

User Guide
English

Objet30 3-D Printer System



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7,364,686

7,369,915

7,479,510

7,500,846

7,604,768

7,628,857

7,658,976

7,725,209

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Using This Guide

This user guide provides instructions for installing, operating and maintaining Objet30 3-D printing systems. It explains how to use features, and provides practical examples to guide you as you use the system.

This document is meant to be used with the Objet30 3-D printer, running software version 30.2.1.5896, and with Objet Studio software version 8.5.9.

This guide assumes that:

- all the hardware, software, and network components of your Objet30 system are installed, configured, and operating correctly.
- the operator has a working knowledge of the Windows® PC platform.

For More Information

Visit <http://www.objet.com/> for more details about Objet's technology, products and consumables, and for service and support contacts.

For other documents that relate to Objet30 3-D printing systems, and for this document in other languages, contact your regional Objet Customer Support office.

If you have any questions about the information presented in this document, or if you have any comments or suggestions for future editions, please send a message to support@objet.com.

Terms Used in This Guide

build tray	<p><i>In Objet Studio:</i> The surface displayed on the screen that represents the actual build tray in the Objet30 printer.</p> <p><i>In the Objet30 printer:</i> The surface upon which models are produced.</p>
cleaning fluid	Cleanser for flushing model feed tubes and the printing block, used to completely remove model material from the system before loading another type of material in the printer. The cleaning fluid is supplied in model-material cartridges.
client/user workstation	The workstation on which Objet software is installed, used for preparing build trays for production on Objet30 printers. (There is no limit to the number of client workstations in the local network.)
Objet30™ printer	The Objet 3-D printer referred to in this guide.
Objet30 computer	The computer inside the Objet30 printer that operates it. (This is sometimes referred to as the “embedded” computer.)
Objet30 printer interface	The GUI (graphical user interface) used for controlling the Objet30 printer.
Objet30 software	Software running on the computer inside the Objet30 printer that controls all printer operations.
host/server workstation	The workstation on which the full version of Job Manager is installed. This workstation interfaces directly with the Objet30 printer and is typically positioned next to it.
Job Manager™	The software that manages production jobs before they are sent to the Objet30 printer.
Model material	Material used for building models.
Objet Studio™	The software with which users prepare jobs for producing models.
OBJTF (Objet Tray Format)	The extension of a file that contains all of the information needed for a model-printing job on Objet 3-D printers. An <i>objtf</i> file is used to send a print job to an Objet 3-D printer.
OBJZF (Objet Z Format)	The extension of a compressed “wrapper” file containing all of the files used in an Objet Studio build tray. Using <i>objzf</i> files, a printing job can be saved as a single file, for convenient storage and transfer.
resin	The base substance from which photopolymer printing materials are made for use in Objet30 printers. In Objet Studio, Job Manager and Objet30 software, “resin” refers to cartridges of model and support materials.

SLC	A file type used with Objet software. (These files are bitmaps of individual slices of the object. For more information, see page 3-3.)
STL	A file type used with Objet software. (For more information, see page 3-3.)
Support material	Material used for supporting the structure of models during production.

2

Safety

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Safety Features

Objet30 3-D printers are designed to comply with CE and FCC standards. They are equipped with the following safety features:

Cover interlock switch

The power supplied to the UV lamp and the motion motors is turned off when the cover is opened.



WARNING: Do not defeat (override) the interlock switch. Doing so could result in serious personal injury. If the interlock switch does not function correctly, do not use the printer, and contact your service provider.

Cover lock

The cover is locked while the printer is working. It is released when the printer reverts to *pause* or *stop* mode.



WARNING: Do not defeat (override) the safety lock. Doing so could result in serious personal injury. If the safety lock does not function correctly, do not use the printer, and contact your service provider.

UV screen

The transparent section of the cover blocks harmful UV radiation, allowing the operator to view the model as it is being made.

Circuit breaker

The power to the printer is turned off in case of electrical overcurrent.

Note: The circuit breaker is only accessible to service personnel.

Grounded chassis

The chassis of the printer is grounded, to prevent electrical shock.

Note: The power outlet must be properly grounded, in accordance with the local electric code, to provide this protection.



Figure 2-1: Front and back views of the Objet30 printer



If the Objet30 3-D printing system is not used as specified in this guide, the safety features may not provide adequate protection.

Symbols and Warning Labels

This following table lists the warning labels located on or in Objet30 printers.

Warning Symbol	Meaning	Location	Comments
	Hazard (general)	On the name plate on the back of the printer.	Read the instructions in this document before operating the printer.
	Hot surface	On the print-head block.	Risk of burns. Do not touch this surface after printing.
	High voltage	Near the UV lamp connector. Near the power-supply enclosures.	Risk of electric shock.
	Ultraviolet radiation	Near the UV lamp.	Risk of injury from ultraviolet radiation.
	Moving parts	On top of the printing assembly.	Risk of injury from moving parts.

Safety Guidelines

The following general guidelines, together with the instructions provided throughout this user guide, ensure user safety while operating and maintaining the Objet30 system. **If the system is not operated as specified, the user's safety may be compromised!**

Printer Installation

- Installation and removal of the Objet30 printer should only be done by qualified service personnel.
- Connect the printer to the electric outlet using a power cord that is safety-certified.
- The electric outlet should be easily accessible, near the printer.
- Never connect the power plug to an outlet that does not have a ground (earth) wire, and never disconnect the ground. Doing so may expose the operator to serious danger from electric shock.
- Leave a minimum of 20 centimeters between ventilation openings and walls or other objects.

Printer Operation

- The Objet30 printer should only be operated by persons trained by an Objet customer-support representative.
- All personnel operating or maintaining the Objet30 printer should know the location of first aid and emergency equipment and how to use it. **Never block access to this equipment!**
- Keep fingers and other body parts clear of the printer cover when closing it.
- Never attempt to open the main cover of the printer while it is working!
- Never override the interlock safety switch!
- If the interlock safety switch ever fails, **do not use the printer.**
- Several parts of the printer remain extremely hot even after it has stopped operating. Avoid touching the UV lamp and the print block.

UV Radiation

- The UV lamp used in the printer emits dangerous radiation. If the UV lamp remains on when the printer cover is open, do not stare directly at the UV light. Shut down the printer and call your Objet service provider.

Printer Maintenance

- Service operations should be performed only by qualified personnel who have been instructed in relevant safety precautions.
- Notify co-workers and those who have access to the Objet30 system before beginning non-routine and hazardous work.



Report any potential dangers and safety-related accidents to your safety officer or to other appropriate authorities.

Model and Support Materials

Model and support materials are made of **chemical substances**. Although precautions must be taken when handling these materials directly, all model and support materials used by the Objet30 system are handled in sealed cartridges. Normally, operators of the Objet30 printer should never be directly exposed to hazardous materials. In the unlikely event of a leak or spill, follow the instructions that are included with the printing-material cartridge used.

- Store cartridges of model and support materials indoors, in a dry area with adequate ventilation, between 16-27 degrees Celsius (60-81 degrees Fahrenheit). Never expose them to flames, heat, sparks, or direct sunlight.
- Keep model and support materials away from areas where food and drink are stored, prepared and consumed.
- Uncured printing material is considered a hazardous substance, requiring certain precautions when directly handling it. To prevent skin irritation, wear **neoprene** or **nitrile gloves**. If there is any chance that model and support materials might splash into the eyes, wear safety goggles. Prolonged direct contact with printing materials can cause an allergic reaction.
- When handling UV-cured models that may not be completely cured on the surface, common latex gloves are adequate.
- To prevent respiratory irritation, ventilate areas where model and support materials are used. The ventilation system should totally replace the air at least four times per hour.
- Clean up model-material and support-material spills with disposable towels or other absorbent, non-reusable material, such as sawdust or activated charcoal. Rinse the spill area with denatured or isopropyl alcohol (IPA), followed by soap and water. Dispose of the absorbent material in accordance with local regulations.
- Do not wash contaminated clothing at home; clothing should be professionally laundered.
- Dispose of contaminated shoes, belts and other leather items in accordance with any applicable regulations. Absorbed printing material may re-expose the user when these items are worn.

First Aid for Working with Printing Materials

In general, try to avoid direct contact with uncured printing material. If skin or eyes come into contact with it, wash the area immediately and thoroughly with water, and follow these first-aid instructions.

Contact with Skin

If uncured printing material comes in contact with skin, wash the affected area immediately and thoroughly with soap and cool water, then remove contaminated clothing. Pay particular attention to flushing the hair, ears, nose and other parts of the body that are not easily cleaned.

- Use cool water to prevent skin pores from opening, so that the liquid material does not easily penetrate the skin.
- Do not use solvents to clean skin.
- If large areas of skin have been exposed, or if prolonged contact results in blisters, seek medical attention. In any case, if irritation persists, seek medical attention.
- Avoid the accidental transfer of printing material from the hands to other areas of the body, especially to the eyes.
- If protective cream was used, do not reapply it until the skin has been completely cleansed.

Contact with Eyes

If uncured printing material comes in contact with the eyes, flush immediately with large amounts of water for 15 minutes and seek medical attention.

- Avoid sunlight, fluorescent light, and other sources of ultraviolet radiation.

The wearing of contact lenses when handling liquid printing materials is not recommended. If the liquid splashes into the eyes when contact lenses are worn, immediately remove the lenses and flush the eyes with water.

- Clean and disinfect the contaminated lenses.
- Do not wear contact lenses until eye irritation disappears.

Ingestion

If printing material is swallowed, refer to the instructions included with the cartridge. *Seek medical attention immediately.*

Inhalation

Vapors from printing materials can be irritating to the respiratory system. If respiratory irritation occurs, expose the victim to fresh air immediately.

- If the victim has stopped breathing, perform artificial respiration or cardiopulmonary resuscitation.
- Seek medical attention immediately.
- Keep the patient warm but not hot.
- Never feed anything by mouth to an unconscious person.
- Oxygen should be administered by authorized personnel only.

Waste Disposal

Fully cured printed models can be disposed of as ordinary office trash. However, special care is required when handling printer waste.

- When removing the waste container from the Objet30 printer, wear neoprene or nitrile gloves.
- To prevent liquid waste from splashing into the eyes, wear safety goggles.
- Liquid waste from the Objet30 printer is classified as hazardous industrial waste. Therefore, printing-material waste must be packaged and disposed of in a manner that prevents human contact with it and contamination of water sources.
- Empty model-material and support-material cartridges contain residue of their contents. Some leakage of this residue may occur through the broken cartridge seal. Therefore, handle and store empty cartridges with care.
- Do not attempt to reuse empty cartridges, and do not puncture them.
- Dispose of used cartridges and waste containers in accordance with local regulations.
- Discard contaminated clothing, shoes, empty containers, etc., in accordance with any applicable regulations.

3

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Figure 3-1: The Objet30 3-D Printer

Work Configurations

The Objet30 3-D printing system can be set up as a single-station system or as a multi-station system. When connected to a local computer network, the system can serve multiple users. In such configurations, each user workstation (client) prepares files with Objet Studio software for production. A server (host), typically next to the 3-D printer, acts as a job manager that sends production jobs to the printer for production.

Figure 3-2 shows the Objet30 printer set up in a multi-client configuration.

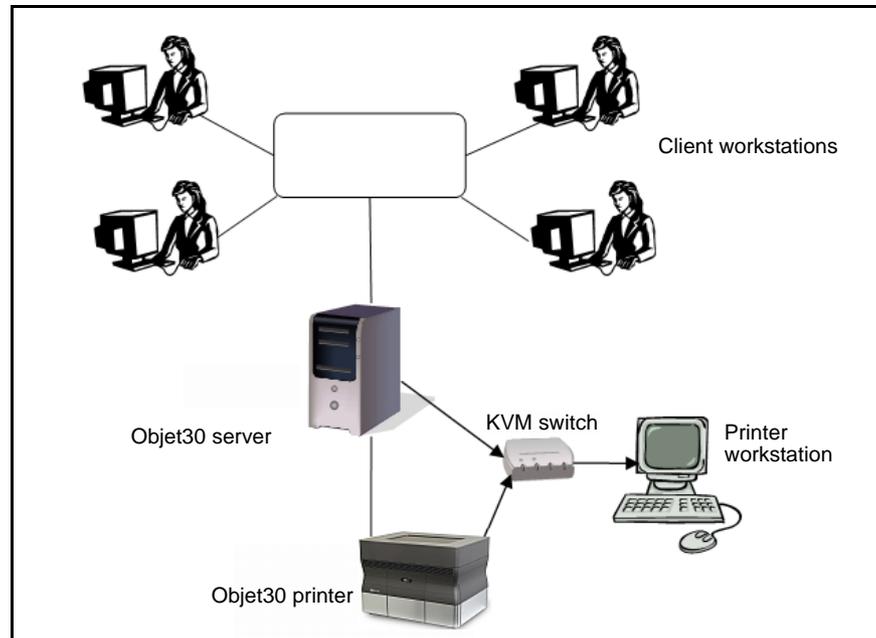


Figure 3-2: Multi-client network configuration

When installing the Objet software, you choose whether to install it as a client station or as a master station (server or standalone station).

The Objet software arranges the jobs it receives according to their priorities, model-material type, and other factors. In multi-workstation configurations, the operator of the server—typically the production administrator—has total control over the jobs sent to the 3-D printer, and can prioritize and delete jobs, review job history and reprint a job, and so on.

Source Files

Objet30 3-D printing systems produce three-dimensional models designed with most 3-D CAD tools and with other job-specific 3-D applications.

Objet30 systems accept:

- STL Files
- SLC Files

Objet30 systems feature the capability of producing both types of model files simultaneously.

STL Files

STL is short for *Standard Triangulation Language*. This language views any object as a collection of surfaces, and describes each surface of the object as a collection of triangles.

For example, a square can be described as two triangles; a cube (six squares) as 12 triangles. Curved surfaces need more triangles to describe them. The higher the tolerance (for smooth surfaces), the more triangles are needed. The result is that high-quality object descriptions mean very heavy files.

Most CAD software can export STL files. The Objet30 system utilizes these files for building models (rapid prototyping), and also for directly making molds for mass-producing items.

STL files are ASCII (text) files. The content of each file begins with “solid” and ends with “end-solid” (both lower case). Between these keywords is a list of the triangles that describes the faces of the solid model. Each triangle defines a single normal vector directed away from the solid’s surface, followed by its X-Y-Z coordinates. These are expressed as Cartesian coordinates and are floating-point values. The coordinates of all triangles should be positive and should fall within the volume of the model.

SLC Files

SLC is short for *Stereo-Lithography Contour*. SLC files describe two-dimensional contours of the three-dimensional models. These contour lines are polylines.

SLC files are ASCII (text) files that save models as a series of slices. This means that models based on SLC files cannot be orientated; only their scale (size) and position on the build tray can be controlled. For this reason, the model’s orientation must be suitable for production before it is saved as an SLC file. Because of the nature of SLC files, the appearance of models in Objet Studio may be different than the solid-object images displayed from STL files.

Printing Materials

Objet30 printers produce models by jetting thin layers of printing materials on the build tray, until the complete model is formed. Two types of material are used in this process:

- *Model* material— which makes up the finished model
- *Support* material— which fills gaps and spaces in the model during printing, and is removed after printing

Available Materials

Two groups of Model materials are available for the Objet30 printer—

- *Vero*

Materials in this group are suitable for general model making, and come in a choice of color (white, blue, gray, and black). They offer the following features:

- thermo-plastics simulation (appearance and feel)
- high dimensional stability (especially with VeroGray™)
- excellent detail and surface quality

- *Durus*

DurusWhite™ is currently available, with the following features:

- polypropylene simulation (appearance and feel)
- enhanced toughness and flexibility— suitable for reusable containers and other snap-fit applications

For up-to-date information about Objet printing materials and their properties, go to www.objet.com/Materials.

Storage

Materials used for printing models with Objet30 printers are made of resins, which are composed of reactive monomers and oligomers. Although printing materials are supplied in sealed, UV-proof cartridges, care must be taken when storing and handling them. Follow these guidelines to protect operators and the environment, and to ensure optimum results.

- To ensure product stability, do not allow these materials to come into contact with metal. Plastics made from monomer-soluble substances (such as polystyrene or polyvinyl chloride) are not suitable for storing Objet printing materials.
- When not in use, keep material cartridges tightly sealed to prevent contamination, the effects of exposure to UV radiation, and accidental spillage.
- Store material cartridges indoors, in a dry area with adequate ventilation, between 16–27 degrees Celsius (60–81 degrees Fahrenheit). If exposed to heat or flames, cartridges may burst or ignite.
- Signs of premature polymerization in material cartridges may include bulging, leaking, the emission of heat, and unusual odor. Exposure to heat can cause resin to gel in the cartridge.
- Make sure that material cartridges are stored in accordance with all local regulations and other applicable requirements.

Shelf Life	Materials used for producing models have a limited shelf life. The expiry date on the label is valid when properly stored in an undamaged, unopened cartridge. Always rotate your stock, so that the cartridge with the earliest date is used first.
Exposure to Light	If printing materials are not in their sealed cartridges, make sure to shield them from sunlight and other sources of UV radiation, such as fluorescent and mercury-vapor lights. Exposure to UV radiation causes an increase in viscosity and, eventually, solidification.
Safety Considerations	<p>Before being cured, resins are hazardous materials. To prevent possible health hazards, follow these precautions regarding printing materials:</p> <ul style="list-style-type: none">• Do not expose to flames, heat or sparks.• Prevent contact with skin and eyes.• Ventilate areas where they are handled.• Keep them separate from food and drink. <p>Cured plastic parts, however, are safe. They can be handled and stored without precautions.</p>
	 You can find more safety information about resins in “Safety Guidelines” on page 2-4, and “First Aid for Working with Printing Materials” on page 2-6.
Disposal	Dispose of cartridges of Objet model and support material in accordance with all applicable laws and regulations. If necessary, the cartridges can be disassembled for recycling.

Work Environment

Extreme heat and humidity conditions can adversely affect the operation of the Objet30 3-D printer. Therefore, it is recommended that you use ventilation or air-conditioning systems, if necessary, to keep the work area within the following ranges:

- 18°–25° C (64°–77° F)
- 30%–70% relative humidity

Workstation Requirements

The minimum requirements for computer components used with Objet 3-D printer software are listed in the following table.

	Server/ Stand-alone Station	Client Workstation
Processor	Pentium 4, 3.0 GHz, 512 KB cache memory (min.)	Pentium 4, 3.0 GHz (min.)
Operating System*	Windows XP <i>Professional</i>	Windows XP <i>Professional</i>
Graphics Card	Supporting open GL, with 512 MB of memory	Supporting open GL, with 512 MB of memory
RAM	4 GB (min.)	2 GB (min.)
CD Drive	IDE CD ROM	IDE CD ROM
Hard-Disk Drive	40 GB (min.)	40 GB (min.)
Network Adaptor Cards	LAN TCP/IP (2)	LAN TCP/IP (1)
Ethernet Cables	<ul style="list-style-type: none"> • Straight-through cable (1) • Crossover cable (1, supplied) 	Straight-through cable (1)

* Also supported:

- Windows 7 (32-bit/64-bit), *Professional, Ultimate, Enterprise* editions
- Windows Vista (32-bit/64-bit) *Ultimate, Business, Enterprise* editions

Note: On 64-bit operating systems, Objet Studio runs as a 32-bit application.

Recommendations:

- Monitor resolution: 1280 x 1024 pixels
- Color quality: 32 bit
- Two Ethernet ports

Preparing Files for Use with Objet30 3-D Printing Systems

Before using files with Objet30 3-D printing systems, you must convert them in your CAD program to either STL files or SLC files. (For an explanation of these file formats, see “Source Files” on page 3-3.)

After converting the model files, it is recommended that you check them for defects in an STL-repair application (such as Magics, by Materialise) before opening them in Objet Studio and producing the model.

You can print several models or parts at the same time, after arranging them on the build tray in Objet Studio. The following are the maximum dimensions for a single model printed on the Objet30 printer:

- *With glossy finish*—
 - X axis: 294.00 mm (11.57 inches)
 - Y axis: 192.60 mm (7.58 inches)
 - Z axis: 148.60 mm (5.85 inches)
- *With matte finish*—
 - X axis: 293.00 mm (11.53 inches)
 - Y axis: 191.60 mm (7.54 inches)
 - Z axis: 148.30 mm (5.83 inches)

Converting CAD Files to STL Format

This procedure may vary slightly, depending on the CAD software used, but the following instructions generally apply.

To convert a file to STL format (in a CAD program):

1. From the File menu, select Save As.
2. In the Save As dialog box, open the Save As Type pull-down menu and select *.STL.
3. Click Options and set the following parameters:
 - Total Quality—approximately 0.1 mm (deviation tolerance / linear-dimension tolerance)
 - Detail Quality—approximately 4° (angle tolerance)

Note: Lowering these values produces more accurate models, but results in larger files and longer loading and processing times. For this reason, it is generally not recommended that you use lower values.
4. In the file format option, choose *binary* or *ASCII*. (Both binary and ASCII formats can be used in Objet Studio. However, binary files are smaller, so this option is recommended.)
5. Click OK or Save.

Converting Files to SLC Format

When converting files to SLC format, it is recommended that you set a layer thickness of 15 microns (0.015 mm). Since SLC files cannot be orientated in Objet Studio, it is important that models are properly orientated before being saved as SLC files. Considerations for suitable model orientation are explained in “Model Orientation” on page 5-10.

Objet Studio Software

Objet Studio software for the Objet30 3-D printing system consists of two main sections:

- Objet Studio
- Job Manager

Objet Studio

With Objet Studio, you prepare source files for production in Objet30 3-D printers. Objet Studio offers you a wide variety of file-preparation options, but always consists of the following basic procedure:

1. Inserting one or more objects on the *build tray*
2. Positioning the object(s) on the tray
3. Configuring object and tray parameters
4. Saving the tray configuration as an *objtf* (Objet Tray Format) file
5. Sending the *objtf* file to the Objet30 3-D printer for production

Using Objet Studio to perform these tasks is described in detail in chapter 5, “Using Objet Studio.”

Job Manager

Job Manager is different for client workstations and for the computer connected directly to the Objet30 3-D printer.

- In Objet Studio installed on the directly-connected computer (server), Job Manager displays the queue and status for all jobs sent to the 3-D printer by the client computers on the network, and allows editing and manipulation of all jobs.
- In Objet Studio installed on client computers, Job Manager displays the queue and status only for jobs sent to the 3-D printer server from that computer, and allows the user to edit only these jobs.



Client computers can be connected, via the local network, to different Objet30 3-D printers, but only to one at a time. The client Job Manager displays the status of the 3-D printer to which the client is currently connected.

4

Installing Objet Software

How to Install Software for the Objet30 3-D Printing System..... 2

How to Install Software for the Objet30 3-D Printing System

The Objet Studio setup wizard guides you when installing the Objet software. During installation, you must choose to install either the server (“host”) application or the client application.

To install Objet software:

1. Insert the Objet Studio CD into the disk drive.
2. Right-click the Start button and select Explore (or use any other method for displaying files on the computer).
3. Open the CD-drive folder and select Setup.

To run the installation wizard, you must accept the Objet Studio license agreement. After reading its terms, click Yes to continue, or No to close the wizard.

If you click Yes, the following screen should appear.

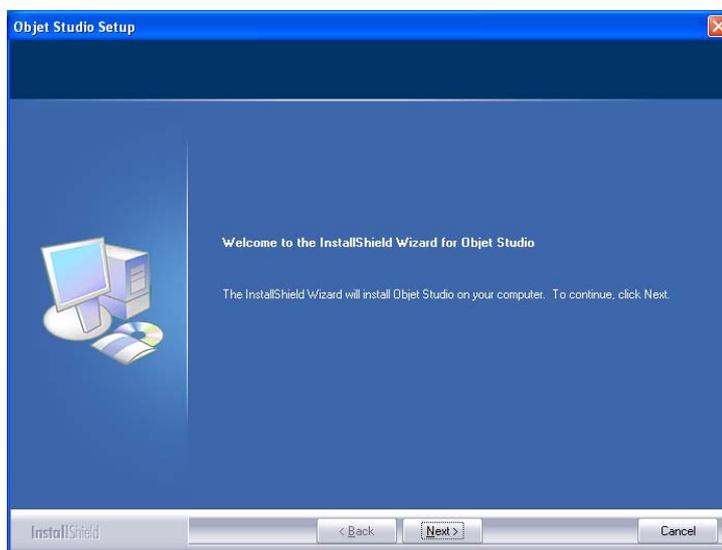


Figure 4-1:Objet Setup—installation wizard *Welcome* screen

4. Click Next to begin installation.

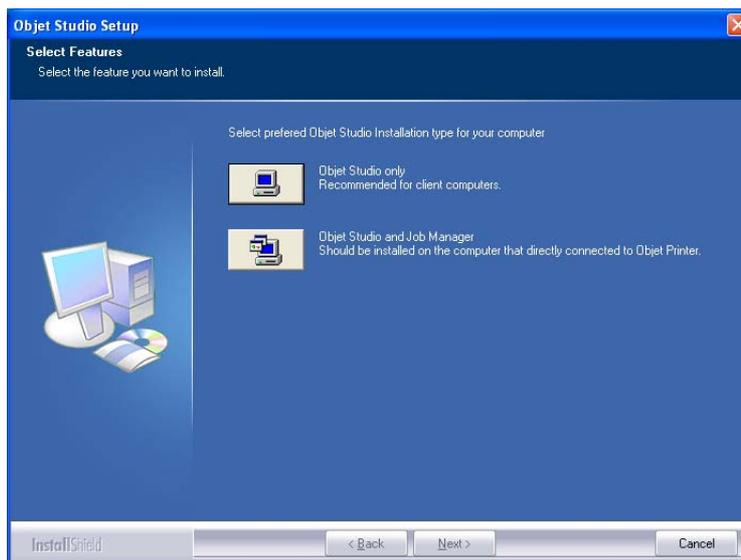


Figure 4-2: Objet Setup—*Select Components* screen

5. When the *Select Components* screen appears, select one of the installation options, then click **Next**.
 - Select **Objet Studio only** for client workstations
 - Select **Objet Studio and Job Manager** for the server (host) station and for a standalone station—that is, the computer directly connected to the Objet30 printer.

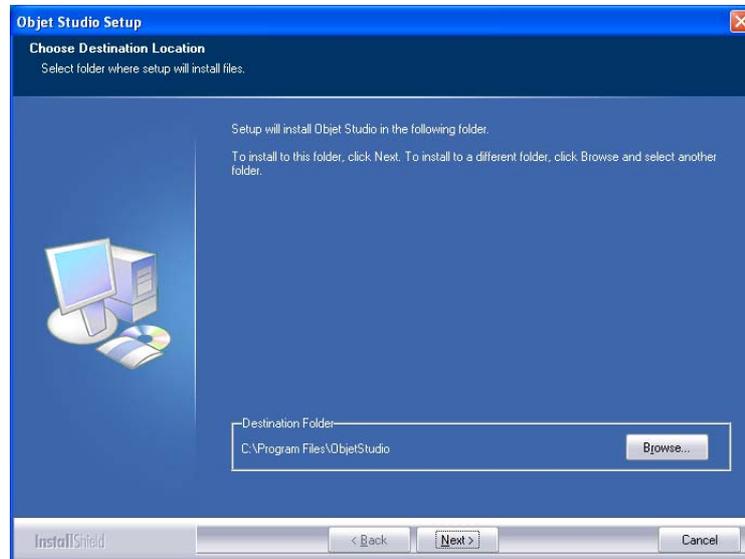


Figure 4-3: Objet Setup—*Choose Destination Location* screen

6. In the *Choose Destination Location* screen, verify the destination folder and click **Next**.



It is recommended that you do not change the default destination folder.

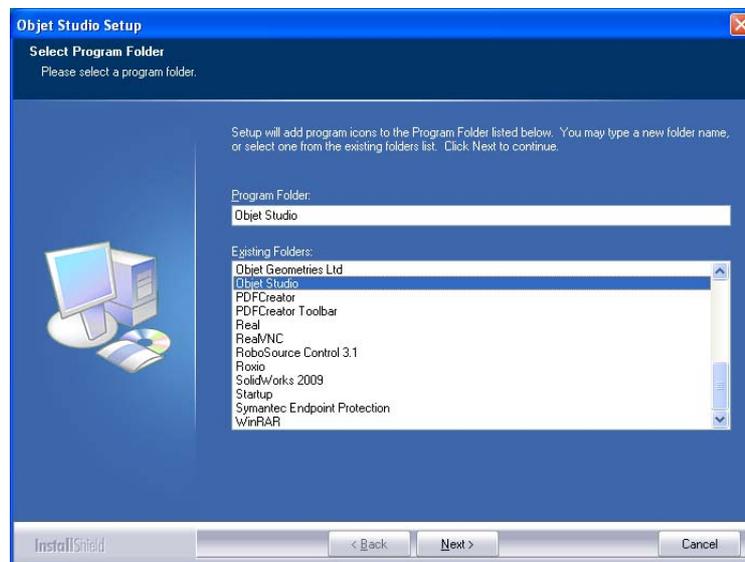


Figure 4-4: Objet Setup—*Select Program Folder* screen

7. In the *Select Program Folder* screen, verify the pre-selected folder in which the Objet Studio icons will be installed.
 - To install the icons in another program folder, select it.
 - To continue, click Next.

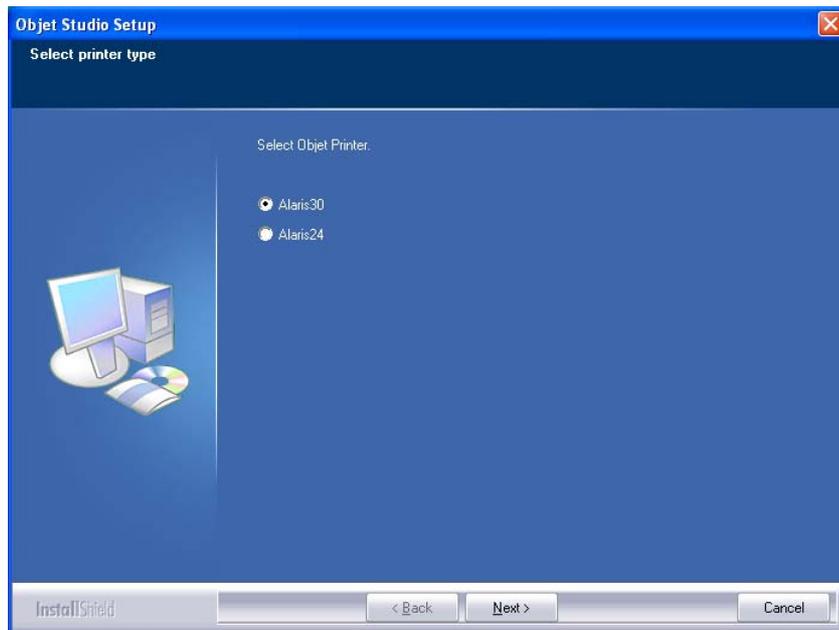


Figure 4-5: Objet Setup—*Select Printer Type* screen

8. In the *Select printer type* screen, select the Objet 3-D printer used for producing models.
To continue, click Next.

Installation begins and the *Setup Status* screen appears, showing the progress of the installation process.

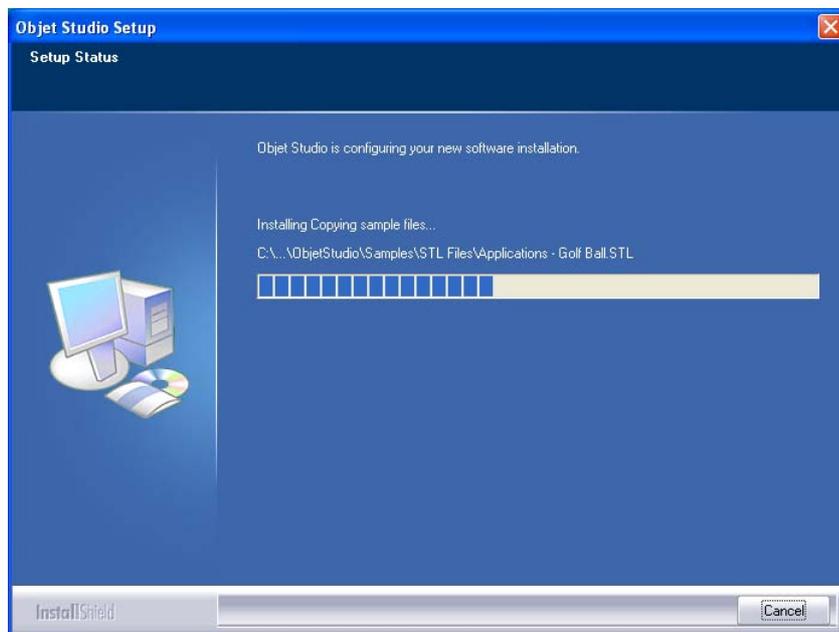


Figure 4-6: Objet Setup—*Setup Status* screen

When the Objet program installation is complete, the final InstallShield Wizard screen appears.

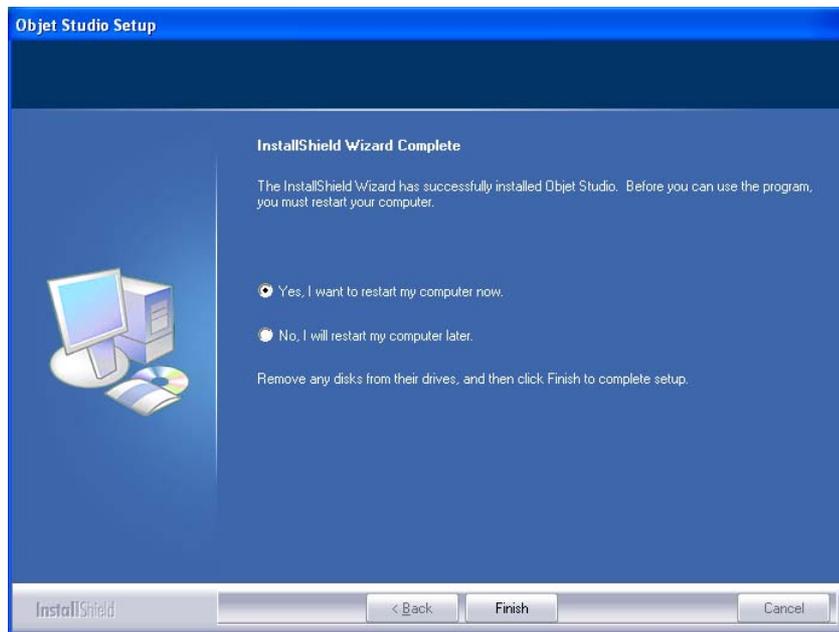


Figure 4-7: Objet Setup—final wizard screen

To complete the software installation, you must restart the computer. You can do so now or at another time.

9. Select either “Yes...” or “No...” and click Finish.

Make sure to remove the CD from the disk drive before restarting the computer.

The installation process ends when the appropriate icon(s) appear on the computer desktop:

- Objet Studio
- Job Manager (for servers and standalone stations)
- Stop Job Manager (for servers and standalone stations)

Using Objet Studio

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Opening Objet Studio



After you install Objet Studio, a launch icon  appears on the Windows desktop. Open the application by double-clicking this icon, or by selecting Objet Studio from the Start > Programs menu.

Objet Studio opens, displaying an empty build tray.

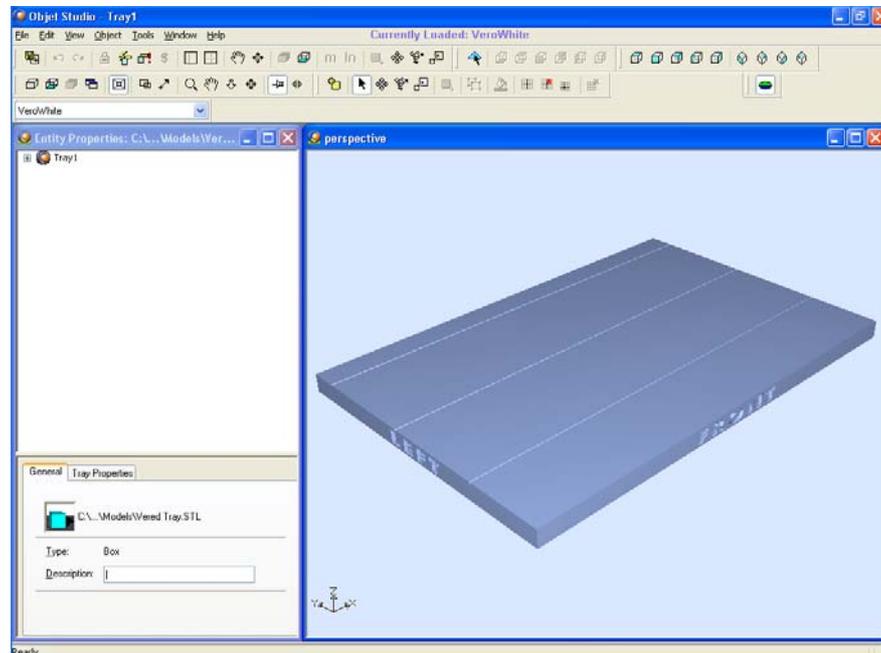


Figure 5-1: Objet Studio opening screen

Toolbars

The icons shown in this chapter are available only when relevant toolbars are displayed. You can control the toolbars displayed at any time, and you can re-arrange them on the screen.

To customize the toolbars displayed in Objet Studio:

1. From the *View* menu, select *Toolbars*.
2. In the *Customize* dialog box, select the toolbars you wish to display, and click *OK*.

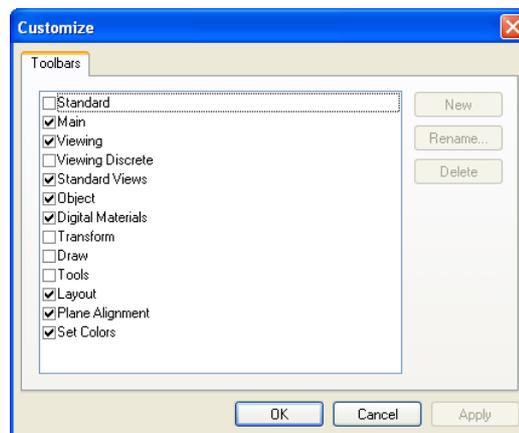


Figure 5-2: Toolbar selection dialog box

3. Click and drag the toolbars to position them as you wish on the Objet Studio screen.

Preparing Models for Production

To produce models, you must open one or more files in Objet Studio and position the objects on the build tray. You can place objects on the build tray in two ways:

- by inserting individual *stl* or *slc* files
- by pasting objects that you copied to the Windows clipboard

If you know what type of model material will be used to produce the models, make sure it is selected from the material drop-down menu.



Figure 5-3: Model material selection toolbar

Note: It is not necessary to select the model material now, but it is recommended—each type of material has unique characteristics that may affect the valid positioning of objects on the build tray.

Opening STL & SLC Files

To place an object on the build tray:

1. Open the *Insert* dialog box —
 - From the *Object* menu, select *Insert*.
 or —
 - On the toolbar, click the *Insert Model* icon .
 or —
 - Right-click on the build tray, and select *Insert*.

The *Insert* dialog box appears.

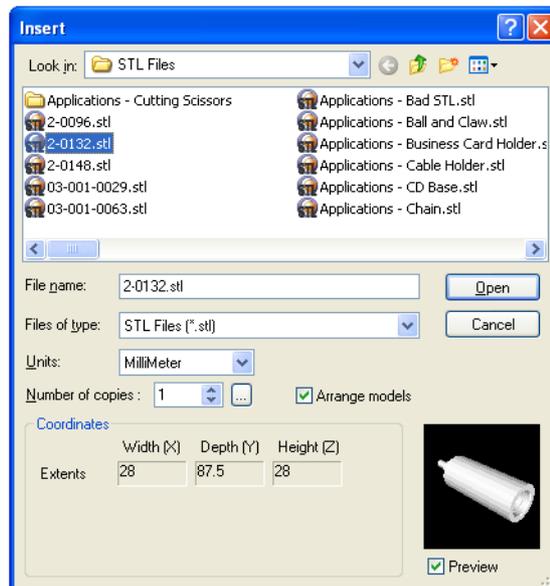


Figure 5-4: *Insert* dialog box

2. In the *Look in* field, display the appropriate folder.
3. In the *Files of type* field, select the file types to display (*stl*, *slc*).
4. Select the desired file, and make sure that it appears in the *File name* field.

If the *Preview* check box is selected, the object is displayed in the dialog box, as shown in figure 5-4.

5. Select any of the following options, as required:
 - **Units**—Choose *millimeters* or *inches* for the object's units of measure.
 - **Number of copies**—Choose how many copies of this object to place on the build tray.
 - **Arrange models**—Select this check box to automatically position objects on the build tray for efficient model building.

Note: The 3-D file contains the object's proportions, but not its units of measure. Therefore, make sure to correctly select either *millimeters* or *inches* when inserting an object. Otherwise, the size of the object on the build tray will be either much too large or much too small.



The *Extents* values displayed at the bottom of the dialog box represent the maximum dimensions of the object on each axis. These dimensions correspond to the virtual “bounding box” surrounding the object (see figure 5-24 on page 19).

6. Click **Open**.

Objet Studio places the object on the build tray, and in the list in the hierarchy pane.

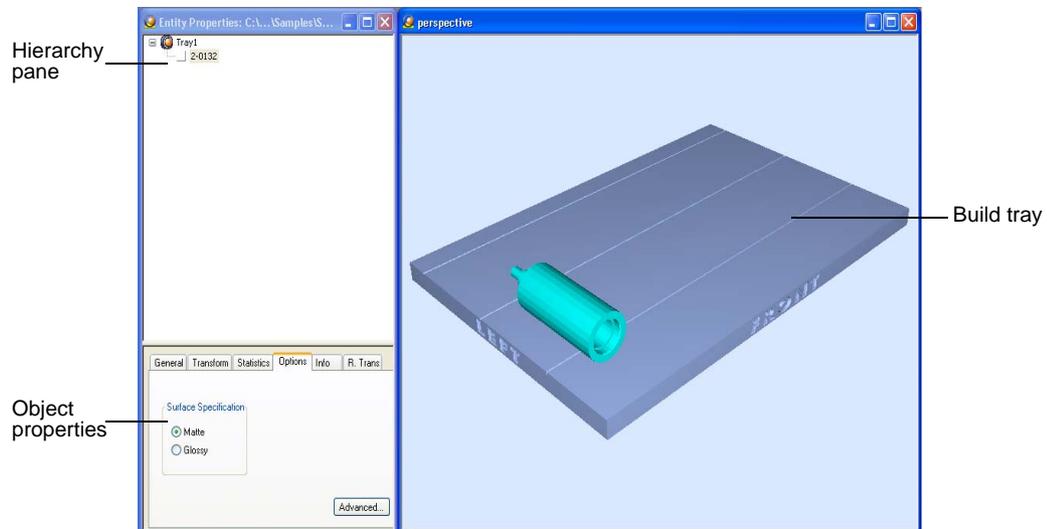


Figure 5-5: Default screen layout

You can place additional objects on the build tray by repeating this procedure.

Copying and Pasting Objects

If you need to duplicate objects on the build tray, you can, of course, insert the same object from its file more than once. An easier way, however, is to copy and paste the object. You can copy objects from the build tray or the hierarchy pane. The objects copied remain in the Windows clipboard until you paste them onto the build tray.

You can also copy objects from one tray and paste them onto another, in the same way as you copy text from one document and paste it into another one. However, Objet Studio allows only one tray to be open at a time. For each build tray you need to work with (at the same time), you must open a separate Objet Studio window, by running the application again (from the Windows *Start* menu).



Having multiple Objet Studio windows open can be convenient when you need to manipulate or configure objects before inserting them in your production build tray. Copying and pasting also allows you to utilize objects already configured on previously-used build trays for newer projects.

You perform the *Copy* and *Paste* commands as in other Windows applications:

- from the *Edit* menu, on the main toolbar
- from the right-click context menu
- by using keyboard shortcuts (Ctrl+C and Ctrl+V, respectively)

The *Paste Special* command (in the *Edit* menu) enables you to place duplicate objects even more efficiently:

- You can specify the number of duplicates to place on the build tray at once.
- You can set the distance, on each axis, between the duplicate objects.
- You can place mirror images of the original object.

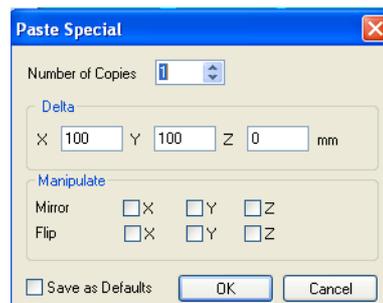


Figure 5-6: *Paste Special* dialog box

Selecting Objects

To manipulate an object on the build tray or assign characteristics to it (surface finish, for example), you must first select the object. You select an object by clicking it, either on the tray or in the tray hierarchy pane. Its image on the build tray changes color (to light blue, by default) and its name is highlighted in the tray hierarchy pane. You can select multiple objects by pressing the Ctrl or Shift keys while clicking additional objects.

Arranging the Objet Studio Screen

The default screen layout displays the *perspective* view of the build tray and the tray hierarchy pane, which lists the elements placed on the tray (see figure 5-5 on page 4). You can view models from different angles by changing the screen layout.

To change the Objet Studio screen layout:

- From the *View* menu, select *Layout*, then the desired number of build-tray views.
 - ❑ **2 Views** is the default screen layout, already displayed (see figure 5-5 on page 4).
By default, the object properties dialog box is also displayed.
 - ❑ **3 Views** adds *top* and *front* views to the default screen layout (see figure 5-8, below).
 - ❑ **4 Views** displays *top*, *front* and *right* views (see figure 5-9).
 - ❑ **1 View** expands the *perspective* view to fill the screen (see figure 5-10).
- You can also change the screen layout with toolbar icons.



Figure 5-7: Screen layout icons

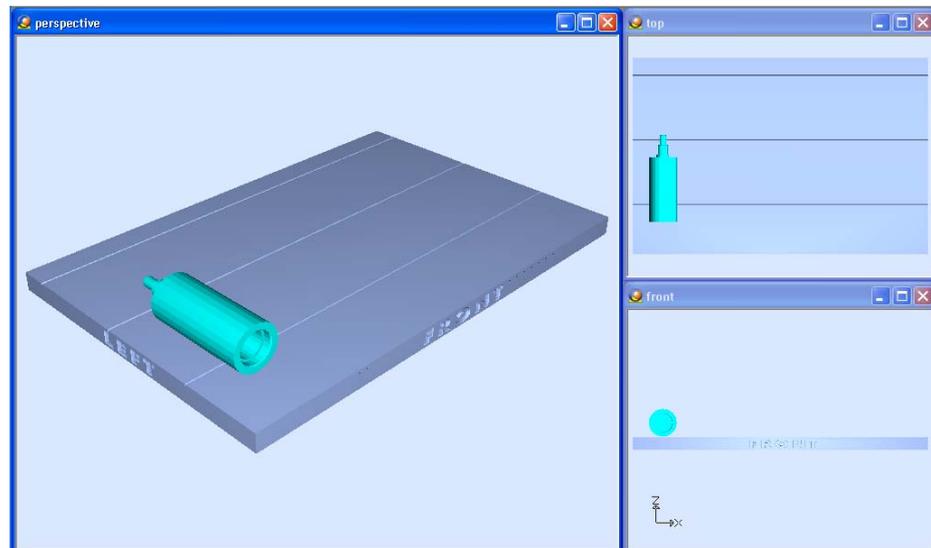


Figure 5-8: 3-view screen layout

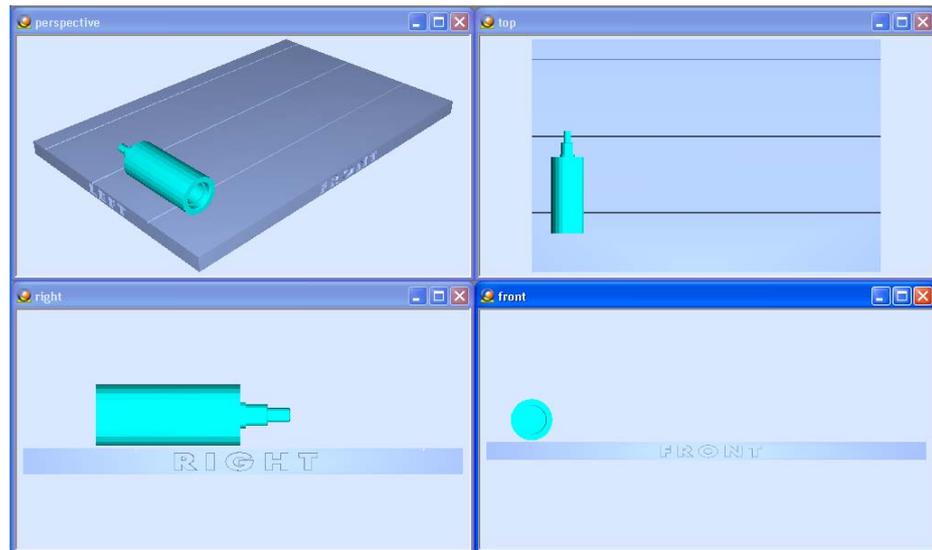


Figure 5-9: 4-view screen layout

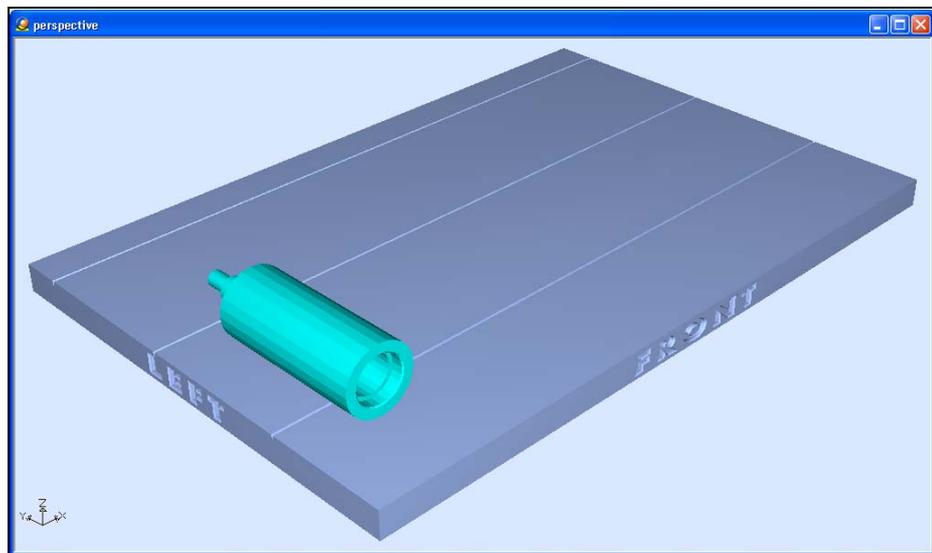


Figure 5-10: 1-view screen layout

You can change the perspective of the active viewing pane by clicking any of the nine viewing icons.

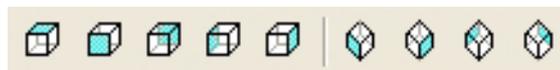


Figure 5-11: Viewing-pane perspective icons

Positioning Objects on the Build Tray

To produce models efficiently and with the required finish, it is important to carefully position objects on the build tray. Objet Studio features the automatic positioning of objects. However, you should check to make sure that the objects are orientated logically for your needs, according the considerations explained in “Model Orientation” on page 5-10.

Automatic Positioning

There are two ways to have Objet Studio position the items on the build tray.

- Anytime you insert an object onto the build tray, select Arrange models in the *Insert* dialog box.

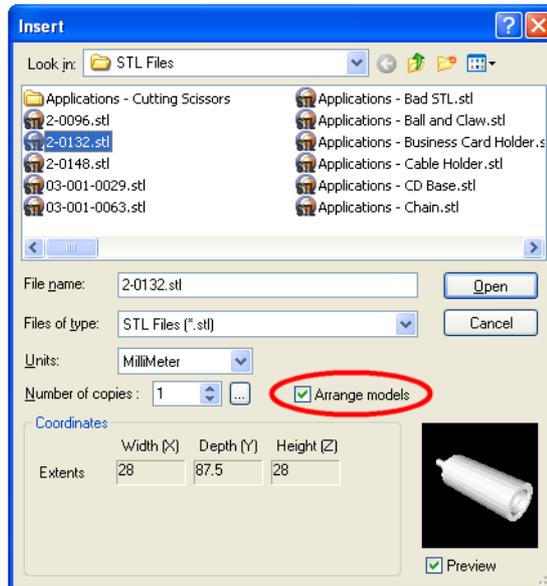


Figure 5-12: *Arrange models* option in the *Insert* dialog box

When you click Open, Objet Studio inserts the new object and arranges all of the objects on the build tray.

- After placing several objects on the build tray, select Tools > Automatic Placement.

The effects of automatic placement are shown in figures 5-13 and 5-14.

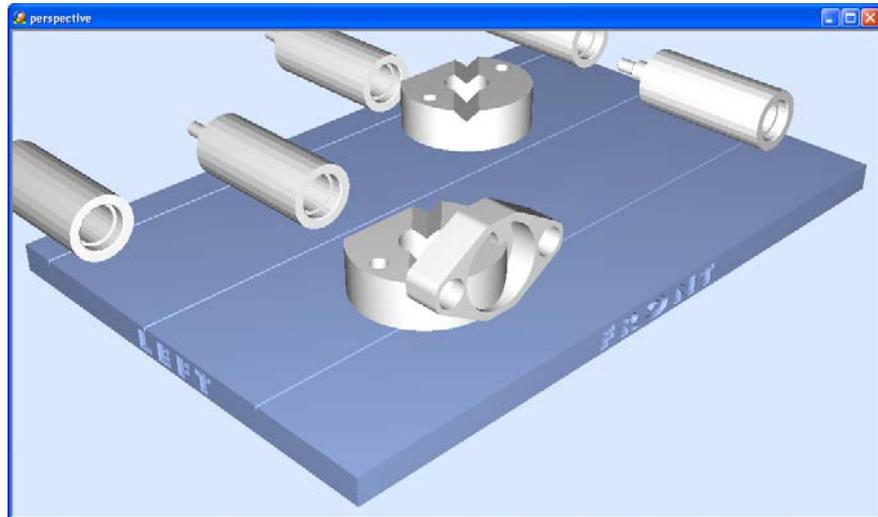


Figure 5-13: Tray before objects are properly arranged

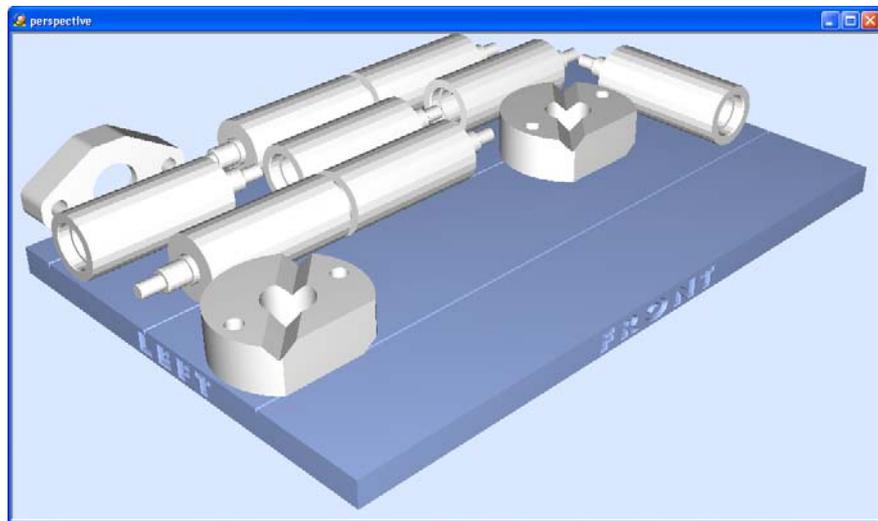


Figure 5-14: Tray after objects have been automatically arranged



Because of the unique characteristics of each type of modeling material, it is recommended that you select the material *before* inserting objects on the tray with automatic positioning or running Automatic Placement.

Manual Positioning

You can manually position objects on the build tray—even if they were inserted using automatic placement (with the *Arrange models* option selected in the *Insert* dialog box). Considerations for positioning objects are reviewed in “Model Orientation” on page 5-10. Tools for changing the position of objects are described in “Repositioning Objects” on page 5-12.

Model Orientation

The orientation of models on the build tray affects how quickly and efficiently they will be produced by the 3-D printer, where and how much support material is used, and whether or not model parts will have a gloss finish. Therefore, you should consider a variety of factors when deciding how to place models on the tray, using the following positioning rules.

X-Y-Z Rule

This rule considers a model's outer dimensions.

- Since the print heads move back and forth along the X-axis, the printing time along this axis is relatively short, compared to printing time along the Y-axis and Z-axis. From this point of view, it is advisable to place the object's *longest* dimension along the X-axis.
- Since models are built up, on the Z-axis, in 30-micron layers, it is very time-consuming to print a tall object. From this point of view, it is advisable to place the object's *smallest* dimension along the Z-axis.
- Since the print heads measure about 2 inches (5 centimeters) on the Y-axis, models measuring less than this (on the Y-axis) are printed in one pass. From this point of view, it is advisable to place the object's *intermediate* dimension along the Y-axis.

Tall-Left Rule

This rule considers models where, after being orientated on the build tray according to other considerations, one side is taller than the other.

- Since the print heads move along the X-axis from left to right, taller sections on the right require the print heads to scan unnecessarily from the left until reaching them. If, on the other hand, the taller sections are positioned on the left of the tray, the print heads only have to scan the model until printing these sections—once the lower parts have been completed. Therefore, you should position the taller side of the model, when possible, *on the left*.

The following rules are based on the fact that support material is not required on the top of the printed model.

Recess-Up Rule

This rule considers models containing surface recesses.

- Recesses in the surface (like hollows, drill holes, etc.) should, when possible, be positioned *face-up*.

Fine-Surface Rule

This rule considers models that have one side on which there are fine details (like the keypad side of a telephone).

- The side of the model containing fine details should, when possible, be positioned *face-up*. This results in a smooth finish.

Avoid Support-Material Rule

This rule considers models that have large holes or hollows, open on at least one side (like a pipe or a container).

- It may be advantageous to print a model *standing up*, so support material does not fill the hollow, even though printing the model lying down would be much faster.

Manipulating Objects on the Build Tray

Object Position on the Z-Axis

When you use automatic positioning to arrange objects on the build tray (see “Automatic Positioning” on page 5-8), the objects are positioned directly on the tray. If you do not insert objects with automatic positioning, they often appear either above or below the tray.



In practice, the Objet30 system prints all models on the build tray on a one-millimeter bed of support material. The importance of positioning objects directly on the build tray with Objet Studio is to correctly display the objects on the screen.

To position objects directly on the tray:

1. Select the object.
2. Click the *Lay On* icon .

or—

From the *Object* menu, select *Lay On*.

To ensure that objects are always directly positioned on the tray:

1. From the *Tools* menu, select *Options*, and display the *Settings* tab.

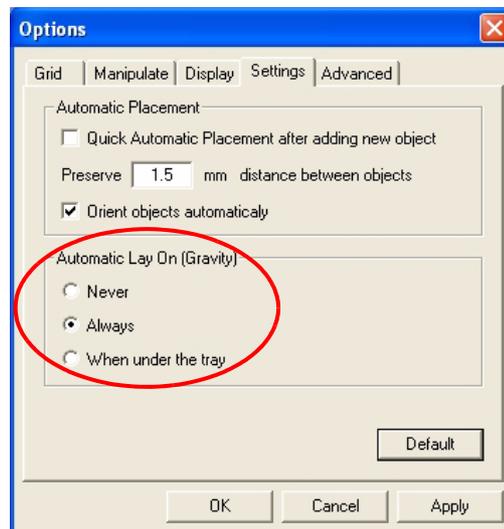


Figure 5-15: *Options* dialog box, *Settings* tab

2. In the *Automatic Lay On (Gravity)* section, select *Always*. (This is the default setting.)

Other Z-axis options (in the *Automatic Lay On* section):

- *When under the tray*—The display of objects that are below the build tray is automatically changed so that the object is at tray level.
- *Never*—The display of objects that are above or below the build tray is not changed.

Repositioning Objects

You can select and manipulate objects on the build tray after selecting the following icons or menu options.

Icon	Menu Option	Purpose	What to do
	(none)	For selecting an object.	Click the object on the build tray.
	Object > Translate	For selecting and moving an object with the mouse.	Click the object to select it. Drag the object to a new location while holding down the mouse button.
	Object > Rotate	For selecting and rotating an object on the Z-axis.	Click the object to select it. Hold down the left mouse button and move the mouse left/right.
	Object > Scale	For selecting and changing the size an object.	Click the object to select it. Hold down the left mouse button and move the mouse left/right.

After using these repositioning icons once, they are disabled, *unless* you first click the *Sticky Mode* icon . After clicking this icon, the repositioning icon used remains active until you click the *Sticky Mode* icon again to release it.

Another way of repositioning objects on the build tray is by using the icons on the *Transform* toolbar that nudge the selected object in different ways.

-   Click to move the object 20 mm along the X-axis.
-   Click to move the object 20 mm along the Y-axis.
-   Click to move the object 30 degrees on the Z-axis.
-   Click to rotate the object 30 degrees on the X-axis.
-   Click to rotate the object 30 degrees on the Y-axis.
-   Click to rotate the object 30 degrees on the Z-axis.

Viewing Object Properties

After you manually manipulate an object with the mouse, its new properties are displayed in the *Transform* tab of the object properties dialog box.



The object-properties dialog box is displayed by default (see figure 5-5 on page 4) and whenever the screen layout is changed or refreshed (see “Arranging the Objet Studio Screen” on page 5-6).

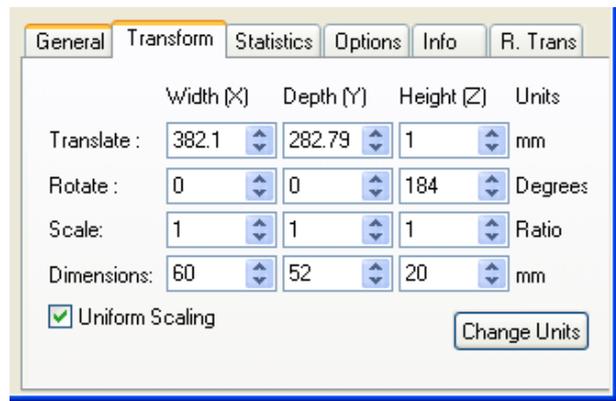


Figure 5-16: Object properties dialog box, *Transform* tab

You can make precise changes to an object on the build tray by selecting the object (either on the tray or in the tray hierarchy pane), changing its values in the dialog box, and clicking *Change Units*.

Note: You can only change the height of the objects on the build tray if this is allowed by the Object Studio settings (see “Object Position on the Z-Axis” on page 5-11.)

The properties displayed in the *Transform* tab of the object properties dialog box are *absolute* values, representing the actual position of the object on the build tray. Another way of repositioning objects on the tray using precise values is by applying changes to object properties *relative to the current position*. There are two *Relative Transform* dialog boxes available:

- The *R. Trans* tab of the object properties dialog box.

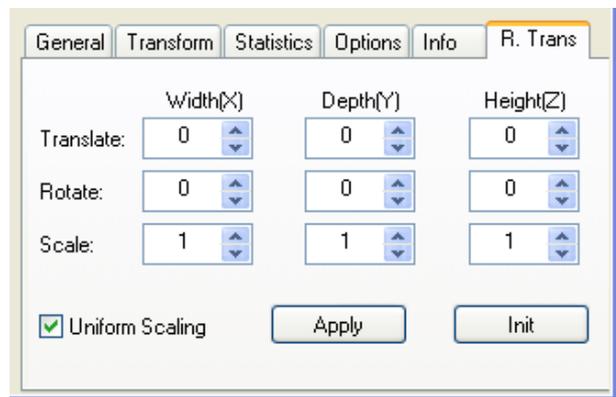


Figure 5-17: Object properties dialog box, *R. Trans* tab

- The *Relative Transform* dialog box, accessible from the *Object* menu.

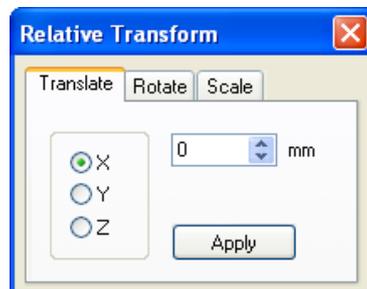


Figure 5-18: *Relative Transform* dialog box

Valid Object Placement

To ensure that models do not overlap when you position them on the build tray, you can select the *Dynamic Checking* icon  from the Tools toolbar. When selected, Objet Studio only allows the positioning of objects if they do not interfere with other objects on the tray. Note that the space occupied by an object includes the “bounding box” surrounding it (see figure 5-24 on page 19).



Even if you do not use *Dynamic Checking* when placing objects on the build tray, Objet Studio automatically checks if there is a problem with the positioning of objects on the tray before sending it to the printer. You can also manually check for problems after positioning objects (see “Tray Validation” on page 23).

Using a Grid to Position Objects

Displaying a grid on the image of the build tray can be useful when positioning objects. You can make use of this feature by clicking the grid toolbar icons or by selecting menu options.

Icon	Menu Option	Result
	Tools > Grid	Displays a grid over all build tray views.
	Tools > Snap to grid	When moving the object, it aligns with the nearest grid line.
		Enables you to change the grid origin (X- and Y-axis meeting point) by clicking on the build tray.
		Cancels the changes made to the grid origin and restores the default grid.

You can review and configure grid settings—and apply them—from the *Options* dialog box.

To use the *Options* dialog box:

1. From the *Tools* menu, select *Options*, and display the *Grid* tab.

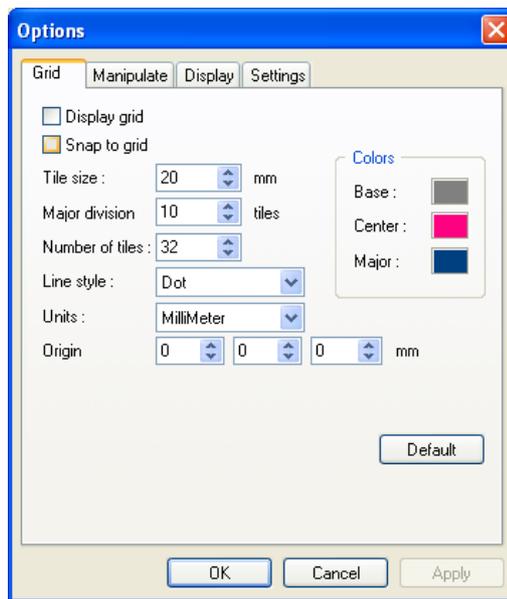


Figure 5-19: *Options* dialog box, *Grid* tab, showing the default settings

Changing an Object's Orientation

The dialog box displays the current grid settings.

2. As required, make changes to the settings, and select or clear the check boxes.
3. Click Apply or OK.

There are several methods for changing the orientation of objects on the build tray.

To rotate an object:

- Select the object and use the *Rotate* icon or *Object* menu options (see "Repositioning Objects" on page 5-12).

To select an object's plane and re-align it with one of six basic directions:

- From the *Plane Alignment* toolbar:

1. Click the *Select Plane* icon .
2. Click a plane on an object displayed on the build tray.
3. Click the appropriate align icon—

 Align Bottom

 Align Top

 Align Front

 Align Back

 Align Left

 Align Right

- From the *Tools* menu:

1. Select Plane Alignment > Select Plane.
2. Click a plane on an object displayed on the build tray.
3. Select Plane Alignment > Align Bottom/Top/Front/Back/Left/Right (as appropriate).

Note: When you are finished re-aligning the plane of objects on the build tray, release the *Select Plane* icon or clear "Select Plane" from the *Tools > Plane Alignment* menu.

To flip an object 180 degrees on any axis:

1. Select the object.
2. From the *Object* menu, select Flip > Flip X / Flip Y / Flip Z.

To make precise changes to the object's orientation on any axis:

1. Select the object.
2. Display the *Transform* tab or the *R. Trans.* tab of the object properties dialog box (see figure 5-16 on page 13 and figure 5-17 on page 13).

or—

From the *Object* menu, select Relative Transform (see figure 5-18 on page 13).

3. Change the *Rotate* values for the desired axis.

Freezing an Object's Orientation

If you manipulate an object on the build tray, you can freeze its orientation so that it does not change when you perform Automatic Placement (see “Automatic Positioning” on page 5-8).

To freeze an object's orientation:

1. Select a model on the build tray.
2. In the *Options* tab of the object properties dialog box, click *Advanced*.

The *Advanced Properties* dialog box opens.

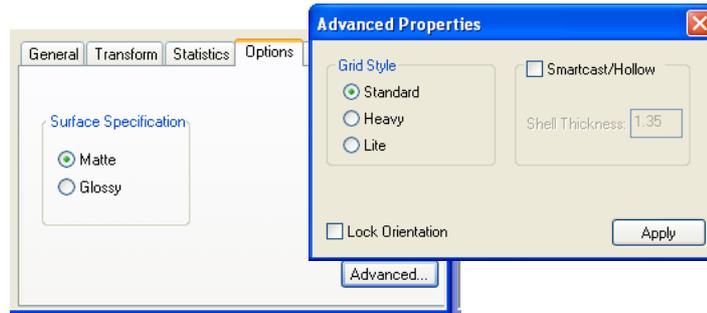


Figure 5-20: *Advanced Properties* dialog box

3. Select the *Lock Orientation* check box.
4. Close the *Advanced Properties* dialog box.



You can set *Lock Orientation* as a default property for all models placed on the build tray. See “*Default Object Properties*” on page 17.

Surface Finish

Models can be produced with a matte or glossy finish. To create a matte finish, the printer surrounds models with a thin layer of support material.

To choose the finish type for a model:

1. Select the model.
2. In the *Options* tab of the object properties dialog box, select *Matte* or *Glossy*.

or—

1. Right-click the model on the build tray.

At the bottom of the context menu, the current finish type is *not* enabled (that is, you *cannot* select it).

2. To change the finish type, select the other (enabled) option.

You can distinguish between the finish of objects on the build tray by their color. When they are *not* selected, objects are displayed in a different shade of green for each finish.



You can set the surface finish as a default property for all models placed on the build tray. See “*Default Object Properties*” on page 17.

Default Object Properties

You can set several default properties for objects placed on the build tray:

- locking of object orientation on the tray

For an explanation of this feature, see [Freezing an Object's Orientation](#) on page 5-16.

- surface finish for printed models

For an explanation of this feature, see [Surface Finish](#) on page 5-16.

- support strength used during printing

For an explanation of this feature, see [Choosing the Support Strength](#) on page 5-26.

- “smartcast” printing

For an explanation of this feature, see [“Smartcast” – Filling Models with Support Material](#) on page 5-27.

To set any of these default properties:

- From the *File* menu, select *Default Properties*.

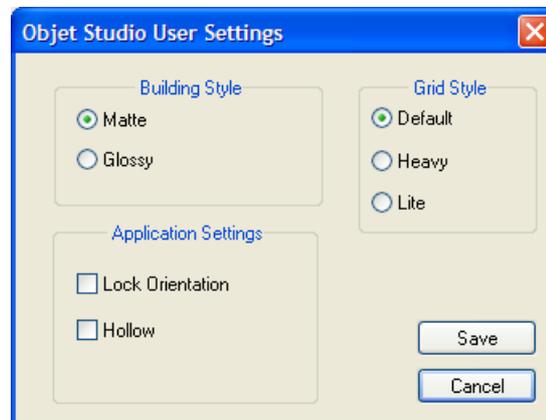


Figure 5-21: Setting default properties for objects

Display Options

From the *View* menu, you can change the way objects are displayed on the screen. The default method for displaying models on the build tray is as solid (“shaded”) objects.

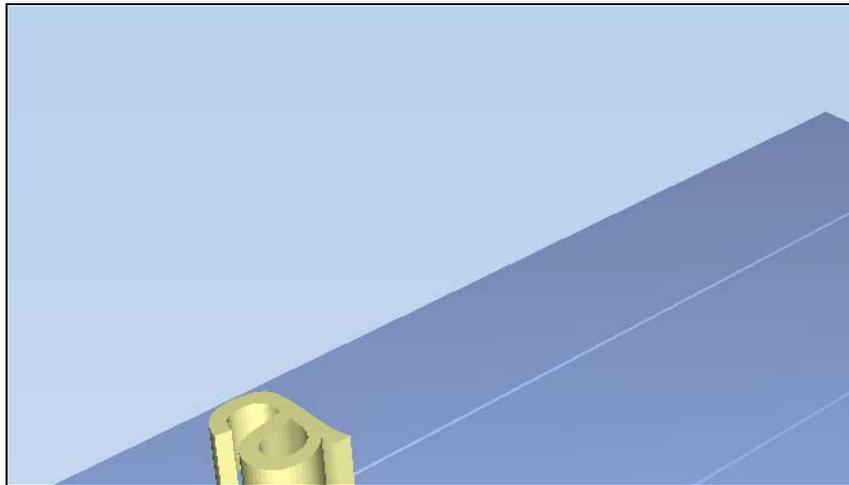


Figure 5-22: Tray and model displayed in *shaded* view

The other display options are *wire frame* and *points*.

To display the build tray in *wire frame* view:

- Select *View > WireFrame* or click the *WireFrame* icon .

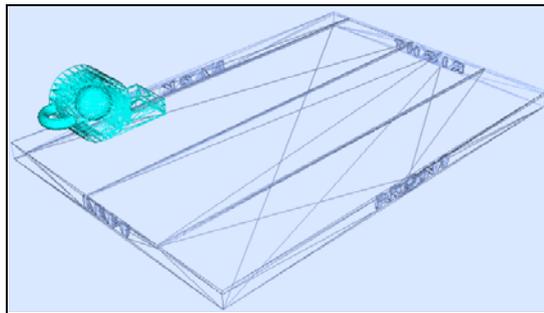


Figure 5-23: Tray and model displayed in *Wire frame* view

To revert to the *shaded* view:

- Select *View > Shaded* or click the *Shaded* icon .

To display objects as boxes, showing their maximum dimensions instead of the model geometry:

- Select *View > Display Bounding Box*.

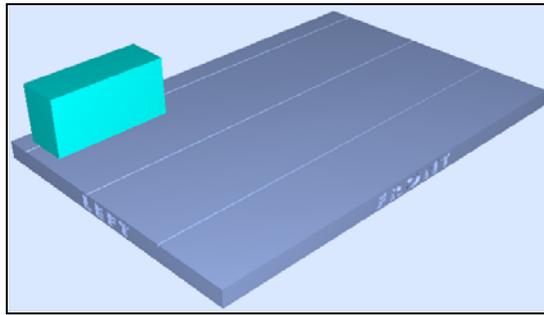


Figure 5-24: Model displayed with bounding box

To display the area around objects needed for support material (to produce a matte finish):

- Select View > Display Thickening Box.

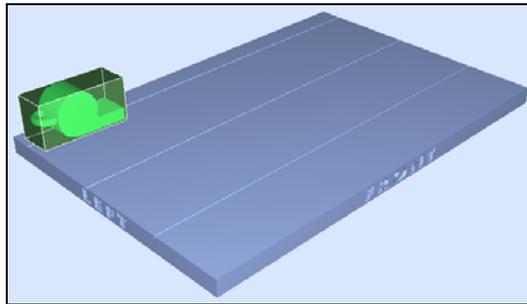


Figure 5-25: Model displayed with thickening box

Display Colors

You can customize some of the colors used for displaying Objet Studio screens and for displaying objects on the build tray.

To change the colors displayed in Objet Studio screens:

1. From the *Tools* menu, select *Define Colors*.
2. In the *Define Colors* dialog box, click the color patch you want to change:
 - *Tray Color*—to change the color of the build tray
 - *Background Color*—to change the background color
 - *Selection Color*—to change the color of objects that are selected

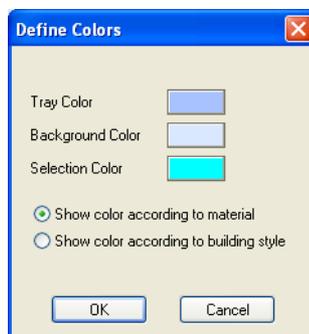


Figure 5-26: *Define Colors* dialog box

3. In the *Colors* dialog box, select a color, or click *Define Custom Colors* to create your own color and shade for displaying this item.
4. Click *OK*.

To set the color indication of objects displayed on the build tray:

1. In the *Define Colors* dialog box, select one of the options.
 - Show color according to material.
 - Show color according to building style.
2. Click OK.

Note: This selection has the same effect as toggling the object-color-display switch.



Figure 5-27: Object-color-display switch



Before sending a build tray to the printer, or when you perform *tray validation*, Objet Studio checks if there is a problem with the *stl* files or the positioning of objects on the tray. If so, the affected objects are displayed with special colors (see “Tray Validation” on page 5-23).

Displaying Large Files

Very large *stl* files can be slow to display and may be difficult to manipulate easily on the build tray. If this is the case, you can display just an image of the object on the build tray without loading the entire file. The *stl* file itself is not changed, and the complete file is sent to the printer.

To display an image of *stl* files when you place objects on the build tray:

1. From the *Tools* menu, select *Options*, and display the *Settings* tab.

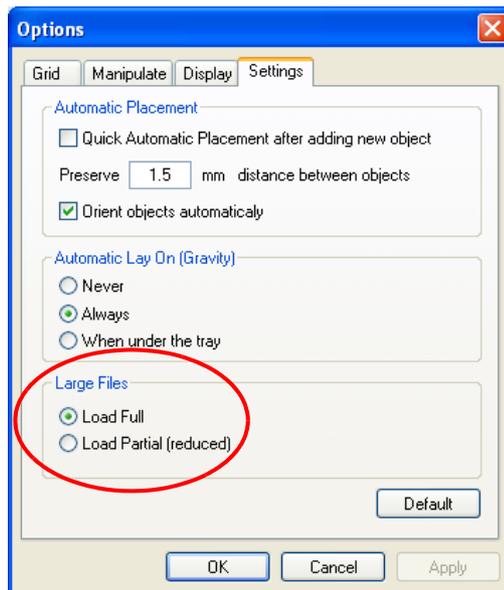


Figure 5-28: *Options* dialog box, *Settings* tab

2. In the *Large Files* section, select *Load Partial*. (*Load Full* is the default setting.)

Tray Viewing Options

The Objet Studio toolbars contain several icons for changing the appearance of the display screen, enabling you to view the tray and objects in different magnifications and from various perspectives.

Note: You must display the relevant toolbar(s) to access many of the icons described below (see “Toolbars” on page 5-2).

Icon	Tool Tip Name	Purpose
	Zoom Full	Reverts to normal view after using various zoom options. (The same as )
	Zoom Object	Fills the viewing pane with the selected object(s).
	Zoom Work Area	Reverts to normal view after using various zoom options. (The same as )
	All Windows	If enabled,  and  affect all viewing panes.
	Perspective/Parallel	When selected, the tray is displayed with depth perspective—closer objects appear bigger. When not selected, the tray is displayed in two dimensions—identical objects appear the same size, regardless of their position on the screen.
	Zoom By Rectangle	Fills the active viewing pane with an area of the build tray after you select it with the mouse.
	Zoom Dynamic	Continuously zooms in/out of the point at which you click and hold down the left mouse button, when you move the cursor up and down.
	Pan By Line	Moves the build tray in the viewing pane according to the line you extend on the screen with the left mouse button.
	Pan Dynamic	Moves the build tray in the viewing pane as you move the cursor on the screen while holding down the left mouse button.
	Walk Dynamic	Zooms and moves the build tray as you hold down the left mouse button and move the cursor on the screen.
	Study Dynamic	Enables you to inspect the build tray from every angle and perspective. As you hold down the left mouse button and move the cursor on the screen, the view of the build tray changes.
	Spin Mode	When used with  ,  and  , the movement of the build tray continues after you release the mouse button. To stop the movement, click in the active view pane or click one of these icons.
	Zoom In	Each mouse click zooms one step to the center of the active viewing pane.
	Zoom Out	Each mouse click zooms-out one step from the center of the active viewing pane.

Icon	Tool Tip Name	Purpose
	Pan Left	Each mouse click moves the build tray to the left in the viewing pane by one step.
	Pan Right	Each mouse click moves the build tray to the right in the active viewing pane by one step.
	Pan Up	Each mouse click moves the build tray up in the active viewing pane by one step.
	Pan Down	Each mouse click moves the build tray down in the active viewing pane by one step.
F	Advance Forward	The same as  . Each mouse click zooms in to the tray displayed in the active viewing pane.
B	Advance Backward	The same as  . Each mouse click zooms out of the tray displayed in the active viewing pane.
	Rotate Left	Each mouse click rotates the build tray to the left in the active viewing pane by one step.
	Rotate Right	Each mouse click rotates the build tray to the right in the active viewing pane by one step.
	Rotate Up	Each mouse click rotates the build tray up in the active viewing pane by one step.
	Rotate Down	Each mouse click rotates the build tray down in the active viewing pane by one step.
	Camera	Displays a virtual camera and its viewing angle of the tray.

Handling Completed Trays

After you have properly placed all objects on the build tray, you save the tray as an *objtf* file, which is sent to the 3-D printer for production. But before saving the tray, you can check that there would be no problem producing it. You can also calculate how much material would be consumed during production and how much time this would take.

Tray Validation Before sending a job to the Objet30 printer for production, you should check that the tray is “valid” and can be printed.

To validate that the tray can be printed:

- From the *Tools* menu, select Tray Validation.

or—

- Click .

If the tray is not valid, the color of the problematic models on the tray changes according to a pre-set color code. If a warning message appears, click OK to close it.



Figure 5-29: Tray validation warning

To view the color code for objects displayed:

- From the *Tools* menu, select Constraints Settings.

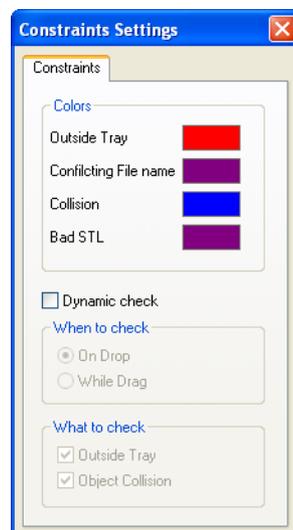


Figure 5-30: *Constraints Settings* dialog box, showing object color codes

Production Estimates

Objet Studio enables you to calculate the time and material resources needed for producing trays before sending them to the Objet30 printer. The time it takes Objet Studio to make this calculation depends on the number of objects on the tray and their complexity. Calculating the production estimate for a full tray could take up to 15 minutes, depending on your computer's specifications. The results displayed are accurate within 10 percent of the actual resources needed.

To calculate the time and materials needed for producing the current tray:

- From the *Tools* menu, select Estimate Consumptions.

or—

- Click .

When Objet Studio finishes calculating the production resources, the results are displayed at the bottom of the screen.

Model Consumption __25 g, Support Consumption __31 g, Building Time (HH:MM) __02:43

Figure 5-31: Production resource calculation

Saving the Tray File

Trays are saved as *objtf* files. You can save a tray before it is ready for production, and open it at another time to continue preparing it. When you send the tray to the Objet30 printer, it is first saved. If the tray was previously saved, its *objtf* file is overwritten at this time.

To save the tray file:

- From the *File* menu, select Save Tray or Save Tray As.

or—

- Click .

Printing the Tray File

When a tray is ready to be printed, it is sent to Job Manager, where it is placed in the print queue. When the job reaches the head of the queue, Job Manager pre-processes the tray file to create slices, and feeds them to the 3-D printer.

To send the tray to the print queue:

- From the *File* menu, select Build Tray.

or—

- Click .

If the build-tray file has not been saved, the *Save As* dialog box opens for you to save it now.

Objet Studio checks if there is a problem with the positioning of objects on the tray. If so, the affected objects are displayed with special colors (see figure 5-30 on page 5-23), and the following warning message appears.



Figure 5-32: Tray validation warning

- To cancel the *Build* command so you can correct the problem, click No.
- To print the models as they are positioned on the tray, click Yes.

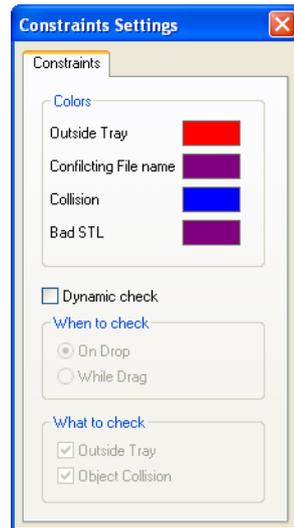


Figure 5-33: *Constraints Settings* dialog box, with color codes for problematic model positioning

The tray file is sent to Job Manager. Objet Studio closes and Job Manager opens, so you can monitor the progress of your trays—before, during, and after printing.

To return to Objet Studio from Job Manager, click *New Job* .

Additional Objet Studio Features

Dividing Objects

You can use the Split Object feature to produce objects larger than the build tray by dividing the model into separate parts. With this feature, you produce only a specific section of a model.

To split an object:

1. Select the object.
2. From the *Object* menu, select Split.
3. In the *Split Object* dialog box, enter the values to determine how Objet Studio will divide the object. You can divide an object along any of its axes, by entering either exact measurements or the number of parts.

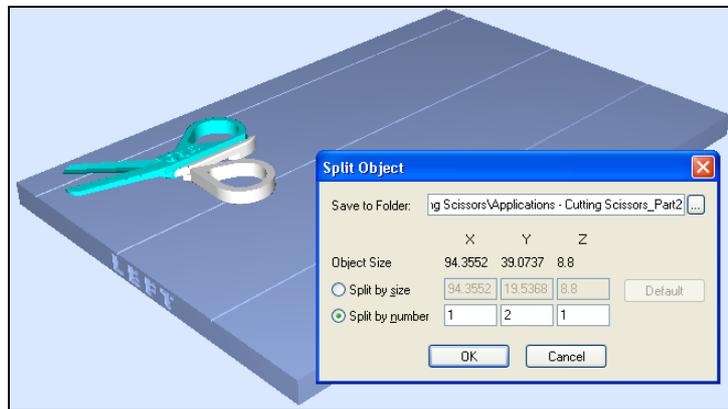


Figure 5-34: *Split Object* dialog box

4. In *Save to Folder*, enter the folder name.
5. Click OK.

The composite parts are saved as new *stl* files with “Part 1,” “Part 2,” etc., added to the original file name.

Note: Before printing the newly created *stl* files, it is recommended that you check them for defects in an STL-repair application, such as *Magics*, by Materialise.

Choosing the Support Strength

When producing models, support material fills some hollow and empty sections (see “Model Orientation” on page 5-10). Objet Studio allows you to adjust the strength of the structure formed with the support material. This adjustment is useful when producing either large/massive models or small/delicate models. For most purposes, the default setting provides adequate support strength.

To change the strength of the support structure used when printing a model:

1. Select a model on the build tray.
2. In the *Options* tab of the object properties dialog box, click Advanced.

The *Advanced Properties* dialog box opens.

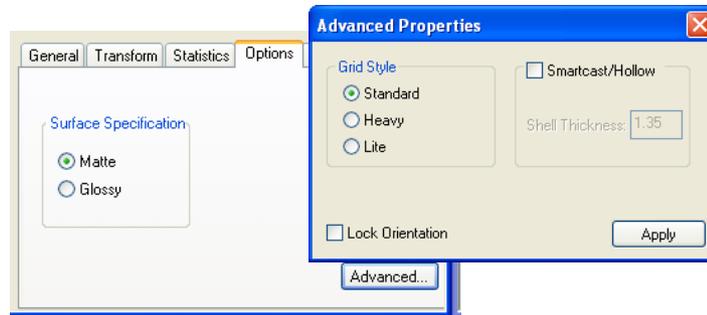


Figure 5-35: *Advanced Properties* dialog box—Grid Style selection

3. In the *Grid Style* section, choose the support strength suitable for the selected model:
 - Heavy—for large models needing much support.
 - Lite—for delicate models needing little support.
 - Default—for models needing average support (most models).

Note: You can select a different support strength for each model on the build tray.
4. Click Apply.



The *Lock Orientation* and *Smartcast/Hollow* options are not connected to the *Grid Style* selection. *Lock Orientation* is described in “Freezing an Object’s Orientation” on page 5-16. *Smartcast/Hollow* is described below.

You can set the support strength as a default property for all models placed on the build tray. See “*Default Object Properties*” on page 17.

“Smartcast”— Filling Models with Support Material

Many objects placed on the build tray from *stl* files are “solid.” This means that, when printed, the model will be completely filled with model material. Often, especially with large objects, this is unnecessary. Instead, the model can be filled with support material, which is less costly. It is also advisable to fill models with support material when preparing them for investment casting, since this material burns off more quickly during the process of making the cast.

Objet Studio enables you to print objects on the build tray with an outer shell of model material and a center filled with support material. This feature of Objet Studio is called “Smartcast/Hollow.” You can set the thickness of the shell—between 0.015 and 3.825 millimeters.

To use the Smartcast/Hollow feature:

1. Select a model on the build tray.
2. In the *Options* tab of the object properties dialog box, click *Advanced*.
The *Advanced Properties* dialog box opens (see figure 5-35).
3. Select the *Smartcast/Hollow* check box.
4. Set the shell thickness, in millimeters.
5. Click *Apply*.

Note: There is no change in the display of objects in Objet Studio when the Smartcast/Hollow feature is used.

To inspect, change or cancel the Smartcast/Hollow setting:

1. Select a model on the build tray.
2. Access the *Advanced Properties* dialog box, as above.
3. If you change or cancel the Smartcast/Hollow setting, click Apply.



You can set *Smartcast/Hollow* as a default property for all models placed on the build tray. See “*Default Object Properties*” on page 17.

Displaying the Cross Section of Objects

The *Section* feature enables you to view the interior of an object by “slicing” it on any axis. You can then manipulate the object to inspect the interior from different angles. This may be important for deciding on the type of support necessary when producing the model (see “*Choosing the Support Strength*” on page 5-26). Displaying an object’s cross section only affects how the tray is displayed on the screen; it does not change the object itself.

To display a cross section of the tray:

1. From the *Tools* menu, select *Section*.

or—

Click  on the toolbar.

The *Section* dialog box opens.



Figure 5-36: *Section* dialog box

2. Select the *Enable Clipping* check box.
3. Use the slider controls for the X-, Y-, and Z-axes to cut the tray so that you see the cross section you want.

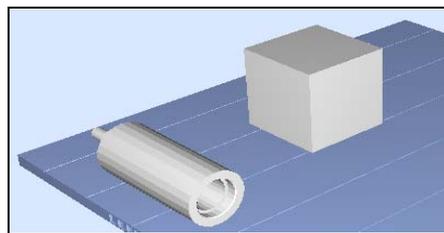


Figure 5-37: Whole view

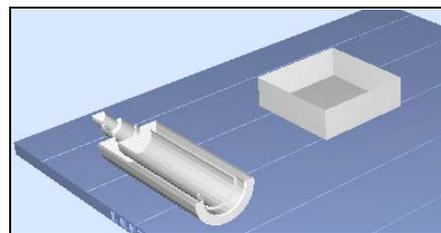


Figure 5-38: Cross-section view, after using the Z-slider

Printing the Screen Display on Paper

You can print the view displayed in the active pane on a regular (paper) printer. Before printing, you can configure how the tray will be printed on the page, and you can display a screen preview of the printed page.

To access the paper printing controls:

- From the *File* menu, select—
 - Page Setup...
 - Page Preview...
 - Print

You can also print a paper copy of the tray by using the standard Windows keyboard shortcut for printing: **Ctrl+P**.

Saving the Screen Display as an Image File

You can save the image displayed in the active viewing screen as a graphic file.

To save the screen display as an image:

1. From the *File* menu, select **Save Bitmap...**

The *Save Bitmap* dialog box opens.

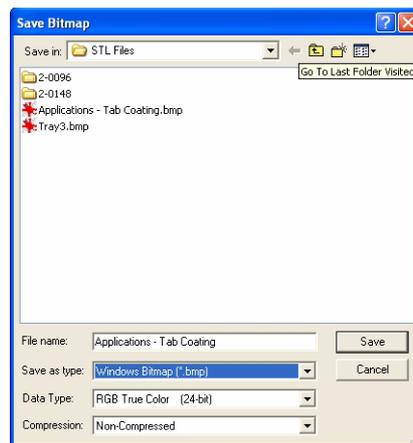


Figure 5-39: *Save Bitmap* dialog box

2. At the top of the dialog box, select the appropriate folder.
3. At the bottom of the dialog box, enter a file name.
4. Open the *Save as type* pull-down menu, and select the file format.
5. Click **Save**.

Exporting and Importing Objet Build Trays

When you save build trays in Objet Studio, they are saved as *objtf* files. These files contain instructions to Objet Studio and to Objet30 printers for displaying and producing the *stl* files used on the tray. To conveniently save all of the files that comprise the build tray, for storing the job, or for transferring it to another location, Objet Studio compresses them into one *objzf* file. To later use the *objzf* file, the file must first be expanded in Objet Studio and its component files saved.

To create an *objzf* file:

1. From the *File* menu, select **Export Packed Job...**

The *Save As* dialog box opens.

2. Select the appropriate folder and change the file name (if necessary).
3. Click **Save**.

To open an *objzf* file:

1. From the *File* menu, select Import Packed Job...
2. In the *Open* dialog box, display the appropriate folder and select the file.
3. In the *Browse for Folder* dialog box, display the folder in which you want Objet Studio to expand the compressed file, and click OK.

The *objtf* file and associated *stl* files are expanded and placed in the selected folder, and the tray is displayed in Objet Studio.

Advanced-Mode Features

The Objet Studio features described in this section are only accessible if the application is set to *Advanced* mode.

To see the current Objet Studio setting:

- Open the *Tools* menu.

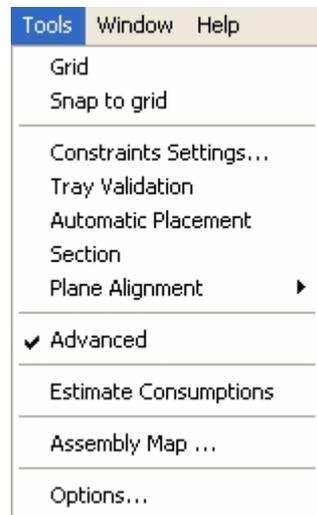


Figure 5-40: *Tools* menu, showing *Advanced* mode selected

If *Advanced* is checked, the advanced features are enabled.

To change the *Advanced* setting:

1. Click *Advanced* in the *Tools* menu.

The following message is displayed, reminding you that the change will only take effect the *next time* you open Objet Studio—even though the check mark in the *Tools* menu appears/disappears after you make the change.

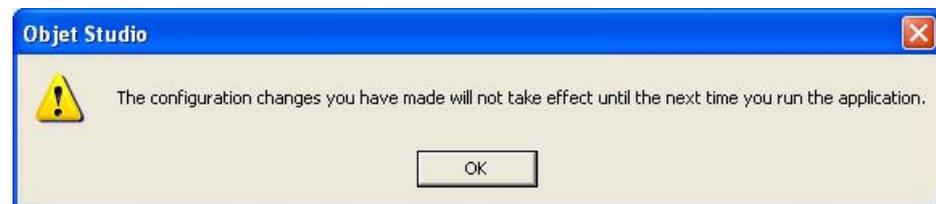


Figure 5-41: Configuration-change message

2. Close and re-open Objet Studio to access the *Advanced* mode features.

Save Tray As... In addition to saving the tray as an *objtf* file, for producing it with an Objet30 3-D printer, you can save a group of objects positioned on the tray as an *stl* file. You can then use this file as any other *stl* file, both in Objet Studio and in other applications. You can also display this and other *stl* files as “floating” objects, without the build tray. This is useful for inspecting objects from every angle.

To save the build tray as an *stl* object:

1. From the *File* menu, select *Save Tray As...*

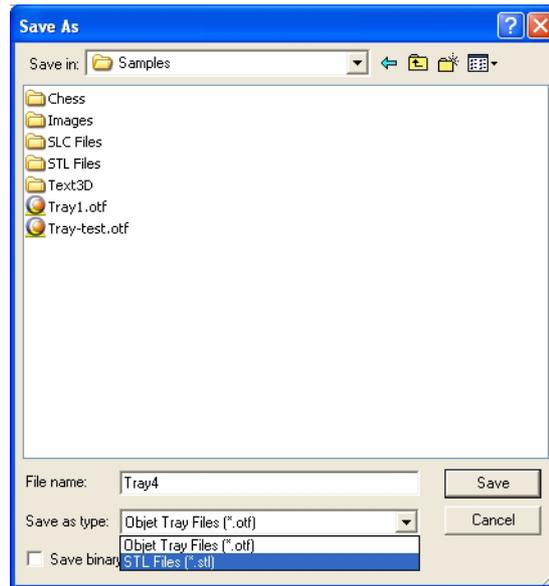


Figure 5-42: *Save As* dialog box

2. At the top of the dialog box, select the appropriate folder.
3. At the bottom of the dialog box, enter a file name.
4. Open the *Save as type* pull-down menu, and select *STL Files (*.stl)*.
5. Click *Save*.

To display *stl* files without the build tray:

1. From the *File* menu, select *Open Tray*.
2. In the *Open* dialog box, open the *Files of type* pull-down menu, and select *STL Files (*.stl)*.
3. Click *Open*.

A three-dimensional image of the file is displayed. You can use many of the Objet Studio tools to manipulate the image on the screen.

Configuring the GL Driver

The OpenGL driver displays 3-D graphics on your screen. There is normally no reason to adjust its settings. If you suspect a problem with the way Objet Studio displays objects, you can use the OpenGL Driver Configuration tool to check and configure the driver settings.

To access the *OpenGL Driver Configuration* dialog box:

1. From the *Tools* menu, select *Options*.
2. In the *Options* dialog box, display the *Advanced* tab and click *OpenGL Driver Configuration...*



Figure 5-43: Accessing GL-driver configuration

Note: If the *Advanced* tab is not displayed, activate the *Advanced* option in the *Tools* menu and re-open Objet Studio.

The dialog box that opens contains tabs that display the pixel format ID (index) for the window and the memory.

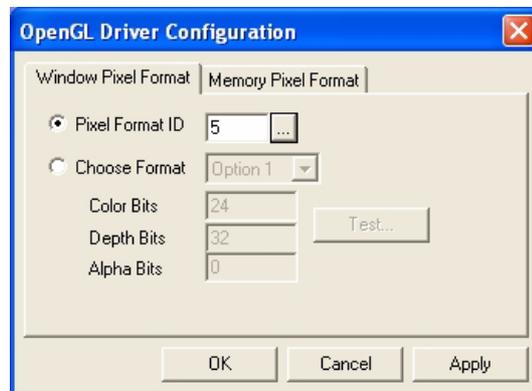


Figure 5-44: *OpenGL Driver Configuration* dialog box

You can display the values and make changes to them by clicking . Alternately, you can select *Choose Format* and change the values in this dialog box.

To perform a test of the driver configuration and enter the suggested pixel format ID:

1. Select Choose Format.
2. Click Test.

Objet Studio returns the recommended pixel format ID.



Figure 5-45: Recommended pixel format ID

3. Click OK.
4. In the OpenGL Driver Configuration dialog box (figure 5-44), select Pixel Format ID and enter this number.
5. Click Apply.
6. Display the other pixel format tab, and repeat this procedure.

6

Using Job Manager

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The Job Manager application is different for client workstations and for the computer connected directly to the 3-D printer.

- Job Manager installed on client computers displays the queue and status only for jobs sent to the 3-D printer server from that computer, and allows the user to edit only these jobs.



If there are several Objet30 printers on the local network, client computers can connect to any of them, but only one at a time.

- Job Manager installed on the computer directly connected to a specific 3-D printer displays the queue and status for all jobs sent to that 3-D printer by client computers on the network. It also allows editing and manipulation of all jobs, and enables re-sending previously-printed jobs to the printer.

Client Job Manager

When you open the client Objet Studio / Job Manager software for the first time, a dialog box opens prompting you to connect to an Objet server computer. To do this, the server computer must be operating and connected to the local network.

- Click **Browse** to find and select the name of the required server computer and then click **OK** to close the dialog box.



Figure 6-1: Server connection dialog box

To change the server-computer connection (to connect to another printer):

- From the *Job Manager* screen, click the *Connect* icon  on the toolbar, or open the 3-D Printer menu and select *Set Printer*.

Job Manager Screen

On a client computer, Job Manager displays the queue of jobs sent by that computer to the printer server.

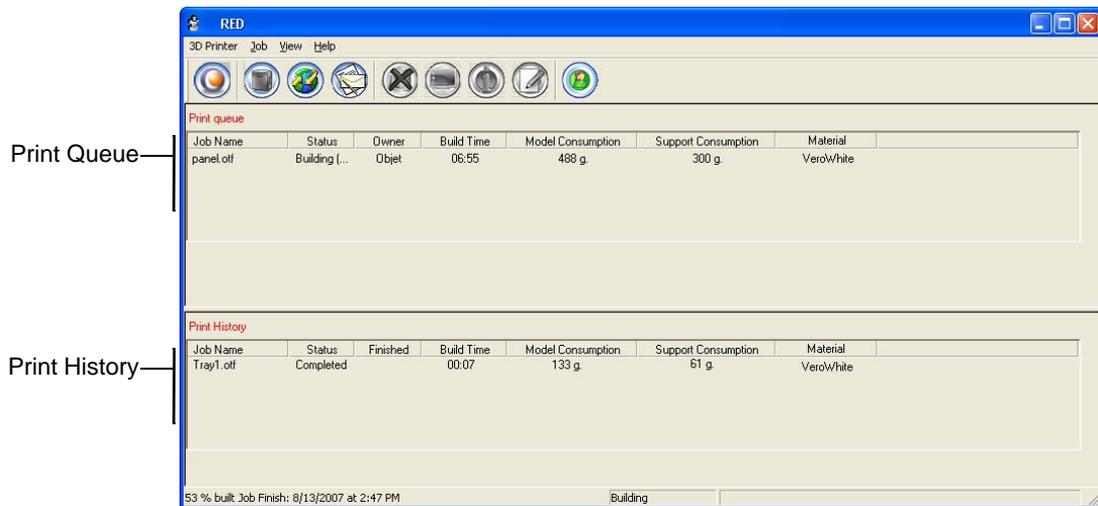


Figure 6-2: Client Job Manager screen

Information for each of the queued jobs is displayed, including the job status:

Status	Meaning
Waiting	Printing of this job has not started.
Building	Printing of this job is in progress.
Paused	Printing of this job began, but was interrupted by the administrator before being completed.
Stopped	Printing of this job was terminated by the administrator, and was put in the print queue again.
Error	Errors occurred during the printing of this job, and it was placed in the print queue again.
Editing	This job is now being edited in Objet Studio.
Previewing	The operator at the server computer is inspecting the model's slices.
Spooling	The job file is being spooled in the printer.
Preprocessing	The 3-D printer is readying itself for printing: the cover locks, print heads warm up and are put in starting position, UV lamps are turned on, build-tray level is adjusted.

Job Manager Operations

Even after sending a build tray to the 3-D printer, you can inspect the tray—and make changes to it, if necessary—as long as it is still in the print queue.

To inspect the build tray:

1. Select the job.
2. Click the *Edit Job* icon  or open the *Job* menu and select *Edit*.

Objet Studio opens, displaying the build tray. To make changes to it, see “Making changes to a Job” on page 6-10.

The following operations are available from the client Job Manager interface:

Icon	Menu Option	Purpose
	3-D Printer > New Job	Launches Objet Studio; to prepare new trays.
	3-D Printer > Set Printer	Displays a network-browsing dialog box, to connect to an Objet server computer. To specify a computer, it must be operating and connected to the local network.
	— —	Displays the status of the 3-D printer (see figure 6-3).
	3-D Printer > Report	Displays options for user messages and alerts (paper printer, e-mail, SMS—see “Configuring User Alerts” on page 6-5).
	Job > Delete...	Removes the selected job from the queue.
	Job > View...	Opens a window displaying the selected tray. In this window, you can view the tray from different angles.
	Job > Properties	Opens a window displaying the properties of the selected model.
	Job > Edit	Launches Objet Studio and loads the current tray, to enable making changes to the tray after it is sent to the server but before it is printed.
	Help > About...	Displays the Job Manager version.

The 3-D printer Status screen enables clients to monitor the progress of printing jobs. To display the screen, click the *Machine Status* icon .

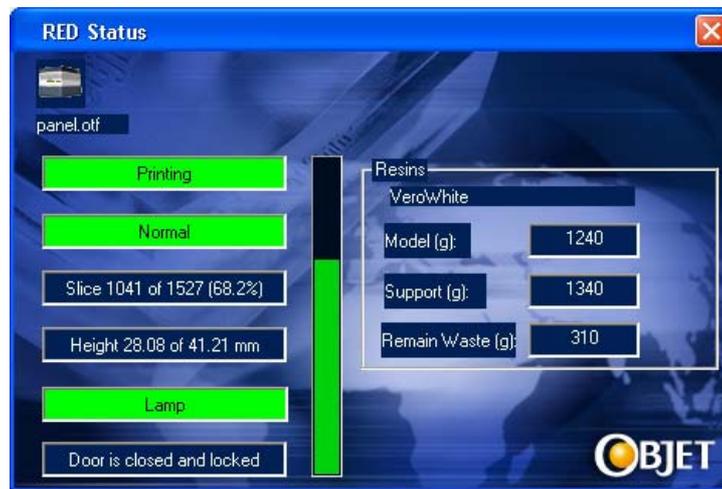


Figure 6-3: Printer status screen

Configuring User Alerts

Job Manager can alert you and others to the status of the jobs sent to the server for printing. The following events can be reported:

- The level of model or support material is low.
- The job was interrupted.
- The job was completed successfully.

To send e-mail and SMS messages, make sure that e-mail software supporting MAPI is installed on the printer's server computer. To send SMS messages, the cellular phone service must support the transmission of e-mail messages by SMS. With SMS alerts, only the subject line of the e-mail message is transmitted.

Note: In the e-mail program, make sure the security settings are set to "low" and add the server Job Manager to the "trusted" list (select Tools > Options, Security tab).

To configure Job Manager to send notifications and alerts for your jobs:

1. Click  or select Notifications from the *3-D Printer* menu.

The *Notifications* dialog box opens.

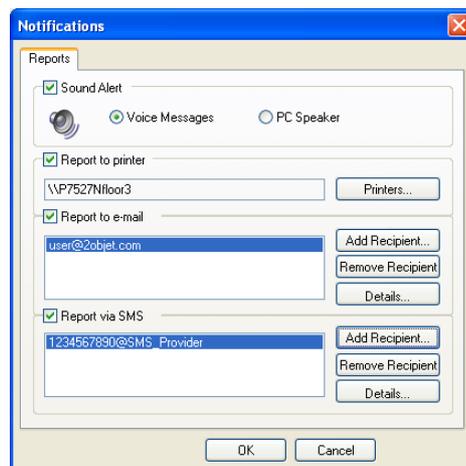


Figure 6-4: User alerts settings

2. For e-mail and SMS alerts, click Add Recipient in the respective sections.
3. To choose the events reported to you by Job Manager, click Details in the relevant sections.



Figure 6-5: Event selection for alerts

4. Select the desired events for sending alerts and click OK.



The parameters for “Low level of material” alerts are set on the printer’s server computer.

Server Job Manager

When you open the server Objet Studio / Job Manager program for the first time, or if the program is not connected to an Objet 3-D printer, you are prompted to connect to a printer. If you click Yes in the dialog box, the *Setting Network Connection* dialog box opens (see figure 6-6).



To connect to a printer, the printer must be on and connected to the local network.

You can switch the server connection to another printer at any time.

To set (or change) the printer connection:

1. From the *3D Printer* menu, select *Set Printer*.
2. In the *Set Printer* dialog box, click *Connect...*

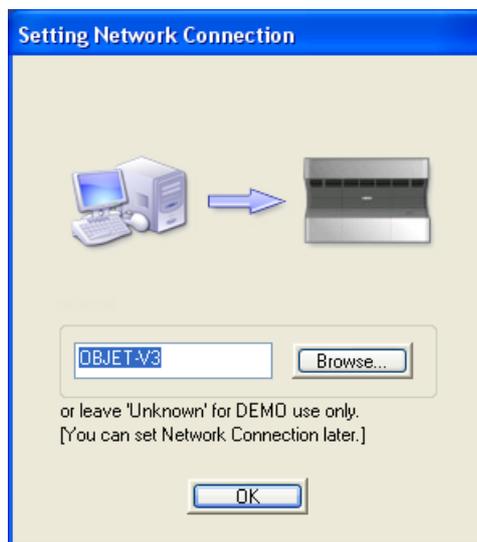


Figure 6-6: Printer connection dialog box

3. Type the name of the computer inside the printer, or click *Browse* to find and select it. Click *OK* to close the dialog box.

Job Manager Screen

On a server computer, Job Manager displays the queue of jobs sent to it by all client computers. In addition, it lists details of the last 15 jobs sent to the printer, and information about the job currently being printed.

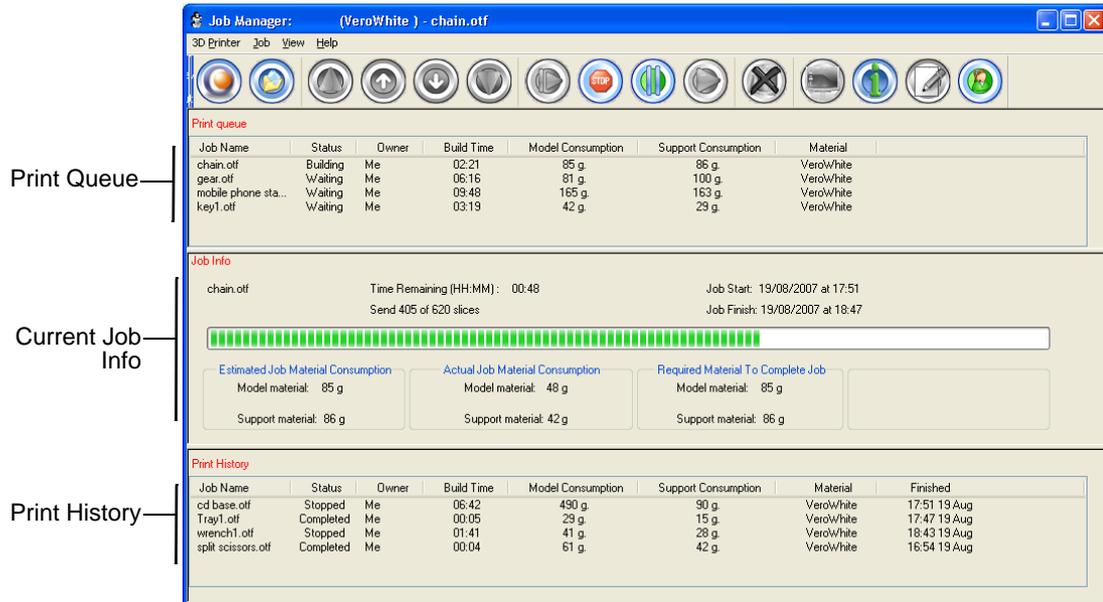


Figure 6-7: Server Job Manager screen

Print Queue

Information for each of the queued jobs is displayed, including the job status:

Status	Meaning
Waiting	Printing of this job has not started.
Building	Printing of this job is in progress.
Paused	Printing of this job began, but was interrupted by the administrator before being completed.
Stopped	Printing of this job was previously terminated by the administrator, and later put in the print queue again.
Error	Errors previously occurred during the printing of this job, and it was placed in the print queue again.
Editing	This job is now being edited (with Objet Studio) on the Objet30 server computer.
Previewing	The slices of this job are being displayed in a separate window. (To display the job tray, open the Job menu and select Preview Slices.)
Spooling	The job file is being spooled in the Objet30 printer.
Preprocessing	The Objet30 printer is readying itself for printing: the cover locks, print heads warm up and are put in starting position, the UV lamp is turned on, build-tray level is adjusted.

Job History

The *History* section of the Job Manager screen lists details of the last 15 jobs sent for printing, showing the job's final status. A job can be returned from the *History* section to the print queue in order to print the tray again.

To move a job from *History* to the print queue:

1. Select the job in the *History* section.
2. Click the *Resume* icon .

The job moves from the *History* section to the end of the print queue.

Note: Alternatively, you can drag the job from the *History* section to the print queue.



To manipulate jobs in other ways, see “Job Manager Operations,” below.

Job Manager Operations

The following table summarizes the main operations available from the server Job Manager interface. Many of the icons are active only if a job is selected.

Icon	Menu Option	Purpose
	3-D Printer > New Job	Launches Objet Studio for preparing new trays.
	3-D Printer > Set Printer	Displays a network-browsing dialog box, to connect to an Objet server computer. To specify a computer, it must be operating and connected to the local network.
	3-D Printer > Add Job...	Enables you to load previously-saved jobs (<i>objtf</i> files).
	3-D Printer > Report	Displays options for user messages and alerts (paper printer, e-mail, SMS—see “Configuring User Alerts” on page 6-5).
	---	Moves the selected job to the head of the print queue.
	---	Moves up the selected job by one step in the print queue. Note: It is recommended that you group together jobs to be printed with the same type of model material. This way, the need for changing model material between jobs is reduced.
	---	Moves down the selected job by one step in the print queue.
	---	Moves the selected job to the end of the print queue.

Icon	Menu Option	Purpose
	Job > Restart Job	<i>For a stopped job in the print queue:</i> Starts printing the selected job from the beginning. <i>For a selected job in the History section:</i> Moves the job to the print queue and changes its status to <i>Waiting</i> .
	Job > Stop...	Instructs the 3-D printer to stop printing after curing the currently printed slice. (You can continue printing with the <i>Resume</i> icon or menu option, but for short interruptions, use the <i>Pause</i> icon or menu option.)
	Job > Pause...	Instructs the 3-D printer to stop printing after curing the currently printed slice. (This command does not flush the printing buffer. Therefore, use it instead of <i>Stop</i> when you intend to continue printing the job shortly.)
	Job > Resume	Continues printing the current job after printing was stopped with the <i>Stop</i> or <i>Pause</i> icon or menu option.
	Job > Delete Job...	Removes the selected job from the queue.
	Job > Review Job...	Opens a window displaying the selected tray. In this window, you can view the tray from different angles.
	Job > Job Info...	Opens a window displaying the properties of the selected model.
	Job > Edit Job...	Launches Objet Studio and loads the selected tray, to enable making changes to it before being printed. (See “Making changes to a Job,” below.)
	Help > About...	Displays the Job Manager version.

Making changes to a Job

From the job (“print”) queue of Job Manager, you can open jobs to make changes to them before printing.

To make changes to a job:

1. Select the job in the print queue.
2. Click the *Edit Job* icon  or open the *Job* menu and select *Edit*.
Objet Studio opens, displaying the build tray. (The status of the job in Job Manager changes from “Waiting” to “Editing.”)
3. Make changes to the build tray in Objet Studio (see chapter 5, “Using Objet Studio”).
4. In Objet Studio, save the changes by selecting *File > Save Tray* (or by pressing *Ctrl+S*).
5. Close Objet Studio.

The status of the job in Job Manager changes back to “Waiting.”

User Alerts

Job Manager can alert you and others to the status of the jobs sent to the server for printing. This is especially useful during long printing jobs, when the operator is away from the 3-D printer. The following events can be reported:

- The level of model or support material is low.
- The job was interrupted.
- The job was completed successfully.

For details on how to configure alert messages, see “Configuring User Alerts” on page 6-5.

To set parameters for “Low level of material” alerts:

1. From the *3-D Printer* menu, select *Material Consumption...*
2. In the dialog box that opens, set the time or the material weight remaining that triggers the alert message.



Figure 6-8: Material alert message dialog box

The dialog box shown above also pops up over the Job Manager screen to alert the operator that there is not enough material loaded in the printer to complete the current job. As long as this condition exists, a warning icon appears in the lower-right corner of the Job Manager screen (when the status bar is visible).

Note: If the status bar is not visible, select it from the View menu.

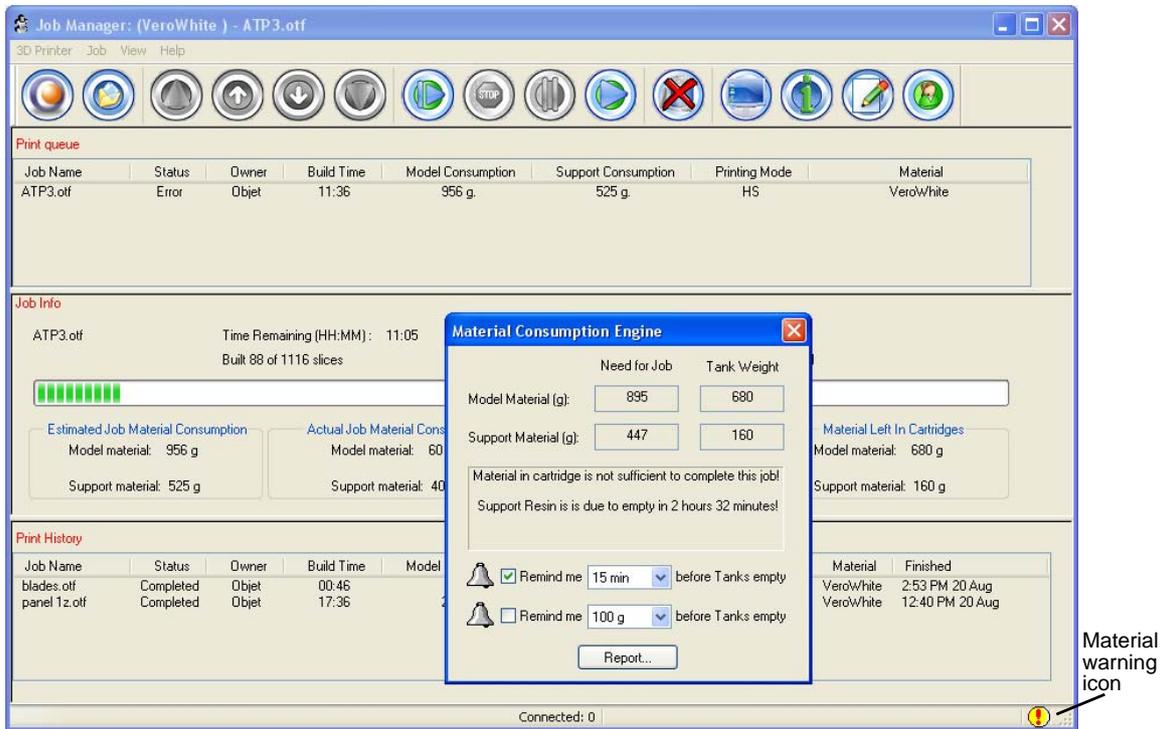


Figure 6-9: Insufficient material warning

When the time set in the dialog box triggers the remote alert message, the warning icon changes color—from a yellow to a red background.

Sending the Tray to the 3-D printer for Production

If there is a job in the print queue, it is sent automatically to the Objet30 printer—as long as it is on, there is a connection to the printer, and the printer is on line. Chapter 7 describes starting and operating the Objet30 printer.

Operating & Maintaining the Objet30 3-D Printer

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Figure 7-1: The Objet30 3-D Printer

Starting the Objet30 Printer



CAUTION!

- Do not attempt to operate the Objet30 printer before being trained by an Objet customer-support representative.
- Observe all safety warnings and follow the safety guidelines described in chapter 2.

1. Turn on the main power switch, located at the back of the Objet30 printer.



Figure 7-2: Main power cable and switch

The main power switch turns on the Objet30 printer, which includes the built-in Objet30 computer.

2. After the computer boots, log in to Windows and launch the Objet30 control application:
 - On the computer desktop, double-click the Objet30 printer icon.
 - or—
 - From the *Start* menu, select *Objet > Objet30*.



A valid HASP key is required on the printer computer for the application to open. This key should be installed during printer installation. If the application does not open and a HASP message appears, contact your dealer or Objet Customer Support.

The Objet30 printer interface screen opens (see figure 7-3). All monitoring and controlling of the Objet30 printer is done from this interface.

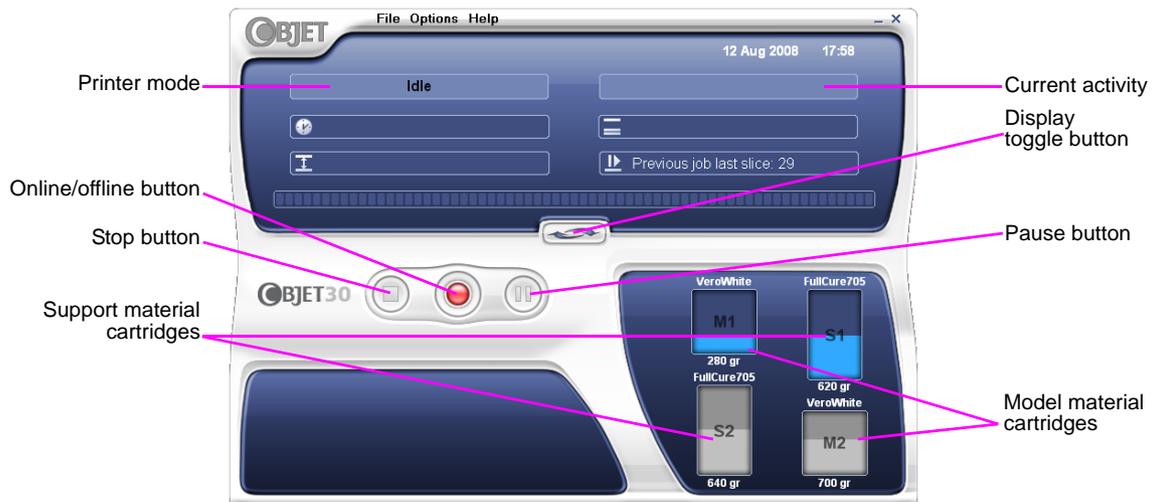


Figure 7-3: Objet30 interface



Objet30 installations utilize one monitor for displaying both the computer running Objet Studio / Job Manager and the computer installed inside the printer. Make sure that the KVM (keyboard-video-mouse) switch is in the correct position so that the Objet30 printer interface is displayed.

Loading Model and Support Cartridges

Objet30 printers use two cartridges of model material and two cartridges of support material, each weighing one kilogram when full. A graphical representation of the cartridges and their current weight appears in the printer interface (see figure 7-3).

Note: The printer-control interface displays the type and weight of the material cartridges loaded only if the printing-materials drawer is closed.



The printer uses RFID technology to automatically identify the material cartridges. For this purpose, an RFID module is part of the printer hardware. Tampering with this module will render the printer inoperable and may void Objet warranties and service contracts.

Important: If you need to replace the model material currently installed with another type, see “Changing the Model Material” on page 7-11. Otherwise, make sure to replace the model cartridge with one containing the same type of material.

To load model and support cartridges:

1. On the front of the Objet30 printer (see figure 7-1), push the printing-materials drawer to release it and pull it open.
2. If you are replacing a cartridge, remove the old one by pulling it straight up.
3. Load model and support cartridges into their respective compartments (see figure 7-4).

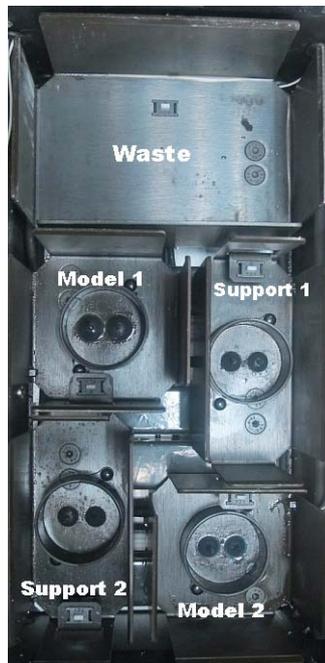


Figure 7-4: Printing-materials drawer

You should feel some resistance, as a needle pierces the cartridge.

4. Check the Objet30 printer interface to make sure that the new cartridge is detected and that its weight is displayed (see figure 7-3).
5. Close the printing-materials drawer.

Tips about replacing cartridges:

- You can replace material cartridges either before or during printing. If you do so while printing, make sure to load the new cartridge and close the cartridge drawer within three minutes. This ensures that the print job is not interrupted. (When the drawer is open, the cartridges are not displayed in the printer interface.)
- If printing stops for an extended time before you replace a material cartridge, the printer may go into *Standby* or *Idle* mode. If this happens, see “Resuming Production After Printing has Stopped” on page 9.
- You can replace partially used cartridges to avoid the need for replacing them during printing. However, repeated removal and installation of a cartridge may cause the material in it to leak. Therefore, it is recommended that you limit the re-installation of used cartridges.
- You can load partially used cartridges, as long as they contain more than 100 grams of material.

Producing Models

The Objet30 printer produces models by printing tray files prepared in the Objet Studio application and sent to the printer from there. For information about preparing model files for printing, see “Using Objet Studio” or Objet Studio Help.

The Objet30 printer is capable of printing models with the following maximum dimensions:

- *With glossy finish*—
 - X axis: 294.00 mm (11.57 inches)
 - Y axis: 192.60 mm (7.58 inches)
 - Z axis: 148.60 mm (5.85 inches)
- *With matte finish*—
 - X axis: 293.00 mm (11.53 inches)
 - Y axis: 191.60 mm (7.54 inches)
 - Z axis: 148.30 mm (5.83 inches)



Before beginning to produce models, it is recommended that you check the current printing quality of the print heads by performing a pattern test (see “Pattern Test” on page 24).

To prepare the Objet30 printer for producing models:

1. Make sure that the build tray in the Objet30 printer is empty and clean. If not, remove old material with the scraper, and clean the tray thoroughly with cleaning fluid.



CAUTION: Use protective gloves when cleaning the build tray, and be careful of the sharp edges of the scraper blade.

2. Make sure that there is sufficient model and support material loaded in the printer, as indicated in the Objet30 printer interface (see figure 7-3). You may want to replace the cartridges of model and support material currently loaded in the printer to avoid the need for replacing them during printing.

For installing material cartridges and replacing empty ones, see “Loading Model and Support Cartridges” on page 7-4.

3. At the bottom of the Objet30 printer interface, click the red button to switch the printer to online mode.

The color of the button changes from red to green (see figure 7-7). If there is a job in the Job Manager queue, it is sent to the printer.

On the Objet30 printer interface, the printer mode changes from *Idle* to *Pre-print*, as the printer's components prepare themselves for production:

- The print block is heated.
- If more than 48 hours have passed since the last print job, the printing materials in the print heads are flushed and replaced, to ensure quality printing. (This step adds 7 to 14 minutes to the *Pre-print* cycle, and it is displayed in the printer interface.)



Figure 7-5: Relimit process during the Pre-Print cycle

- The UV lamp is powered and it warms up.

When printing begins, Job Manager sends seven slices to the Objet30 printer. This is the standard buffer between the Job Manager and the printer. As each slice is printed, the Job Manager sends another slice to the printer.

Depending on the size of the model(s) to be produced, printing can take between several hours to several days. As long as there is enough model and support material in the supply cartridges, printing proceeds automatically until the job is finished.



During printing, the server computer must remain on and it must communicate with the Objet30 printer. Do not log-off Windows until printing is finished.

The Objet30 printer uses one model-material cartridge and one support-material cartridge to produce models. When four cartridges are loaded in the printer, two of them are reserve, or standby, cartridges. By default, the printer first uses the cartridges with the least material in them.

➤ The active cartridges are *blue* in the printer interface.

When the weight of a cartridge drops below 100 grams, the remaining material displayed in the printer interface is *red*. The printer then alternates the pumping of material between the heavier and the almost-empty cartridge. This is indicated in the printer interface by an hour-glass icon. (See Figure 7-8 on page 9.)

When a cartridge is completely empty, a trash icon is displayed.



Figure 7-6: Empty cartridge indicator

You can monitor printer status indicators by switching the printer interface display. To do this, click the display toggle button in the printer interface screen.

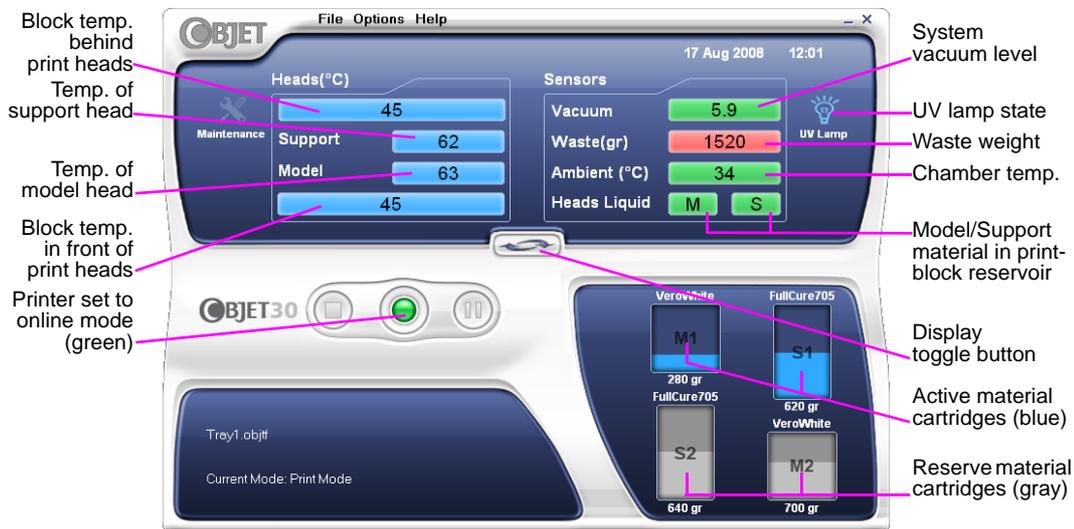


Figure 7-7: Objet30 printer indicators

Printer Interface Color Key

The background colors in the printer indicator fields tell you at a glance whether or not the value or item is suitable or ready for printing.

- *Green*—suitable/ready for printing

For example, in figure 7-7:

- Ambient*—The ambient temperature of the printing chamber is within the acceptable range.
- Heads Liquid*—The level of model and support material in the print-block reservoir is OK.
- Vacuum*—The vacuum level in the system is within the acceptable range.

- *Red*—not suitable for printing (or indicates a warning)

For example, in figure 7-7:

- Waste*—The weight of the waste container is 1520 grams, more than allowed when beginning a print job. (See “Replacing the Waste Container” on page 7-54.)

- *Blue*—not ready

For example, in figure 7-7:

- UV lamp*—The UV lamp is not on.
- Heads (°C)*—The heads have not reached the temperature required for printing models (in printing mode).

The color of the material cartridges displayed in the printer interface indicates which cartridges are active for the current (or next) print job.

- *Blue*—active cartridges
- *Gray*—reserve cartridges

Printing Indicators

The printer interface screen changes when you send a print job from Job Manager to the printer, and the printer is *on line* (see figure 7-8):

- The mode changes from *Pre-print* to *Printing*.
- The specific activity being performed is shown in the “current activity” field.
- Current job-printing information is displayed.
- The printing progress bar is displayed.
- The *Stop* and *Pause* buttons are enabled.

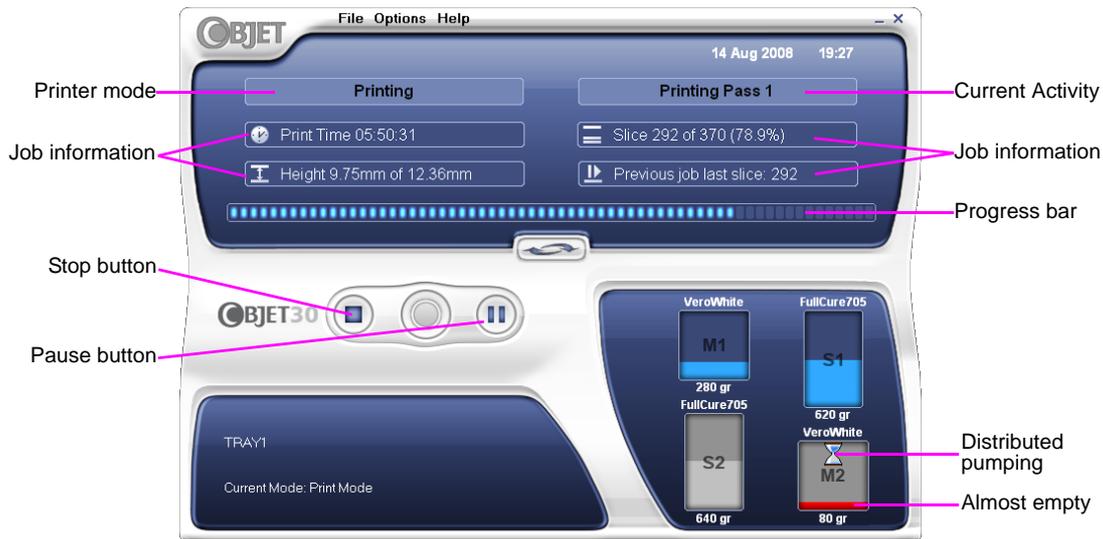


Figure 7-8: Objet30 printer interface during printing

Resuming Production After Printing has Stopped

If the printing process is interrupted, Job Manager stops sending slices to the Objet30 printer. This can happen, for example, if the printing material runs out in the middle of a print job, and you don't replace the empty cartridge immediately. After the printer changes to *Standby* or *Idle* mode, you need to resume printing from Job Manager.



After printing stops, the printer goes into *Standby* mode, when heating of print heads is reduced. About 10 hours later, the printer goes into *Idle* mode, when heating of print heads is stopped.

To continue printing the model:

1. If the printer is in offline mode, switch it to online mode by clicking the red button at the bottom of the Objet30 printer interface (see figure 7-3 on page 3).

The button changes from red to green (see figure 7-7 on page 8).

2. If you don't know why printing has stopped, make sure that the connection between the printer and the server computer is active.

3. In the Job Manager interface, click the *Resume* icon .

4. In the *Continue from Slice* dialog box that appears, confirm the slice number, after checking the Objet30 printer interface.



Figure 7-9: Objet30 printer interface after interrupted printing

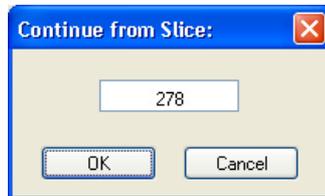


Figure 7-10: *Continue from Slice* confirmation dialog box in server (Job Manager) interface

5. If, for any reason, the correct number does not appear in the dialog box, enter the number and click OK.

You cannot continue printing the model if:

- The number of the last slice printed does not appear in the Objet30 printer interface, even if the server computer displays the *Continue from Slice* confirmation dialog box.
- There was a relatively long interruption in printing, even if the “last slice” and “continue from slice” indicators are correct. The part of the model already printed may deform or shrink, and there might be a visible difference between it and the newly printed part. The effects of a printing stoppage on a model depend on the model size and structure, model material used, ambient temperature and the length of the stoppage.

If you cannot continue printing:

1. Cancel the print job in Job Manager.
2. Remove the partially printed model from the build tray.
3. Send the job to the Objet30 printer again.



You can stop and later resume printing from either the Objet30 printer interface or the Job Manager interface, since both applications are updated when you use these commands. However, after clicking the *Pause* button in the printer interface, you can only resume printing from the printer interface.

Changing the Model Material

Before producing models using a different type of model material than is currently installed, run the Material Replacement wizard to flush the print block and feed tubes.



You should carefully plan printing models with different model materials to avoid unnecessary waste of the material loaded in the printer. The amount of material flushed depends on the flushing cycle chosen and if you are replacing one or both cartridges. For details, see page 12.

To replace the model material:

1. Start the Material Replacement wizard from the *Options* menu.



2. In the opening screen, click Next.
3. If the printer cover is not closed, a screen appears instructing you to close the cover. Confirm that it is closed and click Next.
4. In the *Compartment Selection* screen, select the cartridge(s) you want to replace, and click Next.

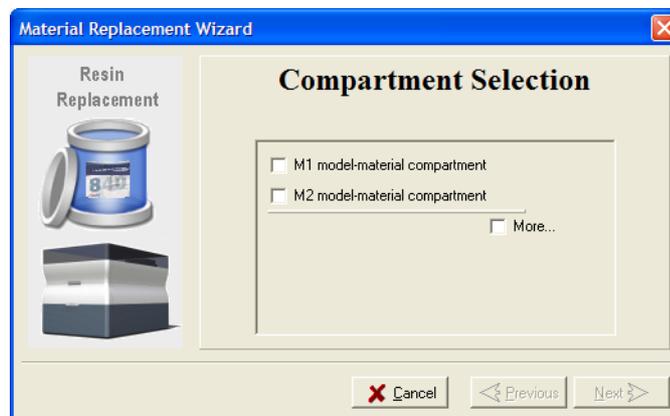


Figure 7-11: *Compartment Selection* screen

- From the drop-down menu, choose the material you want to install, and click Next.

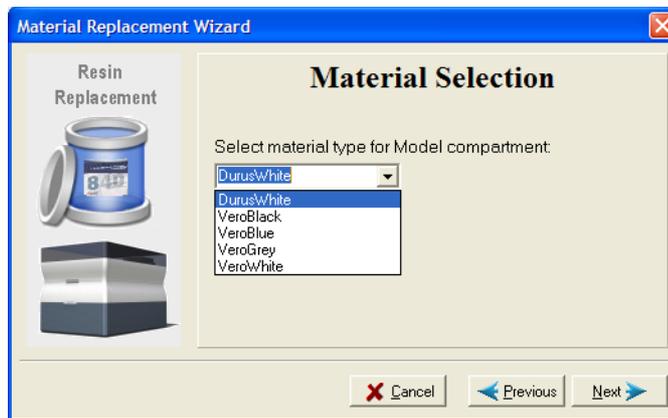


Figure 7-12: *Material Selection* screen

Note: This selection automatically affects the default material setting in Objet Studio.

- In the *Flushing Options* screen, choose the appropriate cycle for the model material you want to install.



Figure 7-13: *Flushing Options* screen

- Economy.* During this cycle, which takes about 25 minutes, the pump purges the model material from the print block, then flushes the system with the new material.

Since traces of the previous material may be present in the first models printed with the new material, this cycle is usually acceptable when replacing a light-colored model material with a darker material (such as VeroBlack™), or if the exact color of the printed models is unimportant. However, this cycle ensures that models will have the *mechanical properties* of the new material.

The amount of material flushed during this cycle is:

65 grams (± 10%) when replacing one cartridge

110 grams (± 10%) when replacing two cartridges

- *High-performance.* During this cycle, which takes about 60 minutes, the wizard cleans the feed tubes and print block more thoroughly by flushing the system with more material.

This cycle ensures that models will have the *color* (and the mechanical properties) of the new material, when replacing a dark-colored material (such as VeroBlack) with a lighter-colored material.

The amount of material flushed during this cycle is:

- 300 grams ($\pm 10\%$) when replacing one cartridge
- 450 grams ($\pm 10\%$) when replacing two cartridges

7. Click **Next**, and take note of the warning screen.

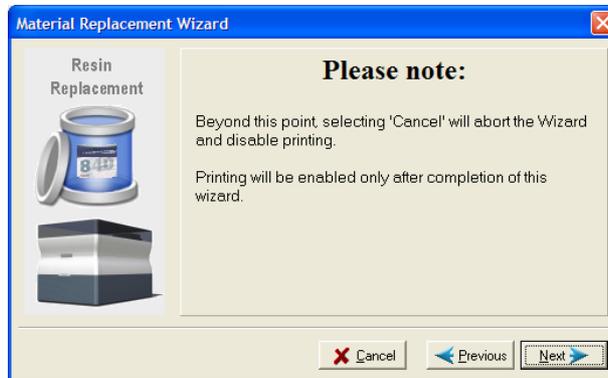


Figure 7-14: Material Replacement warning screen



Once you start this procedure, you must complete it before you can produce models with the Objet30 printer. To perform the procedure at another time, click **Cancel**. If you continue (by clicking **Next**) and you do not complete the procedure, you must start the Material Replacement wizard again before producing models.

8. To continue, click **Next**.
9. When prompted by the wizard screen, remove the material cartridges. Select the check box to confirm that you have done so, and click **Next**.

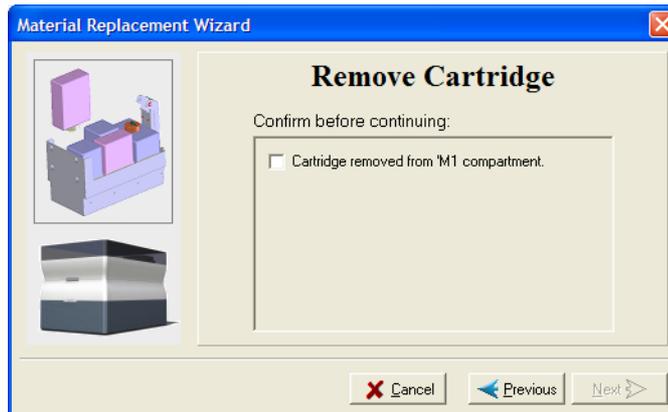


Figure 7-15: Remove Cartridge confirmation screen

- When prompted, load the new cartridge(s) and close the drawer. Confirm this in the wizard screen and click Next.
After identifying the new cartridge(s), the Objet30 printer begins filling the print heads with the new model material.

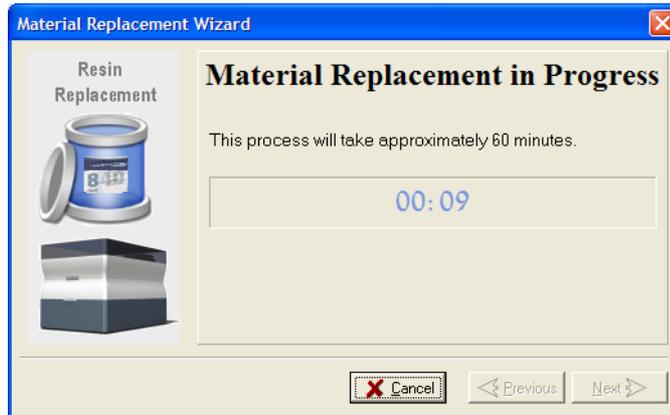


Figure 7-16: Material replacement: filling heads with new material

- When the final wizard screen appears, make sure that the screen displays the newly-loaded material(s). Click Done to close the wizard.



CAUTION: Dispose of all material cartridges in accordance with all applicable laws and regulations. If necessary, the cartridges can be disassembled for recycling. If this is done, protect the person handling the cartridges from direct exposure to uncured resins.

The printer-control interface is automatically updated, and should display the new materials. The Objet Studio interface (on the printer-server workstation) is also updated, and displays the new materials.

Keeping the Objet30 Printer in Idle Mode

Between printing jobs, the Objet30 printer can be kept on for up to one week. If the printer will not be used for more than a week, use the shutdown wizard to automatically perform the procedures that must be done before turning off the printer (see “Shutting Down the Objet30 Printer,” below).

When the Objet30 printer stops producing models, the printer software automatically reduces the temperature of the print heads as follows:

Time after printing	Mode	Change in heating of print heads
first 15 minutes	<i>Standby 1</i>	none
next 5 minutes	<i>Standby 2</i>	heating reduced (to room temp.)
after 10 hours	<i>Idle</i>	heating stopped

Note: The printer mode is indicated in the green field on the left of the interface (see figures 7-3, 7-7 and 7-8 on pages 3, 8 and 9).

If, after printing a job, you know that the printer will not be used for 10 hours or more, you can immediately turn off the heating of the print heads by putting the printer into *Idle* mode.

To put the printer into *Idle* mode:

- From the *File* menu (in the printer interface) click Exit.

Note: The printer remains in *Idle* mode until you open the Objet30 printer application and begin printing again.



When the printer is in *Idle* mode, do **not** turn it off. It can remain in this mode—with the cover closed—for up to a week. For longer periods, shut down the printer by running the Shutdown wizard (see below).

Shutting Down the Objet30 Printer

You only need to shut down the Objet30 printer if it will not be used for a week or more. Otherwise, the printer can remain on, in *Idle* mode. To properly shut down, the printer needs to perform several processes. **Do not attempt to shut down the printer by simply closing the computer interface (the printer-control application), and never disconnect power to the printer before completing this wizard.** Instead, use the wizards that prepare the printer for shutdown.

- **Shutdown Wizard.** This wizard clears the print heads of printing materials before shutdown.

Use this wizard if you need to shutdown the printer computer (or disconnect the power supplied to the printer) for less than one week, and to complete the shutdown process after running the Material Flush/Fill Wizard.

- **Material Flush/Fill Wizard.** This wizard replaces printing materials in the print heads with cleaning fluid.

Use this wizard if you need to shut down the printer for more than one week. (After using this wizard, you must run it again before printing models, this time to replace the cleaning fluid in the print heads with printing materials.) The Material Flush/Fill Wizard is described on page 7-18.

Shutdown Wizard

Note: If you expect the printer to be shut down for more than one week, first run the Material Flush/Fill Wizard (see page 7-18).

To run the Objet30 Shutdown Wizard:

1. Select Shutdown Wizard from the *Options* menu, or press F8.



Figure 7-17: Shutdown wizard, opening dialog box

2. In the opening wizard screen, click Next.

Note: *Run wizard manually* is selected by default. It is recommended that you do not change this selection, to have more control over the shutdown process. If you select *Run wizard unattended*, the shutdown process may take longer, and the wizard will automatically shut down the printer computer.

3. In the next screen, indicate whether or not the tray is empty and click Next.



Figure 7-18: Tray status screen

The shutdown procedure begins.

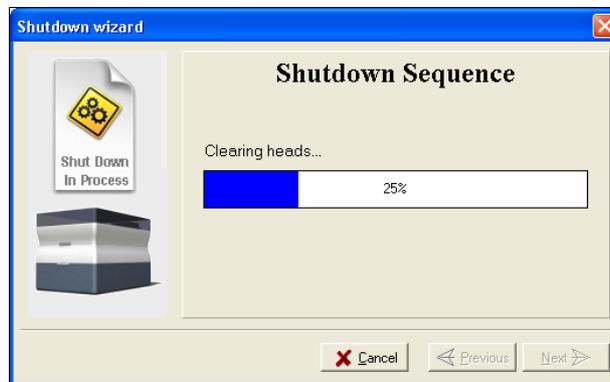


Figure 7-19: Shutdown progress screen

The shutdown procedure may take up to 10 minutes while the following tasks are performed:

- a. The print block returns to its starting point on all axes.
- b. The print heads are heated.
- c. The print heads are cleared of any remaining material.

After these tasks are completed, the final wizard dialog box appears, in which you choose whether or not to shut down the computer in the Objet30 printer at this time.

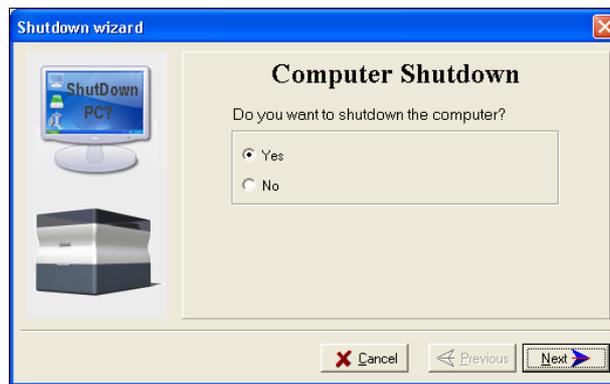


Figure 7-20: Computer Shutdown confirmation dialog box

Material
Flush/Fill
Wizard

4. When completely shutting down the Objet30 printer and turning the power off, select **Yes** and click **Next**.
5. After the printer computer shuts down, turn off the main power switch (at the back of the printer) (see figure 7-2 on page 2).

You use this wizard to prepare the printer for a shutdown of more than one week, and to restore the printer to working condition.

- To prepare the printer for an extended shutdown, the wizard drains printing materials from the print heads, then flushes the system with cleaning fluid. This process takes about 60 minutes.

For this procedure, you need to load four (4) cleaning-fluid cartridges in the cartridge drawer.

- To restore the printer to working condition, the wizard fills the system with printing materials. This process takes about 30 minutes.

For this procedure, you need to load two (2) cartridges of model material and two (2) cartridges of support material.

To run the Material Flush/Fill Wizard:

1. Select **Material Flush/Fill Wizard** from the *Options* menu.
2. In the opening screen, click **Next**.



Figure 7-21: Wizard procedure selection

3. Select the required procedure, and click **Next**.

Note: Before continuing, make sure the required cartridges of material are available for the procedure selected.

4. Load the required cartridges, close the cartridge drawer, and confirm this in the wizard screen.



Figure 7-22: Cartridge confirmation screen—before shutdown

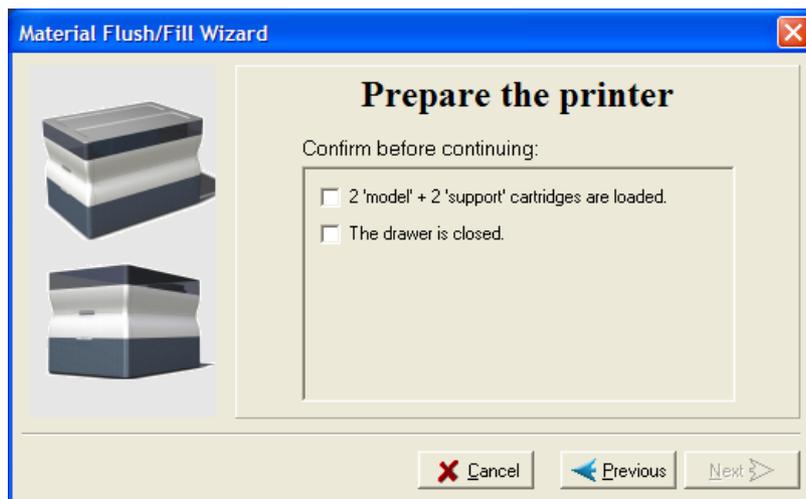


Figure 7-23: Cartridge confirmation screen—before printing

5. In the next wizard screen, confirm that the printer cover is closed, and click Next.

The wizard runs the material-flushing cycles.

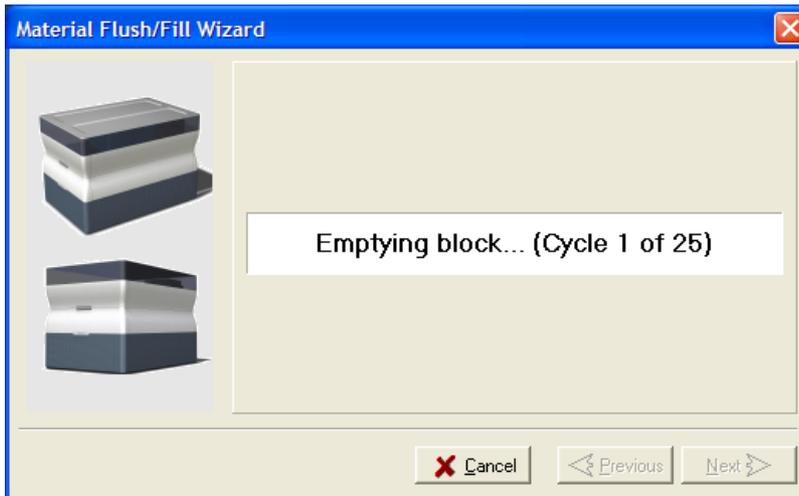


Figure 7-24: Flushing cycles in progress

6. If cleaning-fluid cartridges are loaded in the printer, the wizard prompts you to remove them. Confirm this in the wizard screen, and click Next.

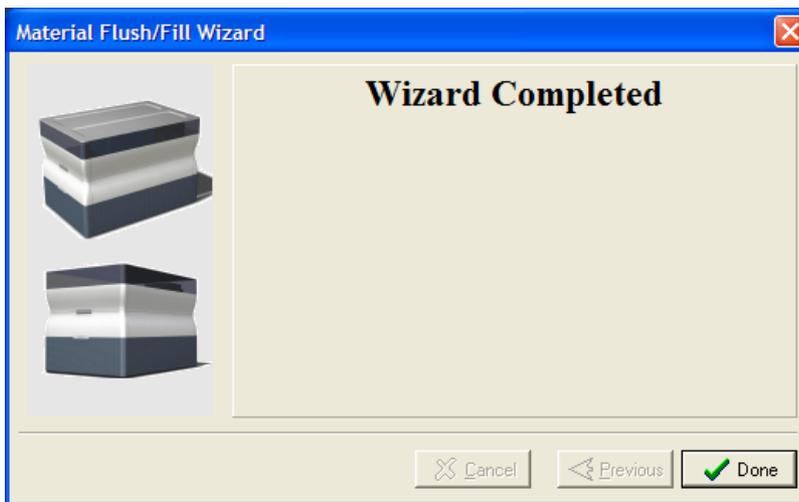


Figure 7-25: Final wizard screen

Note: After preparing the printer for an extended shutdown period with this wizard, run the Shutdown Wizard to complete the shutdown process.

Maintaining the Objet30 Printer

The performance of routine maintenance tasks is essential for getting satisfactory results from Objet30 3-D printers. Perform the tasks at specified intervals for optimum performance.

Routine Maintenance Schedule

Frequency	Task	For More Information
After every print job	Clean the print heads. Clean the build tray and the surrounding area.	See "Cleaning the Print Heads" on page 7-22.
Weekly	Perform the Pattern test.	See "Pattern Test" on page 7-24.
Weekly	Clean and inspect the wiper.	See "Cleaning and Replacing the Wiper" on page 7-25.
Weekly	Restart the Objet30 printer computer and the server computer.	
Monthly	Clean the roller waste collector.	See "Cleaning and Replacing the Roller Waste Collector" on page 7-28.
Monthly, and after replacing print heads	Check the alignment of the print heads.	See "Aligning the Print Heads" on page 7-31.
Every six months	Replace the roller waste collector.	See "Cleaning and Replacing the Roller Waste Collector" on page 7-28.
Every 500 hours of printing, or once every six months	Calibrate the load cells.	See "Calibrating the Load Cells" on page 7-46.
Every 2000 hours of printing, or once a year	Preventive maintenance visit by authorized service engineer.	Contact your Objet support center.
Once a year	Inspect the activated-carbon odor filter, and replace if necessary.	See "Replacing the Odor Filter" on page 7-48.

Cleaning the Print Heads

Periodic inspection and cleaning of the orifice plates on the bottom of the print block ensures that the print nozzles are not clogged. A wizard guides you through the procedure, and adjusts components of the Objet30 printer to enable you to perform it. To maintain your Objet30 printer in optimum condition, clean the print heads after every print job, when you remove the model from the build tray. This procedure takes about 20 minutes.

To clean the print heads:

1. Prepare—
 - isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
 - disposable cleaning gloves
 - an Objet-supplied cleaning cloth or equivalent
 - a mirror
2. Start the Heads Cleaning wizard from the *Options* menu (see figure 7-33 on page 26).
3. Follow the instructions on the wizard screens, and select the check boxes to confirm that:
 - you have checked that the tray is empty.
 - you have closed the cover.



Figure 7-26: Head cleaning procedure—wizard screen

4. Click Next.
The printer prepares for you to clean the print heads.
5. When the following screen appears, open the cover.



Figure 7-27: Head cleaning wizard—steps 5–10



WARNING: The print head orifice plates (bottom surface) may be hot. Do not touch them with your bare hands, and proceed with caution.

6. Place the mirror on the build tray.
7. Put on the gloves.
8. Soak the cleaning cloth with the cleaning fluid.
9. Clean the orifice plates, with a back-and-forth motion (see figure 7-28). Use the mirror to make sure that you have removed all of the residue material.

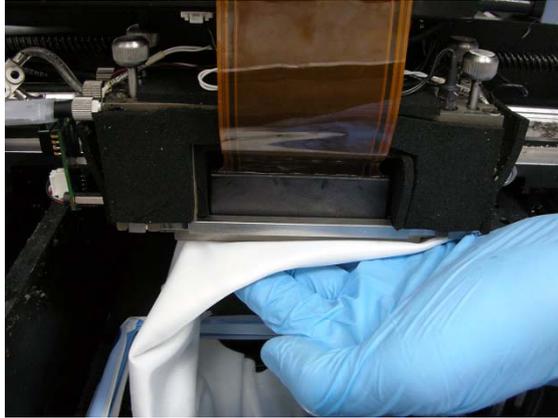


Figure 7-28: Cleaning the heads



It is recommended that you use this opportunity to also clean the roller and the UV-lamp lens (to the right of the print heads).

10. When you have finished cleaning, select the confirmation check box in the wizard screen (see figure 7-27) and click Next.
11. Remove the cleaning materials from the printer and close the cover.
12. Select the confirmation check boxes in the wizard screen and click Next.

The head-purge cycle begins. When this is complete, the final wizard screen appears.



Figure 7-29: Head cleaning wizard—final screen

13. Click Done to close the wizard.

Pattern Test

The pattern test is the basic verification of the printer’s ability to produce quality models, since it demonstrates the condition of the nozzles in the print heads. Make sure, therefore, that you perform this test weekly, and whenever you suspect a printing problem.

To perform the pattern test:

1. Make sure that the build tray is empty.
2. Prepare a sheet of pink paper, approximately 21 × 14 centimeters in size (8.5 × 5.5 inches)—half of the standard A-4 or Letter size.
3. In the Objet30 printer, tape the pink paper to the center of the build tray.
4. Press F3, or open the *Options* menu and select Pattern Test.

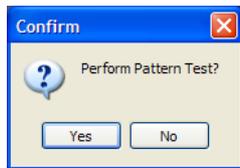


Figure 7-30: Pattern Test confirmation

5. In the following dialog box, click No.

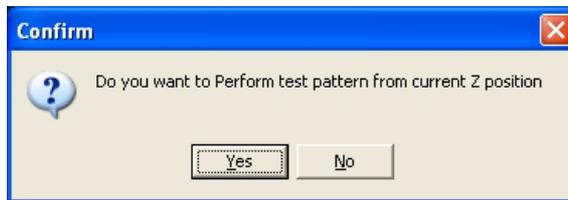


Figure 7-31: Build tray (Z) level adjustment

The Objet30 printer prints a series of lines on the test paper.

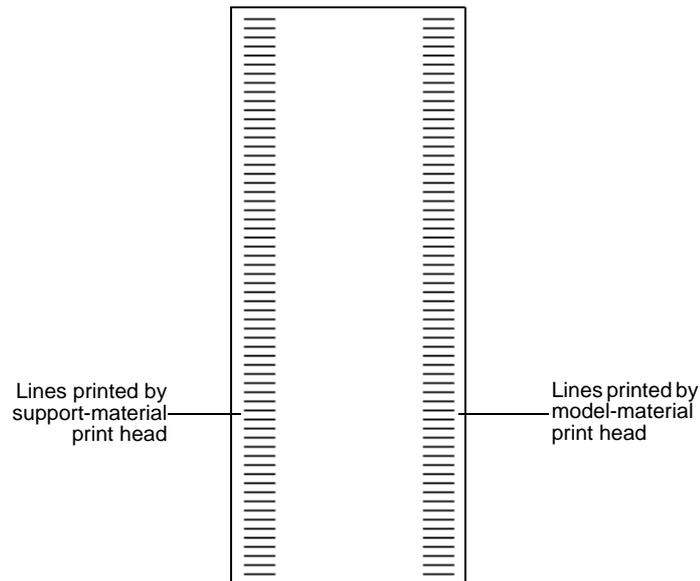


Figure 7-32: Sample Pattern Test

6. Carefully inspect the test paper to see if there are missing lines.

Too many missing lines, especially if they are in the same area, indicates that the quality of printing when producing models will be poor. If this is the case, see “Improving Print Quality,” below.

Note: Acceptable model quality is subjective, and depends on the type and scale (size) of the models produced. As a rule, however, if two consecutive lines are missing, or if there are more than 10 lines missing in either column, the model quality is usually unacceptable.

Improving Print Quality

If you suspect that print quality is poor, perform the pattern test (see “Pattern Test”). If the results are poor, use the following procedure to improve print quality.

If the results of the last pattern test are poor:

1. From the *Options* menu, select *Execute Purge Sequence*, or press F4.
2. In the confirmation dialog box, click *Yes*.

The print heads are purged of model and support material, and the wiper removes excess material from them.

3. Repeat the purge sequence.
4. Perform the pattern test.

If the results of the pattern test are still poor:

1. Manually clean the print heads (see “Cleaning the Print Heads” on page 7-22).
2. Perform the purge sequence.
3. Perform the pattern test.

If the results of the pattern test are still poor:

1. Carefully clean the print heads again, making sure there is no residue left on them.
2. Perform the purge sequence.
3. Perform the pattern test.

If the results of the pattern test are still poor:

- Replace faulty print heads (see “Replacing Print Heads” on page 7-35).

Cleaning and Replacing the Wiper

A rubber wiper removes excess material from the print heads after the purge sequence. This is done automatically before each print job, and performed manually during maintenance tasks. You should clean the wiper and surrounding area at least once a week. If the wiper is damaged or worn, replace it.

To inspect and clean the wiper:

1. Prepare—
 - isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
 - disposable cleaning gloves
 - an Objet-supplied cleaning cloth or equivalent
 - a spare wiper
 - an M2.5 Allen key

2. Start the Wiper Cleaning wizard from the *Options* menu of the printer interface.



Figure 7-33: Starting the Wiper Cleaning wizard

3. Close the printer cover, and click Next in the wizard screen.
4. Make sure that the build tray is empty, and close the printer cover. Confirm this in the wizard screen.



Figure 7-34: Wiper Cleaning procedure—step 4

5. Click Next.

6. When the following screen appears, open the cover.



Figure 7-35: Wiper Cleaning wizard during steps 7–10

7. Put on the cleaning gloves.
8. Using a generous amount of cleaning fluid and the cleaning cloth, remove any material remaining on the wiper and the surrounding area.
9. Inspect the wiper.

If the wiper is scratched, torn or worn, or if you cannot clean it completely, replace it. To ensure that model quality is not reduced over time, you should replace the wiper at least once a month, even if you do not notice any wear.

- a. With the M2.5 Allen key, loosen (but do not remove) the screw securing the wiper.



Figure 8: Wiper and excess-material drain

- b. Grasp the wiper unit and remove it.
 - c. Insert the new wiper, making sure that it is level, and tighten the securing screw.
10. In the wizard screen (see figure 7-35), confirm that the wiper blade is clean, and click Next.
 11. Make sure that you have removed all tools and cleaning materials from the printer, and close the cover.

12. Select the confirmation check boxes in the wizard screen and click Next.



Figure 7-36: Wiper Cleaning procedure—final confirmation screen

13. Click Done to close the wizard.

Cleaning and Replacing the Roller Waste Collector

You should remove the roller waste collector once a month to clean it and to inspect the condition of the scraper. The unit should be replaced every six months, or when the roller knife is worn or damaged.

To remove the roller waste collector:

1. From the *Options* menu, select *Wizards > Heads Cleaning*.
This wizard prepares the printer for removing the roller waste collector.
2. When the following screen appears, confirm that the tray is empty and that the printer cover is closed, then click Next.



Figure 7-37: Wizard confirmation screen

The print block moves to the center of build tray, and the tray lowers.

- When the following screen appears, open the cover.



Figure 7-38: Wizard screen that appears when you can begin the procedure



WARNING: The print head orifice plates (bottom surface) may be hot. Do not touch them with your bare hands, and proceed with caution.

- Loosen the two side screws securing the UV lamp assembly, and remove the assembly.



Figure 7-39: UV-lamp-assembly securing screws

- Move the print block all the way to the front of the printer, exposing the roller-waste-collector locking pin.

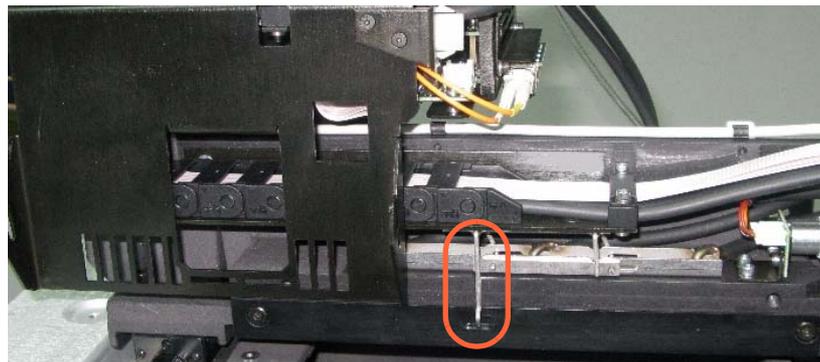


Figure 7-40: Roller-waste-collector locking pin

6. Pull the bottom of the locking pin, and turn it counter-clockwise, to raise the drain-tube bracket from the roller waste collector.

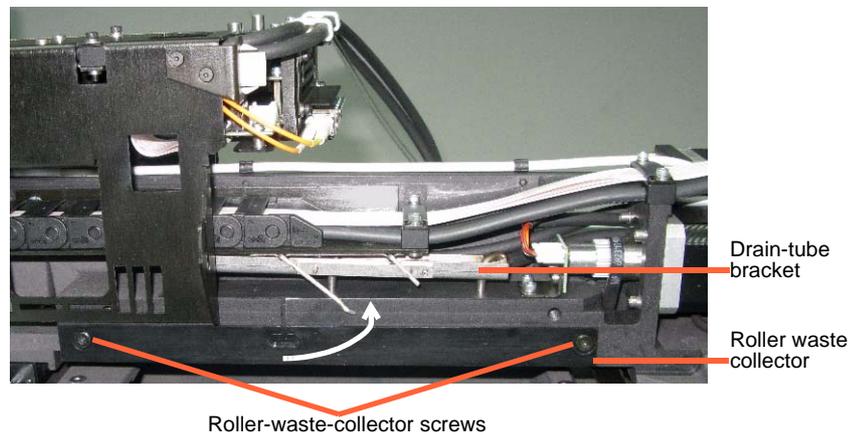


Figure 7-41: Raising the drain-tube bracket

7. Support the roller waste collector with your hand under it, and use a 3 mm Allen key to loosen the screws.
8. Pull out the roller waste collector, taking care not to touch or damage the scraper.



Figure 7-42: Roller waste collector

9. Inspect the roller waste collector.
 - If the scraper is damaged, or after six months of use, replace the entire roller-waste-collector unit.
Save the used unit. At the next maintenance visit, the customer-support engineer will replace the scraper, for future use.
 - If the scraper is not damaged, carefully clean the waste channel with isopropanol and a cleaning cloth.
To prevent damage to the scraper, wipe it from its middle outward, to each side.

To install the roller waste collector:

1. Carefully insert the roller-waste-collector unit.
2. Secure the unit evenly, by alternately tightening the screws.
3. Turn the locking pin clockwise, to lower the drain-tube bracket onto the roller waste collector, and secure the pin in its socket (see figure 7-40 on page 29).
4. Move the print block back to the middle of the printer.
5. Replace the UV lamp assembly and secure it.
6. In the wizard screen, click **Cancel** to return the build tray to its former position.

Aligning the Print Heads

You should check the alignment of the print heads—

- once a month
- if model quality is not acceptable even after cleaning the orifice plate on the bottom of the print block (see “Cleaning the Print Heads” on page 7-22)

The head-alignment procedure takes about 20 minutes.

To check the alignment of the print heads:

1. Prepare—
 - a transparency sheet, at least 10 × 16 centimeters in size (4.5 × 6.5 inches)—about one-quarter of the standard A-4 or Letter size
 - any type of sticky tape, to fasten the transparency sheet to the build tray
2. Start the Head Alignment wizard, from the Objet30 *Options* menu (see figure 7-33 on page 26).
3. Click **Next** to begin, and close the cover.
4. In the wizard screen, select the check box to confirm that the cover is closed, and click **Next**.



Figure 7-43: *Door is closed* confirmation screen

5. When instructed to do so, place the transparency on the build tray—near the left and rear edges of the tray, as shown in the following figure.

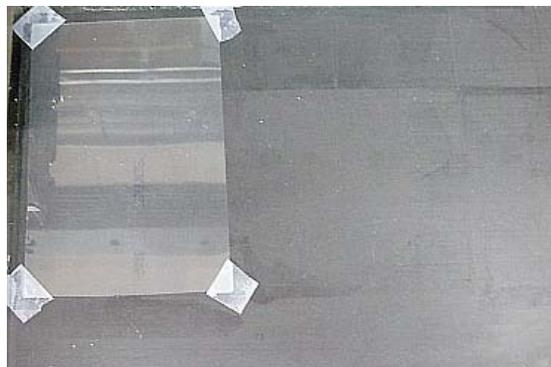


Figure 7-44: Positioning the transparency on the build tray

6. Make sure that the transparency sheet is lying flat, and tape it to the tray.

7. In the wizard screen, select the check box to confirm that the transparency sheet is on the build tray, and click Next.
The Objet30 printer prints the head alignment test on the transparency.
8. When the following screen appears, remove the transparency.



Figure 7-45: Head Alignment wizard—steps 8–10

The transparency sheet is printed with sets of vertical lines in two rows, each showing the results from a different print head.

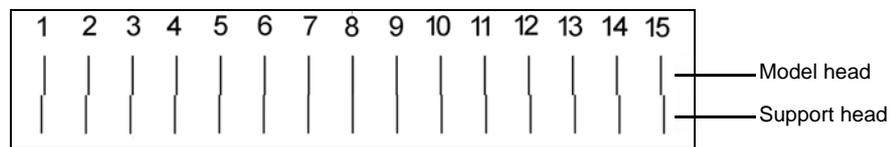


Figure 7-46: Sample head-alignment test

- The top row was printed by the head used for applying model material when producing models.
 - The bottom row was printed by the head used for applying support material.
9. Use a magnifying glass or loupe to inspect the transparency.
Optimum head alignment is shown when the two #8 lines, in the upper and lower rows, are aligned, as in figure 7-46. In the example shown, no change to the head alignment is necessary. If other lines in the set are aligned, you need to change the alignment—in the next wizard screen.
 10. In the wizard screen shown in figure 7-45, select the *Transparency removed* check box, and click Next.

The first in a series of alignment screens appears.

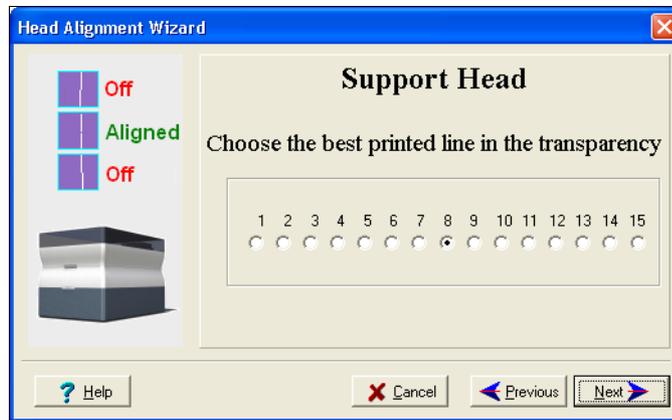


Figure 7-47: Head alignment screen

11. In the head-alignment screen, select the number that indicates which lines align in the upper and lower rows.

Note: Because the alignment of the middle lines is optimum, the number “8” is selected, by default, in the wizard screen. This does not change the head alignment. If you select other numbers, the wizard adjusts the head alignment, accordingly.

12. Click Next.

The following screen is displayed.

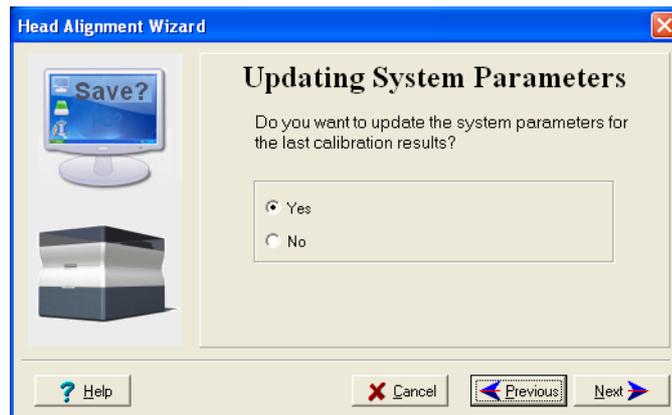


Figure 7-48: Updating System Parameters confirmation screen

13. Continue as follows:
 - To make the alignment changes in the printer, make sure that *Yes* is selected, and click Next.
 - To recheck the alignment test results before making the alignment changes in the printer, click Previous.
 - If you do not want to make alignment changes in the printer at this time, select *No* and click Next.

14. In the final wizard screen, choose to either repeat the head alignment procedure or close the wizard.
 - If the most closely aligned vertical lines for a print head were at either extreme, choose *Yes* to run the head-alignment wizard again, then click *Next*.

The transparency test will show if the heads are now properly aligned, and—if not—the wizard will allow you to “fine tune” the alignment.
 - If the vertical lines for the print heads were not aligned at either extreme, choose *No* to close the wizard, then click *Next*.



Figure 7-49: Final wizard screen

Replacing Print Heads

The condition of the print heads directly affects the quality of printed models. You need to replace a print head if one or more of the following symptoms occurs:

- There are noticeable grooves in the surface of printed models.
- The pattern test reveals that more than four consecutive nozzles—or a total of more than 12 nozzles—are not functioning.
- Visual inspection of the head reveals that its surface is damaged—peeling or bubbles in the nozzle area.
- The Objet30 interface displays a warning or malfunction message relating to a print head—
 - Head Heater temperature timeout
 - Head Heater thermistor open
 - Head Heater thermistor short
- Tests reveal that the material printed by a print head is underweight (that is, not enough material is being outputted).

Note: Weight tests are performed only by an authorized service engineer.



Replacing print heads is expensive. Replace them only after attempting all other means for improving print quality (see “Improving Print Quality” on page 7-25) and after consulting with an Objet-authorized customer-support engineer.

A wizard guides you through the procedure of replacing a print head, and adjusts components of the Objet30 printer to enable you to perform it. Only replace a print head with the aid of the wizard. The procedure takes about 75 minutes, and consists of the following phases:

A. Identifying the head(s) needing replacement.

This is usually done by examining the results of the pattern test, after attempting all other means for improving print quality (see “Improving Print Quality” on page 7-25). Otherwise, evidence of physical damage to the head surface or a malfunction message indicates which head needs replacing.

B. Preparing the print block for head replacement.

This is done automatically when you run the Head Replacement wizard.

C. Removing the defective print head.

D. Installing a new print head.

E. Performing weight calibration.

The wizard prints a sample. After weighing it on a scale, you enter the weight in the wizard dialog box.

F. Performing head alignment.

To replace a print head:

1. Prepare—
 - replacement print head(s)
 - isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
 - disposable safety gloves (included in the head replacement kit)
 - an Objet-supplied cleaning cloth or equivalent
 - the scale supplied by Objet for use in the Weight Test
- Note:** Make sure that you have these items before running the Head Replacement wizard.
2. Start the Head Replacement wizard from the *Options* menu of the printer interface (see figure 7-33 on page 26).
 3. In the opening wizard screen, click Next to begin.
The *Head Replacement Conditions* screen appears.
 4. Read the conditions, select *I Agree* and click Next.
 5. Select the print head(s) needing replacement, and click Next.

Preparing the
print block

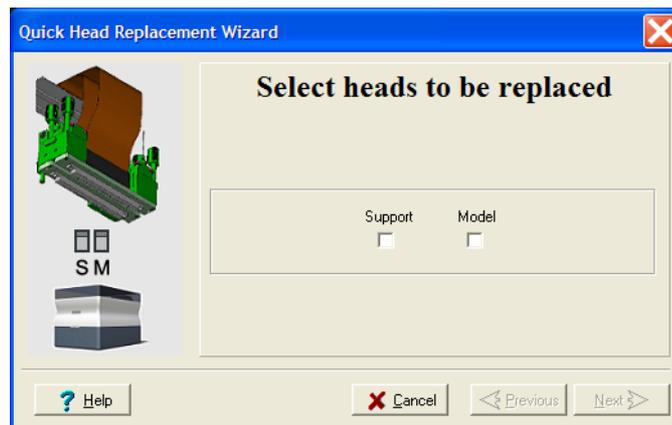


Figure 7-50: Head selection screen

The Objet30 printer heats and empties the print block, and prepares the printer. (This should take about 10 minutes.)

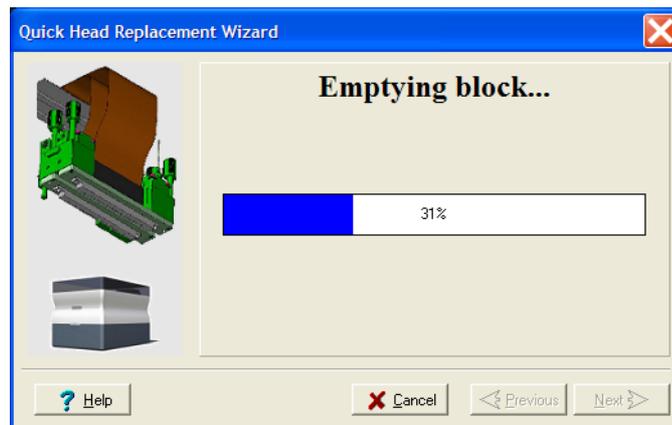


Figure 7-51: Emptying Block progress screen

When the print block is completely drained, the wizard wipes the heads. Then, the following warning screen appears.



Figure 7-52: Head Replacement warning screen

6. Click Next if you are ready to continue.
7. Open the Single Head Replacement kit, and remove the safety gloves and the instructions.
8. Put on the safety gloves.
9. When the following screen is displayed, open the Objet30 printer cover.

Note: The Objet30 printer disconnects power to the heads for your safety.

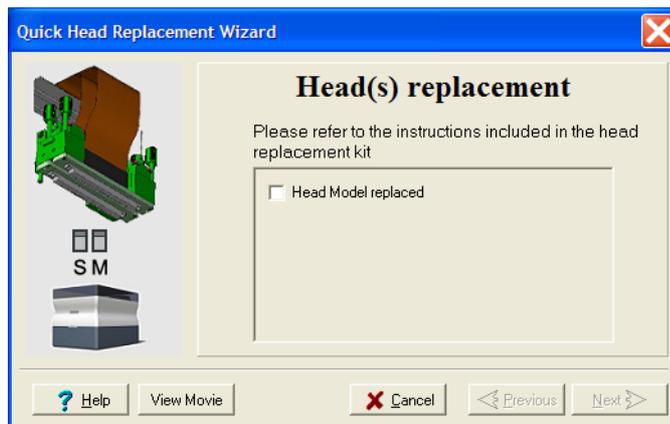


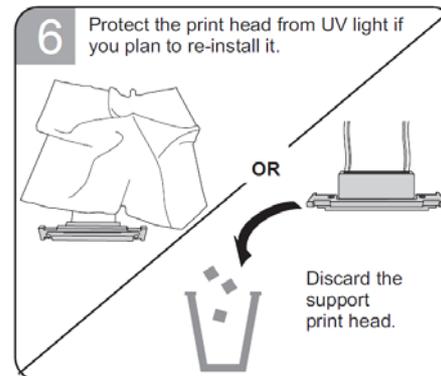
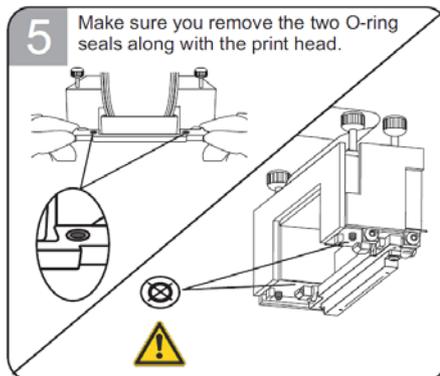
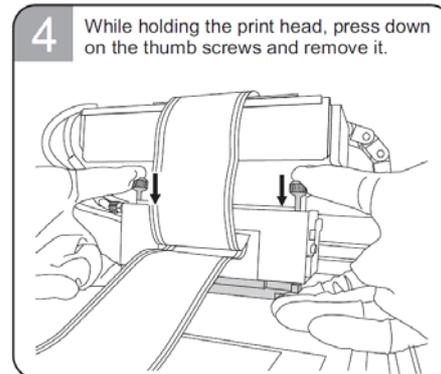
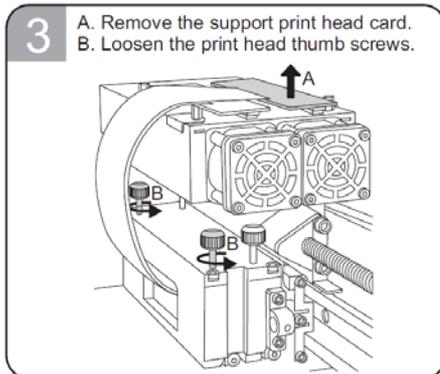
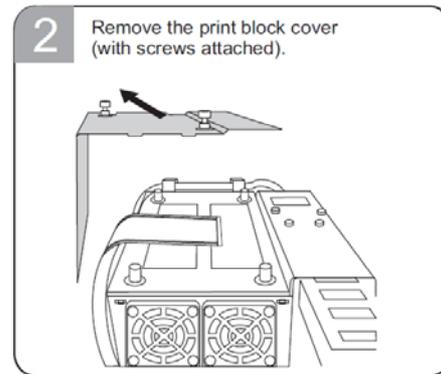
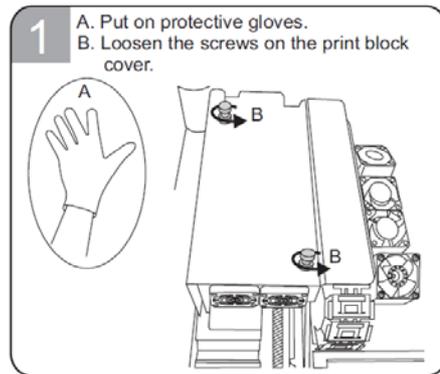
Figure 7-53: Replace the defective head when this screen appears

Removing the Defective Head



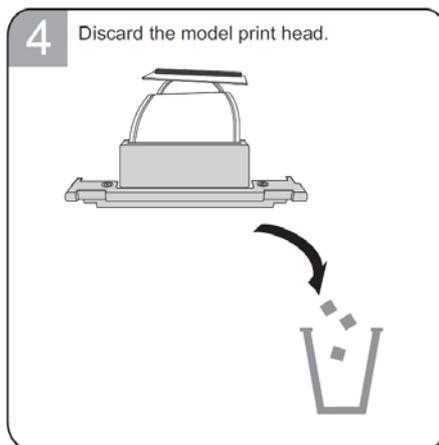
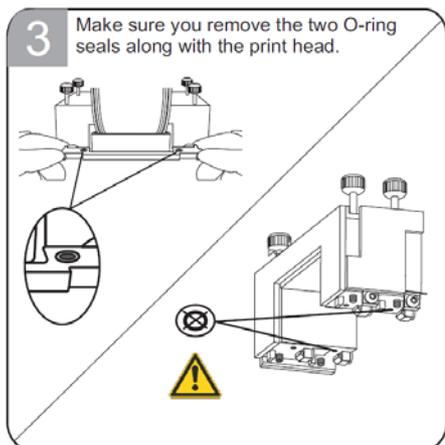
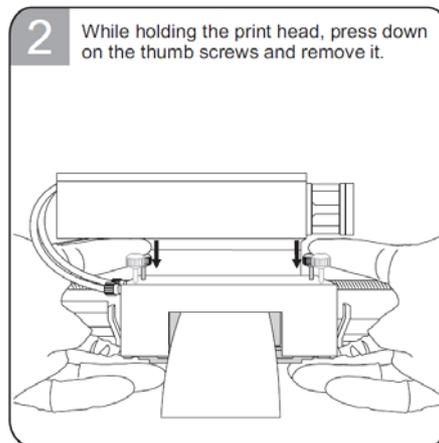
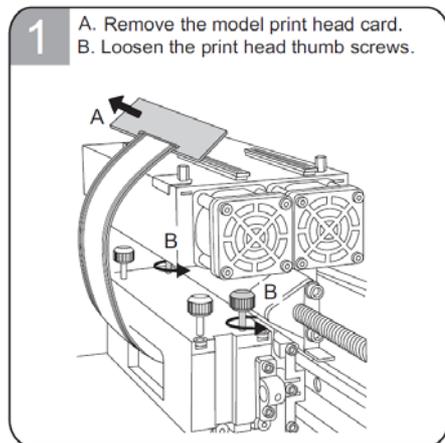
To replace the model print head, you must first remove the support print head.

Support Print Head



- If you do not need to replace the model print head, continue with “Support Print Head” on page 40.

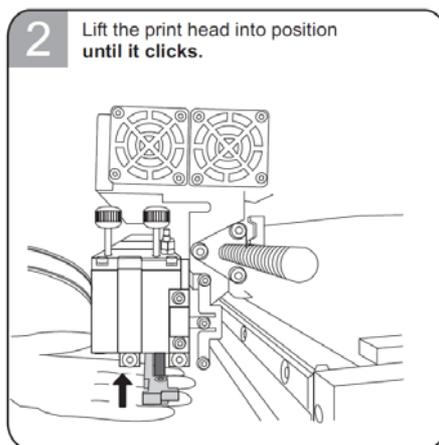
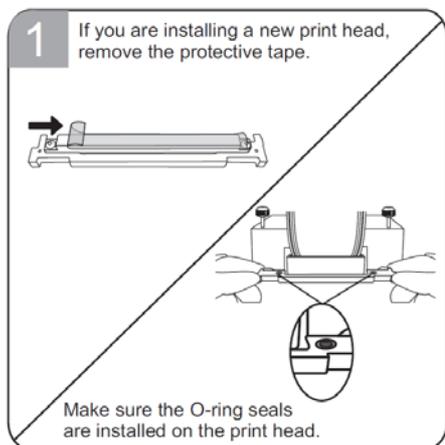
Model Print Head

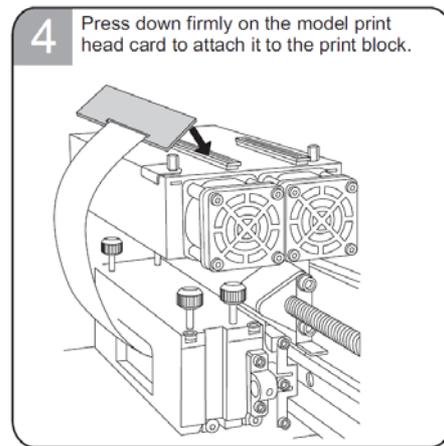
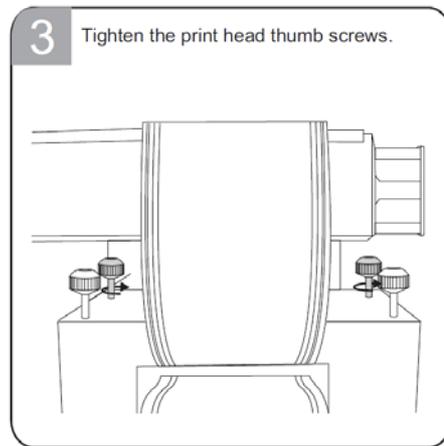


Installing the New Head

Model Print Head

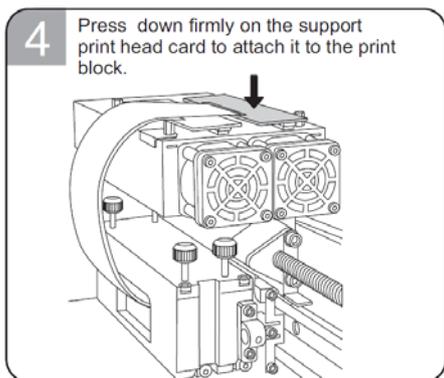
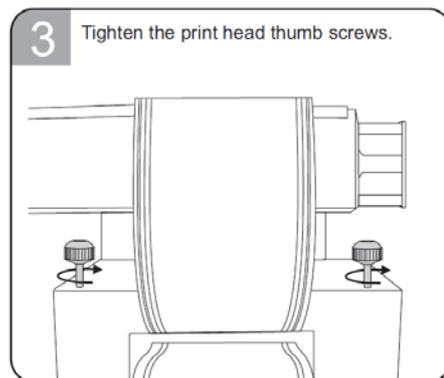
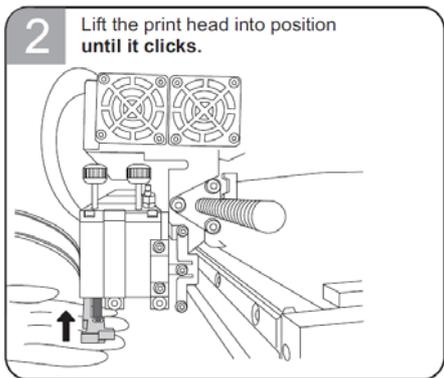
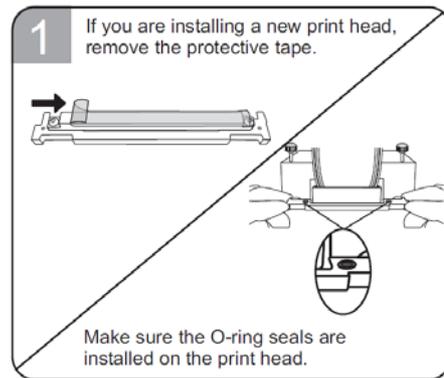
Important: Remove the protective tape from the surface of the new print head.





Support Print Head

Important: Remove the protective tape from the surface of the new print head.



10. In the *Head(s) Replacement* screen (see figure 7-53 on page 37), select the check box to confirm that you have replaced the head(s), and click **Next**.

11. Confirm that the heads are level and even by selecting the check box in the following wizard screen, and click Next.

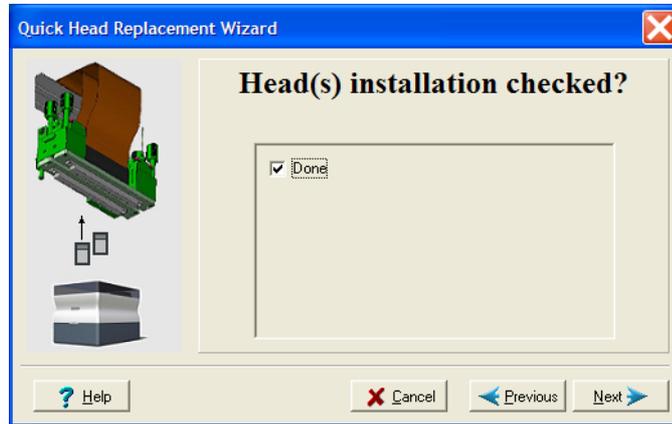


Figure 7-54: Installation-check screen

12. In the next wizard screen, select the check box to confirm that you have removed all tools and objects from the printer.



Figure 7-55: Cleared-tray confirmation screen

13. Close the printer cover.

The wizard continues by filling the heads, then heating and purging them. If there are no installation problems, the weight calibration procedure begins (see "Weight Calibration" on page 7-44).

If a vacuum leakage is detected, or if there are other problems, the wizard alerts you and instructs you how to continue (see "Installation Problems," next).

Installation Problems If the printer detects that there is a problem after you install print heads, relevant warning screens appear.

- If the print head you installed is not new—that is, it was previously removed from a printer—a message appears.

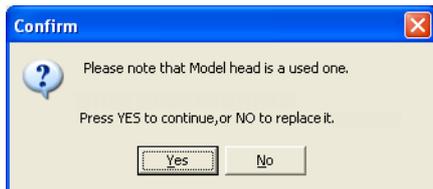


Figure 7-56: Used print head message

- To continue with the installation of this print head, click Yes.
- To remove this print head and install a new one, click No.
- If the printer software does not sense the replaced head, the following warning screen appears.



Figure 7-57: Incorrect-installation screen, showing which head(s) to re-insert

If this happens:

- a. Re-insert the print-head driver card into its socket.
- b. In the wizard screen, select the check box to confirm that you have re-inserted the card, and click Next.

- If the replacement head was not factory-calibrated, the following warning screen appears.



Figure 7-58: Invalid-data warning screen

If this happens:

- Remove the head and replace it with another one.
 - In the wizard screen, select the check box to confirm that you have installed another print head, and click Next.
 - Contact your authorized Objet Customer Support center about the unformatted head.
- If the vacuum test is not successful, the replacement head was not sealed properly during installation, and the following warning screen appears.



Figure 7-59: Vacuum Leakage warning screen

If this happens:

- Click Next.
- Follow the instructions on the wizard screens to re-install the head.

Weight Calibration

After the successful installation of print heads, the wizard begins the weight test, in which each head prints a sample. This test takes 15–25 minutes.

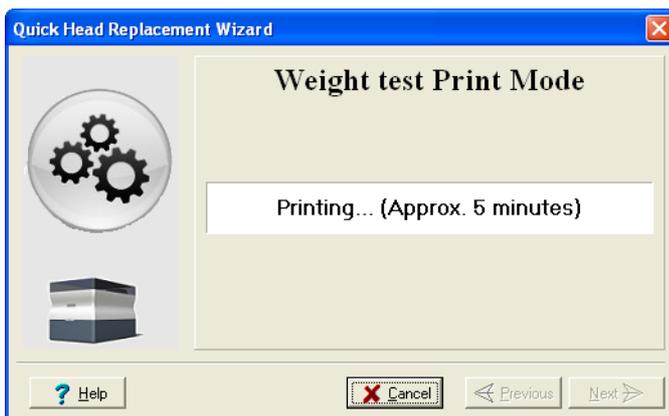


Figure 7-60: Weight test progress screen

14. Carefully remove the samples for each head, keeping track of the head that printed them.



Support Print Head

Model Print Head

Figure 7-61: Samples printed on the Objet30 printer build tray

15. Using the scale, weigh each sample and enter the weight (in grams) for the corresponding head in the wizard screen.
16. Close the printer cover, then click Next.

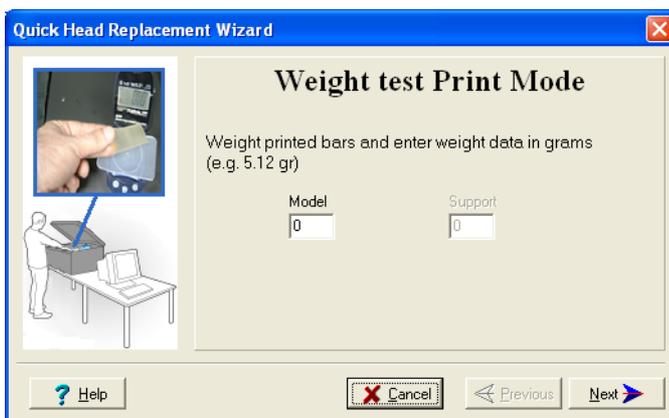


Figure 7-62: Weight Test data entry screen

After the Objet30 printer calibrates itself, the last wizard screen appears.



Figure 7-63: Final Head Replacement screen

17. After replacing print heads, you should check the head alignment before using the Objet30 printer to produce models.
 - Select Yes and click Done to open the Head Alignment wizard (see “Aligning the Print Heads” on page 31).
 - Select No and click Done to align the heads at another time.

18. In the final wizard screen, click Done.

Calibrating the Load Cells

Load cells are sensors that measure the weight of the printing cartridges and the waste container in the printer. It is important that you periodically check that the weight measurements are accurate, both for convenience and to prevent unnecessary waste of printing materials. It is recommended that you calibrate the load cells once a month, with the Load Cell Calibration wizard.

To calibrate load cells:

1. Start the Load Cell Calibration wizard.
 - From the *Options* menu of the printer interface (see figure 7-33 on page 26), select *Wizards > Load Cell Calibration*.
2. Select one or more load cells that you want to calibrate, and click *Next*.

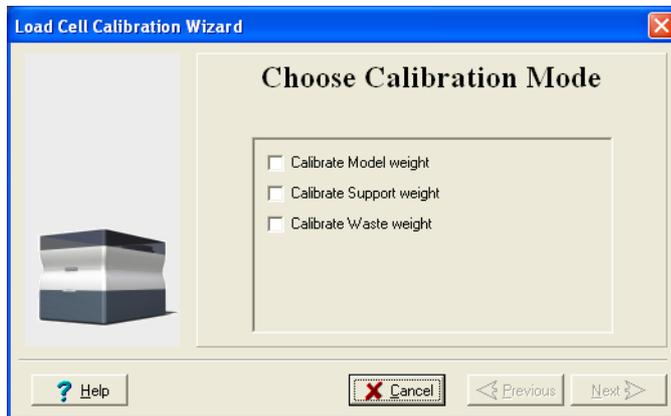


Figure 7-64: Load cell selection

Note: It is recommended that you routinely calibrate all of the load cells, after 500 hours of printing or once every six months.

3. Remove the cartridge or container, as instructed by the wizard, confirm this in the wizard screen, and click *Next*.

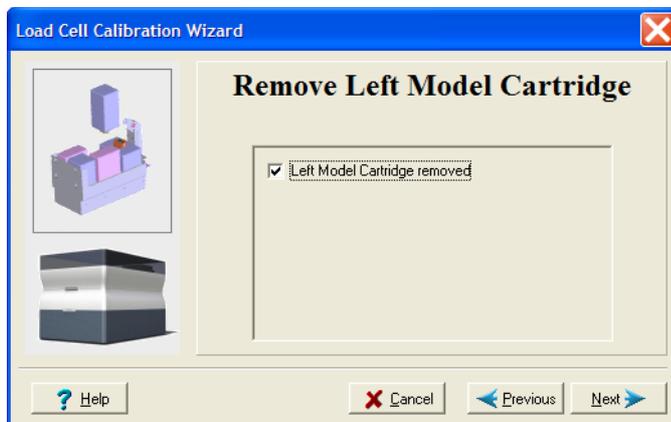


Figure 7-65: Confirmation of cartridge removal

4. In the next wizard screen, observe the numbers and wait until the level is relatively stable—two units above or below the average level shown.



Figure 7-66: Load cell calibration screen

5. Select the *Weight is stable* check box, and click Next.
If you need to calibrate more than one load cell, the next calibration screen appears. Repeat steps 4 and 5 until all of the load cells are calibrated.
6. Click Done in the final wizard screen.



Figure 7-67: Final wizard screen



If you removed the waste container, make sure to replace it with its metal cover, and make sure that the drain tube is not bent. Operating the printer without the waste-container cover results in an inaccurate measurement of the waste weight, which will cause waste to overflow into the printer.

Replacing the Odor Filter

The Objet30 printer has an activated-carbon filter for removing odors from printing materials. The filter should be replaced regularly (about once a year, as necessary) to keep your working environment pleasant. This is normally done during the yearly preventive-maintenance service visit.

To replace the odor filter:

1. Locate the filter drawer at the rear of the printer and pull it open.



Figure 7-68: Rear of the Objet30 printer

2. Remove the used filter. (You can push it out from underneath the drawer.)

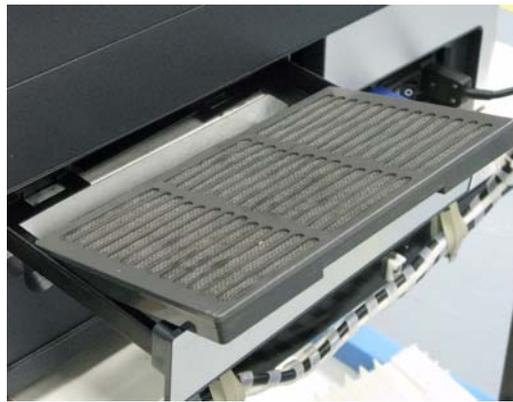


Figure 7-69: Odor filter in drawer

3. Insert a new filter and close the drawer.

Replacing the UV Lamp

The UV lamp used for curing models has a long, but limited, working life. The Objet service engineer tests its effectiveness during regular maintenance checks, and replaces it, if necessary. If, for any reason, you need to replace the UV lamp, follow these instructions:

1. Make sure the Objet30 printer is in *offline* mode.



Figure 7-70: Offline mode indicator (red)

The *online/offline* button on the printer interface should be red. If not, click it to switch the printer to *offline* mode.



WARNING: Before continuing, make sure that the safety interlock in the printer cover is not defeated, and that the lamp is not hot.

2. Start the UV Lamp Replacement wizard.

From the *Options* menu of the printer interface (see figure 7-33 on page 26), select *Wizards > UV Lamp Replacement*.

3. Make sure that the build tray is empty, and confirm this in the wizard screen. Then, close the printer cover and click *Next*.



Figure 7-71: “Empty tray” confirmation screen

The axes move to the “home” position.

4. Disconnect the UV lamp cable and the fan cable.

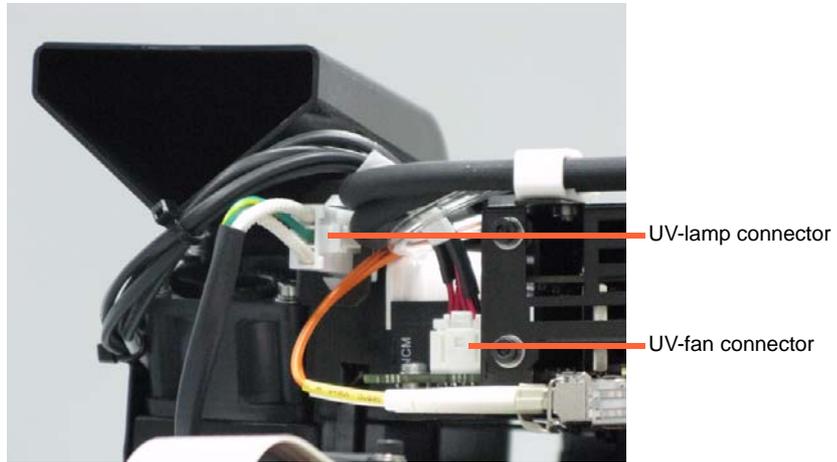


Figure 7-72: Disconnecting the UV lamp assembly

5. Loosen the two side screws securing the UV lamp assembly to the printer.



Figure 7-73: UV-lamp-assembly

6. Remove the assembly, and place it on a flat surface.

7. Loosen the screws securing the UV lamp cover and remove the cover.

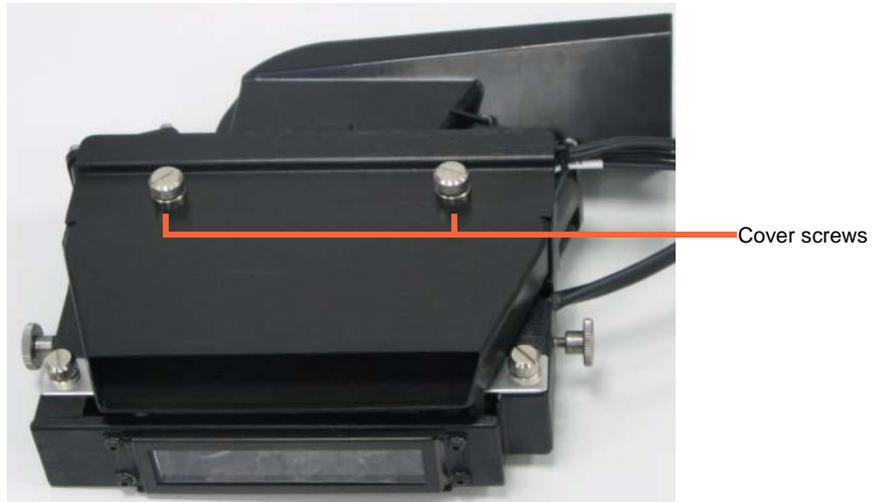


Figure 7-74: UV-lamp-cover screws

8. Loosen the two screws securing the UV reflector.

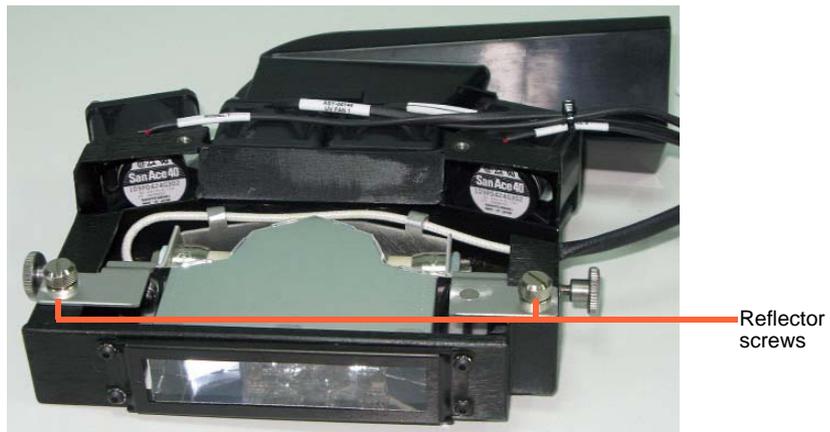


Figure 7-75: UV-reflector screws

9. Remove the UV reflector by raising it slightly, then pulling it out of the housing at an angle, from the bottom.



Figure 7-76: Removing the UV reflector from the UV assembly

10. Inspect the new lamp reflector, and make sure that a black strip is attached to the inside of it. If not, install one—on the side of the reflector *opposite* (not next to) the print block.

Note: Extra black strips are included in the printer Start-up Kit. If necessary, you can remove the black strip from the old reflector and install it in the new reflector (as long as the black paint has not faded).

11. Discard the old reflector and lamp.



Dispose of the used UV lamp in accordance with environmental and safety requirements.

12. Insert the new UV lamp/reflector unit into the housing.
13. Make sure that the UV-lamp cable is in place, inside the housing, and then tighten the securing screws.

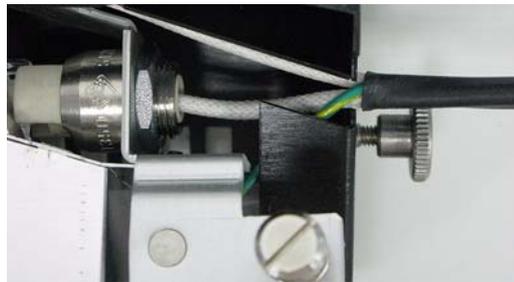


Figure 7-77: Cable position when installing the UV lamp

14. Replace the lamp cover, and tighten the securing screws.
15. Replace the UV lamp assembly in the printer, making sure that the cable fits into the slot together with the side securing screw.



Figure 7-78: UV-lamp cable after replacing the assembly

16. Tighten the two side securing screws.
17. Reconnect the power connections (see figure 7-72).

18. In the wizard screen, confirm that you have replaced the lamp and that the black strip is attached, then click Next.



Figure 7-79: UV-installation confirmation screen

The wizard operates the lamp to test if it is installed correctly. If the lamp does not light, the wizard prompts you to check the power connections and to re-install the lamp.



Figure 7-80: Final wizard screen

Replacing the Waste Container

The waste container contains partially cured polymeric material produced during normal operation and maintenance of the Objet30 printer. For safety and environmental reasons, this material is kept in a special leak-proof, disposable container.

The container has a capacity of 1.8 kilograms of waste material—usually enough for several weeks of printer use. The printer software displays a warning message when there is 1.5 kilograms of material in the container, and stops the printing when the net weight reaches 1.8 kilograms. Above 1.5 kilograms, the software does not allow you to start a print job (or a printing activity) until you replace the waste container. You can monitor the weight of the waste container in the *Maintenance* screen of the printer interface.

To monitor the waste weight (and other indicators) in the Objet30 printer:

- In the main printer interface screen, click the display toggle to view the Objet30 printer indicators.



Figure 7-81: Objet30 printer interface, showing waste weight (red background indicates operator alert)

The waste container consists of a sealed bag inside a cardboard box. You typically dispose of the entire waste container—including the box. Therefore, you must assemble a new box and insert a new waste bag before you can install it in the printer.



Replacement boxes, waste bags, and sealing caps are supplied in the Objet30 printer start-up kit and in the preventive-maintenance kit.

To prepare a new waste container:

1. Assemble the cardboard box, making sure to punch out the perforated sections.
2. Fold a new waste bag—so it fits in the box—and insert the bag’s screw-connector into the hole in the top of the box.

Note: Do not close the box until you connect the waste drain tube from the printer (see below).

To replace the waste container:

1. Open the materials drawer.
2. Remove the fireproof cover from the waste container.



Figure 7-82: Removing the waste-container cover

3. Unscrew the cap securing the waste drain tube.
4. Carefully lift out the waste container to remove it from the printer.
5. Close the full container with a sealing cap.
6. Place the new waste container in the materials drawer, and attach the drain tube to it.

While attaching the cap with the waste drain tube, hold the waste bag stationary.

7. Close the new waste-container box.



Figure 7-83: Waste container with drain tube attached

- Place the fireproof cover over the waste container, making sure that the drain tube is free and not bent.



Figure 7-84: Fireproof cover installed over the waste container

Note: Operating the printer without the waste-container cover results in an inaccurate measurement of the waste weight, which will cause waste to overflow into the printer.

- Close the materials drawer.



Dispose of the full waste container in accordance with environmental and safety requirements.

Cleaning the Exterior Panels

The painted exterior plastic panels of Objet30 3-D printers have a durable finish, offering excellent chemical resistance to common cleaning agents. However, follow the recommendations below when cleaning these areas of the printer.

Acceptable Cleaning Agents

- mild soap solution
- common household cleaners and window cleaners
- common commercial and industrial detergents, 5% solution in water
- alcohol (ethanol, isopropanol), 10% to 40% solution in water

Wipe the exterior of the printer, using a soft cloth moistened with the cleaning solution.

Unacceptable Materials

- industrial solvents
- cleaning agents containing hydrocarbons, ketones, esters and lacquer thinners
- spray disinfectants
- abrasives and agents which could wear away the panel finish

Backing-Up and Restoring Printer Settings

Printer modes and configuration settings are stored in files on the printer computer. You can back up these files, and restore them, if necessary, using desktop icons.



Figure 7-85: *Backup* and *restore* desktop icons

ReInitiate Wizard

One of the wizards listed in the *Options* menu is *ReInitiate*. You normally do **not** have to run this wizard. The process that this wizard controls runs automatically, when needed, as part of the *Pre-print* mode (before printing begins). Run this wizard only if an Objet Customer Support engineer instructs you to do so.

8

Handling Printed Models

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Removing Models After Printing

After printing models, you should allow them to cool as much as possible before handling them. If additional models do not have to be produced on the Objet30 printer, it is best to let the printed models cool in the printer, with the cover closed, as long as possible.

If the Objet30 printer must be used to produce additional models as soon as possible:

1. Let the printed models cool on the build tray for at least 10 minutes.
2. Very carefully, remove the models from the tray with a scraper or spatula (supplied in the tool kit), taking care not to pry or bend the model.



WARNING: Wear protective gloves when handling printed models before they are washed.

3. Place the models on a flat surface, and cover them with a cardboard box or paper hood.

This allows the models to cool slowly and evenly.

4. Let the models cool for several hours.

Removing the Support Material

After printed models have cooled, the support material must be removed. This can be done by different methods, depending on the size of the model, how delicate it is, the amount and location of the support material, and other factors. Use the following methods as a guide, and adapt them (or a combination of them) for finishing the models you are handling.

Removing Excess Support Material by Hand

While wearing protective gloves, break away excess support material on the outside of the model. For delicate models, use a toothpick, pin or small brush after dipping the model in water.

Removing Support Material with Water Pressure

For most models, the most efficient way to remove support material is by using a high-pressure water jet. One suitable system is the Objet WaterJet cleaning unit, shown in figure 8-1 on page 8-3.

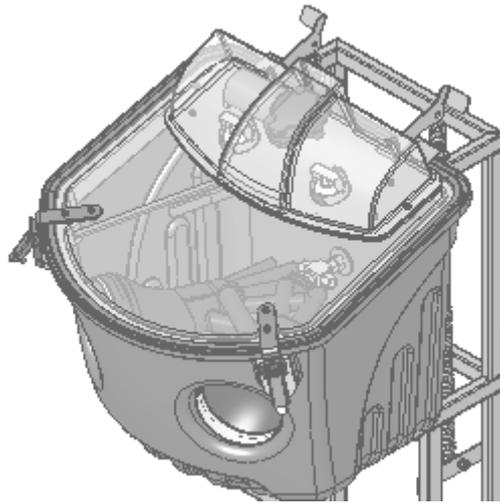


Figure 8-1: Objet WaterJet Cleaning Unit

To clean a model using this device, you place it in the chamber, and you manipulate it and the jet using the built-in, waterproof sleeves. A pump turns ordinary tap water into a high-pressure jet, and a wiper keeps the window clear.



Use caution when cleaning delicate models with high-pressure water systems.

Removing Support Material with Caustic Soda

Soak models in a 2-percent solution of caustic soda (sodium hydroxide) to remove support material from difficult-to-reach areas and to give the model a smooth, clean finish. The amount of time you soak the model in the solution depends on how delicate it is and how much support material needs to be removed, but it is typically between half-an-hour and several hours. In any case, you should remove as much support material as possible before the caustic soda treatment, and rinse the model thoroughly (with a water jet) afterwards.



WARNING: Caustic soda may cause chemical burns, scarring and blindness. Mixing it with water generates heat that could ignite other materials. Take adequate safety precautions; always use nitrile gloves when handling caustic soda and models soaked in it.

Storing Models

Models are cured as they are printed, making them safe and stable for a long time. However, proper storage conditions are necessary to prevent deforming.

- Keep printed models at room temperature and in a low-humidity environment.
- Do not expose models to direct sunlight and other heat sources.

