



**MacBook Pro (13-inch, 2016, Four Thunderbolt 3 ports)**

**MacBook Pro (13-inch, 2017, Four Thunderbolt 3 ports)**

**MacBook Pro (13-inch, 2018, Four Thunderbolt 3 ports)**

**MacBook Pro (13-inch, 2019, Four Thunderbolt 3 ports)**

**MacBook Pro (13-inch, 2020, Four Thunderbolt 3 ports)**

## Apple Recycler Guide

July 2023

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# 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:** This guide may show images from other similar models, but the procedures are the same.

# Identification

You can find the model number printed on the underside of the MacBook Pro, near the regulatory markings.



*Model numbers:*  
A1706, A1989, A2251

# Directive 2012/19/EU Annex VII Components

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

Substance/Component	Apple Part Name	Removal Instructions
Printed circuit board if the surface is greater than 10 square centimeters	Main logic board, trackpad, keyboard, data board assembly, camera with logic board, light-emitting diode (LED) logic board	Follow steps 1–18
External electric cables	Power adapter, charge cable	Follow step 1
Battery	Lithium-ion polymer batteries	Follow steps 1–3
Cover glass and liquid crystal display (LCD) cell if the surface is greater than 100 square centimeters	LCD cell	Follow steps 1–15
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.

## Personal Protective Equipment

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



Wear hand protection



Wear a mask



Wear eye protection



Wear foot protection



Wear protective clothing

## Battery Safety

This product uses a lithium-ion polymer battery. Before beginning any disassembly work, ensure that a safe working procedure for handling lithium-ion batteries has been established, which could include discharging the batteries so that they can be more safely managed. The following considerations may also be included:

- 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 thermal runaway and the release of 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.
- Don't use tools that are sharp or 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 one 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.

## LED Safety

Broken light-emitting diodes (LEDs) must be handled properly to ensure the safety of your employees and mitigate any hazards. Package broken LEDs 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



Sharp edges—cut hazard



Chemical inhalation hazard



Chemical exposure hazard



Rechargeable battery hazard

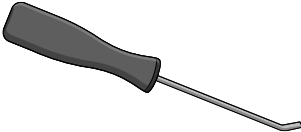


Broken glass hazard

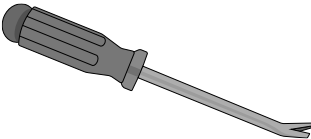


# Recommended Tools

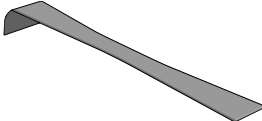
Miniature pry bar



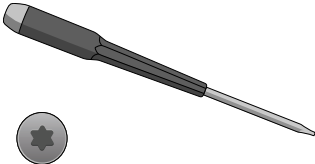
Nail-pulling screwdriver



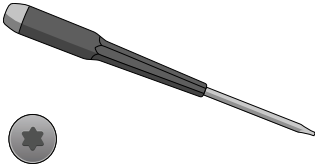
Plastic flat-surface scraper



Torx T2 screwdriver



Torx T5 screwdriver



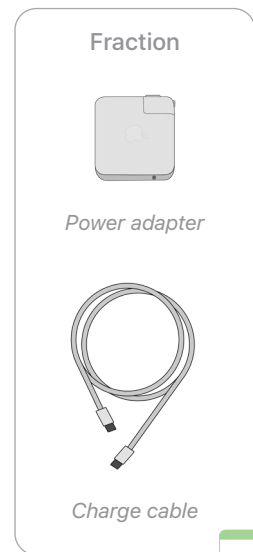
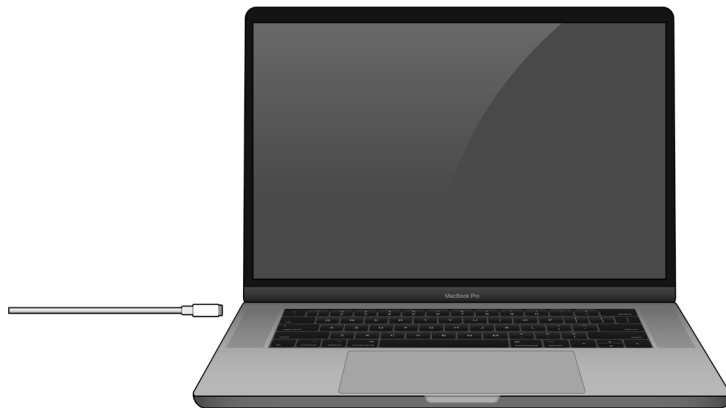
# Disassembly Instructions

## 1. Remove the power adapter and the charge cable.

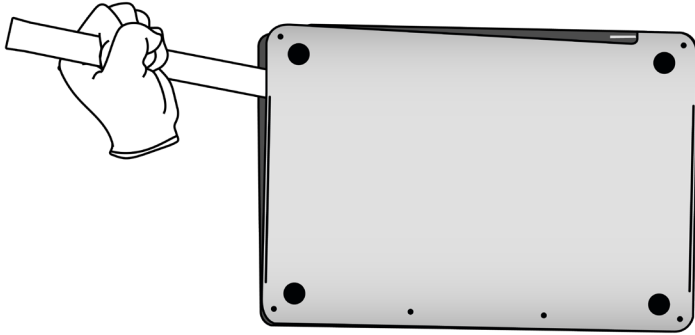
» *Ensure that the MacBook Pro is turned off.*



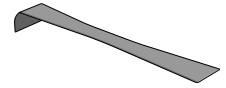
» *Unplug and remove the power adapter and the charge cable.*



2. Pry off the bottom case.



Tools Used



Fraction



Bottom case

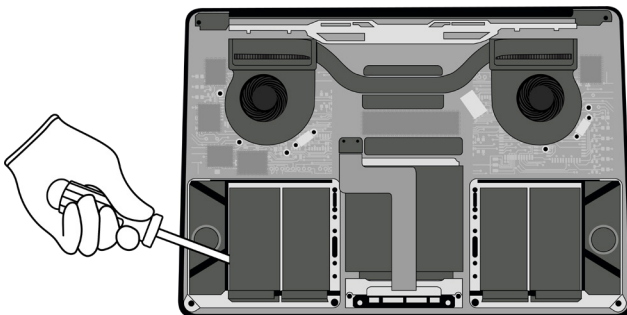
Al

Aluminum

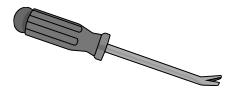
3. From the top case, carefully remove the five lithium-ion polymer batteries.



Rechargeable battery hazard



Tools Used



Fraction

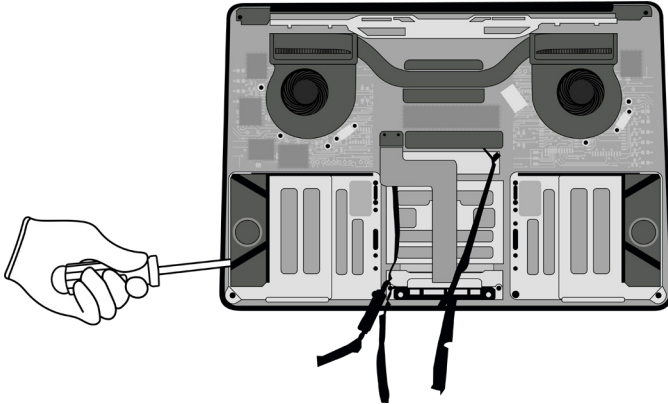


Lithium-ion polymer batteries

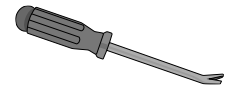
BT

Battery

4. Pry off both speakers.



Tools Used



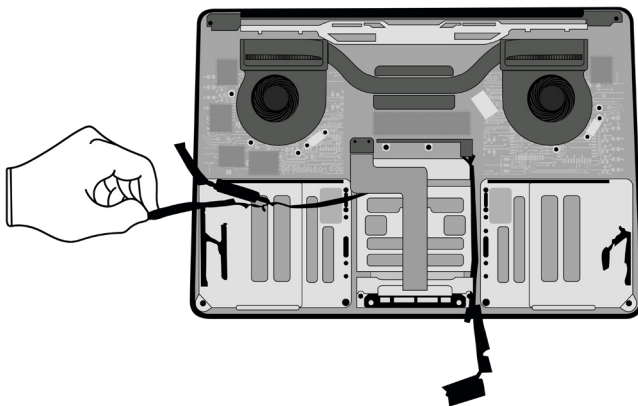
Fraction



Speakers

REE  
Rare Earth  
Elements

5. Pull off the ribbon cables.



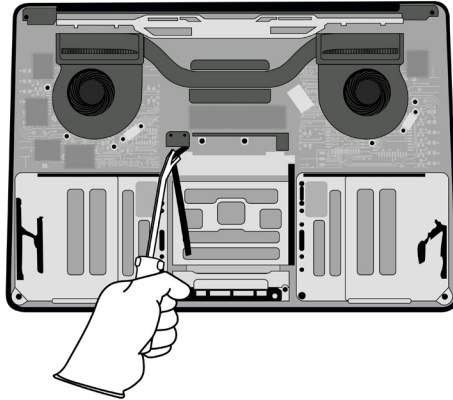
Fraction



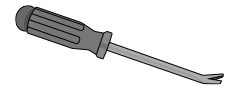
Ribbon cables

Cu  
Copper

6. Pry off the battery brackets.



Tools Used



Fraction

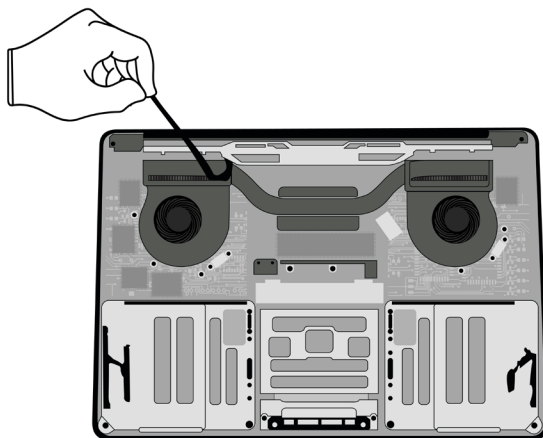


Battery brackets

PL

Plastics

7. Pull off the thermal ducts.



Fraction

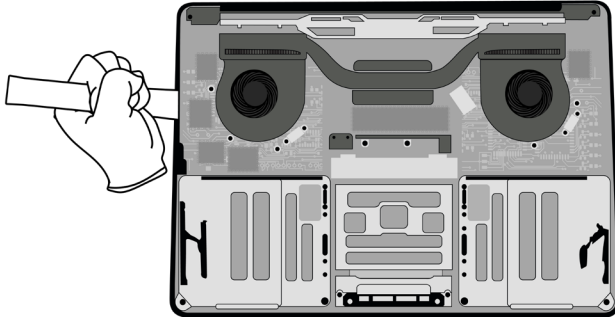


Thermal ducts

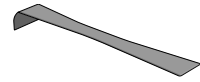
PL

Plastics

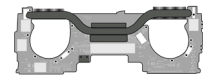
8. Pry off the main logic board.



Tools Used



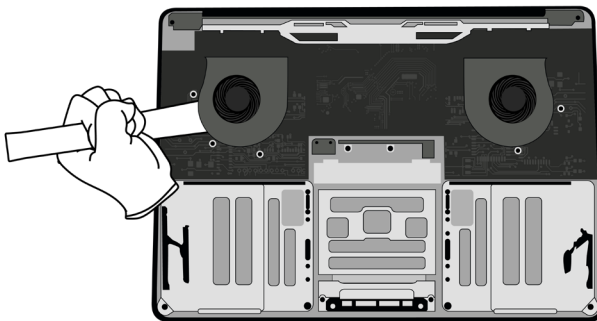
Fraction



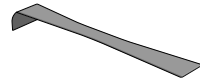
Main logic board

PMs  
Precious Metals

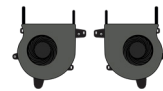
9. Pry off both fans.



Tools Used



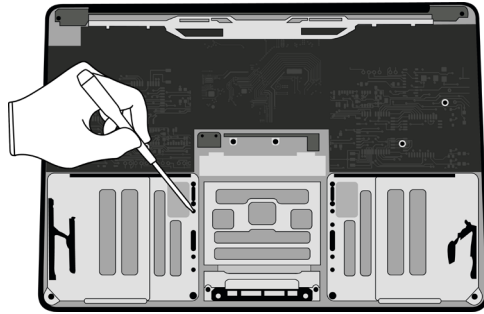
Fraction



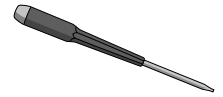
Fans

Cu  
Copper

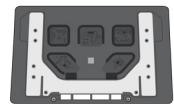
**10.** Remove the trackpad by unscrewing the 10 Torx T5 fasteners.



Tools Used



Fraction



Trackpad

PMs

Precious Metals

Fraction

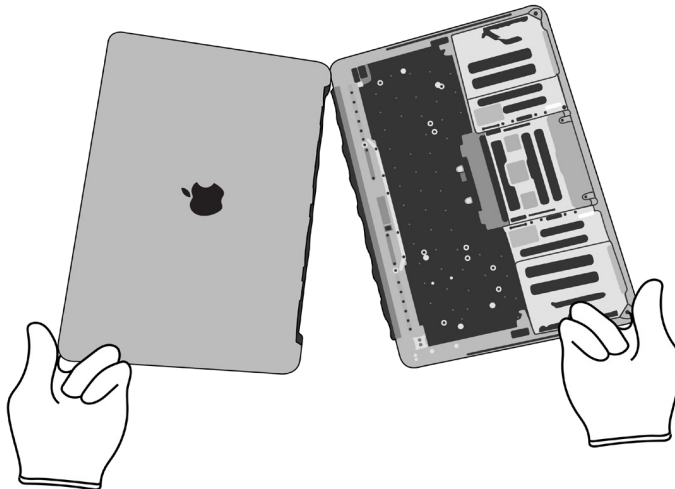
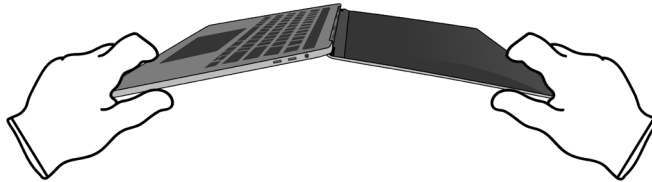


Fasteners (x10)

Fe

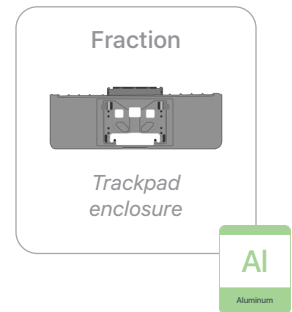
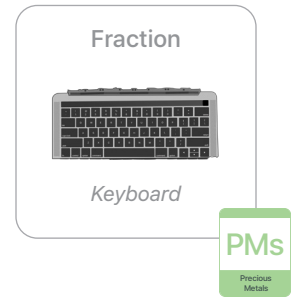
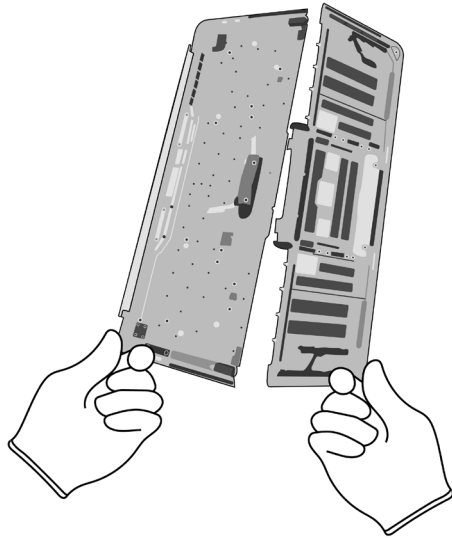
Ferrous

11. Separate the display and top case by bending them back and forth at the hinge until they break in two. Set the display aside.

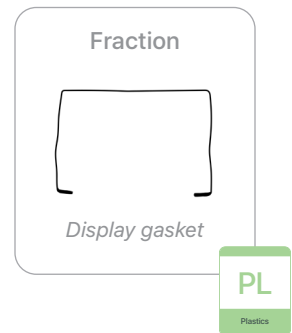
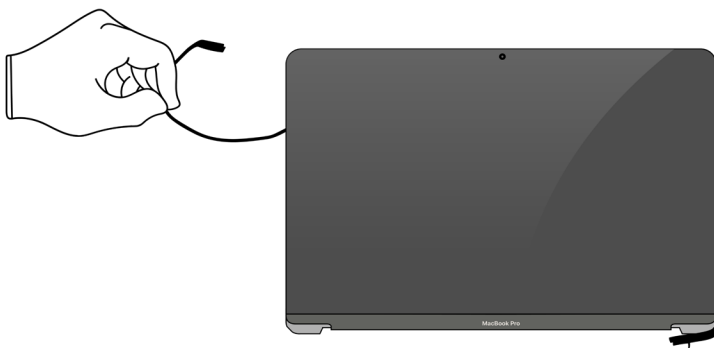





- 12.** Separate the keyboard from the trackpad enclosure by snapping the top case in half.




- 13.** On the display, pull off the display gasket.



**14.** Pry the display films away from the LCD cell and data board assembly.

 Broken glass hazard

 Chemical exposure hazard

Tools Used

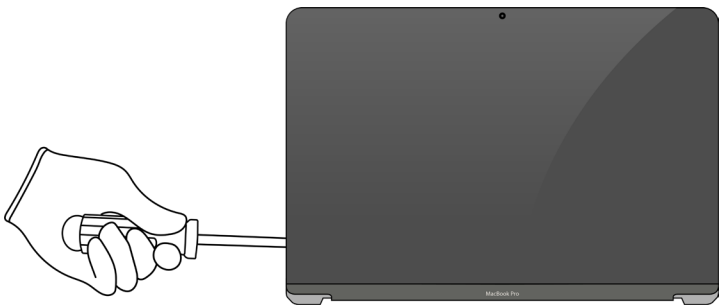


Fraction

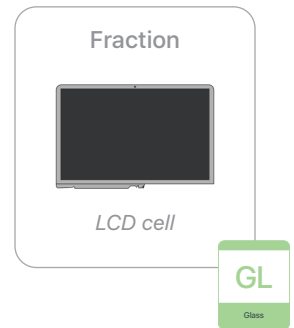
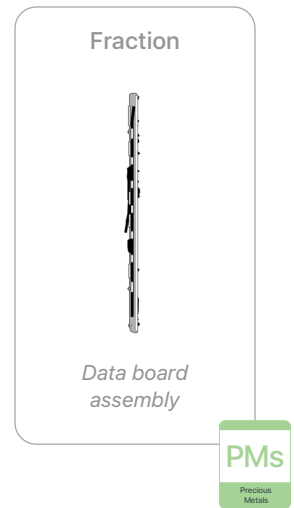
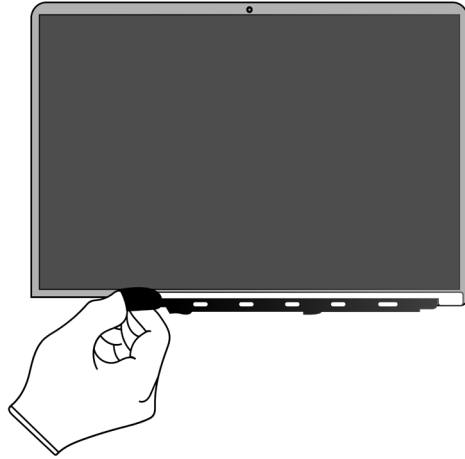


Display films

PL  
Plastics

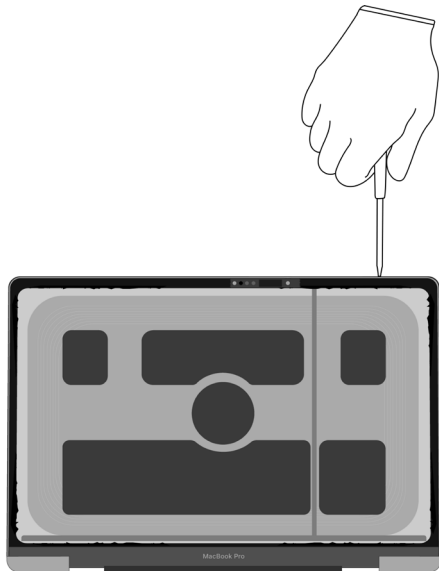
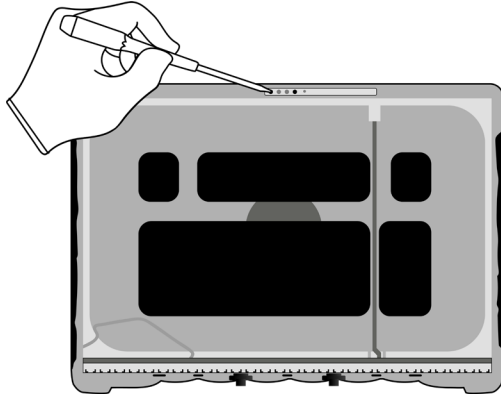


**15.** Pull the data board assembly off the LCD cell.

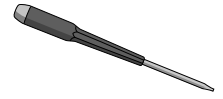


## 16. Remove the camera with logic board.

- » *Unscrew the three Torx T2 screws holding the camera with logic board to the display.*



### Tools Used



### Fraction



Fasteners

Fe

Ferrous

### Fraction

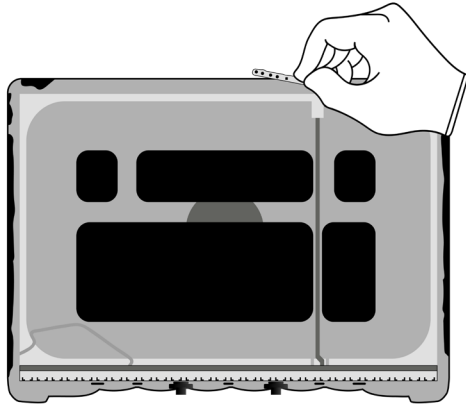


Camera with logic board

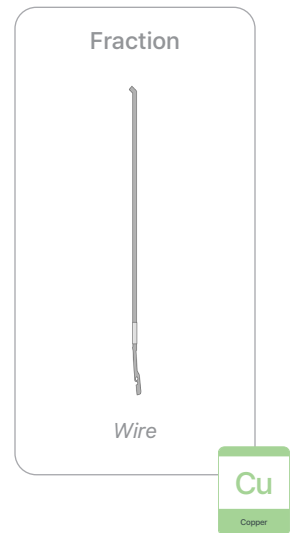
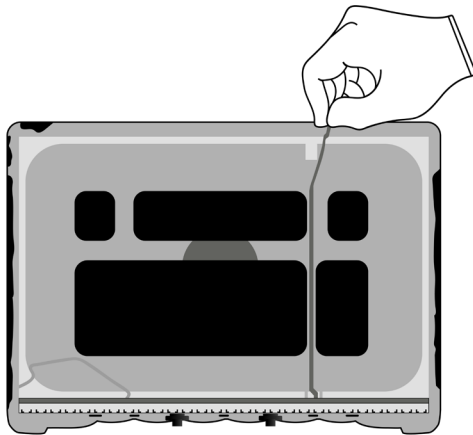
PMs

Precious Metals

» Disconnect the wire from the camera by hand.



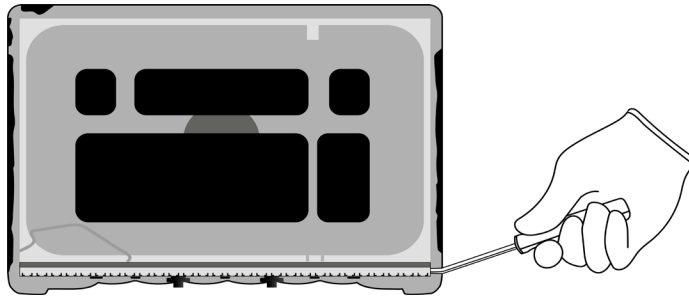
**17.** Remove the wire leading to the LED logic board.



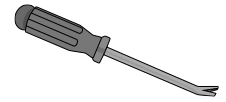
## 18. Pry off the LED logic board.



Chemical inhalation hazard



### Tools Used



### Fraction

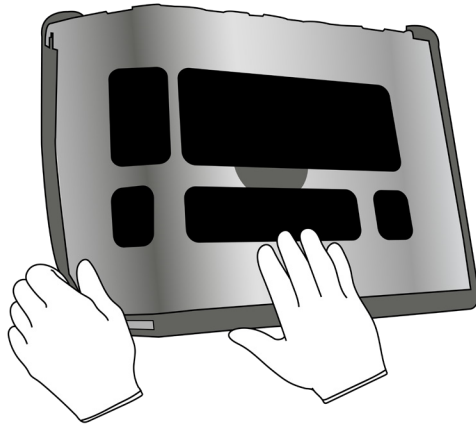


LED logic board

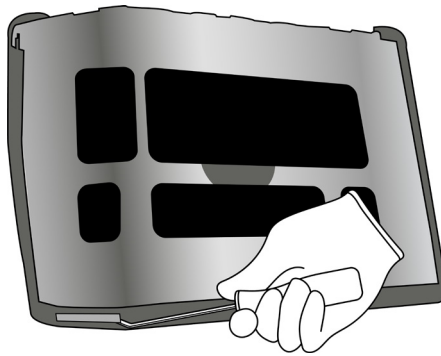


## 19. Remove the magnets.

» *Bend the display housing to pop up the four magnets.*



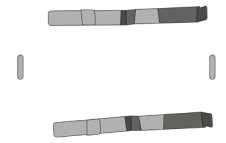
» *Pry off the magnets.*



### Tools Used



### Fraction



Magnets

REE

Rare Earth  
Elements

### Fraction




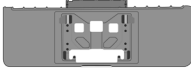







Display  
housing

Al

Aluminum

# 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><b>Aluminum</b></p>  <p><i>Bottom case</i></p>  <p><i>Trackpad enclosure</i></p>  <p><i>Display housing</i></p>	<p><b>Primary Target Material</b></p>  <p><b>Potential Additional Materials</b></p> 
<p><b>Batteries</b></p>  <p><i>Lithium-ion polymer batteries</i></p>	<p><b>Primary Target Material</b></p> 
<p><b>Ferrous</b></p>  <p><i>Fasteners (x13)</i></p>	<p><b>Primary Target Material</b></p> 



**Fraction**

**Downstream Processing**

**Glass**



*LCD cell*

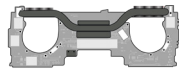
**Primary Target Material**



**Potential Additional Materials**



**Logic Boards**



*Main logic board*

**Primary Target Material**



**Potential Additional Materials**



*Trackpad*



*Keyboard*



*Data board assembly*



*Camera with logic board*



*LED logic board*

**Fraction**

**Downstream Processing**

**Mixed Electronics**



*Power adapter*



*Charge cable*



*Ribbon cables*



*Fans*



*Wire*

**Primary Target Material**



**Potential Additional Materials**



**Fraction**

**Downstream Processing**

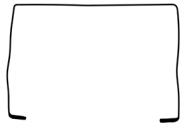
**Mixed Plastics**



*Battery brackets*



*Thermal ducts*



*Display gasket*



*Display films*

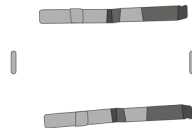
**Primary Target Material**



**Rare Earth Magnets**



*Speakers*



*Magnets*

**Primary Target Material**



**Potential Additional Materials**

