MacBook Pro (15-inch, 2016)

MacBook Pro (15-inch, 2017)

MacBook Pro (15-inch, 2018)

MacBook Pro (15-inch, 2019)

Apple Recycler Guide

July 2023

Contents

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.

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.
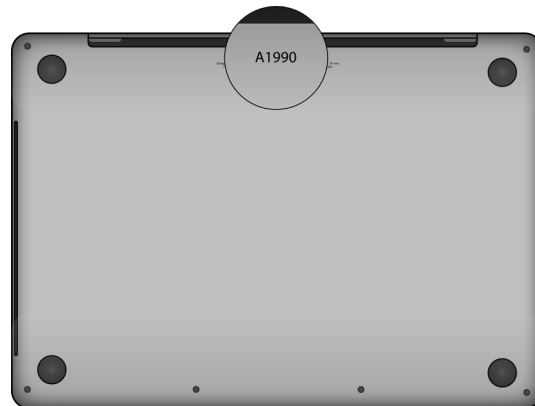
Model numbers:

A1707, A1990

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, light-emitting diode (LED) logic board	Follow steps 1–22
External electric cables	Charge cable, power cord	Follow step 1
Battery	Lithium-ion 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 1–14
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 protective clothing

Wear eye protection

Wear foot protection

Wear a mask

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 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.
- 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_2 fire extinguisher on a thermal runaway battery or a device containing one. Water and ABC/CO_2 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

⚠️	Rechargeable battery hazard
⚠️	Broken glass hazard

⚠️	Chemical exposure hazard
⚠️	Chemical inhalation hazard

Recommended Tools

Flat surface scraper
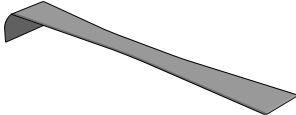
Miniature pry bar
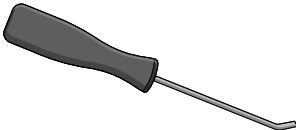
Nail-pulling screwdriver
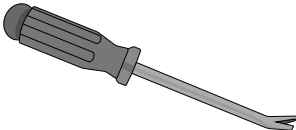
Plastic pry bar
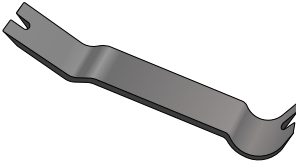
Torx T2 screwdriver
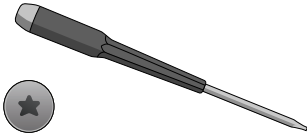
Torx T5 screwdriver
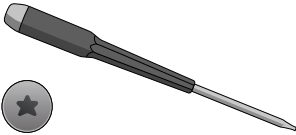
Disassembly Instructions

1. Remove the power adapter and the charge cable.

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

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

Fraction

Power adapter

Charge cable

Cu

Copper
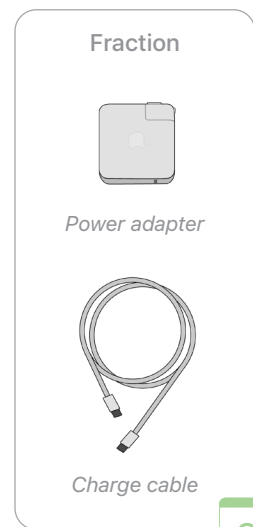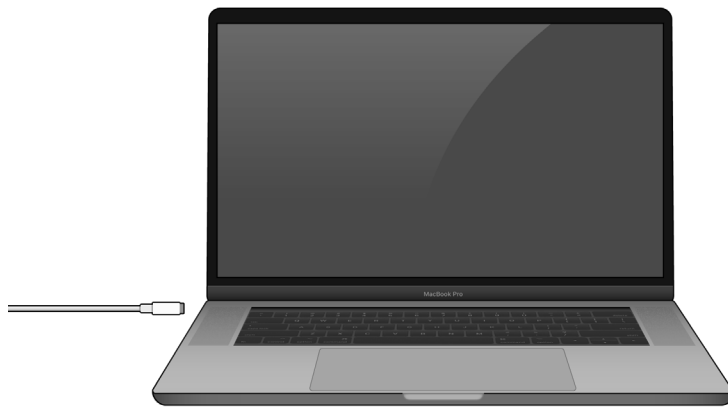
2. Pry off the bottom case. To avoid damage to the batteries, pry only near the fastener attachments.
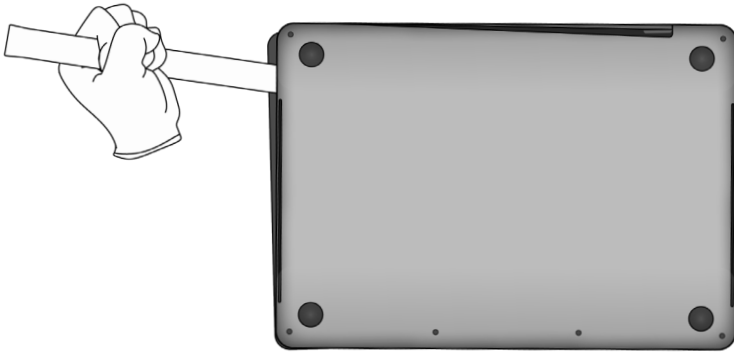
Tools Used
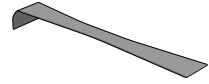
Fraction

Bottom case

Al
Aluminum

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

⚠️ Rechargeable battery hazard
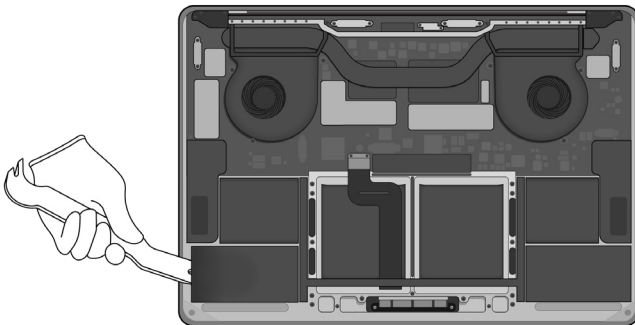
Tools Used
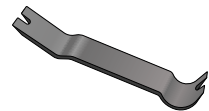
Fraction

Lithium-ion polymer batteries

BT
Battery

4.   Pull off the battery cables.

Fraction

Battery cables
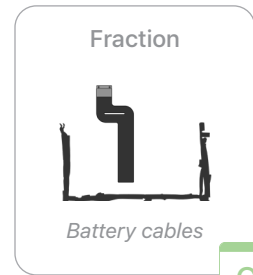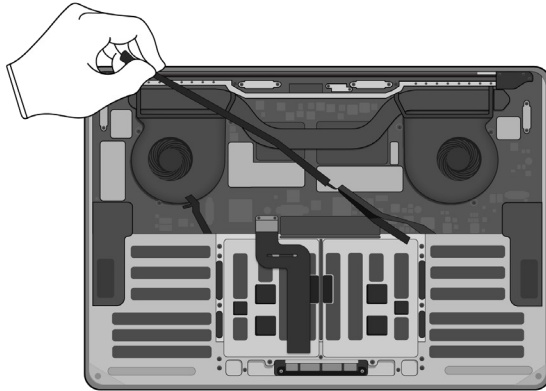
Cu

Copper

5.   Pry off both speakers.

Tools Used

Fraction

Speakers

REE
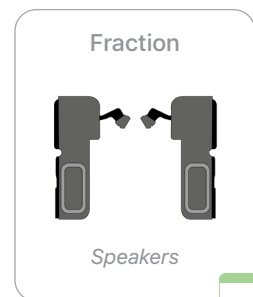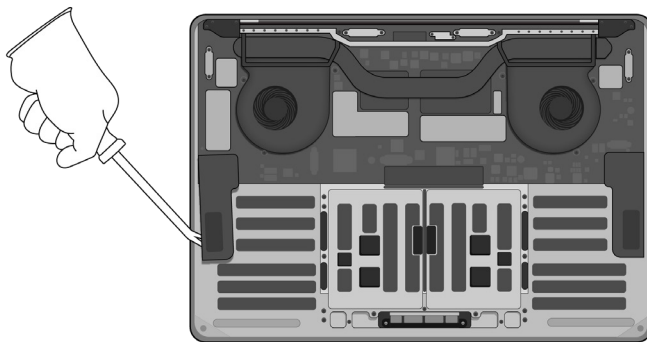
Rare Earth
Elements

6.

Remove the thermal ducts sitting on top of the fans.
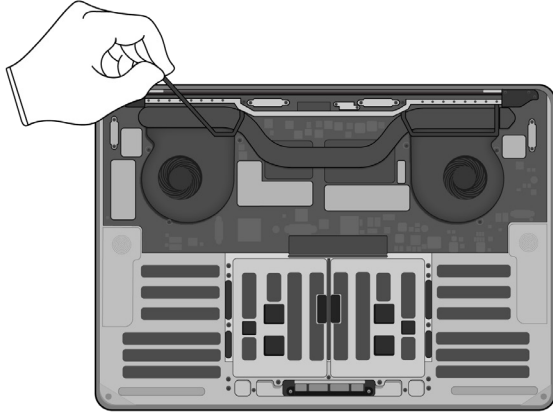
Fraction
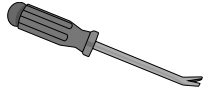
Thermal ducts

PL

Plastics

7.

Pry off the main logic board.
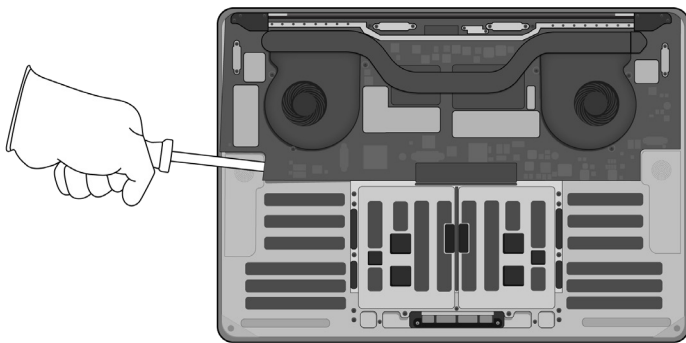
Tools Used

Fraction

Main logic board

PMs

Precious Metals

8. Pry off the battery logic board.
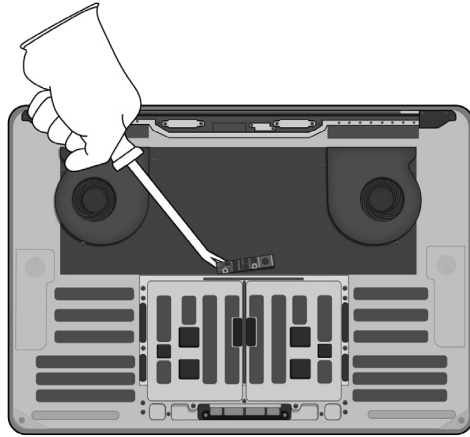
Tools Used
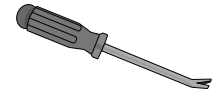
Fraction

Battery logic board

PMs
Precious Metals

9. Pry off both fans.
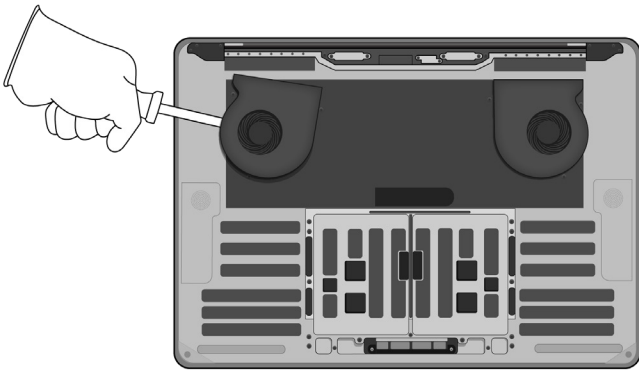
Tools Used
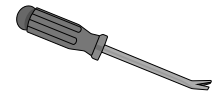
Fraction
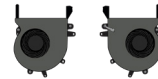
Fans

Cu
Copper

10. Remove the trackpad by unscrewing the 13 Torx T5 fasteners.
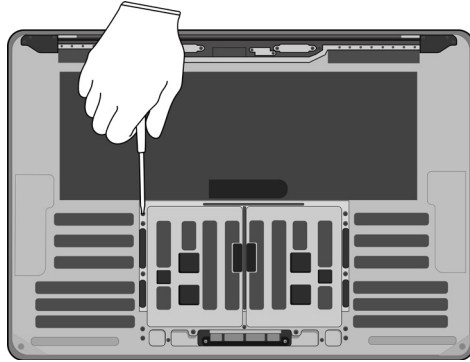
Tools Used
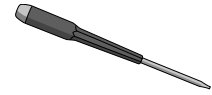
Fraction

Fasteners (x13)

Fe
Ferrous

Fraction

Trackpad

PMs
Precious Metals

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.
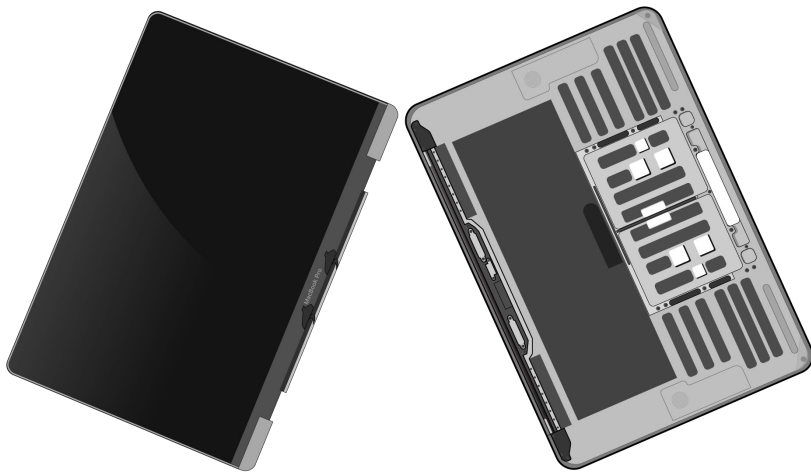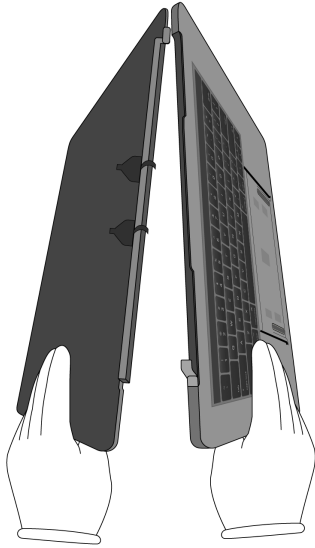
12. Separate the keyboard and trackpad enclosure by snapping the top case in half.

Fraction

Trackpad enclosure

Al
Aluminum

Fraction

Keyboard

PMs
Precious Metals

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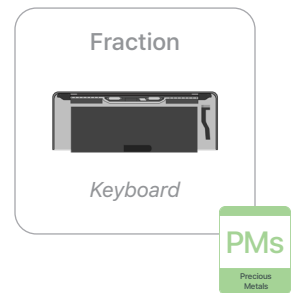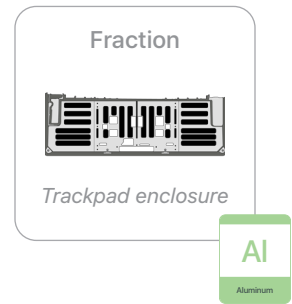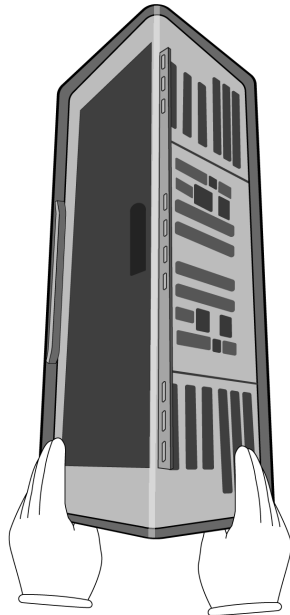
13. Pull off the display gasket.

⚠️ Broken glass hazard
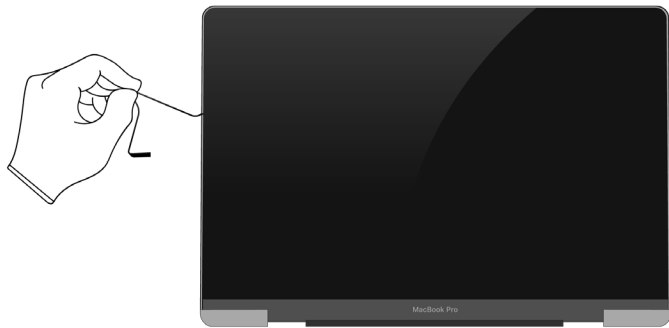
Fraction

Display gasket

PL
Plastics

14. Pry away the LCD cell and display films from the display housing.

⚠️ Chemical exposure hazard

Tools Used

Fraction

LCD cell

GL
Glass

Fraction

Display films

PL
Plastics
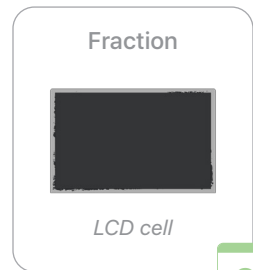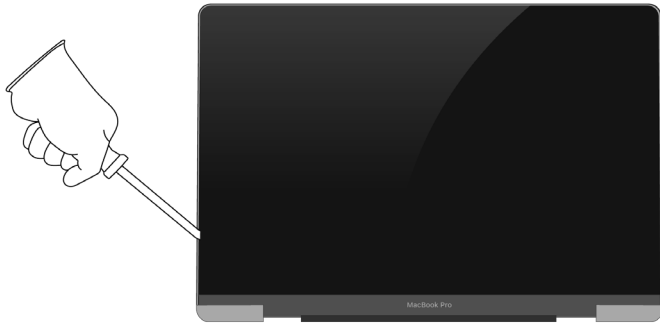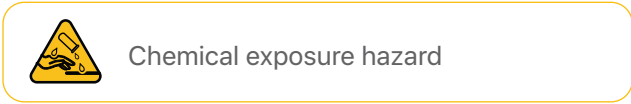
15. Remove the plastic sheet from the display housing.

Fraction

Plastic sheet

PL
Plastics
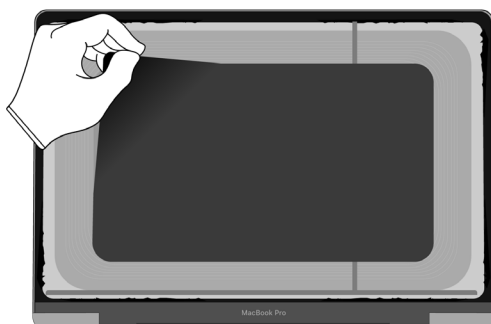
16. Remove the camera with logic board.

» *Unscrew the three Torx T2 fasteners.*

Tools Used

Fraction

Fasteners (x3)

Fe
Ferrous
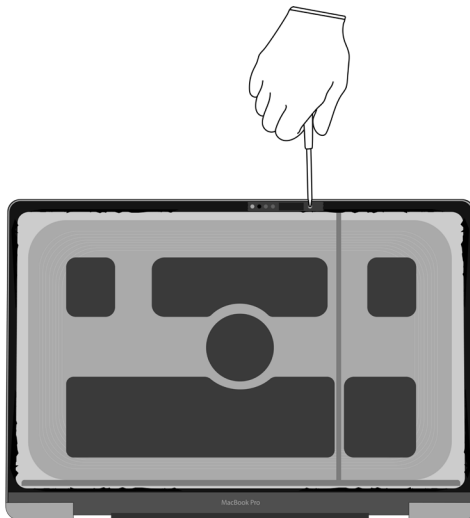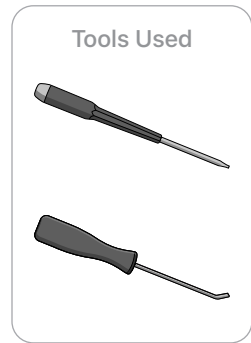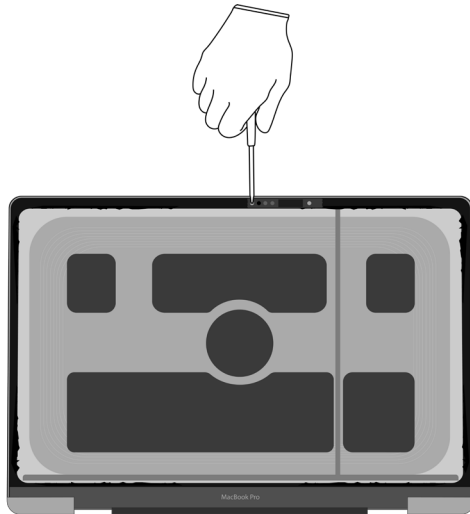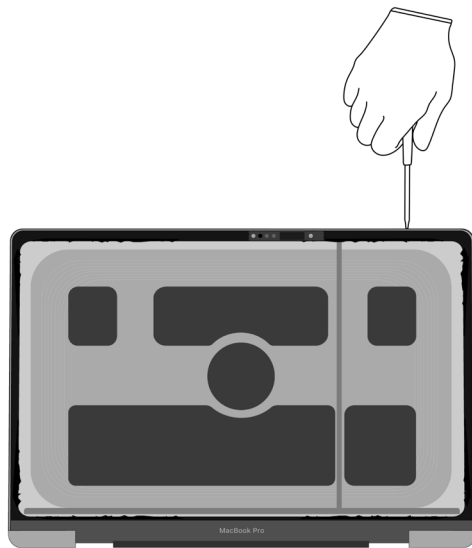
» *Pry the camera with logic board off the display housing.*

Fraction

Camera with logic board

PMs
Precious Metals
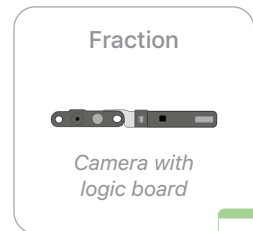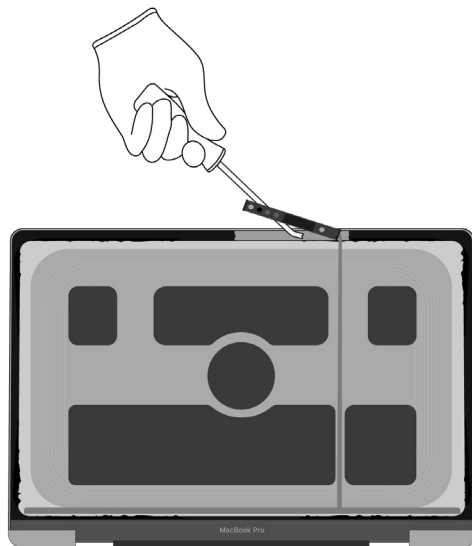
17. Remove the LED/camera wire leading to the LED logic board.
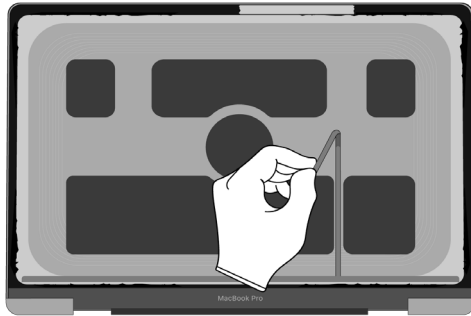
Fraction
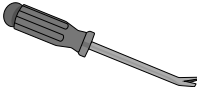
LED/camera wire

Cu
Copper

18. Pry off the data board assembly.
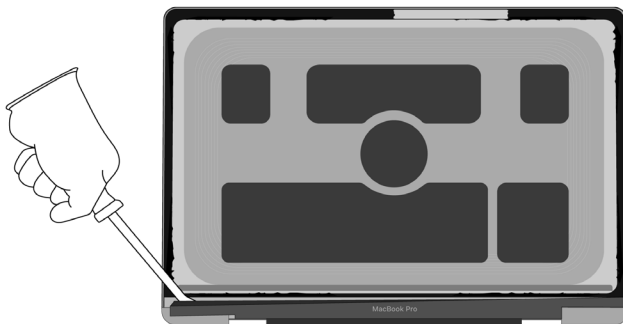
Tools Used

Fraction

Data board assembly

PMs
Precious Metals

19. Pry off the plastic bracket.
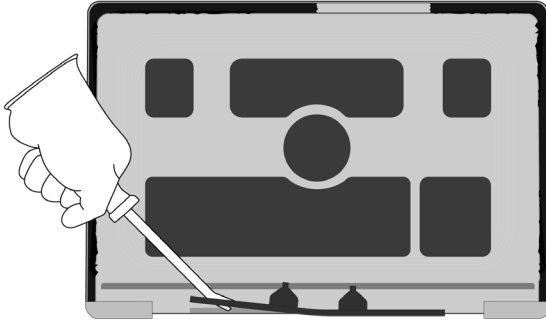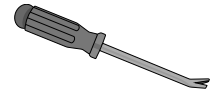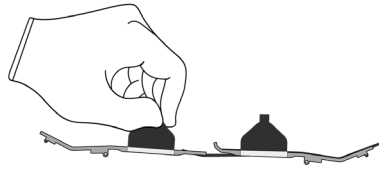

Tools Used
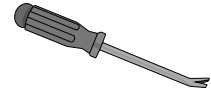
Fraction

Plastic bracket

PL

Plastics

20. Pry off the cable bracket.
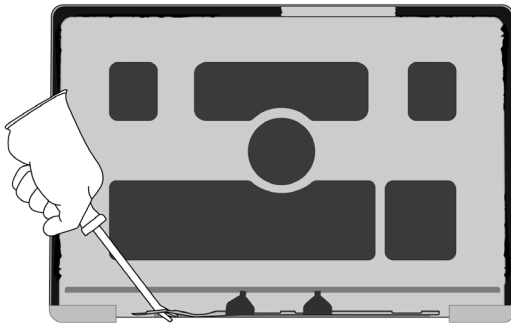
Tools Used

21. Pull the ribbon cables off the cable bracket.

Fraction

Cable bracket

Fe
Ferrous

Fraction

Ribbon cables

Cu
Copper

22. Pull the LED logic board off the display housing. Pull the ribbon cables off the LED logic board.

⚠️ Chemical inhalation hazard
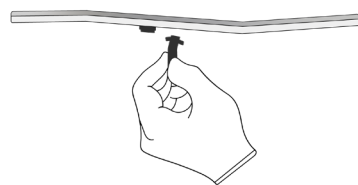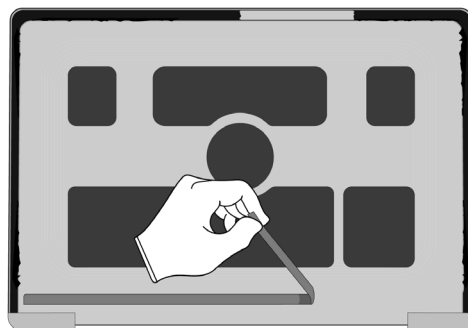
Fraction

Ribbon cables

Cu
Copper

Fraction

LED logic board

PMs
Precious Metals

23. Remove the four magnets.

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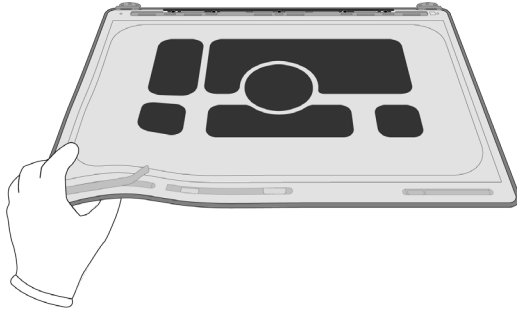
Tools Used

» *Pry off the magnets.*
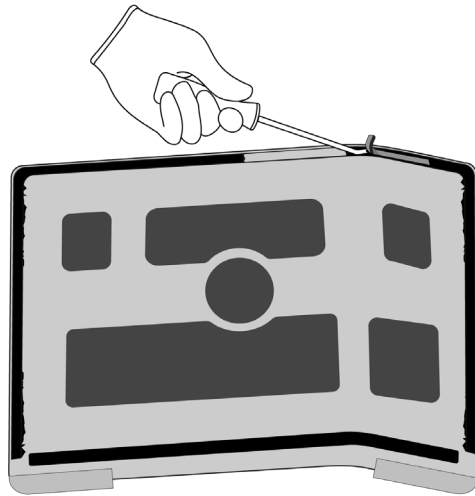
Fraction

Display housing

Al
Aluminum

Fraction
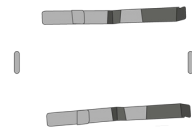
Magnets

REE
Rare Earth
Elements

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
Aluminum	**Primary Target Material**
Bottom case	AI Aluminum
Trackpad enclosure	**Potential Additional Materials** PL Plastics
Display housing	
Batteries	**Primary Target Material**
Lithium-ion polymer batteries	BT Battery

Fraction	Downstream Processing
Ferrous	**Primary Target Material**

Fasteners (x16)

Cable bracket

Fe
Ferrous

Glass

LCD cell

Primary Target Material

GL
Glass

Potential Additional Materials

PL
Plastics

Fraction	Downstream Processing
Logic Boards	**Primary Target Material**

Main logic board

PMs
Precious Metals

Battery logic board

Potential Additional Materials

Cu
Copper

Fe
Ferrous

PL
Plastics

Trackpad

Keyboard

Camera with logic board

Data board assembly

LED logic board

Fraction	Downstream Processing
Mixed Electronics	**Primary Target Material**

Power adapter

Charge cable

Battery cables

Fans

LED/camera wire

Ribbon cables

Primary Target Material

Cu
Copper

Potential Additional Materials

Fe
Ferrous

PL
Plastics

PMs
Precious Metals

Fraction	Downstream Processing

Mixed Plastics

Thermal ducts

Display gasket

Display films

Plastic sheet

Plastic bracket

Primary Target Material

PL
Plastics

Rare Earth Magnets
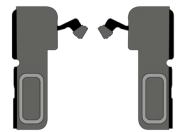
Speakers
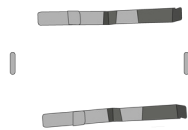
Magnets

Primary Target Material

REE
Rare Earth Elements

Potential Additional Materials

Cu
Copper

Fe
Ferrous

PL
Plastics