iMac (Retina 4K, 21.5-inch, 2019)

Repair Guide

Contents

3 About This Guide

Basics

4 Exploded View
7 Desktop Tools
11 Screws
13 Display Cleaning

Safety

14 Electrical Safety
15 Broken Display

Procedures

17 First Steps
18 Display
40 Embedded DisplayPort (eDP) Cable
43 Display Thermal Sensor Cable
46 Camera
49 Fan
54 Hard Drive
59 Chin Strap
62 Left Speaker
72 Power Supply
81 Logic Board
99 Right Speaker
101 Hard Drive Data and Power Cable
104 Flash Storage
108 Memory
112 Battery
114 Bluetooth and Wi-Fi Antennas
122 Stand

125 Mechanism
128 Rear Housing

About This Guide

This guide includes technical instructions for replacing genuine Apple parts in Apple computers.

All genuine Apple parts and special tools are available to Apple-certified technicians at an Apple Store or at an Apple Authorized Service Provider as part of a repair. Find an Apple Store or an Apple Authorized Service Provider at support.apple.com/repair.

Apple's warranty and any Apple-branded extended service contract, including AppleCare+ and AppleCare Protection Plan, do not cover service that is required due to the failure of parts that are neither supplied by Apple nor genuine Apple parts; or because the product has failed due to unauthorized modification or faulty installation, repair, or maintenance by any entity other than Apple or an Apple Authorized Service Provider.

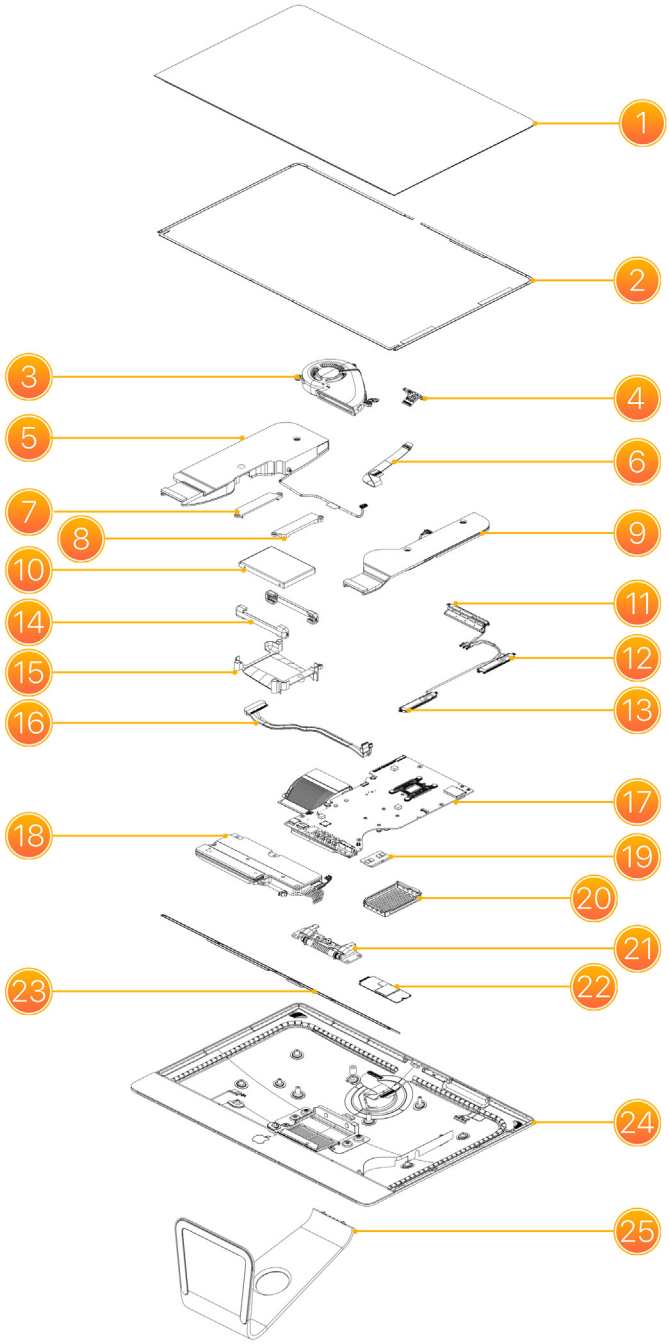
Alerts

Failure to follow alerts may result in data loss, cost, damage to yourself or the computer, or death.

	**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 computer hardware damage.
	Important	Supplemental information for successfully completing procedures; neither a Warning nor a Caution.

Exploded View

This section shows parts and part numbers for iMac (Retina 4K, 21.5-inch, 2019).



1. **Display Assembly**
661-12564

2. **Very High Bond (VHB) Adhesive Strips**
076-00330

3. **Fan**
923-00563

4. **Camera**
923-01618

5. **Speaker Pair (Left)**
923-03080

6. **Camera Cable**
923-03081

7. and 8. **Left and Right Hard Drive Brackets**
076-00333

9. **Speaker Pair (Right)**
923-01617

10. **Hard Drive**
923-01619, 1 TB

11. **Bluetooth Antenna**
923-01619

12. **Middle Wi-Fi Antenna**
923-01620

13. **Lower Wi-Fi Antenna**
923-01621

14. **Hard Drive Bumpers**
661-12547

15. **Hard Drive Cradle**
076-00333

16. **Hard Drive Data and Power Cable**
923-01672
076-00333

17. **Logic Board**
661-12487, 3.6GHz quad-core Intel Core i3, Radeon Pro 555X, HDD, FCC
661-12488, 3.6GHz quad-core Intel Core i3, Radeon Pro 555X, HDD, ETSI
661-12489, 3.6GHz quad-core Intel Core i3, Radeon Pro 555X, HDD, ROW
661-12491, 3.6GHz quad-core Intel Core i3, Radeon Pro 555X, SSD, FCC
661-12492, 3.6GHz quad-core Intel Core i3, Radeon Pro 555X, SSD, ETSI
661-12493, 3.6GHz quad-core Intel Core i3, Radeon Pro 555X, SSD, ROW
661-12495, 3.0GHz 6-core Intel Core i5, Radeon Pro 560X, SSD, FCC
661-12496, 3.0GHz 6-core Intel Core i5, Radeon Pro 560X, SSD, ETSI
661-12497, 3.0GHz 6-core Intel Core i5, Radeon Pro 560X, SSD, ROW

661-12499, 3.0GHz 6-core Intel Core i5, Radeon Pro Vega 20, SSD, FCC
661-12500, 3.0GHz 6-core Intel Core i5, Radeon Pro Vega 20, SSD, ETSI
661-12501, 3.0GHz 6-core Intel Core i5, Radeon Pro Vega 20, SSD, ROW
661-12503, 3.2GHz 6-core Intel Core i7, Radeon Pro 555X, HDD, FCC
661-12504, 3.2GHz 6-core Intel Core i7, Radeon Pro 555X, HDD, ETSI
661-12505, 3.2GHz 6-core Intel Core i7, Radeon Pro 555X, HDD, ROW
661-12507, 3.2GHz 6-core Intel Core i7, Radeon Pro 555X, SDD, FCC
661-12508, 3.2GHz 6-core Intel Core i7, Radeon Pro 555X, SSD, ETSI
661-12509, 3.2GHz 6-core Intel Core i7, Radeon Pro 555X, SSD, ROW
661-12536, 3.2GHz 6-core Intel Core i7, Radeon Pro 560X, SSD, FCC
661-12537, 3.2GHz 6-core Intel Core i7, Radeon Pro 560X, SSD, ETSI
661-12538, 3.2GHz 6-core Intel Core i7, Radeon Pro 560X, SSD, ROW
661-12540, 3.2GHz 6-core Intel Core i7, Radeon Pro Vega 20, SSD, FCC
661-12541, 3.2GHz 6-core Intel Core i7, Radeon Pro Vega 20, SSD, ETSI
661-12542, 3.2GHz 6-core Intel Core i7, Radeon Pro Vega 20, SSD, ROW

18. **Power Supply**
661-08259

19. **Memory**
661-12456, 4 GB
661-12457, 8 GB
661-12458, 16 GB

20. **Memory Cover**
923-03083

21. **Mechanism**
923-00559

22. **Flash Storage**
661-12548, 32 GB
661-12550, 256 GB
661-12551, 512 GB
661-12552, 1 TB

23. **Chin Strap**
923-01678

24. **Rear Housing**
923-00556

25. **Stand**
923-03078

Not Shown
Display Thermal Sensor Cable
Embedded DisplayPort (eDP) Cable

Desktop Tools

Note: This chart includes tools for repairing multiple desktop computer models. You will not need to use all of the tools listed.

923-02298
Access card

iMac Pro (2017)

923-0735
Adjustable torque driver (0.3–1.2 Ncm)

iMac Pro (2017)

923-01322
Antenna tool

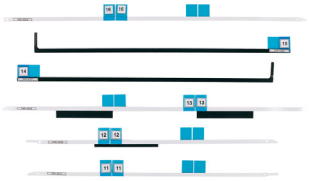
076-1277
Display cleaning starter kit

076-00377
Display extension cable set

iMac Pro (2017)

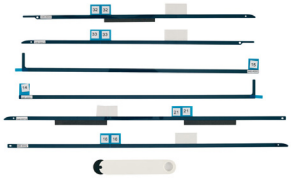
076-1437
Display refill kit

iMac (21.5-inch, 2017)



076-00375
Display refill kit

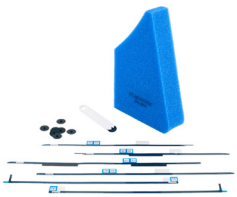
iMac Pro (2017)



076-1417
Display removal wheel kit

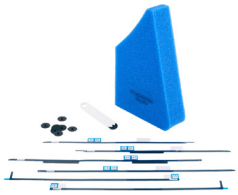
076-00374
Display starter kit

iMac Pro (2017)



076-00330
Display starter kit

iMac (21.5-inch, 2017)



923-0416
Display support stand

922-9468
Electrostatic discharge (ESD) bag

ESD mat

ESD-safe tweezers

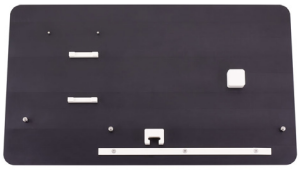
ESD wrist strap with clip or plug

Isopropyl alcohol (IPA) wipes

922-1731
Kapton tape

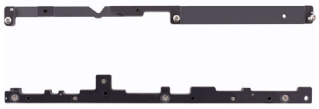
076-00376
Logic board service tray

iMac Pro (2017)



923-02217
Logic board stiffeners

iMac Pro (2017)



922-5065
Nylon probe tool (black stick)

Painters tape

Phillips #00 screwdriver

Phillips PH2 bit

923-0189
Power supply cover

Ruler

Safety glasses

922-8252
Suction cups

922-7144
Thermal compound syringe

076-1445
Thermal pad kit

iMac (21.5-inch, 2017)

Torx T4 screwdriver

Torx T5 screwdriver

Torx T6 screwdriver

923-00304
Torx T6 security bit

Torx T8 screwdriver

923-0734
Torx T8 security bit

923-0740
Torx T10 bit

Torx T10 screwdriver

Torx T25 screwdriver

923-0030
Trilobe driver, large #1

923-01806
Wireless card support tool

iMac (21.5-inch, 2017)

923-02218
Wireless card support tool

iMac Pro (2017)

923-03086
Wireless card support tool

iMac (Retina 4K, 21.5-inch, 2019)

923-03085
Wireless card support tool

iMac (Retina 5K, 27-inch, 2019)

Screws

923-0323
T10

Hard drive bracket (1)

923-00829
T10

Hard drive bracket (2)

923-00830
T10

Hard drive bracket (1)

923-0327
T10

Heat sink, upper (2)

923-0331
T8

Logic board (4)
Hard drive cradle (1)
Power supply (2)

923-0333
T10

Fan (3)
Right speaker (2)
Left speaker (2)

923-0334
T10

Mechanism (4)

923-0335
Phillips #00

Chin strap - short, center (1)

923-0336
T8

Heat sink, lower (2)
Flash storage (1)

923-0338
Phillips #00

Chin strap - long (4)

923-0339
T5

Camera (2)

923-00529
T8

Stand (7)

923-00831
T4

Bluetooth antenna (2)
Middle Wi-Fi antenna (2)
Lower Wi-Fi antenna (2)

923-02294
T5

Antenna cowling (2)

923-03082
T5

Memory cover (2)

Display Cleaning

1. Clean the front of the display with a clean, damp, lint-free cloth.

   Note: Do not use IPA wipes to clean the display.

2. Polish the display with a microfiber polishing cloth.

Electrical Safety

Danger

The power supply remains powered when the computer is plugged in whether or not the computer has been turned on. Use extreme caution when the display is removed. Avoid touching the logic board or power supply while the computer is plugged into an electrical outlet.

Take the following additional precautions:

- Never remove or install any parts while the computer is plugged into an electrical outlet.
- Always wait at least 2 minutes after unplugging the computer to allow the power supply and logic board time to discharge. You may then remove the display.
- Do not touch the logic board or power supply while the computer is plugged in.
- Do not touch the logic board or power supply before the 2-minute discharge wait time has passed.

Follow these steps before working on a computer with exposed, potentially energized parts:

- Remove all metal accessories, including rings and glasses, from your body, as they increase your risk of electric shock.
- Do not wear a cell phone or other signaling device.
- If the computer needs to be plugged in for indicator light checks or similar troubleshooting, do not wear an ESD wrist strap. Wearing ESD grounding systems while the computer is plugged in increases your risk of electric shock.
- Remain alert, focused on the work you are performing, and aware of the grounded objects near your body.
- Use tools as instructed for connecting or disconnecting cables to keep fingers away from potentially energized parts.

Broken Display

Warning

If the display breaks and glass gets in your eye, perform the following steps:

- Immediately seek medical attention.
- Do not rub your eye.
- Do not wash your eye. Washing your eye can move the shard of glass and cause more damage.
- Keep your eye closed or loosely patch it to keep it still.

Handling a Broken Display

- The display glass is untempered and will break into pieces if mishandled. Removing the display requires special tools.
- Use safety glasses when removing a broken display.

Tools

- Display cleaning starter kit
- Safety glasses
- Packing tape

1. Put on safety glasses and cut-resistant gloves.

2. If the display is broken and is still attached to the rear housing, secure the broken glass with packing tape and refer to the Display section.

3. Lay the display on a smooth, clean work surface.

4. Thoroughly cover the broken display with packing tape.

First Steps

Only Apple-certified technicians should repair Apple computers.

Always perform the following steps before starting a repair:

- Turn off the computer.
- Unplug the power cord from the electrical outlet.
- Disconnect all cables.
- Put on an ESD wrist strap and attach it to a properly grounded ESD mat.

Display

Tools

- Service wedge
- ESD bag
- Black stick
- Display removal tool and replacement wheels
- Safety glasses
- IPA wipes
- Silicone display roller
- Painters tape
- Clean, damp, lint-free cloth

The display is attached to the rear housing with adhesive strips. Each VHB strip has one foam layer surrounded by two adhesive layers. To remove the display, you must use the display removal tool to cut the VHB strips. When you cut the VHB strips, you are cutting mostly through the foam layer. The display removal tool has replaceable wheels that you can use 5 to 10 times. If a wheel is nicked, it must be replaced.

Steps for Removal

1. Place the service wedge on the stand with the stand hole covered. Rotate the computer so the display is facing you.

Caution

Keep the service wedge in place for all procedures.

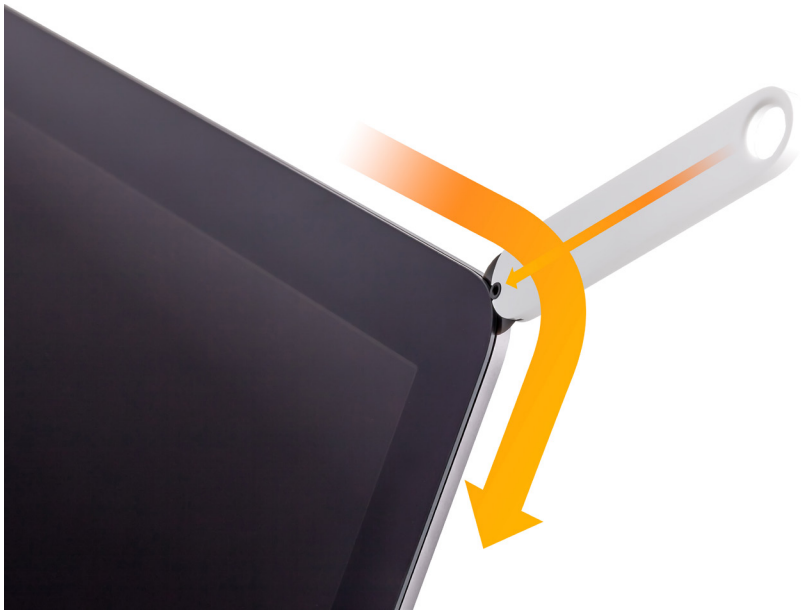
2. Insert the display removal tool at a 90-degree angle in the top left corner between the display and rear housing. Roll the tool across the top of the computer, avoiding the 3-inch area surrounding the camera.

Caution

Failure to lift the tool out of the computer to avoid the camera could damage the display and the camera.

3. Continue to roll the tool around the top right corner and down the right side of the computer.

Note: Ensure that the tool makes steady contact with the display and rear housing at the top corners.

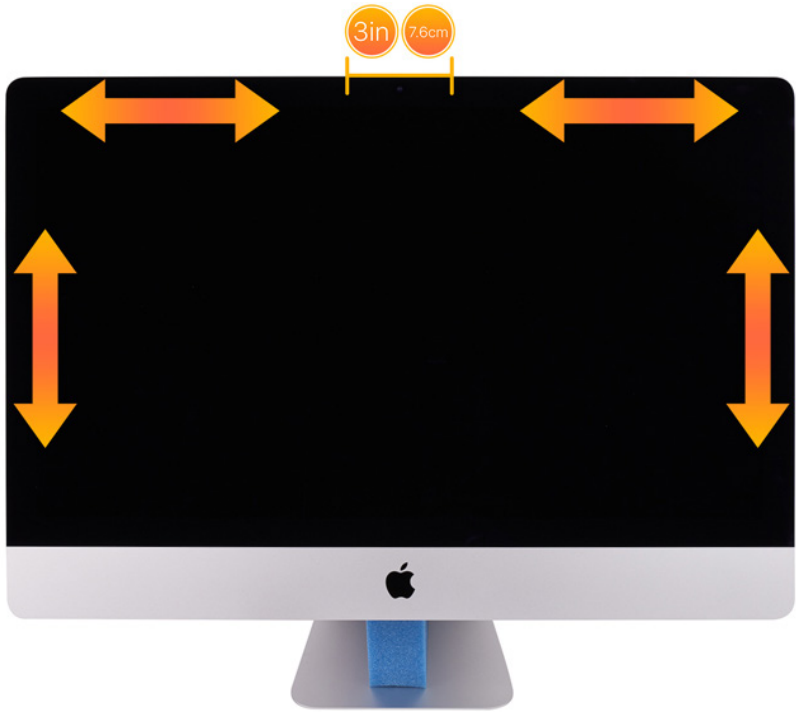


4. Roll the tool around the top left corner and down the left side of the computer.

5. Roll the tool back and forth along the top and sides of the computer until the wheel moves with minimal resistance.

Caution

Use the display removal tool only along the top and sides of the computer.



6. Insert the flat end of a black stick up to its notch between the display and rear housing. Slide the black stick along the edge to cut any remaining adhesive.

Caution

Do not twist, pry, or insert the black stick past its notch. Forcing the black stick between the display and the rear housing may fracture the display.

Use caution with the black stick along the antenna sections.

7. Separate the display from the top of the rear housing. If there is resistance, repeat steps 2 through 6.

8. Tilt open the display just enough for your hand to reach the cables connecting the display to the logic board.

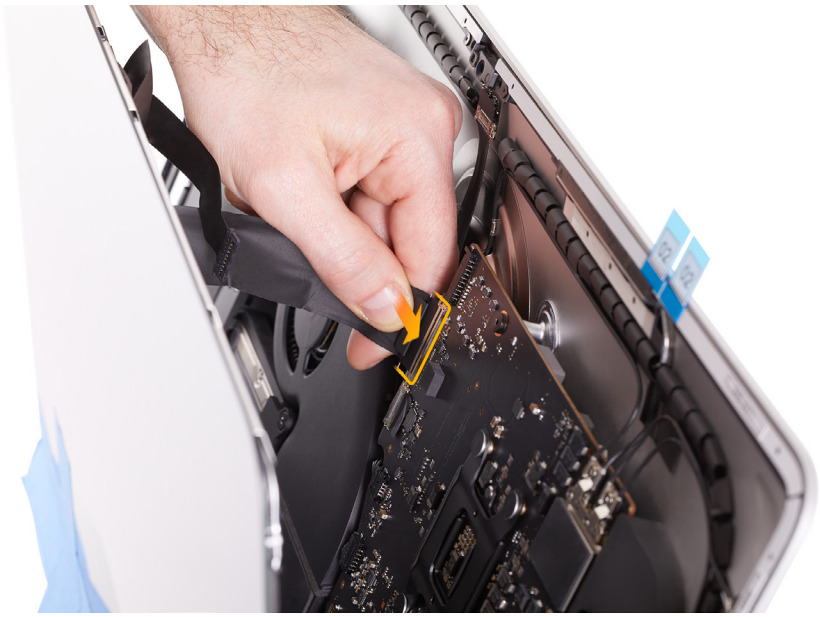
Caution

Do not attempt to remove the display. Its bottom edge is still attached with display adhesive. Do not stress the display cables and connectors on the logic board when tilting the display open. If the connectors on the logic board are damaged, you will need to replace the logic board.

9. Disconnect the embedded DisplayPort (eDP) cable and the display backlight power cable.

Caution

The display backlight power cable is part of the display and is not available as a separate part.



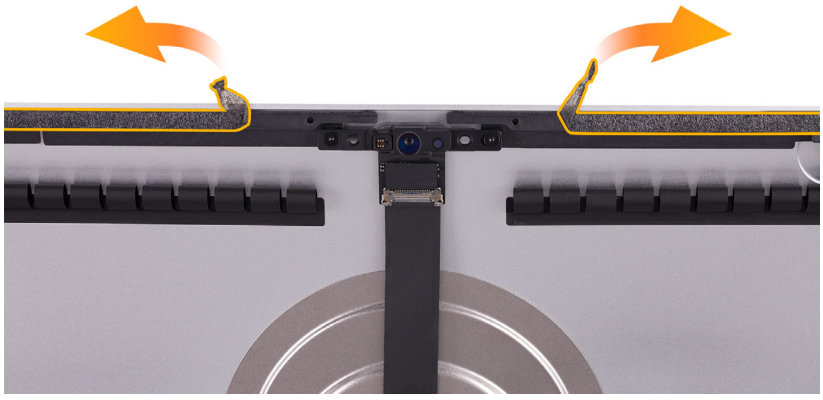
10. Use your hand to support the display and tilt it further toward you.

11. Locate the display adhesive tabs at the bottom corners of the display and pull each toward the center to release the display from the rear housing.

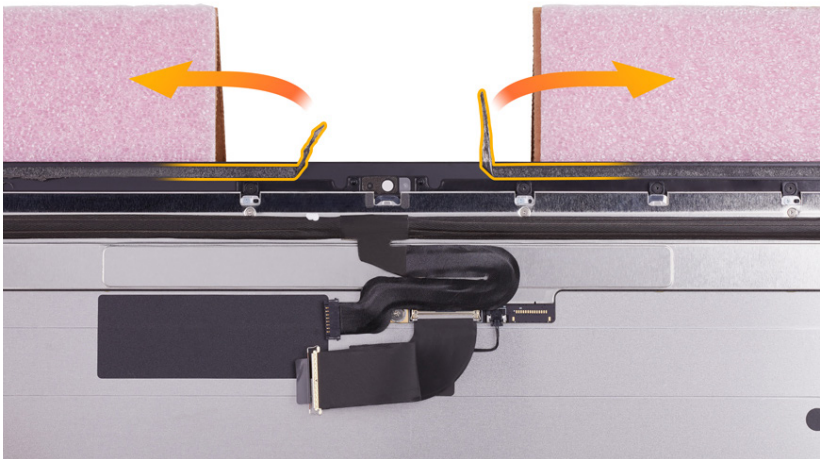
    Note: If the display sticks to the rear housing, use a black stick to break the display adhesive bond.

12. Pull the display from the rear housing and set it face down on a soft cloth on the display support stand.

13. Use your fingers and the flat end of a black stick to peel residual adhesive outward from the top center of the rear housing.



14. Use your fingers and the flat end of a black stick to peel residual adhesive outward from the top center of the display.



Caution

To prevent damage to the Mylar protective film on the display, do not peel residual adhesive inward or downward from the top corners of the display.

15. Use your fingers and the flat end of a black stick to peel residual adhesive upward from the bottom sides of the rear housing.

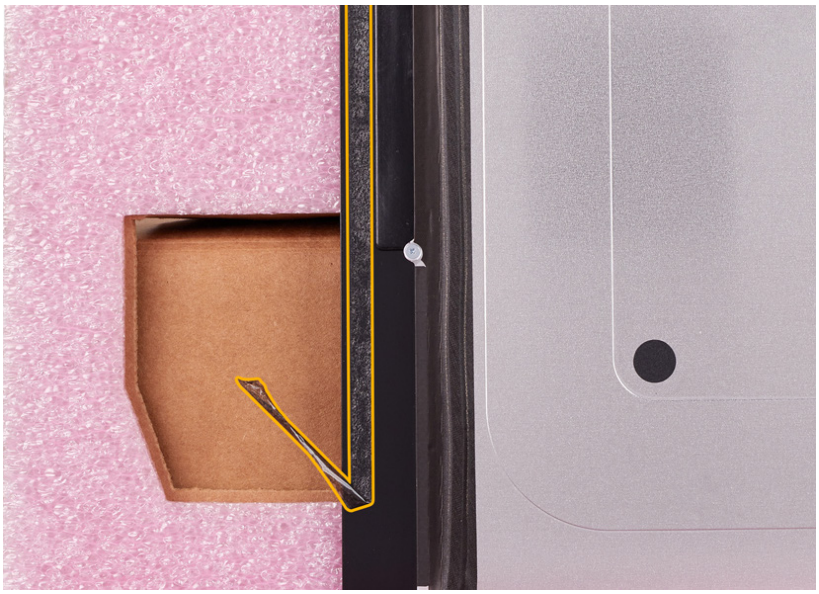
Caution

Do not use IPA wipes on the display or to remove anything other than residual adhesive.

16. Use your fingers and the flat end of a black stick to peel residual adhesive upward from the bottom sides of the display.

Caution

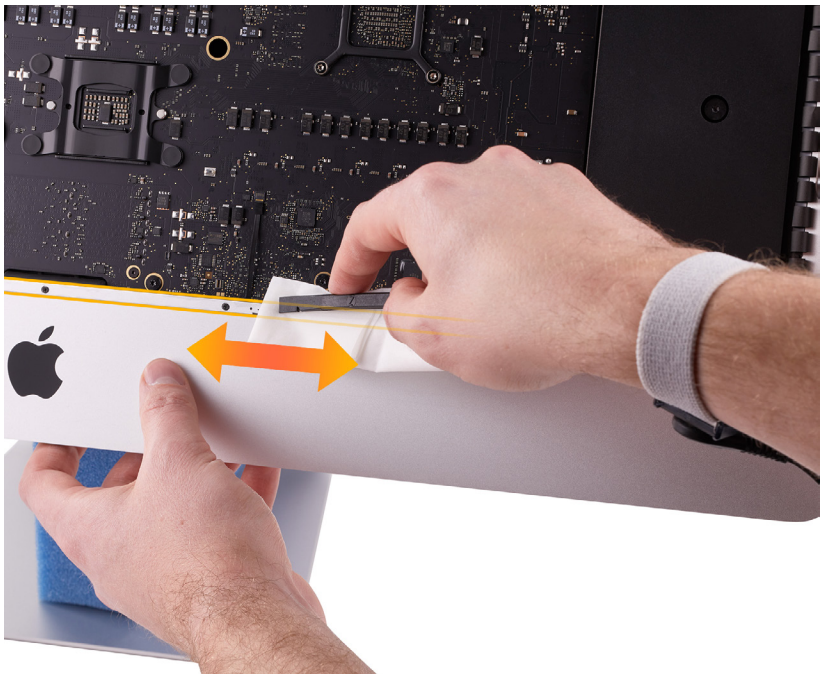
If the Mylar film is peeling or wrinkled, press it back onto the panel with your finger. Ensure that it is smooth and undamaged. If the Mylar is pulled away from the display, you may need to replace the display.



17. Use an IPA wipe to remove any remaining adhesive from the rear housing and display edges. Allow the surfaces to dry for 1 minute.

    Caution

    Residual adhesive can be anywhere along the top, sides, and chin of the rear housing.

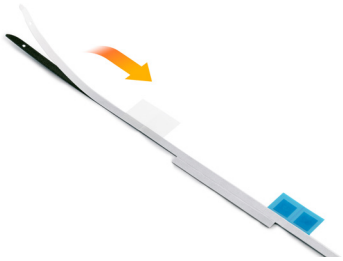


18. Recheck the display and rear housing for any residual adhesive.

Steps for Reassembly

1. Lay out the adhesive strips and inspect them for damage, wrinkles, or exposed sections. Damage can cause cosmetic gaps and leakage and weaken the bond.

Note: The adhesive strips have a foam layer with a removable liner on the underside and a clear plastic liner on the top side.



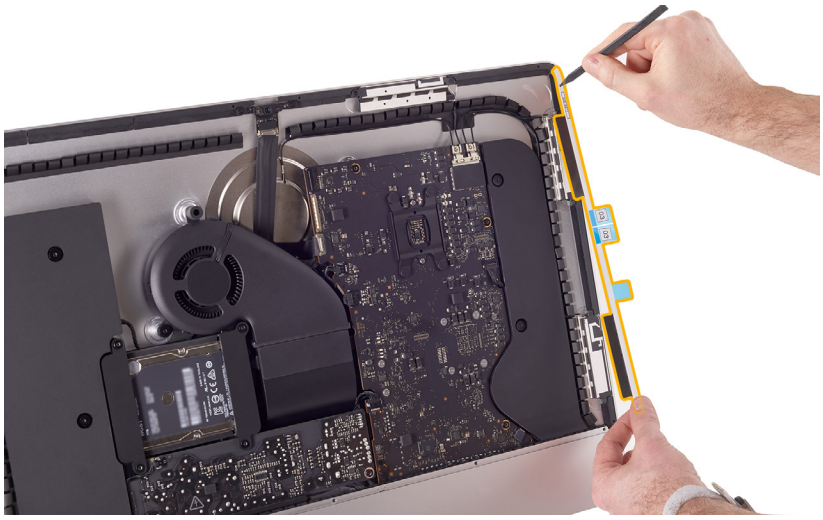
Important

Use the eight alignment holes on the top and sides of the rear housing to align the new display adhesive strips.

2. Use the pull tab on the back of the display adhesive strip to remove the top portion of the paper liner. Leave the remaining paper liner on the bottom portion of the strip.

3. Use the pointed end of a black stick to align the display adhesive strip on one side of the rear housing.

   Note: The paper liner side faces the rear housing.



4. As you position the display adhesive, use the pull tab to peel the remaining paper liner from the underside of the display adhesive strip.

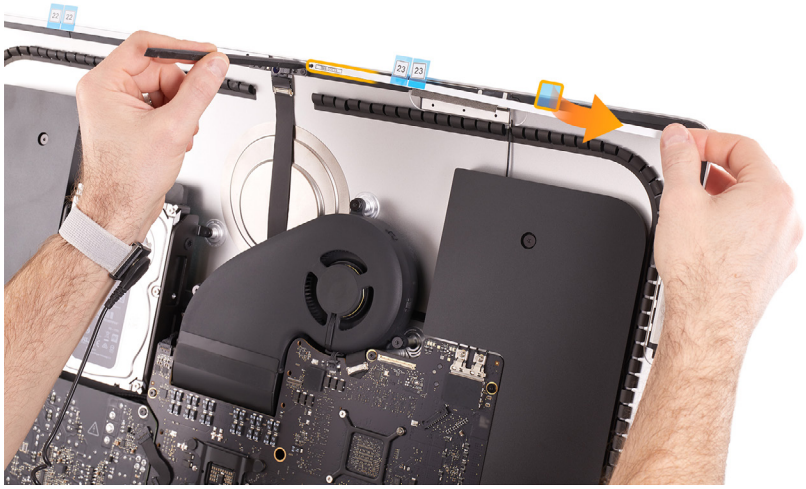
5. Use your finger to press the display adhesive strip into place on the rear housing.

   Note: If the display adhesive strip does not line up correctly, remove it and start again.

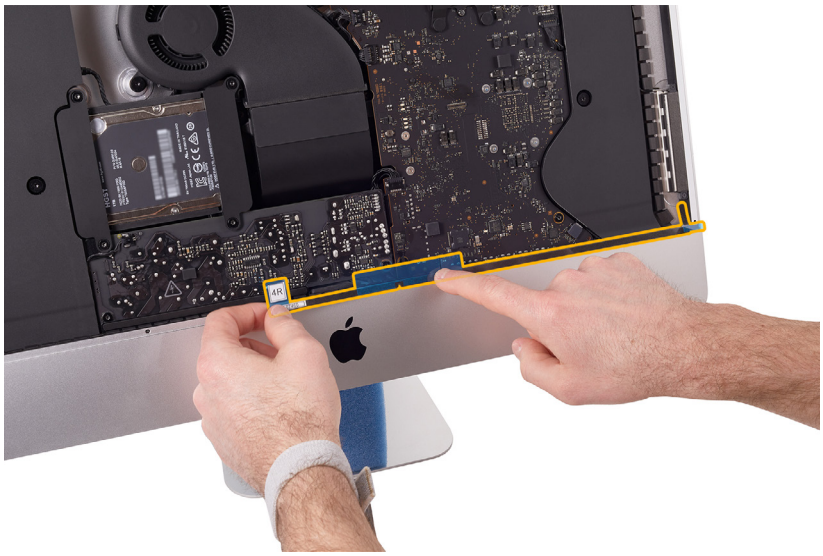
Important

Do not remove the clear plastic liners from the top layer of the strip at this time.

6. Repeat steps 2 through 5 along the top inside edge and other side of the rear housing.



7. Use the two strips of display adhesive along the bottom edge. There are no guide holes on the display adhesive strips or along the bottom of the rear housing, so align the strips by hand.



Important

If a display adhesive strip does not line up correctly, remove it, clean the rear housing, and start again. Ensure there are no wrinkles or exposed sections on the strip.

8. Place the display on the chin of the rear housing. Align the panel and check that it is centered and seated.

9. Hold the display removal tool against the sides of the display to check the alignment. Adjust the display placement if necessary.

10. Anchor the display with a strip of painters tape. Place the tape horizontally where the bottom of the display meets the chin.

11. Step back and check the alignment of the display. If the display is not flush with the rear housing, adjust the display and recheck alignment.

Incorrect alignment

Correct alignment

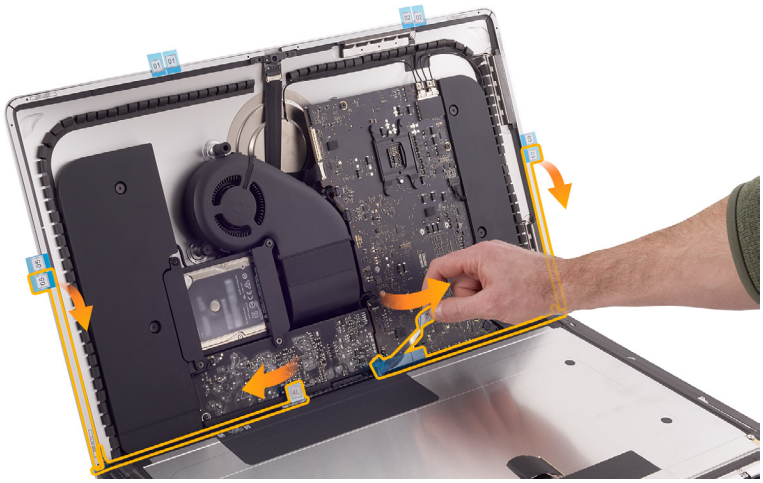
12. Anchor the display further with a vertical strip of painters tape on both ends of the horizontal strip.

13. Use one hand to tilt the display while steadying it with the other hand.

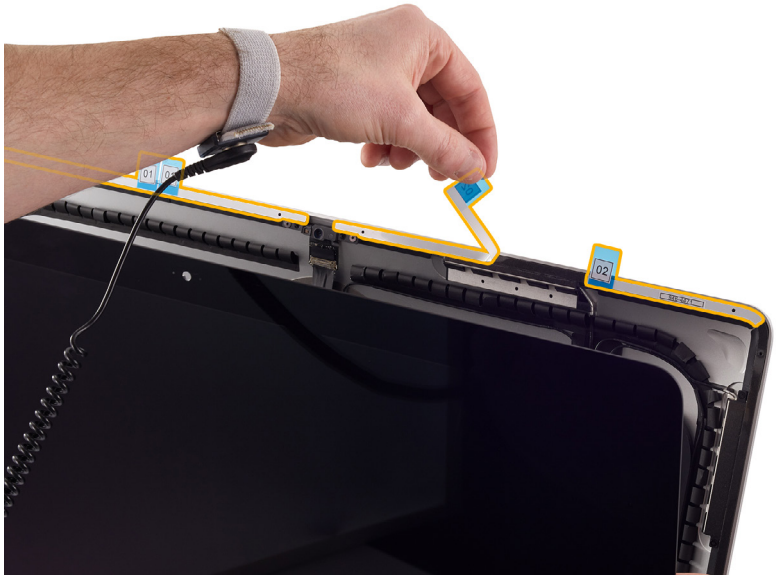
14. While continuing to steady the display with one hand, use the other hand to pull the clear release liners from the adhesive strips at the bottom of the display.

Caution

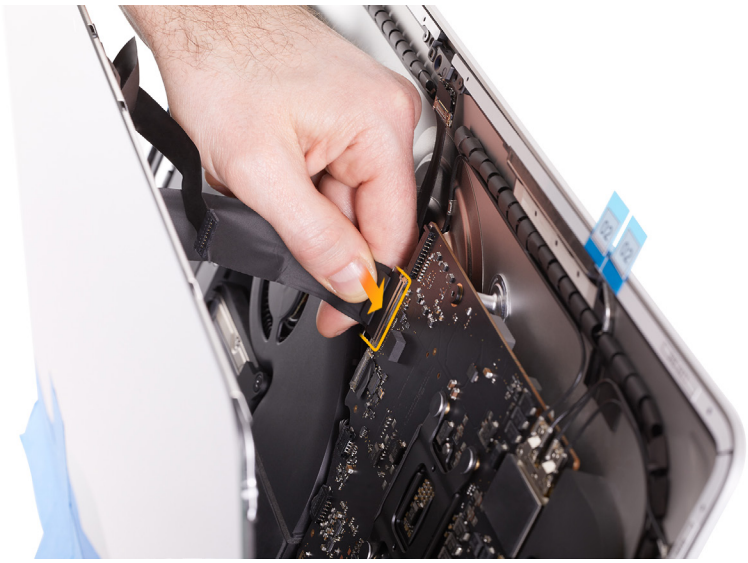
Slowly pull the release liners so they do not tear.



15. Remove the remaining release liners from the top and sides of the display.



16. Tilt up the display, leaving enough room to connect the eDP cable and the display backlight power cable to the logic board. Ensure the connectors are firmly seated.



Caution

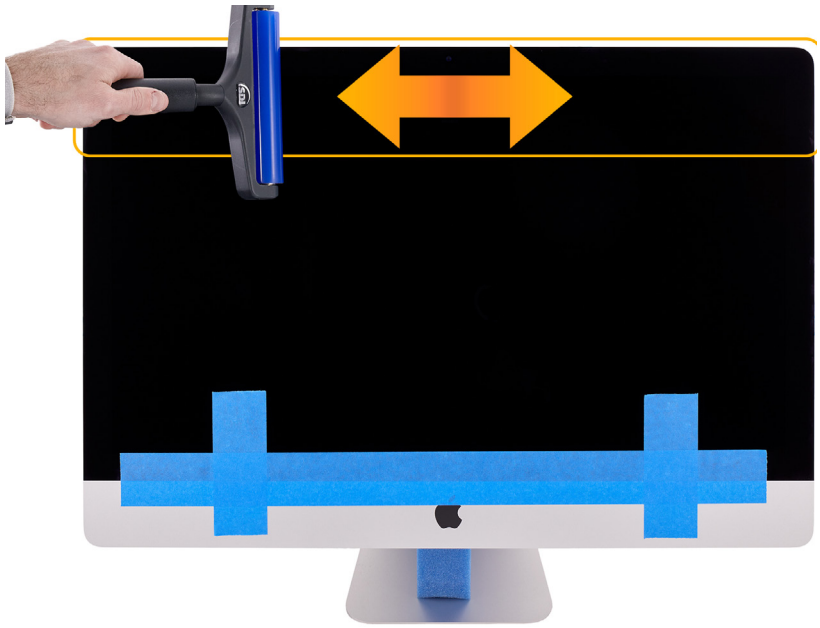
Do not stress the display cables and connectors on the logic board when tilting the display open. If the connectors are damaged, you will need to replace the logic board.

The display backlight power cable is part of the display assembly and is not available as a separate part.

17. After you've removed all the release liners, lean the display against the rear housing.

18. Use the silicone display roller to adhere the display adhesive strips to the glass. To prevent image quality issues, only roll upward.

19. Roll the silicone display roller along the top in a horizontal back-and-forth motion.



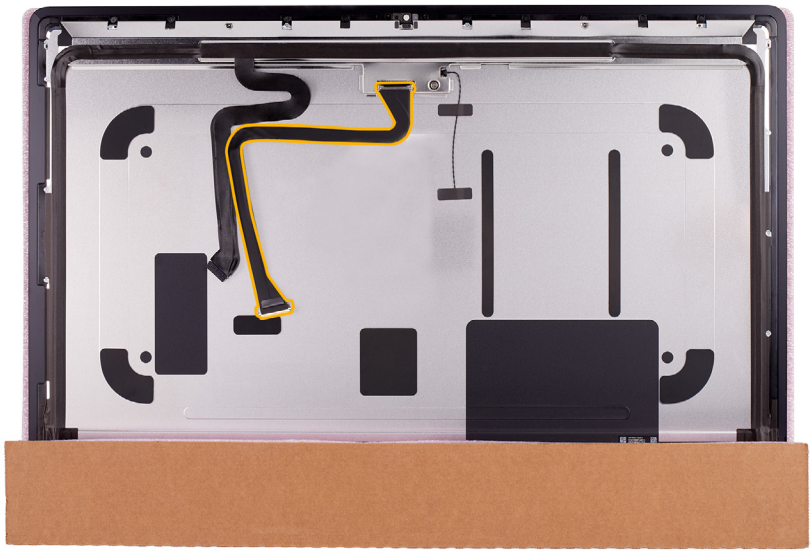
20. Wipe the front of the display with a clean, damp, lint-free cloth.

    Note: Do not use IPA wipes to clean the display. Only use IPA wipes to remove any residual display adhesive.

Embedded DisplayPort (eDP) Cable

Remove the following part before you begin:

- Display



Tools

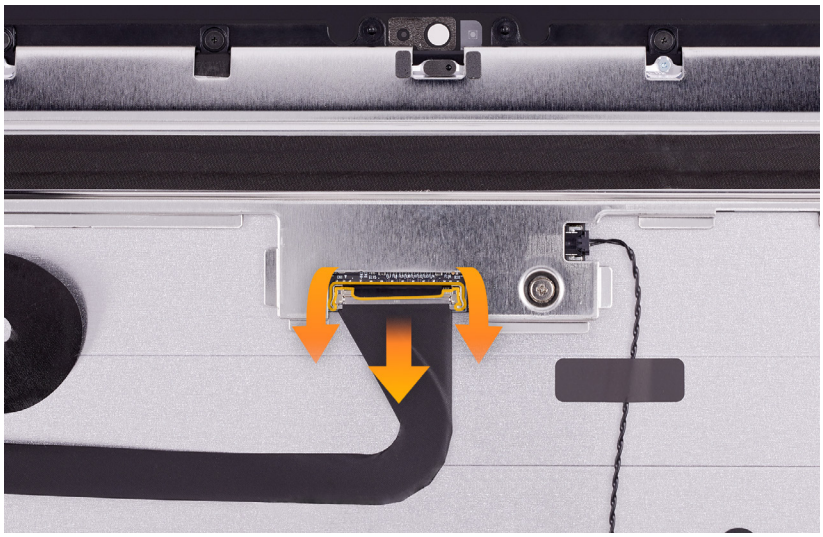
- ESD wrist strap and mat
- Black stick

Steps for Removal

1. Remove any tape securing the eDP cable to the display.

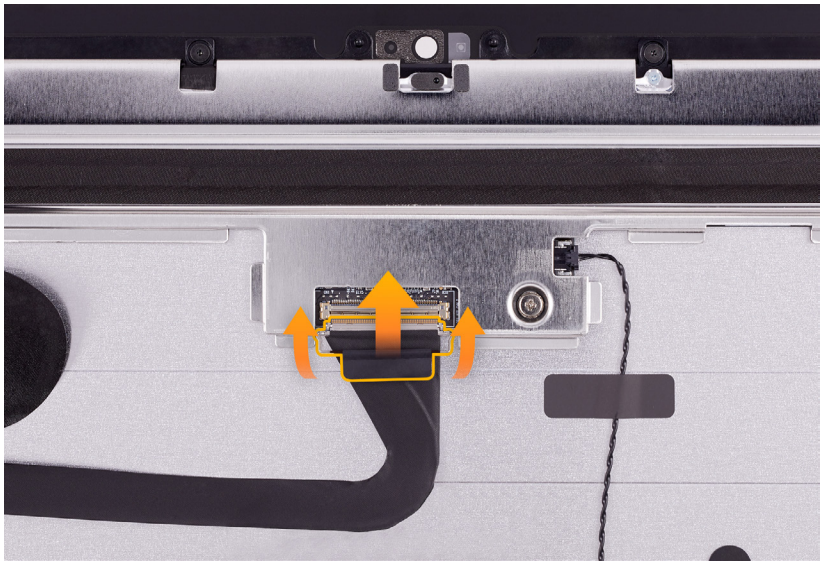
2. Use a black stick to flip the locking bar on the eDP cable.

3. Gently pull the eDP cable out of the connector.



Steps for Reassembly

1. Reinsert the eDP cable into the connector on the display. Flip the locking bar and press the pull tab to secure the cable.



2. Replace any tape that you removed from the eDP cable.

   Note: Press the area of the cable with the adhesive to secure the cable to the display.

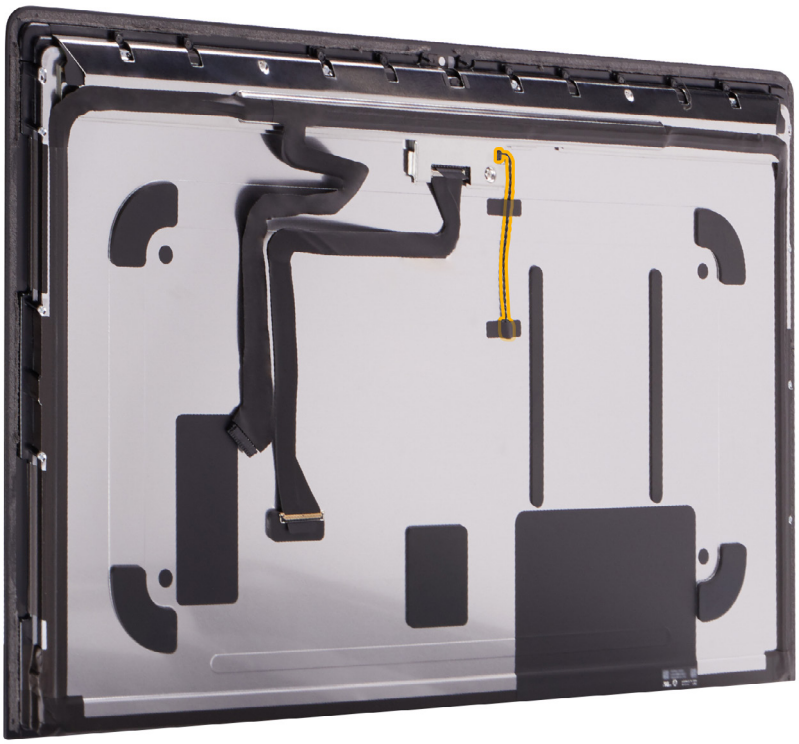
Reinstall the following part to complete reassembly:

- Display

Display Thermal Sensor Cable

Remove the following part before you begin:

- Display

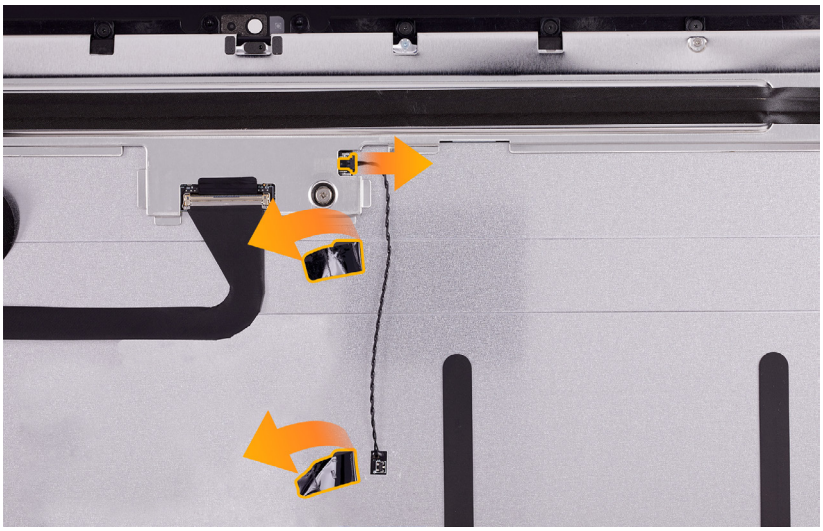


Tools

- ESD wrist strap and mat
- Black stick

Steps for Removal

1. Remove any tape that secures the display thermal sensor cable to the display.



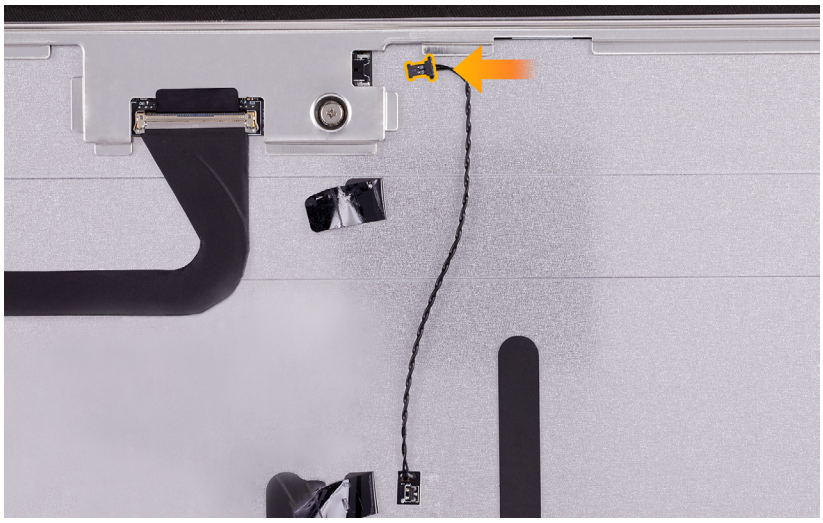
2. Use the pointed end of a black stick to gently push the display thermal sensor cable out of its connector.

3. Use a black stick to peel off the square sensor board from the display.

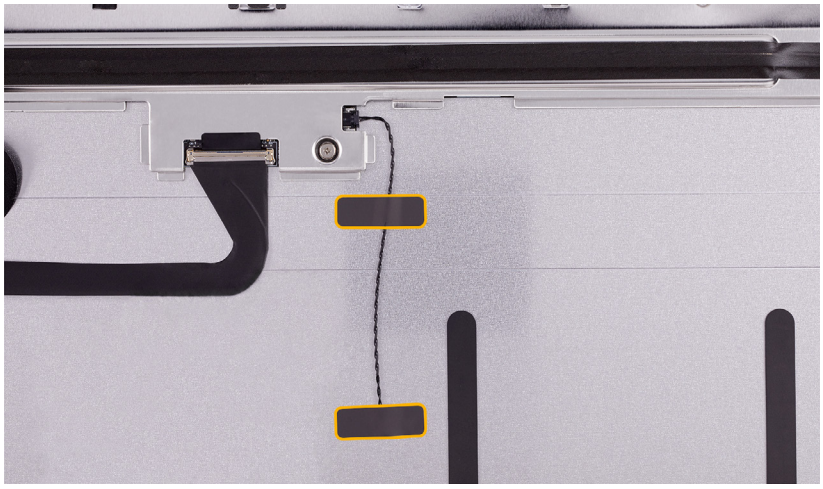
Steps for Reassembly

1. Peel the adhesive liner from the replacement thermal sensor board and adhere the board to the back of the display.

2. Reinsert the thermal sensor cable into the connector on the display.



3. Secure the thermal sensor board and cable with tape.



Reinstall the following part to complete reassembly:

- Display

Camera

Remove the following part before you begin:

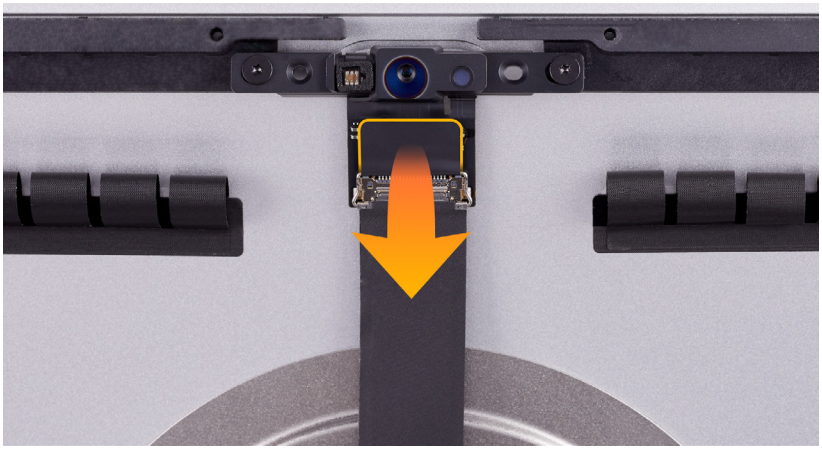
- Display

Tools

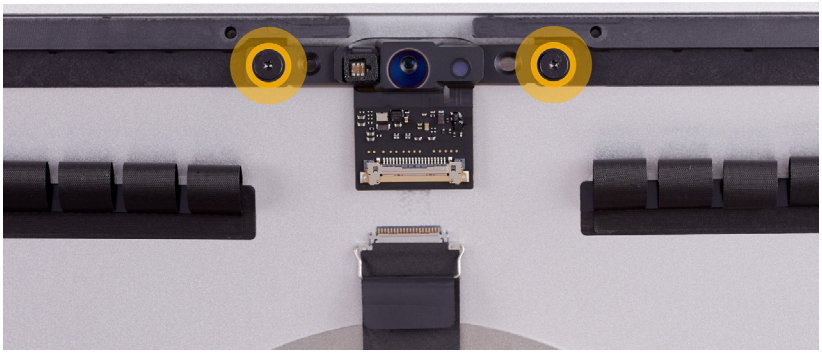
- ESD wrist strap and mat
- Torx T5 screwdriver
- Black stick

Steps for Removal

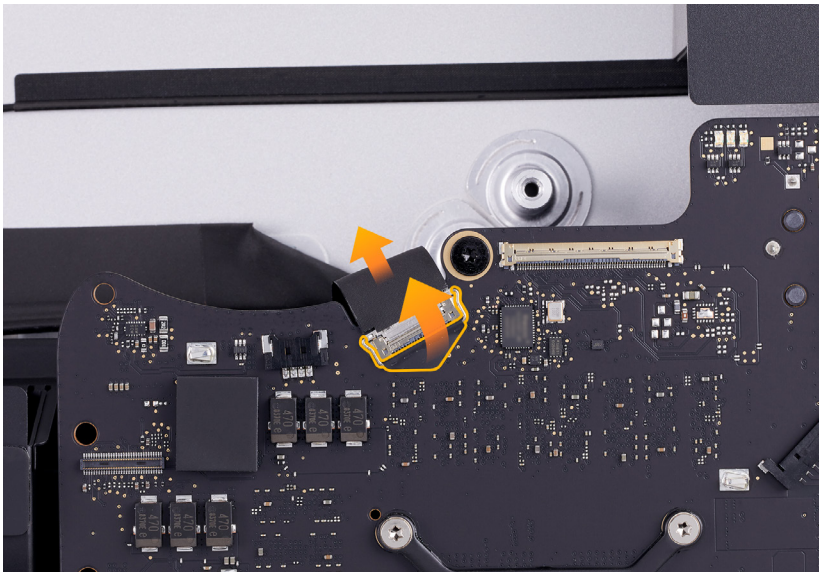
1. Use a black stick to flip the locking bar on the camera cable. Pull the camera cable straight out from the connector on the camera board.



2. Remove the two T5 screws from the camera board.



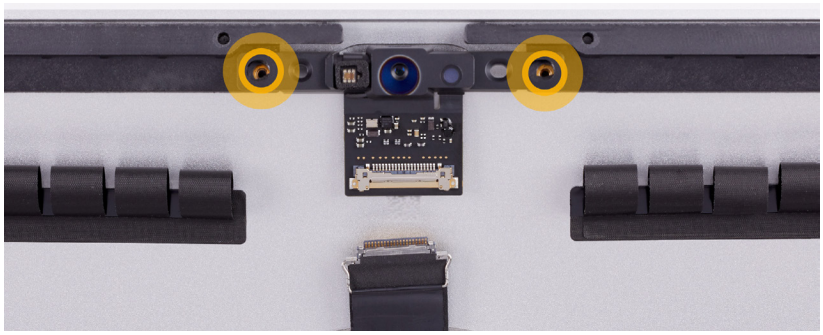
3. If the camera cable needs to be replaced, use a black stick to flip the locking bar on the camera cable. Pull the camera cable straight out from the connector on the logic board.



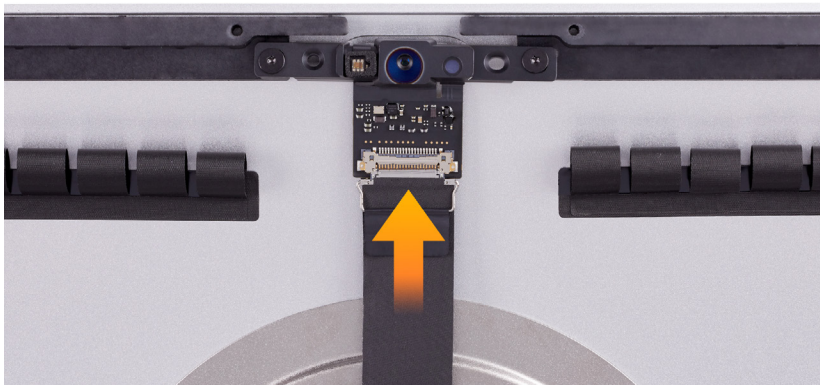
Steps for Reassembly

1. Reinstall the two T5 screws in the camera board.

   Note: If installing a replacement camera, remove the protective film covering the lens.



2. Reinsert the camera cable in the camera board connector. Flip the locking bar to secure the cable.



3. If the camera cable was replaced, connect the camera cable to the logic board connector. Flip the locking bar to secure the cable.

Reinstall the following part to complete reassembly:

- Display

Fan

Remove the following part before you begin:

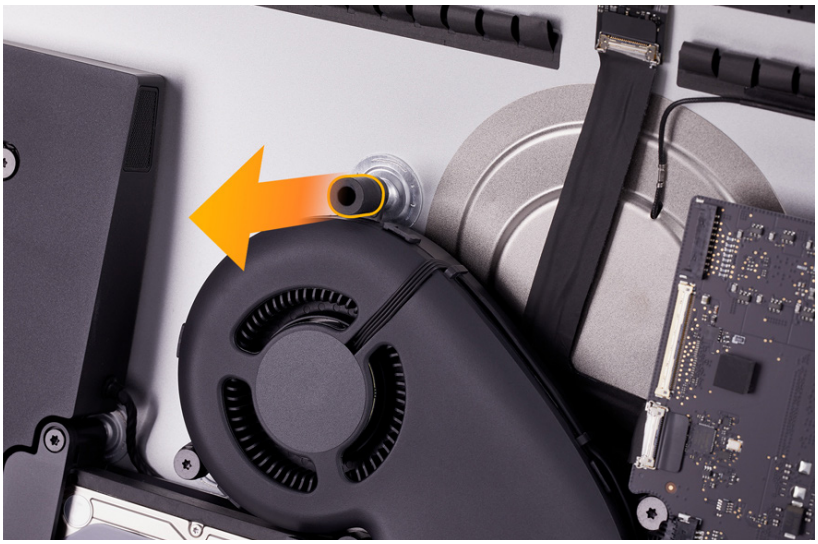
- Display

Tools

- ESD wrist strap and mat
- Torx T10 screwdriver
- Black stick

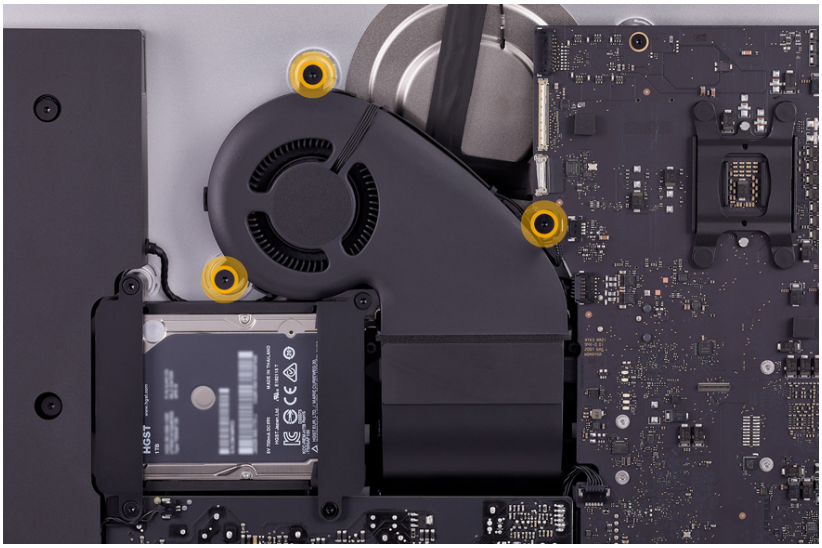
Steps for Removal

1. Remove the spacer from the fan screw and save it for reuse.



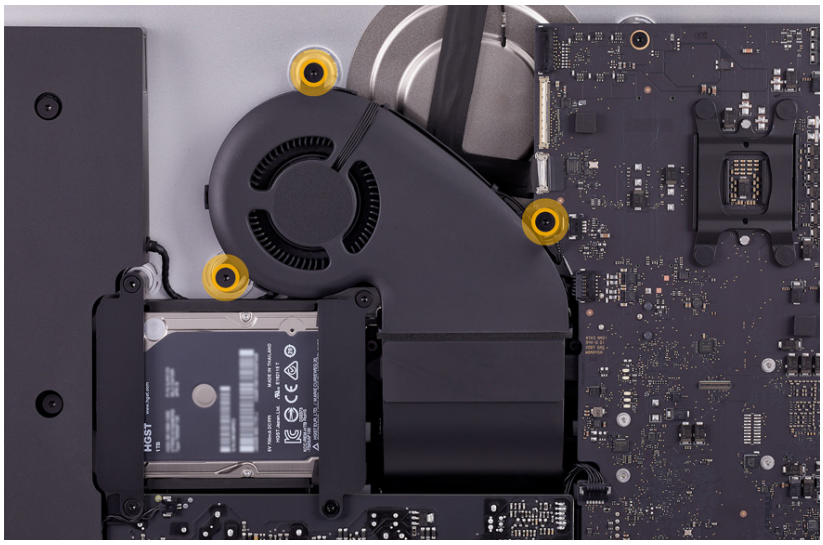
2. Use a black stick to disconnect the fan cable from the logic board.

3. Remove the three T10 screws from the fan.



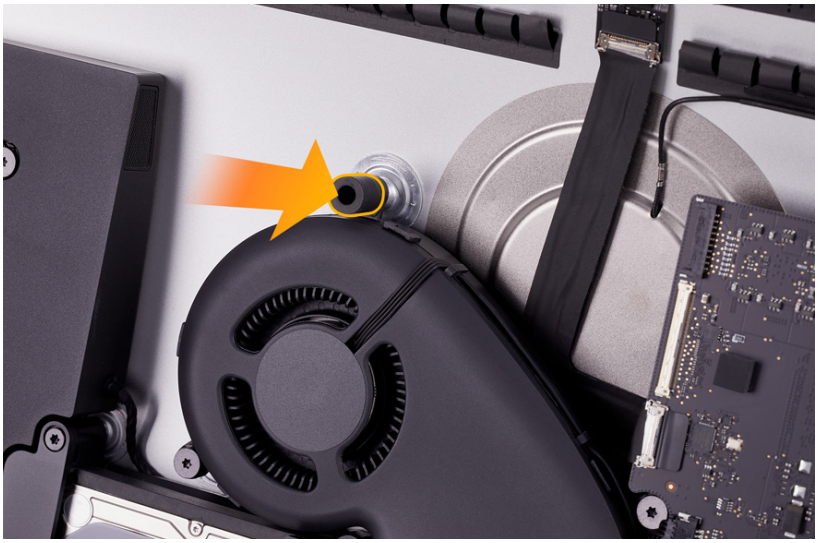
Steps for Reassembly

1. Reinstall the three T10 screws in the fan.



2. Reconnect the fan cable to the logic board. Ensure the cable is routed as shown.

3. Reinstall the spacer on the top screw.



Reinstall the following part to complete reassembly:

- Display

Hard Drive

Remove the following part before you begin:

- Display

Tools

- ESD wrist strap and mat
- Torx T10 screwdriver

Steps for Removal

1. Loosen the two T10 left speaker screws and move the speaker to the left for easier access to the hard drive data and power cable connector.

2. Remove the four T10 screws from the hard drive brackets.

3. Remove the hard drive brackets. Do not remove the bumpers.

4. Disconnect the hard drive power and data cable from the hard drive.

Steps for Reassembly

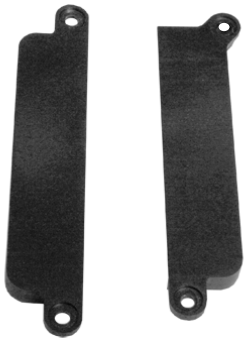
1. Plug the hard drive power and hard drive data cable back into the hard drive.

2. Position the hard drive brackets as shown. The brackets will only install one way.

Caution

When reinstalling the brackets, ensure that none of the hard drive bumpers are pinched between the hard drive and the brackets.

Left Bracket **Right Bracket**



3. Reinstall the four T10 screws into the hard drive brackets.

   Note: If installing a replacement camera, remove the protective film covering the lens.

4. Move left speaker back into place and tighten the two speaker screws.

Reinstall the following part to complete reassembly:

- Display

Chin Strap

Remove the following part before you begin:

- Display

Important

You must remove the chin strap in order to repair any part that sits below the chin.

The chin strap is located in the bottom edge of the rear housing behind the chin, as shown.

Tools

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

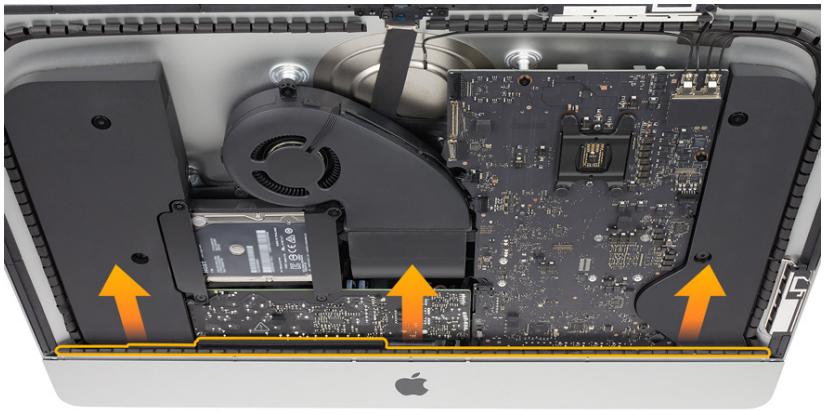
Steps for Removal

1. Remove the five Phillips #00 screws from the chin strap.

2. Pull up the chin strap from behind the chin and save it for reuse.

Important

Do not bend the chin strap.

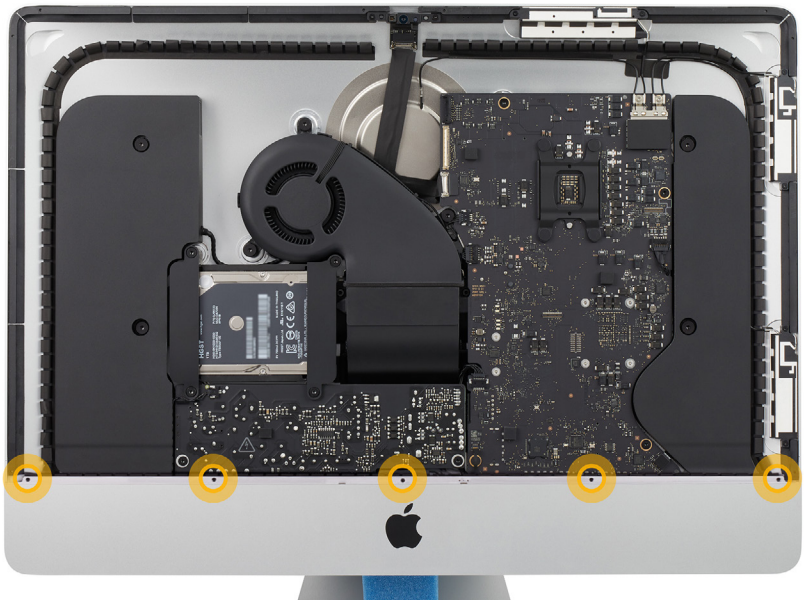


Steps for Reassembly

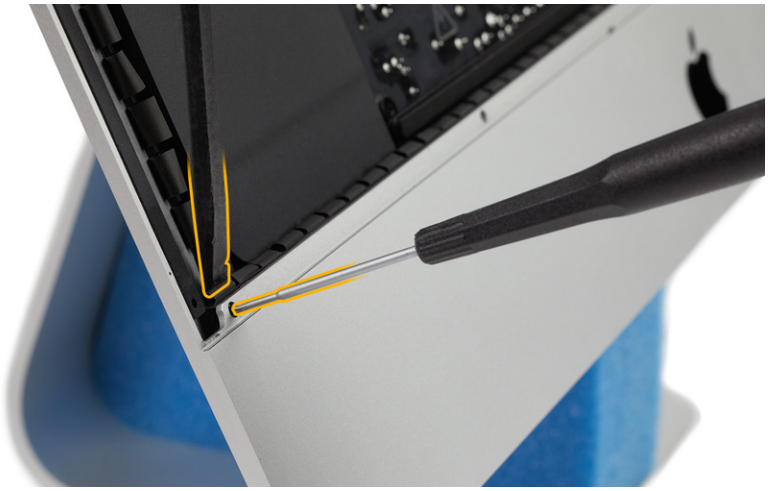
1. Insert the chin strap with the screw holes facing outward and the Mylar ridge facing left.

2. Reinstall the five screws in the chin strap.

   Note: One of the five chin strap screws is shorter than the other screws. Install the shortest chin strap screw in the center hole.



Note: For easier installation of the small chin strap screws, use a black stick to press the chin strap against the front frame if needed. Do not press on the chin. Always press on the back of the chin strap to bring it toward the screw.



Reinstall the following part to complete reassembly:

- Display

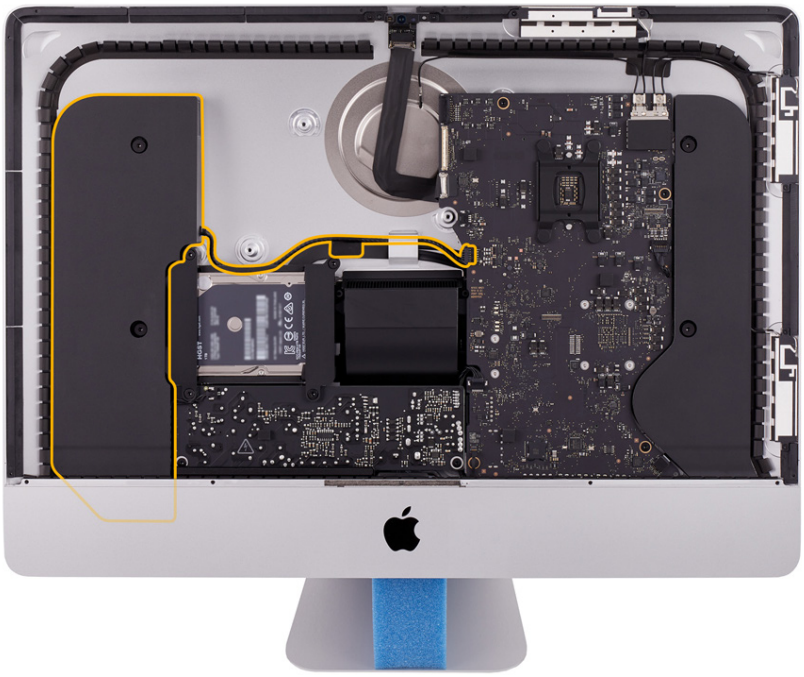
Left Speaker

Remove the following parts before you begin:

- Display
- Fan

Important

You must replace the speakers in pairs. If you replace the left speaker, then you must also replace the right speaker. For right speaker removal and reassembly instructions, refer to the Right Speaker section.



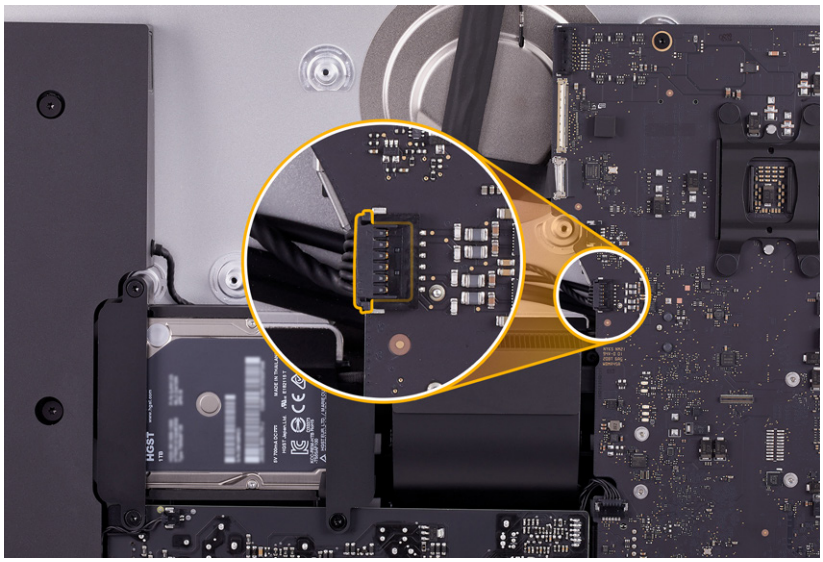
Tools

- ESD wrist strap and mat
- Torx T8 screwdriver
- Black stick
- Phillips #00 screwdriver

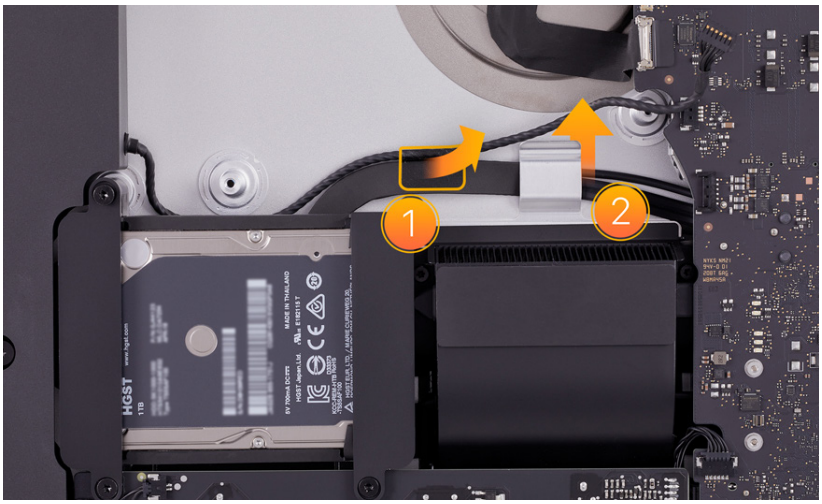
Steps for Removal

1. Loosen the two T8 screws from the hard drive brackets.

2. Disconnect the speaker cable from the logic board.



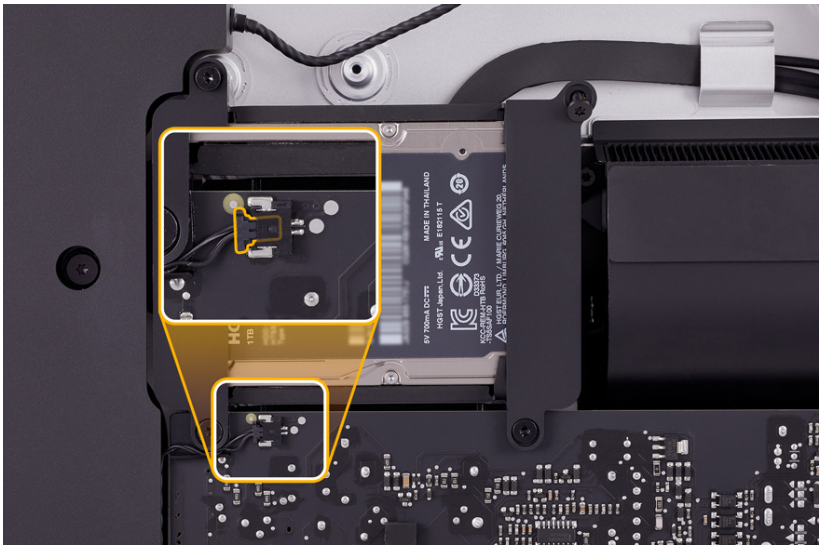
3. Remove the sticker that adheres the speaker cable to the hard drive data and power cable; then remove it from the clip.



4. Use a black stick to disconnect the power button cable from the power supply.

Caution

The power button cable is part of the rear housing. If the cable breaks, the rear housing will need to be replaced.



5. Remove the power button cable from the groove in the speaker.

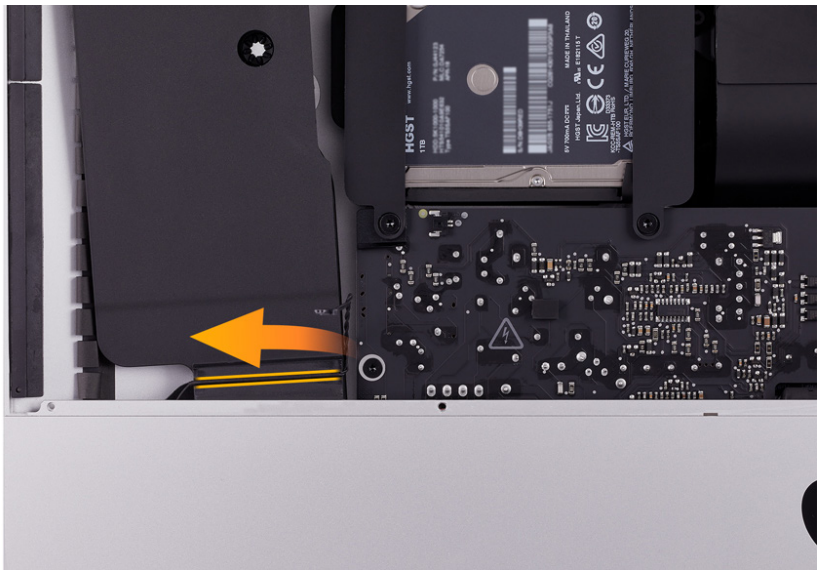
6. Remove the two T10 screws from the left speaker.

   Note: The screws tighten into rubber grommets and may remain in the screw holes when the speaker is removed.

7. Pull the left speaker up just enough to see the power button cable. Remove the power button cable from the channel.

Caution

Failure to remove the power button cable from its channel can result in a damaged cable.

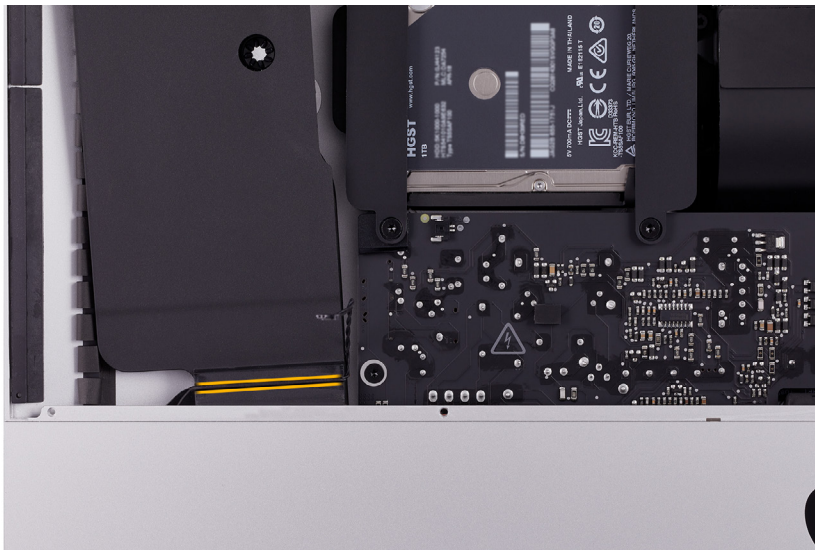


8. Remove the left speaker from the rear housing.

Steps for Reassembly

1. Partially reinsert the left speaker in the rear housing chin.

2. Reinstall the power button cable into its channel on the bottom of the left speaker.



3. Continue to reroute the power button cable along the side of the left speaker.

Caution

If the power button cable is not securely routed in the vertical channel, the cable may come loose and may be damaged by the power supply. A damaged power button cable requires rear housing replacement.

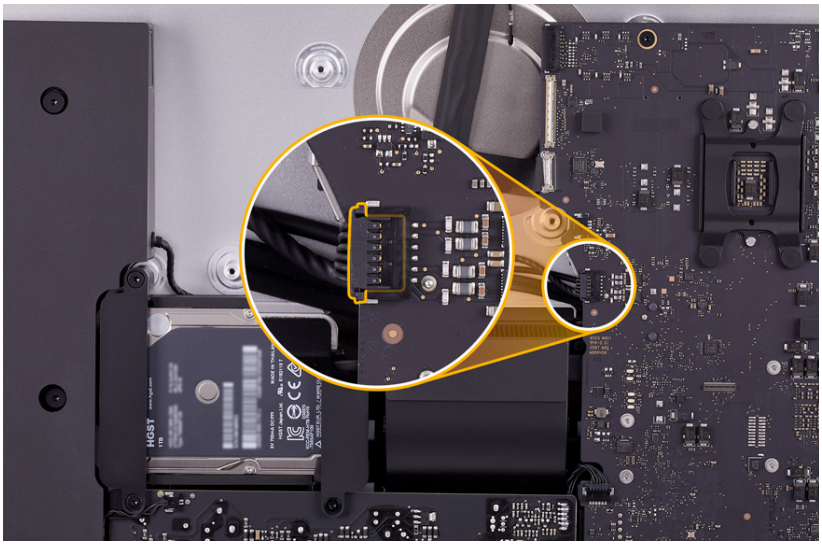
4. Fully reinsert the left speaker into the rear housing chin. Ensure that the power button cable does not bind or slip out of the routing channel as you position the speaker.

   Important

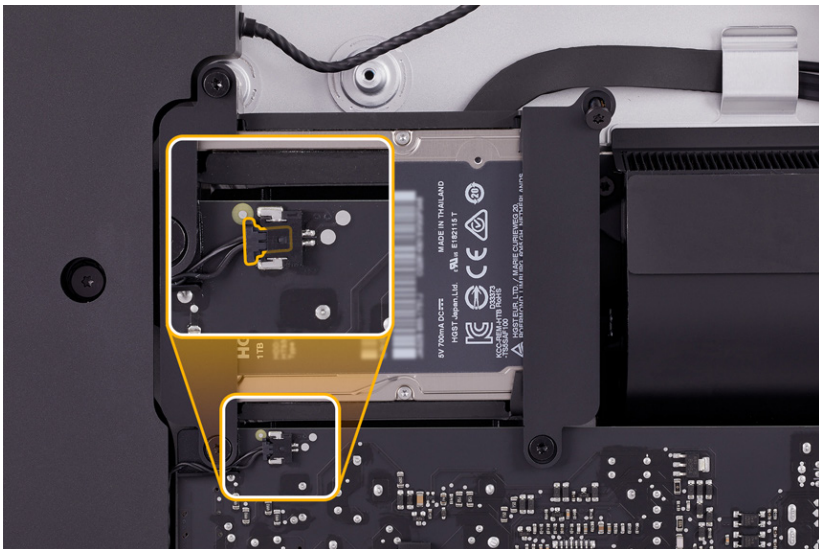
   Push firmly to ensure that the speaker sits down in the chin as far as possible. If the speaker is not positioned correctly in the chin, it can cause display interference issues.

5. Reinstall the two T10 screws in the left speaker.

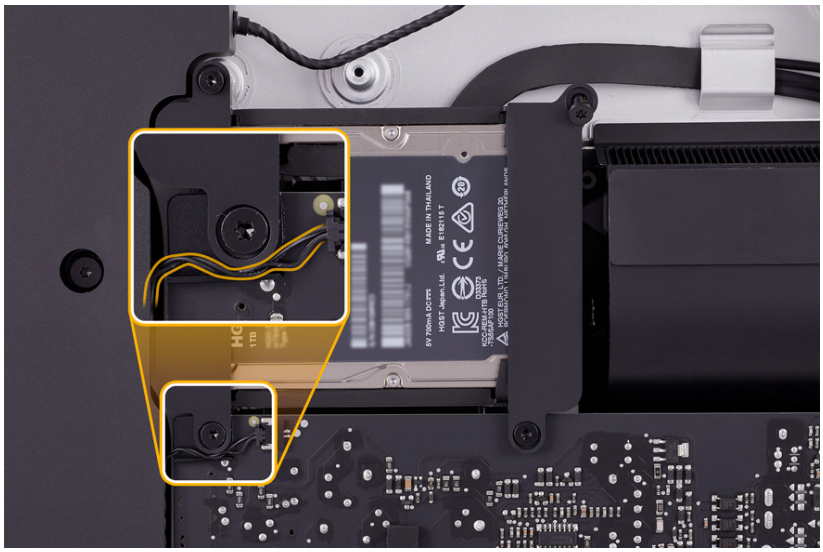
6. Reconnect the speaker cable to the logic board.



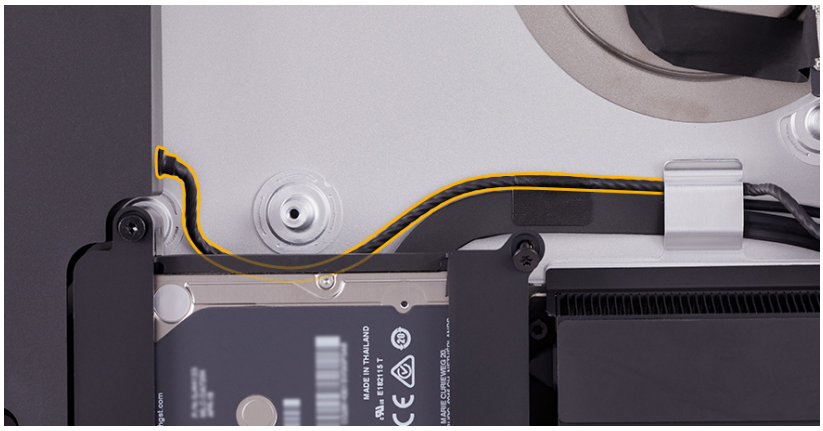
7. Reconnect the power button cable to the power supply.



8. Reroute the cable between the ledge and the screw opening.



9. Reroute the speaker cable as shown. Verify that it is through the clip and adhere it to the hard drive data and power cable.



10. Reinstall the two T8 screws into the hard drive bracket.

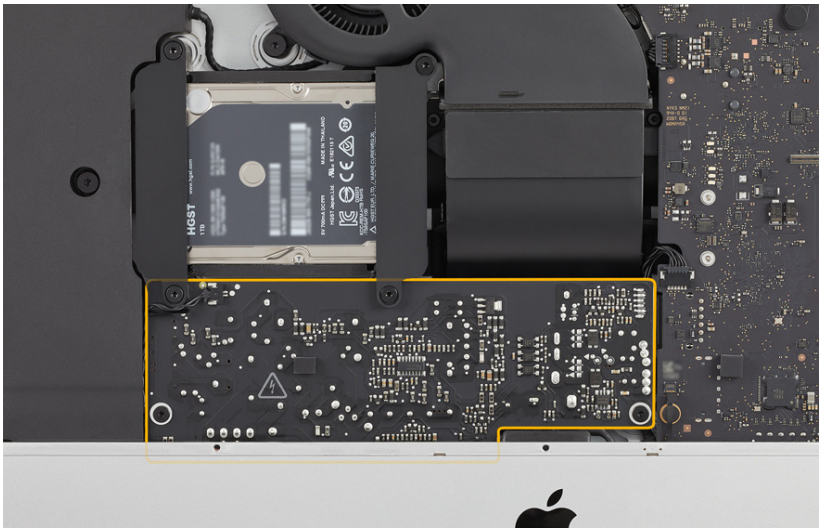
Reinstall the following parts to complete reassembly:

- Chin Strap
- Fan
- Display

Power Supply

Remove the following parts before you begin:

- Display
- Chin strap



Danger

The power supply remains powered when the computer is plugged in whether or not the computer has been turned on. Use extreme caution when the display is removed. Avoid touching the logic board or power supply while the computer is plugged into an electrical outlet.

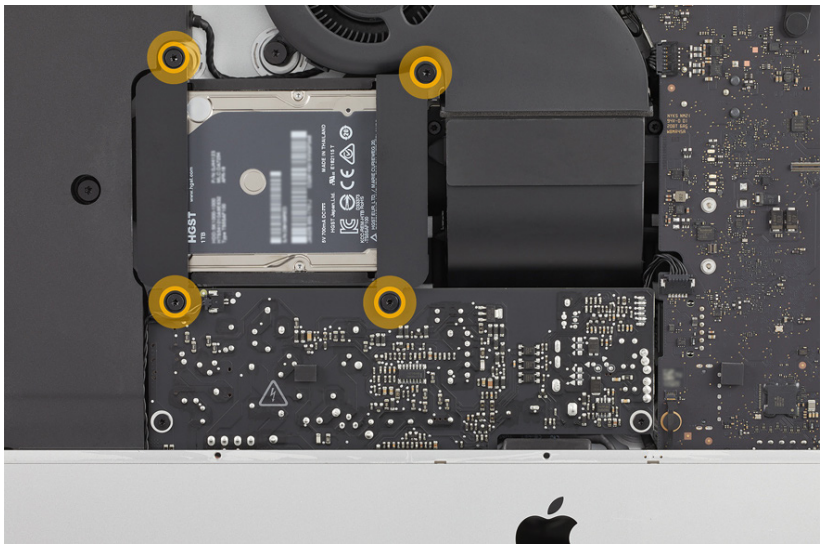
Take the following additional precautions:

- Never remove or install any parts while the computer is plugged into an electrical outlet.
- Always wait at least 2 minutes after unplugging the computer to allow the power supply and logic board time to discharge. You may then remove the display.
- Do not touch the logic board or power supply while the computer is plugged in, or after the computer has been unplugged but before discharge wait time has passed.
- Do not touch the logic board or power supply before the 2-minute discharge wait time has passed.

Tools

- ESD wrist strap and mat
- Torx T8 screwdriver
- Black stick
- Phillips #00 screwdriver

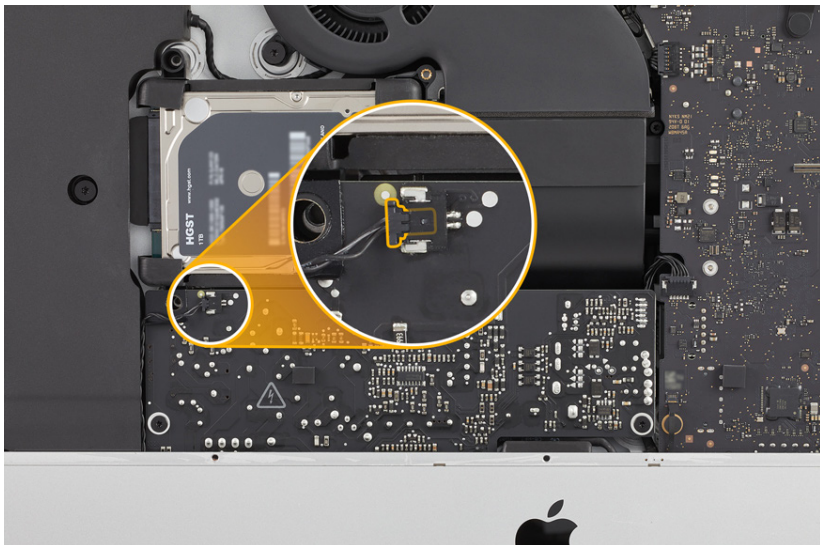
1. Remove the four T8 screws from the hard drive brackets.



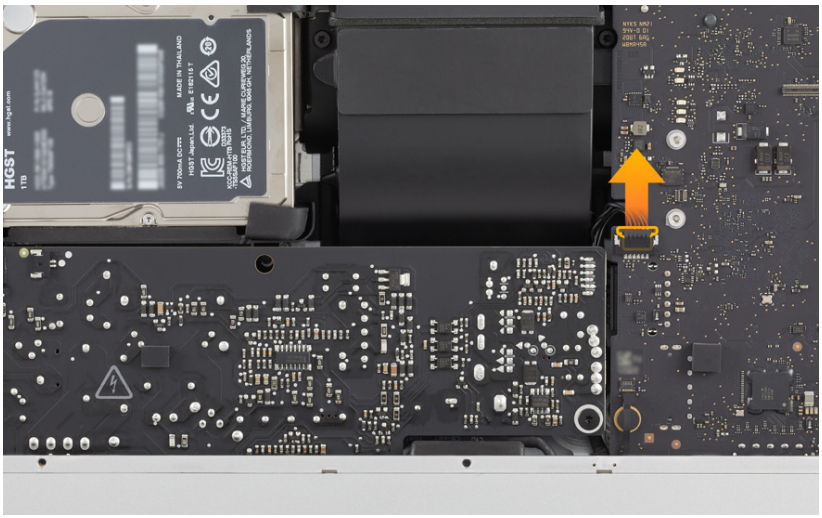
2. Use a black stick to disconnect the power button cable from the power supply.

Caution

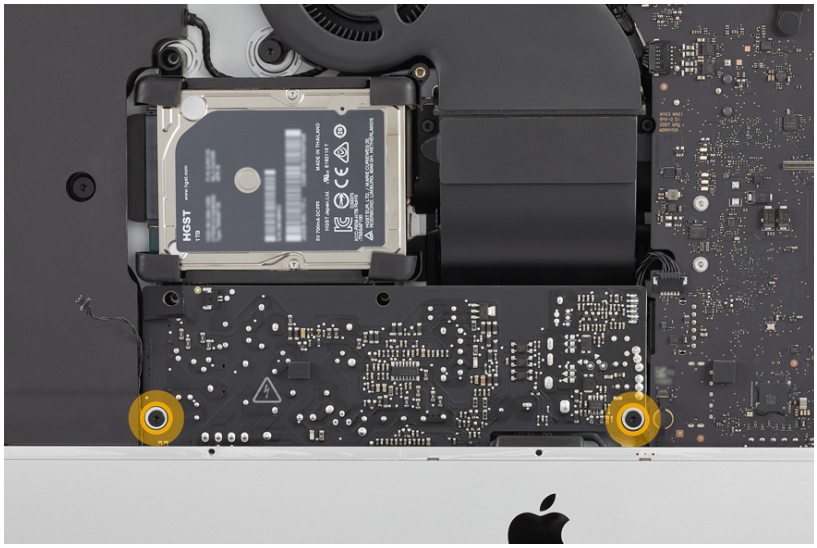
The power button cable is part of the rear housing. If the cable breaks, you will need to replace the rear housing.



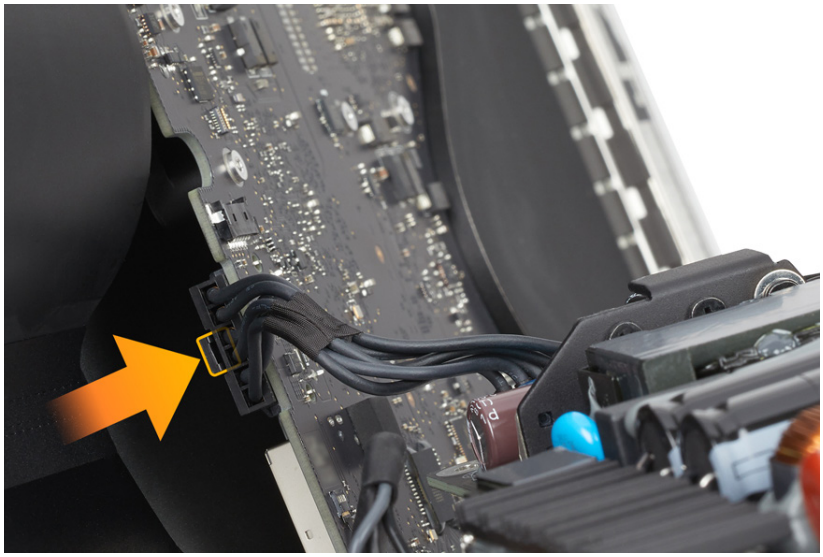
3. Disconnect the power supply signal cable.



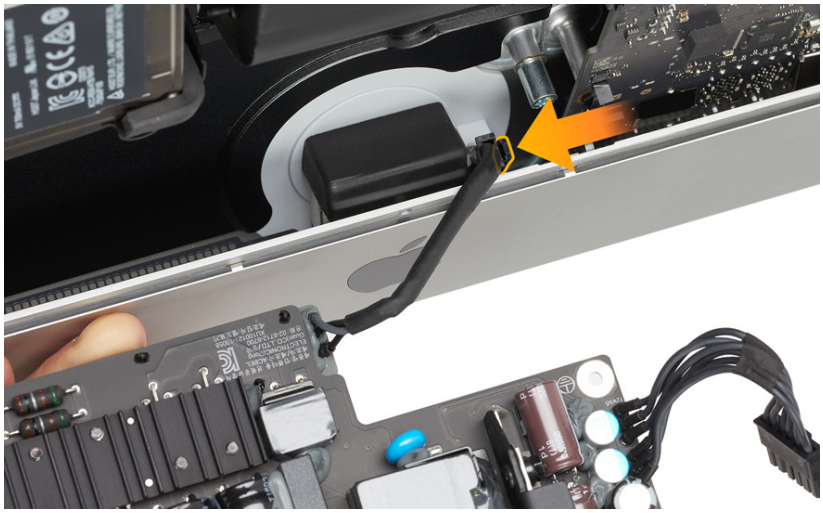
4. Remove the two T8 screws from the power supply.



5. Slide the power supply out of the chin as far as it will go. Disconnect the DC cable from the logic board.



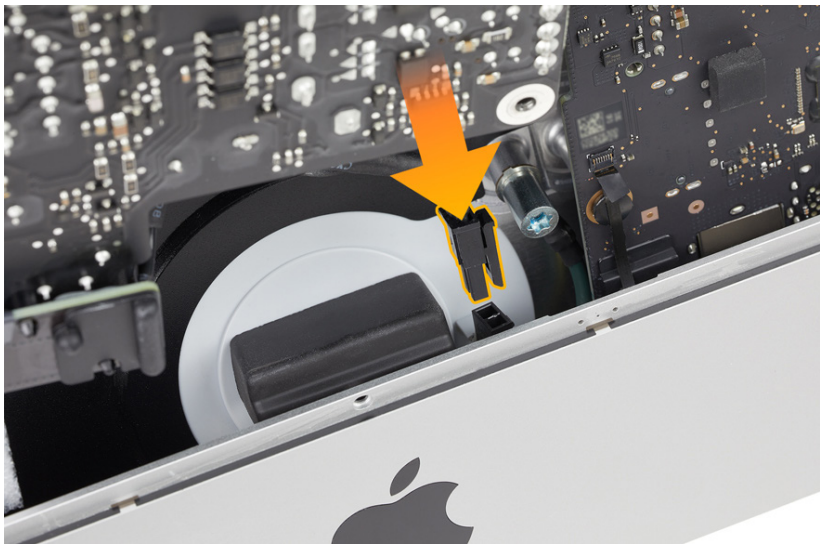
6. Disconnect the AC cable from the AC filter in the rear housing.



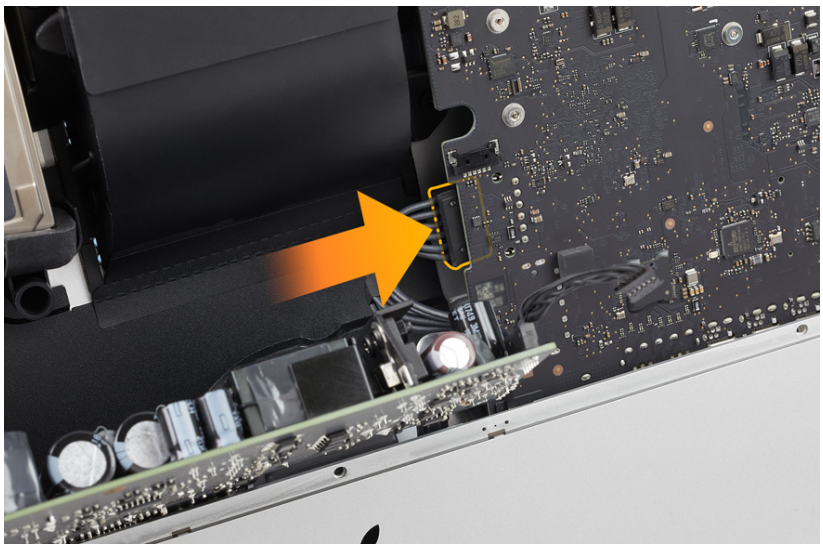
7. Lift the power supply up and out of the chin well.

Steps for Reassembly

1. Reconnect the AC cable to the AC filter in the rear housing.

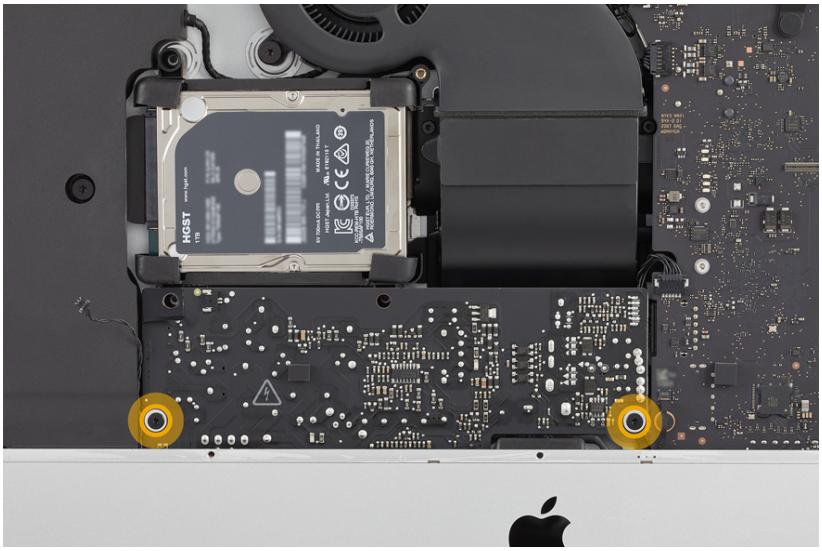


2. Slip the power supply under the rear housing chin. Reconnect the DC cable to the logic board.



3. Reconnect the power supply signal cable.

4. Reinstall the two T8 screws in the power supply.



5. Reconnect the power button cable to the power supply and reroute it along the side of the left speaker.

Caution

If the power button cable breaks, you will need to replace the rear housing. The power button cable is not available separately.

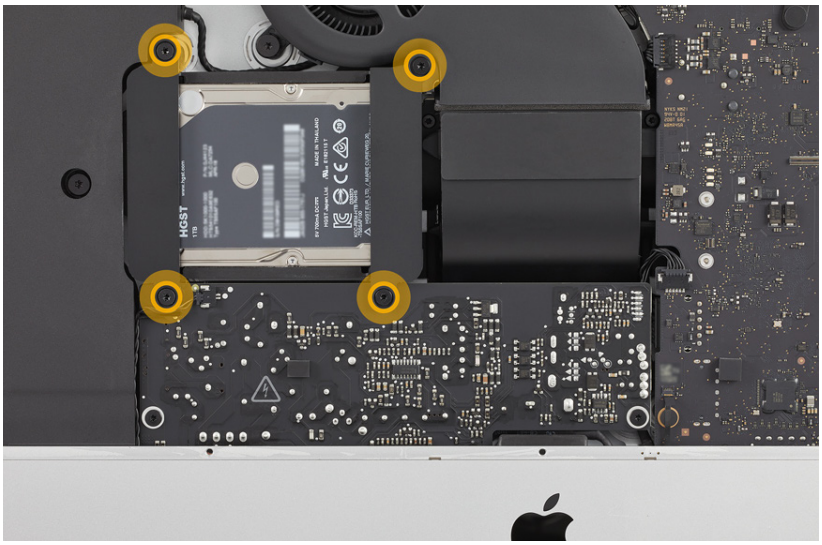
6. Position the hard drive brackets as shown. The brackets will only install one way.

Caution

When reinstalling the brackets, ensure that none of the hard drive bumpers are pinched between the hard drive and the brackets.

Left Bracket **Right Bracket**

7. Reinstall the four T8 screws into the hard drive brackets.



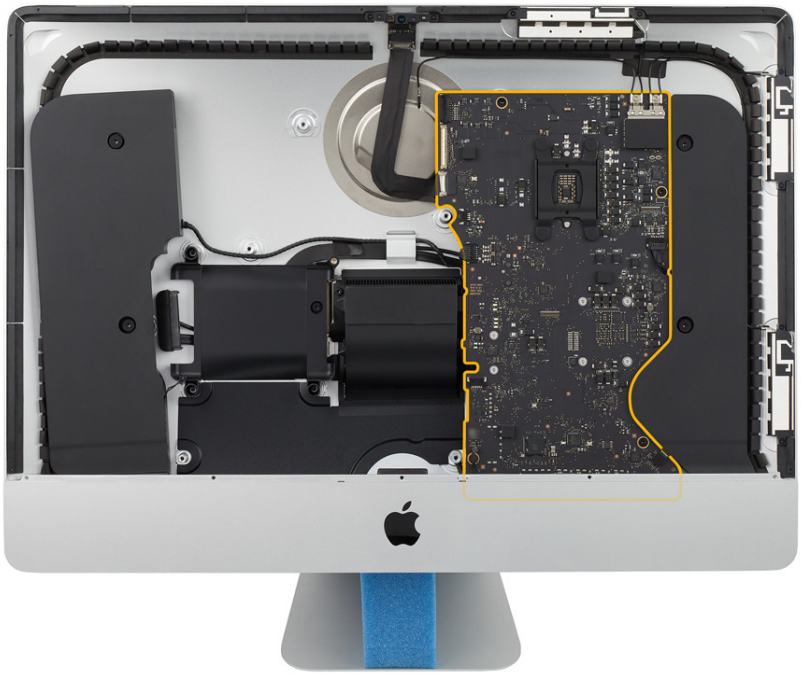
Reinstall the following parts to complete reassembly:

- Chin strap
- Display

Logic Board

Remove the following parts before you begin:

- Display
- Fan
- Hard drive
- Power supply



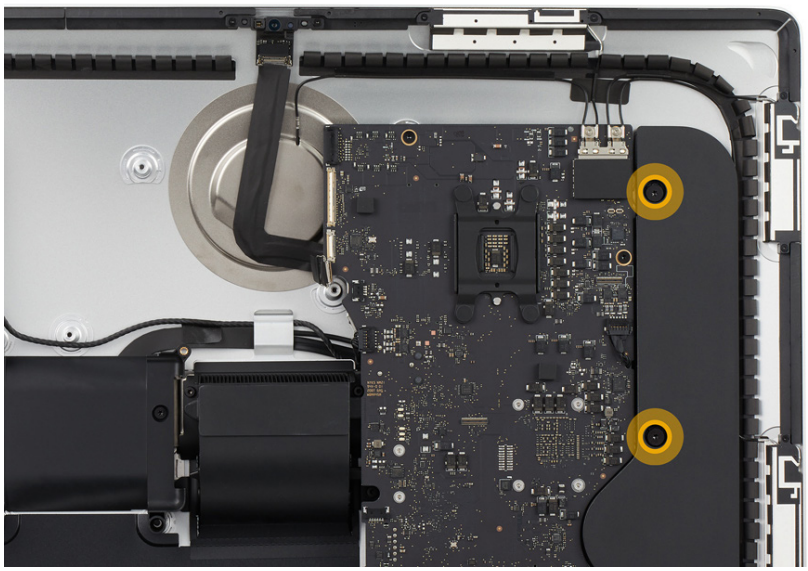
Tools

- ESD wrist strap and mat
- Torx T5 screwdriver
- Torx T8 screwdriver
- Torx T10 screwdriver
- Black stick
- Wireless card support tool
- Antenna tool
- Apple Thunderbolt Cable, USB-C cable, or SD card

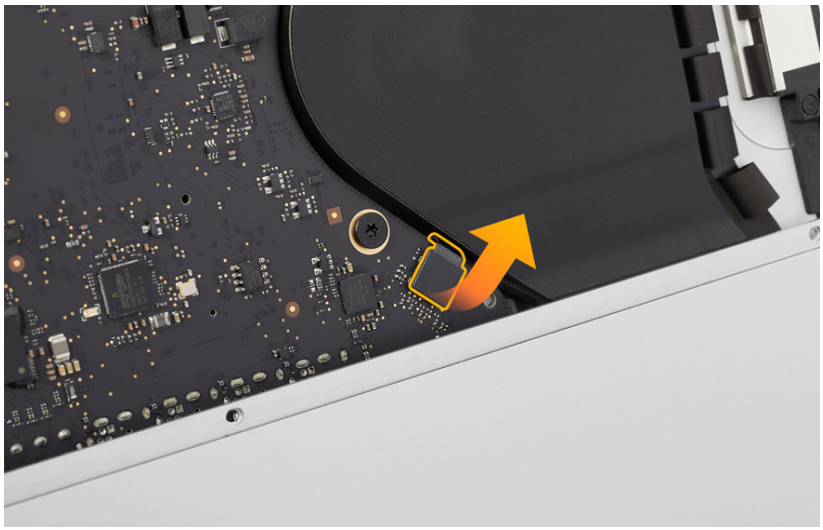
Steps for Removal

1. Disconnect the speaker cable from the logic board.

2. Remove the two T10 screws from the right speaker and disconnect the speaker.



3. Use a black stick to disconnect the audio cable from the lower right corner of the logic board.



4. Disconnect the camera cable.

5. Flip the locking bar on the bottom section of the logic board. Gently pull the microphone flex cable out of the connector to disconnect it.

Caution

Disconnect the cable. A broken microphone flex cable requires a rear housing replacement.

6. Bend the microphone flex cable and tape it to the rear housing to prevent damaging it while performing the rest of the procedure.

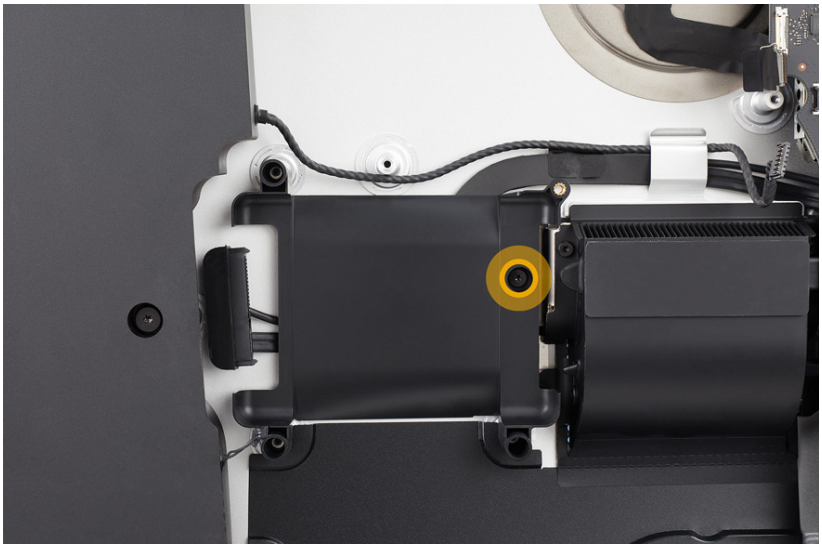
Caution

Do not crimp the flex cable.

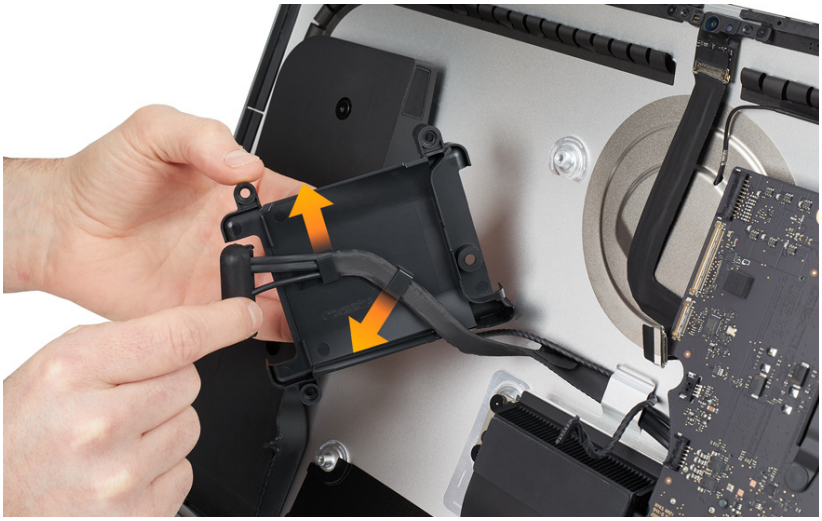
7. Remove the piece of Mylar tape covering the lower left logic board screw. Place the piece of Mylar tape on the rear housing for later use.

8. Disconnect the left speaker cable.

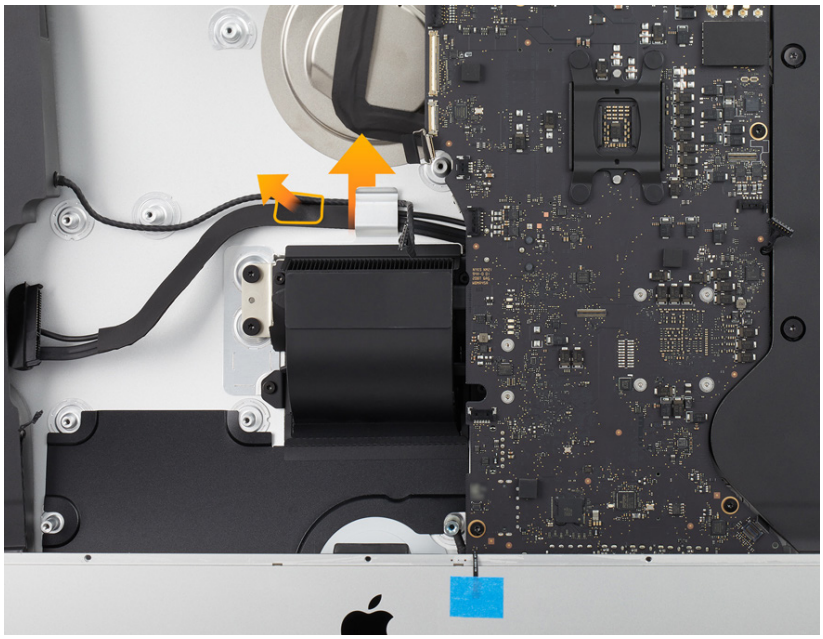
9. Remove the T8 screw from the hard drive cradle.



10. Remove the hard drive cable from the back of the hard drive cradle.

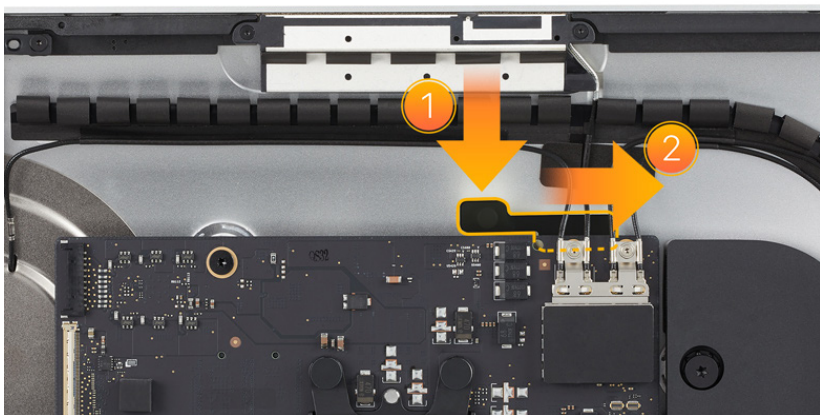


11. Loosen the black tape that adheres the speaker cable to the hard drive data and power cable. Remove the speaker cable and the hard drive data and power cable from the clip on the rear housing.

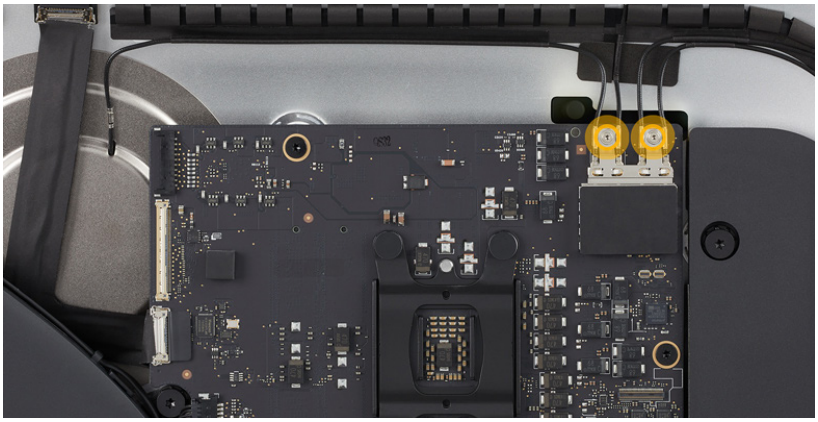


12. Hold the wireless card support tool by the handle. Lower the tool (1) so it rests on the edge of the logic board. Then slide the tool to the right (2) behind the logic board near the antenna connectors.

    Note: Keep the wireless card support tool in position as shown while removing or replacing screws and disconnecting or reconnecting antenna cables.



13. Remove the two T5 screws from the antenna cowling.

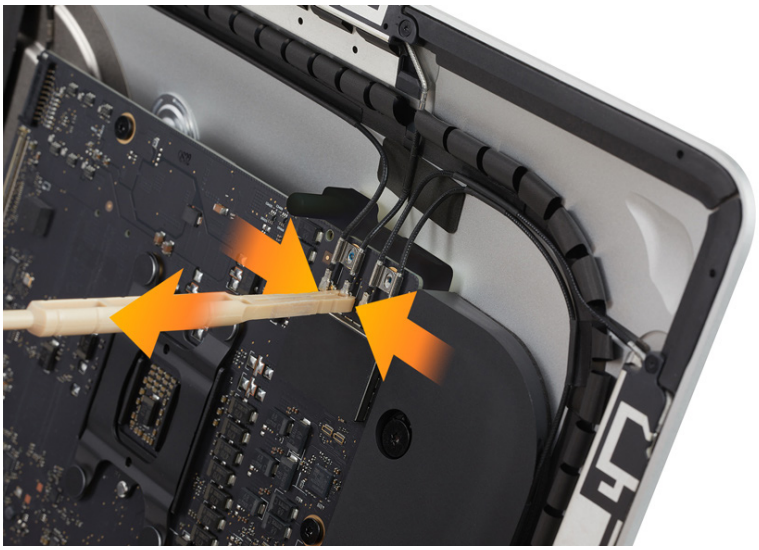


14. Remove the antenna cowling and save it for reuse.

15. Use the antenna tool to disconnect the connector from the wireless card.

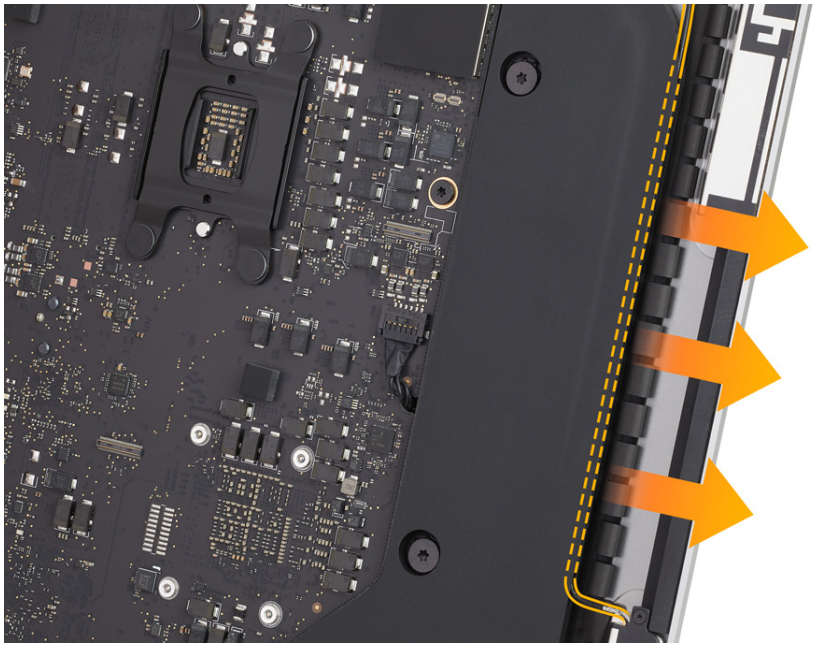
Important

Avoid using a metal tool, which could damage the cable.



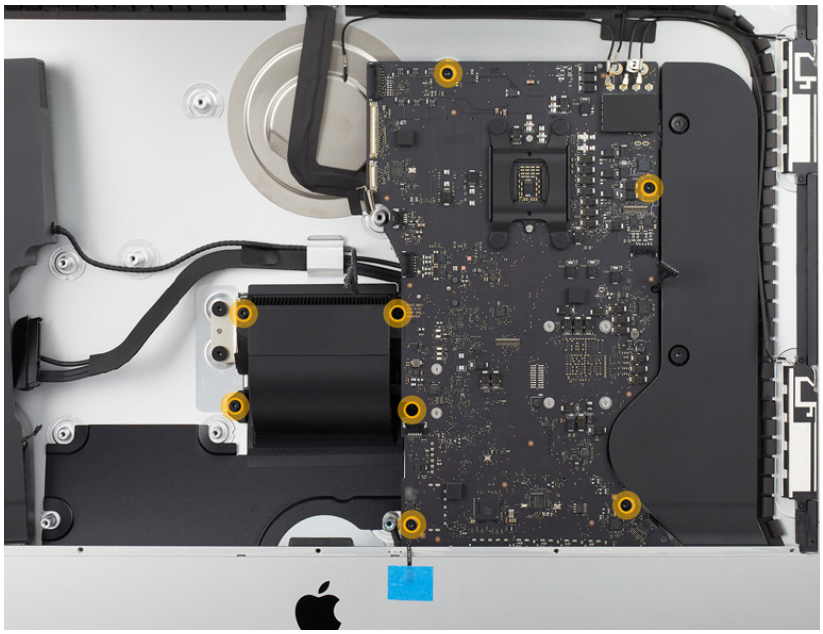
16. Remove the wireless card support tool from the rear housing.

17. Remove the antenna cable from the groove in the right speaker.



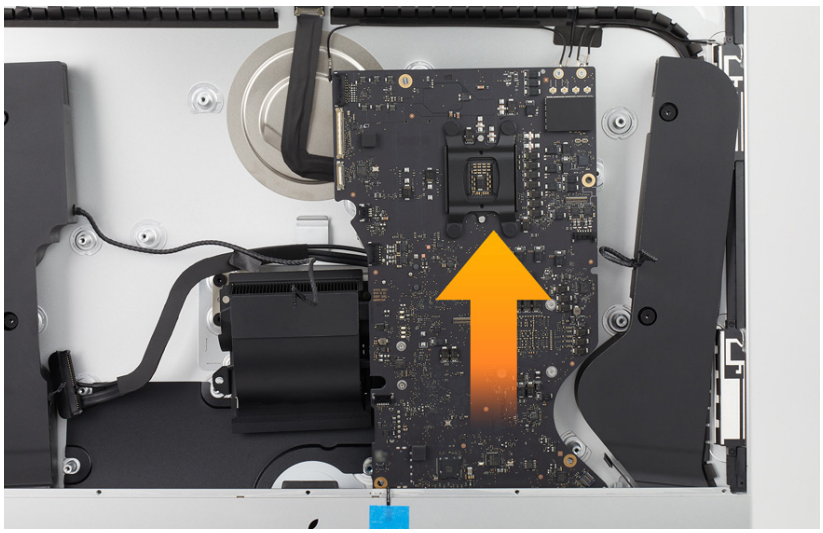
18. Remove the four T8 screws from the logic board and the four T8 screws from the heat sink.

    Note: Lay the computer down when removing the heat sink screws so they do not fall into the chin.



19. Slide the right speaker off to the right.

    Note: The logic board can not be removed until the right speaker is out of the way.



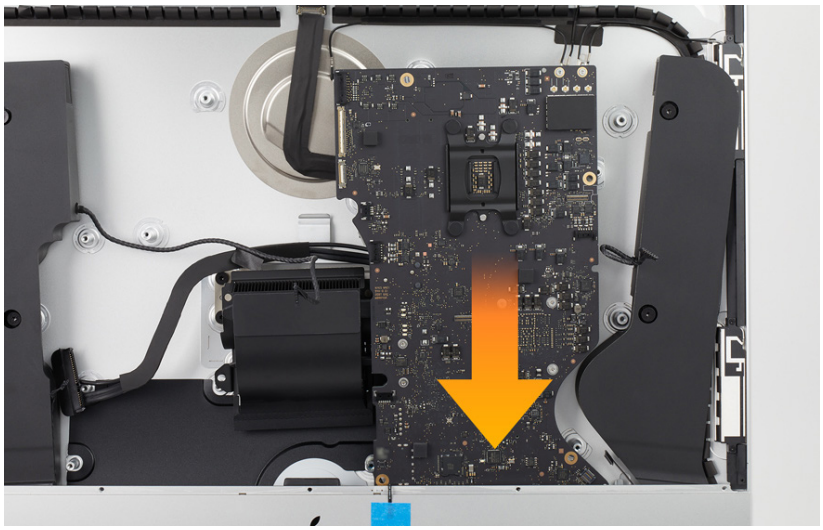
20. Remove the logic board from the rear housing.

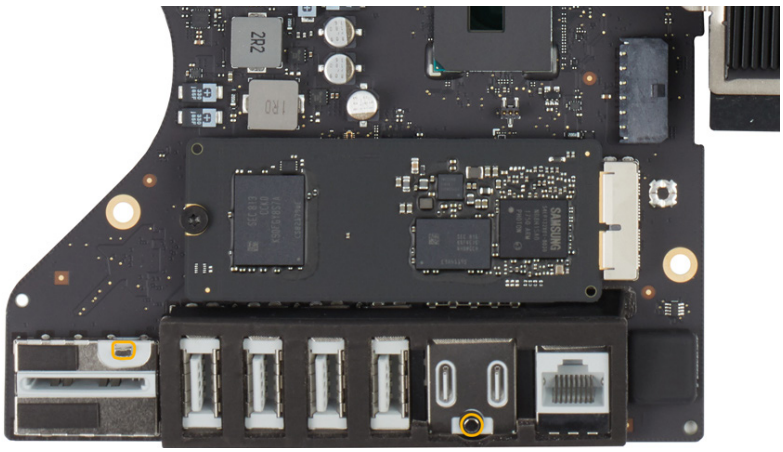
Steps for Reassembly

1. If installing a replacement logic board, transfer the following parts from the existing logic board:
    - Flash storage (if present)
    - Hard drive data and power cable
    - Memory
    - Audio (lower right)

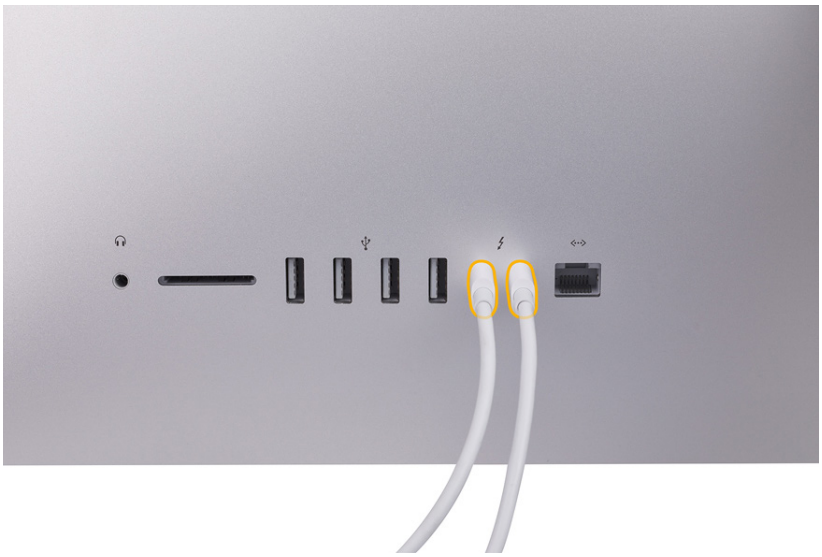
    Note: If the Mylar on the heat sink is missing or damaged, replace it with the new Mylar included with the replacement logic board.

2. Lower the logic board into the rear housing, inserting the input/output connector alignment pins into the blind holes.

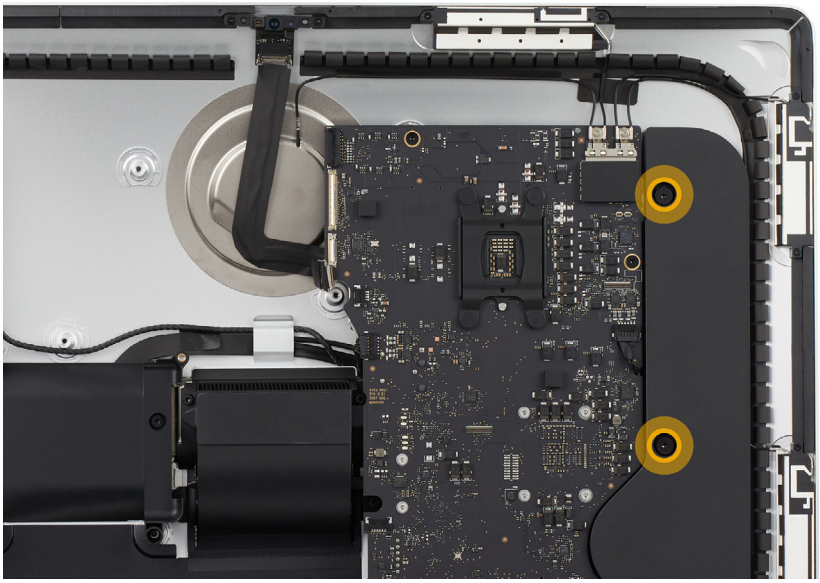




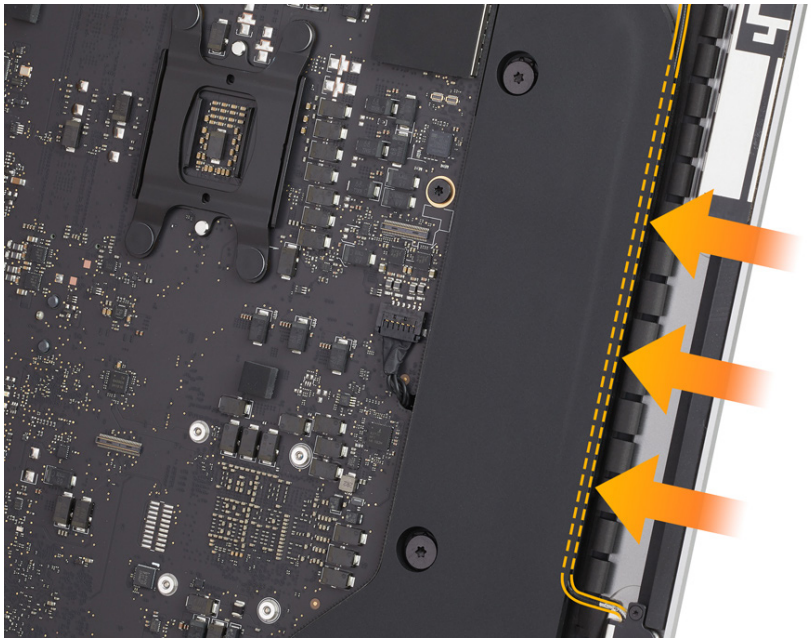
3. Plug in an Apple Thunderbolt Cable or USB-C cable or insert an SD card into the logic board to ensure it aligns with the rear housing.



4. Support the logic board with one hand and reinstall the right speaker, sliding it behind the logic board and into the rear housing. Reinstall the two T10 screws in the speaker and connect the speaker cable.

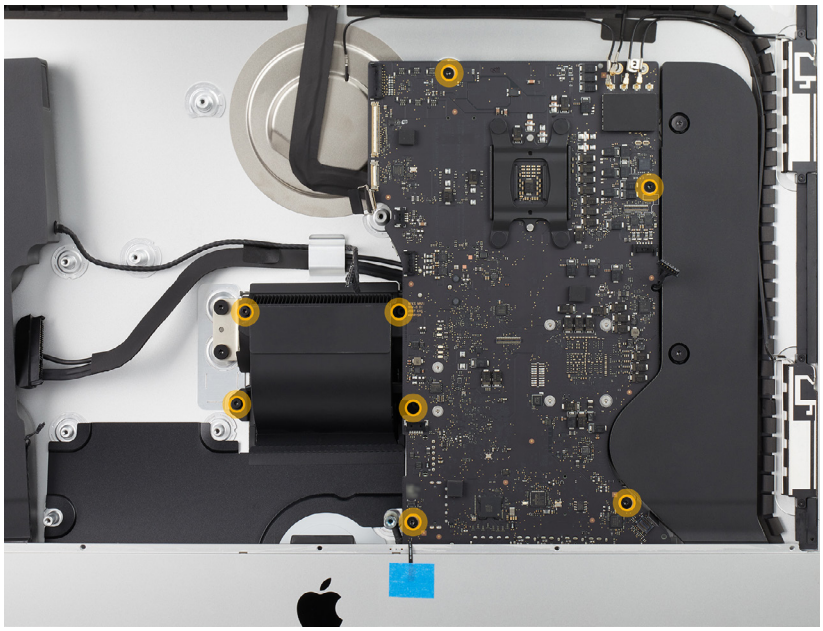


5. Tuck the antenna cable into the channel on the right side of the speaker.



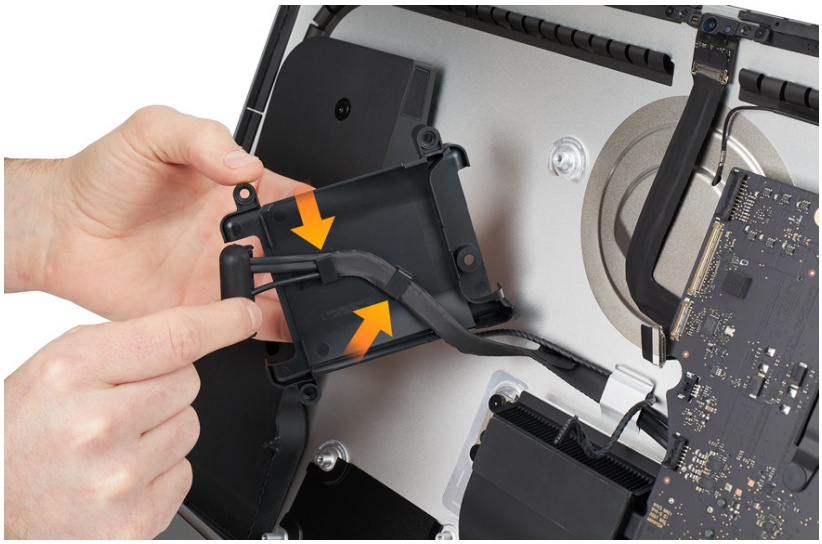
6. Reinstall the four T8 screws in the logic board and the four T8 screws in the heat sink.

   Note: The two longer heat sink screws secure the upper part of the heat sink. The two shorter screws secure the lower part of the heat sink.

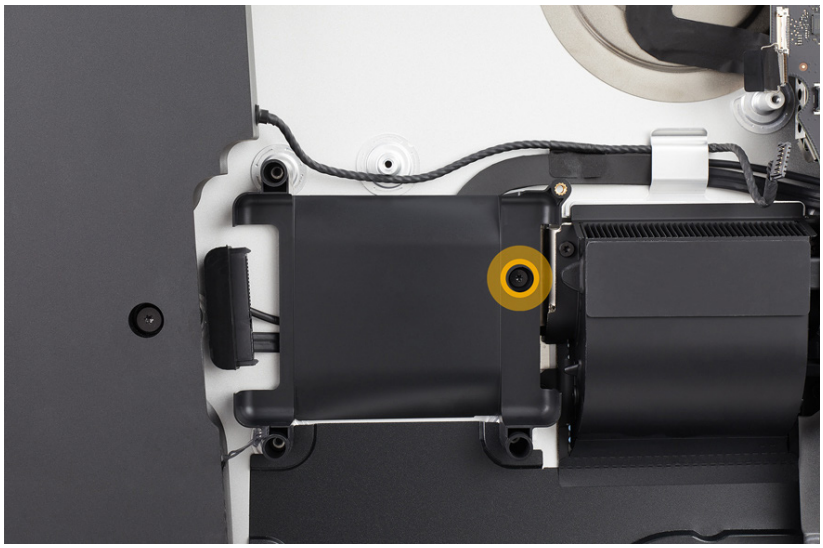


7. Replace the piece of round Mylar tape on the lower left logic board screw. If the Mylar tape is missing, cover the screw with a small piece of Kapton tape.

8. Reroute the hard drive data and power cable through the clips in the hard drive cradle.

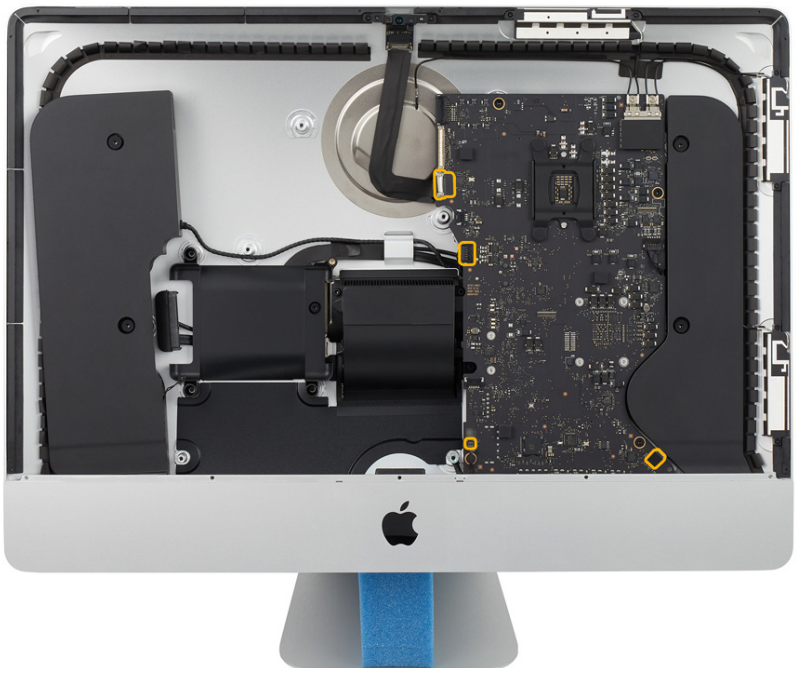


9. Reinstall the T8 screw in the hard drive cradle.



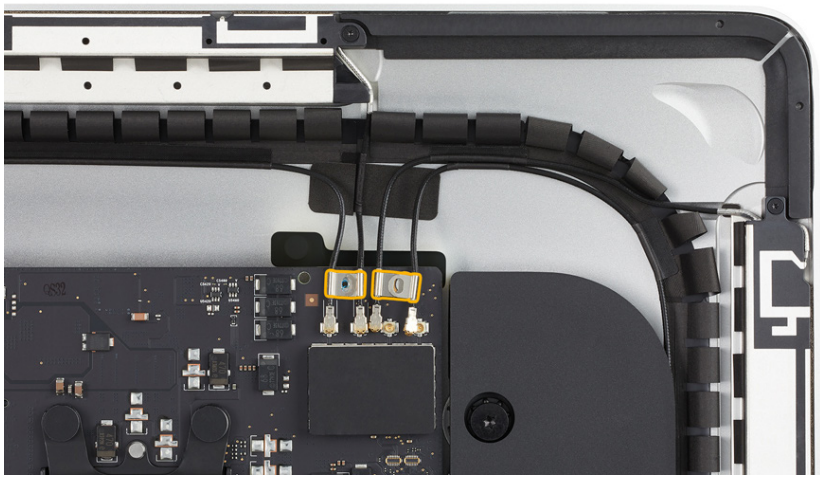
10. Remove any cables used for alignment on the rear I/O ports.

11. Reconnect the following cables to the logic board:
    - Camera (top left)
    - Left speaker (below the camera connector)
    - Microphone flex (lower left)
    - Audio (lower right)

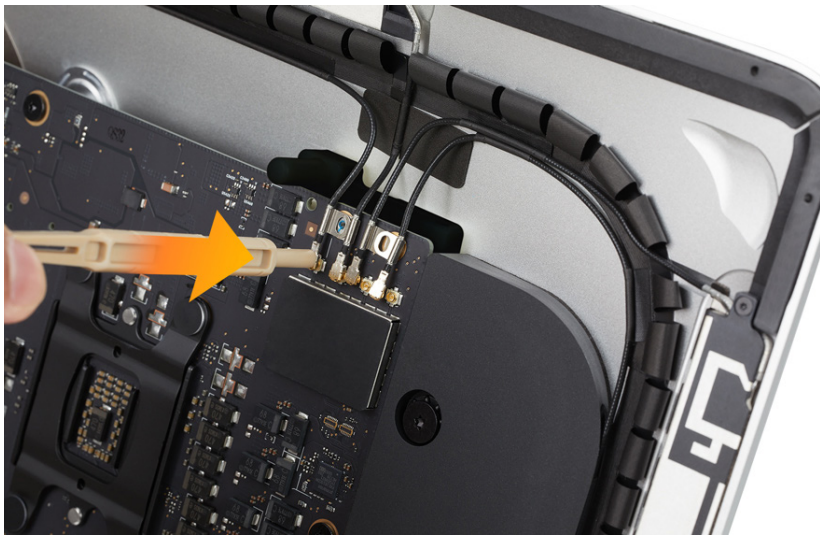


12. Place the wireless card support tool behind the logic board.

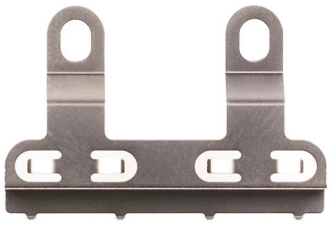
13. Align the bracket holes with the screw bosses on the logic board.

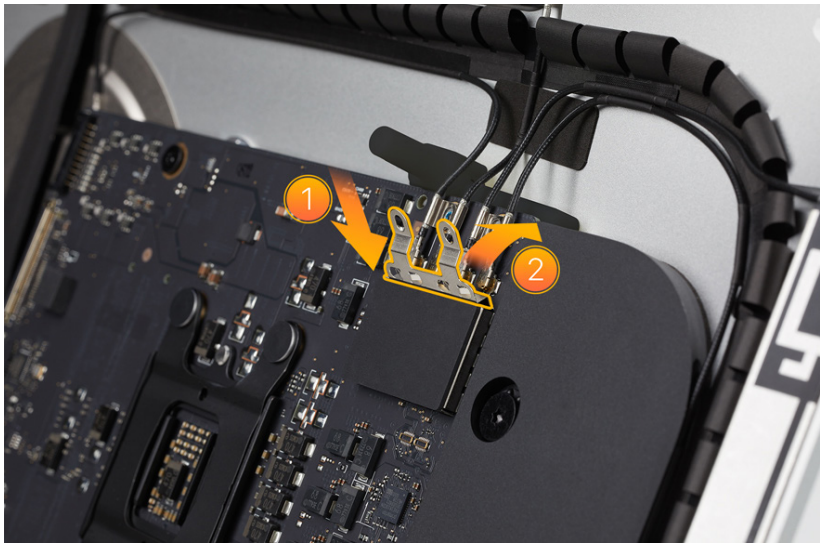


14. Use the antenna tool to reconnect the cable to the logic board.

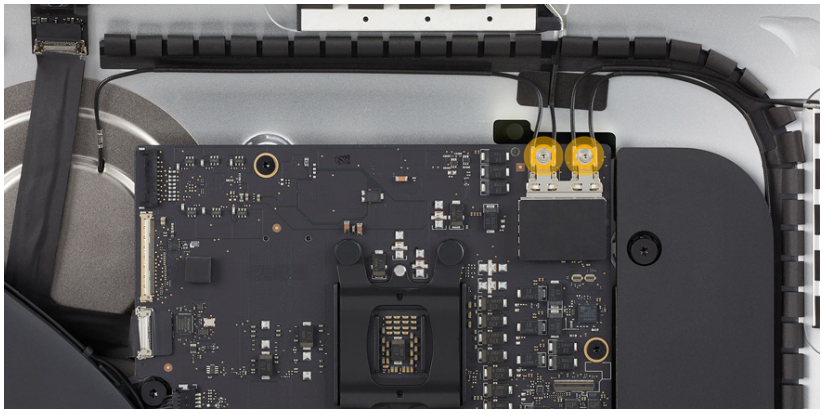


15. Reinstall the antenna cowling by engaging the teeth at an angle; then lay it down over the antenna connectors.



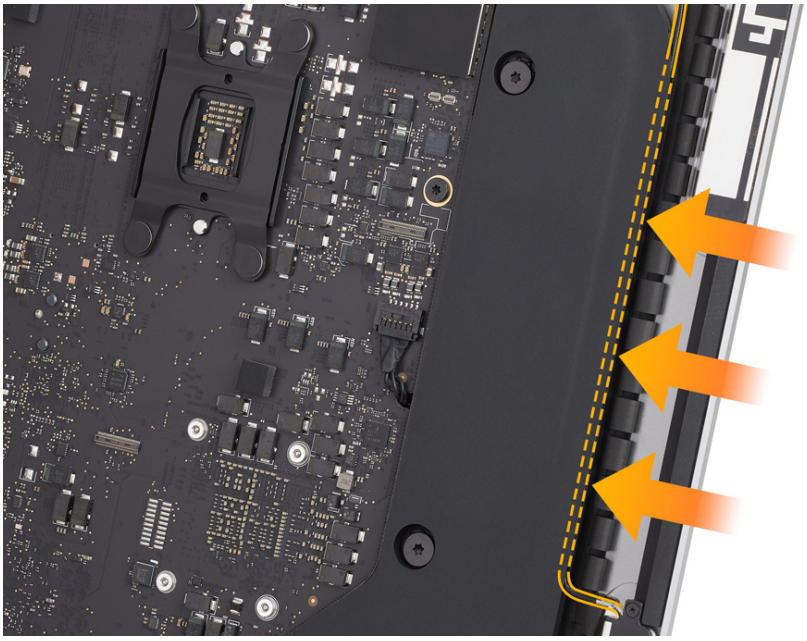


16. Reinstall two T5 screws.



17. Remove the wireless card support tool from the rear housing.

18. Ensure the antenna cable is rerouted in the channel on the right speaker.



19. Use a black stick or tweezers to open any flattened loops along the airloop gasket.

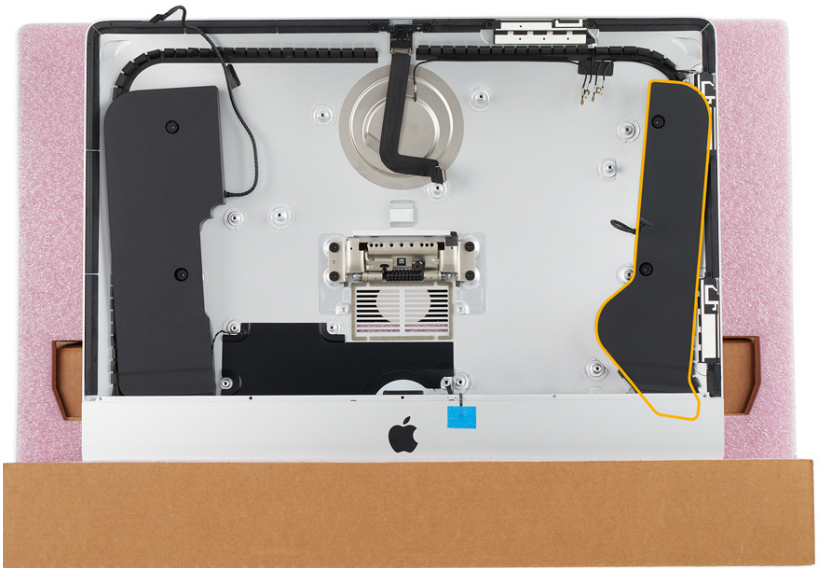
Reinstall the following parts to complete reassembly:

- Chin strap
- Power supply
- Hard drive
- Fan
- Display

Right Speaker

Remove the following parts before you begin:

- Display
- Fan
- Hard drive
- Chin strap
- Power supply
- Logic board



Important

You must replace speakers in pairs. If you replace the right speaker, then you must also replace the left speaker. For left speaker removal and reassembly instructions, refer to the Left Speaker section.

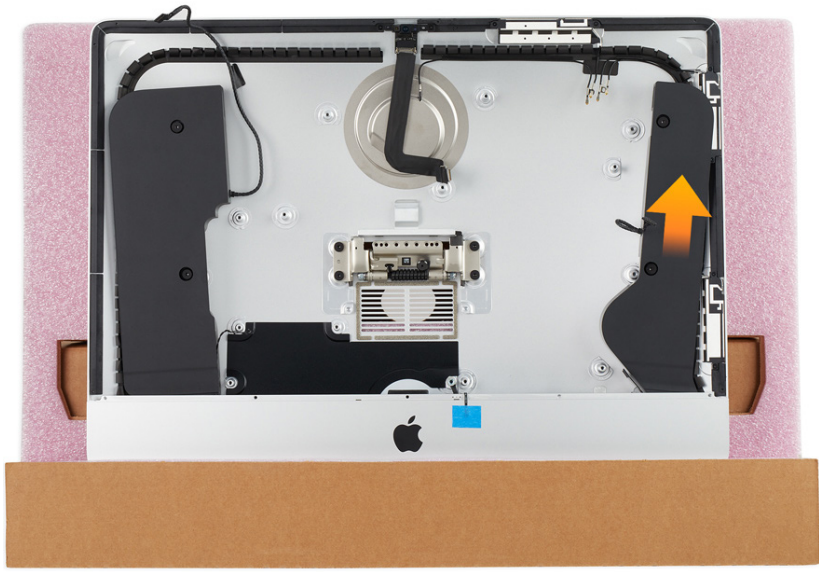
Tools

- ESD wrist strap and mat

Steps for Removal

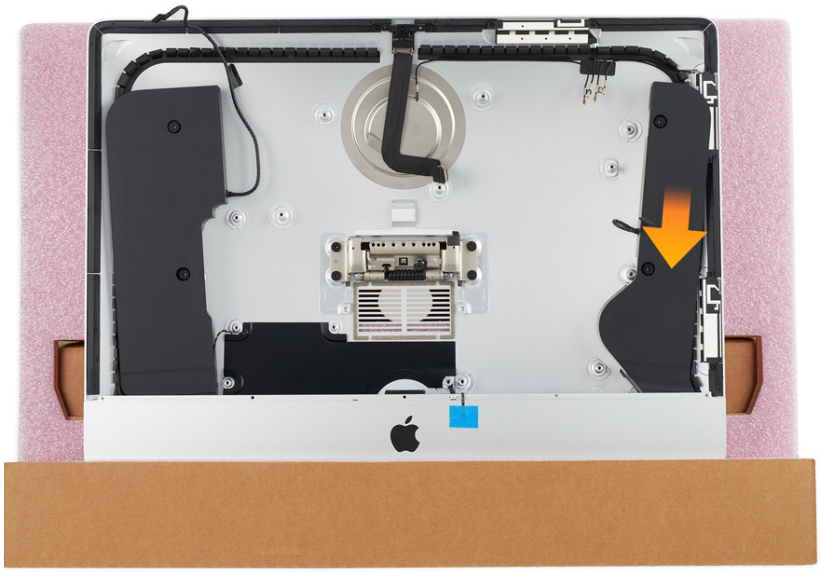
1. Pull the speaker up and out of the rear housing.

   Note: The two T10 right speaker screws were removed during the logic board removal procedure.



Steps for Reassembly

1. Slide the speaker into the rear housing.



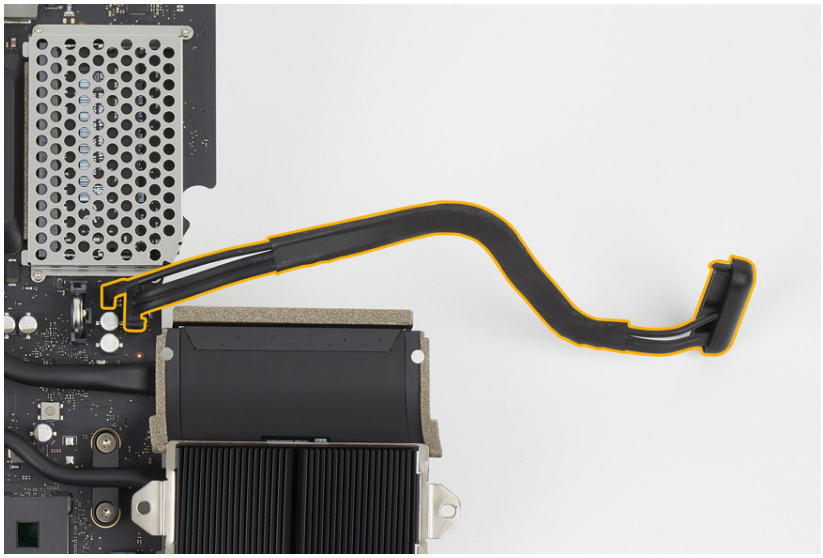
Reinstall the following parts to complete reassembly:

- Logic board
- Power supply
- Chin strap
- Hard drive
- Fan
- Display

Hard Drive Data and Power Cable

Remove the following parts before you begin:

- Display
- Fan
- Hard drive
- Chin strap
- Power supply
- Logic board



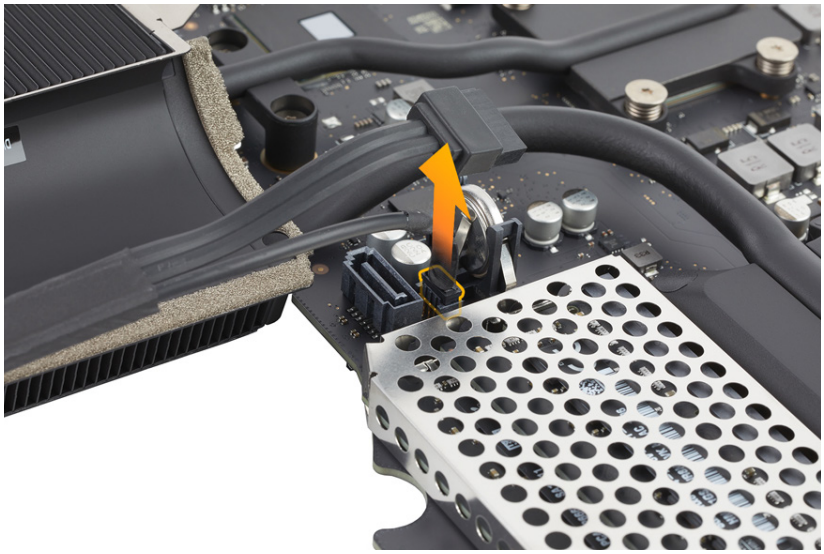
Tools

- ESD wrist strap and mat

Steps for Removal

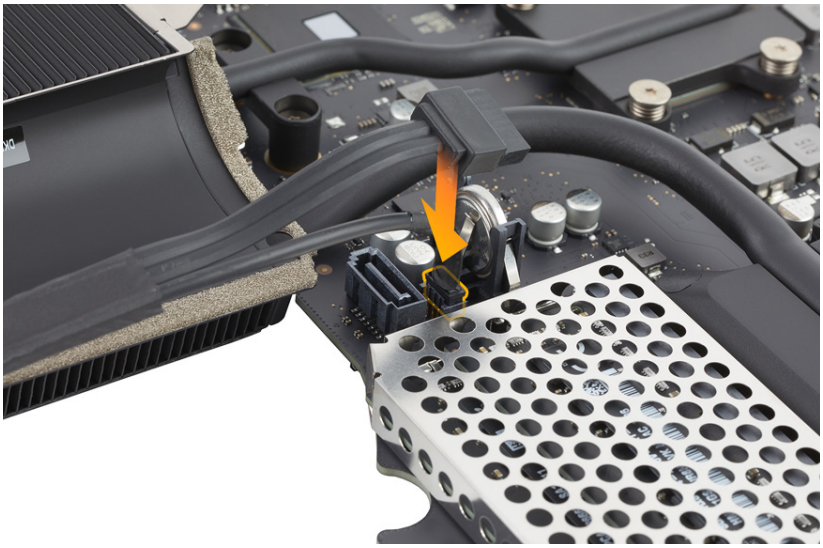
1. Pinch the metal clip on the hard drive data cable connector to release the cable from the logic board. Then pull up to disconnect it.

2. Gently pull the hard drive power cable connector to disconnect the cable from the logic board.

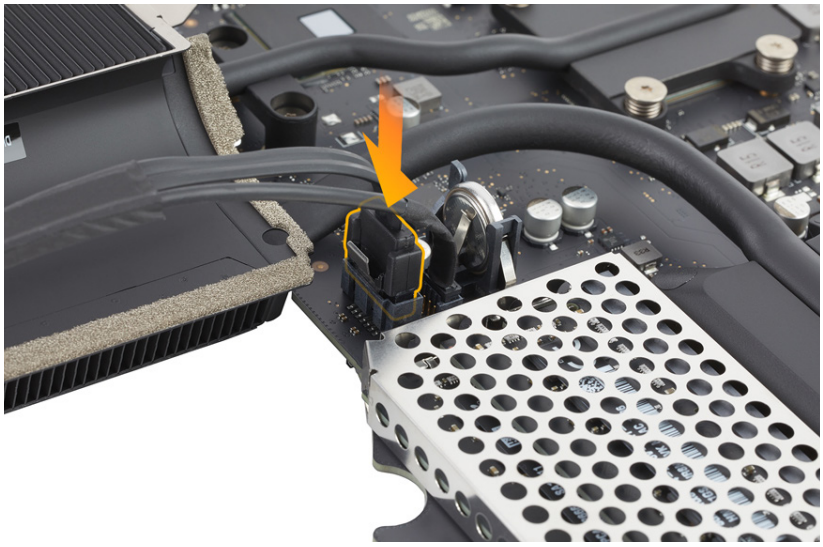


Steps for Reassembly

1. Reinsert the hard drive power connector into the logic board.



2. Reinsert the hard drive data connector into the logic board.



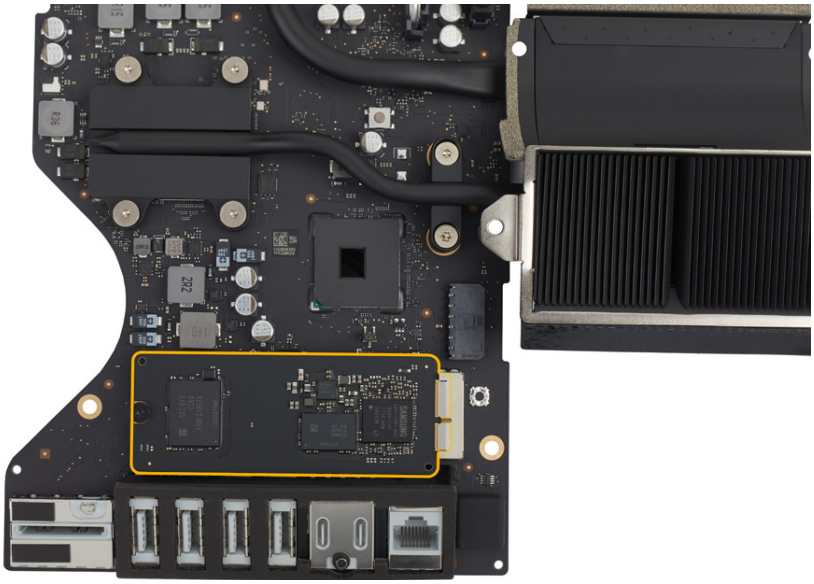
Reinstall the following parts to complete reassembly:

- Logic board
- Power supply
- Chin strap
- Hard drive
- Fan
- Display

Flash Storage

Remove the following parts before you begin:

- Display
- Fan
- Hard drive
- Chin strap
- Power supply
- Logic board



Tools

- ESD wrist strap and mat
- Torx T8 screwdriver

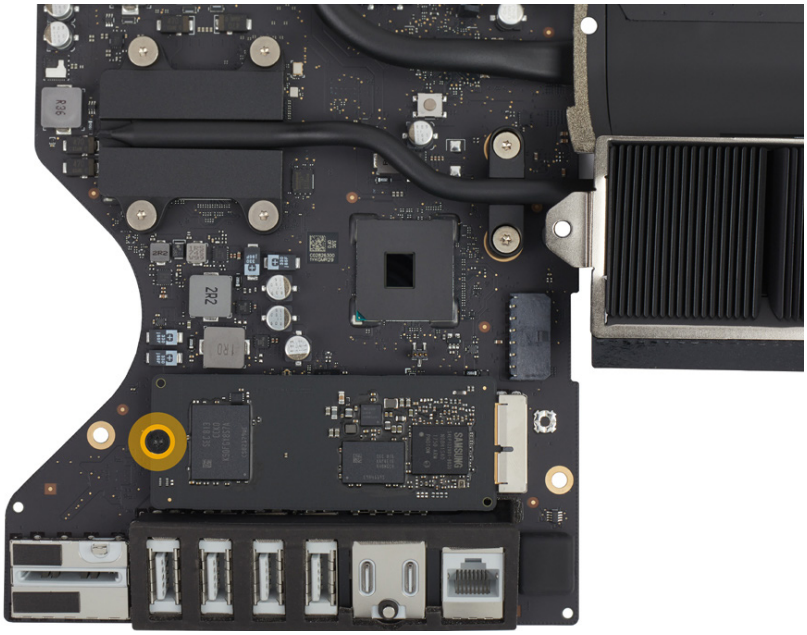
Steps for Removal

1. Remove the T8 screw from the flash storage card.

   Note: The flash storage is on the back of the logic board.

   Caution

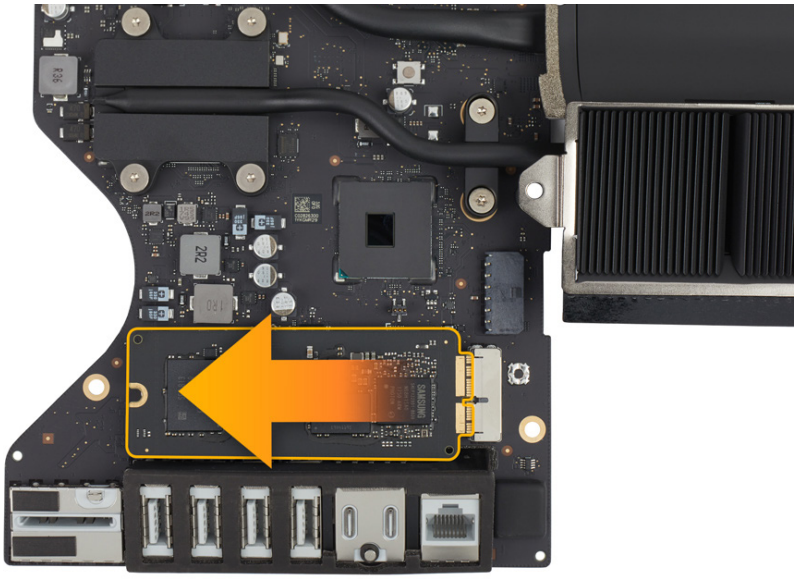
   Ensure that data is backed up before removing the flash storage.



2. Gently pull the flash storage straight out of the connector.

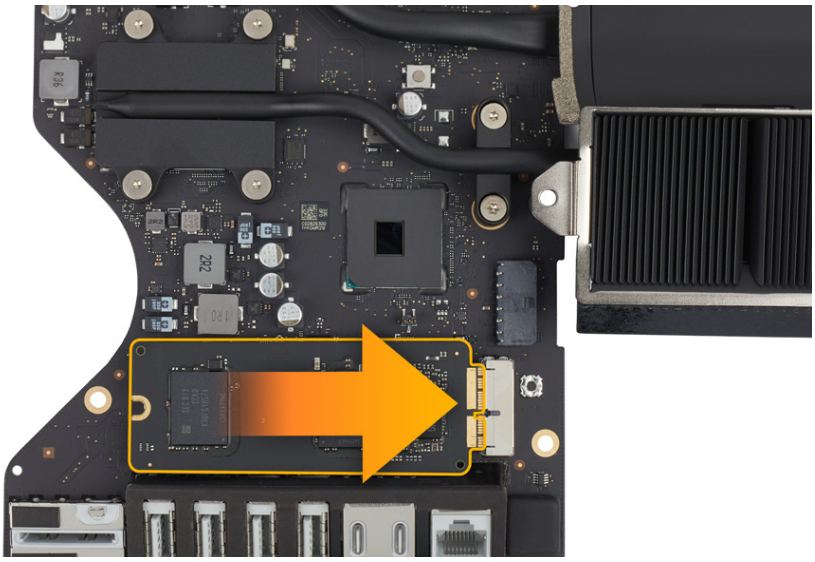
   Caution

   Do not lift the flash storage at an angle when removing it from the connector. A damaged connector requires a logic board replacement.

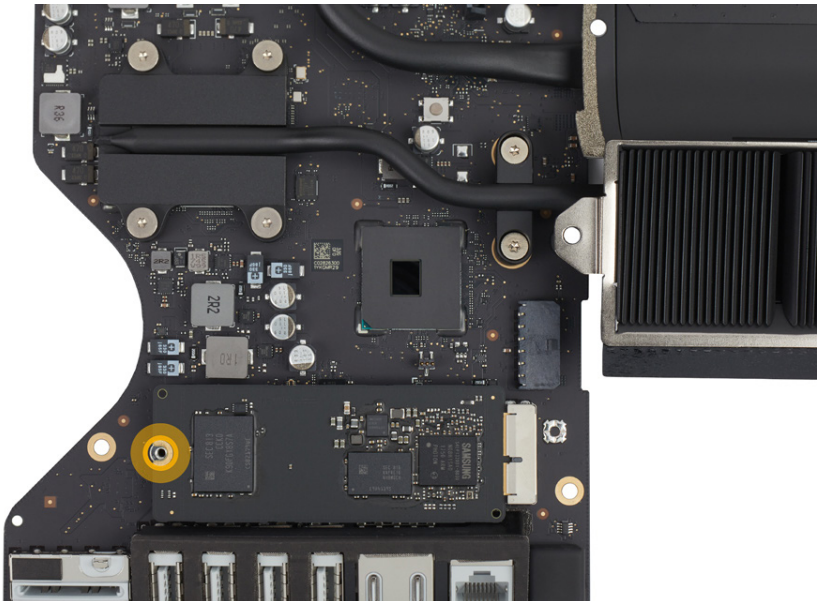


Steps for Reassembly

1. Reinsert the flash storage straight into the connector on the back of the logic board.



2. Reinstall the T8 screw to secure the flash storage card.



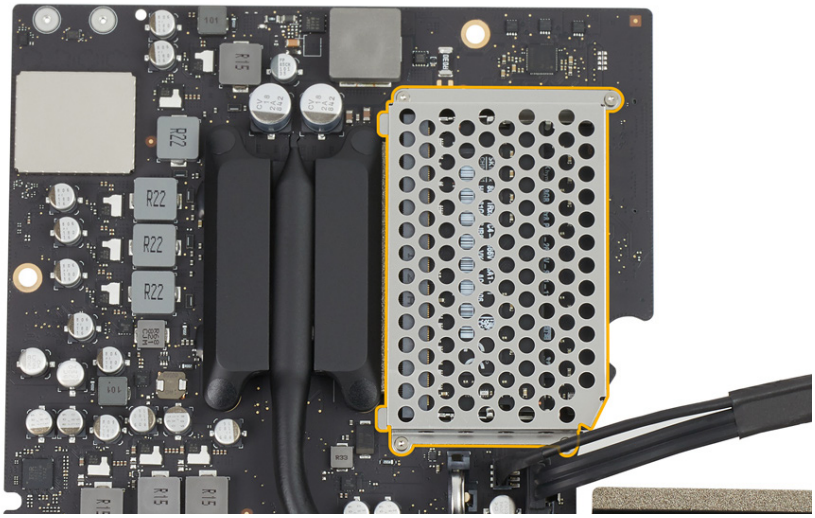
Reinstall the following parts to complete reassembly:

- Logic board
- Power supply
- Chin strap
- Hard drive
- Fan
- Display

Memory

Remove the following parts before you begin:

- Display
- Fan
- Hard drive
- Chin strap
- Power supply
- Logic board

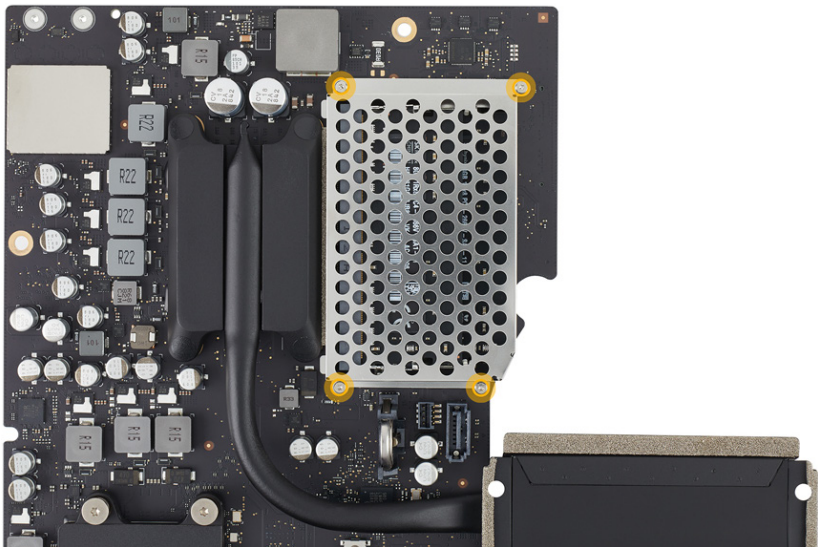


Tools

- Torx T4 screwdriver

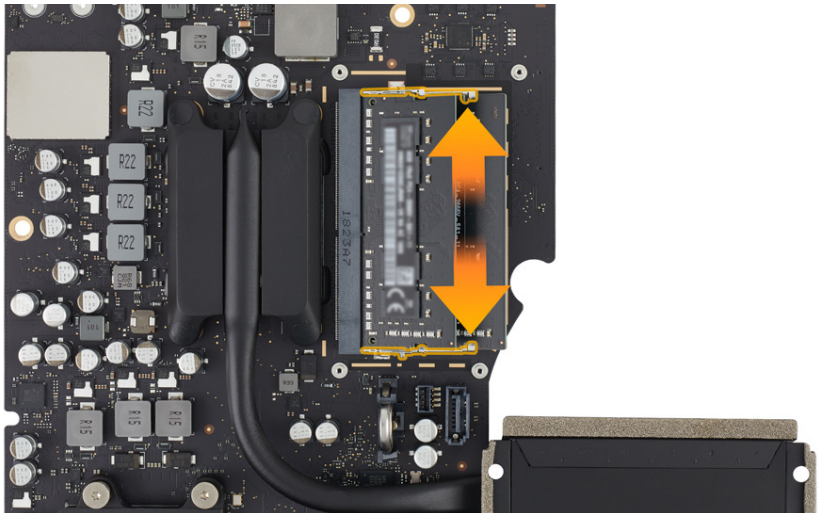
Steps for Removal

1. Remove the four T4 screws from the memory cover.

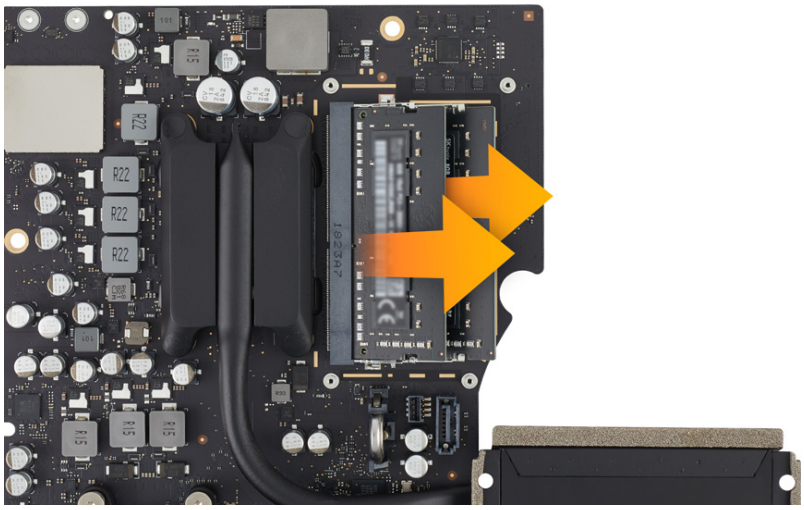


2. Remove the memory cover and save it for reuse.

3. Press the metal latches outward to release the memory from the socket.

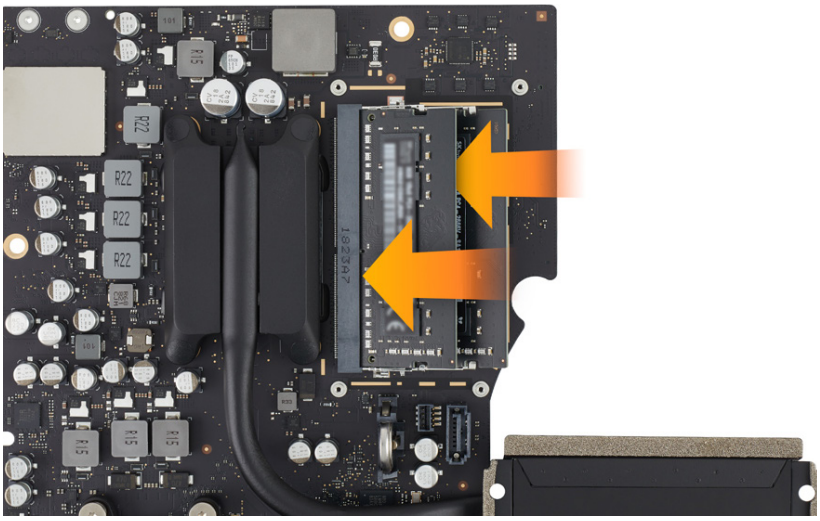


4. Hold the memory by the edges and gently remove it from the slot.



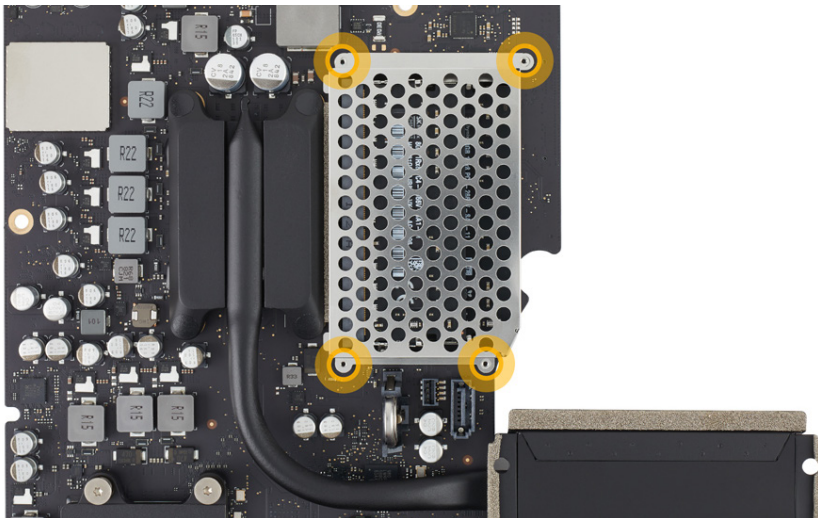
Steps for Reassembly

1. Install the replacement DIMM in the lower slot first, then replace the DIMM in the upper slot. Insert each DIMM into the slot; then press the DIMM down to lock it in place.



2. Reinstall the memory cover.

3. Reinstall the four T4 screws to secure the memory cover to the logic board.



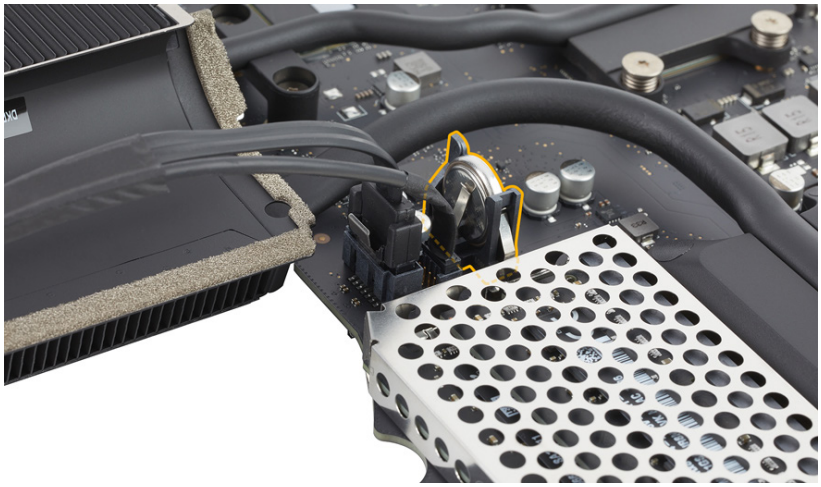
Reinstall the following parts to complete reassembly:

- Logic board
- Power supply
- Chin strap
- Hard drive
- Fan
- Display

Battery

Remove the following parts before you begin:

- Display
- Fan
- Hard drive
- Chin strap
- Power supply
- Logic board

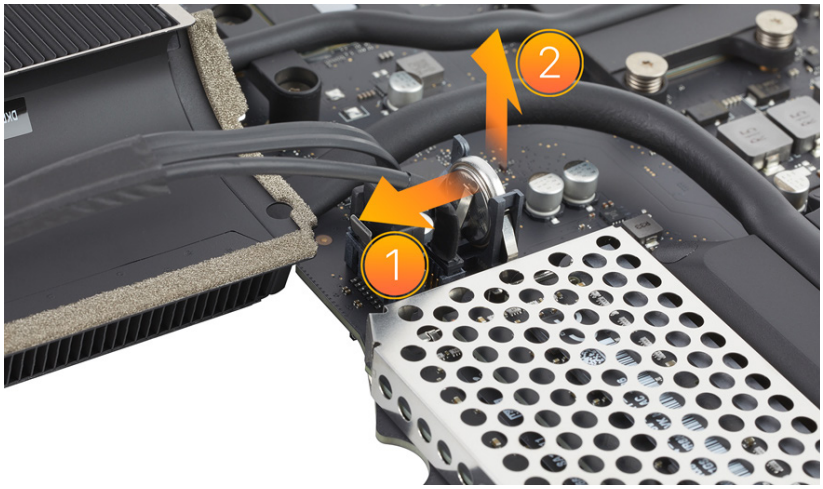


Tools

- ESD wrist strap and mat

Steps for Removal

1. Grasp the battery with two fingers. Push it toward the metal clip (1) and pull it up from the socket to remove it (2).



Steps for Reassembly

1. Ensure the battery socket is open and free of dust.

2. Reinsert the battery into the socket with the negative side (no markings) facing the metal clip.

Warning

If you incorrectly reinstall a battery or replace the battery with an incorrect one, you risk explosion. Dispose of used batteries according to local environmental laws and guidelines.

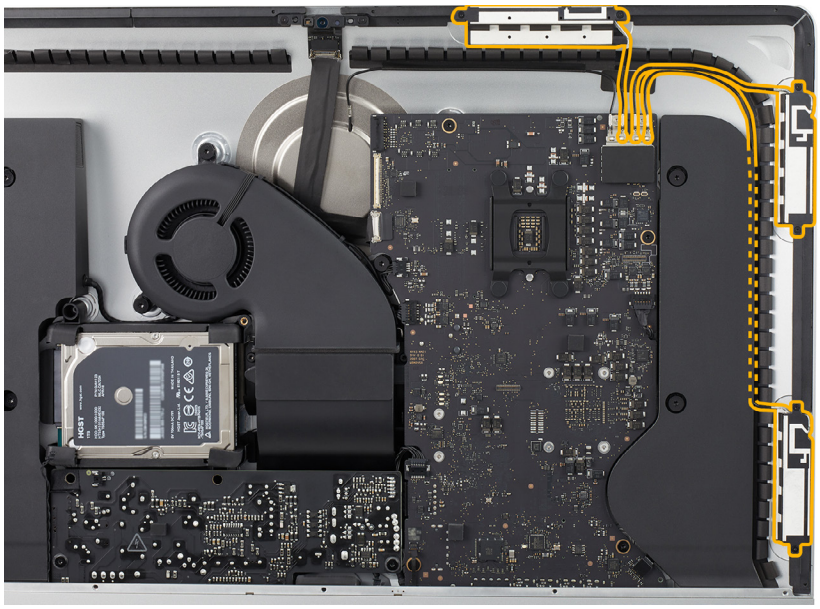
Reinstall the following parts to complete reassembly:

- Logic board
- Power supply
- Chin strap
- Hard drive
- Fan
- Display

Bluetooth and Wi-Fi Antennas

Remove the following part before you begin

- Display

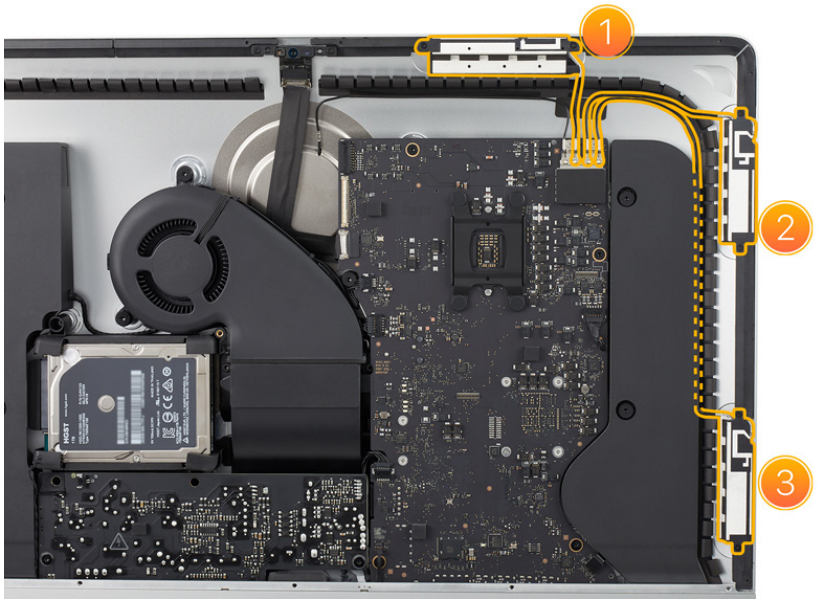


Tools

- ESD wrist strap
- Torx T4 screwdriver
- Torx T5 screwdriver
- Wireless card support tool
- Antenna tool
- Black stick

The procedure is the same for all three antennas. Refer to the following image to determine the location and cable routing of the antenna you intend to replace.

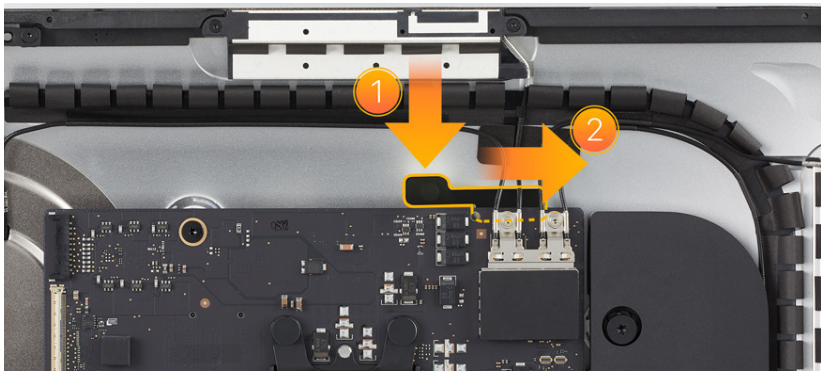
- Bluetooth antenna (1)
- Middle Wi-Fi antenna (2)
- Lower Wi-Fi antenna (3)



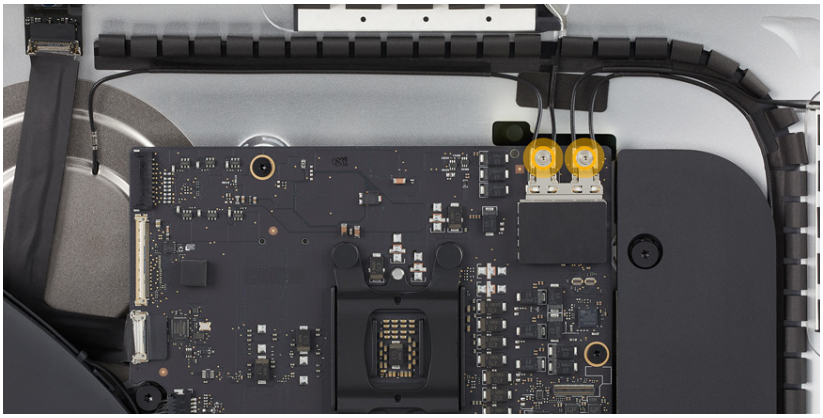
Steps for Removal

1. Hold the wireless card support tool by the handle, lower the tool so it rests on the edge of the logic board (1). Then slide the tool to the right behind the logic board near theantenna connectors (2).

   Note: Keep the wireless card support tool in position shown while removing or replacing screws and disconnecting or reconnecting antenna cables.



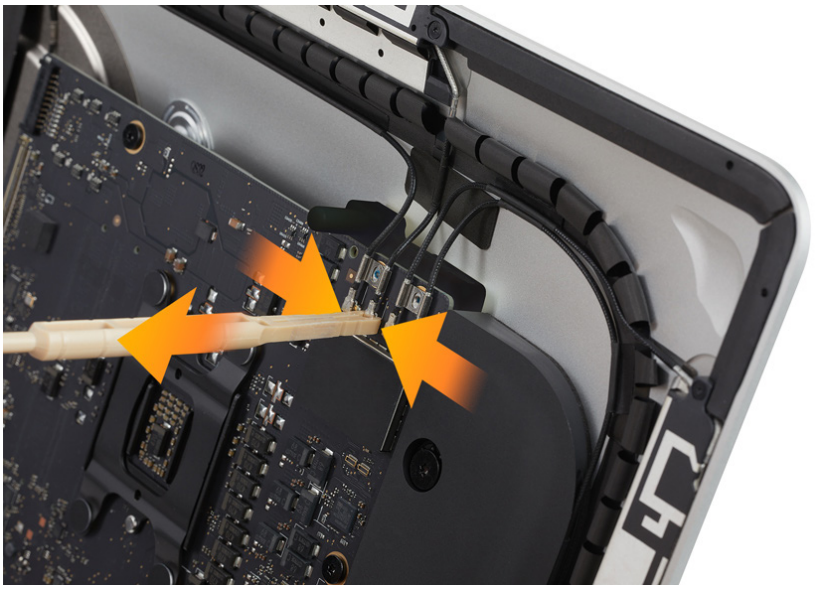
2. Remove the two T5 screws from the antenna cowling. Set the cowling aside for reuse.



3. Use the antenna tool to disconnect the connector from the logic board.

   Important

   Avoid using a metal tool, which could damage the cable.

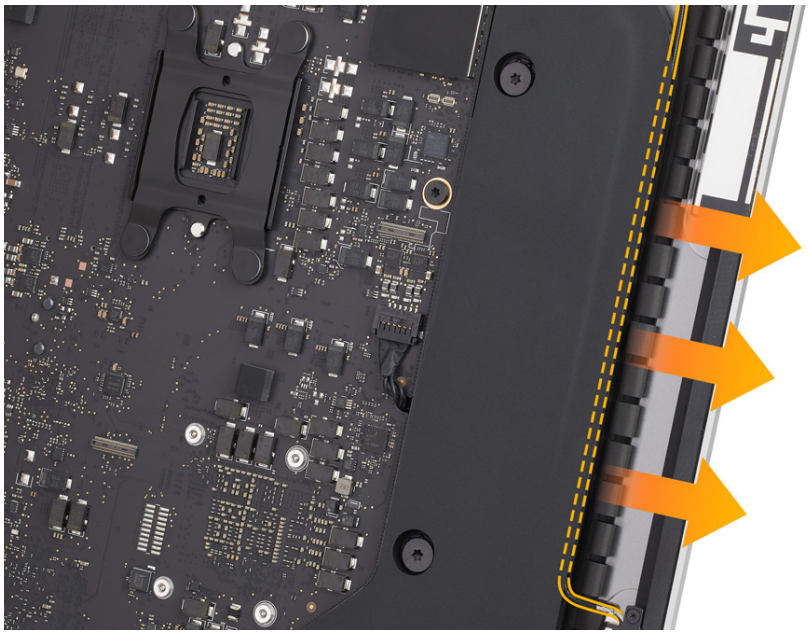


4. Use a black stick or your fingers to gently remove the antenna cable tape from the rear housing.

5. Remove the two T4 screws from the antenna.

6. Remove the antenna from the rear housing.

Note: If you are replacing the lower Wi-Fi antenna, remove the antenna cable from the channel in the right speaker.

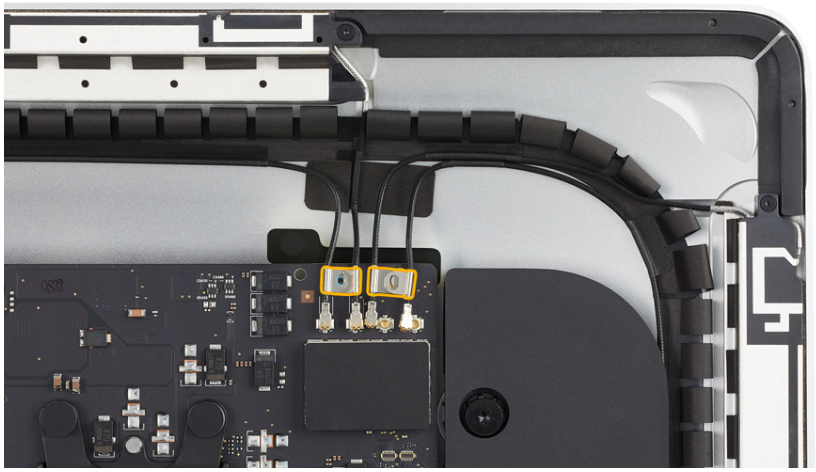


Steps for Reassembly

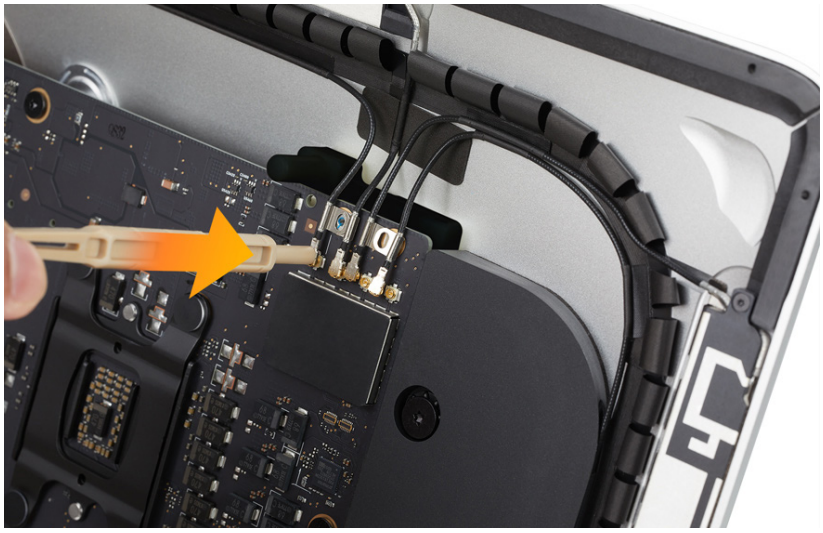
1. Reinstall the two T4 screws in the antenna.

2. Reroute the antenna cable to the antenna connectors on the logic board.

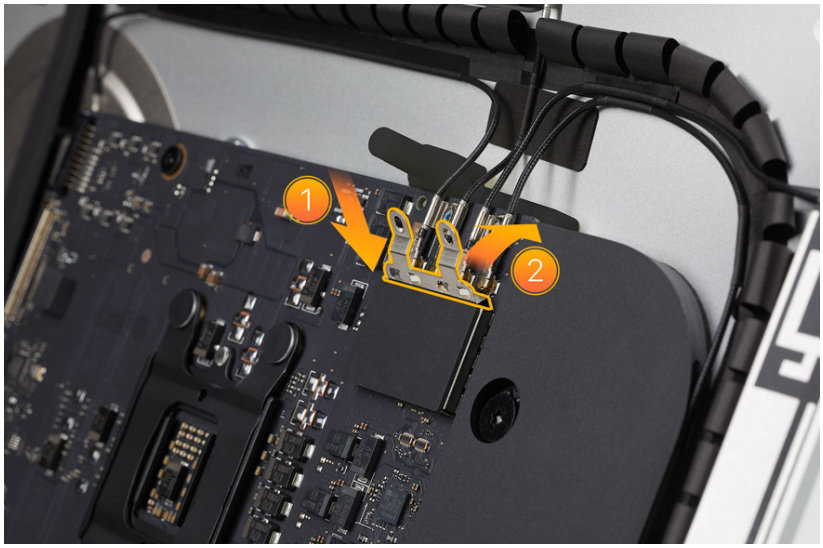
3. Align the bracket holes with the screw bosses on the logic board



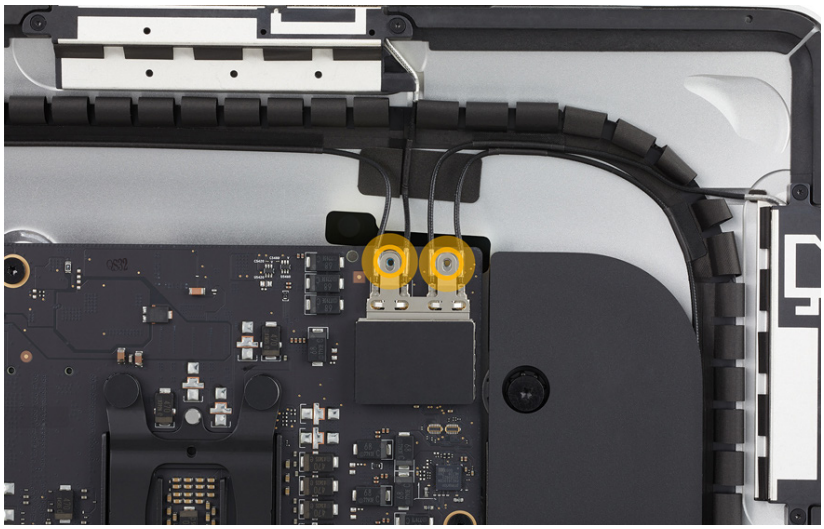
4. Use the blunt end of the antenna tool to reconnect the antenna to the logic board.



5. Reinstall the antenna cowling by engaging the teeth at an angle. Then position it over the antenna connectors.



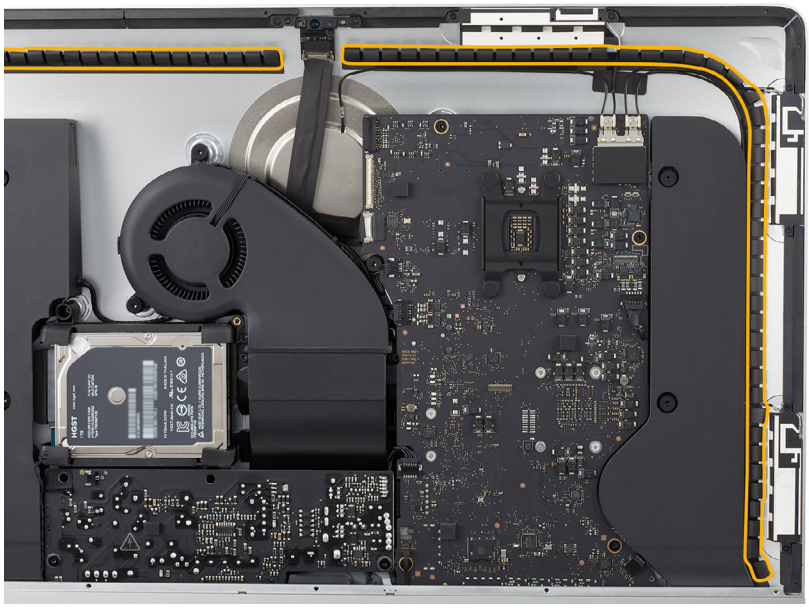
6. Reinstall the two T5 screws into the antenna cowling.



7. Remove the wireless card support tool from the rear housing.

8. If you replaced the lower Wi-Fi antenna, ensure the antenna cable is routed in the channel on the right speaker.

9. Use a black stick to open any flattened loops along the airloop gasket.



Reinstall the following part to complete reassembly:

- Display

Stand

Remove the following parts before you begin:

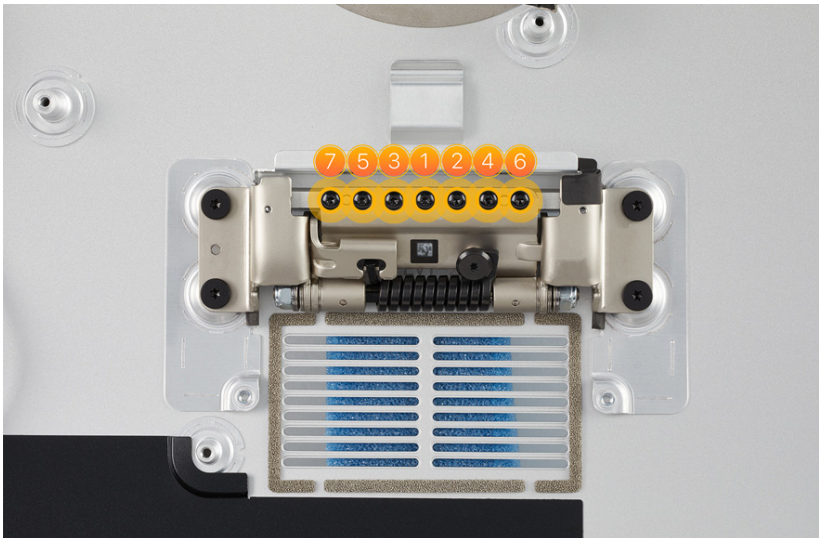
- Display
- Fan
- Hard drive
- Chin strap
- Power supply
- Logic board

Tools

- ESD wrist strap and mat
- Torx T8 screwdriver

Steps for Removal

1. Remove the seven T8 screws in the order shown.

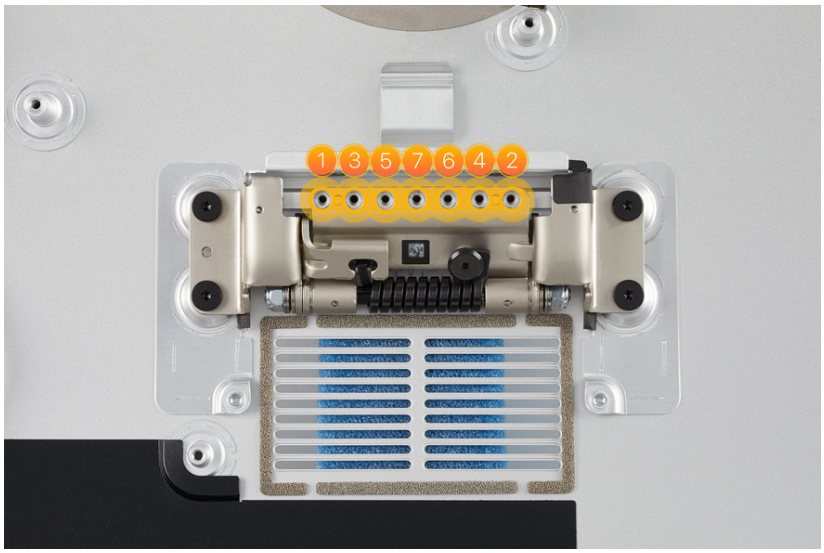


2. Lift the rear housing off of the stand.

Steps for Reassembly

1. Align the two pins on the stand with the pin holes on the mechanism.

2. Reinstall the seven T8 screws in the mechanism in the order shown.



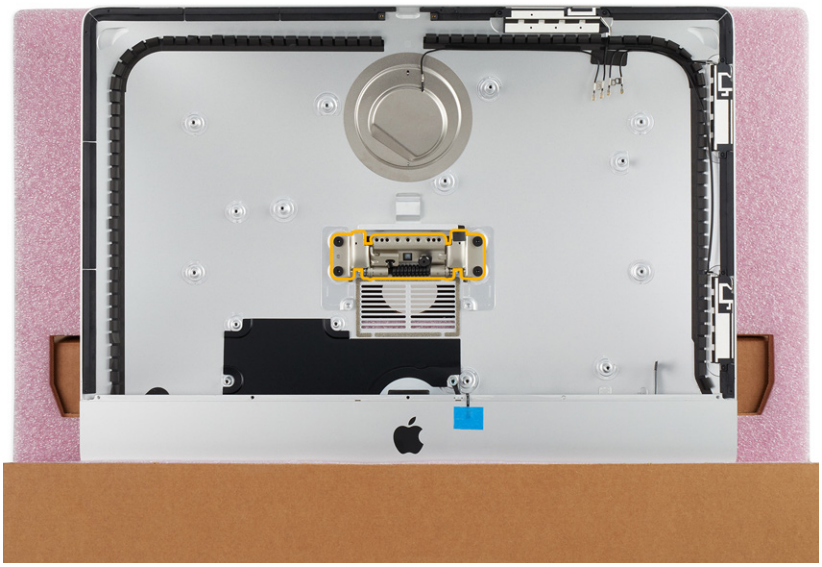
Reinstall the following parts to complete reassembly:

- Logic board
- Power supply
- Chin strap
- Hard drive
- Fan
- Display

Mechanism

Remove the following parts before you begin:

- Display
- Fan
- Left speaker
- Hard drive
- Chin strap
- Power supply
- Logic board
- Right speaker
- Stand



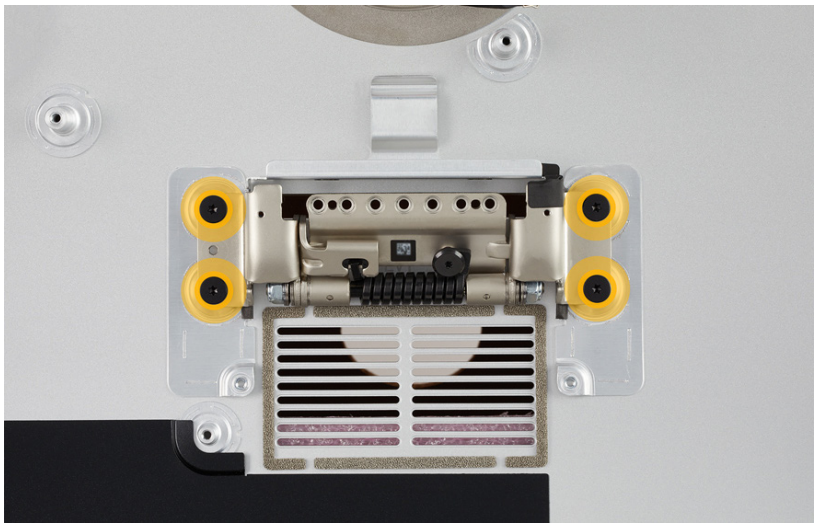
Tools

- ESD wrist strap and mat
- Torx T10 screwdriver
- Display support stand

Steps for Removal

1. Place the rear housing in the display support stand.

2. Remove the four T10 screws from the mechanism.



3. Peel the tape from the top right of the mechanism and save it for reuse.

4. Lift the mechanism off of the rear housing.

Steps for Reassembly

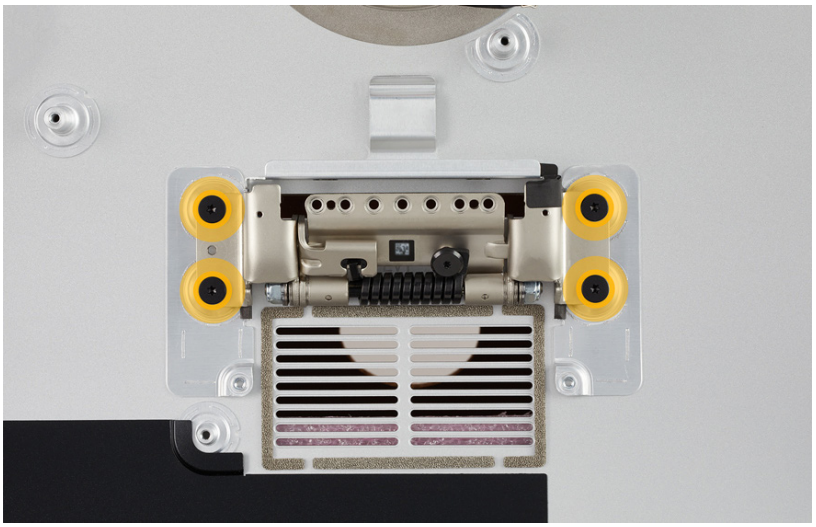
1. Position the mechanism in the rear housing.

2. Reapply the tape to the top right of the mechanism.

3. Reinstall the four T10 screws in the mechanism.

   Important

   Ensure that the mechanism is fully seated after tightening the screws to avoid hinge noise.



Reinstall the following parts to complete reassembly:

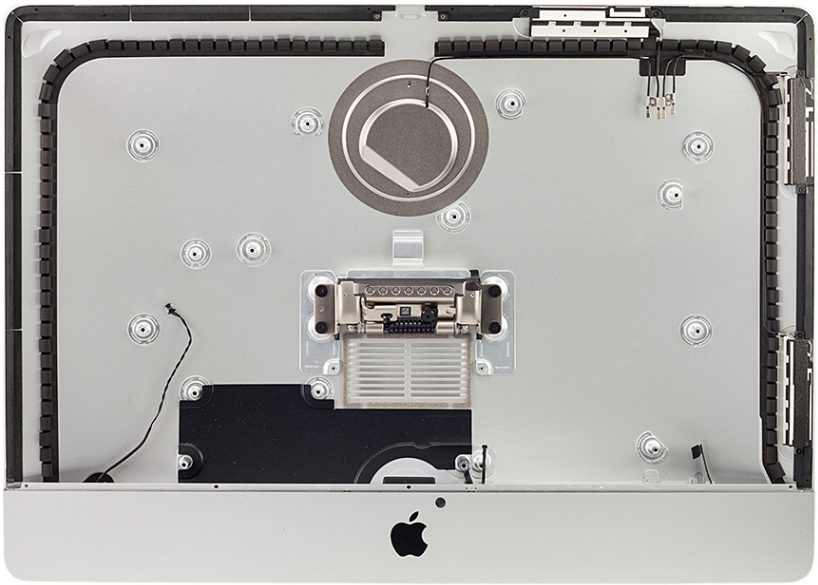
- Stand
- Right speaker
- Logic board
- Power supply
- Chin strap
- Hard drive
- Left speaker
- Fan

Rear Housing

Remove the following parts before you begin:

- Display
- Camera
- Fan
- Hard drive
- Left speaker
- Power supply
- Logic board
- Right speaker
- Chin strap
- Stand

Note: After you have removed the parts listed above, the rear housing is the only remaining part.



Tools

- ESD wrist strap and mat

The replacement rear housing includes the following removable parts, which are available separately:

- Mechanism
- Mechanism screws
- Bluetooth antenna (upper antenna)
- Wi-Fi antennas (middle and lower antennas)

The rear housing includes the following nonremoveable parts, which are not available separately:

- Wi-Fi antenna (in silver circle behind Apple logo)
- Microphone flex cable
- Power button and cable
- AC inlet
- Audio input jack and cable
- Airloop gasket

Caution

Always handle the rear housing with two hands: one hand on the lower left corner and one hand on the lower right corner. Mishandling the rear housing could bend the aluminum and cause alignment issues.

Reinstall the following parts to complete reassembly:

- Stand
- Right speaker
- Chin strap
- Logic board
- Power supply
- Left speaker
- Hard drive
- Fan
- Camera
- Display