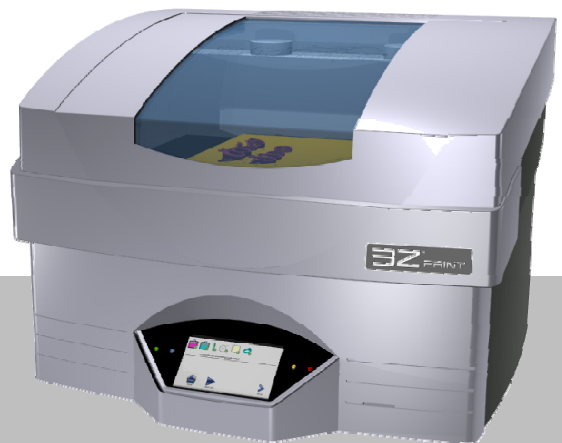




# 3Z SERIES



## User Manual

Part Number 840180 Rev F

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This Class A digital apparatus meets all requirements of the Canadian Interference-causing Equipment Regulations.

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## Cautions

This manual includes several types of special operator notification; general CAUTIONS, temperature related CAUTIONS, flammability related CAUTIONS and Notes. All CAUTIONS are accompanied by an appropriate, internationally recognized symbol and all notifications are enclosed in a bounding box to highlight their significance.



**CAUTION!** General cautions are further distinguished by the accompanying international Caution symbol and are printed in bold face type.

Read the User's Manual prior to installation or operation. Failure to read and comply with safety instructions could result in bodily injury or equipment damage.



**CAUTION HOT!** Heat related cautions are further distinguished by the accompanying international Hot symbol and are printed in bold face type.

Heat related cautions indicate that bodily injury could result from failure to read and comply with the safety instructions.



**CAUTION FLAMMABLE!** Flammability cautions are further distinguished by the accompanying international Flammable symbol and are printed in bold face type.

Flammability related cautions indicate that a potential fire hazard could result from failure to read and comply with the safety instructions.



**CAUTION MECHANICAL HAZARD!** Mechanical hazard cautions are further distinguished by the accompanying international Mechanical Hazard symbol and are printed in bold face type.

Mechanical hazard cautions indicate that bodily injury could result from failure to read and comply with the safety instructions.

**Notes** Notes provide additional information or reiterate information already provided that may be helpful in avoiding non-critical mistakes that are typically encountered if the associated directions are not followed.

- In the event of any severe operational anomalies, power off the printer by pressing the '0', side of the power switch on the left rear corner of the unit.



## SAFETY INTERLOCK

- Always keep the top cover and side panel closed during operation!
- The system is equipped with a safety interlock that suspends and prohibits potentially hazardous model making operations when the cover or side panel are opened.
- To avoid potential damage to model[s] in progress, select and press the *Pause* button and wait for the printhead carriage to return to the home position prior to opening the top cover.

## HOT COMPONENT

The following parts or materials are very hot when the system is powered on. Touching any of these items could cause minor burns. Use caution when working on or near these components.

- Heated lines and printheads.
- Molten 3Z Model and 3Z Support materials.
- Material fill ports, reservoirs and filters.

## FLAMMABLE COMPONENT

- The VSO dewaxing solvent is flammable.
- Under no conditions should you exceed the temperatures specified in Section 11.4
- Use VSO in a well ventilated area.
- Use care around all heat sources.

## MECHANICAL HAZARDS

The cutter blade is very sharp, rotates at high speed and traverses across the build region. Anything in the vicinity of the cutter blade is at risk of injury or damage.

- Confirm that the interlock system is engaged and prohibits cutter motor activation prior to working in the vicinity of the cutter and removing the protective cutter should.
- Never remove the cutter shroud, drive belt shroud or attempt to clean the cutter while the machine is operating.
- Do not touch the cutter blade with bare hands.
- Always use extreme caution when cleaning the cutter blade or working anywhere in the vicinity of this component.
- Clean the cutter blade with a nylon or natural-bristle brush. The cutter blade may also be cleaned with a plastic putty knife. Never use wire brushes or metal scrapers.

## PRINthead AND CUTTER CARRIAGES

- Keep hands, long hair, loose clothing, and other foreign objects away from the printhead and cutter carriage areas while the machine is operating.

## PAPER TAPE SYSTEM

- Keep hands, long hair, loose clothing, and other foreign objects away from the paper tape system while the machine is operating.

## BUILD TABLE

- Do not place hands or other foreign objects between the edge of the build table and the surrounding platform when the table is moving. Although the table mechanism moves slowly, it exerts considerable force.



**CAUTION!** Ensure that the interlock system is engaged and prohibits the build table movement prior to working in the vicinity of the build table and surrounding platform.

## **BUILD AND SUPPORT MATERIALS**

- Do not open the material container until ready to insert a material crayon into the reservoir fill opening.
- Never use material that has been previously processed in the unit.
- Store unopened materials in their original containers in a cool, dry place and out of direct sunlight.



**CAUTION!** The use of any materials other than new materials provided by Solidscape voids the system warranty.

## **POWER CORDS**

Customers, in locations other than the USA, may need to install or replace the plug of the following cords with one compatible with their electrical outlets.

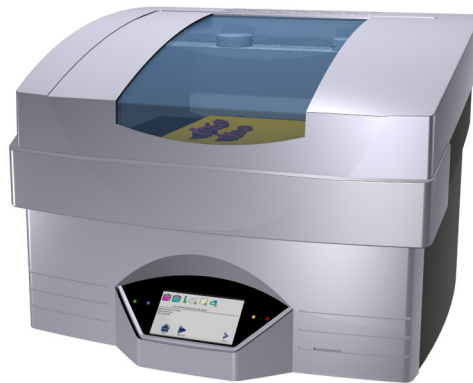
- System power cord
- Vacuum switch box power cord

Being pluggable equipment, the power cord may act as a disconnect device. Therefore, the socket-outlet shall be installed near the equipment and shall be easily accessible.



## Chapter 1 - System Overview

The 3Z Series Model Making System renders high precision, three dimensional (3D) models from CAD model files. The system consists of all the hardware and software necessary to fabricate models and prepare them for final processing. Applications program that resides on the printer provide local control over the model making unit. The operator's Windows workstation and support material removal equipment are not included in the system. See Figure 1-1 3Z Model Making System

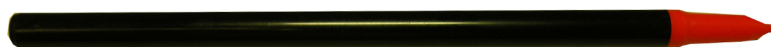


**Figure 1-1 3Z Model Making System**

The primary steps of model making with a 3Z Series consist of:

- Selecting one or more model files and, from them, preparing a model making job file at the operator's workstation.
- Transferring the job from the operator's workstation to the model making system via a USB flash drive or a local network.
- Checking and adding consumables to the model making system as needed. Preparing the build plate.
- Initiating the currently loaded job in the model making system.
- Waiting for the job to complete.
- Removing the build plate from the system and removing the composite model from the build plate.
- Dewaxing, i.e., removing, the sacrificial (support) material from the model.

Note: ***Always use the Stylus provided with the printer to touch the front panel screen.***





## 1.1 LED Status Indicators

There are four status indicator lights on the 3Z Series model making system. The two on the left of the touch panel are the Green (Power) indicator and the Blue (Busy) indicator. The two on the right of the control panel are the Yellow (Caution) and Red (Intervention) indicators. The indicators can be off, blinking, or steady on. The table in Figure 1-2 shows the status of the printer as indicated by the LED status indicators.

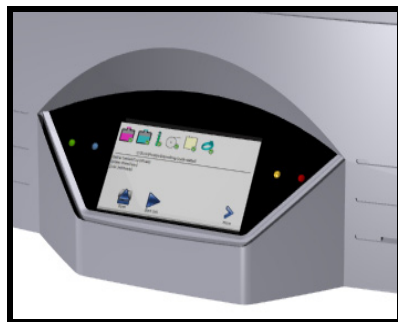


| STATUS |                        |                           |                                |
|--------|------------------------|---------------------------|--------------------------------|
|        | OFF                    | Blinking                  | ON                             |
| Green  | No Power               | Power up or Temp Set back | Power on                       |
| Blue   | No Power or Idle       | Job Preparation Functions | Printing                       |
| Yellow | No Power               | Consumables Low           | Consumables exhausted          |
| Red    | Power Off or no errors | Power up or Temp Set back | Operator intervention required |

**Figure 1-2 LED Status Indicators**

## 1.2 Touch Panel

Operator input to a 3Z Series printer is provided through a touch screen. The printer provides feedback to the operator via the front panel display. 3Z Touch remote runs on any remote, networked Windows workstation. The remotely operated screen provides the operator with the exact same look, feel and level of control as the front panel of the printer. However there are several functions that require close proximity to the system at the time they are performed and, under normal circumstances, these functions **should not** be initiated remotely. See Figure 1-3.



Touch screen



3Z Touch Remote

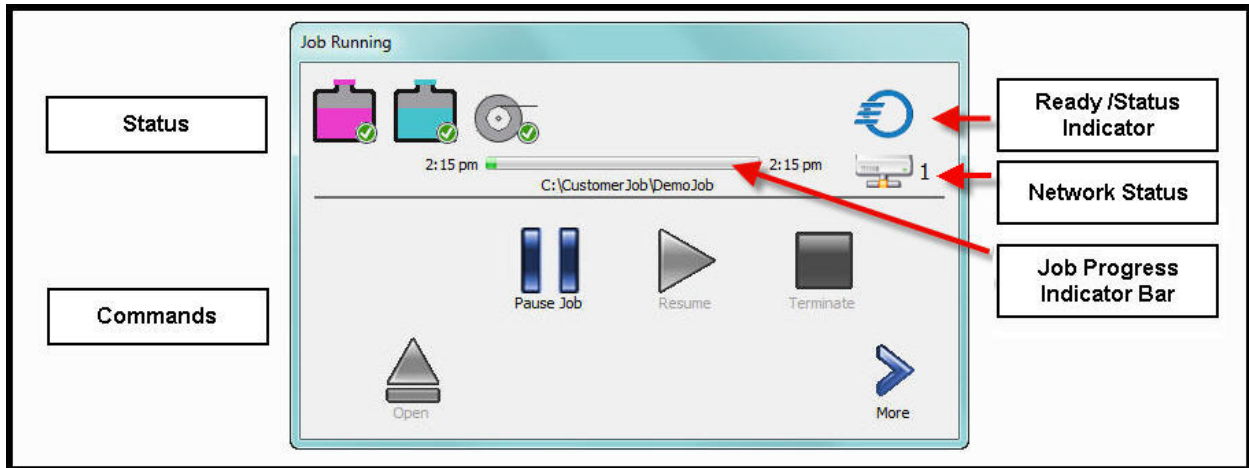
**Figure 1-3 3Z TOUCH SCREEN AND REMOTE**



**CAUTION!** The touch panel provides control over several setup and calibration

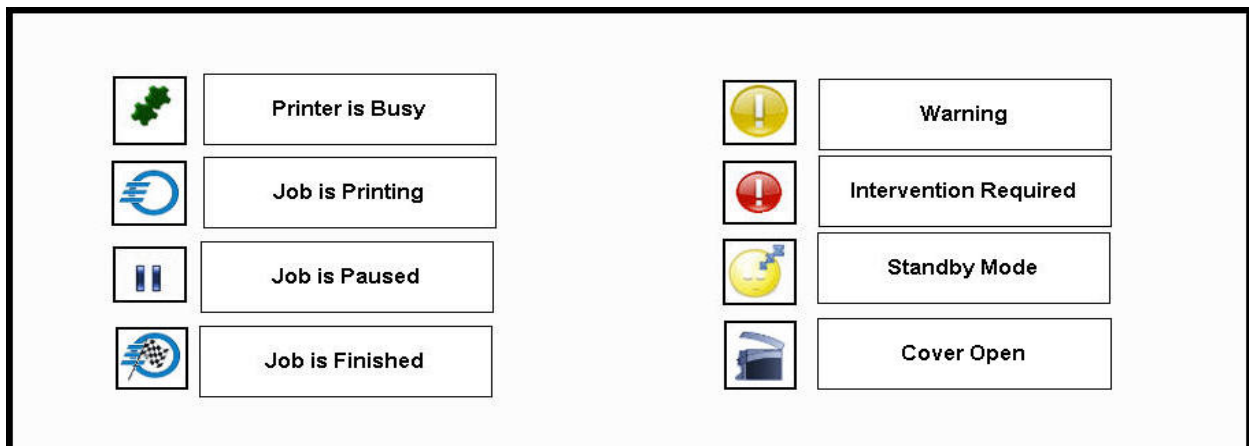
functions. Randomly selecting these functions without understanding what they do, could render the system inoperable until these settings are correctly restored!

The touch panel is divided into 2 sections **Status** and **Command**. See Figure 1-4. The icons above the black line indicate the status of user responsible consumables, the job progress Indicator bar and the printer Ready/Status indicator. The icons below the black line are used for initiating commands to the printer.



**Figure 1-4 3Z Touch Panel**

The Ready/Status Indicator shows the general status of the printer. The descriptions are illustrated in Figure 1-5. Touching the Ready Status icon will reveal more detailed information if available.



**Figure 1-5 3Z Ready Status Indicator**





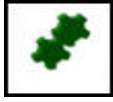


There are 8 basic activity scenarios that the touch screen may be displaying depending on the state of the printer. Within these scenarios there may be supporting displays that provide more









detailed information and operational control. The corresponding Ready/Status indicators are shown to the right. **There is no Ready/Status indicator for Idle.**

The 8 basic scenarios are:

1. **Initialization** - The printer is initializing and resetting hardware and software components during a reset, power up, or recovery. 
2. **Idle** - The printer has initialized properly and is either ready to print or is waiting for the build plate and/or file to be loaded.
3. **Printing** - The printer is in the process of printing a job. 
4. **Pause** - The printer has been paused by the user. 
5. **Job Complete** - Printer has completed the job and the cover has opened. 
6. **Auto Recovery** - The printer is recovering from an abnormal operation. 
7. **Intervention** - The printer has paused and is waiting for assistance  
**Click on the icon for further information.** 
8. **Standby** - The temperatures of the tanks, heated lines and printheads are set to a lower value. 

The Network status icon indicates the connection status between the printer and the network. The network status is illustrated below

1. Printer connected to the network. Available to multiple users. 
2. Printer connected to the network with a second user accessing the printer via 3Z Touch Remote. 
3. Printer locked so printer cannot be accessed from the network (Local control only). 
4. Printer not connected to the network (Local control only). 

## 1.3 3Z Organizer – 3Z Print – 3Z Works – 3Z Analyzer

There are four separate, Windows based applications programs associated with the 3Z Series Model Making System and its operation. They are all installed and run on the operator's workstation and constitute an integral part of the model making process. Details regarding the installation and operation of the 3Z Works, 3Z Analyzer, 3Z Print and 3Z Organizer programs are provided in the 3Z Works User's Manual, P/N 840202, which is available on the SolidScape 3Z Series Software Flash Drive, P/N 945087



**WARNING: Be sure to install 3Z Organizer, 3Z Print, 3ZWorks, and 3Z Analyzer and from the FLASH DRIVE provided with your new Model Making System to ensure that the latest versions of software and configuration files are installed on your PC.**

- **3Z Organizer**



The 3Z Organizer is the primary interface between the operator's workstation and the 3Z Printer. The program is started and then runs invisibly in the background. When an STL, SLC file or a folder with numerous files are dragged / copied into the 3Z Organizer Queue folder, the file(s) are automatically retrieved and processed through the printer driver.

- **3Z Printer Driver**

The printer driver appears and functions similar to other windows based printer drivers. The operator first selects the desired printing parameters and then selects the PRINT button. The printer driver processes the file and then automatically sends the completed file to the desired printer or a pre-defined file folder.

- **3Z Works**



3Z Works is a Windows application program that runs on the operator's workstation. It allows the operator access to more detailed controls with regard to file preparation. Controls include positioning and orienting model files and other advanced operations. The resultant .3zp or .3zs file can then be sent to the printer system via the printer driver or a USB flash drive. 3Z Works automatically generates all support structures required to build the model.



- **3Z Analyzer**



3Z Analyzer is a Windows application program that runs on the operator's workstation. It permits job file viewing, analysis and correction of the job file for pre-build evaluation, repair and diagnostic purposes. It also allows the operator to view the job file one 'slice' at a time exactly as it will be printed on the system. This tool is valuable for observing features, searching for potential defects and identifying anomalies from the 3D CAD process that appear to represent a unified solid model but in fact have internal seams or voids that will ultimately result in several separate model pieces or other model defects. Anomalous layers can be removed or replaced to permit successful model building despite CAD model defects. Break points can be inserted into job files to permit the system to pause when that layer has been completed on the 3Z Printer.

## Chapter 2 – Power On Procedure

---

This section provides complete instructions for preparing the system and initiating a print job. Careful adherence to preparation is essential to producing good quality models. Failure to perform, or short cutting, any of the specified procedures may result in a malfunction and compromise the operation of the system and/or the quality of the models produced.

Job preparation includes both of the procedures listed below when the system is powered off and, under those conditions, requires approximately eight hours. Under normal conditions, i.e., when the system is powered on and at operating temperatures, only the second procedure is required. Performing the New Job Startup Procedure typically takes a trained operator approximately five minutes.

1. Pre Power On Procedure                      Section 2.1
2. Power On Procedure                         Section 2.2

### 2.1 Pre Power-On Procedure

This procedure is typically performed only during a new installation or after a system has been moved or relocated. Step 4 through Step 7 of this procedure must also be performed after the vacuum filter has been replaced. All references to the 'unit' refer to the actual 3Z Series printer.

1. Confirm that the unit is powered off by pressing the '0', side of the power switch on the left rear corner of the unit.
2. Confirm that the unit power cord is plugged into the unit power entry socket.
3. Confirm that the other end of the unit power cord is plugged into an appropriate power outlet.
4. Confirm that the vacuum has a clean bag installed.
5. Confirm that one end of the vacuum control cable is plugged into the vacuum switch box.
6. Confirm that the other end of the vacuum control cable is plugged into the printer.
7. Confirm that the vacuum power cord is plugged into the vacuum switch box.
8. Confirm that the vacuum switch box is plugged into an appropriate power outlet

|                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Note:</b>        There are several different vacuum configurations associated with the system based on the local voltage and regulatory requirements. A summary of vacuum configurations and wiring is provided in Appendix C Vacuums.</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 2.2 Power-On Procedure

This procedure is performed on every power up and serves as a check to confirm that the unit and its subsystems initialize correctly.

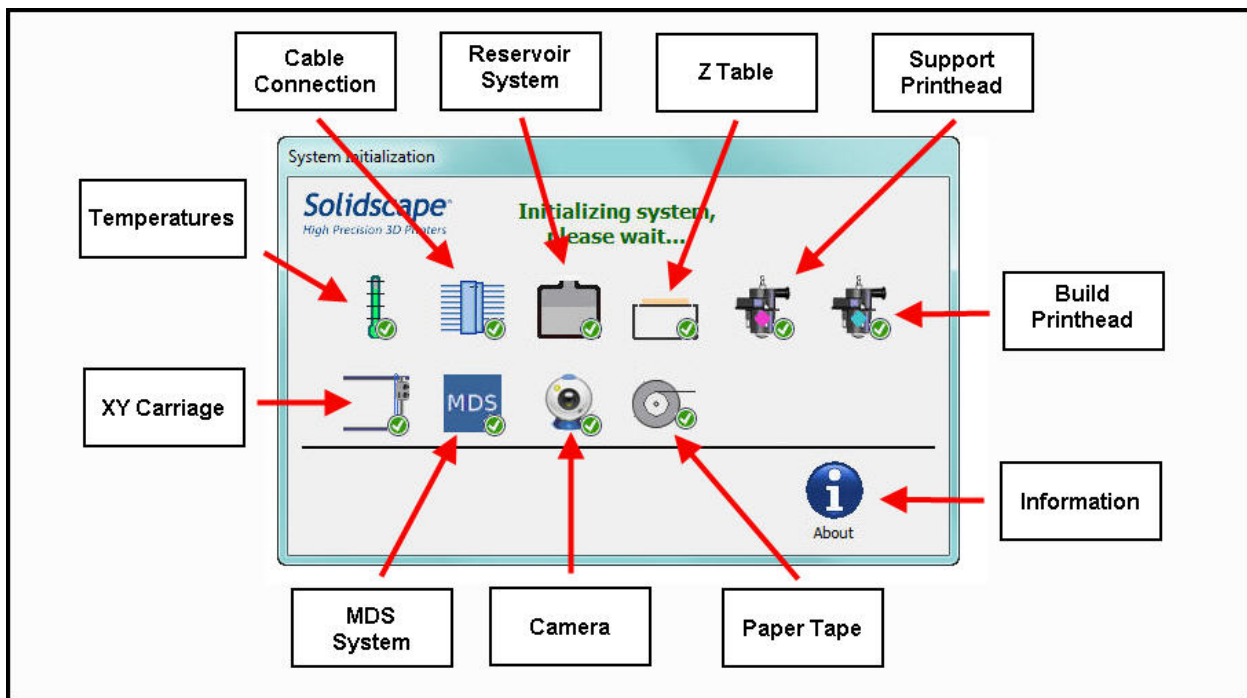


**CAUTION:** If the unit has been exposed to cold weather for an extended period of time, i.e., below freezing temperatures for twelve hours or longer, allow the unit to warm up to room temperature prior to startup. A minimum warm up period of twelve hours is recommended.



1. Turn on the vacuum power switch if it is not already set to the on position.
2. Close the 3Z Series unit side and top covers.

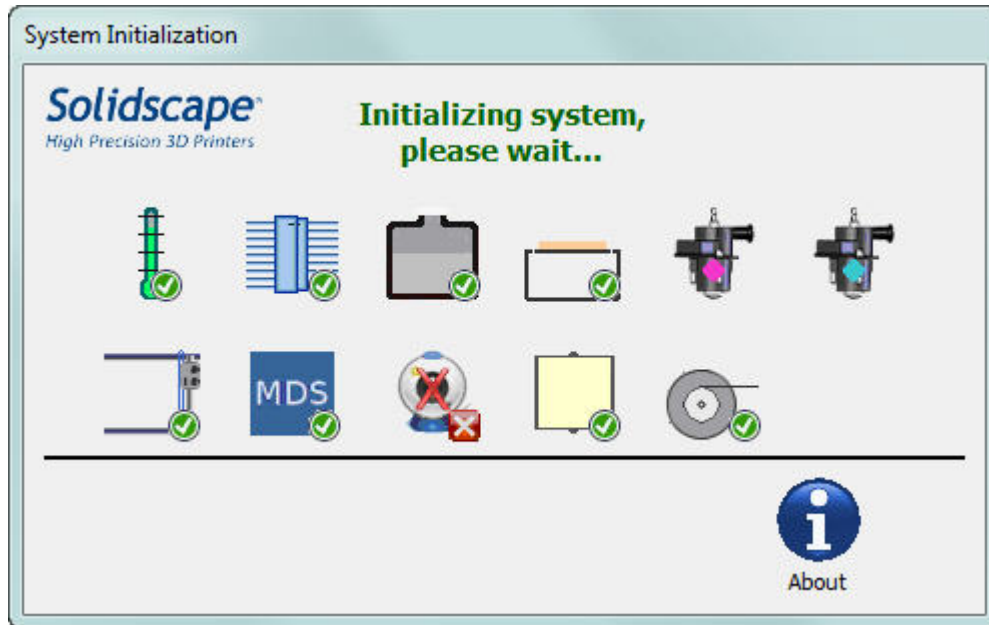
Note: Both covers must be closed or the interlock will prevent the system from completing the start up sequence.

3. Turn on the 3Z Series system by pressing the 'I', side of the power switch on the left rear corner of the unit.
4. Observe the following start up screen, See Figure 2-1, as the system progresses through the initialization stages. Be patient during power-on initialization. Note that it takes approximately one minute to start up the system and during most of that time the unit appears idle.



**Figure 2-1 Initialization screen**

5. All of the initialization screens are automatic and progress from one to the next without any operator intervention required. The icon for each process will be **grey** during initialization. The icon will display a green check  mark upon successful completion or a red  if the process is incomplete or is failing. Figure 2-2. illustrates that the camera did not initialize properly. If an initialization fails, touch the failing icon for a more detailed explanation.



**Figure 2-2 Initialization screen with Camera issue**

6. If the system was shut down or lost power while a job was active, a temporary dialog box will be displayed that disables all other operations during the twenty minute system warm up period.
7. Following a normal software initialization, the control panel displays the idle screen as shown in figure 3-1.
8. If the prior job was interrupted and has not completed, the last layer of the job will be cut back and the job will automatically be continued from that point. This 'automatic restart' function is particularly valuable following power interruptions when no one is present.



**WARNING:** If the printer was powered off for an extended period, it requires a minimum of eight hours for the material to fully melt before any jetting or calibration can reliably be performed. Despite the reading displayed in the *Temperature Status* window, the system will not operate correctly until all the material in the reservoirs is completely melted and all elements in the unit have attained full thermal stability.



## Chapter 3 – New Job Startup

Before a new job can be printed, the 3Z Base or (Build Plate) must be mounted on the printer and a job file must be loaded. Figure 3-1 shows that there is a red X next to the 3Z Base icon and also next to the job file icon indicating that these processes must be completed before a job can be started. The red Intervention icon is also displayed. You can touch any Icon for additional information.

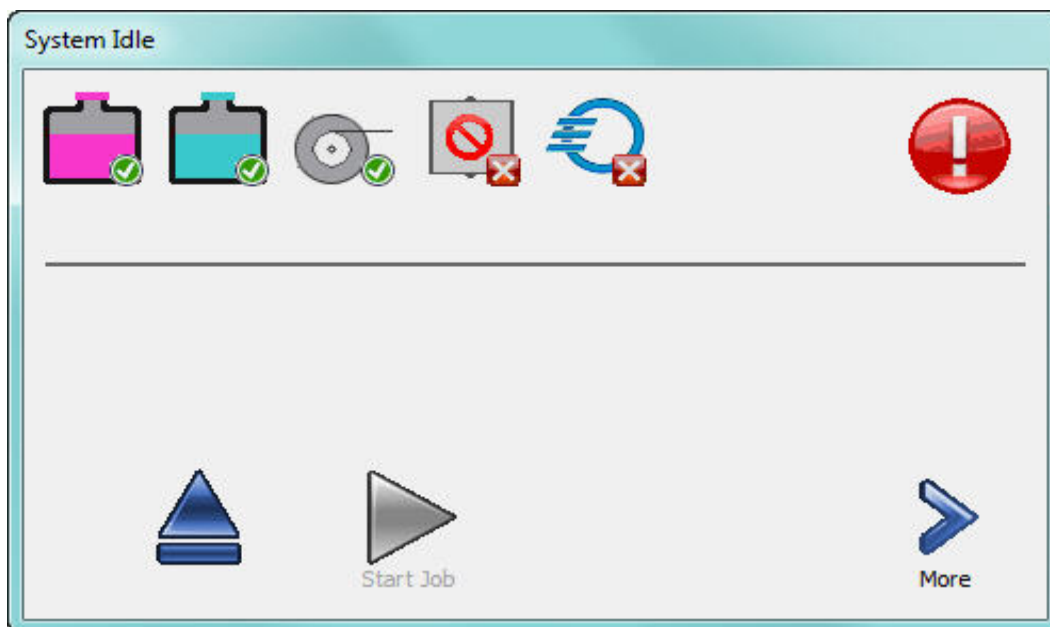


Figure 3-1 Printer Idle Not Ready

### 3.1 3Z Base Setup

The system builds composite models by depositing build and support material on a removable build plate. The build plate consists of a metal plate and a layer of 3ZBase foam that is permanently attached. The metal plate has an alignment slot and an alignment hole along one edge and mounting tabs on the two adjacent edges. The hole and slot ensure that the build plate is properly aligned when it is installed in the system. The tabs provide a means for securely anchoring the build plate. See Figure 3-2 Build plate



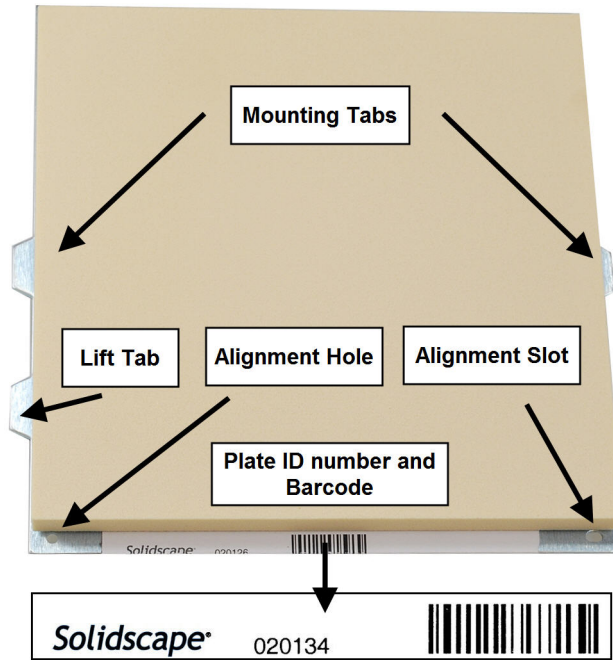


Figure 3-2 Build Plate

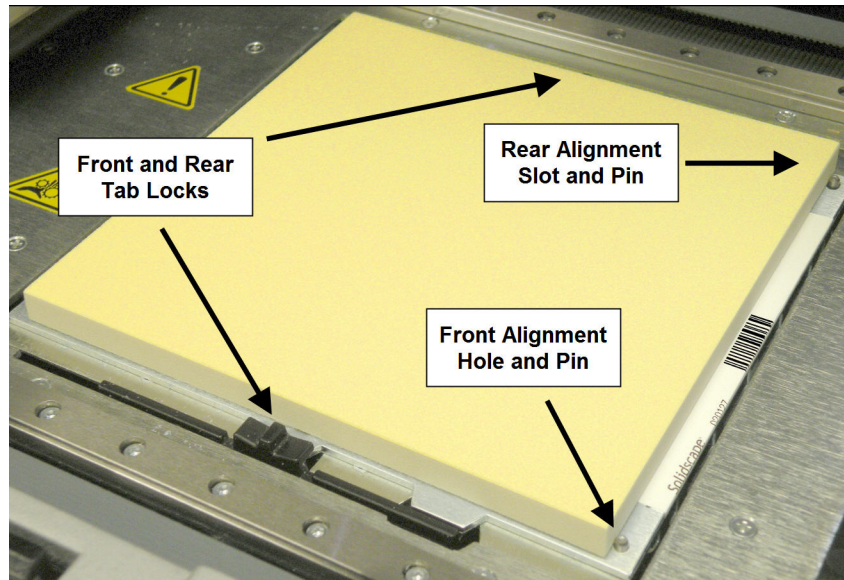
### 3.1.1 Build Plate Mounting

1. Ensure that the back, metal surface of the build plate is smooth and clean and free from material and debris.
2. Ensure that the build plate mounting hole and slot are clean, unobstructed and free from material and debris.
3. Open the top cover by pressing the **OPEN** Icon



4. Ensure that the system build table is clean and free from material and debris.
5. Align the build plate hole and slot with the alignment pins on the right side of the build table and mount the build plate on the build table. See Figure 3-3 Build Plate Mounting
6. Ensure that the build plate lies flat on the build table at all four corners. If not, debris may be caught between the table and plate. Remove the build plate and inspect both the table and plate.
7. Slide the rear then the front tab locks to the right and over the build plate tabs. See Figure 3-3 Build Plate Mounting.
8. Check to ensure that the build plate is fully secured and can not move in any direction.
9. Close the top cover. Upon closing, the printer will automatically print the serial number of the printer on the build plate and then cut the 3Z Base to the proper starting height. The 3Z Base icon will then have a green check next to it, indicating the build plate is ready for use.



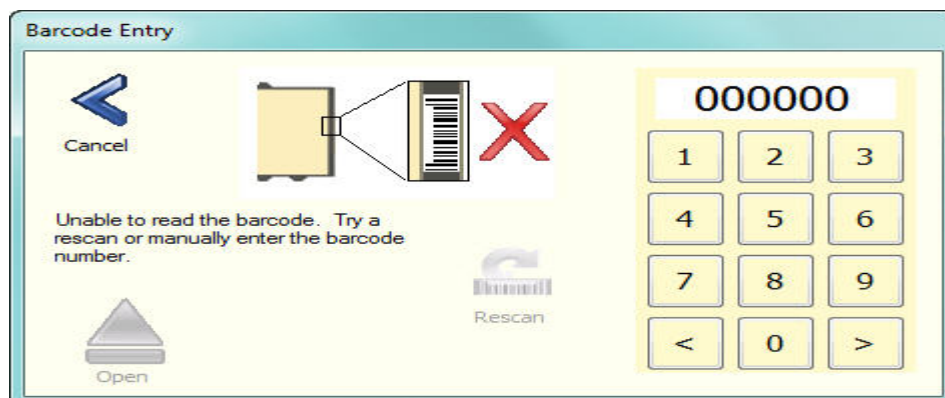


**Figure 3-3 Build Plate Mounting**

### 3.1.2 Build Plate Barcode

Each build plate has a unique barcode attached to the metal surface. The printer uses this barcode to automatically identify and position the build plate for each print job. The barcode is read by the camera and then the printer processes the information. If the plate is not recognized because it is new to the printer, the printer will automatically print a series of dots and lines on the surface and then use these dots and lines to cut the new plate to the proper height. The printer will then remember this information for future print jobs. If the printer cannot read the barcode due to the barcode being dirty or damaged, the printer will allow the user to enter the plate number via a keypad display. See Figure 3-3 Build Plate Mounting and Figure 3-4 Build Plate Barcode Keypad. Using the stylus, enter the barcode number located to the left of the barcode.

**Note:** It is not recommended to use the same build plate on different printers.



**Figure 3-4 Build Plate Barcode Keypad**

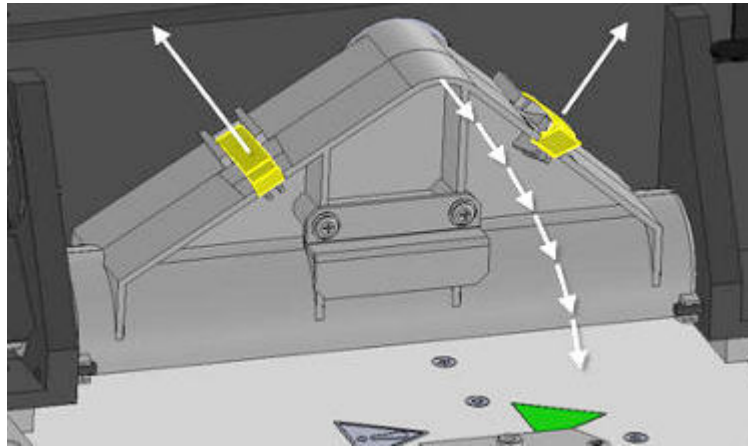


## 3.2 Cleaning the Cutter



**CAUTION! Mechanical Hazard. Use extreme caution when working in the vicinity of the cutter blade.**

1. After each layer of the model is printed, the cutter blade trims the build and support material to the exact height specified by the print job parameters. The blade is extremely sharp. Do not touch the cutter blade. The cutter may occasionally need cleaning to remove dust and debris from the blade. To clean the cutter first, unlock the 2 locking clips and open the cutter shroud to reveal the cutter blade. See Figure 3-4 Opening Cutter Shroud.



**Figure 3-5 Opening Cutter Shroud**

2. Carefully inspect each edge of the cutter blade along its entire length. Use the wooden handled brush provided in the starter kit to rotate the blade for inspection. If there is dust and material on the blade, use the brush and plastic putty knife to remove the debris. See figure 3-6 Cleaning the Cutter Blade.

3. Close the cutter shroud and lock in place by pressing down on the clips.



**Figure 3-6 Cleaning the Cutter Blade**

### 3.3 File transfer and removal

A job file must be transferred to the printer every time a new print job is run. The file type for the 3Z Series printers must have an extension of .3zp. for the 3Z Pro, 3zm for the 3Z Max and .3zs for a 3Z Studio. An example for the 3Z Pro would be **Customer job.3zp**.

There are two methods used to transfer the file to the printer: Via Flash Drive, or via a network connection.

#### 3.3.1 File Transfer via Flash drive.

1. Open the top cover and right side cover of the printer.
2. Insert the flash drive in the USB port. The USB port is located between the paper tape roll and the vacuum hose. See Figure 3-7 USB Port Location
3. The printer will recognize and download the most recently created file automatically only if there is no job already loaded.
4. The newly loaded file is then automatically checked for errors. Upon successful completion of a file transfer, the file icon will display a green check next to it.

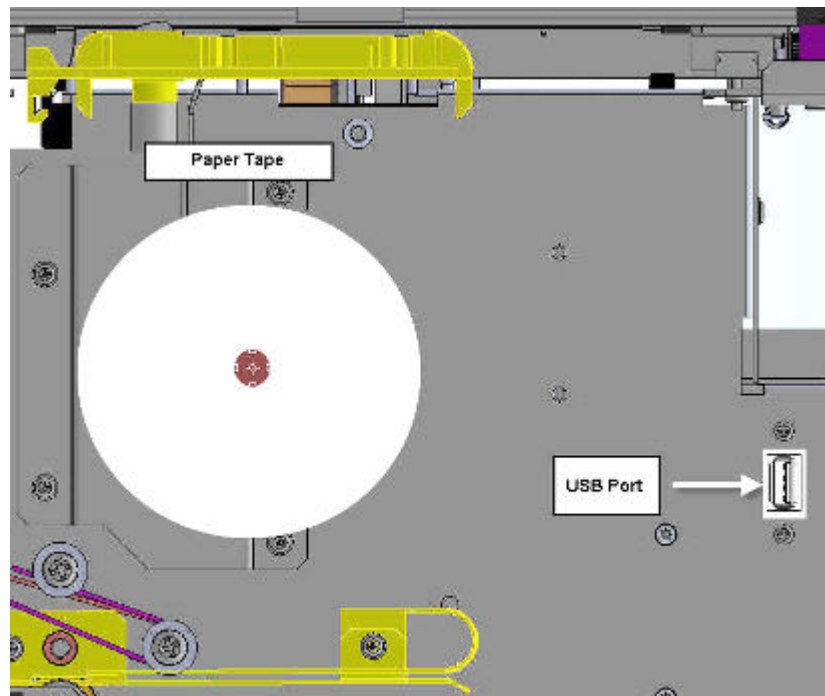


Figure 3-7 USB Port Location

#### 3.3.2 File Transfer via Network.

Transferring a file via a network connection can be processed from 3Z Works, 3Z Analyzer, or the 3Z Printer driver. The printer must have an established network connection.

Refer to section 10.2 for instructions on network installation. The printer must be idle and have no job loaded. For 3Z Works and 3Z Analyzer, use their respective **Copy to** commands. For the



Printer driver, select the **PRINT** button. Refer to the 3ZWorks User's Manual, P/N 840202, which is available on the Solidscape 3Z Series Software Flash Drive, P/N 945087.

### 3.3.3 Removing a file.

1. From the System Idle screen select **More**.
2. Select **Clear Job**.



### 3.4 Starting the Print Job

1. In the System Idle menu, insure all icons have a green check next to them.
2. Select **Start**.
3. The printer will complete a self calibration and then begin printing the model.
4. The Ready/Status indicator will display an animated file icon.





## Chapter 4 – During Job Run

During the print job, the progress bar will move from left to right, indicating the progress of the file and estimated completion time. See Figure 4-1 Job Printing

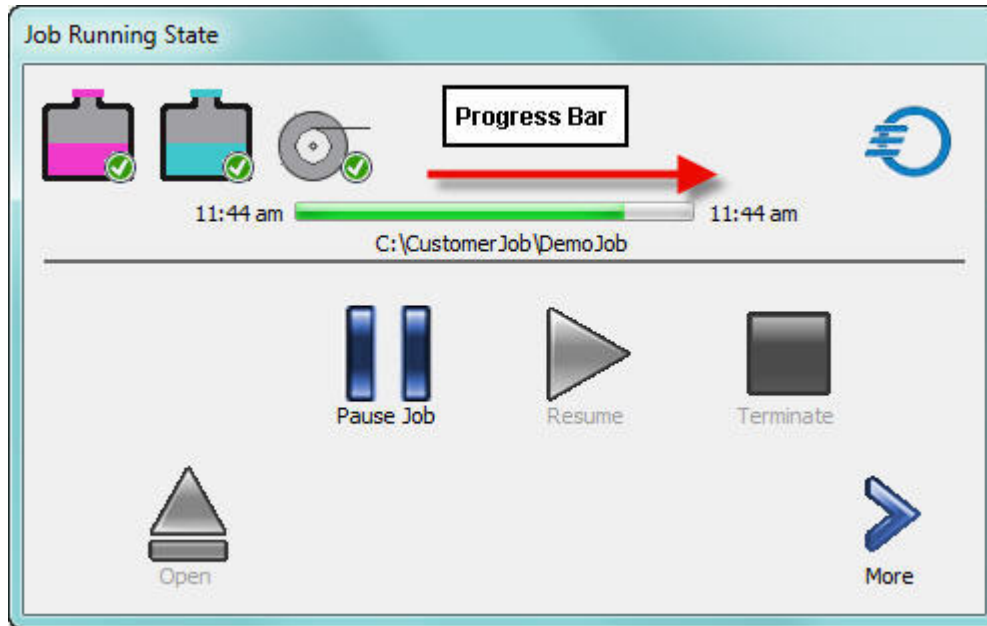


Figure 4-1 Job Printing

### 4.1 Pausing the Job

At any time you can select **Pause Job** to interrupt the printing by touching the Pause icon. See figure 4-2 Job Paused. The carriage will return to the park position.



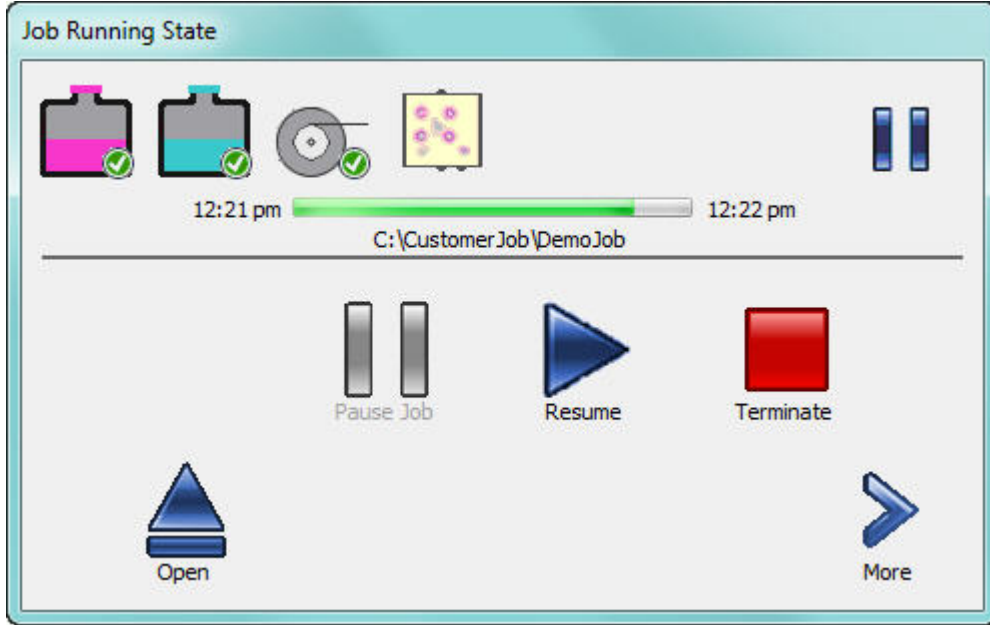
While the printer is paused, there are several options available.

Touch the **Open** icon and the cover will unlatch and open. At this point all carriage and table motions are disabled.



When you want to continue, close the cover and select the **Resume** icon.





**Figure 4-2 Job Paused**

If you want to terminate the print job, select the **Terminate**



icon

At this point the printer will ask you to verify the termination of the print job. Touch **Yes** to verify or **No** to return to the pause menu. See Figure 4-3 Terminate Job



**Figure 4-3 Terminate Job**

## Chapter 5 – Job Finish

When the printing job has completed successfully, the Ready / Status indicator will display the **Finish flag**. See Figure 5-1 Job Waiting for Finalize. Touching the **Finalize** icon will raise the table, open the cover, and the current job file will be removed from the printer. See Figure 5-2 Job Finalized. The build plate can now be removed for post processing.

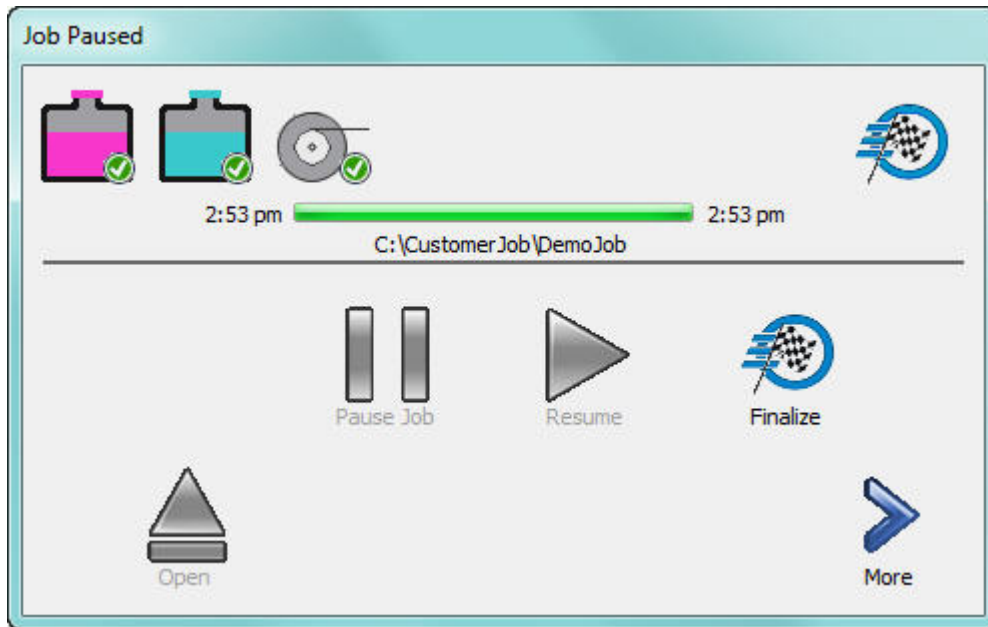


Figure 5-1 Job Waiting for Finalize

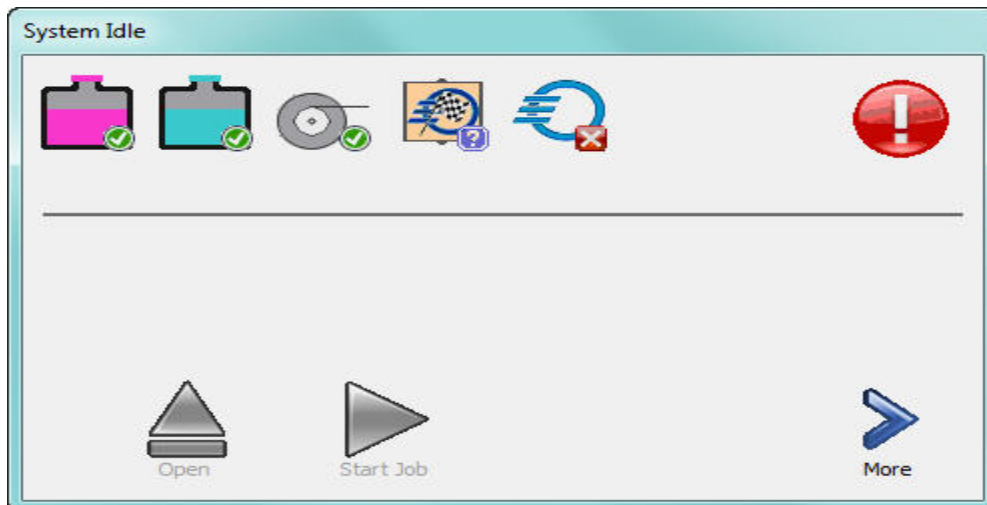


Figure 5-2 Job Finalized

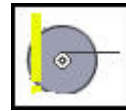




## Chapter 6 – Replacing Consumables

### 6.1 Paper Tape

When the paper tape roll reaches a low level, the status of the paper tape icon will change to a yellow Warning state. At this time the paper tape roll should be changed as soon as possible. If the printer is running, pause the job and open the top and right side covers before proceeding.



Touch the **Paper tape** icon to display the **Paper Move** icon.



Replace the paper tape roll as shown in Figure 6-1 Paper Tape Loading.

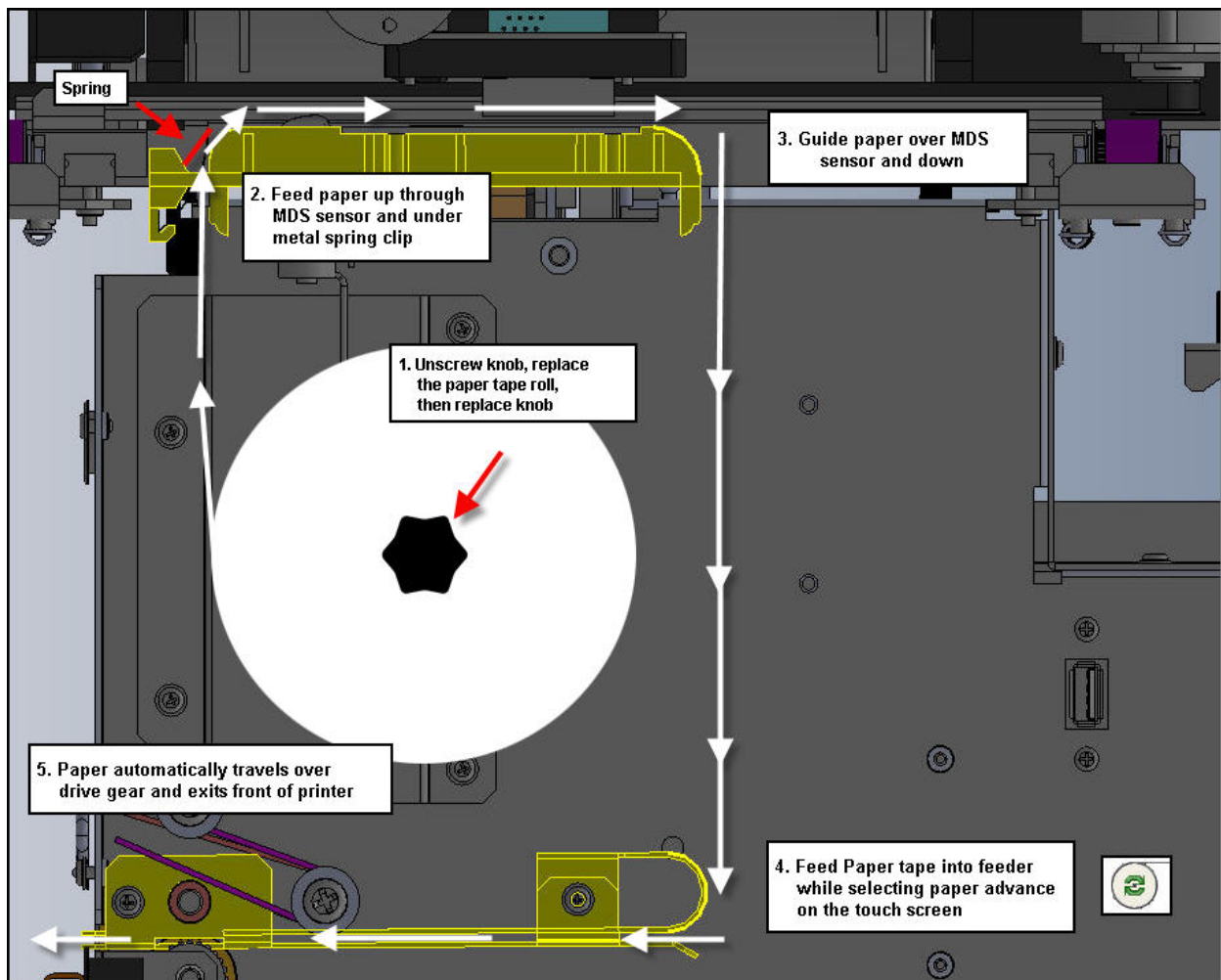


Figure 6-1 Paper Tape Loading



Touch the **Paper Test** Icon to verify the paper is advancing properly.



## 6.2 Build and Support Materials

There are two materials used in the printing process. The build material (3Z Model) is the thermoplastic that is used to construct the model. The support material (3Z Support) is a wax that is used for supporting the model during printing. The support material is dissolved away during the dewaxing process. Refer to chapter 11 for further information on dewaxing the model. Both the build and support materials are manufactured into four inch long crayons. Each material is constructed in a unique shape and color. The (3Z Model) crayon is a teal color and is a round shape. The (3Z Support) crayon is a violet color and is a hexagon shape. See Figure 6-2 Build and Support Materials. The printer holds between 4 and 5 crayons for each material. The crayons are supplied in a box of 10. The box will also contain 10 peel and stick bar code strips used to verify that the material was manufactured by SolidScape.

**Note: Every time a crayon is added, a barcode must be scanned into the printer.**



**Figure 6-2 Build and Support Materials**

The amount of material in the reservoir is displayed on the touch panel. The amount of material displayed will be dependent on whether a file is loaded or not. For example, the display will display the current material available but will change to (+X crayon(s) needed) if the printer requires this amount to complete the print job that has just been loaded. During the printing process, the display will adjust to show the current amount of material available. If the level drops to a point where 1 crayon can be added, the reservoir icon and the ready/status indicator will change. If the level drops to a lower critical level, the Ready/Status indicator will change to intervention and the printer will pause.

## 6.2.1 Adding Material

To add a crayon, follow the example below. The example is illustrated for the build reservoir.

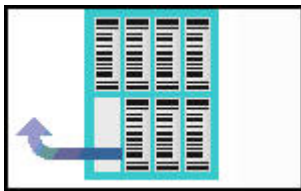
1. On the system Idle screen, Touch the **Reservoir** icon.



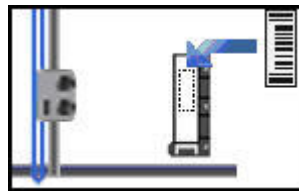
2. A new information screen will open. Now touch the **Add** icon.



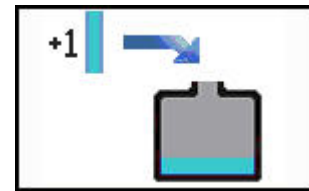
3. The paper tape will move forward and a rectangle frame will be printed on the paper. The top cover will then open. Follow the touch screen instructions as shown in Figure 6-3 Adding Material.



**A**



**B**



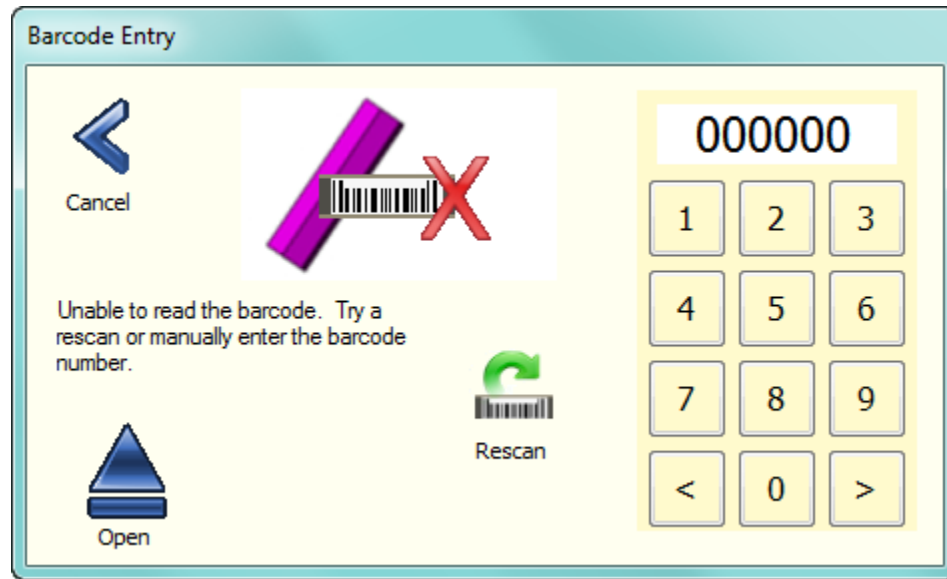
**C**

- A. Remove a barcode label from the barcode sheet.
- B. Place the label on the paper tape within the printed rectangle.
- C. Remove the tank cap and add **1** crayon.
- D. Replace the tank cap and close the cover.
- E. Touch the **Ready** icon.



**Figure 6-3 Adding Material**

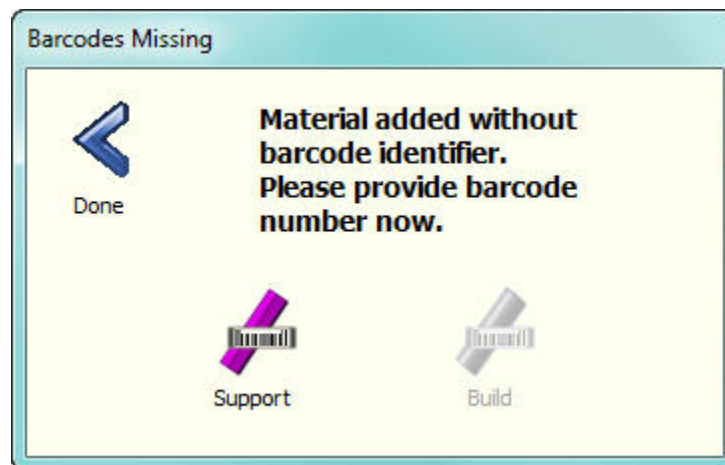
The crayon will completely melt in approximately 40 minutes for the 3Z Support material and 60 minutes for the 3Z Model material. Another crayon can then be added with an associated bar code. If the barcode cannot be read because it is damaged, misaligned, or dirty, then the printer will allow you to enter the crayon barcode number via a keypad display. See [Figure 6-4 Entering Barcode Manually](#)



**Figure 6-4 Entering Barcode Manually**

If material is added without entering a barcode, the printer will routinely prompt the user to enter a valid barcode. See Figure 6-5 Barcode Missing. A barcode should be entered as soon as possible. The printer must be Idle and the cover closed to enable a barcode entry.

**Note: Do Not Add Material to the printer. Enter a barcode only.**



**Figure 6-5 Barcode Missing**

## **Chapter 7 – Maintenance and Printer Status**

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### **7.1 Printhead Maintenance**

The *Printhead* screens provide status information and control functions required to maintain the printheads. Under normal conditions, the operator does not need to utilize these screens because the basic printhead setup is completed whenever a new job is started. There are 2 dialog boxes associated with printhead maintenance. One indicates the status of the printhead and allows the user to initiate automated maintenance commands.

The second screen contains specific information pertaining to the printhead operating parameters and also provides more detailed maintenance and testing commands. To access the printhead maintenance dialog boxes, select the build or support printhead icon located in the second system idle screen.

See Figure 7-1 Printhead Screens.

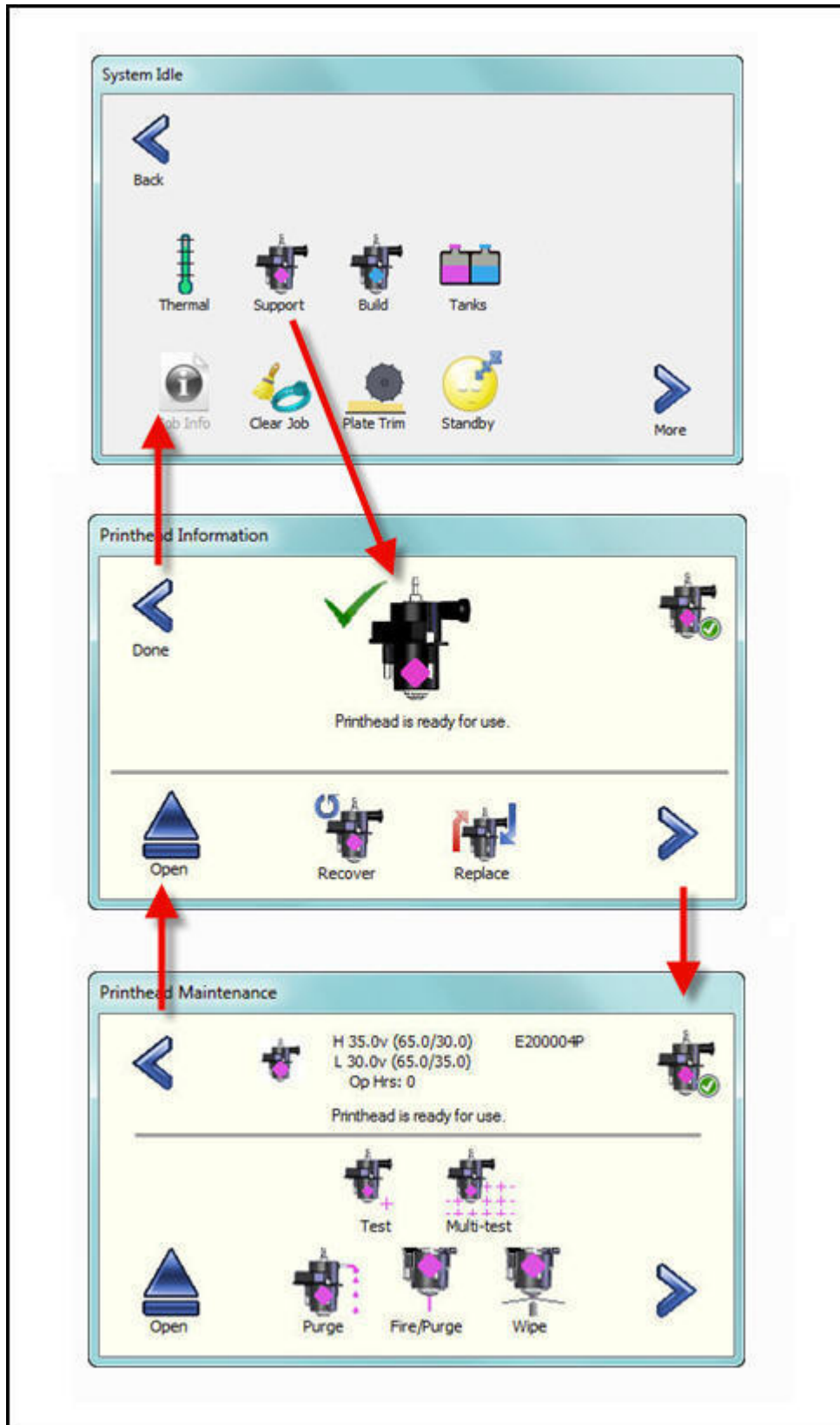
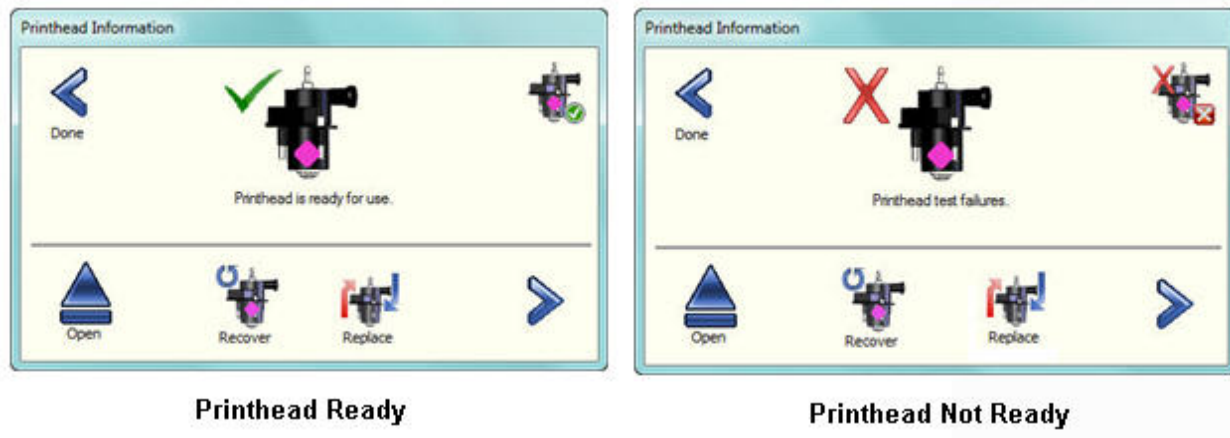


Figure 7-1 Printhead Screens

## 7.1.1 Automated Printhead maintenance

The **Printhead information** screen has one status and 2 command icons. The status icon will indicate when the printhead is functioning properly and ready for a job build. A green check indicates ready and a red X indicates not ready. See Figure 7-2 Printhead Ready / Not Ready.



**Figure 7-2 Printhead Ready / Not Ready**

Touching the **Recover** printhead to the ready printhead.



command icon initiates a series of commands to restore the state. These include purging, firing, wiping, and testing the

The **Replace** automatically calibrations.

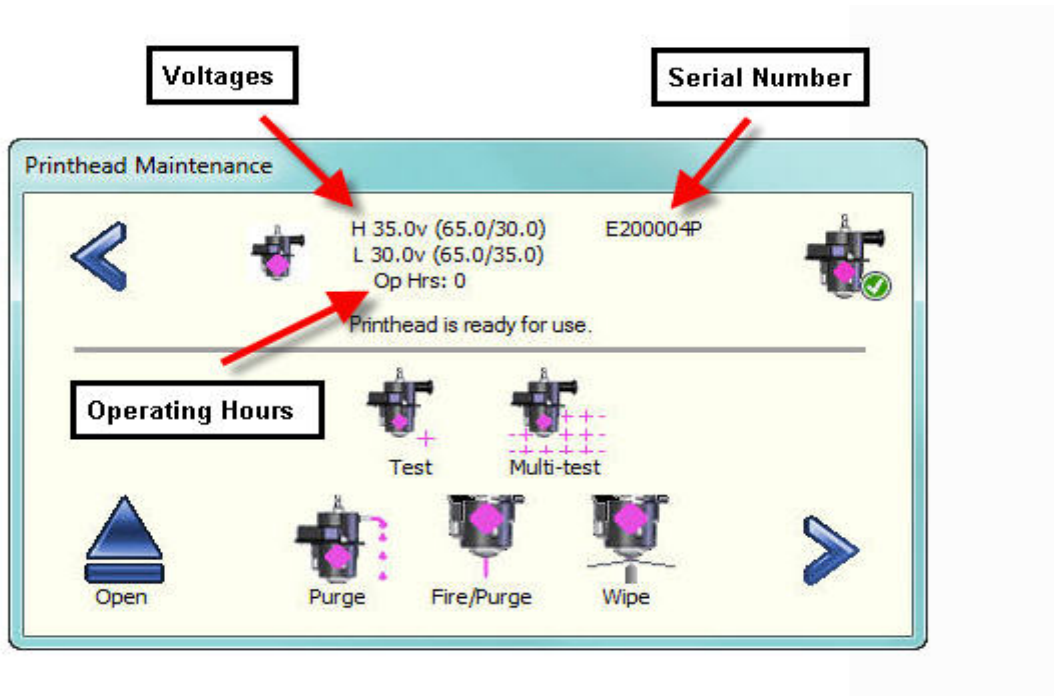


icon is used whenever a new printhead is installed. The printer will prepare the new printhead for operation. This includes all necessary calibrations. When touched, the printer will move the carriage to the appropriate position and then the cover will be opened. After the new printhead is installed, close the cover and the printhead will be tested and calibrated automatically.

## 7.1.2 Detailed Printhead maintenance

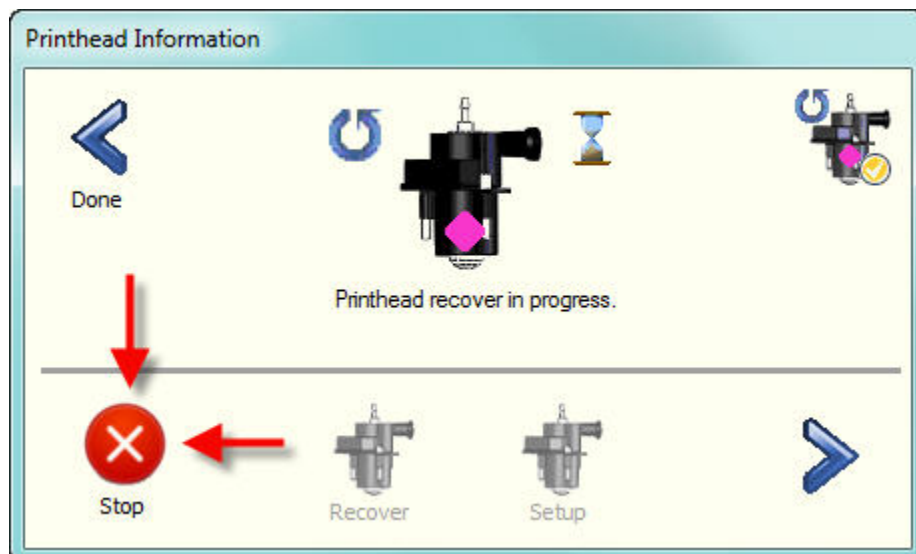
The **Printhead Maintenance screen** displays specific information pertaining to the selected printhead. This information includes: the serial number of the printhead, the operating voltages,





**Figure 7-3 Detailed Printhead Maintenance**

and the operating hours. It also allows the operator to perform specific commands and tests on the printhead. See Figure 7-3 Detailed Printhead Maintenance. Any of the printhead commands can be immediately interrupted by touching the Stop icon. See Figure 7-4 Stop Command.



**Figure 7-4 Stop Command**



**Test** Touching the test icon will command the printhead to print a single test line or cross on the paper. The camera will then attempt to read the line. If the line is read successfully, the printhead icon will have a green check next to it. If there is a failure, the printhead icon will have either a red x or yellow warning check.

Refer to figure 8-2



**Multitest** Touching Multitest will command the printer to print a row of successive tests on the paper. The camera will read each test and will indicate a pass or failure of the test.



**Purge** Touching the purge icon will command the printer remove the purge cap from the printhead and then purge the material into the purge cup. This is done to remove any air bubbles that may have been trapped in the heated line. At this time the air bubble within the printhead, will be restored.



**Fire Purge** Touching the Fire Purge icon will command the printer to force material through the printhead and, at the same time, exercise the printhead with a series of frequency tests.



**Wipe** Touching the Wipe icon will command the printer to wipe any excess material from the face of the printhead.

## 7.2 Cleaning the Camera Lens

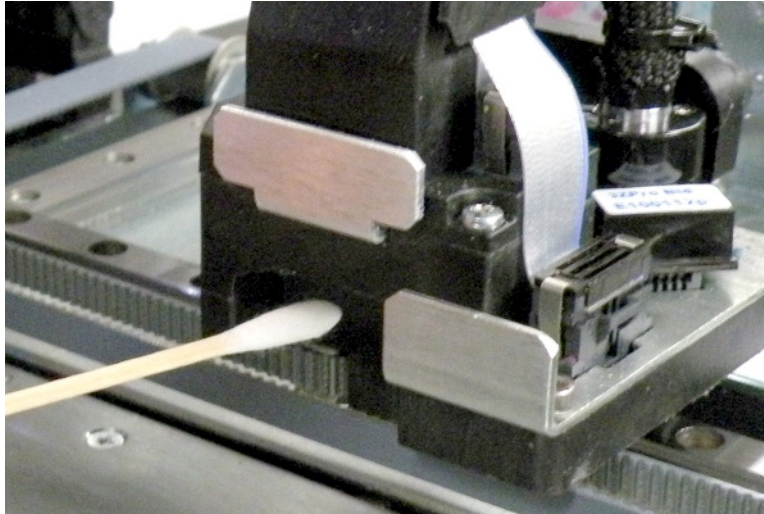
The 3Z printer utilizes a small digital camera for a variety of tests and calibrations. It is essential that the camera lens be clean in order for these procedures to be performed accurately. The camera lens is located on the Y carriage next to the printheads. The lens is facing down. See Figure 7-5 Cleaning Camera Lens. The lens should be cleaned with a pre moistened, lint free lens cleaner similar to one used for cleaning photographic cameras. Place the lens cleaner over a Qtip and gently clean the camera lens. Do not touch the lens with your finger or any other cleaning instrument.

## 7.3 Cleaning the Purge Cap Removal Station.

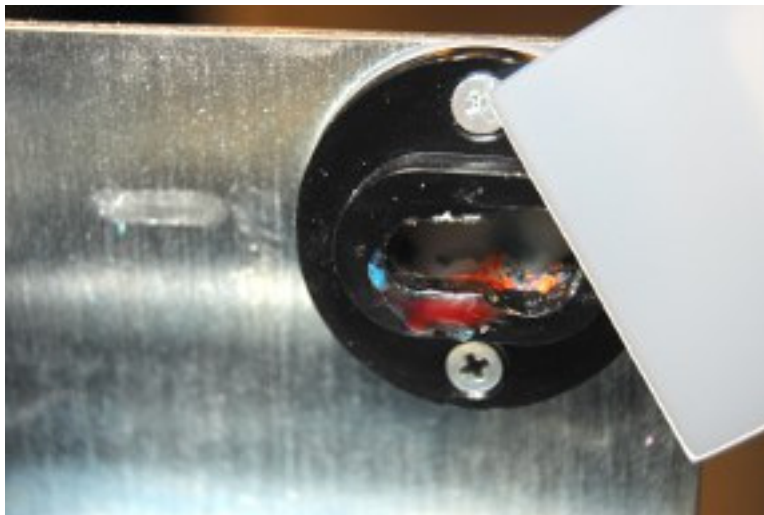
During the printhead setup operation, the purge cap is removed and replaced from each printhead. During this process, some residual build or support material may stick to the purge cap removal station. The excess material may eventually build up. To prevent this, the area must be cleaned periodically. Excess debris should be scraped off with a plastic putty knife and



the remaining debris removed with a Qtip moistened with Isopropyl alcohol. See Figure 7-6  
Cleaning the Purge Cap Removal Station.



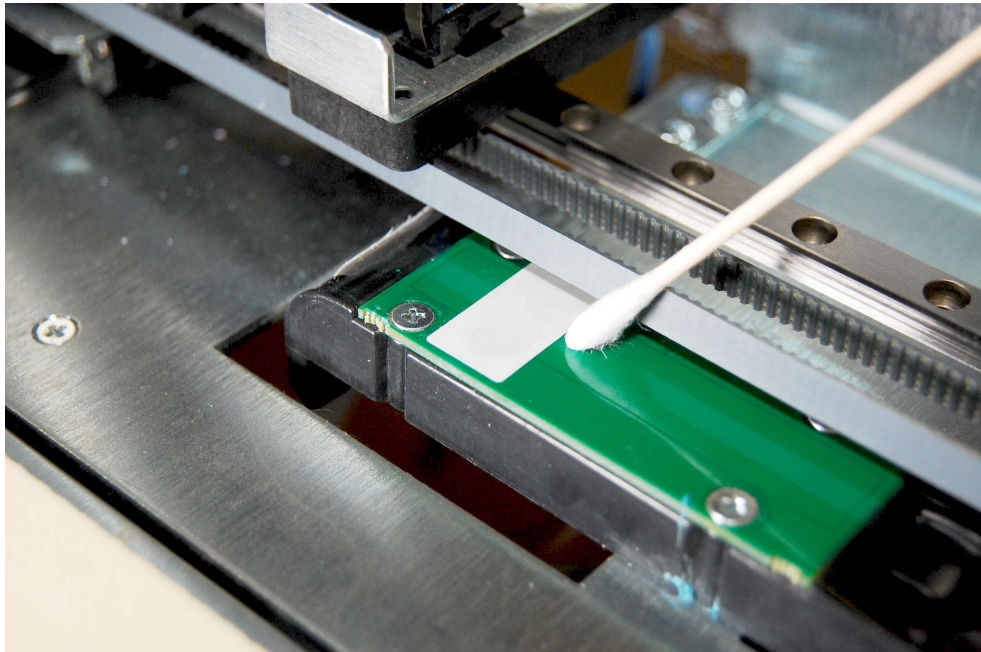
**Figure 7-5 Cleaning Camera Lens**



**Figure 7-6 Cleaning the Purge Cap Removal Station**

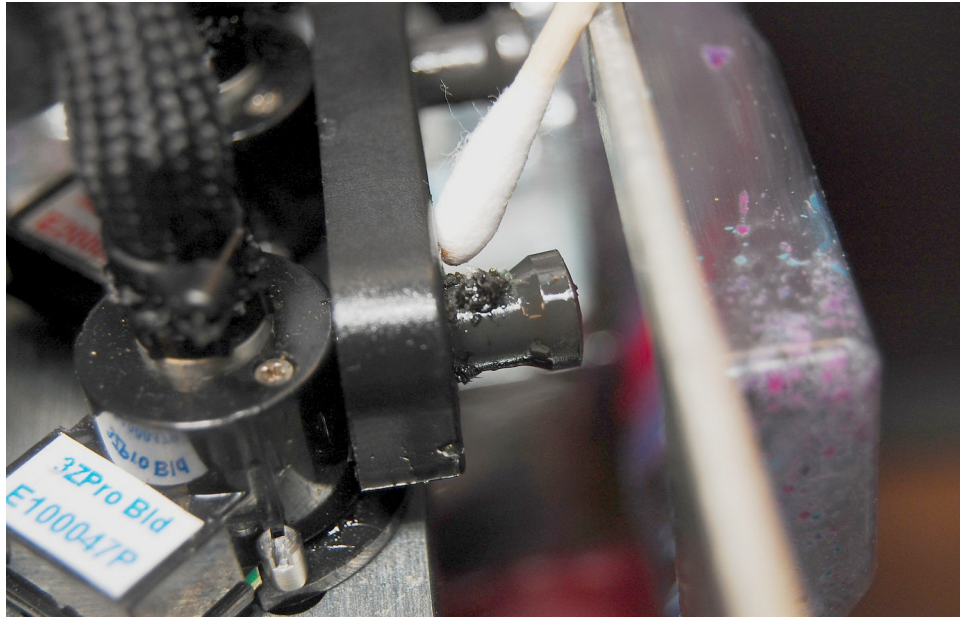
## 7.4 Cleaning the MDS Sensor and Purge Caps

The MDS (Material Deposition Sensor) is used to calibrate and test the printheads. The sensor must be clean and free from debris in order to function properly. The MDS sensor is located to the right of the build plate and is normally covered by the paper tape. See Figure 7-7 Cleaning the MDS Sensor. In order to clean the MDS sensor, the paper tape must be temporarily moved aside. First, move the printhead carriage away from the MDS sensor. Next, move the paper tape by rotating the paper tape roll clockwise and feeding the paper up through the spring clip. Refer to Figure 6-1. Feed enough paper to allow access to the top of the MDS sensor. With the paper moved aside, use a Qtip or clean cloth to clean the MDS sensor and the white reflective strip. After cleaning, rotate the paper tape roll counter clockwise until the paper is taut over the MDS sensor. Finally, use a clean Qtip to remove debris from the Purge caps of the Build and Support printheads. See Figure 7-8 Cleaning the Purge Cap.



**Figure 7-7 Cleaning the MDS Sensor**

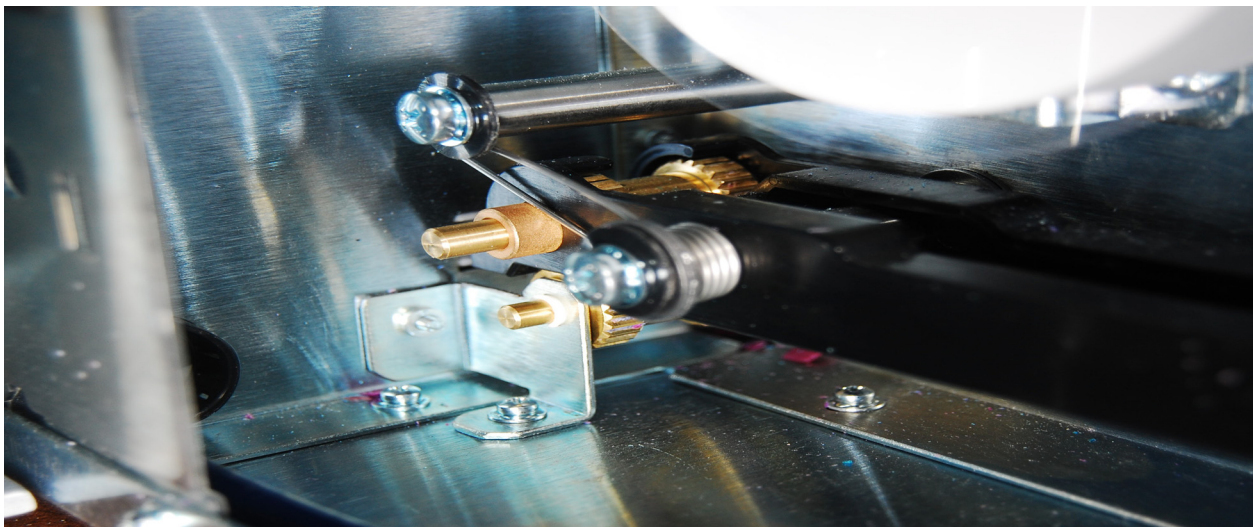




**Figure 7-8 Cleaning the Purge Cap**

## 7.5 Cleaning the Paper Tape Feed Assembly.

The paper tape feed assembly pulls the paper over the MDS sensor and then ejects the paper out through the front of the printer. It uses a system of gears to advance the paper. These gears should be checked periodically for debris. It is important to keep these gears clean. To clean the assembly, first, open the right side door to access the paper tape feed assembly. Use a stiff brush to clear any debris from the travel gears. See Figure 7-9 Cleaning the Paper Tape Feed Assembly. Also remove any residual debris from the feeder area with a brush and vacuum.

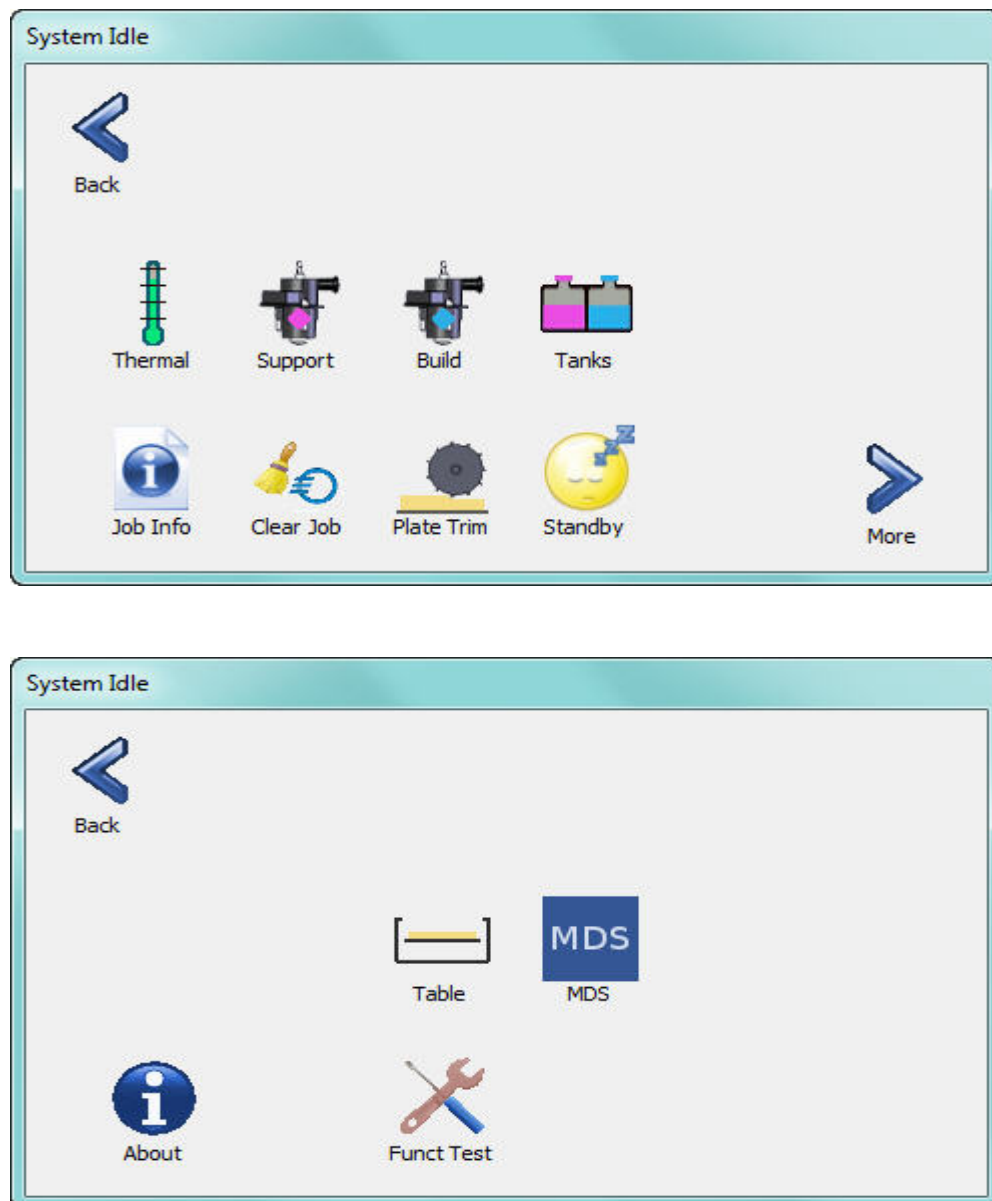


**Figure 7-9 Cleaning the Paper Tape Feed Assembly**

## Chapter 8 – Printer Subordinate Systems

### 8.1 Idle / Status Screens Overview

There are two **Idle / Status** screens that allow the user to gather information from, and initiate commands to, various sub systems within the printer. These sub systems are accessed from the System / Idle screens by touching the More and Back icons. See Figure 8-1 System Idle Screens. Each sub system may have single or multiple commands available.

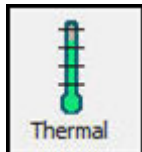


**Figure 8-1 System Idle Screens**



## 8.2 Subordinate Systems

### 8.2.1 Temperature information



Touching the thermal icon will display the current temperatures of the printheads, heated lines, material reservoirs and the build chamber. Normal operation requires all devices have a green check next to the icon. See Figure 8-2 Temperature Information. Note: Values may be different.

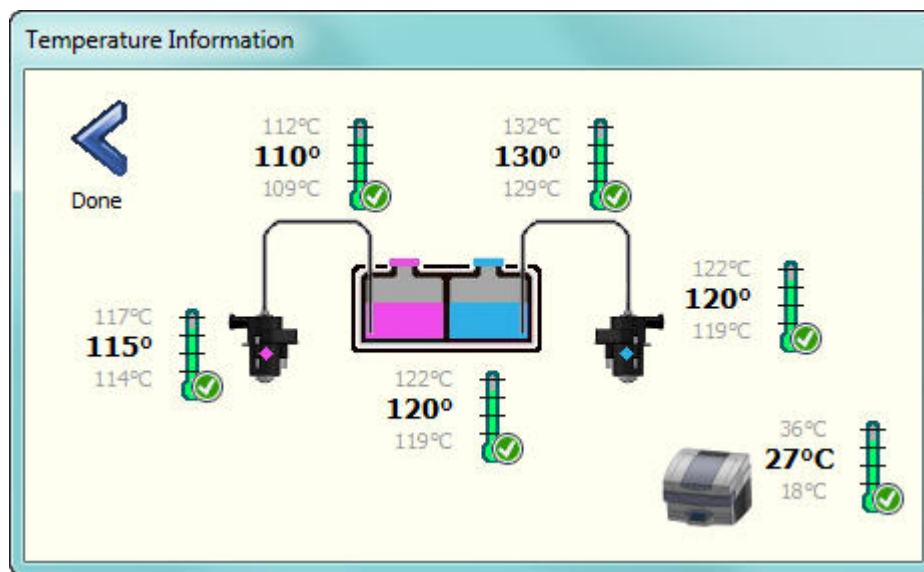
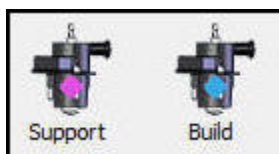


Figure 8-2 Temperature Information

### 8.2.2 Printhead Maintenance

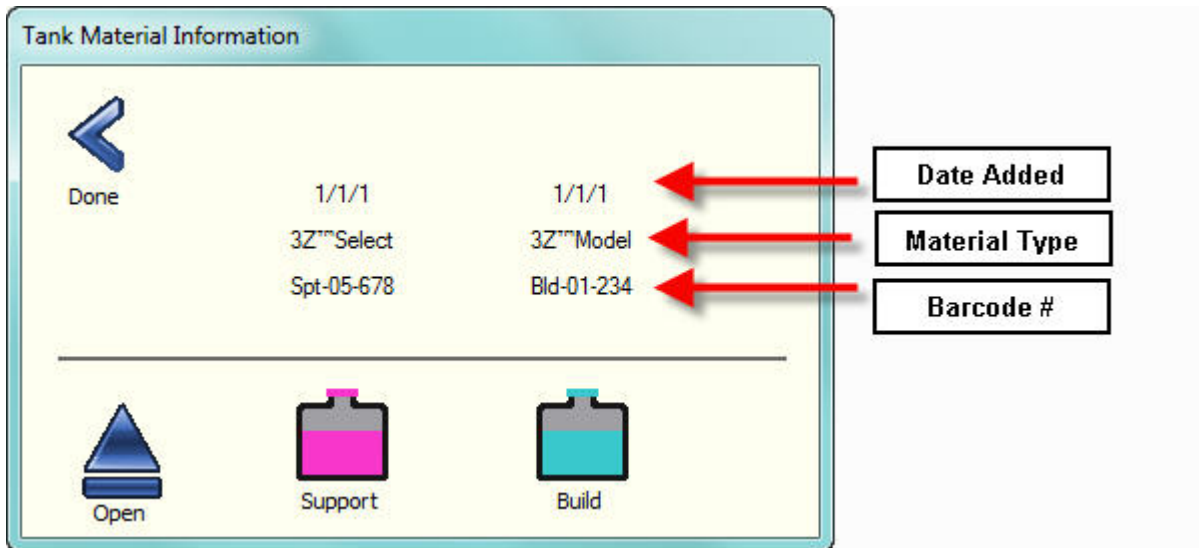


Refer to **Section 7.1 Printhead Maintenance**

### 8.2.3 Tank Material

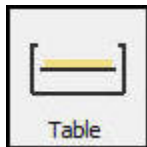


Touching the Tank icon will display current information for the Build and Support materials in the printer. See Figure 8-3 Tank Material Information. To check or add material, touch the appropriate tank icon. Then refer to section 6.2.1 Adding Material, if needed.

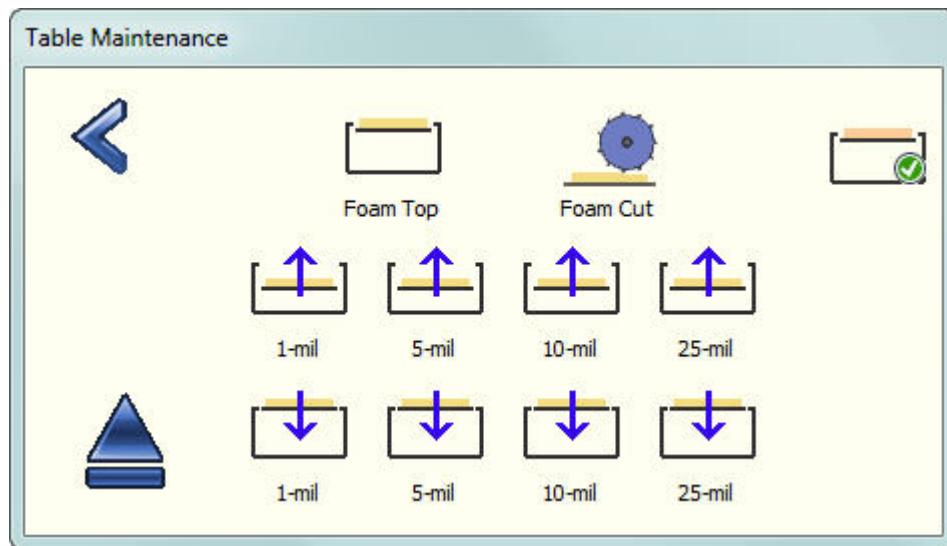


**Figure 8-3 Tank Material Information**

## 8.2.4 Table



Touching the table icon opens the Table Maintenance dialog box. Touching the individual icons will allow the user to move the table up or down a specific amount, or move the table to the up most position. The user can also perform a foam cut of the 3Z Base. Each time the foam cut icon is pressed, the 3Z Base will be cut .004 inches (.1016mm). See Figure 8-4 Table Position Information.



**Figure 8-4 Table Position Information**

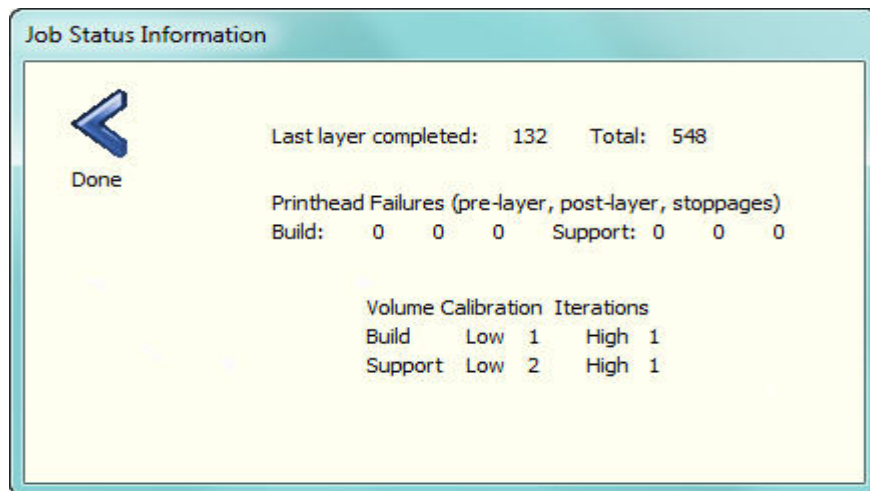




## 8.2.5 Job Information

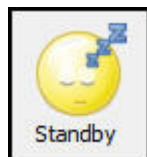


Touching the Job Information icon will open the Job Status Information dialog box. The information displayed includes the current number of layers completed, printhead performance and number of calibration tests required to reach the acceptable values. Figure 8-5 Job Information.



**Figure 8-5 Job Information**

## 8.2.6 Standby



When the Standby icon is touched the printer will reduce the temperatures of the printheads, heated lines, and reservoir tanks. This is done to reduce the effect of heat on stagnate build and support materials. Touching the Wake icon will return the temperatures to their normal operating temperatures.

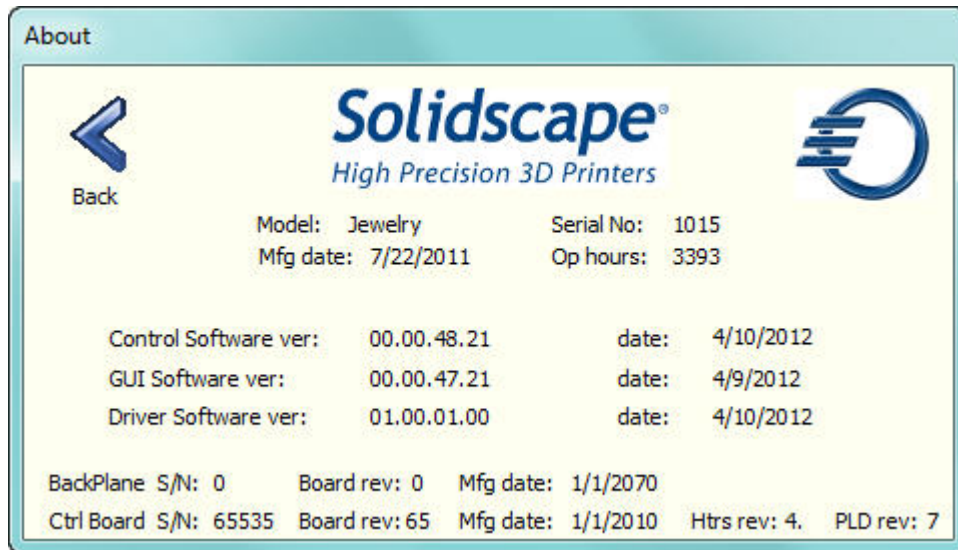


**Note: The printer will automatically go into sleep mode if it is idle for more than 48 hours.**

## 8.2.7 About



Touching the About icon will display important printer information. This information is used to verify that the printer has the correct software and firmware revisions installed. See Figure 8-6 About Printer Information.

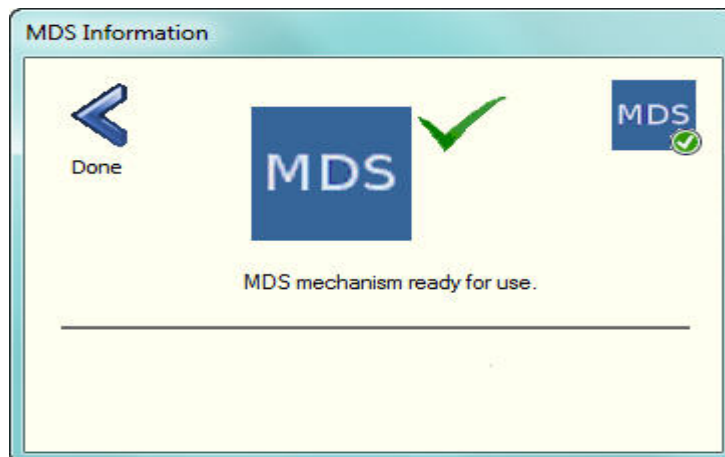


**Figure 8-6 About Printer Information**

## 8.2.8 MDS



Touching the MDS icon will display the current status of the MDS calibration sensor. See Figure 8-7 MDS Status Information.



**Figure 8-7 MDS Status Information**



## Chapter 9 – Function Test

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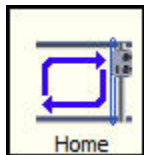
Touching the Funct Test icon will open a dialog box that allows the user to operate and verify various sub systems within the printer.



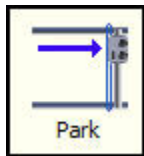
Touching the Vacuum icon will toggle the power to the vacuum. Touch once to apply power to the vacuum and touch again to remove power from the vacuum.



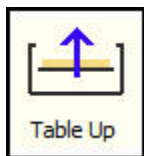
Touching the Fan Power icon will toggle the power to the chamber fan. Touch once to apply power to the fan and touch again to remove power from the fan.



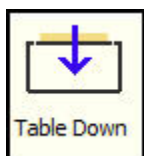
Touching the Home icon will initiate a series of commands to set the home position for the X Y carriage. These commands assist in verifying that the carriage is able to power itself correctly without any motion errors. It also sets the starting values for the printers X Y location.



Touching the Park icon will move the X Y carriage to the park position. This position is the normal position of the carriage when the printer is idle.



Touching the Table up icon once will move the Z table up ½ inch (12.5mm).



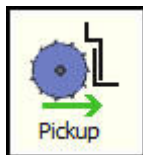
Touching the Table down icon once will move the Z table down ½ inch (12.5mm).



Touching the Open icon will activate a solenoid inside the printer. This solenoid moves the top cover latch which then allows the top cover to spring open.



Touching the Cutter icon will toggle the power to the Cutter motor. Touch once to apply power to the cutter motor and touch again to remove power from the cutter motor.



Touching the Pickup icon will initiate a series of commands to verify that the cutter assembly is picked up and parked properly. First, The X Y carriage will move over to the cutter assembly. Then the cutter assembly will be engaged with the carriage. The carriage will then move the cutter assembly back and forth in the X motion direction 2 times. Then the cutter assembly will be moved to the park position. Finally, the carriage will disengage and return to the carriage park position.



Touching the Advance paper icon will advance the paper 5 inches (127mm).



Touching the Solenoid icon will activate the paper tape solenoid and raise the paper tape for 5 seconds and then automatically deactivate and lower the paper to the normal height.



The Net Test button is used for verifying and troubleshooting printer network settings. Please contact the Solidscape service department for further assistance.

## Chapter 10 – Connecting the printer to your PC



**CAUTION!** The network interface does not require sophisticated networking skills to establish if the following procedures are followed. However, failure to follow these directions can (and usually does) make the network connection process very difficult. Please follow the instructions provided below precisely.

### 10.1 Interface Overview

The preferred method of installing the 3Z series printers is with an Ethernet network connection. This allows for the seamless transfer of job files to the machine from the user's PC via the 3Z Works model processing software. There are several different network connection options, which are discussed below.

In addition, if the 3Z series printer is connected to an internet enabled network, several other benefits become available. First, the 3Z series printer can broadcast status and usage information to our secure server. This will allow for faster and easier access to information that can help diagnose and correct problems that may occur on your 3Z series printer. Note that Solidscape **cannot** directly access your 3Z series printer, thus reducing any concerns about privacy.

Having your 3Z series printer connected to the internet will also help us to keep you current with software updates. This will help ensure that you are always running the most current version of the 3Z Touch software on your printer, helping you produce the best possible quality models.

There are three basic methods of connecting your 3Z series printer to a network, wired through a router or hub, direct wired peer-to-peer, and wireless. Each of these methods is discussed in detail below.

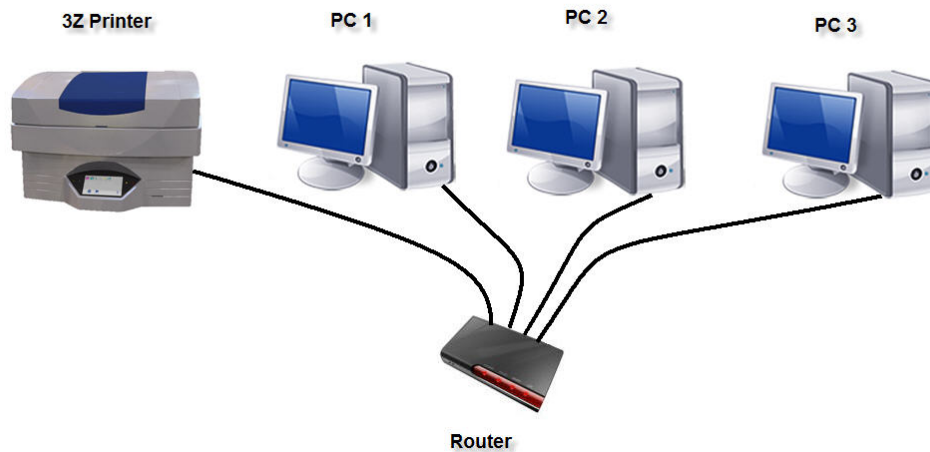
### 10.2 Wired Connection via DHCP

This is the most common and easiest way to connect your 3Z Series printer to a network. The 3Z Series printer's ship from the factory with the network default set to use DHCP. You will need a standard Cat5e network cable to make the network connection. See Figure 10-1

Insert one end of the network cable into the network connection port on the rear of the 3Z Series printer. The other end of the network cable should be inserted into an available port on the network router, hub, or switch. In this configuration, the router acts as a DHCP server, automatically assigning an IP address to the 3Z Series printer.

If you are on a company network, or connect to the internet through a router on the network, you likely have a DHCP server available.

Your 3Z Series printer is now connected to your network.



**Figure 10-1 Wired connection via DHCP**

## 10.3 Wired Connection via Static IP Address

This is another common way to connect your 3Z Series printer to a network. Since the 3Z Series printer's ship from the factory set to use DHCP, you will need to configure the 3Z Series printer to use a static IP address. You will need a standard Cat5e network cable and an IP address and subnet mask to use. Your network administrator will provide you with the IP address and subnet mask. See Figure 10-1

Insert one end of the network cable into the network connection port on the rear of the 3Z Series printer. The other end of the network cable should be inserted into an available port on the network router.

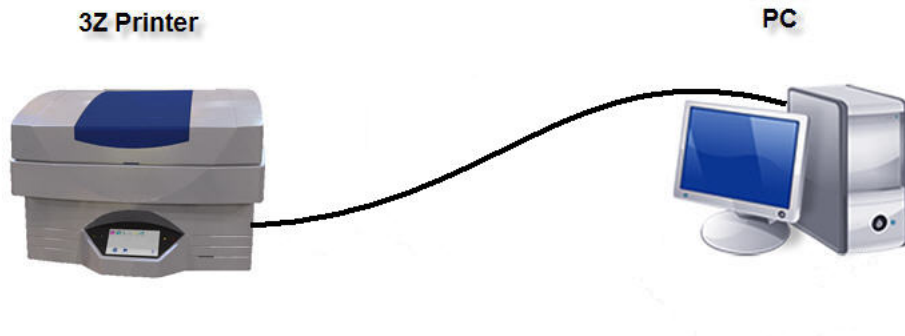
To assign the IP address for your 3Z Series printer, follow the directions in the "Assigning a Static IP Address to a 3Z Printer" section of this document. You will need the IP address and subnet mask provided by your network administrator to perform this step.

Your 3Z Series printer is now connected to your network.

## 10.4 Wired Connection Peer to Peer

This is a less common way to connect your 3Z Series printer to a PC. Since the 3Z Series printer's ship from the factory set to use DHCP, you will need to configure the 3Z Series printer to use a static IP address. You will also need a crossover Cat5e network cable.

Insert one end of the network cable into the network connection port on the rear of the 3Z Series printer. The other end of the network cable should be inserted into the network port on your PC.



**Figure 10-2 Wired connection Peer to Peer**

Follow the directions in the “Assigning a Static IP Address to a 3Z Printer” section of this document to set the IP address to 192.168.0.2 with a subnet mask of 255.255.255.0 on the 3Z series printer.

If your PC is running Windows 7, proceed to the section 10.7 Windows 7 Static IP Address Assignment.

If your PC is running Windows XP, proceed to the section 10.8 Windows XP Static IP Address Assignment.

Your 3Z Series printer is now connected to your network.

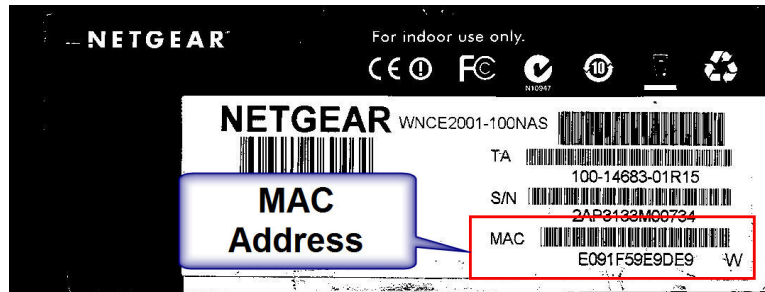
## 10.5 Wireless via DHCP

To wirelessly connect the 3Z Series printer to your wireless network, you will need a third party wireless Ethernet adapter. The wireless Ethernet adapter must connect to the 3Z Series printer Ethernet port, wireless USB adapters will not work on the 3Z Series printers.

The NetGear WNCE2001 Wireless Ethernet adapter has been tested and shown to work with the 3Z Series printers. Other manufacturer’s wireless Ethernet adapters should also work but have not been tested with the 3Z Series printers.

Configure the wireless Ethernet adapter according to the manufacturer’s Installation Guide. When configuring the adapter, make a note of the wireless Ethernet adapters MAC address (i.e. c0:3F:0e:40:d3:05). The MAC address may be listed on the wireless Ethernet adapters box or documentation. If not, see the manufacturer’s documentation for instructions on finding the MAC address. See Figure 10-3.

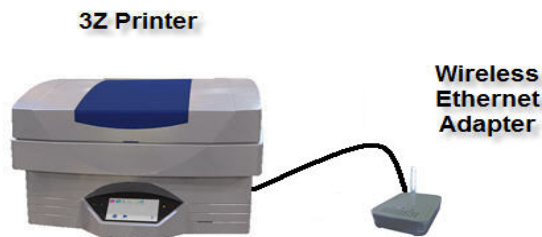






**Figure 10-3 Wireless MAC Address**

If your wireless network router is using MAC address filtering for security purposes, you will need to add the wireless Ethernet adapters MAC address to the routers MAC address filter list. See your routers documentation for information on how to this.

Once the wireless Ethernet adapter has been configured, plug the wireless Ethernet adapter into the network port on the rear of the 3Z Series printer. Plug in the wireless Ethernet adapters power supply. The wireless Ethernet adapter should connect to your wireless network and supply an IP address to the 3Z Series printer. See Figure 10-4 .

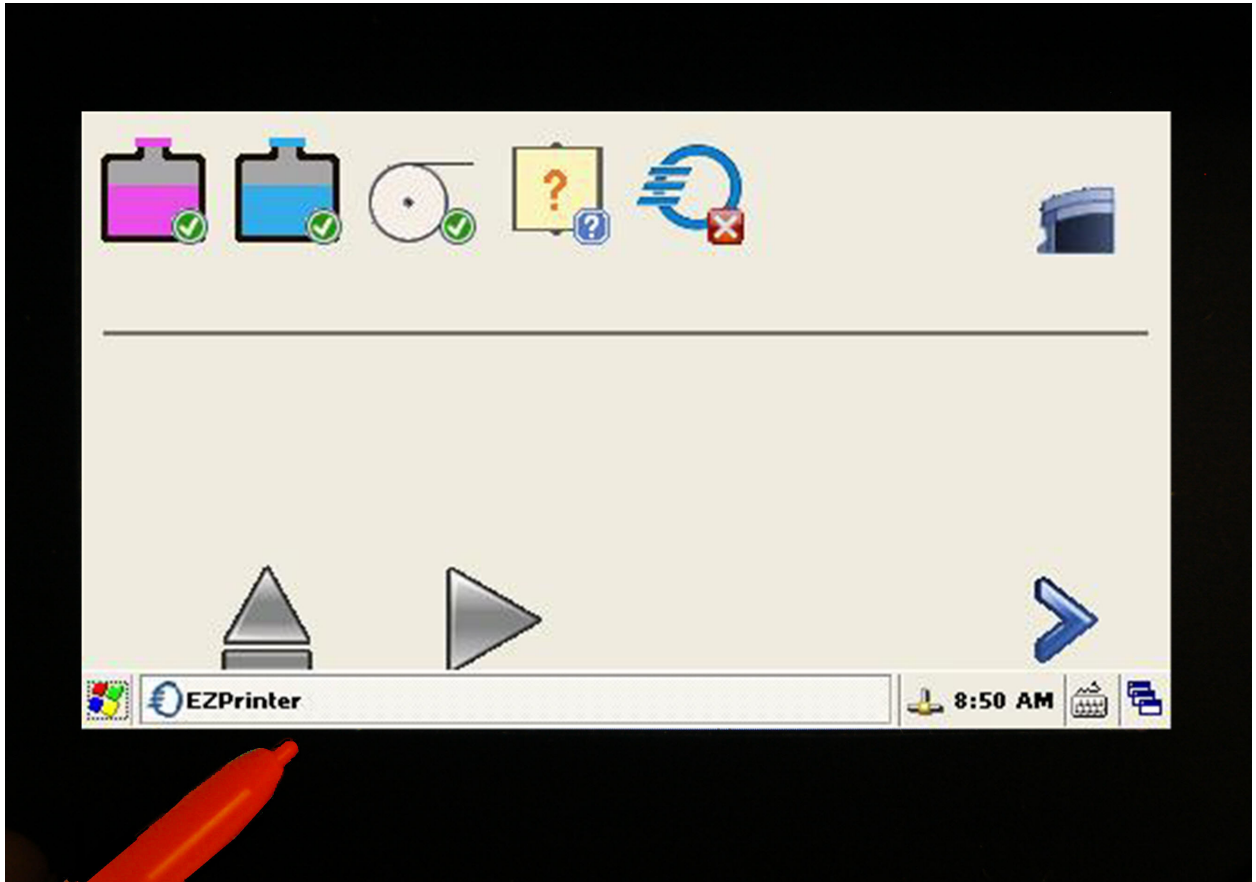


**Figure 10-4 Wireless Ethernet Adapter**


The network connection icon in the 3Z Series printers' status bar should change from  to . This signifies that the machine is connected to the network. Your 3Z Series printer is now connected to your network.

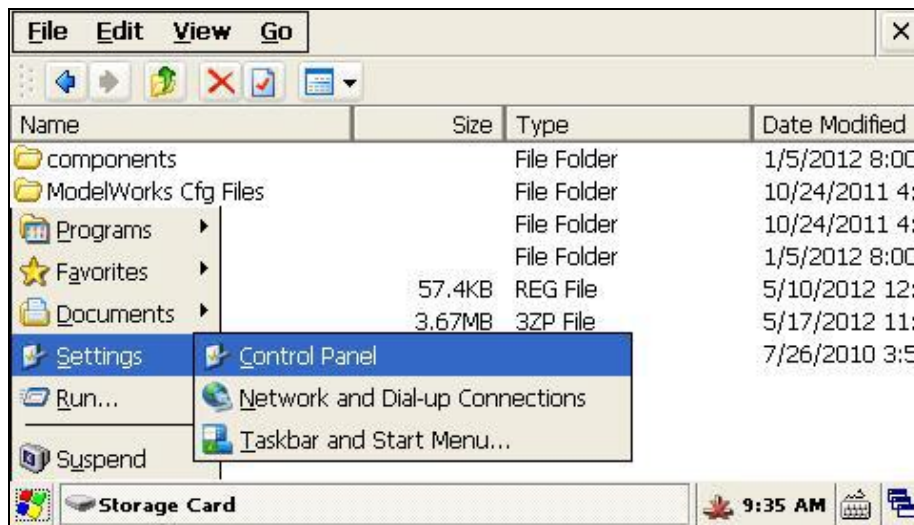
## 10.6 Assigning a Static IP Address to a 3Z Printer

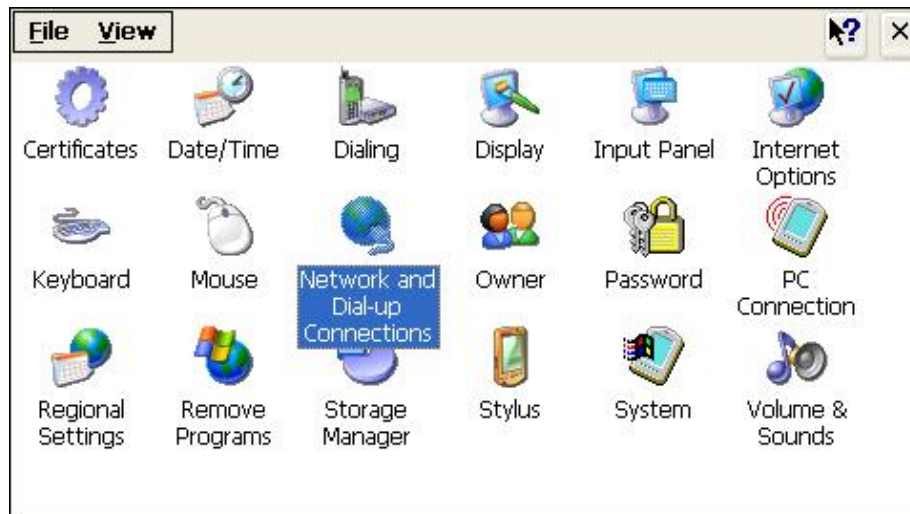
On the 3Z Series printer, touch the stylus on the black bezel just below the display screen to open the status bar. See figure 10-5.





**Figure 10-5 Stylus and Touch Screen**

Touch the  button and select Settings → Control Panel. From the Control Panel double click “Network and Dial-Up Connections”. See Figure 10-6.





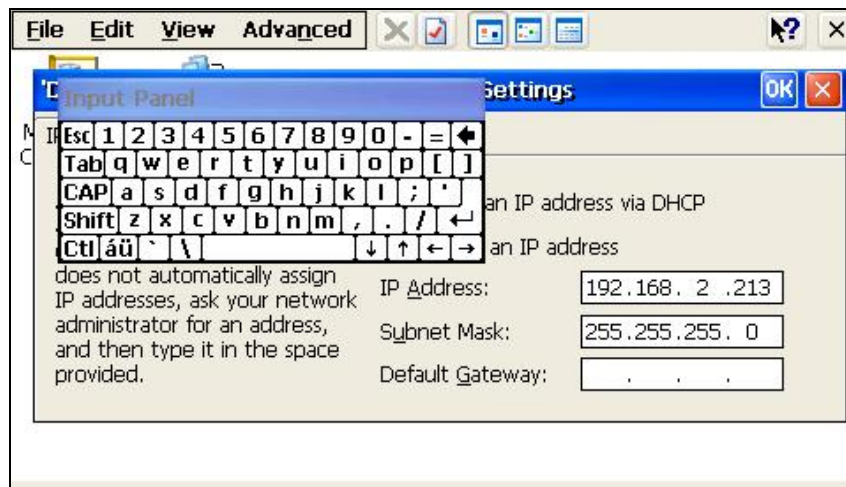
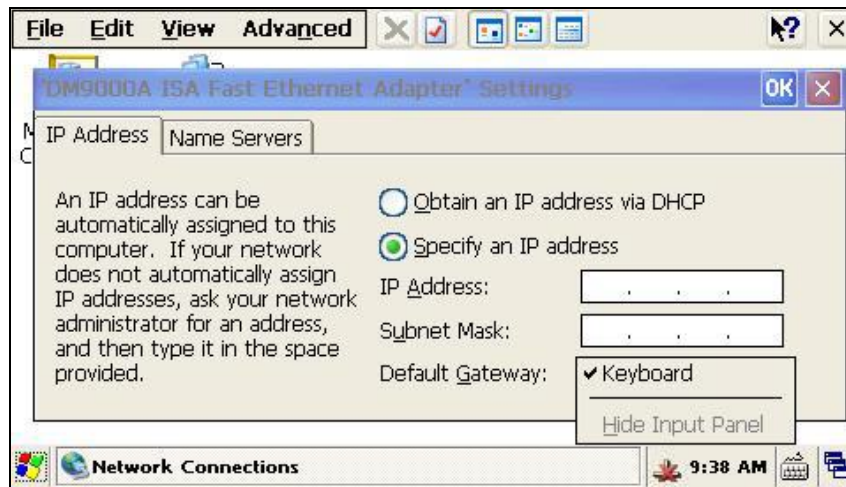
**Figure 10-6 3Z Series Printer Control Panel**

Once the “Network and Dial-up Connections” window opens, double click on the “DM9CE1” icon to open the properties windows for the network adapter. Open the status bar again and click the  icon and click the  icon, this will open the virtual keyboard.








**Figure 10-7 DM9CE1 Icon**

Click the radio button labeled “Specify an IP address”. Using the virtual keyboard, enter the IP address and subnet mask. In this example, we used an IP address of 192.168.2.213 and a subnet mask of 255.255.225.0. See Figure 10-8.



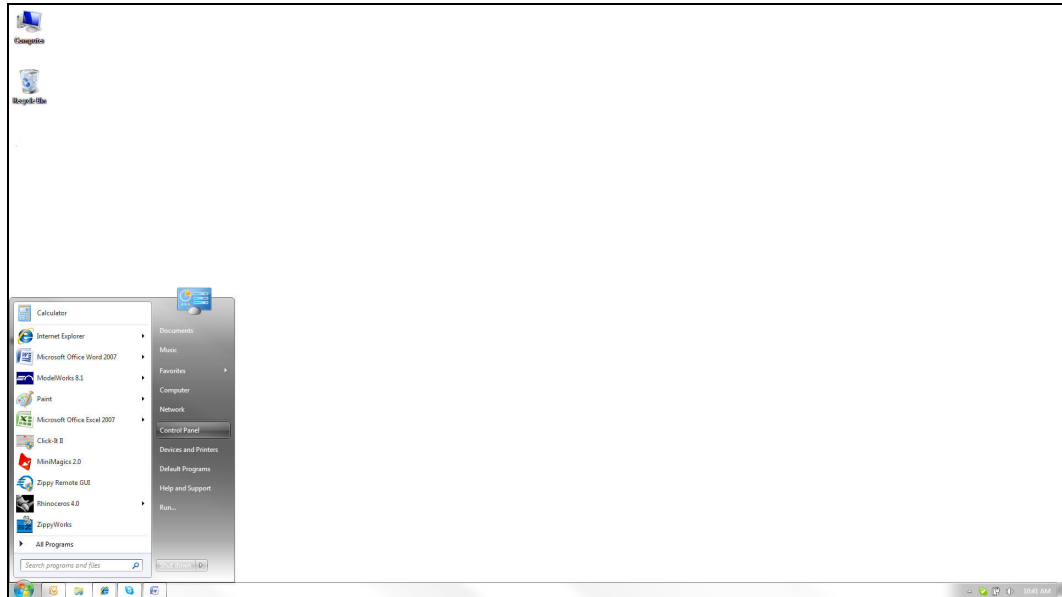
**Figure 10-8 Entering the IP Address**

Click on the  button to accept the values and close the settings window. Press the  button to close the Network Connections window. Close out any open windows by pressing the  icon for that window.

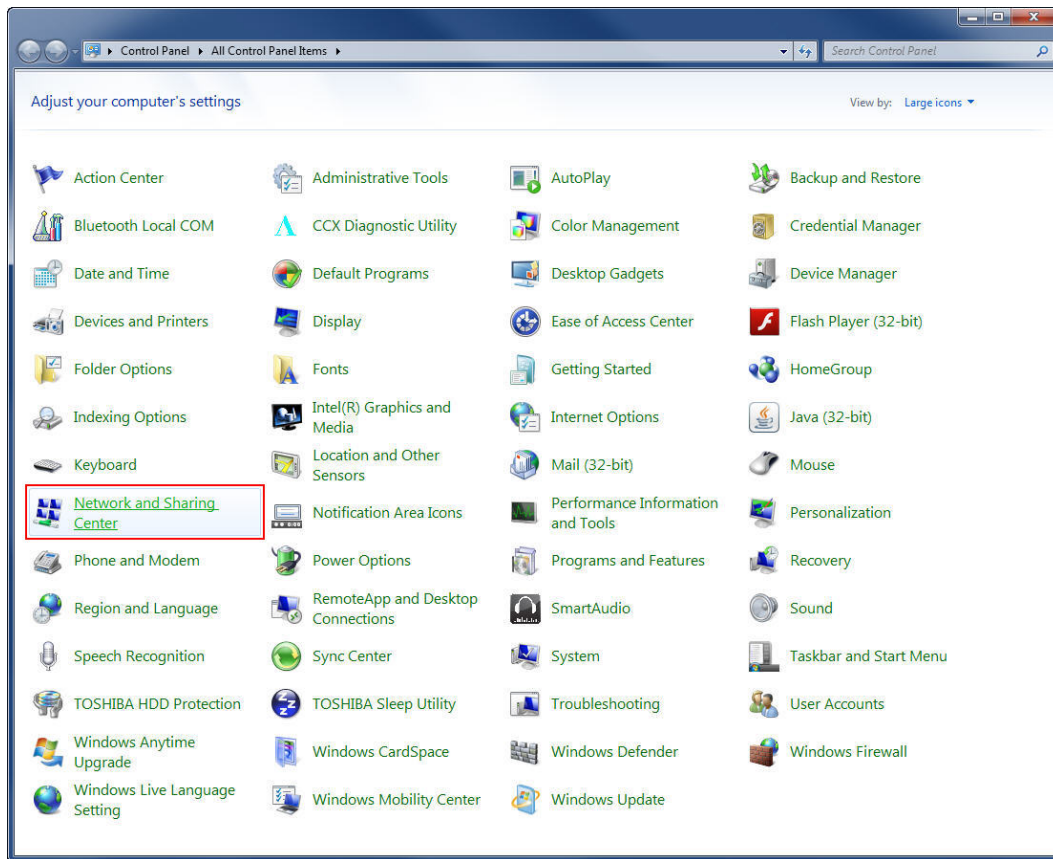
Power the machine off and back on. The network connection icon in the status bar should change from  to . This signifies that the machine is connected to the network.

## 10.7 Windows 7 Static IP Address Assignment

Click on the Windows 7 Start button and select “Control Panel”. In the control panel, double click on the “Network and Sharing Center” icon.



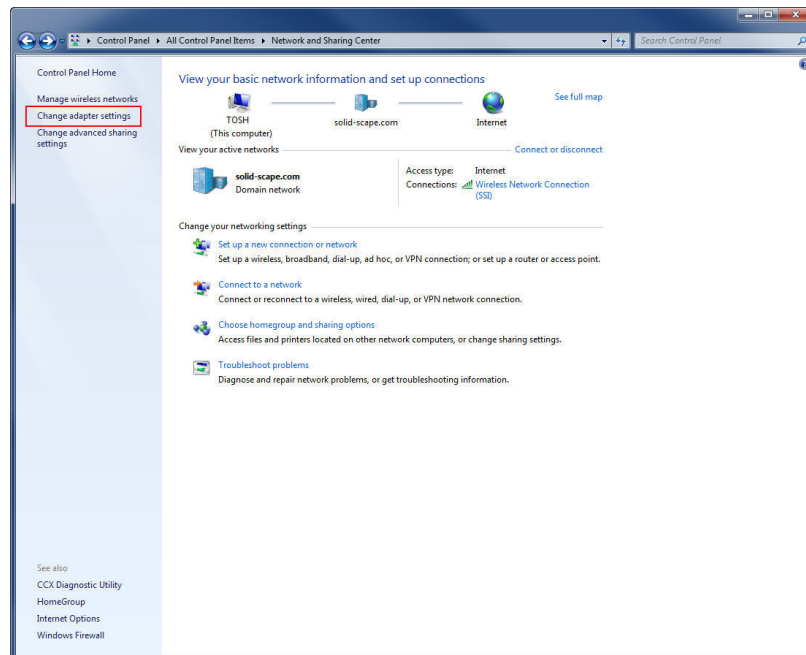
**Figure 10-9 Starting Windows 7 Control Panel**



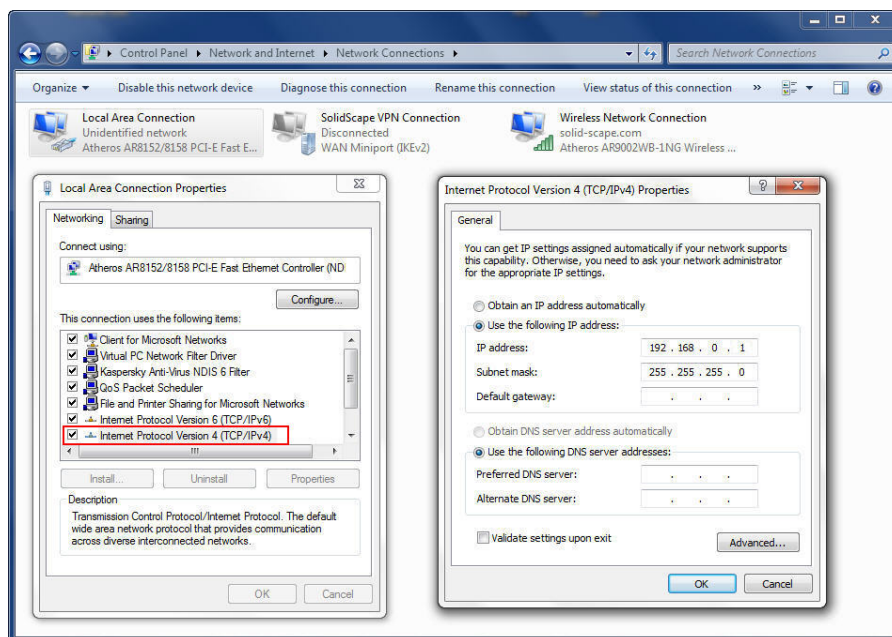
**Figure 10-10 Windows 7 Control Panel**

In the Network and Sharing Center, click the “Change adapter settings” link. This will open the Network Connections window.

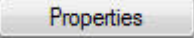




**Figure 10-11 Windows 7 Network and Sharing Center**



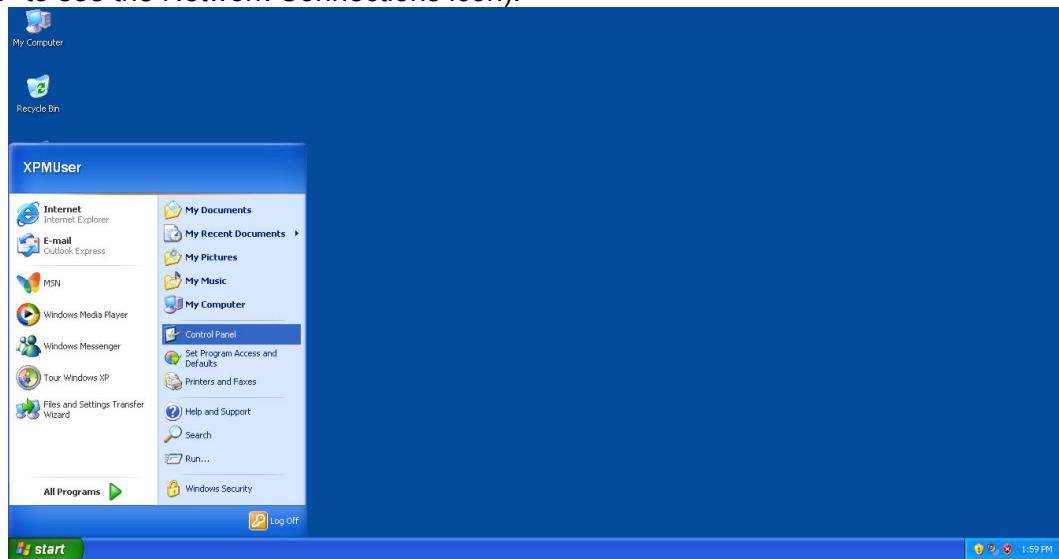
**Figure 10-12 Windows 7 Network Connections**

In the Network Connections window, right click on the “Local Area Connection” icon and select “Properties”, this will open the “Local Area Connection Properties” window. In the Local Area Connection Properties window, select “Internet Protocol Version 4 (TCP/IPv4)” and click the  button. This will open the “Internet Protocol Version 4 (TCP/IPv4) Properties” window. In the Internet Protocol Version 4 (TCP/IPv4) Properties window, use the

radio button to select “Use the following IP address” and enter 192.168.0.1 for the IP address and 255.255.255.0 for the subnet mask. Click the  button to close the Internet Protocol Version 4 (TCP/IPv4) Properties window. Click the  button to close the Local Area Connection Properties window. Close any windows that are still open and reboot the PC.

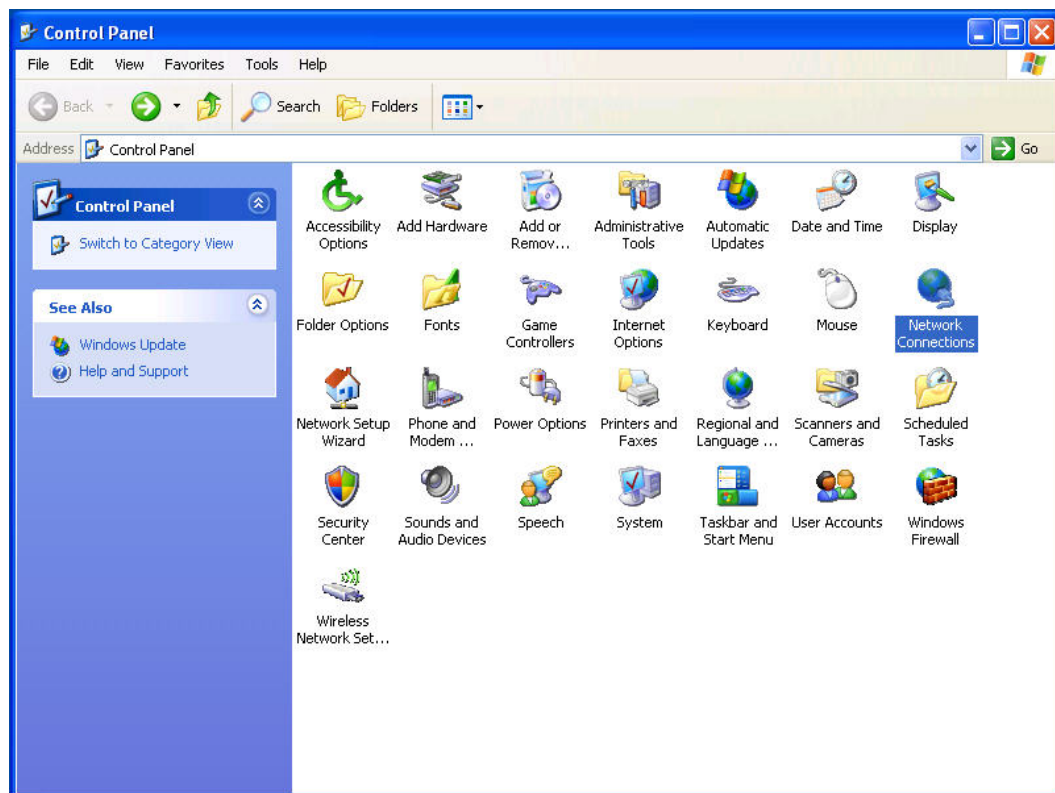
## 10.8 Windows XP Static IP Address Assignment

Click on the Windows XP Start button and select “Control Panel”. In the control panel, double click on the “Network Connections” icon (you may need to click the link “Switch to Classic View” to see the Network Connections icon).



**Figure 10-13 Starting Windows XP Control Panel**





**Figure 10-14 Windows XP Control Panel**

In the Network Connections window, right click on the “Local Area Connection” icon and select “Properties”, this will open the “Local Network Connection Properties” window. In the Local Network Connection Properties window, select “Internet Protocol (TCP/IP)” and click the  button. This will open the “Internet Protocol (TCP/IP) Properties” window. In the Internet Protocol (TCP/IP) Properties window, use the radio button to select “Use the following IP address” and enter 192.168.0.1 for the IP address and 255.255.255.0 for the subnet mask. Click the  button to close the Internet Protocol (TCP/IP) Properties window.

Click the  button to close the Local Area Connection Properties window. Close any open windows and reboot the PC.

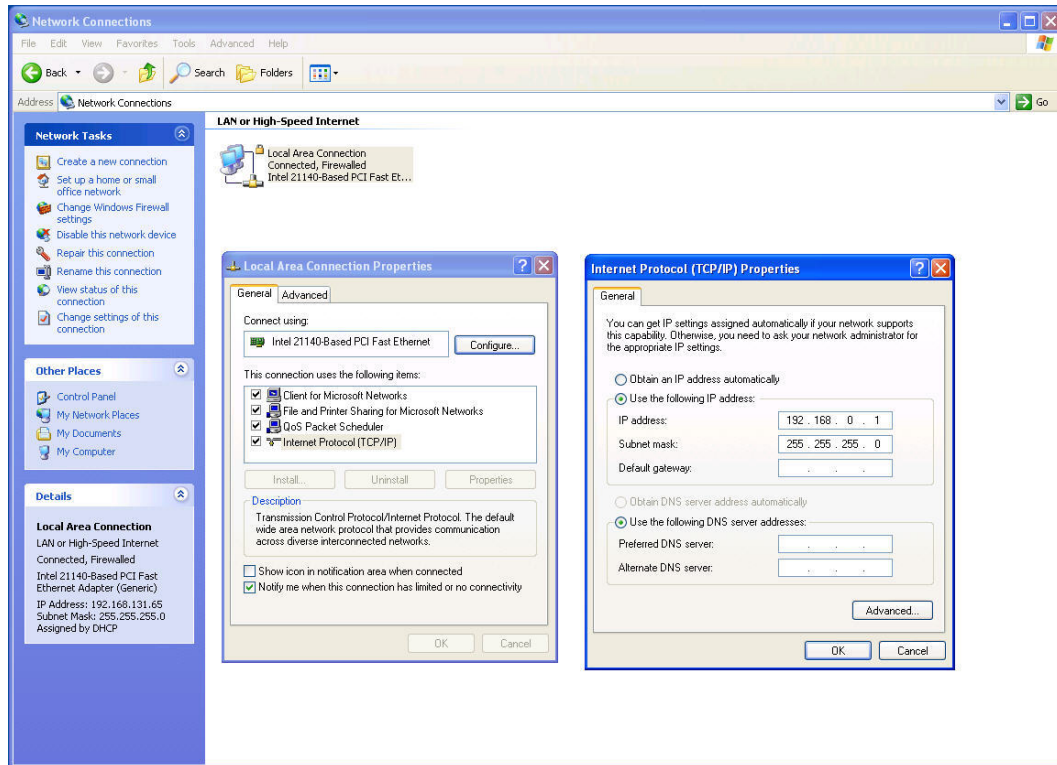


Figure 10-15 Windows XP Network Connection Properties



## Chapter 11 – Post Processing

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### 11.1 Post Processing

The purpose of this section of the manual is to describe the procedure for removing a model from 3Z Base and for removing the 3ZSupport material from a finished model made of 3ZModel. This process is also known as "de-waxing". Adherence to this procedure is critical if the best possible dimensional accuracy is to be maintained in the finished model. The following sections describe one method and a CIMERAC brand Heater Stirrer to complete the dewaxing process. It is not the only method. However; it has been tested within the Solidscape facilities and proven successful.

#### 11.1.1 Materials

- VSO Solvent - approximately 500 ml, depending on model size
- Paper towels
- Latex, rubber or nitrile gloves
- Temperature resistant gloves or mitts

#### 11.1.2 Required Tools

- Heater Stirrer Device (capable of maintaining temperature between 50°C – 55°C)
- Temperature Measuring Device - capable of +/- 2°C.
- Pyrex (temp resistant) Glass bowl(s) – assorted sizes to match strainers (2.5 QT ideal)
- Basket strainer(s) – assorted sizes to match bowls (8" strainer ideal)

#### 11.1.3 References

- VSO MSDS
- 3Z Support MSDS
- 3Z Model MSDS
- Operational instructions Heater Stirrer
- Solidscape document # MP-0144-02 (Dewaxing Procedure for the Heater Stirrer)

### 11.2 General Setup

Turn on the Heater Stirrer and set its temperature control to the prescribed setting for the type of heater stirrer you are using (95°C - 100°C for Cimarec). Clean the glass bowl used for the solvent bath of any loose debris and fill approximately 2/3rds full with fresh VSO (or enough that bottom of the basket strainer is below the bath surface sufficiently enough to fully cover the models). This bath may be used to dewax several models



before the VSO needs to be changed. VSO will saturate with 3Z Support at some point (depending on model geometry or quantity of models) and will have to be changed.

Dispose of used VSO in accordance with your local regulations. As a general rule of thumb, the less the model is exposed to heat, the more accurate it will remain. This procedure is set to operate at the maximum temperature possible to continually maintain accuracy with 3Z materials. Temperatures above 55°C will cause permanent dimensional expansion depending on exposure temperature and duration.

Note: ***The ideal de-waxing temperature range is between 50°C - 55°C***

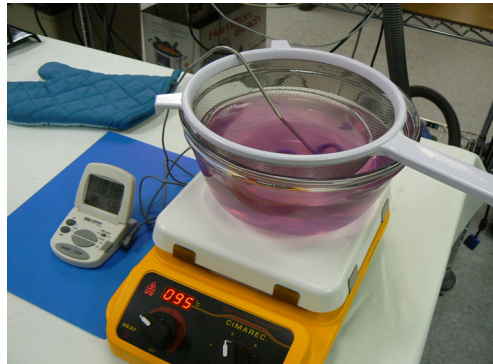


Figure 11-1 Dewaxing System

### 11.3 Model Removal from 3Z Base



**CAUTION** The Heater Stirrer gets hot. Wear gloves or use caution when HOT!



**CAUTION!** Do not use force to remove the model.

1. Remove any loose dust or debris from the model that is about to be de-waxed. This may be done manually by brushing it off, or by using compressed air and blowing it off. Use caution to not damage any delicate features of the model.
2. Place the entire build plate consisting of plate with 3Z Base and model attached, onto the Heater Stirrer shown in Figure 11-2 Heater Stirrer with build plate
3. Check the model every 15 minutes to see if it has released from the 3Z Base. Do this by gently twisting the model. The sides of the model where there is a high concentration of 3Z Support will be soft and may deform as you grasp it. If the model does not twist, leave the model on the plate and check it again in another 10 minutes. If the model does twist, slide it

off the 3Z Base and remove the plate from the heater. Typically this process can take between 20 – 30 minutes.

4. Once the 3Z Base plate cools, it is ready for re-use on the unit.



**Figure 11-2 Heater Stirrer with build plate**

## 11.4 Dewax – 3Z Support Material Removal



**CAUTION! VSO is flammable. Never exceed maximum temperatures specified. Use in a well ventilated area. Use care around heat sources.**

Note 1: The 3Z Model material is dimensionally stable at room temperature. However, it will expand at temperatures in excess of 55° C. **NEVER dewax models in a solvent bath at temperatures above 55° C.**

Note 2: The 3Z Support material exhibits a slightly higher rate of thermal expansion than the 3Z Model build material. Hollow model structures in which the build material surrounds the support material can crack when heated in the solvent. To prevent this from occurring, remove some of the support material with a pointed knife or drill bit prior to immersion in the solvent bath. By creating a hollow in the support material, it collapses inward when it expands, without cracking the surrounding model.

Note 3: Many model geometries are very fragile even at room temperatures. Handle models with care.

1. Once the model is removed from the 3Z Base, place the model into the basket strainer and then place the strainer into VSO bath prepared in step 1.2. Use caution to position the model in the strainer such that it is not resting on a delicate feature.
2. Turn the digital alarm thermometer on; insert the temp probe into the basket with the models being careful to not hurt the models. Set the temperature alarm on the thermometer to 55°C
3. Set the stirrer control on the heater stirrer to a setting that will gently circulate the bath without creating a lot of turbulence; the models should not be moving around in the strainer



4. Check the model every 15 minutes to evaluate its progress. It may be necessary to adjust the heater control up or down slightly to maintain the bath within the ideal de-waxing range of 50°C - 55°C without exceeding the 55°C maximum bath temperature. It may also be necessary to flip or rotate certain designs to facilitate faster, more efficient de-waxing. (Tweezers are a good tool for this.)
5. De-waxing is complete when the last residue of 3Z Support has dissolved off the model. The slowest sections to dissolve are those that are in the least amount of contact with fresh VSO, e.g. deep holes, channels, corners, etc.
6. It may be necessary to rotate or turn over certain models in order to allow them to de-wax completely. Do this gently using tweezers or tongs or by hand (Wearing gloves is recommended.)
7. Periodically during the de-waxing process lift the strainer out of the bath to inspect the models. It is recommended also to raise and lower the strainer in and out of the bath a few times in order to rinse the models of any debris that may be accumulating in the basket or on the models.
8. Once the model is free of 3Z Support, gently remove the model(s) from the VSO bath and place it on a paper towel to dry. (Small tweezers are a good tool for this.)
9. Turnoff the Heater Stirrer device unless you have additional models to de-wax.
10. At this time the models can be cleaned using soft bristled brushes and/or compressed air depending on the robustness of the model geometry.

## 11.5 Post Processing Tool Kit Suggestions

- Soft brushes of various sizes (¼", ½" and 1" wide) with natural bristles for general parts cleaning
- Pipe cleaners (1 package) for cleaning small holes
- Small picks (dental style probes) for cleaning small holes and tight spots
- Syringe bulb (2" diameter "rubber" material) for spraying heated solvent in holes and tight spots
- Alcohol swabs for cleanup and polishing parts
- Clear acrylic nail polish for mending and gluing parts
- Soft shop paper towels for cleanup and drying
- Wire strainer to isolate small parts in solvent bath
- Canned or compressed air to blow off excess solvent
- Rubber gloves (100 nitrile medical exam gloves) for working at length in solvent
- Magnifying glass or 10X eye loupe for inspecting parts and offset calibration results
- Drill bits (various sizes- size 16 to ¼") to remove wax material from models

## 11.6 Model Evaluation

1. Use the following factors to evaluate model quality performance:
  - a. Printhead offset calibration is successful: Result is a good surface finish
  - b. Printhead volume calibration is correct: Result is sufficient build and support material in the model, e.g., no voids on top surfaces or 'spikes' on bottom surfaces.

- c. The model should have the following characteristics (depending on the layer thickness used):
  - Crisp edges, corners and round surfaces.
  - Shiny finish on all surfaces (only thin layer models).
  - Clean finish on all sides (not uneven on verticals).
2. If the model does not meet one of the preceding criteria, check the following:
  - a. Orientation of the model.
  - b. Configuration used to build the model.





## Appendix A - Preventive Maintenance Schedule

| <b>Component</b>           | <b>Every Job</b> | <b>As Required</b> | <b>Weekly</b> | <b>Monthly</b> | <b>Yearly</b> |
|----------------------------|------------------|--------------------|---------------|----------------|---------------|
| Material Reservoir Levels  | Check            | Add Mat'l          |               | Verify         | Calibrate     |
| Paper Tape Roll            | Check            | Replace            |               |                |               |
| Print Head Purge Cup       | Check            | Replace            |               |                |               |
| Build Plate                | Check            | Replace            |               |                |               |
| Vacuum Bag                 |                  | Replace            | Replace       |                |               |
| Camera Lens                |                  | Clean              | Clean         |                |               |
| Paper Tape Drive Area      |                  | Clean              |               | Clean          |               |
| Entire Unit                |                  |                    | Clean         |                |               |
|                            |                  |                    |               |                |               |
| Belts                      |                  |                    |               | Inspect        | Replace       |
| Rails                      |                  |                    |               |                | Clean         |
| Cutter Blade               | Inspect          | Clean              |               |                |               |
| Cutter Vacuum Hose         |                  |                    |               |                | Inspect       |
| Heated Lines               |                  |                    |               | Inspect        | Replace       |
| Temperatures               |                  |                    |               | Inspect        | Calibrate     |
| Reservoir Material Filters |                  |                    |               |                | Replace       |
| Reservoir Air Tubing       |                  |                    |               |                | Replace       |
| Reservoir Level Detect     |                  |                    |               | Inspect        | Calibrate     |
| MDS system                 |                  |                    |               | Clean          | Calibrate     |
| Fuse                       |                  | Replace            |               |                |               |



## Appendix B - Technical Specifications

| <b>Physical</b>              |                                                           |                  |                  |
|------------------------------|-----------------------------------------------------------|------------------|------------------|
| Build area 3Z Pro            | X: 6" (15 cm)                                             | Y: 6"(15 cm)     | Z: 4" (10 cm)    |
| Build area 3Z Studio         | X: 6" (15 cm)                                             | Y: 6"(15 cm)     | Z: 2" (5 cm)     |
| Build area 3Z Max            | X: 6" (15 cm)                                             | Y: 6"(15 cm)     | Z: 4" (10 cm)    |
| Dimensions (closed)          | W: 22" (56 cm)                                            | D: 19.5" (50 cm) | H: 16.5" (42 cm) |
| Dimensions (opened)          | W: 36" (92 cm)                                            | D: 19.5" (50 cm) | H: 35" (89 cm)   |
| Dimensions (carton)          | W: 26" (66 cm)                                            | D: 24" ( cm)     | H: 21" (54 cm)   |
| Dimensions (palletized)      | W: 32" (81 cm )                                           | D: 32" (81 cm)   | H: 47" (120 cm)  |
| Unit weight                  | 75 lb. (34 Kg)                                            |                  |                  |
| Palletized ship weight       | 165 lb. (75 Kg)                                           |                  |                  |
| <b>Physical: Unit Only</b>   |                                                           |                  |                  |
| Room Temperature             | 16°C (60°F) to 27°C (80° F)                               |                  |                  |
| Humidity                     | 40% to 60%                                                |                  |                  |
| Rated Voltage / Current      | 100 - 240 VAC / 5 Amps                                    |                  |                  |
| Fuse                         | 5 Amp Slow Blow (T) 250V                                  |                  |                  |
| Certifications               | CE Certified                                              | TUV              | FCC Class A      |
| Unattended Operation         | 72 hours max                                              |                  |                  |
| <b>Reservoirs</b>            |                                                           |                  |                  |
| Level Accuracy               | +/- 5%                                                    |                  |                  |
| Capacity (max)               | 5 crayons = 150 ml (liquid)                               |                  |                  |
| Refill                       | On prompt                                                 | During operation |                  |
| <b>Physical: Vacuums</b>     |                                                           |                  |                  |
| Rated Voltage / Current      | 120V Model: 120 VAC 14 Amps<br>230V Model: 230 VAC 8 Amps |                  |                  |
| <b>Model Characteristics</b> |                                                           |                  |                  |
| X, Y, Z Accuracy             | ± 0.001 inch per inch                                     |                  |                  |
| Z-axis layer 3Z Pro          | .00025 inch (.00635 mm) to .003 inch (.0762 mm)           |                  |                  |
| Z-axis layer 3Z Studio       | .00025 inch (.00635 mm) to .001 inch (.0254 mm)           |                  |                  |
| Z-axis layer 3Z Max          | .001 inch (.0254mm) to .002 inch (.0508mm)                |                  |                  |
| Dimensional                  | .001 inch per inch (X, Y, and Z axes)                     |                  |                  |
| Surface finish               | 32 to 63 micro-inches (RMS)                               |                  |                  |
| Minimum feature size         | .010 inch (.254 mm)                                       |                  |                  |
| Droplet size                 | .003 inch (.076 mm)                                       |                  |                  |
| Carriage calibration         | Automatic before each build                               |                  |                  |

## Appendix B - Technical Specifications

| <b>3Z Works Requirements</b>                      |                                                   |
|---------------------------------------------------|---------------------------------------------------|
| Configuration                                     | Microsoft Windows XP or Vista or Windows7         |
| Processor                                         | 2 GHz                                             |
| RAM                                               | 256 Mb                                            |
| Hard disk space                                   | 500 Mb available                                  |
| CAD file input                                    | *.STL and *.SLC                                   |
| <b>3Z® Model Build Material</b>                   |                                                   |
| Composition                                       | Thermoplastic                                     |
| Melting point                                     | 203° F (95° C) to 230° F (110° C)                 |
| Density                                           | 1.25 g/ml                                         |
| Melting Shrinkage                                 | 65% (solid to liquid)                             |
| No residue after autoclave process                |                                                   |
| No shrinkage, distortion, disintegration          |                                                   |
| No toxins                                         |                                                   |
| <b>3Z® Support Material</b>                       |                                                   |
| Composition                                       | Natural and synthetic waxes and fatty esters      |
| Melting point                                     | 120° F (49° C) to 158° F (70° C)                  |
| Density                                           | 0.93g/ml @ room temperature<br>0.81 g/ml @ 110° C |
| Melting Shrinkage                                 | 67% (solid to liquid)                             |
| Soluble in a BIOACT VSO solvent at 131° F (55° C) |                                                   |
| No post dissolve dry or cure time                 |                                                   |
| No post dissolve finishing or touch up            |                                                   |
| No toxins                                         |                                                   |



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## Appendix C - Vacuums

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### Vacuum Configurations

There are several different vacuum configurations that you may receive with your 3Z Series based on your geographical location and the preference specified when you ordered your unit. The two standard configurations are:

1. **115V Configuration** - This configuration provides a complete 115V solution and includes:
  - **115V vacuum.** Typically an Electrolux Ultrasilencer EL6984 A, Solidscape part number 970096-01.
  - **115V vacuum switch box.** Solidscape part number 930175-04 that plugs directly into a standard NEMA 5-15 receptacle. See Figure E-1, Vacuum Switch Boxes. The vacuum plugs into the switch box receptacle and the 3Z Series connects to the switch box via the vacuum control cable.
  - **Vacuum control cable.** Solidscape part number 901170 that connects the 3Z Series to the vacuum switch box and facilitates 3Z Series control over the vacuum.
  - **Vacuum bags.** A starter supply of vacuum bags capable of filtering particles as small as 1 micron. Vacuum bag part numbers: Electrolux EL202B and Solidscape 970098-02.
2. **230V Customer (VAR) Supplied Vacuum** - This configuration is not a complete solution! It includes everything except a 230V vacuum that must be provided by the Solidscape reseller (VAR) or the customer themselves. Specifically, it includes:
  - **230V vacuum switch box.** Solidscape part number 930175-03 that plugs directly into a standard Schuko CEE 7 style receptacle. See Figure E-1, Vacuum Switch Boxes. The vacuum plugs into the switch box Schuko CEE 7 style receptacle and the 3Z Series connects to the switch box via the vacuum control cable.
  - **Vacuum control cable.** Solidscape part number 901170 that connects the 3Z Series to the vacuum 230V vacuum and facilitates 3Z Series control over the vacuum.

See *Vacuum Replacement* below for details regarding supplying your own vacuum.



## Appendix C - Vacuums



Figure C-1 Vacuum Switch Boxes

### Vacuum Replacement

A general purpose, external vacuum is required with 3Z Series printers. The most critical requirements are:

- High volume air flow
- High thermal shut-off level relative to air flow
- A Schuko CEE 7 style plug for 230V systems
- A Nema 5-15 style plug for 115V systems
- Vacuum bags capable of capturing very fine dust particles (1 micron)
- Quiet operation, less than 60 dBA, or at least quiet enough for your environment.
- High reliability and long life under nearly continuous operation

Should your 3Z printer come without a vacuum or you need to replace an old vacuum, Solidscape recommends the vacuums listed below. These vacuums have all been tested with Solidscape equipment, are quiet and include variable suction control. They can typically be used at the lower, quieter suction settings. These products are available from numerous internet and local retail vendors and directly from Solidscape.

| <u>Power</u> | <u>Manufacturer</u> | <u>Model</u>            | <u>Solidscape PN</u> |
|--------------|---------------------|-------------------------|----------------------|
| 115V         | Electrolux          | Ultra silencer EL6984 A | 970096-01            |

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## Appendix C - Vacuums

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**CAUTION!** Always replace the vacuum bag every five to seven jobs!  
Always use a new vacuum bag! Never reuse the vacuum bag!  
Never operate the vacuum without a vacuum bag!  
Never permit the vacuum bag to become more than one-half full!  
Never permit dust to enter the vacuum motor!  
Operating the vacuum without a bag or allowing dust to enter the vacuum motor will result in permanent damage to the vacuum motor and void the warranty.