

Operating & Maintaining the Connex500/350 3-D Printer

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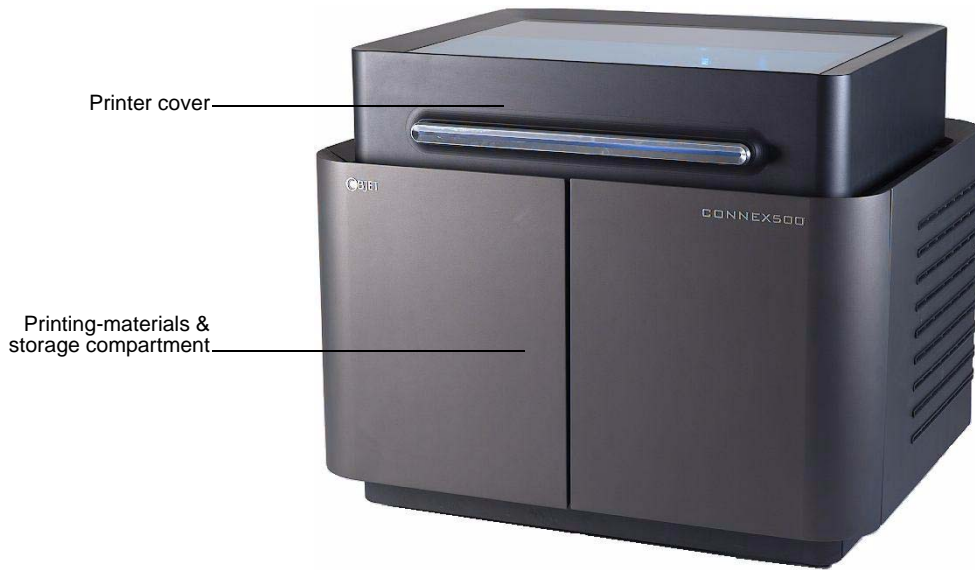


Figure 7-1: The Connex500 3-D Printer

Starting the Connex Printer



CAUTION!

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

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



Figure 7-2: Main power cable and switch

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

2. After the computer boots, log in to Windows and launch the Connex control application:
 - On the computer desktop, double-click the Connex printer icon.
 - or—
 - From the *Start* menu, select *Objet > Connex500/350Connex500/350*.



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

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

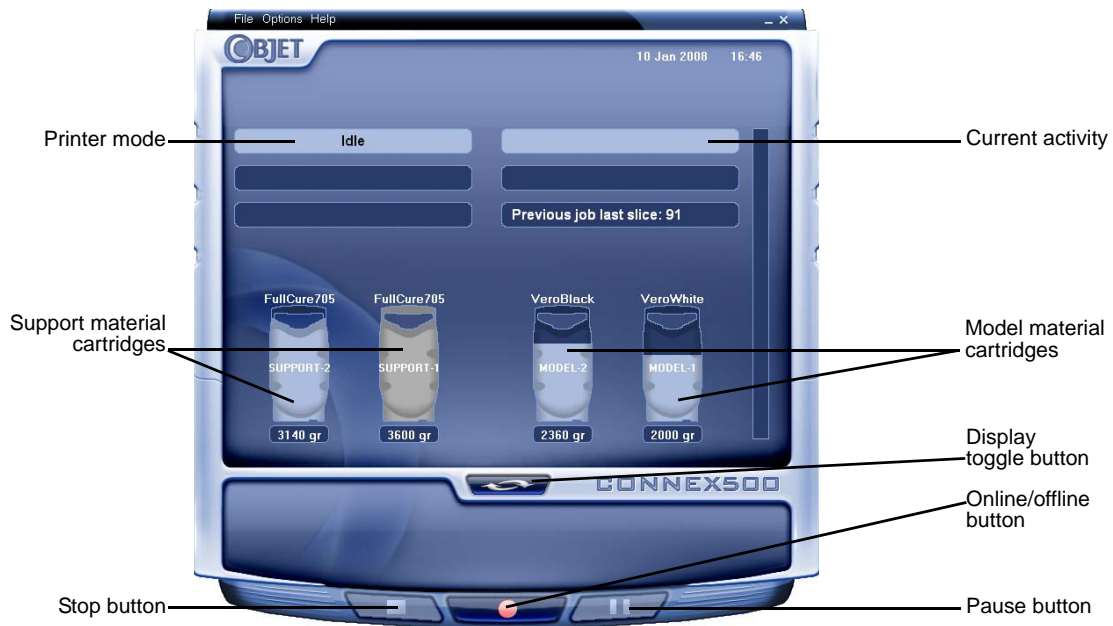


Figure 7-3: Connex500 interface



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

Loading Model and Support Cartridges

Connex printers use two cartridges of model material and two cartridges of support material, each weighing 3.6 kilograms when full. A graphical representation of the cartridges and their current weight appears in the printer interface (see figure 7-3).



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

Important: If you need to replace the model material currently installed with another type, see “Changing the Model Material” on page 7-10. Otherwise, make sure to replace the model cartridge with one containing the same type of material.

To load model and support cartridges:

1. On the front of the Connex printer (see figure 7-1), pull open the doors of the storage compartment.
2. If you are replacing a cartridge, grasp its handle and pull the cartridge out, taking care not to twist or turn it.
3. Load model and support cartridges into their respective compartments—the model cartridge on the right, and the support cartridge on the left. (Note that the cartridges only fit into their correct compartments.)
You should feel some resistance, as a needle pierces the cartridge.
4. Check the Connex printer interface to make sure that the new cartridge is detected and that its weight is displayed (see figure 7-3).
5. Close the storage-compartment door.



Tips about replacing cartridges:

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

Producing Models

The Connex500/350 printer produces models by printing tray files prepared in the Objet Studio application and sent to the printer from there. For information about preparing model files for printing, see "Using Objet Studio" or Objet Studio Help.



Before beginning to produce models, it is recommended that you check the current printing quality of the print heads by performing a pattern test (see "Pattern Test" on page 21).

To prepare the Connex printer for producing models:

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



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

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

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

For changing the type of model material currently loaded, see "Changing the Model Material" on page 10.

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

The color of the button changes from red to green (see figure 7-4). If there is a job in the Job Manager queue, it is sent to the printer.

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

- The print block is heated.
- The UV lamps are powered and they warm up.

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

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



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

The Connex500/350 printer uses one or two model-material cartridges and one support-material cartridge to produce models. If additional cartridges are installed and they are not needed for the current print job, the printer interface indicates which are being used:

- *Blue cartridge*—used for the print job
- *Gray cartridge*—not used for the print job

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

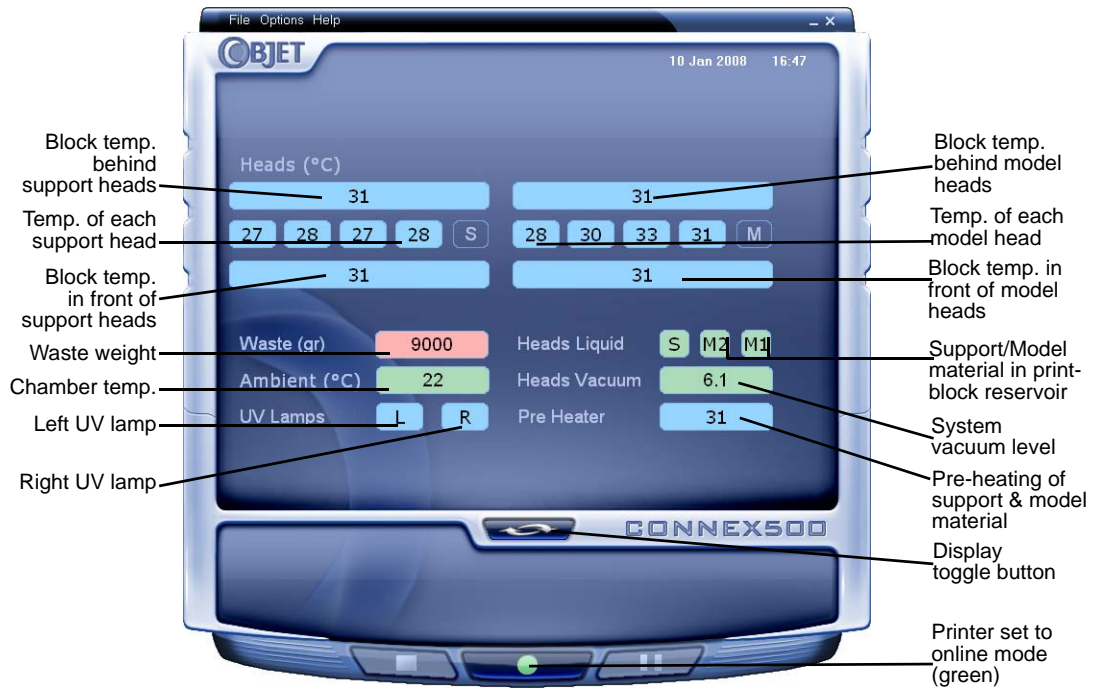


Figure 7-4: Connex printer indicators

Printer Interface Color Key

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

- *Green*—suitable/ready for printing

For example, in figure 7-4:

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

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

For example, in figure 7-4:

- ❑ *Waste*—The weight of the waste container is grams, more than allowed when beginning a print job. (See “Replacing the Waste Container” on page 7-62.)

- *Blue*—not ready

For example, in figure 7-4:

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

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

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

Printing Indicators

The printer interface screen changes when you send a print job from Job Manager to the printer, and the printer is *on line* (see figure 7-5):

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

When the weight of a cartridge drops below 100 grams, the display of the material level in the printer interface is *red*.



Figure 7-5: Connex printer interface during printing

Resuming Production After Printing has Stopped

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

To continue printing the model:


1. Switch the printer to online mode by clicking the red button at the bottom of the Connex printer interface (see figure 7-3 on page 3).
The button changes from red to green (see figure 7-4 on page 6).
2. Make sure that the computer network connecting the printer and Job Manager server is active.
3. In the Job Manager interface, click the *Resume* icon .
4. In the *Continue from Slice* dialog box that appears, confirm the slice number, after checking the Connex printer interface.



Figure 7-6: Connex printer interface after interrupted printing



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

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

You cannot continue printing the model if:

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

If you cannot continue printing:

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



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

Changing the Model Material

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



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

To replace the model material:

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



Figure 7-8: Starting the Material Replacement wizard from the *Options* menu

2. In the opening screen, click Next.
3. If the printer cover is not closed, a screen appears instructing you to close the cover. Confirm that it is closed and click Next.

4. In the *Compartment Selection* screen, select the cartridge(s) you want to replace, and click Next.



Figure 7-9: *Compartment Selection* screen

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



Figure 7-10: *Material Selection* screen

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

6. The Material Replacement Wizard continues as follows:
 - If, according to your selections in the previous wizard screens, you are replacing *both* model material cartridges, and the printer will be loaded with two cartridges containing the *same* model material, the Connex printer flushes the entire system, and prepares for printing in *Single-Material* mode (see below). *Continue with step 8 on page 7-13.*
 - If, according to your selections in the previous wizard screens, you are replacing *both* model material cartridges, and the printer will be loaded with two *different* model materials, the Connex printer flushes the entire system, and prepares for printing in *Digital-Material* mode (see below). *Continue with step 8 on page 7-13.*
 - If, according to your selections in the previous wizard screens, you are replacing only *one* of the model-material cartridges, and the

printer will be loaded with cartridges containing two *different* model materials, the *Printer Mode Selection* screen appears.



Figure 7-11: Printer-mode selection

7. Choose whether you want to produce models in *Single-Material* mode or in *Digital-Material* mode, and click **Next**.

- **Single Material mode**

All four print heads are used to print, using one model material.

- This mode is required to produce build trays with the *High Quality* setting, and to produce trays with the *High Speed* setting using only one model material.

- **Digital Material mode**

Each of the model materials loaded is used in two of the four print heads.

- If only one of the model materials is required for printing, models are produced using two print heads. This makes it unnecessary to replace the other model material cartridge.
- If model-material substitution is allowed, the printer produces trays with the *High Speed* setting using a mixture of both model materials (see “Model Material Substitution” on page 5-37).

Continue with step 8 on page 13.

8. In the *Flushing Options* screen (see figure 7-12), choose how thoroughly you want to flush the system.



Figure 7-12: *Flushing Options* screen

- *Economy*. This cycle can be used when replacing a light-colored model material with a darker material (such as TangoBlack™ or VeroBlack™), or if the exact color of the printed models is unimportant.

The wizard flushes the system with the minimum amount of material needed to ensure that models have the mechanical properties of the new material.

- *Efficiency*. This option is adequate, in almost all situations, for printing models with uniform and accurate color. It is recommended because it can potentially save 25 to 75 percent of the material used to flush out the old material, compared to the *High Performance* cycle. Note, however, that there may be times when the shade (color) of the printed model is slightly affected by material previously used.

The wizard identifies the feed tubes and print heads requiring cleaning, based on your selections in the previous screens, and flushes only these parts of the system.

- *High Performance*. Use this cycle when the printed models must have the *exact color* of the new material.

The wizard thoroughly flushes *all* of the feed tubes and print heads needed for printing, based on your selections in the previous screens. This is done even if a selected material is already present in the system, since it might contain small amounts of material previously used.

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



Figure 7-13: Material Replacement warning screen



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

- To continue, click Next.
- When prompted, load the new cartridge(s). Confirm this in the wizard screen and click Next.



Figure 7-14: Prompt to load new model cartridges

After identifying the new cartridge(s), the Connex printer begins filling the print heads with the new model material.

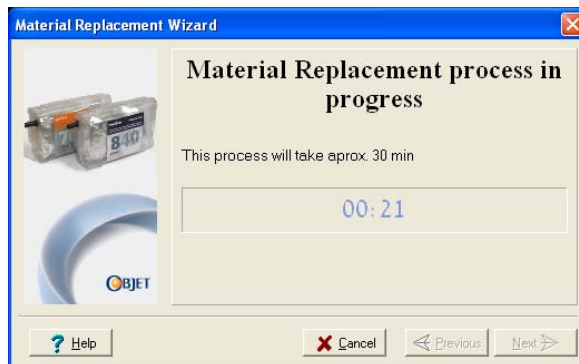


Figure 7-15: Material replacement: filling heads with new material

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



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

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

Keeping the Connex Printer in Idle Mode

Between printing jobs, the Connex500/350 printer can be kept on for up to one week. If the printer will not be used for more than a week, use the shutdown wizard to automatically perform the procedures that must be done before turning off the printer (see “Shutting Down the Connex Printer,” below).

When the Connex500/350 printer stops producing models, the printer software automatically reduces the temperature of the print heads as follows:

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

Note: The printer mode is indicated in the green field on the left of the interface (see figures 7-3, 7-4 and 7-5 on pages 3, 6 and 8).

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

To put the printer into *Idle* mode:

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

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



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

Shutting Down the Connex Printer

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

Depending on the length of time the printer will not be used, you can choose between a short shutdown procedure, and a more thorough procedure.

- **Up to 10 days:** The wizard empties the print block of model and support material, to prevent leaks. This takes about 10 minutes.
- **More than 10 days:** The wizard empties the print block, then flushes the system with cleaning fluid. This takes up to 35 minutes, and you must be present to load cleaning-fluid cartridges when instructed.

To run the Connex Shutdown Wizard:

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



Figure 7-16: Shutdown wizard, opening dialog box

2. In the opening wizard screen, click Next.
3. Choose the appropriate option for the length of time that the printer will not be used—less or more than ten days.
Note: Before selecting *More than 10 days*, make sure that cleaning-fluid cartridges are available.
4. In the next screen, verify that the tray is empty and click Next.

The shutdown procedure begins.

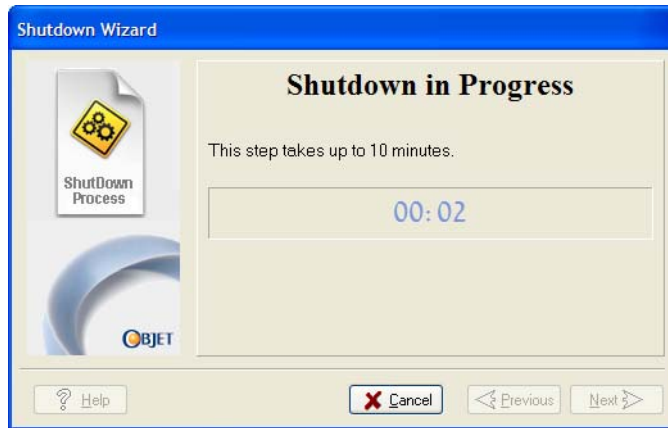


Figure 7-17: Shutdown progress screen

5. When the final wizard screen appears, close the printer-control application and shut down the built-in computer.



Figure 7-18: Final Shutdown Wizard screen

6. After the printer computer shuts down, turn off the main power switch (at the back of the printer) (see figure 7-2 on page 2).

Maintaining the Connex Printer

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

Routine Maintenance Schedule

Frequency	Task	For More Information
Daily, before printing	Clean the print heads.	See "Cleaning the Print Heads" on page 7-19.
Weekly	Clean the build tray and the surrounding area.	
Weekly	Perform the Pattern test.	See "Pattern Test" on page 7-21.
Weekly	Clean and inspect the wiper.	See "Cleaning and Replacing the Wiper" on page 7-23.
Weekly	Restart the Connex printer computer and the server computer.	
Weekly	Clean the roller waste collector.	See "Cleaning the Roller Waste Collector and Inspecting the Roller Scraper (Knife)" on page 7-25.
Every 200 hours of printing (A reminder message appears.)	Test the UV lamps.	See "Testing and Calibrating the UV Lamps" on page 49.
Monthly, and after replacing print heads	Check the alignment of the print heads.	See "Aligning the Print Heads" on page 7-30.
Monthly	Calibrate the load cells.	See "Calibrating the Load Cells" on page 7-51.
Monthly	Inspect the exhaust system (duct, fan, connections).	
Every 2000 hours of printing, or once a year	Preventive maintenance visit by authorized service engineer.	Contact your Objet support center.

Cleaning the Print Heads

Periodic inspection and cleaning of the orifice plates on the bottom of the print block ensures that the print nozzles are not clogged. A wizard guides you through the procedure, and adjusts components of the Connex printer to enable you to perform it. This procedure takes about 20 minutes, and should be done at the beginning of the work day or before a big printing job.

To clean the print heads:

1. Prepare—
 - isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
 - disposable cleaning gloves
 - an Objet-supplied cleaning cloth or equivalent
 - a mirror
2. Start the Heads Cleaning wizard from the *Options* menu of the printer interface (see figure 7-26 on page 23).
3. Follow the instructions on the wizard screens, and select the check boxes to confirm that:
 - you have checked that the tray is empty.
 - you have closed the cover.



Figure 7-19: Head cleaning procedure—wizard screen

4. Click **Next**.
The printer prepares for you to clean the print heads.

- When the following screen appears, open the cover.



Figure 7-20: Head cleaning wizard—steps 5–10



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

- Place the mirror on the build tray.
- Put on the gloves.
- Soak the cleaning cloth with the cleaning fluid.
- Clean the orifice plates, with a back-and-forth motion (see figure 7-21). Use the mirror to make sure that you have removed all of the residue material.

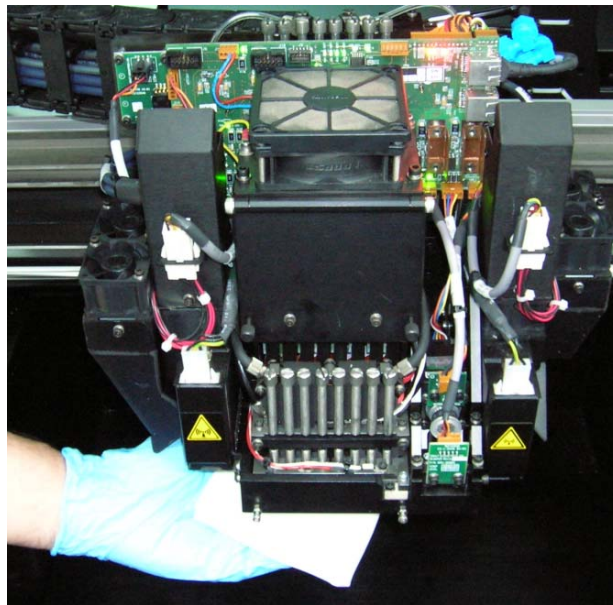


Figure 7-21: Cleaning the heads



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

- When you have finished cleaning, select the confirmation check box in the wizard screen (see figure 7-20) and click Next.

11. Remove the cleaning materials from the printer and close the cover.
12. Select the confirmation check boxes in the wizard screen and click Next.

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



Figure 7-22: Head cleaning wizard—final screen

13. Click Done to close the wizard.

Pattern Test

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

To perform the pattern test:

1. Make sure that the build tray is empty.
2. Prepare a sheet of pink paper—A-4 or Letter size.
3. In the Connex printer, tape the pink paper to the surface left of the build tray.
4. Press F3, or open the *Options* menu and select Pattern Test.

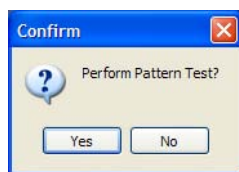


Figure 7-23: Pattern Test confirmation

5. If the build tray is *not* clear, click No in the following dialog box. This lowers the build tray, so that models on the tray are not damaged.



Figure 7-24: Build tray (Z) level adjustment

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

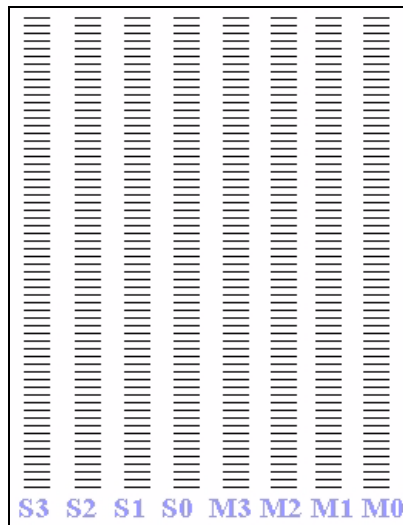


Figure 7-25: Sample Pattern Test

6. Carefully inspect the test paper to see if there are missing lines.
Too many missing lines, especially if they are in the same area, indicates that the quality of printing when producing models will be poor. If this is the case, see “Improving Print Quality,” below.
Note: Acceptable model quality is subjective, and depends on the type and scale (size) of the models produced. As a rule, however, more than 10 missing lines in one area of a column is considered unacceptable.

Improving Print Quality

If you suspect that print quality is poor, perform the pattern test (see “Pattern Test” on page 7-21). If the results are poor, use the following procedure to improve print quality.

If the results of the last pattern test are poor:

1. From the *Options* menu, select *Execute Purge Sequence*, or press F4.
2. In the confirmation dialog box, click *Yes*.
The print heads are purged of model and support material, and the wiper removes excess material from them.
3. Repeat the purge sequence.
4. Perform the pattern test.

If the results of the pattern test are still poor:

1. Manually clean the print heads (see “Cleaning the Print Heads” on page 7-19).
2. Perform the purge sequence.
3. Perform the pattern test.

If the results of the pattern test are still poor:

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

If the results of the pattern test are still poor:

- Replace faulty print heads (see “Replacing Print Heads” on page 7-40).

Cleaning and Replacing the Wiper

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

To inspect and clean the wiper:

1. Prepare—
 - isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
 - disposable cleaning gloves
 - an Objet-supplied cleaning cloth or equivalent
 - a spare wiper
2. Start the Wiper Cleaning wizard from the *Options* menu of the printer interface.



Figure 7-26: Starting the Wiper Cleaning wizard

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

Confirm this in the wizard screen.

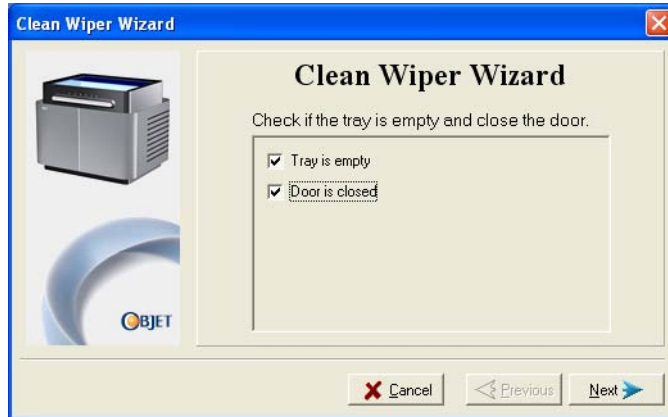


Figure 7-27: Wiper Cleaning procedure—step 4

5. Click Next.
6. When the following screen appears, open the cover.



Figure 7-28: Wiper Cleaning wizard during steps 7–10

7. Put on the cleaning gloves.
8. Using a generous amount of cleaning fluid and the cleaning cloth, remove any material remaining on the wiper and the surrounding area.
9. Inspect the wiper.
If the wiper is scratched, torn or worn, or if you cannot clean it completely, replace it.
 - a. Grasp it and pull it up and out of its bracket.
 - b. Insert the new wiper blade, *making sure that it is straight and secured well on both sides.*
10. In the wizard screen (see figure 7-28), confirm that the wiper blade is clean, and click Next.
11. Make sure that you have removed all tools and cleaning materials from the printer, and close the cover.

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



Figure 7-29: Wiper Cleaning procedure—final confirmation screen

13. Click Done to close the wizard.

Cleaning the Roller Waste Collector and Inspecting the Roller Scraper (Knife)

The roller waste collector removes waste material scraped from the roller. Suction removes this waste to the printer's waste container.

This assembly should be cleaned weekly to prevent a blockage in the tubes leading to the waste container, so that waste material does not overflow into the printer.

To clean the roller waste collector:

1. Prepare—
 - M2.5 and M2 Allen keys
 - disposable cleaning gloves
 - isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
 - cleaning cloth
 - cotton swabs (Q-tips[®] or similar)
2. Put on the gloves.

3. Remove the right UV-lamp assembly:
 - a. Disconnect the UV power cable and the fan power cable.

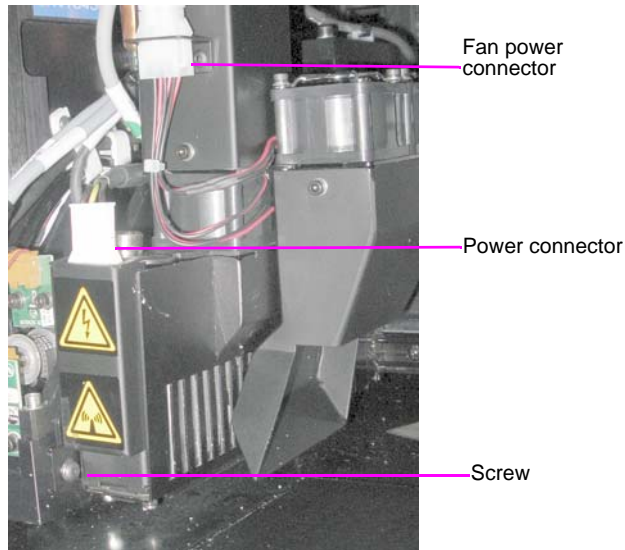


Figure 7-30: Disconnecting the right UV assembly

- b. Remove the screw attaching the right UV lamp to the print block, and then pull and lift up the UV lamp.
4. Loosen the two screws securing the suction tube on the print block

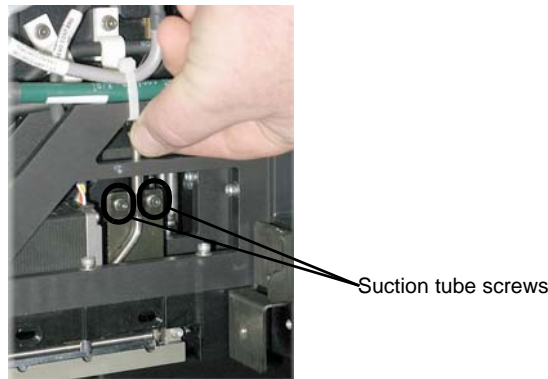


Figure 7-31: Lifting the suction tube

5. Lift the suction tube to secure it in a raised position.
 6. Remove the two screws securing the covering of the roller waste collector and remove it.



Be very careful to save the covering screws. These are special screws, if they are lost you need to order replacements.

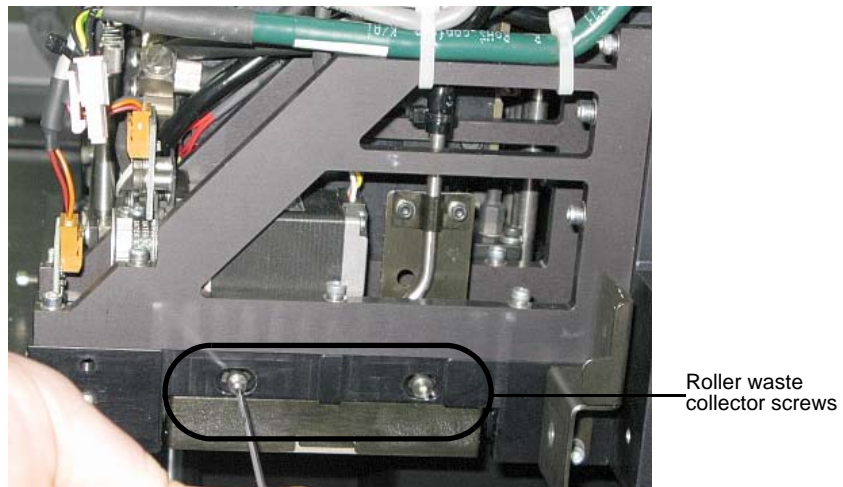


Figure 7-32: Removing the roller waste collector covering

7. Remove the covering by pulling it out, and then lower it.
8. Clean the roller waste collector and the scraper blade surface using cotton swabs. Make sure to remove any remaining printing materials.

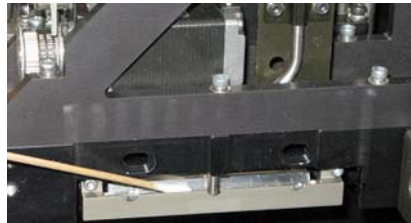


Figure 7-33: Cleaning the roller waste collector



Before replacing the covering you can check the effectiveness of the roller scraper (knife)—see below.

To check the effectiveness of the roller scraper:

1. Put on the cleaning gloves.
2. Wet a cloth with isopropanol.
3. Use the cloth to wet the bottom of the roller.
4. Turn the roller slowly with your hand. As the blade scrapes the roller, make sure the isopropanol is spread evenly over the entire length of the blade
5. Inspect the roller. If it is not dry, replace the blade.
6. Before returning the roller waste collector to the print block, make sure that the pins it rests upon are clean.

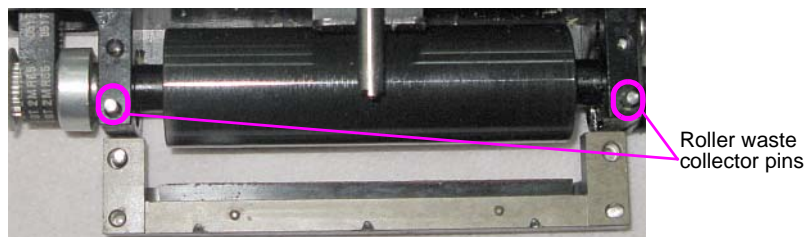


Figure 7-34: Roller waste collector pins

7. Return the roller waste collector to the print block and screw on the covering (see figure 7-32 on page 7-27).
8. Loosen the screws securing the suction tube.

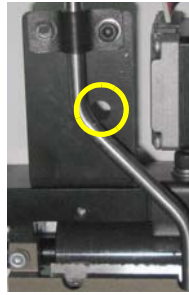


Figure 7-35: Suction tube correctly positioned

9. Lower it so that the hole in the panel behind the suction tube is visible, and tighten the screws to secure the suction tube.
10. Attach the right-UV-lamp assembly to the print block and reconnect the UV power and fan cables.

Replacing the Roller Scraper (Knife)

You should replace the roller scraper blade:

- after 1,000 hours of printing.
- if it does not effectively keep the roller clean.



You should periodically test the effectiveness of the roller scraper when you clean the roller waste collector. See “Cleaning the Roller Waste Collector and Inspecting the Roller Scraper (Knife)” on page 25.

To replace the roller scraper:

1. Prepare—
 - a new roller scraper (knife) (Kit-01026-S)
 - a Phillips 1x75 mm screwdriver
 - M2.5 and M2 Allen keys
2. Remove the right UV lamp and the roller waste collector covering (see steps 3 to 6 on page 7-26.)
3. Loosen the two screws securing the roller waste collector and pull it out.

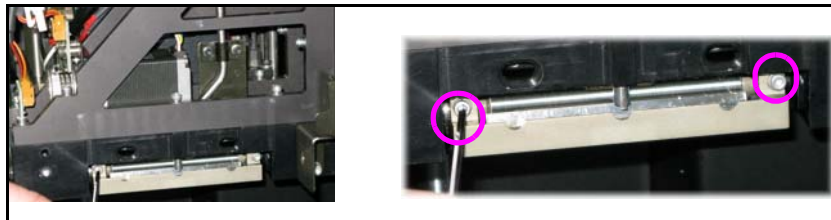


Figure 7-36: Removing the roller waste collector

4. Remove the screws that secure the roller scraper assembly.

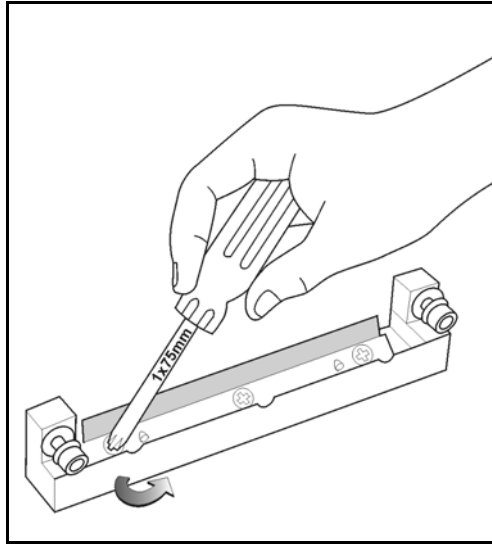


Figure 7-37: Removing the roller scraper screws

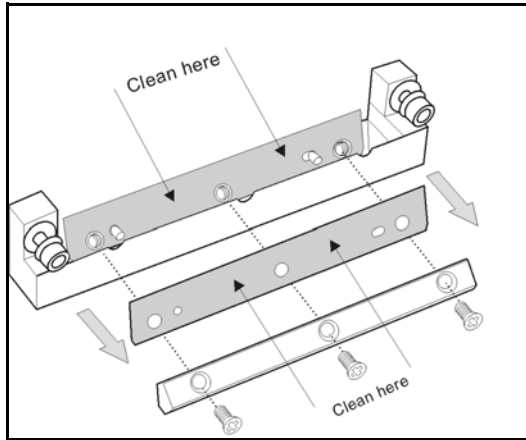


Figure 7-38: Removing the old roller scraper blade

5. Remove the scraper blade and discard it.
6. Place the new scraper blade onto the pins in the holder, as shown.

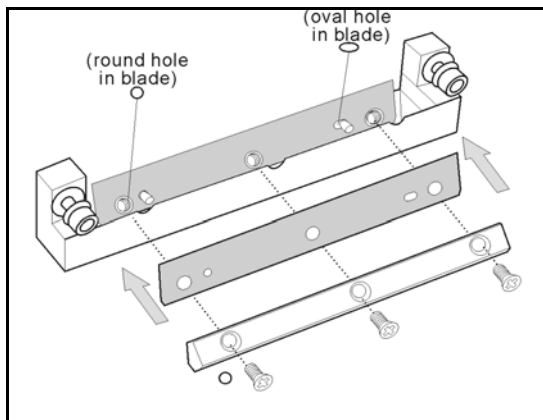


Figure 7-39: Inserting the new roller scraper blade

7. Insert and tighten the roller scraper blade screws.

Important:

- Tighten the screws in the order shown in Figure 7-40.
- Use the new screws supplied in the replacement-kit.

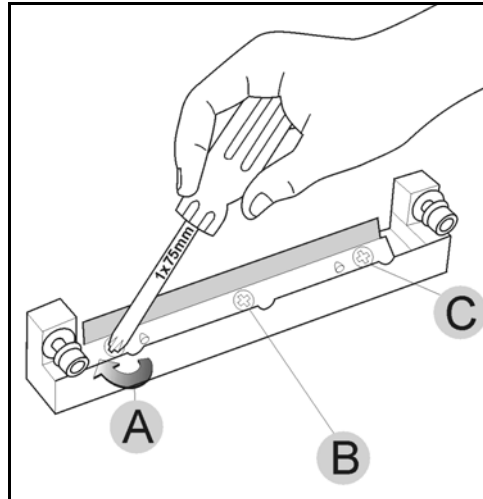


Figure 7-40: Tightening the roller scraper screws

8. After tightening the screws, inspect the blade and make sure that it is straight. If necessary, loosen the screws and tighten them again, evenly.
9. Return the roller waste collector assembly and the right UV lamp to the print block. See steps 6 to 10 from page 7-27.

Aligning the Print Heads

You should check the alignment of the print heads—

- once a month
- after replacing one or more heads
- if model quality is not acceptable even after cleaning the orifice plate on the bottom of the print block (see “Cleaning the Print Heads” on page 7-19)

The head-alignment procedure takes about 20 minutes.

To check the alignment of the print heads:

1. Prepare—
 - a transparency sheet—A-4 or Letter size
 - any type of sticky tape, to fasten the transparency sheet to the build tray
2. Start the Head Alignment wizard, from the *Connex Options* menu (see figure 7-26 on page 23).
3. Click Next to begin, and close the cover.
4. In the wizard screen, select the check box to confirm that the cover is closed, and click Next.

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

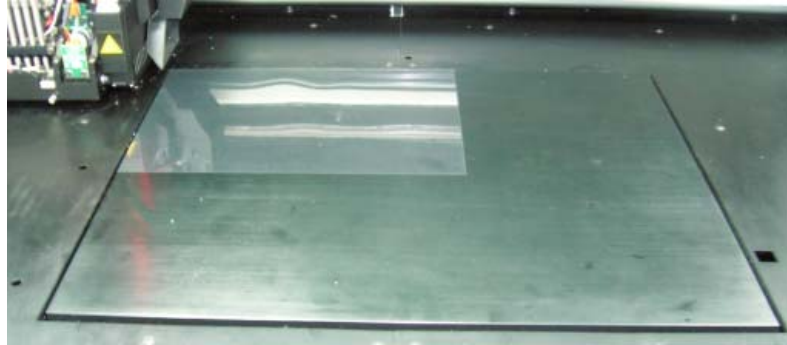


Figure 7-41: Positioning the transparency on the build tray

- Make sure that the transparency sheet is lying flat, and tape it to the tray.
- In the wizard screen, select the check box to confirm that the transparency sheet is on the build tray, and click Next.

The Connex printer prints the head alignment test on the transparency.

- When the following screen appears, remove the transparency.



Figure 7-42: Head Alignment wizard—steps 8–10

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

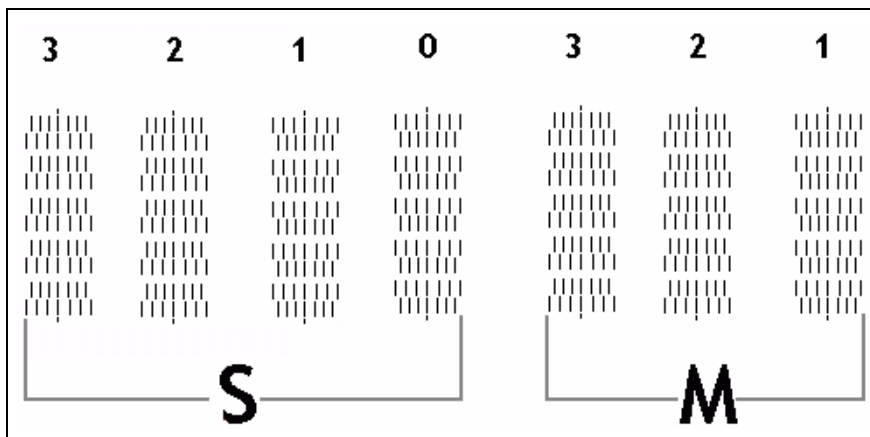


Figure 7-43: Sample head-alignment test

- The three columns on the right were printed by the heads used for applying model material when producing models. From right to left, the columns represent heads M1, M2, M3, respectively. (There is no column for head M0 because its alignment is used as a reference for aligning all other heads.)
 - The four columns of lines on the left were printed by the heads used for applying support material. The columns represent heads S3, S2, S1 and S0, respectively.
9. For each column of lines, use a magnifying glass or loupe to inspect pairs of consecutive rows printed on the transparency to see where the vertical lines align.

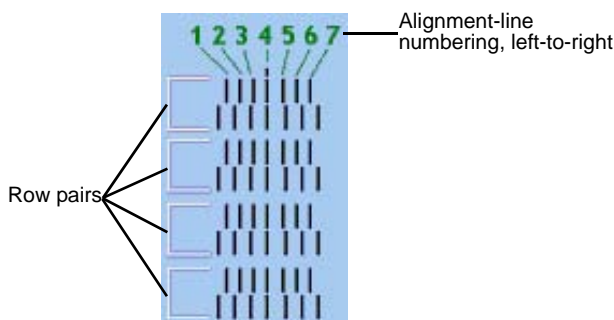


Figure 7-44: Comparing rows of alignment lines

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

Optimum head alignment is shown when the *fourth* lines in the upper and lower rows are aligned, as in figure 7-44. In the example shown, no change to the head alignment is necessary. If other lines in the set are aligned, you need to change the alignment of that head—in the next wizard screens.

10. In the wizard screen shown in figure 7-42, select the *Transparency removed* check box, and click *Next*.

The first in a series of alignment screens appears.



Figure 7-45: Head alignment screen

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

Note: Because the alignment of the fourth lines is optimum, the number “4” is selected, by default, in the wizard screen. This does not change the head alignment. If you select other numbers, the wizard adjusts the head alignment, accordingly.

12. Click Next to display the next head alignment screen, and again select the number representing the most closely aligned vertical lines on the transparency for that print head.

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



Figure 7-46: Updating System Parameters confirmation screen

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

14. In the final wizard screen, choose to either repeat the head alignment procedure or close the wizard.
 - If the most closely aligned vertical lines for a print head were at either extreme—the first or seventh lines—choose *Yes* to run the head-alignment wizard again, then click *Next*.
The transparency test will show if the heads are now properly aligned, and—if not—the wizard will allow you to “fine tune” the alignment.
 - If the vertical lines for the print heads were not aligned at either extreme, choose *No* to close the wizard, then click *Next*.



Figure 7-47: Final wizard screen

Calibrating Print Heads

The condition of the print heads directly affects the quality of printed models. To maintain optimum printing, you should routinely test the print heads, and calibrate them to the best working configuration possible. You do this by running the Head Optimization wizard.

During the optimization process, 32 samples are printed on the build tray. After carefully weighing each of them, you enter the weight in the wizard's data-entry screen. The wizard uses this data to optimize the heads.

If, during the optimization process, the wizard determines that a print head is faulty—or that it is negatively affecting layer uniformity with the current head configuration—the wizard instructs you to replace it. If this happens, you can continue the wizard (to replace the print head) or abort the wizard (to replace the head at another time).



Run the Head Optimization Wizard whenever the condition of print heads is negatively affecting the quality of printed models, or if you suspect that there is a problem with one or more of the print heads.

To test and calibrate the print heads:

1. Prepare—
 - isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
 - disposable cleaning gloves
 - an Objet-supplied cleaning cloth or equivalent
 - a mirror
 - the scale supplied by Objet for use in the Weight Test

2. Start the Head Optimization wizard from the *Options* menu of the printer interface.



Figure 7-48: Starting the Head Optimization wizard

3. In the opening wizard screen, click Next to begin.
The *Wizard Conditions* screen appears.
4. Read the conditions, select *I Agree* and click Next.
5. Close the printer cover, and confirm this in the wizard screen.
6. In the following screen, make sure *Optimize all print heads* is selected, and click Next.

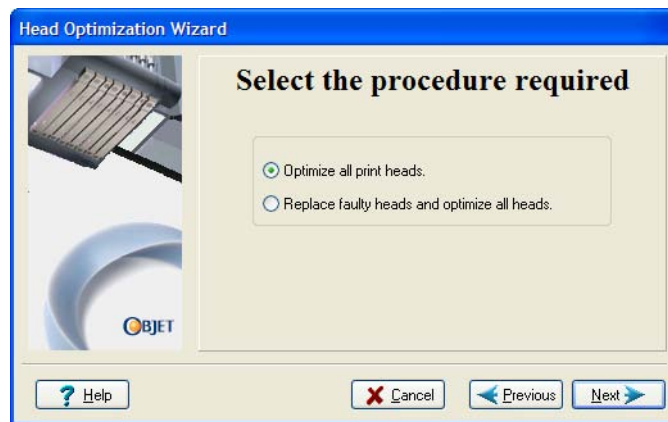


Figure 7-49: Procedure selection screen

The print block moves into position for cleaning and inspecting the print heads.

- When the following screen appears, clean the print heads.



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



Figure 7-50: Clean print heads screen

- Place the mirror on the build tray.
- Put on the cleaning gloves.
- Soak the cleaning cloth with the cleaning fluid (alcohol).
- Clean the orifice plates, with a back-and-forth motion.

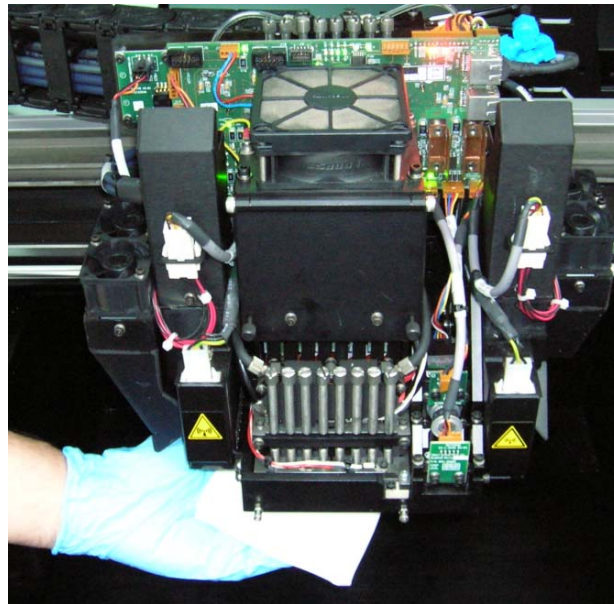


Figure 7-51: Cleaning the print heads

Use the mirror to make sure that you have removed all of the residue material.

- When the print heads are clean, select the confirmation check box in the wizard screen and click Next.
- Remove the cleaning materials from the printer, and close the cover.
- Select the confirmation check box in the wizard screen and click Next.

The head-purge cycle runs, after which the Weight Test is printed.

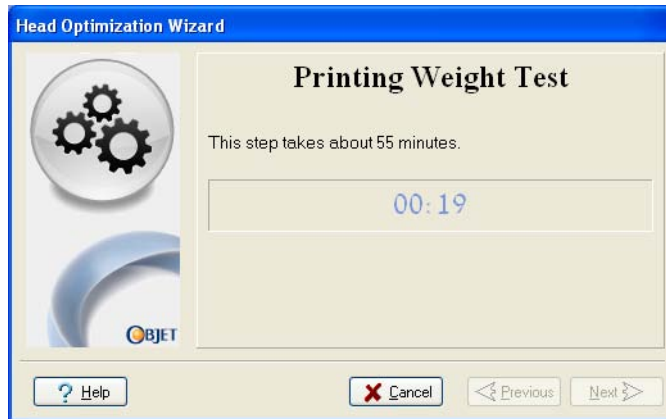



Figure 7-52: Printing Weight Test

15. 32 samples are printed on the build tray, four for each of the print heads. This can take up to 55 minutes.
16. When the following screen appears, open the printer cover. Enter the data that describes the condition of each print head, after inspecting each of the printed samples.



Figure 7-53: Weight Test Data Entry screen



The layout of the data entry screen matches the printed samples on the build tray. Enter the data for the sample indicated by  in the screen.

- a. Enter the number of faulty (“missing”) nozzles.
Faulty nozzles are seen in Weight Test samples as a missing row of printed material. Compare the height of the missing row with the lines printed on the “missing nozzles” ruler. Enter the number next to the line that most closely matches the height of the missing row.

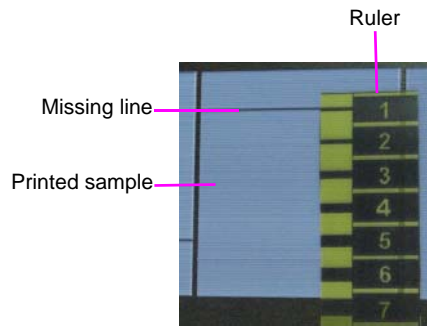



Figure 7-54: Measuring the missing line in a printed sample

In the example above, you would enter “1” in the wizard screen.

- b. Carefully remove the sample, weigh it, and enter the weight in the wizard screen.
Be sure to remove and weigh the entire sample, even if it breaks into several pieces.
- c. Click Apply or press Enter.
The data-entry-indicator  moves to the next position.
- d. Repeat these steps for all 32 samples.

To change an entry, click Edit Data, enter the correct data, and click Save.

- 17. When you have entered the all of the data in the wizard screen, click Next.

The wizard uses the data you entered to analyze the condition of the print heads, and optimizes them so they print models with a uniform layer of material. If the heads are in satisfactory condition, the final wizard screen appears.



Figure 7-55: Final wizard screen, after optimizing print heads

However, if the wizard determines that a print head is faulty—or that it is negatively affecting model quality with the current head configuration—the wizard instructs you to replace it. In this case, the following screen appears.



Figure 7-56: Defective print heads found

18. Choose *Replace defective head(s)* if you are prepared to replace the print heads now.

or—

Choose *Abort wizard* if you want to replace the print heads at another time.



Replacing print heads is expensive. Replace them only after consulting with an Objet-authorized customer-support engineer.

If you are replacing the print heads now, the wizard guides you through the procedure when you click *Next*. Continue with “Preparing the print block” on page 41.

Replacing Print Heads

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

- The Head Optimization wizard determines that one or more print heads are defective. (See “Calibrating Print Heads” on page 34.)
- There are noticeable grooves in the surface of printed models.
- Visual inspection of the head reveals that its surface is damaged—peeling or bubbles in the nozzle area.
- The Connex interface displays a warning or malfunction message relating to a print head—
 - Head Heater temperature timeout
 - Head Heater thermistor open
 - Head Heater thermistor short



Replacing print heads is expensive. Replace them only after consulting with an Objet-authorized customer-support engineer.

The Head Optimization wizard guides you through the procedure of replacing a print head, and adjusts components of the Connex printer to enable you to perform it. Only replace a print head with the aid of the wizard. The procedure takes 75–90 minutes, and consists of the following phases:

A. Identifying the head(s) needing replacement.

This is normally done by the Head Optimization wizard. Otherwise, evidence of physical damage to the head surface or a malfunction message indicates which head needs replacing.

B. Preparing the print block for head replacement.

This is done automatically when you run the wizard.

C. Removing the defective print head.

D. Installing a new print head.

E. Optimizing the print heads (done automatically by the wizard).

F. Performing head alignment.

To replace a print head:

1. Prepare—

- replacement print head(s)
- isopropanol (IPA— isopropyl alcohol) or ethanol (ethyl alcohol)
- disposable safety gloves (included in the head replacement kit)
- an Objet-supplied cleaning cloth or equivalent
- a flat-head screwdriver (5 mm)
- the scale supplied by Objet for use in the Weight Test

Note: Make sure that you have these items before running the wizard.

2. Start the Head Optimization wizard from the *Options* menu of the printer interface (see figure 7-48 on page 35).

3. In the opening wizard screen, click **Next** to begin.

The *Wizard Conditions* screen appears.

4. Read the conditions, select *I Agree* and click Next.

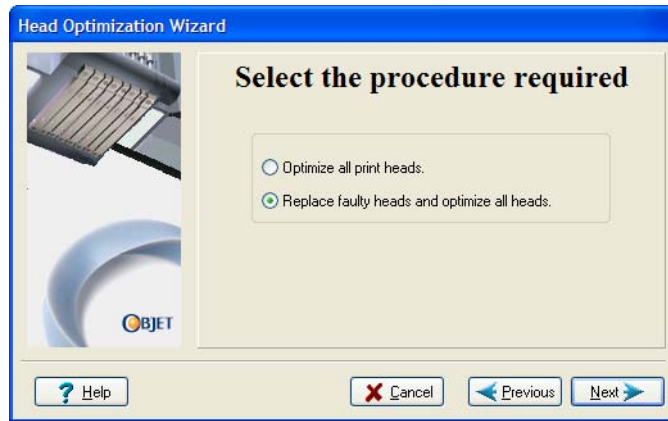


Figure 7-57: Procedure selection screen

5. Choose *Replace faulty heads*, and click Next.
 6. Select the print head(s) needing replacement, and click Next.
- Preparing the print block

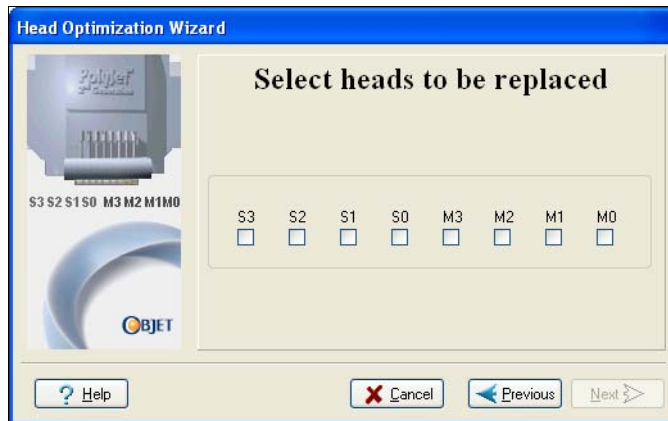


Figure 7-58: Head selection screen

The Connex printer heats and empties the print block, and prepares the printer. (This should take up to 30 minutes.)



Figure 7-59: Printer preparation progress screen

7. Put on the safety gloves.

- When the following screen is displayed, open the Connex printer cover.

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



Figure 7-60: Replace the defective head when this screen appears

Removing the Defective Head

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

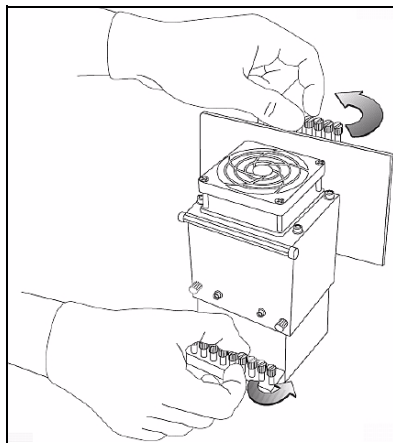


Figure 7-61: Releasing the locking screws

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

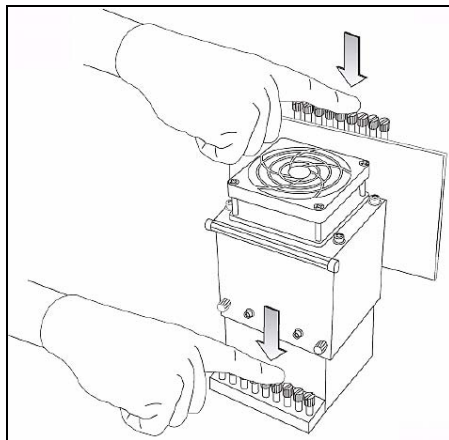


Figure 7-62: Releasing the print head

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

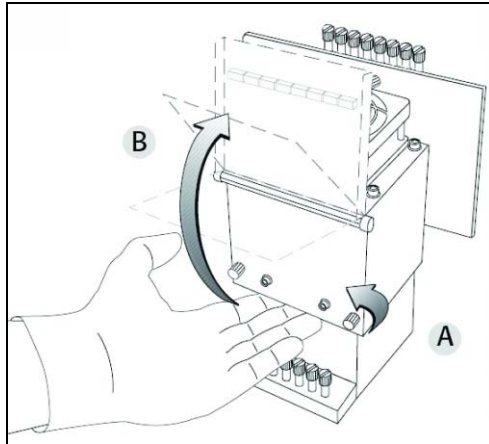


Figure 7-63: Opening the print-head compartment

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

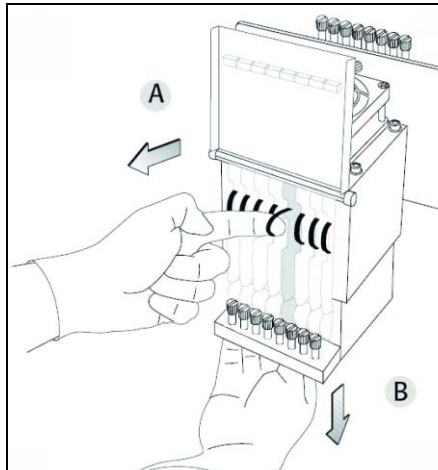


Figure 7-64: Releasing the print-head driver card to remove the head

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

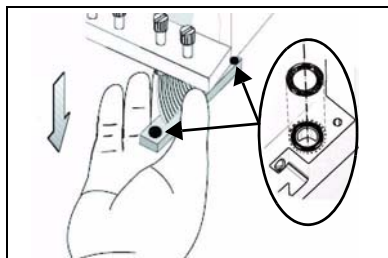


Figure 7-65: O-ring seals on the print head



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

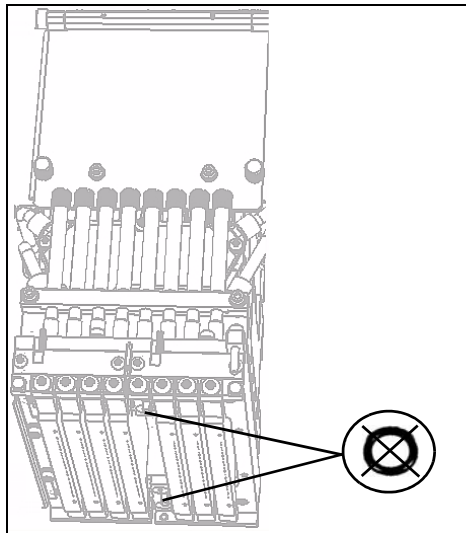


Figure 7-66: Making sure the O-rings are not stuck to the print block

Installing the
New Head

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

14. Inspect the replacement head, and make sure that the O-ring seals are in place (see figure 7-65).
15. Gently insert the replacement head into the vacant slot in the print block, and push the print-head driver card into its socket.

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

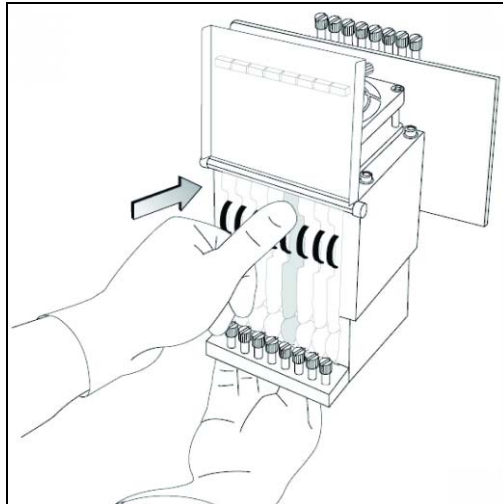


Figure 7-67: Inserting the print-head driver card into its socket

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

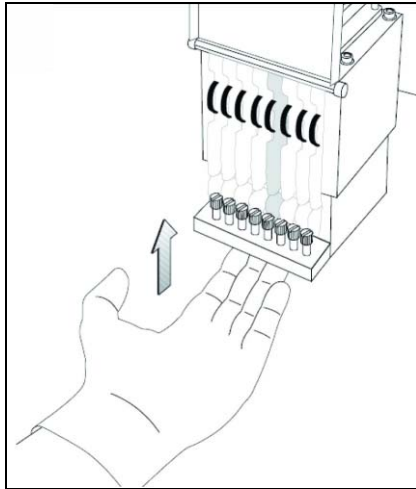


Figure 7-68: Clicking the head into place in the print block

17. Lower the door of the print head compartment, and tighten the screws to lock it in place.
18. Tighten the upper and lower screws that secure the print head in the print block (see figure 7-61 on page 42).
Note: Hand-tighten these screws. Do *not* use a screwdriver.
19. With your fingers, make sure that the new head is level and even with the other heads.

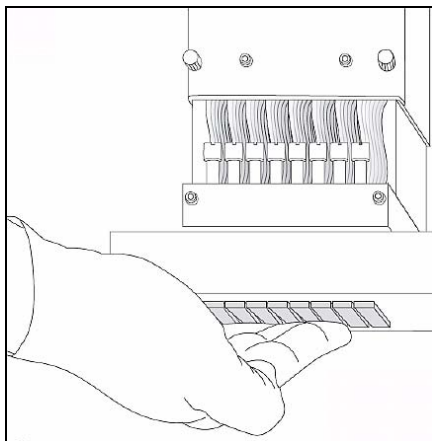


Figure 7-69: Checking the level of the new head

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

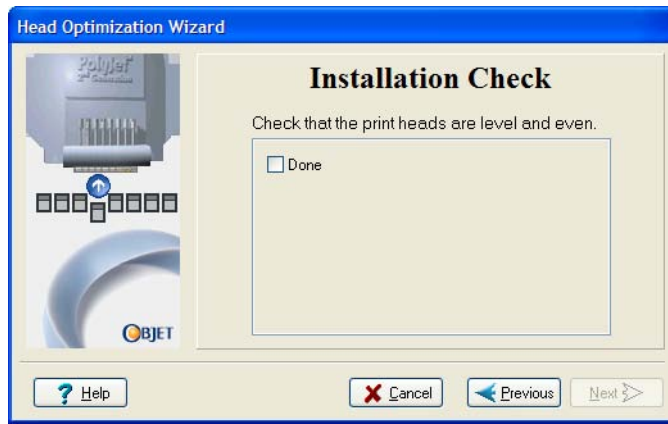


Figure 7-70: Installation-check screen

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



Figure 7-71: Cleared-tray confirmation screen

22. Close the printer cover.

The wizard continues by filling the heads, then heating and purging them. If there are no installation problems, the Head Optimization procedure begins (see “Calibrating Print Heads” on page 7-34).

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

After replacing print heads, you should check the head alignment before using the Connex printer to produce models. In the final wizard screen...

- select Yes and click Done to open the Head Alignment wizard (see “Aligning the Print Heads” on page 30).
- select No and click Done to align the heads at another time.



Figure 7-72: Final Head Optimization Wizard Screen

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

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



Figure 7-73: Incorrect-installation screen

If this happens:

- Open the print head compartment (see figure 7-63 on page 43).
- Re-insert the print-head driver card into its socket (see figure 7-67 on page 44).
- In the wizard screen, select the check box to confirm that you have re-inserted the card, and click Next.

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



Figure 7-74: Invalid-data warning screen

If this happens:

- a. Remove the head and replace it with another one (starting with step 9 on page 7-42).
 - b. In the wizard screen, select the check box to confirm that you have installed another print head, and click Next.
 - c. Contact your authorized Objet Customer Support center about the unformatted head.
- If the vacuum test is not successful, the replacement head was not sealed properly during installation, and the following warning screen appears.



Figure 7-75: Vacuum Leakage warning screen

If this happens:

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

Testing and Calibrating the UV Lamps

The effective radiation of the UV lamps used for curing models can change over time. To ensure optimum curing of models during printing, a pop-up message reminds you to test the lamps and calibrate their effective UV radiation after every 200 hours of printing. You do this by running the UV Calibration Wizard and using the built-in UV radiation sensor.

The wizard compares the radiation you measure to the recommended radiation level for each of the lamps, at each printing mode—High Speed, High Quality and Digital Material. The radiation level is considered acceptable if it is within seven percent of the recommended level.

When calibrating the lamps, the wizard attempts to adjust the radiation level, if necessary, and then prompts you to take a new reading. If the level is acceptable, the wizard continues to the next phase. If further adjustment is necessary, the current phase is repeated. If the level is too low to be adjusted, the wizard continues to the next phase; the final wizard screen indicates that the lamp's radiation for the printing mode is unacceptable.

To test and calibrate UV lamp radiation:

1. Start the UV Calibration wizard from the *Options* menu (see figure 7-26 on page 23).
2. Make sure that the build tray is empty, the UV sensor is exposed and clean, and that the printer cover is closed. Confirm this in the wizard screen and click Next.



Figure 7-76: Confirmation screen

The UV lamps power up and stabilize; this takes several minutes. Then, the print block passes over the sensor.

The wizard compares the measured radiation to the recommended level for the lamp and printing mode tested, and displays the result.

The wizard continues as follows:

- If the level measured in the previous test is acceptable, the wizard begins testing the left UV lamp.
- If the level measured in the previous test is *not* acceptable, the wizard calibrates the right UV lamp by adjusting the current supplied to it, then tests it again.
- If the level measured in the previous test is too low to be adjusted, the wizard records the lamp's radiation as unacceptable, and begins testing the left UV lamp.

When all test have finished, the results are displayed. This shows the current condition of the lamps, after the wizard has calibrated them.

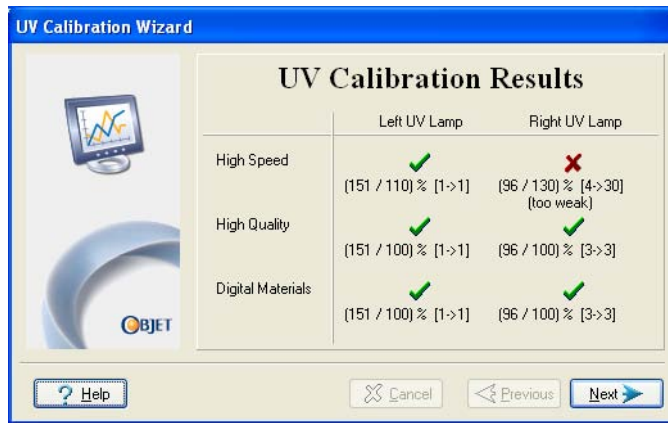


Figure 7-77: Results and current condition of the UV lamps

3. Cover the UV sensor, and confirm this in the next screen.
4. In the final wizard screen, click Done.

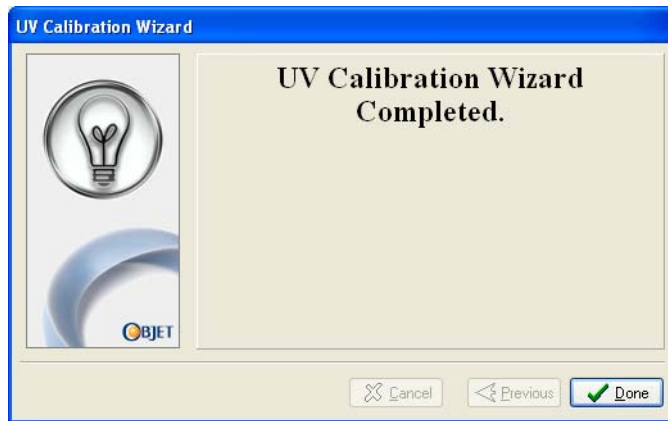


Figure 7-78: Final UV Calibration Wizard screen

Calibrating the Load Cells

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

To calibrate load cells:

1. Start the Load Cell Calibration wizard.
 - From the *Options* menu of the printer interface (see figure 7-26 on page 23), select Wizards > Load Cell Calibration.
2. Select one or more load cells that you want to calibrate, and click Next.

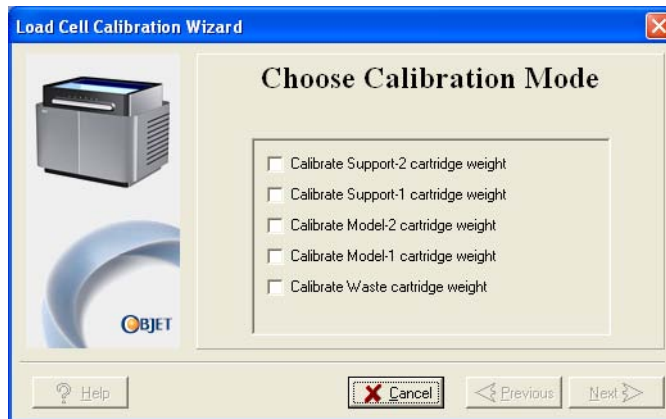


Figure 7-79: Load cell selection

Note: It is recommended that you routinely calibrate all of the load cells.

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



Figure 7-80: Confirmation of cartridge removal

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



Figure 7-81: Load cell calibration screen

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

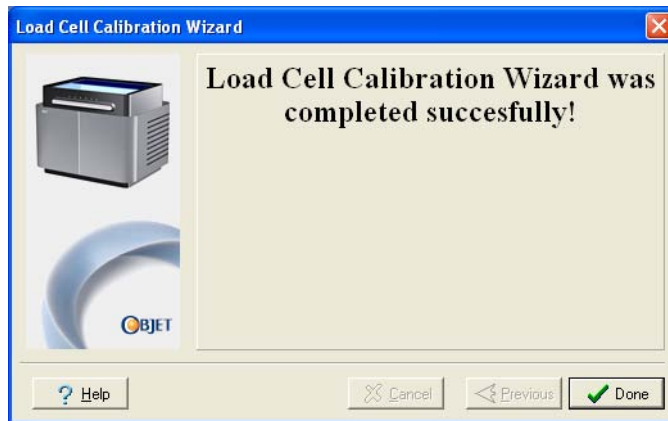


Figure 7-82: Final wizard screen

Replacing the Odor Filter

The Connex500/350 printer has an activated-carbon filter for removing odors from printing materials. The filter should be replaced regularly (about once a year, as necessary) to keep your working environment pleasant. This is normally done during the yearly preventive-maintenance service visit.

Replacing the UV Lamps

The UV lamps used for curing models have a long, but limited, working life. The Objet service engineer tests their effectiveness during regular maintenance checks, and replaces them, if necessary. You can test and

adjust their effective power with the UV Calibration Wizard (see “Testing and Calibrating the UV Lamps” on page 49). If you need to replace a UV lamp, follow these instructions:

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



Figure 7-83: Offline mode indicator (red)

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



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

2. Start the UV Lamp Replacement wizard.

From the *Options* menu of the printer interface (see figure 7-26 on page 23), select Wizards > UV Lamp Replacement.

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

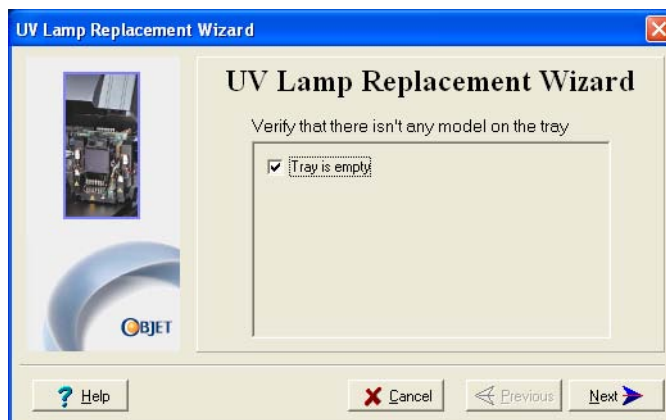


Figure 7-84: “Empty tray” confirmation screen

The axes move to the “home” position.

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

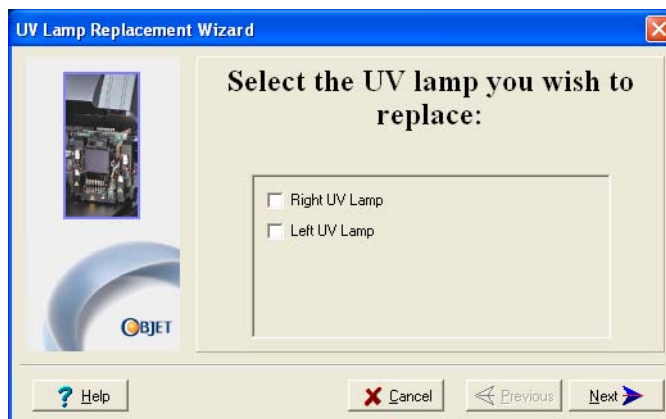


Figure 7-85: UV lamp selection screen

5. Disconnect the power connection to the UV lamp.

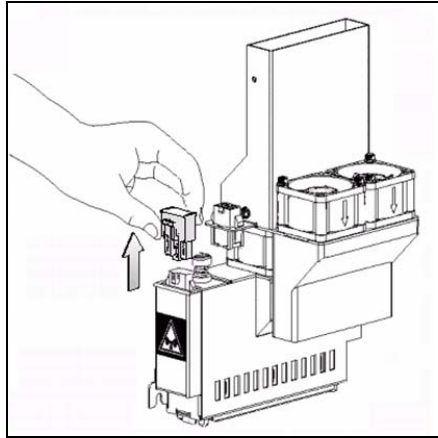


Figure 7-86: Disconnecting the UV lamp

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

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

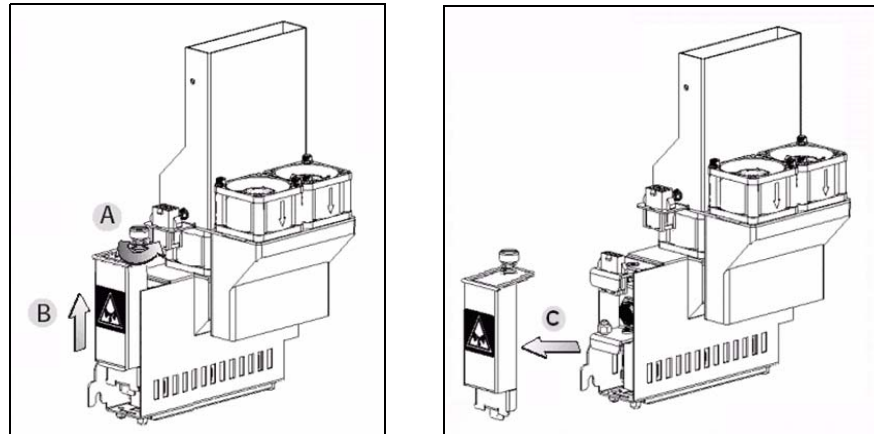


Figure 7-87: Removing the UV lamp cover

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

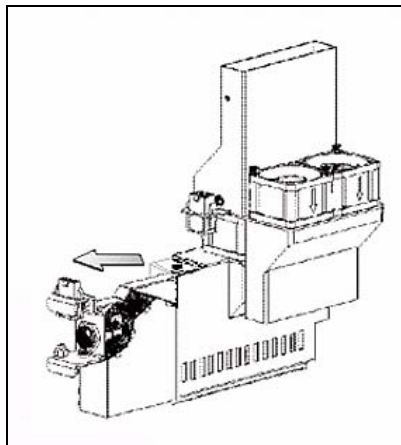


Figure 7-88: Removing the UV lamp reflector

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

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

9. Discard the old reflector and lamp.



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

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

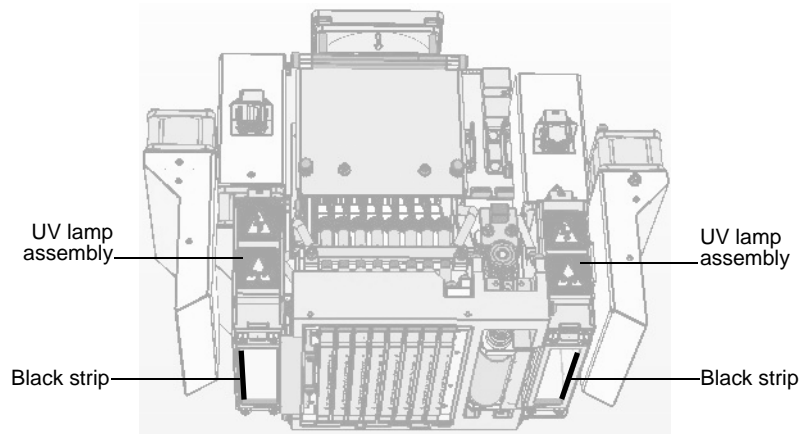


Figure 7-89: Print block and UV lamp assembly, showing correct placement of black strip

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

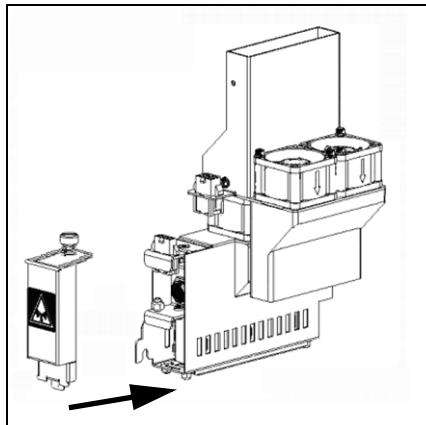


Figure 7-90: Replacing the lamp cover

12. Reconnect the power connection to the UV lamp.

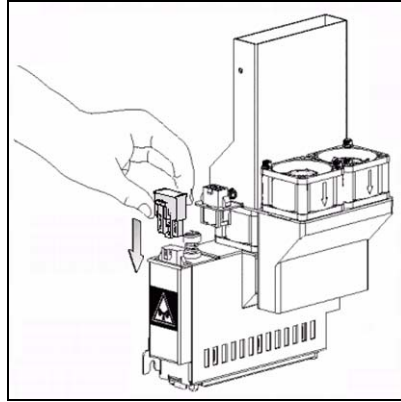


Figure 7-91: Connecting power to the UV lamp

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

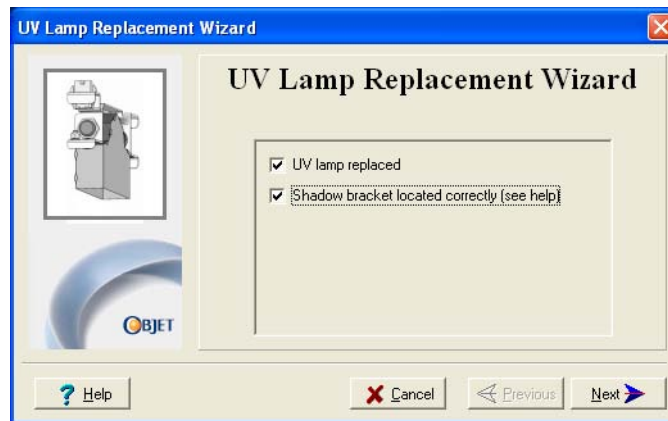


Figure 7-92: UV-installation confirmation screen

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



Figure 7-93: Status screen during UV lamp check

14. After replacing a UV lamp, it is recommended that you calibrate its power for the various printing modes. The final screen allows you to continue to the UV Calibration wizard (see “Testing and Calibrating the UV Lamps” on page 7-49).

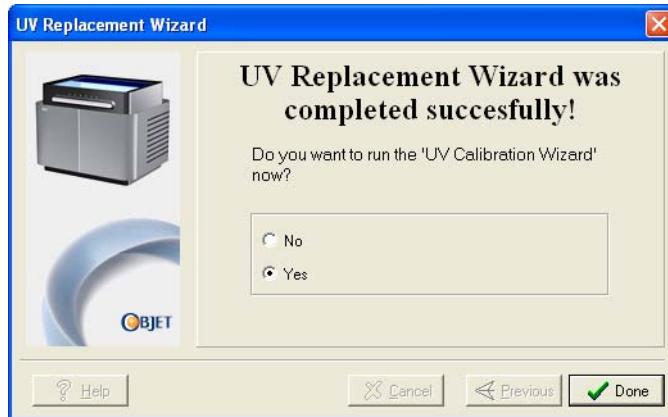


Figure 7-94: Final wizard screen

Built-in Tests

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

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

The test suite features:

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

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



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

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

- Accessing Built-in Tests To open the Built-in Tests screen, do one of the following:
- From the *Options* menu, select Built-In Tests.
 - Press Ctrl+Alt+B.

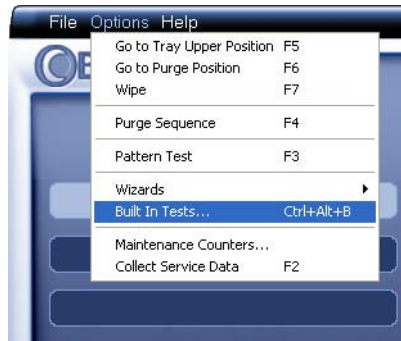


Figure 7-95: Selecting Built-In Tests from the Options Menu

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

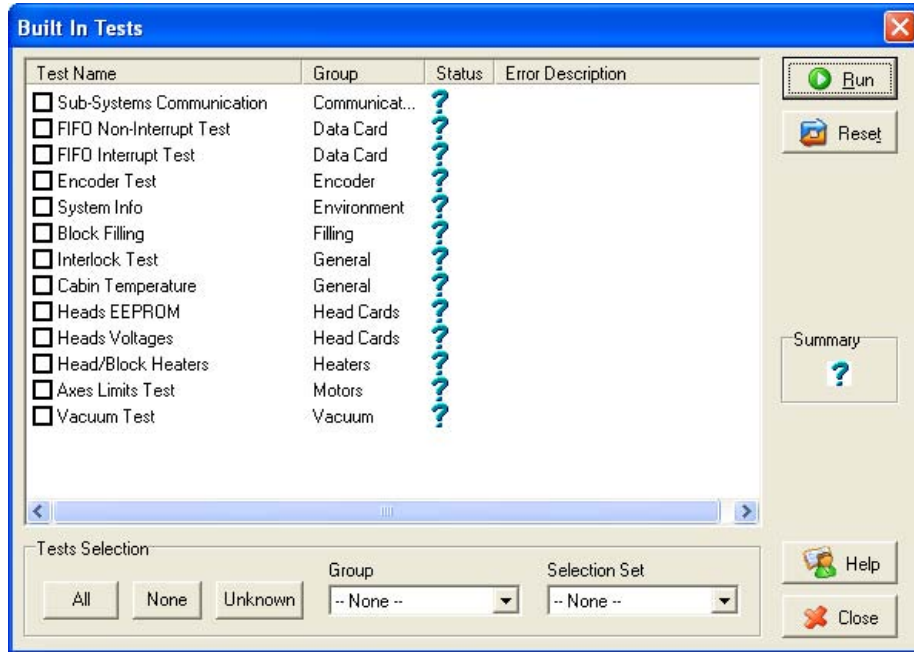


Figure 7-96: Built In Tests screen

Test List Test Name




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

Group

This column shows the component categories for each test. This tells you which tests are run when selecting a category from the *Group* pull-down menu at the bottom of the screen.

Status

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

-  Test successfully completed.
-  Test failed.
-  Unknown results. (The test has not been run yet.)

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

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

Running Tests To run the selected tests:

- Click Run .



After you run a test, the *Save* and *View* command buttons are added to the

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

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

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



Run

Click to run the selected tests.

Reset

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

Save

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

View

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

Close

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

Summary On the right side of the screen, a symbol represents the combined results of all the tests run, using the symbols from the *Status* column.

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

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

Test Name	Description	Possible Reason for Failure
Sub-System Communication	Tests communications between Eden components.	Disconnected communications cable. Faulty cable.
FIFO Non-Interrupt/ FIFO Interrupt	Tests the data queue in the DATA PCI card.	Faulty DATA_PCI card.
Encoder	Tests the encoder's reliability by comparing readings from multiple runs along the X-axis.	Faulty encoder.
System Info	Compares the following parameter values with the minimum requirements. <ul style="list-style-type: none"> • Physical memory • Available memory • Free space on disk • Monitor resolution 	Failure of RAM memory allocation in the Eden computer.
Block Filling	Analyzes the thermistor readings when the block is full and when it is empty.	Faulty thermistor.
Interlock	Tests the interlock in the printer cover.	Failure of interlock mechanism. Faulty latch. Disconnected cables.
Cabin Temperature	Tests the temperature level in the build-tray area.	Faulty temperature sensor (OHDB).
Head EEPROM	Tests the read/write capabilities of the print-head driver cards.	Faulty print-head driver card.
Head Voltage	Checks the control of voltages supplied to the print heads.	Faulty print-head driver card.
Tray Heater	Not used for this printer	—
Head/Block Heaters	Tests the heaters in the print heads and in the print-block body.	Faulty heaters or thermistors.
Axes Limit	Tests the hardware and software limits of all axes.	Faulty hardware sensors. Wrong <i>Max Position</i> parameter.
Vacuum	Tests the vacuum level in the print block.	Faulty vacuum sensor. Vacuum leakage. Wrong parameters.

Replacing the Waste Container

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

The container has a capacity of 10 kilograms of waste material—usually enough for several months of printer use. The printer software displays a warning message when there is 9 kilograms of material in the container, and stops the printer when the net weight reaches 9.5 kilograms. Above 9 kilograms, the software does not allow you to start a print job (or a printing activity) until you replace the waste container. You can monitor the weight of the waste container in the *Maintenance* screen of the printer interface. You can also visually inspect the level of waste in the container. (To access it, see page 7-63.)

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

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



Figure 7-97: Connex printer interface, showing waste weight (red background indicates operator alert)

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



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

To prepare a new waste container:

1. Assemble the cardboard box, making sure to punch out the perforated sections.
2. Place a new plastic container into the box.

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

To replace the waste container:

1. Open the front doors of the printer.



Figure 7-98: Accessing the waste container

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



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

Cleaning the Exterior Panels

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

Acceptable Cleaning Agents

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

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

Unacceptable Materials

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

8

Handling Printed Models

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Removing Models After Printing

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

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

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



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

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

This allows the models to cool slowly and evenly.

4. Let the models cool for several hours.

Removing the Support Material

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

Removing Excess Support Material by Hand

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

Removing Support Material with Water Pressure

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

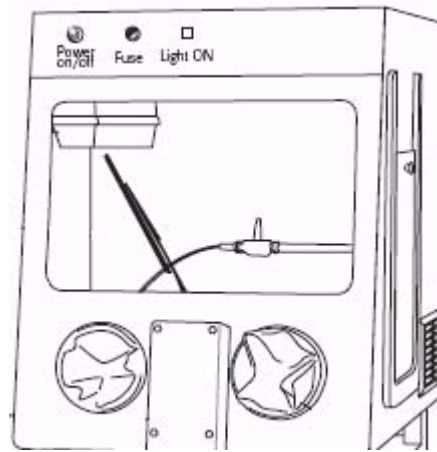


Figure 8-1: Balco WaterJet Cleaning Unit

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



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

Removing Support Material with Caustic Soda

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



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

Storing Models

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

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

