



Fortus 900mc Acceleration Kit

SOFTWARE / **PRODUCT** / FINISHING

OVERVIEW

Stratasys developed the Fortus 900mc™ Acceleration Kit to provide a significant throughput enhancement for the Fortus 900mc 3D Printer (Figure 1). It makes use of a new model tip, the T40A, to enable larger slice thicknesses that dramatically decrease build time. The larger tip size enables a throughput increase 2x-3x over the T20 tip, depending on part geometry.

Common applications where the Fortus 900mc Acceleration Kit can be beneficial:

- Prototypes
 - Concept
 - » Large mockups
 - Functional
 - » Fit tests
 - » Large panels
- Manufacturing
 - Large near-net shape parts
 - » Composite tooling
 - » Thermoforming patterns
 - Jigs and fixtures
 - Surrogate parts
- Production parts



Figure 1: This functional prototype top cover panel for the Fortus 450mc™ measures over 32 inches wide and was built using the Fortus 900mc Acceleration Kit.

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Larger slices and road widths along with the increased build rates enabled by the T40A tip can create certain conditions that customers may find undesirable (Figure 2). These conditions include:

- Melting due to shorter layer times
- Increased stair stepping due to thicker layers
- Lost small/fine feature detail due to wider toolpaths:
 - Small text
 - Sharp corners (geometry and toolpath width-dependent)
- Increased minimum wall thickness compared to other tip sizes

To alleviate this, consistent, high-quality parts can be achieved by adjusting to the specific system and material build characteristics:

Pre-processing – In addition to standard STL processing procedures, proper configuration of the modeler and selection of support structure parameters can be used to significantly improve build quality.

Machine preparation and printing – When packing parts for a job using Control Center™ software, proper placement and orientation of the part on the build platen and machine maintenance considerations are critical to success.

Post-processing – Proper part removal from the build chamber and proper support removal technique can improve user experience and quality of the resulting parts.

1. PRE-PROCESSING CONSIDERATIONS

1.1 PREPARE PART FILE IN INSIGHT™ SOFTWARE.

1.1.1 Material selection – ULTEM™ 1010 resin, ULTEM 1010 CG resin and ASA are available with the T40A tip on the Fortus 900mc (Figure 3).

NOTE: If a part is processed in Insight software to be built in one grade of ULTEM 1010 resin material but the other grade is loaded, the user will be able to confirm an override of the mismatch at the Fortus® system.

1.1.2 Slice thickness selection – The T40A tip enables building parts with a 0.508 mm (0.020 in.) thickness.

The slice height is selected on the **Configure Modeler** window. In the **Slice height** dropdown menu, select 0.508 mm (0.020 in.).

Table 1. T40A material choices and the corresponding model and support tips.

MODEL MATERIAL	MODEL TIP	SUPPORT MATERIAL	SUPPORT TIP
ASA	T40A	SR-30	T20B
ULTEM 1010 resin	T40A	ULTEM 1010 resin support	T20



Figure 2: A part with small, complex toolpaths.



Figure 3: A full-size chair in a Fortus 900mc.

1.1.3 Part orientation — Part geometry should be taken into account when selecting the appropriate orientation. Stair stepping of layers is more pronounced on some surfaces (Figure 4). To optimize surface finish, manual orientation is necessary. For an automated approach, use the Automatic Orientation feature in Insight. For more information on orientation, refer to the “FDM Best Practice: Orienting for Strength, Speed or Surface Finish.”

Short layer times between building on the same part or feature can cause feature distortion due to melting (Figure 5). Avoid packing a single part where residence time of the head on the single part may cause this heat buildup.

TIP: Adding a sacrificial part can help decrease the likelihood of this issue but does not always offer a significant improvement.

1.1.4 Support style — The default support style is sparse. When deviating from the default setting when building tall parts, care must be taken to check for high-aspect-ratio support structures that have a possibility of failing and causing the build to fail.

NOTE: There is often a reduction in support material required when switching to the Fortus 900mc Acceleration Kit. This is partially attributed to the default 40 degree self-supporting angle.

1.1.5 Stabilizer wall — Parts with tall, thin features can often show signs of overheating or distortion. Proper application of a stabilizer wall is the best way to ensure layers are properly aligned (Figure 6).

NOTE: Part stabilization is important because of the large extrusion bead from the T40A tip. This results in the part being pulled with greater force in the direction of the head’s movement.



Figure 4: Default stair stepping of layers.

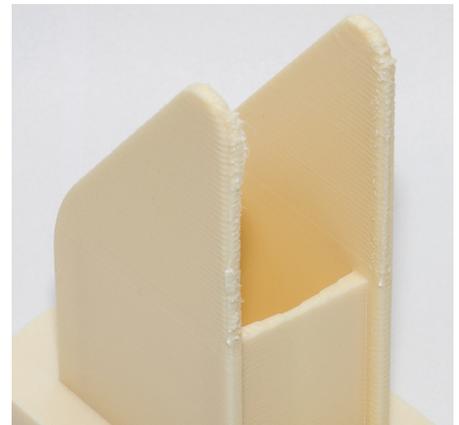


Figure 5: Part deformation due to melting.



Figure 6: Deformation due to instability.

1.1.6 Toolpath setup — Ensure the toolpath widths for a given slice height can produce sufficient fill of the part's features. The default road width is .040 inch and can be manually adjusted up to .058 inch. Take note of areas where the raster angle is near tangent to the contour as these areas may have larger voids (Figure 7).

1.1.7 Minimizing part curl — When printing large ULTEM 1010 resin parts, differential cooling may cause parts to curl. Processing tools integrated into Insight can eliminate or prevent this condition. Several methods are detailed in the “FDM Best Practice: Curl Management.”

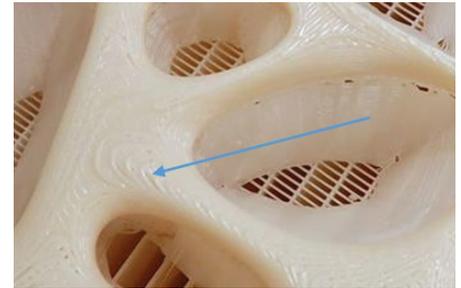


Figure 7: Voids where the raster angle is near tangent to the contour (depicted by the arrow).

1.2 BUILD PREPARATION USING CONTROL CENTER SOFTWARE

1.2.1 Part placement and orientation — Due to the airflow configurations of the Fortus 900mc, proper part placement can prevent and alleviate quality issues. Align the part's long axis along a diagonal between the front-left and back-right corners. For more information on placement in the Fortus 900mc, refer to the “FDM Material Guide: ULTEM 1010 Resin.”

TIP: For parts with large support structures, orienting the build to maximize the airflow across the support structure may improve part quality.

For packs of small parts, use creative placement and build order adjustments to maximize the time between layers to help prevent melting.

1.3 MACHINE PREPARATION AND PRINTING

1.3.1 Machine preparation — Proper machine preparation is important for safeguarding the machine against damage, but also to ensure good build quality. Follow regular maintenance outlined in your machine's user guide. Also, ensure that each of the following items is completed before installing the T40A tip.

TIP: The Tip Change Wizard will provide step-by-step instructions for the tip change process, including basic recommended maintenance.

1.3.2 Maintenance

STEP 1: Clean the platen, vacuum the build chamber and empty the purge bin.

STEP 2: Clean and inspect the tip wipe assembly.

STEP 3: Inspect the Kapton tape around the upper funnel chute and Y-carriage and replace as necessary.

STEP 4: Verify the flicker and brush assembly is calibrated at the correct height.

STEP 5: Ensure that the tip shrouds are clean and undamaged.

1.3.3 Load material – Due to the high material deposition rate, two standard canisters may only supply 13 hours of continuous runtime. (This can be the case for geometries with long toolpaths with no support.)

NOTE: For uninterrupted printing, use XTEND 500™ Fortus Plus boxes to extend printing to 35 hours per box.

Load the model and support materials.

TIP: Load material into each available material bay to prevent excess ambient moisture from entering the filament tubes and degrading build quality.

When using multiple canisters for a single build, match the lot number and manufacturing date to minimize noticeable color variation at the changeover layer.

1.3.4 Insert build sheet - Install a build sheet and verify that vacuum is present.

TIP: When using the small build sheets for the Fortus 900mc, place the build sheet so that the front left corner is aligned just over the front left outline of the small build sheet vacuum port. This prevents vacuum loss due to tension induced by the part being built.

1.3.5 Tip calibration – The T40A tip features a new larger calibration file geometry that prints in three minutes as opposed to seven (Figure 8).

Perform XYZ tip offset calibration.

NOTE: The support slice thickness should be calibrated to 0.508 mm (0.020 in.).

Part quality and support removability are directly related to accurate system calibration. X and Y offset must be within tolerance (± 0.05 mm [± 0.002 in.]). The Z slice variation must be within ± 0.0127 mm (± 0.0005 in.).



Figure 8: New T40A tip calibration box.

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1.4 REMOVE PART

The T40A is well suited for printing large parts that can hold their heat for long periods of time. Caution should be used when removing ULTEM 1010 resin parts from the build chamber.

CAUTION: Wear appropriate personal protective equipment (PPE) such as leather gloves because ULTEM 1010 resin parts will be hot (> 170 °C [338 °F]) and the high-temperature build sheet can become brittle as it cools and may break off in pieces.

1.5 REMOVE SUPPORT

1.5.1 Support removal – Large areas of support can rapidly decrease the effectiveness of the WaterWorks™ concentrate. If the life of the WaterWorks concentrate is important, manual support removal is recommended.

CAUTION: Wear PPE (leather gloves and safety goggles) as the parts will be hot and support can break off in pieces that may become airborne.

2. SAFETY

Observe manufacturer's recommendations for safety, material handling and storage. This information can be found in the Safety Data Sheet.

3. TOOLS AND SUPPLIES

3.1. Optional Items:

- Leather gloves
- Safety goggles

4. MATERIALS

- ASA
- ULTEM 1010 resin
- ULTEM 1010 CG resin

5. SOFTWARE

- Insight software (documented with Insight 10.8)

6. 3D PRINTERS

- Fortus 900mc

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Reference materials:

- Documents
 - Fortus User Guide
 - FDM Material Guide: ULTEM 1010 Resin
 - FDM Best Practice: Orienting for Strength, Speed or Surface Finish
 - FDM Best Practice: Curl Management

CONTACT

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