# PRODIGY™ Plus

# *User Guide*



**STRATASYS®**

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The Prodigy Plus 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

Prodigy Plus is designed with ultimate simplicity in mind. Prodigy Plus enables you to build parts quickly, even if you've never used a modeler before. Its display panel prompts you to press a few keys to get you modeling quickly.

The system models with ABS plastic, so modeled parts are strong and durable. ABS also ensures you'll be able to drill, tap, sand, and paint your creations. Prodigy Plus is an innovative combination of proprietary hardware, software, and material technology.

### *Congratulations…*

### *you've made a smart choice!*

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# *Table of Procedures*

# Installation Checklist

This guide is designed to help you set up and configure your new Prodigy Plus modeling system. The following steps include easy-to-follow instructions.

# Overview

Prodigy Plus builds parts, including internal features, directly from CAD .stl files. The system builds three-dimensional parts by extruding a bead of ABS plastic through a computer-controlled extrusion head, producing high quality parts that are ready to use immediately after completion. With three 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.

Extrusion Head

Extrusion Tips

Guide Rods

Lead Screw

Modeling Base Retainer

Model Material Cartridge

Support Material Cartridge

Tip Cleaning Assembly

Purge Container

Modeling Base

Z-axis table

Display Panel

Power Switch

Context-sensitive display and keys
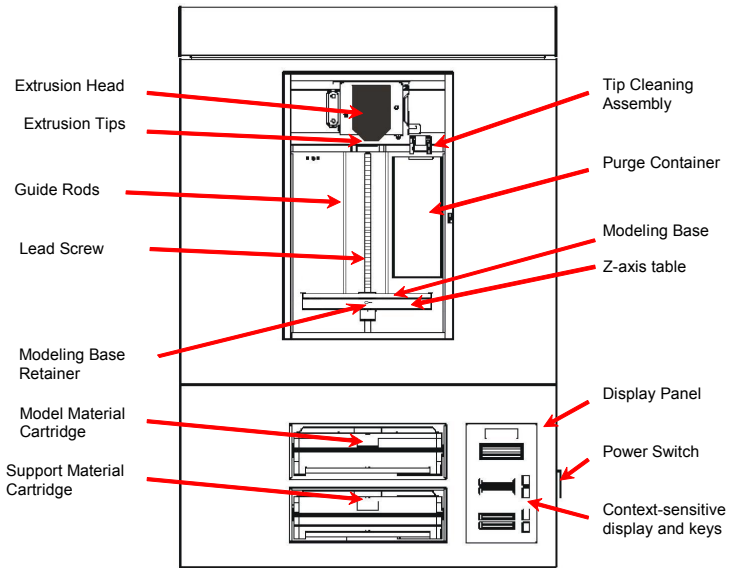
*Figure 1. Prodigy Plus Front View*

The Prodigy Plus system consists of two main components — the machine itself and Insight, the preprocessing software that runs on a Windows NT, Windows 2000, or Windows XP platform.

Prodigy Plus's build envelope measures 203 x 203 x 305 mm (8 x 8 x 12 in). Each material cartridge contains 922cc (56.3 cu. in.) of usable material — enough to build continuously for about 4 days without reloading.

# Finding More Information

Several references are available for use with Prodigy Plus.

## Setting up Prodigy Plus
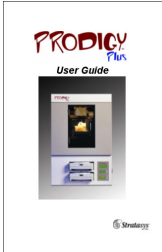
**Prodigy Plus User Guide**

Step-by-step instructions for installing, setting up and operating the Prodigy Plus system.

## Using Prodigy Plus

**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).

**Insight Training CD**

For more detailed training on the many advanced features within Insight, a training CD may be purchased.

**World Wide Web**

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

# Supplies

This section lists all replaceable supplies used by the Prodigy Plus modeling system.

| Part Number | Description |
|---|---|
| **Modeling Material** | |
| 340-20000 | White ABS Filament Cartridge |
| 340-20200 | Black ABS Filament Cartridge |
| 340-20300 | Red ABS Filament Cartridge |
| 340-20400 | Blue ABS Filament Cartridge |
| 340-20500 | Green ABS Filament Cartridge |
| 340-20600 | Yellow ABS Filament Cartridge |
| **WaterWorks Support Material/Concentrate** | |
| 340-30200 | WaterWorks Support Cartridge |
| 300-00600 | WaterWorks Soluble Concentrate (12 bottles) |
| **Modeling Base** | |
| 340-00100 | Prodigy Plus Modeling Base (case of 10) |
| **Miscellaneous** | |
| 300-00100 | Krytox Grease |
| 540-00101 | Tip Cleaning Kit (1 brush, 5 flickers) |
| 540-10000 | Tip Shroud |
| 300-01100 | ABS Glue (case of 12) |
| 340-02000 | 24V 20W Halogen Bulb (qty. 4) |
| To order supplies for your Prodigy Plus system, contact: | |

To order supplies for your Prodigy Plus system, contact:

| | | |
|---|---|---|
| North America: | Stratasys, Inc. | |
| | 952.937.3000 | |
| | 1.888.480.3548 (US Toll Free) | |
| | 952.937.0070 (fax) | |
| International: | Your regional distributor | |

# Setup

## Workspace

Observe the following when placing Prodigy Plus in its operating location:

- Prodigy Plus 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:
  110-120 VAC, 60 Hz, 15A min (20 amp recommended)
  –or–
  220-240 VAC, 50/60 Hz, 7A min (10 amp recommended)

- Temperature: 18–32°C (65-90°F)

- Relative Humidity: 30-80%, 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 Prodigy Plus for its first use.

**To unpack the machine:**

1.  Before unpacking machine, use a forklift to move it near its intended location.

2.  Remove the plastic banding from around the cardboard, and slide the cardboard up and off the pallet.

3.  Using the forklift, place the unit in its final location.

4.  Cut and remove the cable ties that secure the extrusion head to the Z-axis frame (see Figure 2).
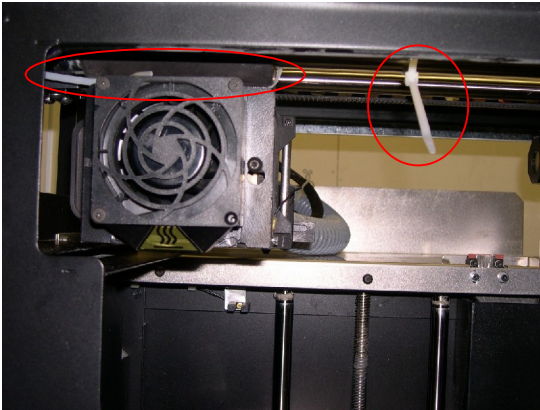


*Figure 2. Cable ties securing the extrusion head to Z-axis frame*



**WARNING**

**Before powering on Prodigy Plus, if you have not yet done so, cut and remove the plastic cable ties that secure the extrusion head to the Z-axis frame (see Figure 2 on page 14). The machine will be damaged if powered on while the head is tied to the Z-stage.**

5.  After uncrating and removing cable ties, inspect the machine and report any shipping damage to the carrier.

# Power Connections

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

**Important**

**Before connecting power to the machine, ensure that the circuit breaker located in the rear of the machine is in the off (down) position.**

Prodigy Plus is provided with two power cords: one for 110V and one for 220V.

**To 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 below. If using a UPS, connect the cord directly into the UPS.
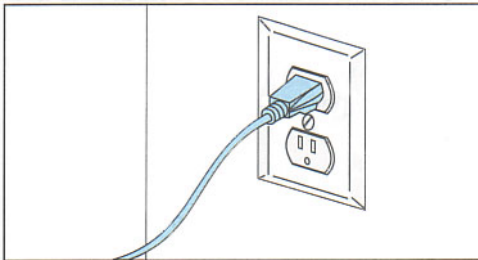


*Figure 3. Connecting to a grounded electrical outlet*

**WARNING**

**Connect the cord directly into the receptacle or UPS. Do not use an extension cord or power strip.**

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

3.  Switch the circuit breaker to the on (up) position.

The machine is now ready for powering on.

## Powering On Prodigy Plus

**WARNING**

**Prodigy Plus's 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. Use the leather safety gloves when working inside the machine.**

Prodigy Plus's power switch is located on the right side of the cabinet, near the bottom (see Figure 4 on page 17). After the switch is pushed, Prodigy Plus boots up in 3 to 7 minutes.

**Note**

**If the machine 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 Prodigy Plus is warming up and cooling down.**

**Note**

**For safety, the head and platen does not move while the chamber door is open. During warm-up and operation, a solenoid triggers the door lock. The door can be opened only when Prodigy Plus is not building a part, getting ready to build a part, or in pause status.**

## Powering Off Prodigy Plus

**Note**

**If the system is powered off during a build, the part will be lost. You should complete the current build and unload the material before a planned power-off.**

If you wish to power-off Prodigy Plus, simply flip the large red power switch on the lower right side of the cabinet (see Figure 4). System cooling fans continue to operate for several minutes ensuring a safe, systematic power down and cooling of the system.
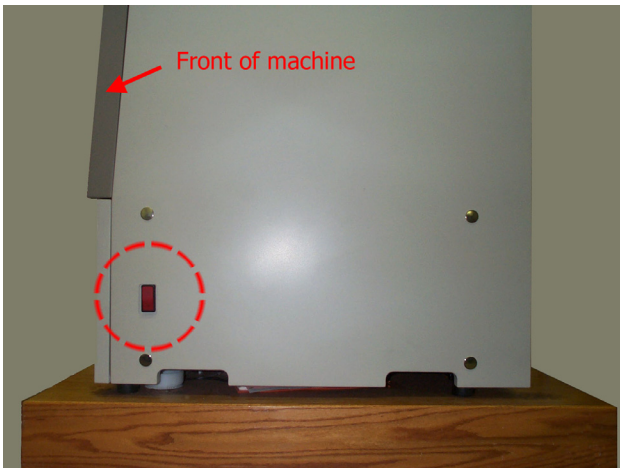


*Figure 4. Location of Power Switch*

**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 Prodigy Plus system. This section discusses the procedure for cycling the electrical system.

**To cycle power:**

1.  Flip the power switch located at the lower right side of the cabinet (Figure 4 on page 17) to the OFF (down) position. Wait for the machine to completely power down.

2.  Flip the circuit breaker located on the rear of the cabinet to the OFF (down) position.

3.  Wait ten (10) seconds and then flip the circuit breaker to the ON (up) position.

4.  Flip the power switch to the ON (up) position.

5.  Wait 15 minutes for the system to prepare itself for normal operation.

# Setting Network Addresses

You will need to set up your network addresses before sending files from the workstation to Prodigy Plus. If this has not been done already follow the steps below. Ask your IT department for your network addresses before beginning this process.

**To set the network addresses:**

1.  From `Idle` or `Ready to Build`, press **Maintenance**. The panel then reads `System Maintenance` and displays the software version.

2.  Press **Set Network**. These 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. The IP address must be changed for your network.

3.  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.

4. Use the three functions above to set your IP address.

5. 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 Net Mask) address. Follow the same steps for all addresses. Depending on your network, you might *only* need to set the IP address.

6. When you have finished setting addresses, press **Done**. The panel displays Change IP, Net Mask, Gateway?

7. Press **Yes**. The panel then displays Resetting Network and after a moment returns to Idle or starts warming up.

8. If you have not done so already, plug in the network patch cable from your network to the rear of Prodigy Plus.

9. From any workstation on your network, open a DOS window and type: "ping..." followed by Prodigy Plus' 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.

# Installing Software

Insight is the preprocessing software that controls Prodigy Plus. If you have not already done so, you will need to install the Insight software and optional utilities on your workstation. You will find the Insight disk 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 Prodigy Plus |
| FDM Modeler Status | Not applicable to Prodigy Plus |
| 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/2000/NT 4.0 (SP6 or higher) | |
| Distribution Media | CD-ROM | |
| Processor | Intel Pentium III 500 MHz minimum.<br>Recommended: Pentium 4 1.0 GHz, AMD Athlon | |
| RAM | 256 MB minimum, 512 MB recommended, 1GB recommended for large or complex jobs, and jobs with high detail or small slice intervals | |
| Hard Disk | Installation: | 15 MB (30 for full install) |
| | Paging File System: | 300 MB MB (minimum, dependant on amount of installed RAM) |
| Monitor | 17 inch or larger | |
| Graphics Resolution | 800x600 (minimum)<br>1024x768<br>1280x1024 (optimal and recommended) | |
| Video Card | Requires OpenGL-compliant accelerated graphics card<br>Preferred Vendors:<br>Nvidia based cards (GeForce and above)<br>Permedia based cards (Elsa, Diamond)<br>ATI Radeon based cards | |
| Network Interface Card | Ethernet 10/100 Base T | |
| Keyboard | 101 key or equivalent | |
| Mouse | 2 button or 3 button | |
| Web Browser | Internet Explorer 5.5 or later for online help | |
| **Note**: Changes to supported platforms, operating systems and graphics cards are periodically updated. Visit the customer login section at www.stratasys.com for latest supported versions. | | |

**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 controller software version:**

1. Check the version displayed on the system keypad.

2. Compare the version number to the controller software CD provided in the Startup Kit.

3. 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.

# Operation

## Display Panel and Keypad

The main interface to Prodigy Plus is the Display Panel and Keypad (see Figure 5).
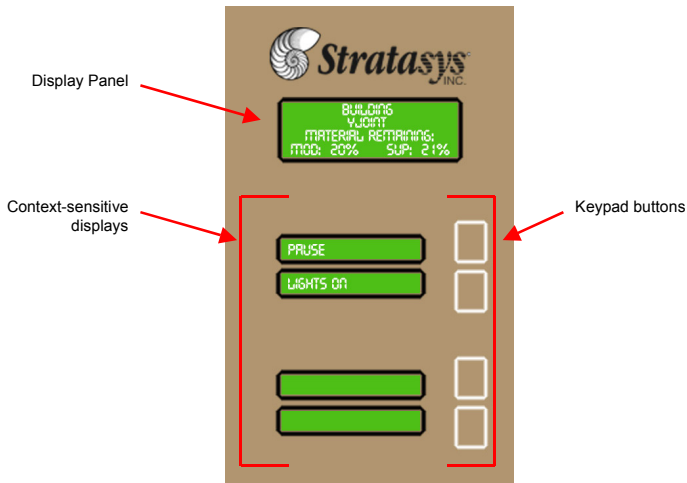


*Figure 5. Prodigy Plus Display Panel and Keypad*

The Prodigy Plus display panel and keypad 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 machine status. The remaining three lines give details related to the current operation.

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

# Loading a Modeling Base

Prior to installing a modeling base, remove any material buildup on the Z-platform and around the lead screw. Failure to do so could cause the base to become unleveled, or if the buildup is large enough, the Z-stage could jam at its upper limit. After powering on the machine, slide a modeling base into the guide rails, keeping one hand on top of the base to carefully guide it.

**Note**

**When inserting the base, ensure the rails slide smoothly into the gap in the base. Do not create a new gap, or your base will not be level!**

**Note**

**Re-use of modeling base may result in poor part quality.**

After inserting the base, visually ensure it is level, and secure it with the front modeling base retainer.

# Loading Build Materials

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

**To load material cartridges:**

1. Remove packaging and find the end of the material filament taped with a "flag".

**Important**

**Be careful when touching the pinch roller on the side of the cartridge. If you roll it backwards, you can inadvertently draw the material into the cartridge (refer to Figure 6 on page 25 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.**
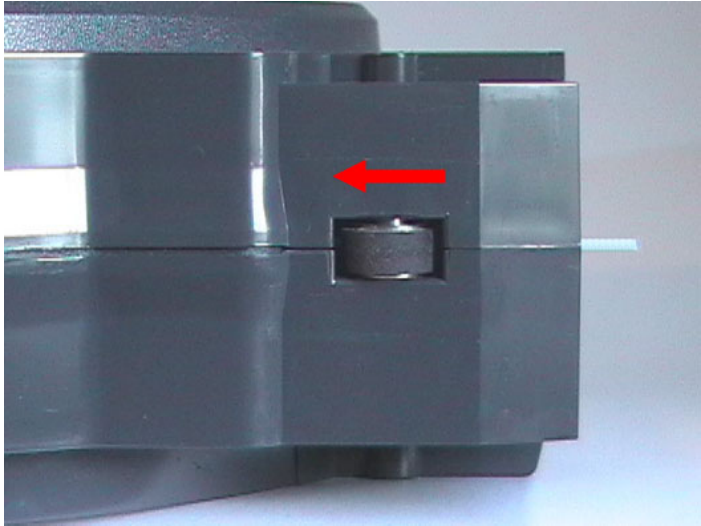
*Figure 6. Direction to Move Cartridge Roller*

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

3.  With the cutter provided in your Startup Kit, snip the filament at an angle, leaving 6mm (¼") of material protruding from the cartridge (see Figure 7 on page 26).
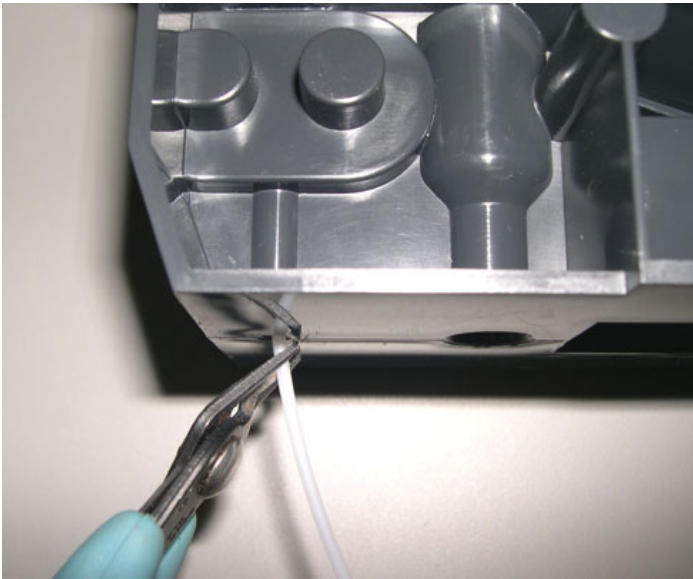
*Figure 7. Snipping the material filament to 6mm (¼") length*

4.  Press the **Material Load** button, which will be blinking. The panel first displays Unloading and then it instructs you to insert the cartridges with the prompt Replace Both Cartridges.

5.  Insert each cartridge. The panel then reads Ready to Load.

6.  Press **Load**. The panel then displays Loading. After the material loads, the panel displays Material Loaded.

**Note**

You might get the message, **Model 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.**

7.  Watch the appropriate extrusion tip (see diagram in Figure 8 on page 27) to see if material purges after loading. The panel will then display `Did material purge?`

8.  Press **Yes** or **No** as appropriate — or press **Purge Again** if you're unsure.



Support Tip

Modeling Tip
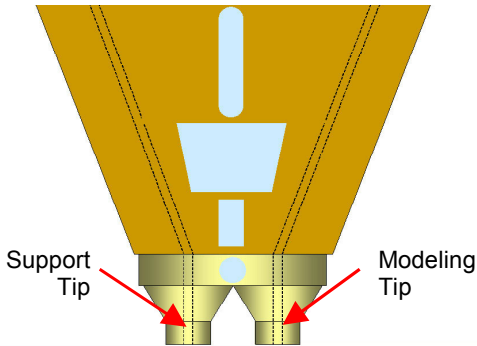
*Figure 8. Closeup diagram of Extrusion Tips*

Pressing **No** returns the machine to the `Load Material` state.
Pressing **Yes** brings the machine to the `Ready to Build` state.

**Note**

**If the display reads `Load Failed`, press `Retry`. If load fails again, remove the cartridges, snip the material at an angle (see Figure 7 on page 26), and reinsert cartridge.**

# Unloading

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 machine 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.

**To unload material cartridges:**

1.  Press **Material Load**.
    The panel reads `Load material` and prompts with,
    `Replace model?`

2.  Press **Yes**.
    The panel displays `Replacing model`, and asks if you
    want to replace the support material also. It also displays
    the remaining percentage of support material.

3.  If you want to replace the support material cartridge also,
    press **Yes**.
    The panel displays `Unloading` for approximately 15 to 20
    seconds, and then displays `Remove cartridge`.

4.  Remove the model material cartridge by first pushing it
    forward gently, and then pulling it out of the slot.

5.  Remove the cartridge(s) and approximately 180 cm (6') of
    material.

6.  To store a partially used cartridge, place a small flag of tape
    on the filament near the cartridge, and strip off and discard
    the remaining material. The tape flag ensures the filament
    does not roll back into the cartridge.

# Building a Test Part

Stratasys has factory-preloaded test parts into Prodigy Plus. It is
recommended you build a test part as your first build to familiarize
yourself with the system. Once the machine has warmed up,
material has been loaded, and a 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. Prodigy Plus automatically starts building the part.

3.  When the part is finished, follow the steps under .

# Sending Your CAD File to Prodigy Plus

This section describes the procedures used for sending your own CAD files to Prodigy Plus

**To send a "job" to Prodigy Plus:**

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 appears (see Figure 9 on page 29).
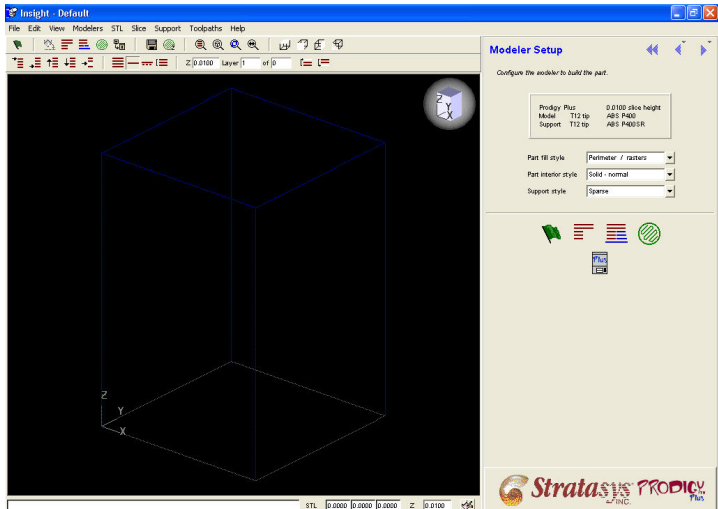


*Figure 9. Insight Main Window*

3.   On 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 Prodigy Plus

7.  Click on the Status icon  on the desktop of your workstation to send your file to Prodigy Plus. For more information on Status, refer to the Insight help files.

# Building a Part from Your CMB File

After Prodigy Plus has warmed up to correct build temperatures and Status has sent a .cmb file, the panel displays `Ready to Build` and your part's name.

**To build a part:**

Press **Start Model**.
The panel displays `Finding Home`, meaning the head is currently finding the top of the modeling base on which the part is to be built.

After finding its starting point, Prodigy Plus begins building the part. There are no further steps you need to take until the part is complete.

Machine Status

Model File Name

Model Material Remaining

Support Material Remaining
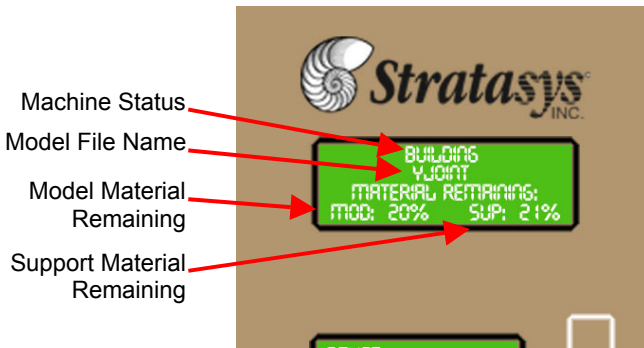
*Figure 10. Display Panel during build*

The top display panel shows machine-status messages on the first two lines (see Figure 10 above). Material remaining amounts will be shown on the next two lines of the panel. The example in Figure 10 shows remaining model material at 20% and remaining support material at 21%.

This message reports the amount of modeling material and support material remaining in the cartridges.

## Machine Chamber Light

When a part is being built, the chamber light activates and stays on for 30 minutes. You can also manually control the light by pressing **Lights On**. The light remains on for 5 minutes. Press again for Lights Always; the lights will remain on until the power is cycled.

# Pausing Build

While building a part, you may want to pause operations for some reason, such as to replace a material cartridge. To pause the build operation at any time, press **Pause**. On your workstation, Status displays the following information:

- Pause status
- the modeler's name
- the type of modeler (Prodigy Plus)

- the job name
- build time remaining
- percentage of part built.

**Note**

**When the build process is paused, Prodigy Plus completes the current tool path before pausing.**

# Resuming Build from Pause Mode

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

# Resuming Operations from Standby Mode

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

**To continue operation from Standby mode:**

1. Press **Resume**.
   Prodigy Plus requires a few minutes to warm up to build temperatures. You can view the temperature values rising in the display.

2. When the machine has warmed up, the panel reads `Ready to build` and displays your part's name (if there is a part in the queue). It also displays 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.

3. Press **Start Model** to start modeling.

# 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 Prodigy Plus stops building, press **Cancel Build**. The panel displays `Are you Sure?`

3.  Press **Yes**. The panel displays `Build Stopped`, and the part name.

    The panel prompts you to remove the part and replace the modeling base. Once the chamber door has been opened and closed, the panel asks: `Part Removed?`

4.  Press **Yes** *only after* removing the part using the instructions in the following section, *Removing a Completed Part*.

<table>
<tr><td>⚠️</td><td>

**WARNING**

**If you press** Yes **before removing the part, the machine can be damaged, and a service call will be required.**
</td></tr>
</table>

# Removing a Completed Part

When the part has completed, the panel displays `Completed Build`, and the file's name. It also displays `Remove Part` and `Replace Substrate`.

**To remove a completed part:**

1.  Open the modeling chamber door.

2.  Release the modeling base retainer and pull the base towards you, out of the guide rails.

3.  Depending on the strength of the part, either snap it free from the base or pry it loose with a putty knife.

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**.



**WARNING**

**The machine can be damaged if the part
hasn't been removed!**

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

# WaterWorks

Prodigy Plus uses WaterWorks, a water-based solution designed to
simply wash away 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. The dissolving is affected by four parameters.

- **Chemistry** Stratasys produces soluble concentrate in
  packages of 12 bottles. Each bottle is designed to produce
  the optimal concentration when mixed with 40 liters (approx
  11 US gallons) of water. When using larger tanks, maintain
  the same ratio of concentration to water.

- **Temperature** The warmer the water used for dissolving, the
  faster the parts are cleaned. Stratasys does not recommend
  operating any cleaning tank above 70°C (185°F) to prevent
  the ABS parts from warping. Therefore, it is recommended
  to run the tank without the lid to avoid increasing
  temperatures.

- **Mechanical Energy** Dissolving is enhanced by agitation of
  the water. An ultrasonic tank or a tank with agitation is
  fastest and the surest method of removing soluble support
  material. Commercial ultrasonic units are available in both
  25Khz and 40Khz; either frequency can be used.

  Jet propulsion systems are also recommended, as the
  results are comparable.

- **Time** Support removal time is dependant on all of the above. It can be reduced significantly by breaking off much of the support by hand before putting the part in the solution. This will also extend the working concentration of the solution.

The solution should be changed regularly. Frequency is dependant on how much support has been dissolved. It should be changed at first sign of part discoloration. These parts can be re-rinsed in fresh solution to restore the original color.

# Maintenance

Follow the simple procedures within this chapter to ensure continued proper operation of Prodigy Plus.

## Maintenance and Troubleshooting Tools

Provided in your Prodigy Plus Startup Kit is a set of tools used to help you maintain the system.

The following lists 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
- 5/16" Flat Head Screwdriver
- Allen Wrench Set
- Tube Anti-Seize Compound
- 2 oz. Tube Krytox Grease

# Daily Maintenance

## 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 9)

1.  Remove the purge container by grasping and pushing it upward to release it from the three mounts.

2.  Pull the container towards you and out of the chamber to empty.

> **WARNING**
>
> **When reinstalling the container, ensure that it locks in all three mounts and hangs flush with the chamber wall to avoid damage.**

## 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 unleveled or, if the buildup is large enough, it could cause the Z-stage to jam at its upper limit.

# Weekly Maintenance

## Vacuum Build Chamber

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

# Quarterly Maintenance

## Axis Maintenance

Clean the items below using isopropyl alcohol. Refer to Figure 11 on page 39 for locations.

- Z-axis lead screw (or *drive* screw)
- All X and Y-axis guide rods
- Z-axis guide rods
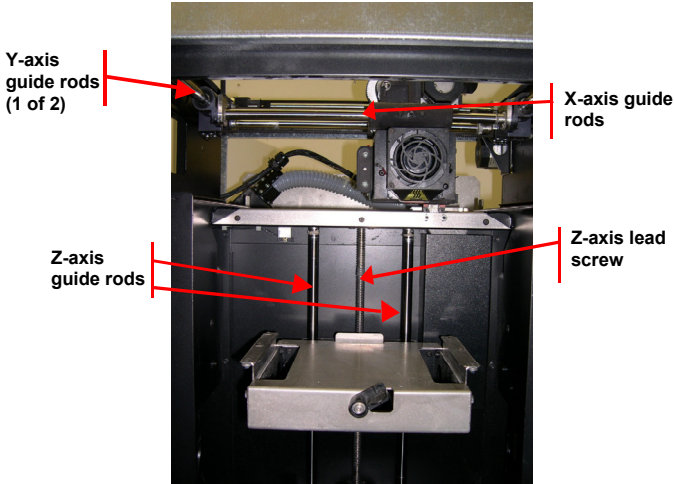


*Figure 11. Lead screw and guide rod identification*

## Axis Lubrication

Lubricate the following items using the Krytox grease provided in the Startup Kit. Refer to Figure 11 for locations. Use the grease sparingly.

- Z-axis lead screw
- Both Z-guide rods
- All X and Y-axis guide rods

## Clean fan filter

**To clean the fan filter:**

1. Locate the lower fan on the rear panel of Prodigy Plus and snap off the plastic frame that secures the fan filter.

2. Clean the filter with soap and water, and blot it dry.

3.   Reassemble.

## Tip Cleaning Assembly

**To replace the extrusion head's tip cleaning assembly:**

1.   Completely power down Prodigy Plus. Refer to *Powering Off Prodigy Plus* on page 17.

2.   Remove the purge container.

3.   Remove the old flicker by loosening the rear screws and pulling up on the flicker.

4.   Insert the new flicker and tighten the rear screws while gently pushing down on the flicker.

5.   Remove the old tip cleaning brush by loosening the two mounting screws (See Figure 12 below) 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 just touches the tips but just misses the bottom of the tip shroud (see Figure 12) and tighten mounting screws.



Top of brush just misses bottom of shroud.

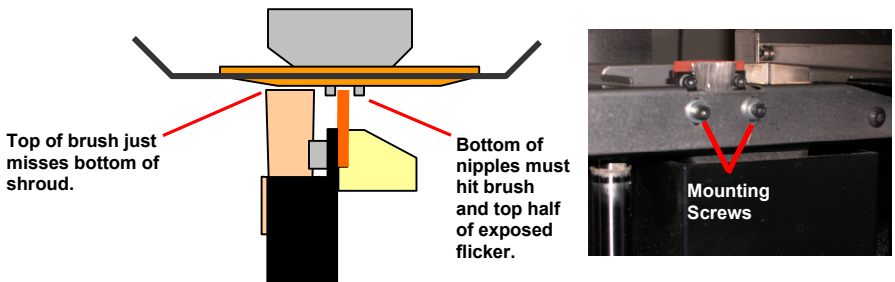Bottom of nipples must hit brush and top half of exposed flicker.

Mounting Screws

*Figure 12. Replacing the tip cleaning brush*

# As Needed Maintenance

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

## Chamber Lamp

Replace the chamber lamp when it burns out.

**To replace the chamber lamp:**

1. Power down the system.

2. Locate the lamp socket plug about 3 inches beneath the lamp socket. Unplug lamp socket from wire harness.

3. Lightly pull the socket wires away from the socket while pulling lamp straight out of the socket.

**WARNING**

**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 24V, 20w bulbs.**

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.

5. Plug the socket wires back into the wire harness.

**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

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.

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

1.  Enter **Maintenance** 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 13 below), but do not remove the screws.
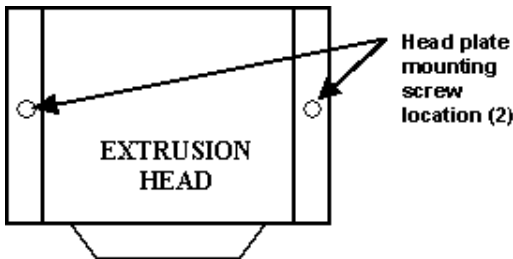


*Figure 13. Head plate mounting screw location*

3.  Pull the head plate slightly away from the head until the right side of the plate is clear of the mounting screw head.

4.  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 14. There is a small notch on the bottom of the plate for this purpose.
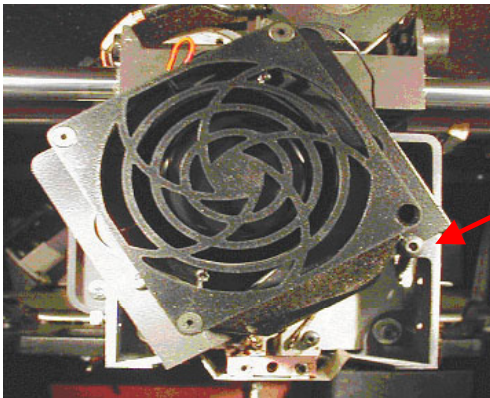
*Figure 14. Head plate in shroud replacement position*

5.  Locate the shroud, the shroud-mounting screws, and shield, as shown in Figure 15.



*Figure 15. Shroud and shield location*

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

⚠ **CAUTION**
    **Screws are very hot!! Use gloves when working in this area of machine!**

7.  Once the screws are removed, pull the metal shield down to remove. Be careful not to bend or damage the shield.

8.  Pull the shroud downward to remove it.

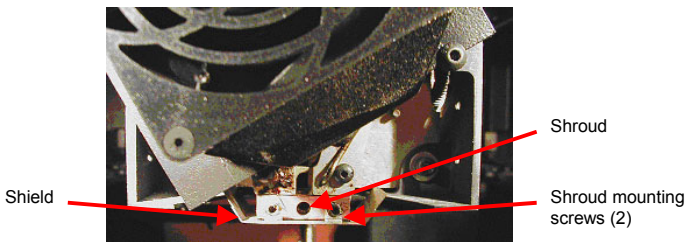9.  Clean the exposed tip with the bronze brush provided in the Startup Kit.

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.

**IMPORTANT**

**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 (refer to *Building a Test Part* on page 28).

# 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. |
| No text displayed on Display Panel | Cycle power (see *Cycling Power* on page 17) |
| Display Panel displays `Load Failed` | Re-try with same cartridge. |
| | Try a different cartridge. |
| | Filament may be jammed in extrusion head (see *Loss of Extrusion* on page 47). |
| Display Panel displays `Could Not Read Cartridge` | Remove cartridge and cycle power (see *Cycling Power* on page 17); reload cartridge. |
| | Try a different cartridge. |
| 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 47). |
| Display Panel displays `Can't Find Home – Check Foam` | Verify a modeling base is inserted. |
| | Modeling base may be used or defective – replace. |
| Error Code displayed on Display Panel | Call for customer service. For more information, refer to *Fault Determination Codes* on page 46. |

| Problem or error message | Solution |
|---|---|
| Display Panel displays `Build Error` | Partial or bad part file sent to system. Check STL file validity in CAD software; re-process STL in Insight and re-download to system. |
| Cannot communicate with system through network | Incorrect IP address – check that the IP addresses within the Prodigy Plus system and Insight are the same values (see *Setting Network Addresses* on page 18). |
| | 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. |

# Fault Determination Codes

If a fault occurs, which would prevent Prodigy Plus 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 machine has finished cooling, the only option displayed is **Continue**. Press **Continue** and the machine reboots and tries to return to normal operation. If pressing **Continue** does not recover the machine, the machine should be power cycled using the red power switch on the right side of the machine (refer to *Cycling Power* on page 17); wait 60 seconds before switching power on again. In most cases you will be able to continue operation. However, if the machine continues to shut down and display the same error, call your service representative.

# Loss of Extrusion

## Diagnosing Loss of Extrusion

Occasionally, the machine'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 machine!**

**To diagnose loss of extrusion:**

1. **Cancel** and remove any parts from the machine.

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-axis table will move. The display now reads `Head Maintenance`.

4. Determine if there is an extrusion problem by pressing **Forward**. Watch both tips for several seconds, looking for extrusion.

5. Press **Stop** to stop the extrusion.

6. If material steadily flowed from both tips, the head is not experiencing loss of extrusion. Push **Done** to return the machine to an idle state.

   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**

**Before proceeding, read through the entire procedure.**

## Overview

❑    1.   Enter Maintenance mode

❑    2.   Attempt to re-establish extrusion

❑    3.   Snip both filaments approximately 1 inch from the fixed part of the Head

❑    4.   Remove the filament from both drive block assemblies if there is enough to remove by hand

❑    5.   Remove both drive block assemblies from the swivel part of the Head

❑    6.   Inspect the drive block funnels for obstructions

❑    7.   Inspect the liquefier inlets for material buildup

❑    8.   Clean the inside of the liquefier inlets

❑    9.   Replace both drive-block assemblies

❑    10. Clean the drive wheels

❑    11. Check for extrusion

**To recover from loss of extrusion:**

1.  Enter Maintenance mode.

    a.  Press **Maintenance** and then press **Next**.

    b.  Press **Select Drive** repeatedly until `Both Drive Motors` is displayed.

    c.  With the Phillips-head screwdriver provided in the Startup Kit, release the two screws securing the head assembly (see Figure 16) and swing open the front half of the head. The screws require only ¼ rotation to release.



Phillips head screws(2)
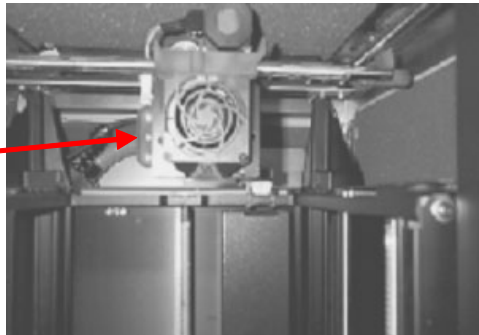
*Figure 16. Location of swivel head ¼ turn screws (2)*

2.  Attempt to re-establish extrusion.

    **Note**

    **Both materials must be coming out of the feed tubes at the back of the head (see Figure 17 on page 50) and going into the drive block funnels in order to proceed with this step. If not, continue with step 3.**
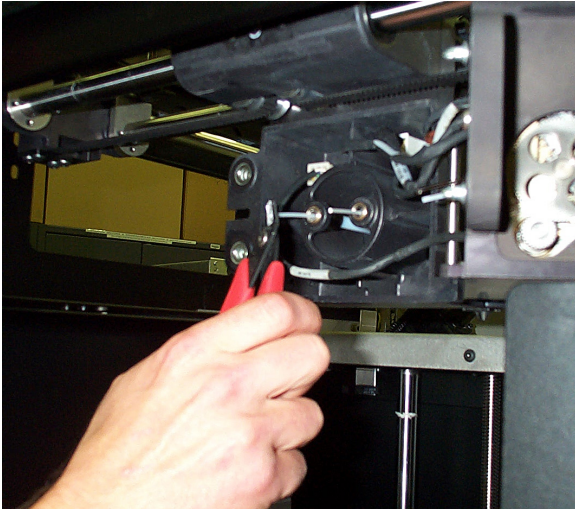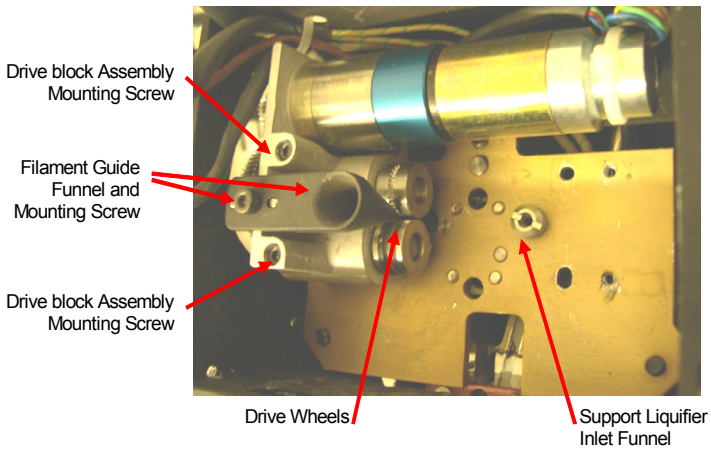
*Figure 17. Materials coming out of feed tubes*

a.  Run both filament motors forward while gently pushing the filament that stopped extruding into the filament guide rollers. Do so for about 3 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 ¼ turn screws.

    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.

c.  If material did not purge, continue with the following steps.

3.  Snip both filaments approximately 1 inch from the fixed part of the Head.

**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 about 6 inches of filament through the head to make sure the filament is not caught at the receiver. Then snip the filament approximately 1 inch from the fixed part of the head.**

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

5.  Remove both drive block assemblies from the swivel part of the head.

a.  Set a second modeling base on top of the modeling base already in the machine to support the removed drive block assemblies.

b.  Remove the support drive block first. Use a 3/32" Allen wrench to remove the two screws securing the motor assembly as illustrated in Figure 18 on page 52.

Drive block Assembly
Mounting Screw

Filament Guide
Funnel and
Mounting Screw

Drive block Assembly
Mounting Screw

Drive Wheels

Support Liquifier
Inlet Funnel

*Figure 18. Checking for buildup of material (shown with the
support drive block assembly removed)*

    c.   Remove the long mounting screw(s) from the drive
block and set aside so that they will not fall out
while handling the assembly.

    d.   Set the drive block assembly on the modeling base.

    e.   Remove the Model drive block assembly the same
way.

6.   Inspect the drive block filament guide funnels for
obstructions.

With the drive blocks removed, look through both filament
guide funnels for obstructions. If an obstruction is present in
either drive block, follow the appropriate procedures for
clearing drive block obstructions.

**WARNING**

**Do not remove the support filament guide funnel. The
position is factory-calibrated. Filament breaks may occur
if removed and re-installed.**

**Clearing support drive block obstructions:**

a.   Press **Select Drive** repeatedly until the display shows `Support Drive Motor.`

b.   Pick up the support motor assembly and press **Forward**.

c.   Insert a 1/16" Allen wrench through the filament guide funnel and push the obstruction through the drive wheels.

d.   Once the obstruction is through the drive wheels, press **Stop,** then **Reverse** to remove the Allen wrench.

e.   Set the drive block back on the modeling base.

f.   Press **Select Drive** repeatedly until the display shows `Both Drive Motors.`

**Clearing model drive block obstructions:**

a.   Remove the filament guide using the Allen wrench provided in the Startup Kit by removing the filament-guide mounting screw as shown in .

b.   Remove any excess material; use the needle-nose pliers if necessary.

c.   Replace the filament guide.

7.   Inspect the liquefier inlets for material buildup.

With the drive blocks removed, the liquefier inlet (model side) or inlet funnel (support side) is visible. If material is visible, proceed to the appropriate clearing liquefier inlet procedure.

⚠   **WARNING**

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

**Clearing the support liquefier inlet:**

a.  If material is extended out from the inlet funnel, 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, try inserting a 1/16" Allen wrench into the liquefier inlet funnel and pushing the obstruction forward.

c.  If this doesn't work, remove the liquefier inlet funnel using a 5/16" flat head screwdriver (see Figure 18 on page 52). Dissolve support material from the funnel with the Waterworks 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 inlet tube.

e.  Replace the liquefier inlet funnel.

**Clearing the model liquefier inlet:**

a.  If material is extended out from the inlet funnel, gently remove material with the bronze brush or needle-nose pliers, if necessary.

b.  Inspect for damage to the inlet tube

8.  Clean the inside of the liquefier inlets.

Carefully insert a 1/16" Allen wrench into each liquefier inlet tube and gently push forward until it stops (about 1/4 inch).

9.  Replace both drive-block assemblies.

Install the model drive block assembly first. Make sure the block is seated flush against the swivel plate. Take care not to pinch the assembly's wiring harness under the block or

behind the motor before replacing and tightening the mounting screws. Repeat for the support drive block assembly.

10. 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.

11. 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 3.

      ii. If, after two tries the material fails to extrude, call your service provider.

   c. If the purge was successful, 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.

      i. Once the head is closed, tighten both ¼ turn screws.

      ii. Verify material continues to extrude through both tips for an additional 30 seconds, then press **Stop** to halt extrusion.

      iii. Push **Done**. The panel displays `Is material loaded?`

iv. Press **Yes**. The panel displays `Exiting maintenance` and you can resume normal operation.

**S T R A T A S Y S** ®