Apple Technician Guide

MacBook Air (11-inch, Late 2010)

Updated 2010-11-15

Apple Inc.

Every effort has been made to ensure that the information in this document is accurate. Apple is not responsible for printing or clerical errors.

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- General Troubleshooting/ Apple Service Diagnostic (ASD)/ Mac Resource Inspector (MRI): Emphasized text: **Not all thermal sensors are on the logic board. Some are on the battery, I/O board, or trackpad. Without fully testing a system, do not assume the logic board requires replacement.**
- Symptom Charts/ Startup and Power/ Won't Start Up: Added step 5 to Quick Check and revised steps 3-4
- Symptom Charts/ Mass Storage/ Solid State Drive (SSD) Not Recognized/Not Mounting: Added step 3 to Quick Check

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- Battery: Updated Tools image
- Top Case: Revised steps about installing trackpad in new top case

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Basics

- Overview: Updated link to CP1226: Safely Handling Lithium Ion and Lithium Polymer Batteries

Troubleshooting

- Symptom Charts/ Startup and Power/ No Video/Bad Video: Updated steps 9 and 10; added steps 11-13
- Symptom Charts/ Display/ Built-in iSight Not Operating Correctly: Added step 3 to Quick Check; revised Deep Dive steps 3-7
- Symptom Charts/ Mechanical /Enclosure: Deleted Thermal Monitoring Errors topic (it is now located in the Troubleshooting/ Sensors chapter)
- Symptom Charts/ Input/Output Devices: Revised symptom chart "Built-In Speaker Has No Audio; added the following symptom charts —External Display Port Has No Audio, External Microphone Has No Audio, Internal Microphone Has No Audio, No Audio from Any Source

Take Apart

- Battery: Added important statement to Packing the Battery; added link to HT3378: Air Shipment Regulations for Lithium-Based Batteries
- Bottom Case: Updated image for Pentalobe driver
- Solid-State Drive (SSD) Card: Replaced the section "Reinstalling Software that Came with the Computer"
- Input/Output (I/O) Board: Added new step 4 showing how to loosen tape on cable.

- Logic Board: Revised replacement steps 1-3.
- Top Case: Added steps about removing mylar strip from new trackpad before completing installation; added steps about folding down trackpad cable

Views

- Exploded View: Updated logic board descriptions

Apple Technician Guide introduced 20 October 2010

Feedback

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

Please email any comments to:

smfeedback4@apple.com

Apple Technician Guide

Basics

MacBook Air (11-inch, Late 2010)

Overview

The MacBook Air (11-inch, Late 2010) features a 1.4 GHz or 1.6 GHz Intel Core 2 Duo Penryn processor, NVIDIA GeForce 320M graphics chip, 64 GB or 128 GB flash storage, 11.6-inch display, and aluminum unibody enclosure.

For full technical specifications, refer to AppleCare Tech Specs:
http://support.apple.com/specs/

Battery Safety Precautions

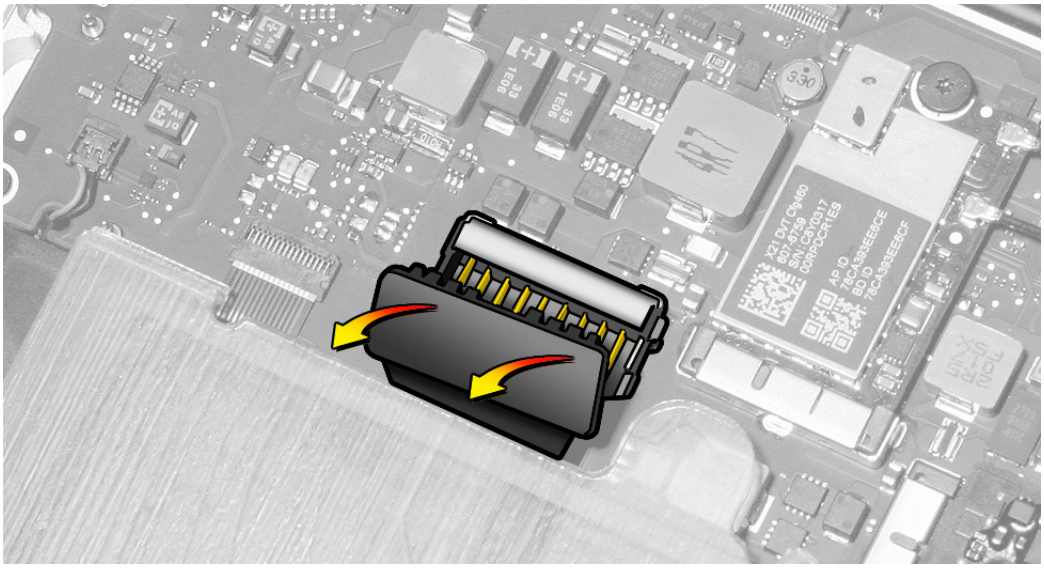
This computer contains an internal-only Lithium-Ion Polymer rechargeable battery pack that is serviceable by Apple-authorized service providers only. Tamper-resistant screws are employed to prevent customers from attempting to remove the battery.

WARNING: Every time you remove the bottom case, attach the protective battery cover, and disconnect the battery cable from the logic board.

WARNING:

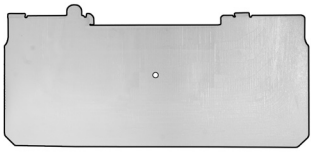
- Batteries must be handled with utmost care
- All work space must be free of foreign or sharp material and batteries should not be exposed to heat or open flame
- Do not drop, stack, puncture, crush, flex or apply unnecessary pressure to a battery, as this may result in damage
- Damage to a battery may result in a potential fire hazard

WARNING: Because the battery is internal and connected to the logic board by a cable, it **MUST BE DISCONNECTED** before performing service procedures. If you fail to do so, live current from the battery will short circuit the components and render the logic board and/or the EDP cable unusable.



Handling and Storage

Best Practices



The battery contains several soft battery cells. Do not press on the battery cells with your fingers, and do not handle the battery pack in any way that might apply any physical pressure to these cells.

- Always attach the battery cover (922-9736) to the battery immediately after removing the bottom case and before beginning battery removal or any other repair.
- Handle the covered battery by its edges only, with two hands at all times.
- Keep the battery cover on the battery at all times when the battery is out of the computer.
- Only remove the battery cover just before replacing the computer's bottom case. Keep the battery cover on the battery at all other times.
- Do not drop a loose battery. If the battery is dropped, replace the battery.
- Only tighten the battery's screws finger tight; do not overtighten them by any amount, or irreparable damage to the battery pack can result.
- Do not twist or torque the battery, or irreparable damage to the battery can result.

Proper Sequence For Battery Removal

Battery removal steps are mentioned below, however detailed battery removal and replacement steps are described in the **battery take-apart chapter**.

Important: When servicing the MacBook Air (11-inch, Late 2010)/MacBook Air (13-inch, Late 2010) computers, make sure you have a battery cover for each model, as the batteries are different sizes. Ensure a cover is placed on each battery whenever the bottom case is removed or if the battery is out of unit.

1. Remove bottom case.
2. Attach battery cover onto exposed side of battery while it is still installed inside the computer. **Note**: You can remove the cover by carefully pulling up on the rounded tab, located next to the battery connector.
3. Disconnect battery connector from logic board.
4. Remove battery screws.
5. Carefully lift out covered battery with both hands and place on a smooth, hard, clean surface free of screws and other debris. Or, place battery in the box that the known-good battery shipped in.

Proper Sequence For Battery Replacement

Caution: Make sure no screws are stuck under the battery (inside the top case) or stuck to the inside cover of the bottom case. Check both areas before inserting battery and replacing bottom case.

1. Ensure battery cover is properly attached to the soft side of the battery before installing into computer. **Note**: The known-good battery should come with a cover already installed. Extra covers may be ordered in GSX.
2. Make sure top case interior is clean—free of any dust, dirt, loose screws, etc.
3. Carefully place known-good battery into position with both hands, aligning the screw holes in the battery frame with those of the computer's top case.
4. Use a torque driver, if available, to tighten battery screws to 1.8 ± 0.18 Kgf-cm. Do not overtighten them by any amount or irreparable damage to the battery assembly can result.
5. Connect battery connector to logic board.
6. Before replacing bottom case, remove battery cover and inspect battery for any dust, dirt, loose screws, etc.
7. Install bottom case from the front, and press lightly so that the internal clip snaps onto battery. The bottom case clip can puncture a cell if the bottom case is installed incorrectly.

Personal Protection

Use utmost care when handling the battery. In general,

- Keep battery and computer away from heat and open flame. Store in a cool dry place.
- When servicing the computer, use the battery cover as directed.
- When handling a large container of batteries, steel-toed shoes are recommended.

WARNING: For complete training on battery safety and first-aid measures in case of accidental exposure, **make sure you read and understand this article before servicing this computer:**

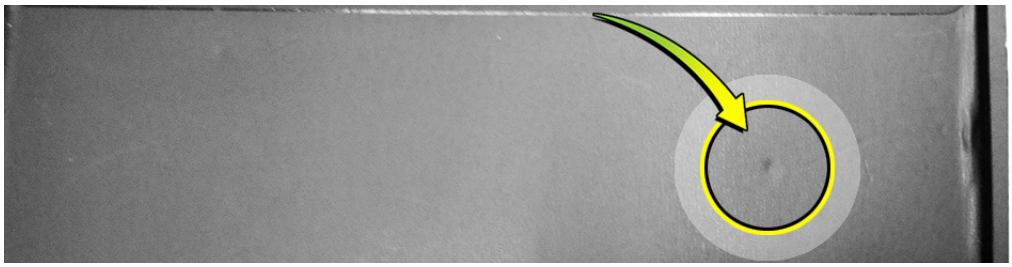
CP1226: Lithium Ion and Lithium Polymer Battery safe handling and emergency response procedures

Evaluating Battery Damage

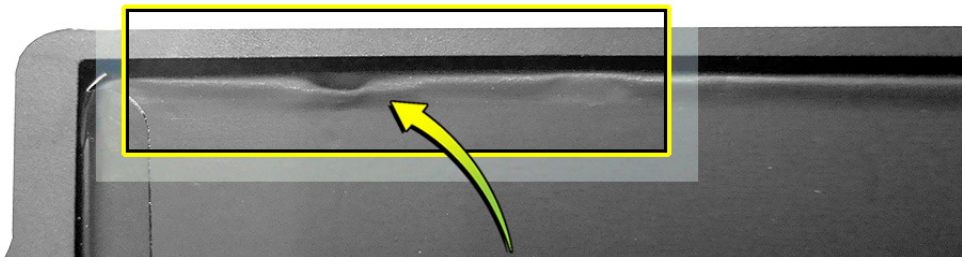
For more examples of cosmetic damage and directions on visual inspection, go to HT4409: http://support.apple.com/kb/HT4409?

Use battery if

- Minor dents (up to 8 dents if 0.4 mm deep or less; up to 5 if 1.5 mm deep or less; up to 3 if 2.0 mm deep or less)

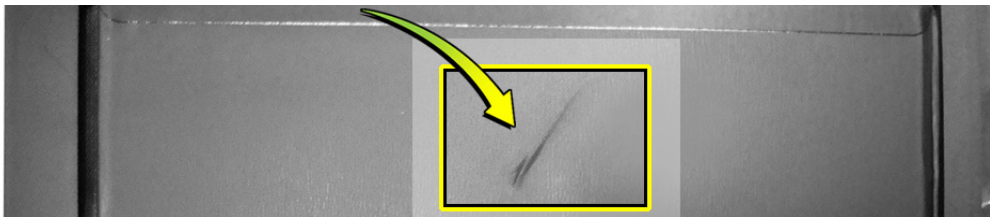


- Minor cell pack deformity (up to 2.0 mm total area)

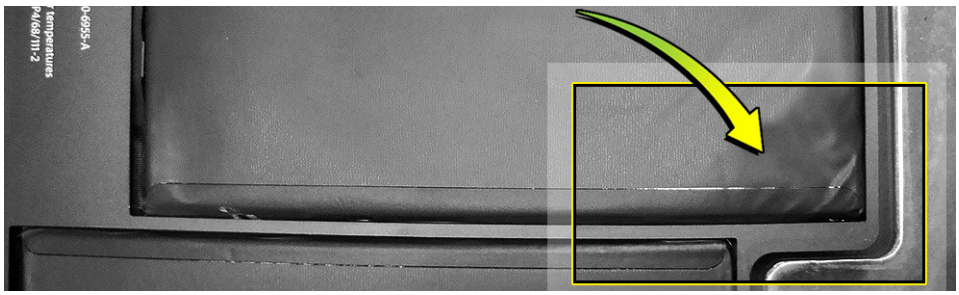


Return battery if

- Scratches

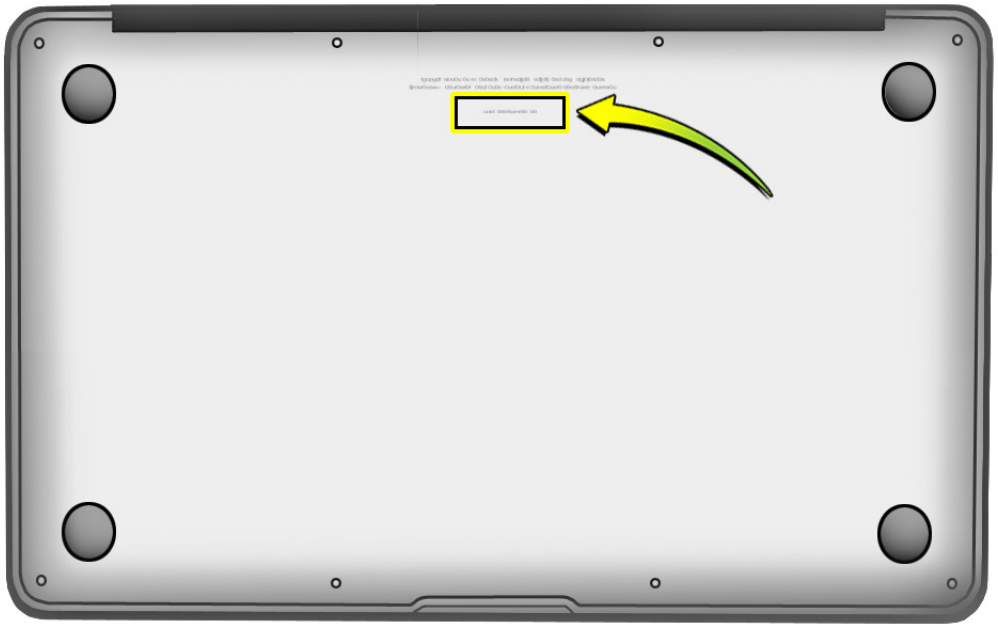


- Swollen or wrinkled cell pack

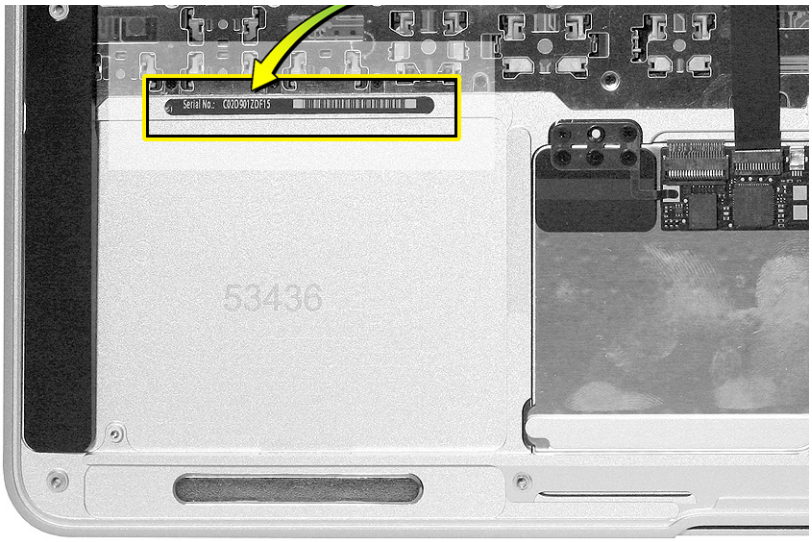


Serial Number Location

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

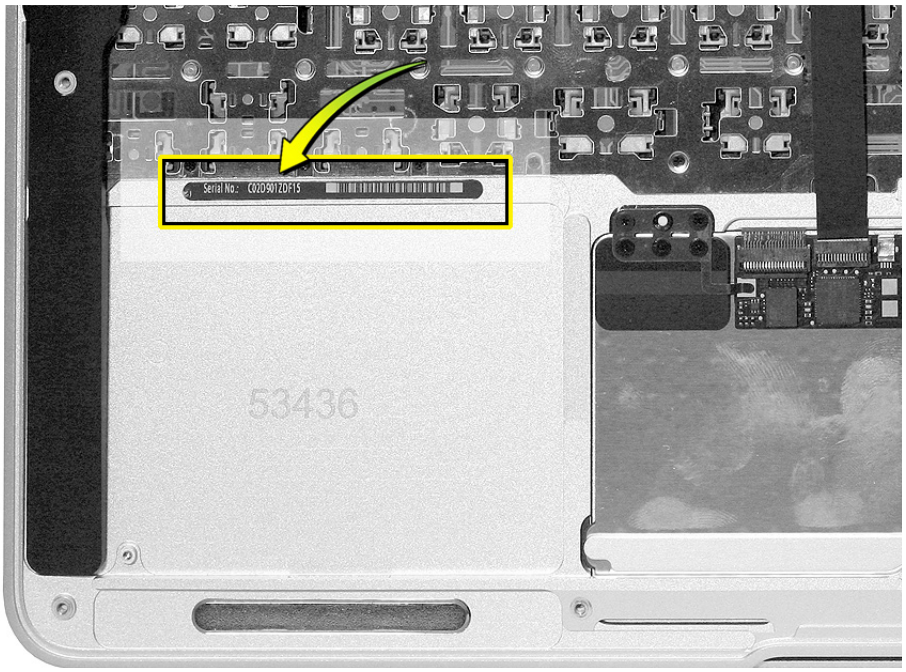


With the battery removed, see the serial number label on the top case:

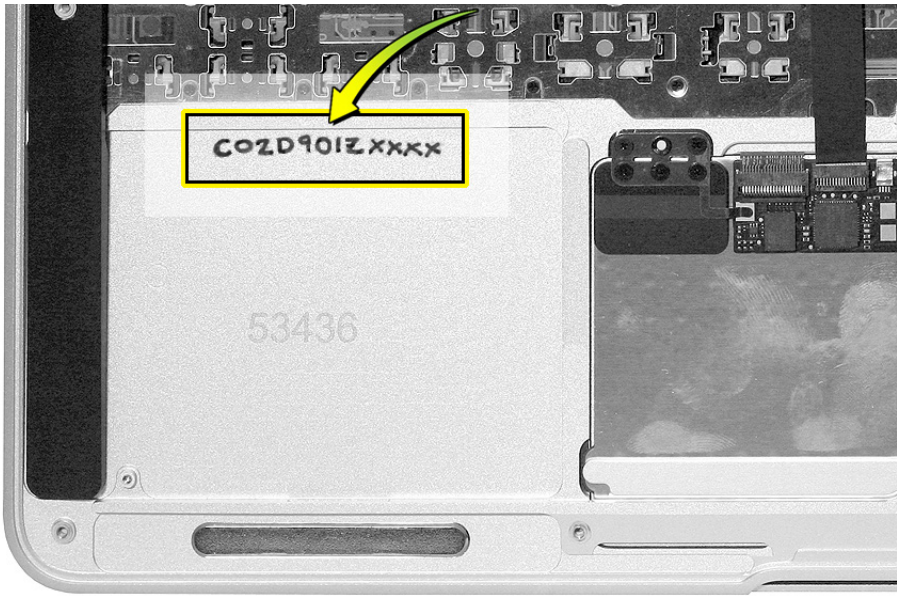


Transferring the Serial Number

When replacing a top case, retain the customer's top case until the repair is complete. Before installing the replacement top case, attach serial number label in the space between the keyboard and palm rest.



If the serial number label cannot be reused, use a fine-tipped permanent marker to write the serial number on the palm rest.



Apple Technician Guide

Troubleshooting

MacBook Air (11-inch, Late 2010)

General Troubleshooting

Update System Software & Firmware

Important: Ensure the correct version Mac OS X and latest software and firmware updates have been applied before you begin troubleshooting. Computers sometimes exhibit symptoms that indicate the wrong Mac OS X system software is installed.

Firmware is the name given to software that is written into memory circuits such as flash storage, that will hold the software code indefinitely, even when power is removed from the hardware. Firmware on Intel Mac computers is designed to be updated if necessary by running the Mac OS X Software Update check (available in the Apple (🍎) menu) while computer is connected to the Internet. For more information about firmware updates, refer to:
kBase # HT1557: About firmware updates for Intel-based Macs

Troubleshooting Theory

For general information on troubleshooting theory, go to GSX and find the Service Training course menu link. From there you can access the Troubleshooting Theory self-paced course.

Hardware vs. Software

For information on how to isolate a hardware issue from a software issue, refer to:
kBase #TS1388: Isolating issues in Mac OS X

For information on how to troubleshoot a software issue, refer to:
kBase #HT1199: Mac OS X: How to troubleshoot a software issue
kBase #TS1394: Mac OS X: Troubleshooting installation and software updates
kBase #HT2956: Troubleshooting Mac OS X installation from CD or DVD

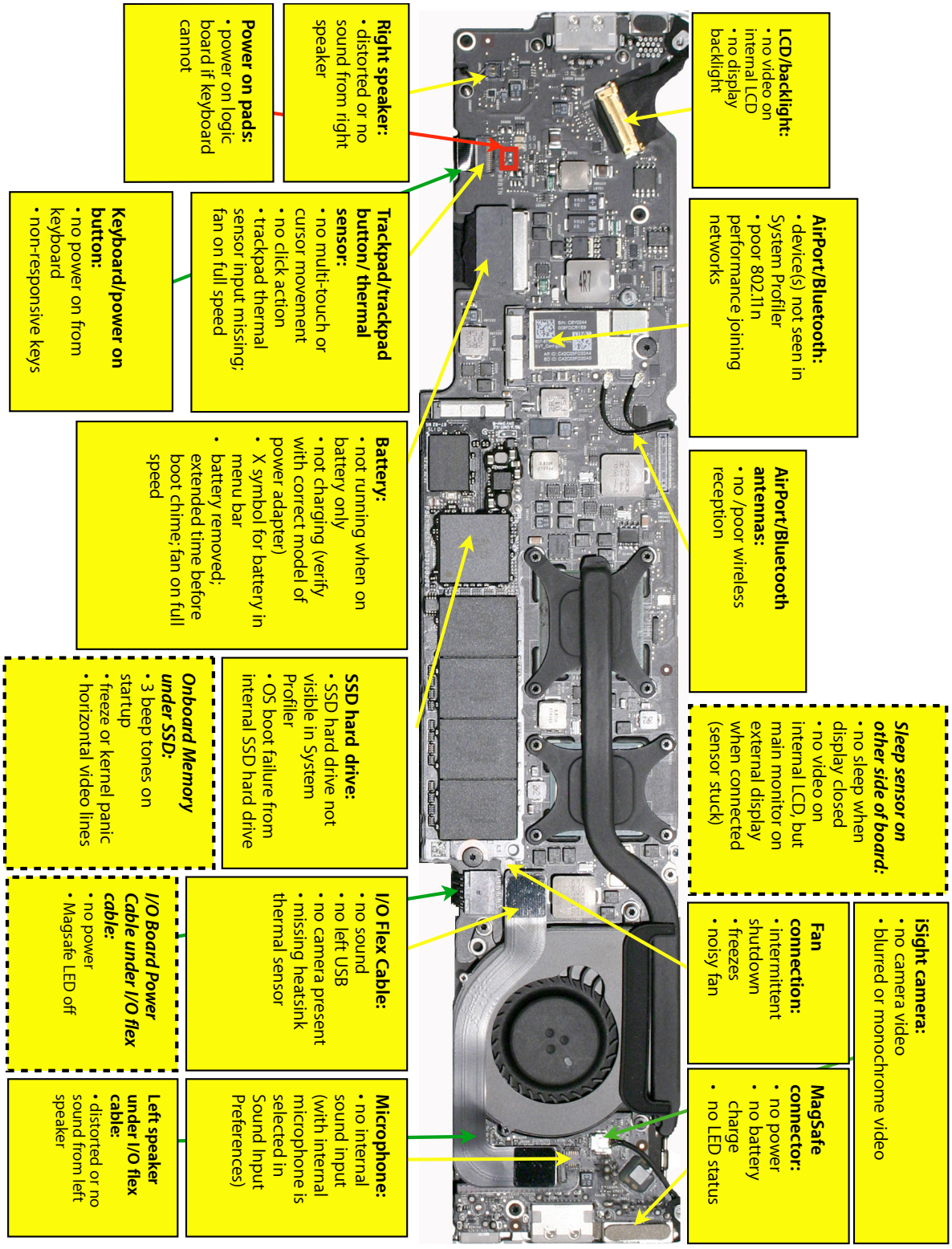
Temperature Concerns

The normal operating temperature of this computer is well within national and international safety standards. Nevertheless, customers may be concerned about generated heat. To prevent an unneeded repair, you can compare a customer's computer to a similar running model, if available, at your repair site. For more information, refer to
kBase #HT1778: Apple Portables: Operating temperature

Functional Overview

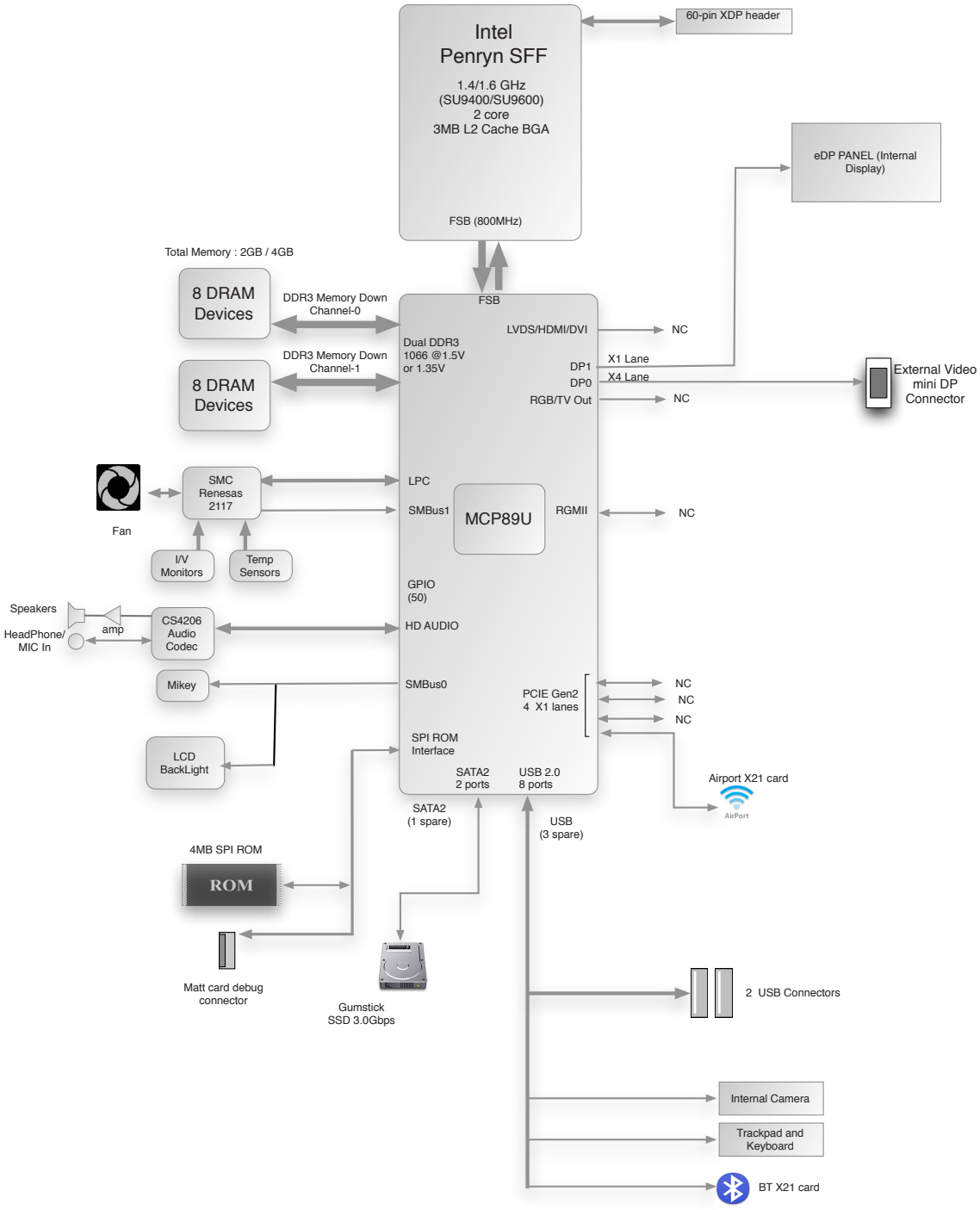
Refer to this diagram for symptoms related to logic board connectors.

To rotate this page in Preview for easier viewing, go to Tools menu and choose "Rotate Left".



Block Diagram

Refer to this diagram to see how modules are interrelated.



Liquid Contact Indicators

To help discover accidental damage to the computer, the top case includes spill sensors called liquid contact indicators (LCI). The sensors are only visible when the bottom case and most 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 an accidental spill.

For more information, refer to
kBase #HT3400: About liquid contact indicators (LCI) on portable and desktop computers

This image shows the general location of the LCIs in this computer. For LCIs that are not readily visible with the bottom case removed, check the same area under cables or on the other side of modules.

Common Reset Procedures

Resetting the System Management Controller (SMC)

The System Management Controller (SMC) is a chip on the logic board that controls all power functions. If the computer is experiencing any power issue, such as not starting up, not displaying video, sleep issues, or fan noise issues, resetting SMC may resolve it. To reset SMC:

1. If computer is on, turn it off by choosing Shut Down from the Apple (🍎) menu.
2. Connect power adapter to computer and to a working power source.
3. On built-in keyboard, press (left-side) Shift-Control-Option along with power button just once. **Important:** Use Shift-Control-Option keys on left side of keyboard.

   Note: When the LED on the MagSafe connector is orange/amber, resetting the SMC will change it to green for a few seconds, indicating that SMC was correctly reset.
4. Wait 5 seconds and press power button to start computer. **Note:** If bottom case is removed, you can alternately reset SMC by disconnecting both power adapter and main battery, and holding down power button for 5 seconds.

For more information, refer to:
kBase #HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)

Resetting Parameter RAM (PRAM)

PRAM stores certain system and device settings in a location that Mac OS X can access quickly. Exactly which settings are stored in the computer's PRAM varies depending on the type of computer as well as the types of devices and drives connected. To reset PRAM:

1. If computer is on, turn it off by choosing Shut Down from Apple (🍎) menu.
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 keyboard does not have an Option key, use Alt key instead.
3. Press power button.
4. Immediately press and hold Command-Option-P-R keys.
   Important: You must press this key combination before the gray screen appears.
5. Hold down keys until computer restarts, and you hear startup chime a second time.
6. Release keys.

For more information, refer to:
kBase #HT1242: Mac OS X: What's stored in PRAM
kBase #HT1379: Resetting your Mac's PRAM and NVRAM

Starting Up in Safe Mode

Starting up into Safe Mode does several things that can help resolve software or directory issues that may exist on the startup volume. To start up in Safe Mode:

1. If computer is on, turn it off by choosing Shut Down from Apple (🍎) menu.
2. Press power button.
3. Immediately after you hear startup tone, press and hold Shift key.
   Note: The Shift key should be held as soon as possible after startup tone but not before.
4. Release Shift key when you see the screen with a gray Apple and progress indicator (looks like a spinning gear). Note that booting into Safe Mode will take longer than a normal startup. During startup, the words "Safe Boot" will appear on Mac OS X startup screen.
5. To leave Safe Mode, restart computer normally, without holding down any keys during startup.

For more information, refer to:
kBase #HT1564: Mac OS X: What is Safe Boot, Safe Mode?
kBase #TS1884: Safe Boot takes longer than normal startup

Sleep Status Tips

This computer does not have a sleep LED. To troubleshoot without one,

- Connect a USB device that has a power-on or activity LED. As power is restored to the USB bus and the system wakes from sleep, the LED lights up.
- Press Caps lock key multiple times to wake system from sleep.
- Open display and press an alphanumeric key to wake system from sleep.
- A system that has been asleep for an extended period can consume the remaining charge of the battery. Restore power to system with known-good power adapter, and check that MagSafe indicator light shows an in-progress battery charge. System boots from a hibernation file and starts from where it left off.
- Resetting SMC instantly shuts down system with some system side effects. If system is in sleep mode, it will reboot from a hibernation file. If system is booted to Mac OS during SMC reset, data from open applications can be lost. If system is already shut down, there will be no side effects. Look for MagSafe indicator light to momentarily go from off to green as SMC is reset and reestablishes communication with power adapter, then change from green to orange if battery needs a charge.

Apple Service Diagnostic (ASD)

Run Apple Service Diagnostic to determine if any of the thermal sensors are malfunctioning. When sensors fail, replace the corresponding part. See table below for correlation between error code and part.

Mac Resource Inspector (MRI)

MRI is a troubleshooting tool that reveals system errors and reports sensor readings that help you identify parts that need replacement. As you become familiar with the names and locations of system sensors, they will help you properly troubleshoot MRI and ASD reported errors.

Not all thermal sensors are on the logic board. Some are on the battery, I/O board, or trackpad. Without fully testing a system, do not assume the logic board requires replacement.

Important: Whenever you run MRI, use the power adapter, rather than battery only, to effectively verify battery charging circuitry.

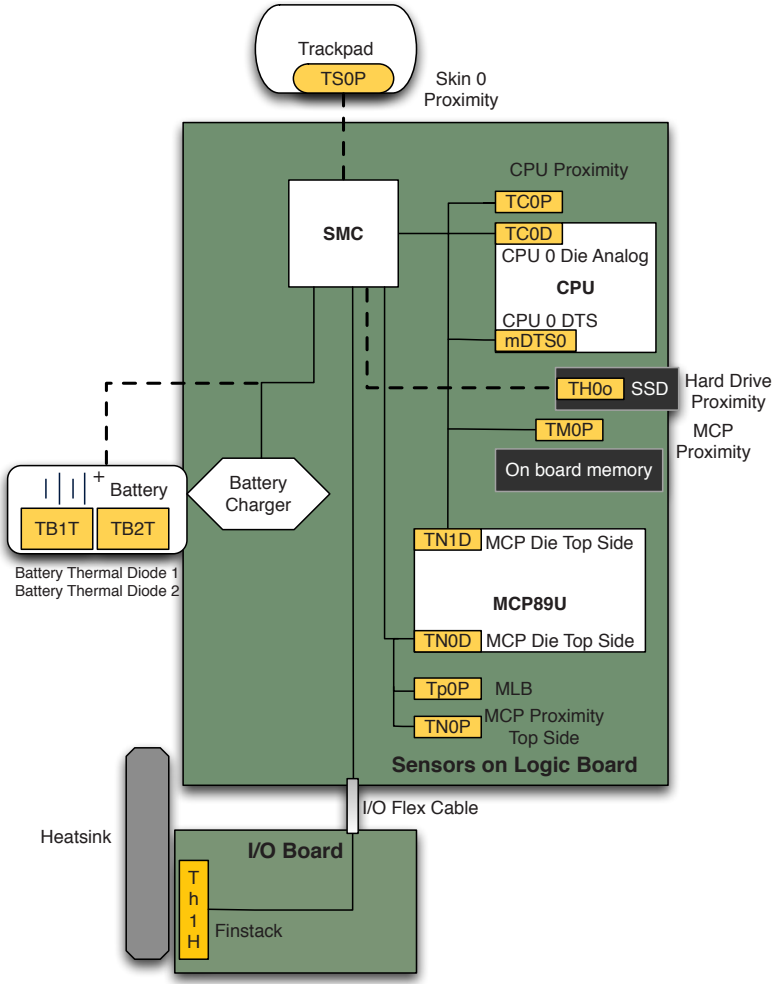
These tables and the following thermal code map show the thermal and electrical sensors that MRI uses to check the computer's performance.

SMC Name	Location	General Description	MRI/ASD Name
TC0D	Logic board	CPU 0 Die	CPU 0 Die Analog
TC0P	Logic board	CPU 0 Proximity	CPU Proximity
mDTS0	Logic board	CPU Int Die	CPU 0 DTS
TN0D	Logic board	MCP 0 Die	MCP Die Top Side
TN1D	Logic board	MCP Int Die	MCP Die Top Side
TM0P	Logic board	SSD & RAM Proximity	MCP Proximity
Tp0P	Logic board	MLB Thermal	MLB
TN0P	Logic board	MCP 0 Proximity	MCP Proximity Top Side
Th1H	I/O board	Heatsink Proximity	Fin Stack
Ts0P	Trackpad	Trackpad/Palmrest Thermal	Skin 0 Proximity
TB1T	Battery	Battery Thermal Diode 1	Battery Thermal Diode 1
TB2T	Battery	Battery Thermal Diode 2	Battery Thermal Diode 2
TH0o	SSD card	Hard Disk out-of-band	Hard Drive Proximity

Electrical Sensor	Location	General Description	MRI/ASD Name
VC0C	Logic board	CPU Vcore (Voltage)	CPU 0 Core
VN0C	Logic board	MCP Vcore (Voltage)	MCP Core 0
VP0R	Logic board	PBUS (Voltage)	PBus
PC0C	Logic board	CPU Vcore (Power)	CPU 0 VCore Loadside
ID0R	Logic board	DC-IN(AMON) (Current)	DC In
IB0R	Logic board	Battery(BMON) (Current)	Battery
IN0C	Logic board	MCP Vcore (Current)	MCP 0 Core
IN1C	Logic board	MCP memory (Current)	MCP 1 Memory
1c0R	Logic board	CPUVcore_VTT (Current)	Sensor Rail 0

Thermal Code Map

This map shows the general location of the thermal sensors (highlighted in gold) and their associated part within the computer housing.



LCD Display 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. Use the LCD Tester Diagnostic Utility to 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 MacBook Air (11-inch, Late 2010) 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 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 steps in the order indicated below. If an action resolves the issue, retest system to verify.

Note: A compilation of Quick Check tables is available at:
http://service.info.apple.com/QRS/en/quickreference.pdf

Startup and Power

No Power / Dead Unit

Unlikely cause: display clamshell, SSD, AirPort/Bluetooth, fan, speakers

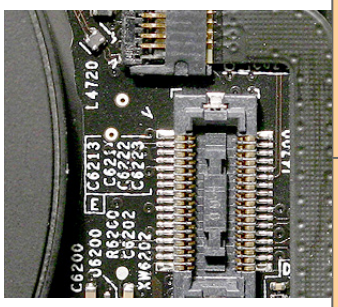
Quick Check

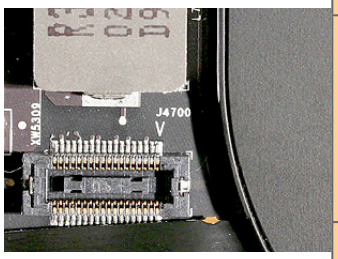
Symptom	Quick Check
No Power / Dead Unit • No power • No image • No startup chime • No fan spin • No light if Caps Lock pressed • Non-operational	**1.** Verify AC power presence with MagSafe LED indicating on or charge state. **2.** Verify battery as being partly charged, with orange/amber LED on MagSafe power connector. **3.** Reset SMC. **4.** If power is restored using steps above, run Notebook Battery and Adapter Diagnostic.

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 one at a time, verifying operation as each external device is reinstalled.	
	No	Go to step 2.	
2. Connect a known-good AC adapter, reset SMC and verify unit starts. SMC reset is best confirmed by MagSafe LED going green then back to orange/amber if charge is needed. Can system power on 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? Reseat and inspect battery connector for burn marks or damaged pins. If needed, substitute a known-good battery to verify unit is able to power up from battery.	Yes	System can start up from a charged or known-good battery. User's battery possibly at fault or needs to be charged. Continue to verify user's battery then AC adapter use and battery charging. Go to step 4.	**P11**
	No	System will not power on using only known-good battery. Go to step 16.	
4. User's battery may be run down, or not recognized. Verify user's battery in a known-good system is recognized and accepting a charge. Confirm user's battery is not consumed nor defective. Allow user's battery to charge for several minutes, to at least 5%.	Yes	Battery is recognized, charging and health is good. Return to test user's computer with user's battery and AC adapter power. Go to step 6.	
	No	Replace user's battery for not charging (P10), not recognized (P11), or damaged or burned wires (P12). User to purchase a replacement battery if consumed (P18).	**P10** **P11** **P12** **P18**
5. Inspect battery cable and connection to logic board and reseat if necessary. Replace battery and logic board if logic board connector is damaged or burned. Can the system power on from a charged battery?	Yes	Battery power restored. Return to test user's computer with user battery and AC adapter power. Go to step 6.	
	No	Logic board is expected to power with battery only. Replace logic board if battery connector is damaged. Replace battery if connector is damaged. Go to step 15 to verify power button.	**M20** **P12**
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) or replace adapter due to wire damage, burned pins, or not working on a known-good system.	**P14**
7. Inspect MagSafe port on computer for physical damage, debris or metal fragments attracted to magnetic connector. Is MagSafe connector clean and free from defects?	Yes	Go to step 8.	
	No	Clean port assembly. Replace I/O board if necessary.	**M21**





8. Verify adapter status LED turns on green then orange/amber indicating power and battery charge in progress. Is LED orange/amber?	Yes	System has power and indicates charging battery and is now ready to power on and boot system. Go to step 14.	**P11**
	No	LED is solid green indicating charge mode is off, or LED is off indicating no power to system. Go to step 9.	
9. Is adapter status LED on and green only?	Yes	Green-only LED could mean battery fully charged or battery not recognized. Go to step 14.	
	No	SMC communication to adapter may be missing, AC adapter is not enabled to power system. Go to step 10.	
10. Inspect logic board and I/O board for burned electronics. Also inspect I/O flex cable connections and power cable from I/O board to logic board for cable/connector damage or burn marks. Remove battery and AC power when reseating cable connections. Is there any damage to electronics, cables or connectors?	Yes	Replace logic board and I/O board showing signs of damaged connectors and/or damaged electronics. Replace I/O flex cable showing signs of cable or connector damage.	**M21** **X03**
	No	Go to step 11.	
11. With I/O flex cable and power cable from I/O board reseated, does MagSafe LED status come on green or green to orange/amber?	Yes	SMC enabled AC adapter power ready to boot system. Go to step 14.	
	No	Go to step 12.	
12. Test using a known-good I/O flex cable. Does MagSafe LED status come on green or green to orange/amber?	Yes	Replace I/O flex cable	**X03**
	No	Still no LED from a proven good AC adapter, continue to root cause to I/O and logic board. Go to step 13.	
13. Test using a known-good I/O board with known-good I/O flex cable. Does MagSafe LED status come on green or green to orange/amber?	Yes	Replace I/O board.	**M01**
	No	Replace logic board	**M01**

14. MagSafe LED indicates power enabled for system. Will system power on when power-on key is pressed?	Yes	Power-on issue resolved, continue to boot system and verify battery and system operation.	
	No	No power on due to logic board, I/O board, I/O flex cable or keyboard power-on key via trackpad connections. Go to step 15.	
15. Inspect keyboard flex cable connection to trackpad, ensure cable is fully seated and locked and trackpad to logic board connections are seated properly; reseat if necessary. Does power-on key boot system?	Yes	Power-on issue resolved. Clear PRAM and continue to verify operation.	
	No	Go to step 16.	
16. Disconnect trackpad from logic board and jumpstart logic board power-on pads using a conductive metal flat blade screwdriver. Does system power on?	Yes	System will power on indicating problem exists in top case keyboard or keyboard/trackpad device circuit path is open. Go to step 19.	
	No	Problem with logic board, I/O board or I/O flex cable exists. Go to step 17.	
17. Test using a known-good I/O flex cable. Jumpstart logic board power-on pads to initiate power on. Does system power on?	Yes	Replace I/O flex cable.	**X03**
	No	Go to step 18.	
18. Test using a known-good I/O board with known-good I/O flex cable. Jumpstart logic board power-on pads to initiate power on. Does system power on?	Yes	Replace I/O board.	**M01**
	No	Replace logic board.	**M01**
19. Test using a known-good trackpad. Visually inspect keyboard flex cable connection looking for wrinkles in cable that might leave a disconnect. Does keyboard power-on key initiate a system power on and attempt to boot up?	Yes	Top case keyboard is good. Replace trackpad.	**K01**
	No	Replace top case.	**K01**

Won't Start Up

Unlikely cause: fan, speakers, top case

Quick Check

Symptom	Quick Check
Power but no start up • No startup chime, some video activity, Apple logo, startup spinning gear • Startup chime with possible beep tones • Fan spin sound • Caps Lock LED toggles when pressed • Flashing question mark when booting from external drive	**1.** Reset SMC. **2.** Verify startup process passes initial memory checks with no beep errors. Display activity is starting up. **3.** Reset PRAM. Verify starts up from user's SSD. **4.** Boot from original product OS installation media or connect known-good external bootable device and press Option(Alt) key during startup then select external startup device to bring up system for diagnostics. **5.** If flashing question mark appears with an external drive, press and hold Option (Alt) key at startup to check for a firmware password. Type password to start up from SSD drive, or refer to **TS3554: MacBook Air (Late 2010): Recovering a lost firmware password**. **6.** Verify presence and status of user's SSD. Use Disk Utility to repair drive and file permissions.

Deep Dive

Check	Result	Action	Code
1. Reset SMC and PRAM to set default startup device to internal SSD.	Yes	User's SSD bootable, issue resolved default settings.	
	No	Not starting up. Go to step 2.	
2. With sound enabled via PRAM reset above, is system indicating a memory error at startup with repeated beep tones, either 3 short beeps or a single long beep?	Yes	Defective memory. Replace logic board.	**M07**
	No	Continue with startup sequence verification. Go to step 3.	
3. Hold the Option(Alt) key during startup and verify there is a bootable drive shown in Startup Manager. Choose user's SSD. Does start up from this drive work?	Yes	System starts up from user's SSD. Issue resolved.	
	No	User's SSD not present or does not start up. Firmware password screen appears. Go to step 4.	

4. Type firmware password to start up from SSD drive, or refer to **TS3554: MacBook Air (Late 2010): Recovering a lost firmware password**. Does startup work?	Yes	System starts up from user's SSD. Issue resolved.	
	No	Go to step 5.	
5. Insert original product OS installation media, which is bootable and should be present in Startup Manager. Can system start up from original product OS installation media?	Yes	Starts up from original product OS installation media, but user's SSD not bootable. Go to step 8.	
	No	Computer has no bootable devices. Test external startup devices, go to step 6.	
6. Boot from a known-good bootable OS on a USB drive or network server to start up and verify internal drive is available using System Profiler or Disk Utility.	Yes	System started up from external device and reports data regarding internal SSD. Go to step 7.	
	No	No startup from any source. Replace logic board.	**M02**
7. Use Disk Utility loaded from original product OS installation media to verify if SSD is available on device list. Is user's SSD listed in Disk Utility?	Yes	User's SSD available for inspections and repair. Go to step 9.	
	No	SSD not present, troubleshoot drive. Go to step 8.	
8. Try reseating SSD and/or installing a known-good SSD into unit. Is drive now listed in Disk Utility?	Yes	Reseat of SSD now has user's SSD visible in Disk Utility, go to step 9.	
		Known-good SSD worked; suspect user's SSD OS is corrupt. Attempt OS restore on user's SSD. Go to step 9.	
	No	Known-good SSD used, still no drive present. Replace logic board.	**M19**
9. Boot system with Shift key held down to boot into Safe Mode. Will system boot up from user's SSD?	Yes	Go to **kBase #HT1199: Mac OS X: How to troubleshoot a software issue**	
	No	Go to step 10.	
10. Use Disk Utility to repair user's SSD and repair permissions if system OS found on drive. Is drive bootable after software repairs?	Yes	OS on user's SSD repaired, issue resolved.	
	No	Drive not bootable, perhaps missing OS, go to step 11.	

11. Use Disk Utility to partition user's SSD with one GUID partition then restore Mac OS from original product OS installation media. Is drive bootable after OS install?	Yes	User's SSD now starts up from new OS image, issue resolved.	
	No	Replace SSD.	**H02**

Intermittent Shutdown

Unlikely cause: display clamshell, SSD, AirPort/Bluetooth, speakers

Troubleshooting Shutdown Causes

Always run the available Apple diagnostics to check for cause of the previous shutdown(s). Running ASD would also permit to isolate any abnormal value reading from a thermal, a voltage, or a current sensor, or from a fan speed meter.

Collect all available info from user on shut down occurrence details: periodicity, power state when issue happens, running applications, running time before shutdown.

Shutdown events could be categorized between four different types of causes.

1. User-related shutdowns

A computer shutdown event may be caused by user operation. Shutting down the computer (by selecting the Shutdown menu, by keeping pressed 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, so the suggested steps for troubleshooting will be:

- to reset the SMC,
- to check Energy Saver preferences settings,
- to test top case button and magnetic sleep sensor operation and secure connection to logic board.

2. Activity-related system shutdowns

- system could not succeed the standard shutdown process and had to force shutdown,
- an installed watchdog detected that an application did not respond within specified time (this watchdog can be enabled on Mac OS X Server Energy Saver preferences)

These shut downs may be linked to system settings, devices drivers, applications or operating system freezes, so the suggested steps for troubleshooting will be:

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

3. Power-related system shut downs

- External or battery power source was removed,
- Battery went empty while computer was on,
- Battery went empty while computer was asleep,

These shut downs are due to power management, poor connections or defective power sources so the suggested steps for troubleshooting will be:

- to reset SMC,
- to check secure AC cable, AC adapter and battery connection to logic board,
- to verify the battery and power adapter health using the Notebook Battery and Adapter Diagnostic.

4. Hardware-related system shutdowns

- one of the temperature sensors exceeded a specified temperature limit,
- one of the voltage sensors exceeded a specified voltage limit,
- one of the current sensors exceeded a specified current limit,

These shut downs are due to temperature, voltage, current, fan speed or other hardware-related sensor values getting out of range, so the suggested steps for troubleshooting will be:

- to check for all sensors connections and values using Apple Service Toolkit, Macintosh Repair Inspector, and other available Apple Service utilities,
- to check for usage of Apple-branded battery and power adapter,
- to check for abnormal battery temperature,
- to check for fan operation,
- to check for cleanliness of the heat sink fins and fan air flow,
- to check for correct seating of the heatsink on logic board and presence of thermal transfer material.

Quick Check

Symptom	Quick Check
Intermittent shutdown • Powers off during startup • Powers off during use	**1.** Collect details from user 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 and health status. **3.** Check AC adapter MagSafe connector and connection with system. **4.** Reset SMC and PRAM. **5.** Start up with Shift key down for safe mode. **6.** Start up from known-good bootable device. **7.** Run ASD or MRI for sensors and thermal tests.

Deep Dive

Check	Result	Action	Code
1. Activity related shutdowns: Reset SMC and PRAM and verify if shutdown issue is still present.	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. Start up from known-good external bootable drive and verify if shutdown issue is still present.	Yes	Go to step 3.	
	No	Shutdown events do not occur on known-good OS. Reinstall Mac OS on user's SSD, update OS with latest version and check if any firmware update is available.	
3. Power-related shutdowns: Testing with a known-good AC adapter and battery, verify that shutdown issue can ONLY be reproduced with user's battery and AC adapter. Use MRI or NBAD to verify health of battery and AC adapter.	Yes	Intermittent power issue. Check user's AC cable for intermittent connection; check user's battery & AC adapter health. Replace suspect battery (P12) or AC adapter (P14) that leads to system shutdown.	**P12 P14**
	No	Issue also occurs with known-good battery and AC adapter. Go to step 4.	
4. Reset SMC and PRAM, then verify if shutdown symptoms no longer occur.	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 do not occur when known-good battery is used without AC adapter.	Yes	Recharge user's battery and retest. Check for user's battery health in Apple System Profiler or run NBAD, 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 do not occur with known-good AC 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 step 7.	
7. Hardware-related shutdowns: Run ASD or MRI and verify if a sensor failure is reported.	Yes	-If a temperature or a fan sensor failure is reported, **go to sensor troubleshooting.** -If a voltage or a current sensor failure is reported in ASD or MRI 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 8. If no failure is found, return unit to user.	
8. Verify if a thermal sensor or fan failure is reported in ASD or MRI.	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 occur 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 heatsink. Go to step 9.	**X10**
9. Isolate if issue solved Verify if shutdown/issue does not occur after part exchange.	Yes	Issue resolved.	
	No	Replace logic board with corresponding symptom: -if for thermal error cause -if for other cause	**M18** **M08**

No Video/Bad Video

Unlikely cause: battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers

Quick Check

Symptom	Quick Check
Power, but No Video • Power • No video • Fan spin sound • Caps Lock light if key pressed	**1.** Reset SMC. **2.** Reset PRAM to restore default audio setting (not muted) and to restore default display brightness. **3.** If no startup chime, verify using headphones. **4.** Verify with external display. **5.** Boot from original product OS install media to verify internal/external display.

Deep Dive

Check	Result	Action	Code
1. Define whether the issue is a bad image with backlight OR no video issue. Verify whether 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. Disconnect all peripherals, external devices, and display adapters if present and verify that 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. Power-on unit, attempt to adjust brightness to maximum using brightness (F1/F2) keys and verify that video is displayed.	Yes	Video displayed; 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 that 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 that system video is displayed.	Yes	Invalid or corrupt PRAM contents affecting video output.	
	No	Go to step 6.	

6. Connect known-good external display, press power button and close clamshell lid to force main screen startup on external display. Verify that video is correct when viewed on 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 according symptom code: -no video -bad/distorted video	**M03** **M04**
7. After verification with external display, is "Color LCD" listed in System Profiler? If not found, reseat EDP (Embedded DisplayPort) cable connection from clamshell to logic board and retest.	Yes	Go to step 8.	
	No	Go to step 10.	
8. Shutdown system and reboot while clearing PRAM. Has video returned to built-in LCD?	Yes	Issue resolved.	
	No	Go to step 9.	
9. MRI test can verify sleep sensor activation when a medium-sized magnet is placed over the sleep sensor on top case near tab key on left side of keyboard . MRI sensor reading is >1.0 if closed, or 0 if open. Does the sleep sensor appear to be stuck closed?	Yes	Sleep sensor appears to be stuck closed. Go to step 11.	
	No	Go to step 10.	
10. Check for backlight condition. Power on unit. Using a low-heat light source, verify if a faint image or Apple logo appears on startup. Does LCD have a working video backlight?	Yes	Backlight but no video. Go to **Blank/No Video, Unit Has Power** (in Displays chapter).	
	No	Go to **Backlight Issue / No Backlight**.	
11. Inspect logic baord cable and I/O board connectors then reseat I/O board flex cable. Does the sleep sensor appear to be stuck closed?	Yes	Go to step 12.	
	No	Sleep sensor appears to be working properly. Issue resolved.	
12. Substitute a known good I/O board flex cable. Does the sleep sensor appear to be stuck closed?	Yes	Go to step 13.	
	No	Replace I/O board flex cable.	**X03**

13. Substitute a known good I/O flex cable and I/O board. Does the sleep sensor appear to be stuck closed?	Yes	Replace logic board.	**M22**
	No	Replace I/O board.	**M22**

Battery Isn't Recognized or Won't Charge

Unlikely cause: display clamshell, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Battery isn't recognized or won't charge • AC adapter MagSafe LED indicator is not lit • AC adapter MagSafe LED indicator does not change to orange/amber when battery is less than 95% charged	**1.** Check battery level and test AC power. **2.** Reset SMC by pressing the (left) Shift-Control-Option(Alt) keys along with the power button once. **3.** Test system with Notebook Battery and Adapter Diagnostic or Apple Service Toolkit and Macintosh Repair Inspector.

Deep Dive

Check	Result	Action	Code
1. Does the MagSafe LED change from green to amber when connected to the computer?	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 / Dead Unit**.	
2. Does battery status indicate a fully charged battery above 95%?	Yes	User's battery charge is at full charge; check battery health. Go to step 10.	
	No	Go to step 3.	
3. Does battery status indicate the battery is not recognized?	Yes	Go to step 7 and tag battery as a possible P11 candidate.	**(P11)**
	No	Go to step 4.	

4. Does battery status indicate the battery is recognized but not charging with capacity less than 95%?	Yes	Go to step 7 and tag battery as a possible P10 candidate.	**(P10)**
	No	Go to step 5.	
5. Does battery status indicate battery is charging and has a current percentage value greater than zero?	Yes	User's battery charging, check health. Go to step 10.	
	No	Battery status not charging. Go to step 7.	
6. Does battery status indicate a low battery with 0% while charging of battery?	Yes	Allow user's battery to charge to 5% before checking battery condition. (A rundown battery can take several minutes to reach 5%.) Go to step 10.	
	No	Go to step 7.	
7. Test with a known-good battery. Is battery recognized and charging?	Yes	Replace battery: -not charging -not recognized	**P10** **P11**
	No	Go to step 8.	
8. Inspect user's battery cable and battery connector for bent pins, corrosion, or burned connections.	Yes	If pin or connector damage, replace battery. If battery connector damage on logic board, replace logic board.	**X03** **M20**
	No	Go to step 9.	
9. Reseat battery cable at logic board connector, and retest. Is battery recognized and charging?	Yes	Issue resolved by cable reseat. Check battery condition, go to step 10.	
	No	Replace logic board.	**M20**
10. Open Apple System Profiler and click on the Power tab on the left. Is the battery over 1000 cycle counts?	Yes	Battery has been consumed, and user will need to purchase a replacement.	
	No	Go to step 11.	
11. Is battery still covered by Limited Warranty or an AppleCare agreement?	Yes	Go to step 13.	
	No	Battery warranty expired. Go to step 12.	

12. Is the health of the battery "Good" according to System Profiler?	Yes	Battery is in good health and should continue to function until consumed. Do not replace battery.	
	No	Battery is consumed outside warranty coverage. User will need to purchase a replacement battery.	
13. For batteries still covered by warranty, is the health of the battery "Good"?	Yes	Battery functioning normally. Go to step 14.	
	No	Battery has premature capacity loss. Replace battery.	**P08**
14. With battery charge greater than 20% does battery support system operation without AC adapter connected?	Yes	User's battery is good.	
	No	Go to step 15.	
15. Test with a known-good battery. Does known-good battery support system operation without AC adapter connected?	Yes	Replace battery.	**P12**
	No	Replace logic board.	**M20**

Kernel Panic/System Crashes

Unlikely cause: battery, power adapter, fan, speakers

Quick Check

Symptom	Quick Check
Memory Issues/Kernel panic and freezes • Display notice of system kernel panic during start up and desktop use. • System freeze during use. • System freeze upon wake from sleep.	**1.** Reset SMC and PRAM. **2.** Remove external peripheral devices. **3.** Verify memory configuration matches memory installed. **4.** Start up with Shift key down for safe mode. **5.** Start up from known-good bootable device. **6.** Check panic.log info for crash cause. **7.** Run AHT or MRI to test sensors and possible missing I/O device from system configuration.

Deep Dive

Check	Result	Action	Code
1. Isolate peripherals as cause. Disconnect all peripherals, external devices, and display adapters if present.	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 that 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 user's drive and check for affected interface that crashed. If unit still crashes during startup, you will need to remove SSD and install in a known-good system to access the file. Verify that kernel panic dependency is not with 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 I/O board. - Disconnect AirPort/Bluetooth antennas and AirPort/Bluetooth card from logic board. - Disable SSD by booting from an external bootable drive or from MRI. 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 is crashing system, replace display clamshell. If AirPort/Bluetooth card presence is crashing system, replace AirPort/Bluetooth card. If SSD presence is crashing system, try with known-good SSD. If user's SSD is causing the crash, replace user's SSD.	**L14** **N13** **H01**
	No	Symptoms unchanged. Go to step 5.	

5. Attempt to start up with original product OS installation media, or from an external drive with product OS installed, and verify that system starts without kernel panic.	Yes	Kernel panics cease running known-good OS. Run ASD/ Disk Utility to repair and test SSD. If repair attempts fail, erase & install OS. If restore fails, replace SSD.	**H03**
	No	Symptoms unchanged. Go to step 6.	
6. Disconnect display clamshell and test with known-good display clamshell. Verify that system now starts up without kernel panic/freeze.	Yes	Replace display clamshell.	**L14**
	No	Go to step 7.	
7. Run ASD or MRI to check for fan and sensors test, and verify that ASD or MRI does not report any overtemp, failing sensor, or fan. Did MRI report a sensor failure that could be related to system hang/freeze?	Yes	Go to step 8.	
	No	No thermal fail detected. Replace logic board with matching symptom: - If hang or freeze - If kernel panic/system crash	**M05** **M06**
8. Is reported sensor a thermal sensor failure?	Yes	Go to thermal troubleshooting.	
	No	Go to electrical troubleshooting.	

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)	**1.** Check if the battery is covered under a repair extension program. Refer to **kBase #CP165: Notebook Computer Battery and Adapter Screening Process** **2.** Verify no applications have runaway processes with the CPU. Refer to **kBase #TS1473:"Runaway applications can shorten battery runtime** **3.** Screen for short battery run time using **kBase #HT1446: Apple Portables: Tips for maximizing your battery charge.** 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: display clamshell, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Won't Run on Power Adapter Alone • Runs on battery but not on AC adapter only.	**1.** Check for dirty or stuck pins on the MagSafe connectors, both on the AC adapter and the computer. **2.** Verify AC adapter is connected to known-good wall outlet. **3.** Verify power cord or plug is properly attached to AC adapter and MagSafe cable and connector are not damaged. **4.** Reset SMC by pressing the (left) Shift-Control-Option(Alt) keys along with the power button once.

Deep Dive

Check	Result	Action	Code
1. With battery removed, will a known-good AC adapter start up and run the system and show MagSafe LED status?	Yes	Replace user's AC adapter.	**P14**
	No	Verify seating of I/O flex cable to logic board. Go to step 2.	

2. Does a known-good power adapter's LED light up either green or orange/amber?	Yes	SMC on logic board senses AC adapter. Go to step 3.	
	No	Troubleshoot I/O board. Go to step 4.	
3. Does the unit run on known-good AC adapter alone?	Yes	Issued resolved.	**X03**
	No	Go to step 4.	
4. Reseat I/O flex cable to logic board. Connect known-good AC adapter. Is MagSafe LED either green or orange/amber?	Yes	Reseating cable resolved issue.	
	No	Go to step 5.	
5. Verify power restored using a known-good I/O board and a known-good AC adapter. Does MagSafe LED light up either green or orange/amber?	Yes	Replace I/O board. Go to step 6.	
	No	Replace logic board.	**M01**
6. Power on logic board and verify system boot. Did computer successfully start up?	Yes	Issue resolved.	
	No	Replace logic board.	**M01**

Power Adapter Issue

Unlikely cause: display clamshell, logic board, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Power Adapter Issue • No power • No power LED • Non-operational • Stuck /broken pin • MRI test indicates a failed adapter or an AC issue with a caution symbol	**1.** Connect AC adapter's MagSafe connector to the computer. The LED on the connector should be green or orange/amber. **2.** Verify power cord or duckhead is firmly attached to AC adapter. Check that duckhead is not damaged. **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. **5.** Reset SMC by pressing the (left) Shift-Control-Option(Alt) keys along with the power button once.

Deep Dive

Check	Result	Action	Code
1. Connect user's AC adapter to user's computer and verify MagSafe LED is green or orange/amber.	Yes	SMC on logic board senses AC power and enabled power delivery to system. Go to step 4.	
	No	No LED indicator of power. Go to step 2.	
2. Reset SMC. Verify power source and AC adapter, cord/duckhead are good. Check for contaminated or stuck MagSafe pins. Does MagSafe LED now show green or orange/amber status?	Yes	SMC reset restored use of AC adapter. -Released MagSafe stuck pin -Cleaned MagSafe connector -Replaced defective power cord/duckhead -Damaged power cord/duckhead Go to step 4.	**P15** **P16** **X03** **P16**
	No	No LED indicator of power. Go to step 3.	
3. Test user's AC adapter with known-good system. Verify green or orange/amber LED status and power supplied can boot known-good system.	Yes	User's AC adapter is good. Verify again on user's system. Go to step 4.	
	No	No LED indicator of power. Replace AC adapter.	**P15**
4. Verify user's AC adapter can power user's computer. When power button pressed, are there indicators of startup such as boot chime, fan spin or video display?	Yes	Issue resolved.	
	No	User's computer will not power on. Go to **No Power / Dead Unit**.	

Battery Leaking or Swollen

Quick Check

Symptom	Quick Check
Battery Leaking or Swollen • Trackpad cannot be clicked • Battery cells swollen • Battery cells leaking • Bottom case cannot be reinstalled	**1.** Check if the battery is covered under a repair extension program. **2.** Refer to **kBase #CP165: Notebook Computer Battery and Adapter Screening Process** 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 whether existing symptom code applies to the issue reported by the user. If not, document reported symptom and send feedback to **smfeedback4@apple.com** stating that a suitable symptom code could not be found.

Display

Blank / No Video, Unit Has Power

Unlikely cause: battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Blank / No Video, Unit Has Power • No video • No backlight	**1.** Check brightness setting. **2.** Reset PRAM to restore brightness to default level. **3.** Connect known-good supported external display and see if an image is visible on external display. **4.** Boot from original product OS installation media .

Deep Dive

Check	Result	Action	Code
1. Restart system and verify if boot chime is present. Reset SMC if necessary for proper startup. Is LCD video present?	Yes	Go to step 3.	
	No	Go to step 2.	
2. Connect known-good external display. Verify if external display shows video on system boot.	Yes	Go to step 3.	
	No	Go to **No Video / Bad Video** (in Startup & Power chapter).	
3. Determine if issue is backlight or image display: - Backlight with no video can be seen in Apple logo on rear of display, or as a soft glow behind a black or solid color. - Image with no backlight can be seen by shining a low-heat light source onto display during or after boot.	Yes	Image, but no backlight. Go to **Backlight Issue / No Backlight**.	
	No	Backlight, but no video. Go to step 4.	
4. Reseat EDP (Embedded DisplayPort) cable from clamshell to logic board. Is image now visible?	Yes	Issue resolved.	
	No	Go to step 5.	
5. Test with a known-good display clamshell. Is image now visible on built-in display?	Yes	Replace display clamshell.	**L03**
	No	Replace logic board.	**M03**

Backlight Issue / No Backlight

Unlikely cause: battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Backlight Issue / No Backlight • Display not illuminated • Flashing, unstable or non uniform background lighting • Poor backlight at some or all settings	**1.** Reset PRAM to restore brightness to default level. **2.** Check that brightness setting steps gradually from off to minimum, up to maximum setting.

Deep Dive

Check	Result	Action	Code
1. Clear PRAM to restore default brightness setting. Reset SMC if necessary for proper startup. Is backlight present?	Yes	Issue resolved.	
	No	Go to step 2.	
2. Connect known-good external display. Adjust brightness control to maximum setting. Is backlight now present?	Yes	Issue resolved.	
	No	Go to step 3.	
3. Determine if issue is backlight or image display: - Backlight with no video can be seen in Apple logo on rear of display, or as a soft glow behind a black or solid color. - Image with no backlight can be seen by shining a low-heat light source onto display during or after boot.	Yes	Backlight, but no video. Go to **Blank / No Video, Unit Has Power**.	
	No	Image, but no backlight. Go to step 4.	
4. Reseat EDP (Embedded DisplayPort) cable from clamshell to logic board. Is backlight now present on built-in display?	Yes	Issue resolved.	
	No	Go to step 5.	
5. Test with a known-good display clamshell. Is image now visible on built-in display?	Yes	Replace display clamshell.	**L09**
	No	Replace logic board.	**M25**

Noise / Unstable Flickering

Unlikely cause: battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Noise / Unstable Flickering • 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	Go to step 3.	
	No	Display is disappearing intermittently from System Profiler. Go to **Blank / No Video, Unit Has Power**.	
3. Inspect and reseat EDP (Embedded DisplayPort) cable from clamshell to logic board and camera cable to I/O board. Also test if brightness setting is a contributing factor. Has flickering stopped?	Yes	Loose cable connection. Issue resolved.	
	No	Go to step 4.	
4. Substitute a known-good display clamshell. Has flickering stopped?	Yes	Replace display clamshell.	**L06**
	No	Replace logic board.	**M04**
5. Verify source of noise is 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 user.	
	No	Noise from another source. Go to **Noise/Hum/Vibration**.	

Display Anomalies

Unlikely cause: battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Display Anomalies • Incorrect/missing colors • Distorted/blurred image • Pixel anomalies • Vertical/horizontal lines • Non-uniform brightness • Image flicker • Image persistence	**1.** Allow display to reach normal operating temperature for about 1 minute before evaluating front-of-screen performance. **2.** Check display preferences for use of custom display profile. Return to default Color LCD and default resolution. **3.** Check brightness setting. **4.** Check for software updates. **5.** Clean display while checking for dust/debris.

Deep Dive: General

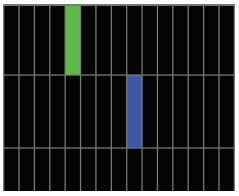
Check	Result	Action	Code
1. Verify if user's issue is incorrect/ missing colors.	Yes	Go to Deep Dive: Incorrect/ Missing Colors.	
	No	Go to step 2.	
2. Verify if user's issue is distorted/ blurred image.	Yes	Go to Deep Dive: Distorted/ Blurred Image.	
	No	Go to step 3.	
3. Verify if user's issue is bright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

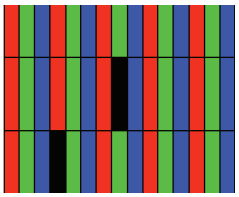
Deep Dive: Incorrect/Missing Colors

Check	Result	Action	Code
1. In System Profiler's Graphics/Displays device tree, is display listed as "Color LCD"?	Yes	Go to step 3.	
	No	Go to step 2.	
2. Run Clamshell Service Diagnostic utility and check for LCD panel presence. If not found, reseat EDP (Embedded DisplayPort) cable to logic board. Is display now listed in System Profiler?	Yes	Go to step 3.	
	No	Go to step 8.	
3. Verify System Preferences: Displays: Color is valid for display being tested. Display 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 4.	
	No	Set System Preferences: Displays: Color to "Color LCD" and retest.	
4. Verify that the LCD is free of contaminants.	Yes	Go to step 5.	
	No	Clean LCD panel. Retest.	
5. Set desktop pattern in System Preferences to 'Solid Gray Light'. Verify if incorrect/missing color issue affects entire display.	Yes	Go to step 6.	
	No	Go to step 7.	
6. Set up user's display side by side with a known-good display showing same image. Verify if issue is noticeably worse on the unit under test.	Yes	Go to step 7.	**L02**
	No	Small variations in color uniformity are normal and do not warrant replacement or repair.	
7. Substitute a known-good display clamshell to test logic board video output. Is normal video restored?	Yes	Replace display clamshell.	**L02**
	No	Replace logic board.	**M04**

Deep Dive: Distorted/Blurred Image

Check	Result	Action	Code
1. Sample image illustrates loss of EDP data signals to LCD or a defective LCD panel. Inspect & reseat EDP cable looking for damaged or bent pins. Is image restored to normal?	Yes	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 video output. Is normal video restored?	Yes	Replace display clamshell.	**L04**
	No	Replace logic board.	**M04**

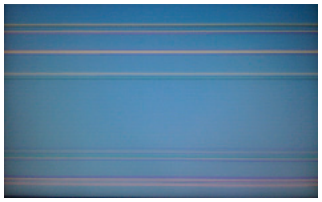




Deep Dive: Pixel Anomalies

Check	Result	Action	Code
1. Determine if "defects" are dust/debris on surface of LCD panel.	Yes	Clean LCD.	
	No	Go to step 2.	
2. Determine if bright pixel defects exceed acceptable number. See **kBase #HT1721: About LCD display pixel anomalies**	Yes	Replace display clamshell.	**L08**
	No	LCD meets bright pixel defect specifications. Go to step 3.	
3. Determine if dark pixel defects exceed acceptable number. See **kBase #HT1721: About LCD display pixel anomalies**	Yes	Replace display clamshell.	**L08**
	No	LCD meets dark pixel defect specifications. Go to step 4.	
4. Determine if the combination of bright/dark pixel defects exceed acceptable number. See **kBase #HT1721: About LCD display pixel anomalies**	Yes	Replace display clamshell.	**L08**
	No	Explain to user that LCD is within specifications. Do not replace display clamshell.	

Deep Dive: Vertical/Horizontal Lines



Check	Result	Action	Code
1. Horizontal lines may be related to a failing RAM. Verify if video issue only happens AFTER the Apple logo and spinning gear has appeared.	Yes	Issue only happens AFTER Apple logo and spinning gear appears. Go to step 2.	
	No	Issue happens since startup. Go to step 3.	
2. Start with shift key down (Safe Mode) to disable system extensions. Is normal video restored?	Yes	Go to step 3.	
	No	Go to step 4.	
3. System may have corrupt video drivers in OS. Boot from known-good OS. Is normal video restored?	Yes	Restore OS on internal drive. Issue resolved.	
	No	Go to step 4.	
4. Run Clamshell Service Diagnostic utility and check for LCD panel presence. If not found, reseat EDP (Embedded DisplayPort) cable to logic board. Is normal video restored?	Yes	Issue resolved.	
	No	Go to step 5.	
5. Connect external compatible DisplayPort display (or DisplayPort adapter and display). Verify if correct video appears on external display.	Yes	Go to step 6.	
	No	Replace logic board.	**M04**
6. Substitute a known-good display clamshell. Is normal video restored?	Yes	Replace display clamshell.	**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 about 1 minute.	Yes	Go to step 2.	
	No	Display backlight can take a minute to stabilize.	
2. Reseat EDP (Embedded DisplayPort) cable to logic board. Is normal brightness restored?	Yes	Issue resolved.	
	No	Go to step 3.	
3. Determine if variation in uniformity appears excessive when compared to a known-good similar unit.	Yes	Replace display clamshell.	**L07**
	No	Explain to user that LCD appears to meet specifications.	

Defective Camera / Built-in iSight Not Operating Correctly

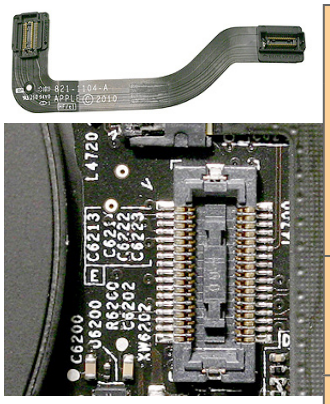
Unlikely cause: battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, top case

Quick Check

Symptom	Quick Check
Defective Camera • Camera not detected • No green LED for camera • Excessive blooming • Poor white balance • Poor focus • Green image • Image distortion	**1.** Verify computer has latest software updates. **2.** Verify camera lens is free of contaminants. **3.** Verify camera is present in System Profiler.

Deep Dive

Check	Result	Action	Code
1. Launch System Profiler and confirm that "Built-in iSight" is listed in USB device tree.	Yes	Go to step 4.	
	No	Go to step 2.	
2. Inspect and reseat camera cable from clamshell to I/O board. Is iSight now listed in System Profiler?	Yes	Go to step 4.	
	No	Go to step 3.	



3. Reseat or try known-good I/O flex cable between I/O board and logic board. Inspect logic board, IO board, and I/O flex cable connectors for damaged pins. Is iSight now listed in System Profiler?	Yes	Go to step 6.	
	No	Go to step 4.	
4. Reseat camera cable to I/O board. Is iSight now listed in System Profiler?	Yes	Go to step 6.	
	No	Go to step 5.	
5. Install known-good I/O board and connect cables. Is iSight now listed in System Profiler?	Yes	Go to step 6.	
	No	Go to step 7.	
6. Launch Photo Booth. Verify that camera's green LED is on and image appears normal.	Yes	Issue resolved.	
	No	Go to step 7.	
7. Substitute a known-good display clamshell. Is iSight camera operating properly?	Yes	Replace display clamshell.	**X11**
	No	Replace logic board.	

Cosmetic Defects

Quick Check

Symptom	Quick Check
Cosmetic Defects • Cracked LCD • Scorched or melted LCD • LCD impact damage	**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 smfeedback4@apple.com stating that a suitable symptom code could not be found.

Mass Storage

Solid State Drive (SSD) Read/Write Issue

Unlikely cause: clamshell, battery, power adapter, AirPort/Bluetooth, fan, speakers, microphone, top case

Quick Check

Symptom	Quick Check
SSD Read/Write Issue **Defective Formatting Issue** • Cannot save documents • Read/write error message • Hang when accessing or saving data	**1.** Boot from original product OS installation media. Verify S.M.A.R.T. status of internal SSD using Disk Utility. **2.** Repair Disk with Disk Utility. **3.** Erase SSD and reinstall Mac OS.

Deep Dive

Check	Result	Action	Code
1. Start up from known-good original product OS installation media and launch Disk Utility. Can Disk Utility mount user's SSD? Reseat SSD card if necessary.	Yes	Go to step 2.	
	No	Go to step 3.	
2. Did Disk Utility mount and repair user's SSD successfully?	Yes	Restart computer. Go to step 5.	
	No	Go to step 4.	
3. Substitute a known-good bootable SSD, does system start up to desktop?	Yes	Reinstall user's SSD. Go to step 4.	
	No	Replace logic board.	**M19**
4. Reinstall user's SSD card. Can Disk Utility partition and erase user's SSD?	Yes	Go to step 2.	
	No	Replace SSD.	**H01**
5. Did user's SSD start up successfully?	Yes	Issue resolved.	
	No	Restart computer. Go to step 6.	**H01**

6. Partition, erase & install Mac OS on SSD. Did install complete without error and start up successfully?	Yes	Issue resolved	
	No	Replace SSD.	**H01**

Solid State Drive (SSD) Not Recognized/Not Mounting

Unlikely cause: clamshell, battery, power adapter, AirPort/Bluetooth, fan, speakers, microphone, top case

Quick Check

Symptom	Quick Check
SSD Not Recognized/Mount Drive No Boot • Flashing question mark • Boots to grey screen • Boots to blue screen • S.M.A.R.T. error • MRI finds SSD not recognized	**1.** Use a known-good mouse. Stuck mouse button will not allow boot. **2.** Boot from original product OS installation media. Verify S.M.A.R.T. status of internal SSD using Disk Utility. **3.** If flashing question mark appears with an external drive, press and hold Option (Alt) key at startup to check for a firmware password. Type password to start up from SSD drive, or refer to **TS3554: MacBook Air (Late 2010): Recovering a lost firmware password**. **4.** Repair Disk with Disk Utility. **5.** Erase SSD and reinstall Mac OS.

Deep Dive

Check	Result	Action	Code
1. Start up from known-good original product OS installation media and launch Disk Utility. Is user's SSD available for Disk Utility to repair?	Yes	Go to step 2.	
	No	Go to step 3.	
2. Did Disk Utility mount and repair user's SSD successfully? Reseat SSD if necessary.	Yes	Restart computer. Go to step 5.	
	No	Go to step 3.	
3. Substitute a known-good bootable SSD, does system start up to desktop?	Yes	Reinstall user's SSD. Go to step 4.	
	No	Replace logic board.	**M19**

4. Can Disk Utility mount and repair user's SSD?	Yes	Go to step 6.	
	No	Replace SSD. Go to step 6.	**H01**
5. Did user's SSD start up successfully?	Yes	Issue resolved.	
	No	Replace SSD. Go to step 6.	**H01**
6. Partition, erase & install Mac OS on SSD. Did install complete without error and start up successfully?	Yes	Issue resolved	
	No	Replace SSD.	**H01**

USB Optical Drive Read/Write Data Error

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone, top case

Quick Check

Symptom	Quick Check
Optical Drive Read/Write Data Error • Errors when reading optical media. • Errors when writing optical media. • Hang when accessing or preparing to write data.	**1.** Test user's optical media in a similar known-good optical drive to rule out media issue. **2.** For write issues, test known-good optical media, that performs well in a similar known-good optical drive, in user's optical drive. **3.** Check both CD and DVD media. If only one type of media can be read or written this might indicate a laser issue. **4.** Check if user's USB optical drive functions with a known-good computer that supports a USB optical drive. This would indicate users's optical drive is not causing the issue. **5.** Check if a known-good USB optical drive will function with user's computer. This would indicate user's computer is not causing the issue. **6.** If user's USB optical drive is not functioning, replace optical drive with code J03. If optical drive is damaged, use code J05.

USB Optical Drive Not Recognized/Mount

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone, top case

Quick Check

Symptom	Quick Check
Optical Drive Not Recognized/ Mount • Discs inject and eject, but do not appear in Finder • Discs auto-eject unexpectedly • USB optical drive not recognized	**1.** Check Finder Preferences: General and make sure "CD's, DVD's and iPods" is checked under "Show these items on the Desktop." **2.** Check if optical drive is listed in System Profiler USB device tree. **3.** Check if optical drive is recognized when connected to either left or right USB ports of user's computer. If one USB port works and the other doesn't, go to **USB Port Does Not Recognize Devices** symptom flow. **4.** Test user's USB optical drive with a known-good computer that supports a USB optical drive. This would indicate users's optical drive is not causing the issue. **5.** Test known-good USB optical drive with user's computer. This would indicate user's computer is not causing the issue. **6.** Check both CD and DVD media. If only one type of media is recognized, or if all discs auto-eject, this might indicate a laser issue. **7.** If user's USB optical drive is not functioning, replace optical drive.

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 **smfeedback4@apple.com** stating that a suitable symptom code could not be found.

Communications

USB Ethernet Issue

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone, top case

Quick Check

Symptom	Quick Check
USB Ethernet Issue • 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	**1.** Go to System Preferences: Network and verify if Ethernet device is recognized and if it has an assigned IP address. **2.** Check that USB Ethernet adapter, Ethernet cable, and Ethernet hub are securely connected and free of dust, debris or damage. **3.** Check if Ethernet adapter is recognized when connected to either left or right USB ports of user's computer. If one USB port works and the other doesn't, go to **USB Port Does Not Recognize Devices** symptom flow. **4.** Verify network functionality with a known-good system. Isolate firewall, MAC address filtering or hardware access control devices. **5.** Test user's USB Ethernet adapter with a known-good computer that supports a USB Ethernet adapter. **6.** Test known-good USB Ethernet adapter with user's computer. **7.** Try a known-good Ethernet cable – CAT5 or better recommended for 100Mbps+ connections. **8.** Ensure distance from networking infrastructure is less than 300 feet / 105 meters. **9.** Check system logs. Isolate OS by starting up from original product OS installation media. **10.** If user's USB Ethernet adapter is not functioning, replace Ethernet adapter with code N19.

AirPort/Bluetooth: Defective Wireless Devices

Unlikely cause: battery, power adapter, SSD, fan, I/O board, speakers, microphone, top case

Caution: When testing an AirPort card connection, wait at least 15 seconds after shutdown and battery removal before removing antennas or AirPort/Bluetooth card from the logic board. Waiting less than that could damage the AirPort/Bluetooth card.

Quick Check

Symptom	Quick Check
AirPort or Bluetooth: Defective Wireless Devices • Unable to join networks or pair devices • Card not available or recognized • Intermittent device or connection dropouts • MRI reports AirPort or Bluetooth issue	**1.** Open System Preferences and make sure AirPort or Bluetooth is turned on and (for AirPort) that a network is selected. **2.** Verify that correct OS is installed and all software and firmware updates have been run. **3.** Check that base station is using only supported connection and encryption protocols. **4.** Check for nearby interference sources such as microwave ovens or cordless phones. See **kBase #HT1365: AirPort and Bluetooth: Potential sources of interference for wireless devices and networks** **5.** Check the number of users trying to use AirPort in the area for possible network congestion. **6.** Isolate OS by booting from original product OS installation media. Attempt to connect to wireless network (AirPort) or pair with wireless input device (Bluetooth). **7.** Reset PRAM.

Deep Dive

Check	Result	Action	Code
1. Open System Profiler, check to see if AirPort and Bluetooth are recognized. Run Clamshell Service Diagnostic or MRI and check for all devices' presence.	Yes	(AirPort) Ensure MAC address filtering is not enabled on the base station. Go to step 2. (Bluetooth) Ensure target devices are set to discoverable.	
	No	AirPort and/or Bluetooth not recognized. Go to step 4.	

2. (AirPort) Put unit to sleep and then wake it up. Is AirPort still recognized?	Yes	AirPort recognized. Intermittent issue not replicated. Continue testing and get more info from user.	
	No	AirPort not recognized. Go to step 3.	
3. Reseat AirPort/Bluetooth card to logic board. Retest and verify if issue is resolved.	Yes	Loose logic board connection.	**N04**
	No	AirPort issue, go to step 4; Bluetooth issue, go to step 7.	
4. (AirPort) Verify antenna connections to AirPort card are not reversed or loose. Reseat antenna cable connections. **Note:** To minimize reassembly between troubleshooting steps, leave clutch barrel off, attach clamshell to top case using 1 clutch screw on each side, and connect an external display, keyboard and mouse.	Yes	Loose connections or crossed antenna.	**N04**
	No	If connectors are secure, antenna connections not reversed and show no signs of damage or wear, go to step 5.	
5. (AirPort) Try a known-good AirPort card. Retest then close & open display to exercise a sleep/wake cycle and verify if issue is resolved.	Yes	Replace AirPort card. Verify repair by testing after a sleep-wake cycle.	**N12**
	No	Reinstall original AirPort card. Go to step 6.	
6. (AirPort) Try a known-good display clamshell if available. Retest then close & open display to exercise a sleep/wake cycle and verify if issue is resolved.	Yes	Replace display clamshell.	**L16**
	No	Reinstall original display clamshell. Replace logic board.	**M11**
7. (Bluetooth) Enable Bluetooth and try a known-good AirPort/Bluetooth card. Retest and verify if issue is resolved.	Yes	Replace AirPort/Bluetooth card.	**N15**
	No	Go to step 8.	
8. (Bluetooth) Try a known-good display clamshell. Retest and verify if issue is resolved.	Yes	Replace display clamshell.	**L16**
	No	Replace logic board.	**M11**

No/Poor Wireless Signal

Unlikely cause: battery, power adapter, SSD, fan, LIO board, speakers, microphone, top case

Quick Check

Symptom	Quick Check
No/Poor Wireless Signal • Unable to find networks • Intermittent connection dropouts • Slow transfer speeds	**1.** Check for nearby interference sources such as microwave ovens and cordless phones. See **kBase #HT1365: AirPort and Bluetooth: Potential sources of interference for wireless devices and networks** **2.** Check that computer is within base station range; try moving closer to base station. **3.** Base station checks: a. Base station is not set to low-power transmission mode b. Base station is not using unsupported connection and encryption protocols c. Check for possible Wi-Fi channel overlap (nearby base stations using adjacent channel) **4.** Isolate OS by booting from original product OS installation media. Attempt to connect to base station.

Deep Dive

Check	Result	Action	Code
1. Open System Profiler and check to see if AirPort Extreme card is recognized under Network: AirPort.	Yes	Make sure all AirPort software and firmware updates have been applied. Ensure base station is not using MAC address filtering or creating a hidden network.	
	No	Go to step 2.	
2. Verify AirPort card antenna connections and reseat if loose or reversed. Is issue resolved?	Yes	Issue resolved by antenna reseat.	
	No	Go to step 3.	
3. Try a known-good AirPort/ Bluetooth card. Is issue resolved?	Yes	Replace AirPort/Bluetooth card.	**N15**
	No	Go to step 4.	
4. Try a known-good display clamshell. Is issue resolved?	Yes	Replace display clamshell.	**L16**
	No	Replace logic board.	**M11**

AirPort Card: Kernel Panic

Unlikely cause: battery, power adapter, SSD, fan, LIO board, speakers, microphone, top case

Quick Check

Symptom	Quick Check
AirPort Card: Kernel Panic • Kernel panic on boot • Kernel panic or freezing while attempting to connect to wireless networks • Kernel panic while transferring data on wireless networks.	**1.** Isolate OS by booting from original product OS installation media. Attempt to connect to wireless network. **2.** Use Software Update to make sure all AirPort software and firmware updates have been applied.

Deep Dive

Check	Result	Action	Code
1. Ensure MAC address filtering is not enabled on the base station. Is kernel panic resolved?	Yes	Software issue.	
	No	Go to **AirPort/Bluetooth: Defective Wireless Devices**.	

Wireless Performance Issue / Slow Connection

Unlikely cause: battery, power adapter, SSD, fan, LIO board, speakers, microphone, top case

Quick Check

Symptom	Quick Check
Wireless Performance Issue / Slow Connection • Slow or stalled data transfers • Intermittent connection dropouts	**1.** Check for nearby interference sources such as microwave ovens or cordless phones. See **kBase #HT1365: "AirPort and Bluetooth: Potential sources of interference for wireless devices and networks"**) **2.** (AirPort) Check the number of users trying to use AirPort in the area for possible network congestion. Move computer closer to base station. **3.** (Bluetooth) Move devices closer together. **4.** Check wireless network performance with a known-good computer. **5.** (AirPort) Wireless base station checks: 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 product OS installation media. 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 AirPort and Bluetooth antenna cables. Are cables damaged?	Yes	Replace display clamshell.	**L14**
	No	Go to step 2.	
2. Turn off Bluetooth. Refer to **kBase #TS1809: MacBook Air: Optimizing AirPort performance while using Bluetooth** Is issue resolved?	Yes	Possible AirPort interference from Bluetooth card. Change AirPort base station channel.	**N06**
	No	Go to **AirPort/Bluetooth: Defective Wireless Devices**.	

Bluetooth Wireless Input Device Loses Connection

Unlikely cause: battery, power adapter, SSD, fan, LIO board, speakers, microphone, top case

Quick Check

Symptom	Quick Check
Wireless Input Device Loses Connection • Bluetooth keyboard, mouse or trackpad loses connection	**1.** Check Bluetooth wireless input device has fully charged batteries. **2.** Verify computer has latest software updates. **3.** Use Bluetooth Service Diagnostic to verify Bluetooth channels and wireless input device functionality.

Deep Dive

Check	Result	Action	Code
1. System Profiler should list Bluetooth radio device under system hardware. Is Bluetooth device available?	Yes	Go to step 2.	
	No	Go to step 5.	
2. Verify System Preferences has a Bluetooth control panel. Ensure Bluetooth is on and device is discoverable. Are there any devices listed in pairing window?	Yes	Choose known-good device and establish a connection. Go to step 3.	
	No	Go to step 5.	
3. Ensure a known-good Bluetooth device is on, in close range and in discoverable mode. Is computer pairing with known-good device?	Yes	Pairing verified, connect with user's device, go to step 4.	
	No	Go to step 5.	
4. Is computer pairing with user's Bluetooth device?	Yes	Connection established, continue testing for connection loss, go to step 7.	
	No	Check for software updates for both computer & device.	**K07**
5. Run MRI or Clamshell Service Diagnostic utility and check for all devices' presence. If not found, reseat AirPort/Bluetooth card on logic board. Is the Bluetooth radio present, on and pairing with a known-good device?	Yes	Issue resolved.	**N04**
	No	Go to step 6.	

6. Install and test a known-good AirPort/Bluetooth card. Is the Bluetooth radio present, on and pairing with a known-good device?	Yes	Replace AirPort/Bluetooth card.	**N18**
	No	Replace logic board.	**M11**
7. Use Bluetooth Service Diagnostic to actively test a known-good Bluetooth device and determine if there is a disconnect. Do not allow computer to sleep during this test. Is link lost during test?	Yes	Check for software update, 2.4 GHz interference or device low battery. Go to step 8.	
	No	Known-good device passed, test with user's Bluetooth device.	
8. Boot from original product OS installation media and test Bluetooth device to see if wireless still disconnects.	Yes	Bluetooth disconnection appears to be hardware-related. Go to step 9.	
	No	Restore user's OS.	
9. Try known-good AirPort/Bluetooth card. Is issue resolved?	Yes	Replace AirPort/Bluetooth card.	**N15**
	No	Go to step 10.	
10. Try known-good display clamshell. Is issue resolved?	Yes	Replace display clamshell.	**L16**
	No	Replace logic board.	**M11**

Bluetooth Wireless Input Device Doesn't Pair

Unlikely cause: battery, power adapter, SSD, fan, LIO board, speakers, microphone, top case

Quick Check

Symptom	Quick Check
Wireless Input Device Doesn't Pair • System does not recognize Bluetooth input device	**1.** Check System Preferences: Bluetooth is turned on and discoverable. **2.** Check Bluetooth device has fully charged batteries. **3.** Ensure computer has the latest software updates. **4.** If Bluetooth devices pairs with no issues at service location, 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. Is Bluetooth device available?	Yes	Bluetooth radio present, verify Bluetooth preference settings, go to step 2.	
	No	Go to step 5.	
2. Verify System Preferences has a Bluetooth control panel. Ensure Bluetooth is on and device is discoverable. Are there any devices listed in pairing window?	Yes	Choose known-good device and establish a connection. Go to step 3.	
	No	Go to step 5.	
3. Ensure a known-good Bluetooth device is on, in close range and discoverable mode, Is system pairing with known-good device?	Yes	Pairing verified, connect with user's device, go to step 4.	
	No	Go to step 5.	
4. Is Bluetooth pairing with user's Bluetooth device?	Yes	Issue resolved.	
	No	Check for software updates.	
5. Run MRI or Clamshell Service Diagnostic utility and check for all devices' presence. If not found, reseat AirPort/ Bluetooth card to logic board. Is the Bluetooth radio present, on and pairing with a known-good device?	Yes	Issue resolved.	
	No	Go to step 6.	

6. Install and test a known-good AirPort/Bluetooth card. Is the Bluetooth radio present, on and pairing with a known-good device?	Yes	Replace AirPort/Bluetooth card.	**N16**
	No	Replace logic board. Go to step 7.	**M11**
7. With the logic board replacement, is the Bluetooth now pairing?	Yes	Issue resolved with logic board replacement.	
	No	Replace display clamshell.	**L16**

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 **smfeedback4@apple.com** stating that a suitable symptom code could not be found.

Input/Output Devices

USB Port Does Not Recognize Devices

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone, top case

Quick Check

Symptom	Quick Check
USB Port does not recognize devices • USB wired keyboard or mouse not recognized • USB flash drive not recognized • MRI reported a USB issue	**1.** Check for software updates. **2.** Use System Profiler to verify computer recognizes USB bus. **3.** Test port with known-good Apple USB keyboard or USB mouse. **4.** Verify any USB hubs have sufficient power.

Deep Dive

Check	Result	Action	Code
1. Reset SMC and PRAM. Is USB device recognized?	Yes	Issue resolved.	
	No	Go to step 2.	
2. Is USB device receiving power from USB port? Note: first device to need >500ma will get 1000ma, all others are limited to ≤500ma.	Yes	Go to step 4.	
	No	Go to step 3.	
3. Does issue pertain to left USB port only?	Yes	Go to step 5.	
	No	Go to step 4.	
4. Is the latest Mac-compatible USB software driver for this USB device installed?	Yes	Replace logic board.	**M15**
	No	Obtain Mac-compatible USB driver.	
5. Left USB uses a flex cable from logic board to I/O board. Reseat I/O flex cable and/or test with known-good I/O flex cable. Is left USB restored?	Yes	Reseat cable restored USB. Replace flex cable if needed.	**X03**
	No	Go to step 6.	
6. Install known-good I/O board and test if USB is restored.	Yes	Replace I/O board.	**M15**
	No	Replace logic board.	**M15**

Built-in Keyboard Does Not Work Properly

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone

Quick Check

Symptom	Quick Check
Built-in Keyboard Does Not Work Properly • Keystrokes not recognized • Keyboard locks up • Displayed characters don't match what is typed	**1.** In System Preferences: International: Input Menu, enable Keyboard Viewer. Select Show Keyboard Viewer from Input Menu in menu bar. Test keyboard. **2.** Confirm correct keyboard layout is selected. **3.** Check for software or firmware updates. **4.** Press Caps Lock to see if light comes on, which would indicate at least a partial connection to logic board.

Deep Dive

Check	Result	Action	Code
1. If specific keys are not working, confirm if they are physically broken.	Yes	Refer to kBase #HT4002: MacBook/MacBook Pro: Black Keycap Replacement. Replace affected key(s).	
		If keycap replacement is not available, replace top case.	**K01**
	No	Go to step 2.	
2. Is keyboard visible in System Profiler > USB? It should be listed as "Apple Internal Keyboard / Trackpad"	Yes	Go to step 6.	
	No	Go to step 3.	
3. Reseat keyboard flex cable to trackpad, and IPD flex cable to trackpad and logic board. Verify that cables are fully seated and locked into connectors. Is issue resolved?	Yes	Issue resolved.	
	No	Go to step 4.	
4. Try known-good IPD flex cable. Is issue resolved?	Yes	Replace IPD flex cable.	**X03**
	No	Go to step 5.	
5. Try known-good trackpad and known-good IPD flex cable. Is issue resolved?	Yes	Replace trackpad.	
	No	Replace logic board.	

6. Reseat keyboard flex cable to trackpad. Is issue resolved?	Yes	Issue resolved.	
	No	Replace top case.	**K01**

Keyboard: Specific Keys Don't Work

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone

Quick Check

Symptom	Quick Check
Specific Keys Don't Work • Keycap broken • Key switch mechanism broken • Sticky key • Key pressed not recognized • Liquid spill indicator activated	**1.** Determine if key 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 **3.** Inspect keycap to remove debris trapped under it. **4.** If the keycap is loose, check if clasp and scissor mechanism are still intact and reattach it. **5.** Refer to kBase #HT4002: MacBook/MacBook Pro: Black Keycap Replacement. 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 **K17**).

Deep Dive

Check	Result	Action	Code
1. Single key problems are typically key scissor or single switch related. Multiple keys related by row or column are related by shorting or open scan signals to keyboard controller. Shorts can occur with liquid spills. Opens can occur with flex cable connection to trackpad. Are multiple keys involved?	Yes	Go to step 3.	
	No	Go to step 2.	

2. Single key repair. Inspect key switch by removing keycap and scissor set. Does key dome and switch work when pressed?	Yes	Replace keycap and/or scissor set.	
	No	Replace top case.	**K01**
3. Inspect liquid contact indicators for activated sensors on top case, trackpad and logic board. Are there are any activated sensors?	Yes	Not covered by warranty.	
	No	Go to step 4.	
4. Is key issue affecting a specific row or column of keys?	Yes	Go to step 5.	
	No	All keys are nonfunctional. Go to **Built-in Keyboard Does Not Work Properly** to ensure trackpad controller is not part of the issue.	
5. Inspect and reseat keyboard flex cable to trackpad to determine if cable contact can be restored to bring back missing row or column. Did reseat fix multiple key issue?	Yes	Issue resolved.	
	No	Replace top case.	**K01**

Built-in Trackpad Does Not Work

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone

Quick Check

Symptom	Quick Check
Built-in Trackpad Does Not Work • Cursor does not move • Clicking does not work • Multi-touch does not work • MRI lists trackpad as not recognized • Keyboard and trackpad both not working	**1.** Check for environmental factors such as humidity, hand lotion or jewelry. Check if user might be touching the trackpad simultaneously with both hands. (Two-hand touch is not like two-finger touch.) **2.** Clean the trackpad surface (with computer powered off) using a clean, dry, lint-free cloth. **3.** Make sure all software and firmware updates have been applied. **4.** Verify if trackpad is continuously listed on USB in Apple System Profiler.

Deep Dive

Check	Result	Action	Code
1. Can you see the trackpad continuously listed on USB in Apple System Profiler?	Yes	Go to step 5.	
	No	Go to step 2.	
2. Does trackpad or IPD flex cable connector on trackpad look damaged? Also inspect keyboard flex cable to trackpad connector for damage.	Yes	Replace trackpad according to symptom found: - No trackpad response - Trackpad cursor not tracking properly - Trackpad button issues - Damaged trackpad - Damaged keyboard flex cable connector Go to step 6.	**K02** **K12** **K13** **K16** **K11**
	No	Go to step 3.	
3. Reseat IPD flex cable to logic board and trackpad. Verify that IPD flex cable is in good condition (no delamination or torn cable ends, no missing or cracked tracks). Does trackpad work now?	Yes	Reseating cable resolved issue.	
	No	Replace IPD flex cable. Go to step 4.	**X03**
4. Is IPD flex cable connector on logic board damaged?	Yes	Replace logic board.	**M24**
	No	Go to step 5.	
5. In System Preferences: Universal Access, turn off special Keyboard and Mouse & Trackpad settings. Set for normal use, enable and test multi-touch features. Does trackpad work now?	Yes	Settings issue resolved.	
	No	Go to step 6.	
6. Does trackpad click properly? Verify trackpad alignment.	Yes	All trackpad issues resolved.	
	No	Go to step 7.	
7. Does a known-good trackpad work?	Yes	Replace trackpad according to symptom found. - No trackpad response - Trackpad cursor not tracking properly - Trackpad button issues - Damaged trackpad	**K02** **K12** **K13** **K16**
	No	Replace logic board.	**M16**

Built-in Keyboard Is Not Recognized

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone

Quick Check

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

Deep Dive

Check	Result	Action	Code
1. In Apple System Profiler is "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. Reseat IPD flex cable to logic board and trackpad. Verify that IPD flex cable is in good condition (no delamination or torn cable ends, no missing or cracked tracks). Does keyboard function properly now?	Yes	Issue resolved.	
	No	Replace IPD flex cable. Go to step 4.	**X03**
4. Verify that flex cable is fully inserted into connectors on logic board and trackpad, that connectors are not damaged, and that connector locks are closed. Does keyboard function properly now?	Yes	Issue resolved.	
	No	If damaged connector on trackpad, replace trackpad. Otherwise, replace top case. Go to step 5.	**K04** **K11**
5. Verify that all keys are functional using ASD or Keyboard Viewer.	Yes	Issue resolved.	
	No	Replace logic board.	**M15**

Built-in Trackpad Does Not Track Properly

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone

Quick Check

Symptom	Quick Check
Built-in Trackpad Does Not Track Properly • Cursor movement is random, uneven, or jumpy. • Cursor hangs or stalls along path.	**1.** Check for environmental factors such as humidity, hand lotion or jewelry. Check if user is touching the trackpad simultaneously with both hands. **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 the power adapter, use a grounded power cord with the power adapter.

Deep Dive

Check	Result	Action	Code
1. Can you see the trackpad continuously listed under USB in Apple System Profiler?	Yes	Trackpad communicating to system. Go to step 5.	
	No	Go to step 2.	
2. Is the trackpad damaged?	Yes	Replace trackpad. Go to step 6.	**K04**
	No	Go to step 3.	
3. Reseat IPD flex cable at trackpad and logic board. Does trackpad work now?	Yes	Reseating cable resolved issue.	
	No	Go to step 4.	
4. Is IPD flex cable connector on trackpad or logic board damaged?	Yes	Replace the affected part: - trackpad - logic board	**K02** **M24**
	No	Go to step 5.	
5. In System Preferences: Universal Access, turn off special Keyboard and Mouse & Trackpad settings. Does trackpad work now?	Yes	Settings issue resolved.	
	No	Go to step 6.	

6. Are trackpad flexure grounding clips touching trackpad contact surfaces?	Yes	Go to step 7.	
	No	Replace grounding clips (or trackpad)	
7. Does a known-good trackpad work?	Yes	Replace trackpad according to symptom found. - No trackpad response - Trackpad cursor not tracking properly - Trackpad button issues	**K02** **K12** **K13**
	No	Replace logic board.	**M16**

Built-in Speaker Has No Audio

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, top case

Quick Check

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

Deep Dive

Check	Result	Action	Code
1. Use System Profiler to verify Intel Hi Def Audio is present in Audio (Built in). Is Intel HDA controller present?	Yes	Go to step 2	
	No	Go to **No Audio from Any Source**.	
2. Check System Preferences: Sound: Output and verify that no external speakers, "Digital Out," or headphones are being reported connected when there is none present.	Yes	Audio-out port is not damaged. Go to step 4.	
	No	Go to step 3.	

3. With known-good headphone or speakers, plug in the audio output jack for several cycles. Verify that you get audio through external headphones/ speakers when connected.	Yes	Go to step 4.	
	No	Go to step 5.	
4. Remove headphones from audio output jack. Verify that you now get audio through internal speakers.	Yes	Issue resolved.	
	No	Go to step 5.	
5. With headphones removed, does System Profiler report "digital audio out" for output?	Yes	Replace logic board.	**M09**
	No	Go to step 6.	
6. With audio out set to internal speakers, is audio coming from one or both speakers?	Yes	Issue resolved.	
	No	Go to step 7.	
7. Are speakers or speaker cables damaged?	Yes	Replace affected speaker(s).	**X08**
	No	Go to step 8.	
8. Inspect and reseat I/O flex cable. Is damage present on cable or connectors?	Yes	Replace I/O flex cable. Replace logic board. Replace I/O board.	**X03** **M09** **M09**
	No	Go to step 9.	
9. Install and test a known-good I/O flex cable. Are both speakers working?	Yes	Replace I/O flex cable.	**X03**
	No	Go to step 10.	
10. Install and test a known-good I/O flex cable and I/O board. Are both speakers working?	Yes	Replace I/O board.	**M09**
	No	Replace logic board.	**M09**

Internal Speaker Has Distorted Sound

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, top case

Quick Check

Symptom	Quick Check
Internal Speaker Has Distorted Sound • Distorted audio	**1.** Reset PRAM. **2.** Adjust sound output and level in System Preferences: Sound: Output, and use the Balance to locate left or right 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. Comparing internal speakers with headphones, is the distortion on both headphones and 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 test the left and right speakers. Are both speakers free of distortion, sounding clear and loud?	Yes	Issue resolved.	
	No	Adjust volume to test full range of volume settings. Go to step 3.	
3. Is affected speaker cable properly inserted and free from damage?	Yes	Go to step 4.	
	No	Reseat speaker cable or replace damaged speaker. Go to step 5.	**X09**
4. Is affected speaker membrane 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 bad speaker(s).	**X09**

5. Verify that speaker enclosure is not damaged, correctly installed in system, and does not create unneeded vibration when sound is played.	Yes	Speaker housing and installation is good. Go to step 6.	
	No	Properly install or replace affected speaker. Go to step 6.	
6. Verify that internal speakers no longer produce distorted sound.	Yes	Issue resolved.	**X09**
	No	Replace logic board.	**M09**
7. Verify that speaker enclosure is not damaged, correctly installed in system, and does not create unneeded vibration when sound is played.	Yes	Speaker housing and installation is good. Go to step 6.	
	No	Properly install or replace affected speaker. Go to step 6.	
8. Verify that internal speakers no longer produce distorted sound.	Yes	Issue resolved.	**X09**
	No	Replace logic board.	**M09**

External Display Port Has No Audio

Quick Check

Symptom	Quick Check
External Display Port Has No Audio • Built-in Intel Hi Def Audio Controller missing from system profiler: Audio • HDMI - Display Port not listed under Intel HDA in system profiler. • No sound for external monitor using HDMI adapter	**1.** Make sure all software updates have been applied and user is not booted from an earlier version of OS. **2.** Verify with system profiler that built-in shows there is an Intel Hi Def Audio controller present. **3.** Exercise sound out to external monitor via HDMI adapter.

Deep Dive

Check	Result	Action	Code
1. Confirm Intel Hi Def Audio (HDA) Controller is recognized in system profiler Audio (Built In). Is Intel HDA present with internal microphone listed as the audio device?	Yes	Go to step 2.	
	No	Go to **No Audio From Any Source**	
2. HDMI Display Port for audio out to external monitor is an automatic OS configuration listed in Sound: Output in system preference with connection to a HDMI compatible monitor. Is sound from system heard on external monitor?	Yes	Issue resolved	
	No	Go to step 3.	
3. Inspect external display port on logic board for connector damage; then test with a known-good HDMI adapter. Does external monitor play movie or iTunes audio?	Yes	Replace HDMI adapter. Replace logic board with damaged connector.	**X03** **M24**
	No	Go to step 4.	
4. Inspect I/O flex cable, logic board and I/O board connectors while reseating I/O flex cable and testing with known good HDMI adapter. Does external monitor play movie or iTunes audio?	Yes	Issue resolved by reseating I/O flex cable	**X03**
	No	Go to step 5.	
5. Install and test a known good I/O flex cable and known good HDMI adapter. Does external monitor play movie or iTunes audio?	Yes	Replace defective I/O flex cable	**X03**
	No	Go to step 6.	
6. Install and test a known good I/O Board with known good I/O flex cable and HDMI adapter. Does external monitor play movie or iTunes audio?	Yes	Replace defective I/O board	**M09**
	No	Replace logic board	**M09**

Internal Microphone Has No Audio

Quick Check

Symptom	Quick Check
Internal Microphone Has No Audio • Built-in Intel Hi Def Audio Controller missing from system profiler: Audio • Internal microphone not listed under Intel HDA in system profiler. • No sound recording level using system preferences: Sound: Input: Built in Internal Mic with Input Volume greater than 50%	**1.** Make sure all software updates have been applied and user is not booted from an earlier version of OS. **2.** Verify with system profiler that built-in shows there is an Intel Hi Def Audio controller present. **3.** Exercise microphone input sound level using system preferences, selecting input from internal microphone.

Deep Dive

Check	Result	Action	Code
1. Confirm Intel Hi Def Audio (HDA) Controller is recognized in system profiler Audio (Built In). Is Intel HDA present with internal microphone listed as the audio device?	Yes	Go to step 2.	
	No	Go to **No Audio From Any Source**	
2. Selecting internal microphone as input device in system preferences and adjusting input level to a usable level greater than 50%, does microphone show recording levels with speech or palm rest tapping?	Yes	Issue resolved, sound recording levels indicate microphone provides sound input.	
	No	Go to step 3.	
3. Inspect internal microphone cable connection on I/O Board. Look for broken microphone leads or broken connector latch. Are there loose or broken wire connector or connections to microphone?	Yes	Replace microphone. Replace I/O board.	**X03** **M24**
	No	Go to step 4.	

4. Connect a known-good internal microphone to I/O Board and test audio in with system preferences. Is microphone use restored using the known-good microphone?	Yes	Replace internal microphone.	**X03**
	No	Go to step 5.	
5. Inspect I/O flex cable, logic board, and I/O board connectors while reseating I/O flex cable and testing known good microphone assembly. Is microphone use restored using the known good microphone?	Yes	Issue resolved by reseating I/O flex cable.	
	No	Go to step 6.	
6. Install and test a known-good I/O flex cable and known-good microphone. Is microphone use restored using the known good I/O flex cable and known good microphone?	Yes	Replace defective I/O flex cable.	**X03**
	No	Go to step 7.	
7. Install and test a known good I/O board with known good I/O flex cable and microphone. Is microphone use restored using the known good I/O board, flex cable and microphone?	Yes	Replace defective I/O board.	**M09**
	No	Replace logic board.	**M09**

External Microphone Has No Audio

Quick Check

Symptom	Quick Check
External Microphone Has No Audio • Built-in Intel Hi Def Audio Controller missing from system profiler: Audio • External microphone not listed under Intel HDA in system profiler. • No sound recording level using system preferences: Sound: Input: Built in Internal Mic with Input Volume greater than 50%	**1.** Make sure all software updates have been applied and user is not booted from an earlier version of OS. **2.** Verify with system profiler that built-in shows there is an Intel Hi Def Audio controller present. **3.** Exercise microphone input sound level using system preferences, selecting input from external microphone plugged into headphone jack.

Deep Dive

Check	Result	Action	Code
1. Confirm Intel Hi Def Audio (HDA) Controller is recognized in system profiler Audio (Built In). Is Intel HDA present with internal microphone listed as the audio device?	Yes	Go to step 2.	
	No	Go to **No Audio From Any Source**	
2. Selecting external microphone as input device in system preferences and adjusting input level to a usable level greater than 50%, does microphone show recording levels with speech or headset microphone tapping?	Yes	Issue resolved, sound recording levels indicate microphone provides sound input.	
	No	Go to step 3.	
3. Inspect headset microphone cable and full insertion into headphone jack. Are there pinched or broken wire connections to microphone/ switch?	Yes	Replace microphone headset assembly.	**X03**
	No	Go to step 4.	

4. Connect a known good iPhone style microphone/ switch headset and test audio in with system preferences. Is microphone use restored using the known good mic-headset assembly?	Yes	Replace headset assembly	**X03**
	No	Go to step 5.	
5. Use the known good headset and inspect I/O flex cable, MLB and I/O Board connectors while reseating I/O flex cable and testing known good microphone assembly. Is microphone use restored using the known good mic-headset assembly?	Yes	Issue resolved by reseating I/O flex cable.	
	No	Go to step 6.	
6. Install and test a known good I/O flex cable and known good mic-headset assembly. Is microphone use restored using the known good I/O flex cable and known good mic-headset assembly?	Yes	Replace defective I/O flex cable.	**X03**
	No	Go to step 7.	
7. Install and test a known good I/O Board with known good I/O flex cable and microphone. Is microphone use restored using the known good I/O Board, flex cable and mic-headset assembly?	Yes	Replace defective I/O board.	**M09**
	No	Replace logic board.	**M09**

No Audio from Any Source

Quick Check

Symptom	Quick Check

No Audio from Any Source
• Missing Built in Intel Hi Def Audio Controller in system profiler: Audio
• Lost audio devices:
  • internal microphone
  • speaker
  • headphone
  • external headset microphone & controls
  • HDMI audio via external display port
	1. Make sure all software updates have been applied and user is not booted from an earlier version of OS.
	2. Verify with system profiler that built-in shows there is an Intel Hi Def Audio controller present.
	3. Exercise some audio source to headphone or iPhone headset.

Deep Dive

Check	Result	Action	Code
1. No audio from internal microphone, built in speakers, line in, headphone jack (ext mic with controls) or external display port to monitor is a good indicator Hi Def Audio (HDA) controller is not seen by logic board. Using system profiler, is Intel HDA controller present under Audio (Built In)?	Yes	Go to step 2.	
	No	Go to step 2	
2. Inspect I/O flex cable and logic board/ I/O Board connections for damage and reset connections at both ends of flex cable. Is there any damage found on connector or cable?	Yes	Replace damaged I/O flex cable. Replace damaged logic board Replace damaged I/O Board	**X03** **M09** **M09**
	No	Go to step 3.	
3. Install and test a known good I/O flex cable? Is Intel HDA controller now present for Audio (Built In) in system profiler?	Yes	Replace I/O flex cable.	**X03**
	No	Go to step 4.	

4. Install and test a known good I/O Board using known good I/O flex cable. Is Intel HDA controller now present for Audio (Built In) in system profiler?	Yes	Replace I/O board.	**M09**
	No	Replace logic board.	**M09**
5. Is audio not working for headphone or built in speakers?	Yes	Go to **Built in Speaker Has No Audio**	
	No	Go to step 6.	
6. Is audio not working for internal microphone ?	Yes	Go to **Internal Microphone Has No Audio**	
	No	Go to step 7.	
7. Is audio not working for external microphone and sound control?	Yes	Go to **External Microphone Has No Audio**	
	No	Go to step 8.	
8. Is audio not working for external display port and HDMI cable	Yes	Go to **External Display Port Has No Audio Out**	
	No	All possible audio channels are verified with steps above. Contact Apple with feed back should you still have an audio concern.	

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 customer. If not, document reported symptom and send feedback to **smfeedback4@apple.com** stating that a suitable symptom code could not be found.

Mechanical/Enclosure

Noise / Hum / Vibration

Unlikely cause: display clamshell, battery, SSD, AirPort/Bluetooth, top case

Quick Check

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

Deep Dive

Check	Result	Action	Code
1. Does use of a known-good AC adapter eliminate the noise/ vibration?	Yes	Replace AC adapter.	**P04**
	No	Go to step 2.	
2. Verify if noise is heard through built-in speakers and/or headphones?	Yes	Go to step 3.	
	No	Go to step 4.	
3. Disconnect any peripheral devices and cables attached to the unit. Did the noise disappear?	Yes	Check for possible ground loop. Verify all devices use a grounded AC cord.	
	No	Go to step 4.	
4. Locate source of the noise. Is the noise from the audio circuit? Adjust volume and mute audio, test with headphones, to determine source. Is noise audio-related?	Yes	Two possible reasons: -amplified power switching -audio feedback or two audio sources or outputs enabled	
	No	Go to step 5.	

5. Is the noise coming from the fan?	Yes	The fan generally runs 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 mechanical interference with fan (foam, bracket, shield) before replacing a noisy fan.	**X23**
	No	Go to step 6.	
6. Noise may be 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: bottom case, top case

Quick Check

Symptom	Quick Check
Burnt Smell / Odor • Computer or AC adapter emits an odor or smell of smoke.	**1.** Disconnect battery and AC adapter from computer. **2.** Attempt to identify the source of the odor. Visual clues are component damage like capacitor chip popped or burn marks. **3.** Check battery cells.

Deep Dive

Check	Result	Action	Code
1. Has the source of the odor been identified?	Yes	Replace the affected part.	**P08**
	No	Go to step 2.	
2. Are any burn marks visible on pinched cables or components?	Yes	An improperly seated cable or damaged cable can blow logic board components. Make sure you identify cause before replacing affected part.	**P08**
	No	Go to step 3.	
3. Liquid spills can short power, cause component failure, and burn out electronics. Refer to **Liquid Contact Indicators**. Are any sensors triggered red?	Yes	For more information, refer to **kBase #HT3400: About liquid contact indicators (LCI) on portable and desktop computers**	
	No	Go to step 4.	
4. Is the computer operating normally?	Yes	This could be related to normal operation. Also check for accidental damage. See **kBase #CP161: Determining and Quoting Accidental Damage**	
	No	Refer to most-related troubleshooting section. If after inspecting the unit you feel there is a possible safety issue, please notify Apple.	

Power Button Stuck

Unlikely cause: clamshell, battery, power adapter, SSD, AirPort/Bluetooth, fan, speakers, microphone

Quick Check

Symptom	Quick Check
Power Button Stuck • System will not power on • System sounds boot ROM unlock tone during startup • System automatically starts up repeatedly	**1.** Diagnose stuck power button with SMC keyboard reset sequence. **2.** Check for issue occurrence on battery and on AC power. **3.** If issue occurs when computer is running on battery only, check battery using Battery Diagnostic Utility.

Deep Dive

Check	Result	Action	Code
1. Reset SMC by pressing Shift-Control-Option(Alt) along with power button. MagSafe LED can verify SMC reset. Momentary stop of battery charging will indicate SMC reset, orange/amber LED will go green momentarily then return to orange/amber.	Yes	SMC reset successful and multiple press and release of power button works to show power button not stuck.	
	No	SMC reset not working, suggests power button is open circuit or stuck down. Go to step 2.	
2. If you press Shift-Control-Option(Alt) keys does the SMC reset even without pressing the power button? This would indicate a stuck power button.	Yes	Try to repair stuck power button or replace top case.	**X14**
	No	Go to step 3.	
3. Disconnect battery and AC power for 30 seconds to perform a manual SMC reset. Apply AC power. Does power button work when pressed?	Yes	Issue resolved.	
	No	Power button stuck or open. Go to step 4.	
4. Inspect, align and reseat IPD flex cable and keyboard flex cable. Does power button now work correctly?	Yes	Issue resolved.	
	No	Go to step 5.	
5. Use conductive tool to touch power-on pads on logic board. Does system power on when shorting power-on pads?	Yes	Replace top case.	**X14**
	No	Go to **No Power / Dead Unit**.	

System Runs Hot

Unlikely cause: clamshell, SSD, AirPort/Bluetooth, speakers, microphone, top case

Quick Check

Symptom	Quick Check
System Runs Hot • System feels very warm • Fan not working • Fan running at high speed	**1.** Verify computer is operating on a flat, hard surface and vents are not blocked. **2.** Verify if computer temperature is comparable to a known-good similar system. See **kBase #HT1778: Apple Portables: Operating Temperature** **3.** Check if computer has any runaway applications. See **kBase #TS1473: Runaway applications can shorten battery runtime** **4.** Reset SMC. **5.** Inspect fan performance. **6.** Run MRI and review thermal sensor test.

Deep Dive

Check	Result	Action	Code
1. Fans are typically on at minimum speed. Perform SMC reset or remove all power for 5 minutes and reboot. Is fan spinning?	Yes	Go to step 3.	
	No	Go to step 2.	
2. Reseat fan connection to logic board or test a known-good fan. Is fan now spinning?	Yes	Go to step 3.	
	No	Replace fan. If issue persists, replace logic board.	**X99** **M18**
3. Does MRI test indicate an error with thermal sensors?	Yes	**Go to thermal troubleshooting.**	
	No	Go to step 4.	
4. Is heatsink installed properly with no damage to heat fins or bend in heat pipe?	Yes	Go to step 5.	
	No	Replace heatsink. Retest.	**X10**
5. Inspect heatsink. Is thermal grease possibly missing or improperly installed during previous repair?	Yes	Replace thermal grease. If issue persists, replace heatsink.	**X10**
	No	Replace logic board.	**M23**

Mechanical/Physical Damage

Quick Check

Symptom	Quick Check
Mechanical/Physical Damage • Broken glass • Broken hinge • Stripped screw/head • Stripped screw boss • Dent or scratch to chassis	**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 **smfeedback4@apple.com** stating that a suitable symptom code could not be found.

Sensors

Thermal Monitoring Errors

Unlikely cause: display, SSD, AirPort/Bluetooth, speakers, microphone, top case

Quick Check

Symptom	Quick Check
Thermal Monitoring Errors • Fan on full speed • Thermal monitoring leading to reduced CPU performance or system shutdown. • MRI reported thermal sensor error • Battery internal thermal sensor error • Battery not connected may activate fan on full speed due to missing thermal sensors.	**1.** Validate thermal characteristics of system. Is there a thermal concern of a runaway CPU application that might be activating fan at full speed? **2.** Reset SMC. SMC monitors thermal sensors and controls CPU performance and system cooling based upon sensor readings. **3.** Verify cooling fan is operational. The fan should be running at all times, 1500 RPM minimum. Fan on full speed can be thermal limit or a sensor cannot read error. **4.** Run MRI and review sensors flagged as erred. Reminder: Thermal sensors external to logic board are in the battery, top case and display.

Deep Dive

Check	Result	Action	Code
1. Reset SMC. Start up system on OS 10.6+ and characterize thermal concerns. If after warming up, does system show signs of thermal stress with fan running at excessive speed? Fan is always spinning. 2000 RPM is a minimum speed; excessive speed is above 4500 RPM.	Yes	Fan is on near full speed. Go to step 2.	
	No	Fan is normal at 2000 RPM or fan may not be spinning at all. Go to step 14.	

2. Is system exhibiting a valid thermal concern? (Warm air flowing from fan or warm top/bottom case)	Yes	Appears to be a system under stress, working to cool off while running OS applications. Go to step 3.	
	No	Fan is running fast for a system that does not appear to be overheating. Thermal monitoring may not be working correctly. Go to step 6.	
3. Inspect CPU processes using Activity Monitor to determine if specific application is in runaway mode: pushing CPU usage to the limit. Is there a CPU or GPU related application that is producing abnormal %CPU processing and heating system?	Yes	Quit offending application to determine if root cause. Delete application system preference or restore application start from application default settings and program code.	
	No	CPU process running normally. Thermal concern appears to be hardware related. Go to step 4.	
4. Verify sensor reading using a recent reading of thermal results from MRI. Is temperature approaching or over range limit, flagged red or yellow?	Yes	Device related to the thermal sensor above or near limit needs troubleshooting to determine fault. Go to step 5.	
	No	Thermal stress noted running OS is not seen exceeding MRI thermal monitoring with EFI version of MRI. Restore OS on system as hardware appears to be operating correctly.	
5. Inspect heatsink air vents, fan airflow, and heatsink thermal interface between CPU/GPU and heatsink if necessary to determine if cooling processes are working properly. Is heatsink or thermal interface part of the problem of thermal sensor(s) at or above thermal limit?	Yes	Replace heatsink and use proper amount of thermal grease.	**X10**
	No	Replace logic board.	**M18**

6. Does MRI report a thermal sensor error for Palmrest (Ts0P) or Battery Pack (TB1T or TB2T)? These thermal sensors are physically away from logic board. Ensure battery and trackpad are connected to system during MRI testing. SMC will spin fan with missing sensor(s). MRI will label them as "can't read."	Yes	Reseat trackpad cable or replace trackpad if Palmrest sensor continues to fail. Reseat battery to logic board connector or replace battery should internal thermal sensor continue to fail.	**X10** **P19**
	No	Go to step 7.	
7. Does MRI report a thermal sensor error for missing or abnormal reading for Heatsink area (Th1H) sensor? This thermal sensor is on I/O board. If missing, I/O board or I/O flex cable may have an open connection or damaged device. Reseat I/O flex cable while inspecting for cable or connector damage (on both logic board and I/O board).	Yes	Troubleshoot connections to thermal sensor near heatsink (Th1H) in I/O board. Go to step 8.	
	No	Another thermal sensor exists. Go to step 10.	
8. Is thermal sensor on I/O board near heatsink restored by reseating I/O flex cable or replacing with a known-good cable? (Th1H sensor on I/O board, aka Heatsink Proximity sensor or Finstack Proximity sensor)	Yes	Reseating I/O flex cable restored connection–issue resolved. Replace cable if known-good cable restored sensor connection.	**X03**
	No	Defective sensor or open connection to sensor. Go to step 9.	
9. Substitute a known-good flex cable and known-good I/O board to verify known-good parts will restore heatsink proximity sensor. Is this sensor now present and a value above ambient temperature?	Yes	Replace I/O board.	**M18**
	No	Replace logic board.	**M18**

10. Does MRI report a thermal sensor error "HardDisk out-of-band" for missing or abnormal reading for this SSD specific thermal sensor (TH0o)? This thermal sensor is built into SSD. If missing, we may have an open connection or damaged device. Reseat SSD while inspecting for connector damage on both logic board and SSD.	Yes	Go to step 11	
	No	Go to step 12	
11. Test using a known good SSD. Is SSD thermal sensor (Th0o) missing or over limit with known good SSD?	Yes	Replace logic board.	**M23**
	No	Replace SSD due to defective thermal sensor or device overheating.	**M23**
12. Does MRI report one or more thermal sensor(s) missing or can't read for logic board related thermal sensors? - CPU (TC0D, TC0P, mDTSO) - GPU, (TN1D, TN0P, TN0D) - logic board (Tp0P) These thermal sensors are physically on logic board or internal to CPU and GPU.	Yes	Replace logic board for missing and failed thermal sensor(s).	**M23**
	No	Go to step 13.	
13. Inspect heatsink air vents, fan airflow, and heatsink thermal interface between CPU/GPU and heatsink if necessary to determine if logic board cooling processes are working properly. Is heatsink or thermal interface part of the problem of thermal sensor(s) at or above thermal limit?	Yes	Replace heatsink and use proper amount of thermal grease.	**X10**
	No	Replace logic board.	**M18**
14. Is MRI reporting fan speed slow (less than 2000) RPM or stuck at 0? Inspect fan for foreign material, fan housing damage, and fan cable connection to logic board.	Yes	Replace fan if damaged or connector and cable are broken. Go to step 15.	**X22**
	No	Fan appears to operate in normal range. Check repair by reviewing MRI thermal sensors. Go to step 6.	

15. Substitute a known-good fan and verify fan is spinning at 2000 RPM. Is logic board spinning a known-good fan at 2000 RPM or slightly higher? Again inspect fan for foreign material, fan housing damage, and fan cable connection to logic board.	Yes	Replace fan.	**X22**
	No	Replace logic board.	**M18**

Electrical Monitoring Errors

Unlikely cause: display, AirPort/Bluetooth, speakers, microphone, top case

Quick Check

Symptom	Quick Check
Electrical Monitoring Errors • MRI or ASD reports an electrical sensor error with value out of range. • MRI or ASD reports VP0R out of range due to test being performed on a battery only that is near empty.	**1.** Reset SMC. SMC monitors thermal sensors and controls CPU performance and core voltage settings based upon environmental evaluation. **2.** Ensure battery capacity is at least 33% if MRI must run on battery only. Always use product AC adapter to verify battery charge circuity with MRI. **3.** Always have a battery connected to system when testing MRI to verify battery charging circuits and battery internal thermal sensors.

Deep Dive

Check	Result	Action	Code
1. Reset SMC. Verify if MRI or ASD still reports a thermal or electrical sensor error. Is error result a thermal sensor error?	Yes	Go to **Thermal Sensor Error** troubleshooting steps.	
	No	If SMC reset resolved error, issue resolved else go to step 2.	

2. Running MRI on battery only that is near empty may lead to internal voltages reaching lower limits. VP0R sensor may trigger a low voltage reading should battery be low and no adapter is supporting test. Is VP0R voltage sensor your only error being reported and adapter was not used during test?	Yes	Run MRI again with AC adapter connected.	
	No	VP0R and/or other electrical sensors are failing while testing with adapter support the test. Go to step 3.	
3. Retest using a known good I/O board, known good I/O flex cable and known good AC adapter. Is electrical sensor error still present? Sensors VC0C, VN0C, VP0R, PC0C, IN0C, IN1C and Ic0R are MLB related sensors. IB0R may be related to battery and ID0R may be related to I/O board.	Yes	Isolate potential battery induced error as root cause or logic board as root cause for sensor error. Go to step 5.	
	No	Isolate I/O board or I/O flex cable as cause for sensor error. Go to step 4.	
4. Reinstall user I/O flex cable mating it to known good I/O board and retest MRI. Has electrical sensor error(s) returned?	Yes	Replace I/O flex cable.	**X03**
	No	Replace user's defective I/O board.	**M23**
5. Retest using a known good battery. Do any electrical sensor error remain?	Yes	Replace logic board.	**M23**
	No	Replace battery.	**P19**

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 smfeedback4@apple.com stating that a suitable symptom code could not be found.

Apple Technician Guide

Take Apart

MacBook Air (11-inch, Late 2010)

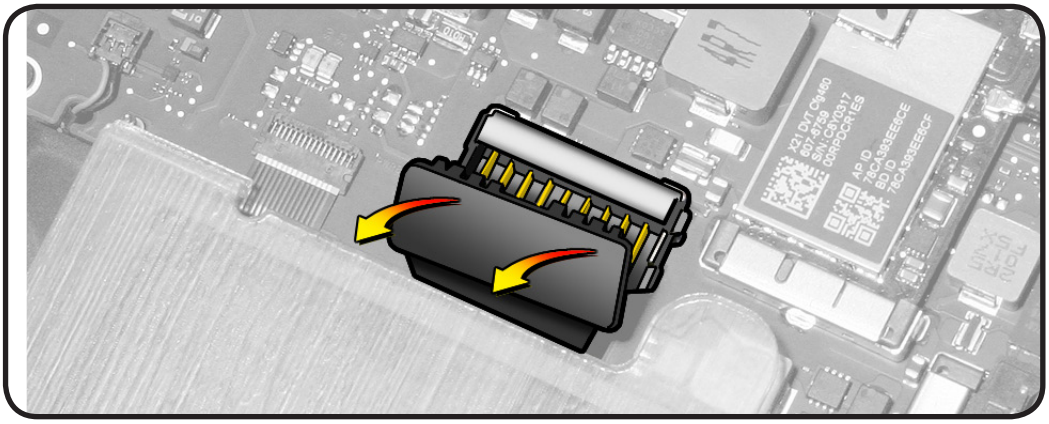
General Information

Connector Types on Logic Board

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

Battery Connector

- Use black stick or fingernails to pull up evenly.
- Align connector over receptacle and press onto board when reconnecting.

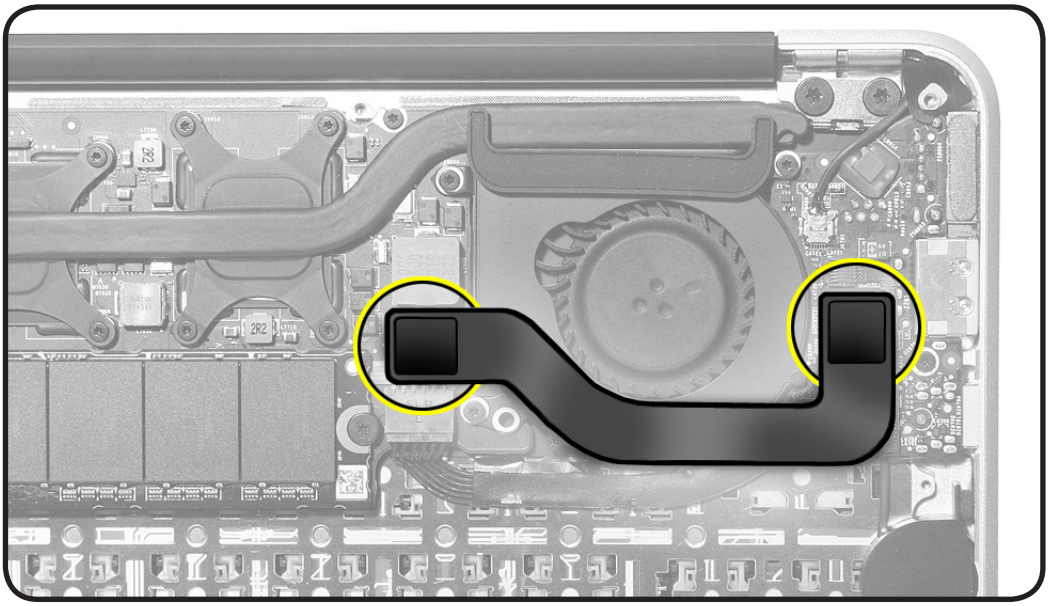


Low-Profile Solid Platform Flex

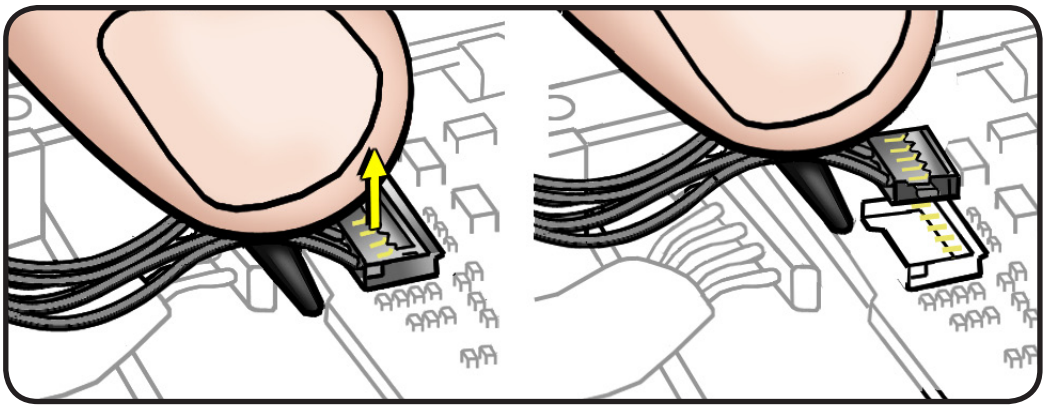
- Use black stick to remove cable straight up.
- Keep connector level to board and press evenly to install cable.

Examples:

- I/O flex cable



Vertical Insertion (JST)

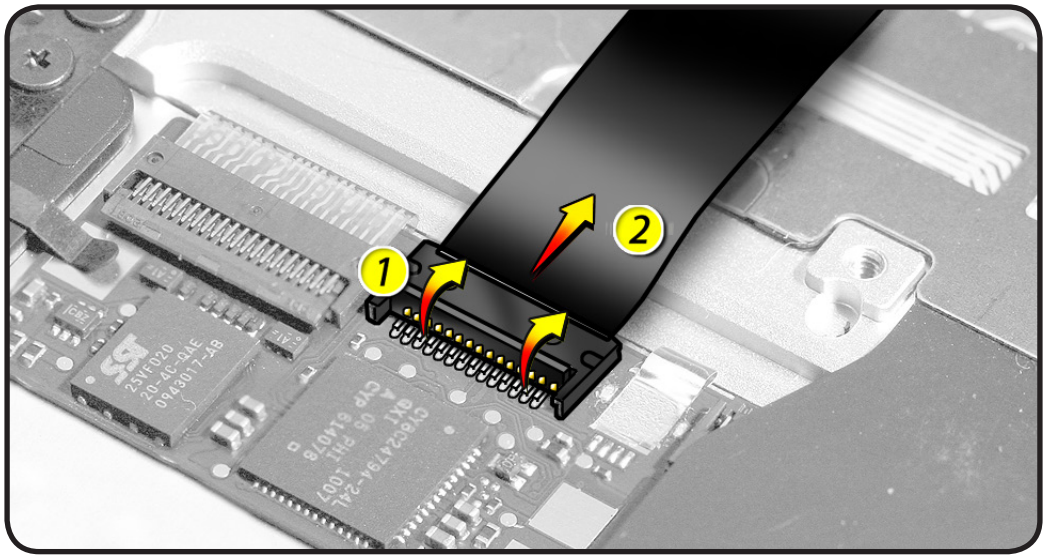


- Use black stick under cable to remove.
- Keep connector level to board when disconnecting and reconnecting.
- Press evenly when reconnecting or connector can be tipped up and not fully seated.

Examples:

- right speaker
- left speaker

Locking Lever



- Flip up lever 90 degrees for cable removal.
- Slide connector into receptacle on same horizontal plane as logic board.
- Lock down lever after inserting cable.

Examples:

- IPD flex cable
- keyboard flex cable
- fan
- microphone

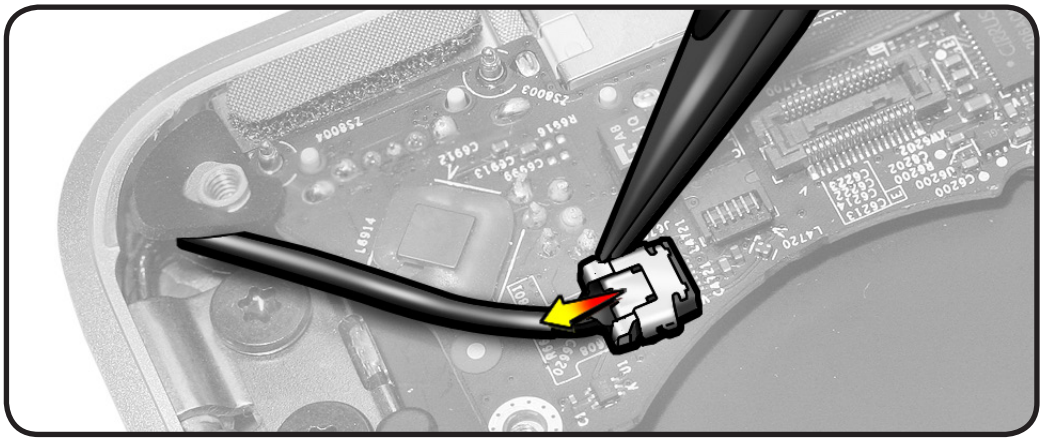
Caution: Use black stick to push IPD flex cable **all the way** into connector to prevent "no power" symptoms.

Thin, Multi-Pin Horizontal Insert

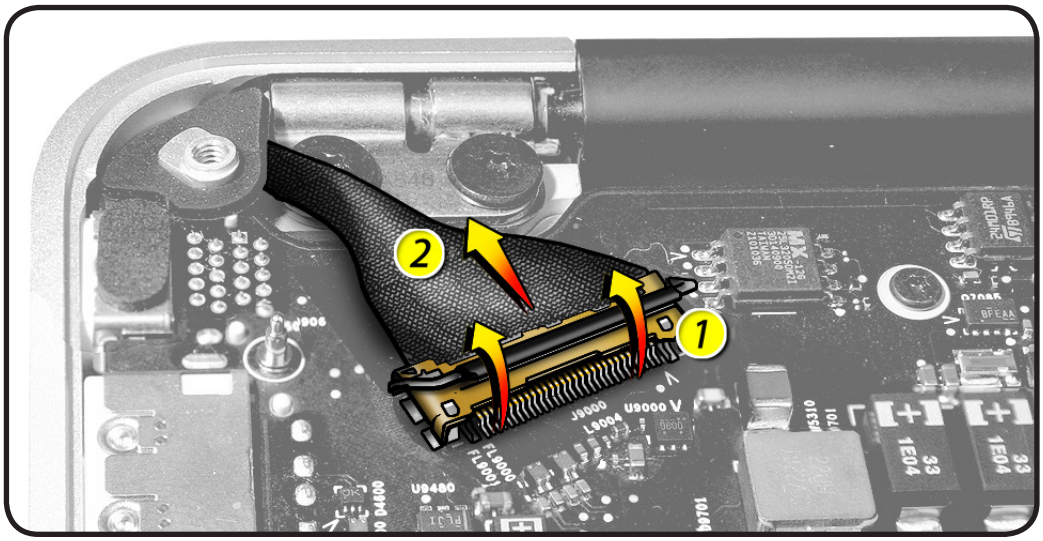
- Use black stick on alternating sides to evenly disconnect cable.
- Slide connector into receptacle on same horizontal plane as board.

Examples shown:

- camera cable
- EDP cable



Note: Flip over lock bar before disconnecting EDP cable, but do not use bar as a handle. When cable is fully installed, flip lock bar over leads to secure cable in place.

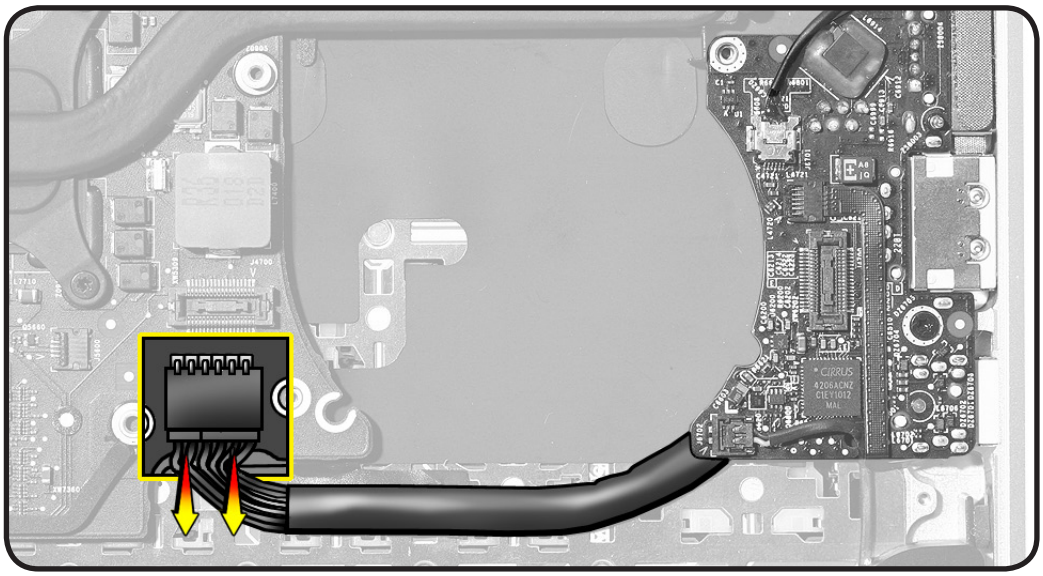


Horizontal Install

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

Example shown:

- I/O power cable



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 this computer:

- Clean, soft, lint-free cloth
- ESD-safe workstation, including an ESD mat and wrist or heel strap
- ESD bags (for storing ESD-sensitive parts while removed from unit)
- Pentalobe screwdriver and protective battery cover (Apple kit part #076-1372 or cover only, 922-9736)
- Phillips #000 screwdriver, magnetized
- Torx T5 screwdriver, magnetized
- Torx T8 screwdriver, magnetized
- Black stick (nylon probe, Apple part #922-5065) or other nonconductive nylon or plastic flat-blade tool
- EMI-safe plastic or nylon tweezers for routing antenna cables
- Thermal grease syringe (Apple part #922-7144)
- Alcohol wipes
- Kapton tape
- Permanent marking, fine-point, felt-tip pen
- Magnifying glass, for reading serial number etched on bottom case
- Digital volt meter (troubleshooting)

If available, a torque driver that measures in Kgf/cm is recommended for replacing the battery screws.

For more information about tools, refer to:
kBase #HT3452: Hand Tools for Desktop and Portable Repairs

For more information about ESD, refer to:
kBase #HT3451: Electrostatic Discharge Precautions and Myths
AppleCare Service Training: ESD Precautions

In addition, the following software programs are required for troubleshooting:

- **Apple Service Diagnostic (ASD)**
  version 3S142 or later
- **Apple Hardware Test (AHT)**
  version 3A105 or later
- **Notebook Battery and Adapter Diagnostic (NBAD)**

Reassembly Steps

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

Note About Images in This Guide

Because a pre-production model was used for most images in this guide, you may notice small differences in appearance between the image pictured and the computer you are servicing. However, although appearance may differ, steps and sequence are the same unless noted.

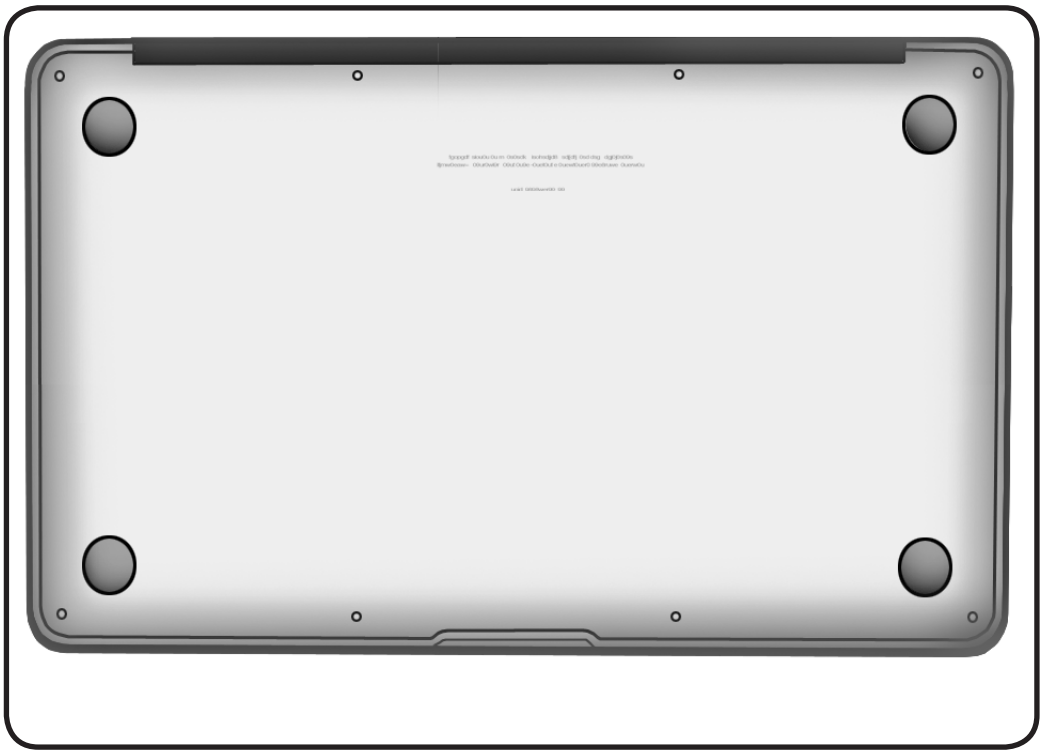
Screw Sizes

All screw sizes shown are approximate and represent the total length of the screw.

Bottom Case

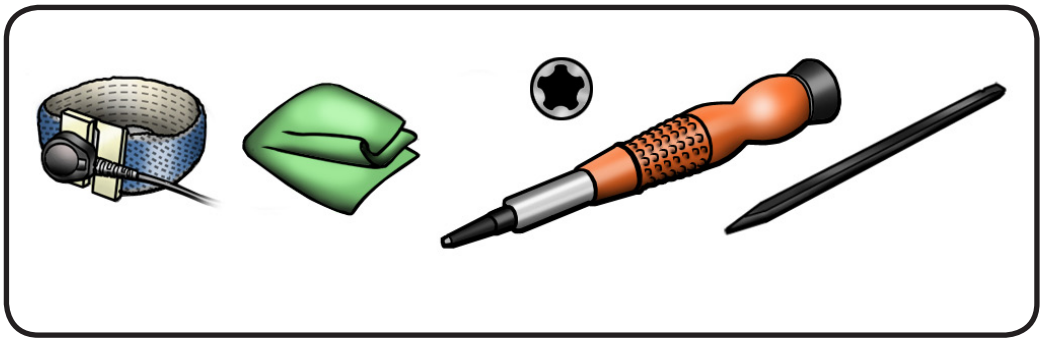
First Steps

- Shut down computer.
- Unplug all cables.
- Put on ESD strap.
- Place computer on a clean, flat surface.



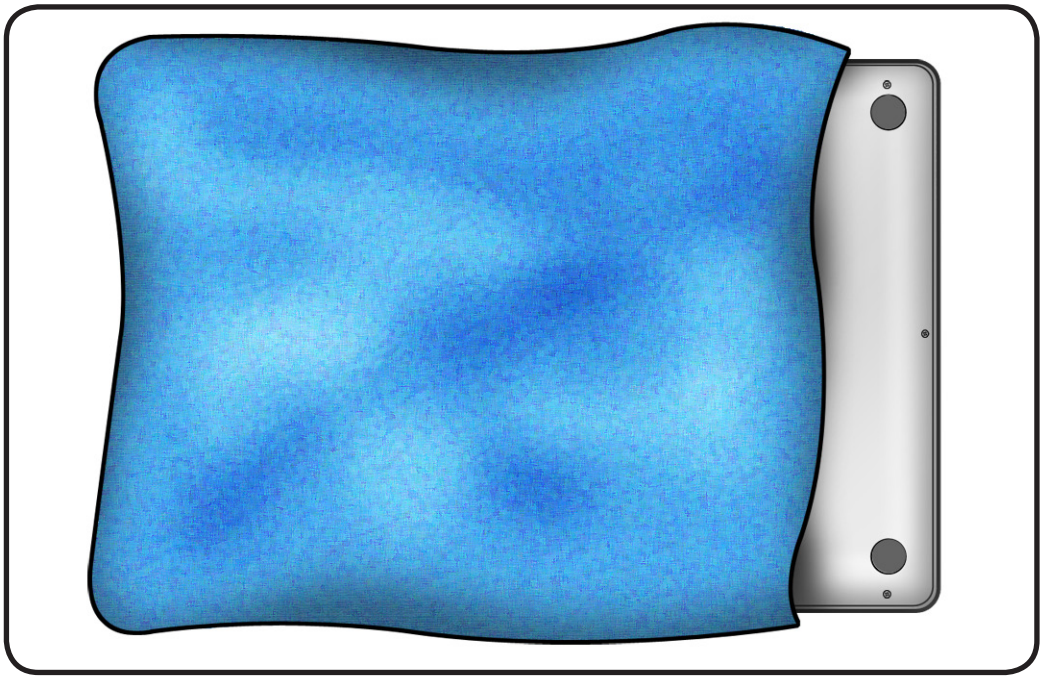
Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Pentalobe screwdriver
- Black stick



Removal

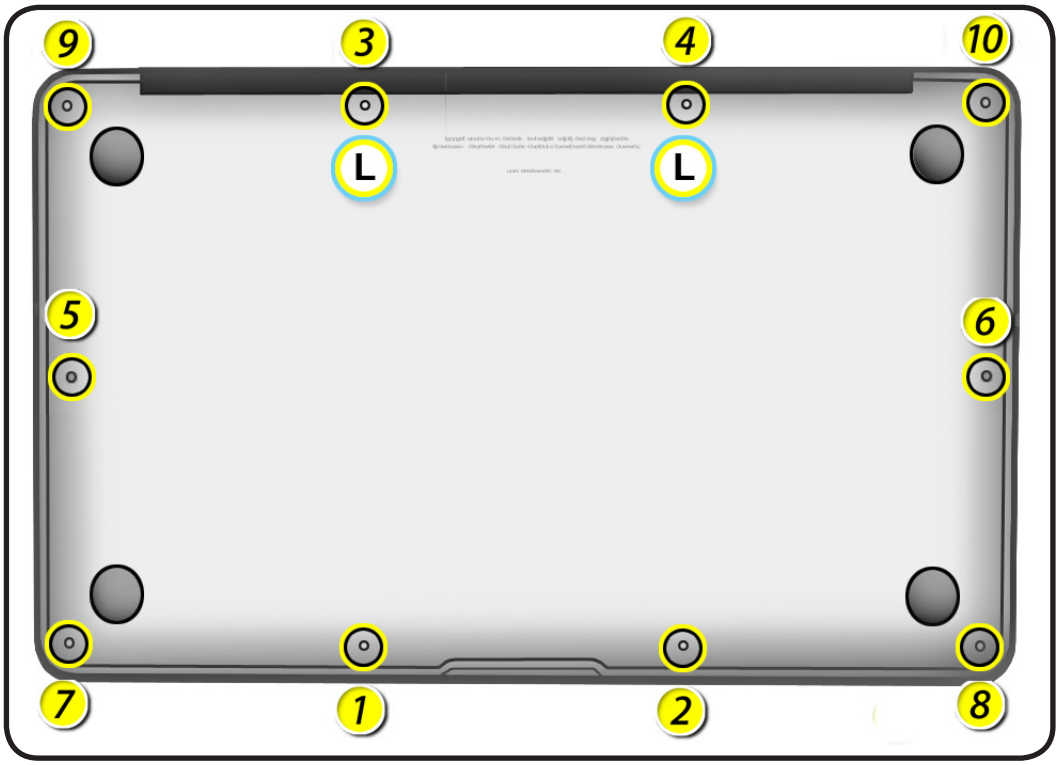
Caution: To prevent scratches, use a protective cloth when working with metal tools



1 Remove 10 Pentalobe security screws (L = long):

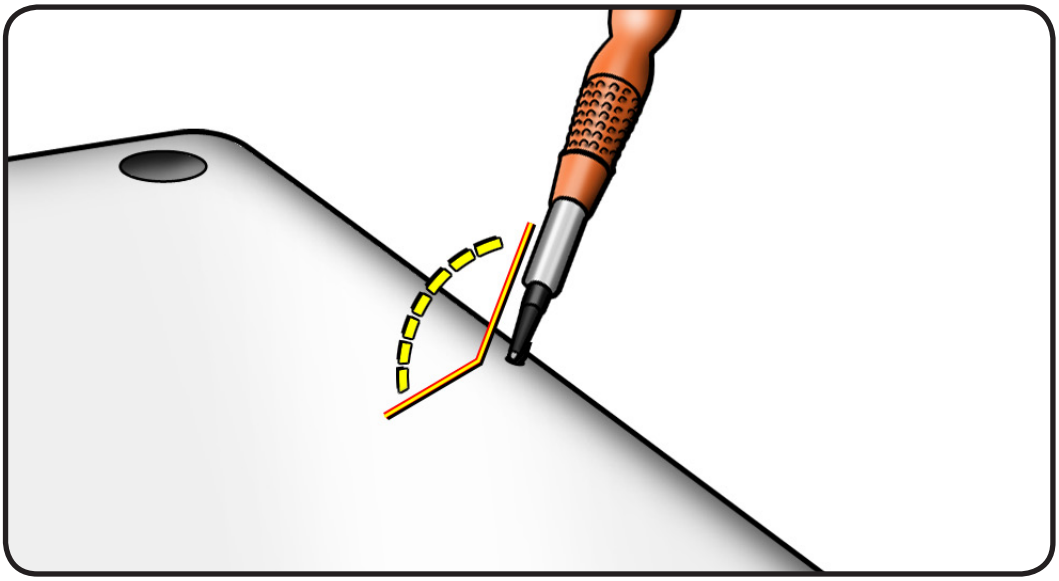
(2 L) 922-9686
(7.9 mm)

(8) 922-9685
(2.48 mm)

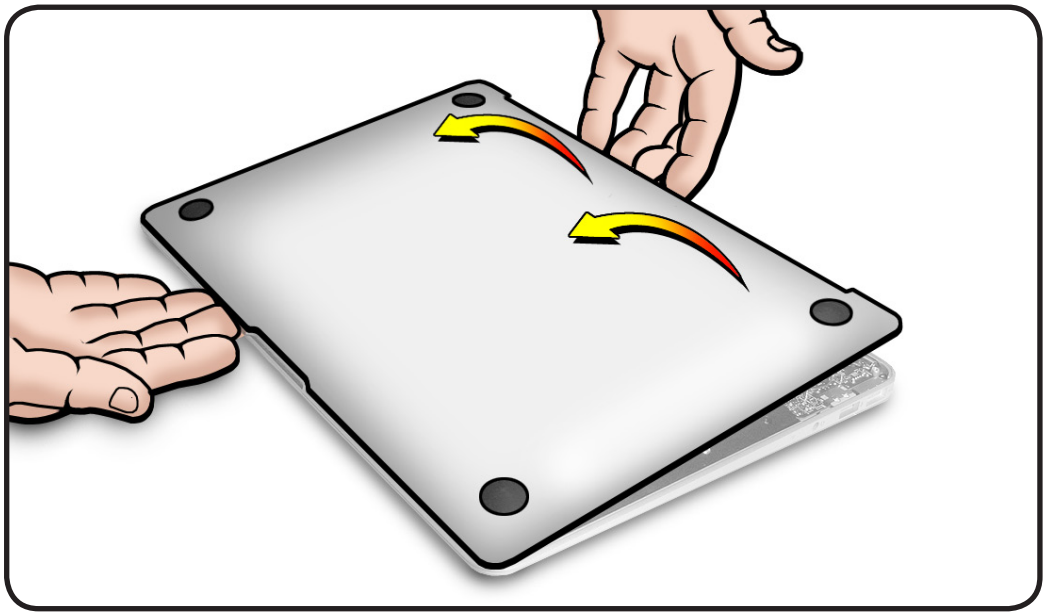


Important: Screws must be removed and installed at an angle.

Reassembly Note: Install screws in order shown above. If sequence is not followed, bottom case might wobble when placed on level surface.



2 Lift from top edge and remove bottom case.



Important: Always attach the battery cover immediately after removing the bottom case if performing any other procedures.

Replacement

1 Make sure bottom case interior is clean and free of debris.

2 Install bottom case from the front, and press lightly so that internal clip snaps onto battery.

Caution: The bottom case clip can puncture a cell if the bottom case is installed incorrectly.

3 Confirm all screw holes align before installing screws.

Battery

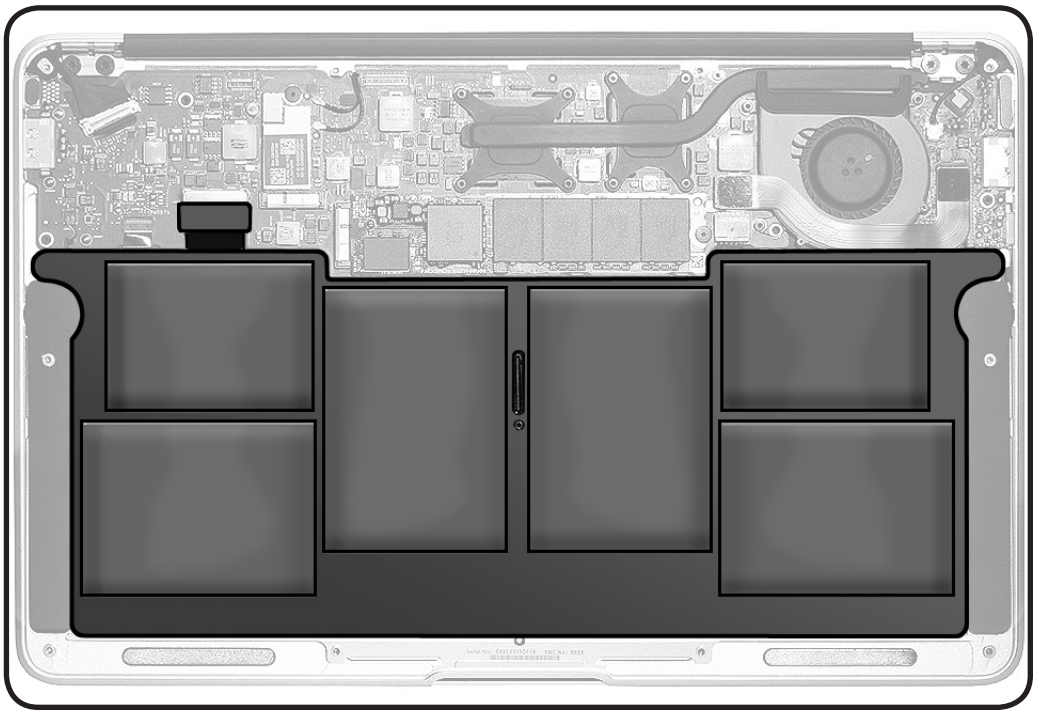
First Steps

Remove:

- Bottom case

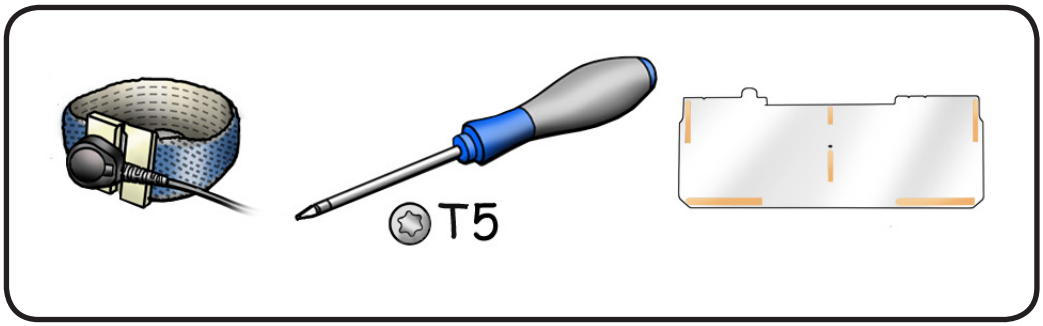
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

- ESD wrist strap
- Protective battery cover, 922-9736 or 076-1372 (kit)
- Torx T5 screwdriver, magnetized
- torque driver, optional

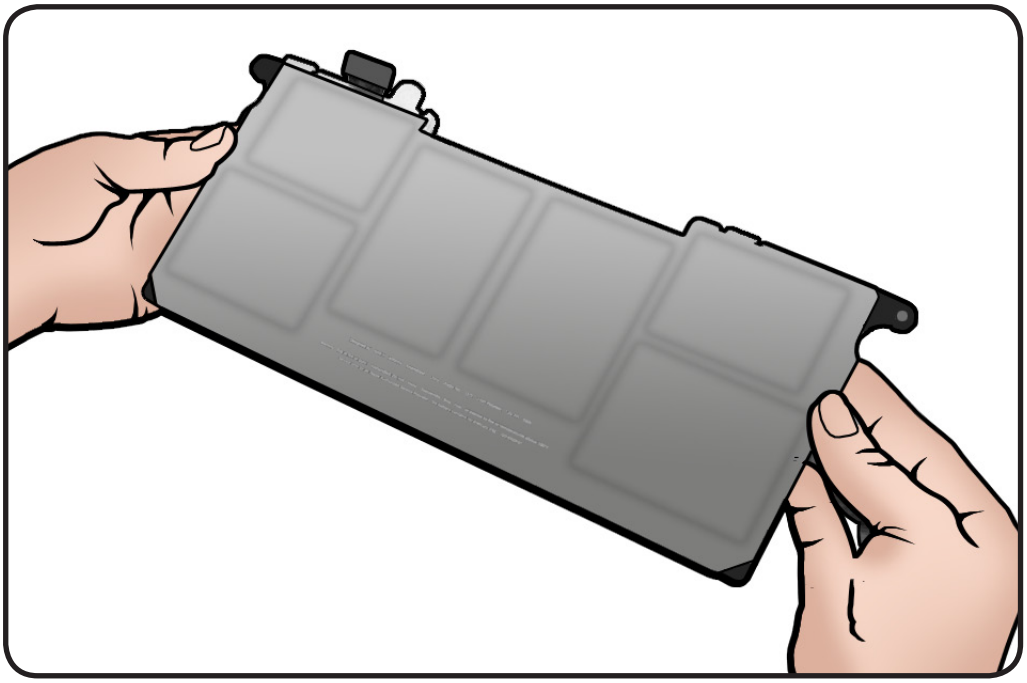


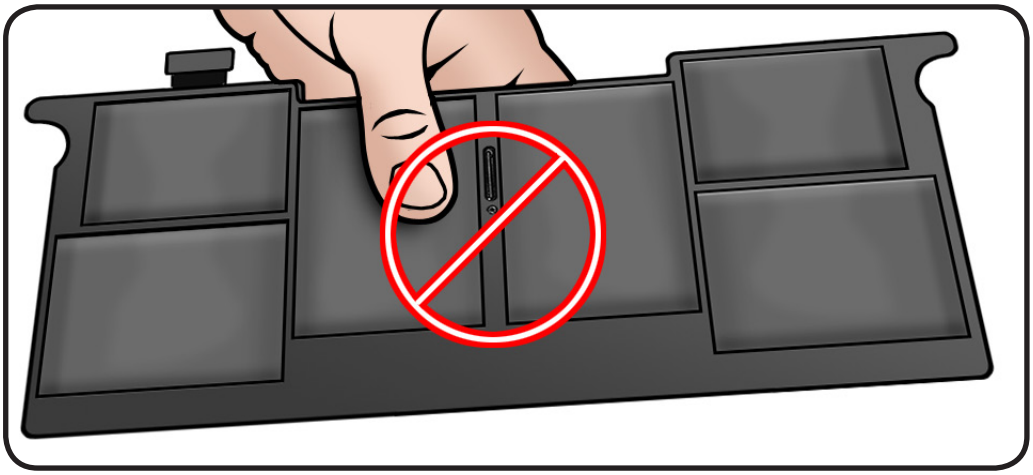
Removal

Warning:
The battery contains several soft battery packs. Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

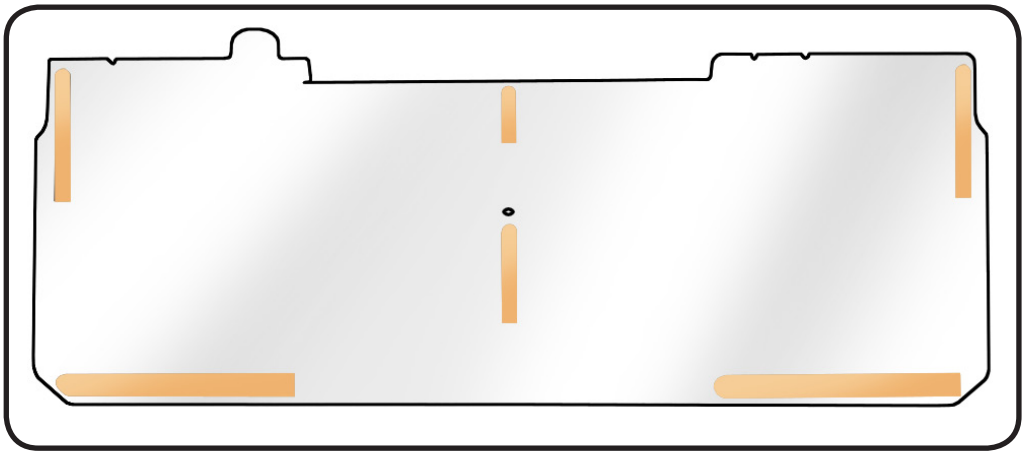
Important:

- Keep battery cover on battery at all times when battery is out of the computer.
- Handle battery with utmost care.
- Hold battery by edges only, with two hands at all times.
- Do not drop, stack, puncture, press, squeeze, crush, flex, twist, torque, or apply unnecessary pressure to a battery, as this may result in damage.
- If setting battery aside, make sure surface is clean—free of dust, dirt, screws, etc.
- If battery is dropped, replace it even if no damage is visible.





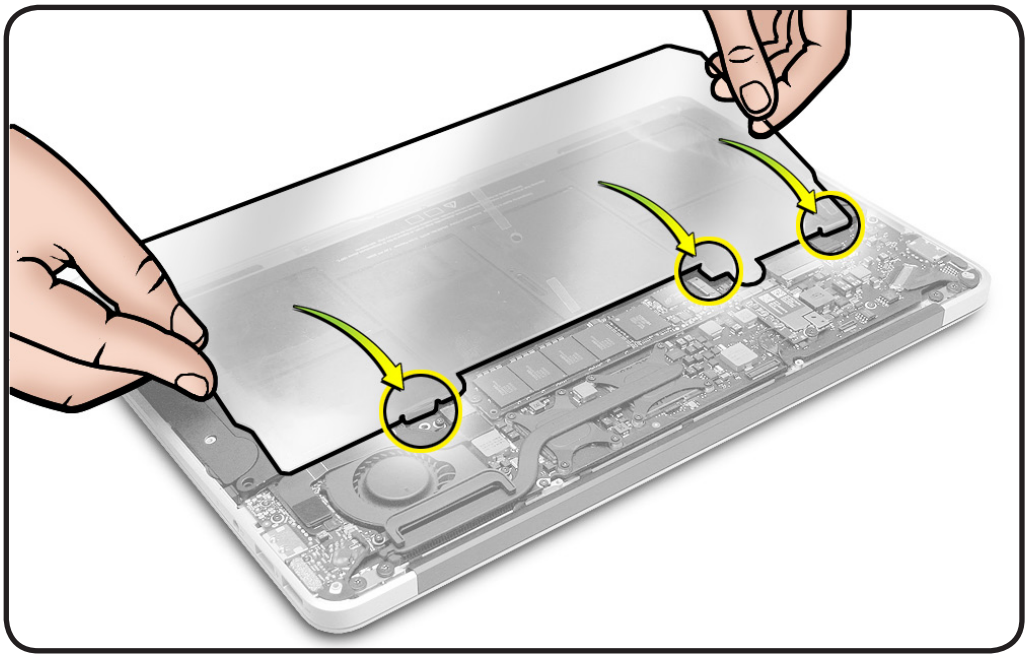
1 With battery installed in the computer, remove adhesive strips from clean battery cover.



Warning: Do not perform this procedure without a clean battery cover.

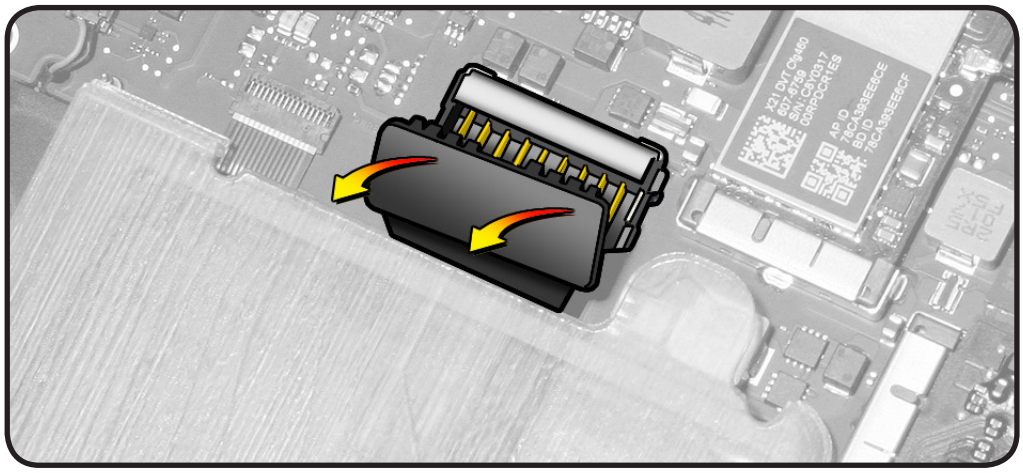
2 Using the hooks at the top of the battery cover, tilt the cover onto the battery.

3 Gently secure cover by running your finger over the parts of the cover that have adhesive.



4 Pull battery connector straight up from logic board.

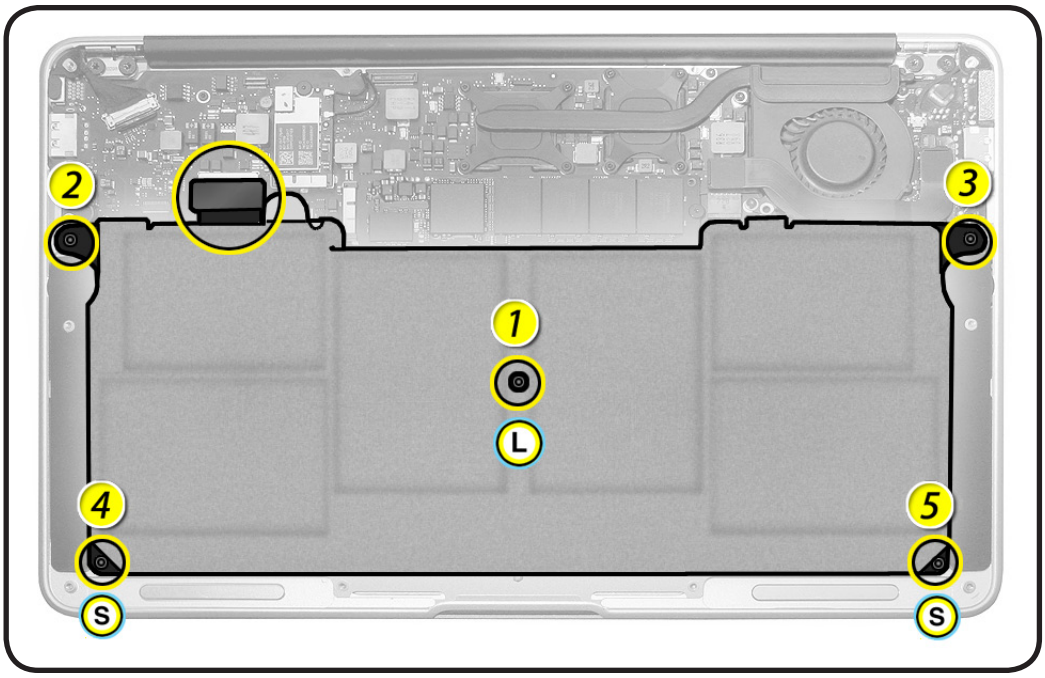
Important: Disconnect the battery connector whenever performing repairs. You do not need to remove the battery unless it blocks the module being repaired.



5 Keeping screwdriver perpendicular to avoid battery damage, remove 5 Torx T5 screws:
(2) 922-9689
(5.16 mm) rear

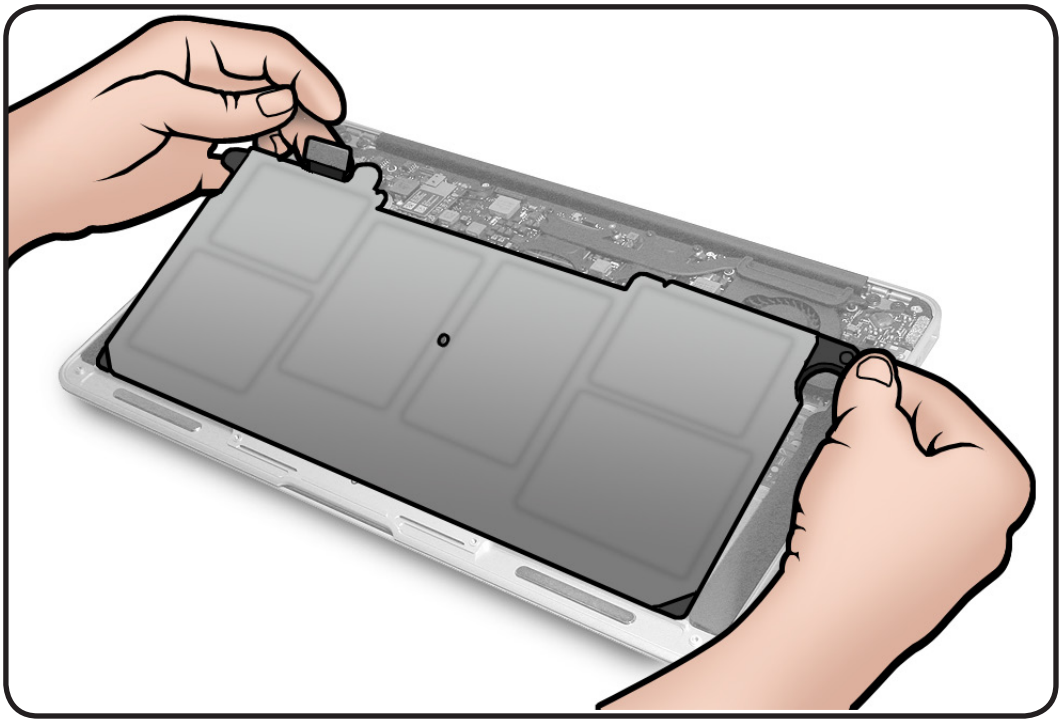
(2) 922-9690
(2.62 mm) front

(1) 922-9693,
(6.02 mm) center



6 Handle battery by the edges.

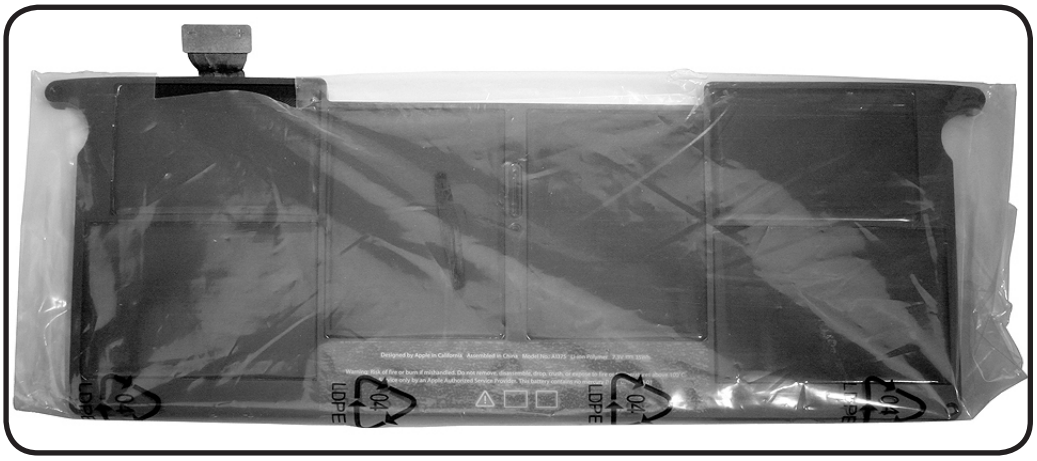
Using battery cable, tilt covered battery out of system.



7 Place covered battery (with cover up) on a clean surface—free of dust, dirt, screws, etc.

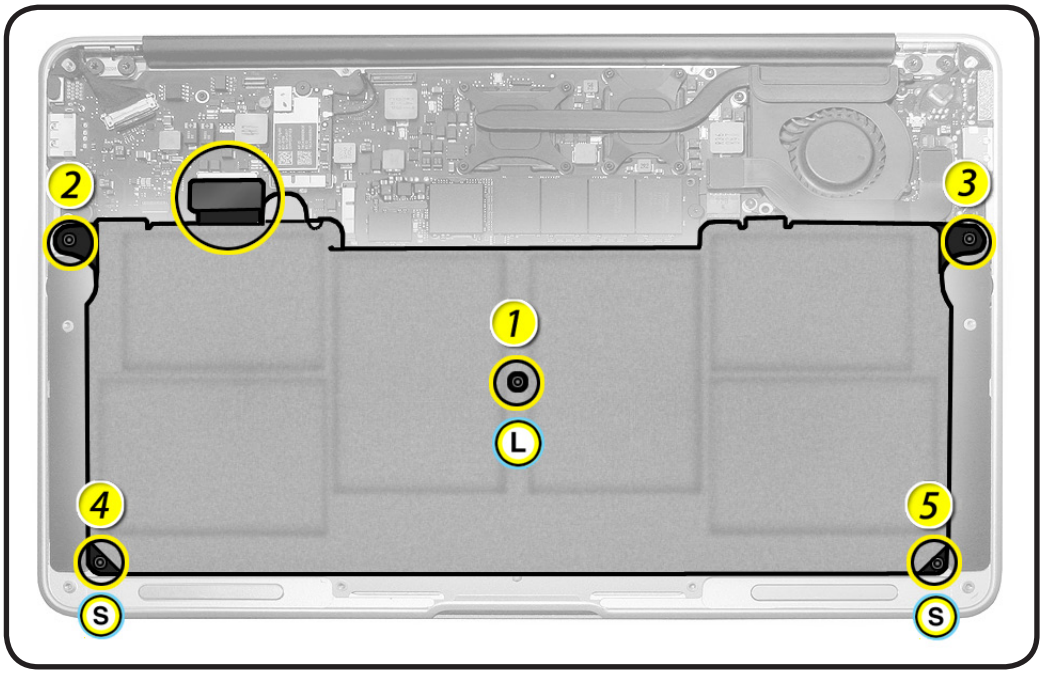
8 If packaging battery for return, keep battery cover installed.

Replacement



1 If installing new battery, unwrap it and make sure it has a battery cover. Do NOT use it if it does not have a cover—contact Technical Service Provider Support for further directions.

2 Before installing the battery, check that top case is clean—free of screws or other foreign material in the battery area.



3 Use two hands to place covered battery into top case.

4 Install 5 screws in order shown (longest screw at center, shortest screws in front). **Note:** Use a torque driver, if available, to tighten screws to 1.8 ± 0.18 Kgf-cm. If no torque driver is available, install screws finger tight.

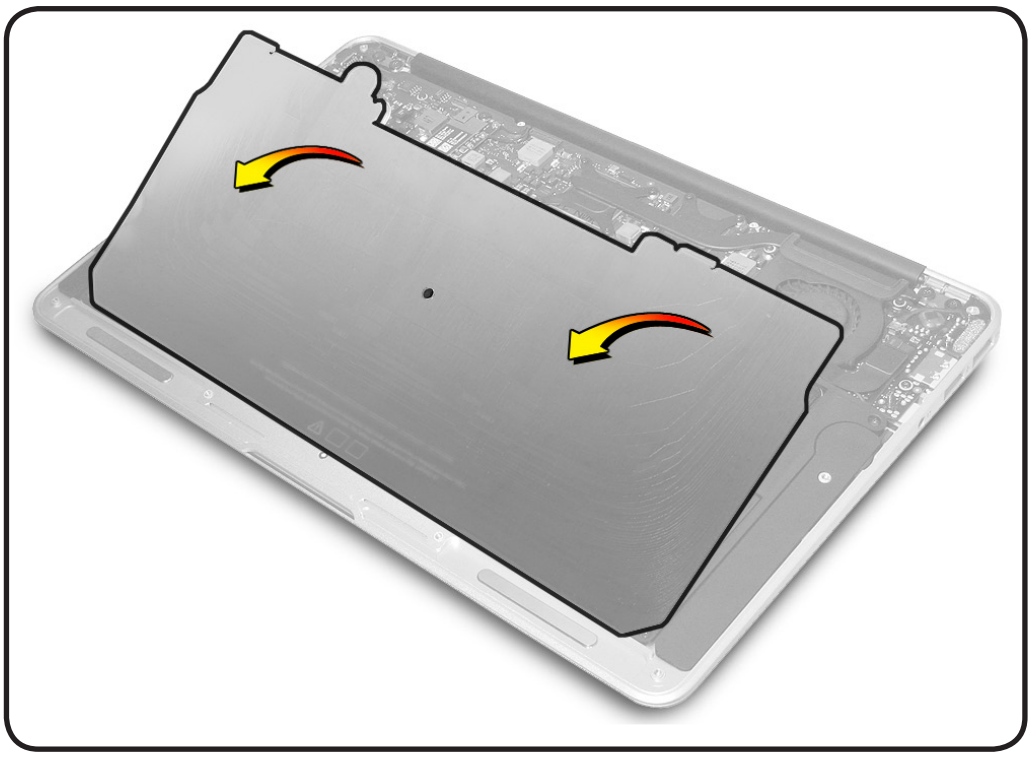
Important: Handle screwdriver perpendicular to the battery cover to prevent damage to the battery.

5 If performing other repairs, be sure to leave battery cable disconnected. Otherwise, connect battery cable to logic board.

6 Before installing bottom case, peel off battery cover using rounded tab at top.

Note: A clean battery cover can be reused for another repair if it is free of dust, dirt, etc.

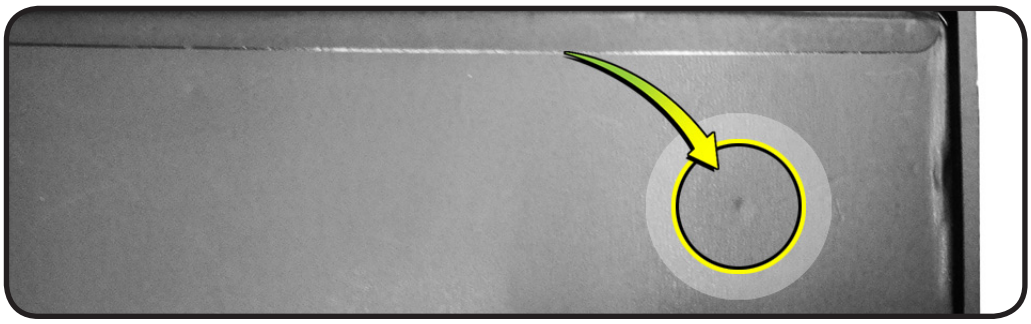
7 Visually evaluate battery for damage.



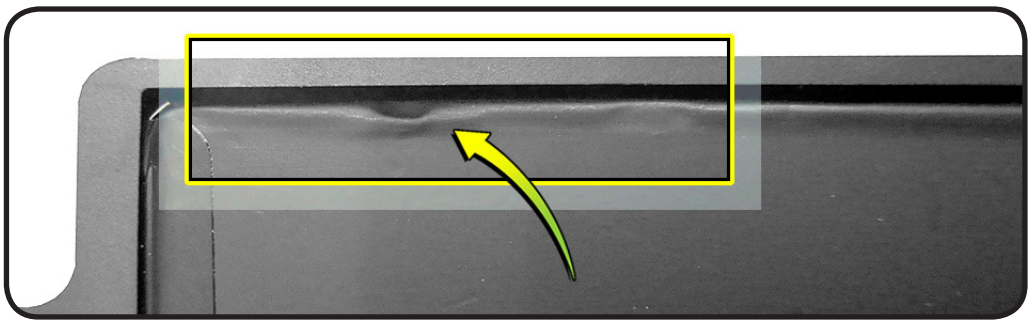
Evaluating Battery Damage

Use battery if

- Minor dents (up to 8 dents if 0.4 mm deep or less; up to 5 if 1.5 mm deep or less; up to 3 if 2.0 mm deep or less)

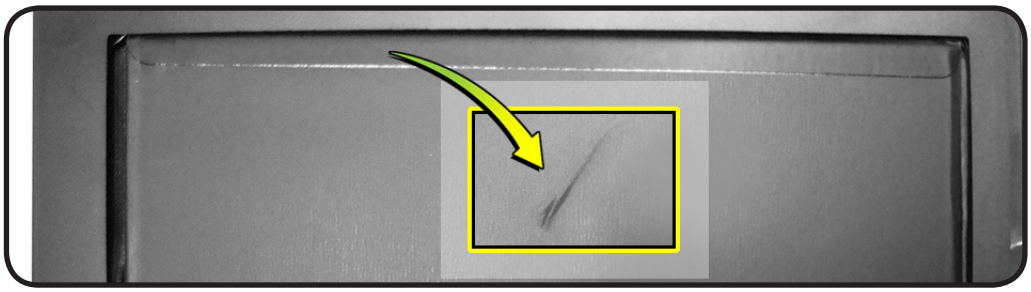


- Minor cell pack deformity (up to 2.0 mm total area)

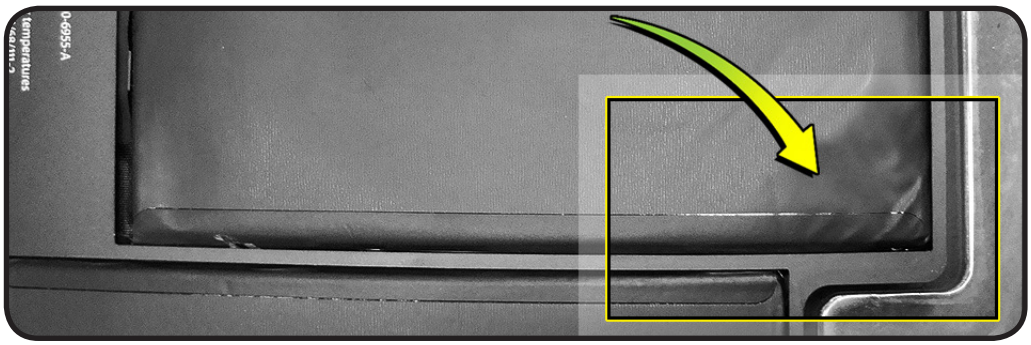


Return battery if

- Scratches



- Swollen or wrinkled cell pack



Packing the Battery

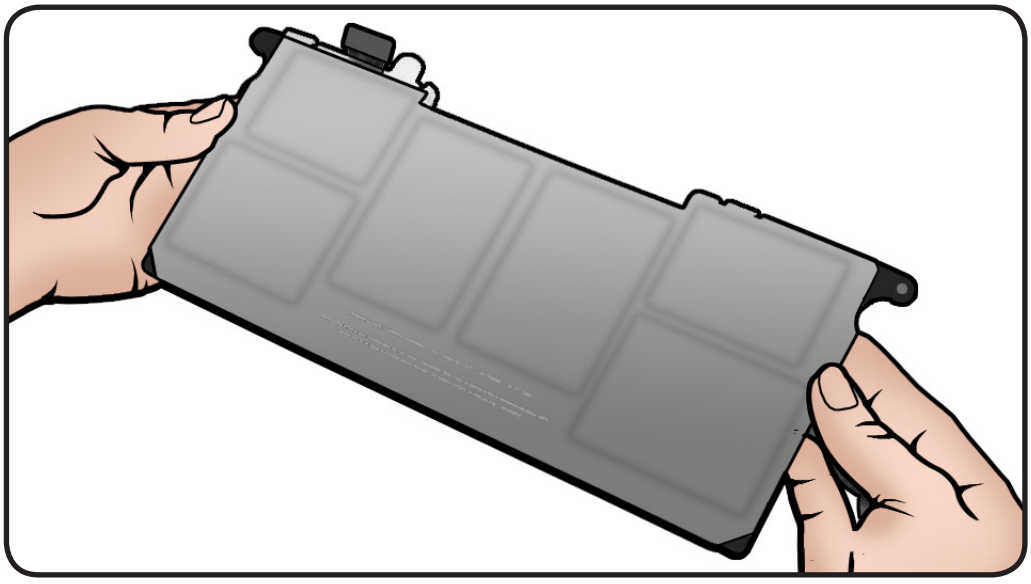
IMPORTANT: Do not discard battery packaging!

Both the inner and outer cardboard boxes used to ship a KGB battery must be used when returning a KBB battery. Follow the packing procedure below.

If either box has been damaged or lost, order a replacement service package. The service package includes both the inner and outer cardboard boxes and an ESD bag. Reuse the battery cover that was included with the KGB battery or, if a new cover is needed, order part #922-9736.

Part Number	Description
606-0090	SVC, PKG, BATTERY, MB AIR 13-INCH
606-0091	SVC, PKG, BATTERY, MB AIR 11-INCH

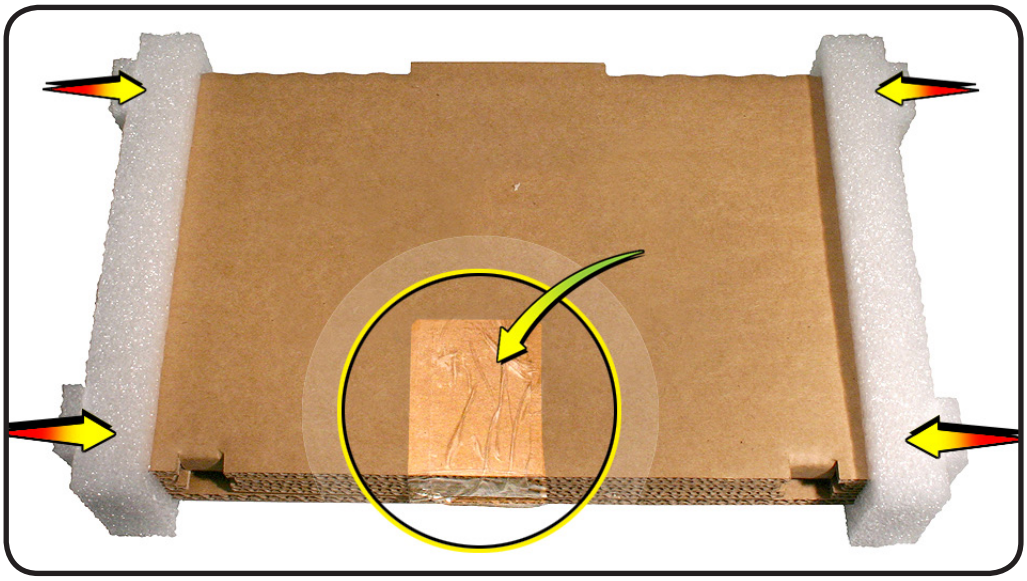
1 Place protective cover on battery.



2 Place covered battery inside ESD bag.

3 Carefully place covered and wrapped battery in cardboard packing material.

4 Close inner box. Attach foam end pieces on box and tape the box closed. **Note**: The packing MUST be taped closed. Any tape will work.



5 Carefully place taped box into shipping box.

6 Close box and return battery using normal shipping procedures.

Note: As with shipping any battery, IATA compliance is a must: **HT3378: Air Shipment Regulations for Lithium-Based Batteries**.

Right Speaker

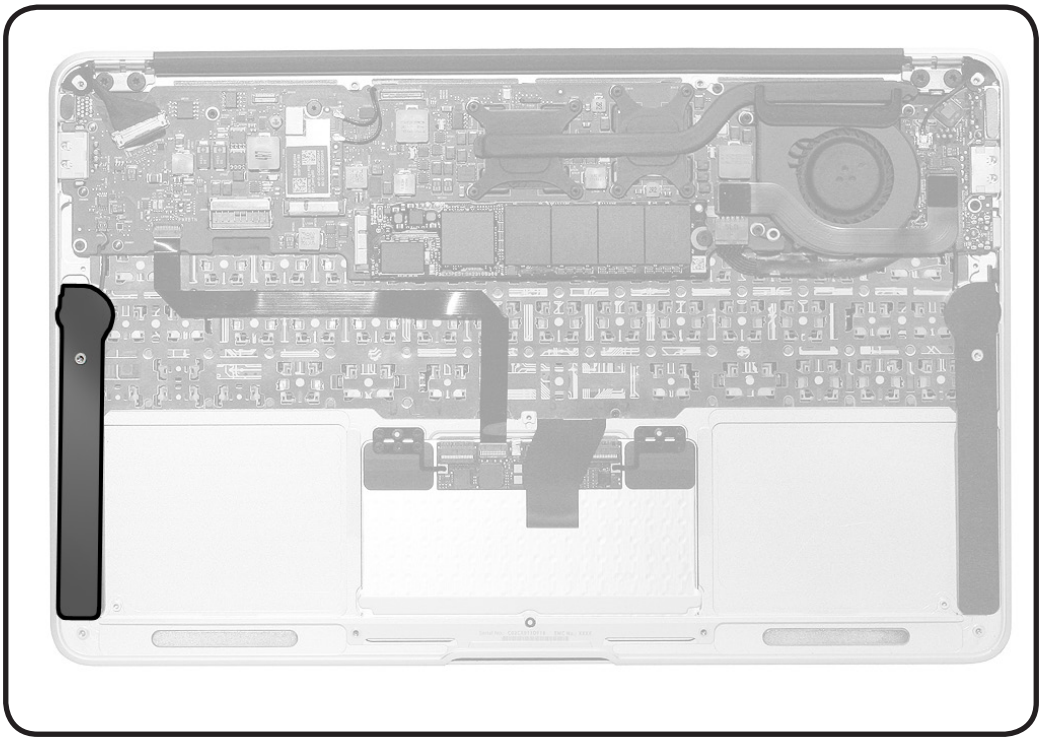
First Steps

Remove:

- Bottom case
- Battery

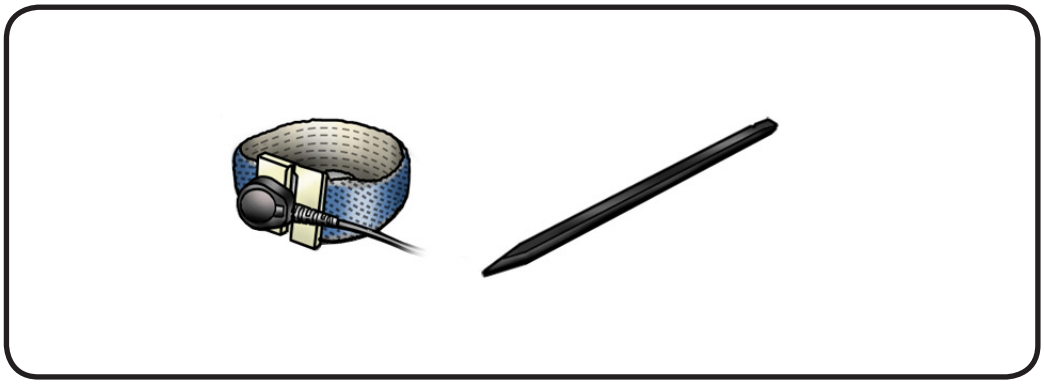
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.



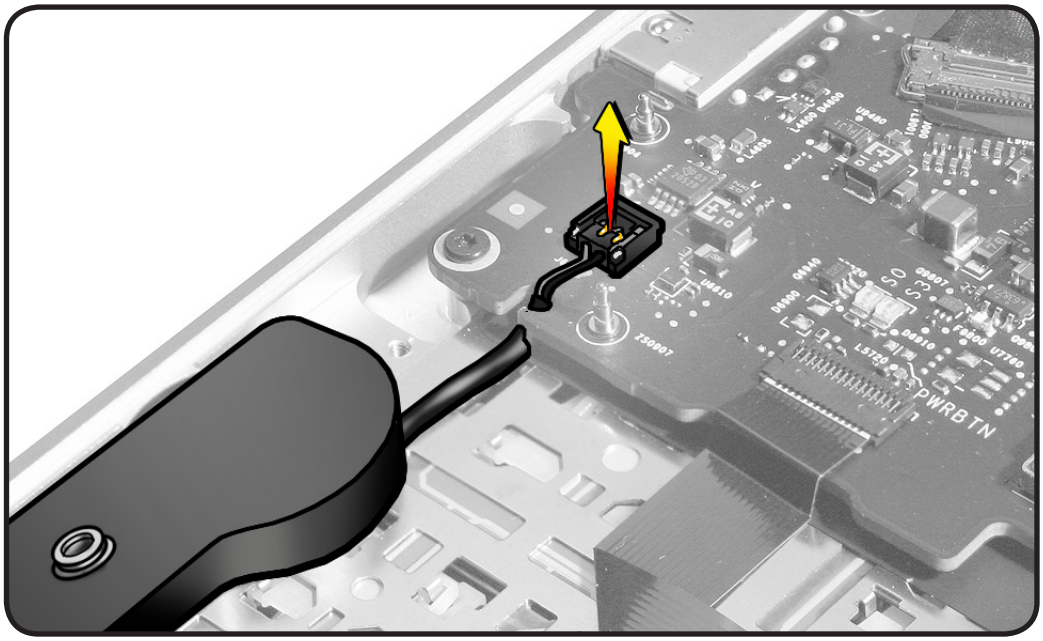
Tools

- ESD wrist strap
- Black stick



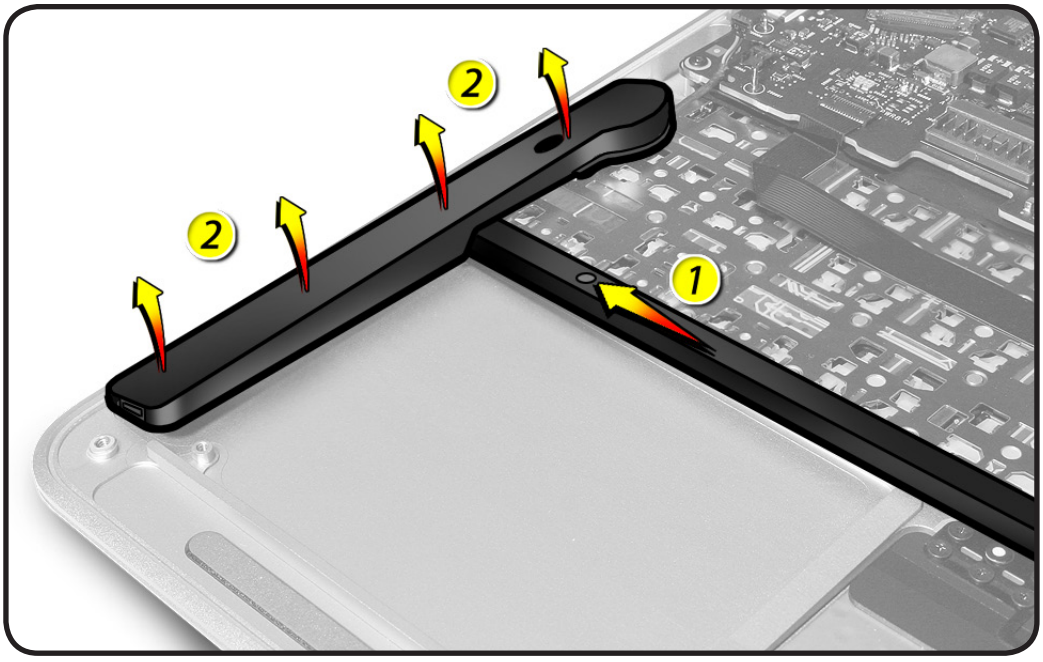
Removal

1 Use black stick to disconnect vertical insertion cable from logic board.



2 Unroute cable.

3 Use black stick to pry very high bond (VHB) adhesive securing speaker to top case.



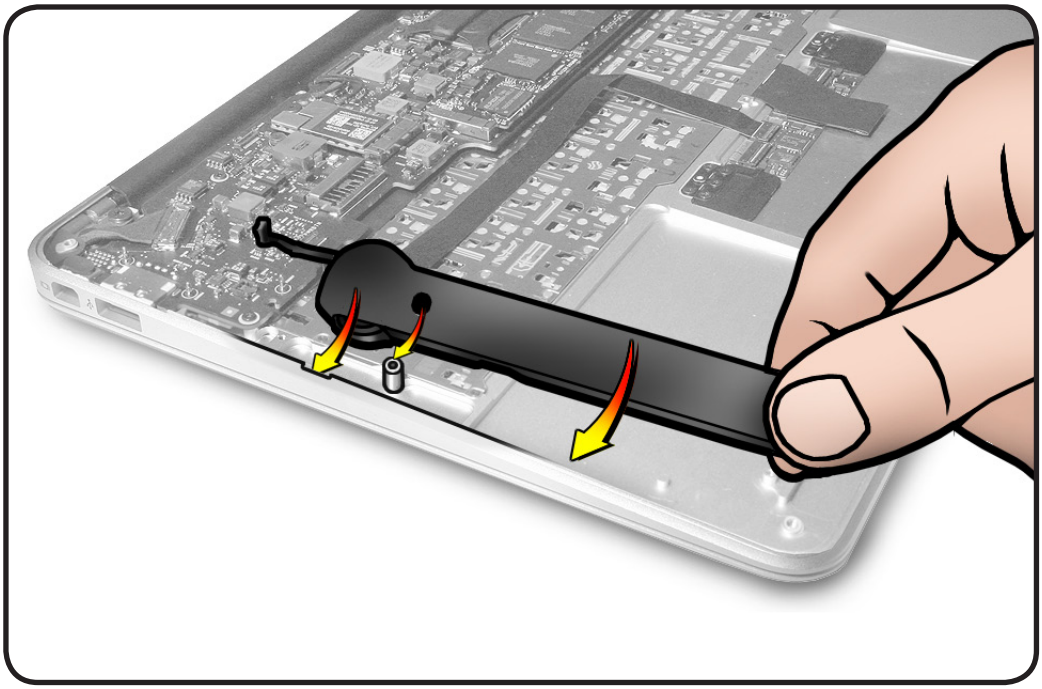
Replacement

1. Make sure top case is free of residual VHB adhesive if installing new speaker.

2. Peel adhesive backing from new speaker body, and tilt speaker over guidepost and into top case.

3. Press speaker into case so that VHB adheres completely.

4. Connect cable.



Left Speaker

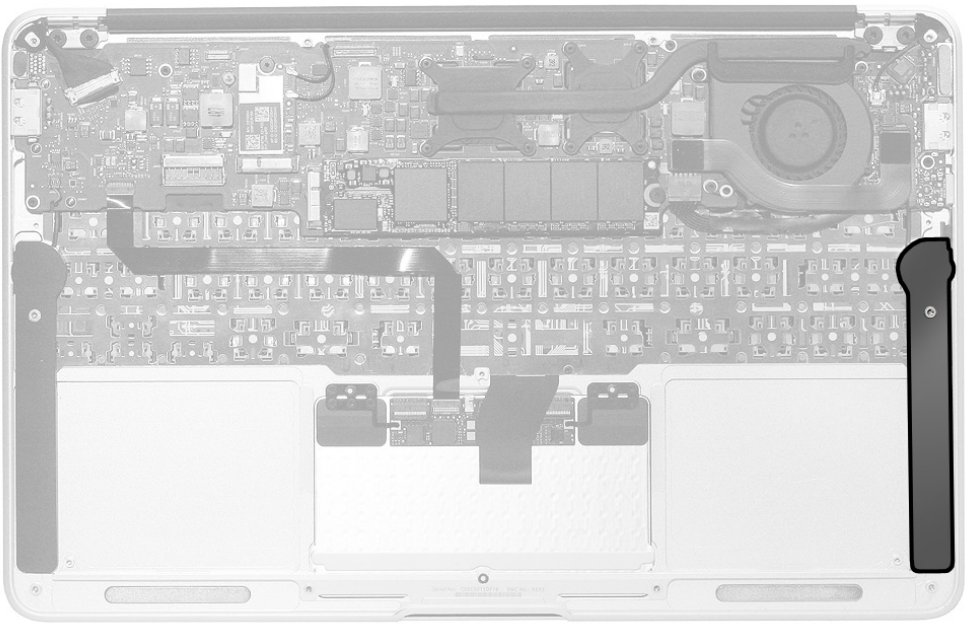
First Steps

Remove:

- Bottom case
- Battery

Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.



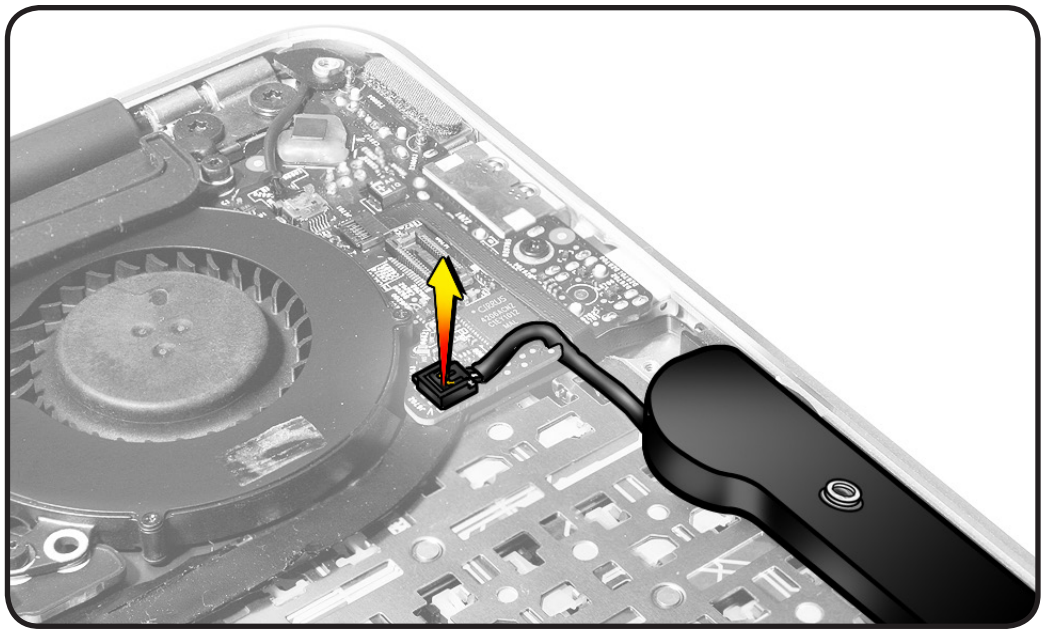
Tools

- ESD wrist strap
- Black stick

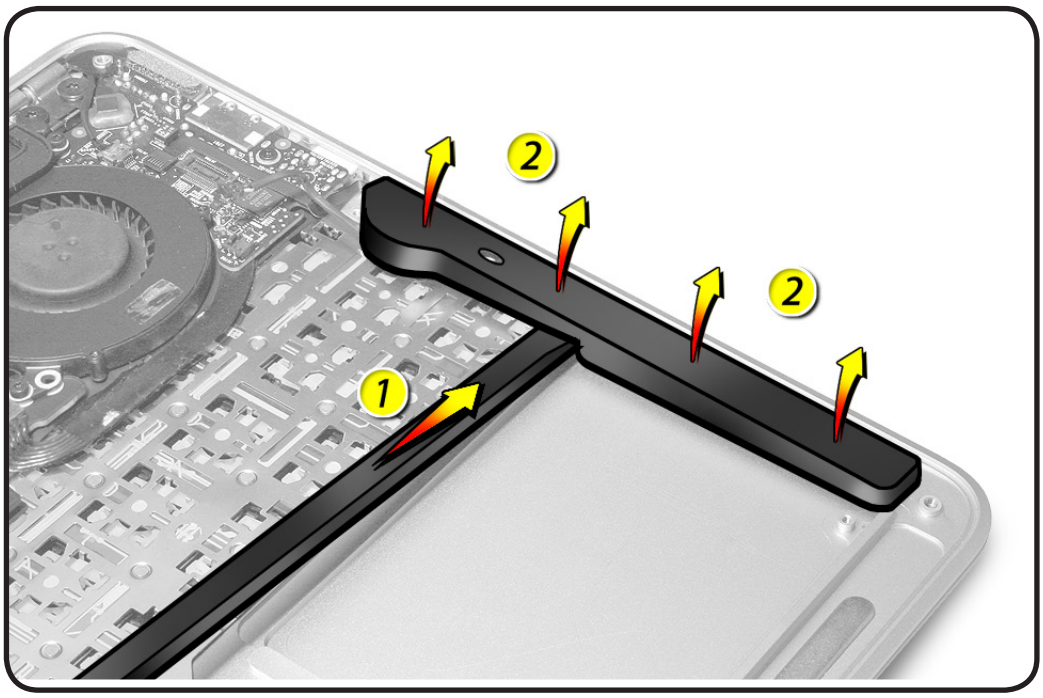
Removal

1 Use black stick to disconnect vertical insertion cable from I/O board.

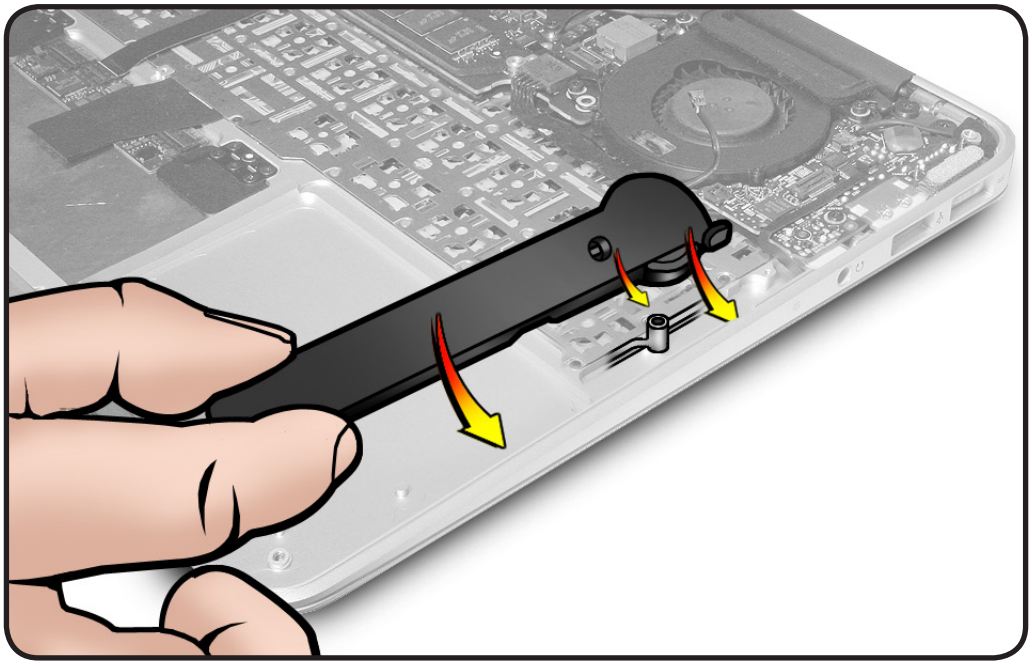
2 Unroute cable.



3 Use black stick to pry very high bond (VHB) adhesive securing speaker to top case.



Replacement



1 Make sure top case is free of residual VHB adhesive if installing new speaker.

2 Peel adhesive backing from new speaker body, and tilt speaker over guidepost and into top case.

3 Press speaker into case so that VHB adheres completely.

4 Connect cable.

Solid-State Drive (SSD) Card

First Steps

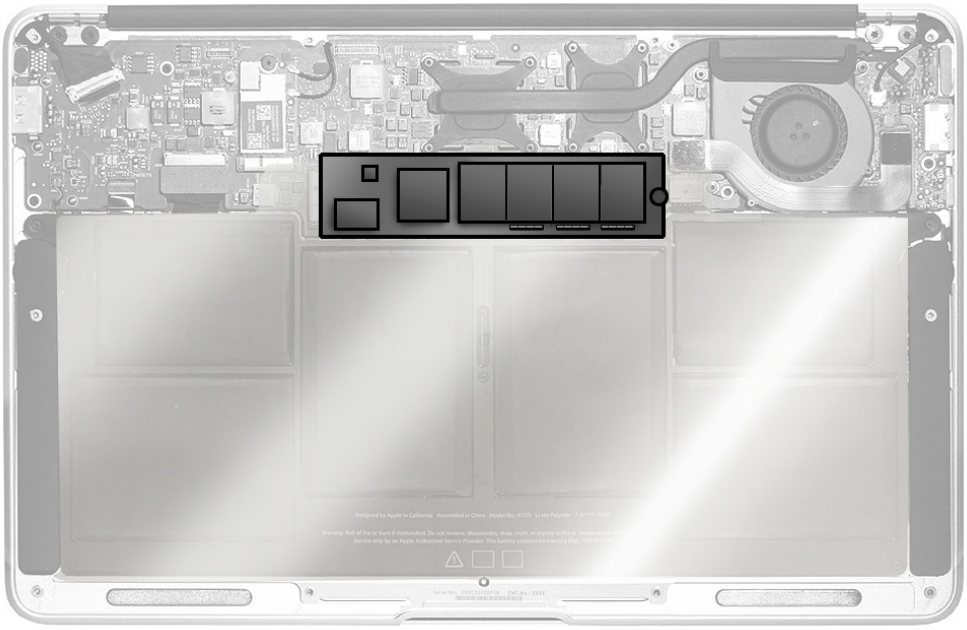
Remove

- Bottom case

Important: Always attach the battery cover immediately after removing the bottom case.

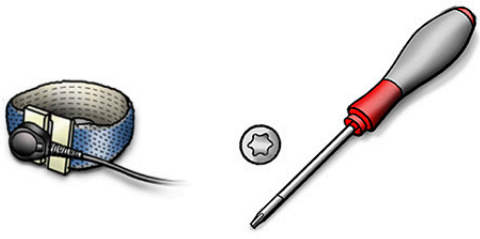
Caution: Read Battery Safety Precautions before beginning this procedure.

Caution: Make sure data is backed up before removing SSD card.



Tools

- ESD wrist strap
- Torx #5 screwdriver, magnetized

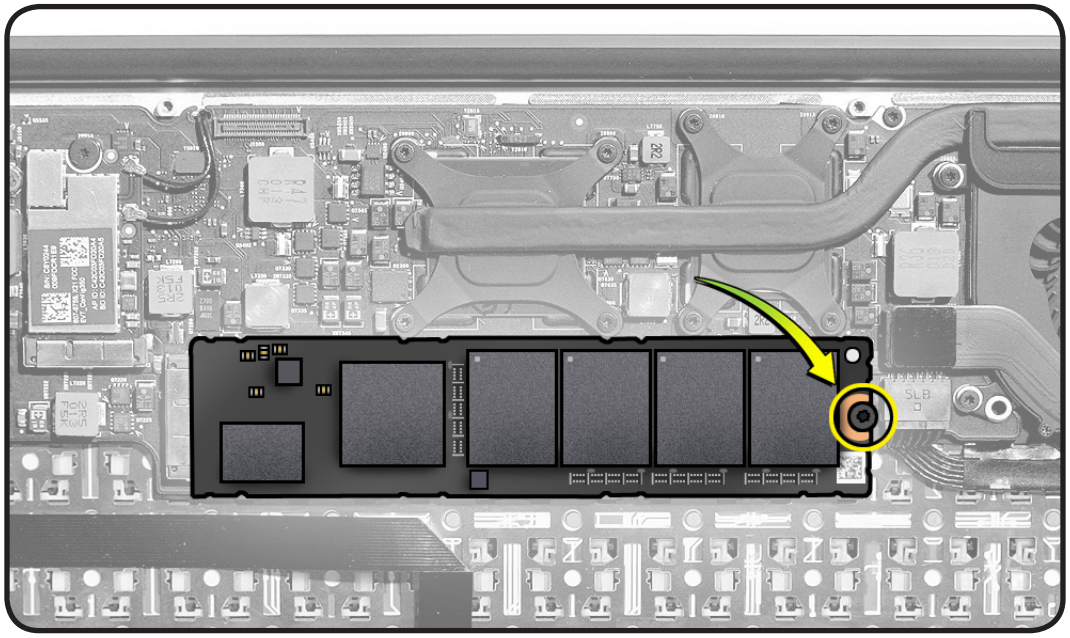


Removal

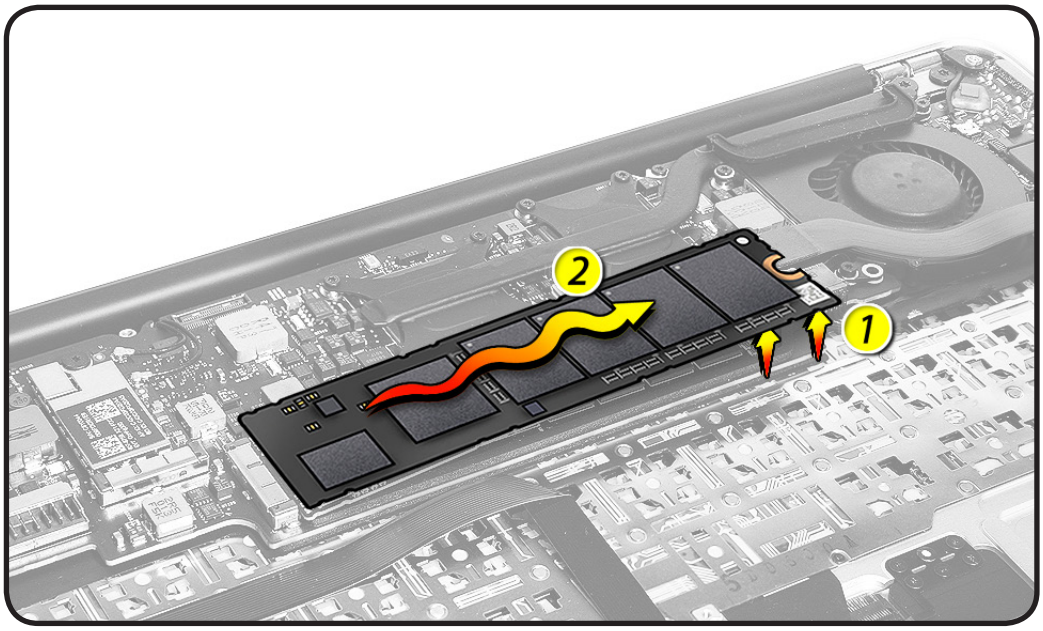
1 Remove Torx T5 screw 922-9651 (2.85 mm)

Note: Follow safe handling:

- Hold card by edges.
- Do not touch gold connectors.
- Do not touch circuitry.

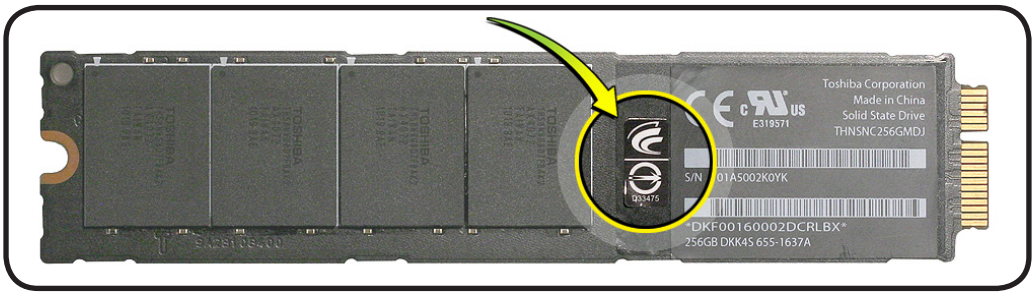


2 Tilt up SSD card at a slight angle—just enough to hold it. Gently rock card while pulling it to disconnect it from logic board. Keep it close and parallel to the logic board.



Reassembly Note: Push SSD card securely into slot confirming that it is seated properly.

Replacement Note: Locate and remove the compliance label from a new SSD card before installing it in the computer.



Reinstalling Software that Came with the Computer

Use software install media that came with the computer to reinstall Mac OS X and any bundled applications. A new storage device may have the operating system installed on it. If not, or if you want to use another version, refer to http://support.apple.com/kb/HT3910.

Important: Apple recommends backing up data on the storage device before restoring software. 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 to a powered wall outlet.
3. Insert Mac OS X Install media that came with the computer.
4. Double-click "Install Mac OS X".
5. Follow onscreen instructions.

   Note: To restore computer to original factory settings, click Options in the "Select a Destination" pane of the Installer, and then select "Install." You will see a message reminding you to use the Applications Install media to reinstall bundled applications that came with the computer.
6. When the installation is complete, click Restart.
7. Follow prompts in Setup Assistant to set up the user account.

Installing Applications

If you reinstall Mac OS X and select the "Install" option, you must reinstall bundled 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 to a powered wall outlet.
2. Insert the Applications Install media that came with the computer.
3. Double-click "Install Bundled Software".
4. Follow onscreen instructions.
5. When installation is complete, click Close.

AirPort/Bluetooth Card

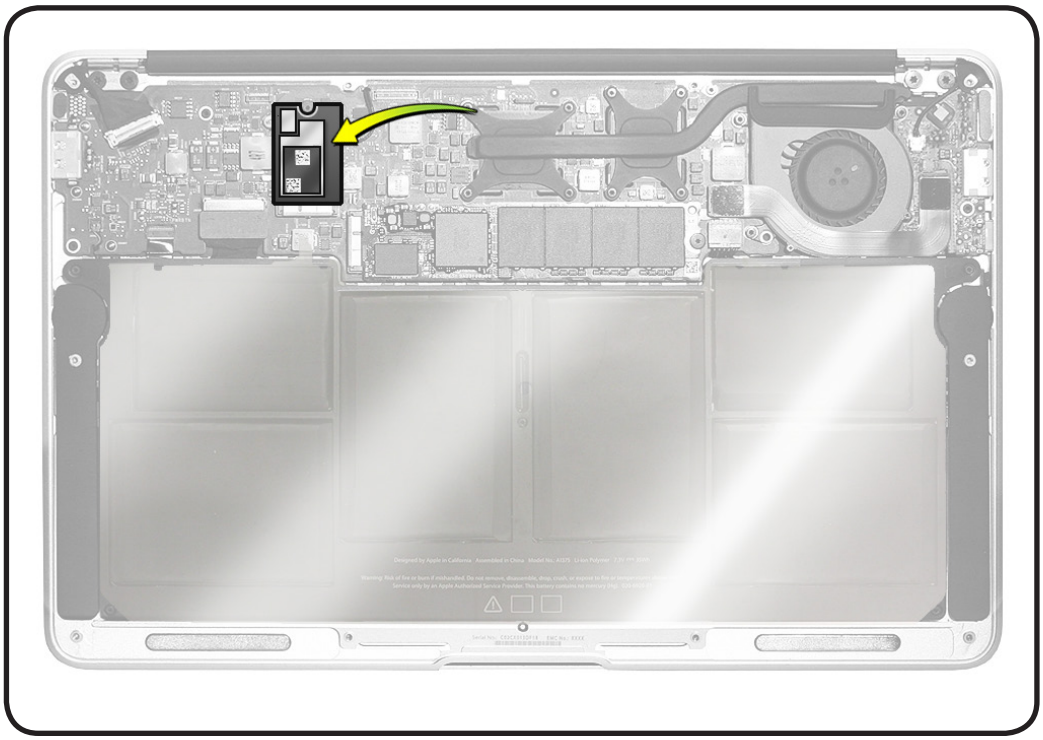
First Steps

Remove

- Bottom case

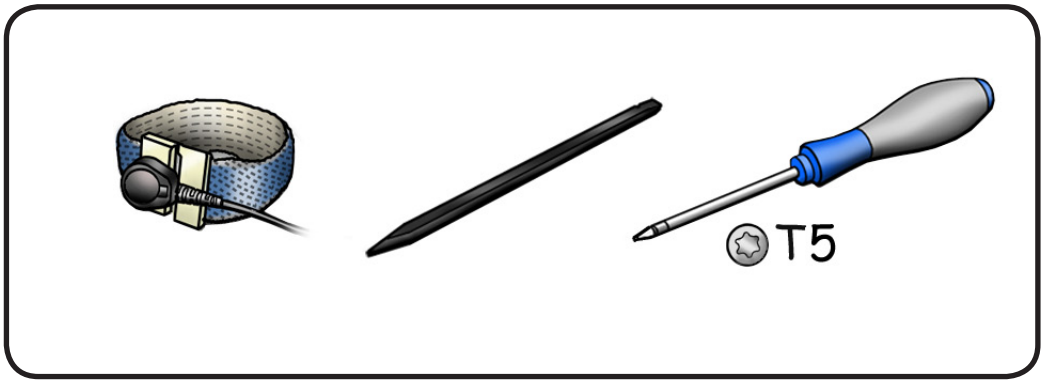
Important: Always attach the battery cover immediately after removing the bottom case.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

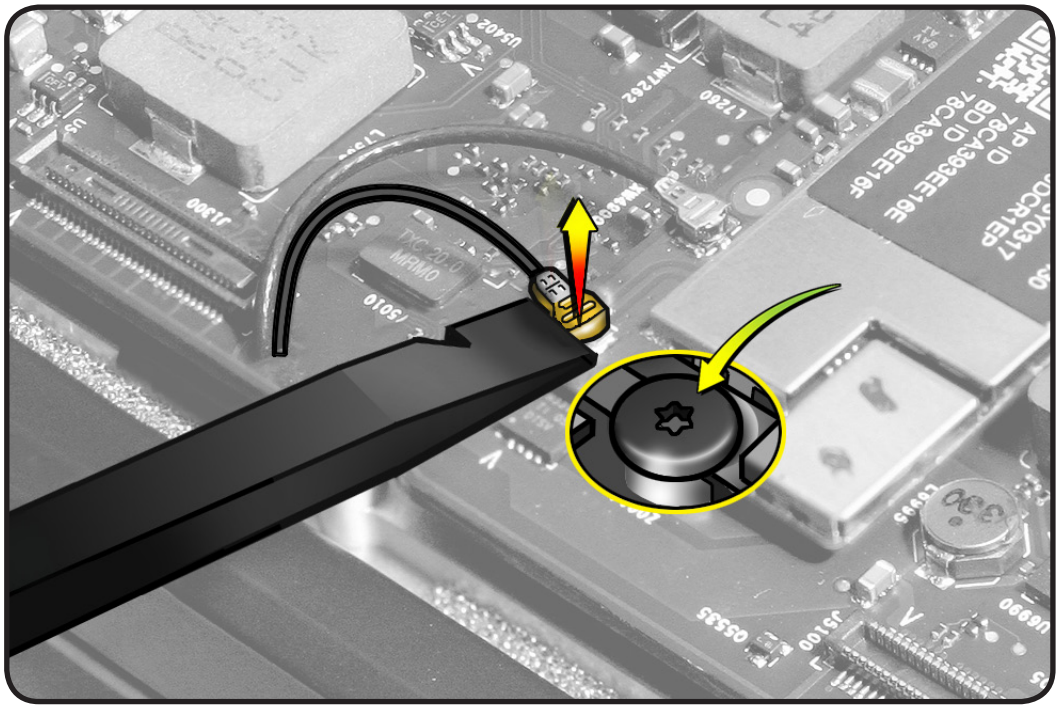
- ESD wrist strap
- Black stick
- Torx T5 screwdriver, magnetized



Removal

1 To disconnect the 2 antenna cables,

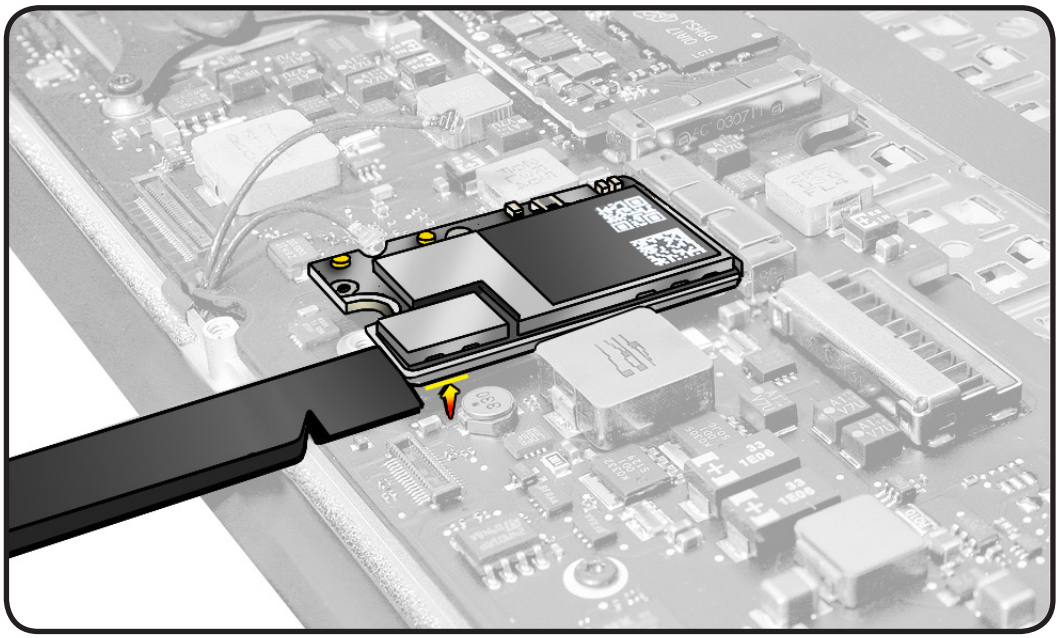
- avoid stress on cable
- pop connector head straight up



2 Place the flat end of a black stick up to the connector head. Then slightly press down on the other end of the black stick to pop up the connector.

3 Remove the Torx T5 screw.
922-9651 (2.85 mm)

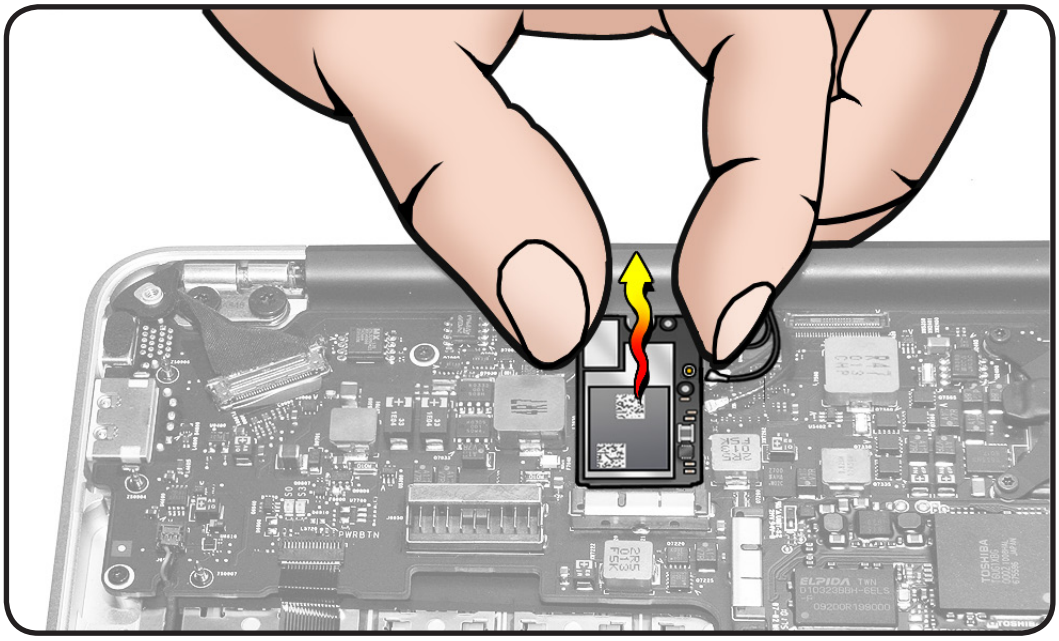
4 Use a black stick to slightly tilt up the AirPort/Bluetooth card just enough to clear the screw standoff.



5 Rock and pull card to disconnect it from logic board connector. Keep it close and parallel to the logic board.

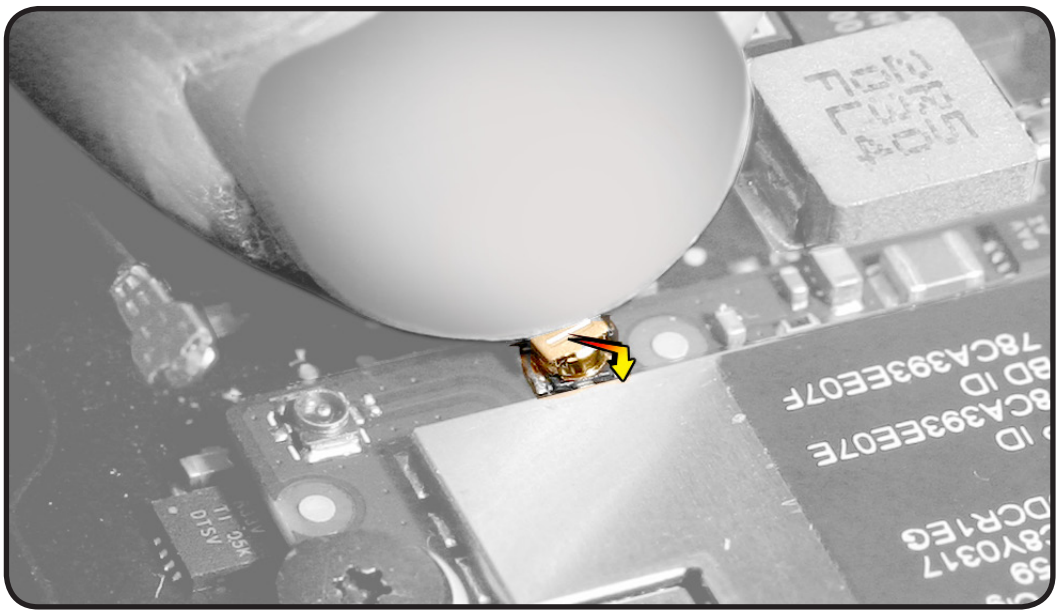
Note: Follow safe handling:

- Hold card by edges.
- Do not touch gold connectors.
- Do not touch circuitry.

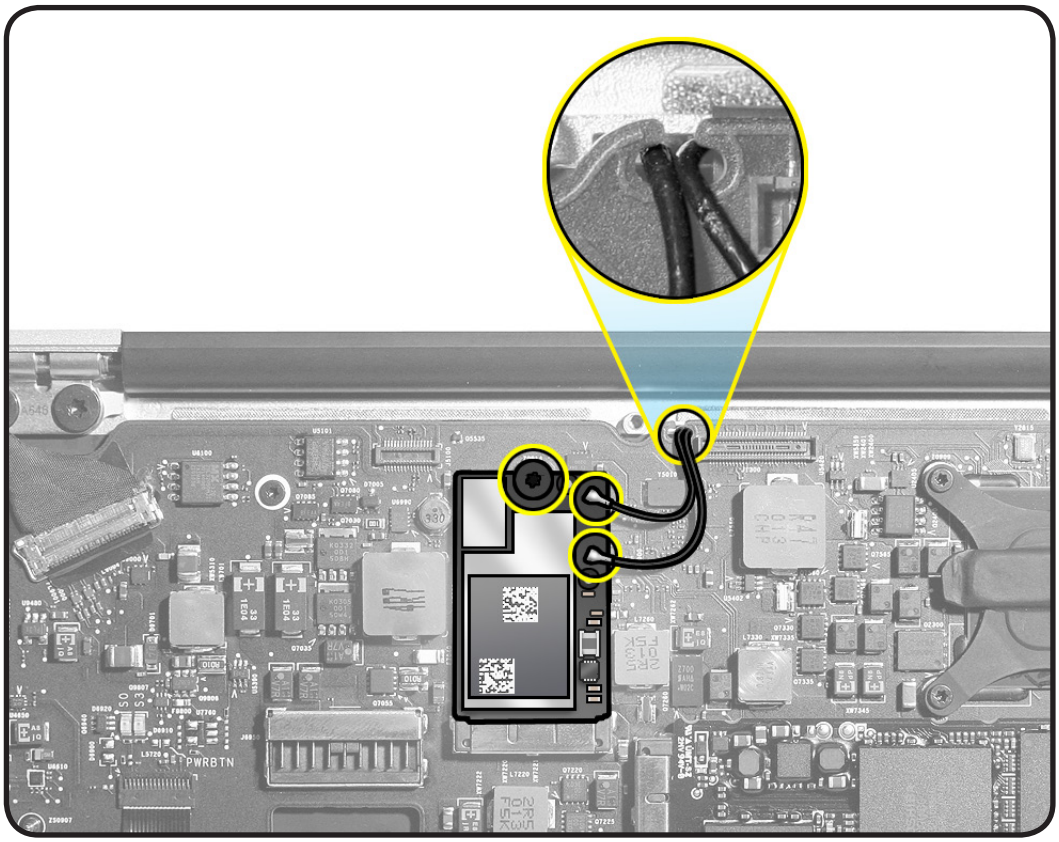


Replacement

Caution: Using too much force to reseat antenna cables can distort connector or connector rim.



1 Carefully connect antenna cables by holding connector nearly parallel to card until you feel it catch the rim on the card. Then press straight down to snap it into place.



2 Holding the card by the edges, connect the card into the logic board connector, and install the screw.

Important: Make sure the cables are routed properly through the notch in the logic board.

Make sure the slightly shorter cable connects near the corner of the card. Do not swap cables.

Input/Output (I/O) Flex Cable

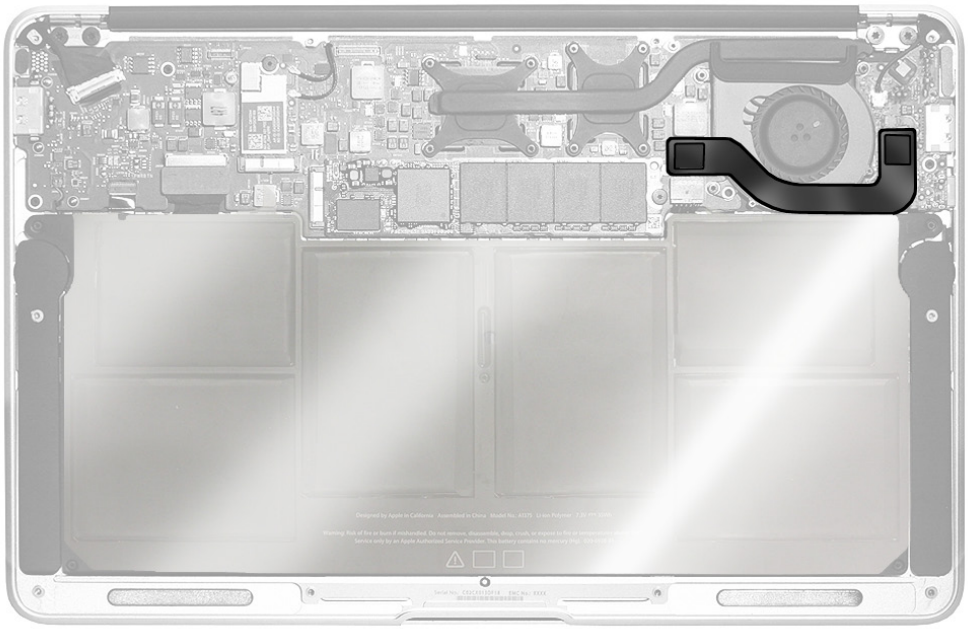
First Steps

Remove

- Bottom case

Important: Always attach the battery cover immediately after removing the bottom case.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

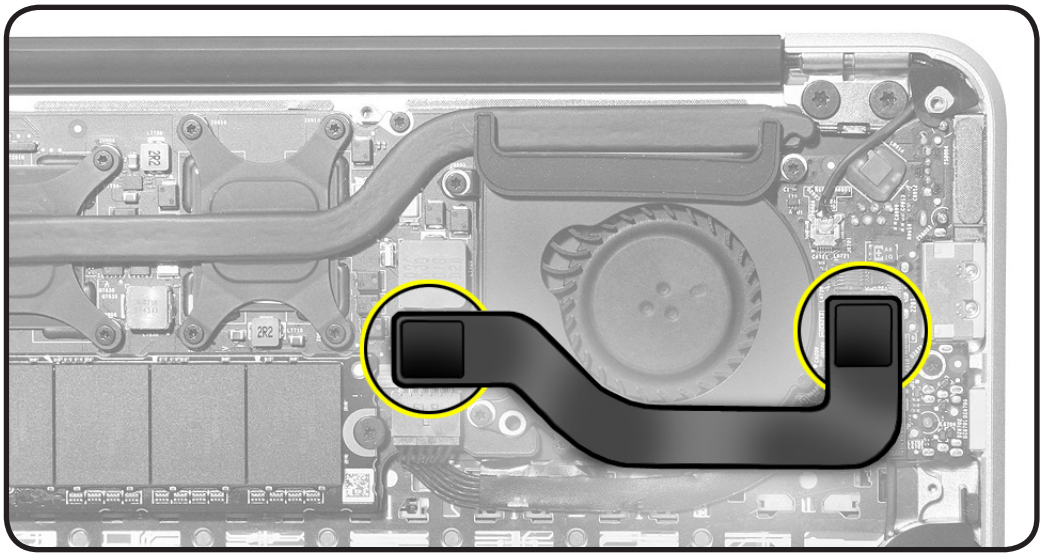
- ESD wrist strap
- Black stick

Removal

1 Use black stick at each connector to disconnect cable straight up from logic board and I/O board.

2 Peel up cable from adhesive on fan.

Replacement Note: Before installing cable, check the connectors on each board for any pin deformities.



Fan

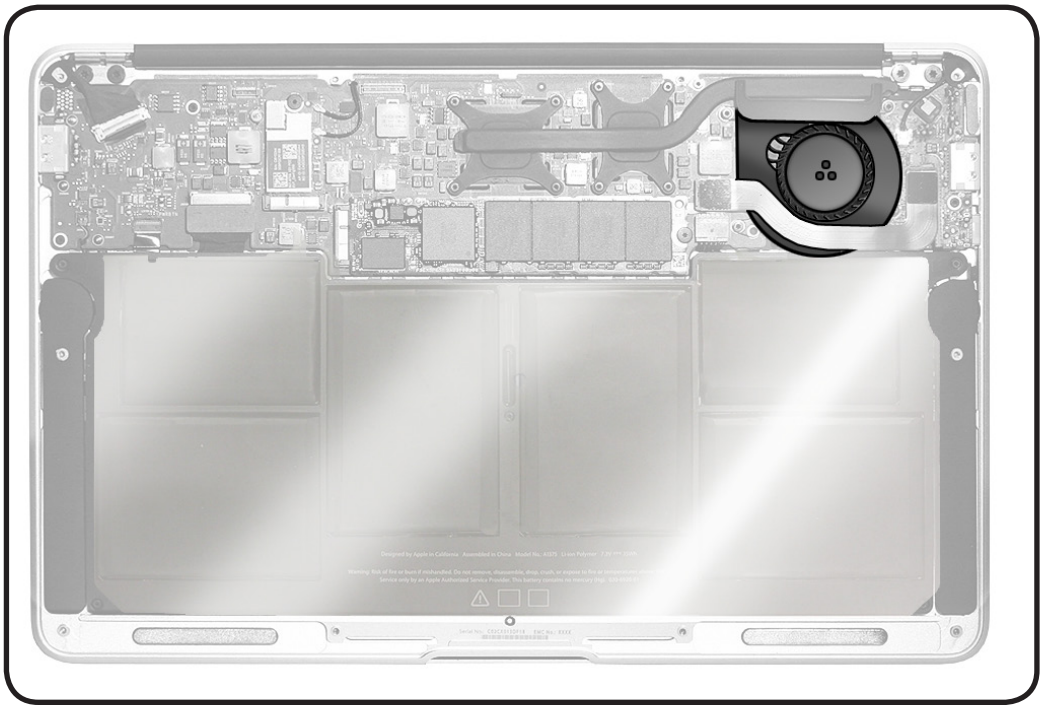
First Steps

Remove:

- Bottom case
- SSD card
- I/O flex cable

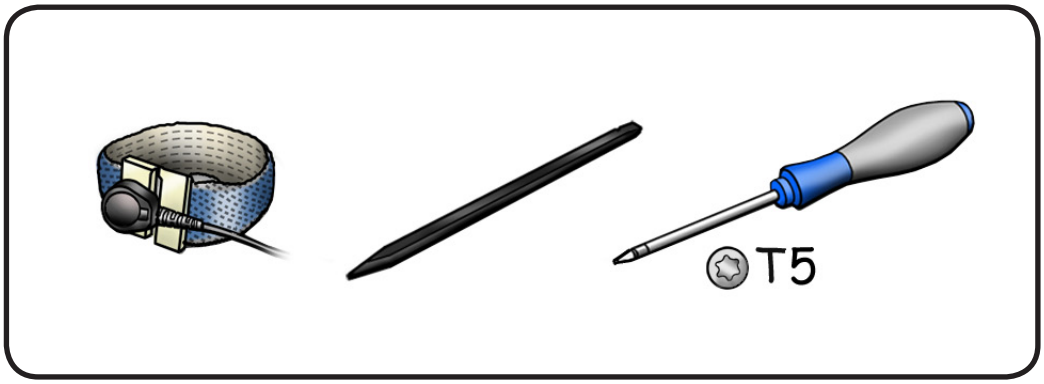
Important: Always attach the battery cover immediately after removing the bottom case.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

- ESD wrist strap
- Black stick
- Torx T5 screwdriver, magnetized

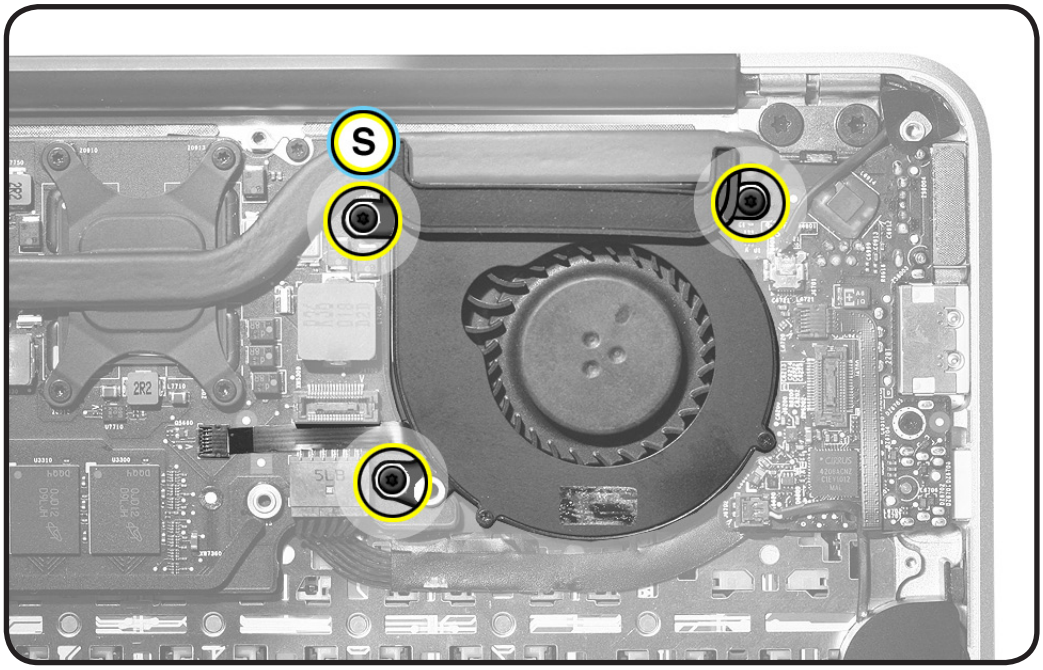


Removal

1 Remove 3 Torx T5 screws (short=S):
(S) [top left] 922-9692 (3.62 mm)

(2) 922-9691 (5.2 mm)

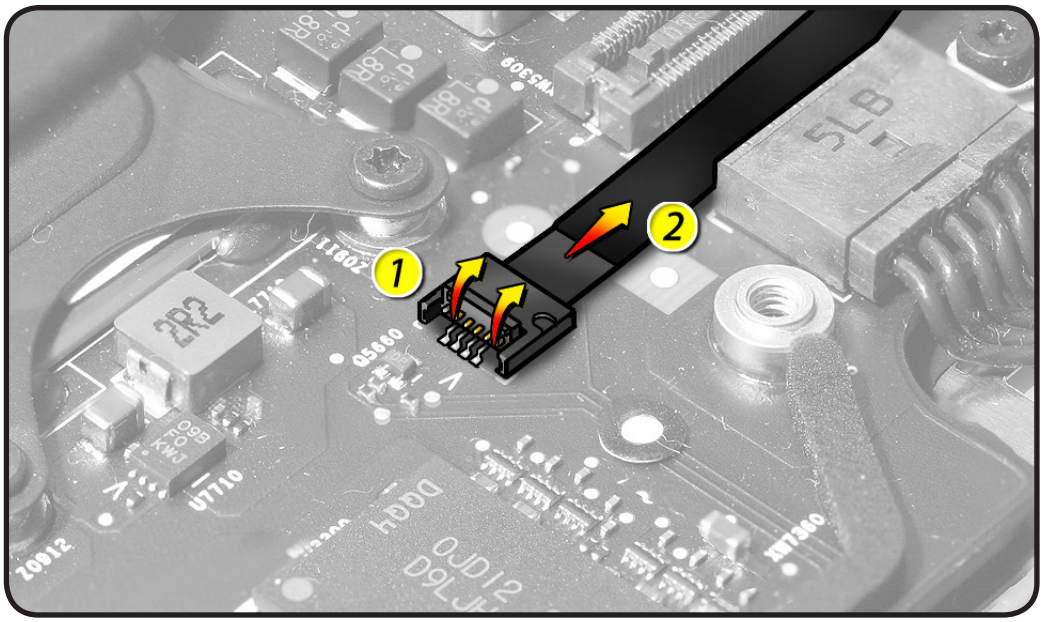
Note: If the fan body has attached steel washers under the screws, do not remove washers.



2 Flip up locking lever and carefully disconnect flexible fan cable.

Caution: Pulling cable too fast could tear it.

Replacement Note: Insert cable before tilting fan into top case.



3 Tilt up fan from the left.

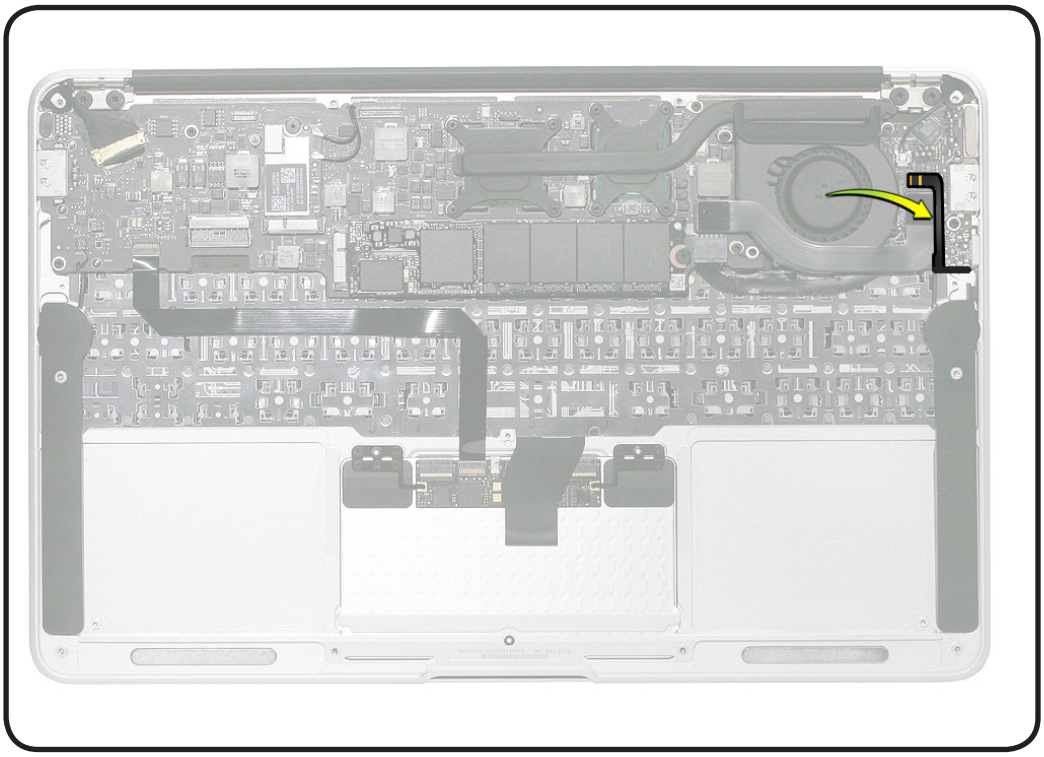
4 Transfer rubber gasket (922-9700) if installing new fan.

Microphone Cable

First Steps

Remove:

- Bottom case
- Battery
- I/O flex cable
- Left speaker

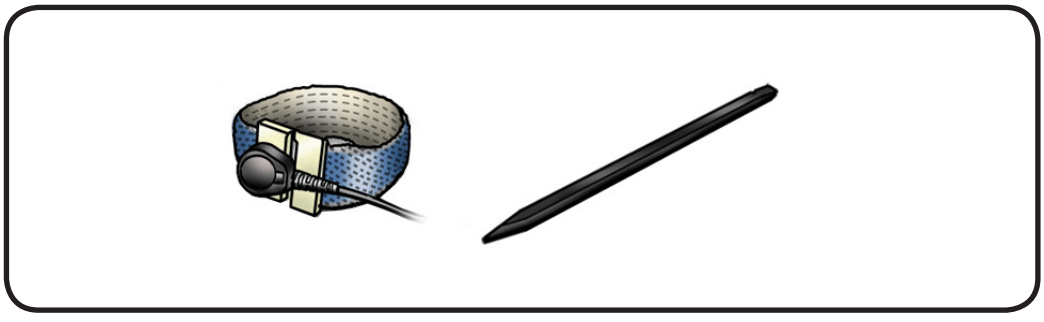


Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.

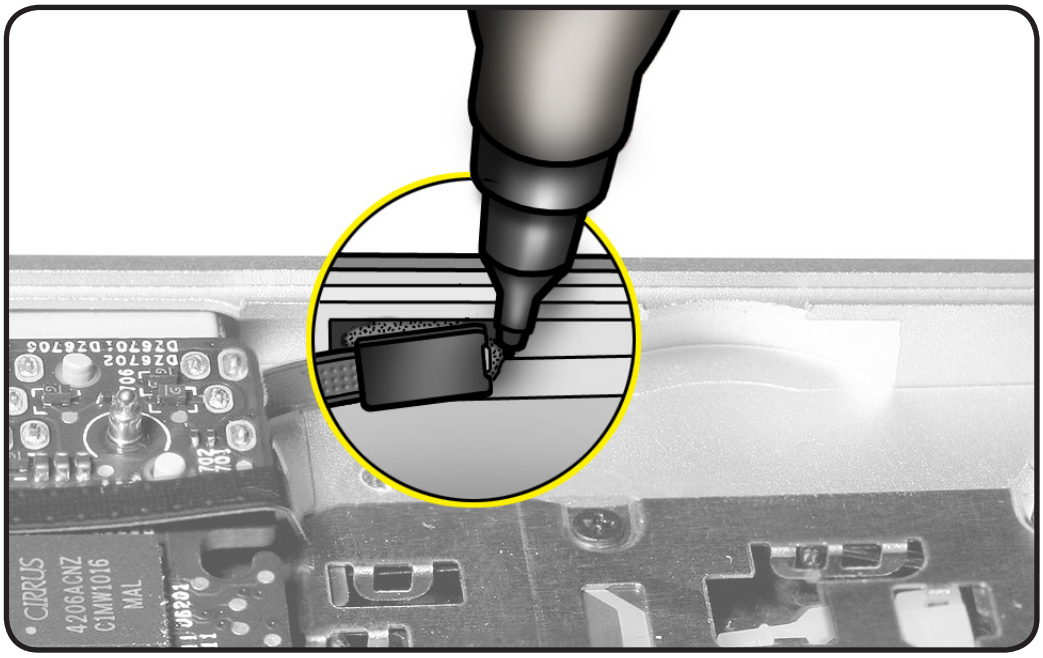
Tools

- ESD wrist strap
- Black stick



Removal

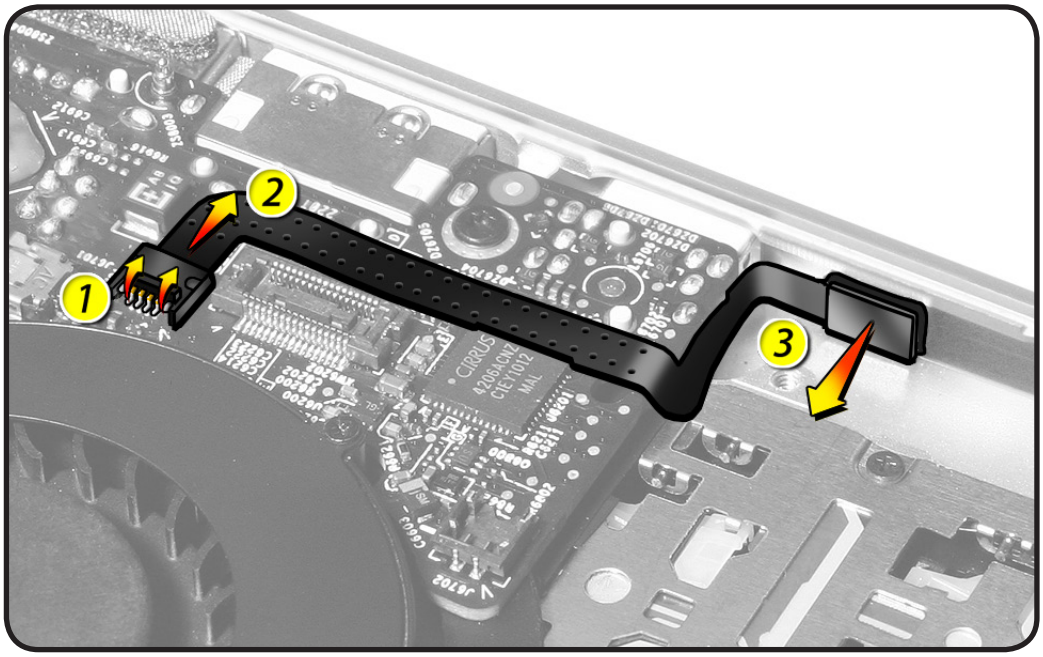
1 Use a fine-tip permanent marker to mark inside of top case at end of microphone gasket.



2 Use black stick to disconnect microphone cable from I/O board.

3 Peel cable up from adhesive on I/O board.

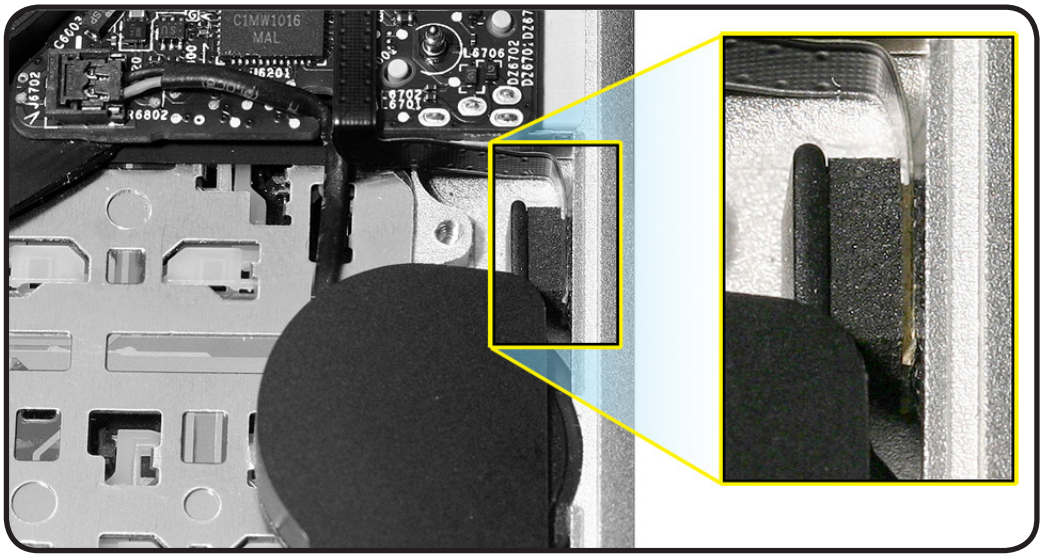
4 Pry the microphone and gasket from top case.



5 Clean any residue from adhesive on top case, and replace with a new microphone precisely where shown.

6 Apply light pressure to the gasket to set the very high bond (VHB) adhesive.

7 With the speaker installed, check that microphone gasket aligns to pad on left speaker extension.



Input/Output (I/O) Board

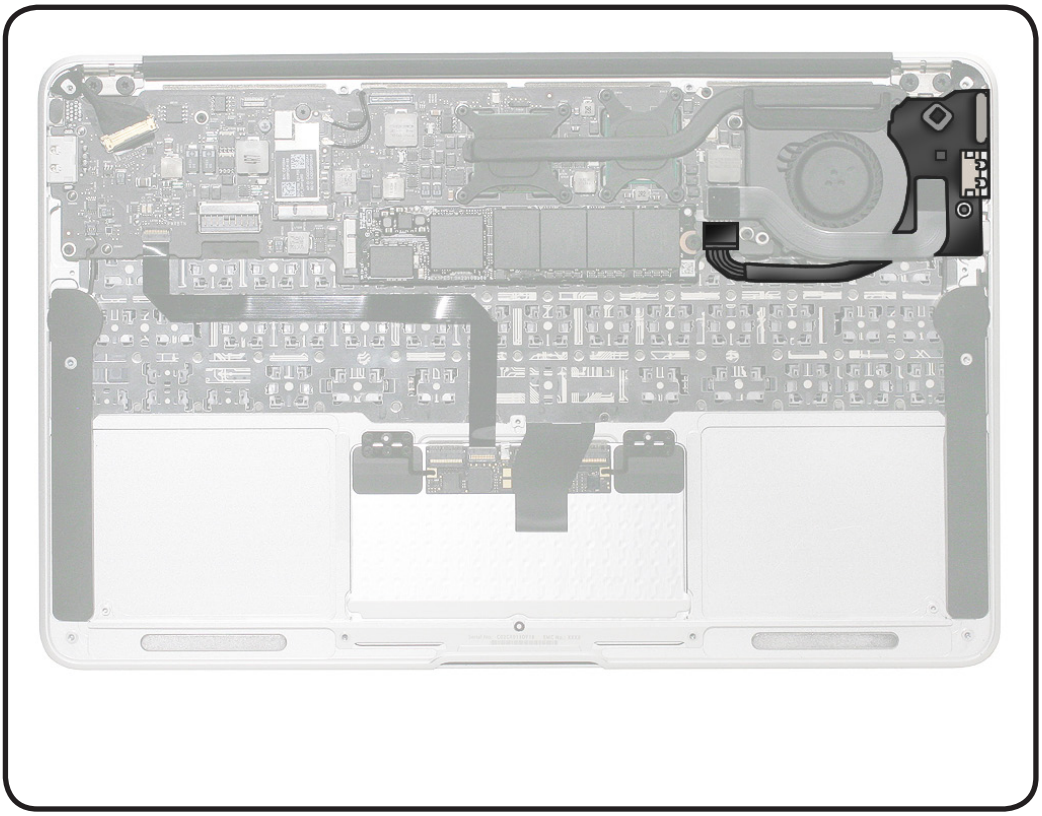
First Steps

Remove:

- Bottom case
- Battery
- SSD card
- I/O flex cable
- Fan

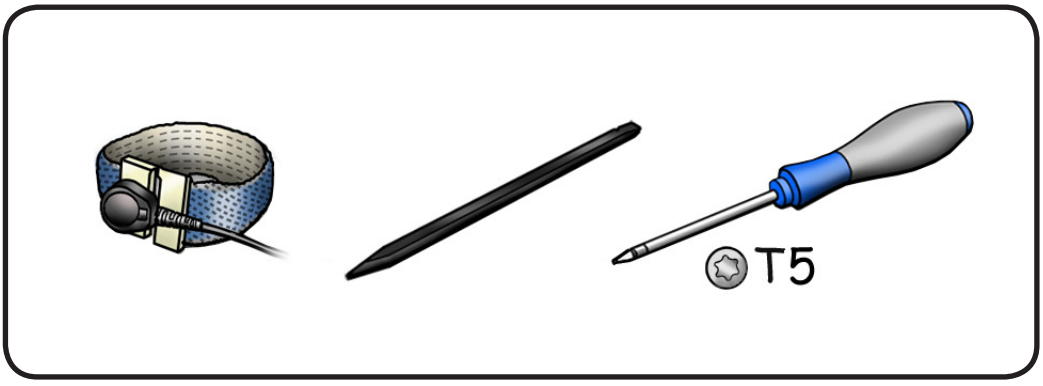
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

- ESD wrist strap
- Black stick
- Torx T5 screwdriver, magnetized

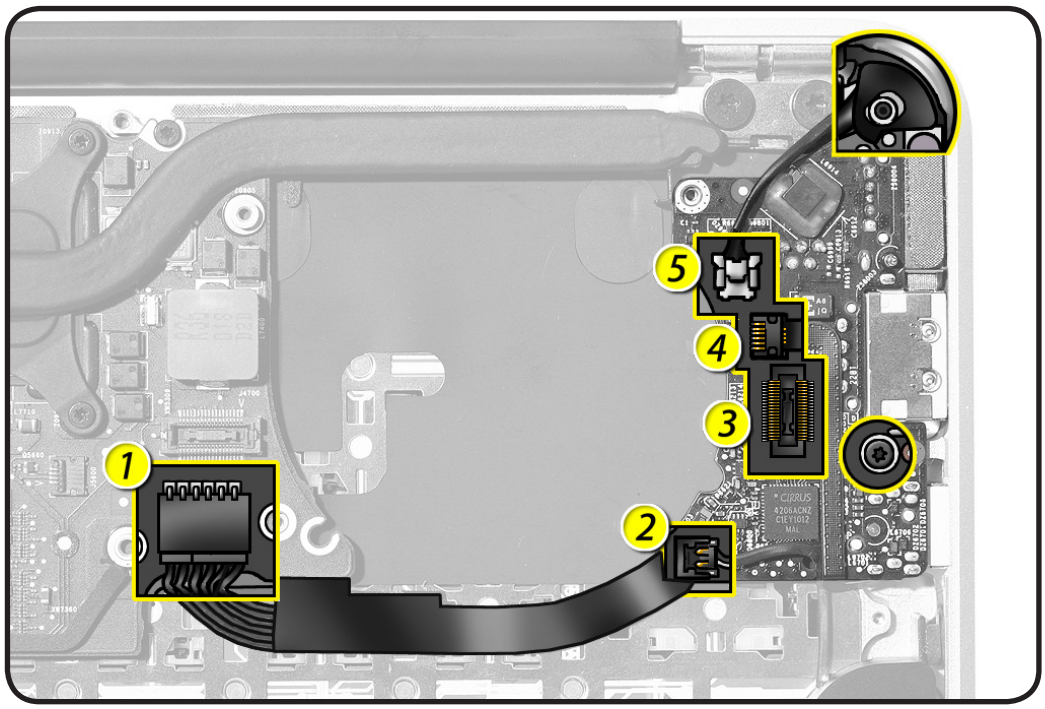


Removal

1 Use black stick to pry up wedge-shaped rubber gasket in corner.

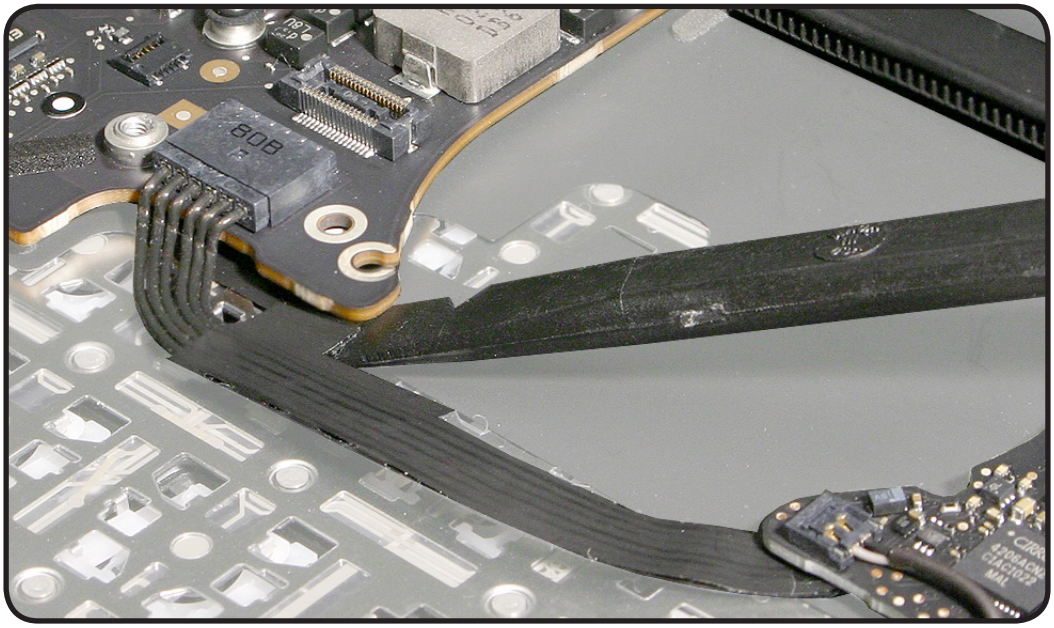
2 Referring to numbers on image, disconnect

- (1) power cable to logic board
- (2) left speaker cable
- (3) I/O flex cable (removed previously)
- (4) microphone cable
- (5) camera cable (refer to step 5)

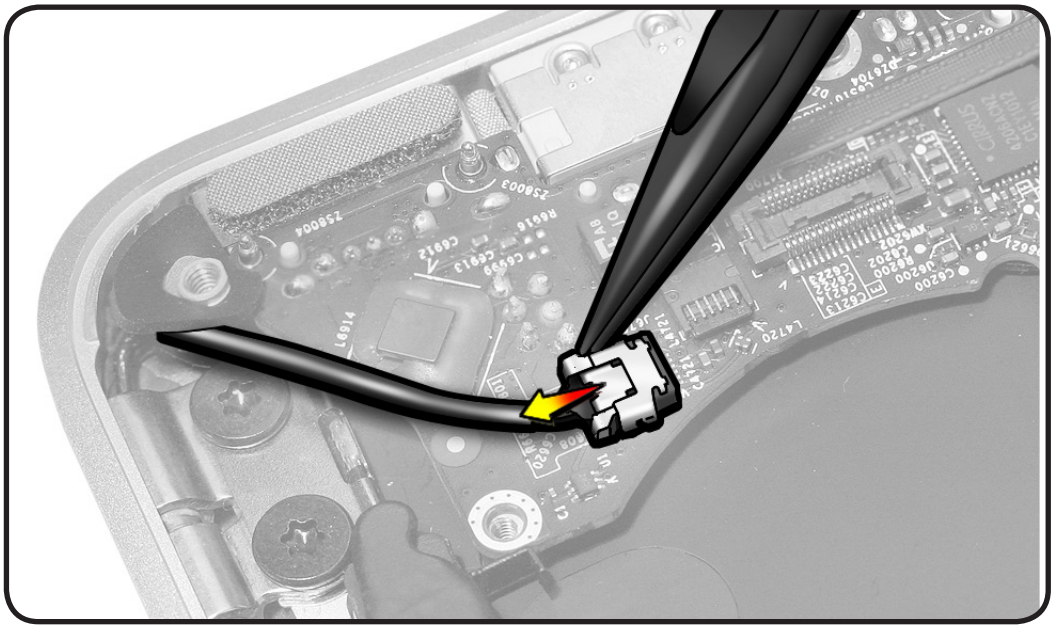


3 Remove Torx T5 screw 922-9692 (3.62 mm)

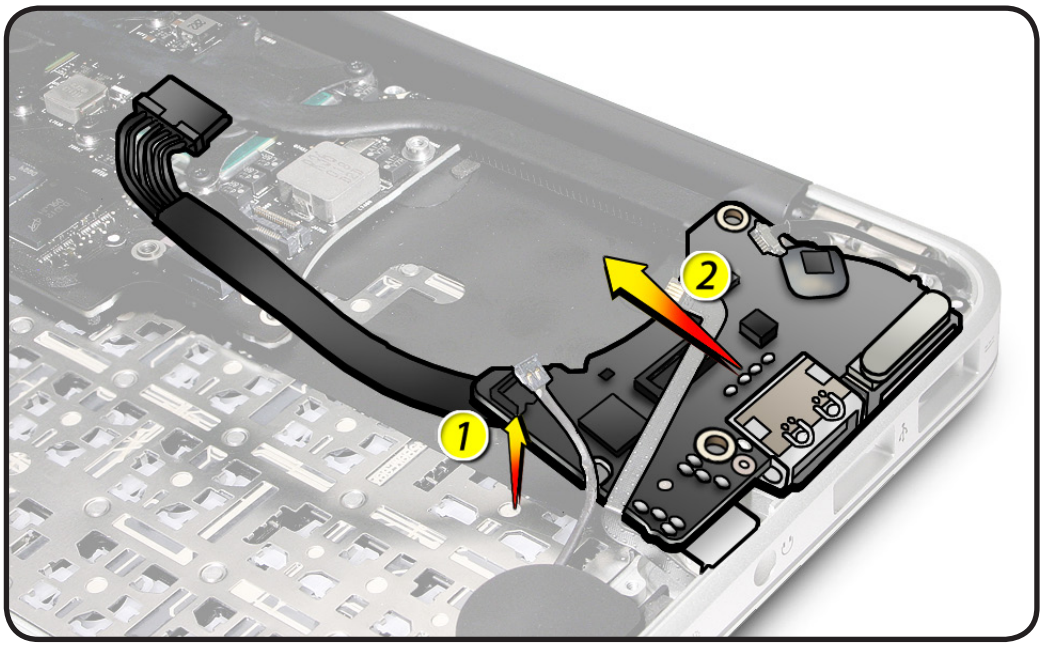
4 Use a black stick to loosen the cable tape under the lower corner of the logic board.



5 When disconnecting camera cable, use a black stick on alternate sides to disconnect cable evenly.



6 Tilt up board and move it away from ports and out of top case.

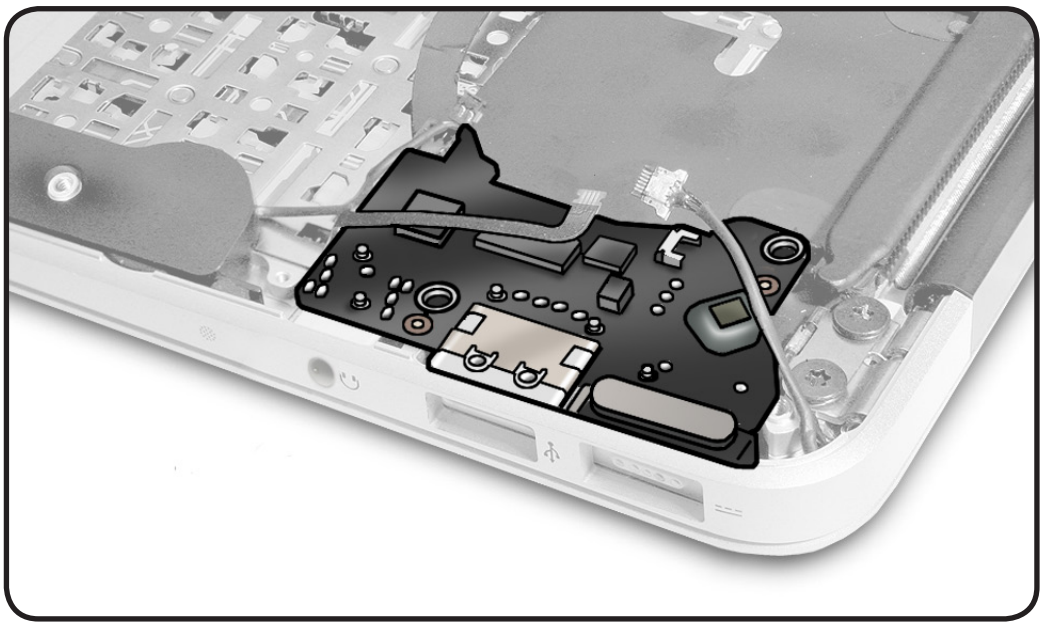


Replacement

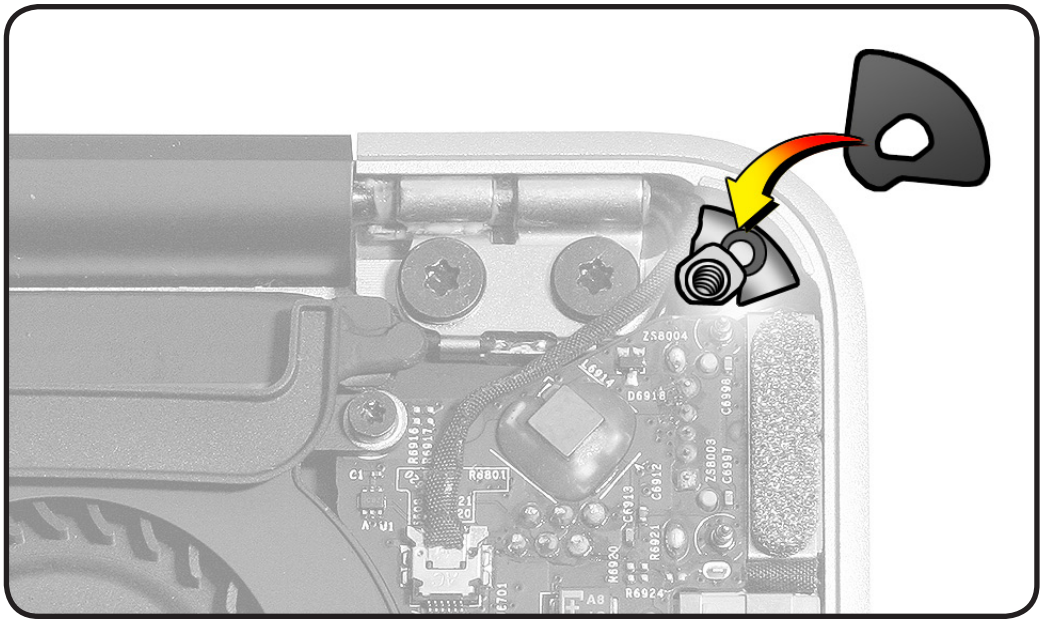
1 Without pinching cables, tip board into top case, and push it against top case wall to secure ports.

2 Check screw and port alignment before installing screws.

3 Connect remaining cables.



4 Insert rubber gasket as shown. (The gasket shape is unique for each rear corner).



Input Device (IPD) Flex Cable

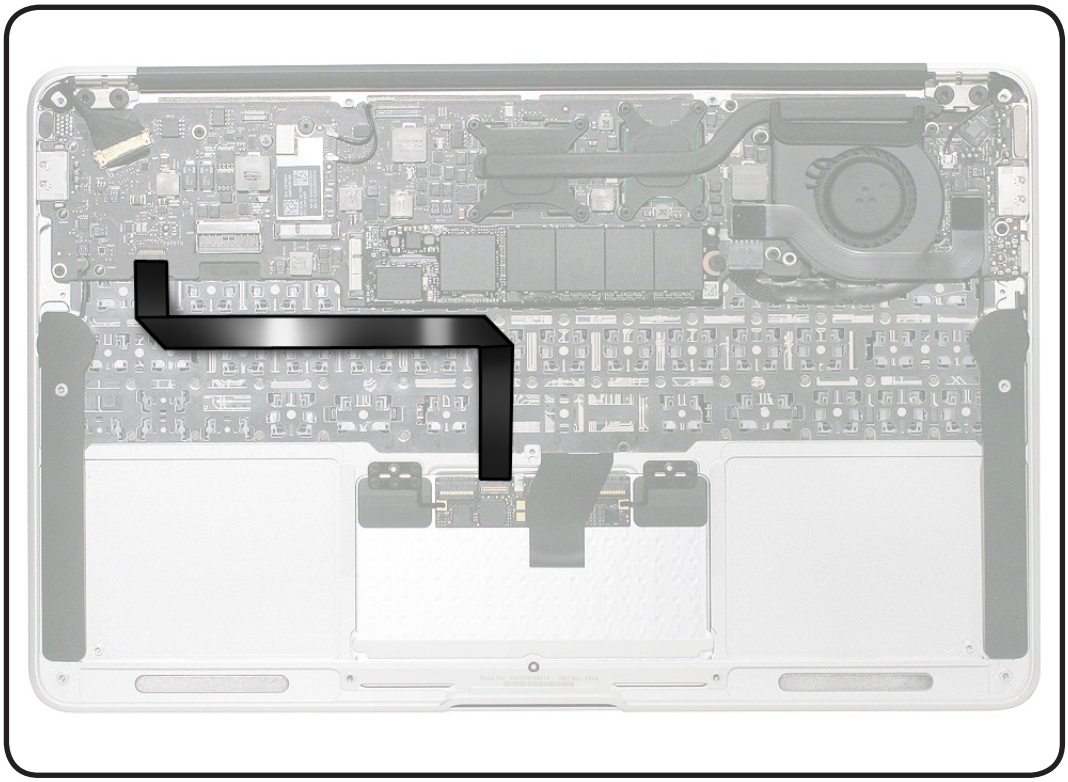
First Steps

Remove:

- Bottom Case
- Battery

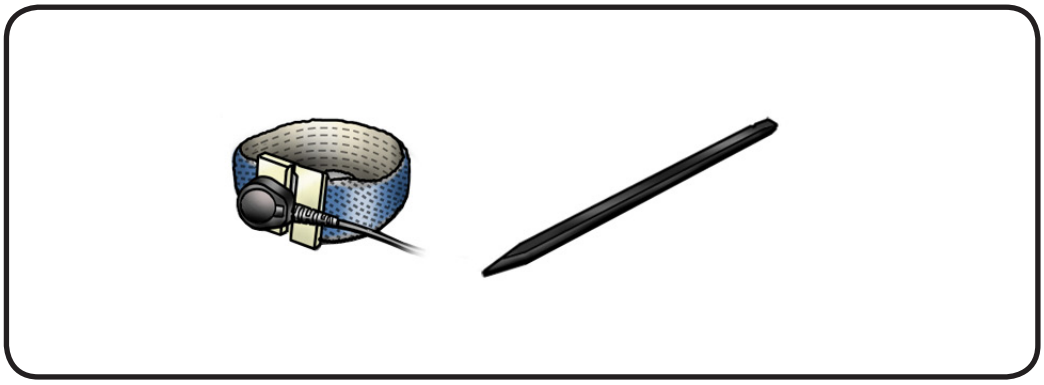
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

- ESD wrist strap
- Black stick

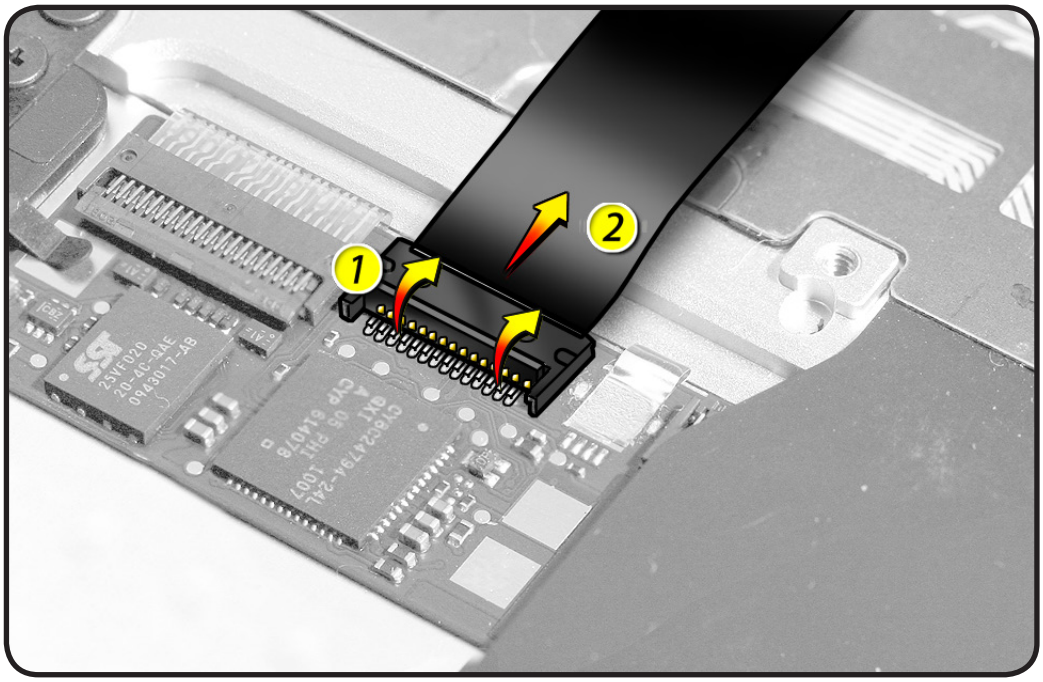


Removal

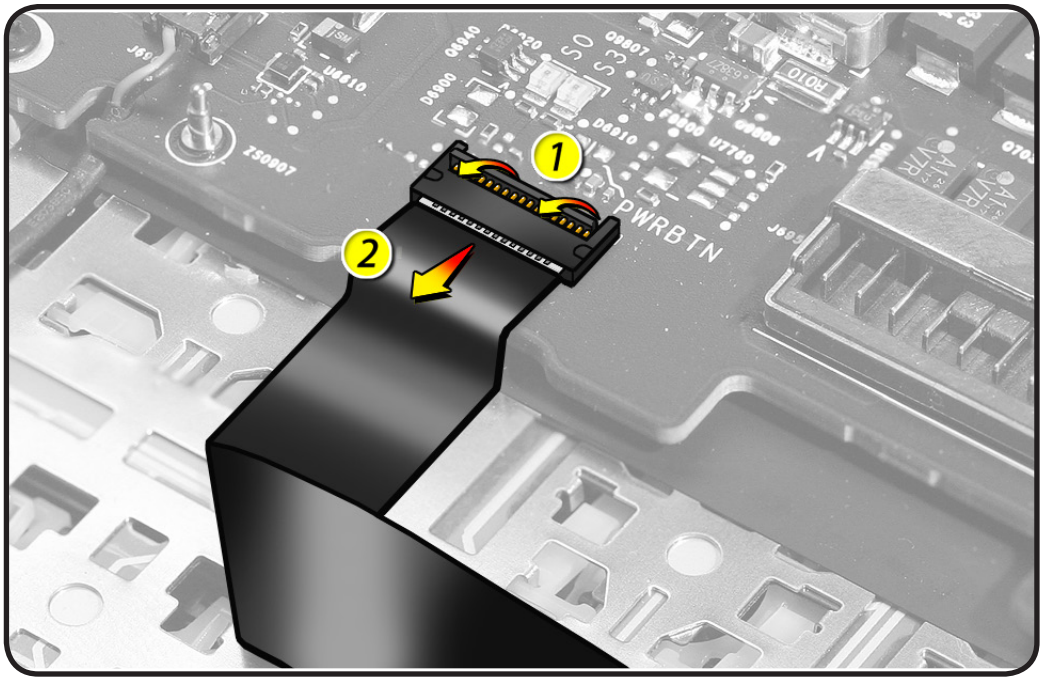
1 Disconnect cable from flip-lever connector at trackpad.

2 Peel up cable from top case.

Replacement Note: When installing new cable, peel off adhesive backing.



3 Disconnect cable from flip-lever connector at logic board.



Heatsink

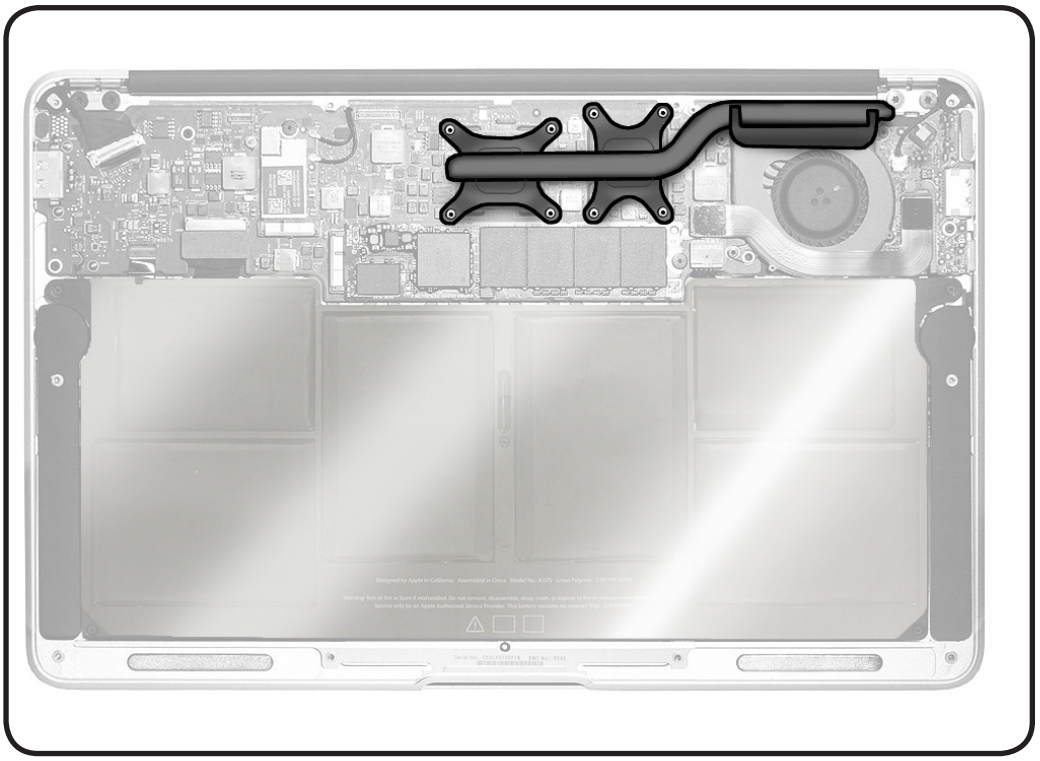
First Steps

Remove:

- Bottom case
- I/O flex cable
- SSD card
- Fan

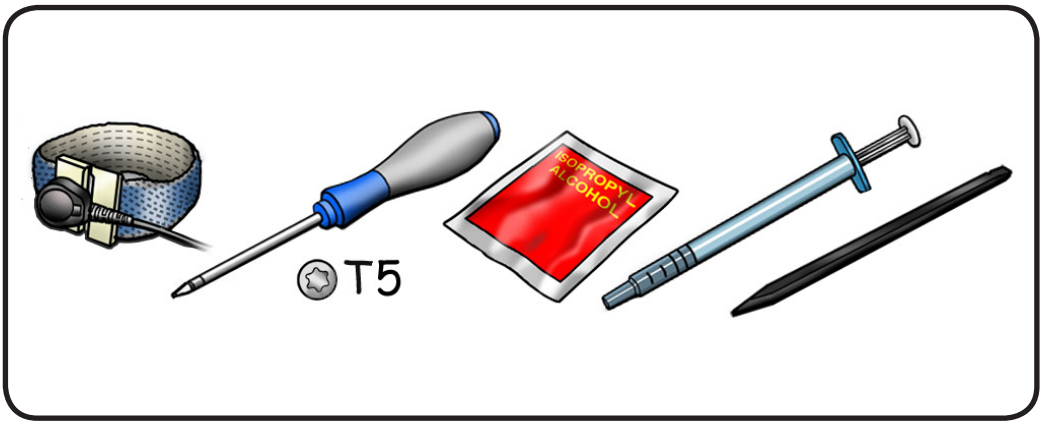
Important: Always attach the battery cover immediately after removing the bottom case.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

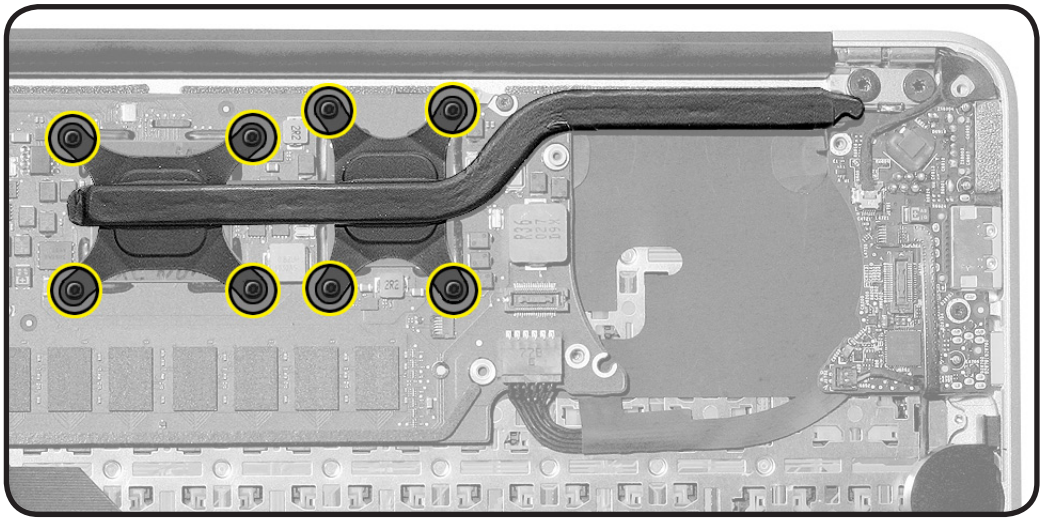
- ESD wrist strap
- Torx T5 screwdriver, magnetized
- Alcohol pads
- Thermal grease syringe (922-7144)
- Black stick



Removal

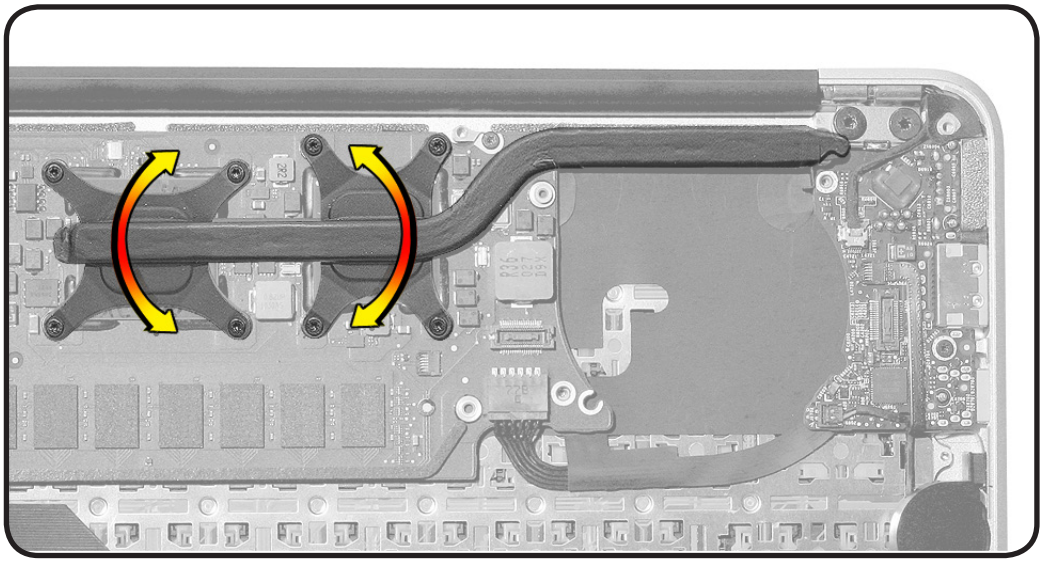
Caution: Do not grasp heatsink arm.

1 Remove 8 Torx T5 screws:
922-9694 (2.53 mm)



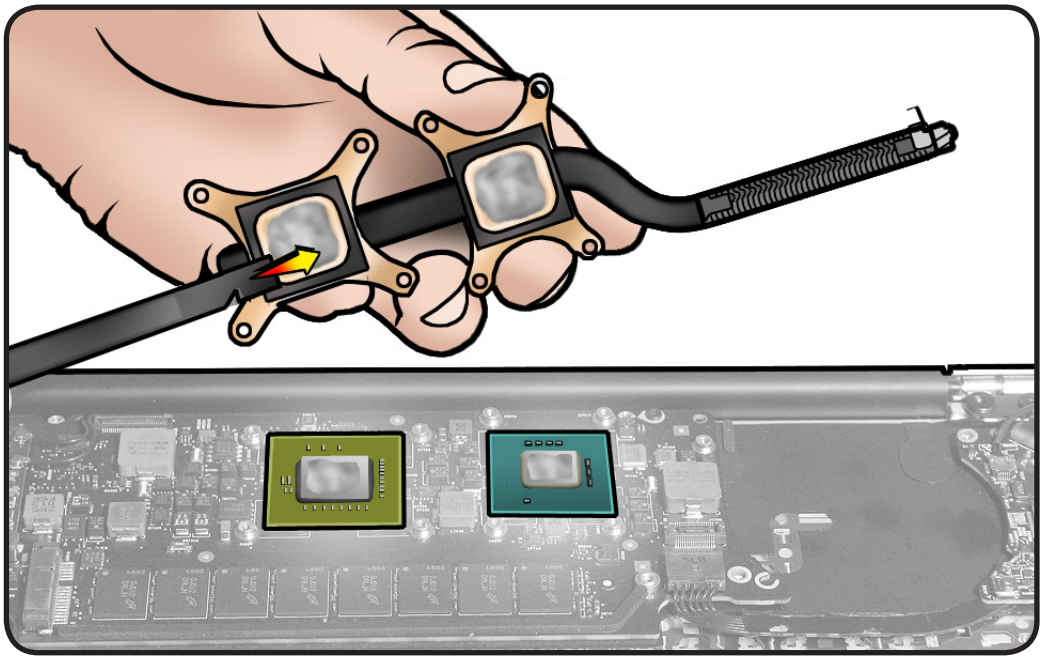
2 **Important:** To avoid flexing logic board, remove heatsink while logic board is secure in top case.

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

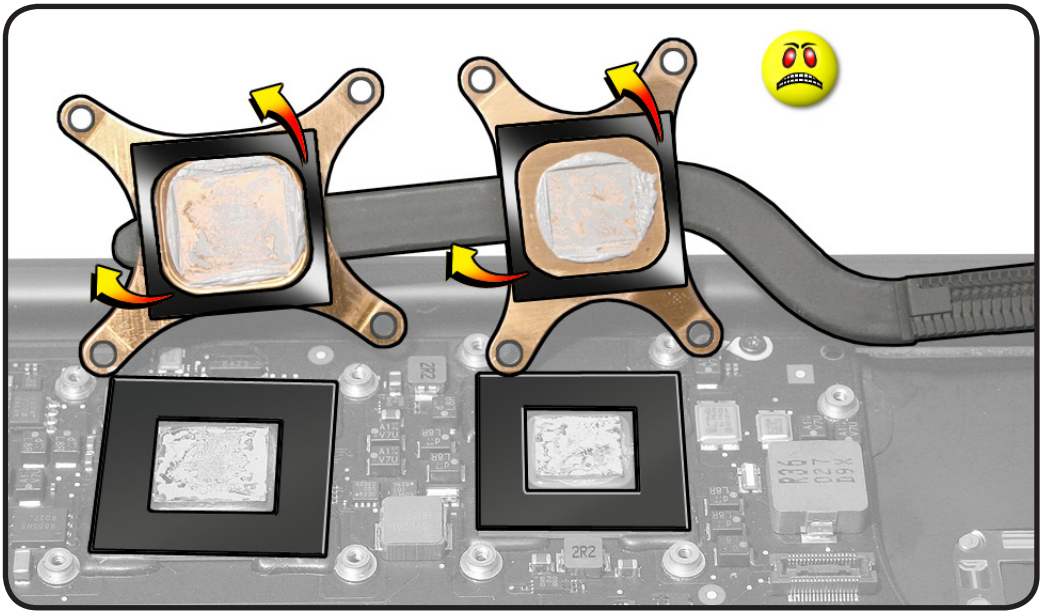


Caution: Do not pull heatsink.

3 Scrape off thermal grease, and use alcohol pad to clean thermal pads and chips.



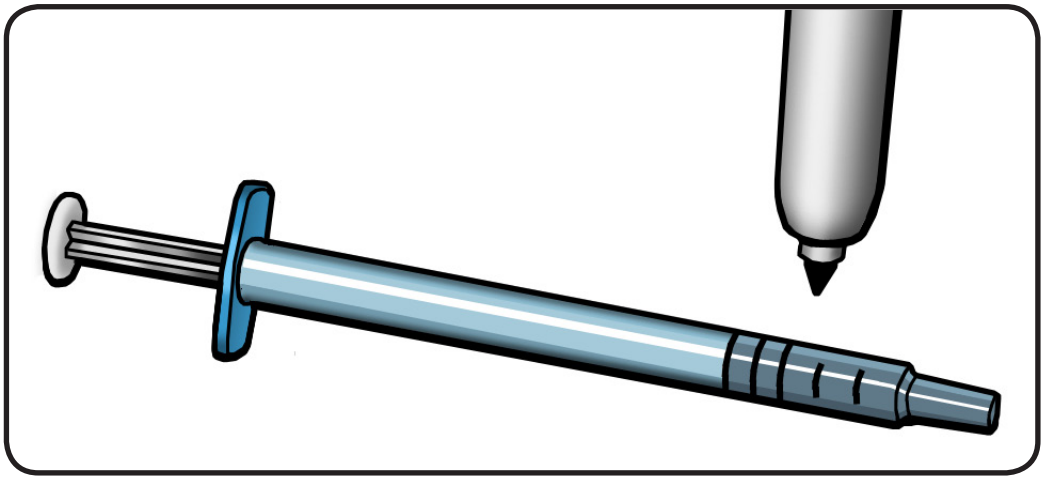
4 If heatsink has mylar frames, use a black stick to remove the mylar.



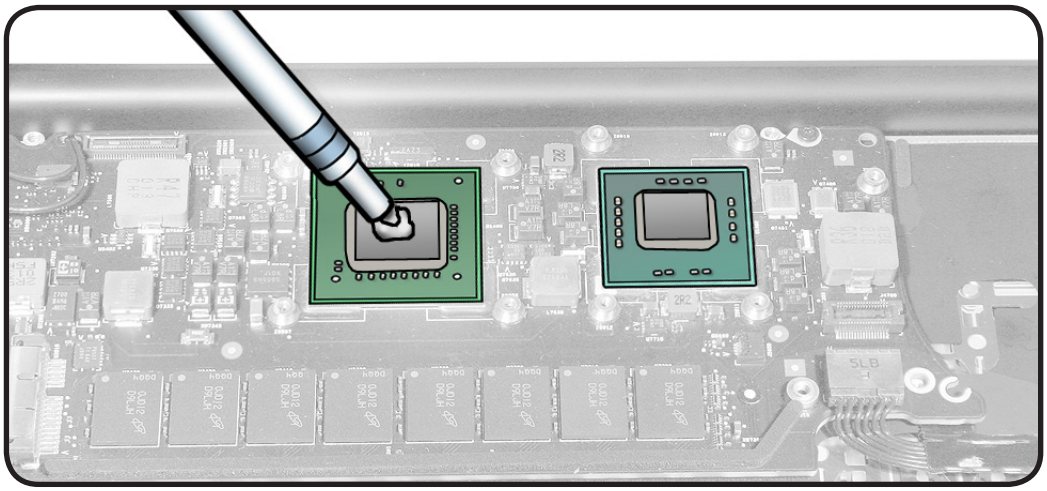
Replacement

1 Use a pen to mark the syringe in thirds.

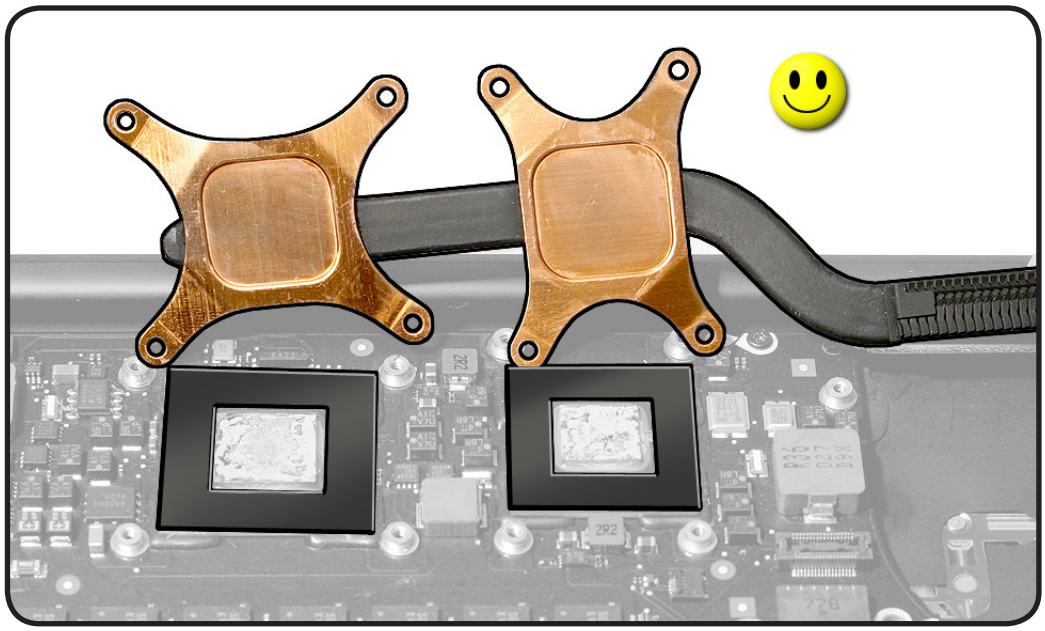
Caution: Syringe (922-7144) contains enough thermal grease for 3 chips. Because this computer has only 2 chips, use only 2/3 of syringe contents.



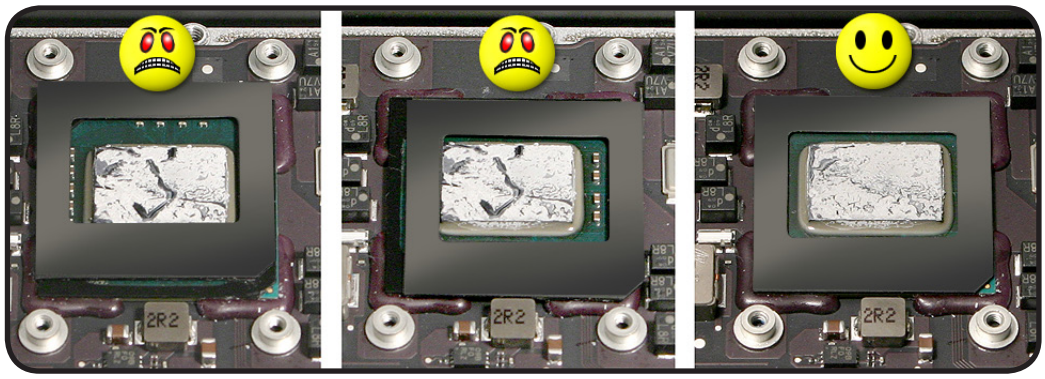
2 Inject 1/3 of grease on each chip.



3 If logic board does not have mylar frames, install them over the MCP (Media Core Processor) and CPU chips.



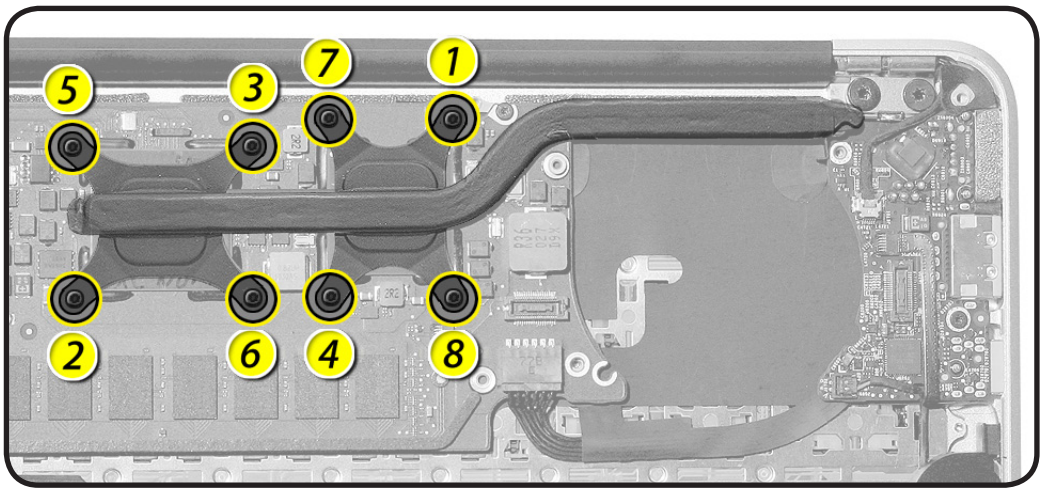
4 Make sure mylar frame is centered over chip and covers the tiny capacitors. Do not press too hard or the capactitors may be damaged.



5 Lower heatsink over logic board.

6 Install screws.

Reassembly Note: Install screws 1/2 way first; then tighten in order shown.



Logic Board

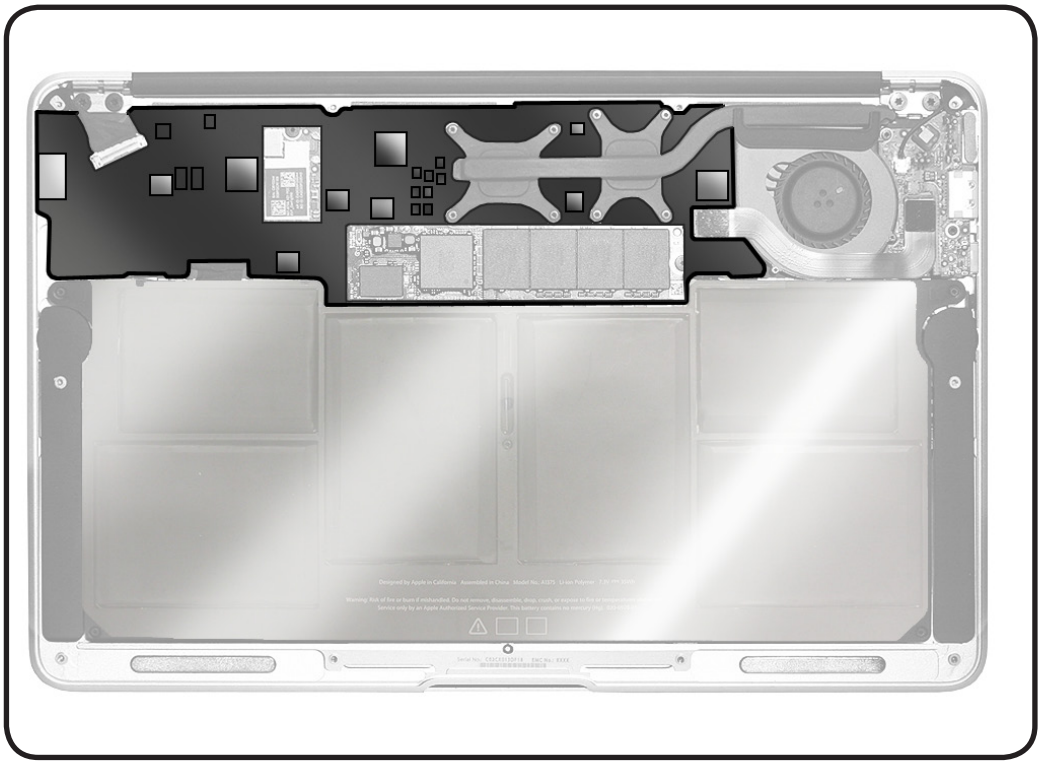
First Steps

Remove:

- Bottom case
- Battery
- SSD card
- I/O flex cable
- Fan

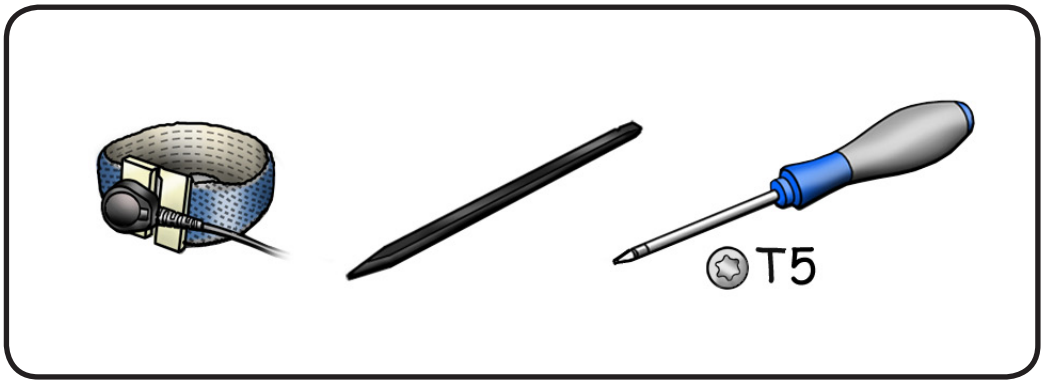
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

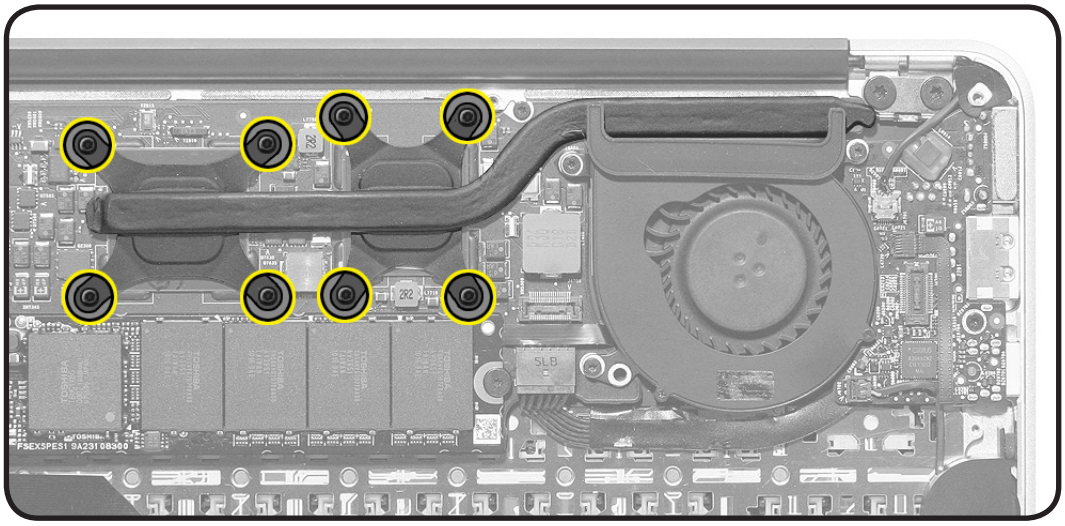
- ESD wrist strap
- Black stick
- Torx T5 screwdriver, magnetized



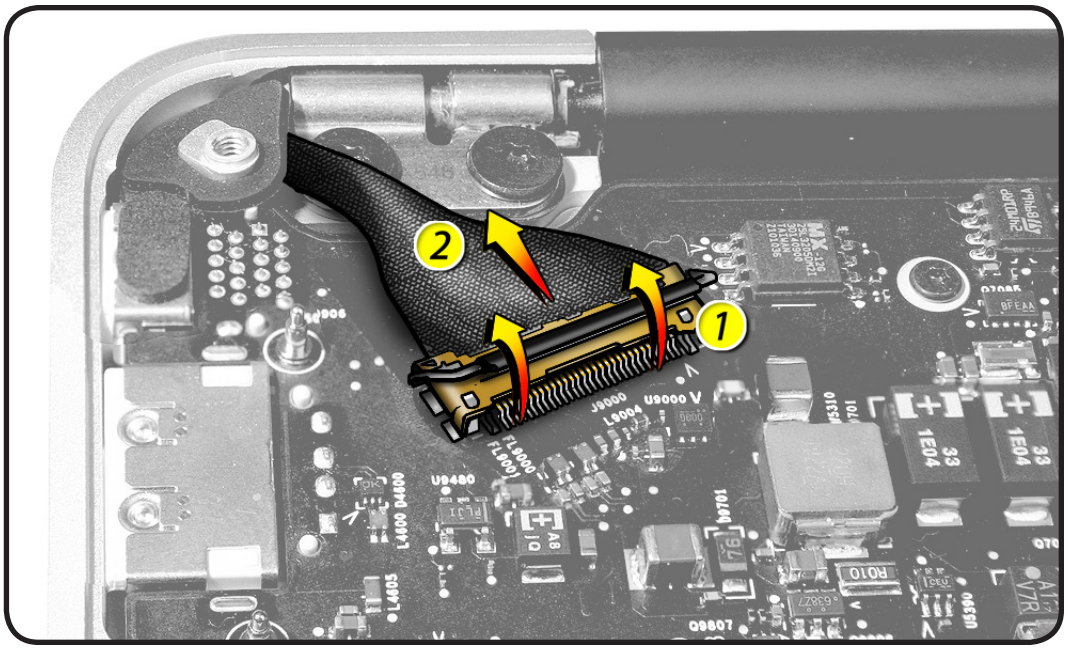
Removal

1 If replacing logic board with a new one, transfer **Heatsink** while the logic board is in the top case to avoid flexing the board.

If reinstalling same logic board, do not remove AirPort/ Bluetooth card and heatsink.



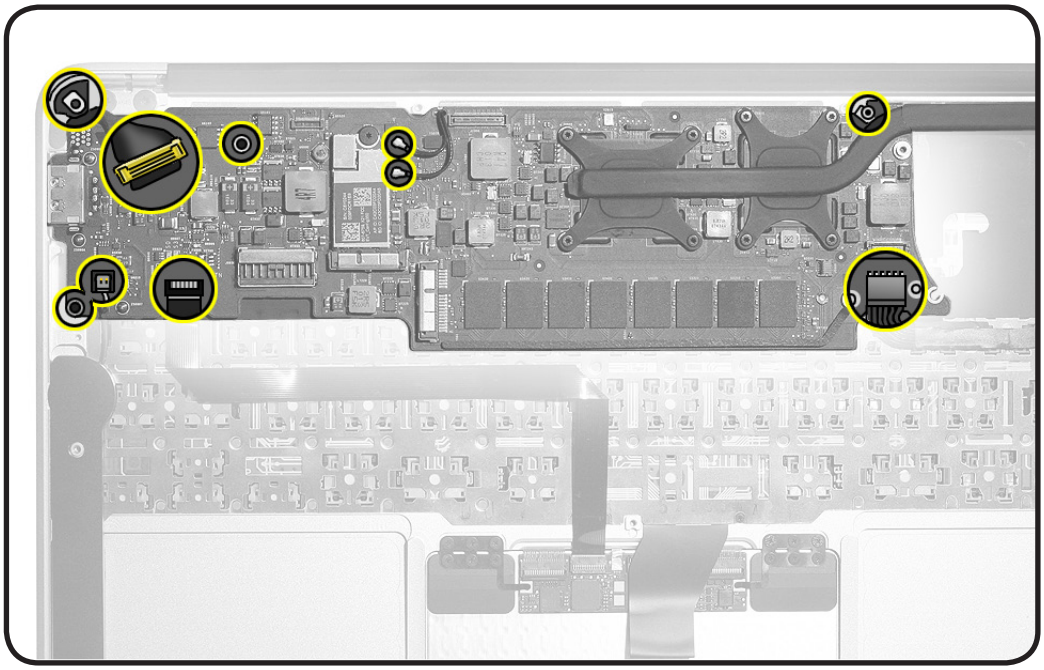
2 Flip up locking bar and pull embedded display port (EDP) cable—not bar—to disconnect cable.



3 Disconnect cables:

- input device (IPD)
- embedded display port (EDP)
- AirPort/Bluetooth antennas
- right speaker
- I/O power

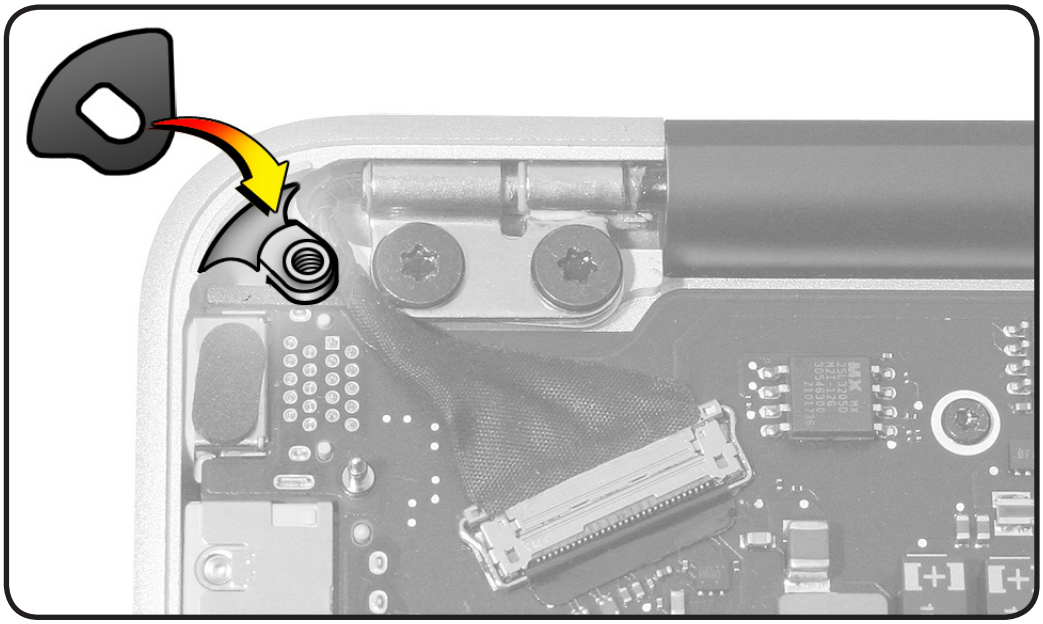
Note: Be sure to unroute cables from notches in logic board.



4 Remove 3 Torx T5 screws:
922-9692 (3.62 mm)

5 Remove wedge-shaped rubber gasket from corner of top case (922-9698).

Replacement Note: Insert rubber gasket as shown. (The gasket shape is unique for each rear corner).

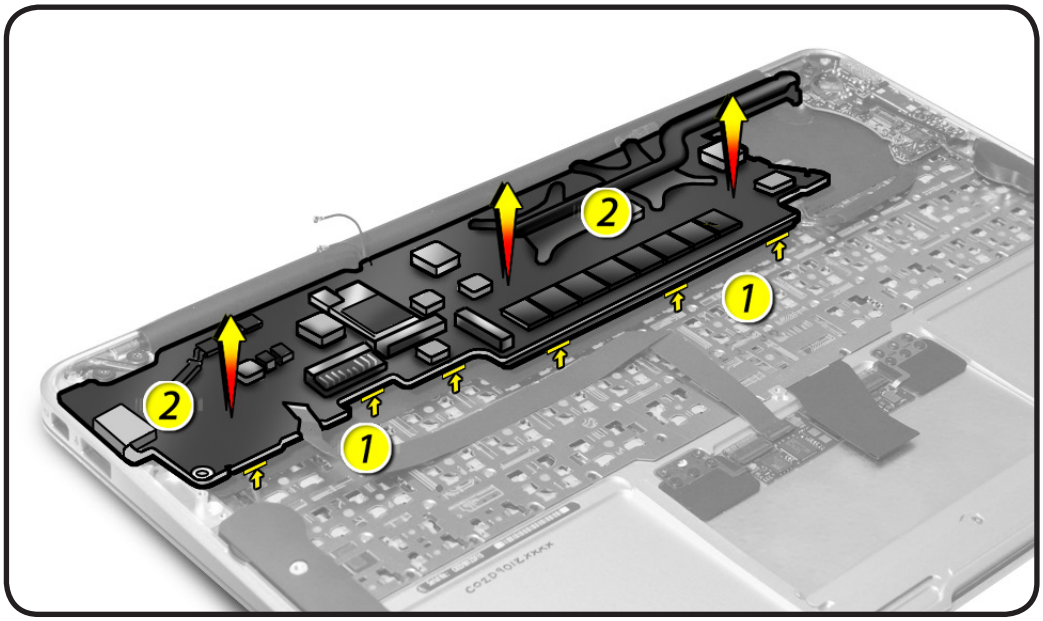


6 **Note:** Follow safe handling:

- Hold board by edges.
- Do not touch heatsink or connectors.
- Do not touch circuitry.

7 Tip up front edge of logic board, and lift board straight up.

Caution: Make sure cables are not pinched.

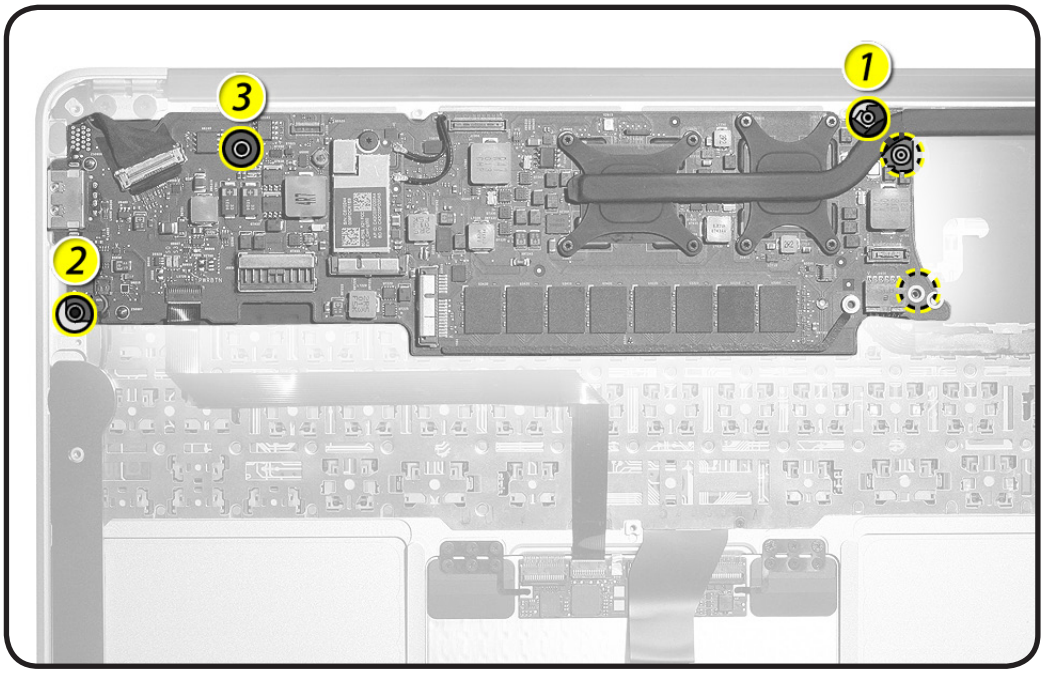


Replacement

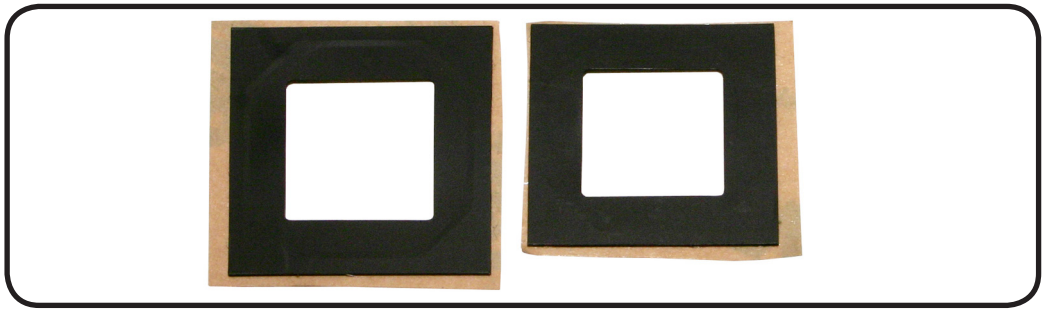
1 Place logic board into top case and slide it toward ports. Align connector and screw holes to openings in top case.

Caution: Make sure cables are not pinched.

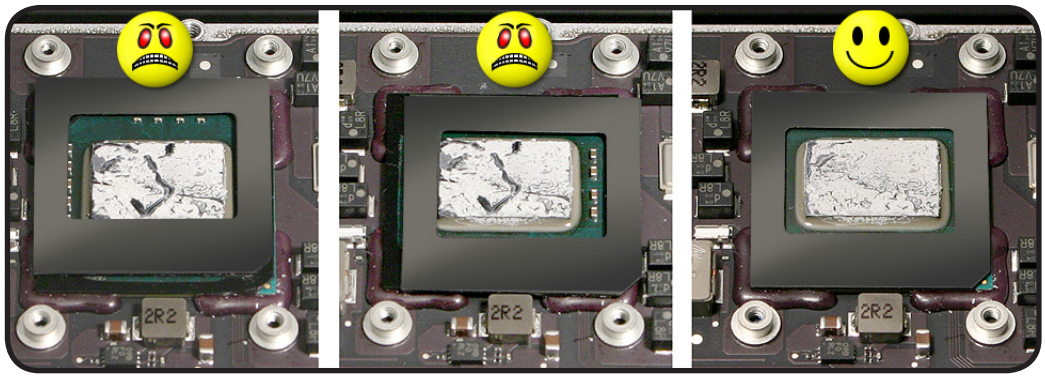
2 Loosely install screws, correct for alignment with fan screw holes, and secure logic board screws in order shown.



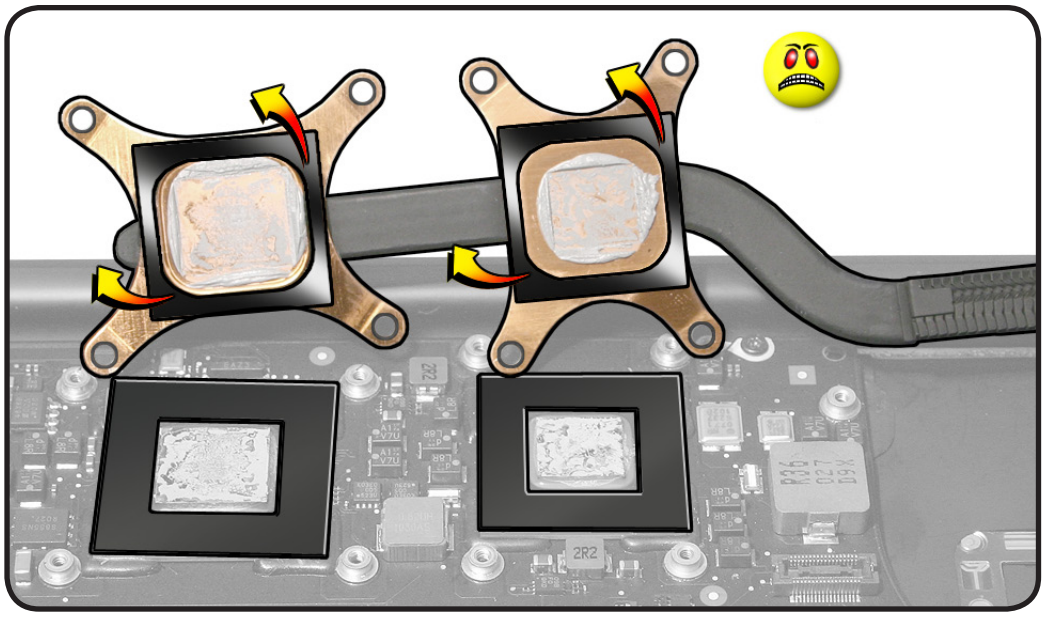
3 If replacing logic board with a new one, verify replacement logic board has mylar frames on MCP (Media Core Processor) and CPU chips.



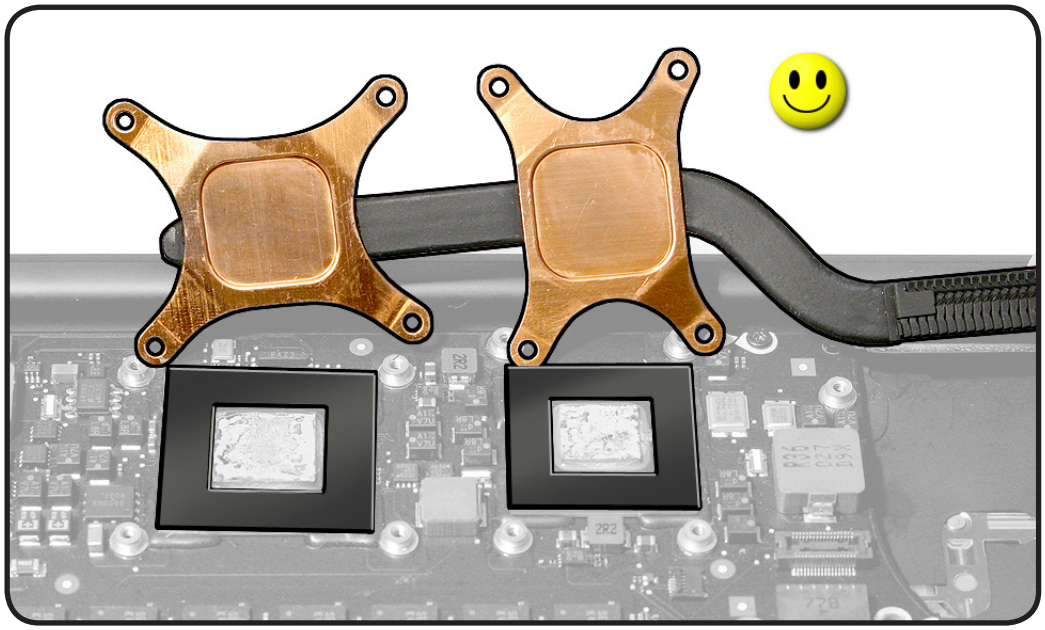
4 If you need to install them, make sure mylar frame is centered over chip and covers the tiny capacitors. Do not press too hard or the capacitors may be damaged.



5 If mylar frames are on heatsink, use a black stick to remove the mylar.



6 Clean heatsink, apply thermal grease to the 2 chips and replace heatsink.



Trackpad

First Steps

Remove:

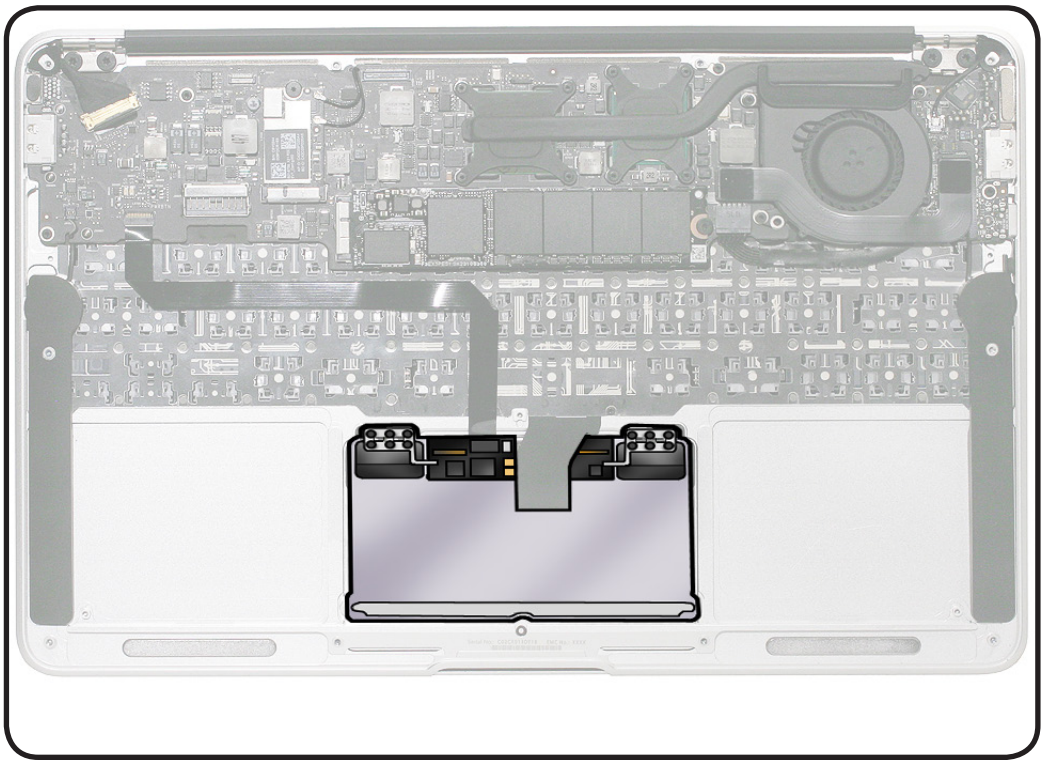
- Bottom Case
- Battery

Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.

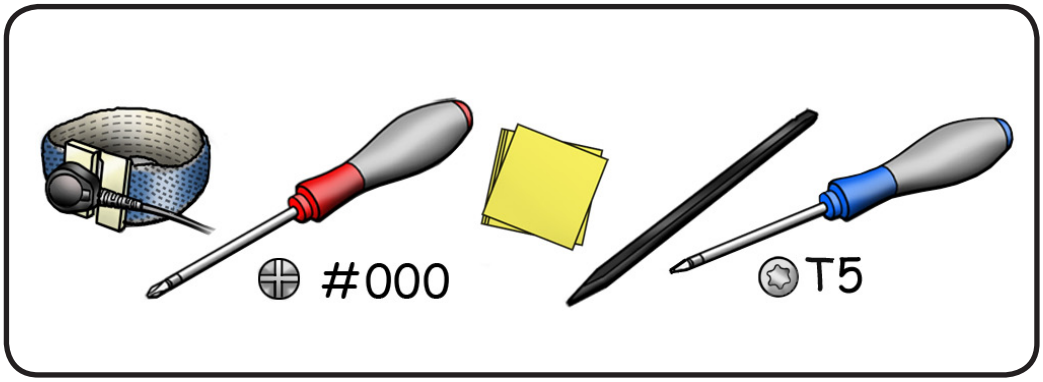
Note: Trackpad kit 922-9670 includes:

- trackpad
- 2 metal flexures
- flexure screws
- set screw



Tools

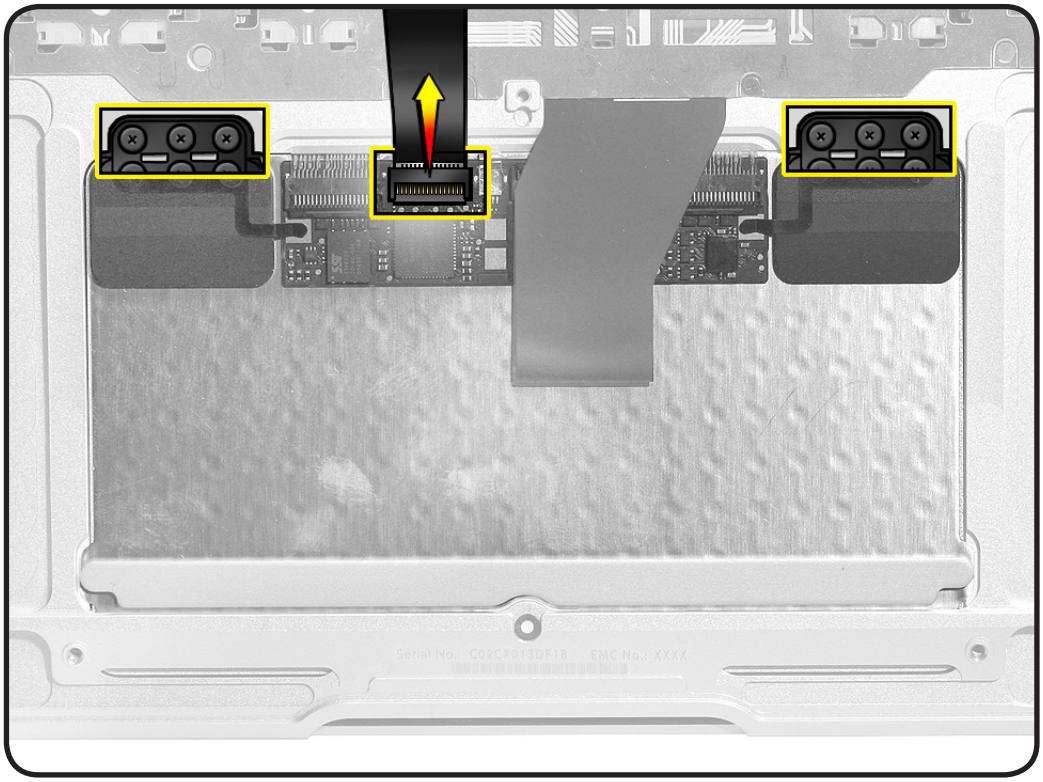
- ESD wrist strap
- Sticky (Post-it) notes
- Black stick
- Phillips #000 screwdriver, magnetized
- Torx T5 screwdriver



Removal

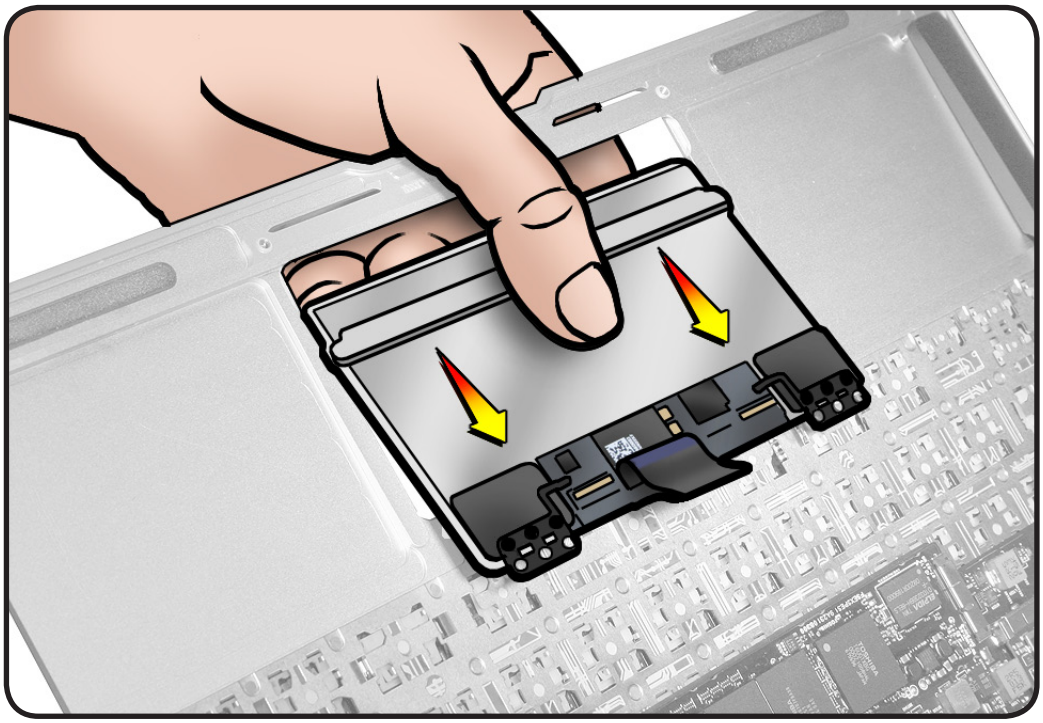
1 Place protective cloth over display.

2 Flip up locking lever to disconnect IPD cable from trackpad. Pull cable toward keyboard.

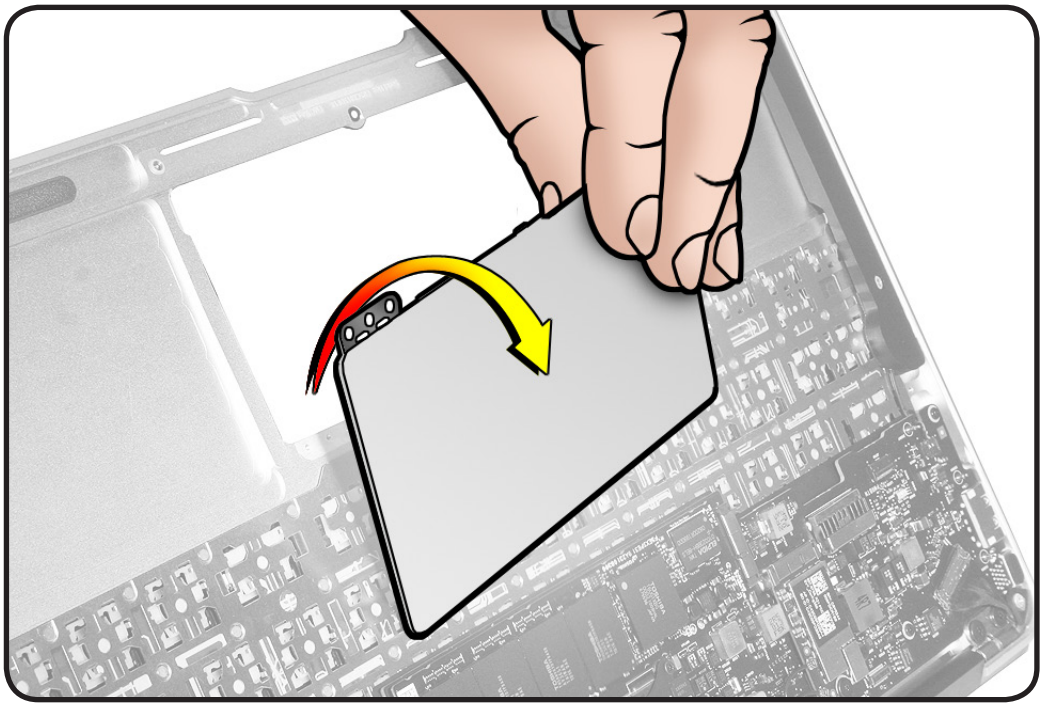


3 Remove 6 Phillips #000 screws from flexures (3 screws on top row of flexures). Discard screws.
922-9255 (1.47 mm)

4 With keyboard flex cable still connected, lift top case up and push trackpad toward keyboard until bottom lip of trackpad clears top case.

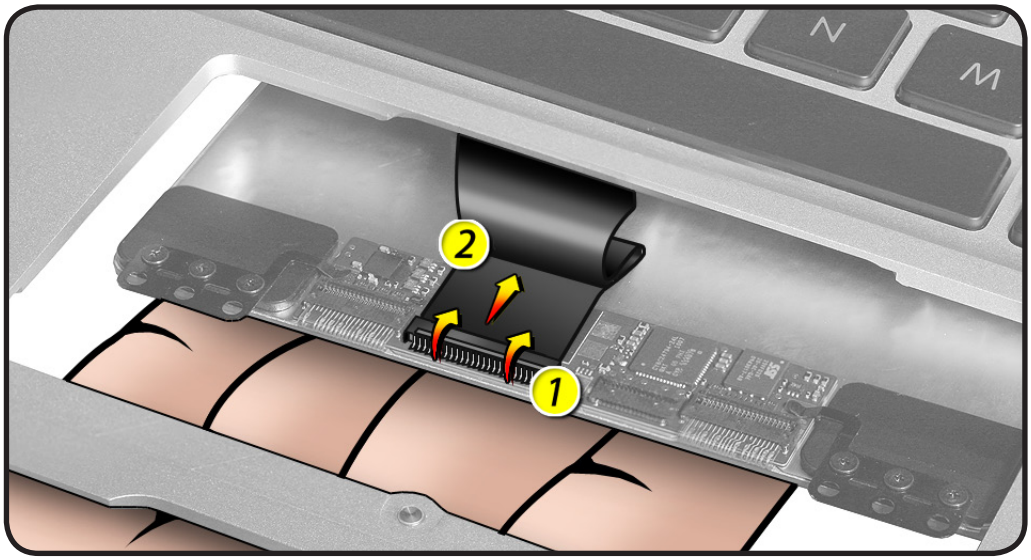


5 Without straining flex cable, support trackpad as you turn it over.



6 Tilt up top case to access cable from other side.

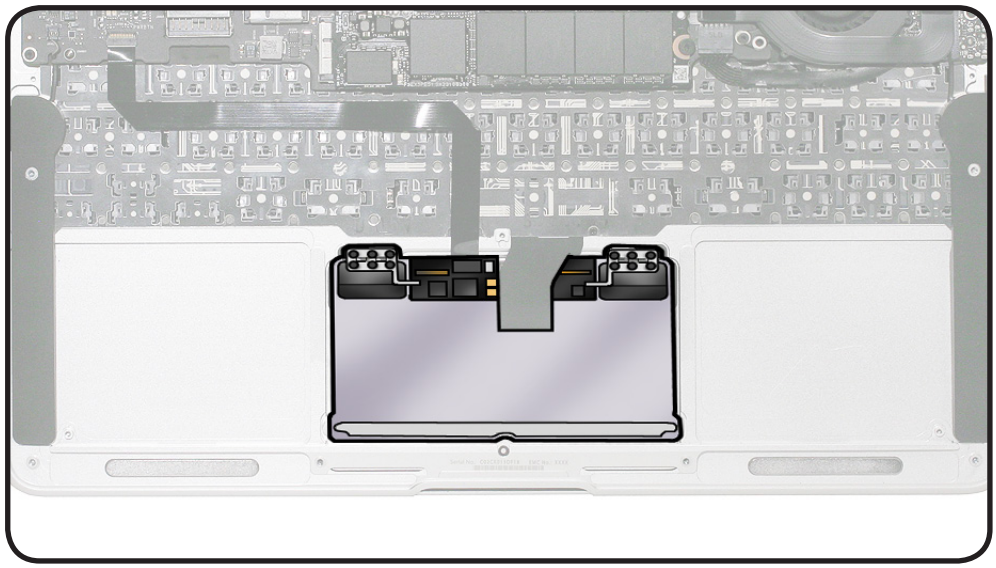
7 Flip up locking lever to disconnect keyboard flex cable from trackpad.



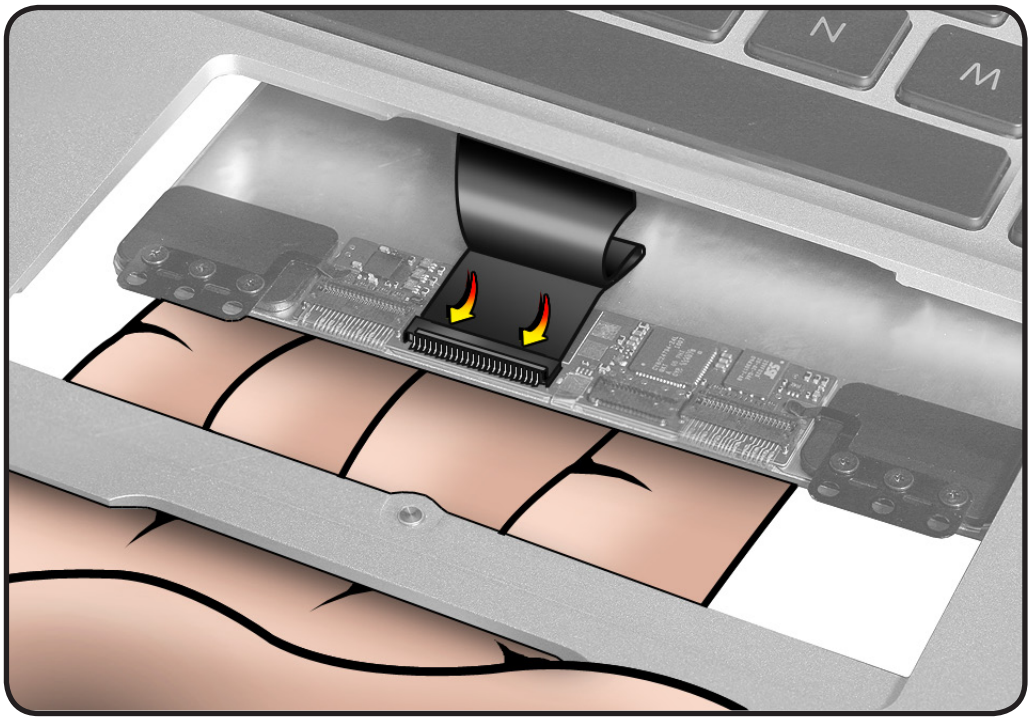
Replacement

1 Securely connect keyboard flex cable to trackpad.

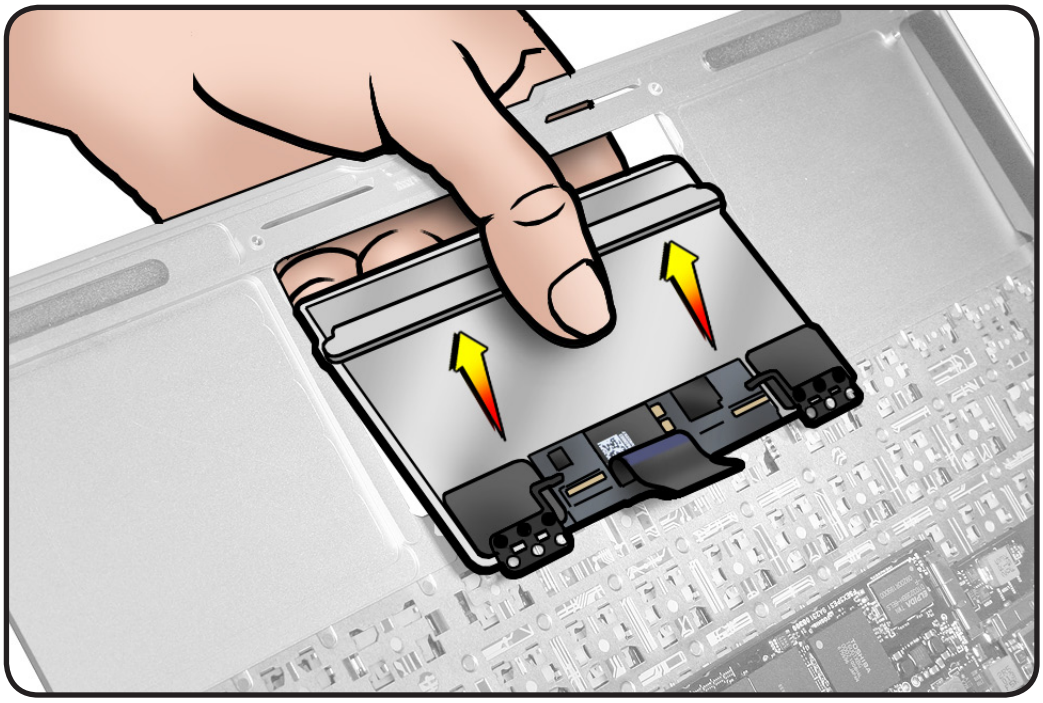
Important The keyboard flex cable MUST lay flat against the trackpad. The very high bond (VHB) adhesive holds the bend in the cable. If the VHB adhesive or cable are compromised, trackpad alignment issues may occur, which may require top case replacement.



2 Connect keyboard flex cable to trackpad and verify cable is seated properly before locking lever.



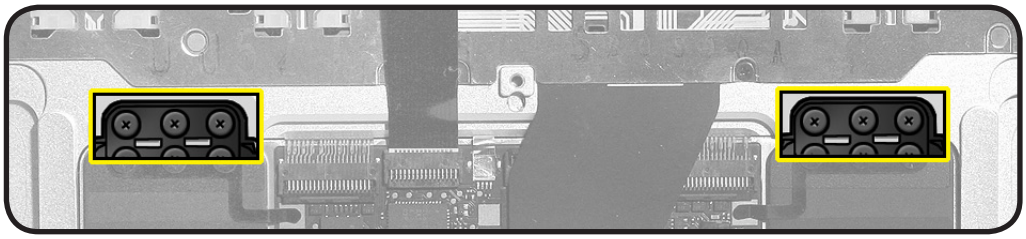
3 Rotate the trackpad (bottom lip first) into top case.



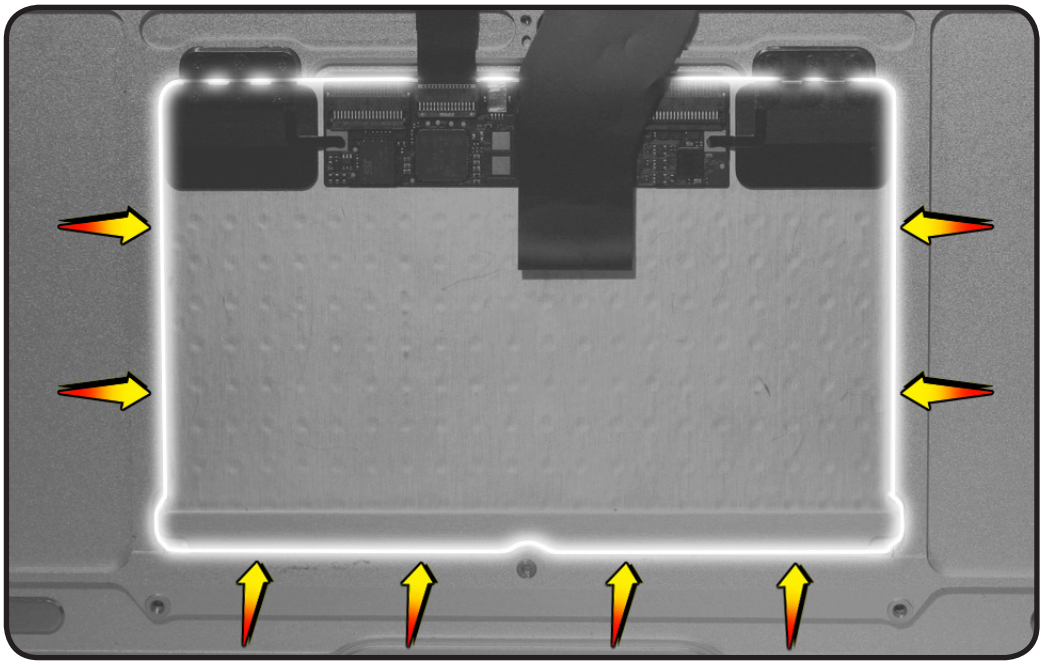
Caution: Be extremely careful not to scratch the trackpad against the top case during installation, especially along the lower front edge, where there is a protrusion on the top case for the set screw. Scratches on the silver trackpad will create black spots when viewed from the user side the trackpad.

Caution: Minimize rubbing edges of trackpad against top case while installing. This could cause tiny cracks to form on the trackpad.

4 Using screws from trackpad kit, loosely insert 6 screws in flexures. Do not tighten yet.

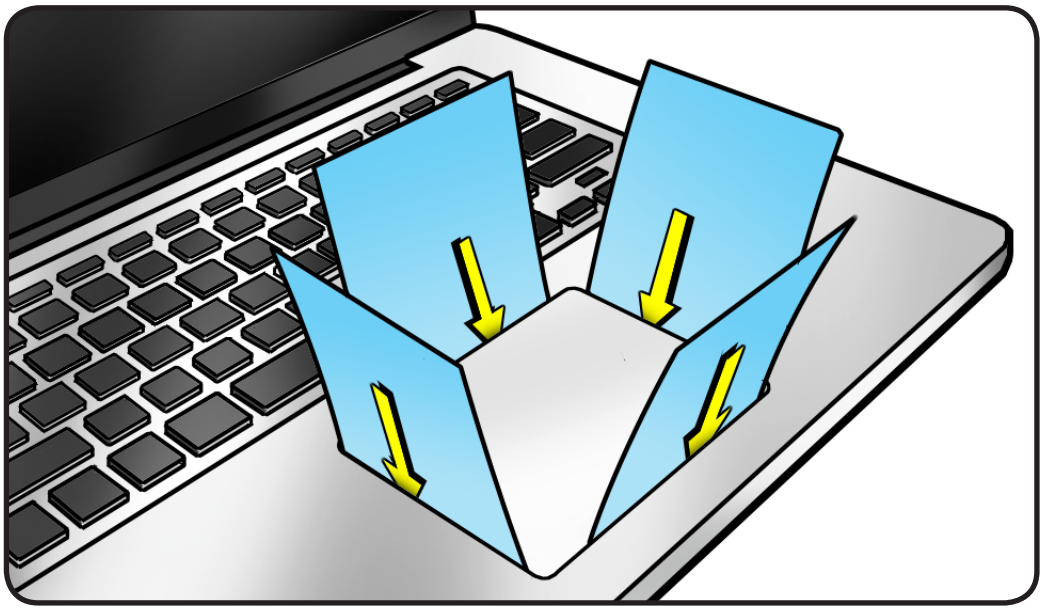


5 Check for even trackpad alignment at top, bottom, and sides by holding top case up to light. Look for even gaps.

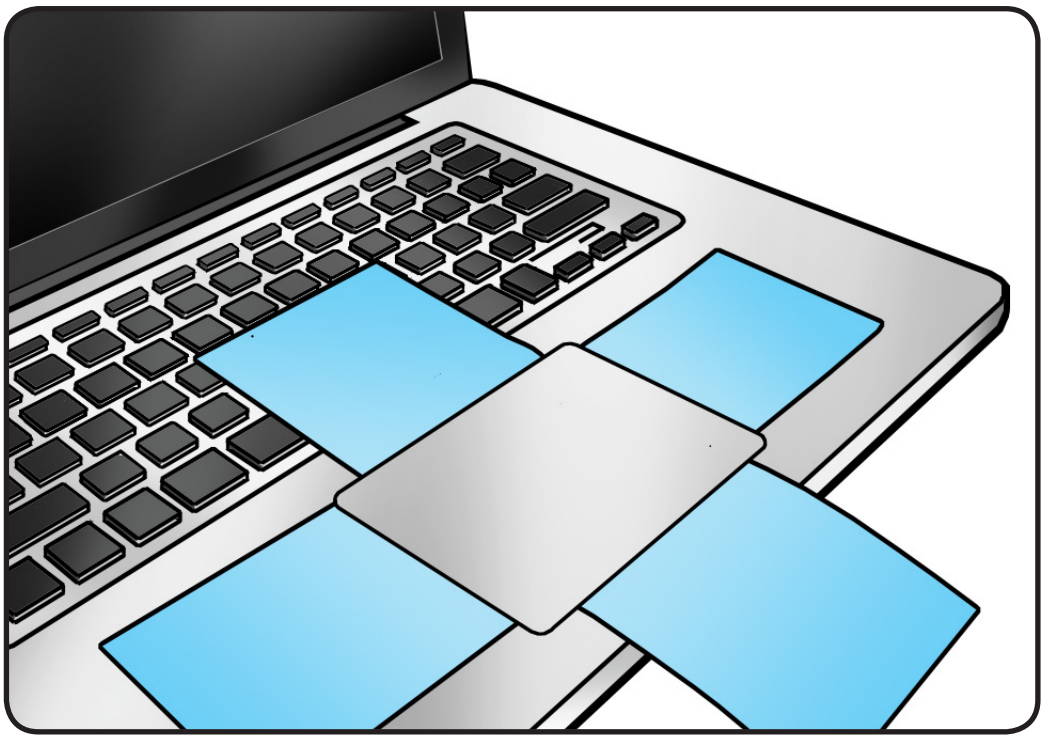


6 With even gaps verified, secure 2 center screws first.

7 If necessary, on the palm rest, insert one sticky (Post-It) note into gap on each of the four sides of trackpad.



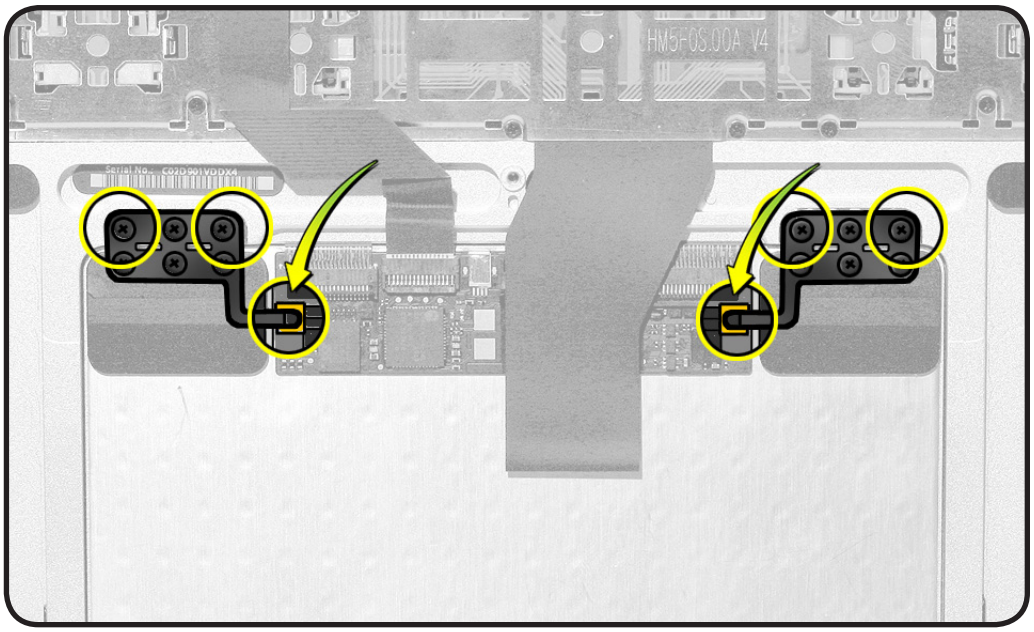
8 Fold sticky notes over so that top case can be laid flat.



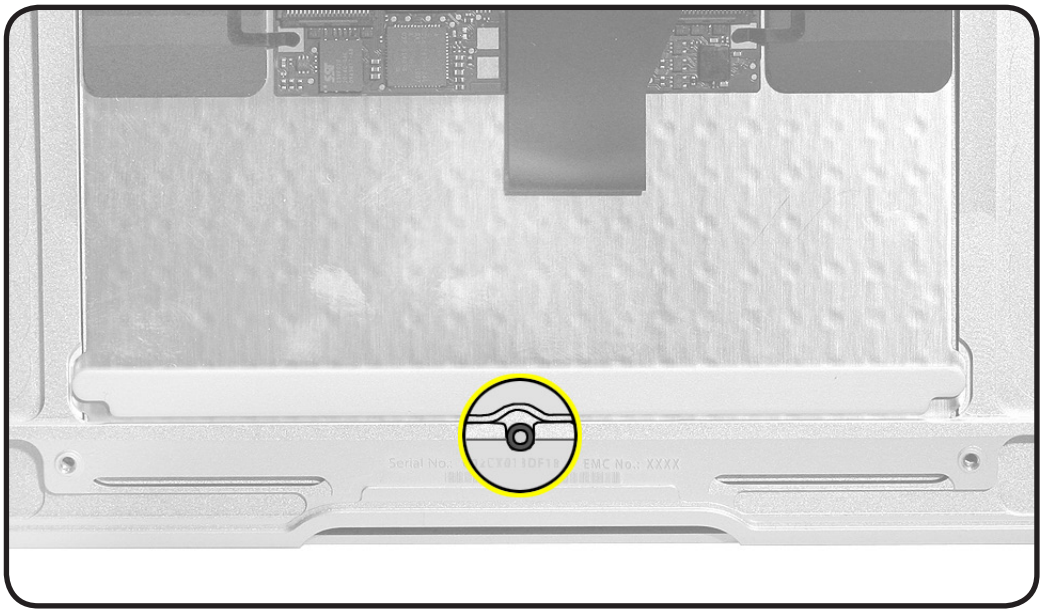
9 Close display and secure final 4 screws.

10 Make sure flexure arms are touching the copper pads.

11 Connect IPD flex cable.

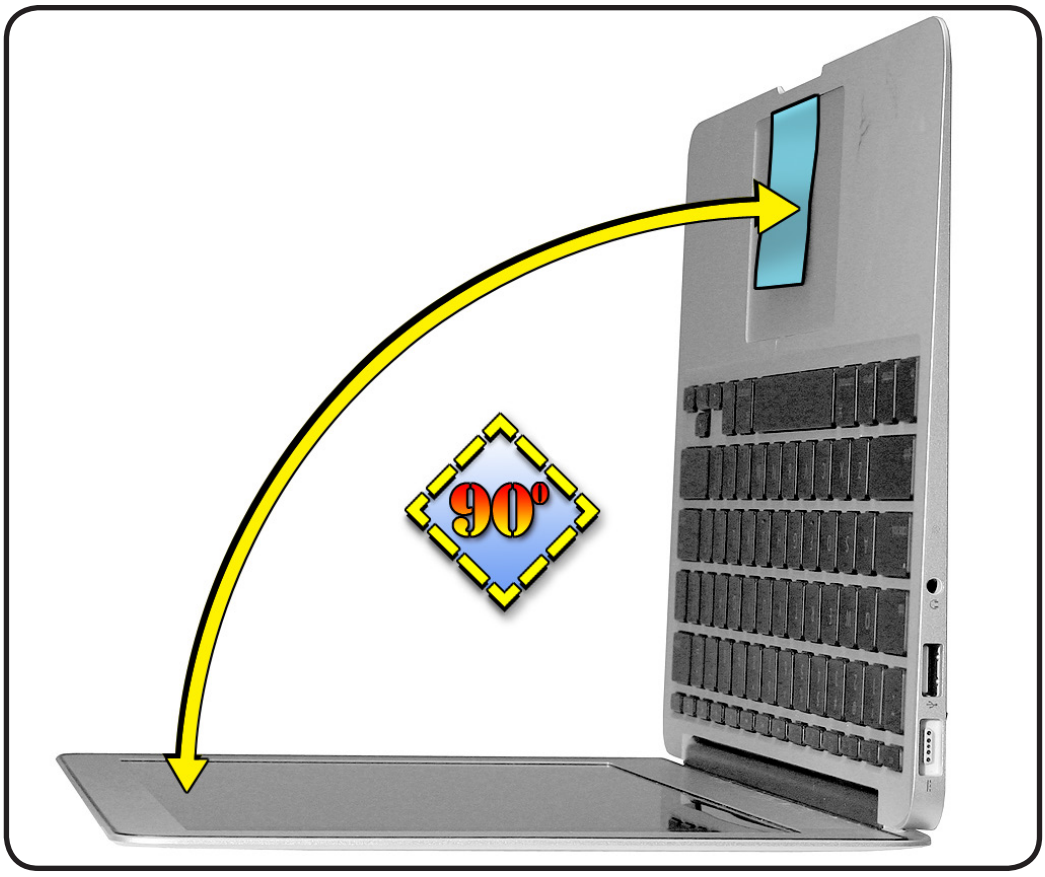


12 If you are installing the trackpad in a new top case, loosely install T5 set screw and go to next step
922-9255 (1.47 mm)



Important: If you are installing the trackpad in the existing top case, do not adjust the set screw, but check trackpad for normal clicking motion and reassemble the computer.

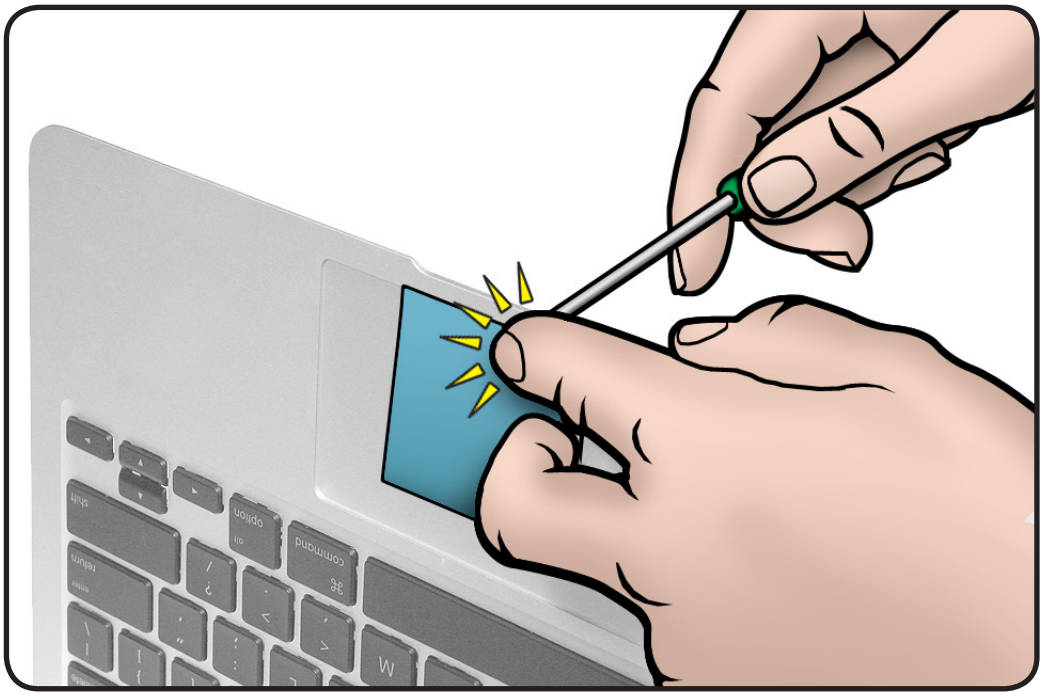
13 Place top case vertically, and align 1 sticky note to bottom edge of trackpad.



14 With one hand on edge of sticky note and the other hand slowly adjusting the set screw, tighten screw just until sticky note on trackpad feels flush with top case.

Important: Overtightening set screw can damage trackpad.

15 Remove sticky note and check trackpad for normal clicking motion.



Display Module

First Steps

Remove:

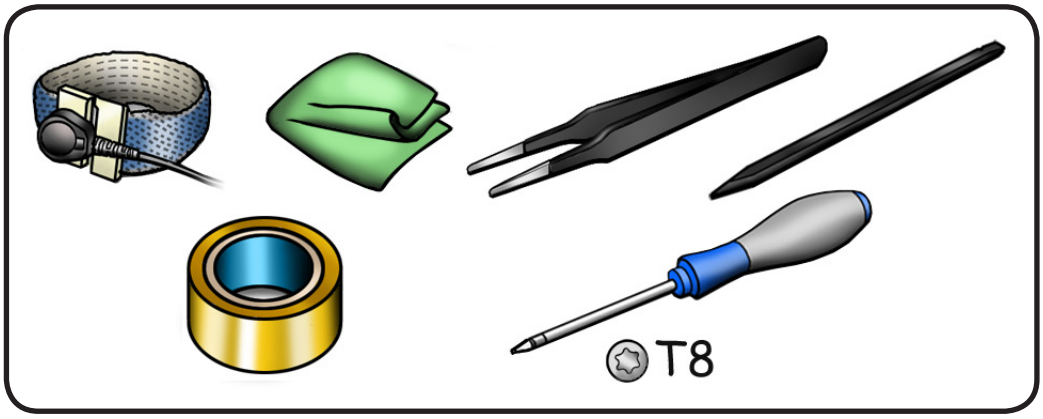
- Bottom Case
- Battery
- I/O flex cable
- Fan
- Logic board (with heatsink and AirPort/ Bluetooth attached)

Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.

Tools

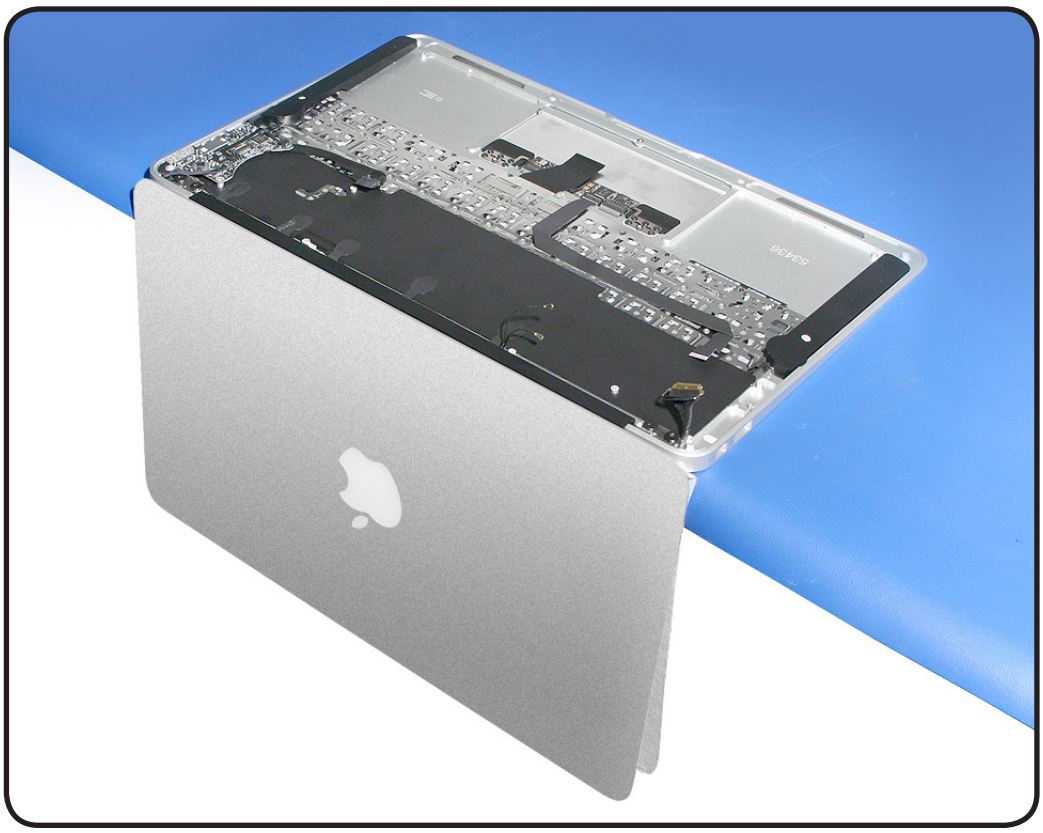
- ESD wrist strap
- Clean, soft, lint-free cloth
- Torx T8 screwdriver, magnetized
- Black stick
- Tweezers
- Kapton tape



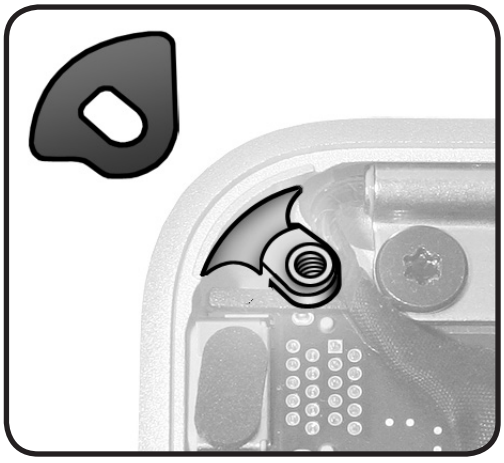
Removal

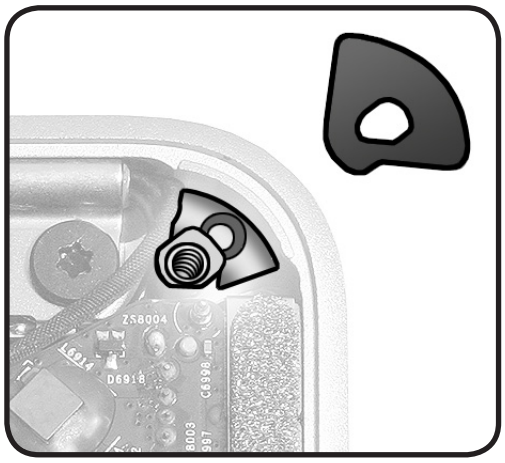
1 Place display (open to 90 degrees) so it safely hangs over a clean, padded table edge.

The back of the display housing should face you. Use a clean, soft, lint-free cloth to protect the assembly from scratches.

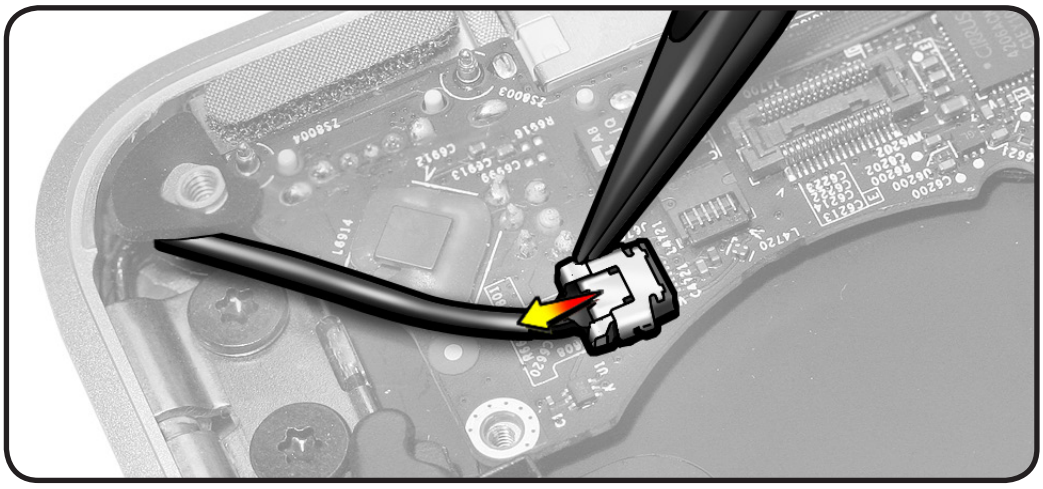


2 Retain 2 wedge-shaped rubber cable gaskets from rear corners of top case. The gaskets are unique to each rear corner.



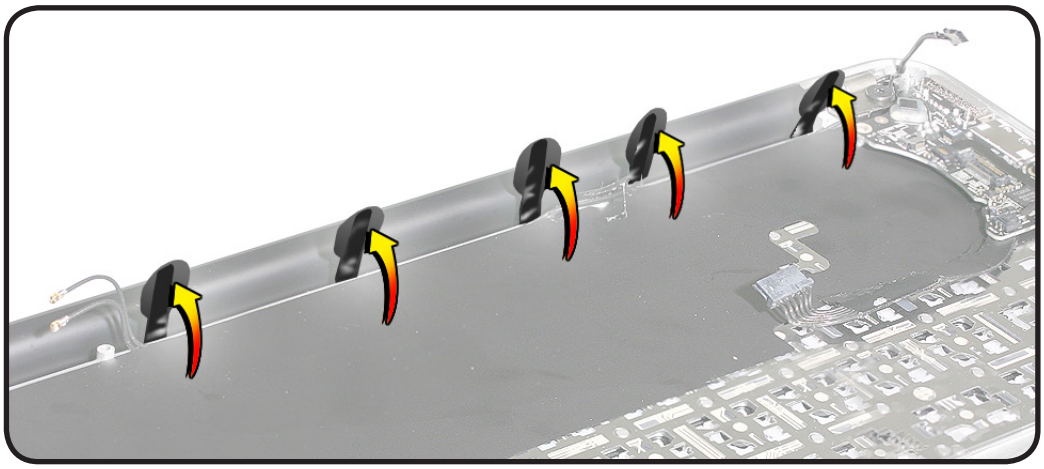


3 Disconnect camera cable from I/O board.

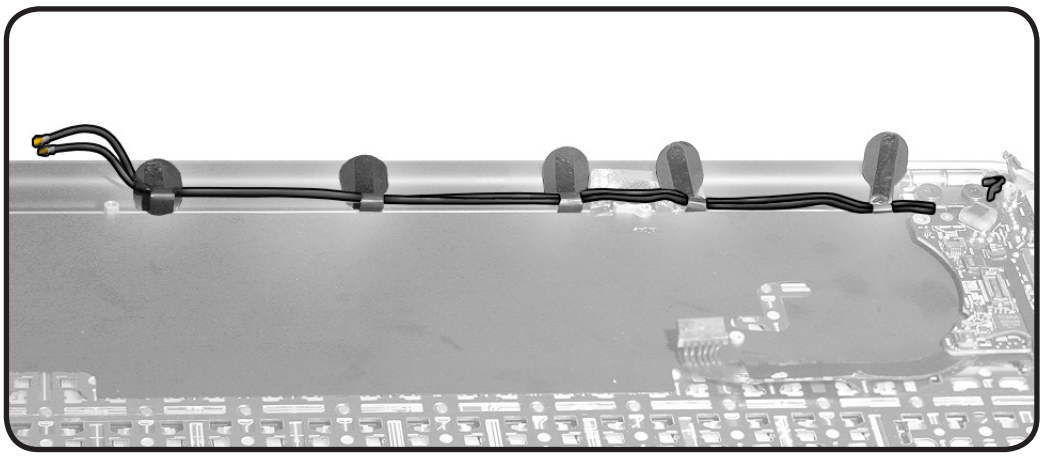


4 Peel up 5 wireless cable labels.

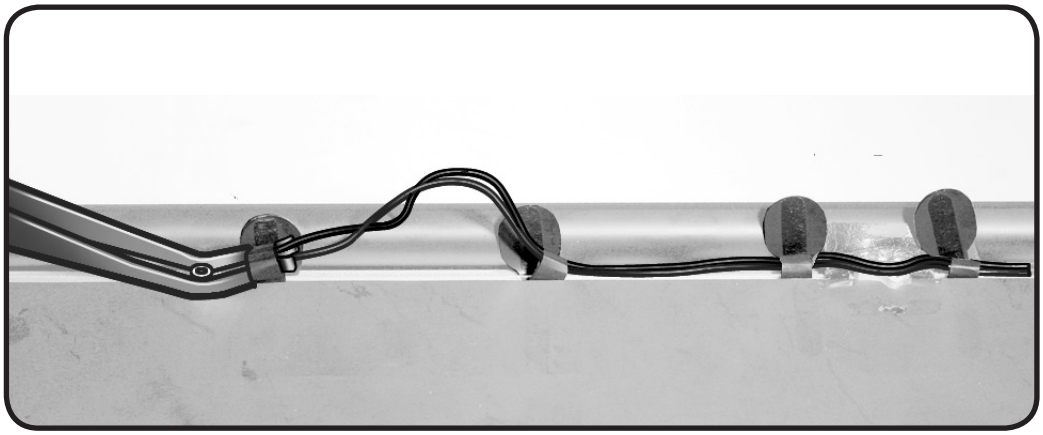
Note: You might notice a slightly different label shape.



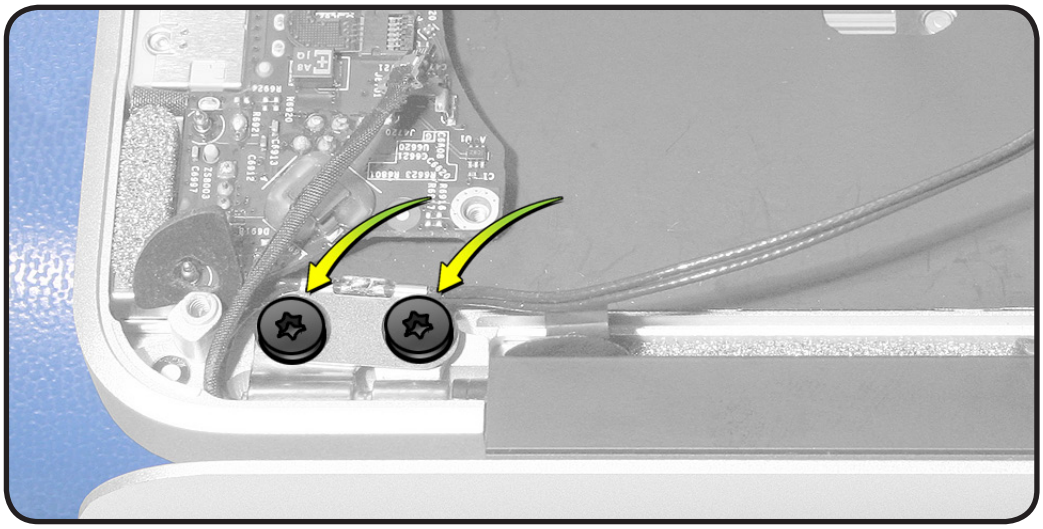
5 Use a black stick to pull looped end of labels through slots.

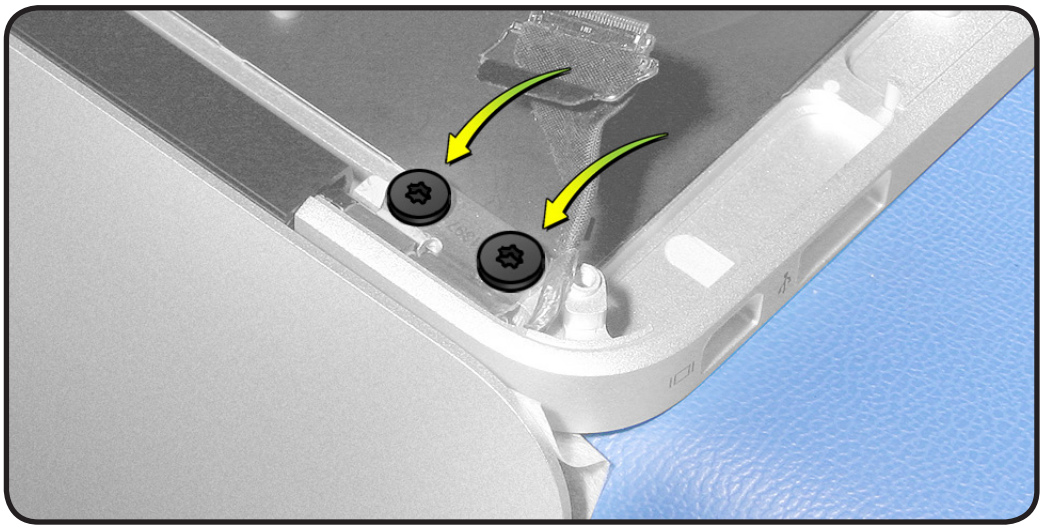


6 Use tweezers or black stick to hold open each loop as you feed the pair of antenna cables toward I/O board.



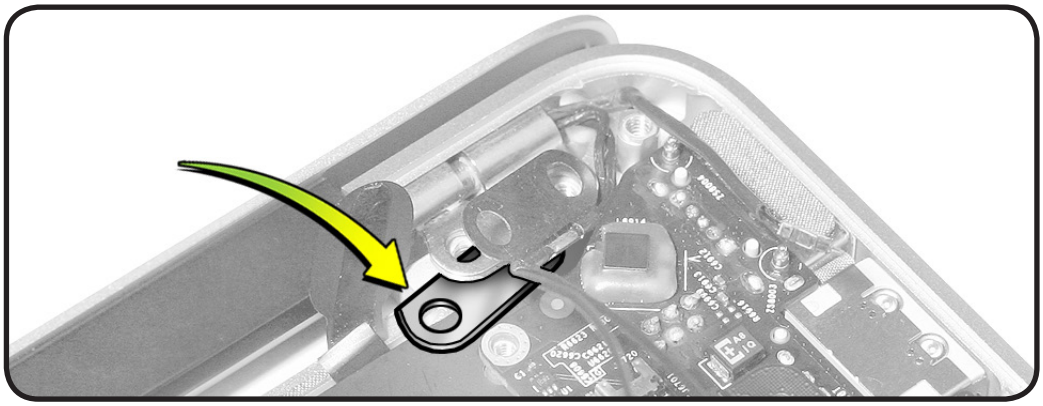
7 Remove 4 Torx T8 screws (2 at each clutch)
922-9688 (4.85 mm)

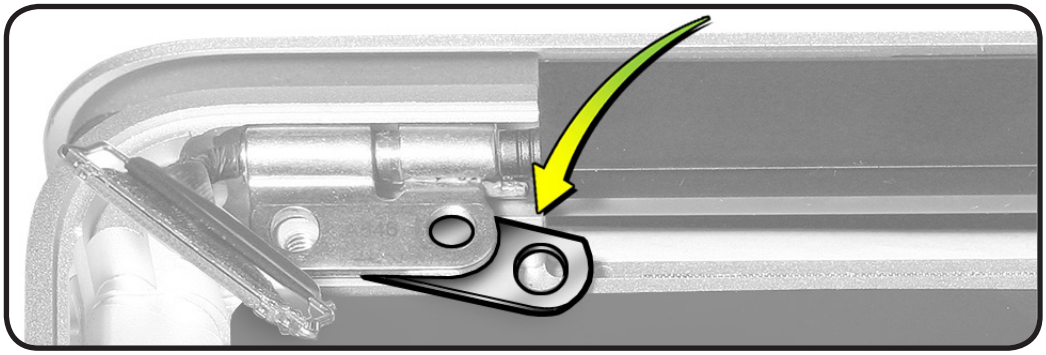




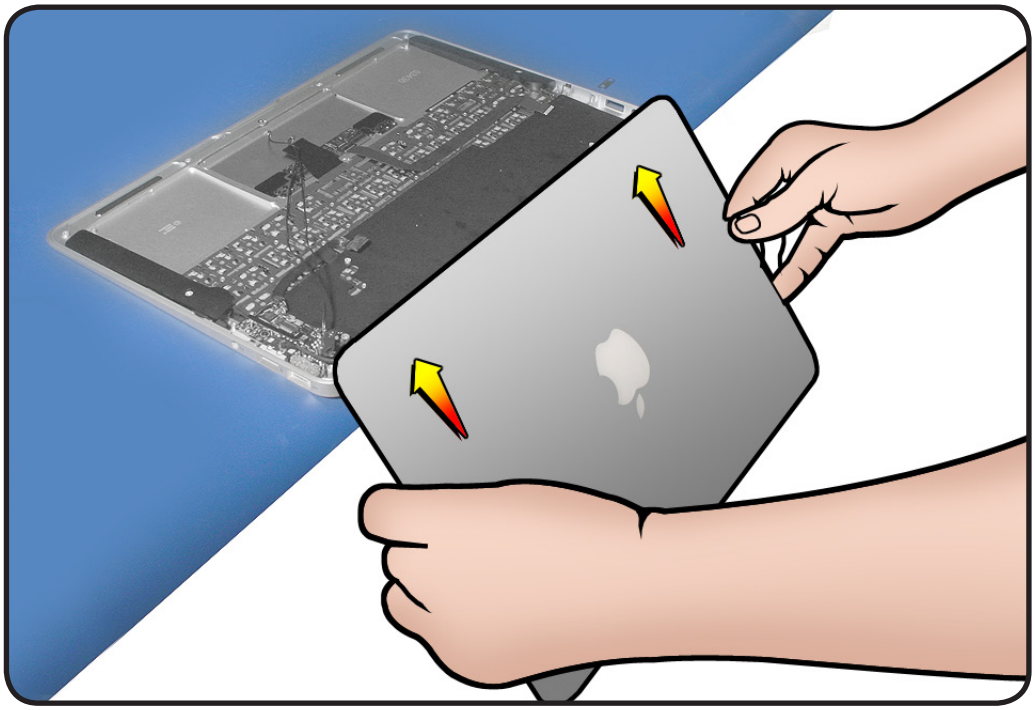
8 Reserve metal shim at each clutch:
922-9695 (0.2 mm thick)

Replacement Note: Place 1 shim under each clutch hinge before securing clutch screws. At the hinge with the antenna cables, the clutch hinge fits in between the shim and the cable retainer.



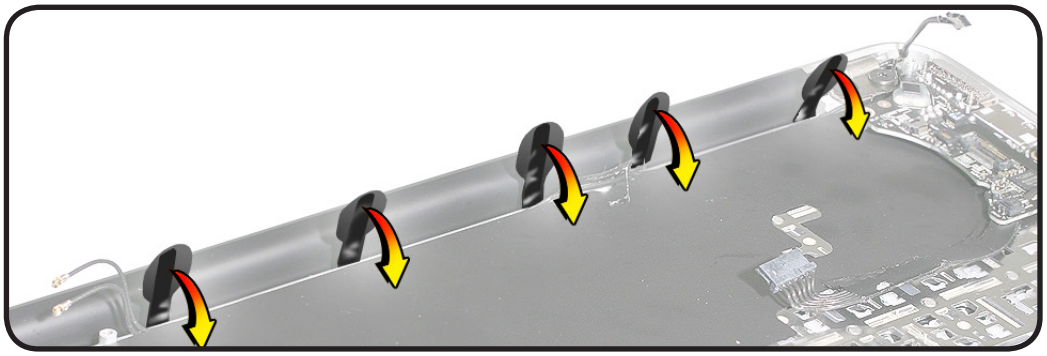


9 While supporting assembly, separate display module from top case.



Replacement

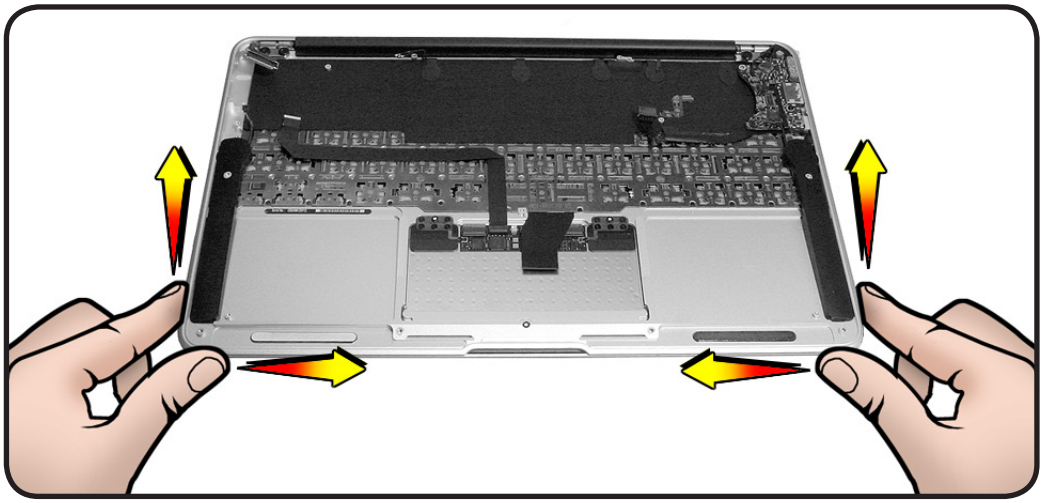
Note: If you are replacing the display module, as opposed to the top case, reuse the wireless cable labels unless they are damaged. If labels are damaged, install new ones as shown in **Wireless Cable Labels**.



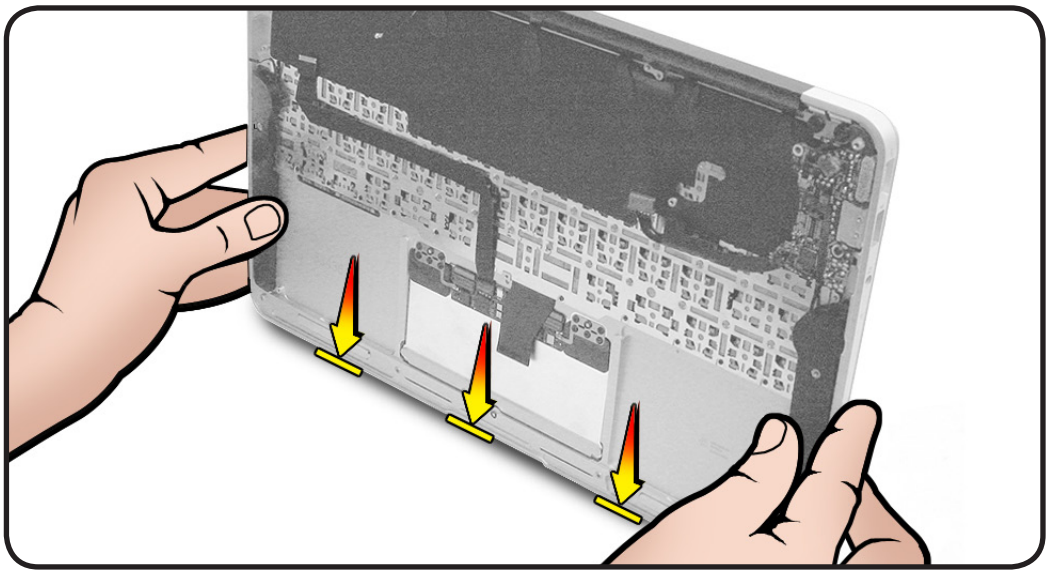
1 With shims under clutch hinges, loosely install screws.

2 Close the display and place the system on a flat surface.

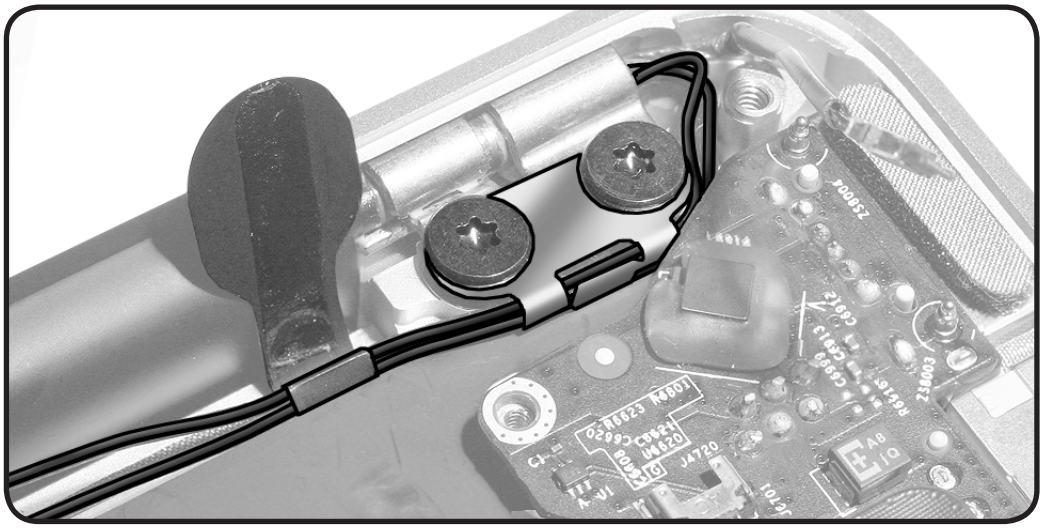
3 Adjust the alignment by touch.



4 Stand up the system on a clean, flat surface to level the front-to-rear clutch alignment.



5 Secure screws hand tight, and pull cable labels up from display clutch.

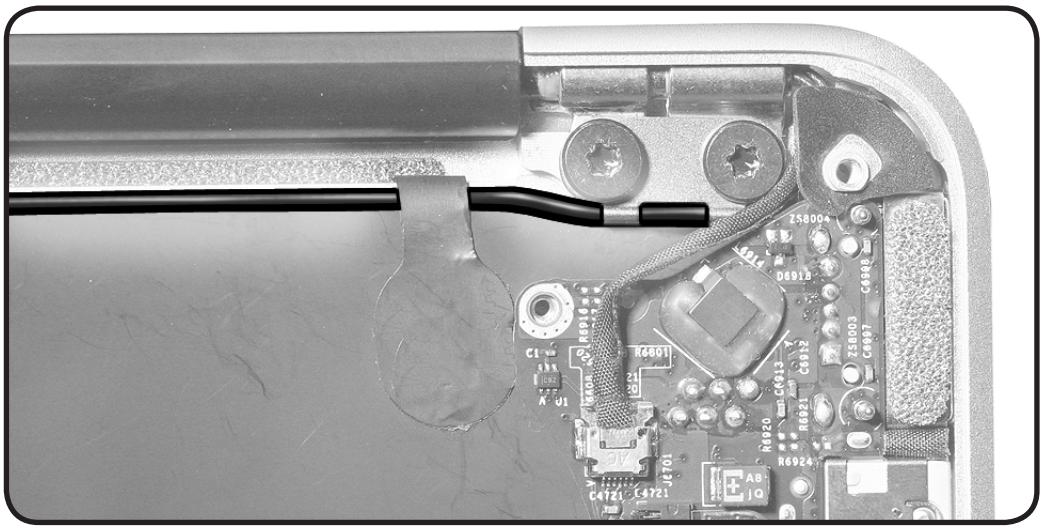


6 Note cable routing at display hinge for reinstalling the antenna cables.

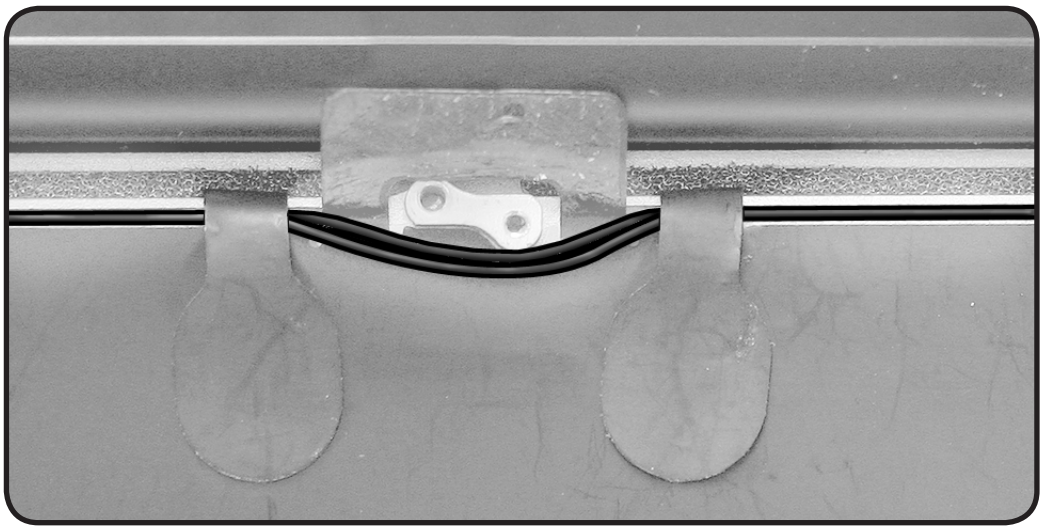
7 Feed paired cables through the loop of each wireless cable label and into slot.

8 Route cables into slot, one on top of the other. Make sure they maintain that orientation (already set by the retainer) throughout.
Avoid

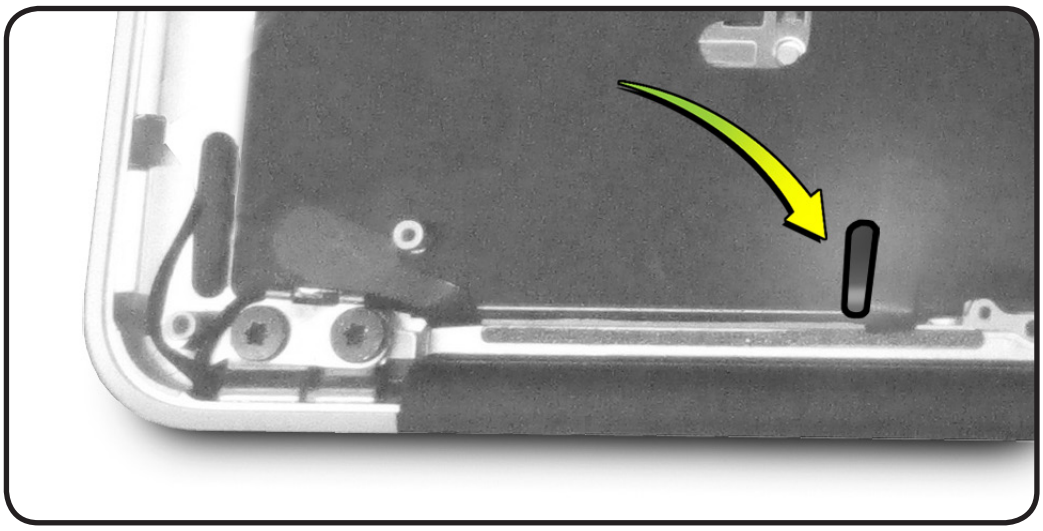
- twisted cables
- pinched cables
- excess cables



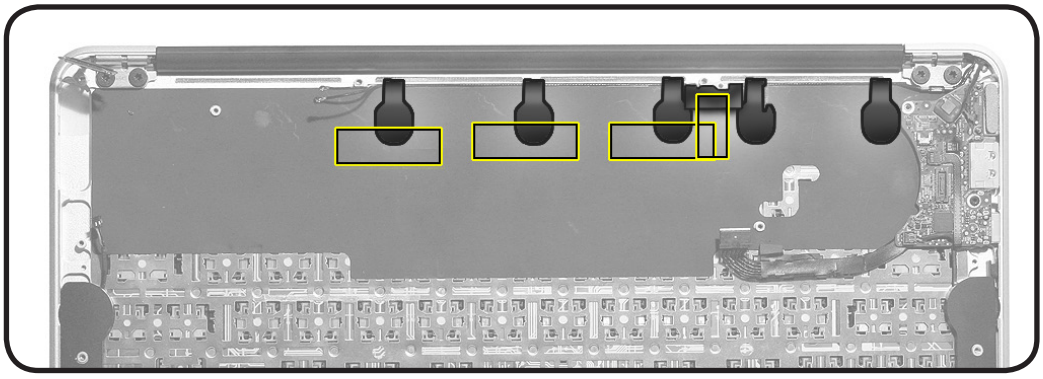
9 Continue routing antenna cables to the left, tucking them into slot.



10 If the foam pad under the fan is moved during this procedure, reposition it beside the second cable label, as shown.

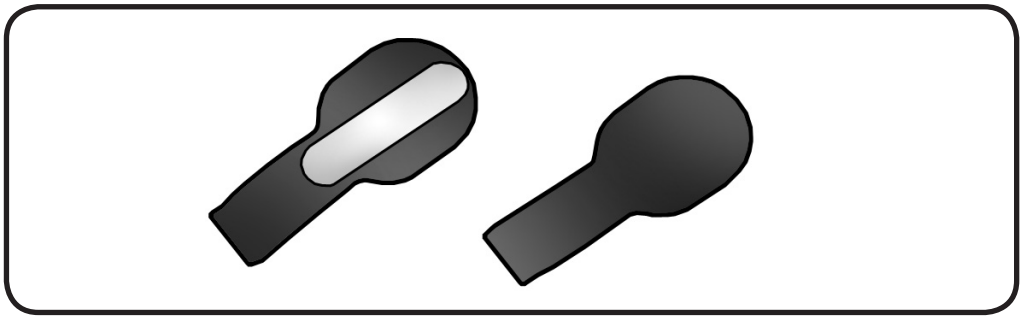


11 **Note**: If the adhesive on a cable label no longer sticks, replace the cable label. Or if a replacement is not available, apply 1 strip of Kapton tape over the lower 2/3 of any of the cable labels shown.



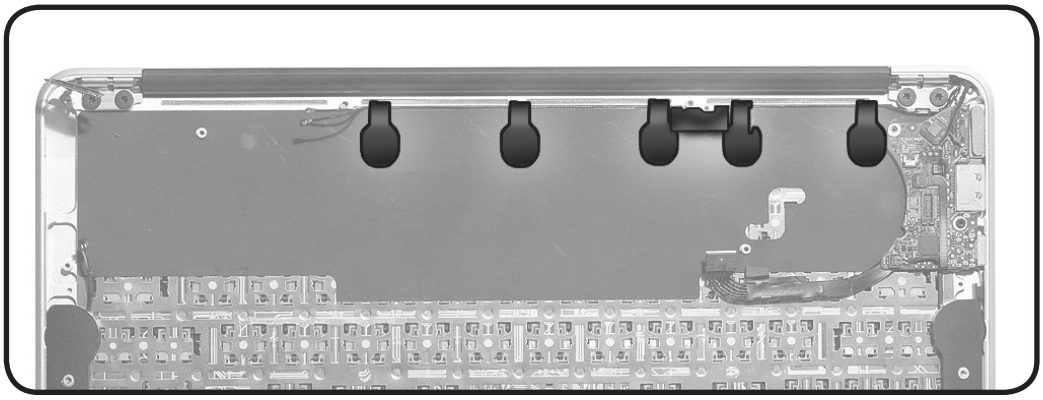
The fan body maintains pressure on the other 2 cable labels.

Caution: Do not add tape under fan; doing so could result in fan noise or impede fan function. Instead, make sure labels under fan are completely flush with top case. If not, replace labels under fan.



Wireless Cable Labels

First Steps



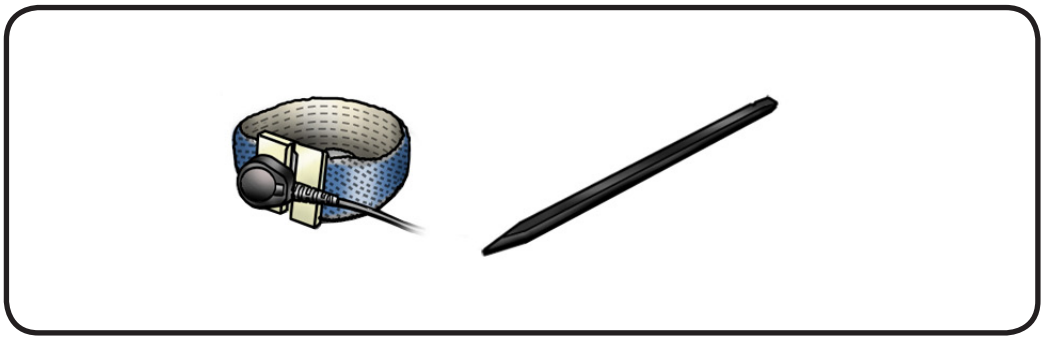
Remove:

- Bottom case
- Battery
- SSD Card
- I/O flex cable
- Fan
- Logic board (with heatsink and AirPort/ Bluetooth attached)
- Display module

Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.

Tools



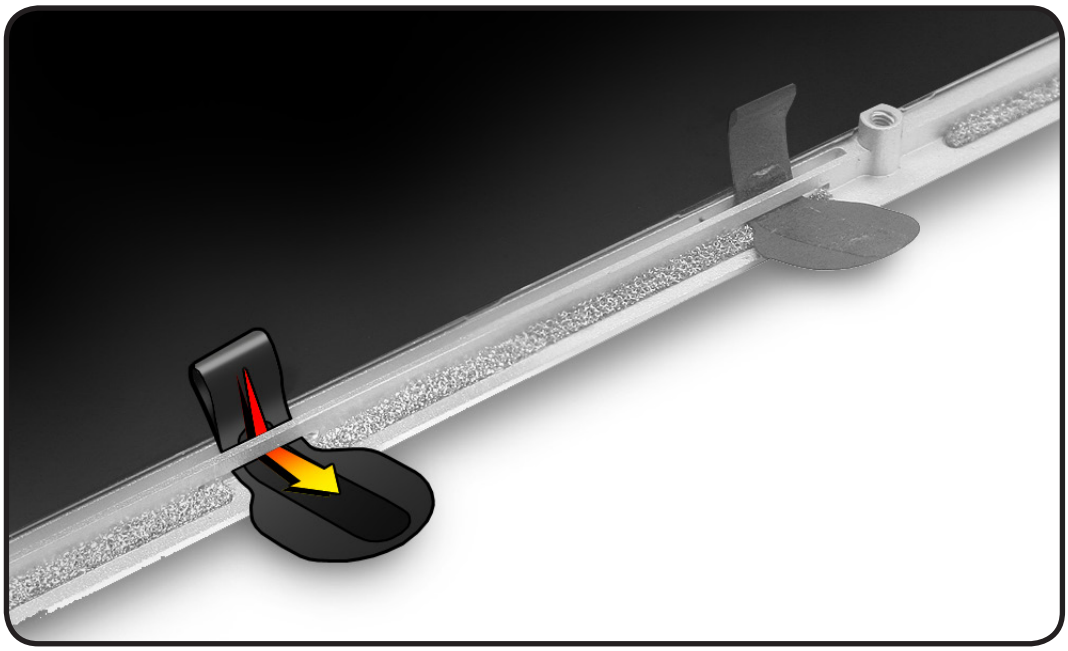
- ESD wrist strap
- Black stick

Removal

Note: You might notice a slightly different label shape. Refer to **Cable Label Differences**.

Pull out wireless cable label(s) from back of top case.

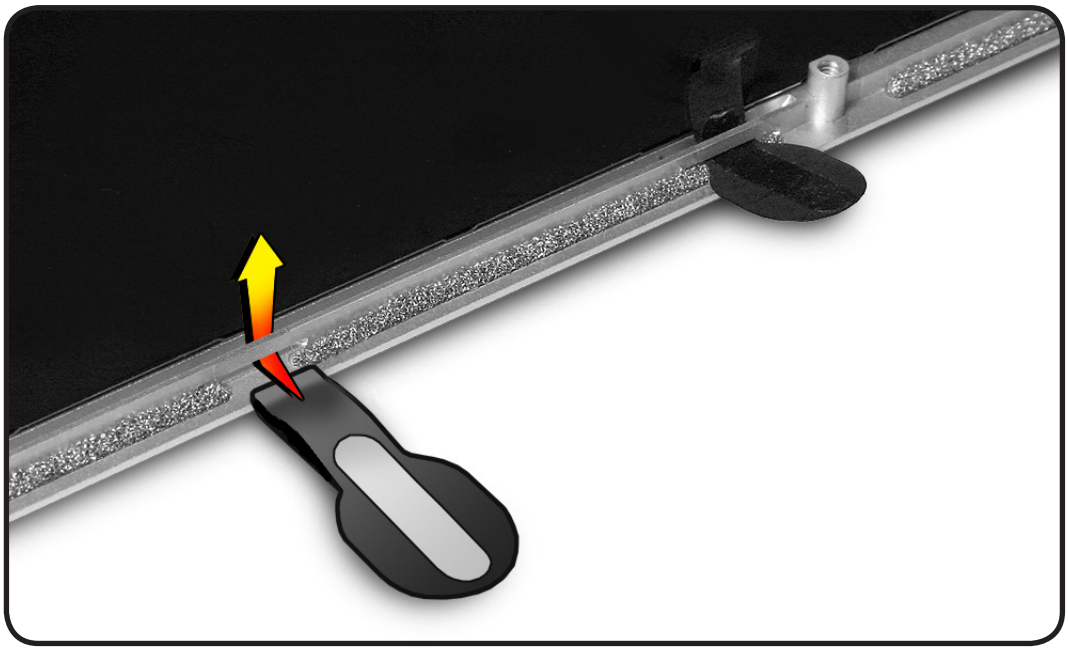
Only replace those labels that cannot be reused.



Replacement

1 Feed narrow end of wireless cable label through slot in top case. Repeat for other labels if necessary.

2 Before removing adhesive strips from labels, align display module to top case as described in **Display Module**.

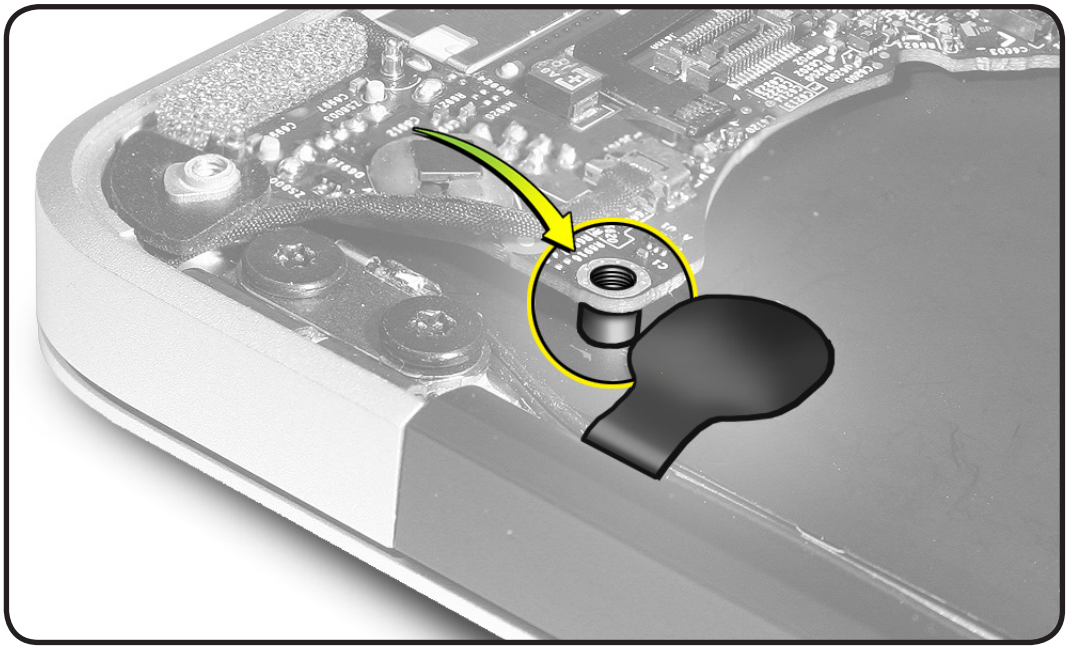


Cable Label Differences

A different label shape represents changes on the production line and does not affect product performance.

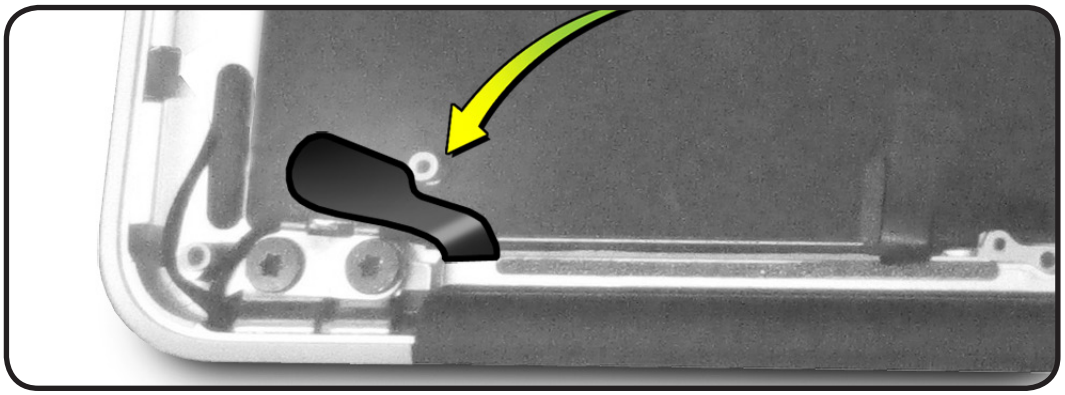
The service procedure is the same except for the cable label closest to the I/O board:

- If the cable label has no cutout, the label attaches next to, but not under, the I/O board.



- If the cable label has a cutout for the standoff, you must remove the I/O board to attach the label over the standoff.

- If the cable label has no cutout for the standoff but fits between the display hinge and standoff, you must remove the I/O board to attach the label.



Display Clutch Cover

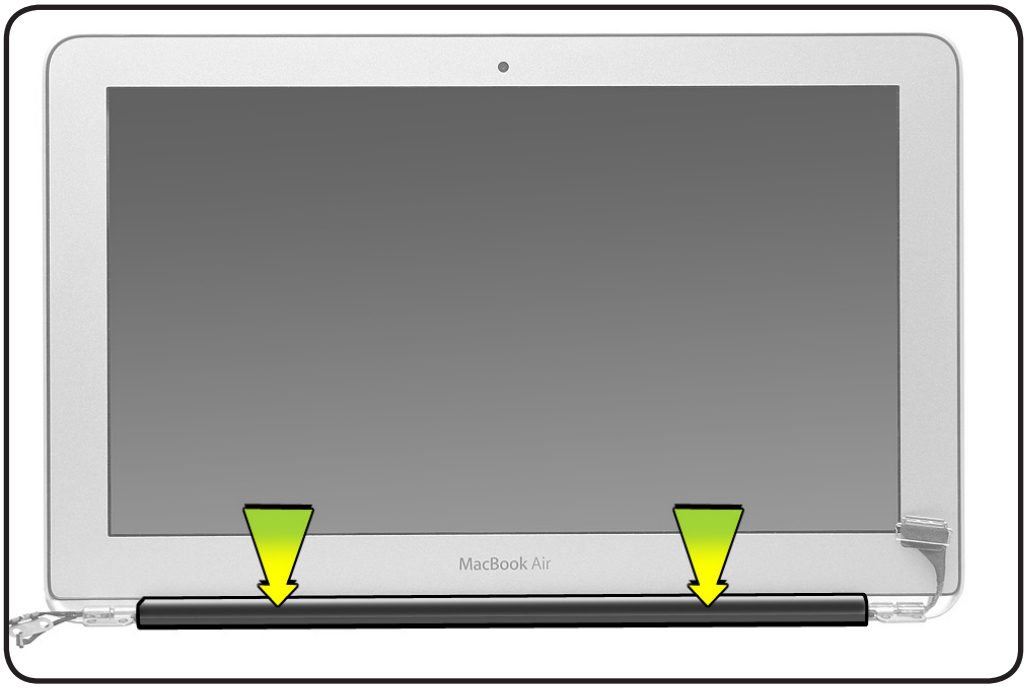
First Steps

Remove:

- Bottom Case
- Battery
- SSD card
- I/O flex cable
- Fan
- Logic board (with heatsink and AirPort/ Bluetooth attached)
- Display module

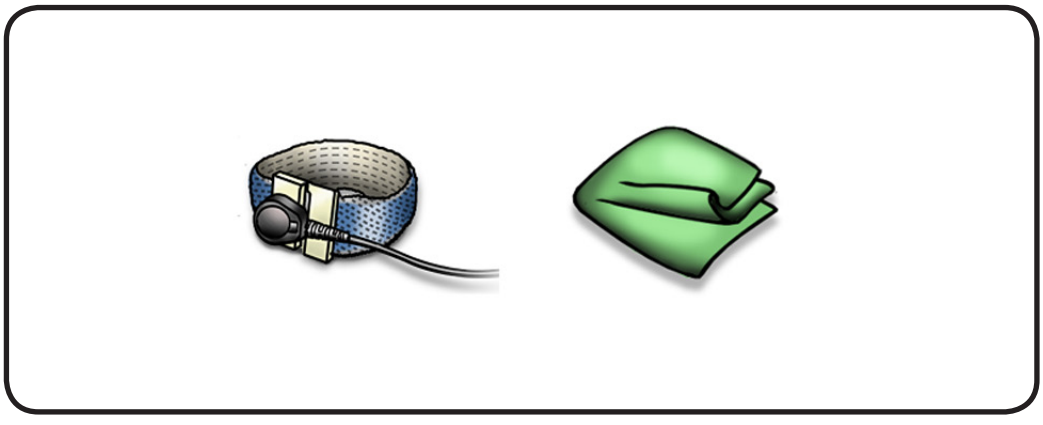
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.



Tools

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

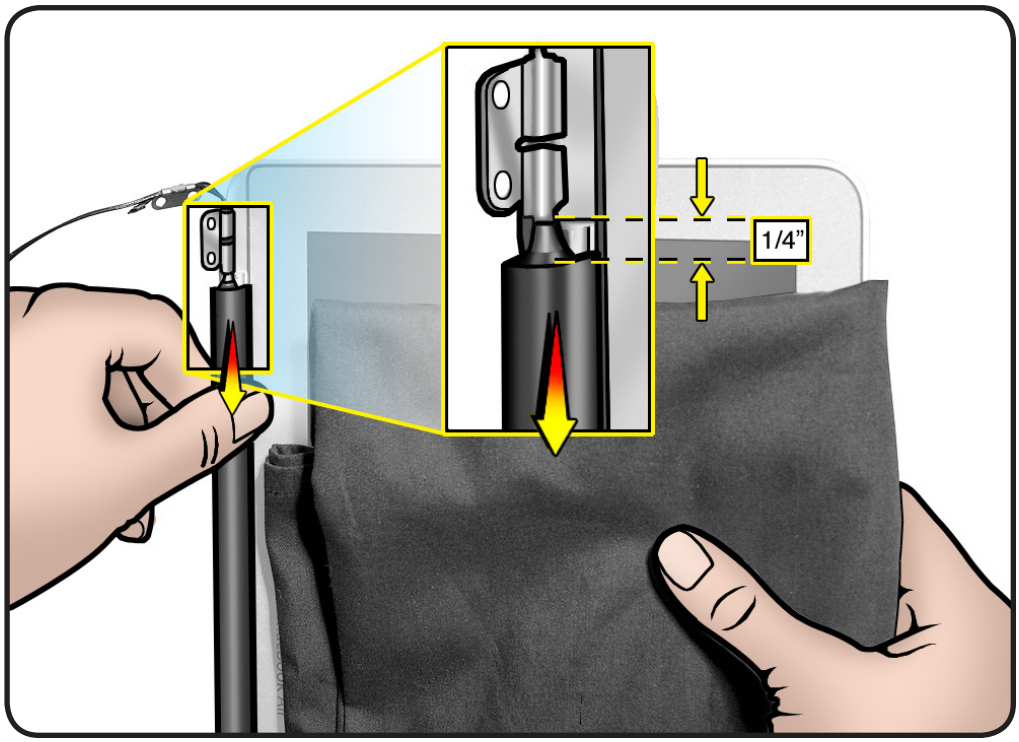


Removal

1 Cover display face with clean, soft cloth, and hold it vertically.

2 Slide clutch cover 1/4 inch (6.35 mm) away from antenna cables.

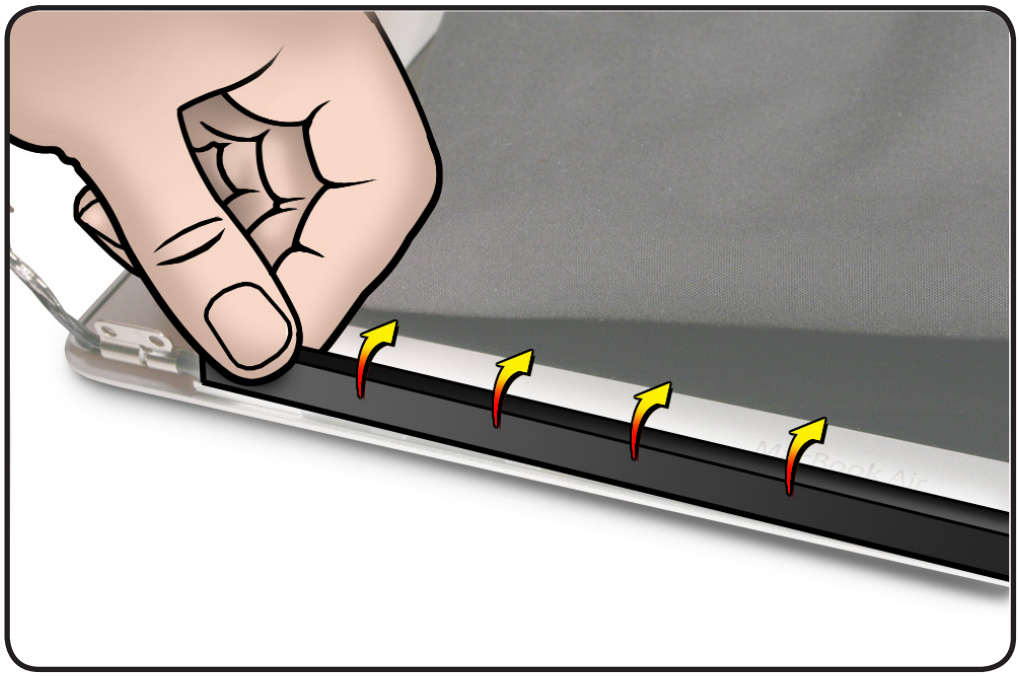
Note: If the clutch cover resists movement, insert a black stick in the crease to loosen any adhesive on the end of the clutch.



3 Place display module on table.

4 Pinch and tilt up end of clutch cover as you **roll it toward display face**.

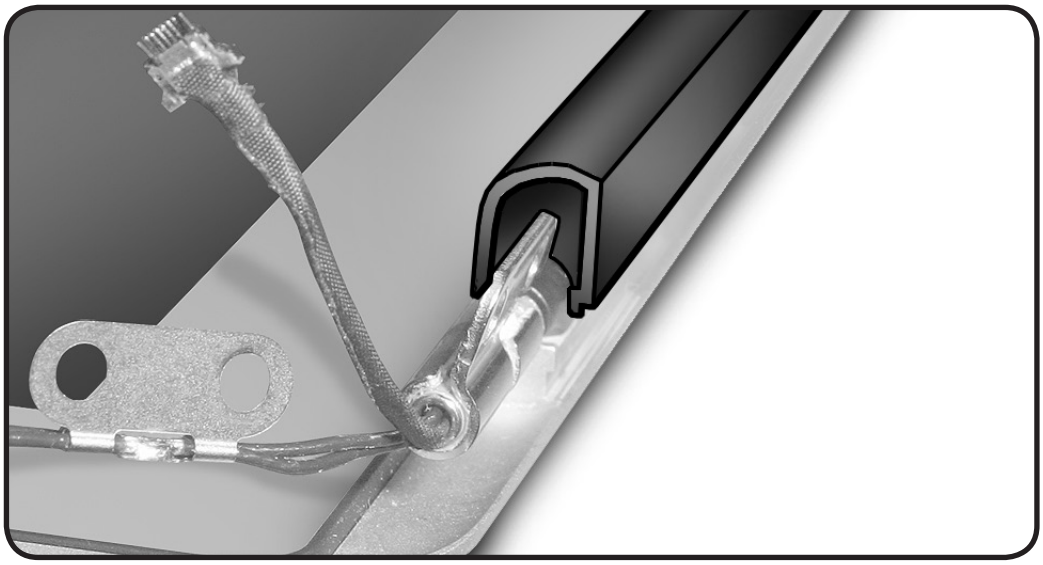
5 Remove clutch cover.



Replacement

1 Note shape of clutch cover:

- flat at bottom
- curved at top

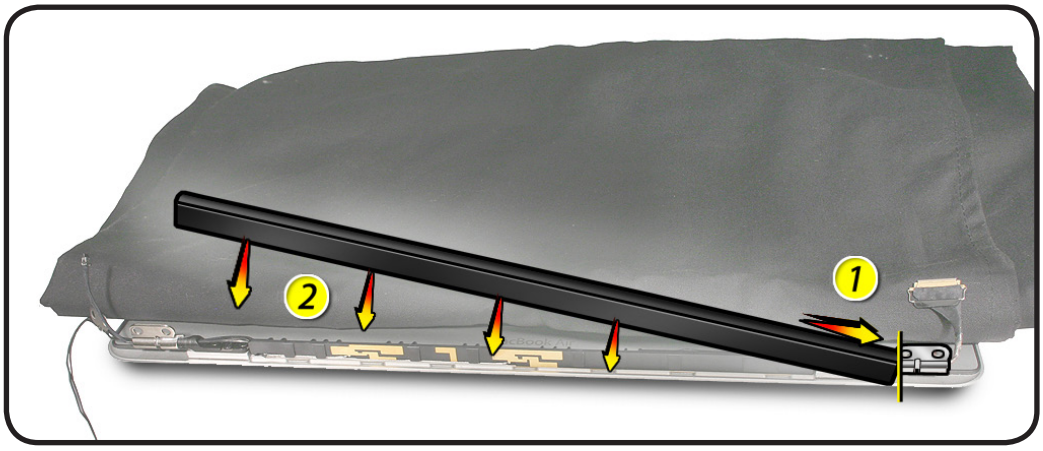


2 Make sure flat edge is at bottom of display.

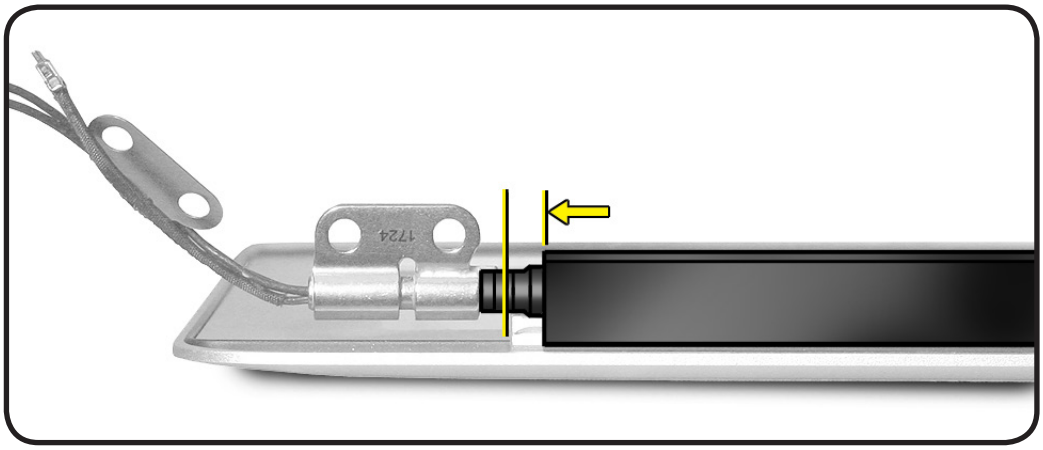
3 Tilt right end of clutch cover so it butts up against right hinge.

4 Lower clutch cover onto display assembly.

5 Listen for snapping sound as hooks engage.

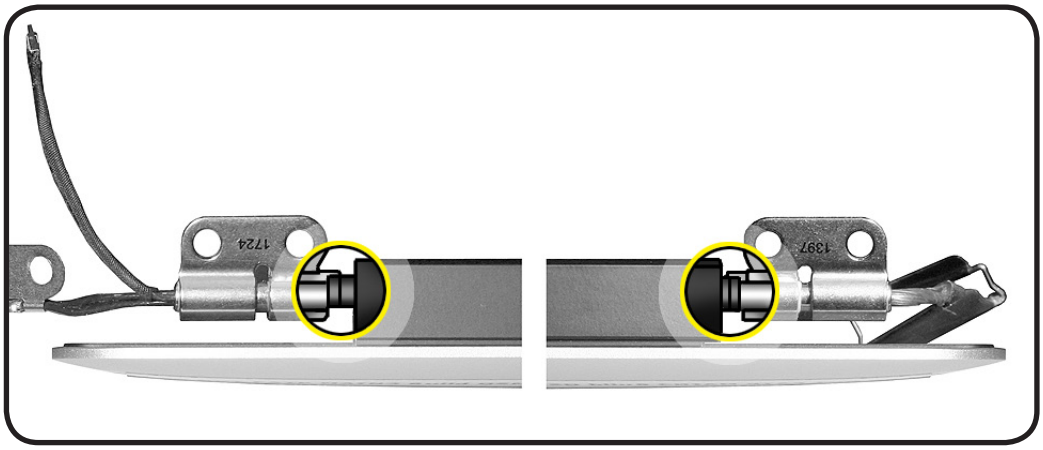


6 With the clutch cover engaged, slide it to the left to close the gap.



7 Check for good fit at both ends and across the clutch cover. Avoid:

- gaps
- bulges
- pinched cables

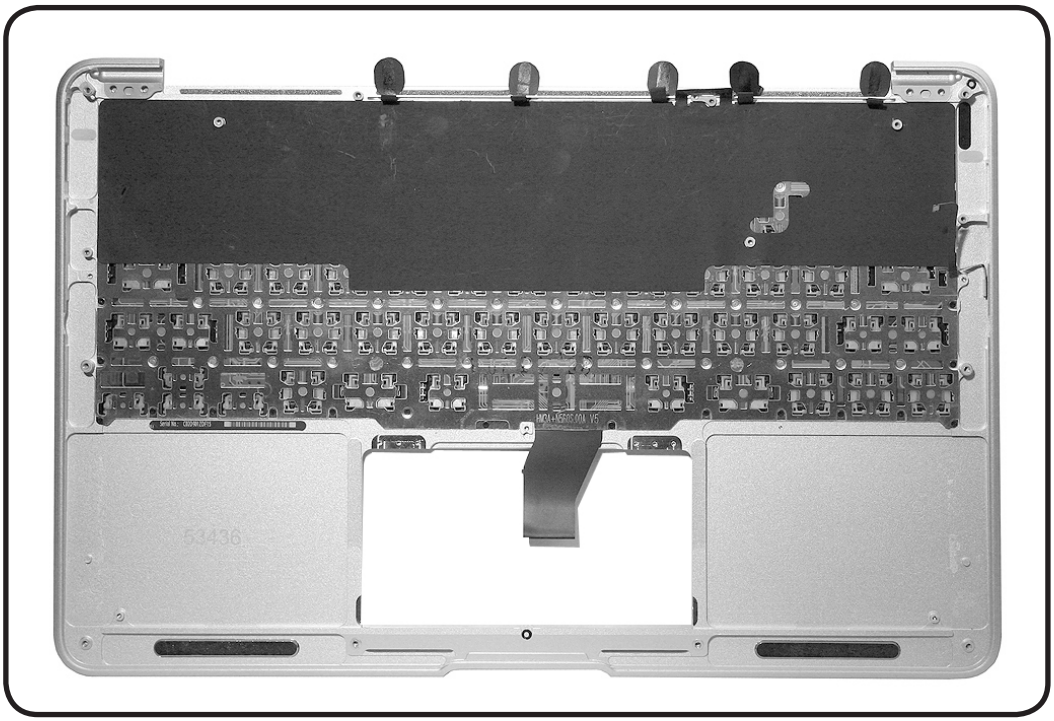


Top Case with Keyboard

First Steps

Remove:

- Bottom case
- Battery
- IPD flex cable
- Right speaker
- Left speaker
- Display module
- SSD card
- Fan
- Logic board (with heatsink and AirPort/ Bluetooth attached)
- Input/output board
- Trackpad
- I/O flex cable

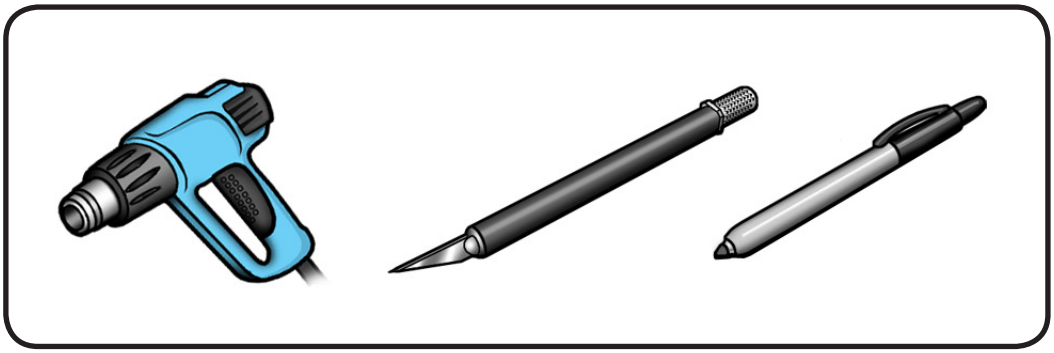


Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before beginning this procedure.

Tools

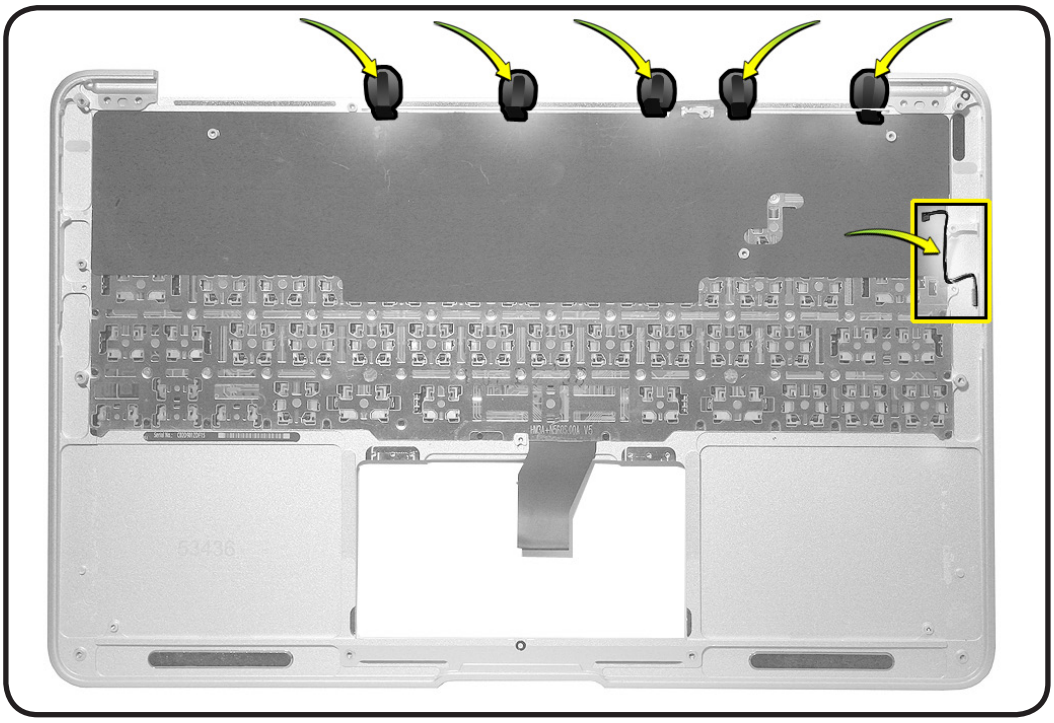
- Heat gun
- Knife
- Fine-tip permanent marker



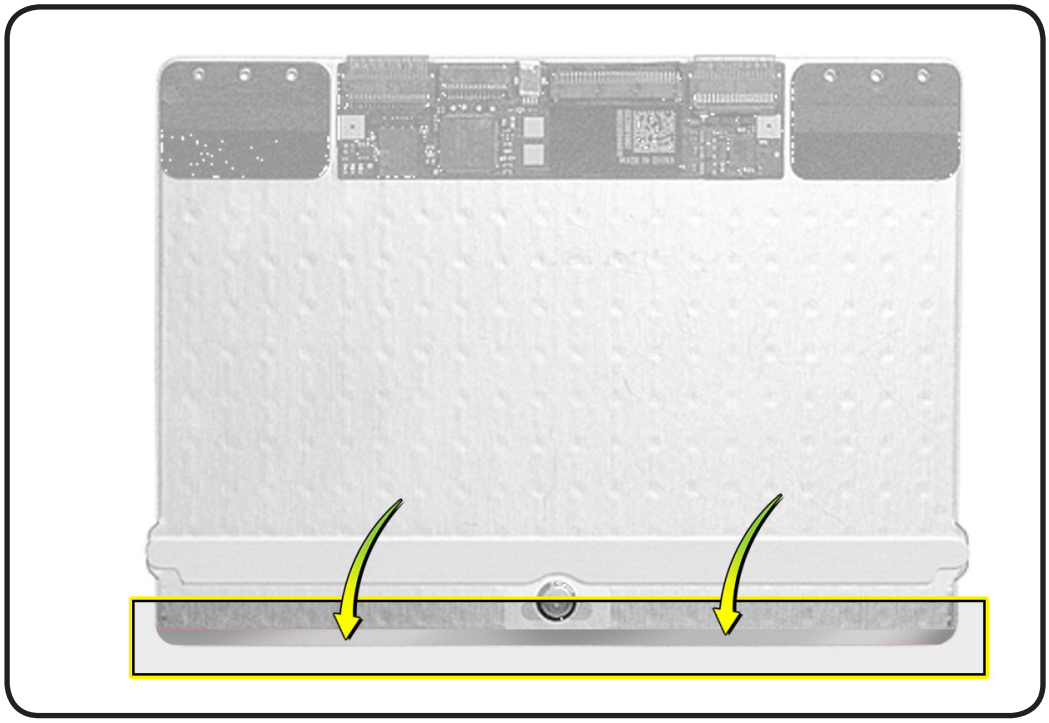
Removal

With the first steps completed, the top case is the remaining part. It includes these parts that are also available separately:

- microphone
- 5 wireless cable labels

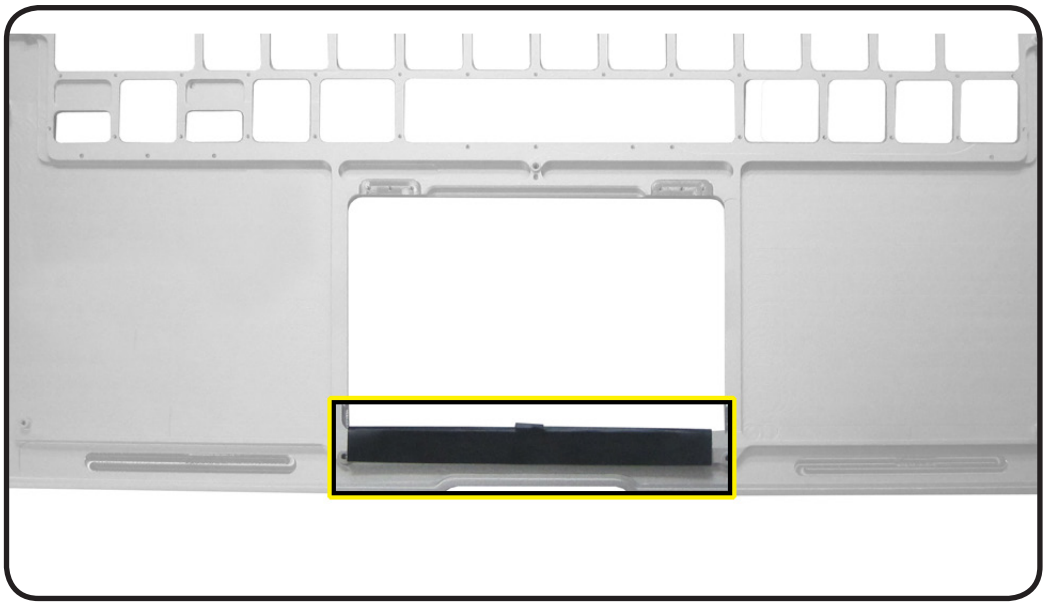


Replacement



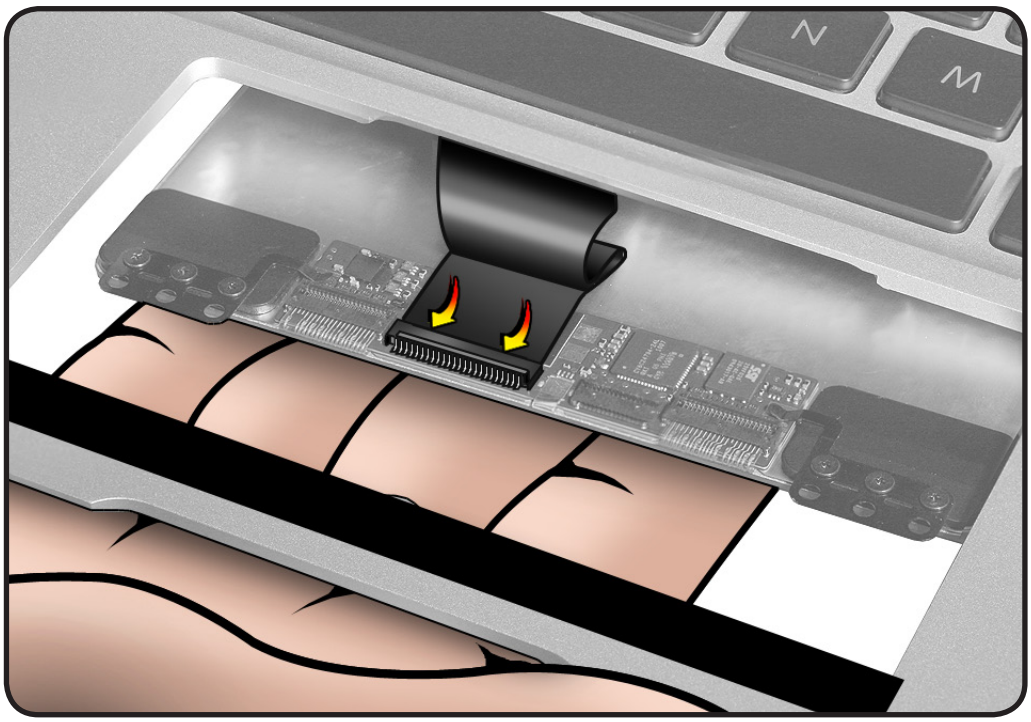
IMPORTANT: Be careful not to scratch the exposed silver ink on the lower edge of the trackpad when installing the trackpad into the top case. Scratches create black spots and can be seen from the user side of the trackpad.

1 Replacement top cases have a strip of mylar along the lower edge of the trackpad opening to protect the exposed trackpad ink.



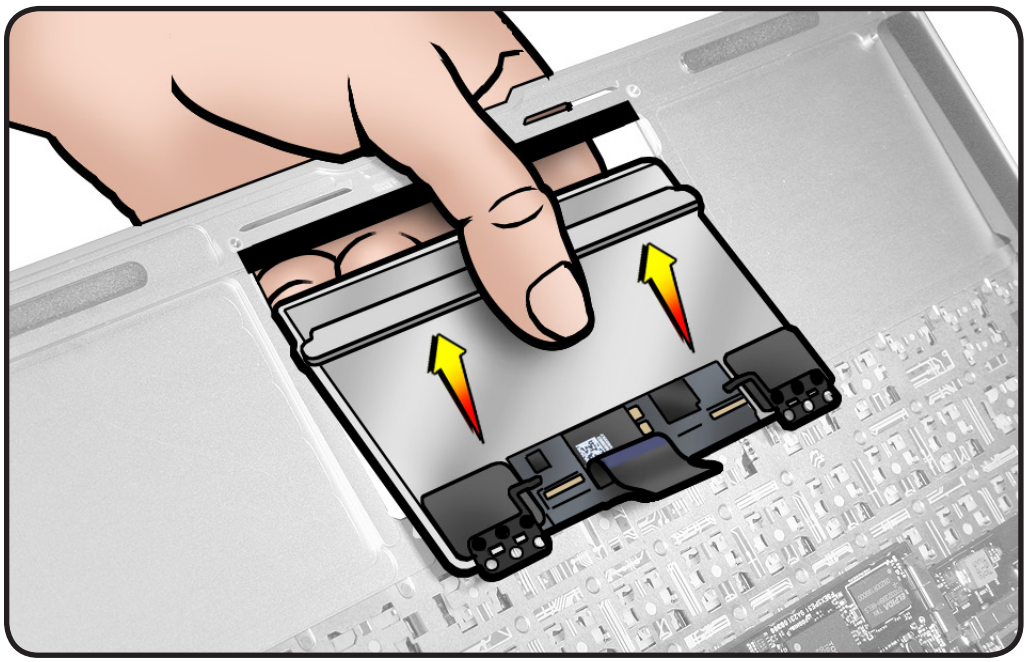
2 Connect keyboard flex cable to trackpad and verify cable is seated properly before locking lever.

Note: If the cable is already folded and sealed with very high bond (VHB) adhesive, skip steps 5 and 6.

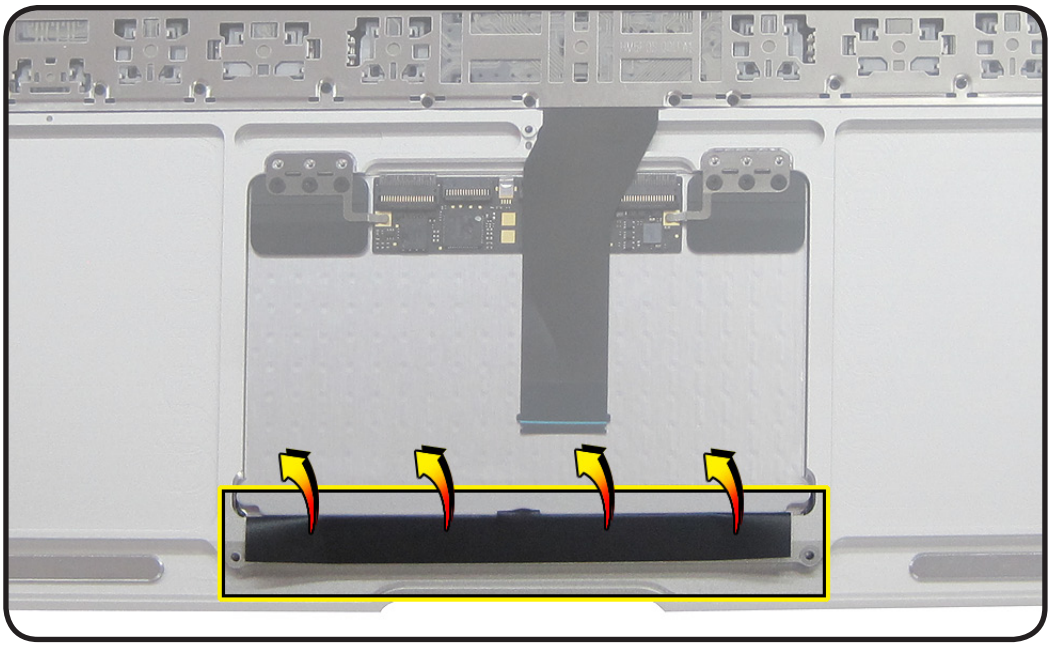


3 Carefully slide the trackpad—lower edge first—into top case, until the trackpad seats inside the opening.

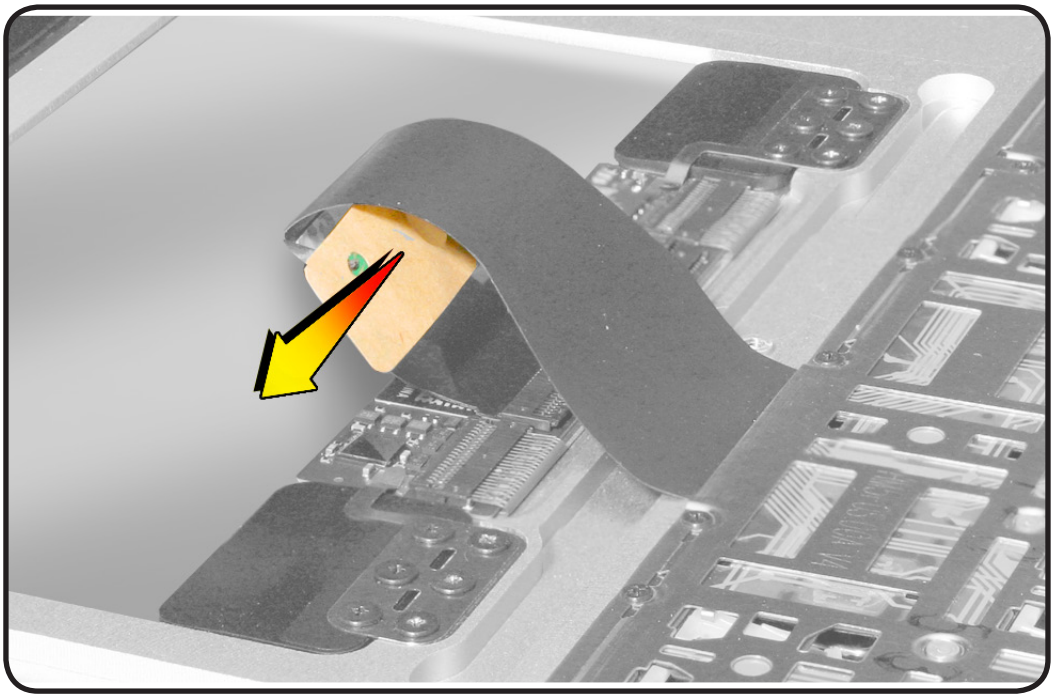
Caution: Minimize rubbing edges of trackpad against top case while installing. This could cause tiny cracks to form on the trackpad.



4 Remove the mylar, including any pieces that may be caught between the trackpad and top case.

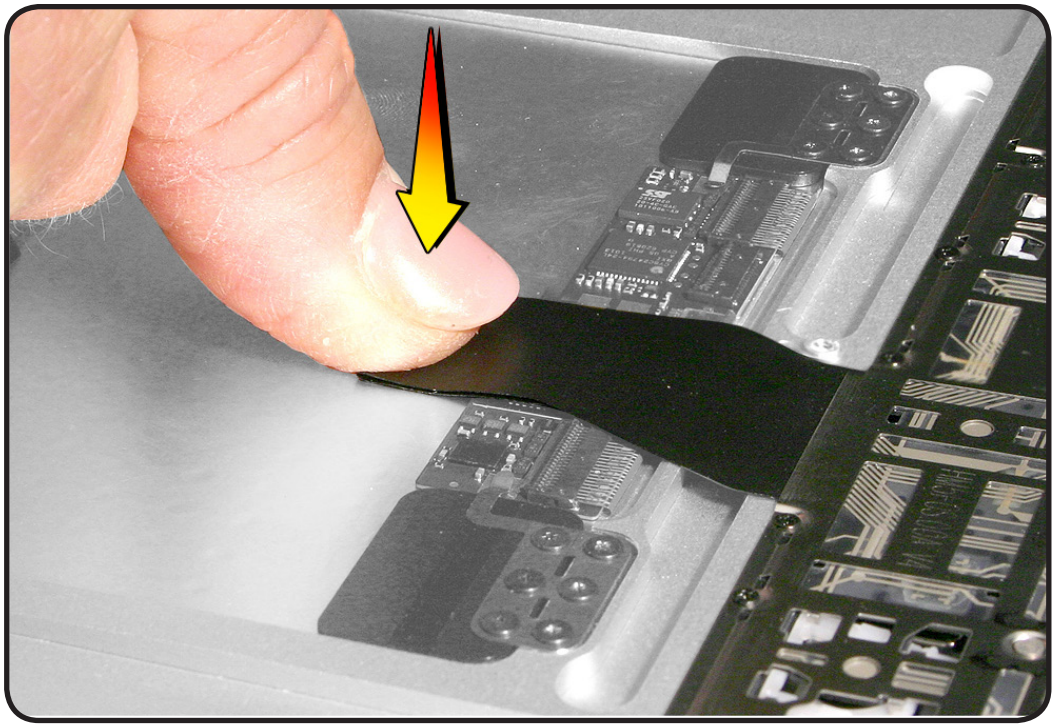


5 Peel paper backing from keyboard cable to expose VHB adhesive.



6 Press down firmly on keyboard cable for 15 seconds to:

- flatten cable
- adhere VHB to upper and lower surfaces of cable



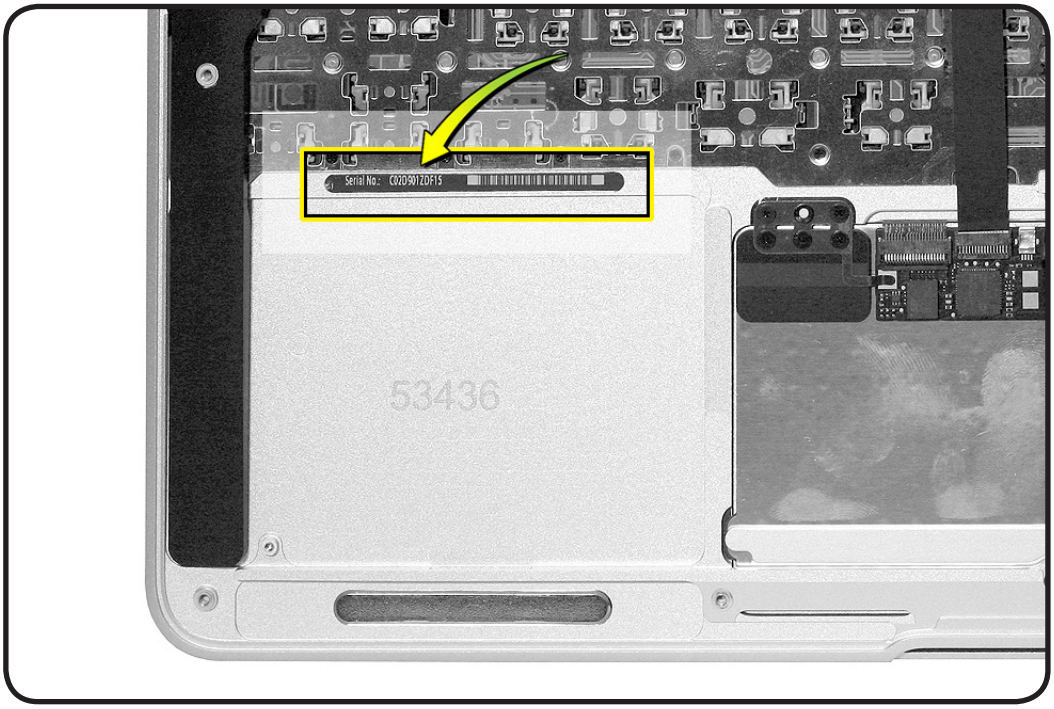
Important The keyboard cable MUST lay flat against the trackpad. The VHB adhesive holds the bend in the cable. If the VHB or cable are compromised, trackpad alignment issues may occur, which may require top case replacement.

7 Replace trackpad screws, connect input cable, and align trackpad.

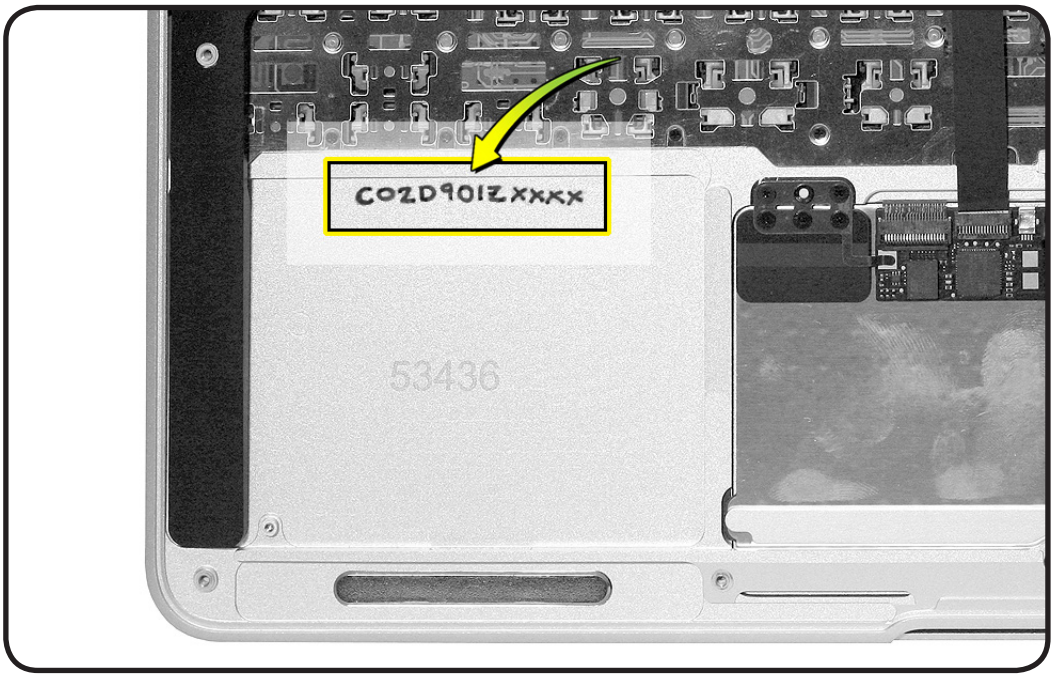
8 When installing a new top case, retain original top case until repair is complete.

9 Before installing replacement top case, use a heat gun and knife to lift off the serial number label.

10 Transfer label to inside of new top case.



11 If label cannot be reused, use a fine-tip permanent marker to write the serial number on the inside of the new top case.

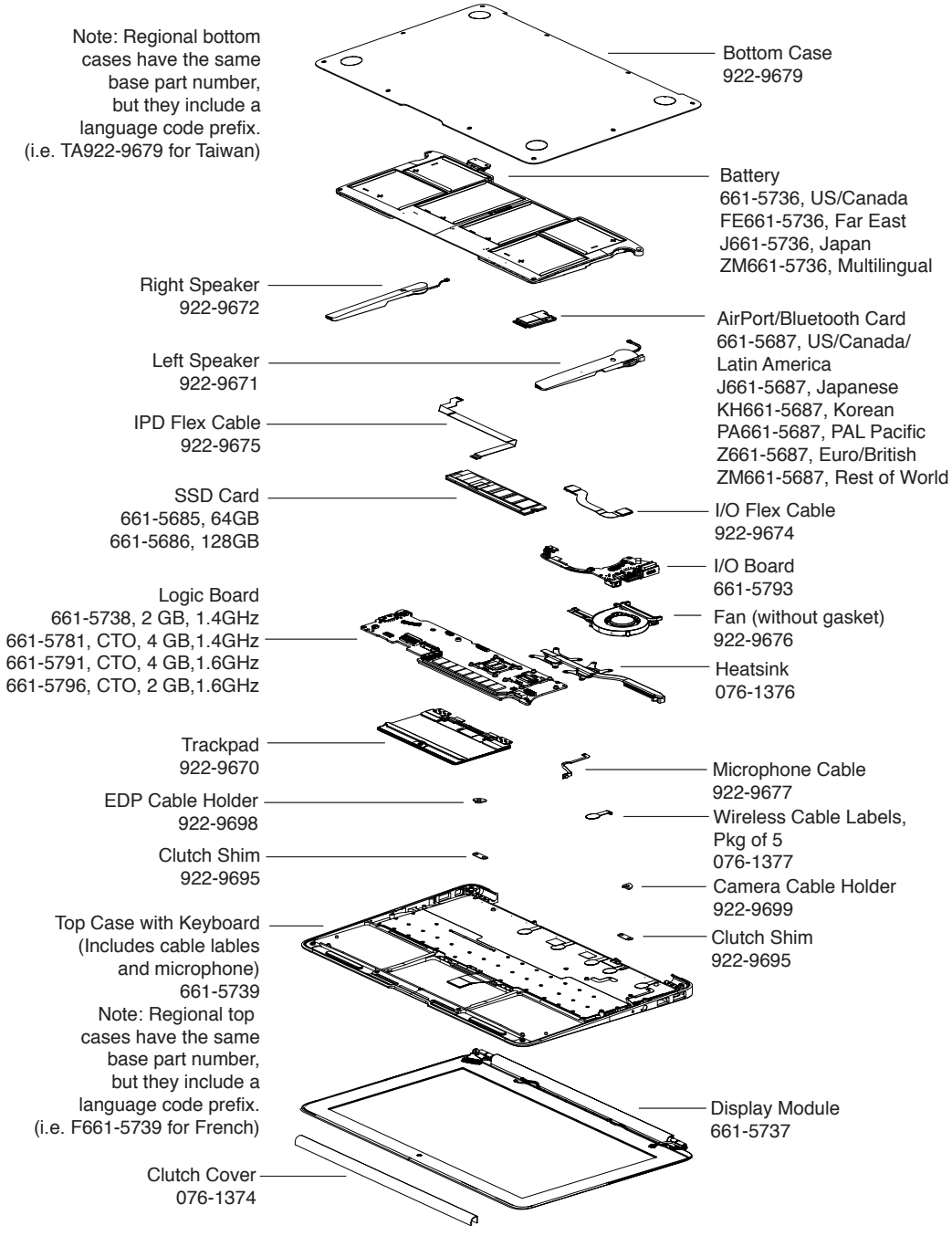


Apple Technician Guide

Views

MacBook Air (11-inch, Late 2010)

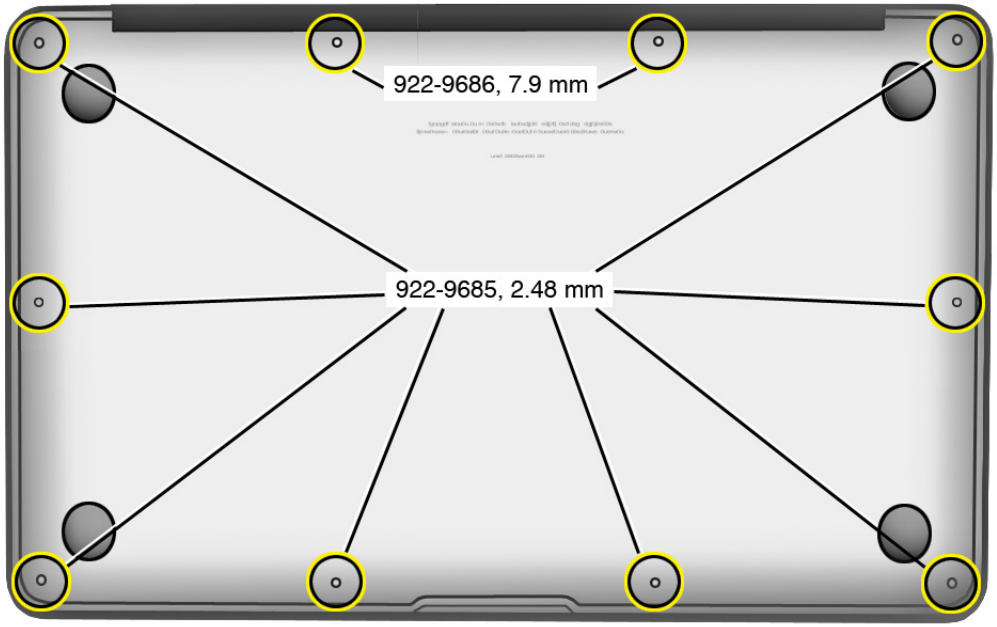
Exploded View



Screw Location Diagrams

Bottom Case

All screw sizes shown are approximate and represent the total length of the screw.

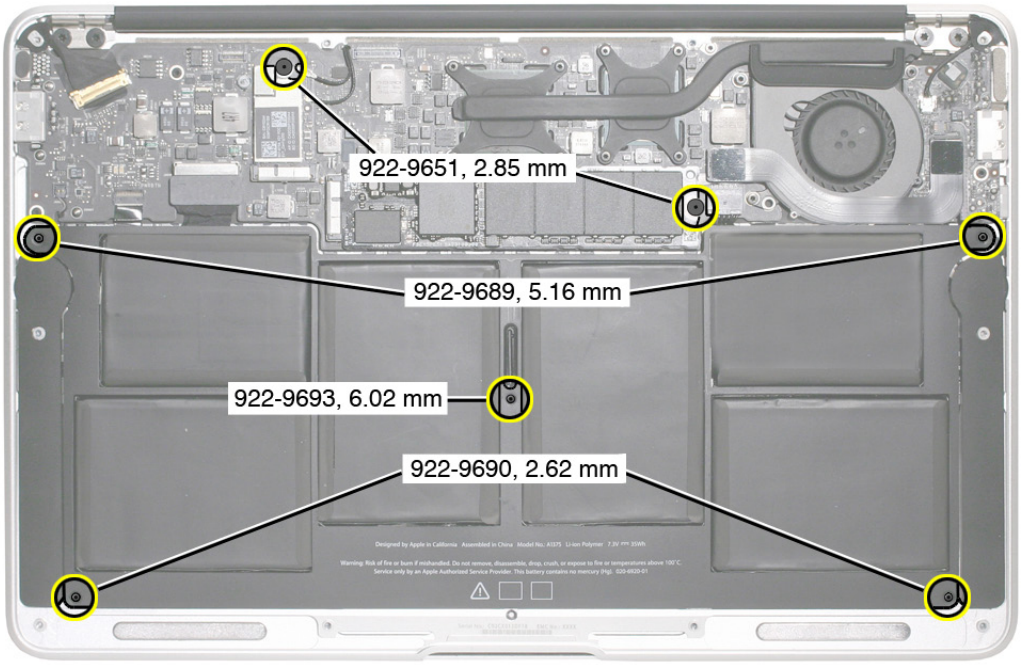


Battery, AirPort/Bluetooth Card, SSD Card

All screw sizes shown are approximate and represent the total length of the screw.

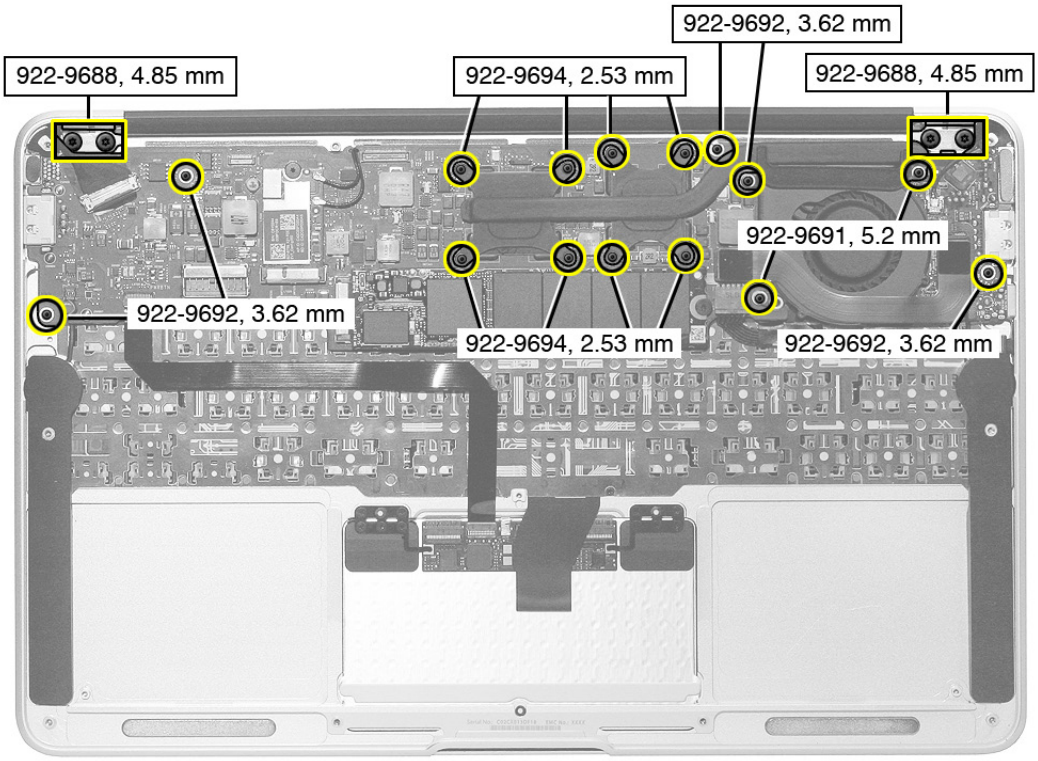
Important: Always attach the battery cover immediately after removing the bottom case, before beginning battery removal.

Caution: Read Battery Safety Precautions before removing screws.



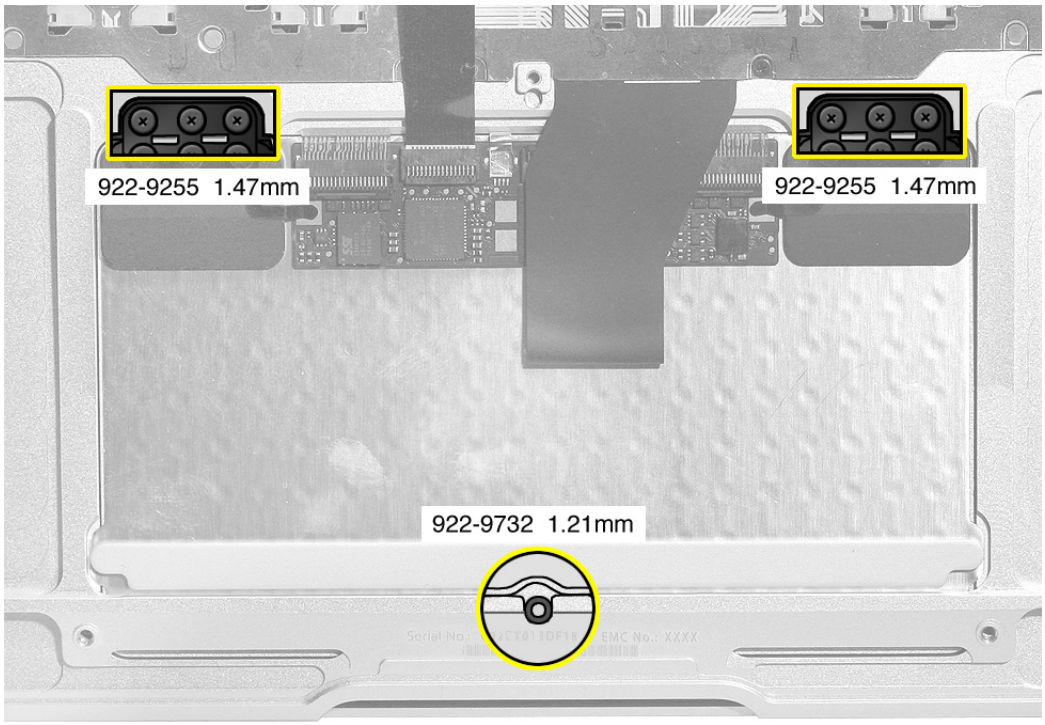
Fan, I/O Board, Heatsink, Logic Board, Display Module

All screw sizes shown are approximate and represent the total length of the screw.



Trackpad

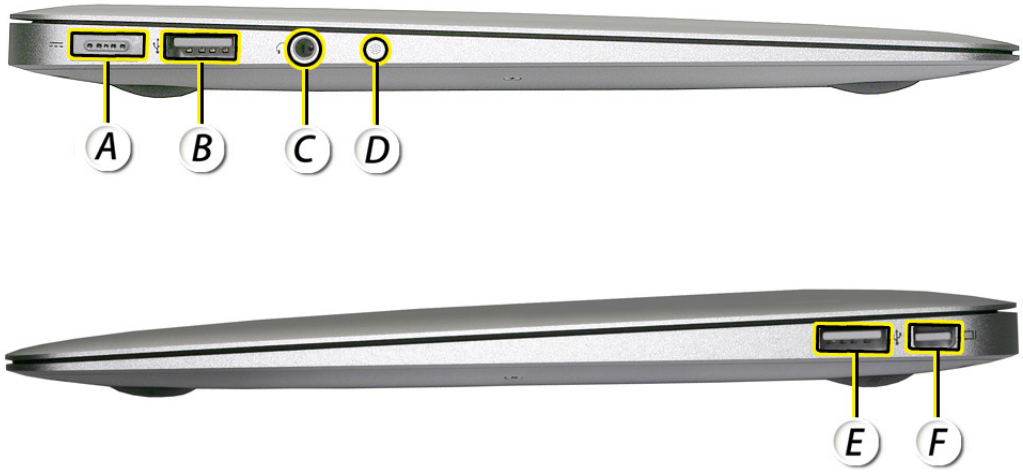
All screw sizes shown are approximate and represent the total length of the screw.



External Views

Front View

Port View



A = MagSafe Power

B = USB 2.0

C = Headphone (audio out)

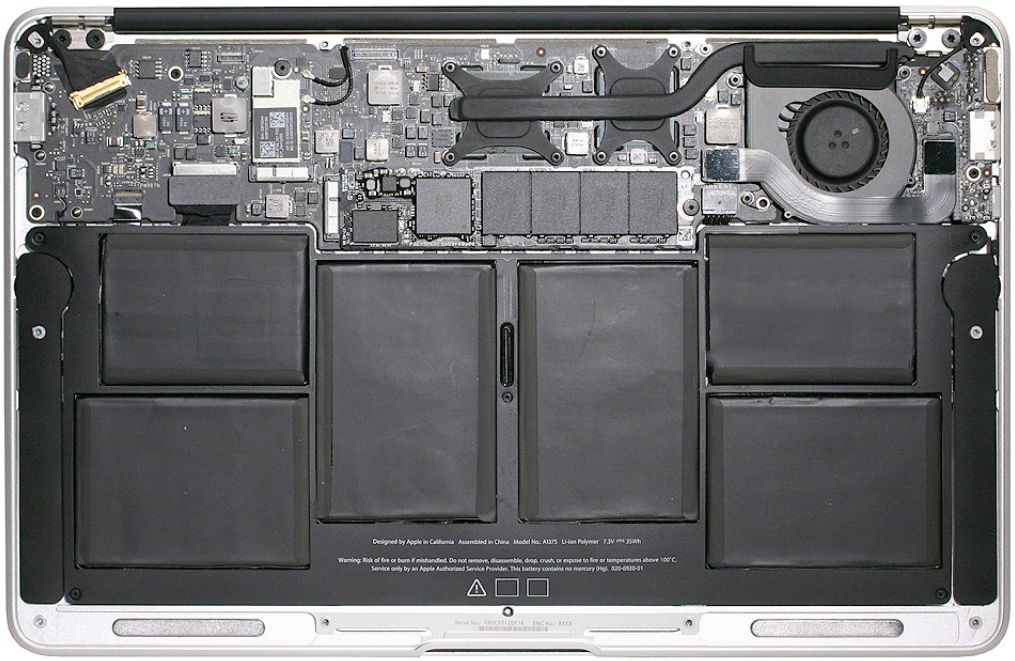
D = Microphone

E = USB 2.0

F = Mini DisplayPort (video out)

Internal Views

Bottom Case Removed



Screw Chart

922-9255 Phillips #000  Trackpad flexure (6)	**922-9651** Torx T5  Solid state drive (SSD) (1) AirPort/Bluotooth card (1)	**922-9685** Pentalobe  Bottom case (8)
922-9686 Pentalobe  Bottom case (2)	**922-9688** Torx T8  Display hinge clutch (4)	**922-9689** Torx T5  Battery to top case (2)
922-9690 Torx T5  Battery to top case (2)	**922-9691** Torx T5  Fan, long (2)	**922-9692** Torx T5  Fan, short (1) Logic board (3) I/O board (1)
922-9693 Torx T5  Battery to top case (1)	**922-9694** Torx T5  Heatsink (8)	**922-9732** Torx T5  Trackpad set screw (1)