Mac Pro (2019)

Apple Recycler Guide

May 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.

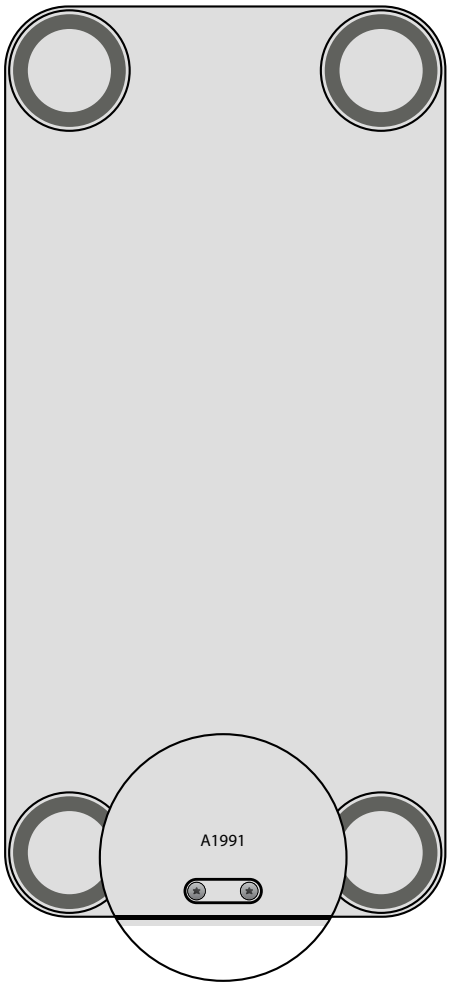
To conserve important resources, we work to reduce the materials we use and aim to one day source only recycled or renewable materials in our products. A key path to reaching that goal is resource recovery from end-of-life electronics.

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.

Identification

You can find the model number of the Mac Pro (2019) underneath the bottom plate.



Model number:
A1991

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	Graphics processing unit (GPU) logic board, power supply logic board, memory modules, processor, input/output (I/O) card, main logic board	Follow steps 1–36
External electric cables	Power cord	Follow step 1
Battery	Coin cell battery	Follow steps 1–11
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 eye protection

Wear protective clothing

Wear foot protection

Hazard Warnings

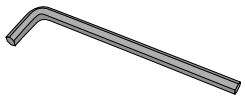
Crushing hazard

Sharp edges—cut hazard

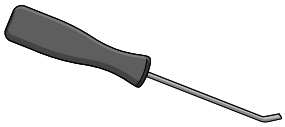
Heavy weight hazard

Recommended Tools

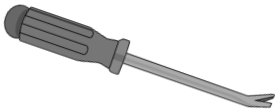
4 mm L-key



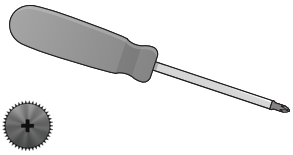
Miniature pry bar



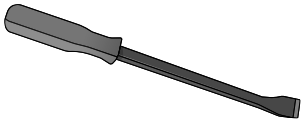
Nail-pulling screwdriver



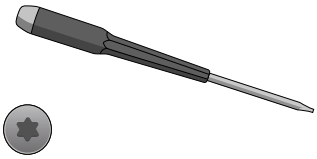
Phillips screwdriver



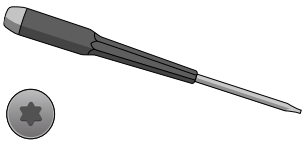
Screwdriver-handle pry bar



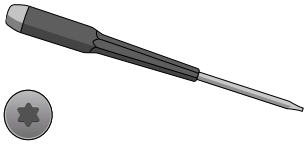
Torx T5 screwdriver



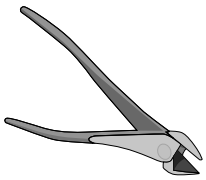
Torx T8 screwdriver



Torx T15 screwdriver



Wire cutters

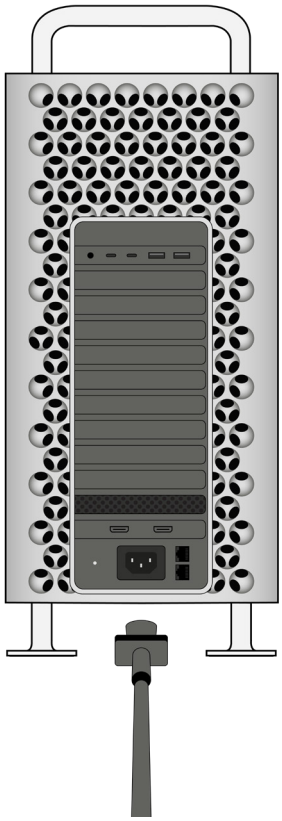


Disassembly Instructions

1. Remove the power cord.

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

» *Unplug the power cord from the back of the computer.*



Fraction

Power cord

Cu

Copper

Warning: Before continuing disassembly, wait 10 minutes after unplugging the device for stored energy to discharge.

2. Unlock the housing.

» *Lift the handle and turn it counterclockwise.*

» *Pull the handle up and slide off the housing.*

» *Set the assembly aside.*

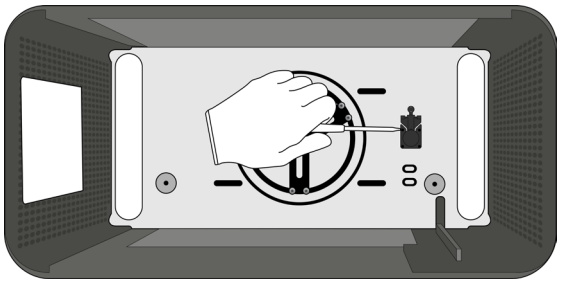
3. Remove the power button.

» *Turn the housing upside down.*

Crushing hazard

Heavy weight hazard

» *Detach the power button by unscrewing the four Torx T5 fasteners from inside the housing.*



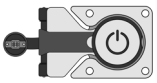
Tools Used

Fraction

Fasteners (x4)

Fe
Ferrous

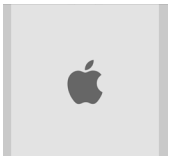
Fraction



Power button

Cu
Copper

Fraction

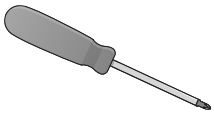


Housing

Al
Aluminum

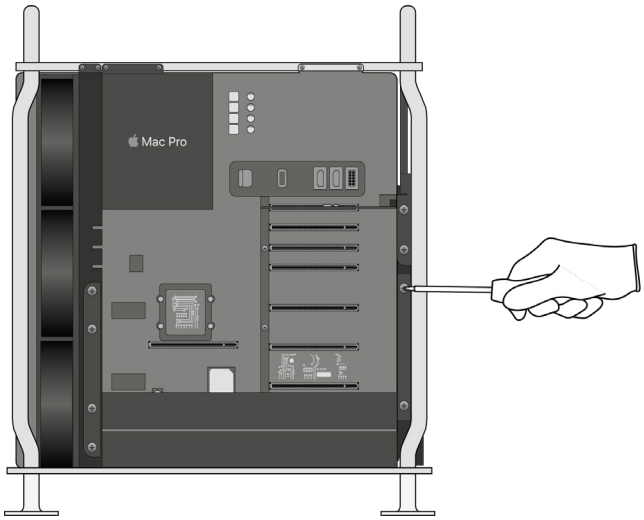
4. From the assembly, remove the three clamp plates.

Tools Used



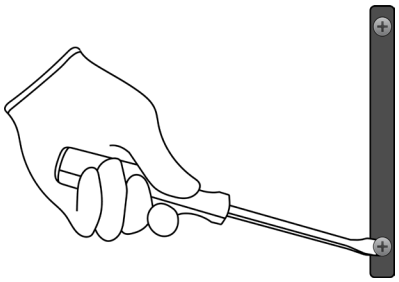
» *On the right side, loosen the four Phillips captive fasteners from two clamp plates.*

» *On the left side, loosen four more captive fasteners from the third clamp plate.*

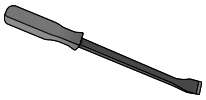


5.

Pry the Phillips captive fasteners and springs off the three clamp plates.

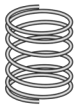


Tools Used



Fraction

Captive fasteners (x8)



Captive fastener springs (x8)

Fe
Ferrous

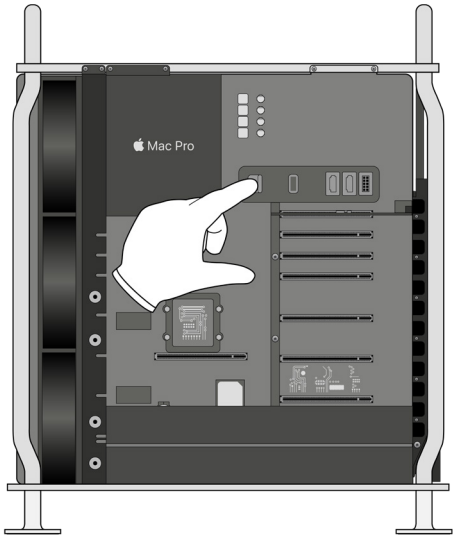
Fraction

Clamp plates

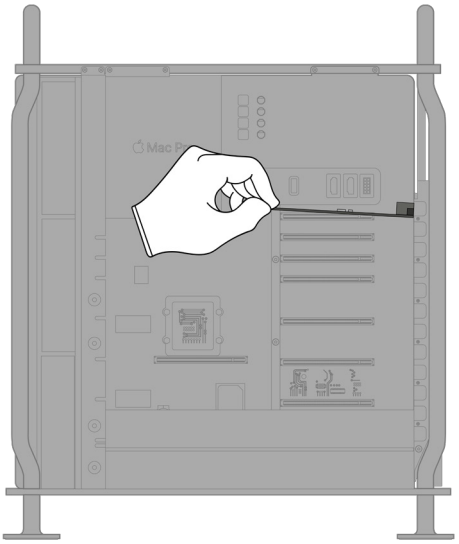
Al
Aluminum

6. Remove the I/O card.

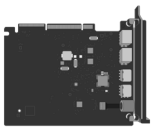
» *Slide the PCI lock to the unlocked position.*



» *Pull out the I/O card.*



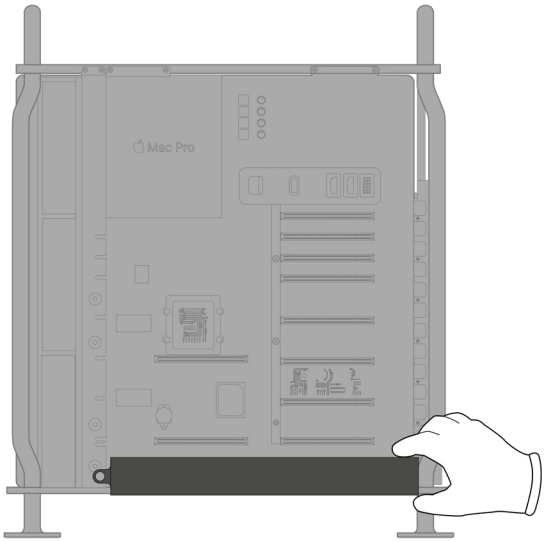
Fraction



I/O card

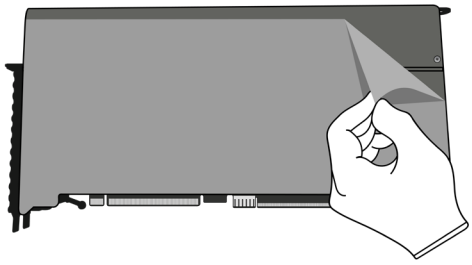
PMs
Precious Metals

7. Using the ejector latch, slide the GPU off the main logic board.



8. Disassemble the GPU.

» *Peel off the Mylar film by hand.*



Tools Used

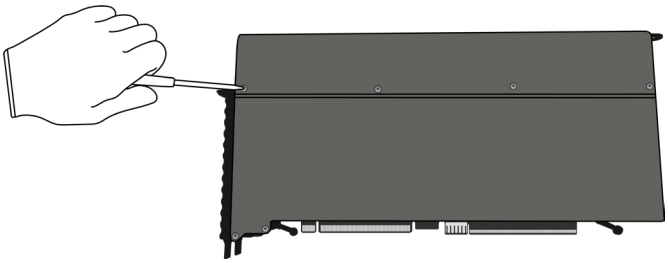
Torx T8, Torx T5

Fraction

Film

PL
Plastics

» *Unscrew the one Torx T8 and five Torx T5 fasteners.*



Fraction

Fasteners (x6)

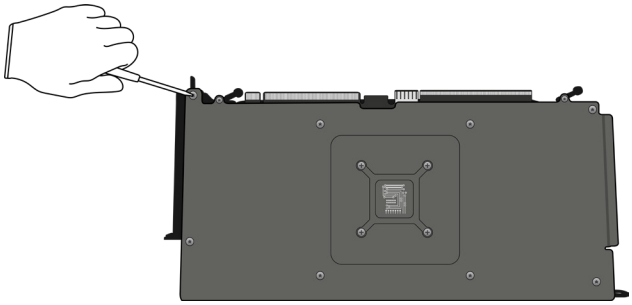
Fe
Ferrous

9. Remove the center bracket.

Tools Used

Torx T8, Torx T5

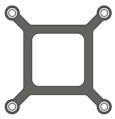
» *Flip the GPU over. Unscrew the 10 Torx T8 fasteners.*



» *Unscrew the four Torx T5 fasteners. Pull off the center bracket by hand.*

Fraction

Fasteners (x14)

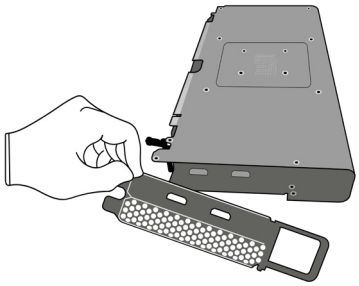


Center bracket

Fe
Ferrous

10. Remove the heat sink and GPU logic board.

» *Pull off the front face of the GPU.*

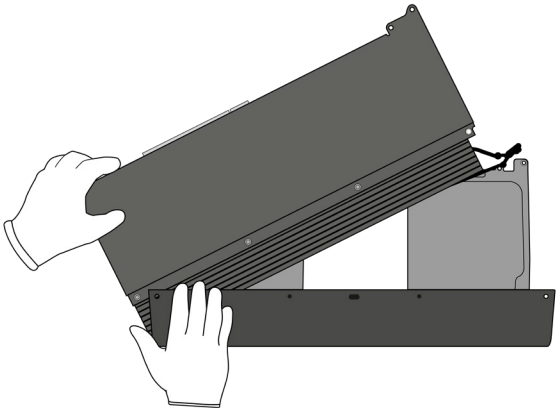


Fraction

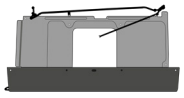
Front face

Al
Aluminum

» *Separate the GPU housing from the heat sink.*



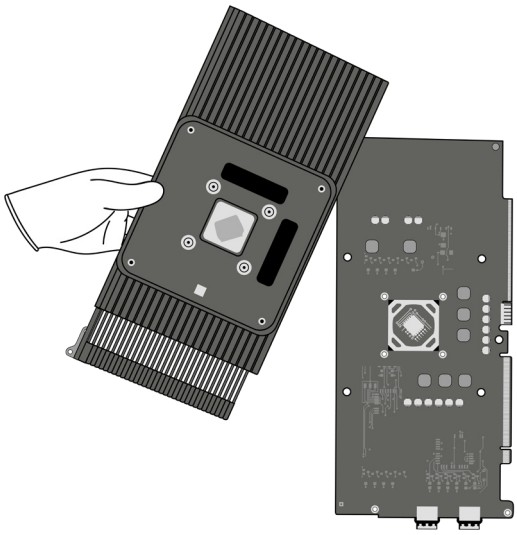
Fraction



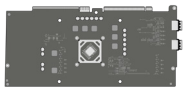
GPU housing

Al
Aluminum

» *Pull the GPU logic board off the heat sink.*



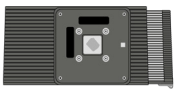
Fraction



GPU logic board

PMs
Precious Metals

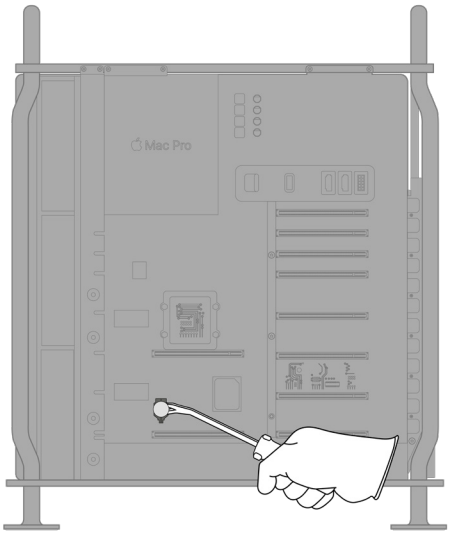
Fraction



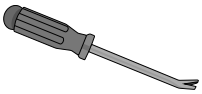
Heat sink

Cu
Copper

11. Remove the coin cell battery from the main logic board.



Tools Used



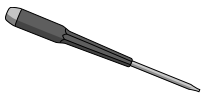
Fraction

Coin cell battery

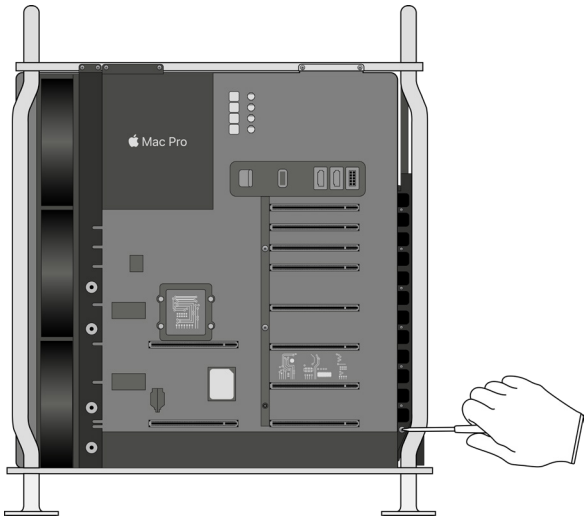
BT
Battery

12. Remove the power supply enclosure.

Tools Used



» *Unscrew the one Torx T8 fastener. Slide out the enclosure.*

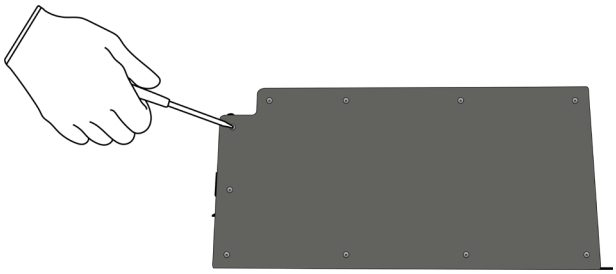


» *Unscrew the 10 Torx T8 fasteners.*

Fraction

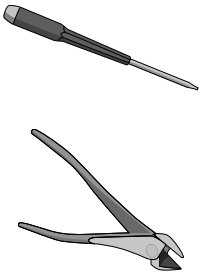
Fasteners (x11)

Fe
Ferrous



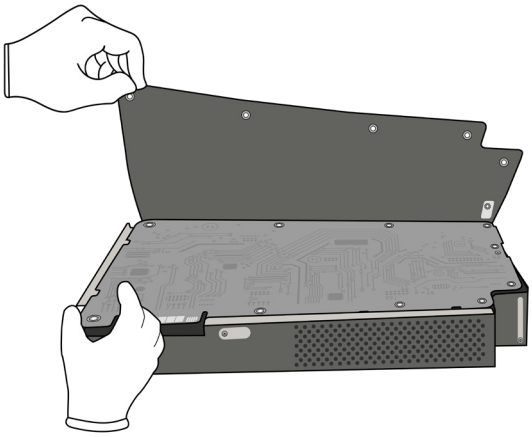
13. Remove the power supply logic board.

Tools Used



» *Pry open the power supply enclosure by hand.*

Sharp edges—cut hazard



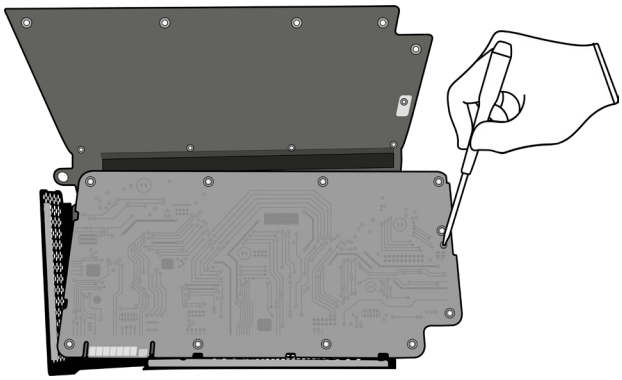
» *Unscrew the one Torx T8 fastener from the power supply logic board.*

Fraction

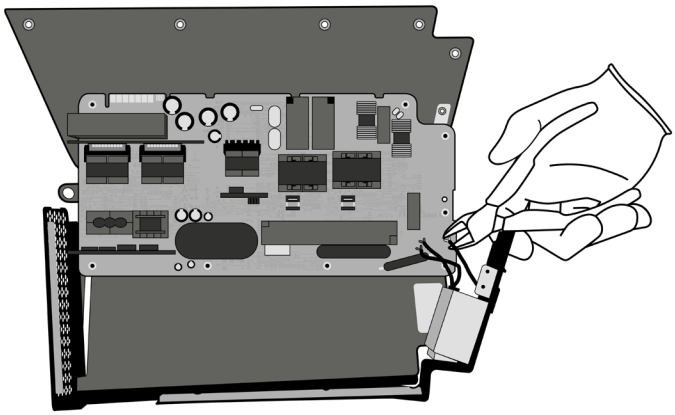
Fastener

Fe

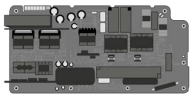
Ferrous



» *Separate the power supply logic board from its enclosure by cutting the wires.*



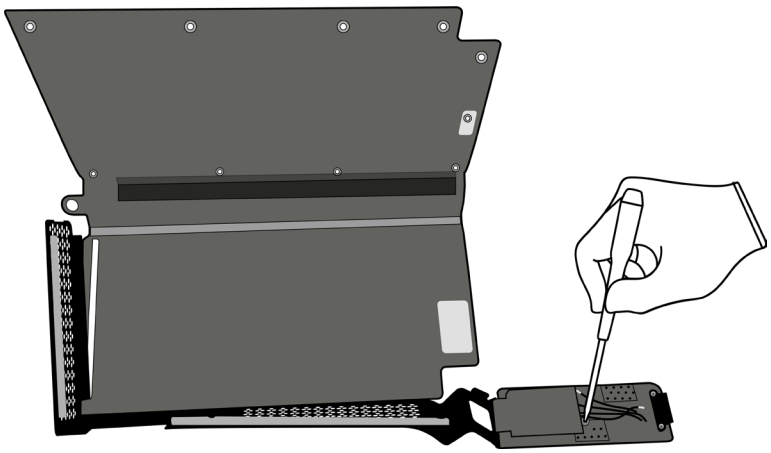
Fraction



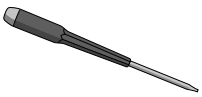
Power supply logic board

PMs
Precious Metals

14. From the enclosure, remove the power adapter by unscrewing the one Torx T8 fastener.



Tools Used



Fraction

Fastener

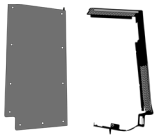
Fe
Ferrous

Fraction

Power adapter

Cu
Copper

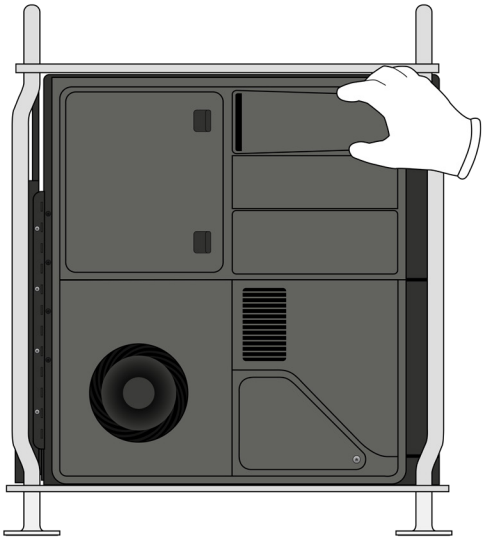
Fraction



Power supply enclosure

Al
Aluminum

15. Remove both memory module covers.



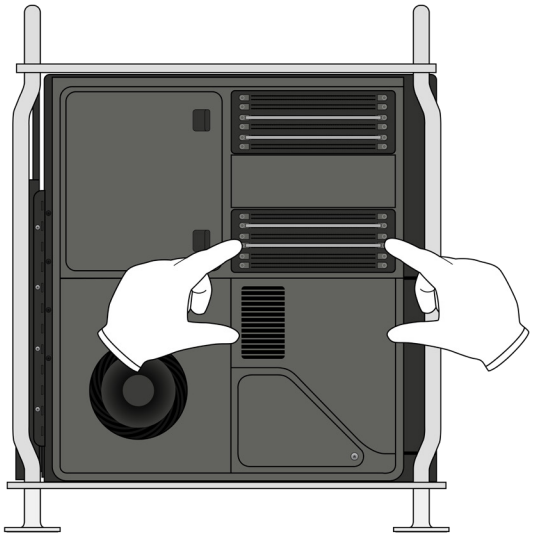
Fraction

Memory module covers

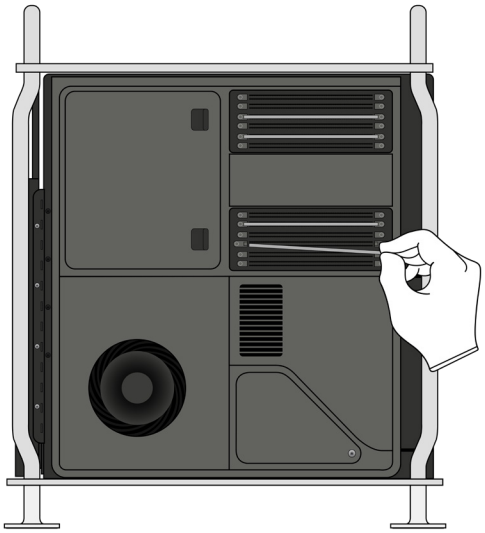
PL
Plastics

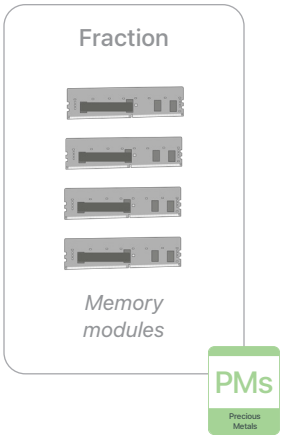
16. Remove the memory modules.

» *Unlatch the memory modules by pushing the memory module ejectors.*



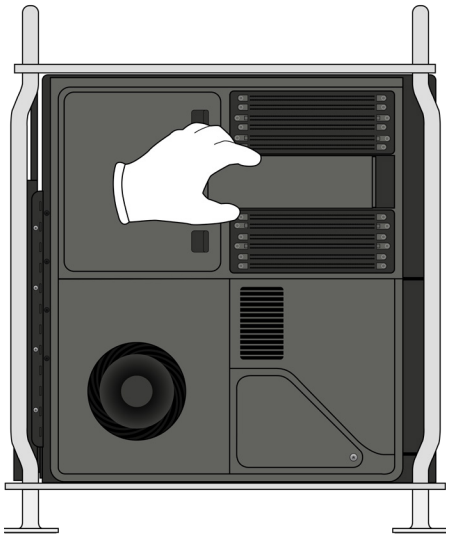
» *Pull out the four memory modules.*



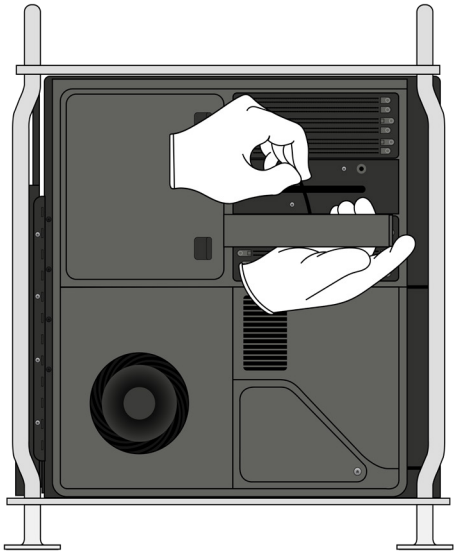


17. Remove the speaker.

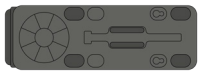
» *Slide the speaker to the left and tilt it forward.*



» *Disconnect the speaker wire from the main logic board.*



Fraction



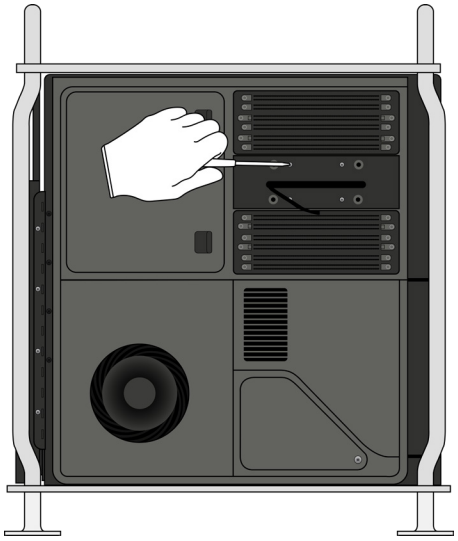
Speaker

REE

Rare Earth Elements

18. Remove the thermal module.

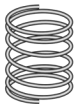
» *Unscrew the four Torx T15 fasteners and springs.*



Tools Used

Torx T15, Torx T8

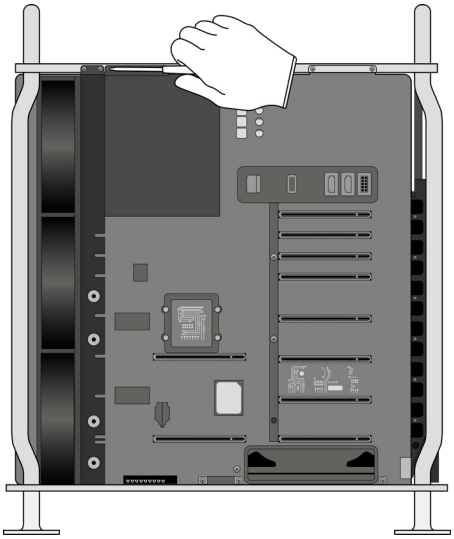
Fraction



Springs (x4)

Fe
Ferrous

» *Flip the assembly around. Unscrew the two Torx T8 fasteners from the thermal module.*

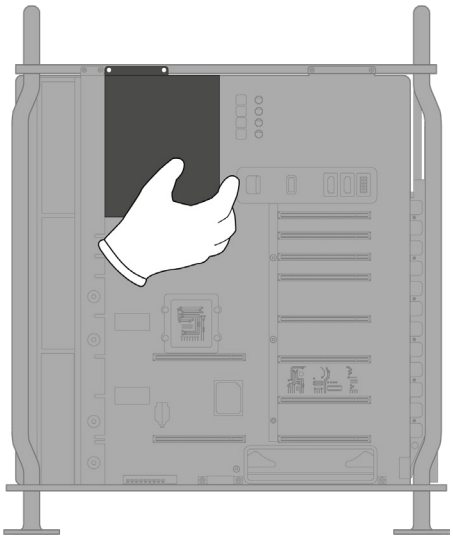


Fraction

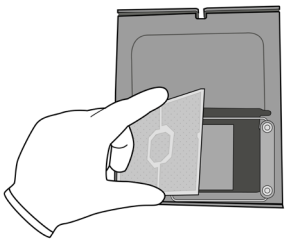
Fasteners (x6)

Fe
Ferrous

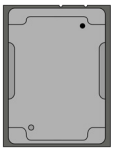
» *Slide the thermal module off the assembly. Lay it facedown to expose the processor.*



19. Lift the processor out of the thermal module.



Fraction



Processor

PMs
Precious Metals

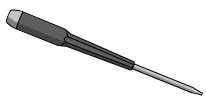
Fraction

Thermal module

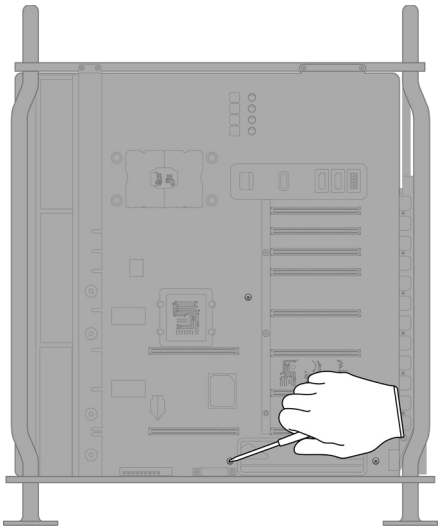
Cu
Copper

20. Remove the duct and blower.

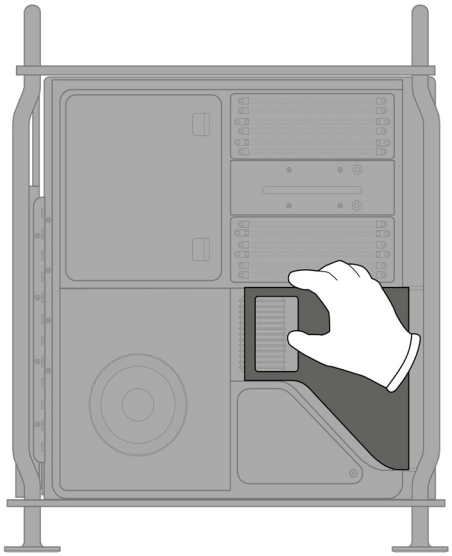
Tools Used



» *Loosen the three Torx T8 captive fasteners from the main logic board.*



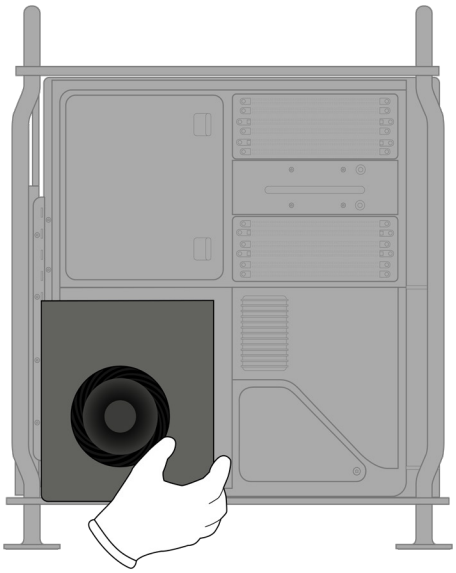
» *Flip the assembly around and pull off the duct and the blower.*



Fraction

Duct

PL
Plastics

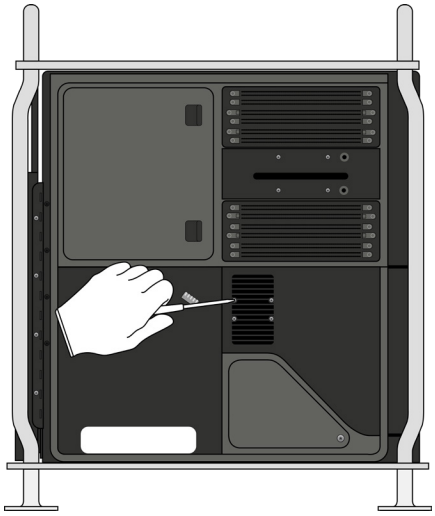


Fraction

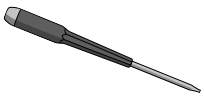
Blower

Cu
Copper

21. Remove the heat sink by unscrewing the four Torx T8 fasteners and springs.

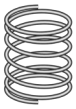


Tools Used



Fraction

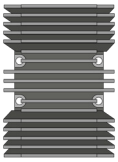
Fasteners (x4)



Springs (x4)

Fe
Ferrous

Fraction

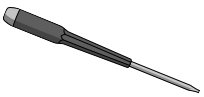


Heat sink

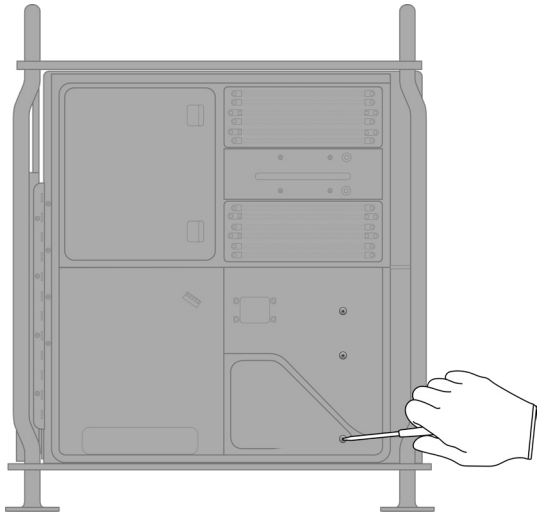
Al
Aluminum

22. Remove the system fans.

Tools Used



» *Unscrew the three Torx T8 fasteners attached to the fans from the main logic board.*

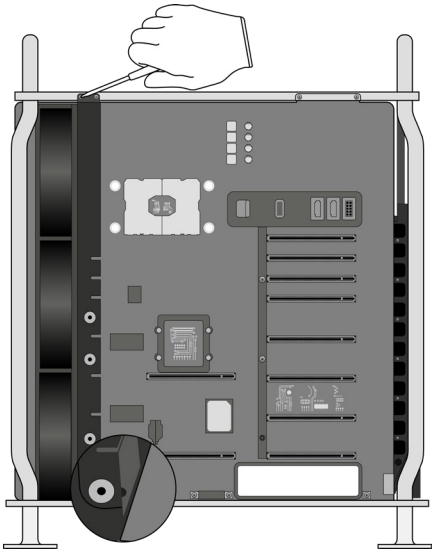


» *Turn the assembly around. Unscrew the two Torx T8 fasteners from the top of the fans. Then unscrew the one Torx T8 fastener at the bottom.*

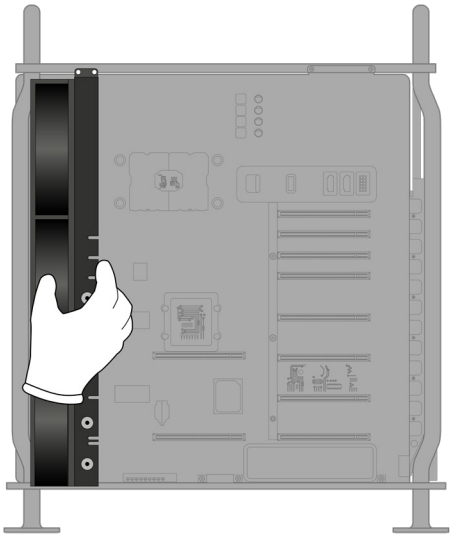
Fraction

Fasteners (x6)

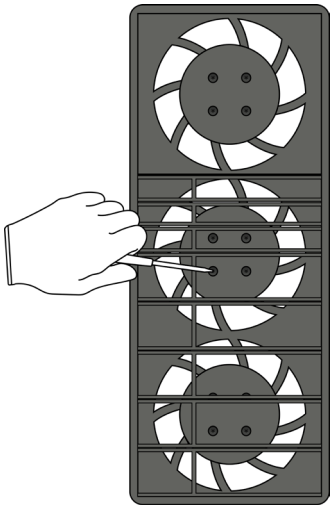
Fe
Ferrous



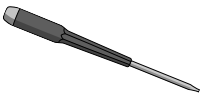
» *Pull out the system fans.*



23. Unscrew the 12 Torx T8 fasteners from the system fans.



Tools Used



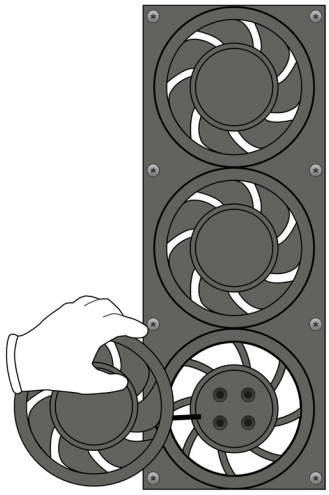
Fraction

Fasteners (x12)

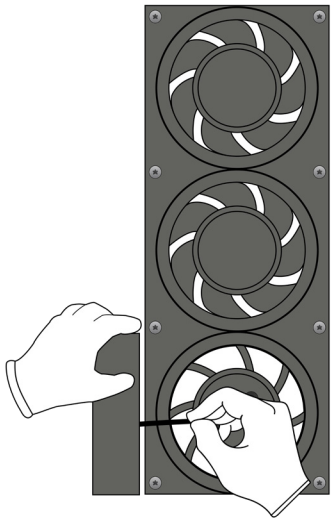
Fe
Ferrous

24. Remove each fan.

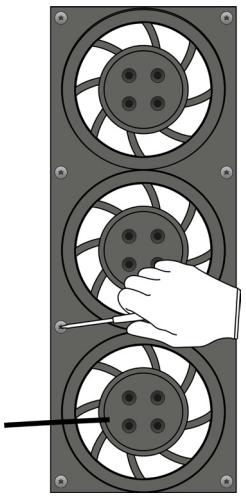
» *Flip the system fans over and lift them out.*

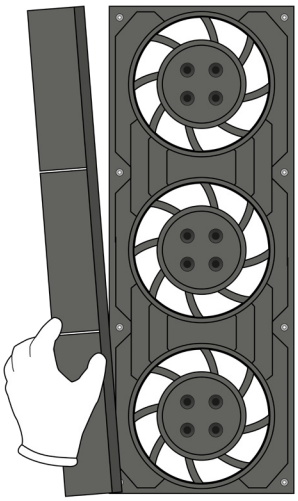


» *Disconnect the ribbon cable from behind each fan. Set the fans aside.*

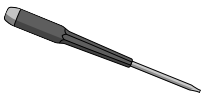


25. Unscrew the eight Torx T8 fasteners from the fan enclosure. Lift up the top piece.





Tools Used

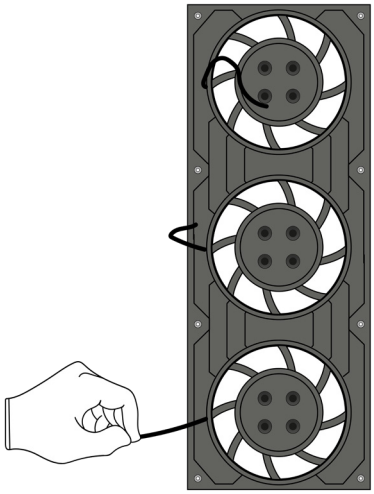


Fraction

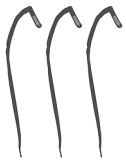
Fasteners (x8)

Fe
Ferrous

26. Remove the three ribbon cables from the fan enclosure.



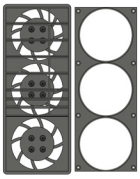
Fraction



Ribbon cables

Cu
Copper

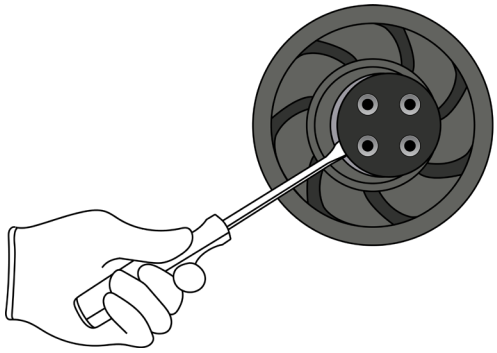
Fraction



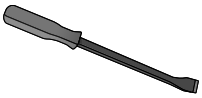
Fan enclosure

PL
Plastics

27. Pry the motor off each fan.



Tools Used



Fraction

Motors

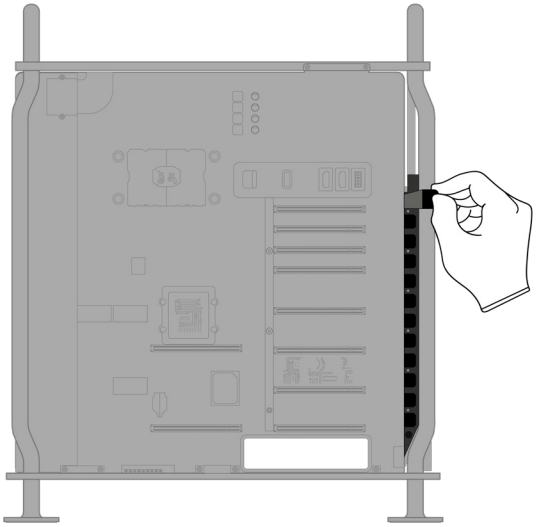
Cu
Copper

Fraction

Fans

PL
Plastics

28. Remove the nine PCI Express slot covers.



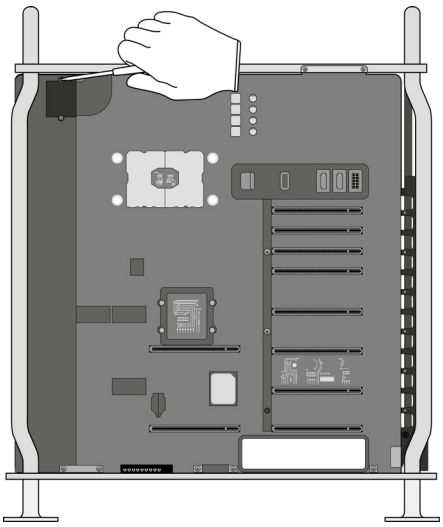
Fraction

PCI Express slot covers (x9)

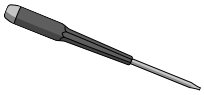
Al
Aluminum

29. Remove the I/O board flex cable.

» *Remove the flex cable cover by unscrewing the two Torx T5 fasteners.*



Tools Used

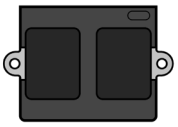


Fraction

Fasteners (x2)

Fe
Ferrous

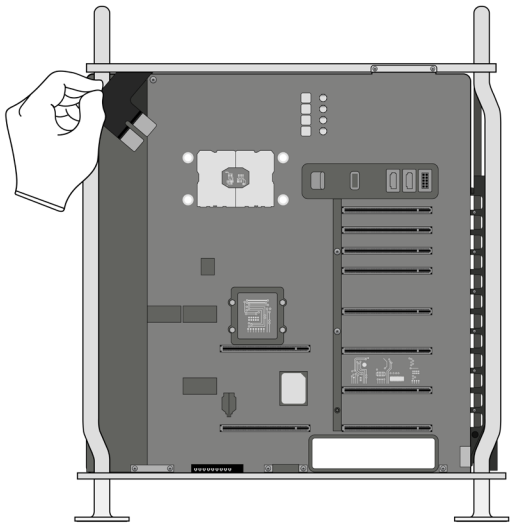
Fraction



Flex cable cover

Al
Aluminum

» *Remove the I/O board flex cable by hand.*



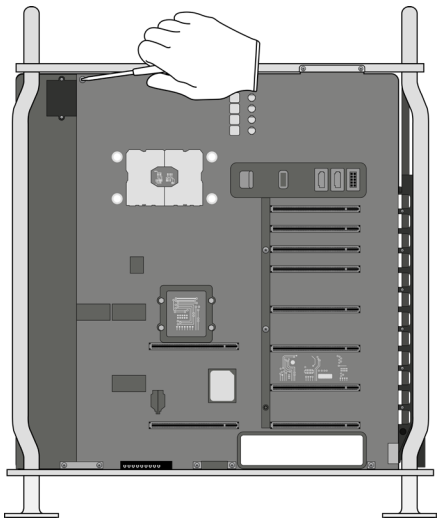
Fraction

I/O board flex cable

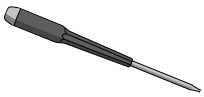
Cu
Copper

30. Remove the I/O board.

» *Access the I/O board by unscrewing the one Torx T8 fastener with washer.*



Tools Used



Fraction

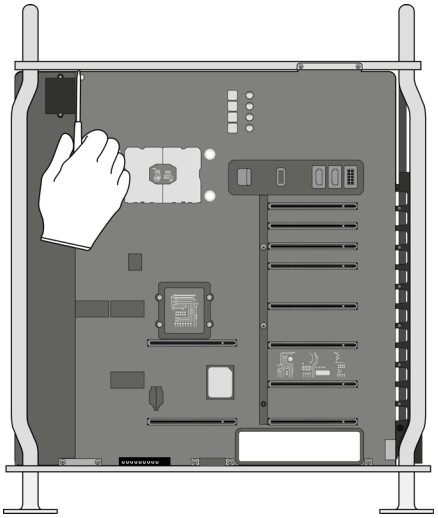
Fastener

Washer

Fe

Ferrous

» *Unscrew the six Torx T8 fasteners from around the I/O board.*

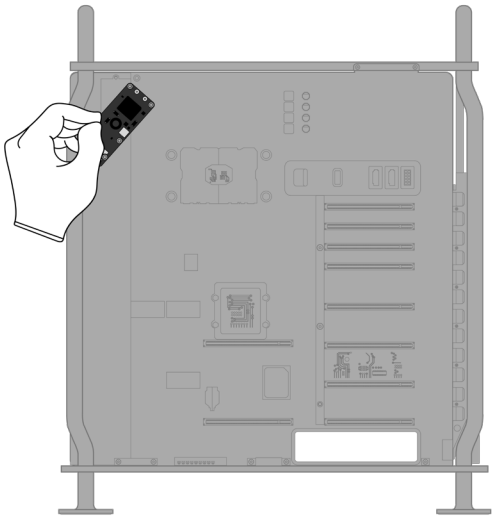


Fraction

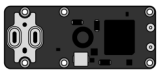
Fasteners (x6)

Fe
Ferrous

» *Remove the I/O board by hand.*



Fraction

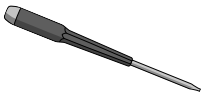


I/O board

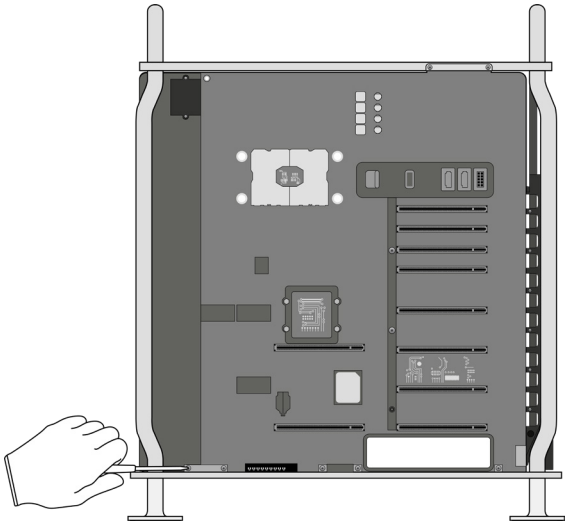
PMs
Precious Metals

31. Remove the main logic board from its frame.

Tools Used



» *Unscrew the five Torx T8 fasteners from the bottom of the logic board.*

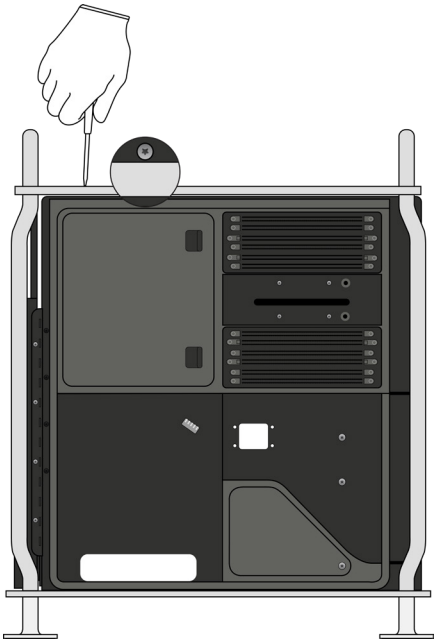


» *Turn the frame to the back. Unscrew the four Torx T8 fasteners from the top of the logic board.*

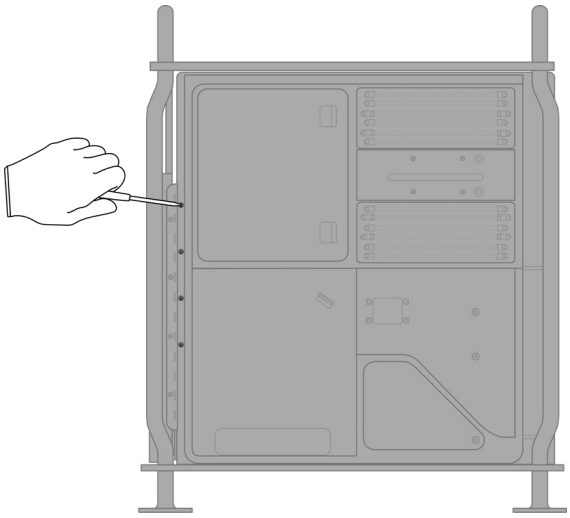
Fraction

Fasteners (x9)

Fe
Ferrous



» *Unscrew the other four Torx T8 fasteners along the left side.*



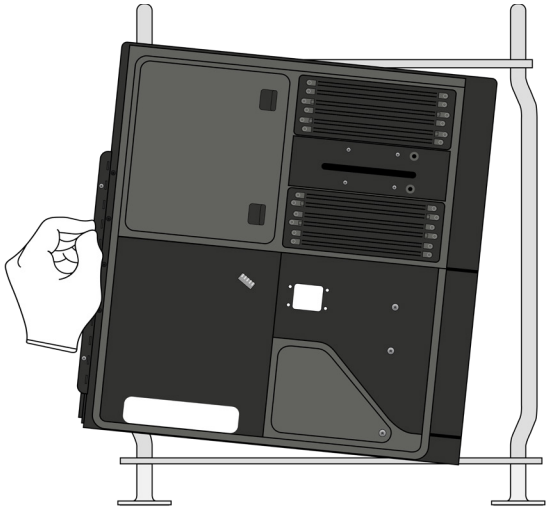
Fraction

Fasteners (x4)

Fe

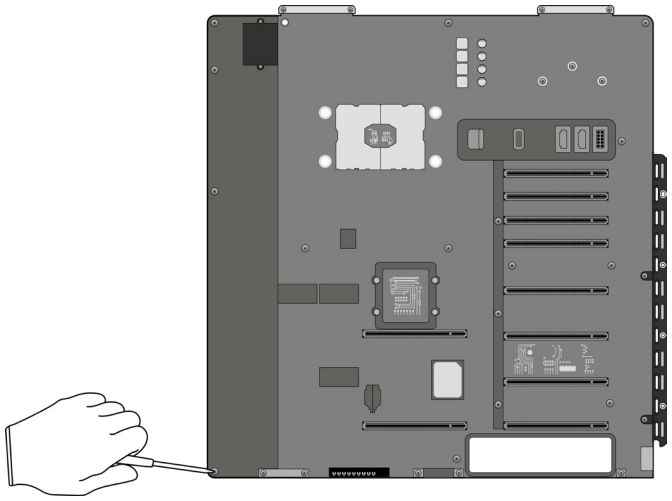
Ferrous

» *Slide the main logic board out of its frame. Set the frame aside.*

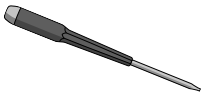


32. Remove the heat sink from the main logic board.

» *Unscrew the four Torx T8 fasteners along the length of the heat sink.*



Tools Used

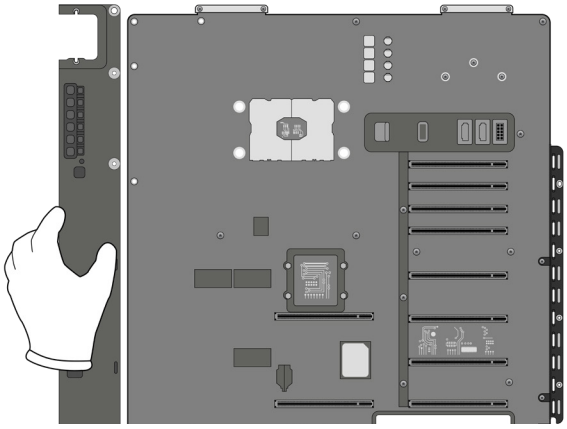


Fraction

Fasteners (x4)

Fe
Ferrous

» *By hand, pull the heat sink away from the logic board.*



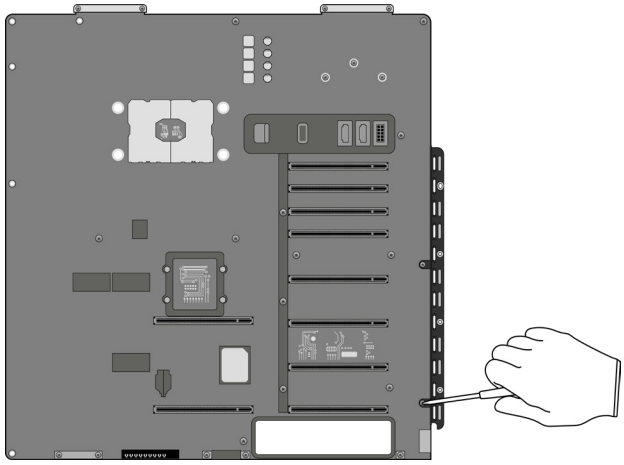
Fraction

Heat sink

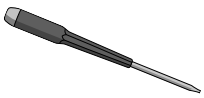
Al
Aluminum

33. Remove the side metal bracket.

» *Unscrew the two Torx T8 fasteners.*



Tools Used

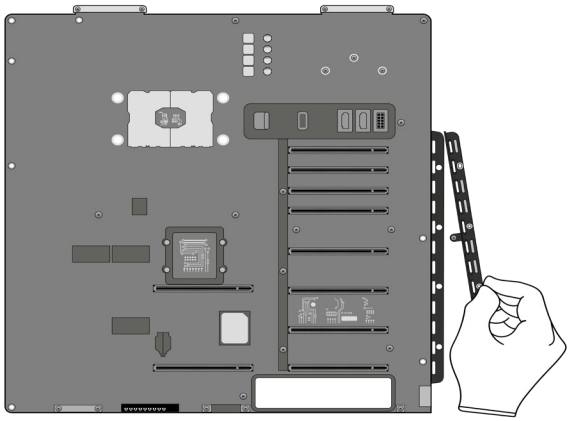


Fraction

Fasteners (x2)

Fe
Ferrous

» *Pull off the metal bracket.*

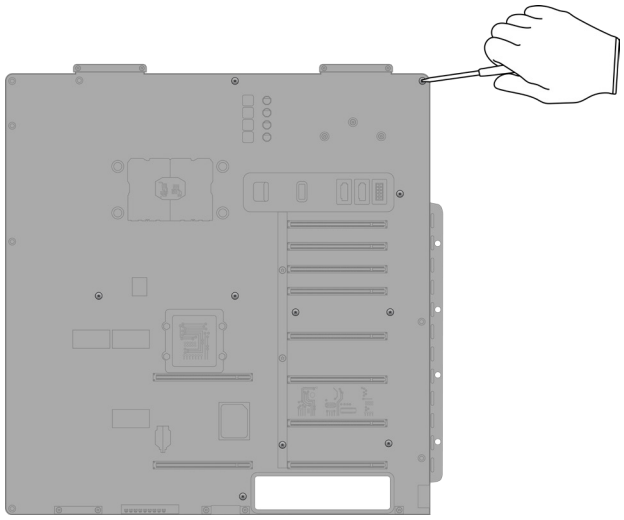


Fraction

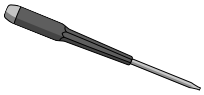
Bracket

Al
Aluminum

34. Unscrew the 10 Torx T8 fasteners from the main logic board.



Tools Used



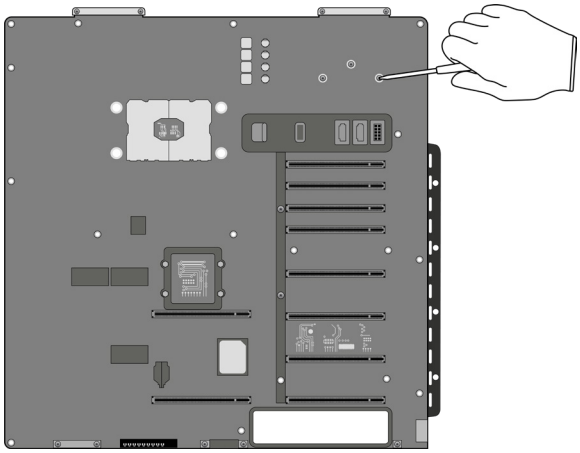
Fraction

Fasteners (x10)

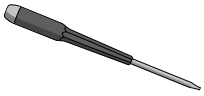
Fe
Ferrous

35. Remove the aluminum back plate.

» *Unscrew the three Torx T8 fasteners from the top right corner.*



Tools Used

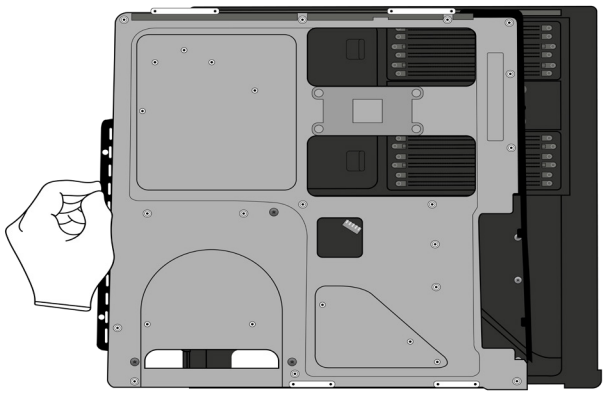


Fraction

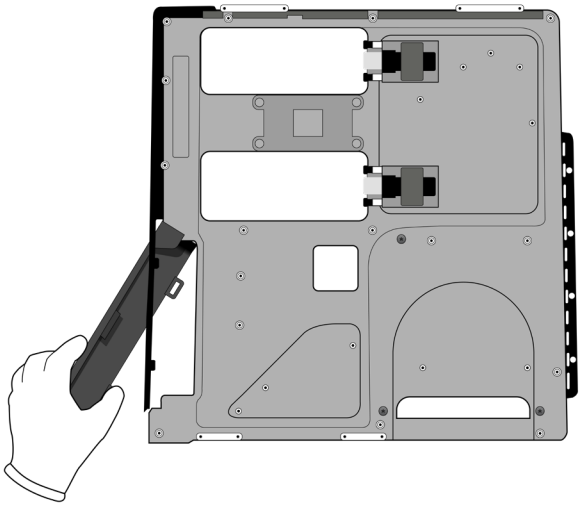
Fasteners (x3)

Fe
Ferrous

» *Flip the main logic board to the back. By hand, separate the back plate from the logic board.*



» *Remove the plastic cover from the back plate.*

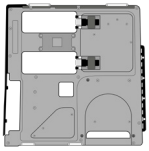


Fraction

Cover

PL
Plastics

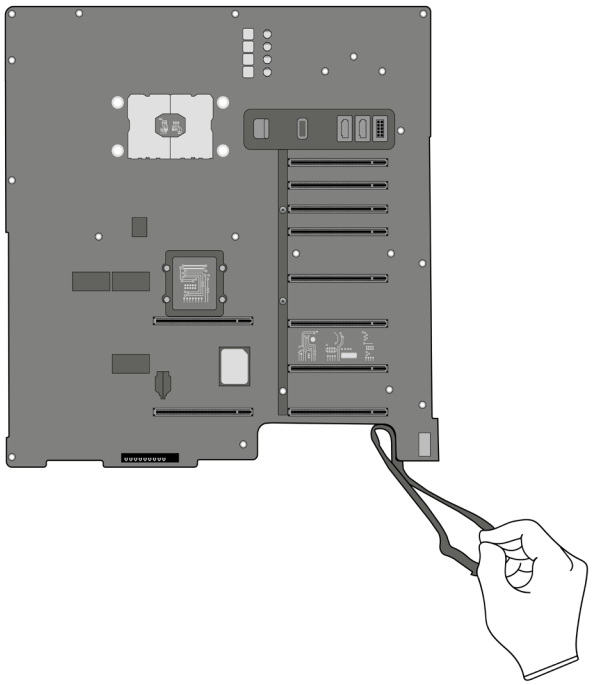
Fraction



Back plate

Al
Aluminum

36. Remove the plastic gasket from the main logic board.



Fraction

Gasket

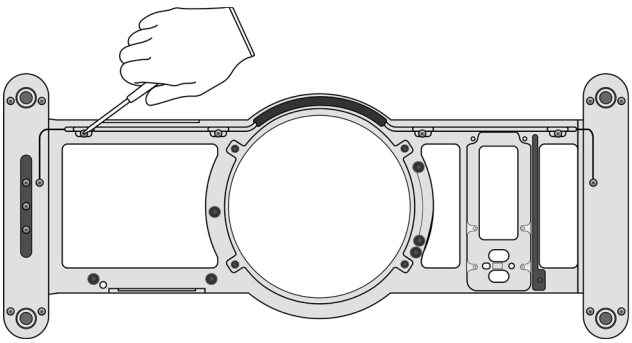
PL
Plastics

Fraction

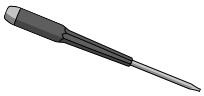
Main logic board

PMs
Precious Metals

37. Unscrew the six Torx T5 fasteners that hold the cable brackets to the top plate.



Tools Used

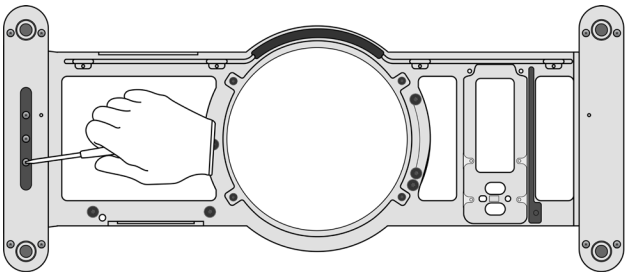


Fraction

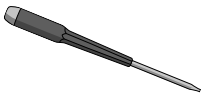
Fasteners (x6)

Fe
Ferrous

38. Remove the PCI Express slots frame by unscrewing the three Torx T8 fasteners.



Tools Used

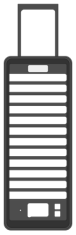


Fraction

Fasteners (x3)

Fe
Ferrous

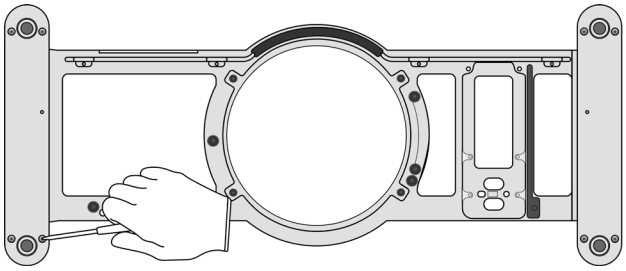
Fraction



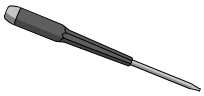
PCI Express slots frame

Al
Aluminum

39. Loosen the top plate by unscrewing the eight Torx T8 fasteners.



Tools Used

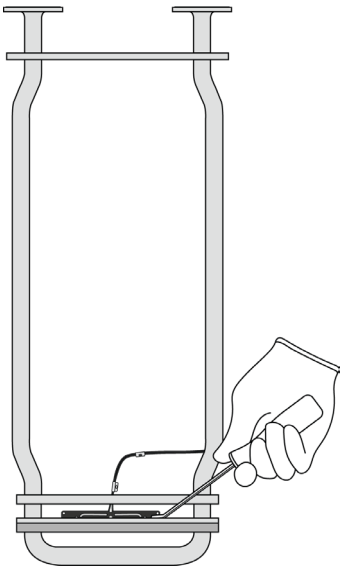


Fraction

Fasteners (x8)

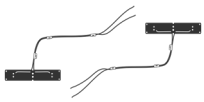
Fe
Ferrous

40. Pry off both antennas from between the plates.



Tools Used

Fraction



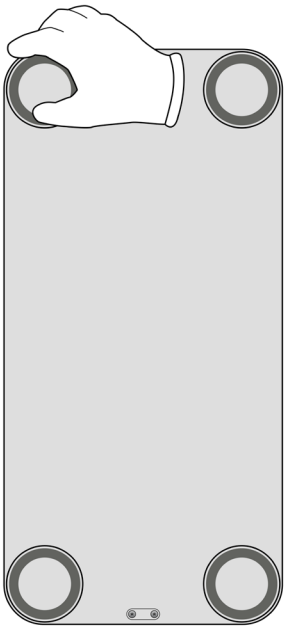
Antennas

Cu
Copper

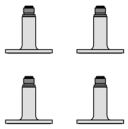
41. Remove the bottom plate.

» *Lay the frame on its side.*

» *Unscrew the four feet.*



Fraction



Feet

Fe

Ferrous

Fraction

Bottom plate

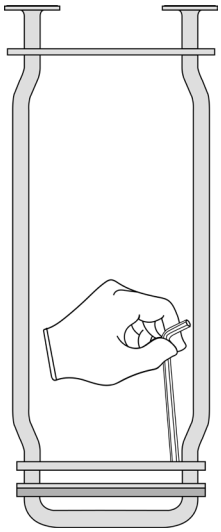
Al

Aluminum

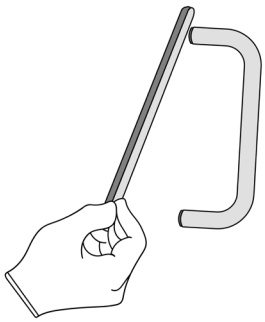
42. Remove the handles and antenna housing.

Tools Used

» *Set the frame upside down on the handles with the legs pointing straight up. Loosen the socket captive fasteners, two for each handle.*



» *Separate the handles from the antenna housing.*

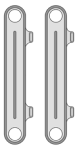


Fraction

Handles

Fe
Ferrous

Fraction



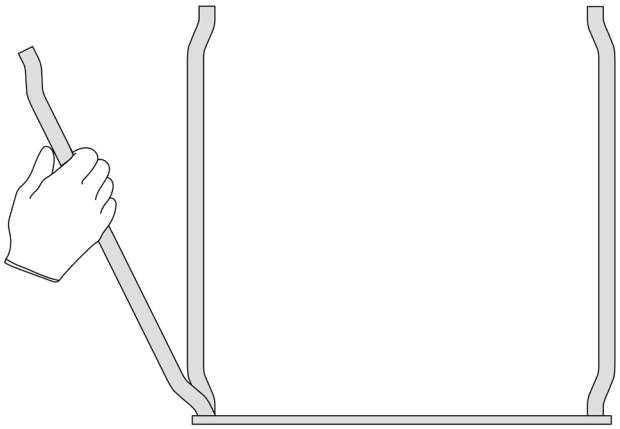
Antenna housing

Al
Aluminum

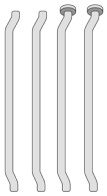
43. Remove the four legs.

» *Lay the frame on its side.*

» *Move each leg back and forth until it separates from the top plate.*



Fraction



Legs

Fe

Ferrous

Fraction

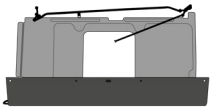
Top plate

Al

Aluminum

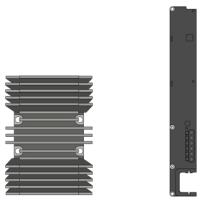
Material Categorization of Output Fractions

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.

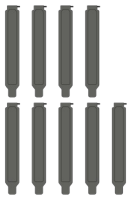
Fraction	Downstream Processing
Aluminum	**Primary Target Material**
 *Housing*	Al Aluminum
 *Clamp plates*	**Potential Additional Materials**
 *Front face*	PL Plastics
 *GPU housing*	
 *Power supply enclosure*	

Fraction	Downstream Processing

Aluminum (cont.)



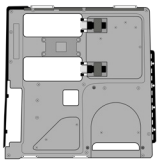
Heat sinks



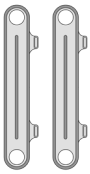
PCI Express slot covers

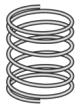
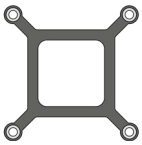
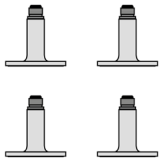
I/O board flex cable cover

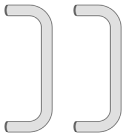
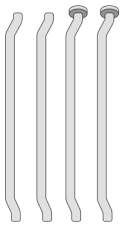
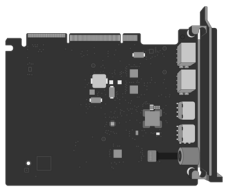
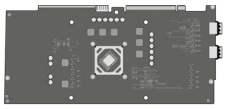
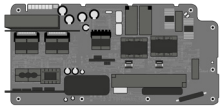
Bracket



Back plate

Fraction	Downstream Processing
Aluminum (cont.)	
 *PCI Express slots frame*	
 *Bottom plate*	
 *Antenna housing*	
 *Top plate*	
Batteries	**Primary Target Material**
 *Coin cell battery*	

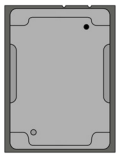
Fraction	Downstream Processing
Ferrous	**Primary Target Material**
 *Captive fasteners (x8)*	
 *Captive fastener springs (x8)*	
 *Fasteners (x131), springs (x8), and washer*	
 *Center bracket*	
 *Feet*	

Fraction	Downstream Processing
Ferrous (cont.)	
 *Handles*	
 *Legs*	
Logic Boards	**Primary Target Material**
 *I/O card*	PMs Precious Metals
 *GPU logic board*	**Potential Additional Materials**
 *Power supply logic board*	Cu Copper, Fe Ferrous, PL Plastics

Fraction	Downstream Processing

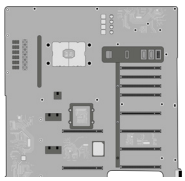
Logic Boards (cont.)

Memory modules



Processor

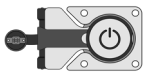
I/O board



Main logic board

Mixed Electronics

Power cord



Power button

Primary Target Material

Cu
Copper

Potential Additional Materials

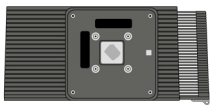
Fe
Ferrous

PL
Plastics

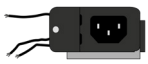
PMs
Precious Metals

Fraction	Downstream Processing

Mixed Electronics (cont.)



Heat sink



Power adapter

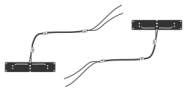
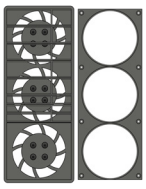
Thermal module

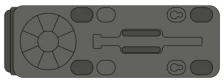
Blower

Ribbon cables

Fan motors

I/O board flex cable

Fraction	Downstream Processing
Mixed Electronics (cont.)	
 *Antennas*	
Mixed Plastics	**Primary Target Material**
 *Mylar film*	
 *Memory module covers*	
 *Duct*	
 *Fan enclosure*	

Fraction	Downstream Processing
Mixed Plastics (cont.)  *Fans*  *Cover*  *Gasket*	
Rare Earth Magnets  *Speaker*	**Primary Target Material**  **Potential Additional Materials**