User Guide

English

Connex500/350
3-D Printer System

OBJET

FCC Compliance

The equipment referred to in this guide has been tested and found to comply with the limits for a Class A device pursuant to part 15 of the FCC rules. These limits provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Objet 3-D printing systems generate, use and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

The 3-D printer referred to in this guide contains a transmitter module, FCC ID: YH6-RFID.

NOTE: Objet Geometries is not responsible for radio or TV interference caused by unauthorized modification to this equipment. Such modification could void the user's authority to operate the equipment.

Equipment Recycling

In the European Union, this symbol indicates that when the last user wishes to discard a product, it must be sent to appropriate facilities for recovery and recycling. For information about proper disposal, check your purchase contract, or contact the supplier of the equipment.

Patents

This product is covered by one or more of the following U.S. patents:

5,263,130

5,287,435

5,386,500

5,519,816

5,695,708

6,259,962

6,569,373

6,644,763

6,658,314

6,850,334

6,863,859

7,183,335

7,209,797

7,225,045

7,300,619

7,364,686

7,368,484

7,369,915

7,479,510

7,500,846

7,604,768

7,628,857

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About This Guide

Using This Guide

This user guide provides instructions for installing, operating and maintaining Connex 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 Connex500 3-D printer, printer software version 57.1.0.5491 and Objet Studio software version 8.5.1.5.

This guide assumes that:

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

For More Information

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

For other documents that relate to Connex500/350 3-D printing systems, and for this document in other languages, contact your regional Objet Customer Support office.

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

Terms Used in This Guide

build tray	*In Objet Studio:* The surface displayed on the screen that represents the actual build tray in the Connex printer.
	In the Connex 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 Connex printers. (There is no limit to the number of client workstations in the local network.)
Connex™ printer	The Objet 3-D printer referred to in this guide.
Connex computer	The computer inside the Connex printer that operates it. (This is sometimes referred to as the "embedded" computer.)
Connex printer interface	The GUI (graphical user interface) used for controlling the Connex printer.
Connex software	Software running on the computer inside the Connex printer that controls all printer operations.
Digital Material™	Combinations of model materials fabricated on the Connex printer from the two basic model materials installed.
Digital Material Mode	The printer mode used to print a job using two different model materials. (This mode can also be used to eliminate the need for performing the Material Replacement procedure when printing with a single model material.)
host/server workstation	The workstation on which the full version of Job Manager is installed. This workstation interfaces directly with the Connex printer and is typically positioned next to it.
Job Manager™	The software that manages production jobs before they are sent to the Connex printer.
mixed part	Models whose parts are printed using more than one model material.
mixed tray	A build tray containing objects, each of which is designed to be printed using a different model material.
Model material	Material used for building models.
Objet Studio™	The software with which users prepare jobs for producing models.
OBJDF (Objet Digital Format)	The extension of a file that contains information about the geometry of an object *and* the materials required to print it. *objdf* files are created in Objet Studio. (For more information, see page 5-3.)

OBJTF (Objet Tray Format)	The extension of a file that contains all of the information needed for a model-printing job on Objet 3-D printers. An *objtf* file is used to send a print job to an Objet 3-D printer.
OBJZF (Objet Z Format)	The extension of a compressed "wrapper" file containing all of the files used in an Objet Studio build tray. Using *objzf* files, a printing job can be saved as a single file, for convenient storage and transfer.
PolyJet Matrix™	The technology of printing models by jetting multiple materials simultaneously from the print heads. This technology enables Connex500/350 printers to print in Digital Material mode.
resin	The base substance from which photopolymer printing materials are made for use in Connex printers. In Objet Studio, Job Manager and Connex 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.

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Safety

Safety Features

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

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

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

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

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

UV screen	The transparent section of the cover blocks harmful UV radiation, allowing the operator to view the model as it is being made.
Circuit breaker	The power to the printer is turned off in case of electrical overcurrent.
	Note: The circuit breaker is only accessible to service personnel.
Grounded chassis	The chassis of the printer is grounded, to prevent electrical shock.
	Note: The power outlet must be properly grounded, in accordance with the local electric code, to provide this protection.

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

Symbols and Warning Labels

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

Warning Symbol	Meaning	Location	Comments
	Hazard (general)	On the name plate on the back of the printer.	Read the instructions in this document before operating the printer.
	Hot surface	On the print-head block.	Risk of burns. Do not touch this surface after printing.
	High voltage	Near the UV lamp connectors. Near the power-supply enclosures.	Risk of electric shock.
	Ultraviolet radiation	Near the UV lamps.	Risk of injury from ultraviolet radiation.
	Moving parts	On the panel visible when you open the doors of the printing-materials compartment.	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 Connex system. **If the system is not operated as specified, the user's safety may be compromised!**

Printer Installation

➢ Installation and removal of the Connex printer should only be done by qualified service personnel.

➢ Connect the printer to the electric outlet using a power cord that is safety-certified.

➢ The electric outlet should be easily accessible, near the printer.

➢ Never connect the power plug to an outlet that does not have a ground (earth) wire, and never disconnect the ground. Doing so may expose the operator to serious danger from electric shock.

➢ Leave a minimum of 15 centimeters between ventilation openings and walls or other objects.

Printer Operation

➢ The Connex printer should only be operated by persons trained by an Objet customer-support representative.

➢ All personnel operating or maintaining the Connex printer should know the location of first aid and emergency equipment and how to use it. **Never block access to this equipment!**

➢ Keep fingers and other body parts clear of the printer cover when closing it.

➢ Never attempt to open the main cover of the printer while it is working!

➢ Never override the interlock safety switch!

➢ If the interlock safety switch ever fails, **do not use the printer**.

➢ Several parts of the printer remain extremely hot even after it has stopped operating. Avoid touching the UV lamps and the print block.

UV Radiation

➢ The UV lamps used in the printer emit dangerous radiation. If the UV lamps remain on when the printer cover is open, do not stare directly at the UV light. Shut down the printer and call your Objet service provider.

Printer Maintenance

➢ Service operations should be performed only by qualified personnel who have been instructed in relevant safety precautions.

➢ Notify co-workers and those who have access to the Connex system before beginning non-routine and hazardous work.

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

Model and
Support
Materials

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

➢ Store cartridges of model and support materials indoors, in a dry area with adequate ventilation, between 16-27 degrees Celsius (60-81 degrees Fahrenheit). Never expose them to flames, heat, sparks, or direct sunlight.

➢ Keep model and support materials away from areas where food and drink are stored, prepared and consumed.

➢ Uncured printing material is considered a hazardous substance, requiring certain precautions when directly handling it. To prevent skin irritation, wear **neoprene** or **nitrile gloves**. If there is any chance that model and support materials might splash into the eyes, wear safety goggles. Prolonged direct contact with printing materials can cause an allergic reaction.

➢ When handling UV-cured models that may not be completely cured on the surface, common latex gloves are adequate.

➢ To prevent respiratory irritation, ventilate areas where model and support materials are used. The ventilation system should totally replace the air at least 20 times per hour.

➢ Clean up model-material and support-material spills with disposable towels or other absorbent, non-reusable material, such as sawdust or activated charcoal. Rinse the spill area with denatured or isopropyl alcohol (IPA), followed by soap and water. Dispose of the absorbent material in accordance with local regulations.

➢ Do not wash contaminated clothing at home; clothing should be professionally laundered.

➢ Dispose of contaminated shoes, belts and other leather items in accordance with any applicable regulations. Absorbed printing material may re-expose the user when these items are worn.

First Aid for Working with Printing Materials

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

Contact with Skin

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

➢ Use cool water to prevent skin pores from opening, so that the liquid material does not easily penetrate the skin.

➢ Do not use solvents to clean skin.

➢ If large areas of skin have been exposed, or if prolonged contact results in blisters, seek medical attention. In any case, if irritation persists, seek medical attention.

➢ Avoid the accidental transfer of printing material from the hands to other areas of the body, especially to the eyes.

➢ If protective cream was used, do not reapply it until the skin has been completely cleansed.

Contact with Eyes

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

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

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

➢ Clean and disinfect the contaminated lenses.

➢ Do not wear contact lenses until eye irritation disappears.

Ingestion

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

Inhalation

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

➢ If the victim has stopped breathing, perform artificial respiration or cardiopulmonary resuscitation.

➢ Seek medical attention immediately.

➢ Keep the patient warm but not hot.

➢ Never feed anything by mouth to an unconscious person.

➢ Oxygen should be administered by authorized personnel only.

Waste Disposal

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

➢ When removing the waste container from the Connex printer, wear neoprene or nitrile gloves.

➢ To prevent liquid waste from splashing into the eyes, wear safety goggles.

➢ Liquid waste from the Connex printer is classified as hazardous industrial waste. Therefore, printing-material waste must be packaged and disposed of in a manner that prevents human contact with it and contamination of water sources.

➢ Empty model-material and support-material cartridges contain residue of their contents. Some leakage of this residue may occur through the broken cartridge seal. Therefore, handle and store empty cartridges with care.

➢ Do not attempt to reuse empty cartridges, and do not puncture them.

➢ Dispose of used cartridges and waste containers in accordance with local regulations.

➢ Discard contaminated clothing, shoes, empty containers, etc., in accordance with any applicable regulations.

Introducing the Connex 3-D Printing System

Welcome to Connex

The advanced capabilities of the Connex 3-D printing system are made possible by PolyJet Matrix™ technology, specially developed by Objet for printing models simultaneously with different model materials. For the first time, you can achieve the following results when printing 3-D models:

- You can prepare models for printing with designated model materials and then print them—using two basic model materials loaded in the printer, or combinations of the two materials (*digital materials*).

- Parts of the same model can be made—simultaneously—from different materials.

- Models made from digital materials can have unique physical properties, depending on the materials used.

- You can print objects that have a "coating" made from a different material than the main part of the object.

In addition, because Connex printers can be loaded with two different materials, and can print simultaneously with combinations of them, you can streamline and economize the process of producing models:

- You can print models made from different (single) materials on the same build tray ("mixed tray"), in the same print job. This eliminates the time-consuming need and expense of loading another material, flushing the system, and sending a separate job to be printed.

- You can quickly alternate printing jobs with either of the two model materials loaded—or with material combinations—again, without the need and expense of replacing materials.

The Connex system also enables you to split models into component parts ("shells") so you can isolate, manipulate and print parts of a model. However, you have ultimate control when separating models into shells by preparing *stl* files with your CAD software. Then, with Objet software, you can assign model materials and other characteristics to the shells.

Figure 3-1: The Connex500 3-D Printer

Work Configurations

The Connex500/350 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 Connex printer set up in a multi-client configuration.
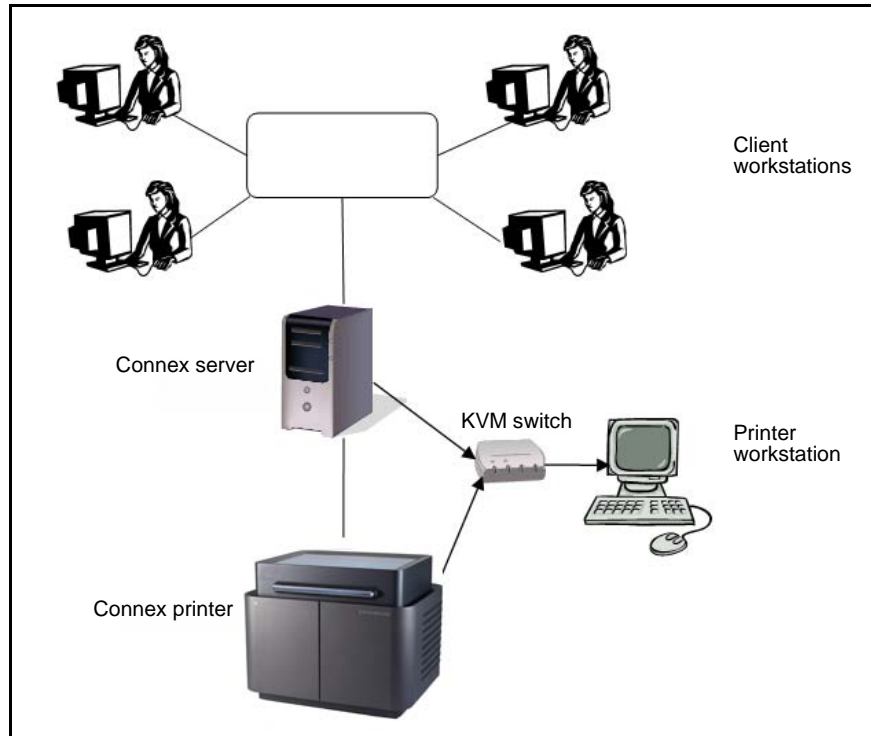
Figure 3-2: Multi-client network configuration

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

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

- STL Files
- SLC Files

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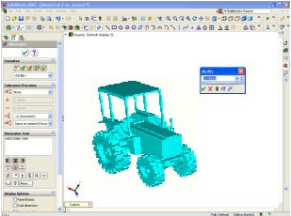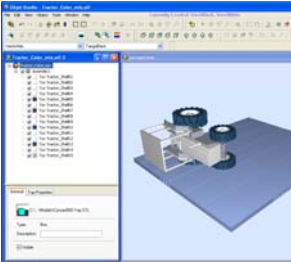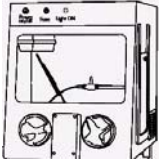
SLC is short for *Stereo-Lithography Contour*. SLC files describe two-dimensional contours of the three-dimensional models. These contour lines are polylines.

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.

Connex Workflows

With Connex 3-D printing systems, you have great flexibility in preparing model files and printing them. Below are the major workflows that have been made possible by PolyJet Matrix technology on Connex systems. You can find detailed instructions for implementing the listed tasks in chapter 5 ("Using Objet Studio").

Stage	Workflow A	Workflow B	Workflow C
CAD program	• Design a 3-D object. • Save as a single *stl* file.	• Design a 3-D object. • Save the object as an assembly of *stl* files.	
Objet Studio	• Open (*Insert*) the *stl* file. • Separate the object into its components ("shells"). • Assign materials to the components.	• Open (*Insert*) the *stl* files as an *assembly*. • Assign materials to the assembly's components.	• Open (*Import*) an *objdf* file. (*objdf* files contain model-material information.)
	• Save the object as an *objdf* file (optional).		
	• Save the build tray. / Send the build to the printer.		
Connex 3-D Printer	*Models are produced in the printer.*		
WaterJet	• Remove the support material from the models.		
Finished model	*Finished model.*		

Connex workflows, from design to finished models

Printing Materials

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

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

Storage

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

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

Shelf Life

Materials used for producing models have a limited shelf life. The expiry date on the label is valid when properly stored in an undamaged, unopened cartridge. Always rotate your stock, so that the cartridge with the earliest date is used first.

Exposure to Light

If printing materials are not in their sealed cartridges, make sure to shield them from sunlight and other sources of UV radiation, such as fluorescent and mercury-vapor lights. Exposure to UV radiation causes an increase in viscosity and, eventually, solidification.

Safety
Considerations

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.

You can find more safety information about resins in "Safety Guidelines" on page 2-4, and "First Aid for Working with Printing Materials" on page 2-6.

Disposal

Dispose of cartridges of Objet model and support material in accordance with all applicable laws and regulations. If necessary, the cartridges can be disassembled for recycling.

Work Environment

Extreme heat and humidity conditions can adversely affect the operation of the Connex 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°–22° C (64°–71° F)
- 30%–70% relative humidity

Workstation Requirements

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

	Server/Stand-alone Station	Client Workstation
Processor	Pentium 4, 3.0 GHz, 512 KB cache memory (min.)	Pentium 4, 3.0 GHz (min.)
Operating System*	Windows XP *Professional*	Windows XP *Professional*
Graphics Card	Supporting open GL, with 512 MB of memory	Supporting open GL, with 512 MB of memory
RAM	4 GB (min.)	2 GB (min.)
CD Drive	IDE CD ROM	IDE CD ROM
Hard-Disk Drive	40 GB (min.)	40 GB (min.)
Network Adaptor Cards	LAN TCP/IP (2)	LAN TCP/IP (1)
Ethernet Cables	•Straight-through cable (1) •Crossover cable (1, supplied)	Straight-through cable (1)

* Also supported:

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

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

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

Recommendations:

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

Preparing Files for Use with Connex 3-D Printing Systems

Before using files with Connex 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 3-4.)

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*. (Both binary and ASCII formats can be used in Objet Studio. However, binary files are smaller, so this option is recommended.)

5. Click OK or Save.

Converting Files to SLC Format

When converting files to SLC format, it is recommended that you set a layer thickness of 15 microns (0.015 mm). Since SLC files cannot be orientated in Objet Studio, it is important that models are properly orientated before being saved as SLC files. Considerations for suitable model orientation are explained in "Model Orientation" on page 5-18.

Objet Studio Software

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

- Objet Studio
- Job Manager

Objet Studio

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

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

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

Job Manager

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

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

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

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

Installing Objet Software

4

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

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

To install Objet software:

1. Insert the Objet Studio CD into the disk drive.

2. Right-click the Start button and select Explore (or use any other method for displaying files on the computer).

3. Open the CD-drive folder and select Setup.

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

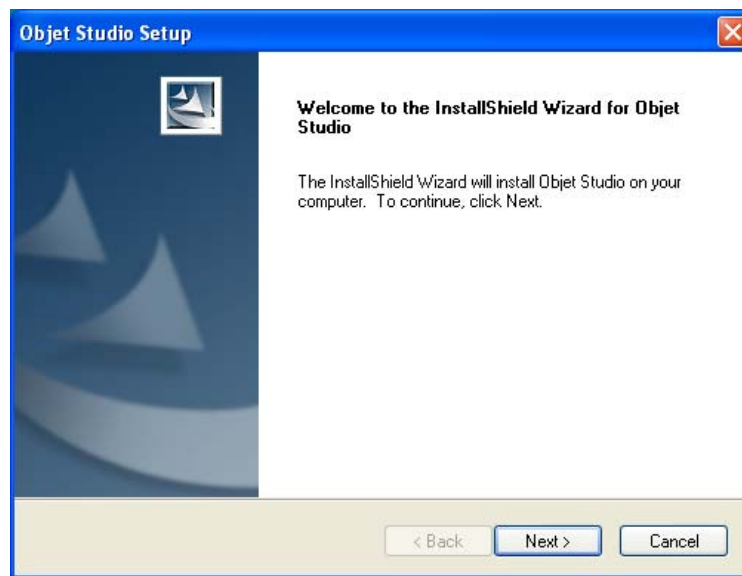   If you click Yes, the following screen should appear.

Figure 4-1:Objet Setup—installation wizard *Welcome* screen
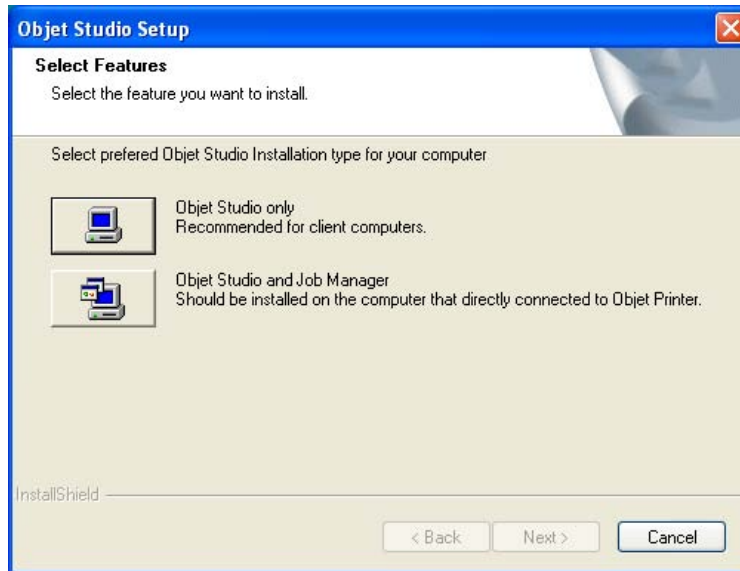
4. Click Next to begin installation.

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

5. When the *Select Components* screen appears, select one of the installation options, then click Next.

   • Select Objet Studio only for client workstations

   • Select Objet Studio and Job Manager for the server (host) station and for a standalone station—that is, the computer directly connected to the Connex printer.
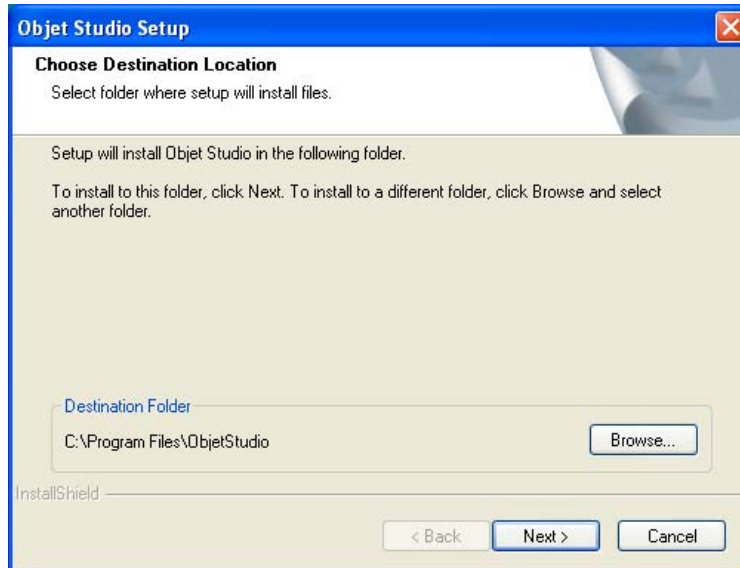

Figure 4-3: Objet Setup—*Choose Destination Location* screen

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.

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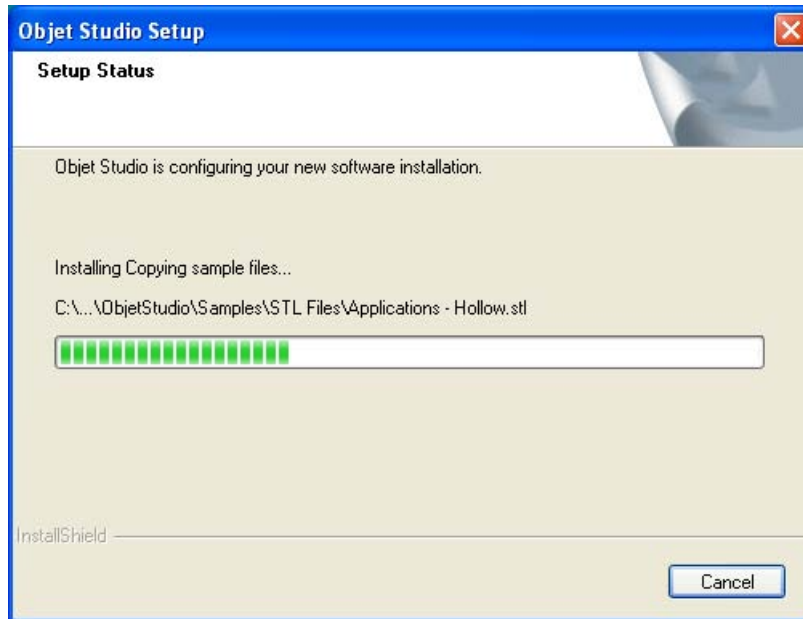

Figure 4-5: Objet Setup—*Setup Status* screen

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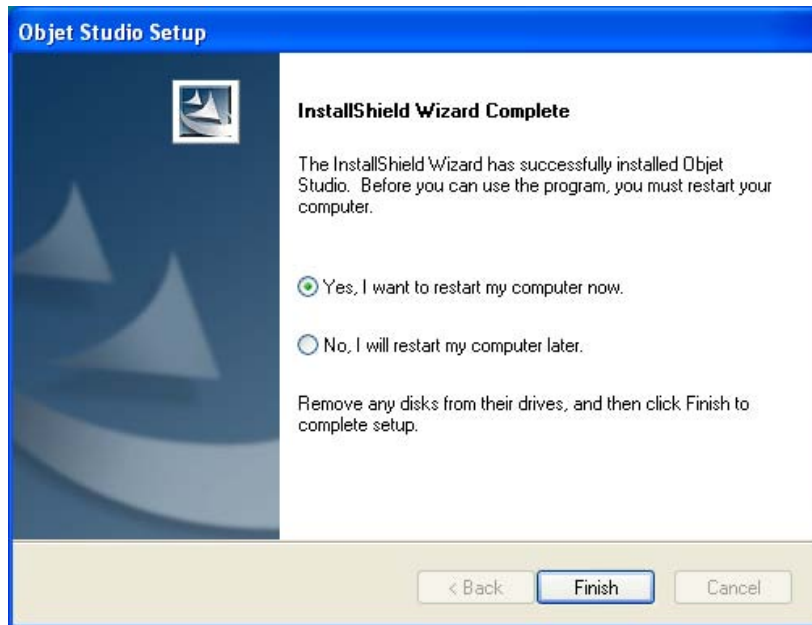

Figure 4-6: Objet Setup—final wizard screen

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

8. Select either "Yes…" or "No…" and click Finish.

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

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

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

Using Objet Studio

Opening Objet Studio

After you install Objet Studio, a launch icon ![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.
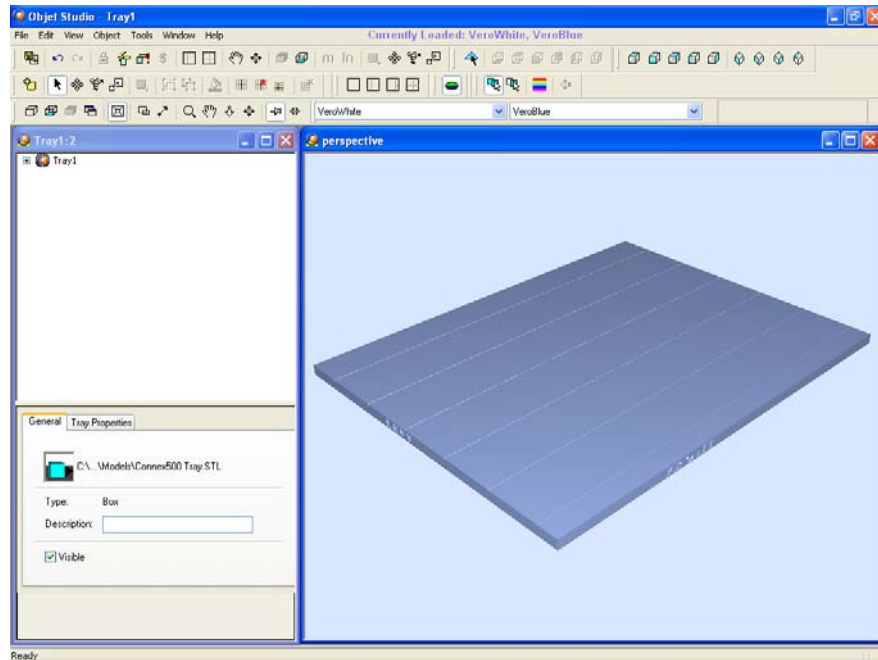
Figure 5-1: Objet Studio opening screen

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.
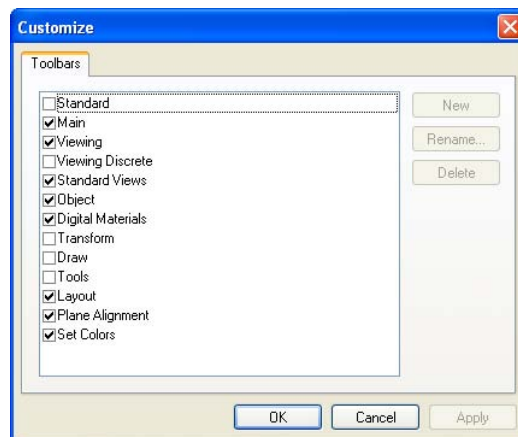
Figure 5-2: Toolbar selection dialog box

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

Preparing Models for Production

Just as Connex printers can produce different models on the build tray using different materials, you can produce components of models with different materials. To do this, each part of the model must be a separate *stl* file. If the model's component parts were not saved in the CAD software as separate *stl* files, you can use Objet Studio to separate the model into component parts. (This is described in "Splitting Objects into Components" on page 8 and in "Dividing Objects" on page 39.)

OBJDF Files: Overview

An *objdf* file describes both the geometry of a single object and the materials required to print it. The *objdf* file can represent an object that is a single *stl* file, or an object assembled from component *stl* files.

Objet Studio enables you to split an *stl* file representing a complex object into an assembly of component *stl* files, and save the assembly as an *objdf* file. Each part (*stl* file) described by the *objdf* file can have its own model-material characteristic, so that the Connex printer produces the component parts from specific materials.

Another use for *objdf* files is for saving a group of separate objects on the build tray as one unit, together with their relative positions and materials. This is especially useful for producing models in the future with the same materials. In fact, when you save *objdf* files, you specify materials for printing models without regard to the material cartridges loaded in the Connex printer. The same object can later be placed on build trays for printing. Each time you send a build tray to the printer, you decide whether to allow printing with substitute materials or only with the materials specified.

The Connex version of Objet Studio enables you to display, manipulate and print component parts of a model assembly that was saved as an *objdf* file, since each component is a separate *stl* file. This can be useful for printing only specific parts of a model.

Further explanations of *objdf* files and assemblies, and instructions for utilizing their features, appear throughout this chapter.

Opening Model Files

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 several ways:

- by inserting individual *stl* or *slc* files (or an assembly of *stl* files)
- by importing an *objdf* file (an assembly)
- by pasting objects that you copied to the Windows clipboard

Opening STL & SLC Files

To place an object on the build tray using *stl* or *slc* files:

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.
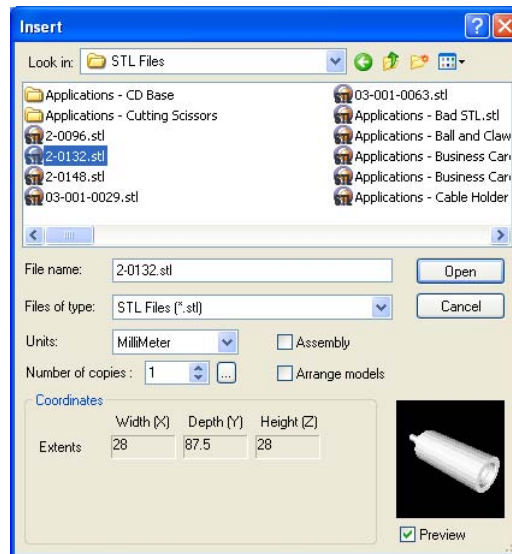
Figure 5-3: *Insert* dialog box

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 5-3.

   Note: You can open several *stl* files at once, to place several models on the build tray. If you select multiple *stl* files that make up an assembly, you can select all or some of the parts. To print the entire model, select all of an assembly's component *stl* files, and select the *Assembly* check box. This inserts the parts as a complete, integrated model instead of as independent parts. To see the effects of selecting the *Assembly* check box—in both the hierarchy pane and the build tray display—see the following figures.
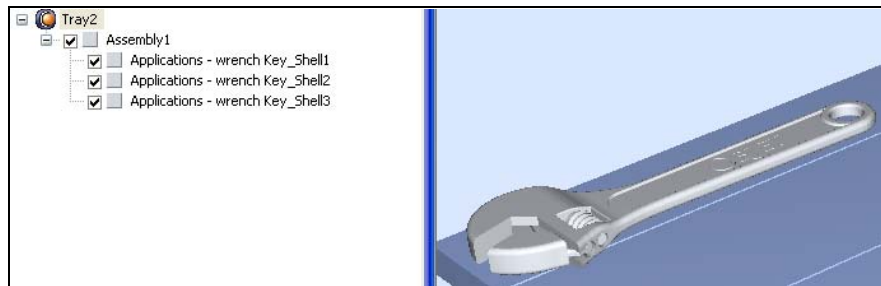
Figure 5-4: *Assembly* check box selected—*stl* files are inserted as *assembly*
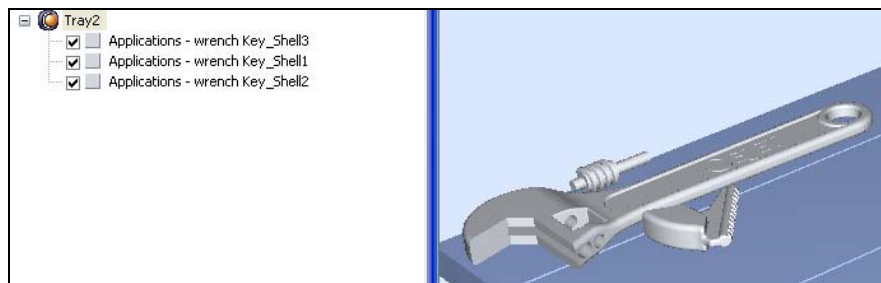
Figure 5-5: *Assembly* check box not selected—*stl* files are inserted as *parts*

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.
- Assembly—Select this check box if you selected multiple *stl* files that are parts of an assembly.

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 5-43 on page 27).

6. Click Open.

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

Figure 5-6: Default screen layout

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

Opening Objet Digital Files

To place an object saved as an Objet Digital Format file (*.objdf* or *.odf*) on the build tray:

- From the *Object* menu, select Import OBJDF File.

or—

- Right-click on the build tray, and select Import OBJDF File from the context menu.
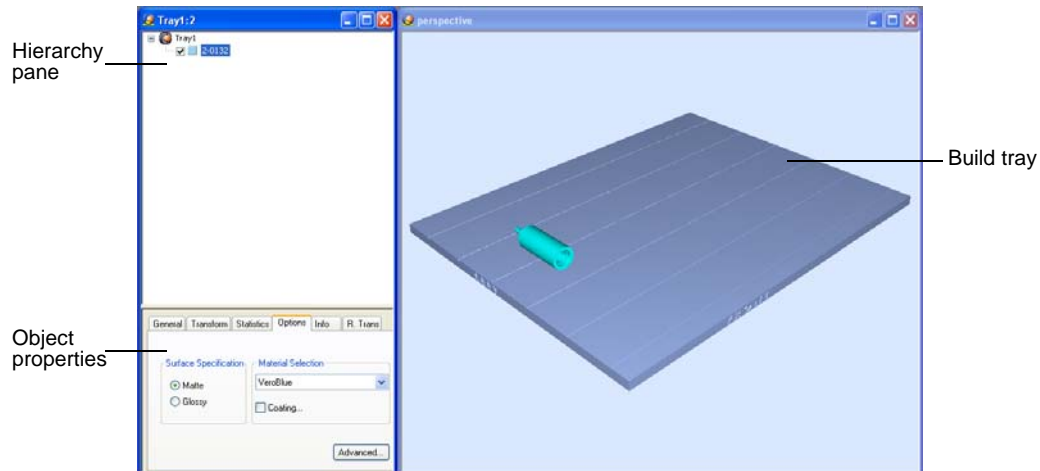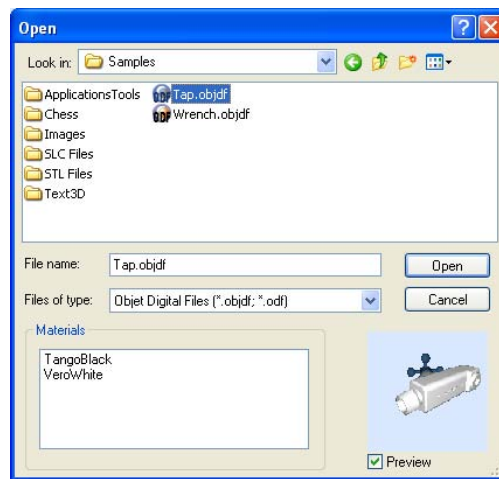
The *Open* dialog box is displayed.

Figure 5-7: Objet Digital File import dialog box

7. In the *Look in* field, display the appropriate folder.

8. 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.

   The *Materials* box displays the models material(s) defined for the object.

9. Click Open.

   The following dialog box opens.

Figure 5-8: *Objet Digital File* Folder dialog box

   Before placing the object on the build tray, Objet Studio must extract additional information regarding the materials and the position of the object and its parts. To do this, Objet Studio creates a folder with the same name as the *objdf* file. By default, this folder is created in the same location as the *objdf* file, but you can select another location.

10. Click OK.

   Objet Studio places the object on the build tray and lists it in the hierarchy pane as an *assembly* together with its components.

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

Because *objdf* files contain information about model materials, a warning message appears if the object you wish to place on the build tray is defined with materials not supported by your system, or if an object already on the build tray uses different materials. (If this happens, see "Model-Material Settings" on page 9 for printing options.)

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—individual or multiple parts or assemblies. 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. For example, if you need to change the model material of an object (saved as an *objdf* file) to match the model material already used in the production build tray, you must do so *before* inserting the object—on another 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 5-9: *Paste Special* dialog box

Selecting
Objects

To manipulate an object on the build tray or assign characteristics to it
(model material, surface finish, etc.), 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.

Sometimes, you need to select individual elements of an assembly. Other
times, you need to select the entire assembly. To choose which will be
selected when you click on the model, first click the appropriate icon on the
toolbar:

Figure 5-10: *Select Group* and *Select Element* icons

Note: When selecting one element of an assembly from the hierarchy
pane, the *Select Element* icon is automatically activated.

Splitting
Objects into
Components

You can convert a complex object to an assembly of component parts. To do
so, you split the *stl* file that represents the object into an group of separate
stl files, each one representing a component. (This is referred to in the Objet
Studio interface as separating the object into *shells*.) You can then assign a
model material to each *stl* file, and you can save the newly-created
assembly as an *objdf* file.

To convert an object to an assembly of component parts:

1. If the object is not displayed, place it on the build tray by inserting its *stl*
   file (see "Opening STL & SLC Files" on page 3).

   The object appears—on the build tray and in the hierarchy pane—as a
   single part. It is assigned, by default, the "primary" model material. (If
   Objet Studio is configured with a secondary material, you can assign
   it—or a *digital material*—to the entire object. This is explained in
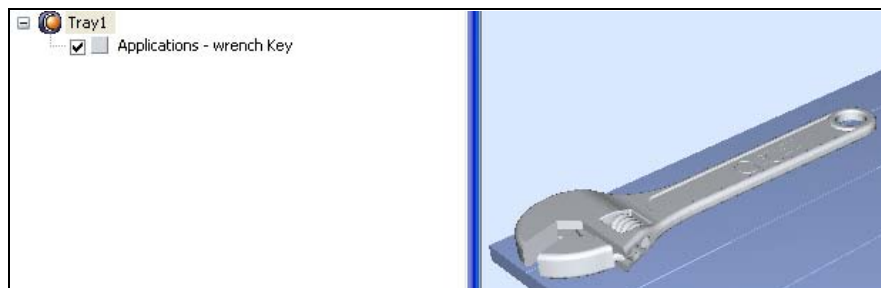   "Model-Material Settings" on page 9.)

Figure 5-11: Object placed on the build tray from a single *stl* file

Note: There is no need to resize or arrange the object on the build tray at
this time.

2. With the object selected, do either of the following:

   • From the *Object* menu, select Separate into Shells.

   or—

   • On the toolbar, click the *Separate into Shells* icon .

A dialog box opens in which you can specify where to save the component *stl* files. (By default, Objet Studio offers to save the new files in a folder in the same location as the original *stl* file.)
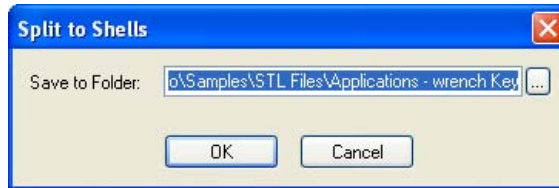

Figure 5-12: Folder selection for saving *stl* files after splitting into shells

3. Click OK.

    Objet Studio splits the object into an assembly of component parts, each a separate *stl* file ("shell").

    The object appears—on the build tray and in the hierarchy pane—as an assembly of parts ("shells"). You can assign each part a different model material (This is explained in "Model-Material Settings" on page 9).
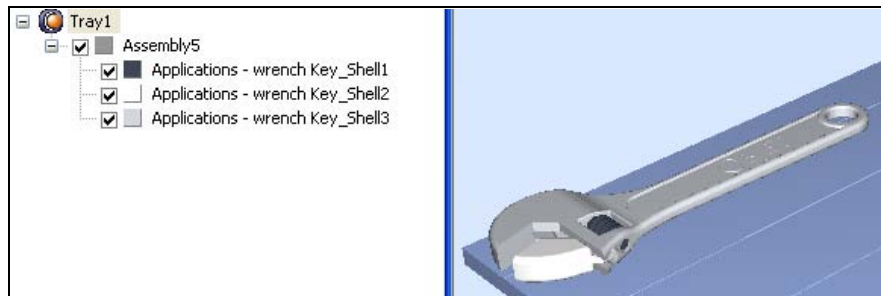

Figure 5-13: Object after being converted to an assembly of component parts

Model-Material Settings
Before placing objects on the build tray in Objet Studio, you should pay attention to the model-material settings in the toolbar.
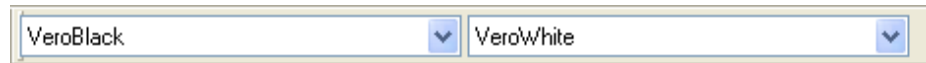

Figure 5-14: Model-material-settings toolbar

*   By default, the model-material settings in the Objet Studio toolbar correspond to the two model cartridges loaded in the Connex printer.

*   The material displayed on the right (VeroWhite, in the figure above) is considered the *primary* model material ("Model-1"). It is assigned to objects that do not have a material assignment when you place them on the build tray. For example, since *stl* files do not contain information about the model material, Objet Studio assigns the primary model material to them. Also, if you try to import *objdf* files whose assigned materials are not recognized by your version of Objet Studio, you can open the file by substituting the primary model material for the missing materials.

*   If you import an *objdf* file to an empty build tray, and the model-material assignment does not match the settings in the model-material toolbar, the toolbar settings are changed automatically. However, if

there is an object already on the build tray whose materials don't match the material assignment in the *objdf* file, you cannot place the new object on the tray. To print this object, you have the following options:

❑ Instead of printing it on the same build tray, print the new object as a separate job.

❑ Change the materials assigned to objects on the build tray to match those assigned to the new object (see "Changing the Model Material" and "Assigning a Model Material to Objects," below).

❑ Change the materials assigned to the new object before importing it, so there is no conflict with the settings in the model-material toolbar.

To change the materials assigned to an object before importing it:

1. Open another Objet Studio window, by running the application from the Windows *Start* menu.

2. Import the new object (*objdf* file) to the empty build tray.

3. Change the model-material settings in the toolbar to those used on the other build tray.

4. Assign materials to the object (see "Assigning a Model Material to Objects" on page 11).

5. Select the object and copy it.

6. Display the other Objet Studio window, and paste the object onto the build tray.

Note: You can save the object with the new materials either as a new *objdf* file, or by saving the original file with the changes.

Changing the
Model Material

When you design a build tray in Objet Studio, you can use model materials that may not be currently installed in the Connex printer. Because the installed materials are displayed by default, change the model-material settings in the toolbar (from the drop-down menus), if necessary.
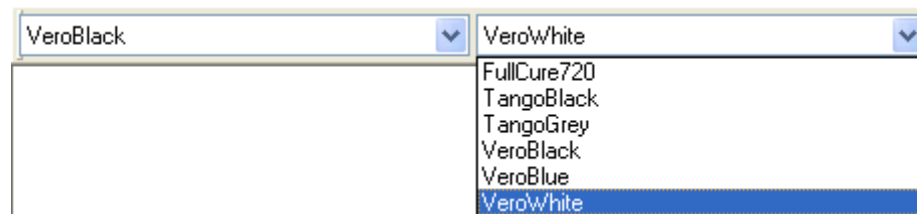

Figure 5-15: Configuring the model material to be used with the current build tray

When you send the job to the print queue, you indicate whether or not you allow substitute materials to be used—see "Model Material Substitution" on page 37.

Digital
Materials

When two different model materials appear in the toolbar, you can produce objects from either material or from a combination of them—*digital materials*. Different pairs of model materials enable you to print objects using unique digital materials. Certain digital materials can produce objects with different shades of color. Combinations of model materials that have different mechanical properties result in digital materials with unique characteristics.

To view the digital materials available for printing objects (using two basic model materials):

1. Make sure that you have selected the appropriate model materials in Objet Studio.
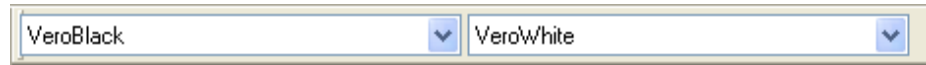

Figure 5-16: Model-material-settings toolbar, showing two basic model materials

2. Click the Material Selection Guide icon .

   A screen is displayed, showing the basic model materials (at the top of the list) and the digital materials available (combinations of them).
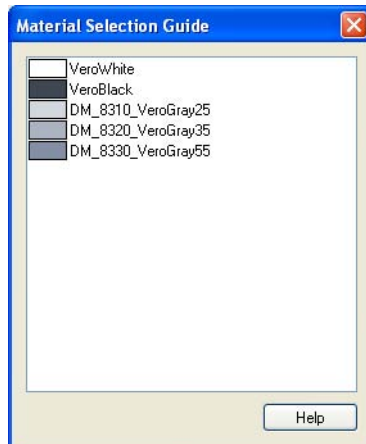

Figure 5-17: Material Selection Guide, showing the digital materials available with the two basic model materials

Assigning a Model Material to Objects

You can assign any of the available digital materials to objects on the build tray.

To assign a model material to objects:

1. Select an object on the build tray (see "Selecting Objects" on page 8).

   When an object is selected, its properties are displayed in the *object properties* dialog box (in the *Options* tab).
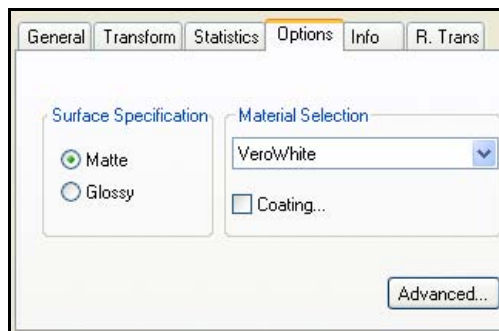
Figure 5-18: Object properties, *Options* tab

2. In the Material Selection section, display the pull-down menu and select the desired material.
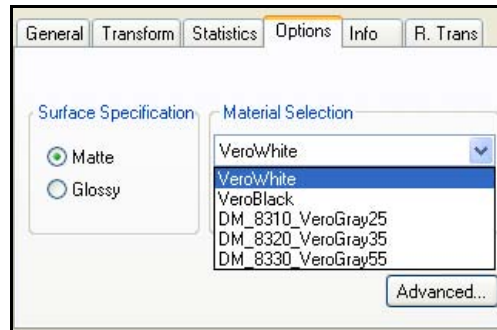

Figure 5-19: Menu for assigning materials to objects

When you de-select the object on the build tray, it is displayed, by default, with the color of the material you selected. In the same way, you can assign model materials to each of the independent objects on the build tray.

Note: If the model-material color is not displayed, click the object-color-display switch.

Figure 5-20: Object-color-display switch

To separate an object into independent, component parts (each an *stl* file), see "Splitting Objects into Components" on page 8.

Coating Objects

You can print composite models where the surface layer is a different material than the inside. This can be useful to achieve unique mechanical and textural characteristics. This technique is called "coating."

To coat an object with a different model material:

1. Select an object on the build tray.

2. In the object properties dialog box (see figure 5-18), click ☐ Coating...
    The *Coat with* dialog box opens.

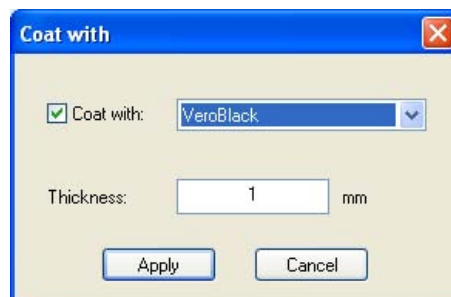3. Select Coat with and, from the pull-down menu, select the coating material.

Figure 5-21: Coating material selected

4. In the *Thickness* field, enter the coating thickness, in millimeters, between 0.3 and 3.

   Note: The coating thickness does not affect the external dimensions of the object, which remains unchanged. The coating layer replaces part of the main model material.

5. Click Apply.

   In the object properties dialog box, Coating is selected.

   Note: When you de-select objects, they are displayed, by default, with colors representing the model-material. Even after adding a coating to an object, its color remains that of the main material, not the color of the coating material.

To inspect, modify or remove the coating applied to an object:

1. In the object properties dialog box, click ☐ Coating...

   The *Coat with* dialog box opens.

2. Perform one of the following actions—

   • Change the coating settings, and click Apply.

   • To remove the coating, clear the *Coat by* check box and click Apply.

   • To keep the current coating settings, click Apply or Cancel.

Assigning Properties to Hidden Objects

To enable you to assign materials and other properties to parts of objects that are hidden from view in the build-tray display, you can temporarily turn off the display of some objects.

To prevent the display of objects:

1. Right-click an object, either on the build tray or in the hierarchy pane.

2. From the menu that opens, select one of the following options—

   • Hide, to cause the selected object to disappear

   • Hide Others, to cause all other objects on the build tray to disappear, so that only the selected object is displayed

Alternately, you can clear the check box next to the name of the object in the hierarchy pane to cause that object to disappear.
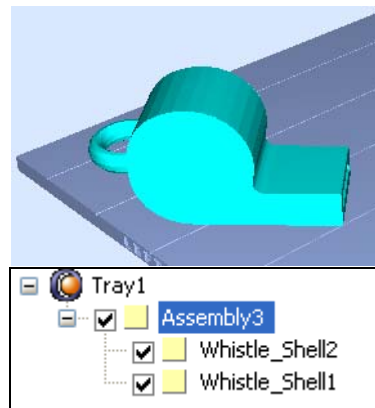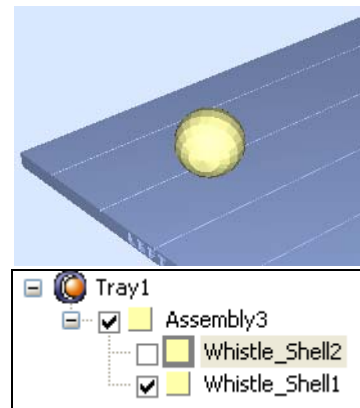

Figure 5-22: All objects shown

Figure 5-23: Outer object hidden

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 5-6 on page 5). 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 5-6 on page 5).

      By default, the object properties dialog box is also displayed.

   ❐ 3 Views adds *top* and *front* views to the default screen layout (see figure 5-25, below).

   ❐ 4 Views displays *top*, *front* and *right* views (see figure 5-26).

   ❐ 1 View expands the *perspective* view to fill the screen (see figure 5-27).

➢ You can also change the screen layout with toolbar icons.

Figure 5-24: Screen layout icons
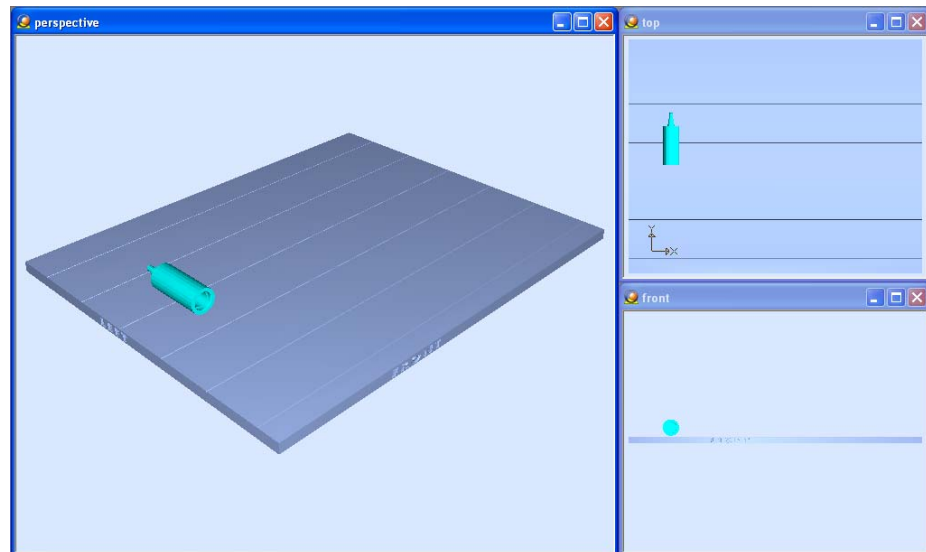
Figure 5-25: 3-view screen layout
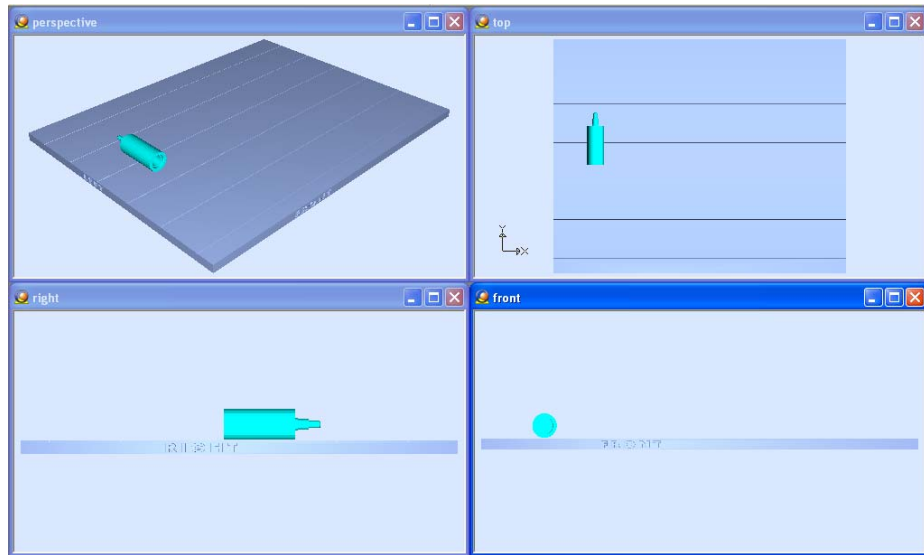
Figure 5-26: 4-view screen layout
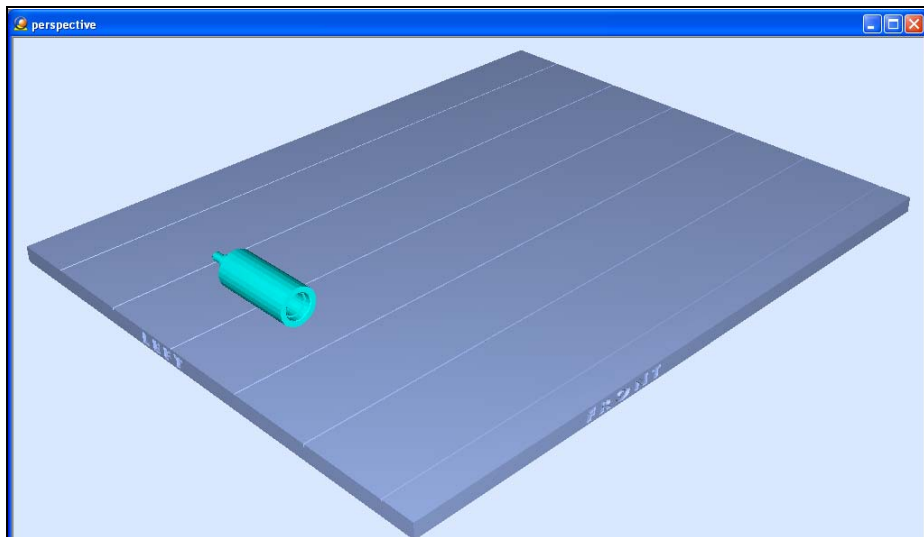
Figure 5-27: 1-view screen layout

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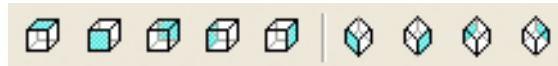

Figure 5-28: Viewing-pane perspective icons

Positioning Objects on the Build Tray

To produce models efficiently and with the required finish, it is important to carefully position objects on the build tray. Objet Studio features the automatic positioning of objects. However, you should check to make sure that the objects are orientated logically for your needs, according the considerations explained in "Model Orientation" on page 5-18.

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.
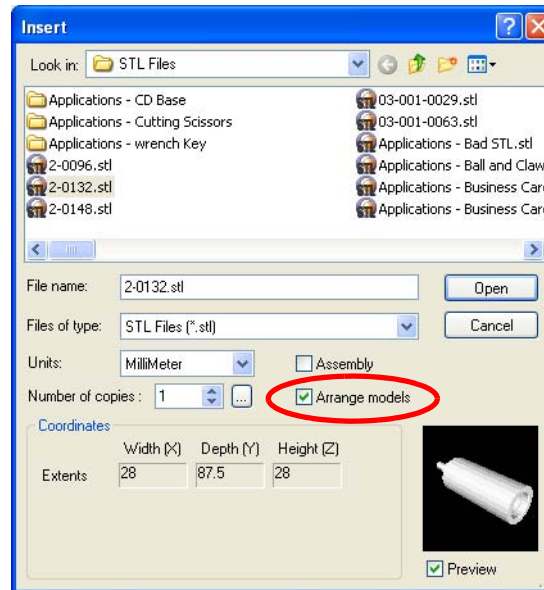
Figure 5-29: *Arrange models* option in the *Insert* dialog box

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 5-30 and 5-31.
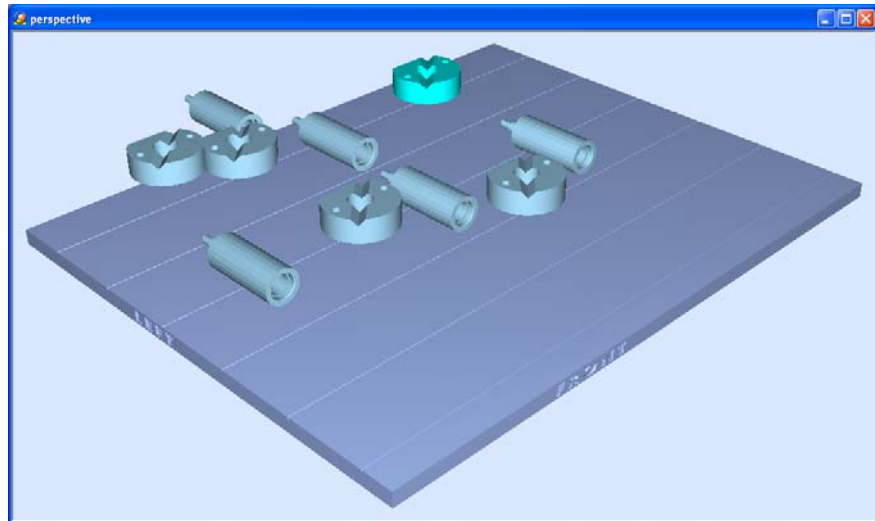
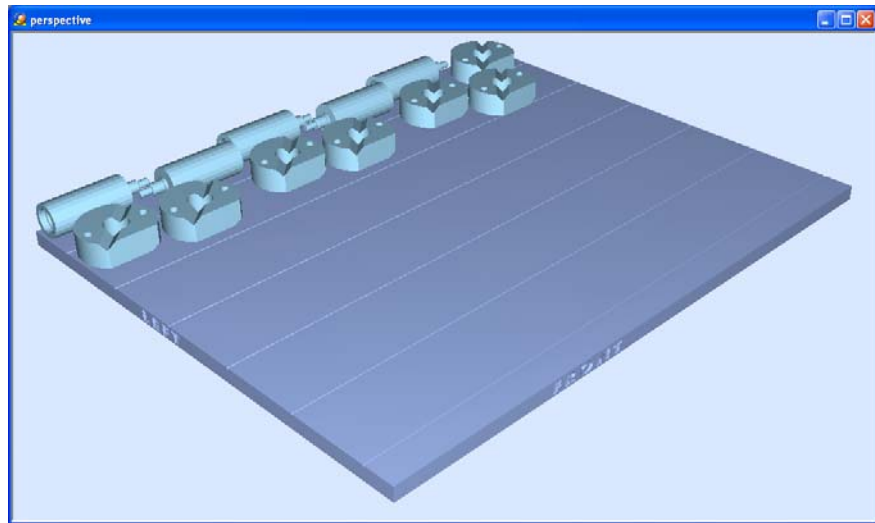Figure 5-30: Tray before objects are properly arranged

Figure 5-31: Tray after objects have been automatically arranged

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

Manual
Positioning

You can manually position objects on the build tray—even if they were inserted using automatic placement (with the *Arrange models* option selected in the *Insert* dialog box). Considerations for positioning objects are reviewed in "Model Orientation" on page 5-18. Tools for changing the position of objects are described in "Repositioning Objects" on page 5-20.

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 5-16), 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 Connex 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 🔲ᵢ.

   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.
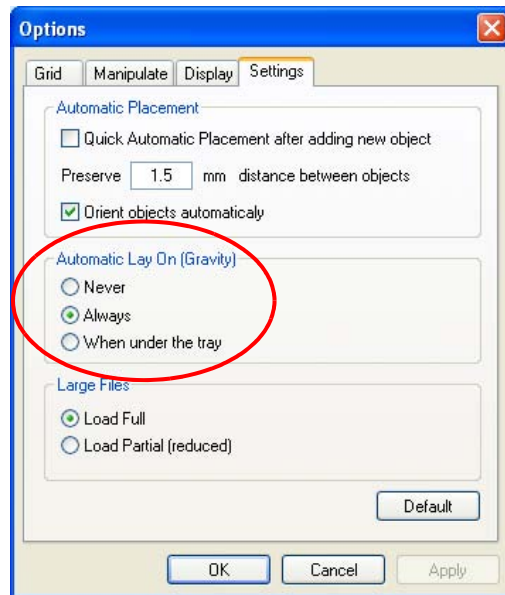
Figure 5-32: *Options* dialog box, *Settings* tab

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

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

- When under the tray—The display of objects that are below the build tray is automatically changed so that the object is at tray level.

- Never—The display of objects that are above or below the build tray is not changed.

Repositioning Objects

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

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

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

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

Click to move the object 20 mm along the X-axis.

Click to move the object 20 mm along the Y-axis.

Click to move the object 30 degrees on the Z-axis.

Click to rotate the object 30 degrees on the X-axis.

Click to rotate the object 30 degrees on the Y-axis.

Click to rotate the object 30 degrees on the Z-axis.

Viewing Object Properties

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

The object-properties dialog box is displayed by default (see figure 5-6 on page 5) and whenever the screen layout is changed or refreshed (see "Arranging the Objet Studio Screen" on page 5-14).
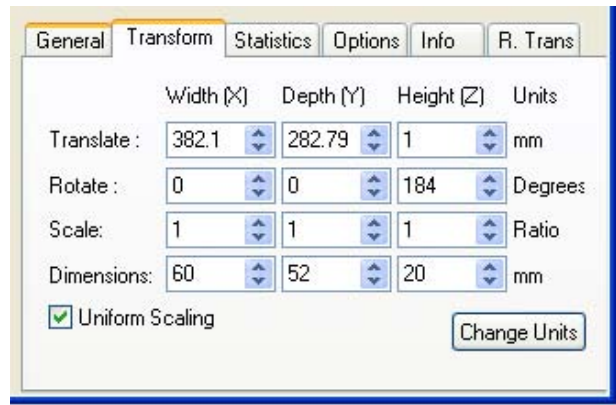
Figure 5-33: Object properties dialog box, *Transform* tab

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

Note: You can only change the height of the objects on the build tray if this is allowed by the Objet Studio settings (see "Object Position on the Z-Axis" on page 5-19.)

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

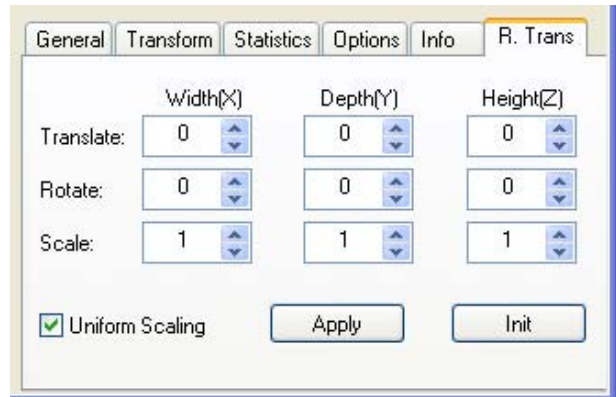- The *R. Trans* tab of the object properties dialog box.

Figure 5-34: Object properties dialog box, *R. Trans* tab

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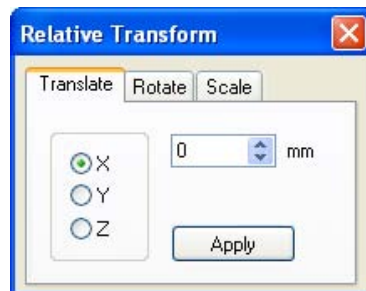

Figure 5-35: *Relative Transform* dialog box

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 5-43 on page 27).

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 32).

Grouping and Ungrouping Objects

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

- Selecting multiple objects

  Manipulating done to one object affects all selected objects. For example, turning one object on its axis causes all selected objects to turn on their respective axes.

- Converting the objects to an assembly

  Separate objects become parts of one unit. For example, turning the assembly on its axis causes the whole assembly to turn as one unit.

To convert objects to an assembly:

1. Select the objects (see "Selecting Objects" on page 5-8).
2. Click the *Group to Assembly* icon 🔲.

   or—

   From the *Object* menu, select Group to Assembly.

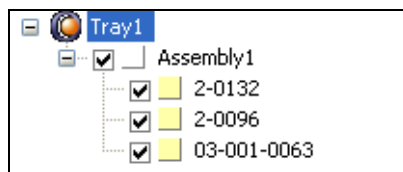   In the tray hierarchy pane, the objects now appear under "Assembly."

Figure 5-36: Assembly in the tray hierarchy pane

The tray hierarchy pane does not display the assembly file name unless you import it as an *objdf* file.

After creating an assembly, you can save it as an *objdf* file, for re-use. (Saving the assembly is not necessary for manipulating and printing it).

To save an assembly:

1. Select the assembly, (either on the build tray or in the tray hierarchy pane).

2. From the *Object* menu, select Export as OBJDF File...

3. In the *Save As* dialog box, choose a location, name the file, and click Save.

To separate assemblies into individual objects (*stl* files):

1. Select the assembly (either on the build tray or in the tray hierarchy pane).

2. Click the *Ungroup* icon ⊞.

   or—

   From the *Object* menu, select Ungroup.

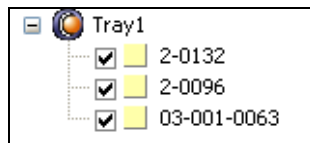   In the tray hierarchy pane, the elements now appear as separate objects.

Figure 5-37: Objects in the tray hierarchy pane

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:

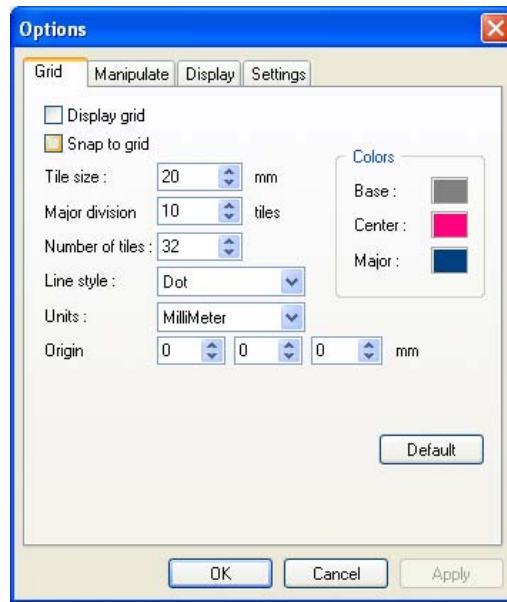1. From the *Tools* menu, select Options, and display the *Grid* tab.

Figure 5-38: *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 5-20).

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

• From the *Plane Alignment* toolbar:

1. Click the *Select Plane* icon .

2. Click a plane on an object displayed on the build tray.

3. Click the appropriate align icon—

 Align Bottom

 Align Top

 Align Front

 Align Back

 Align Left

 Align Right

• From the *Tools* menu:

1. Select Plane Alignment > Select Plane.

2. Click a plane on an object displayed on the build tray.

3. Select Plane Alignment > Align Bottom/Top/Front/Back/Left/Right (as appropriate).

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

To flip an object 180 degrees on any axis:

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

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

1. Select the object.
2. Display the *Transform* tab or the *R. Trans.* tab of the object properties dialog box (see figure 5-33 on page 21 and figure 5-34 on page 21).

   or—

   From the *Object* menu, select Relative Transform (see figure 5-35 on page 21).
3. Change the *Rotate* values for the desired axis.

Freezing an Object's Orientation

If you manipulate an object on the build tray, you can freeze its orientation so that it does not change when you perform Automatic Placement (see "Automatic Positioning" on page 5-16).

To freeze an object's orientation:

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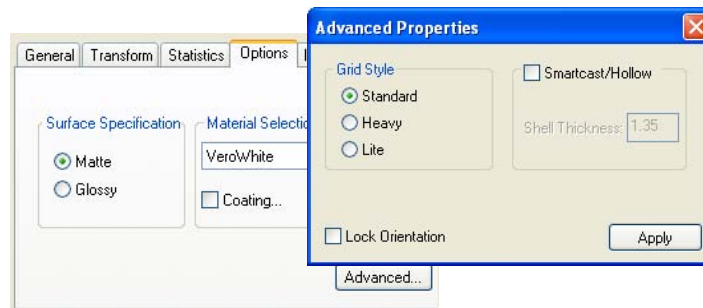
   The *Advanced Properties* dialog box opens.

Figure 5-39: *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 object properties dialog box, select Matte or Glossy.

or—

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

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

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

You can distinguish between the finish of objects on the build tray by their color. When they are *not* selected, objects are displayed in a different shade of green for each finish. Because objects can also be displayed with the colors of the model material, a toolbar icon enables you to switch between the object color display, as follows:

A. Objects are displayed with the model-material color.

B. Objects are displayed with colors to indicate the finish (matte/glossy).

Figure 5-40: Object-color-display switch

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.
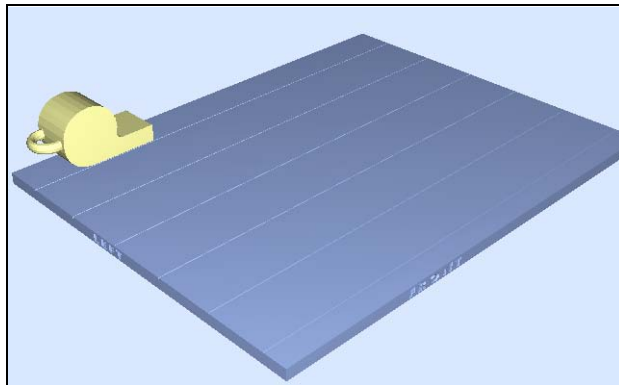

Figure 5-41: Tray and model displayed in *shaded* view

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

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

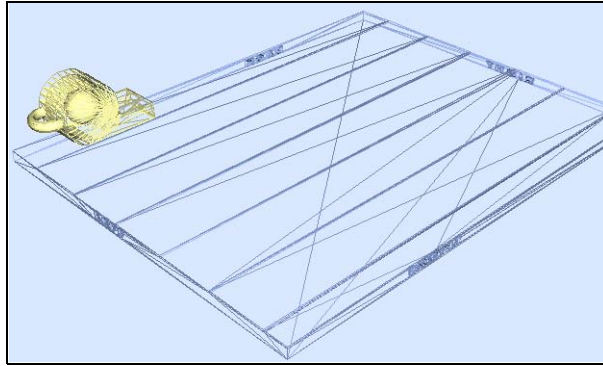➢ Select View > WireFrame or click the *WireFrame* icon ⬡ .

Figure 5-42: 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:
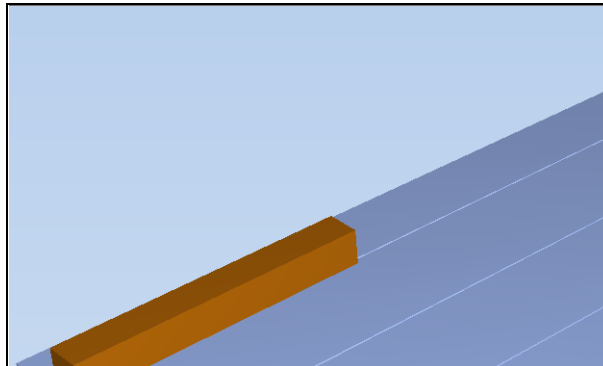
➢ Select View > Display Bounding Box.

Figure 5-43: Model displayed with bounding box

To display the area around objects needed for support material (to produce a matte finish):
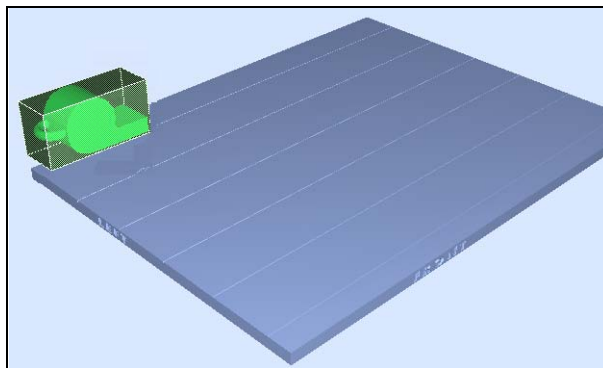
➢ Select View > Display Thickening Box.

Figure 5-44: Model displayed with thickening box

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

To change the colors displayed in Objet Studio screens:

1. From the *Tools* menu, select Define Colors.

2. In the *Define Colors* dialog box, click the color patch you want to change:

    - *Tray Color*—to change the color of the build tray
    - *Background Color*—to change the background color
    - *Selection Color*—to change the color of objects that are selected

Figure 5-45: *Define Colors* dialog box

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

4. Click OK.

The color of objects on the build tray—when they are *not* selected—can indicate either the color of the model material or the surface finish (matte or glossy) of the printed model.

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

1. In the *Define Colors* dialog box, select one of the options.

    - Show color according to material.
    - Show color according to building style.

2. Click OK.

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

Figure 5-46: Object-color-display switch

Before sending a build tray to the printer, or when you perform *tray validation*, Objet Studio checks if there is a problem with the *stl* files or the positioning of objects on the tray. If so, the affected objects are displayed with special colors (see "Tray Validation" on page 5-32).

Displaying
Large Files

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

To display an image of *stl* files when you place objects on the build tray:
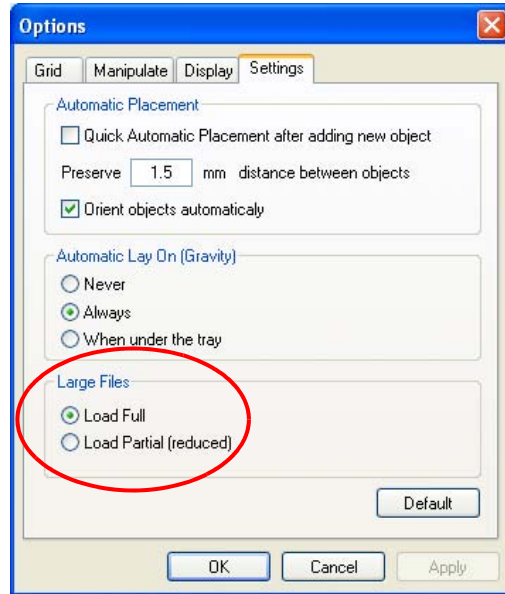
1. From the *Tools* menu, select Options, and display the *Settings* tab.

Figure 5-47: *Options* dialog box, *Settings* tab

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

Tray Viewing Options

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

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

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

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

Handling Completed Trays

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

Tray Validation   Before sending a job to the Connex 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 5-48: Tray validation warning

To view the color code for objects displayed:

➢ From the *Tools* menu, select Constraints Settings.
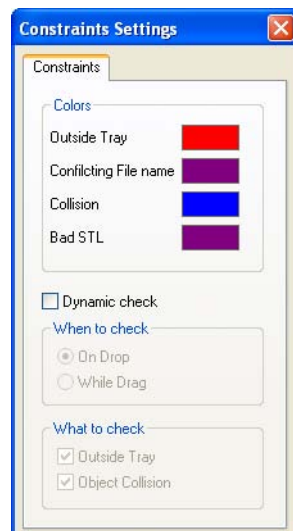
Figure 5-49: *Constraints Settings* dialog box, showing object color codes

Production
Estimates

Objet Studio enables you to calculate the time and material resources needed for producing trays before sending them to the Connex 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 in one of the following dialog boxes.
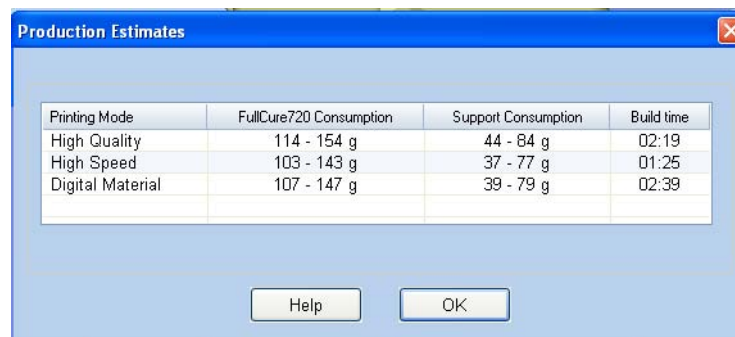
Figure 5-50: Production resource calculations for different printing modes
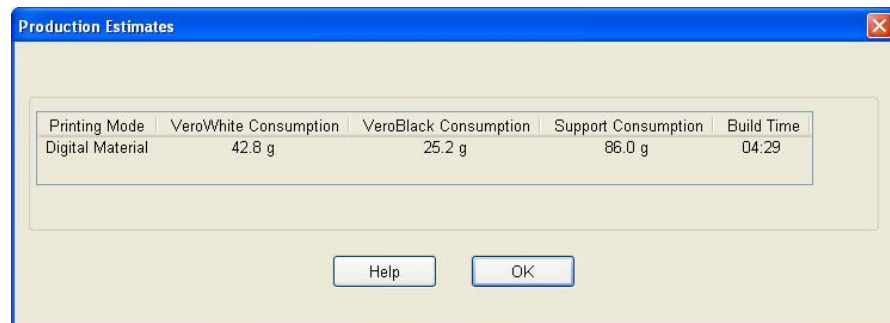
Figure 5-51: Production resource calculation—Digital Material mode only

As shown in the *Production Estimates* dialog box, the resources needed for producing the models on the tray depend on the printing mode used by the printer when producing the job. You might want to consider these estimates when deciding on the printing mode (see below) and whether or not to allow using substitute model materials when printing the job.

Note: You select the printing mode and material substitute options after you send the build tray to the printer (see "Printing the Tray File" on page 35).

Printing Modes   Connex printers can build models using three possible printing modes.

High Quality Mode—

- Models are printed in 16-micron layers, resulting in smooth surfaces, suitable for producing fine details and delicate items.
- Almost twice as much time is required to print most trays, compared to the High Speed setting.
- This setting is only available when using all four print heads in *single-material printing*.

Single-material printing: All print heads print models without regard to the source of the model material. This happens in the following situations:

- All print heads are supplied with one model material.
- Each pair of print heads is supplied with a different model material, but models are printed *as if they were the same material*. The result is an arbitrary mixture of materials in the printed model.

High Speed Mode—

- Models are produced in 30-micron layers, suitable for producing larger models.
- Much less time is required to print most trays, compared to the High Quality setting.
- This setting is only available when using all four print heads in *single-material printing*.

Digital Material Mode—

- Used when producing models designed to be made from two different model materials.
- Used when producing a tray containing two or more models, each designed to be made from a different (single) model material.
- Used when producing models from only one of the model materials loaded in the printer by printing with two of the four print heads.
- Models are produced in 30-micron layers, but the printing is near-high quality.
- Printing time is similar to printing time in High Quality mode.

  Although printing time is longer than with High Speed mode, Digital Material mode can make material replacement unnecessary—saving both time and the cost of wasted model material.

Digital Material Mode is selected automatically when more than one model material is assigned to objects on the build tray.

You can see estimates of time and material resources needed for printing trays using the different printing modes (see "Production Estimates" on page 33). You also see these production estimates when you send the build tray to the printer. At that time, you can select the printing mode, including an option that enables Objet Studio to print the build tray by the most efficient method (see "Printing-Mode Selection" on page 36).

Saving the Tray File

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

To save the tray file:

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

or—

➢ Click 💾.

Printing the Tray File

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

To send the tray to the print queue:

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

    or—

    Click 🖼️.

    • If printing the tray requires two model materials (Digital Material mode), the *Job Summary* dialog box opens.
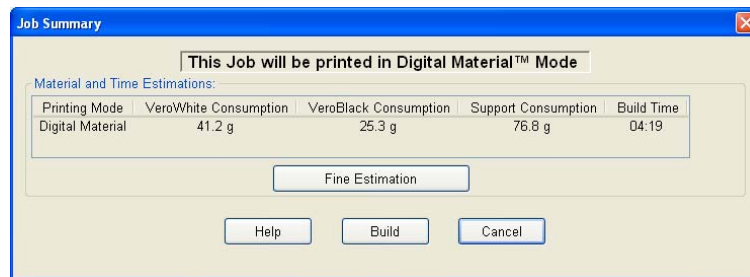
Figure 5-52:Job Summary when printing with two model materials

Note: The values displayed are the result of a quick calculation, and represent a rough estimate of the materials and time required to print the job. For a more accurate calculation, click Fine Estimation.

➢ Continue with step 4 on page 37.

• If printing the tray requires only one model material, the *Printing Mode Selection* dialog box opens.
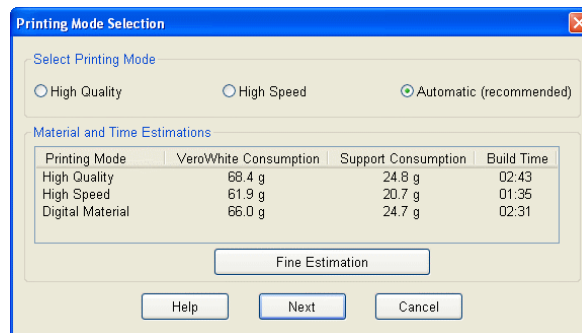

Figure 5-53:*Printing Mode Selection* dialog box

Note: The values displayed are the result of a quick calculation, and represent a rough estimate of the materials and time required to print the job. For a more accurate calculation, click Fine Estimation.

Printing-Mode
Selection

2. Select the appropriate printing mode.

- If you require the job to be printed in High Quality mode, select this option.

- If you require the job to be printed in High Speed mode, select this option.

- If you do not require the job to be printed either in High Quality or High Speed mode, select Automatic.

  This setting enables the Connex software to determine (just before printing) the most efficient way to print the tray. Digital Material mode is used if this saves the need to perform the Material Replacement procedure. Otherwise, High Speed mode is used.

  For example, if printing the tray requires only one of the two model materials loaded in the printer, only the two print heads using that material are used to print models—Digital Material mode. (High Quality and High Speed modes require printing with all four heads, which would require you to perform the Material Replacement procedure.)

  On the other hand, if printing the tray can be done using all four print heads without running the Material Replacement procedure, High Speed mode is used to print models. This is possible if all print heads are supplied with one model material, or if you allow printing with an arbitrary mixture of similar materials (see "Model Material Substitution," below).

Model Quality When Digital Material Mode is Used

- Near-high-quality is achieved for most models.

- A tray of objects inserted from *stl* files are printed with the standard 600 dpi (dots per inch) resolution along the Y-axis—unless glossy finish is required (see "Surface Finish" on page 25).

- If there is an assembly on the build tray, all of the models on the tray are printed with a resolution of 300 dpi along the Y-axis.

3. Click Next.

   The *Model Material Substitution* dialog box opens—if this is relevant for the build tray. (If not, the *Job Summary* dialog box opens—continue with step 4.)
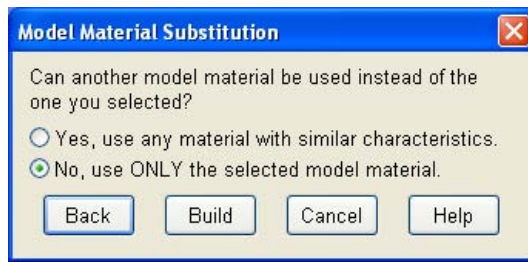
Model Material
Substitution

Figure 5-54: *Model Material Substitution* dialog box

If you allow the use of substitute model materials, the printer will use different materials whose characteristics (strength, flexibility, etc.) are similar to those of the material you assigned to the object when designing the build tray—under the following conditions:

- The material you assigned is not installed in the printer at the time of printing.

  In this case, the tray is printed with either one or two substitute materials (depending on the materials installed in the printer at the time of printing). If possible, High Speed mode is used.

- In addition to the material you selected, there is another (similar) material installed in the printer at the time of printing.

  In this case, High Speed mode is used, by printing with a mixture of the two materials (as if they were the same material).

4. Click Build.

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

   Objet Studio checks if there is a problem with the positioning of objects on the tray. If so, the affected objects are displayed with special colors (see figure 5-49 on page 5-32), and the following warning message appears.

Figure 5-55: Tray validation warning

- To cancel the *Build* command so you can correct the problem, click No.

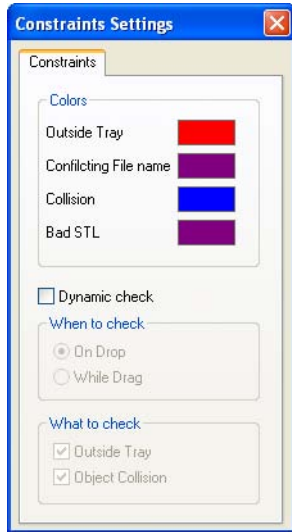• To print the models as they are positioned on the tray, click Yes.

Figure 5-56: *Constraints Settings* dialog box, with color codes for problematic model positioning

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

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

Additional Objet Studio Features

Dividing Objects

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

To split an object:

1. Select the object.

2. From the *Object* menu, select Split.

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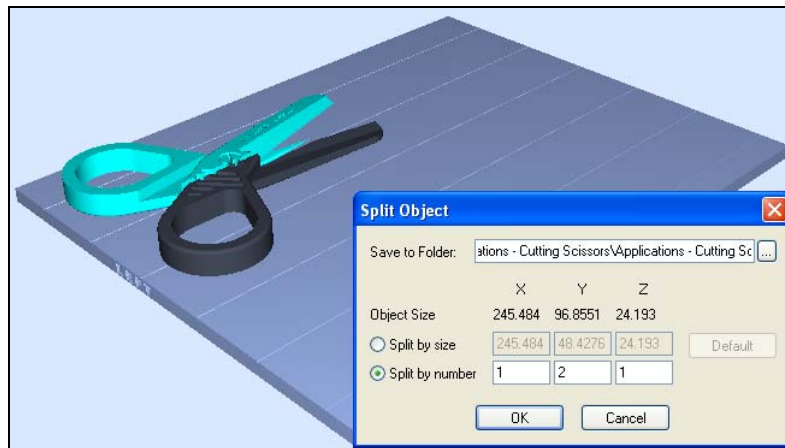

Figure 5-57: *Split Object* dialog box

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

5. Click OK.

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

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

Choosing the Support Strength

When producing models, support material fills some hollow and empty sections (see "Model Orientation" on page 5-18). Objet Studio allows you to adjust the strength of the structure formed with the support material. This adjustment is useful when producing either large/massive models or small/ delicate models. For most purposes, the default setting provides adequate support strength.

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

1. Select a model on the build tray.

2. In the *Options* tab of the object properties dialog box, click Advanced.

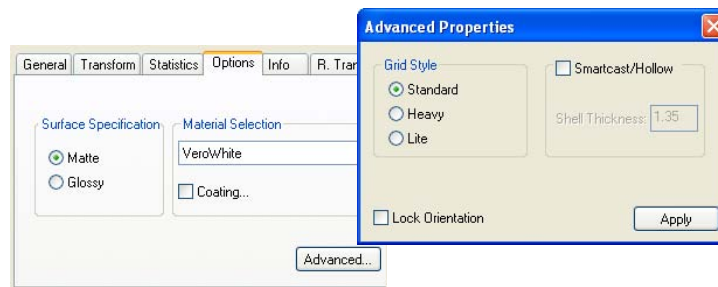The *Advanced Properties* dialog box opens.

Figure 5-58: *Advanced Properties* dialog box—Grid Style selection

3. In the *Grid Style* section, choose the support strength suitable for the selected model:

- Heavy—for large models needing much support.
- Lite—for delicate models needing little support.
- Default—for models needing average support (most models).

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

4. Click Apply.

The *Lock Orientation* and *Smartcast/Hollow* options are not connected to the Grid Style selection. *Lock Orientation* is described in "Freezing an Object's Orientation" on page 5-25. *Smartcast/Hollow* is described below.

"Smartcast"— Filling Models with Support Material

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

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

To use the Smartcast/Hollow feature:

1. Select a model on the build tray.

2. In the *Options* tab of the object properties dialog box, click Advanced.

   The *Advanced Properties* dialog box opens (see figure 5-58).

3. Select the *Smartcast/Hollow* check box.

4. Set the shell thickness, in millimeters.

5. Click Apply.

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

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

1. Select a model on the build tray.

2. Access the *Advanced Properties* dialog box, as above.

3. If you change or cancel the Smartcast/Hollow setting, click Apply.

Displaying the Cross Section of Objects

The *Section* feature enables you to view the interior of an object by "slicing" it on any axis. You can then manipulate the object to inspect the interior from different angles. This may be important for deciding on the type of support necessary when producing the model (see "Choosing the Support Strength" on page 5-39). 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 5-59: *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.
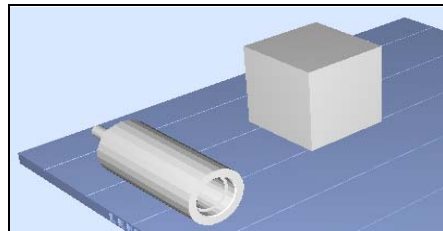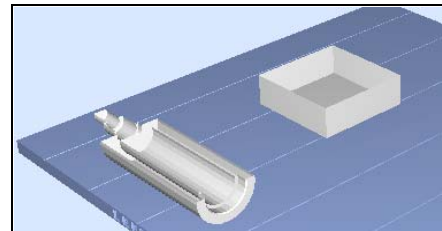

Figure 5-60: Whole view

Figure 5-61: 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…
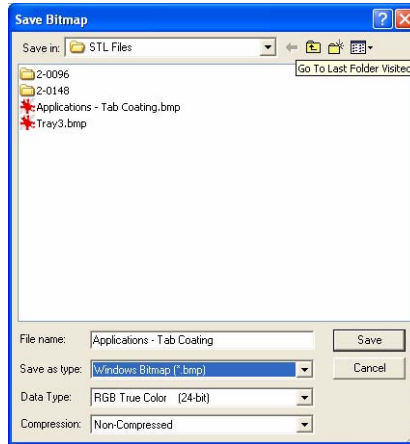
   The *Save Bitmap* dialog box opens.

Figure 5-62: *Save Bitmap* dialog box

2. At the top of the dialog box, select the appropriate folder.

3. At the bottom of the dialog box, enter a file name.

4. Open the *Save as type* pull-down menu, and select the file format.

5. Click Save.

Exporting and Importing Objet Build Trays

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

To create an *objzf* file:

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

   The *Save As* dialog box opens.

2. Select the appropriate folder and change the file name (if necessary).

3. Click Save.

To open an *objzf* file:

1. From the *File* menu, select Import Packed Job…

2. In the *Open* dialog box, display the appropriate folder and select the file.

3. In the *Browse for Folder* dialog box, display the folder in which you want Objet Studio to expand the compressed file, and click OK.

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

Advanced-Mode Features

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

To see the current Objet Studio setting:
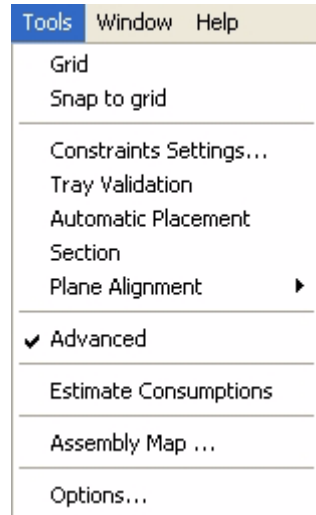
➢ Open the *Tools* menu.

Figure 5-63: *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.
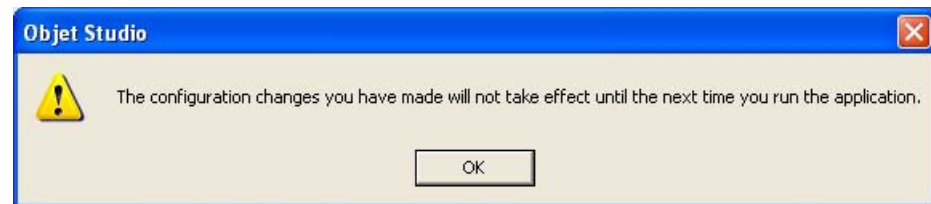

Figure 5-64: Configuration-change message

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

Save Tray As... In addition to saving the tray as an *objtf* file, for producing it with an Connex 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:
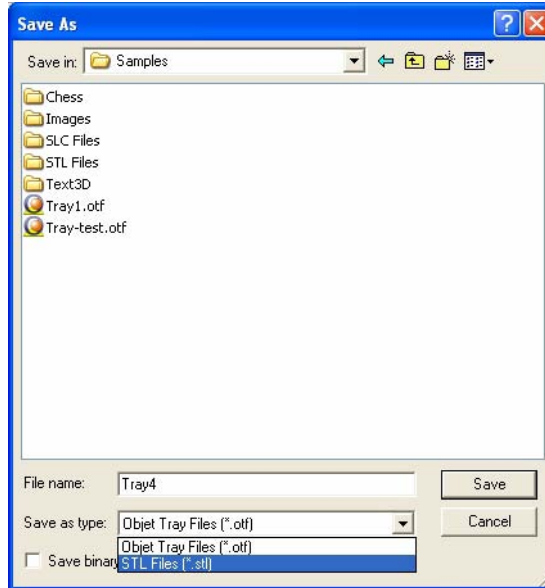
1. From the *File* menu, select Save Tray As...

Figure 5-65: *Save As* dialog box

2. At the top of the dialog box, select the appropriate folder.

3. At the bottom of the dialog box, enter a file name.

4. Open the *Save as type* pull-down menu, and select STL Files (*.stl).

5. Click Save.

To display *stl* files without the build tray:

1. From the *File* menu, select Open Tray.

2. In the *Open* dialog box, open the *Files of type* pull-down menu, and select STL Files (*.stl).

3. Click Open.

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

Configuring
the GL Driver

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

To access the *OpenGL Driver Configuration* dialog box:

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

2. In the *Options* dialog box, display the *Advanced* tab and click OpenGL Driver Configuration…

Figure 5-66: 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.

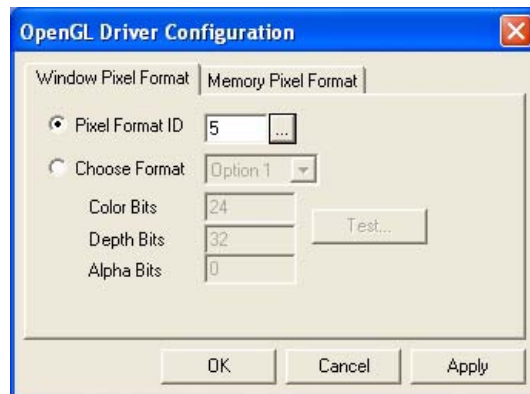The dialog box that opens contains tabs that display the pixel format ID (index) for the window and the memory.

Figure 5-67: *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 5-68: Recommended pixel format ID

3. Click OK.

4. In the OpenGL Driver Configuration dialog box (figure 5-67), 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 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 Connex 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.
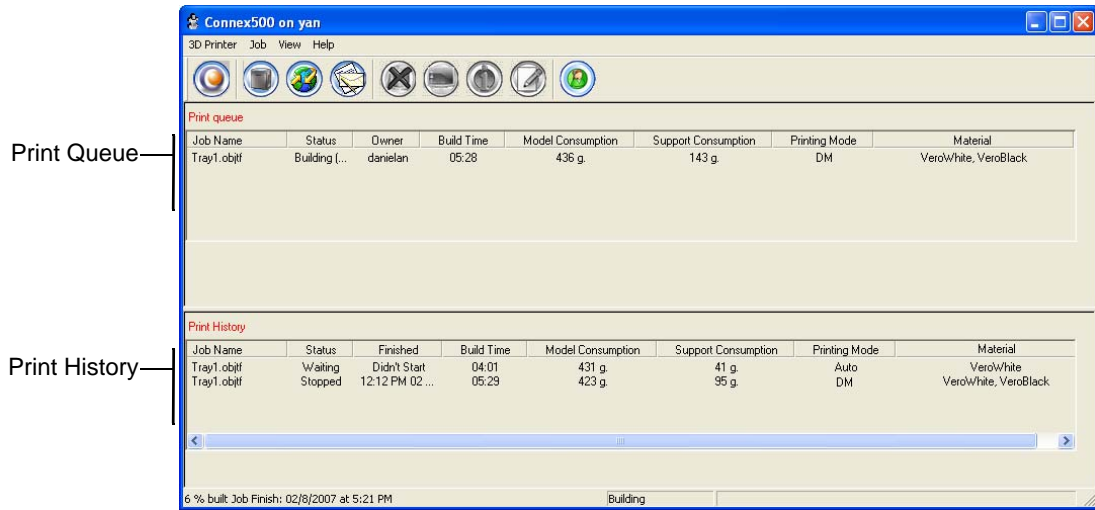
Print Queue —

Print History —

Figure 6-2: Client Job Manager screen

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

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

Job Manager Operations

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

To inspect the build tray:

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

     Objet Studio opens, displaying the build tray. To make changes to it, see "Making changes to a Job" on page 6-9.

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.
	3-D Printer > Report	Displays options for user messages and alerts (paper printer, e-mail, SMS—see "Configuring User Alerts" on page 6-4).
	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 .

Configuring User Alerts

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

●   The level of model or support material is low.

●   The job was interrupted.

●   The job was completed successfully.

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

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

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

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

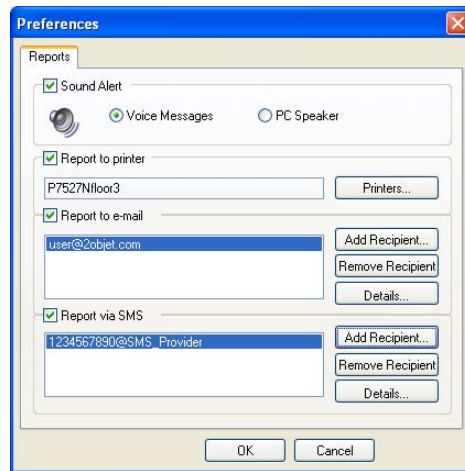   The *Preferences/Reports* dialog box opens.

Figure 6-3: 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 6-4: 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.