



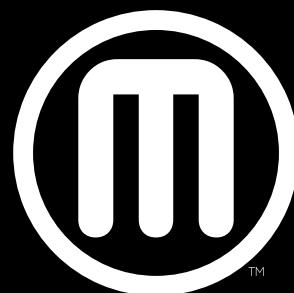
MakerBot®

Replicator® 2X

EXPERIMENTAL 3D PRINTER

TROUBLESHOOTING AND MAINTENANCE





MarkerBot®

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Troubleshooting

INTRODUCTION

This Troubleshooting and Maintenance Guide is designed as a companion to your MakerBot Replicator 2X User Guide. In the first section you will find troubleshooting solutions to common problems you may come across when using your Makerbot Replicator 2X. In the second section we explain several methods for keeping your MakerBot Replicator 2X well maintained. Referring to this guide will help ensure that you continue to make amazing things with your MakerBot Replicator 2X.

PRINTING ISSUES

OBJECTS DO NOT STICK TO THE BUILD PLATE

If printed objects are not sticking to the build plate, try these solutions:

- Re-level your build plate by going to the LCD menu and navigating to Utilities > Level Build Plate. Inconsistent plate height will lead to inconsistent adhesion. If any one part of your object does not adhere well to the plate, the whole object might peel off the plate. Try leveling the plate again using a thinner piece of paper or feeler gauge to check the distance between the nozzle and the build plate.
- Ensure that the plate is clean. Bubbles, scratches, dust, and oil from your hands can prevent objects from sticking to the Kapton tape. Wipe down the build plate with a clean, lint-free cloth.

- Increase the temperature of the build plate by five degrees. You can change the temperature of the build plate in the **Advanced Options** section in the **Make** dialog in MakerWare.
- If you continue to have adhesion problems, loosen each of the plate-leveling knobs about a quarter of a turn to bring the plate slightly closer to the nozzles.

OBJECTS ARE DIFFICULT TO REMOVE FROM THE BUILD PLATE

If printed objects are difficult to remove from the build plate, try these solutions:

- Wait for the build plate to cool down. Objects will detach more easily when both the plastic and the plate are cool.
- Use a metal craft spatula and carefully work the blade under the edge of the object. When the blade is under the object, twist the handle slightly. The object should come free.

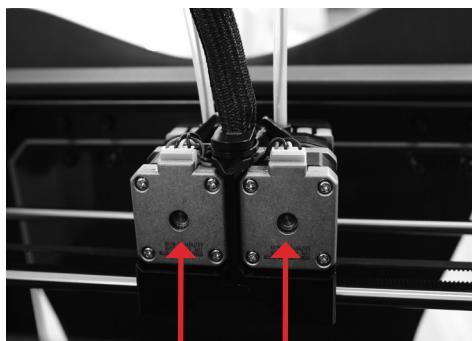


Fig. 1.1
Motor shafts

EXTRUSION STOPS

There are a few problems that can cause your MakerBot Replicator 2X to stop extruding. Use this checklist to determine the cause and appropriate solution.

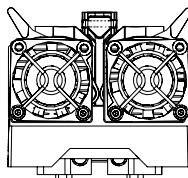
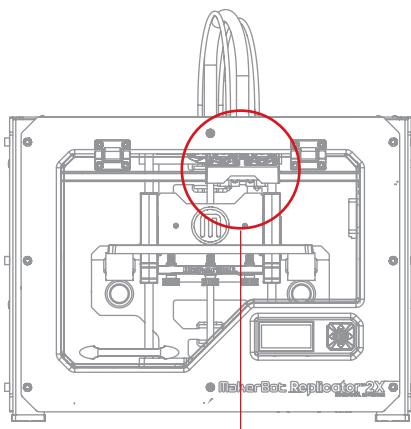
- **Is your extruder motor rotating?** Use a marker to draw a line across the end of the motor shaft that is visible at the back of the motor. When the extruder is running, you should be able to see the shaft turning. The shaft may sometimes reverse direction in order to retract filament, but during extrusion it should be moving at a slow but constant rate. If the shaft does not turn, or stops turning, please get in touch with MakerBot Support and we'll help you figure out what's going on. [Fig 1.1]
- **Is your filament tangled?** Check that the spool is spinning smoothly on the mount.
- **Is the build plate too close to the extruder?** If so, there might not be room for the plastic to come out of the extruder. If your extruder stops extruding during the first or second layer of a build, this usually indicates that the build plate is too close to the extruder.
- **Is the nozzle clogged?** Go to the LCD menu on your MakerBot Replicator 2X and navigate to Utilities > Change Filament > Load right or Load left. Run the Load script. Observe the plastic as it emerges from the nozzle. Does it drop straight down, or curl up toward the extruder? If it curls back up toward the extruder, the nozzle may be partially clogged. Contact MakerBot Support for assistance.
- **Still having trouble?** You can always get in touch with support@makerbot.com for additional help and information.

PRINTING ISSUES CONTINUED

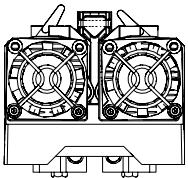
REPLICATOR 2X SHAKES

Your Replicator 2X will shake during printing if you print at high speeds with acceleration turned off. Attempting to print at high speeds with acceleration turned off can harm your MakerBot Replicator 2X. To check and change the Acceleration setting, go to the LCD menu on your

Replicator MakerBot 2X and navigate to Info and Settings > General Settings > Accelerate. You can turn acceleration off and on. You can also do this using the Onboard Preferences in MakerWare or ReplicatorG. Acceleration is turned on by default. If you have acceleration turned off, you should not print at speeds above 40 mm/s.



Extruder arms open



Extruder arms closed

Fig. 1.2

FILAMENT NOT LOADING

If you are having problems loading filament into one of the extruders, perform the following steps:

1. Go to the LCD panel and select Utilities > Filament Options > Unload. This option heats the extruders.
2. Set the extruder arm to the open position. [Fig 1.2]
3. Make a fresh cut at the end of the filament. It is important that the filament have no bends in it. If there are bends, cut off the bent section of filament.
4. Insert the filament into the hole at the top of the extruder. Keep pushing it in until you start to see plastic come out of the nozzle. You might have to apply some pressure.
5. When the filament is successfully loaded, set the extruder lever arm to the closed position.

If filament doesn't emerge from the nozzle, try the following solutions:

- Remove the filament from the top of the extruder and check for a bend at the end of the filament. If the filament is bent, it is possible that the filament is slipping under the extruder bearing instead of entering the hot end.
- Remove the extruder fan and assembly using the instructions in the section **Disassembling an Extruder**. This will allow you to watch the filament travel through the extruder and determine where the filament is getting stuck. This will also allow you to see if a piece of filament is stuck inside the extruder.

PRINTING ISSUES CONTINUED

FILAMENT STUCK

Filament can swell inside the extruder and get stuck. If you cannot unload filament from one of the extruders, do the following:

1. Go to the LCD panel and select Utilities > Filament Options > Unload. This option heats the extruders.
2. Set the extruder arm to the open position.
3. Push about half an inch of filament through the extruder to clear the blockage.

4. Try pulling the filament out of the extruder again.

If you are unable to unload filament because it has broken off inside the extruder, you might not be able to reach inside the extruder to clear the blockage. In that case, see the section **Disassembling an Extruder**.

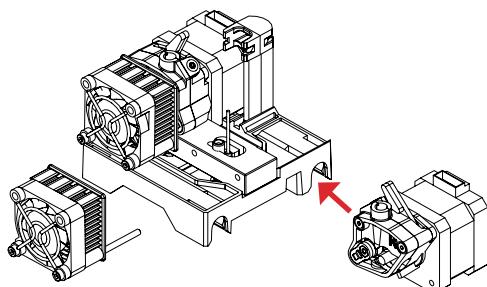


Fig. 1.3

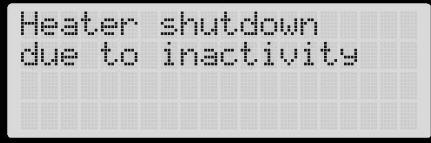
DISASSEMBLING AN EXTRUDER

1. Unload the MakerBot Filament from the extruder. To run the script for unloading filament, go to the LCD panel and select Utilities > Filament Options > Unload.
2. Switch off the power on the MakerBot Replicator 2X and unplug the power supply. Pull on the connector to release it from the power input port.
3. Unscrew the two bolts at the lower corners of the fan guard using your 2.5 mm hex wrench. As one piece, remove the fan guard, the fan, the heat sink, and the spacers. Keep these pieces assembled and move them out of the way.
4. Set the extruder lever arm to the open position. [Fig 1.2]
5. Unplug the motor wire harness from the top of the extruder motor and slide the motor assembly out of the extruder.
6. The extruder is now broken down into its main assemblies. [Fig 1.3] To remove any filament stuck in the thermal barrier tube, turn on the Replicator 2X, run the Unload script to heat the extruder and use a pair of pliers to pull the filament free.

LCD ERROR MESSAGES

If your MakerBot Replicator 2X encounters problems during operation, the LCD menu will display an error message. The following table describes each possible error message.

NOTE: If you see an error message in an unexpected context, please contact MakerBot Support by emailing support@makerbot.com.

Error Message	Description
	<p>Use the LCD menu to check your target extruder temperatures. Navigate to Info and Settings > Preheat Settings to make sure the extruder temperatures are not set higher than 300C.</p> <p>If the extruder temperatures are set to below 300C, contact MakerBot support.</p> <p>To clear this message, you will have to restart your MakerBot Replicator 2X.</p>
	<p>Your MakerBot Replicator 2X has automatically disabled its heaters after a period of inactivity as a safety precaution. Re-start your print or the preheat routine to reset your heaters.</p>

LCD ERROR MESSAGES CONTINUED

<p>Heating Failure #2 My extruders are not heating properly. Check my connections</p>	<p>These messages indicate that your MakerBot Replicator 2X cannot read the temperature for one of the extruders.</p> <p>Ensure that the wires going into your extruders are securely plugged in or contact MakerBot Support by emailing support@makerbot.com.</p> <p>To clear Heating Errors #3 and 4, you will have to restart your MakerBot Replicator 2X.</p>
<p>Heating Failure #3 My extruders are losing temperature. Check my connections</p>	
<p>Heating Failure #4 My temperature reads are failing. Check my connections</p>	
<p>Heating Failure #5 I'm reading out of range temperatures. Check my connections</p>	
<p>I can't read SD cards with storage larger than 2GB.</p>	<p>Your MakerBot Replicator 2X cannot read SD cards larger than 2GB. Try a smaller card.</p>
<p>I saw a glitch in my SD card. If this is the first error try this build again.</p>	<p>Your MakerBot Replicator 2X ran into a one-time problem while reading the SD card. The problem should not reoccur.</p>

LCD ERROR MESSAGES CONTINUED

<p>I timed out while attempting to heat my extruder.</p>	Something might be wrong with your extruder. Please contact MakerBot Support by emailing support@makerbot.com.
<p>My motor timed out after 5 minutes. Press M to exit.</p>	This is just an informational message. If you are loading or unloading filament, the process times out after five minutes.
<p>My temperature was changed externally. Reselect filament menu to try again.</p>	The onboard preheat sequence was interrupted by instructions sent by the software telling the MakerBot Replicator 2X to change the extruder temperature.
<p>I can't read this SD card format! Try reformatting the card to FAT16.</p>	These are the messages you could receive if your SD card is not formatted correctly or if there is something wrong with the card. Your MakerBot Replicator 2X can read SD cards: <ul style="list-style-type: none">• formatted for FAT16 SDSC card• no larger than 2GB.
<p>SD Card Removed.</p>	Make sure your SD card has not been removed from the MakerBot Replicator 2X during printing. If the card is still in its port on the MakerBot Replicator 2X, there might be a problem with the card itself. Make sure the card is formatted correctly.

MISALIGNED NOZZLES

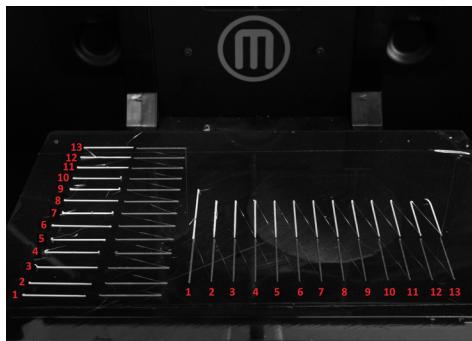


Fig. 1.4

MakerBot executes an alignment script on every MakerBot Replicator 2X before shipping. However, if plastic coming from the two extruders does not appear to be aligned correctly during dual extrusion prints, you can run the alignment script again at home.

1. Make sure filament is loaded into both extruders.
2. To start the nozzle alignment script, go to the LCD menu and navigate to Utilities > Calibrate Nozzles.
3. The MakerBot Replicator 2X will heat the build plate and extruders and then print a test print for aligning the nozzles.

First, one extruder prints a series of straight lines parallel to the front of the build platform, starting at the front left corner of the platform and extending to the back left corner of the platform. The other extruder then prints a second series of lines, perpendicular to the front of the build platform and starting at the center of the platform and extending to the left. The second extruder then prints a line alongside each line printed by the first extruder.

4. When the test print has completed, you will see two sets of lines. Each set includes two sets of 13 parallel lines, one set printed by each extruder. [Fig. 1.4]

After the test print is completed, the LCD menu will provide new instructions and prompt you for input.

MISALIGNED NOZZLES CONTINUED

5. Look closely at your test print. First look at the set of lines to the left (the lines that are parallel to the front of the build plate). Notice that the first lines on the left are farther from the front of the build plate than the first lines on the right. Examine the lines and find the pair of lines that match best. The best match will look the most like a single continuous line, with both test lines perfectly centered. Note the number. This is the best line for the Y axis.
6. Look at the set of lines to the right (the lines that are perpendicular to the front of the build plate). Examine the lines and find the pair that match best. The best match will look the most like a single continuous line, with

- both test lines perfectly centered. Note the number. This is the best line for the X axis.
7. The LCD menu will prompt you to enter the line number that is best for the X axis and the line number that is best for the Y axis.
8. Use the arrow buttons to select a line number and the M button to select a line number. The MakerBot Replicator 2X will store this information about the locations of the extruder nozzles and use them to make future prints align better.

MAKERBOT MAKERWARE ERROR MESSAGES

MakerWare displays error messages to help you avoid potential problems and diagnose existing problems.

INSTALLATION

The following error message could appear during installation of MakerBot MakerWare:

Error Message	Description
<p>The installation failed.</p> <p>The installer encountered an error that caused the installation to fail. Contact the software manufacturer for assistance.</p>	<p>This message appears when installation is not successful.</p> <p>Perform the installation steps again. If the installation fails again, collect as much information on the failure as you can and open a Support Ticket by emailing support@makerbot.com.</p> <p>Your operating system may not recognize the drivers MakerWare is installing because they are specific to MakerWare and to your MakerBot Replicator 2X. Select “OK” to allow MakerWare and its device drivers to install.</p>

STARTUP

The following error messages could appear when you open MakerWare:

Error Message	Description
<p>Background Service Unavailable.</p> <p>The background job management service is not available. Please go to Services -> Restart Background Service. For more help, please visit http://www.makerbot.com/support or email support@makerbot.com</p>	<p>Conveyor, the background service that manages print jobs and your computer's connection to your Replicator 2X, is not running. This service is required by MakerWare.</p> <p>To restart Conveyor:</p> <ol style="list-style-type: none">1. Go the Services menu.2. Select Restart Background Service.

MAKERBOT MAKERWARE ERROR MESSAGES CONTINUED

MAKERWARE WINDOW

The following error messages could appear in the main MakerWare window during operation:

Error Message	Description
Print failed. See MakerWare log for more information.	This error message appears when: <ul style="list-style-type: none">• A print is cancelled before completion.• The MakerBot Replicator 2X is disconnected from the computer where MakerWare is running during a print via USB. Check the USB connection between the MakerBot Replicator 2X and the computer.• Conveyor, the background service, is unavailable. To restart Conveyor, go to the Service menu and select “Restart Background Service.”
Service Error. No connection to the background service.	This error message appears when: <ul style="list-style-type: none">• You try to print an object while the background is unavailable.• You try to export a file while the background service is unavailable. To restart Conveyor, the background service: <ol style="list-style-type: none">1. Go the Services menu.2. Select Restart Background Service.
There are unfinished exports in progress. Closing MakerWare will prevent these files from being placed in the correct directory.	<ul style="list-style-type: none">• Select Cancel to keep MakerWare open and running until the export completes. You can then quit MakerWare again.• Select Close MakerWare to close MakerWare without finishing the export.
Error Saving [file name and location]. Unable to open file for writing.	This message appears when you try to save a file to a location that is read-only. Try saving to another location.

MAKERBOT MAKERWARE ERROR MESSAGES CONTINUED

OPENING A FILE

The following messages could appear when you add an object to the plate:

Error Message	Description
The file could not be loaded. It may be an unsupported file format.	This message appears when you load a file of a format other than OBJ, STL or Thing, or a badly formatted STL, OBJ or Thing file.
Error opening file Couldn't open [file name]	MakerWare is unable to open the file. This could appear if you don't have permissions to open the file, or if the file is corrupted.
The object is off the platform. Do you want to put it on the platform?	Select No to leave the object in its current position. Select Yes to place the object on the platform.
This object seems very small. It may have been designed in inches. Would you like to scale it to mm?	Select No to leave the object at its current size. Select Yes to convert the units of your object from inches to millimeters. This will resize the object.

MAKE DIALOG

The following error messages could appear when you try to make something on your MakerBot Replicator 2X:

Error Message	Description
Background Service Unavailable.	This error message appears when you try to Make an object while Conveyor, MakerWare's background service, is unavailable. To restart Conveyor: <ol style="list-style-type: none">1. Go the Services menu.2. Select Restart Background Service.

MAKERWARE ERROR MESSAGES CONTINUED

Printer is busy.	This message appears when you try to print something while another print is still in progress.
Print failed. See MakerWare log for more information.	This error message appears when: <ul style="list-style-type: none">• A print is cancelled before completion.• The MakerBot Replicator 2X is disconnected from the computer where MakerWare is running during a print via USB. Check the USB connection between the MakerBot Replicator 2X and the computer.• Conveyor, the background service, is unavailable. To restart Conveyor, go to the Service menu and select “Restart Background Service.”

ONBOARD PREFERENCES

The following error messages could appear when you select the MakerBots > Onboard Preferences menu entry:

Error Message	Description
Error displaying onboard preferences.	This message appears when you attempt to view your Replicator 2X Onboard menu while your bot is printing.

MAKERWARE ERROR MESSAGES CONTINUED

UPLOADING FIRMWARE

The following error messages could appear when you try to update the firmware on your MakerBot Replicator 2X:

Error Message	Description
Firmware upload requires an internet connection.	This message appears when a user selects the menu entry MakerBots > Upload Firmware and the computer running MakerWare is not connected to the internet.
Upload Failure.	This message appears when a user attempts to upload firmware while the MakerBot Replicator 2X is printing.

MAKERBOT SUPPORT

HOW TO USE MAKERBOT SUPPORT

At MakerBot, we take pride in offering expert, responsive, friendly customer support to all of our customers around the world. When you email or call us, there are a few things you can do ahead of time to help us help you.

Have your serial number ready.

We use your serial number to look up your order and get more complete information on your MakerBot Replicator 2X. The serial number is located on the underside of the MakerBot Replicator 2X.

If you are contacting us via email, be as thorough as possible.

To get the most helpful support response, provide as much information as possible about your issue in your initial email. The more information we have, the more accurately we can identify your issue. Additional emails will reach us, but might push your support request down in the queue.

Send a photo.

Many issues are easier to diagnose with photographs. These kinds of issues include:

- Situations where something is physically damaged or out of place.
- Print quality issues.
- Situations where you believe you understand the issue, but don't know the names of the components involved.

DOS AND DON'TS

MakerBot encourages you to tinker with your Replicator 2X Experimental 3D Printer, but there are some things we know are bad ideas, and you should know about them, too.

- Don't put any liquids into your extruder. Whether it's boiling water or acetone or anything in between, it's not going to help and it could do a lot of harm.
- Don't overheat your extruder. We set temperature limits in our software for your safety and for the extruder's safety, so don't use anything other than the installed heaters to heat your extruder – don't use blowtorches, and don't detach parts of the extruder and put them in the oven.
- Don't use sharp tools to remove objects from the build plate – using a knife or a razor blade to remove prints is just as likely to hurt you as it is to help.
- Don't turn your MakerBot Replicator 2X off immediately after finishing a print. Give the extruder fans time to cool the extruder first.

- Don't drill out your extruder nozzle or drive any kind of metal tool through the nozzle. If you change the shape or size of your nozzle, the slicer will not be able to create accurate toolpaths.
- Don't try to replace your extruder nozzles. The nozzles are very securely attached to the extruder, and trying to remove them might result in the threaded portion of the nozzle shearing off and remaining inside the thermal core.
- Do make sure small and medium-sized prints work well before leaving your MakerBot Replicator 2X unattended for long prints.
- Do use only MakerBot Filament with your MakerBot Replicator 2X.
- Do be careful with the ceramic insulation on your extruders' thermal cores. Hitting them with tools or gripping them with pliers might break off parts of the ceramic insulation.

USEFUL TOOLS

Your MakerBot Replicator 2X package includes everything you need to start printing, but here are a few other things that might come in handy as you begin to experiment.

A craft spatula. A thin metal craft spatula is a great tool for removing stubborn prints from the build plate. Carefully work the edge of the spatula under the edge of your print, making sure to keep the spatula at a low angle. If the spatula is pointing down too steeply, it's more likely to damage your Kapton tape. When you've used the spatula to detach as much of the edges from the build surface as possible, twist the handle slightly. The print should pop right off.

Sandpaper and files. Files are good for removing small imperfections in a print, or removing traces of support structures, and sandpaper is great at smoothing out layer lines. Use progressively finer grades of sandpaper for a smoother and smoother finish.

A small brush or canned air. You can use either of these tools to clean out the drive gears on your extruders. The drive gears are accessible through the outside sides of each extruder's drive block.

DIAGNOSING PRINT QUALITY ISSUES



File Name: Frank's Head

Design by: michaelmelcone

Thingiverse: 142860

Fig. 1.5

Sometimes little things can go wrong with a print – things that are easy to fix, but only if you know what's causing the problem. This guide can help: just find the picture of the problem you're experiencing and read the tips on how to fix it.

Warping or Cracking

Are your prints curling off the build plate? This can happen during printing when the air around your print is too cool. Thermal expansion means that warmer layers closer to the extruder are shrinking, causing strain on the cooler layers below. The shrinking layers pull at the stable layers, warping the object. If the bond between two layers isn't strong, the strain of the warping layers can actually cause cracks in the sides of your objects. [Fig. 1.5]

Warping occurs more often with ABS than with PLA because ABS expands more when it's heated. For either type of plastic, warping can be reduced by warming up the area around your object. When your print is surrounded by warm air, newly-printed layers will cool at a slower rate and adjacent layers will be closer in temperature. This is why the MakerBot Replicator 2X is fully enclosed. The enclosure keeps the heat from the extruders within the build area and keeps prints at a more constant temperature.

DIAGNOSING PRINT QUALITY ISSUES

Filament Variation

Does it seem like there's too much or too little plastic being used in your prints? This can happen when your filament doesn't look or behave exactly how the slicing engine expects it to. Sometimes 1.75 mm plastic filament is actually closer to 1.65 mm or 1.85 mm. Your extruder can handle this range of sizes, but the slicer requires an accurate description of your filament to create a good toolpath.

To compensate for filament variation, you can create a custom profile. Instructions on creating custom profiles are available at makerbot.com/support/makerware/documentation/slicer.

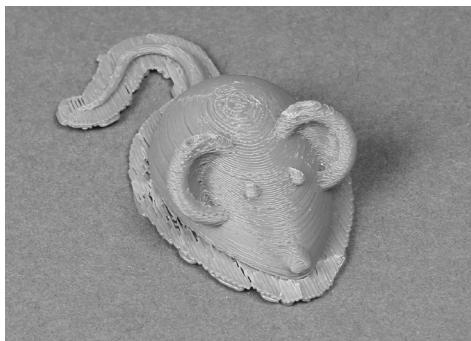
1. Unspool a couple of feet of filament and use a caliper to measure it at several different points. Average out those measurements and note the averaged value.
2. Create a custom profile and click the Edit Profile button to open the config file in a text editor. Then find the correct "feedDiameter"

setting. You will see two "feedDiameter" settings, one enclosed in each of the extruder profiles. Change the first "feedDiameter" setting if you are printing using the right extruder on your MakerBot Replicator 2X and change the second "feedDiameter" setting if you are using the left extruder.

3. Save the config file and use your new custom profile to print.

If you are having trouble with the amount of plastic being extruded and the value entered for "feedDiameter" is accurate, look at the "feedstockMultiplier" setting. This setting compensates for any difference between the calculated volume of plastic going into the extruder and the actual amount of the plastic coming out of the extruder. Like the "feedDiameter" setting, the "feedstockMultiplier" setting appears twice in the config file – once in each of the two extruder profiles. When changing the "feedstockMultiplier" setting, make sure you choose the setting for the correct extruder.

DIAGNOSING PRINT QUALITY ISSUES CONTINUED



File Name: 3D mouse

Design by: DDStarkey

Thingiverse: 61909

Fig. 1.6

If you are overextruding [Fig. 1.6], increase the “feedstockMultiplier” setting by 0.05, save the config file, and Export your file again. If the “feedstockMultiplier” setting reaches a value of 1.0 without the problem being resolved, you might have a different issue. Please contact MakerBot Support.

If you are underextruding [Fig. 1.7], decrease the “feedstockMultiplier” setting by 0.05, save the config file, and Export your file again. Continue to decrease the value entered for this setting in increments. If, after lowering the default setting by a total of 0.2, your results do not improve, you might have a different issue. Please contact MakerBot Support.



File Name: 3D mouse

Design by: DDStarkey

Thingiverse: 31909

Fig. 1.7



File Name: light house

Design by: tc_fea

Thingiverse: 19786

Fig. 1.8

Rippling

Do you see faint vertical ripples on the walls of your prints? [Fig. 1.8] This is due to mechanical feedback and occurs at higher speeds. Reduce your print speed in the **Advanced Options** section of MakerWare's Make dialog.

To print quickly but avoid rippling, reduce your print speed only on outer shells. To do this, you must create a custom profile. Instructions on creating custom profiles are available at makerbot.com/support/makerware/documentation/slicer.

After you have created a custom profile, click the **Edit Profile** button to open the config file in a text editor. Find the “outlines” extrusion profile near the end of the config file. In this extrusion profile, find the “feedrate” setting. Enter a smaller number of millimeters per second, then save the config file and use your new custom profile to print.

Axis Drift

Does it look like your whole print shifted sideways? [Fig. 1.9] This is the result of skipping on the X or Y-axis. This problem has multiple possible causes.



File Name: Polygon Vase, Cup, and Bracelet Generator

Design by: Eckerput

Thingiverse: 86502

Fig. 1.9

Loose belts: If the toothed belts that move the gantry are loose, the gear that drives them can start skipping over the teeth in the belt instead of grabbing onto them. See <http://www.makerbot.com/support/replicator2/troubleshooting/> for instructions on how to tighten the gantry belts.

DIAGNOSING PRINT QUALITY ISSUES CONTINUED

Loose drive gear: If the drive gear in the extruder comes loose on the extruder motor shaft, the gear cannot grip the filament and drive it down into the extruder. Use the **Disassembling an Extruder** section on page 10 to remove the motor assembly from the extruder. Then:

1. Use the 2 mm hex wrench from the accessory box to remove the two bolts holding the drive block to the extruder motor. Remove the drive block and set it aside. Be careful with the drive block – if any of the pieces are detached, you might have a difficult time putting it back together.
2. Ensure that the drive gear is in the correct position on the motor shaft. The top of the drive gear should be about 2 mm from the end of the motor shaft. Locate the set screw that secures the gear to the motor shaft and make sure it touches the flat side of the motor shaft.
3. Use the 1.5 mm hex wrench from the accessory box to tighten the set screw against the motor shaft.

4. Return the drive block to the motor. Orient it so that the extruder lever arm points in the same direction as the white connector on the motor. Secure the drive block using the 2 mm hex wrench and the two bolts you removed earlier.

5. Return the extruder motor assembly to the extruder carriage.

6. Reconnect the motor wire harness to the top of the extruder motor.

7. As one piece, return the fan guard, the fan, the heat sink, and the spacers to the extruder. [Fig 1.3] Use the 2.5 mm hex wrench to tighten the two bolts at the lower corners of the fan guard.

XYZ Motor Cable: There may be a problem with the section of the motor cable leading to the X-axis motor. If so, the cable will need to be replaced. Get in touch with support@makerbot.com for more information.

2

Maintenance

LEVELING THE BUILD PLATE

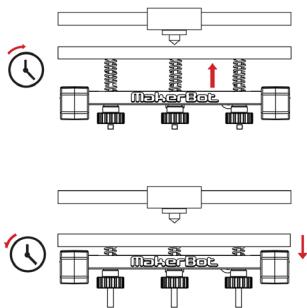


Fig. 2.1

LEVELING THE BUILD PLATE

One of the best things you can do to keep your MakerBot Replicator 2X in top shape is to level your build plate frequently. It never hurts to re-level, but forgetting to do so can hurt your success rate.

- If the build platform is too far from the extruder nozzle, or if one part of the plate is farther from the nozzle than another part, your prints might not stick to the build plate.
- If the build platform is too close to the extruder nozzle, the build plate can block your filament from extruding from the nozzle. The nozzle can also scratch the build plate if it is too close to the plate.
- Leveling your build plate often will help ensure that your prints always stick well to the build plate.

To access the MakerBot Replicator 2X built-in leveling script, go to the Utilities menu on the LCD screen and select Level Build Plate.

To level the plate without using the built-in script:

1. Go to the Utilities menu on the LCD screen and select Home Axes.
2. Manually move the extruders to different points above the build plate. At each point, use a piece of paper, feeler gauge or other measuring tool to gauge the distance between the build plate and extruder nozzles. The distance should be about 75% of your planned layer height.
3. At each point, turn the leveling knobs beneath the build plate to the left to raise the build plate and to the right to lower it [Fig. 2.1].

LEVELING BUILD PLATE CONTINUED

You should level your build plate regularly, especially if you notice that your extruder nozzle is scratching the build plate, or that the first layer of an object doesn't adhere to the plate. Each time you level, you should also make sure that your build plate is clean: dust, scratches and oil from your hands can cause some of the same problems as a plate that's too far from the extruder.

Here are a few tips to keep in mind when you level your build plate:

- Make sure to take your fingers off the leveling knobs and platform when you test the friction on your paper or feeler gauge; pressure from your hands can affect platform height.

- If you're having trouble leveling your build plate, make sure your nozzles are clean. Small amounts of plastic stuck to the nozzles can make it feel like the nozzle is closer to the plate than it really is. Wrinkles in the Kapton tape can also yield confusing results.
- Printing at lower layer heights might require the plate and nozzle to be a little closer together. If you are printing at a lower layer height than you were previously and the first layer of your print isn't sticking well to the plate, try turning each leveling knob about a quarter turn to the left.

REPLACING KAPTON TAPE



Fig. 2.2

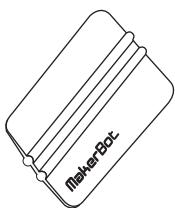


Fig. 2.3



Fig. 2.4

Over time, the Kapton tape on your build plate will be scratched and torn, and you will need to replace it with one of the die-cut Kapton sheets that was included in the package with your MakerBot Replicator 2X.

To replace the Kapton tape:

1. Peel off the old Kapton tape and discard it.
2. Locate the extra sheets of Kapton tape that were included with your MakerBot Replicator 2X. [Fig. 2.2] If you have used all of the included sheets of Kapton tape, rolls of Kapton tape are available at <http://store.makerbot.com/>.
Find the tape applicator that was included with your MakerBot Replicator 2X. [Fig. 2.3] If you can't find the tape applicator, you can use a plastic spatula or a credit card.
3. On one of the short sides of the sheet, peel back the plastic backing approximately 1/4 inch from the edge, so that 1/4 inch of the sticky side of the Kapton tape is exposed.
4. Place the exposed strip of Kapton tape along the edge of one of the short sides of the build plate. Use your finger to apply pressure and adhere the Kapton tape to the build plate.
5. Use the tape applicator to simultaneously roll back the plastic backing bit by bit and smooth the newly exposed Kapton tape as you go. Make sure to smooth out any bubbles. [Fig. 2.4]
6. Continue smoothing the tape down bit by bit until you have covered the entire plate.

REPLACING KAPTON TAPE CONTINUED

7. If there are still bubbles under the Kapton tape, lift the edge of the tape that is nearest to the bubbles and use the tape applicator to smooth the tape from the center out.

8. When the Kapton tape is applied as smoothly as possible, trim the edges of the sheet or fold them over the sides of the build plate.

NOTE: To view a video of this process, go to the MakerBot Replicator 2X video page at makerbot.com/support/replicator2x/videos and select the video Replicator 2X Kapton Tape Application.

LUBRICATING Z-AXIS ROD AND IDLER PULLEY



Fig. 2.5

After approximately 50 hours of build time, you should lubricate the threaded rod on your Z-axis and the X-axis idler pulley.

To lubricate the threaded rod and the idler pulley:

1. Find the tube of PTFE-based grease included in the package with your the MakerBot Replicator 2X. If you have used up this tube of grease, PTFE-based grease is available from many online retailers.

2. Grasp both sides of the build platform and push it gently to the bottom of the MakerBot Replicator 2X.

3. Use a clean, lint-free rag [or your finger] to spread the PTFE-based grease onto as much of the threaded rod as you can reach. Make sure you get the grease inside the threads themselves. [Fig. 2.5]

LUBRICATING Z-AXIS ROD AND IDLER PULLEY CONTINUED

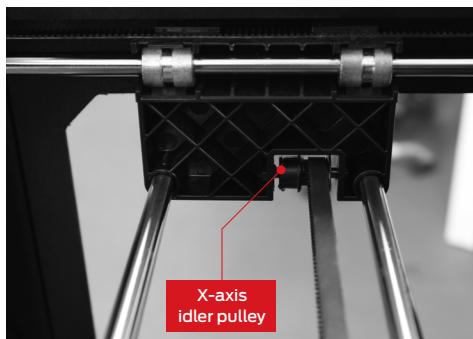


Fig. 2.6



Fig. 2.7

4. Grasp both sides of the build platform and move it to the top of the MakerBot Replicator 2X.

5. Use a clean, lint-free rag [or your finger] to spread the PTFE-based grease onto the bottom section of the threaded rod. Make sure you get the grease inside the threads themselves.

6. Locate the X-axis idler pulley. Facing the front of the MakerBot Replicator 2X, the idler pulley is at the top left side. [Fig. 2.6] The idler pulley is one of the pulleys that allow the rubber belt to move the extruder from left to right, or along the X-axis. The pulley at the other side of the gantry is called the timing pulley and does not require lubrication.

7. Squeeze a small amount of the PTFE-based grease directly onto the exposed area of the metal rod inside the idler pulley and manually move the pulley back and forth to spread the grease.[Fig. 2.7]

NOTE: To view a video of this process, go to the MakerBot Replicator 2X video page at makerbot.com/support/replicator2x/videos and select the video Replicator 2X Maintenance.

REALIGNING THE GANTRY

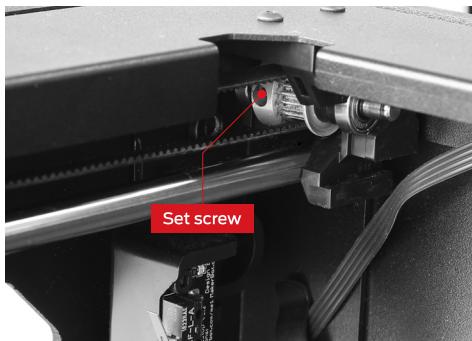


Fig. 2.8



Fig. 2.9

The gantry is the system of rods and belts that moves the extruder. If one side is too far out of alignment with the other, the outlines of printed objects might appear slanted on the build plate. You should make sure your gantry is aligned after moving or jolting your MakerBot Replicator 2X.

To determine whether your gantry is aligned correctly, push the extruders all the way to the front of the MakerBot Replicator 2X. Hold the right side of the gantry against the front of the MakerBot Replicator 2X. Then try pushing the left side forwards. It should not move. If it does move, perform the following steps.

1. Turn off the MakerBot Replicator 2X.
2. Unscrew the bolts on each of the makerBot Replicator 2X side panels. Set the bolts and panels aside.
3. Locate the four pulleys holding the Y-axis belts. There is one pulley in each corner of the MakerBot Replicator 2X upper frame. You will see two pulleys in the back right corner of the MakerBot Replicator 2X. You will be adjusting the pulley closer to the center of the MakerBot Replicator 2X.
4. For each pulley, manually move the extruders backwards or forwards to rotate the pulley until you have a clear view of the set screw holding the pulley to the front or back gantry rod. Use the 1.5 mm hex wrench from the Accessory Box to loosen each set screw. [Figs 2.8 and 2.9]
5. Manually move the extruders to the front of the MakerBot Replicator 2X, as far forward as they will go. Make sure that the plastic pieces on both sides of the gantry are flush against the plastic brackets that hold the two front pulleys.

REALIGNING THE GANTRY CONTINUED

6. Use the 1.5 mm hex wrench to tighten the set screw in each of the two back pulleys. Make sure these set screws are very tight.

NOTE: If you cannot see one of the set screws, hold both sides of the gantry and gently push it away from the front of the MakerBot Replicator 2X. Make sure to exert an equal amount of pressure on both sides of the gantry. Push only until you can see the hidden set screw.

7. Manually move the extruders toward the back of the MakerBot Replicator 2X. Make sure the gantry is as far back as it can go.

8. Use the 1.5 mm hex wrench to tighten the set screw in each of the two front pulleys.

Make sure these set screws are very tight.

NOTE: If you cannot see one of the set screws, hold both sides of the gantry and very gently push it away from the back of the MakerBot Replicator 2X. Make sure to exert an equal amount of pressure on both sides of the gantry. Push only until you can see the hidden set screw.

When you have completed these steps, your gantry will be correctly aligned again.

NOTE: To view a video of this process, go to <http://www.youtube.com/watch?v=NP47vjSZQtA>

TIGHTENING THE X-AXIS PULLEY AND THE Y-AXIS PULLEY

Loose X and Y-axis pulleys in your MakerBot Replicator 2X can result in belts slipping during printing. If you notice shifts on the X or Y-axis during a print, it might be time to tighten your pulleys. **To do this:**

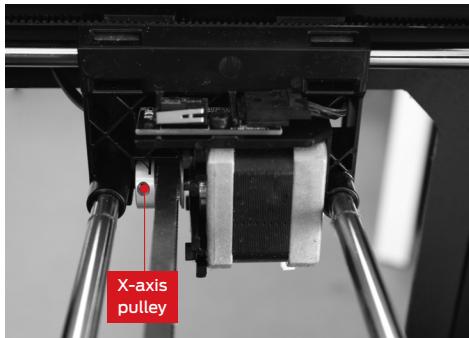


Fig. 2.11

1. Locate the X-axis pulley. It is attached to the motor mounted on the right side of the gantry. Slide the extruders to the left until you have access to the set screw holding the pulley to the motor shaft. Use the 1.5mm hex wrench from the Accessory Box to tighten the set screw. [Fig 2.11]

2. Locate the Y-axis pulley. It is attached to the motor mounted in the back right corner of the Replicator 2X. Slide the extruders to the front of the Replicator 2X until you have access to the set screw holding the pulley to the motor shaft. Use the 1.5mm hex wrench from the Accessory Box to tighten the set screw.

NOTE: To view a video of this process, go to <http://www.youtube.com/watch?v=76XaGlyGOZO>

FILAMENT CARE

Your MakerBot Replicator 2X Experimental 3D Printer is optimized to print with 1.75 mm MakerBot ABS plastic filament. For maximum performance, you must keep your ABS filament cool and dry. Heat and humidity can cause the ABS plastic to absorb moisture and swell. To reduce the absorption of moisture, keep the filament in

a sealed plastic bag when not in use. Keep your filament tightly wound on the spool. Loose filament will become tangled, and can break or jam during a print.

For more details on ABS plastic filament, see the chapter on filament in the *MakerBot Replicator 2X User Manual*.

ADJUSTING EXTRUDER SPRING TENSION

Each extruder in the MakerBot Replicator 2X includes a spring that puts tension on the extruder bearing. The extruder bearing then pushes the filament against the drive gear, which drives the filament into the hot end of the extruder. If the spring puts too much or too little tension on this bearing, the MakerBot Replicator 2X cannot extrude filament.

To adjust the tension on the extruder bearing:

1. Unload any filament.
2. Locate the extruder spring set screw on the extruder that needs adjustment. The set

screw is located in the threaded brass insert next to the filament hole in each extruder's drive block.

3. Set the extruder lever arm to the closed position. The lever arm should point towards the opposite extruder. Use the 2 mm hex wrench from the Accessory Box to tighten the set screw completely.
4. Turn the set screw $\frac{1}{2}$ turn counter-clockwise.
5. Test the tension on the spring. You should be able to move the extruder lever arm to the open position with some difficulty.

CONTACT US

SUPPORT

makerbot.com/support

Our website has extensive documentation and troubleshooting information about your MakerBot Replicator 2X Experimental 3D Printer. It's a great resource when you want to try to solve issues quickly on your own.

support@makerbot.com

If you ever need help resolving an issue with your MakerBot Replicator 2X, send an email to the address above to open a ticket with the MakerBot Support Team. To help us understand your problem from the start, it is very helpful to include pictures or a video as attachments on your email.

SALES

sales@makerbot.com

To learn about other MakerBot products, including MakerBot Filament, please email the address above, or call our Sales Team at 1-347-334-6800.

FEEDBACK

thoughts@makerbot.com

For general questions, or to tell us what's on your mind, send an email to the address above. We love to hear from you, and using this email address helps keep our Sales and Support lines free for customers in need.

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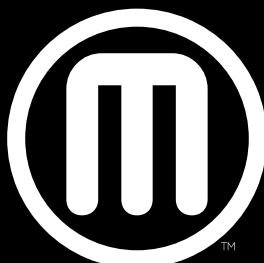
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NOTES



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