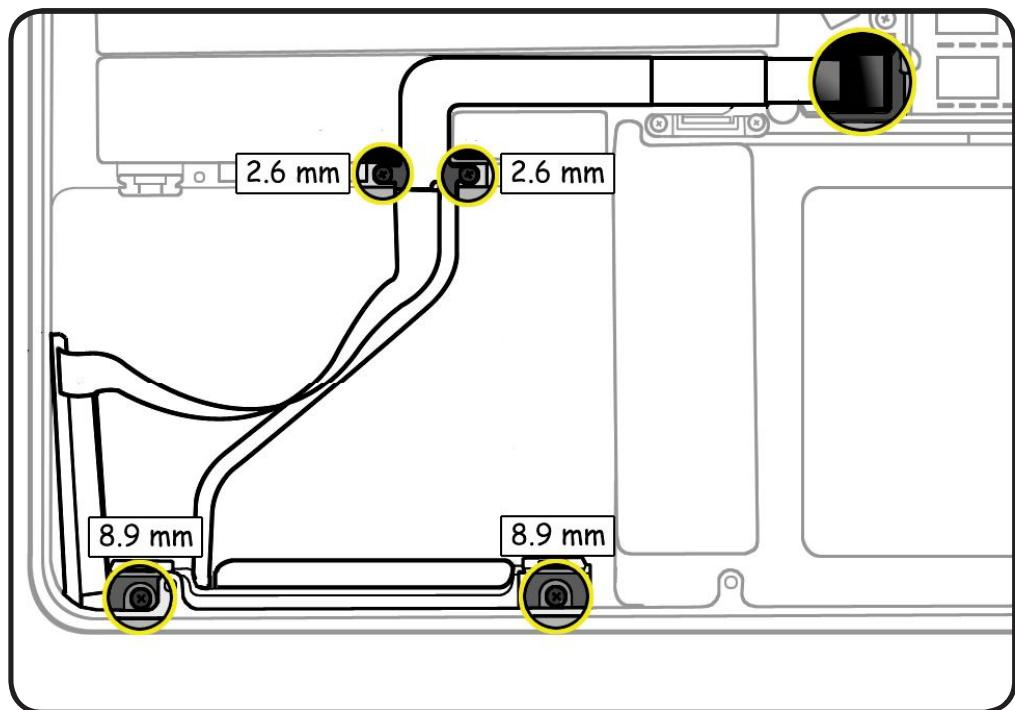


Removal

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.



Memory

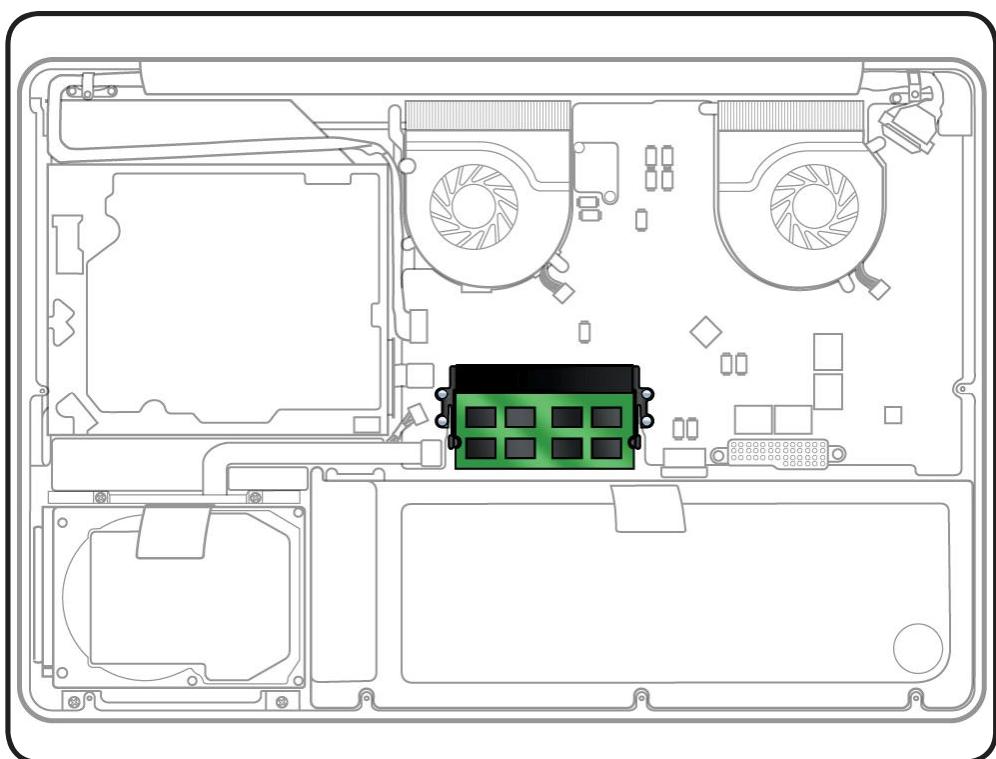
First Steps

Remove:

- Bottom case
- Battery

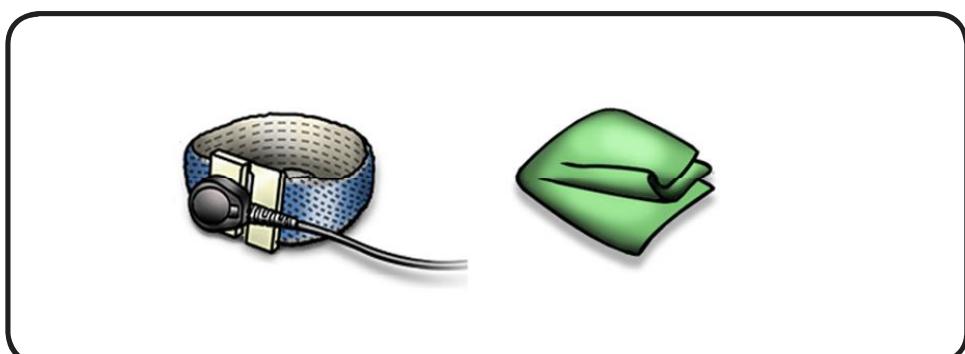


Caution: Avoid touching anything other than the memory area.



Tools

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





Memory Information

Memory cards must be:

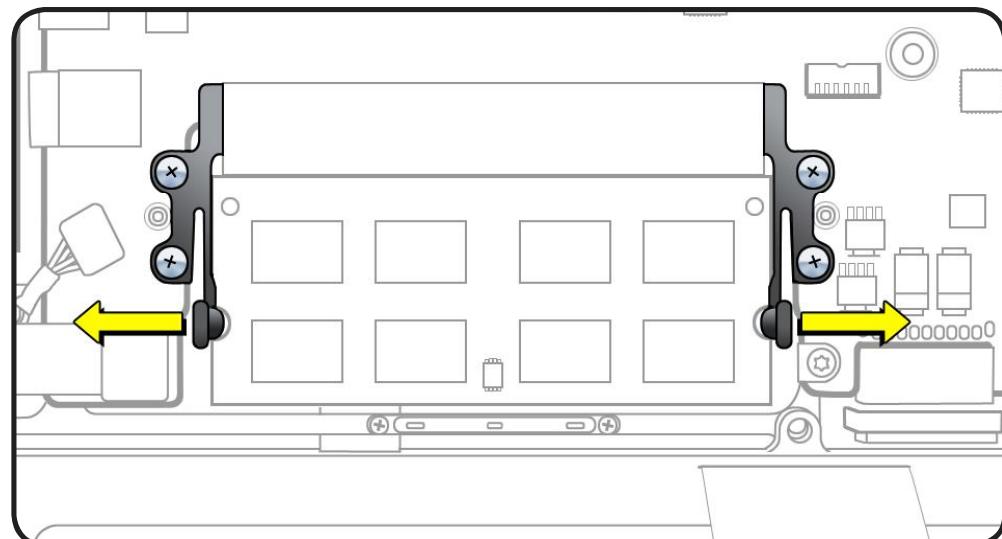
- 1.18 inch (30 mm)
- 2 GB or 4 GB
- 204-pin
- PC-8500 DDR3, 1066 MHz RAM

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.

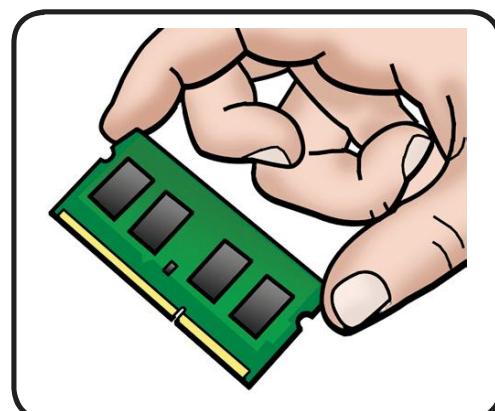
Make sure you see the half-circle notches on the memory card. If not, press the ejection levers again.



- 2 Remove memory card from the slot.

- 3 Hold the card by the edges.

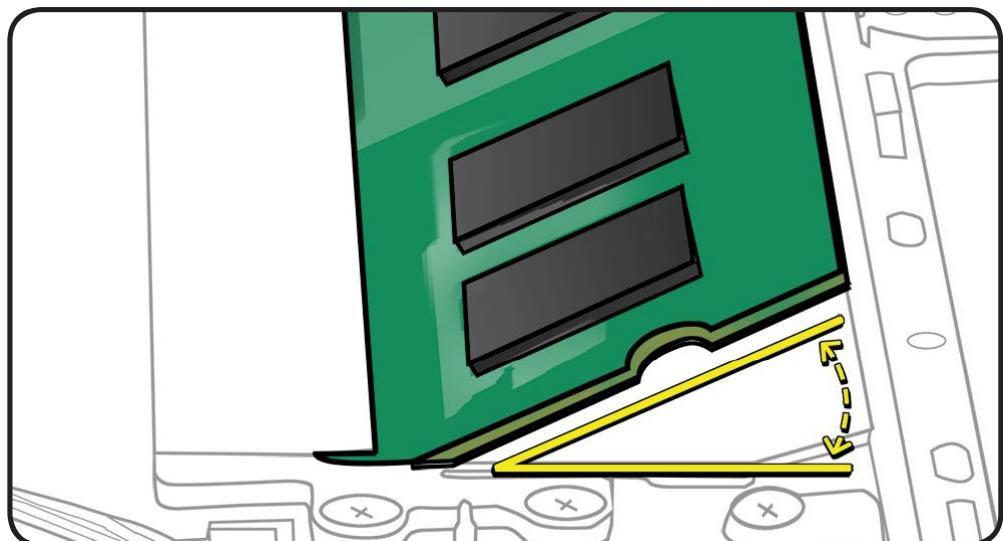
- 4 Do not touch the gold connectors.





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.



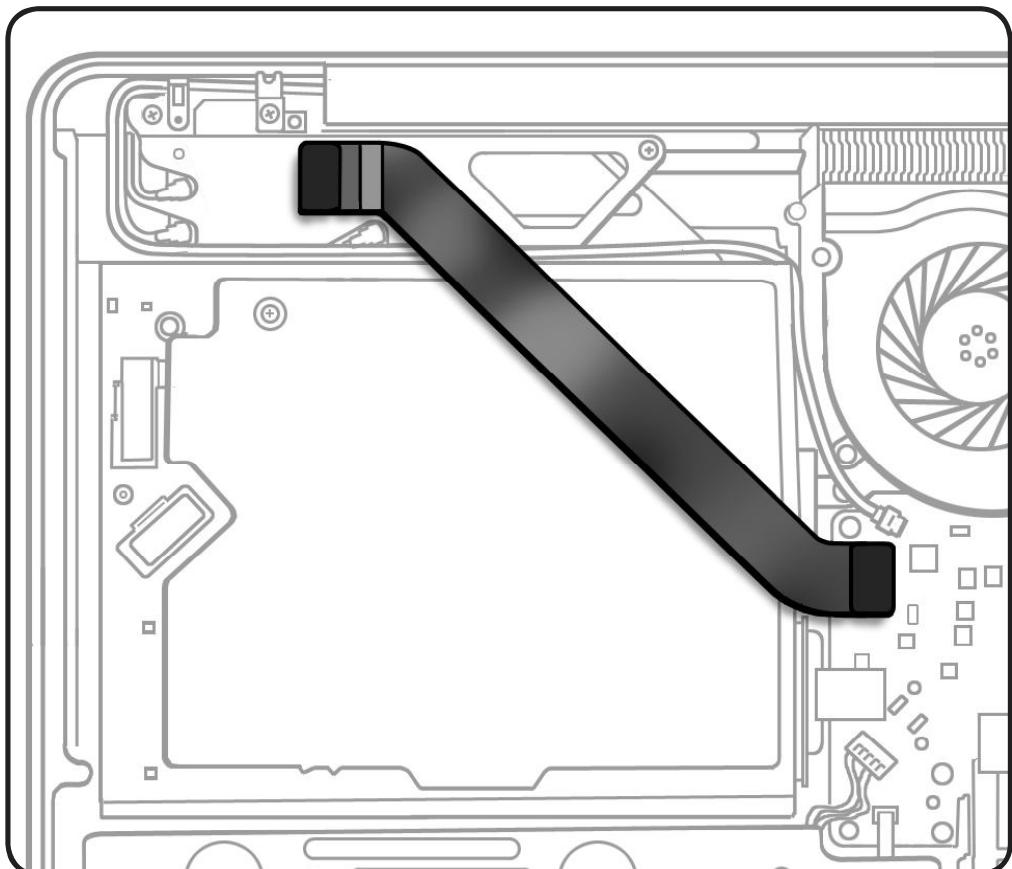


AirPort/Bluetooth Flex Cable

First Steps

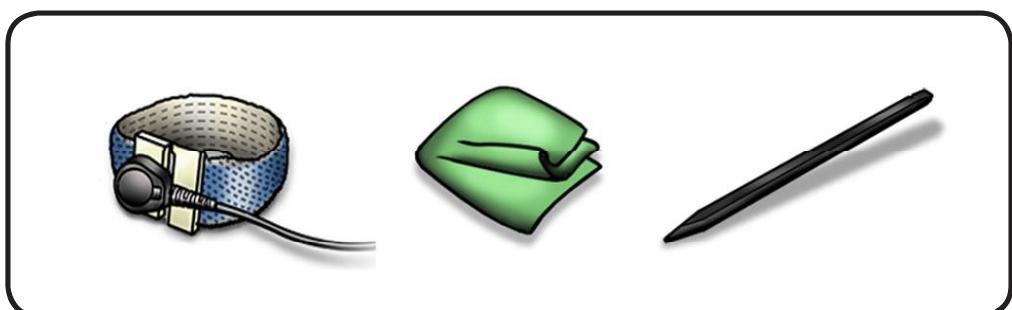
Remove:

- Bottom case
- Battery



Tools

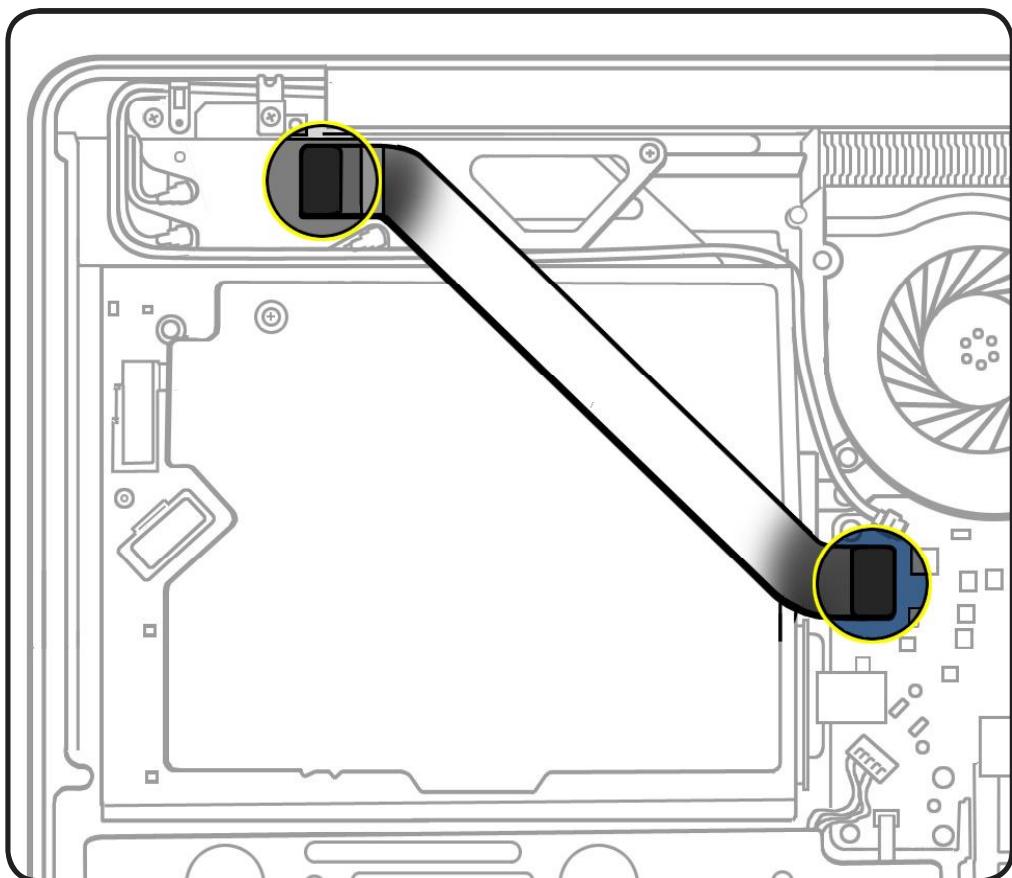
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick





Removal

- 1** Disconnect both ends of flex cable.
- 2** Remove cable from bottom case.



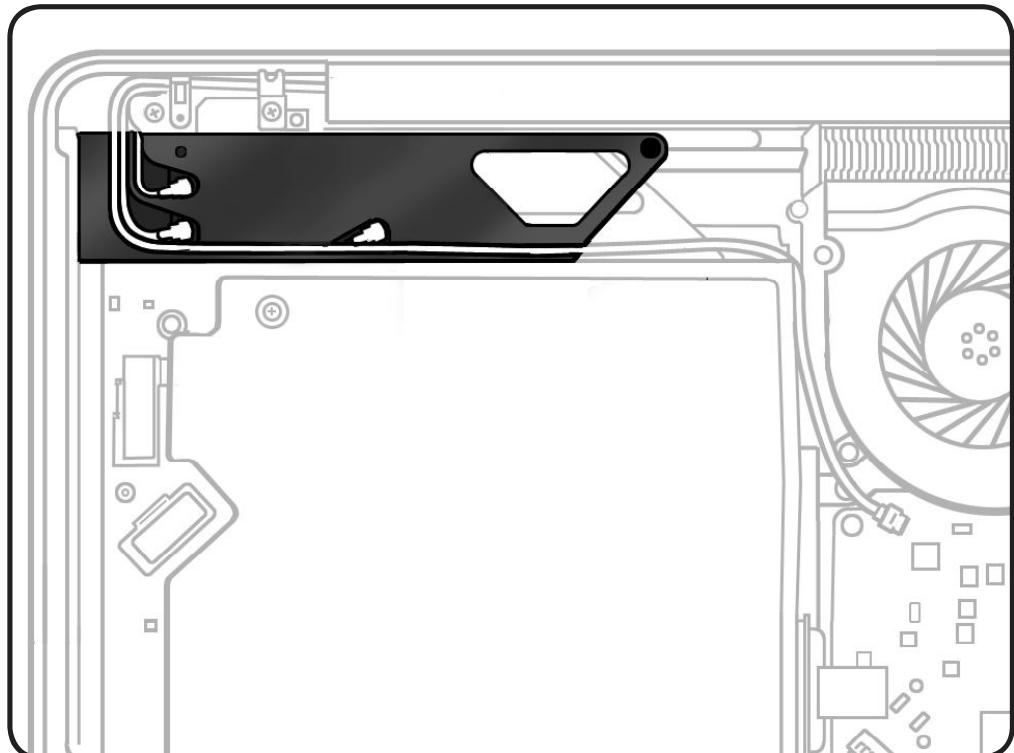


AirPort/Bluetooth Card With Holder

First Steps

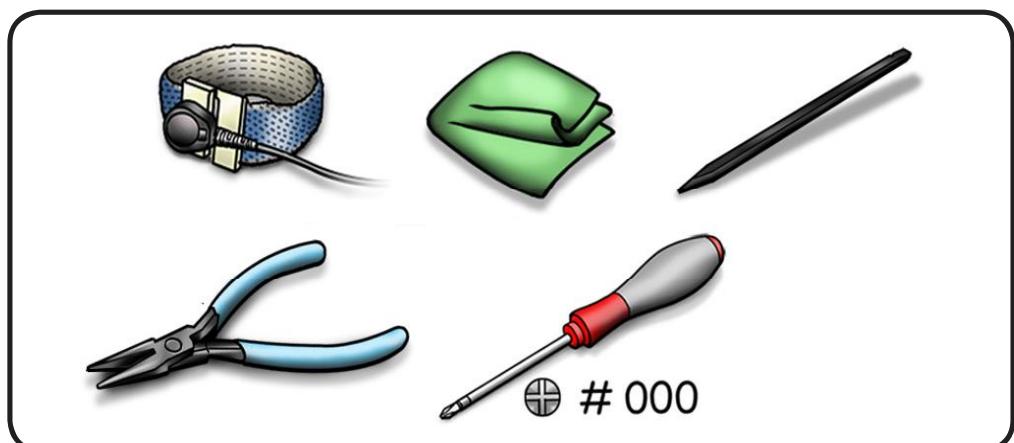
Remove:

- Bottom case
- Battery
- AirPort/Bluetooth flex cable



Tools

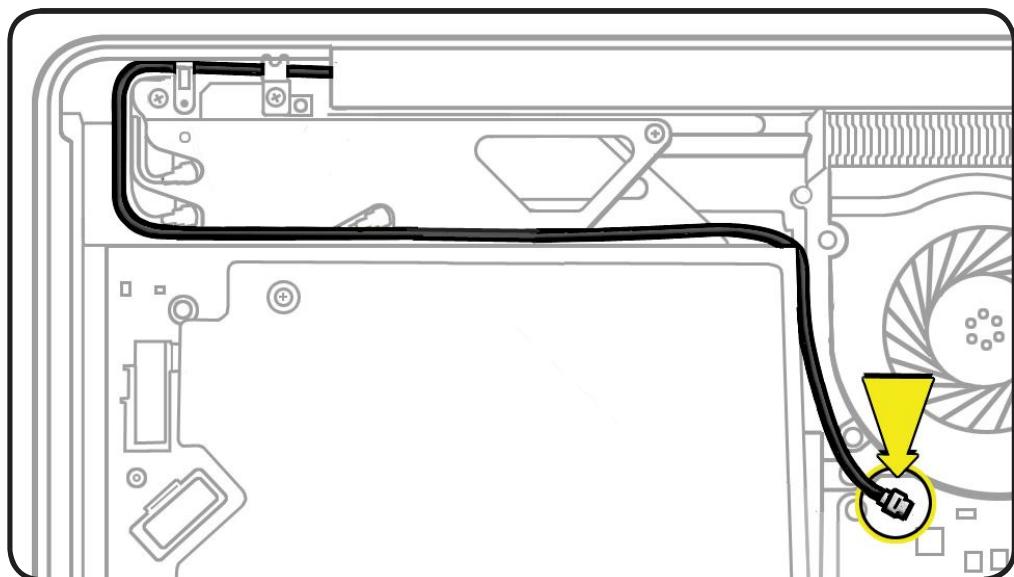
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
- Needlenose pliers or tweezers
- Black stick (1 or 2)



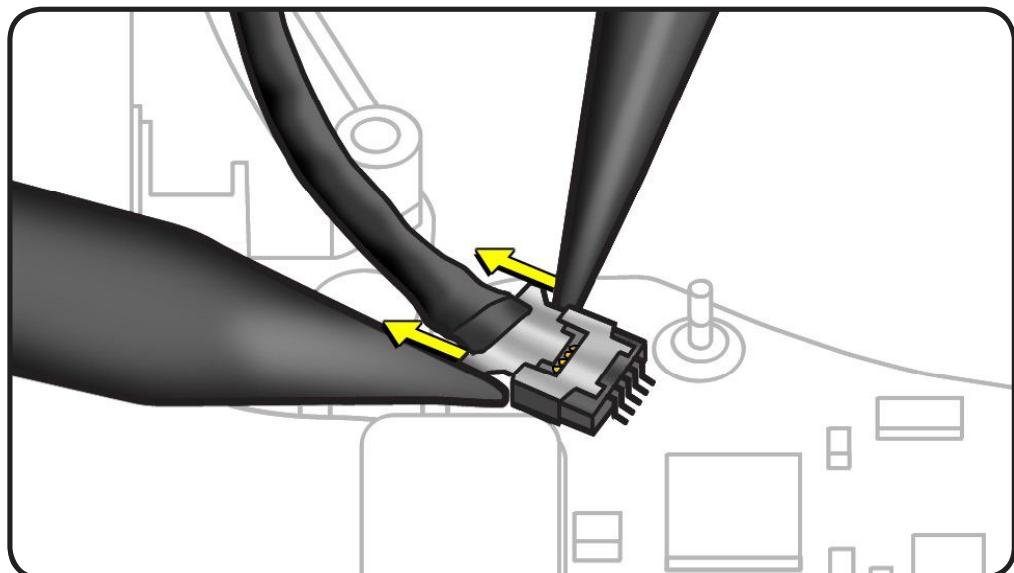


Removal

- 1 Disconnect camera cable from logic board.



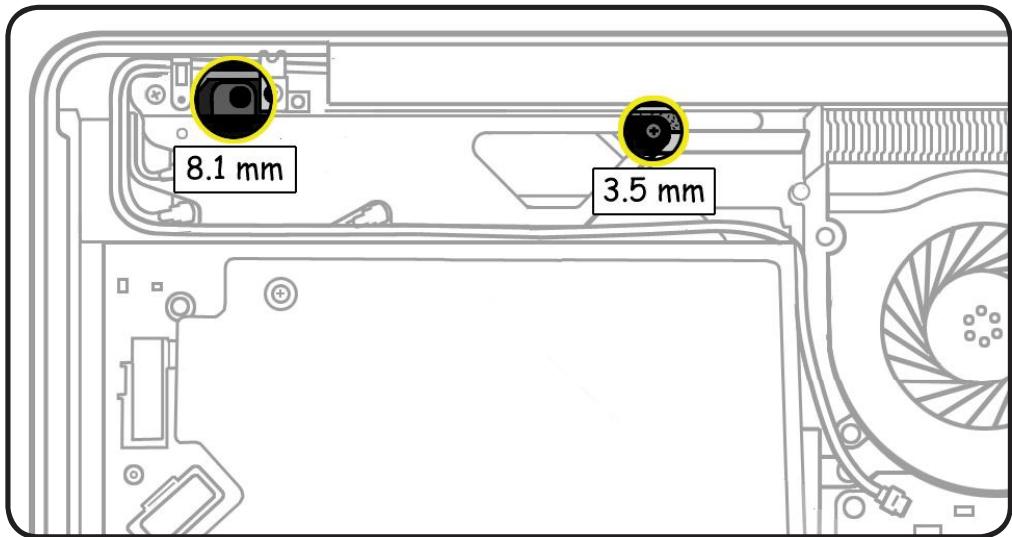
Note: When disconnecting camera cable, use two black sticks (or one black stick, alternating sides) to disconnect cable evenly.



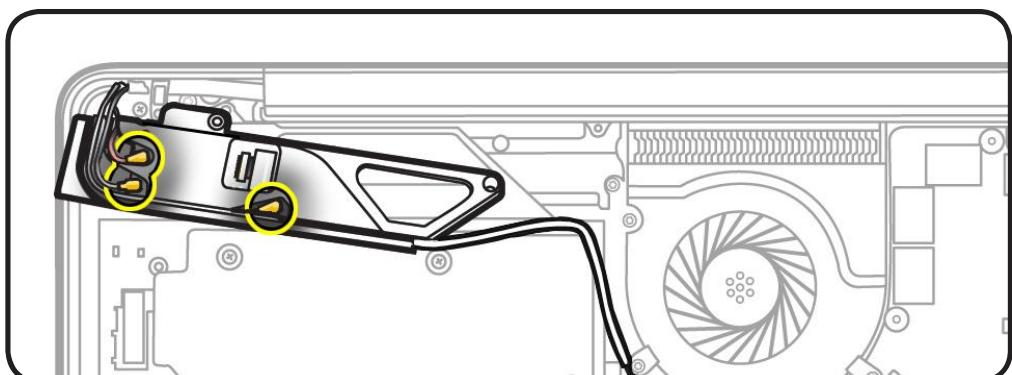


2 Remove 2 screws:

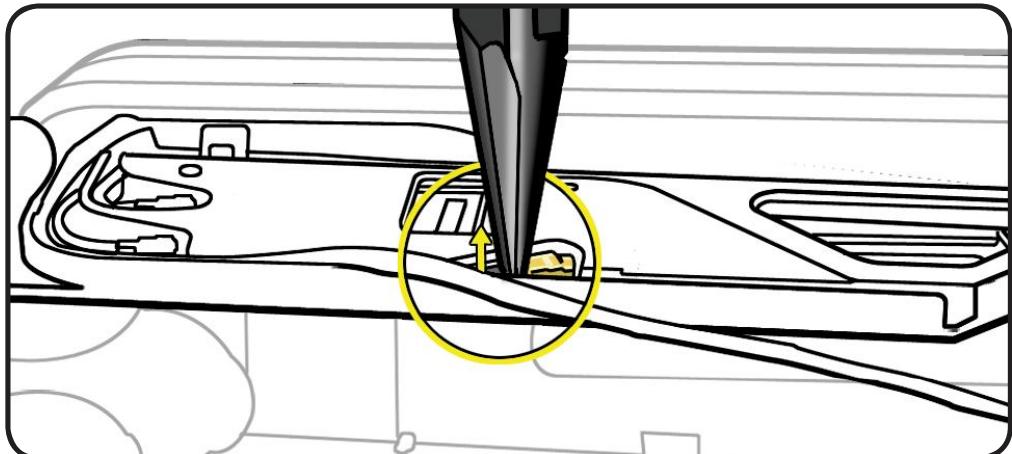
- 1 (8.1 mm) 922-9107
- 1 (3.5 mm) 922-8974



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

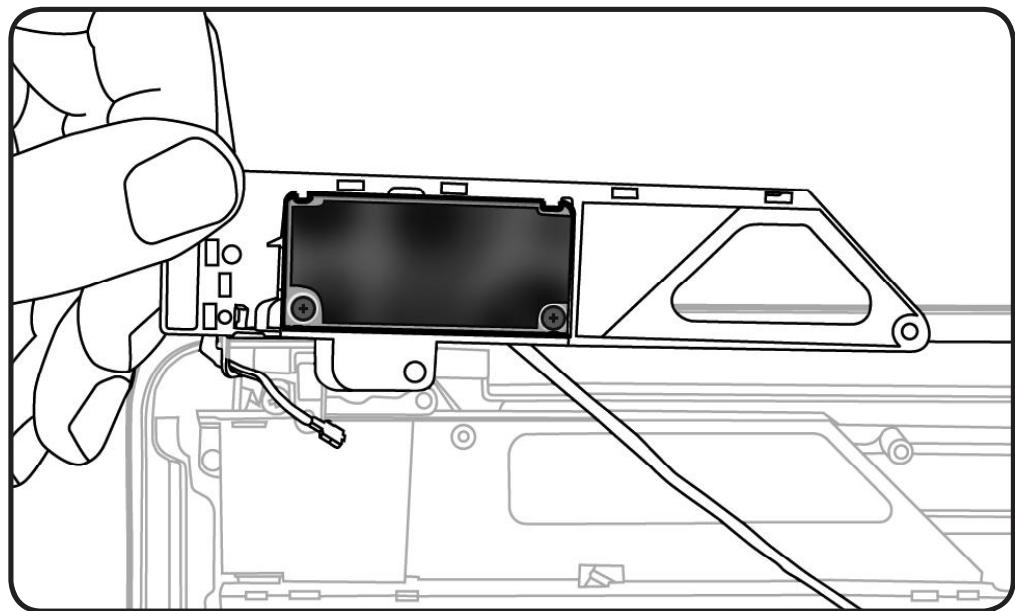


Note: Use needlenose pliers or tweezers to lift metal connector of each cable straight up

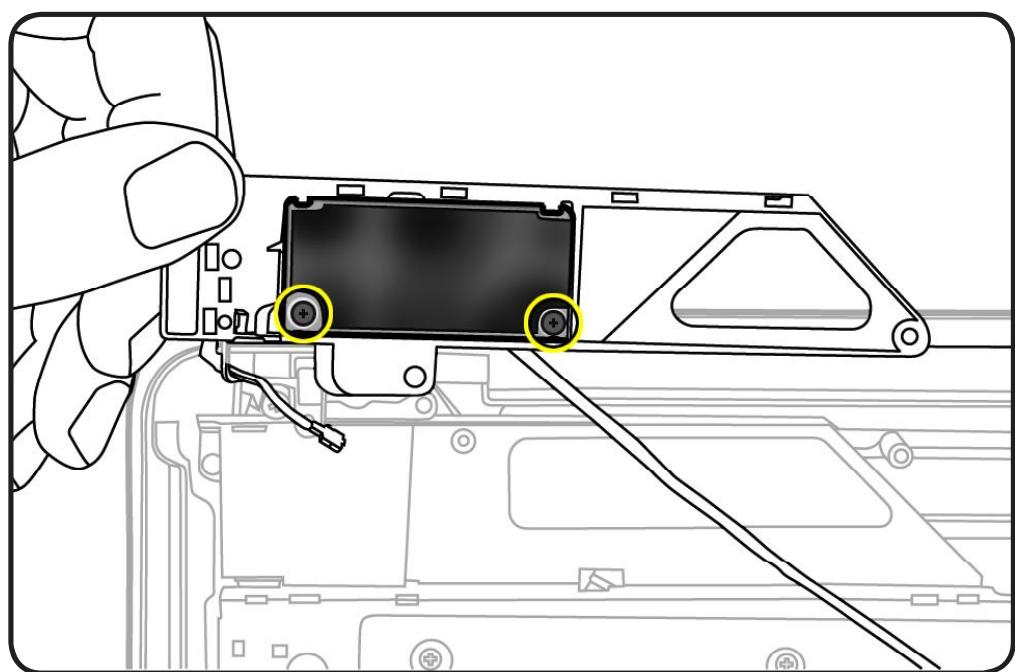




- 4 Rotate card holder back from bottom case.

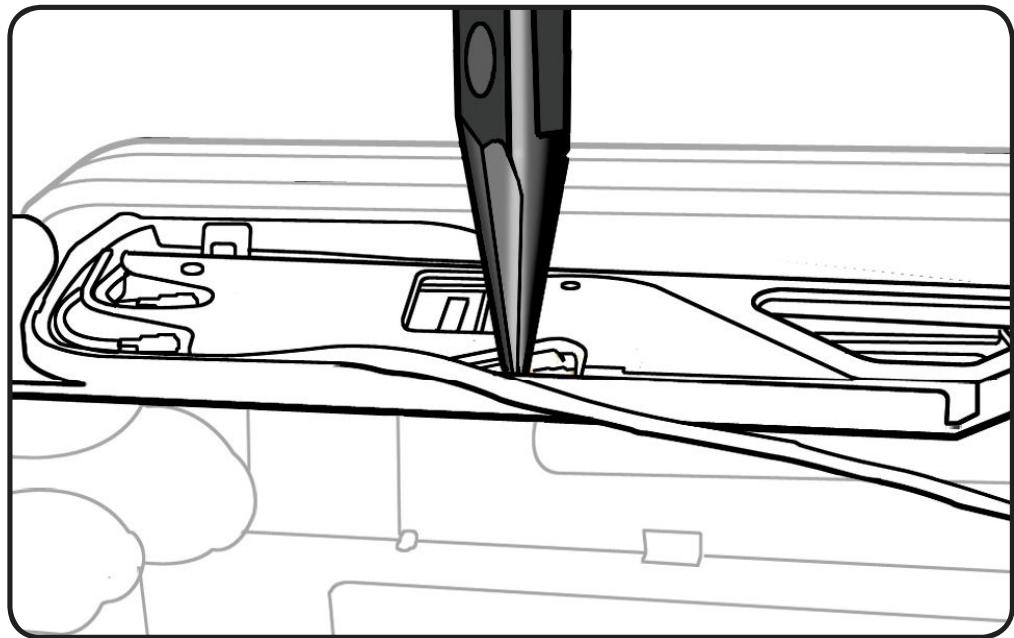


- 5 To remove card from holder, remove 2 (2.5 mm) 922-9200 screws and lift card from holder.



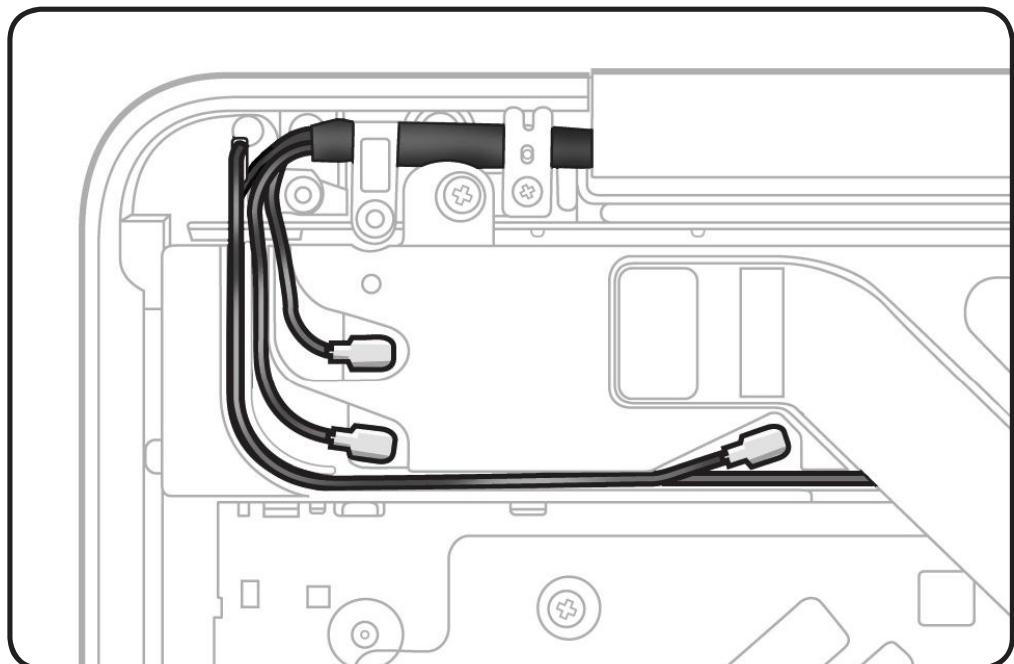


- 6 If you are removing card holder from top case, use a black stick or needlenose pliers to pry cables from the holder's channels, and remove card holder from case.



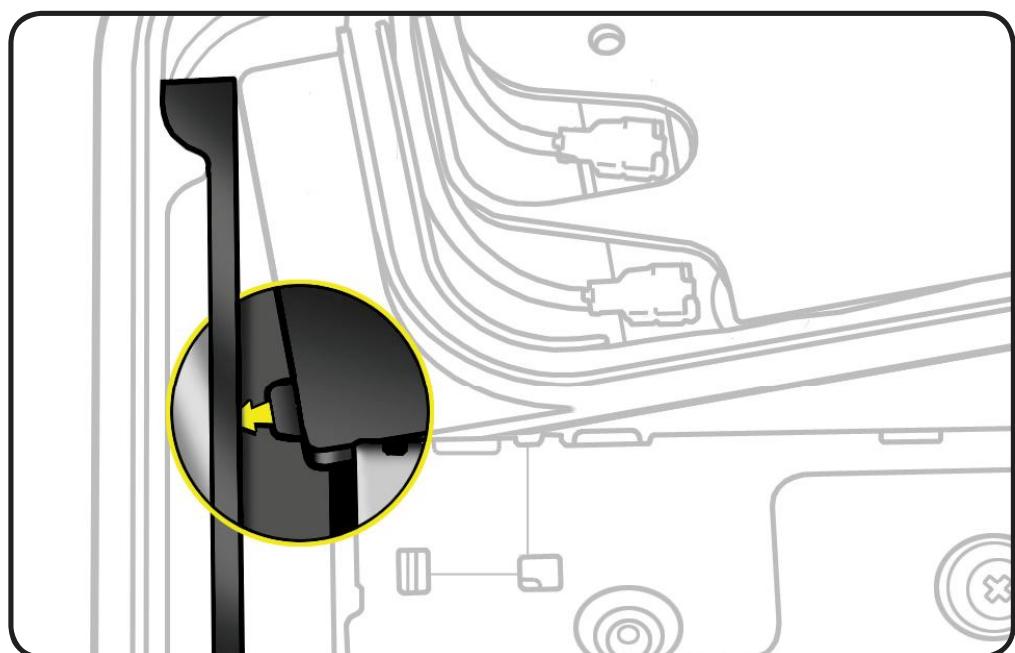
Replacement Note:

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

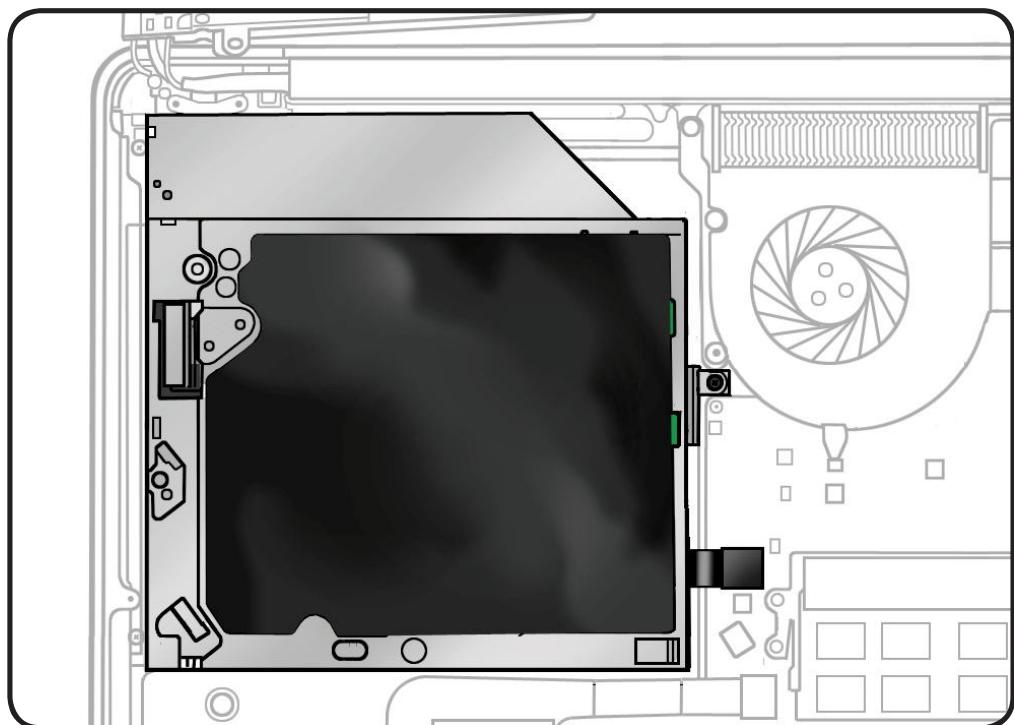
First Steps

Do the following:

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

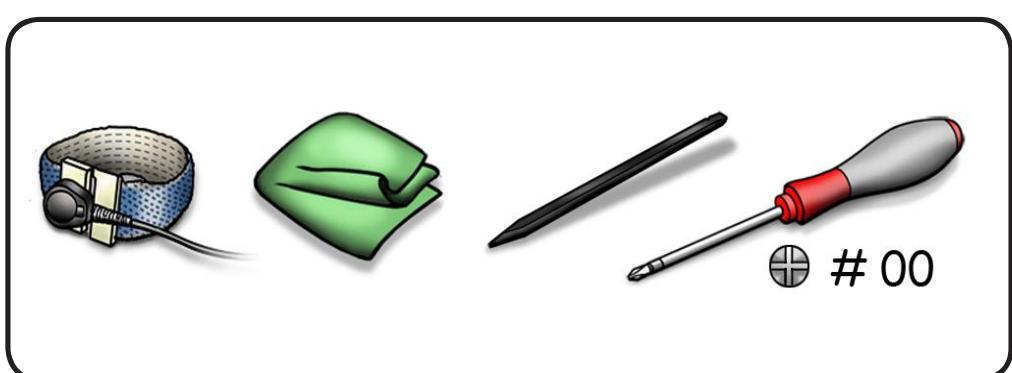


Caution: The optical drive
is very fragile. Handle by
the sides only.



Tools

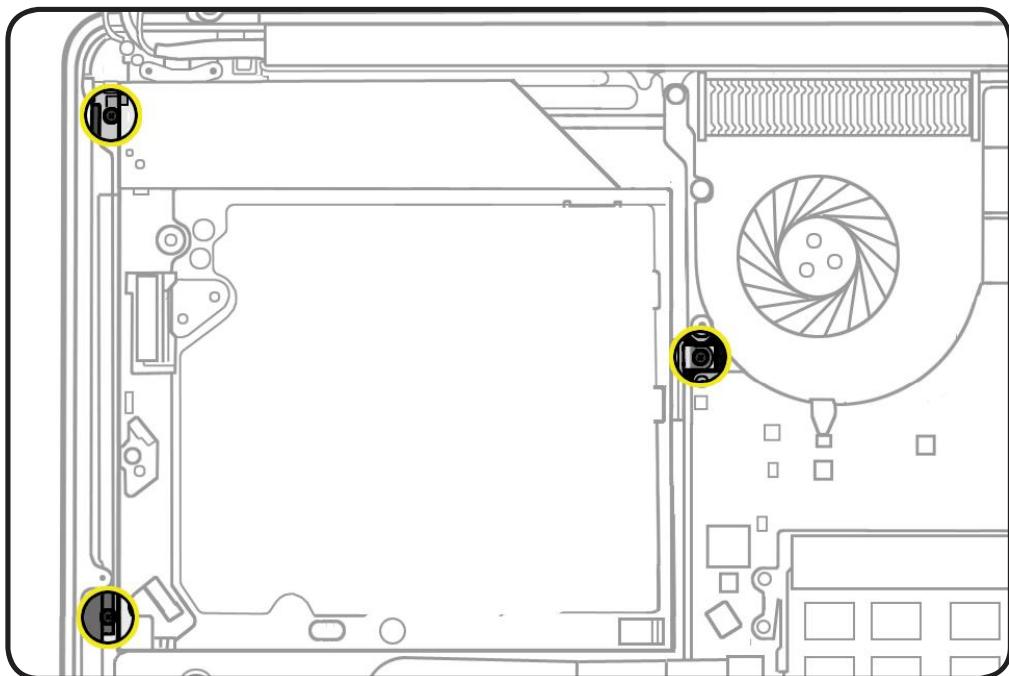
- Clean, soft, lint-free
cloth
- ESD wrist strap and
mat
- Magnetized Phillips
#00 screwdriver
- Black stick





Removal

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



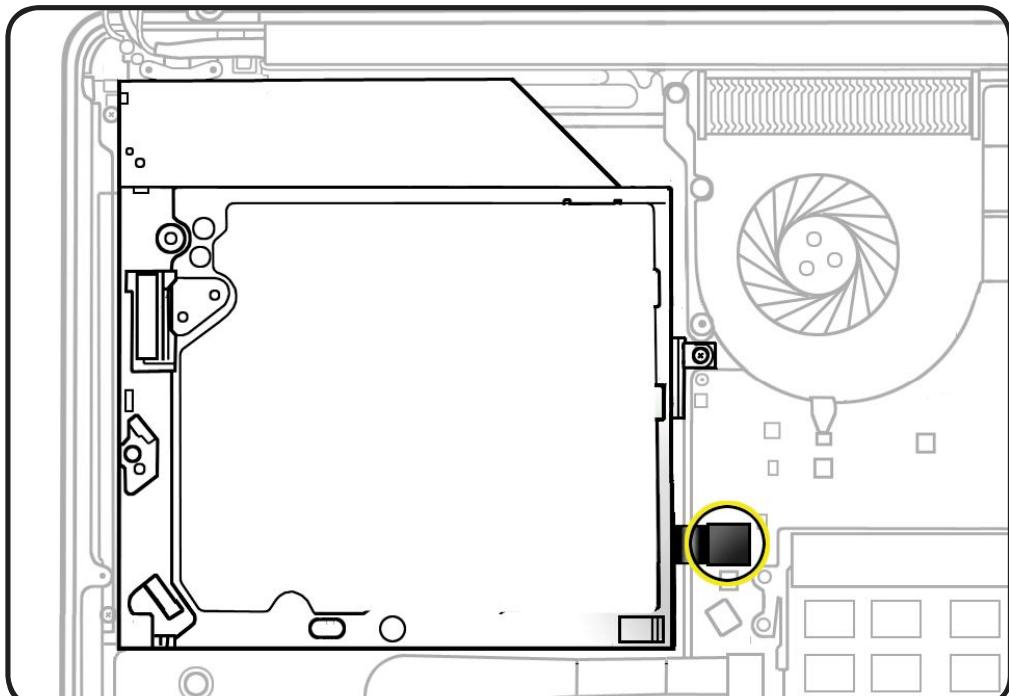
- 2 With a black stick, carefully pry optical cable straight up and off logic board.



**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

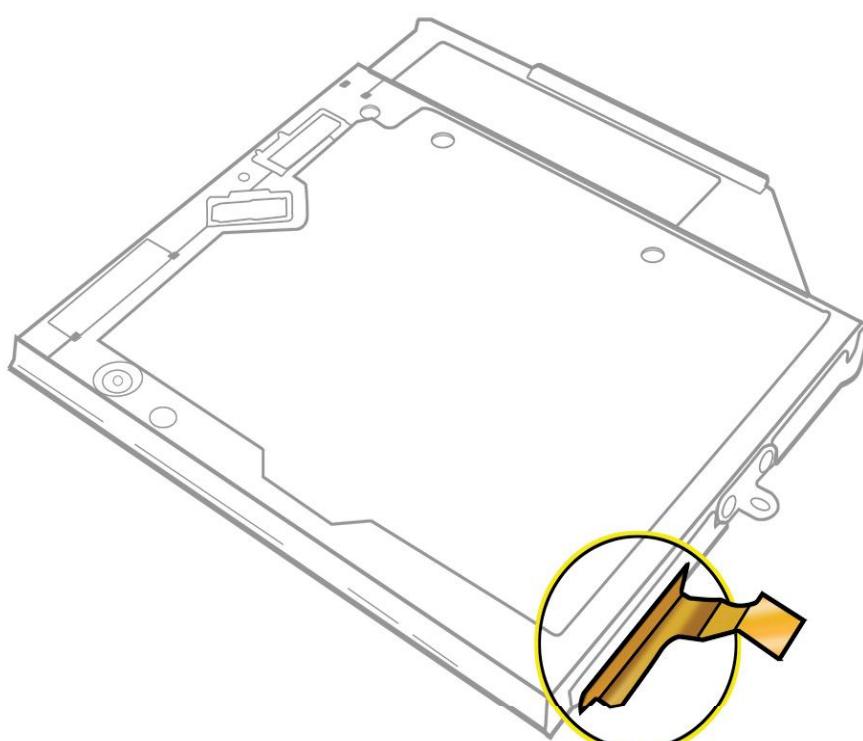
First Steps

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

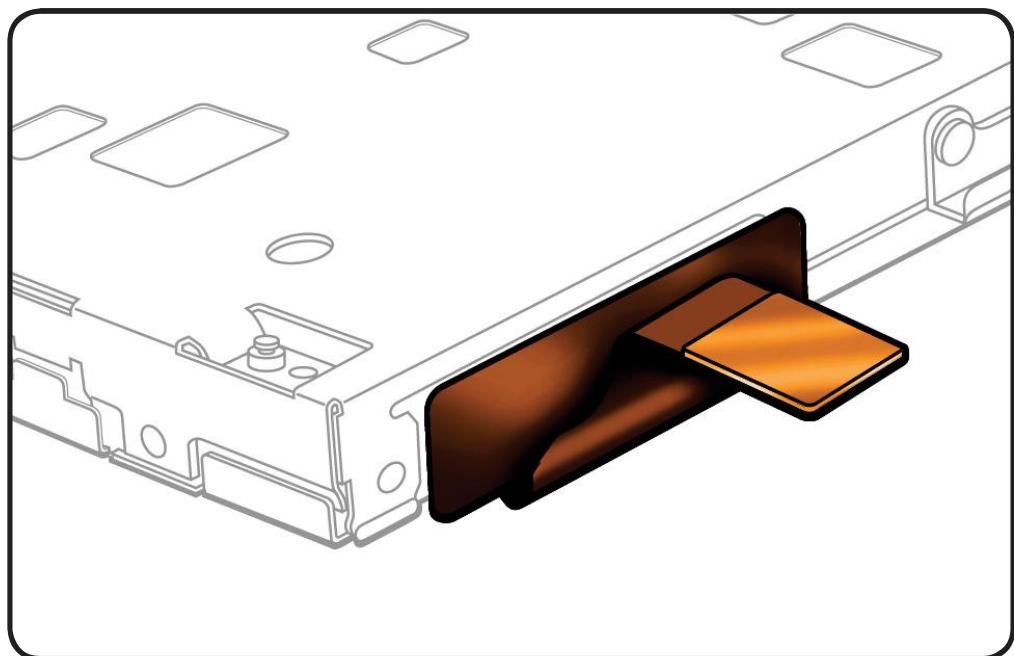
- Clean, soft, lint-free
cloth
- ESD wrist strap and
mat
- Black stick





Removal

With a black stick or fingernail, carefully wiggle flex cable off optical drive.



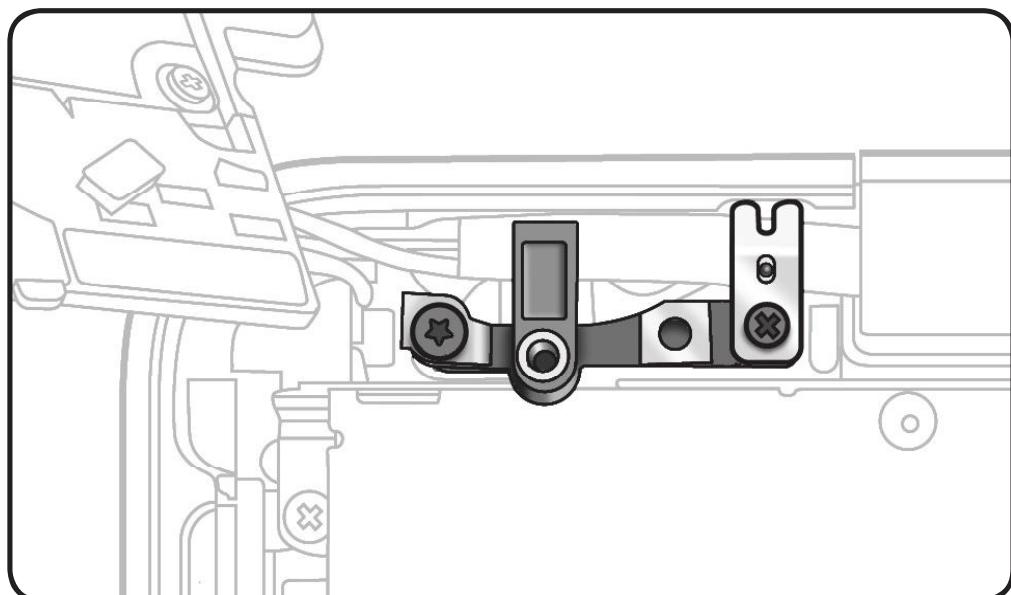


Camera Cable Guide

First Steps

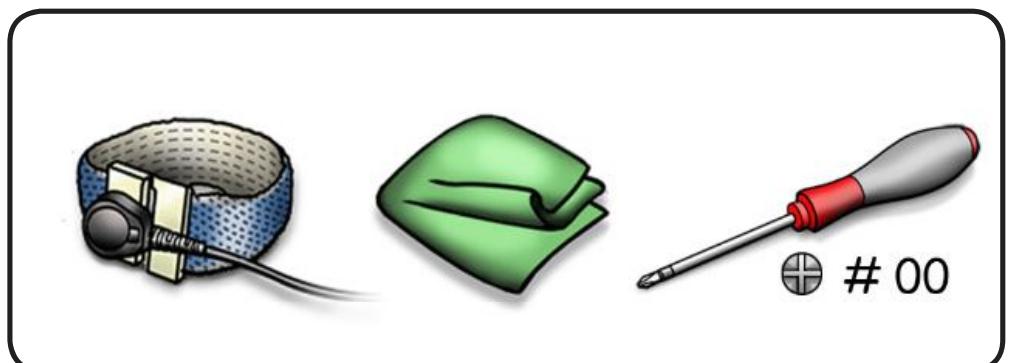
Do the following:

- 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



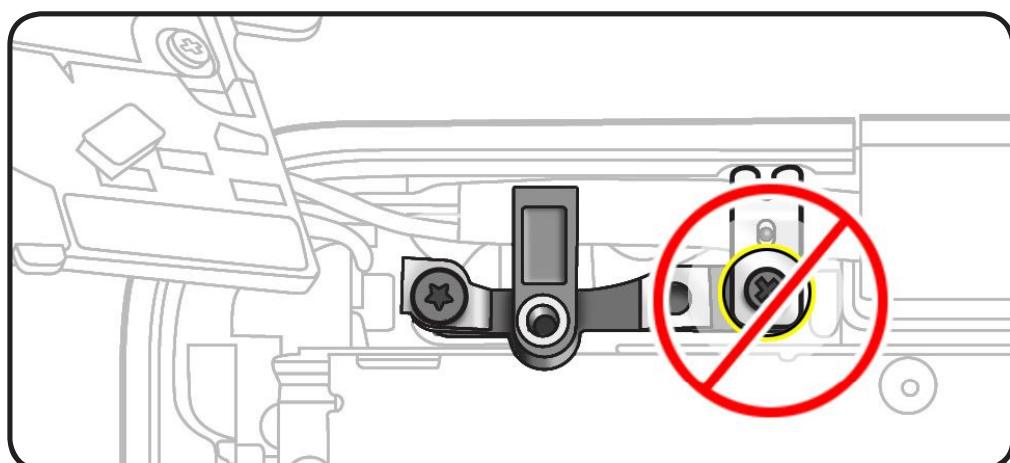
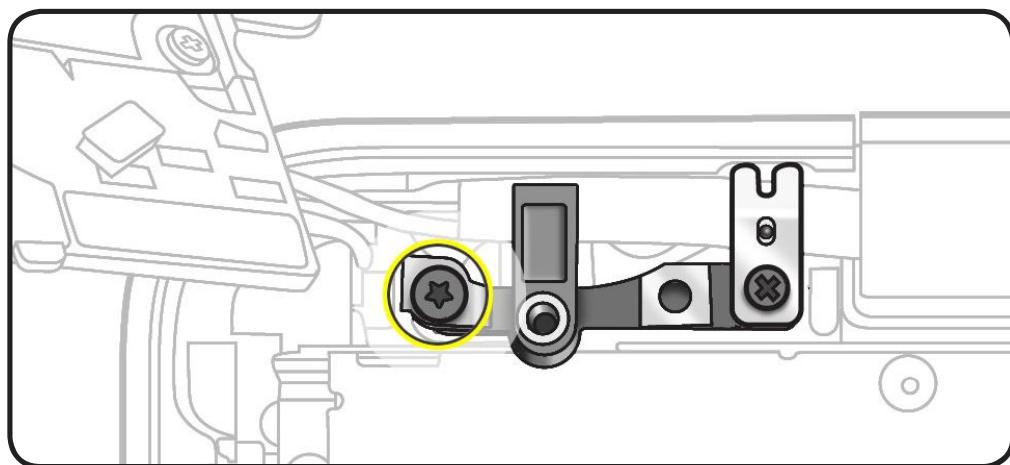


Removal

- 1 Remove 8.1 mm (922-9107) screw.
- 2 Remove cable guide assembly from case.

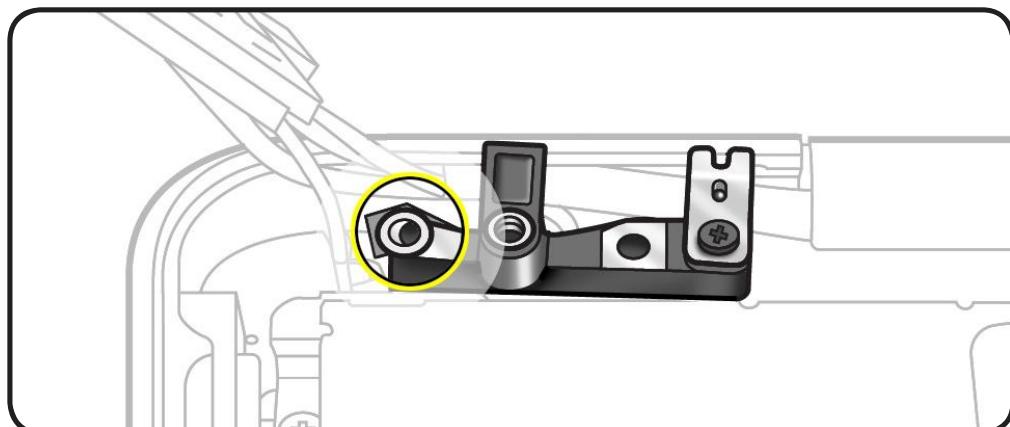


Important: When removing the camera cable guide, do NOT remove the screw that secures the guide's grounding clip. The clip is delicate and should remain with the guide. If the clip is damaged, install a new cable guide.



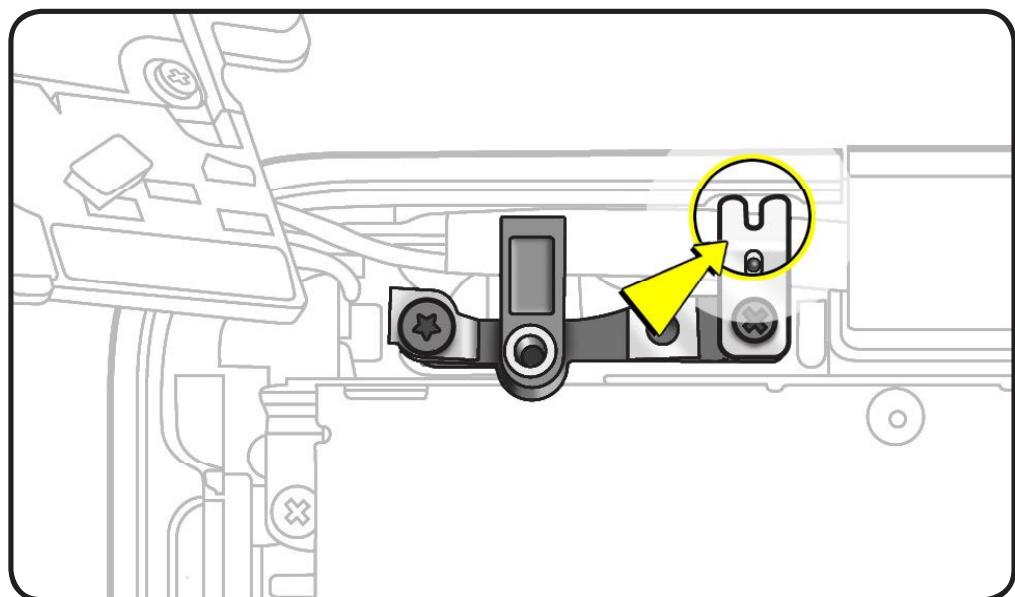
Replacement Note: Be sure to anchor ground tab when reinstalling cable guide. Check that

- 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.



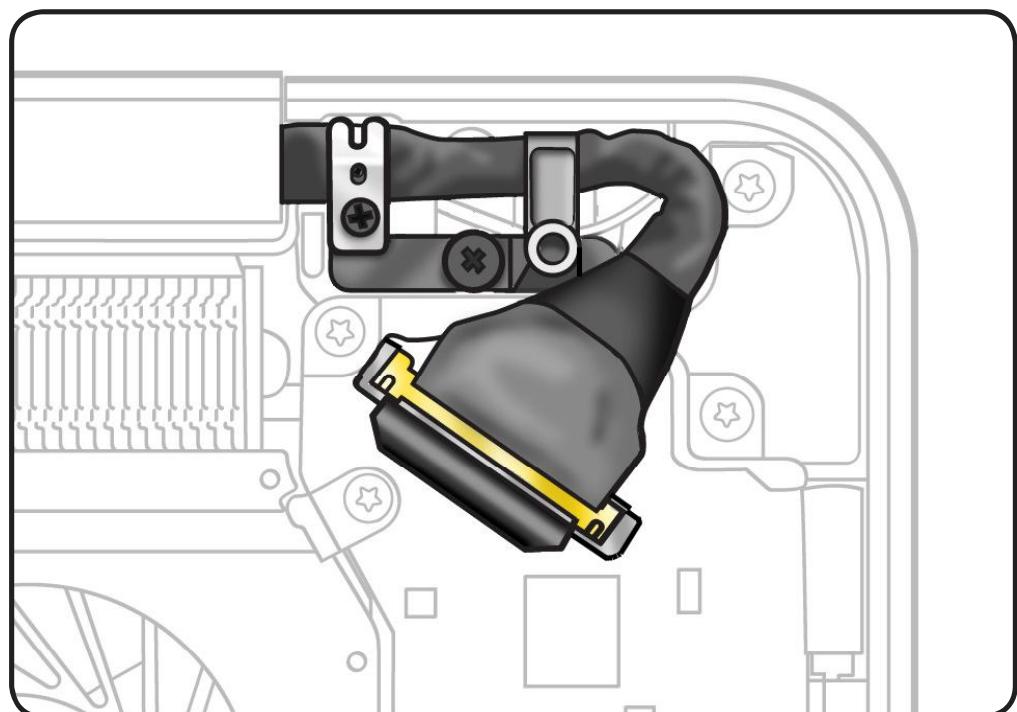


LVDS Cable Guide

First Steps

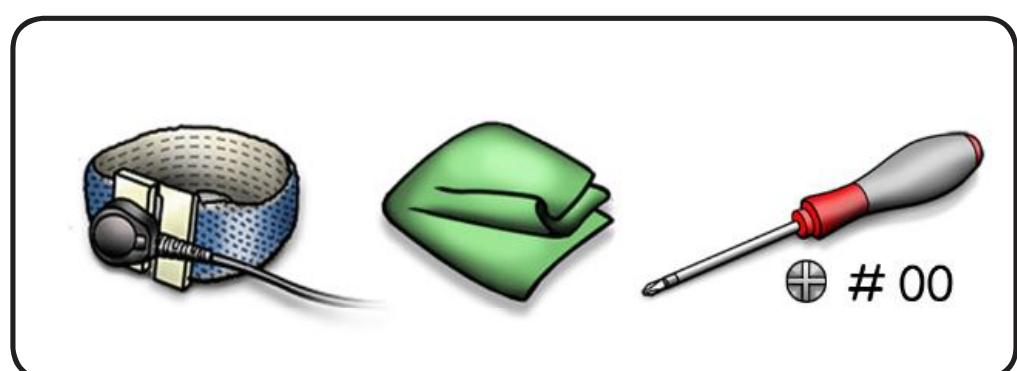
Remove:

- Bottom case
- Battery



Tools

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





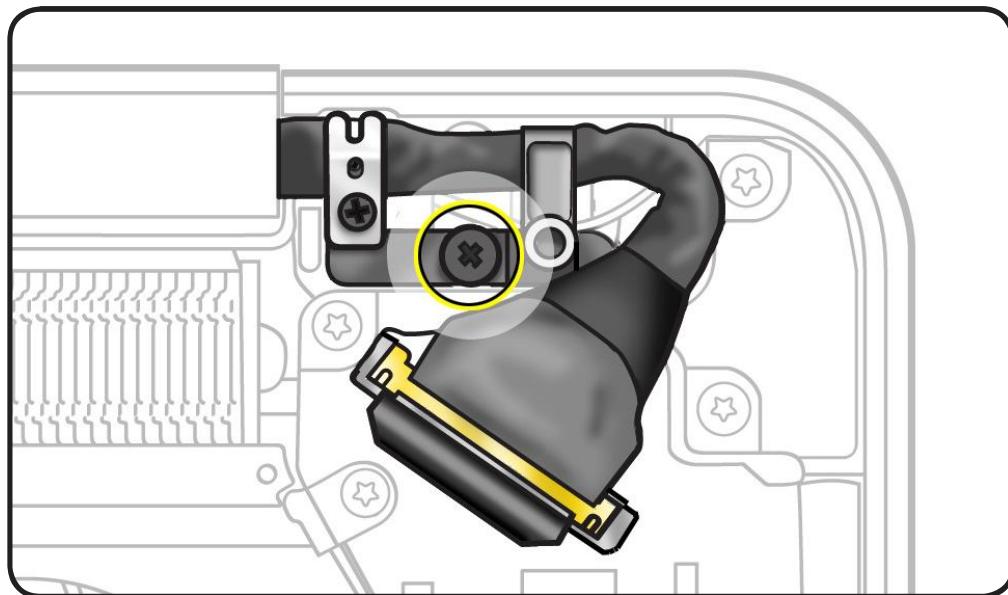
Removal

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

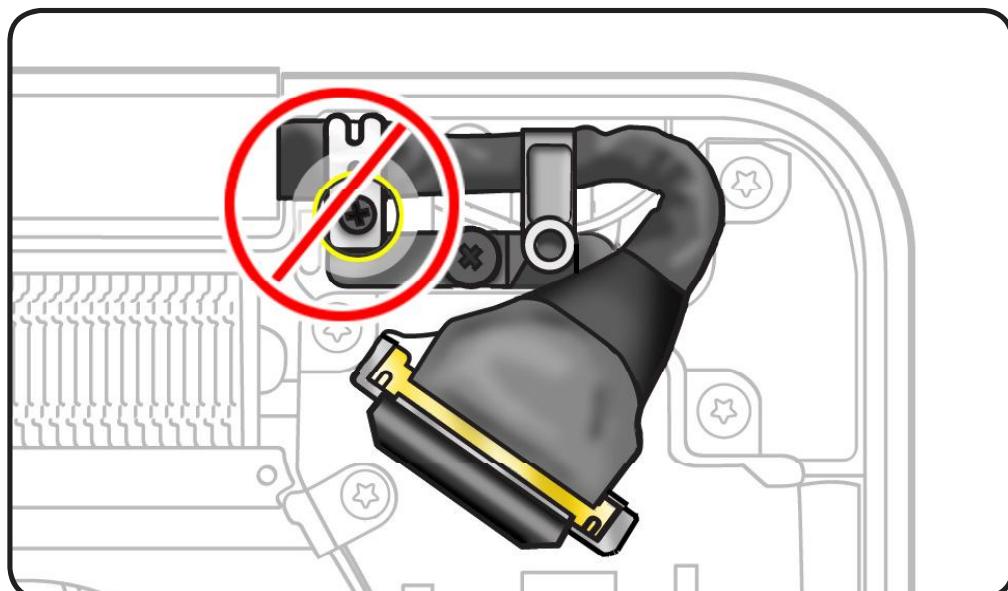
Replacement Note:

Be sure to anchor the ground tab when reinstalling the screw.

- 2 Remove cable guide assembly from case.

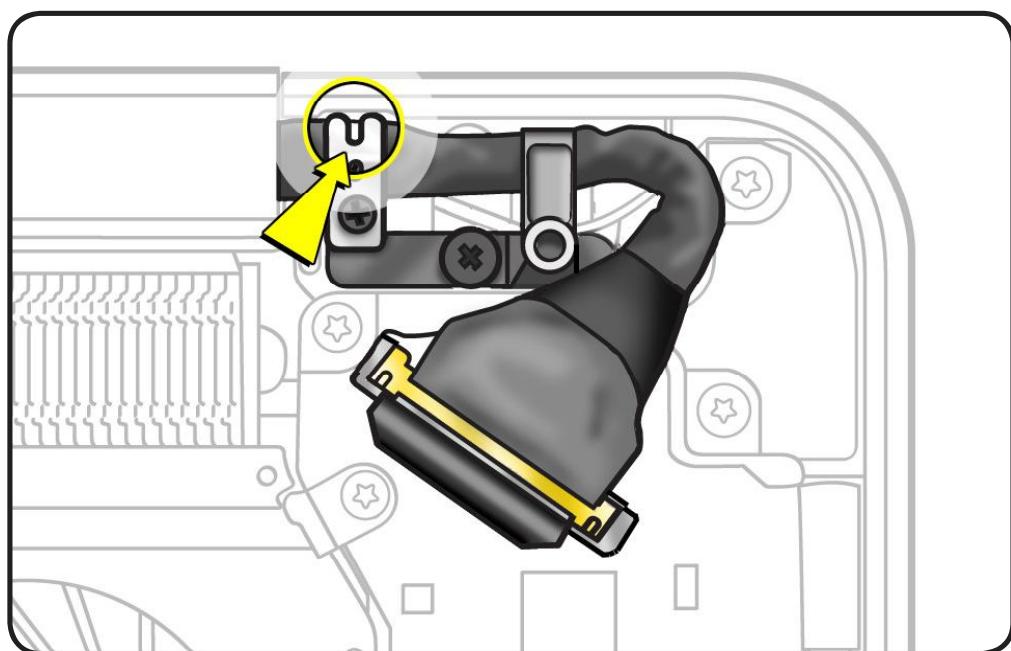


Important: When removing the LVDS cable guide, do NOT remove the screw that secures the guide's grounding clip. The clip is delicate and should remain with the guide. If the clip is damaged, install a new cable guide.





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

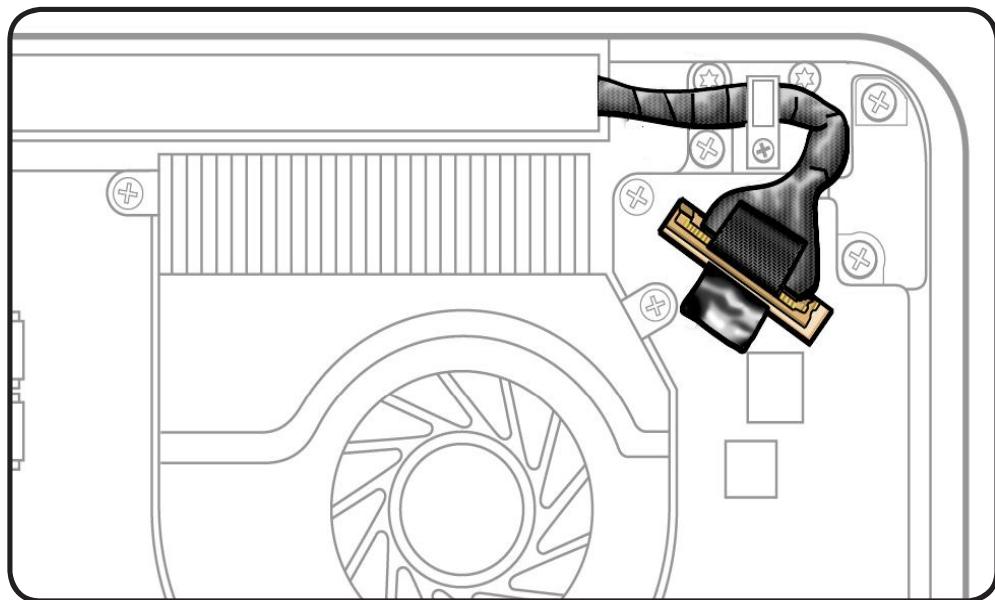




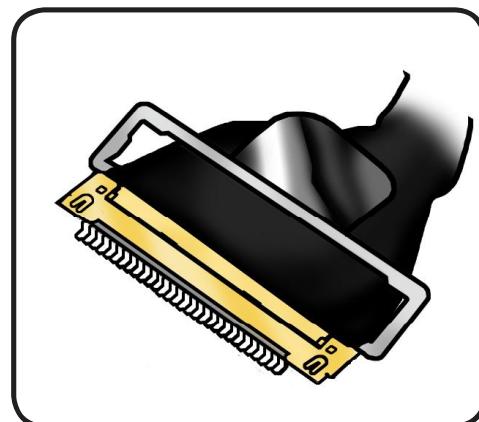
Removal



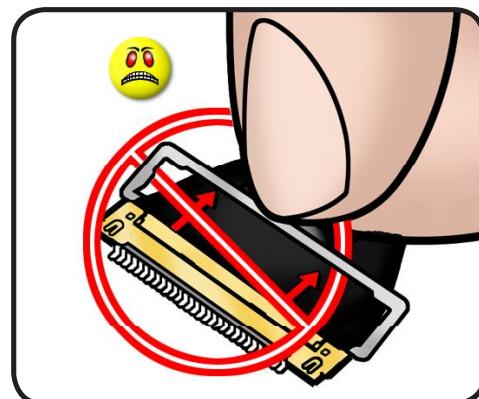
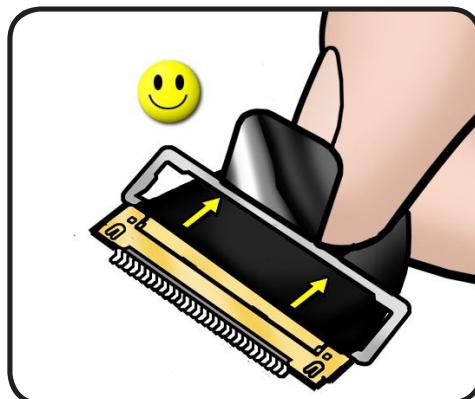
Caution: Do not pull on the black tab or the LVDS lock bar. Pulling on the tab to remove the LVDS cable will likely result in the metal LVDS lock bar being torn off the cable body. This bar is only to be used to disengage the lock from the LVDS connector. A broken lock bar results in a display assembly 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.



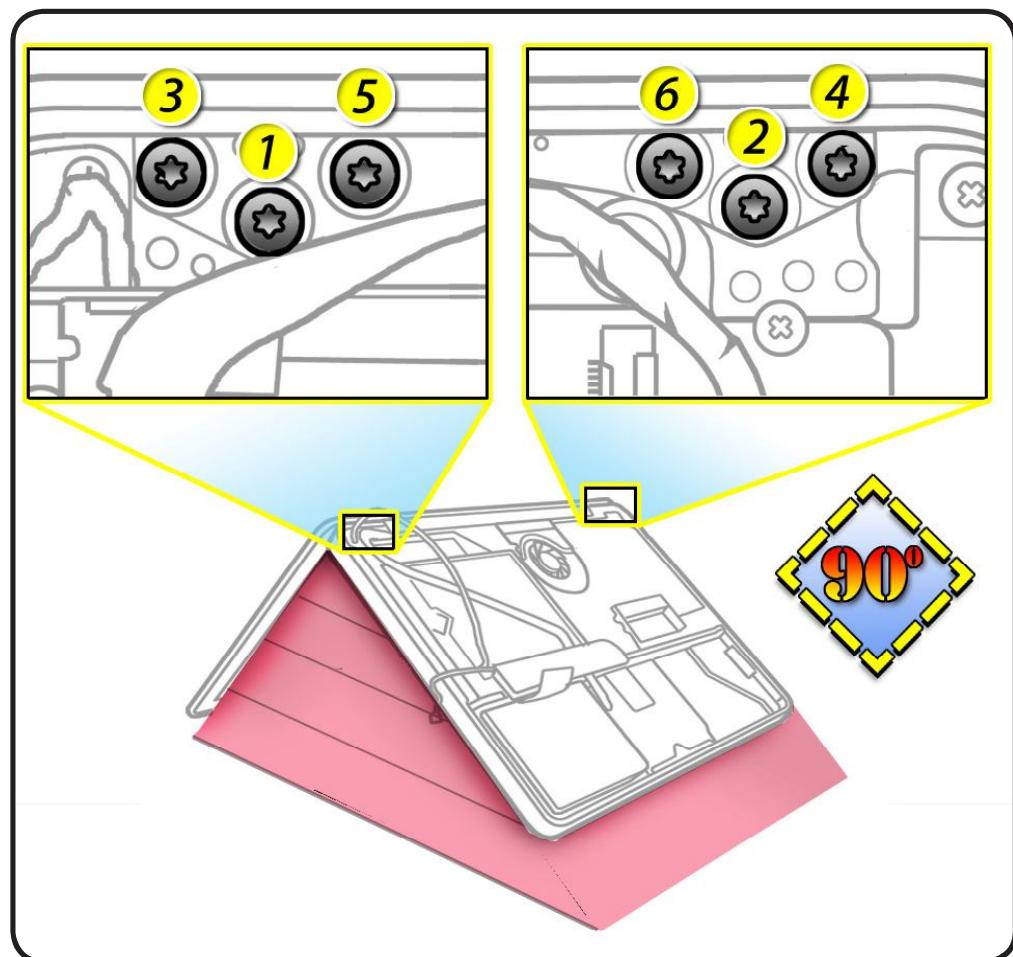
- 3 Slide cable out of connector by pulling the cable. Do not pull the black tab or lock bar.



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

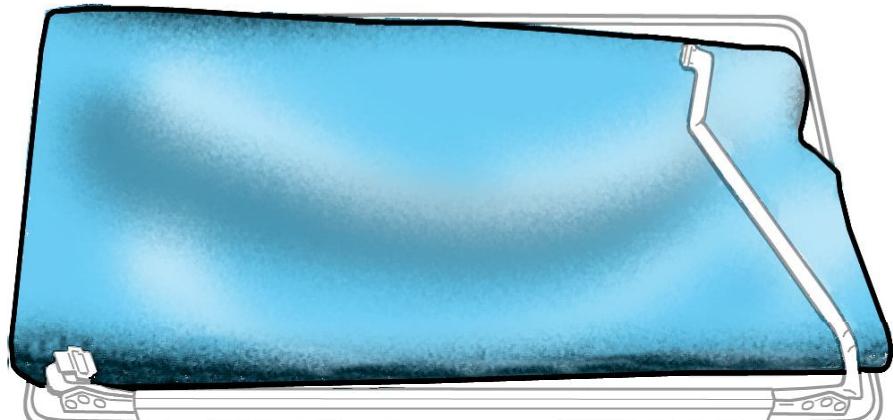
- Clean, soft, lint-free cloth
- ESD wrist strap and mat



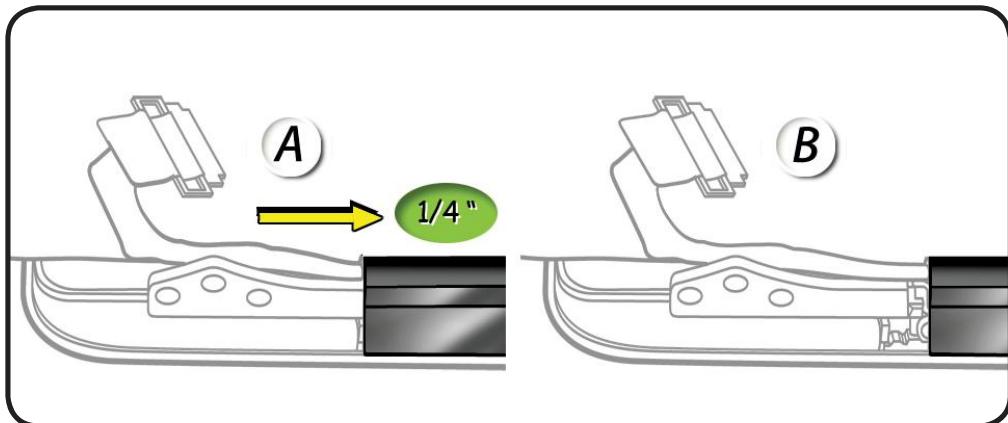


Removal

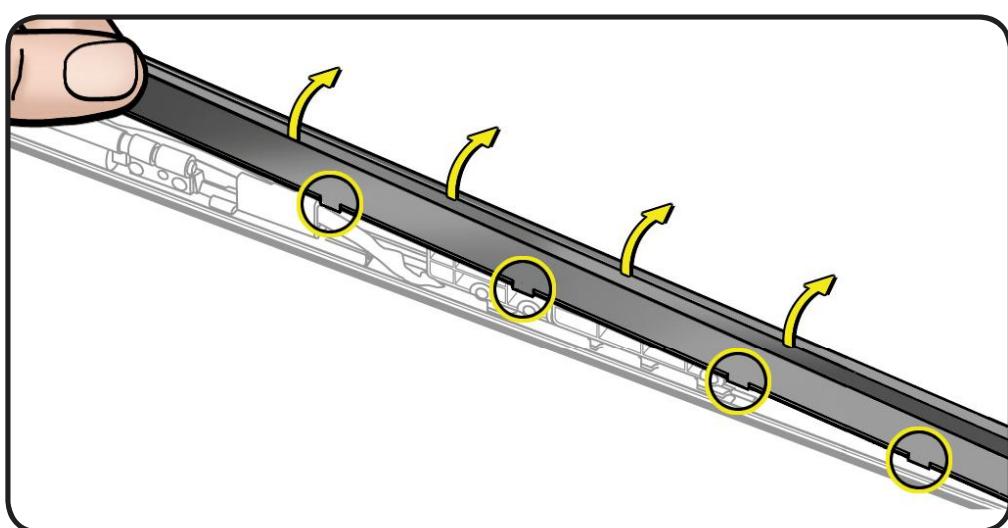
- 1 Cover display face with clean, soft cloth.



- 2 Holding left hinge, slide clutch cover $\frac{1}{4}$ inch (6.35 mm) away from the LVDS cable.



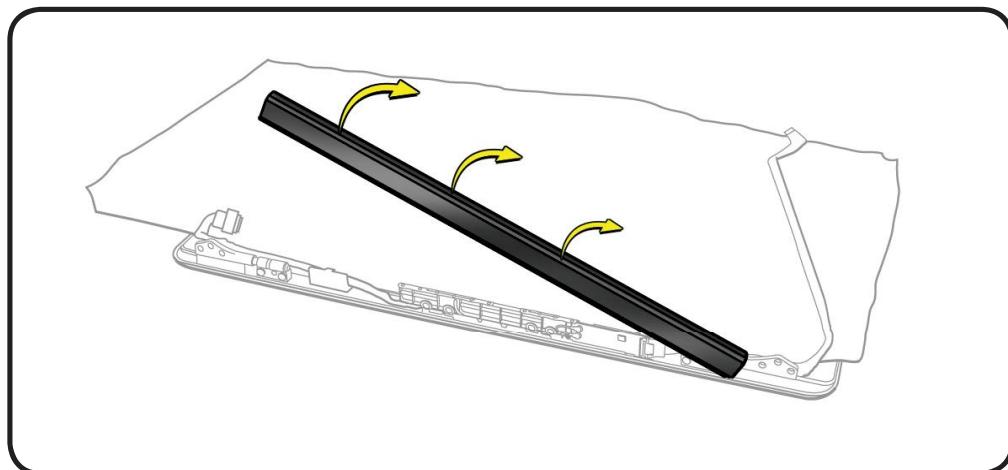
- 3 Press down on clutch cover to loosen 4 hooks inside.





4 Tilt up end of clutch cover as you roll it toward display face.

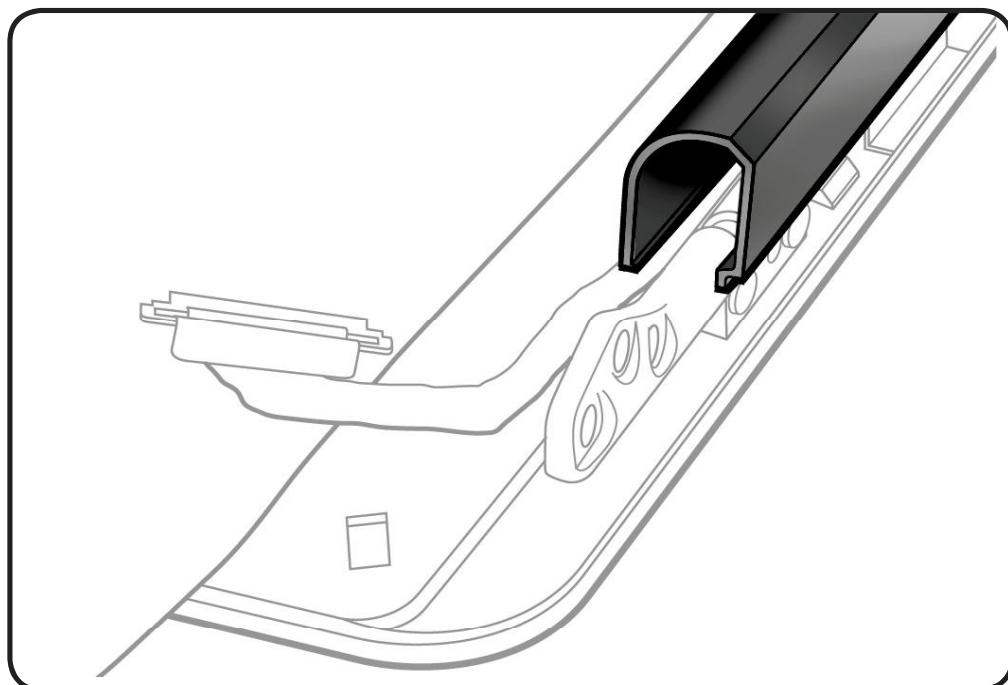
5 Remove clutch cover.



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.

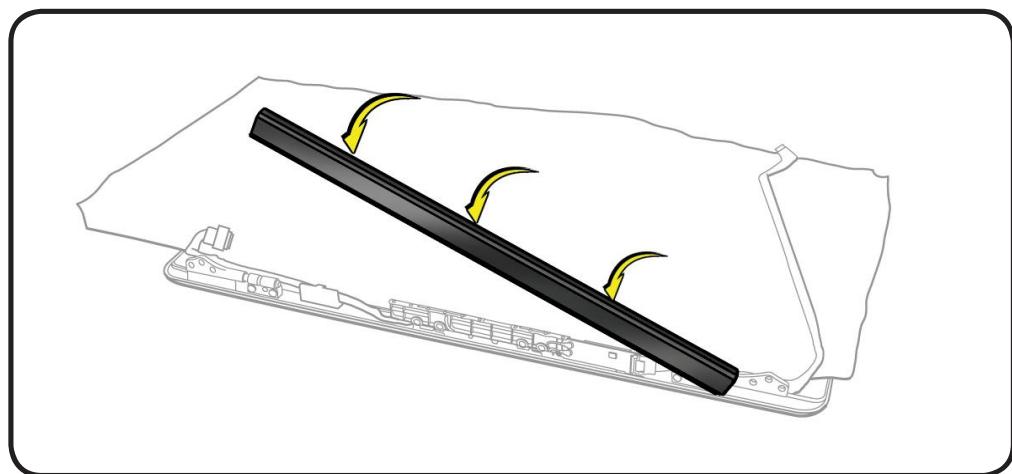
4 Lower clutch cover onto display assembly.

5 Listen for snapping sound as hooks engage.

6 Check for good fit.

Avoid:

- gaps
- bulges
- pinched cables



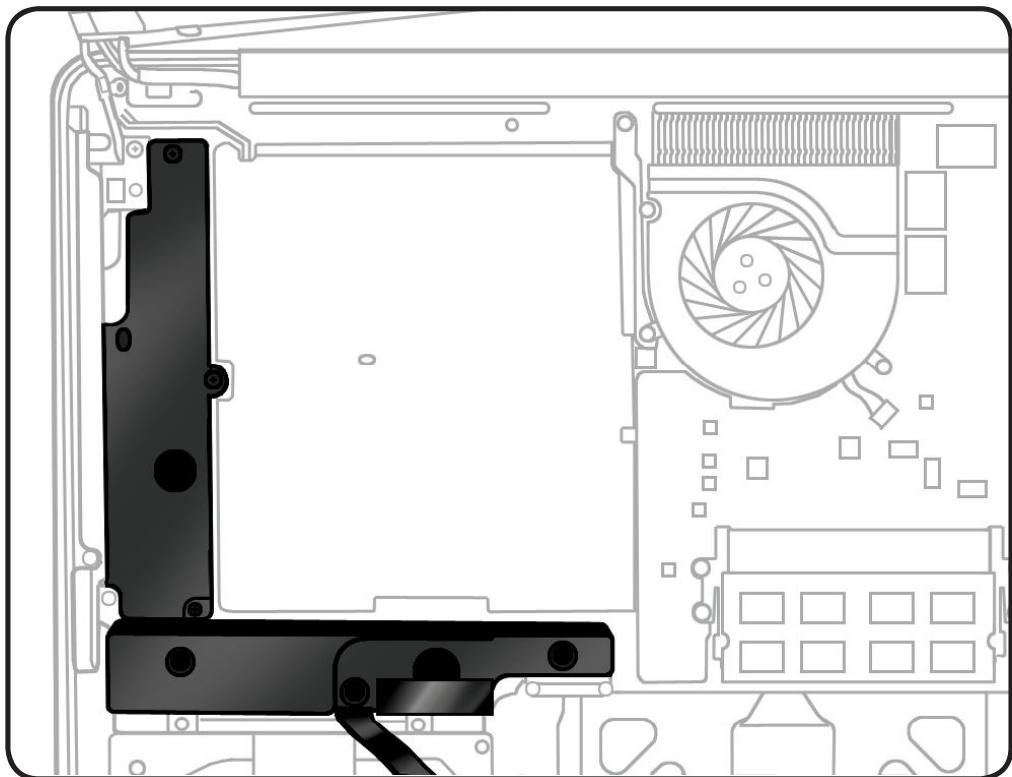


Right Speaker / Subwoofer

First Steps

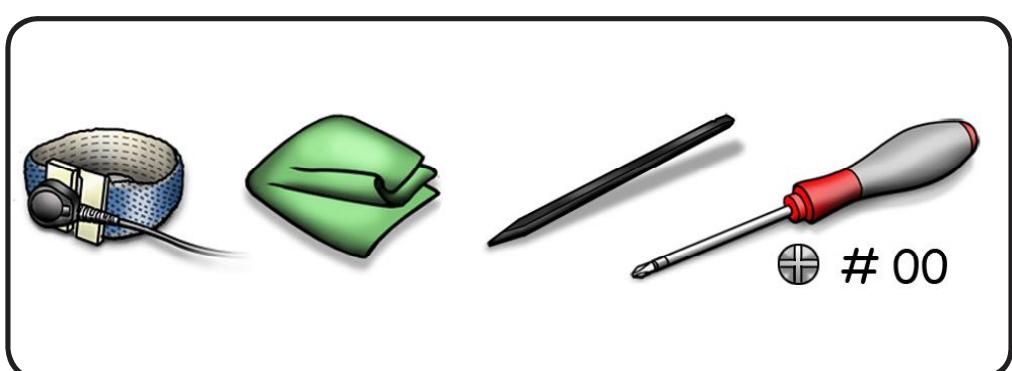
Do the following:

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



Tools

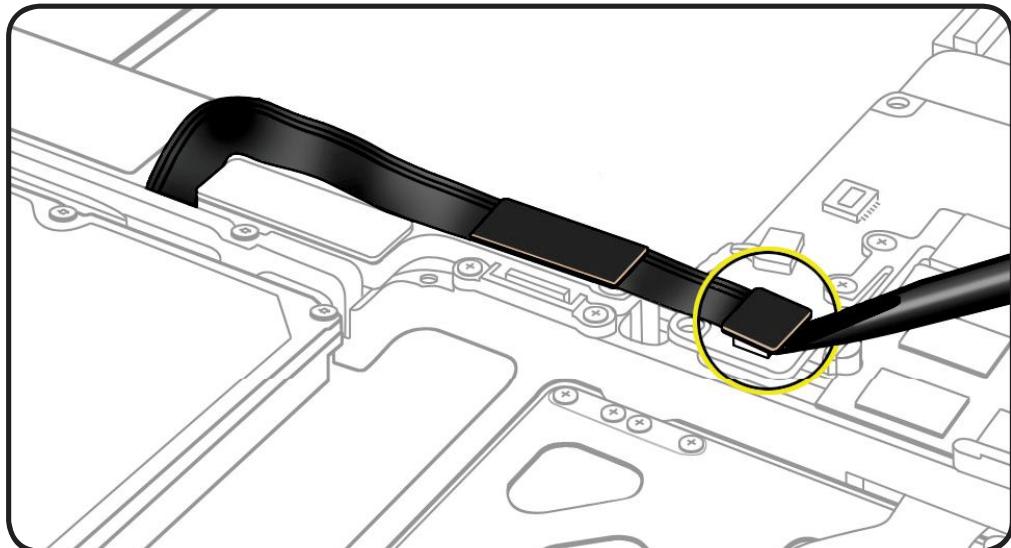
- Clean, soft, lint-free
cloth
- ESD wrist strap and
mat
- Black stick
- Magnetized Phillips
#00 screwdriver





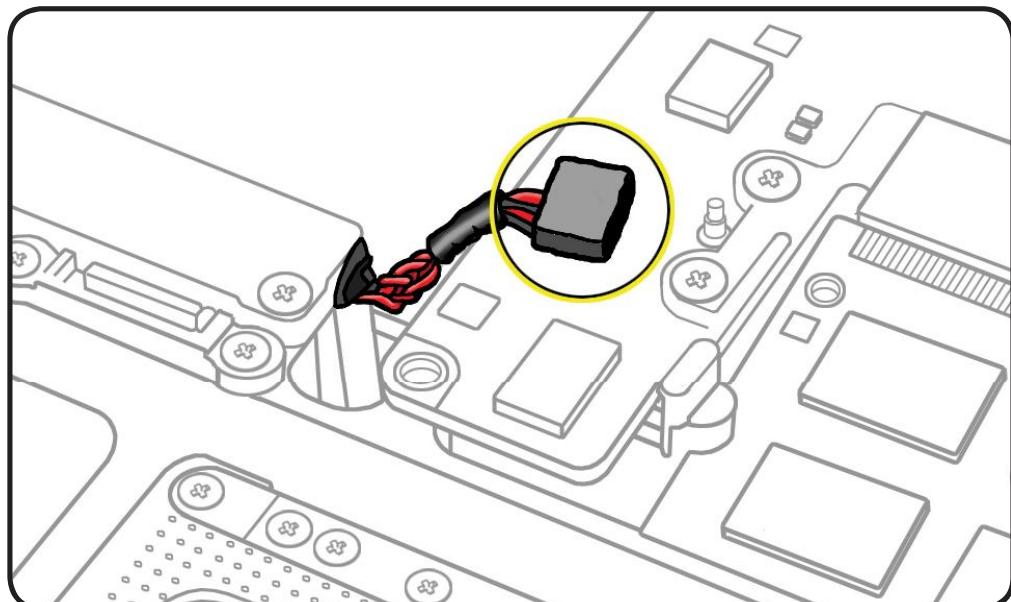
Removal

- 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.

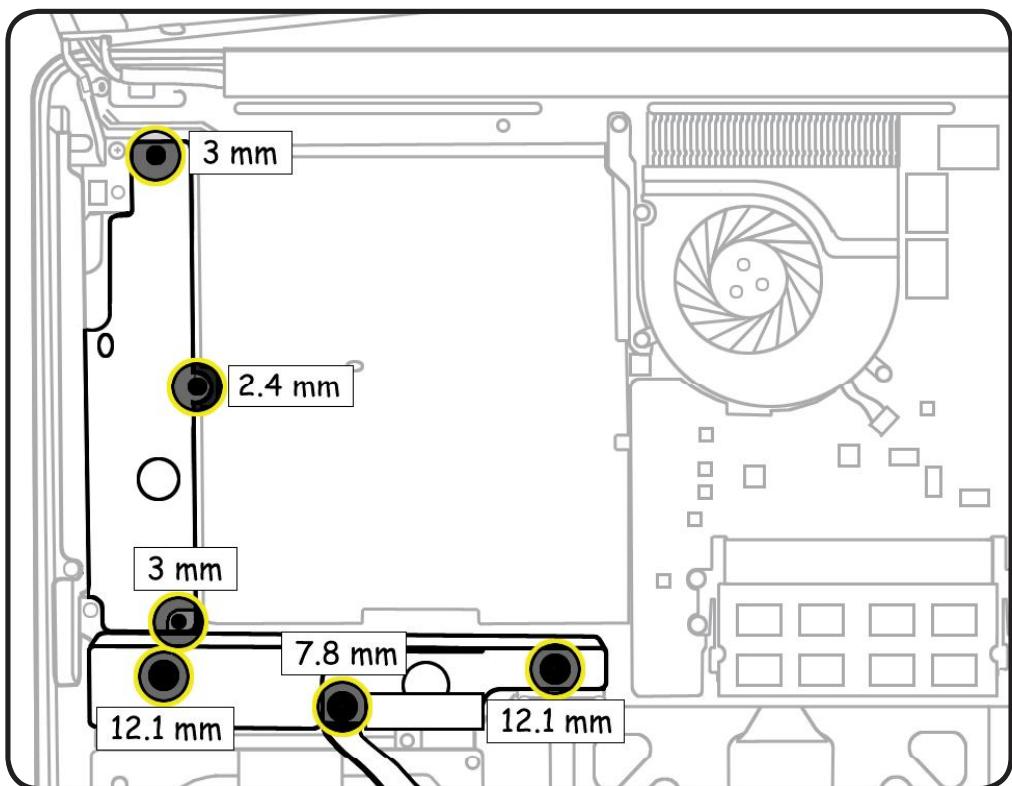




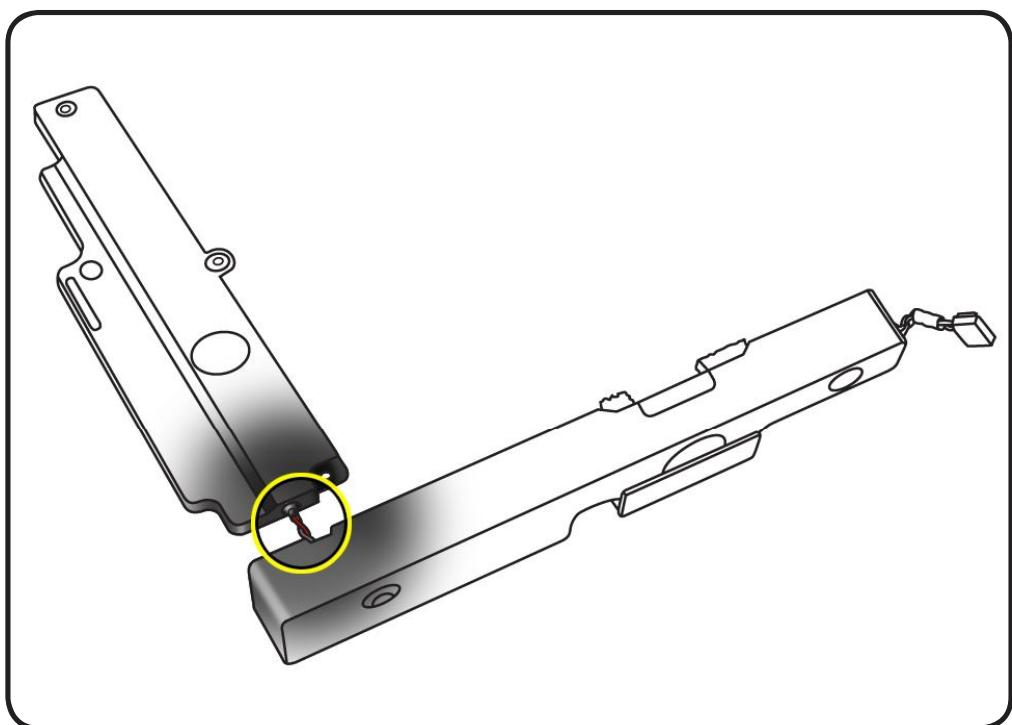
4 Remove 6 screws:

- 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.

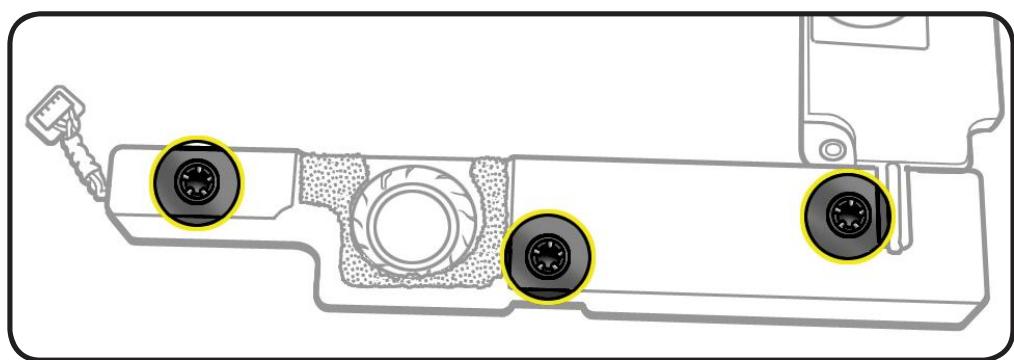
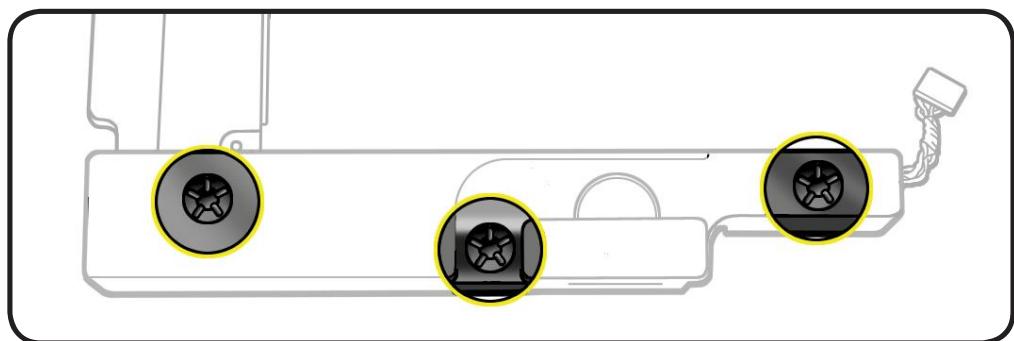


Note: The right speaker/subwoofer is made up of two sections connected by a narrow, twisted-wire cable. Be careful not to damage the cable when removing and reinstalling the part

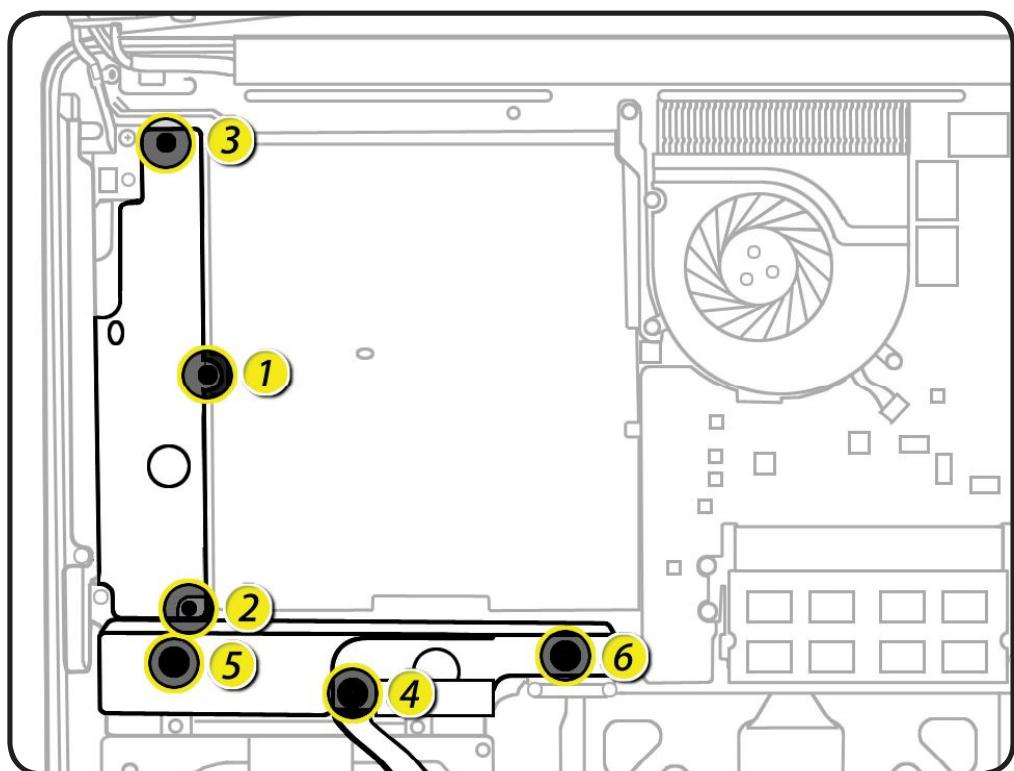




Reassembly Note: Inspect the top and bottom rubber snubbers associated with the three large speaker screws. The snubbers are used for vibration damping. If any snubber is damaged, replace it with a new, corresponding top snubber (922-9502) or bottom snubber (922-9503).



Reassembly Note:
Replace screws in the order indicated.



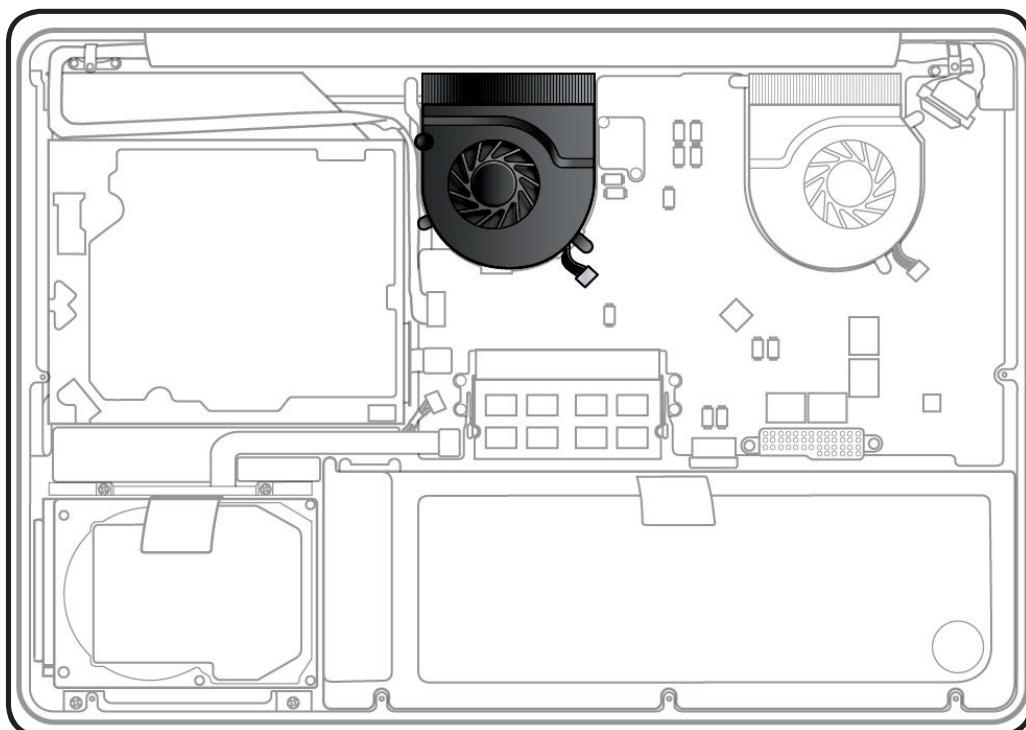


Fan, Right

First Steps

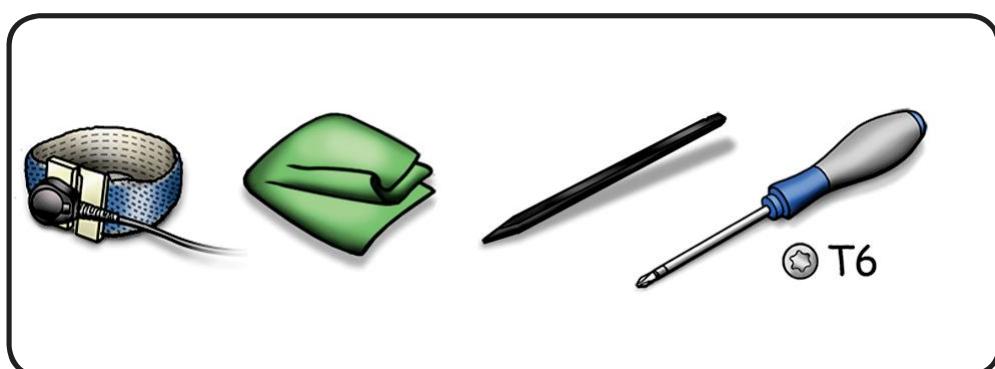
Remove:

- Bottom case
- Battery



Tools

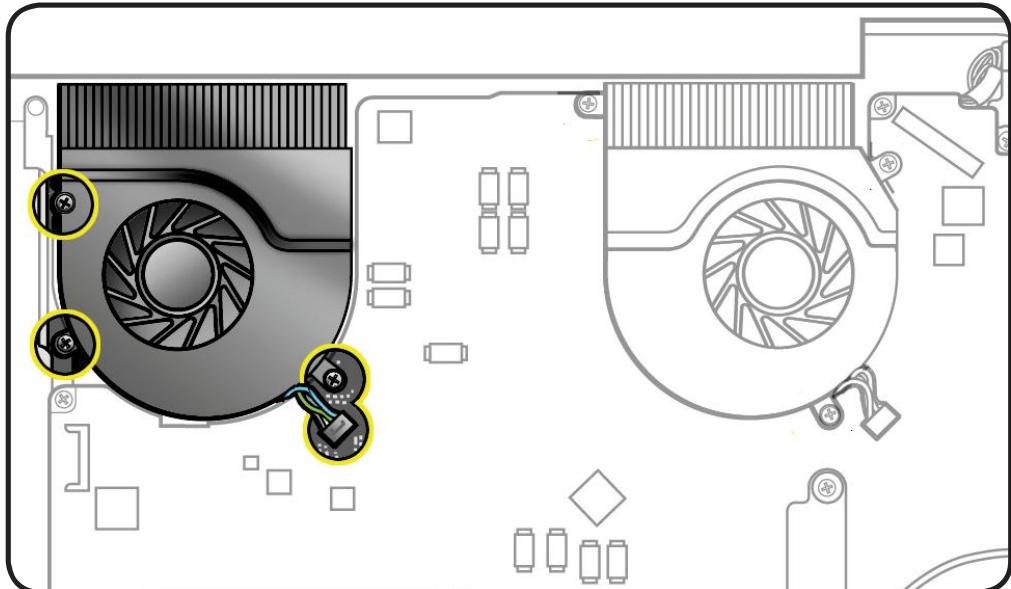
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
- Torx T6 screwdriver





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.



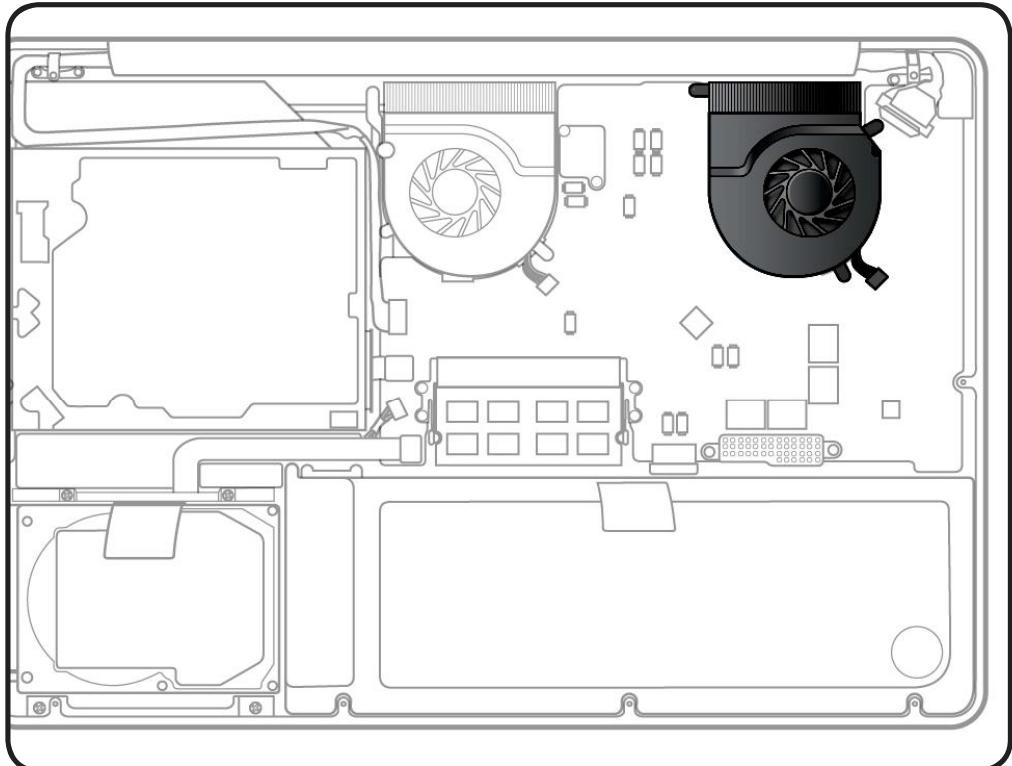


Fan, Left

First Steps

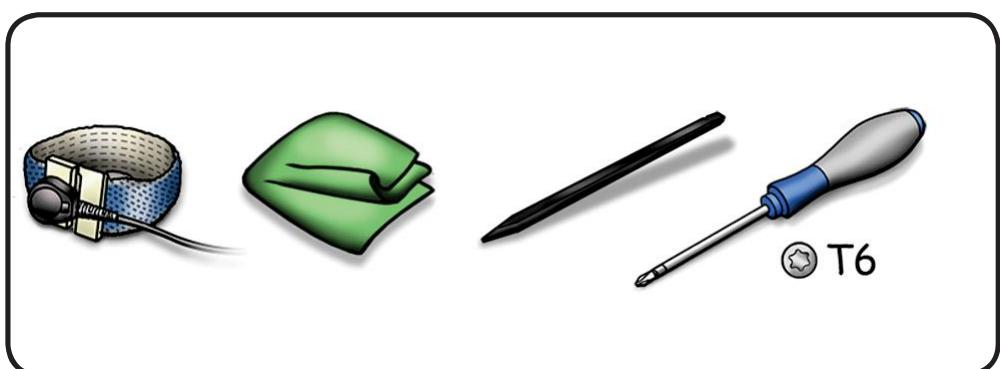
Remove:

- Bottom case
- Battery



Tools

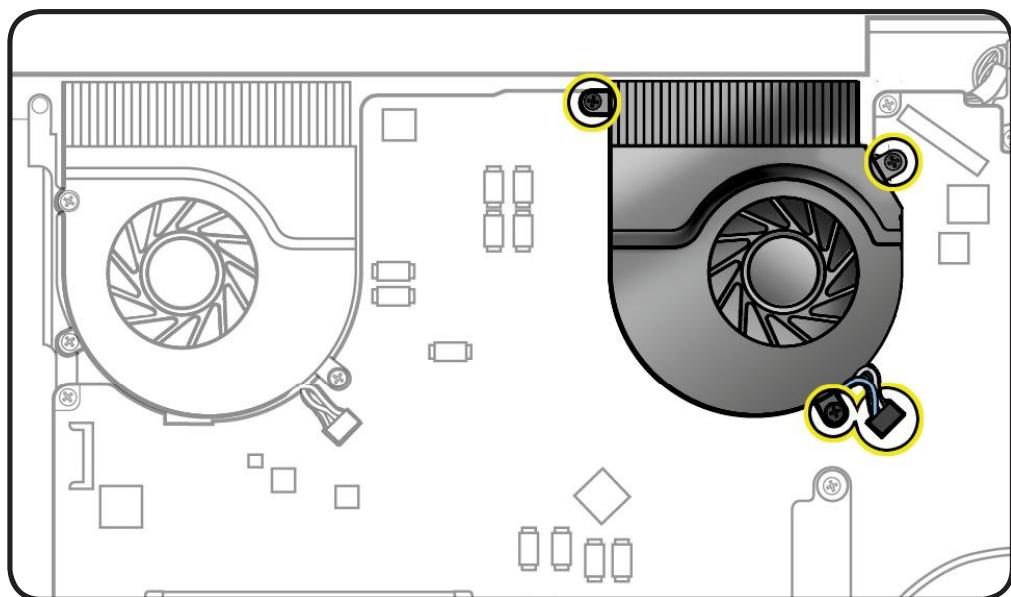
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick
- Torx T6 screwdriver





Removal

- 1** Use a black stick to pry fan cable from logic board.
- 2** Remove 3 (3.0 mm) 922-9108 Torx T6 screws.



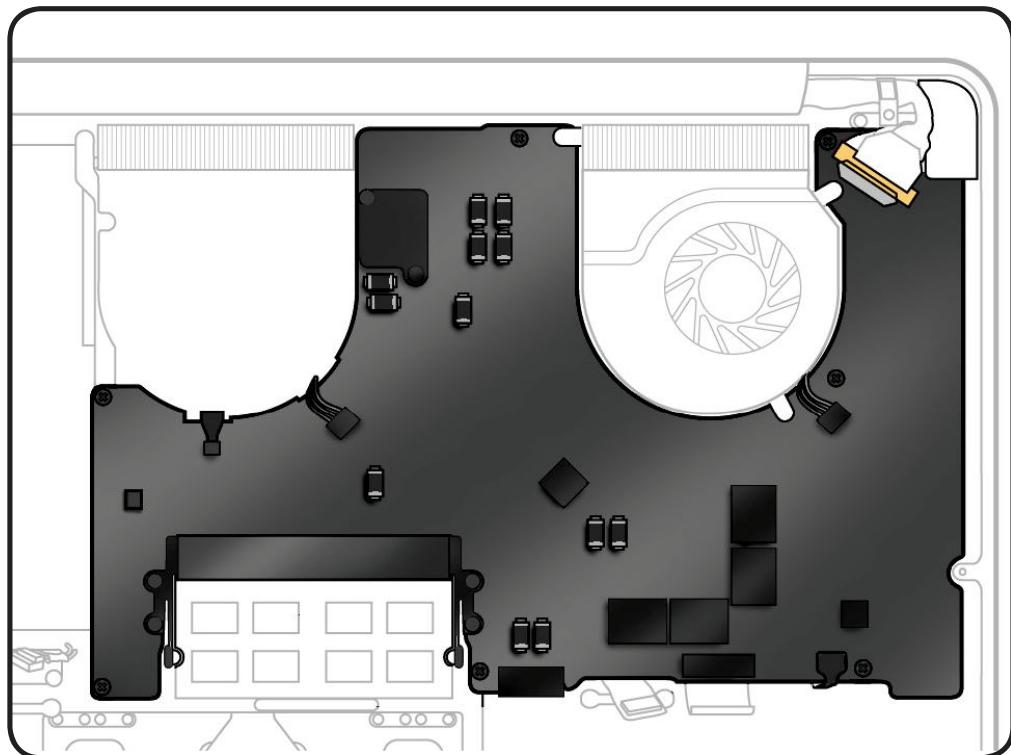


Logic Board

First Steps

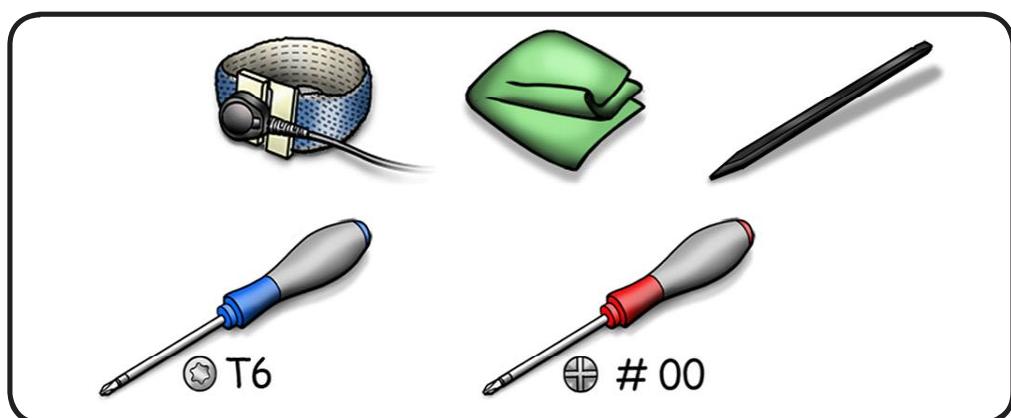
Remove:

- 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



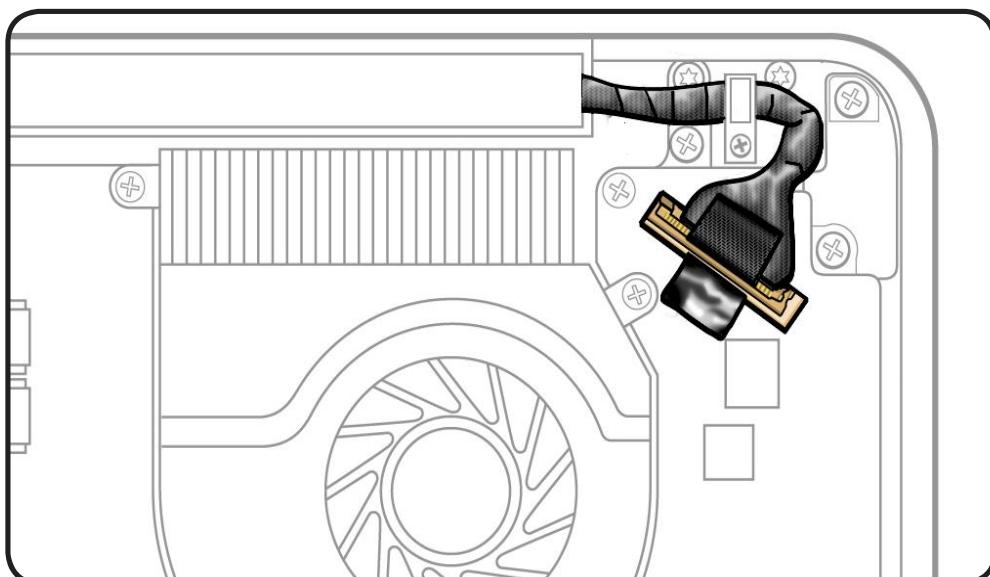


Removal

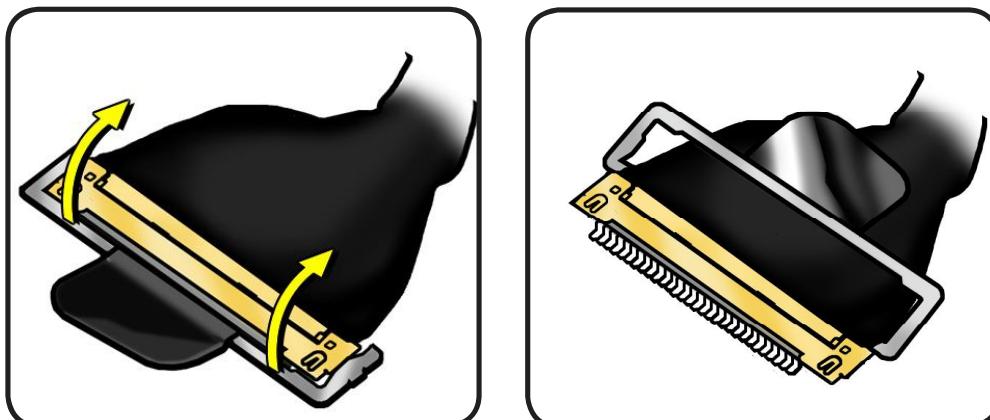
Caution: The LVDS cable/lock bar is very fragile; handle with care. A broken lock bar results in a display assembly replacement.



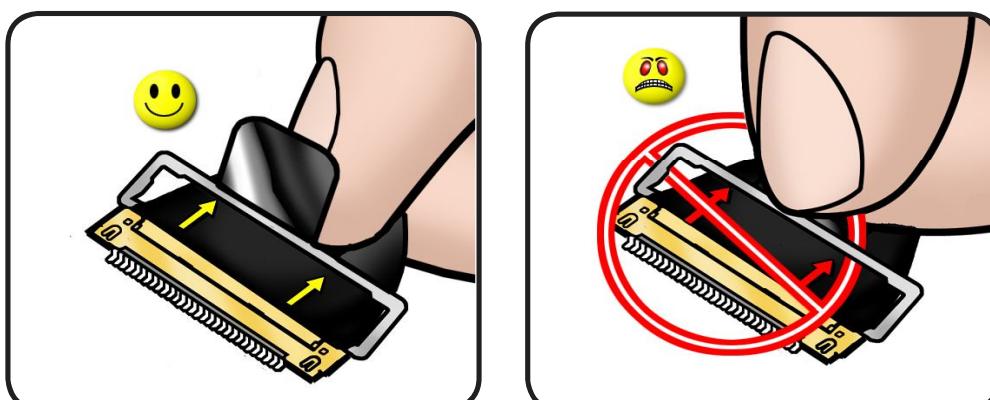
- 1 Peel EMI gasket off the top of LVDS cable, pull towards the fan.



- 2 To disconnect LVDS cable, grasp black tab and gently swing LVDS lock bar up and back to unlock the cable.

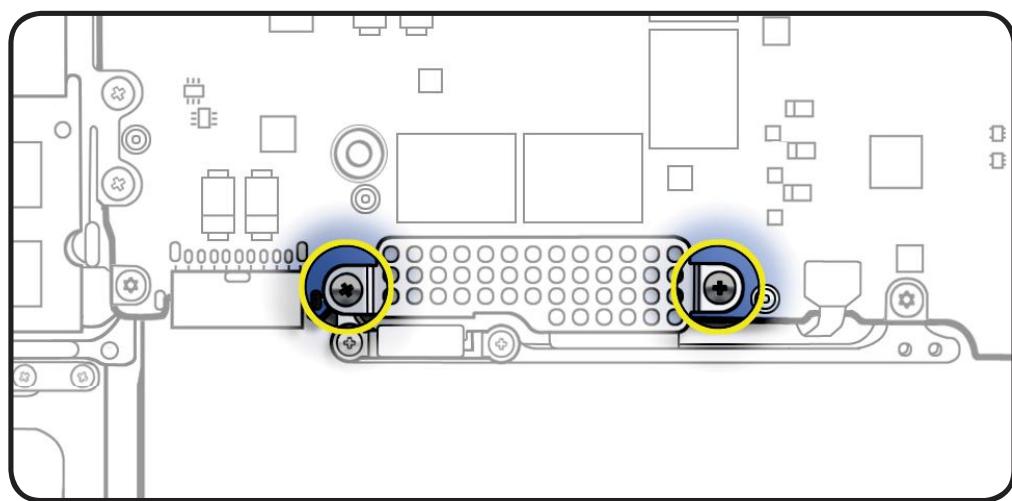


- 3 Slide cable out of connector by pulling the cable. Do not pull the black tab or lock bar.



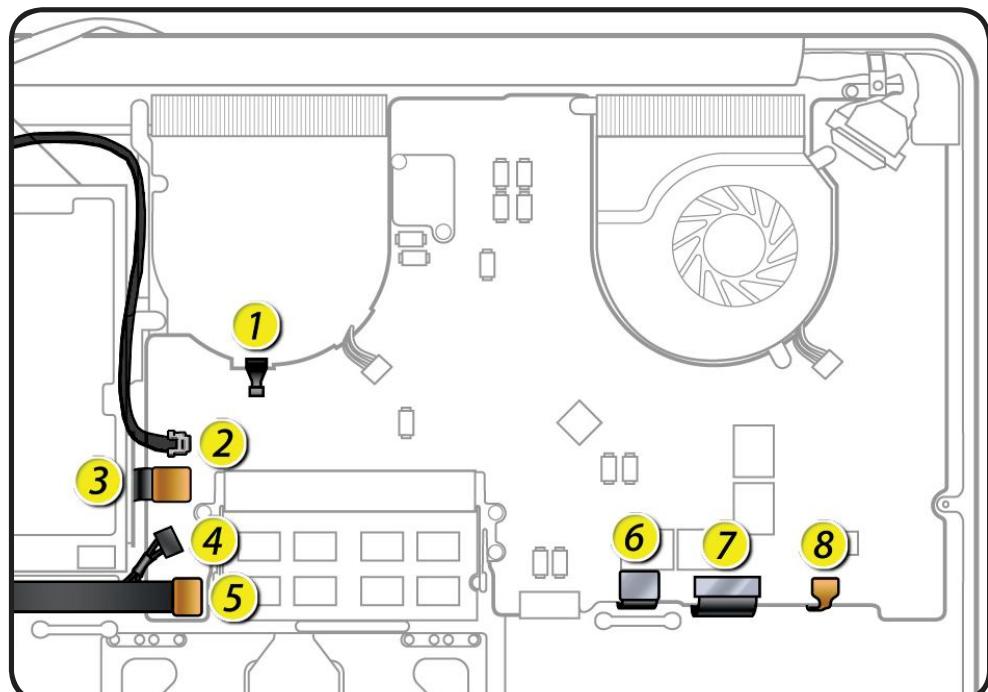


- 4 Remove 2 (1.2 mm) 922-9037 screws, and remove cable cover.



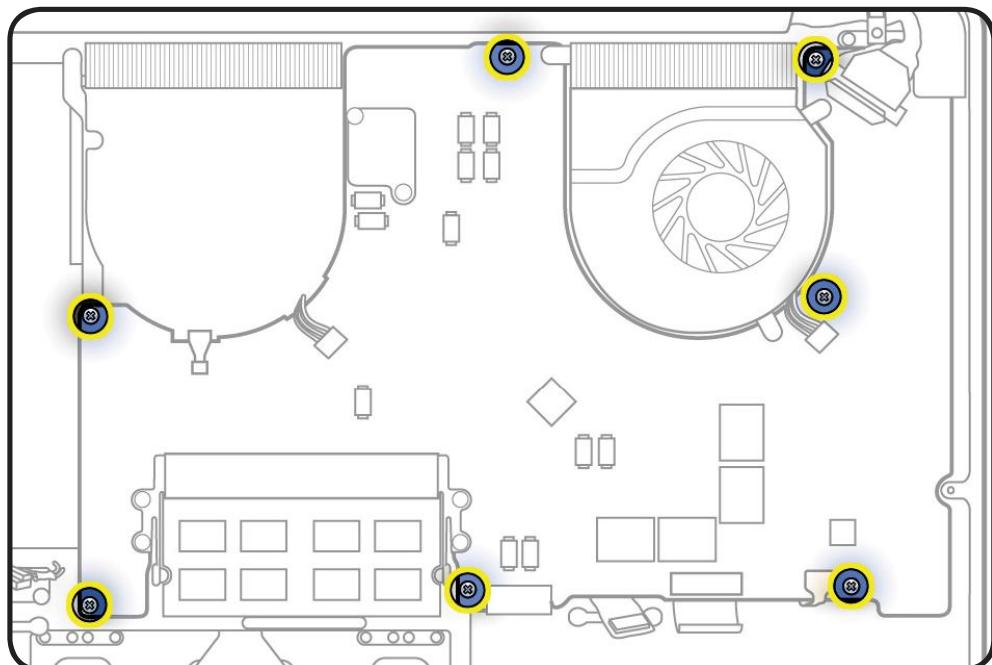
- 5 **Caution:** Referring to ["Connector Types,"](#) carefully disconnect 8 more cables in the order shown:

- (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.

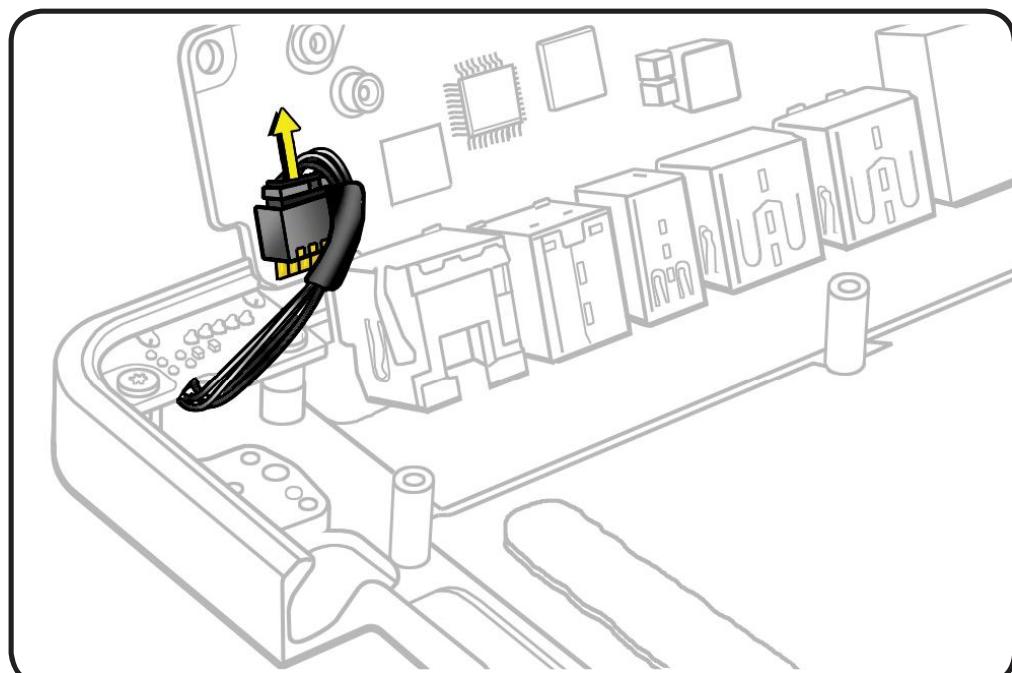
- 8** Tilt board vertically and on the underside disconnect the magsafe board cable.

- 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:

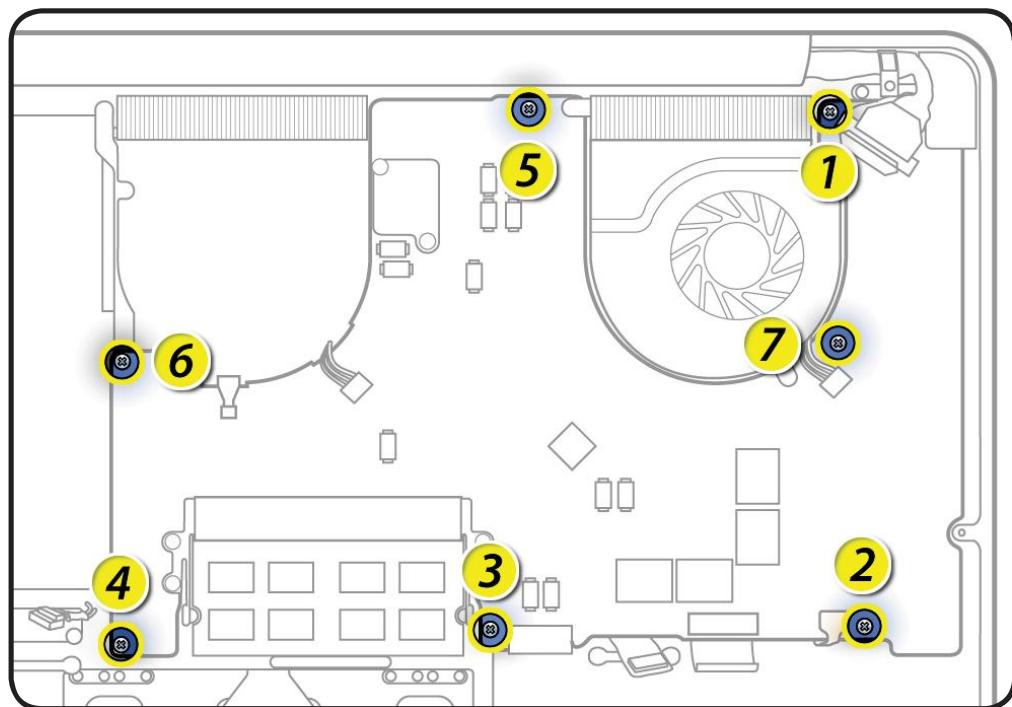
- left speaker
- microphone
- heatsink
- left fan





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.



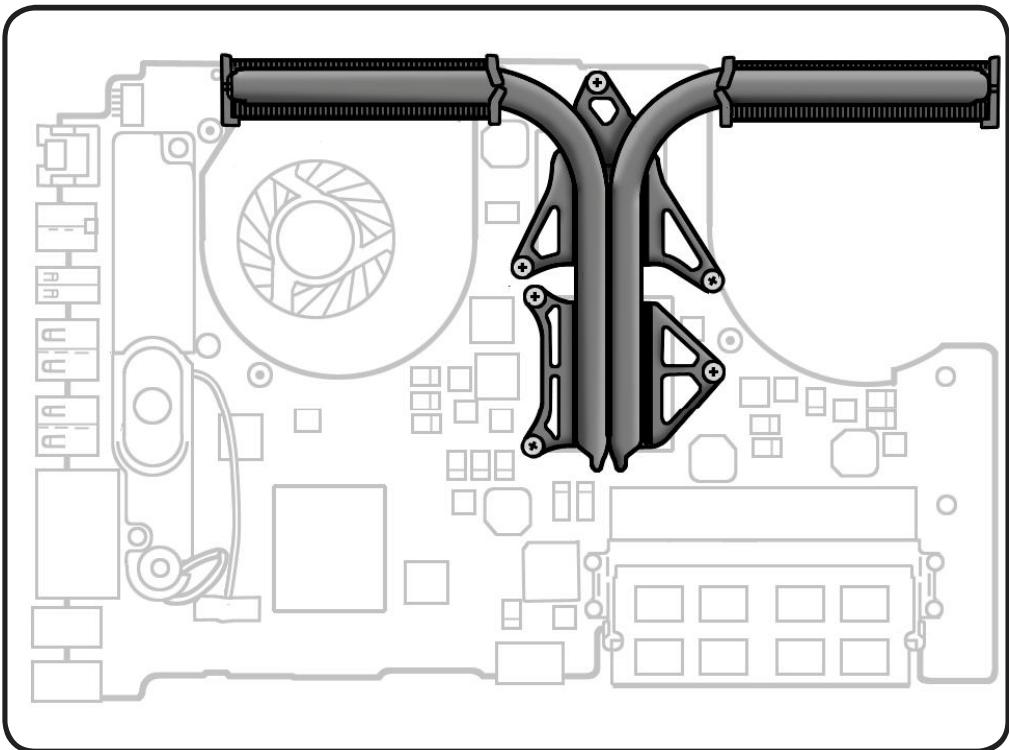


Heatsink

First Steps

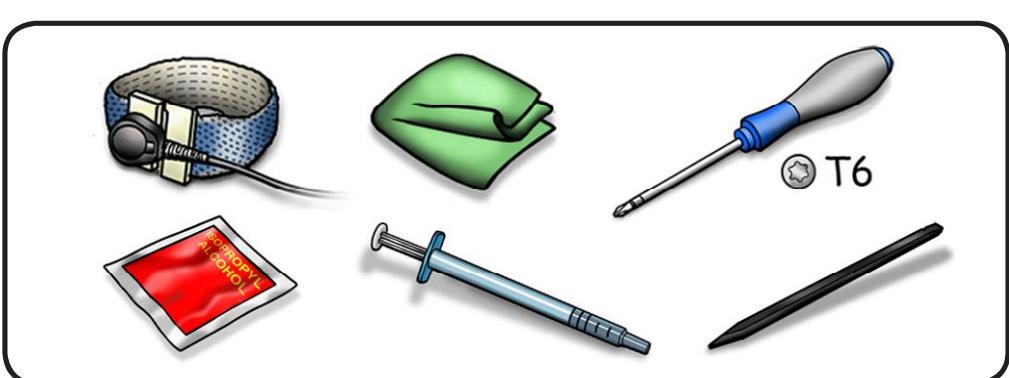
Remove:

- 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

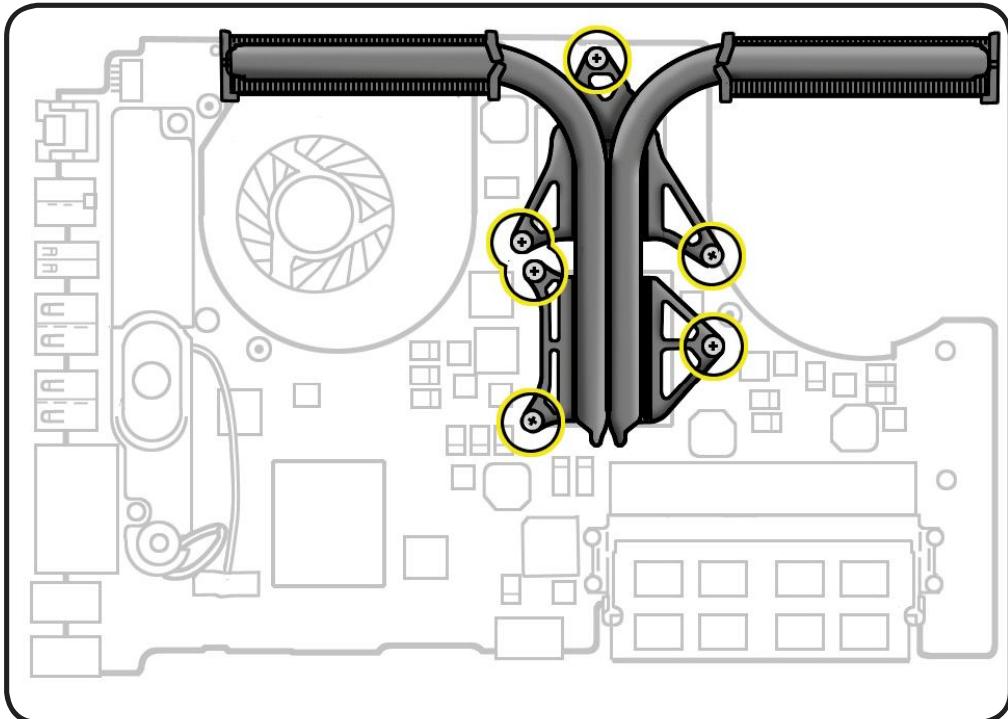
- 1 Remove 6 (8 mm) 922-9328 Torx T6 screws.

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

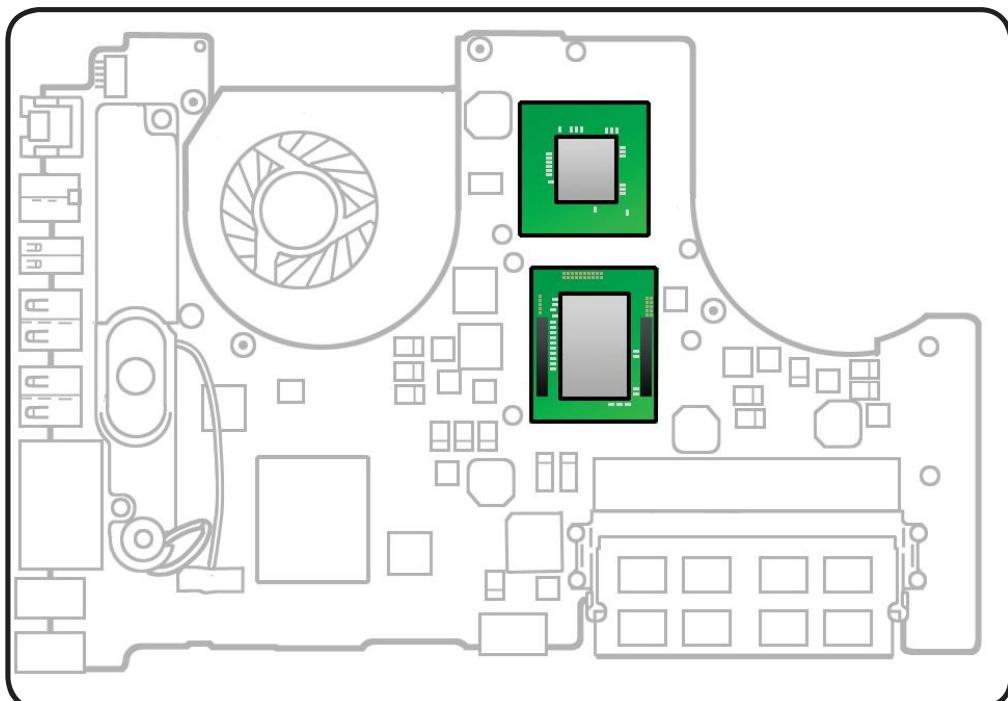


Caution: Hold heatsink by edges, not by the heat pipes.

- 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.

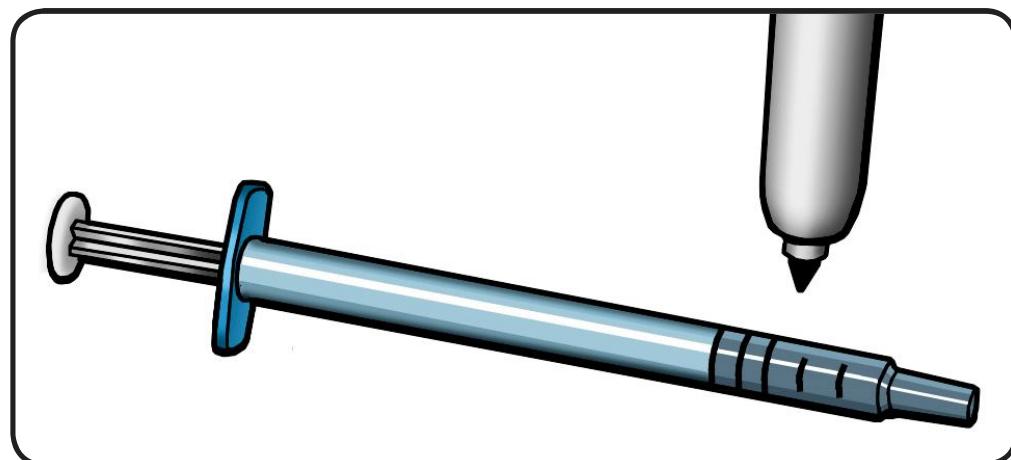




Replacement

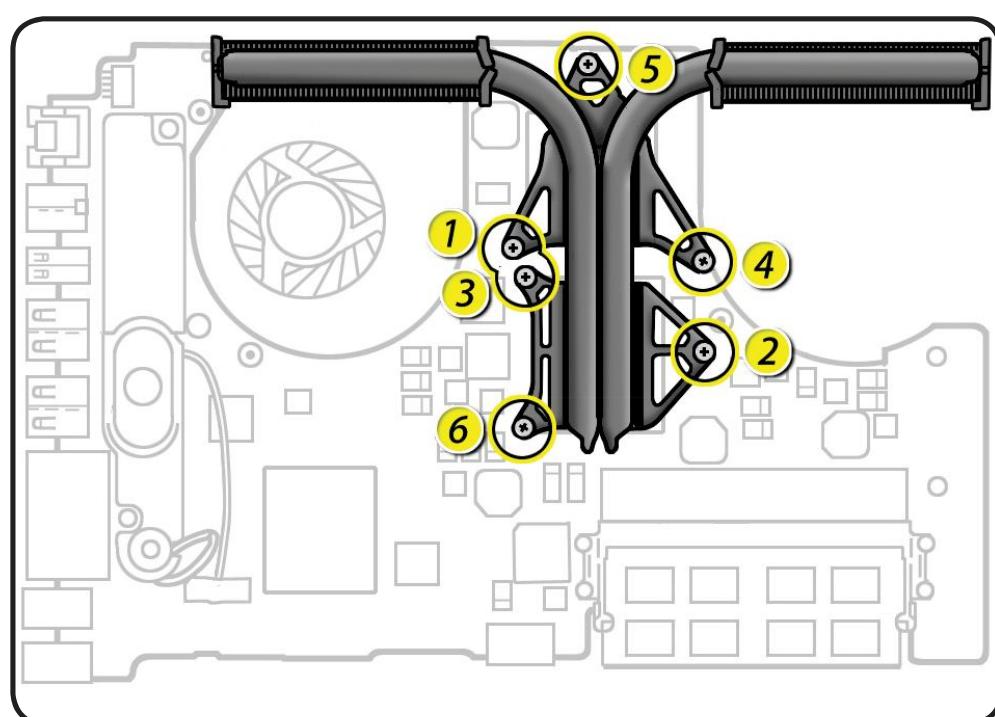
Important: New heatsinks include pre-applied thermal grease. Follow steps 1-2 only if re-installing the original heatsink.

- 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

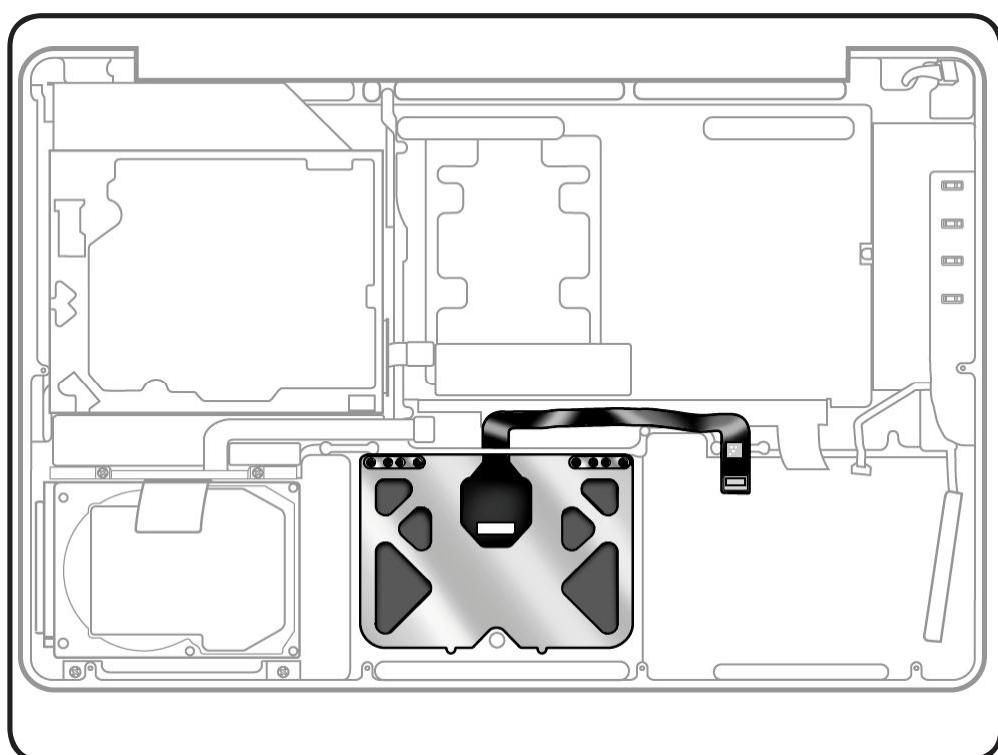
Remove:

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

Trackpad Kit 922-9306

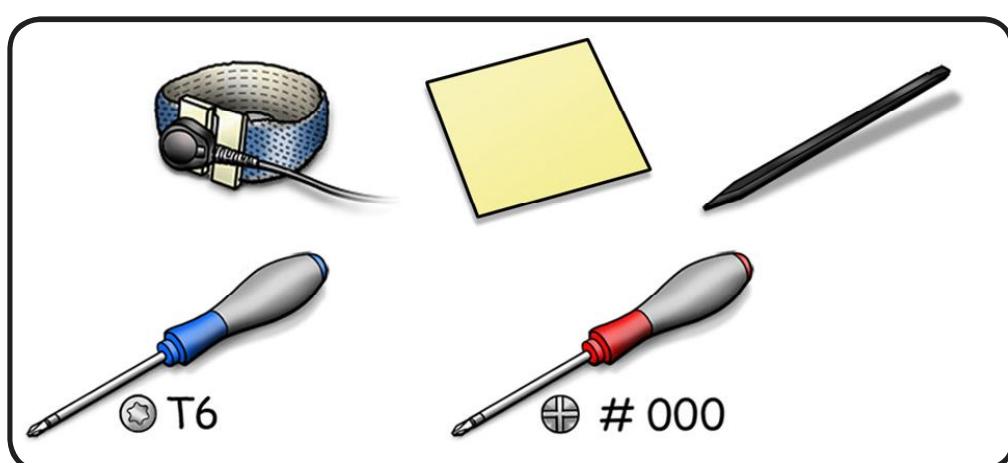
includes:

- trackpad
- 8 flexure screws
- 1 T6 set screw
- 2 metal flexures



Tools

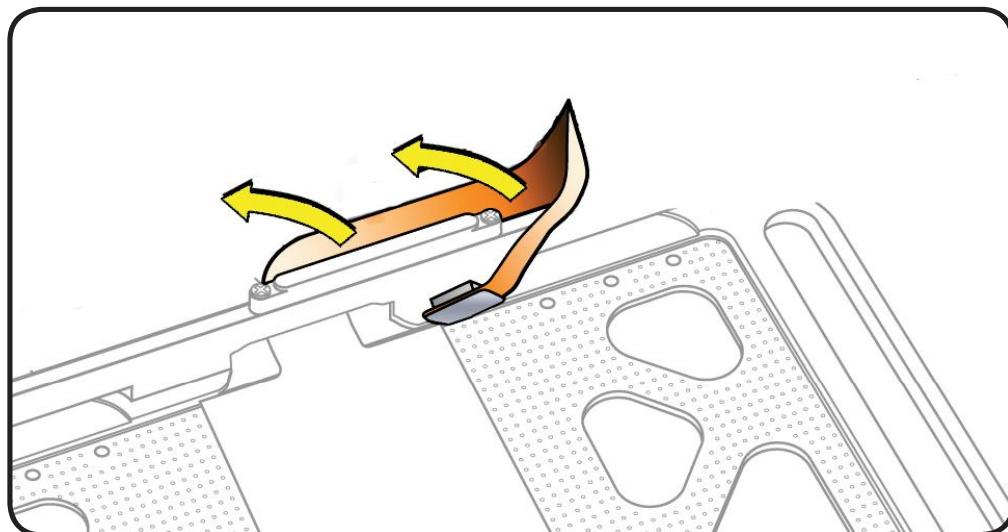
- ESD wrist strap and mat
- Sticky (Post-It) notes
- Black stick
- Magnetized Phillips #000 screwdriver
- Magnetized Torx T6 screwdriver





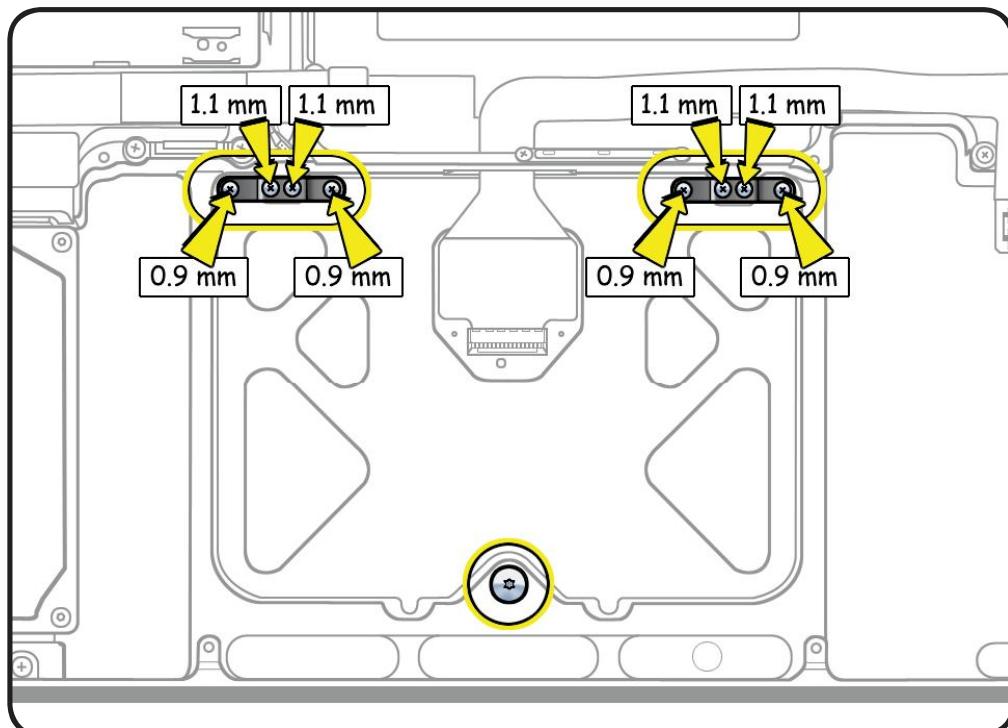
Removal

- 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.

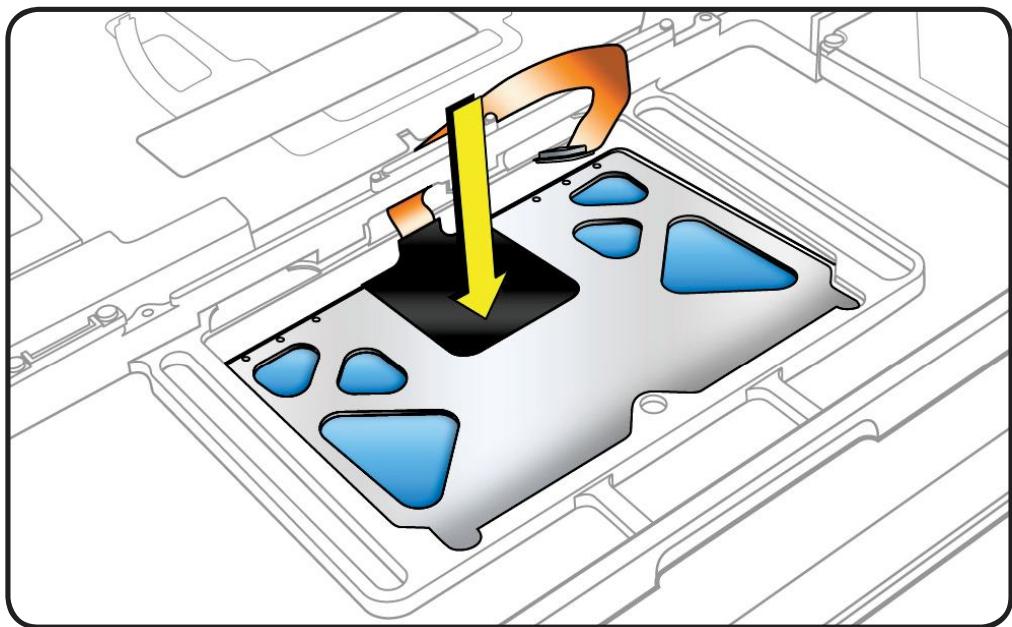


- 3 Remove 1 Torx T6 set screw. Discard old screw. (New set screw comes only with trackpad assembly.)

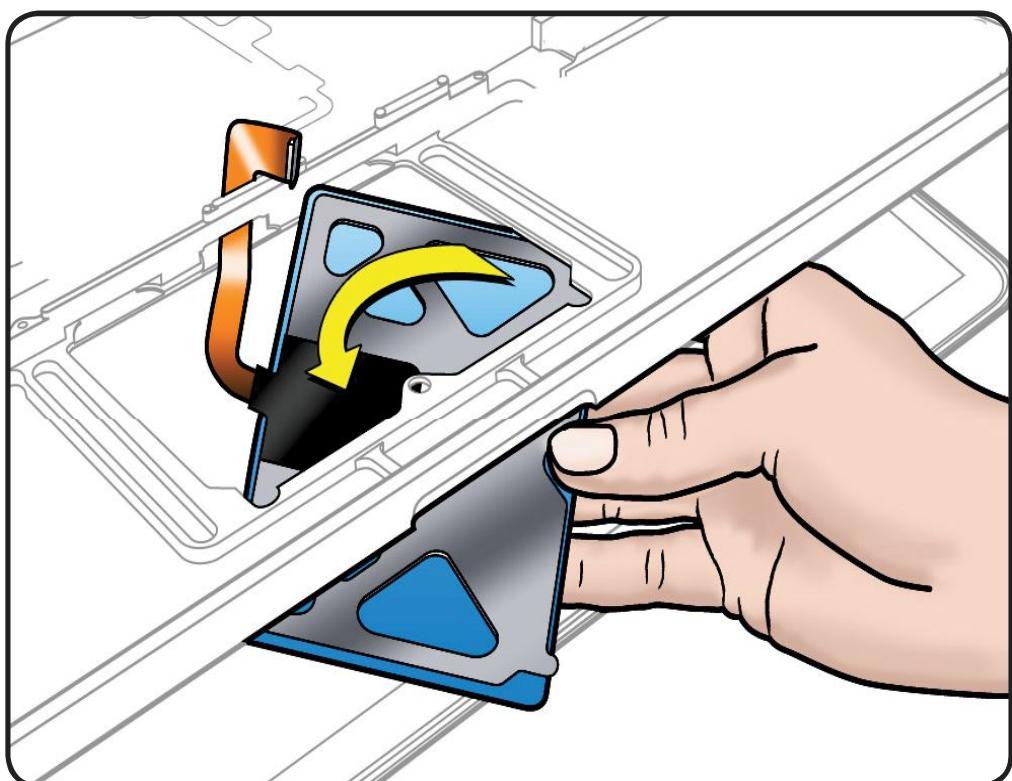
- 4 Remove and dispose of 2 metal flexures (thin metal pieces); they are matched to each individual trackpad by thickness.



- 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.



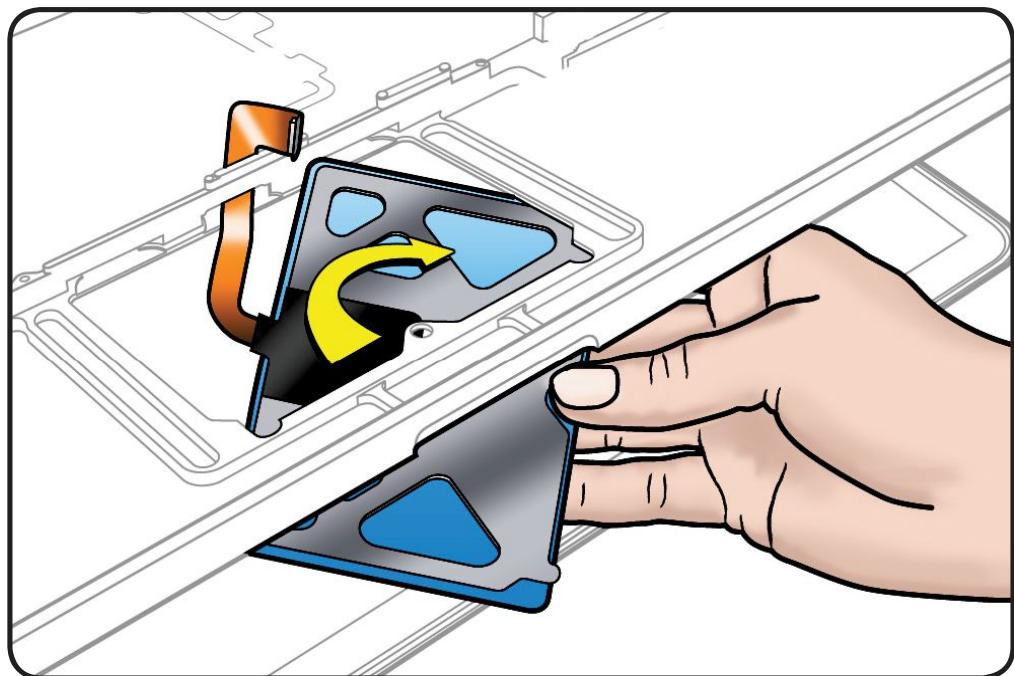


Replacement

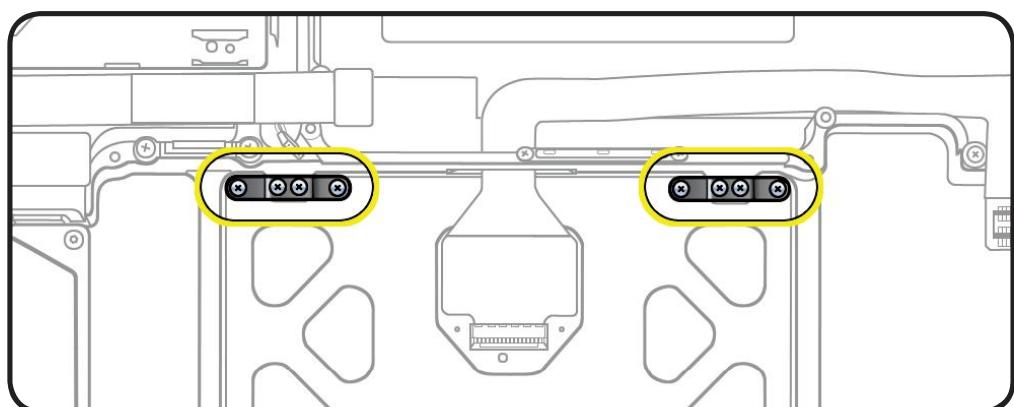
1 Route flex cable through opening.

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.

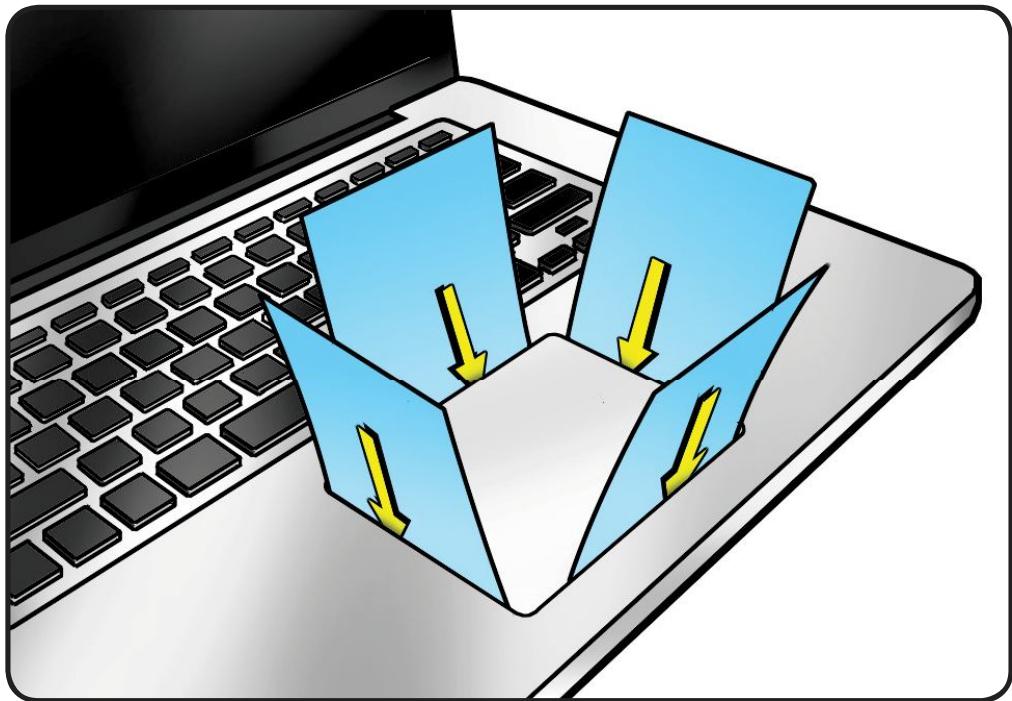


3 Loosely insert 8 screws into new flexures. Tighten a little.

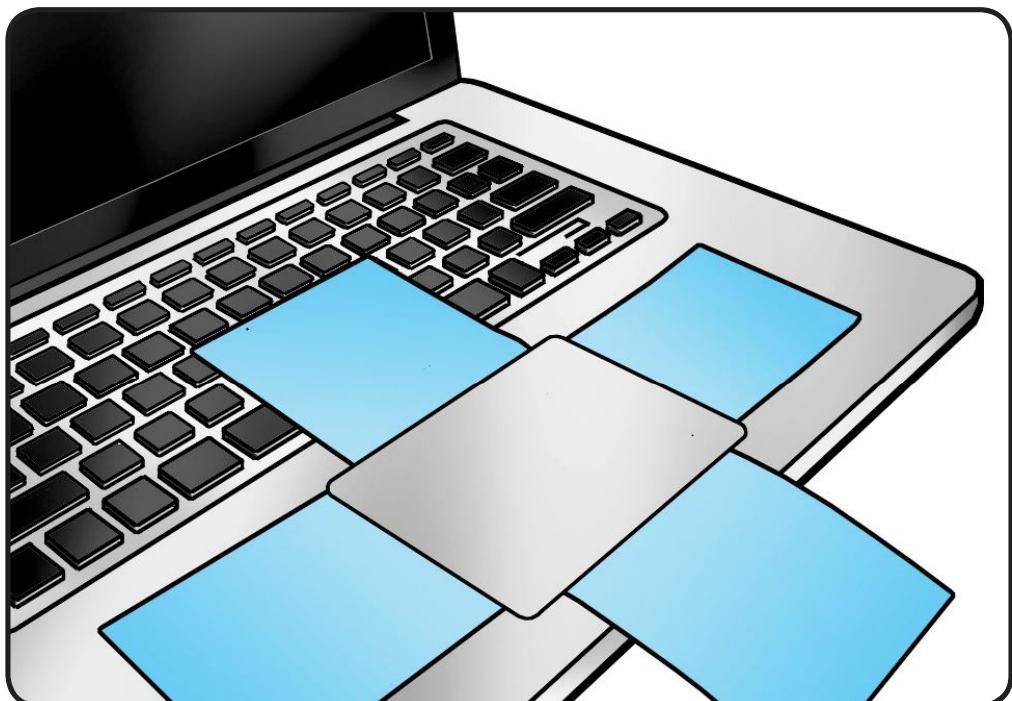




- 4** On the palm rest, insert one sticky (Post-It) note into gap on each of the four sides of trackpad.



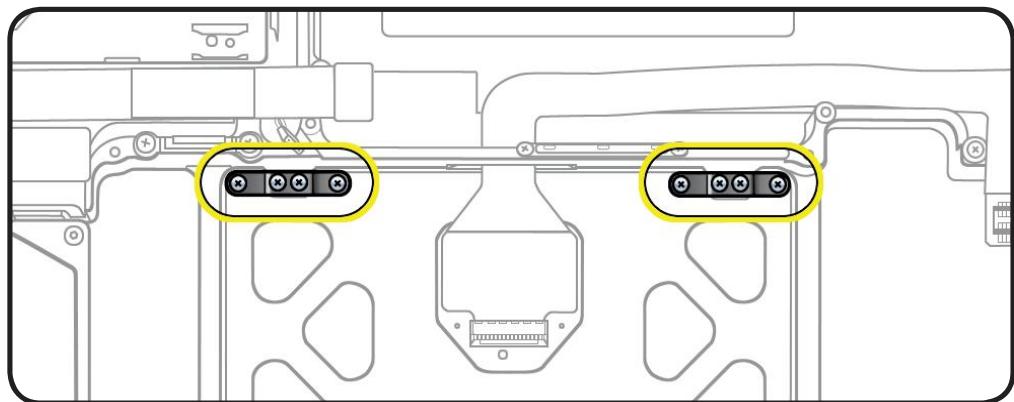
- 5** Fold sticky notes over so that top case can be laid flat.





- 6 Turn top case over.
Tighten screws at
flexures.

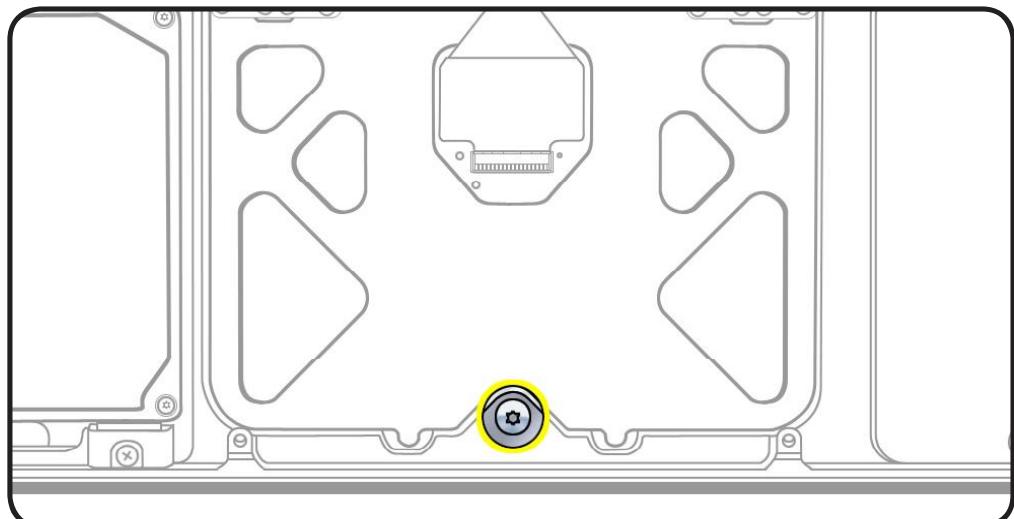
- 7 Check that gaps
between trackpad
and top case are even
on all sides. If not,
loosen screws and
adjust.



- 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.

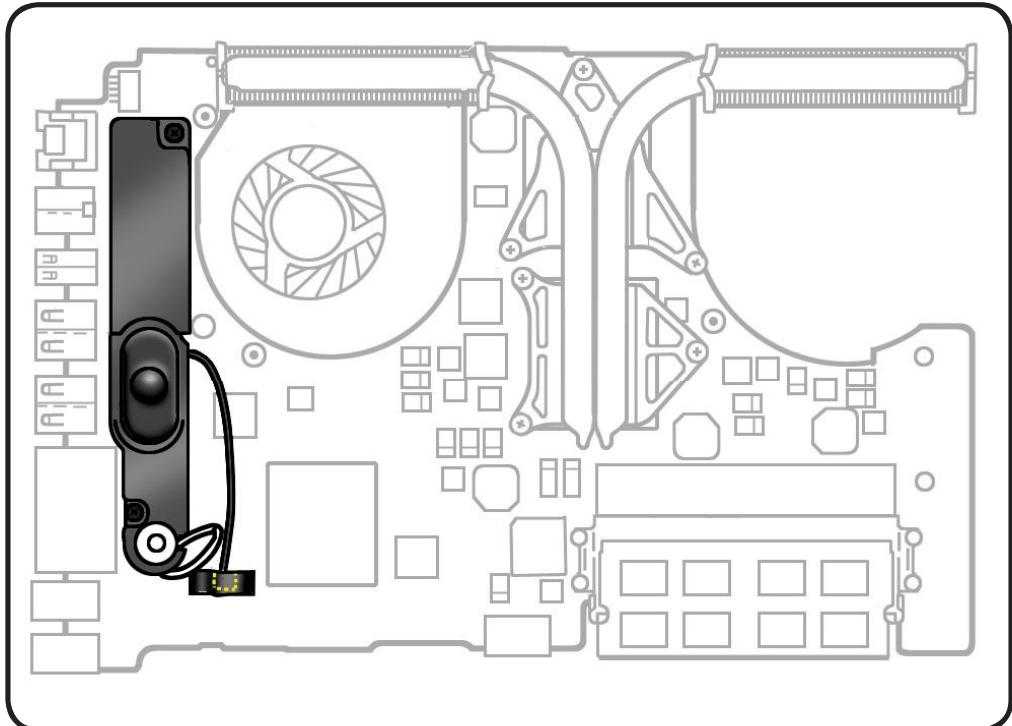


Left Speaker

First Steps

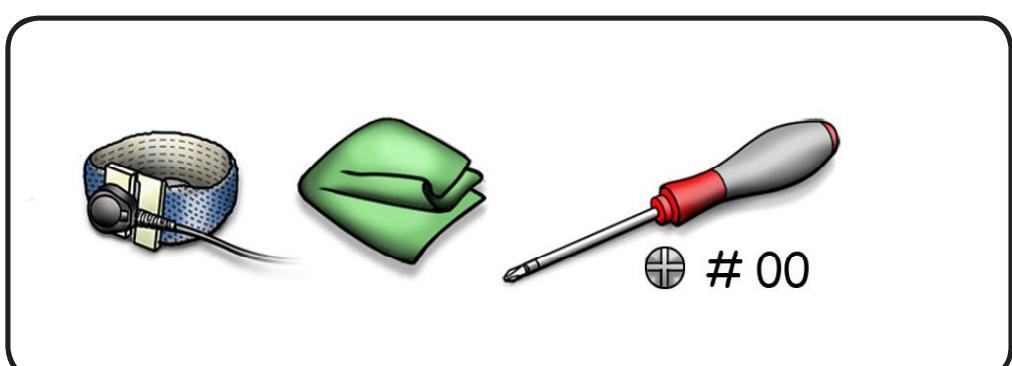
Remove:

- 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



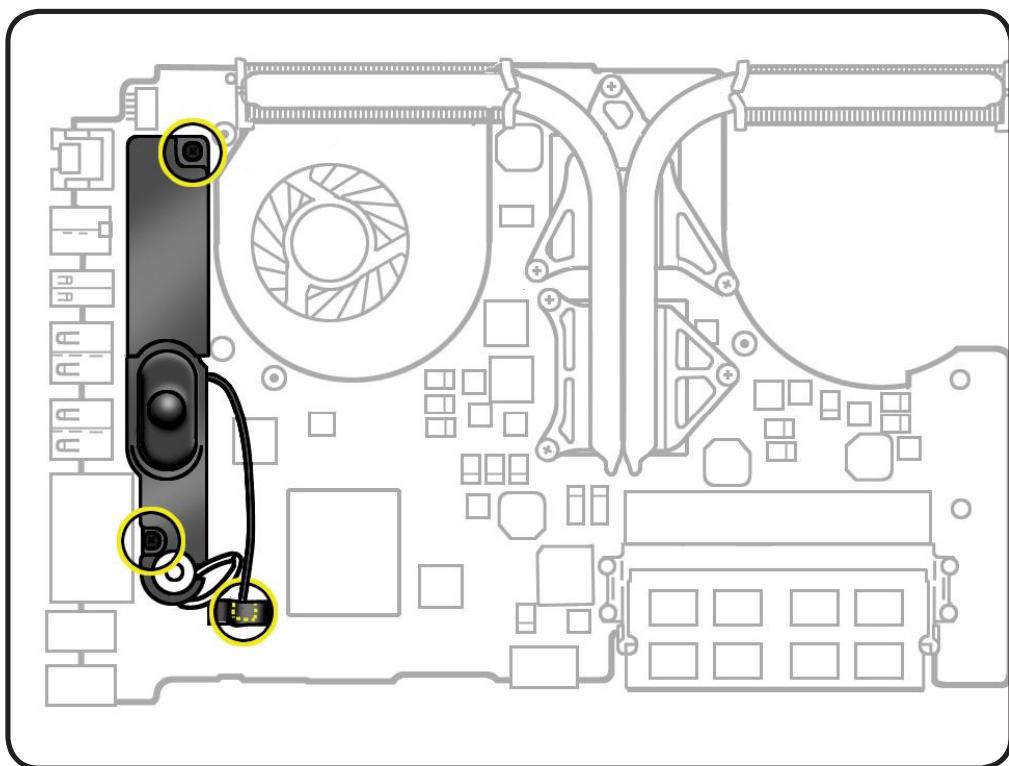


Removal

- 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.



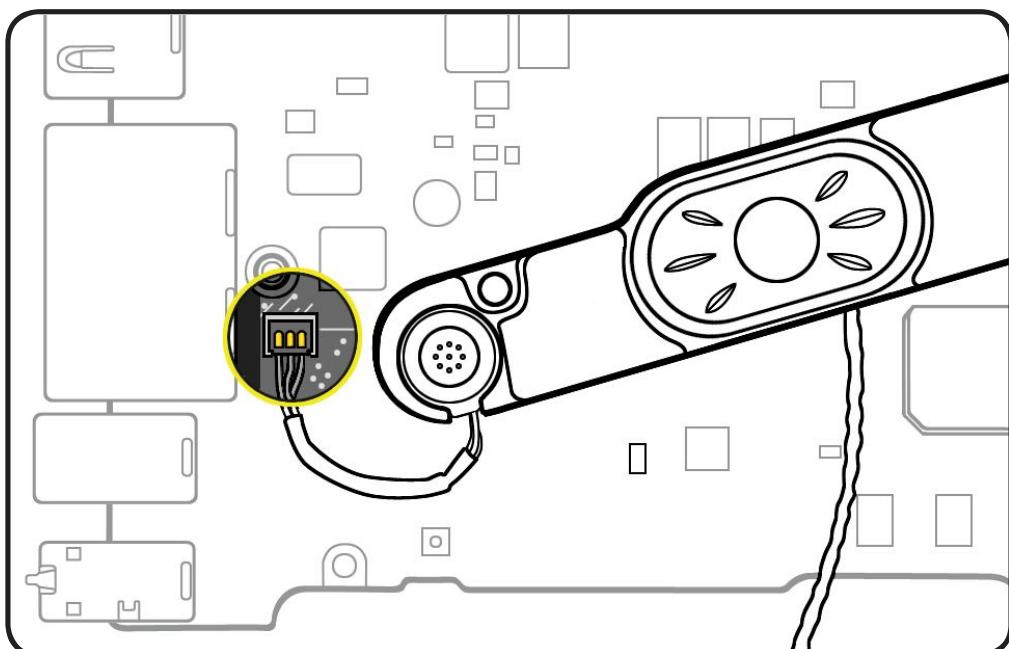
- 2 Remove 2 (4.5 mm) 922-8744 screws.

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.



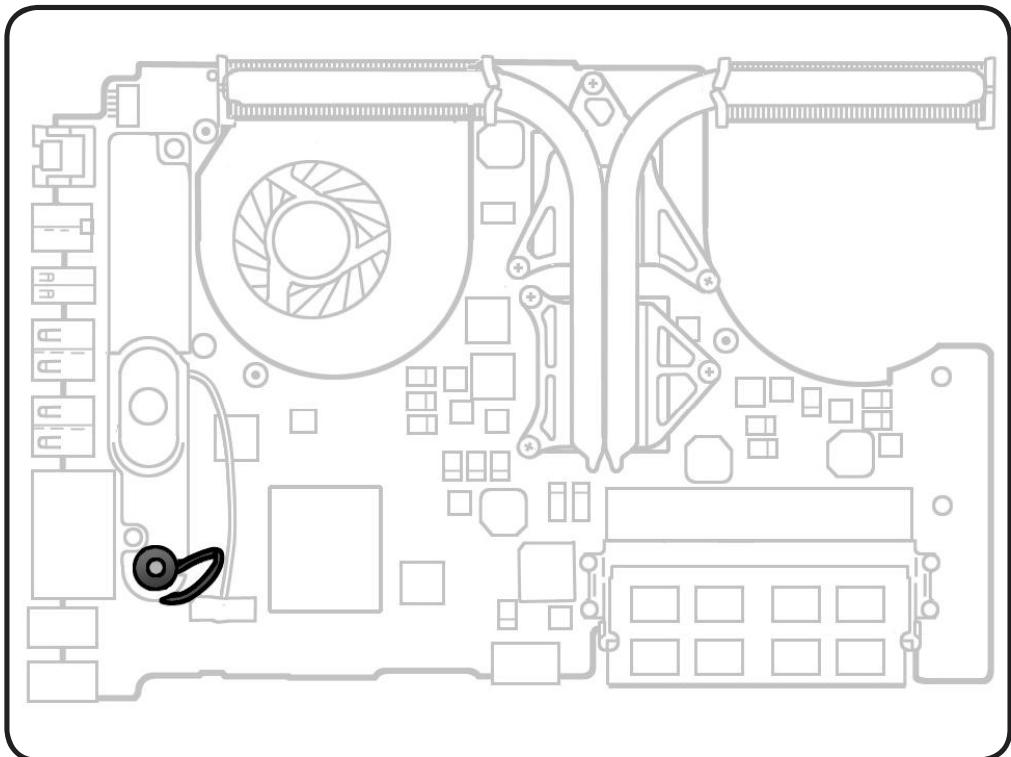


Microphone

First Steps

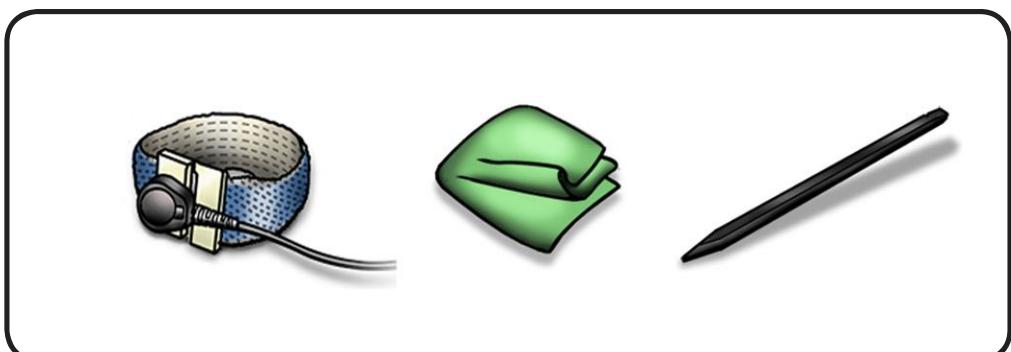
Remove:

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



Tools

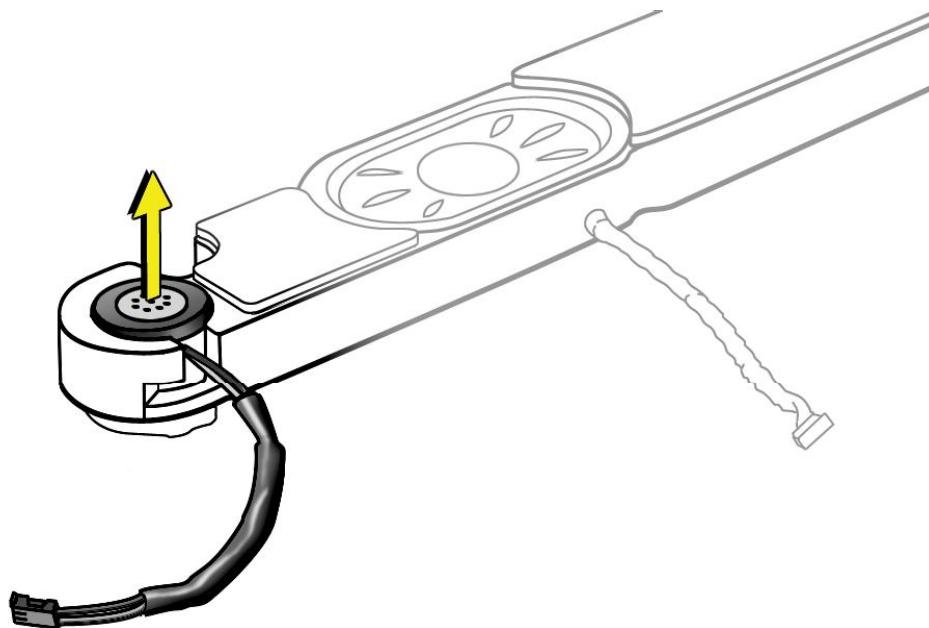
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Black stick





Removal

Use black stick to pry microphone cable from speaker assembly.



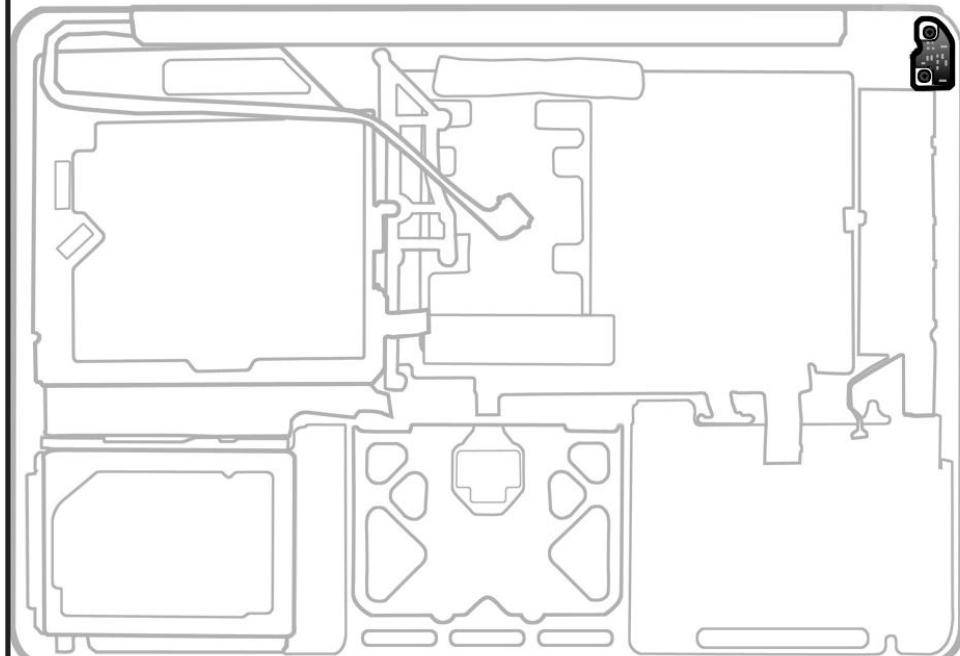


MagSafe Board

First Steps

Remove:

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



Tools

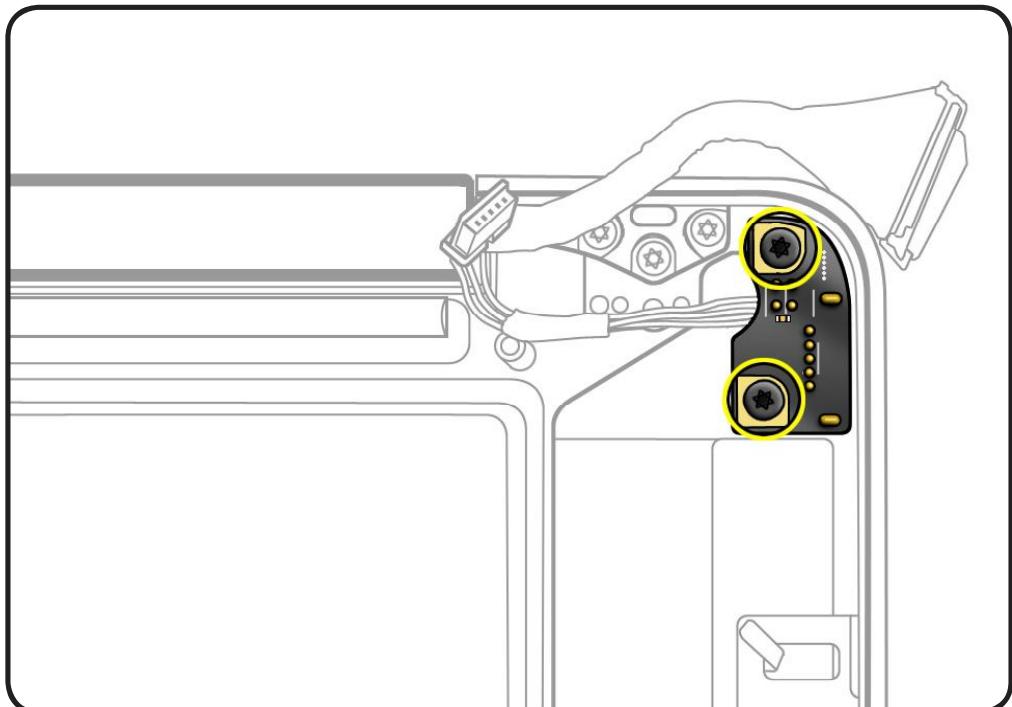
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Torx T6 screwdriver



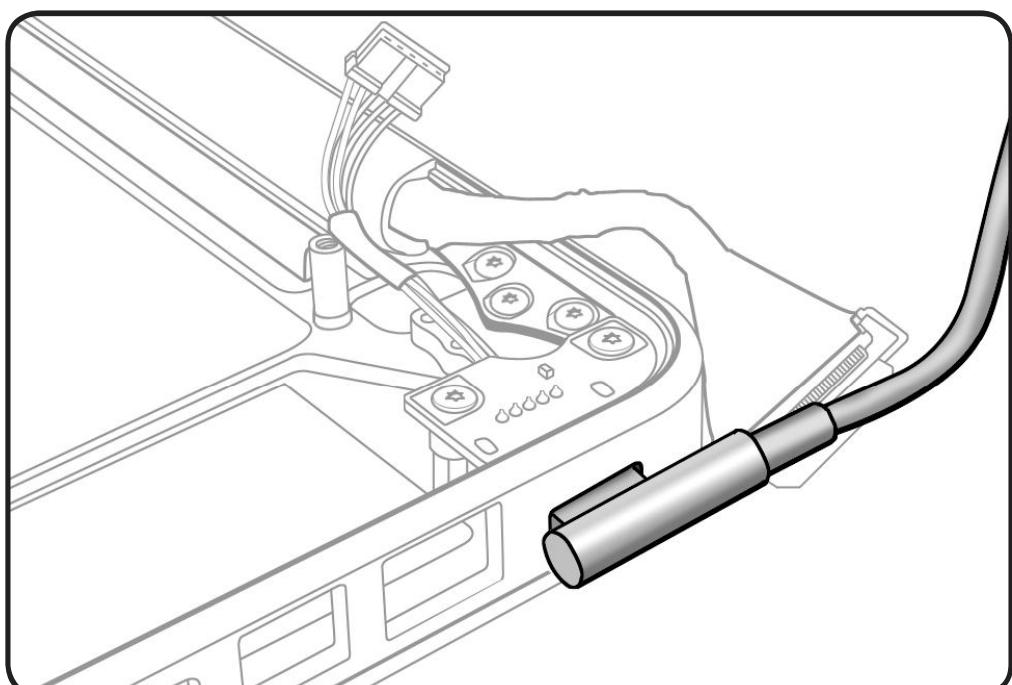


Removal

- 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.



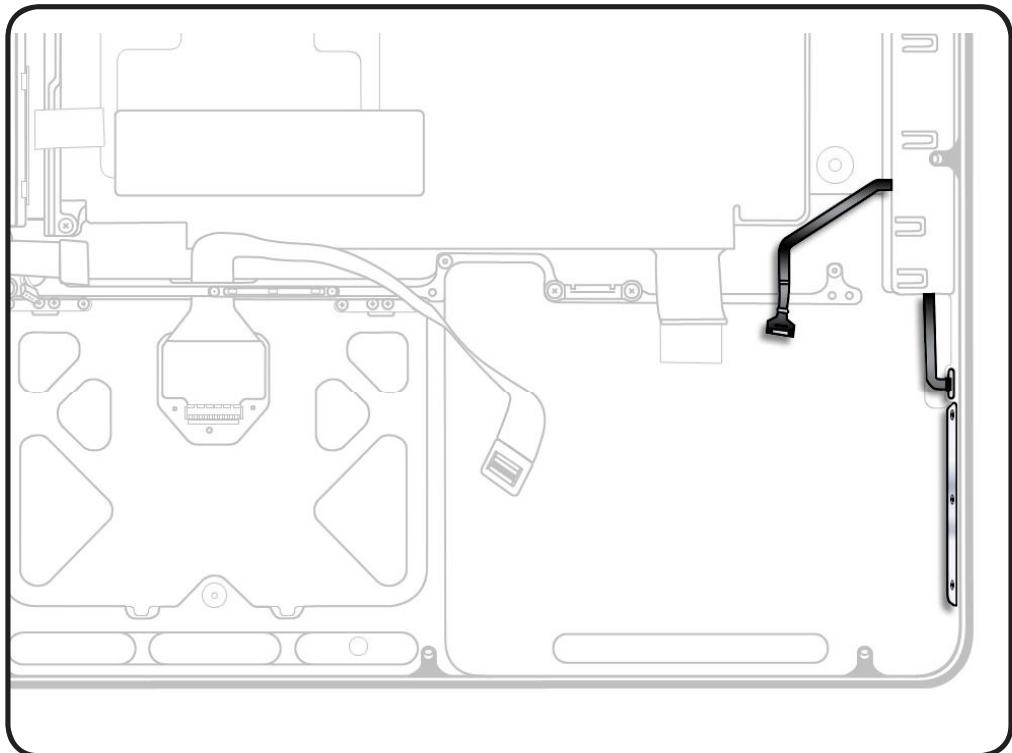


Battery Indicator Light Cable and Board

First Steps

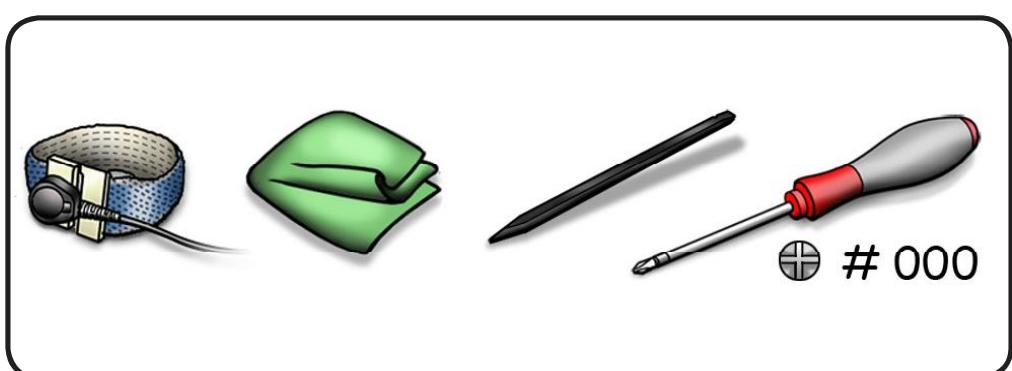
Remove:

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



Tools

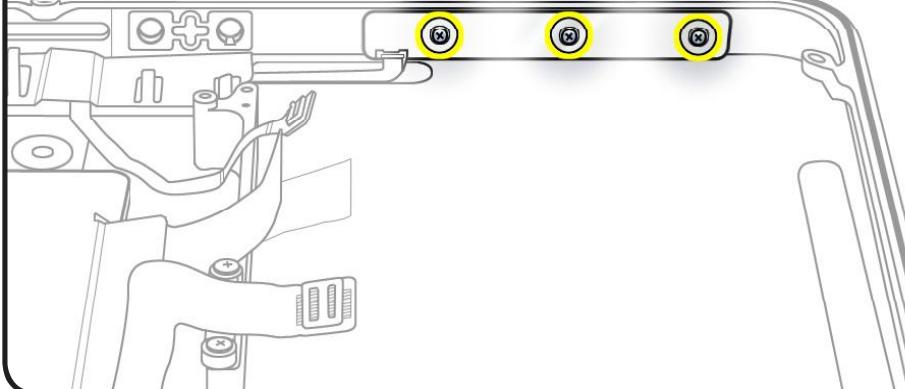
- Clean, soft, lint-free cloth
- ESD wrist strap and mat
- Magnetized Phillips #000 screwdriver
- Black stick





Removal

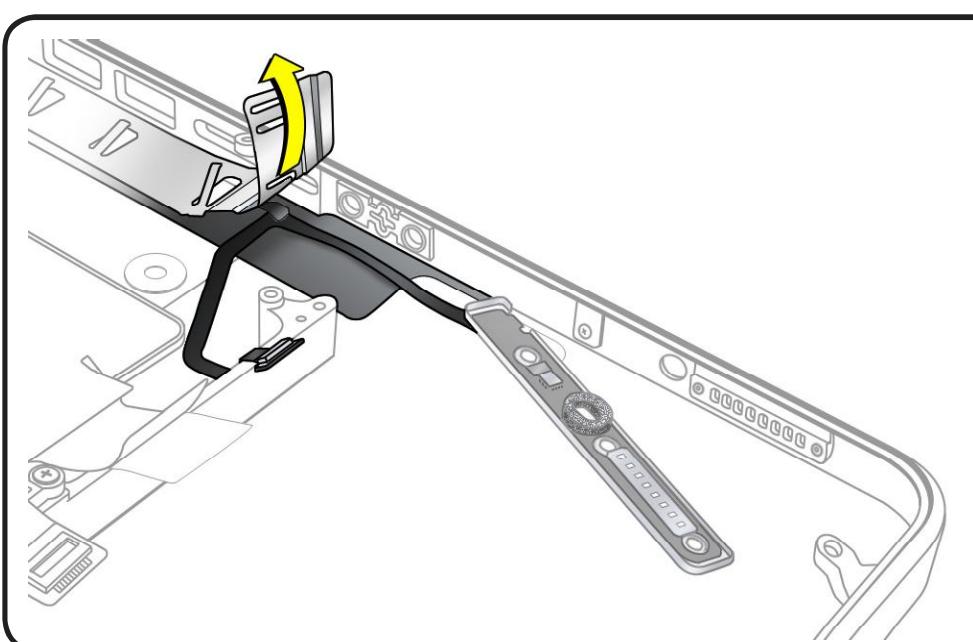
- 1 Place tape over battery button on outside of top case to prevent losing the button.
- 2 Remove 3 (1.8 mm) 922-9069 screws.



- 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

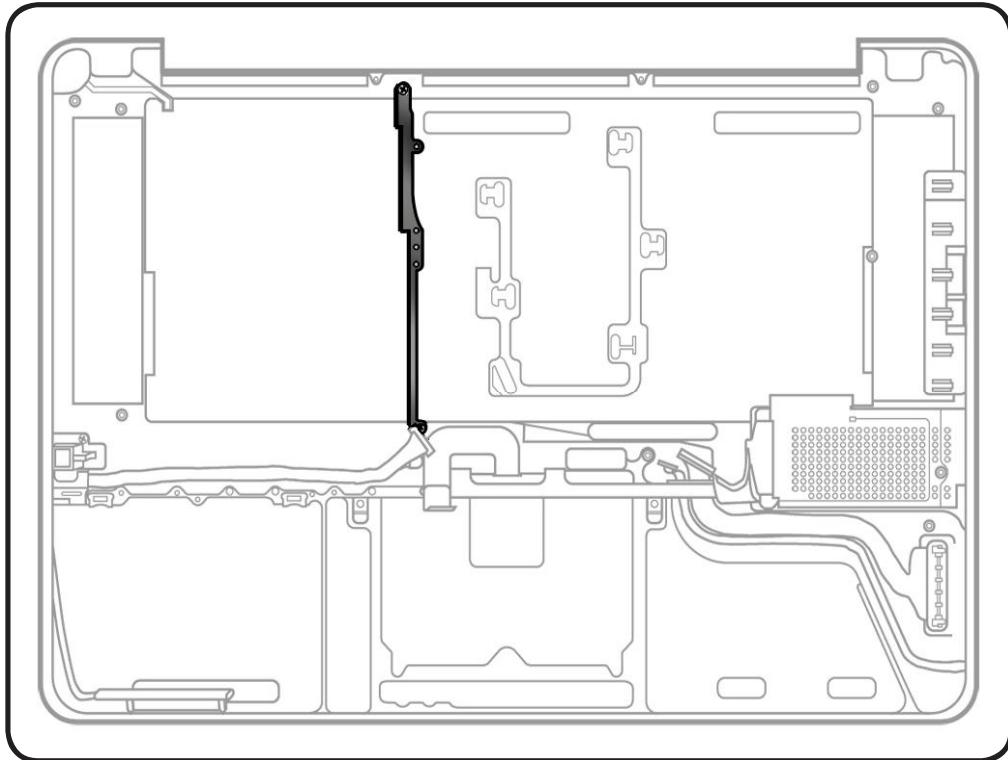


Center Bracket

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



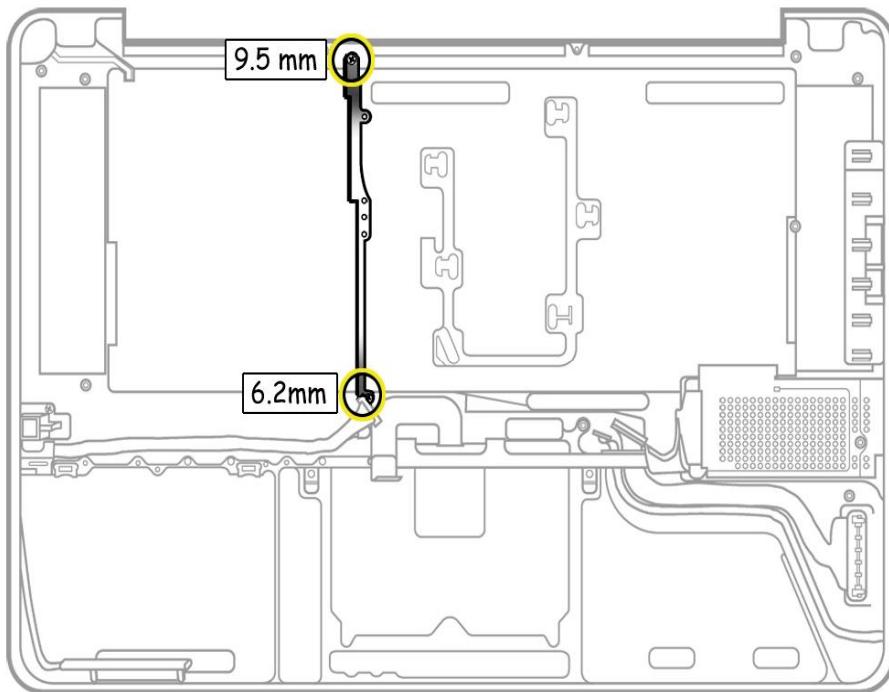


Removal

1 Remove 2 screws:

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

2 Remove center bracket.



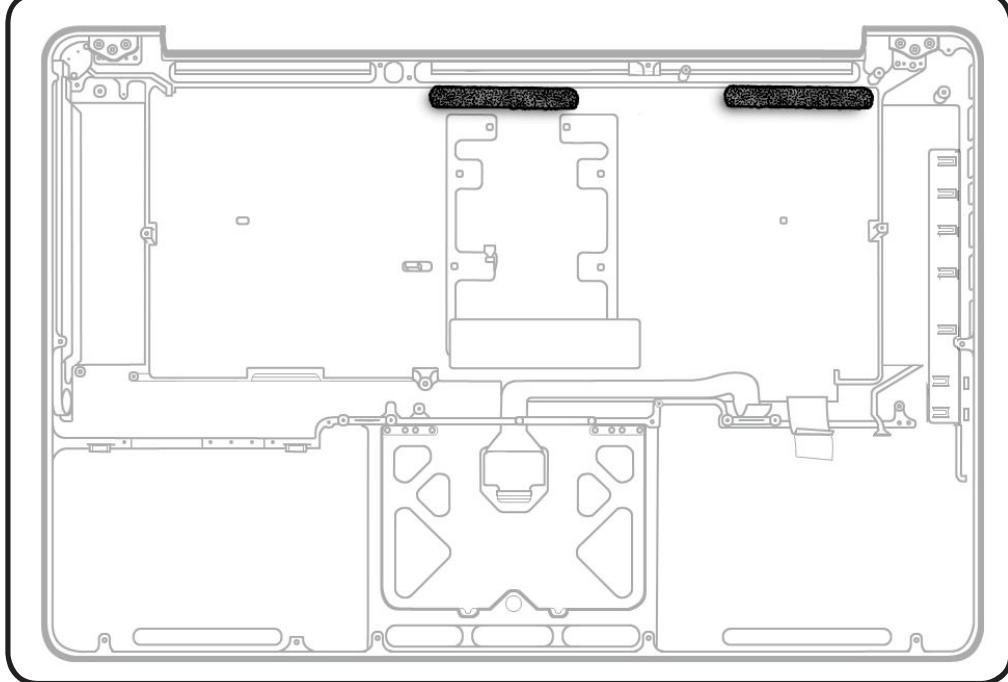


Top Case

First Steps

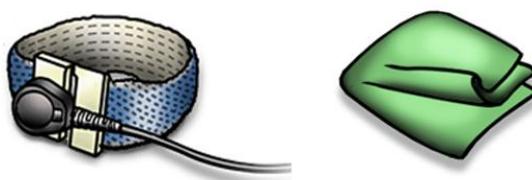
Remove:

- 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

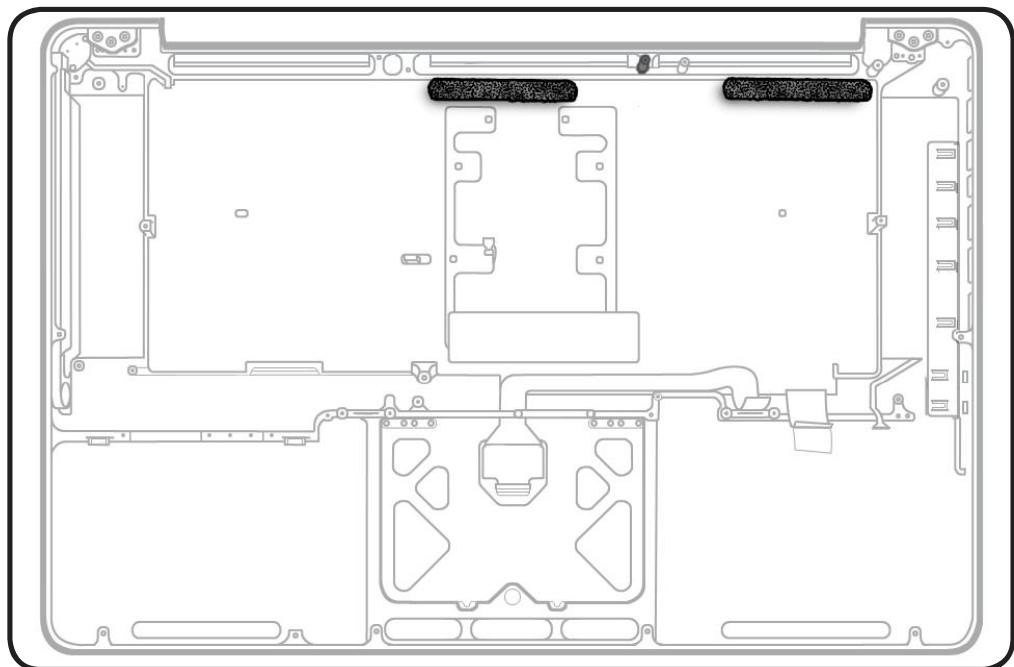
- Clean, soft, lint-free cloth
- ESD wrist strap





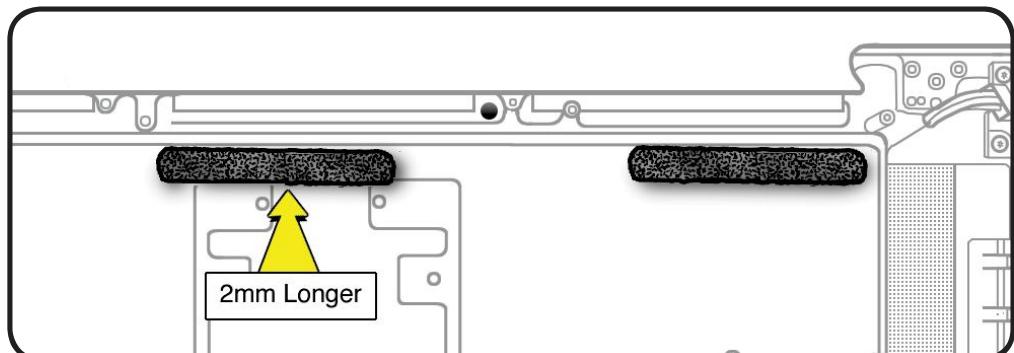
Removal

With the first steps completed, the top case with keyboard is the remaining part.

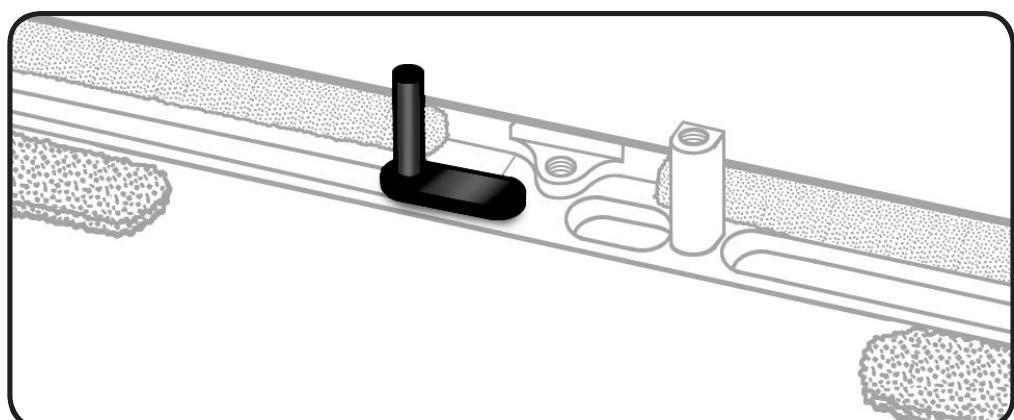


Replacement Note: Three small foam pads are included with the new top case. Before reassembling the case, install the two narrow pads as illustrated. Discard the third pad.

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



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



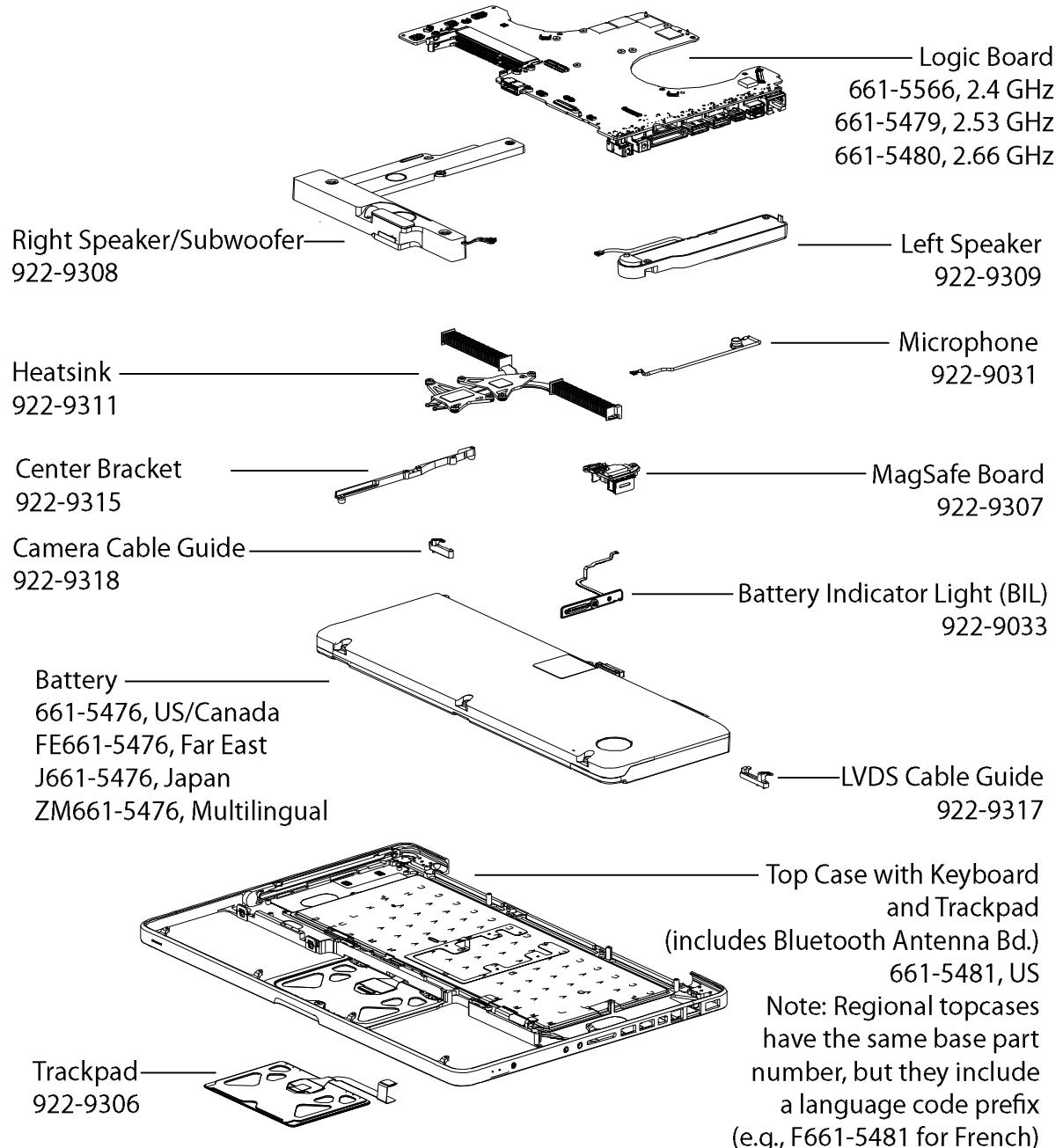
Views

MacBook Pro (15-inch, Mid 2010)



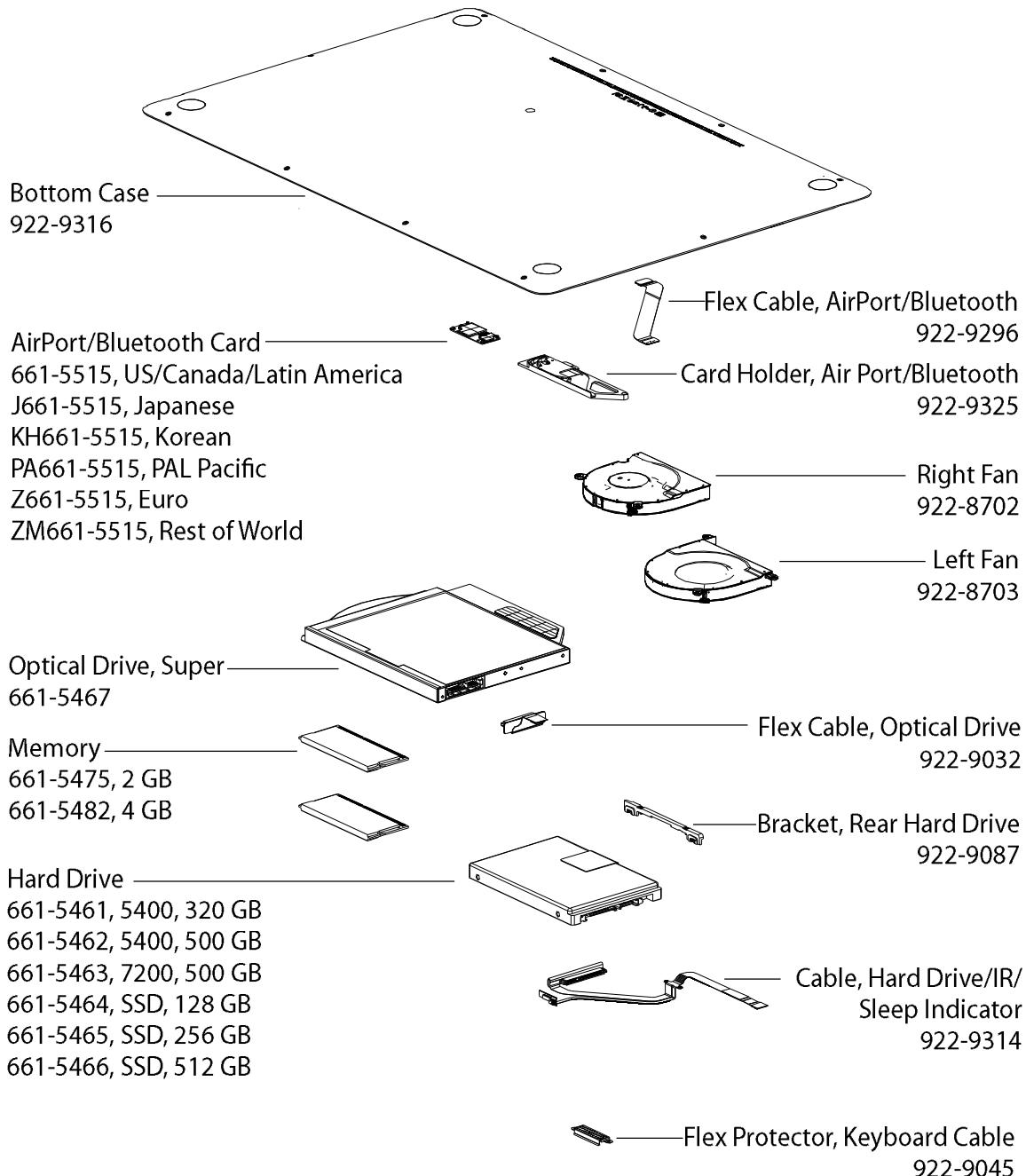
Exploded Views

Main Assembly 1



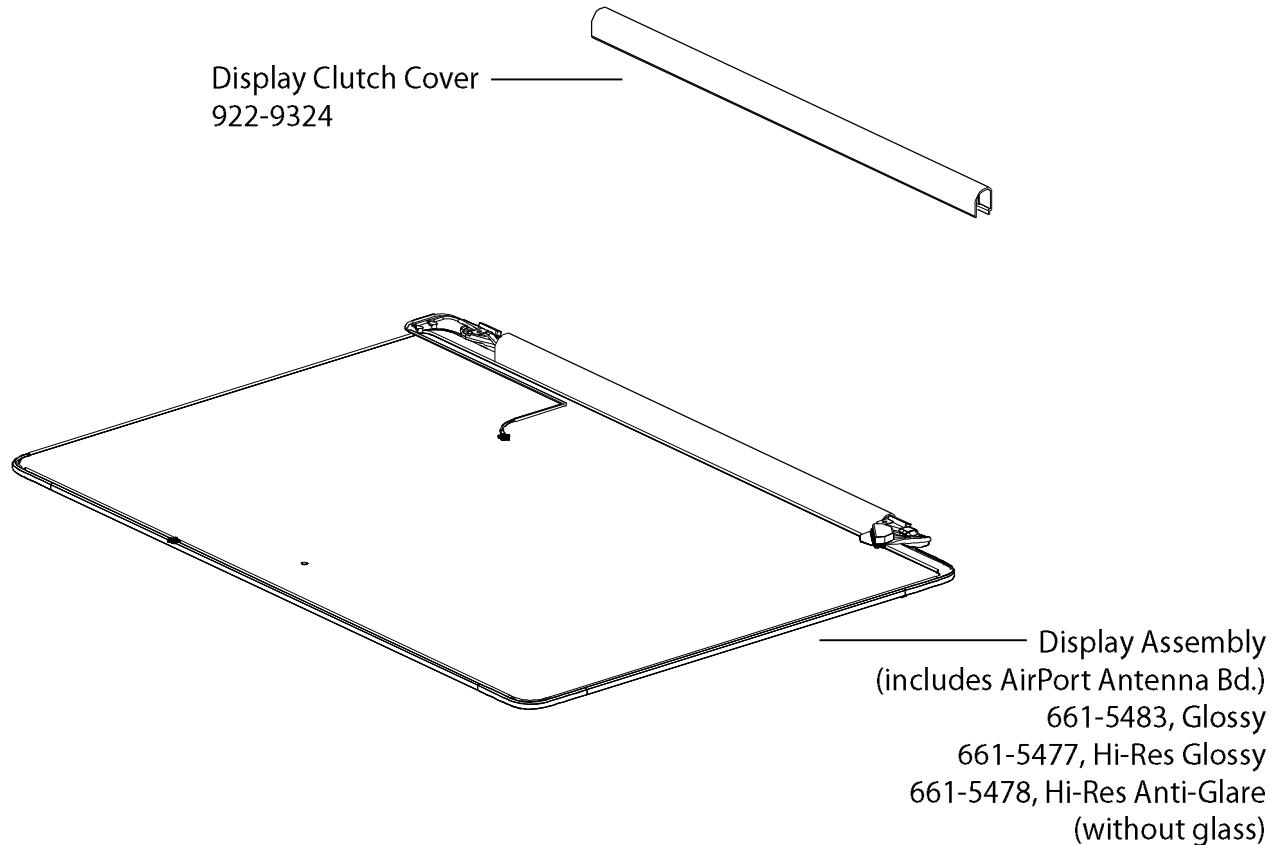


Main Assembly 2





Main Assembly 3





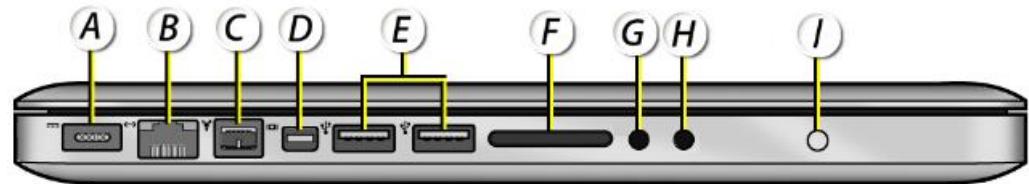
External Views

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



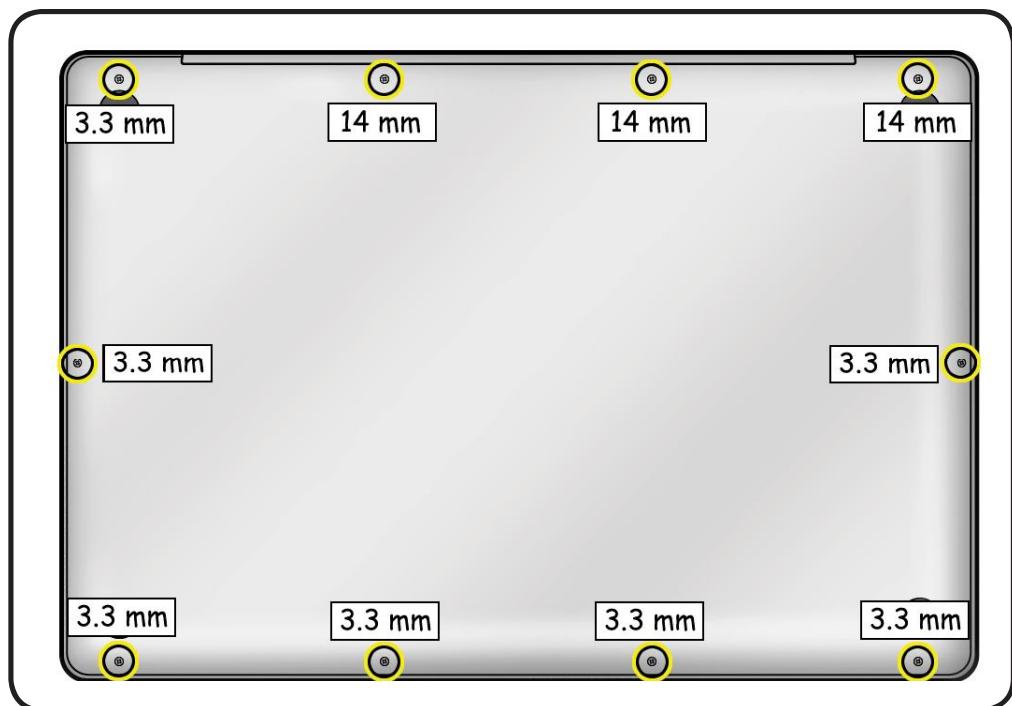
Screw Locations

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

Bottom Case

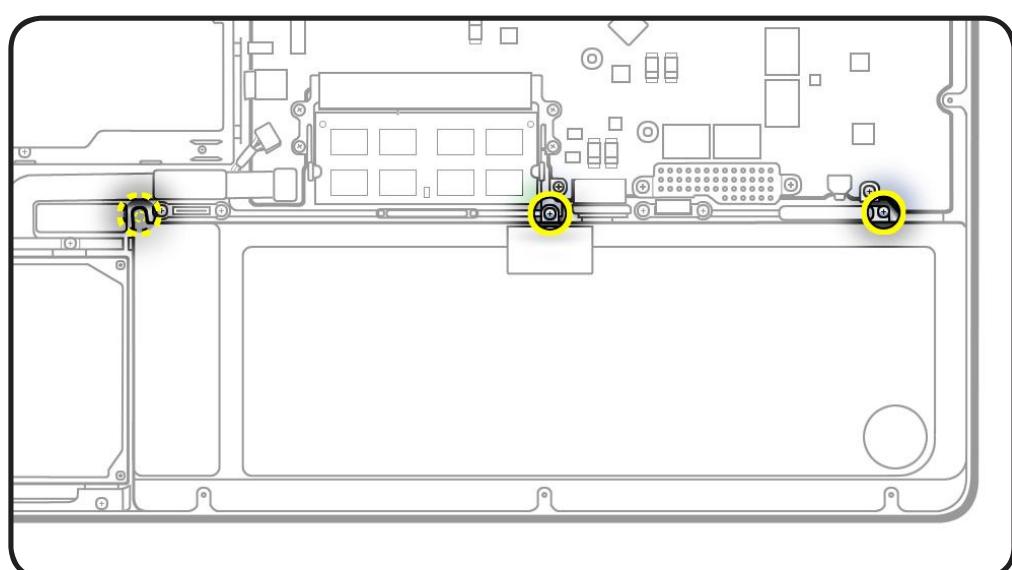
3 (14 mm) 922-8985

7 (3.3 mm) 922-9334



Battery

3 (5.5 mm) 922-9321
trilobe security screws

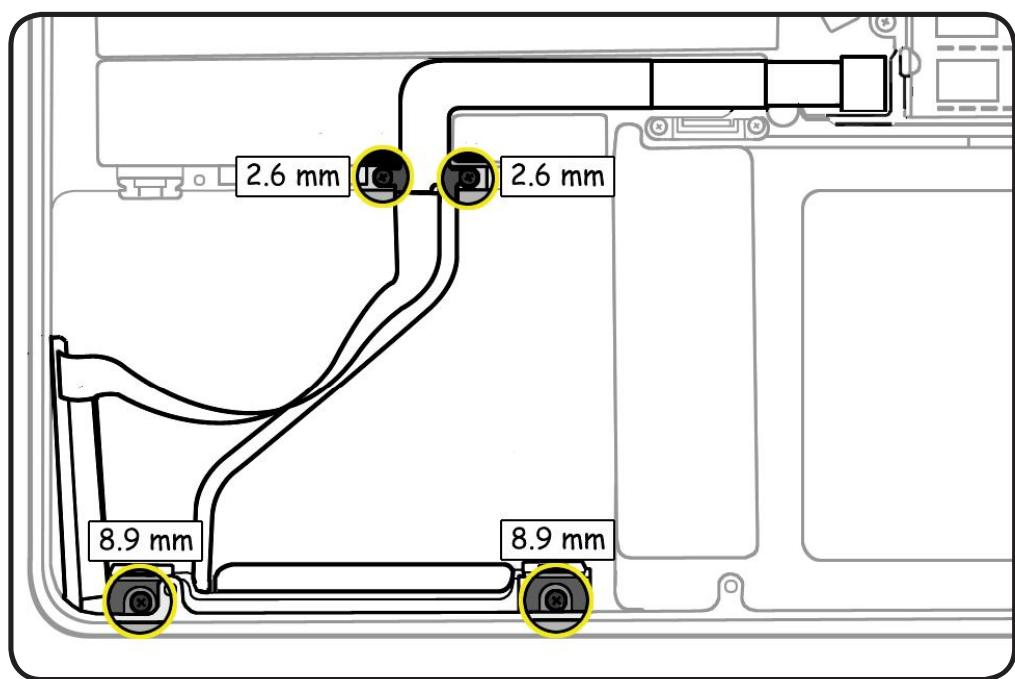




Hard Drive/IR/Sleep Indicator Cable

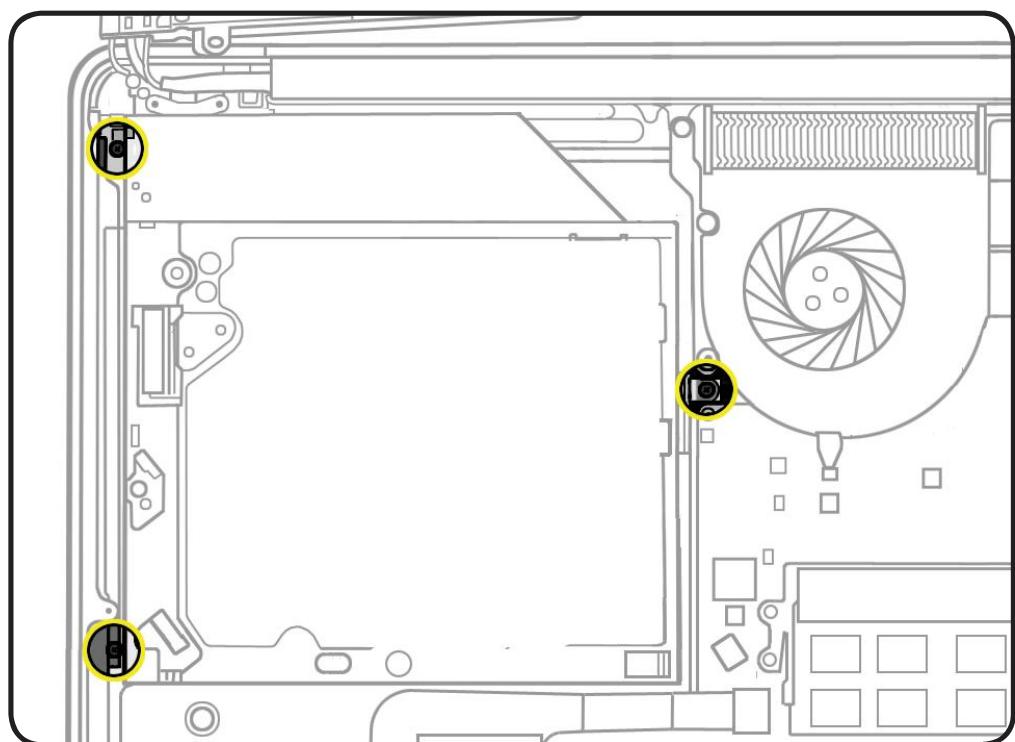
2 (2.6 mm) 922-9036 on cable

2 (8.9 mm) 922-9105 on front bracket



Optical Drive

3 (3 mm) 922-8719

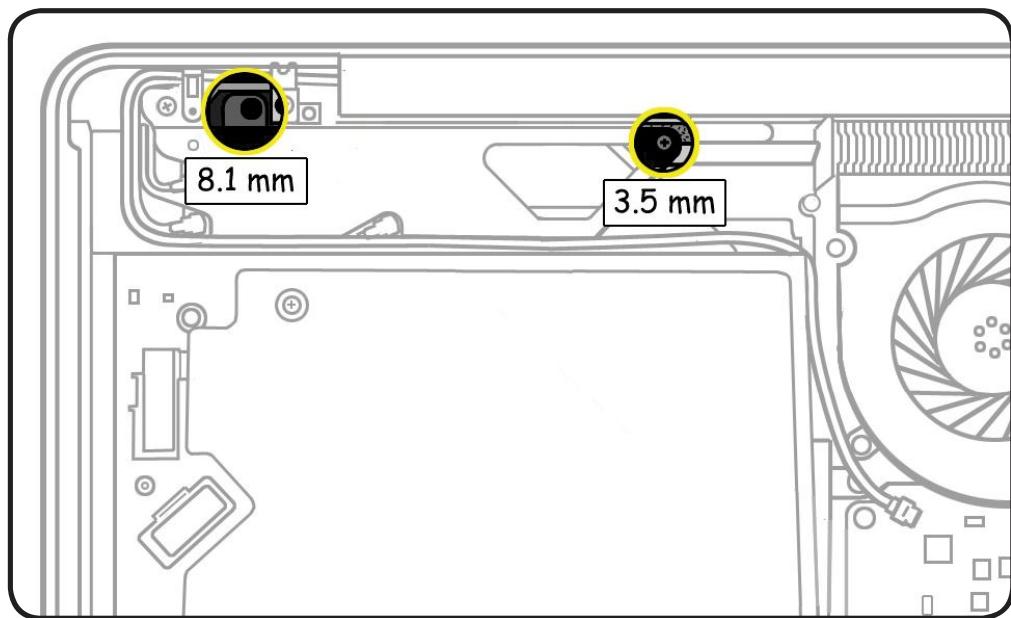




AirPort/Bluetooth Card Holder

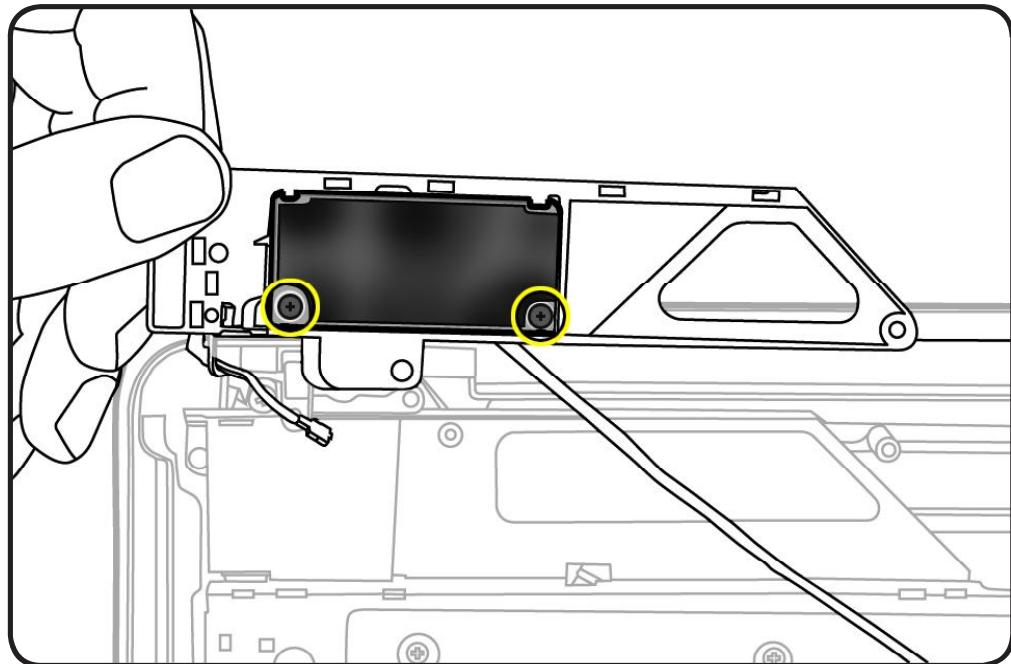
1 (8.1 mm) 922-9107

1 (3.5 mm) 922-8974



AirPort/Bluetooth Card

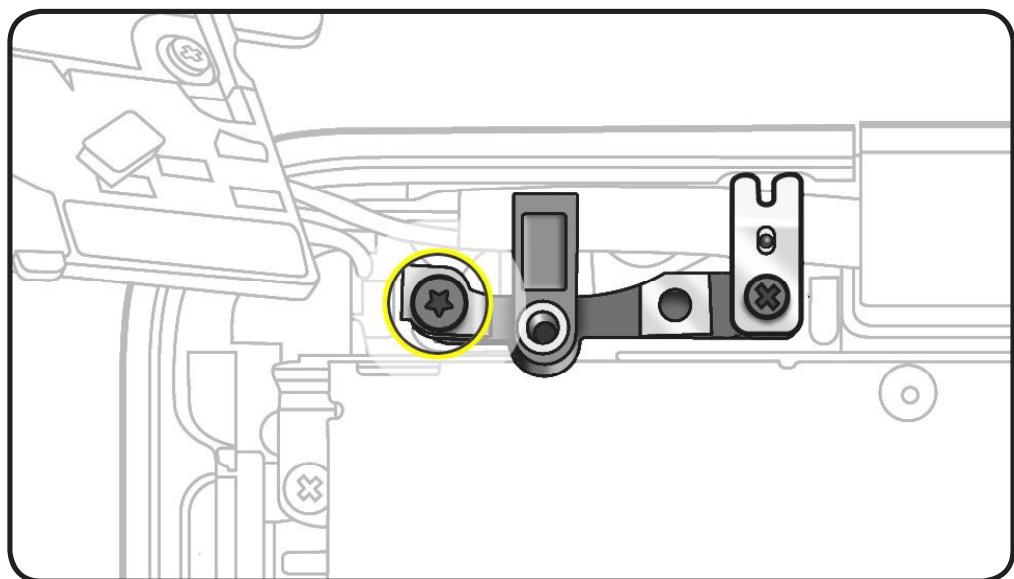
2 (2.5 mm) 922-9200





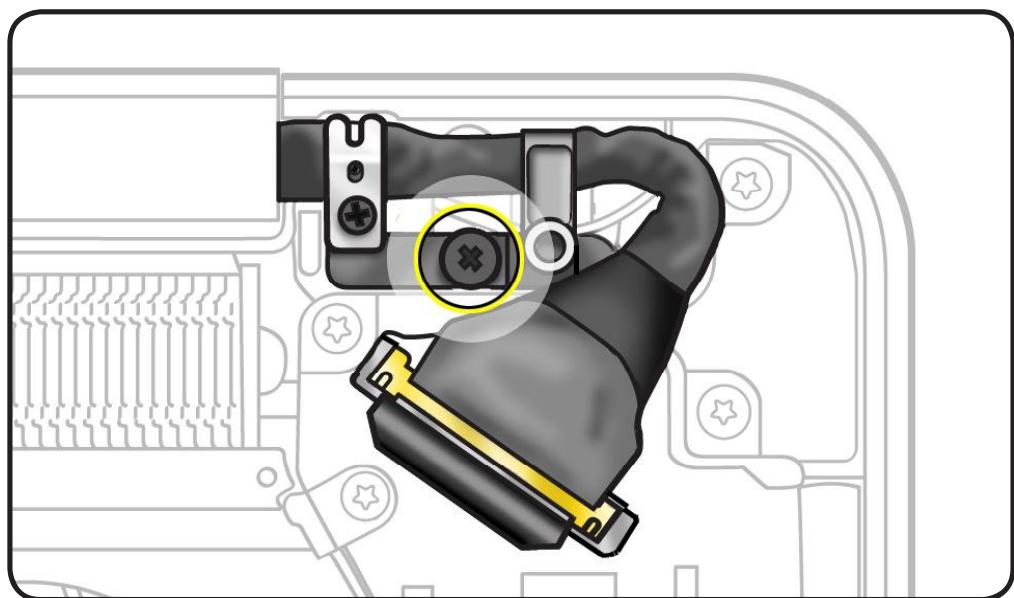
Camera Cable Guide

1 (8.1 mm) 922-9107



LVDS Cable Guide

1 (6.5 mm) 922-8645

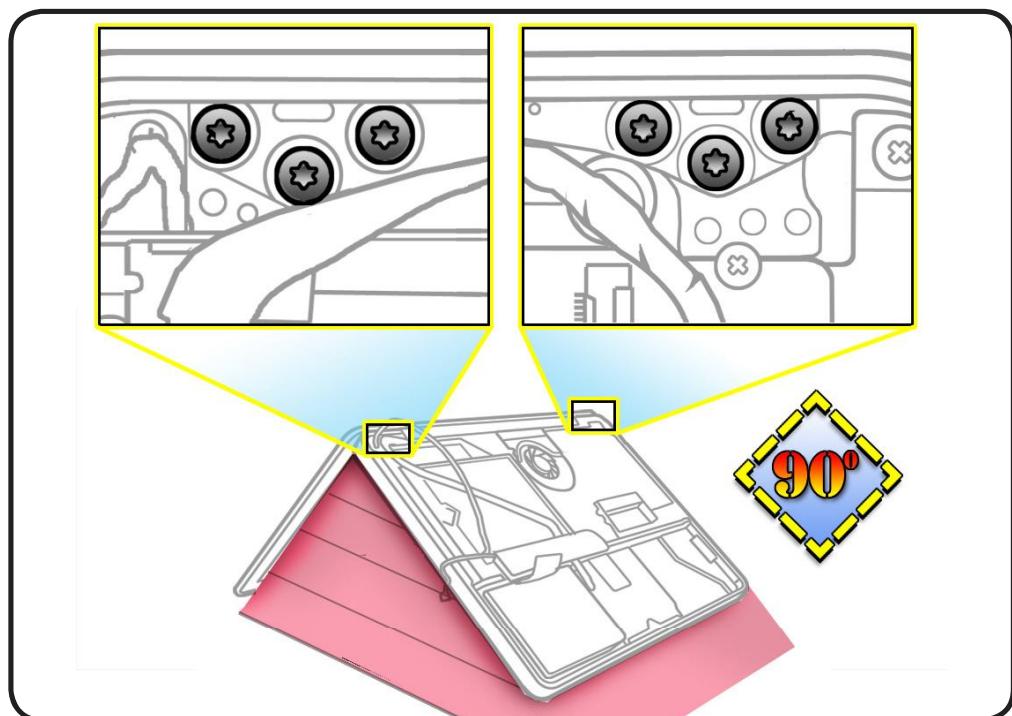




Display Assembly

6 (5.3 mm) 922-8646

Torx T6 screws



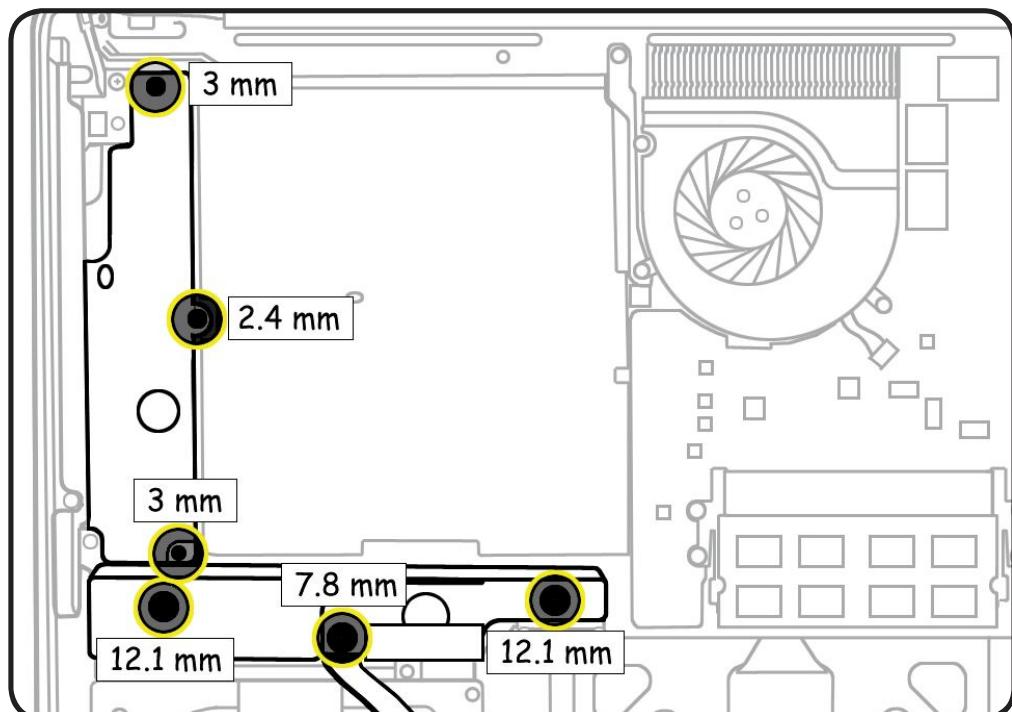
Right Speaker/ Subwoofer

2 (3 mm) 922-9095

1 (2.4 mm) 922-9094

2 (12.1 mm) 922-9466

1 (7.8 mm) 922-9467

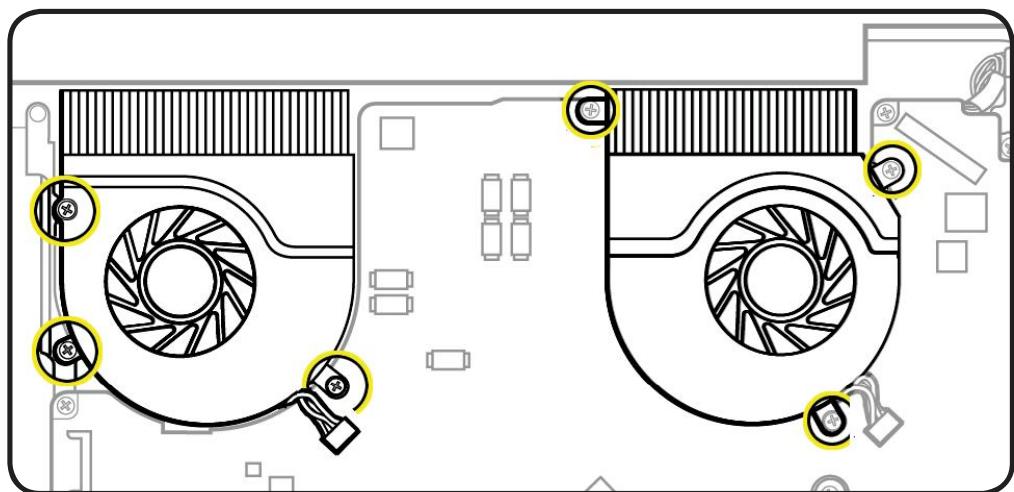




Right/Left Fans

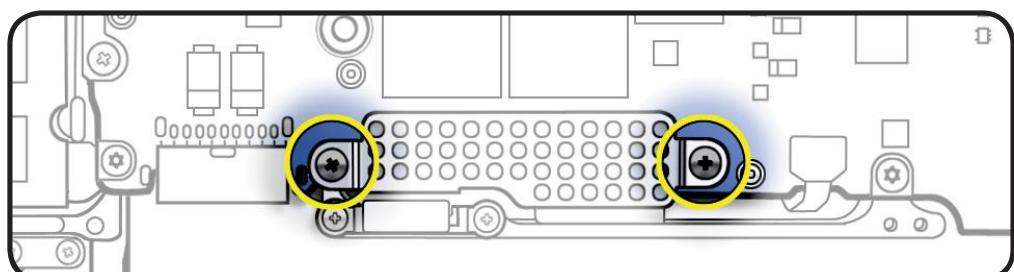
6 (3.0 mm) 922-9108

Torx T6 screws



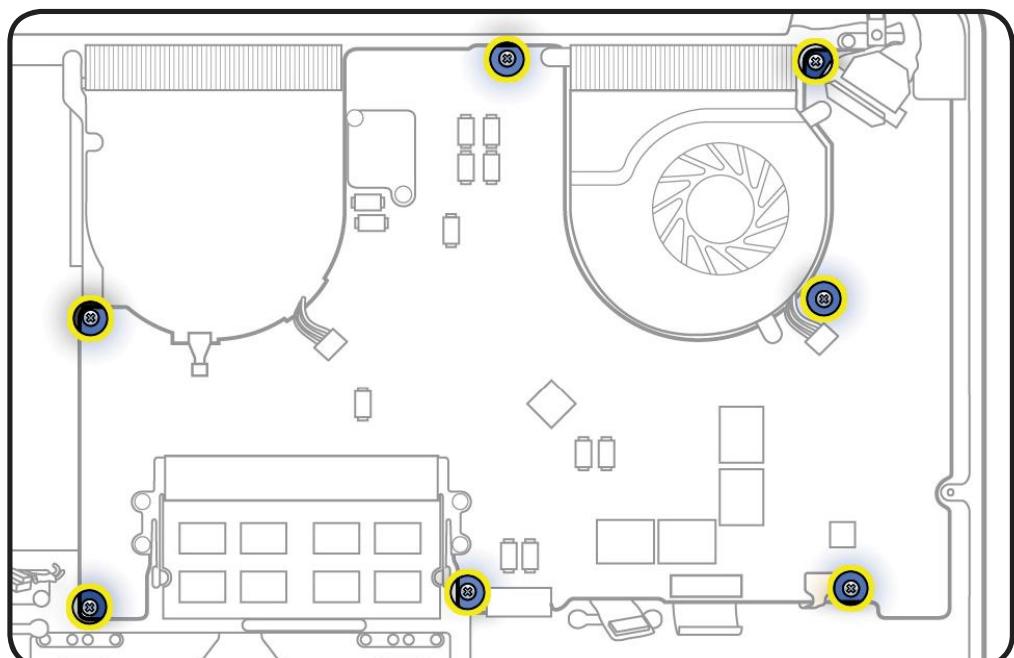
Logic Board

2 (1.2 mm) 922-9037



7 (3.0 mm) 922-9108

Torx T6 screws

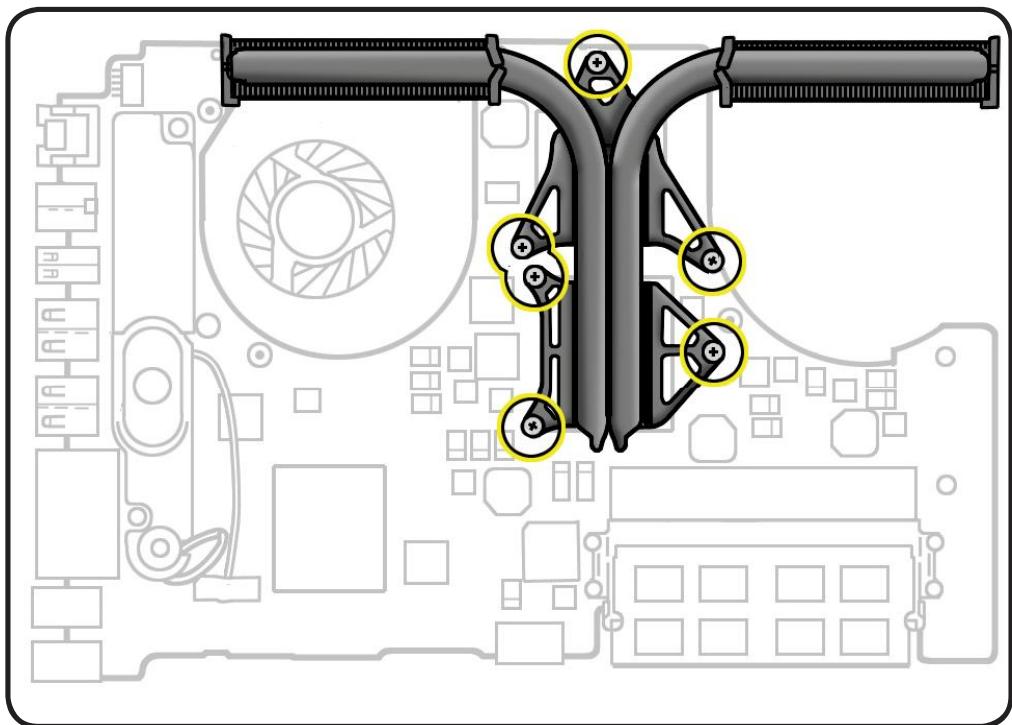




Heatsink

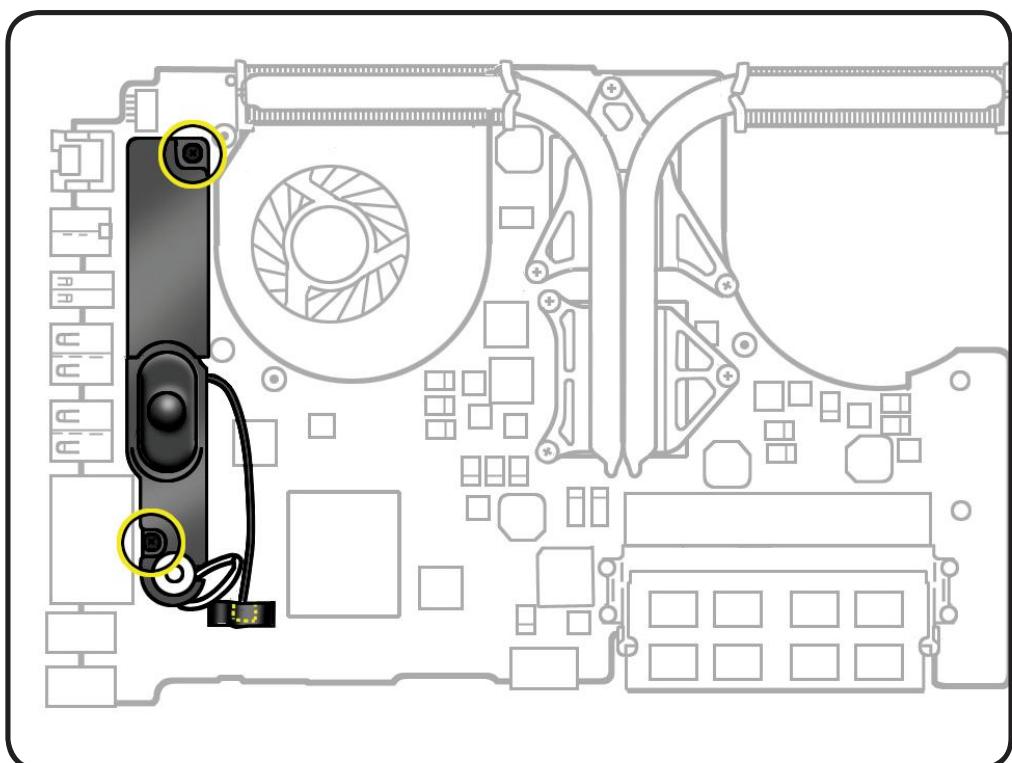
6 (8 mm) 922-9328

Torx T6 screws



Left Speaker

2 (4.5 mm) 922-8744



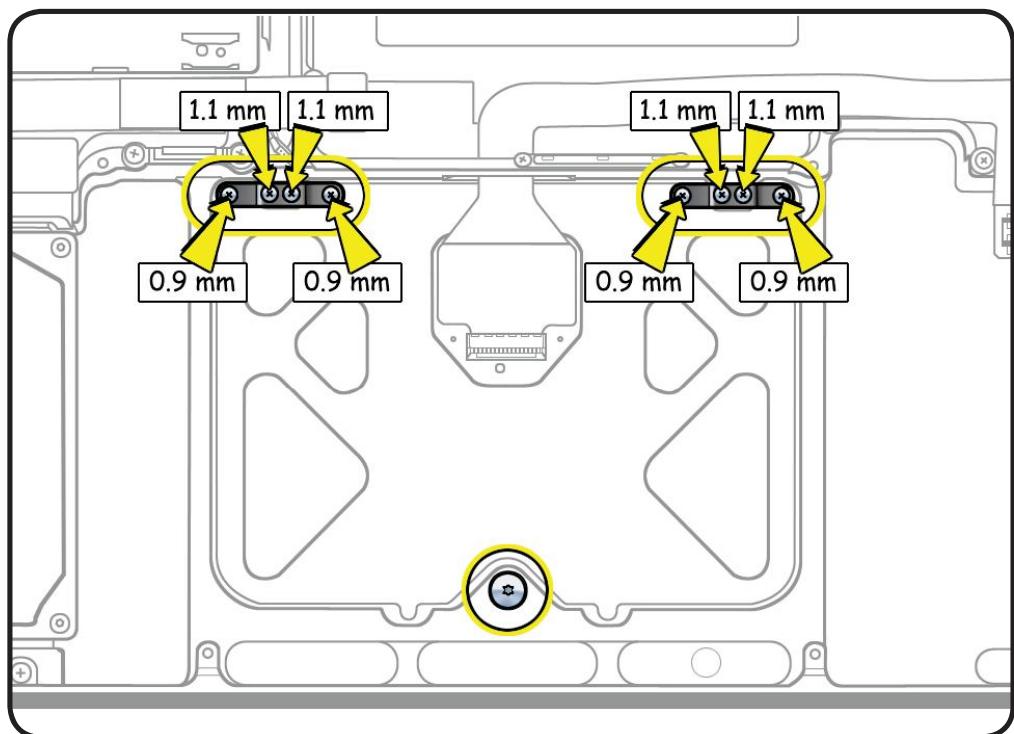


Trackpad

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

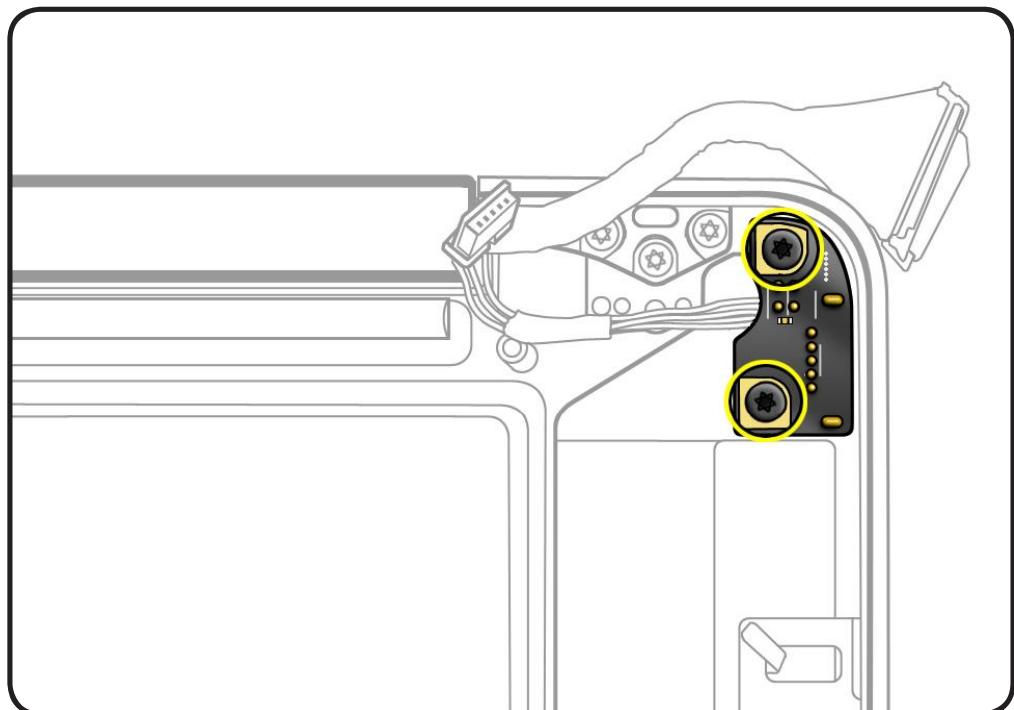
4 (1.1 mm) 922-9461
(black)

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



MagSafe Board

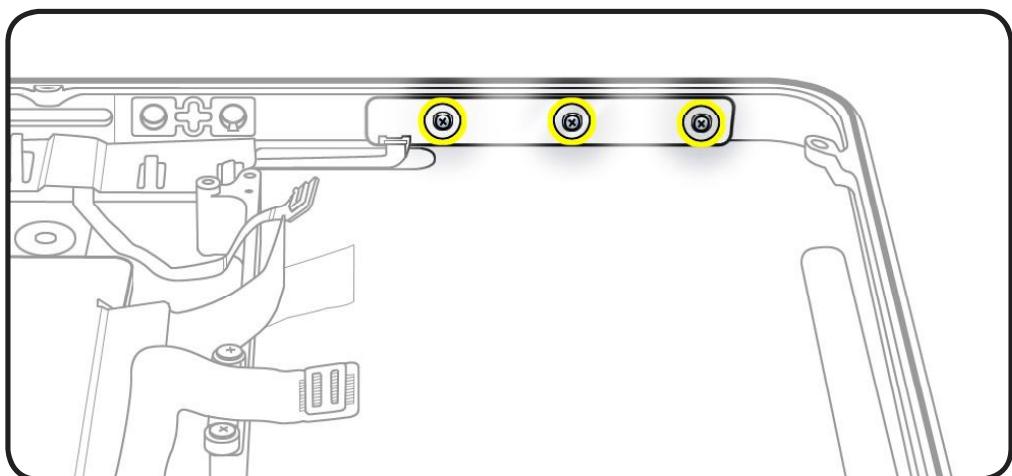
2 (7.5 mm) 922-9042
Torx T6 screws





Battery Indicator Light Board

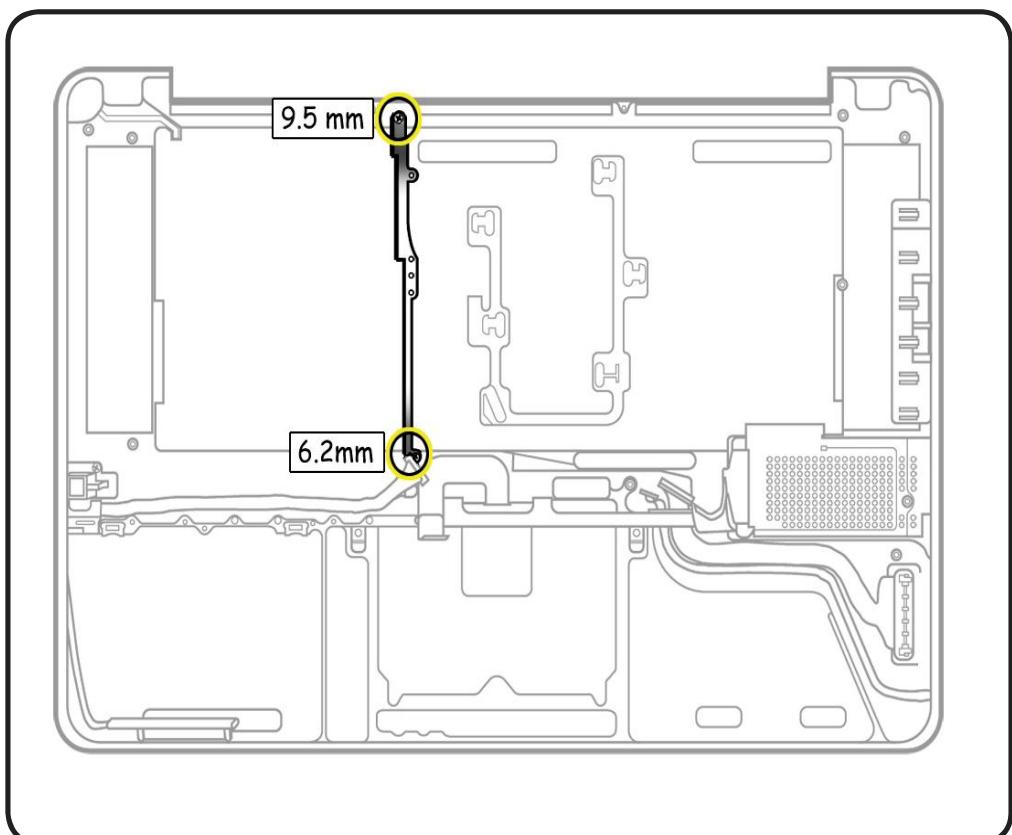
3 (1.8 mm) 922-9069



Center Bracket

1 (9.5 mm) 922-8648

1 (6.2 mm) 922-8725





Screw Chart

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



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