MacBook Air (M2, 2022)

Repair Manual

Contents

Introduction

This manual includes technical instructions for replacing genuine Apple parts in Mac and is intended for individual technicians with the knowledge, experience, and tools required to repair electronic devices.

Important

- Read the entire manual first. If you're not comfortable performing the repairs as instructed in this manual, don't proceed.
- Always use the latest version of this document available at support.apple.com/en_US/manuals/maclaptops.

Warning

Failure to follow the repair instructions or to use genuine Apple parts or proper tools may cause fire or other safety issues and lead to personal injury or death.

Caution

Failure to follow the repair instructions or to use genuine Apple parts or proper tools may damage the Mac, parts, or other property, or compromise the device's functionality.

Warranty information

Damage caused by repairs performed outside of Apple or the Apple Authorized Service Provider network is not covered by Apple's warranty or AppleCare plans. Such damage may cause future repairs to be subject to out-of-warranty costs or render the device ineligible for future repairs by Apple or Apple Authorized Service Providers.

Tools and parts

Ordering tools and parts

You can learn how to order genuine Apple parts and tools at support.apple.com/self-service-repair. During the purchase process, enter the manual ID **PTGVKD** to indicate that you've read this manual in its entirety and agree that you have the knowledge and experience to perform your intended repair.

Software tools

Apple Diagnostics can check your Mac for hardware issues.

A System Configuration step may be required at the end of your repair. System Configuration is a postrepair software tool that completes the repair for genuine Apple parts. Running System Configuration has a number of purposes that vary based on the part replaced.

What System Configuration does	Why it's important
Updates replacement logic board with device serial number	Replacement logic boards must be updated with your device's serial number to ensure that Apple Pay, FaceTime, iMessage, and iCloud services, such as Find My, can communicate safely and securely with your device.
Transfers factory calibration values	Certain parts like displays, cameras, and ambient light sensors have calibration values that are customized to each individual part during manufacturing. Transferring these values ensures maximum performance and quality after a repair.
Links Secure Enclave and biometric authentication parts	After repair of a logic board or a biometric authentication part (Touch ID), linking the biometric sensors to the Secure Enclave on the logic board is required to ensure device security.
Ensures repair integrity	After a hardware repair, software checks are performed to ensure repair integrity. Repair integrity means that a genuine Apple part has been correctly installed.
Assigns wireless region	To comply with regional communications regulations, a wireless region must be assigned to your logic board.
Updates firmware	Keeping firmware up to date ensures that the device has all the latest security and performance features.

System Configuration requires a strong Wi-Fi network capable of 1.0 Mbps download and upload speeds, with less than 400 ms latency and less than 2% packet loss. Estimated data usage to run System Configuration is 6–22 MB.

The device must be running the latest version of macOS and not a beta version.

Learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

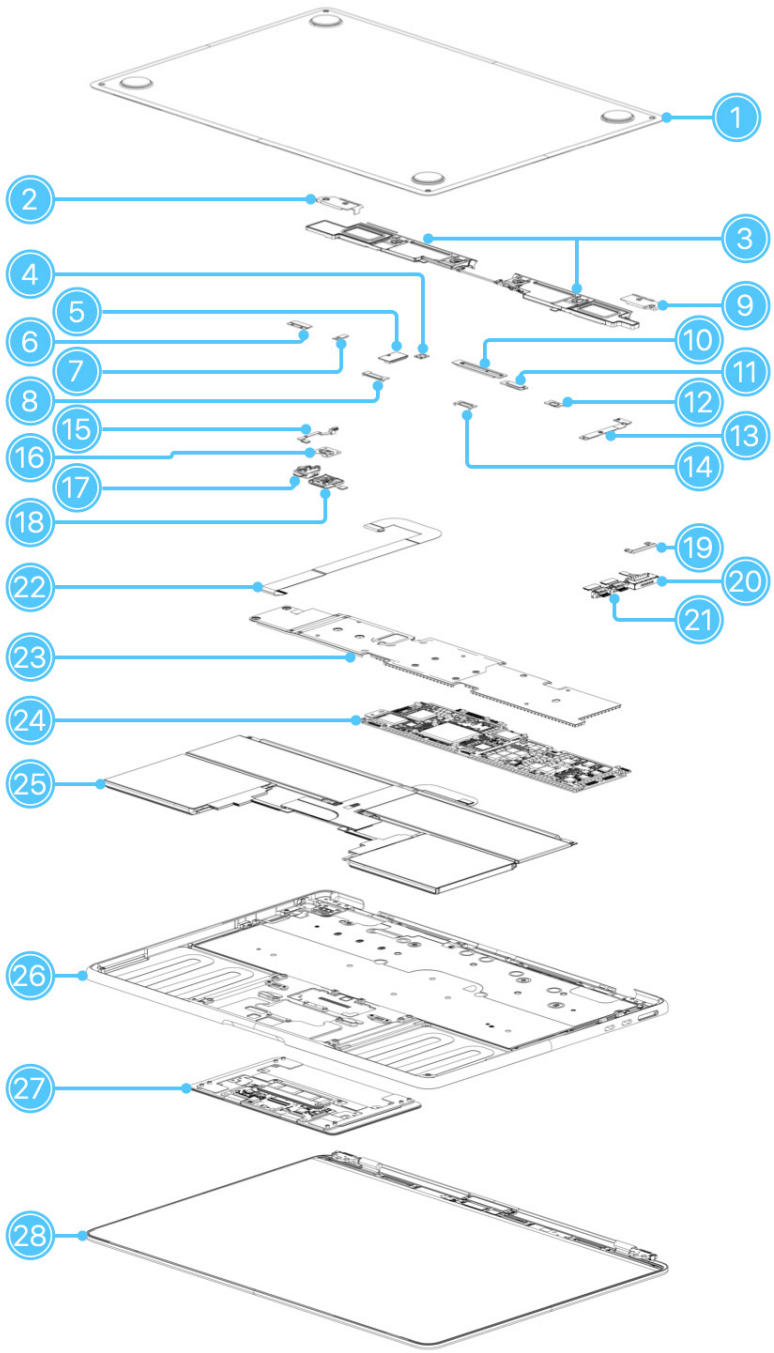
Alerts

Failure to follow alerts could result in fire, injury, data loss, or damage to the device, parts, or other property.

Danger	Instructions for reducing risk of electric shock and electrocution
Warning	Instructions for reducing risk of personal injury
Caution	Instructions for reducing risk of data loss or device hardware damage
Important	Supplemental information for successfully completing procedures; neither a Warning nor a Caution

Exploded View and Orderable Parts

This section shows parts, part names, and part numbers for MacBook Air (M2, 2022).



Part Name	Number
1. Bottom case	923-07248, space gray 923-07249, silver 923-07250, starlight 923-07251, midnight
2. Right display hinge cover	923-07241, space gray 923-07243, silver 923-07245, starlight 923-07247, midnight
3. Left and right speakers with antennas	923-07232
4. Right speaker connector cowling	923-07265
5. Interposer board connector cowling	923-07272
6. Lid angle sensor/audio board connector cowling	923-07257
7. Touch ID board connector cowling	923-07271
8. Trackpad connector cowling	923-07268
9. Left display hinge cover	923-07240, space gray 923-07242, silver 923-07244, starlight 923-07246, midnight
10. Display connectors cowling	923-07270
11. Antenna coaxial cables connector cowling	923-07234
12. Left speaker connector cowling	923-07264
13. MagSafe 3 board/USB-C boards connector cowling	923-07273
14. Battery connector cowling	923-07267
15. Lid angle sensor	661-26216
16. Touch ID board flexible cowling	included with a replacement Touch ID board
17. Audio board	923-07256, space gray 923-07563, silver 923-07565, starlight 923-07567, midnight
18. Touch ID board	661-26143, space gray, silver, or starlight 661-26207, midnight
19. MagSafe 3 board wedge	923-07295

Part Name	Number
20. MagSafe 3 board	923-07298, space gray 923-07564, silver 923-07566, starlight 923-07568, midnight
21. USB-C boards	923-07252, space gray 923-07253, silver 923-07254, starlight 923-07255, midnight
22. Trackpad flex cable	included with a replacement trackpad
23. Heat sink	923-07577
24. Logic board	661-25623, M2, 8-core GPU, 8 GB, 256 GB 661-25624, M2, 8-core GPU, 8 GB, 512 GB 661-25625, M2, 8-core GPU, 8 GB, 1 TB 661-25626, M2, 8-core GPU, 8 GB, 2 TB 661-25627, M2, 8-core GPU, 16 GB, 256 GB 661-25628, M2, 8-core GPU, 16 GB, 512 GB 661-25629, M2, 8-core GPU, 16 GB, 1 TB 661-25630, M2, 8-core GPU, 16 GB, 2 TB 661-25631, M2, 8-core GPU, 24 GB, 256 GB 661-25632, M2, 8-core GPU, 24 GB, 512 GB 661-25633, M2, 8-core GPU, 24 GB, 1 TB 661-25634, M2, 8-core GPU, 24 GB, 2 TB 661-25635, M2, 10-core GPU, 8 GB, 256 GB 661-25636, M2, 10-core GPU, 8 GB, 512 GB 661-25637, M2, 10-core GPU, 8 GB, 1 TB 661-25638, M2, 10-core GPU, 8 GB, 2 TB 661-25639, M2, 10-core GPU, 16 GB, 256 GB 661-25640, M2, 10-core GPU, 16 GB, 512 GB 661-25641, M2, 10-core GPU, 16 GB, 1 TB 661-25642, M2, 10-core GPU, 16 GB, 2 TB 661-25643, M2, 10-core GPU, 24 GB, 256 GB 661-25644, M2, 10-core GPU, 24 GB, 512 GB 661-25645, M2, 10-core GPU, 24 GB, 1 TB 661-25646, M2, 10-core GPU, 24 GB, 2 TB
25. Battery	661-26150
26. Top case Read the Important alert on the next page to ensure that you order the correct top case.	661-25685, space gray 661-25686, silver 661-25687, starlight 661-25688, midnight

Part Name	Number
27. Trackpad	661-26202, space gray 661-26203, silver 661-26204, starlight 661-26205, midnight
28. Display	661-25797, space gray 661-25798, silver 661-25799, starlight 661-25800, midnight

Part Name (Not Shown)	Number
Interposer board flex cable	923-07299

Important

The English (US) top case part number begins with 661. Other regional top case part numbers also begin with 661, but they include a language prefix. For example, the Italian top case part number begins with T661. To determine the correct language prefix, identify your keyboard language by country or region. Then identify the correct country code from the language prefix list below:

AB	Arabic	GR	Greek	RS	Russian
B	British	H	Norwegian Bokmal	S	Swedish
BG	Bulgarian	HB	Israeli	SF	Swiss French
C	Canadian French	IS	Icelandic	SL	Slovak
CH	Chinese (Pinyin)	J	Japanese	T	Italian
CR	Croatian	KH	Korean	TA	Chinese (Zhuyin)
CZ	Czech	LA	Latin America	TH	Thai
D	German	MG	Hungarian	TQ	Turkish-Q
DK	Danish	N	Dutch	TU	Turkish-F
E	Western Spanish	PO	Portuguese	Z	English International
F	French	RO	Romanian		

Screws

Caution

- Save undamaged screws and cowlings for reassembly.
- Note the location of screws and cowlings during removal. Then organize them to ensure that you reinstall them in the correct location.
- Both overtightened screws and loose screws can damage parts.

923-07258
Torx® T5

Trackpad (10)

923-07259
Torx Plus 4IP

Battery tray (2)

923-07260, space gray
923-07542, silver and starlight
923-07543, midnight
Pentalobe

Bottom case, front (2)

923-07261, space gray
923-07262, silver and starlight
923-07544, midnight
Pentalobe

Bottom case, rear (2)

923-07263
Torx T5

Left speaker with antenna (1)

Right speaker with antenna (1)

923-07269
Torx Plus 4IP

Left speaker with antenna (2)

Right speaker with antenna (2)

923-07276
Torx T5

USB-C boards (4)

923-07277
Torx T3

Antenna coaxial cables connector cowling (2)

Battery connector cowling (2)

Display connectors cowling (3)

Left speaker connector cowling (2)

Lid angle sensor/audio board connector cowling (2)

Logic board to interposer board connector cowling (1)

MagSafe 3 board/USB-C boards connector cowling (4)

Right speaker connector cowling (2)

Trackpad connector cowling (2)

Touch ID board connector cowling (1)

923-07278
Torx Plus 1IP

Lid angle sensor (1)

923-07279
Torx Plus 3IP

Battery tray (2)

923-07280
Torx T5

MagSafe 3 board (2)

923-07281
Torx Plus 3IP

MagSafe 3 board wedge (2)

923-07282
Torx T5

Logic board (1)

923-07283
Torx T5

Logic board (2)

923-07284
Torx T5

Logic board (1)

923-07285
Torx Plus 3IP

Display flex cables cowling (2)

923-07286
Torx Plus 8IP

Display hinges (6)

923-07287
Torx Plus 3IP

Display hinge covers (2)

923-07288
Torx Plus 3IP

Heat sink (6)

923-07289
Torx T5

Audio board (2)

923-07292
Torx T5

Heat sink (2)

923-07293
Torx T3

Touch ID board (2)

923-07297
Torx T5

Logic board (1)

923-07546
Torx T3

Touch ID board, corners (4)

Tools

Tools with part numbers are available for purchase from the Self Service Repair Store. Tools without part numbers can be purchased from electronics supply retailers.

922-7172
Access card

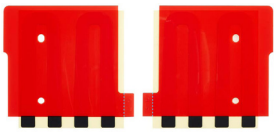
923-02995
Adjustable torque driver (10–34 Ncm)

923-0735
Adjustable torque driver (0.3-1.2 Nm)

923-07525
Alignment pin

923-01322
Antenna tool

076-00520
Battery adhesive



923-07605
Battery cover

923-07943
Battery flex cable alignment tool

923-07601
Battery support frame and press plate

Compressed air

923-01368
Cut-resistant gloves

ESD mat

ESD-safe cleaning solution

ESD-safe tweezers

ESD wrist strap with clip or plug

Ethanol wipes[1]

Fireproof enclosure

923-02998
Gap offset kit

Heat-resistant gloves

IPA wipes

661-08916
iPhone display press

922-1731
Kapton tape

923-01803
Keycap lever

Magnetizer

Microterry polishing cloth

Needle-nose pliers

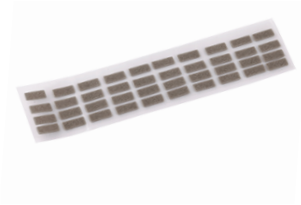
Nitrile gloves

922-5065
Nylon probe (black stick)

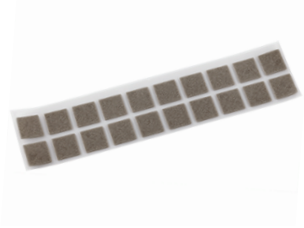
923-0731
Pentalobe screwdriver

Permanent marker

923-01800
Precut adhesive strips (1x0.5)



923-01801
Precut adhesive strips (1x1)



Safety glasses with side shields

Sand[2]

Sand container[3]

922-8252
Suction cups

923-07604
Thermal gel stencil[4]

923-0448
Torque driver (blue, 0.65 kgf cm)

923-07620
Torx Plus 1IP 44 mm half-moon bit

923-06752
Torx Plus 2IP 44 mm half-moon bit

923-07593
Torx Plus 3IP 25 mm bit

923-07594
Torx Plus 4IP 25 mm bit

923-07595
Torx Plus 8IP 25 mm bit

923-07060
Torx T3 half-moon bit

Torx T3 screwdriver

Torx T4 screwdriver

923-02996
Torx T5 bit

Torx T5 screwdriver

USB-C to MagSafe 3 cable

923-03032
Touch ID alignment kit

USB-C charge cable

[1] Ethanol wipes must contain at least 90% ethanol and no additives except isopropyl alcohol.

[2] Clean, dry, untreated sand (8–10 cups)

[3] Sand container (wide-mouthed, quick pour, nonbreakable plastic container with a flip-top lid)

[4] A thermal gel stencil includes two 3IP screws and an access card.

Battery Safety

Warning

- This device contains a built-in lithium-ion rechargeable battery with soft battery cells. Battery safety is the number one concern when repairing a device with a built-in lithium-ion battery.
- Only technicians with the knowledge, experience, and tools required to repair electronic devices should replace a battery.
- Improper battery replacement, improper handling of parts, failure to discharge the battery before repair, or failure to follow the provided instructions could cause battery overheating, swelling, venting, leaking, or a battery thermal event. These events could result in fire, injury, death, data loss, or damage to the device, parts, or other property.
- To avoid these potentially harmful events, follow the battery safety guidelines and work in a safety-focused workspace with the tools listed below. It's important to be prepared for all possible outcomes.

How to set up a workspace for battery safety

Tools

- Clean, dry, untreated sand (8–10 cups)
- Sand container (wide-mouthed, quick pour, nonbreakable plastic container with a flip-top lid)
- Heat-resistant gloves
- Safety glasses with side shields
- ESD-safe cleaning solution
- Fireproof enclosure

Workspaces used to repair Apple devices should meet the following criteria:

- Nonflammable and electrostatic discharge (ESD)-safe work bench
- At least 2 feet away from paper and other combustible materials
- Sand container within reach (2 feet) on one side of the workspace, not above the workspace
- Adequate ventilation
- Within 20 feet of a fireproof enclosure. Don't store combustible or flammable materials in the enclosure. Ensure that the enclosure remains empty.

Warning

How to handle a battery thermal event

A battery thermal event is a rapid chemical chain reaction that occurs inside a battery cell. The energy stored in the battery is released suddenly, which can cause outgassing and fire. A battery thermal event can be triggered by physical damage to the battery, improper replacement or repair, or temperatures outside the battery's operating range.

Act immediately if you notice any of the following signs of a battery thermal event:

- The lithium-ion battery or a device that contains one begins to smoke or emit sparks or soot.
- The battery pouch suddenly and quickly puffs out.
- The lithium-ion battery or a device that contains one begins to emit hissing or popping sounds.

Do smother the battery or device immediately with plenty of clean, dry sand. Dump the sand all at once. Timing is critical — the faster you pour all the sand, the sooner the reaction will be contained.

Do contact local fire authorities if further assistance is needed.

Do leave the room for 30 minutes after the reaction is contained. Ventilate the area. Don't return until the area is clear of smoke.

Do wait 30 minutes before touching the device. Wear the heat-resistant gloves and safety glasses with side shields to remove the device from the sand. Then place the device into the fireproof enclosure. Leave it in the enclosure for at least 2 hours.

Do wipe the affected area with water first. Then wipe the area with an ESD-safe cleaning solution.

Do dispose of the damaged battery or device (including any debris removed from the sand) according to local environmental laws and guidelines.

How to handle batteries

Discharge the battery

Warning

Fully discharge the battery before you begin a repair. A discharged battery is less susceptible to a battery thermal event. If you can't determine the battery level, don't repair the device.

The following actions will help to discharge the battery:

- Disconnect the power cable.
- Increase display brightness to the highest setting.
- Turn on Wi-Fi and Bluetooth.
- Open the FaceTime app or Photo Booth app to turn on the camera.
- Play a video from the local drive or a streaming service.

Use a battery cover

Avoid damaging the battery by performing the following actions:

- Immediately after removing the bottom case, follow the instructions to attach the battery cover and disconnect the battery from the logic board.
- Always keep the battery cover on the battery when it's exposed.
- Only remove the battery cover immediately before you install the bottom case, unless otherwise instructed.

Best practices

- To avoid noxious fumes or a battery thermal event, don't puncture, strike, or crush a lithium-ion battery or a device that contains one.
- Keep your workspace clear of foreign objects and sharp materials.
- Be careful when using sharp tools near the battery.
- Don't leave loose screws, extra screws, or small parts inside the device.
- Don't use tools that conduct electricity.
- Don't throw or drop the battery.
- Don't expose the battery to excessive heat or sunlight, or temperatures outside the battery's operating range.
- Handle and dispose of waste batteries in accordance with local laws and regulations.

First Steps

Always perform the following steps before starting a repair:

- Back up the Mac.
- If replacing the logic board or Touch ID board, turn off Find My Mac. Choose Apple Menu > System Preferences > Apple ID. Select iCloud in the sidebar. Then deselect the Find My Mac checkbox. If you're unable to access the Apple menu, continue performing the following steps.
- Discharge the battery fully.
- Turn off the Mac.
- If you were unable to turn off Find My Mac from the Apple menu, go to iCloud.com/find on a different device. Select All Devices. Select the device you want to remove. Then select Remove from Account.
- Unplug the power cable from the electrical outlet. Keep the power cable unplugged while the device is being repaired.
- Disconnect all cables.
- Remove all cases and covers.
- Clear and clean your workspace.
- Put on an ESD wrist strap and attach it to a properly grounded ESD mat.

Caution

ESD (electrostatic discharge, or the release of static electricity) can damage electronic components.

Be aware of the following while performing a repair:

- The manual for this model may show images of other models, but the procedures are the same. Ensure that you use the correct tools for the model you're repairing.
- Take your time. Thoroughly read all instructions and alerts.
- Magnetizing the screwdrivers will make it easier to work with small screws.
- Use only Kapton tape to secure cables and keep them out of the way when removing and reinstalling parts.
- The end of each flex cable must align with its connector. Press the end of each flex cable to its connector until it clicks to ensure that it's secure.

Warning

Avoid damaging the battery by performing the following actions:

- Immediately after removing the bottom case, follow the instructions to attach the battery cover and disconnect the battery from the logic board.
- Always keep the battery cover on the battery when it's exposed.
- Set aside all parts and screws removed during the repair and account for them at the end of the repair.
- Only remove the battery cover immediately before you install the bottom case, unless otherwise instructed.

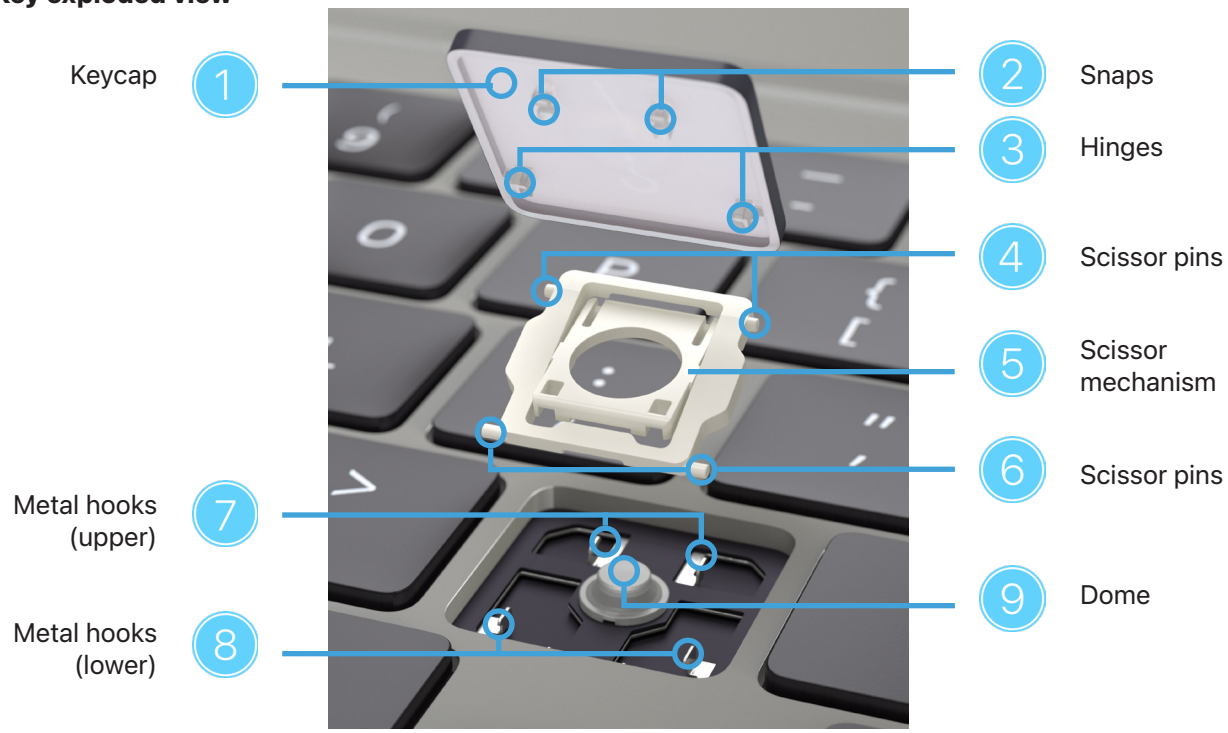
Keys

Before You Begin

Before you repair or replace a key, you need to:

- Know the different key parts — review the exploded view on this page.
- Identify your keyboard design.
- Identify which type of key you're replacing.
- Determine during the keycap removal procedure whether you need to also replace the key's scissor mechanism.

Key exploded view



Tools

- Compressed air
- ESD-safe tweezers
- Keycap levers (Some link bar keycaps require 2 keycap levers for removal)
- Microterry polishing cloth
- Needle-nose pliers
- Nylon probe (black stick)
- Precut adhesive strips (1x0.5)
- Precut adhesive strips (1x1)

Clean the keyboard thoroughly with compressed air before you replace a missing keycap or a keycap on an unresponsive key.

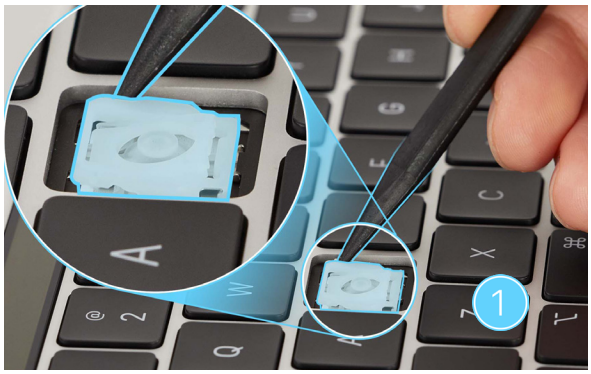
Caution

- The adhesive on the precut adhesive strips that you'll use to remove keycaps is very strong. If you accidentally place the keycap lever on the wrong keycap, you must remove and replace that keycap.
- An adhesive strip can be used only once. You must replace the adhesive strip for every keycap removal.
- Always replace a keycap that you removed with a new one. Don't reuse keycaps.
- Use gentle pressure on the keycap to activate the adhesive. Do not bend the top case when you press the keycap lever onto the keycap.
- If a keycap replacement doesn't resolve the issue, replace the top case.

Important

Before you replace a keycap, inspect the scissor mechanism, the dome, and the metal hooks inside the well of the keycap:

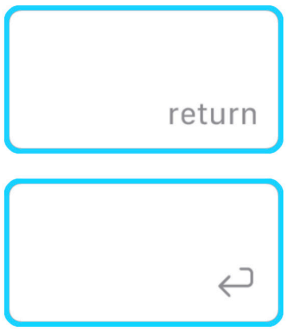
- Ensure that the scissor mechanism is installed in the well of the keycap. If not, install a new scissor mechanism.
- Use the black stick to gently move the scissor mechanism up and down (1). Verify that the scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.
- Press and release the dome (2) — it should spring back upright. If the dome is damaged or not centered, replace the top case.
- If a lower hook is bent (3), try to bend it back to a 90-degree angle.
- If an upper hook is bent (4), use needle-nose pliers to straighten it.
- If any lower hook or upper hook is broken or bent beyond repair, replace the top case.



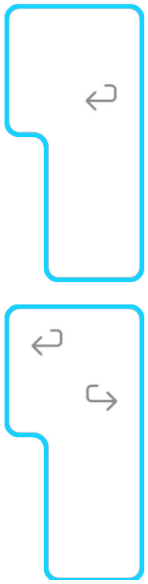
Keyboard Identification

Determine your keyboard design by comparing your Return key to the images:

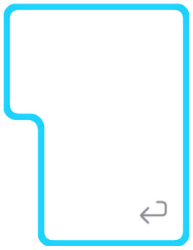
ANSI



ISO



JIS

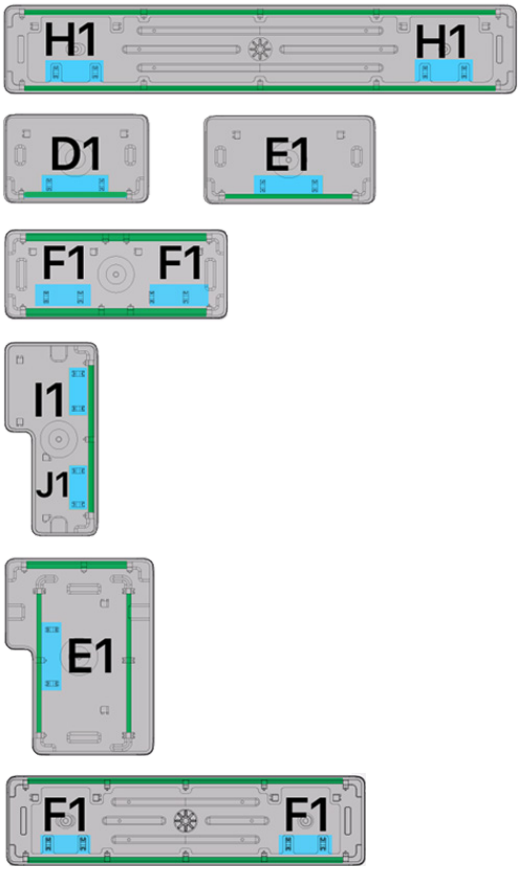


Key Identification

1x1 Keys

1x0.5 Keys

Link Bar Keys

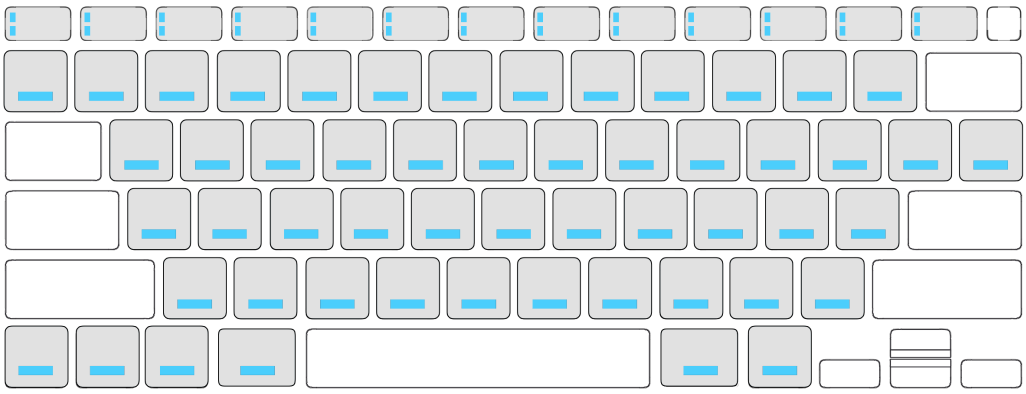


1x1 Keys

Maps

The 1x1 keys are highlighted, and the dark blue bars show the location of snaps.

ANSI



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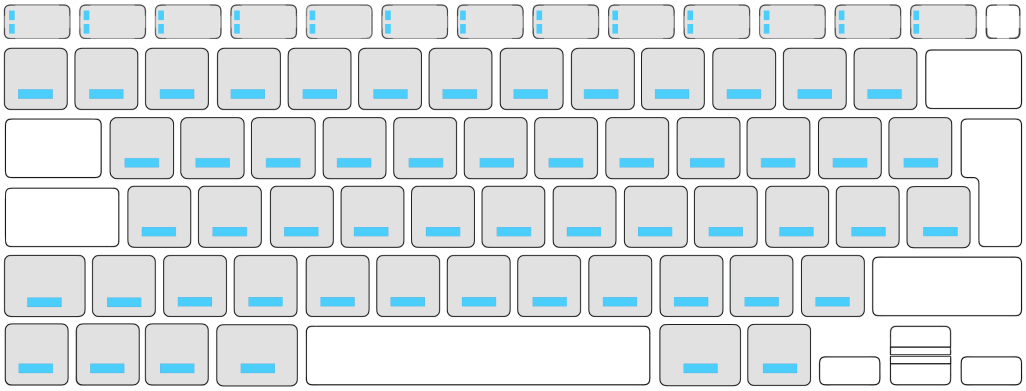
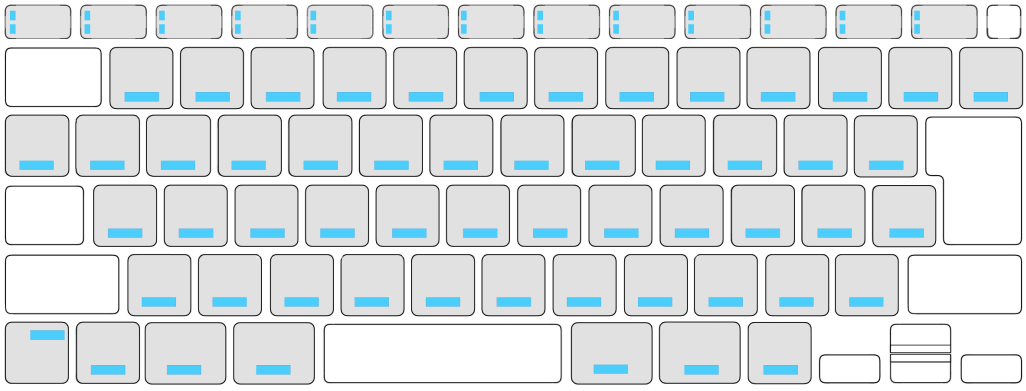
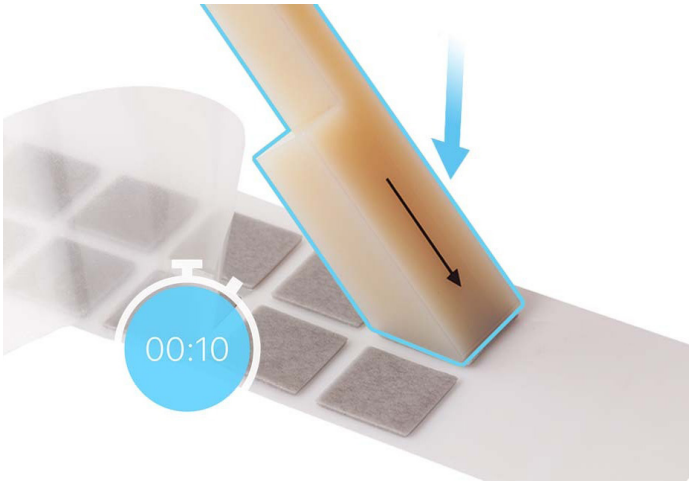


JIS



Removal

1. Peel the frosted liner from one side of the 1x1 precut adhesive strips. Press and hold the large end of the keycap lever on the adhesive for 10 seconds.



2. Lift the keycap lever and the adhesive to separate them from the white liner.

3. Lightly press the large end of the keycap lever and the adhesive onto the key.

Important

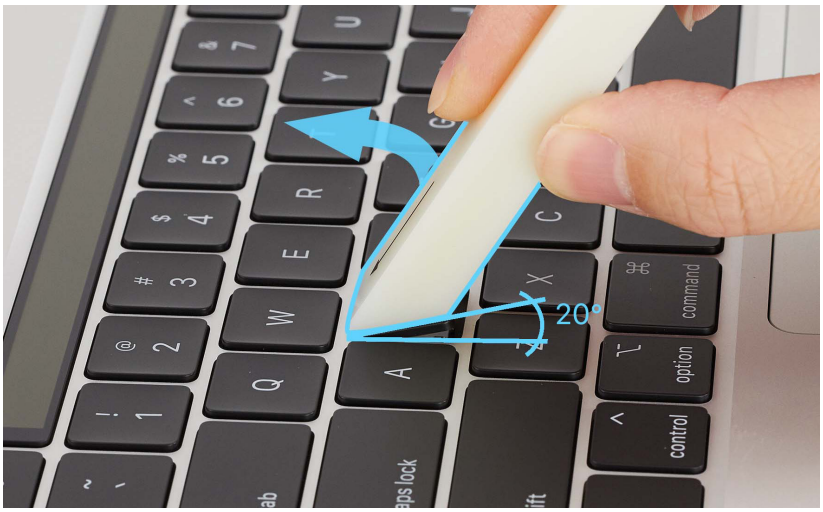
- The arrow on the lever must point to the hinged side of the keycap, which is opposite of the side that snaps onto the keyboard.
- Use the map for the 1x1 keys to identify the location of each snap.
- On the JIS keyboard, the snaps for the 1x1 Caps Lock key are on the display side of the keycap.

4. Hold the keycap lever on the key for 10 seconds to activate the adhesive.

5. Tilt up the keycap lever in the direction of the arrow until you feel the snaps release.

Caution

To avoid damaging the scissor mechanism, don't tilt up the keycap more than 20 degrees.



6. Lift the keycap off the keyboard.

7. Use the black stick to gently move the scissor mechanism up and down. Ensure that the scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.

8. Inspect the well of the keycap:
    - Use the black stick to press and release the dome through the top of the scissor mechanism — the dome should spring back upright. If the dome is damaged or not centered, replace the top case.
    - If a lower hook is bent, try to bend it back to a 90-degree angle.
    - If an upper hook is bent, use needle-nose pliers to straighten it.
    - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.
9. Use compressed air to clean the well of the keycap.

    Note: If compressed air doesn't dislodge visible debris, use the black stick to gently dislodge it.

10. Remove the keycap and adhesive from the keycap lever. Discard the keycap and adhesive.

Reassembly

1. Gently push the hinged side of the replacement keycap into the hinged side of the well at a 15-degree angle until the hinges engage.

2. Gently press the top of the keycap to engage the snaps.

3. Tap the key repeatedly to check that it springs back each time. Compare the response of the new keycap with the response of the keycaps around it.

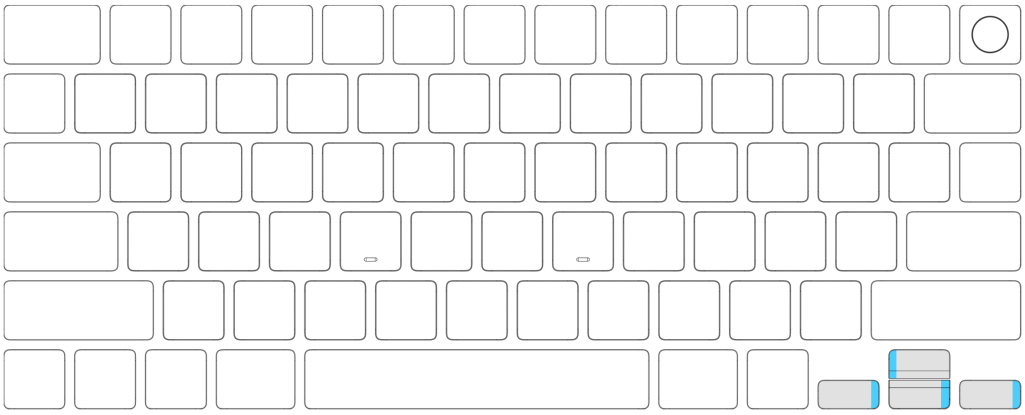
4. If the keycap doesn't appear to be correctly installed, repeat all removal and reassembly steps with a new keycap.

1x0.5 Keys

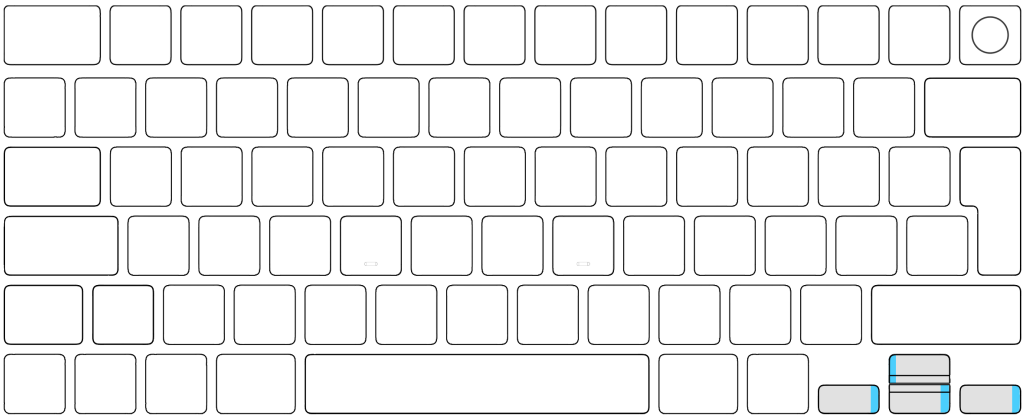
Maps

The Arrow keys are highlighted, and the blue bars show the location of snaps.

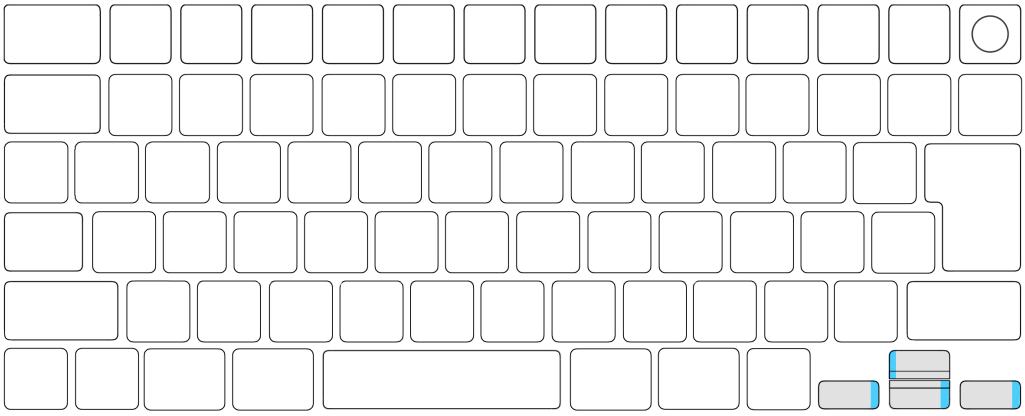
ANSI



ISO



JIS

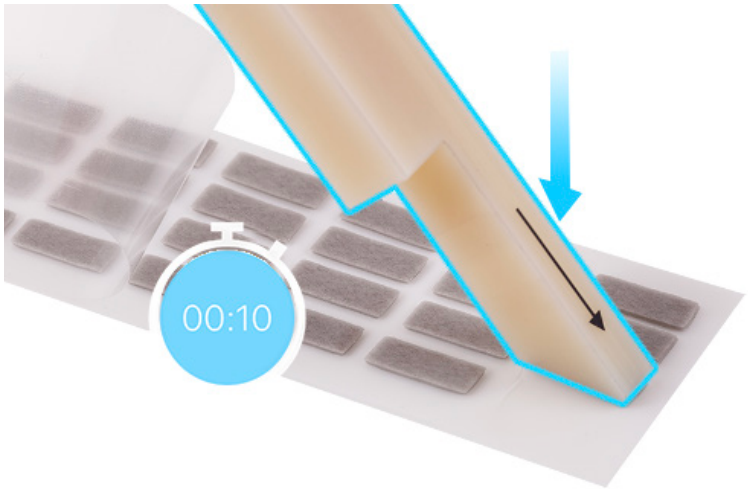


Removal

Important

- The hinges of the bottom-row arrow keys are on the left. Point the arrow on the keycap lever toward the left.
- The hinges of the Up Arrow key and Escape key are on the right. Point the keycap lever arrow toward the right.

1. Peel the frosted liner from one side of the 1x0.5 precut adhesive strips. Press and hold the small end of the keycap lever on the adhesive for 10 seconds.



2. Lift the keycap lever and the adhesive to separate them from the white liner.

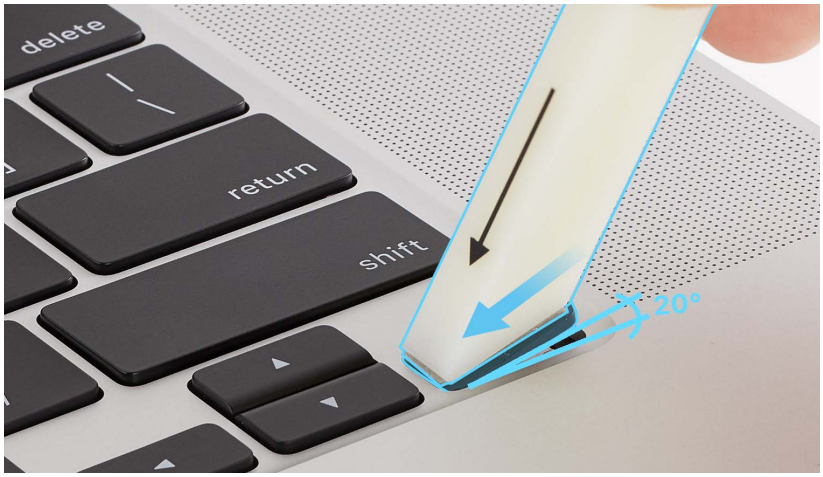
3. Lightly press the small end of the keycap lever and the adhesive onto the key.

Important

Point the arrow on the lever toward the hinged side of the keycap, which is opposite of the side that snaps onto the keyboard. You can find the location of the snaps at the 1x0.5 Key Maps.

4. Hold the keycap lever on the key for 10 seconds to activate the adhesive.

5. Push the keycap lever toward the arrow and tilt up the lever until you feel the snaps release.



Caution

To avoid damaging the scissor mechanism, don't tilt up the keycap more than 20 degrees.

6. Push the keycap lever toward the hinge to release the keycap (1). Lift the keycap lever to release the keycap from the snaps (2).

7. Inspect the scissor mechanism and well of the keycap:
   - Use the black stick to gently move the scissor mechanism up and down (1). Verify that the scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.
   - Use the black stick to press and release the dome through the top of the scissor mechanism — the dome should spring back upright. If the dome is damaged or not centered, replace the top case.
   - If a lower hook is bent, try to bend it back to a 90-degree angle.
   - If an upper hook is bent, use needle-nose pliers to straighten it.
   - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.

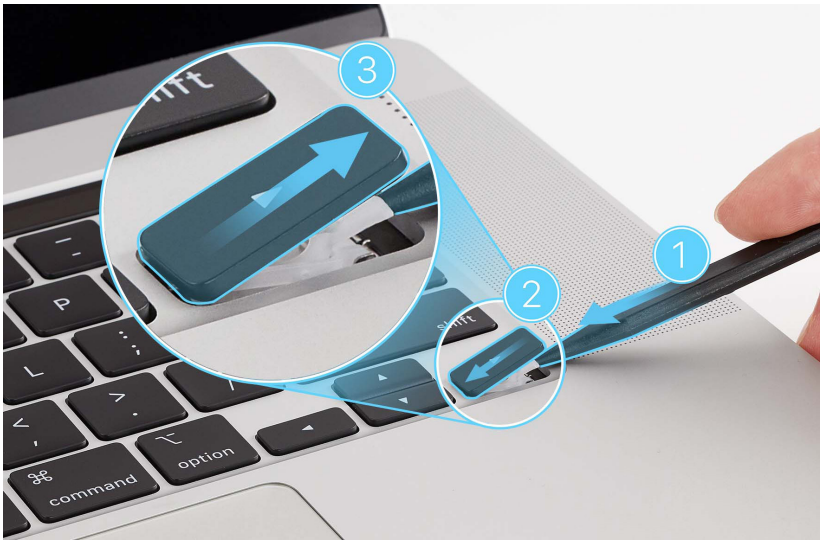
8. Use compressed air to clean the well of the keycap.

   Note: If compressed air doesn't dislodge visible debris, use the black stick to gently dislodge it.

9. Remove the keycap and adhesive from the keycap lever. Discard the keycap and adhesive.

Reassembly

1. Use the black stick to lift the scissor slightly (1). Insert the hinged side of the replacement keycap into the well at a 15-degree angle as shown (2). Slide the keycap back toward the snap to engage the hinge (3).



2. Remove the black stick and gently press the top of the keycap to engage the snaps.

3. Tap the key repeatedly to check that it springs back each time. Compare the response of the new keycap with the response of the keycaps around it.

4. If the keycap doesn't appear to be correctly installed, repeat all removal and reassembly steps with a new keycap.

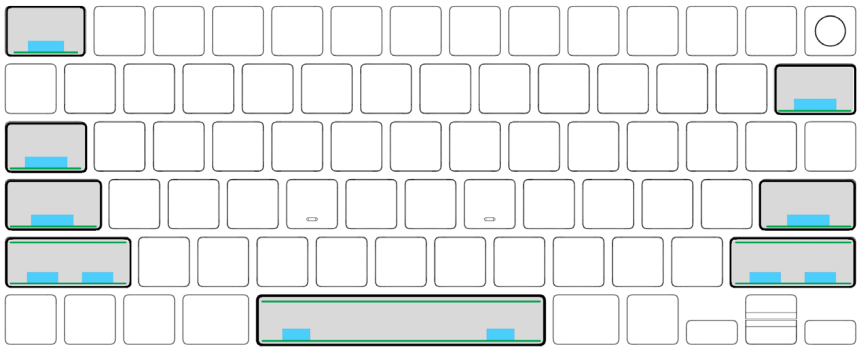
Link Bar Keys

Maps

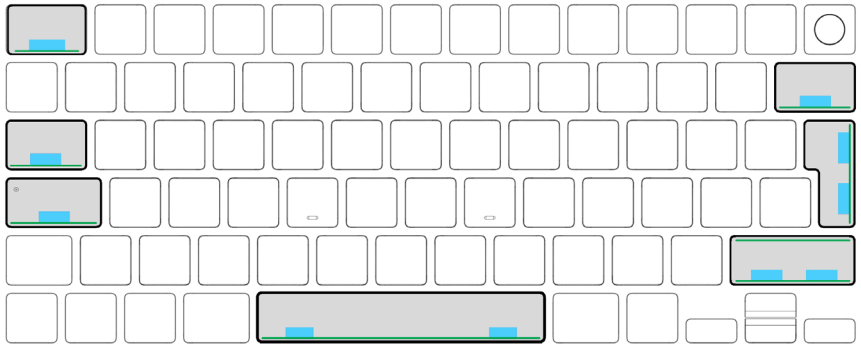
Link Bar keys are highlighted and include the following:

- Escape
- Shift
- Delete
- Return
- Space Bar
- Tab
- Caps Lock

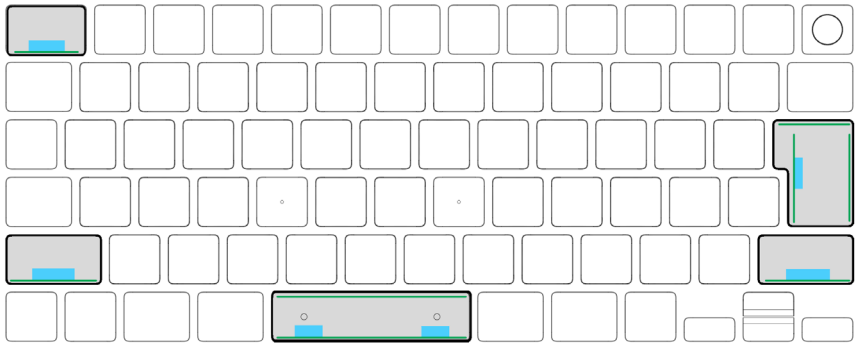
ANSI



ISO



JIS



Note:

- Blue bars show the location of snaps.
- Green lines show the location of link bars.

Removal

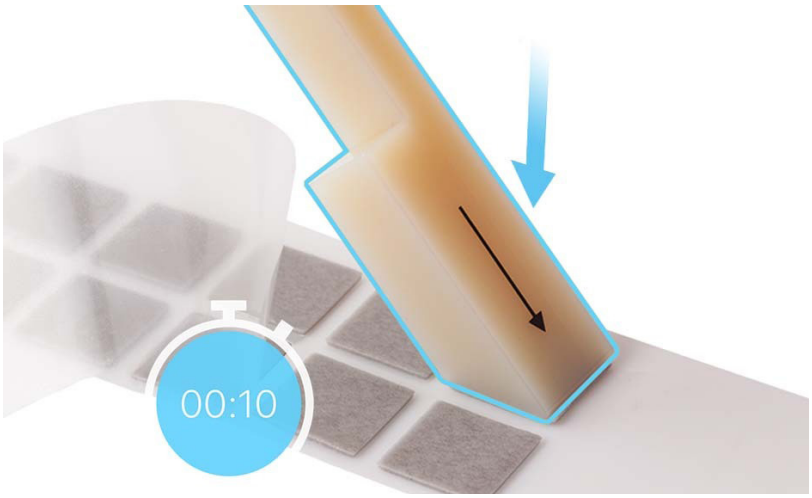
Important

Use two keycap levers for keys with two snaps. You can see these key types in the Link Bar Key Maps.

Note: This procedure shows the removal and reassembly of the Space bar, but the steps are the same whether a link bar key requires using one or two keycap levers. Notes and alerts describe how the procedures vary for the other types of link bar keys.

1. Identify the location of the snaps under the key that you need to replace using the Link Bar Key Maps.

2. Peel the frosted liner from one side of the 1x1 precut adhesive strips. Press and hold the large end of the keycap lever on the adhesive for 10 seconds. Lift the keycap lever and the adhesive to separate them from the white liner.



3. Place the keycap lever on its side. Repeat step 2 with the second keycap lever, then continue to step 4.

4. Align the keycap levers over the snaps.

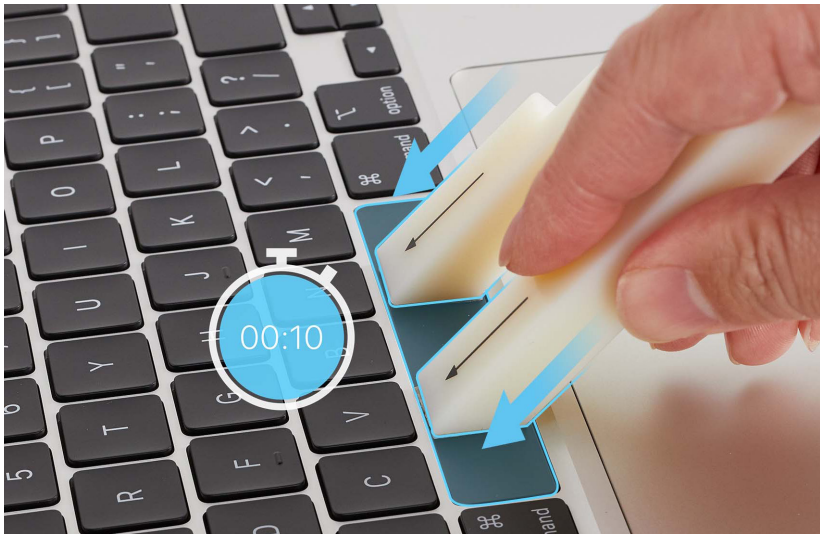
5. Lightly press the adhesive ends of the keycap levers onto the key.

Important

Point the arrow on a lever to the hinged side of the keycap, which is opposite of the side that snaps onto the keyboard. You can find the location of the snaps in the Link Bar Key Maps.

Note: The JIS Return key has three link bars and one side snap. Position the keycap lever so that the arrow points toward the link bar on the right side of the keyboard.

6. Hold the keycap levers and adhesive on the key for 10 seconds to activate the adhesive.



7. Tilt up the keycap levers in the direction of the arrows until you feel the snaps release.

Caution

For a key with one link bar, don't tilt up the keycap more than 20 degrees.

Important

The bottom link bar on larger keys might stick to the keycap during removal. If this happens, hold the two keycap levers and insert the black stick between the keycap and the bottom link bar. Use the black stick to release the link bar into the keycap well.

8. Remove the keycap.

9. Inspect the scissor mechanisms and keycap wells.
   - Use the black stick to gently move each scissor mechanism up and down. Verify that each scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.
   - Use the black stick to press and release each dome through the top of the scissor mechanism — a dome should spring back upright. If a dome is damaged or not centered, replace the top case.
   - If a lower hook is bent, try to bend it back to a 90-degree angle.
   - If an upper hook is bent, use needle-nose pliers to straighten it.
   - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.

10. Use compressed air to clean the well of the keycap.

    Note: If compressed air doesn't dislodge visible debris, use a microterry polishing cloth to gently dislodge the debris.

11. Remove the keycap and adhesives from the keycap lever. Discard the keycap and adhesives.

Reassembly

Important

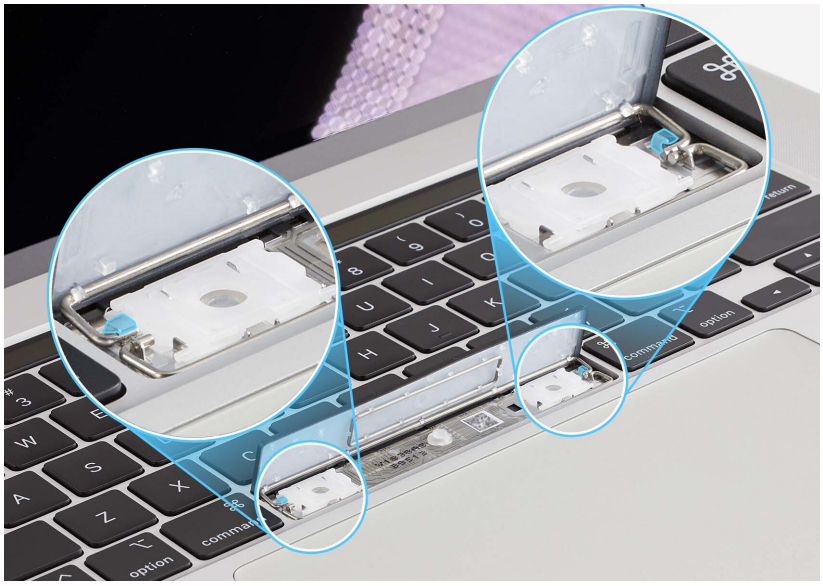
For the keycaps that have more than one link bar, check that the top link bar is preinstalled on the replacement keycap.

Note: On the JIS Return key, the link bar that fits into the right side of the keycap well is preinstalled.

1. Position the keycap in the well and insert the top link bar into the metal hooks that are on each side of the well.

Important

To reinstall the JIS Return key, insert the keycap into the right side of the well.



2. Push the keycap forward to set the top link bar in place.

3. Gently press the snaps and scissor mechanisms as shown to engage the keycap. You can find the snap locations in the Link Bar Key Maps.

   Note: For keys with one link bar, gently push the hinged side of the replacement keycap into the hinged side of the well at a 15-degree angle until the hinges engage. Then gently press the snap or snaps.

4. Tap the key repeatedly to verify that it springs back each time. If the keycap doesn't appear to be correctly installed, repeat all removal and reassembly steps with a new keycap.

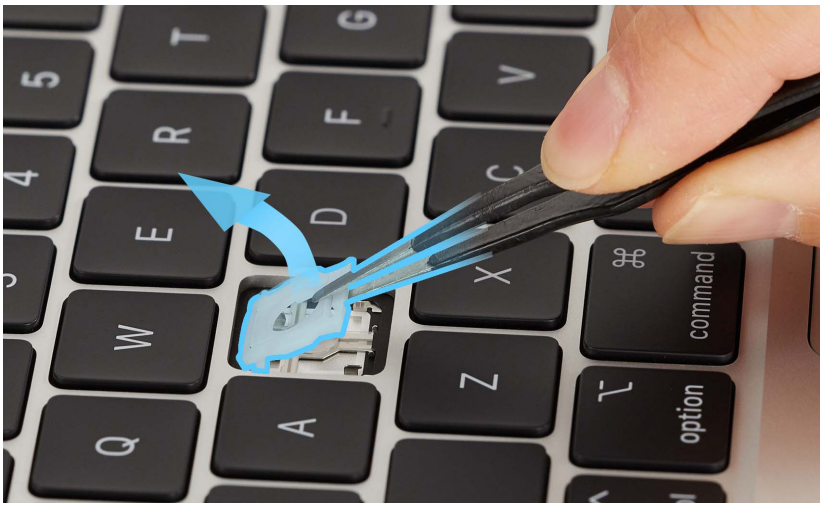
Scissor Mechanisms
Removal

Important

- Do not remove a scissor mechanism unless it is damaged. You can find the correct replacement in the scissor mechanism identification chart.
- Note the orientation of the scissor mechanism before you remove it.

1. Use the black stick to disengage the scissor pins from the lower hooks.

2. Use tweezers to lift the scissor mechanism out of the well.



3. Inspect the well of the keycap:
    - When you press and release the dome, it should spring back upright. If the dome is damaged or not centered, replace the top case.
    - If a lower hook is bent, try to bend it back to a 90-degree angle.
    - If an upper hook is bent, use needle-nose pliers to straighten it.
    - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.

Reassembly

1. Use compressed air to clean the well of the keycap.

   Note: If compressed air doesn't dislodge visible debris, use the black stick to gently dislodge it.

2. Use ESD-safe tweezers to position the scissor in the well and engage the upper hooks.

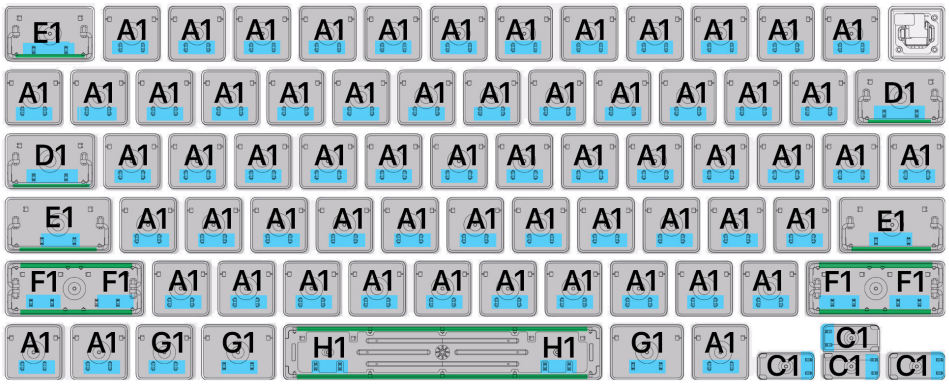
3. Use the black stick to engage the scissor pins with the lower hooks. The pin is engaged as shown (1). The pin is not engaged as shown (2).

4. Use the black stick to gently move the scissor mechanism up and down. Ensure that the scissor mechanism moves easily and lies flat when released.

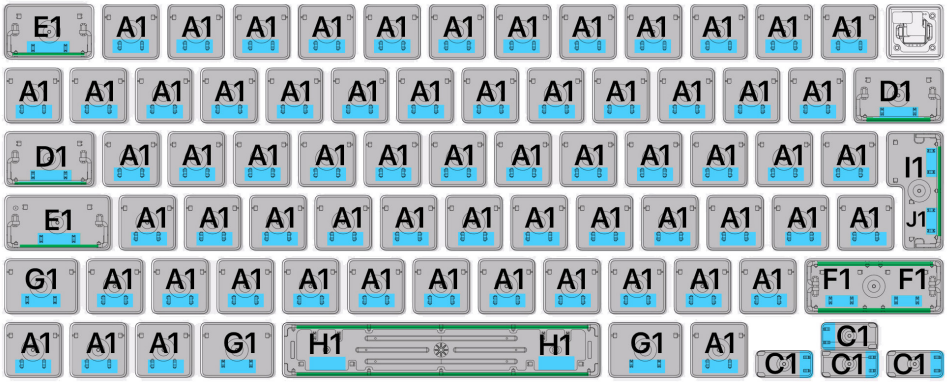
Keyboard Maps

Each symbol on the maps below corresponds to a symbol on the scissor mechanism identification chart and the scissor bag. Blue indicates where the snaps are located, and green indicates link bars.

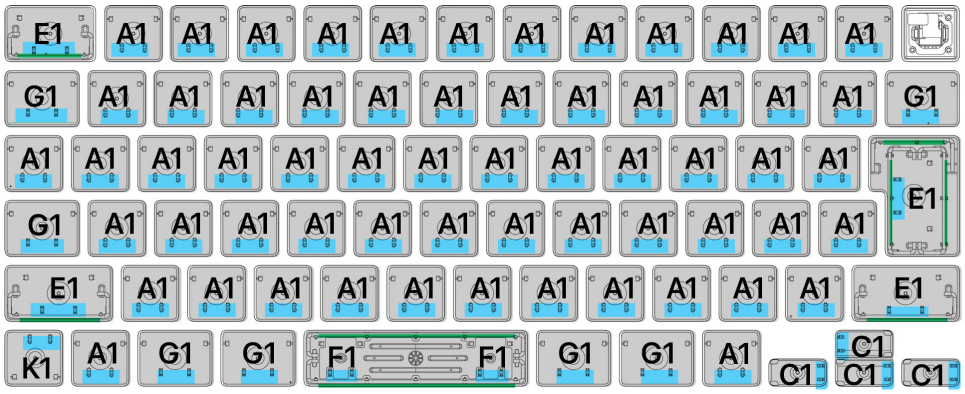
ANSI



ISO



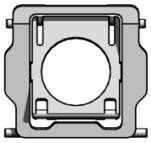
JIS



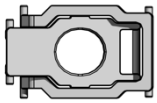
Scissor Mechanism Identification

Match the scissor mechanism to the label to identify the correct replacement. Don’t replace a scissor mechanism unless it is broken.

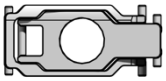
A1



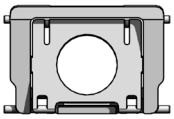
B1



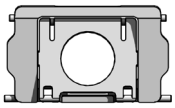
C1



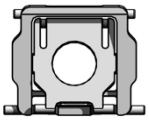
D1



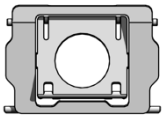
E1



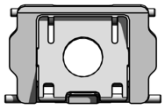
F1



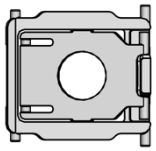
G1



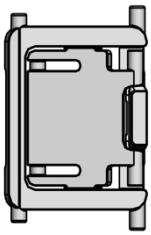
H1



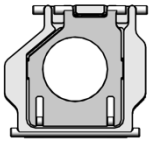
I1



J1



K1



Bottom Case

Before You Begin

Warning

Read Battery Safety and follow workspace and battery handling guidelines before you begin.

Tools

- Battery flex cable alignment tool
- Battery cover
- Cut-resistant gloves
- Nylon probe (black stick) (2)
- Pentalobe screwdriver
- Suction cup
- Torque driver (blue, 0.65 kgf cm)
- Torx T3 half-moon bit

Removal

1. Place the computer on a clean, flat surface with the bottom faceup.

2. Use the pentalobe screwdriver to remove the two pentalobe screws (1) from the rear corners of the bottom case.

   Note: The screw color is specific to your model.

   - Midnight (923-07544)
   - Silver (923-07262)
   - Space gray (923-07261)
   - Starlight (923-07262)

3. Use the pentalobe screwdriver to remove the two pentalobe screws (2) from the front corners of the bottom case.

   Note: The screw color is specific to your model.

   - Midnight (923-07543)
   - Silver (923-07542)
   - Space gray (923-07260)
   - Starlight (923-07542)

4. Press the suction cup to attach it to the upper right corner of the bottom case.

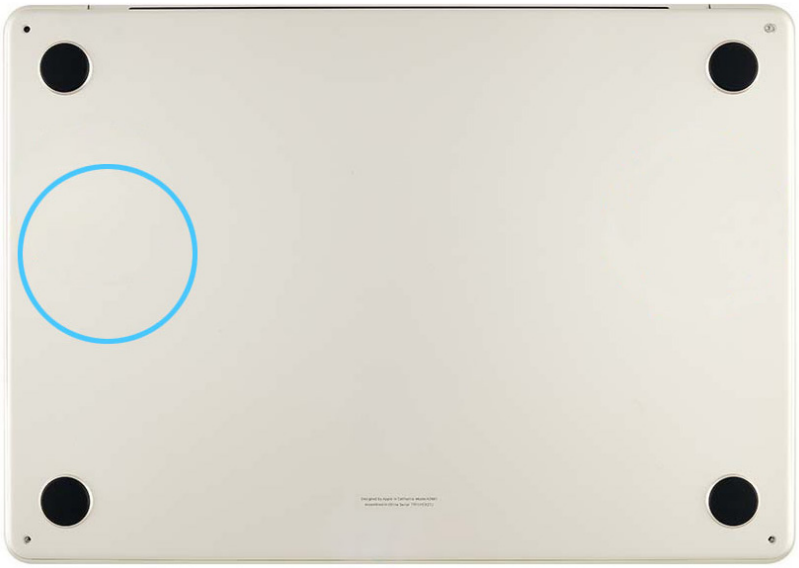
5. Four internal clips attach the bottom case to the top case. Pull up the handle of the suction cup until you feel the internal clip on the right release.

6. Squeeze the edges of the suction cup to release it.

7. Press the suction cup to attach it to the bottom of the bottom case.

8. Pull up the handle of the suction cup until you feel the two internal clips on the bottom release. Then squeeze the edges of the suction cup to release it.

9. Press the suction cup to attach it to the upper left corner of the bottom case.



10. Pull up the handle of the suction cup until you feel the internal clip on the left release. Then squeeze the edges of the suction cup to release it.

11. Insert the two black sticks into the gap between the display and top case as shown (1). Pull the two black sticks against the edge of the bottom case to disengage it and create a gap next to the display hinges (2).

12. Put on the cut-resistant gloves.

13. Slightly lift the bottom case to create a narrow opening between the bottom case and top case on the side facing you. Then pull the bottom case to remove it from the top case. Set the bottom case faceup on a clean, flat surface.

Caution

Don't lift the bottom case more than 10 mm.

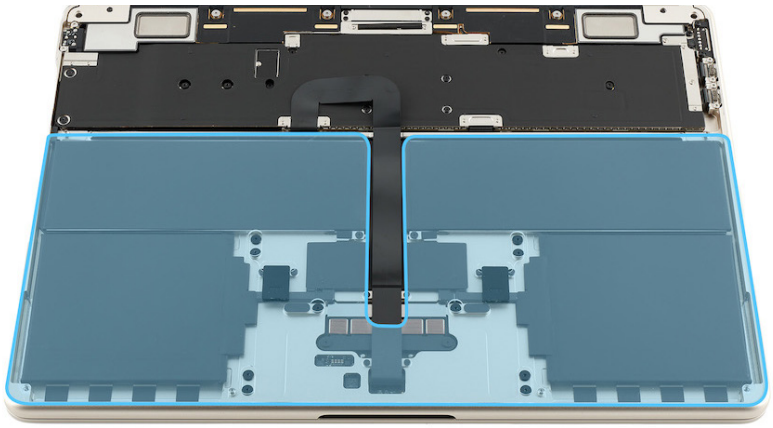
Important

If you're replacing the bottom case:

- Keep the existing bottom case until the repair is complete.
- Use a fine-tip permanent marker to write the computer serial number on the inside of the replacement bottom case.
- If you're replacing only the bottom case and no other parts, skip to reassembly step 7.

14. Take off the gloves.

15. Place the battery cover on the battery. Then press the black tabs into the clips on the top case until you feel a click.

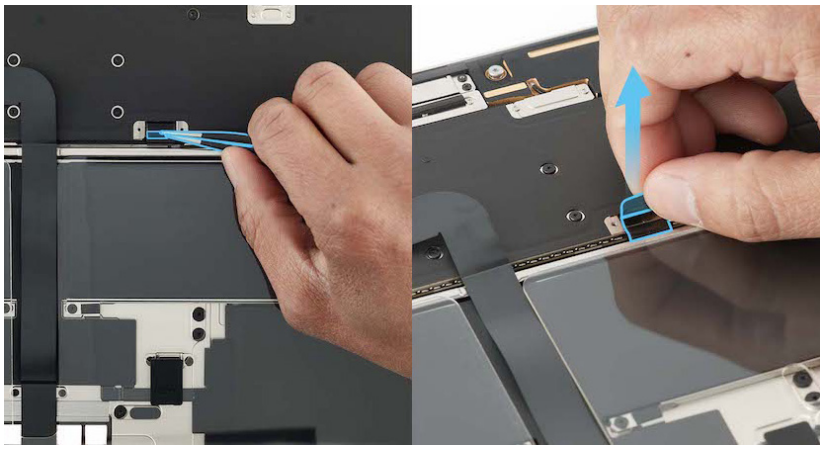


16. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the two T3 screws (923-07277) from the battery connector cowling.

17. Remove the battery connector cowling and save it for reassembly.

18. Use ESD-safe tweezers to peel the polyester film tab from the end of the battery flex cable.

19. Grasp the polyester film tab and lift the end of the battery flex cable off the connector.



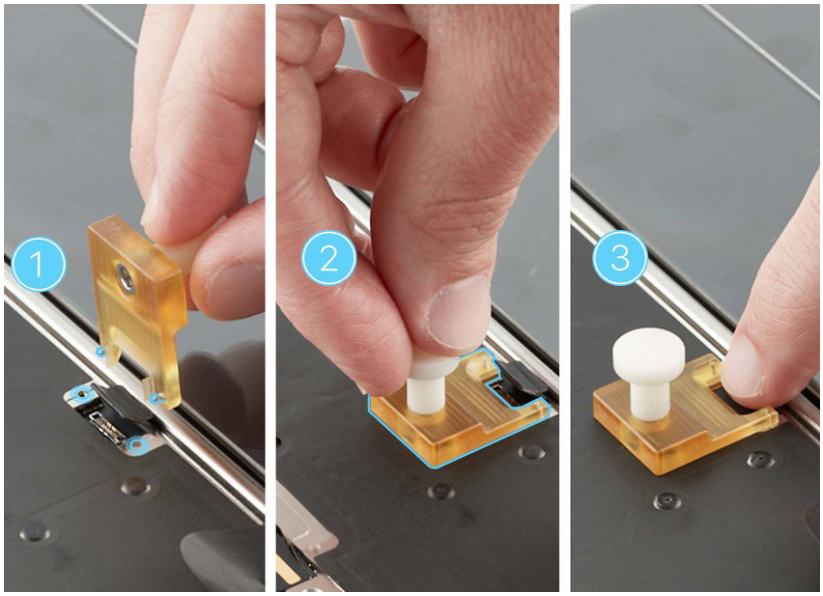
Reassembly

1. Position and insert the battery flex cable alignment tool pins into the screw holes as shown (1).

2. Lower the battery flex cable alignment tool onto the heat sink as shown (2).

3. Press the end of the battery flex cable to the connector (3).

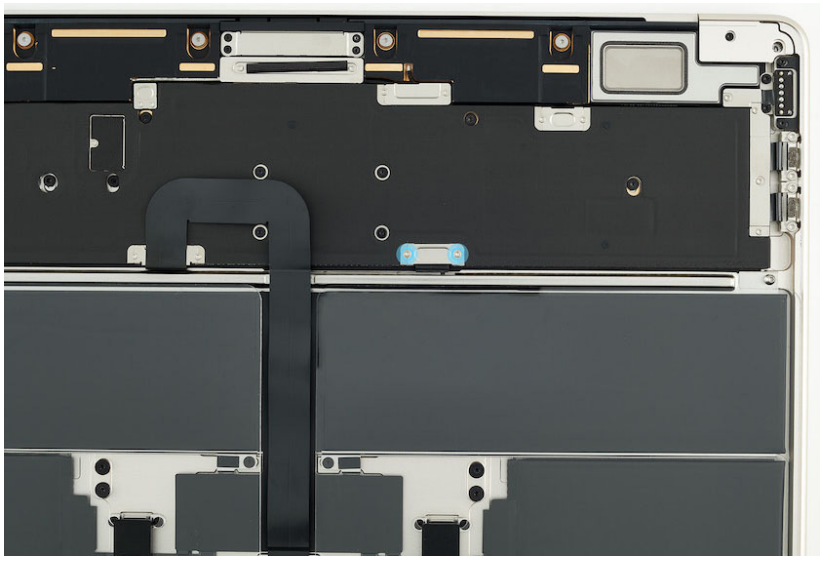
   Note: Ensure that the polyester film tab is adhered onto the end of the battery flex cable.



4. Remove the battery flex cable alignment tool.

5. Position the battery connector cowling over the end of the battery flex cable.

6. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the two T3 screws (923-07277) into the battery connector cowling.



7. Rotate the computer so the display hinges are closest to you.

8. Put on the cut-resistant gloves.

9. Position the bottom case over the top case to align the screw holes near the display hinge cover (1). Push down the bottom case as you slide it toward you to hook two bottom case brackets onto two internal screws as shown (2).

Important

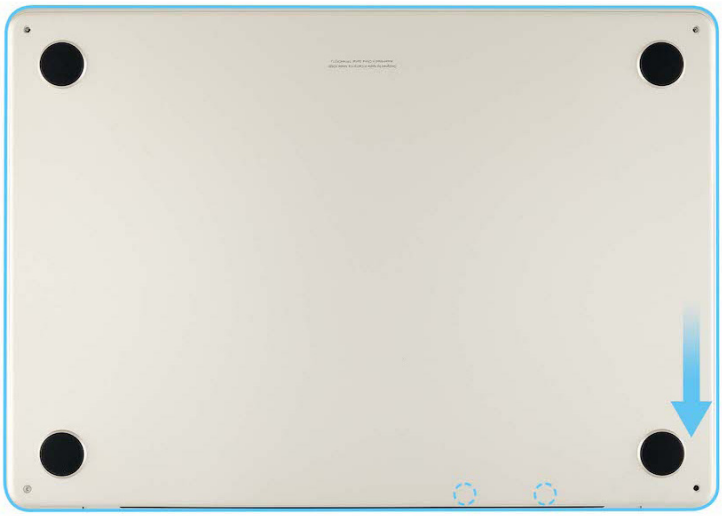
Ensure that the bottom case hovers approximately 10 mm above the top case to minimize scratching (3).

10. Use the pentalobe screwdriver to partially reinstall the pentalobe screw into the rear corner of the bottom case.

    Note: Use the correct screw color for your model.

    - Midnight (923-07544)
    - Silver (923-07262)
    - Space gray (923-07261)
    - Starlight (923-07262)

11. Push down the bottom case as you slide it toward you to hook the remaining two bottom case brackets onto the two internal screws.



12. Press the bottom case down to engage the four internal clips in the top case.

13. Use the pentalobe screwdriver to partially reinstall the remaining three pentalobe screws into the bottom case in the order shown.

    Note: Use the correct screw color for your model.

    - Midnight (923-07544)
    - Silver (923-07262)
    - Space gray (923-07261)
    - Starlight (923-07262)

14. Use the pentalobe screwdriver to fully reinstall the four pentalobe screws into the bottom case.

Important

- System Configuration is required if you've installed a replacement display, lid angle sensor, logic board, right and left speakers with antennas, or Touch ID board.
- If you replaced the logic board, the computer will start up in Diagnostics mode until you complete System Configuration.
- If you replaced the Touch ID board, it will function only as a power button until you complete System Configuration.
- After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Display Hinge Covers

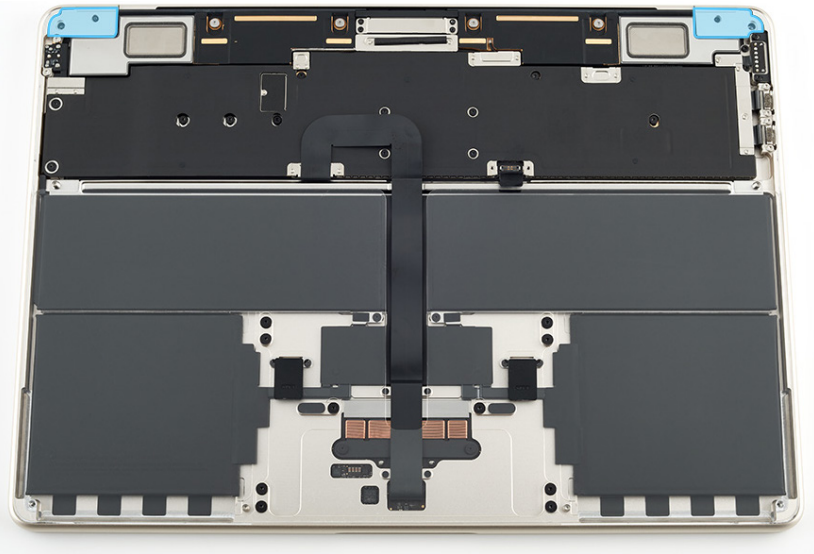
Before You Begin

Remove the following part before you begin:

- Bottom case

Tools

- Adjustable torque driver (10-34 Ncm)
- Keycap lever
- Precut adhesive strips (1x0.5)
- Torx Plus 3IP 25 mm bit

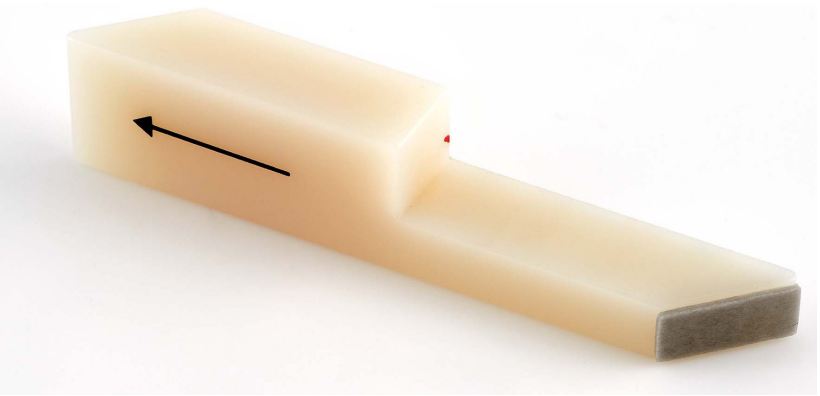


Removal

1. Insert the 3IP bit into the 10–34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to remove the 3IP screw (923-07287) from the right display hinge cover.

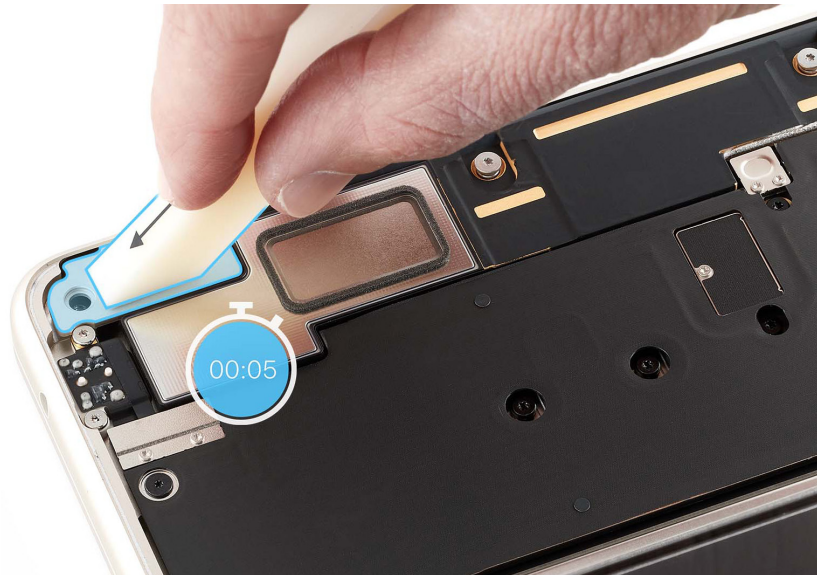
2. Peel the frosted liner from one side of the 1x0.5 precut adhesive strip. Press and hold the small end of the keycap lever on the adhesive for 10 seconds.

3. Lift the keycap lever and the adhesive to separate them from the white liner.

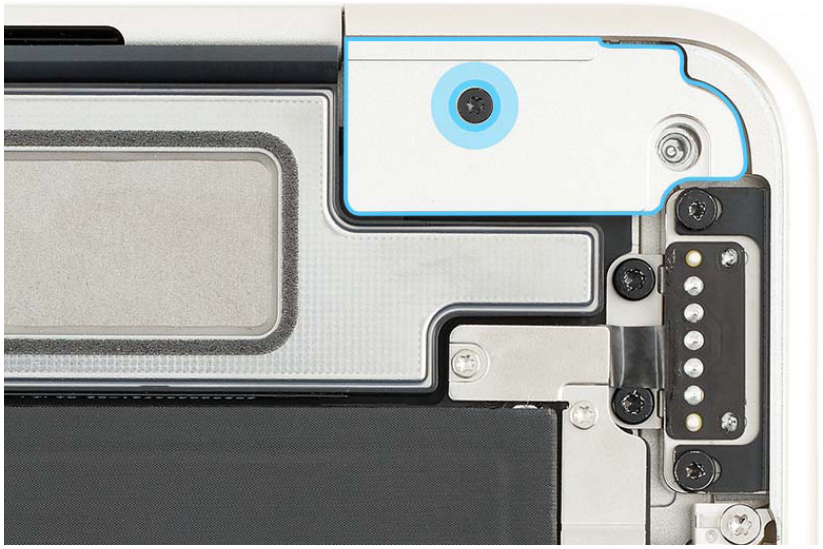


4. Lightly press the small end of the keycap lever and the adhesive onto the right display hinge cover. Hold the keycap lever on the display hinge cover for 5 seconds to activate the adhesive.

5. Lift the keycap lever to remove the right display hinge cover from the top case.



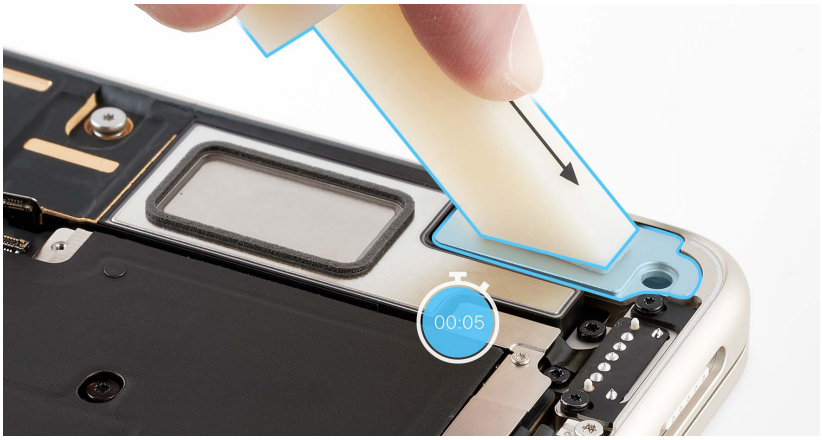
6. Keep the 3IP bit in the 10–34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to remove the 3IP screw (923-07287) from the left display hinge cover.



7. Press and hold the small end of the keycap lever on the 1x0.5 precut adhesive strip for 10 seconds.

8. Lift the keycap lever and the adhesive to separate them from the white liner.

9. Lightly press the small end of the keycap lever and the adhesive onto the left display hinge cover. Hold the keycap lever on the display hinge cover for 5 seconds to activate the adhesive.



10. Lift the keycap lever to remove the left display hinge cover from the top case.

Reassembly

1. Position the right hinge cover in the top case.

2. Insert the 3IP bit into the 10–34 Ncm adjustable torque driver. Set the torque value to 10 Ncm.

3. Use the adjustable torque driver and 3IP bit to reinstall the 3IP screw (923-07287) into the right display hinge cover.

4. Position the left display hinge cover in the top case.

5. Keep the 3IP bit in the 10–34 Ncm adjustable torque driver. Set the torque value to 10 Ncm.

6. Use the adjustable torque driver and 3IP bit to install the 3IP screw (923-07287) into the left display hinge cover.

Reinstall the following part to complete reassembly:

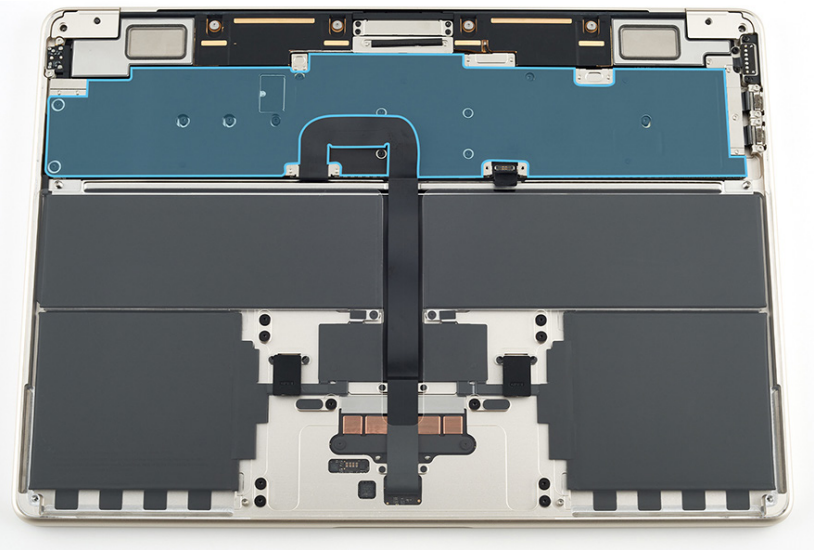
- Bottom case

Heat Sink

Before You Begin

Remove the following part before you begin:

- Bottom case



Tools

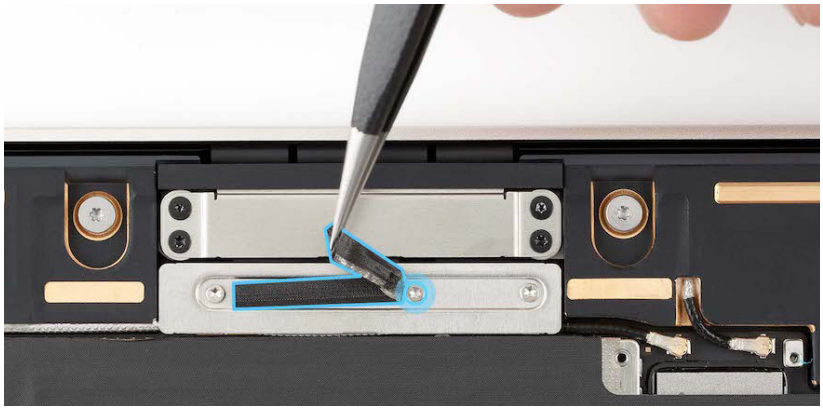
- Access card
- Adjustable torque driver (10-34 Ncm)
- Antenna tool
- ESD-safe tweezers
- Ethanol wipes or isopropyl alcohol (IPA) wipes
- Kapton tape
- Nitrile gloves
- Nylon probe (black stick)
- Safety glasses with side shields
- Torque driver (blue, 0.65 kgf cm)
- Thermal gel
- Thermal gel stencil
- Torx Plus 3IP 25 mm bit
- Torx T3 half-moon bit
- Torx T5 bit

Important

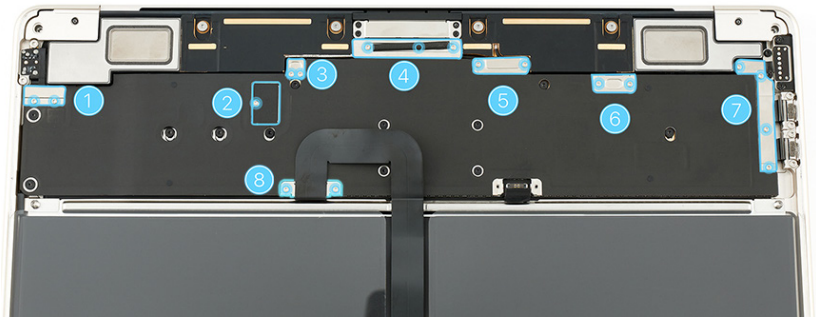
- The heat sink can't be reused. Always install a replacement heat sink.
- Thermal gel is required for this procedure. Thermal gel is included with a replacement heat sink.

Removal

1. Use the ESD-safe tweezers to peel the foam from the display connectors cowling to access the middle screw.



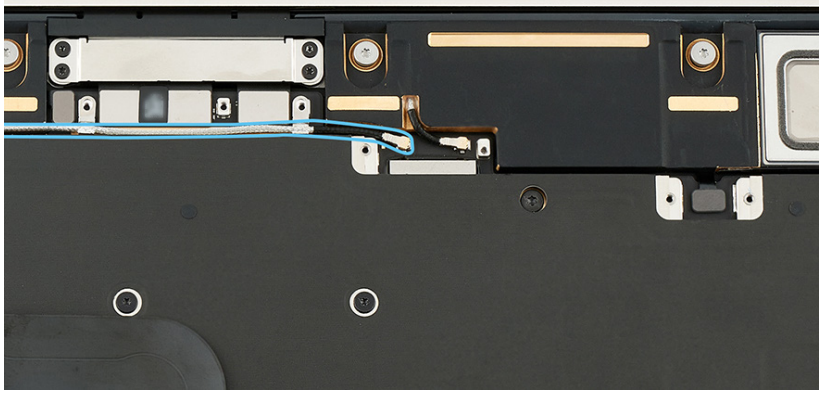
2. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove 18 T3 screws (923-07277) from the following eight cowlings:
   - Lid angle sensor/audio board connector cowling (1)
   - Interposer board connector cowling (2)
   - Right speaker connector cowling (3)
   - Display connectors cowling (4)
   - Antenna coaxial cables connector cowling (5)
   - Left speaker connector cowling (6)
   - MagSafe 3 board/USB-C boards connector cowling (7)
   - Trackpad connector cowling (8)



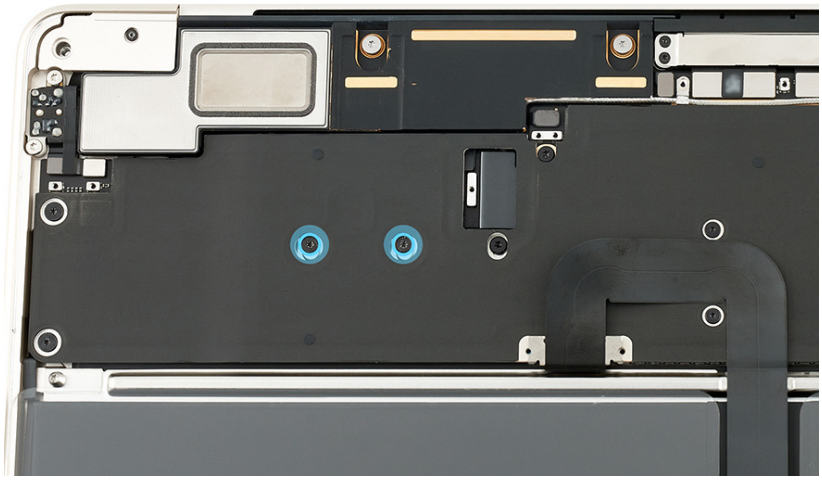
3. Remove seven cowlings (1-7) and save them for reassembly.

   Note: The trackpad connector cowling (8) is adhered to the trackpad flex cable. It doesn't need to be removed for this repair.

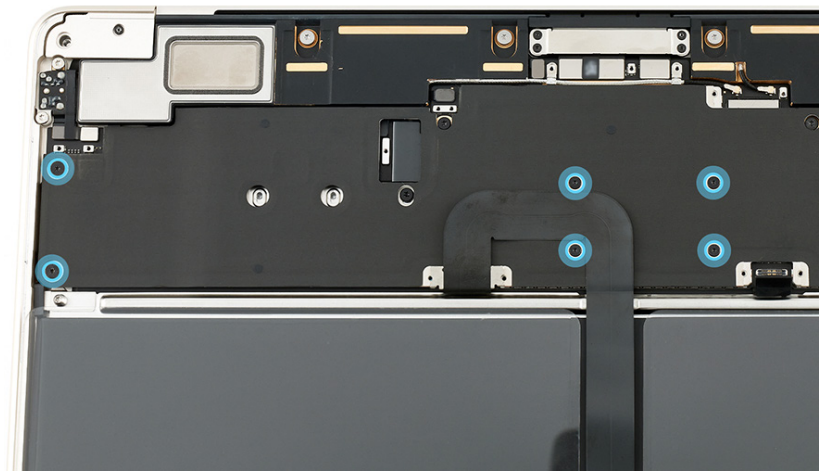
4. Use the black stick to lift the end of the right antenna coaxial cable off the connector.



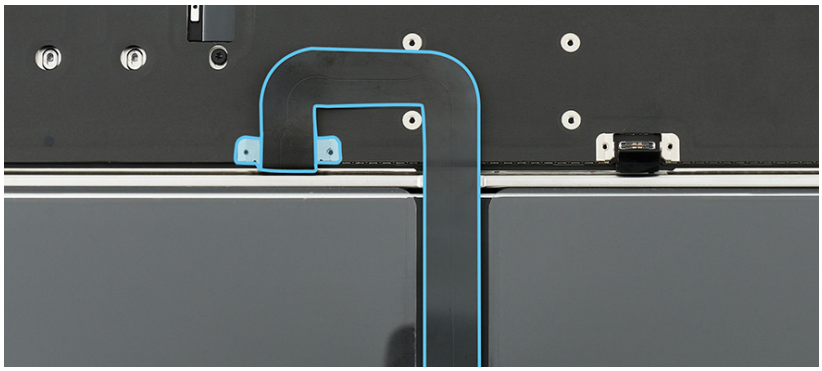
5. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the two T5 screws (923-07292) from the heat sink.



6. Insert the 3IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to remove the six 3IP screws (923-07288) from the heat sink.



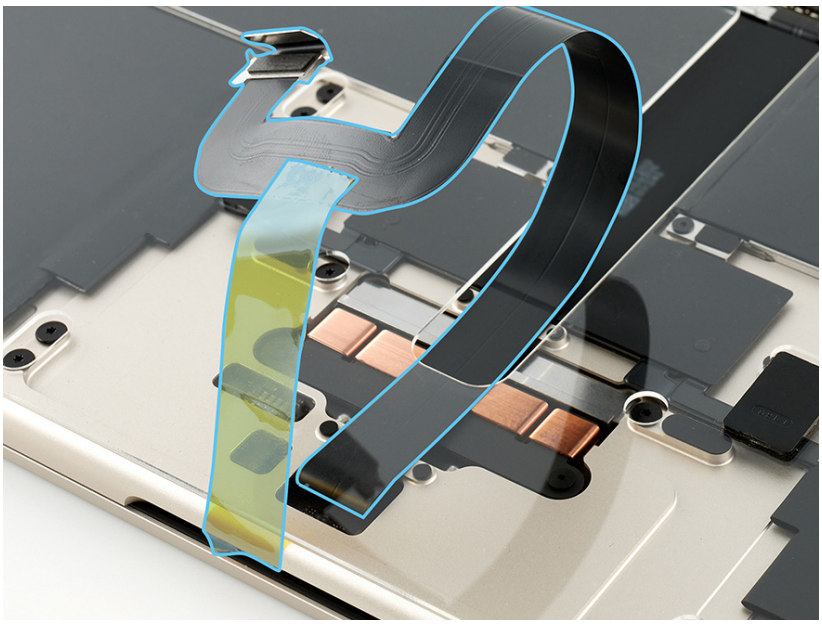
7. Lift the end of the trackpad flex cable and trackpad connector cowling off the connector.



8. Tape the trackpad flex cable out of the way with Kapton tape as shown.

Caution

Don't fold or crease the flex cable.

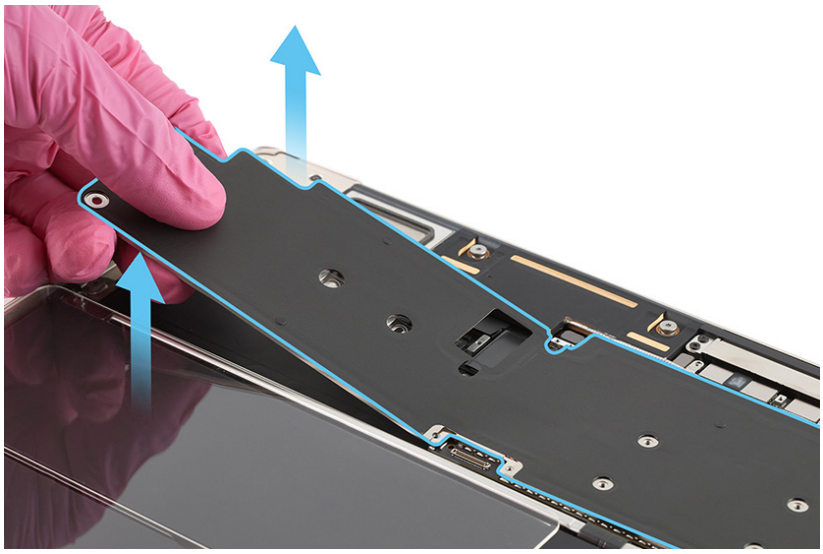


9. Put on the gloves and safety glasses with side shields.

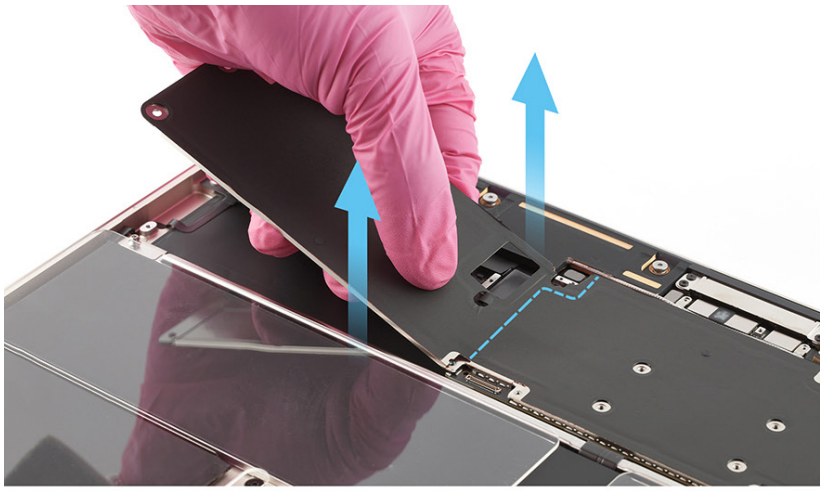
Caution

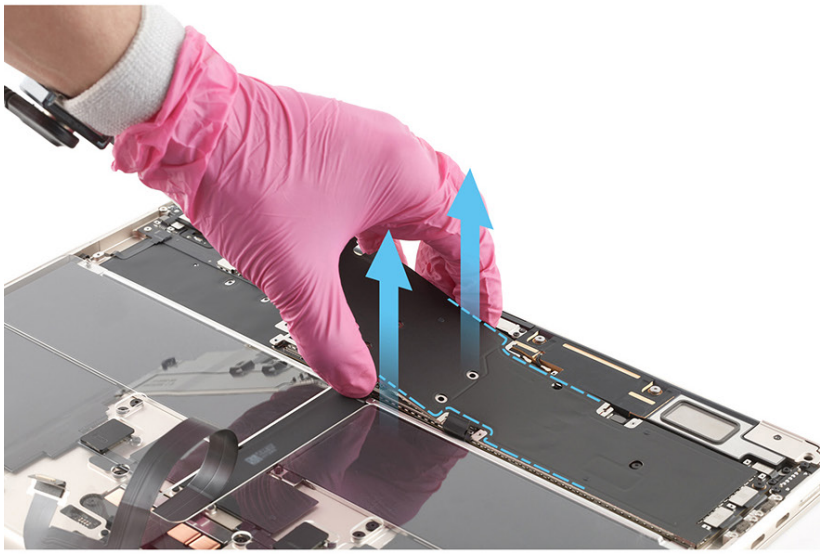
Thermal gel can discolor your skin and clothes. Ensure that you wear the gloves and safety glasses while working with the thermal gel.

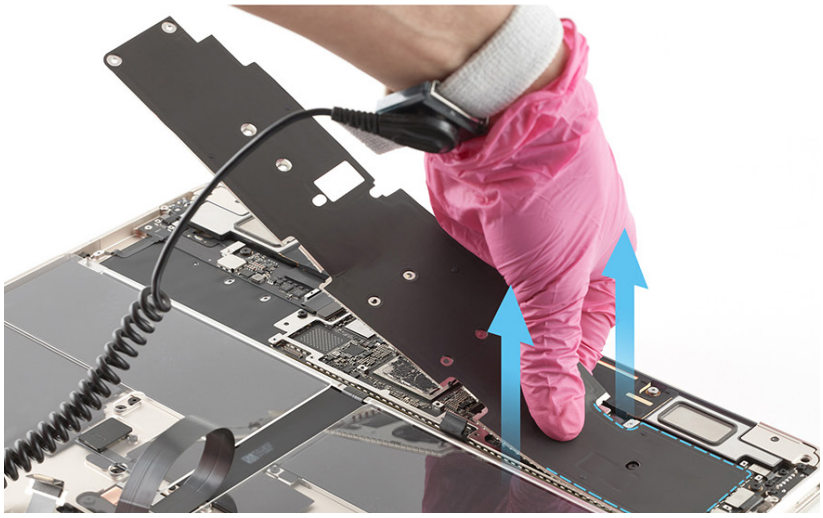
10. Gently tilt up the left side of the heat sink as shown.



11. Continue to gently remove the heat sink from left to right as shown, releasing the clips that attach the heat sink to the logic board. Lift the top and bottom of the heat sink alternatively and as evenly as possible to disengage the clips.





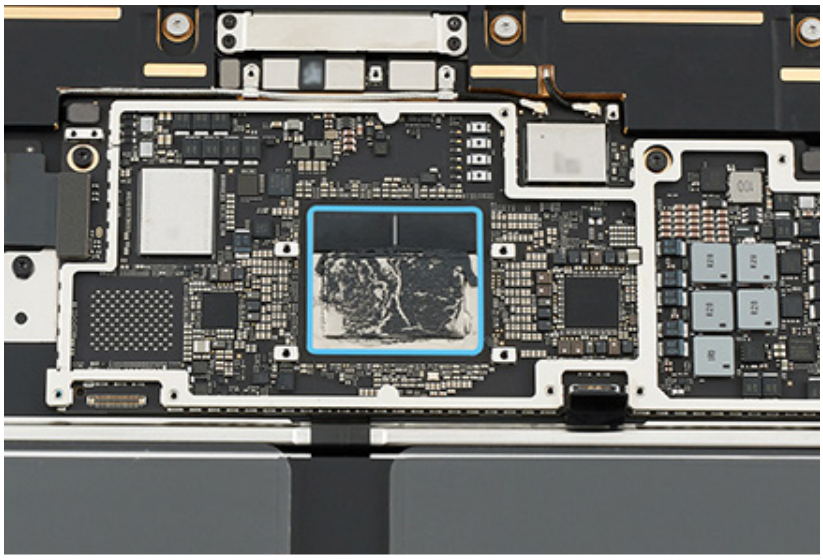


12. Use ethanol or IPA wipes to clean the thermal gel from the chip on the logic board. Ensure that you clean off any thermal gel remaining on other parts as well.

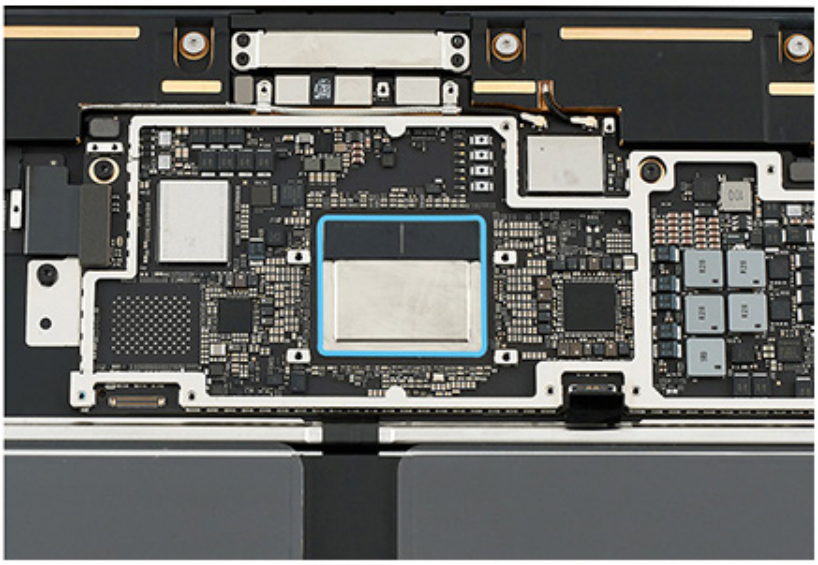
Important

- Ensure that the wipes aren't dripping with liquid. If they are, use a paper towel to absorb the excess liquid from the wipe.
- If needed for more precise cleaning, wrap a wipe around the black stick to clean the chip. Don't scratch the chip by applying too much pressure with the black stick.

Before



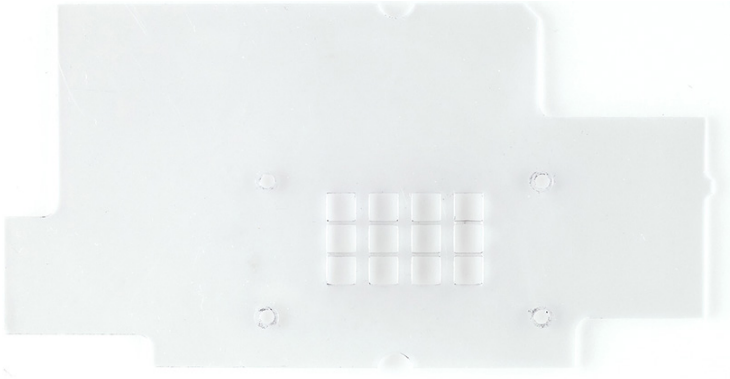
After



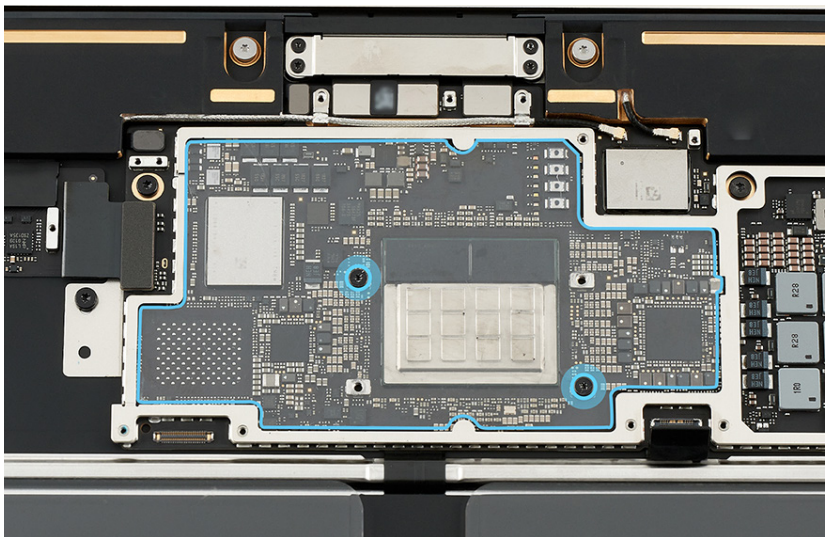
Reassembly

1. Put on the gloves and safety glasses with side shields.

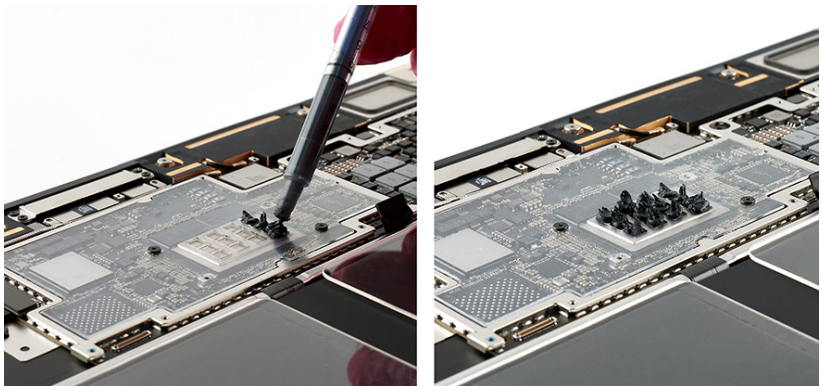
2. Position the thermal gel stencil over the logic board.



3. Insert the 3IP bit into the blue torque driver. Then use the blue torque driver and 3IP bit to partially reinstall the two 3IP screws into the thermal gel stencil and logic board as shown.



4. Apply the thermal gel to the thermal gel stencil. Ensure that you fill all 12 squares in the stencil as shown.

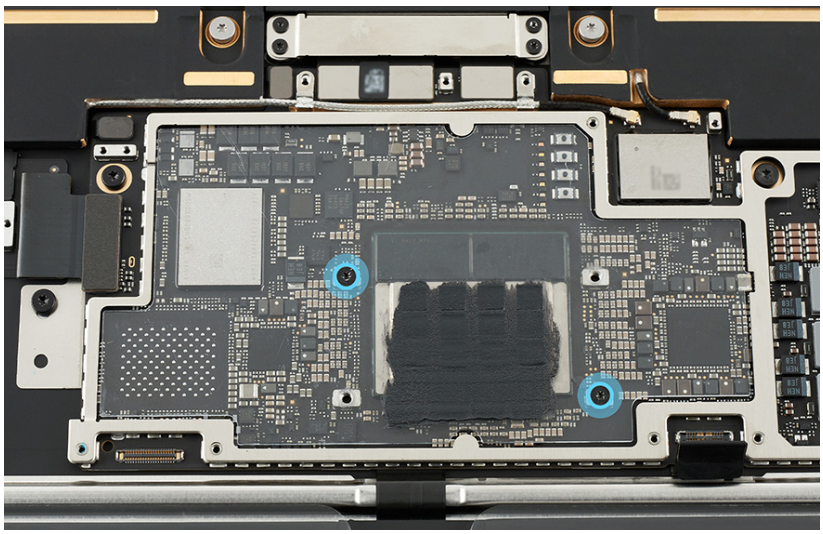


5. Gently press the access card downward across the thermal gel stencil to scrape off the excess thermal gel.

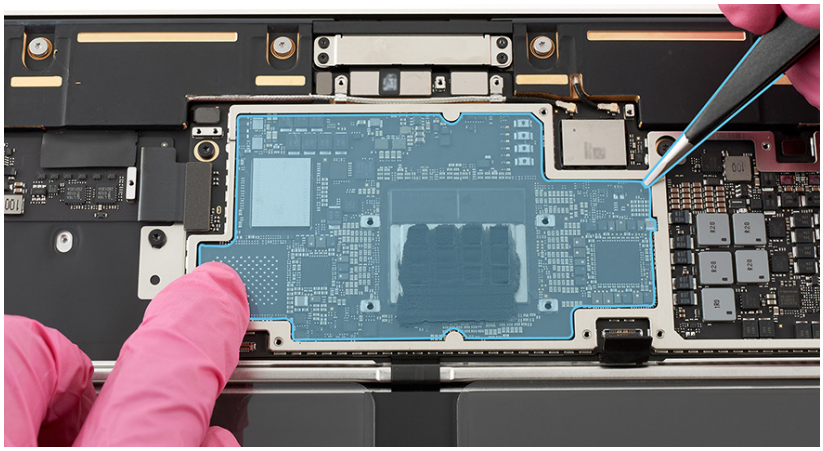
6. Using the same side of the access card, gently press the access card upward across the thermal gel stencil.

   Note: Ensure that all 12 squares in the stencil are filled with thermal gel. If the squares aren't completely filled with thermal gel, repeat steps 5 and 6 until they are. Then continue to step 7.

7. Insert the 3IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to remove the two 3IP screws from the thermal gel stencil and logic board.

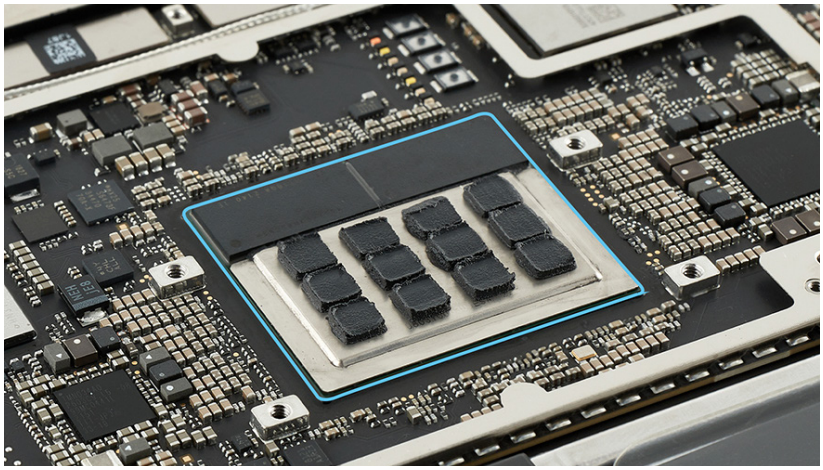


8. Use ESD-safe tweezers to grasp one side of the thermal gel stencil while holding the other side of the stencil in place. Then remove the stencil from the top case.



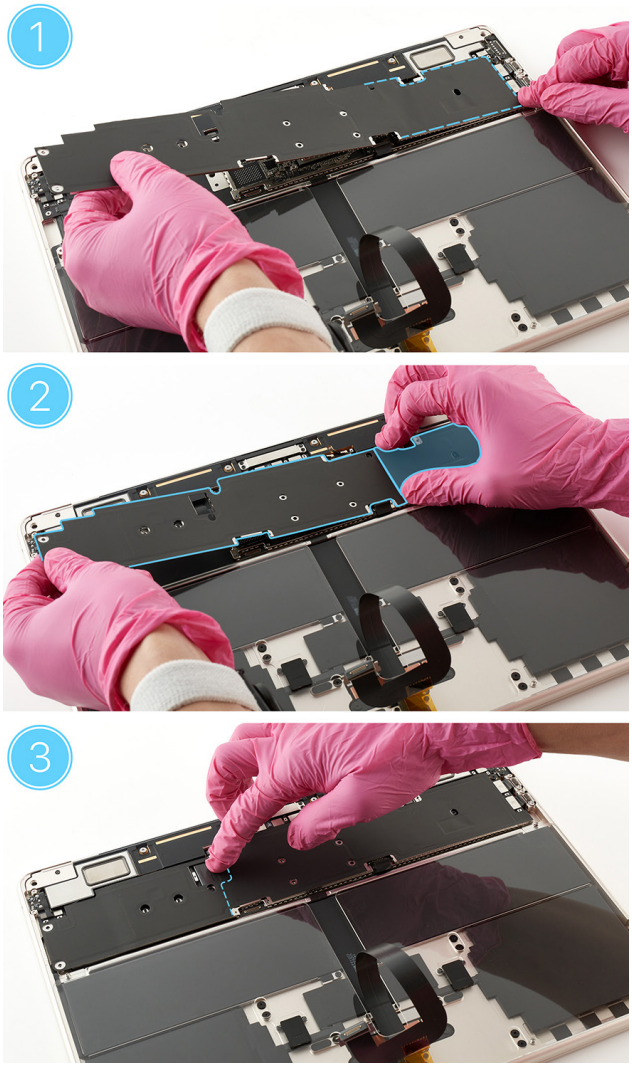
Important

Ensure that the thermal gel application is applied as shown after the thermal gel stencil is removed.

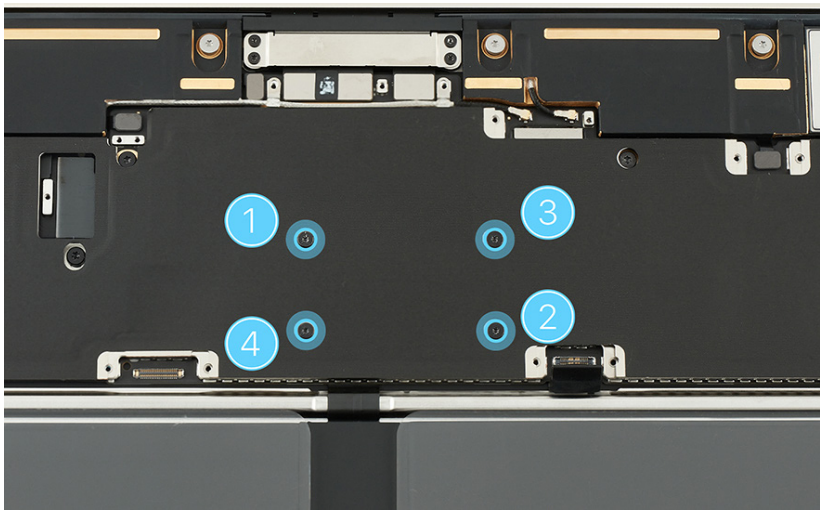


9. Position the right side of the replacement heat sink in the top case as shown. Then gently press down on the lower right corner to engage the clips next to the USB-C boards.

10. Moving left, continue positioning the heat sink in the top case while engaging the clips (1). Stop at the battery flex cable connector (2). Then press the heat sink down to engage the clips near the trackpad flex cable connector (3).

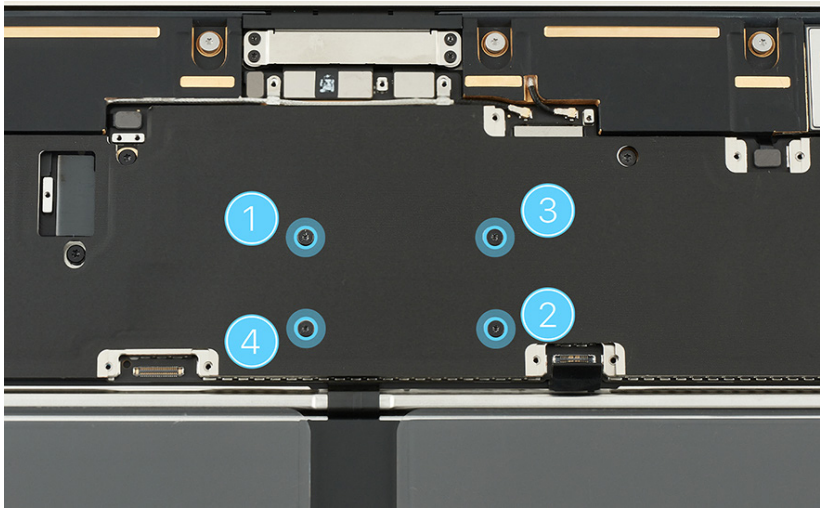


11. Keep the 3IP bit in the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to partially reinstall the four 3IP screws (923-07288) into the heat sink in the order shown.

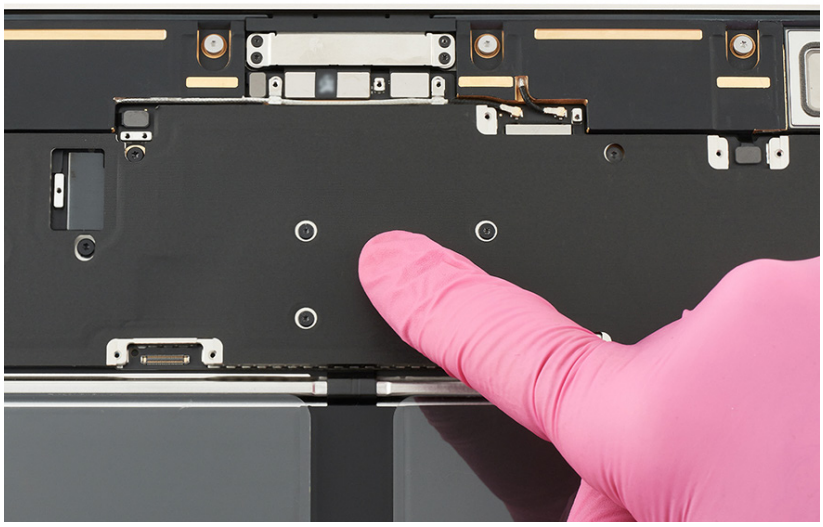


12. With the 3IP bit still in the 10-34 Ncm adjustable torque driver, set the torque value to 11.5 Ncm.

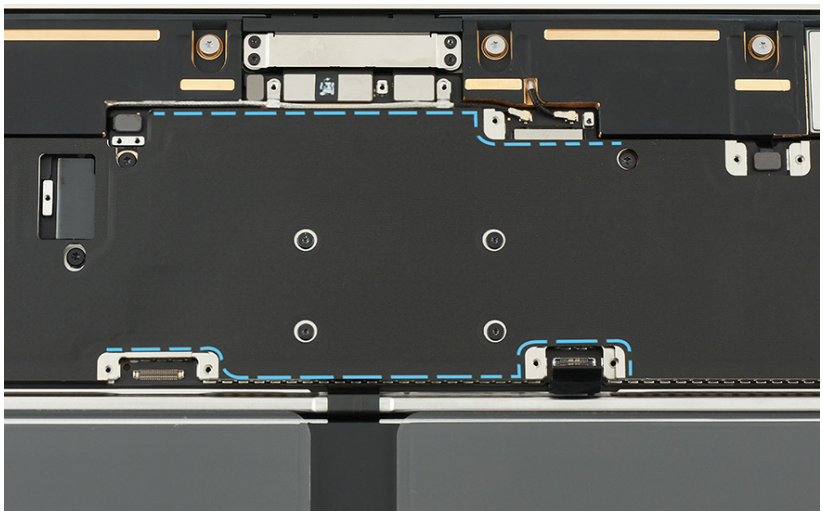
13. Use the adjustable torque driver and 3IP bit to fully reinstall the four 3IP screws in the order shown.



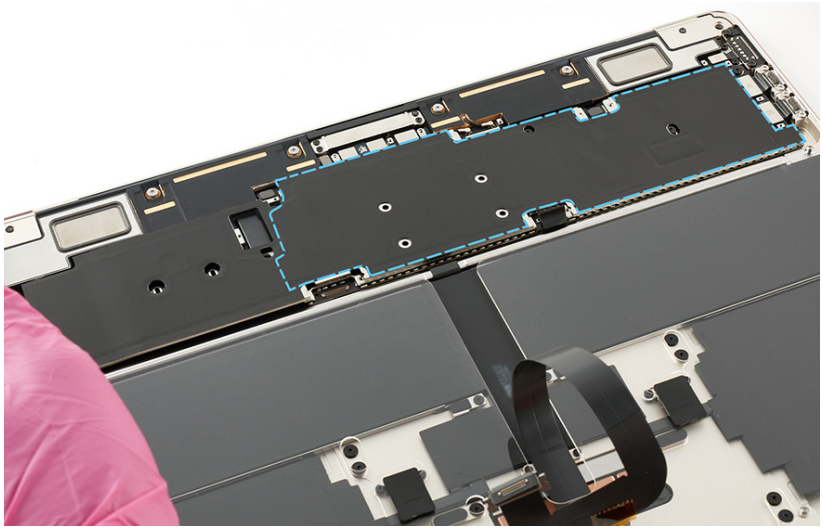
14. Gently press on the heat sink over the chip to adhere the heat sink to the chip.



15. Gently press the heat sink to engage the remaining clips as shown.

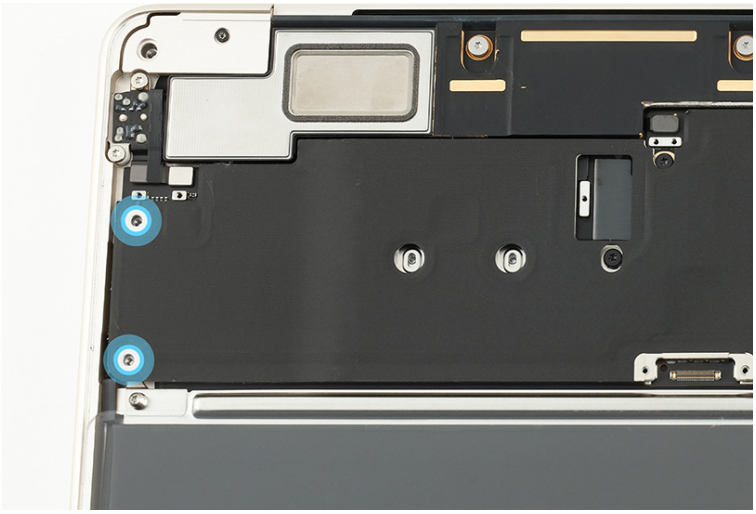


16. Ensure that all the clips between the heat sink and the logic board are engaged.



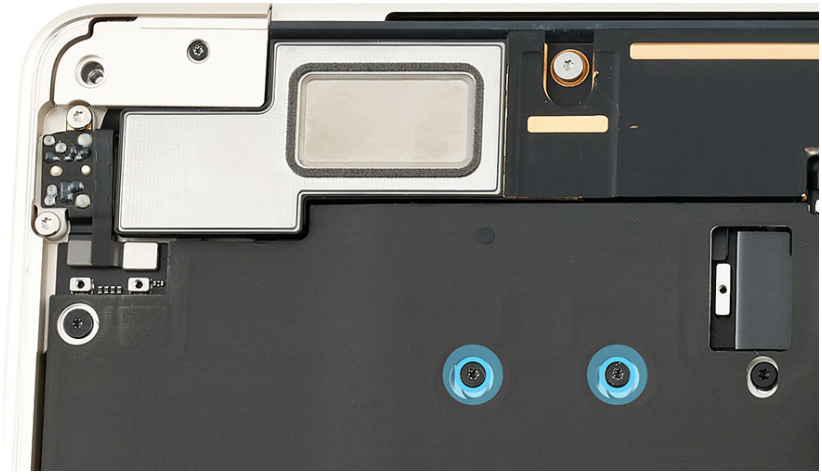
17. Keep the 3IP bit in the 10-34 Ncm adjustable torque driver. Ensure that the torque value is still set to 11.5 Ncm.

18. Use the adjustable torque driver and 3IP bit to reinstall two 3IP screws (923-07288) into the left side of the heat sink.



19. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 10 Ncm.

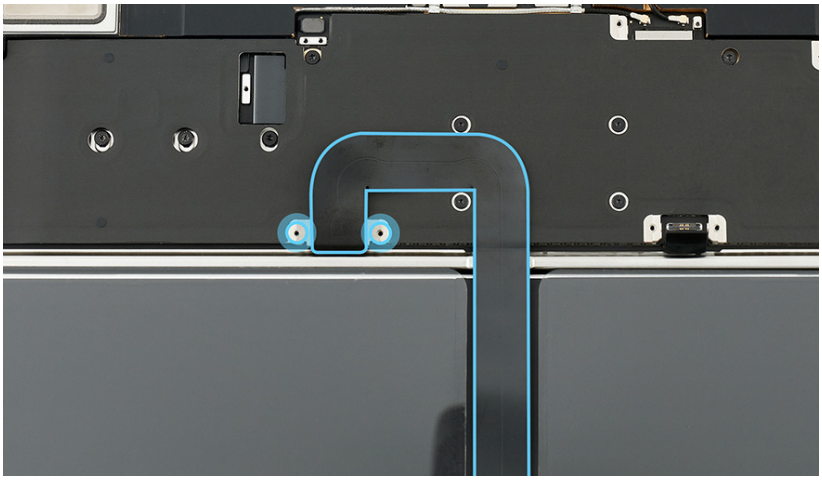
20. Use the adjustable torque driver and Torx T5 bit to reinstall the two T5 screws (923-07292) into the heat sink.



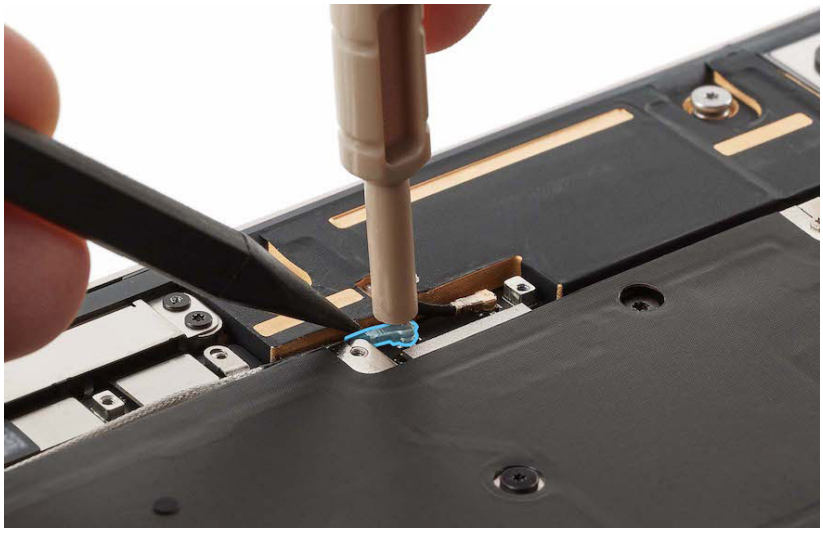
21. Remove the Kapton tape from trackpad flex cable.

22. Press the end of the trackpad flex cable and trackpad connector cowling to the connector.

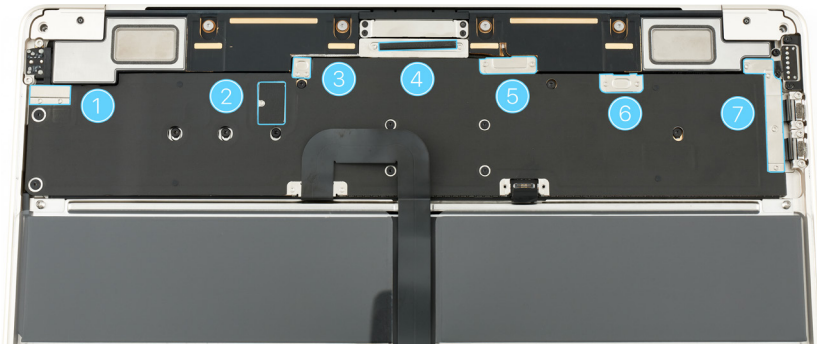
23. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the two T3 screws (923-07277) into the trackpad connector cowling.



24. Use the black stick or ESD-safe tweezers to position the end of the right antenna coaxial cable over the connector. Then use the blunt end of the antenna tool to press the end of the antenna coaxial cable to the connector.

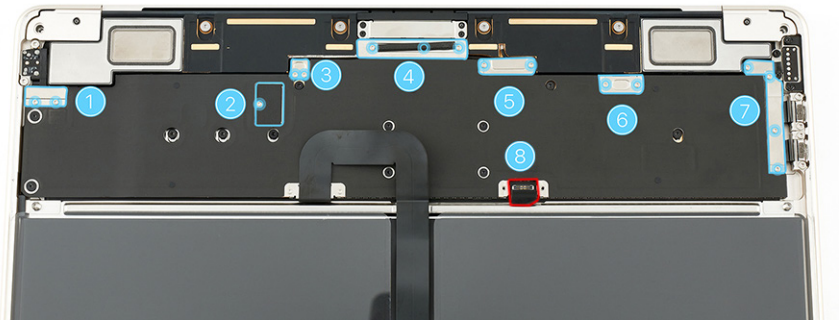


25. Position the following seven cowlings (1-7):
    - Lid angle sensor/ audio board connector cowling (1)
    - Interposer board connector cowling (2)
    - Right speaker connector cowling (3)
    - Display connectors cowling (4)
    - Antenna coaxial cables connector cowling (5)
    - Left speaker connector cowling (6)
    - MagSafe 3 board/ USB-C boards connector cowling (7)



26. Use ESD-safe tweezers to peel the foam from the display connectors cowling to access the middle screw hole.

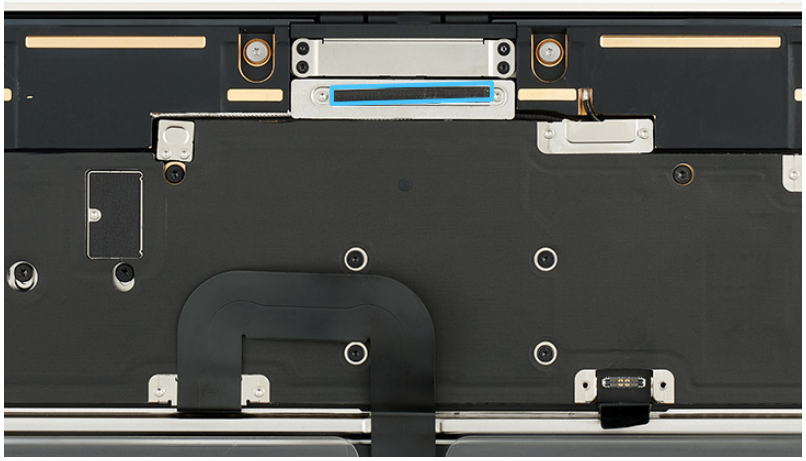
27. Keep the Torx T3 bit in the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the 16 T3 screws (923-07277) into the seven cowlings (1-7).



Caution

Don't connect the battery flex cable (8) or you may damage the logic board.

28. Press along the length of the foam on the display connectors cowling to adhere it to the cowling.



Reinstall the following part to complete reassembly:

- Bottom case

MagSafe 3 Board

Before You Begin

Remove the following part before you begin:

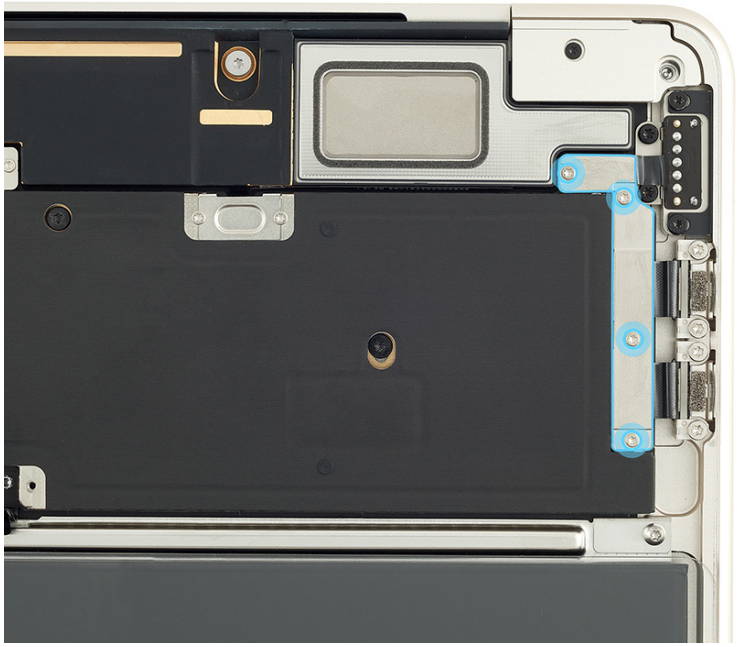
- Bottom case

Tools

- Adjustable torque driver (10-34 Ncm)
- ESD-safe tweezers
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 3IP 25 mm bit
- Torx T3 half-moon bit
- Torx T5 bit
- USB-C to MagSafe 3 cable

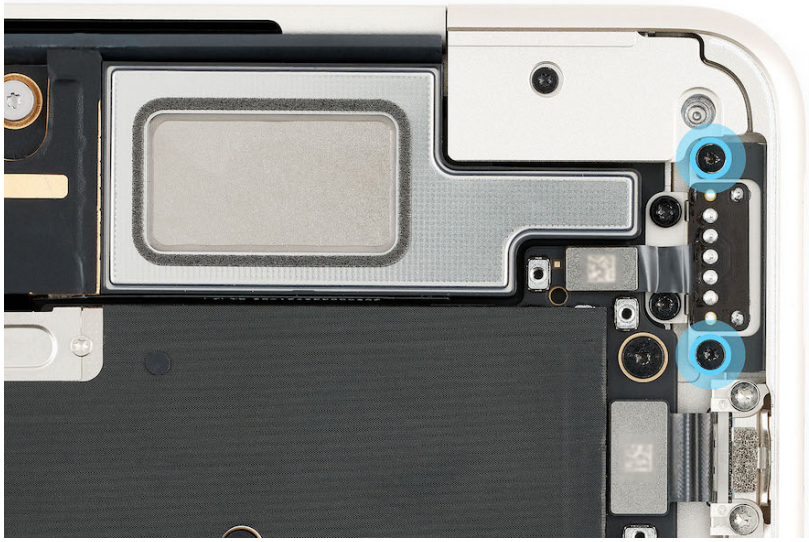
Removal

1. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the four T3 screws (923-07277) from the MagSafe 3 board/USB-C boards connector cowling.

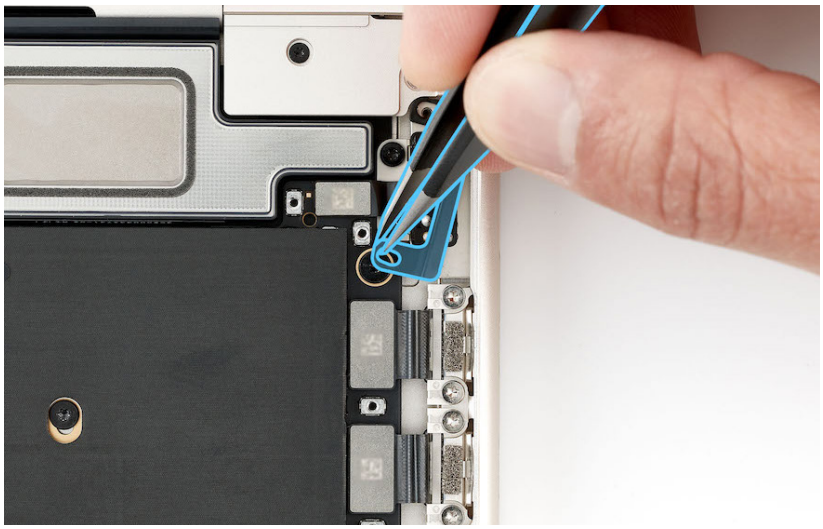


2. Remove the MagSafe 3 board/USB-C boards connector cowling and save it for reassembly.

3. Insert the 3IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to remove the two 3IP screws (923-07281) from the MagSafe 3 board wedge.

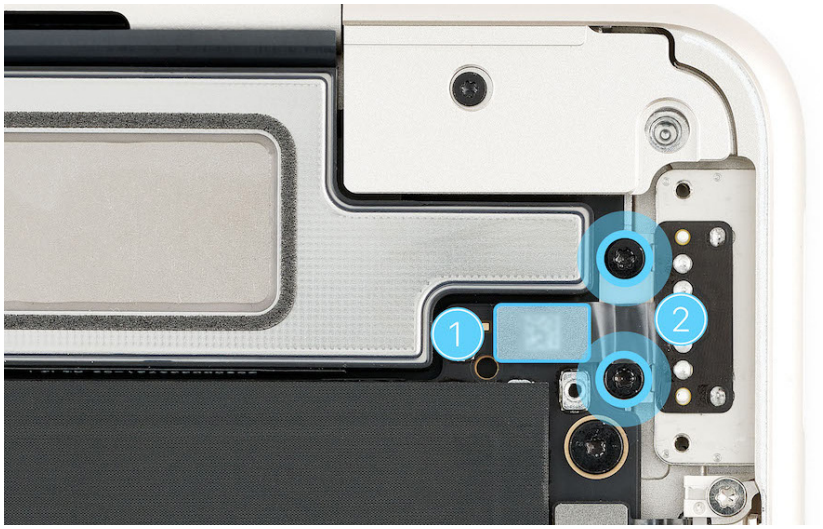


4. Use ESD-safe tweezers to remove the MagSafe 3 board wedge and save it for reassembly.



5. Use the black stick to lift the end of the MagSafe 3 board flex cable off the connector (1).

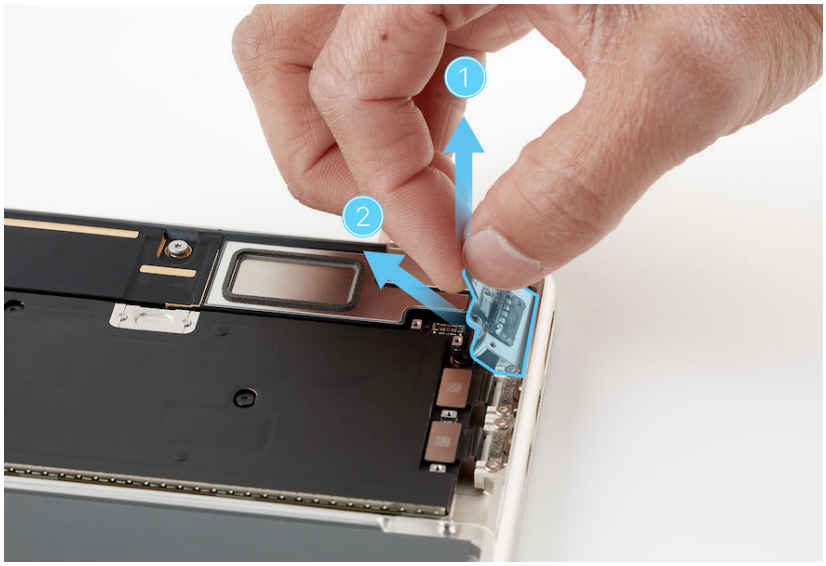
6. Insert the Torx T5 bit into the 10–34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the two T5 screws (923-07280) from the MagSafe 3 board (2).



7. Hold the end of the MagSafe 3 board flex cable to tilt up the MagSafe 3 board (1). Then remove it from the top case (2).

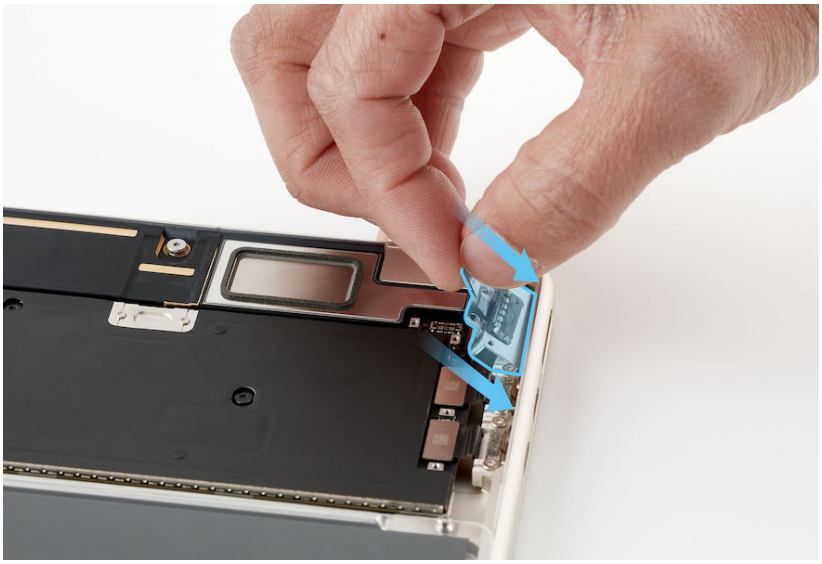
Caution

Don't touch the logic board while removing the MagSafe 3 board.

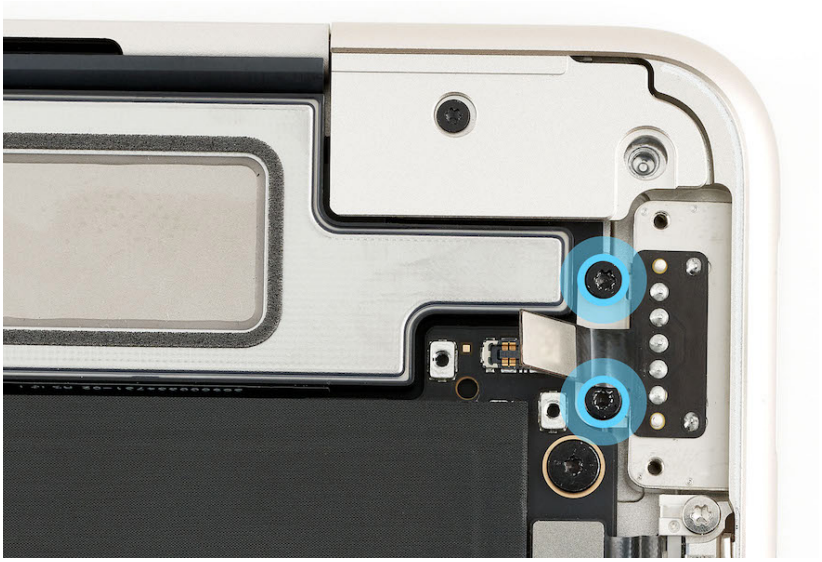


Reassembly

1. Position the MagSafe 3 board in the top case as shown.



2. Insert the Torx T5 bit into the 10–34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to partially reinstall the two T5 screws (923-07280) into the MagSafe 3 board.



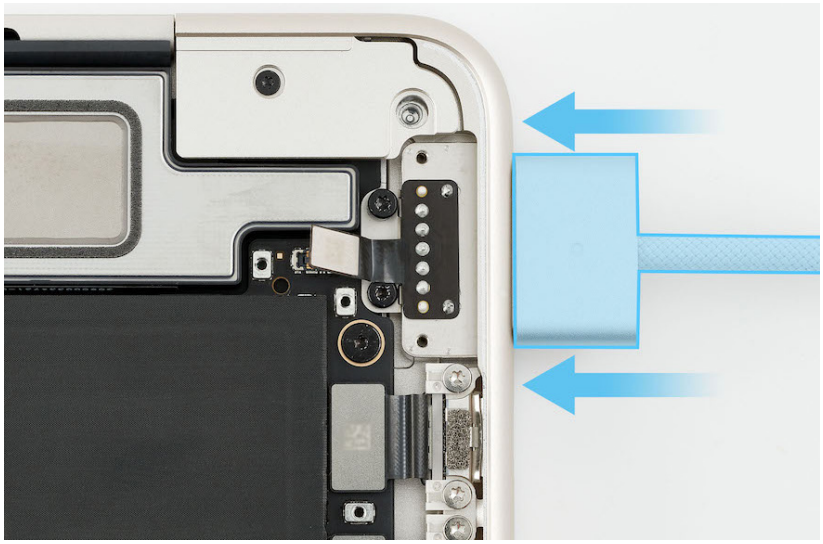
Caution

Ensure that the MagSafe 3 board flex cable isn't damaged or trapped under the T5 screw during reinstallation. The flex cable should be positioned on top of the screw. If the flex cable is damaged, replace the MagSafe 3 board.

3. Plug the MagSafe 3 end of the USB-C to MagSafe 3 cable into the MagSafe 3 port to ensure alignment.

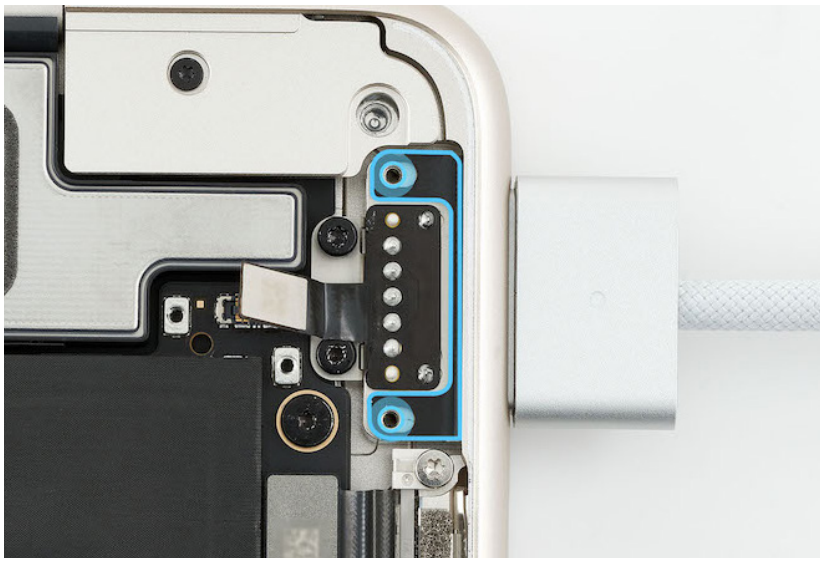
Danger

Ensure that the USB-C to MagSafe 3 cable isn't plugged into power.



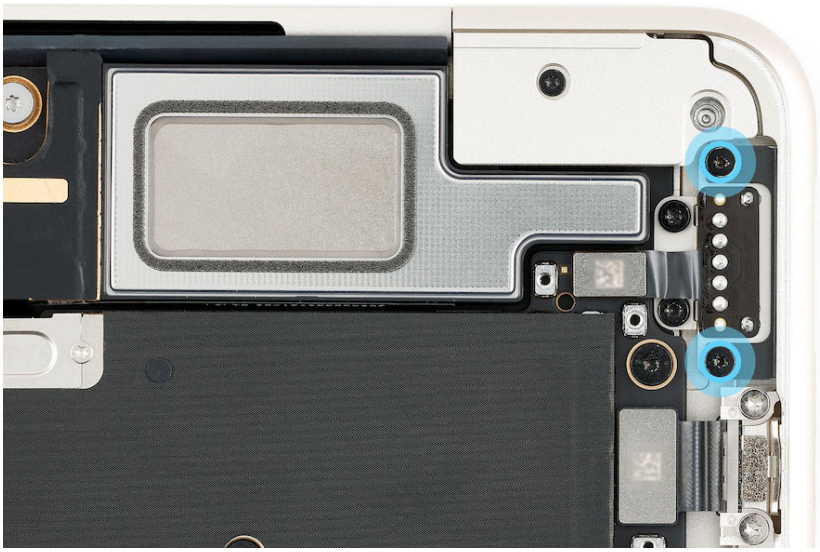
4. Position the MagSafe 3 board wedge in the top case.

5. Insert the 3IP bit into the 10–34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to partially reinstall the two 3IP screws (923-07281) into the MagSafe 3 board wedge.



6. Keep the 3IP bit in the 10–34 Ncm adjustable torque driver. Set the torque value to 10 Ncm.

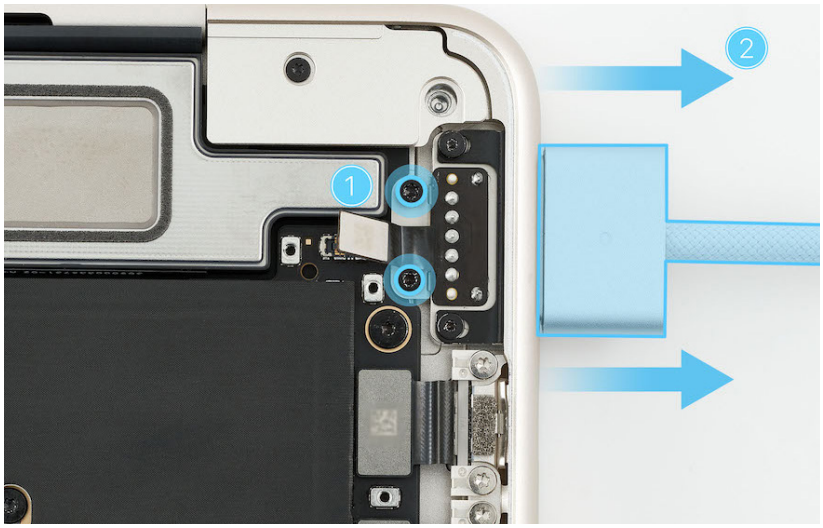
7. Use the black stick to push the MagSafe 3 board wedge against the enclosure and hold the wedge in place. Then use the adjustable torque driver and 3IP bit to fully reinstall the two 3IP screws into the MagSafe 3 board wedge.



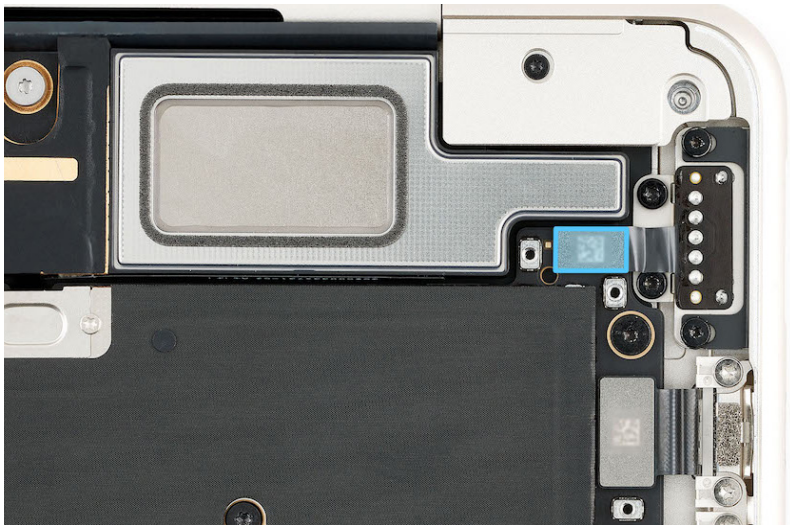
8. Insert the Torx T5 bit into the 10–34 Ncm adjustable torque driver. Set the torque value to 17.5 Ncm.

9. Use the adjustable torque driver and Torx T5 bit to fully reinstall the two T5 screws into the MagSafe 3 board (1).

10. Unplug the USB-C to MagSafe 3 cable from the MagSafe 3 port (2).



11. Press the end of the MagSafe 3 board flex cable to the connector.



12. Position the MagSafe 3 board/USB-C boards connector cowling.

13. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the four T3 screws (923-07277) into the MagSafe 3 board/USB-C boards connector cowling.

Reinstall the following part to complete reassembly:

- Bottom case

Trackpad and Trackpad Flex Cable

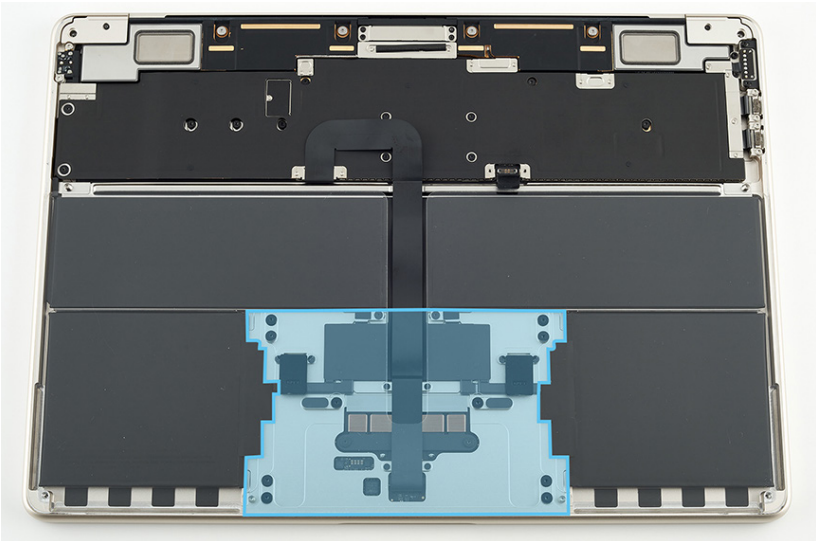
Before You Begin

Warning

Read Battery Safety and follow workspace and battery handling guidelines before you begin.

Remove the following part before you begin:

- Bottom case



Tools

- Adjustable torque driver (10-34 Ncm)
- Gap offset kit
- Kapton tape
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx T3 half-moon bit
- Torx T5 bit

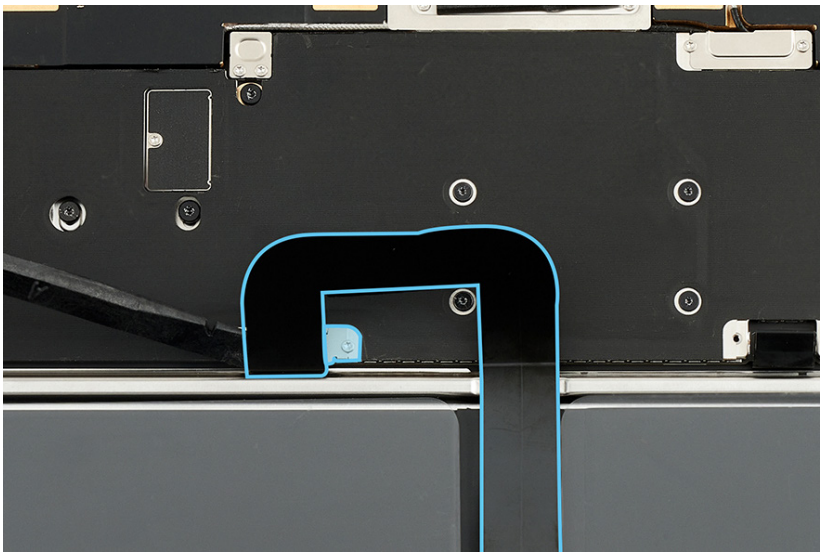
Important

- This procedure requires a replacement trackpad connector cowling, which is included with a new trackpad.
- This procedure may require a trackpad shim kit, which only comes with a replacement trackpad. It's not a separate orderable part.

Removal

1. Open the display. Place the computer on the edge of the table with the display hanging down.

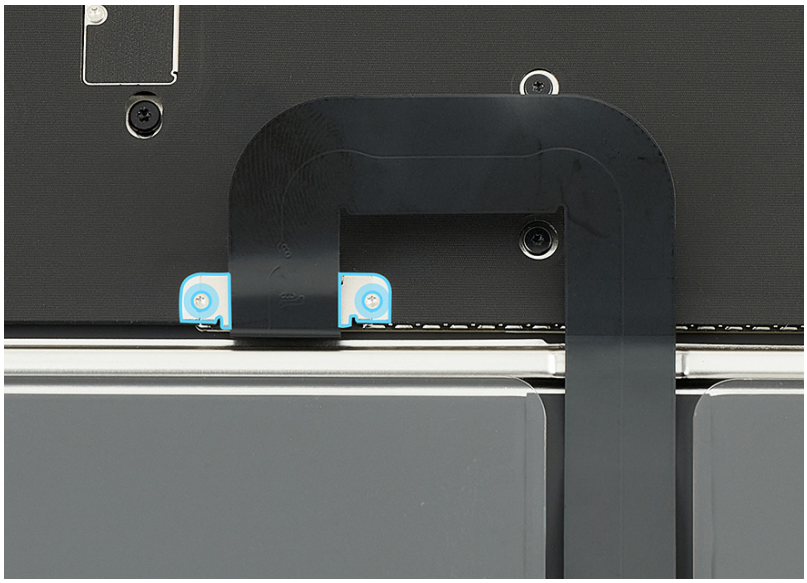
2. Use the black stick to gently peel the trackpad flex cable off the trackpad connector cowling.



Caution

Don't damage the trackpad flex cable while peeling it off the trackpad connector cowling.

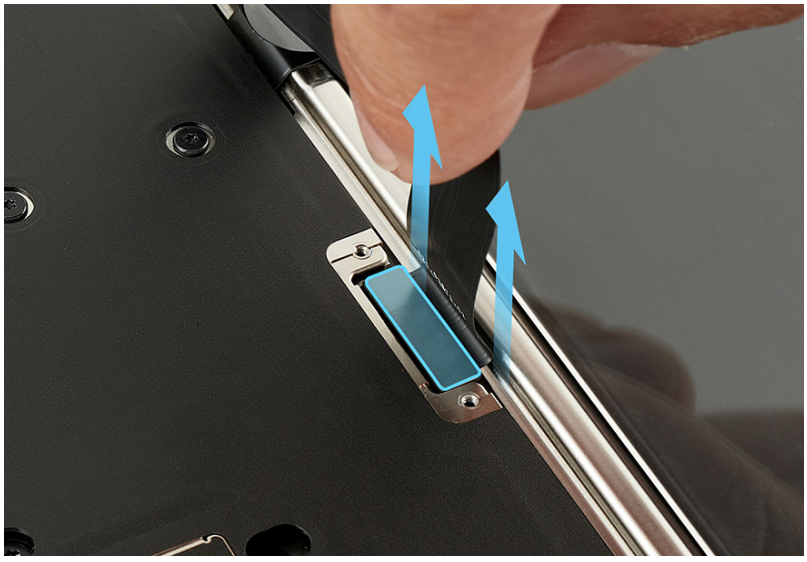
3. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the two T3 screws (923-07277) from the trackpad connector cowling.



4. Remove the trackpad connector cowling and set it aside.

   Note: If you're reinstalling the original trackpad, save the cowling for reassembly.

5. Lift the end of the trackpad flex cable off the connector.



6. Hold the battery cover by the edges and lift it off the top case.

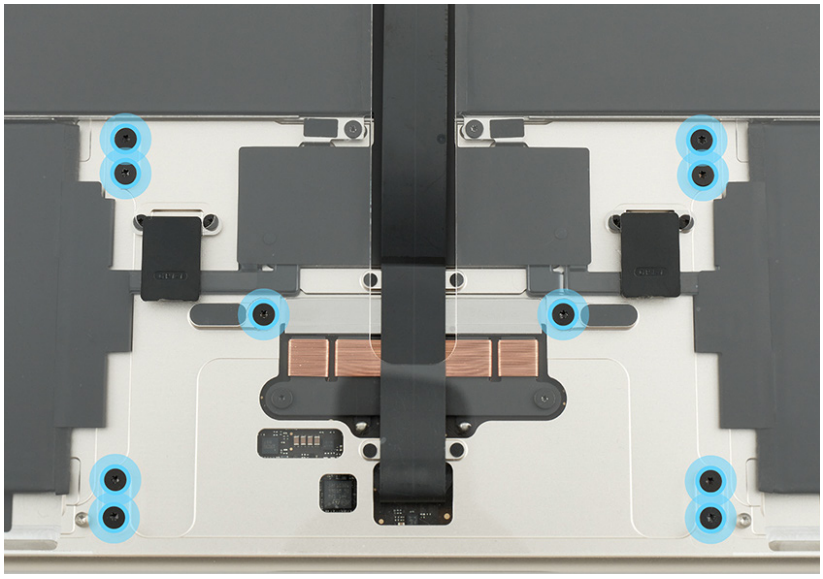
7. Use the black stick to gently peel the trackpad flex cable off the top case.

Caution

The adhesive under the trackpad flex cable is very strong. Don't damage the flex cable when peeling it from the trackpad.

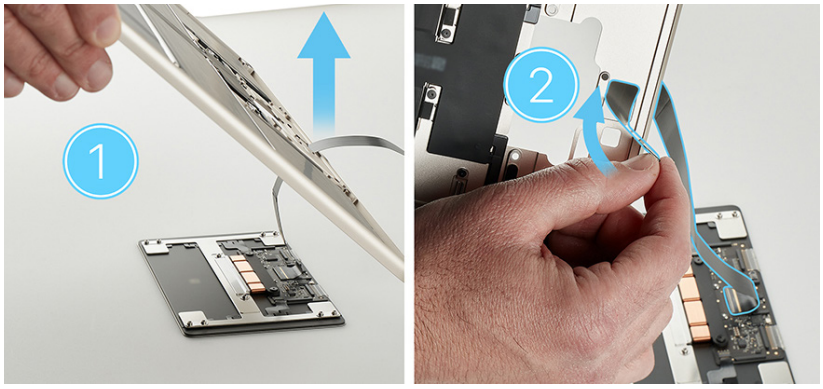
8. Place the battery cover on the battery. Then press the black tabs into the clips on the top case until you feel a click.

9. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the 10 T5 screws (923-07258) from the trackpad.



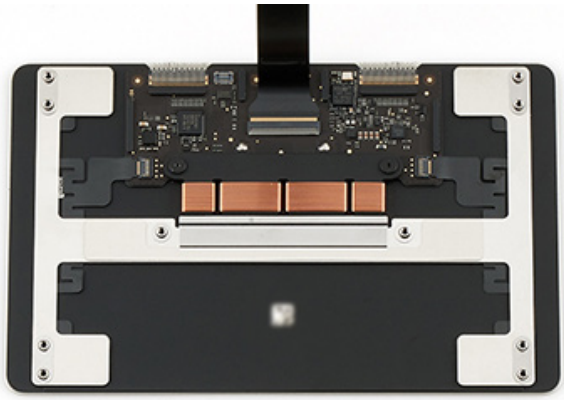
10. Hold the battery cover by the edges. Then lift it off the top case.

11. Lift the computer off the table (1). Allow the trackpad flex cable to pass through the opening in the top case (2). Leave the trackpad flat on the table to keep the shims in place.

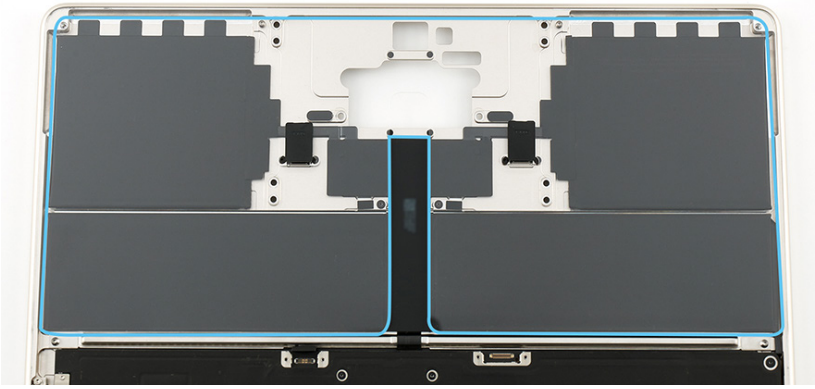


Important

If the shims fall out, they must be reinstalled in their original locations. If you can't determine the shims' original locations, replace them. A replacement shim kit is available only with a replacement trackpad.

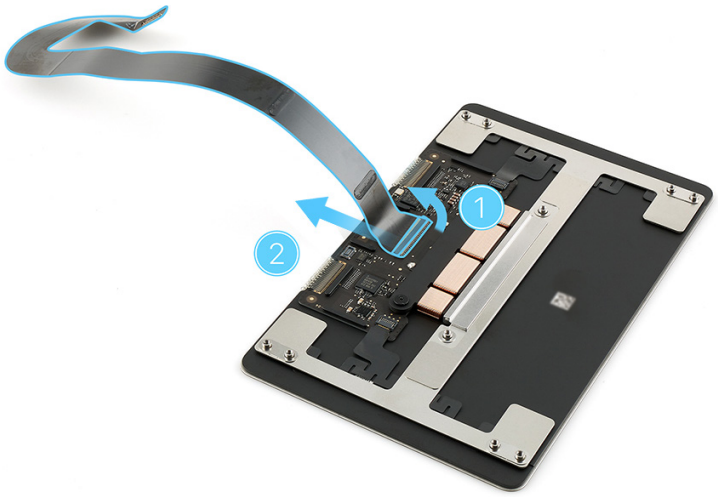


12. Place the battery cover on the battery. Then press the black tabs into the clips on the top case until you feel a click.



Important

If the trackpad flex cable is damaged, flip up the locking lever on the flex cable connector (1). Peel the end of the flex cable off the trackpad. Then slide the end of the flex cable out of the connector (2).

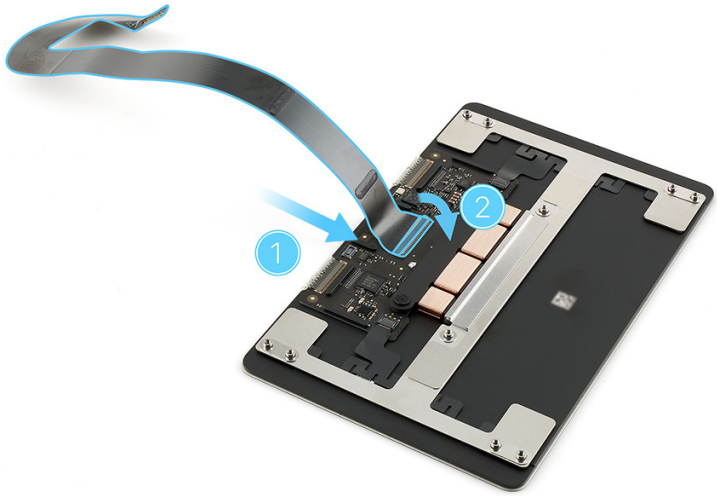


Reassembly

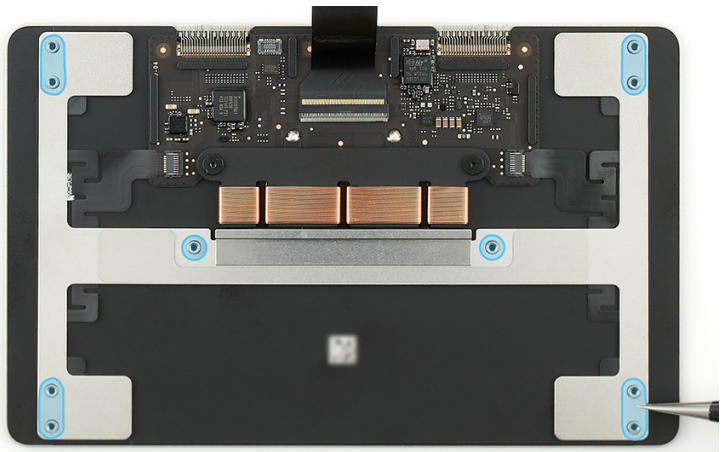
Important

If you're installing a replacement trackpad flex cable on the existing trackpad or on a replacement trackpad, complete reassembly step 1. If you're installing the existing trackpad and trackpad flex cable with replacement shims, skip to step 2. If you're installing the existing trackpad and the shims are still in place, skip to reassembly step 3.

1. Slide the end of the replacement trackpad flex cable into the connector on the trackpad (1). Then flip down the locking lever (2).



2. Use ESD-safe tweezers to install replacement trackpad shims. Position four rectangular shims on the outer screw holes. Then position two circular shims on the middle screw holes.

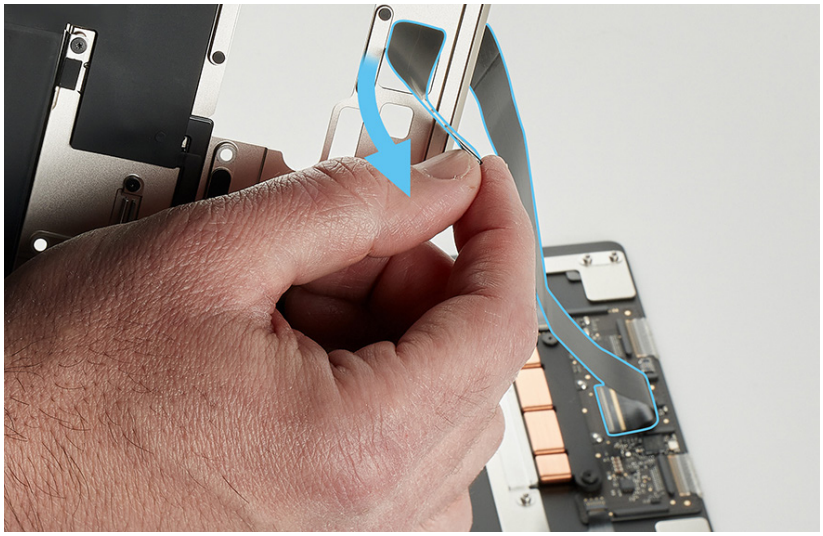


Important

A replacement trackpad comes with three sizes of shims (0.075 mm, 0.125 mm, and 0.175 mm). Start with the 0.125 mm shims. Use thinner or thicker shims to adjust alignment in step 12.

3. Hold the battery cover by the edges and lift it off the top case.

4. Route the trackpad flex cable back through the trackpad opening in the top case.



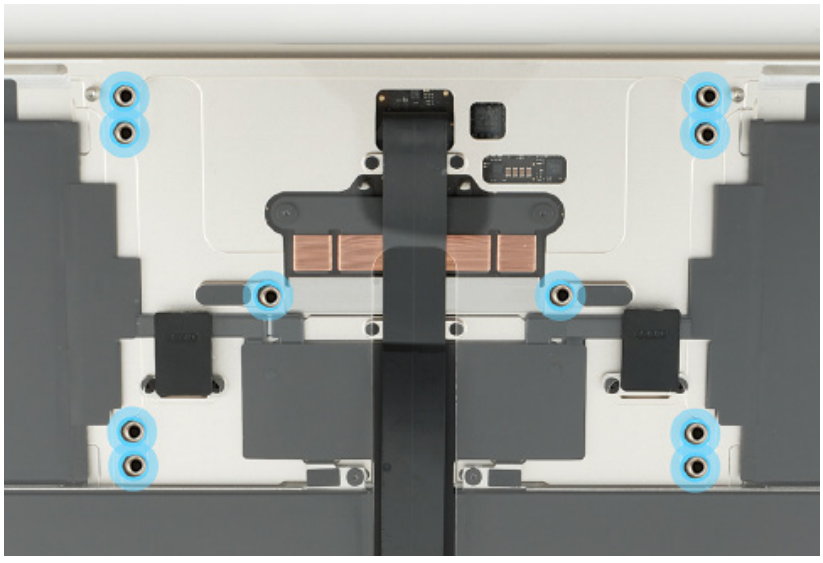
5. Slowly lower the computer over the trackpad and align the screw holes in the top case with the screw holes in the trackpad. Let the display hang over the table edge.

6. Ensure that the trackpad flex cable lies flat against the trackpad. Place the battery cover on the battery and press the black tabs into the clips on the top case until you feel a click.

7. Hold the trackpad in place as you turn the computer right side up. Insert one gap offset in each of the four corners of the trackpad. Then secure each gap offset with a piece of Kapton tape.

8. Turn the computer keyboard-side down. Let the display hang over the table edge.

9. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to partially reinstall the 10 T5 screws (923-07258) into the trackpad.



10. Stand the computer on its side with the display still open.

11. Keep the Torx T5 bit in the 10-34 Ncm adjustable torque driver. Set the torque value to 17.5 Ncm.

12. Use the adjustable torque driver and Torx T5 bit to fully reinstall the four outer corner T5 screws.

13. Place the computer right side up. To verify the top of the trackpad is at the correct height, align one sticky note on the trackpad's top edge. Ensure that the sticky note is flush with the top case.

14. To verify that the bottom of the trackpad is at the correct height, align a stack of two sticky notes on the trackpad's bottom edge. Ensure that the two sticky notes are flush with the top case.

15. If the trackpad is at the correct height, continue to step 16. If the trackpad edges are higher or lower than the top case, or if the gap around the trackpad and top case are uneven, remove the sticky notes, gap offsets, and Kapton tape. Place the computer on the edge of the table with the display hanging down. Repeat removal steps 9 through 12. Then follow reassembly steps 2 through 15.

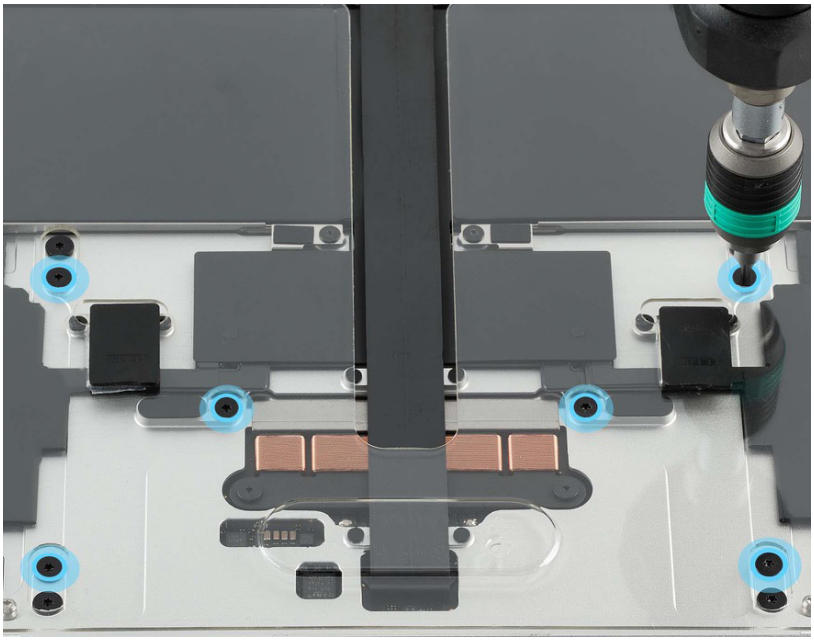
Important

- If the trackpad is higher than the top case, install the thinner 0.075 mm shims.
- If the trackpad is lower than the top case, install the thicker 0.175 mm shims.

16. Place the computer on the edge of the table with the display hanging down.

17. Keep the Torx T5 bit in the 10-34 Ncm adjustable torque driver. Ensure that the torque value is set to 17.5 Ncm.

18. Use the adjustable torque driver and Torx T5 bit to fully reinstall the six remaining T5 screws into the trackpad.

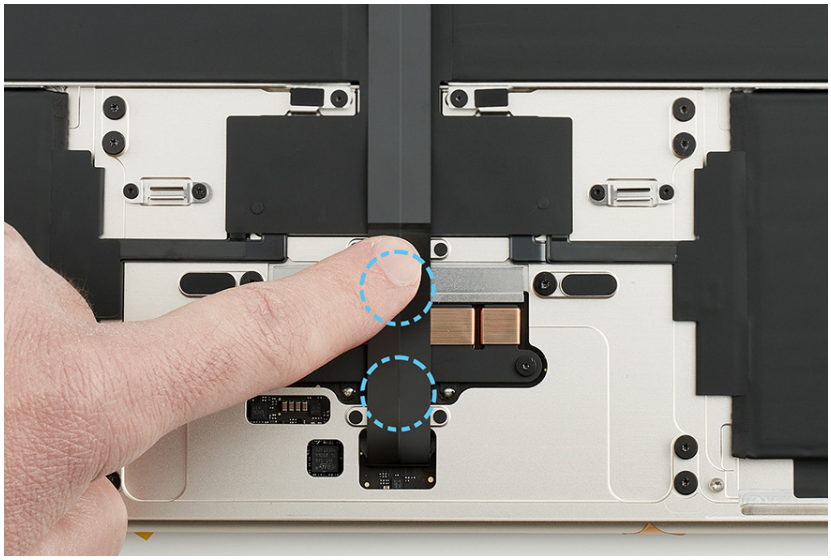


19. Hold the battery cover by the edges and lift it off the top case.

20. Press the trackpad flex cable to adhere it to the trackpad as shown.

Important

If you're installing a replacement trackpad flex cable, remove the adhesive backing before adhering the flex cable to the trackpad.



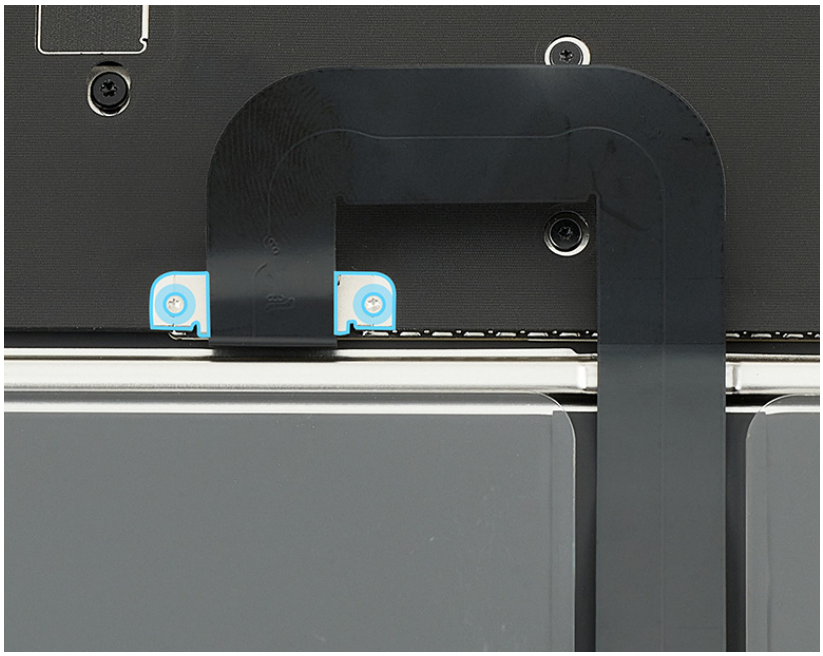
21. Place the battery cover on the battery and press the black tabs into the clips on the top case until you feel a click.

22. Press the end of the trackpad flex cable to the connector.

23. Position the trackpad connector cowling.

    Note: If you're installing a replacement trackpad, install the included replacement trackpad connector cowling.

24. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the two T3 screws (923-07277) into the trackpad connector cowling.



25. Remove the adhesive backing from the top of the trackpad connector cowling. Then press the end of the trackpad flex cable to adhere it to the trackpad connector cowling.

26. Turn over the computer. Use the flat end of the black stick to lift the gap offsets and Kapton tape off the trackpad.

Reinstall the following part to complete reassembly:

- Bottom case

USB-C Boards

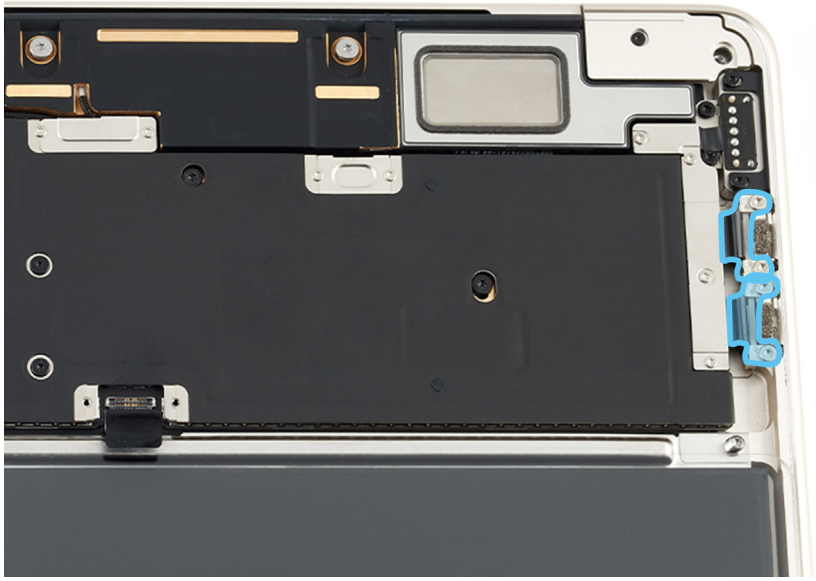
Before You Begin

Remove the following part before you begin:

- Bottom case

Tools

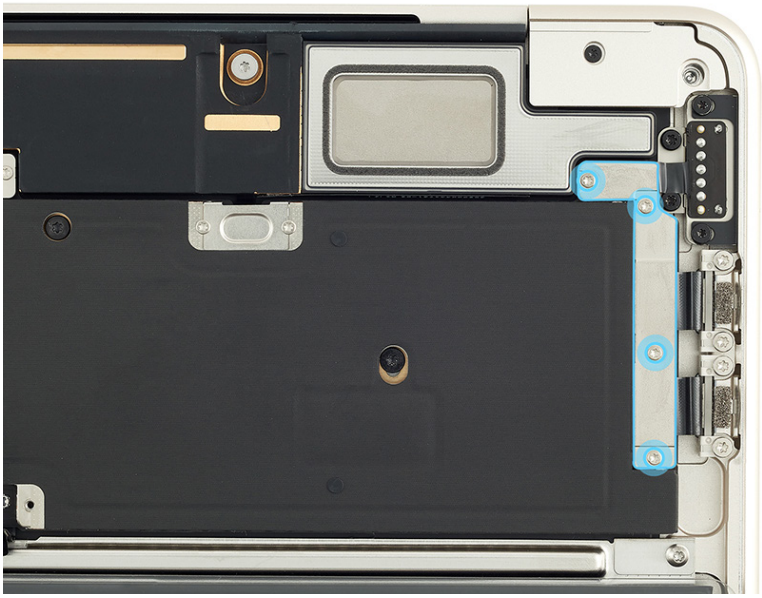
- Adjustable torque driver (10-34 Ncm)
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx T3 half-moon bit
- Torx T5 bit
- USB-C charge cable



Removal

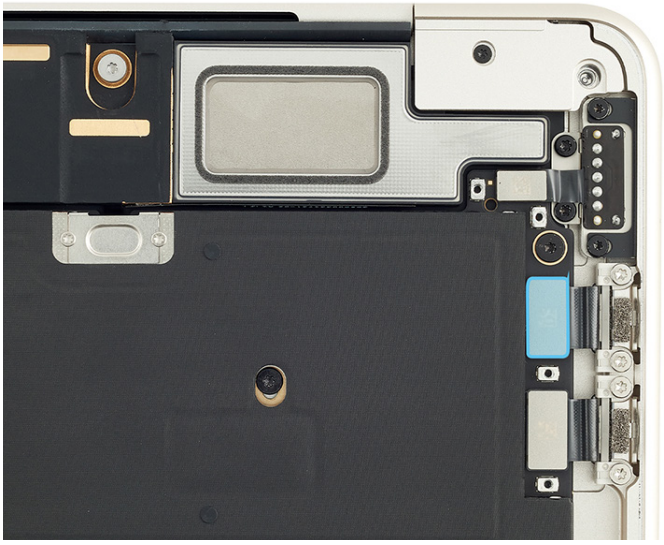
Note: The images in this procedure show the removal and reinstallation of only one USB-C board. However, the procedure is the same for both USB-C boards.

1. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the four T3 screws (923-07277) from the MagSafe 3 board/ USB-C boards connector cowling.

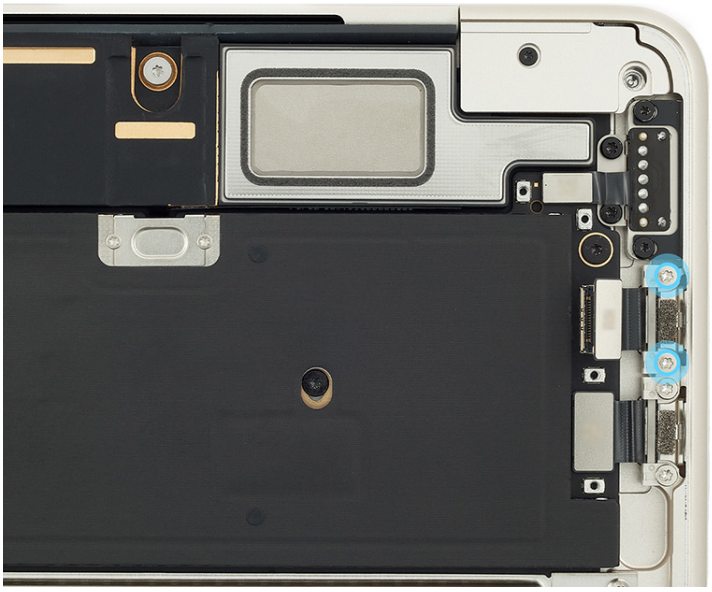


2. Remove the MagSafe 3 board/USB-C boards connector cowling and save it for reassembly.

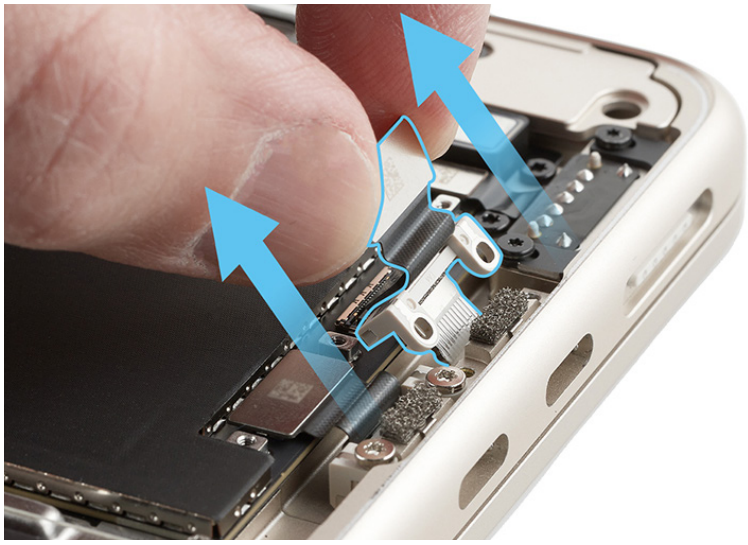
3. Use the black stick to lift the end of the USB-C board flex cable off the connector.



4. Insert the Torx T5 bit into the 10–34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the two T5 screws (923-07276) from the USB-C board.

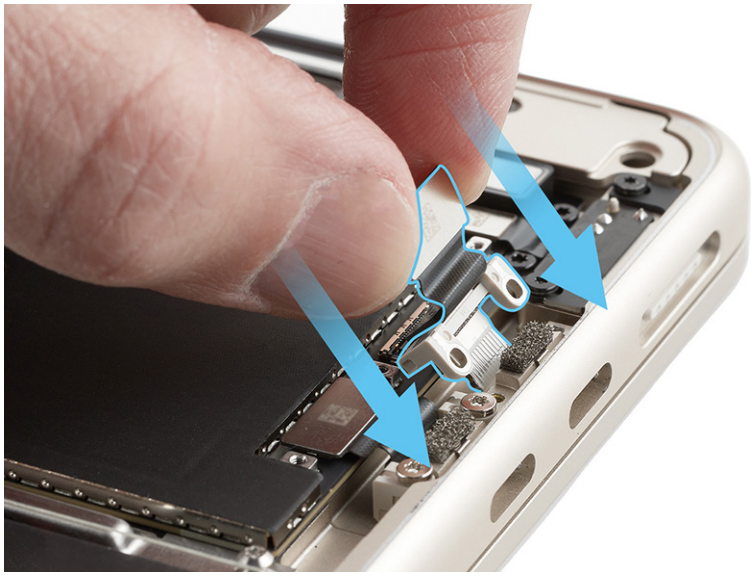


5. Hold the end of the USB-C board flex cable. Then tilt up the USB-C board and remove it from the top case.



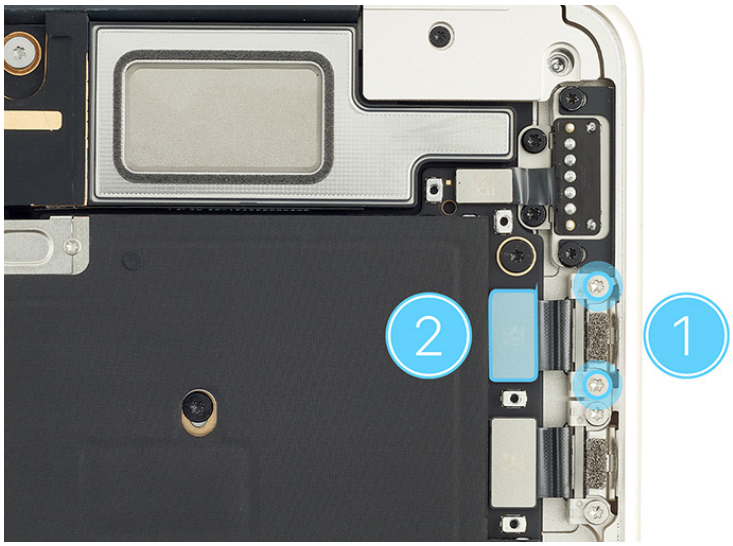
Reassembly

1. Insert the USB-C board into the top case as shown. Then lower the end of the USB-C board flex cable into the top case after the USB-C board clears the logic board.



2. Insert the Torx T5 bit into the 10–34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to partially reinstall the two T5 screws (923-07276) into the USB-C board (1).

3. Press the end of the USB-C board flex cable to the connector (2).



4. Plug one end of the USB-C charge cable into the port to ensure USB-C board alignment. Adjust the alignment of the USB-C board until the end of the cable is easy to insert and remove.

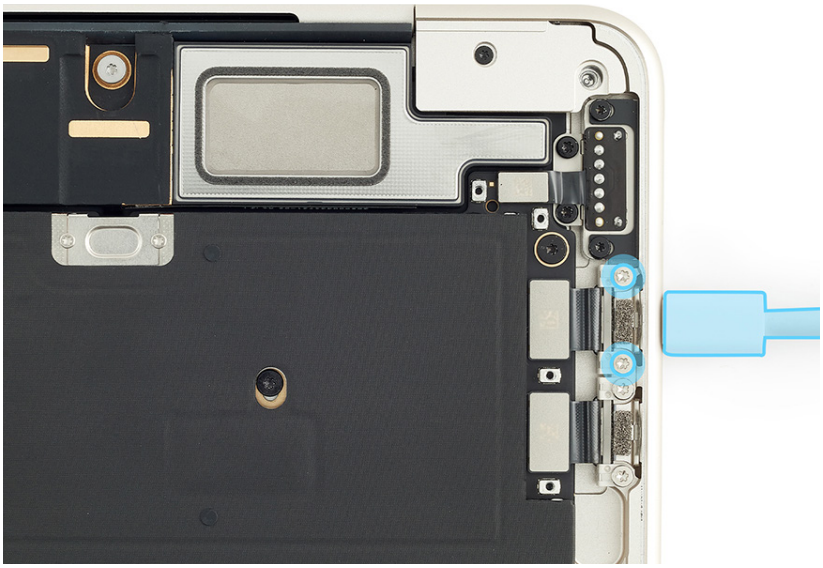
Danger

Ensure that the USB-C charge cable isn't plugged into power.

5. Keep the Torx T5 bit inserted in the 10–34 Ncm adjustable torque driver. Set the torque value to 11.5 Ncm.

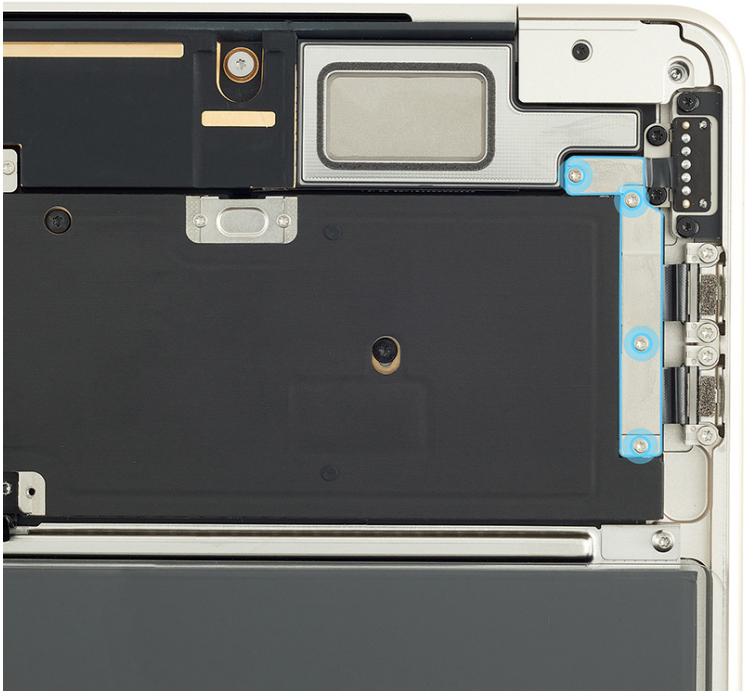
6. Use the adjustable torque driver and Torx T5 bit to fully reinstall the two T5 screws into the USB-C board.

7. Unplug the USB-C charge cable from the port.



8. Position the MagSafe 3 board/USB-C boards connector cowling.

9. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the four T3 screws (923-07277) into the MagSafe 3 board/USB-C boards connector cowling.



Reinstall the following part to complete reassembly:

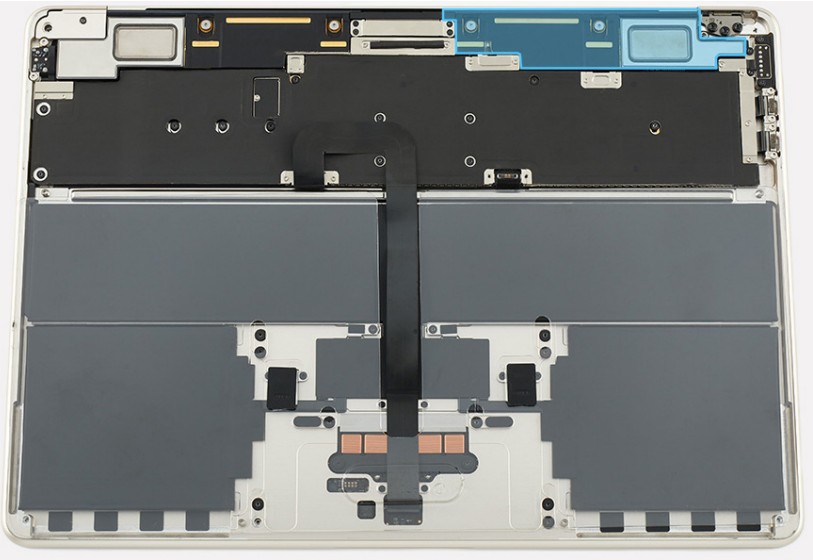
- Bottom case

Left Speaker with Antenna

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Left display hinge cover



Tools

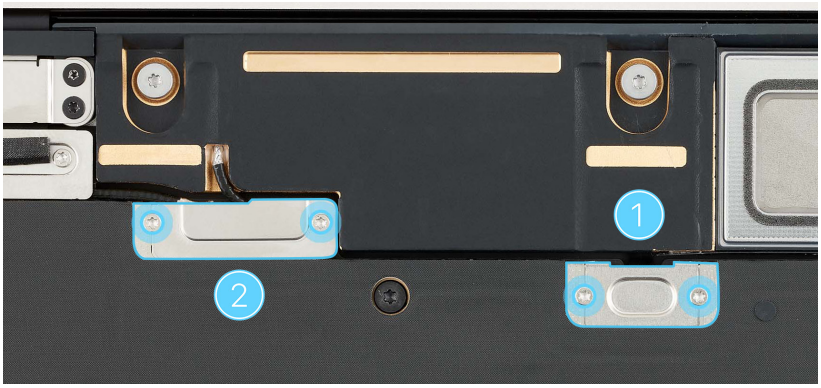
- Adjustable torque driver (10-34 Ncm)
- Antenna tool
- ESD-safe tweezers
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 4IP 25mm bit
- Torx T3 half-moon bit
- Torx T5 bit

Important

- If you replace the left speaker with antenna, you must also replace the right speaker with antenna. Refer to the Right Speaker with Antenna section for removal and reassembly instructions.
- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Removal

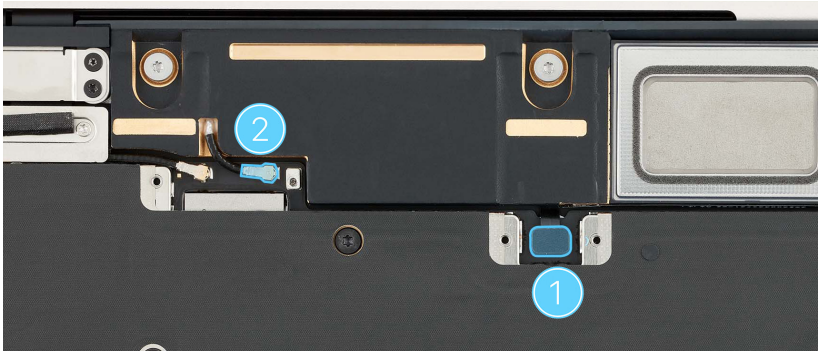
1. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the four T3 screws (923-07277) from the left speaker connector cowling (1) and antenna coaxial cables connector cowling (2).



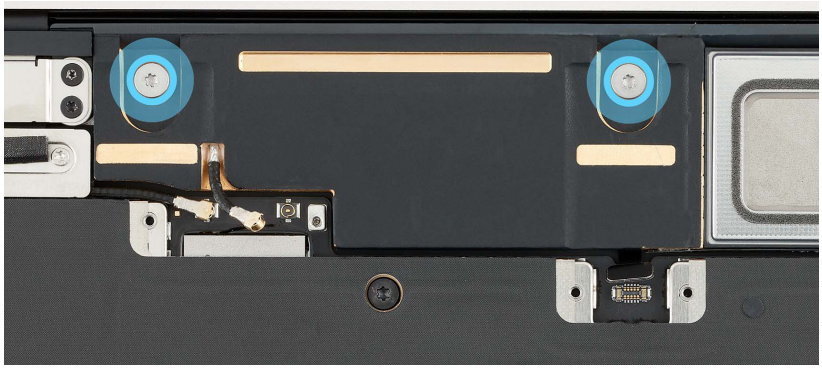
2. Remove the left speaker connector cowling and antenna coaxial cables connector cowling. Save the cowlings for reassembly.

3. Use the black stick to lift the end of the left speaker flex cable off the connector (1).

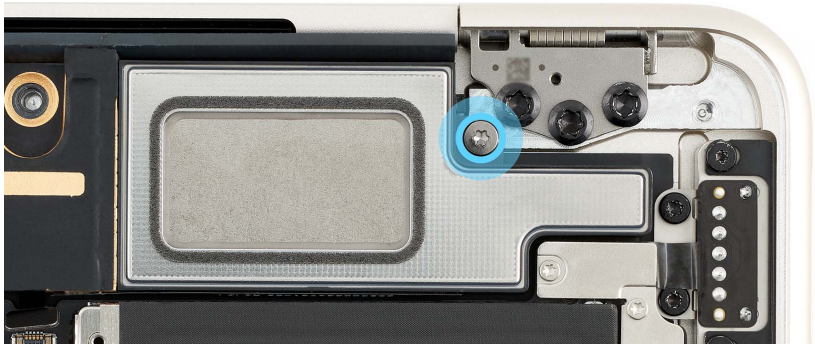
4. Use the black stick to lift the end of the left antenna coaxial cable off the connector (2).



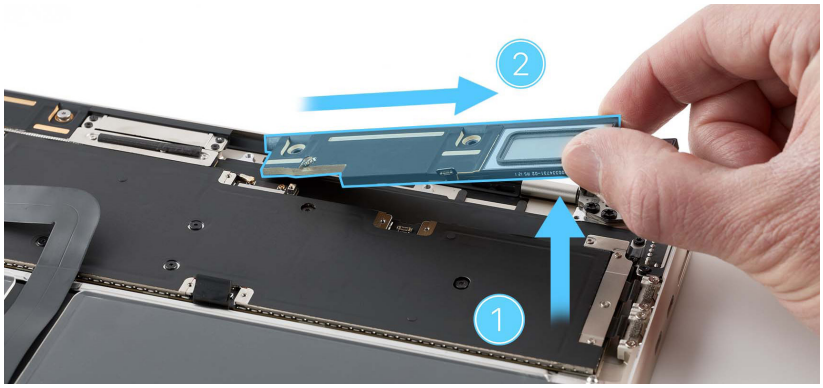
5. Insert the 4IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 4IP bit to remove the two 4IP screws (923-07269) from the left speaker with antenna.



6. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the T5 screw (923-07263) from the left speaker with antenna.

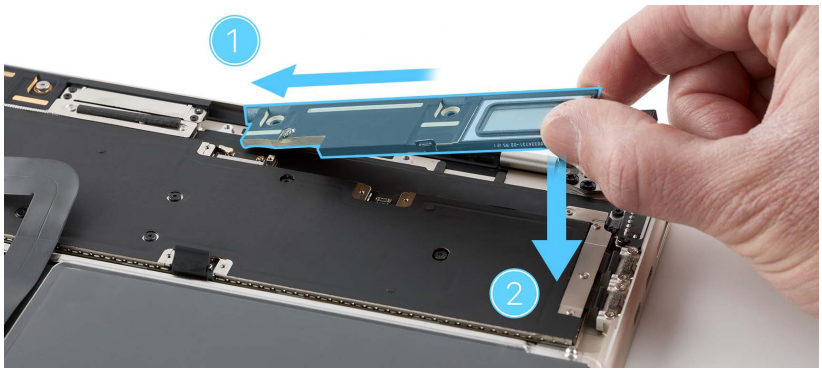


7. Use the black stick to tilt up the right side of the left speaker with antenna (1). Then slide the left speaker with antenna to the right and remove it from the top case (2).



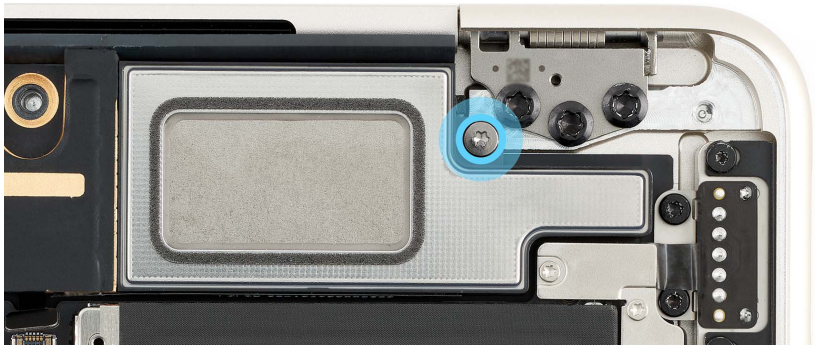
Reassembly

1. Insert the left side of the left speaker with antenna into the top case as shown (1). Then lower the left speaker with antenna into the top case (2).



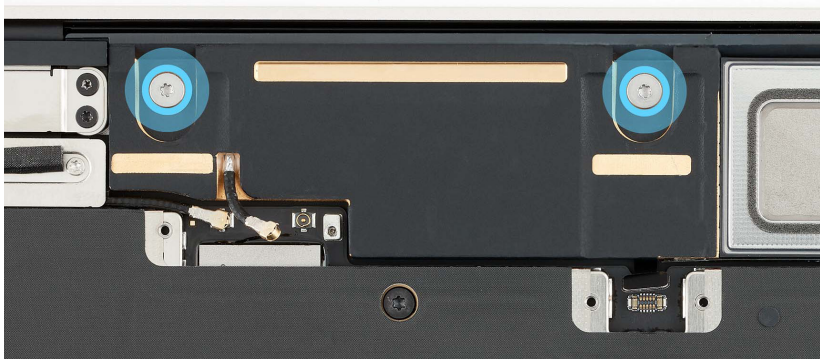
2. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 11.5 Ncm.

3. Use the adjustable torque driver and Torx T5 bit to reinstall the T5 screw (923-07263) into the left speaker with antenna.

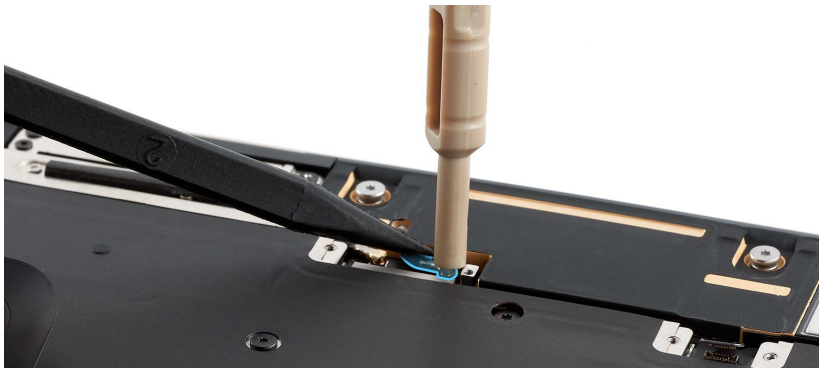


4. Insert the 4IP bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 20.5 Ncm.

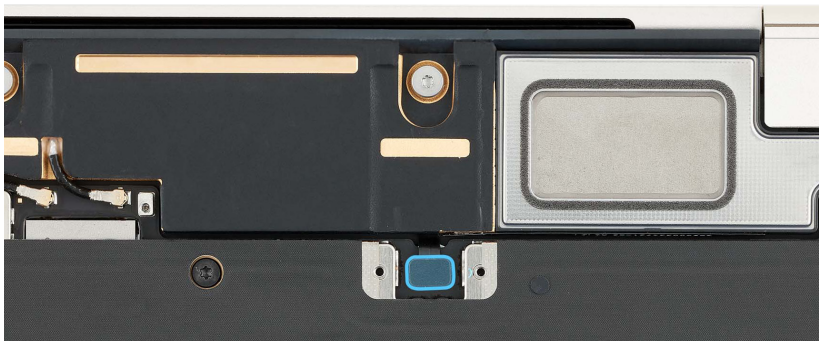
5. Use the adjustable torque driver and 4IP bit to reinstall the two 4IP screws (923-07269) into the left speaker with antenna.



6. Use the black stick or ESD-safe tweezers to position the end of the left antenna coaxial cable over the connector. Then use the blunt end of the antenna tool to press the end of antenna coaxial cable to the connector.



7. Press the end of the left speaker flex cable to the connector.



8. Position the antenna coaxial cables connector cowling and left speaker connector cowling.

9. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the four T3 screws (923-07277) into the cowlings.

Reinstall the following parts to complete reassembly:

- Left display hinge cover
- Bottom case

Important

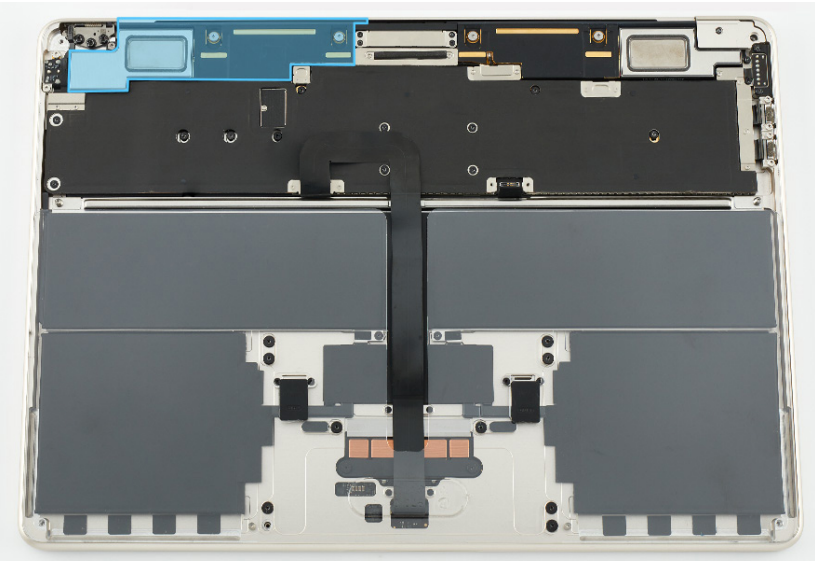
After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Right Speaker with Antenna

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Right display hinge cover



Tools

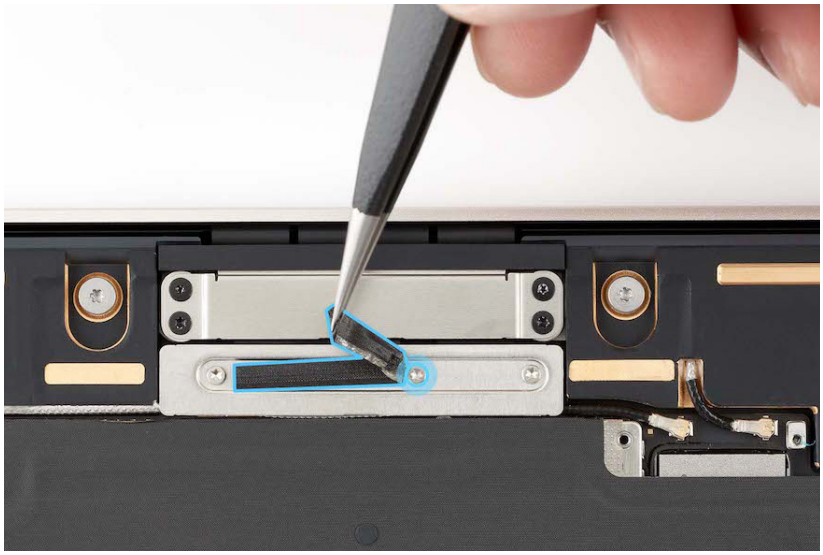
- Adjustable torque driver (10-34 Ncm)
- Antenna tool
- ESD-safe tweezers
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 4IP 25mm bit
- Torx T3 half-moon bit
- Torx T5 bit

Important

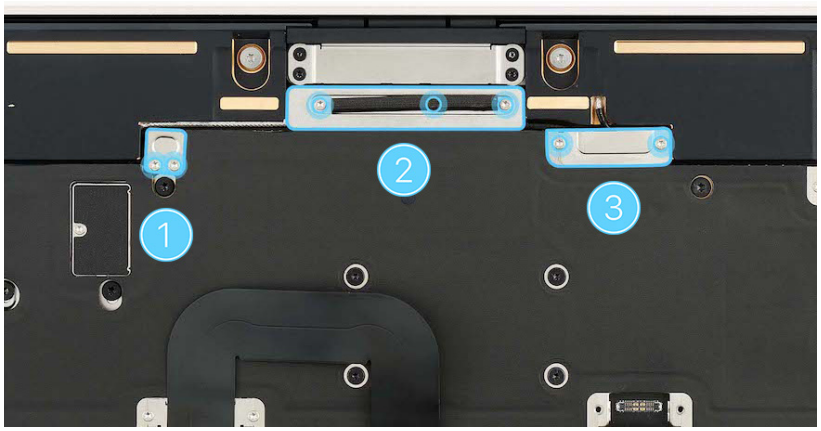
- If you replace the right speaker with antenna, you must also replace the left speaker with antenna. Refer to the Left Speaker with Antenna section for removal and reassembly instructions.
- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Removal

1. Use the black stick or ESD-safe tweezers to peel the foam from the display connectors cowling to access the middle screw.



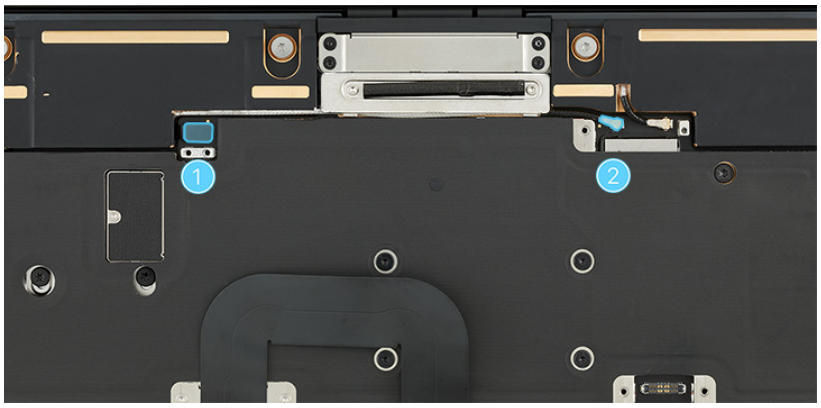
2. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the seven T3 screws (923-07277) from the right speaker connector cowling (1), display connectors cowling (2), and antenna coaxial cables connector cowling (3).



3. Remove the three cowlings and save them for reassembly.

4. Use the black stick to lift the end of the right speaker flex cable (1) off the connector.

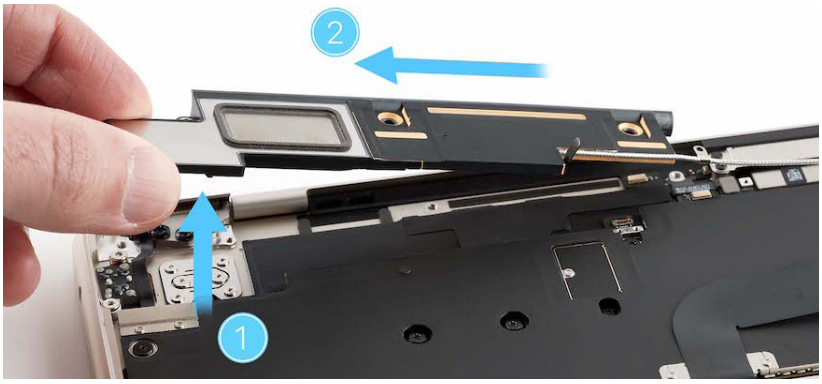
5. Use the black stick to lift the end of the right antenna coaxial cable (2) off the connector.



6. Insert the 4IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 4IP bit to remove the two 4IP screws (923-07269) from the right speaker with antenna.

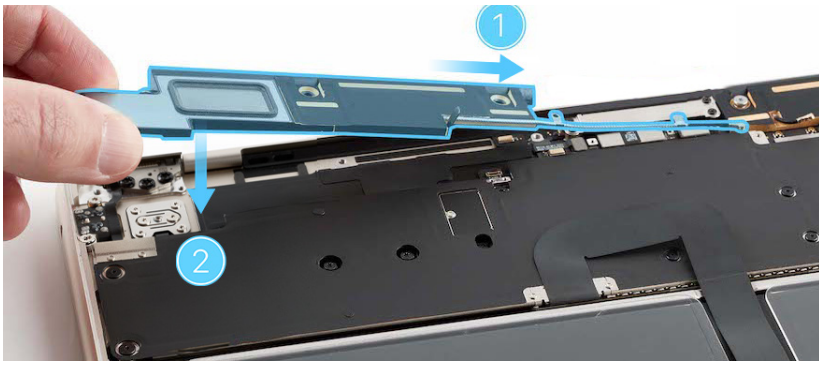
7. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the T5 screw (923-07263) from the right speaker with antenna.

8. Use the black stick to tilt up the left side of the right speaker with antenna (1). Then slide the right speaker with antenna to the left and remove it from the top case.



Reassembly

1. Insert the right side of the right speaker with antenna into the top case as shown (1). Then lower the right speaker with antenna into the top case (2).



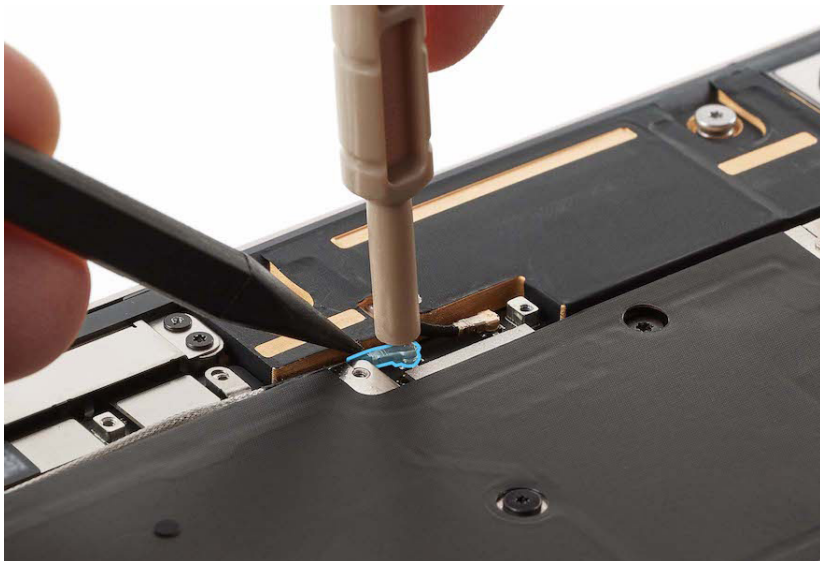
2. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 11.5 Ncm.

3. Use the adjustable torque driver and Torx T5 bit to reinstall the T5 screw (923-07263) into the right speaker with antenna.

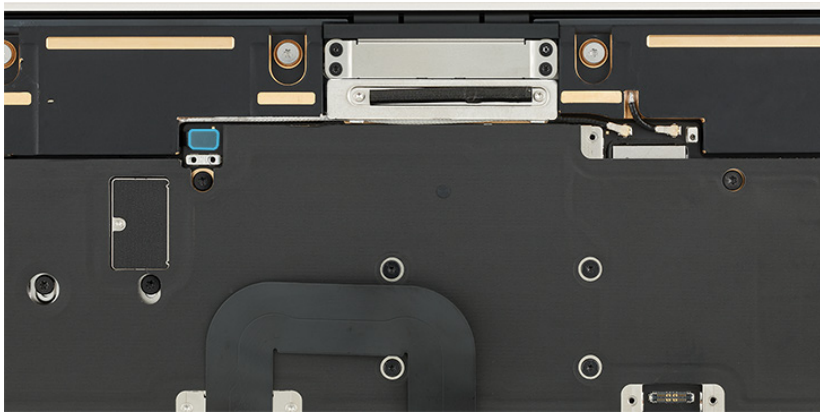
4. Insert the 4IP bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 20.5 Ncm.

5. Use the adjustable torque driver and 4IP bit to reinstall the two 4IP screws (923-07269) into the right speaker with antenna.

6. Use the black stick or ESD-safe tweezers to position the end of the right antenna coaxial cable over the connector. Then use the blunt end of the antenna tool to press the end of the antenna coaxial cable to the connector.



7. Press the end of the right speaker flex cable to the connector.

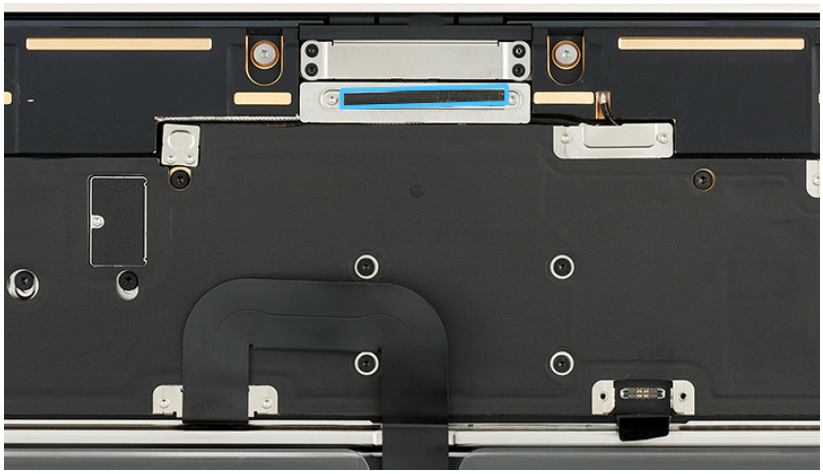


8. Position the right speaker connector cowling, display connectors cowling, and antenna coaxial cables connector cowling.

9. Use ESD-safe tweezers to peel the foam from the display connectors cowling to access the middle screw hole.

10. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the seven T3 screws (923-07277) into the right speaker connector cowling, display connectors cowling, and antenna coaxial cables connector cowling.

11. Press along the length of the foam on the display connectors cowling to adhere it to the cowling.



Reinstall the following parts to complete reassembly:

- Right display hinge cover
- Bottom case

Important

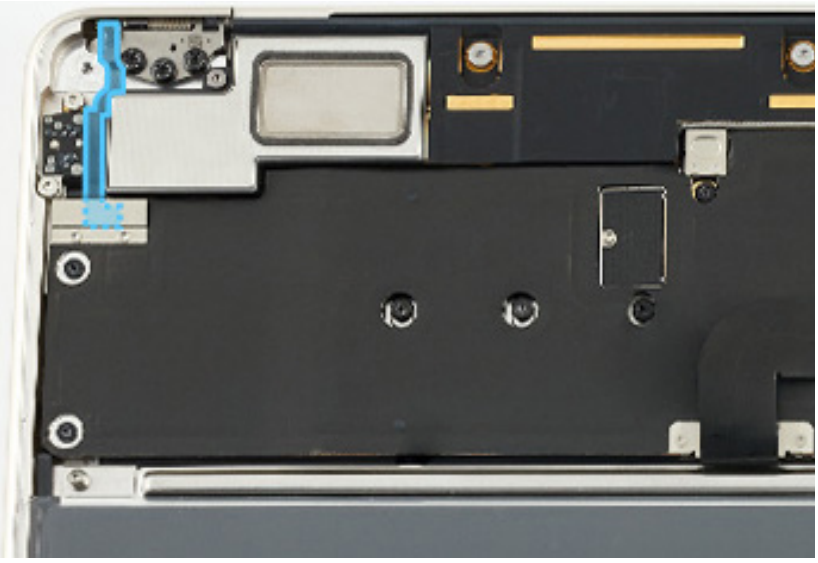
After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Lid Angle Sensor

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Right display hinge cover



Tools

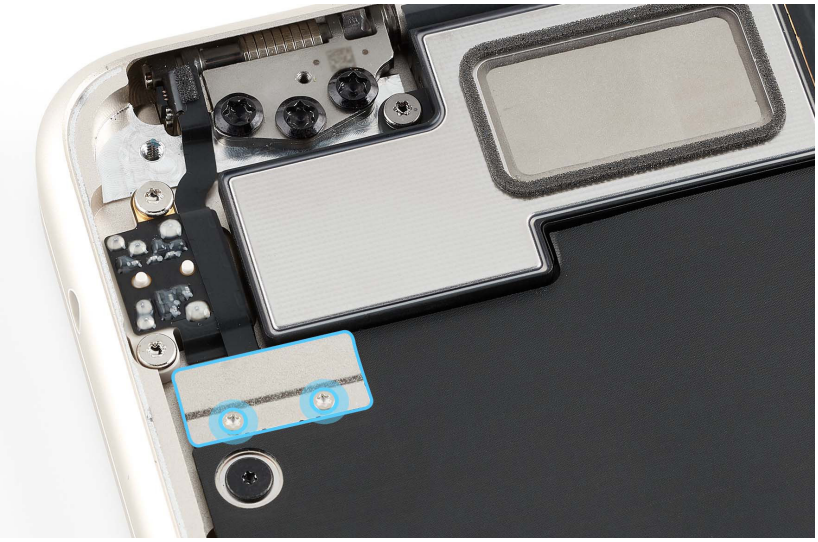
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 1IP 44 mm half-moon bit
- Torx T3 half-moon bit

Important

This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

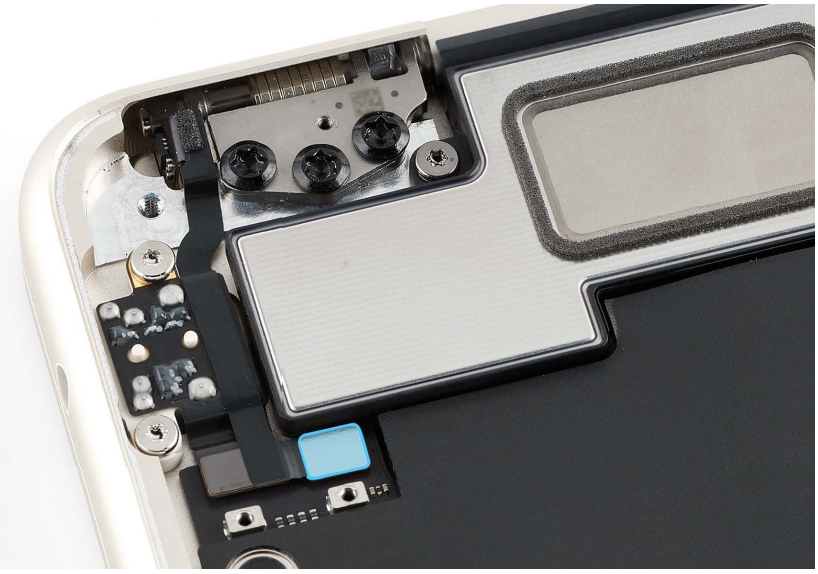
Removal

1. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the two T3 screws (923-07277) from the lid angle sensor/audio board connector cowling.

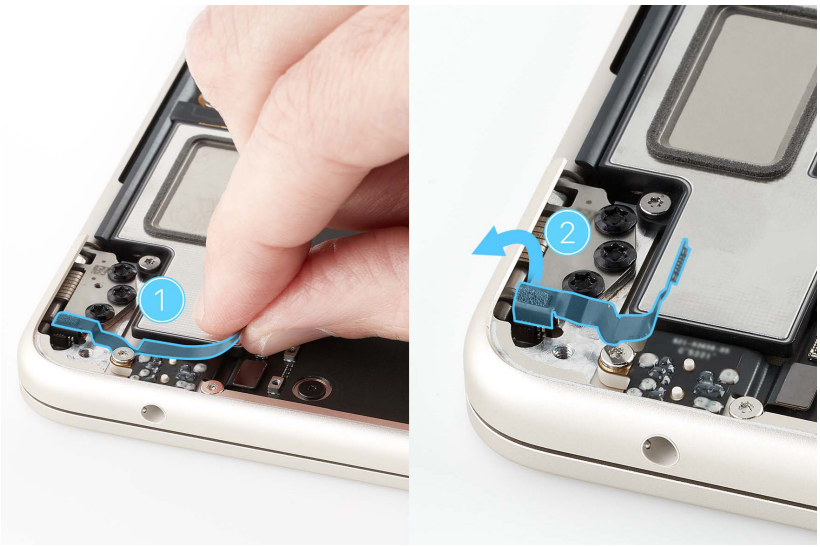


2. Remove the lid angle sensor/audio board connector cowling and save it for reassembly.

3. Use the black stick to lift the end of the lid angle sensor flex cable off the connector.



4. Loosen the adhesive and peel the lid angle sensor flex cable from the audio board (1). Then move the end of flex cable aside to access the 1IP screw (923-07278) in the lid angle sensor (2).

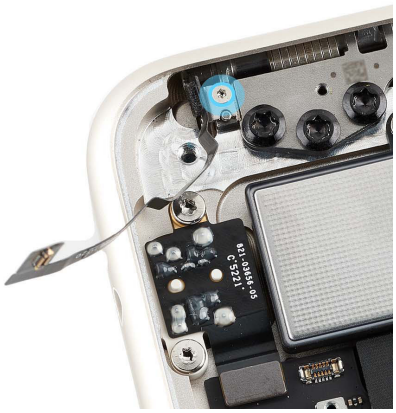


5. Insert the 1IP bit into the blue torque driver. Then use the blue torque driver and 1IP bit to remove one 1IP screw from the lid angle sensor.

6. Remove the lid angle sensor from the top case.

Reassembly

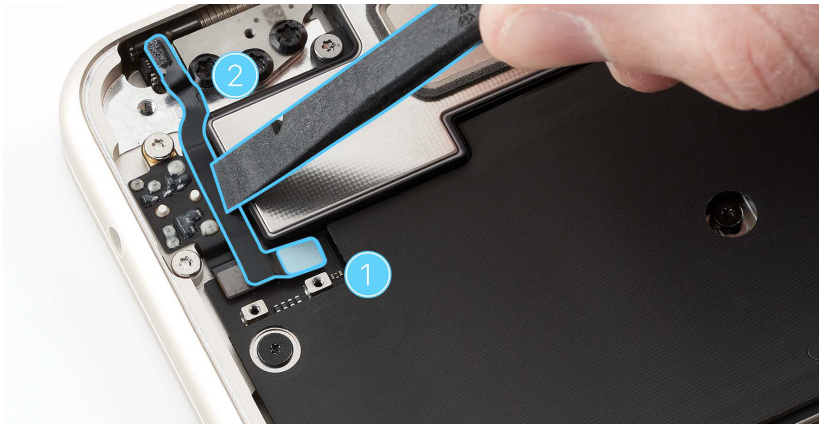
1. Position the clip on the lid angle sensor flex cable so the slot and screw hole on the clip are aligned with the pin and screw hole in the top case.



2. Insert the 1IP bit into the blue torque driver. Then use the blue torque driver and 1IP bit to reinstall the 1IP screw (923-07278) into the lid angle sensor.

3. Press the end of the lid angle sensor flex cable to the connector (1).

4. Use the flat end of the black stick to adhere the lid angle sensor flex cable to the audio board (2).



Important

If you're installing a replacement lid angle sensor flex cable, peel the adhesive backing off first.

5. Position the lid angle sensor/audio board connector cowling over the end of the lid angle sensor flex cable.

6. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the two T3 screws (923-07277) into the lid angle sensor/audio board connector cowling.

Reinstall the following parts to complete reassembly:

- Right display hinge cover
- Bottom case

Important

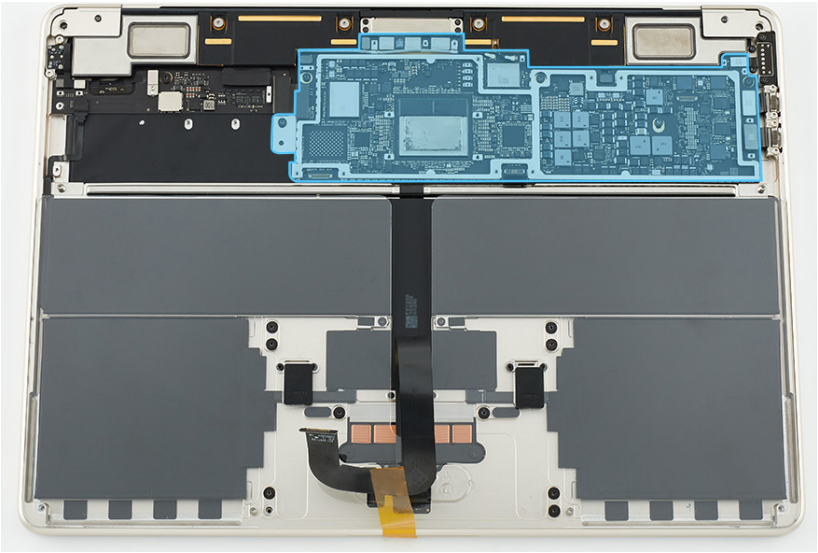
- After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- Close the display when prompted while you run System Configuration. If the display isn't fully closed during the process, you'll need to replace the lid angle sensor. Ensure that you follow all System Configuration steps to complete the repair.

Logic Board

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Heat sink



Tools

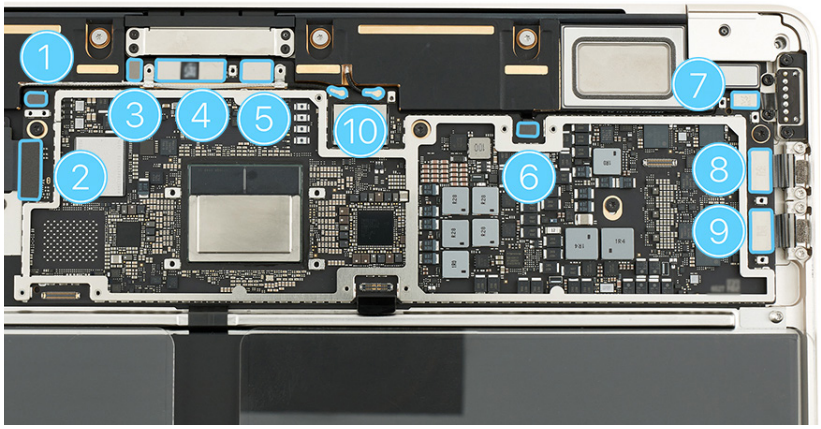
- Adjustable torque driver (10-34 Ncm)
- Antenna tool
- ESD-safe tweezers
- Nylon probe (black stick)
- Torx T5 bit

Important

- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- If you're installing a replacement logic board, you must also install a replacement Touch ID board.
- The heat sink can't be reused. A replacement heat sink is included with a new logic board.

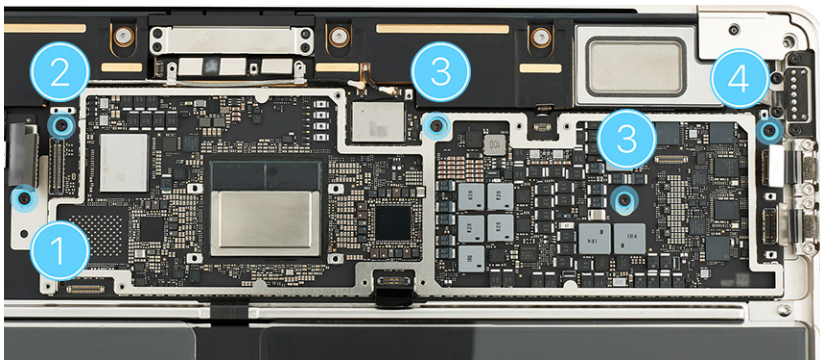
Removal

1. Use the black stick to lift the ends of the nine flex cables (1-9) off the connectors.

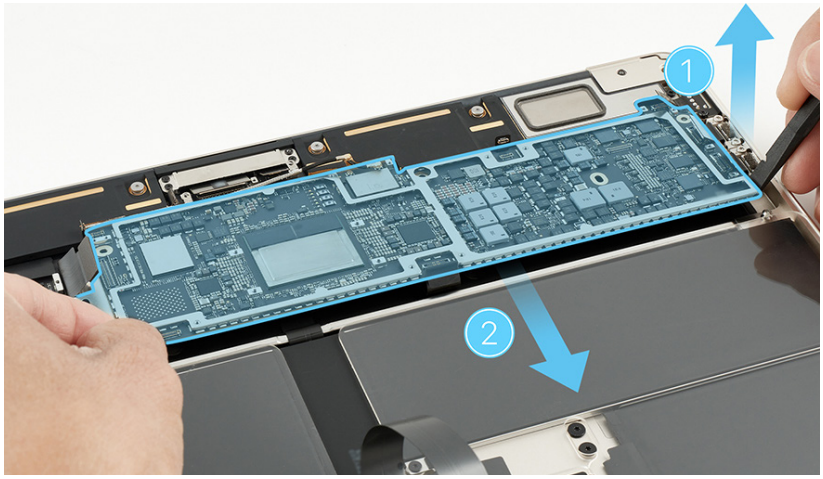


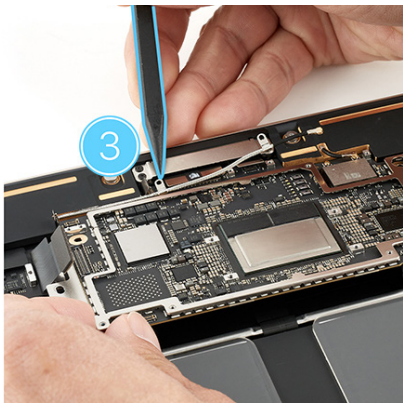
2. Use the black stick to lift the ends of the two antenna coaxial cables off the connectors (10).

3. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the following five T5 screws from the logic board:
   - One T5 screw (923-07297) (1)
   - One T5 screw (923-07284) (2)
   - Two T5 screws (923-07283) (3)
   - One T5 screw (923-07282) (4)



4. Use the flat end of the black stick to tilt up the logic board from the lower right corner (1). Then lift the logic board toward you to remove it from the top case (2). Use the black stick to move the cables out of the way as you remove the logic board (3).





Reassembly

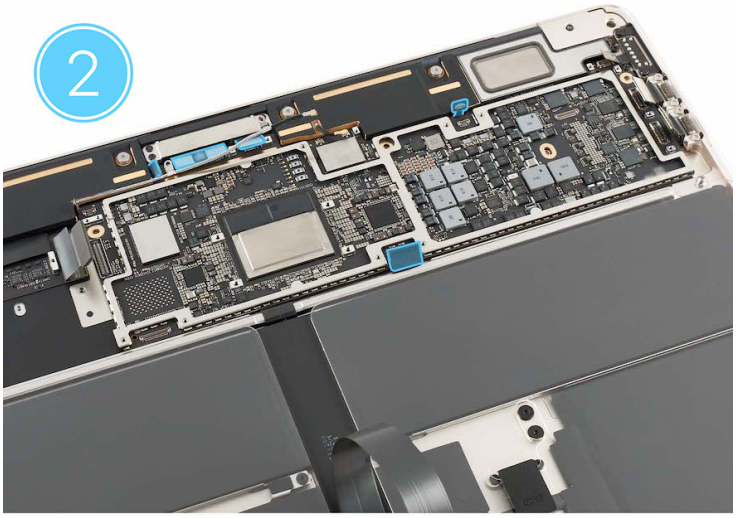
1. Hold the logic board by the edges. Tilt down the edge of the logic board closest to the display hinges (1). Then tilt the lower part of the logic board into the top case.

Caution

Ensure that no cables are caught under the logic board (2).

Important

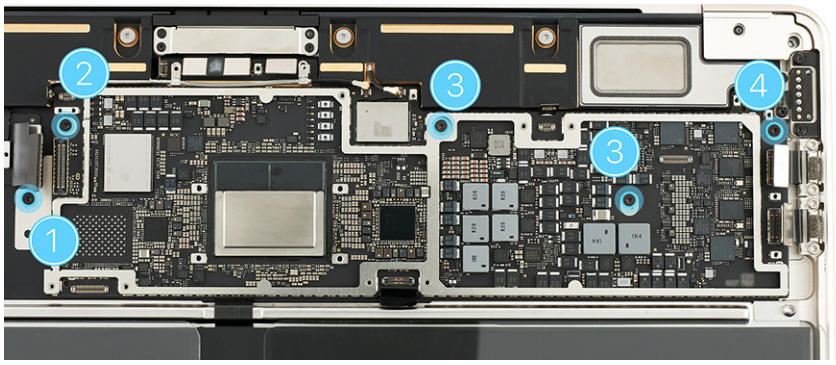
Ensure that the screw holes in the logic board align with the screw holes in the top case (3).



2. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 10 Ncm.

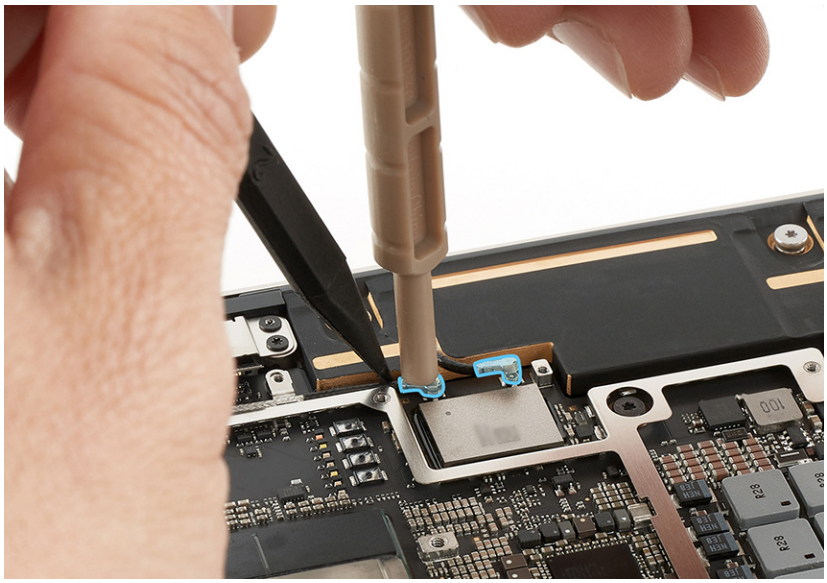
3. Use the adjustable torque driver and Torx T5 bit to reinstall one T5 screw (923-07297) (1) into the logic board.

4. Keep the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 14.5 Ncm.

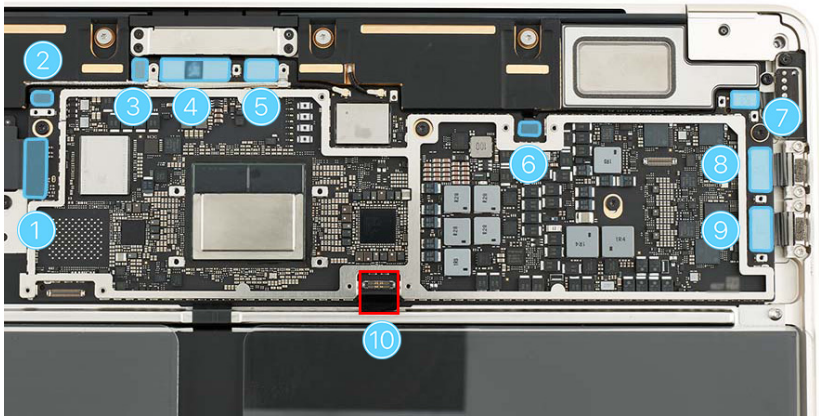


5. Use the adjustable torque driver and Torx T5 bit to reinstall the following four T5 screws into the logic board:
   - One T5 screw (923-07284) (2)
   - Two T5 screws (923-07283) (3)
   - One T5 screw (923-07282) (4)

6. Use the black stick or ESD-safe tweezers to position the ends of the two antenna coaxial cables over the connectors. Then use the blunt end of antenna tool to press the ends of the two antenna coaxial cables to the connectors.



7. Press the ends of the nine flex cables (1-9) to the connectors.



Caution

Don't connect the battery flex cable (10) or you may damage the logic board.

8. Install a replacement heat sink.

Reinstall the following part to complete reassembly:

- Bottom case

Important

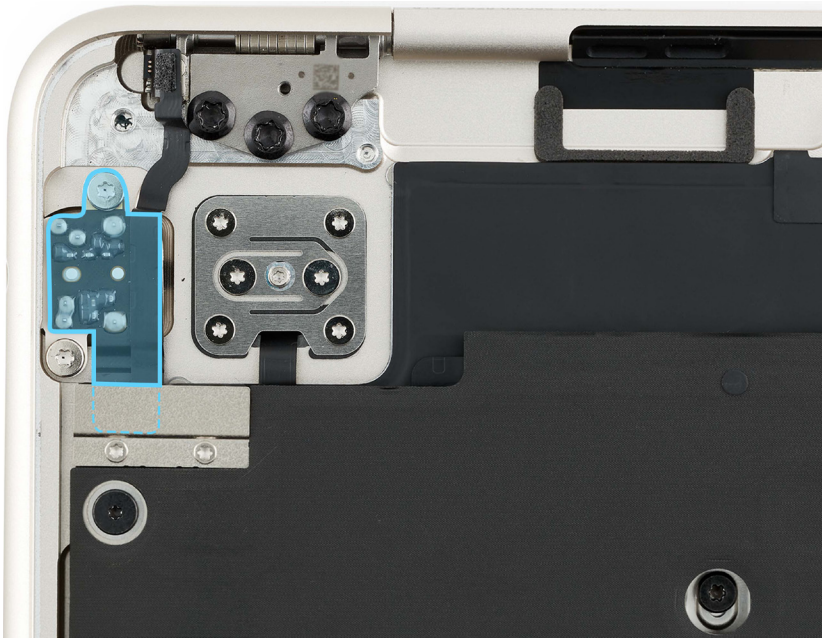
After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Audio Board

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Right display hinge cover
- Right speaker with antenna



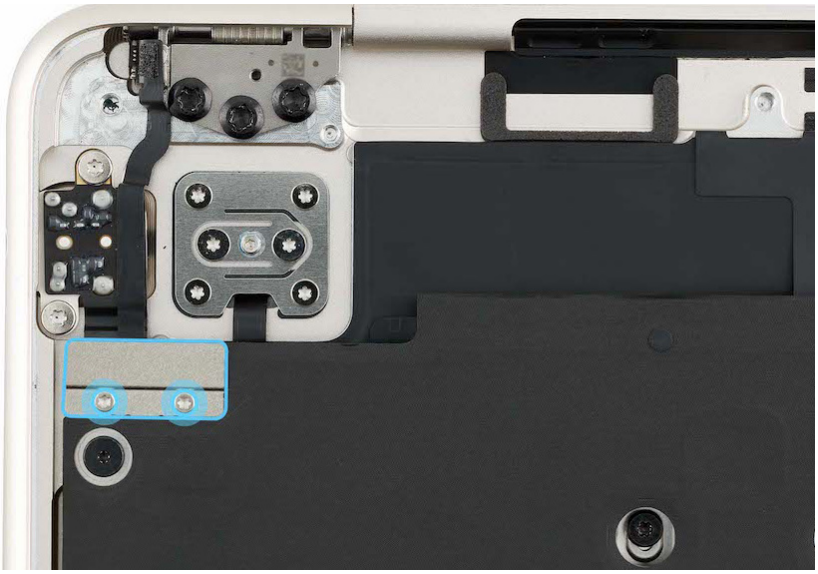
Tools

- Adjustable torque driver (10-34 Ncm)
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx T3 half-moon bit
- Torx T5 bit

Removal

1. Insert the Torx T3 bit into the blue torque driver.

2. Use the blue torque driver and Torx T3 bit to remove the two T3 screws (923-07277) from the lid angle sensor/audio board connector cowling.

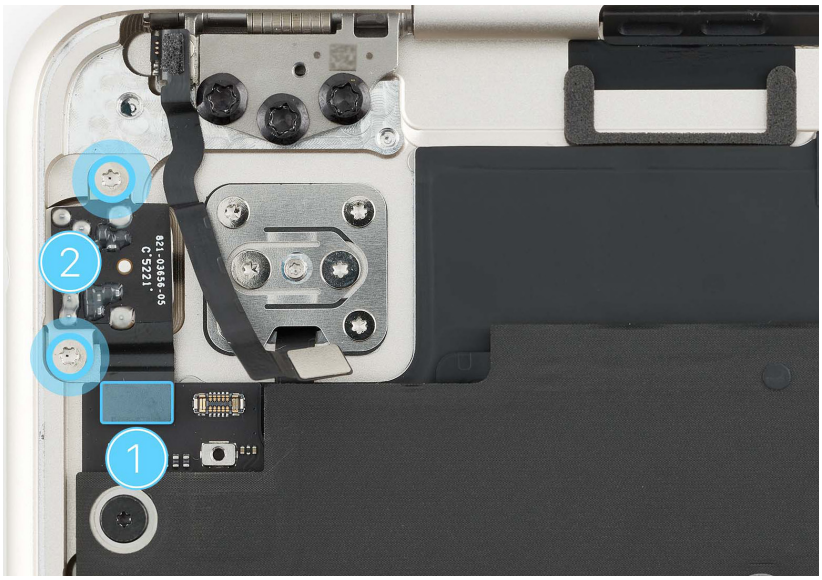


3. Remove the lid angle sensor/audio board connector cowling and save it for reassembly.

4. Use the black stick to lift the end of the lid angle sensor flex cable off the connector (1). Then gently peel the lid angle sensor flex cable off the audio board (2).

5. Use the black stick to lift the end of the audio board flex cable off the connector (1).

6. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and Torx T5 bit to remove the two T5 screws (923-07289) from the audio board (2).



7. Use the black stick to tilt up the end of the audio board flex cable. Then remove the audio board from the top case.

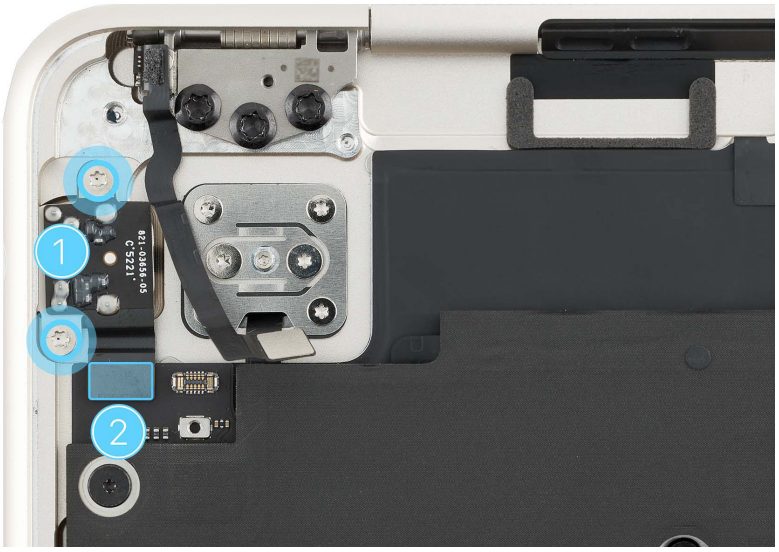
Reassembly

1. Use the black stick to position the audio board in the top case.

2. Insert the Torx T5 bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 16 Ncm.

3. Use the adjustable torque driver and Torx T5 bit to reinstall the two T5 screws (923-07289) into the audio board (1).

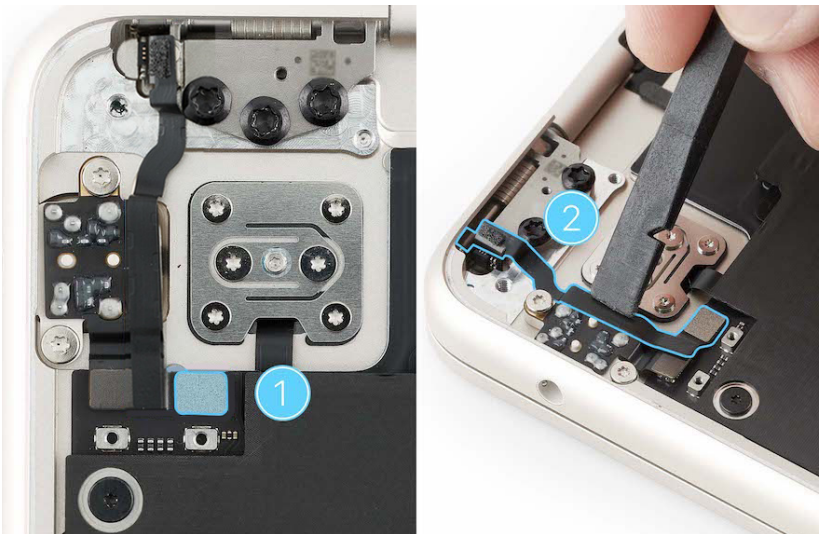
> **Caution**
>
> Ensure that the lid angle sensor flex cable isn't trapped under the audio board.



4. Press the end of the audio board flex cable to the connector (2).

5. Press the end of the lid angle sensor flex cable to the connector (1).

6. Use the flat end of the black stick to adhere the lid angle sensor flex cable onto the audio board (2).



7. Position the lid angle sensor/audio board connector cowling over the ends of the lid angle sensor and audio board flex cables.

8. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the two T3 screws (923-07277) into the lid angle sensor/audio board connector cowling.

Reinstall the following parts to complete reassembly:

- Right speaker with antenna
- Right display hinge cover
- Bottom case

Battery

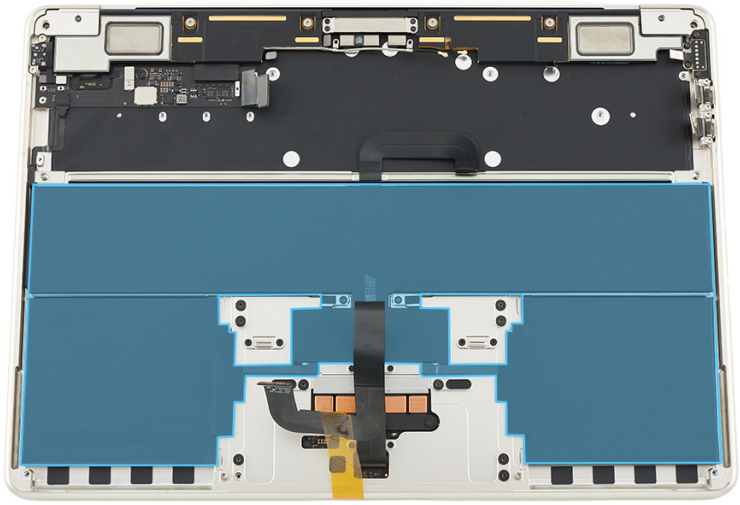
Before You Begin

Warning

Read Battery Safety and follow workspace and battery handling guidelines before you begin.

Remove the following parts before you begin:

- Bottom case
- Heat sink
- Logic board



Tools

- Adjustable torque driver (10-34 Ncm)
- Alignment pins (2 mm)
- Battery adhesive
- Battery support frame and press plate
- ESD-safe tweezers
- Ethanol wipes or isopropyl (IPA) wipes
- iPhone display press
- Nylon probe (black stick)
- Torx Plus 3IP 25 mm bit
- Torx Plus 4IP 25 mm bit

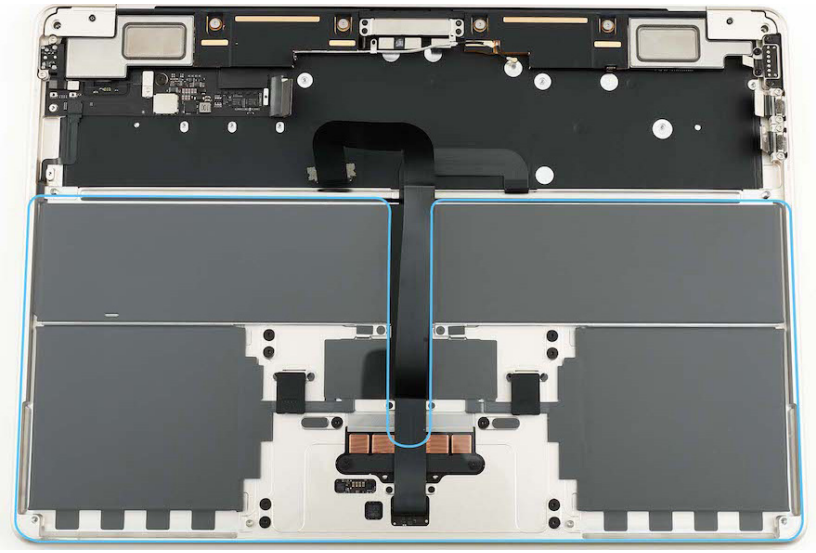
Important

The heat sink can’t be reused. A replacement heat sink is included with a new battery.

Removal

1. Remove the Kapton tape from trackpad flex cable.

2. Hold the battery cover by the edges and lift it off the top case.



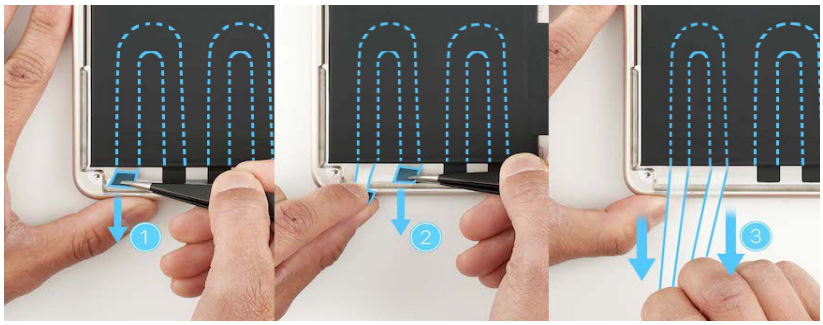
3. Insert the 4IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 4IP bit to remove the two 4IP screws (923-07259) (1) from the battery tray.

4. Insert the 3IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to remove the two 3IP screws (923-07279) (2) from the battery tray.

5. Use ESD-safe tweezers to grasp the first battery adhesive tab (1). Gently peel the adhesive tab away from the top case.

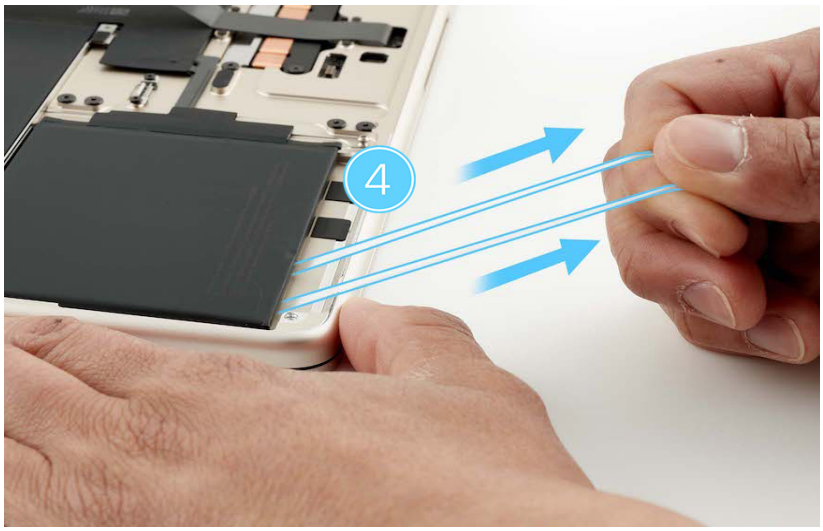
6. Use ESD-safe tweezers to grasp the second battery adhesive tab (2). Gently peel the adhesive tab away from the top case.

7. Pull both battery adhesive tabs to peel them away from the battery tray and top case (3).



Important

While grasping the two battery adhesive tabs, pull the adhesive strip past the edge of the top case at a slight upward angle until you've removed the entire adhesive strip (4). Don't touch the edge of the top case while removing the adhesive strip.



8. Repeat steps 5 through 7 to remove the remaining three battery adhesive strips (2-4). Then continue to step 9.

9. Tape the trackpad flex cable out of the way with Kapton tape as shown.

Caution

Don't fold or crease the flex cable.

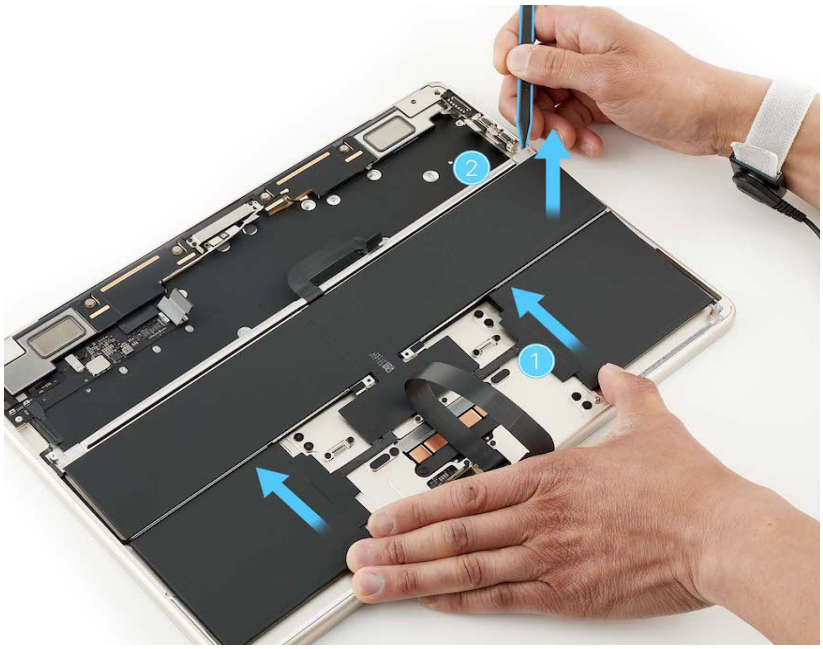
9. Use the black stick to peel the battery flex cable off the top case.

Warning

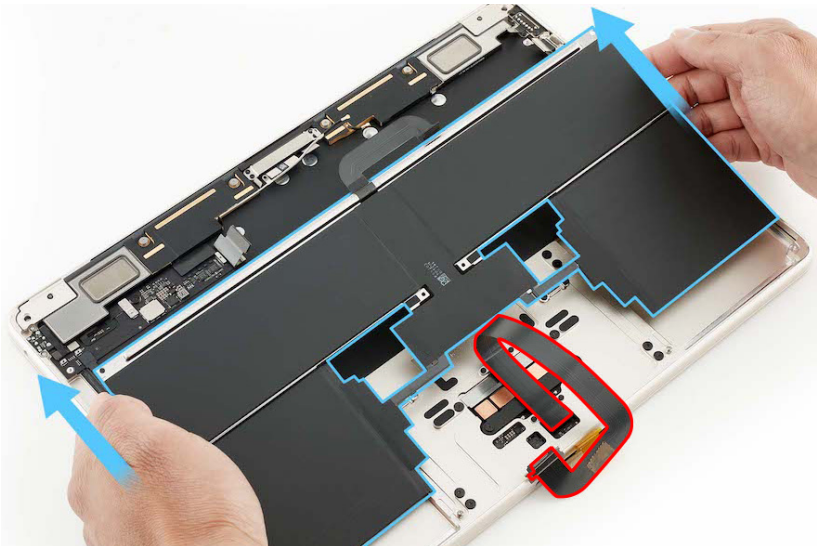
Don't touch the battery flex cable connector.

11. Push the bottom edge of the battery to slide it up (1).

12. Use the black stick to tilt up the top edge of the battery tray (2).



13. Hold the sides of the battery. Then lift the battery as shown to remove it from the top case.



Warning

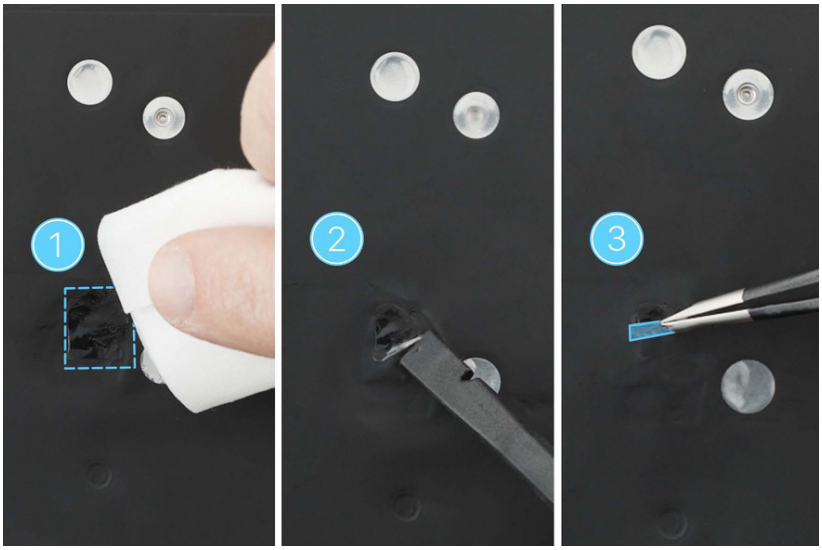
Don't remove the battery from the battery tray.

Important

Don't touch the trackpad flex cable while removing the battery.

14. Use an ethanol or IPA wipe to gently dampen the remaining battery flex cable adhesive on the top case (1).

15. Use the flat end of the black stick to gently lift one edge of the battery flex cable adhesive (2). Then use ESD-safe tweezers to remove the adhesive (3).

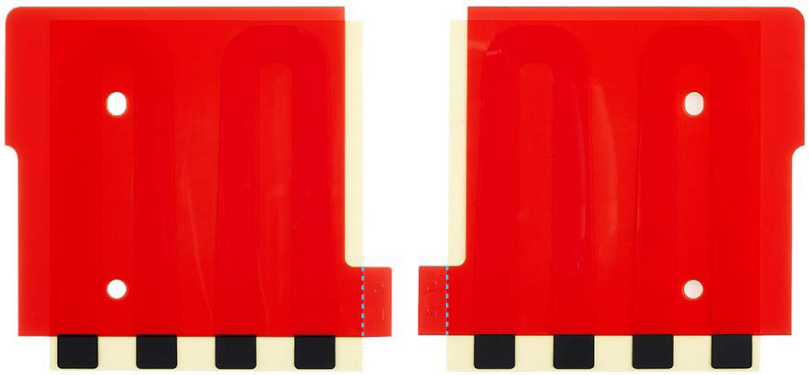


Caution

Don't damage the graphite layer while removing the adhesive.

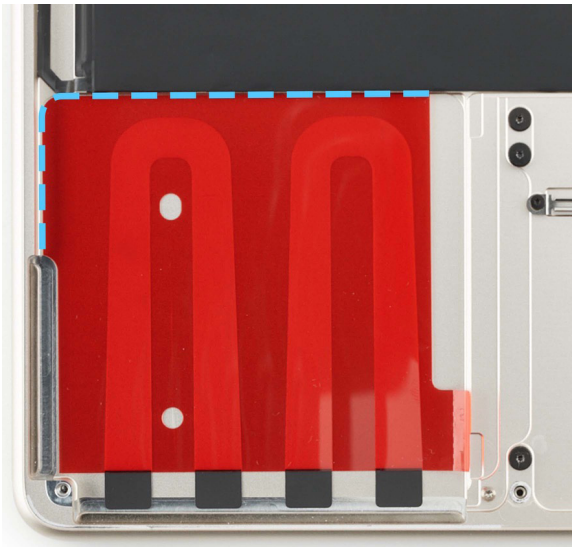
Reassembly

1. Fold the tabs on each battery adhesive 90 degrees at the perforated line.

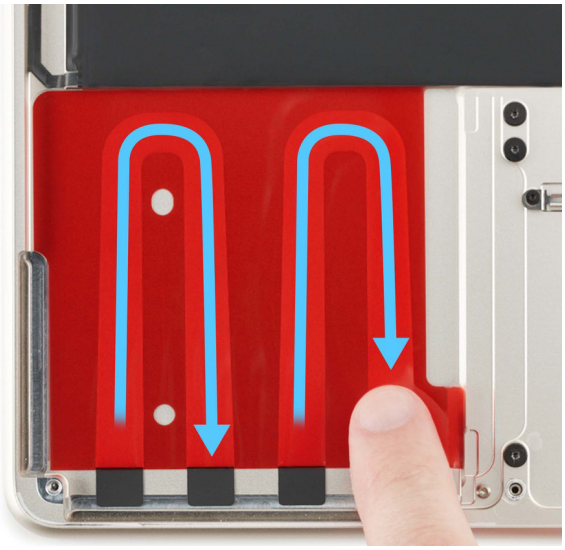


2. Remove the adhesive backing from the battery adhesive.

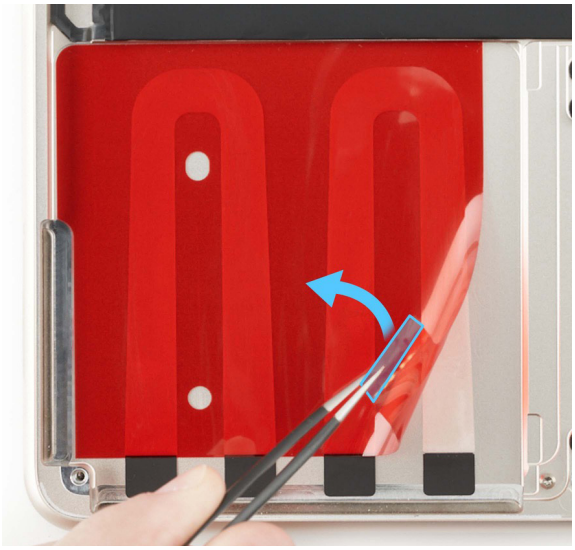
3. Align the battery adhesive over the corner of the top case as shown.



4. Press the battery adhesive strips onto the top case.



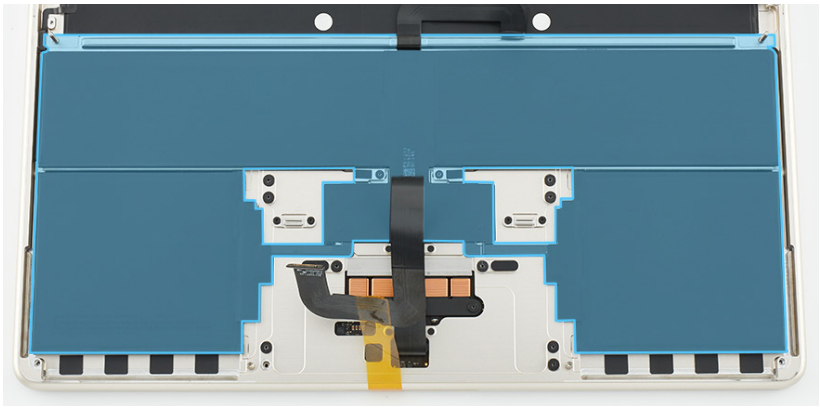
5. Use ESD-safe tweezers to grasp the folded tab on the top release liner. Then peel the top release liner off the battery adhesive strips.



6. Repeat steps 2 through 5 to adhere the second battery adhesive onto the other corner of the top case. Then continue to step 7.

7. Insert the threaded ends of the two 2 mm alignment pins into the screw holes on each side of the top case.

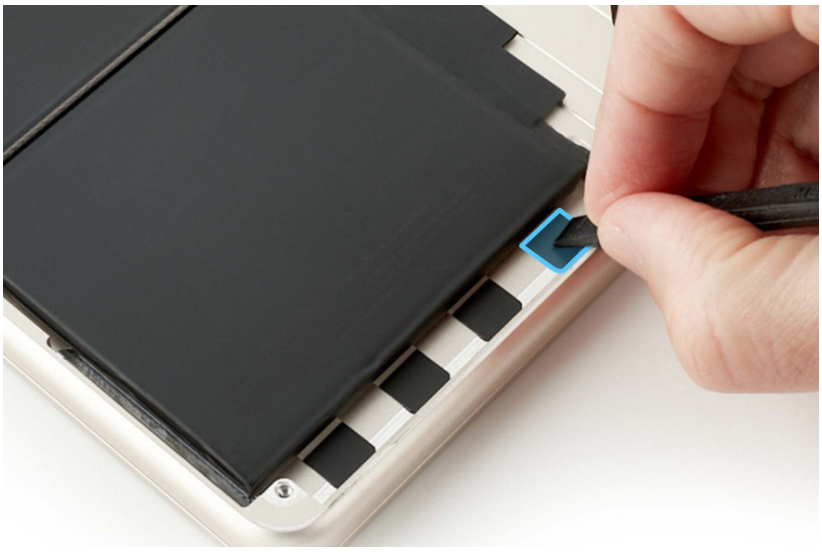
8. Align the screw holes on the battery tray over the alignment pins and lower the battery onto the top case.



9. Use the flat end of the black stick to press the battery adhesive tabs onto the top case.

Important

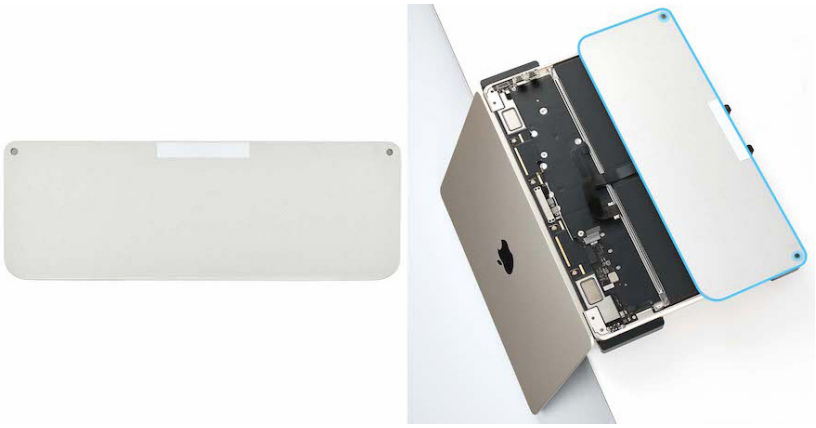
Press the adhesive tabs twice with the black stick to ensure the entire width of the tabs adhere onto the top case.



10. Remove the Kapton tape from the trackpad flex cable.

11. Open the display. Then place the computer in the support frame with the display hanging over the edge of the table.

12. Align the holes on the battery press plate over the alignment pins on the support frame. Lower the press plate onto the battery.



Caution

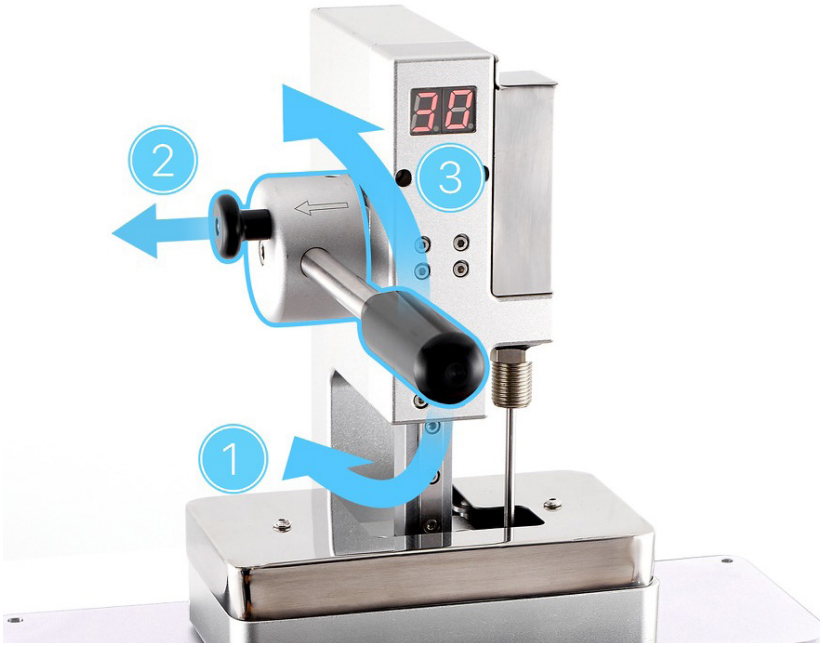
Ensure that the trackpad flex cable lies flat against the battery to avoid damaging it with the press plate.

13. Place the support frame in the iPhone display press.

14. Ensure that the support frame is aligned with the back of the iPhone display press.

15. Pull down the lever until it locks.

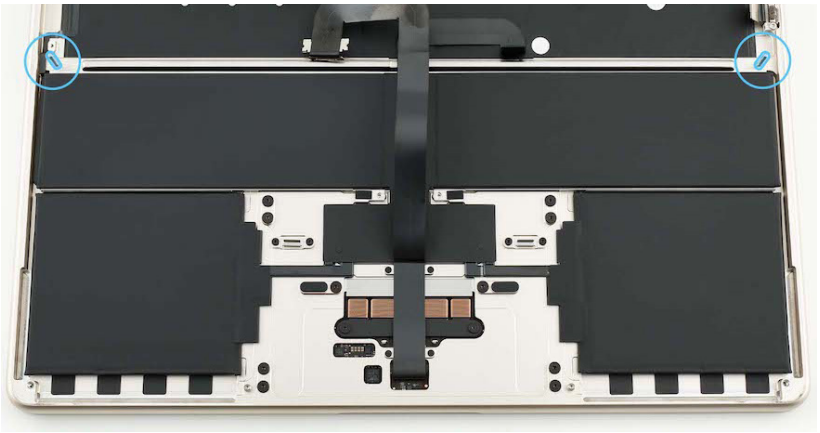
16. Wait until the iPhone display press beeps and the timer shows 0. Pull down the lever slightly (1) and pull out the release knob (2). Then lift the lever (3).



17. Remove the support frame from the iPhone display press. Then lift off the press plate.

18. Remove the computer from the support frame. Close the display and place the computer display-side down.

19. Remove the two alignment pins.



20. Insert the 4IP bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 16 Ncm.

21. Use the adjustable torque driver and 4IP bit to reinstall the two 4IP screws (923-07259) (1) into the battery tray.

22. Insert the 3IP bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 16 Ncm.

23. Use the adjustable torque driver and 3IP bit to reinstall the two 3IP screws (923-07279) (2) into the battery tray.

24. Reinstall the logic board.

25. Install a replacement heat sink.

    Note: A replacement heat sink is included with a replacement battery.

Reinstall the following part to complete reassembly:

- Bottom case

Display

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Display hinge covers
- Left speaker with antenna
- Right speaker with antenna

Tools

- Adjustable torque driver (0.3-1.2 Nm)
- Adjustable torque driver (10-34 Ncm)
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 3IP 25 mm bit
- Torx Plus 8IP 25 mm
- Torx T3 half-moon bit

Important

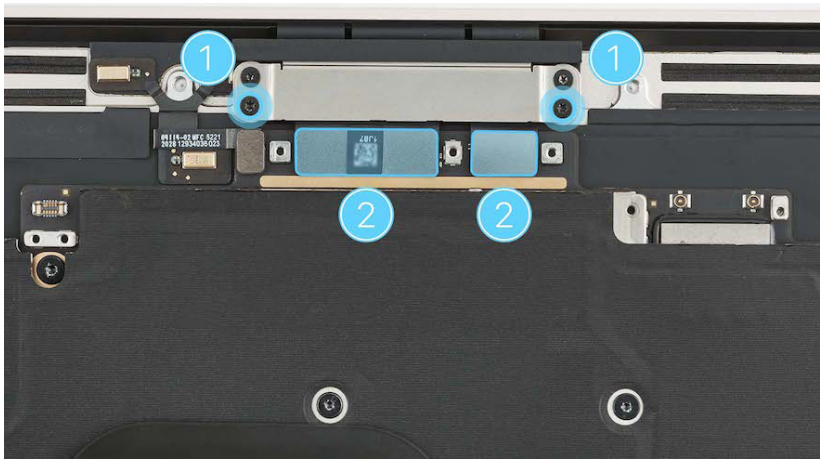
- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- If you replace the display, you must also replace the lid angle sensor.

Removal

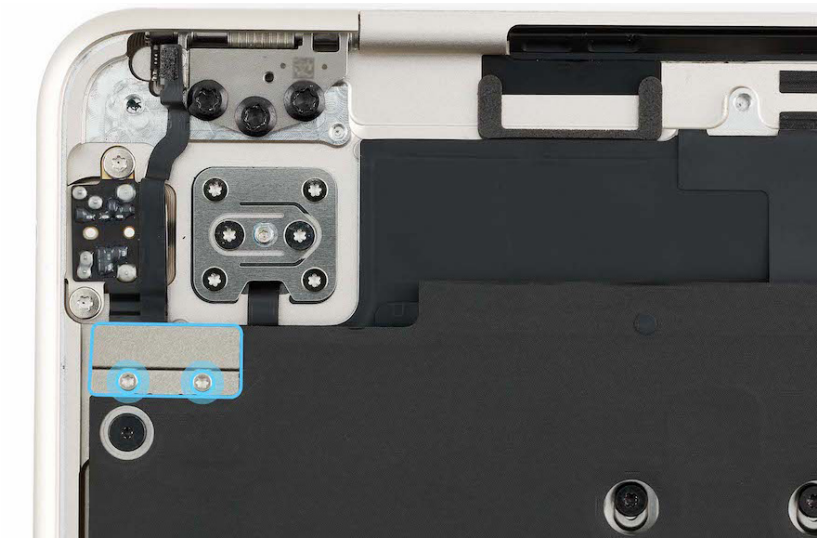
1. Open the display. Then place the computer on the edge of the table with the display hanging down.

2. Insert the 3IP bit into the 10-34 Ncm adjustable torque driver. Then use the adjustable torque driver and 3IP bit to remove the two 3IP screws (923-07285) from the display flex cables cowling (1).

3. Use the black stick to lift the ends of the display and camera flex cables off the connectors (2).



4. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to remove the two T3 screws (923-07277) from the lid angle sensor/audio board connector cowling.



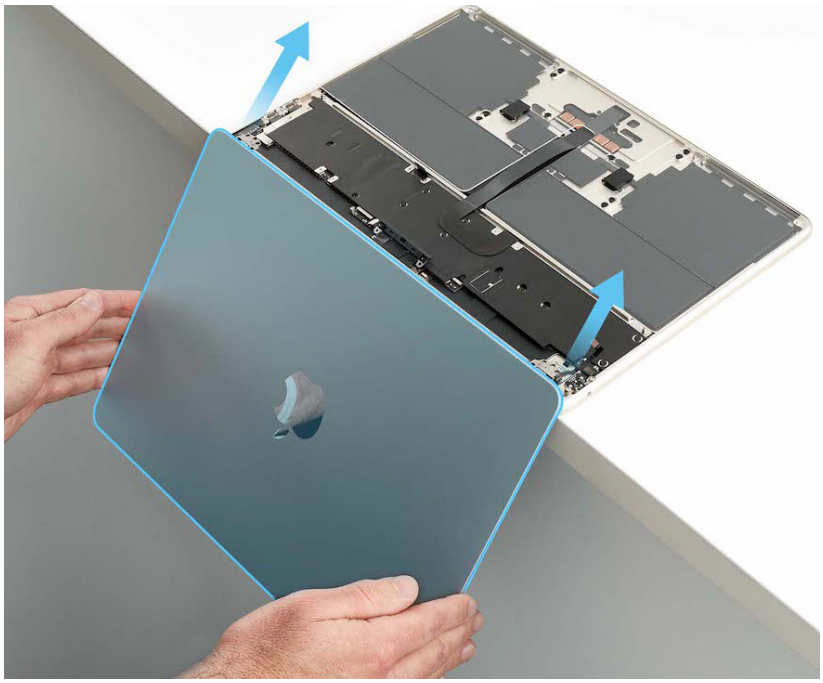
5. Remove the lid angle sensor/audio board connector cowling and save it for reassembly.

6. Lift the end of the lid angle sensor flex cable off the connector (1).

7. Loosen the adhesive and peel the lid angle sensor flex cable from the audio board (2).

8. Insert the 8IP bit into the 0.3-1.2 Nm adjustable torque driver. Then use the adjustable torque driver and 8IP bit to remove the six 8IP screws (923-07286) from the left and right display hinges.

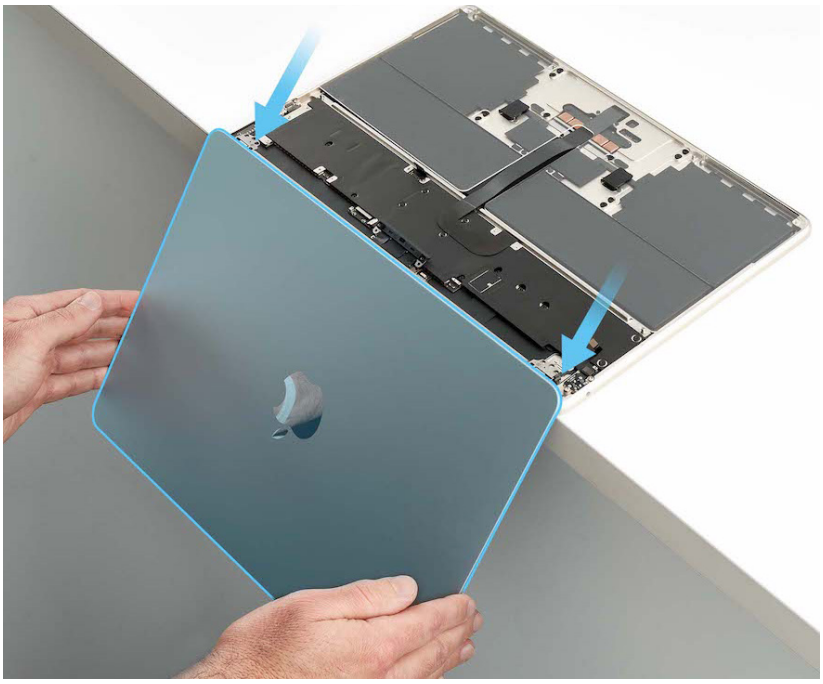
9. Open the display fully. Then lift the display at the angle shown to remove it from the top case. Ensure that the display hinge covers clear the edge of the top case.



Reassembly

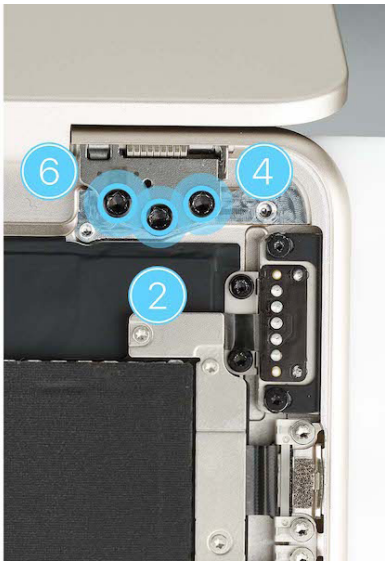
1. Position the display on the top case.

   Note: The display includes the display and camera flex cables.

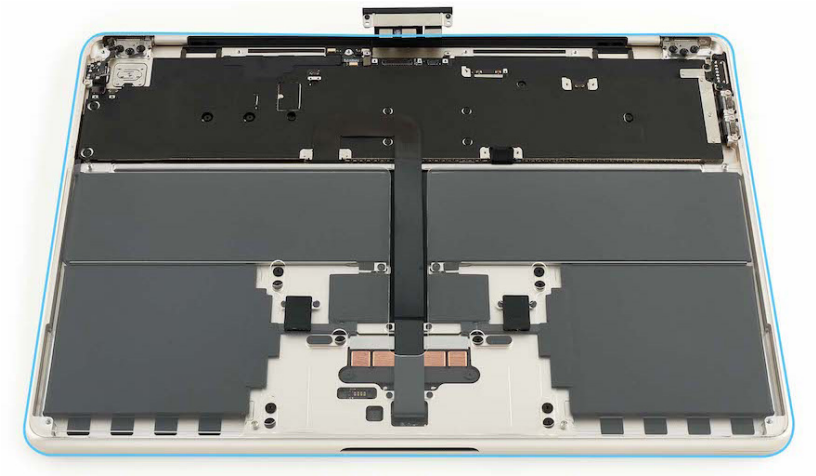


2. Position the display and camera flex cables inside the top case.

3. Insert the 8IP bit into the 0.3-1.2 Nm adjustable torque driver. Then use the adjustable torque driver and 8IP bit to partially reinstall the six 8IP screws (923-07286) into the right and left display hinge covers in the order shown.

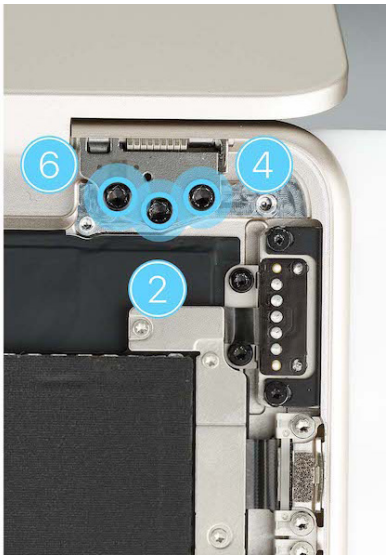


4. Close the display and adjust it until it's flush with the top case.



5. Keep the 8IP bit in the 0.3-1.2 Nm adjustable torque driver. Set the torque value to 0.6 Nm.

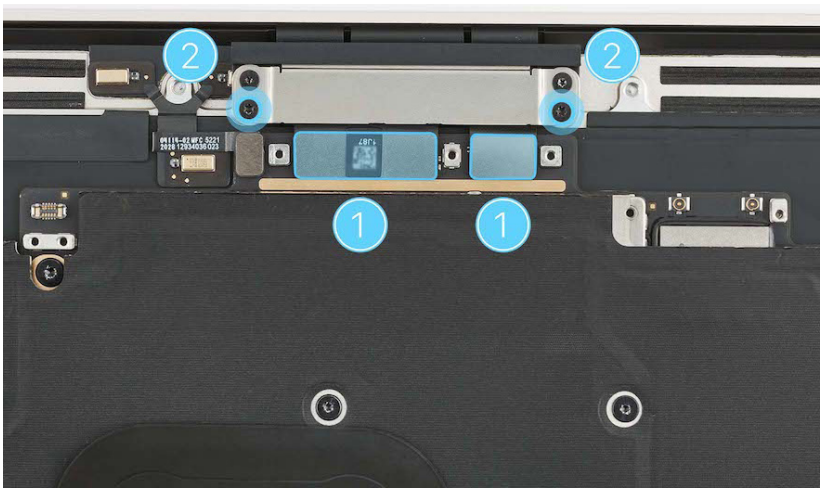
6. Use the 0.3-1.2 Nm adjustable torque driver and 8IP bit to fully reinstall the six 8IP screws in the right and left display hinge covers in the order shown.



7. Press the ends of the display and camera flex cables to the connectors (1).

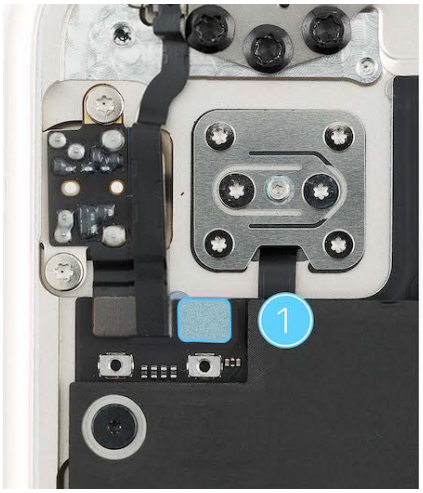
8. Insert the 3IP bit into the 10-34 Ncm adjustable torque driver. Set the torque value to 11.5 Ncm.

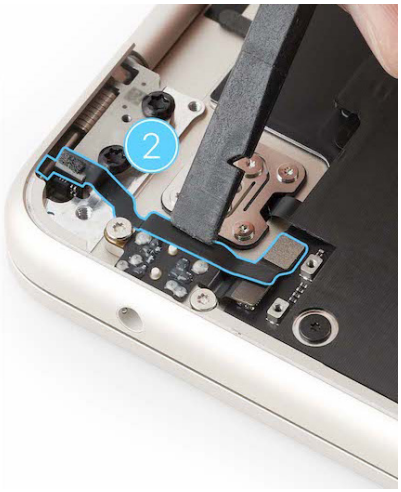
9. Use the adjustable torque driver and 3IP bit to reinstall the two 3IP screws (923-07285) into the display flex cables cowling (2).



10. Press the end of the lid angle sensor flex cable to the connector (1).

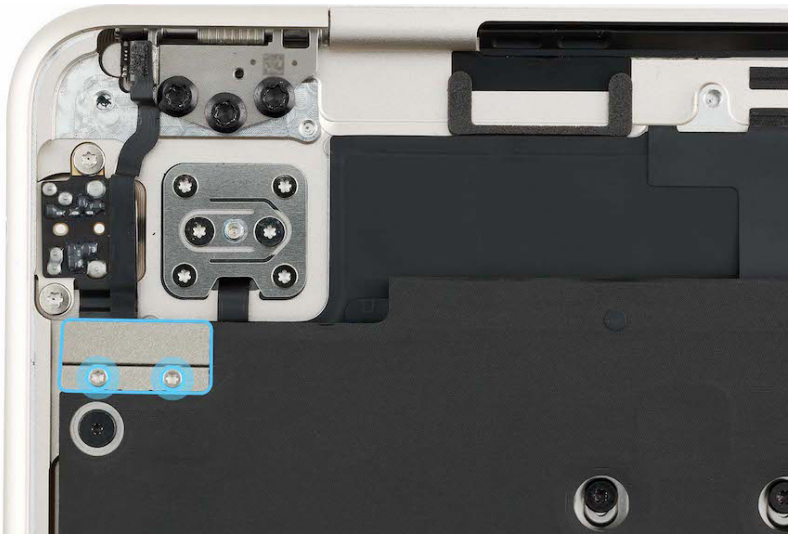
11. Use the flat end of the black stick to adhere the lid angle sensor flex cable to the audio board (2).





12. Position the lid angle sensor cable/audio board connector cowling over the end of the lid angle sensor flex cable.

13. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the two T3 screws (923-07277) into the lid angle sensor cable/audio board connector cowling.



Reinstall the following parts to complete reassembly:

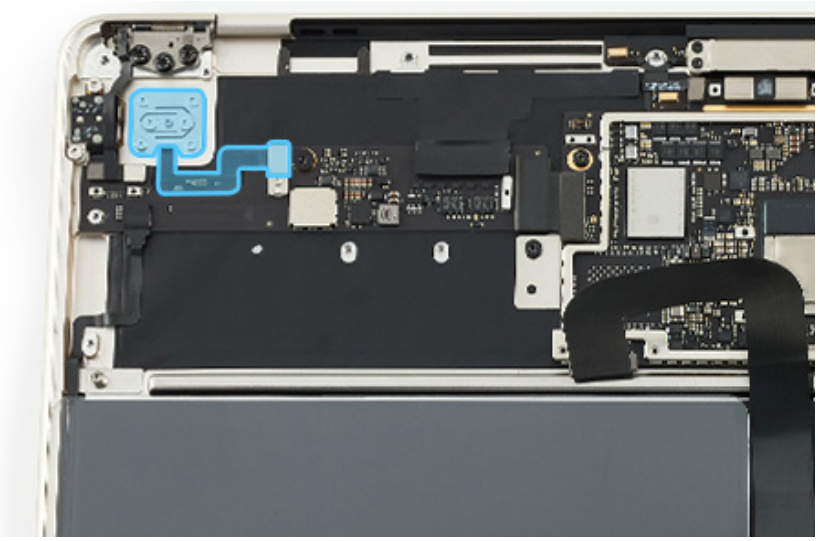
- Right speaker with antenna
- Left speaker with antenna
- Display hinge covers
- Bottom case

Important

- After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- Close the display when prompted while you run System Configuration. If the display isn't fully closed during the process, you'll need to replace the lid angle sensor. Ensure that you follow all System Configuration steps to complete the repair.

Touch ID Board

Before You Begin



Remove the following parts before you begin:

- Bottom case
- Display hinge covers
- Left speaker with antenna
- Right speaker with antenna
- Heat sink

Tools

- ESD-safe tweezers
- Kapton tape
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 2IP 44 mm half-moon bit
- Torx T3 half-moon bit
- Torx T3 screwdriver
- Touch ID alignment kit

Important

- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- The heat sink can't be reused. Install a replacement heat sink.

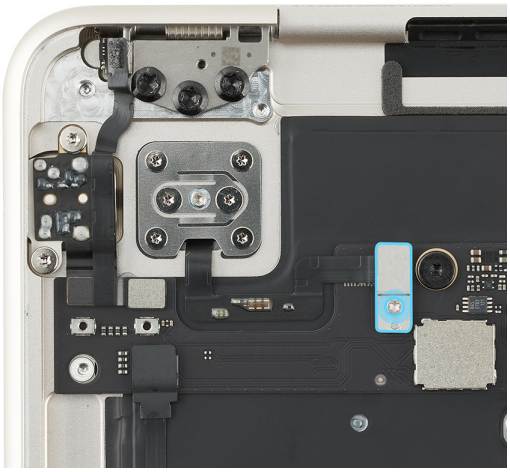
Removal

1. Open the display and stand the computer on its side.

2. Press the Touch ID button. During reassembly, you'll need to ensure that it feels the same way when you press it.

3. Close the display and the lay the computer display-side down.

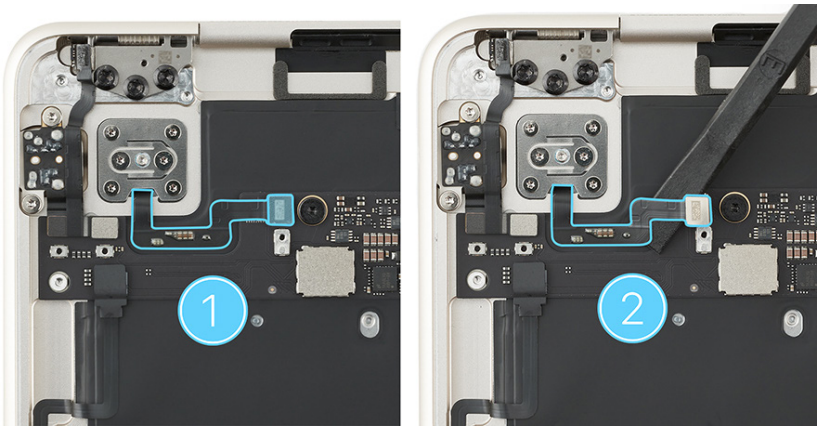
4. Use the T3 screwdriver to remove the T3 screw (923-07277) from the Touch ID board connector cowling.



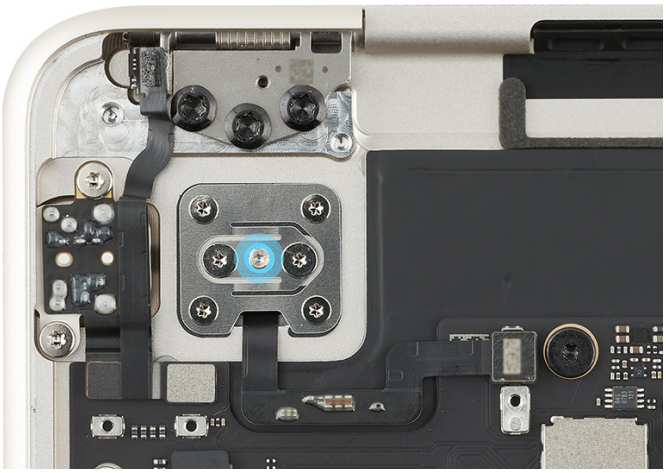
5. Remove the Touch ID board connector cowling and save it for reassembly.

6. Use the black stick to lift the end of the Touch ID board flex cable off the connector (1).

7. Use the flat end of the black stick to gently peel the Touch ID board flex cable from the top case (2).

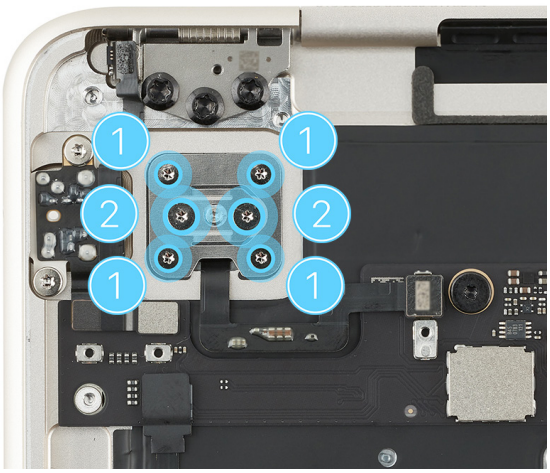


8. Insert the 2IP bit into the blue torque driver. Then use the blue torque driver and 2IP bit to partially unscrew the middle captive screw with one turn.



9. Use the T3 screwdriver to remove the four corner T3 screws (923-07546) (1) from the Touch ID board.

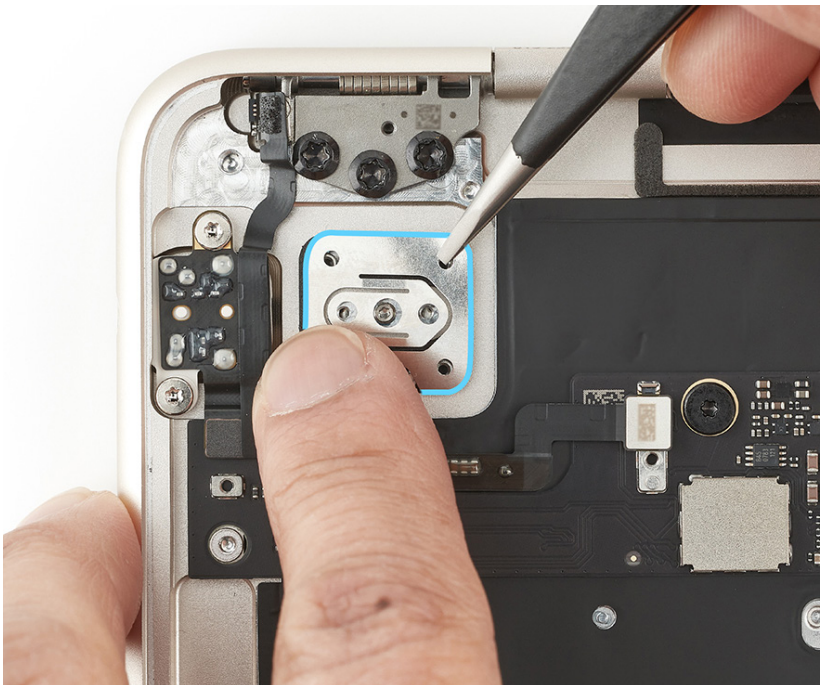
10. Use the T3 screwdriver to remove the two middle T3 screws (923-07293) (2) from the Touch ID board.



11. Use ESD-safe tweezers to remove the Touch ID board flexible cowling. Save the flexible cowling for reassembly.

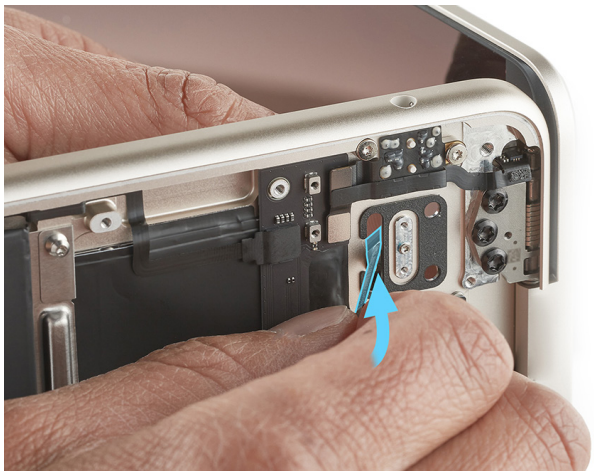
Important

Note the orientation of the Touch ID board flexible cowling for reassembly.



12. Open the display and stand the computer on its side.

13. Support the Touch ID board as you route the Touch ID board flex cable through the slot as shown. Remove the Touch ID board from the keyboard side of the top case.



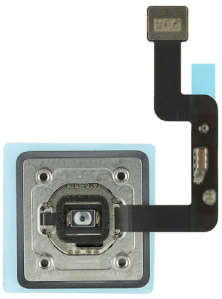
Reassembly

1. Stand the computer on its side with the display still open.

2. Set two Y-shaped alignment tools in the Touch ID board opening in the top case as shown. Secure the Y-shaped tools in the corner edges with Kapton tape.

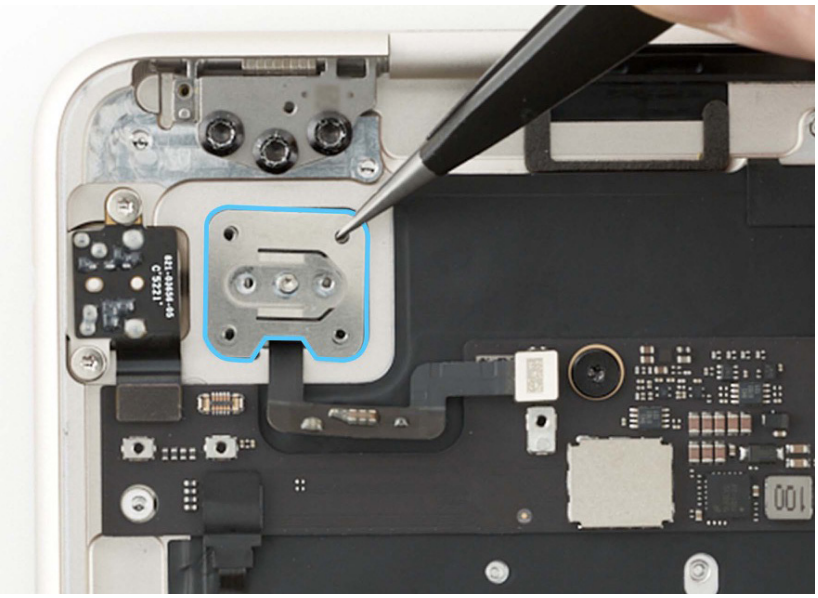
3. Route the Touch ID board flex cable through the slot in the top case. Then position the Touch ID board in the opening in the top case.

   Note: If you're installing a replacement Touch ID board, remove the protective film from the glass surface and the Touch ID board flex cable.



4. Close the display. Ensure that the Touch ID button is held in place by the Y-shaped tools as you close the display. Then place the computer display-side down.

5. Use ESD-safe tweezers to position the Touch ID board flexible cowling as shown.

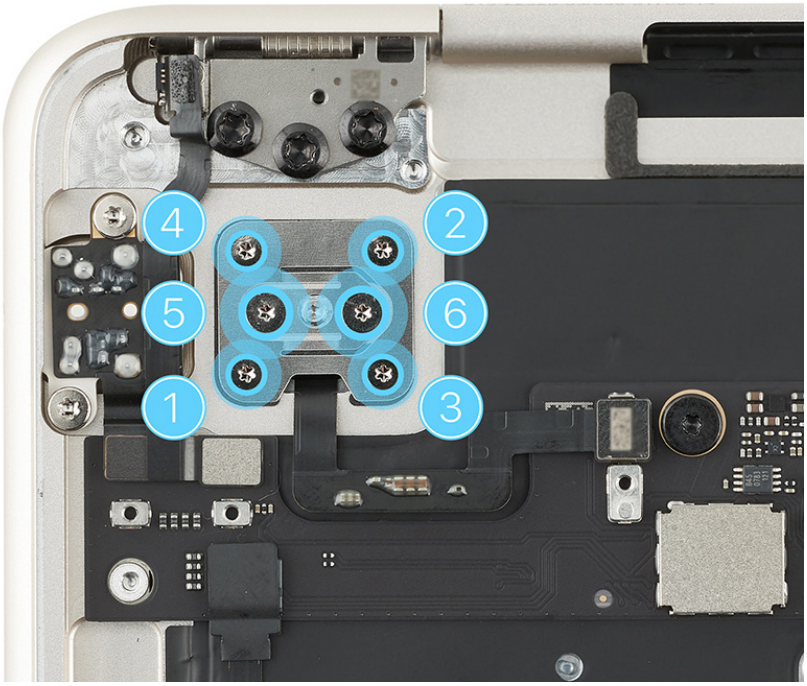


5. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to partially reinstall the bottom left T3 screw (923-07546) (1) into the Touch ID board.

6. Keep the Torx T3 bit in the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the upper right T3 screw (923-07546) (2). Then fully reinstall the bottom left T3 screw.

7. Keep the Torx T3 bit in the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the lower right and upper left T3 screws (923-07546) (3, 4) in the order shown.

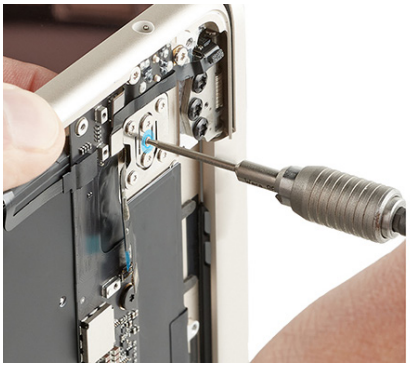
8. Use the T3 screwdriver to reinstall the two middle T3 screws (923-07293) (5, 6) in the order shown.



9. Open the display and stand the computer on its side.

10. Remove the Kapton tape and Y-shaped alignment tools.

11. Insert the 2IP bit into the blue torque driver. Then use the blue torque driver and 2IP bit to tighten or loosen the captive screw while you press the Touch ID button. Ensure that it feels the same way as it did prior to removal.



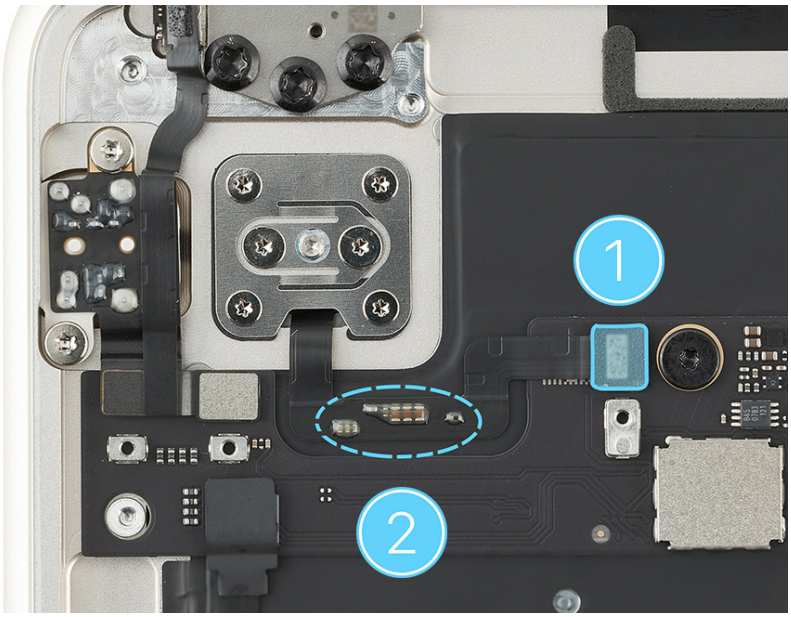
Important

- If the Touch ID button feels too stiff or doesn't move, the captive screw has been overtightened. Use the blue torque driver and 2IP bit to loosen the captive screw.
- If the Touch ID button can be pressed down but doesn't click, the captive screw has been reinstalled too loose. Use the blue torque driver and 2IP bit to tighten the captive screw.

12. Close the display and place the computer display-side down.

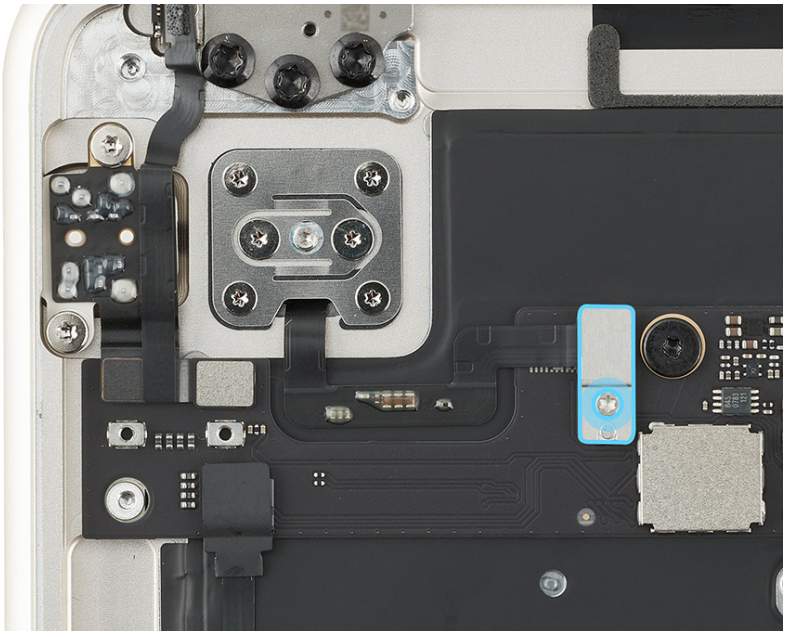
13. Press the end of the Touch ID board flex cable to the connector (1).

14. Use the black stick to adhere the Touch ID board flex cable to the top case (2).



15. Position the Touch ID board connector cowling.

16. Insert the Torx T3 bit into the blue torque driver. Then use the blue torque driver and Torx T3 bit to reinstall the T3 screw (923-07277) into the Touch ID board connector cowling.



17. Install a replacement heat sink.

Reinstall the following parts to complete reassembly:

- Right speaker with antenna
- Left speaker with antenna
- Display hinge covers
- Bottom case

Important

After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Top Case with Keyboard

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Display hinge covers
- Left speaker with antenna
- Right speaker with antenna
- MagSafe 3 board
- USB-C boards
- Lid angle sensor
- Trackpad and trackpad flex cable
- Heat sink
- Audio board
- Logic board
- Display
- Touch ID board
- Battery

Tools

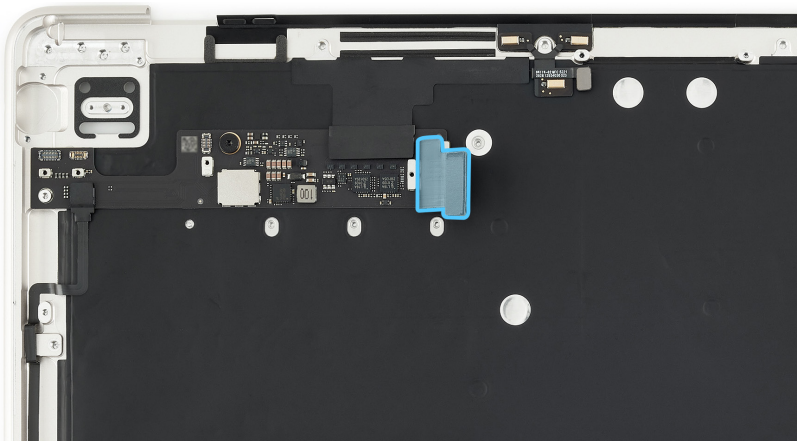
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 2IP 44 mm half-moon bit

Important

The heat sink can’t be reused. A replacement heat sink is included with a new top case.

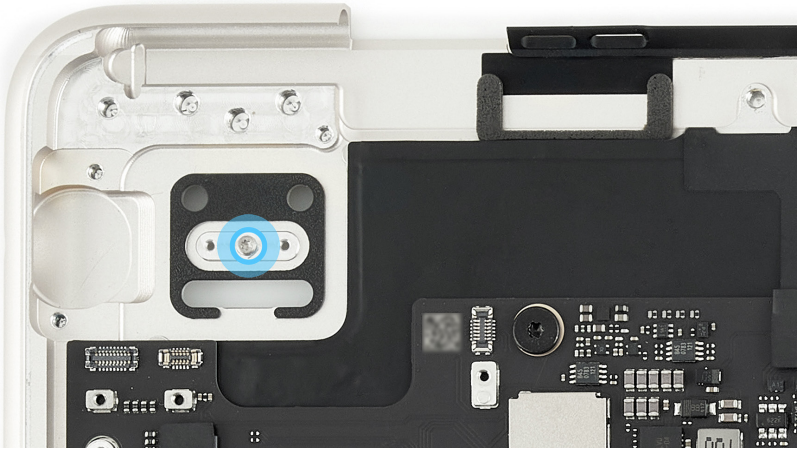
Removal

1. Use the flat end of the black stick to lift the interposer board flex cable off the connector on the interposer board.



2. Remove from the interposer board flex cable from top case and save it for reassembly.

3. Use the blue torque driver and 2IP bit to remove the Touch ID board captive screw. Save the screw for reassembly.

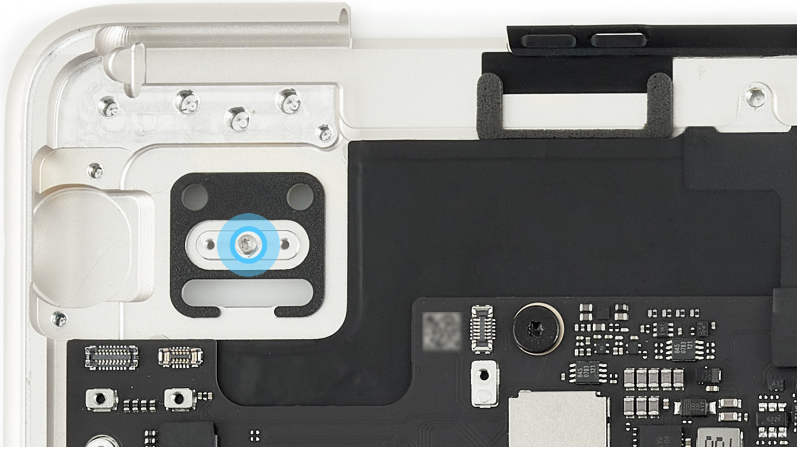


Note: The top case includes four nonremovable parts.

- Keyboard and keyboard flex cable
- Keyboard backlight flex cable
- Microphone and microphone flex cable
- Interposer board

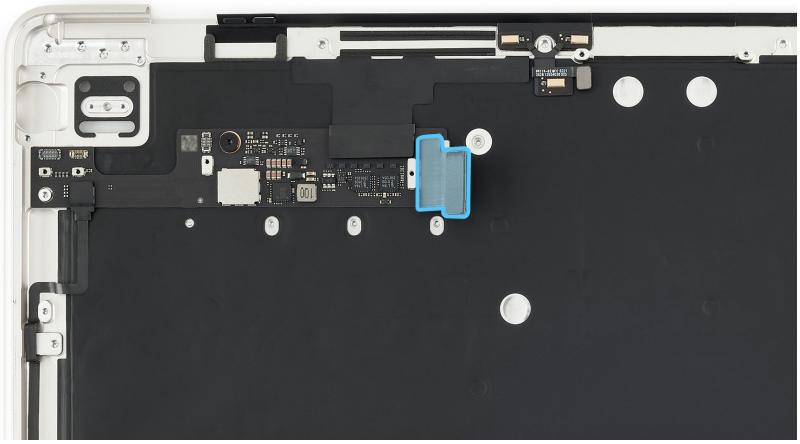
Reassembly

1. Use the blue torque driver and 2IP bit to partially install the Touch ID board captive screw into the top case.



> **Important**
>
> Don't tighten the Touch ID board captive screw.

2. Press the end of the interposer board flex cable to the connector on the interposer board.



3. Reinstall the battery.
4. Reinstall the Touch ID board.
5. Reinstall the display.
6. Reinstall the logic board.
7. Reinstall the audio board.
8. Install a replacement heat sink.

Reinstall the following parts to complete reassembly:

- Trackpad and trackpad flex cable
- Lid angle sensor
- USB-C boards
- MagSafe 3 board
- Right speaker with antenna
- Left speaker with antenna
- Display hinge covers
- Bottom case