User Guide

English

Eden500V/350V/350 3-D Printer System

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6,850,334
6,863,859
7,183,335
7,209,797
7,225,045
7,300,619

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Contents

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About This Guide

Using This Guide

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

The text and figures in this guide are based on the Eden500V 3-D printer, printer software version 50.0.1.14 and Objet Studio software version 8.0.2.3.

This guide assumes that:

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

For More Information

Visit http://www.2objet.com/ for more details about Objet's technology, products and consumables, and for service and support contacts.

For other documents that relate to Eden500V/Eden350V/Eden350 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@2objet.com.

Terms Used in This Guide

build tray	*In Objet Studio:* The surface displayed on the screen that represents the actual build tray in the Eden printer. *In the Eden printer:* The surface upon which models are produced.
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 Eden printers. (There is no limit to the number of client workstations in the local network.)
Eden™ printer	The Eden500V/Eden350V/Eden350 3-D printer referred to in this guide.
Eden computer	The computer inside the Eden printer that operates it. (This is sometimes referred to as the "embedded" computer.)
Eden printer interface	The GUI (graphical user interface) used for controlling the Eden printer.
Eden software	Software running on the computer inside the Eden 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 Eden printer and is typically positioned next to it.
Job Manager™	The software that manages production jobs before they are sent to the Eden printer.
model material	Material used for building models.
Objet Studio™	The software with which users prepare jobs for producing models.
OTF (Objet Tray Format)	The file type containing all of the information needed for a model-building job on Objet 3-D printers.
resin	The base substance from which photopolymer printing materials are made for use in Eden printers. In Objet Studio, Job Manager and Eden 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 3-4.)
STL	A file type used with Objet software. (For more information, see page 3-4.)
support material	Material used for supporting the structure of models during production.

2

Safety

Safety Features

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

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 the safety lock. Doing so could result in serious personal injury.** If the safety lock does not function correctly, contact your service provider.
Cover interlock switch	The internal AC power supply (to the UV lamp, motion motors and the tray heater) is turned off when the cover is opened.
	 **WARNING: Do not defeat the interlock switch. Doing so could result in serious personal injury.** If the interlock does not function correctly, 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 main power supply is turned off by an internal switch in case of an electrical malfunction.
Grounded chassis	The frame and chassis of the printer are grounded to prevent electrical shock.

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

Symbols and Warnings

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

Warning Symbol	Meaning	Location	Comments
	Hazard (general)	The main label on the back of the printer.	Caution.
	Hot surface	Near head block.	Risk of burns. Do not touch this surface when hot.
	High voltage	Near UV lamp connectors, on the rear, left and right covers of the UV enclosure.	Risk of electric shock.
	Ultraviolet radiation	Near UV lamps	Risk of injury from ultraviolet radiation. Always use protective eyewear during operation.
	Moving parts	Near tray Near UV power supply	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 Eden system. If the system is not operated as specified, the user's safety may be compromised.

Eden Printer

- Installation and removal of the Eden printer should only be done by qualified service personnel.
- The Eden printer should only be operated by persons trained by an Objet customer-support representative.
- Service operations should be performed only by personnel who have been instructed in relevant safety precautions.
- All personnel operating or maintaining the Eden printer should know the location of first aid and emergency equipment and how to use it. Never block access to this equipment.
- Never attempt to open the main cover of the printer while it is working.
- Never bypass the interlock safety switch.
- If the interlock safety switch ever fails, or if servicing is ever necessary while the main cover is open, never stare directly at the UV lamps without glasses that screen out UV radiation. For this purpose, ordinary sunglasses with UV screening are adequate.
- Never connect the power plug to a socket 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.
- The power cable should be connected at an easily accessible electric socket near the printer.
- Never insert screwdrivers, wires, or other objects into the power supply housing.
- Leave a minimum of 15 centimeters between ventilation openings and walls or other objects.
- Several parts of the printer remain extremely hot even after it has stopped operating. Avoid touching the main power supply, the UV-lamp power supply, UV lamps, and the print heads.
- Notify co-workers and those who have access to the Eden 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 Material

Model and support materials are made of resins. Although precautions must be taken when handling resins directly, all model and support materials used by the Eden system are handled in sealed cartridges. Normally, operators of the Eden printer should never be directly exposed to dangerous materials. Most of the following recommendations for handling resins apply to the unlikely event of a leak or spill. If this should occur, follow the specific instructions printed on 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 resin is considered a hazardous material, requiring certain precautions when handling it. To prevent skin irritation, wear protective gloves, if necessary. If there is any chance that model and support materials might splash into the eyes, wear safety goggles. Prolonged direct contact with resins can cause an allergic reaction.
- To prevent respiratory irritation, ventilate areas where model and support materials are used. The ventilation system should totally replace the air 20 times per hour.
- Clean 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. Absorbed resin may re-expose the user when these items are worn again.

First Aid for Working With Resins

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

Contact with Skin

If uncured resin 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 resin does not easily penetrate the skin.
- Do not use solvents to clean skin.
- If large areas of skin have been exposed to resin, or if prolonged contact results in blisters, seek medical attention.
- Avoid the accidental transfer of resin 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 resin 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 working near resin is not recommended. If resin 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 resin is swallowed, refer to the cartridge label for specific instructions. *Seek medical attention immediately.*

Inhalation

Resin vapors 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 resins present no special safety or health-related issues. However, check if local regulations regard cured and partially cured resins as hazardous industrial waste, and comply with all applicable regulations governing their disposal.

- When removing the waste container from the Eden printer, protective gloves are not required. When directly handling uncured resins, neoprene or nitrile gloves should be worn.
- When handling cured materials that may not be completely cured on the surface, common latex gloves are adequate.
- Even if not classified as hazardous industrial waste or otherwise regulated, resin materials must be packaged and disposed of in a manner that prevents human contact with the waste. Therefore, take steps to prevent the contamination of both groundwater and surface water.
- Empty model-material and support-material cartridges are sealed to prevent leakage. Do not attempt to reuse them, and do not puncture them.
- Discard contaminated clothing, shoes, empty containers, etc., in accordance with any applicable laws and regulations.

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Introducing the Eden 3-D Printing System

Figure 3-1: The Eden500V/Eden350V/Eden350 3-D Printer

Work Configurations

The Eden 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 Eden printer set up in a multi-client configuration.

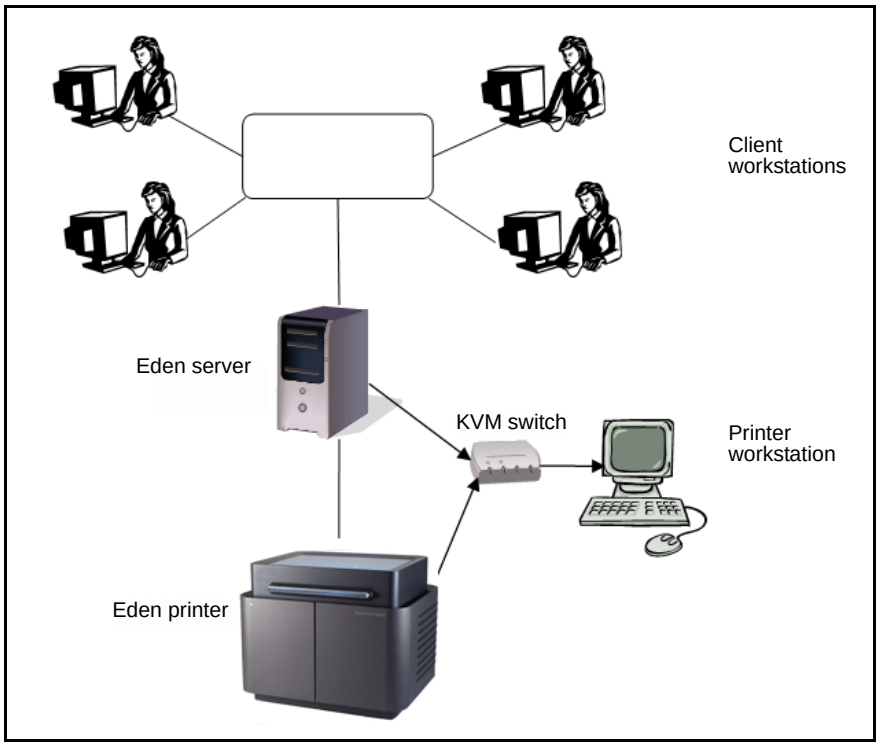

Figure 3-2: Multi-client network configuration

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

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

- STL files
- SLC files

Eden 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 Eden 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

Materials used for printing models with Eden printers are made of resins, which are composed of reactive monomers and oligomers. Care must be taken when storing and handling them, both to protect operators and the environment, and to ensure their effectiveness.

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. To prevent this, observe the following guidelines when handling and storing Eden modeling and support materials.

Storage

Printing materials used with Eden systems are supplied in UV-proof cartridges.

- 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.
- 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.

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

Before being cured, resins are hazardous materials. To prevent possible health hazards, follow these precautions regarding printing materials:

- 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.

Cured plastic parts, however, are safe. They can be handled and stored without precautions.

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.

You can find more safety information about resins in “Safety Guidelines” on page 2-4, and “First Aid for Working With Resins” on page 2-6.

Work Environment

Extreme heat and humidity conditions can adversely affect the operation of the Eden 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	Microsoft Windows XP or Windows 2000	Microsoft Windows XP or Windows 2000
Graphics Card	Supporting open GL, with 256 MB of memory	Supporting open GL, with 256 MB of memory
RAM	2 GB (min.)	1 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	•Straight-through cable (1) •Crossover cable (1, supplied)	Straight-through cable (1)

Preparing Files for Use with Eden 3-D Printing Systems

Before using files with Eden 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.

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*. (Binary files are smaller than files saved in ASCII format; they are, however, functionally identical in Objet Studio.)
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 Software

Objet software for the Eden 3-D printing system consists of two applications:

- Objet Studio
- Job Manager

Objet Studio

With Objet Studio, you prepare source files for production in Eden 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 *otf* (Objet Tray Format) file
5. Sending the *otf* file to the Eden 3-D printer for production

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

Job Manager

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

- Job Manager installed on the directly-connected computer (server) 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.
- 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.

Job Manager is described in detail in chapter 6, "Using Job Manager."

Client computers can be connected, via the local network, to different Eden 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 Eden 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.

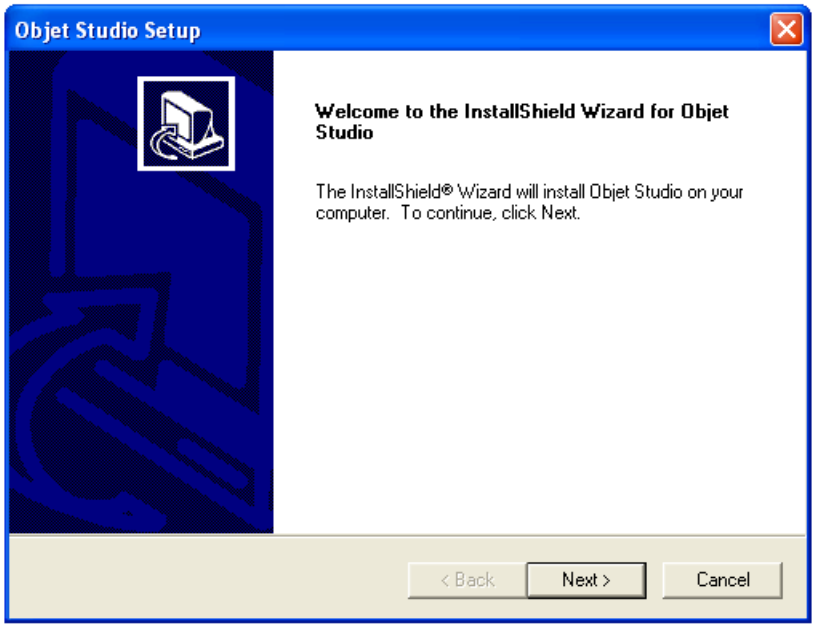

Figure 4-1:Objet Setup—installation wizard *Welcome* screen

4. When the *Welcome* screen appears, click Next.

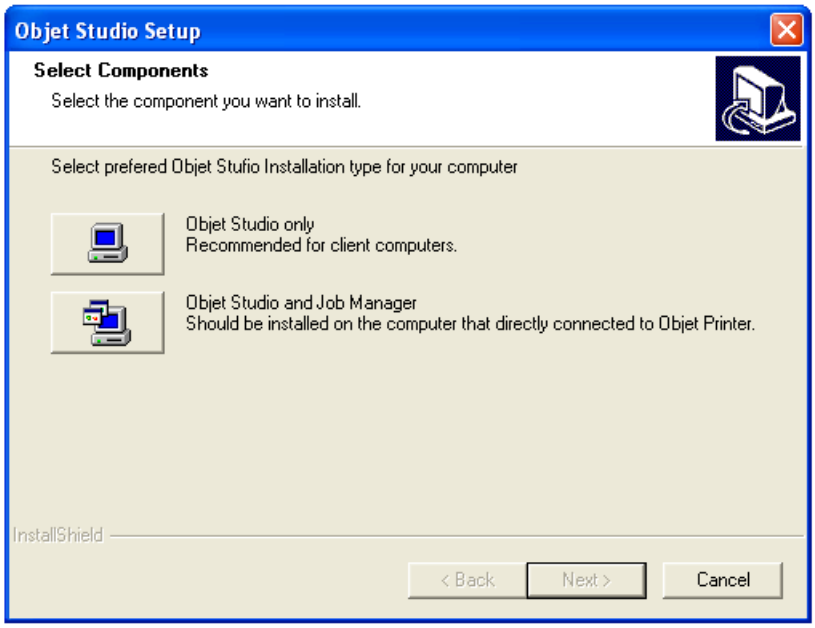

Figure 4-2: Objet Setup—*Select Components* screen

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 Eden printer.

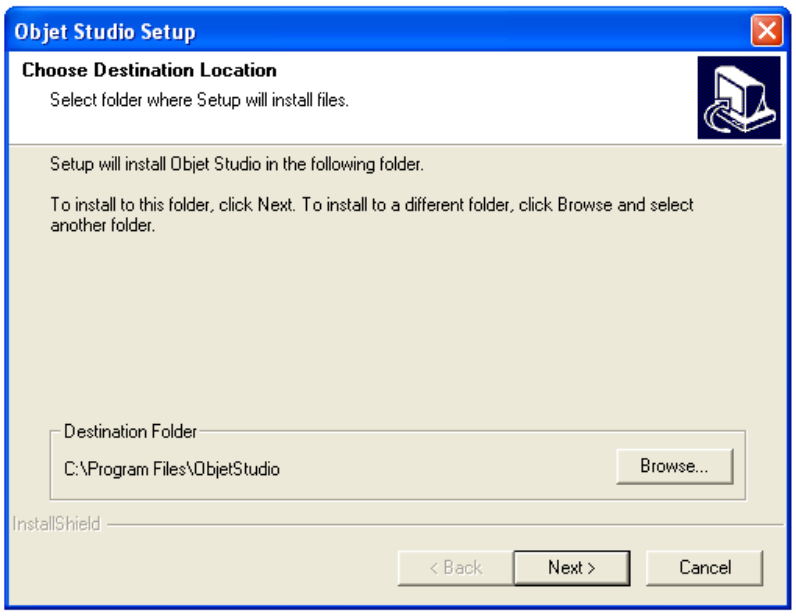

Figure 4-3: Objet Setup—*Choose Destination Location* screen

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.

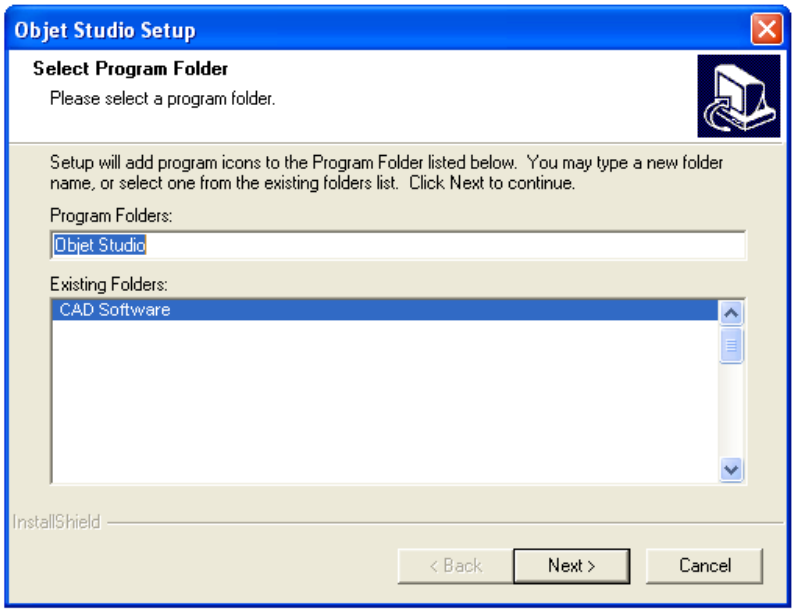

Figure 4-4: Objet Setup—*Select Program Folder* screen

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.

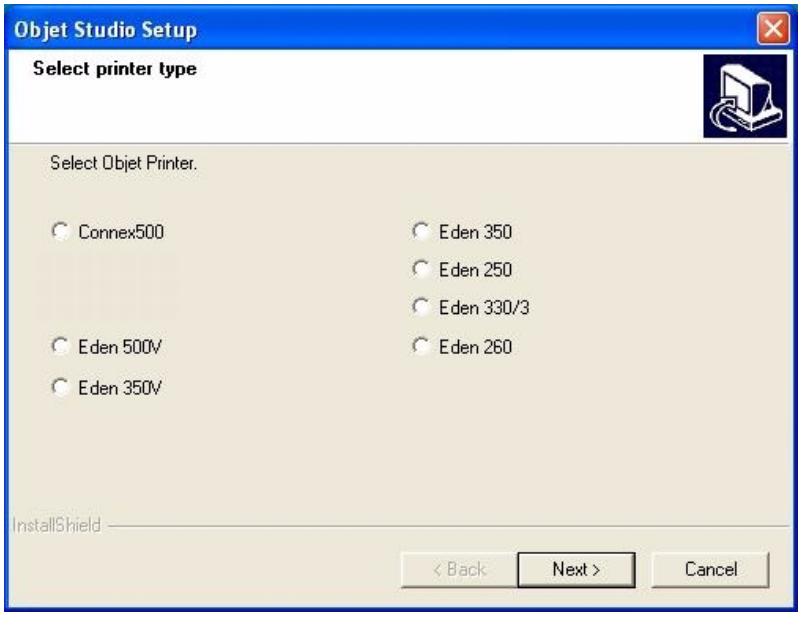

Figure 4-5: Objet Setup—*Select Printer Type* screen

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.

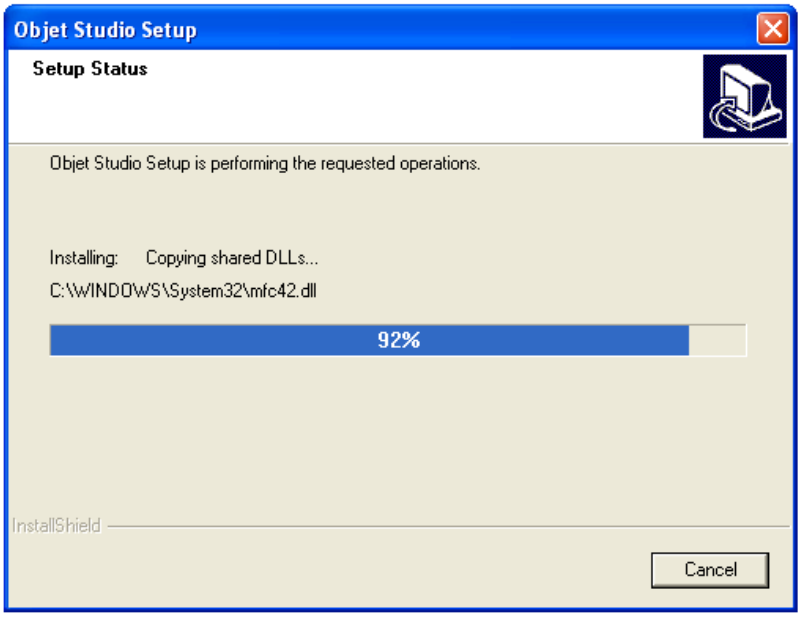

Figure 4-6: Objet Setup—*Setup Status* screen

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

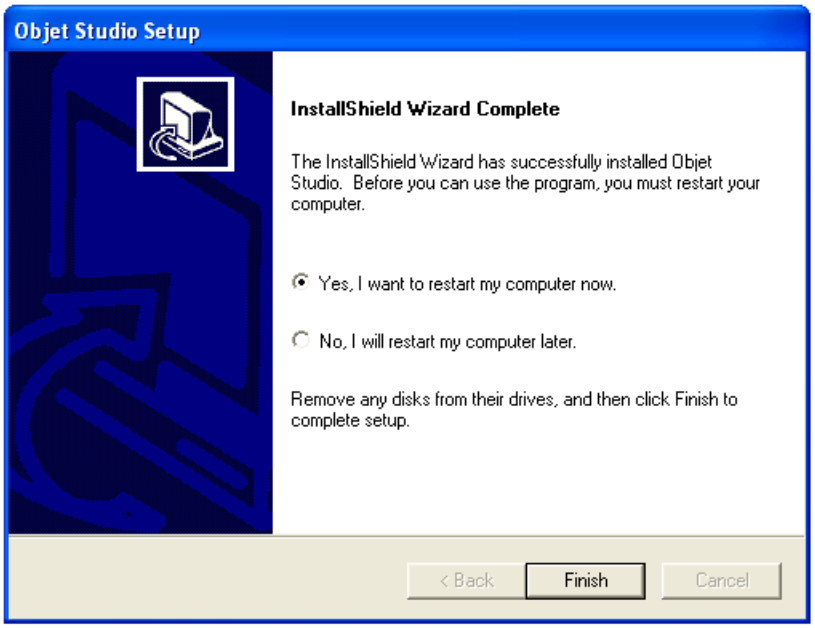

Figure 4-7: Objet Setup—final wizard screen

9. To complete installation, you must restart the computer. To do so, remove the CD from the disk drive, select "Yes…" and click Finish.

The computer shuts down and restarts, and the software installs the appropriate icon(s) on the computer desktop:

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

5

Using Objet Studio

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.

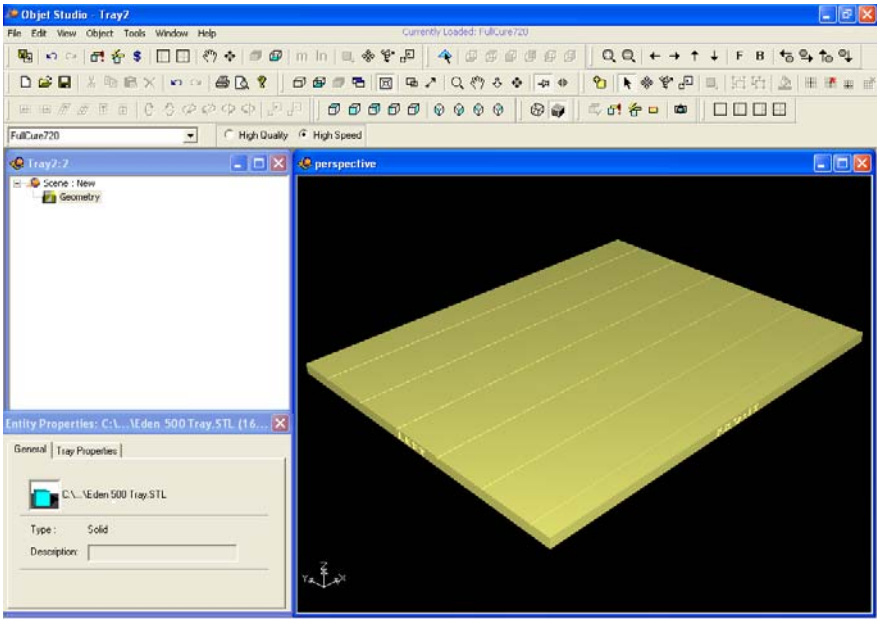

Figure 5-1: Objet Studio opening screen

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.

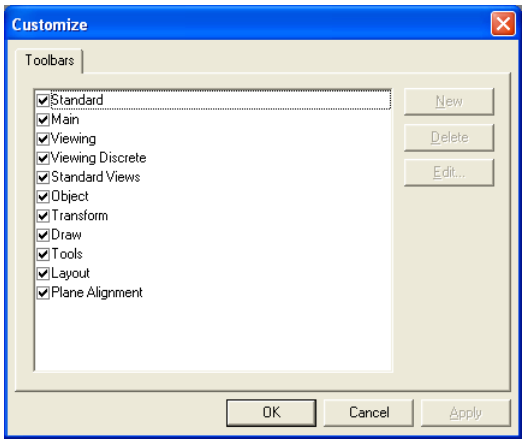

Figure 5-2: Toolbar selection dialog box

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.

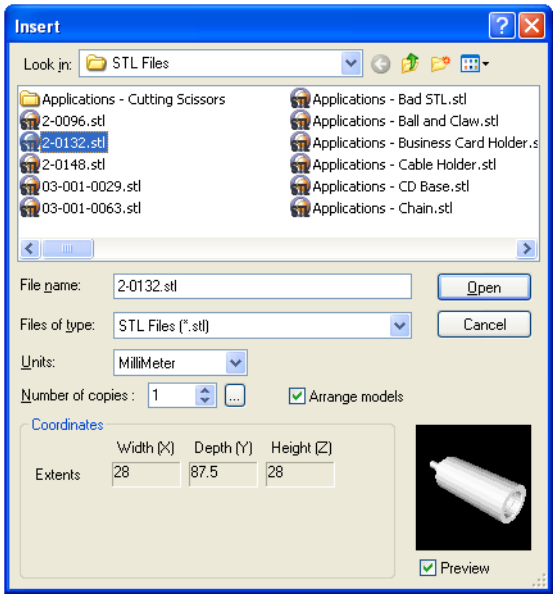

Figure 5-4: Insert dialog box

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 18).

6. Click Open.

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

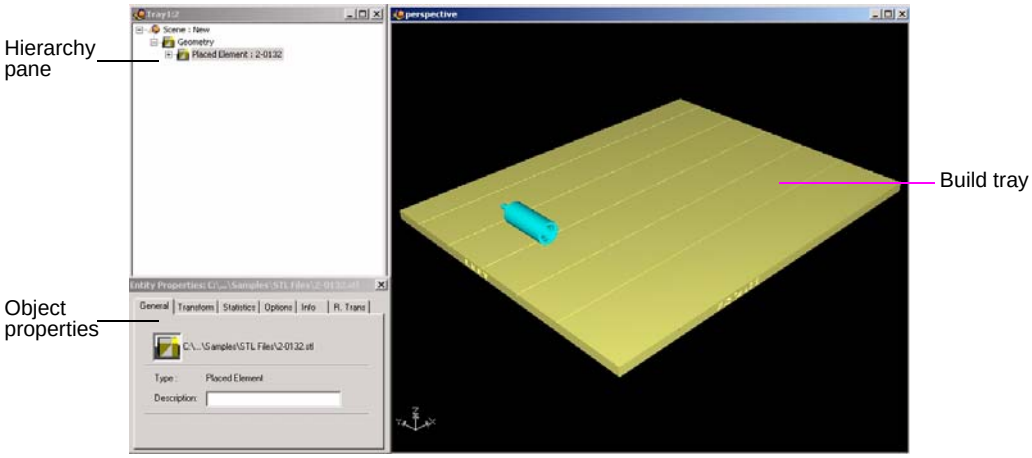

Figure 5-5: Default screen layout

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.

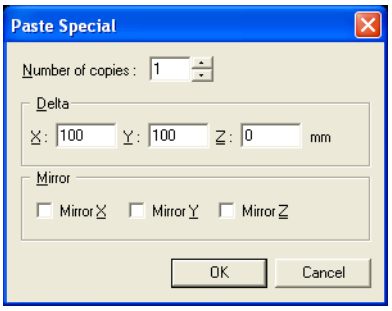

Figure 5-6: Paste Special dialog box

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 *Entity 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

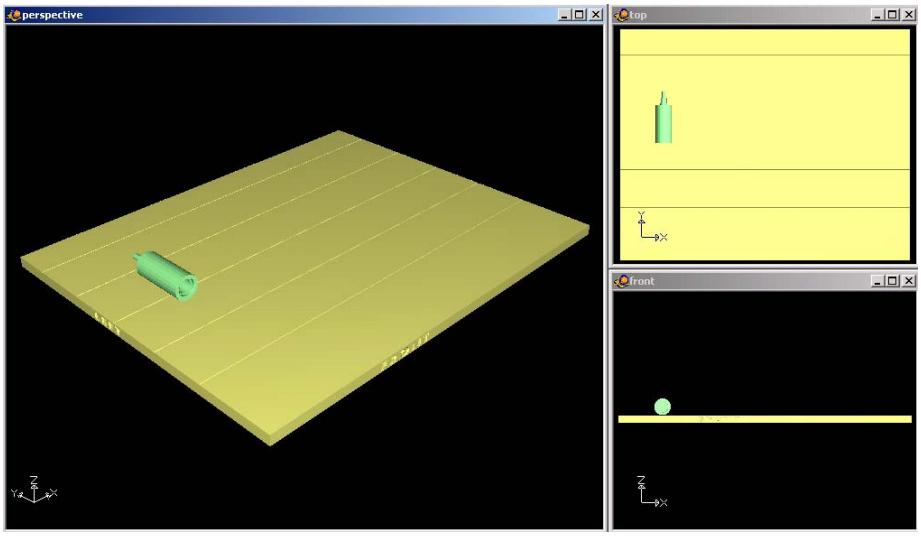

Figure 5-8: 3-view screen layout

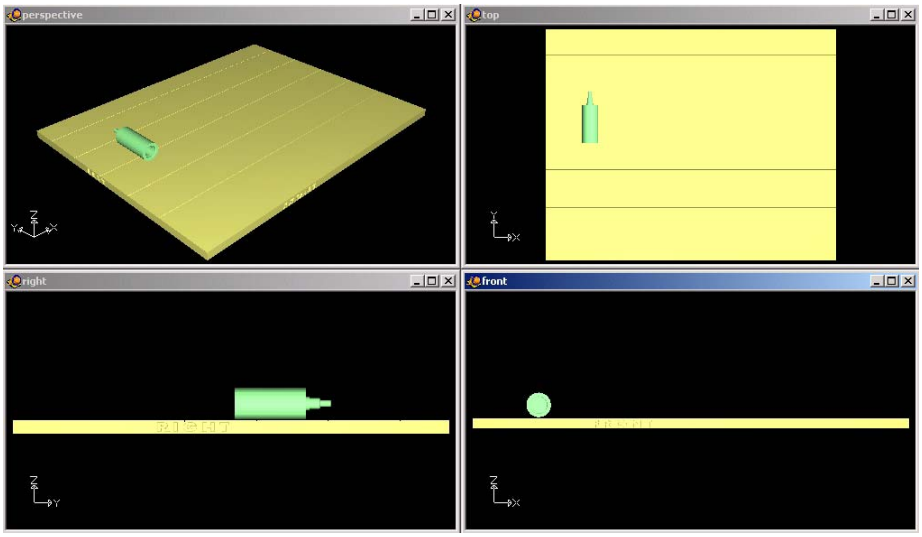

Figure 5-9: 4-view screen layout

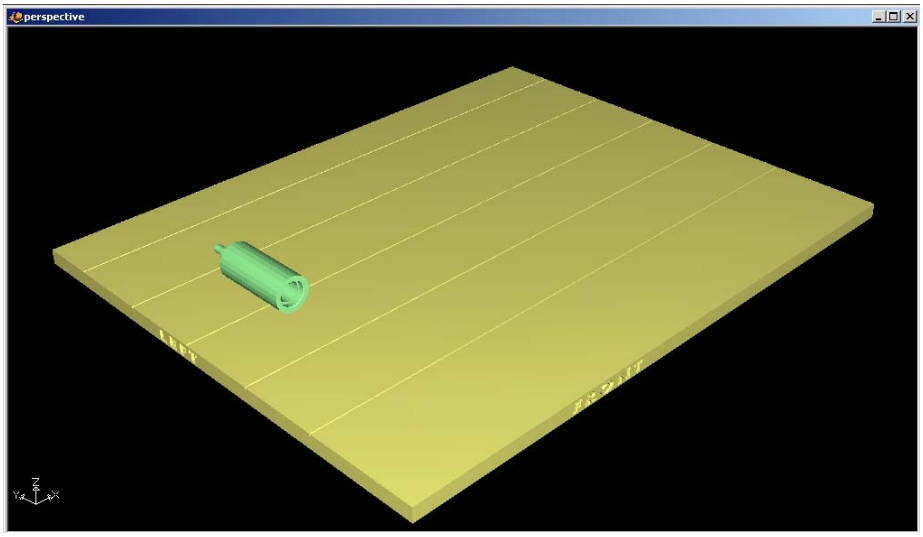

Figure 5-10: 1-view screen layout

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

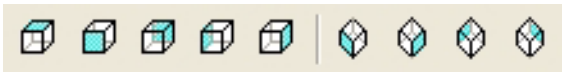

Figure 5-11: Viewing-pane perspective icons

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 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.

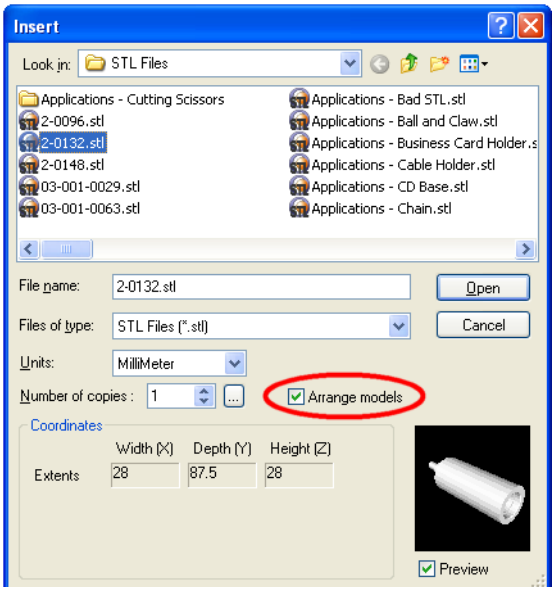

Figure 5-12: *Arrange models* option in the Insert dialog box

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.

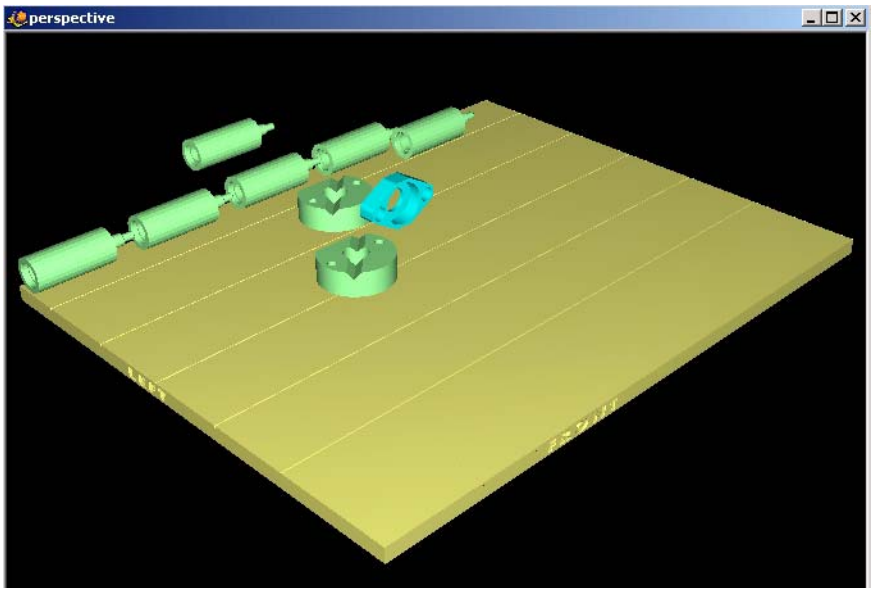

Figure 5-13: Tray before objects are properly arranged

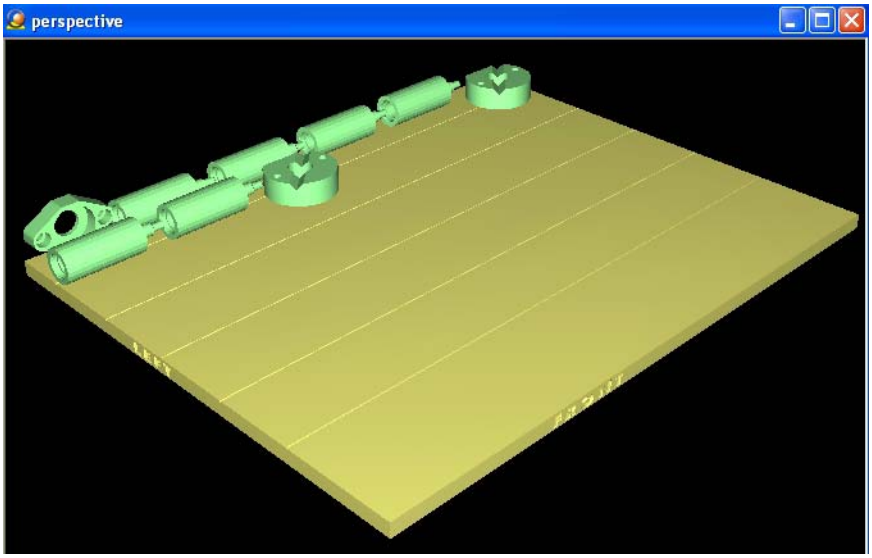

Figure 5-14: Tray after objects have been automatically arranged

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 10. Tools for changing the position of objects are described in "Repositioning Objects" on page 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 high-resolution models are built up, on the Z-axis, in 16-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 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 Eden 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.

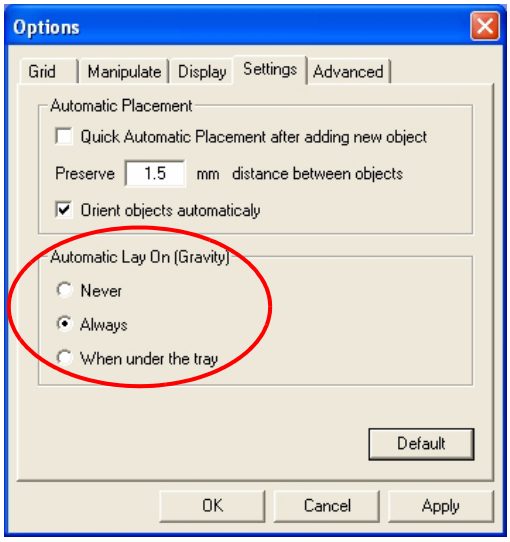

Figure 5-15:*Options* dialog box, *Settings* tab

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 *Entity Properties* dialog box.

The *Entity 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 6).

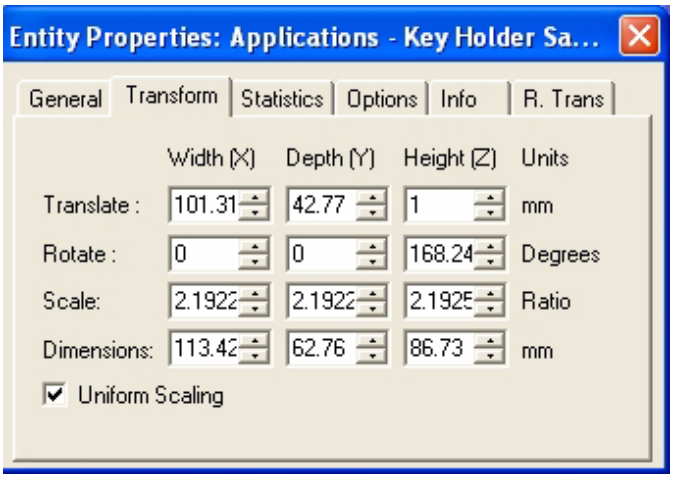

Figure 5-16: *Entity Properties* dialog box, *Transform* tab

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) and changing its values in the dialog box.

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

The properties displayed in the *Transform* tab of the *Entity 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 *Entity Properties* dialog box.

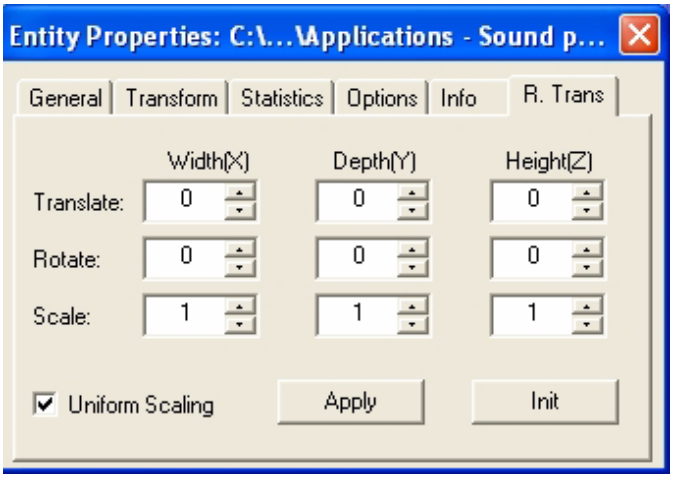

Figure 5-17: *Entity Properties* dialog box, *R. Trans* tab

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

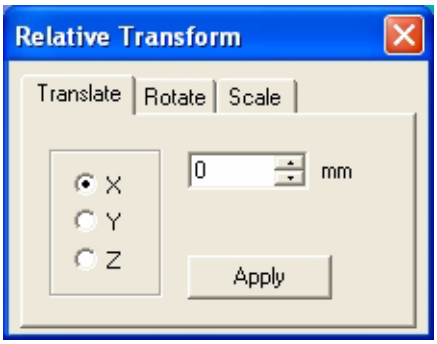

Figure 5-18: *Relative Transform* dialog box

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 18).

Note: Because of the unique characteristics of each type of modeling material, it is recommended that you select the material *before* precisely positioning objects on the tray.

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 21).

Grouping and Ungrouping Objects

You can manipulate two or more objects on the build tray, at the same time.

To group objects:

1. Select the objects (see "Selecting Objects" on page 5).
2. Click the *Group* icon .

   or—

   From the *Object* menu, select Group.

   In the tray hierarchy pane, the objects now appear under "Group Element."

Figure 5-19:Group Element in the tray hierarchy pane

To separate grouped objects:

1. Select the group element (either on the build tray or in the tray hierarchy pane).
2. Click the *Ungroup* icon .

   or—

   From the *Object* menu, select Ungroup.

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.

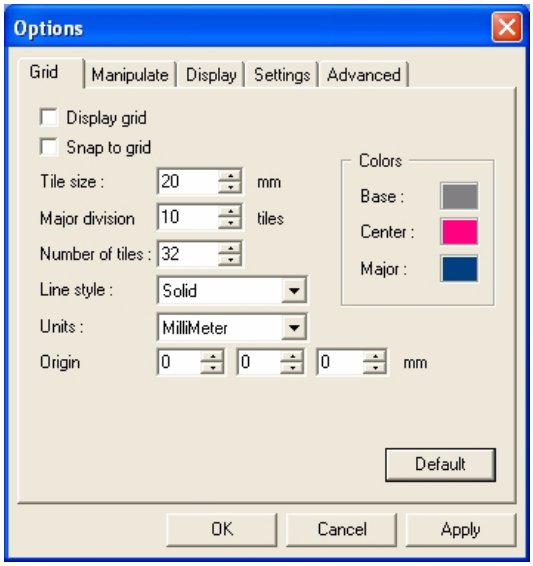

Figure 5-20:*Options* dialog box, *Grid* tab, showing the default settings

   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.

Changing an Object's Orientation

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 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 *Entity 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 14).
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 8).

To freeze an object's orientation:

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

The *Advanced Properties* dialog box opens.

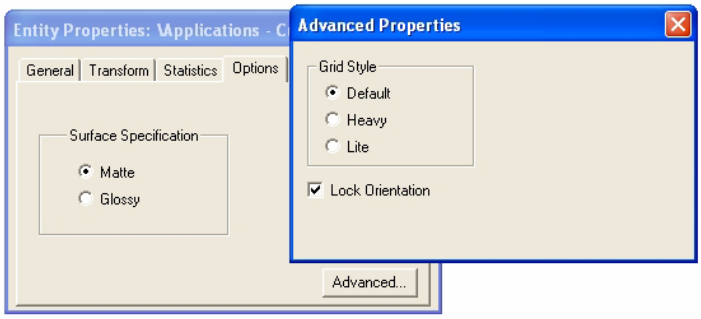

Figure 5-21:*Advanced Properties* dialog box

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

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.

Models produced with a glossy finish are printed with a resolution of 300 dpi (dots per inch) along the Y-axis, instead of the standard 600 dpi resolution.

Note: You can print a tray that contains models having both glossy and matte finishes. However, they will all be printed with a Y-axis resolution of 300 dpi.

To choose the finish type for a model:

1. Select the model.
2. In the *Options* tab of the *Entity 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, by default, in a different shade of green for each finish. To change these-color settings, see "Object Color Codes" on page 5-49.

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.

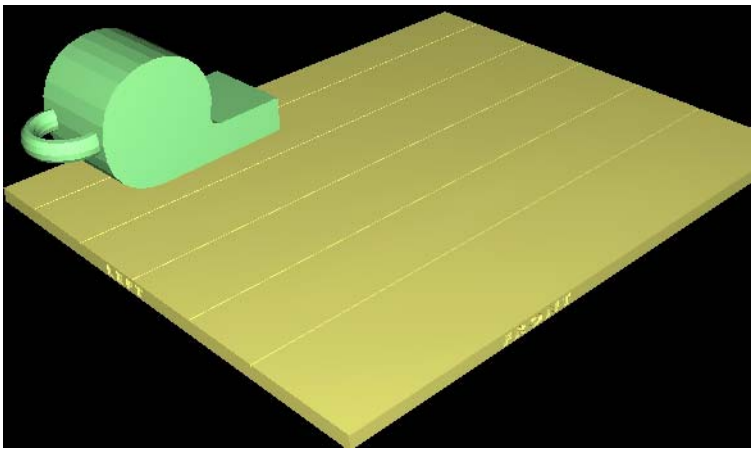

Figure 5-22: Tray and model displayed in *shaded* view

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 .

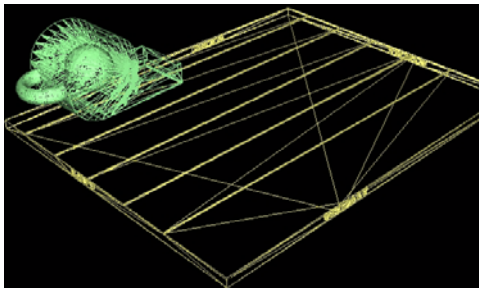

Figure 5-23: Tray and model displayed in *Wire frame* view

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.

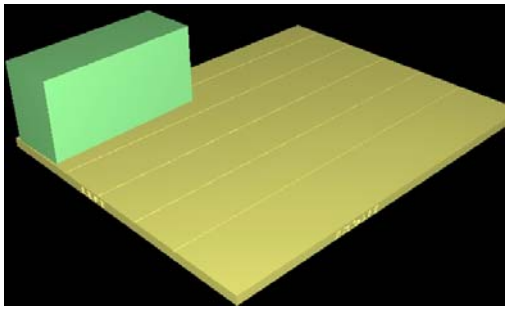

Figure 5-24: Model displayed with bounding box

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

➢ Select View > Display Thickening Box.

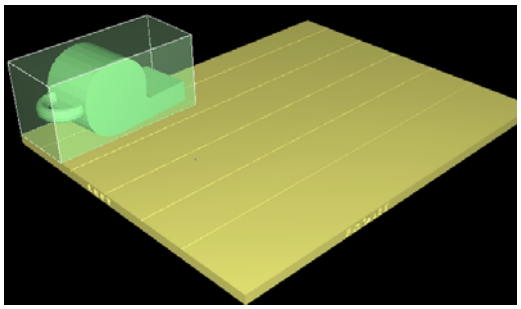

Figure 5-25: Model displayed with thickening box

To change the display color of an object:

1. Select the object.

   Its color changes to blue, indicating that the object has been selected.
2. From the *Object* menu, select Fill Color or click the *Fill Color* icon .
3. Select a color from the color palette and click OK.

   When the object is de-selected, it appears in the new color.

Note: You can repeat this procedure for other objects, so that different objects on the build tray are displayed in different colors.

Objet Studio displays objects to be produced with matte and glossy finishes in different colors. See “Surface Finish” on page 17 and “Object Color Codes” on page 22

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).

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 effect 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.

Icon	Tool Tip Name	Purpose
	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.
	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.

Icon	Tool Tip Name	Purpose
	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 *otf* 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 Eden printer for production, you should check that the tray is "valid" and can be printed.

Note: Because of the unique characteristics of each type of modeling material, make sure that the correct material is selected *before* performing Tray Validation.

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 5-26: Tray validation warning

Object Color Codes

To view the color code for objects displayed:

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

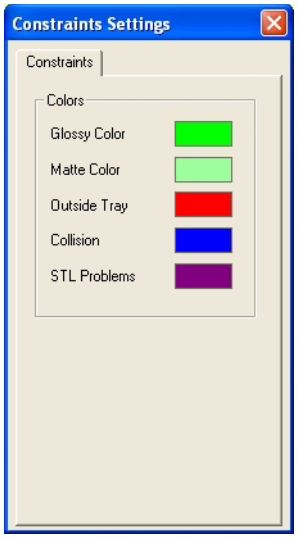

Figure 5-27: *Constraints Settings* dialog box, showing object color codes

To change the color settings:

1. Click the current color displayed in the *Constraints Settings* dialog box.
2. From the color palette that opens, select a color and click OK.

Note: The color of objects already displayed does not change automatically. The color change tales effect the next time an object's state is changed.

Quality/Speed Setting

When producing models on Eden500V and Eden350V printers, Objet Studio allows you to choose the quality/speed setting most suitable for your project. (Eden350 printers operate in High Quality mode only.)

High Quality—

- Prints models in 16-micron layers, suitable for producing fine details and delicate items.
- Requires much more time to print most trays, compared to High Speed setting.

High Speed—

- Prints models in 29-micron layers, suitable for producing larger models.
- Requires much less time to print most trays, compared to High Quality setting.

If high speed printing is supported by the printer, the Quality/Speed selection buttons are available on the main toolbar. Change the setting, if necessary, before sending the tray to the 3-D printer.

Figure 5-28: Quality/Speed setting

Production Estimates

Objet Studio enables you to calculate the time and material resources needed for producing trays before sending them to the Eden 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.

Figure 5-29: Production resource calculation

Note: Make sure to calculate production resources *after* selecting the Quality/Speed setting (see page 22). You can compare the required resources for each of the settings.

Saving the Tray File

Trays are saved as *otf* 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 Eden 3-D printer, it is first saved. If the tray was previously saved, its *otf* 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.

  The tray file is sent to Job Manager, for printing. 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.

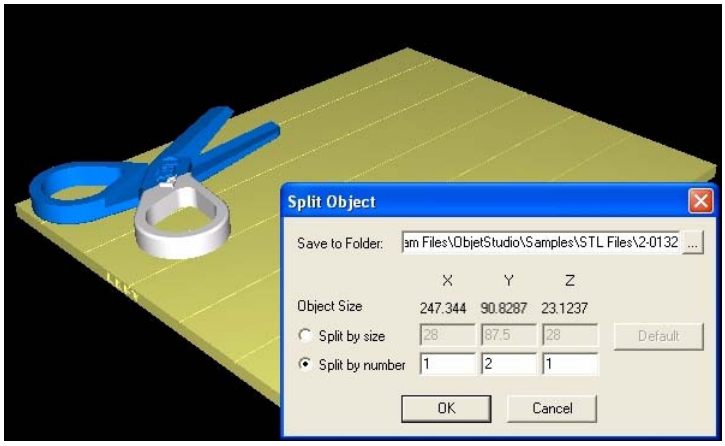

Figure 5-30:*Split Object* dialog box

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 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 *Entity Properties* dialog box, click Advanced.

The *Advanced Properties* dialog box opens.

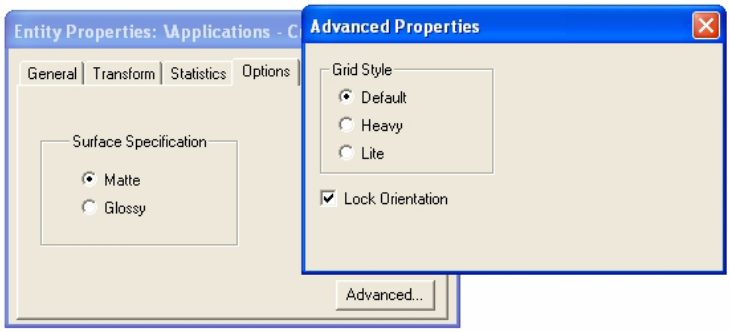

Figure 5-31:*Advanced Properties* dialog box—Grid Style selection

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. Close the *Advanced Properties* dialog box.

The *Lock Orientation* option is not connected to the Grid Style selection. This setting is described in “Freezing an Object’s Orientation” on page 16.

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 24). 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.

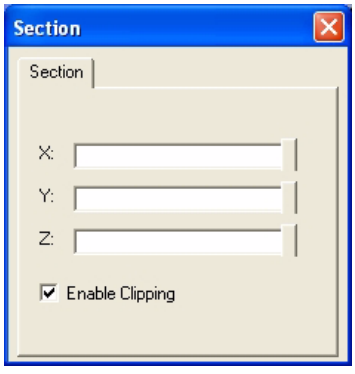

Figure 5-32:Section dialog box

2. Select the *Enable Clicking* 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.

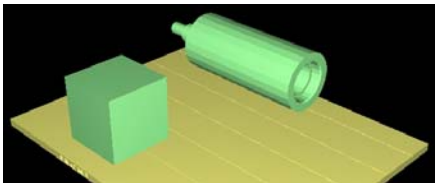

Figure 5-33: Whole view

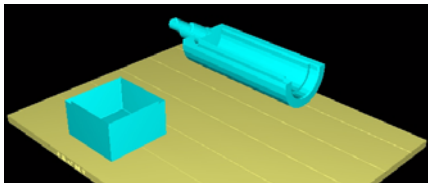

Figure 5-34: Cross-section view, after using the Z-slider

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.

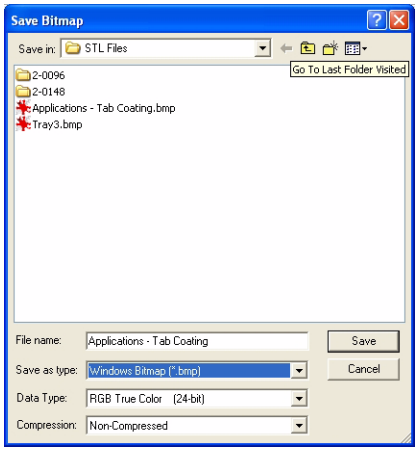

Figure 5-35:*Save Bitmap* dialog box

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 *otf* files. These files contain instructions to Objet Studio and to Eden 3-D printers for displaying and producing the *stl* files used on the tray. To save all of the files that comprise the build tray, for storage or transfer to another location, Objet Studio compresses them into one *ozf* file. To open an *ozf* file in Objet Studio, the file must first be expanded and its component files saved.

To create an *ozf* 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 *ozf* 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 *otf* 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.

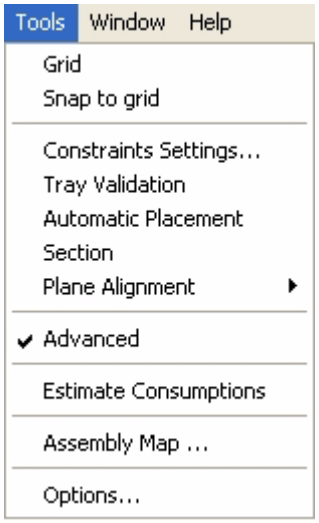

Figure 5-36: *Tools* menu, showing *Advanced* mode selected

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.

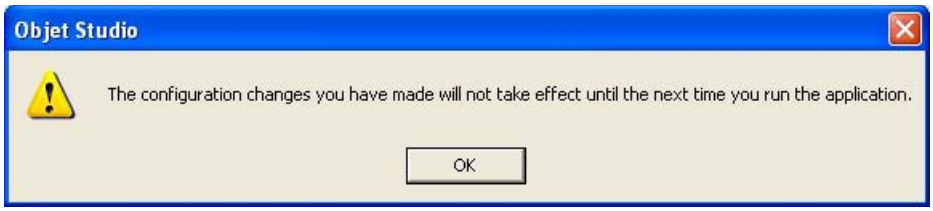

Figure 5-37: Configuration-change message

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

Save Tray As...

In addition to saving the tray as an *otf* file, for producing it with an Eden 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…

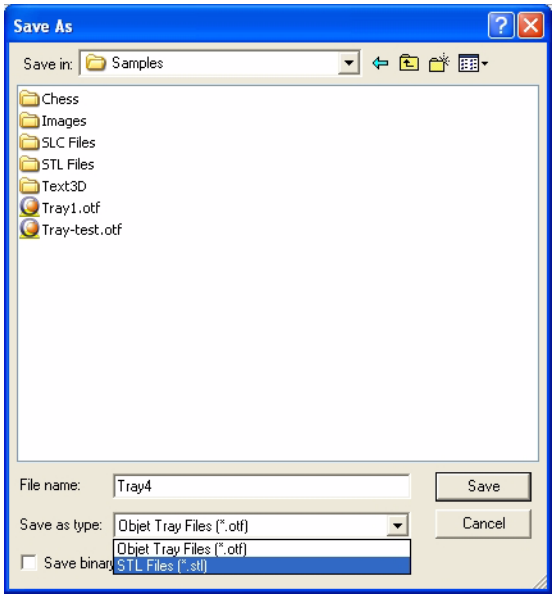

Figure 5-38:*Save As* dialog box

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 GL 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…

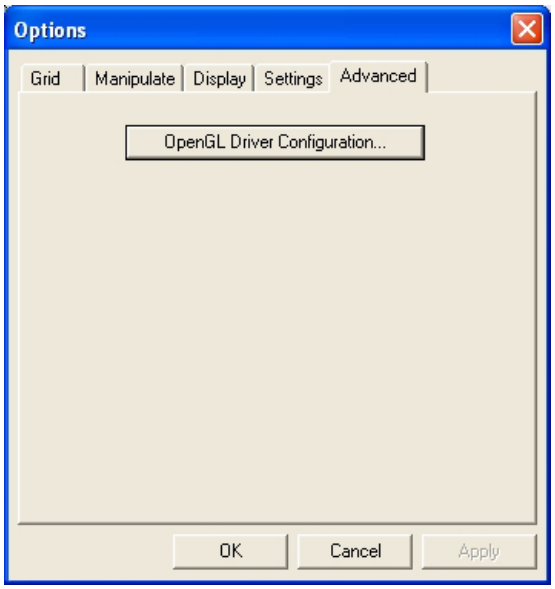

Figure 5-39:Accessing GL-driver configuration

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.

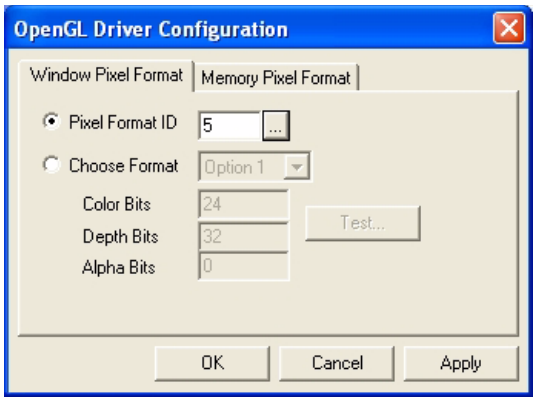

Figure 5-40:*OpenGL Driver Configuration* dialog box

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 5-41:Recommended pixel format ID

3. Click OK.
4. In the OpenGL Driver Configuration dialog box (figure 5-40), 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

The Job Manager application is different for client workstations and for the computer connected directly to the Eden 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 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.

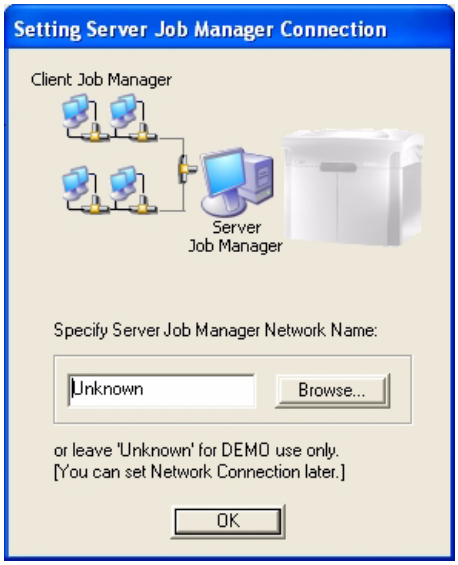

Figure 6-1: Server connection dialog box

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.

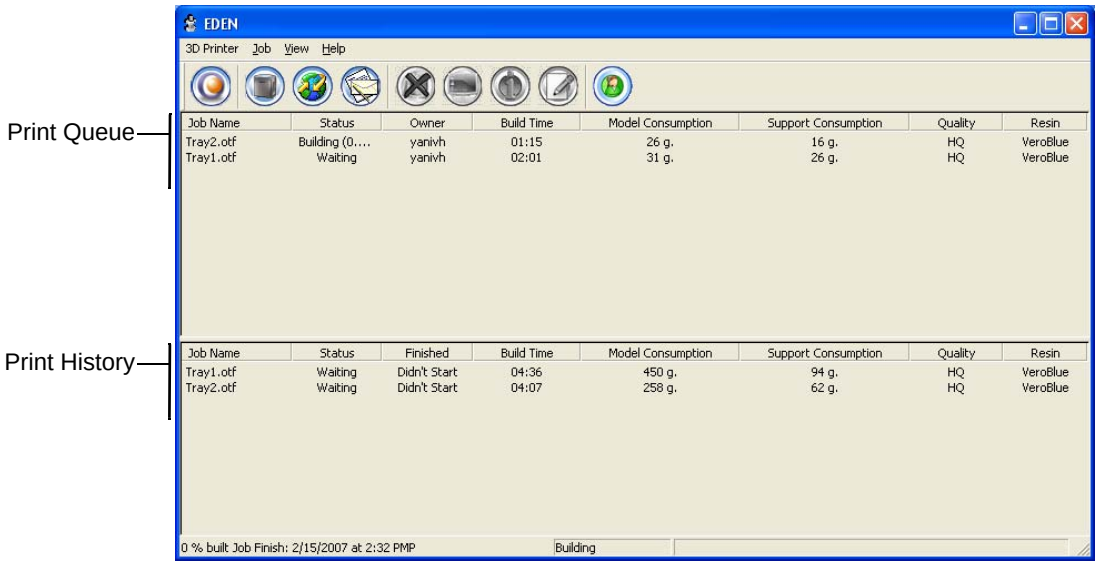

Figure 6-2: Client Job Manager screen

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 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 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  .

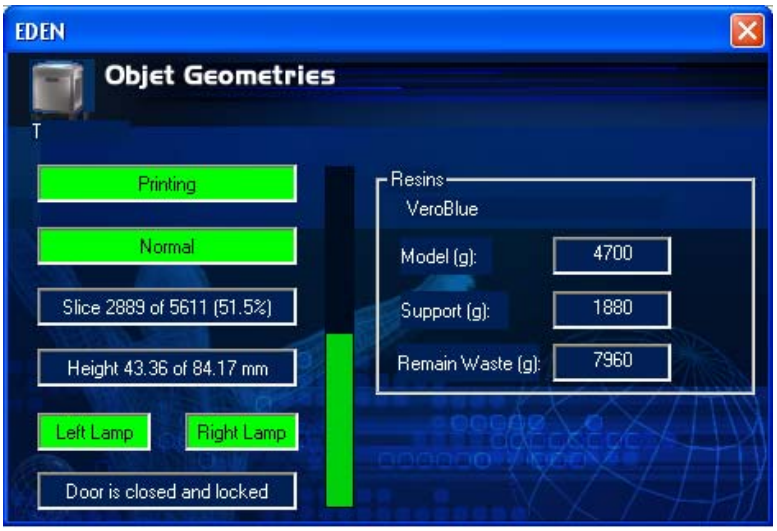

Figure 6-3: Printer status screen

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 messages, make sure that e-mail software supporting MAPI is installed on the printer's server computer. To send SMS messages, the e-mail program must convert the messages and transmit them. Microsoft *Outlook*, for example, can do this; *Outlook Express* cannot. In addition, 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 Report from the *3-D Printer* menu.

   The *Preferences/Reports* dialog box opens.

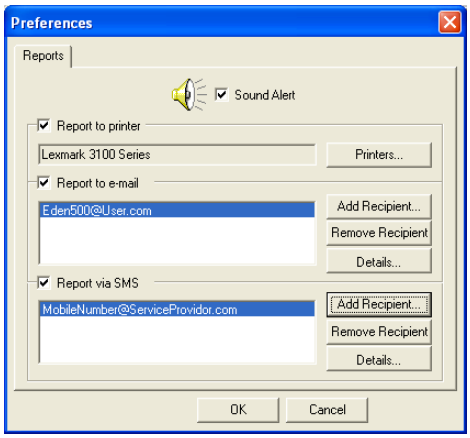

Figure 6-4: User alerts settings

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 for the first time, you are prompted to connect to an Objet 3-D printer. To do this, the printer must be on and connected to the local network. If you click **Yes**, the Setting Network Connection dialog box opens.

Figure 6-6: Printer connection dialog box

Click Browse to find and select the name of the computer inside the printer and then 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.

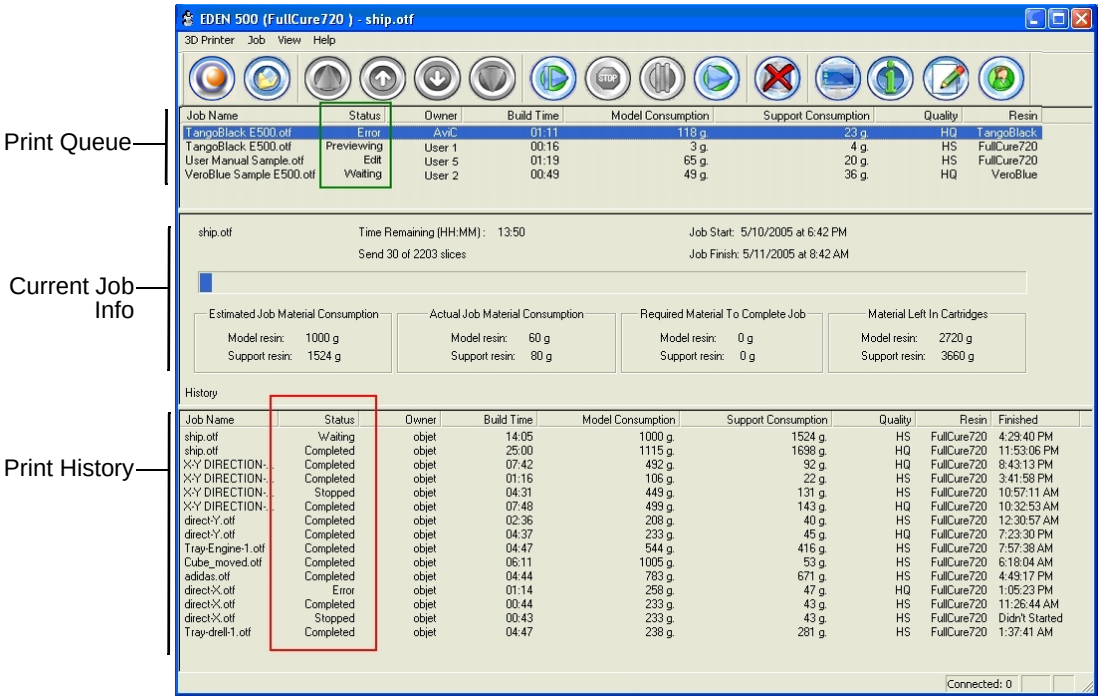

Figure 6-7: Server Job Manager screen

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 Eden 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 Eden printer.
Preprocessing	The Eden printer is readying itself for printing: the cover locks, print heads warm up and are put in starting position, the UV lamps are 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 (*otf* files).
	3-D Printer > Report	Displays options for user messages and alerts (paper printer, e-mail, SMS—see "Configuring User Alerts" on page 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.
	Job > Restart Job	*For a stopped job in the print queue:* Starts printing the selected job from the beginning. *For a selected job in the* History *section:* Moves the job to the print queue and changes its status to *Waiting*.
	Job > Stop...	Instructs the Eden printer to stop printing after curing the currently printed slice. (You can continue printing with the *Resume* icon or menu option, but for short interruptions, use the *Pause* icon or menu option.)
	Job > Pause...	Instructs the Eden printer to stop printing after curing the currently printed slice. (This command does not flush the printing buffer. Therefore, use it instead of *Stop* when you intend to continue printing the job shortly.)
	Job > Resume	Continues printing the current job after printing was stopped with the *Stop* or *Pause* icon or menu option.

Icon	Menu Option	Purpose
	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 Eden 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 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.

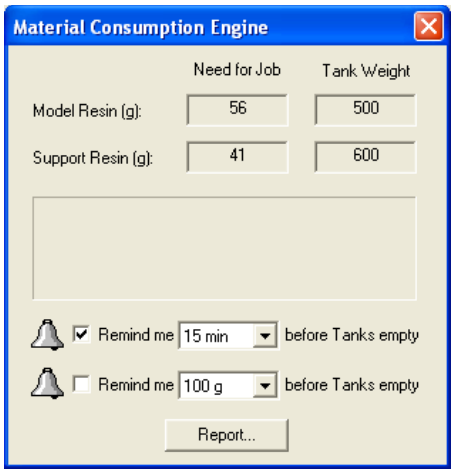

Figure 6-8: Material alert message dialog box

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.)

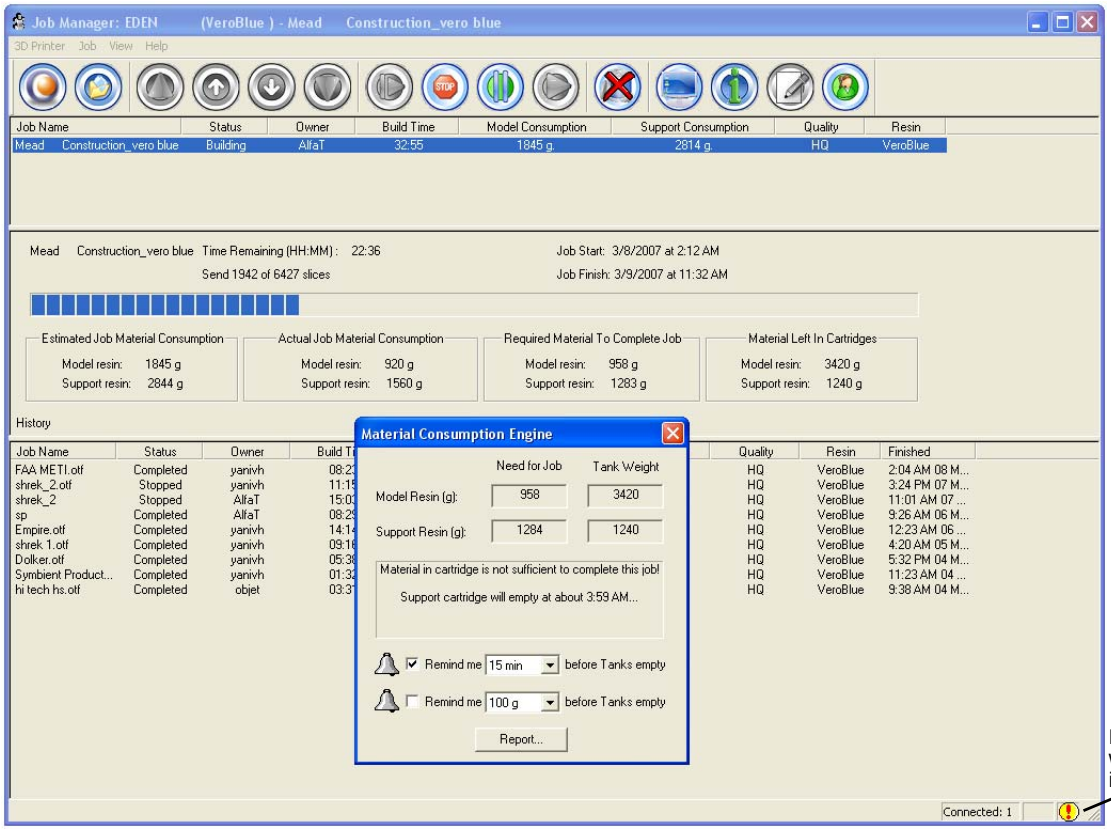

Figure 6-9: Insufficient material warning

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 Eden 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 Eden printer.

7

Operating & Maintaining the Eden 3-D Printer

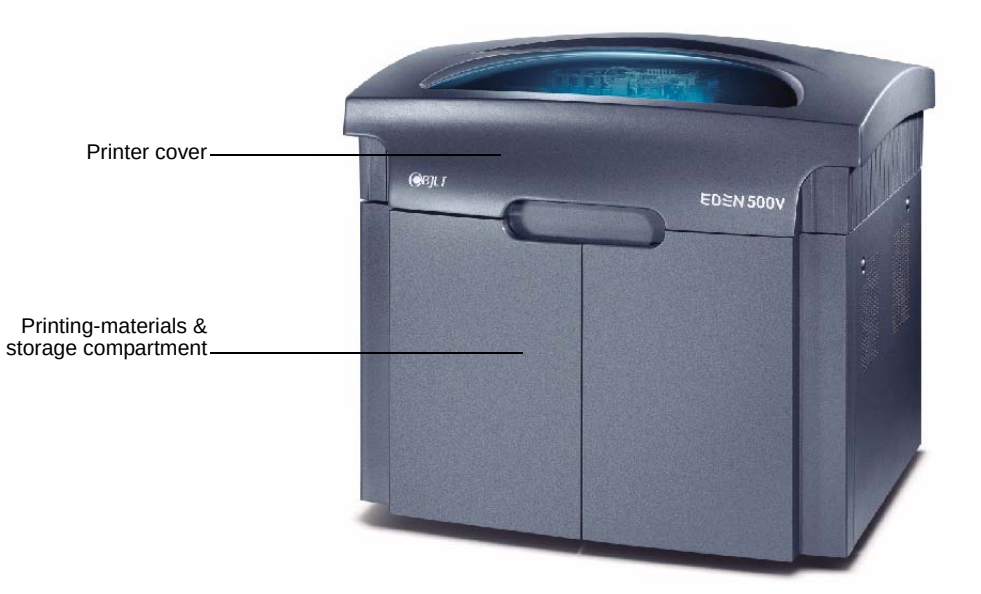

Figure 7-1: The Eden500 3-D Printer

Starting the Eden500V/350V/350 3-D Printer

CAUTION!

- Do not attempt to operate the Eden 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 Eden printer.

Figure 7-2: Main power cable and switch

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

2. After the computer boots, log in to Windows and launch the Eden control software:
   - On the computer desktop, double-click the Eden printer icon.

or —

- From the *Start* menu, select Objet > Eden500/Eden350V/Eden350.

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

Figure 7-3: Eden500 interface

Eden 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 Eden printer interface is displayed.

Loading Model and Support Cartridges

The Eden350 printer uses one cartridge of model material and one cartridge of support material, each weighing 3.6 kilograms when full. Eden500V and Eden350V printers are equipped to be loaded with two cartridges of each type. This lets you print longer without changing cartridges and allows you to easily replace empty cartridges during prolonged printing operations. A graphical representation of the cartridges and their current weight appears in the Eden printer interface (see figure 7-3).

If you need to replace the model material currently installed with another type, see “Changing the Model Material” on page 8. 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 Eden printer (see figure 7-1), pull open the doors of the storage compartment.
2. If you are replacing a cartridge, grasp its handle and pull the cartridge out, taking care not to twist or turn it.

3. Insert model and support cartridges in their respective compartments —the model cartridge on the right, and the support cartridge on the left. (Note that the cartridges only fit into their correct compartments.)

   You should feel some resistance, as a needle pierces the cartridge.
4. Check the Eden printer interface to make sure that the new cartridge is detected and that its weight is displayed (see figure 7-3).
5. Close the storage compartment door.

Tips about replacing cartridges:

- You can replace material cartridges either before or during printing.
- You can replace partially used cartridges to avoid the need for replacing them during printing.
- You can load partially used cartridges, as long as they contain more than 100 grams of material.

Producing Models

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 19).

To prepare the Eden printer for producing models:

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

   Note: 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 Eden 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 3.
   - For changing the type of model material currently loaded, see "Changing the Model Material" on page 8.
3. At the bottom of the Eden printer interface, click the red button to switch the printer to online mode (see figure 7-3).

   The color of the button changes from red to green. If there is a job in the Job Manager queue, it is sent (in slices) to the Eden printer. On the Eden 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.
   - The UV lamps are powered and they warm up.

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

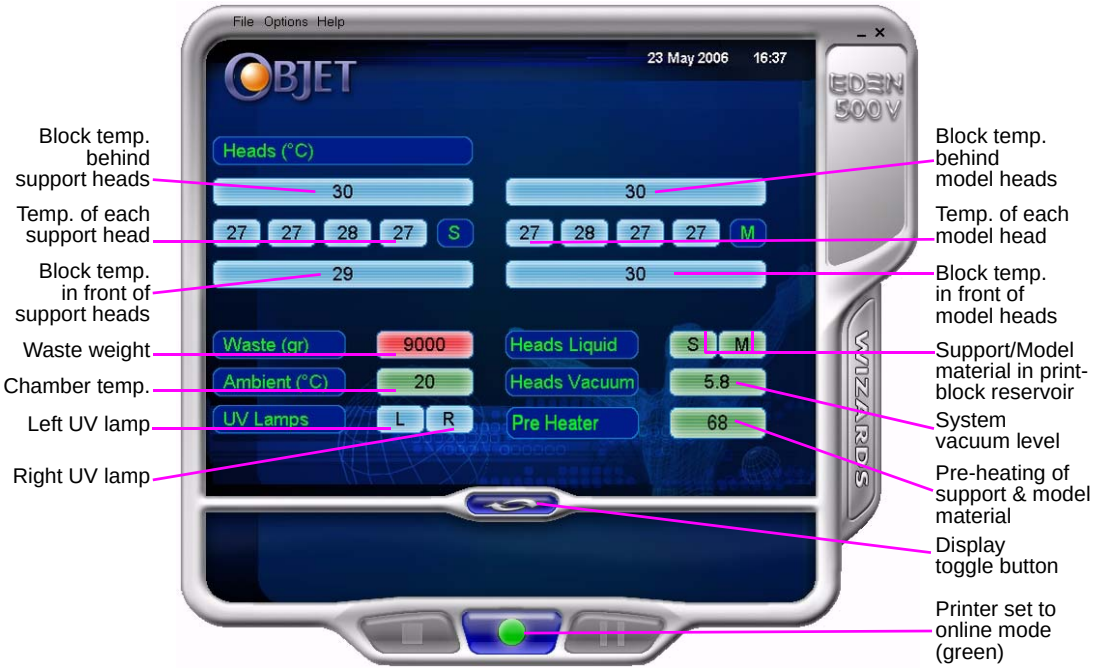

Figure 7-4: Eden printer indicators

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 7-4:

  - *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.
  - *Heads Vacuum*—The vacuum level in the system is within the acceptable range.
  - *Pre-Heater*—The model and support resins need to be heated before being supplied to the print block. The temperature has reached the acceptable range.

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

  For example, in figure 7-4:

  - *Waste*—The weight of the waste container is 9000 grams, more than allowed when beginning a print job. (See "Replacing the Waste Container" on page 47.)

- *Blue*—not ready for printing

  For example, in figure 7-4:

  - *UV lamps*—The UV lamps are not on (or not operating at full power).
  - *Heads (°C)*—The heads have not reached the temperature required for printing models.

Printing Indicators

When the printer is ready, the main interface screen changes (see figure 7-5):

- 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 7-5: Eden printer interface during printing

When printing begins, Job Manager sends seven slices to the Eden 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 Eden printer. Do not log-off Windows until printing is finished.

Resuming Production After Printing has Stopped

If the printing process is interrupted for any reason, Job Manager stops sending slices to the Eden printer.

To continue printing the model:

1. Switch the printer to online mode by clicking the red button at the bottom of the Eden printer interface (see figure 7-3 on page 3).

   The button changes from red to green (see figure 7-4 on page 5).

2. Make sure that the computer network connecting the printer and Job Manager server 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 Eden printer interface.

Figure 7-6: Eden printer interface after interrupted printing

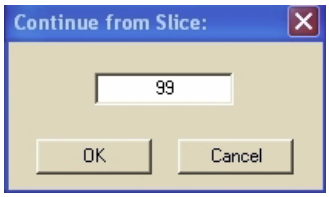

Figure 7-7: *Continue from Slice* confirmation dialog box in server (Job Manager) interface

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 Eden 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 Eden printer again.

You can stop and later resume printing from either the Eden 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 (resin) than is currently installed, you must flush the print block and feed tubes by running the Resin Replacement wizard.

To replace the model material:

1. Start the Resin Replacement wizard, either from the *Wizards* tab (on the right side of the Eden interface) or from the *Options* menu.

Figure 7-8: Starting the Resin Replacement wizard from the *Wizards* tab

Figure 7-9: Starting the Resin Replacement wizard from the *Options* menu

2. From the opening screen, click Next to display the *Resin Selection* screen.

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. From the drop-down menu, choose the type of model material (resin) you want to install, and click Next.

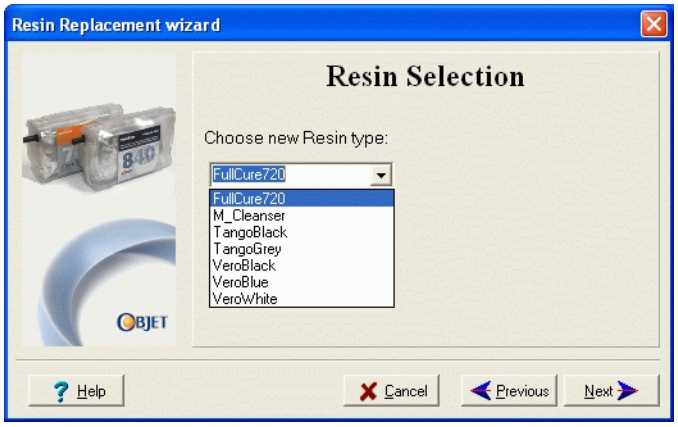

Figure 7-10: *Resin Selection* screen

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

5. *For Eden500V and Eden350V printers only—*
Select an option for changing the resin type for either model cartridge or for both cartridges, and click Next.

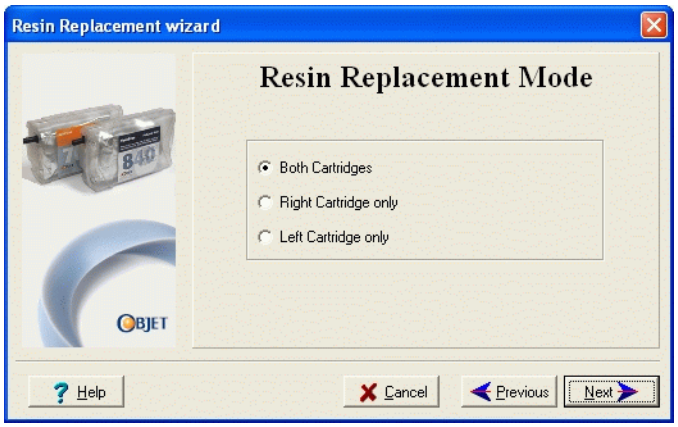

Figure 7-11: Cartridge-replacement options screen

6. In the *Resin Replacement Cycle* screen (see figure 7-12), choose the appropriate cycle for the model material you want to install. With two of the options, the print block is flushed with the new model material. With the third option, the print block is flushed with cleaning fluid before it is filled with the new model material.

   ❒ Flushing the block with model material:

   - *Short Cycle*. During this cycle, which takes about 30 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 TangoBlack™ or VeroBlack™), or if the color of the printed models is unimportant.

   - *Double Short Cycle*. During this cycle, which takes about 50 minutes, the wizard cleans the feed tubes and print block more thoroughly by flushing the system twice with the new material.

     This cycle is used when replacing a dark-colored model material (such as TangoBlack or VeroBlack) with a lighter material.

   ❒ Flushing the block with cleaning fluid:

   - *Long Cycle*. During this cycle, which takes about 60 minutes, the wizard cleans the tube and print block very thoroughly by flushing the system with cleaning fluid before filling the block with the new material.

     This cycle is used when replacing a dark-colored model material (such as TangoBlack or VeroBlack) with a lighter material. Using cleaning material is recommended over cleaning the system with model material, since it is more effective and economical. However, you must be present during the process to change the cartridges of cleaning fluid and model material.

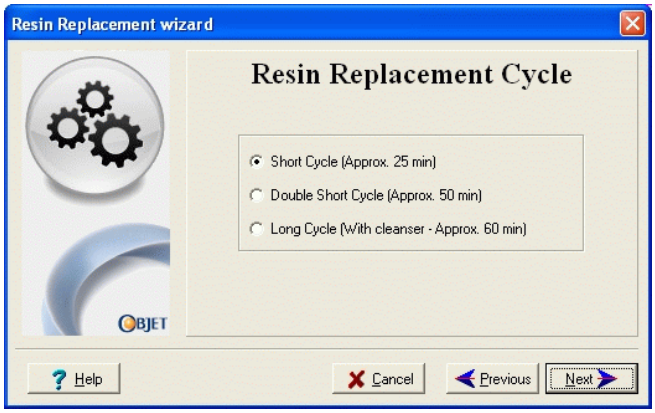

Figure 7-12: *Resin Replacement Cycle* screen

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

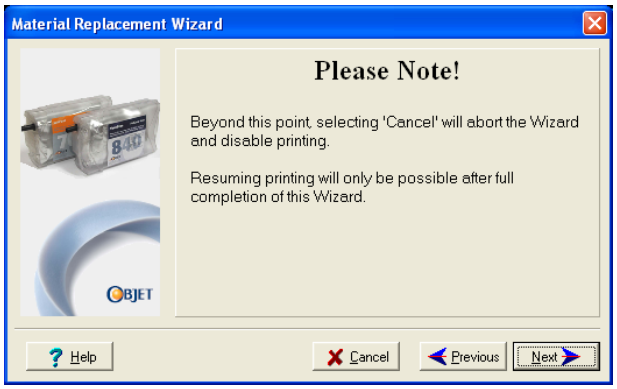

Figure 7-13: Resin Material Replacement warning screen

Once you start this procedure, you must complete it before you can produce models with the Eden 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 Resin Replacement wizard again (see step 1 on page 8) before producing models.

8. To continue, click Next.
9. When prompted by the wizard screen, remove the model-material cartridge(s). Select the check box to confirm that you have done so, and click Next.
10. When prompted, insert the new cartridge(s) of model material. Select the check box and click Next.

Figure 7-14: Prompt to insert new right-hand model cartridge

The Eden printer begins the process of filling the print heads with the new model material. This may take up to 15 minutes.

Figure 7-15: Resin replacement: filling heads with new model material

11. When the final wizard screen appears, click Done to close the wizard.

CAUTION: Dispose of cartridges of Eden model and support material 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.

Keeping the Eden 3-D Printer in Idle Mode

Between printing jobs, the Eden 3-D 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 Eden 3-D Printer," below).

When the Eden 3-D 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	*Standby 1*	none
next 10 hours	*Standby 2*	heating reduced (to room temp.)
after 10 hours	*Idle*	heating stopped

Note: The printer mode is indicated in the green field on the left of the interface (see figures 7-3, 7-4 and 7-5 on pages 3, 5 and 6).

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 Eden 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 Eden 3-D Printer

You only need to shut down the Eden 3-D printer if it will not be used for a week or more. To properly shut down, the printer needs to perform several processes. These are controlled by the *Shutdown* wizard. Always use this wizard, instead of just closing the Eden printer interface.

To run the Eden *Shutdown* wizard:

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

Figure 7-16: *Shutdown* wizard, opening dialog box

2. In the opening dialog box, click Next.
3. In the next wizard screen, indicate whether or not the tray is empty and click Next.

Figure 7-17: Tray status screen

The shutdown procedure begins.

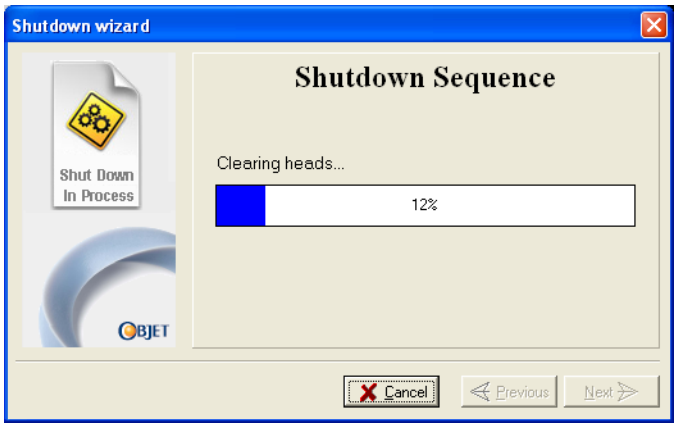

Figure 7-17: *Shutdown Sequence* screen

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 shutdown the computer in the Eden printer.

Figure 7-18: *Computer Shutdown* confirmation dialog box

4. When completely shutting down the Eden 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).

Maintaining Eden 3-D Printers

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

Routine Maintenance Schedule

Frequency	Task	For More Information
Daily, before printing	Clean the print heads.	See "Cleaning the Print Heads," below.
Weekly	Perform the Pattern test.	See "Pattern Test" on page 19.
Weekly	Clean and inspect the wiper.	See "Cleaning and Replacing the Wiper" on page 20.
Weekly	Clean the build tray and the surrounding area.	
Weekly	Restart the Eden printer computer and the server computer.	
Monthly, and after replacing print heads	Check the alignment of the print heads.	See "Aligning the Print Heads" on page 23.
Monthly	Clean the roller waste collector.	
Monthly	Inspect the exhaust system (duct, fan, connections).	
Every 2000 hours of printing or once a year	Preventive maintenance by authorized service engineer.	Contact your Objet support center.
At least once a year	Replace the activated carbon odor filter.	Contact your Objet support center.

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 blocked. A wizard guides you through the procedure, and adjusts components of the Eden printer to enable you to perform it. This procedure takes about 20 minutes, and should be done at the beginning of the work day or before a big printing job.

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, either from the *Wizards* tab (on the right side of the printer interface) or from the *Options* menu (see figure 7-25 on page 21).

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 7-19: 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 7-20: 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 7-21). Use the mirror to make sure that you have removed all of the residue material.

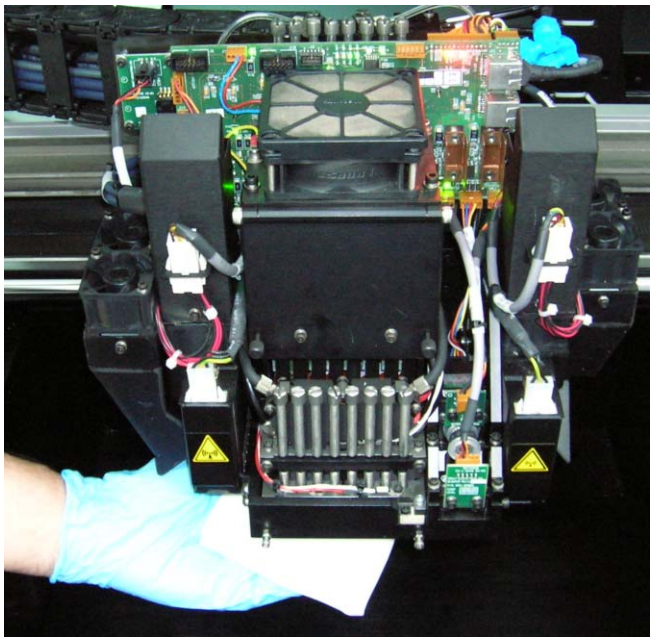

Figure 7-21: Cleaning the heads

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 7-20) 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 7-22: 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—A-4 or Letter size.
3. In the Eden printer, tape the pink paper to the surface left of the build tray.
4. In the Eden computer interface, open the *Options* menu and select Pattern Test, or press F3.
5. In the *Confirm* dialog box, click Yes.

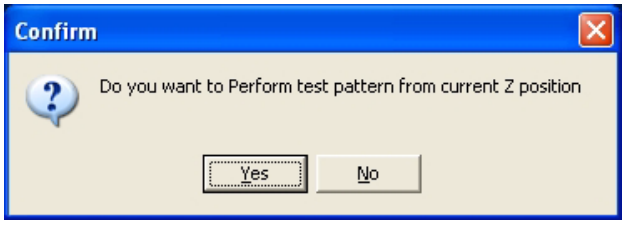

Figure 7-23: Pattern test confirmation

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

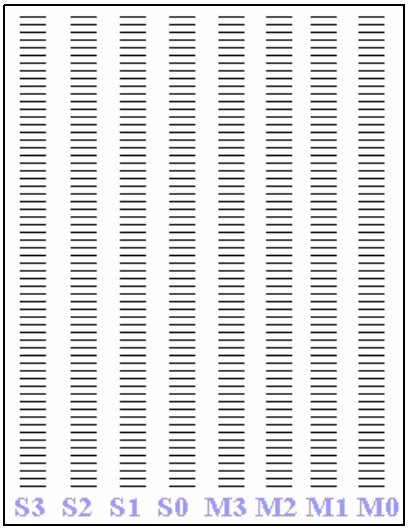

Figure 7-24: Sample Pattern Test

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, is an indication 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, more than 15 missing lines in one area of a column is considered unacceptable.

Improving Print Quality

If you suspect that print quality is poor, perform the pattern test (see "Pattern Test" on page 19). 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 16).
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 27).

Cleaning and Replacing the Wiper

A rubber wiper blade 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. In any case, replace the wiper at least once a month.

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 blade

2. Start the *Wiper Cleaning* wizard, either from the *Wizards* tab (on the right side of the printer interface) or from the *Options* menu.

Figure 7-25: Starting the *Wiper Cleaning* wizard

3. Close the Eden printer cover, and click Next in the wizard screen.
4. 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: Wiper Cleaning procedure—step 4

5. Click Next.

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

Figure 7-27: Wiper Cleaning procedure—steps 7–10

7. Put on the cleaning glove.
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 blade.

   If the wiper blade is scratched, torn or worn, or if you cannot clean it completely, replace it.

   a. Grasp it and pull it up and out of its bracket.

   b. Insert the new wiper blade, *making sure that it is straight and secured well on both sides*.
10. In the wizard screen ("Is wiper clean?"), select the confirmation check box (see figure 7-27) 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.

13. Click Done to close the wizard.

Aligning the Print Heads

You should check the alignment of the print heads—

- once a month
- after replacing one or more heads
- 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 16)

The head-alignment procedure takes about 20 minutes.

To check the alignment of the print heads:

1. Prepare—
   - a transparency sheet—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, either from the *Wizards* tab (on the right side of the Eden interface) or from the Eden *Options* menu (see figure 7-25 on page 21).
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.
5. When instructed to do so, place the transparency on the build tray—next to the left and rear edges of the tray, as shown in the following figure.

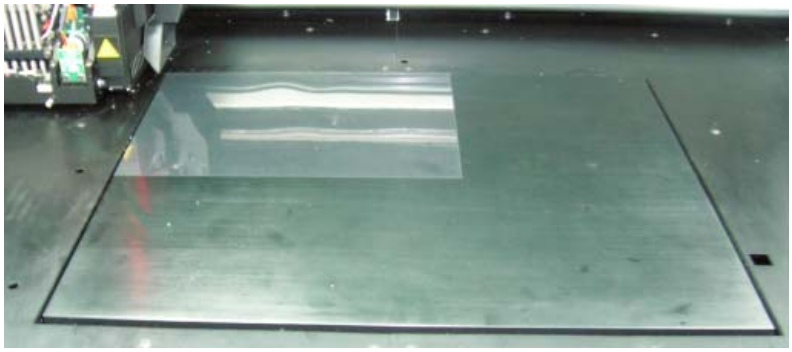

Figure 7-28: Positioning the transparency on the build tray

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 Eden printer prints the head alignment test on the transparency.

8. When the following screen appears, remove the transparency.

Figure 7-29: Head Alignment wizard—steps 8–10

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

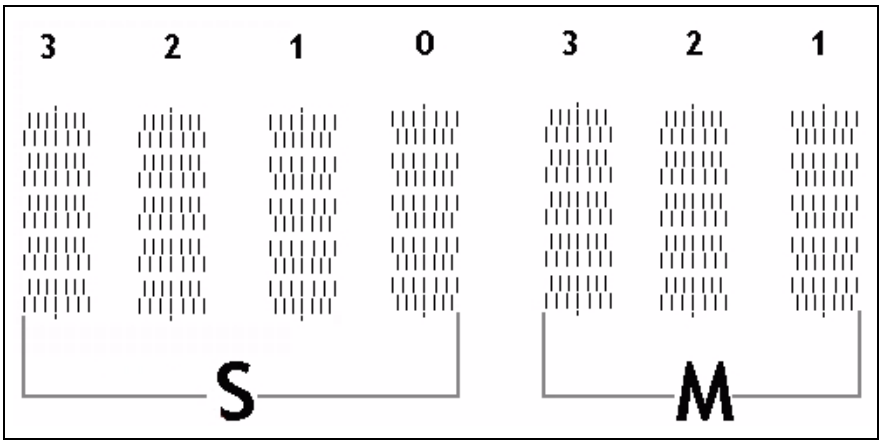

Figure 7-30: Sample head-alignment test

- The three columns on the right were printed by the heads used for applying model material when producing models. From right to left, the columns represent heads M1, M2, M3, respectively. (There is no column for head M0 because its alignment is used as a reference for aligning all other heads.)
- The four columns of lines on the left were printed by the heads used for applying support material. The columns represent heads S3, S2, S1 and S0, respectively.

9. For each column of lines, use a magnifying glass or loupe to inspect pairs of consecutive rows printed on the transparency to see where the vertical lines align.

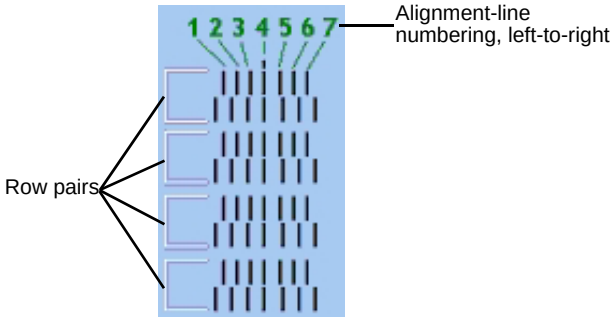

Figure 7-31: Comparing rows of alignment lines

Note: It does not matter which pair of lines you inspect, since they were all printed by the same head. Choose a pair of clearly printed lines for the inspection. (Since some nozzles may not print clearly, you may have to inspect several pairs of lines to properly inspect the alignment.)

Optimum head alignment is shown when the *fourth* lines in the upper and lower rows are aligned, as in figure 7-31. 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 of that head—in the next wizard screens.

10. In the wizard screen shown in figure 7-29, select the *Transparency removed* check box, and click Next.

The first in a series of alignment screens appears.

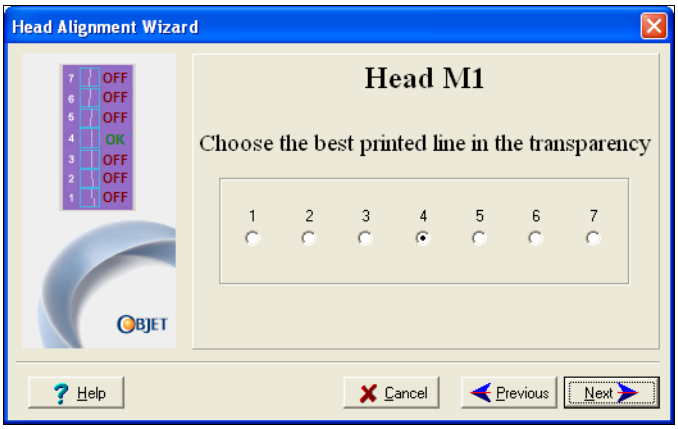

Figure 7-32: Head alignment screen

11. In the head-alignment screen, select the number that indicates which lines align in the upper and lower rows of a pair on the transparency (counting from the left) for this print head.

Note: Because the alignment of the fourth lines is optimum, the number “4” 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 to display the next head alignment screen, and again select the number representing the most closely aligned vertical lines on the transparency for that print head.

When you have finished aligning all of the heads, the following screen is displayed.

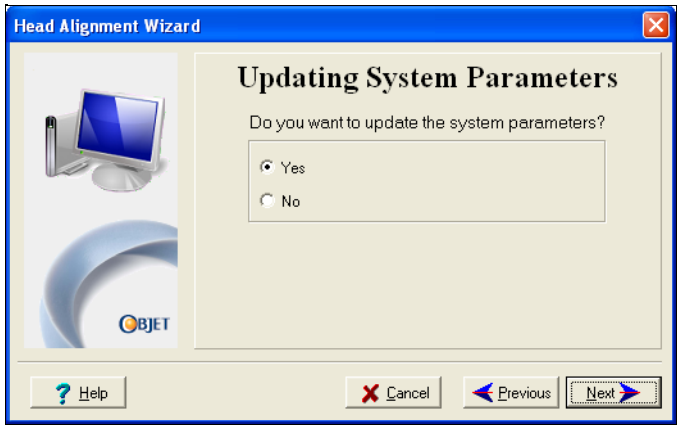

Figure 7-33: Updating System Parameters confirmation screen

13. Choose one of the following to continue:
    - 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—the first or seventh lines—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 7-34: Final head alignment screen

Replacing Print Heads

You need to replace a print head if one or more of the following symptoms occurs:

- The pattern test reveals that more than 15 nozzles are not functioning in one area of the head.
- Visual inspection reveals that the surface of the head is damaged—peeling or bubbles in the nozzle area.
- The Eden 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 consulting with Objet customer support to determine that head replacement is necessary.

A wizard guides you through the procedure of replacing a print head, and adjusts components of the Eden printer to enable you to perform it. Only replace a print head with the aid of the wizard. The procedure takes 75—90 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 20). 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
   - a flat-head screwdriver (5 mm)
   - 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, either from the *Wizards* tab (on the right side of the Eden interface) or from the *Options* menu (see figure 7-25 on page 21).
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.

Preparing the print block

5. Select the print head(s) needing replacement, and click Next.

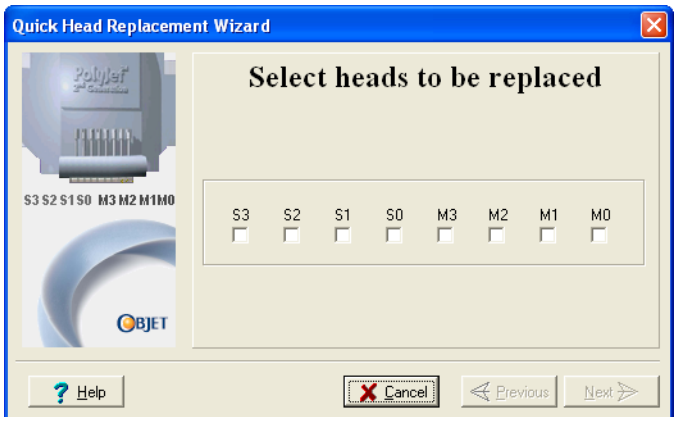

Figure 7-35: Head selection screen

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

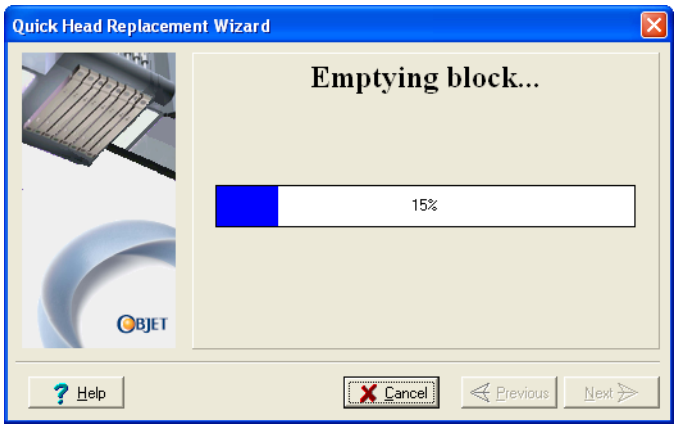

Figure 7-36: Emptying Block progress screen

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

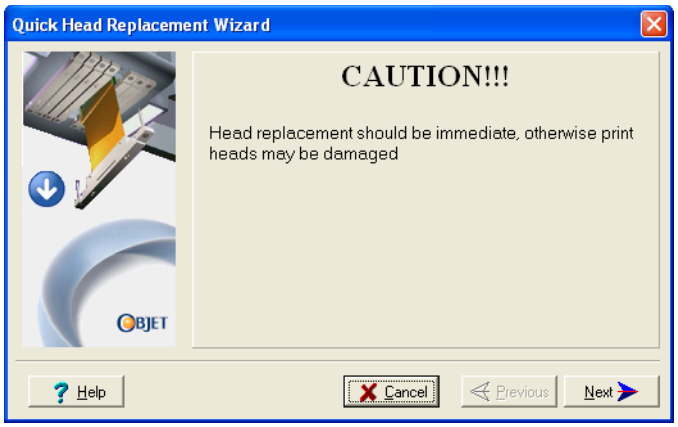

Figure 7-37: Head Replacement warning screen

6. Select the *Open door* check box and 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 Eden printer cover.

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

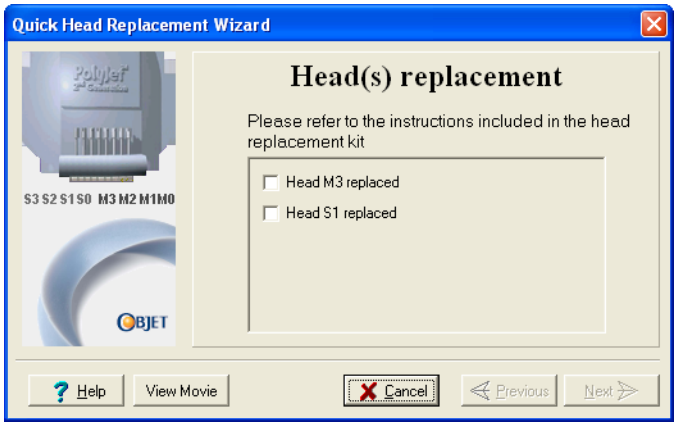

Figure 7-38: Replace the defective head when this screen appears

Removing the Defective Head

10. On the print block, release the upper and lower screws that secure the print head in the block. (If necessary, you may use a screwdriver to loosen the screws.)

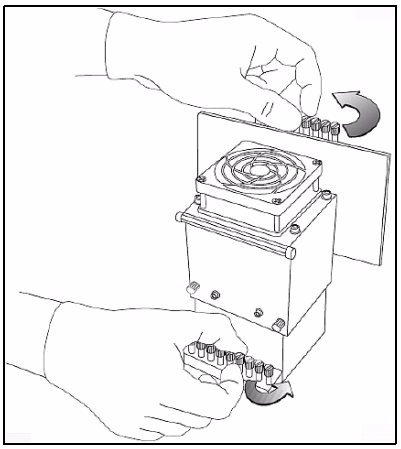

Figure 7-39: Releasing the locking screws

11. Press down on the upper and lower locking screws to release the print head.

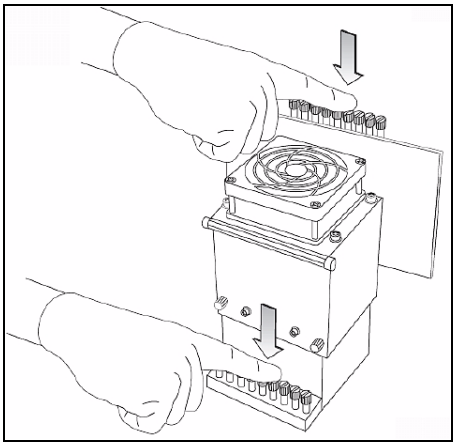

Figure 7-40: Releasing the print head

12. Loosen the screws on the door of the compartment protecting the print-head driver cards (A), then pull and lift up the door (B).

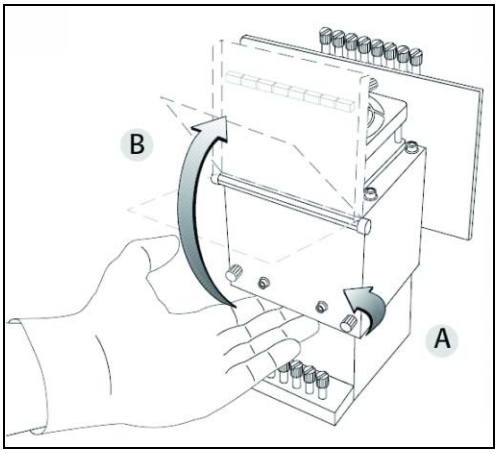

Figure 7-41: Opening the print-head compartment

13. Pull the print-head driver card out of its socket so that the head is free (A), and remove it from the bottom of the print block (B).

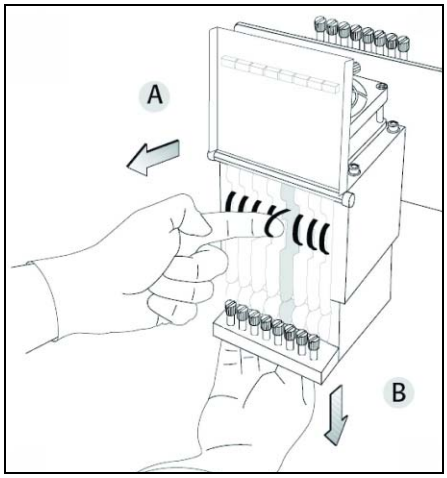

Figure 7-42: Releasing the print-head driver card to remove the head

14. Make sure that along with the head, you remove the two rubber O-ring seals.

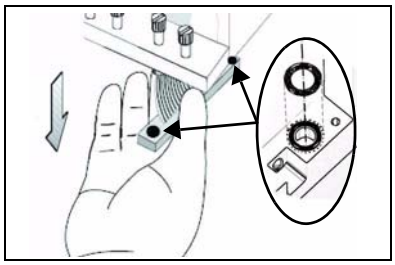

Figure 7-43: O-ring seals on the print head

Important: If the seals are not removed with the head, they are probably stuck to the print block housing. If so, remove them.

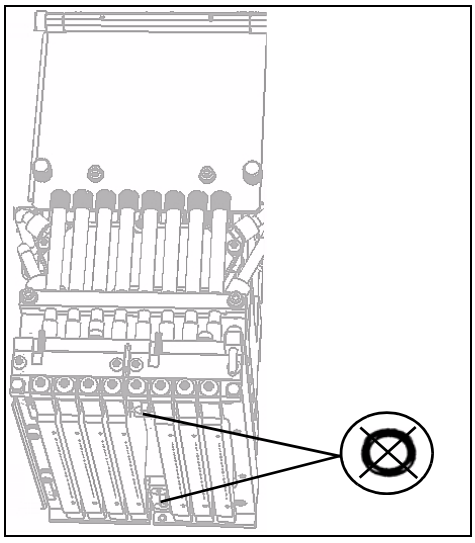

Figure 7-44: Making sure the O-rings are not stuck to the print block

Installing the New Head

15. Inspect the replacement head, and make sure that the O-ring seals are in place (see figure 7-43).
16. Gently insert the replacement head into the vacant slot in the print block, and push the print-head driver card into its socket.

    Note: Make sure to insert the head with driver card facing its socket, in the rear of the print block.

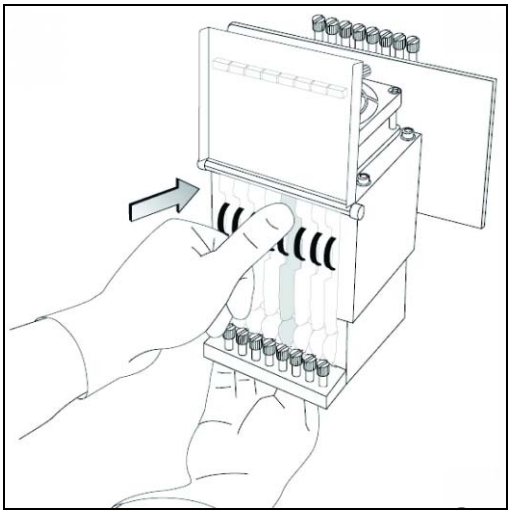

Figure 7-45: Inserting the print-head driver card into its socket

17. Push the head up until you hear it click into place, in both front and rear holders.

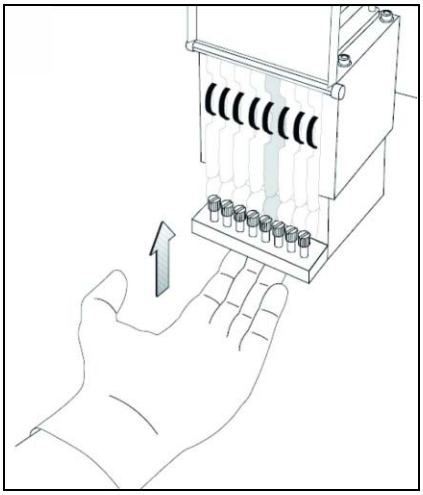

Figure 7-46: Clicking the head into place in the print block

18. Lower the door of the print head compartment, and tighten the screws to lock it in place.
19. Tighten the upper and lower screws that secure the print head in the print block (see figure 7-39 on page 30).

    Note: Hand-tighten these screws. Do *not* use a screwdriver.

20. In the Replace Head Now dialog box (see figure 7-38 on page 29), select the check box to confirm that you have replaced the head, and click Next.

21. With your fingers, make sure that the new head is level and even with the other heads.

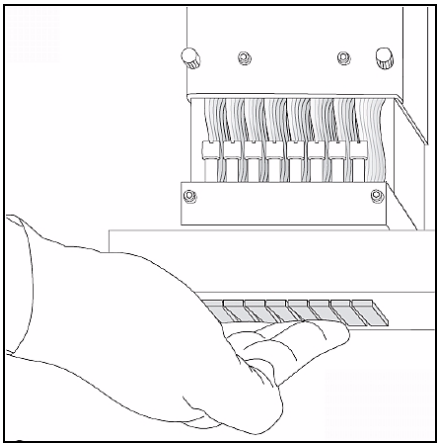

Figure 7-47: Checking the level of the new head

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

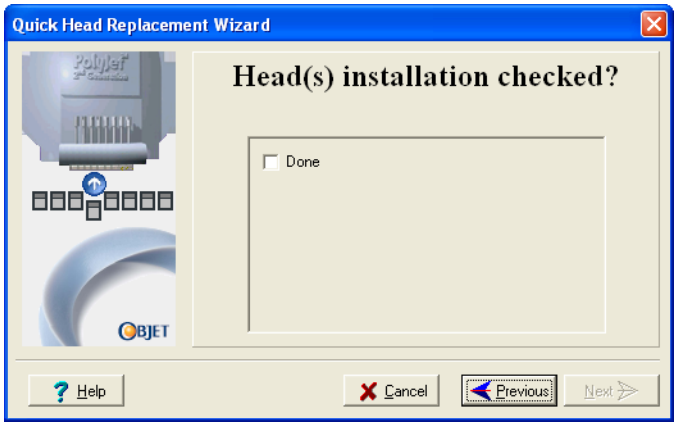

Figure 7-48: Installation-check screen

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

Figure 7-49: Cleared-tray confirmation screen

24. 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 35).

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,” below).

Installation Problems

- If the printer software does not sense the replaced head, the following warning screen appears.

Figure 7-50: Incorrect-installation screen, showing which head(s) to re-insert

If this happens:

a. Open the print head compartment (see figure 7-41 on page 30).
b. Re-insert the print-head driver card into its socket (see figure 7-45 on page 32).
c. 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.

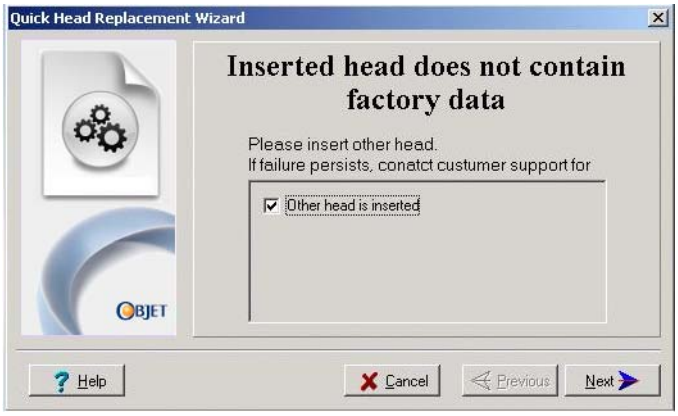

Figure 7-51: “No factory data” warning screen

If this happens:

a. Remove the head and replace it with another one (starting with step 10 on page 30).
b. In the wizard screen, select the check box to confirm that you have installed another print head, and click Next.
c. Contact Objet customer support about the uncalibrated head.

- If the vacuum test is not successful, the replacement head was not sealed properly during installation, and the following warning screen appears.

Figure 7-52: Vacuum Leakage warning screen

If this happens:

a. Click Next.

b. 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 first of two weight tests, in which each head prints a sample. Each test takes 15–25 minutes.

Note: For Eden350 printers, only one weight test is performed (for High Quality mode). For other Eden printers (including Eden350V models), two weight tests are performed (for High Quality and High Speed modes).

25. When the following screen appears, click Next to start the weight test.

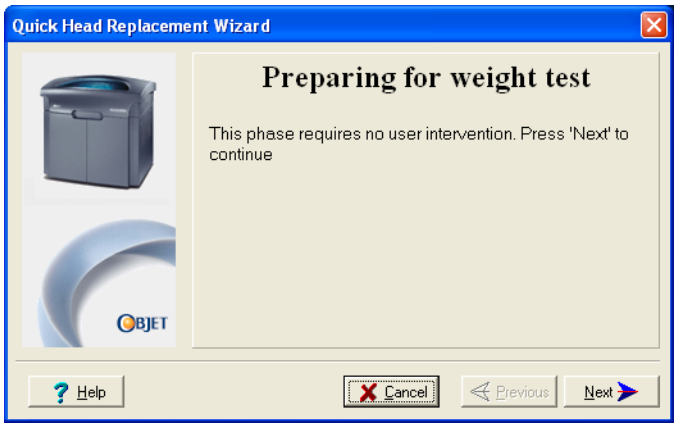

Figure 7-53: Starting the weight test

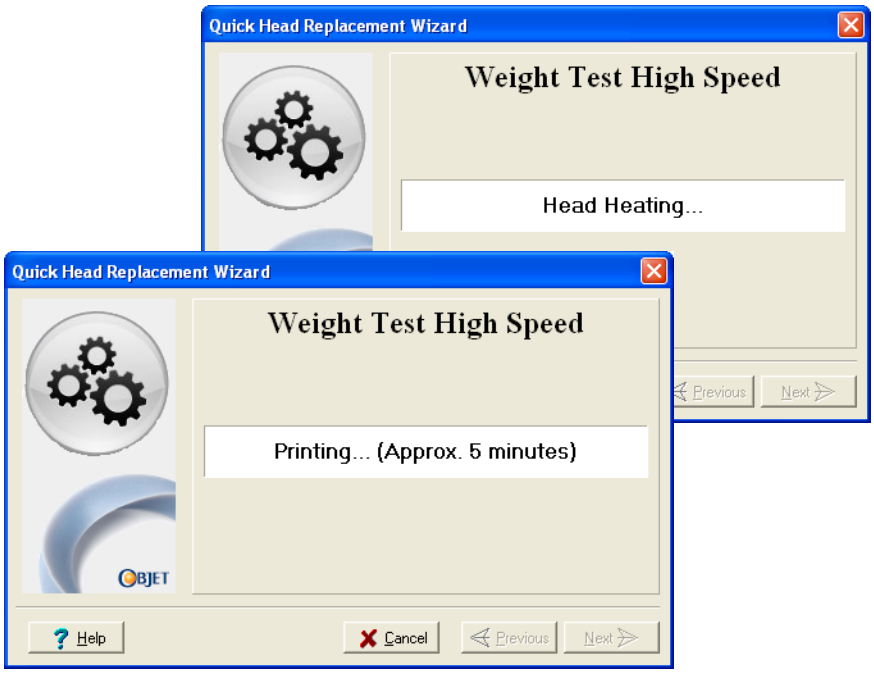

Figure 7-54: High-speed-printing weight test screens

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

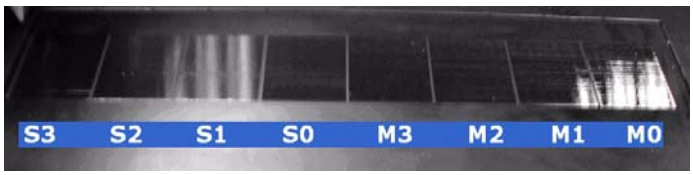

Figure 7-55: Samples printed on the Eden printer build tray

27. Using the scale, weigh each sample and enter the weight (in grams) for the corresponding head in the wizard screen. Then click Next.

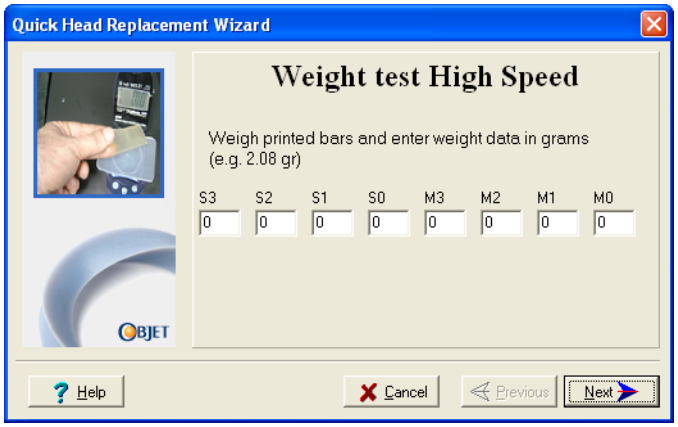

Figure 7-56: Weight Test data entry screen

After the first weight test, the printer calibrates the heads for this mode, prepares for the next weight test, and prints more samples (except for Eden350 printers).

28. Remove and weigh the samples and enter the data, as before (see steps 26 and 27). Then click Next.

After the Eden printer calibrates itself for this mode, the final wizard screen appears.

Figure 7-57: Final Head Replacement screen

29. After replacing print heads, you should check the head alignment before using the Eden printer to produce models.
    - Select Yes and click Done to open the Head Alignment wizard (see "Aligning the Print Heads" on page 23).
    - Select No and click Done to align the heads at another time.

Replacing the UV Lamps

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

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

Figure 7-58: Offline mode indicator (red)

The *online/offline* button at the bottom of 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. Open the cover of the Eden printer.
3. Start the UV Lamp Replacement wizard.
    - From the *Options* menu of the printer interface (see figure 7-25 on page 21), select Wizards > UV Lamp Replacement.

4. Make sure that the build tray is empty. In the wizard screen, confirm this and click Next.

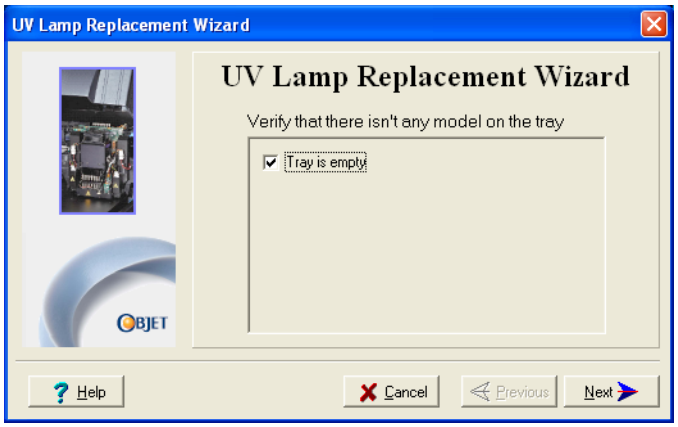

Figure 7-59: “Empty tray” confirmation screen

5. Select the UV lamp(s) to be replaced and click Next.

Figure 7-60: UV lamp selection screen

6. Disconnect the power connection to the UV lamp.

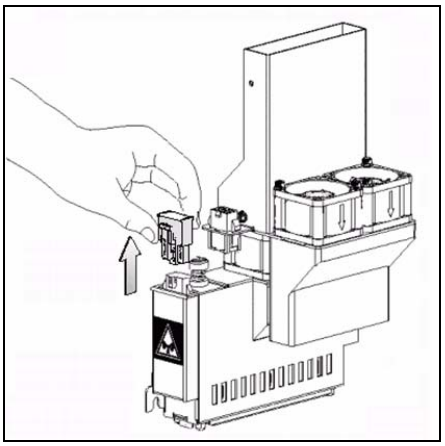

Figure 7-61: Disconnecting power to the UV lamp

Note: Do *not* disconnect the power connection to the cooling fans.

7. Loosen the screw securing the UV lamp cover (A), and pull the cover up (B), then out (C).

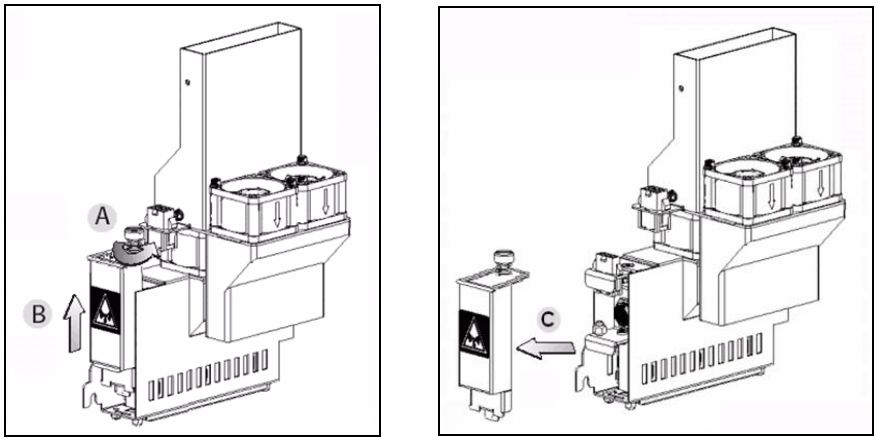

Figure 7-62: Removing the UV lamp cover

8. Pull the lamp reflector out of the print block.

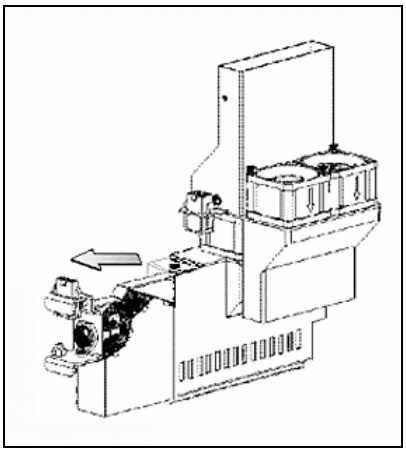

Figure 7-63: Removing the UV lamp reflector

9. On the inside of the lamp reflector, a black strip covers part of the reflector. Remove this strip by sliding it off.

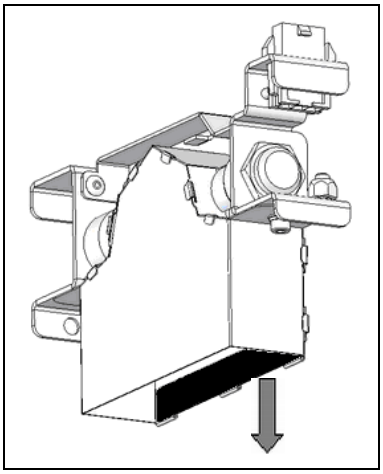

Figure 7-64: Removing the black strip from the old reflector

10. Discard the old reflector and lamp, but save the black strip so you can install it in the new reflector.

11. Fasten the black strip to the inside of the new UV lamp reflector, *on the same side as it was in the old reflector.*

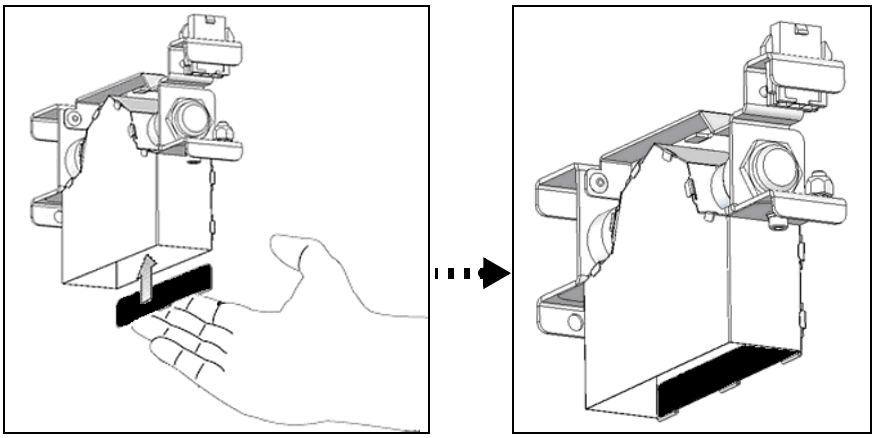

Figure 7-65: Fastening the black strip to the right UV lamp reflector

Important: The black strip must always be on the side of the reflector opposite the print block.

12. Insert the new UV lamp/reflector unit into the housing next to the print block.

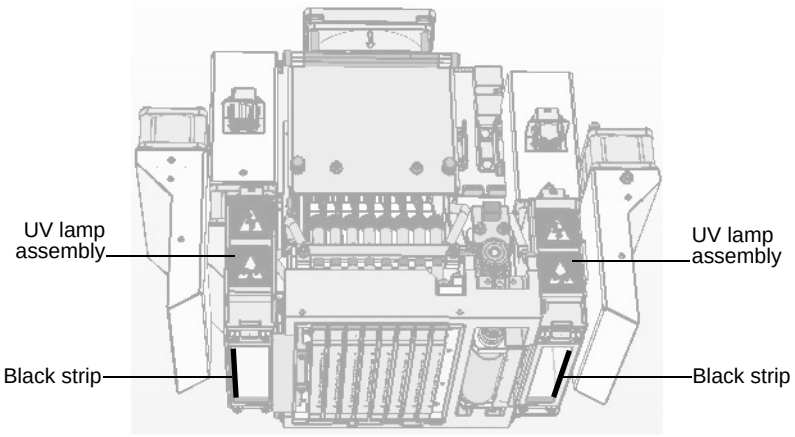

Figure 7-66: Print block and UV lamp assembly, showing correct placement of black strip

13. Replace the lamp cover by inserting it into the slot on the bottom of the housing, and tighten the securing screw on top.

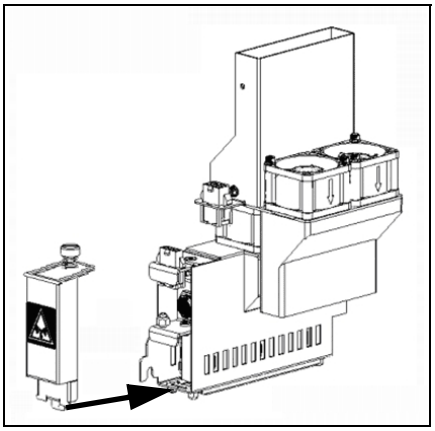

Figure 7-67: Replacing the lamp cover

14. Reconnect the power connection to the UV lamp.

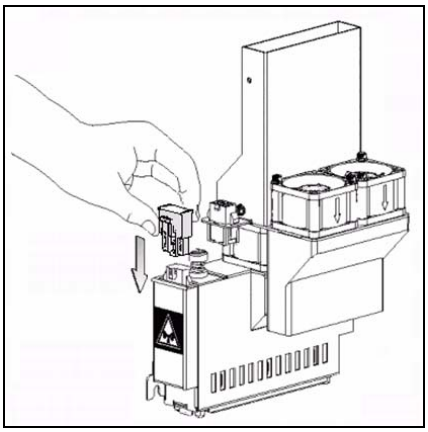

Figure 7-68: Connecting power to the UV lamp

15. In the wizard screen, confirm that you have replaced the lamp(s) and attached the black strip, then click Next.

Figure 7-69: Installation confirmation screen

The wizard operates the lamps and checks if their power is within the acceptable range for each printing mode. (The mode currently being checked appears in the lower-left corner of the printer interface.)

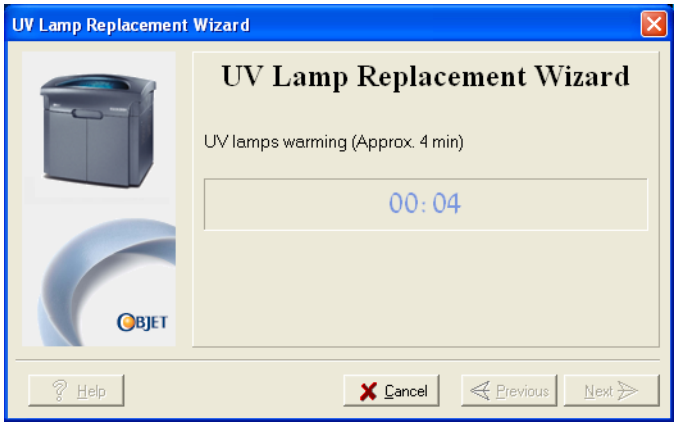

Figure 7-70: Status screen during UV lamp check

16. When the final wizard screen appears, click Done.

Figure 7-71: Final wizard screen

Built-in Tests

The software that runs your Eden 3-D printer contains a suite of tests for regularly checking the hardware and software, and for troubleshooting. You can configure basic communications and environment tests to run automatically, when the Eden software opens. In addition, you can run a more comprehensive set of tests before processing a print job, as a system check, to ensure optimum printing results.

Because running the tests effects the operation of the printer, you can only open the Built-in Tests interface when the Eden system is not printing.

The test suite features:

- The organization of printing-related tasks in categories:
  - ❒ Communications
  - ❒ Data cards
  - ❒ Temperatures
  - ❒ Voltages
  - ❒ Encoder repeatability
  - ❒ Print-head heating
  - ❒ Print-head filling
- A clear display of test results and the source of any failures, enabling you to determine if printing is possible or worthwhile.
- The ability to monitor test results for specific components.
- Troubleshooting tips.

Running these tests can help identify problems in the printer hardware and software. A large number of hardware defects (or near-defects) warns you of possible printing problems, either for current or future jobs.

Objet recommends running the built-in tests in the following cases:

- As a routine test, once every two weeks
- As a system check, before major (long) jobs
- As needed, for troubleshooting.

Accessing Built-in Tests

To open the Built-in Tests screen, do one of the following:

- From the *Options* menu, select Built-In Tests.
- Press Ctrl+Alt+B.

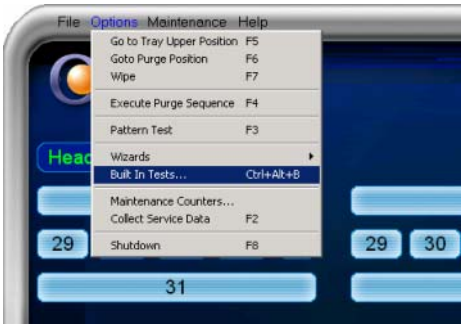

Figure 7-1: Selecting Built-In Tests from the Options Menu

Test Interface

The *Built In Tests* screen lists pre-configured tests, grouped by component categories. In this screen, you select and run tests, and the results are displayed.

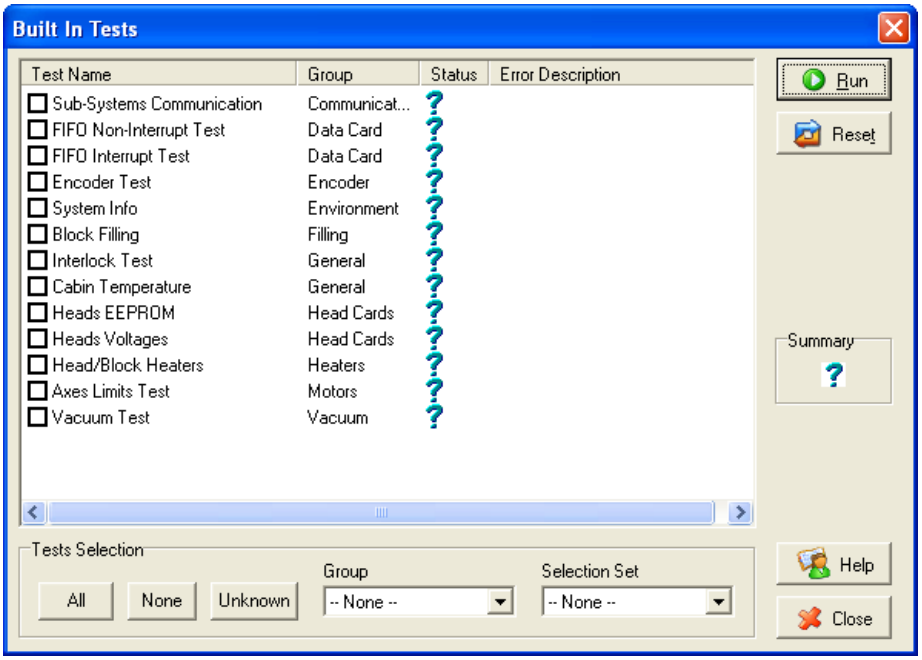

Figure 7-2: Built In Tests screen

Test List

Test Name

This column lists all of the tests, together with selection check boxes.

Click the check boxes to select the tests you want to run. To remove a selection, click the check box again. To quickly select all of the tests in a component category, use the *Group* pull-down menu at the bottom of the screen.

Group

This column shows the component categories for each test.

This tells you which tests are run when selecting a category from the *Group* pull-down menu at the bottom of the screen.

Status

This column shows the status of each test after you run it:

- Test successfully completed.
- Test failed. (Double-click on a failed test's line to review the failure details.)
- Unknown results. (The test has not been run yet.)

Test Selection Area

In the *Test Selection* area, at the bottom of the screen, you can quickly select or de-select tests by their characteristics:

All	Click to select all of the tests in the list.
None	Click to de-select all of the tests in the list.
Unknown	Click to select all test that have not been run yet (Status = ?).
Group	Use this menu to select tests by component category.
Selection Set	Use this menu to select a pre-configured set of tests to run at specified times (computer startup, before printing, etc.).

Running Tests

To run the selected tests:

- Click the *Run* button.

Test Results

To display the detailed results of any single test:

- Double-click the name of the test in the list.

  The results are displayed in a separate window.

To save and view a report of all of the tests:

- Use the *Save* and *View* command buttons (see below).

Command Buttons

You click the command buttons, on the right side of the screen, to perform the following operations:

Run

Click to run the selected tests.

Reset

Click to clear previously run tests. This returns the status of each test to *Unknown* (?).

Save

Click to save a report that summarizes the tests run. The report is saved as an HTML file. You can save any number of reports for the tests you run; the name of the file saved is BITReport [date][time].htm. By default, these files are saved in the Eden installation folder, but you can save it in any other folder.

View

Click to display the latest test report that you saved. (You can view other test reports by opening the relevant files in your Web browser. To do so, open Windows Explorer, and double click the *BITReport* file.

Close

Click to close the *Built-in Tests* screen.

Summary

This area, on the right side of the screen, displays the combined results of all the tests run, using the symbols used in the Status column:

- All tests successfully completed.
- At least one test failed.
- Not all tests performed.

Test Descriptions and Troubleshooting

The following table lists the name of each test in the Built-in Tests suite, together with its description and a possible reason for its failure. If you need assistance, contact your Object service provider.

Test Name	Description	Possible Reason for Failure
Sub-System Communication	Tests communications between Eden components.	Disconnected communications cable. Faulty cable.
FIFO Non-Interrupt/ FIFO Interrupt	Tests the data queue in the DATA PCI card.	Faulty DATA_PCI card.
Encoder	Tests the encoder's reliability by comparing readings from multiple runs along the X-axis.	Faulty encoder.
System Info	Compares the following parameter values with the minimum requirements. • Physical memory • Available memory • Free space on disk • Monitor resolution	Failure of RAM memory allocation in the Eden computer.
Block Filling	Analyzes the thermistor readings when the block is full and when it is empty.	Faulty thermistor.
Interlock	Tests the interlock in the printer cover.	Failure of interlock mechanism. Faulty latch. Disconnected cables.
Cabin Temperature	Tests the temperature level in the build-tray area.	Faulty temperature sensor (OHDB).
Head EEPROM	Tests the read/write capabilities of the print-head driver cards.	Faulty print-head driver card.
Head Voltage	Checks the control of voltages supplied to the print heads.	Faulty print-head driver card.
Tray Heater	Not used for this printer	—

Test Name	Description	Possible Reason for Failure
Head/Block Heaters	Tests the heaters in the print heads and in the print-block body.	Faulty heaters or thermistors.
Axes Limit	Tests the hardware and software limits of all axes.	Faulty hardware sensors. Wrong *Max Position* parameter.
Vacuum	Tests the vacuum level in the print block.	Faulty vacuum sensor. Vacuum leakage. Wrong parameters.

Replacing the Waste Container

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

The container has a capacity of 10 kilograms of waste material—usually enough for several months of printer use. The printer software displays a warning message when the container weighs 9 kilograms, and stops the printer when it weighs 9.5 kilograms. Above 9 kilograms, the software does not allow you to start a print job until you replace the waste container. You can monitor the weight of the waste container in the *Maintenance* screen of the printer interface. You can also visually inspect the level of waste in the container. (To access it, see page 48.)

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

➢ In the main printer interface screen, click the display toggle to view the Eden printer indicators.

Figure 7-3: Eden printer interface, showing waste weight (red background indicates operator alert)

The waste container consists of a plastic container 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 plastic container before you can install it in the printer.

Replacement boxes, plastic containers, and sealing caps are supplied in the Eden printer start-up and preventive-maintenance kits.

To prepare a new waste container:

1. Assemble the cardboard box, making sure to punch out the perforated sections.
2. Place a new plastic container into 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. Locate the door on the lower-left side of the Eden printer.
2. Push in the upper-right corner of the door to release the latch and open the door.

Figure 7-4: Accessing the waste container

3. Carefully slide out the waste container, removing it from the printer.

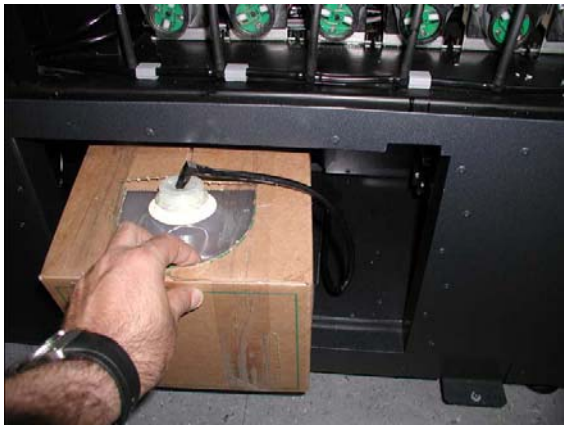

Figure 7-5: Removing the waste container

4. Place the new waste container next to the full container.

5. Unscrew the cap securing the waste drain tube and connect it to the new container.
6. Close the full container with a sealing cap.
7. Close the new waste-container box, using tape to hold it closed.
8. Position the waste container under the Eden printer, on the load cells.
   - The container should be on the extreme right side of the compartment.
   - Make sure that the waste drain tube is not crimped and that it is not pinched by the container.
9. Close the waste compartment door.

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

8

Handling Printed Models

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 Eden printer, it is best to let the printed models cool in the printer, with the cover closed, as long as possible.

If the Eden 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 Balco WaterJet cleaning unit, shown in figure 8-1 on page 8-3. This device is marketed by Objet.

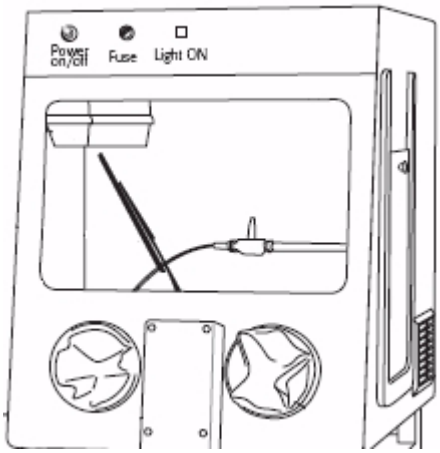

Figure 8-1: Balco WaterJet Cleaning Unit

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.