

FDM 200_{mc}

User Guide



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ETL Listed

Conforms to ANSI/UL STD. 60950-1-2003

Certified to CAN/CSA C22.2 No.60950-1-03



The FDM 200mc system conforms with the following standards, in accordance with the EU Machinery, Low Voltage and Electromagnetic Compatibility Directives: EU 89/392/EEC, EU 98/37/EEC, EU 73/23/EEC amended by 93/68/EEC, EU 89/336/EEC

Introduction

The FDM 200mc is designed with ultimate simplicity in mind. It allows you to build parts quickly, even if you have never used a modeler before. Its display panel prompts you to press a few keys to get you modeling quickly.

The system models with P430 ABSplus, so modeled parts are strong and durable. P430 ABSplus also ensures you'll be able to drill, tap, sand, and paint your creations.

FDM 200mc is an innovative combination of proprietary hardware, software, and material technology.

Congratulations...

you made a smart choice!

How To Use This Manual

This User's Guide is laid out in easy to follow sections which cover Set-up, Operation, Maintenance, and Troubleshooting of your FDM 200mc system. Be sure to read each section carefully so that you will get the best performance from your system.

Highlighted Information

The manual is written in a step-by-step format so as to guide you through a variety of operational tasks. Information of particular importance is presented in one of three formats

WARNING



A **WARNING** indicates a procedure that may cause **Injury** to an operator if the procedure is not followed. A **WARNING** will precede the paragraph of instruction to which it relates.

CAUTION



A **CAUTION** indicates a procedure that may cause **Damage To Equipment** if the procedure is not followed. A **CAUTION** will precede the paragraph of instruction to which it relates.

NOTE

A **NOTE** is used to highlight a specific point or to provide an operational tip. While useful, a **NOTE** does not indicate a procedure that can cause injury or damage if it is not followed. A **NOTE** will follow the paragraph of instruction to which it relates.

The FDM 200mc guides you through operational tasks from a User Interface (UI) on the front panel of the system. Throughout the User Guide, text representing messages that appear on the UI are presented in a specific format. **Interface Messages** appear as a bold, serif, fixed-pitch (mono-space) font.

Sections Of The Manual

Overview...

Provides a quick reference for the layout of the system and its operating components. Overview also provides a quick reference for sources of additional information and supplies.

Setup...

Guides you through the initial system installation and setup. Topics include unpacking, connecting power, installing software, and connecting to a computer network. Generally, topics in setup are only accomplished during installation or relocation.

Operation...

Further develops your understanding of the FDM 200mc by presenting the User Interface, Loading and Unloading of Material, Building Parts, Removing Completed Parts, and Removing Support Material. The tasks presented are common procedures accomplished during normal operation.

Maintenance...

Lists several tasks that you will need to perform to keep your FDM 200mc performing at its best. 'House Cleaning', Axis Maintenance, Tip Cleaning Assembly Replacement, Chamber Lamp Replacement, and Tip Shroud Replacement are procedures that you can perform with the help of the User Guide.

Troubleshooting...

Allows you to perform some problem diagnosis and correction procedures in the event that your system has a problem. A Troubleshooting Checklist, Fault Determination Codes, and a procedure to recover from a Loss of Extrusion are provided.

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Overview

FDM 200mc builds models, including internal features, from CAD STL files. The system builds three-dimensional parts by extruding a bead of P430 ABSplus through a computer-controlled extrusion head, producing high quality parts that are ready to use immediately after completion. With two layer resolution settings, you can choose to build a part quickly for design verification, or you can choose a finer setting for higher quality surface detail.

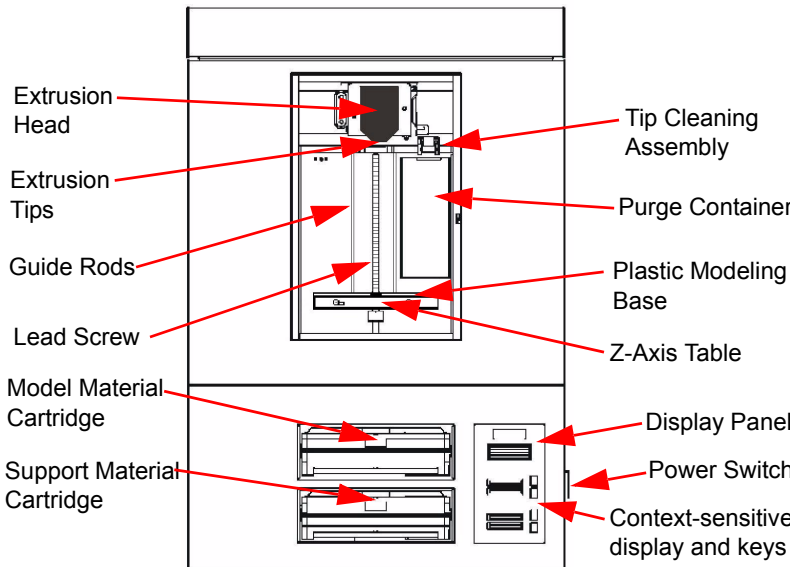


Figure 1: FDM 200mc Front View

The FDM 200mc system consists of two main components — the modeler and the Insight software. Insight is the preprocessing software that runs on a Windows 2000 or Windows XP platform.

FDM 200mc's build envelope measures 203 x 203 x 305 mm (8 x 8 x 12 in). Each material cartridge contains 922 cc (56.3 cu. in.) of usable material — enough to build continuously for about four days without reloading.

Finding More Information

Several references are available for use with the FDM 200mc.

Setting up the FDM 200mc



FDM 200mc User Guide

Step-by-step instructions for installing, setting up and operating the FDM 200mc system.

Using the FDM 200mc



Insight Online Users Guide

Simple operating instructions for Insight are online. You can access them at any time by clicking **Help**. You can also print the Insight instruction file, (approximately six pages).



World Wide Web

Additional information is available at:
<http://www.stratasys.com>

Consumables

This section lists all replaceable consumables used by the FDM 200mc modeling system.

Part Number	Description
Modeling Material	
340-21200	Natural P430 ABSplus Filament Cartridge
Soluble Support Material / WaterWorks Concentrate	
340-30200	Soluble Support Cartridge
300-00600	WaterWorks Soluble Soluble Concentrate (12 bottles)
Modeling Base	
340-00200	Plastic Modeling Base (qty. 24)
To order consumables for your FDM 200mc system, contact:	
North America:	Stratasys, Inc. Consumable Orders +1.800.937.3010 (US toll-free) +1.952.906.2727 (fax) consumables@stratasys.com
International:	Your regional distributor

Workspace

Observe the following when placing FDM 200mc in its operating location:

- FDM 200mc has an approximate weight of 128 kg (282 lbs.) and requires a table capable of safely supporting 300 lbs.
- System Dimensions:
864 x 686 x 1041 mm (34 x 27 x 41 in)
Four-inch minimum space behind unit for air circulation
- Dedicated outlet requirements: (Nominal)
110-120 VAC, 60 Hz, 15 A min. (20 amp recommended)
–or–
220-240 VAC, 50/60 Hz, 7 A min. (10 amp recommended)
- Temperature: 18–32°C (65-90°F)
- Relative Humidity: 30-70%, Non-condensing
- Ethernet 10/100 Base T network
- Network patch cable with RJ45 connectors
- Optional UPS for power interruptions (brown-out conditions):
Rated Power – 2200 VA
Output Power – 1600 watts

Unpacking

This section describes the recommended procedures for unpacking and preparing the FDM 200mc for its first use.

Unpack the system:

WARNING



The FDM 200mc weighs approximately 128 kg (282 lbs). Use proper moving and lifting techniques when positioning the unit. For your convenience, there are forklift pads built into the bottom of the unit. They are accessible from the side of the unit.

1. Before unpacking the system, move it near to its operating location.
2. Remove the plastic banding from around the cardboard.
3. Remove the top cover. Set aside the fork access covers (2) and bag of screws (2).
4. Remove screws (4) that attach cardboard to pallet and remove the cardboard side panels.
5. Remove the top foam.
6. Remove outer plastic wrap - use care if using a knife so as to not scratch the system.
7. Remove the foam door channels (2) and tape.

WARNING



The Lead Screw and Guide Rods are lubricated with a thin coat of Krytox grease. Krytox grease can cause skin irritation. Be careful not to get the grease on your hands or clothing.

CAUTION



Remove the foam tubes that isolate the extrusion head from the frame (see [Figure 2](#)). The system will be damaged if powered on with the foam tubes in place.

CAUTION

Be careful not to damage the rod sensors when removing the foam tubes (see [Figure 2](#)).

8. Remove the foam tubes that isolate the extrusion head from the frame (see [Figure 2](#)).

Circles indicate Rod Sensor locations. There are also two sensors on the back side of the Extrusion Head.

Foam Tubes (4)

Extrusion Head

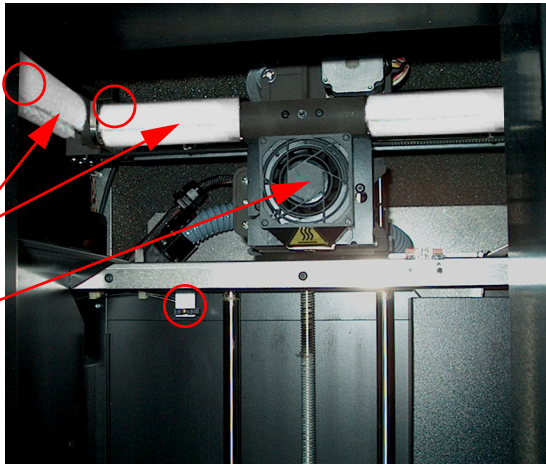


Figure 2: Foam tubes isolating the extrusion head from the Z-axis frame

9. After unpacking, inspect the system and report any shipping damage to the carrier.

Power Connections

This section discusses the procedure for preparing all power connections for the system.



CAUTION

Before connecting power to the system, make sure that the FDM 200mc circuit breaker is in the off (down) position. It is located at the rear of the system, next to the power cord attachment point.

FDM 200mc is provided with two power cords: one for 110 V and one for 220 V.

Prepare all power connections:

1. Connect the male end of the supplied power cord directly into a grounded electrical outlet, as shown in [Figure 3](#). (If using a Uninterrupted Power Supply (UPS), connect the cord directly into the UPS).

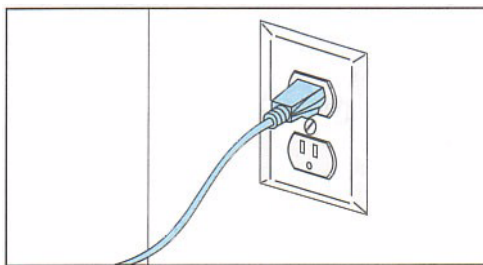


Figure 3: Connecting to a grounded electrical outlet



WARNING

Do not use an extension cord or power strip with the FDM 200mc system. Connect the cord directly into the receptacle or UPS.

2. Connect the female end of the power cord directly into the rear of the cabinet.

3. Switch the FDM 200mc circuit breaker to the on (up) position. Power is now supplied to the system. The system is ready to be 'Powered ON'.

Powering On the FDM 200mc

WARNING



The FDM 200mc build chamber and extrusion-head tip get very hot! The chamber and head tip reach temperatures of approximately 75° C (167° F) and 280° C (536° F) respectively. Personal injury can occur if proper techniques and safety materials are not used. Use the leather safety gloves provided in the Startup Kit when working inside the system.

CAUTION



Remove the foam tubes that isolate the extrusion head from the frame (see [Figure 2 on page 17](#)). The system will be damaged if powered on with the foam tubes in place.

The FDM 200mc power switch is located on the right (viewed from the front) side cover of the cabinet, near the bottom front corner (see [Figure 4](#)). After the switch is pushed, the FDM 200mc boots up in three to seven minutes.

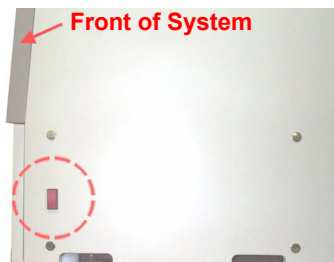


Figure 4: Location of Power Switch

Note

If the system was off and is at room temperature, it requires approximately 30 minutes to warm up before you can perform any functions. Temperatures are factory-preset and not adjustable. The panel displays the head and envelope temperatures while the FDM 200mc is warming up and cooling down.

Note

For safety, the head and platen do not move while the chamber door is open. During warm-up and operation the door is locked. The door can be opened only when the FDM 200mc is not building a part, getting ready to build a part, or in Pause mode...

Insert Modeling Base

Make sure retainers are turned 'down' - so as not to interfere with the modeling base installation. Set the modeling base down on the Z-platform allowing the four outer tabs to drop into the cutouts in the sheet metal tray. Slide the modeling base forward until it is flush with the front edge of the tray (see [Figure 5](#)). Secure the base with the two retainers.

Note

When inserting and removing the modeling base, use the handle to avoid touching the top surface. Grease and oil that contact the top build surface could cause poor part adhesion. You can clean the top build surface with isopropyl alcohol if necessary.

Slide modeling base into the side tray guides (2 on other side).

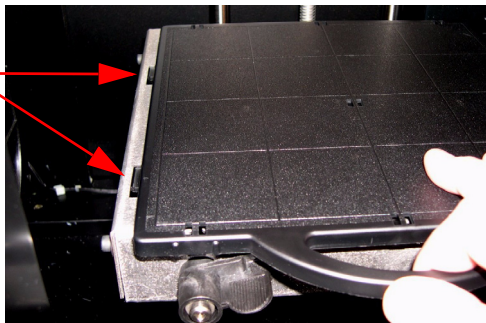


Figure 5: Inserting a plastic modeling base

Installing Software

There are two software programs that work with the FDM 200mc.

- Insight is the preprocessing software that controls the FDM 200mc. If you have not already done so, you will need to install the Insight software on your PC workstation. You will find the Insight software on the CD-ROM included in your Startup Kit (See [“To install Insight:” on page 23.](#)).
- There is also ‘controller’ software loaded directly onto your FDM 200mc system from the factory. Because we do occasionally make changes to this software, you will need to verify that you have the latest version installed (See [“Verifying the controller software version:” on page 23.](#)). A controller software CD is included in your Startup Kit.

CD-ROM Software Contents

The following table displays the contents of the distribution CD including typical and custom options.

Typical Installation	
Insight	Preprocessing software that controls FDM 200mc
FDM Modeler Status	Not applicable to FDM 200mc
Status	Status is used to manage all interaction with your network modeler from your PC workstation. Using Status, you will download jobs to be built, monitor the build status, and modify the pending jobs queue. The modeler and job status is updated continuously during a part build. The main Status window displays the Job Name, remaining time to complete, and the percent of job completed.
Administration	Offers control over administrative tasks
Custom Installation	
CMBView	The CMB viewer program can be used to view STL or CMB files.
Sample and Training Files	Files provided to allow you to quickly understand and use your system.

Workstation Requirements

The following is a list of requirements for operating the Insight workstation:

Operating System	Microsoft Windows XP or Windows 2000
Distribution Media	CD-ROM
Processor Minimum: Recommended:	Intel Pentium-4, 1.8 GHz; AMD Athlon XP 2400 Intel Pentium-4, 2.8 GHz; AMD Athlon XP 3200 or better (Faster processors will shorten job processing times)
RAM Minimum: Recommended:	1.0 GB 2.0 GB
Hard Disk Installation: Paging File Space:	Installation: 45 MB 300 MB (minimum)
Monitor	17 inch or larger
Graphics Resolution Minimum: Recommended:	1024 x 768 1280 x 1024 or higher
Video Card Required: Recommended: Preferred Vendors:	OpenGL compliant accelerated graphics card. Hardware support for OpenGL. Nvidia based cards (Geforce and above) ATI Radeon based cards recommend minimum of 128 MB graphics card memory
Ethernet	Ethernet 10/100 Base T
Keyboard	101 key or equivalent
Mouse	2 button or 3 button with wheel
Web Browser	Internet Explorer 5.5 or higher for online help
Changes to supported platforms, operating system, and graphics cards are periodically updated. Please call Customer Service for latest supported version.	

To install Insight:

1. At your workstation, log on as the Administrator or with a user name that has administrative privileges.
2. Insert the Insight installation disc into your CD-ROM drive. The installation menu automatically appears.
3. Click the **Install** button.
4. Follow the prompts to finish installing the software.

Note

Insight's installation setup allows you to change or confirm the target installation directory. To install Insight in a directory other than the default, type the path and directory name in the dialog box when prompted.

5. If you want to customize your installation, select the **Custom** option. Custom options include the following:
 - Insight Files
 - CMB Utilities
 - Training Files

Verifying the controller software version:

6. Check the version displayed on the system keypad.
 - From **Idle**, press **Maintenance**. The version number will be listed in the top display window under **System Maintenance**.
7. Compare the version number to the controller software CD provided in the Startup Kit.
8. If the version on the controller software CD is newer than the system version, follow the controller software upgrade process instructions provided in the Startup Kit.

Setting Network Addresses

You will need to set up your network addresses before sending files from the workstation to FDM 200mc.

The network address can be Dynamic or Static.

- Dynamic address - the system will generate its own random IP address. A different IP address may be generated each time the system is powered down and re-started.

Note

It is recommended that the Static option be used for network addresses. The Insight work station software does not currently implement features that take advantage of the Dynamic option. A future release of Insight will fully support the Dynamic function.

- Static address - your system administrator must provide an IP address that will be entered into the system. Once entered, the address will not change.

If your IT department requires a NIC MAC address to assign a static IP address:

1. From *Idle* or *Ready to Build*, press **Maintenance**. Press **Next** until the panel displays *Setup Maintenance*.
2. Read the serial number and the NIC MAC address from the display.
3. Press **Next** to return to *Idle* or *Ready to Build*.

To set the network addresses:

1. From *Idle* or *Ready to Build*, press **Maintenance**. The panel then displays *System Maintenance* and displays the software version.
2. Press **Set Network**.
3. Choose **Static IP...**

4. Three network addresses appear:

IP Address:198.000.000.001
NM Address:255.255.000.000
GW Address:198.000.000.001

These are the factory default addresses; they must be changed for your network.

5. Look for the cursor beneath the first digit of the IP address. The cursor does *not* blink. To update the IP address:
Press **Increment** to increase the value, one digit at a time.
Press **Next Digit** to move the cursor one place to the right.
Press **Last Digit** to move the cursor one place to the left.
6. Use the three functions above to set your IP address.
7. After setting the final digit of the IP address, move the cursor one more place to the right. The cursor moves to the NM (or Netmask) address. Follow the same steps for all addresses.
8. When you have finished setting addresses, press **Done**. The panel displays *Change IP, Netmask, Gateway?*
9. Press **Yes**. The panel then displays *Resetting Network* and after a moment returns to *Idle* or starts warming up.
10. If you have not done so already, plug in the network patch cable from your network to the rear of the FDM 200mc.
11. From any workstation on your network, open a DOS window and type: "ping..." followed by '200mc' new IP address (e.g. ping 198.000.000.001). You should receive a reply from your network. If you do not, contact your IT department for assistance.

Verifying Tip Depth

The system's tip depth has been set at the factory and normally does not need adjustment. During shipment, however, tip depth may be altered. Customers that self-install need to verify the tip depth setting prior to building. Building with the wrong tip depth can result in models not adhering to the plastic modeling base or a loss of extrusion.

To verify tip depth:

1. Install an unused modeling base (substrate).
2. Load Model and Support material (see ["Loading Material" on page 32](#)).
3. Press **Maintenance**.
4. Press **Test Parts**, and select *test_tipdep_plstc.cmb*.

The system will create six groups of numbers on the modeling platform. Each individual group will consist of four number pairs. Each number pair will have an extruded number and an etched number. Each number pair is created at one of four Z-heights: -5, 0, +5, and +10 (in .001 inches from 'home' level). See [Figure 6 on page 27](#).

NOTE

The etched number is created by the idle tip. It is normal for only some of these numbers to be visible.

The extruded number is created at a very low flow rate and may not show up clearly.

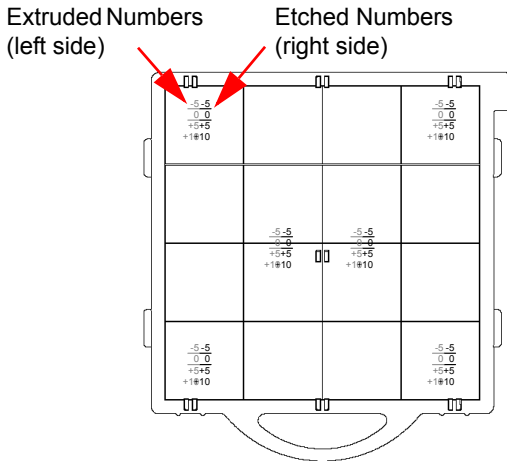


Figure 6: Plastic modeling base with test_tipdep_plstc.cmb model

5. Evaluate the **etched** numbers in each of the six groups. The etched numbers must meet the following criteria:
 - -5 must be visible in at least one of the six groups.
 - +10 must **not** be visible in any of the six groups.

NOTE

The etched numbers can be difficult to see. It may be necessary to tilt the modeling base to the light for inspection.

It is acceptable for some groups to have NO visible etched numbers. To meet the criteria, only one of the six groups must have a visible -5.

6. If the tip depth does not meet the above criteria, run the model a second time on a second unused modeling base and evaluate again.
7. If the tip depth again fails the above criteria, contact Stratasys Customer Support for more information on adjusting tip depth.

Operation

Display Panel and Keypad

The main interface to FDM 200mc is the Display Panel and Keypad (see [Figure 7](#)).

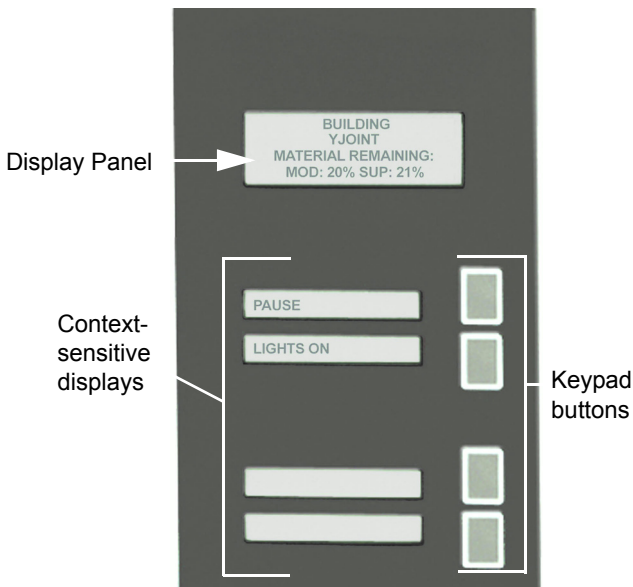


Figure 7: FDM 200mc display panel and keypad

The display panel and keypad is very easy to use. It consists of a larger multiple-line LCD display on top, and four single-line context-sensitive displays, each with one button (or key). The top line in the large display always reveals the system status. The lower three lines of the large display show details related to the current operation.

At times there will be an item blinking in the lower (context-sensitive) displays. The blinking item is usually the most logical selection.

Inserting a Modeling Base

Prior to inserting a plastic modeling base (substrate) into the tray, remove any material buildup on and behind the Z-platform and around the lead screw. Failure to do so could cause the modeling base to be unlevel or, if the buildup is large enough, cause the Z-stage to jam at its upper limit.

Install the modeling base (See [“Insert Modeling Base” on page 20](#) - "Setup").

Reusing a modeling base:

The square outlines on the modeling base represent modeling areas. The base is intended for single-use on each modeling area. Building on a used modeling area may cause a part to curl or break loose from the modeling base.



CAUTION

Failure to completely remove all other layers from a previous build can cause a head collision and result in system damage.

Before inserting a used modeling base into the system, make sure that all material above the previous part's first layer is removed from the base.

A modeling base may become worn or distorted after several builds. The system performs a modeling base levelness check at the start of every part build; upon detection of a faulty modeling base, the system pauses and allows you to install a new one.

Powering On the FDM 200mc

Refer to [“Powering On the FDM 200mc” on page 19](#) for instructions.

Powering Off the FDM 200mc

If you wish to power-off the FDM 200mc, move the power switch to the OFF position (see [Figure 4 on page 19](#)). You can do this at any time without harming the system. No other steps are necessary. If this is done while the system is building a part, the part will be lost. System cooling fans continue to operate for several minutes. This ensures a safe, systematic power down.

Note

For extended non-use periods, unload the material cartridges and then power off the system.

Cycling Power

Situations may occur that require completely shutting off and then restarting the FDM 200mc system. This section discusses the procedure for cycling the electrical system.

To cycle power:

1. Move the power switch to the OFF position ([Figure 4 on page 19](#)) to the OFF (down) position. Wait for the system to completely power down.
2. Move the circuit breaker located on the rear of the cabinet to the OFF (down) position.
3. Wait ten seconds and then move the circuit breaker to the ON (up) position.
4. Move the power switch to the ON position.
5. Wait 15 minutes for the system to prepare itself for normal operation.

NOTE

When the system is 'cycled' in this manner, it may take up to 15 minutes for it to reach its normal operating state.

Loading Material

Material cartridges are factory packaged in a box and an anti-static, moisture-proof bag to preserve shelf life. Material will stay humidity free inside the cartridge for at least 30 days after opening. Shelf life is more than one year if the cartridge package remains sealed.

Load material cartridges:

1. Remove packaging.
2. If present, remove the red sealing plug from the cartridge: (see [Figure 8](#))

NOTE

Plug must be removed before cartridge can be installed.

- A. Turn the plug a quarter turn counter clockwise.
- B. Lift up the plug to remove it from the cartridge - discard (or recycle) the plug.



Figure 8: Remove red plug before loading

3. Find the end of the material filament taped with a “flag”.



CAUTION

Be careful when touching the pinch roller on the side of the cartridge. If you roll it backwards, you could draw the material into the cartridge (see [Figure 9](#) for the correct direction to move the cartridge roller).

If this occurs, there is no way to retrieve the filament without opening the cartridge and exposing the material to humidity, which reduces shelf life to a few days.

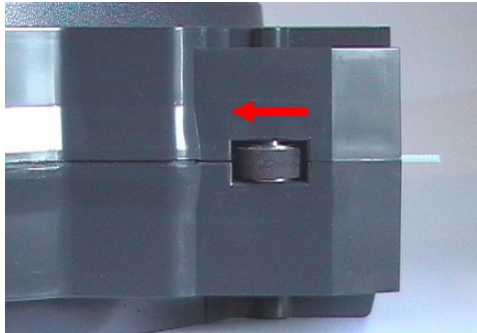


Figure 9: Direction to move cartridge roller

4. Pull filament out of cartridge to expose about 12 inches of material. You should easily be able to pull out the material.

NOTE

The above step makes sure that the filament will feed freely from the spool.

5. With the cutter from your Startup Kit, snip the filament flush with the end of the cartridge (see [Figure 10 on page 34](#)).

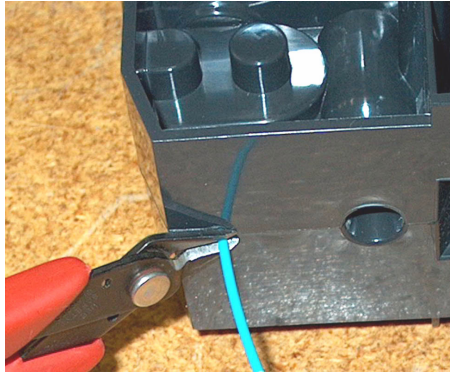


Figure 10: Snipping the material filament

6. If the system is in **Idle**, press the **Material Load** button, which will be blinking.
7. Display will prompt with **Load Model - Replace Both Cartridges** (flashing)
8. Insert material cartridges into their appropriate slot from the front of the system (Model material cartridge goes in the Top slot; Support material goes in the Bottom slot).

NOTE

You might get the message, Cartridge Not Replaced Or Invalid. This occurs if you do not insert the new cartridges within 30 seconds. In this case the cartridge will not lock into its slot. You must press the Retry button before continuing the process.

9. The panel will display **Load Material - Ready To Load**. Press **Load** to load material.
10. Watch the extrusion tips (see [Figure 11 on page 35](#)) to see if material extrudes (purges) after loading. The panel will then display **Did Material Purge?**
 - Press **Yes** (to continue) or **No** (to return to Load Material) as appropriate — or press **Purge Again** if you're unsure which to choose.

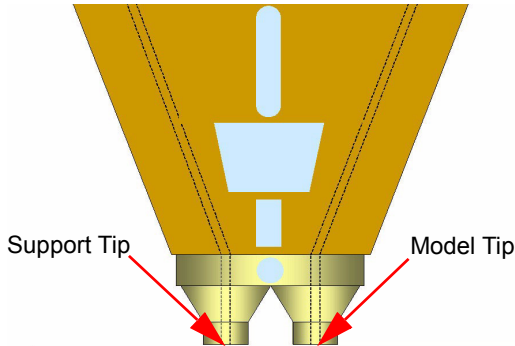


Figure 11: Close-up of extrusion tips

NOTE

If the display shows **Load Failed**, press **Retry**. If load fails again, remove the cartridge, snip the material (see [Figure 10 on page 34](#)), remove filament in the system, and reinsert the cartridge.

Unloading Material

The model and support material cartridges may be replaced separately or at the same time. In idle-, load-, or build-related modes, the panel displays the percentage of material remaining in the cartridges. If the system will be operating unattended for a long period, and the material level is getting low, you may want to replace the cartridges before starting a new part. Of course, you will also need to replace the cartridges when they are empty.

Unload material cartridges:

1. From **Idle** (or **Ready To Build**), Press **Material Load**.
 - A. The panel displays **Load Material** and prompts with, **Replace model?**
 - Press **Yes**. to unload the Model Material. The panel displays **Replacing model**,
 - Press **No** if you do not wish to unload the model material.

- B. The panel then prompts with, **Replace support?**
 - Press **Yes.** to unload the Support Material. The panel displays **Replacing support,**
 - Press **No** if you do not wish to unload the support material.
 - C. After you have made the above choices, the panel displays **Unloading** for approximately 60 to 75 seconds (the selected materials will be unloaded from the extrusion head).
 - D. When unloading is complete, the panel will prompt you to remove a cartridge based upon your choices - i.e., **Replace Both Cartridges, Replace Model (Top) Cartridge, OR Replace Support (Bottom) Cartridge.**
2. Remove the material cartridge(s) by first pushing it forward gently, and then pulling it out of the slot.

CAUTION



Do NOT try to rewind the filament that remains in the system. This will cause material to cross-wind in the cartridge causing cartridge failure.

- When you remove a cartridge there will be approximately 180 cm (6 feet) of filament that will need to be pulled from the system. (This is normal. Material is only retracted from the extrusion head during 'unloading'.)
3. To store a partially used cartridge, place a small flag of tape on the filament near the cartridge. Cut off and discard the remaining material. The tape flag ensures the filament does not retract into the cartridge.

Building a Test Part

Stratasys has factory-preloaded test parts into the FDM 200mc. It is recommended that you build a test part as your first build to familiarize yourself with the system.

Once the system has warmed up, material has been loaded, and a plastic modeling base is in place, you can build a test part.

To build a test part:

1. Press **Maintenance**.
2. Press **Test Parts**, and select one of the available sample parts.


FDM 200mc automatically starts building the part.

3. When the part is finished, follow the steps for [“Removing a Completed Part” on page 41](#).

Sending Your CAD File to the System

This section describes the procedures used for sending your own CAD files to FDM 200mc.

Send a “job” to the FDM 200mc:

1. Create an .stl file with your CAD software.
2. Click on the Insight icon  on the desktop of your workstation.

The Insight main window opens (Figure 12).

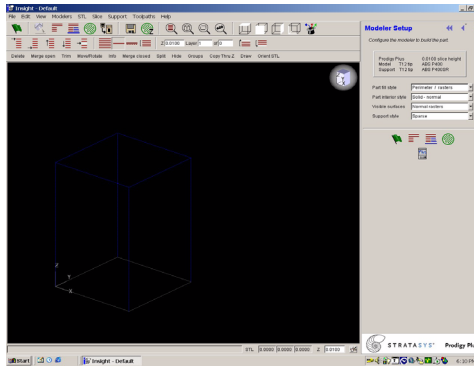




Figure 12: Insight main window

3. From the File menu, click **Open**.
4. Choose an .stl file from your CAD package, and open it.
5. Orient your part. For more information on part orientation, refer to the Insight help files.
6. Prepare the part by either clicking on the green flag button  , or by manually processing the file. This step:
 - “Slices” your part into layers
 - Calculates support geometry
 - Generates toolpaths (motions the head makes while extruding)
 - Completes all processing to create a .cmb file for FDM 200mc
7. Click on the Status icon  on the desktop of your workstation to send your file to FDM 200mc. For more information on Status, refer to the Insight help files.

Building a Part from Your CMB File

After Status has sent a .cmb file, the panel displays **Ready to Build** and your file's name.

Build a part:

Press **start Model**. The system will warm up to correct build temperatures. The panel displays **Finding Home**, meaning the head is currently finding the top of the plastic modeling base on which the part is to be built. After finding its starting point, FDM 200mc begins building the part.

Read the display panel while building:

The two lines of the display panel show system-status messages on the first two lines ([Figure 13](#)). The bottom line of the panel shows the material amounts remaining in the cartridges.

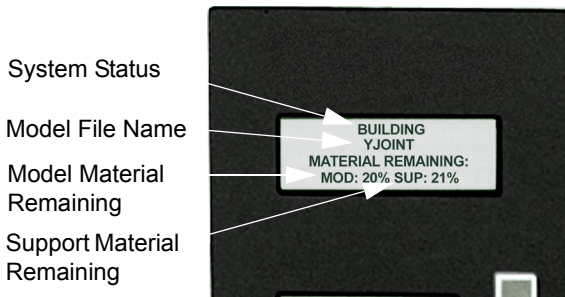


Figure 13: Display panel during build

Chamber Lights

When a part starts to build, the chamber lights are automatically ON. You can toggle lights ON or OFF through the Display Panel.

You can also turn the light on continuously. Go to the **Idle** or **Ready to Build** mode. Press **Maintenance** and then press **Next** until **Setup Maintenance** is displayed. Press **Lights Always**. The light will remain ON until the system is powered OFF.

Pausing Build

While building a part, you may want to pause the operation - e.g, to allow for replacement of a material cartridge. To pause the build operation at any time, press **Pause**.

NOTE

When the build process is paused, the FDM 200mc completes the current tool path before pausing.

On your workstation, Status displays the following information:

- Pause status
- Modeler's name
- Type of modeler (FDM 200mc)
- Job name
- Build time remaining
- Percentage of part built

Resuming Build from Pause Mode

If you have pressed **Pause**, and are ready to resume building the part, press **Resume**. FDM 200mc resumes modeling.

Resuming Operations from Standby Mode

After several minutes of inactivity, FDM 200mc enters Standby mode. During Standby, the head and build envelope temperatures lower to save energy.

Continue operation from Standby mode:

1. Press **Resume**.
 - The panel displays **Ready to Build** and your part's name (if there is a part in the queue). It also shows the amount of material remaining in the model material cartridge and the support material cartridge (e.g. **Mod 90 %**, **Sup 85 %**).
 - **Start Model** begins blinking.

2. Press **Start Model** to begin modeling.
(The FDM 200mc may require a few minutes to warm up to proper build temperatures. You can view the temperature values in the display.)

Canceling a Job

You can cancel a job at any time while the part is being built.

To cancel a job:

1. Press **Pause**.
2. Once FDM 200mc stops building, press **Cancel Build**.
The panel displays **Are you Sure?**
3. Press **Yes**. The panel displays **Build Stopped** followed by the part name.
4. The panel prompts you to remove the part and replace the modeling base (See ["Insert Modeling Base" on page 20.](#)).
Once the chamber door has been opened and closed, the panel asks: **Part Removed?**
5. Press **Yes only after** removing the part - refer to ["Removing a Completed Part"](#).

CAUTION



If you press **Yes** before removing the part, the system can be damaged, and a service call will be required.

Removing a Completed Part

When the part has completed, the panel displays **Completed Build**, and the file's name. It also shows **Remove Part** and **Replace Modeling Base**.

Remove a completed part from the FDM 200mc system:

1. Open the modeling chamber door.

2. Release the modeling base retainers and pull the modeling base towards you, out of the tray guides.
3. Insert a new modeling base.
4. Close the modeling chamber door.
5. After you have opened and closed the door, the panel displays **Part Removed?** *Only* after removing the part, press **Yes**.

CAUTION



The system can be damaged if you answer **Yes and the part has not been removed!**

After you press **Yes**, the panel displays the status as **Ready to Build** for the next part in the queue.

Remove a completed part from the modeling base:

1. After removing the base from the system, firmly flex the modeling base back and forth with your hands to loosen the part. For best results, flex the modeling base front-right to back-left.
2. Pull the part off the base or use a putty knife to pry the part completely off.

NOTE

Parts are much easier to remove when the modeling base is still warm.

Soluble Supports

FDM 200mc uses a soluble support material. WaterWorks Soluble Support Concentrate is a water-based solution designed to simplify the removal of the support material. Your part is left smooth and clean with the fine details intact. The soluble support material can be removed by hand with relative ease, but is designed to be dissolved off of your parts for hands-free part finishing.

WARNING



Wear the safety goggles safety gloves (provided in the Startup Kit) when removing supports.

When removing soluble supports by hand, wear leather gloves.

When removing soluble supports with the soluble concentrate, wear rubber gloves.

Dissolving supports is affected by four parameters:

- **Chemistry:** Each bottle of soluble concentrate is designed to produce the optimal concentration when mixed with 40 liters (approx. 11 US gallons) of water. Always maintain the correct ratio of concentrate to water. Always add the concentrate to water, never add water to the concentrate.
- **Temperature:** The warmer the water used for dissolving, the faster the parts are cleaned. To avoid warped or damaged parts, do not use the cleaning tank above an operating temperature of 70° C (158° F). If using an ultrasonic tank, it is recommended to the tank be operated without a lid to avoid over-temperature conditions.
- **Mechanical Energy:** The dissolving of material is enhanced by agitating the solution. Using a circulation or ultrasonic tank is the fastest and surest method of removing soluble support material. Commercial ultrasonic units are available in both 25 Khz and 40 Khz; either frequency can be used.
- **Time:** Support removal time is dependent on various factors. It can be reduced significantly by breaking off much of the support by hand before putting the part in the solution. This also extends the working concentration level of the solution.

To check the part and water level:

Various factors determine how long it takes to remove supports in the tank. These factors include: tank type, tank usage, part size, and part geometry.

For best part quality, check parts as follows:

- Check parts after two hours and then periodically until complete. Due to air pockets and circulation patterns, rotating the part may help shorten dissolving time.
- Check the tank periodically for over-heating and evaporation. The water level always needs to be above the parts. You can add more water if necessary, but do not add more soluble concentrate.

CAUTION



Adding more soluble concentrate than recommended can damage parts.

To remove the part from the tank:

Carefully remove parts from the tank using either plastic or stainless steel removal tools, as they need to withstand the water temperature and high alkaline solution.

To rinse or soak parts:

Rinse white parts thoroughly with water until surfaces are no longer slippery (1-2 minutes). Some white parts may need to soak for an hour to help pull the concentrate from surface to reduce possible staining. Soak color parts in water for one hour to pull and dissolve the concentrate.

Not rinsing or soaking parts long enough can leave them with a white residue, and/or streaks. To remove the residue, re-rinse or soak parts in a solution of dish washing rinse aid and water. Then re-rinse to break the surface tension.

If you build parts using the Sparse build style, allow solution to fully drain from them. Rinse parts thoroughly under hot water to remove trapped solution.

To dry parts:

Air-dry, use paper towels, or use compressed air to remove moisture.

To change the solution in the tank:

How often the solution must be changed is dependent upon the quantity of dissolved support material, the tank type, and the complexities of the parts you build. We recommend changing the solution after using approximately 25 cubic inches (410 cc) of material.

The following indicate the need to change solution:

- Parts turn brown or yellow.
- Parts have a sticky residue and/or stick together.
- Parts with moving features that do not function.
- Parts have shiny surfaces.
- Small pieces of plastic stick firmly to the part and cannot be removed. (This is more common with circulation tanks.)
- Supports won't remove after soaking parts.

To dispose of the soluble concentrate:

The soluble solution has been specially formulated to be safely disposed after dilution or neutralization to an acceptable pH level. The pH level of fresh solution is similar to dishwasher and laundry detergents, and household cleaners.

Product	pH Level
Fresh soluble solution	12.6
Laundry detergent	11-12
Household cleaners	9-12
Dishwasher detergent	10-11

Check your local, state, and/or international regulatory statutes for what pH level is acceptable for disposal. Stratasys recommends that disposal procedures be verified by the proper authorities in your region.

Stratasys cannot anticipate local, state, or international regulatory statutes. Stratasys cannot be held liable if the solution is not disposed of properly. You may need to document how you dispose of the concentrate.

Soluble Solution Drain Effluent

You can dilute the solution with water using the appropriate ratio to meet your acceptable pH level. The Drain effluent data below is based on a dilution of 1 part soluble concentrate to 5 parts water containing approximately 28 cubic inches of soluble release material dissolved in 11 gallons of water.

Parameter	Test Method	Units	Tank Value	Diluted Value*
pH	EPA 150-1		12.6	11.8
COD**	EPA 410-1	mg/L	14,000	2,400
BOD***	SM 5210B	mg/L	820	250
Total Solids	EPA 160.3	mg/L	27,000	4,400
Total Suspended Solids	EPA 160.2	mg/L	430	54
Cadmium	SW-846, 6010A	ug/L	<5	<5
Chromium	SW-846, 6010A	ug/L	<5	<5
Copper	SW-846, 6010A	ug/L	<10	<10
Nickel	SW-846, 6010A	ug/L	<10	<10
Lead	SW-846, 6010A	ug/L	<40	<40
Zinc	SW-846, 6010A	ug/L	<20	<20
Mercury	SW-846, 7470A	ug/L	<2	<2

*These values remain constant if the same ratios apply (e.g. 5.5 gallons cleaning device containing approximately 14 cubic inches of soluble release material with the same dilution ratio of 1 part soluble concentrate to 5 parts water).

**Chemical Oxygen Demand

***Biological Oxygen Demand

Neutralization

The solution can be further neutralized to lower the pH level by slowly adding acid (e.g. malic acid) to the tank before draining the solution.

Maintenance

Follow the simple procedures within this chapter to ensure continued proper operation of FDM 200mc.

Startup Kit Tools

Provided in your FDM 200mc Startup Kit is a set of tools used to help you maintain the system, as well as replacement parts.

The following list is of the tools contained in the Startup Kit that are used in Maintenance and Troubleshooting procedures.

- Needle Nose Pliers
- Leather Insulated Gloves (Pair)
- Putty Knife
- Cutters
- Soft-bristled Glue Brush
- Brush (bronze)
- #2 Phillips Head Screwdriver
- Allen Wrench Set
- Tube Anti-Seize Compound

WARNING



**Krytox grease can cause skin irritation.
Avoid contact with skin and clothing
when it is being handled.**

- 2 oz. Tube Krytox Grease

After Each Build

Empty Purge Container

The black, plastic purge container is attached to the rear wall of the modeling chamber, on the right side (see [Figure 1 on page 11](#)).

NOTE

A full purge container may impact part quality.

1. Remove the purge container by grasping it and pushing it upward to release it from its three mounts.
2. Pull the container towards you and out of the chamber.

CAUTION



When reinstalling the container, make sure that it locks on all three mounts and hangs flush with the chamber wall to avoid damage.

3. Empty the container and reinstall on 3 mounts.

Remove Debris Buildup

Remove any material buildup on the Z-platform and around the lead screw. Failure to do so could cause the base to become unlevel or, if the buildup is large enough, it could cause the Z-stage to jam at its upper limit.

Weekly Maintenance

Vacuum the Build Chamber

Vacuum the build chamber to remove all foreign particles and purged material.

Quarterly Maintenance

Axis Maintenance

1. Clean and lubricate the Z-axis lead screw (*drive screw*), X-axis guide rods (2), Y-axis guide rods (2), and Z-axis guide rods (2). See [Figure 14](#) for locations.
 - Clean with isopropyl alcohol.

WARNING



Krytox grease can cause skin irritation. When it is being handled, use impervious gloves and avoid contact with skin and clothing.

- Lubricate using the Krytox grease provided in the Startup Kit. Use the grease sparingly.

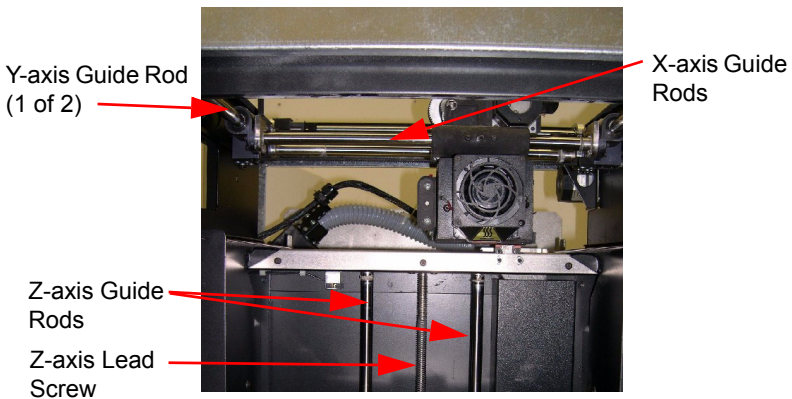


Figure 14: Lead screw and guide rod identification

Clean fan filter

To clean the fan filter:

1. Locate the lower fan on the rear panel of the FDM 200mc and remove the plastic frame (snaps on and off) that secures the fan filter.
2. Clean the filter with soap and water, and blot it dry.
3. Reassemble.

Tip Cleaning Assembly (Brush/Flicker Assembly)

(Refer to [Figure 15 on page 51](#)).

NOTE

The flicker should be replaced after 500 hours. It is only necessary to replace the brush after 2000 hours.

1. Completely power down the system. See [“Powering Off the FDM 200mc” on page 31](#).
2. Remove the purge container. See [“FDM 200mc Front View” on page 11](#).
3. Remove the old flicker. - loosen the flicker attachment (rear) screws and pull up on the flicker.
4. Insert the new flicker and tighten the rear screws while gently pushing down on the flicker.

NOTE

The bottom of the material tip must hit in the top 75% of the flicker.

5. Remove the old tip cleaning brush by loosening the two mounting screws and pulling up on the brush.
6. Install the new tip cleaning brush, but do not tighten the mounting screws.
7. With a glove on your hand, move the head so that the tips are above the tip cleaning brush.
8. Adjust the tip cleaning assembly until the brush lightly touches the bottom of the Model Tip Shroud. Tighten the brush mounting screws to 12 in-lbs (1.356 Nm) of torque.

NOTE

Ideally, the top of the brush and the top of the flicker should be the same height. Brush height, however is more important to tip maintenance than the flicker height.

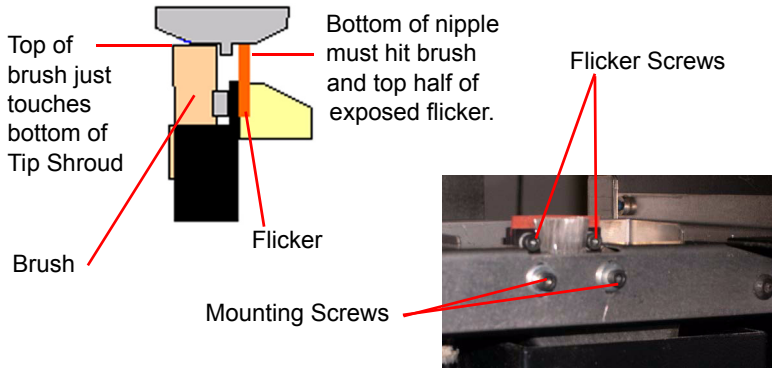


Figure 15: Replacing the tip cleaning brush

As Needed Maintenance

The following maintenance items have no routine schedule but should be tended to as needed.

Clean Door Glass

The door glass can be cleaned with any commercial glass cleaner.

Chamber Lamp Replacement

Replace the chamber lamp when it burns out.

NOTE

There are two chamber lamps in the modeling chamber. They are located on the front wall of the chamber. One to the upper right, the other to the upper left.

To replace the chamber lamp:

1. Power down the system.
2. Pull the lamp straight out of the socket.



CAUTION

Do not touch the new bulb with bare fingers. The natural oil of your skin can cause premature bulb failure. Grasp the base of the bulb instead.

Use only 24 V, 20 W bulbs.

3. Find the socket wires leading away from the socket.
4. Pull on the socket wires while inserting the two prongs of the new lamp into the two holes of the socket. When the lamp is seated into the socket, release the socket wires.

NOTE

Pulling on the socket wires releases the spring-loaded contacts in the socket. If the lamp is installed without pulling on the socket wires, the lamp might not be held securely in the socket.

Tip Shroud Replacement

Due to repeated contact with the tip-wipe brush, it is normal for the tip shroud to become worn. When chronic build up of material around the tip area or clumps of burnt material become imbedded in the part, replace the tip shroud.

WARNING



Head area is very hot! Use gloves when installing a new shroud!

1. Enter **Maintenance**, press **Next**, and access the **Table Maintenance** function.

The head temperature decreases.

2. Using a 1/8-inch hex wrench, back out the two head-plate mounting screws approximately 1/8 inch (see [Figure 16](#)). Do not remove the screws.
3. Pull the head plate slightly away from the head until the right side of the plate is clear of the mounting screw head.

- Pivot the right side of the head plate upwards, and rest the right side of the plate on the right mounting screw, as shown in [Figure 16](#). There is a small notch on the bottom of the plate for this purpose.

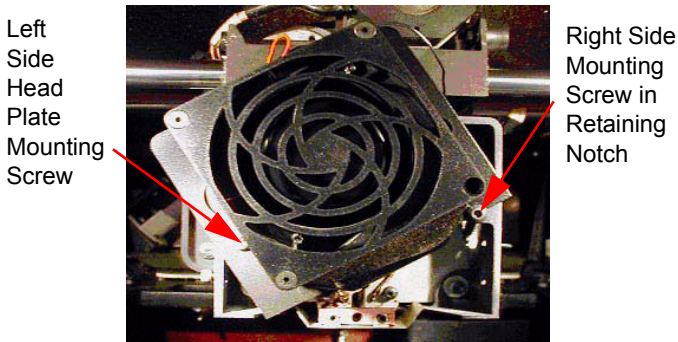


Figure 16: Head plate in shroud replacement position

- Locate the shroud, the shroud-mounting screws, and shield, as shown in [Figure 17](#).

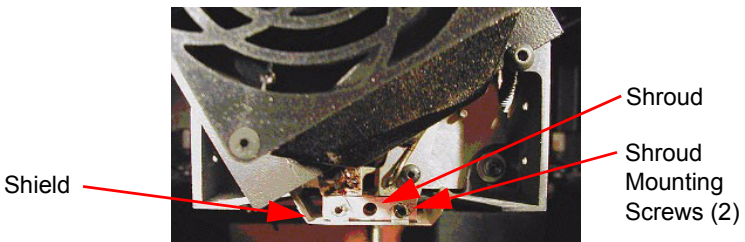


Figure 17: Shroud and shield location

- Remove the two shroud mounting screws using a 3/32 inch hex wrench.



WARNING

Screws are very hot! Use gloves when working in this area of system!

7. Remove the metal shield - pull the metal shield down to remove it. Be careful not to bend or damage the shield.
8. Pull the shroud downward to remove it.
9. Clean the exposed tip with the bronze brush provided in the Startup Kit.
10. Install the new shroud by pushing it up onto the tip.

NOTE

The shroud is keyed and can only be installed with the holes offset to the rear.

11. Slide the metal shield back over the shroud.
12. Check that both the shroud and shield are positioned correctly.

NOTE

Apply a thin coat of anti-seize compound to the threads of the shroud mounting screws.

13. Drive the two shroud-mounting screws into the shroud and tighten, but ***do not over-tighten the screws!***
14. Lower the head cover into position, and tighten both head cover screws.
15. Exit the Table Maintenance function.
16. Build a test part to verify system is operating correctly. See ["Building a Test Part" on page 37](#)

Troubleshooting

Troubleshooting Checklist

Problem or error message	Solution
No power	Verify power cord is securely plugged in.
	Verify circuit breaker (at rear of system) and power switch (right side of system) are both in the ON (up) position.
	Verify AC power is present at wall outlet.
System fails to reach operating temperatures	Verify the system is not connected to an extension cord or power strip.
Material not extruding	Filament may be jammed in extrusion head (See “Loss of Extrusion” on page 58.).
Purge material accumulating on part.	Make sure that the flicker and brush are set to the proper height. (See “Tip Cleaning Assembly (Brush/Flicker Assembly)” on page 50.)
	Check condition of Flicker and Brush. Replace if worn. (See “Tip Cleaning Assembly (Brush/Flicker Assembly)” on page 50.)
No text displayed on Display Panel	Cycle power (See “Cycling Power” on page 31.).

Problem or error message	Solution
Cannot communicate with system through network	Incorrect IP address – check that the IP addresses within the FDM 200mc system and Insight are the same values (See “Setting Network Addresses” on page 24.).
	Make sure IP address is static on your network (contact your IT department).
	Verify IP address entered in Insight “Status” or “Admin” has the same value as system but contains no zero’s in the first position within each section of the IP address.
Error Code displayed on Display Panel	Call for customer service. For more information, See “Fault Determination Codes” on page 57..
Display Panel displays Build Error	Partial or bad part file sent to system. Check STL file validity in CAD software; reprocess STL in Insight and reupload to system.
Display Panel displays Can’t Find Home – Check Substrate	Verify a plastic modeling base (substrate) is inserted.
	Plastic modeling base may be used or defective. Replace it.
Display Panel displays Communication lost at HR:MN UCT	The system stopped reporting its status at the UCT (Universal Coordinated Time) shown. Wait for the system to complete building the part. The system will automatically restart and display Build Complete. It is then safe to remove the model.
Display Panel displays Could Not Read Cartridge	Remove cartridge and cycle power (See “Cycling Power” on page 31.); reload cartridge.
	Try a different cartridge.

Problem or error message	Solution
Display Panel displays Load Failed	Retry with same cartridge.
	Try a different cartridge.
	Filament may be jammed in extrusion head (See “Loss of Extrusion” on page 58.).

Fault Determination Codes

If a fault occurs, which would prevent FDM 200mc from executing an operator request, the system begins shutting down and cooling. The panel then displays one or two error codes. An error-code list (with the filename “error.txt”) can be found on the CD-ROM for the controller software. Since this list changes with each new software version, make sure to use your most recent version of the controller software on CD-ROM.

When the system has finished cooling, the only option displayed is **Continue**. Press **Continue** and the system reboots and tries to return to normal operation. If pressing **Continue** does not recover the system, the system should be power cycled using the red power switch on the right side of the system (See [“Cycling Power” on page 31.](#)); wait 60 seconds before switching power on again. In most cases you will be able to continue operation. However, if the system continues to shut down and display the same error, call your service representative.

Loss of Extrusion

Diagnosing Loss of Extrusion

Occasionally, the system's head may experience loss of extrusion. This will be evident by observing one of the following:

- Seeing the head moving with no material coming out of either liquefier tip
- The height of the model and support materials are not equal
- Sagging structures due to lack of support materials

WARNING



The head area is very hot! Use gloves when working in this area of system!

Diagnose loss of extrusion:

1. Press **Cancel** and remove any parts from the system.
2. Insert a new modeling base.
3. From **Idle**, enter **Head Maintenance**
 - A. Using the keypad, press **Maintenance**.
 - B. Press **Next**. The head will come to rest in the center of the chamber and the Z Platform will change position. Choose **Head Maintenance**.
4. Determine if there is an extrusion problem by pressing **Forward** (command will be available after Head reaches operating temperature). Watch both tips for several seconds, looking for extrusion (material purge).

NOTE

The tip may not immediately extrude material if it was at a cool temperature. After the tip reaches operating temperature you may need to wait up to 30 seconds before extrusion will begin.

5. Press **stop** to stop extrusion.

6. If material steadily flowed from the tips, the head is not experiencing loss of extrusion.
7. Return the system to the Maintenance state - Push **Done**, then answer **Yes** when the system displays **Is Material Loaded?**
8. If material did not extrude from both tips follow the procedure in the following section, "[Recovering From Loss of Extrusion](#)".

Recovering From Loss of Extrusion

NOTE

It is recommended that you read and understand this entire procedure before performing any of the work.

1. Enter **Head Maintenance** mode.
 - From **Idle**, press **Maintenance** > then **Next** > then **Head Maintenance**.

WARNING



The head area is very hot! Use leather gloves when working in this area of system!

2. With the Phillips-head screwdriver provided in the Startup Kit, release the two screws securing the head assembly (see [Figure 18](#) - the screws require only ¼ turn to release). Swing open the front half of the head.

NOTE

You may feel resistance when you swing open the front half of the head. One, or both, of the material filament lines are likely to still be routed into the head and held by the drive motor. This is normal. Swing the door open slowly, but firmly.

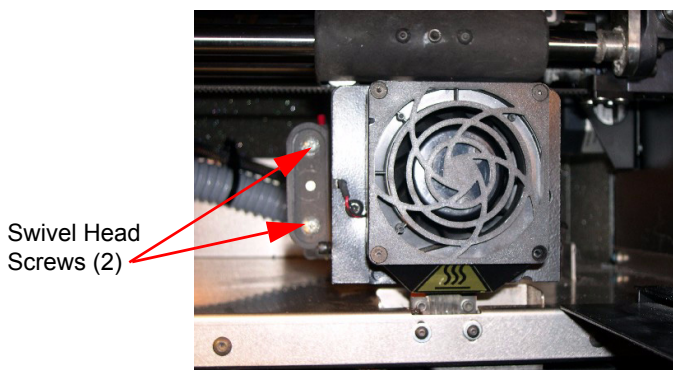


Figure 18: Location of swivel head screws (2)

3. Attempt to re-establish extrusion.

NOTE

Both material filaments must be coming out of the feed tubes at the back of the head (see [Figure 19](#)) and still be going into the drive block funnels in the front half of the head in order to proceed with this step. If not, skip to [step 4](#).

- A. Run both filament motors forward while gently pushing the filament that stopped extruding into the filament guide rollers. Do so for about three seconds.
- B. If the purge was successful:
 - i. Continue to run both filament motors forward and slowly swivel the head closed. Be careful to not pinch the filament or the head wiring when closing the head.
 - ii. Once the head is closed, tighten both of the swivel head screws, $\frac{1}{4}$ turn.
 - iii. Verify material continues to extrude through both tips for an additional 30 seconds, then press **Stop** to halt extrusion.
 - iv. Push **Done**. The panel displays **Is material loaded?**
 - v. Press **Yes**. The panel displays **Exiting maintenance** and you can now resume normal operation. (Skip [Steps 4](#) through [13](#).)

- C. If material did not purge, continue with the following steps.
4. Snip both filaments approximately 1 inch from the fixed part of the head (see [Figure 19](#)).



Figure 19: Materials coming out of feed tubes

NOTE

On rare occasions, the material may **NOT** be extending out from the feed tubes. If this occurs, push in the appropriate cartridge to unlatch it. Pull out the cartridge to expose the filament and manually feed the filament through the feed tubes until the filament comes through the back of the head. Pull the filament from the head while inserting the cartridge. Once the cartridge latches, pull an additional 6 inches of filament through the head (to make sure the filament is not caught at the cartridge receiver). Then snip the filament approximately 1 inch from the fixed part of the head.

5. Remove the filament from both drive block assemblies if there is enough to remove by hand.
 - A. Select **Reverse**.
This causes the drive wheels to reverse, so the material filaments can be backed out of the liquefier.
 - B. Grasp the filament from the drive blocks with your fingertips, and gently pull it out of the drive wheels. Repeat for second filament. If you are unable to easily remove

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either filament, leave the filament in the drive block for now.

6. Remove both drive block assemblies from the swivel part of the head.
 - A. Set a material cartridge on top of the tray to support the removed drive block assemblies.
 - B. Remove the support drive block first. Use a 7/64" Allen wrench to remove the two screws securing the motor assembly as shown in [Figure 20](#).

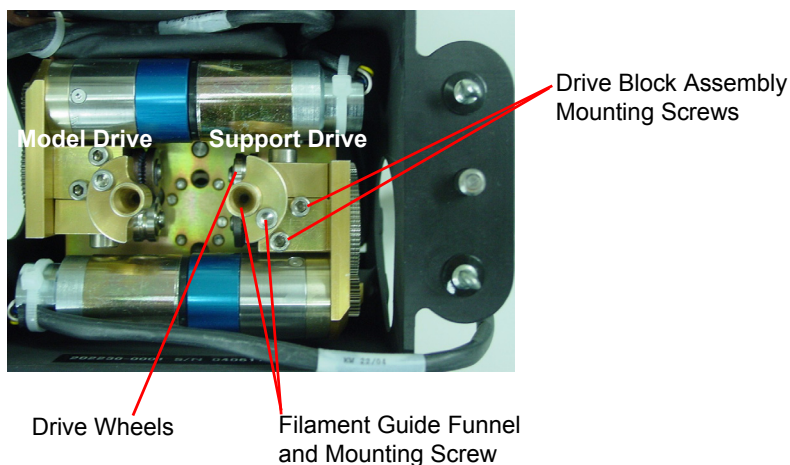


Figure 20: Removing the drive block assemblies to check for buildup

- C. Set the drive block assembly on the material cartridge.
 - D. Remove the model drive block assembly the same way.
7. With the drive blocks removed, look through both filament guide funnels for obstructions. If an obstruction is present, clear the drive block obstruction:
 - A. Remove the filament guide funnel.
Use the 7/64" Allen wrench provided in the Startup Kit to remove the filament-guide mounting screw as shown in [Figure 20](#).
 - B. Remove any excess material; use the needle-nose pliers if necessary.

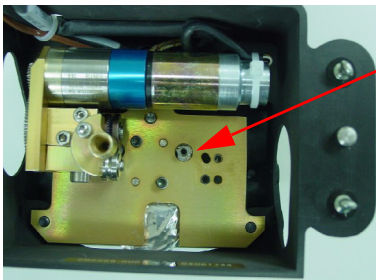
- C. Replace the filament guide funnel.

CAUTION



Liquefier inlet tubes are fragile. Be careful not to damage them when removing material.

8. With the drive blocks removed, inspect liquefier tube inlet area.
- A. (Inspect the liquefier inlet tubes (Figure 21).
- i. If material is extended out from an inlet tube, gently remove material with the bronze brush or needle-nose pliers.
 - ii. Inspect for damage to the inlet tube.



Support Liquefier Inlet Tube
(shown with only the support drive block removed)
Model Liquefier Inlet Tube will look the same.

Figure 21: Inspecting the liquefier inlet tubes

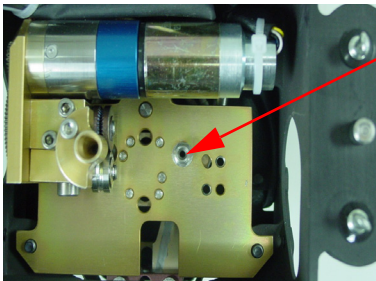
- B. Inspect the *model* liquefier inlet tube, and the *support inlet funnel* covering the *support* liquefier inlet tube (Figure 22).
- i. If material is extended out from the *inlet* tube:
 - a. Gently remove material with the bronze brush or needle-nose pliers, if necessary.
 - b. Inspect for damage to the inlet tube.
 - ii. If material is extended out from the *support* inlet funnel:
 - a. Gently remove material with the bronze brush or needle-nose pliers, if necessary.

- b. If the material buildup in the inlet funnel is difficult to remove, insert a 1/16" Allen wrench into the liquefier inlet funnel and try pushing the obstruction forward.
- c. If this doesn't work, remove the liquefier inlet funnel using a 1/4" nut driver. Dissolve support material from the funnel with the soluble support solution.

NOTE

It is typical for material to build up around the support liquefier inlet tube under the inlet funnel. Do not remove this material unless it interferes with reinstallation of the inlet funnel.

- d. Inspect for damage to the support inlet tube.
- e. Replace the liquefier inlet funnel.



Support Liquefier Inlet Funnel

(shown with only the support drive block removed)

Model Liquefier Inlet Tube does not have a funnel.

Figure 22: Inspecting the support liquefier inlet funnel and model liquefier

- 9. Clean the inside of the liquefier inlet tubes. Carefully insert a 1/16" Allen wrench into the liquefier inlet tubes and gently push forward until it stops (about 1/4 inch).
- 10. Replace both drive-block assemblies. Install the model drive block assembly first. Make sure the block is seated flush against the swivel plate.

CAUTION



Be careful not to pinch the assembly's wiring harness under the block or behind the motor before replacing and tightening the mounting screws.

11. Repeat for the support drive block assembly.
12. Clean the drive wheels.
 - A. Press **Select Drive** repeatedly until the display shows **Both Drive Motors**.
 - B. Press **Reverse**.
 - C. With the glue brush provided in the Startup Kit, clear any material buildup from each drive by brushing its serrated drive wheel.
13. Check for Extrusion.
 - A. Press **Forward**.
Pull out 6 inches of material from the fixed head housing. Feed the filament into the drive blocks and look at the tips to verify material is extruding through both liquefiers.
 - B. If the filament does not extrude:
 - i. Stop the motors and return to Step 4.
 - ii. If, after two tries the material fails to extrude, call your service provider.

CAUTION



While closing the head, be careful not to crimp the filament, and make sure that the head wiring doesn't get pinched between the swivel head and the rear head housing.

- C. If the purge was successful, continue to run both filament motors forward and slowly swivel the head closed.
- D. Once the head is closed, tighten both $\frac{1}{4}$ turn screws.

- E. Verify material continues to extrude through both tips for an additional 30 seconds, and then press **stop** to halt extrusion.
- F. Push **Done**. The panel displays **Is material loaded?**
- G. Press **Yes**. The panel displays **Exiting maintenance** and you can resume normal operation.



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