



**Apple Watch Series 4 (GPS)**

**Apple Watch Series 4 (GPS + Cellular)**

**Apple Watch Series 5 (GPS)**

**Apple Watch Series 5 (GPS + Cellular)**

**Apple Watch Series 6 (GPS)**

**Apple Watch Series 6 (GPS + Cellular)**

**Apple Watch SE (GPS)**

**Apple Watch SE (GPS + Cellular)**

## **Apple Recycler Guide**

July 2022

# Contents

|    |   |
|----|---|
| 3  | <a href="#">About This Guide</a>                            |
| 4  | <a href="#">Identification</a>                              |
| 5  | <a href="#">Directive 2021/19/EU Annex VII Components</a>   |
| 6  | <a href="#">Safety Considerations</a>                       |
| 7  | <a href="#">Recommended Tools</a>                           |
| 8  | <a href="#">Disassembly Instructions</a>                    |
| 22 | <a href="#">Material Categorization of Output Fractions</a> |

# About This Guide

Apple Recycler Guides provide guidance for electronics recyclers on how to disassemble products to maximize recovery of resources. The guides provide step-by-step disassembly instructions and information on the material composition to help recyclers direct fractions to the appropriate material recycler.

To conserve important resources, we work to reduce the materials we use and aim to one day source only recycled or renewable materials in our products. A key path to reaching that goal is resource recovery from end-of-life electronics.

Disassembly procedures are intended to be performed only by trained electronics recycling professionals. The recycler is responsible for independently evaluating and ensuring compliance with all applicable environmental, health, and safety laws related to the work. These include but are not limited to laws relating to the management, handling, shipping, and disposal of the outputs of this work as waste and laws in place to ensure the health and safety of all employees who support this work.

For questions or feedback about this guide, email [contactesci@apple.com](mailto:contactesci@apple.com).

**Note:** The enclosures for the Apple Watch models in this guide may be aluminum, stainless steel, titanium, or ceramic. This guide was created using Apple Watch Series 5 with an aluminum enclosure, but the procedures are the same for each model and enclosure material.

# Identification

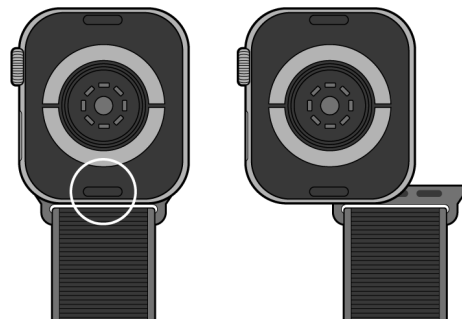
You can find the model number on the band slot of the Apple Watch.



*Model numbers:*

*A1975, A1976, A1977, A1978, A2007, A2008, A2092, A2093, A2094, A2095, A2156, A2157, A2291, A2292, A2293, A2294, A2351, A2352, A2353, A2354, A2355, A2356, A2375, A2376*

If the band is attached, press and hold the band release button, then slide the band across to remove it.



# Directive 2012/19/EU Annex VII Components

Directive 2012/19/EU Annex VII requirements apply to the following substances and components.

| <b>Substance/Component</b>  | <b>Location</b>                       | <b>Removal Instructions</b> |
|---|---------------------------------------|-----------------------------|
| Printed circuit board if the surface is greater than 10 square centimeters  | Main logic board, display logic board | Follow steps 1–13           |
| External electric cables  | Power adapter                         | Follow step 1               |
| Battery   | Apple Watch enclosure                 | Follow steps 1–5            |
| Cover glass and organic light-emitting diode (OLED) display if the surface is greater than 100 square centimeters | OLED display                          | Follow steps 1–3            |
| No further substances or components as listed in Annex VII  |                                       |                             |

# Safety Considerations

The recycler is responsible for independently evaluating all activities undertaken by its employees to perform or support the work and ensuring compliance with all applicable health and safety laws related to the work. These include but are not limited to laws relating to the health and safety of all employees who perform or support this work. The recycler is also responsible for evaluating the workspace and ensuring that the area in which the work is to be undertaken is designed using ergonomic best practices and meets all ergonomic requirements to ensure the protection of its employees.

Certain enclosure metals, such as titanium, if shredded together in quantity and to a small particle size (where the particles become finely divided), are capable of igniting spontaneously on exposure to air, can create sparks during shredding, and can be potentially reactive with water or humid air under certain conditions. Develop and apply preventative measures to store in properly rated/designed non-flammable containers to minimize the potential for an event to occur. Evaluate potential for emergency situations and ensure proper plans and materials are available to respond if an event were to occur. Ensure an adequate dust collection system is in place which has been designed for the specific combustibility hazard and to minimize airborne concentrations. Avoid using water or halogenated extinguishing agents for fire extinguishing, as exposure could introduce additional hazards.

## Personal Protective Equipment

Personal protective equipment should be worn during the entire recycling process.



Wear hand protection



Wear foot protection



Wear eye protection



Wear a mask



Wear protective clothing

## Battery Safety

This product uses a lithium-ion polymer battery. Follow these steps for safe removal and disposal of the battery:

- Discharge the battery to less than 25 percent before beginning any disassembly. Thermal runaway is less likely to occur in a discharged battery.
- Remove anything from your person that could conduct energy, such as jewelry and watches, to avoid electric shock to yourself or the logic board.
- To avoid the potential for thermal runaway and the release of potentially noxious fumes, don't puncture, strike, or crush lithium-ion polymer batteries or devices powered by them.
- Don't throw, drop, or bend the battery.

- Don't expose the battery to excessive heat or sunlight.
- Use only tools that are not sharp and do not conduct electricity.
- Keep your workspace clear of foreign objects and sharp materials.
- Dispose of batteries according to local environmental laws and guidelines.

### Workspace safety guidelines

- Use heat-resistant gloves and safety glasses.
- Keep a sand dispenser within arm's reach (2 feet or 0.6 m) on either side of the workstation, not above the workstation. The dispenser should be a wide-mouthed, quick-pour metal container with a flip-top lid or tray that contains 8–10 cups (1.9–2.4 L) of clean, dry, untreated sand.
- Keep the battery at least 2 feet (0.6 m) from paper and other combustible materials.
- Work in an area with adequate ventilation.

### Handling a thermal runaway

If you notice any of the following signs, a thermal runaway is likely underway, and you should act immediately:

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

**Don't** use water or an ABC/CO<sub>2</sub> fire extinguisher on a thermal runaway battery or a device containing one. Water and ABC/CO<sub>2</sub> fire extinguishers will not stop the reaction.

**Do** smother the battery or device immediately with plenty of clean, dry sand, dumped all at once. Timing is critical; the faster you pour all the sand, the faster the thermal runaway will stop.

**Do** leave the room for 30 minutes if the thermal runaway causes any irritation.

**Do** wait 30 minutes before touching the battery. Wear heat-resistant gloves and safety glasses to remove the battery from the sand, or use a touchless thermometer to measure the battery temperature. Only touch the battery when the event has finished.

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

## OLED Safety

Broken OLEDs must be handled properly to ensure the safety of your employees and mitigate any hazards. Package broken OLEDs in an appropriate container to properly manage the hazards associated with the materials and store only with compatible materials. All waste must be properly classified, packaged, and labeled in accordance with all relevant laws and regulations.

## Hazard Warnings



Broken glass hazard



Rechargeable battery hazard

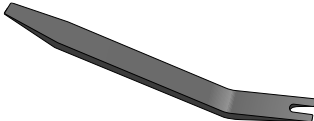


Chemical inhalation hazard

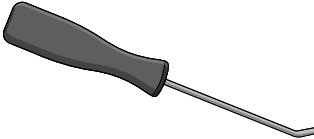


# Recommended Tools

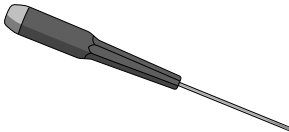
Miniature plastic pry bar



Miniature pry bar



Precision slotted screwdriver



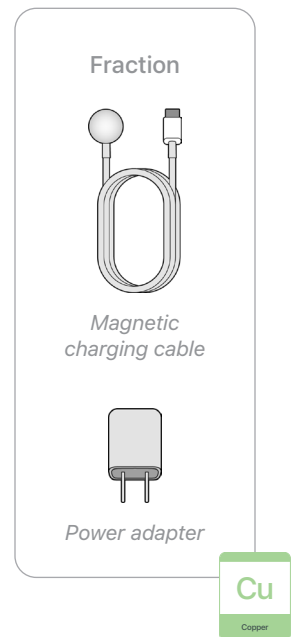
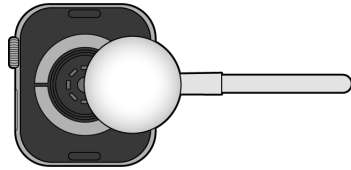
Precision tri-wing screwdriver



# Disassembly Instructions

## 1. Remove the power adapter and the magnetic charging cable.

- » *Turn off the Apple Watch.*
- » *Unplug the power adapter. Disconnect both ends of the magnetic charging cable.*



## 2. Remove the display.

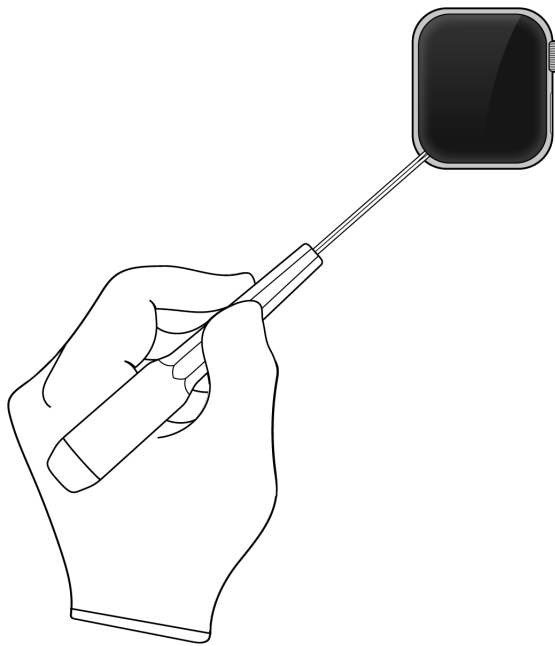


Broken glass hazard



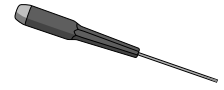
Chemical inhalation hazard

- » *Hold the Apple Watch at the edge of a counter with the display facing up.*
- » *Insert the tool tip between the display and the enclosure. Push the handle down to pry the display from the enclosure.*



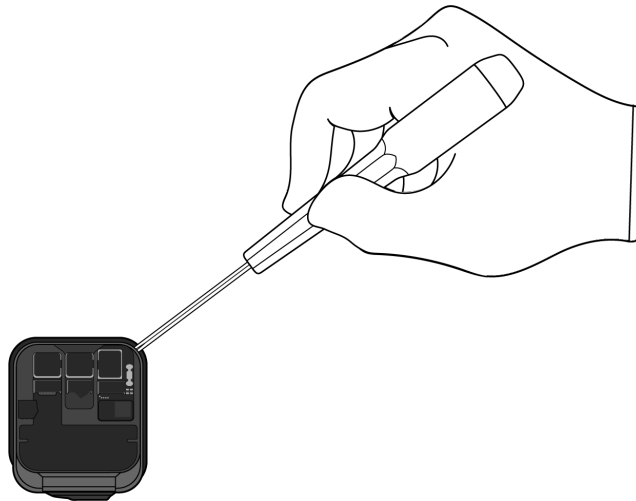
- » *Remove the display by hand. Set the enclosure aside.*

### Tools Used

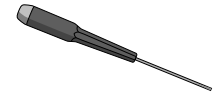


### 3. Remove the display logic board.

- » Lay the display facedown.
- » Pry off the display logic board.



#### Tools Used



#### Fraction



Display logic board

PMs  
Precious  
Metals

#### Fraction

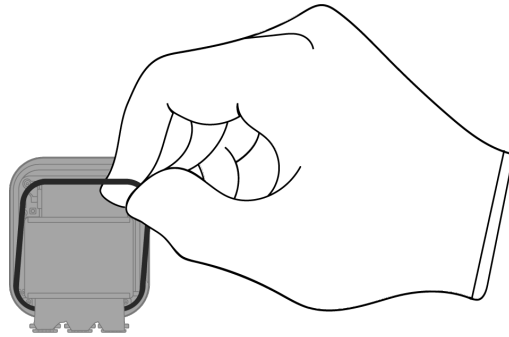


OLED display

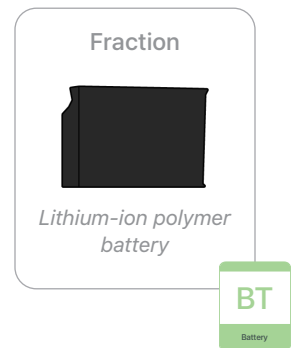
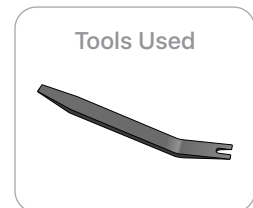
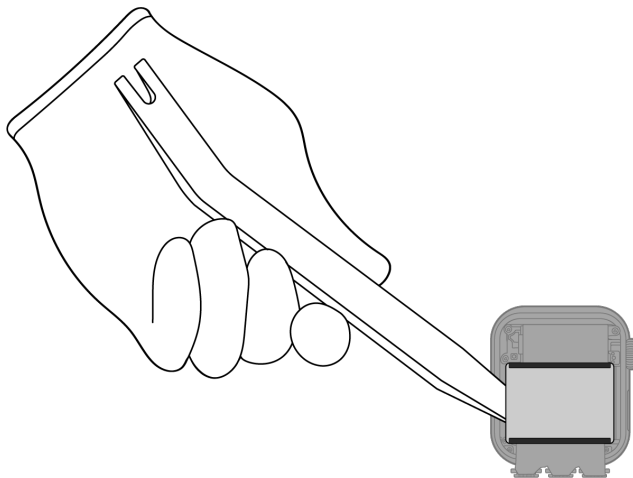
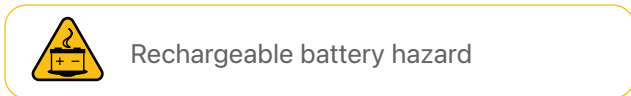
GL

Glass

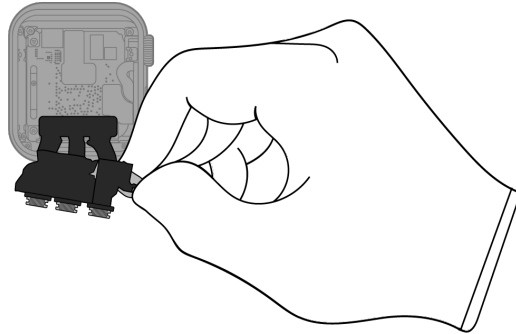
4. From the enclosure, remove the Force Touch gasket by hand.



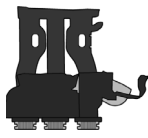
5. Carefully remove the lithium-ion polymer battery.



6. Pull off the display ribbon cable by hand.



Fraction

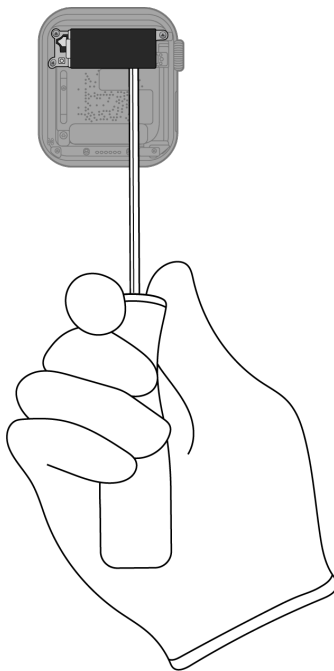


Ribbon cable


**Cu**  
Copper

A rounded rectangular box containing the text 'Fraction' at the top, an icon of a ribbon cable in the center, and the text 'Ribbon cable' below the icon. To the right of this box is a small green square with 'Cu' in white and 'Copper' in small text below it.


7. Pry off the Taptic Engine.



Tools Used

A simple line drawing of a screwdriver with a dark handle and a metal shaft.

Fraction

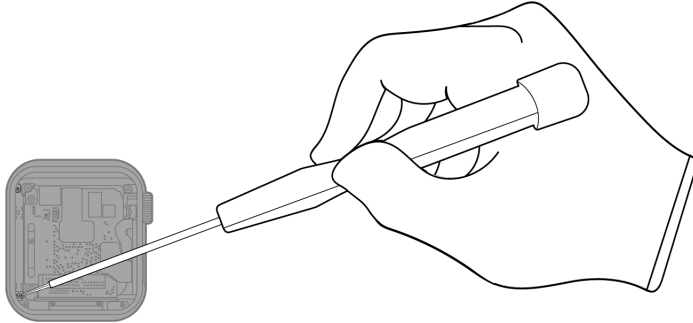
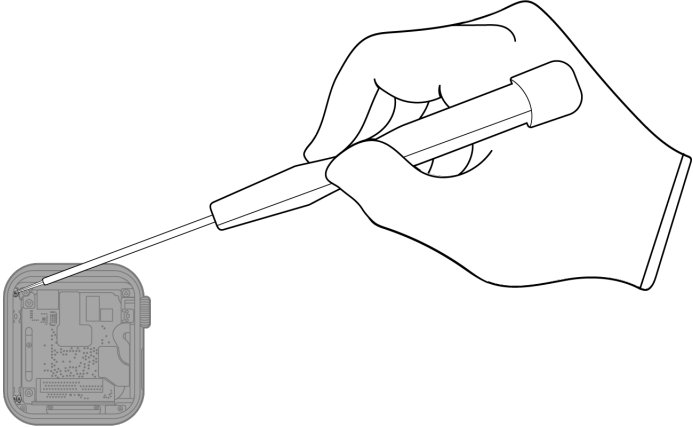


Taptic Engine

**REE**  
Rare Earth Elements

A rounded rectangular box containing the text 'Fraction' at the top, an icon of a Taptic Engine in the center, and the text 'Taptic Engine' below the icon. To the right of this box is a small green square with 'REE' in white and 'Rare Earth Elements' in small text below it.

8. Unscrew the three fasteners from the speaker.



Tools Used



Fraction

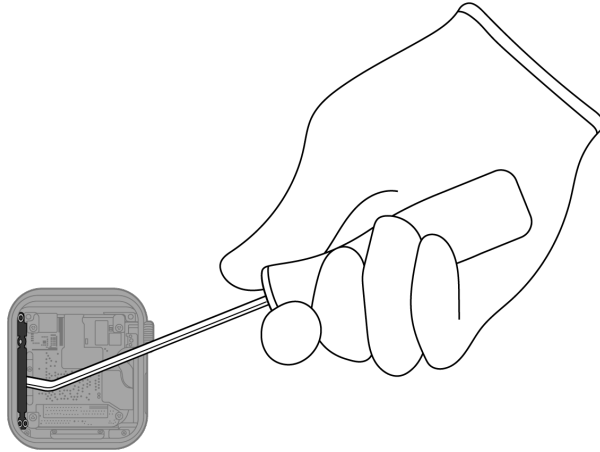


Fasteners (x3)

Fe

Ferrous

**9.** Pry off the speaker.



Tools Used



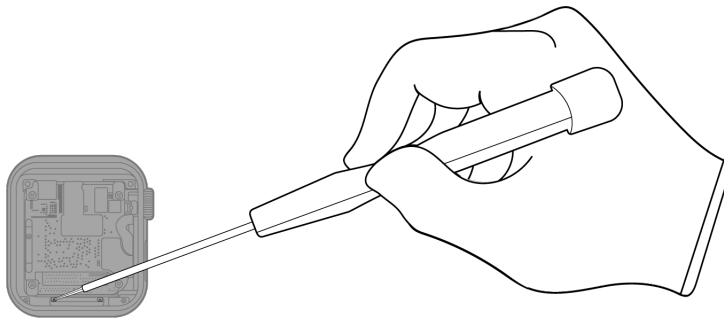
Fraction



Speaker

REE  
Rare Earth  
Elements

**10.** Unscrew the two fasteners from the ribbon cable assembly.



Tools Used



Fraction

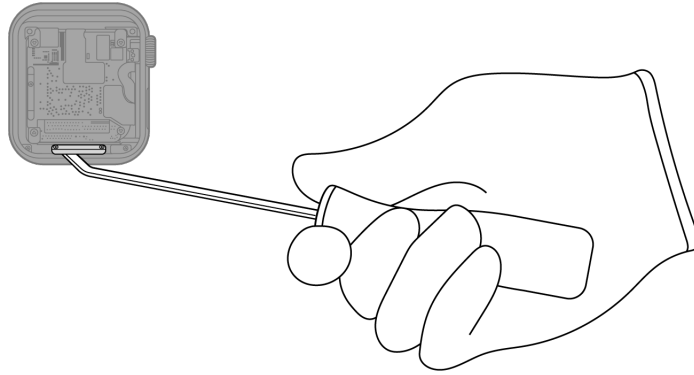


Fasteners (x2)

Fe  
Ferrous



**11.** Pry off the ribbon cable assembly.



Tools Used



Fraction

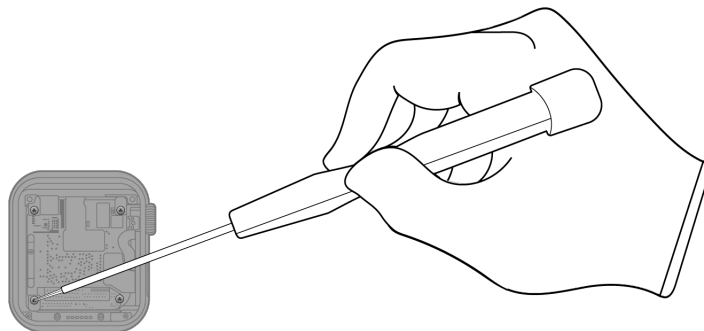


Ribbon cable

Cu

Copper

**12.** Remove the main logic board brackets by unscrewing the four fasteners.



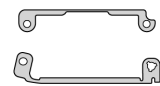
Tools Used



Fraction



Fasteners (x4)

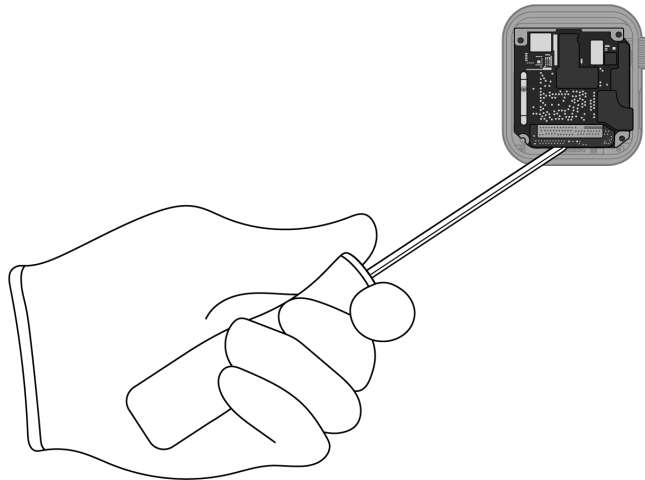


Main logic board brackets

Fe

Ferrous

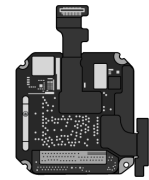
### 13. Pry off the main logic board.



#### Tools Used



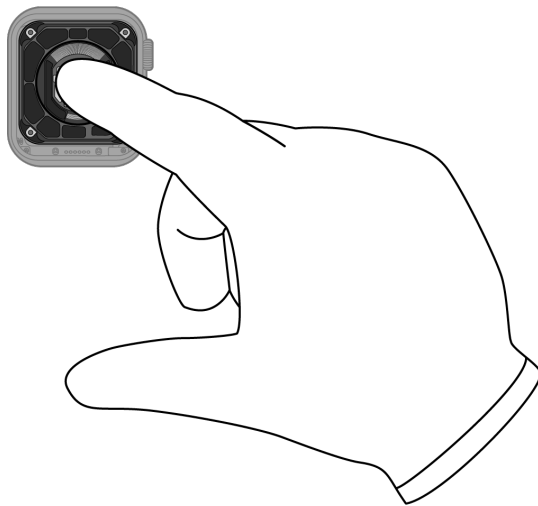
#### Fraction



Main logic board

**PMs**  
Precious  
Metals

### 14. Push out the sensor array by hand.



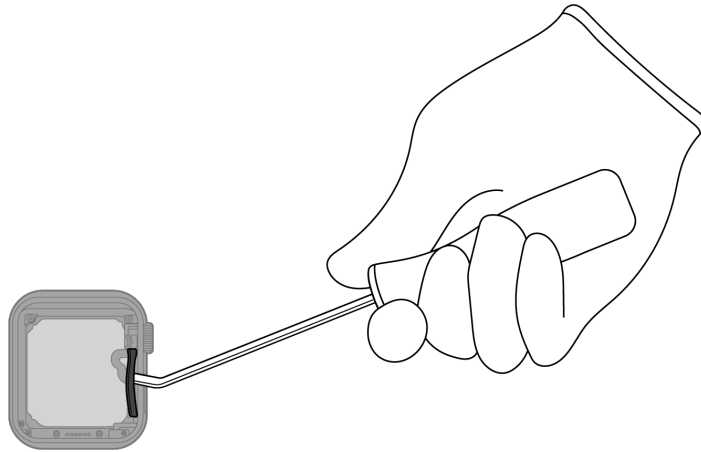
#### Fraction



Sensor array

**Cu**  
Copper

**15.** Pry off the microphone cover.



Tools Used



Fraction

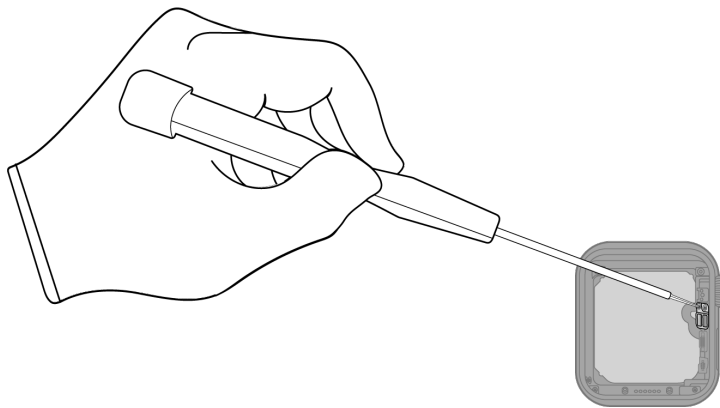


Microphone cover

Fe

Ferrous

**16.** Unscrew the two fasteners from the microphone bracket.



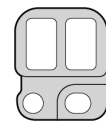
Tools Used



Fraction



Fasteners (x2)

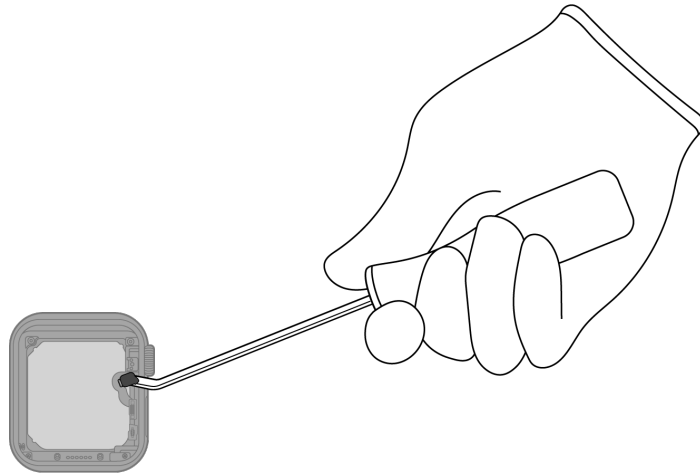


Microphone bracket

Fe

Ferrous

**17.** Pry off the microphone.



Tools Used



Fraction

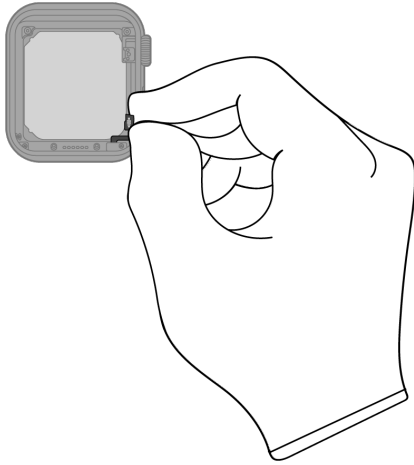
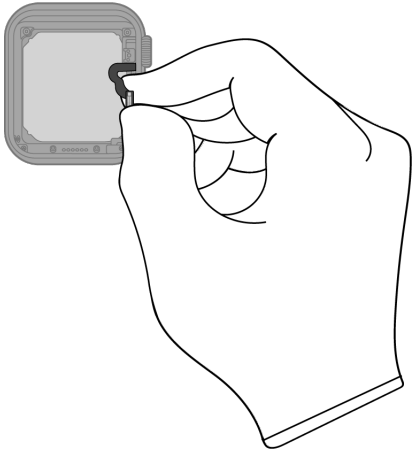


Microphone


Cu

Copper

**18.** Remove the ribbon cables by hand.



Fraction




Ribbon cables

**Cu**  
Copper

A diagram showing three different types of ribbon cables. Below the cables is a green box with the chemical symbol 'Cu' and the word 'Copper' underneath.

Fraction






Enclosure



**Al**  
Aluminum

A diagram showing a single icon of the Apple Watch enclosure. Below the enclosure is a green box with the chemical symbol 'Al' and the word 'Aluminum' underneath.

# Material Categorization of Output Fractions

All outputs from this process must be managed, handled, and disposed of in accordance with applicable waste laws and regulations, including but not limited to the Waste Framework Directive and its national enactments in Europe.

| Fraction  | Downstream Processing  |
|---|--|
| <p data-bbox="435 604 570 632"><b>Aluminum</b></p>  <p data-bbox="451 856 553 877"><i>Enclosure</i></p> <p data-bbox="201 921 802 1045"><b>Note:</b> Depending on the material, the enclosure may be processed as aluminum, titanium, ferrous (stainless steel enclosures), or mixed electronics (ceramic enclosures).</p> | <p data-bbox="964 604 1276 632"><b>Primary Target Material</b></p>  <p data-bbox="925 831 1313 858"><b>Potential Additional Materials</b></p>  |

|   |  |
|---|--|
| <p data-bbox="440 1142 565 1169"><b>Batteries</b></p>  <p data-bbox="367 1333 634 1354"><i>Lithium-ion polymer battery</i></p> | <p data-bbox="964 1142 1276 1169"><b>Primary Target Material</b></p>  |
|---|--|

| Fraction | Downstream Processing |
|----------|-----------------------|
|----------|-----------------------|

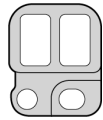
**Ferrous**



*Fasteners (x11)*



*Main logic board brackets*



*Microphone bracket*



*Microphone cover*

**Primary Target Material**



**Glass**



*OLED display*

**Primary Target Material**



**Potential Additional Materials**



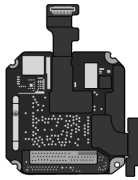
**Fraction**

**Downstream Processing**

**Logic Boards**



*Display logic board*



*Main logic board*

**Primary Target Material**



**Potential Additional Materials**

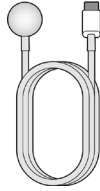




**Fraction**

**Downstream Processing**

**Mixed Electronics**



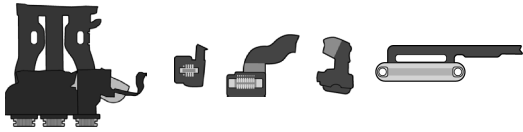
*Magnetic charging cable*



*Power adapter*



*Force Touch gasket*



*Ribbon cables*



*Sensor array*



*Microphone*

**Primary Target Material**



**Potential Additional Materials**



**Fraction**

**Downstream Processing**

**Rare Earth Magnets**



*Taptic Engine*



*Speaker*

**Primary Target Material**



**Potential Additional Materials**

