

Exhibit E - Exemplary Infringement Evidence for U.S. Patent No. 10,556,381

RESTRICTED CONFIDENTIAL SOURCE CODE

Subject to its express reservation of rights to supplement or amend its contentions as may be appropriate in view of discovery, further investigation, and/or the claim construction process, Plaintiff Stratasys, Inc. (“Plaintiff” or “Stratasys”) provides its preliminary disclosure of asserted claims and infringement contentions to Shenzhen Tuozhu Technology Co., Ltd., Shanghai Lunkuo Technology Co., Ltd., Bambulab Limited and Tuozhu Technology Limited (collectively, “Defendants” or “Bambu Lab”), pursuant to the Court’s Scheduling Order, D.I. 20; the Court’s October 30, 2024 Order extending the time to comply with P.R. 3-1, 3-2, 3-3, and 3-4, D.I. 22; P.R. 3-1; the Court’s May 9, 2025 Order (Dkt. No. 52); and Paragraph 3(a)(i) of the Court’s Discovery Order (Dkt. No. 35). Nothing in these contentions should be interpreted as an admission or concession regarding the scope of the asserted claims.

Disclosure of Asserted Claims for U.S. Patent No. 10,556,381 (“the ’381 Patent”) under P.R. 3-1(a): Claims 1, 2, 5, 6, 9, 11, 12, and 14.

Disclosure of Accused Instrumentalities for the ’381 Patent under P.R. 3-1(b): For each of the Asserted Claims, all Bambu Lab branded or manufactured three-dimensional (3-D) printers with sensors for detecting force, including but not limited to the Bambu Lab A1, A1 mini, and H2D printers, alone or in combination with Bambu Lab software, such as Bambu Studio (e.g. Bambu Studio v1, Bambu Studio v2) or Bambu Handy, and all Bambu Lab Parts.

Based on information available to-date, the Bambu Lab A1 and A1 mini have no material differences relevant to these infringement contentions. See <https://bambulab.com/en-us/compare> (comparing A1 and A1 mini upon selection). The A1 includes several upgrades over the A1 mini, including a larger build volume, higher max build plate temperature, and larger display. *Id.* Accordingly, references to components or functionality of either the A1 or A1 mini in this chart—other than the larger build volume, higher max build plate temperature, and larger display—apply to both printers.

Based on information available to-date, Bambu Studio v1 and Bambu Studio v2 have no material differences relevant to these infringement contentions. See <https://wiki.bambulab.com/en/software/bambu-studio/release/release-note-2-0-0> (explaining additional features of Bambu Studio v2). Accordingly, references to functionality of either Bambu Studio v1 or Bambu Studio v2 in this chart apply to both versions of the software.

Disclosure of Priority Date under P.R. 3-1(e): The asserted claims of the ’381 Patent are each entitled to a priority date of at least as early as October 29, 2012.

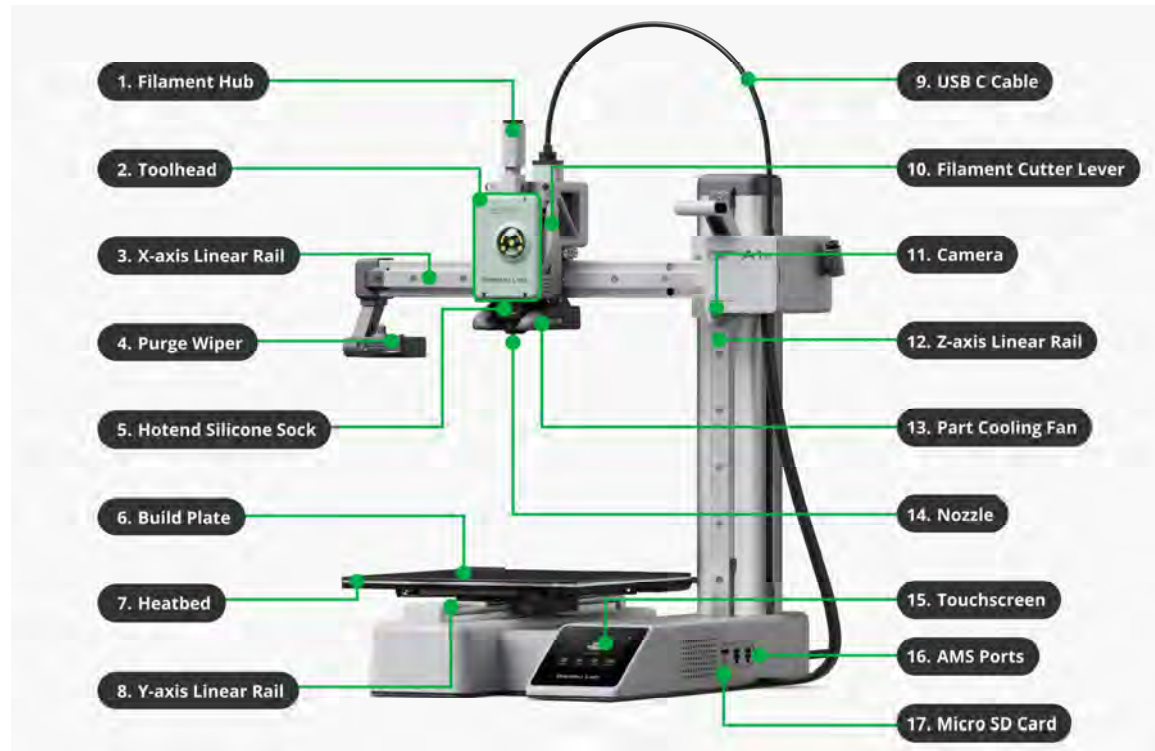
Disclosures under P.R. 3-1(c)-(d): Stratasys identifies in the chart below specifically where each element of each Asserted Claim is found within each of the Accused Instrumentalities.

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Disclosure under P.R. 3-1(f): At this time, Stratasys does not intend to rely on the assertion that its own products or other instrumentalities practice the claimed invention. Stratasys reserves the right to amend and/or supplement this disclosure as discovery progresses.

Claim	Contention
1. A three-dimensional printer comprising:	To the extent the preamble is a limitation, each Accused Instrumentality is a three-dimensional printer. Bambu Lab provides various additive manufacturing systems (i.e., 3D printers), including the A1, A1 mini, and H2D are used for fabricating three-dimensional parts. See, e.g., https://wiki.bambulab.com/en/a1-mini:

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See, e.g., <https://wiki.bambulab.com/en/a1>:

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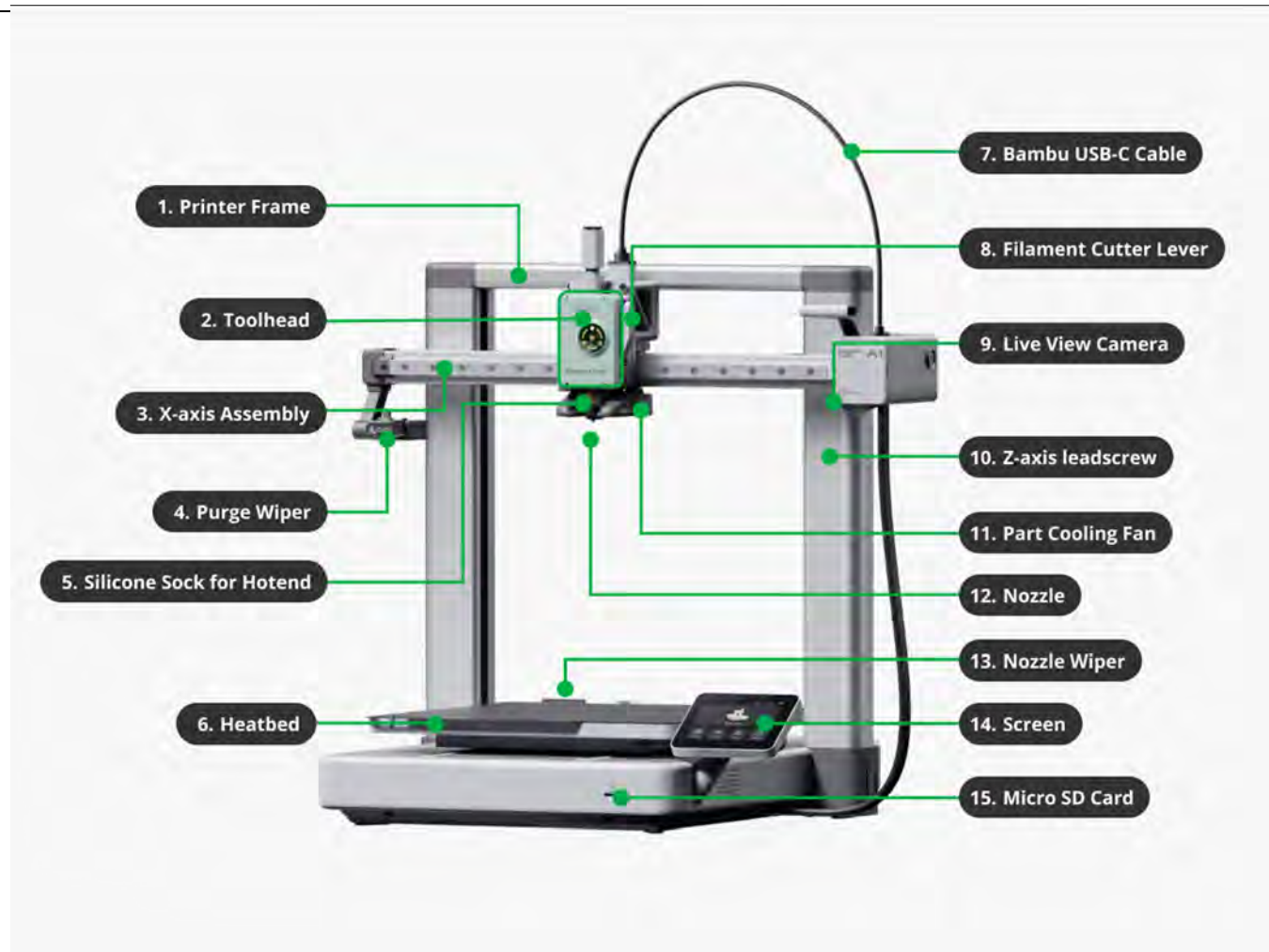
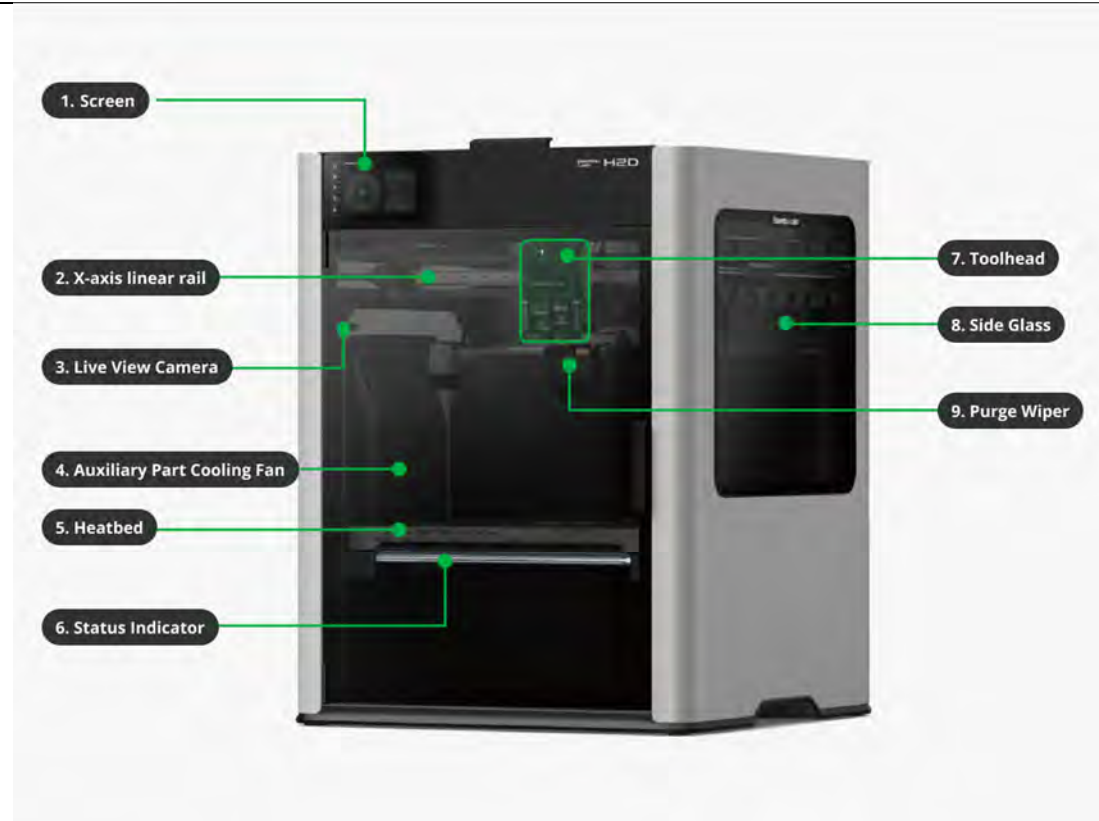


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<https://wiki.bambulab.com/en/h2d>

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a fabrication tool including an extruder configured to extrude build material to fabricate an object during a build process;

Each Accused Instrumentality includes a fabrication tool including an extruder configured to extrude build material to fabricate an object during a build process.

For example, the A1, A1 mini and H2D include a toolhead with an extrusion nozzle. See, e.g., <https://wiki.bambulab.com/en/a1-mini> (toolhead 2 with extrusion nozzle 14):

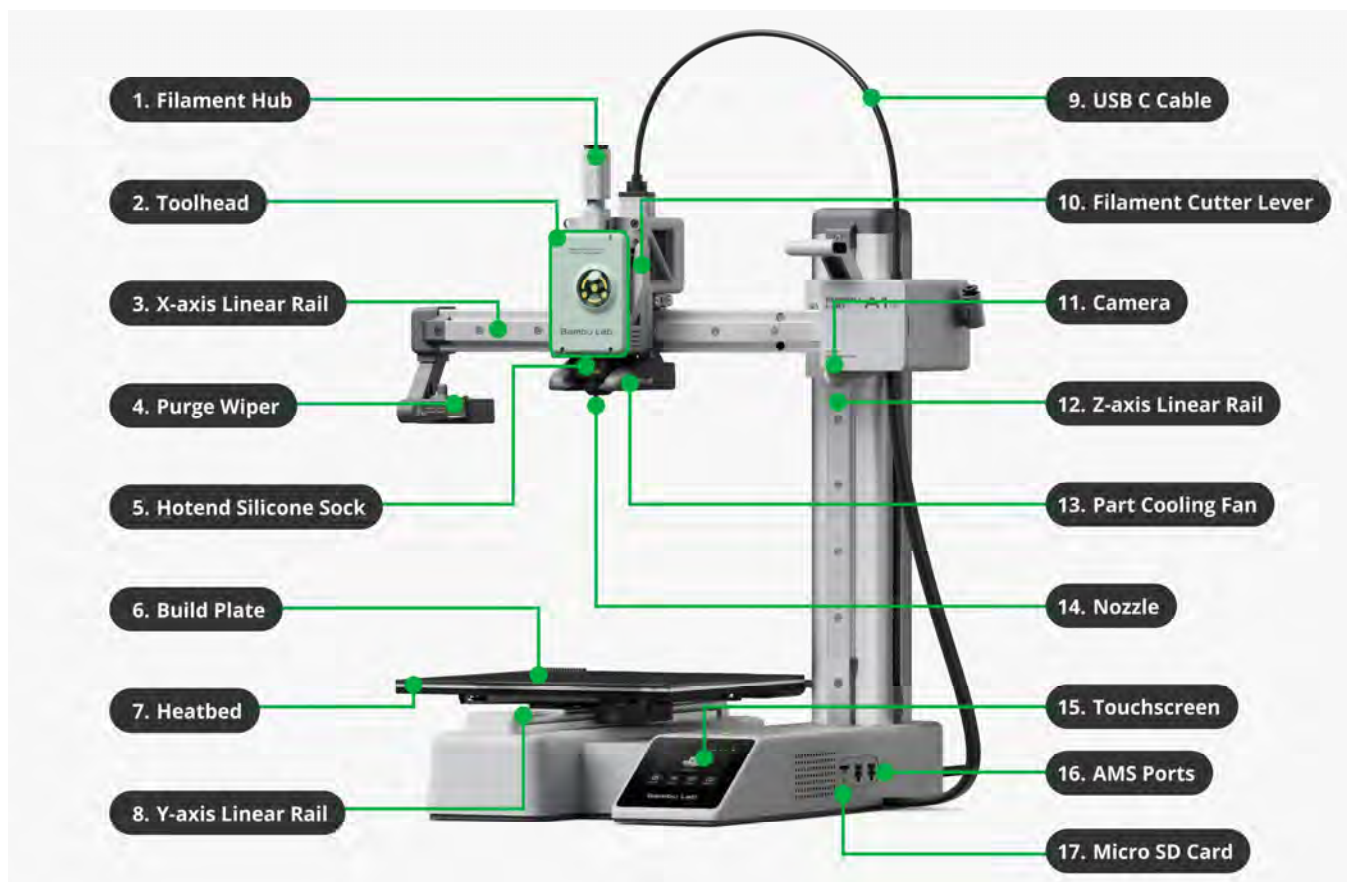
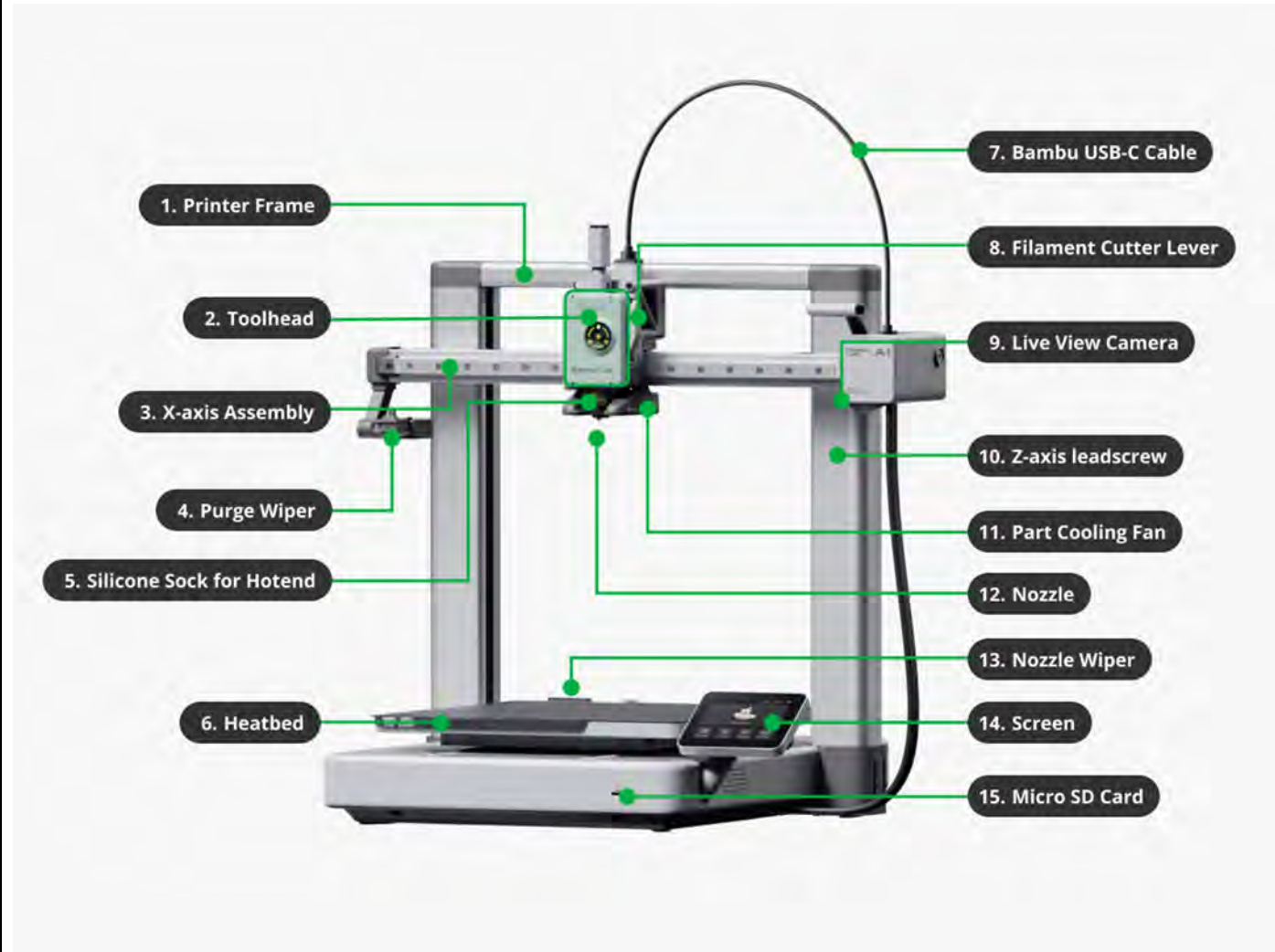


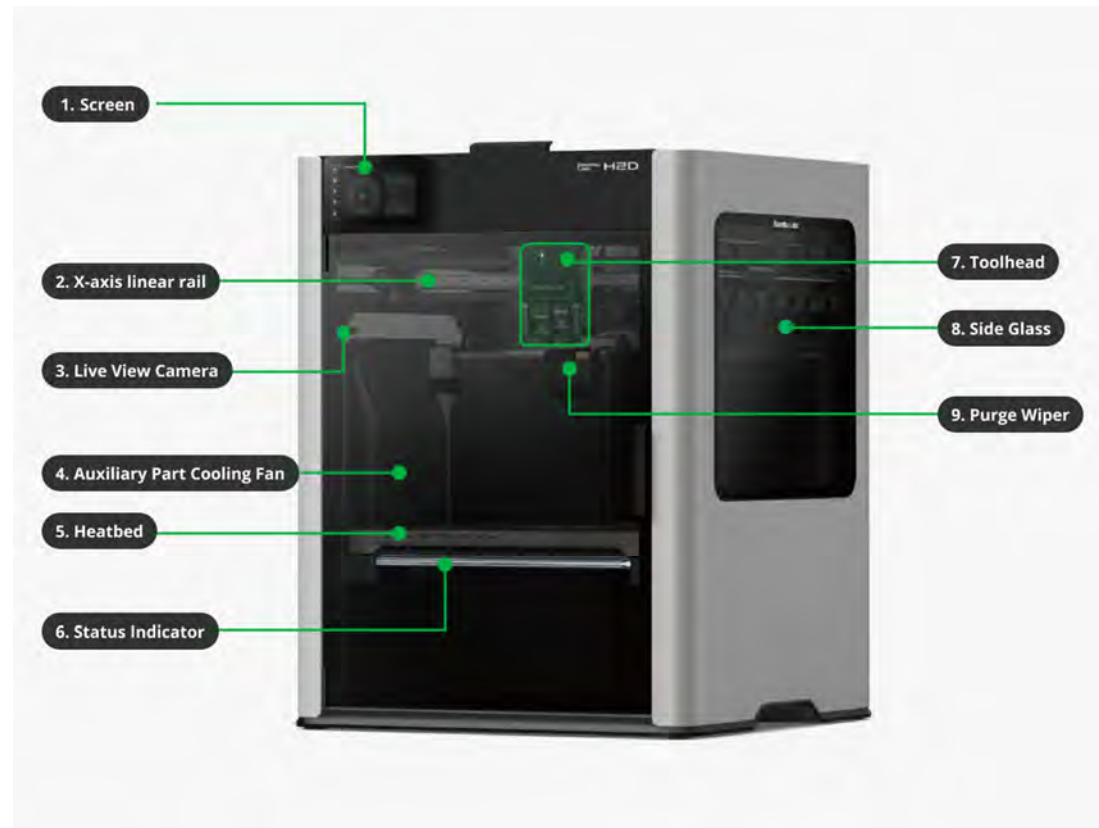
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See, e.g., <https://wiki.bambulab.com/en/a1> (toolhead 2 with extrusion nozzle 12):



See <https://wiki.bambulab.com/en/h2d> (toolhead 7):

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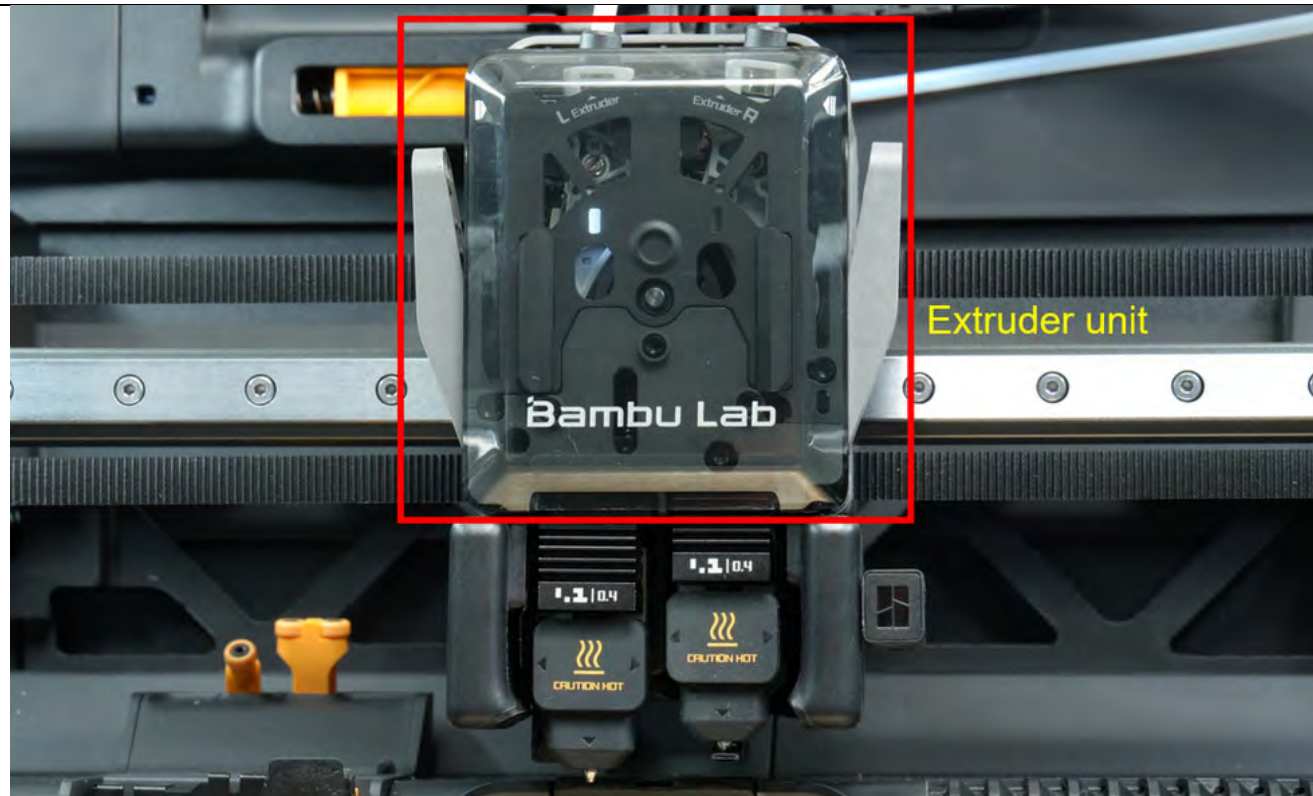
See <https://wiki.bambulab.com/en/h2/manual/h2d-intro> (H2D extruder):

“Extruder

The extruder is responsible for pulling the filament out of the spool and feeding it into the hotend. After heating and melting, it is extruded through the nozzle to generate a printed model.

The extruder needs to accurately control the length of extrusion and retraction of the filament to ensure the dimensional accuracy and appearance quality of the printed model. It is one of the core components of a 3D printer.

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...

The extrusion motor drives the extrusion driving wheel to rotate clockwise or counterclockwise, which can drive the driven wheels on both sides to extrude the filament respectively, to achieve the effect of left or right extrusion with one extrusion driving wheel.”

See also, <https://wiki.bambulab.com/en/a1-mini/manual/intro-a1-mini>:

“Tool head module

The tool head unit is one of the key components of the A1 mini. The tool head module mainly consists of the following components: hotend assembly, extruder unit, cutter unit, filament hub, and filament sensor.

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Toolhead module



Hotend and
silicone sock



Hotend heating
assembly and fan

Hotend assembly

The hotend assembly is a core component of the toolhead module, consisting of a hotend heating assembly, a hotend (integrated with a nozzle and a heat sink), a hotend fan, and a hotend silicone sock. The hotend assembly is responsible for heating the filament to a specific temperature, melting it, and depositing it in thin layers to generate the object.

Different filaments require different heating temperatures. For example, PLA material is printed at lower temperatures around 210-220°C, while PETG material requires higher temperatures around 250-260°C. Like the classic X1 series, the Bambu Lab A1 mini printer has an integrated hotend design that combines

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the nozzle and heat sink, enabling a faster heating effect than a regular hotend.

Additionally, it facilitates quick hotend replacement without unplugging tiny connectors or searching for a reliable screwdriver.



Hotend heating
assembly



hotend



Hotend fan



Silicone sock

Extruder unit

The extruder motor and extruder gears are essential components of the extruder unit. The extruder motor pulls the filament from the spool and feeds it into the hotend. Once heated and melted, the filament is extruded through the nozzle to create the printed model. The extruder motor is critical in accurately controlling the length of filament extruded through the hotend and is a core component of a 3D printer.

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Internal Gear Structure
of the Extruder



Extruder motor

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See also <https://wiki.bambulab.com/en/a1/manual/intro-a1>:

“Toolhead module

The toolhead unit is a crucial component of the A1. It comprises several key modules, including the hotend assembly, extruder unit, cutter unit, filament hub, and filament sensor.



Toolhead module



Hotend and
silicone sock



Hotend heating
assembly and fan

Hotend assembly

The hotend assembly is a core component of the toolhead module, consisting of a hotend heating assembly, a hotend (integrated with a nozzle and a heat sink), a hotend fan, and a silicone sock for hotend. The hotend assembly is responsible for heating the filament to a specific temperature, melting it, and depositing it in

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Additionally, it facilitates quick hotend replacement without unplugging tiny connectors or searching for a reliable screwdriver.



Hotend heating
assembly



hotend



Hotend fan



Silicone sock

Extruder unit

The extruder motor and extruder gears are essential components of the extruder unit. The extruder motor pulls the filament from the spool and feeds it into the hotend. Once heated and melted, the filament is extruded through the nozzle to create the printed model. The extruder motor is critical in accurately controlling the length of filament extruded through the hotend and is a core component of a 3D printer.

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Internal Gear Structure
of the Extruder



Extruder motor

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one or more sensors mechanically coupled to the extruder, wherein the one or more sensors are collectively operable to sense a contact force between the extruder and a separate structure distinct from the fabrication tool; and	Each Accused Instrumentality includes one or more sensors mechanically coupled to the extruder, wherein the one or more sensors are collectively operable to sense a contact force between the extruder and a separate structure distinct from the fabrication tool. The Bambu Labs A1, A1 Mini and H2D include an extrusion force sensor (or eddy force sensor) mechanically coupled to the toolhead. For example, https://wiki.bambulab.com/en/a1-mini/manual/build-plate-detection describes the “extrusion force sensor (eddy current sensor) in the tool head” on the A1 Mini printer. See also e.g., https://wiki.bambulab.com/en/a1-mini/troubleshooting/hmscode/0300_1A00_0002_0002:
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See also <https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>:

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“A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration. When the MC board fails to receive signals from the force sensor, this alarm is triggered.

Possible reasons for HMS activation include:

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	• Damage to the force sensor (including the eddy current coil and signal cable). • Disconnection of the force sensor signal cable from the TH board. • Communication anomalies within the chips on the TH board. • Communication anomalies between the TH board and the MC board.” https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003 The extrusion force sensor senses contact between the toolhead wrapped with a filament clump and the heatbed. See https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection; see also https://wiki.bambulab.com/en/a1 (the “nozzle clumping detection” link on the A1 page links to https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection):
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	 Bambu Lab Wiki    How to detect the clumping? The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, <u>and the extrusion force sensor will detect the change in force.</u> Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and <u>the force change will be detected.</u> There are two types of nozzle clumping detection. After the detection is enabled, the printer will perform nozzle clumping detection when the following conditions are met: 1. After printing all the walls of the first object on the third layer of this plate, the tool head will move to the position of the purge wiper for the first detection. The specific coordinates of the nozzle during detection: A1 mini (X-6, Y 170, Z-1); A1 (X 261, Y 250, Z-1). The detection process is shown in the following figure. Bambu Lab H2D: “The Nozzle Eddy Sensor is used to detect whether the nozzle is wrapped by molten filament.” https://us.store.bambulab.com/products/nozzle-eddy-sensor See also https://wiki.bambulab.com/en/a1-mini/troubleshooting/hmscode/0300_1A00_0002_0001:
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HMS_0300-1A00-0002-0001: The nozzle is wrapped in the filament or the build plate is placed incorrectly

0300-1A00-0002-0001

 Edit

What it is

A1 series printers are equipped with the nozzle clumping detection function, you can refer to the wiki for details: [Nozzle clumping detection | Bambu Lab Wiki](#)

The extrusion force sensor is used to detect whether the nozzle is covered by filament, if the nozzle is covered by filament, or if the build plate is placed incorrectly, the force on the nozzle will change. When the nozzle clumping detection is enabled, the nozzle will move outside the heat bed and then continue to move down. If the nozzle is covered by the filament, forming a thick material mass, the process of the above movement will cause the material mass to hit the heat bed and cause the force change. The change in force will be detected by the extrusion force sensor (eddy current sensor coil).

Bambu Lab H2D:

“A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration.”

https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003

Additionally, the Bambu A1 and A1 mini perform build plate detection, where the contact force between the extruder and a separate structure (heat bed) is sensed:

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The principle of build plate detection is to use the extrusion force sensor (eddy current sensor) in the tool head to detect the build plate. **When it starts the detection, the printer first lowers the tool head so that the nozzle touches the heat bed to confirm the zero coordinates in the Z direction. Then move to a specific position and move the tool head downwards to allow the nozzle to make a probing touch. If the build plate is placed, the nozzle will touch the part of the build plate to detect the change in force. If the build board is not placed, during the movement, it will only touch the air and no change in force will be detected, and the printer will determine that the build plate is not placed.**

<https://wiki.bambulab.com/en/a1-mini/manual/build-plate-detection>; see also <https://wiki.bambulab.com/en/a1> (the “build plate detection” link on the A1 page links to <https://wiki.bambulab.com/en/a1-mini/manual/build-plate-detection>).

Also, the Bambu A1, A1 mini and H2D perform homing, where the contact force between the extruder and a separate structure (heat bed) is sensed:

Homing

A homing proces refers to the printer detecting the stoppers for XYZ axes to determine the toolhead's zero coordinates in three-dimensional space. During the homing process, the printer uses the motors for X-axis (toolhead moving) and Y-axis (heatbed moving) to detect load to determine if they have reached their boundaries. For the Z-axis, homing will cause the toolhead to descend until the nozzle touches the heatbed. The eddy current sensor above the hotend will detect whether the nozzle has made contact with the heatbed.

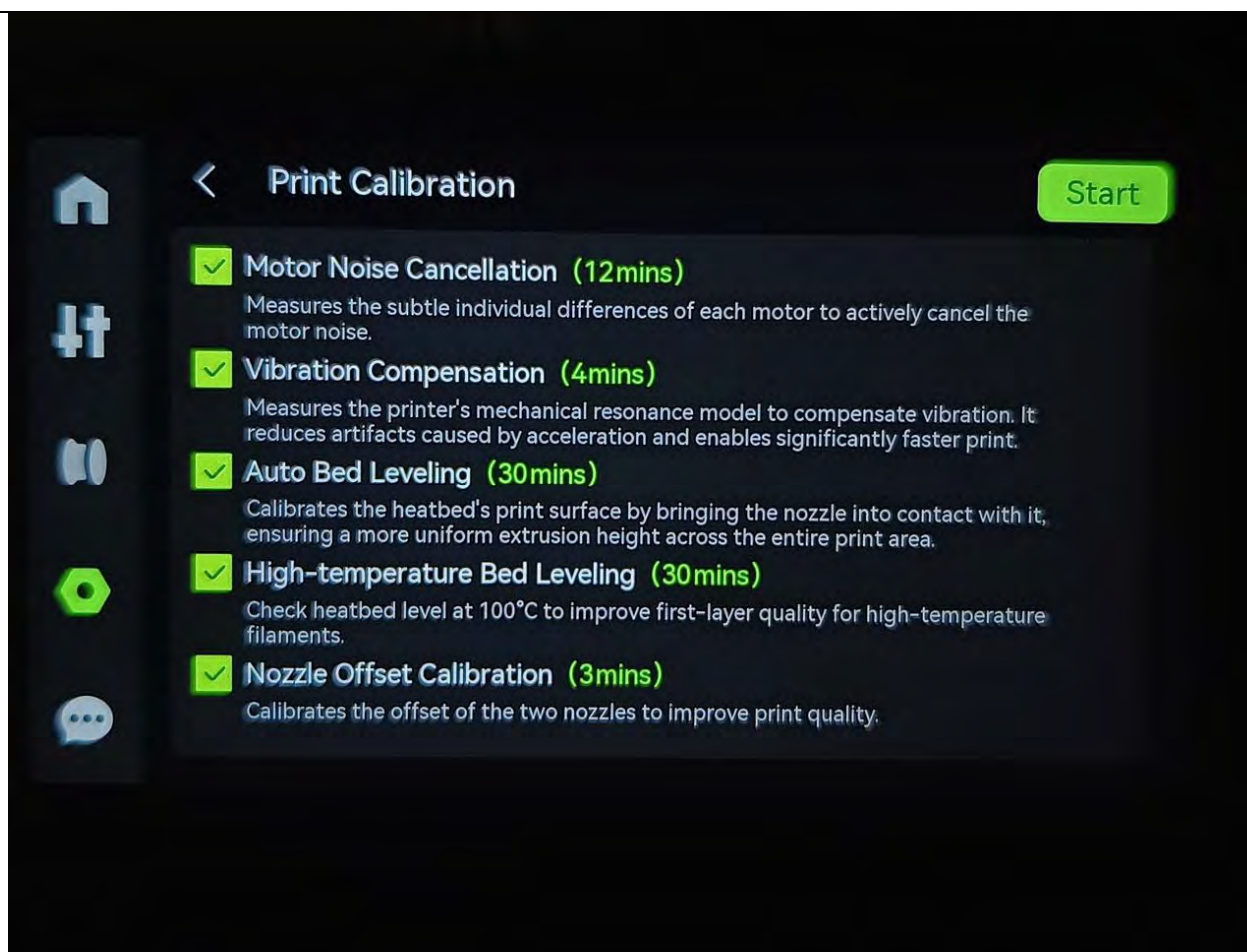
<https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>; see also <https://wiki.bambulab.com/en/a1-mini> (the “homing and leveling failure troubleshooting guide for A1 series” link on the A1-mini page links to <https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>).

Bambu Lab H2D:

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	“A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration.” https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003 The Bambu Lab H2D performs automatic bed leveling, where the contact force between the extruder and a separate structure (heat bed) is sensed: “Auto bed leveling on the Print calibration page • Heat the nozzle to 140°C; • With the bed at room temperature, perform an 8×8 point leveling using the right nozzle; • Heat the bed to 55°C, then perform another 8×8 point leveling with the right nozzle; • Continue with a 22×22 point leveling using the right nozzle; • Finally, switch to the left nozzle and perform an 8×8 point leveling.
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High-temperature bed leveling on the Print calibration page

1. Heat the bed to 100°C while heating the nozzle to 140°C;
2. Use the right nozzle to perform the following leveling steps:
 - 8×8 point leveling
 - 22×22 point leveling

Note: The high-temperature bed leveling data will be automatically applied when the bed temperature during the print job is $\geq 80^{\circ}\text{C}$. Suppose you have replaced, disassembled, or manually leveled the bed. In that case, it is recommended to run both Auto Bed Leveling and High-

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	Temperature Bed Leveling again on the Print Calibration page to ensure the machine obtains accurate bed plane data. Auto Bed leveling before printing
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Send print job



Cube 

 35m1s  14.28 g

Printer

 3DP-094-067 

 PEI

Filament

Left Nozzle

Right Nozzle

PLA-CF

 A2 

Filaments to AMS slots mappings have been established. You can click a filament above to change its mapping AMS slot

Rearrange filaments of the left and right nozzles ->

[Click here if you can't connect to the printer](#)

Advanced Options 

Auto Bed Leveling

This checks the flatness of heatbed. Leveling makes extruded height uniform.
*Automatic mode: Run a leveling check(about 10 seconds). Skip if surface is fine.

Flow Dynamics Calibration

Auto On Off

Auto On Off

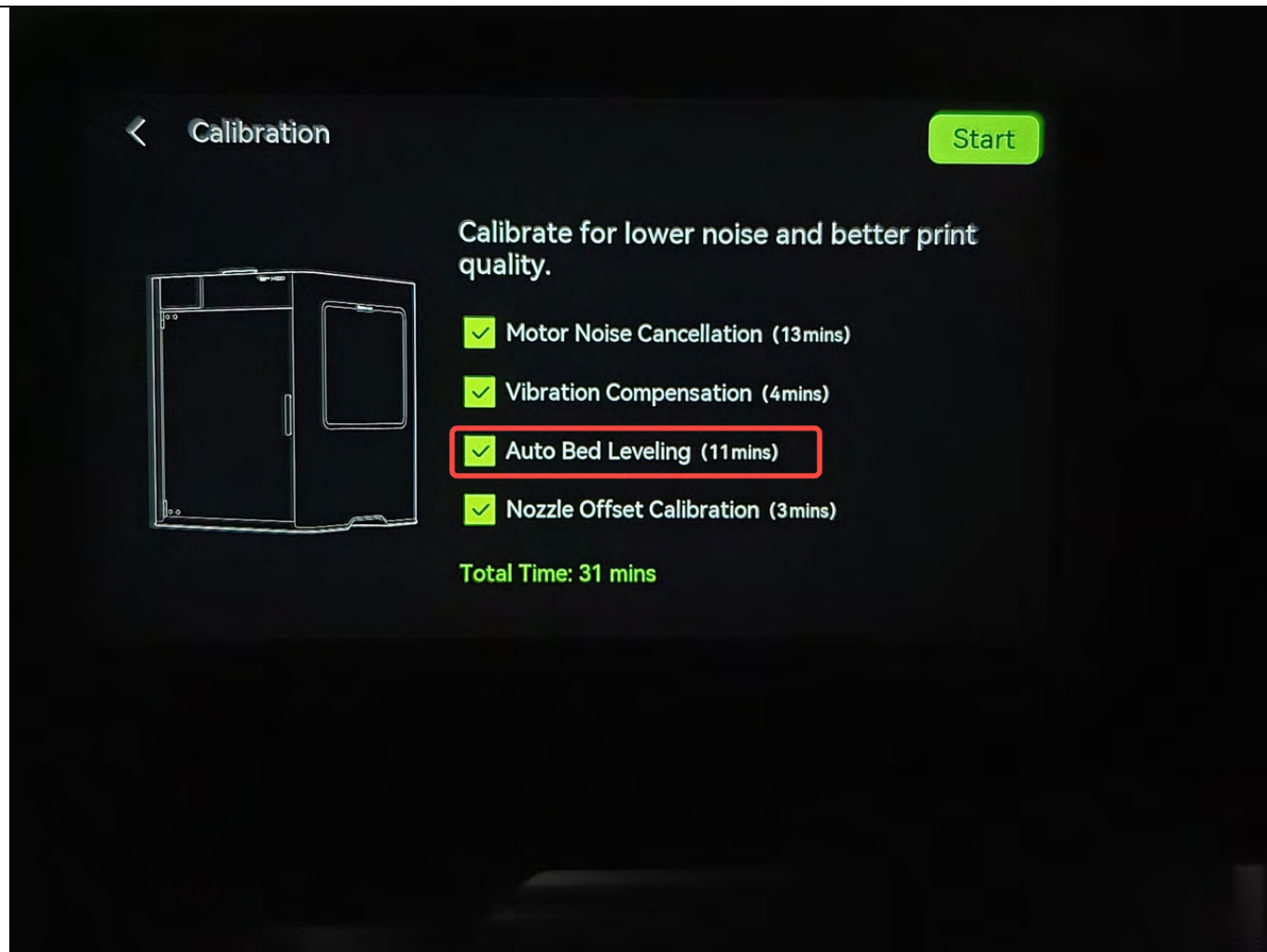
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	When "Auto" mode is selected: Before printing, a 5-point touch test will be performed on the corresponding areas of the model contour to determine whether partial leveling is needed. • If partial leveling is required, use the 8×8 leveling points that cover the model's projection contour on the bed for leveling. • If not required, skip the partial leveling step. When "On" mode is selected: • Directly perform partial leveling on the model contour area on the print bed. Note: The partial leveling data and calibration leveling data (including Auto Bed Leveling and High-Temperature Bed Leveling) will be stored in the printer. During printing, the system will automatically combine and apply both sets of leveling data. This data remains effective until a new corresponding leveling task is performed to update it. • Auto Bed Leveling during the unboxing process
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1. Initial Leveling:

- Heat the nozzle to 140°C;
- With the bed at room temperature, perform an 8×8 point leveling using the right nozzle.

2. Post-Heating Leveling:

- Heat the bed to 55°C;
- Perform another 8×8 point leveling using the right nozzle.

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	3. Nozzle-Switching Leveling: • Switch to the left nozzle and perform an 8×8 point leveling again.” https://wiki.bambulab.com/en/h2/manual/h2d-faq
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a controller configured to receive a signal from the one or more sensors on the extruder and to calculate the contact force between the extruder and the separate structure.

Each Accused Instrumentality includes a controller configured to receive a signal from the one or more sensors on the extruder and to calculate the contact force between the extruder and the separate structure. See, e.g., <https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection>:

Nozzle clumping detection

This guide describes the nozzle clumping detection feature for A1 series printers

Edit

What is the nozzle clumping detection?

Nozzle clumping usually refers to the phenomenon that the nozzle is wrapped by the filament during printing because the filament is not stuck on the build plate or some other reasons, resulting in printing failure or even damage to the hot end, extruder, and other parts, as shown in the following figure.

Because of the possibility of damage to the printer, the Bambu A1 series is equipped with a nozzle clumping detection feature to deal with this situation, when the printer detects that the nozzle is wrapped in molten filament, it automatically stops printing and alerts it to avoid further damage to the printer after the wrapping.



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“How to detect the clumping?”

The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, and the extrusion force sensor will detect the change in force. Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and the force change will be detected.”

Bambu Lab H2D:

“The Nozzle Eddy Sensor is used to detect whether the nozzle is wrapped by molten filament.”

<https://us.store.bambulab.com/products/nozzle-eddy-sensor>

In Bambu’s build plate detection, the contact force between the extruder and the separate structure (heat bed) is calculated based on a signal from the extrusion force sensor:

The principle of build plate detection is to use the extrusion force sensor (eddy current sensor) in the tool head to detect the build plate. **When it starts the detection, the printer first lowers the tool head so that the nozzle touches the heat bed to confirm the zero coordinates in the Z direction. Then move to a specific position and move the tool head downwards to allow the nozzle to make a probing touch. If the build plate is placed, the nozzle will touch the part of the build plate to detect the change in force. If the build board is not placed, during the movement, it will only touch the air and no change in force will be detected, and the printer will determine that the build plate is not placed.**

<https://wiki.bambulab.com/en/a1-mini/manual/build-plate-detection>

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In Bambu's homing process, the contact force (non-zero or zero) between the extruder and the separate structure (heat bed) is detected based on a signal from the extrusion force sensor:

Homing

A homing process refers to the printer detecting the stoppers for XYZ axes to determine the toolhead's zero coordinates in three-dimensional space. During the homing process, the printer uses the motors for X-axis (toolhead moving) and Y-axis (heatbed moving) to detect load to determine if they have reached their boundaries. For the Z-axis, homing will cause the toolhead to descend until the nozzle touches the heatbed. The eddy current sensor above the hotend will detect whether the nozzle has made contact with the heatbed.

<https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>

Bambu Lab H2D:

"A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration."

https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003

Bambu Lab printers include a controller, such as one or more MCUs, alone or integrated with on a System-on-Chip (SOC) with a processor, as well as associated circuitry, such as for receiving signals from sensors.

<https://wiki.bambulab.com/en/a1/manual/intro-a1> ("The main control board of the A1 printer consists of a low-power SoC (System-on-Chip) with a dual-core processor, Wi-Fi baseband, Bluetooth baseband, RF module, and other peripherals. It also includes a dual-core MCU (Microcontroller Unit) and a single-core MCU."); see also <https://wiki.bambulab.com/en/a1/maintenance/th-board-replacement-guide>, <https://wiki.bambulab.com/en/a1-mini/th-board-replacement-guide>, <https://wiki.bambulab.com/en/glossary>.

"Electrical Components

There are many electronic components inside the H2D. Here is an introduction to some of the most important ones:

Main control board

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	H2D has two types of core main control boards, one is responsible for interactive logic processing, and the other is responsible for the control processing of the whole machine motion unit. AP Logic mainboard The logic mainboard contains a quad-core CPU and the connections required for the different media electronics connected to the printer. The CPU handles the H2D's intelligent functions (including AI detection, flow calibration, and vibration compensation) and the connection between the slicing software/mobile app and the printer. MC motion control board The motion control board contains a dual M4 core MCU, a single M7 core MCU, and stepper drivers and connections to the different motion electronics of the printer, providing: xyz motion control, chamber temperature control, heated temperature control, chamber status detection (door, top cover, side panel switch and glass type detection), and circulation system control (air circulation and flow channel control) The MCU controls the actual movement and overall status of the printer after obtaining the G code stream from the CPU.” https://wiki.bambulab.com/en/h2/manual/h2d-intro
2. The three-dimensional printer of claim 1, wherein the contact force is a force along an extrusion axis of the extruder.	For each Accused Instrumentality, the contact force is a force along an extrusion axis of the extruder. In Bambu’s clump detection, the nozzle making contact with the heat bed (during its “tentative touch” discussed in the excerpt below) indicates a clumping. The tentative touch is in the z direction, the extrusion axis. The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, and the extrusion force sensor will detect the change in force. Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and the force change will be detected.

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<https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection>

Bambu Lab H2D:

“The Nozzle Eddy Sensor is used to detect whether the nozzle is wrapped by molten filament.”
<https://us.store.bambulab.com/products/nozzle-eddy-sensor>

In Bambu’s build plate detection, the nozzle touches the heat bed to detect if the build plate is in place and detects a change in force. This touch is in the z direction, the extrusion axis.

The principle of build plate detection is to use the extrusion force sensor (eddy current sensor) in the tool head to detect the build plate. **When it starts the detection, the printer first lowers the tool head so that the nozzle touches the heat bed to confirm the zero coordinates in the Z direction. Then move to a specific position and move the tool head downwards to allow the nozzle to make a probing touch. If the build plate is placed, the nozzle will touch the part of the build plate to detect the change in force. If the build board is not placed, during the movement, it will only touch the air and no change in force will be detected, and the printer will determine that the build plate is not placed.**

<https://wiki.bambulab.com/en/a1-mini/manual/build-plate-detection>

In Bambu’s homing process, the nozzle touches the heat bed, with the eddy current sensor detecting whether the nozzle has made contact with the head bed. This touch is in the z direction, the extrusion axis.

Homing

A homing proces refers to the printer detecting the stoppers for XYZ axes to determine the toolhead's zero coordinates in three-dimensional space. During the homing process, the printer uses the motors for X-axis (toolhead moving) and Y-axis (heatbed moving) to detect load to determine if they have reached their boundaries. For the Z-axis, homing will cause the toolhead to descend until the nozzle touches the heatbed. The eddy current sensor above the hotend will detect whether the nozzle has made contact with the heatbed.

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	https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure Bambu Lab H2D: “A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration.” https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003
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5. The three-dimensional printer of claim 1, wherein the separate structure includes a build platform of the three-dimensional printer.	In each Accused Instrumentality, the separate structure includes a build platform of the three-dimensional printer. In Bambu's clump detection, the nozzle making contact with the heat bed (during it's "tentative touch") indicates clumping: The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, and the extrusion force sensor will detect the change in force. Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and the force change will be detected. https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection Bambu Lab H2D: "The Nozzle Eddy Sensor is used to detect whether the nozzle is wrapped by molten filament." https://us.store.bambulab.com/products/nozzle-eddy-sensor In Bambu's homing process, the nozzle touches the heat bed, with the eddy current sensor detecting whether the nozzle has made contact with the head bed.
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Homing

A homing process refers to the printer detecting the stoppers for XYZ axes to determine the toolhead's zero coordinates in three-dimensional space. During the homing process, the printer uses the motors for X-axis (toolhead moving) and Y-axis (heatbed moving) to detect load to determine if they have reached their boundaries. For the Z-axis, homing will cause the toolhead to descend until the nozzle touches the heatbed. The eddy current sensor above the hotend will detect whether the nozzle has made contact with the heatbed.

<https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>

Bambu Lab H2D:

“A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration.”

https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003

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6. The three-dimensional printer of claim 1, wherein the contact force is a force normal to a surface of the separate structure.	For each Accused Instrumentality, the contact force is a force normal to a surface of the separate structure. Specifically, the contact force is in the z direction, which is normal to the surface of the heat bed. In Bambu's clump detection, the nozzle making contact with the heat bed (during its "tentative touch" discussed in the excerpt below) indicates a clumping. The tentative touch is in the z direction, the extrusion axis. The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, and the extrusion force sensor will detect the change in force. Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and the force change will be detected. https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection Bambu Lab H2D: "The Nozzle Eddy Sensor is used to detect whether the nozzle is wrapped by molten filament." https://us.store.bambulab.com/products/nozzle-eddy-sensor In Bambu's build plate detection, the nozzle touches the heat bed to detect if the build plate is in place and detects a change in force. This touch is in the z direction, the extrusion axis.
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The principle of build plate detection is to use the extrusion force sensor (eddy current sensor) in the tool head to detect the build plate. **When it starts the detection, the printer first lowers the tool head so that the nozzle touches the heat bed to confirm the zero coordinates in the Z direction. Then move to a specific position and move the tool head downwards to allow the nozzle to make a probing touch. If the build plate is placed, the nozzle will touch the part of the build plate to detect the change in force. If the build board is not placed, during the movement, it will only touch the air and no change in force will be detected, and the printer will determine that the build plate is not placed.**

<https://wiki.bambulab.com/en/a1-mini/manual/build-plate-detection>

In Bambu's homing process, the nozzle touches the heat bed, with the eddy current sensor detecting whether the nozzle has made contact with the head bed. This touch is in the z direction, the extrusion axis.

Homing

A homing process refers to the printer detecting the stoppers for XYZ axes to determine the toolhead's zero coordinates in three-dimensional space. During the homing process, the printer uses the motors for X-axis (toolhead moving) and Y-axis (heatbed moving) to detect load to determine if they have reached their boundaries. For the Z-axis, homing will cause the toolhead to descend until the nozzle touches the heatbed. The eddy current sensor above the hotend will detect whether the nozzle has made contact with the heatbed.

<https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>

Bambu Lab H2D:

“A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration.”

https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003

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9. The three-dimensional printer of claim 1, wherein each of the one or more sensors are selected from the group consisting of: capacitive sensors, electromagnetic sensors, optical sensors, potentiometric sensors, and piezoelectric sensors.	For each Accused Instrumentality, each of the one or more sensors are selected from the group consisting of: capacitive sensors, electromagnetic sensors, optical sensors, potentiometric sensors, and piezoelectric sensors. Bambu discusses the use of extrusion force sensors such as an eddy current sensor, which is a type of electromagnetic sensor. The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, and the extrusion force sensor will detect the change in force. Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and the force change will be detected. https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection Bambu Lab H2D: “The Nozzle Eddy Sensor is used to detect whether the nozzle is wrapped by molten filament.” https://us.store.bambulab.com/products/nozzle-eddy-sensor A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration. When the MC board fails to receive signals from the force sensor, this alarm is triggered. Possible reasons for HMS activation include: ▸ Damage to the force sensor (including the eddy current coil and signal cable). ▸ Disconnection of the force sensor signal cable from the TH board. ▸ Communication anomalies within the chips on the TH board. ▸ Communication anomalies between the TH board and the MC board. https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003
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11. The three-dimensional printer of claim 1, further comprising:
one or more actuators mechanically coupled to the fabrication tool

Each Accused Instrumentality includes one or more actuators mechanically coupled to the fabrication tool.

The Bambu A1, A1 mini and H2D include actuators coupled to the toolhead to control its movement.

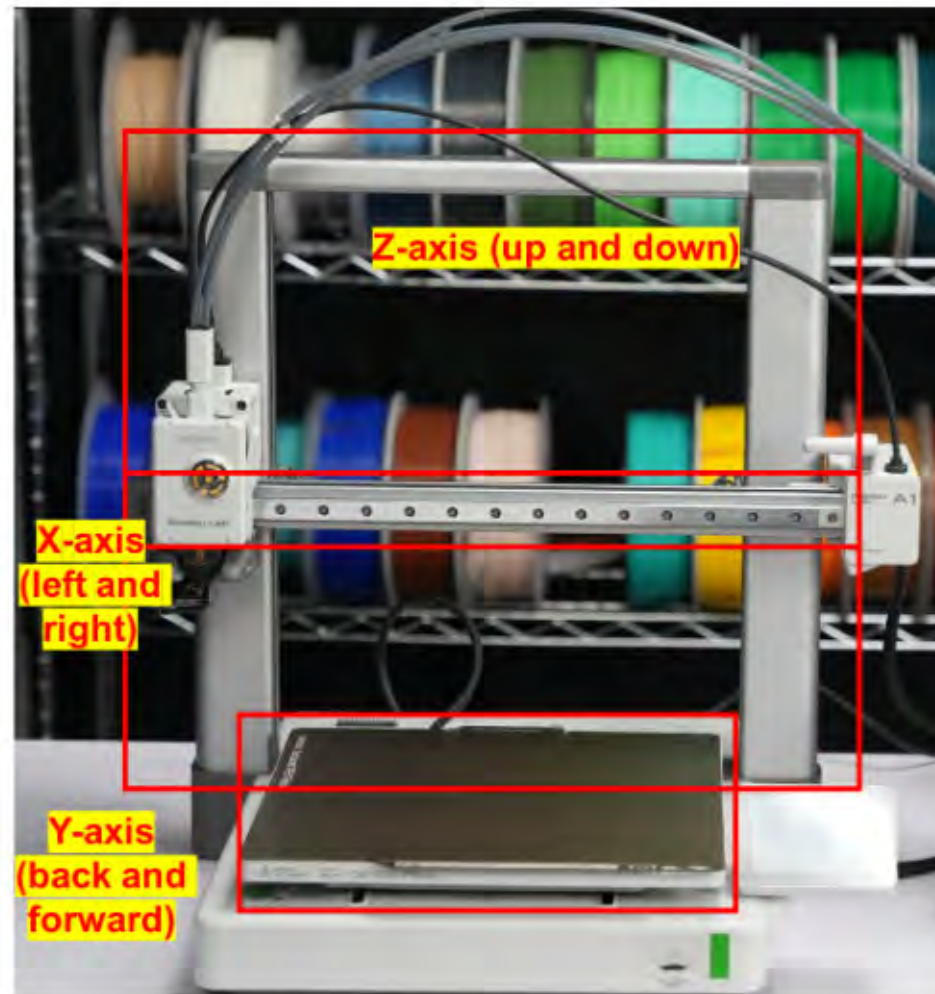
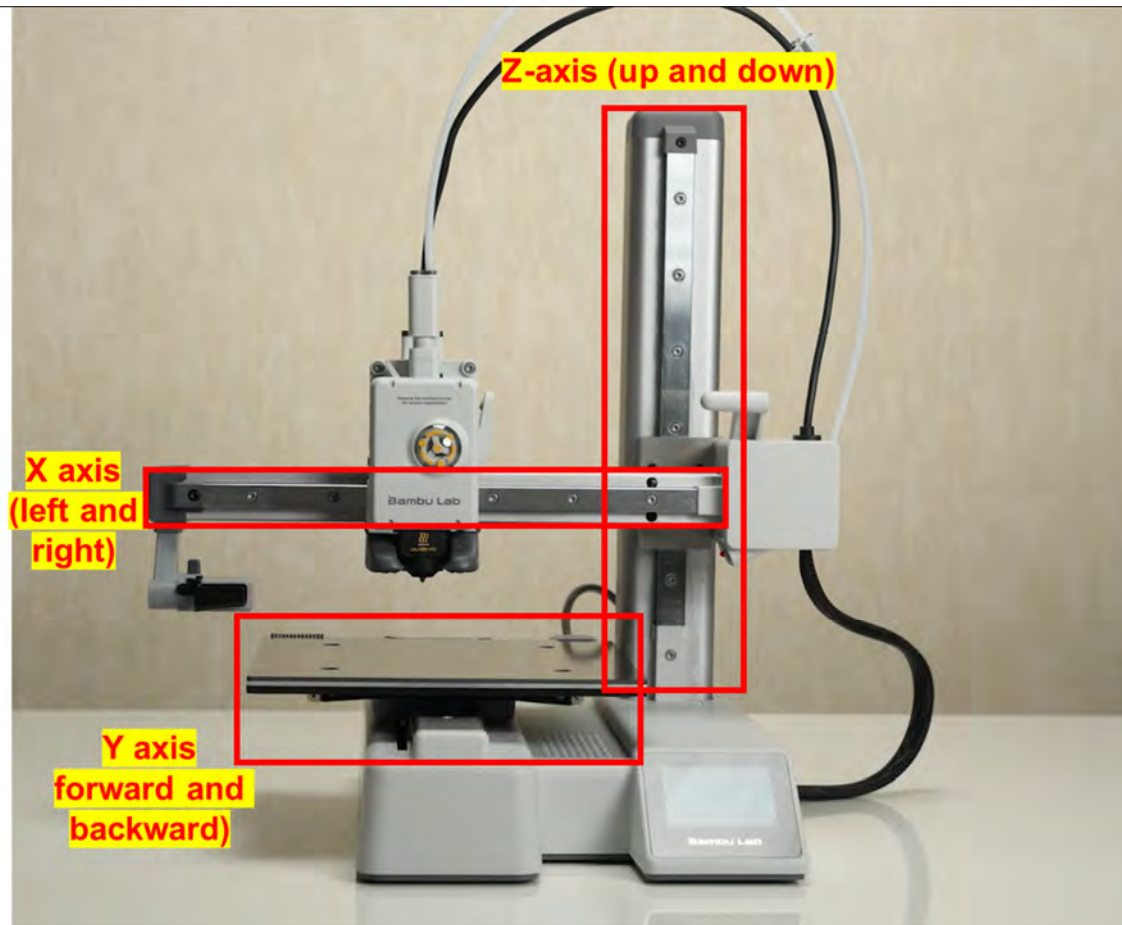


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	X-axis motion The X-axis motion system consists of a high-precision linear rail and a beam. The print head is mounted on a linear guide slider, allowing it to freely slide along the horizontal rail. By controlling the slider's left and right movement, the print head can achieve precise motion along the X-axis. Y-axis motion The Y-axis motion system comprises a high-precision horizontal guide rail and a print bed. The print bed is mounted on a guide rail slider, enabling it to freely slide along the horizontal guide rail. By controlling the slider's forward and backward movement, the print bed can achieve precise motion along the Y-axis. Z-axis motion The Z-axis motion system controls the vertical position of the print head relative to the print bed. It consists of dual optical shaft-linear bearing guide components, dual lead screws with nuts, stepper motors, and synchronous belt drive components. The dual lead screws are connected in series with the stepper motor through a synchronous belt, enabling synchronized motion of the two lead screws. Additionally, the synchronous belt is equipped with a quick tensioner and combined with a tension detection algorithm to ensure optimal tension range, ensuring precise and stable motion of the print head in the Z-axis direction. By simultaneously controlling the movement of the X-axis, Y-axis, and Z-axis, the A1 can achieve precise motion of the print head in all three directions. Typically, these movements are controlled by motors and their corresponding drive circuits, with the machine controller reading the print file and sending instructions to control the motion path and speed of the print head. https://wiki.bambulab.com/en/a1/manual/intro-a1 The motion system of the A1 mini
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The A1 mini utilizes a Cartesian coordinate motion system, which consists of the following components:

X-axis motion

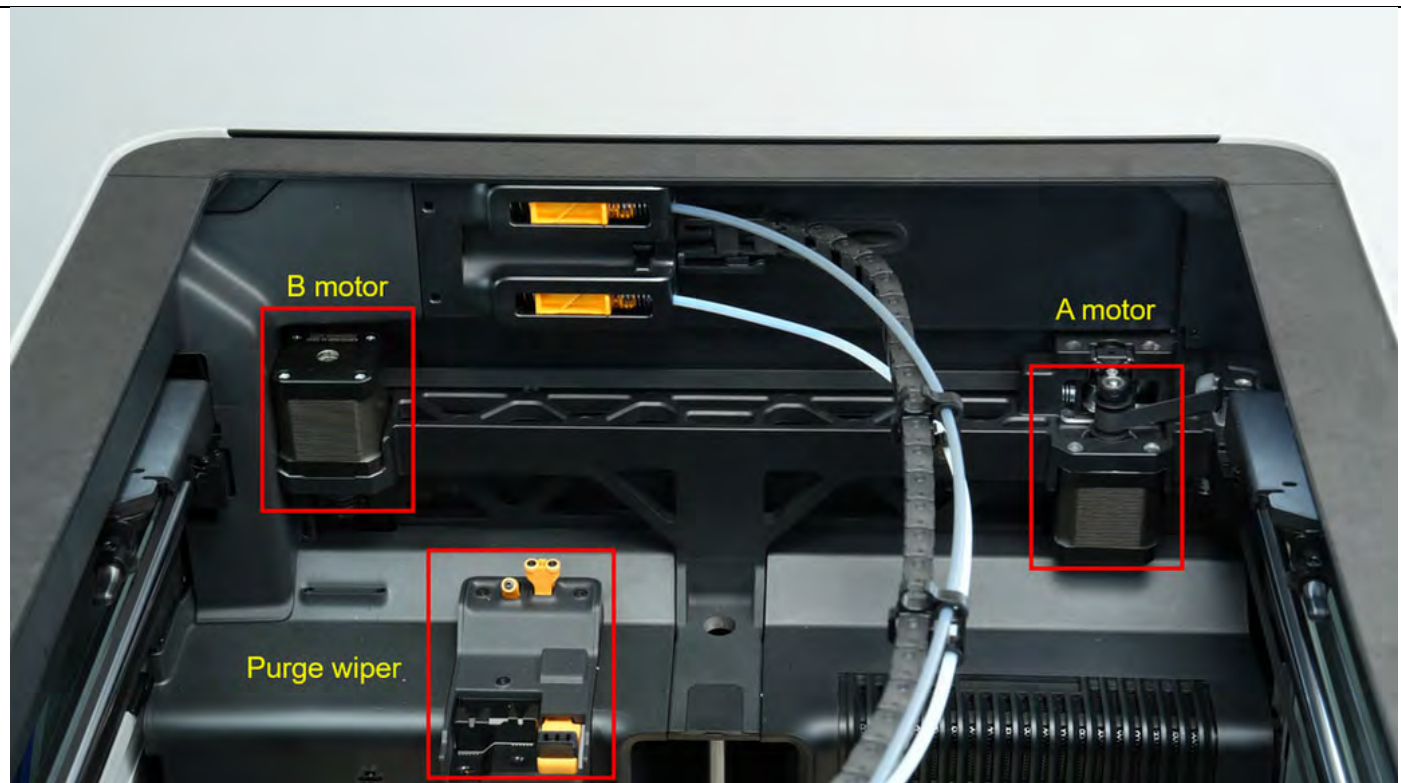
The X-axis motion comprises a horizontal guide rail and a crossbeam. The printhead is fixed on a sliding block that can freely slide along the horizontal guide rail. By controlling the left and right movement of the sliding block, the printhead can be accurately positioned in the X-axis direction.

Y-axis motion

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	The Y-axis motion comprises a horizontal guide rail and a print platform. The print platform is on the guide rail and can move back and forth along the Y-axis. By controlling the forward and backward movement of the print platform, control for printing in the Y-axis direction is achieved. Z-axis motion The Z-axis motion is used to control the vertical position of the printhead relative to the print platform. It comprises a lead screw, nut, coupling, and stepper motor. The stepper motor drives the lead screw to rotate through the coupling, thereby controlling the Z-axis motion of the tool head. The A1 mini can precisely position the printhead in all three directions by controlling the X-axis, Y-axis, and Z-axis motion. Typically, these motions are controlled by motors and corresponding driver circuits. The print head's motion path and speed can be controlled by reading the print file through the machine controller and sending instructions. https://wiki.bambulab.com/en/a1-mini/manual/intro-a1-mini “Core XY Movement System Bambu Lab H2D is based on the Core-XY architecture, which contains two stepper motors and multiple sets of idler pulleys on the XY plane. Each stepper motor is connected to the toolhead through an independent timing belt, and the movement and position of the toolhead are controlled by the motor-timing belt coordinated transmission.
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H2D prints faster with the CoreXY movement system than with traditional Cartesian printers because it is lighter, which is important for fast printing.

For more information on the CoreXY movement system, visit [this link](#).

Z-axis

The Z-axis of the printer consists of 3 lead screws, which are connected to the Z-axis stepper motor through a belt.”

<https://wiki.bambulab.com/en/h2/manual/h2d-intro>

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and a control circuit in data communication with the one or more actuators and the one or more sensors,	Each Accused Instrumentality includes a control circuit in data communication with the one or more actuators and the one or more sensors. Each Accused Instrumentality includes a control circuit comprising a main circuit board, a toolhead board, and/or associated circuitry, where the control circuit controls movement of the printer. Circuit board The main control board of the A1 printer consists of a low-power SoC (System-on-Chip) with a dual-core processor, Wi-Fi baseband, Bluetooth baseband, RF module, and other peripherals. It also includes a dual-core MCU (Microcontroller Unit) and a single-core MCU. Additionally, it incorporates stepper motor drivers and connectors required for connecting various electronic devices to the printer. The SoC is primarily responsible for handling the user interface of the A1 printer and managing the connection between the slicing software/mobile application and the printer. On the other hand, the MCU controls the printer's heating and movement after receiving the CPU's G-code stream. https://wiki.bambulab.com/en/a1/manual/intro-a1
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When to use?

This guide is intended for use if there is a problem with the Toolhead board.

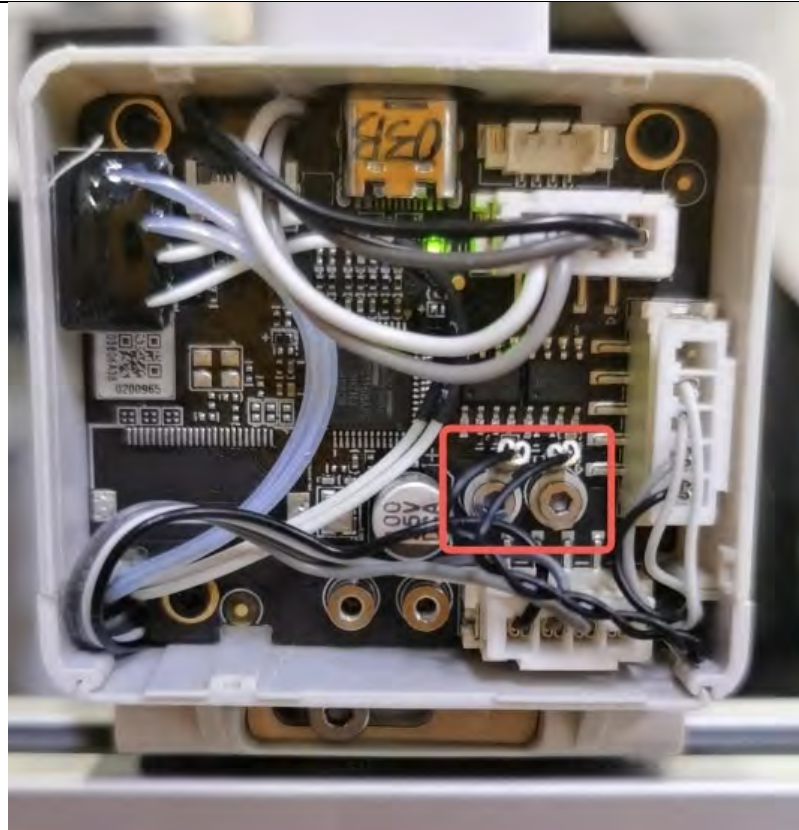
Common issues that may indicate the need for replacement of the A1 Toolhead Board include:

- Problems with bed leveling, where the nozzle doesn't accurately perform the homing procedure
- The extruder motor is not turning as expected, due to a potentially faulty stepper driver
- The USB C connector is damaged
- The Filament Sensor ribbon cable connector is damaged
- The Heater connector is damaged
- The tool head is not detected, and an error message is displayed on the printer screen
- Recommended by Bambu Lab Technical Support

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	https://wiki.bambulab.com/en/a1/maintenance/th-board-replacement-guide, https://wiki.bambulab.com/en/a1-mini/th-board-replacement-guide “1: Abnormal data from eddy current sensor The eddy current sensor has an open circuit During homing, XY axes can be normally homed. Then, the toolhead moves to the center of the heatbed, rises a little, descends a little, and stops. It will not descend enough to touch the heatbed. The printer reports an error as Z homing failed. HMS error information: HMS_0300-1800-0001-0004: The data from extrusion force sensor is abnormal, the sensor should be broken. Reasons and solutions: This is usually because the printer cannot receive data from the eddy current seonsor. Please check the connection between the eddy current sensor and the TH board. If the problem still persists, it could be the eddy current sensor is broken or the TH board malfunctions. Please refer to the wiki article above to check if the wire of the eddy current sensor is fixed on the screw of the TH board. If the wire is loose, please tighten it and try again. If the screw on the TH board for fixing the wire is broken, please contact our customer support team.”
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<https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>

Circuit board

The mainboard contains a low-power SoC (System-on-Chip) with a dual-core processor, Wi-Fi baseband, Bluetooth baseband, RF module, and other peripherals. It also includes a dual-core MCU and a single-core MCU. Additionally, it features stepper motor drivers and connectors necessary for connecting different electronic devices to the printer. The SoC handles the user interaction and the communication between the slicing software/mobile application and the printer. The MCU controls the actual heating and movement of the printer after receiving G-code instructions from the CPU.

<https://wiki.bambulab.com/en/a1-mini/manual/intro-a1-mini>

“Electrical Components

There are many electronic components inside the H2D. Here is an introduction to some of the most important ones:

Main control board

H2D has two types of core main control boards, one is responsible for interactive logic processing, and the other is responsible for the control processing of the whole machine motion unit.

AP Logic mainboard

The logic mainboard contains a quad-core CPU and the connections required for the different media electronics connected to the printer.

The CPU handles the H2D's intelligent functions (including AI detection, flow calibration, and vibration compensation) and the connection between the slicing software/mobile app and the printer.

MC motion control board

The motion control board contains a dual M4 core MCU, a single M7 core MCU, and stepper drivers and connections to the different motion electronics of the printer, providing: xyz motion control, chamber temperature control, heated temperature control, chamber status detection (door, top cover, side panel switch and glass type detection), and circulation system control (air circulation and flow channel control). The MCU controls the actual movement and overall status of the printer after obtaining the G code stream from the CPU.”

<https://wiki.bambulab.com/en/h2/manual/h2d-intro>

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	A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration. When the MC board fails to receive signals from the force sensor, this alarm is triggered. Possible reasons for HMS activation include: ➤ Damage to the force sensor (including the eddy current coil and signal cable). ➤ Disconnection of the force sensor signal cable from the TH board. ➤ Communication anomalies within the chips on the TH board. ➤ Communication anomalies between the TH board and the MC board.  <pre> graph LR L[Left extrusion force sensor] --- TH[TH board] R[Right extrusion force sensor] --- TH TH --- C[Toolhead to MC board cable] --- MC[MC board] </pre> https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003
the control circuit configured to control the one or more actuators to achieve a specified contact force between the one or more sensors and the separate structure	For each Accused Instrumentality, the control circuit is configured to control the one or more actuators to achieve a specified contact force between the one or more sensors and the separate structure. The Bambu clumping detection senses a detectable change in force to determine the presence of a clump. The specified force is whatever force is detectable by the eddy current sensor. The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, and the extrusion force sensor will detect the change in force. Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and the force change will be detected.

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<https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection>

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4: External force detected mid-air by the nozzle

During homing, the nozzle detects external force mid-air while descending. It touches in the air and then rises. The error Z homing failed is reported after 5 attempts.

This is because high sensitivity causes the nozzle to mistakenly detect objects mid-air. Eventually, poor precision from repeated touches lead to failed homing. There is currently no HMS error information for this issue.

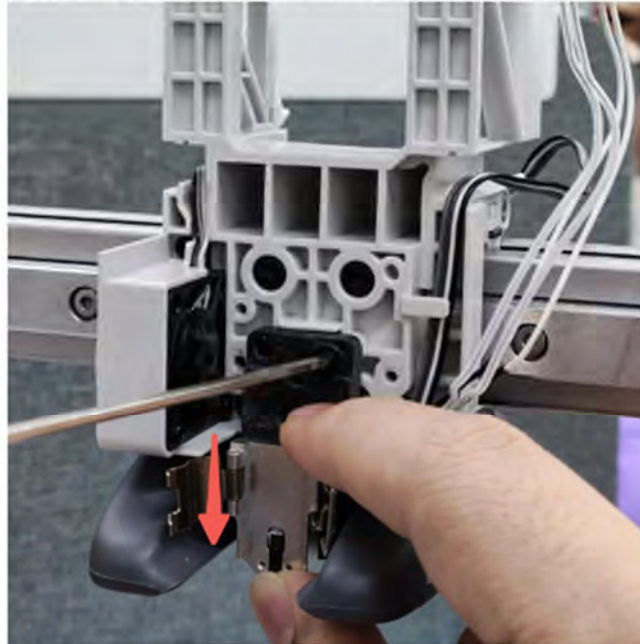
Reasons and solutions:

1. The sensitivity threshold of the eddy current sensor is too high. We recommend updating the printer firmware to the latest version (1.03 or later).
2. The PTFE tubes on the filament hub is bent too much, exerting excessive force on the filament hub. This can lead to mistaken touches. Please organize the PTFE tubes on the filament hub, and try not to install any accessories on them to avoid unintended force. Then, place the printer in a stable position and try again.



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3. The frequency detected by the eddy current sensor is too high. Try to loosen the screws of the heating assembly, manually press it down, and then retighten the screws. This is to fix the heating assembly in a slightly lower position. Alternatively, you can replace the hotend or the heating assembly and try again.



<https://wiki.bambulab.com/en/a1/troubleshooting/homing-leveling-failure>

Bambu Lab H2D:

“A force sensor is installed above each hotend on the left and right sides of the toolhead, designed to detect the extrusion force applied by the hotend. Additionally, the force sensor is crucial for functions such as homing, leveling, nozzle Z offset calibration, and dynamic flow calibration.”

https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003

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12. The three-dimensional printer of claim 1, wherein the controller is further configured to adjust operation of the three-dimensional printer according to one or more of the signal from the one or more sensors and the calculated contact force.	For each Accused Instrumentality, the controller is configured to adjust operation of the three-dimensional printer according to one or more of the signal from the one or more sensors and the calculated contact force. In Bambu's clumping detection, when the extrusion force sensor detects the change in force, the printer will pause printing. The principle of nozzle clumping detection is to use the extrusion force sensor (eddy current sensor) to detect whether the nozzle is wrapped by the molten filament. When the detection is performed, the printer moves outside the heat bed and then makes a tentative touch. If the nozzle is not covered by filaments, the nozzle will only touch the air during this process, and the sensor will not detect any external force. If the nozzle is wrapped with filaments to form a thick mass, the mass will hit the heat bed during the above motion, and the extrusion force sensor will detect the change in force. Note: During this process, if the nozzle is wrapped by filaments or the build plate is not placed properly, the nozzle will touch the heat bed and the force change will be detected. When the clumping is detected, the printer will automatically pause printing and pop up a reminder, since the detection function is not 100% accurate, you need to determine whether the nozzle is clumped by the filament or just the nozzle touched the build plate or other foreign objects. Clear the blob or place the build plate properly before printing. If the nozzle is indeed wrapped in a filament to form a blob, you can refer to this wiki to clean it up: Hotend Blob Cleaning Instructions Bambu Lab Wiki https://wiki.bambulab.com/en/a1-mini/manual/nozzle-warp-detection Bambu Lab H2D: "The Nozzle Eddy Sensor is used to detect whether the nozzle is wrapped by molten filament." https://us.store.bambulab.com/products/nozzle-eddy-sensor
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14. The three-dimensional printer of claim 12, wherein the controller is configured to adjust a z-axis position of the extruder in response to the calculated contact force.	For each Accused Instrumentality, the controller is configured to adjust a z-axis position of the extruder in response to the calculated contact force. <u>RESTRICTED CONFIDENTIAL SOURCE CODE</u> For example, the controller is configured to adjust a z-axis position of the extruder and thus operation of the printer in response to the calculated contact force and according to a signal from the eddy current sensor when performing a homing and bed leveling routine. <i>See, e.g.,</i> A1 printer firmware, BAMBU-SC-000026–000028, C:\source\A1_U0\machine_controller\app\bammc_main.c, lines 1-172, BAMBU-SC-000013–000014, 000019–000022, C:\source\A1_U0\machine_controller\app\gcode\bammc_gcode_runner.c, lines 391-520, 803-1033, BAMBU-SC-000011–000012, C:\source\A1_U0_machine_controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c, lines 1929-2036; A1 Mini printer firmware, BAMBU-SC-000073–000075, C:\source\A1_mini_U0\machine_controller\app\bammc_main.c, lines 1-169, BAMBU-SC-000061–000062, 000067–000070, C:\source\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_runner.c, lines 391-518, 802-1036, BAMBU-SC-000059–000060, C:\source\A1_mini_U0_machine_Controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c, lines 1925-2029. The firmware of the Accused Instrumentalities registers a thread. <i>See, e.g.,</i> A1 printer firmware, C:\source\A1_U0\machine_controller\app\bammc_main.c, BAMBU-SC000026–000028, lines 1-172; A1 Mini printer firmware, C:\source\A1_mini_U0\machine_controller\app\bammc_main.c, BAMBU-SC-000073–000075, lines 1-169.
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The thread calls functions to process G-code commands. For example, the functions process a G28 command. As another example, the functions process a G29 command.

See, e.g., A1 printer firmware,

BAMBU_SC_000013–000014, 000019-000022,

C:\source\A1_U0\machine_controller\app\gcode\bammc_gcode_runner.c, lines 391-520, 803-1033,

BAMBU_SC_000023, C:\A1_U0\machine_controller\app\gcode\bammc_gcode_runner.h, lines 935-937;

A1 Mini printer firmware,

BAMBU-SC-000061–000062, 000067–000070,

C:\source\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_runner.c, lines 391-518, 802-1036,

BAMBU_SC_000071, C:\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_runner.h, lines 919-921.

Additional code requested from and to be produced by Bambu Lab will show that when a command is processed, the corresponding command is executed by the printer. For example, the functions that process G28 and G29 commands execute a homing and bed leveling routine on the printer. As another example, the G38 command executes clumping detection. Stratasys has requested but not received printouts of such code and reserves the right to supplement or amend its contentions after it receives such printouts.

See, e.g., A1 printer firmware,

C:\source\A1_U0\machine_controller\app\gcode\bammc_gcode_G28.c,

C:\source\A1_U0\machine_controller\app\gcode\bammc_gcode_G38.c,

C:\source\A1_U0\machine_controller\app\gcode\bammc_gcode_runner.c;

A1 Mini printer firmware,

C:\source\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_G28.c,

C:\source\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_G38.c,

C:\source\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_runner.c.

For example, when performing the bed leveling routine, the Accused Instrumentalities iterate through sets

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of locations, including initial adjustments to the z-axis position of the extruder.

See, e.g., A1 printer firmware,
BAMBU-SC-000011–000012,

C:\source\A1_U0\machine_controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c, lines 1929–2036;

A1 Mini printer firmware,
BAMBU-SC-000059–000060,

C:\source\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c, lines 1925–2029.

The controller is configured to adjust the z-axis position of the extruder in response to the calculated contact force and according to a signal from the eddy current sensor. After initially adjusting the extruder's z-axis position, the Accused Instrumentalities process each location in the set. For each, the Accused Instrumentalities move the extruder to a target position, lower the extruder while the calculated contact force is within a threshold according to a signal from the eddy current sensor, and save the position of the extruder before raising the extruder when the calculated contact force is within a different threshold.

See, e.g., A1 printer firmware,
BAMBU-SC-000011–000012,

C:\source\A1_U0\machine_controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c, lines 1974–2036;

BAMBU-SC-000030, C:\source\A1_U0\machine_controller\app\product\MC-N102-V2\bammc_main_config.h, lines 337-363,

BAMBU-SC-000032–000034, C:\source\A1_U0\machine_controller\app\planner\bammc_planner.h, lines 186-187, 228-229, 245-279.

A1 Mini printer firmware,
BAMBU-SC-000059–000060,

C:\source\A1_mini_U0\machine_controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c, lines 1970–2029,

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BAMBU-SC-000077, C:\source\A1_mini_U0\machine_controller\app\product\MC-N001-V2\bammc_main_config.h, lines 331-357,
BAMBU-SC-000079-000081, C:\source\A1_mini_U0\machine_controller\app\planner\bammc_planner.h, lines 186-187, 228-229, 245-279.

Additional code requested from and to be produced by Bambu Lab will show functionality for contact force calculations and lowering the extruder while the contact force is within a threshold, as discussed above. Stratasys has requested but not received printouts of such code and reserves the right to supplement or amend its contentions after it receives such printouts.

See e.g., A1 printer firmware,
C:\source\A1_U0_machine_controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c,
bmc_hf_cap.c;
A1 Mini printer firmware,
C:\source\A1_mini_U0_machine_controller\app\gcode\bammc_gcode_G28_bed_proximity_eddy.c,
bmc_hf_cap.c.

When performing print calibration (e.g., homing, leveling), and when using the results of print calibration, the Bambu Lab H2D printer adjusts the z-axis position of the extruder in response to the contact force calculated by the sensor (e.g., the eddy sensor). *See, e.g.*,
https://wiki.bambulab.com/en/h2/troubleshooting/hmscode/0300_2500_0001_0003.

See also <https://wiki.bambulab.com/en/h2/manual/h2d-faq>:

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