

FX10 USER GUIDE



Markforged

60 Tower Rd.
Waltham, MA 02451
USA

*<https://support.markforged.com>
support@markforged.com*

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Safety First

Please take a moment to review the following use and safety guidelines.

Labeling scheme

	DANGER
	Indicates a hazard which will result in serious injury or death if not avoided.
	WARNING
	Indicates a hazard which can result in serious injury or death.
	CAUTION
	Indicates a hazard which may cause minor or moderate injury.
	NOTICE
	Mandatory instruction - Indicates a potentially harmful situation in which the printer can be damaged or unsatisfactory function can occur.

	NOTICE
	Familiarize yourself with the contents of this Safety Sheet and the <i>FX10 User Guide</i> , and be aware of potential hazards before performing any maintenance procedures on the FX10 printer, particularly those involving removal of the upper rear panel.

Please retain these safety instructions for reference.

For detailed instructions on setup, operation, and maintenance of your FX10 printer, visit <https://support.markforged.com> or email setup@markforged.com.

Safety Hazards

The following notes indicate potential safety hazards that should be recognized when operating a Markforged FX10 3D Printer.

DANGER	
	Electric Shock - The printer has live electrical components that can cause serious injury or death. Do not remove the upper rear sheet metal cover of the printer unless explicitly directed to by Markforged Support. Please consult Markforged or an Authorized Dealer for service. - The printer shall only be installed in buildings where installation meets all required national and local wiring rules and building codes. - Use only the supplied power cord. Use of modified or alternate power cords may cause risk of electric shock or system damage.
	The printer relies on proper earthing of the plug for protective bonding. The printer may only be installed in a wall socket where integrity of the protective earth ground is ensured.
WARNING	
	Hot Surfaces The print chamber heaters, print head, and print bed generate high temperatures and may cause severe burns. Material extruded from the nozzles is extremely hot. Do not touch the print head, nozzles, or print bed when at operating temperature. Keep all doors closed and guards in place while in operation. Use thermal protection gloves and/or sleeves when reaching into the heated chamber.
WARNING	
	An appropriate step ladder must be used for access to the upper area of the machine via the hinged top lid.
WARNING	
	The printer contains a Class 2 (II) laser product per IEC 60825-1: 2008-05 and complies with FDA regulations 21CFR 1040.10 and 1040.11. Direct exposure can cause serious eye injury. Do not stare directly into the beam or view with optical instruments.

CAUTION	
	Moving parts The printer has many moving parts including belts, pulleys, and lead screws. Moving parts can entangle and cut. Keep hands, loose clothing, and jewelry away from all moving parts. Keep all doors closed and guards in place while in operation.
CAUTION	
 	• To prevent risk of fire and shock, use only the power cord supplied with your FX10. Do not attempt to replace the AC mains plug with the same or a different plug configuration. • Do not attempt to replace the cord connector body that plugs into the 3D printer power inlet. • In case of cord damage, contact Markforged Support for a replacement cord.
NOTICE	
	Before performing any installation, maintenance, or repair, disconnect the power cord from the printer.
NOTICE	
	The printer must be plugged into a power socket that is close to the machine and easily accessible. In case of emergency, disconnect the printer from the socket immediately.
NOTICE	
	The printer is designed to work only with Markforged proprietary materials and consumables. Use only materials that have been approved for use in the printer.

NOTICE



The printer melts thermoplastics and can emit odors during printing. Make sure to operate the printer in a well-ventilated area.

RADIO INTERFERENCE

NOTICE



WARNING: Potential for wireless radio interference

This equipment is compliant with Class A of **EN 61000-6-4**. In a residential environment, this equipment may cause radio interference.

SAFETY AND COMPLIANCE

PRODUCT IDENTIFICATION

This *User Guide* covers the Markforged FX10 printer.

INTENDED USE

The Markforged FX10 3D printer is designed and built to print 3D parts using Markforged proprietary spooled filaments in an industrial environment. In its base state, known as the Composite Configuration, the FX10 prints composite base materials reinforceable with continuous fiber. Printed Onyx plastic parts are twice as strong as conventional printed plastics and, when combined with continuous fiber reinforcement, can replace machined aluminum tooling in jigs, jaws, and fixtures. In the Metal Configuration, which is available after installation of the FX10 Metal Kit, the FX10 prints metal 3D parts fully compatible with the Wash-1, Sinter-1, and Sinter-2.

Eiger software is an integrated suite of tools: part management library, slicer for turning CAD drawings into files for 3D printing, print monitoring tool, and fleet management tool. It offers secure part and build storage and sharing within organizations, allows custom fiber reinforcement for sliced parts, and seamlessly connects online Markforged devices. In addition, Offline Eiger provides Eiger functionality for offline users and locally networked devices.

FORESEEABLE MISUSE

The Markforged FX10 printer is intended for use only with Markforged proprietary plastic and fiber materials while in the Composite Configuration, or with Markforged proprietary metal and release materials while in the Metal Configuration. Use with and performance of materials that have not been evaluated and approved for use with this 3D printer is strongly discouraged and may lead to failed prints and potential safety risks, and may invalidate the Warranty. Installation, power connection, and use of these printers must be in accordance with the instructions contained in the *Safety Booklet*, *Facilities Guide*, *Install Guide*, and this *User Guide*. Contact your Markforged Partner via one of the methods specified in the *Safety Booklet* that came with your printer for any concerns or questions about applications or appropriate use.

TABLETOP USE ONLY

The FX10 printer is approved for tabletop use only, not freestanding floor setup. Operate the printer on a sturdy, stable, level surface with sufficient access on all sides (see the [Facilities Guide](#)).

POWER DISCONNECT ACCESS

The FX10 must be set up so that the following disconnecting devices are accessible at all times:

- Power cord appliance coupler
- Power switch on rear panel of printer
- Facility disconnect

If the power switch becomes inoperable or inaccessible, the power cord can be disconnected as an emergency shutdown measure.

OPERATING ENVIRONMENT

Composite plastic printing materials are highly hygroscopic and will absorb any available moisture, potentially increasing the frequency of jams and leading to reduction in print quality and/or part strength. For best results, operate your printer in a typical climate-controlled environment (see the [Facilities Guide](#) for specifications). Running the system or storing the print materials in an extremely humid environment may require additional material purges or an increased frequency in material changeover.

VENTILATION REQUIREMENTS

Markforged Composite and Metal Printers melt thermoplastics and emit thermoplastic fumes during printing. Ensure that your printer is used in a well-ventilated area. No dedicated exhaust is required for the FX10 printer. Additional measures may be required based on local regulations.

CLEANING/DECONTAMINATION

Do not use any cleaning fluids on your FX10 unless specifically directed in this document. Be careful of hot surfaces and components when cleaning the build chamber. For more information, see *Reducing Burn Risks*.

If using isopropyl alcohol on a cloth, only wipe down metal surfaces. Alcohol-based cleaners should never be used on plastic components of the FX10 printer, such as the visor, touchscreen, PCBs, or fiber plastic panel.

For more information, see *Cleaning Your Printer* below.



REDUCING BURN RISKS

WARNING: The print bed grows quite hot during normal printer operation. Wear appropriate PPE when working in the print chamber (loading/unloading fiber, adjusting belt tension, removing prints, etc.) to avoid burn injury.

- Do not touch nozzles or print head when hot, unless explicitly instructed to by user/service manual
- During a print, the build chamber visor and lid must be closed
- Avoid touching the print bed or surfaces in the build chamber when hot
- Note that newly printed parts can be hot. Handle with care
- Hot air flows from build chamber vents when printing

SHOCK PROTECTION

Insulation category: Class 1

INGRESS PROTECTION

Protection class per EN 60529: IP20.

SOUND OUTPUT

Continuous sound pressure level (Leq) is less than 70dBA.

CLIMATE CONTROL

- Operating temperature: 18°C–30°C (64°F–86°F)
- Operating humidity: 0%–95%, non-condensing
- Operating altitude: <3000 m (9842 ft)
- Pollution degree: 2
- No dedicated exhaust is required

ALWAYS FOLLOW SAFETY INSTRUCTIONS

Failing to use your FX10 printer in the manner specified by the manufacturer may lead to unsafe operating conditions. Follow all safety instructions posted on the unit and in the written documentation.

Note: Consult the Safety Sheet included with your device for an explanation of the safety icons used in this manual.



FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

USER NOTES

Please read this section carefully and check it regularly for updates. It contains an assortment of notes, best practices, and updates not found elsewhere in the *User Guide*.

COMPOSITE AND METAL CONFIGURATIONS

Your FX10 printer has two possible configurations: the default Composite Configuration, in which the FX10 prints plastic parts reinforceable with continuous fiber, and the optional Metal Configuration, in which the FX10 prints metal parts fully compatible with the Wash-1 and Markforged sintering furnaces. Purchase and installation of the FX10 Metal Kit is required to enable the Metal Configuration on your FX10. After the initial Metal Kit installation, you can keep your printer in one configuration as desired or swap between the two.

This *User Guide* is set up as follows: a general section, covering information common to both configurations; a Composite Configuration section; a Metal Configuration section; and a section on installing the Metal Kit and changing printer configurations. Keep this layout in mind and refer to the appropriate section of this *User Guide* for your printer's current configuration.

To purchase the Metal Kit, please contact your Markforged Partner. For information on installing the FX10 Metal Kit, see *Changing Printer Configuration*.

ADDITIONAL SUPPORT AND REPLACEMENT PARTS

For safety sheets, product datasheets, and additional information regarding Markforged devices, materials, and replacement parts, see the support site (support.markforged.com) and online store (shop.markforged.com).

PRESERVING FACTORY CALIBRATION

The material extruders and print head are factory-calibrated; do NOT adjust or disassemble in any way unless specifically instructed to do so by Markforged Support. Warranty claims for assemblies that have been adjusted, disassembled, or modified may not be honored.



HIGH VOLTAGE / ELECTRONICS

The high voltage panel is located behind the upper rear panel. **DO NOT REMOVE THIS COVER UNLESS EXPLICITLY INSTRUCTED TO DO SO.** Contact your Partner to perform any service in this area of the printer you do not feel experienced enough to perform yourself.

VARIABLE NOZZLE HEIGHTS

Two nozzles extend downward from the print head. During the printing process, the appropriate nozzle will be activated for printing depending on the print requirement for plastic or fiber in Composite Configuration, or for metal or release material in Metal Configuration. The FX10 is capable of automatically setting the nozzle height of each nozzle to print the appropriate material. The inactive nozzle will be shifted into a raised configuration in order to prevent collision with the printed part.

PRODUCT DIMENSIONS

Size: 760 x 648 x 1200 mm (30.0 x 25.5 x 46.0 in)

Weight: 122 kg (270 lbs)

WHAT'S IN THE BOX?

Note: For contents of the FX10 Metal Kit, see FX10 Metal Kit below.

ACCESSORY KIT CONTENTS

Item	Purchasable Part Number	Quantity
FX10 Safety Booklet	—	1
FX10 Print Sheet v1	22138	1
FX10 Sheet Press	—	1
Dust pan and brush	100210-FRU	1
Torque driver, 5in-lb with 2.5mm blade	22506	1

ACCESSORY BAG CONTENTS

The accessory bag ships inside the Accessory Kit.

Item	Purchasable Part Number	Quantity
Anti-Seize	S24469-FRU	1
Flush wire cutters, 5in	—	1
2.0mm hex key	—	1
2.5mm hex key	—	1
3.0mm hex key	—	1
4.0mm hex key	—	1
5.0mm hex key	—	1
Combination wrench, 8mm	—	1
Elmer's Disappearing Purple	S25048-FRU	1
Tweezers	—	1
Print Head Service Tool	22143	1
Torque driver, 12.4in-lb with 10mm fiber nozzle bit	A3609-FRU	1
Brass nozzle brush	—	1
Lens wipes	—	10
Lid screwdriver: #0 Phillips head or 7/64in hex	—	1

REPLACEMENT SUPPLIES

Consumable items, print material, and other parts and supplies are available from your Partner and from the Markforged Shop (shop.markforged.com). The following items are among the most frequently replaced parts for FX10 printers:

COMPOSITE CONFIGURATION

Product Name	Part Number
FX10 Plastic Nozzle	21997
FX10 Fiber Nozzle	21998
Fiber Nozzle PTFE Tube Pack	F-PC-2001
FX10 Upper Material Tube A	22064
FX10 Lower Material Tube A Set	22070
FX10 and FX20 Fiber Load Tube	21373
FX10 Fiber Bowden Tube	22067
FX10 Print Sheet v2	22535

METAL CONFIGURATION

Product Name	Part Number
FX10 Metal Nozzle	22489
FX10 Release Nozzle	22490
FX10 Metal Upper Material Tube A	22485
FX10 Metal Upper Material Tube B	22486
FX10 Metal Lower Material Tube Set	22487
FX10 Metal Print Sheet	22488

BOTH CONFIGURATIONS

Product Name	Part Number
Wiping Station Brush Pack	F-PC-5005
FX10 Lower Material Tube B Set	22071
FX10 Material Load Tube	22077

CONTROL OF HAZARDOUS ENERGIES

The following safety measures are provided:

- XYZ motion interlock system on visor and lid
- Emergency stop button
- High voltage and Z-axis area located behind upper rear panel; power must be disconnected prior to accessing
- Safety labels applied to panels and areas of high risk; safety symbols are described in the included safety sheet
- Safety manuals, instructions, maintenance instructions available from support.markforged.com

EMERGENCY STOP AND SHUTDOWN

We recommend that you keep your FX10 printer powered on at all times. If you must power off your printer for an extended period, follow the instructions below:

1. Unload spools and properly store them (see *Important Material Information*).
2. Turn off the switch on the back of the printer and unplug the power cord to power off your FX10.

EMERGENCY SHUTDOWN

The following serve as electrical disconnecting devices:

- Power switch on the rear of the FX10 printer
- Power cord to the FX10 printer
- Facility power shutoff for the FX10 printer

In case of emergency, use one of these disconnecting devices to cut power to the printer.



The emergency stop button on the front of the printer is not an electrical disconnecting device; rather, it de-energizes specific printer subsystems. (See below.)

EMERGENCY STOP BUTTON

The red emergency stop (“e-stop”) button is located on the front center panel of the printer, to the right of the touchscreen.

Pressing the emergency stop immediately terminates the current print, depowering the gantry and print bed driver motors. Pressing the e-stop does not power down the entire printer. When the e-stop is pressed, the following occurs:

- The motion system is disabled

The following actions are also triggered by the onboard software:

- Print chamber heaters are disabled
- Main heater fans are disabled

Once pressed, the e-stop will remain depressed until the button is released. To reset the emergency stop, simply rotate the red button clockwise until it releases from its depressed position. The displayed error message must be cleared before resuming operation.

Any print interrupted by the e-stop is not recoverable.

If you press the e-stop to interrupt a print, first reset the e-stop, then use the controls on the Manual Control screen to lower the bed and disable the vacuum. Follow the instructions in *Safely Removing Composite Parts* or *Safely Removing Metal Parts* to safely remove the print.

RESTART PROCEDURE

Restarting the printer requires a full power down procedure. If the FX10 is actively printing during the printer restart, the part will not be recoverable.

1. Prior to restarting the printer, ensure that the printer is not actively printing or running a utility. If needed, cancel out of the utility or cancel the print.
2. Locate the power switch at the rear of the machine and switch it off.
3. Wait 5–10 seconds and turn the power switch back on.
4. The printer will initiate the restart sequence.

OPERATING THE VISOR AND LID

Unless otherwise prompted, the visor and lid must be closed during a print run, and must be closed any time the chamber or print bed is heating. It is not possible to begin a print with the visor or lid open.

The visor and lid do not lock, but are equipped with an interlock system that disables motors when opened.

When the visor or lid is opened during a print, the FX10 will attempt to pause the print. Depending on the state of the printer when the interruption occurred, the print *may not be recoverable*.

The FX10 lid is fastened with either Phillips head screws or 7/64in hex screws. The correct lid screwdriver for your machine is provided in the Accessory Kit.

NETWORK & FIRMWARE

CONNECT VIA WI-FI

The FX10 must connect to the local network via Wi-Fi or Ethernet; on the Wi-Fi enabled model of the FX10, the Wi-Fi antenna is located on the rear panel of the printer. See the [FX10 Facilities Guide](#) for detailed network requirements. Consult your IT department to confirm that your local network and Internet connection meet the requirements in the [Advanced Networking Features](#) support article.

1. Power on the printer.
2. If connected, a Wi-Fi icon indicator should appear on the home screen.
3. Select the Wi-Fi icon and follow onscreen instructions to select a Wi-Fi network.

CONNECT VIA ETHERNET (LAN)

If not connecting to the local network and Internet via Wi-Fi, or if using the FX10 No Wi-Fi model, the FX10 can instead connect via Ethernet; the Ethernet port is located on the rear panel of the printer. See the [FX10 Facilities Guide](#) for detailed network requirements. Consult your IT department to confirm that your local network and Internet connection meet the requirements in the [Advanced Networking Features](#) article.

1. Plug your Ethernet cable into the Ethernet port.
2. The Ethernet icon should appear in the top right corner of the home screen.

DISABLE WI-FI / ETHERNET

1. Select the Wi-Fi / Ethernet icon from the home screen.
2. Disable its toggle switch.
3. Select **Close** to return to the home screen.

NETWORK REQUIREMENTS

See the [FX10 Facilities Guide](#) for printer network requirements.

UPDATING FIRMWARE

When a firmware update is available, select the onscreen **Update Available** popup or navigate to **Settings > Updates**.

MANUAL CONTROL

Select the **Controls** icon from the left side panel of the touchscreen to access Manual Control. The manual controls available for use depend on which Configuration is currently active.

COMPOSITE CONFIGURATION

NOZZLES & CONTROLS

Control the preheating and cooling of the following:

- Nozzle A
- Nozzle F
- Build Chamber
- Print Bed

Engage and disengage the following:

- Print Bed Vacuum

ADVANCED

- Print Bed Position
 - Toggle enables incremental movement
 - Up/down arrows incrementally raise or lower (or prompt for homing, if the print bed is not homed)
- Fiber Extrude
 - Toggle enables fiber advancement from nozzle
 - Advance/cut buttons move fiber to the print head and actuate the fiber cutter
- Nozzle A
 - Toggle enables material advancement from heated nozzle
 - Button advances material a fixed amount to/through nozzle

MATERIAL STORAGE

- Automatic Material Changeover: Enable/disable Automatic Material Changeover



- Spool Bay: Select the desired Spool Bay to load/unload material

METAL CONFIGURATION

NOZZLES & CONTROLS

Control the preheating and cooling of the following:

- Nozzle A
- Nozzle B
- Build Chamber
- Print Bed

Engage and disengage the following:

- Print Bed Vacuum

ADVANCED

- Print Bed Position
 - Toggle enables incremental movement
 - Up/down arrows incrementally raise or lower (or prompt for homing, if the print bed is not homed)
- Nozzle A
 - Toggle enables material advancement from heated nozzle A
 - Button advances material a fixed amount to/through nozzle A
- Nozzle B
 - Toggle enables material advancement from heated nozzle B
 - Button advances material a fixed amount to/through nozzle B

MATERIAL STORAGE

- Nozzle A
 - Automatic Material Changeover: Enable/disable Automatic Material Changeover between A1 and A2 spool bays



- Nozzle B
 - Automatic Material Changeover: Enable/disable Automatic Material Changeover between B1 and B2 spool bays



- Spool Bay: Select the desired Spool Bay to load/unload material

MATERIAL ROUTING

COMPOSITE MATERIAL ROUTING

The material routing system consists of a material chamber with four separate spool bays (each with pre-extruder) connected upstream from a material routing block via flexible tubing; downstream are the slack mechanism, extruder and heated nozzles mounted on the print head. The system drives and routes material from the spool to the nozzle on the print head.

See *Diagrams* below to clarify the connections and relationships between components in the material path.

MATERIAL PATHWAY NOMENCLATURE

In Composite Configuration, the material routing system of the FX10 entails material pathways for plastic spools and continuous fiber filament.

The four lower material tubes leading from the A1, A2, B1, and B2 spool bays converge in the material routing block to form a single material path A to the print head.

All components of each material pathway are consistently labeled to indicate connection.

PRINT HEAD

The print head of the FX10 features two nozzles through which material is extruded. These nozzles are installed into the print head.

- Nozzle A: extrudes plastic filament from material pathway A
- Nozzle F: extrudes continuous fiber filament from material pathway F

SLACK MECHANISM

The slack mechanism is located at the top left of the print head, above the extruder. It provides feedback to the pre-extruder and print head extruder on how to optimally feed material through the system.

MATERIAL ROUTING BLOCK

The material routing block allows for efficient use of your FX10 by enabling printing through all four spool bays. When Automatic Material Changeover is enabled, filament loaded in any of the four spool bays is fed into the material routing block and directed into the single material pathway to the print head.

MATERIAL CHAMBER

The material chamber and spool bays store and protect material from moisture and assist in loading and extruding filament using the pre-extruders. The chamber contains four spool bays that can hold all compatible Markforged composite base material spools, excluding 3200cc XL spools. These holders are labeled from left to right, facing the front of the machine:

- Spool bay A1
- Spool bay A2
- Spool bay B1
- Spool bay B2

The material loaded into a spool bay is fed into the corresponding material load tube inlet. The material load tubes feed material into a pre-extruder, which feeds material up through the material routing block to the slack mechanism in the print head.

MATERIAL PATHWAY F

As in other Markforged composite printers, the material pathway for fiber filament is shorter and less complex. Fiber filament feeds from a spool mounted in the build chamber of the printer. The fiber load tube connects the spool to the fiber extruder; the material is then fed through the fiber Bowden tube to the print head where it extrudes from nozzle F.

METAL MATERIAL ROUTING

The material routing system consists of a material chamber with four separate spool bays (each with a pre-extruder) connected to a material routing block via flexible tubing; downstream are the slack mechanism, extruder and heated nozzles mounted on the print head. The system drives and routes material from the spool to the nozzle on the print head.

See *Diagrams* below to clarify the connections and relationships between components in the material path.

MATERIAL PATHWAY NOMENCLATURE

The material routing system of an FX10 in Metal Configuration entails material pathways for metal and ceramic release filament. Metal spools can be loaded into spool bays A1 and A2. Ceramic release spools can be loaded into spool bays B1 and B2. Four lower material tubes lead from these spool bays to the 4-to-2 material routing block, from which Upper Material Tubes A and B lead to the print head.

All components of each material pathway are consistently labeled to indicate connection.

PRINT HEAD

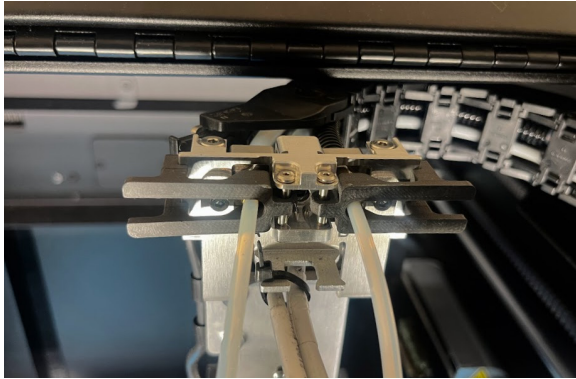
The print head of the FX10 features two nozzles through which material is extruded. These nozzles are installed into the print head.

- Nozzle A: extrudes filament from material pathway A
- Nozzle B: extrudes filament from material pathway B

SLACK MECHANISMS

Two slack mechanisms are located at the top left and right of the print head, above the metal and release extruders. They provide feedback to the pre-extruders and print head extruder on how to optimally feed material through the system.

TUBE ADJUSTMENT MECHANISM



The tube adjustment mechanism is an assembly located at the print head end of the energy chain that helps route metal filament into the print head. This component comes installed by default on newer FX10 printers. It can be installed on older printers as part of the FX10 Metal Kit, replacing the material tube retention clip that comes installed on such units. The tube adjustment mechanism can be used in both Composite and Metal Configurations.

MATERIAL ROUTING BLOCK

The material routing block allows for efficient use of your FX10 by enabling printing through multiple spool bays. When Automatic Material Changeover is enabled, filament loaded in either of the A and B spool bays is fed into the material routing block and directed into the two material pathways to the print head. For more information, see *Automatic Material Changeover*.

MATERIAL CHAMBER

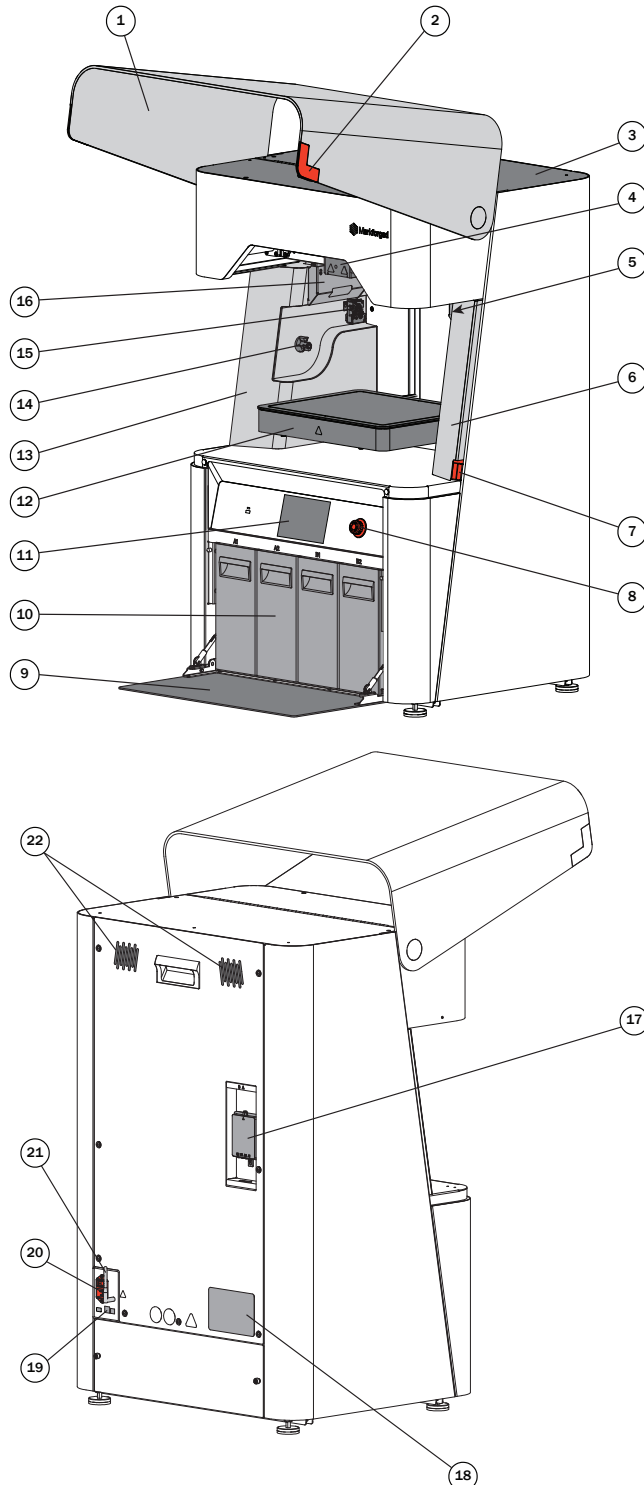
The material chamber and spool bays store and protect material from moisture and assist in loading and extruding filament using the pre-extruders. The chamber contains four spool bays that can hold all compatible Markforged metal and release material spools. These holders are labeled from left to right, facing the front of the machine:

- Spool bay A1
- Spool bay A2
- Spool bay B1
- Spool bay B2

The material loaded into a spool bay is fed into the corresponding material load tube inlet. The material load tubes feed material into a pre-extruder, which feeds material up through the material routing block to the slack mechanism in the print head.

DIAGRAMS

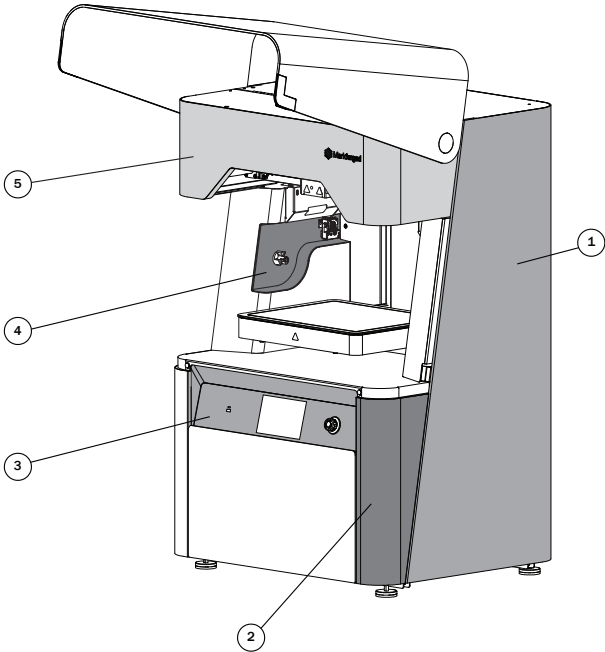
FX10 PRINTER



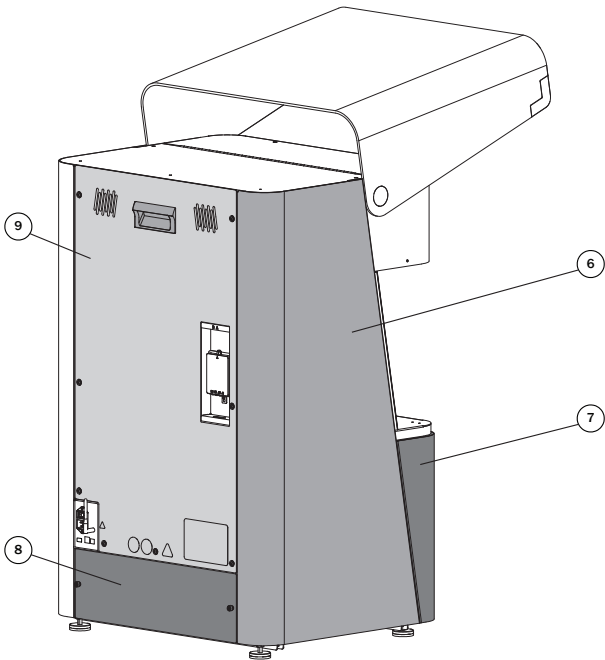
#	Component
1	Visor
2	Visor safety sensor actuator
3	Lid
4	Print head *
5	Right wiping station
6	Right chamber heater
7	Visor safety sensor
8	Emergency stop button
9	Material chamber door
10	Spool bays
11	Touchscreen
12	Print bed
13	Left chamber heater
14	Fiber spool spindle
15	Fiber extruder
16	Left wiping station
17	Material routing block *
18	Device ID label
19	Rear USB / Ethernet ports
20	Power input module + switch
21	Wi-Fi connector and antenna
22	Build chamber vent fans

* Composite Configuration shown

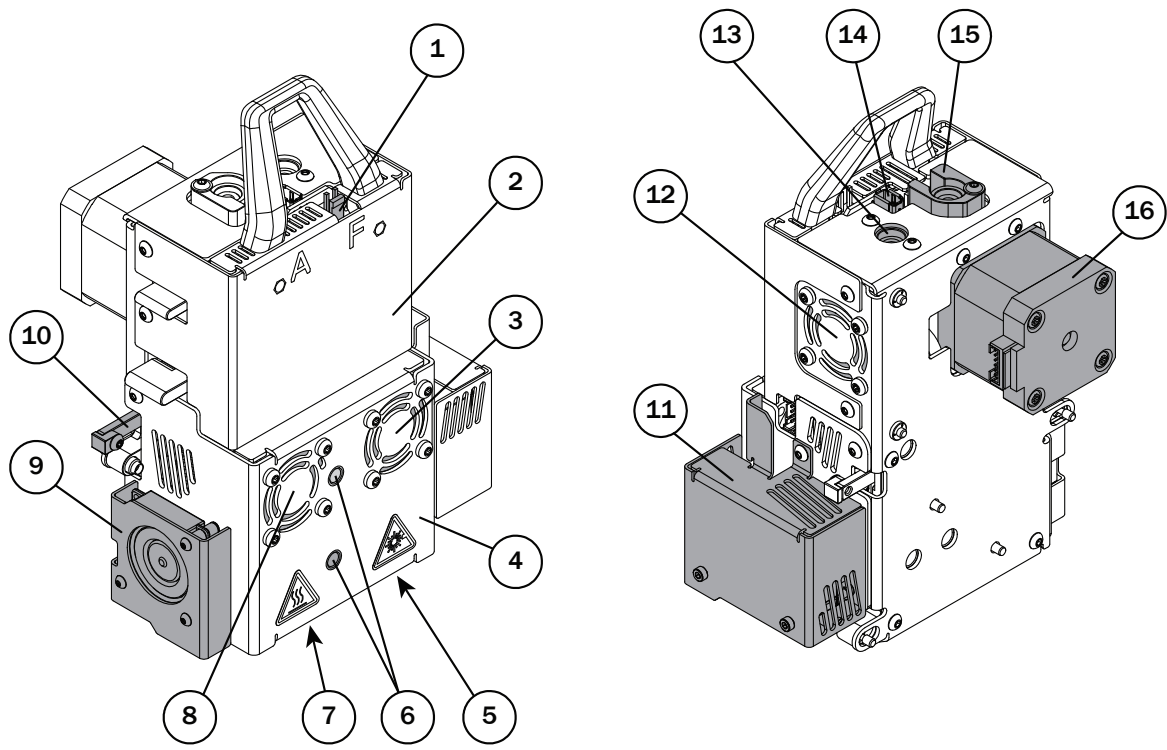
COSMETIC PANELS



#	Component
1	Right side panel
2	Right corner panel
3	Touchscreen panel
4	Fiber plastic panel
5	Top front panel
6	Left side panel
7	Left corner panel
8	Lower rear panel
9	Upper rear panel

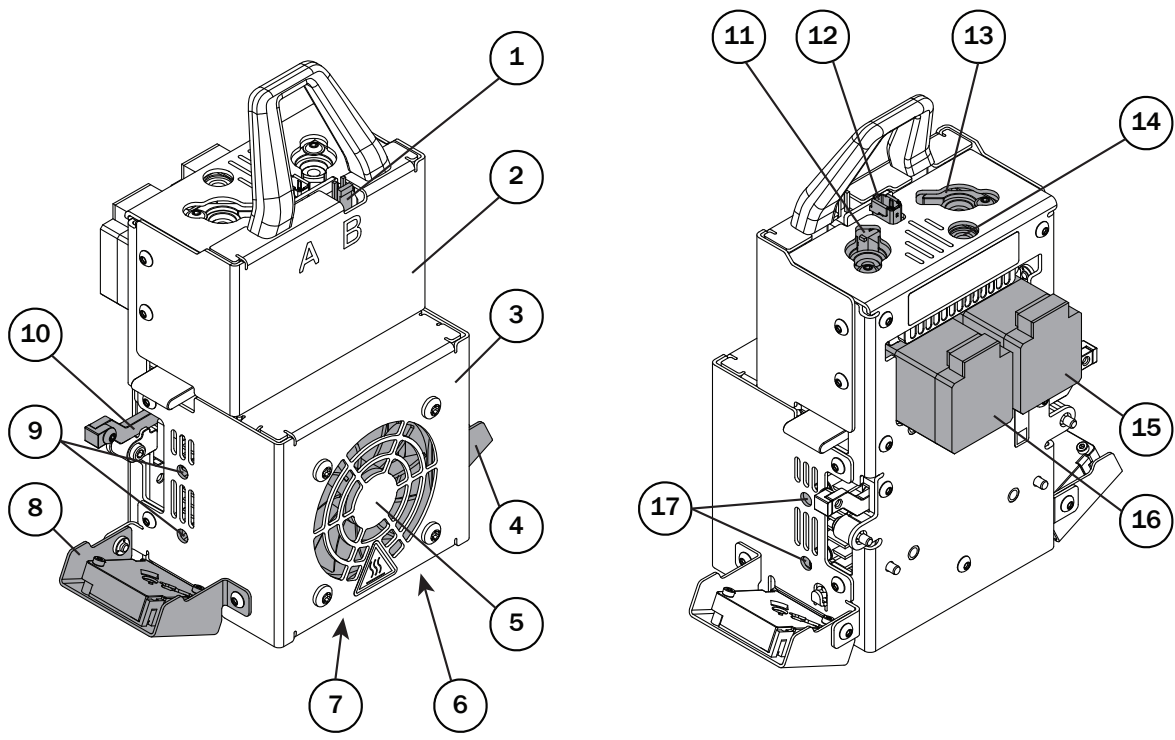


COMPOSITE PRINT HEAD COMPONENTS



#	Component	#	Component
1	Print head power cable connector	9	Part fan
2	Print head top cover	10	Cam mechanism
3	Fiber heat sink fan	11	Print head laser
4	Print head fan cover	12	Composite extruder fan
5	Nozzle F (Fiber nozzle)	13	Fiber Bowden Tube inlet
6	Plastic nozzle retention screws	14	Print head communication cable connector
7	Nozzle A (Plastic nozzle)	15	Slack mechanism
8	Plastic heat sink fan	16	Composite extruder motor

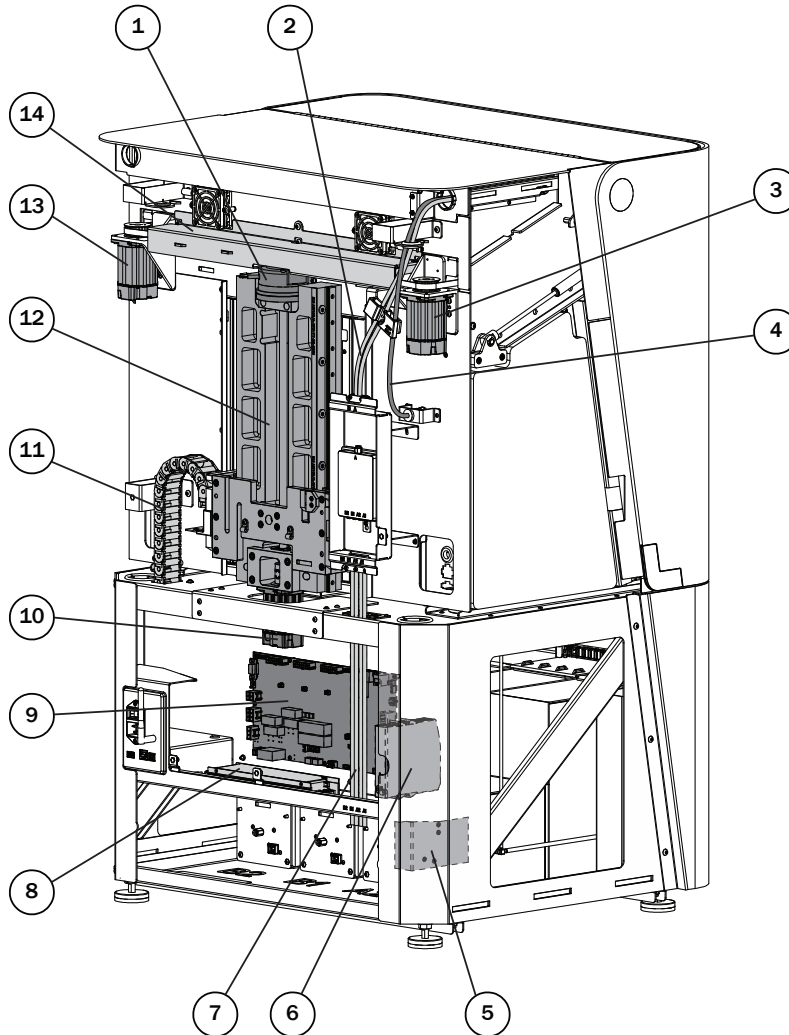
METAL PRINT HEAD COMPONENTS



#	Component	#	Component
1	Print head power cable connector	10	Cam mechanism
2	Print head top cover	11	Nozzle B slack mechanism
3	Print head fan cover	12	Print head communication cable connector
4	Nozzle B part fan	13	Nozzle A slack mechanism
5	Heat sink fan	14	Fiber Bowden Tube restraint
6	Nozzle B (Release nozzle)	15	Metal extruder A motor
7	Nozzle A (Metal nozzle)	16	Metal extruder B motor
8	Nozzle A part fan	17	Nozzle B retention screws
9	Nozzle A retention screws		

INTERNAL COMPONENTS

Note: The upper rear panel should only be removed by a Markforged trained technician. Never remove the rear panel while the device is powered on and attached to power.



#	Component
1	Z-axis safety brake
2	Upper conduit A, B
3	XY-axis motor
4	Fiber conduit
5	Print bed vacuum pump
6	Safety controller
7	Lower conduit A1, A2, B1, B2
8	24V power supply
9	Motherboard
10	Z-axis motor
11	Print bed energy chain
12	Z-axis motion system
13	XY-axis motor
14	Belt cover

AUTOMATIC MATERIAL CHANGEOVER

When the FX10 runs out of material on the currently loaded filament spool, it can automatically begin to use a second, preloaded spool of the same filament. This allows for composite prints up to 3200cc or metal prints up to 800cc without manual spool-swapping. In Composite Configuration, you can preload up to three additional spools of composite material to Nozzle A. In Metal Configuration, you can preload one additional spool of metal material to Nozzle A and one additional spool of release material to Nozzle B.

Filament can be added to the printer in two ways:

- **Load to Head:** Load material to the print head as usual. Only one spool may be loaded to a nozzle at a time. The next time you print a part, this primary spool will be used up first before the printer changes over to any preloaded spool.
- **Preload Material:** Draw the filament a short distance into the material pathway, to the material routing block just past the spool bay pre-extruder. If automatic changeover is enabled, then when the primary spool runs out, the printer will automatically begin to draw on the preloaded spool—for instance, when spool A1 runs out, the printer will attempt to print with preloaded material in spool bay A2, or vice versa.

If Automatic Material Changeover is disabled, then manual spool swapping is required. Automatic Material Changeover is automatically enabled when you load one spool and preload another.

The Automatic Material Changeover process takes roughly 10 minutes. Note that adding pauses to a print job or switching material spools mid-print allows previously extruded material to cool, which may reduce interlayer adhesion strength. While the brief Automatic Material Changeover process minimizes this effect in comparison to manual spool swapping, part strength reductions may still be present. In addition, composite parts may display a small visible seam at the changeover layer.

Note: Seams may be less likely to form on metal parts.

ENABLING AUTOMATIC MATERIAL CHANGEOVER

When Automatic Material Changeover is enabled, a text label and green icon are displayed with the nozzle information in the **Controls > Material Storage** tab; when it is enabled, a button appears next to the nozzle name allowing you to **Preload Material**.

In the same tab, a spool bay with material *loaded to the print head* is highlighted in blue. Preloaded spools display a spool image and the amount of material on the spool, but are not highlighted.

- Tap the greyed-out circle-A icon to enable Automatic Material Changeover.



- Tap the blue Information icon on the nozzle card for an introduction to the Automatic Material Changeover feature.

HOW TO LOAD AND PRELOAD PRINT MATERIAL

You can load and preload material from the Queue or Material Storage screens.

Note: The preloaded material type must be the same as the loaded material to perform a changeover during a print. While the system will not prevent you from pre-loading two different material types, if you do so a changeover will not occur.

1. Select **Controls > Material Storage**, then tap the card for the spool bay you wish to load or preload material from.
2. In addition to the standard options (material, spool size, full/partial spool), you will be prompted to **LOAD TO HEAD**; if material is already loaded to the head, you will also have the option to **PRELOAD**.
3. If material has already been loaded to the print head (from either spool bay), you have three options:
 - Unload the loaded material, *then* load new material to either spool bay
 - Preload new material to the respective nozzle from the other spool bay
 - Cancel

The remaining steps are the same as in the standard material load routine: cut the filament at a 45° angle and insert the filament into the pre-extruder inlet. When you preload material, the filament travels a short distance to the material routing block, taking only a few seconds; if you are loading filament to the print head, the material will take a couple of minutes to travel to the print head and prepare for printing.

Note that pre-loaded spools will be printed in the order that they were pre-loaded into the printer.

IMPORTANT MATERIAL INFORMATION

COMPOSITE BASE MATERIAL

Plastic filament is very susceptible to absorbing moisture. Plastic filament that has absorbed too much moisture will cause a number of printing issues, including failed prints, underextrusion, holes in the roof of parts, etc. Take special care to NEVER leave plastic exposed to ambient air, and ALWAYS keep plastic either inside the FX10 material chamber with desiccant, in an airtight sealed container with desiccant, or in its original packaging.

TIPS TO AVOID RUINING YOUR FILAMENT

- NEVER leave a plastic spool exposed to ambient atmosphere.
- DO NOT open plastic spool packaging until you are ready to use it.
- Make sure your spool bays are securely closed during operation.
- Do not open the material chamber and spool bays unless absolutely necessary. If the chamber must be opened, limit exposure to <15 minutes for any single spool.
- Inspect plastic filament packaging for any holes or tears prior to using.
- When changing spools, always discard any old desiccant packs and replace them with the most recently provided desiccant packs.

DESICCANT REPLACEMENT

The material chamber features four spool bays (marked A1, A2, B1, and B2), each with a desiccant pocket between the spool rollers. When loading a new spool into a spool bay, be sure to remove any old leftover desiccant in the spool bay, then place the fresh pack(s) that came packaged with your new material into the pocket. When inserting a desiccant pack, ensure it will not interfere with the spool of filament.

The spool bay should always contain all the desiccant pack(s) included with the loaded spool, and no more.

Do not reuse spent desiccant.

PLASTIC MATERIAL STORAGE

Please refer to the original material packaging for storage requirements. Do not open material packaging until ready to load into the printer.

Long-term storage of plastic outside of the material chamber will severely degrade the print quality produced by a spool, as the plastic filament readily absorbs water from the environment. This increased moisture content will degrade print performance and may clog the print head.

Important: *Each spool of plastic material ships with two desiccant packs (except Onyx ESD, which ships with one). Each spool in the material chamber should ONLY be stored with the desiccant pack(s) it shipped with. Any extra or leftover desiccant packs in the spool bins from previous spools of material will likely have absorbed excess moisture, which will permeate to the partial spool, making it wet.*

If you need to remove a plastic spool from the material chamber, please store it in an airtight container.

Markforged recommends the Pelican 1430 case. Do not store partial spools of material in any type of sealable bag, as those do not protect spools from moisture. Airtight containers used for partial spool storage must have solid walls and a soft plastic seal in the lid.

If you plan on leaving your printer unused for an extended period of time, it is recommended to remove all spools from the material chamber and place them in airtight containers with desiccant (new desiccant if possible).

Plastic Shelf Life

Note: For material-specific shelf life information, see the [Shelf Life of Markforged Materials](#) support article.

Unopened spools of plastic filament have a minimum shelf life of two years from date of manufacture when stored properly in their original sealed packaging. Once unsealed, plastic spools should be stored for use in the FX10 material chamber for up to 90 days, or in an airtight container such as the Pelican 1430 case. The material spool bays are not airtight containers and are not intended for long-term storage. To keep plastic material as dry as possible over a long-term storage period greater than 90 days, use an external drybox.

Once opened, plastic spools can be stored in an airtight container for up to one year. Plastic spools must be stored with the desiccant packs they shipped with at all times.

Drying Plastic Material

We strongly recommend that you do not attempt to dry your material. Drying can degrade material performance, leading to part failure and printer malfunction or damage. Markforged does not test or support customer material-drying configurations.

FIBER FILAMENT STORAGE

Store all composite filaments at room temperature in a cool, dry place, out of direct sunlight. Kevlar® should be stored in a bag or container which blocks exposure to all light.

Fiber Shelf Life

Unopened fiber spools have a minimum shelf life of five years from date of manufacture when stored in their original sealed packaging at temperatures between 55–90°F (13–33°C). Once unsealed, fiber spools can be stored for up to one year.

METAL MATERIAL STORAGE

Improperly stored or handled print material can suffer damage, leading to reduced part quality, interrupted and failed prints, and unnecessary waste of time and materials. This section outlines proper care and storage of metal print material.

Always handle print material with care.

HUMIDITY

Markforged metal filaments should be treated as raw material stock of the base metal. Markforged metal filaments are less sensitive to environmental humidity than our Nylon and Onyx composite materials. Avoid storing metal filament in high-humidity conditions, which may cause non-stainless steel filament to rust.

Consult the [FX10 Facilities Guide](#) for printer environmental requirements.

TEMPERATURE

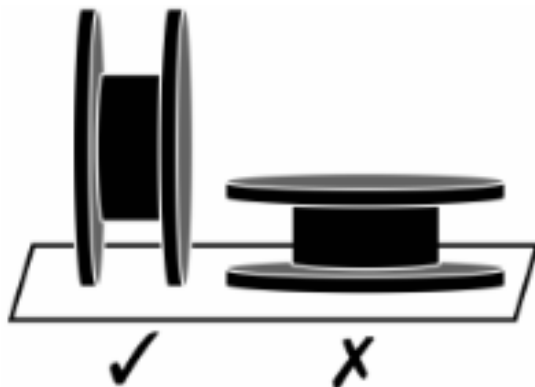
While the metal print material is fairly robust against environmental humidity, it is sensitive to changes in temperature, growing brittle at low temperatures and potentially beginning to thermally debind at high temperatures. We recommend storing material and operating the printer within the temperature range given in the Environmental Requirements section of the [FX10 Facilities Guide](#).

Do not store spools in direct sunlight, even inside their original packaging.

Do not store spools in the print chamber, near the print bed, for extended periods.

IMPACT / ORIENTATION

To avoid damaging metal filament, always store spools—both full and partial—in a vertical orientation with as little slack in the spool as possible. To avoid breakage, avoid sharp shocks to the spool. **Do not drop the spool.** If you do, you should assume that the material is compromised (cracked or broken) and no longer usable.



Note regarding release material: It is also especially important to store spools of release filament in a vertical orientation, to avoid unspooling.

To prevent tangles, unspooling, and breakage when moving a spool of release material, we recommend using painter's tape to secure the end of the filament.

SEAL / ORIGINAL PACKAGING

Keep spools in their original packaging until ready to use. Metal spools in their original packaging can be stored horizontally or vertically, and must be handled with care. Once spools have been removed from their original packaging, store them vertically as above.

Note that filament packaging is not watertight. It should never be submerged in water. Any spools exposed to excess moisture must immediately be moved to a dry location. If corrosion or rust is visible, dispose of the filament immediately.

Avoid exposing print material to dust, dirt, and debris. Completely cover material in storage to prevent exposure to contaminants. We recommend using large sealable bags.

SHELF LIFE

Spools of metal material have a shelf life of one year from date of manufacture under recommended storage conditions. Spools of ceramic release material have a shelf life of two years from date of manufacture under recommended storage conditions.

PRINTING A PART

If your printer is connected to Eiger, printing is as easy as pressing a button. Once all your part and build settings are configured in Eiger, select your FX10 printer and press **Print**. For more information, see the [Working with Builds](#) support article.

Alternatively, you can export the build from Eiger to a USB key for offline printing.

For detailed instructions on using our Eiger software, visit support.markforged.com.

To kick off your print on the FX10, use the printer's touchscreen to select it from the queue (or add it from a USB key). Follow onscreen directions to confirm that the printer is ready to initiate printing, with the print sheet correctly installed and prepared, and all necessary material loaded. The FX10 will perform a series of preflight checks before commencing the print.

IMPORTANT NOTES FOR PRINTING METAL

Ensure that the blue FX10 Metal Print Sheet is correctly installed and prepared, and all necessary material loaded. For more information, see *Applying a Metal Print Sheet* below.

PART SIZE

It is important to distinguish between the maximum printable size for printed parts on the FX10, and the maximum sinterable size for parts going into the Sinter-1 or Sinter-2.

The FX10 is able to print parts larger than the setter plate of the Sinter-1 and Sinter-2, as well as the basket of the Wash-1. However, a printed part, including its raft, must fit entirely on the setter plate when sintering. For very large parts, Eiger offers an **External Sintering** setting.

See the [Metal X Design Guide](#) for information on designing your parts for successful printing, washing, and sintering.

Note: The Sinter-2 has a larger working volume than the Sinter-1. Make sure your parts are able to fit into the furnace at your facility.

MATERIAL BUILDUP DURING PRINTING

Note that some material buildup on the side of the nozzle is normal during the first few layers of a print (the raft). There is no need to pause or cancel your print when you observe this behavior; the printer should resolve the buildup after the initial layers, and it should not cause problems with the part itself. In case of error, the printer will pause automatically and prompt you for input.

PRINTER CALIBRATION

To run the following utilities, navigate to **Utilities > Calibration** on your printer's touchscreen.

PRINT BED LEVEL UTILITY

For optimal print quality, it is vital that the print bed is properly leveled. The FX10 will perform a multi-point touch-off procedure before every print to confirm the print bed is level. After initial calibration during installation, the print bed should remain level under normal printer use.

GANTRY CALIBRATION UTILITY

To ensure the gantry is properly calibrated, the Gantry Calibration utility should be completed. This utility checks belt tension and gantry skew.

The motion system belts should be regularly tuned, every 500 print hours or after changing any component of the motion system. To tune the belts, run the Gantry Calibration utility and pluck the belt as instructed.

BELT TENSION

When prompted by the touchscreen, pluck the far outer belt on the left side of the printer. The screen will then prompt you to pluck the far outer belt on the right side of the printer. If the printer does not detect the first belt pluck, wait 5 seconds and pluck again.

GANTRY SCAN

In Composite Configuration, the print head laser will scan the vacuum groove on the print bed to determine gantry skew. In Metal Configuration, the print head will determine gantry skew by performing nozzle touchoffs along the print bed groove.

Make sure that the print bed and laser, if applicable, are clean, and that the print sheet has been removed from the printer.

ADJUSTMENT

Following the belt tension check and gantry scan, instructions on how to adjust the belt tension will be provided in the event adjustment is required.

LASER OFFSET CALIBRATION UTILITY

This automated process calibrates the position of the plastic nozzle and laser. This utility is available in Composite Configuration only.

TUBE ADJUSTMENT UTILITY

Tools:

- 2.5mm hex key
- Step ladder
- Lid screwdriver

During the material load routine and before each print job, your printer automatically checks the tube adjustment mechanism. If needed, you will be prompted to run the Tube Adjustment utility to better position the upper material tubes for successful printing. This utility is available in Metal Configuration only.

NOZZLE OFFSET CALIBRATION UTILITY

The Nozzle Offset Calibration utility is an automated process which calibrates the position of the two print head nozzles.

WHEN SHOULD I RUN THESE UTILITIES?

BED LEVEL AND GANTRY CALIBRATION

- Both utilities: After moving the printer
- Gantry Calibration: Every 500 print hours, or after changing any motion system component

NOZZLE OFFSET CALIBRATION

- After installing a new nozzle
- After installation of the print head

CLEANING YOUR PRINTER

Do not use any cleaning fluids on your FX10 unless specifically directed in this document. Be careful of hot surfaces and components when cleaning the build chamber.

While printing Onyx and other Nylon-based materials, it is normal for white caprolactam residue to accumulate on surfaces inside the build chamber. However, you can use a damp microfiber cloth to remove any buildup if desired.

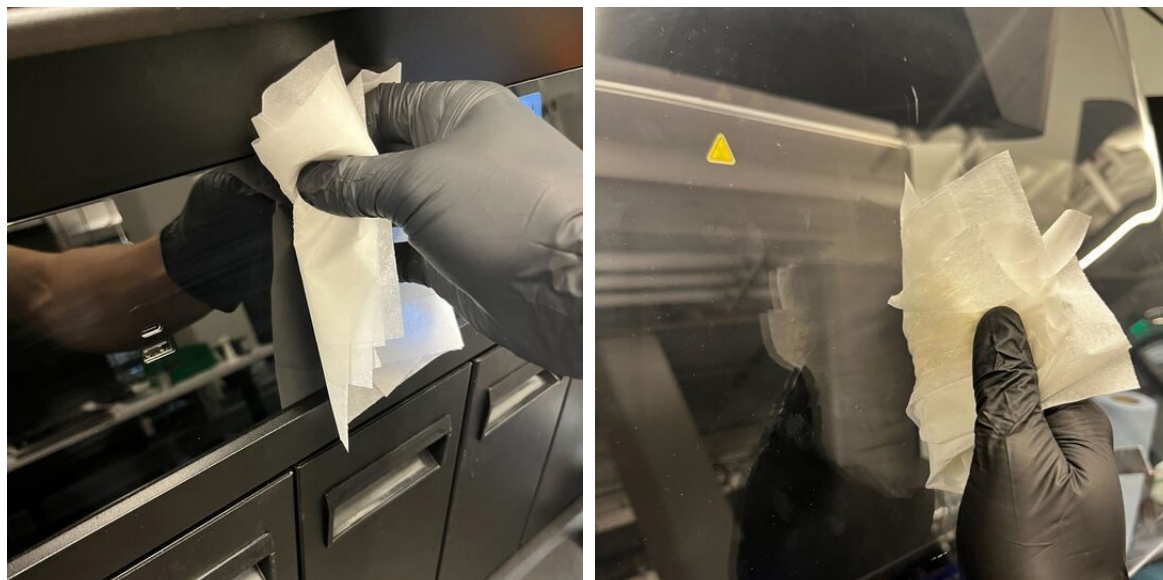
To clean the panels and print bed, use a lint-free cloth dampened with water or isopropyl alcohol. To clean the touchscreen and visor, use a non-ammonia based cleaner and a lint-free cloth. Zeiss lens wipes are included in the FX10 Accessory Kit for cleaning the build chamber camera lens, print head laser, and vision module (mounted on the print head behind the X-rail).

If using isopropyl alcohol on a cloth, only wipe down metal surfaces. Alcohol-based cleaners should never be used on **plastic components** of the FX10 printer, such as the visor, touchscreen, PCBs, or fiber plastic panel.

TOUCHSCREEN AND VISOR

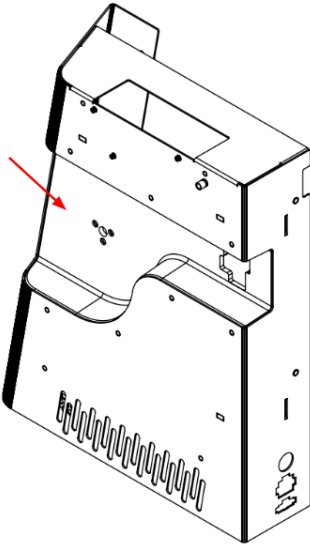
Important: DO NOT wipe the touchscreen or visor with isopropyl alcohol or ammonia-based cleaner.

The touchscreen and visor can be cleaned using a microfiber cloth sprayed with a non-alcohol and non-ammonia-based cleaner.

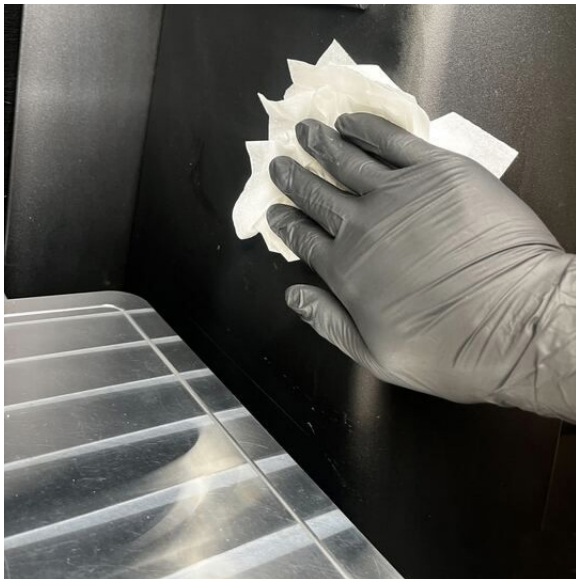


PANELS

Important: DO NOT wipe the plastic fiber panel part (indicated by the red arrow in the image below) with isopropyl alcohol or ammonia-based cleaner.



Use a slightly damp lint-free cloth to remove buildup from the panels.



GANTRY

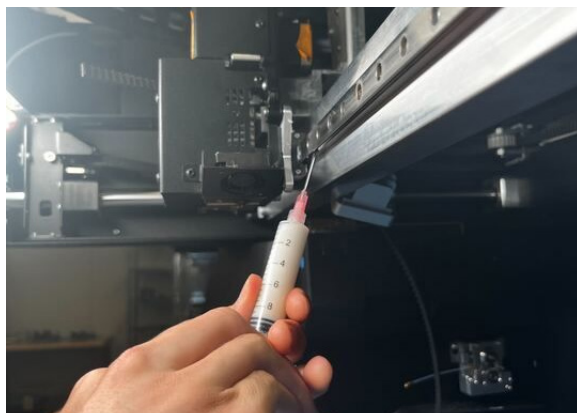
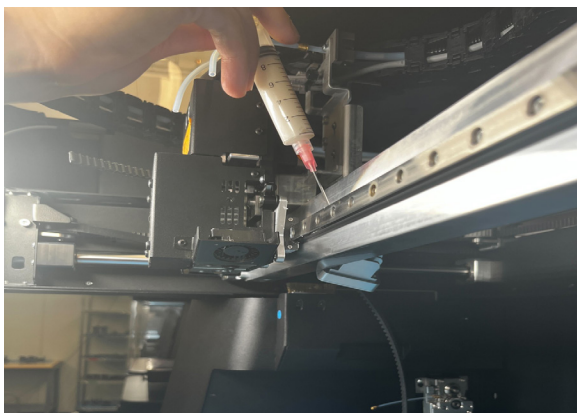
Clean the Y-linear rails by applying isopropyl alcohol with a lint-free cloth.



Clean the X-rail with isopropyl alcohol on a lint-free cloth.



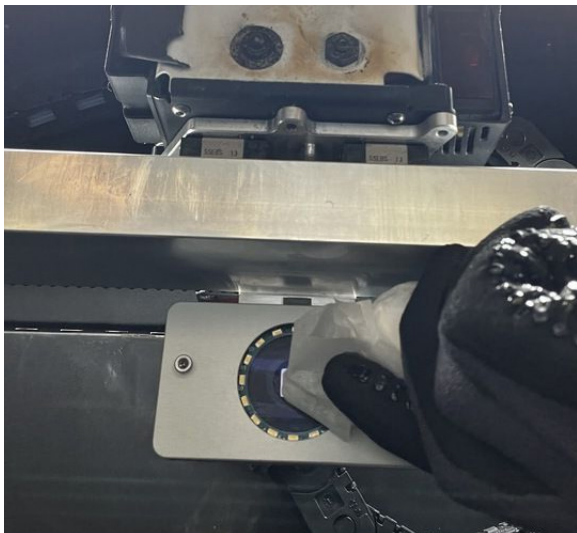
Additionally, you can grease the rails using Molykote 44 Medium High Temperature Grease.



CAMERAS

Over time, caprolactam (Composite Configuration) or wax (Metal Configuration) will build up on the lenses of the cameras mounted in the print chamber and on the print head, leading to foggy images. If these lenses are not cleaned occasionally, the cameras' images will cease to be useful for monitoring parts and diagnosing print failures.

Do not use any harsh solvent to clean camera lenses. Instead, use a dry Kimwipe or other lint-free wipe, or one of the lens wipes included in the Accessory Kit. Note that it may take some time to fully remove the wax. Do not remove the camera or lens from the printer.



PRINT HEAD LASER

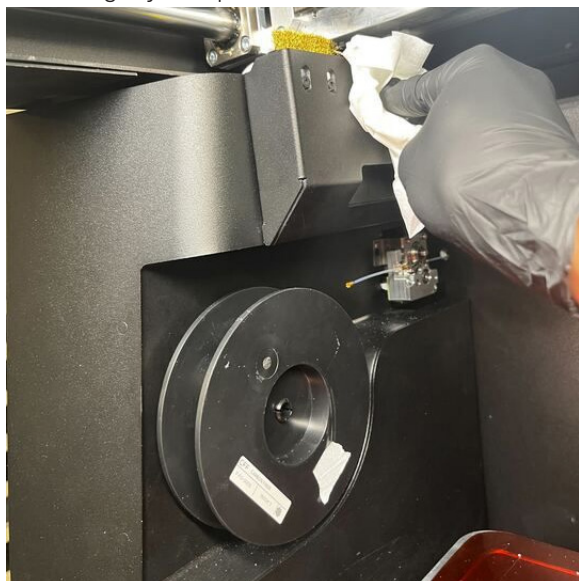
Use a dry Kimwipe or other lint-free wipe, or one of the lens wipes included in the Accessory Kit, to wipe any plastic caprolactam or wax buildup from the laser on the composite print head.



WIPING STATIONS

The FX10 extrudes purged print material directly into two purge bins, mounted atop the left and right chamber heaters. The wiping stations are equipped with brushes to clear excess filament from the nozzle between print layers.

Use a slightly damp lint-free cloth to remove buildup from the wiping stations.



Extruded material left on the wiping station brushes may build up and impact the quality of printed parts. You can clear any excess print material out of the wiping station brushes with a fingertip, knocking the material down into the wiping station itself. Before every print, dispose of accumulated material by dumping the contents of the wiping station into an appropriate waste container. **Wear safety gloves when working with the wiping station brushes; the bristles are very sharp.**

Separate wiping stations should be used for the Metal and Composite Configurations to prevent material cross-contamination. For this purpose, the metal wiping station should be marked with one of the provided blue stickers. Note that wiping station brushes may wear faster in the Metal Configuration than in Composite. Replace wiping station brushes when they show visible wear.

For more information, see *Wiping Station Maintenance* below.

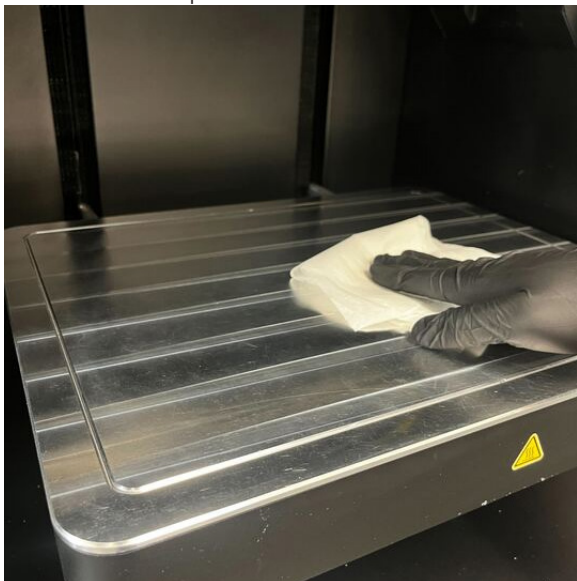
BUILD CHAMBER

Occasionally clean the chamber and chamber heater vents with either a lint-free cloth or a vacuum with a HEPA filter. Take care not to scratch the paint.



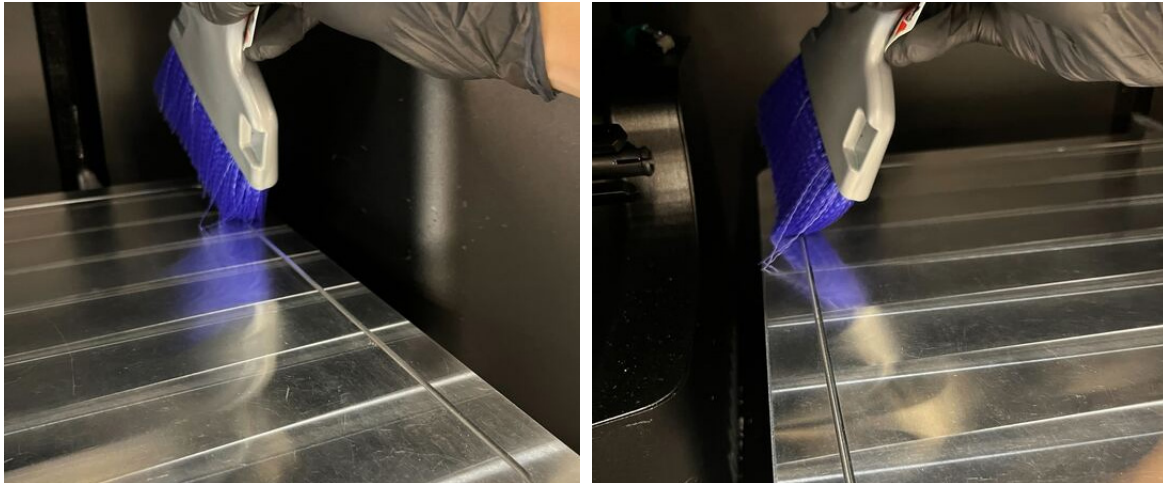
PRINT BED

Remove the print sheet and wipe the print bed with isopropyl alcohol on a lint-free cloth. Do not use this cloth anywhere else; do not allow it to touch plastic or acrylic parts. Alternatively, use a non-metal/abrasive brush to collect plastic debris.



VACUUM CHANNELS

Inspect the vacuum channels on the print bed before each print. If debris appears to be present, brush out the vacuum channels with the included brush or a vacuum with a HEPA filter.



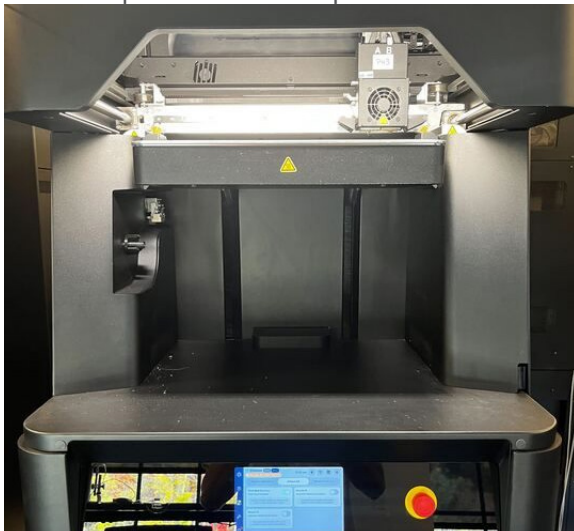
DEEP CLEANING THE PRINT BED

In the event that your printer cannot produce a strong vacuum seal on print sheets, you can perform a deep clean as follows.

Tools:

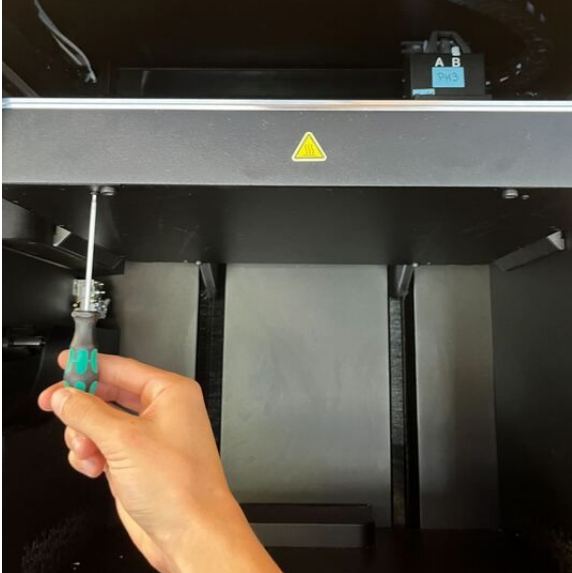
- 2mm hex driver
- Tweezers

1. Move the print bed to the top of the build chamber.

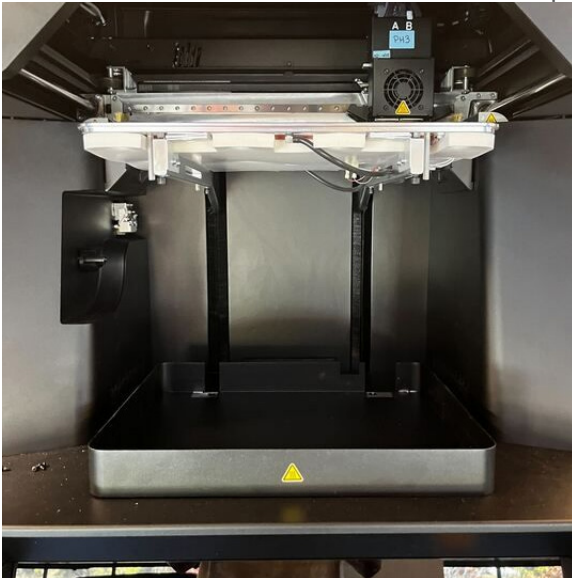


2. Power off the printer.

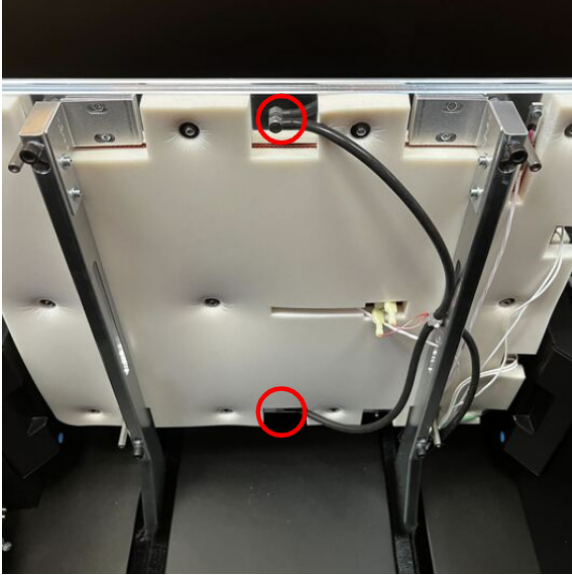
3. Using the 2mm hex driver, undo the four screws underneath the print bed.



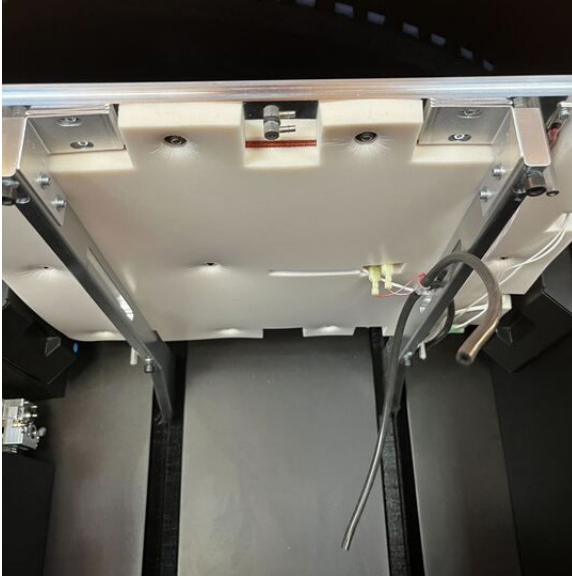
4. Remove and set aside the bottom cover of the print bed. Take care not to scratch it.



5. Locate the lines to the two 90° connectors.



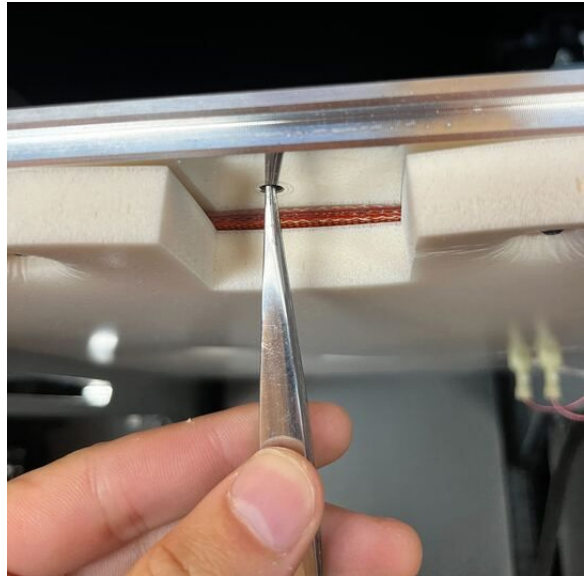
6. Unplug the vacuum tubing. If needed, clear both tubes of debris by shaking them.



7. Remove both fittings and inspect them for debris. If found, use tweezers to remove debris.



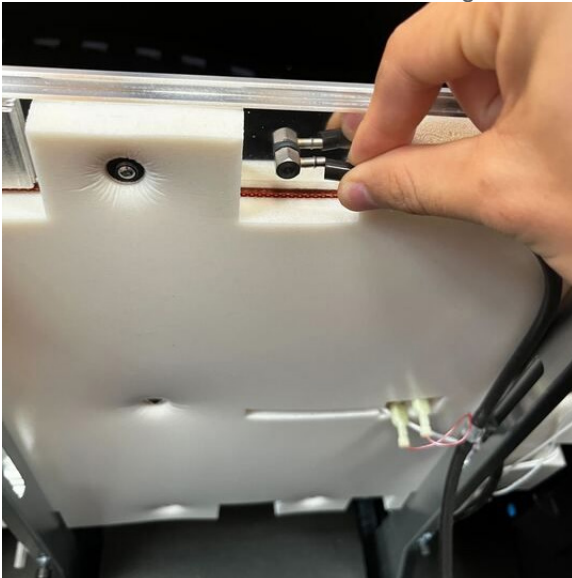
8. Check fitting inlets for debris. If found, remove debris using tweezers.



9. Hand-screw the fittings into the inlets until finger-tight, such that their threads are no longer visible.
Note: Ensure that the gaskets are in the correct orientation and the O-rings are not overly compressed.



10. Reattach the vacuum tubes to the fittings.



11. While supporting the bottom cover with one hand, reinstall the four screws securing it to the bed using the 2mm hex driver. Torque each screw to 5 in-lb (0.55 N-m).



12. Power on the printer and check for errors.
13. Enable the vacuum seal to test vacuum engagement.

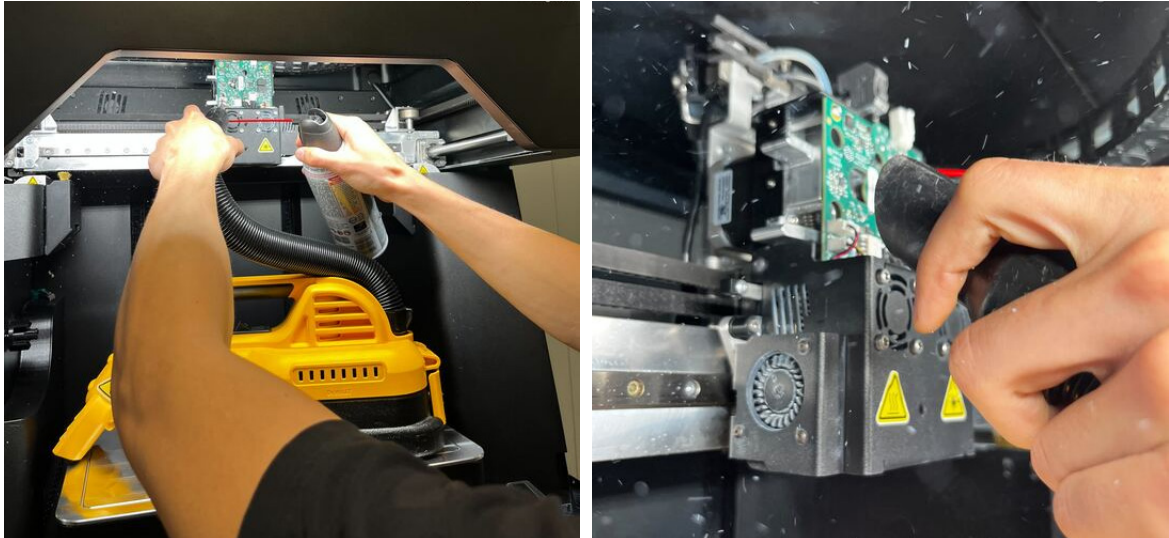
PRINT HEAD

Tools:

- 2mm hex driver
 - Dust mask
 - Eye protection
 - Vacuum with HEPA filter
 - Compressed air
1. Unload all material from the print head.
 2. Move the print bed to its lowest height. For more information, see *Manual Control* above.
 3. Power off the printer.
 4. Open the visor.
 5. Disconnect the communications cable from the print head board.
 6. Disconnect the power cable from the print head board.
 7. Power on the printer to make use of the build chamber lighting.
Note: Disregard any error messages.
 8. Using the 2mm hex driver, remove the top cover of the print head.
 9. Equip dust mask and eye protection. Make sure that anyone not wearing PPE for airborne debris leaves the vicinity.

10. Use the vacuum and compressed air to remove caprolactam from the PCB board, fans, extruder hob, and idler wheel area.

Important: Do not touch the board or fans directly with the compressed air nozzle or vacuum tube.



11. Close the visor and allow debris to settle in the chamber.
12. Move the print bed up and reach underneath it to clean the build chamber of debris.
13. Reattach the top cover of the print head.
14. Power off the printer.
15. Connect the power cable to the print head board.
16. Connect the communications cable to the print head board.
17. Power on the printer and check for errors.

REPLACING MATERIAL TUBES

When installing material tubes, you must ensure that the tube is fully inserted into each push-to-connect fitting. You can confirm a proper fit by making a mark 14mm (9/16in) from each end of the tube, then pushing the tube into the fitting until the mark is positioned just above the push-to-connect collet.

REPLACING COMPOSITE MATERIAL TUBES

*Note: Before initiating replacement of material tubes, unload material. For more information, see Unloading Plastic Filament **and** Unloading Fiber Filament **below**.*

UPPER MATERIAL TUBE REPLACEMENT

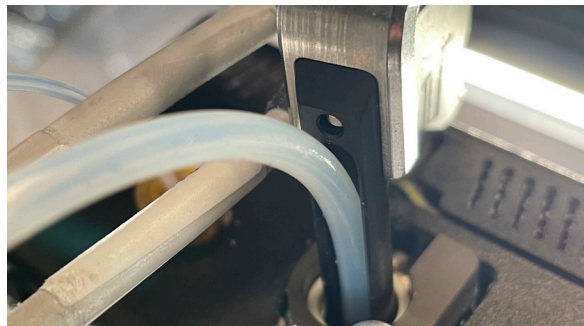
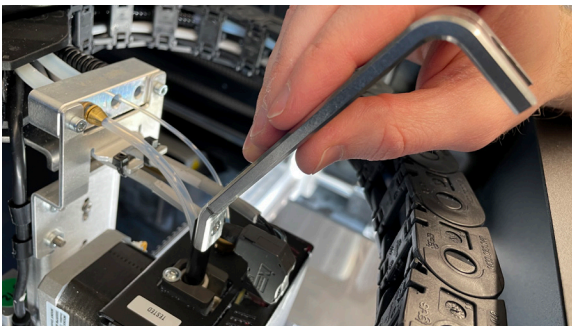
Tools:

- Lid screwdriver
- Print Head Service Tool
- Optional: Step stool

1. Unscrew the two captive upper-lid screws and open the printer lid.
2. Remove and set aside the material tube retention clip located at the print head end of the energy chain, as shown in the first picture below. Or, if the tube adjustment mechanism has been installed, instead flip the lefthand upper tube retention clip open, as shown in the second picture below.



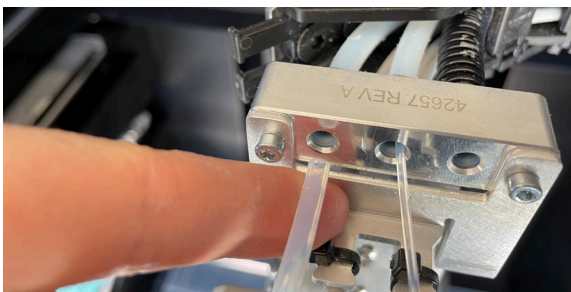
3. Use the plastic end of the Print Head Service Tool to depress the push-to-connect fitting in the top of the print head and remove the Upper Material Tube from the print head.



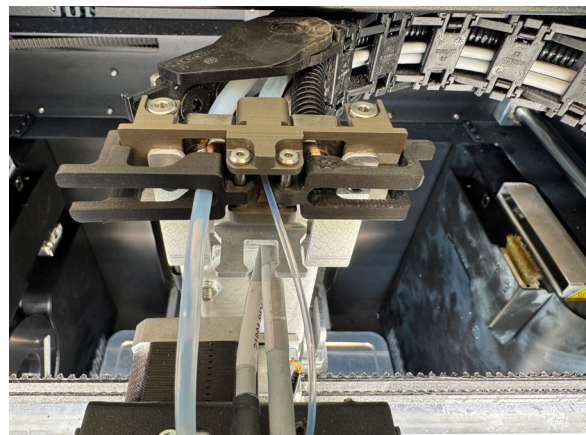
4. Move to the rear of the printer. Press the push-to-connect fitting on the top of the routing block, then pull the Upper Material Tube out of the routing block.



5. Move to the front of the printer and open the visor. Pull the Upper Material Tube out of the energy chain and discard it.
6. Insert the new Upper Material Tube into the opening on the energy chain above the print head.



7. When fully inserted, insert the end of the material tube into the push-to-connect fitting on the print head.
8. Reinstall the material tube retention clip, as shown in the first picture below. Or, if the tube adjustment mechanism has been installed, instead flip the lefthand upper tube retention clip closed, as shown in the second picture below.



9. At the rear of the printer, locate the material tube now dangling above the material routing block. Insert it securely into the push-to-connect fitting on top of the routing block.



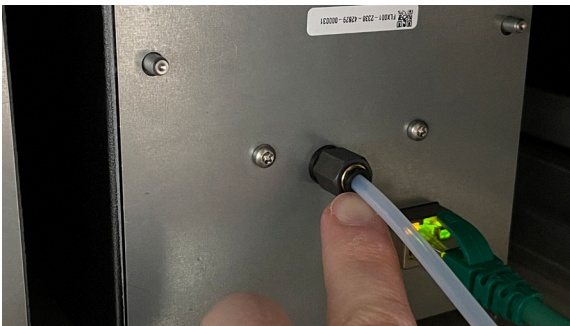
LOWER MATERIAL TUBE REPLACEMENT

1. At the rear of the machine, remove the lower rear panel using the captive thumbscrews.



2. Locate the push-to-connect outlet fitting on the rear of the pre-extruder corresponding to the Lower Material Tube that needs to be replaced. Depress the push-to-connect fitting and remove the tube.

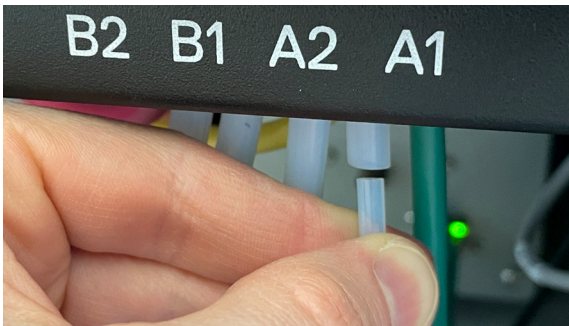
Note: If dual pre-extruders are installed on your machine, disconnect the Lower Material Tube from Outlet 1 on the righthand side of the rear face of the pre-extruder.



3. At the inlet fitting on the bottom of the material routing block, locate the tube that needs to be replaced. Depress the push-to-connect fitting and pull the Lower Material Tube out of the fitting.



4. The tube is now free and can be pulled out of the printer.
5. Retrieve the replacement tube. Confirm that the tube's label corresponds to the appropriate spool bay.
6. Feed the unlabeled end of the material tube into the conduit at the lower rear panel, until it emerges below the material routing block. Insert the unlabeled end of the tube fully and securely into the push-to-connect fitting below the material routing block, and insert the labeled end into the fitting on the rear of the pre-extruder.



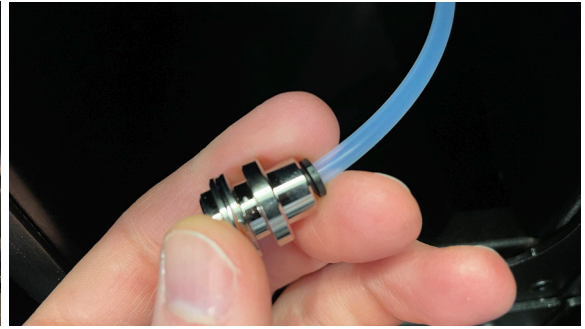
7. Confirm that all tubes are securely installed in their push-to-connect fittings.
8. Reinstall the lower rear panel.

MATERIAL LOAD TUBE REPLACEMENT

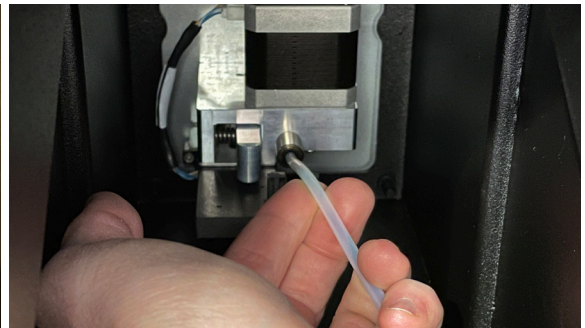
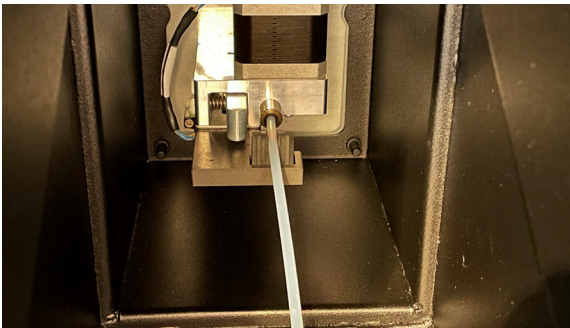
1. Open the spool bay containing the Material Load Tube you want to replace.
2. Remove the spool holder tray while grabbing the spool roller and pulling directly up and out.



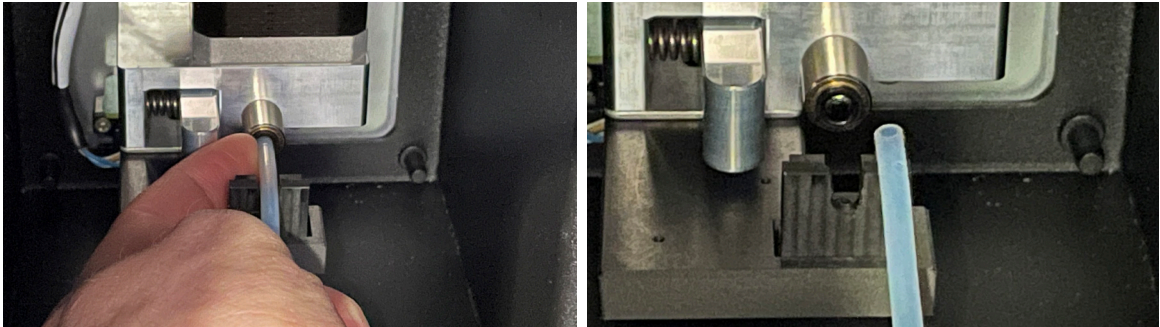
3. Slide the Material Load Tube fitting out of its bracket, then depress its push-to-connect fitting to free the Material Load Tube. Set the load tube fitting aside.



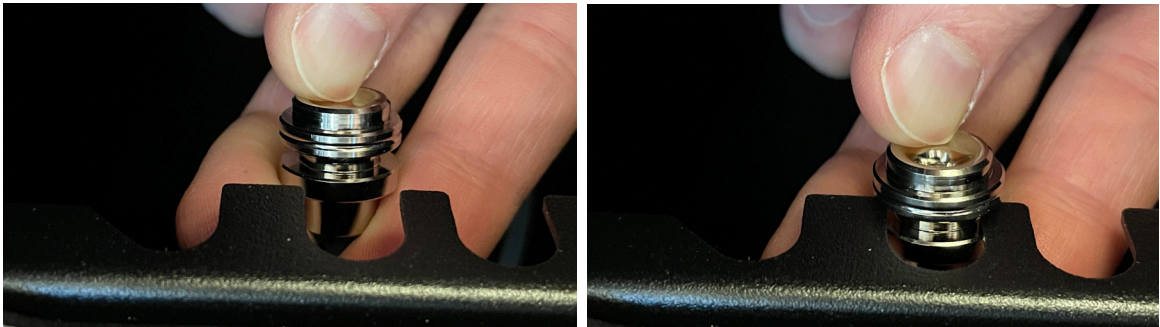
4. Lift the load tube up out of the optical sensor in front of the pre-extruder inlet.



5. Depress the push-to-connect fitting on the pre-extruder inlet, at the rear of the spool bay, and pull the load tube out of the pre-extruder inlet fitting. Discard the old load tube.



6. To install a new tube, depress the push-to-connect fitting on the inlet of the pre-extruder, and insert the Material Load Tube until it is fully seated in the fitting.
7. Press the load tube back down into the sensor in front of the pre-extruder inlet, until it clicks into place.
8. Reinstall the load tube fitting on the front end of the Material Load Tube.
9. Slide the fitting into the *left-hand bracket* (Port 1) at the front of the spool bay.



10. Reinstall the spool tray by positioning the tray's inlet cutout over the inlet fitting, with the front lip of the tray behind the spool bay flange and the rear of the tray resting on the ledge at the back of the bay. The load tube fitting should be flush with the tray.



FIBER LOAD TUBE REPLACEMENT

Tools:

- 2mm hex key
1. Use the 2mm hex key to loosen, but not fully remove, the inlet retention screw on the fiber extruder located on the left chamber heater.



2. Slide the Fiber Load Tube out of the fiber extruder.
3. Discard the used Fiber Load Tube.
4. Insert the outlet end of the new load tube into the fiber extruder.
5. Tighten the retention screw with the 2mm hex key until the tube is secure. Make sure not to overtighten.

FIBER BOWDEN TUBE REPLACEMENT

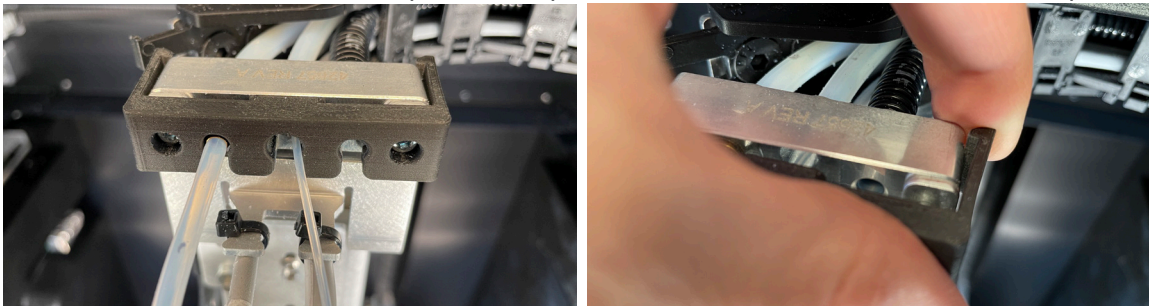
Tools:

- Lid screwdriver
 - 2mm hex key
 - Step stool
1. Use the 2mm hex key to loosen, but not fully remove, the outlet retention screw on the fiber extruder located on the left chamber heater.



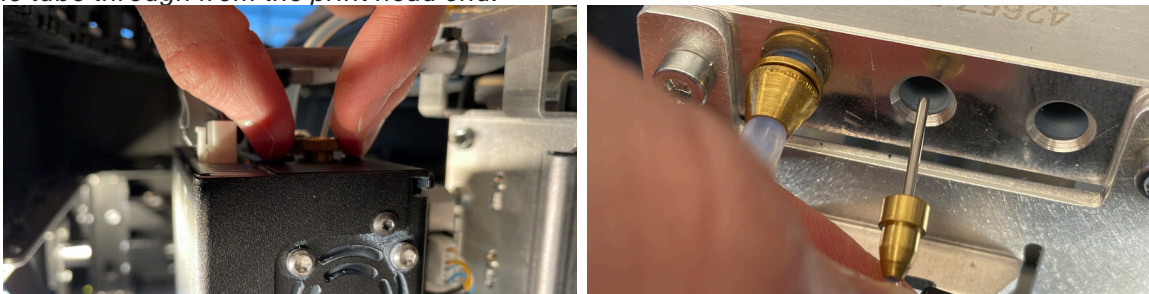
2. Pull the metal ferrule and tube away from the fiber extruder.
3. Mount a step stool. Unscrew and open the printer lid.

4. Locate the material tube retention clip above the print head and remove it. Set the retention clip aside.



5. Unscrew the Fiber Bowden Tube from the top of the print head and pull the tube out of the energy chain. Then, discard it.

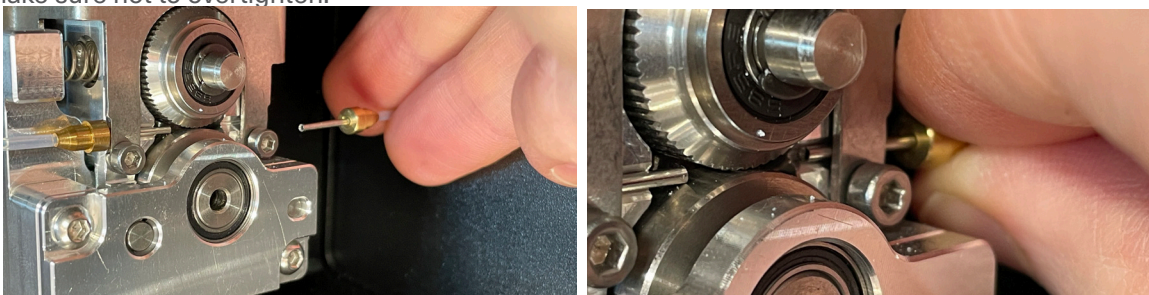
*Note: If you encounter resistance when pulling the tube out of the energy chain, **do not tug on the print head fiber retention screw**. Instead, use the plastic end of the Print Head Service Tool to nudge the ferrule fitting on the fiber extruder end into the conduit tube, then gently pull the tube through from the print head end.*



6. Install a new Fiber Bowden Tube by feeding the inlet end of the tube (without the thumbscrew) into the open hole marked "F" above the print head. Once the replacement Fiber Bowden Tube feeds all the way through the energy chain, you will see it pop out of the hole behind the fiber extruder at the rear of the build chamber.

Note: If the inlet end catches on a gap between the fiber conduit tube and push-to-connect fitting, shut down the printer, disconnect it from power, remove the back panel, and firmly insert the conduit tube into the fitting, then try to push the Bowden tube through again. Reinstall the back panel and power on the printer before continuing.

7. Screw the outlet (thumbscrew) end of the Fiber Bowden Tube into the top of the print head.
8. Reinstall the material tube retention clip, then close and secure the lid.
9. Insert the inlet end of the Fiber Bowden Tube into the outlet at the rear of the fiber extruder.
10. Tighten the retention screw with the 2mm hex key until the screw is snug and the tube is secure; make sure not to overtighten.



REPLACING METAL MATERIAL TUBES

Before initiating replacement of material tubes, unload material. For more information, see *Unloading Metal Filament* and *Unloading Release Filament* below.

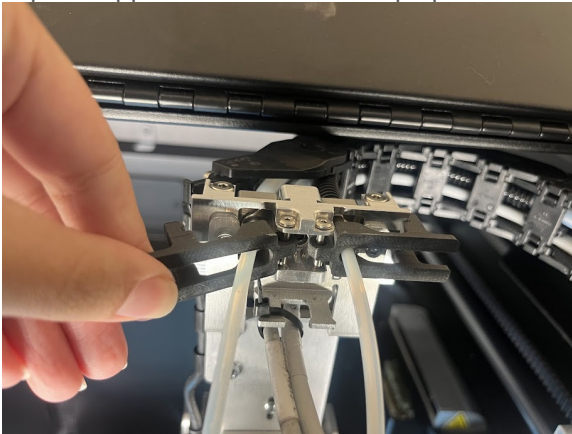
UPPER MATERIAL TUBE REPLACEMENT

Tools:

- Lid screwdriver
- Print Head Service Tool
- Optional: Step stool

Follow the steps below to replace Metal Upper Material Tube A or B. Note that the images in this section depict Metal Upper Material Tube A.

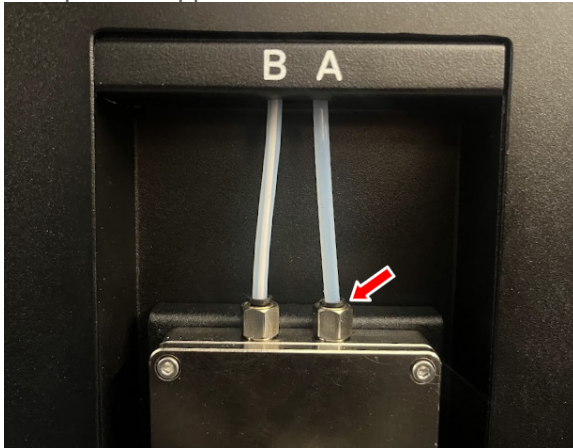
1. Unscrew the two captive upper-lid screws and open the printer lid.
2. Flip the Upper Tube Retention Clip open.



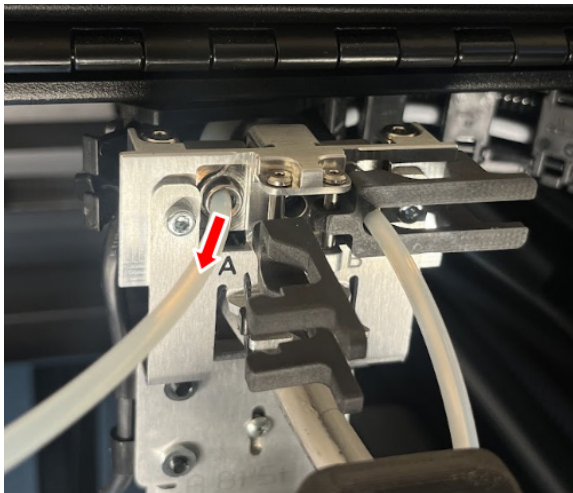
3. Use the plastic end of the Print Head Service Tool to depress the push-to-connect fitting in the top of the print head and remove the Upper Material Tube from the print head.



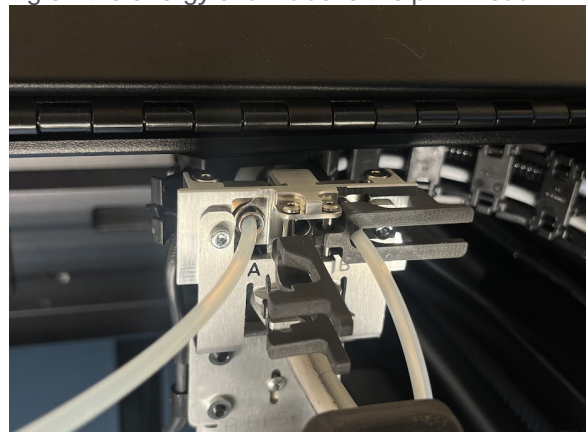
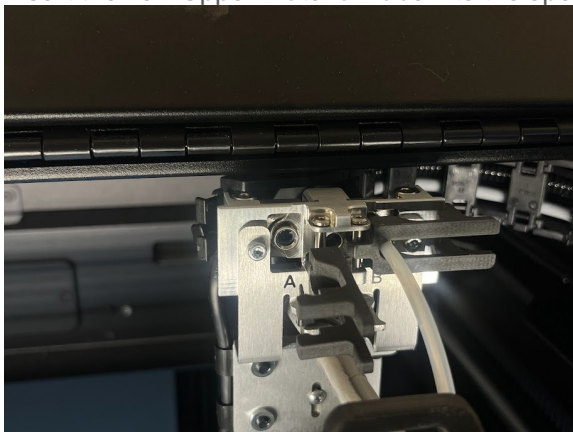
4. Move to the rear of the printer. Press the push-to-connect fitting on the top of the routing block, then pull the Upper Material Tube out of the routing block.



5. Move to the front of the printer and open the visor. Pull the Upper Material Tube out of the energy chain and discard it.



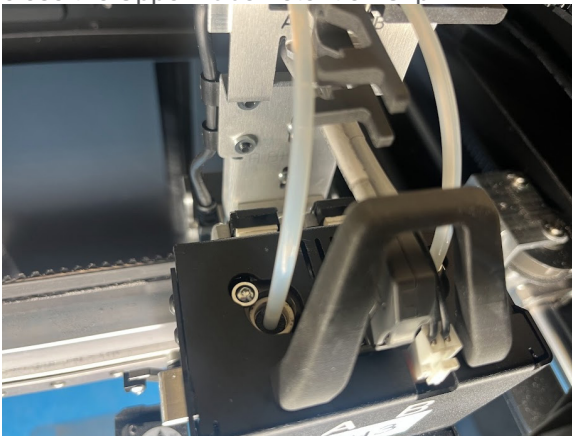
6. Insert the new Upper Material Tube into the opening on the energy chain above the print head.



7. At the rear of the printer, locate the material tube now dangling above the material routing block. Insert it securely into the push-to-connect fitting on top of the routing block.



8. Secure the other end of the material tube into the push-to-connect fitting on the print head, then close the Upper Tube Retention Clip.



LOWER MATERIAL TUBE REPLACEMENT

1. At the rear of the machine, remove the lower rear panel using the captive thumbscrews.



2. Locate the Outlet 2 push-to-connect fitting on the rear of the pre-extruder corresponding to the Lower Material Tube that needs to be replaced. Depress the push-to-connect fitting and remove the tube.

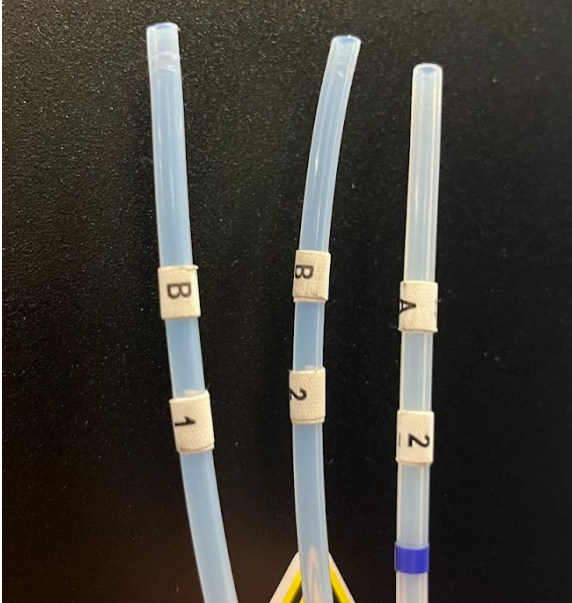


3. At the inlet fitting on the bottom of the material routing block, locate the tube that needs to be replaced. Depress the push-to-connect fitting and pull the Lower Material Tube out of the fitting.

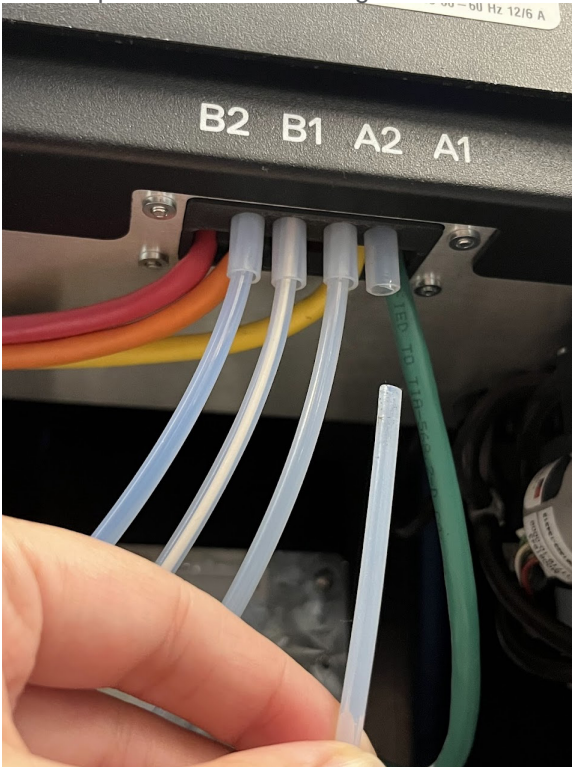


4. The tube is now free and can be pulled out of the printer.

5. Retrieve the replacement tube. Confirm that the tube's label corresponds to the appropriate spool bay. Note that Metal Lower Material Tubes A1 and A2 have a blue marking on them.



6. Feed the unlabeled end of the material tube into the conduit at the lower rear panel, until it emerges below the material routing block. Insert the unlabeled end of the tube fully and securely into the push-to-connect fitting below the material routing block.



7. Insert the labeled end of the tube into Outlet 2 on the rear of the pre-extruder.



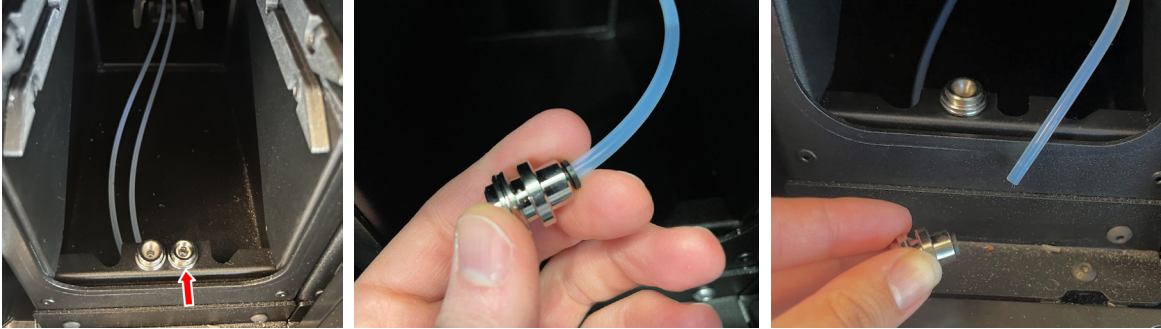
8. Confirm that all tubes are securely installed in their push-to-connect fittings.
9. Reinstall the lower rear panel.

MATERIAL LOAD TUBE REPLACEMENT

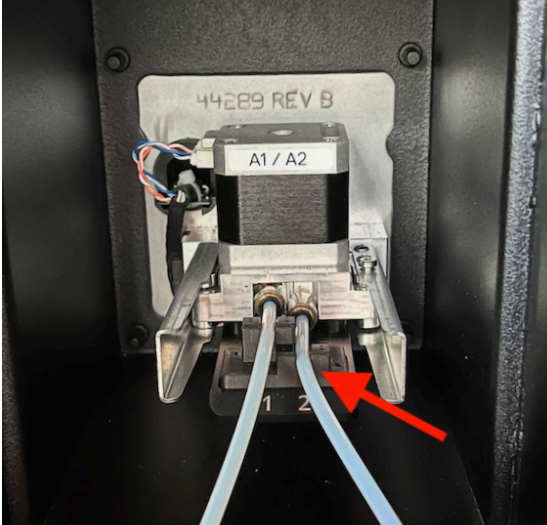
1. Open the spool bay containing the Material Load Tube you want to replace.
2. Remove the spool holder tray while grabbing the spool roller and pulling directly up and out.



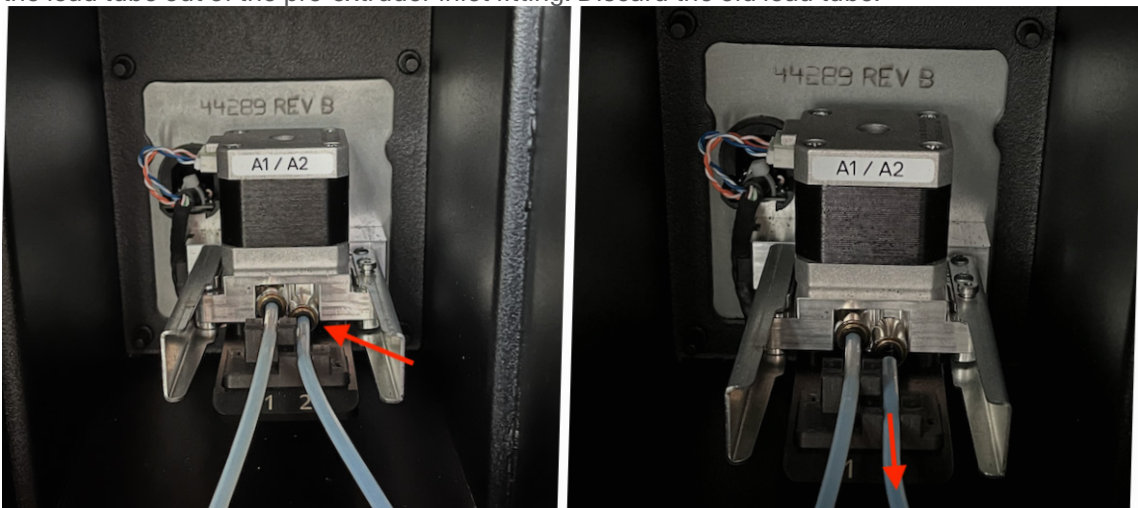
3. Slide the Port 2 load tube fitting out of its bracket, then depress its push-to-connect fitting to free the Material Load Tube. Set the load tube fitting aside.



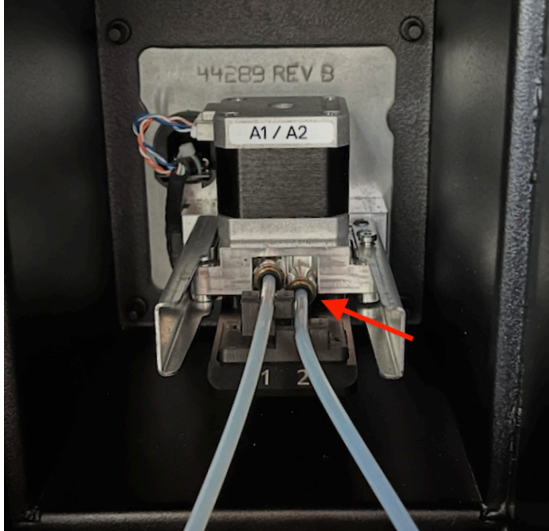
4. Lift the load tube up out of the optical sensor in front of the pre-extruder inlet.



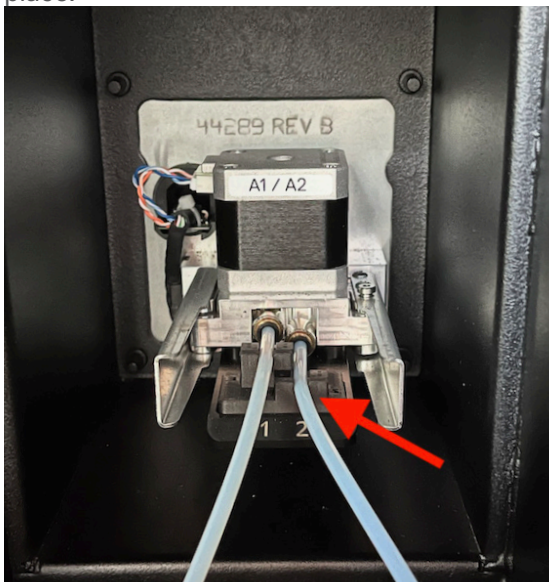
5. Depress the push-to-connect fitting on the pre-extruder inlet, at the rear of the spool bay, and pull the load tube out of the pre-extruder inlet fitting. Discard the old load tube.



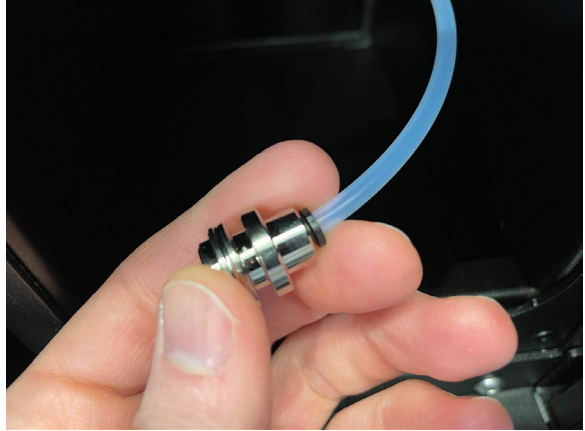
6. To install a new tube, depress the push-to-connect fitting on the inlet of the pre-extruder, and insert the Material Load Tube until it is fully seated in the fitting.



7. Press the load tube back down into the sensor in front of the pre-extruder inlet, until it clicks into place.



8. Reinstall the load tube fitting on the front end of the Material Load Tube.



9. Slide the fitting into the Port 2 bracket at the front of the spool bay. Check to ensure that the Lower Material Tubes are not crossed.



10. Reinstall the spool tray by positioning the tray's inlet cutout over the inlet fitting, with the front lip of the tray behind the spool bay flange and the rear of the tray resting on the ledge at the back of the bay. The load tube fitting should be flush with the tray.



WIPING STATION MAINTENANCE

NOTES



- When emptying the purge bin, be very careful not to burn yourself on the nozzles and print bed. It is safest to remove and empty the bin when the print bed and nozzles are cool.
- Use two hands when removing the wiping station bins. Take care not to drop the bins on the print bed, which can potentially damage the surface. If you find the bins difficult to handle, lay a lint-free cloth across the bed to protect it.
- When removing the bins, we recommend removing any parts and leaving a clean print sheet on the bed, to avoid spilling filament into the print bed groove. ***Wear safety gloves when working with the wiping station brushes; the bristles are very sharp.***

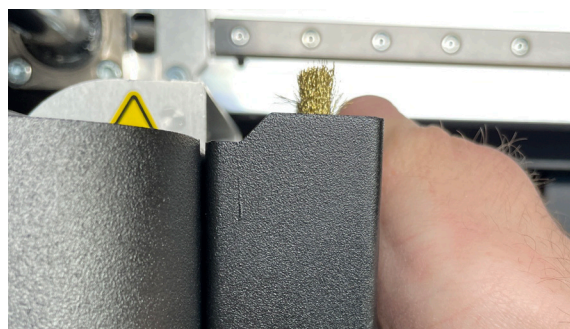
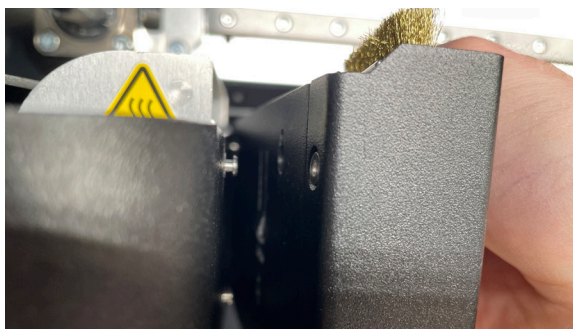
EMPTYING THE WIPING STATION BINS

Tools:

- Safety gloves

The wiping station bins can rapidly accumulate spent filament, and should be ***emptied after every print.*** The amount of purged filament varies based on the parts printed. Maintain clean wiping stations for successful printing.

1. If the print bed is near the top of the build chamber, manually lower it via the touchscreen by navigating to **Controls > Advanced**, toggling on **Print Bed Position**, and pressing **Down**.
2. To uninstall each wiping station bin, push it against the chamber heater and lift up from below, off of the three mounting pins.
Important: Take care not to impact the temperature sensors located behind each bin.
3. After dumping the spent filament, slot the bin back onto its three mounting pins, then push it against the chamber heater while pulling it down into place. ***The opening of the bin must be flush with the top of the chamber heater wall;*** otherwise, damage to the print head may result.



REPLACING WIPING STATION BRUSHES

Tools:

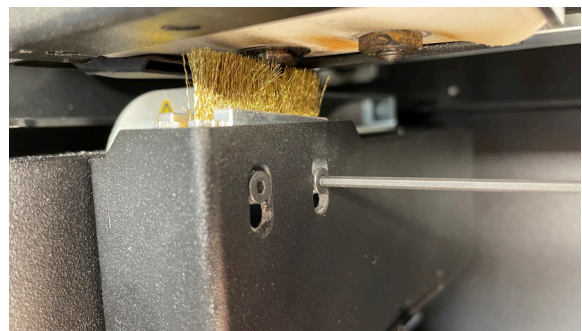
- Safety gloves
 - 2mm hex key
1. Follow the instructions above to uninstall the wiping station bin.
 2. Using the 2mm hex key, remove the wiping station brush mount from the wiping station.



3. *Wearing safety gloves*, use the 2mm hex key to remove the two screws capturing the brush retention clip.



4. Pull the brush retention clip outward to free the brush.
5. Slide the brush outward. Gloves or pliers can be used for ease of removal, as the brushes are sharp.
6. Discard the brush.
7. Insert the clean brush into the retention clip, then slide the brush and clip into the brush mount.
8. Reinstall the two screws.
9. Reinstall the brush mount on the wiping station, but do not tighten the screws yet.
10. Reinstall the wiping station (see above), then adjust the height of the newly installed brush with the Brush Height Adjustment utility.



MANAGE PRINTER DATA

The FX10 generates a large amount of data while printing, which online printers transmit securely to Markforged. This data includes text logs as well as sensor data collected during print jobs and utilities.

Printer data is an important tool for continuously improving print quality and system operation, and enables Markforged Support to debug issues both internally and in the field.

However, this device data does contain potentially sensitive part information. If desired, Offline Eiger users may choose not to share this information with Markforged, or to permit it to be backed up to cloud storage.

MANAGE DATA OFFLINE

The Manage Data tool enables Offline Eiger users to manually share a limited range of printer data (or the complete data output) with Markforged to aid in support and debugging.

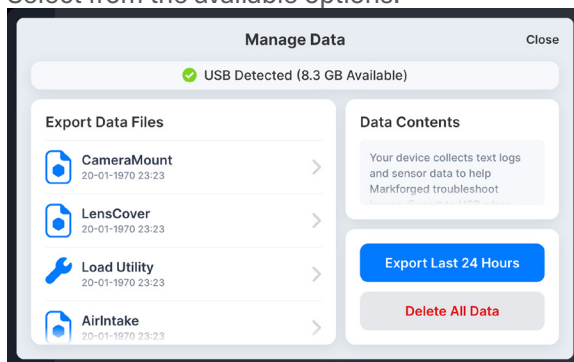
For print jobs, you have the option to export the text logs and sensor data for the most recent two layers of the selected print, or for the entire print run, whether or not the print was successfully completed.

For utilities, you can export all data associated with the selected utility run.

USING THE MANAGE DATA TOOL

The Manage Data tool presents a list of recently generated data files, which can be exported individually or as a group, or else deleted. If a USB drive is inserted, the available space on the drive will appear at the top of the screen; in addition, selecting a file will prompt a confirmation screen showing the file size prior to export.

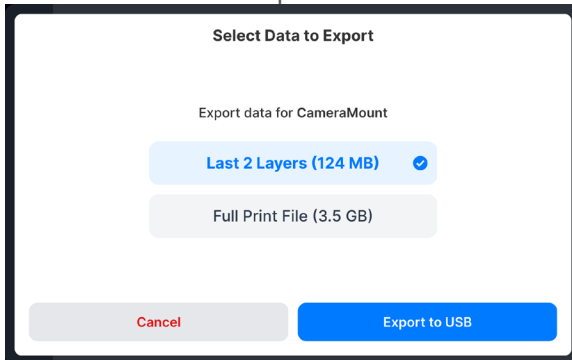
1. Navigate to **Menu > Settings > Manage Data**.
2. If you are exporting the file to a USB drive, insert the drive into the USB port beside the touchscreen.
Note: There is an additional USB port at the back of the printer.
3. Select from the available options:



- **Export Data Files:** Select the data file you intend to work with from the list
- **Export Last 24 Hours**
- **Delete All Data**

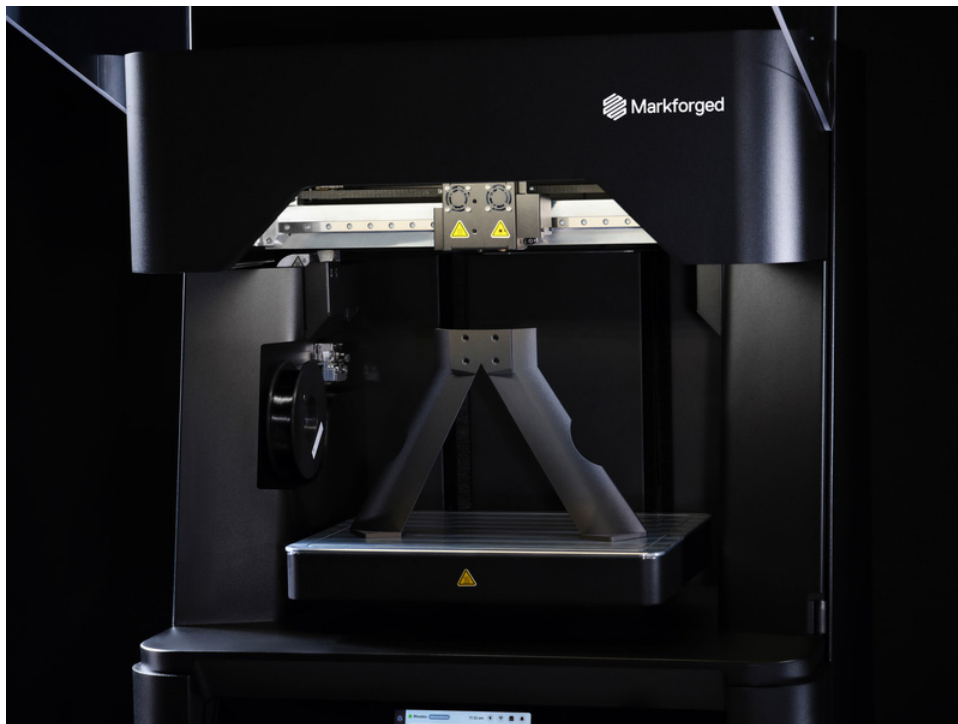
*Note: Deleted printer data **cannot be recovered**.*

4. **If you selected a print job:** Press either **Last 2 Layers** or **Full Print File**. Note the file size associated with each option.



5. Confirm or complete the export onscreen.
6. Exit the utility and remove your USB drive.

COMPOSITE CONFIGURATION



APPLYING A COMPOSITE PRINT SHEET

OVERVIEW

The FX10 composite print sheet has two variants: FX10 Print Sheet v1 (22138, previously known as FX10 Print Sheet) and FX10 Print Sheet v2 (22535). V2 print sheets come in a two-pack with a green scouring pad. For best results, we recommend using v2 print sheets with your FX10.

Note that the two print sheet variants have different application and cleaning procedures. Please refer to the relevant subsection below for the print sheet you plan to apply.

NOTES



- Always make sure the square corner of the print sheet is located in the front right corner of the print bed.
- Avoid flipping the print sheet over to glue its underside, as this might cause the print bed to contaminate the print sheet.
- Always clean print sheets after a print, following the instructions in *Cleaning a Composite Print Sheet*.
- Do not leave an adhesive-covered print sheet in the heated build chamber between prints; it will dry out, and will require cleaning and reapplication of fresh adhesive.
- To avoid contaminating the print sheet with felt from the sheet press, do not apply adhesive to the print sheet until after sealing it to the print bed.

PRINT SHEET ADHESIVE TABLE

Print Sheet	Material	Adhesive	Sponge for Adhesive Application
FX10 Print Sheet v1 (22138)	Onyx	Elmer's Disappearing Purple (S25048-FRU)	None
	Onyx FR, Onyx FR-A		
	Onyx ESD v2	Magigoo Pro HT (21369)	Scotch-Brite® Non-Scratch Scrub Sponge
	Nylon White, Nylon White FS		
FX10 Print Sheet v2 (22535)	All composites	Magigoo Pro HT (21369)	Scotch-Brite® Heavy Duty Scour Pad (green, included with Print Sheet v2 two-pack)

V1 PRINT SHEET

Tools:

- FX10 sheet press from FX10 Accessory Kit
- Brush from FX10 Accessory Kit
- Elmer's Disappearing Purple (material dependent)
- Scotch-Brite® Non-Scratch Scrub Sponge (material dependent)

If you are printing Onyx ESD v2, Nylon White, Nylon White FS, or unreinforced solid fill parts:

Run the Preheat Print Sheet utility instead of following this workflow. For more information, see *Preheating the Print Bed* below.

1. Open the visor and use the included brush to clear any debris off of the print bed and vacuum grooves.
2. Get the print sheet press included in the FX10 Accessory Kit. Refer to the chart above for material-specific supplies.
3. Use the onscreen controls (**Utilities > All Utilities > Vacuum Seal** or **Manual Control > Vacuum Seal**) to activate the vacuum.
4. Place the print sheet on the print bed. The print sheet must be centered on the bed, fully covering the vacuum groove, with *only* the sharp corner hanging over the sides of the print bed.



5. Use the sheet press to apply pressure evenly across the print sheet and smooth it out. Once a proper vacuum seal is achieved, the vacuum indicator will turn green.
6. After the print sheet has been secured to the print bed, apply a single layer of adhesive to the print sheet. Be sure to cover the entire print area.

V2 PRINT SHEET

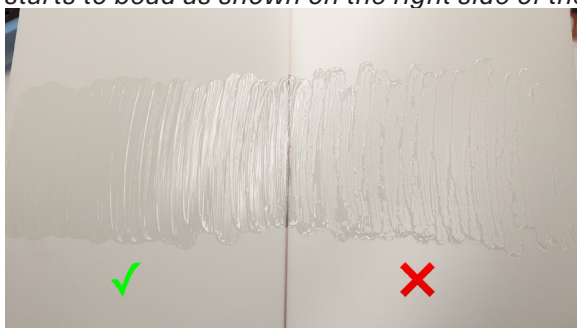
Tools:

- FX10 sheet press from FX10 Accessory Kit
- Brush from FX10 Accessory Kit
- Scotch-Brite® Heavy Duty Scour Pad (green, included with Print Sheet v2 two-pack)
- Magigoo Pro HT (21369)

The FX10 Print Sheet v2 (22535) requires some preparation before it can be used for the first time. Follow the instructions below to apply the v2 print sheet to your printer.

1. **If using a brand new print sheet:**
 - a. Rinse the print sheet in warm water. **Do not use soap.**
 - b. Scrub the print sheet with the green scouring pad. Roughing the surface in this way ensures that the glue will apply properly.
 - c. Completely dry the print sheet with a lint-free cloth or shop towel.
2. Open the visor and use the included brush to clear any debris off of the print bed and vacuum grooves.
3. Get the print sheet press included in the FX10 Accessory Kit.
4. Use the onscreen controls (**Utilities > All Utilities > Vacuum Seal** or **Manual Control > Vacuum Seal**) to activate the vacuum.
5. Place the print sheet on the print bed. The print sheet must be centered on the bed, fully covering the vacuum groove, with only the sharp corner hanging over the sides of the print bed.
6. Use the sheet press to apply pressure evenly across the print sheet and smooth it out. Once a proper vacuum seal is achieved, the vacuum indicator will turn green.
7. Apply a generous, uniform layer of Magigoo Pro HT to the side that you just scrubbed. Be sure to cover the entire print area, leaving minimal dry spots.

Note: Inspect the glue while applying it onto the print sheet. If the glue is not spread evenly over the print sheet, repeat steps 1 and 5-6 before proceeding. Do not proceed if the glue starts to bead as shown on the right side of the image below.



The v2 print sheet is thicker and more rigid than v1 and may be more prone to vacuum issues as a result. To promote vacuum adhesion, ensure that the print sheet lays flat on a clean, undented print bed.

If material has built up on the print bed, you can gently scrub the buildup away using a clean Scotch-Brite® Non-Scratch Scrub Sponge or Scotch-Brite® Heavy Duty Scour Pad with a small amount of isopropyl alcohol. For tougher buildup, use a non-marring plastic scraper such as a plastic razor blade.

If you have difficulty getting a strong vacuum seal, see the *Print Bed* section of *Cleaning Your Printer* above.

PREHEATING THE PRINT BED

Tools:

- Elmer's Disappearing Purple (material dependent)
- Scotch-Brite® Non-Scratch Scrub Sponge (material dependent)
- Sheet press
- Heat-resistant gloves

To improve the long-term longevity of **v1** composite print sheets, we recommend you run the Print Sheet Preheat utility on your FX10 immediately before printing certain composite parts, as instructed by Eiger. For a complete list of part settings that require this utility, see the [Preheating the Print Bed](#) support article.

However, such parts can be printed on **v2** composite print sheets **without** running this utility first. For more information, see the **v2** section of *Applying a Composite Print Sheet* above.

Note: After preheating, the bed will only stay preheated for four hours. After this time, the utility will need to be run again.

1. Navigate to **Utilities > Routine Workflows > Print Sheet Preheat** and press **Start**.
2. Press **Acknowledge**.
3. Press **Next**.
4. Ensure that the build chamber is clear of obstructions, then press **Acknowledge**. Wait while the print bed moves to position. Ensure that all doors are closed.
5. Remove the print sheet from the printer.
6. Wash and dry the print sheet; for more information, see *Cleaning a Composite Print Sheet* below. Place the print sheet on a clean surface **other than the print bed** with the **square corner in the bottom right**.
7. Apply a single layer of glue to the print sheet, then press **Next**.
*Note: If printing **Onyx ESD v2**, **Nylon White**, or **Nylon White FS**, apply a generous layer of Magigoo Pro HT to the print sheet, covering the entire print area. Spread the adhesive further with the abrasive side of a completely dry blue sponge. For more information, see the [Best Practices for Printing Onyx ESD](#) support article.*
8. Place the print sheet on the print bed such that it's centered, with the square corner in the front right. Ensure that the print sheet covers all print bed grooves. Then, press **Next**.
9. Wait while the print bed reaches temperature. This may take up to 20 minutes. Ensure that all chamber doors are closed.
10. Press **Run Vacuum Seal Utility**.
Note: Use caution when working around the print bed, as it will be very hot.
11. Press **Next** when the print sheet is successfully sealed.
12. Press **Done**. Be sure to start your print within the next four hours before the print bed cools automatically.

CLEANING A COMPOSITE PRINT SHEET

Composite print sheets should be cleaned after every print. Diligent cleaning and proper handling will prolong the life of the print sheet. In addition, parts adhere better to clean print sheets, making for a better vacuum seal and promoting print success.

We strongly recommend having a dedicated surface for cleaning print sheets, which must be kept clean and free of debris. If debris accumulates between the print sheet and the work surface, the print sheet may be damaged during cleaning.

V1 PRINT SHEET

Tools:

- Scotch-Brite® Heavy Duty Scour Pad (green, included with Print Sheet v2 two-pack)
 - Lint-free cloth/towel
1. Rinse the print sheet in warm water. **Do not use soap.**
 2. Scrub the glued face with the scouring pad to remove any glue residue.
 3. Completely dry the print sheet with a lint-free cloth or shop towel.

V2 PRINT SHEET

Tools:

- Sponge (non-abrasive)
 - Lint-free cloth/towel
1. Use warm water and a soft, non-abrasive sponge to clean the glue residue off the FX10 print sheet. **Do not use soap.**
 2. Completely dry the print sheet with a lint-free cloth or shop towel.

LOADING PLASTIC FILAMENT

Tools:

- Scale accurate to 1g (for loading partially used spools)
- Flush cutters

The Load Material utility includes detailed onscreen instructions; the precise order of operations may differ from the instructions below. If you wish to use Automatic Material Changeover, then when prompted, be sure to choose the preload option for at least one spool, in addition to the spool that is loaded to the print head.

1. Unload material if needed. For more information, see *Unloading Plastic Filament* below.
2. To begin loading material, select the desired spool bay on the home screen, then select **Load Material**. Alternatively, navigate to **Utilities > Routine Utilities > Load Plastic** or **Manual Control > Material Storage > (select spool bay)**.
3. When prompted onscreen, choose the material that you are loading.
4. Select **Full** or **Partial Spool**. If you are loading a partial spool, weigh the spool of material to the nearest gram and enter the weight on the touchscreen, then press **Next**.
Note: The FX10 will automatically account for the weight of the spool itself.
5. If another spool of filament is already loaded into the printer, you will have the option to preload the new spool. Preloading additional spools enables Automatic Material Changeover to occur, effectively allowing for continuous printing up to 3200cc (using all four bays with four new 800cc spools of Onyx). For more information, see *Automatic Material Changeover* above.
6. Use flush cutters to cut the end of the filament at a 45° angle as directed.
7. Open the material chamber door, then open the spool bay you selected earlier.



8. Remove any old desiccant packs from the open spool bay and replace them with fresh packs included with the new spool.

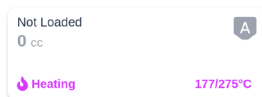
9. Follow the onscreen directions to load the spool into the spool bay, feeding the filament through the inlet and into the Material Load Tube. The utility will advance automatically once the printer senses that the filament has reached the pre-extruder. You will feel the pre-extruder motor catch the filament.

*Note: If dual pre-extruders have been installed as part of the FX10 Metal Kit, feed the plastic filament into the lefthand **Port 1** inlet.*



10. Close the spool bay and material chamber doors.
11. If preloading material, you are now done. If loading to head, the nozzles will now begin to heat. Close any open doors before proceeding.
12. The nozzles will now heat to the appropriate temperature to prepare to extrude material. The utility will advance automatically once the nozzles have reached their set points. It may take a few minutes for the filament to reach the print head.

Load Material Cancel
Heating the left nozzle to the required temperature for material loading.



Please wait...

13. The print head will move to the wiping station and extrude a small amount of material into the bin. The length of this process depends on which materials are currently loaded and have been loaded previously. The utility will advance automatically.
14. A confirmation screen will appear, displaying nozzle and material information. Press **Done** to exit the **Load Material** utility and return to the home screen.

Load Material Cancel

Onyx has been successfully loaded from the A1 material bay.

Done

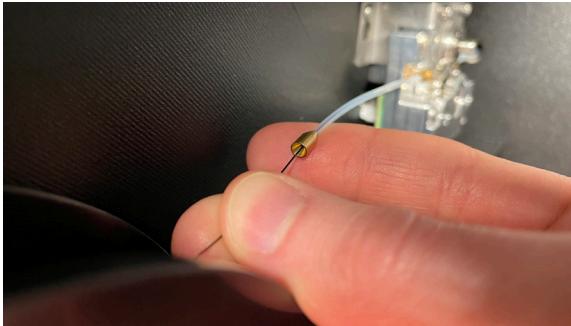
LOADING FIBER FILAMENT

Note: The FX10 is compatible with 150cc fiber spools only (P/N F-FG-0005 and F-FG-0007). 50cc fiber spools (P/N CF-FR-50 and CF-BA-50) are not FX10 compatible.



WARNING: The fiber spool is located in the build chamber. The chamber may be hot while reloading fiber filament; in particular, the print bed may be hot enough to cause injury. Use caution and wear appropriate PPE when working inside the build chamber.

1. To begin loading fiber, select **Nozzle F** on the touchscreen, then press **Load Material**. Alternatively, select **Utilities > Routine Workflows > Load Fiber** or **Manual Control > Nozzles & Controls > Nozzle F**.
2. Select the fiber material you intend to load, as well as the appropriate spool size.
3. Select **Full** or **Partial Spool**. If loading a partially used spool, you will be prompted to enter the weight of the spool in grams. Use a scale to weigh the spool.
Note: For partial spools, the meter-loading routine automatically accounts for the weight of the spool itself.
4. Follow the onscreen instructions to load the fiber spool onto the spindle and run the fiber material through the load tube to the extruder.



5. Once the printer has finished loading fiber material, remove the excess filament from the print bed.

UNLOADING PLASTIC FILAMENT

Tools:

- Flush cutters
1. To begin unloading material, select the spool you wish to unload on the home screen, then select **Unload Material**. Alternatively, navigate to **Utilities > Routine Utilities > Unload Plastic** or **Manual Control > Material Storage > (select spool bay)**.
 2. Follow onscreen instructions. When prompted, cut the filament above the inlet in the spool bay.



3. The printer will retract filament back into the spool bay. When prompted, reopen the spool bay and discard the cut and expelled filament. You can now opt to load material.



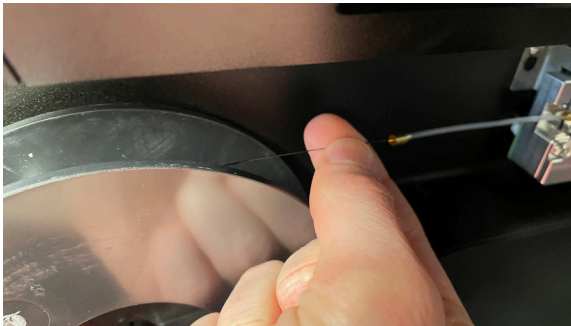
UNLOADING FIBER FILAMENT

WARNING: The fiber spool is located in the build chamber, which may be hot while loading or unloading fiber filament. In particular, the print bed may be hot enough to cause injury. Use caution and wear appropriate PPE when working inside the build chamber.

Fiber filament for the FX10 is stored on the surface of the heater on the left side of the build chamber.

Note: Before unloading fiber, be sure to have a small piece of tape on hand to secure the filament, to keep it from unwinding.

1. To begin unloading fiber, select **Nozzle F** on the home screen, then select **Unload Material**. Alternatively, navigate to **Utilities > Routine Utilities > Unload Fiber** or **Manual Control > Material Storage > Nozzle F**.
2. Follow the onscreen instructions to retract the material. Note that the fiber material pathway is much shorter than the plastic pathways, so unloading is relatively quick.
3. Manually wind the fiber filament onto the spool. Pay attention to the fiber filament as it retracts through the fiber pathway, and tape the filament to the spool to prevent unwinding.



4. Remove the fiber spool from the spool holder for storage.

SAFELY REMOVING COMPOSITE PARTS

Once a composite part is finished, the build chamber will begin cooling down. Parts removed from the FX10, as well as internal surfaces in the build chamber, may be hot.

1. Follow the onscreen instructions to turn off the vacuum.
2. Lift the visor.
3. Lift the front right corner of the print sheet to break the vacuum seal and carefully remove the sheet and part from the bed. Support the printed part from below when lifting it out of the build chamber.
4. Carefully remove the printed part from the print sheet by peeling the print sheet away from the bottom of the part.
5. Follow the instructions in *Cleaning a Composite Print Sheet* above.
6. Place the clean composite print sheet on the print bed and reengage the vacuum seal. For more information, see *Applying a Composite Print Sheet* above.
7. Empty the left purge bin. For more information, see *Wiping Station Maintenance* above.
8. You can assign the print a 1–5 star quality rating on the touchscreen, which will be viewable on the **Print Jobs** page in Eiger.
9. Press **Done** to exit the post-print routine, or **Reprint Build** to print the same build again.

REPLACING THE PLASTIC NOZZLE

Tools:

- 2.5mm torque driver hex blade
- 5in-lb torque driver handle
- Print Head Service Tool

Note: All screws involved are captive and will remain in place.

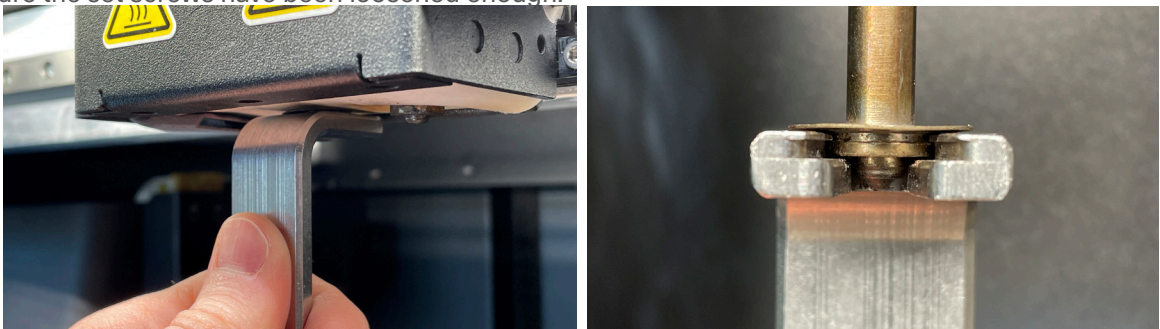
1. Check the plastic nozzle you are replacing for loaded material, and **unload any plastic filament**.
2. Lift the visor and reposition the print head in an easily accessible space at the front of the printer.
3. If the print head is hot, wait for it to cool before replacing the nozzle.



NOTE: REMOVING A PLASTIC NOZZLE WHILE HOT WILL DAMAGE THE PRINT HEAD. NEVER REMOVE A PLASTIC NOZZLE WHILE HOT.

REMOVE PLASTIC NOZZLE

1. Navigate to **Utilities > Maintain & Replace > Plastic Nozzle Replacement**.
2. Using the included 2.5mm torque driver hex blade and 5 in-lb handle, loosen the two captive recessed screws on the print head.
3. Use the Print Head Service Tool to grab the exposed end of the nozzle and pull down to remove it. **THIS DOES NOT REQUIRE SIGNIFICANT FORCE.** If you experience significant resistance, make sure the set screws have been loosened enough.



4. Discard the old nozzle and proceed to the installation procedure below.

INSTALL REPLACEMENT NOZZLE

NOTE: NEVER TIGHTEN PRINT HEAD NOZZLE SCREWS WITHOUT A PLASTIC NOZZLE INSTALLED. THIS WILL DAMAGE THE PRINT HEAD.

1. Follow onscreen instructions for installing the replacement nozzle.
2. Insert the new nozzle as far into the print head as possible, until the washer sits flush against the bottom of the print head. You may need to compress the print head shield in order to do so.
3. Using the provided torque wrench, **first** tighten the **lower** nozzle retention screw to 5 in-lbs, and then tighten the **upper** retention screw. The screws are recessed in the print head.

Note: It is critical to tighten the lower retention screw before the upper one. Failure to tighten the nozzle retention screws in the correct sequence and/or to the proper torque can damage the nozzle or cause poor print quality.

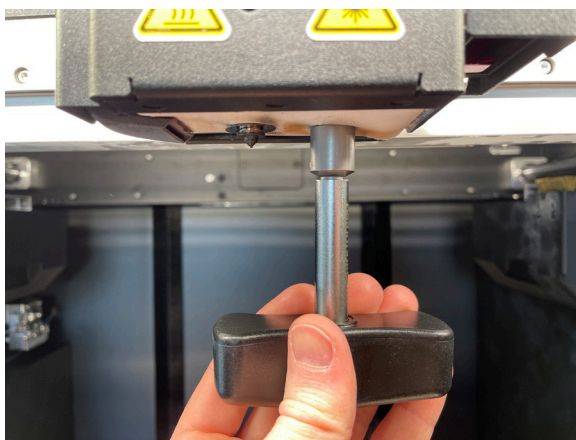
REPLACING THE FIBER NOZZLE

Tools:

- Torque wrench with 10mm hex bit
- Anti-Seize

The fiber nozzle can be removed using the included fiber nozzle torque wrench. Do NOT use other sockets or torque wrenches.

1. Navigate to **Utilities > Maintain & Replace > Fiber Nozzle Replacement** and follow the onscreen instructions.
2. Unscrew the fiber nozzle with the included 10mm torque wrench, and carefully set it aside.
Note: Do not touch the nozzle with your hands, as it will be very hot.



3. Retrieve the replacement fiber nozzle and verify that the PTFE tube is inserted inside.
4. Apply a small amount of Anti-Seize to the end of the threads of the new fiber nozzle.
Note: Take care not to get any of the Anti-Seize inside the nozzle.
5. Disperse Anti-Seize across the threads: Using the torque wrench, screw the new nozzle partway into the print head, then unscrew it and screw it in again.
6. Tighten the nozzle with the torque wrench until it clicks, then follow onscreen instructions to proceed.
Note: The fiber nozzle should only be tightened after heating. Attempting to tighten an unheated fiber nozzle may cause damage to the print head.
7. Before attempting to print, run the Nozzle Offset Calibration utility to recalibrate the nozzle height offset.



COMPOSITE CONFIGURATION PREVENTIVE MAINTENANCE

The following suggested maintenance intervals are meant as averages, not minimums; always check your printer's components for wear and use your judgment about when to replace worn components.

SUMMARY TABLE

Procedure	Interval
Replace Plastic Nozzle	5,600 cc of plastic material printed (unless irreparably jammed)
Replace Material Tubes	10,000 cc of plastic material printed
Replace Fiber Nozzle	10,000 cc of fiber material printed (unless irreparably jammed)
Replace Fiber Bowden Tube	300 cc of fiber material printed
Replace Fiber Load Tube	5,000 cc of fiber material printed
Check Belt Tension	500 print hours
Replace Wiping Station Brushes	5,000 print hours
Replace Print Sheet v1	50 prints (if maintained properly)
Replace Print Sheet v2	100 prints (if maintained properly)

EVERY DAY

- Clear debris from the build chamber and print bed (especially the vacuum groove)
- After each print, empty wiping station bins; see *Wiping Station Maintenance*
- After each print, clean the print sheet; see *Cleaning a Composite Print Sheet*
- Check your consumables
- Inspect nozzles for signs of damage or wear
- Inspect material pathway tubes for signs of wear
- Inspect wiping station brushes for wear, rotating or replacing them if necessary

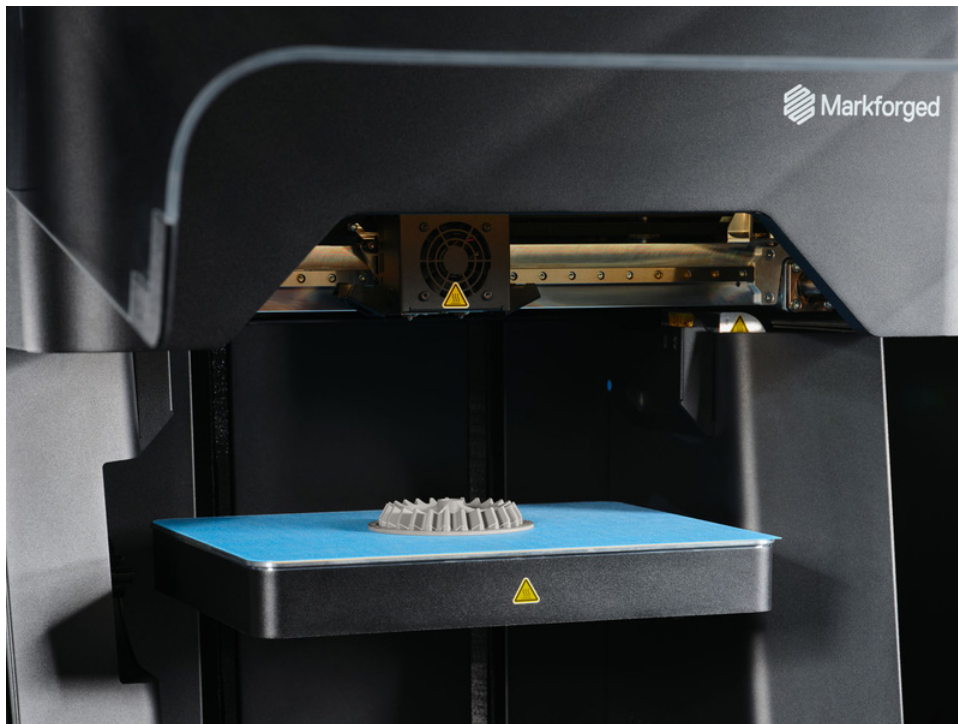
SHORT TERM

- Keep all software updated; see *Network and Firmware*
- Check laser and camera lenses for smudges or debris and clean if necessary; see *Cleaning Your Printer*
- With proper cleaning and part removal, replace print sheet every 50 (v1) or 100 (v2) prints

LONG TERM

- Check belt tension and adjust if necessary every 500 print hours, or after changing any component of the motion system; see *Printer Calibration*
- Replace Upper and Lower Material Tubes every 10,000cc of plastic printed; see *Replacing Composite Material Tubes*
- Replace Fiber Bowden Tube every 300cc of fiber printed
- Replace Fiber Load Tube every 5,000cc of fiber printed

METAL CONFIGURATION



APPLYING A METAL PRINT SHEET

Tools:

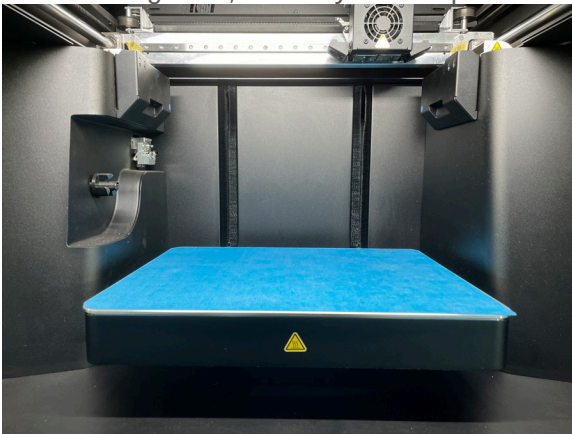
- FX10 sheet press
- Dustpan and brush set
- FX10 Metal Print Sheet

NOTES

- Always make sure the square corner of the print sheet is located in the front right corner of the print bed.
- Do not reuse FX10 Metal Print Sheets. Immediately discard used print sheets following each print.
- Do not apply any adhesive on the FX10 Metal Print Sheet.

APPLYING A PRINT SHEET

1. Open the visor and use the included brush to clear any debris off of the print bed and vacuum grooves.
2. Get the sheet press from the FX10 Accessory Kit.
3. Use the onscreen controls (**Utilities > All Utilities > Vacuum Seal** or **Manual Control > Vacuum Seal**) to activate the vacuum.
4. Place the print sheet on the print bed. The print sheet must be centered on the bed, fully covering the vacuum groove, with only the sharp corner hanging over the sides of the print bed.



5. Use the sheet press to apply pressure evenly across the print sheet and smooth it out. Once a proper vacuum seal is achieved, the word **Sealed** will appear in green onscreen.

LOADING METAL FILAMENT

Tools:

- Scale accurate to 1g (for loading partially used spools)
- Flush cutters

BEFORE LOADING MATERIAL

It is important to complete a visual inspection of metal filament spools before loading material. Carefully remove the new spool from its packaging. To avoid breakage, all metal material spools should be oriented vertically at all times once removed from their packaging. Check the spool to ensure that the filament is not broken. If your material is damaged, please contact your Partner.

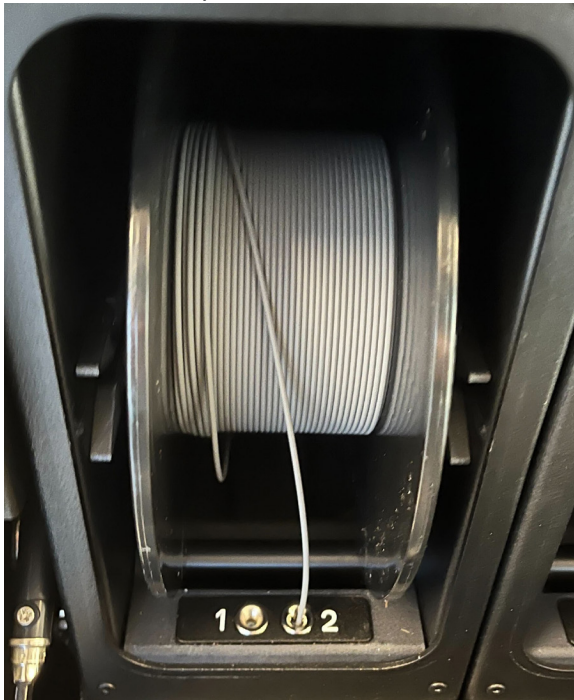
PROCEDURE

The Load Material utility includes detailed onscreen instructions; the precise order of operations may differ from the instructions below. If you wish to use Automatic Material Changeover, then when prompted, be sure to choose the preload option for at least one spool, in addition to the spool that is loaded to the print head.

1. If needed, unload material. For more information, see *Unloading Metal Filament* below.
2. To begin loading material, select spool bay **A1** or **A2** on the home screen, then press **Load Material**. Alternatively, navigate to **Utilities > Routine Utilities > Load Metal** and select the desired spool bay.
3. When prompted onscreen, choose the material that you are loading.
4. Select **Full** or **Partial Spool**. If you are loading a partial spool, weigh the spool of material to the nearest gram and enter the weight on the touchscreen, then press **Next**.
Note: The FX10 will automatically account for the weight of the spool itself.
5. If another spool of filament is already loaded in another spool bay, you will have the option to preload the new spool. Preloading additional spools enables Automatic Material Changeover to occur, effectively allowing for continuous printing up to 800cc (using both A bays with two new 400cc spools of metal and both B bays with full spools of release material). For more information, see *Automatic Material Changeover* above.
6. Use flush cutters to cut the end of the filament at a 45° angle as directed.
7. Open the material chamber door, then open the spool bay you selected earlier.



8. Load the spool onto the spindle and place it on the spindle mounts in the spool bay. Feed the filament through the **Port 2** inlet and into the Material Load Tube until you feel it caught by the pre-extruder motor. The utility will advance automatically once the printer senses that the filament has reached the pre-extruder.



9. Close the spool bay and material chamber doors. If any other doors are open, close them before proceeding.
10. The nozzles will now begin to heat to the appropriate temperature to prepare to extrude material. The utility will advance automatically once the nozzles have reached their set points. It may take a few minutes for the filament to reach the print head.
11. The print head will move to the wiping station and extrude a small amount of material into the bin. The length of this process depends on which materials are currently loaded and have been loaded previously. The utility will advance automatically.
12. Wait for the print head to verify the positions of the slack mechanism and tube adjustment mechanism.
13. A confirmation screen will appear, displaying nozzle and material information. Press **Done** to exit the Load Material utility and return to the home screen.

LOADING RELEASE FILAMENT

Tools:

- Scale accurate to 1g (for loading partially used spools)
- Flush cutters

Release material is not as fragile as metal print material and doesn't require the same precautions during storage.

COMPATIBILITY

The FX10 is compatible with ceramic release spools made on or after 2023-10-13, denoted on the spool ID/barcode label as 231013. To verify that your ceramic material is FX10-compatible, confirm that the first number sequence in the spool ID is *greater than or equal to 231013* as in the image below.



PROCEDURE

The Load Release utility includes detailed onscreen instructions; the precise order of operations may differ from the instructions below. If you wish to use Automatic Material Changeover, then when prompted, be sure to choose the preload option for at least one spool, in addition to the spool that is loaded to the print head.

1. Unload material if needed. For more information, see *Unloading Release Filament* below.
2. To begin loading material, select spool bay **B1** or **B2** on the home screen, then press **Load Material**. Alternatively, navigate to **Utilities > Routine Utilities > Load Release** and select the desired spool bay.
3. Select **Full** or **Partial Spool**. If you are loading a partial spool, weigh the spool of material to the nearest gram and enter the weight on the touchscreen, then press **Next**.
Note: The FX10 will automatically account for the weight of the spool itself.
4. If another spool of filament is already loaded into the printer, you will have the option to preload the new spool. Preloading additional spools enables Automatic Material Changeover to occur, effectively allowing for continuous printing up to 800cc (using both A bays with two new 400cc spools of metal and both B bays with full spools of release material). For more information, see *Automatic Material Changeover* above.
5. Use flush cutters to cut the end of the filament at a 45° angle as directed.

6. Open the material chamber door, then open the spool bay you selected earlier.



7. Load the spool onto the spindle mount and place the spindle mount pegs on the spindle mount rack in the spool bay. Feed the filament through the **Port 2** inlet and into the Material Load Tube until you feel it caught by the pre-extruder motor. The utility will advance automatically once the printer senses that the filament has reached the pre-extruder.



8. Close the spool bay and material chamber doors. If any other doors are open, close them before proceeding.
9. The nozzles will now begin to heat to the appropriate temperature to prepare to extrude material. The utility will advance automatically once the nozzles have reached their set points. It may take a few minutes for the filament to reach the print head.
10. The print head will move to the wiping station and extrude a small amount of material into the bin. The length of this process depends on which materials are currently loaded and have been loaded previously. The utility will advance automatically.
11. Wait for the print head to verify the positions of the slack mechanism and tube adjustment mechanism.
12. A confirmation screen will appear, displaying nozzle and material information. Press **Done** to exit the Load Release utility and return to the home screen.

UNLOADING METAL FILAMENT

Tools:

- Flush cutters
1. To begin unloading material, select the spool you wish to unload on the home screen, then select **Unload Material**. Alternatively, navigate to **Utilities > Routine Utilities > Unload Metal** and select the desired spool bay.
 2. When prompted, open the spool bay. Cut the filament above the inlet, then close the spool bay. Press **Next**.
 3. If the spool is loaded to the print head, the FX10 nozzle will heat to retract material, then cool.
 4. The printer will retract filament back into the spool bay. When prompted, reopen the spool bay and discard the cut and expelled filament. You can now opt to load material.

SPOOL STORAGE AND DISPOSAL

See *Metal Material Storage* above for more information.

When storing metal and release material, it is crucial that the spools are stored in a vertical position. This will prevent material damage and tangling. When appropriate, the open end of the filament should be taped to the spool to decrease tangling and make finding the end of the filament easier for future use.

If stored spools have been removed from original packaging, storage space should be free from dust and vapors.

Avoid impacts and shock when storing or transporting material.

Please contact your local waste management facility to learn of their preferred method of disposal for this type of item.

UNLOADING RELEASE FILAMENT

Tools:

- Flush cutters
- 1. To begin unloading material, select the spool you wish to unload from the home screen, then press **Unload Material**. Alternatively, navigate to **Utilities > Routine Utilities > Unload Release** and select the desired spool bay.
- 2. When prompted, open the spool bay. Cut the filament above the inlet, then close the spool bay. Press **Next**.
- 3. If the spool is loaded to the print head, the FX10 nozzle will heat to retract material, then cool.
- 4. The printer will retract filament back into the spool bay. When prompted, reopen the spool bay and discard the cut and expelled filament. You can now opt to load material.

SPOOL STORAGE AND DISPOSAL

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Please contact your local waste management facility to learn of their preferred method of disposal for this type of item.

SAFELY REMOVING METAL PARTS

Once a metal part is finished printing, the build chamber will begin cooling down. Parts removed from the FX10, as well as internal surfaces in the build chamber, may be hot. The cooldown cycle should be thought of as a regular part of the print process.

Tools:

- Dustpan and brush set
- FX10 Metal Print Sheet

1. You will receive an email notification when the print job is done and the print bed has begun cooling. Please wait until the cooldown process is finished to remove your parts. Alternatively, you can select **Skip Cooling** on the touchscreen to cancel the cooldown process, though **we recommend always cooling the part on the print bed before removing the part** to avoid part warping and potential operator injury.
2. Press **Next** to begin the post-print routine.
Note: If you have completed the cooldown process, the part and print bed should be safe to handle at this point but may still feel warm to the touch, especially the print bed.
3. Follow the onscreen instructions to turn off the vacuum.
4. Lift the visor.
5. Use the included brush and dustpan to remove any debris from the print sheet.
6. Lift the front right corner of the print sheet to break the vacuum seal and carefully remove the sheet and parts from the bed. Support printed parts from below when lifting them out of the build chamber.
7. Allow parts to cool for approximately five minutes after removal from the print bed, then place the sheet on the edge of a table and slide the sheet downwards off the table's edge while carefully lifting parts off the sheet.
8. Gently remove the part(s) from the print sheet. You should be able to peel the flexible print sheet away from the parts without difficulty.



9. Discard the print sheet.
Note: Do not reuse print sheets. Always ensure that a new metal print sheet is used for each print.
10. Place a new metal print sheet on the print bed and reengage the vacuum seal. For more information, see *Applying a Metal Print Sheet* above.
11. Empty both purge bins. For more information, see *Wiping Station Maintenance* above.
12. You can assign the print a 1–5 star quality rating on the touchscreen, which will be viewable on the **Print Jobs** page in Eiger.
13. Press **Done** to exit the post-print routine, or **Reprint Build** to print the same build again.

PART HANDLING AFTER REMOVAL

Printed parts should be handled carefully. Though the parts are not brittle, rough handling or falls can damage them. A dropped or roughly handled part may contain invisible micro-fractures that can compromise part strength.

Make sure to set the warm part down only on an insulated surface to avoid damaging the part by cooling it too rapidly.

Newly printed *green parts* must be washed in a Markforged Wash-1 debinding station. For more information on loading parts into the Wash-1 station, please see the [Load Green Parts](#) support article.

REPLACING THE METAL NOZZLE

Tools:

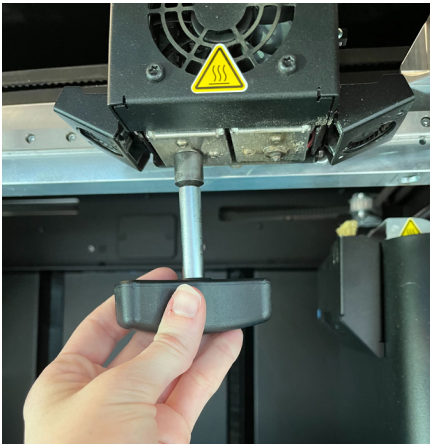
- 5in-lb torque driver handle with 2.5mm torque driver hex blade
- Torque wrench with 10mm hex bit
- Brass brush
- Flush cutters
- Anti-Seize

NOTE: All screws involved are captive and will remain in place.

1. Lift the visor.
2. If the print head is hot, wait for it to cool before replacing the nozzle.
3. Navigate to **Utilities > Maintain & Replace > Metal Nozzle Replacement**.
4. If prompted, unload metal filament. For more information, see *Unloading Metal Filament* above.
5. When prompted, visually inspect the metal nozzle. If it is dirty, clean it using the brass brush to make removal easier.
6. Using the included 2.5mm torque driver hex blade and 5 in-lb handle, loosen the two captive recessed nozzle retention screws on the left side of the print head.

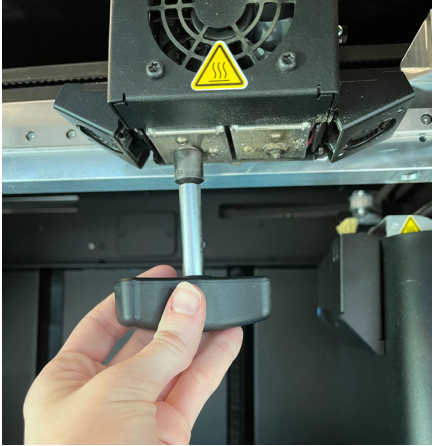


7. Unscrew the metal nozzle with the included torque wrench and 10mm hex bit.

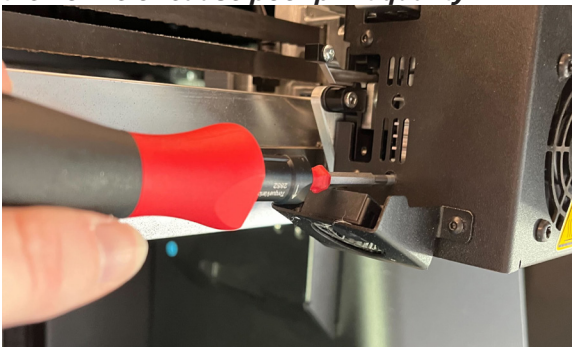


8. Discard the old nozzle.

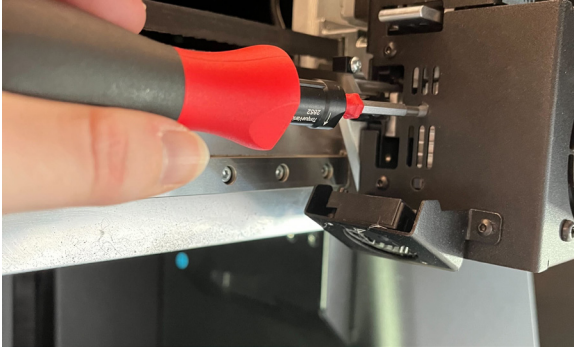
9. Confirm that you have the correct replacement nozzle by comparing it with the image onscreen.
10. Apply a small amount of Anti-Seize to the end of the threads of the new metal nozzle.
Note: Take care not to get any of the Anti-Seize inside the nozzle.
11. Disperse Anti-Seize across the threads: When prompted, use the torque wrench to screw the replacement nozzle partway into the print head, then unscrew it until only one thread is engaged.



12. Wait for the nozzle to heat, then thread and tighten the nozzle with the torque wrench until it clicks.
13. Using the provided torque driver, tighten the **lower** nozzle retention screw on the left side of the print head to 5 in-lbs, until you hear an audible click.
*Note: It is critical to tighten the lower retention screw before the upper one. Failure to tighten the nozzle retention screws in the correct sequence and/or to the proper torque can **damage the nozzle or cause poor print quality.***



14. Using the provided torque driver, tighten the **upper** retention screw on the left side of the print head to 5 in-lbs, until you hear an audible click.



15. Confirm nozzle installation onscreen.
16. When prompted, load material. For more information, see *Loading Metal Filament* above.
17. If prompted, follow onscreen instructions to perform an Upper Material Tube Adjustment.
18. Run the Nozzle Offset Calibration utility.

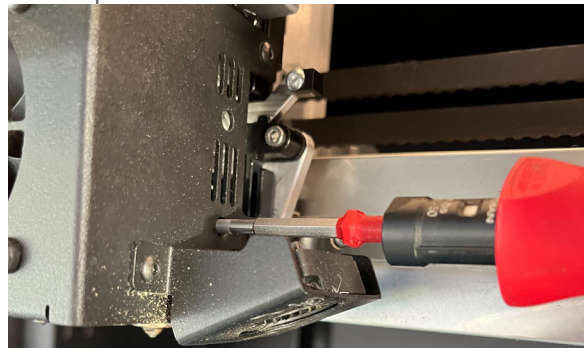
REPLACING THE RELEASE NOZZLE

Tools:

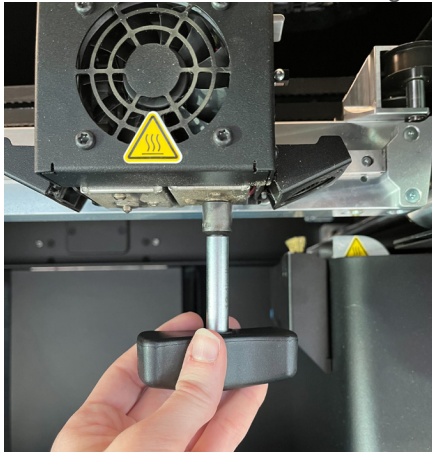
- 5in-lb torque driver handle with 2.5mm torque driver hex blade
- Torque wrench with 10mm hex bit
- Brass brush
- Flush cutters
- Anti-Seize

NOTE: All screws involved are captive and will remain in place.

1. Lift the visor.
2. If the print head is hot, wait for it to cool before replacing the nozzle.
3. Navigate to **Utilities > Maintain & Replace > Release Nozzle Replacement**.
4. If prompted, unload release filament. For more information, see *Unloading Release Filament* above.
5. When prompted, visually inspect the release nozzle. If it is dirty, clean it using the brass brush to make removal easier.
6. Using the included 2.5mm torque driver hex blade in the 5 in-lb handle, loosen the two captive recessed nozzle retention screws on the right side of the print head.

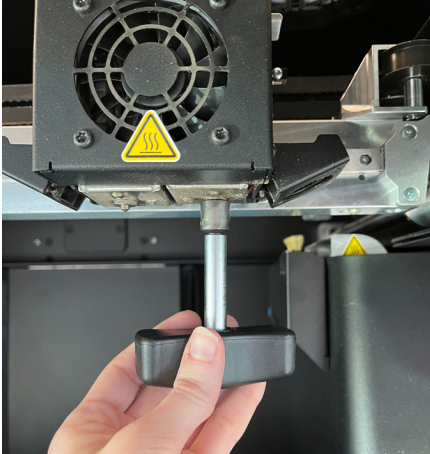


7. Unscrew the release nozzle using the included nozzle torque wrench with the 10mm hex bit.

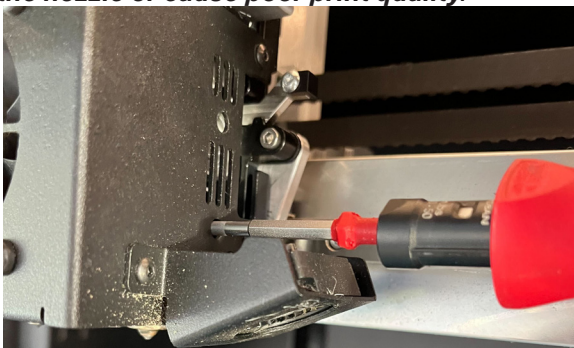


8. Discard the old nozzle.

9. Confirm that you have the correct replacement nozzle by comparing it with the image onscreen.
10. Apply a small amount of Anti-Seize to the end of the threads of the new release nozzle.
Note: Take care not to get any of the Anti-Seize inside the nozzle.
11. Disperse Anti-Seize across the threads: When prompted, use the torque wrench to screw the replacement nozzle partway into the print head, then unscrew it until only one thread is engaged.



12. Wait for the nozzle to heat, then thread and tighten the nozzle with the torque wrench until it clicks.
13. Using the provided torque driver, tighten the **lower** nozzle retention screw on the right side of the print head to 5 in-lbs, until you hear an audible click.
*Note: It is critical to tighten the lower retention screw before the upper one. Failure to tighten the nozzle retention screws in the correct sequence and/or to the proper torque can **damage the nozzle or cause poor print quality.***



14. Using the provided torque driver, tighten the **upper** retention screw on the right side of the print head to 5 in-lbs, until you hear an audible click.



15. Confirm nozzle installation onscreen.
16. When prompted, load material. For more information, see *Load Release Filament* above.
17. If prompted, follow onscreen instructions to perform an Upper Material Tube Adjustment.
18. Run the Nozzle Offset Calibration utility.

METAL CONFIGURATION PREVENTIVE MAINTENANCE

The following suggested maintenance intervals are meant as averages, not minimums; always check your printer's components for wear and use your judgment about when to replace worn components.

SUMMARY TABLE

Procedure	Interval
Empty Wiping Stations	Every print
Replace Print Sheet	Every print
Replace Metal Nozzle	2,000 cc of metal material printed
Replace Release Nozzle	1,000 cc of release material printed
Replace Metal Tubes: • Metal Upper Material Tube A • Metal Lower Material Tubes (A1 and A2) • Material Load Tube Port 2 (A1 and A2)	4,800 cc of metal material printed
Replace Metal Upper Material Tube B	1,000 cc of release material printed
Replace Lower Material Tubes (B1 and B2)	10,000 cc of plastic or release material printed
Replace Material Load Tube Port 2 (B1 and B2)	1,000 cc of release material printed
Replace Material Load Tube Port 1 (A1 and A2)	10,000 cc of plastic material printed
Replace Material Load Tube Port 1 (B1 and B2)	10,000 cc of plastic material printed
Check Belt Tension	500 print hours
Replace Wiping Station Brush (left side)	2,000 cc of metal material printed
Replace Wiping Station Brush (right side)	1,000 cc of release material printed

EVERY DAY

- Clear debris from the build chamber and print bed (especially the vacuum groove)
- After each print, empty wiping station bins; see *Wiping Station Maintenance*
- After each print, replace the print sheet
- Check your consumables
- Inspect nozzles for signs of damage or wear
- Inspect material pathway tubes for signs of wear
- Inspect wiping station brushes for wear, rotating or replacing them if necessary

SHORT TERM

- Keep all software updated; see *Network and Firmware*
- Check camera lenses for smudges or debris and clean if necessary; see *Cleaning Your Printer*

LONG TERM

- Check belt tension and adjust if necessary every 500 print hours, or after changing any component of the motion system; see *Printer Calibration*
- Replace Metal Upper, Lower, and Load Material Tubes every 4,800cc of metal material printed; see *Replacing Metal Material Tubes*
- Replace Metal Upper Material Tube B and Metal Material Load Tubes B1 and B2 every 1,000cc of release material printed
- Replace Lower Material Tubes B1 and B2 every 10,000cc of plastic or release material printed

CHANGING PRINTER CONFIGURATION



FX10 METAL KIT

OVERVIEW

The FX10 Metal Kit contains two sets of components: one-time component upgrades and a swappable set of Metal Configuration components. The one-time component upgrades can be used in both Metal and Composite Configurations. Once those are installed, you can swap between Metal Configuration and the default Composite Configuration by swapping out the Metal and Composite Configuration component sets. An onboard utility will guide you during these configuration changes.

One-time upgrades include replacing the pre-extruders, adding four material load tubes and inlet fittings, and upgrading the face plates on the spool bay trays. In addition, some units may need the spool bay trays replaced, spindle holders added to the spool bays, or tube adjustment mechanism installed.

Metal Configuration components include lower material tubes for bays A1 and A2, upper material tubes, metal print head, 4-to-2 material routing block, metal print sheets, and metal wiping stations. Maintaining a separate set of Metal Configuration components helps avoid material contamination when printing composite parts, and vice versa. To aid the separation of these component sets, metal print sheets and the metal material tubes are colored blue or have blue labels. We recommend that you apply the provided blue stickers to the metal wiping stations to distinguish them from their composite counterparts.

The FX10 Metal Kit also includes spool bay plugs for the pre-extruder inlets associated with the configuration not currently in use.

FX10 METAL KIT CONTENTS

Your FX10 Metal Kit ships with everything needed to change an FX10 from the Composite Configuration to the Metal Configuration. FX10s manufactured before specific dates may need additional components to enable printing metal. Please see *Spool Bay Spindle Mount Installation* and *Tube Adjustment Mechanism Installation* in the *First-Time Hardware Installation* section for more information.

Components for the configuration not actively in use may be stored in the reusable packaging for organization and protection from damage.

Item	Purchasable Part Number	Quantity
Dual pre-extruders for A1/A2 spool bays	22491	2
Dual pre-extruders for B1/B2 spool bays	22492	2
Material Load Tubes	22077	8
Material Load Tube fittings	22090	4
Dual Material Load Tube fitting covers	22089	4
Metal print head	22493	1
4-to-2 routing block	22494	1
Spool bay spindle assemblies (cap and hub)	22495	4
Right wiping station	22496	1

(cont'd)

Item	Purchasable Part Number	Quantity
Left wiping station	22497	1
Wiping station identification stickers	—	2
FX10 Metal Upper Material Tube A	22485	1
FX10 Metal Upper Material Tube B	22486	1
FX10 Metal Lower Material Tube Set (A1 and A2)	22487	1
Spool bay plugs	S24370-FRU	6
FX10 Metal Print Sheets	22488	15

FIRST-TIME HARDWARE INSTALLATION

DUAL PRE-EXTRUDER INSTALLATION

Tools:

- 2.5mm hex key
- 2 dual pre-extruders for A1/A2 spool bays
- 2 dual pre-extruders for B1/B2 spool bays
- 8 Material Load Tubes
- 4 Material Load Tube fittings
- 4 dual Material Load Tube fitting covers
- 4 spool bay plugs

Note: FX10 printers manufactured before August 2024 have the original flat-bottomed spool trays (left in the image below), which may not fit into the spool bays following spindle mount installation. If you encounter this issue, reach out to your Partner to request replacement spool trays.



1. Unload and remove any material and desiccant from the system. For more information, see *Unloading Plastic Filament* and *Unloading Fiber Filament* above. Store any partial plastic spools with desiccant in an airtight container.
2. Ensure that the printer is powered down.
Note: NEVER DISCONNECT CABLE CONNECTORS WITH THE POWER ON. Disconnecting any cables while the FX10 is powered on may damage electrical components.
3. Loosen the lower rear panel thumbscrews, then remove the panel to expose the pre-extruders.
4. For ease of access, disconnect the Lower Material Tubes from all four pre-extruders.

5. Remove the single pre-extruder from spool bay A1.
 - a. Open the spool bay, then remove the spool tray by pulling it straight up, then out.



- b. Slide the load tube fitting out of its bracket, then depress its push-to-connect fitting to free the Material Load Tube. Set the load tube fitting aside.



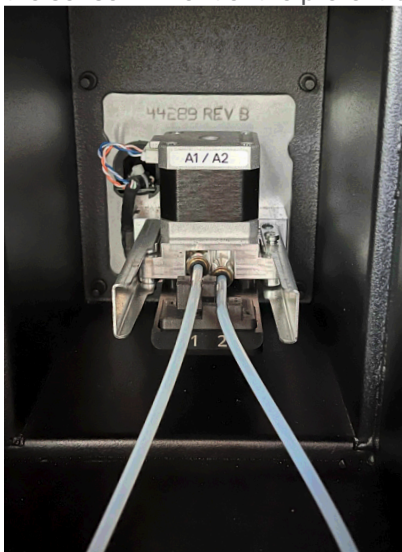
- c. Disconnect the pre-extruder cable from the pre-extruder. Leave the load tube connected.



- d. Using the 2.5mm hex key, remove and set aside the four (4) screws securing the pre-extruder. Then, remove the pre-extruder and load tube from the back of the machine.



- e. Discard the old load tube, which is not compatible with the dual pre-extruder.
6. Install the relevant dual pre-extruder to spool bay A1.
Note: The two pre-extruders labeled A1/A2 must be installed into spool bays A1 and A2. The two pre-extruders labeled B1/B2 must be installed into spool bays B1 and B2.
 - a. Install the two new Material Load Tubes to the pre-extruder. Press both load tubes down into the sensor in front of the pre-extruder inlets, until they click into place.



- b. Insert the pre-extruder into the rear of the spool bay, making sure to align it with the locating pins.

- c. Install load tube fittings onto the load tubes, fully inserting each tube into its fitting.
Note: Incomplete tube insertion can lead to material unload and changeover issues.



- d. Use the 2.5mm hex key to install the four screws into the rear of the spool bay. Torque each screw to 8.5 in-lb (1 N-m).



- e. Plug the Lower Material Tube into Outlet 1 on the righthand side of the rear face of the pre-extruder. Plug the pre-extruder cable into the cable connector. Make sure both are seated properly.

Note: The Lower Material Tube is installed into Outlet 1 in this step because the FX10 must remain in Composite Configuration until a later stage in the installation process.



- f. Insert the red spool bay plug into Outlet 2 on the lefthand side of the rear face of the pre-extruder.



7. Prepare the spool tray.

- a. Using the 2.5mm hex key, remove the single-slot load tube fitting cover from the spool tray.



- b. Install the new double-slot load tube fitting cover to the spool tray. Torque to 8.5 in-lb or less.



8. Slide the lefthand load tube fitting into Port 1, the lefthand bracket at the front of the spool bay. Slide the other fitting into Port 2, the righthand bracket. Ensure the tubes do not cross or overlap.



9. If you need to install the spool bay spindle mounts, go to the *Spool Bay Spindle Mount Installation* section below.
10. Install the spool tray in the bay over the load tube fittings.



11. Repeat steps 5–10 for the remaining three spool bays.
12. Reinstall the lower rear panel using the thumbscrews.

SPOOL BAY SPINDLE MOUNT INSTALLATION

FX10s built after August 2025 have pre-installed spool bay spindle mounts. If your FX10 was built before this date and the spool bay spindle mounts were not included in your FX10 Metal Kit, please ask your Markforged Partner to request **four (4)** FX10 Spindle Mount Packs (part number: 22501) for you and these will be provided at no additional cost.

Tools:

- 2.5mm hex key
 - 8 spindle mounts
 - 24 mounting screws
1. Open one spool bay. Remove the spool tray, if installed.
 2. Install one spindle mount on one side of the spool bay with three screws. We recommended you start from the back for ease of installation.



3. Repeat step 2 to install one spindle mount on the other side of the spool bay.



4. Repeat for the other three spool bays.

TUBE ADJUSTMENT MECHANISM INSTALLATION

FX10s built after August 2025 have a pre-installed tube adjustment mechanism. If your FX10 was built before this date and the tube adjustment mechanism was not included in your FX10 Metal Kit, please ask your Markforged Partner to request **one (1)** FX10 Tube Adjustment Mechanism (part number: 22502) for you and it will be provided at no additional cost.

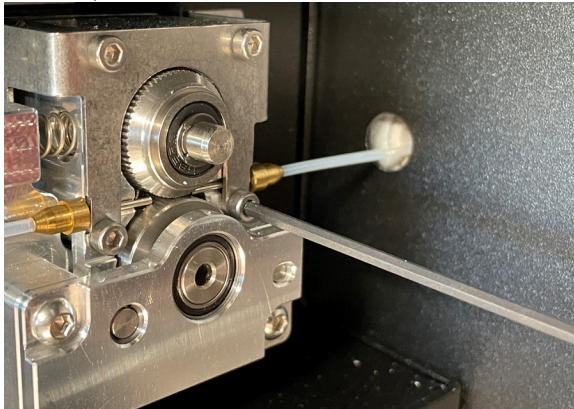
Note: These instructions assume that the Metal Configuration has never been used on your FX10 and the machine is currently in the Composite Configuration.

Tools:

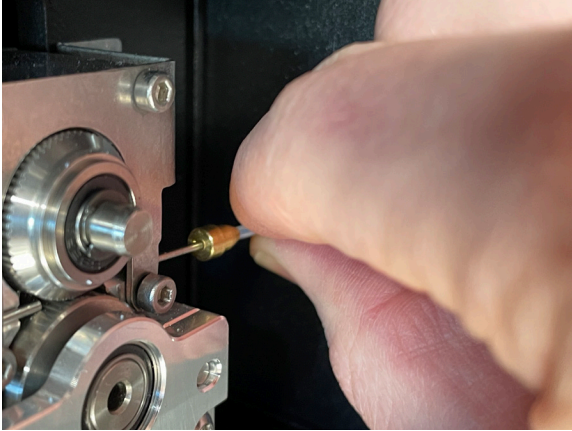
- Print Head Service Tool
- Step stool
- 2mm hex key
- 2.5mm hex key
- Lid screwdriver

REMOVE THE EXISTING CONDUIT BLOCK

1. Check whether material is still loaded to the print head.
 - If so, power on the printer, then unload material. For more information, see *Unloading Plastic Filament* and *Unloading Fiber Filament* above.
2. Move to the front of the printer and open the visor. Use the 2mm hex key to loosen, but not fully remove, the fiber tube retention screw located on the fiber extruder.



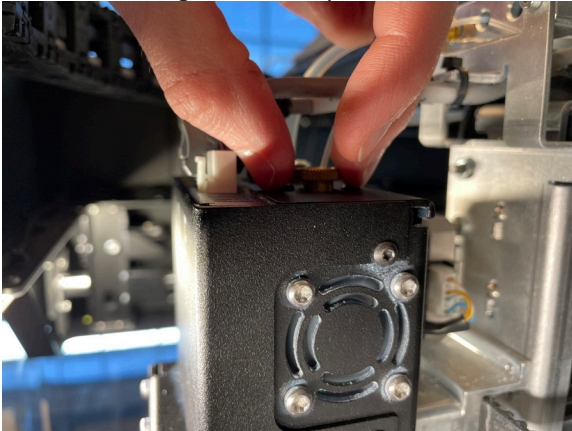
3. Pull the metal ferrule of the Fiber Bowden Tube away from the fiber extruder.



4. Unscrew and open the printer lid.
5. Locate and remove the material tube retention clip above the print head.



6. Unscrew the Fiber Bowden Tube from the top of the print head and pull the tube out of the energy chain.
*Note: If you encounter resistance when pulling the tube out of the energy chain, **do not tug on the print head fiber retention screw**. Instead, use the plastic end of the Print Head Service Tool to nudge the ferrule fitting on the fiber extruder end into the conduit tube, then gently pull the tube through from the print head end.*



7. Use the plastic end of the Print Head Service Tool to depress the push-to-connect fitting on the top of the print head and remove the Upper Material Tube from the print head.



8. Move to the rear of the printer. Press the push-to-connect fitting on the top of the routing block, then pull the Upper Material Tube out of the routing block.



9. Move to the front of the printer and open the visor. Pull the Upper Material Tube out of the energy chain.
10. Use the 2.5mm hex key to remove the two screws on the conduit block. Set these mounting screws aside to reuse. Spares are included with the new tube adjustment mechanism.



11. Pull the conduit block up and away from the bracket slightly. Then for each of the material conduit tubes attached to the back of the block, press the push-to-connect fitting, then pull the material conduit tubes out of the conduit block.

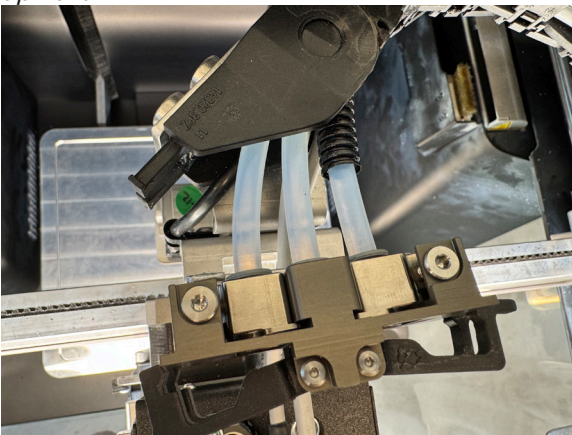
Note: To ensure proper reinstallation later on, do not allow the tubes to twist or cross one another.



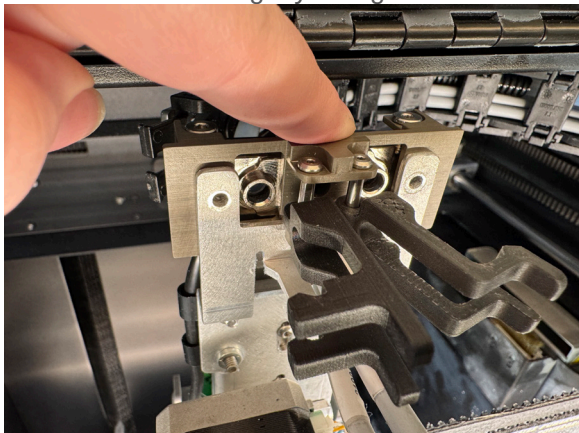
INSTALL THE TUBE ADJUSTMENT MECHANISM

1. Ensure that the upper tube retention clips on the tube adjustment mechanism are not clipped to the metal body and are able to pivot freely.
2. Insert and fully seat the three unconnected material conduit tubes into the three push-to-connect fittings on the back of the tube adjustment mechanism.

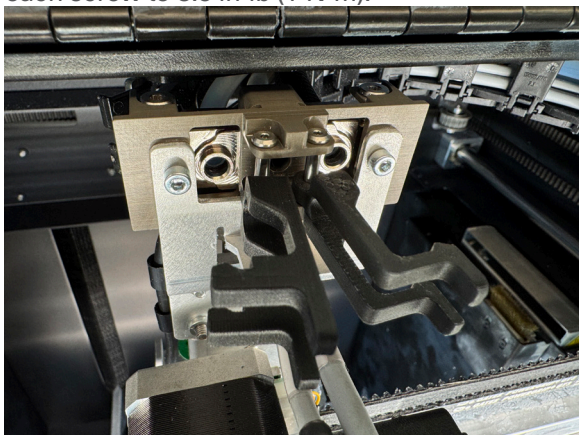
Note: Ensure that the heads of the screws on the top of the tube adjustment mechanism face upward.



3. Position the tube adjustment mechanism behind the mounting bracket by pushing the material conduit tubes further into the energy chain. You may need to press the tube adjustment mechanism down slightly to align the threaded holes with the holes on the bracket.



4. Use the 2.5mm hex key to install the mounting screws into the tube adjustment mechanism. Torque each screw to 8.5 in-lb (1 N-m).



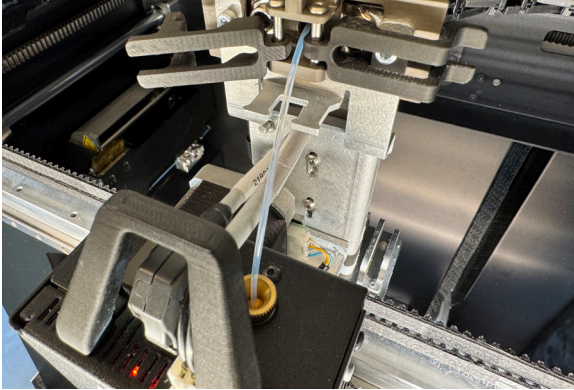
If continuing to use the FX10 in Composite Configuration:

1. Install the Fiber Bowden Tube by feeding the inlet end of the tube (without the thumbscrew) into the center hole in the tube adjustment mechanism. Once the Fiber Bowden Tube feeds all the way through the energy chain, you will see it pop out of the hole behind the fiber extruder at the rear of the build chamber.

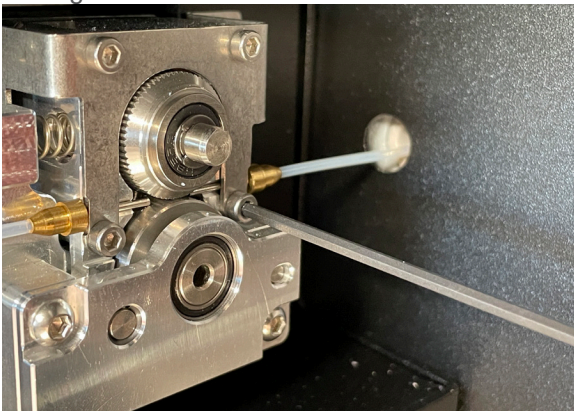
Note:: If the inlet end catches on a gap between the fiber conduit tube and push-to-connect fitting, shut down the printer, disconnect it from power, remove the back panel, and firmly insert the conduit tube into the fitting, then try to push the Bowden tube through again. Reinstall the back panel and power on the printer before continuing.



2. Insert the outlet end of the Fiber Bowden Tube outlet into the top of the print head, then tighten the thumbscrew to secure it in place.

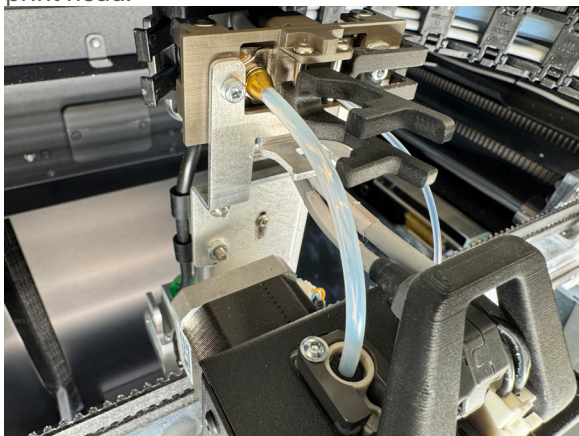


3. Insert the inlet end of the Fiber Bowden Tube into the outlet at the rear of the fiber extruder.
4. Tighten the retention screw with the 2mm hex key to 5 in-lb (0.55 N-m). Make sure not to overtighten.

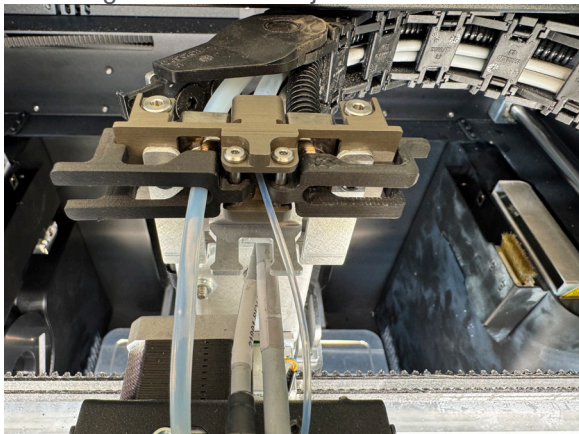


5. Install the Upper Material Tube by feeding the inlet end of the tube (without the ferrule) into the left hole in the tube adjustment mechanism.
6. At the rear of the printer, locate the Upper Material Tube end above the routing block. Insert it securely into the push-to-connect fitting on top of the routing block.

7. Secure the other end of the Upper Material Tube into the push-to-connect fitting on the top of the print head.



8. Install the upper tube retention clips over the Upper Material Tube on the left and the unused hole on the right of the tube adjustment mechanism by snapping them into place.



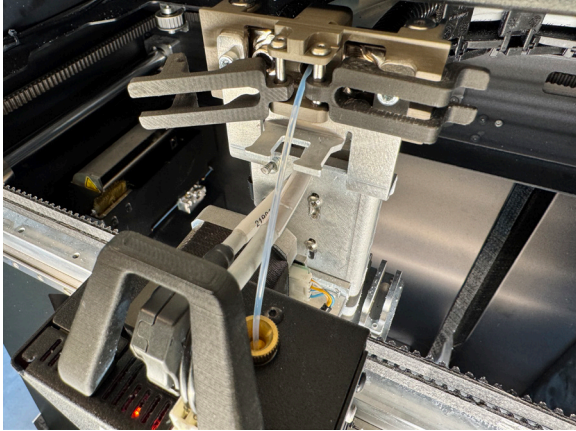
9. Follow the instructions in the *Loading Plastic Filament* section to load plastic material to prepare the printer for printing.
10. Follow the instruction in the *Loading Fiber Filament* section to load fiber if desired.

If swapping to the Metal Configuration for the first time

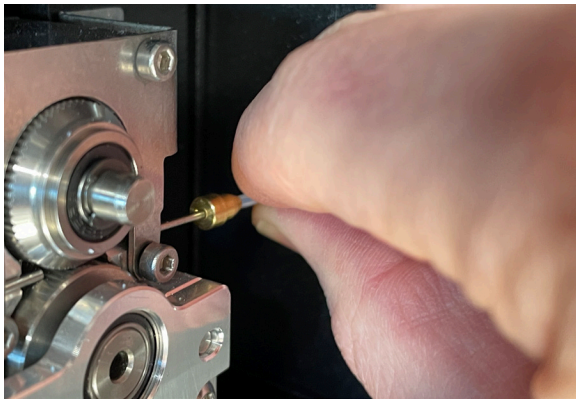
1. Install the Fiber Bowden Tube by feeding the inlet end of the tube (without the thumbscrew) into the center hole in the tube adjustment mechanism. Once the Fiber Bowden Tube feeds all the way through the energy chain, you will see it pop out of the hole behind the fiber extruder at the rear of the build chamber.

Note: The Fiber Bowden Tube remains installed in the Metal Configuration to protect it for later use.

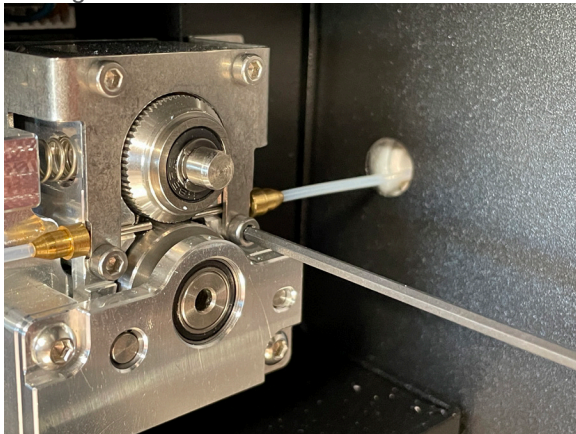
2. Screw the outlet (thumbscrew) of the Fiber Bowden Tube into the top of the print head.



3. Insert the inlet end of the Fiber Bowden Tube into the outlet at the rear of the fiber extruder.



4. Tighten the retention screw with the 2mm hex key to 5 in-lb (0.55 N-m). Make sure not to overtighten.



5. Leave the Upper Material Tube uninstalled and the Upper Tube Retention Clips unclipped. You will install new tubes for printing metal at a later step.
6. Run the Change Printer Configuration utility to finalize setup. See *Swap from Composite to Metal Configuration* for further instructions.

SWAP FROM COMPOSITE TO METAL CONFIGURATION

You must use the Change Printer Configuration utility to change your FX10 from the Composite Configuration to the Metal Configuration in order to avoid causing damage to electrical components and to ensure all hardware is installed properly. Use this utility every time you wish to switch configurations of your FX10.

Before starting the Change Printer Configuration utility, ensure that all four dual pre-extruders are installed and verify that the tube adjustment mechanism and spool bay spindle mounts are present. For more information, please refer to the *First-Time Hardware Installation* section above.

When you are ready to change your FX10 from the Composite Configuration to the Metal Configuration, start the Change Printer Configuration utility by navigating to **Utilities > Routine Workflows**.

PERFORM THE SWAP

Note: *It is critical that you do not unplug the print head before the utility instructs you to do so. Unplugging the print head while it is powered can cause permanent damage to the print head and the FX10.*

Tools:

- Flush cutters
- Print Head Service Tool
- 2.5mm hex key
- Compatible metal spool
- Ceramic release spool
- FX10 Metal Kit

The Change Printer Configuration utility guides you through the following procedures in order:

1. **Hardware Verification:** Automatic checks and a one-time question to ensure the proper hardware is installed
2. **Unloading Material:** Unload all composite materials and remove fiber spools from the chamber
3. **Removing Composite Material Tubes:** Guided instructions on removing composite material tubes from the system
4. **Changing Routing Block:** Guided instructions on swapping the routing block
5. **Powering Down the Print Head:** Critical step to ensure the print head is not damaged during removal
6. **Removing the Composite Print Head:** Do not remove the print head before this step
7. **Installing the Metal Print Head:** Puts the printer into Metal Configuration after a software reboot
8. **Installing Metal Material Tubes:** Guided instructions on installing metal material tubes necessary for printing

9. **Swapping Additional Components:** Guided instructions on swapping in the metal wiping stations, installing spool spindles, and removing the composite print sheet
10. **Loading Metal Material:** Prompts loading metal and ceramic release material
11. **Calibrations:** Prompts the Nozzle Offset Calibration and Vacuum Seal utilities

Your FX10 is now ready to print metal. Store all unused Composite Configuration components inside of the FX10 Metal Kit box.

SWAP FROM METAL TO COMPOSITE CONFIGURATION

You must use the Change Printer Configuration utility to change your FX10 from the Metal Configuration to the Composite Configuration in order to avoid causing damage to electrical components and to ensure all hardware is installed properly. Use this utility every time you wish to switch configurations of your FX10.

These instructions assume that your FX10 is already in the Metal Configuration. The Change Printer Configuration utility will automatically detect which configuration you are in and provide the relevant instructions.

PERFORM THE SWAP

Note: *It is critical that you do not unplug the print head before the utility instructs you to do so. Unplugging the print head while it is powered can cause permanent damage to the print head and the FX10.*

Tools:

- Flush cutters
- Print Head Service Tool
- 2.5mm hex key
- Compatible composite spool
- Fiber spool (optional)
- FX10 Metal Kit with stored Composite components

The Change Printer Configuration utility guides you through the following procedures in order:

1. **Hardware Verification:** Automatic checks and a one-time question to ensure the proper hardware is installed
2. **Unloading Material:** Unload all metal and release materials
3. **Removing Metal Material Tubes:** Guided instructions on removing metal material tubes from the system
4. **Changing Routing Block:** Guided instructions on swapping the routing block
5. **Powering Down the Print Head:** Critical step to ensure the print head is not damaged during removal
6. **Removing the Metal Print Head:** Do not remove the print head before this step
7. **Installing the Composite Print Head:** Puts the printer into Composite Configuration after a software reboot
8. **Installing Composite Material Tubes:** Guided instructions on installing composite material tubes necessary for printing
9. **Swapping Additional Components:** Guided instructions on swapping in the composite wiping stations and removing the metal print sheet
10. **Laser Offsets:** Prompts the Laser Offsets utility

11. **Loading Composite Material:** Prompts loading plastic and fiber filament
12. **Calibrations:** Prompts the Nozzle Offset Calibration and Vacuum Seal utilities

Your FX10 is now ready to print composite materials. Store all unused Metal Configuration components inside of the FX10 Metal Kit box.