



Dimension[®] 768/Elite 3D Printer

Service Manual

Part No. 209009-0001, Rev A

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About This Guide

This service guide is designed to help you easily find the information you need to successfully service Dimension BST and SST systems. This guide is arranged in chapters with tabs for easy reference.

When viewing the electronic PDF version, you can easily hyperlink to specific headings or chapters using the following methods:

- Use the Bookmarks window in the PDF application as hyperlinks.
- Click on the headings and page numbers in the Table of Contents to go to a specific page or chapter.
- Click on italicized text, which are cross-references to figures, headings, and chapters.

The following conventions are used in this guide:

- When you see text in **blue**, it indicates that the text is a linked reference to a specific figure, heading, or page number.
- When you see text in **Bold**, it indicates important information that needs to be emphasized.
- Text representing **Interface Messages** that appear on the display panel are presented in a bold font.

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Dimension 768 and Elite printers are designed to be safe and reliable rapid prototyping systems. However, as an installer and service engineer for this equipment, it will be required that you access areas of the machine that are potentially dangerous. This chapter includes the hazard classifications that are listed throughout this guide. Specific safety warnings will appear in the service guide, when a potential danger exists.

Hazard Classifications

Please be aware of the following hazard classifications that are used throughout this guide.



Caution: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



Warning: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



DANGER: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Product Safety Symbols

The following symbol is located inside the machine to warn you about high temperatures.



Hot Surface Sign. The hot surface sign indicates the presence of devices with high temperatures. Always use extra care, and wear safety gloves, when working around heated components.

Safety Devices

The following safety devices are connected to the 186 processor board:

- Chamber T/C alarm - activated for a bad or missing thermocouple
- Liquefier T/C alarm - activated for a bad or missing thermocouple
- Power shut down signal from the PDB - activated if any thermal limit switches trip
- Head and chamber snap switches
- Main thermal fuse

Electronics Overview

2

In this chapter you will learn about the main components of the system. The contents and page numbers of this chapter are as follows:

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Dimension 768 and Elite Specifications

Build Size	Parts can be built up to 203 x 203 x 305 mm (8 x 8 x 12 in.)
Material	Parts are built of tough, durable ABS plastic in white (standard), blue, black, red, or green. Custom colors are available.
Material Supply	Two autoload cartridges with 0.95 kg (2.1 lbs) material per system (1 model and 1 support). Each cartridge has enough material to build continuously for three days without reloading.
Layer Resolution	User may select 0.007 in (0.178 mm), 0.010 in (0.245 mm) or 0.013 in (0.33 mm) layer resolution for Elite printer. User may select 0.010 in (0.245 mm) or 0.013 in (0.33 mm) layer resolution for 768 printers.
Positional Accuracy (X,Y)	0.025 mm (0.001 in.)
Z Repeatability	0.0127 mm (0.0005 in.)
Automatic Operation	Catalyst software automatically imports and slices .stl files, allows you to orient parts for optimal builds, generates support structures, if necessary, and creates the deposition path to build parts.
Network Connectivity	TCP/IP 100/10 baseT
Workstation Compatibility	Windows 7, Windows Vista, Windows XP 32 and 64 Bit, Windows 2000, Windows NT - service pack 4 or higher.
Support Structures	Any necessary support structures are automatically created within CatalystEx software. Break-away Support System (BASS™) allows for easy support removal. Dimension SST uses Soluble Support Technology (SST), which allows supports to be washed away with a water-based solution.
Functionality	Multiple parts may be packed within the build envelope to maximize build efficiency. CatalystEx software provides queue management capabilities, build and material status, runtimes, and printer status information. The display panel located on the front of the system guides you through startup, material reload steps, and provides status information on the system including material remaining in the cartridges.
Size and Weight	864 x 686 x 1041 mm (34 x 27 x 41 in.) 175 kg (388 lbs in crate), 136 kg (300 lbs) on table
Power Requirements	110-120 VAC, 60 Hz, 15A max. to 220-240 VAC, 50/60 Hz, 7 A max. The system will auto-detect the input voltage.
Regulatory Compliance	CE
Special Facility Requirements	None
Operator Attendance	Not required

What Happens When...

Powering Up

When power is supplied to the system, the fans run continuously until power is shut off. Like any PC compatible computer, the SBC executes a built-in test and then goes out the HDD and loads the Linux Operating System. The OS and controller software are loaded and the Linux drivers are initialized. The system manager sends the starting up message to the display and establishes communication with the 186 Board. The system manager then asks the 186 Board to "find home".

While the OS is loading, the 186 Board initializes all the secondary processors, tests dual port memory integrity, and begins heating the liquefier and chamber. When a "find home" command is received from the SBC, the 186 boards moves the x and y axis to their limits of travel, checks the end of travel switches and home sensors, and saves the locations for reference during modeling. This defines the location of home and the dimensions of X and Y axis.

As the unit is warming up, the display shows the current head and chamber temperatures being read by the 186. Once modeling temperature is reached (BST: 270 °C, SST: 280° C Model, 250° C support), the SBC will ask the 186 to check for cartridges and the amount of material in each. The material remaining will be displayed. "0 %" can either mean that there is an empty cartridge installed or no cartridge installed.

Once the unit is ready to build, the display will read "IDLE" (no part in the queue) or "READY TO BUILD" followed by the part name.

Powering Down

When the PDS (Power Down Switch) is turned off, the unit begins a controlled shut down. The active software processes are suspended, eliminating any disk I/O. The power to the liquefier and chamber is turned off. The 186 board monitors the temperature of the liquefier and chamber. The display will say "SHUTTING DOWN". Once the liquefier temperature drops below 102 °C, the SBC changes the display to "SHUT DOWN" and turns off all power to the unit.

Loading Material

When the load material button is pressed with cartridges installed in the unit, the SBC will ask the 186 Board to unload the cartridge requested by the operator. The most recent value for material remaining is written to the cartridge EPROM. The appropriate filament motor(s) is run in reverse to unload the liquefier. When filament is clear of the drive wheels, the 186 Board tells the SBC that the command is complete. The SBC sends "REMOVE CARTRIDGE" to the display, the cartridges are unlatched, and the unit waits for you to respond.

If there are no cartridges in the system when the material button is pushed, or if an unload has just been completed, the SBC will ask the operator to INSERT CARTRIDGE. The unit will look for a valid cartridge EPROM. If there is no change to cartridge EPROM status in 30 seconds, you are asked if you want to RETRY. Once valid cartridges are read, the unit engages the cartridge loading motors. These motors drive filament out of the cartridge and up to the liquefier. It should be noted that the head will be in the front right corner when loading is occurring.

Once the filament is detected in the head, the loading motors stop, and the head moves to the right rear location over the purge bucket. At this time, the filament motors are driven forward, loading the liquefier, causing it to purge. You will be asked to verify that the purge has occurred.

Making a Part

Once the printer is in **READY TO BUILD**, the **Start Model** button will begin to flash. Once you press the **START MODEL** button, the printer will start to make a part. The first thing that happens is that the printer lowers the substrate sensor and moves around the XY envelope and measures the height of the substrate. At the same time that the printer is finding the Z zero position, the SBC is converting the model file into the motion commands that the 186/Controller board will execute to build the model. Once the substrate has been measured in four locations it moves the Z stage down to check the Z end-of-travel. Once this operation is complete, the head will move over the purge bucket and prepare both tips for use.

Once the start of model purge is complete, the printer will start to build the model. During model construction, the printer will display the percentage of material remaining on each spool, and buttons that allow you to pause the printer, or turn on the chamber lights. The printer will stay in the Building State until the model is finished or the printer pauses. If the printer pauses, it will enter a Pending Pause state until the current road is finished. Once that road is complete, the head will move over the purge bucket, and the Z stage will descend to the bottom of the envelope. In the Pause State the printer can be resumed, material can be loaded and unloaded, the build can be canceled, and printer maintenance may be performed.

A System Error Occurs

Should an error occur during normal operation, the SBC will display SYSTEM ERROR followed by an error code such as code 14, 4. A code 14 is an error reported by the 186/Controller board and the 4 indicates a bad or missing modeling base (foam or substrate). For a complete list of error codes, see “[Troubleshooting](#)” on page 4-1.

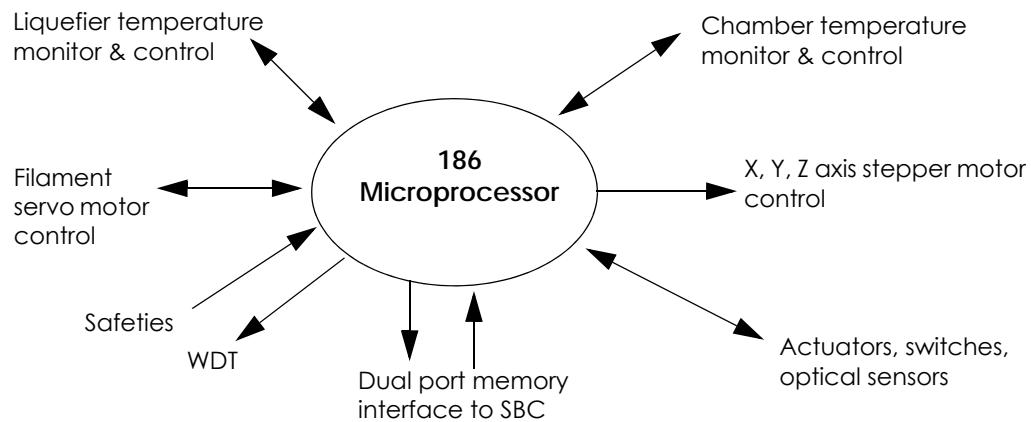
Gen 1 Electronics

186 Processor Board

186 Microprocessor Overview

The 186 board provides all of the low level hardware control and sensing for the system. The software that runs on the 186 CPU and is E-prom resident (rather than on the HDD as with the SBC). For a block diagram of all the functions serviced by the 186 CPU, see [Figure 1](#).

Figure 1: 186 microprocessor detail



Dual Port Memory Interface

The dual port memory located on the 186 board provides the communication channel with the single board computer (SBC) through the P104 connector. This connector has long gold pins coming out of the back of the board and care must be exercised when handling the 186 board to avoid damage. The SBC provides the coordinates, velocities, and flow rate commands for modeling to the 186. The 186 board provides the status/error information about the hardware to the SBC.

X,Y,Z Axis Control

The 186 cpu takes the coordinate and velocity inputs from the SBC and sends them to a pair of stepper motor control processors called PMD chips. Each pair of PMD processors can service one or two stepper motors. X and Y axis stepper motor movements are controlled by the top pair of PMD processors. The Z axis control is provided by the lower pair of PMD processors. There is no feedback from the stepper motors to the system. They are open-loop-controlled.

Filament Motor Control

The 186 cpu takes the flow rate information from the SBC and sends it to a 629 servo motor controller. The 629 uses this information along with the encoder signals from the filament motors to generate an output signal to drive this servo motor in the head assembly. There are two filament motors and two 629 servo motor controllers. Since the encoders provide feedback, the filament motors have a closed loop control. Their position and turn rate are precisely known at all times.

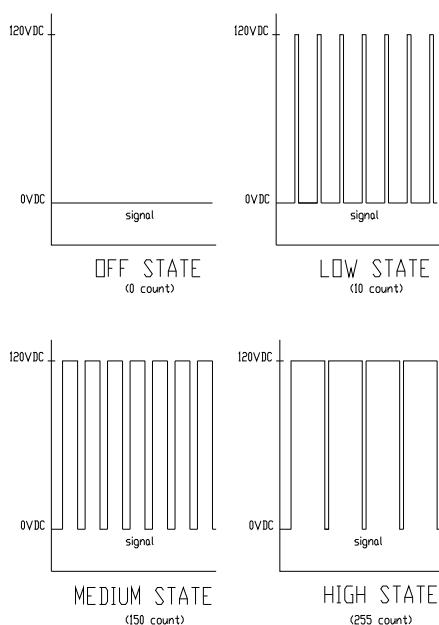
Chamber Temperature Control

The chamber thermocouple (T/C) connects directly to the 186 board. The T/C generates a variable low level current that depends on the temperature of the T/C. This analog signal from the thermocouple is amplified on the 186 board. From the amplifier, the signal goes to an A to D converter. 186 cpu reads the digital value corresponding to chamber temperature and the chamber headers on or off as required to maintain about a 70 °C (BST) and 75 °C (SST) temperature. The chamber fans run continuously when the printer is on.

Liquefier Temperature Control

The liquefier T/C connects to the 186 board through the head distribution board. The T/C generates a variable low level current that depends on the temperature of the T/C. This analog signal from the T/C is amplified by the head distribution board before being sent down the umbilical cable to the 186 board. An A to D converter on the 186 board converts the analog signal to digital. In order to improve temperature resolution, this signal is biased. The lowest reading possible is 102.5 °C. The highest reading is 330 °C. The liquefier temperature is maintained at 270 °C (BST), 280° C for Model and 250° C for support (SST). Temperature control is accomplished using pulse width modulation. See [Figure 2](#).

Figure 2: Pulse Width Modulation



Actual power to the liquefier heater is supplied by the power distribution board which is controlled by the 186 processor. The heater is turned off and on 1000 times a second (pulses). The duration of the 120 VDC pulse determines the average power being supplied to keep the liquefier at temperature.

Actuators, Switches & Optical Sensors

The non-motor actuators on the system are 24 volt solenoids. The 24 volt power is supplied by the power distribution board (PDB) which in turn is controlled by the 186 board. The following is a list of actuators:

- Door solenoid – locks the door to the modeling chamber.
- Cartridge latches (2) – holds cartridges in the receiver unit.
- Receiver solenoids & motors (2) – engages the motor that feeds the filament from the cartridge to the liquefier during auto load.

The 186 board reads and updates the remaining material information on the smart cartridge (e-prom) used by the system. This is accomplished through a serial interface to the receiver encryption board. The receiver encryption board in turn connects to the e-prom on the cartridge via two pogo pins.

The switches are measured by the 186 board:

- Z limit switches – both upper and lower
- X end of travel switch
- Y end of travel switch
- Door open switch

Powering and reading the optical sensors is performed by the 186 boards. The following is a list of the optical sensors found on the system:

- X home sensor
- Y home sensor
- Top of foam sensor
- Z jam sensor

Safety Devices

The following safety devices are connected to the 186 board.

- Chamber T/C alarm – activated for a bad or missing T/C
- Liquefier T/C alarm – activated for a bad or missing T/C
- Power shut down signal from the PDB – activated if any thermal limit switches trip
- Head and chamber snap switches
- Main thermal fuse (Serial numbers <P0590)
- Main thermostat (Serial numbers >P0590)

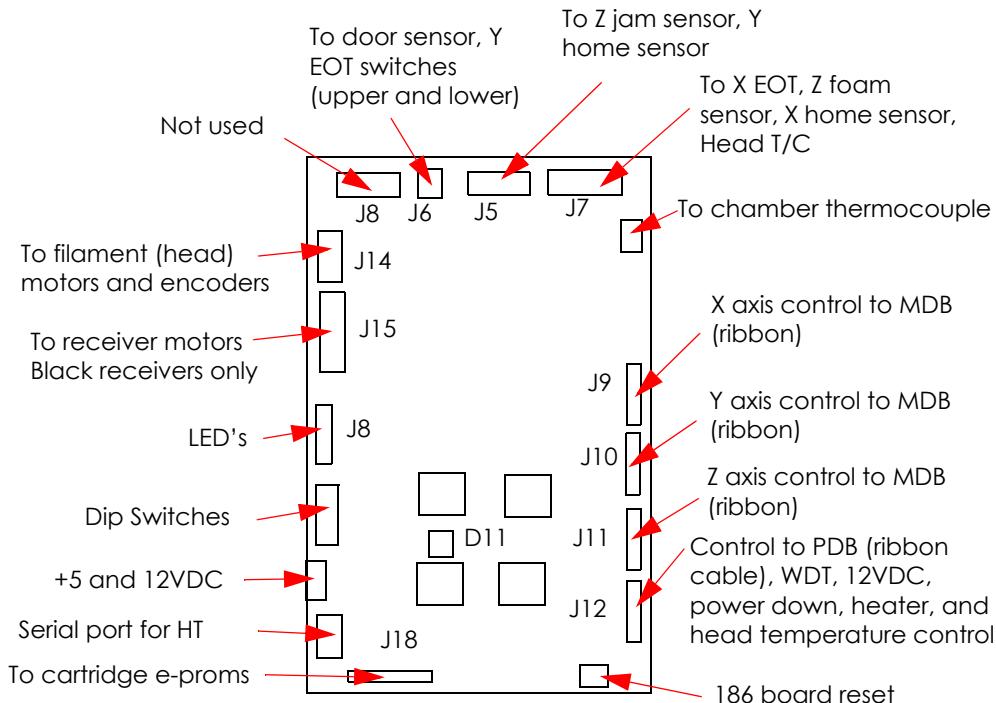
Watch Dog Timer (WDT)

The operational integrity of the 186 board is monitored by a watch dog timer located on the PDB. The 186 must service the watch dog timer periodically or power will be cut to the system. This prevents system runaway (temperature or motion) should the 186 be malfunctioning.

186 Board Layout

Figure 3 below shows the layout of the 186 board connectors with labels indicating where each of the functions described previously are connected. In addition to those functions, the figure shows a reset button, a set of dip switches, and the LEDs (D3 – D11).

Figure 3: 186 processor board detail



Reset Button

Located on the lower left side of the board, this button will do a hard reset of the 186 board causing the software to go through a complete initialization. LEDs D3 – D10 will come on and go out. LED D11 will come on and stay on. These indicate the 186 board initialized correctly.

Dip Switches

There are eight dip switches located on the right side of the board. These are all normally off but can be used to perform the following special functions:

- Switches 1 – 3 provide a way to upgrade the firmware on the 186 board from the hyperterminal. This is no longer used since the firmware upgrade is accomplished as part of the software upgrade from Maraca or from Admin in Catalyst.
- Switch 4 will override the door switch so that a field engineer can run the mechanism with the door open.



DANGER: Take extreme caution when accessing this area. It is very dangerous since there is no safety mechanism if anything, such as a body part, gets caught in the system.

- Switch 5 will print out through the hyperterminal the temperature and power settings of both the liquefier and the chamber. The display is updated every second.

The format is as follows:

Head = 2703	This is the current liquefier temperature to 1/10 of a degree. The decimal point is assumed.
PWM = 47	This shows the current power level to the liquefier. Small numbers are low power high numbers (e.g. 255) are high power.
AVG DAC =8 40	This is the average reading out of the A/D converter.
Diff = - 3	This shows the difference.
Chamber =5 56 ON	This is the current chamber temperature reading to 1/10 of a degree. The last field shows whether or not the chamber heaters are on.

- Switch 6 will display the current levels in the two filament motors through the HyperTerminal.

The format is as follows:

HM current Modeling = 190 Support = 170

The numbers from the A/D converter with values ranging from 255 (off) to high current values like 150 during modeling at 3 ips.

- Switch 7 on is used by the factory to change the logic in the CPLD (Electrical Programmable Logic Device). The current version is readable in Maraca.
- Switch 8 is not currently used.

Memory

There are three types of memory contained on the 186 processor board.

- Dual Port RAM: The communication buffer between the 186 processor board and the single board computer. Events (from the 186), Commands (from the SBC), and motion control vertices (from the SBC) are passed over the P104 connector joining the two boards.
- EPROM (Erasable Programmable Read-only Memory): Where the executable code resides.
- Battery backup RAM: Where the 186 processor board saves the current build values. These values are used in the event of a power failure to restart a part that stopped building when the power went off.

LED's

There are nine LED's located on the 186 board. A grouping of eight (D3-D10) on the left side are normally off. If the 186 board has encountered a fatal error and is no longer operating properly, these LEDs will be on/off/on/off/on/off/on/off. The ninth LED (D11) will light when the 186 board has initialized properly.

Single Board Computer

The single board computer (SBC) is the main processor in the system. It is a complete "PC compatible computer" on a single board. See [Figure 4](#).

The TCP/IP network interface connects directly to the RJ-45 connector on the SBC. The network interface supports both 10baseT and 100baseT operation. The hardware differentiates automatically. There are three LEDs to the right of the RJ-45 connector. These show the status of the network connection as follows:

- Green LED: Indicated a valid Ethernet connection has been established.
- Yellow LED: Indicated valid data is being sent and received (e.g. traffic).
- Red LED: Indicates bad packet data is being received. This is most likely a bad network connection. This LED should rarely be on for normal operation.

The Hard Disk Drive connects to a standard wide IDE interface located on the left side of the board. The HDD contains the Linux operating system and all the control software needed to run the system (except the 186/controller firmware). This is also where all the downloaded models are stored (the Queue).

The Control Panel Display (CPD) connects to the SBC on J13 of the Ampro board and CN7 on the Nova board. See [Figure 6](#). All user commands from the buttons come in here and all the display text is output from here. For the Gen 2 Electronics, the CPD connects to the PDB and passes through the SBC.

The P104 connector on the top edge of the board is a bus level interface to the 186 board. This allows the SBC to read and write to the dual port ram on the 186/controller board, which forms the communication channel between the two boards.

Figure 4: New Ampro SBC detail

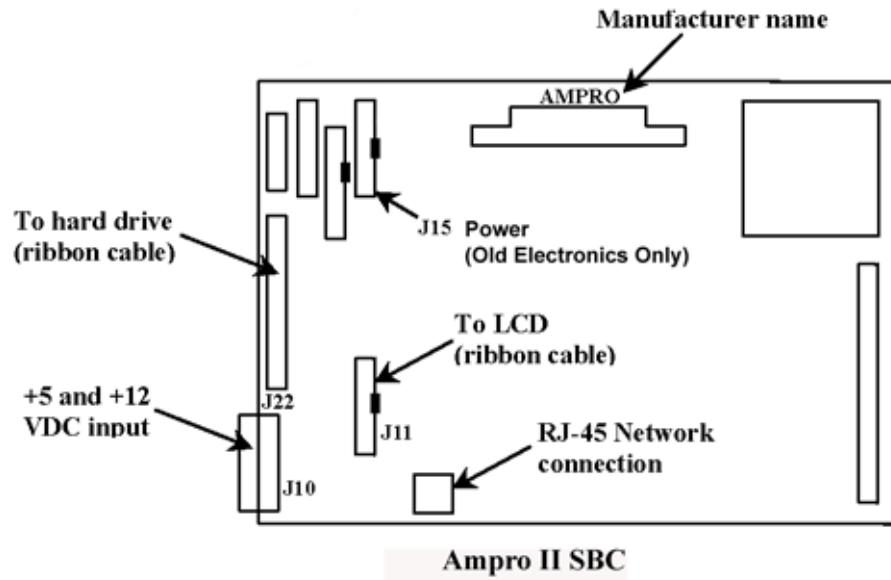


Figure 5: Old Ampro SBC detail

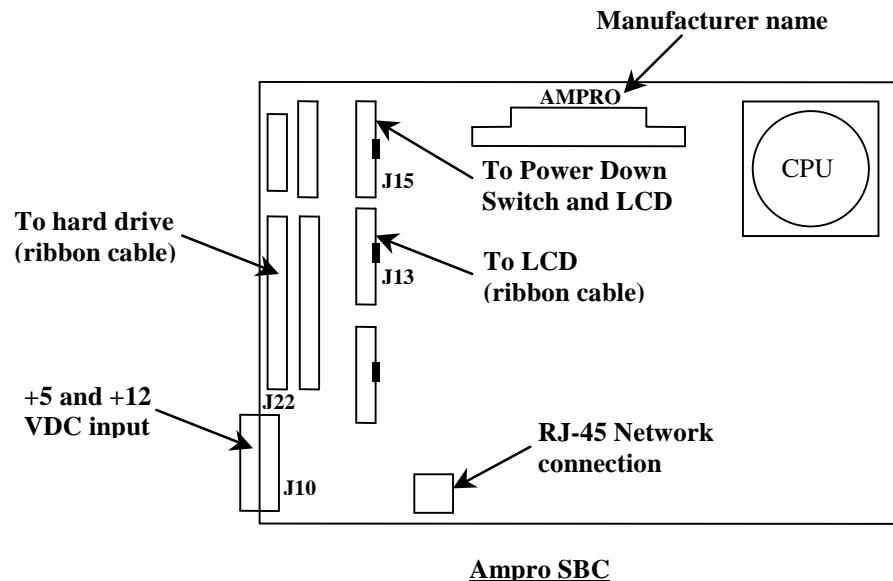
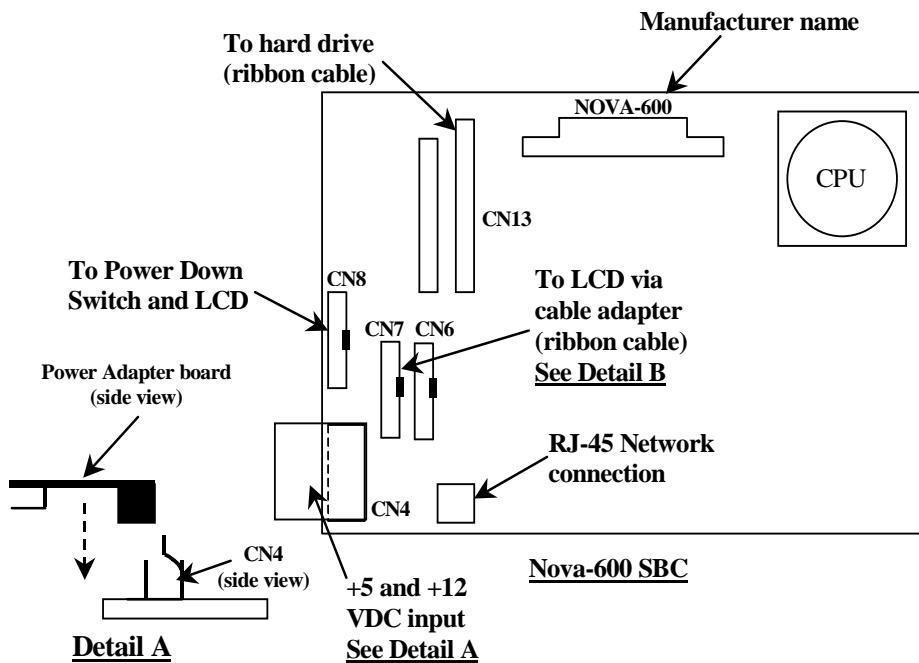


Figure 6: Nova 600 SBC detail



Power Distribution Board (PDB)

This board provides all the various power levels required to run the system. AC line voltage comes into the PDB, as well as 24 VDC from the main power supply.

AC line voltage comes into the PDB, see [Figure 7](#). The voltage is routed through the solid state relay to jumpers or an auto switching circuit. The jumpers or circuit are used to supply the chamber heater voltage: 240 VAC in series or 120 VAC in parallel. The solid state relay is controlled by the 186 board turning off/on the heater to regulate the chamber temperature.

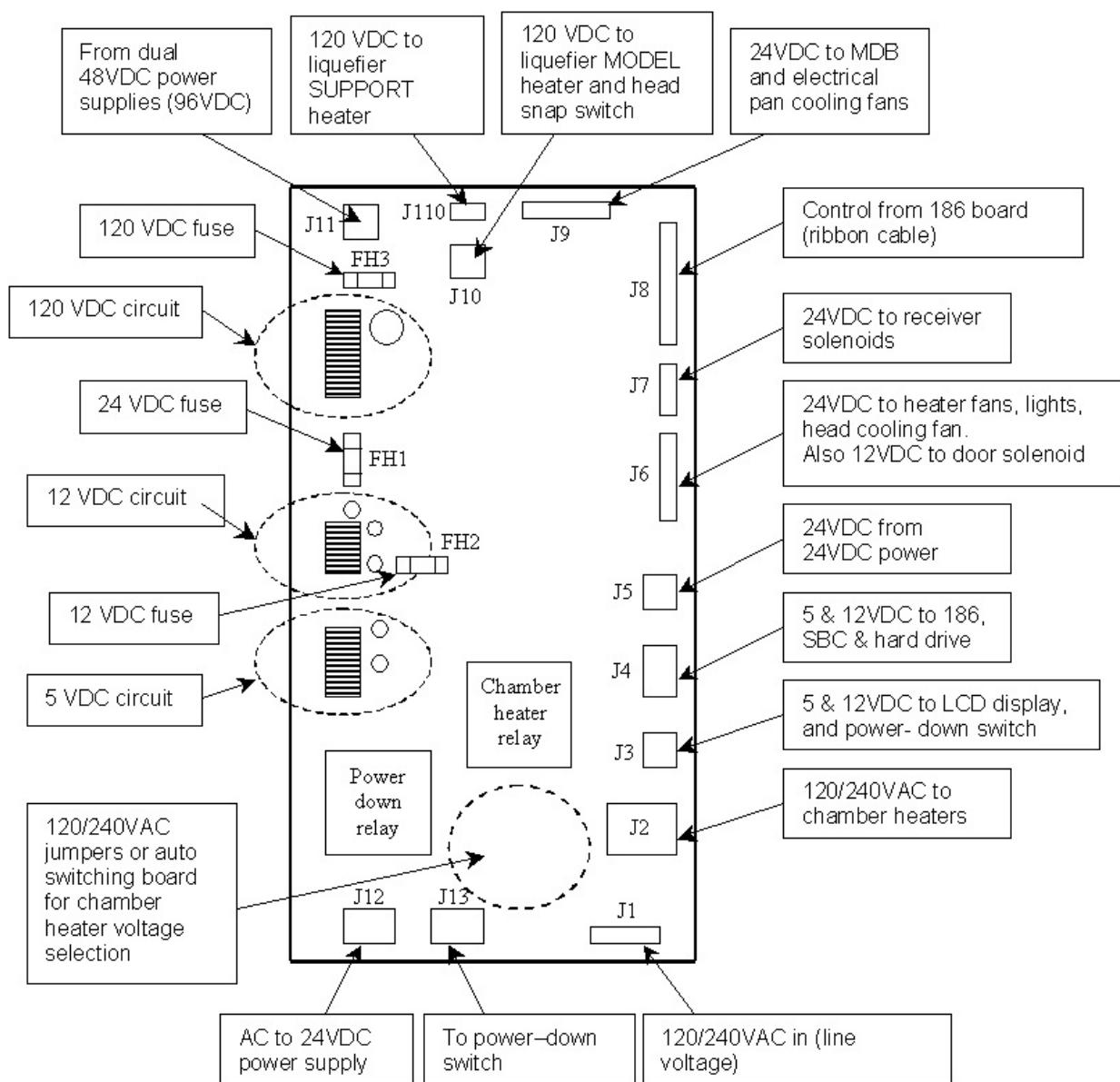
- The 24 VDC from the commercial switching power supply is converted by the PDB to 5 VDC, 12 VDC, 24 VDC, and 120 VDC.
- The 5 VDC and 12 VDC are used by the 186 board, single board computer and hard disk drive. The 12 VDC also powers the filament motors through the 186 board.
- The 24 VDC powers the stepper motors (through the motor driver board), the solenoids, the fans (seven of them), and the chamber lights.
- The 120 VDC supplies power to the model and support heaters in the liquefier. If BOTH heaters are warming up a backup dual 48VDC supply may supply the needed additional current. This is fed into the PDB through J11.

There are three fuses on the power distribution board. See [Figure 7](#).

- Fuse 1 protects the 24 volts
- Fuse 2 protects the 12 volts
- Fuse 3 protects the 120 volts
- The 5 volt leg is NOT fused

The second solid state relay provides AC line voltage to everything. It is controlled by the 186 board and allows for safe system shut down when the power down switch is turned off.

Figure 7: Power distribution board detail



Motor Driver Board

Overview

The motor driver board supplies current amplification for the X, Y and Z stepper motors. Control signals from the PMD chips (186 board) are sent via ribbon cables to the motor driver board. These signals are then amplified and sent to the X, Y and Z stepper motors. The board contains three identical and separate amplifying circuits, one for each of the three stepper motors.

Power/Voltages

Three connectors on the top edge of the board provide 24 VDC to the board. This power is supplied from the power distribution board.

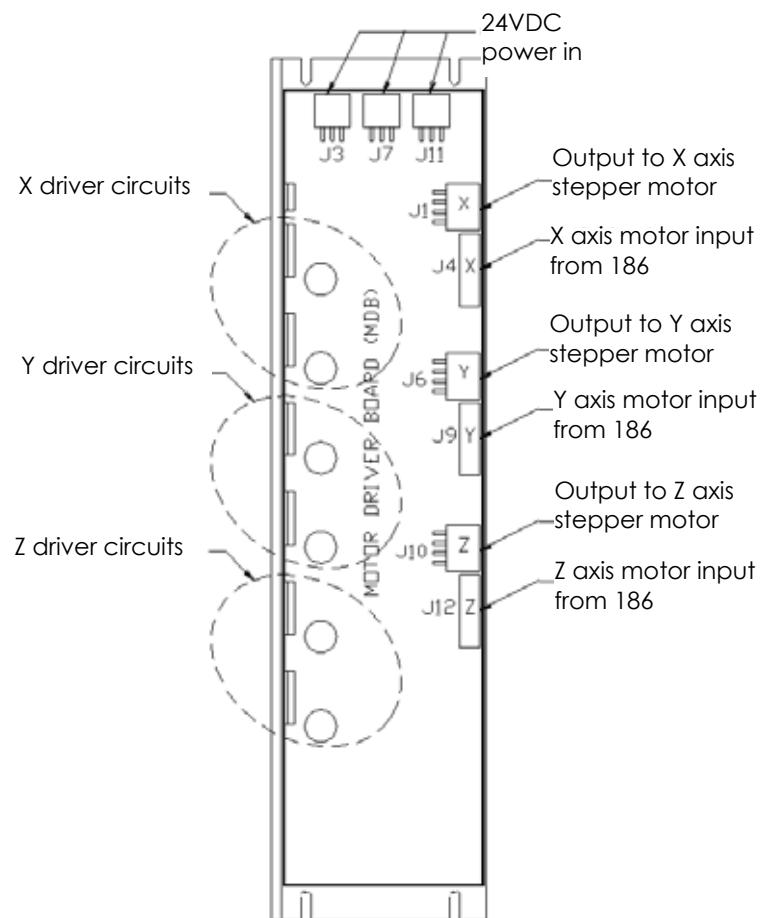
The control signals from the PMD chips on the 186 board are fed into the motor driver board amplifiers through the ribbon cable, one for each axis. All three input connectors (from the 186 board) can be swapped to assist in troubleshooting.

The output connectors to the motors are all six pin mate-n-locks. The output connectors for X and Y can be switched for troubleshooting purposes. The Z output connector is unique and cannot be swapped with X nor Y.



For troubleshooting, the X and Y motor connectors (J1 and J6) can be swapped. The X motor connector (J10) is unique and CANNOT be swapped. All three ribbon cable inputs (J4, J9, and J12) from the 186 to the MDB CAN be swapped.

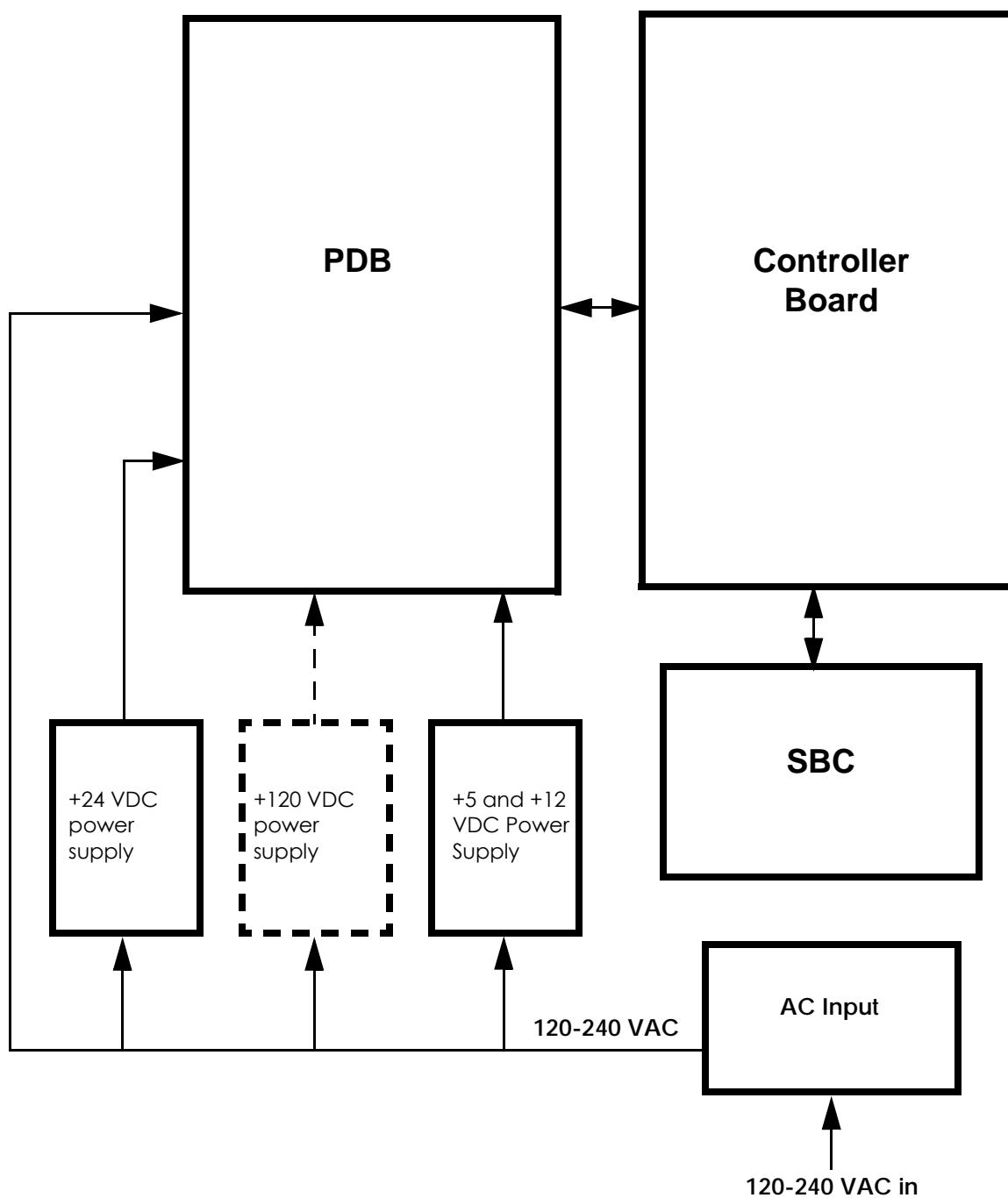
Figure 8: Motor driver board detail



Gen 2 Electronics

Electronics Overview

Figure 9: Gen 2 electronics detail



Controller Board

Overview

The controller board in BST/SST provides all of the low level hardware control and sensing for the system. The software runs on the controller cpu and is flash resident (rather than on the HDD as with the SBC).

Voltage Generation

- +/-15 VDC is used for PMD DACs
- 10 VDC is used for DAC reference
- 3.3 VDC is used for controller board logic

Dual Port Memory Interface

The dual port memory located on the controller board provides the communication channel with the single board computer (SBC) through the P104 connector. This connector has long gold pins coming out of the back of the board and care must be exercised when handling the controller board to avoid damage. The SBC provides the coordinates, velocities, and flow rate commands for modeling to the controller. The controller board provides the status/error information about the hardware back to the SBC.

X, Y, Z Axis Control

The controller takes the flow rate information from the SBC and sends it to the PMD processor. The PMD 2840 processor services the X and Y stepper motors and the model and support head servo motors. The 3410 processor services the Z axis stepper motor. There is no feedback from the stepper motors to the system (they are open-loop controlled).

Filament Motor Control

The controller takes the flow rate information from the SBC and sends it to the PMD 2840 processors. The PMD uses this information along with the encoder signals from the filament motors to generate an output signal to drive the servo motors in the head assembly. Since the encoders provide feedback ,the filament motors have a closed-loop control. Their position and rotation are precisely known at all times.

Temperature Control

The controller board reads the three thermocouple (T/C) inputs/signals (2 for the head, 1 for the chamber).

Liquefier Temperature Control

The liquefier T/C connects to the controller board through the power distribution board. The T/C generates a variable low level current that depends on the temperature of the T/C. This analog

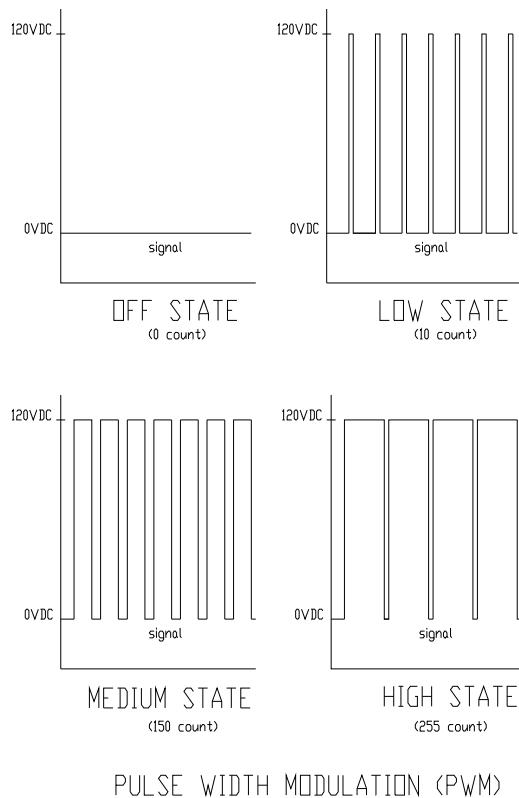
signal from the T/C is amplified by the head distribution. It is then sent down the umbilical cable to the PDB, and then to the controller board. An A to D converter in the ColdFire chip converts the analog signal to digital. In order to improve temperature resolution, this signal is biased. The lowest reading possible is 89.5 °C. The highest reading is 330 °C.

The liquefier temperature is maintained at:

	BST Single Heater	SST Dual Heater
Model	270 °C	280° C
Support	NA	250° C

Temperature control is accomplished using pulse width modulation. See [Figure 10](#).

Figure 10: Pulse Width Modulation (PWM)



Actual power to the liquefier heater is supplied by the PDB, which is controlled by the controller board. The head heaters are turned off and on 1000 times a second (pulses). The duration of the 120 VDC pulse determines the average power being supplied to keep the liquefier at temperature. Temperatures can be read using a volt meter at test points TP5 for model, and TP4 support on the PDB (10 mV per degree C).

Actuators, Switches & Optical Sensors

The input and output signals are passed through the PDB and then processed by the controller board. The non-motor actuators on a BST/SST system are 24 volt solenoids. The 24 volt power is supplied by the PDB which in turn is controlled by the controller board. The following is a list of actuators:

- Door solenoid - locks the door to the modeling chamber.
- Cartridge latches (2) - holds cartridges in the receiver unit.
- Receiver solenoids - engage the motor that feeds filament from cartridges to liquefier during auto load.

The controller board reads and updates the remaining material information on the smart cartridge (e-prom). This is accomplished through a serial interface to the receiver encryption board. The receiver encryption board in turn connects to the e-prom on the cartridge via two pogo pins.

The controller board monitors these switches:

- Z limit switches - upper and lower
- X end of travel switch
- Y end of travel switch

The controller board monitors the following optical sensors:

- X home sensor
- Y home sensor
- Top of foam sensor

Safety Devices

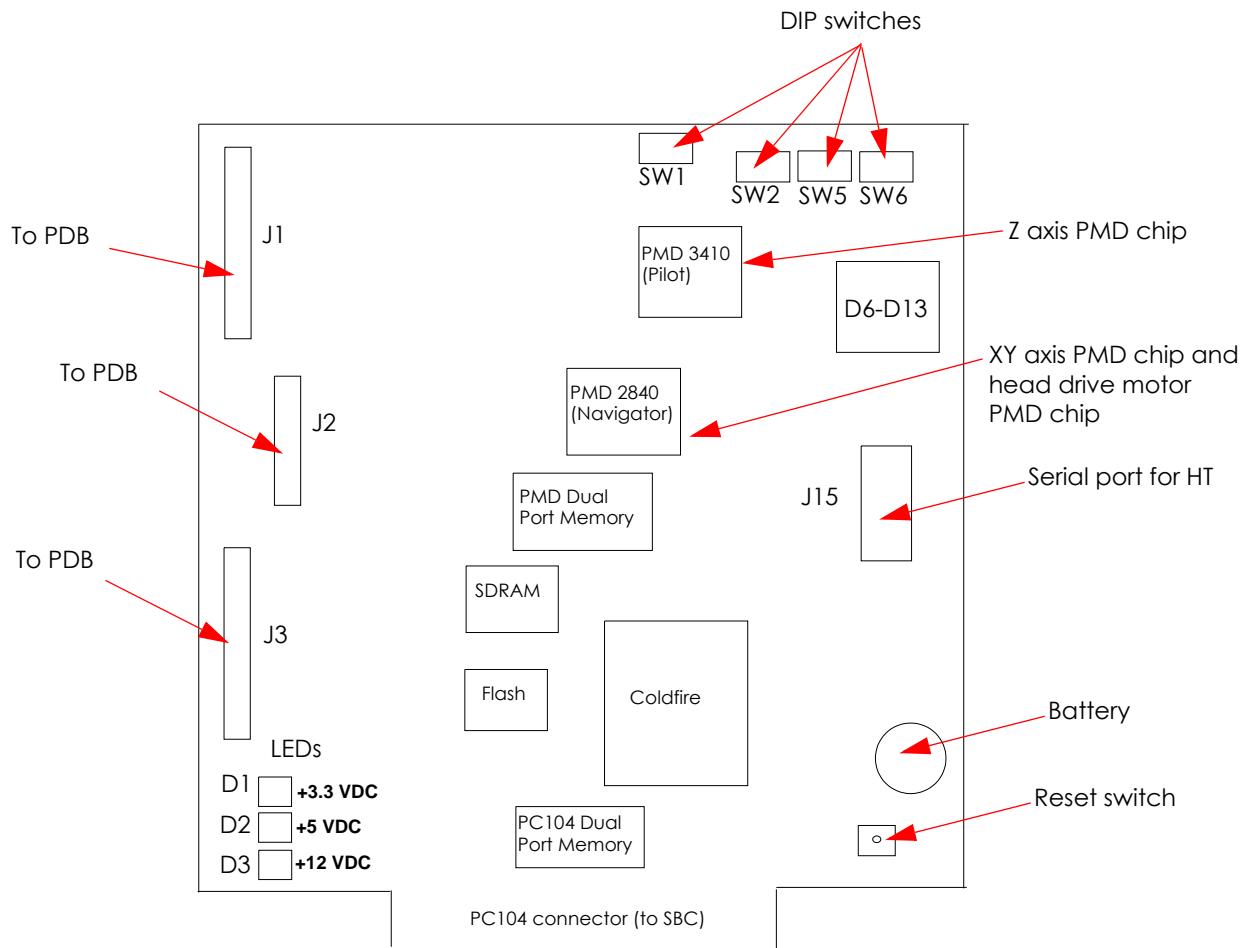
The controller board monitors the following safety devices:

- Chamber T/C alarm - activated for a bad or missing T/C
- Liquefier T/C alarm - activated for a bad or missing T/C
- Head and chamber snap switches
- Main thermostat
- Door open switch
- Door latch solenoid

Controller Board Layout

[Fig. 11](#) below shows the layout of the controller board connectors with labels indicating where each of the functions described previously are connected. In addition to those functions, the figure shows a reset button, a set of dip switches, and the LEDs (D1-D3 and D6-D13).

Figure 11: Controller board detail



Reset Button

Located on the lower right side of the board, the reset button will do a hard reset of the controller board. Before continuing with normal operation after resetting the board, system power must be cycled before building.

Dip Switches

There are four dip switch banks (SW1, SW2, SW5, SW6) located on the top right side of the board.



Read the black numbers on the switch bank for SW1 and read the white numbers on the board for SW2, SW5, and SW6.

SW1

Number (in black)	Description	Setting	Default
1-3	PMD pilot baud rate	57600	1-2 off, 3 on
4-5	Pilot parity bits	None	Off
6	Pilot stop bits	2	Off
7	Pilot protocol	Point to point	On
8	Unused	Unused	Off

SW2

Number (in white)	Description	Default
16-24	Unused	Off

SW5

Number (in white)	Description	Default
8-15	Unused	Off

SW6

Number (in white)	Description	Default
0	Run built-in self test (BIST)	Off
1	Load Firmware (turn on when using SND-BIN.EXE)	Off
2	Disable door latching	Off
3	Unused	Off
4	Don't reset controller when in command is issued	Off
5	Disable WatchDog timer	Off
6	Enable use of dc commands	Off
7	Unused	Off

Memory

There are three types of memory contained on the controller board.

- Dual Port RAM: The communication buffer between the controller board and the single board computer. Events (from the controller), commands (from the SBC), and motion control vertices (from the SBC) are passed through the P104 connector joining the two boards.
- Flash Memory: Where the executable code resides.
- Battery backup RAM: Where the controller board stores system parameters.

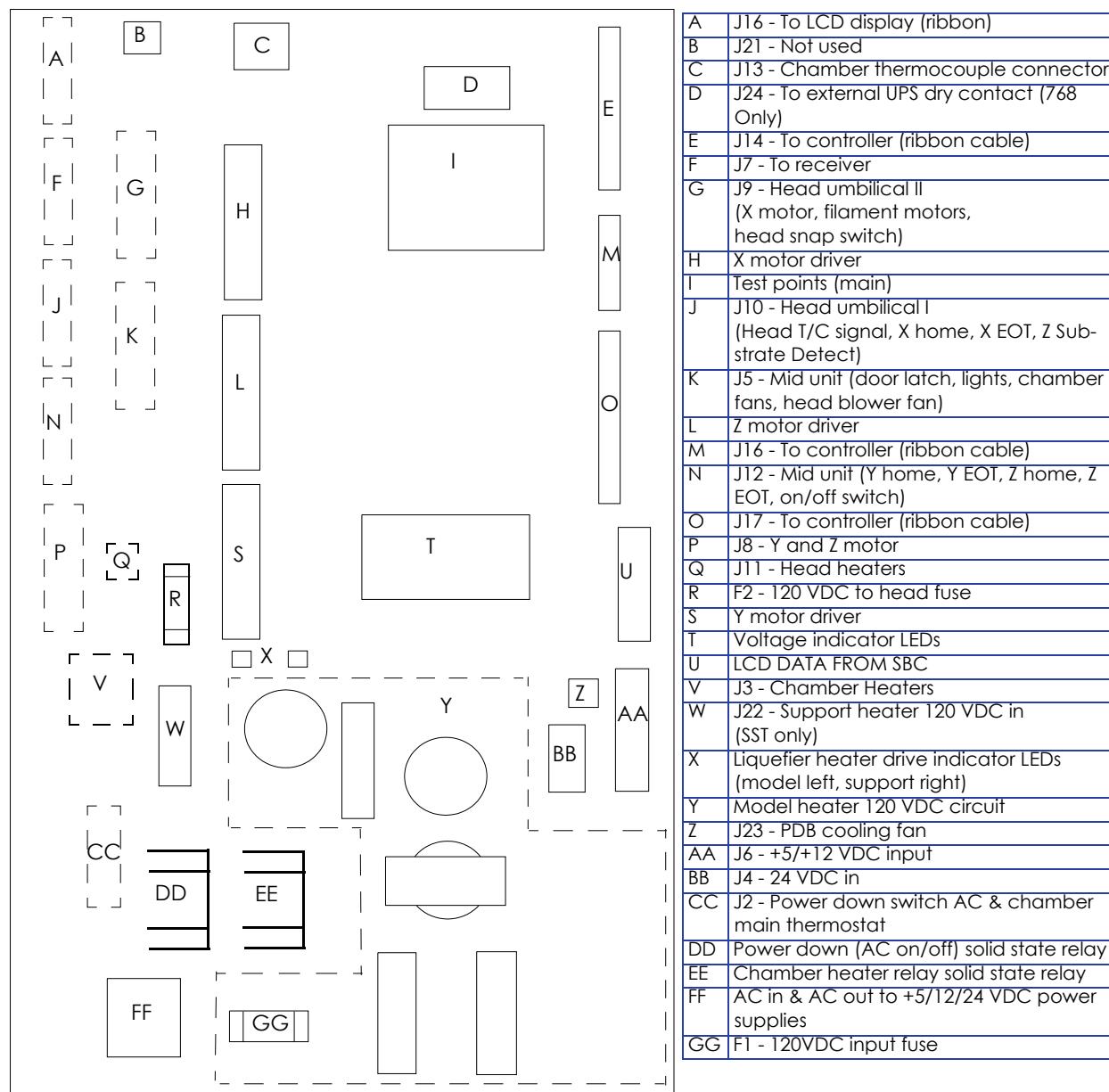
LEDs

There are 11 LEDs located on the controller board. A grouping of three (D1-D3) are located on the lower left side. The other group of eight (D6-D13) are located on the upper right side. D1-D3 are lit when their associated voltage, as shown in table below, is present. The 3.3 VDC supply is generated on the controller board, +5 and +12 VDC come from the PDB. One function of the D6-D12 LEDs is that they turn on sequentially to show software download progress. During normal operation, D13 will blink approx. once every two seconds to indicate that the watchdog is being serviced.

LED Label	Description
D1	+3.3 VDC Supply
D2	+5 VDC Supply
D3	+12 VDC Supply
D6-D12	Debug LEDs (software use only)
D13	Coldfire processor heartbeat

Power Distribution Board (PDB)

Figure 12: Power distribution board detail



This board provides the power required to run the system. AC line voltage, +5 VDC, +12 VDC, and +24 VDC feed into the PDB. For SST and Prodigy Plus only, an additional +120 VDC input feeds into the PDB.

AC line voltage comes into the PDB (Fig. 12). The voltage is routed through the solid state relay to an auto switching circuit. The circuit is used to supply the chamber heater voltage: 240 VAC in

series, or 120 VAC in parallel. The solid state relay is controlled by the controller board, and turns the heater on/off to regulate the chamber temperature. A second solid state relay provides AC line voltage to the system. It is controlled by the controller board and safely shuts down the system when the power down switch is turned off.

- The 5 VDC and 12 VDC are used by the controller board, single board computer, and hard drive. The 12 VDC also powers the filament motors.
- The 24 VDC powers the stepper motors, solenoids, fans, and chamber lights.
- The 120 VDC circuit powers the model heater. For SST only, a separate 120 VDC supply powers the support heater.

There are two fuses on the power distribution board. See [Figure 12](#).

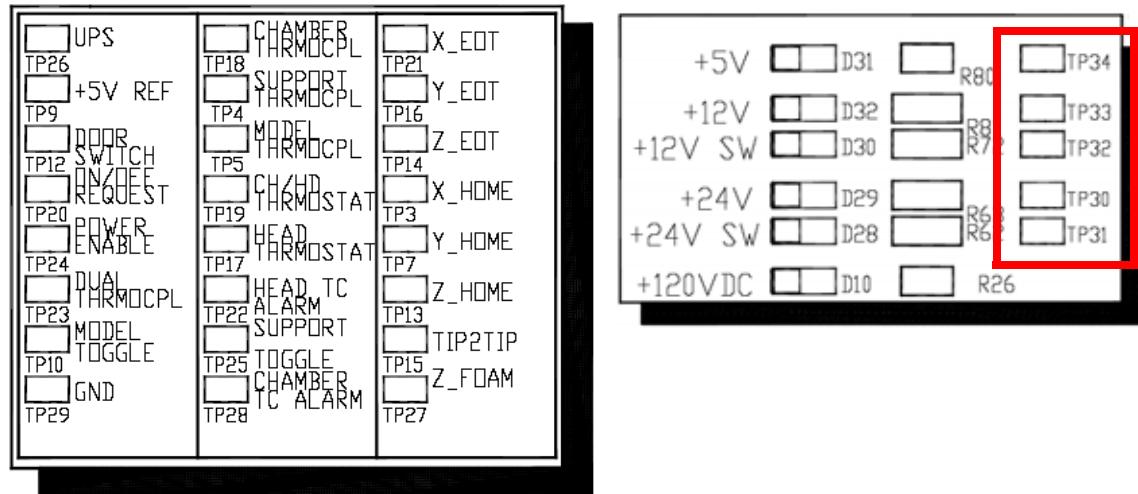
- Fuse F1 fuses the AC input to the +120 VDC supply.
- Fuse F2 fuses the +120 VDC output.

Chamber Temperature Control

The chamber thermocouple (T/C) connects directly to the PDB and the signal is sent to the controller board. The T/C generates a variable low level voltage that depends on the temperature of the chamber. This analog signal from the thermocouple is amplified on the PDB. From the amplifier, the signal goes to an A to D converter in the ColdFire. The controller reads the chamber temperature and turns the heaters on and off to maintain 75 °C. The chamber fans run continuously when the printer is on. Temperatures can be read on the PDB using a voltmeter at test points TP5 for model, TP4 support, and TP18 for the chamber (10 mV per degree C).

Test Points

Test points are very useful for troubleshooting the system. The test points are listed below with a brief description.



System Component	Test Point	Description
UPS	TP26	Power fail signal from external UPS
+5V REF	TP9	Head T/C service reference
Door Switch	TP12	State of the door (open or closed)
On/Off Request	TP20	State of power down switch
Power Enable	TP24	Enables power to circuitry (normally high)
Dual Thermocouple	TP23	SST: High, T/C board jumper present BST: Low, T/C board jumper removed
Model Toggle	TP10	Not used
GND	TP29	Ground
Chamber Thermocouple	TP18	Voltage corresponds to chamber temperature (10 mV=° C)
Support Thermocouple	TP4	Voltage corresponds to support temperature (10 mV=° C)
Model Thermocouple	TP5	Voltage corresponds to model temperature (10 mV=° C)
CH/HD Thermostat	TP19	Chamber and head thermostat (snap switches) (+5 VDC if both switches closed) Normal = tp17 lo, tp19 hi ch thermostat fault=tp17 lo, tp19 lo.
Head Thermostat	TP17	Goes high if head thermostat trips Normal=tp17 lo, tp19 hi hd thermostat fault=tp17 hi, tp19 lo
Head TC Alarm	TP22	High if head T/C not plugged in or open
Support Toggle	TP25	Not used
Chamber TC Alarm	TP28	High if chamber T/C not plugged in or open
X EOT	TP21	X end of travel sensor (5 VDC), switches are wired normally closed (NC)
Y EOT	TP16	Y end of travel sensor (5 VDC), switches are wired normally closed (NC)
Z EOT	TP14	Z end of travel sensor (5 VDC), switches are wired normally closed (NC)
X Home	TP3	X home sensor (5 VDC), switches are wired normally closed (NC)
Y Home	TP7	Y home sensor (5 VDC), switches are wired normally closed (NC)
Z Home	TP13	Z home sensor (5 VDC), switches are wired normally closed (NC)
Tip-to-Tip	TP15	Not used
Z Foam	TP27	Z substrate sensor (5 VDC)
+5 VDC	TP34	+5 VDC
+12 VDC	TP33	+12 VDC

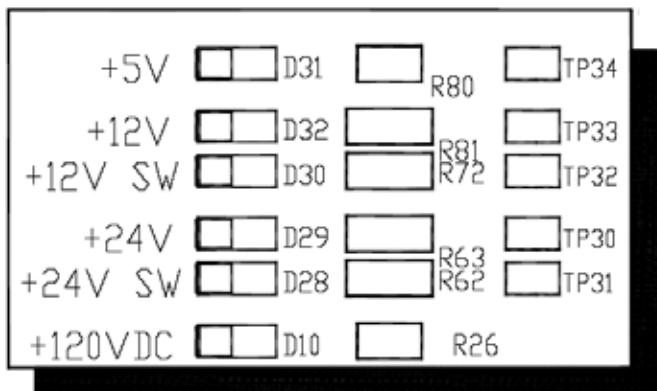
System Component	Test Point	Description
+12 VDC SW	TP32	+12 VDC switched (off when power enable is off, when powering up, and during download)
+24 VDC	TP31	+24 VDC
+24 VDC SW	TP30	+24 VDC switched (off when power enable is off, when powering up, and during download)
AC On/Off	TP1	Drive signal to power down relay
Chamber Heater	TP2	Chamber heater on or off

LEDs

LED voltage is present when LED is lit. The LEDs are listed below with a brief description.



Lit LEDs do not imply accurate voltage. Verify voltage levels using a meter.



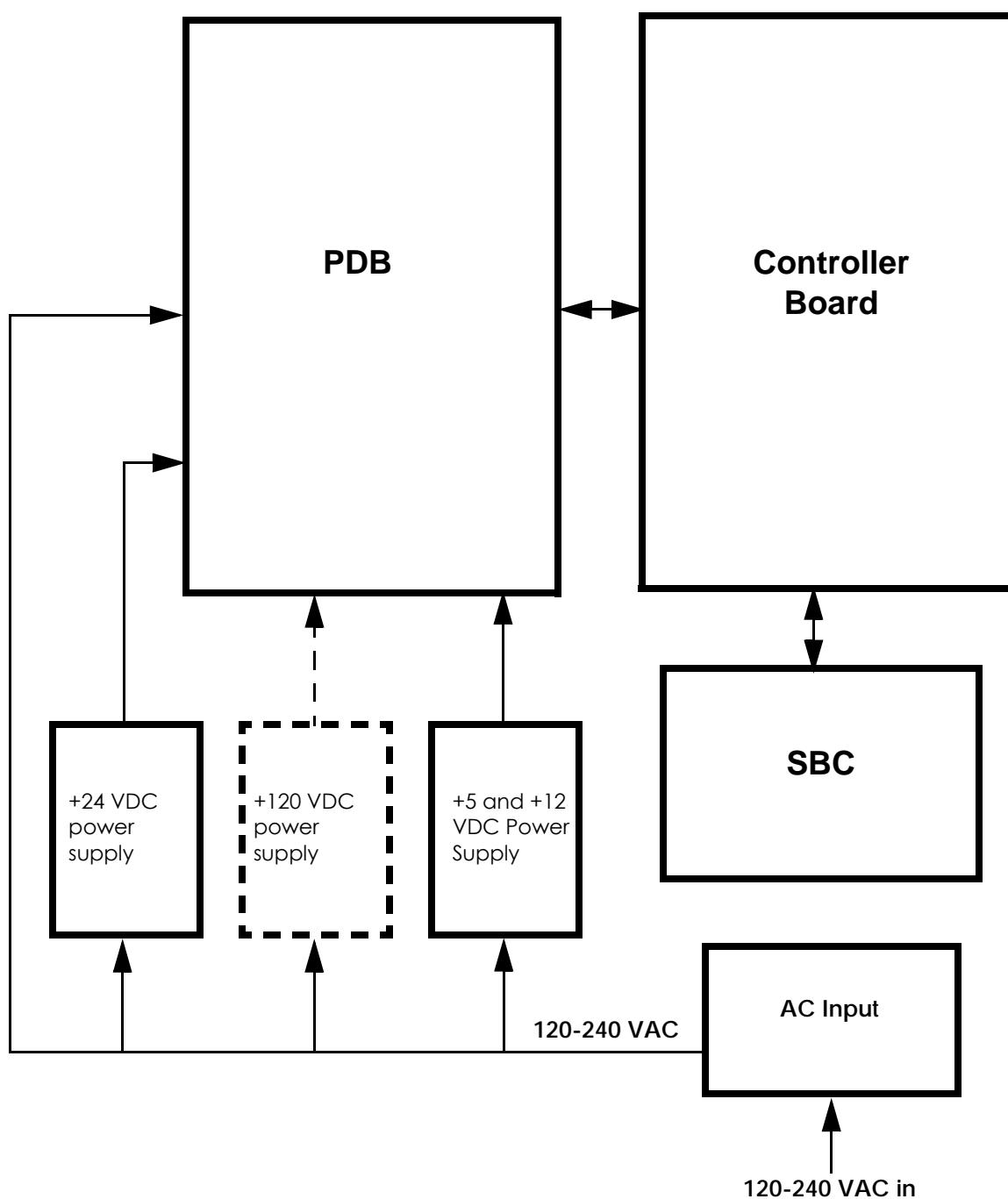
System Component	LED	Description
+5 V	D31	+5 VDC present
+12 V	D32	+12 VDC present
+12 V SW	D30	+12 VDC switched (power enabled)
+24 V	D29	+24 VDC present
+24 V SW	D28	+24 VDC switched (power enabled)
+120 VDC	D10	+120 VDC will blink if voltage is above +50 VDC
AC On/Off	D16	Drive signal to the power down relay

System Component	LED	Description
Chamber Heater	D15	On or off
+120 VDC	D7	Model +120 VDC on
Model Heater PWM	D39	Indicates duty cycle of model PWM
Support Heater PWM	D40	Indicates duty cycle of support PWM

Gen 3 Electronics

Electronics Overview

Figure 13: Electronics overview detail



Controller Board

Overview

The controller board in BST/SST provides all of the low level hardware control and sensing for the system. The software runs on the controller cpu and is flash resident (rather than on the HDD as with the SBC).

Voltage Generation

- +/-15 VDC is used for PMD DACs
- 10 VDC is used for DAC reference
- 3.3 VDC is used for controller board logic

Dual Port Memory Interface

The dual port memory located on the controller board provides the communication channel with the single board computer (SBC) through the P104 connector. This connector has long gold pins coming out of the back of the board and care must be exercised when handling the controller board to avoid damage. The SBC provides the coordinates, velocities, and flow rate commands for modeling to the controller. The controller board provides the status/error information about the hardware back to the SBC.

X, Y, Z Axis Control

The controller takes the flow rate information from the SBC and sends it to the PMD processor. The PMD 2840 processor services the X and Y stepper motors and the model and support head servo motors. The 3410 processor services the Z axis stepper motor. There is no feedback from the stepper motors to the system (they are open-loop controlled).

Filament Motor Control

The controller takes the flow rate information from the SBC and sends it to the PMD 2840 processors. The PMD uses this information along with the encoder signals from the filament motors to generate an output signal to drive the servo motors in the head assembly. Since the encoders provide feedback ,the filament motors have a closed-loop control. Their position and rotation are precisely known at all times.

Temperature Control

The controller board reads the three thermocouple (T/C) inputs/signals (2 for the head, 1 for the chamber).

Liquefier Temperature Control

The liquefier T/C connects to the controller board through the power distribution board. The T/C generates a variable low level current that depends on the temperature of the T/C. This analog

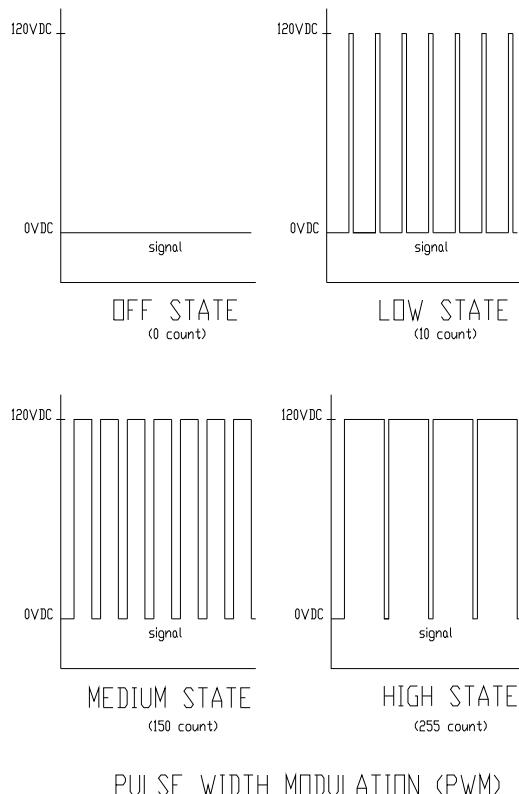
signal from the T/C is amplified by the head distribution. It is then sent down the umbilical cable to the PDB, and then to the controller board. An A to D converter in the ColdFire chip converts the analog signal to digital. In order to improve temperature resolution, this signal is biased. The lowest reading possible is 89.5 °C. The highest reading is 330 °C.

The liquefier temperature is maintained at:

	BST Single Heater	SST Dual Heater
Model	270 °C	280° C
Support	NA	250° C

Temperature control is accomplished using pulse width modulation. See [Figure 14](#).

Figure 14: Pulse Width Modulation (PWM)



Actual power to the liquefier heater is supplied by the PDB, which is controlled by the controller board. The head heaters are turned off and on 1000 times a second (pulses). The duration of the 120 VDC pulse determines the average power being supplied to keep the liquefier at temperature. Temperatures can be read using a volt meter at test points TP5 for model, and TP4 support on the PDB (10 mV per degree C).

Actuators, Switches & Optical Sensors

The input and output signals are passed through the PDB and then processed by the controller board. The non-motor actuators on a BST/SST system are 24 volt solenoids. The 24 volt power is supplied by the PDB which in turn is controlled by the controller board. The following is a list of actuators:

- Door solenoid - locks the door to the modeling chamber.
- Cartridge latches (2) - holds cartridges in the receiver unit.
- Receiver solenoids - engage the motor that feeds filament from cartridges to liquefier during auto load.

The controller board reads and updates the remaining material information on the smart cartridge (e-prom). This is accomplished through a serial interface to the receiver encryption board. The receiver encryption board in turn connects to the e-prom on the cartridge via two pogo pins.

The controller board monitors these switches:

- Z limit switches - upper and lower
- X end of travel switch
- Y end of travel switch

The controller board monitors the following optical sensors:

- X home sensor
- Y home sensor
- Top of foam sensor

Safety Devices

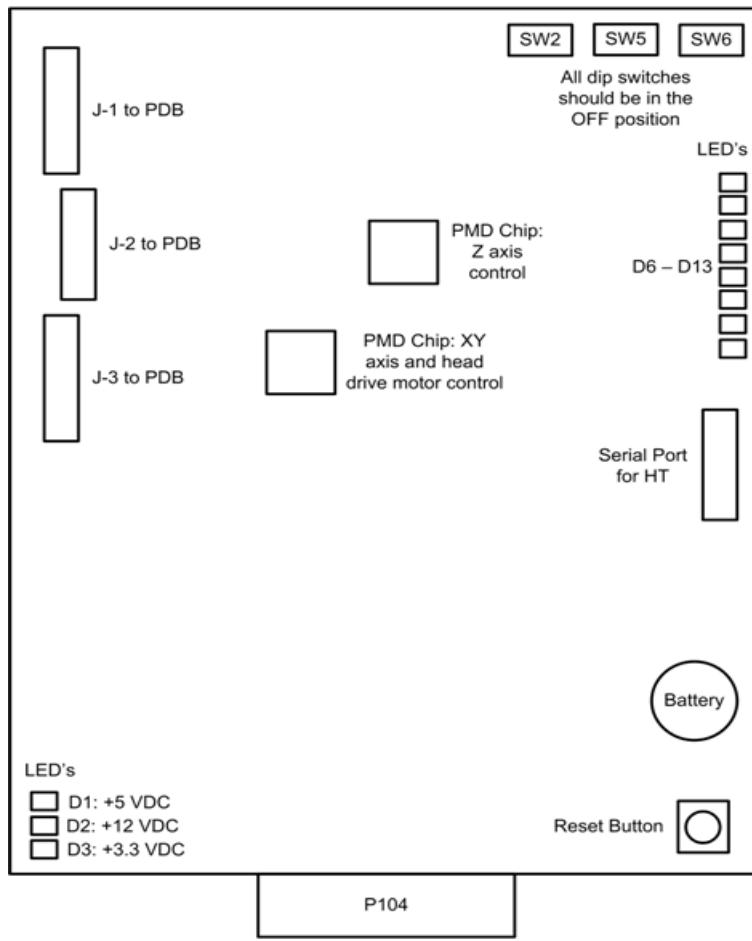
The controller board monitors the following safety devices:

- Chamber T/C alarm - activated for a bad or missing T/C
- Liquefier T/C alarm - activated for a bad or missing T/C
- Head and chamber snap switches
- Main thermostat
- Door open switch
- Door latch solenoid

Controller Board Layout

[Fig. 15](#) below shows the layout of the controller board connectors with labels indicating where each of the functions described previously are connected. In addition to those functions, the figure shows a reset button, a set of dip switches, and the LEDs (D1-D3 and D6-D13).

Figure 15: Controller board connection detail



Reset Button

Located on the lower right side of the board, the reset button will do a hard reset of the controller board. Before continuing with normal operation after resetting the board, system power must be cycled before building.

Dip Switches

There are three dip switch banks (**SW2**, **SW5**, **SW6**) located on the top right side of the board. All dip switches should be in the OFF position.

SW2

Number (in white)	Description	Default
16-24	Unused	Off

SW5

Number (in white)	Description	Default
8-15	Unused	Off

SW6

Number (in white)	Description	Default
0	Run built-in self test (BIST)	Off
1	Load Firmware (turn on when using SNDBIN.EXE)	Off
2	Disable door latching	Off
3	Unused	Off
4	Don't reset controller when in command is issued	Off
5	Disable WatchDog timer	Off
6	Enable use of dc commands	Off
7	Unused	Off

Memory

There are three types of memory contained on the controller board.

- Dual Port RAM: The communication buffer between the controller board and the single board computer. Events (from the controller), commands (from the SBC), and motion control vertices (from the SBC) are passed through the P104 connector joining the two boards.
- Flash Memory: Where the executable code resides.
- Battery backup RAM: Where the controller board stores system parameters.

LEDs

There are 11 LEDs located on the controller board. A grouping of three (D1-D3) are located on the lower left side. The other group of eight (D6-D13) are located on the upper right side. D1-D3 are lit when their associated voltage, as shown in table below, is present. The 3.3 VDC supply is generated on the controller board, +5 and +12 VDC come from the PDB. One function of the D6-D12 LEDs is that they turn on sequentially to show software download progress. During normal operation, D13 will blink approx. once every two seconds to indicate that the watchdog is being serviced.

LED Label	Description
D1	+3.3 VDC Supply
D2	+5 VDC Supply
D3	+12 VDC Supply
D6-D12	Debug LEDs (software use only)
D13	Coldfire processor heartbeat

Single Board Computer

The single board computer (SBC) is the main processor in the system. It is a complete “PC compatible computer” on a single board. See [Figure 16](#).

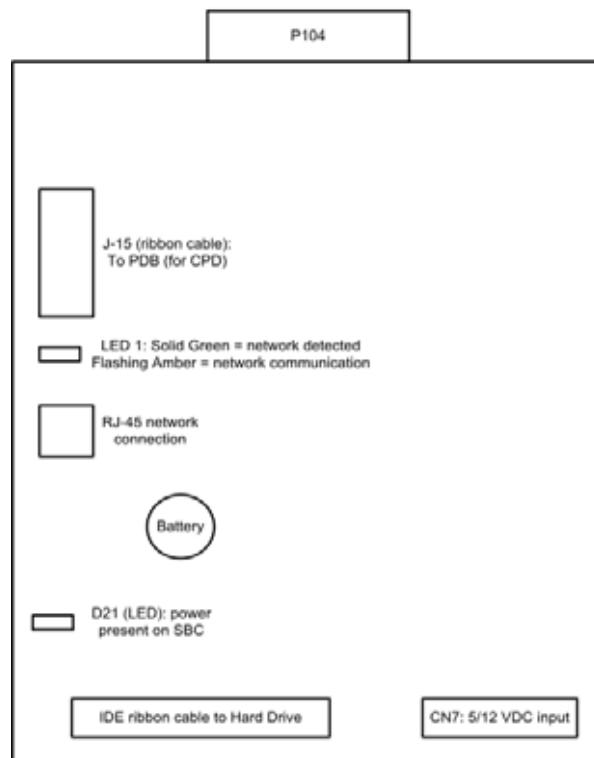
The TCP/IP network interface connects directly to the RJ-45 connector on the SBC. The network interface supports both 10baseT and 100baseT operation. The hardware differentiates automatically. There is a green LED next to the RJ-45 connector. The LED shows the status of the network connection as follows:

- Green LED: Indicates there is a network connection present.
- Yellow LED: Indicates there is network communication present.

The HDD contains the Linux operating system and all the control software needed to run the system (except the controller firmware). This is also where all the downloaded models are stored (the queue).

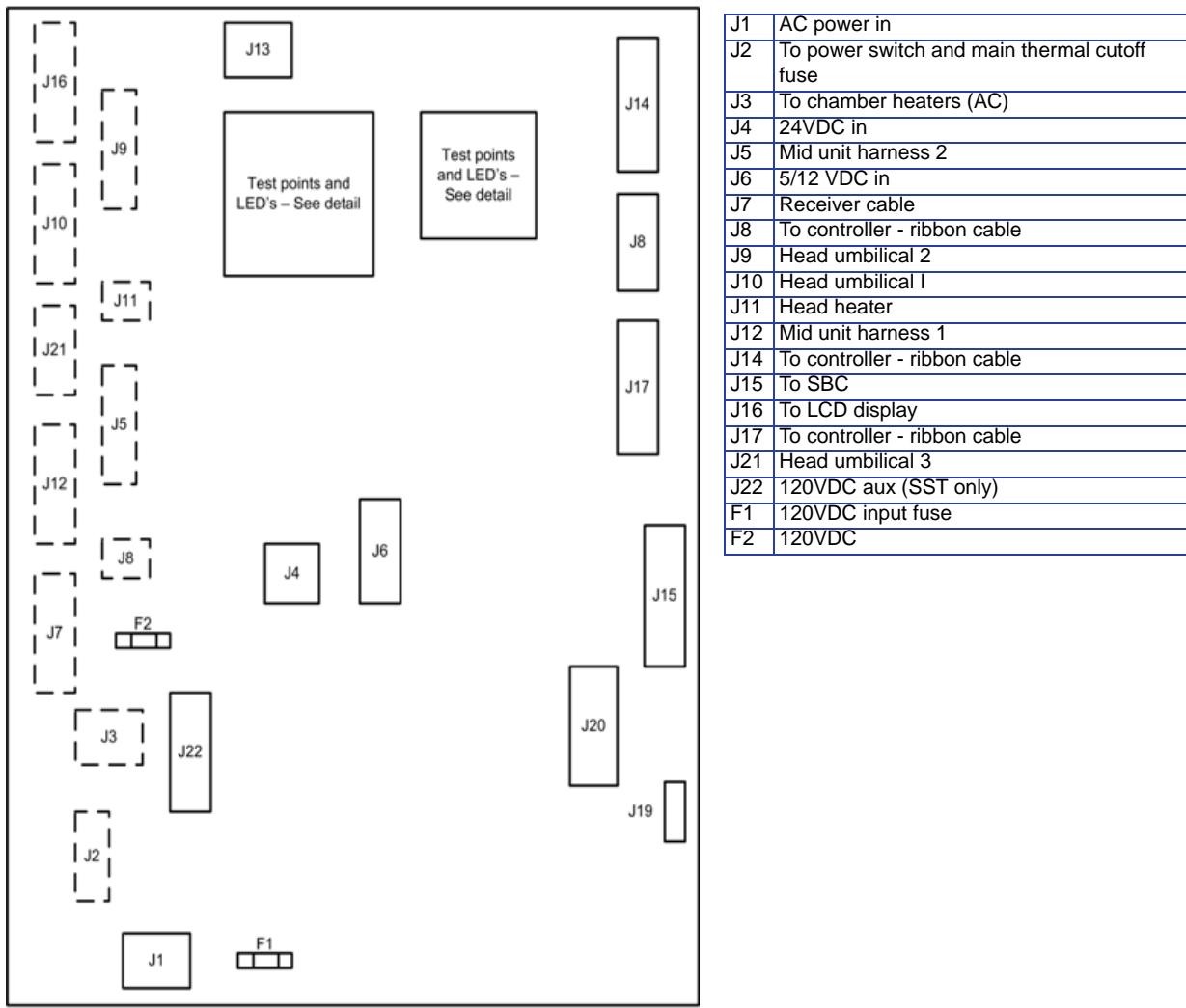
The Control Panel Display (CPD) connects to the SBC at J15 connector. The ribbon cable will connect to the Power Distribution Board (PDB). All user entered commands from the CPD buttons are routed through the PDB and then to the SBC.

Figure 16: Single Board Computer detail



Power Distribution Board (PDB)

Figure 17: Power Distribution Board detail



This board provides the power required to run the system. AC line voltage, +5 VDC, +12 VDC, and +24 VDC feed into the PDB. For SST and Prodigy Plus only, an additional +120 VDC input feeds into the PDB.

AC line voltage comes into the PDB (Fig. 17). The voltage is routed through the solid state relay to an auto switching circuit. The circuit is used to supply the chamber heater voltage: 240 VAC in series, or 120 VAC in parallel. The solid state relay is controlled by the controller board, and turns the heater on/off to regulate the chamber temperature. A second solid state relay provides AC line voltage to the system. It is controlled by the controller board and safely shuts down the system when the power down switch is turned off.

- The 5 VDC and 12 VDC are used by the controller board, single board computer, and hard drive. The 12 VDC also powers the filament motors.

- The 24 VDC powers the stepper motors, solenoids, fans, and chamber lights.
- The 120 VDC circuit powers the model heater. For SST only, a separate 120 VDC supply powers the support heater.

There are two fuses on the power distribution board. See [Figure 17](#).

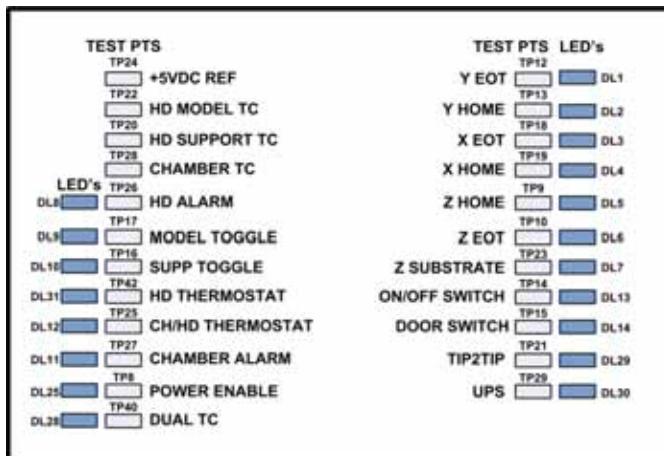
- Fuse F1 fuses the AC input to the +120 VDC supply.
- Fuse F2 fuses the +120 VDC output.

Chamber Temperature Control

The chamber thermocouple (T/C) connects directly to the PDB and the signal is sent to the controller board. The T/C generates a variable low level voltage that depends on the temperature of the chamber. This analog signal from the thermocouple is amplified on the PDB. From the amplifier, the signal goes to an A to D converter in the ColdFire. The controller reads the chamber temperature and turns the heaters on and off to maintain 75 °C. The chamber fans run continuously when the printer is on. Temperatures can be read on the PDB using a voltmeter at test points TP22 for model, TP20 for support, and TP28 for the chamber (10 mV per degree C).

Test Points and LED's

Test points and LED's are very useful for troubleshooting the system. The test points and LED's are listed below with a brief description.



System Component	LED	Test Point	Description
UPS	DL30	TP29	Power fail signal from external UPS
+5V REF	N/A	TP24	Head T/C service reference
Door Switch	DL14	TP15	State of the door (open or closed)

System Component	LED	Test Point	Description
On/Off Request	DL13	TP14	State of power down switch
Power Enable	DL25	TP8	Enables power to circuitry (normally high)
Dual Thermocouple	DL28	TP40	SST: High, T/C board jumper present BST: Low, T/C board jumper removed
Model Toggle	DL9	TP17	Not used
GND	N/A	Ground Points	Ground
Chamber Thermocouple	N/A	TP28	Voltage corresponds to chamber temperature (10 mV=° C)
Support Thermocouple	N/A	TP20	Voltage corresponds to support temperature (10 mV=° C)
Model Thermocouple	N/A	TP22	Voltage corresponds to model temperature (10 mV=° C)
CH/HD Thermostat	DL31	TP25	Chamber and head thermostat (snap switches) (+5 VDC if both switches closed) Normal = tp25 lo, tp42 hi ch thermostat fault=tp25 lo, tp42 lo.
Head Thermostat	DL31	TP42	Goes high if head thermostat trips Normal=tp25 lo, tp42 hi hd thermostat fault=tp25 hi, tp42 lo
Head TC Alarm	DL8	TP26	High if head T/C not plugged in or open
Support Toggle	DL10	TP16	Not used
Chamber TC Alarm	DL11	TP27	High if chamber T/C not plugged in or open
X EOT	DL3	TP18	X end of travel sensor (5 VDC), switches are wired normally closed (NC)
Y EOT	DL1	TP12	Y end of travel sensor (5 VDC), switches are wired normally closed (NC)
Z EOT	DL6	TP10	Z end of travel sensor (5 VDC), switches are wired normally closed (NC)
X Home	DL4	TP19	X home sensor (5 VDC), switches are wired normally closed (NC)
Y Home	DL2	TP13	Y home sensor (5 VDC), switches are wired normally closed (NC)
Z Home	DL5	TP9	Z home sensor (5 VDC), switches are wired normally closed (NC)
Tip-to-Tip	DL29	TP21	Not used
Z Foam	DL7	TP23	Z substrate sensor (5 VDC)
AC On/Off	DL15	TP1	Drive signal to power down relay
Chamber Heater	DL16	N/A	Chamber heater on or off



Lit LEDs do not imply accurate voltage. Verify voltage levels using a meter.

Figure 18: LED and test point detail

LED's	TEST PTS	
DL27	TP3	+5 V
DL19	TP4	+12 V
DL22	TP5	+12 V SW
DL20	TP6	+24 V
DL21	TP7	+24 V SW

System Component	LED	Description
+5 V	DL27	+5 VDC present
+12 V	DL19	+12 VDC present
+12 V SW	DL22	+12 VDC switched (power enabled)
+24 V	DL20	+24 VDC present
+24 V SW	DL21	+24 VDC switched (power enabled)
+120 VDC	DL18	+120 VDC will blink if voltage is above +50 VDC
AC On/Off	DL15	Drive signal to the power down relay
Chamber Heater	DL16	On or off
+120 VDC	DL17	Model +120 VDC on
Model Heater PWM	DL23	Indicates duty cycle of model PWM
Support Heater PWM	DL24	Indicates duty cycle of support PWM

Software

3

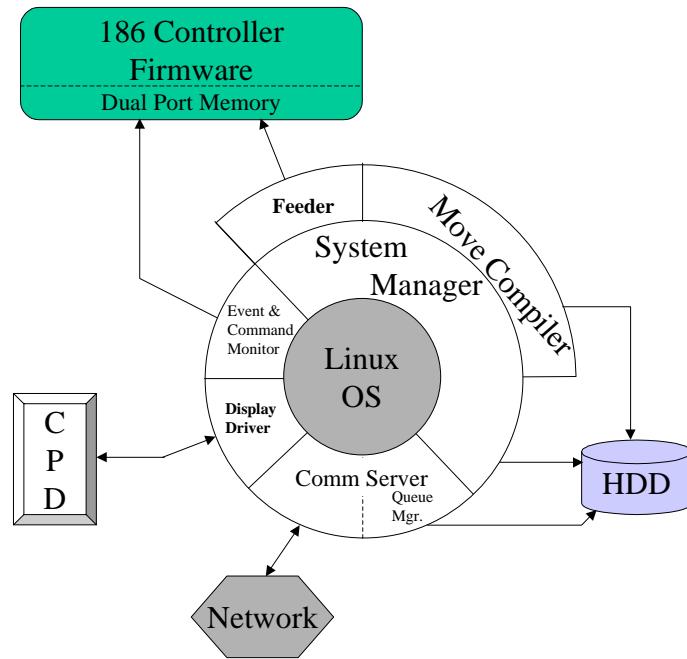
In this chapter you will learn about the software that is used in the system. The contents and page numbers of this chapter are as follows:

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DataStat.....	4
CatalystEX Help.....	5
Maraca Help	7
System Software	13

Software Architecture

Figure 1 shows the major software components that control the system. The software that runs on the 186 board is EPROM based. The software that runs on the SBC is stored on the HDD and loaded during power up. Like all PC compatible computers, the SBC runs a brief self-test on power up and then loads the operating system followed by the system's application components.

Figure 1: Software Architecture Diagram



Operating System

The system's software currently runs on RedHat Linux version 5.2. The OS is multi tasking allowing the software components to run fairly independently. The OS also provides support for the TCP/IP network interface and the HDD.

Display Driver

This software interacts with the operator display panel on the front of the system. This software processes all button pushes. The driver also formats the information going to the four line display and the context sensitive button labels.

Comm Server

The comm server software on the system is the other half of the download software that is part of the Catalyst workstation software. Parts to be built (.cmb files) are received by the comm server and saved on the data partition of the HDD. Queue management of the parts to be built is also part of the comm server. Lastly the comm server provides Catalyst the system status information that is displayed on workstation.

System Manager

The system manager software provides the overall control and decision making functions that are used by the system during all operations. User requests are received from the Display Driver (in response to button pushes). The requests are processed and commands sent to the 186 board to activate the appropriate hardware.

Move Compiler

When “start part” is requested the system manager activates the move compiler. The move compiler retrieves the cmb file from the top of the queue. The cmb defines the tool path for the part on a layer by layer basis. The move compiler calculates the proper extrusion rate for the road thus combining tool path and extrusion. The resulting motion control is saved in a PCB file.

Feeder

This driver takes the output of the move compiler and feeds the motion control information to the 186 board on demand. The feeder will typically start before the move compiler has finished the calculations for the part. This eliminates waiting for all calculation to be complete. As the 186 board executes the motion control commands they are removed from dual port memory. The feeder adds new commands as space becomes available.

Event/Command Monitor

This software handles all non-motion control interactions between the SBC and the 186 Board. Events are machine status information being sent to the SBC. Commands come from the SBC telling the 186 to do something such as find home.

DataStat

DataStat is a “condensed” version of Maraca. It was developed to:

- Aid in troubleshooting system problems by allowing the customer to view and report specific system information.
- Allow the customer to adjust tip depth into foam (Z offset).

Using DataStat allows you to:

- Select a modeler.
- Add or delete a modeler.
- View a detailed system status window. The window includes important output “state” information. This information will aid in troubleshooting system problems without being on-site.
- View detailed material information.
- Adjust Z offset (tip depth).
- Reset the administrator password to null.

DataStat is located as a separate program on all Prodigy Class backend CD's of build 1140 or greater. DataStat will NOT install on the workstation when performing a backend download. DataStat is used primarily for diagnosing system problems. Generally the customer does not need to access DataStat. For this reason, the customer should only use DataStat when requested by a Prodigy Class trained service representative.

It is very important that you assist the customer when adjusting the Z offset. Failure to do so could cause damage to the system. Reference Appendix E of the Service Guide for the Z offset adjustment procedure.

Parts and Tools Required

- Prodigy Class backend CD Build 1140 or greater
- Workstation

Procedure:

1. Insert the Prodigy Class backend CD into workstation.
2. Select the CD drive and open the *datastat* folder.
3. Select *setup.exe*.
4. Follow the install steps displayed to load the program on the workstation.
5. Open DataStat from Start – Programs pull down.
6. Select the “+” button and enter the system name, type and IP address. Do not enter leading 0's in the IP address.
7. Select the green arrow to close the window.
8. Select the “connect to modeler” (two blue arrows) button to establish communications to the system.
9. Information is now shown in the State, Internal State, and Home State windows of DataStat.
10. From this point the customer can open any of the button options.

CatalystEX Help

CatalystEX Overview

CatalystEX is an intuitive, user-friendly application designed to interface with Dimension 3D printers. It allows you to quickly and easily open a 3D drawing of a part, prepare the drawing for print, and send the print command to create the part.

CatalystEX provides 'Help' information in two ways - through a Conventional Help file and through a Dynamic Help system.

Conventional Help File

The entire Help file is accessible through the Menu Bar (Help>Contents). This will open CatalystEX Help in a separate window containing standard Help tools - TOC, Search, Index, and personally selected Favorites.

Dynamic Help

Dynamic Help is available from within the CatalystEX application window. The right side of the application window is dedicated to Dynamic Help.

Send a "job" to Dimension:

1. Create an STL file with your CAD software.
2. Open CatalystEX from the laptop or workstation.
3. From the **File** menu, click **Open**.
4. Select and Open an STL file produced with your CAD software.
5. Choose one of several options for printing your part. From the General Tab:



For detailed information about the many file processing options available in CatalystEX, refer to the CatalystEX Help files.

- Click 'Print' to have CatalystEX process your part and immediately send it to your Dimension for printing.
...OR...
- Click 'Pack' to have CatalystEX process the part for printing, but not send the part to your Dimension... send the part to the printer later as part of a pack (from the Pack Tab).

Regardless of how you choose to prepare your file for printing, the end result will be the same. CatalystEX will process the STL file into a CMB file. It is the CMB file that CatalystEX will send to the Dimension printer to create your part.



For more information about STL files, CMB files, part orientation, modeling envelope placement, print 'job' efficiency, and other print controls refer to the CatalystEX Help file.

The main screen is divided into several sections. The main menu and a toolbar are along the upper part of the screen. CatalystEX reports information and problems in the system-message area beneath the geometry window.

The STL model, boundary curves, and toolpaths are displayed in the geometry window.

The View Sphere allows you to dynamically pan and rotate your view of the geometry using the mouse button to make selections.

In the right window, there are interface parameters for changing the part build style.

Maraca Help

Overview

Maraca is a program used for machine configuration and troubleshooting. It is intended for use by trained service personnel only.



Caution: It is possible, using this program, to damage the controller software and make the machine non-functional.

Using Maraca you can select a modeler to work with, modify machine-specific configuration parameters, download new calibration file data, download new test parts, and test the machine's operation.

- Select a Modeler
- Modeler States
- Modeler Setup
- Maraca Configuration
- Show Machine Status
- Materials
- Tip Offset and Liquefier Calibration
- Gantry
- Temperatures
- Outputs
- Table Calibration
- Get Calibration
- Send Calibration
- Get Configuration
- Test Parts
- Reset Password
- Connect

Select a Modeler

From the Current Modeler drop down list select a modeler to connect to with Maraca. To add modelers to the list, use the plus button at the bottom of the window.

Modeler States

These three fields provide the current information for the state of the machine:

State	The current machine state as reported to Catalyst status.
Internal State	The current internal software state (e.g. sttIdle)
Home State	The previous internal state in any state that cares about that state.

Modeler Setup

In order to use Maraca on a network modeler, you must first create a modeler definition. You can create modeler definitions by clicking the + button in the main window.

A modeler definition is made complete by specifying the following:

- Modeler name (You can use any descriptive name for the modeler.)
- Modeler type
- Modeler IP address

You can delete a modeler definition by selecting the - button in the main window and then choosing the modeler to delete from the current list of modelers.

Configuration

Clicking the properties icon, "Set up the display parameters", in the main window will bring up a dialog to select Metric or English units of measure. Click the green arrow to close the window after making your selection. Maraca will now display numerical values in the units you chose.

Machine Status

Maraca machine status provides the ability to set the machines serial number and detailed information about the current mechanical state of the machine.

- Position and Temperatures
- Versions
- Travel Limits
- Filament
- Door
- Setting the Serial Number

Position and Temperatures

Current Position	The current X, Y and Z position in micro steps. X and Y = 16000 micro-steps per inch. Z = 128000 micro-steps per inch.
Current / Total Layers	The current build layer and the total number of layers in the model
Current Curve	The current curve number of the model
Current Vertex	The current vertex number of the model.
Head Temp	The actual head temperature and its set point in C.
Head PWM	The pulse width modulation value 0 = off / 255 = 100%
Support Temp	The support liquefier temperature and its set point (SST only)
Support PWM	The pulse width modulation value 0 = off / 255 = 100%
Chamber Temp	The actual chamber temperature and its set point in C.

Versions

Product Version	The current version number for the complete software release
Build Version	The build number for current SBC software
Firmware Version	The current version for the 186 controller software
PLD Version	The current version of the programmable logic devices on the 186.
Product serial number	The serial number of the complete system.

Travel Limits

If the box is checked the switch is tripped.

X home	The X axis home limit switch state
X Limit	The X axis end of travel limit switch state
Y Home	The Y axis home limit switch state
Y Limit	The Y axis end of travel limit switch state
Z Home	The Z axis home limit switch state
Z Limit	The Z axis end of travel limit switch state
Z Jam	The Z jam encoder switch state
Z Foam	The Z top of foam switch state.

Filament

Model Latched	The model material cartridge latch state
Model in Head	The state of the modeling material in the machine. True = material moved out of cartridge False = material not moved out of cartridge.
Support Latched	The support material cartridge latch state.
Support in Head	The state of the support material in the machine. True = material moved out of the cartridge. False = material not moved out of the cartridge

Door

Door Latched	The state of the door latch solenoid
Door Open	The state of the door switch

Setting the Serial Number

To set the system serial number enter the serial number in the "Product Serial Number" field and click on the green check mark. The serial number displayed in this field is the current serial number of the product.

Materials

Every cartridge has a SmartSpool EEPROM attached that tracks information about the filament remaining on the cartridge, and shelf life information. The following information is provided for each cartridge. The top cartridge is the Model material cartridge, and the bottom cartridge is the Support material cartridge.

Cartridge Information

Serial Number	This is a unique number assigned to each cartridge.
Material Type	This is the type of material on the cartridge. For example: P400 - is a standard modeling material P400R - is a standard release material. P400SR - is a standard soluble release material.
Manufacturing Lot	This is a lot code used by Stratasys to control the manufacturing process.
Manufacturing Date	This is the date that the cartridge was manufactured.
Use Date	This is the date that the cartridge was first inserted in a machine.
Initial Quantity	This is the amount of material that was on the cartridge initially.
Current Quantity	This is the amount of material currently on the cartridge.

Temperatures

The temperature control dialog allows you to adjust the set points for the head and chamber temperatures, for both modeling and at standby.

Temperature Limits

Temperature	Min.	Max
Head	102	300
Support	102	300
Chamber	40	75

Outputs

The outputs dialog contains toggle buttons to control solenoids and motors that can not be directly controlled on the Control Panel Display.

Model Latch	The check box shows the state of the model (top) cartridge latch, and the toggle button changes that state.
Motor Enabled	The check button shows the state of the model (top) feed motor solenoid, and the toggle button changes that state.
Motor Running	The check box shows the state of the model (top) filament feed motor, and the toggle button changes that state.
Support Latched	The check box shows the state of the support (bottom) cartridge latch, and the toggle button changes that state.
Motor Enabled	The check box shows the state of the support (bottom) feed motor solenoid, and the toggle button changes that state.
Motor Running	The check box shows that state of the support (bottom) filament feed motor, and the toggle button changes that state.
Door Latch	This check box shows the state of the door latch solenoid, and the toggle button changes that state.
Lights On	This check box shows the state of the chamber lights, and the toggle button changes that state.

Table Calibration

Table calibration consists of downloading the correct XY table calibration file to the machine to properly adjust for table-to-table tolerance issues. The Table dialog allows you to browse for and select the calibration file for the currently installed XY table and to download it to the machine.

Get Calibration

The Get Calibration button allows a single calibration file to be retrieved from any machine with a build number greater than or equal to 1132. This calibration file will also be on the system

calibration floppy that ships in the electronics pan for systems with a build number greater than or equal to 1132. This file contains all the factory calibration information, including, but not limited to: Tip Offset, Tip Depth, Y Lash, X Correction, and the table calibration DAT file.

When the button is pressed, a file selection dialog is presented allowing the assignment of a file name and the selection of a storage location. This file should be updated any time maintenance is performed that affects the factory calibration.

Send Calibration

The Send Calibration button allows you to send the complete set of factory calibrations to the machine as a single file. This includes but is not limited to: Tip Offset, Tip Depth, YLash, X Correction, and the gantry DAT file. This file is stored on the system calibration floppy if the system shipped with Controller software build 1132 or higher installed. A calibration file can be retrieved from the modeler using Get Calibration from any system with a build number of 1132 or higher.

When this button is pressed a dialog box appears that allows you to browse for and select the calibration file to send to the machine.

Get Configuration

Clicking the properties icon, "Set up the display parameters", in the main window will bring up a dialog to select Metric or English units of measure. Click the green arrow to close the window after making your selection. Maraca will now display numerical values in the units you chose.

Test Parts

Test Parts consists of downloading sample and test part files to the machine. These file must be in the .cmb.gz format produced by CatalystEX.

The Test Part dialog allows you to browse for and select the sample or test file and to download it to the machine. The Test Parts are not preserved during a software upgrade. To remove unwanted test parts, upgrade the software to the current level and only the factory test parts will remain on the system.

Reset Password

This button resets the administrator password to null. This turns off password control of the queue. This is used for clearing a forgotten password.

Connect

If the system is not available over the network, when Maraca first loads, Maraca will only try to connect one time. This allows you to interact with Maraca when it is not connected to a machine. The Connect button allows you to request additional connection attempts.

System Software

Required Tools

- Dimension controller software and CatalystEX.
- Crossover cable or network connection
- Notebook computer or workstation.

Installing system software:

1. System should be powered on and MUST be in **Idle** mode.
2. Select **Maintenance** from the display menu.
3. Select **System Maintenance** from the display menu.
4. Select **Load Upgrade** from the display menu.
5. Insert the Dimension controller software CD into the workstation CD drive.
6. Open CatalystEX on the workstation.
7. Click on the **Printer Services** tab.
8. Click on the **Update Software** button.
9. Once the upgrade window opens select **Browse** and navigate to the CD ROM drive.
10. Select the **Upgrade.upg** file and click **OK**.
11. After the software has been downloaded to the printer, the printer will display **Verifying Update**.
12. At completion of the verification process, the printer will display **Reboot to Complete**. Select **Yes**.
13. The printer will automatically reboot and return to **Idle**.



Caution: DO NOT open the chamber door during the upgrade process.

Troubleshooting

4

In this chapter you will learn how to troubleshoot the system. The contents of this chapter are as follows:

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Testing the Hard Drive and SBC:	4
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Troubleshooting a System Malfunction

Overview

How to troubleshoot system malfunction and narrow down the possible cause of a system malfunction to either the 186, SBC or hard drive.

Parts and Tools Required

- Null modem cable (Laplink cable)
- SBC to monitor cable
- VGA monitor



Always check/re-seat connectors before assuming that the problem is component based.

Testing the 186 processor board:

1. Install the null modem cable to the workstation or laptop.
2. Open HyperTerminal as shown in "HyperTerminal Instructions" on page 9 - 22.
3. Once communication has been established, enter **IN** (Initialize the Controller) command.
4. Text will then be displayed.
5. If 186 related error codes **only** are displayed, the 186 board is most likely defective. Some examples of 186 related error codes are - "Abort: Hardware turned off power supply" or "Abort: Z-axis not ready".

Errors other than 186 board related errors need to be interpreted accordingly. As an example if a "Abort : Head thermocouple fault" error is displayed, check the thermocouple and connectors.



Always download the printer firmware after installation of a 186 processor board.

6. If only one or two of the **same** error is displayed, the problem is most likely **NOT** the 186. Continue on to the next section of this bulletin.

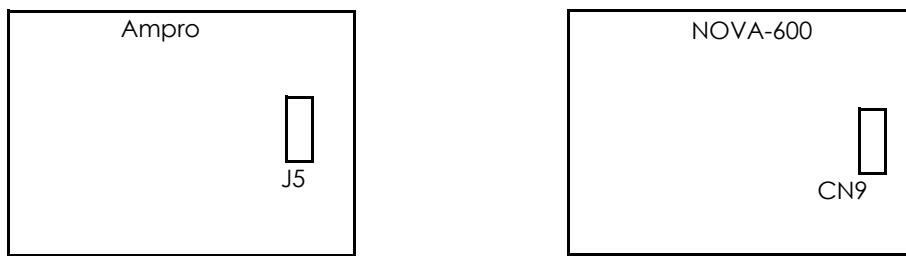
Testing the Hard Drive and SBC:

1. Power down the system and remove the rear panel.
2. Determine which SBC is installed in the printer, Ampro or Nova 600, and:
 - a. Connect a monitor and monitor cable to J5 of the Ampro SBC. See [Figure 1](#).
 - b. Connect a monitor and monitor cable to CN9 of the Nova 600 SBC. See [Figure 1](#).



Contact Stratasys technical support for monitor cable.

Figure 1: SBC detail

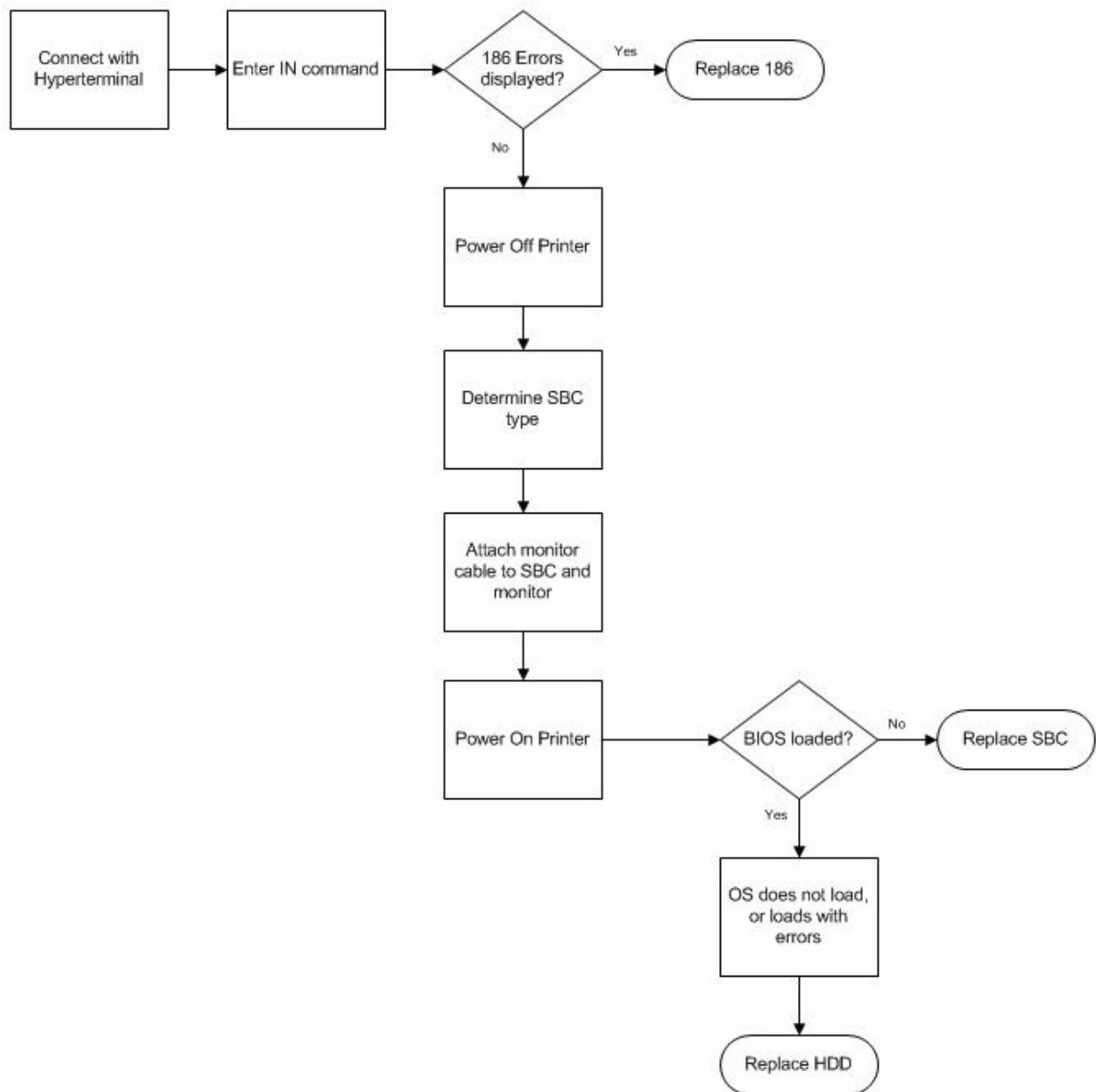


3. Power on the system and observe the text displayed on the monitor.
4. If the hard drive is bad you will not see the normal hard drive booting process. You may see:
 - a. The BIOS load but **NOT** the operating system.
 - b. The operating system load but with numerous errors.
5. If you **do** not see the bios load the SBC will need to be replaced.

Final Test:

1. If the 186 processor board was replaced you must download the most current printer firmware.
2. If the hard drive was replaced, update the system software.
3. Run the Hysteresis and tip-offset calibration and adjust settings if appropriate.
4. Run several test parts via the network to ensure proper operation.

Figure 2: Troubleshooting sequence



Fault determination codes

If a fault occurs which would prevent the printer from executing an operator request, the printer will begin to shut down and cool. The panel will display an error code. An error-code list (with the filename "error.txt") can be found on the DVD-ROM for the printer firmware. (Because this list may change with each new software version, be sure to check the error.txt attachment when you download new firmware upgrades.)

After the printer has finished cooling, the only option displayed is **Continue**. Press **Continue** and the printer will reboot and try to return to normal operation. If pressing **Continue** does not eliminate the error, power should be cycled (see "["Cycling power" on page 6..](#)"); wait 60 seconds before switching power on again. In most cases you will be able to continue operation. However, if the printer continues to shut down and display the same error, contact technical support.

Cycling power

1. Turn the power switch to the OFF position. The display will show **Shutting Down**.
2. After the printer has cooled down enough to shut down, the display will go blank.
3. When the display is blank and the printer has shut down, turn the circuit breaker to the OFF position.
4. Once the circuit breaker has been turned to the OFF position, wait 60 seconds and turn the circuit breaker back to the ON position.
5. Turn the power switch to the ON position. The printer display will show that it is starting up.

Once the display shows **Idle** or **Ready to Print**, you can send a file to the printer to be printed.

Diagnosing loss of extrusion

Occasionally, the printer's head may experience loss of extrusion. This will be evident by observing one of the following:

- The head is moving with no material coming out of either tip
- The height of the model and support materials are not equal
- Sagging structures due to lack of support materials



Warning: The head area is hot. Use gloves when working in this area of printer.

1. From the display panel press **Cancel** and remove parts from the printer.
2. Insert a new modeling base.
3. From **Idle**, press **Maintenance**
4. Press **Machine**.
5. Press **Head**. The head will move to the center of the chamber and the Z platform will change position. The display will read: **Model Drive Motor Stopped**
6. Determine if there is a model material extrusion problem by pressing **Forward** (command will be available after head reaches operating temperature). Watch the model tip (right tip) for any extrusion (material purge).



You may need to wait up to 30 seconds before extrusion will begin as the tip may need to reach operating temperature

7. Press **Stop** to stop the extrusion.
8. If material did NOT flow from the model tip, see “[Press Done until back to Idle](#)” on page 8. If material steadily flowed from the model tip, the model tip is functioning properly.
9. Test the support material tip by choosing: **Select Drive**.
10. Determine if there is a support material extrusion problem by pressing **Forward**. Watch the support tip (left tip) for any extrusion (material purge).
11. Press **Stop** to stop the extrusion.
12. If material did NOT flow from the support tip, see “[Press Done until back to Idle](#)” on page 8. If material steadily flowed from the support tip, the support tip is functioning properly.
13. Return the printer to the Maintenance state - Press **Done**, then press **Yes** when the printer displays **Is Material Loaded?**
14. Press **Done** until back at **Idle**.

Clogged tip

Occasionally, a tip may clog with material. This will often result in a loss of extrusion (LOE). A clogged tip will prohibit material load and part building.

1. From the display panel, press **Maintenance**.
2. Press **Machine**.
3. Press **Head**.
4. Select which drive may have a clogged tip.
5. Press **Forward**. If the material does not extrude, press **High Heat** to turn off the head cooling fan. This temporary raise in temperature can help remove a clog.
6. If material does not extrude, see “[Press Done until back to Idle](#)” on page 8.
7. Press **Done**.
8. Display will ask **Which Materials Loaded?** Press **Both**.
9. Press **Done** until back to **Idle**

Service Troubleshooting

How to use this Guide

1. Determine what type of error you are experiencing; either a Code Error or Non-Code Error.
2. If you experience a Code Error:
 - A. Refer to the Code Error Section of the guide. See "[Code Errors](#)" on page 10.
 - B. Match the code number with the number in the guide.
 - C. Follow the corrective actions to fix the error.
 - D. Complete and verify each step before proceeding to the next step.
3. If you experience a Non- Code Error:
 - A. Refer to the Non-Code Error Section of the guide. See "[Non-Code Errors](#)" on page 26.
 - B. If the display on the machine displays an error message, match that message to one of the non-error codes in the guide.
 - C. If a message does not appear, match the problem to one of the non-error codes in the guide.
 - D. Complete and verify each step before proceeding to the next step.
4. If you have any suggestions, additions or changes that need to be made to this guide please e-mail prodigyTSGuideteam@stratasys.com.
 - A. Verify that the machine is plugged directly into a wall outlet. Do not use an extension cord or power strip.
 - B. Verify you are running the current CatalystEX and printer firmware. Upgrade the software if necessary.
 - C. After "**Power down**" is complete, always shut the breaker off to fully reset the system.
 - D. When measuring DC voltages and signals using chassis ground is preferred. Do NOT measure AC voltages using chassis ground.
 - E. Check/re-seat appropriate cables as part of the troubleshooting process.
 - F. Hyperterminal move commands are in inches.
 - G. Check limit switch states using the test points and/or LED's on the power distribution board.
 - H. Replacement hard drive may take up to 45 minutes to boot. The hard drive is running check disk (chkdsk).
 - I. Ignore multiple error code listings at end of a CFG file (LE output)
 - J. Never "hotplug" the material bay cables. Doing so will damage the material bay serial transceiver.
 - K. Correct seating of the I/O board to the power distribution board is critical. Check for proper alignment through electronics bay viewing window

Code Errors

Major Codes



These codes are displayed on the system LCD Display.

Code	Error	Definition/Recommendation
01	Unknown Error	No data on what error occurred. Cycle power.
02	PUC Error	Path, utilities and controller development library (Used for software testing). Cycle power.
03	No Display	Process that runs LCD display generated error. Cycle power.
04	Memory Error	Single board computer experienced memory error. Cycle power.
05	LCD Display	Failed to write to LCD display board from SBC (error will be seen in .cfg file). Cycle power. Replace LCD Display
06	LCD Keypad	Failed to read from LCD keypad to SBC (error will be seen in .cfg file). Cycle power. Replace LCD Display
07	Manager Channel	Socket from manager internal manager process was on, SBC (Software error, will not be displayed). Cycle power.
08	Manager Disconnected	Socket from manager internal manager process was off, SBC (Software error, will not be displayed)
09	Manager Send	Failed to send from manager (SBC) (Software error)
10	Command Failed	Sent legal command that was rejected (exp. Move Z command with door open). Cycle power.
11	Queue Communication	Socket from queue process was interrupted (broken) (Software error). Cycle power.
12	Joblog Message Buffer	Failed to write to job log (Software error). Cycle power.
13	Joblog File	Failed to create the job log (Software error). Cycle power.
14	Controller Abort	Controller failure (See sub errors below)
15	Starting Up Failed	Some part of the start up procedure failed. Cycle power.
15.1	Starting Up Failed	Verify controller is correctly gendered (gender is the machine type) from the .CFG file. If not, replace with a neutral gender board and perform firmware upgrade.
16	Find Z Failed	Failed to find Z limit switch. Check for obstructions or Z switch issues.
17	Controller Load Failed	Unable to load global parameters (Temp values, flow control). Cycle power.
18	Temperature Failed to Regulate	Liquefier or chamber failed to reach temperature within 7 min. See 18 error code below.

Code	Error	Definition/Recommendation
19	Controller Initialization Failed	Controller failed to reboot or start. See detailed 19 error code section below.
20	Door Latch Command Failed	See detailed non-error code section of this guide.
21	Ldrool Failed	Cycle power
22	Controller Communications Failed	Not used.
23	Universal Device Name error	Cycle power

Major Codes with Minor Codes



Currently minor codes exist for major codes 14, 15 17-20, 22, & 23 only.

Controller Abort Minor Errors (Code: 14, XX)

Code	Description	Corrective Actions
14.01	Abort: Z Axis jammed	<ol style="list-style-type: none"> 1. Check for objects blocking Z stage. 2. Check for purge material around lead screws. 3. Power cycle machine including rear breaker. 4. Using Maraca/LED's/test points: Check Z position. See if both Z home & Z limit boxes are checked. If so, check limit switches and/or mid unit harness. 5. Gen 1 - HyperTerminal: Check to see if Z stage moves (mz 50000 or mz -50000). This allow you to move the Z stage without tripping the Z jam sensor. + is down, - is up. 6. Gen 1 - Check Z jam sensor, Z jam cable and/or Mid-Unit Harness. 7. Gen 2/3 - HyperTerminal: Check to see if Z stage moves (mz 0.5 or mz -0.5). This will allow you to move the Z stage without tripping the Z jam sensor. + is down, - is up. 8. Replace Z stage motor.

Code	Description	Corrective Actions
14,02	Report: Attempt to raise modeling base sensor failed	<ol style="list-style-type: none"> 1. Cycle power 2. Replace Substrate. 3. Check for obstructions preventing X or Y movement 4. Check the Z foam sensor bar is not damaged. If so, replace bar. 5. Gen 1 - Check connector J7 on 186 board for loose pins. 6. Gen 2 - Check connector J10 (pin 19) on the PDB for loose pins. 7. Gen 3 - Check connector J10 (pin 13) on the PDB for loose pins. 8. Using Maraca/LED's/test points: Check to see Z foam box toggles when switch is activated, if not, check Z foam sensor and/or umbilical cable. Gen 2 - Check signal at TP27. Gen 3 - check signal at TP23. 9. Using Maraca/LED's/test points: Check to see Z home box toggles when switch is activated. If not, check Z home switch and/or Mid-Unit Harness. Gen 2 - Check signal at TP13. Gen 3 - Check signal at TP9 10. Check Z home switch position. Adjust if needed.
14,03	Report: modeling base sensor up when it should be down.	<ol style="list-style-type: none"> 1. Cycle power. 2. Check the substrate sensor assembly for free operation. 3. Check to see if the sensor arm is broken. 4. Gen 1 - Check connector J& on the 186 board for loose pins. 5. Gen 2/3 - Check connector J10 (pin 19) on the PDB board for loose pins. 6. Using Maraca/LED's/test points: Check to see Z foam box toggles when switch is activated. If not, check substrate sensor, sensor assembly and/or umbilical cable. Gen 2/3 - Check signal at TP27.
14,04	Report: modeling base sensor down when it should be up.	<ol style="list-style-type: none"> 1. Push the sensor assembly up if it is down. 2. Check to see if the tip-wipe brush is set too high. 3. Run the FZ command using HyperTerminal -Verify the sensor is being pushed all the way up. 4. Remove, clean and reinstall the substrate sensor assembly. 5. Check spring (replace 5 coils with 7 coils) and verify that the foam sensor arm has a bump added.
14,05 14,06 14,07 14,08	Abort : Unexpected contact with X axis home sensor. Abort : Unexpected contact with X axis EOT sensor. Abort : Unexpected contact with Y axis home sensor. Abort : Unexpected contact with Y axis EOT sensor.	<ol style="list-style-type: none"> 1. Power cycle the machine. 2. Check for an obstruction hitting the model. 3. Check to make sure the homing sensors are clean. 4. Using Maraca/LED's/test points: Check if home & limit boxes are checked. If so, check limit switches and/or umbilical cable for X sensors, mid unit harness for Y sensors. 5. Manually move the XY table in X and Y checking for smooth operation. 6. Belt Drive XY Table - Check and adjust belt tension. 7. Cable Drive XY Table - Check and adjust cable tension. 8. Incorrect length substrate arm installed. Replace substrate arm with the correct length. 9. Replace XY table. Failed bearings in the Y drive shaft possible root cause.
14,09 14,10	Abort : Unexpected contact with Z axis home sensor. Abort : Unexpected contact with Z axis EOT sensor.	<ol style="list-style-type: none"> 1. Check to see if the switch is operating correctly using the LED/test points on the PDB. 2. Check to see if there are any obstructions interfering with Z stage movement. 3. Gen 1 - Check J6 on 186 board for loose pins. Gen 2 - Check J12 on the PDB for loose pins. Z Home - pin 3, Z EOT - pin 5. Check signals at TP13 and TP14. Gen 3 - Check J12 on the PDB for loose pins. Z Home - pin 9, Z EOT - pin 11. Check signals at TP9 and TP10. 4. Check the Z motor. Run the TZ command from hyperterminal. 5. Check Z belt condition and adjust tension as needed. 6. If error occurs when running the FZ (find Z) command, replace the Z Foam sensor.

Code	Description	Corrective Actions
14,11	Abort : Door opened while axis in motion	<ol style="list-style-type: none"> 1. Check to see if door latch is activating using Maraca/LED's/test points Gen 2- Check signal at TP12 Gen 3- Check signal at J5 -pin 1 2. Look at LCD display, should show "Door Open" when machine is idle and door is open. 3. Gen 1- -Check J6 on the 186 and P6 on the mid-unit harness for loose contacts or bent pins. Gen 2/3- -Check J12 pin 1 on the PDB for loose contacts or bent pins. 4. Using Maraca/LED's/test points: Check to see "Door Open" box toggles when switch is activated. If not, check door switch and/or Mid-Unit Harness. 5. Prodigy Plus: Check to make sure the door switch isn't loose. Adjust if necessary. 6. Prodigy Plus: Check to see if the door is warped or bowed, which will cause the door tab to disengage from the switch. 7. Prodigy Plus: Check to see if door plug is bent or missing. 8. Wiggle the door, make sure the sensor reads. 9. Verify the door magnet is present. If not, replace door magnet.
14,12	Abort : One second timer late. Gen 1 electronics only (Housekeeper needs to be preformed every second but did not, Software sends pulse from the 186 every second -software has hung up)	<ol style="list-style-type: none"> 1. Power cycle machine. 2. If problem continues check/re-seat ribbon cable from 186 to the PDB. 3. If problem still continues send config file to SSYS CS, 186 may need to be replaced.
14,13	Abort : Under Run at vertex buffer	<ol style="list-style-type: none"> 1. Reprocess the part and send again. 2. Reorient the STL and re-send.
14,14	Abort : Under Run not in tool path	<ol style="list-style-type: none"> 3. If the frequency of the error is greater than once every three months, then replace the SBC or Hard Drive.
14,15	Report: Head motor running without XY motion	<ol style="list-style-type: none"> 1. Will not be displayed on LCD display. Will be seen only using HyperTerminal.
14,16	Abort : Vertex FIFO tail is not on a 4 byte boundary.	<ol style="list-style-type: none"> 1. Communication error between Controller Board and the SBC . Cycle power. 2. Re-seat the 186/ Controller Board into SBC. 3. Replace 186/Controller Board and/or SBC.
14,17	Abort : User abort.	<ol style="list-style-type: none"> 1. Build was cancelled through the keypad.
14,18	Abort : User panic stop.	<ol style="list-style-type: none"> 1. Will not be displayed on LCD (Opening door during build can cause this error).
14,19	Abort : Idle loop is slow.	<ol style="list-style-type: none"> 1. Cycle power. 2. Escalate the case providing the configuration file.
14,20	Abort : XY axis not ready.	<ol style="list-style-type: none"> 1. Cycle power.
14,21	Abort : Z axis not ready.	<ol style="list-style-type: none"> 2. Using the HyperTerminal, type SS. "X Axis Ready" should be displayed. If it is not displayed, then type the "FH" & "FZ" commands. Finally type "SS" again. If "X Axis Ready" still is not displayed, then replace the controller Board.
14,22	Abort : Head temperature set-point too low.	<ol style="list-style-type: none"> 3. Battery could be bad on 186/Controller Board. Open Hyper Terminal, look for boot error. Replace 186/Controller Board.
		<ol style="list-style-type: none"> 1. Reinstall system software. 2. Verify the head temperature set point using MaracaEX. <ul style="list-style-type: none"> - The model must be above 240 degrees. - The support must be above 220 degrees (Prodigy Plus only).

Code	Description	Corrective Actions
14,23	Report: Begin curve parameters not in sequence.	<ol style="list-style-type: none"> 1. Communication error between 186/Controller Board & SBC - Cycle power 2. Re-seat the 186/Controller Board into SBC. 3. Replace 186/Controller Board and/or SBC.
14,24	Abort : X axis command error (PMD error)	1. Cycle power.
14,25	Abort : Y axis command error (PMD error)	2. Verify system software at current release. If not, upgrade to current release.
14,26	Abort : Z axis command error (PMD error)	3. If error continues - possible memory problem, replace SBC.
14,27	Abort : X axis motion error (PMD error)	4. If the frequency of the error is greater than once every three months, replace the 186/Controller board.
14,28	Abort : Y axis motion error (PMD error)	1. Cycle power.
14,29	Abort : Z axis motion error (PMD error)	2. Verify system software at current release. If not, upgrade to current release.
14,30	Abort : PMD axis command was not X, Y, or Z.	3. If the frequency of the error is greater than once every three months, replace the 186/Controller Board.
14,31	Abort : Move absolute error.	1. Power cycle machine.
14,32	Abort : Reinstall System Software.	2. Check and re-seat connectors to the X and Y motors.
14,33	Abort : Check home and EOT switches for correct operation. Replace if defective.	2. Check home and EOT switches for correct operation. Replace if defective.
14,34	Abort : PMD checksum error.	1. Cycle power.
14,35	Abort : Invalid being send to PMD chip.	2. Verify system software at current release. If not, upgrade to current release.
14,36	Abort : Z axis table jammed Gen 1 electronics only	3. If the frequency of the error is greater than once every three months, replace the 186/Controller Board.
14,37	Abort : Z axis table jammed Gen 2 electronics only	1. Check for objects/parts on Z stage.
14,38	Abort : Z axis table jammed Gen 3 electronics only	2. Check for purge material around lead screws. Remove material, clean and lube.
14,39	Abort : Z axis table jammed Gen 4 electronics only	3. Toggle power switch
14,40	Abort : Z axis table jammed Gen 5 electronics only	4. Manually move the table away from the upper and lower Z limit switches then cycle power.
14,41	Abort : Z axis table jammed Gen 6 electronics only	5. Using Maraca/LED's/test points: Check Z position. See if Z home & Z limit boxes are checked. If so, check limit switches and/or spread pins on J5 and J6 on the 186 board.
14,42	Abort : Z axis table jammed Gen 7 electronics only	6. HyperTerminal: Check to see if Z stage moves (mz 50000 or mz -50000). This will allow you to move the Z stage without tripping the Z jam sensor.
14,43	Abort : Z axis table jammed Gen 8 electronics only	+ is down, - is up. If the motor moves, the jam sensor is the problem.
14,44	Abort : Z axis table jammed Gen 9 electronics only	7. Swap the ribbon cables on the 186. (Power down the machine first, then power up with the door open. Run the MX and MY Commands)
14,45	Abort : Z axis table jammed Gen 10 electronics only	8. Check Z jam sensor and/or Mid-Unit Harness.
14,46	Abort : Z axis table jammed Gen 11 electronics only	9. Table is not level. Check and level using the head leveling fixture.
14,47	Abort : Z axis table jammed Gen 12 electronics only	10. Z-axis motor has failed (see 14,1)
14,48	Abort : Z axis table jammed Gen 13 electronics only	11. Z-axis belt is loose or worn. Adjust tension or replace belt.
14,49	Abort : Z axis table jammed Gen 14 electronics only	12. Z channel of the MDB has failed - replace the MDB.
14,50	Abort : Z axis table jammed Gen 15 electronics only	13. Z belt has damaged Z jam sensor wire. Check wire for damage.
14,51	Report: Time out while loading carrier.	1. See Load Failed in the Non-Error Code Section.

Code	Description	Corrective Actions
14,36 14,37	Report: Modeling material not moving in head. Report: Support material not moving in head.	<p>Gen 1 electronics</p> <ol style="list-style-type: none"> 1. Cycle power. 2. If error continues, replace the 186/Controller Board. <p>Gen 2/3 electronics</p> <ol style="list-style-type: none"> 1. Cycle power. 2. Check/re-seat J9 on PDB. 3. If error continues, replace the Controller Board.
14,38	Abort : Hardware turned off power supply.	<p>Gen 1 electronics</p> <ol style="list-style-type: none"> 1. Jumper WD timeout on PDB to override error. Remove jumper after completing testing! 2. Use HyperTerminal and/or CFG File to check for additional error codes (root cause). 3. Check head, envelope snap switches, and cables. 4. Check WD timeout signal to decide if the problem is with the 186 or PDB as follows: <ol style="list-style-type: none"> a. Measure the voltage (pulse) at TP52 (near J8) on the PDB. If a pulse is detected about every second the 186 is ok. If no pulse is detected the signal is not being generated from the 186 - replace the 186. b. Measure TP45 to GND on the PDB. Reading should be near 0. If not near 0 AND the 186 is sending a pulse the PDB circuit is bad. 5. Check/re-seat ribbon cables from the 186 to the PDB. <p>Gen 2/3 electronics</p> <ol style="list-style-type: none"> 1. Jumper WD timeout on PDB to override error. Remove jumper after completing testing! 2. Check head, envelope snap switches, and cables. Head - TP17 normally is high. Envelope - TP19 normally is low. 3. Check/re-seat J9 and J12 connectors on the PDB J9 pin 19 for head snap switch. J12 pin 14 for envelope snap switch. 4. Check and re-seat connectors to Controller Board and PDB. 5. Replace the Controller Board. 6. Replace the PDB. 7. Replace umbilical cable.
14,39	Abort : Head thermocouple fault. Steps 1-8: Head Thermocouple is OPEN Step 9: Head Thermocouple is CLOSED	<ol style="list-style-type: none"> 1. Check thermocouple wire for damage. 2. Verify ambient temperature is above 18° C (64.4° F). 3. Using a meter, check to see if thermocouple is open at head. 4. Open may be in umbilical head cable. <p>Gen 1 - Check J7 on 186 for spread pins.</p> <p>Gen 2 - Check J10 on the PDB.</p> <p>Gen 3 - Check J9 on the PDB.</p> <ol style="list-style-type: none"> 5. Check TC Head Board for correct jumper configuration. (Jumpers are used only on SST or Prodigy Plus) 6. Check the ground wire (connection) at head TC Board. 7. Check the component leads on back of Head TC Board are not shorting to head. 8. Check signal voltage at T/C - if incorrect replace T/C board. <ol style="list-style-type: none"> a. Single heater board - TPALR and GND should be <3VDC. b. Dual heater board - TP301 and GND should be <3VDC. 9. Check and re-seat J7 and check pins 7 and 10 on the T/C amp board. 10. Replace the swivel head. 11. Check thermal snap switches and wires. Replace as needed.
14,40	Abort : Chamber thermocouple fault.	<ol style="list-style-type: none"> 1. Check to see if chamber thermocouple is plugged in: Gen 1 - connected to 186 Gen 2/3 - connected to PDB. 2. Verify ambient temperature is above 18° C (64.4° F). 3. Using a meter check if thermocouple is open. If so, replace thermocouple. 4. Check chamber thermocouple and wire for damage.

Code	Description	Corrective Actions
14,41	Abort : Motion command while door open. 14,42 Abort : Load cartridge while door open. 14,43 Abort : Modeling command while door open 14,44 Abort : Select head command while door open. 14,47 Abort : Tip wipe command while door open.	<ol style="list-style-type: none"> 1. Cycle power. 2. Check to see if door solenoid is operating properly. Toggle solenoid using MaracaEX. 3. Look at LCD display, should read "Door Open" when machine is idle and door is open. 4. Using MaracaEX/LED's/test points: Check to see "Door Open" toggles when switch is activated. If not, check door switch and/or Mid-Unit Harness. 5. Wiggle the door, make sure the sensor reads the magnet with movement to the door. 6. Check that the door magnet is present. If not, install magnet. 7. Verify door is not warped. If warped, replace door.
14,45	Report: Unable to write to model material guide tube. 14,46 Report: Unable to write to support material guide tube.	<ol style="list-style-type: none"> 1. Try a different cartridge. Also verify that material is the correct type for printer. 2. Check the LED on card reader board. Should be blinking. If reader board is seeing cartridge, LED blinking speed will double. 3. Gen 1 - re-seat and check pins on J18 on the 186. Gen 2/3 - re-seat and check pins on J7 on the PDB. 4. Replace cable running from receiver to the 186/controller board. 5. Replace card reader board. 6. Gen 1 - Replace 186. MUX on 186 may be bad. Gen 2/3 - Replace the controller board
14,48	Abort : Vertex command error.	<ol style="list-style-type: none"> 1. If this message is displayed on LCD ONLY, possible memory problem, replace SBC. If this message is not displayed on the LCD, (seen in cfg file), RAM is NOT the root cause. 2. If the frequency of the error is greater than once every three months, replace the 186/Controller board.
14,49	Internal : PCode Error, Bad Curve.	This error will not be displayed. Software development use only.
14,50	Internal : PCode Error, DY within curve.	This error will not be displayed. Software development use only.
14,51 14,52 14,53 14,54	Abort : Model material not loaded. Abort : Support material not loaded. Abort : Model head motor not ready. Abort : Support head motor not ready.	<ol style="list-style-type: none"> 1. Reload material. Note: System is not recognizing that material is loaded.
14,55 14,56	Abort : Find home failed, X home and X eot both on Abort : Find home failed, Y home and Y eot both on	<ol style="list-style-type: none"> 1. Move head away from sensors and cycle power. 2. Gen 1 - Check J5, J6, and J7 connectors on the 186 pins for loose pins. Gen2 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP3, 7, 16 & 21. Note: X home -J10, pin 15, Y home- J12, pin 22, X EOT - J10, pin 24, Y EOT- J12, pin 11. Gen 3 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP12, 13, 18 & 19. Note: X home -J10, pin 2, Y home- J12, pin 22, X EOT - J10, pin 8, Y EOT- J12, pin 11. 3. Using Maraca/LED's/test points: Check to see if switch state toggles. If not, check sensor and/or umbilical cable (for X) / mid-unit harness (for Y). 4. Using Maraca/LED's/test points: Check to see if switch state toggles. If not, check switch and/or umbilical cable (for X) / mid-unit harness (for Y).

Code	Description	Corrective Actions
14,57	Abort : Find home failed, X home timeout	1. Move the head away from the sensors and cycle power.
14,58	Abort : Find home failed, Y home timeout	2. If chatter in motor, check motor and/or motor cable for Y, umbilical cable for X. 3. Check for obstacles obstructing X or Y movement. 4. Using Maraca/LED's/test points: Check to see that the state changes when sensor is activated. If not, check sensor and/or umbilical cable for X and mid unit harness for Y.
14,59	Abort : Find home failed, X home not tripped	1. Move the head away from the sensors and cycle power.
14,60	Abort : Find home failed, Y home not tripped	2. Gen 1 - Check for loose pins on J5, J6 & J7 on the 186 board. Gen 2 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP3, 7, 16 & 21. Note: X home -J10, pin 15, Y home- J12, pin 22, X EOT - J10, pin 24, Y EOT- J12, pin 11. Gen 3 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP12, 13, 18 & 19. Note: X home -J10, pin 2, Y home- J12, pin 22, X EOT - J10, pin 8, Y EOT- J12, pin 11. 3. Using LED's/test points: Check to see home LEDs toggles when sensor is activated. If not, check sensor and/or Umbilical Cable for X and mid unit harness for Y.
14,61	Abort : Find home failed, X home tripped	1. Move the head away from the sensors and cycle power.
14,62	Abort : Find home failed, Y home tripped	2. Gen 1 - Check for loose pins on J5, J6 & J7 on the 186 board. Gen 2 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP3, 7, 16 & 21. Note: X home -J10, pin 15, Y home- J12, pin 22, X EOT - J10, pin 24, Y EOT- J12, pin 11. Gen 3 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP12, 13, 18 & 19. 3. Using LED's/test points: Check to see home box toggles when sensor is activated. If not, check sensor and/or umbilical cable for X , mid unit harness for Y.
14,63	Abort : Find home failed, X eot tripped	1. Move the head away from the sensors and cycle power.
14,64	Abort : Find home failed, Y eot tripped	2. Gen 1 - Check for loose pins on J5, J6 & J7 on the 186 board. Gen 2 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP3, 7, 16 & 21. Note: X home -J10, pin 15, Y home- J12, pin 22, X EOT - J10, pin 24, Y EOT- J12, pin 11. Gen 3 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP12, 13, 18 & 19. 3. Using Maraca/LED's/test points: Check to see home box toggles when sensor is activated. If not, check sensor and/or umbilical cable for X , mid unit harness for Y.
14,65	Abort : Find home failed, X eot not tripped	1. Move the head away from the sensors and cycle power.
14,66	Abort : Find home failed, Y eot not tripped	2. Gen 1 - Check for loose pins on J5, J6 & J7 on the 186 board. Gen 2 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP3, 7, 16 & 21. Note: X home -J10, pin 15, Y home- J12, pin 22, X EOT - J10, pin 24, Y EOT- J12, pin 11. Gen 3 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP12, 13, 18 & 19. 3. Using Maraca/LED's/test points: Check to see home box toggles when sensor is activated. If not, check sensor and/or umbilical cable for X , mid unit harness for Y.

Code	Description	Corrective Actions
14,67	Abort : Head temperature too high	<ol style="list-style-type: none"> 1. Verify the TC and Liquefier Heaters are plugged in properly. 2. Verify umbilical cable is connected properly. 3. TC Amp board is bad. Replace TC Amp board. 4. Head Board is bad. Replace head board. 5. Replace the umbilical cable.
14,68	Abort: Illegal PMD Command	<ol style="list-style-type: none"> 1. If error occurs more than once a month replace the 186/controller board.
14,69	Abort: XY PMD Read Checksum error	<ol style="list-style-type: none"> 1. If error occurs more than once a month replace the 186/controller board.
14,70	Abort: XY PMD Write Checksum error	<ol style="list-style-type: none"> 1. If error occurs more than once a month replace the 186/controller board.
14,71	Abort: Z PMD Read Checksum error	<ol style="list-style-type: none"> 1. If error occurs more than once a month replace the 186/controller board.
14,72	Abort: Z PMD Write Checksum error	<ol style="list-style-type: none"> 1. If error occurs more than once a month replace the 186/controller board.
14,73	Abort: Head TC Board Configuration error	<ol style="list-style-type: none"> 1. Check jumper configuration on Head TC board. See 14, 39.
14,74	Unexpected contact with unknown limit.	<ol style="list-style-type: none"> 1. Move the head away from the sensors and cycle power. 2. Gen 1 - Check for loose pins on J5, J6 & J7 on the 186 board. Gen 2 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP3, 7, 16 & 21 Note: X home - J10, pin 15, Y home- J12, pin 22, X EOT - J10, pin 24, Y EOT- J12, pin 11. Gen 3 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP12, 13, 18 & 19. 3. Using Maraca/LED's/test points: Check to see limit box toggles when switch is activated. If not, check switch and/or umbilical cable for X, mid unit harness for Y.
14,75	Unknown	<ol style="list-style-type: none"> 1. No error code associated with an error.
14,76	Software bug	<ol style="list-style-type: none"> 1. Cycle power.
14,77	Buffer is larger than the data	<ol style="list-style-type: none"> 1. Cycle power.
14,78	Buffer is smaller than the data	<ol style="list-style-type: none"> 2. Replace single board computer. 3. Replace 186/controller board.
14,79	Run-time error	<ol style="list-style-type: none"> 1. Cycle power. 2. Check configuration file for other errors. 3. Replace single board computer. 4. Replace controller board.
14,80	Index out of bounds	<ol style="list-style-type: none"> 1. Cycle power.
14,81	Invalid argument	<ol style="list-style-type: none"> 1. Cycle power.
14,82	Invalid channel	<ol style="list-style-type: none"> 1. Cycle power.
14,83	Invalid command	<ol style="list-style-type: none"> 1. Cycle power.
14,84	Invalid command opCode	<ol style="list-style-type: none"> 1. Cycle power.
14,85	The operation is not implemented	<p>Software error; will not be displayed.</p>
14,86	Timeout	<ol style="list-style-type: none"> 1. Cycle power. 2. Replace 186/controller board.

Code	Description	Corrective Actions
14,87	Resource already in use	1. Cycle power.
14,88	The dual-port memory is corrupted	1. Cycle power.
14,89	No valid ISR callback routine set	1. Cycle power.
14,90	An internal queue has overflowed	1. Cycle power.
14,91	Address not properly aligned	1. Cycle power.
14,92	Message too big for queue	1. Cycle power.
14,93	Data unit size violation	1. Cycle power.
14,94	Checksum bad	1. Cycle power. 2. Check 5/12 VDC power (5 and 12VDC LEDs will repeatedly dim). Replace 5/12 VDC power supply. 3. Replace 186/controller board.
14,95	PMD Host IO Error	1. Cycle power. 2. Check 5/12 VDC power (5 and 12VDC LEDs will repeatedly dim). Replace 5/12 VDC power supply. 3. Replace 186/controller board.
14,96	Unidentified interrupt occurred	1. Cycle power.
14,97	Invalid data type	1. Cycle power.
14,98	Find home failed, X EOT time-out	1. Move the head away from the sensors and cycle power.
14,99	Find home failed, Y EOT time-out	2. Gen 1 - Check for loose pins on J5, J6 & J7 on the 186 board. Gen 2 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP3, 7, 16 & 21. Note: X home -J10, pin 15, Y home- J12, pin 22, X EOT - J10, pin 24, Y EOT- J12, pin 11. Gen 3 - Check for loose pins on J10 & J12 on the PDB. Check signals at TP12, 13, 18 & 19. 3. Using Maraca/LED's/test points: Check to see limit box toggles when switch is activated. If not, check switch and/or umbilical cable for X, mid unit harness for Y.

Code	Description	Corrective Actions
14,100	Find home failed, Z HOME (BOT) not tripped	1. Move Z stage away from sensors and cycle power. 2. Check for objects/parts on Z stage and around lead screw. 3. Check for purge material around lead screws. Remove material, clean and lube. 4. Using Maraca/LED's/test points: Check Z position. See if Z home & Z limit boxes are checked. If so, check limit switches and/or spread pins. 5. Gen 1- Check J6 on the 186 board for loose pins. Gen 2- Check J12 on the PDB for loose pins. Z home-pin 3, Z EOT-pin 5. Check signals at TP14, TP13. Gen 3- Check J12 on the PDB for loose pins. Z home-pin 9, Z EOT-pin 11. Check signals at TP9, TP10.
14,101	Find home failed, Z EOT not tripped	
14,102	Find home failed, Z HOME (BOT) timeout	
14,103	Find home failed, Z EOT timeout	
		6. Gen 1- HyperTerminal: Check to see if Z stage moves (mz 50000 or mz -50000). This will allow you to move the Z stage without tripping the Z jam sensor. + is down, - is up. If the motor moves, the jam sensor is the problem. Gen 2/3- HyperTerminal: Check to see if Z stage moves (mz 0.5 or mz -0.5). This will allow you to move the Z stage without tripping the Z jam sensor. + is down, - is up. 7. Gen 1 -Swap the ribbon cables on the 186. (Power down the machine first, then power up with the door open. Run the MX and MY Commands). 8. Gen 1 -Check Z jam sensor and/or Mid-Unit Harness. 9. Table is not level. Check and level per the service manual using the head leveling fixture. 10. Z-axis motor has failed (see 14,1) 11. Z-axis belt is loose or worn. Adjust tension or replace belt. 12. Gen 1 -Z channel of the MDB has failed - replace the MDB. 13. Gen 1 -Z belt has damaged Z jam sensor wire. Check wire for damage. 14. Sensor flag has possibly become magnetized - check for magnetism. Replace flag if magnetized. 15. Gen 2/3- Check pins on Z-axis motor connectors (both ends) to make sure that they are fully seated in connector housing. 16. 14.101 error only - Check 5/12 VDC power (5 and 12VDC LEDs will repeatedly dim) Replace 5/12 VDC power supply
14,104	Surface not found	1. No modeling base. Install modeling base. 2. Modeling base is used/defective, has low spot. Replace Modeling base. 3. Verify substrate sensor is working. If not, replace Substrate Sensor.
14,105	Controller not ready to build a model	1. Cycle power.
14,106	BOT offset is higher than the BOT switch	1. Use MaracaEX to zero the Z offset value. 2. Run tip Z calibration. 3. Check Z home sensor.
14,107	End model command while not modeling	Software error; will not be displayed.
14,108	Operation was killed	Software error; will not be displayed.
14,109	Out of memory	Software error; will not be displayed.
14,110	Cartridge communication error	1. Replace cartridge. 2. Replace cartridge reader card. 3. Replace receiver cable.
14,111	Invalid frame check sequence	1. Cycle power. 2. If error repeats, replace 186/controller board.
14,112	EEPROM communication error	Software error; will not be displayed.

Code	Description	Corrective Actions
14,113	Door not latched	<ol style="list-style-type: none"> 1. Inspect solenoid and wiring. 2. Check for 24VDC on the upper harness at the solenoid power connection. 3. Replace solenoid. 4. Replace PDB.
14,114	Thermocouple snap switch tripped	<ol style="list-style-type: none"> 1. Using a meter, check if head or chamber thermostat are open. If they are open, press the reset button. 2. If thermostat remains open, replace it. 3. Head or chamber thermostat wires are open. 4. Gen 2/3 - re-seat connectors on PDB. 5. Gen 2/3 - Replace PDB.
14,115	Z stage planarity beyond tolerance	<ol style="list-style-type: none"> 1. Replace modeling base. 2. Re-level XY table.
14,116	I2C configuration info is corrupt	Software error; will not be displayed.
14,117	A command failed while modeling	<ol style="list-style-type: none"> 1. Download CFG file - check error code details. 2. Gantry/part calibration values have been set to zero - check using Maraca. Download CAL files to restore values. 3. Replace PDB (U8 chip failure).
14,118	Invalid cyclic redundancy check	Software error; will not be displayed
14,119	Operation already active	Software error; will not be displayed
14,120	Invalid vector detected	<ol style="list-style-type: none"> 1. Reprocess the part and send again. 2. Reorient part and send again. 3. If the frequency of the error is greater than once every three months, then replace the SBC or hard drive.
14,121	Processor Exception	<ol style="list-style-type: none"> 1. Cycle power.
14,122	Processor halted	<ol style="list-style-type: none"> 1. Cycle power.
14,123	Watchdog timeout	<ol style="list-style-type: none"> 1. Cycle power. 2. Check all cable connections including thermocouples. 3. Check 5/12 VDC power (5 and 12VDC LEDs will repeatedly dim). Replace 5/12 VDC power supply 4. Escalate the case providing .cfg file.
14,124	Stack overflow	<ol style="list-style-type: none"> 1. Cycle power. 2. If problem persists, replace 186/controller board.
14,125	Runtime error	<ol style="list-style-type: none"> 1. Cycle power.
14,126	Operation active - try again	<ol style="list-style-type: none"> 1. Cycle power.
14,127	Invalid gender	<ol style="list-style-type: none"> 1. Cycle power. 2. If problem persists, replace 186/controller board.
14,128	Invalid platform	<ol style="list-style-type: none"> 1. Cycle power. 2. If problem persists, replace 186/controller board.
14,129	Toggle Head failure	<ol style="list-style-type: none"> 1. Cycle power.
14,130	Temperature setback is active	<ol style="list-style-type: none"> 1. Cycle power.
14,131	Toggle when head motor is running	<ol style="list-style-type: none"> 1. Cycle power.

Code	Description	Corrective Actions
14,132	UPS low power	1. UPS is shutting down. Check UPS and AC power.
14,133	Head liquefier is not heating up	1. Liquefier heater is open (infinite resistance). 2. Liquefier T/C may be crushed. Test using meter. If crushed, reading will be 0 Ohms between pin 1 and ground. 3. Check for 120 VDC at head board, if OK heater is bad. Replace head. 4. The umbilical cable to the heater is broken or has a bad connector. 5. Make sure the printer is plugged directly into a wall outlet. 6. Gen 2 -Check that D10 on the PDB is lit. If not 120VDC circuit maybe bad - replace PDB. Gen 3 -Check that DL18 on the PDB is lit. If not 120VDC circuit maybe bad - replace PDB. 7. Gen 3 -Monitor DL23 (Model) and DL24 (support). LED's should turn on when head is commanded to heat. If not lit- check 120VDC, if absent replace PDB 8. Check the thermocouple connectors, heater connectors. 9. Use Maraca to check to see if the temp is going over 182 Deg. 10. Check PDB output voltage to model. If OK, check output voltage to support. If support voltage is low, auxiliary 120VDC power supply. 11. Verify that hard drive has not lost its .CAL values. If values are lost, download .CAL files.
14,134	Invalid packet size	Software use only
14,135	Initialization failure	1. See LE (List Errors) output at end of CFG File.
14,136	Invalid state for operation Attempt to program firmware when system is not in upgrade mode.	1. Cycle power. 2. Reinstall upgrade.

Starting Up Failed Minor Errors (15.XX)

Code	Description	Corrective Actions
15,01	Startup state activation failed	Software use only
15,02	Timeout period expired while starting up	<ol style="list-style-type: none"> 1. See CFG file for additional error details. 2. Replacement Controller or Hard Drive is gendered incorrectly. 3. If printer is in Dynamic Mode: <ol style="list-style-type: none"> a. Issue may be a network timeout due to improper DHCP settings on the network. Verify by looking at CFG, if code reads: - MASTER logger: Punching nameserver xxx.xxx.xxx.xxx through the firewall. b. If using System Software version 2230 try workaround. Contact CS for workaround instructions. c. Upgrade System Software to a version newer than 2230. 4. Material Bay Connection timeout. Refer to error code 14,139.

Controller Load Failed Minor Errors (17.XX)

Code	Description	Corrective Actions
17,01	LG_COMMAND Failed on Controller	Software use only.
17,02	LG_COMMAND Timeout	Software use only.

Temperature Failed to Regulate Minor Errors (18.XX)

Code	Description	Corrective Actions
18,01	Temperature not changing fast enough. Chamber is slow to heat up.	<ol style="list-style-type: none"> 1. Status-Details: Check to see if current envelope temperature is above 72C before starting a model. 2. Status--Details: Check to see if envelope temperature set point is 77C. If not, toggle power switch. 3. Check heaters, chamber fans, and heater cables. 4. Check chamber thermocouple - see 14.40. 5. Check AC input. Verify that no extension cords or power strips are attached to the system. 6. Check AC output from PDB to chamber heaters. Check AC cables. Replace PDB.
	Liquefier won't heat up (its cold). Use CatalystEX to check to see if the temp is going over 90C. If temp is above 90C go to next section	<ol style="list-style-type: none"> 1. Liquefier heater is open (infinite resistance). 2. Liquefier T/C may be crushed. Test using meter. If crushed, reading will be 0 Ohms between pin 1 and ground. 3. Check for 120 VDC at head board, if OK heater is bad. Replace head. 4. Gen 1 -Fuse on the 120 VDC supply is blown (on PDB). 5. Gen 1 -Check for 120VDC out on the PDB (fuse OK). If no 120VDC output replace PDB. 6. Gen 2 -Check that D10 on the PDB is lit. If not 120VDC circuit maybe bad - replace PDB. 7. Gen 3 -Check that DL18 on the PDB is lit. If not 120VDC circuit maybe bad - replace PDB 8. Gen 3 -Monitor DL23 (Model) and DL24 (support). LED's should turn on when head is commanded to heat. If not lit - check 120VDC, if absent replace PDB. 9. The umbilical cable to the heater is broken or has a bad connector. 10. Check AC input. Verify that no extension cords or power strips are attached to the system.
	Liquefier is warm but doesn't reach operating temperature.	<ol style="list-style-type: none"> 1. Check AC input. Verify that no extension cords or power strips are attached to the system. 2. Liquefier heater has higher than normal resistance, correct value should be about 98 ohms for BST and 75 ohms for SST. If incorrect replace head. 3. The umbilical cable has an intermittent connection. Replace umbilical cable. 4. Replace the TC Amp board. 5. Check 120VDC, if low, replace PDB (model) or 120VDC AUX (support).
	Chamber temperature too high (over 77 degrees)	<ol style="list-style-type: none"> 1. Chamber T/C has failed. 2. Chamber temperature offset is incorrect. Correctly set at 77 degrees using MaracaEX See ""Temperatures" on page 62.
18,02	Temperature failed to regulate within 7 degrees.	<ol style="list-style-type: none"> 1. Status--Details: Check to see if head temperature set point is 270C. 2. Check Liquefier Thermocouple wire and/or Heater wires. 3. Check for torn or damaged insulation on the liquefier, especially at the tip. 4. Check head T/C and umbilical cable for a loose connection. Replace umbilical cable.
18,03	Incorrect model head temperature.	<ol style="list-style-type: none"> 1. Using MaracaEX, set model temperature to default of 280C. 2. See also 18,01.
18,04	Incorrect support head temperature.	<ol style="list-style-type: none"> 1. Using MaracaEX, set support temperature to default of 280C.
18,05	Incorrect chamber temperature.	<ol style="list-style-type: none"> 1. Using MaracaEX, set chamber temperature to default of 75C.

Controller Initialization Failed Minor Errors (19.XX)

Code	Description	Corrective Actions
19,01	IN_COMMAND Rejected by Controller.	Software use only
19,02	IN_COMMAND Timeout.	<ol style="list-style-type: none">1. Cycle power.2. Replace 186/controller board.3. Replace Hard Drive.

Door Unlatch Failed (20.XX)

Code	Description	Corrective Actions
20,01	Unlatch command rejected.	<ol style="list-style-type: none">1. Check door latch solenoid wiring.
20,02	Timeout period expired waiting for head to stop.	<ol style="list-style-type: none">2. Check ability of door to latch

Controller Communications Failed Sub Errors (22.XX)

Code	Description	Corrective Actions
22,01	FC_SERVICE event not received.	Install controller software build 1204 or higher.
22,02	Insufficient material to complete job.	

Unique Device Name Error (23.XX)

Code	Description	Corrective Actions
23,01	UDN controller command failed.	<ol style="list-style-type: none">1. Check network for connectivity.
23,02	UDN controller command timed out.	<ol style="list-style-type: none">2. Cycle power.

Non-Code Errors

- A. "Build Error" displayed on LCD
- B. Tip depth is incorrect
- C. "Corrupted Upgrade" Displayed on LCD
- D. "Cartridge Invalid or Empty" Displayed on LCD
- E. Door Latch
- F. "Door Open" Displayed on LCD
- G. Download
- H. Loss of Extrusion (LOE)
- I. Lights
- J. Material/Unload Error
- K. Network Communication
- L. Pauses During Build
- M. Power UP / Boot
- N. "Can't Find Home - Check Modeling Base" displayed on LCD
- O. Power Down
- P. System VERY slow to reach temperature
- Q. Calibration Issues
- R. Z Calibration Failure
- S. Noise

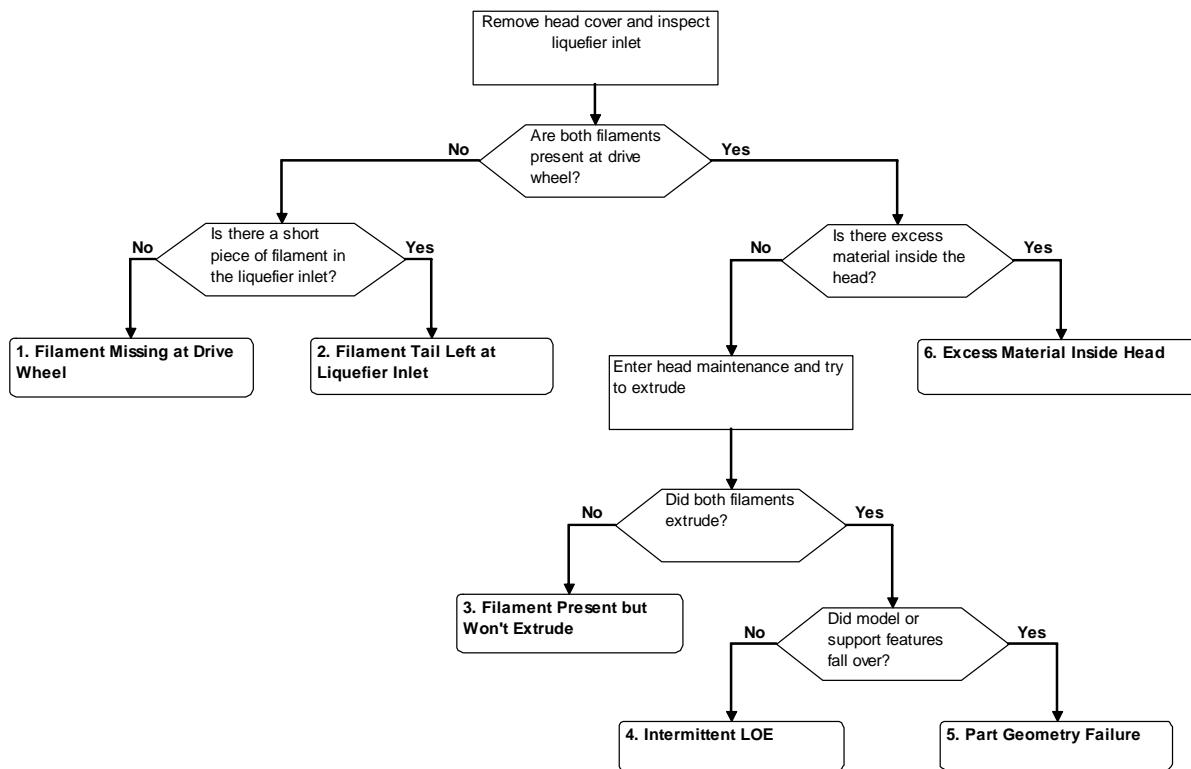
A. "Build Error" displayed on LCD	
Part stops building before complete.	<ol style="list-style-type: none"> 1. Partial or bad model file sent to unit. - Check and reprocess the STL and re-download
B. Tip depth is incorrect	
Tip Depth is wrong (too deep or above the modeling base)	<ol style="list-style-type: none"> 1. Replace the substrate. 2. Cycle power. 3. Check/Adjust the Z offset calibration using Maraca. 4. Check and/or clean the Z foam sensor. 5. Replace the Z foam assembly and sensor
Builds above the foam consistently	<ol style="list-style-type: none"> 1. Verify the Z foam sensor value changes using Hyperterminal. If no change, possible bad umbilical cable. 2. Check tip depth value in Maraca. Should be less than -0.10 3. Replace the Z foam assembly and sensor 4. Replace 186/controller board.
C. "Corrupted Upgrade" Displayed on LCD	
	<ol style="list-style-type: none"> 1. Verify the CD is the correct gender. (Same as the printer) 2. Cycle power and try download again. If not possible or fails again replace hard drive. 3. Verify the hard drive and the controller board are gendered correctly.
D. "Cartridge Invalid or Empty" Displayed on LCD	
	<ol style="list-style-type: none"> 1. Remove cartridge and cycle power. Reload cartridge. 2. Cartridge e-prom empty or failed. Load a different cartridge. 3. Gen 1 - Loose J8 on 186 board. Check for spread pins and re-seat connector. 4. Gen 2/3 - Loose J7 on controller board. Check for spread pins and re-seat connector. 5. Loose connector on card reader. re-seat card connector. 6. Verify card reader board has flashing LEDs. 7. Gen 1 - MUX has failed on 186 board. Swap card reader cables, if error follows cable replace the 186 board. If error stays with card reader, replace card reader.
E. Door Latch	
Door doesn't latch/unlatch.	<ol style="list-style-type: none"> 1. Check for door delamination or warping. If present, replace door. 2. Door solenoid pin is bent, replace door solenoid. 3. Using Maraca, toggle door solenoid, if door solenoid will not engage, replace solenoid. 4. Replace solenoid cable. 5. PDB has failed (won't latch only). Replace PDB.

F. "Door Open" Displayed on LCD

Door doesn't latch/unlatch.	<ol style="list-style-type: none"> The door is open. Close the door. Verify the magnet mounted to door frame is not misaligned or missing. Door switch is bad, replace door switch. Check for door delamination or warping. If present, replace door.
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G. Download

Model sent to system, but did not appear in queue.	<ol style="list-style-type: none"> Verify the IP address on the printer and in CatalystEX match. Send the file again. Check the lower status bar in CatalystEX for error messages. Reprocess and send the file again. Remove special characters from CMB file name. Cycle power on both the system and the work station. Downloading starts but fails during download process. External or internal network cable bad. Try different network cable or replace pigtail (internal) network cable.
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H. Loss of Extrusion (LOE)

Use flow chart above to determine type of LOE, then follow the steps below.

H. Loss of Extrusion (LOE)	
1. Material missing at drive wheel - Material tube disconnected - Material pulled back	1. Drive wheel or mushroom jam. Refer to loss of extrusion section. " "Diagnosing loss of extrusion" on page 7. " 2. Material jammed in cartridge. Replace cartridge. 3. Material motor connector is bad. Test using head maintenance. Also flex wires while extruding to test for loose connection. 4. Liquefier is plugged. Test by manually feeding material into liquefier. 5. Worn drive wheels (intermittent LOE). Replace head. 6. Liquefier heater has higher than normal resistance. Value should be about 98 ohms for BST and about 75 ohms for SST. If value is different, replace head. 7. Umbilical cable is bad. Replace umbilical cable.
2. Waterworks material frequently breaking (more than once per 1000 hours)	1. Drive wheel or mushroom jam. Refer to loss of extrusion section. " "Diagnosing loss of extrusion" on page 7. " 2. Material jammed in cartridge. Replace cartridge. 3. Clean drive wheels of excess material. 4. Align filament guide. 5. Verify material tubes are not twisted. If twisted, replace material tubes. 6. Replace head.
3. Part Geometry Failure - Model or support features fell over	1. Reorient, reprocess and resubmit the part. 2. Run Z calibration. 3. Replace tip wipe assembly. 4. If part has shifted in X or Y, refer to part quality section, part shift subsection. 5. Replace Z assembly.
4. Filament motor is running very fast.	1. Make sure the head connectors are seated properly. 2. Bad motor. Replace head assembly. 3. Broken wire in the umbilical cable. Replace umbilical cable.
5. Material slips at head	1. High pull force or jammed cartridge. Replace cartridge. 2. Plugged liquefier. Replace head. 3. Worn material tubes. Replace material tubes.

I. Lights	
Chamber lights won't come on or are dim. (Unit is otherwise functioning normally)	1. Lights are burned out. Replace bulbs. 2. Check continuity to light with volt meter. If open replace cable. 3. Light socket bad, replace light socket. 4. GEN 1 - Replace PDB.

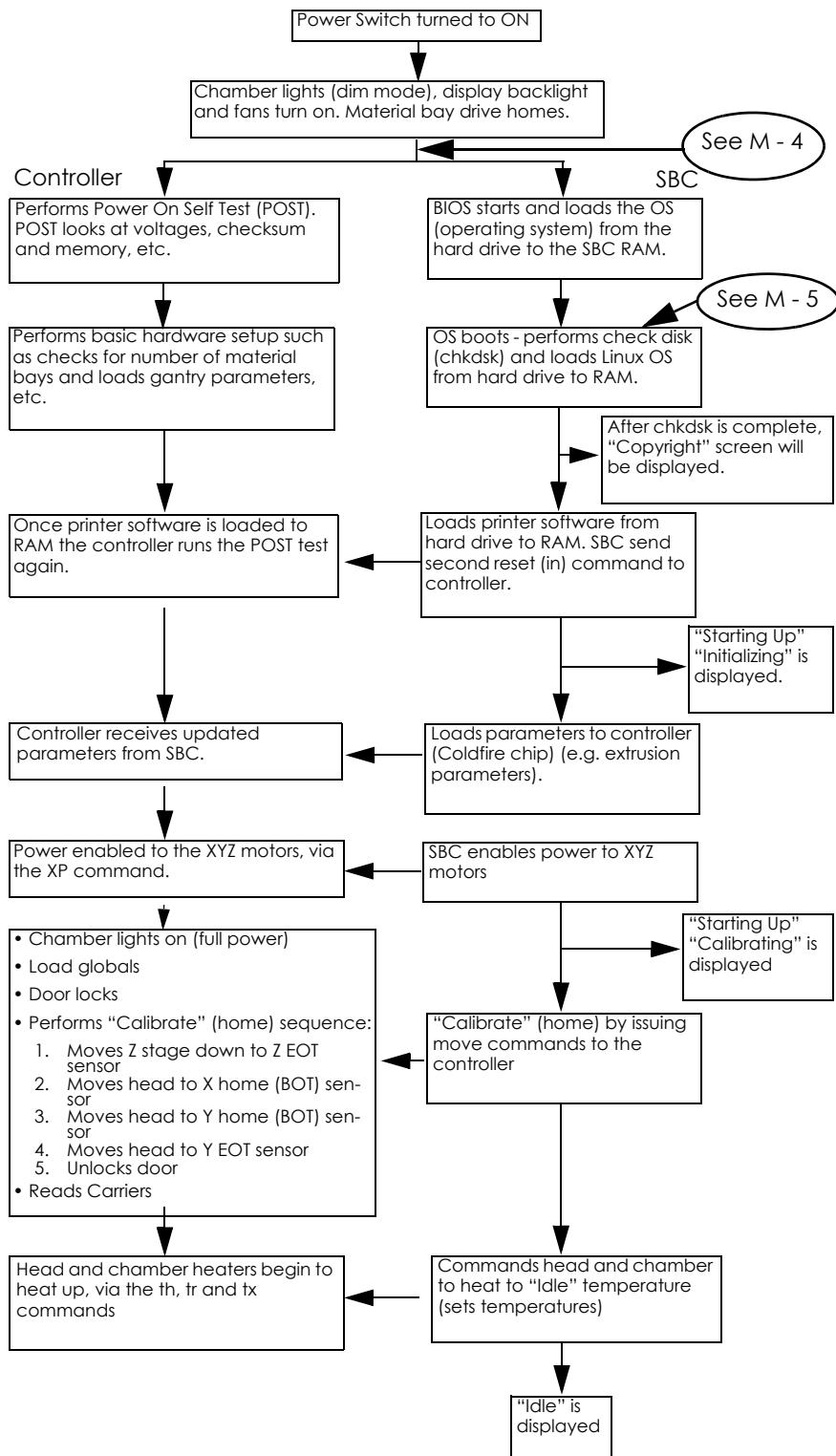
J. Material/Unload Error	
Material Error Filament error	1. Remove the carrier and verify material is coming out of the material guide. 2. Verify material pulls freely from the carrier. 3. Verify the material tubes are free of material 4. Reload material.
Material Error Filament blocked	1. Remove carrier and verify material pulls freely from carrier. 2. Verify the material tubes are free of material. 3. Reload material.
Material Error Carrier invalid	1. Remove carrier and verify it is not empty. 2. Replace material spool.

J. Material/Unload Error (Continued)	
Cartridge will not load (no movement) after pressing load.	<ol style="list-style-type: none"> 1. Verify cartridge inserted completely and latched. 2. Move Z stage away from sensors and cycle power. 3. E-prom has failed. Replace cartridge. 4. Receiver encryption board has failed, replace cartridge. 5. Pogo pins bent or failed, replace receiver.
Cartridge failed to load after three attempts.	<ol style="list-style-type: none"> 1. Cartridge is defective. Replace cartridge. 2. Cartridge is empty, replace cartridge. 3. Material in head. Clean head. 4. re-seat receiver connections. 5. Worn or bent material tubes. Replace material tubes. 6. Align filament guides at motor blocks. 7. Enter head maintenance and verify motors operate properly.
Galvanized receiver only - Model material loads 2 meters (6 feet) but support material does not move on dual auto load.	<ol style="list-style-type: none"> 1. Material in head. Clean head. 2. Align filament guides at motor blocks. 3. Replace receiver plate.
Galvanized receiver only -Material leaves cartridge but does not reach head.	<ol style="list-style-type: none"> 1. Model Only - Adjust the location of the model solenoid. Move solenoid toward the cartridge if motor is bogging down, away from cartridge if wheel is slipping. 2. Straighten the bend in receiver plate. 3. Check for loose receiver drive wheels. Align drive wheels and tighten set screw.

K. Network Communication	
Printer boots but will not communicate over network	<ol style="list-style-type: none"> 1. Wrong IP Address. Verify IP Address on printer is IP Address entered into CatalystEX. 2. Network internal (pigtail) cable bad. Replace cable. 3. Check pin alignment on RJ-45 connection. 4. OS on hard drive may be bad, replace hard drive. 5. Network interface on SBC has failed. Replace SBC.
Unable to communicate using crossover cable (Windows XP)	<ol style="list-style-type: none"> 1. From workstation, open control panel. 2. Open Firewall Client Options. 3. Uncheck the box for Enable Firewall Client. 4. Change the TCP/IP settings in network setup from dynamic to static.
Need to find MAC address	<ol style="list-style-type: none"> 1. Go to setup menu on printer. 2. From DOS command window, type: arp -a and press enter.
Loss of Communication displayed and/or part disappears after Start Part is selected.	<ol style="list-style-type: none"> 1. Symbol in filename. Remove symbol and re-send part.

L. Pauses During Build	
Chamber won't heat up to at least - 70 degrees	<ol style="list-style-type: none"> Verify top and side panels and insulation are installed. Verify chamber fans are operating. Gen 1 - PDB strapped for wrong power. Jumper PDB to proper AC input voltage. re-seat heater connections - Gen 1 - J7 on 186 board. Gen 2/3 - J3 on controller board. Heater bad. Check heater resistance - should be 36 +/- 5 ohms. If out of tolerance, replace heater. Relay failed on PDB, replace PDB.
Head not maintaining temperature.	<ol style="list-style-type: none"> Low AC input power. Make sure system is NOT attached to an ext. cord/power strip Verify TC Amp board ground cable is not loose. Check for 120VDC output from the PDB. If voltage is not present or low - replace the PDB. Check if liquefier insulation is missing or torn. If so, replace head. SST Only - Gen 1 - One or both Dual 48 VDC power supplies is bad. Verify voltage at J11 on PDB, should read 96 VDC. If not, replace dual 48 VDC power supplies. Gen 2 - Auxillary 120 VDC power supply is bad. Check connection J2 on PDB for 120 VDC. If not present, replace 120 VDC Auxillary power supply. Gen 3 - Auxillary 120 VDC power supply is bad. Check connection J8 on PDB for 120 VDC. If not present, replace 120 VDC Auxillary power supply. Umbilical cable connector loose at TC Amp board - check to make sure it is fully seated. Head T/C is crushed. Check by ohming from the T/C connector pin to the head body. Reading should show open. If not, replace head. T/C Amp board is bad. Replace T/C Amp board The heater wires in the umbilical cable are broken. Replace umbilical cable.
Pausing during build and temperatures are correct. NOTE: Pausing may be caused by multiple carrier read/write errors, not temperature issues.	<ol style="list-style-type: none"> Check CFG for multiple EEPROM write errors. If errors are noted: <ol style="list-style-type: none"> Select Resume. (from display panel) Replace card reader. Replace receiver plate and receiver cable. Replace 186/controller board.
STOPs during build, display still shows building, does not start to build again.	<ol style="list-style-type: none"> Cycle power Reprocess and re-send the part If issue continues replace SBC

What happens during Power Up / Boot



M. Power UP / Boot	
Chamber wont heat up to at least: BST - 50 degrees SST - 65 degrees	<ol style="list-style-type: none"> 1. Heater bad. Check heater resistance - should be 36 +/- 5 ohms. If out of tolerance, replace heater. 2. Gen 1 - PDB strapped for wrong power. Jumper PDB to proper AC input voltage. 3. Replace PDB.
Chamber won't heat up:	<ol style="list-style-type: none"> 1. Verify top and side panels and insulation are installed. 2. Verify chamber fans are operating. 3. Heater bad. Check heater resistance - should be 36 +/- 5 ohms. If out of tolerance, replace heater. 4. Relay failed on PDB, replace PDB.
Head won't heat up.	<ol style="list-style-type: none"> 1. Low AC input power. Make sure system is NOT attached to an ext. cord/power strip 2. Fuse on the 120 VDC supply is blown (on PDB). 3. Verify 120 VDC at head heater connectors, if present check resistance of heaters 92 Ohms. If heaters are out of spec, replace head. 4. T/C Amp board is bad. Replace T/C Amp board 5. Check for 120VDC output from the PDB. If voltage is not present or low - replace the PDB. 6. The heater wires in the umbilical cable are broken. Replace umbilical cable.
No fans, lights, text and no LCD back light (no nothing)	<ol style="list-style-type: none"> 1. Verify AC power is present at outlet. 2. Verify circuit breaker is in the ON position 3. Check if the thermal snap switches are open. If snap switches are open, verify chamber fans are operating correctly. Replace chamber fans. 4. 24VDC power supply is bad. Replace 24VDC supply. 5. Check cable from 24VDC supply to PDB. 6. PDB has failed, no 24 volt output. Replace PDB.
No fans, lights, text and LCD back light is ON	<ol style="list-style-type: none"> 1. Use HyperTerminal and/or CFG File to check for additional error codes (root cause). 2. Check 24VDC at power distribution board, if not present replace 24 VDC supply.
System won't boot, no display after 5 minutes. Fans, lights and LCD backlight are operating NOTE: Replacement Hard Drive may take up to 45 minutes to boot.	<ol style="list-style-type: none"> 1. If system homes: Check LCD cable, if OK replace LCD 2. If system does NOT home: Power on for at least 10 minutes. If still no text, Cycle power at circuit breaker and wait 10 minutes. If after three power cycles of 10 minutes each and there is still no text replace the hard drive. 3. Measure for 12VDC at the hard drive. If not present check 12VDC power supply, replace cable or supply as needed. 4. Connect a monitor and keyboard to the SBC. <ul style="list-style-type: none"> a. Does BIOS drive listing show HD as primary, if not re-seat IDE ribbon cable on both ends, Verify red line is to the right. b. Disk Boot Failure shown on monitor, software not seeing the hard drive. re-seat IDE ribbon cable on both ends. Verify red line is to the right. c. Kernel Panic Init Failed shown on monitor. Replace Hard Drive. d. If monitor displays: <code>/dev/hdaxX: UNEXPECTED INCONSISTENCY;</code> RUN fsck MANUALLY *** An error occurred during the file system check *** Dropping you to a shell; the system will reboot *** when you leave the shell - Replace Hard Drive e. Disk Check Failed (CHKDSK). Replace Hard Drive. 5. Replace SBC. <p>/dev/hdaxX: UNEXPECTED INCONSISTENCY; RUN fsck MANUALLY</p> <p>*** An error occurred during the file system check *** Dropping you to a shell; the system will reboot *** when you leave the shell - Replace Hard Drive e. Disk Check Failed (CHKDSK). Replace Hard Drive.</p>
System powers off after a few seconds.	<ol style="list-style-type: none"> 1. Check for shorts in the AC input. (eg. circuit breaker, line filter board, AC input cabling) 2. Power switch is bad, replace power switch. 3. Gen 1 - Jumper watch dog timer on PDB to override error. Pull CFG and review. Power down and remove jumper when finished. 4. Verify DC power supply outputs are not shorted to ground.

M. Power UP / Boot (Continued)	
System reaching temp, does not go to "Idle" screen and head hits into the right side of the machine	1. Substrate sensor broken. System is attempting to retract sensor. Replace the sensor.
System displays "Copyright" screen and does not home within 5 minutes. (Halted on Copyright screen)	1. Cycle Power at the Circuit Breaker. 2. re-seat the IDE cable, Verify red line is to the right. 3. Replace 186/controller board. 4. Replace single board computer. 5. Replace hard drive.
System displays "Initializing" (Halted in Initializing)	1. Cycle Power at the Circuit Breaker. 2. Verify the Substrate Sensor is in the correct position. 3. Re-seat the 186/controller board and SBC.
System displays "Starting Up / Calibrating" (Halted in Starting Up / Calibrating)	1. Cycle Power at the Circuit Breaker. 2. Verify the Substrate Sensor is in the correct position.

N. "Can't Find Home - Check Modeling Base" displayed on LCD	
Head stops over Z stage/ modeling base	1. No modeling base. Install modeling base. 2. Modeling base is used/defective - Replace. 3. Verify substrate sensor is working properly, verify at LED/test points on PDB. 4. Substrate sensor is loose or defective, tighten or replace. 5. Upper Z limit switch is too low. Adjust as needed.
Head moves to lower modeling base sensor but does NOT move over modeling base	1. Modeling base sensor is NOT turning off before performing touchdown (verify using Maraca/LED) 2. Y EOT sensor is not operating correctly. Verify using LED/test points on PDB. 3. Debris on Z Stage casting prevents Z stage from finding home
Head completes finding modeling base routine then displays error message.	1. Modeling base is used/defective - Replace 2. Z offset value is incorrect (out of operating range) Check/adjust value using MaracaEX or download CAL file from CD to restore factory calibration values. 3. Flatness check may have failed. Use HT to read the touchdown values. Compare these values to the "tolerance" value displayed. If this value is over 1728 replace the modeling base. 4. If failure reoccurs check XY table level using the head bracket and dial indicator. Values should be a band of 0.010 total for the four points (0.003 total) 5. - If values are out of spec: Check for loose tray mounting screws. If so level per procedure. 6. - If screws are tight, level the XY table per procedure. 7. If failure reoccurs the X rear guide rod may be out of alignment. Replace XY table. 8. Upper Z limit switch is too low. Adjust as needed.
Head stops moving while attempting to lower Z detect sensor plunger	1. Using Maraca/LED's check to see that all sensors are working correctly. If not check sensor connections/wires or replace sensor 2. Z offset value is incorrect (out of operating range) Check/adjust value using MaracaEX or download CAL file from CD to restore factory calibration values.

O. Power Down	
Fails to shutdown.	<ol style="list-style-type: none"> 1. Toggle the power switch again. Wait 5 minutes 2. Shut system off at the breaker.
Display indicates "Recovery after uncontrolled shut-down"	<ol style="list-style-type: none"> 1. AC power was interrupted. Check customer AC power. 2. Bad power switch cable. 3. UPS malfunctioned, replace UPS.
Display indicates "Recovery after controlled loss of power"	<ol style="list-style-type: none"> 1. AC power was interrupted. Check customer AC power. 2. UPS wiring is incorrect. Check wiring 3. UPS malfunctioned, replace UPS.
Shuts down immediately after the power switch is thrown.	<ol style="list-style-type: none"> 1. Replace the SBC. 2. Replace the PDB. 3. Replace power switch.
Shuts down after part is complete	<ol style="list-style-type: none"> 1. Auto power down was enabled, normal operation.

P. System VERY slow to reach temperature	
Envelope takes unusually long (over 40 minutes) to reach temperature.	<ol style="list-style-type: none"> 1. Verify all covers and panels are properly installed. 2. Envelope heater(s) bad. Check heater resistance - should be about 36 ohms. If not, replace heater(s). 3. Replace PDB

Q. Calibration Issues	
Tip offset cal part - support and model over .25" offset	<ol style="list-style-type: none"> 1. Check that tip offset values are close to default values: BST = 0.10, 0.00 SST = 0.25, 0.00
Tip offset values change but do not take.	<ol style="list-style-type: none"> 1. Tip offset is changed in Maraca and the change is stored correctly in the hard drive (verified by viewing the CFG file). When the tip_offset part is run though, the offset does not change. Replace SBC.

R. Z Calibration Failure	
First layer too deep into modeling base Diagnostic details: Left square (SS) <i>Upper layers</i> - Missing <i>1st layer</i> - May be visible, but looks choked off. Etches may be visible in modeling base. Right square (model) <i>Upper layers</i> - Missing or barely stuck to modeling base. Part layer shifted. <i>1st layer</i> - May be visible, but looks choked off. Etches may be visible in modeling base.	<ol style="list-style-type: none"> 1. Add +.010 to Z offset value

R. Z Calibration Failure (Continued)	
First layer tip too high off modeling base Diagnostic details: Left square (SS) <i>Upper layers</i> - Missing or barely stuck to modeling base <i>1st layer</i> - Missing or barely stuck to modeling base Right square (model) <i>Upper layers</i> - Missing or barely stuck to modeling base <i>1st layer</i> - Missing or barely stuck to modeling base	1. Add -.010 to Z offset value
Support tip much lower than model tip Diagnostic details: Left square (SS) <i>Upper layers</i> - Built OK <i>1st layer</i> - OK Right square (model) <i>Upper layers</i> - Missing or barely stuck to modeling base. <i>1st layer</i> - OK	1. Add -.010 to Z offset value
Support tip much higher than model tip Diagnostic details: Left square (SS) <i>Upper layers</i> - Built OK <i>1st layer</i> - OK Right square (model) <i>Upper layers</i> - Did not build completely. may be some wisps of model material. <i>1st layer</i> - May be visible, but roughed up from the support tip	1. Add +.010 to Z offset value
Possible worn/bad tip shield Diagnostic details: Left square (SS) <i>Upper layers</i> - Part built, but surface looks rough or looks OK but cal failed <i>1st layer</i> - OK Right square (model) <i>Upper layers</i> - Part built, but surface looks rough or looks OK but cal failed <i>1st layer</i> - OK	1. Replace tip shield

R. Z Calibration Failure (Continued)

<p>Model filament not loaded Diagnostic details: Left square (SS) <i>Upper layers</i> - Built OK <i>1st layer</i> - OK Right square (model) <i>Upper layers</i> - Missing or barely stuck to modeling base. <i>1st layer</i> - Missing. No evidence of ABS extrusion</p>	<p>1. Load material</p>
<p>Support filament not loaded Diagnostic details: Left square (SS) <i>Upper layers</i> - Missing. No evidence of SS extrusion <i>1st layer</i> - Missing. No evidence of SS extrusion Right square (model) <i>Upper layers</i> - Missing or barely stuck to modeling base. <i>1st layer</i> - Missing. No evidence of SS extrusion</p>	<p>1. Load material</p>
<p>Continued difficulty calibrating</p>	<p>1. Replace Z motor 2. Replace XY table. Failed bearings in the Y drive shaft possible root cause.</p>

S. Noise

<p>Buzzing noise from XY motors</p>	<p>1. Replace XY motors 2. Replace XY table. Failed bearings in the Y drive shaft possible root cause.</p>
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Part Quality Troubleshooting

Embedded support strands in model

Characteristics: Strands of support material embedded in model.



Example of embedded support



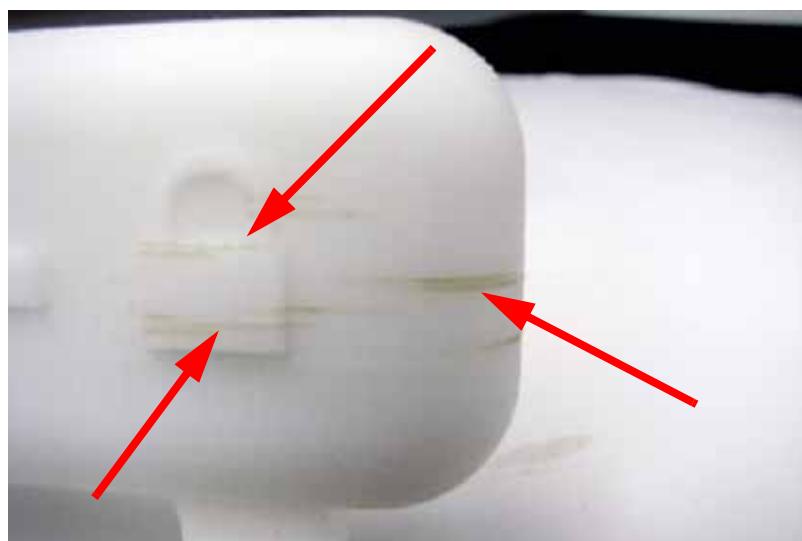
Problem corrected after re-orientation

Corrective actions:

1. Change the part orientation. Rotate part 90 degrees - see example above.
2. Build the part using the “Minimal” support option.
3. Material is built-up on the shields. Using a brush to remove the excess material.
4. Replace tip shields.
5. Check brush flicker assembly for damage or wear. If worn or damaged, replace brush flicker assembly.
6. Tip(s) are loose, check if tip screws are loose. Tighten tip screws.
7. Replace support material.

Brown streaks (burn marks)

Characteristics: Brown streaks in parts.



Corrective actions:

1. Part geometry's are such that the model tip sits idle for an extended period of time. Change the part orientation.
2. Worn tip shrouds, replace tip shrouds.
3. Material build-up behind the tips, remove excess material.
4. Check brush and flicker for damage or wear. Replace brush and flicker if needed
5. Check and adjust the brush and flicker height.
6. Tip(s) are loose, check if tip screws are loose. Tighten tip screws.

Loss of Extrusion (LOE)

Characteristics: Material strands inside build envelope and/or partially built parts. Either the model or support material has failed to extrude from swivel head or toggle plate assembly. Can also be caused by a part falling over or a part shift.



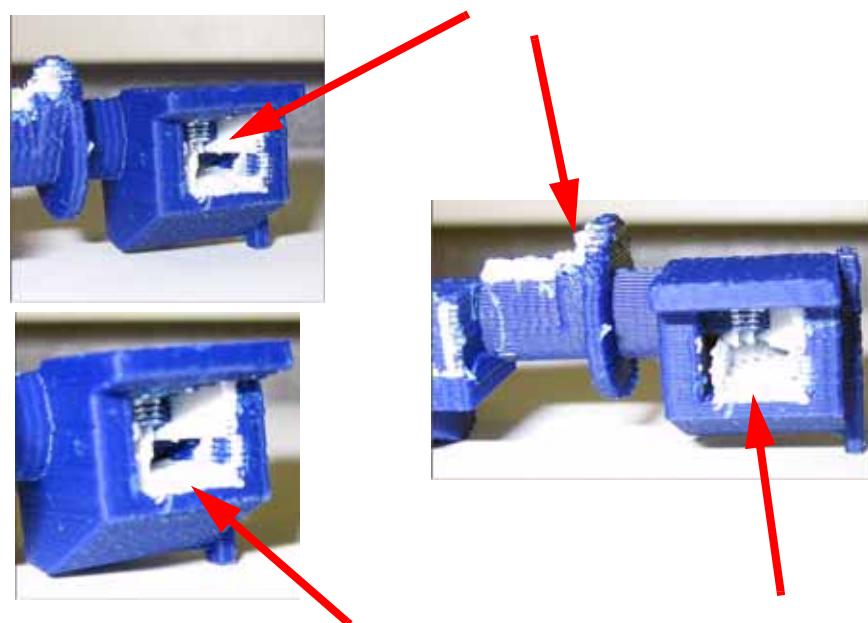
Here the support material has had a loss of extrusion, causing the model material to continue to extrude without support material under it. If the model material has had a loss of extrusion, the scenario would be reversed, the support material would have extruded with no model material under it.

Corrective actions:

1. Material cartridge is jammed or empty. Replace cartridge.
2. Tips are plugged. Replace the tips
3. Toggle assembly is jammed. Attempt to clear the jam, replace the toggle head assembly if needed
4. Liquefier heater has higher than normal resistance, value should be between 175 and 216 ohms. If resistance is too high, replace the toggle head assembly.
5. Check for twisted or worn filament guide tubes. If worn replace tubes.
6. Filament motor is malfunctioning or is disconnected. Verify proper operation and connections. Test using head maintenance. Also flex the wires while extruding to test for poor connections.
7. Broken wire in umbilical cable. Replace umbilical cable.
8. Check umbilical hose for proper alignment and connection to the head cooling fan.
9. Head cooling fan has low air flow, replace the head cooling fan.
10. Z table could be jammed. Check for debris build up around lead screw and guide rods. Replace Z stage if needed.
11. Irregular XY table movement, loose guide rods or loose drive belts. Verify the guide rods are securely fastened and the drive belt tensions are correct. Replace XY table if needed.

Model embedded in to support

Characteristics: Difficult to remove the support material.

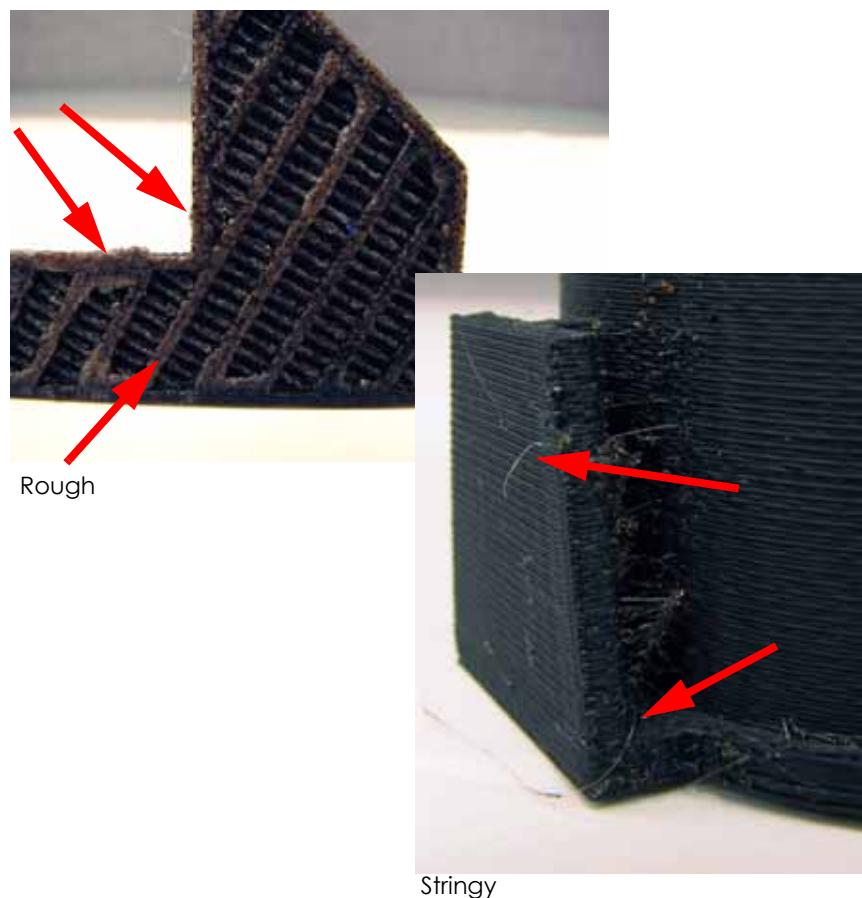


Corrective actions:

1. Run Z and Offset Calibrations
2. Check for loose tip screws. Tighten screws if required.
3. Check for loose modeling base. Use a new modeling base.

Moisture in material

Characteristics: Material will appear to rough or stringy.

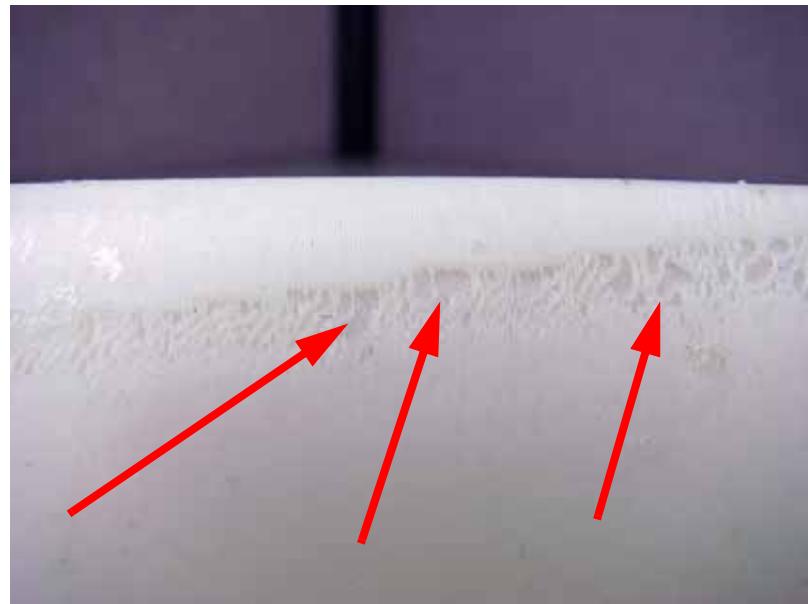


Corrective actions:

1. Material is older than one year. Replace with newer material.
2. Moisture in material. Replace using new material spool.

Open seams

Characteristics: Visible gap in the model material.

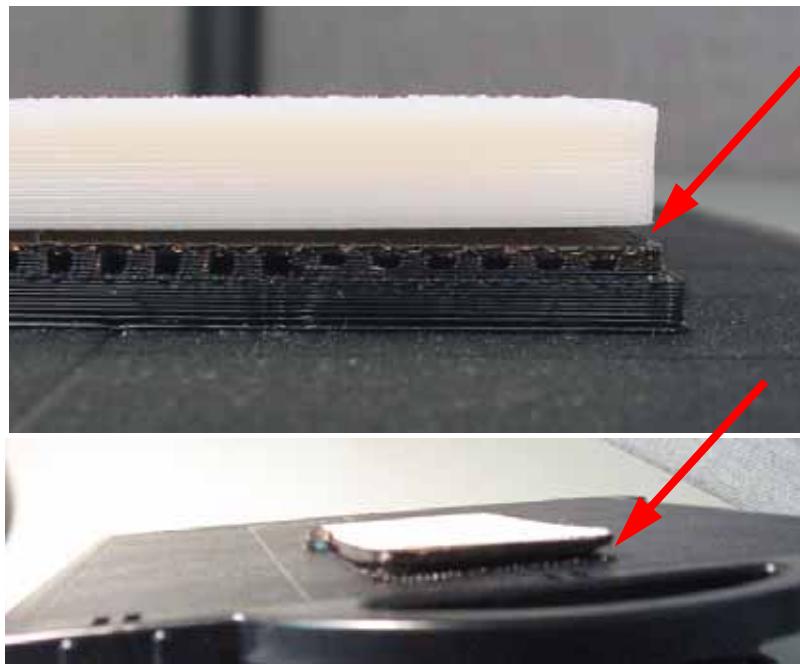


Corrective actions:

1. Check the height of the brush and flicker.
2. Verify wall thickness is greater than: 0.040" for 0.010" slice.
3. Reprocess the part using the latest version of CatalystEX and check STL report for errors.
4. Repair STL file with original CAD program.
5. Possible bad head motor cable. Replace umbilical cable.
6. Possible bad head motor. Replace toggle head assembly.

Part curling

Characteristics: Top surface appears rough. Model and support will separate or support and substrate will separate.



Corrective actions:

1. The part is too dense, try using the “Sparse Fill” option in CatalystEX.
2. Modeling base has been re-used or is defective. Replace with unused modeling base.
3. Run Z Calibrations.
4. Verify proper operation of all chamber fans. Replace fans as needed.
5. Verify chamber heaters are secured and operating properly. Replace heaters as needed.
6. Verify X, Y and Z level is within specification. If not level, re-level and calibrate.

Part fell over

Characteristics: A part falls over and separates at the support base or substrate. Material will continue to extrude causing strands of material to build up in the envelope.



Corrective actions:

1. Substrate has been re-used or is defective. Replace the substrate.
2. Check for material build up on tips, brush and flicker. Remove excess material.
3. Verify brush/flicker height. Adjust if required.
4. The part does not have sufficient support material. Reprocess the part using basic or surround support in CatalystEX.
5. The base support layer is separating from the substrate. Run Z calibration.
6. Model material is separating from the support base top layer. Run Z calibration.
7. Z stage may not be moving properly. Check for obstructions.

Part shifting

Characteristics: Model shifts in X or Y axis, this may cause unexpected contact errors with X or Y sensors.

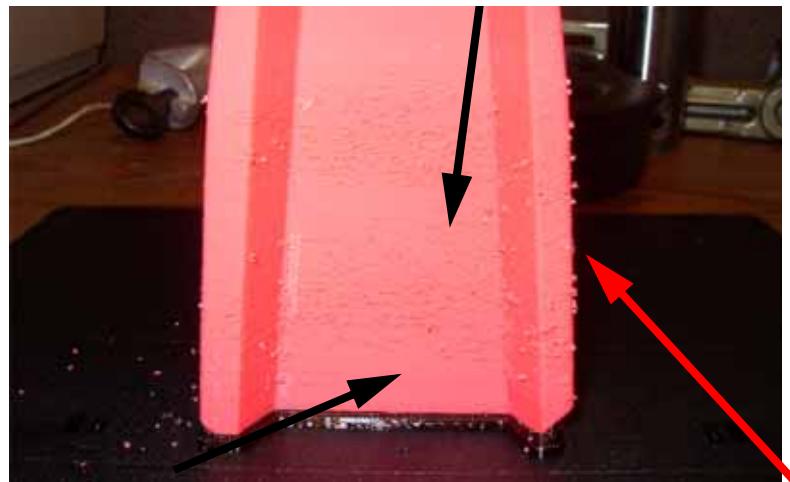


Corrective actions:

1. The modeling base is defective or is not latched tightly. Replace modeling base and latch properly.
2. Check XY table:
 - A. Verify X and Y guide rods are securely fastened.
 - B. Verify the toggle head moves freely.
 - C. Verify proper belt tensions for X and Y axis. Tension the belts as needed.
 - D. With X and Y motors unplugged, make sure the motors will spin freely.
 - E. Replace the XY motors or XY table as needed.
3. Check Z stage:
 - A. Clean the Z stage lead screw.
 - B. Bad Z stage motor and belt. Replace Z motor and belt as needed.
 - C. Verify Z stage is level. Re-level as needed.
 - D. Verify the Z stage guide rods are not loose. Tighten as needed.
 - E. Z stage may have too much play, replace the Z stage as needed.

Rough surface quality

Characteristics: Sides of part are rough or over filled, with little or no part shift.



Corrective actions:

1. STL wall thickness is too thin. Verify proper wall thickness.
2. Reprocess the part using the latest version of CatalystEX software and check STL report for errors.
3. Check for STL errors in CAD software.
4. Replace the tip shrouds.
5. Loose tips screws, tighten the screws.
6. Replace the tips.
7. Deformed toggle spring, replace the toggle spring.
8. Check X/Y guide rods for loose hardware. Replace XY table as needed.

Rough quality all over

Characteristics: The part sides, top and bottom are very rough.



Corrective actions:

1. Moisture in material, replace with new cartridge.
2. Reprocess the part using the latest version of CatalystEX software.
3. Check for STL errors with CAD software.
4. Replace the tip shrouds.
5. Loose tips screws, tighten the screws.
6. Replace the tips.
7. Deformed toggle spring, replace the toggle spring.

Model strands on parts

Characteristics: Model material strands appear outside the normal model build.



Corrective actions:

1. Check for material build up on tips, brush and flicker. Remove excess material.
2. Verify brush/flicker height. Adjust if required.
3. Run Z and Offset Calibrations.
4. Check X and Y drive belt tensions.
5. Umbilical cable may have bad connection or broken wire, replace the umbilical cable.
6. Head motor is not stopping when it is supposed to. Replace the toggle head assembly.
7. Head motor is not stopping when it is supposed to. Replace the controller board.

Witness marks

Characteristics: Small void on one side of the part,

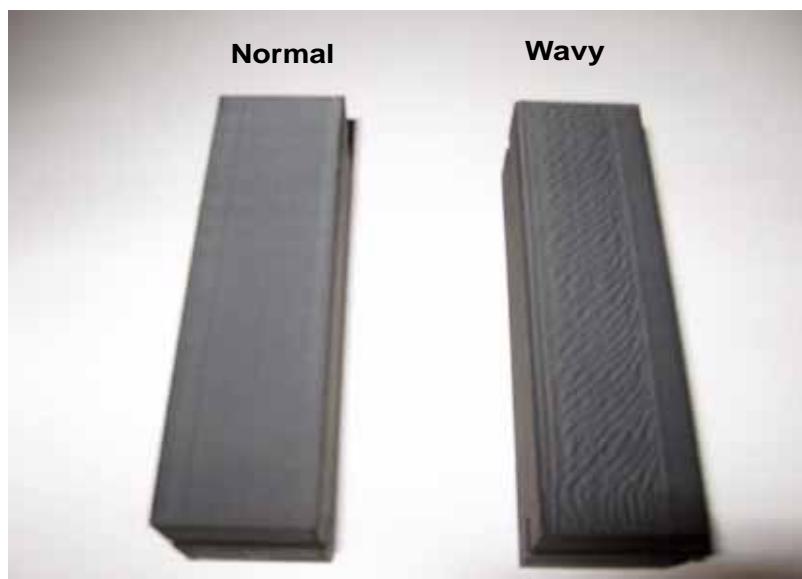


Corrective actions:

1. Run Z and Offset calibrations.
2. Replace the tips.
3. Rotate the part 45 degrees in CatalystEX.

Wavy surface

Characteristics: One side of the model will have wavy build.



Corrective actions:

1. Run Z and Offset calibrations.
2. Reprocess the part using the latest version of CatalystEX and check STL report for errors.
3. Check for STL errors in CAD software.
4. Replace the tip shrouds.
5. Loose tips screws, tighten the screws.
6. Replace the tips.
7. Deformed toggle spring, replace the toggle spring.
8. Check X/Y guide rods for loose hardware. Replace XY table as needed.

Wavy parts

Characteristics: Parts will shift in X and Y, giving the appearance of waves.

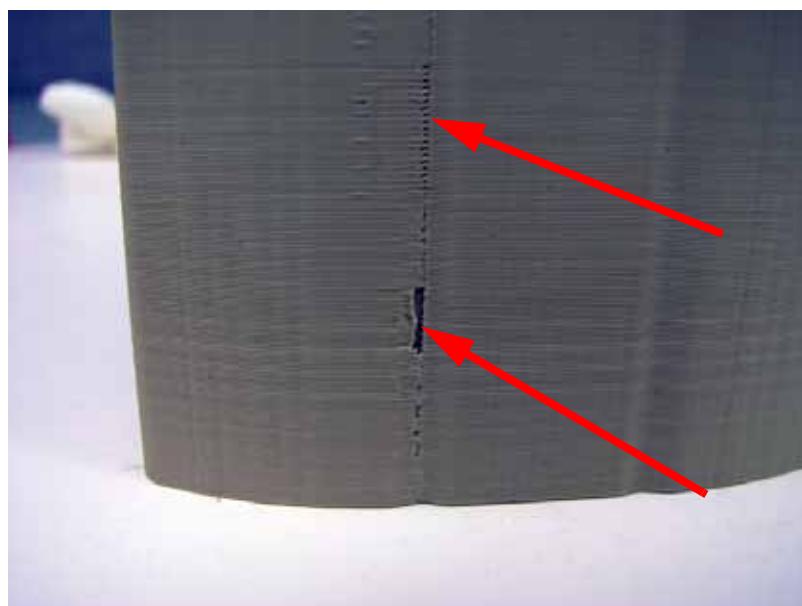


Corrective actions:

1. Verify X and Y guide rods are securely fastened.
2. Check and adjust X, Y and Z belt tensions.
3. Verify the Z stage is properly leveled.
4. Verify the Z pulley is in the correct position.
5. Replace the Z stage.
6. Replace the XY table.

Under fill

Characteristics: Open seam between start and stop of toolpaths.



Corrective actions:

1. Verify wall thickness is greater than: 0.040" for 0.010" slice.
2. Reprocess the part using the latest version of CatalystEX software.
3. Check for material build up around head and tips.
4. Replace tips.
5. Replace the head board.

Material sagging on curved parts

Characteristics: Surface finish not smooth.

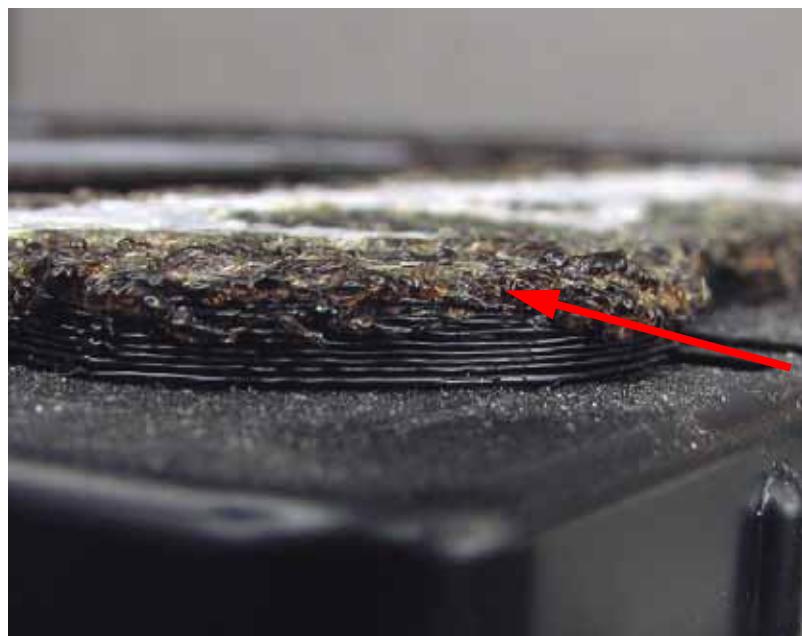


Corrective actions:

1. Reprocess the part using the latest version of CatalystEX software.
2. Reprocess part with CAD software.
3. Check for bad bearings in X/Y table. Replace XY table if needed.
4. Check Z stage:
 - A. Check Z belt tension.
 - B. Verify Z stage tray is level.
 - C. Verify the Z stage guide rods are not loose. Tighten as needed.
 - D. Check for play on Z lead screw, move up and down. Replace Z stage if needed.

Fused layers

Characteristics: Layers appear to be fused together.



Corrective actions:

1. Check Z stage:
 - A. Check connections to Z motor.
 - B. If head is digging in to the part, check Z motor belt tension.
 - C. Check to see if Z stage is jamming.
 - D. Verify the Z stage is level.
 - E. Verify proper operation of the Z jamming flag. May have become magnetized.
 - F. If Z stage is running in to the head, verify correct position of the travel sensors.
2. Run Z calibration.

Z layers inconsistent

Characteristics: Z layers not bonding properly.



Corrective actions:

1. Check Z stage:
 - A. Verify Z motor is tightly secured.
 - B. Verify Z stage is level.
 - C. Replace the Z motor.
 - D. Replace the Z stage if substrate is lower in the back (failed to find home).
2. Replace the tips.

Hyperterminal

Using Hyperterminal (HT)

When using these commands, there is a high risk of damage to the machine because the printer does not recognize the location of any other components in the machine that may be in the way. This means if you use the command to move the Z-Stage, you will have to make sure that the Head is moved out of the way. The same if you want to move the X-Y axis. The Z-Stage has to be moved out of the way. The printer does see the EOT switches and the Home Sensors.

Required Tools

- Null modem cable (“Laplink”) with DB9 style connectors, pins 2 and 3 swapped
- Computer with windows NT 4.0, 2000 or XP

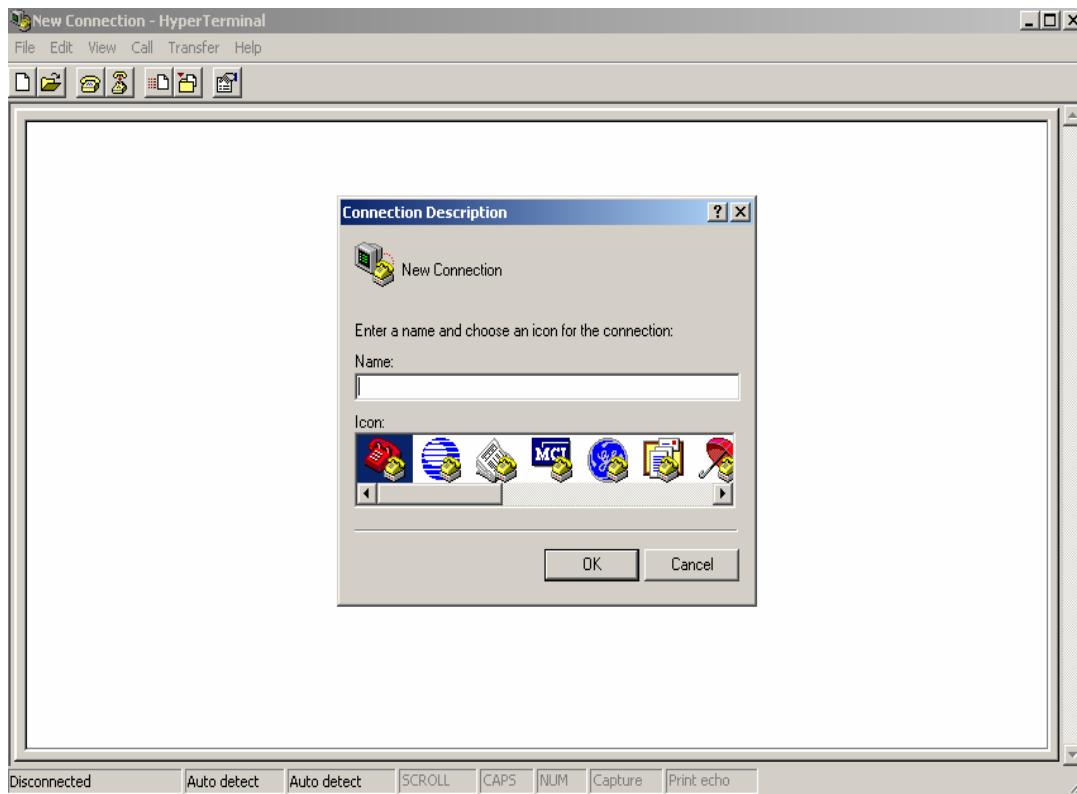
Hyperterminal Settings

From the Computer, select: **Start – Programs – Accessories – Communications – HyperTerminal**

1. Start Hyperterminal:

- A. Once HyperTerminal is started the connection screen will come up, see [Figure 3](#).

Figure 3: New Connection



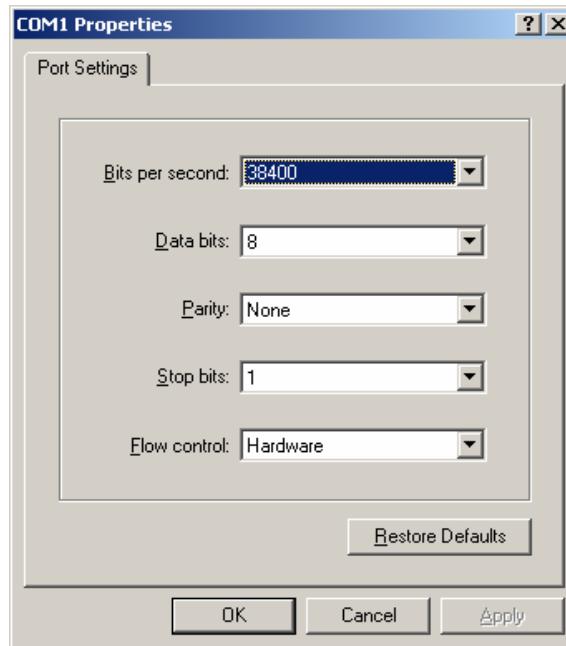
- B. Type a name for the new connection and click OK.
- C. Select the appropriate COM Port and click OK, see [Figure 4](#).

Figure 4: COM Port



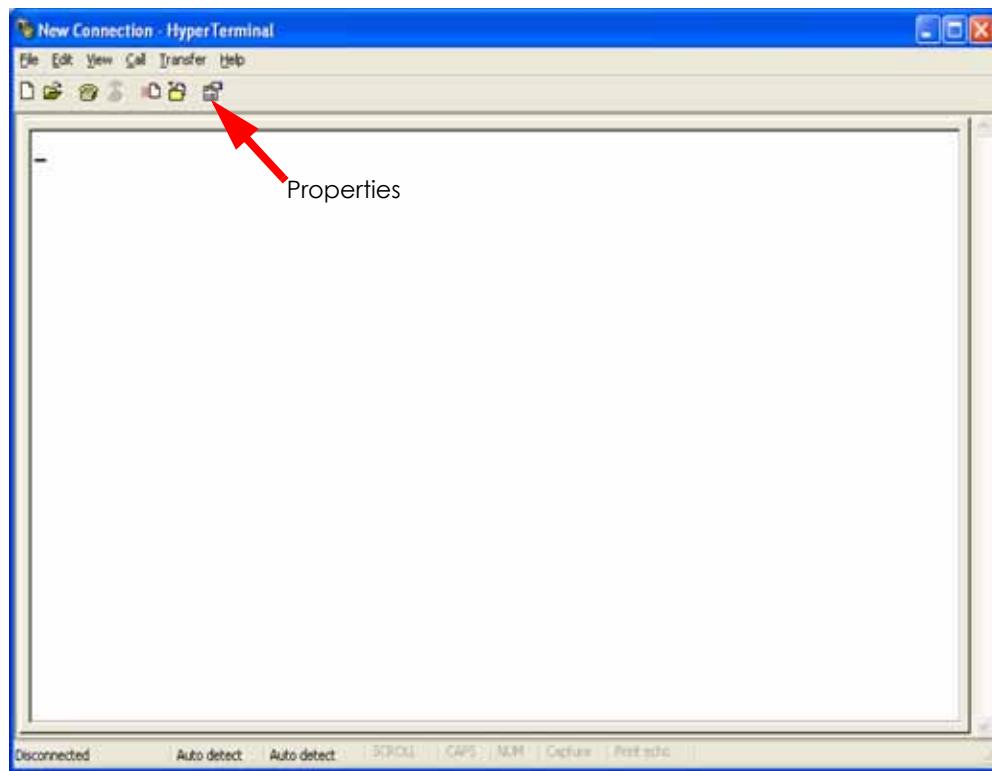
- D. Set the Port settings to match the figure below and click OK, see [Figure 5](#).

Figure 5: Port Settings



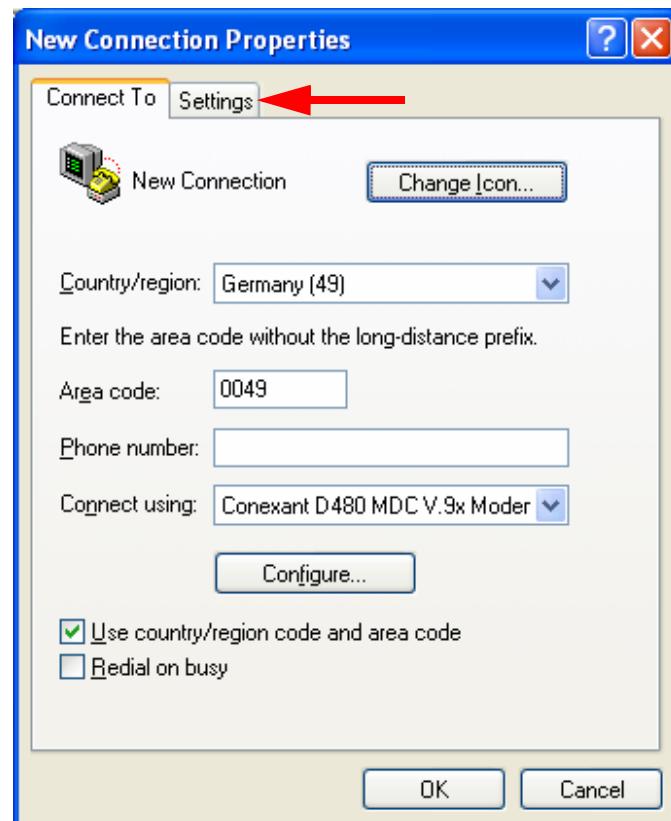
- E. Now you should be able to communicate with the machine, if not, here are a couple of things that you can try:
- If it failed to establish communication, check to see if the appropriate COM Port is selected. Click on configuration to see if the settings for the COM Port are correct. (see item D)
 - If you follow all of these steps, you should be able to communicate with the machine.
- F. Once you are connected with the machine, select the properties button, see [Figure 6](#).

Figure 6: Properties



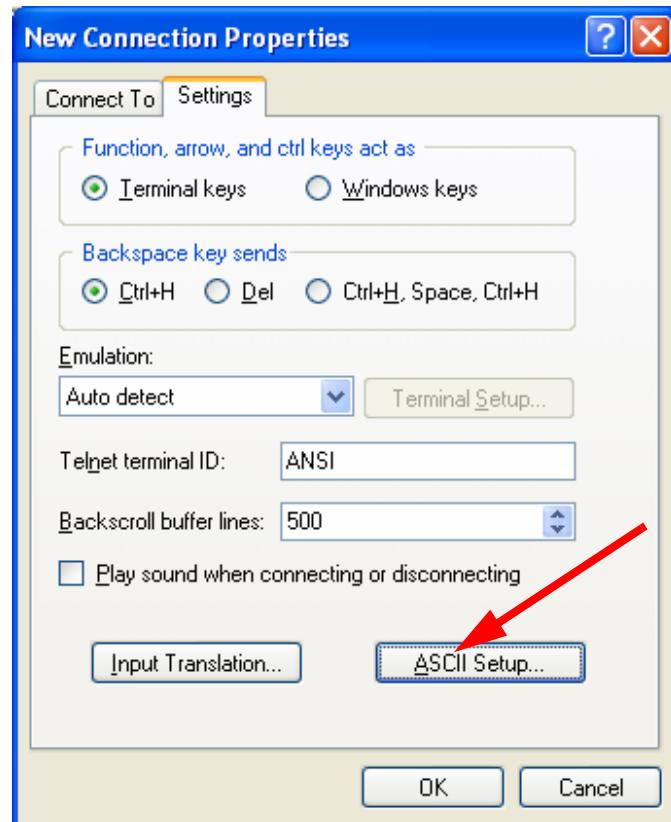
G. Select the Settings Tab, see [Figure 7](#).

Figure 7: Settings



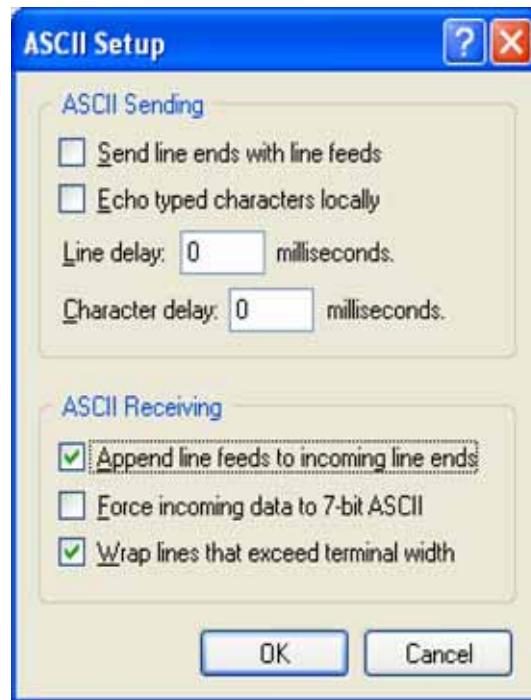
H. Select the ASCII button, see [Figure 8](#).

Figure 8: ASCII Setup



- I. Under ASCII receiving, check "Append line feeds to incoming line ends" and "Wrap lines that exceed terminal width", see [Figure 9](#).

Figure 9: ASCII Setup



- J. Select OK twice to exit setting window.
- K. In the HT window enter - ***trace c commandDetails on***. This will enable details to be shown in the HT window.
- L. Always cycle power after using HT.

Hyperterminal Commands

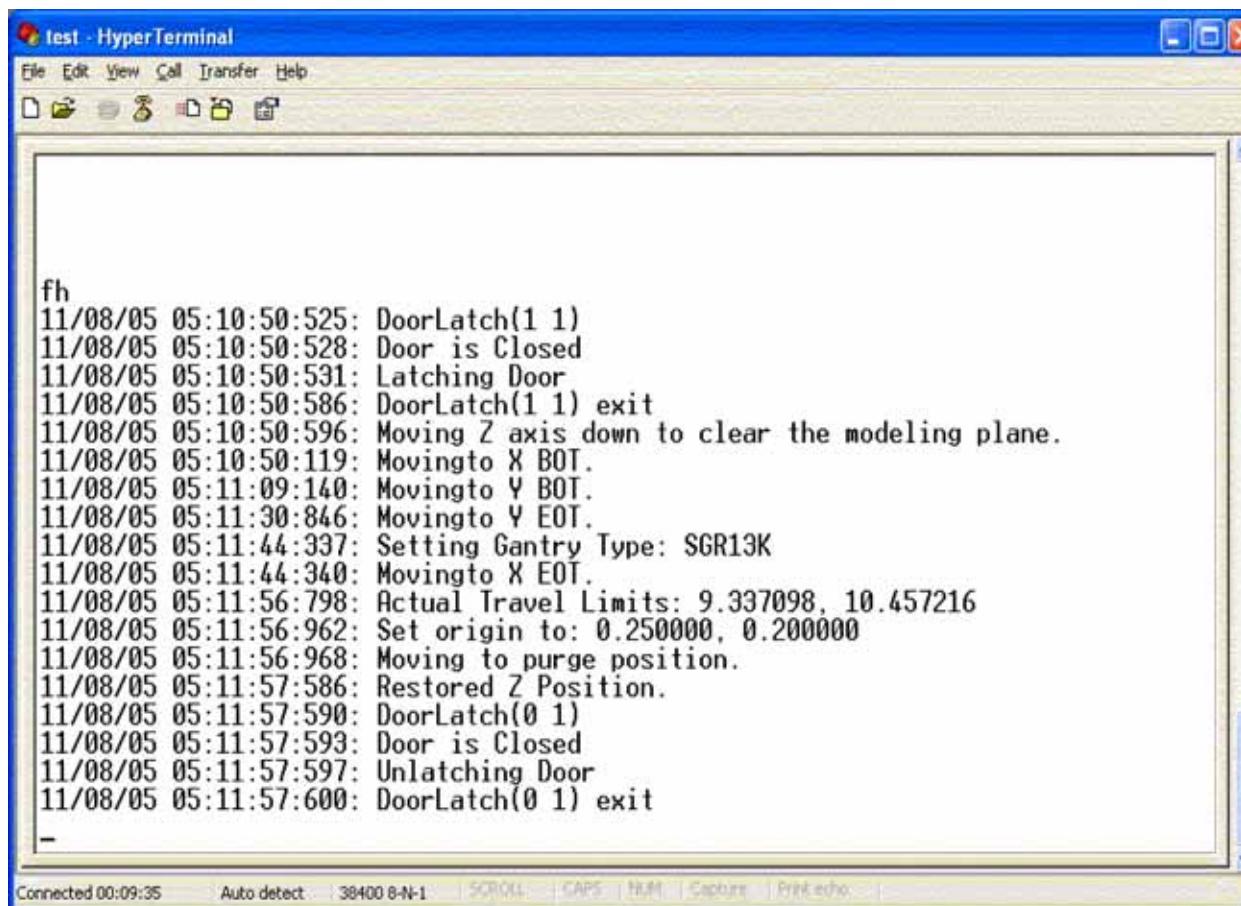
Hyperterminal is an easy way to check and troubleshoot the hardware of a machine. Here are a couple of helpful commands which can be used to operate the machine through HyperTerminal. All values, which are displayed in Hyperterminal, are in inches. For some commands, the machine must find Home position before you can enter commands.

1. **Fh =Find Home.**

This command determines the XY axis home position. It locates the X and Y axis limit switches, sets the origin, and places the head over the purge bucket.

Example= fh The values which are displayed are explained below, see [Figure 10](#).

Figure 10: Find Home



The screenshot shows a Windows HyperTerminal window titled "test - HyperTerminal". The menu bar includes File, Edit, View, Call, Transfer, Help. The toolbar includes icons for New, Open, Save, Print, Copy, Paste, Cut, Find, Replace, and Exit. The main terminal window displays the following text:

```
fh
11/08/05 05:10:50:525: DoorLatch(1 1)
11/08/05 05:10:50:528: Door is Closed
11/08/05 05:10:50:531: Latching Door
11/08/05 05:10:50:586: DoorLatch(1 1) exit
11/08/05 05:10:50:596: Moving Z axis down to clear the modeling plane.
11/08/05 05:10:50:119: Movingto X BOT.
11/08/05 05:11:09:140: Movingto Y BOT.
11/08/05 05:11:30:846: Movingto Y EOT.
11/08/05 05:11:44:337: Setting Gantry Type: SGR13K
11/08/05 05:11:44:340: Movingto X EOT.
11/08/05 05:11:56:798: Actual Travel Limits: 9.337098, 10.457216
11/08/05 05:11:56:962: Set origin to: 0.250000, 0.200000
11/08/05 05:11:56:968: Moving to purge position.
11/08/05 05:11:57:586: Restored Z Position.
11/08/05 05:11:57:590: DoorLatch(0 1)
11/08/05 05:11:57:593: Door is Closed
11/08/05 05:11:57:597: Unlatching Door
11/08/05 05:11:57:600: DoorLatch(0 1) exit
```

At the bottom of the window, status indicators show: Connected 00:09:35, Auto detect, 38400 B-N-1, SCROLL, CAPS, NUM, Capture, Print echo.

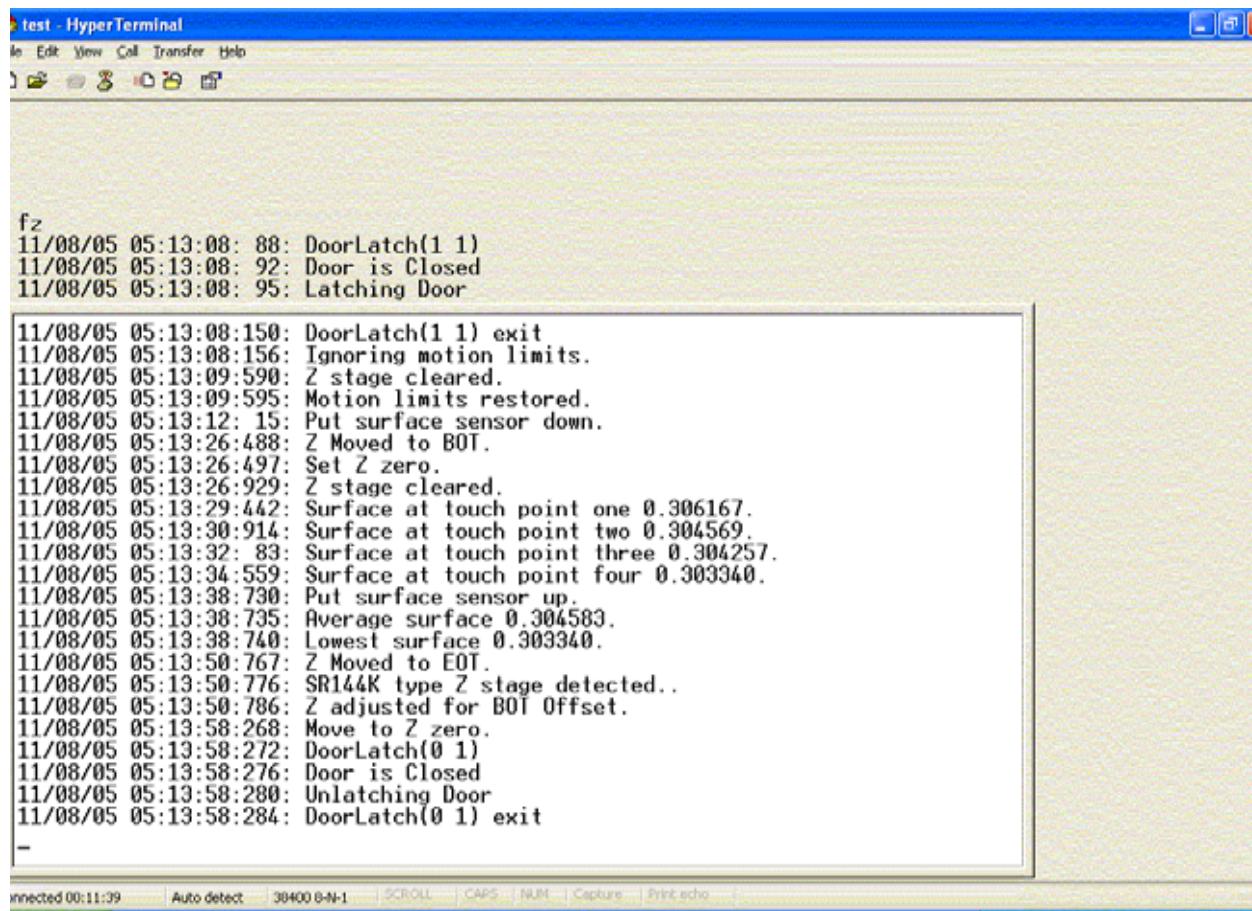
Setting Gantry Type:	During the home sequence, the machine is also looking at which table is installed in the machine (cable drive or Belt drive). SGR13K means, the Gear Ratio is 13000 microsteps/inch.
Actual Travel Limits:	This is the distance between the BOT (Begin Of Travel) and EOT (End Of Travel) Sensors in inches.
Set origin to:	This gives an offset to the BOT sensors that the machine is not moving into the sensors during building.

2. fz = Find Z home

This command determines the Z axis home position. This position is determined by the modeling base that is installed in the system. The find home command must be executed before this command will work.

Example: fz The values, which are displayed, are explained below, see [Figure 11](#).

Figure 11: Find Z Home



The screenshot shows a Windows HyperTerminal window titled "test - HyperTerminal". The menu bar includes File, Edit, View, Call, Transfer, Help. The toolbar includes icons for New, Open, Save, Print, Copy, Paste, Cut, Find, Replace, and Exit. The main window displays the command "fz" followed by a series of log entries from November 8, 2005, at 05:13:08. The log entries describe the process of finding the Z home position, including door latching, motion limits, surface sensor readings, and Z stage detection. The log ends with "DoorLatch(0 1) exit".

```
fz
11/08/05 05:13:08: 88: DoorLatch(1 1)
11/08/05 05:13:08: 92: Door is Closed
11/08/05 05:13:08: 95: Latching Door

11/08/05 05:13:08:150: DoorLatch(1 1) exit
11/08/05 05:13:08:156: Ignoring motion limits.
11/08/05 05:13:09:590: Z stage cleared.
11/08/05 05:13:09:595: Motion limits restored.
11/08/05 05:13:12: 15: Put surface sensor down.
11/08/05 05:13:26:488: Z Moved to BOT.
11/08/05 05:13:26:497: Set Z zero.
11/08/05 05:13:26:929: Z stage cleared.
11/08/05 05:13:29:442: Surface at touch point one 0.306167.
11/08/05 05:13:30:914: Surface at touch point two 0.304569.
11/08/05 05:13:32: 83: Surface at touch point three 0.304257.
11/08/05 05:13:34:559: Surface at touch point four 0.303340.
11/08/05 05:13:38:730: Put surface sensor up.
11/08/05 05:13:38:735: Average surface 0.304583.
11/08/05 05:13:38:740: Lowest surface 0.303340.
11/08/05 05:13:50:767: Z Moved to EOT.
11/08/05 05:13:50:776: SR144K type Z stage detected..
11/08/05 05:13:50:786: Z adjusted for BOT Offset.
11/08/05 05:13:58:268: Move to Z zero.
11/08/05 05:13:58:272: DoorLatch(0 1)
11/08/05 05:13:58:276: Door is Closed
11/08/05 05:13:58:280: Unlatching Door
11/08/05 05:13:58:284: DoorLatch(0 1) exit
-
```

Surface at touch point:	This is the distance in inch from the surface of the substrate to the Z BOT sensor.
Average surface:	This is the Average distance in inches between the substrate and the Z BOT sensor. The machine is looking for the planarity of the substrate, if the substrate is not flat, then the machine will not home.
Lowest surface:	This is the lowest distance in inches between the substrate and the Z BOT sensor.
	SR 144K type Z-Stage detected means, that the Z-Stage has a Gear Ratio of 144000 microsteps per inch. This indicates either a three leadscrew Z-Stage or a single leadscrew Z-Stage.

3. **mz = Move Z**

The MZ command moves the Z-Stage relative to the current position. A positive value moves the Z-Stage down. A negative value moves the Z-Stage up.

Example: mz 4.0 This command will move the Z-Stage 4 inch down.

4. **tz=Test Z error position.**



Before you can use the XT and TZ command, you MUST run the FH and FZ command!

This command measures the distance from a user-specified offset to the limit switches. The same relative offset is used for each switch.

The command can be used for testing the Z-Stage. To do so, repeat the **tz** command at least 2 times and compare the **Z BOT delta** values and the **Z EOT delta** values.

Parameters:

Float Offset:

Defines the relative offset distance in inches from the limit switch. The offset is the starting point for the measurement.

Example= tz 2.0 2.0 = distance, where the machine starts to look for the sensors.

For repeating the command, type in the following: **rt 2 1 "xt 2.0"**. For more information see the rt command, step [8](#).

Figure 12: TZ command

The screenshot shows a Windows HyperTerminal window titled "test - HyperTerminal". The menu bar includes File, Edit, View, Call, Transfer, Help. The toolbar has icons for New, Open, Save, Print, Copy, Paste, Find, Replace, and Cut/Copy/Paste. The main window displays the following text:

```
as indicated by the limit switches.

Parameters:
  float offset
    Defines the relative offset distance in inches from the
    measurement.

xt 4
11/08/05 05:18:35:941: Measuring distance to limit switch from an offset of 4.00
0000 inches
11/08/05 05:18:35:945: DoorLatch(1 1)
11/08/05 05:18:35:948: Door is Closed
11/08/05 05:18:35:952: Latching Door
11/08/05 05:18:35: 6: DoorLatch(1 1) exit
11/08/05 05:18:35: 13: quadrant 2 X EOT Y EOT X offset 5.337098 Y offset 6.45721
6
11/08/05 05:19:01:838: quadrant 3 X EOT Y BOT X offset 5.337098 Y offset 4.000000
0
11/08/05 05:19:28:837: quadrant 0 X BOT Y BOT X offset 4.000000 Y offset 4.000000
0
11/08/05 05:19:55:286: quadrant 1 X BOT Y EOT X offset 4.000000 Y offset 6.45721
6
X BOT delta is 4.258176
X EOT delta is -3.740421
Y BOT delta is 4.208786
Y EOT delta is -3.796235
11/08/05 05:20:24:569: DoorLatch(0 1)
11/08/05 05:20:24:572: Door is Closed
11/08/05 05:20:24:575: Unlatching Door
11/08/05 05:20:24:579: DoorLatch(0 1) exit
```

At the bottom of the terminal window, there are status indicators: Connected 00:19:31, Auto detect, 38400 8-N-1, SCROLL, CAPS, NORM, Capture, Print echo.

Z BOT Zoffset:	This value is the expected position of the Z BOT sensor.
Z EOT Z offset:	This value is the expected position of the Z EOT sensor.
Z BOT delta :	This value is the actual position - expected position of the Z BOT sensor.
Z EOT delta :	This value is the actual position - expected position of the Z EOT sensor.

5. xt=Test XY Limits

Tests the XY axis by moving from corner to corner, stopping at each corner and measuring the offset against the actual position as indicated by the limit switches.

The command can be used for testing the Z-Stage. To do so, repeat the **tz** command at least 2 times and compare the **XBOT delta** values, **X EOT delta** values, **YBOT delta** values and the **Y EOT delta** values.

Parameters:

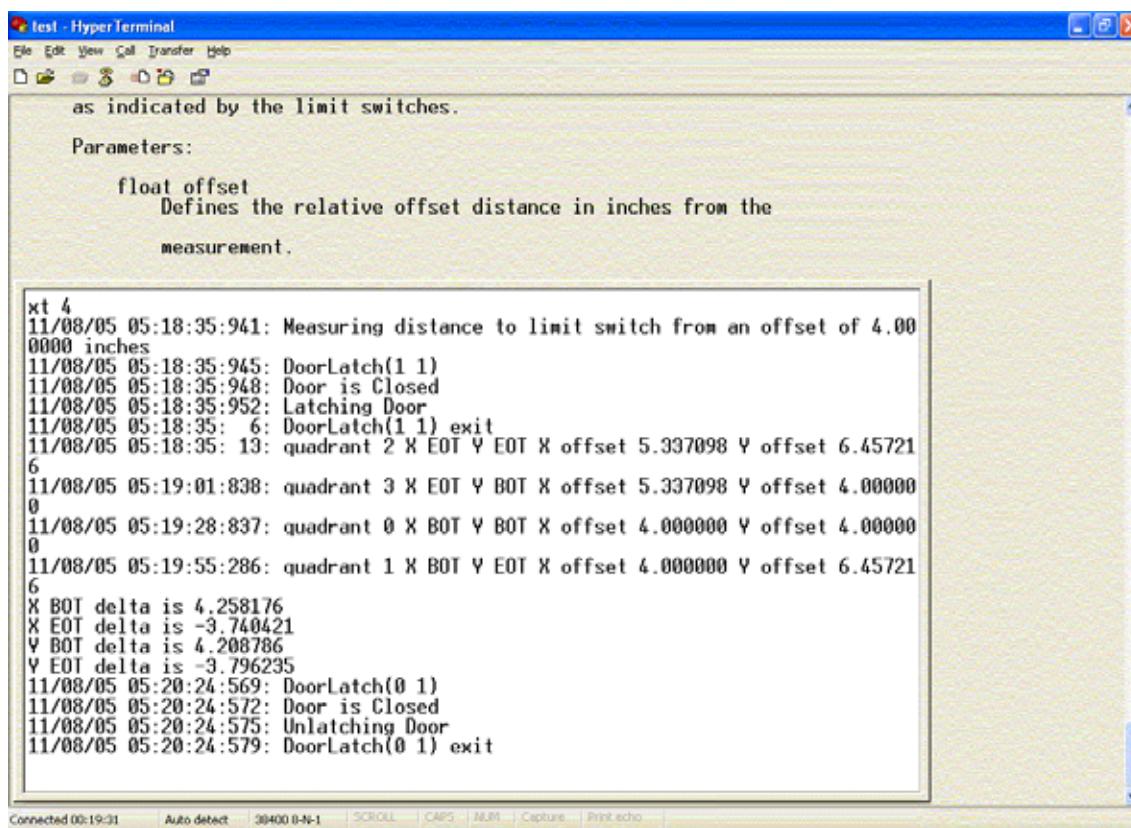
Float Offset:

Defines the relative offset distance in inches from the limit switch. The offset is the starting point for the measurement.

Example= xt 2.0 2.0= distance, where the machine starts to look for the sensors.

For repeating the command, type in the following: **rt 2 1 "xt 2.0"**. For more information see the **rt** command (item #8) in this manual.

Figure 13: Text XY limits



The screenshot shows a Windows HyperTerminal window titled "test - HyperTerminal". The window displays the following text:

```
as indicated by the limit switches.

Parameters:
    float offset
        Defines the relative offset distance in inches from the
        measurement.

xt 4
11/08/05 05:18:35:941: Measuring distance to limit switch from an offset of 4.00
0000 inches
11/08/05 05:18:35:945: DoorLatch(1 1)
11/08/05 05:18:35:948: Door is Closed
11/08/05 05:18:35:952: Latching Door
11/08/05 05:18:35: 6: DoorLatch(1 1) exit
11/08/05 05:18:35: 13: quadrant 2 X EOT Y EOT X offset 5.337098 Y offset 6.45721
6
11/08/05 05:19:01:838: quadrant 3 X EOT Y BOT X offset 5.337098 Y offset 4.00000
0
11/08/05 05:19:28:837: quadrant 0 X BOT Y BOT X offset 4.000000 Y offset 4.00000
0
11/08/05 05:19:55:286: quadrant 1 X BOT Y EOT X offset 4.000000 Y offset 6.45721
6
X BOT delta is 4.258176
X EOT delta is -3.740421
Y BOT delta is 4.208786
Y EOT delta is -3.796235
11/08/05 05:20:24:569: DoorLatch(0 1)
11/08/05 05:20:24:572: Door is Closed
11/08/05 05:20:24:575: Unlatching Door
11/08/05 05:20:24:579: DoorLatch(0 1) exit
```

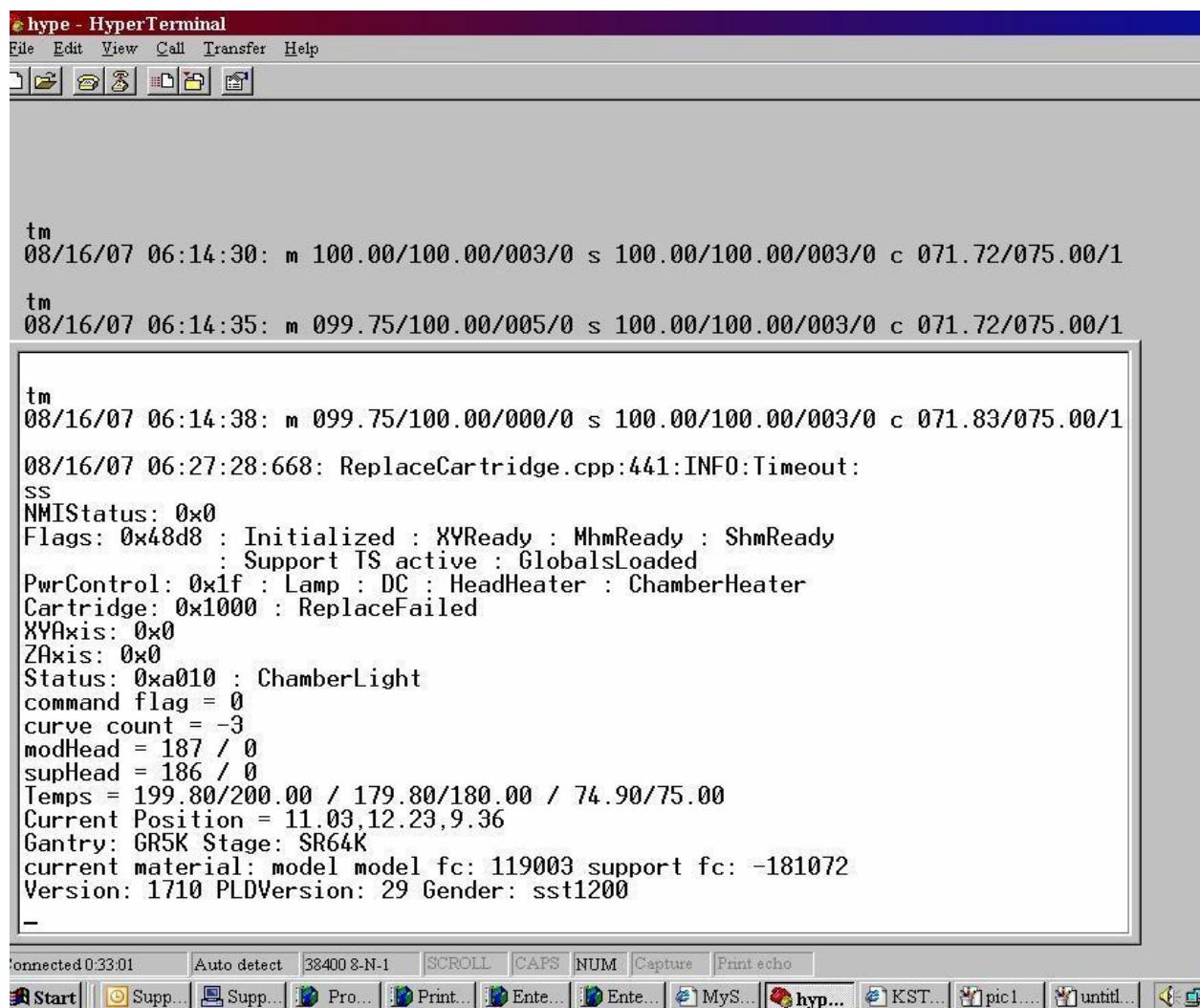
At the bottom of the window, status indicators show: Connected 00:19:31, Auto detect, 38400 8-N-1, SCROLL, CAPS, NUM, Capslock, Printecho.

6. ss=Switch Status

The ss diagnostic message stands for send status. The controller outputs a report on optical and mechanical switches to the terminal window.

Use this command to look for the Gender of the system and the Software version.

Figure 14: Switch status



The screenshot shows a HyperTerminal window titled "hype - HyperTerminal". The window displays a series of diagnostic messages. The first two lines show timestamped sensor readings. The subsequent lines show the results of the "ss" command, detailing various system status parameters such as NMIStatus, Flags, PwrControl, Cartridge, XYAxis, ZAxis, Status, command flag, curve count, modHead, supHead, Temps, Current Position, Gantry, current material, and Version. The output concludes with the Gender: sst1200.

```
tm
08/16/07 06:14:30: m 100.00/100.00/003/0 s 100.00/100.00/003/0 c 071.72/075.00/1
tm
08/16/07 06:14:35: m 099.75/100.00/005/0 s 100.00/100.00/003/0 c 071.72/075.00/1
tm
08/16/07 06:14:38: m 099.75/100.00/000/0 s 100.00/100.00/003/0 c 071.83/075.00/1
08/16/07 06:27:28:668: ReplaceCartridge.cpp:441:INFO:Timeout:
ss
NMIStatus: 0x0
Flags: 0x48d8 : Initialized : XYReady : MhmReady : ShmReady
          : Support TS active : GlobalsLoaded
PwrControl: 0x1f : Lamp : DC : HeadHeater : ChamberHeater
Cartridge: 0x1000 : ReplaceFailed
XYAxis: 0x0
ZAxis: 0x0
Status: 0xa010 : ChamberLight
command flag = 0
curve count = -3
modHead = 187 / 0
supHead = 186 / 0
Temps = 199.80/200.00 / 179.80/180.00 / 74.90/75.00
Current Position = 11.03,12.23,9.36
Gantry: GR5K Stage: SR64K
current material: model model fc: 119003 support fc: -181072
Version: 1710 PLDVersion: 29 Gender: sst1200
-
```

7. gp = get POST. Displays power on self test results

Use this command to check if the controller board passes the self test and to see the reason for the last reset.

Figure 15: Get POST

The figure consists of two side-by-side screenshots of a HyperTerminal window. Both windows have a title bar '1 - HyperTerminal' and a menu bar 'File Edit View Cell Transfer Help'. The left window shows POST results for a board connected at 38400 B-N-1. The right window shows similar results for another board connected at 38400 B-N-1. Both windows display a series of tests and their outcomes, including memory and voltage checks.

```
11/10/05 06:38:36:928: reading POST results and sending to client 1
Internal Flash CRC Test [PASS]
SDRAM Addr Test [PASS]
ISA DPM Addr Test [PASS]
PmD DPM Data Test [PASS]
External Flash CRC Test [PASS]
NVRAM check [PASS]
Supply Voltages
 5V supply: 5.05V Range: 4.85 to 5.15 [PASS]
12V supply: 11.96V Range: 11.28 to 12.72 [PASS]
15V supply: 15.96V Range: 13.50 to 16.50 [PASS]
-15V supply: -15.64V Range: -13.50 to -16.50 [PASS]
10V supply: 9.96V Range: 9.84 to 10.16 [PASS]
3.3V supply: 3.30V Range: 3.23 to 3.37 [PASS]
Navigator checksum: 0x12345678
Navigator version: 0x28400f23
Pilot checksum: 0x12345678
Pilot version: 0x34100f20

PmD DAC Tests
XSin@0.00V: 0.01V Range: -0.06 to 0.06 [PASS]
XSin@2.15V: 2.25V Range: 1.96 to 2.34 [PASS]
XSin@4.30V: 4.29V Range: 3.98 to 4.62 [PASS]
VSin@0.00V: 0.01V Range: -0.06 to 0.06 [PASS]
VSin@2.15V: 2.25V Range: 1.96 to 2.34 [PASS]
VSin@4.30V: 4.27V Range: 3.98 to 4.62 [PASS]
ZSin@0.00V: 0.01V Range: -0.06 to 0.06 [PASS]
ZSin@2.15V: 2.25V Range: 1.96 to 2.34 [PASS]
ZSin@4.30V: 4.35V Range: 3.98 to 4.62 [PASS]
Controller board EEPROM CRC Test [PASS]

Connected 00:14:33 Auto detect: 38400 B-N-1 SCROLL CAPS NUM CAPTURE PRINT ECHO
```



```
12V supply: 11.96V Range: 11.28 to 12.72 [PASS]
15V supply: 15.96V Range: 13.50 to 16.50 [PASS]
-15V supply: -15.64V Range: -13.50 to -16.50 [PASS]
10V supply: 9.96V Range: 9.84 to 10.16 [PASS]
3.3V supply: 3.30V Range: 3.23 to 3.37 [PASS]
Navigator checksum: 0x12345678
Navigator version: 0x28400f23
Pilot checksum: 0x12345678
Pilot version: 0x34100f20

PmD DAC Tests
XSin@0.00V: 0.01V Range: -0.06 to 0.06 [PASS]
XSin@2.15V: 2.25V Range: 1.96 to 2.34 [PASS]
XSin@4.30V: 4.29V Range: 3.98 to 4.62 [PASS]
VSin@0.00V: 0.01V Range: -0.06 to 0.06 [PASS]
VSin@2.15V: 2.25V Range: 1.96 to 2.34 [PASS]
VSin@4.30V: 4.27V Range: 3.98 to 4.62 [PASS]
ZSin@0.00V: 0.01V Range: -0.06 to 0.06 [PASS]
ZSin@2.15V: 2.25V Range: 1.96 to 2.34 [PASS]
ZSin@4.30V: 4.35V Range: 3.98 to 4.62 [PASS]
Controller board EEPROM CRC Test [PASS]
Controller Configuration ID: 0
Controller part number: 202140-0008
Controller serial number: 0513-000076
Power Dist board EEPROM CRC Test [PASS]
PDB Configuration ID: 0
PDB part number: 202143-0002
PDB serial number: 0511-000053
CPLD version: 29
Coldfire version: 2 rev: 0
Mariner build: 1400.0
Cause of last reset: Software Reset
POST successful!
-
```

Connected 00:15:13 Auto detect: 38400 B-N-1 SCROLL CAPS NUM CAPTURE PRINT ECHO

8. **rt = repeat**

This command will tell the machine to repeat the previous command. The command line takes a repeat count, and flags whether or not to ignore errors. It will also flag whether or not to show the command line of the command to be run. The command line consists of one or more commands separated by semicolons. The entire command line must be enclosed within double quotes. Each command within the command line consists of a name and its parameters. The command line is run until the iteration count is reached or an error occurs. For each iteration, each command within the command line is run in the order in which it appears.

Parameters:

signed integer count	This parameter specifies the number of times the command is to be run.
signed integer ignoreErrors	This parameter specifies whether errors should be ignored. A value of zero causes the test to stop when an error is encountered. A value of one causes the test to run for the full count even when errors occur.
string commandLine	This parameter contains the command line of the command to be run enclosed within double quotes. A commandline includes the name of the command followed by its parameters.

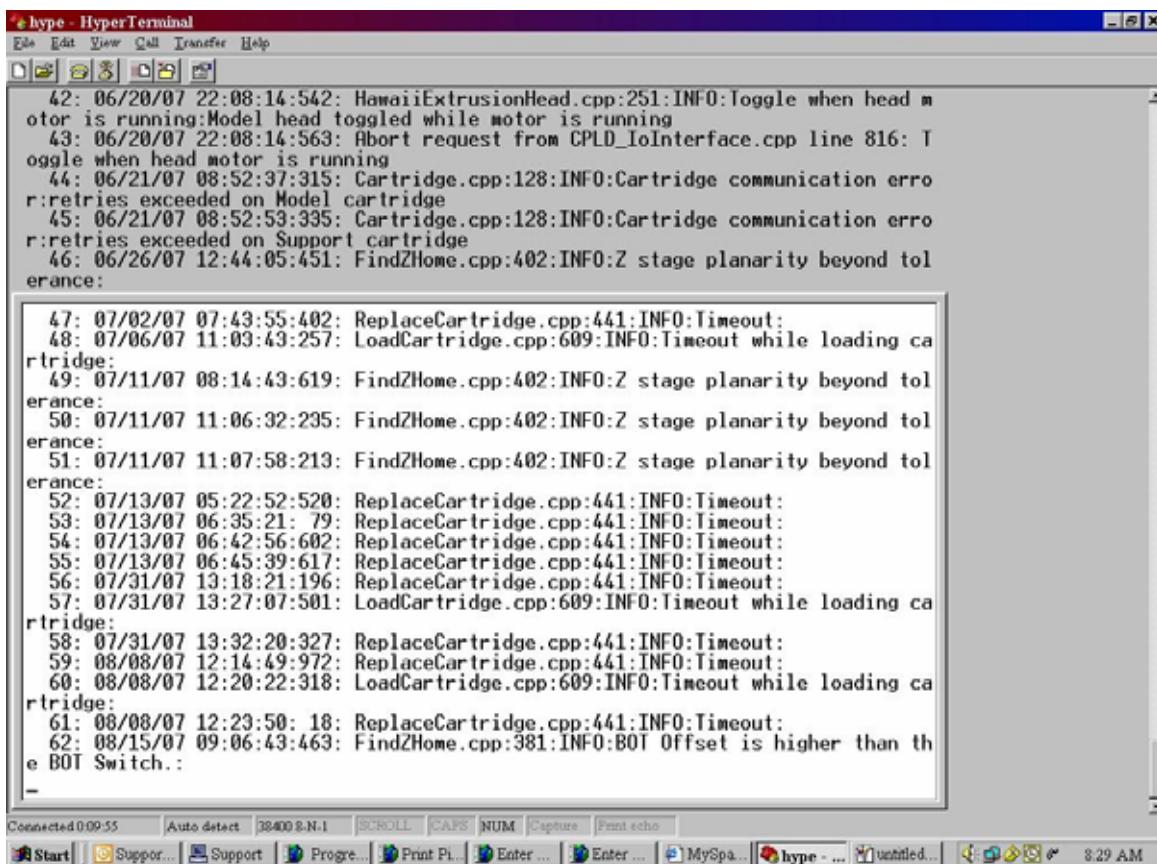
Example: rt 2 1 "fh"

9. le = load exception log

This command prints the contents of the exception log located in non-volatile memory. This exception log contains a record of the most recent exceptions that occurred within the controller. The exceptions are printed in chronological order.

Use this command to get the History of systems errors printed on the screen.

Figure 16: Load exception



```
42: 06/20/07 22:08:14:542: HawaiiExtrusionHead.cpp:251:INFO:Toggle when head motor is running:Model head toggled while motor is running
43: 06/20/07 22:08:14:563: Abort request from CPLD_IoInterface.cpp line 816: Toggle when head motor is running
44: 06/21/07 08:52:37:315: Cartridge.cpp:128:INFO:Cartridge communication error:retries exceeded on Model cartridge
45: 06/21/07 08:52:53:335: Cartridge.cpp:128:INFO:Cartridge communication error:retries exceeded on Support cartridge
46: 06/26/07 12:44:05:451: FindZHome.cpp:402:INFO:Z stage planarity beyond tolerance:
47: 07/02/07 07:43:55:402: ReplaceCartridge.cpp:441:INFO:Timeout:
48: 07/06/07 11:03:43:257: LoadCartridge.cpp:609:INFO:Timeout while loading cartridge:
49: 07/11/07 08:14:43:619: FindZHome.cpp:402:INFO:Z stage planarity beyond tolerance:
50: 07/11/07 11:06:32:235: FindZHome.cpp:402:INFO:Z stage planarity beyond tolerance:
51: 07/11/07 11:07:58:213: FindZHome.cpp:402:INFO:Z stage planarity beyond tolerance:
52: 07/13/07 05:22:52:520: ReplaceCartridge.cpp:441:INFO:Timeout:
53: 07/13/07 06:35:21: 79: ReplaceCartridge.cpp:441:INFO:Timeout:
54: 07/13/07 06:42:56:602: ReplaceCartridge.cpp:441:INFO:Timeout:
55: 07/13/07 06:45:39:617: ReplaceCartridge.cpp:441:INFO:Timeout:
56: 07/31/07 13:18:21:196: ReplaceCartridge.cpp:441:INFO:Timeout:
57: 07/31/07 13:27:07:501: LoadCartridge.cpp:609:INFO:Timeout while loading cartridge:
58: 07/31/07 13:32:20:327: ReplaceCartridge.cpp:441:INFO:Timeout:
59: 08/08/07 12:14:49:972: ReplaceCartridge.cpp:441:INFO:Timeout:
60: 08/08/07 12:20:22:318: LoadCartridge.cpp:609:INFO:Timeout while loading cartridge:
61: 08/08/07 12:23:50: 18: ReplaceCartridge.cpp:441:INFO:Timeout:
62: 08/15/07 09:06:43:463: FindZHome.cpp:381:INFO:BOT Offset is higher than the BOT Switch.:
```

10. mx = move x

This command moves the head in the X axis.

Parameters:

Float Position:

This is the position it moves to, in inches, when the command is sent from the Console and in device units when the command is sent through the DPM.

Example: mx 3.0 (moves the X-Axis 3 inches away from the X-Home sensor)

11. **my = move y**

This command moves the head in the y axis.

Parameters:

Float Position:

This is the position it moves to, in inches, when the command is sent from the Console and in device units when the command is sent through the DPM.

Example: my 3.0 (moves the Y-Axis 3 inches away from the Y-Home sensor)

12. **cl = chamber light**

This command turns the chamber light on and off.

Parameters:

signed integer lightState

- 0 turns the light off.
- 1 turns the light on

Example: cl 1 (turns the lights on)

13. **dl = door latch**

This command controls the door latch solenoid. The door latch can be opened or closed.

Parameters:

signed integer state

- 0 - Open the door latch.
- 1 - Close the door latch.
- 2 - Place the controller in charge of the latch.

Example: dl 1 (closes the door latch)

14. **tm = monitors temperatures**

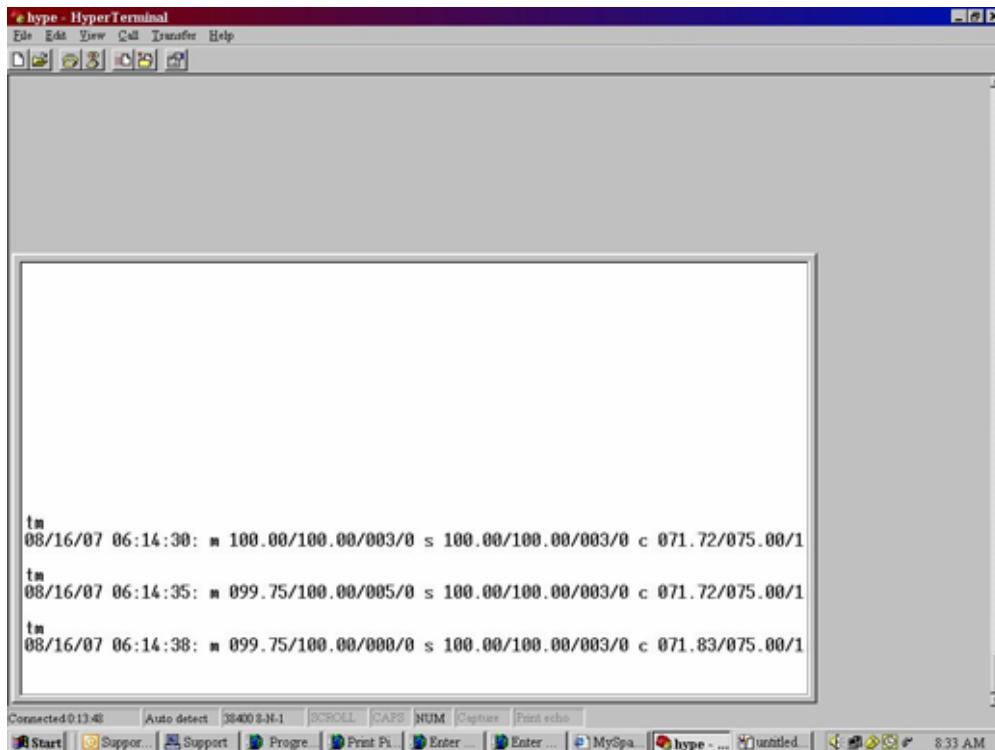
This command displays temperature information for the model Liquefier, support liquefier, and chamber heater. The chamber Door Latch (1 1)

The information is displayed on a single line in the following format:

MM/DD/YY HH:MM:SS:

m <cur>/<set>/<pwm>/<ts> s <cur>/<set>/<pwm>/<ts> c <cur>/<set>/<on/off>

Figure 17: Monitor temperatures



This is what the set temperature is regulated to. This is either the set point or the setback temperature depending on whether temperature setback is active. The TS field shows whether temperature setback is active.

The TS fields are displayed as 0 or 1 depending on whether they disabled/enabled or off/on respectively.

Parameters:

Signed integer enable. This optional parameter enables the continuous display of the temperature information. A value of 0 disables the display and a value of 1 enables it. The information is displayed just once if this parameter is missing.

Example: It is useful if you use the rt command together with the tm command (see the rt command for more information)

rt 1000 1 "tm" - this prints the temperature 1000 times on the screen.

Use this command if you experience temperature problems with the head. Check if the model and support temperature reach the setpoint and if the temperature is stable once it reaches the setpoint temperature. Check if the PWM value varies instead of switching on and off. If the PWM switches on and off, then the T/C board might be the root cause. (see also 14:67 error in the Troubleshooting Guide)

Service Procedures

5

This chapter describes removal and replacement procedures for Dimension, 768 and Elite printers.

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Should you have any questions about Dimension BST/SST replacement procedures, contact Stratasys Customer Support at 1-800-801-6491 for further information or assistance.

Read these warnings before performing any service on this machine!



Warning: Ensure the printer is not powered on when performing any of the assembly instructions in this chapter. Failure to do so can cause severe personal injury or damage to the electronics.



Caution: Servicing instructions outlined in this chapter are intended for use by qualified personnel only. Failure to follow these guidelines can cause severe injury. Do not perform any service that is not outlined in this chapter, unless qualified.



Warning: The Power Down Switch does NOT remove power from the system. The Circuit Breaker Switch located on the rear of the printer MUST be off before service is performed on the printer. It is recommended that the AC power cord be disconnected before servicing the printer.



Warning: Use extreme caution when the door solenoid is disabled. Axis may move unexpectedly, which may cause serious injury. Always remember to enable the door solenoid once service is completed.

Exterior Components

Rear Door

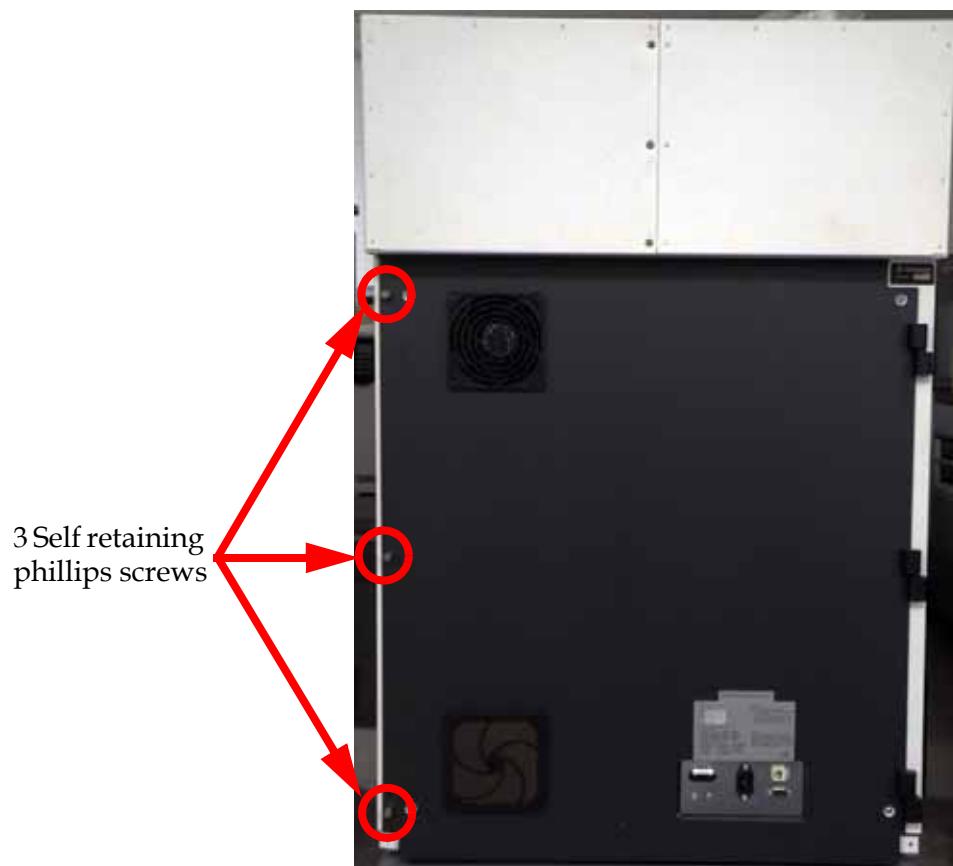
Required Tools

- Phillips screwdriver

Removing the Rear Door:

1. Using a phillips screwdriver, loosen the 3 self retaining screws. See [Figure 1](#).

Figure 1: Self retaining screw locations



2. Open the door and lift upwards to remove from hinges. Set door aside. See [Figure 2](#).

Figure 2: Removing rear door



Installing the Rear Door:

1. Align the door with the hinges and set into place.
2. Close the door and use a phillips screwdriver to tighten the 3 self retaining screws.

Side Panels



Printers with a serial number less than P04746 will have white panels.
Printers with a serial number greater than P04746 will have gray panels.

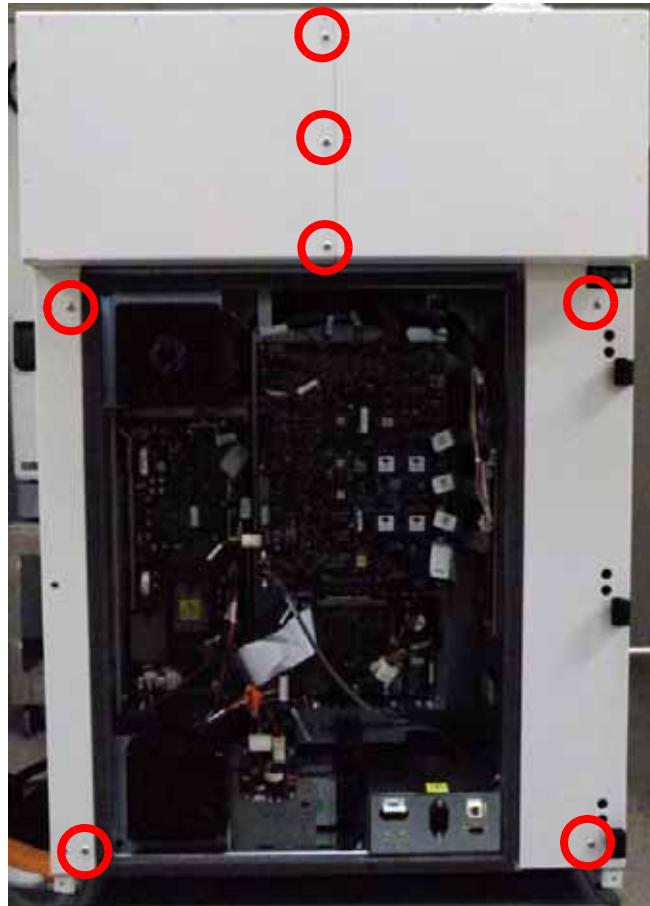
Required Tools

- $\frac{1}{8}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver

Removing the Side Panels for serial numbers less than P04746:

1. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
2. Using a $\frac{1}{8}$ " allen wrench, remove the 7 side panel mounting screws. See [Figure 3](#).

Figure 3: Side panel mounting screw locations



3. Lift the panels and remove.

Installing the Side Panels for serial numbers less than P04746:

1. Align the panels with the printer.
2. Using a $\frac{1}{8}$ " allen wrench, reinstall the 7 mounting screws.
3. Reinstall the rear door. See "["Installing the Rear Door:"](#) on page 5-10.

Removing the Side Panels for serial numbers greater than P04746:

1. Remove the rear door. See "["Removing the Rear Door:"](#) on page 5-9.
2. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 7 side panel mounting screws. See [Figure 4](#).

Figure 4: Side panel mounting screw locations



3. Lift the panels and remove.

Installing the Side Panels for serial numbers greater than P04746:

1. Align the panels with the printer.
2. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 7 mounting screws.
3. Reinstall the rear door. See "["Installing the Rear Door:"](#) on page 5-10.

Front Bezel

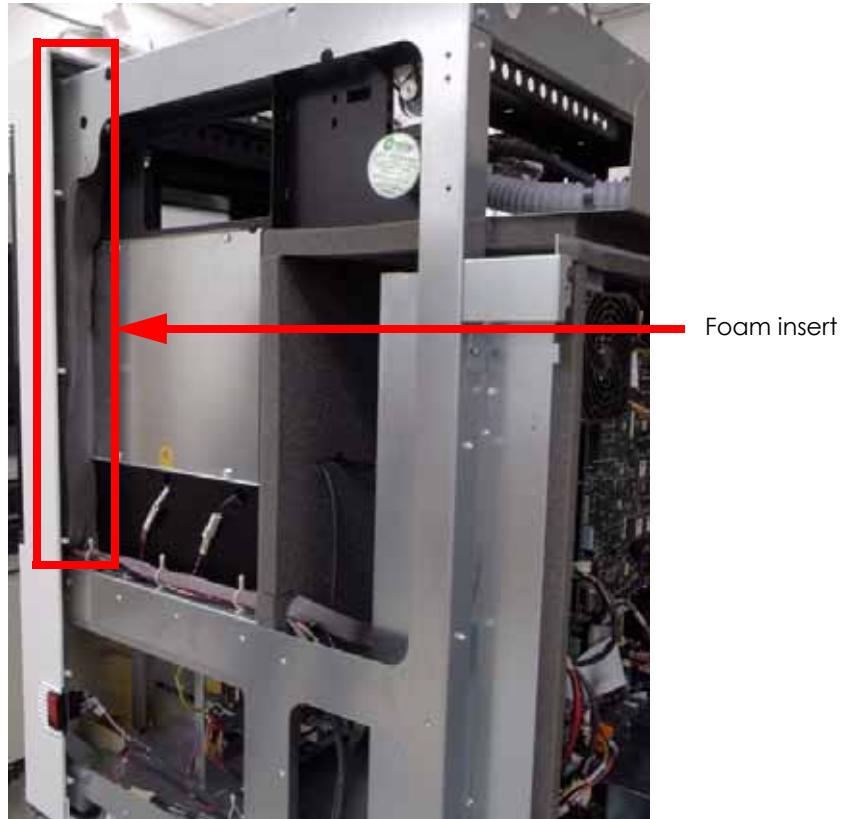
Required Tools

- $\frac{3}{16}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{11}{32}$ " nut driver or box wrench
- $\frac{1}{4}$ " nut driver or box wrench

Removing the Front Bezel:

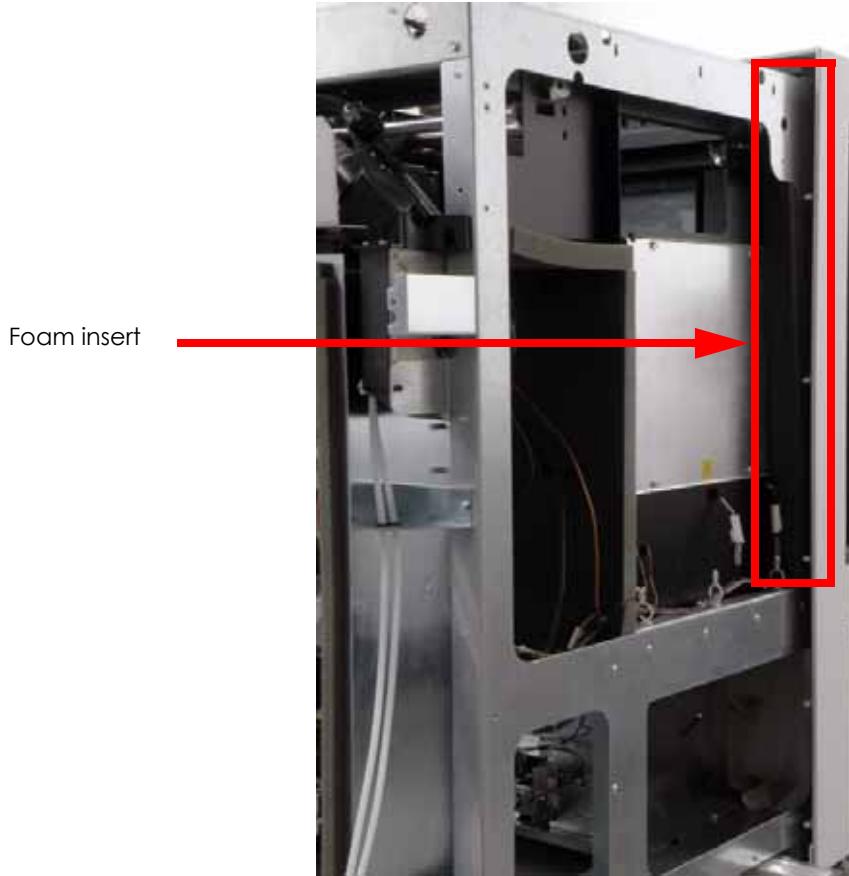
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the foam insert from behind the right side of the bezel. See [Figure 5](#).

Figure 5: Right side foam insert location



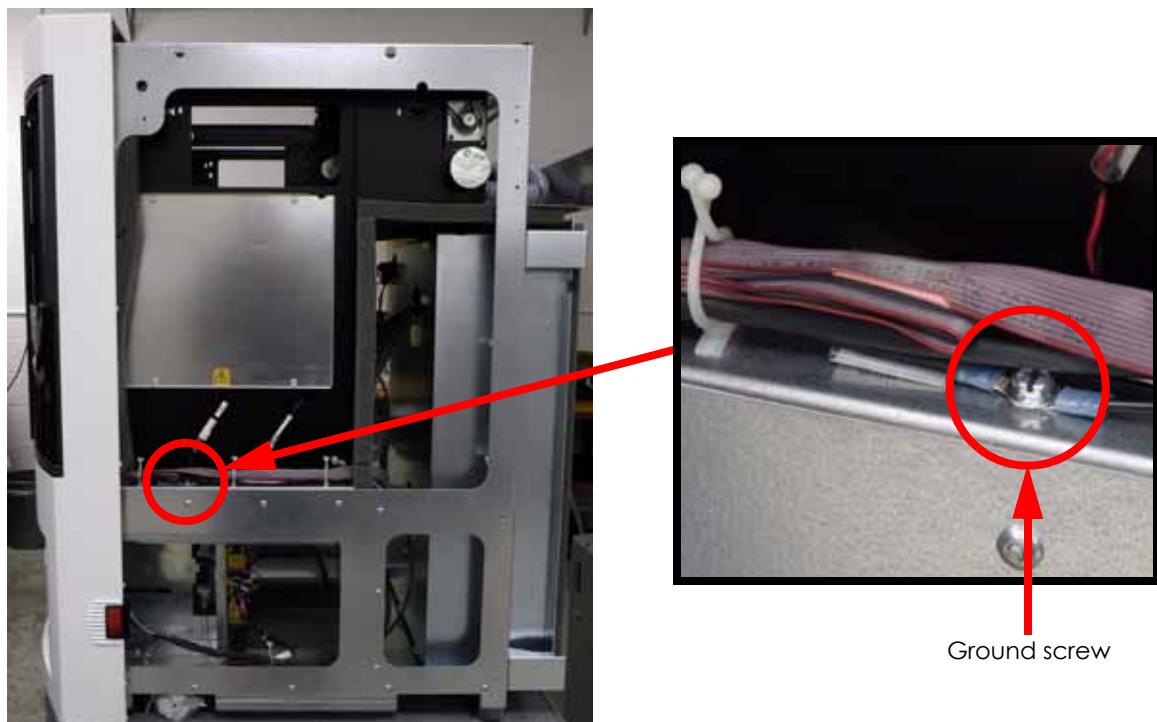
6. Remove the foam insert from behind the left side of the bezel. See [Figure 6](#).

Figure 6: Left side foam insert location



7. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the ground wire screw from the frame. See [Figure 7](#).

Figure 7: Ground screw location



8. Un-clip the 4 wire clips from behind the bezel on the right side. See [Figure 8](#).

Figure 8: Wire clip locations

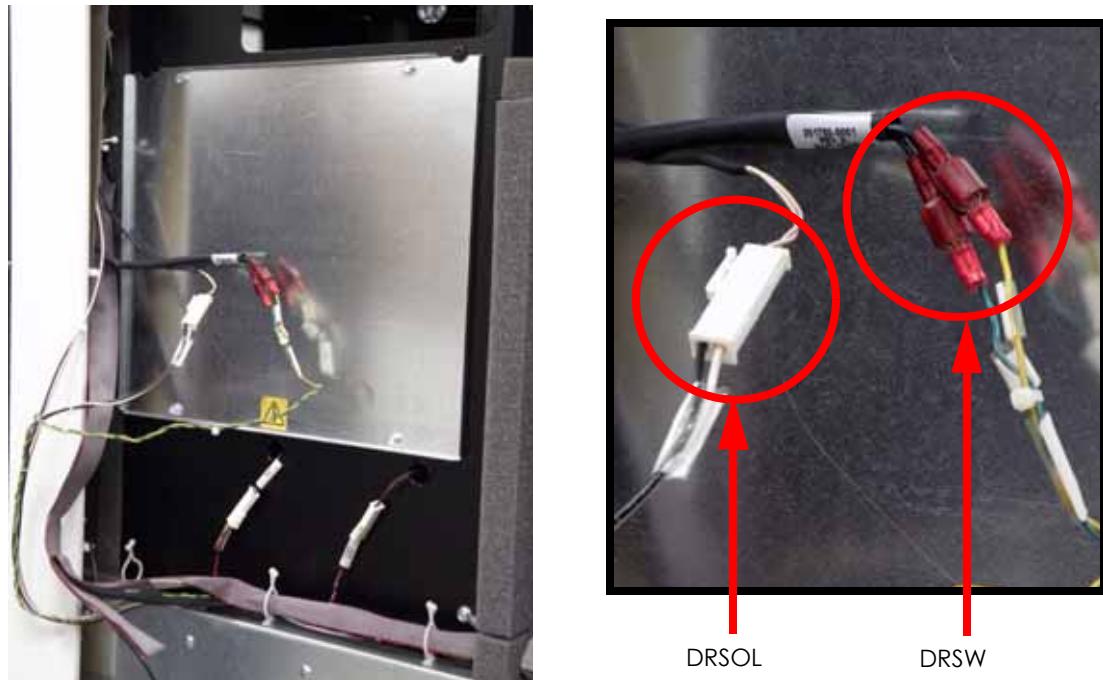


9. Disconnect the DRSOL cable by pressing the tab and pulling apart. See [Figure 9](#).
10. Disconnect the DRSW COM (green) and ON (yellow) by pulling apart. See [Figure 9](#).



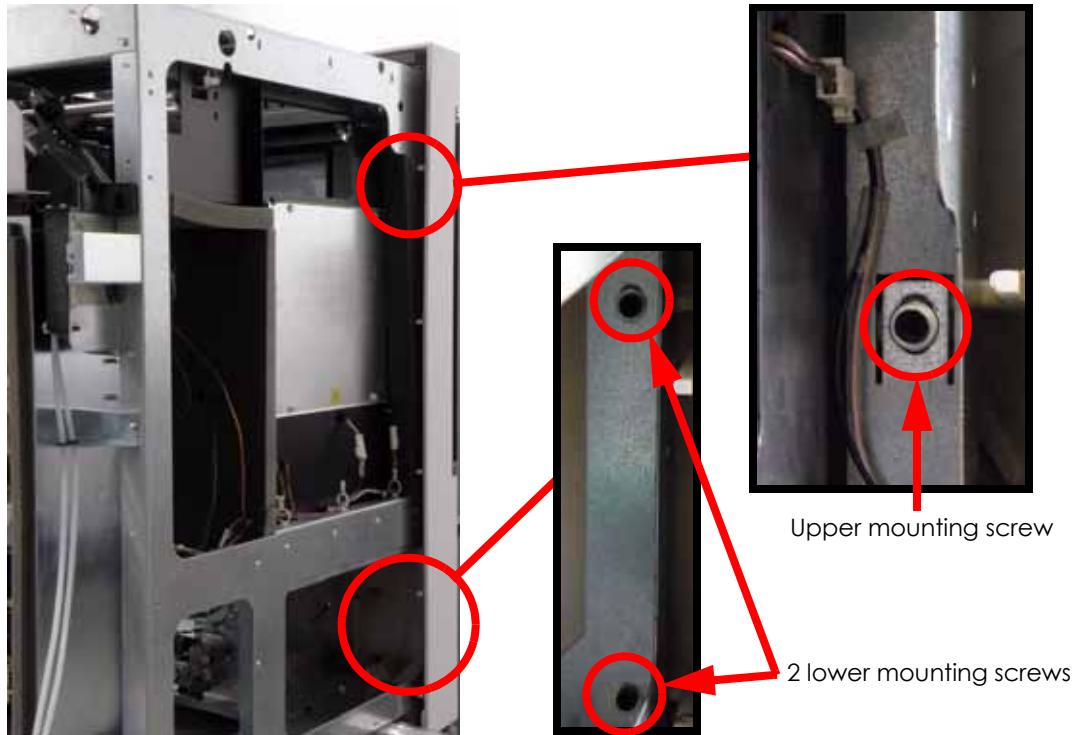
Mark the DRSW cables for easy reinstallation

Figure 9: Door cable locations



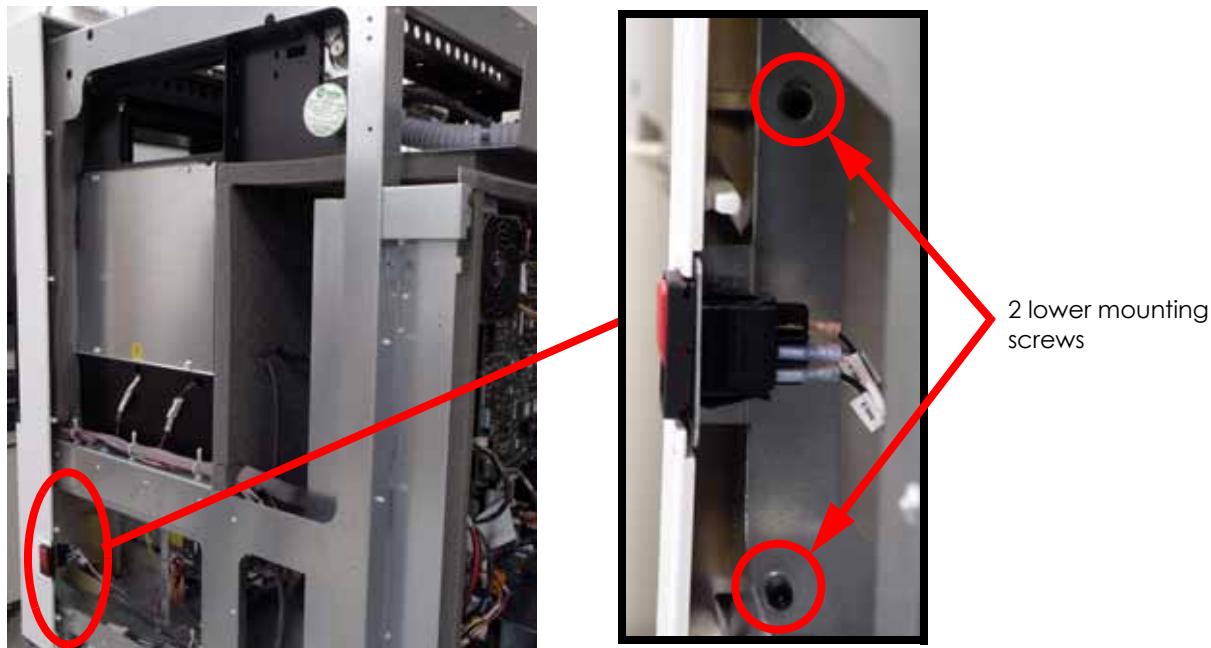
11. Using a $\frac{3}{16}$ " allen wrench, remove the 3 left side bezel mounting screws. See [Figure 10](#).

Figure 10: Bezel left side mounting screw locations



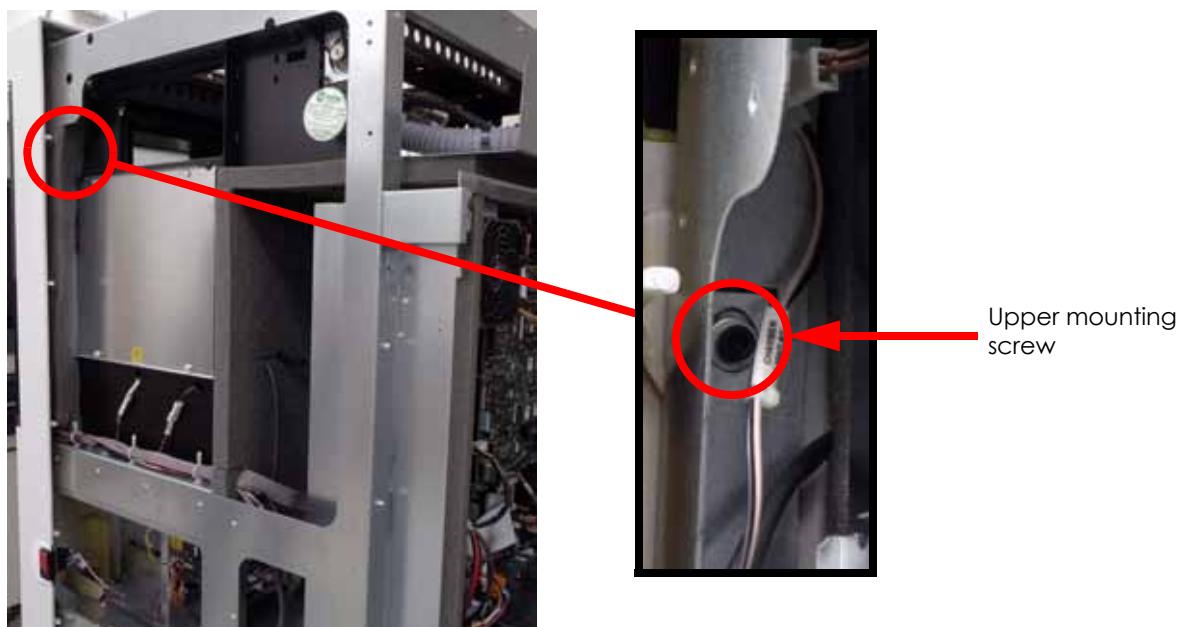
12. Using a $\frac{3}{16}$ " allen wrench, remove the 2 lower right side bezel mounting screws. See [Figure 11](#).

Figure 11: Bezel right side lower mounting screw locations



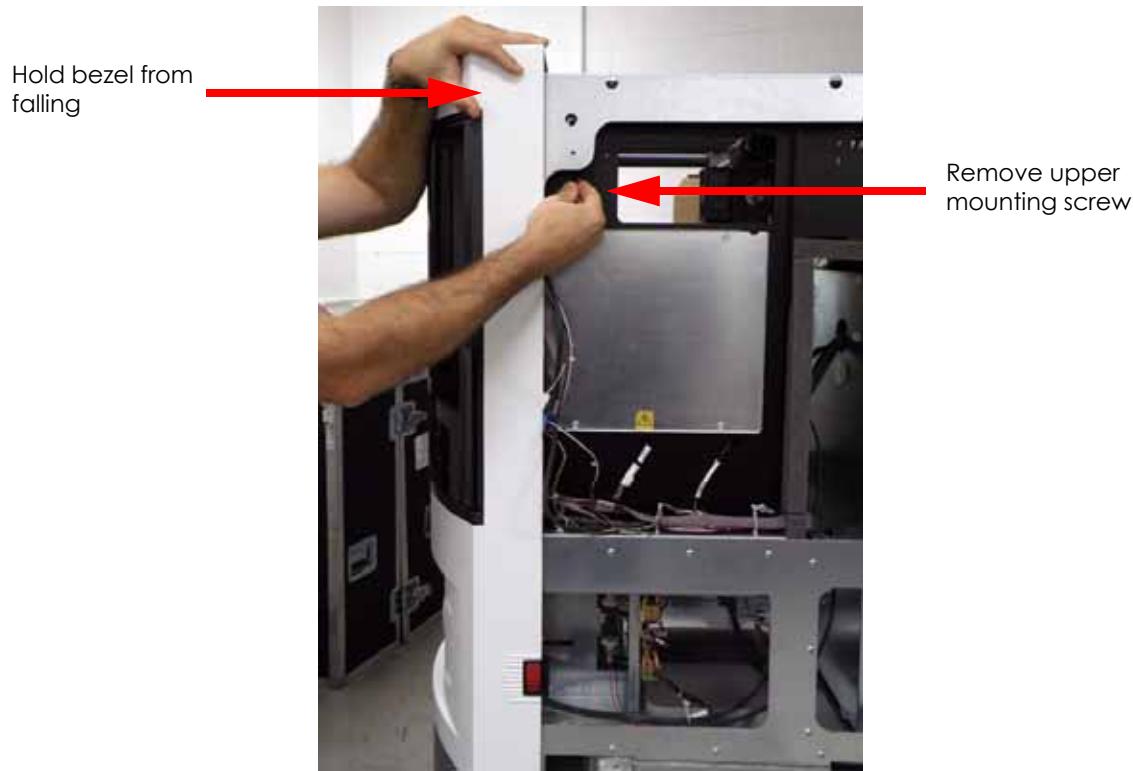
13. Using a $\frac{3}{16}$ " allen wrench, loosen but do not remove the upper right side bezel mounting screw. See [Figure 12](#).

Figure 12: Bezel right side upper mounting screw location



14. Hold the front bezel so it will not fall and use a $\frac{3}{16}$ " allen wrench to remove the upper right side bezel mounting screw. See [Figure 13](#).

Figure 13: Removing the upper bezel mounting screw



15. Gently set the bezel down next to the frame.



Set the bezel down in front of the frame to avoid pulling on cables.

16. Remove the display panel. See ["Removing the Display Panel:"](#) on page 5-21.
17. Remove the door solenoid. See ["Removing the Door Solenoid:"](#) on page 5-24.
18. Remove the door sensor. See ["Removing the Door Sensor:"](#) on page 5-26.

Installing the Front Bezel:

1. Reinstall the door sensor. See “[Installing the Door Sensor:](#)” on page 5-27.
2. Reinstall the door solenoid. See “[Installing the Door Solenoid:](#)” on page 5-25.
3. Reinstall the display panel. See “[Installing the Display Panel:](#)” on page 5-23.
4. Gently lift the front bezel and align it with the mounting holes on the frame.
5. Hold the front bezel so it will not fall and use a $\frac{3}{16}$ ” allen wrench to reinstall the upper right side bezel mounting screw.
6. Using a $\frac{3}{16}$ ” allen wrench, reinstall the 2 lower right side bezel mounting screws.
7. Using a $\frac{3}{16}$ ” allen wrench, reinstall the 3 left side bezel mounting screws.
8. Reconnect the DRSW COM (green) and DRSW ON (yellow) by pushing the spade connectors together.
9. Reconnect the DRSSOL cable by pushing into the connector.
10. Align the 2 ground wires with the ground mounting hole.
11. Using a $\frac{5}{16}$ ” nut driver or standard screwdriver, reinstall the ground screw.
12. Run the cables through the 4 wire clips and close the wire clips.
13. Reinstall the foam inserts to the left and right sides.
14. Reinstall the side panels. See “[Side Panels](#)” on page 5-11.
15. Reinstall the rear door. See “[Installing the Rear Door:](#)” on page 5-10.
16. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
17. Power on the system. The system should reach **Idle** with no displayed errors.
18. Run a small test part and monitor system operation during build.

Display Panel

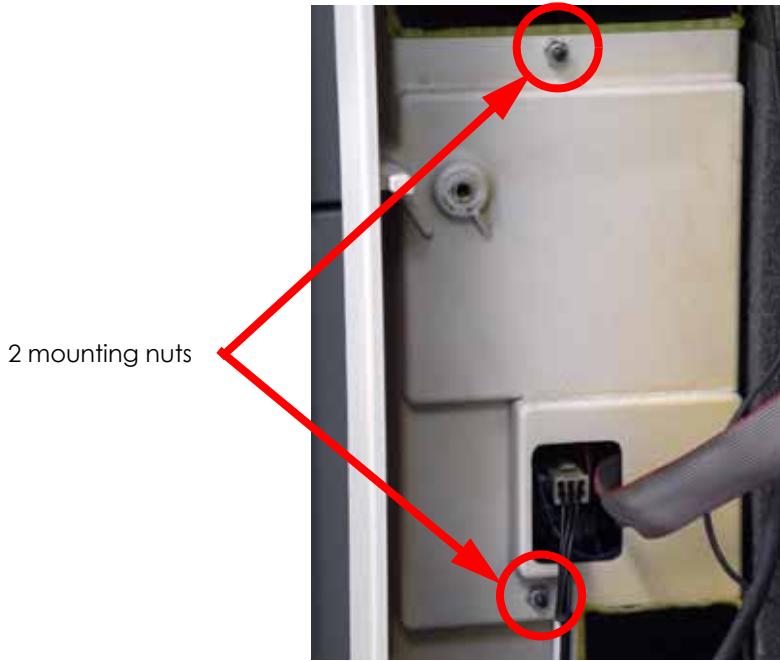
Required Tools

- $\frac{11}{32}$ " nut driver or box wrench

Removing the Display Panel:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
6. Using an $\frac{11}{32}$ " nut driver or box wrench, remove the 2 display panel mounting nuts. See [Figure 14](#).

Figure 14: Display panel mounting nut locations



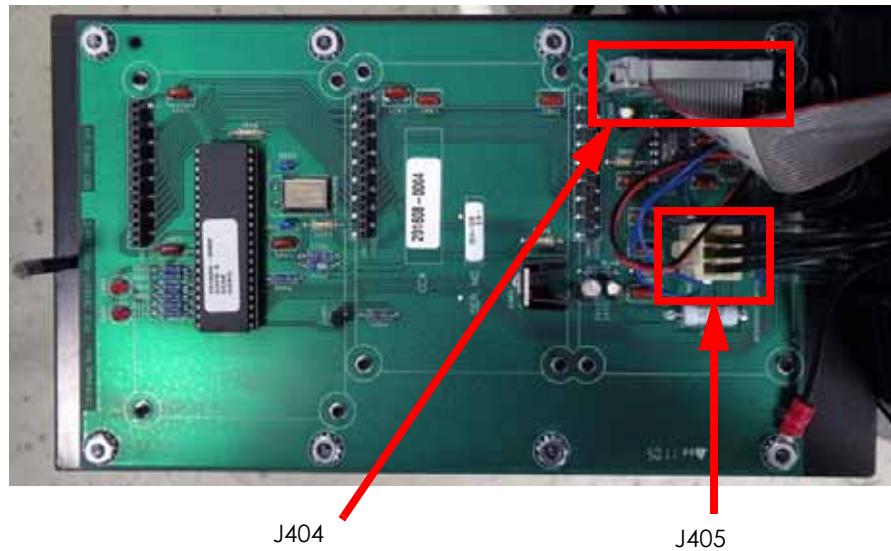
7. Remove the display panel from the bezel by pushing it out through the cable access hatch. See [Figure 15](#).

Figure 15: Display panel cable access hatch location



8. Disconnect the J404 ribbon cable from the display panel by pressing the tabs out and pulling outwards. See [Figure 16](#).
9. Disconnect the J405 cable from the display panel by pressing the tab and pulling outwards. See [Figure 16](#).

Figure 16: Display panel cable locations



10. Remove the display panel and discard.

Installing the Display Panel:

1. Reconnect the J405 cable by pushing into place.
2. Reconnect the J404 ribbon cable by pushing into place.
3. Align the 2 display panel mounting screws with the mounting holes and push into place.



Be sure to feed all wires through the display panel access hatch.

4. Using an $11/32$ " nut driver or box wrench, reinstall the 2 display panel mounting nuts.
5. Reinstall the front bezel. See "["Installing the Front Bezel:" on page 5-20](#)".
6. Install the side panels. See "["Side Panels" on page 5-11](#)".
7. Install the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power on the system. The system should reach **Idle** with no displayed errors.
10. Run a small test part and monitor system operation during build.

Door Solenoid

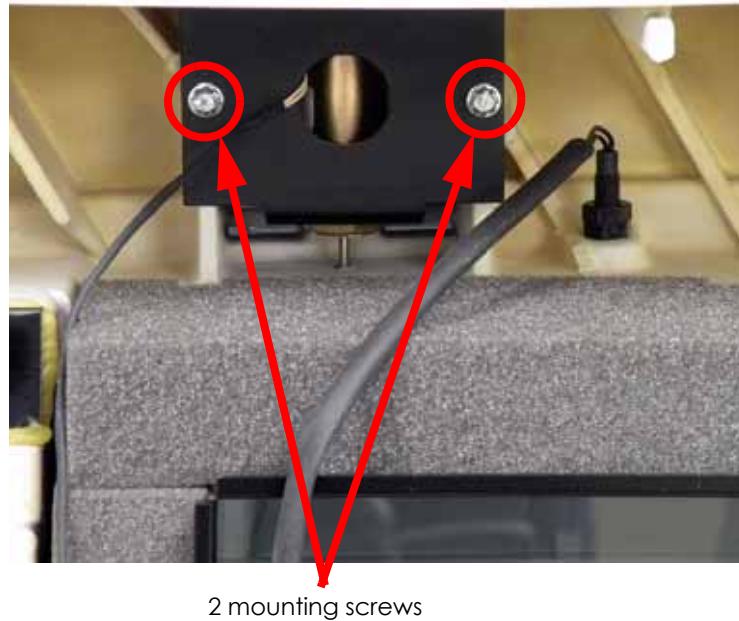
Required Tools

- $\frac{1}{4}$ " nut driver or box wrench

Removing the Door Solenoid:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Remove the front bezel. See “[Removing the Front Bezel:](#)” on page 5-13.
6. Using a $\frac{1}{4}$ " nut driver or box wrench, remove the 2 door solenoid bracket mounting screws. See

Figure 17: Door solenoid bracket mounting screw locations

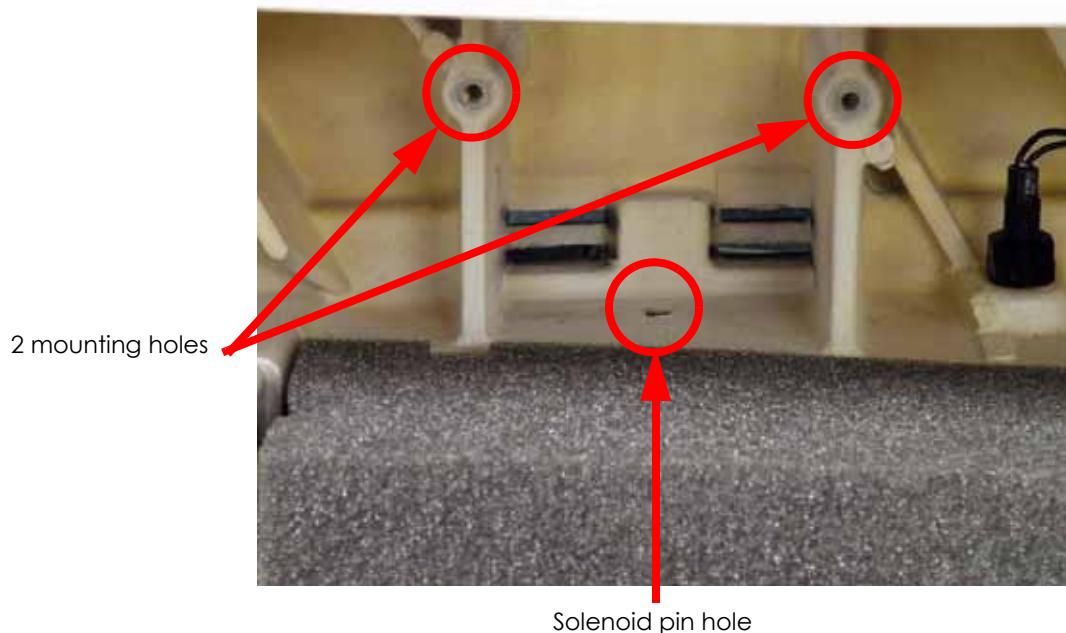


7. Discard the door solenoid assembly.

Installing the Door Solenoid:

1. Align the door solenoid bracket with the mounting holes and slide the solenoid pin through the hole in the front bezel. See [Figure 18](#).

Figure 18: Door solenoid mounting location



2. Using a $\frac{1}{4}$ " nut driver or box wrench, reinstall the 2 door solenoid bracket mounting screws.
3. Reinstall the front bezel. See "[Installing the Front Bezel](#):" on page 5-20.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Door Sensor

Required Tools

- $\frac{1}{2}$ " box wrench
- Light colored marker

Removing the Door Sensor:

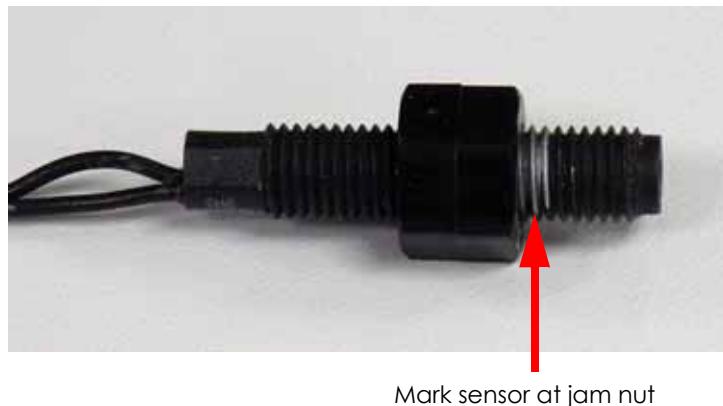
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
6. Using a $\frac{1}{2}$ " box wrench slightly loosen the door sensor jam nuts. See [Figure 19](#).

Figure 19: Door sensor location



7. Remove the door sensor by unscrewing by hand.
8. Using a light colored marker or equivalent, mark the door sensor where the jam nuts are for easy reinstallation. See [Figure 20](#).

Figure 20: Mark the door sensor



Installing the Door Sensor:

1. Line up the door sensors and mark the new door sensor at the same place as the old door sensor.
2. Tighten jam nuts to mark on door sensor.
3. Install the door sensor and turn by hand until tight.
4. Using a $\frac{1}{2}$ " box wrench slightly tighten the door sensor jam nuts.



Do not over tighten the door sensor, it may break if too tight.

5. Reinstall the front bezel. See "["Installing the Front Bezel:" on page 5-20](#).
6. Reinstall the side panels. See "["Side Panels" on page 5-11](#).
7. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#).
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power on the system. The system should reach **Idle** with no displayed errors.
10. Run a small test part and monitor system operation during build.

Gen 3 Electrical Components

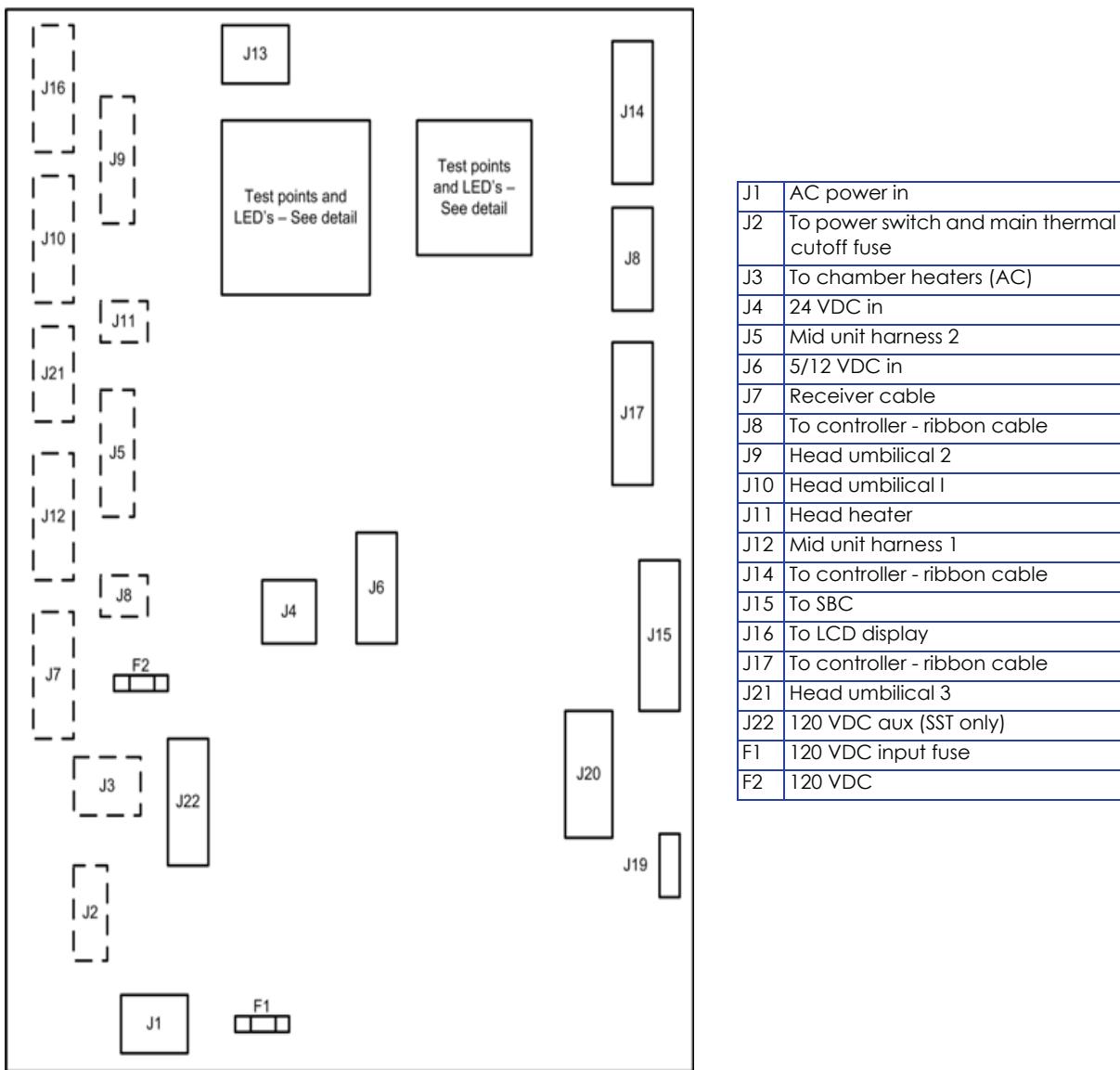
Gen 3 electronics will be installed on printers with serial numbers greater than P09000.

Power Distribution Board (PDB)

Required Tools

- Standard screwdriver
- Phillips screwdriver
- Grounding wrist strap

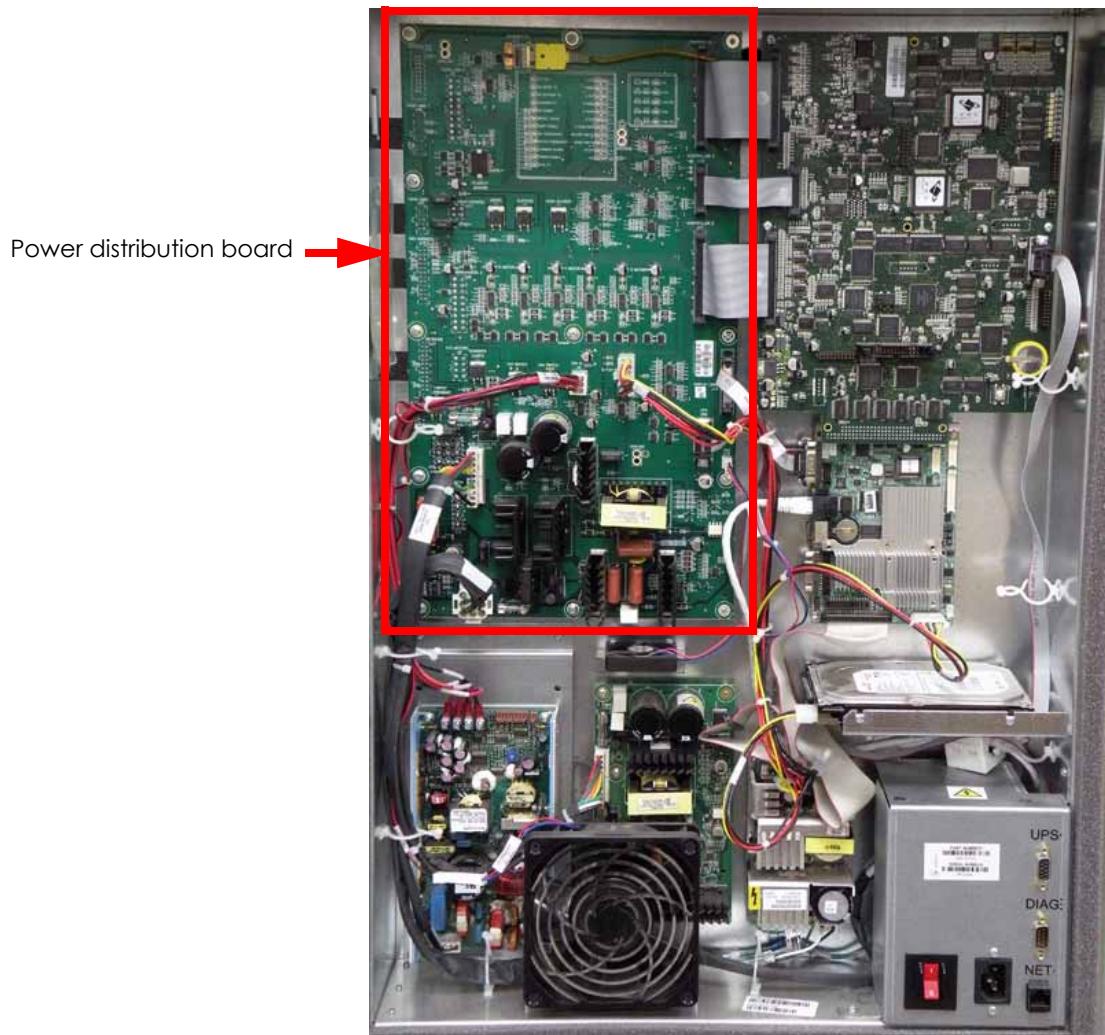
Figure 21: Power distribution board details



Removing the Power Distribution Board:

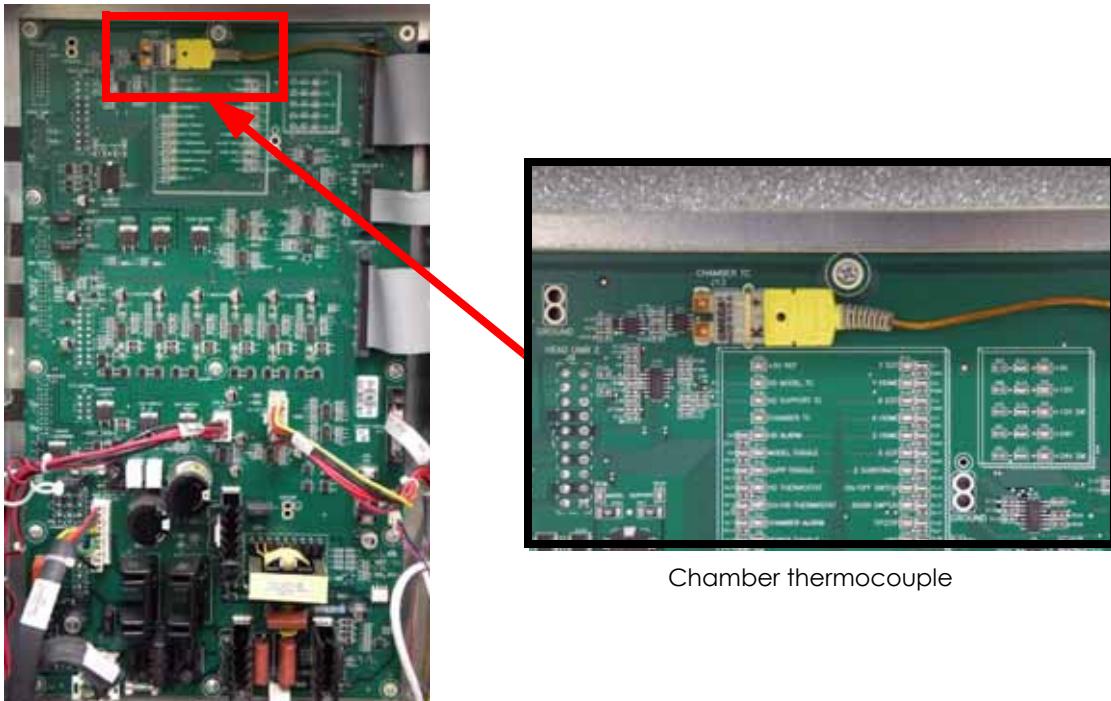
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Wear a grounding wrist strap and connect the end to the electronics bay pan.
6. Locate the power distribution board. See [Figure 22](#).

Figure 22: Power distribution board location



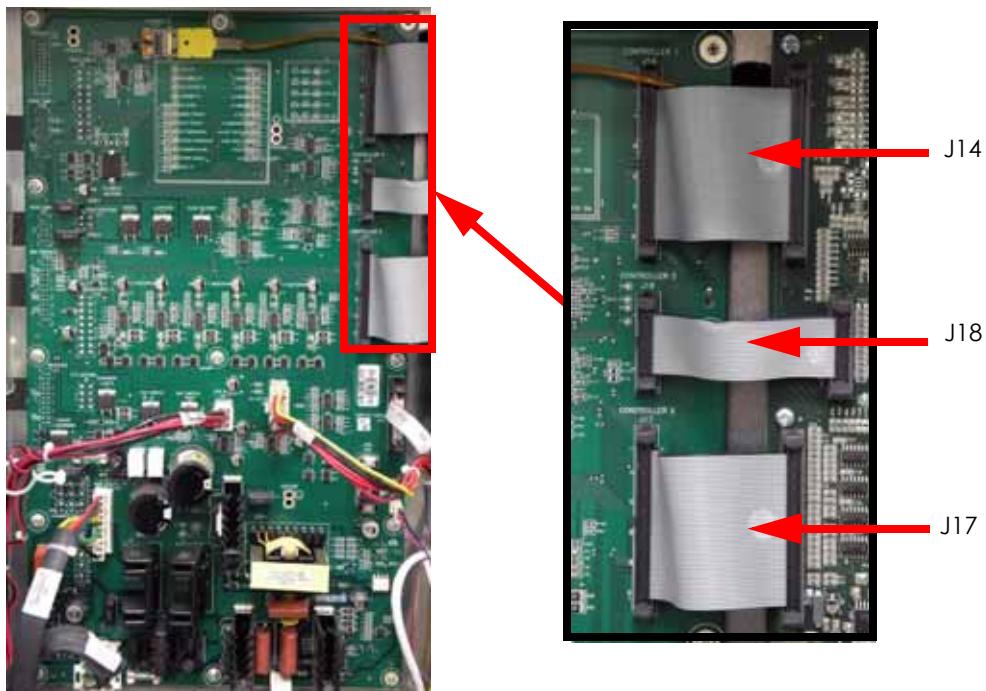
7. Disconnect the chamber thermocouple by pulling outward. See [Figure 23](#).

Figure 23: Chamber thermocouple location



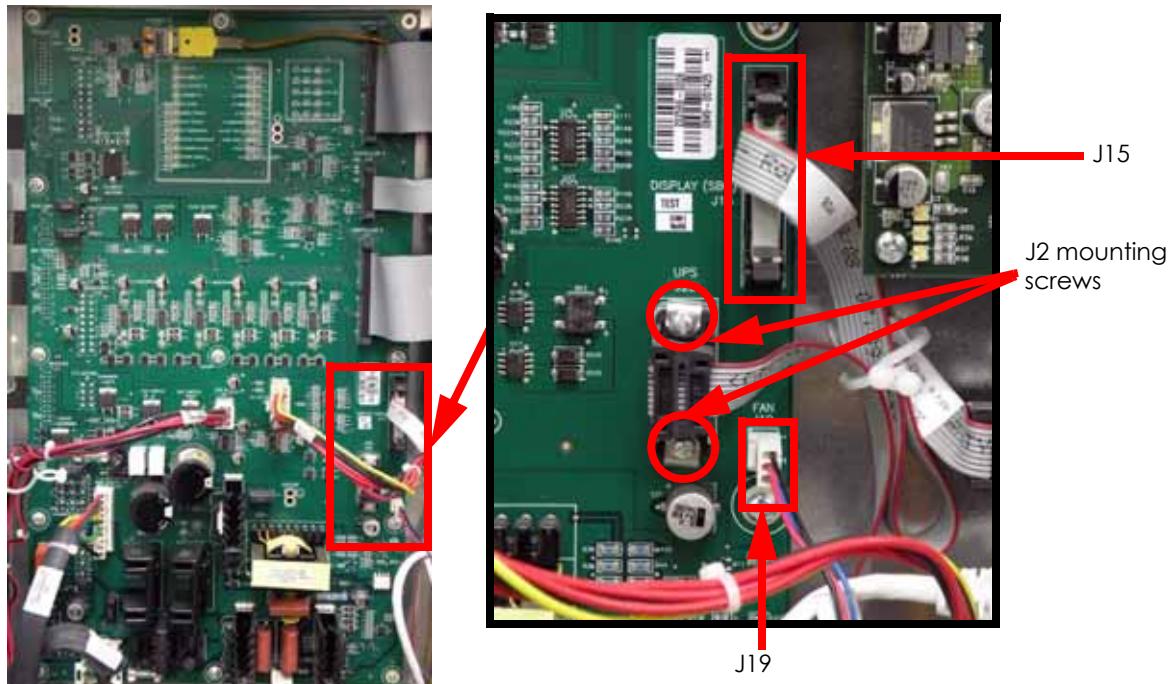
8. Disconnect the J14, J17 and J18 ribbon cables from the power distribution board by pressing the tabs and pulling outwards. See [Figure 24](#).

Figure 24: Power distribution board ribbon cable locations



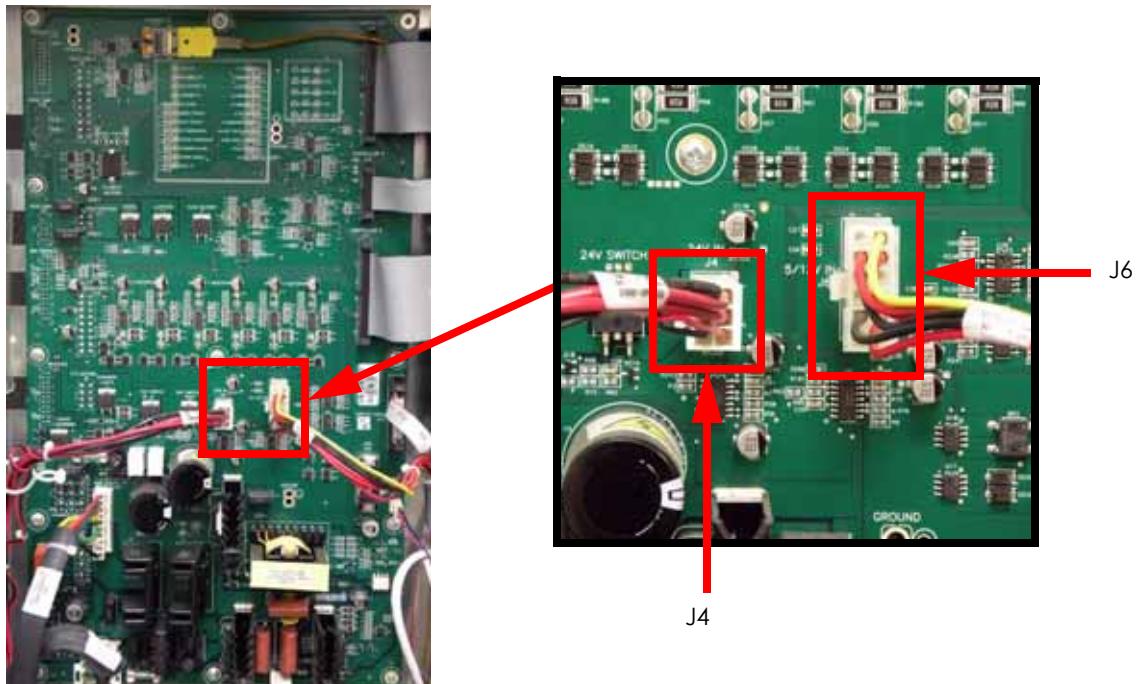
9. Disconnect the J19 fan cable by pulling outwards. See [Figure 25](#).
10. Disconnect the J15 ribbon cable by pressing the tabs and pulling outwards. See [Figure 25](#).
11. Using a standard screwdriver, loosen the J2 DB-9 cable mounting screws and pull outwards to remove. See [Figure 25](#).

Figure 25: Power distribution board cable locations



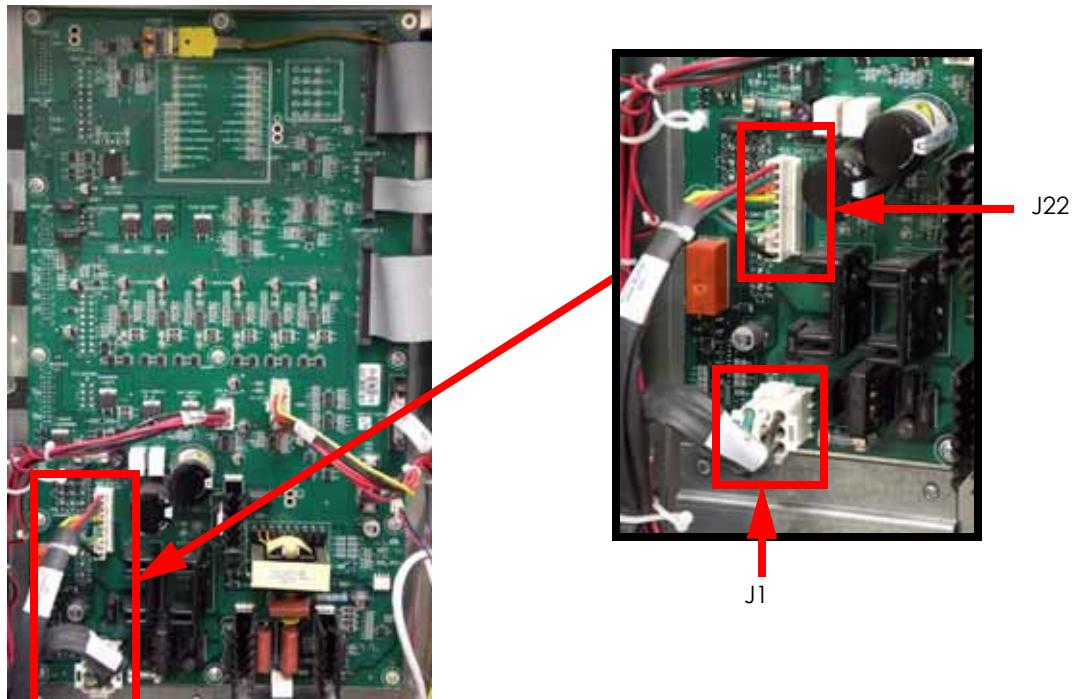
12. Disconnect J6 from the power distribution board by pressing the tab in and pulling outwards. See [Figure 26](#).
13. Disconnect J4 from the power distribution board by pressing the tab in and pulling outwards. See [Figure 26](#).

Figure 26: Power distribution board cable locations



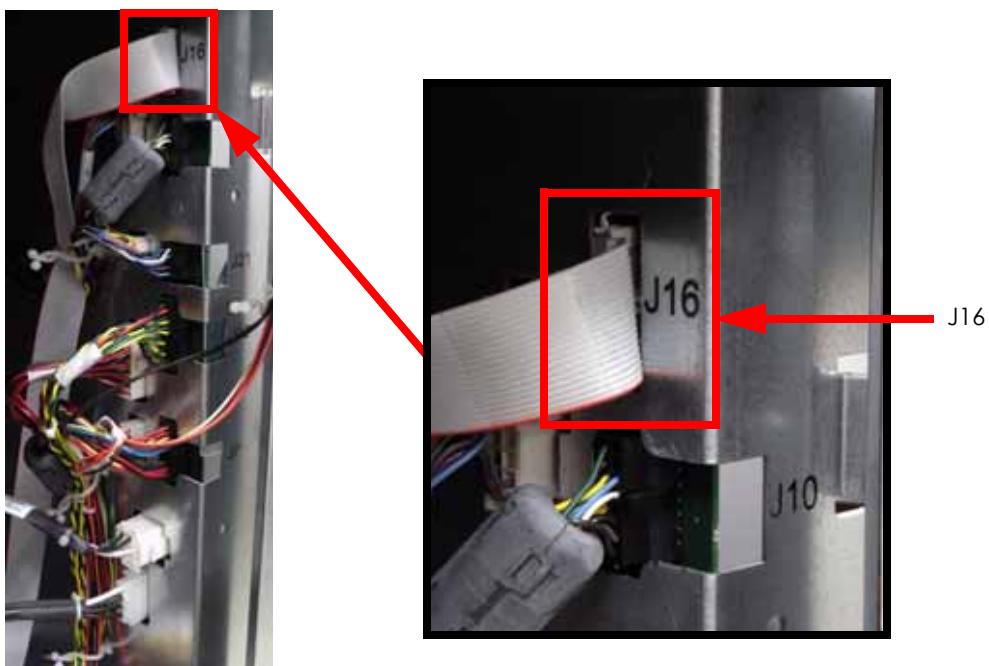
14. Disconnect J22 from the power distribution board by pressing the tab in and pulling outwards. See [Figure 27](#).
15. Disconnect J1 from the power distribution board by pressing the tab in and pulling outwards. See [Figure 27](#).

Figure 27: Power distribution board cable locations



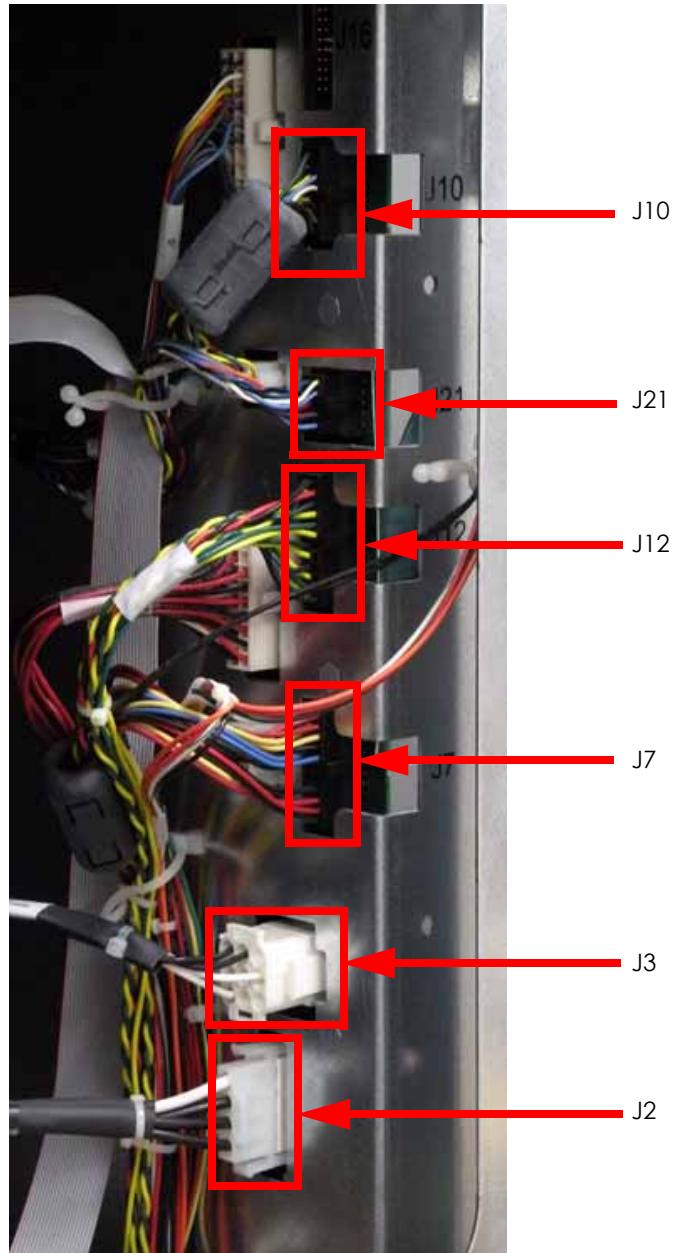
16. At the back side of the power distribution board, disconnect the J16 ribbon cable by pulling outwards. See [Figure 28](#).

Figure 28: J16 ribbon cable location



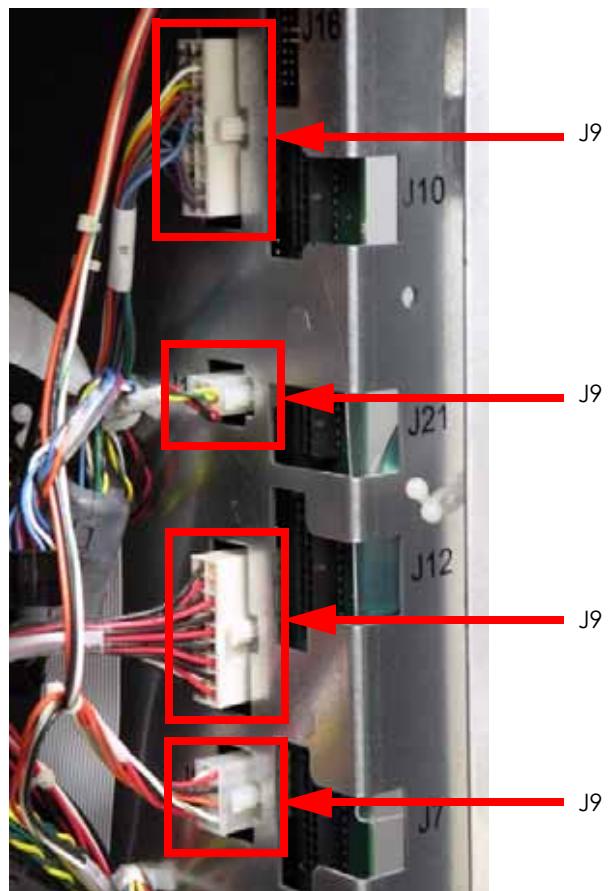
17. Disconnect the J10, J21, J12, J7, J3 and J2 cables from the back side of the power distribution board by pressing the tabs in and pulling outwards. See [Figure 29](#).

Figure 29: Rear power distribution board cables



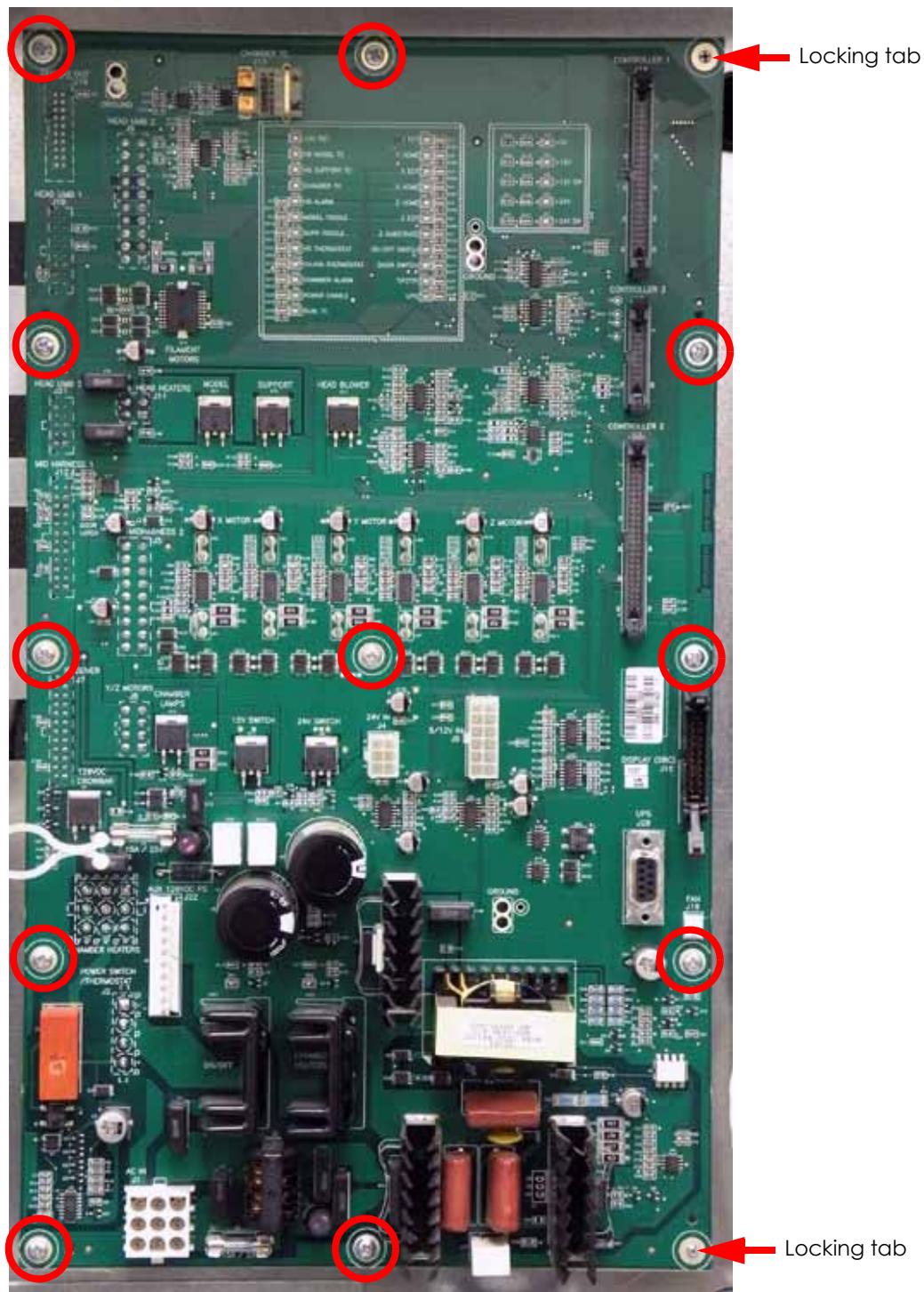
18. Disconnect the J9, J11, J5 and J8 cables from the back side of the power distribution board by pressing the tabs in and pulling outwards. See [Figure 30](#).

Figure 30: Rear power distribution board cables



19. Using a phillips screwdriver, remove the 11 power distribution board mounting screws.
See [Figure 31](#).

Figure 31: Power distribution board mounting screw locations



20. Gently pull the power distribution board away from the mounting posts.

Installing the Power Distribution Board:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the power distribution board with the mounting posts and use a phillips screwdriver to reinstall the 11 mounting screws.
3. Reconnect the J9, J11, J5 and J8 cables to the back side of the power distribution board by pushing into place.
4. Reconnect the J10, J21, J12, J7, J3 and J2 cables to the back side of the power distribution board by pushing into place.
5. Reconnect the J16 ribbon cable to the back side of the power distribution board by pushing into place.
6. Reconnect the J1 and J22 cables to the power distribution board by pushing into place.
7. Reconnect J4 and J6 cables to the power distribution board by pushing into place.
8. Reconnect the J15 ribbon cable and the J19 cable to the power distribution board by pushing into place.
9. Reconnect the J15 DB-9 cable to the power distribution board by pushing into place and use a standard screwdriver to tighten the mounting screws.
10. Reconnect the J14, J17 and J18 ribbon cables to the power distribution board by pushing into place.
11. Reconnect the chamber thermocouple by pushing into place.



Be sure the + terminal of the chamber thermocouple is at the top when reconnecting.

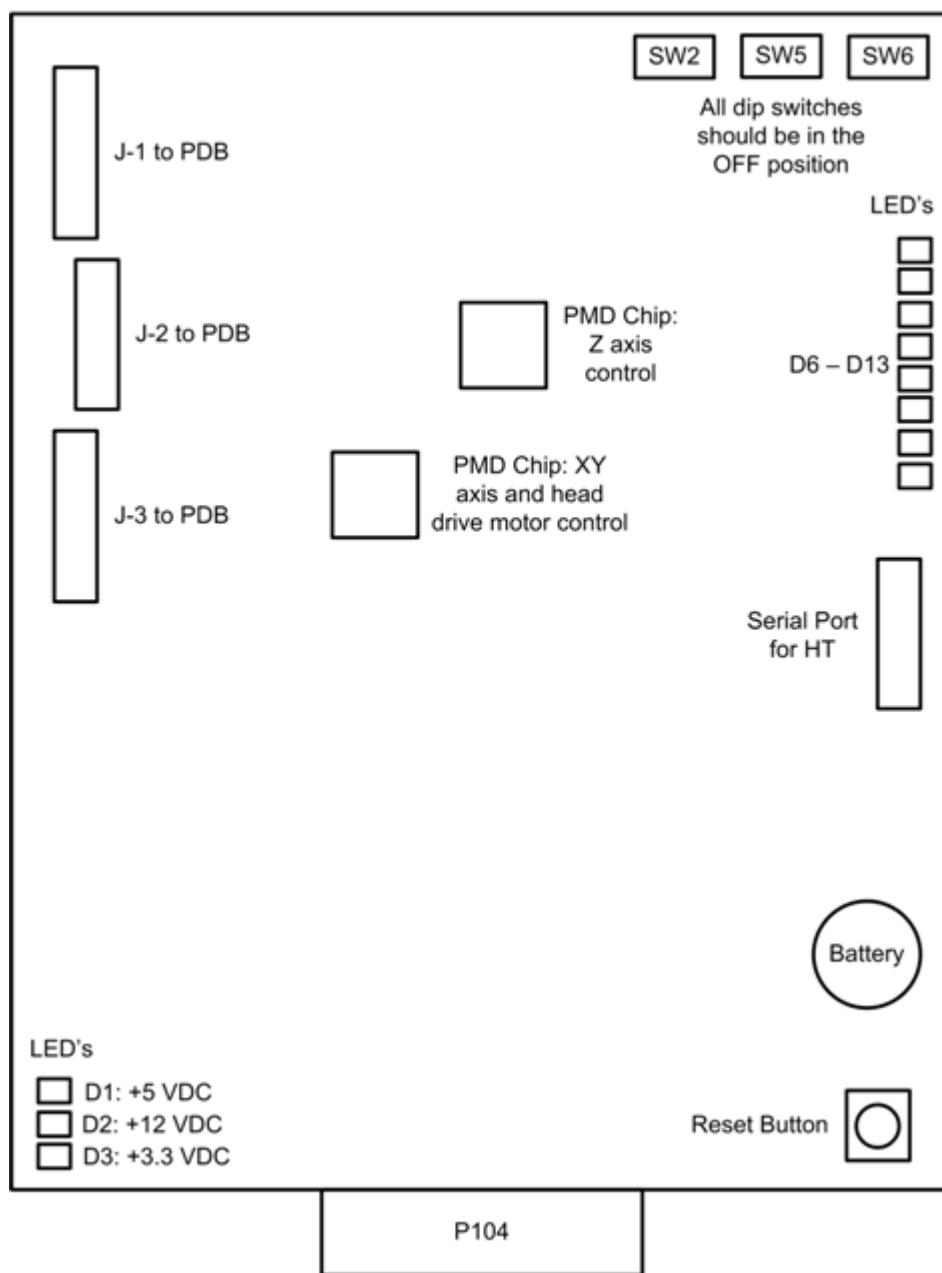
12. Reinstall the side panels. See “[Side Panels](#)” on page 5-11.
13. Reinstall the rear door. See “[Installing the Rear Door](#)” on page 5-10.
14. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
15. Power on the system. The system should reach **Idle** with no displayed errors.
16. Run a small test part and monitor system operation during build.
17. Send the bad power distribution board back to Stratasys, Inc.

Controller Board

Required Tools

- Standard screwdriver
- Phillips screwdriver
- Grounding wrist strap

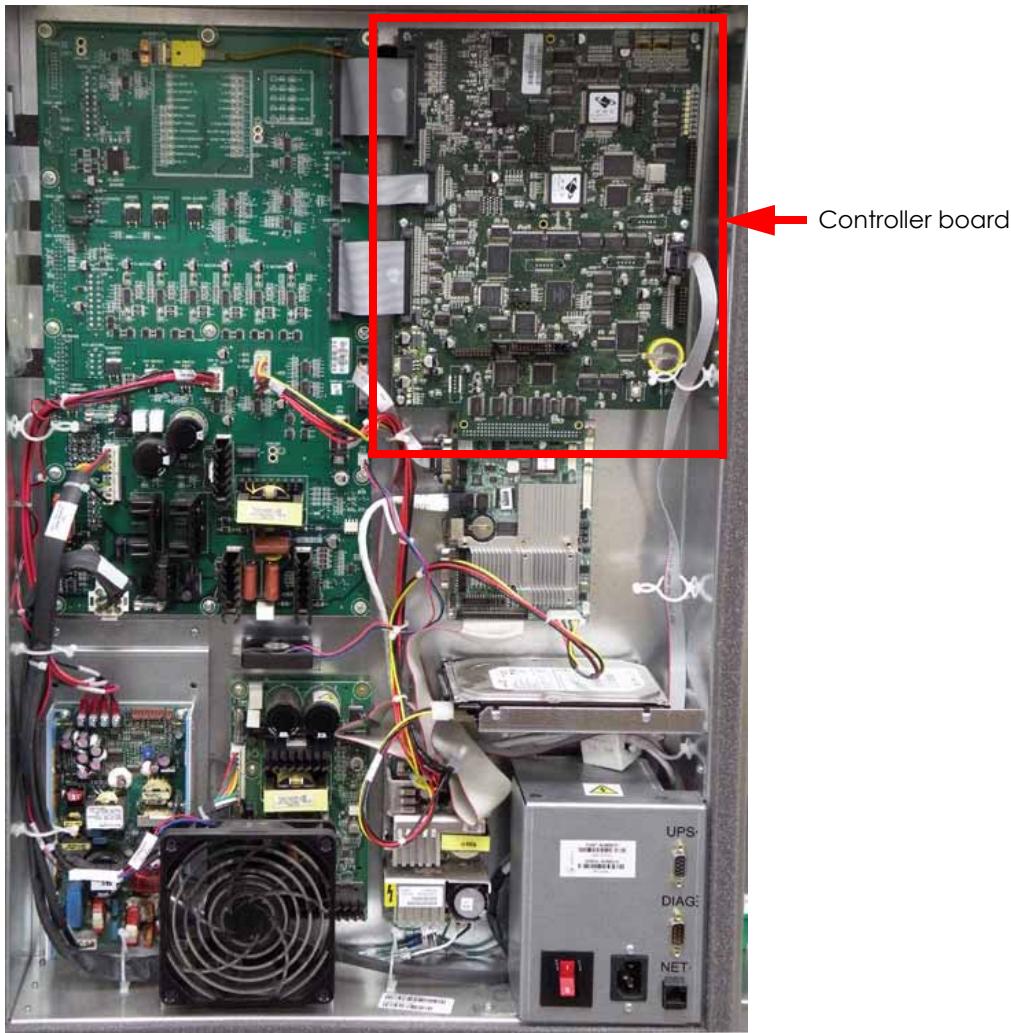
Figure 32: Controller board detail



Removing the Controller Board:

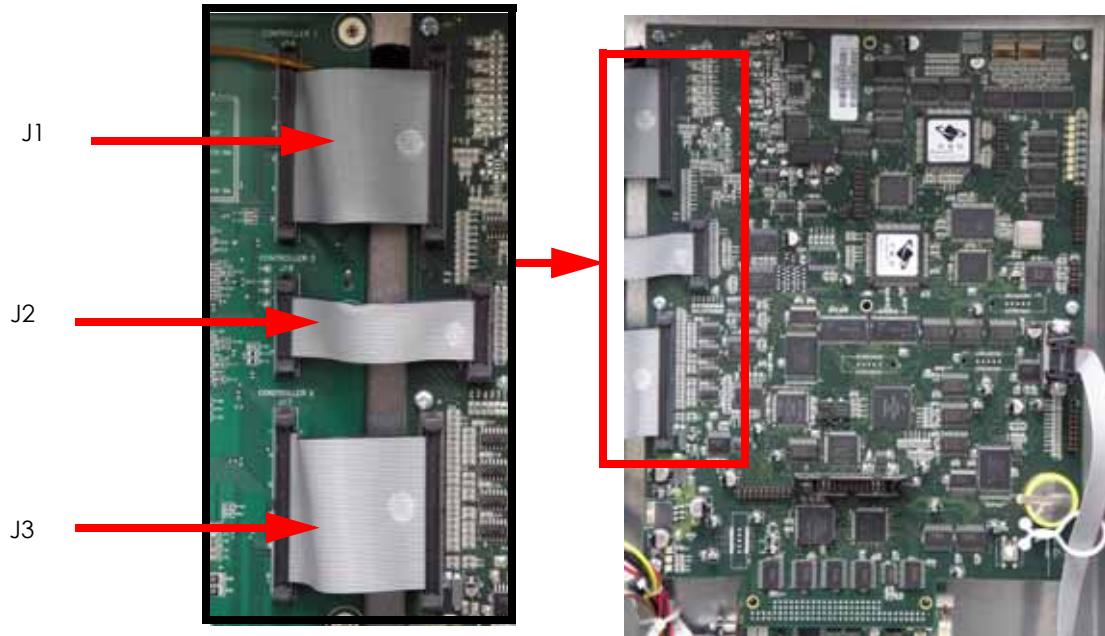
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the controller board. See [Figure 33](#).

Figure 33: Controller board location



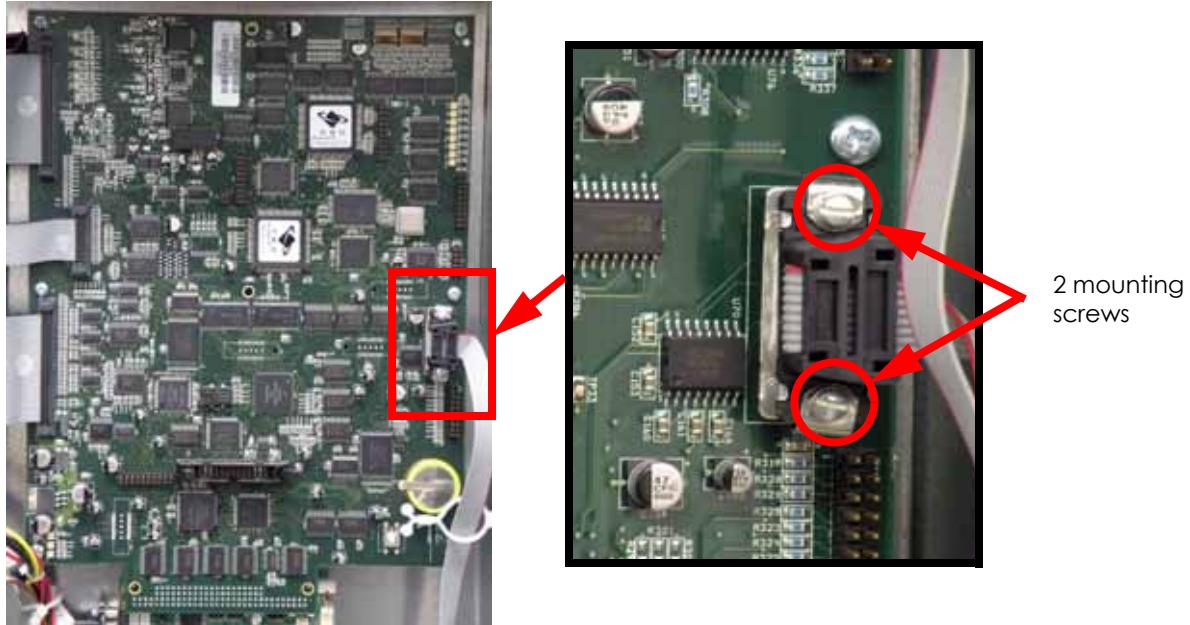
6. Disconnect the J1, J2 and J3 ribbon cables from the controller board by pressing the tabs and pulling outwards. See [Figure 34](#).

Figure 34: Ribbon cable locations



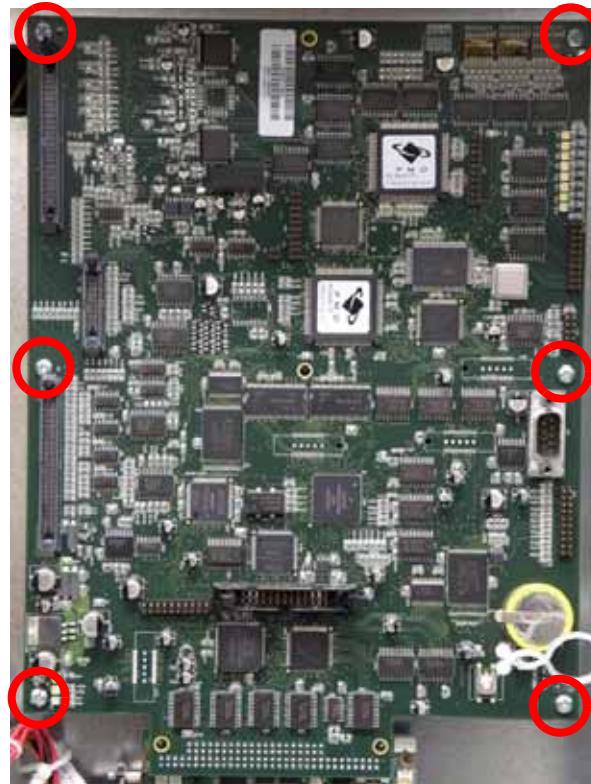
7. Using a standard screwdriver, loosen the J15 DB-9 connector and pull outwards to disconnect. See [Figure 35](#).

Figure 35: J15 location



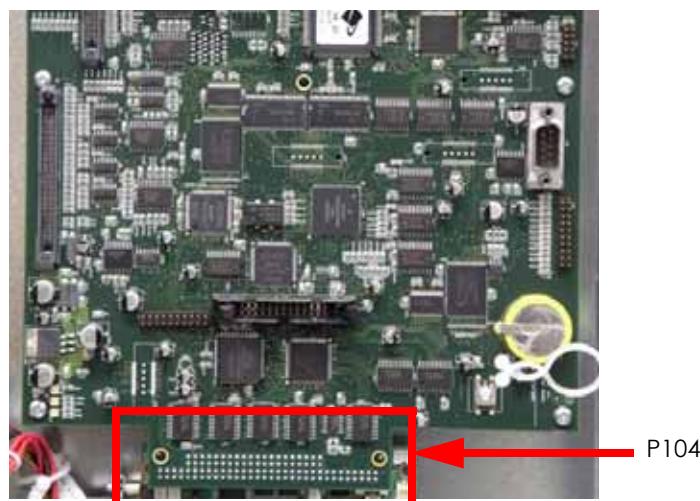
- Using a Phillips screwdriver, remove the 6 controller board mounting screws. See [Figure 36](#).

Figure 36: Controller board mounting screw locations



- Gently pull the controller board at the P104 connector on the single board computer to remove. See [Figure 37](#).

Figure 37: P104 location



Installing the Controller Board:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Gently align the controller board P104 with the single board computer socket and press into place.



Be careful not to bend any pins on the P104 connector.

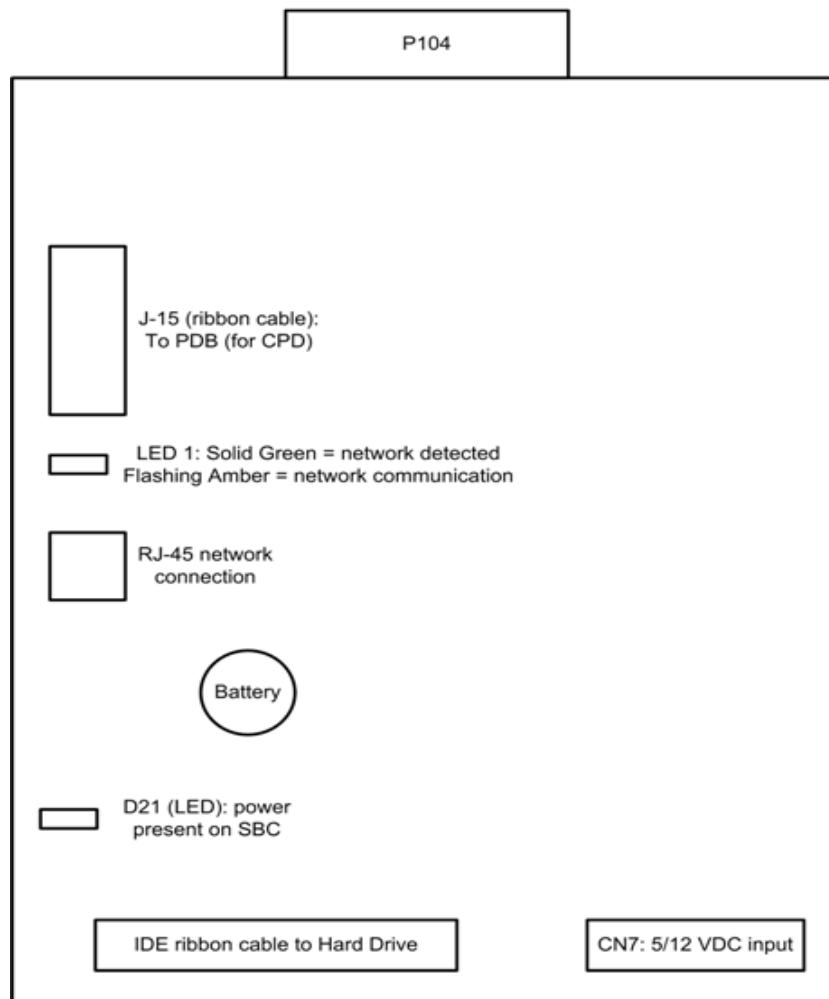
3. Using a phillips screwdriver, reinstall the 6 mounting screws.
4. Reconnect the J15 DB-9 connector by pushing into place and use a standard screwdriver to tighten the 2 mounting screws.
5. Reconnect the J1, J2 and J3 ribbon cables by pushing into place.
6. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer. You will be prompted to load the controller software.
9. Assign the printer static IP or dynamic IP networking depending on your network. If you assign it static IP you will need to enter the static IP address. When finished press **Done**.
10. Insert the system software CD into the notebook computer or workstation CD drive.
11. Open CatalystEX from the notebook computer or workstation.
12. Click on the **Printer Services** tab.
13. Click on the **Update Software** button.
14. Navigate CatalystEX to the CD drive and select the proper .UPG file for the printer.
15. When finished downloading, verifying and installing, reboot the printer.
16. Run a small test part and monitor system operation during build.
17. Send the bad controller board back to Stratasys, Inc.

Single Board Computer (SBC)

Required Tools

- Standard screwdriver
- Phillips screwdriver
- Grounding wrist strap

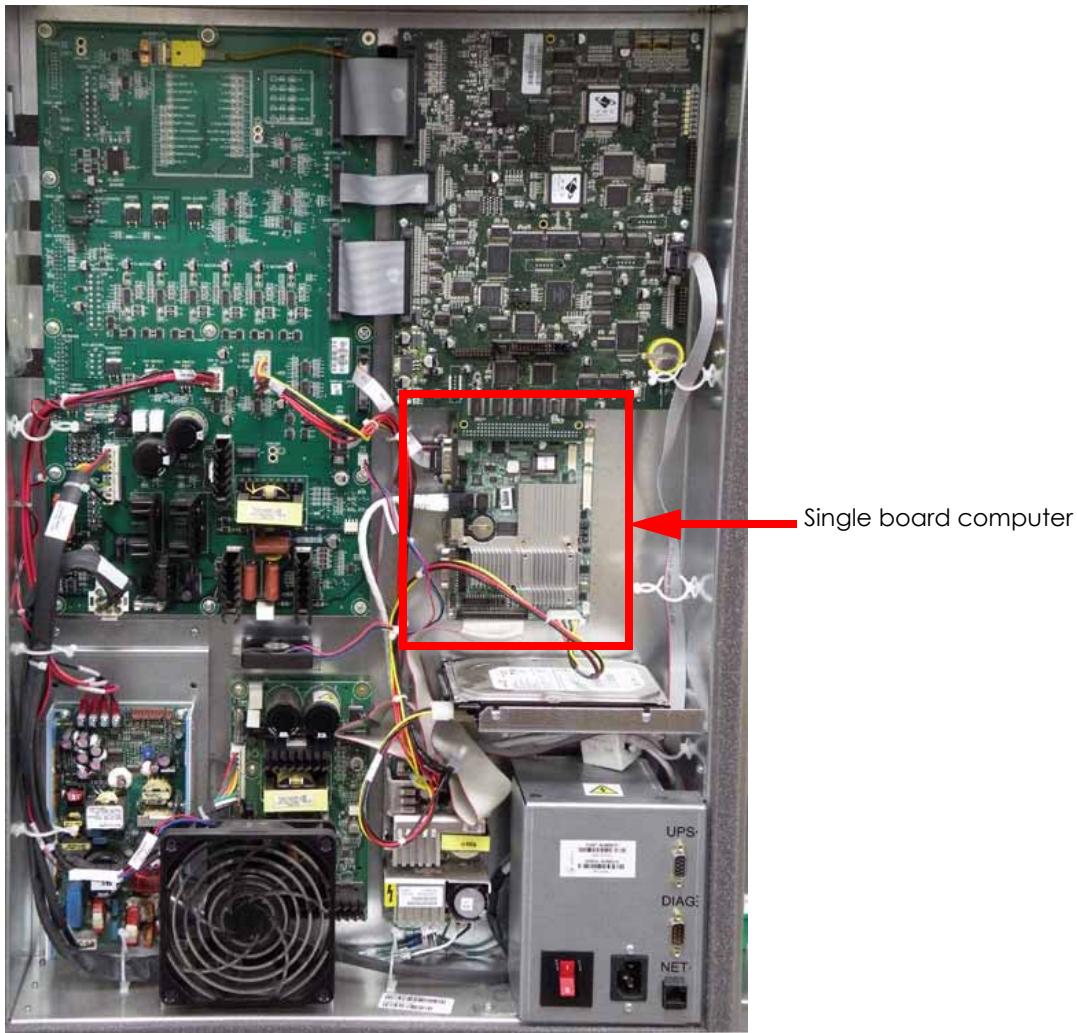
Figure 38: Single board computer detail



Removing the IDE Single Board Computer:

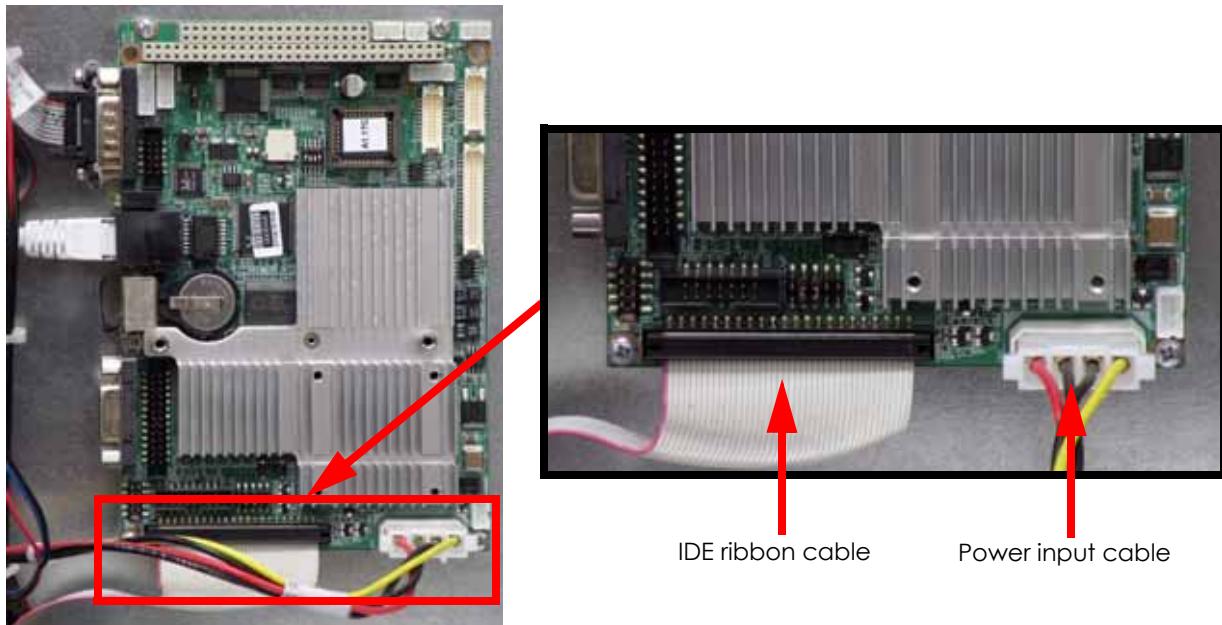
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the Single board computer. See [Figure 39](#).

Figure 39: Single board computer location



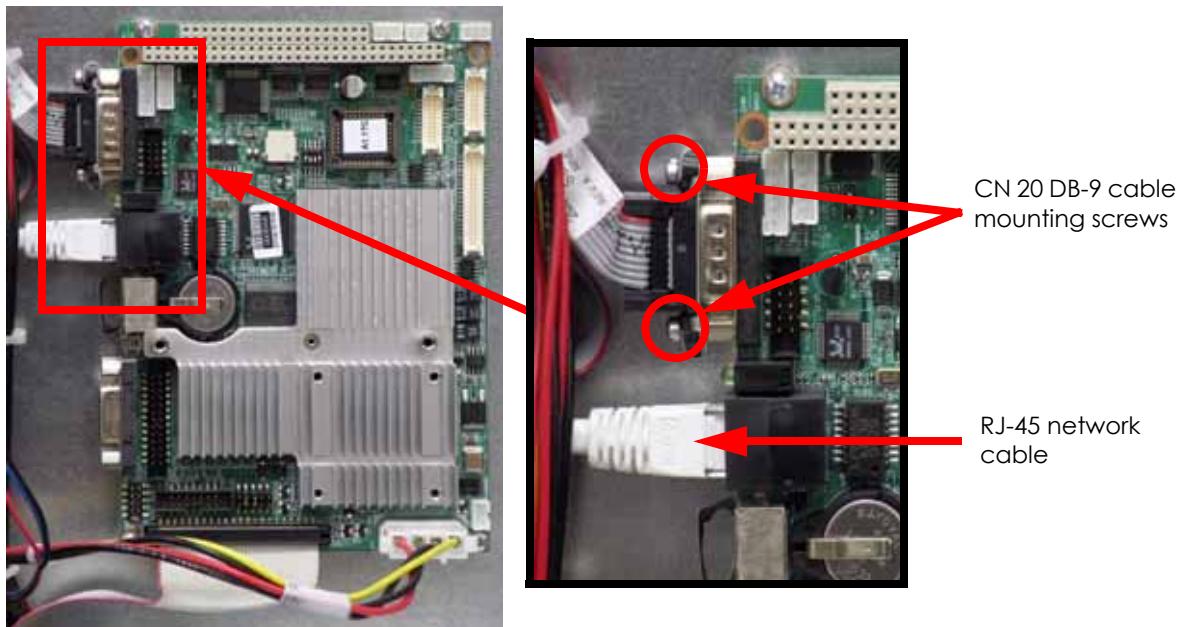
6. Remove the controller board. See “[Removing the Controller Board:](#)” on page 5-39.
7. Disconnect the IDE ribbon cable by pulling downwards. See [Figure 40](#).
8. Disconnect the power input cable by pulling outwards. See [Figure 40](#).

Figure 40: IDE ribbon cable and power input cable locations



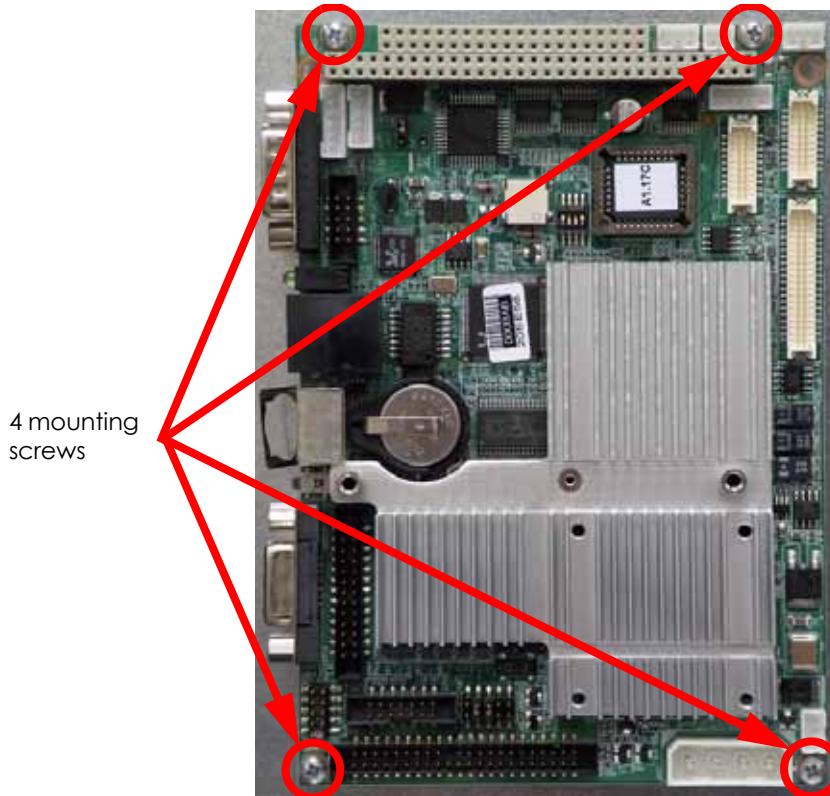
9. Disconnect the RJ-45 network cable by pressing the tab in and pulling outwards. See [Figure 41](#).
10. Using a standard screwdriver, loosen the 2 CN 20 DB-9 connector mounting screws and then pull outwards to remove. See [Figure 41](#).

Figure 41: Single board computer connector locations



11. Using a Phillips screwdriver, remove the 4 single board computer mounting screws. See [Figure 42](#).

Figure 42: Single board computer mounting screw locations



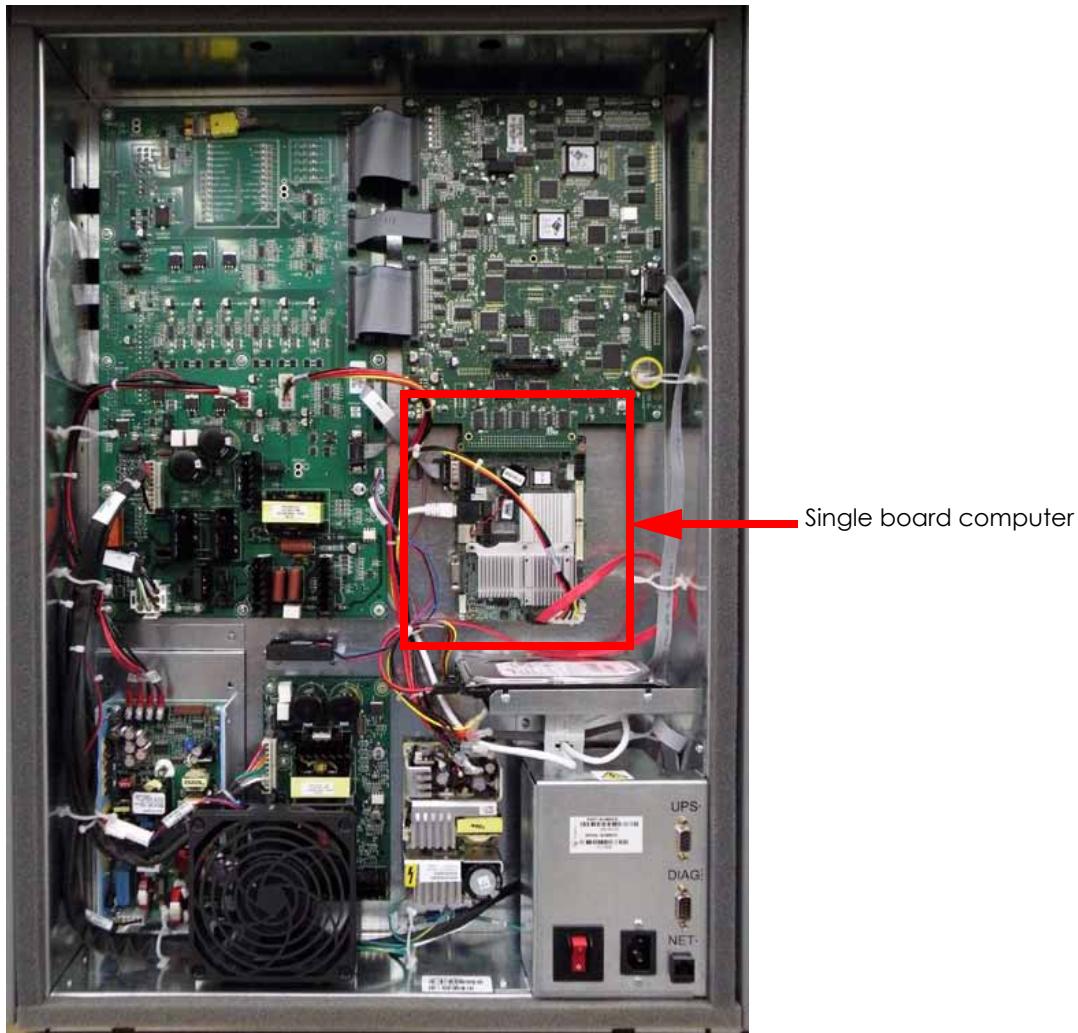
Installing the IDE Single Board Computer:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the single board computer with the mounts and use a phillips screwdriver to reinstall the 4 mounting screws.
3. Reconnect the CN 20 DB-9 connector by pushing into place and use a standard screwdriver to tighten the 2 mounting screws.
4. Reconnect the RJ-45 network cable by pushing into place.
5. Reconnect the IDE ribbon cable by pushing into place.
6. Reconnect the power input cable by pushing into place.
7. Reinstall the controller board. See "[Installing the Controller Board:](#)" on page 5-42.
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.
12. Send the bad single board computer back to Stratasys, Inc.

Removing the SATA Single Board Computer:

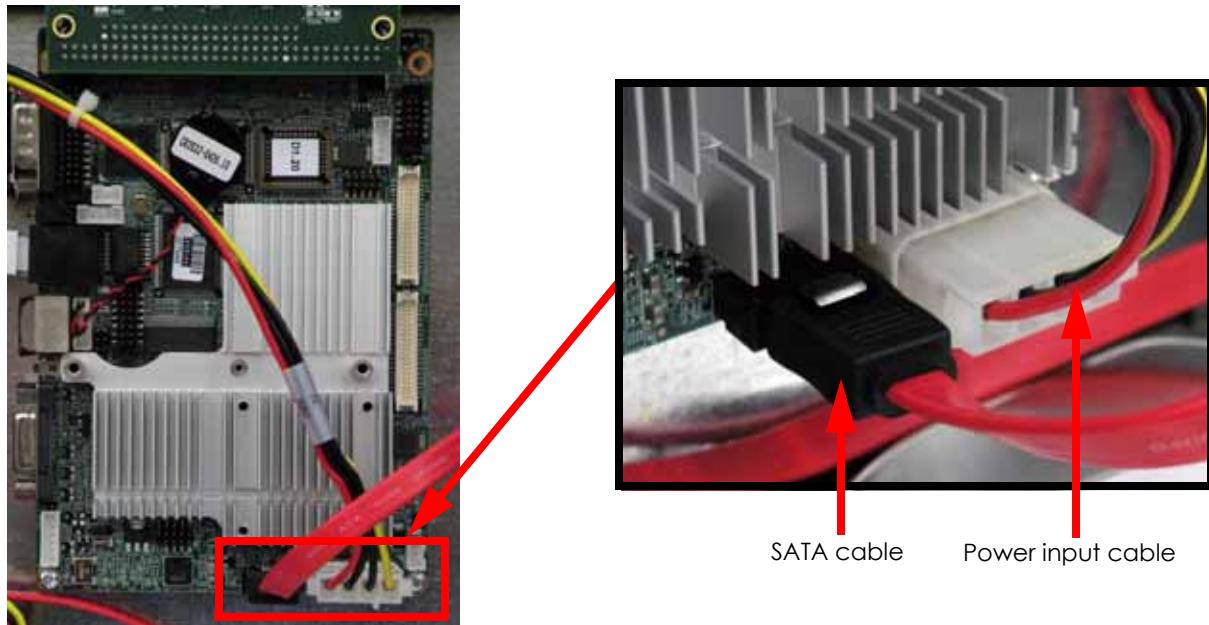
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the Single board computer. See [Figure 43](#).

Figure 43: Single board computer location



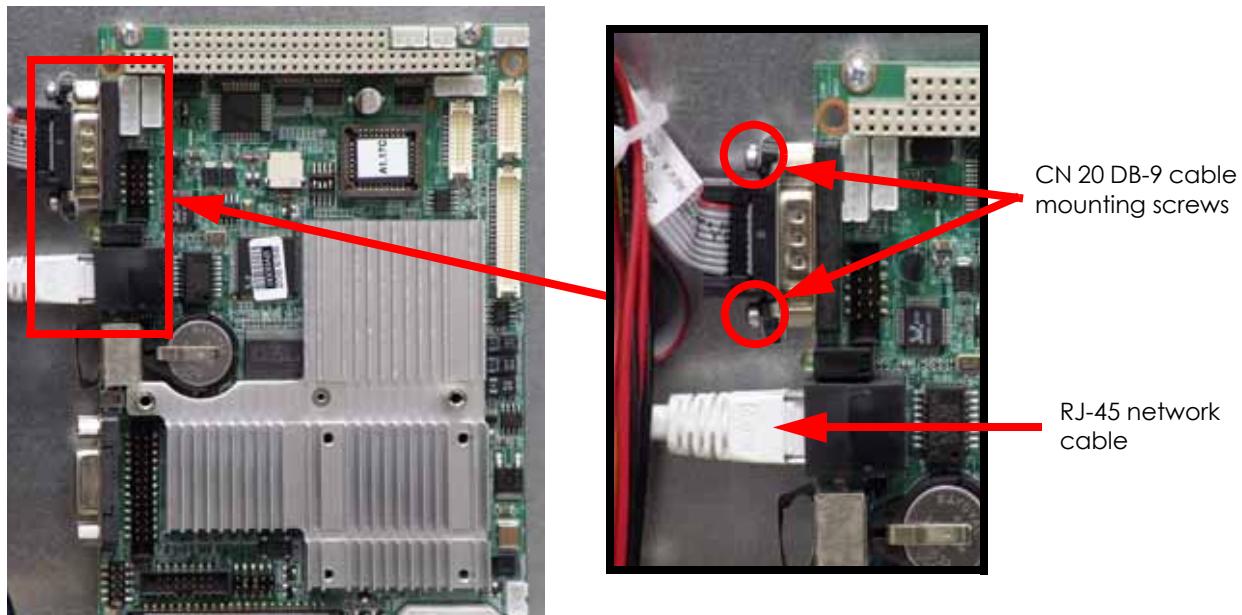
6. Remove the controller board. See “[Removing the Controller Board:](#)” on page 5-39.
7. Disconnect the SATA cable by pressing the metal tab in and pulling outwards. See [Figure 44](#).
8. Disconnect the power input cable by pulling outwards. See [Figure 44](#).

Figure 44: SATA cable and power input cable locations



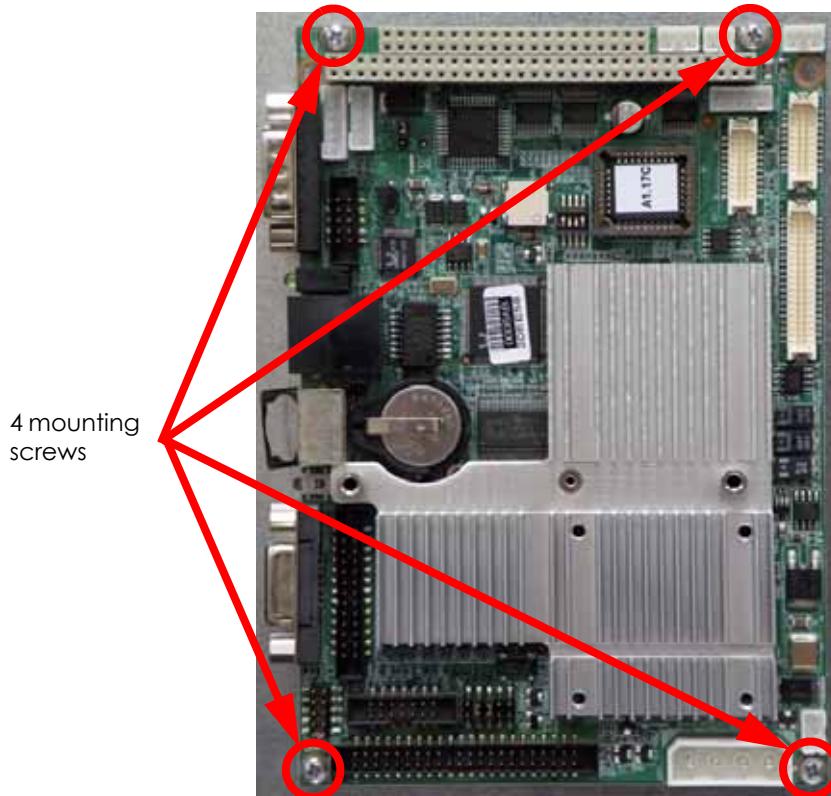
9. Disconnect the RJ-45 network cable by pressing the tab in and pulling outwards. See [Figure 45](#).
10. Using a standard screwdriver, loosen the 2 CN 20 DB-9 connector mounting screws and then pull outwards to remove. See [Figure 45](#).

Figure 45: Single board computer connector locations



11. Using a Phillips screwdriver, remove the 4 single board computer mounting screws. See [Figure 46](#).

Figure 46: Single board computer mounting screw locations



Installing the SATA Single Board Computer:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the single board computer with the mounts and use a phillips screwdriver to reinstall the 4 mounting screws.
3. Reconnect the CN 20 DB-9 connector by pushing into place and use a standard screwdriver to tighten the 2 mounting screws.
4. Reconnect the RJ-45 network cable by pushing into place.
5. Reconnect the SATA cable by pushing into place.
6. Reconnect the power input cable by pushing into place.
7. Reinstall the controller board. See "[Installing the Controller Board:](#)" on page 5-42.
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.
1. Send the bad single board computer back to Stratasys, Inc.

Hard Drive

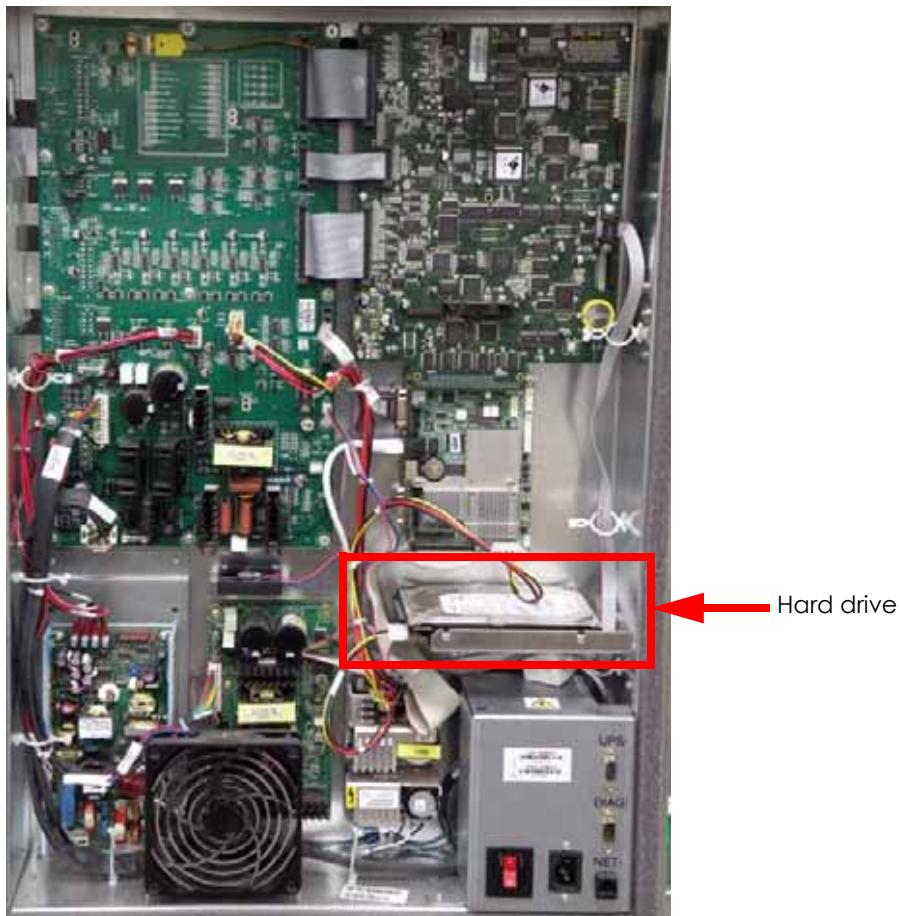
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the IDE Hard Drive:

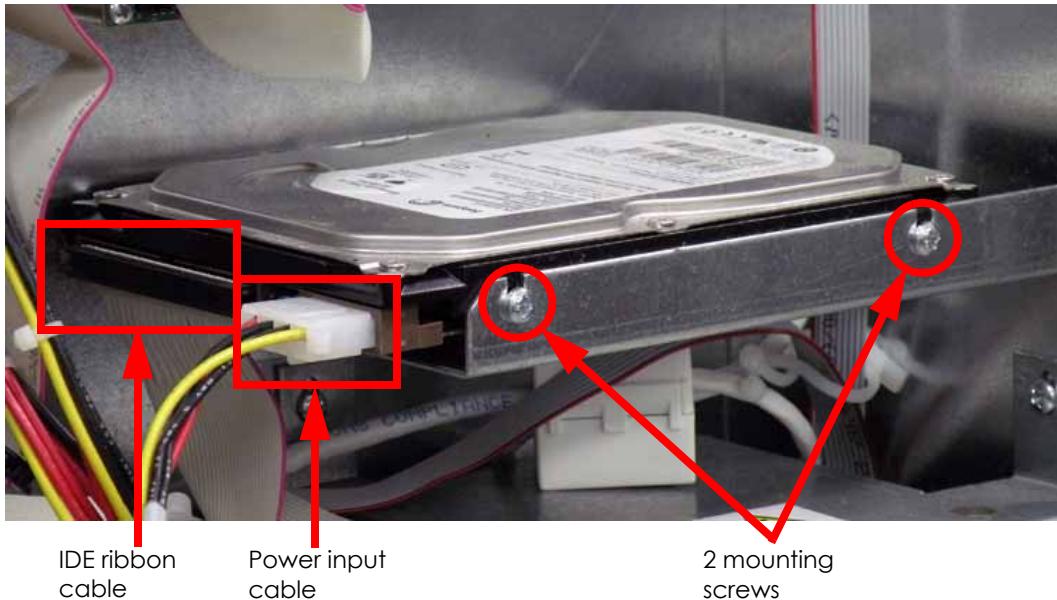
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the hard drive. See [Figure 47](#).

Figure 47: Hard drive location



6. Disconnect the power input cable by pulling outwards. See [Figure 48](#).
7. Disconnect the IDE ribbon cable by pulling outwards. See [Figure 48](#).
8. Using a phillips screwdriver, remove the 2 hard drive mounting screws. See [Figure 48](#).

Figure 48: Hard drive connector locations

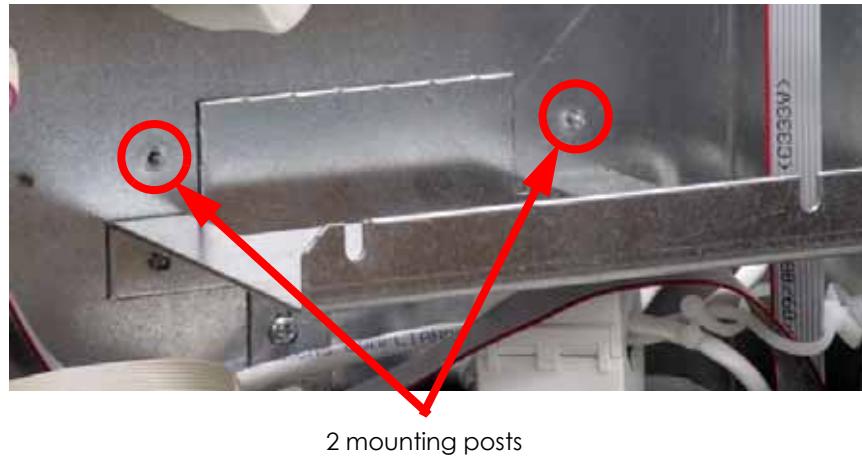


9. Remove the hard drive from the electronics bay.

Installing the IDE Hard Drive:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the hard drive with the mounting posts. See [Figure 49](#).

Figure 49: Hard drive mounting post locations



3. Using a phillips screwdriver, reinstall the 2 mounting screws.
4. Reconnect the IDE ribbon cable by pushing into place.



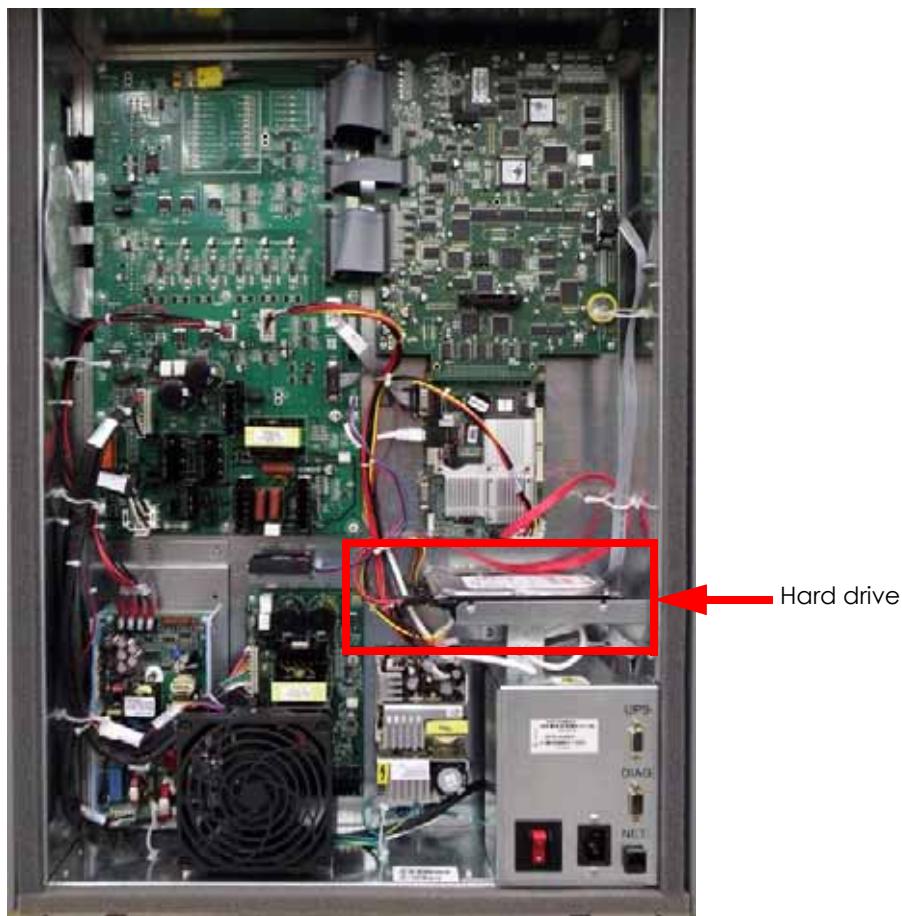
The IDE ribbon cable should be installed with the red line to the right

5. Reconnect the power input cable by pushing into place.
6. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer. You will be prompted to load the controller software.
9. Assign the printer static IP or dynamic IP networking depending on your network. If you assign it static IP you will need to enter the static IP address. When finished press **Done**.
10. Insert the system software CD into the notebook computer or workstation CD drive.
11. Open CatalystEX from the notebook computer or workstation.
12. Click on the **Printer Services** tab.
13. Click on the **Update Software** button.
14. Navigate CatalystEX to the CD drive and select the proper .UPG file for the printer.
15. When finished downloading, verifying and installing, reboot the printer.
16. Run a small test part and monitor system operation during build.
17. Send the bad hard drive back to Stratasys, Inc.

Removing the SATA Hard Drive:

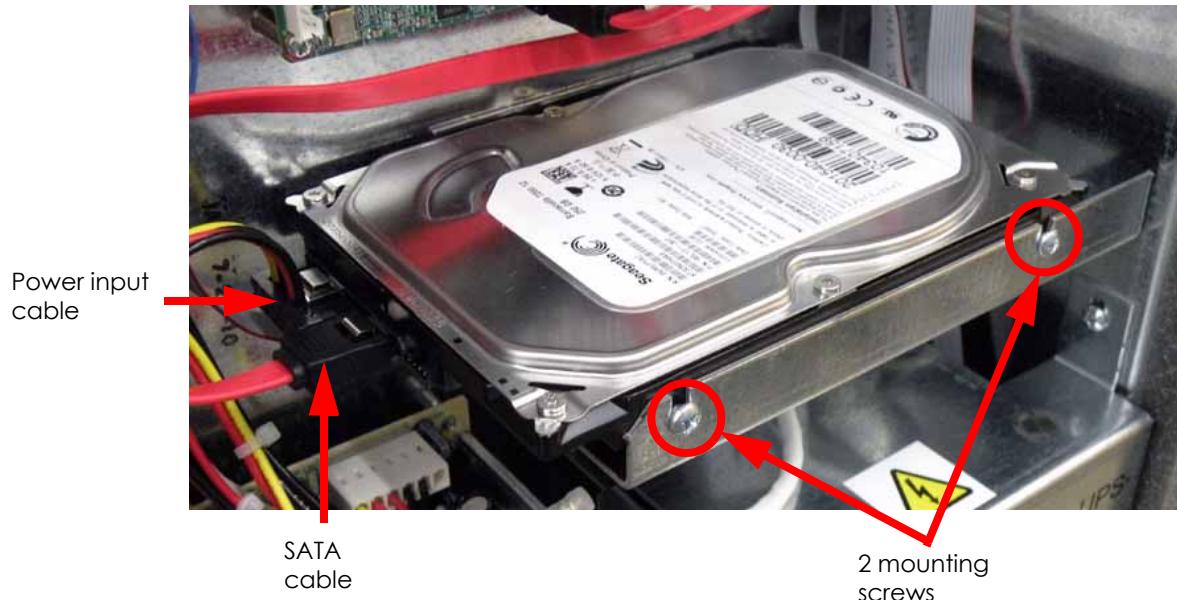
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the hard drive. See [Figure 50](#).

Figure 50: Hard drive location



6. Disconnect the power input cable by pressing the metal tab in and pulling outwards. See [Figure 51](#).
7. Disconnect the SATA cable by pressing the metal tab in pulling outwards. See [Figure 51](#).
8. Using a phillips screwdriver, remove the 2 hard drive mounting screws. See [Figure 51](#).

Figure 51: Hard drive connector locations

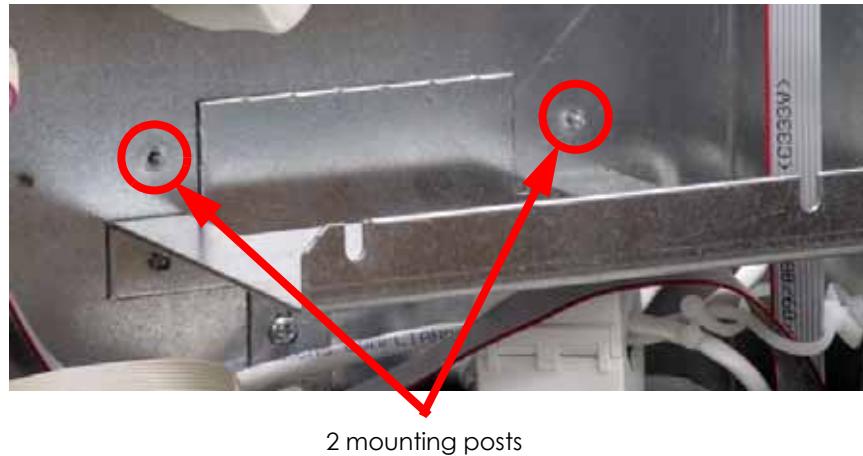


9. Remove the hard drive from the electronics bay.

Installing the SATA Hard Drive:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the hard drive with the mounting posts. See [Figure 52](#).

Figure 52: Hard drive mounting post locations



3. Using a phillips screwdriver, reinstall the 2 mounting screws.
4. Reconnect the SATA cable by pushing into place.

5. Reconnect the power input cable by pushing into place.
6. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer. You will be prompted to load the controller software.
9. Assign the printer static IP or dynamic IP networking depending on your network. If you assign it static IP you will need to enter the static IP address. When finished press **Done**.
10. Insert the system software CD into the notebook computer or workstation CD drive.
11. Open CatalystEX from the notebook computer or workstation.
12. Click on the **Printer Services** tab.
13. Click on the **Update Software** button.
14. Navigate CatalystEX to the CD drive and select the proper .UPG file for the printer.
15. When finished downloading, verifying and installing, reboot the printer.
16. Run a small test part and monitor system operation during build.
17. Send the bad hard drive back to Stratasys, Inc.

Electronics Bay Cooling Fan

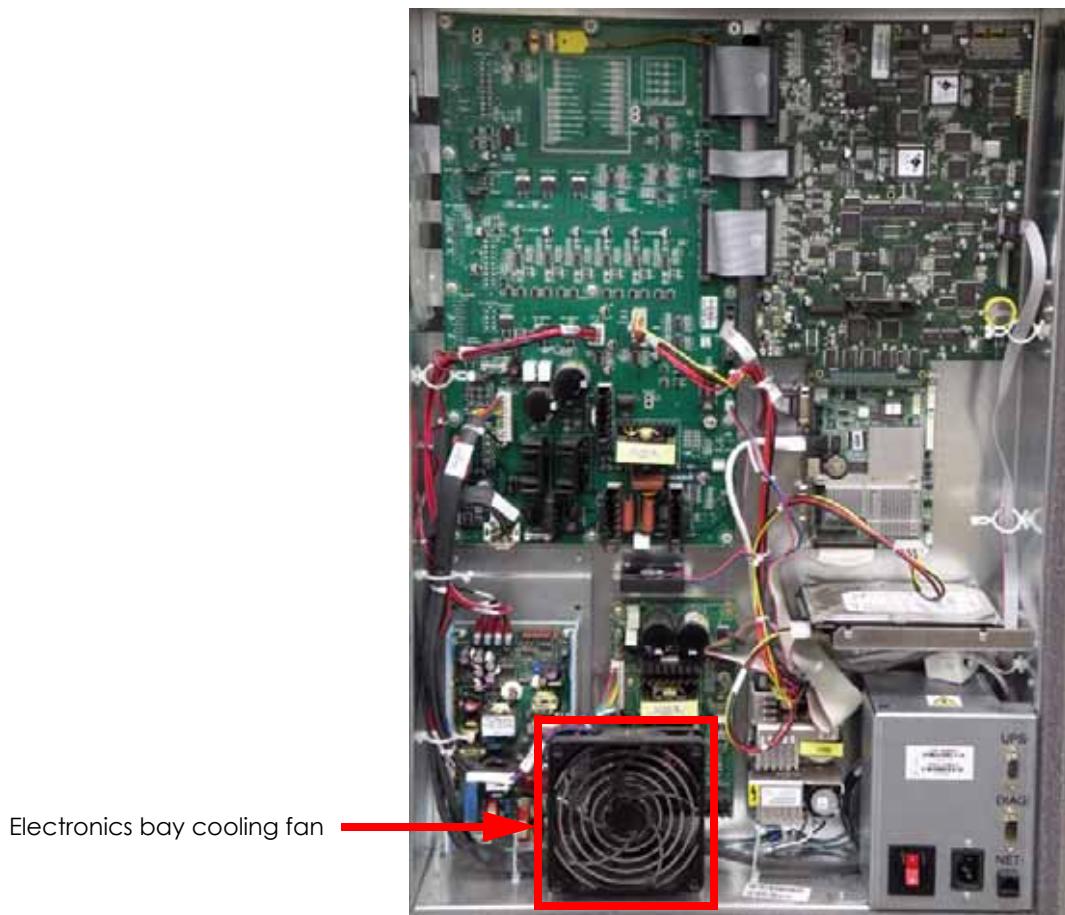
Required Tools

- $\frac{5}{64}$ " allen wrench
- Grounding wrist strap

Removing the Electronics Bay Cooling Fan:

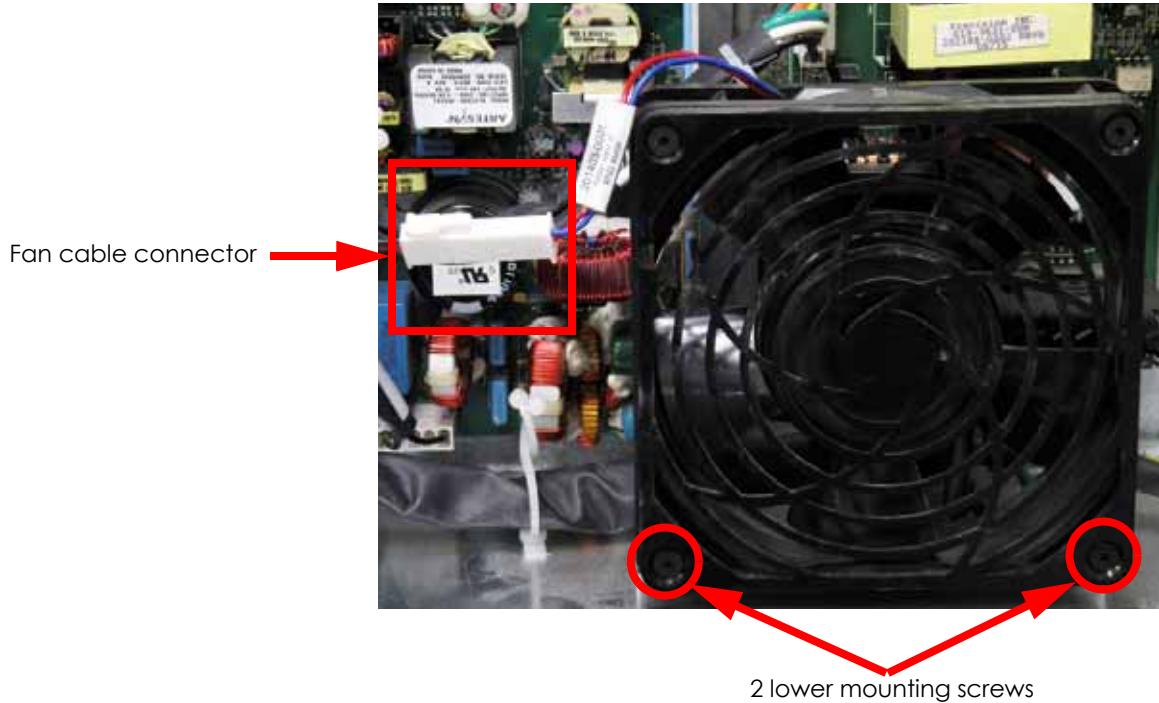
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See ["Removing the Rear Door:" on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the electronics bay cooling fan. See [Figure 53](#).

Figure 53: Electronics bay cooling fan location



6. Disconnect the electronics bay cooling fan cable by pressing the tab in and pulling outwards. See [Figure 54](#).
7. Using a $\frac{5}{64}$ " allen wrench, remove the lower 2 electronics bay cooling fan mounting screws. See [Figure 54](#).

Figure 54: Electronics bay cooling fan connector location



8. Remove the electronics bay cooling fan.

Installing the Electronics Bay Cooling Fan:

1. Align the electronics bay cooling fan with the mounting holes.
2. Using a $\frac{5}{64}$ " allen wrench, reinstall the 2 lower mounting screws.
3. Reconnect the fan cable by pushing the connectors together.
4. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
5. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
6. Power up the printer.
7. Run a small test part and monitor system operation during build.

24 VDC Power Supply

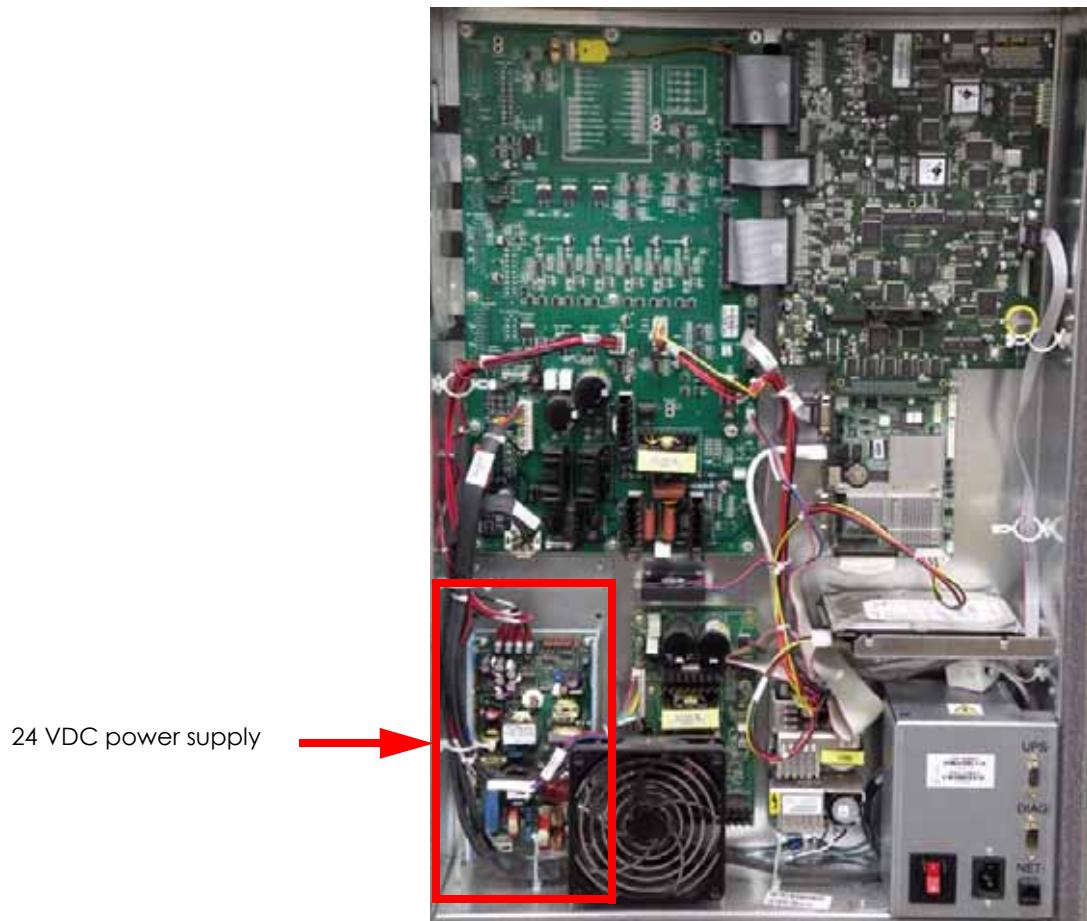
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the 24 VDC Power Supply:

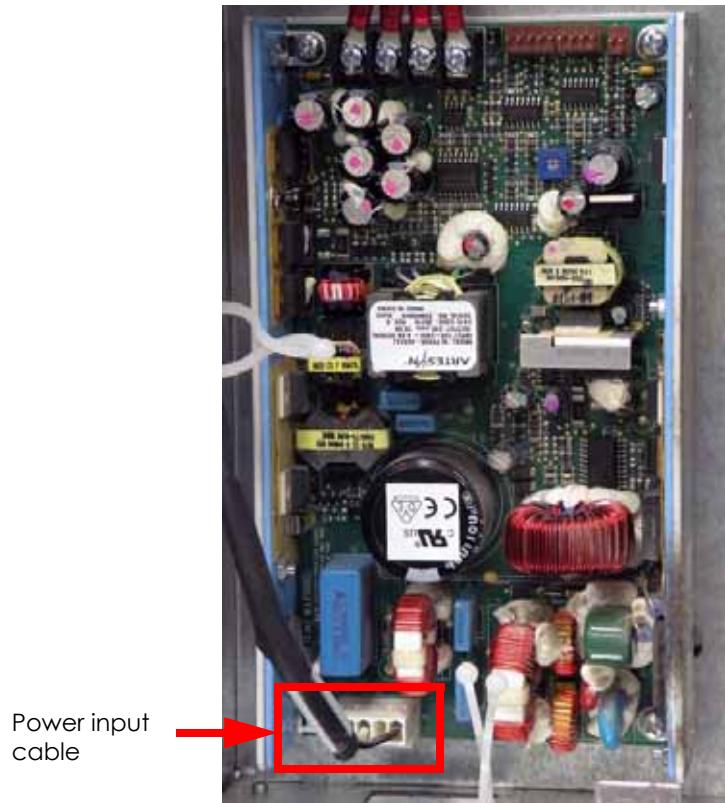
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 24 VDC power supply. See [Figure 55](#).

Figure 55: 24 VDC power supply location



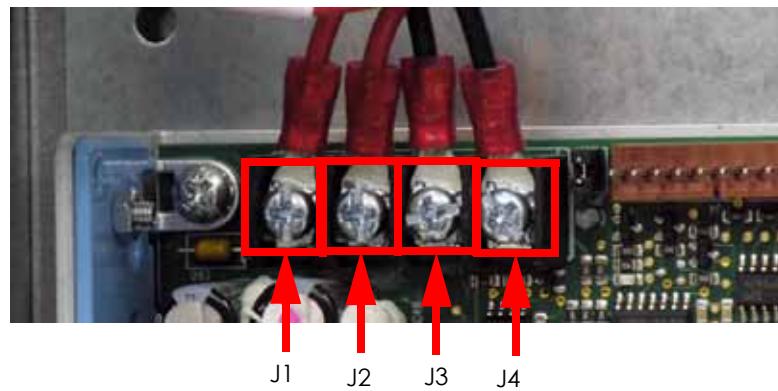
6. Remove the electronics bay cooling fan. See “[Removing the Electronics Bay Cooling Fan:](#)” on page 5-56.
7. Disconnect the power input cable by pulling outwards. See [Figure 56](#).

Figure 56: 24 VDC power supply cable locations



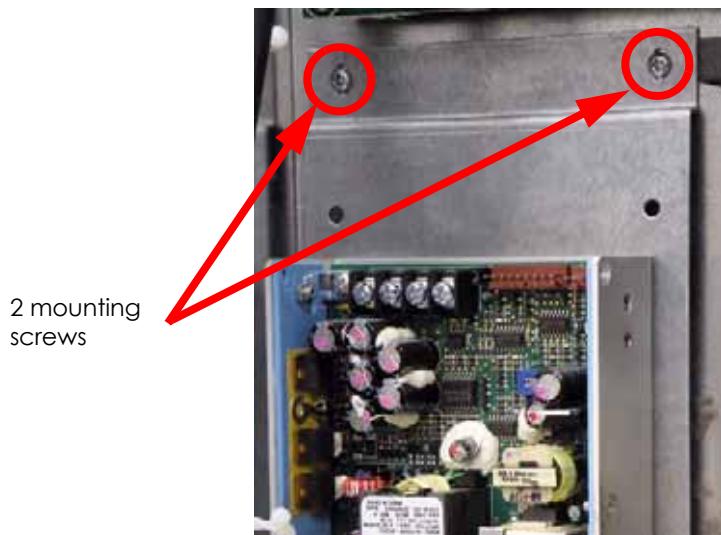
8. Using a phillips screwdriver, loosen but do not remove the J1, J2, J3 and J4 output wire terminals and remove the wires from the terminal. See [Figure 57](#).

Figure 57: 24 VDC output wire locations



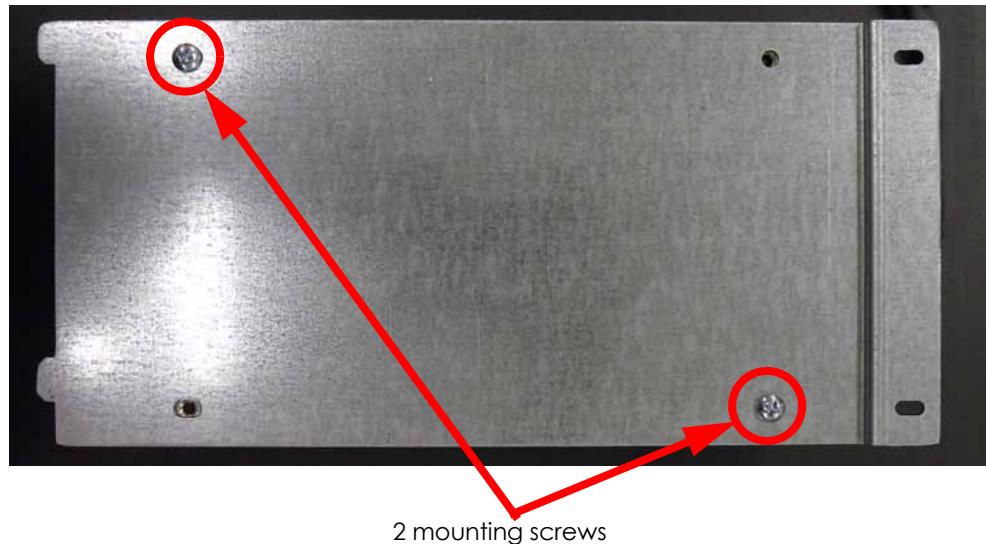
9. Using a phillips screwdriver, remove the 24 VDC power supply mounting screws. See [Figure 58](#).

Figure 58: 24 VDC power supply mounting screw locations



10. Lift the 24 VDC power supply upwards and angle out of the electronics bay.
11. Turn the 24 VDC power supply over and use a phillips screwdriver to remove the 2 mounting bracket mounting screws. See [Figure 59](#).

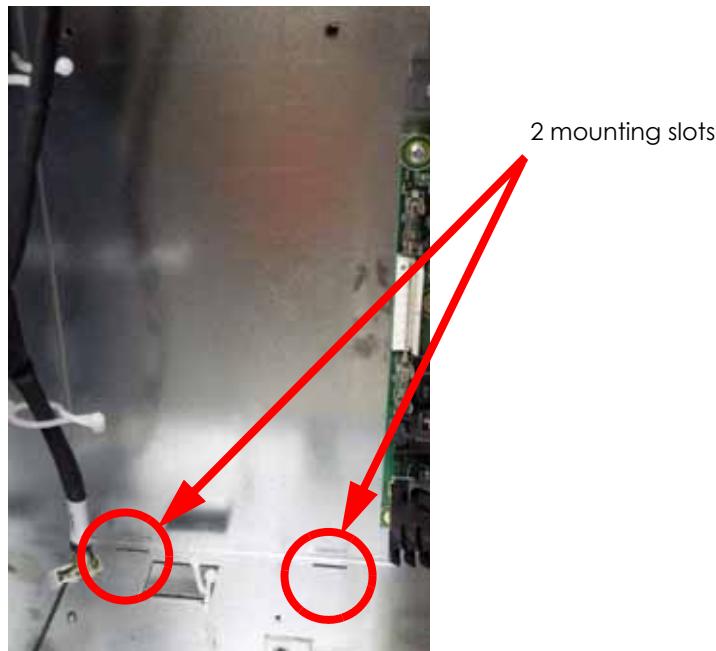
Figure 59: 24 VDC power supply mounting bracket mounting screw locations



Installing the 24 VDC Power Supply:

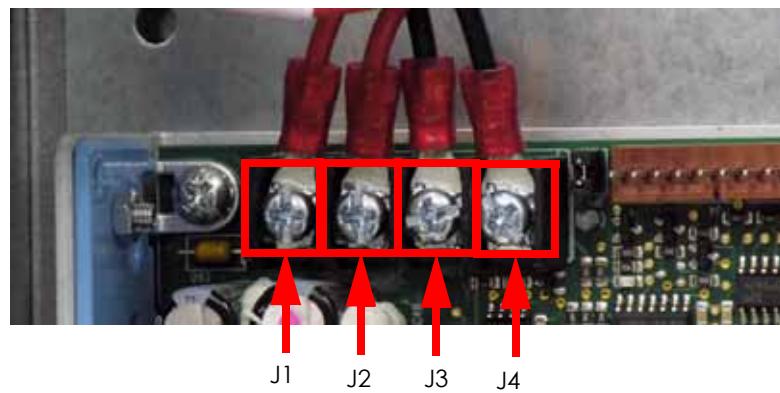
1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the 24 VDC power supply with the mounting bracket and use a phillips screwdriver to reinstall the 2 mounting screws.
3. Align the 24 VDC power supply mounting bracket tabs with the slots in the electronics bay and slide into place. See [Figure 60](#).

Figure 60: 24 VDC power supply mounting slot locations



4. Using a phillips screwdriver, reinstall the 2 mounting screws.
5. Reconnect J1, J2, J3 and J4 output wires and use a phillips screwdriver to tighten the terminal screws. See [Figure 61](#).

Figure 61: 24 VDC output wire locations



6. Reconnect the power input cable to the 24 VDC power supply.
7. Reinstall the electronics bay cooling fan. See "[Installing the Electronics Bay Cooling Fan:](#)" [on page 5-102](#).
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" [on page 5-10](#).
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.

120 VDC Power Supply (SST only)

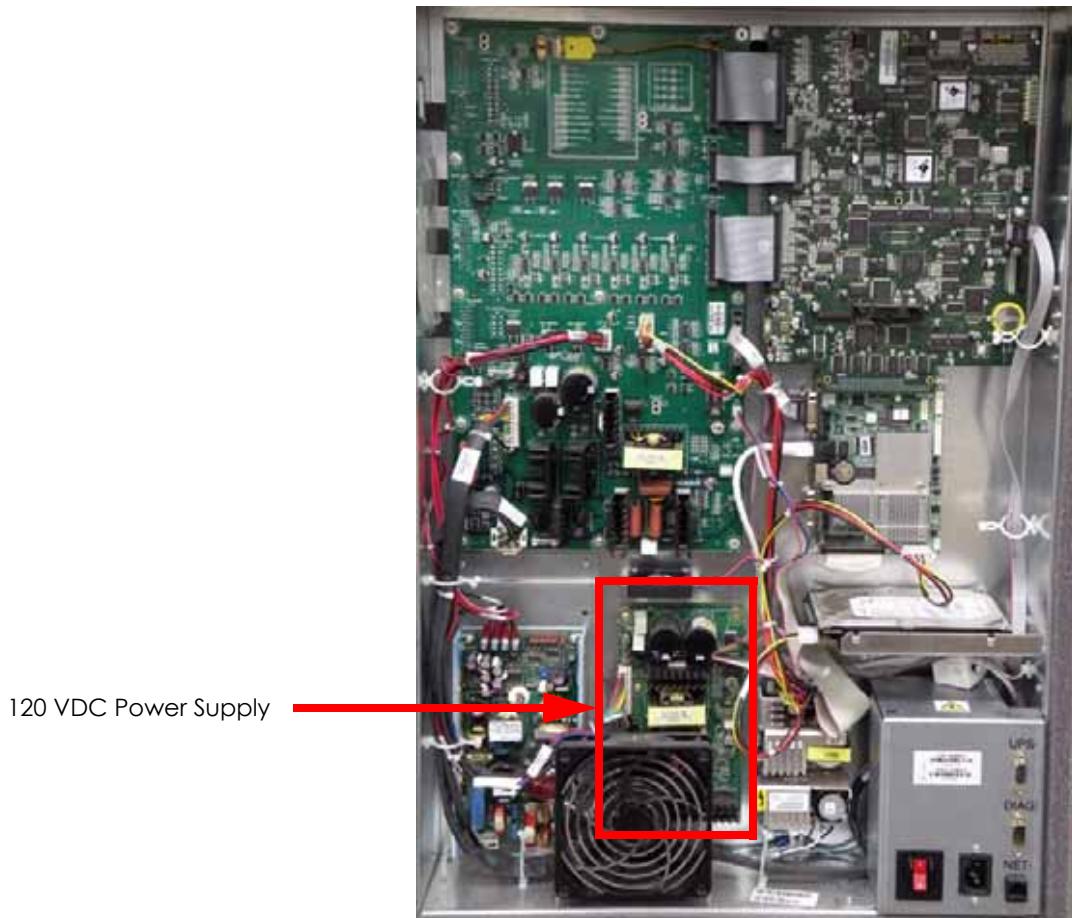
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the 120 VDC Power Supply:

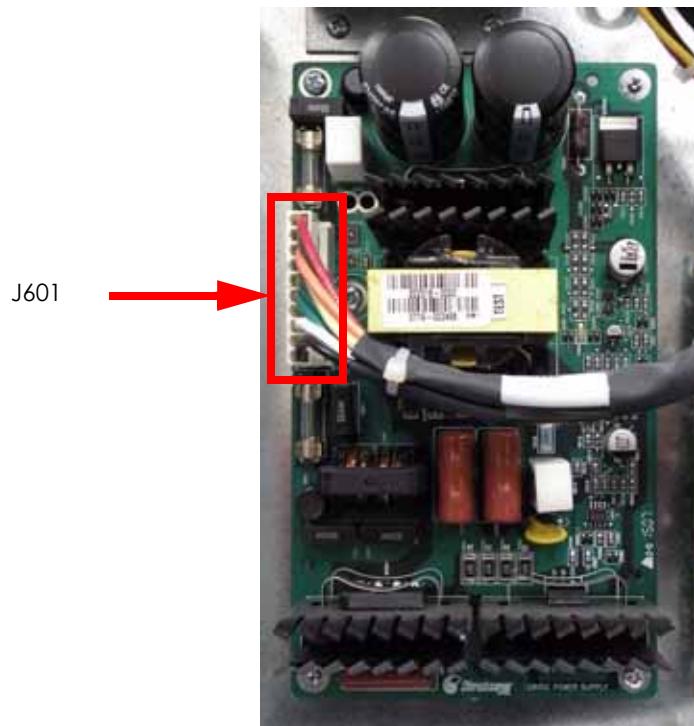
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 120 VDC power supply. See [Figure 62](#).

Figure 62: 120 VDC power supply location



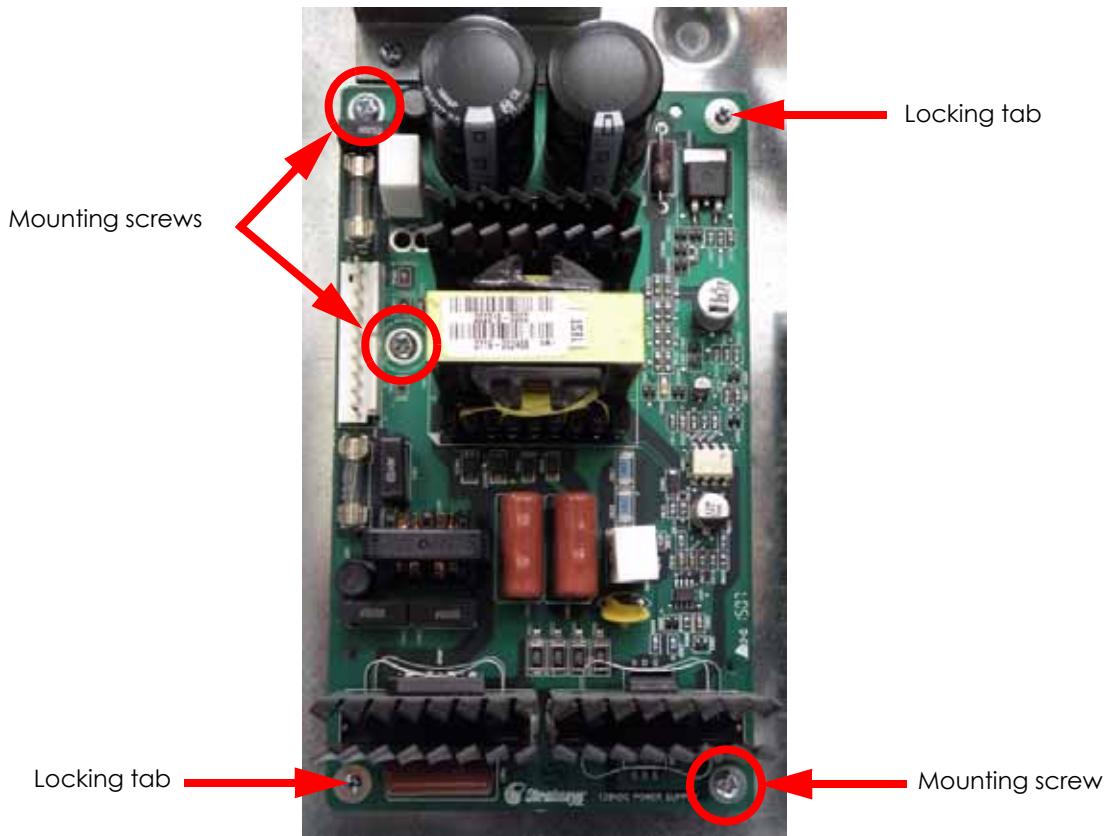
6. Remove the electronics bay cooling fan. See “[Removing the Electronics Bay Cooling Fan:](#)” [on page 5-101](#).
7. Disconnect the J601 cable by pulling outward. See [Figure 63](#).

Figure 63: J601 cable location



8. Using a phillips screwdriver, remove the 3 mounting screws. See [Figure 64](#).

Figure 64: 120 VDC power supply mounting screw locations



Installing the 120 VDC Power Supply:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the 120 VDC power supply with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
3. Reconnect J601.
4. Reinstall the electronics bay cooling fan. See "["Installing the Electronics Bay Cooling Fan:" on page 5-102](#).
5. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#).
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power up the printer.
8. Run a small test part and monitor system operation during build.

5/12 VDC Power Supply

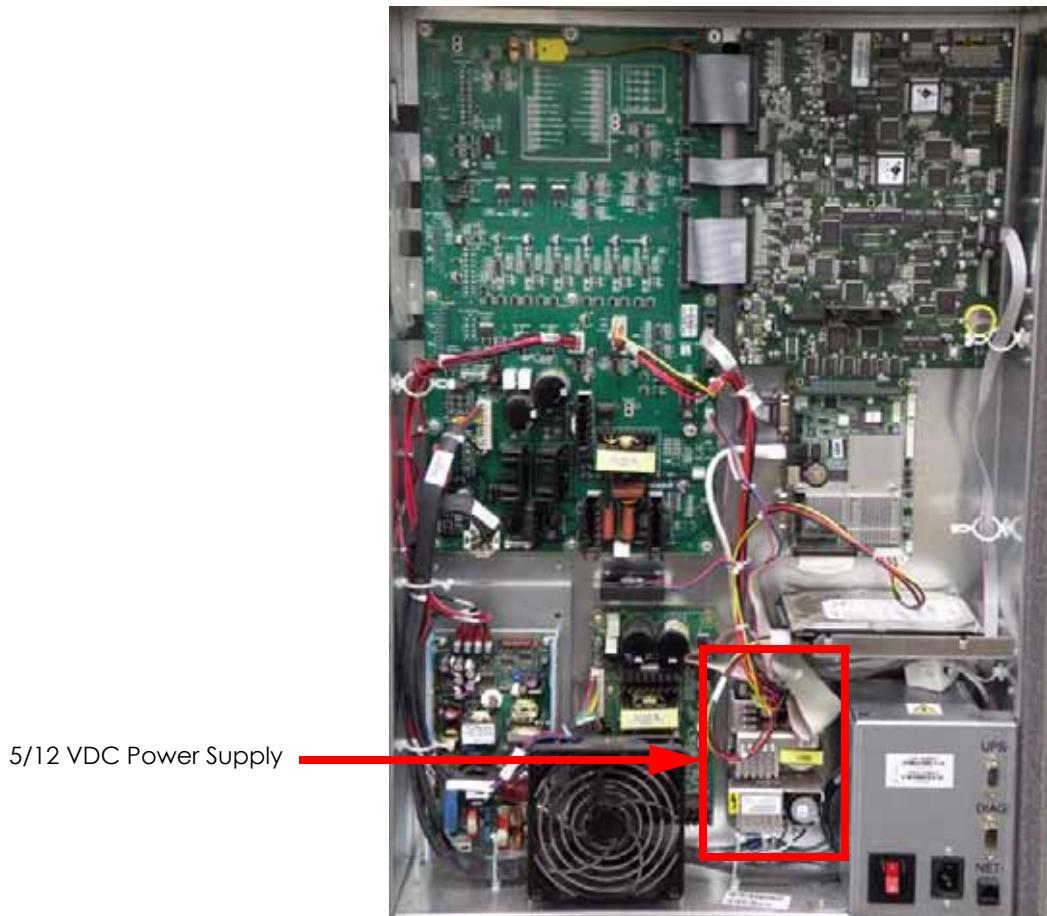
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the 5/12 VDC Power Supply:

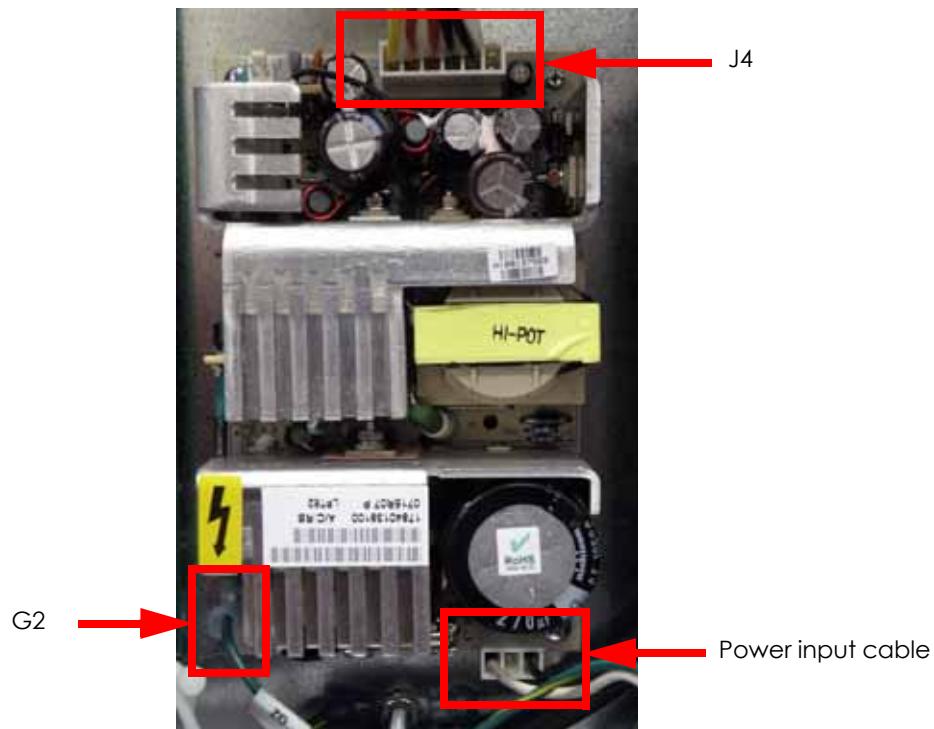
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 120 VDC power supply. See [Figure 65](#).

Figure 65: 5/12 VDC power supply location



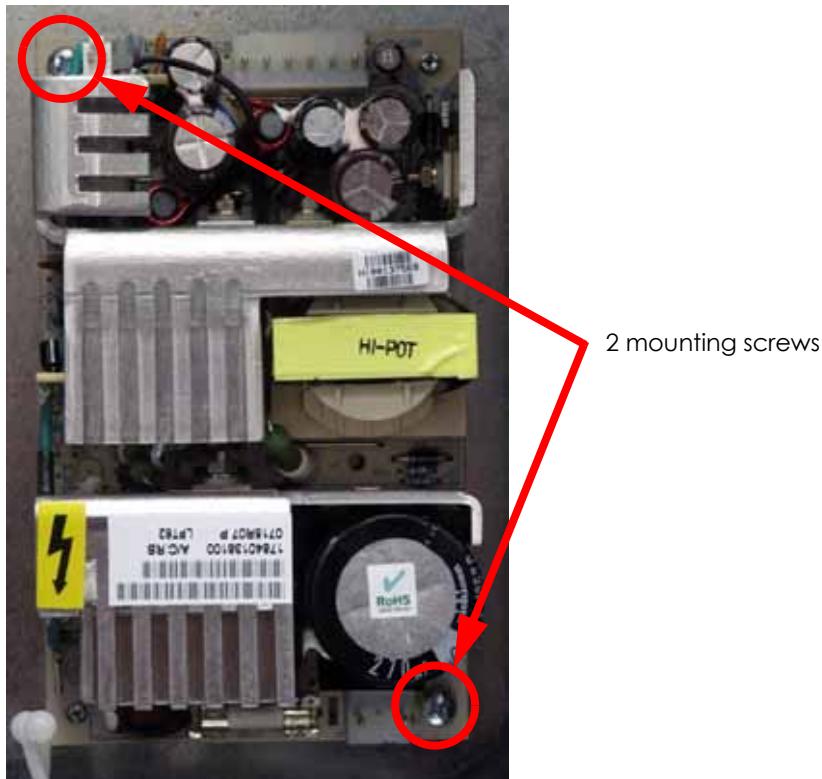
6. Disconnect the J4 cable by pulling outwards. See [Figure 66](#).
7. Disconnect the power input cable by pulling outwards. See [Figure 66](#).
8. Disconnect the G2 ground wire by pulling outwards. See [Figure 66](#).

Figure 66: J4 cable location



9. Using a phillips screwdriver, remove the 2 mounting screws. See [Figure 67](#).

Figure 67: 5/12 VDC power supply mounting screw locations



Installing the 5/12 VDC Power Supply:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the 5/12 VDC power supply with the mounting holes and use a phillips screwdriver to reinstall the 2 mounting screws.
3. Reconnect the G2 ground wire.
4. Reconnect the power input cable.
5. Reconnect the J4 cable.
6. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10.](#)
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer.
9. Run a small test part and monitor system operation during build.

Line Filter Board

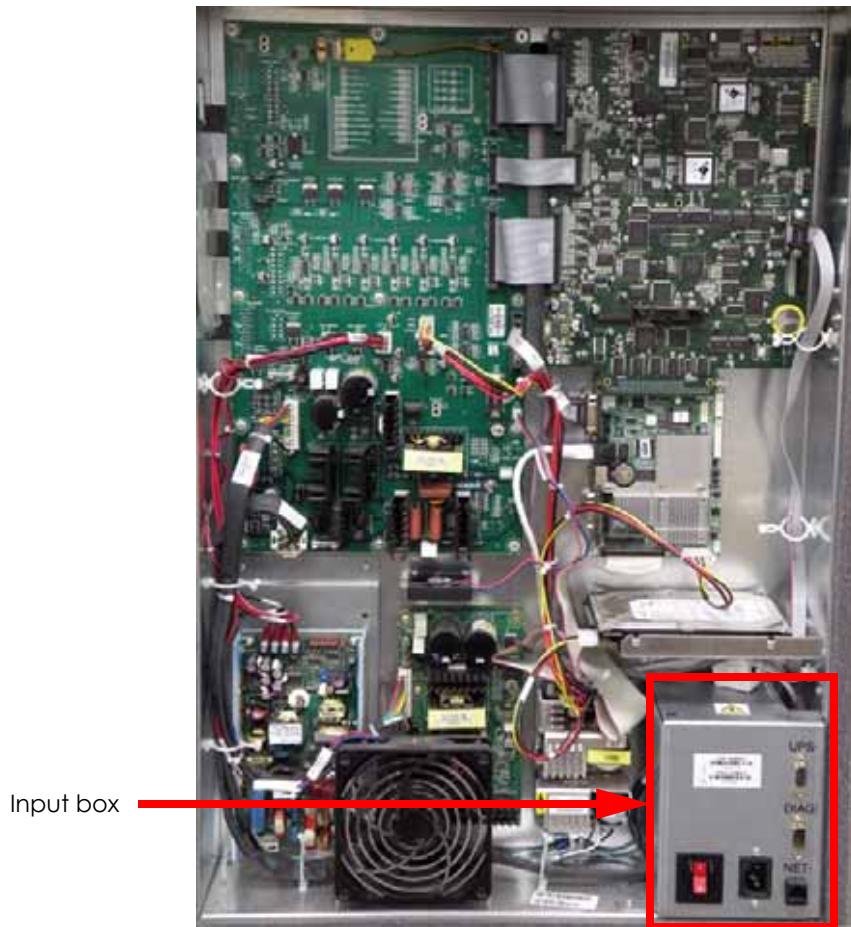
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the Line Filter Board:

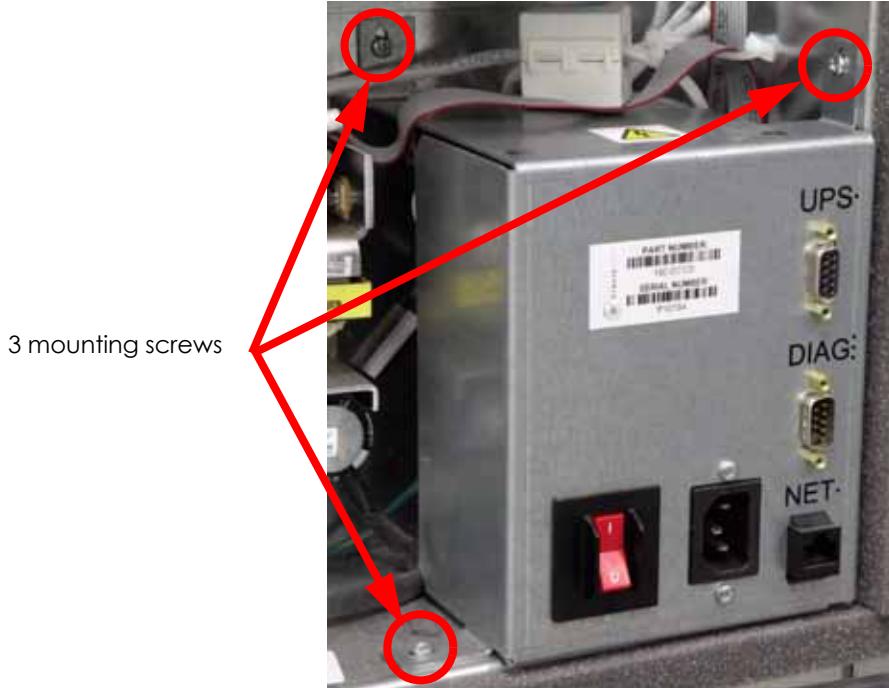
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 68](#).

Figure 68: Input box location



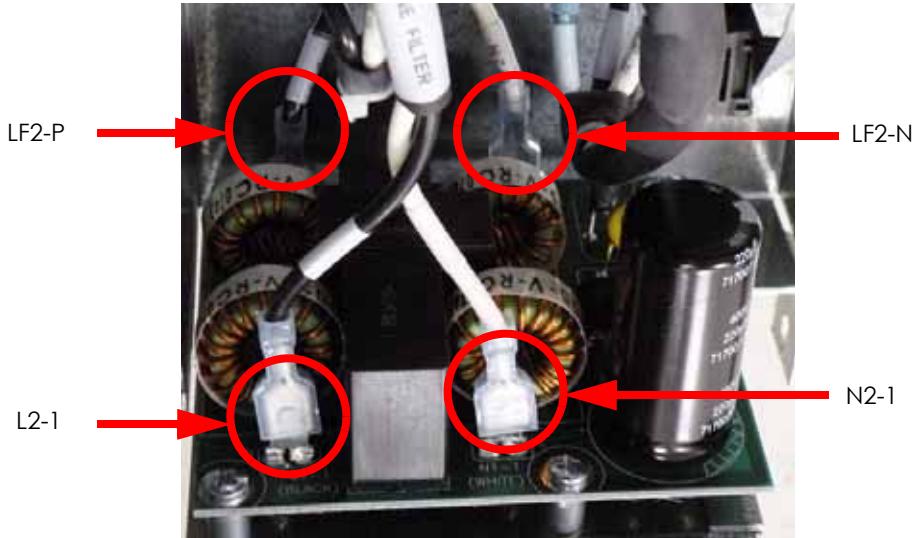
6. Using a phillips screwdriver, remove the 3 input box mounting screws. See [Figure 69](#).

Figure 69: Input box mounting screw locations



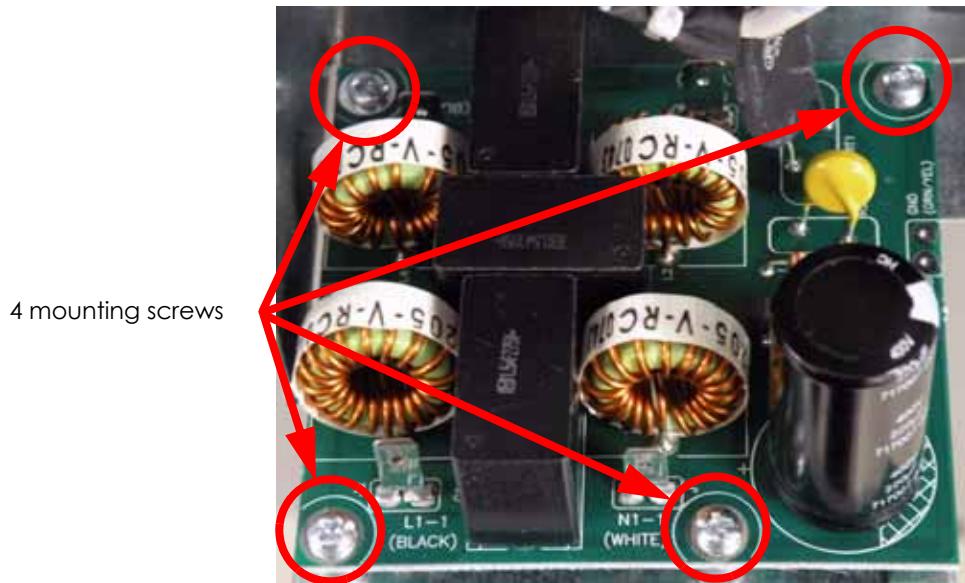
7. Disconnect L2-1 (black) and N2-1 (white) from the front of the line filter board. See [Figure 70](#).
8. Disconnect LF2-P (black) and LF2-N (white) from the rear of the line filter board. See [Figure 70](#).

Figure 70: Line filter connector locations



9. Using a phillips screwdriver, remove the 4 mounting screws. See [Figure 71](#).

Figure 71: Line filter mounting screw locations



Installing the Line Filter Board:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the line filter with the mounting standoffs and use a phillips screwdriver to reinstall the 4 mounting screws.
3. Reconnect LF2-P (black) to the left rear of the line filter board.
4. Reconnect LF2-N (white) to the right rear of the line filter board.
5. Reconnect L2-1 (black) to the left front of the line filter board.
6. Reconnect N2-1 (white) to the right front of the line filter board.
7. Align the input box cover with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.

AC Input

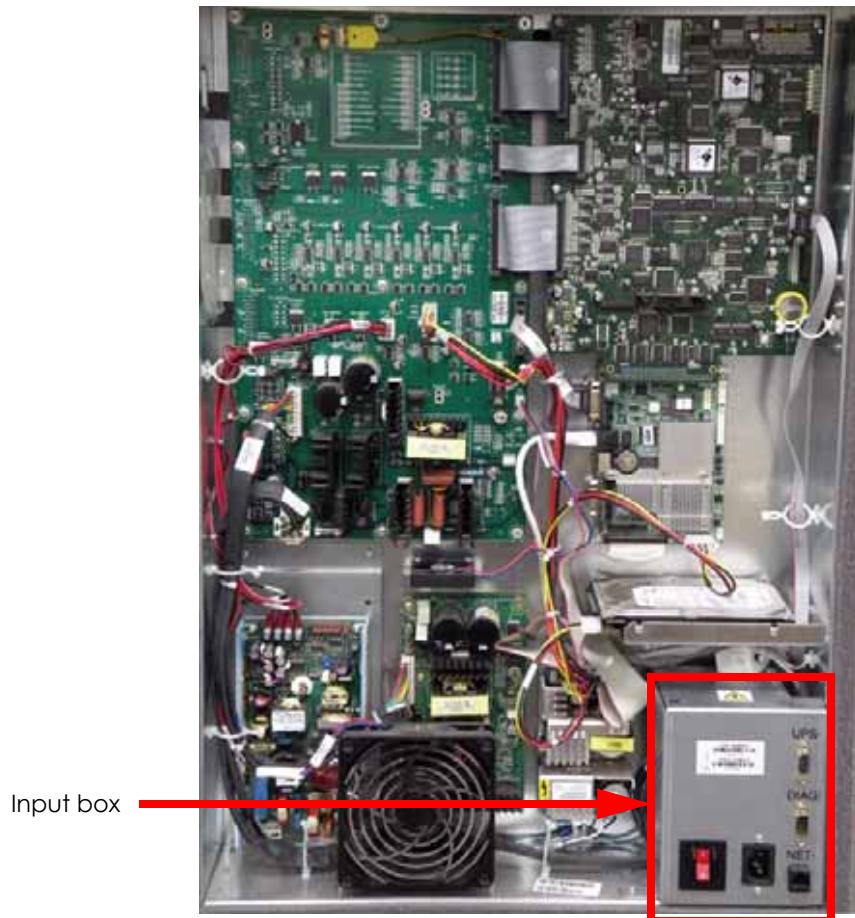
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the AC Input:

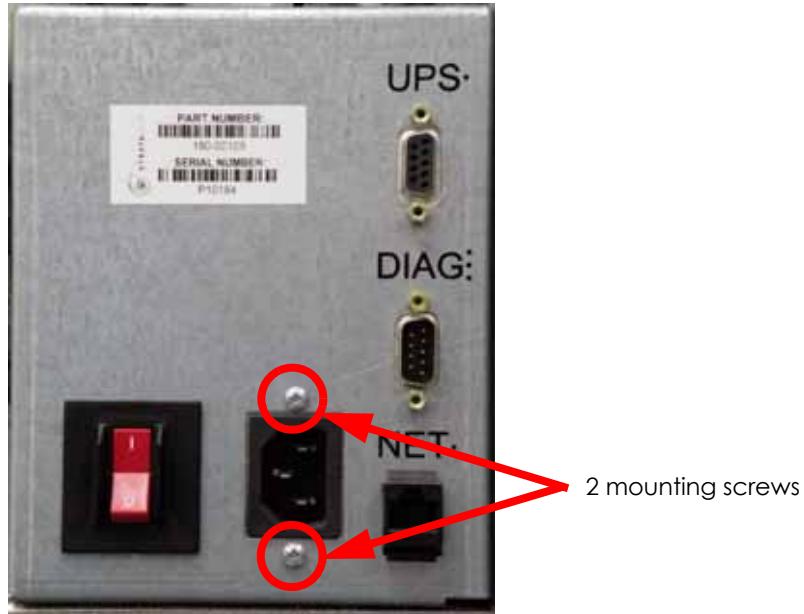
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 72](#).

Figure 72: Input box location



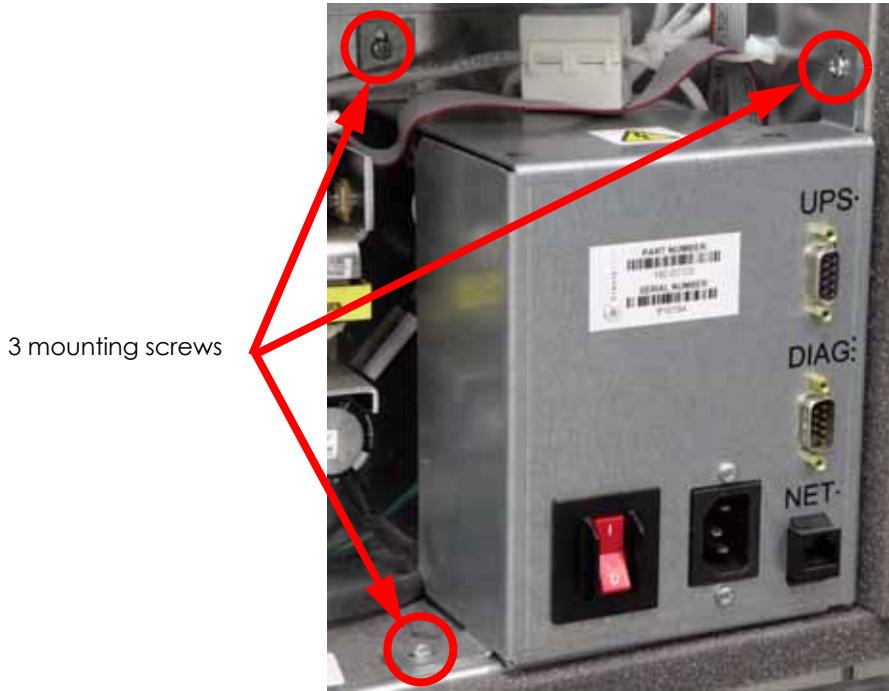
6. Using a phillips screwdriver, remove the 2 AC input mounting screws. See Figure 73.

Figure 73: AC input mounting screw locations



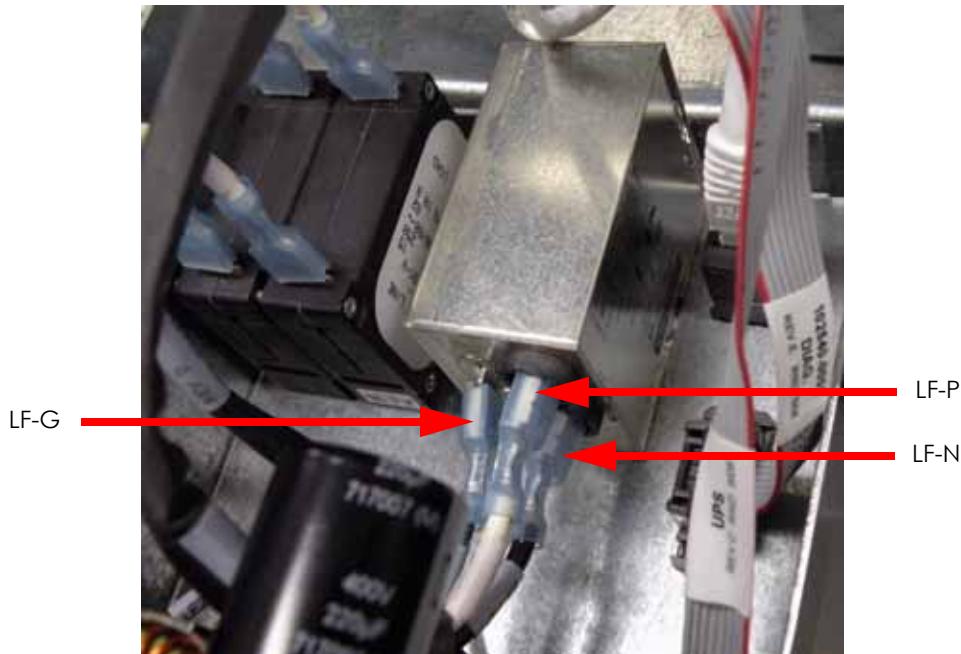
7. Using a phillips screwdriver, remove the 3 input box mounting screws. See Figure 74.

Figure 74: Input box mounting screw locations



8. Disconnect LF-P (black) from the bottom right side of the AC input by pulling outwards. See [Figure 75](#).
9. Disconnect LF-N (white) from the upper right side of the AC input by pulling outwards. See [Figure 75](#).
10. Disconnect LF-G (green) from the left side of the AC input by pulling outwards. See [Figure 75](#).

Figure 75: AC input connection locations



Installing the AC Input:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Reconnect LF-P (black) to the lower right side of the AC input.
3. Reconnect LF-N (white) to the upper right side of the AC input.
4. Reconnect LF-G (green) to the left side of the AC input.
5. Align the AC input with the mounting holes and use a phillips screwdriver to reinstall the 2 mounting screws.
6. Align the input box with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power up the printer.
10. Run a small test part and monitor system operation during build.

Circuit Breaker

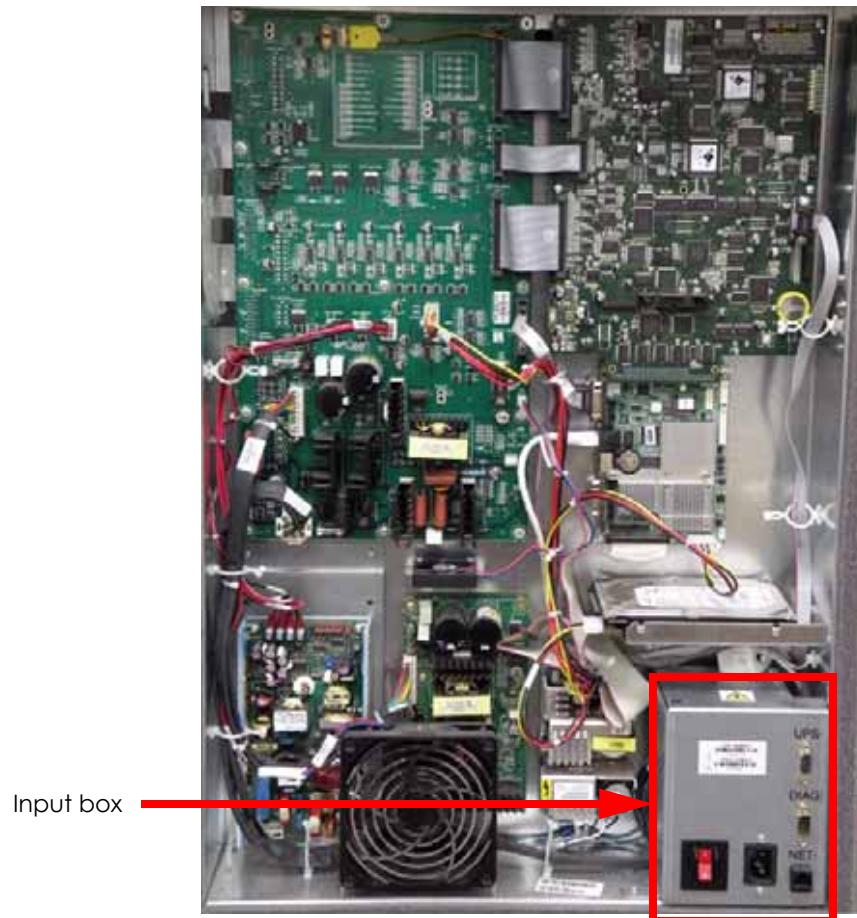
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the Circuit Breaker:

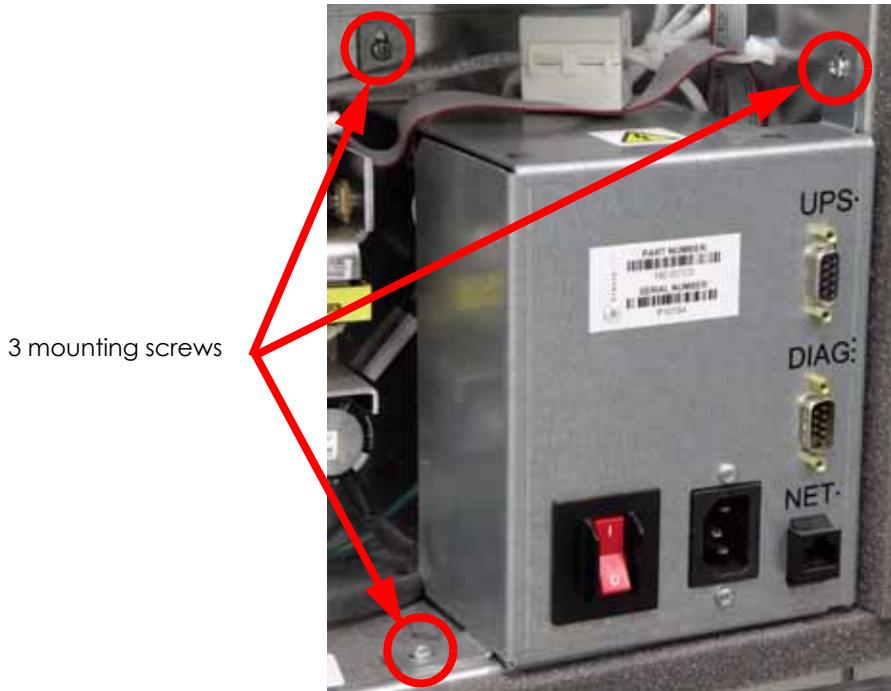
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 76](#).

Figure 76: Input box location



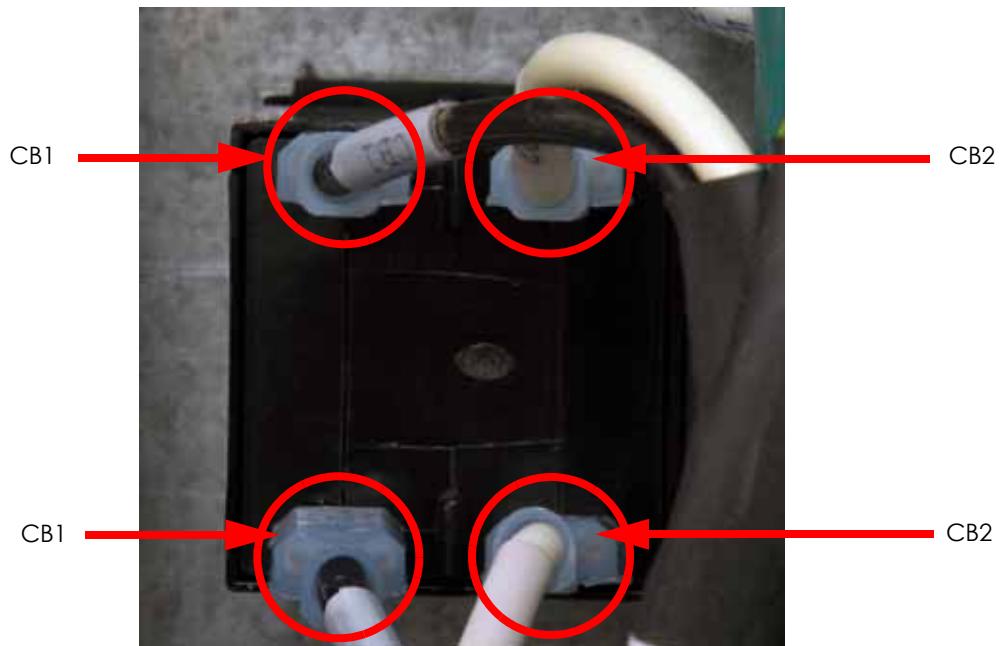
6. Using a phillips screwdriver, remove the 3 input box mounting screws. See [Figure 77](#).

Figure 77: Input box mounting screw locations



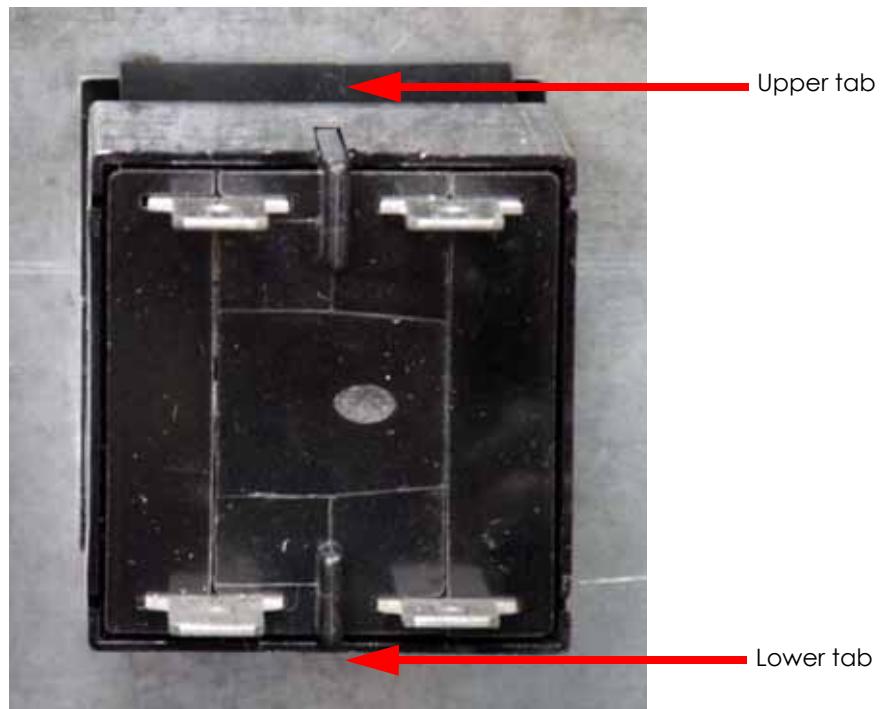
7. Disconnect CB1 (black) from the upper left side of the circuit breaker by pulling outward. See [Figure 78](#).
8. Disconnect CB2 (white) from the upper right side of the circuit breaker by pulling outward. See [Figure 78](#).
9. Disconnect CB1 (black) from the lower left side of the circuit breaker by pulling outward. See [Figure 78](#).
10. Disconnect CB2 (white) from the lower right side of the circuit breaker by pulling outward. See [Figure 78](#).

Figure 78: Circuit breaker connection locations



11. Press the 2 tabs in and push the circuit breaker outwards to remove. See [Figure 79](#).

Figure 79: Circuit breaker tab locations



Installing the Circuit Breaker:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Push the circuit breaker into the input box until it locks in place.
3. Reconnect CB1 (black) to the upper left side of the circuit breaker.
4. Reconnect CB2 (white) to the upper right side of the circuit breaker.
5. Reconnect CB1 (black) to the lower left side of the circuit breaker.
6. Reconnect CB2 (white) to the upper right side of the circuit breaker.
7. Align the input box with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
8. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#).
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.

Gen 2 Electrical Components

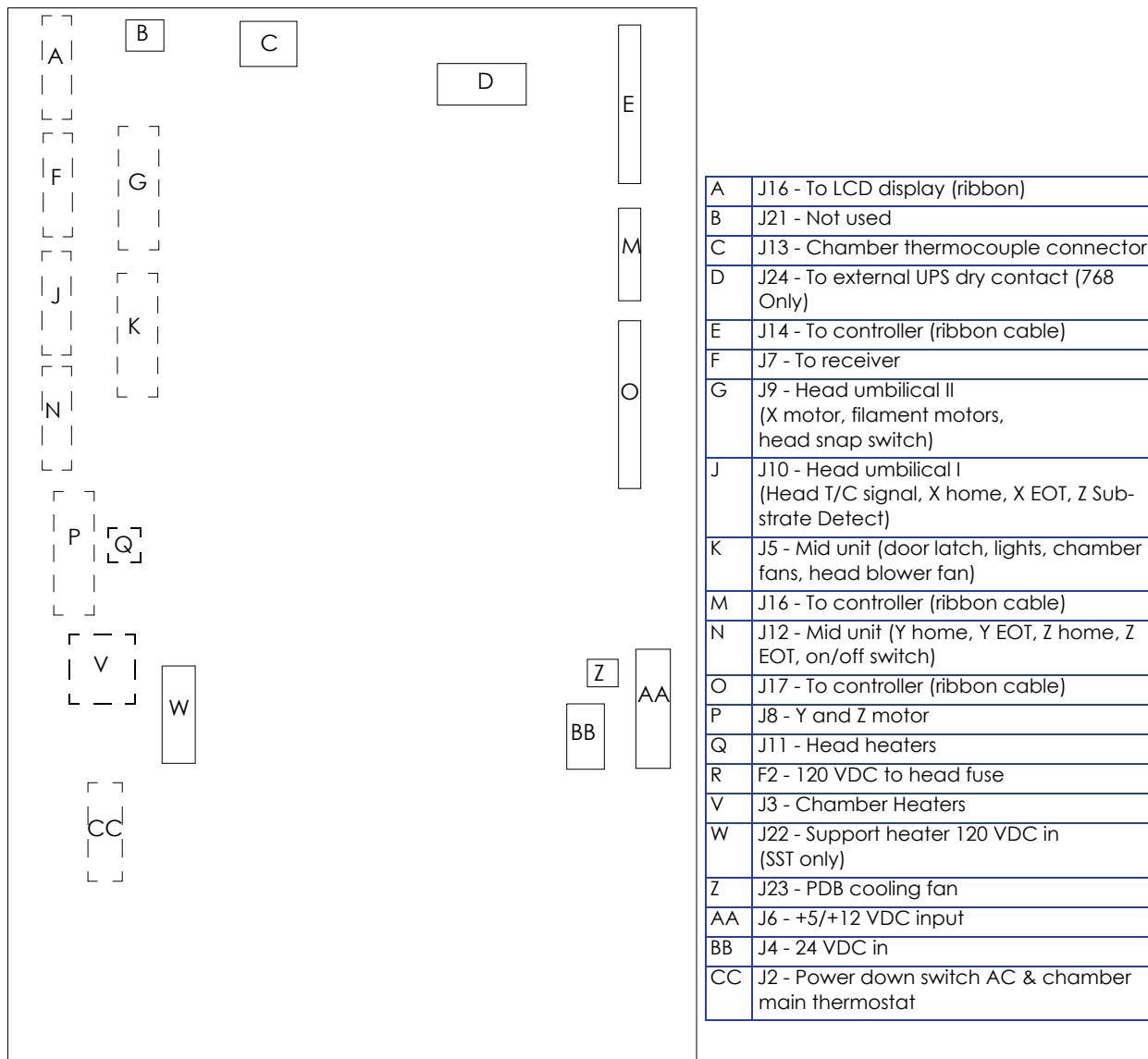
Gen 2 electronics will be installed on printers with serial numbers between P4000 and P08999

Power Distribution Board (PDB)

Required Tools

- Phillips screwdriver
- Small standard screwdriver
- Grounding wrist strap

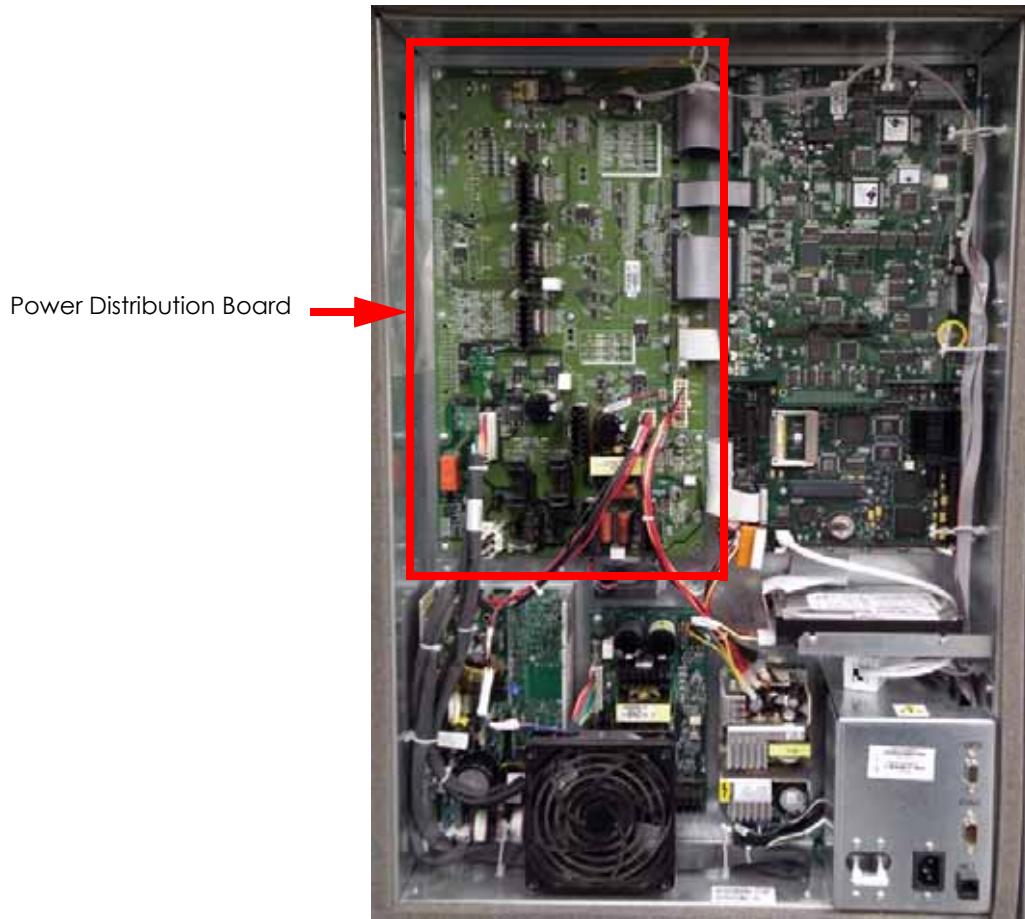
Figure 80: Gen 2 power distribution board detail



Removing the Power Distribution Board:

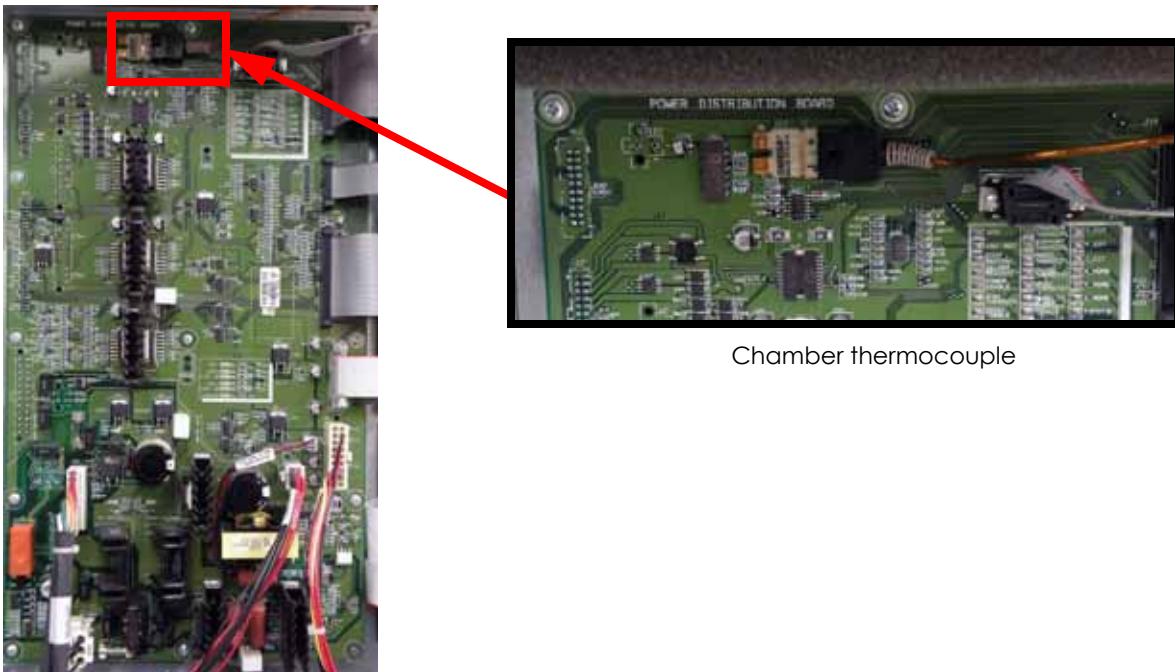
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Remove the side panels. See [“Side Panels” on page 5-11](#).
5. Wear a grounding wrist strap and connect the end to the electronics bay pan.
6. Locate the power distribution board. See [Figure 81](#).

Figure 81: Power distribution board location



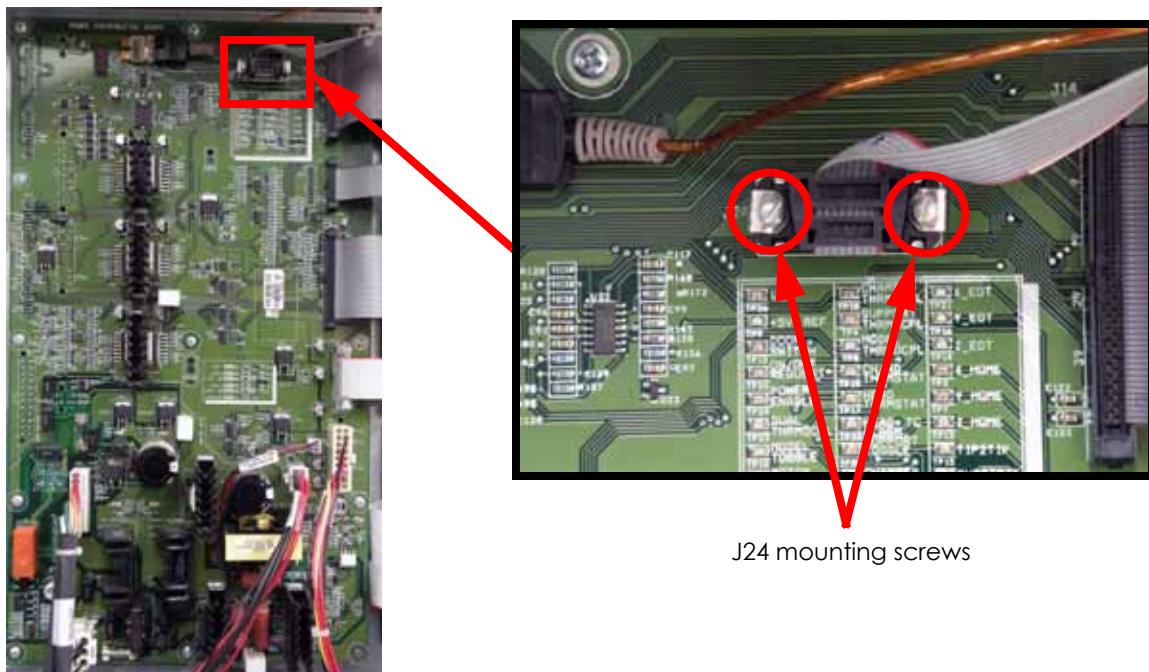
7. Disconnect the chamber thermocouple from the power distribution board by pulling outward. See [Figure 82](#).

Figure 82: Chamber thermocouple location



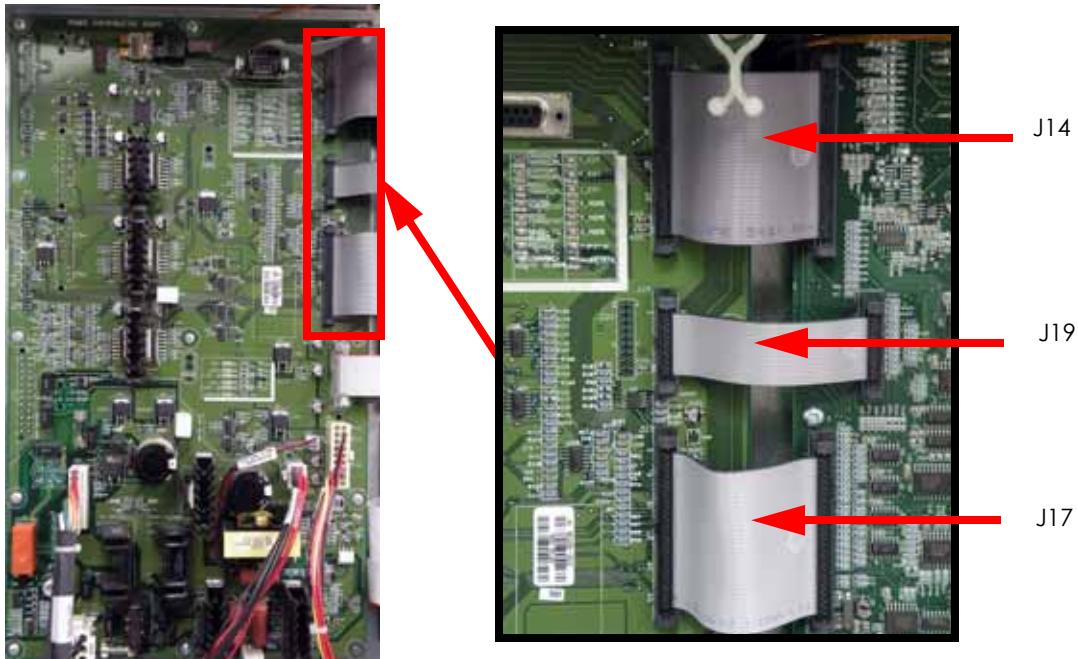
8. Using a standard screwdriver, loosen the J24 DB-9 connector on the power distribution board and pull outward to disconnect. See [Figure 83](#).

Figure 83: J24 location



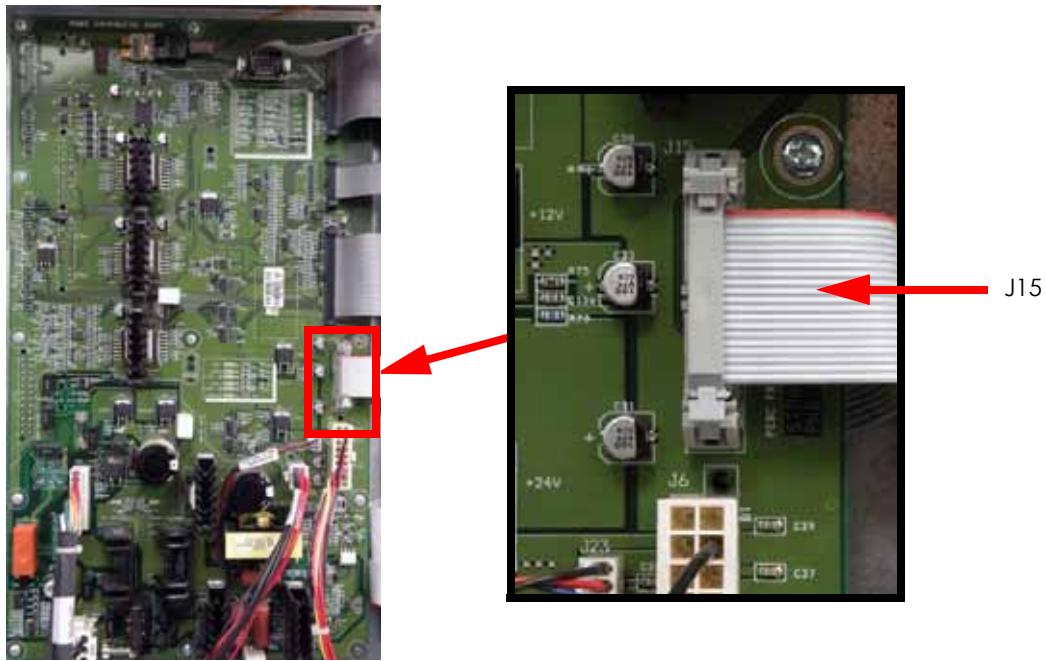
9. Disconnect the J14, J17 and J19 ribbon cables from the power distribution board by pressing the tabs in and pulling outwards. See [Figure 84](#).

Figure 84: Power distribution board ribbon cable locations



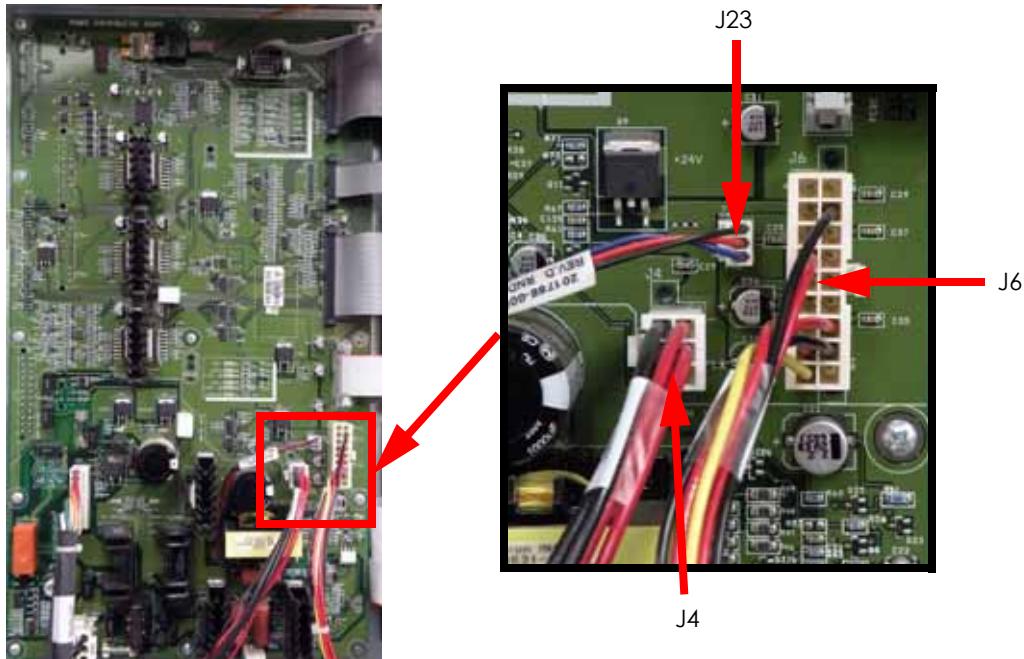
10. Disconnect the J15 ribbon cable by pressing the tabs in and pulling outward. See [Figure 85](#).

Figure 85: J15 ribbon cable location



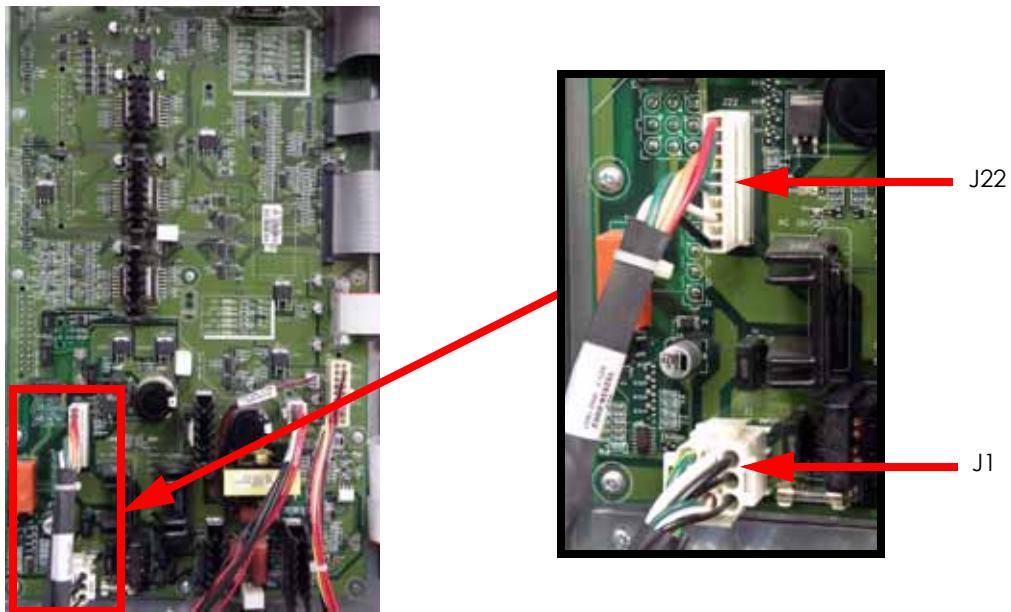
11. Disconnect the J4, J6 and J23 cables by pressing the tabs in and pulling outwards. See [Figure 86](#).

Figure 86: Power distribution board cable locations



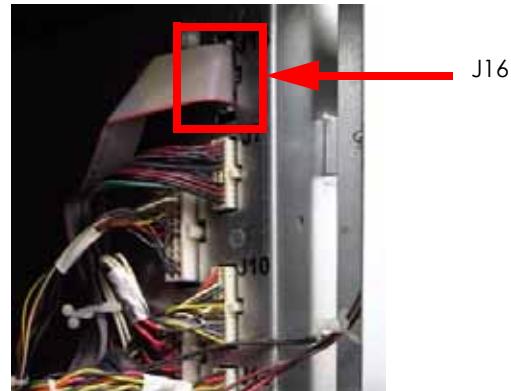
12. Disconnect the J1 and J22 cables by pressing the tabs in and pulling outwards. See [Figure 87](#).

Figure 87: Power distribution board cable locations



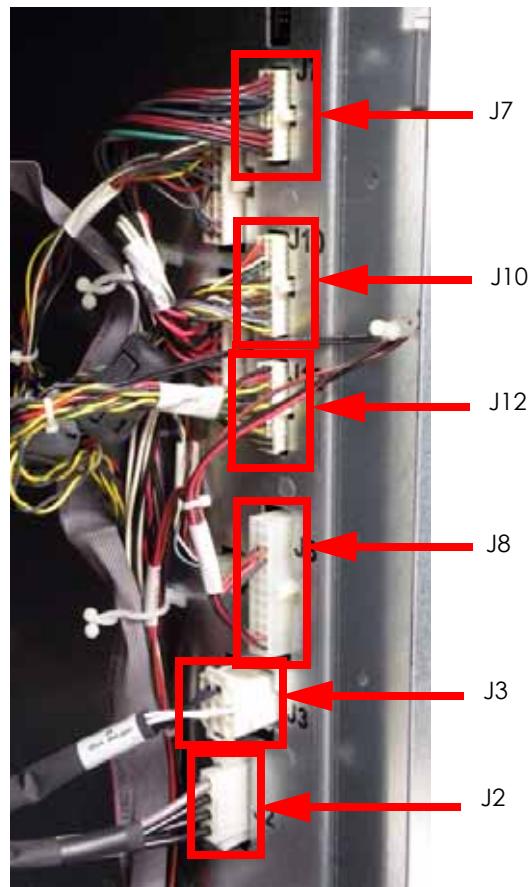
13. At the back side of the power distribution board, disconnect the J16 ribbon cable by pulling outwards. See [Figure 88](#).

Figure 88: J16 cable location



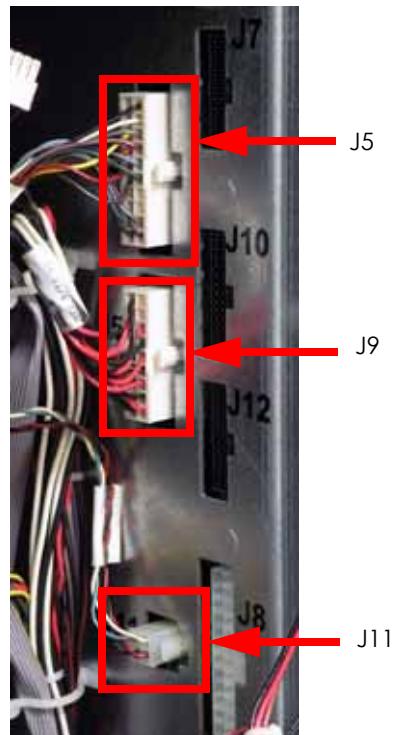
14. At the back side of the power distribution board, disconnect the J7, J10, J12, J8, J3 and J2 cables by pressing the tabs in and pulling outwards. See [Figure 89](#).

Figure 89: Power distribution board rear cable locations



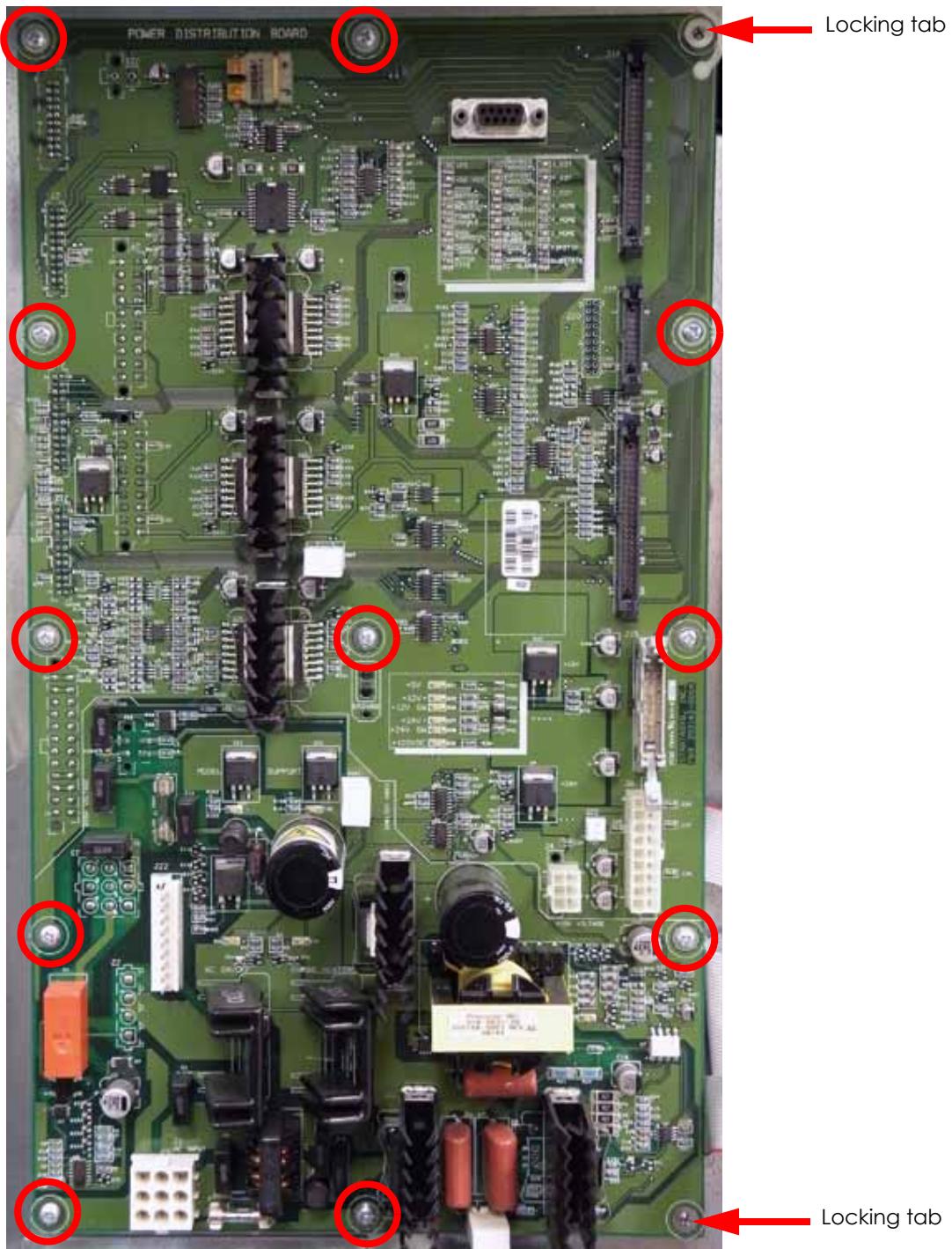
15. At the back side of the power distribution board, disconnect the J5, J9 and J11 cables by pressing the tabs in and pulling outwards. See [Figure 90](#).

Figure 90: Power distribution board rear cable locations



16. Using a phillips screwdriver, remove the 11 power distribution board mounting screws. See [Figure 91](#).

Figure 91: Power distribution board mounting screw locations



17. Gently pull the power distribution board away from the mounting posts.

Installing the Power Distribution Board:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the power distribution board with the mounting holes and press into place.
3. Use a phillips screwdriver to reinstall the 11 mounting screws.
4. Reconnect J5, J9 and J11 at the rear of the power distribution board by pushing into place.
5. Reconnect J7, J10, J12, J8, J3 and J2 at the rear of the power distribution board by pushing into place.
6. Reconnect the J16 ribbon cable at the rear of the power distribution board by pushing into place.
7. Reconnect the J1 and J22 cables by pushing into place.
8. Reconnect the J4, J6 and J23 cables by pushing into place.
9. Reconnect the J15 ribbon cable by pushing into place.
10. Reconnect the J14, J17 and J19 ribbon cables by pushing into place.
11. Reconnect the J24 DB-9 connector by pushing into place. Use a standard screwdriver to tighten the 2 mounting screws.
12. Reconnect the chamber thermocouple by pushing into place.



Be sure the + terminal of the chamber thermocouple is at the top when reconnecting.

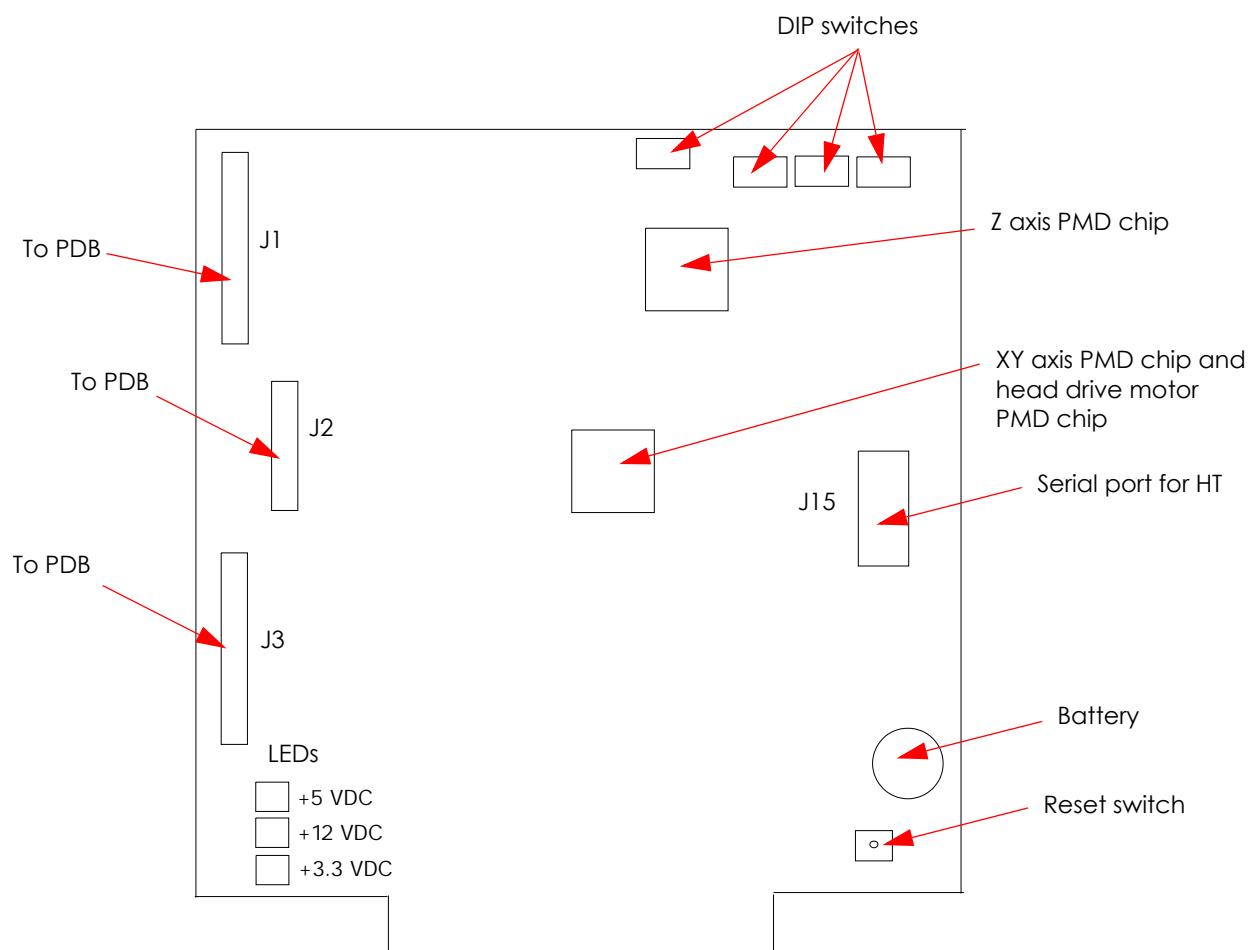
13. Reinstall the side panels. See "["Side Panels" on page 5-11](#)".
14. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
15. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
16. Power on the system. The system should reach **Idle** with no displayed errors.
17. Run a small test part and monitor system operation during build.
18. Send the bad power distribution board back to Stratasys, Inc.

Controller Board

Required Tools

- Phillips screwdriver
- Small standard screwdriver
- Grounding wrist strap

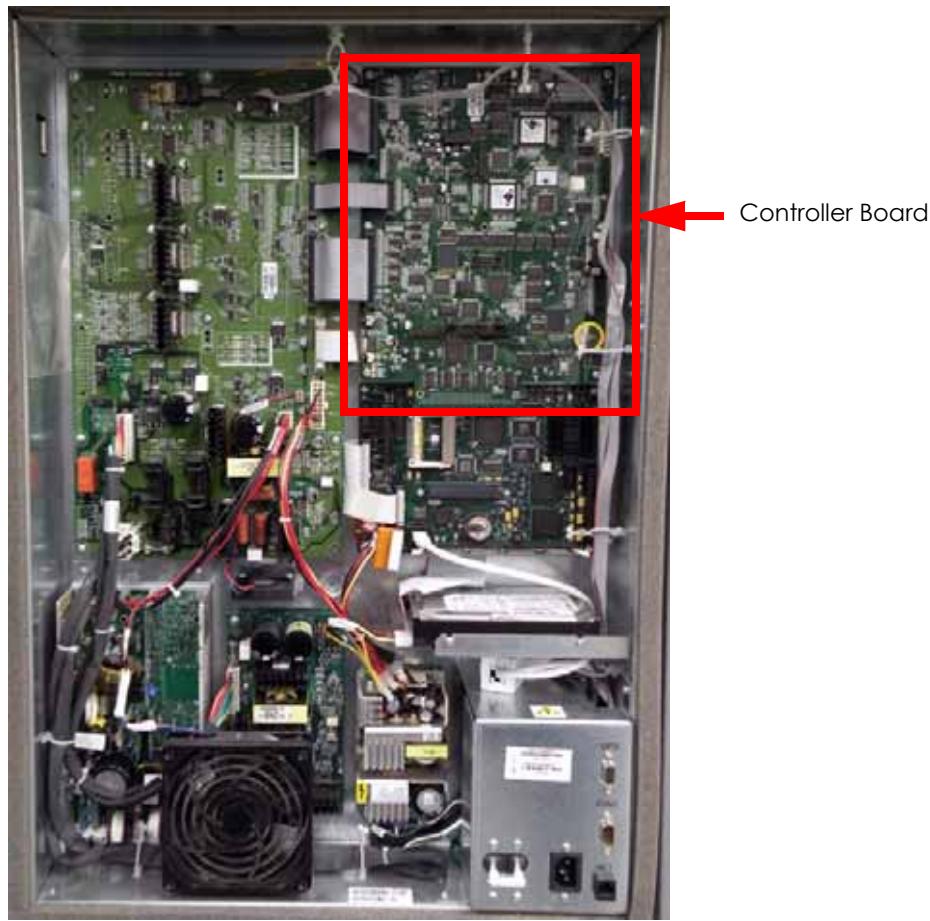
Figure 92: Controller board detail



Removing the Controller Board:

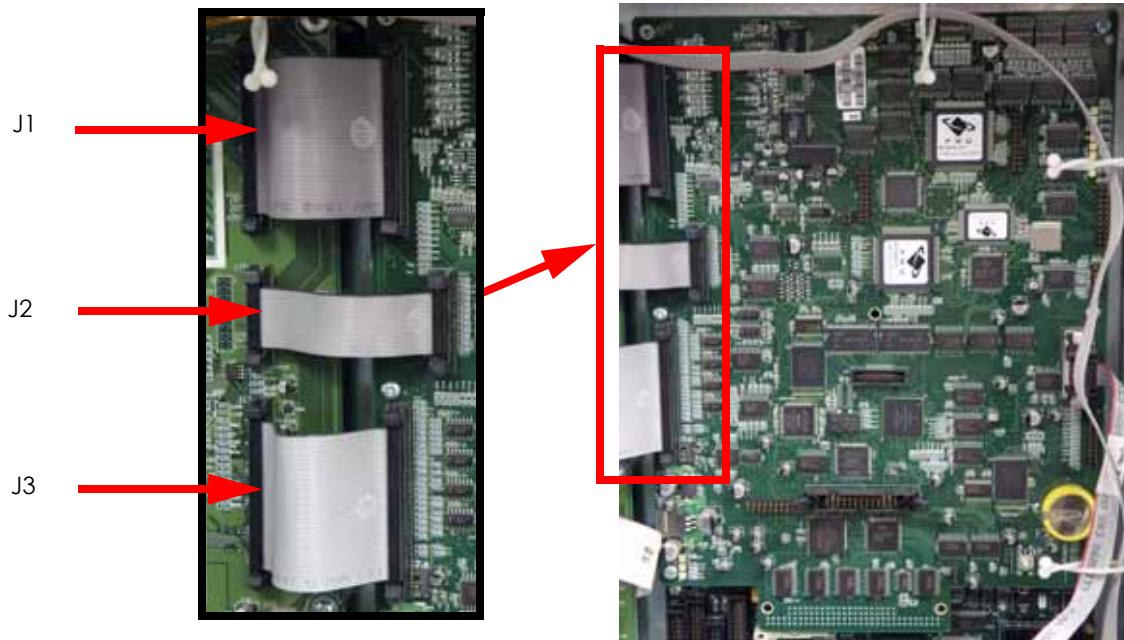
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the controller board. See [Figure 93](#).

Figure 93: Controller board location



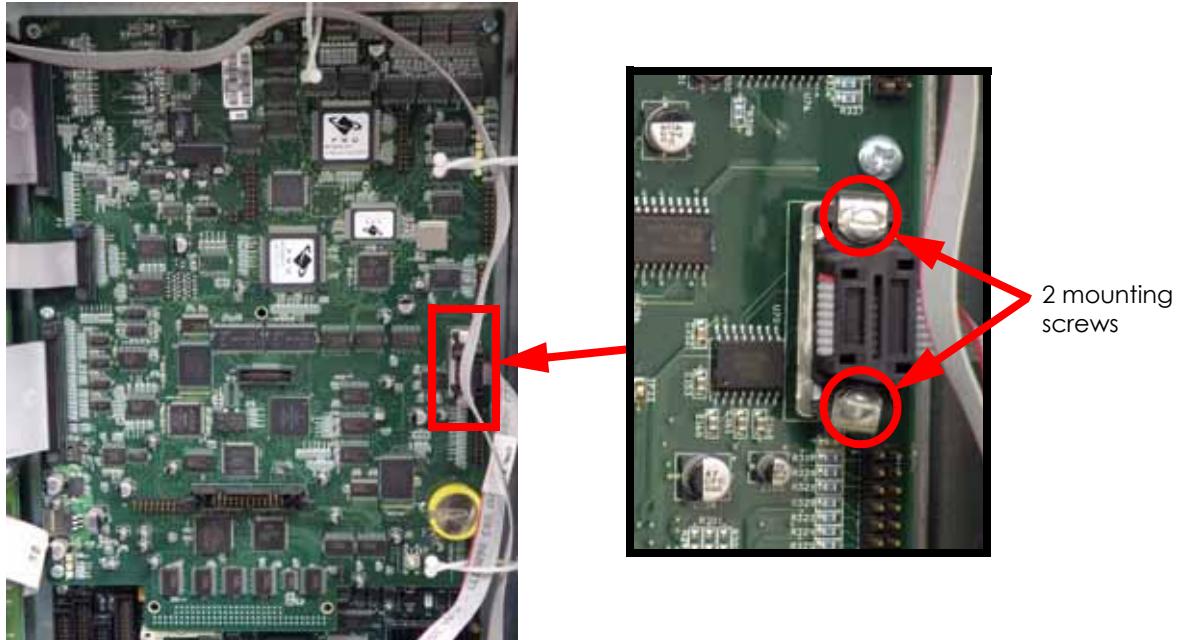
6. Disconnect the J1, J2 and J3 ribbon cables by pressing the tabs in and pulling outwards. See [Figure 94](#).

Figure 94: Controller board ribbon cable locations



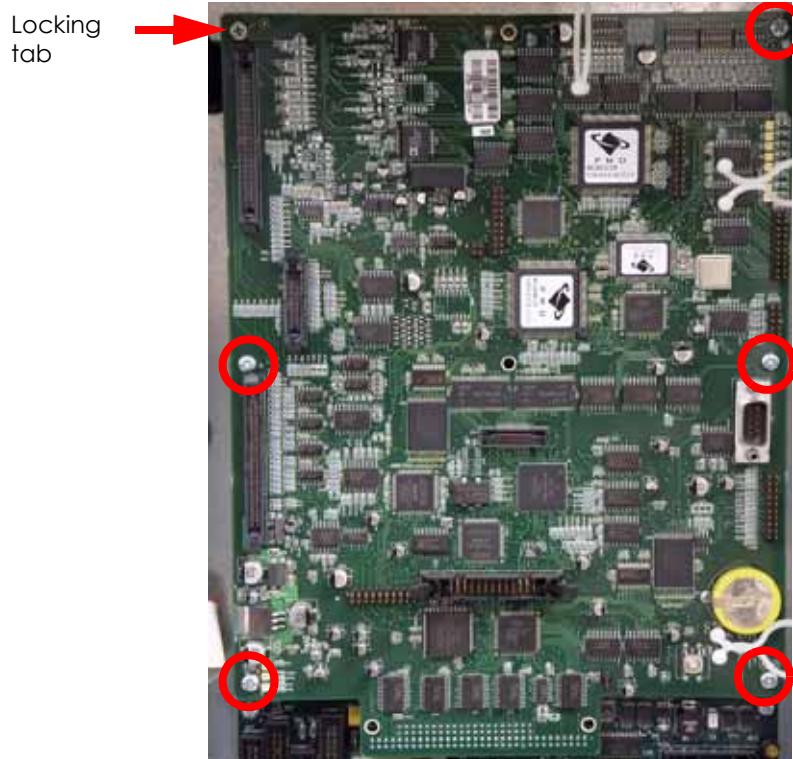
7. Using a small standard screwdriver, loosen the 2 J15 DB-9 ribbon cable mounting screws and disconnect by pulling outwards. See [Figure 95](#).

Figure 95: J15 DB-9 cable location



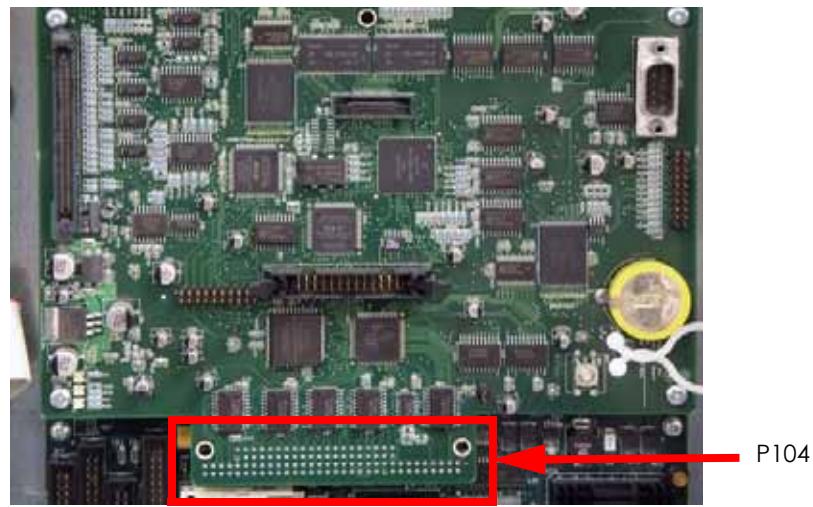
- Using a phillips screwdriver, remove the 5 controller board mounting screws. See [Figure 96](#).

Figure 96: Controller board mounting screw locations



- Gently pull the controller board at the P104 connector on the single board computer to remove. See [Figure 97](#).

Figure 97: P104 location



Installing the Controller Board:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Gently align the controller board P104 with the single board computer socket and press into place.



Be careful not to bend any pins on the P104 connector.

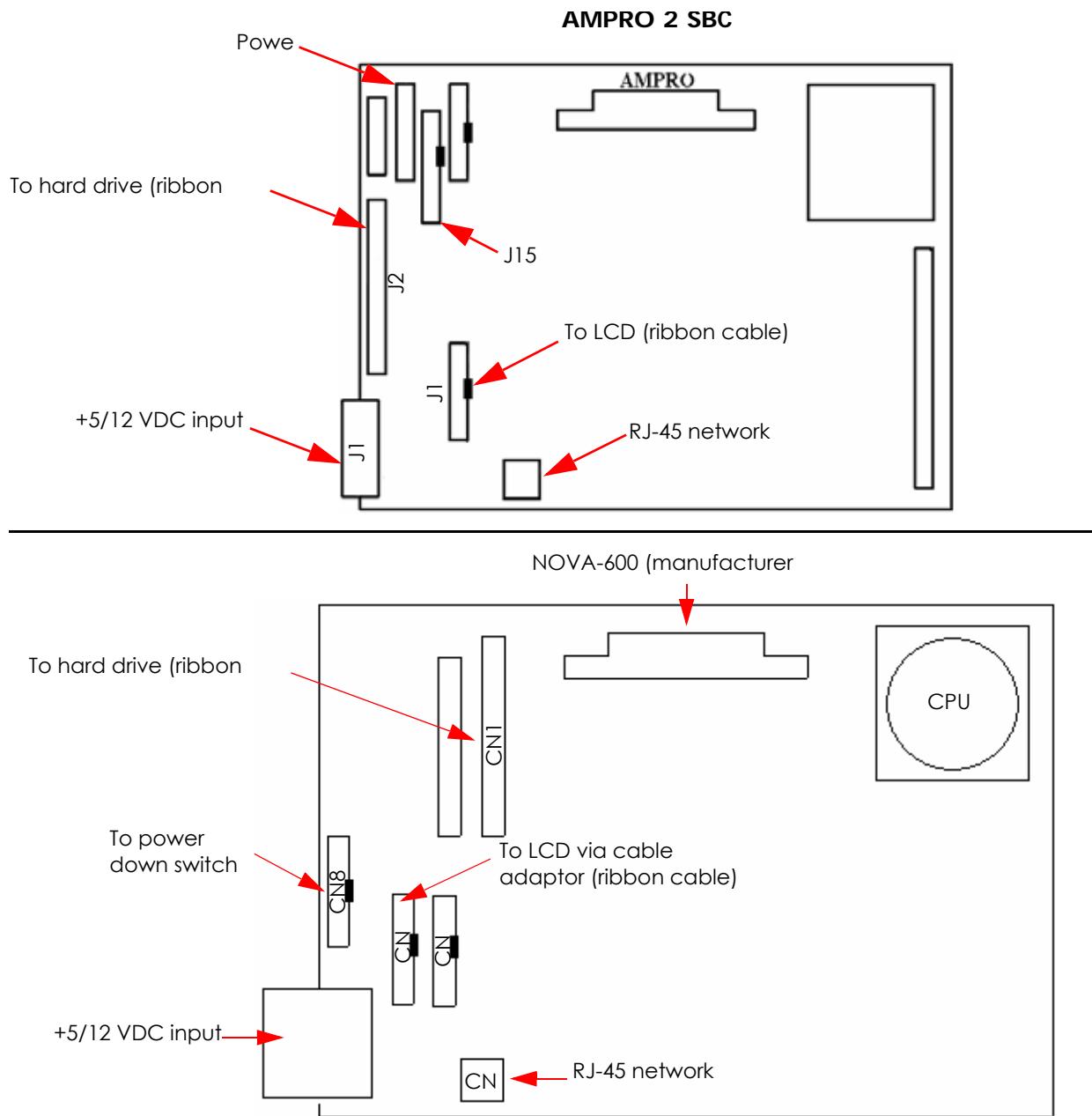
3. Using a phillips screwdriver, reinstall the 5 mounting screws.
4. Reconnect the J15 DB-9 connector by pushing into place. Use a small standard screwdriver to tighten the mounting screws.
5. Reconnect the J1, J2 and J3 ribbon cables by pressing into place.
6. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer. You will be prompted to load the controller software.
9. Assign the printer static IP or dynamic IP networking depending on your network. If you assign it static IP you will need to enter the static IP address. When finished press **Done**.
10. Insert the system software CD into the notebook computer or workstation CD drive.
11. Open CatalystEX from the notebook computer or workstation.
12. Click on the **Printer Services** tab.
13. Click on the **Update Software** button.
14. Navigate CatalystEX to the CD drive and select the proper .UPG file for the printer.
15. When finished downloading, verifying and installing, reboot the printer.
16. Run a small test part and monitor system operation during build.
17. Send the bad controller board back to Stratasys, Inc.

Single Board Computer (SBC)

Required Tools

- Phillips screwdriver
- Small standard screwdriver
- Grounding wrist strap

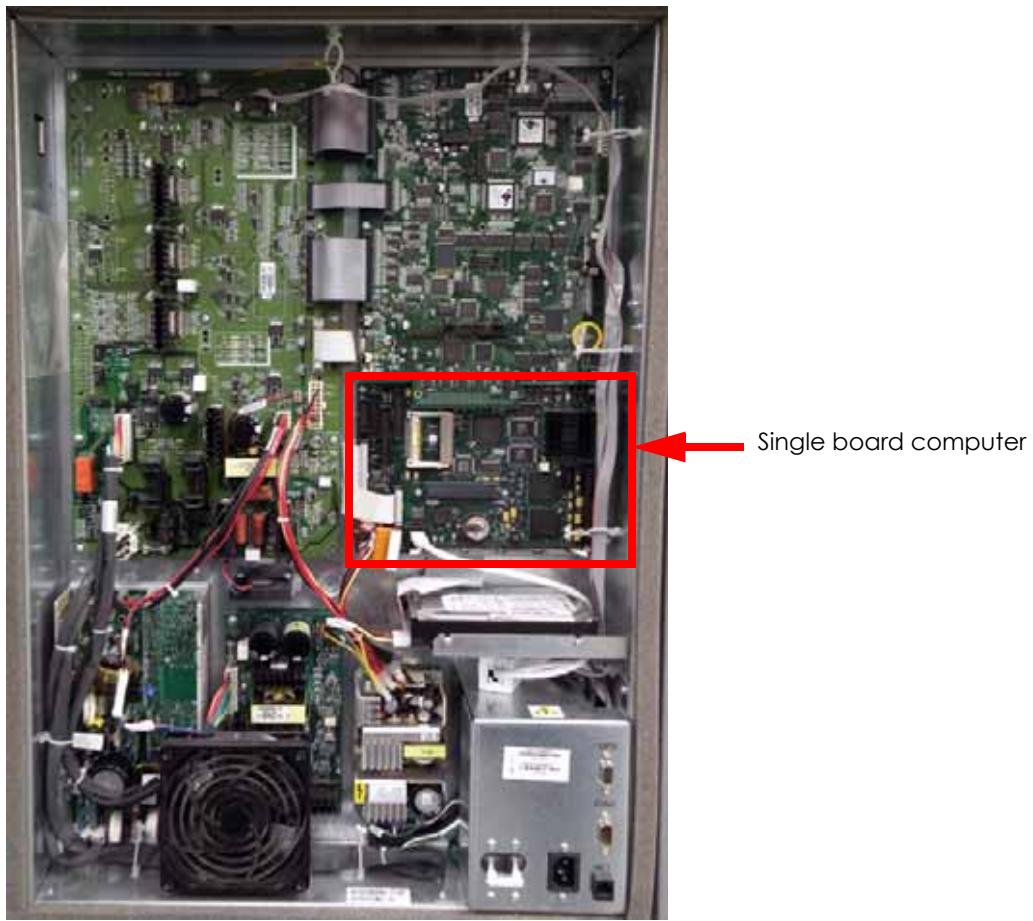
Figure 98: Single board computer details



Removing the Single Board Computer:

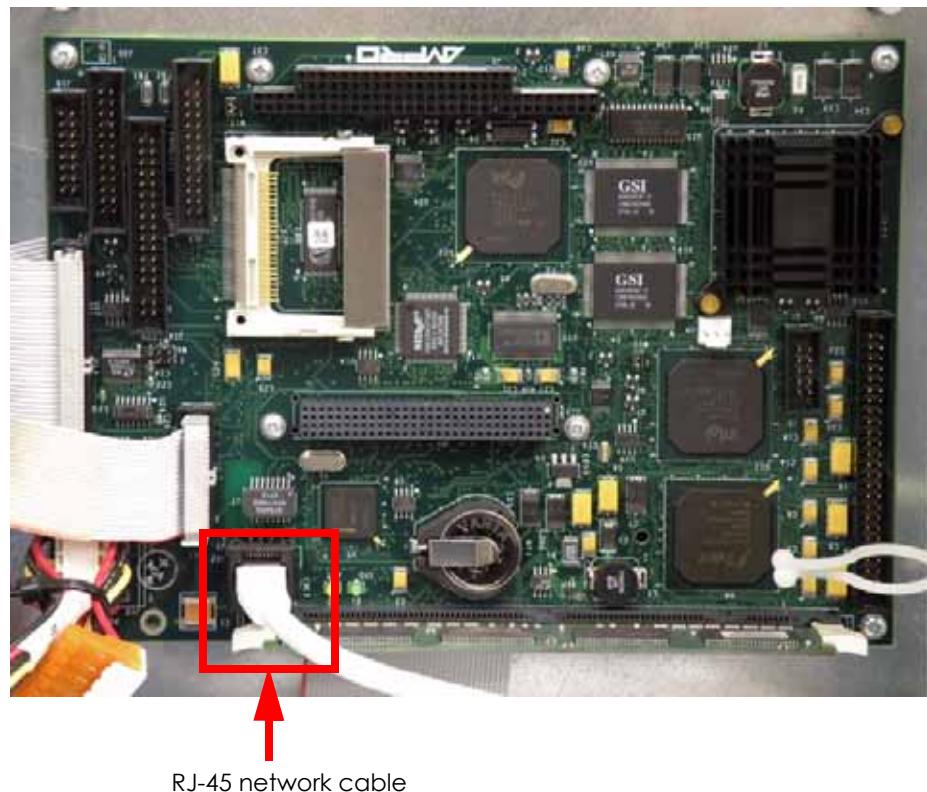
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the single board computer. See [Figure 99](#).

Figure 99: Single board computer location



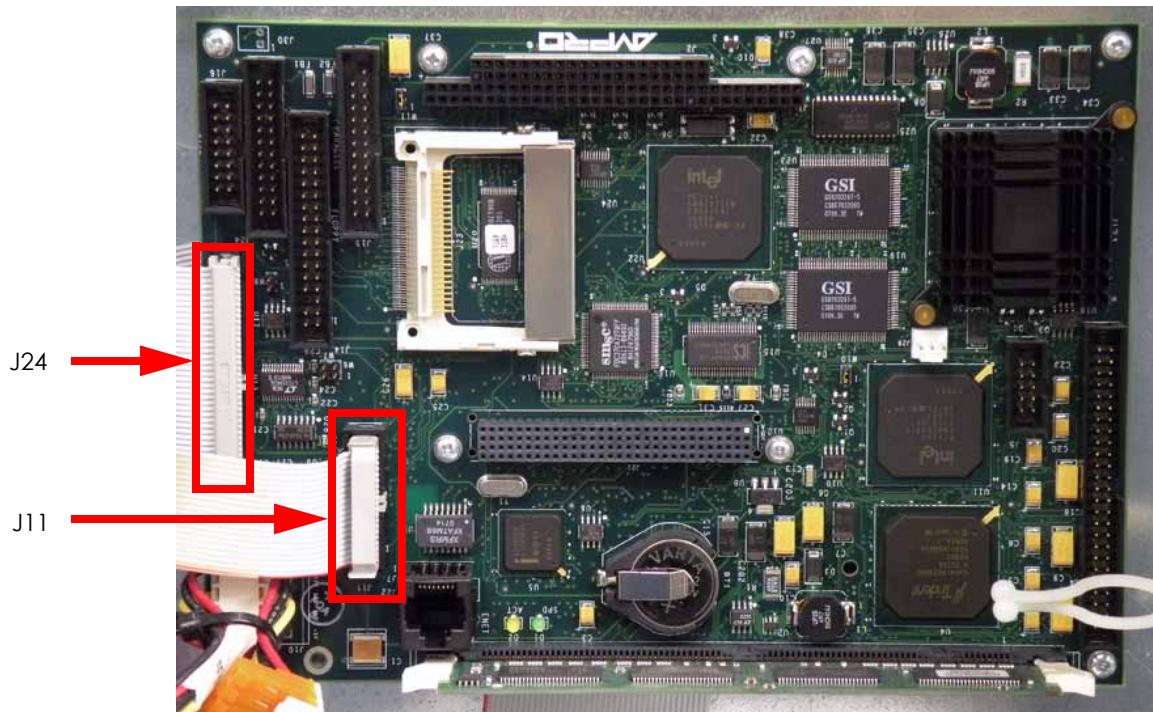
6. Remove the controller board. See "[Removing the Controller Board:](#)" on page 5-89.
7. Disconnect the RJ-45 network cable from the single board computer by pressing the tab in and pulling outward. See [Figure 100](#).

Figure 100: RJ-45 network cable location



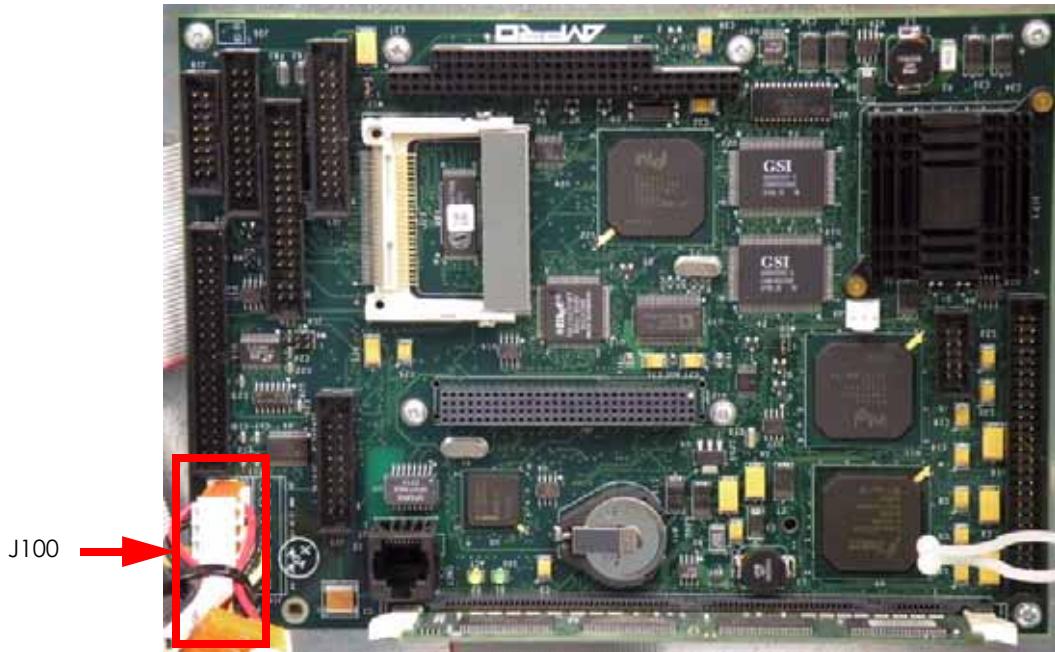
8. Disconnect the J11 ribbon cable (for Ampro SBC's, CN7 for Nova SBC's) by pulling outward. See [Figure 101](#).
9. Disconnect the J24 ribbon cable by pulling outward. See [Figure 101](#).

Figure 101: J11 and J24 ribbon cable locations



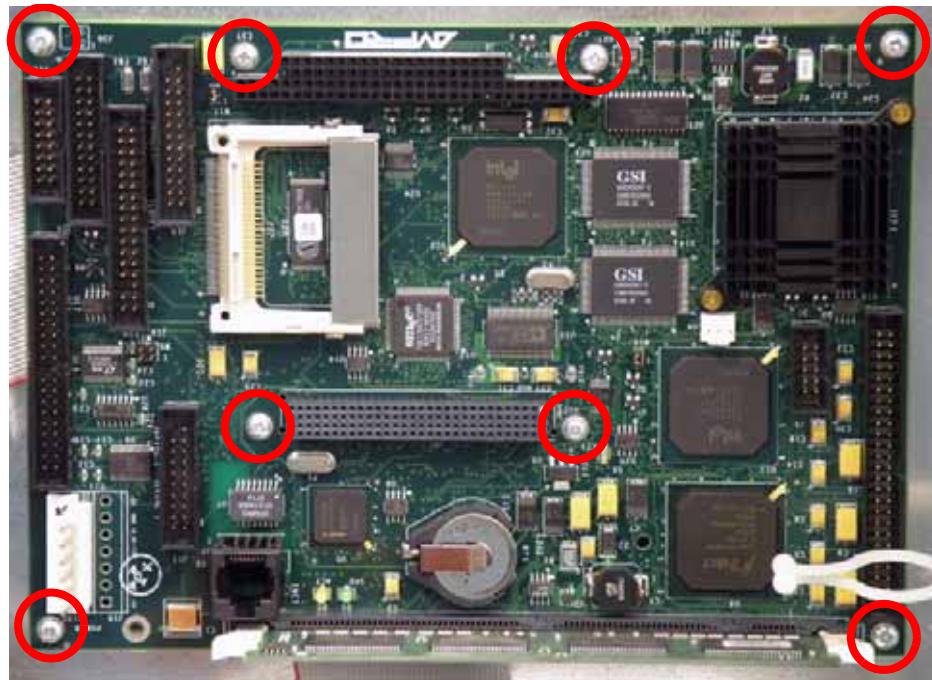
10. Disconnect the power J100 cable by pulling outward. See [Figure 102](#).

Figure 102: J100 cable location



11. Using a phillips screwdriver, remove the 8 single board computer mounting screws and remove the single board computer. See [Figure 103](#).

Figure 103: Single board computer mounting screw locations



Installing the Single Board Computer:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the single board computer with the mounting holes and use a phillips screwdriver to reinstall the 8 mounting screws.
3. Reconnect J100 by pushing into place.
4. Reconnect the J24 ribbon cable by pushing into place.
5. Reconnect the J11 ribbon cable (for Ampro SBC's, CN7 for Nova SBC's) by pushing into place.
6. Reconnect the RJ-45 network cable by pushing into place.
7. Reinstall the controller board. See "[Installing the Controller Board:](#)" on page 5-92.
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.
12. Send the bad single board computer back to Stratasys, Inc.

Hard Drive

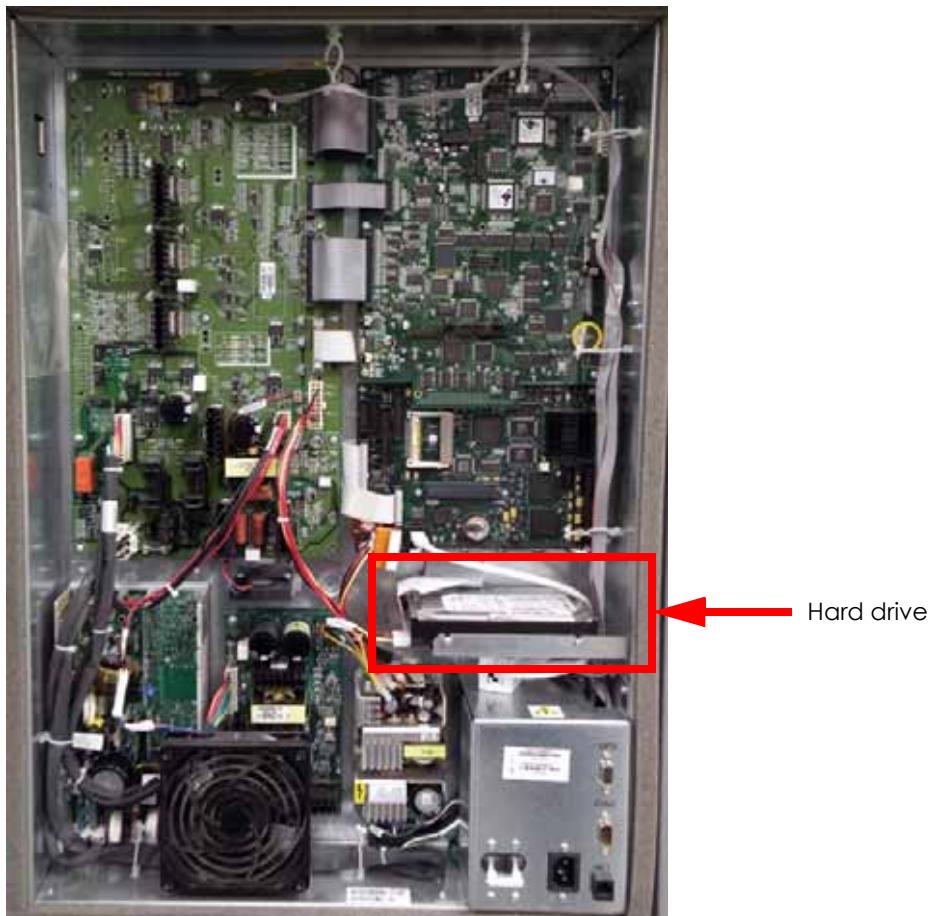
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the Hard Drive:

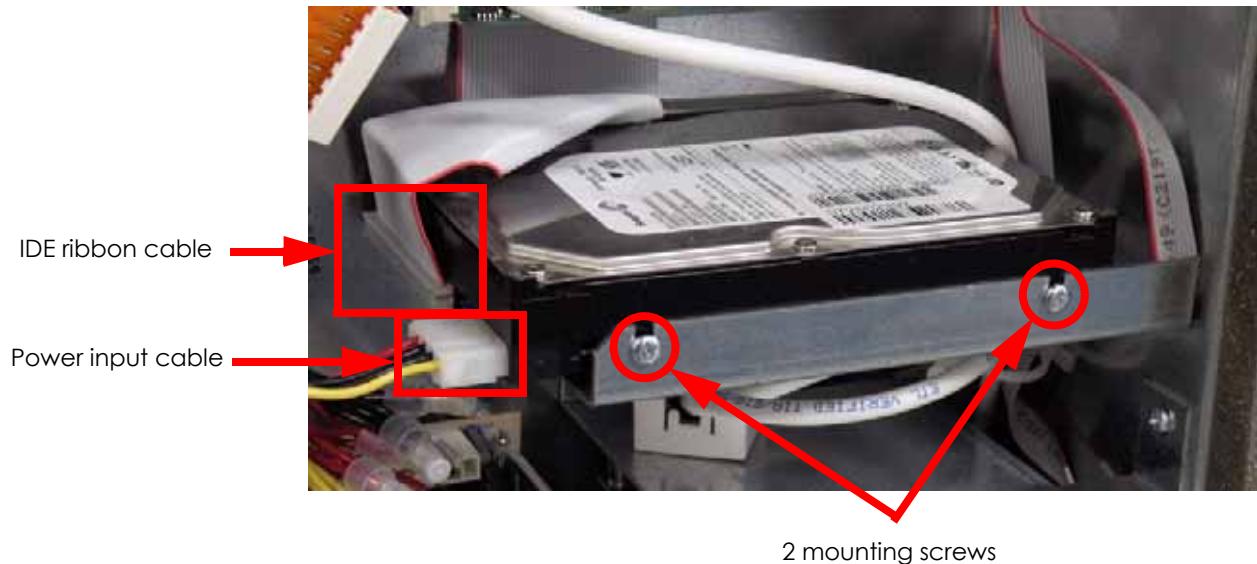
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the hard drive. See [Figure 104](#).

Figure 104: Hard drive location



6. Disconnect the power input cable by pulling outwards. See [Figure 105](#).
7. Disconnect the IDE ribbon cable by pulling outwards. See [Figure 105](#).
8. Using a phillips screwdriver, remove the 2 hard drive mounting screws. See [Figure 105](#).

Figure 105: Hard drive cable and mounting screw locations



9. Remove the hard drive.

Installing the Hard Drive:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the back side of the hard drive with the mounting posts in the electronics bay. See [Figure 106](#).

Figure 106: Hard drive mounting post locations



3. Using a phillips screwdriver, reinstall the 2 mounting screws.
4. Reconnect the IDE ribbon cable by pressing into place.
5. Reconnect the power input cable by pressing into place.
6. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer. You will be prompted to load the controller software.
9. Assign the printer static IP or dynamic IP networking depending on your network. If you assign it static IP you will need to enter the static IP address. When finished press **Done**.
10. Insert the system software CD into the notebook computer or workstation CD drive.
11. Open CatalystEX from the notebook computer or workstation.
12. Click on the **Printer Services** tab.
13. Click on the **Update Software** button.
14. Navigate CatalystEX to the CD drive and select the proper .UPG file for the printer.
15. When finished downloading, verifying and installing, reboot the printer.
16. Run a small test part and monitor system operation during build.
17. Send the bad hard drive back to Stratasys, Inc.

Electronics Bay Cooling Fan

Required Tools

- $\frac{5}{64}$ " allen wrench
- Grounding wrist strap

Removing the Electronics Bay Cooling Fan:

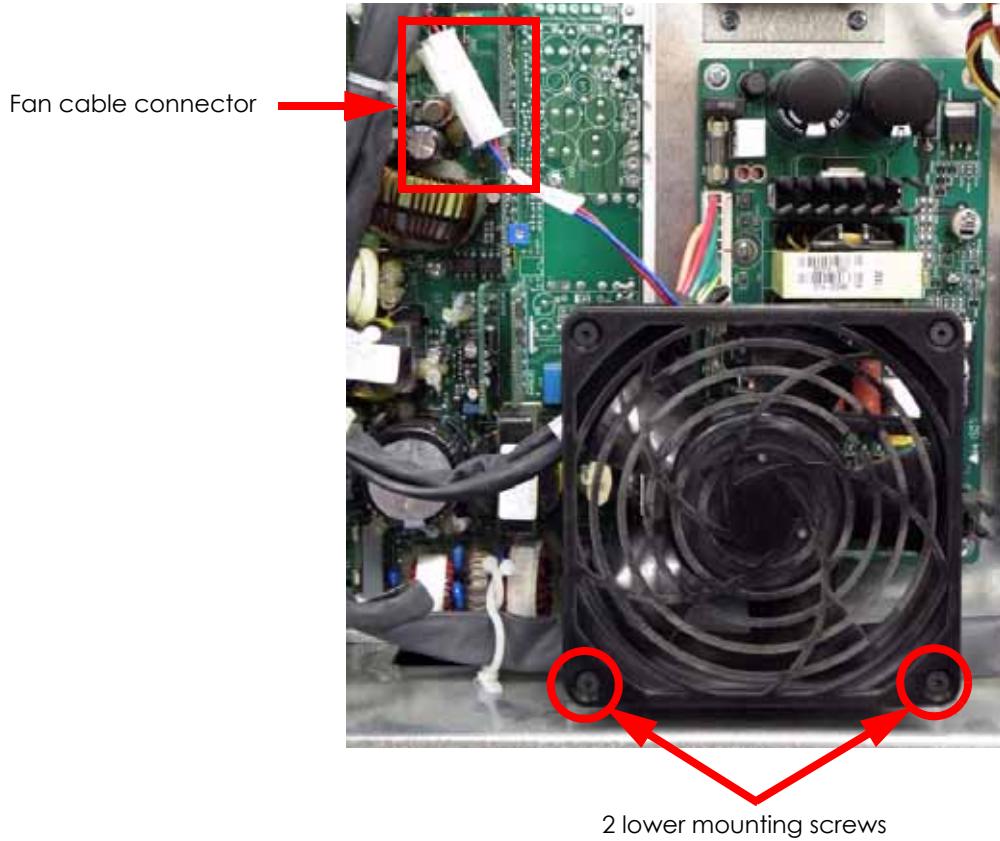
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the electronics bay cooling fan. See [Figure 107](#).

Figure 107: Electronics bay cooling fan location



6. Disconnect the electronics bay cooling fan cable by pressing the tab in and pulling outwards. See [Figure 108](#).
7. Using a $5/64"$ allen wrench, remove the lower 2 electronics bay cooling fan mounting screws. See [Figure 108](#).

Figure 108: Electronics bay cooling fan connector location



8. Remove the electronics bay cooling fan.

Installing the Electronics Bay Cooling Fan:

1. Align the electronics bay cooling fan with the mounting holes.
2. Using a $5/64"$ allen wrench, reinstall the 2 lower mounting screws.
3. Reconnect the fan cable by pushing the connectors together.
4. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
5. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
6. Power up the printer.
7. Run a small test part and monitor system operation during build.

24 VDC Power Supply

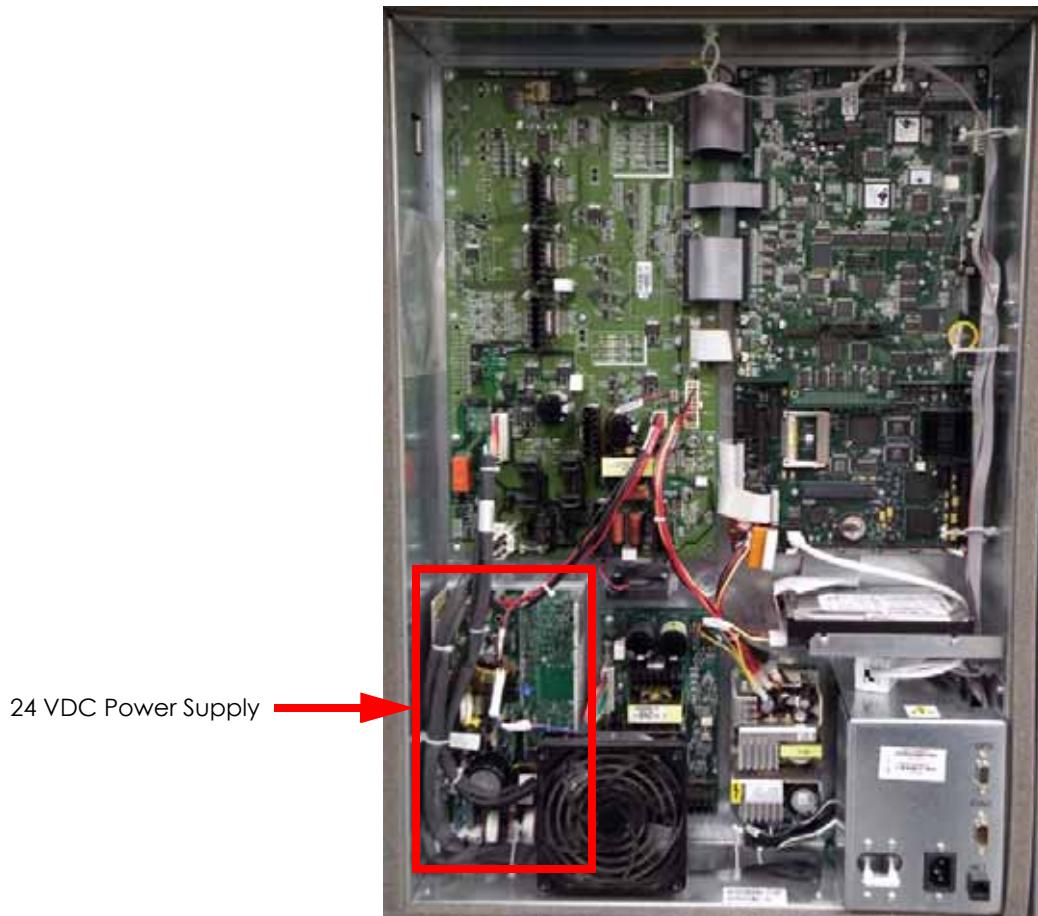
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the 24 VDC Power Supply:

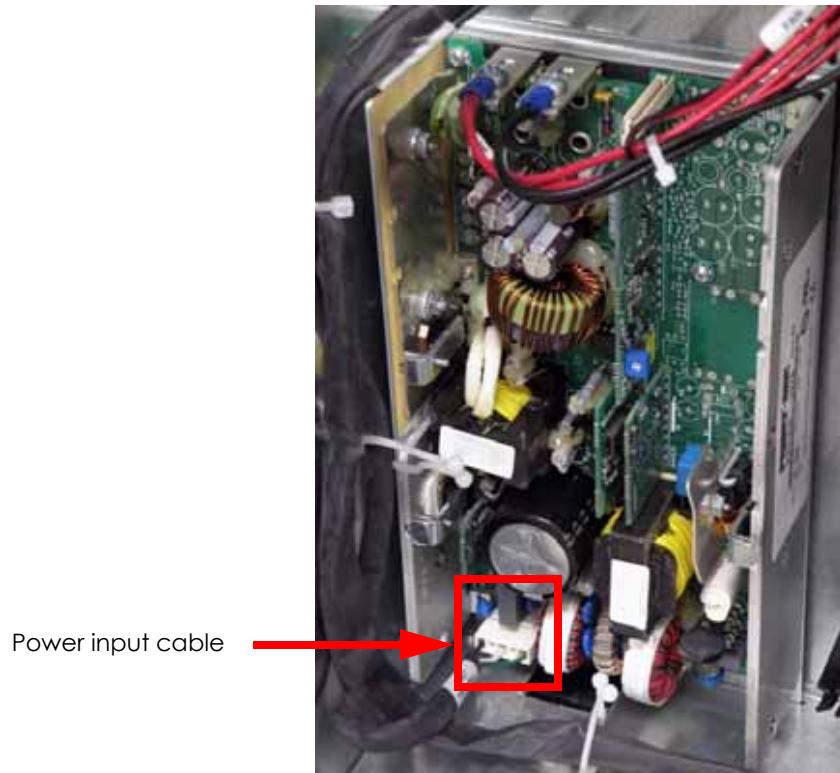
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 24 VDC power supply. See [Figure 109](#).

Figure 109: 24 VDC power supply location



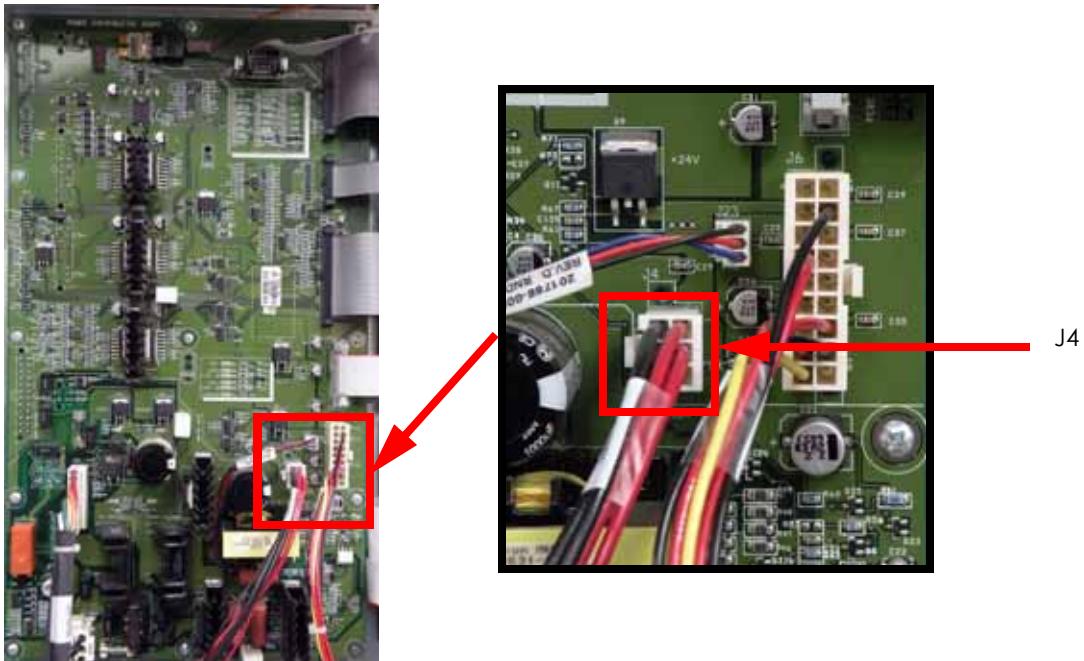
6. Remove the electronics bay cooling fan. See “[Removing the Electronics Bay Cooling Fan:](#)” [on page 5-101](#).
7. Disconnect the 24 VDC power input cable by pulling outward. See [Figure 110](#).

Figure 110: 24 VDC power input cable location



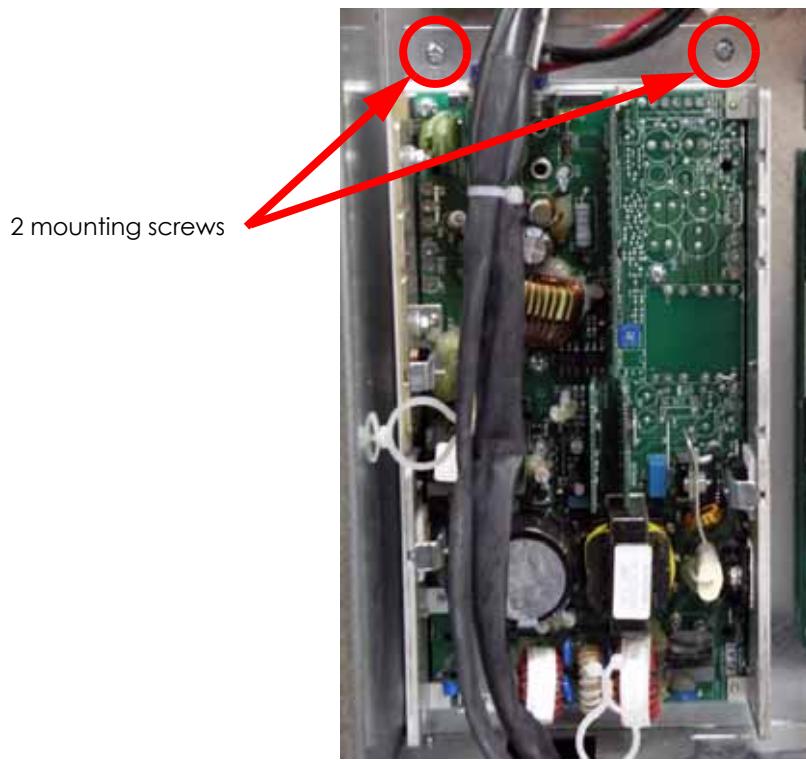
8. Disconnect J4 from the power distribution board by pressing the tab in and pulling outward. See [Figure 111](#).

Figure 111: J4 location



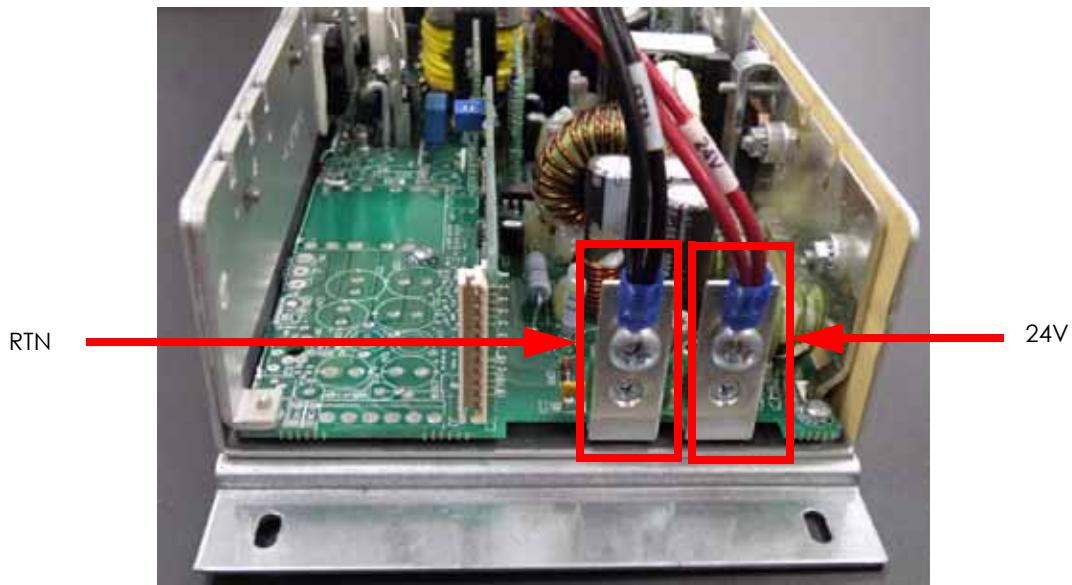
9. Using a phillips screwdriver, remove the 2 mounting screws. See [Figure 112](#).

Figure 112: 24 VDC mounting screw locations



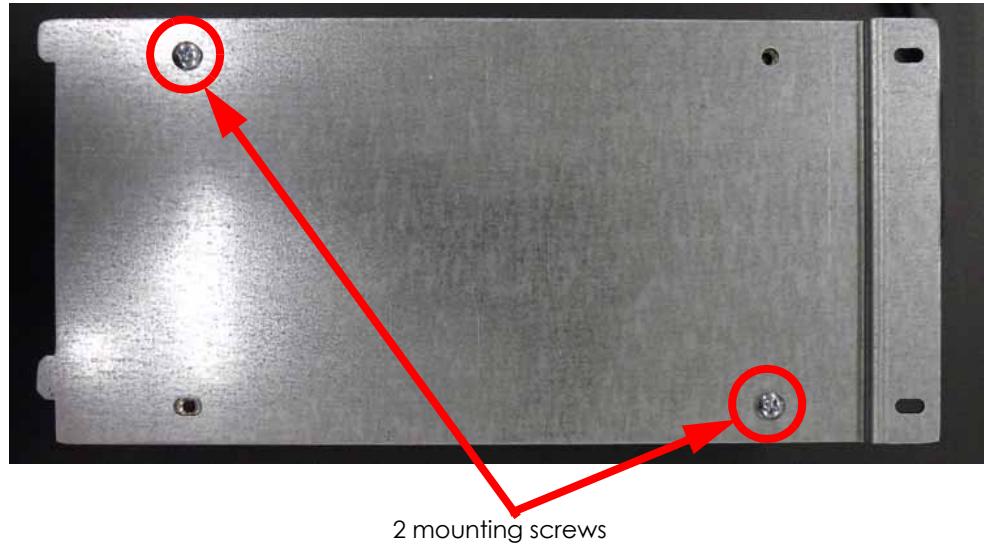
10. Lift the power supply up and angle outwards to remove from the electronics bay.
11. Using a phillips screwdriver, remove the 24V (red) cable and RTN (black) cable from the 24 VDC power supply. See [Figure 113](#).

Figure 113: 24 VDC output cable locations



12. Turn the 24 VDC power supply over and use a phillips screwdriver to remove the 2 mounting bracket mounting screws. See [Figure 114](#).

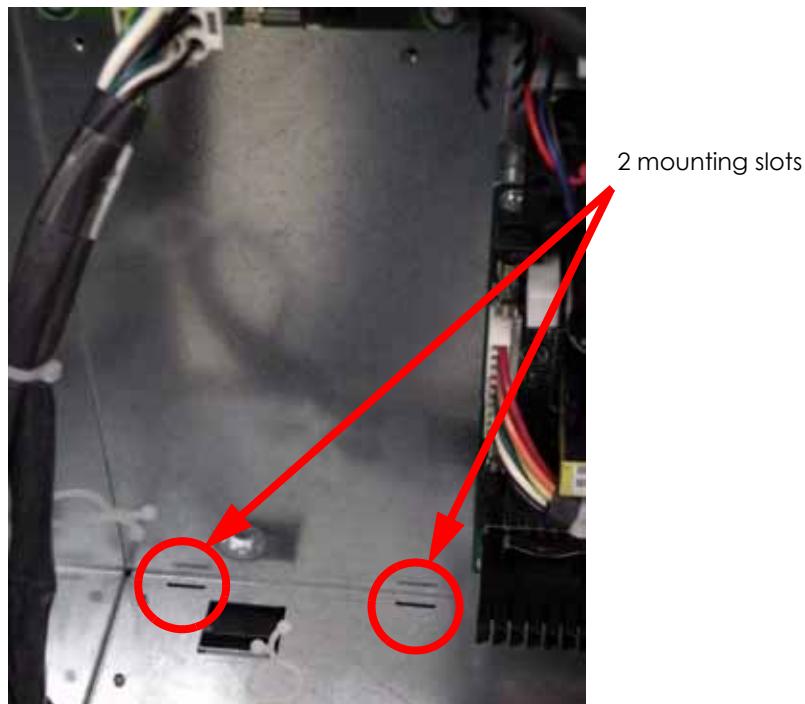
Figure 114: 24 VDC power supply mounting bracket mounting screw locations



Installing the 24 VDC Power Supply:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the 24 VDC power supply with the mounting bracket and use a phillips screwdriver to reinstall the 2 mounting screws.
3. Using a phillips screwdriver, reinstall the 24V (red) cable to the right post and the RTN (black) cable to the left post.
4. Align the 24 VDC power supply mounting bracket tabs with the slots in the electronics bay and slide into place. See [Figure 115](#).

Figure 115: 24 VDC power supply mounting slot locations



5. Using a phillips screwdriver, reinstall the 2 mounting screws.
6. Reconnect J4 to the power distribution board.
7. Reconnect the power input cable to the 24 VDC power supply.
8. Reinstall the electronics bay cooling fan. See "[Installing the Electronics Bay Cooling Fan:](#)" on page 5-102.
9. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
10. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
11. Power up the printer.
12. Run a small test part and monitor system operation during build.

120 VDC Power Supply (SST only)

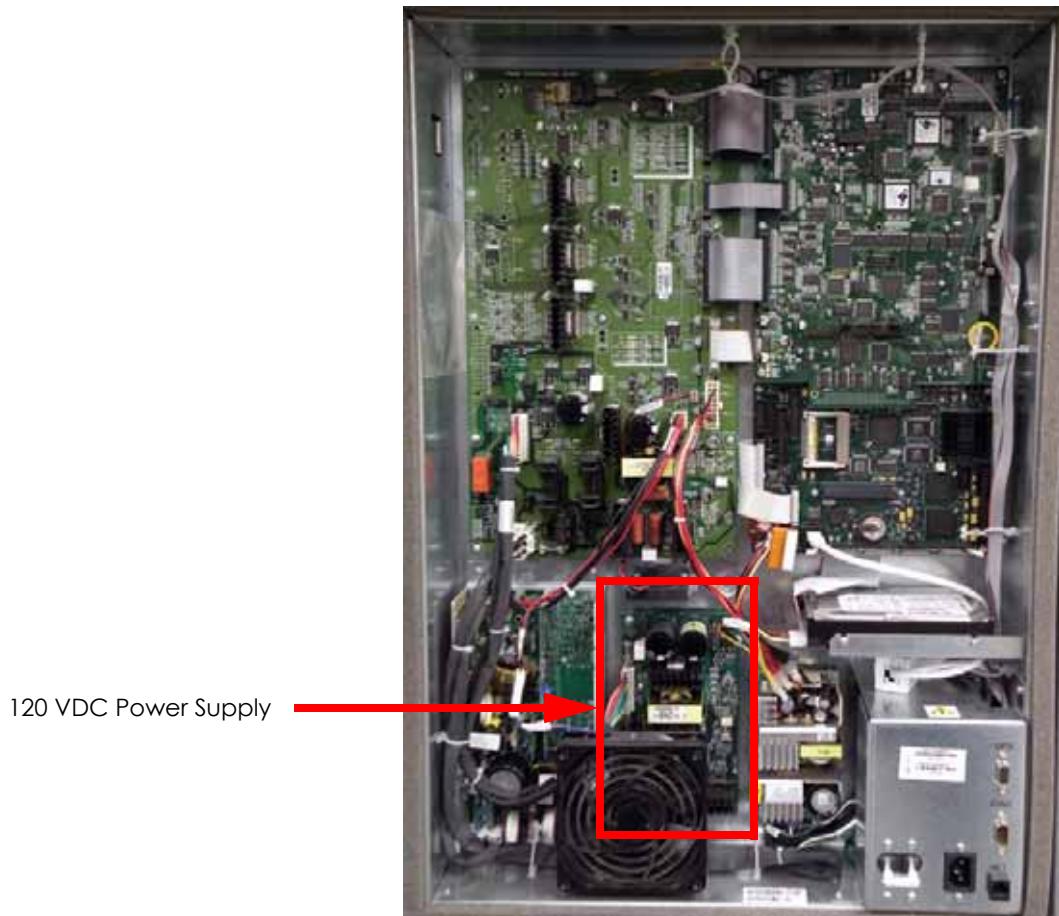
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the 120 VDC Power Supply:

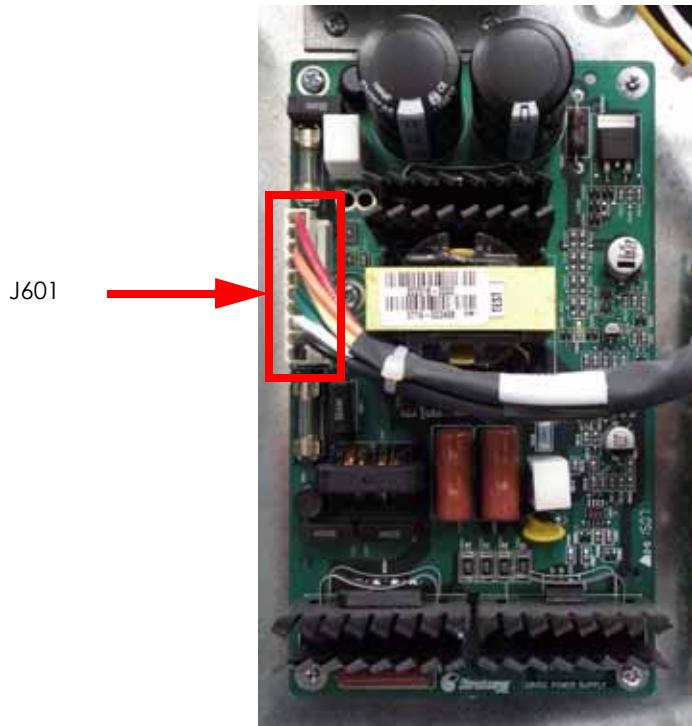
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 120 VDC power supply. See [Figure 116](#).

Figure 116: 120 VDC power supply location



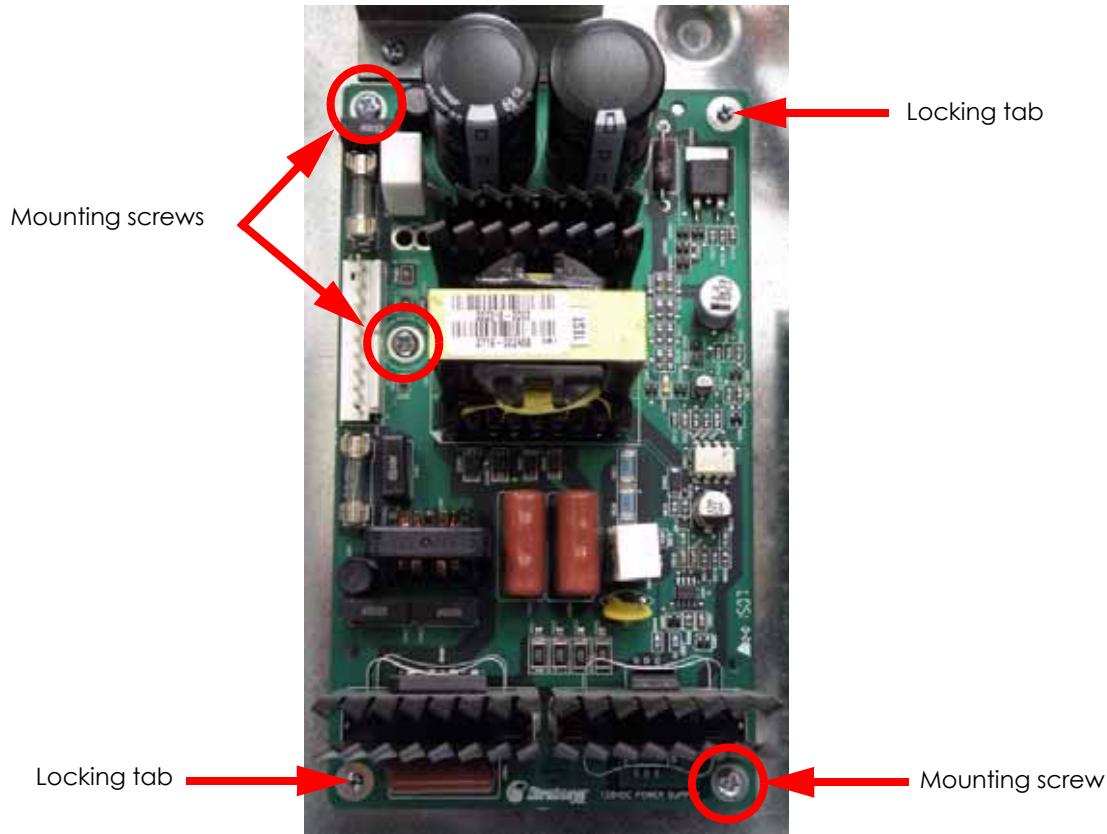
6. Remove the electronics bay cooling fan. See “[Removing the Electronics Bay Cooling Fan:](#)” [on page 5-101](#).
7. Disconnect the J601 cable by pulling outward. See [Figure 117](#).

Figure 117: J601 cable location



8. Using a phillips screwdriver, remove the 3 mounting screws. See [Figure 118](#).

Figure 118: 120 VDC power supply mounting screw locations



Installing the 120 VDC Power Supply:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the 120 VDC power supply with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
3. Reconnect J601.
4. Reinstall the electronics bay cooling fan. See "["Installing the Electronics Bay Cooling Fan:" on page 5-102](#).
5. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#).
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power up the printer.
8. Run a small test part and monitor system operation during build.

5/12 VDC Power Supply

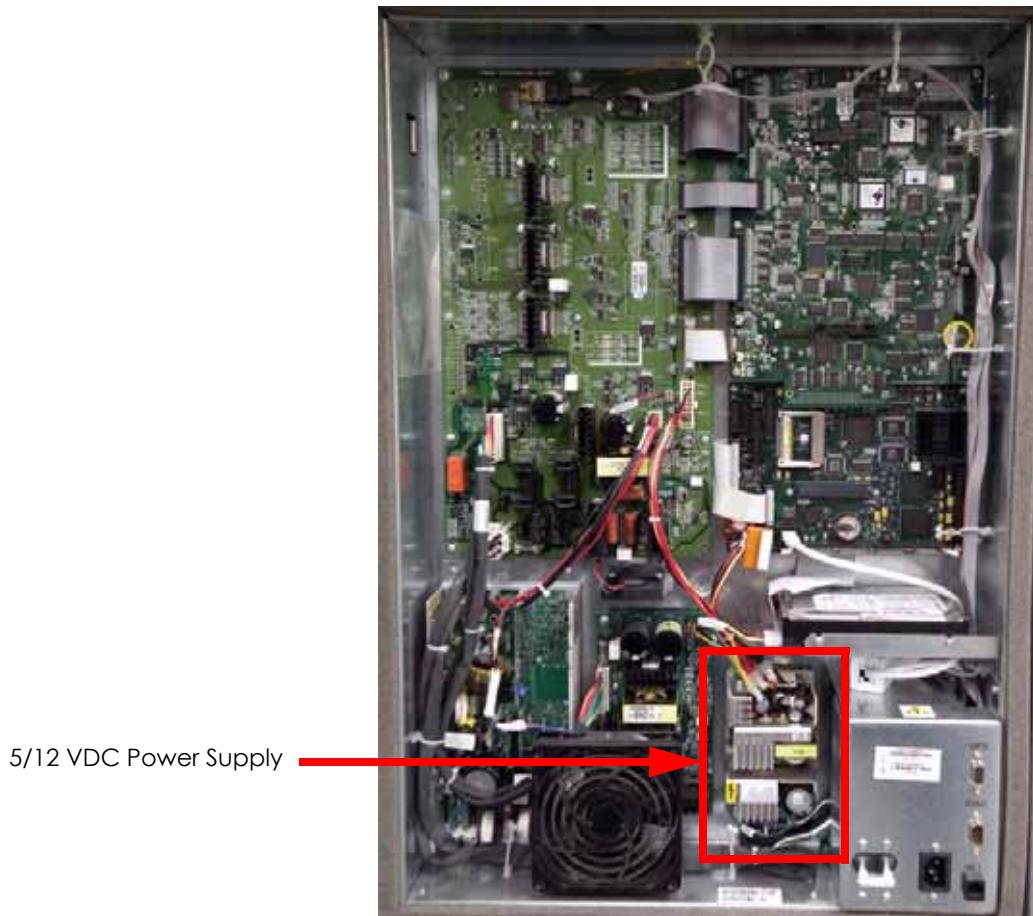
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the 5/12 VDC Power Supply:

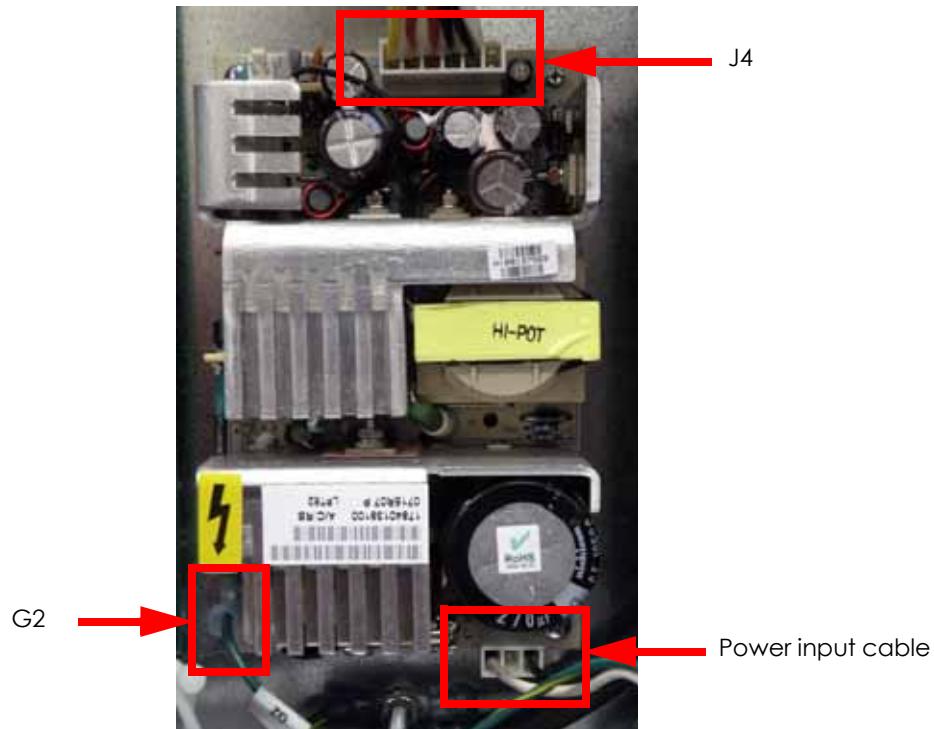
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 120 VDC power supply. See [Figure 119](#).

Figure 119: 5/12 VDC power supply location



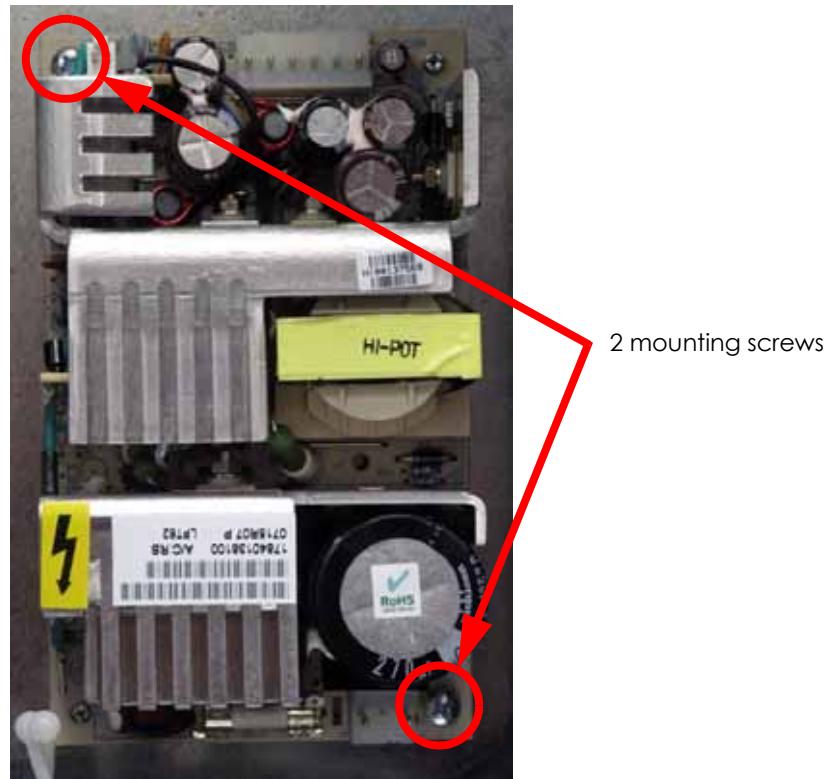
6. Disconnect the J4 cable by pulling outwards. See [Figure 120](#).
7. Disconnect the power input cable by pulling outwards. See [Figure 120](#).
8. Disconnect the G2 ground wire by pulling outwards. See [Figure 120](#).

Figure 120: J4 cable location



9. Using a phillips screwdriver, remove the 2 mounting screws. See [Figure 121](#).

Figure 121: 5/12 VDC power supply mounting screw locations



Installing the 5/12 VDC Power Supply:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the 5/12 VDC power supply with the mounting holes and use a phillips screwdriver to reinstall the 2 mounting screws.
3. Reconnect the G2 ground wire.
4. Reconnect the power input cable.
5. Reconnect the J4 cable.
6. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10.](#)
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer.
9. Run a small test part and monitor system operation during build.

Line Filter Board

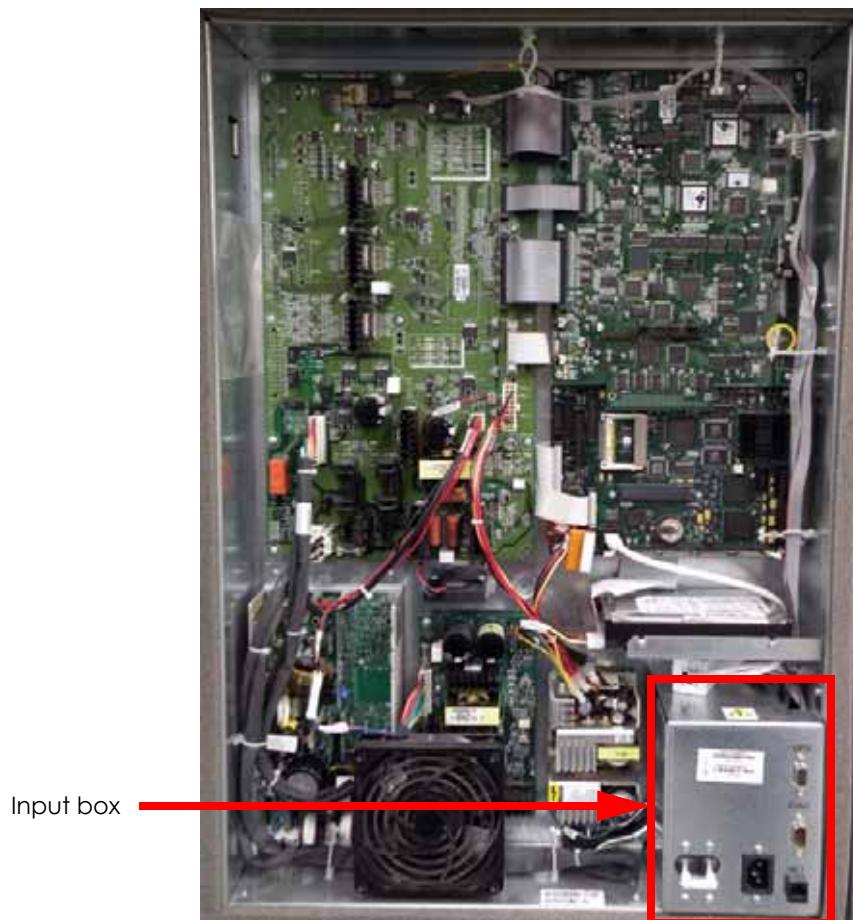
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the Line Filter Board:

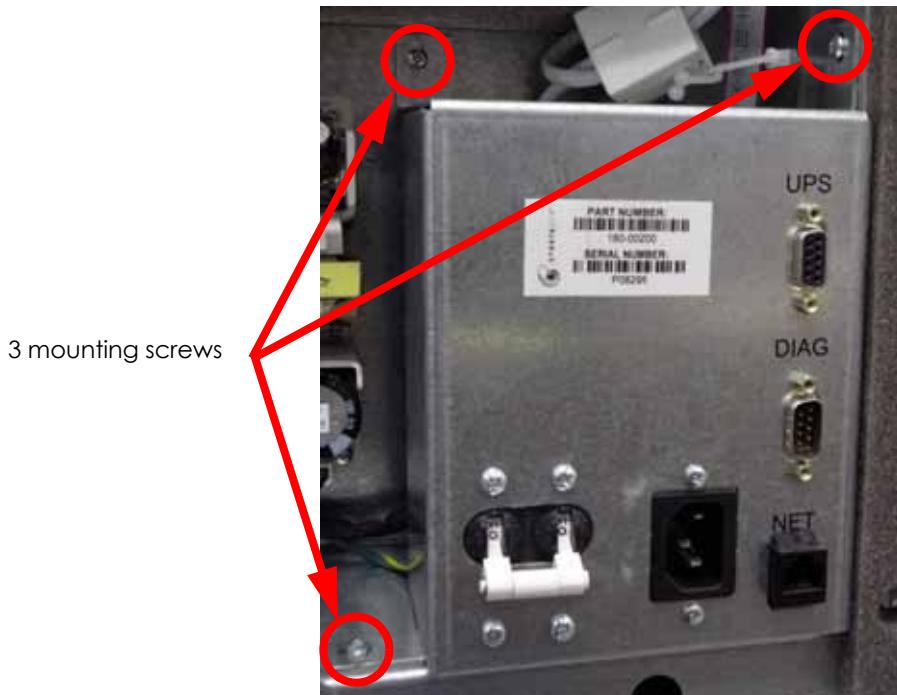
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 122](#).

Figure 122: Input box location



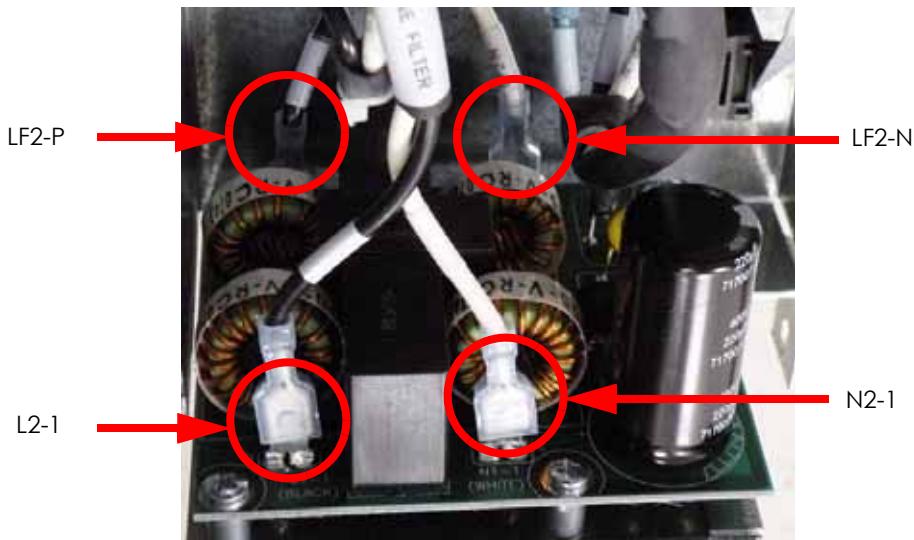
6. Using a phillips screwdriver, remove the 3 input box mounting screws. See [Figure 123](#).

Figure 123: Input box mounting screw locations



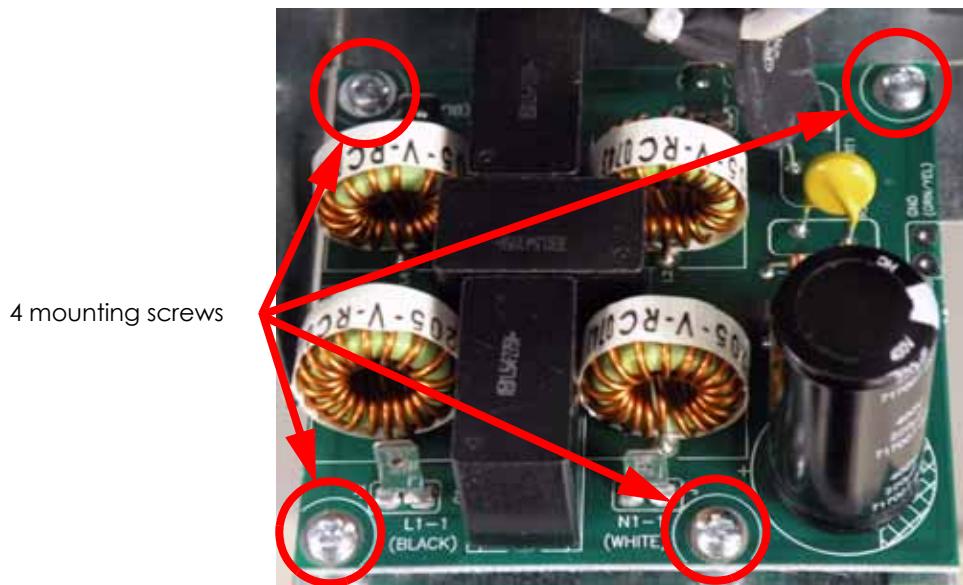
7. Disconnect L2-1 (black) and N2-1 (white) from the front of the line filter board. See [Figure 124](#).
8. Disconnect LF2-P (black) and LF2-N (white) from the rear of the line filter board. See [Figure 124](#).

Figure 124: Line filter connector locations



- Using a phillips screwdriver, remove the 4 mounting screws. See [Figure 125](#).

Figure 125: Line filter mounting screw locations



Installing the Line Filter Board:

- Wear a grounding wrist strap and connect the end to the electronics bay pan.
- Align the line filter with the mounting standoffs and use a phillips screwdriver to reinstall the 4 mounting screws.
- Reconnect LF2-P (black) to the left rear of the line filter board.
- Reconnect LF2-N (white) to the right rear of the line filter board.
- Reconnect L2-1 (black) to the left front of the line filter board.
- Reconnect N2-1 (white) to the right front of the line filter board.
- Align the input box cover with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
- Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
- Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
- Power up the printer.
- Run a small test part and monitor system operation during build.

AC Input

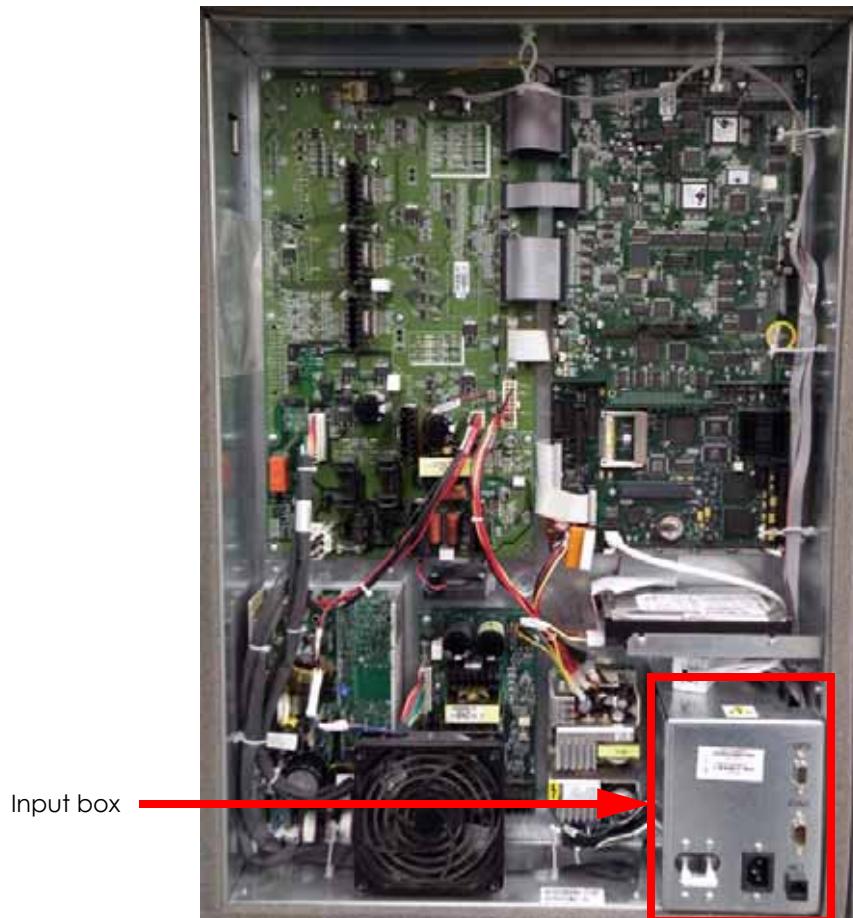
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the AC Input:

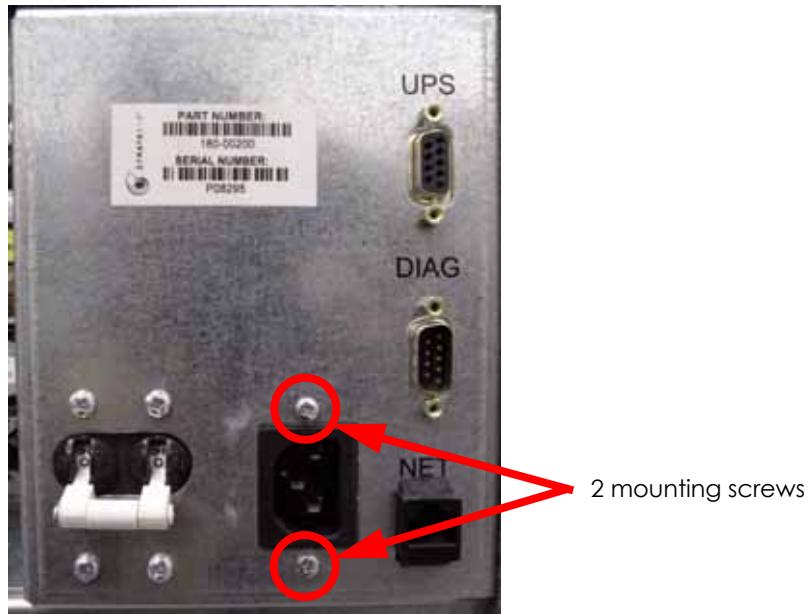
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 126](#).

Figure 126: Input box location



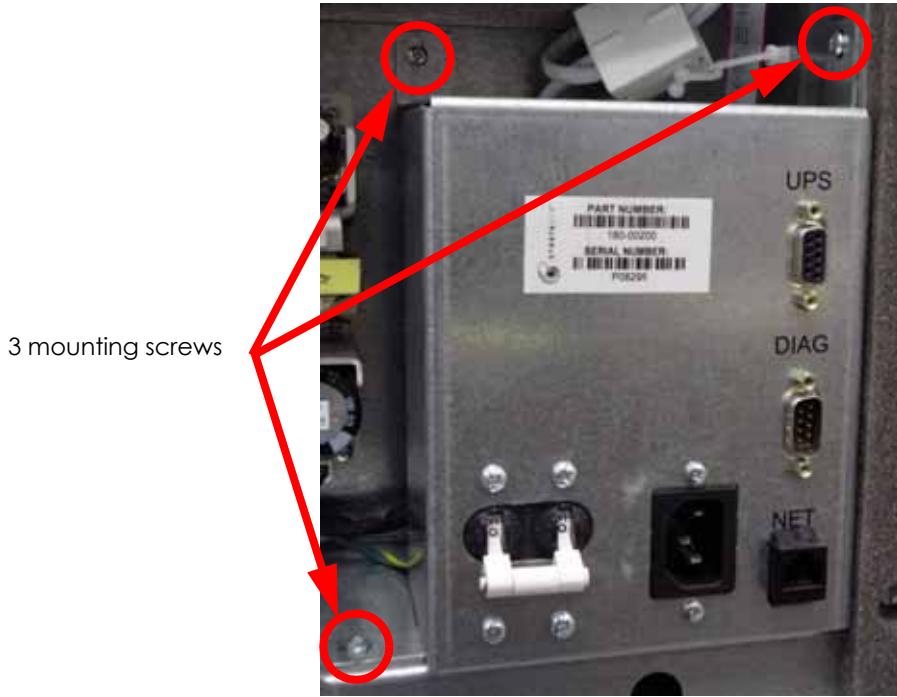
6. Using a phillips screwdriver, remove the 2 AC input mounting screws. See Figure 127.

Figure 127: AC input mounting screw locations



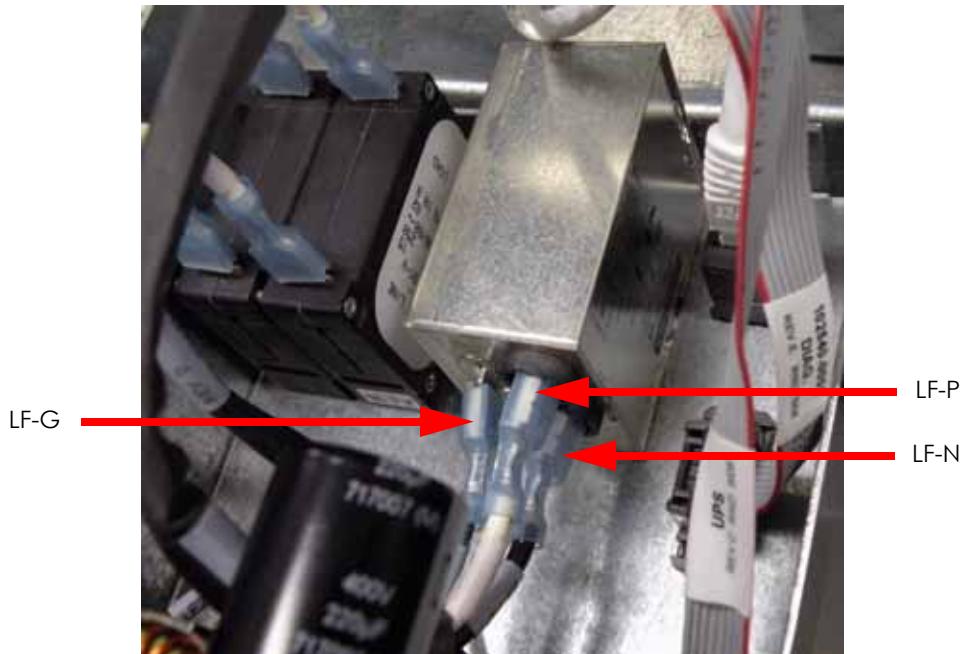
7. Using a phillips screwdriver, remove the 3 input box mounting screws. See Figure 128.

Figure 128: Input box mounting screw locations



8. Disconnect LF-P (black) from the bottom right side of the AC input by pulling outwards. See [Figure 129](#).
9. Disconnect LF-N (white) from the upper right side of the AC input by pulling outwards. See [Figure 129](#).
10. Disconnect LF-G (green) from the left side of the AC input by pulling outwards. See [Figure 129](#).

Figure 129: AC input connection locations



Installing the AC Input:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Reconnect LF-P (black) to the lower right side of the AC input.
3. Reconnect LF-N (white) to the upper right side of the AC input.
4. Reconnect LF-G (green) to the left side of the AC input.
5. Align the AC input with the mounting holes and use a phillips screwdriver to reinstall the 2 mounting screws.
6. Align the input box with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power up the printer.
10. Run a small test part and monitor system operation during build.

Circuit Breaker

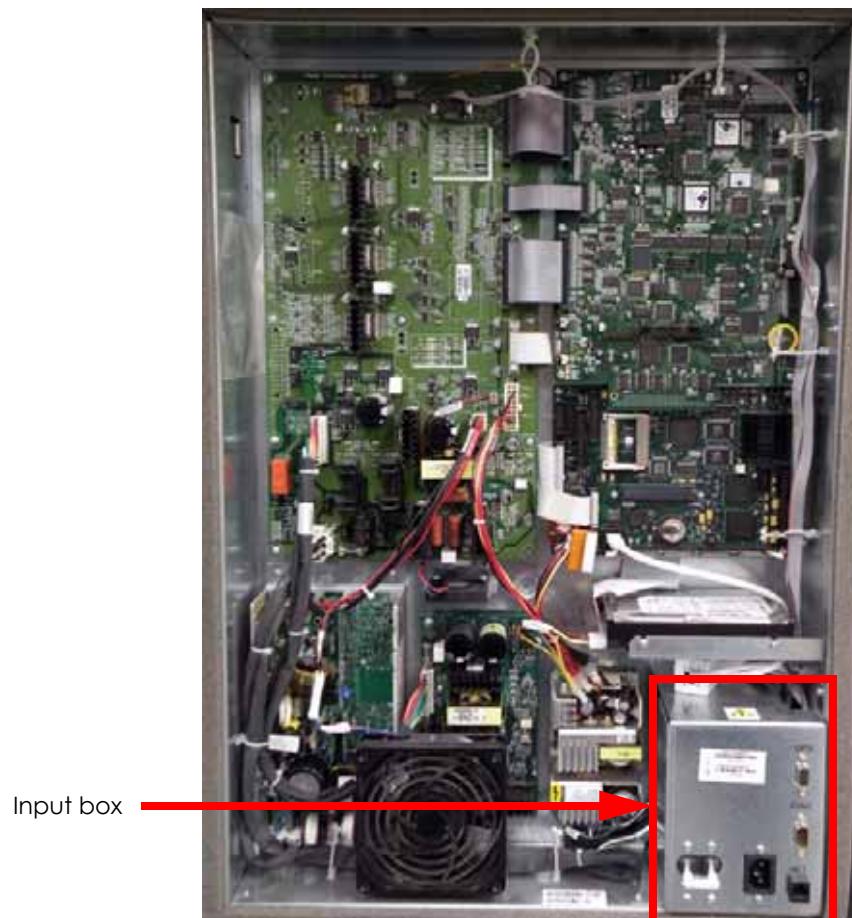
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the Circuit Breaker:

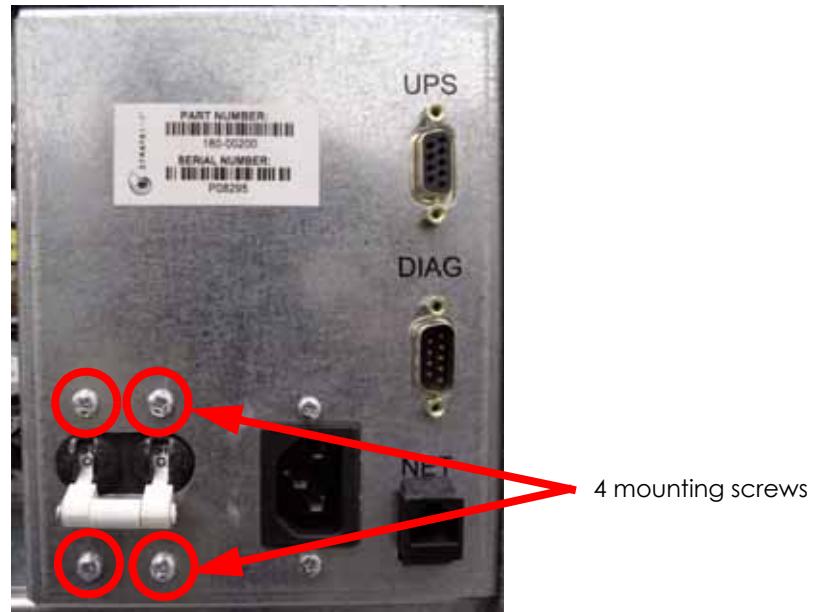
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 130](#).

Figure 130: Input box location



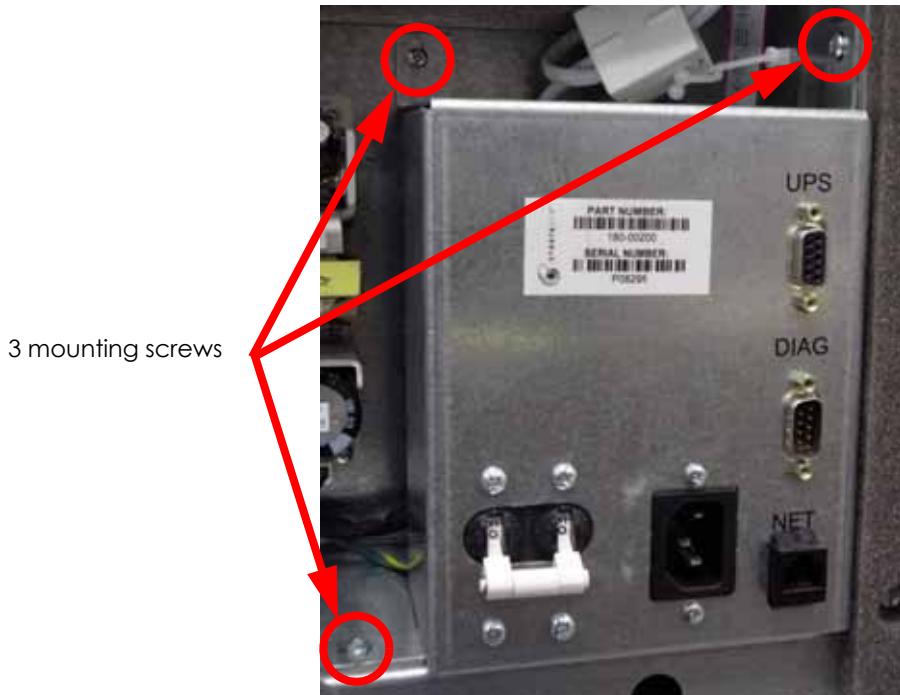
6. Using a phillips screwdriver, remove the 4 circuit breaker mounting screws. See [Figure 131](#).

Figure 131: AC input mounting screw locations



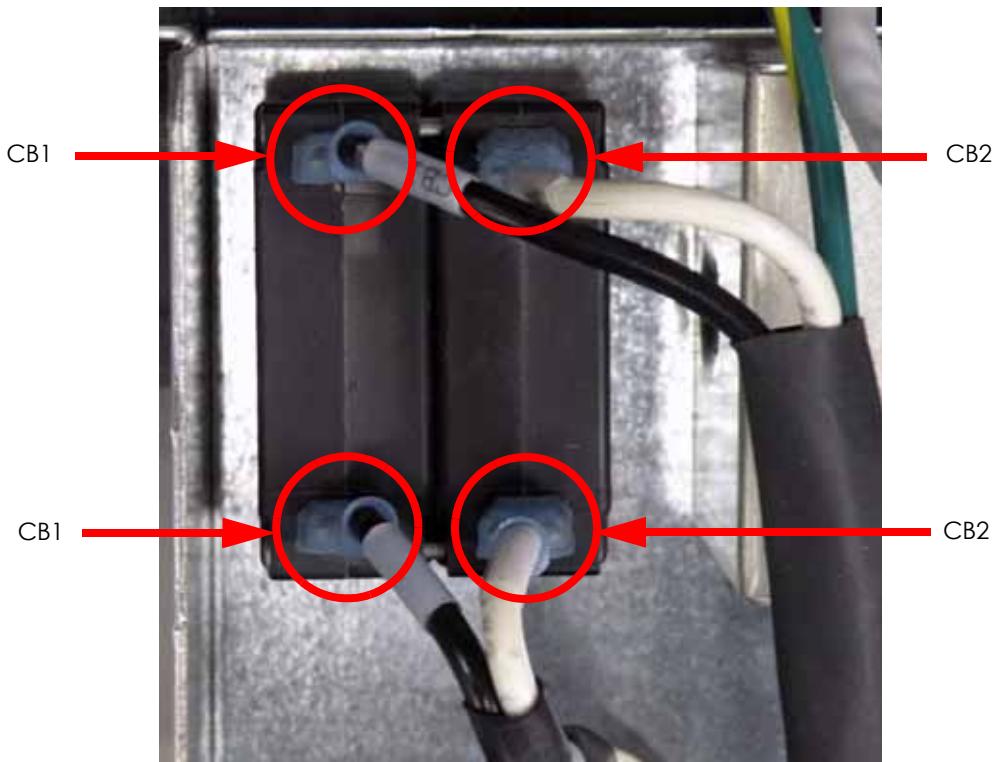
7. Using a phillips screwdriver, remove the 3 input box mounting screws. See [Figure 132](#).

Figure 132: Input box mounting screw locations



8. Disconnect CB1 (black) from the upper left side of the circuit breaker by pulling outward. See [Figure 133](#).
9. Disconnect CB2 (white) from the upper right side of the circuit breaker by pulling outward. See [Figure 133](#).
10. Disconnect CB1 (black) from the lower left side of the circuit breaker by pulling outward. See [Figure 133](#).
11. Disconnect CB2 (white) from the lower right side of the circuit breaker by pulling outward. See [Figure 133](#).

Figure 133: Circuit breaker connection locations



Installing the Circuit Breaker:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Reconnect CB1 (black) to the upper left side of the circuit breaker.
3. Reconnect CB2 (white) to the upper right side of the circuit breaker.
4. Reconnect CB1 (black) to the lower left side of the circuit breaker.
5. Reconnect CB2 (white) to the upper right side of the circuit breaker.
6. Align the circuit breaker with the mounting holes and use a phillips screwdriver to reinstall the 4 mounting screws.
7. Align the input box with the mounting holes and use a phillips screwdriver to reinstall the 3 mounting screws.
8. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#).
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.

Gen 1 Electrical Components

Power Distribution Board (PDB)

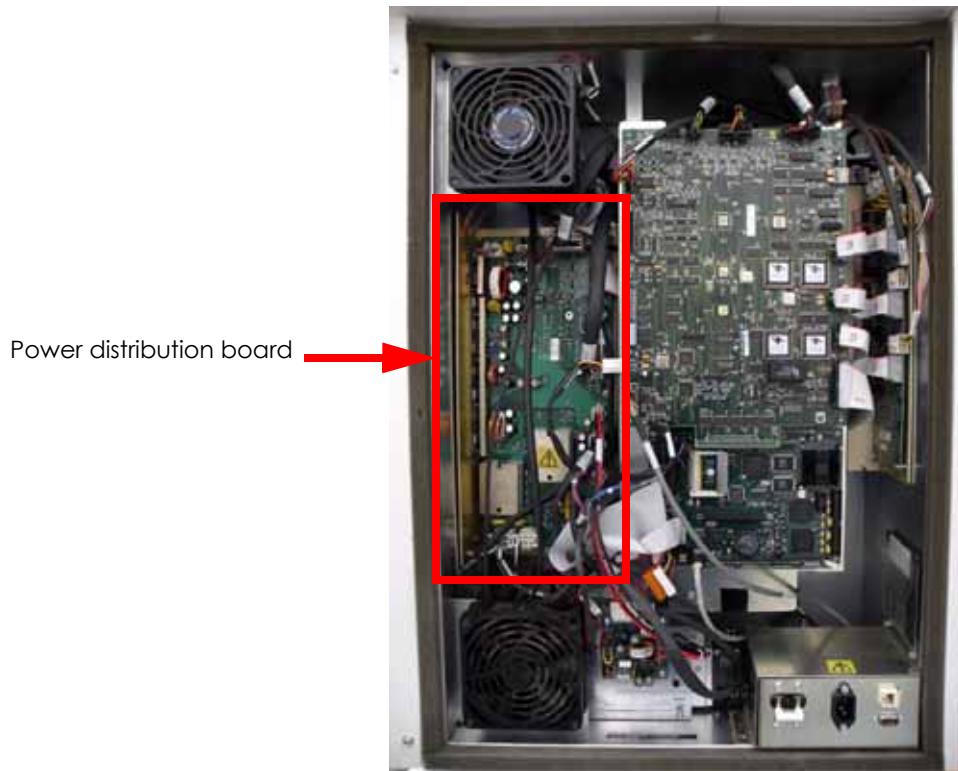
Required Tools

- Phillips screwdriver
- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap

Removing the Power Distribution Board:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "["Removing the Rear Door:" on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the power distribution board. See [Figure 134](#).

Figure 134: PDB location

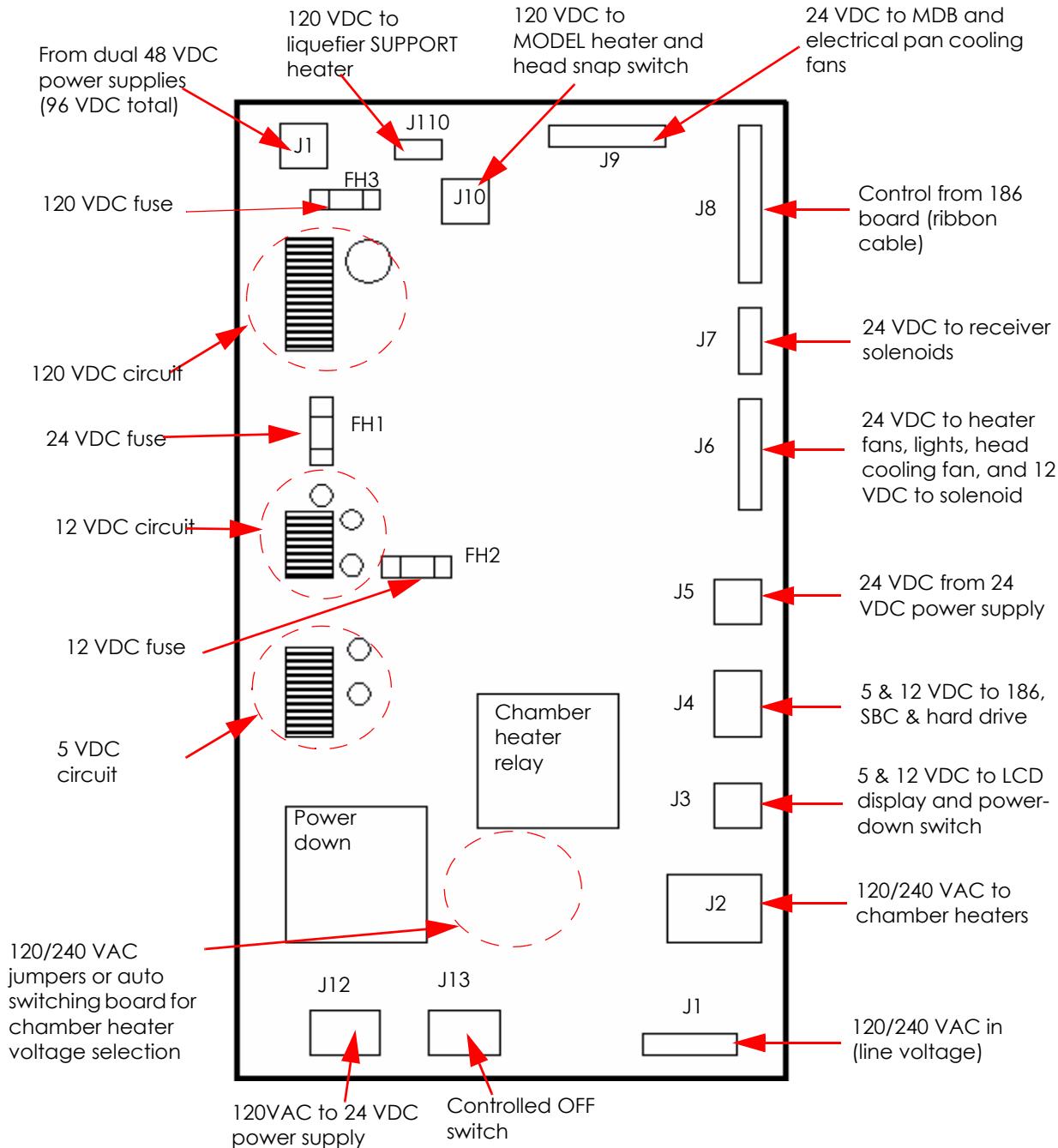


6. Disconnect the 14 cables on the power distribution board. See [Figure 135](#).



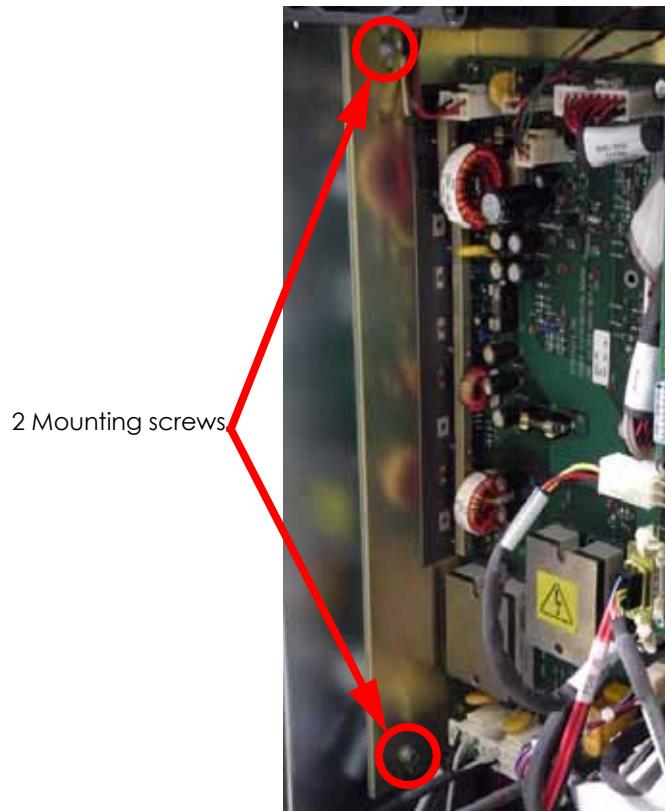
Carefully note the location and orientation of the connectors. If necessary, mark cable orientation and location to guarantee correct reconnection.

Figure 135: Power distribution board details



7. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 screws holding the board and heat sink to the electronics bay [Figure 136](#).

Figure 136: PDB mounting screw locations

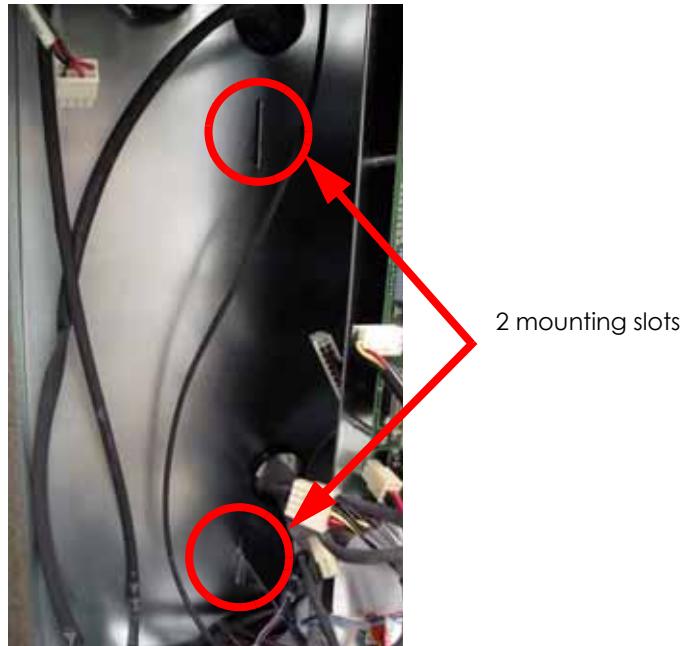


8. Lift upward on the board and pull outwards to remove.

Installing the Power Distribution Board:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the PDB and heat sink tabs with the 2 mounting slots at the back of the electronics bay and push into place. See [Figure 137](#).

Figure 137: PDB mounting slot locations



3. Lift the PDB upwards and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws.
4. Reconnect the 14 cables on the PDB making sure that the location and orientation are correct.
5. Reinstall the rear door. See "[Installing the Rear Door](#)." on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.
9. Send the bad PDB back to Stratasys, Inc.

186 Processor Board

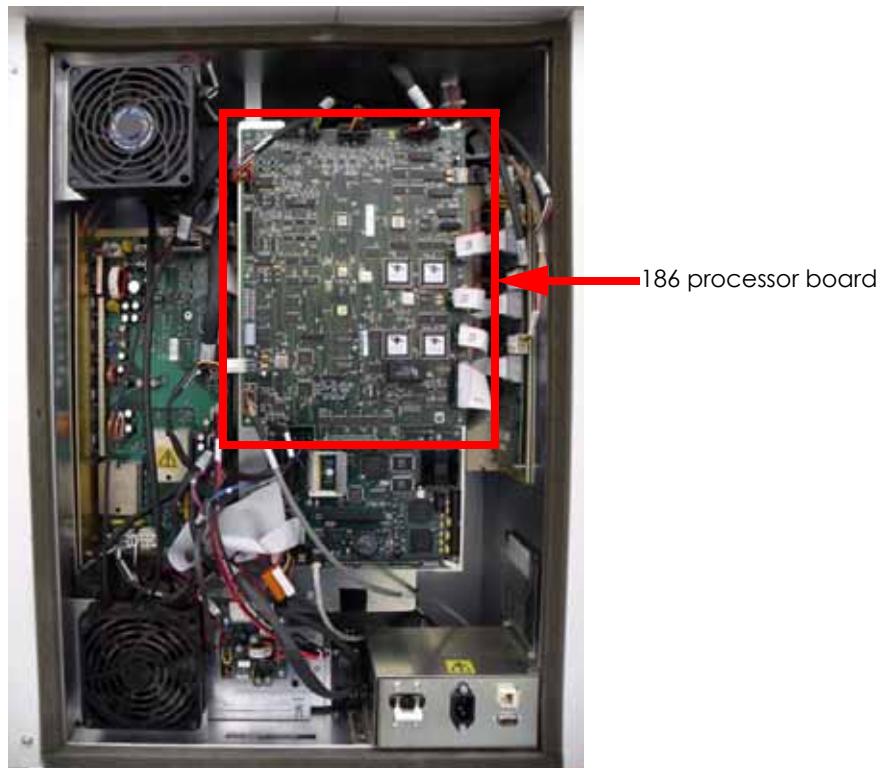
Required Tools

- Phillips screwdriver
- Grounding wrist strap
- Cutters

Removing the 186 processor board:

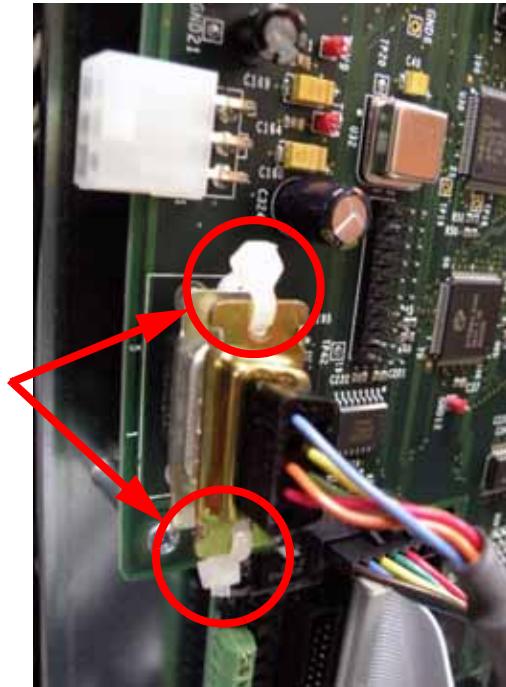
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 186 processor board [Figure 138](#).

Figure 138: 186 processor board location



6. Using a cutters, cut the wire ties from the diagnostics cable connector. See [Figure 139](#).

Figure 139: Diagnostics cable location

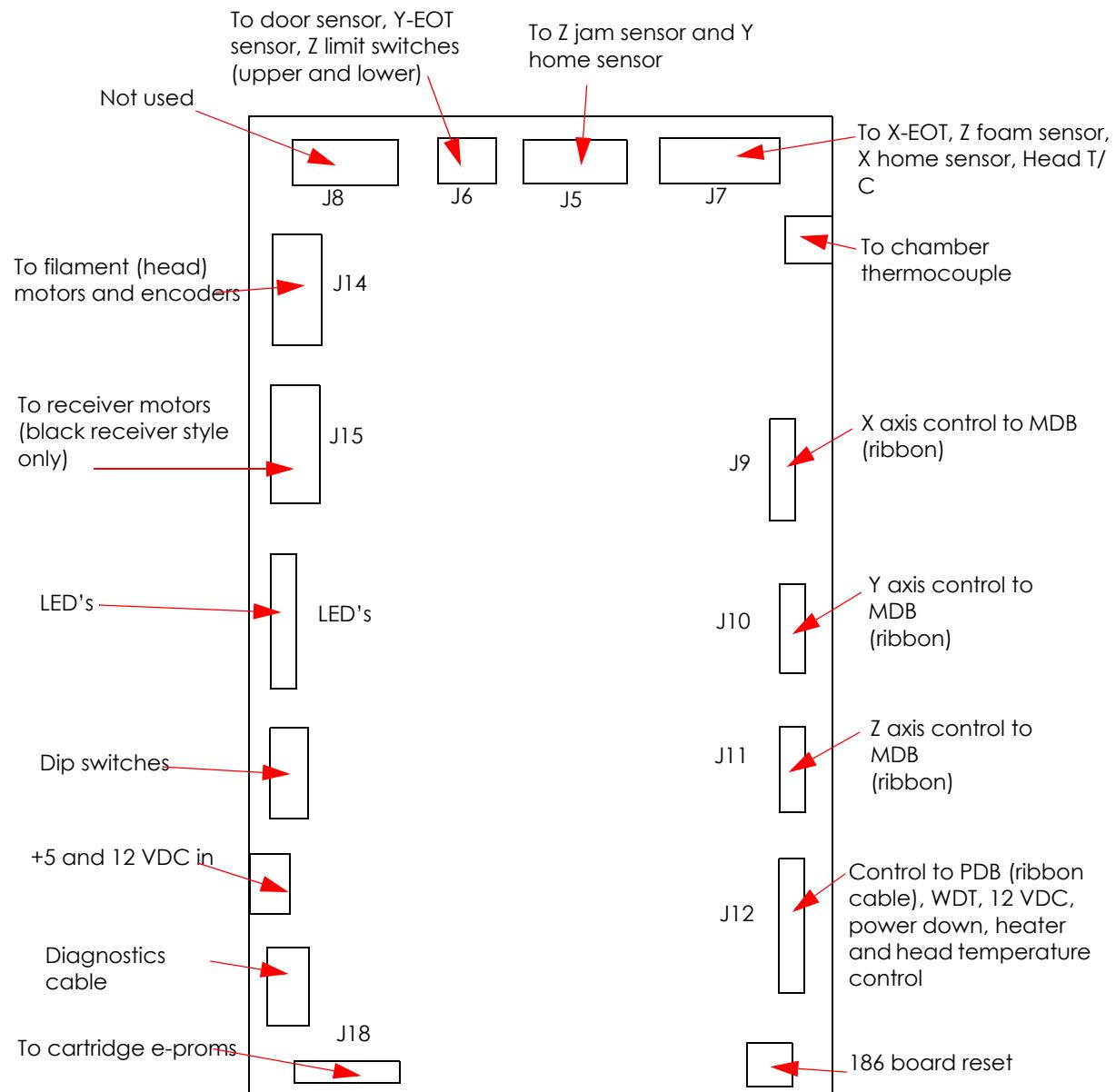


7. Disconnect the 12 connectors from the 186 board. See [Figure 140](#).



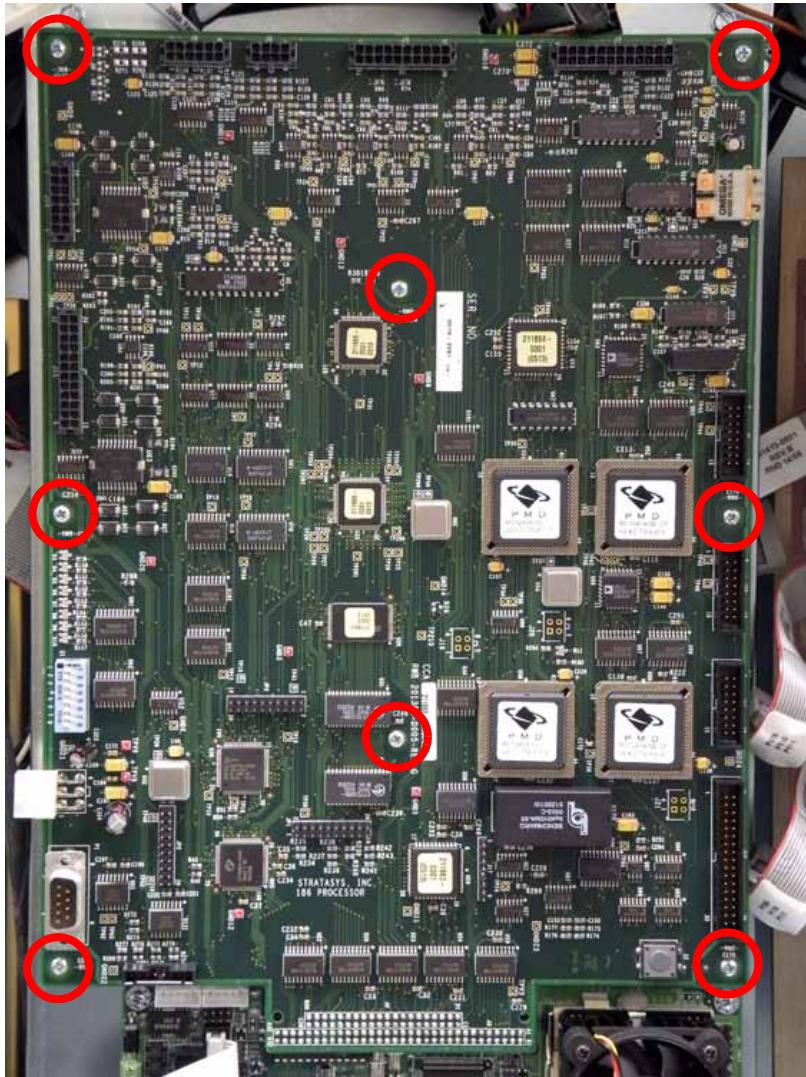
Carefully note the location and orientation of the connectors. If necessary, mark cable orientation and location to guarantee correct reconnection.

Figure 140: 186 processor board details



- Using a phillips screwdriver, remove the 8 186 processor board mounting screws. See [Figure 141](#).

Figure 141: 186 processor board mounting screw locations



9. Carefully remove the 186 processor board from the P104 connector on the Single Board Computer (SBC) by pulling outward until the 186 processor board is free of the SBC.



The lower portion of the 186 processor board is connected to the top of the SBC via an array of pins. Use caution not to bend the pins or put excessive force on either board.

Installing the 186 processor board:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Carefully align the 186 processor board pin array with the P104 connector on the SBC. Gently press the pin array into the connector. See [Figure 142](#).

Figure 142: P104 pin array



3. Using a phillips screwdriver, reinstall the 8 mounting screws.
4. Reconnect the 12 connectors, making sure that location and orientation are correct. See [Figure 140](#).
5. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power up the printer. You will be prompted to load the controller software.
8. Assign the printer static IP or dynamic IP networking depending on your network. If you assign it static IP you will need to enter the static IP address. When finished press **Done**.
9. Insert the system software CD into the notebook computer or workstation CD drive.
10. Open CatalystEX from the notebook computer or workstation.
11. Click on the **Printer Services** tab.
12. Click on the **Update Software** button.
13. Navigate CatalystEX to the CD drive and select the proper .UPG file for the printer.
14. When finished downloading, verifying and installing, reboot the printer.
15. Run a small test part and monitor system operation during build.
16. Send the bad 186 processor board back to Stratasys, Inc.

Single Board Computer (SBC)

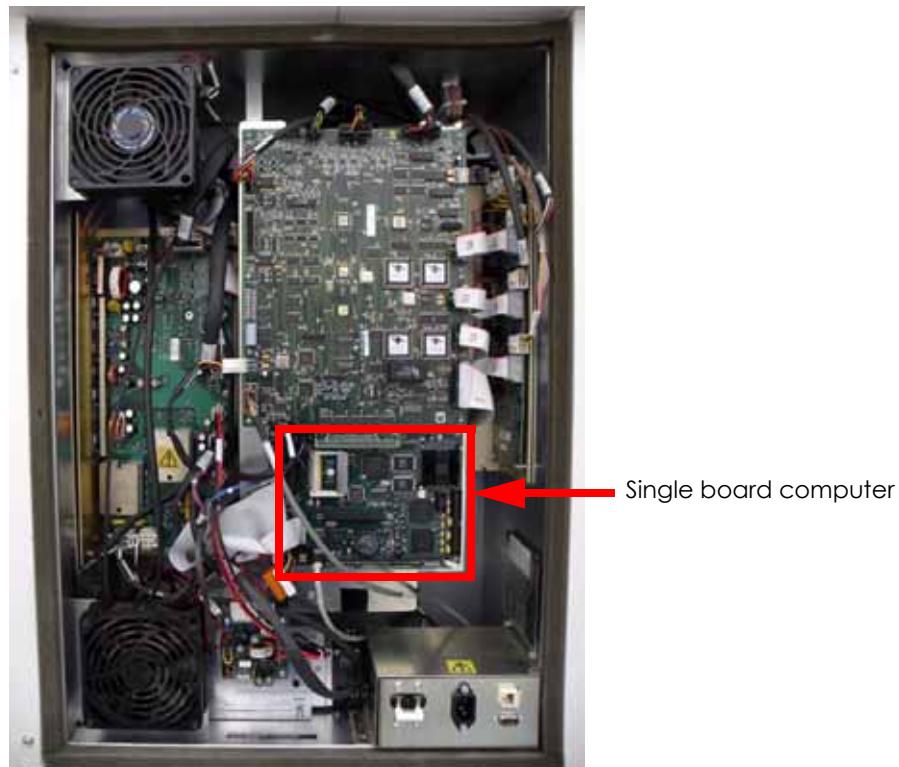
Required Tools

- Phillips screwdriver
- Grounding wrist strap

Removing the Single Board Computer:

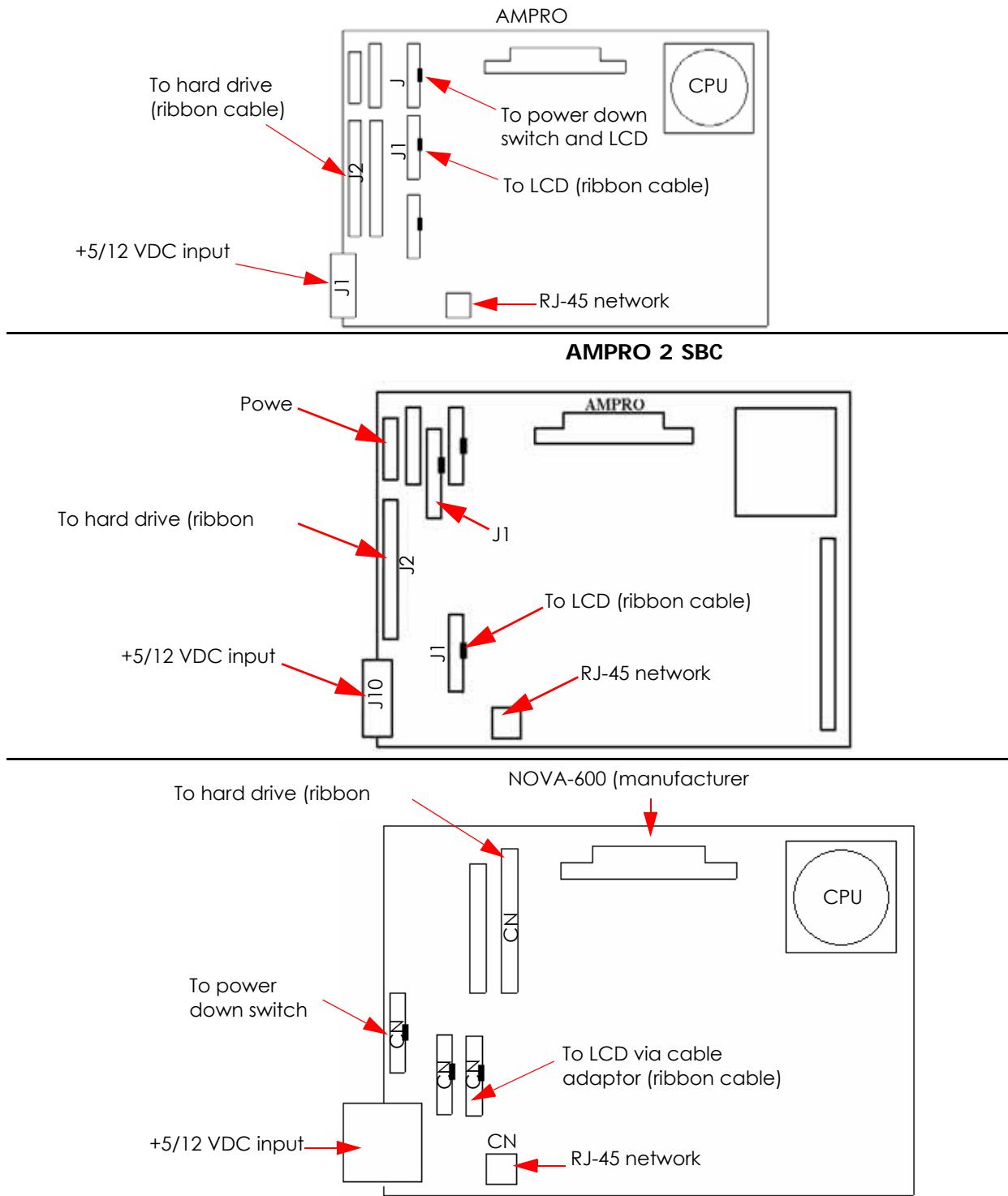
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the SBC. See [Figure 143](#).

Figure 143: Single board computer location



6. Remove the 186 processor board. See "[Removing the 186 processor board:](#)" on page 5-128.
7. Determine what brand of SBC the printer has. See [Figure 144](#).

Figure 144: Single board computer details



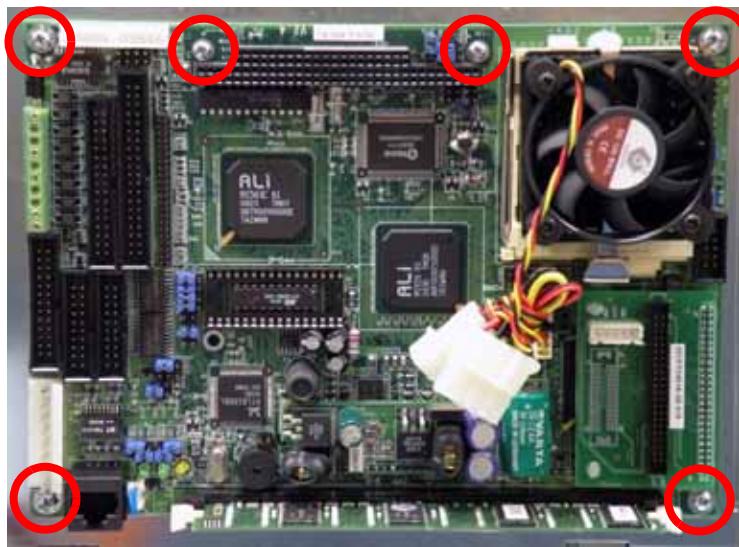
8. Disconnect the 5 cables from the SBC.



Carefully note the location and orientation of the connectors. If necessary, mark cable orientation and location to guarantee correct reconnection.

9. Using a phillips screwdriver, remove the 6 SBC mounting screws. See [Figure 145](#).

Figure 145: SBC mounting screw locations



10. Remove the SBC.

Installing the Single Board Computer:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the SBC with mounting standoffs and use a phillips screwdriver to reinstall the 6 mounting screws.
3. Reinstall the 186 processor board. See "[Installing the 186 processor board](#):" on page 5-132.
4. Check if a 5 VDC piggyback supply is installed in system. If one is not installed, or if you are unsure, see "[5 VDC Piggyback Power Supply](#)" on page 5-136.
5. Note which brand of board is being used for replacement. See [Figure 144](#).
6. Reconnect the five cables on the single board computer [Figure 144](#).
7. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
8. Reconnect the AC cord and the RJ-45 network cable.
9. Power on the system. The system should reach **Idle** without displaying an error.
10. Run a small test part and monitor system operation during build.
11. Send the bad SBC back to Stratasys, Inc.

5 VDC Piggyback Power Supply

Due to availability, printers will now use two different manufacturers of Single Board Computers: Nova and Ampro. The Nova SBC has a higher 5 VDC current rating, therefore an additional 5 VDC supply must be added when a Nova board is installed. If a Nova SBC is installed the additional 5 VDC supply must be present. The Ampro SBC will function with or without the additional supply.

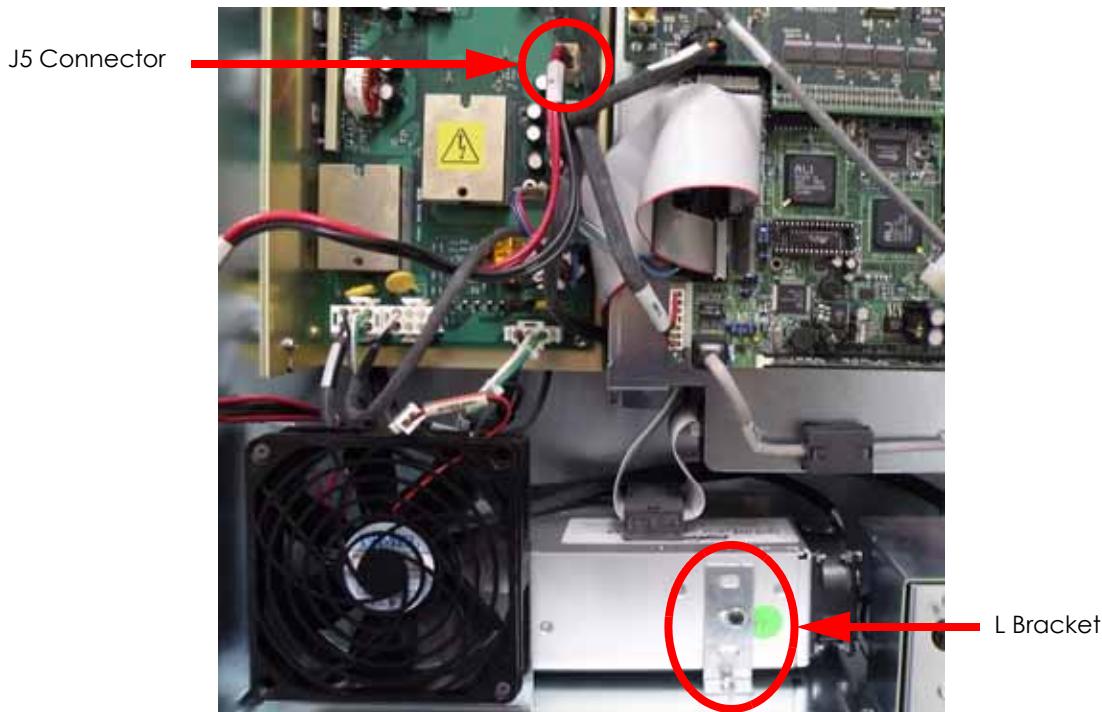
Required Tools

- Phillips screwdriver
- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap

Installing the 5 VDC piggyback power supply for the first time:

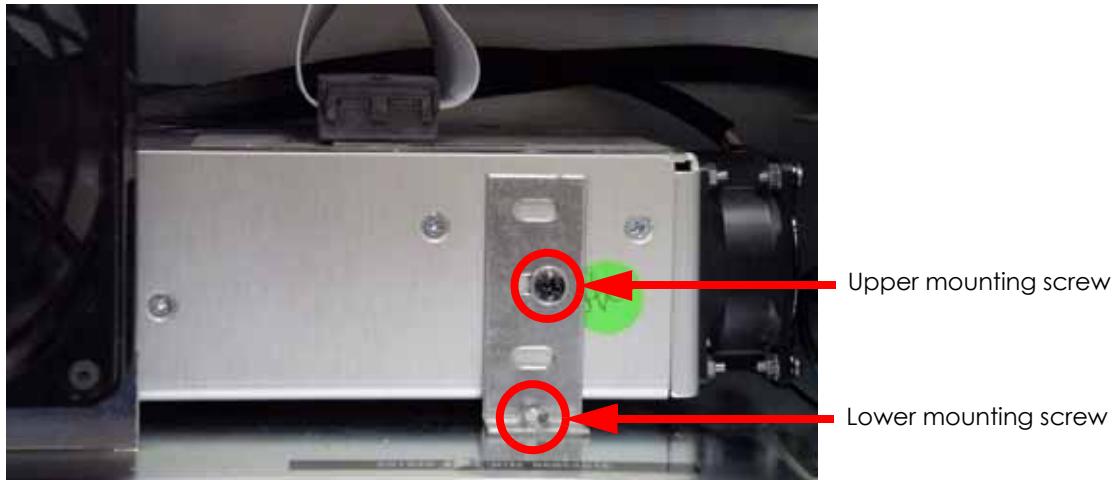
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 24 VDC power supply right side L bracket. See [Figure 146](#).

Figure 146: L bracket location



6. Using a phillips screwdriver, remove the upper mounting screw from the L bracket. See [Figure 147](#).
7. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the lower mounting screw from the L bracket. See [Figure 147](#).

Figure 147: L Bracket mounting screw locations



8. Position the 5 VDC supply and mounting bracket, secure using the 2 mounting screws. See [Figure 148](#).

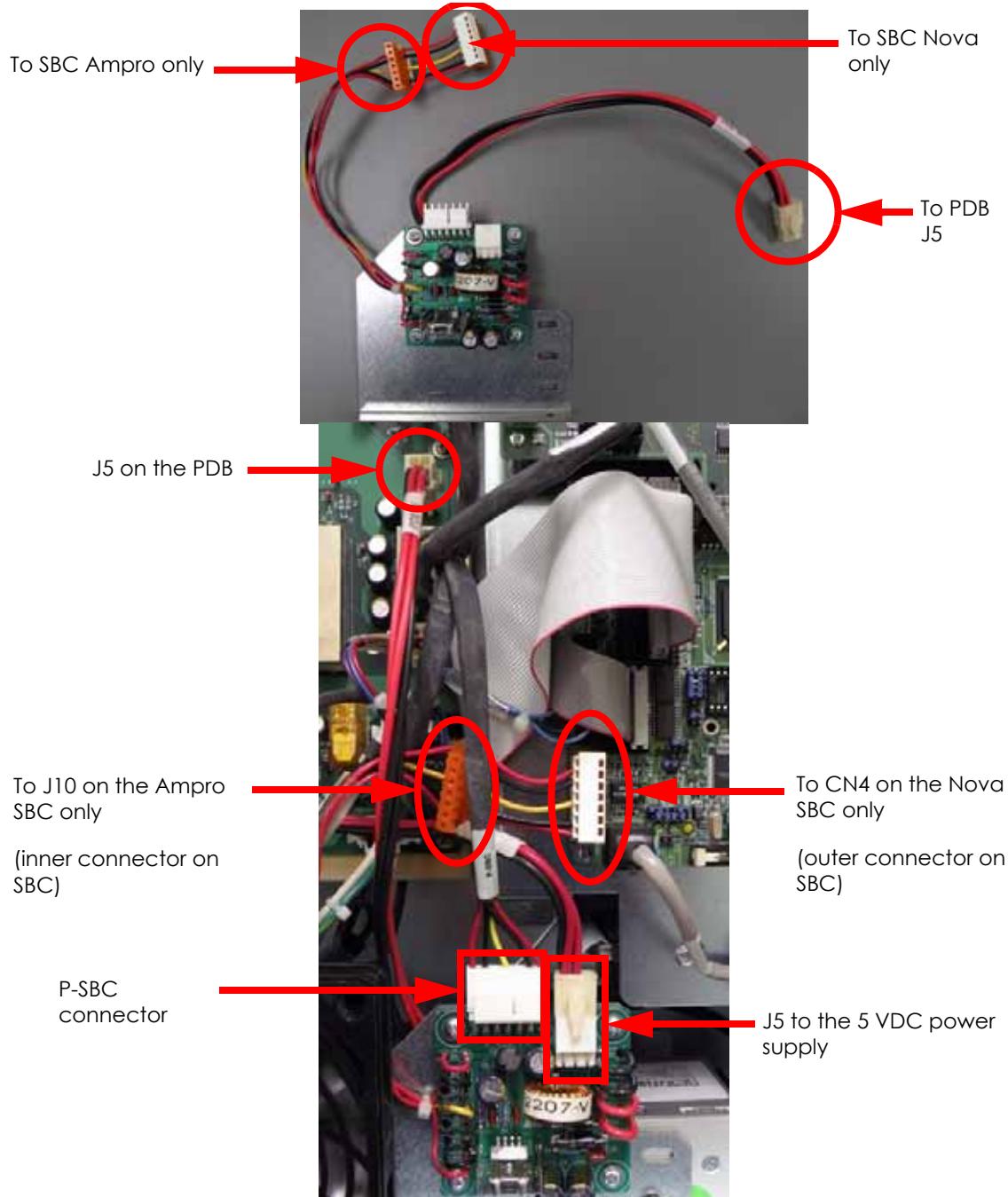
Figure 148: 5 VDC piggyback supply and mounting bracket



9. Disconnect the J5 connector from the power distribution board and connect to J1 on the 5 VDC piggy back power supply. See [Figure 149](#).

10. Connect the J5 connector from the 5 VDC supply to J5 on the PDB.
11. If not already disconnected, disconnect the P-SBC connector from the SBC and plug it into the top of the 5 VDC board.
12. Connect the SBC power cable from the 5 VDC board into the SBC. See [Figure 149](#).

Figure 149: 5 VDC piggyback supply connections

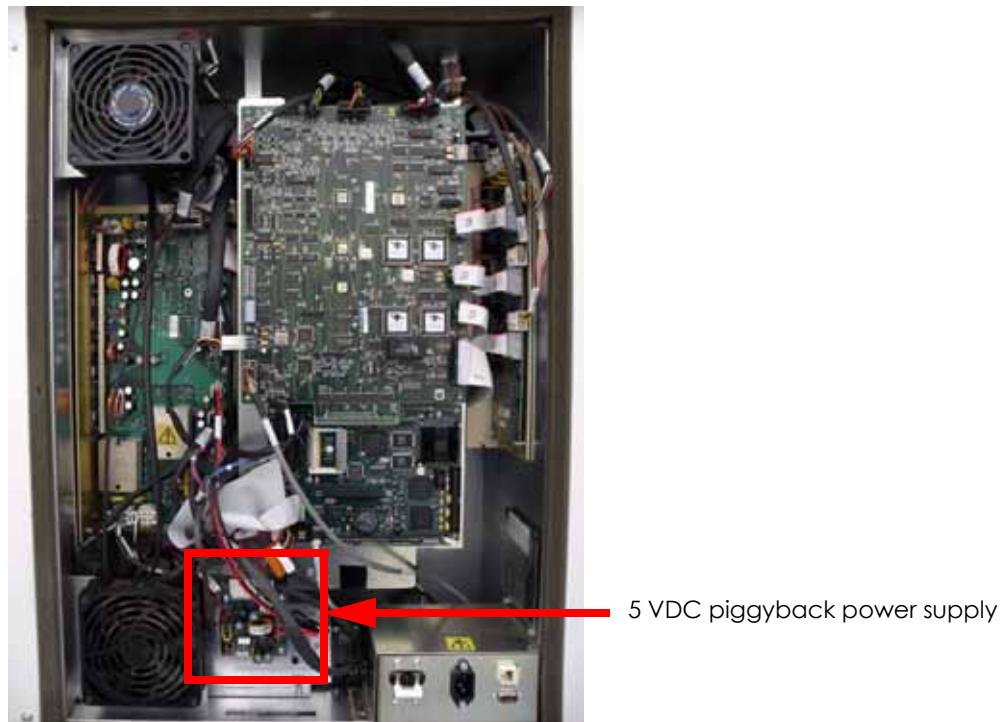


13. Build several small test parts, via the network, to ensure proper system operation.

Removing the 5 VDC piggyback power supply:

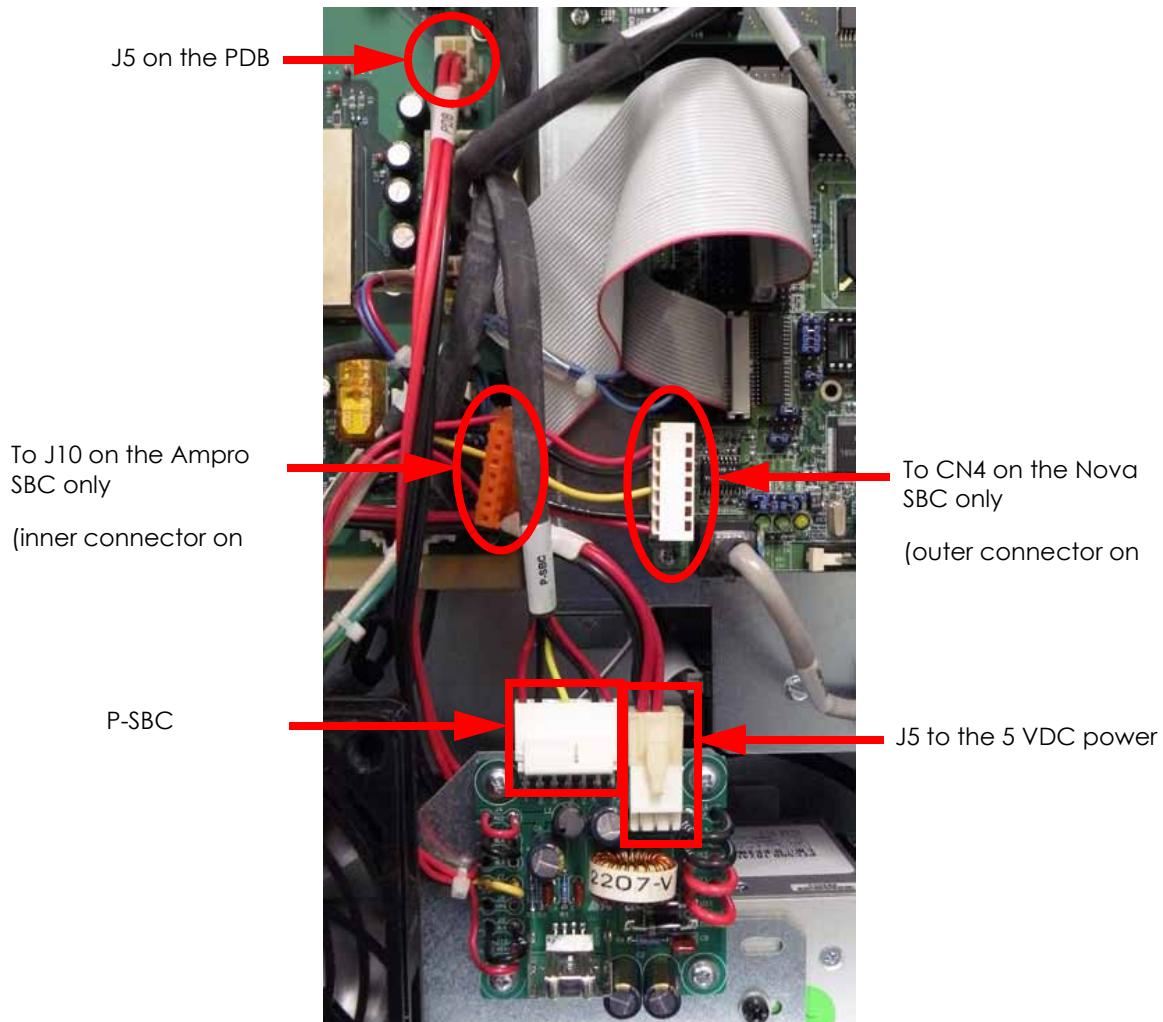
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door](#)” on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 5 VDC piggy back power supply. See [Figure 150](#).

Figure 150: 5 VDC piggyback power supply location



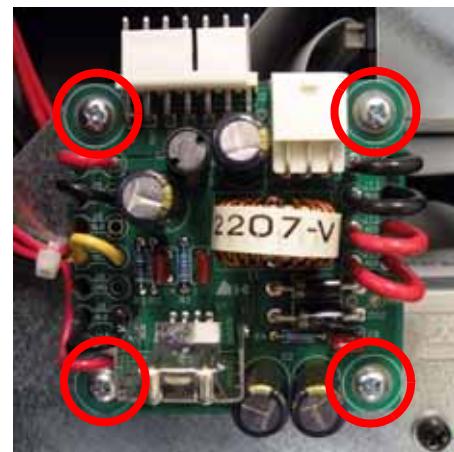
6. Disconnect the J5 and P-SBC connectors from the 5 VDC piggyback power supply. See [Figure 151](#).
7. Disconnect the J5 connector from the PDB. See [Figure 151](#).
8. Disconnect the J10 connector (for Ampro SBC) or CN4 connector (for Nova SBC) from the SBC. See [Figure 151](#).

Figure 151: 5 VDC piggyback power supply connections



9. Using a phillips screwdriver, remove the 4 piggyback power supply mounting screws. See [Figure 152](#).

Figure 152: 5 VDC piggyback power supply mounting screw locations

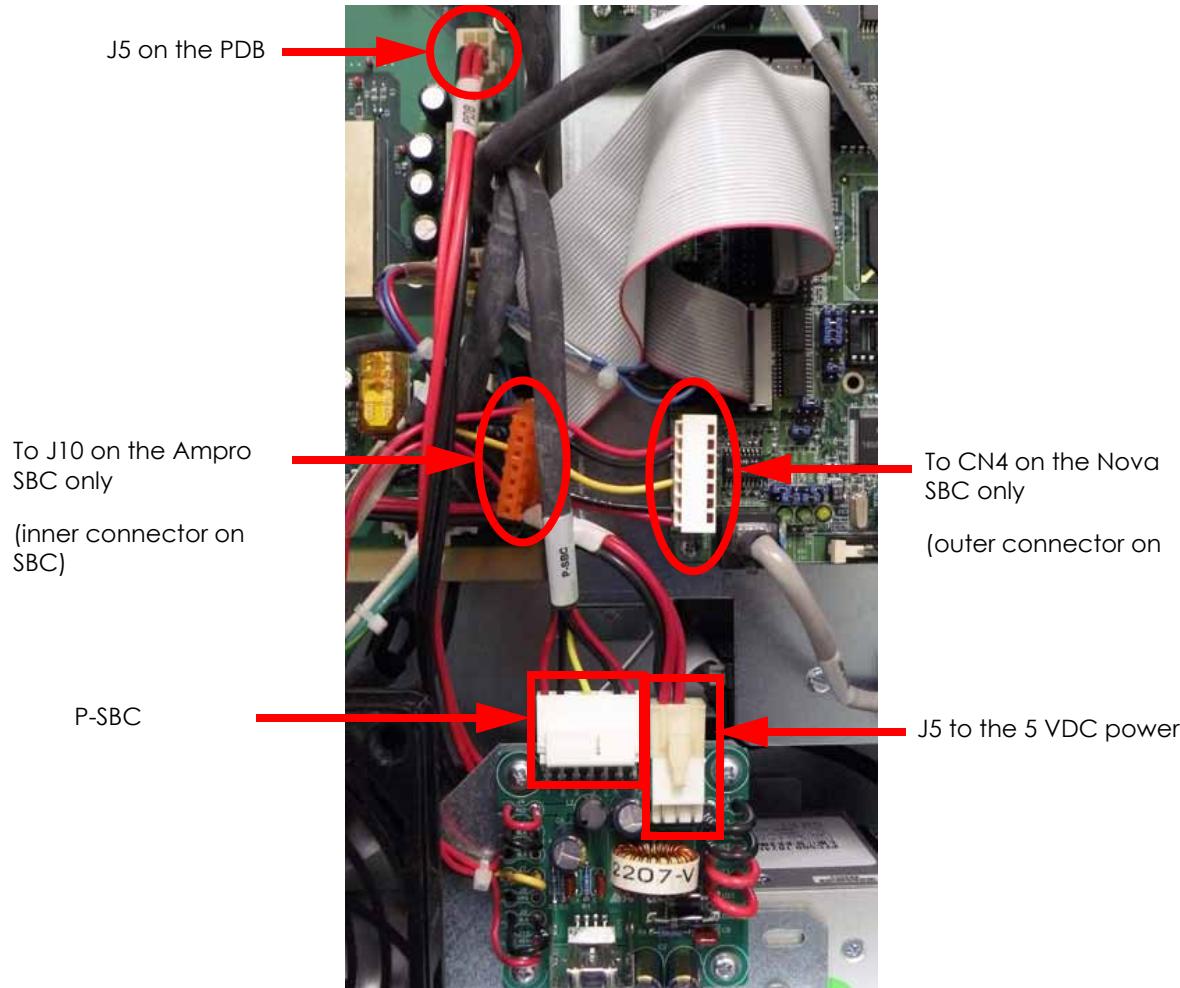


10. Remove the 5 VDC piggyback power supply and discard.

Installing the 5 VDC piggyback power supply:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the 5 VDC piggyback power supply with the mounting bracket.
3. Using a phillips screwdriver, reinstall the 4 mounting screws.
4. Reconnect the J5 and P-SBC cables to the top of the 5 VDC piggyback power supply. See [Figure 153](#).
5. Reconnect the J5 connector to the PDB. See [Figure 153](#).
6. Reconnect the J10 connector (for Ampro SBC) or CN4 connector (for Nova SBC) to the SBC. See [Figure 153](#).

Figure 153: 5 VDC piggyback power supply connections



7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power the printer up.
10. Build a test part to verify proper operation of the printer.

24 VDC Power Supply

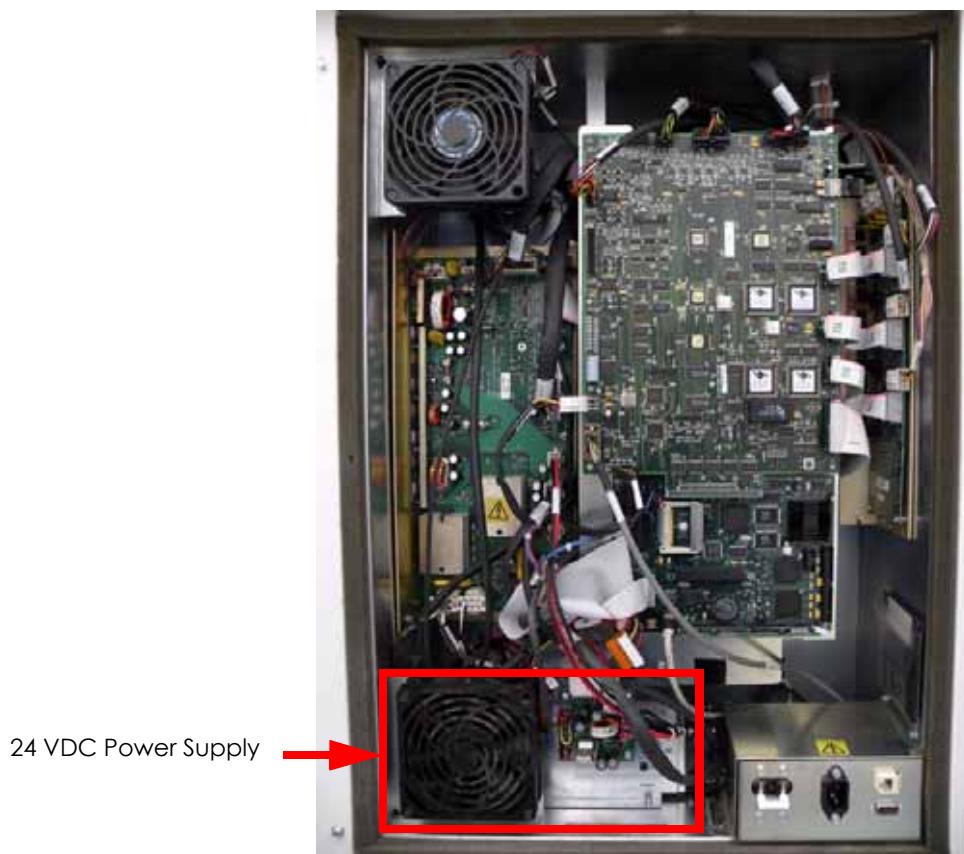
Required Tools

- Phillips screwdriver
- $\frac{1}{4}$ " nut driver or standard screwdriver
- $\frac{5}{64}$ " allen wrench
- Grounding wrist strap

Removing the 24 VDC Power Supply

1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the 24 VDC power supply [Figure 154](#).

Figure 154: 24 VDC power supply location

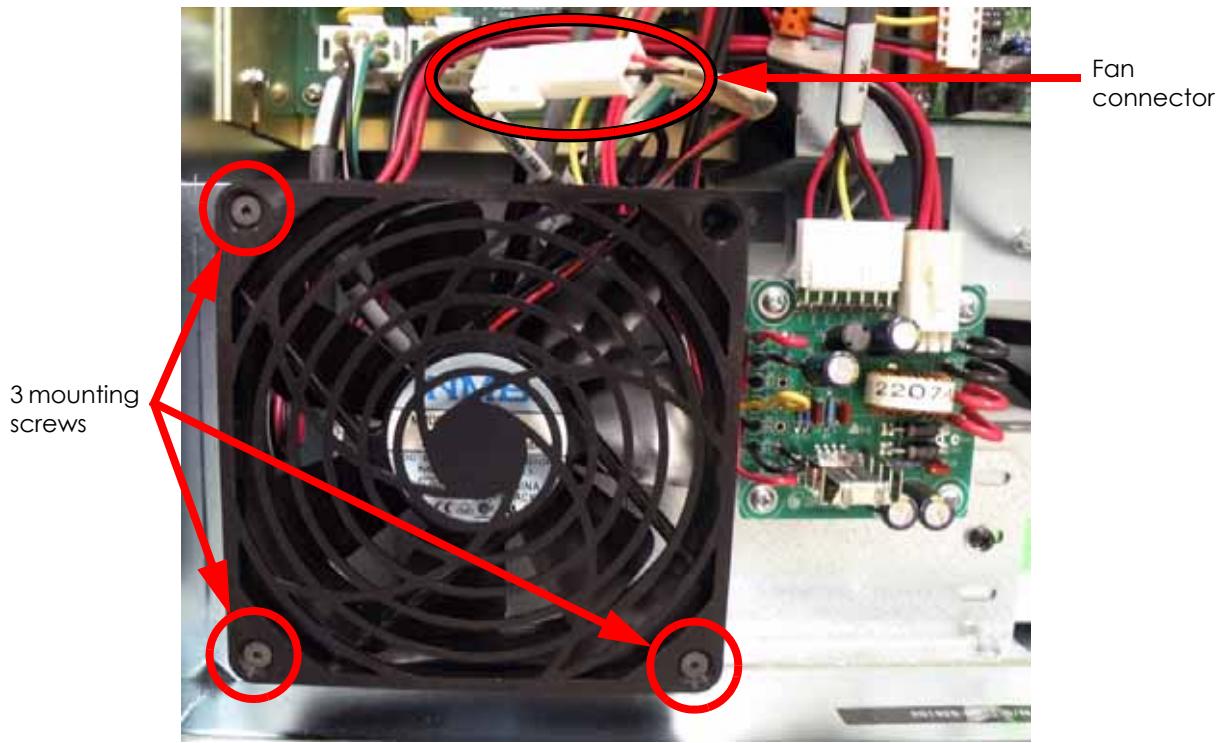


6. Disconnect the lower electronics bay cooling fan cable by pressing the tab in and pulling the connector apart. See [Figure 155](#).
7. Using a $\frac{5}{64}$ " allen wrench, remove the 3 lower electronics bay cooling fan and fan guard mounting screws. See [Figure 155](#).



Airflow direction arrows are embossed on side of fan. Fan must be replaced with the correct direction of airflow.

Figure 155: Lower electronics bay cooling fan location



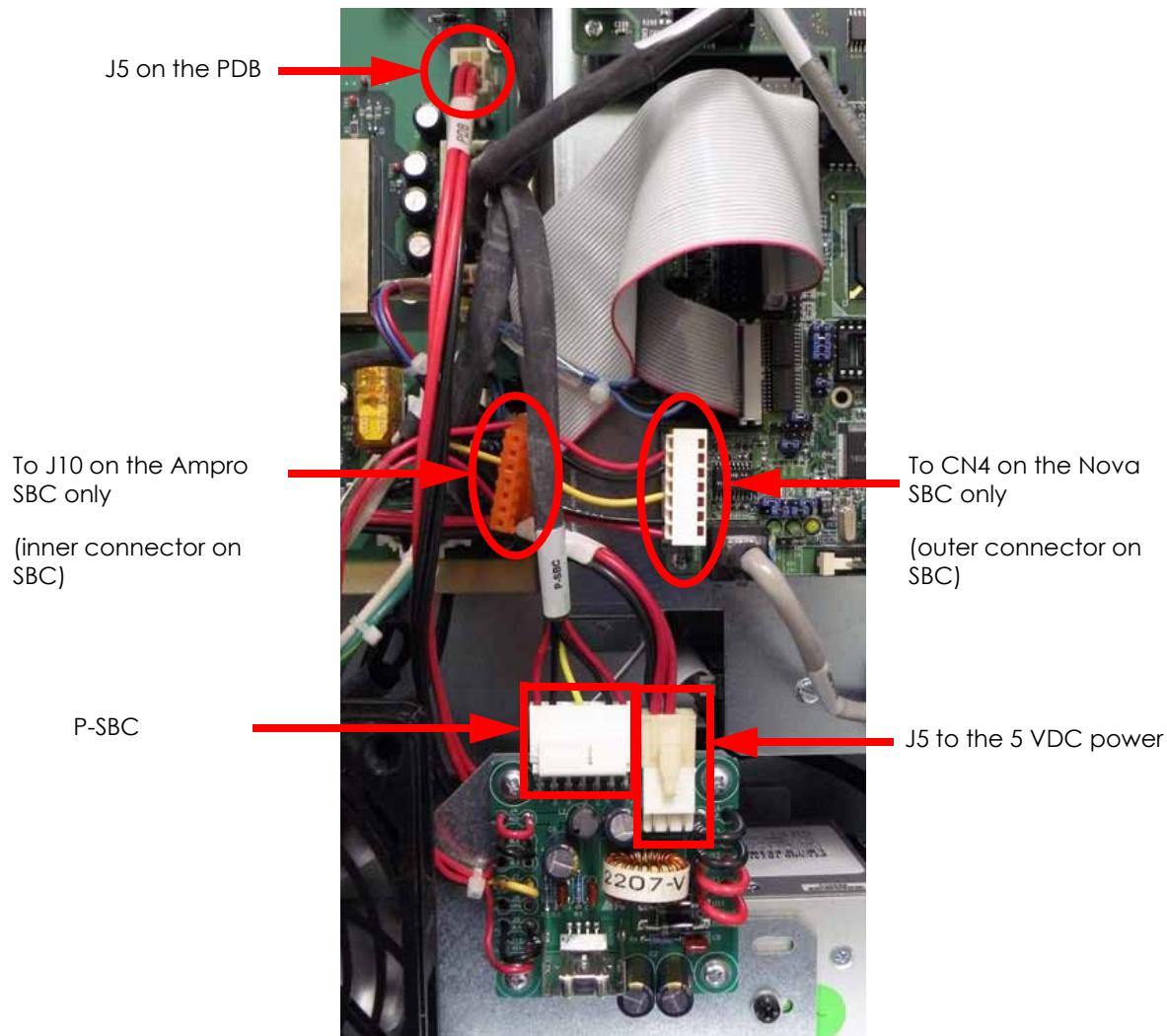
If 5 VDC piggyback power supply is installed:



If the 5 VDC piggyback power supply is not installed proceed to “[If the 5 VDC piggyback power supply is NOT installed:](#)” on page 5-148.

1. Disconnect the P-SBC and J5 cables from the piggyback power supply. See [Figure 156](#).
2. Disconnect the J5 cable from the power distribution board. See [Figure 156](#).
3. If Ampro single board computer is installed, disconnect the J10 connector. If Nova single board computer is installed, disconnect the CN4 connector. See [Figure 156](#).

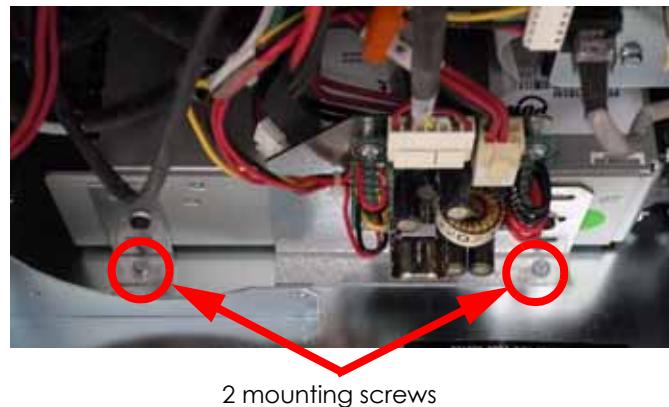
Figure 156: 5 VDC piggyback power supply and PDB connections



4. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 mounting screws holding the 24 VDC power supply L bracket and 5 VDC piggyback power supply bracket to the electronics bay. See [Figure 157](#).

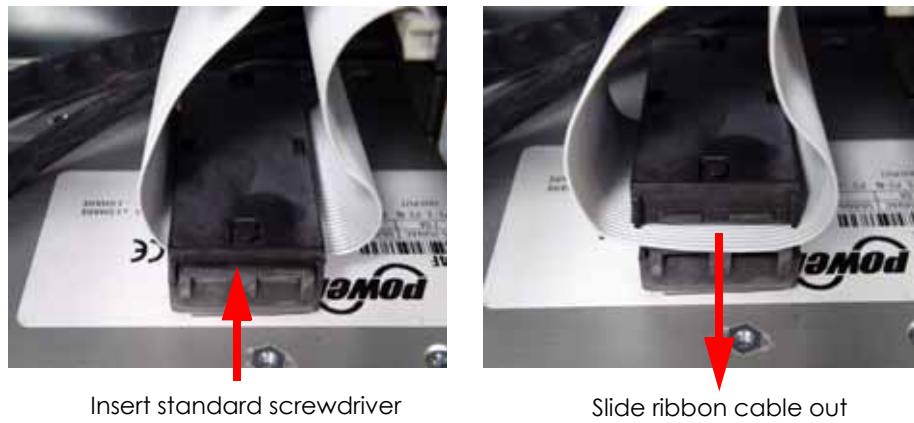
Figure 157: L bracket mounting screw locations

24 VDC power supply with 5 VDC piggy back power supply installed



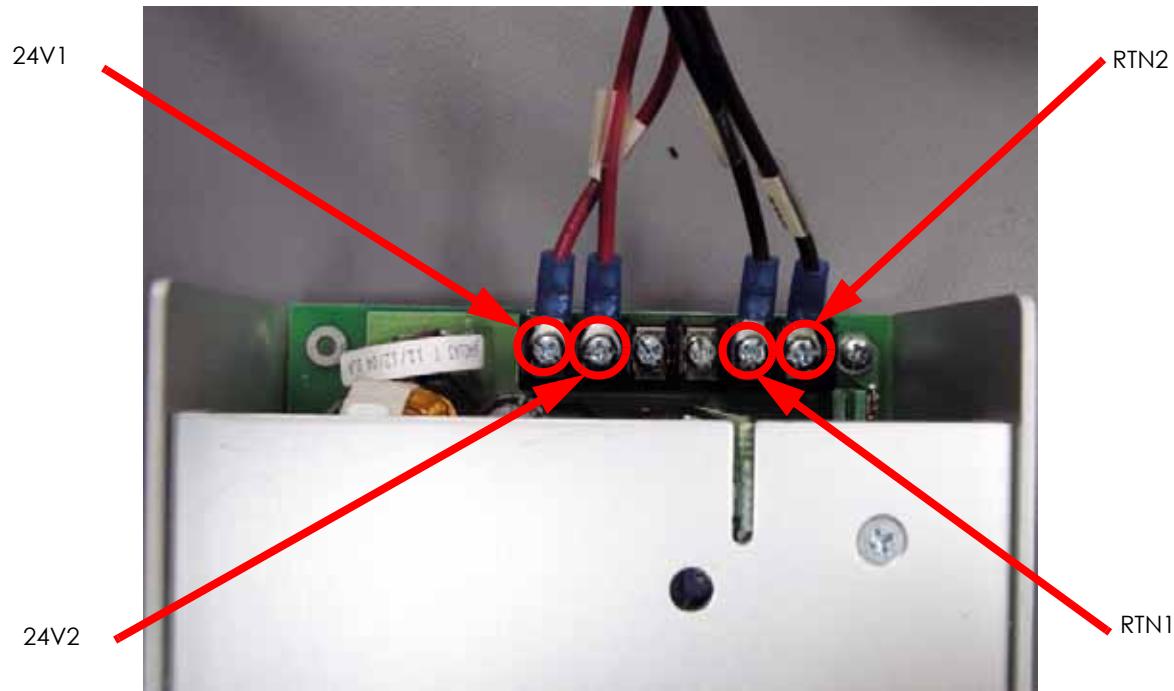
5. Move the power supply forward about 6" or enough to access the left side of the supply.
6. Using a standard screwdriver, pry open the ribbon cable ferrite on top of the 24 VDC power supply and slide ribbon cable out. See [Figure 158](#).

Figure 158: Ribbon cable ferrite location



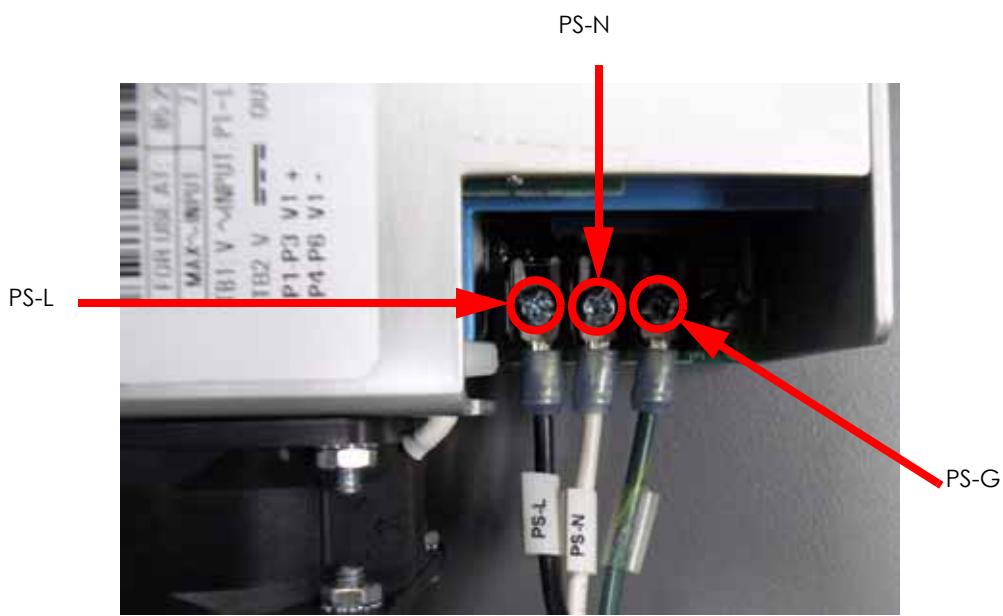
7. Using a phillips screwdriver, loosen but do not remove the 4 output wire mounting screws. Disconnect the wires from the power supply. Note the location of the wires for reinstallation. See [Figure 159](#).

Figure 159: 24 VDC output cable locations



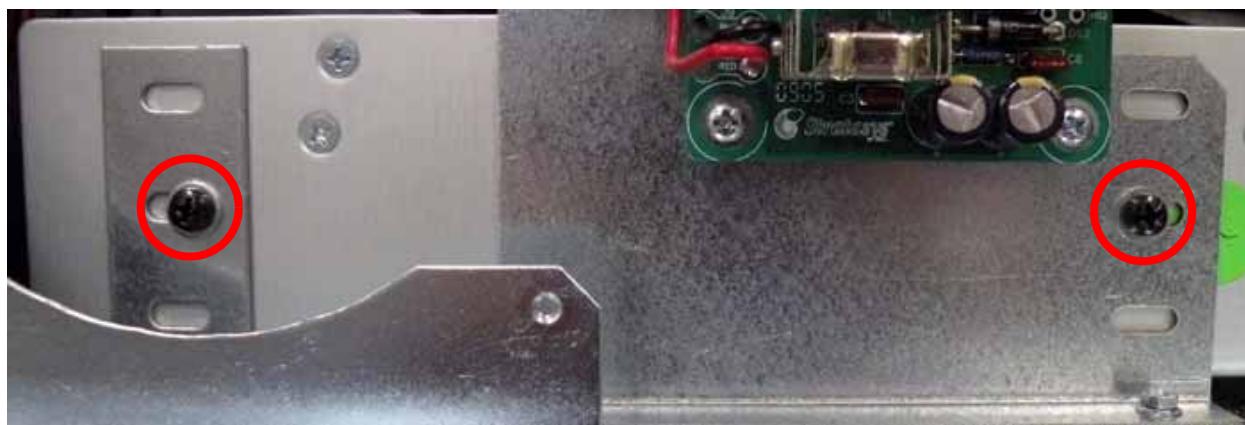
8. Rotate supply to gain access to the right side of the supply.
9. Using a phillips screwdriver, loosen but do not remove the 3 AC input wire mounting screws. Disconnect the wires from the power supply. Note the location of the wires for re-installation. See [Figure 160](#).

Figure 160: 24 VDC AC input wire locations



10. Remove power supply.
11. Using a phillips screwdriver, remove the L bracket mounting screw and the 5 VDC piggy-back power supply bracket mounting screw. See [Figure 161](#).

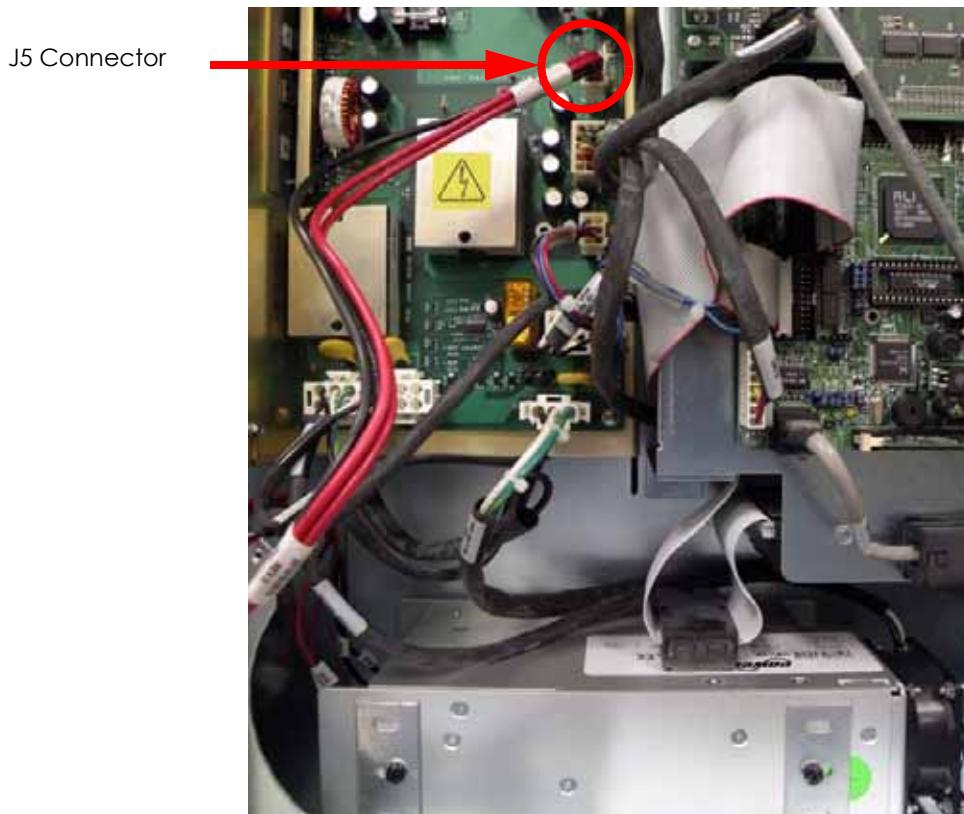
Figure 161: Bracket mounting screw locations



If the 5 VDC piggyback power supply is NOT installed:

1. Disconnect J5 from the power distribution board. See [Figure 162](#).

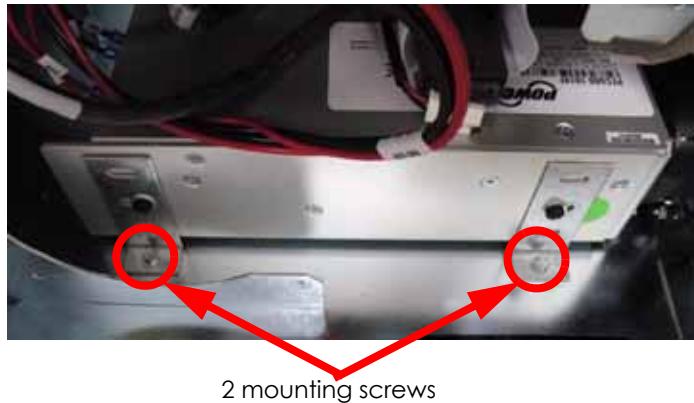
Figure 162: J5 connector location



- Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 mounting screws holding the 24 VDC power supply L brackets to the electronics bay. See [Figure 163](#).

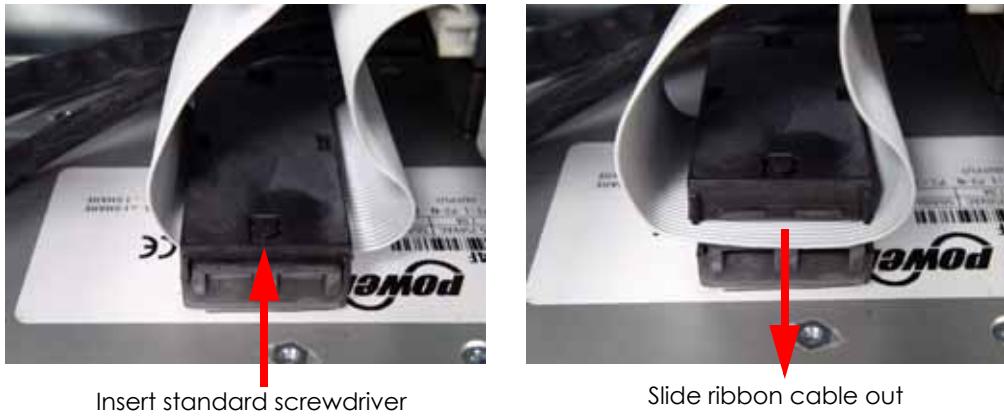
Figure 163: L bracket mounting screw locations

24 VDC power supply without 5 VDC piggy back power supply installed



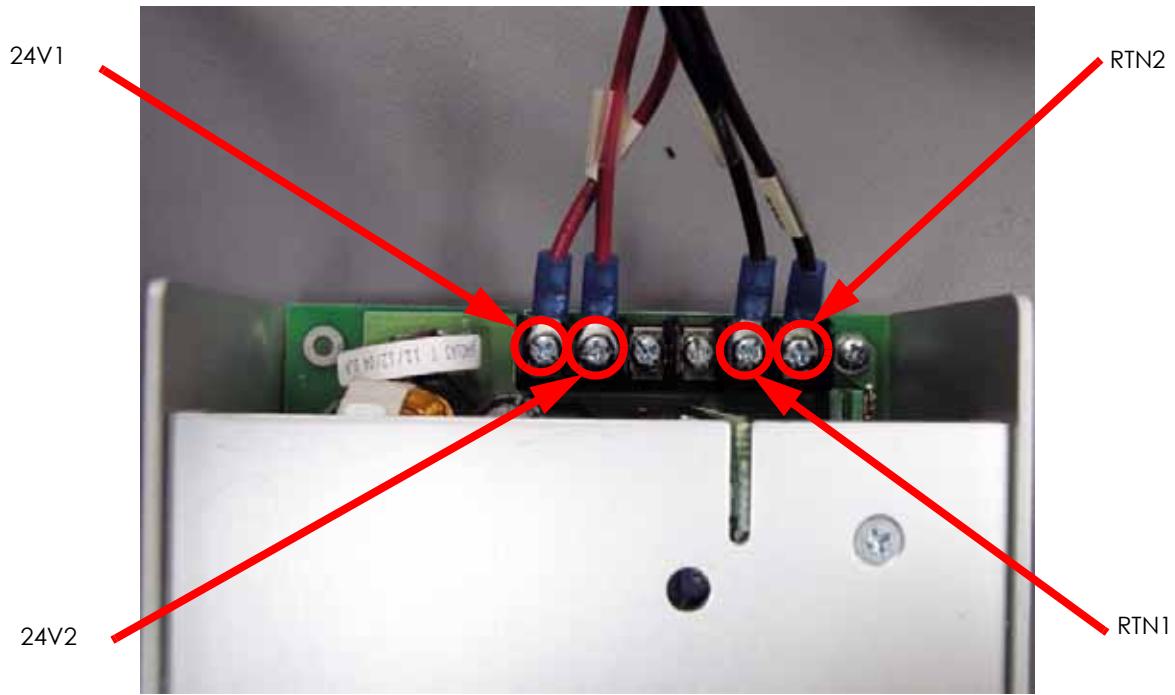
- Move the power supply forward about 6" or enough to access the left side of the supply.
- Using a standard screwdriver, pry open the ribbon cable ferrite on top of the 24 VDC power supply and slide ribbon cable out. See [Figure 164](#).

Figure 164: Ribbon cable ferrite location



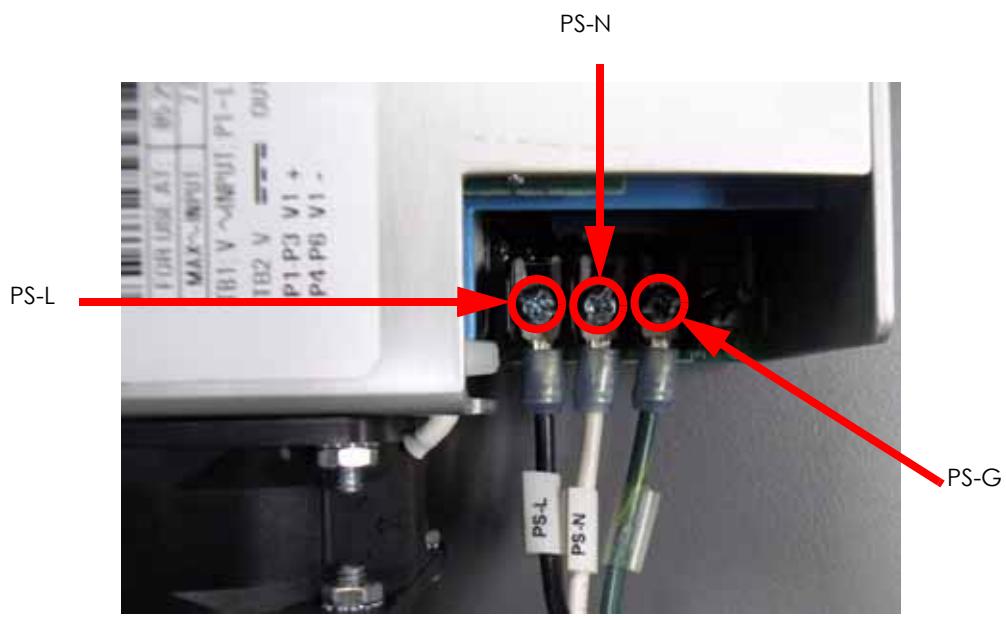
- Using a phillips screwdriver, loosen but do not remove the four +24 VDC wire mounting screws. Disconnect the wires from the power supply. Note the location of the wires for reinstallation. See [Figure 165](#).

Figure 165: 24 VDC output wire locations



6. Rotate supply to gain access to the right side of the supply.
7. Using a phillips screwdriver, loosen but do not remove the 3 AC input wire mounting screws. Disconnect the wires from the power supply. Note the location of the wires for reinstallation. See [Figure 166](#).

Figure 166: 24 VDC AC input wire locations



8. Remove power supply.
9. Using a phillips screwdriver, remove the two L bracket mounting screws. See [Figure 167](#).

Figure 167: L bracket mounting screw locations



Installing the 24 VDC Power Supply:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.

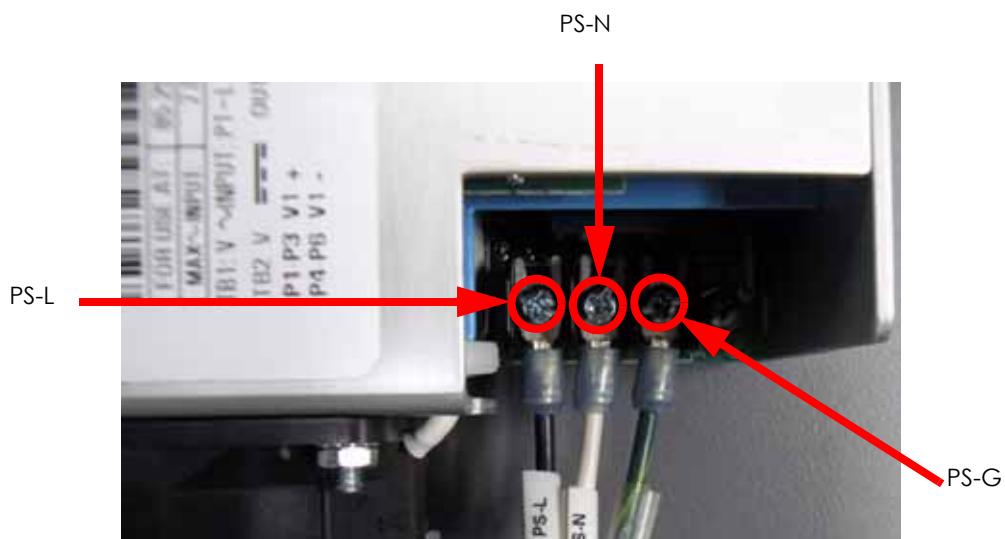
If 5 VDC piggyback power supply is NOT installed:



If the 5 VDC piggyback power supply is installed proceed to "[If the 5 VDC piggyback power supply is installed:](#)" on page 5-153.

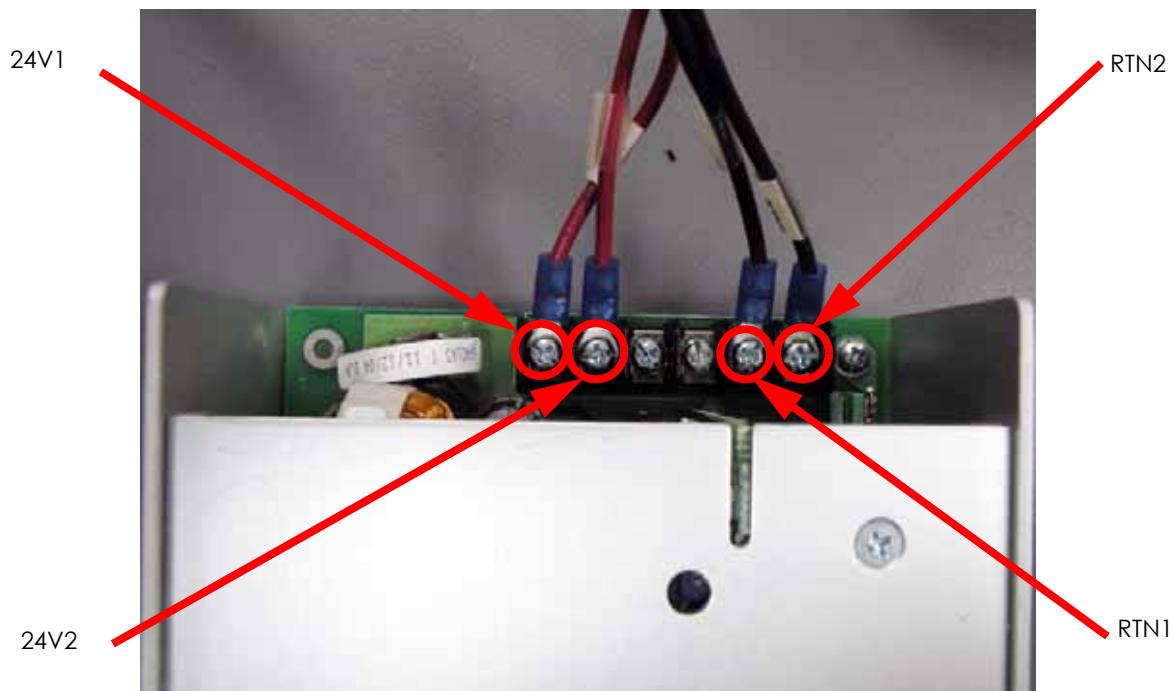
1. Using a phillips screwdriver, reinstall the 2 L brackets to the 24 VDC power supply.
2. Using a phillips screwdriver, reconnect the 3 AC input wires. See [Figure 168](#).

Figure 168: 24 VDC power supply AC input wire locations



3. Using a phillips screwdriver, reinstall the 4 output wires. See [Figure 169](#).

Figure 169: 24 VDC output wire locations



4. Align the 24 VDC power supply with the mounting holes.
5. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, secure the L brackets to the electronics bay.
6. Reconnect J5 to the PDB.
7. Insert the ribbon cable into the ribbon cable ferrite and close.
8. Using a $\frac{5}{64}$ " allen wrench, reinstall the lower electronics bay cooling fan and fan guard with the airflow in the proper direction.



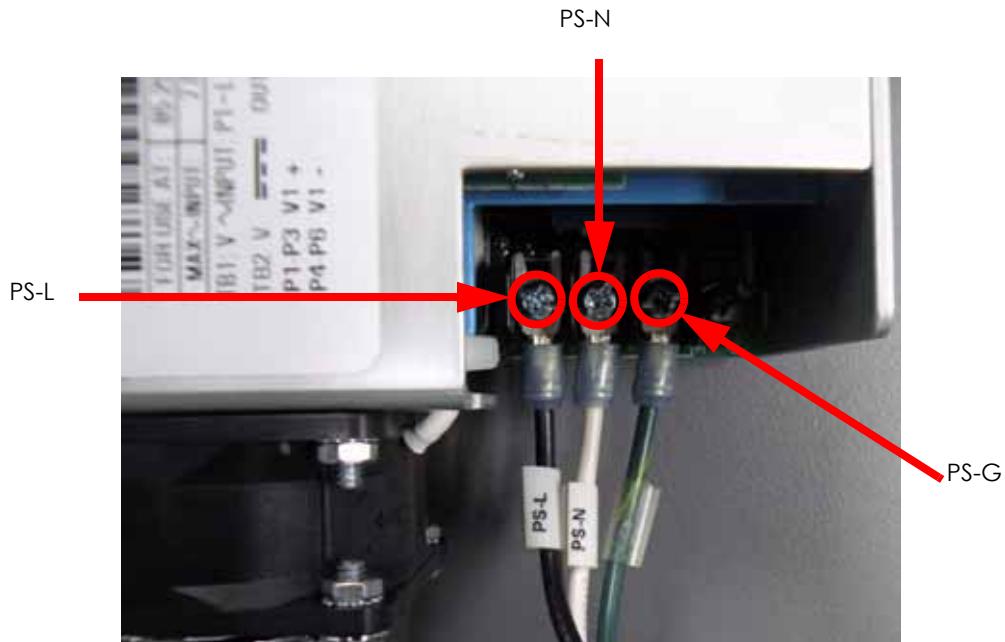
Airflow direction arrows are embossed on side of fan. Fan must be replaced with the correct direction of airflow.

9. Reconnect the lower electronics bay fan cable.
10. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
11. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
12. Power on the system. System should reach **Idle** without displaying an error.
13. Run a small test part and monitor system operation during build.

If the 5 VDC piggyback power supply is installed:

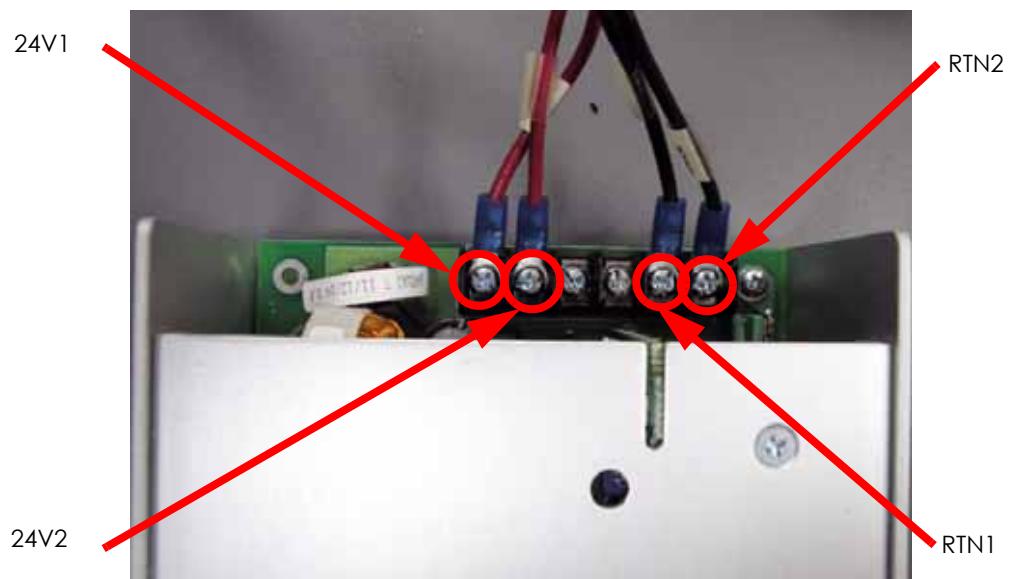
1. Using a phillips screwdriver, reinstall the L bracket and 5 VDC piggyback power supply bracket to the 24 VDC power supply.
2. Using a phillips screwdriver, reconnect the 3 AC input wires. See [Figure 170](#).

Figure 170: 24 VDC power supply AC input wire locations



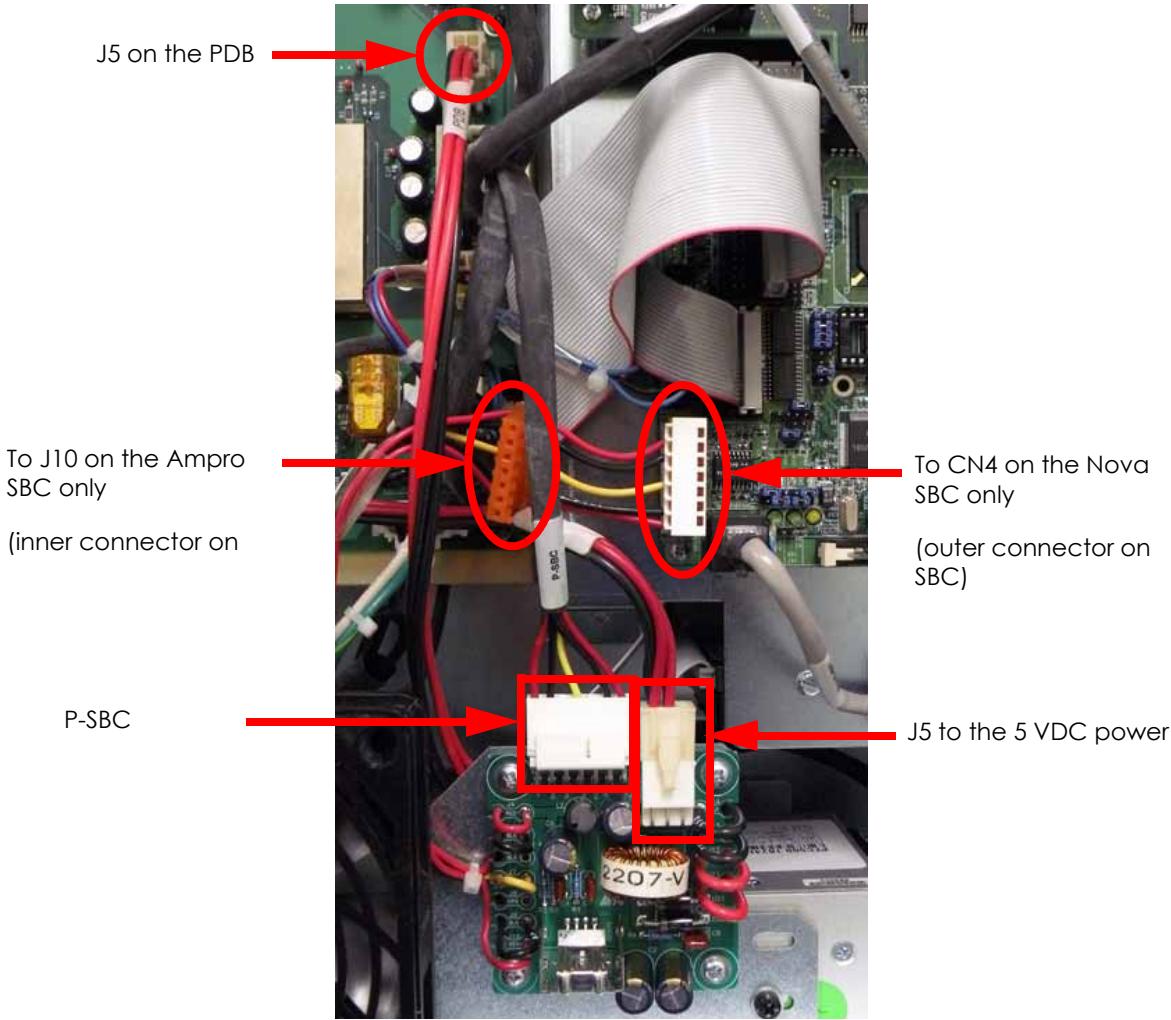
3. Using a phillips screwdriver, reinstall the 4 output wires. See [Figure 171](#).

Figure 171: 24 VDC output wire locations



4. Align the 24 VDC power supply with the mounting holes.
5. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, secure the L bracket and 5 VDC piggyback power supply bracket to the electronics bay.
6. Reconnect the P-SBC and J5 cables to the piggyback power supply. See [Figure 172](#).
7. Reconnect the J5 cable to the power distribution board. See [Figure 172](#).
8. If Ampro single board computer is installed, reconnect the J10 connector. If Nova single board computer is installed, reconnect the CN4 connector. See [Figure 172](#).

Figure 172: 5 VDC piggyback power supply and PDB connections



9. Insert the ribbon cable into the ribbon cable ferrite and close.
10. Using a $\frac{5}{64}$ " allen wrench, reinstall the lower electronics bay cooling fan and fan guard with the airflow in the proper direction.



Airflow direction arrows are embossed on side of fan. Fan must be replaced with the correct direction of airflow.

11. Reconnect the lower electronics bay fan cable.
12. Reinstall the rear door. See "["Installing the Rear Door."](#) on page 5-10.
13. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
14. Power on the system. System should reach **Idle** without displaying an error.
15. Run a small test part and monitor system operation during build.

Dual 48 VDC Power Supplies (SST only)

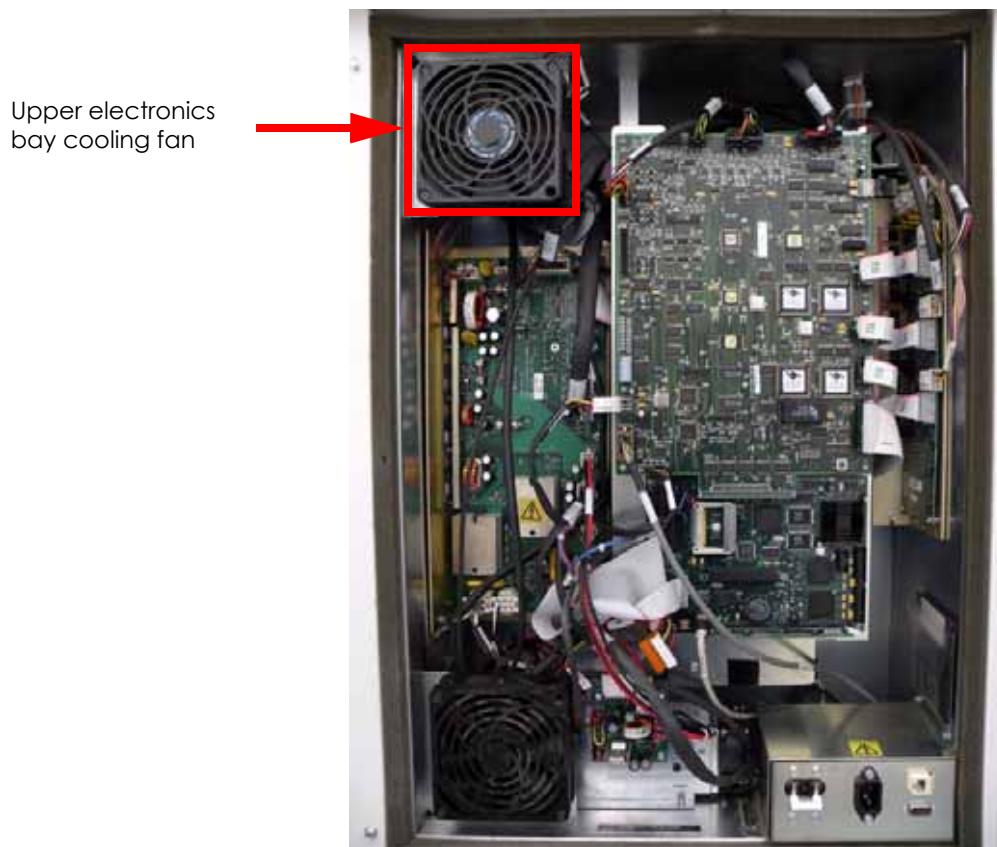
Required Tools

- Phillips screwdriver
- $\frac{1}{4}$ " nut driver or standard screwdriver
- $\frac{5}{64}$ " allen wrench
- Grounding wrist strap

Removing the Dual 48 VDC Power Supplies:

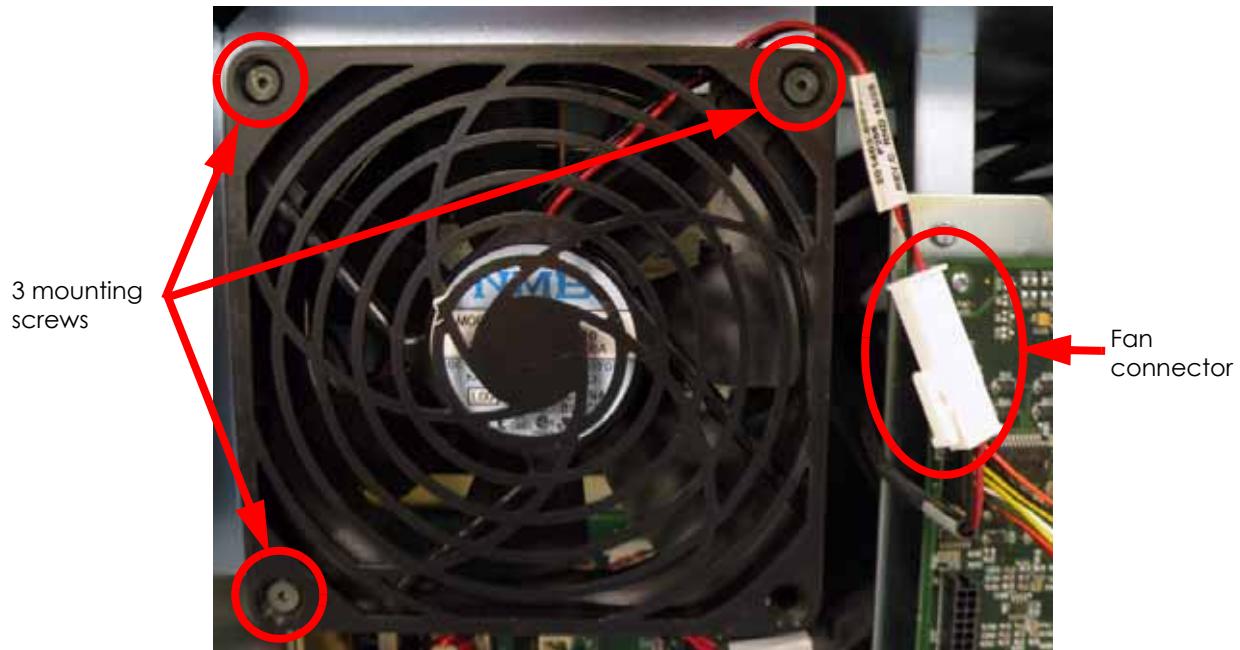
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the upper electronics bay cooling fan. See [Figure 173](#).

Figure 173: Dual 48 VDC power supply location



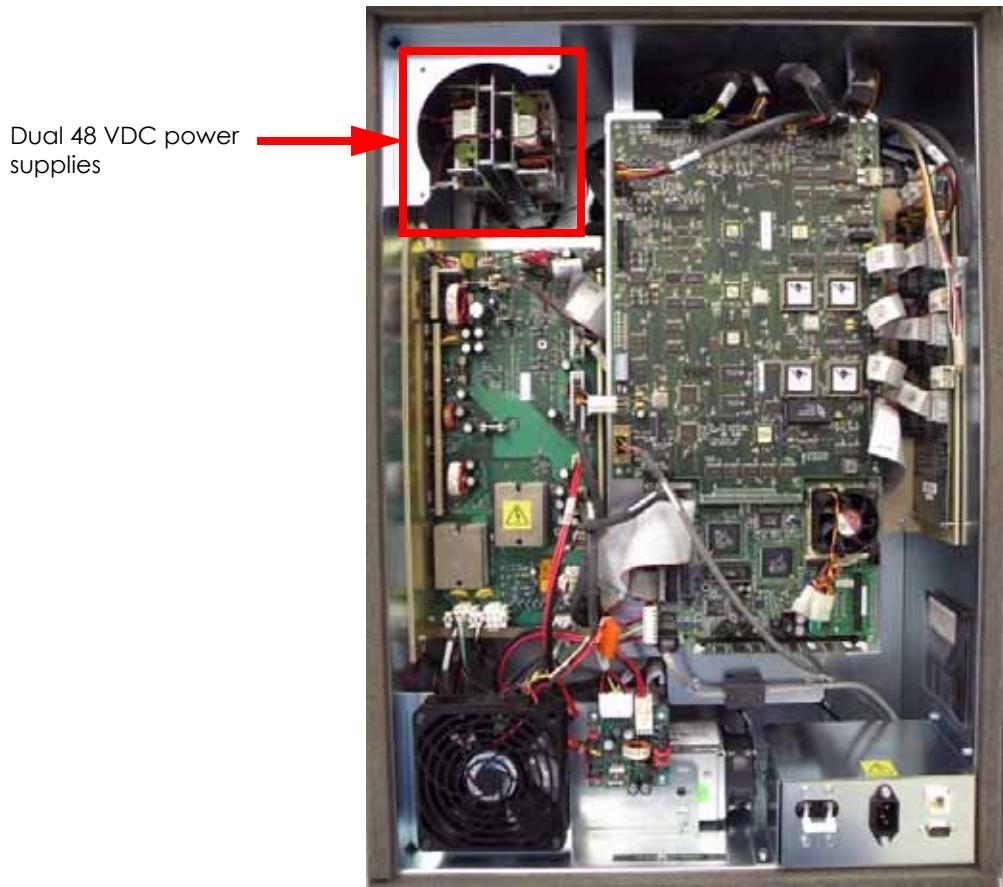
6. Disconnect the upper electronics bay cooling fan cable by pressing the tab in and pulling the connector apart. See [Figure 174](#).
7. Using a $5/64"$ allen wrench, remove the 3 upper electronics bay cooling fan mounting screws. See [Figure 174](#).

Figure 174: Upper electronics bay cooling fan mounting screw and connector locations



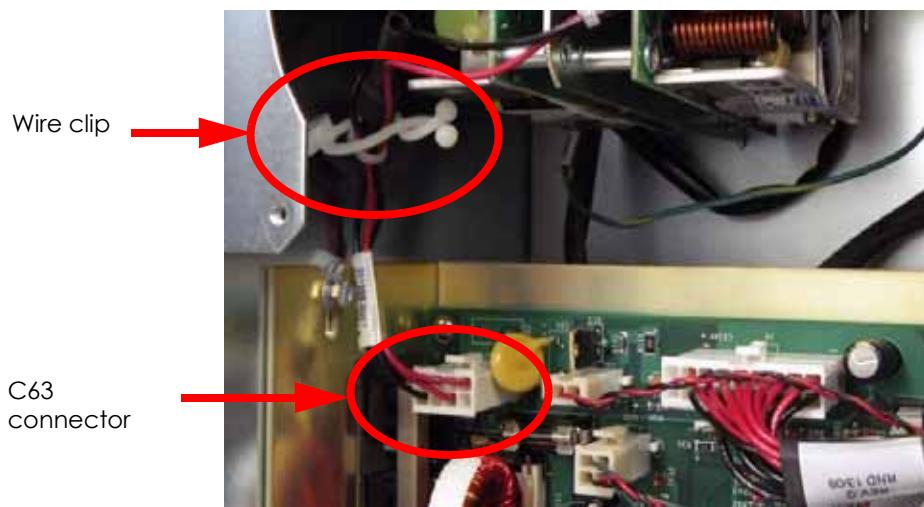
8. Locate the dual 48 VDC power supplies. See [Figure 175](#).

Figure 175: Dual 48 VDC power supplies location



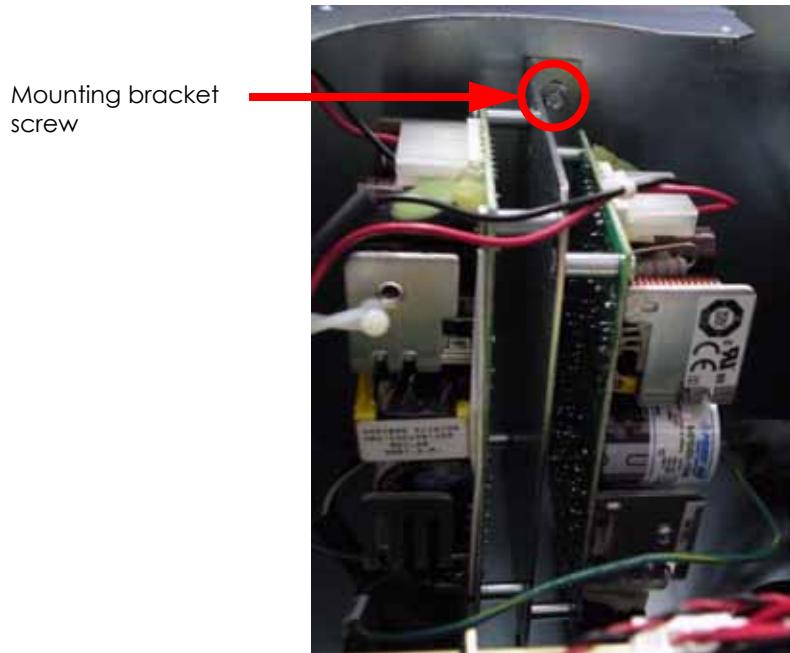
9. Disconnect C63 from the power distribution board by pulling outward and remove the cable from the wire clip. See [Figure 176](#).

Figure 176: C63 connector location



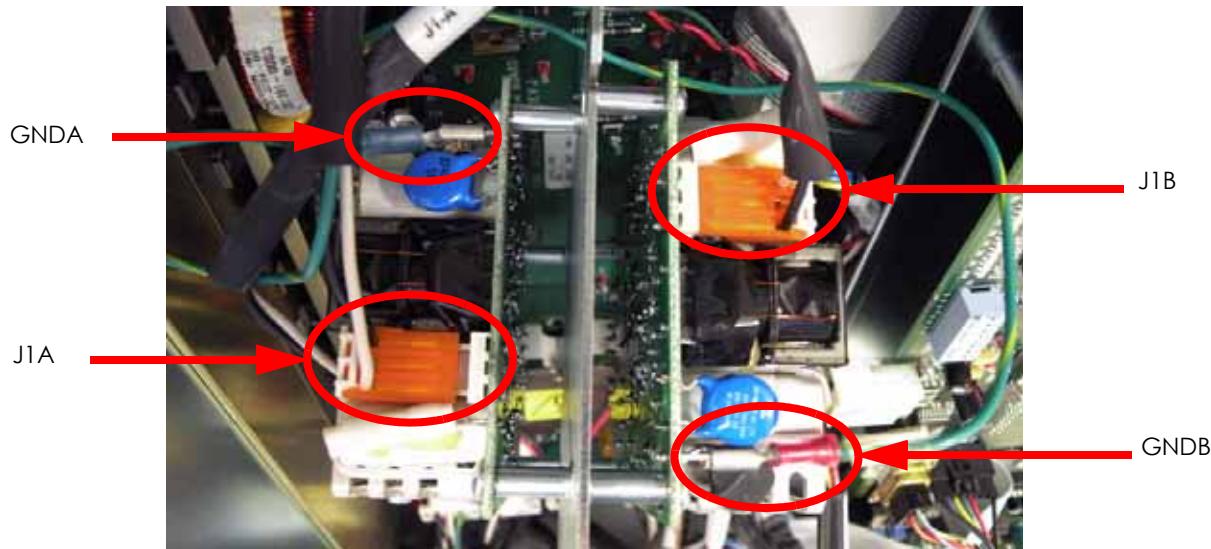
10. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the dual 48 VDC mounting bracket mounting screw. See [Figure 177](#).

Figure 177: Dual 48 VDC mounting bracket location



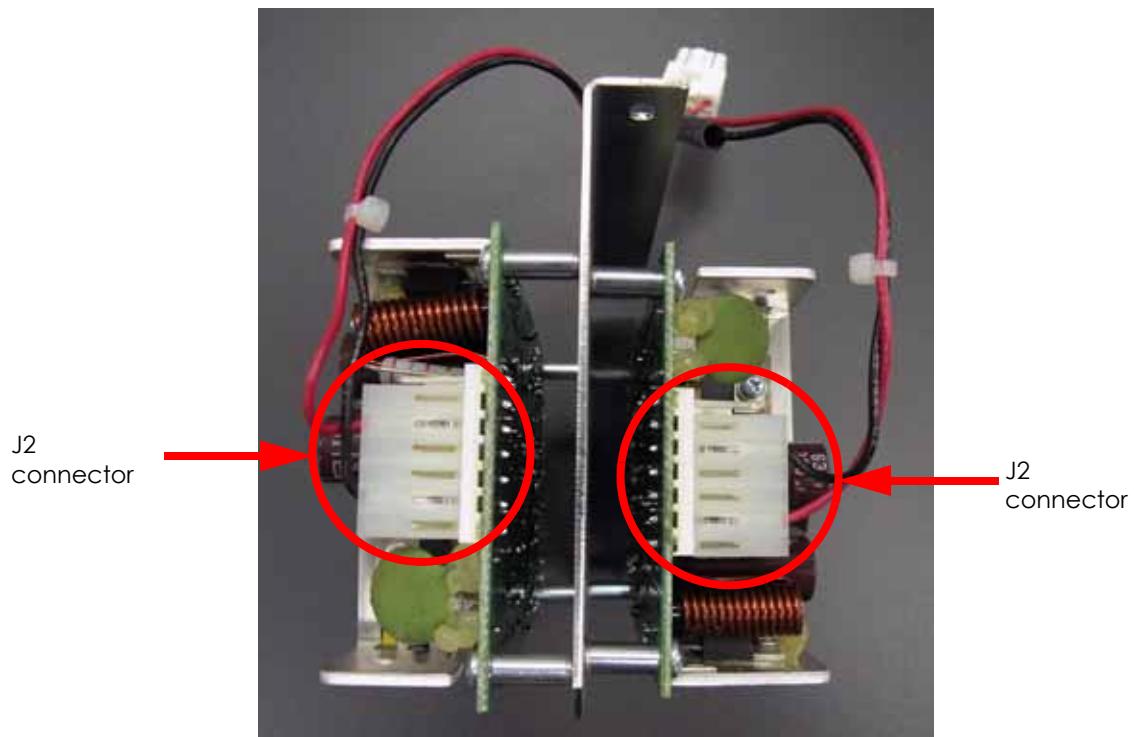
11. Remove the assembly by pulling forward until it is free from the mounting slot.
12. Disconnect J1A and J1B from the the dual 48 VDC power supplies. See [Figure 178](#).
13. Disconnect GNDA and GNDB from the ground spades. See [Figure 178](#).

Figure 178: Dual 48 VDC power supply connection locations



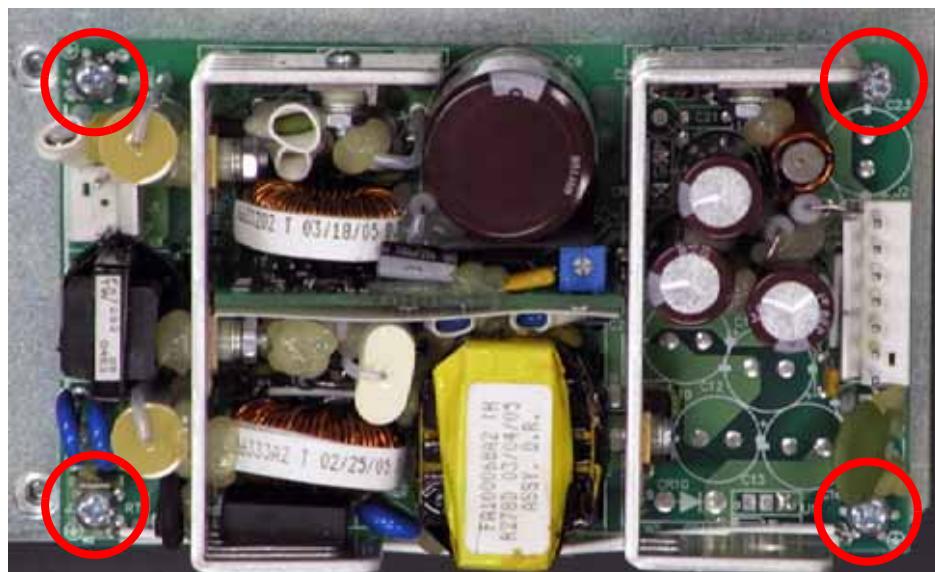
14. Disconnect the J2 cable from both power supplies. See [Figure 179](#).

Figure 179: J2 connector location



15. Using phillips screwdriver, remove the 4 mounting screws from each power supply. See [Figure 180](#).

Figure 180: Dual 48 VDC power supplies mounting screw locations



Installing the Dual 48 VDC Power Supplies:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the new 48 VDC power supplies with the mounting standoffs on the mounting bracket.
3. Using a phillips screwdriver reinstall the 4 mounting screws for each power supply.
4. Reconnect the J2 connectors to the dual 48 VDC power supplies.
5. Reconnect J1A, J1B, GNDA and GNDB to the dual 48 VDC power supplies.
6. Slide the dual 48 VDC power supplies mounting bracket into the slot on the back of the electronics bay.
7. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the dual 48 VDC power supplies mounting bracket mounting screw.
8. Reconnect C63 to the power distribution board.
9. Place the C63 wire into the wire clip and close the wire clip.
10. Using a $\frac{5}{64}$ " allen wrench, reinstall the upper electronics bay cooling fan and fan guard with the airflow in the proper direction.



Airflow direction arrows are embossed on side of fan. Fan must be replaced with the correct direction of airflow.

11. Reconnect the upper electronics bay cooling fan cable.
12. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
13. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
14. Power on the system. System should reach **Idle** without displaying an error.
15. Run a small test part and monitor system operation during build.

Motor Driver Board (MDB)

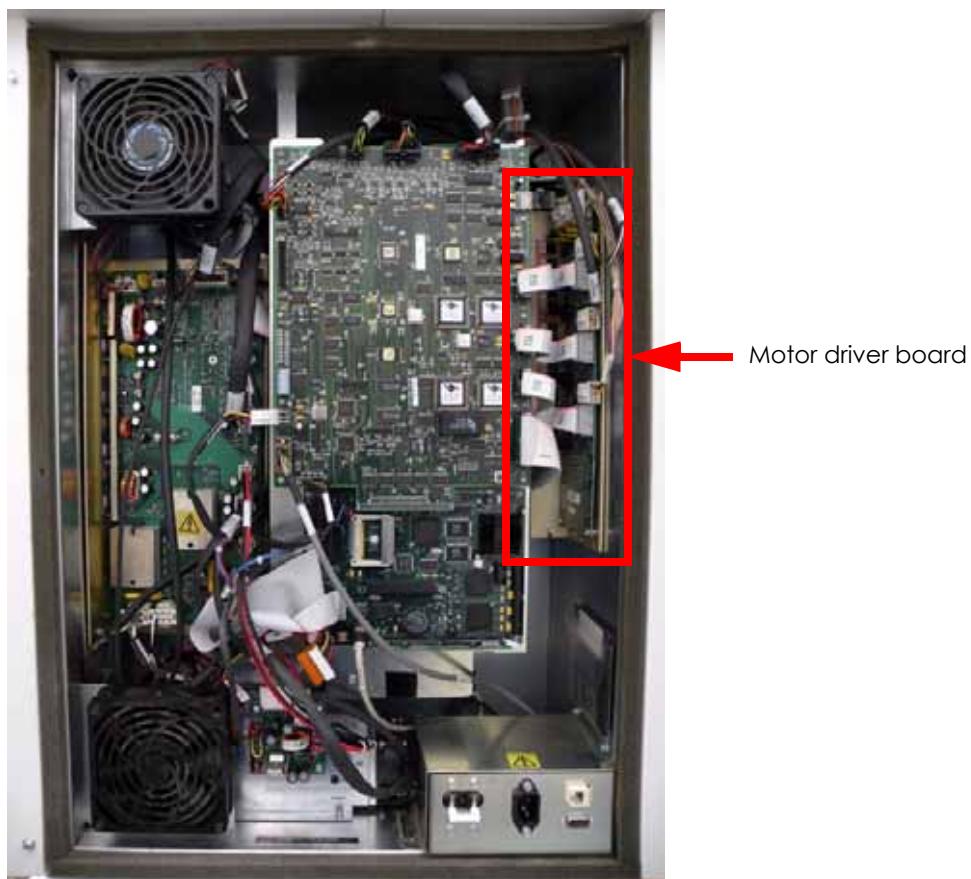
Required Tools

- Phillips screwdriver
- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap

Removing the Motor Driver Board:

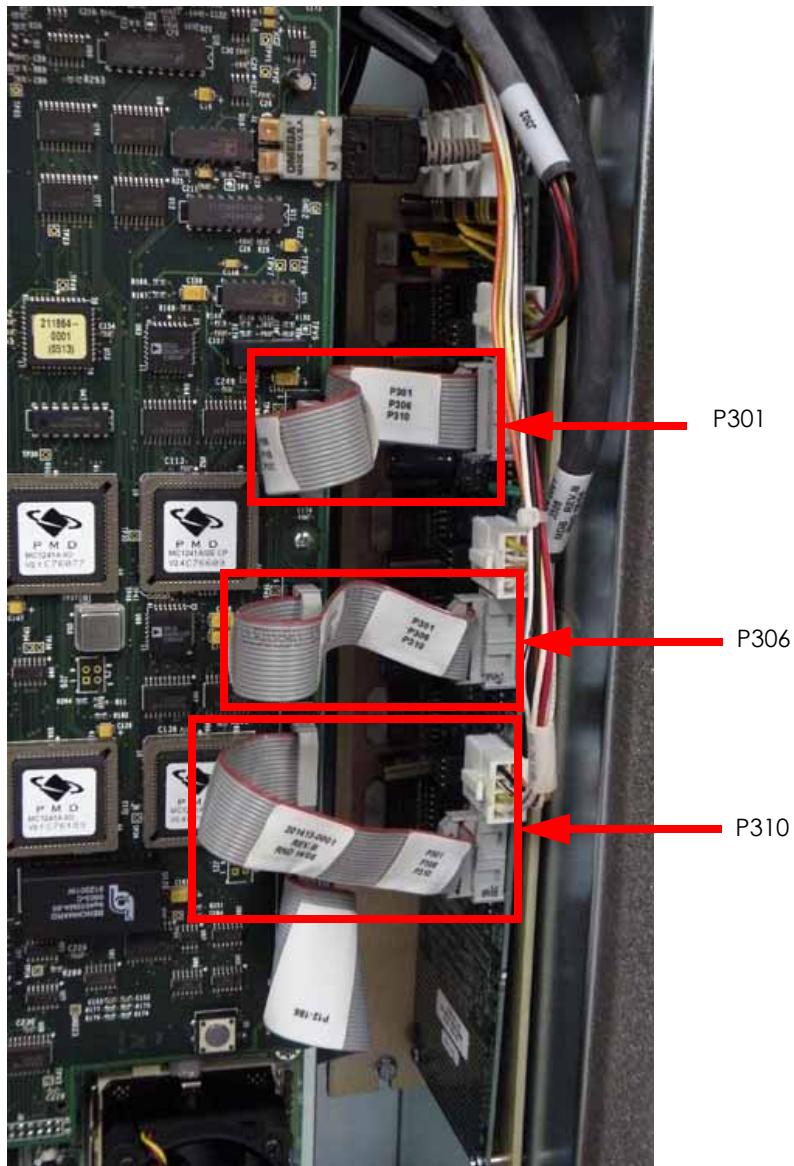
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the motor driver board. See [Figure 181](#).

Figure 181: Motor driver board location



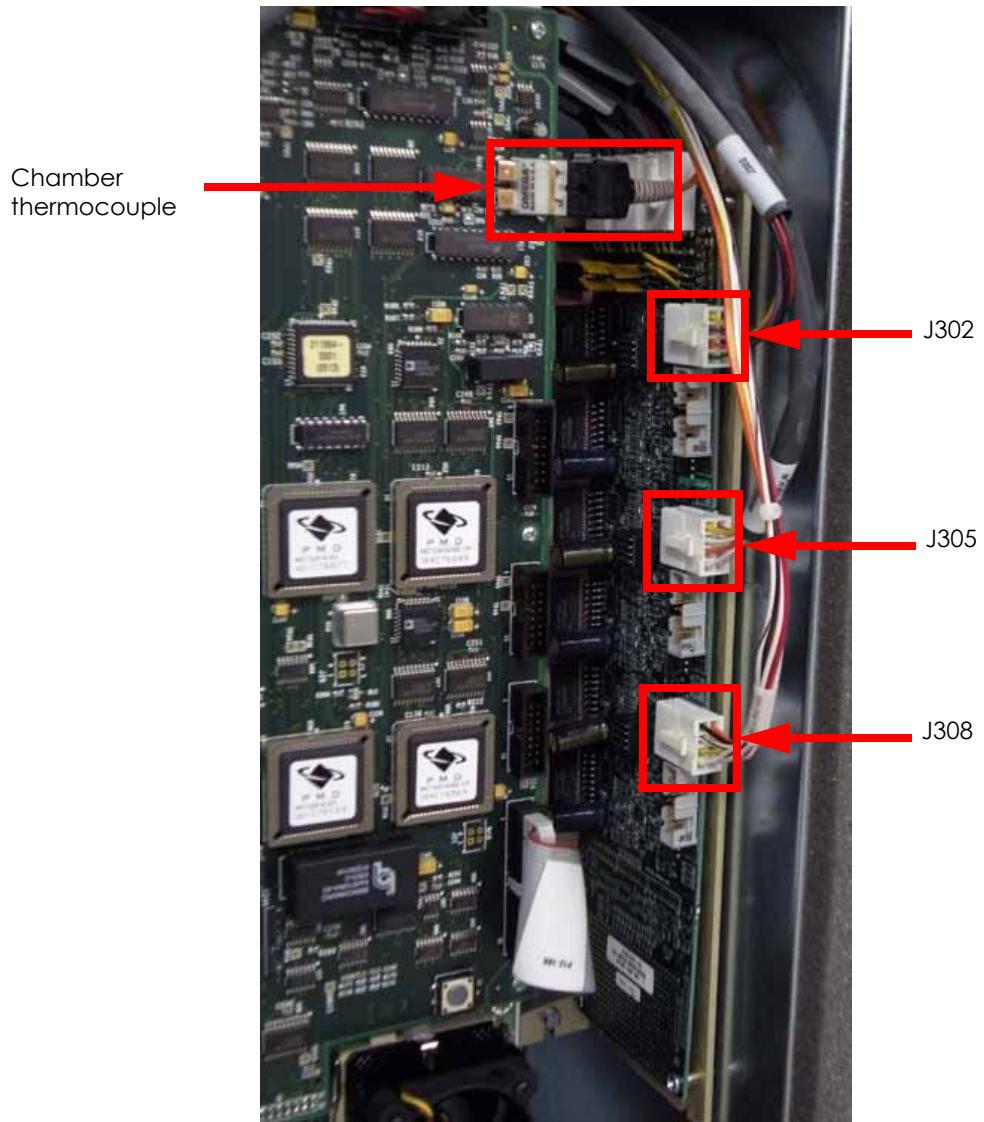
6. Disconnect the P301, P306 and P310 ribbon cables from the motor driver board and 186 processor board by pulling outward. See [Figure 182](#).

Figure 182: MDB ribbon connector locations



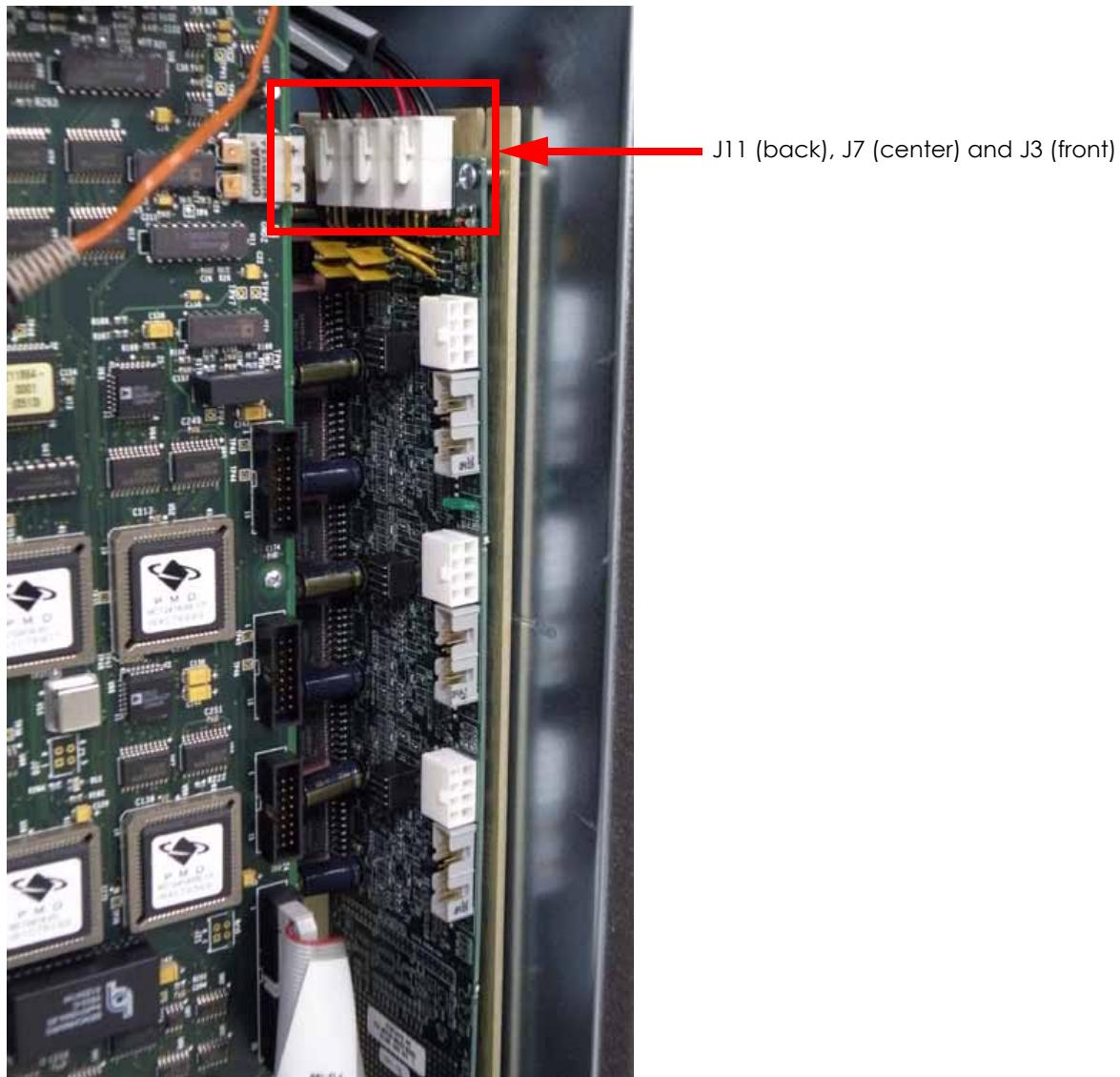
7. Disconnect the J302, J305 and J308 connectors from the motor driver board by pressing the tabs in and pulling out ward. See [Figure 183](#).
8. Disconnect the chamber thermocouple from the 186 processor board by pulling outwards. See [Figure 183](#).

Figure 183: MDB cable locations



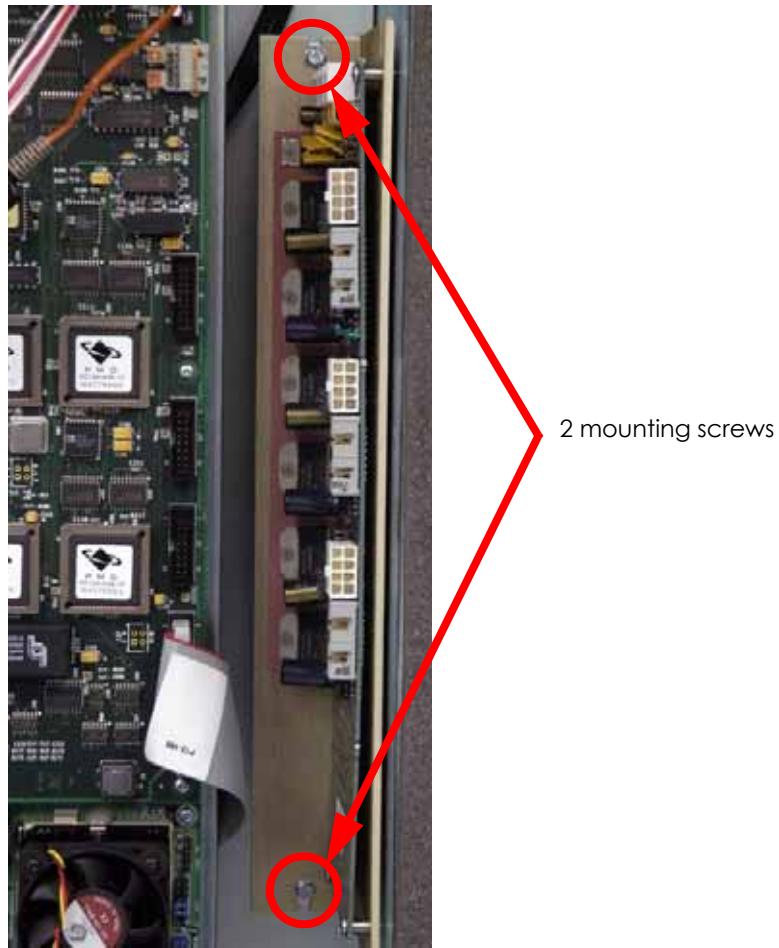
9. Disconnect the J3, J7 and J11 cables from the motor diver board. See [Figure 184](#).

Figure 184: MDB cable locations



10. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 motor driver board mounting screws. See [Figure 185](#).
11. Remove the motor driver board and heat sink.

Figure 185: MDB mounting screw locations



Installing the Motor Driver Board:

1. Align the motor driver board and heatsink with the mounting holes and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws.
2. Reconnect the J11, J7 and J3 cables to the motor driver board. See [Figure 184](#).
3. Reconnect the chamber thermocouple. See [Figure 183](#).
4. Reconnect the J302, J305 and J308 cables to the motor driver board. See [Figure 183](#).
5. Reconnect the J301, J306 and J310 ribbon cable to the motor driver board and 186 processor board. See [Figure 182](#).
6. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power up the printer.
9. Run a small test part and monitor system operation during build.
10. Send the bad motor driver board back to Stratasys, Inc.

Hard Drive

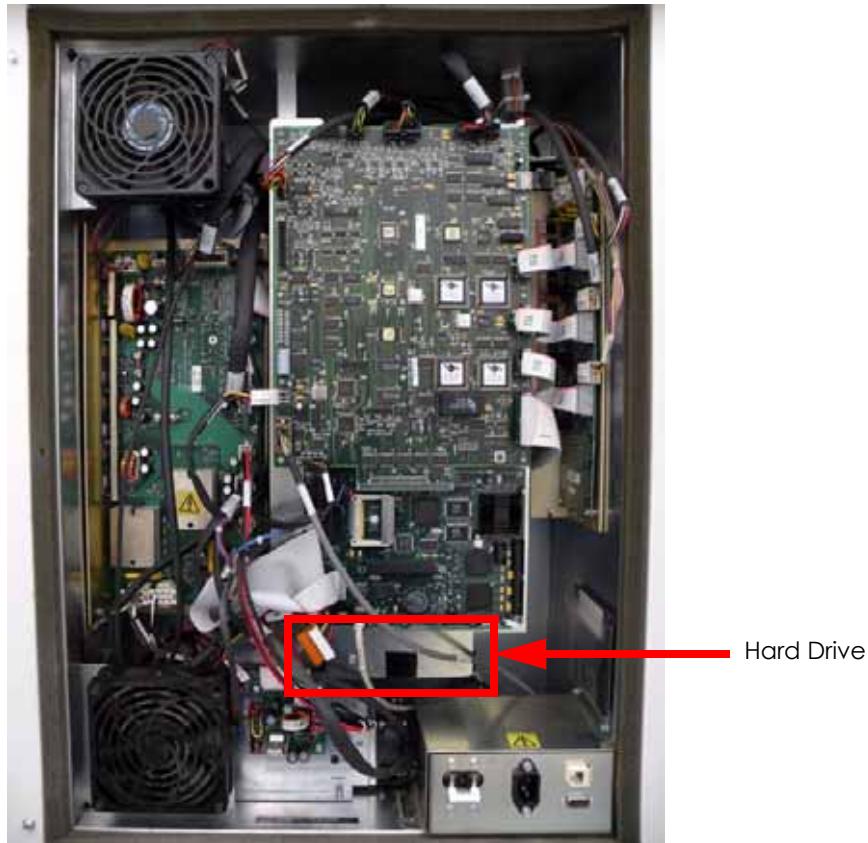
Required Tools

- Phillips screwdriver
- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap
- Notebook computer or Workstation running CatalystEX
- System Software CD

Removing the Hard Drive:

1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "["Removing the Rear Door:" on page 5-9.](#)
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the Hard Drive. See [Figure 186.](#)

Figure 186: Hard Drive location



6. Using a phillips screwdriver, remove the upper 5 VDC piggyback power supply mounting screw. See [Figure 187](#).
7. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the lower 5 VDC piggyback power supply mounting screw. See [Figure 187](#).

Figure 187: 5 VDC piggyback power supply mounting screw locations



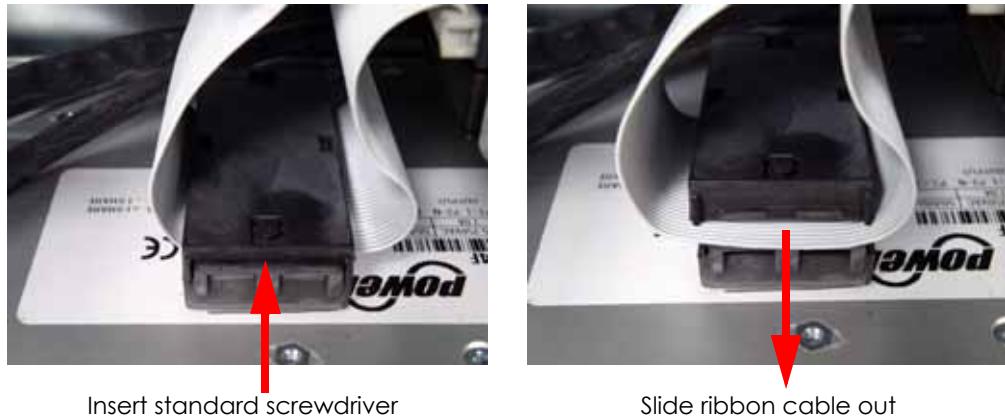
8. Set the 5 VDC piggyback supply off to the side. See [Figure 188](#).

Figure 188: Setting the 5 VDC piggyback power supply off to the side



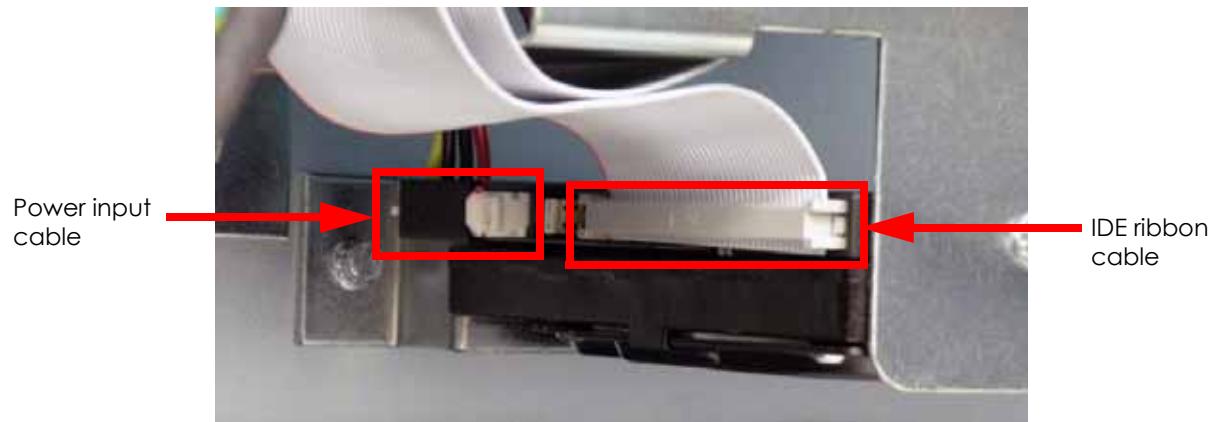
9. Using a standard screwdriver, pry open the ribbon cable ferrite on top of the 24 VDC power supply and slide IDE ribbon cable out. See [Figure 189](#).

Figure 189: Ribbon cable ferrite location



10. Disconnect the hard drive IDE ribbon cable by pulling outward. See [Figure 190](#).
11. Disconnect the hard drive power input cable by pulling outward. See [Figure 190](#).

Figure 190: Hard drive cable locations

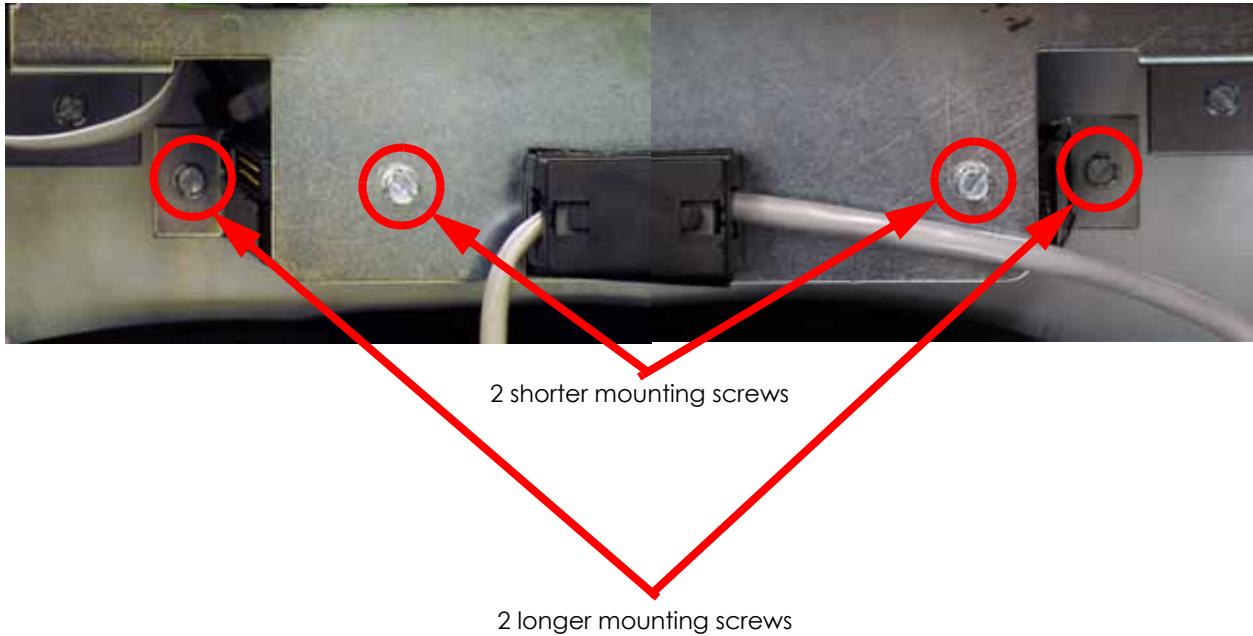


12. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 hard drive mounting screws. See [Figure 191](#).



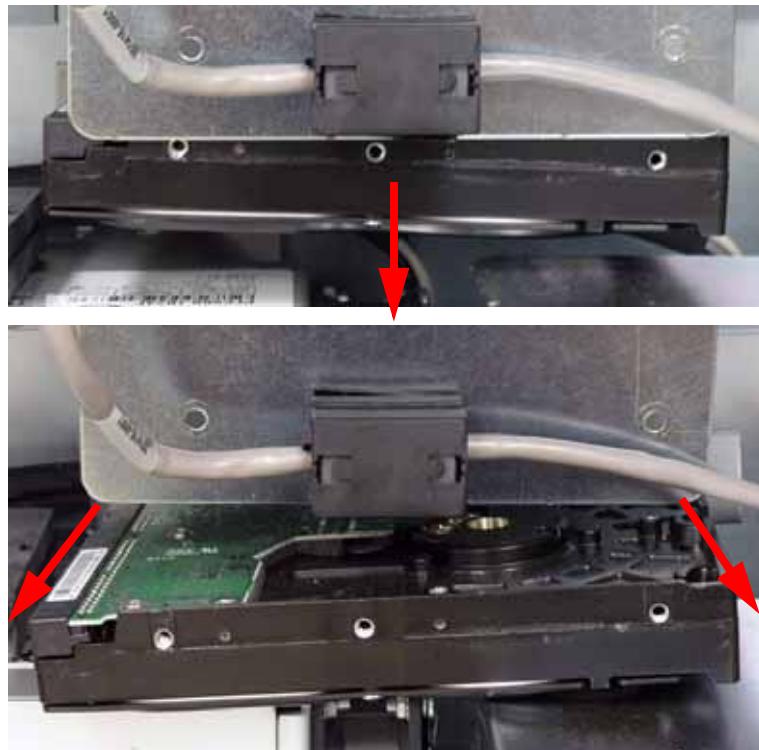
The longer mounting screws will be used to secure the hard drive mounting bracket to the electronics bay. The shorter mounting screws will be used to secure the hard drive to the electronics bay.

Figure 191: Hard drive mounting screw locations



13. Slide the hard drive down and pull it outwards to remove. See [Figure 192](#).

Figure 192: Removing the hard drive

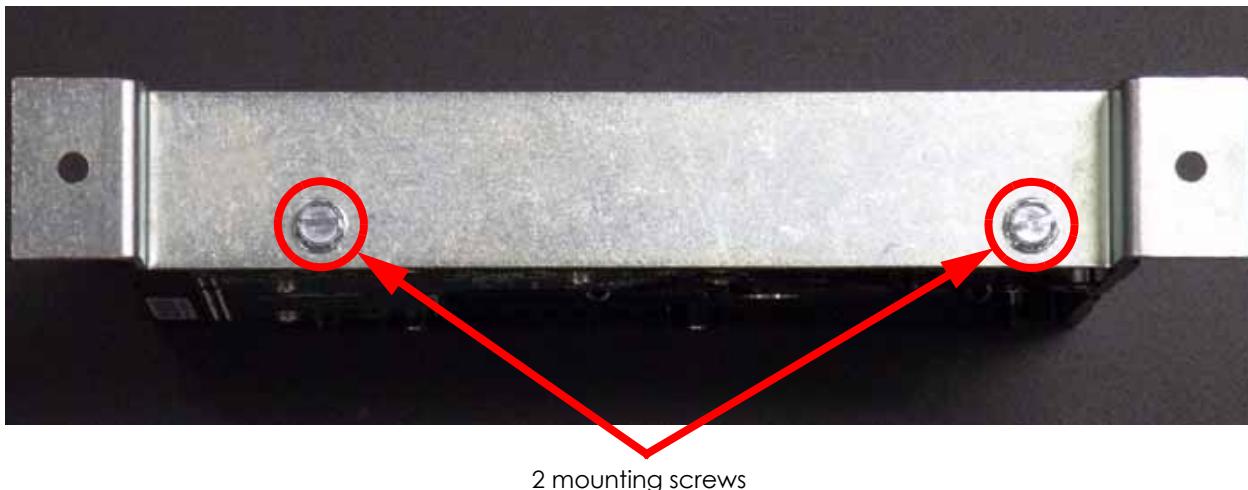


14. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 hard drive mounting bracket mounting screws. See [Figure 193](#).



The orientation of the mounting bracket on the hard drive for reinstallation.

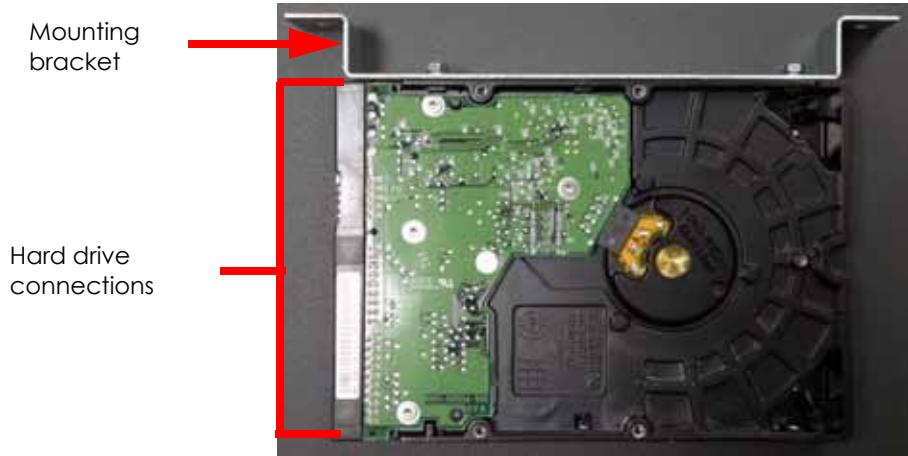
Figure 193: Hard drive mounting bracket mounting screw locations



Installing the Hard Drive:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the hard drive mounting bracket with the hard drive and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 2 hard drive mounting bracket mounting screws. See [Figure 194](#).

Figure 194: Hard drive mounting bracket orientation



3. Align the hard drive with the mounting holes in the electronics bay.
4. Using a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 4 hard drive mounting screws.



The longer mounting screws will be used to secure the hard drive mounting bracket to the electronics bay. The shorter mounting screws will be used to secure the hard drive to the electronics bay.

5. Reconnect the hard drive power input cable.
6. Reconnect the hard drive IDE ribbon cable.
7. Slide the hard drive IDE ribbon cable into the ferrite and close the ferrite.
8. Align the 5 VDC piggyback power supply with the mounting holes.
9. Using a phillips screwdriver, reinstall the upper 5 VDC piggyback power supply mounting screw.
10. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the lower 5 VDC piggyback power supply mounting screw.
11. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
12. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
13. Power up the printer. You will be prompted to load the controller software.
14. Assign the printer static IP or dynamic IP networking depending on your network. If you assign it static IP you will need to enter the static IP address. When finished press **Done**.
15. Insert the system software CD into the notebook computer or workstation CD drive.
16. Open CatalystEX from the notebook computer or workstation.
17. Click on the **Printer Services** tab.
18. Click on the **Update Software** button.
19. Navigate CatalystEX to the CD drive and select the proper .UPG file for the printer.
20. When finished downloading, verifying and installing, reboot the printer.
21. Run a small test part and monitor system operation during build.
22. Follow the steps in the Hard Drive Installation Checklist. See "[Hard Drive Installation Checklist](#)" on page [Appendix-18](#).
23. Send the bad hard drive back to Stratasys, Inc.

Line Filter

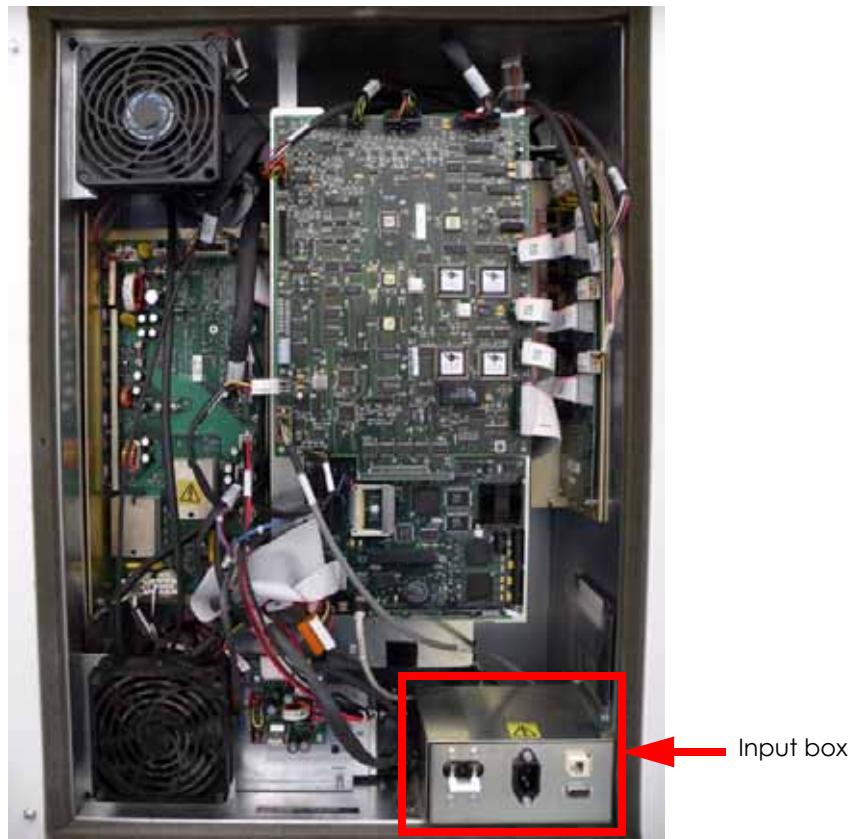
Required Tools

- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap

Removing the Line Filter:

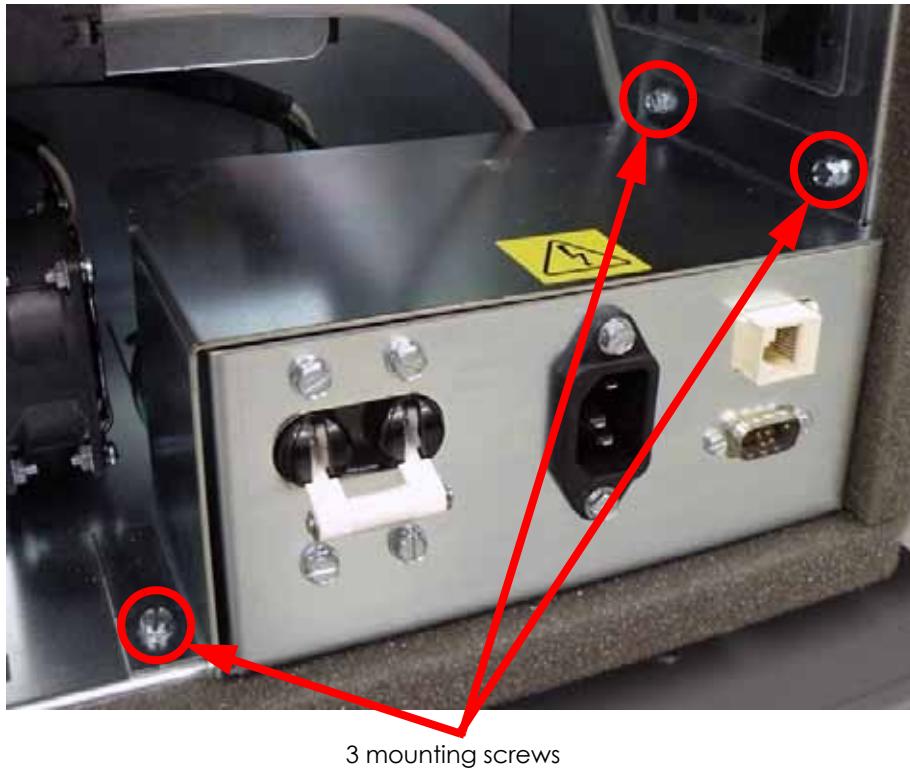
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See ["Removing the Rear Door:" on page 5-9](#).
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 195](#).

Figure 195: Input box location



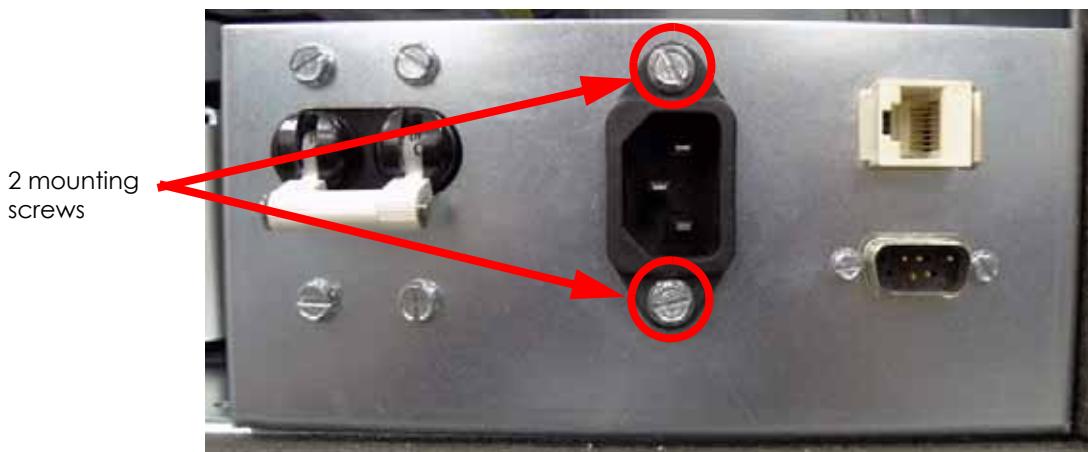
- Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 3 input box cover mounting screws and set the input box cover aside. See [Figure 196](#).

Figure 196: Input box cover mounting screw locations



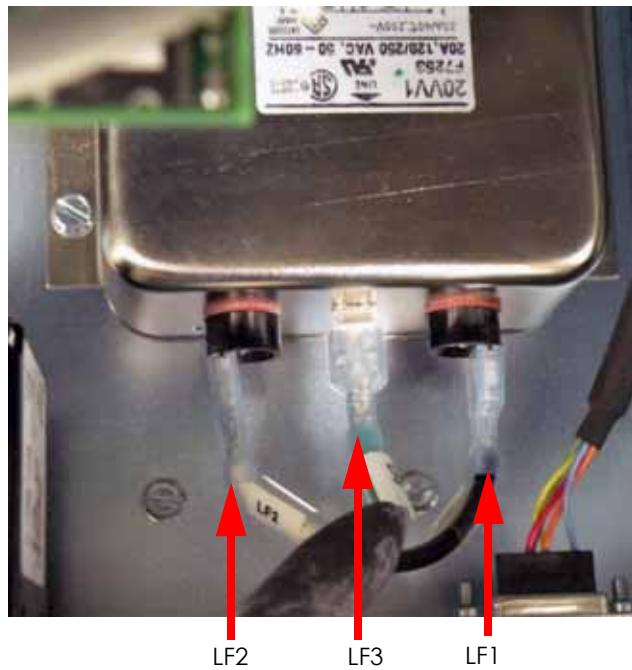
- Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the AC input mounting screws and pull the AC input out of the input box. See [Figure 197](#).

Figure 197: AC input mounting screw locations



8. Disconnect LF1 (black), LF2 (white) and LF3 (green) from the front of the line filter by pulling outward. See [Figure 198](#).

Figure 198: Line filter front connection locations



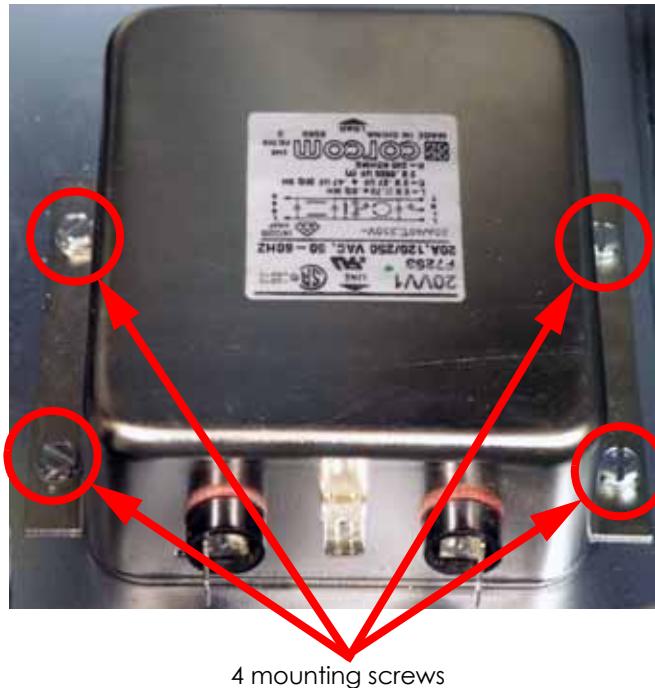
9. Disconnect LF4 (black) and LF5 (white) from the rear of the line filter by pulling outward. See [Figure 199](#).

Figure 199: Line filter rear connection locations



10. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 line filter mounting screws and remove the line filter. See [Figure 200](#).

Figure 200: Line filter mounting screw locations



Installing the Line Filter:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Align the line filter with the mounting holes and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
3. Reconnect LF4 (black) to the rear right and LF5 (white) to the rear left of the line filter.
4. Reconnect LF1 (black) to the front right, LF2 (white) to the front left and LF3 (green) to the front center of the line filter.
5. Push the AC input back into the input box and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws.
6. Align the input box cover with the input box and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 3 mounting screws.
7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power up the printer.
10. Run a small test part and monitor system operation during build.

AC Input

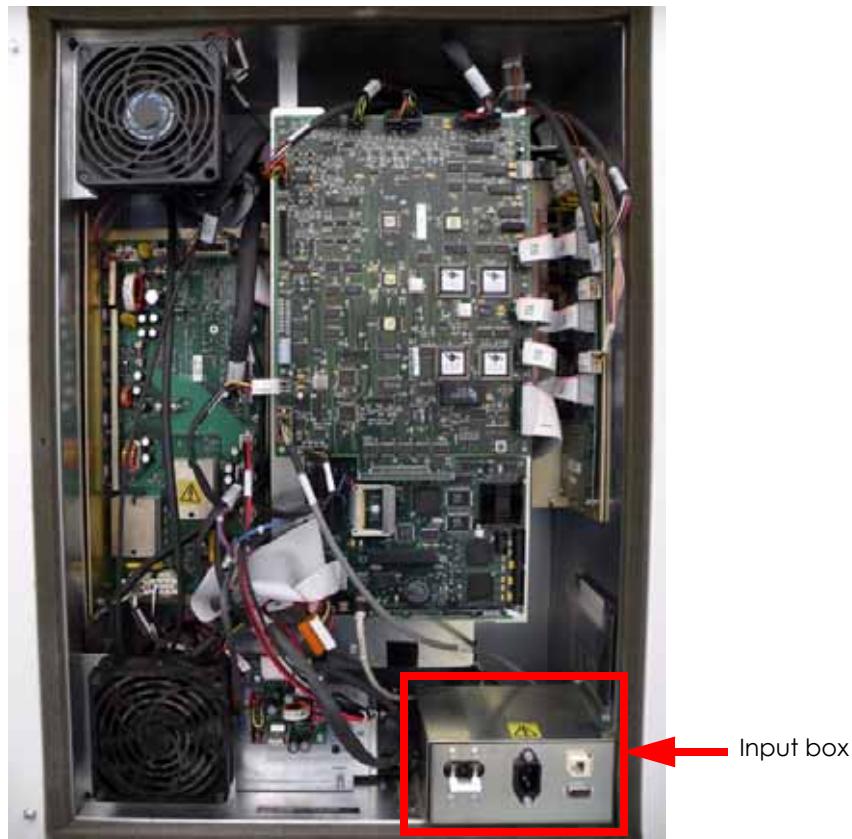
Required Tools

- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap

Removing the AC Input:

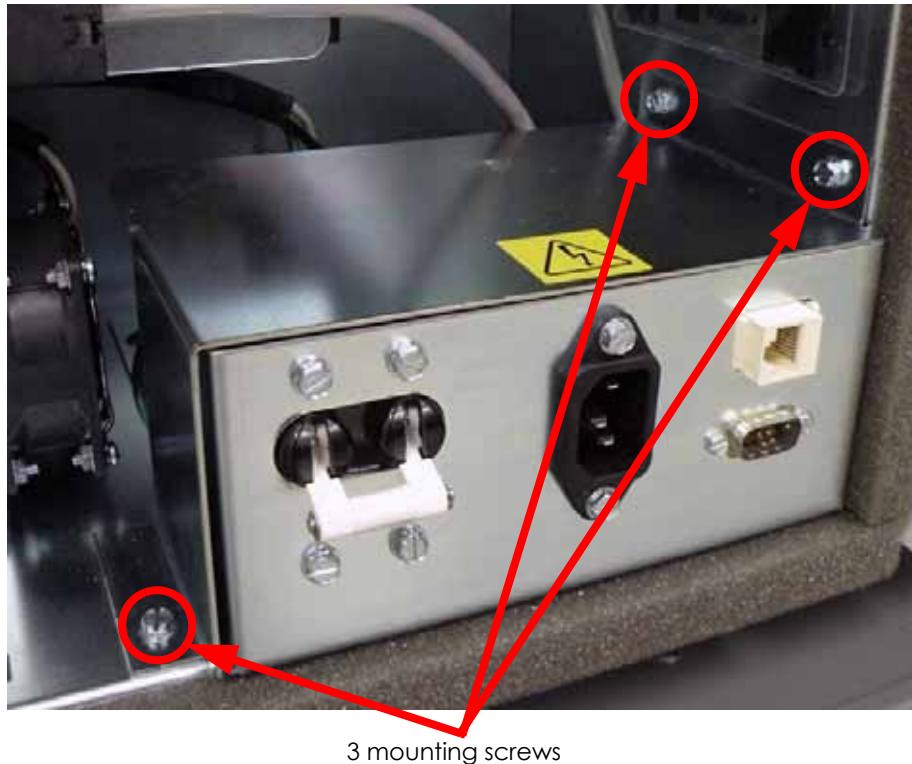
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 201](#).

Figure 201: Input box location



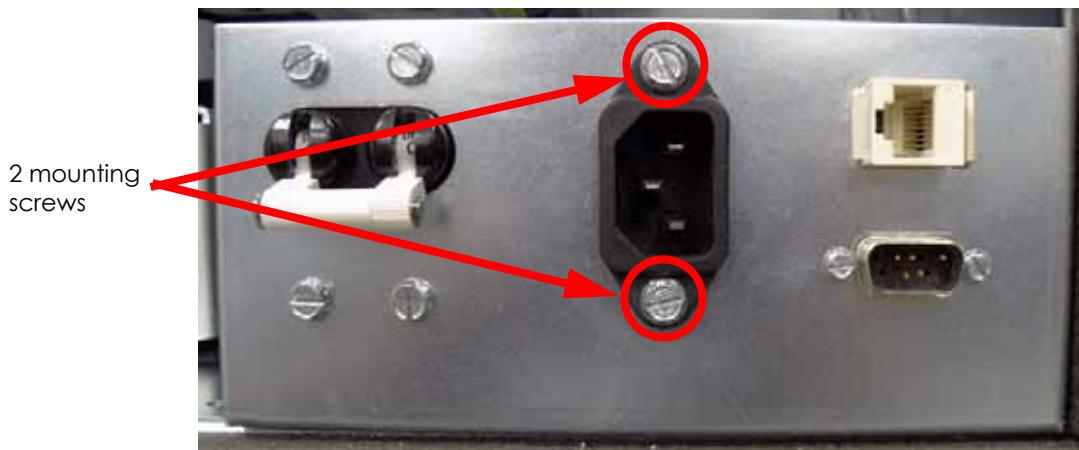
- Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 3 input box cover mounting screws and set the input box cover aside. See [Figure 202](#).

Figure 202: Input box cover mounting screw locations



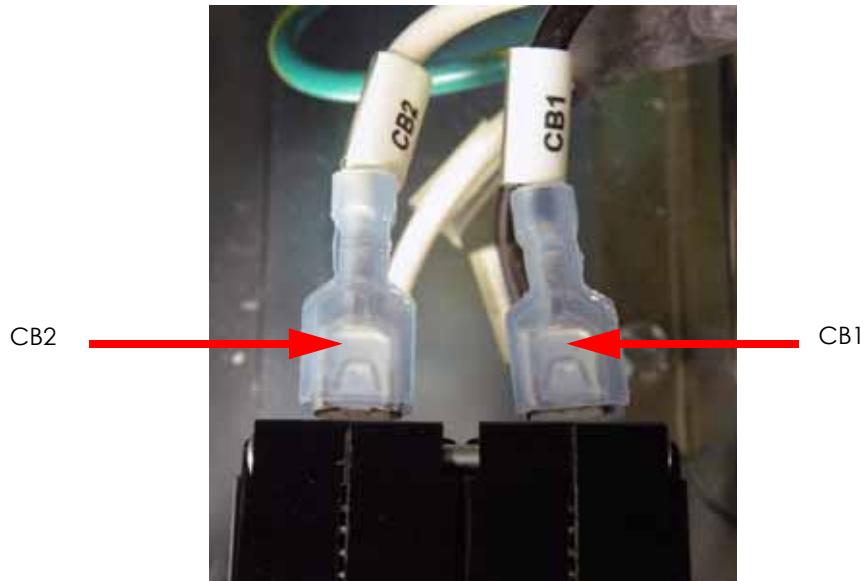
- Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 AC input mounting screws and pull the AC input out of the input box. See [Figure 203](#).

Figure 203: AC input mounting screw locations



8. Disconnect CB1 (black) from the upper right and CB2 (white) from the upper left of the circuit breaker. See [Figure 204](#).

Figure 204: Circuit breaker connection locations



9. Using a $\frac{1}{4}$ " nut driver, remove the grounding post nut. See [Figure 205](#).
10. Disconnect G1 from the grounding post. See [Figure 205](#).

Figure 205: Ground post location



11. Remove the AC input and discard.

Installing the AC Input:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Slide the AC input through the mounting hole on the input box.
3. Reconnect G1 to the grounding post.
4. Using a $\frac{1}{4}$ " nut driver, reinstall the grounding post nut.
5. Reconnect CB1 (black) to the upper right post and CB2 (white) to the upper left post of the circuit breaker.
6. Align the AC input with the mounting holes and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws.
7. Align the input box cover and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 3 mounting screws.
8. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#).
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power up the printer.
11. Run a small test part and monitor system operation during build.

Circuit Breaker

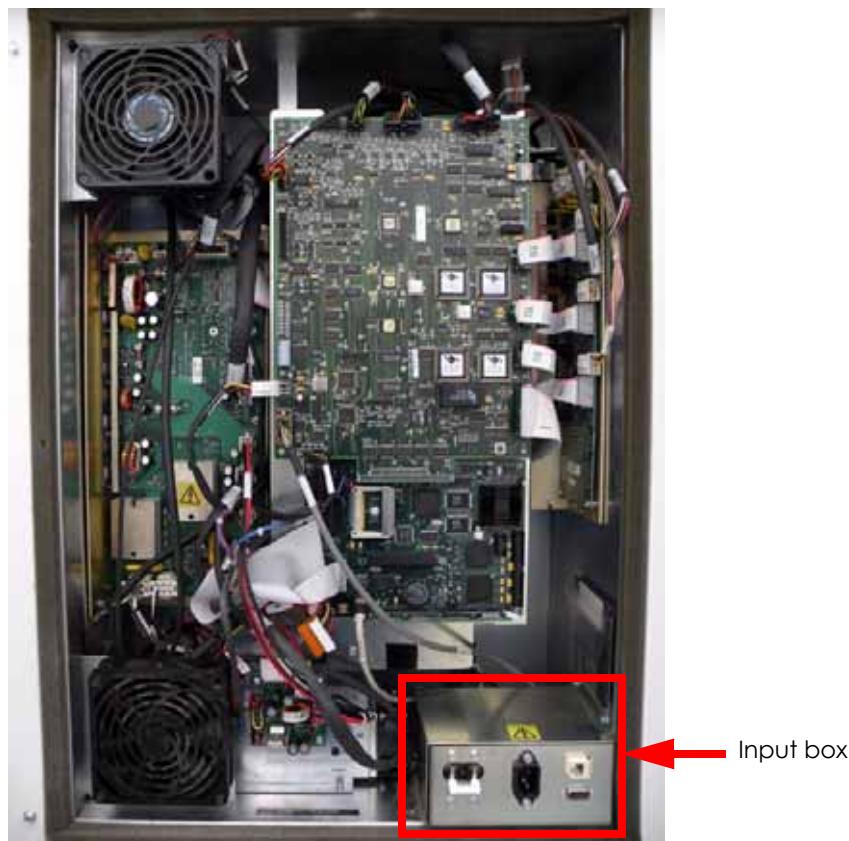
Required Tools

- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap

Removing the Circuit Breaker:

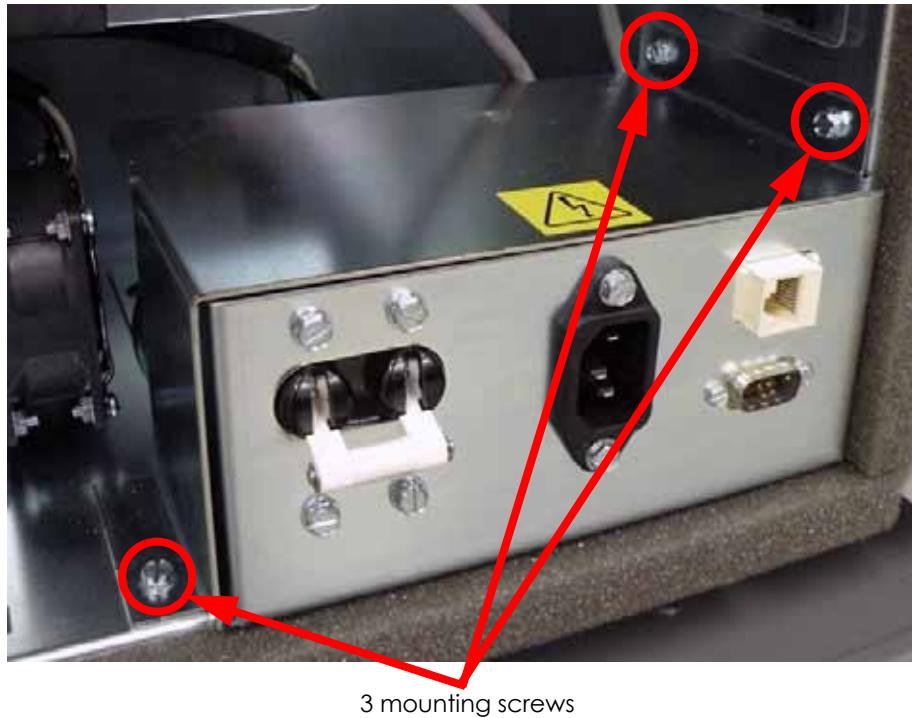
1. Power down the system using the power-down switch. Once the system is powered down, turn the breaker off.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Wear a grounding wrist strap and connect the end to the electronics bay pan.
5. Locate the input box. See [Figure 206](#).

Figure 206: Input box location



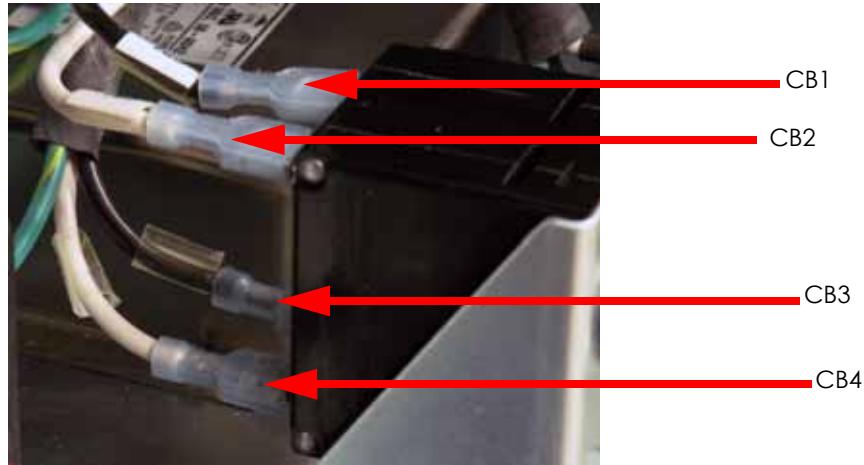
- Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 3 input box cover mounting screws and set the input box cover aside. See [Figure 207](#).

Figure 207: Input box cover mounting screw locations



- Disconnect CB1 (black) from the upper right and CB2 (white) from the upper left of the circuit breaker by pulling outwards. See [Figure 208](#).
- Disconnect CB3 (black) from the lower right and CB4 (white) from the lower left of the circuit breaker by pulling outwards. See [Figure 208](#).

Figure 208: Circuit breaker connector locations



9. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 circuit breaker mounting screws. See [Figure 209](#).

Figure 209: Circuit breaker mounting screw locations



10. Push the circuit breaker through the back of the input box, remove and discard.

Installing the Circuit Breaker:

1. Wear a grounding wrist strap and connect the end to the electronics bay pan.
2. Push the circuit breaker through the front of the input box.
3. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the 4 circuit breaker mounting screws.
4. Reconnect CB3 (black) to the lower right and CB4 (white) to the lower left of the circuit breaker.
5. Reconnect CB1 (black) to the upper right and CB2 (white) to the upper left of the circuit breaker.
6. Align the input box cover and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 3 mounting screws.
7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power up the printer.
10. Run a small test part and monitor system operation during build.

Head Components

Head Cooling Fan

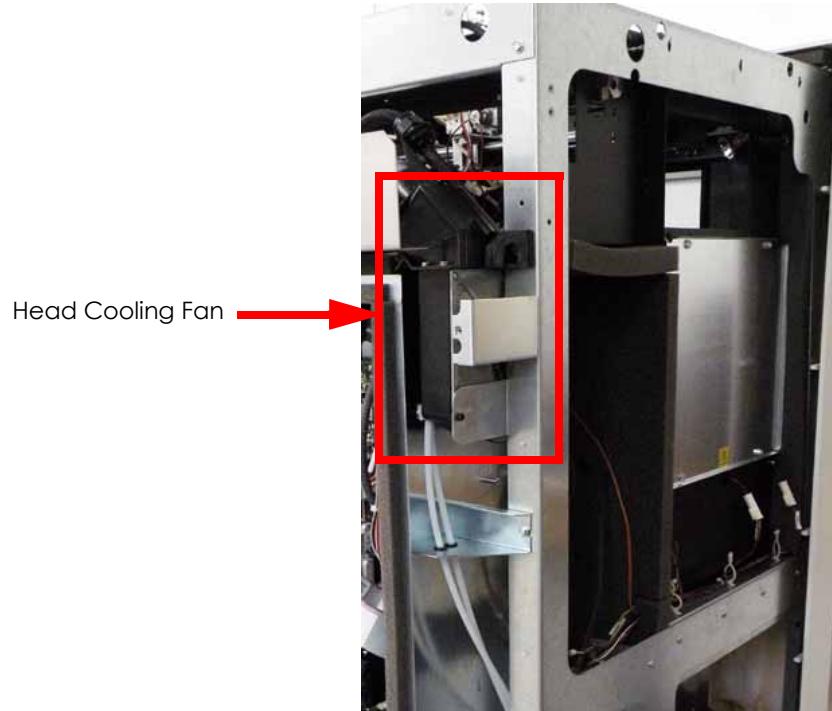
Required Tools

- $\frac{1}{4}$ " nut driver or standard screwdriver
- $\frac{5}{32}$ " allen wrench
- $\frac{5}{64}$ " allen wrench
- $\frac{9}{64}$ " allen wrench

Removing the Head Cooling Fan:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the head cooling fan on the left rear side of the printer. See [Figure 210](#).

Figure 210: Head cooling fan location



6. Disconnect the fan cable by pressing the tab in and pulling apart. See [Figure 211](#).

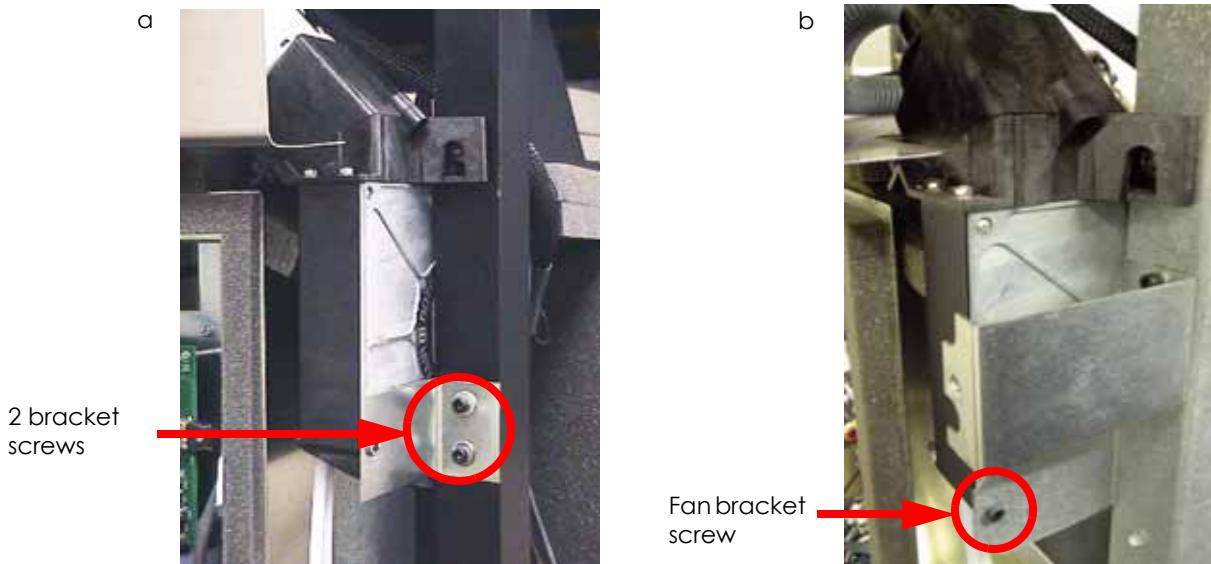
Figure 211: Fan cable location



7. Depending on which bracket style you have, complete the following:

- Using a $\frac{5}{32}$ " allen wrench, remove the 2 screws holding the fan bracket to the frame. See [Figure 212](#).
- Using a $\frac{9}{64}$ " allen wrench, remove the fan bracket screw holding the fan to the frame. See [Figure 212](#).

Figure 212: Head cooling fan detail



- Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 hose collar mounting screws. See [Figure 213](#).

Figure 213: Hose collar mounting screw locations

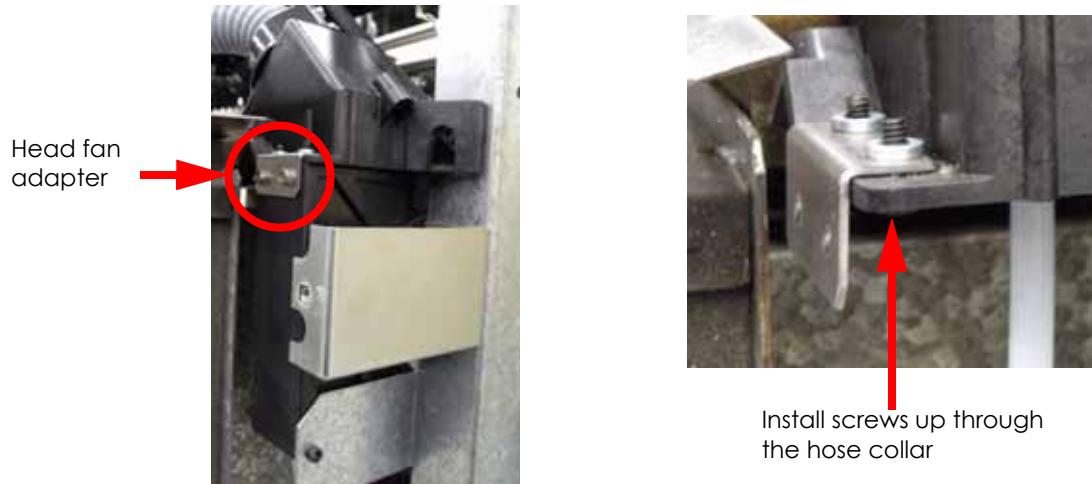


- Slide the fan down and out the back of the machine.

Installing the Head Cooling Fan:

1. Using a $\frac{5}{64}$ " allen wrench, attach the head cooling fan adapter plate to the hose collar using the screws provided in the kit. See [Figure 214](#).

Figure 214: Head cooling fan adapter plate



2. Depending on which mounting style the printer has complete the following:
 - a. Remove the mounting bracket from the old fan using a $\frac{5}{32}$ " allen wrench and install on the new fan, align the fan with the hose collar and reinstall the 2 mounting bracket screws to the frame.
 - b. Align the fan with the hose collar and use a $\frac{9}{64}$ " allen wrench to reinstall the fan bracket screw.
3. Align the fan with the hose collar and use a $\frac{1}{4}$ " nut driver or standard screwdriver to install the front 2 screws through the head fan adapter plate.
4. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the rear 2 screws to the fan and the hose collar.
5. Reconnect the head cooling fan cable.
6. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power on the system. The system should reach **Idle** with no displayed errors.
10. Run a small test part and monitor system operation during build.

Head Temperature Snap Switch

Required Tools

- $\frac{7}{64}$ " allen wrench

Removing the Head Temperature Snap Switch:

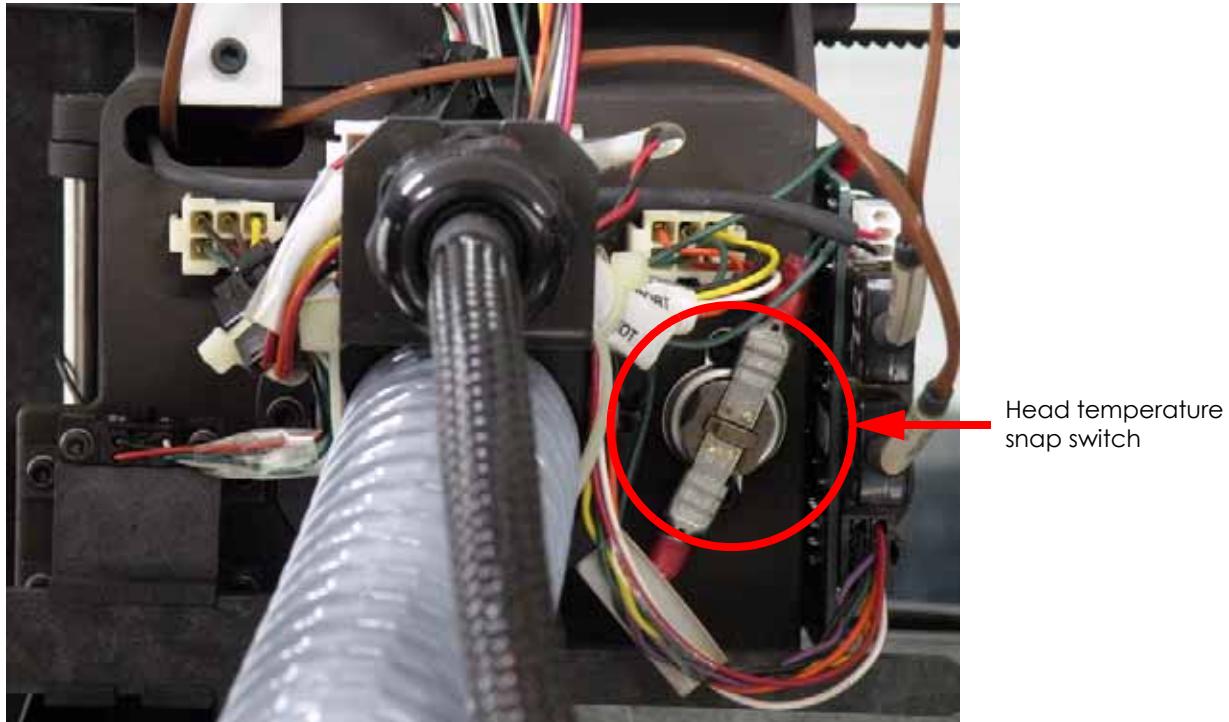
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.



Caution: Head will be hot! Allow head to cool down or use an insulated glove before proceeding with switch replacement.

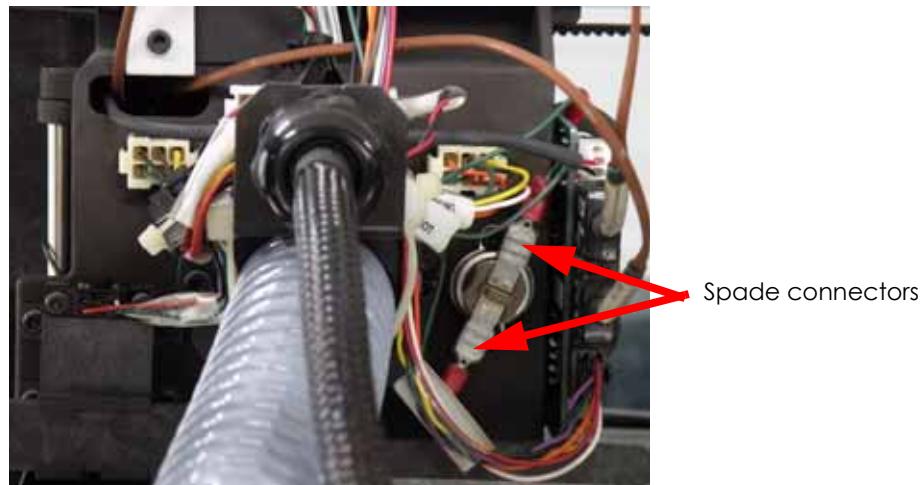
5. Move head to far front left of the machine.
6. Locate the head temperature snap switch on the left rear side of the head. See [Figure 215](#).

Figure 215: Head temperature snap switch location



7. Remove the two female spade connectors from the head temperature snap switch by pulling away from the spades. See [Figure 216](#).

Figure 216: Head temperature snap switch connections

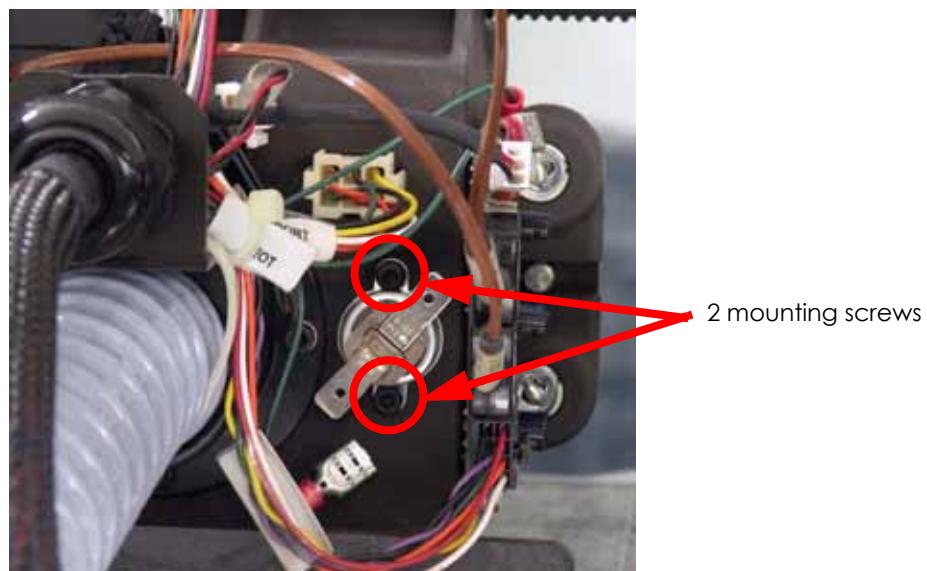


8. Using a $\frac{7}{64}$ " allen wrench, remove the 2 mounting screws. See



If necessary, turn the head temperature snap switch to access the mounting screws.

Figure 217: Head temperature snap switch mounting screw locations



9. Remove the head temperature snap switch and discard.

Installing the Head Temperature Snap Switch:

1. Align the head temperature snap switch with the mounting holes and use a $\frac{7}{64}$ " allen wrench to reinstall the 2 mounting screws.
2. Reconnect both spade connectors by pushing them onto the spades.
3. Reinstall the side panels. See "["Side Panels" on page 5-11](#)".
4. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
5. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
6. Power on the system. The system should reach **Idle** with no displayed errors.
7. Run a small test part and monitor system operation during build.

BST Swivel Head

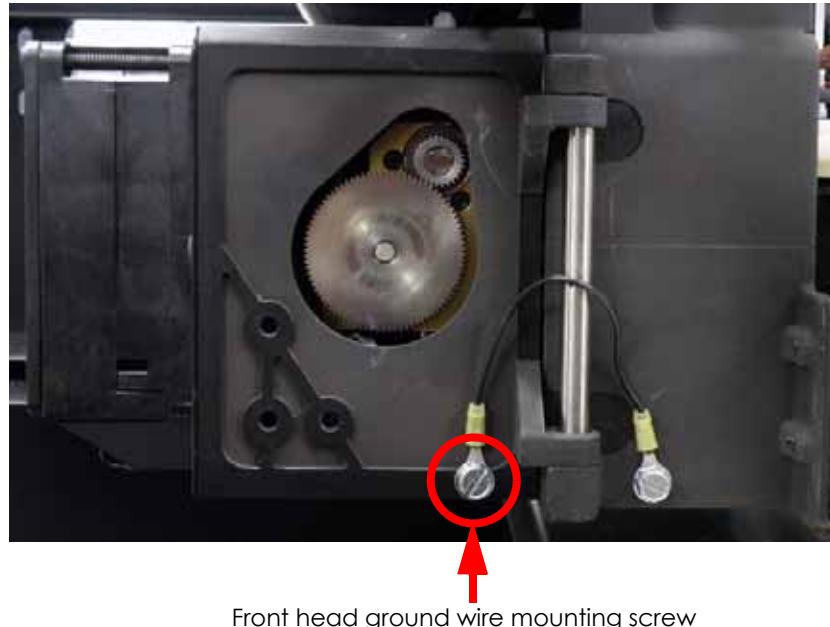
Required Tools

- Phillips screwdriver
- $\frac{5}{64}$ " allen wrench
- $\frac{1}{4}$ " nut driver or standard screwdriver

Removing the BST Swivel Head:

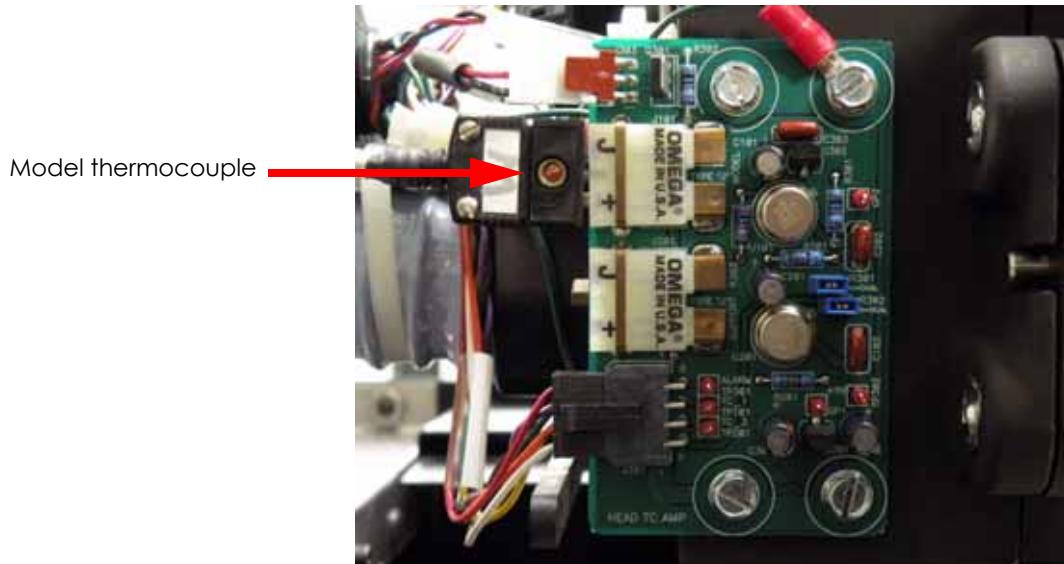
1. Unload both model and support material from the head.
2. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
3. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
4. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
5. Remove the side panels. See "[Side Panels](#)" on page 5-11.
6. Locate the head ground wire and use a $\frac{1}{4}$ " nut driver or standard screwdriver to remove the front mounting screw only. See [Figure 218](#).

Figure 218: Head ground wire location



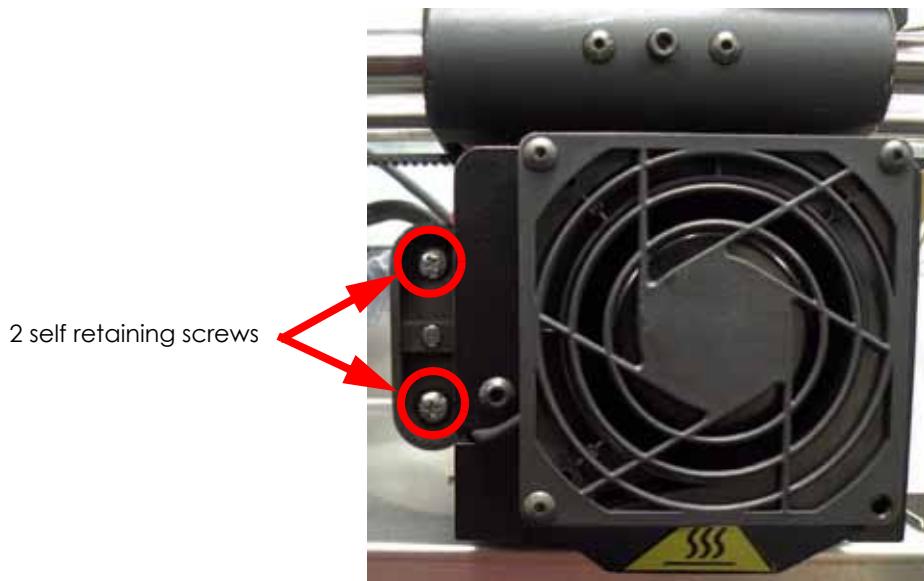
7. At the TC Amp board, disconnect the model thermocouple by pulling outwards. See [Figure 219](#).

Figure 219: Model thermocouple location



8. Using a phillips screwdriver, loosen the 2 self retaining screws from the left side of the head and open the head by pulling outward. See [Figure 220](#).

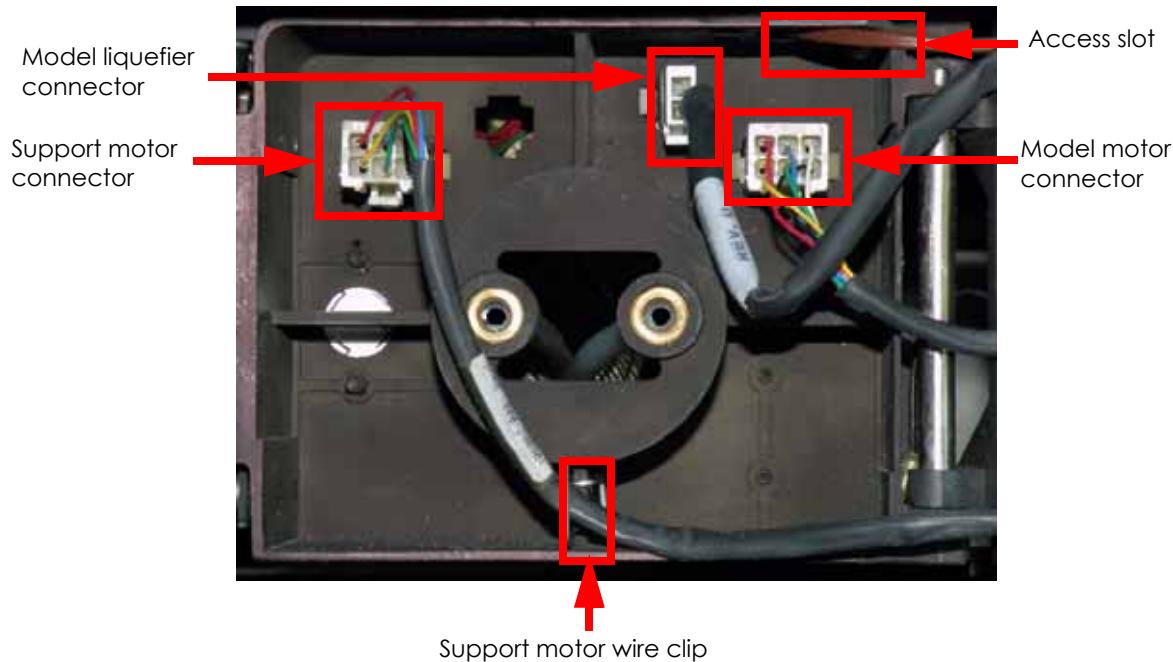
Figure 220: Head self retaining screw locations



9. Disconnect the model motor connector by pressing the tab in and pulling outwards. See [Figure 221](#).
10. Disconnect the support motor connector by pressing the tab in and pulling outwards. See [Figure 221](#).
11. Pull the support motor wire clip from the translator. See [Figure 221](#).

12. Disconnect the model liquefier connector by pressing the tab in and pulling outwards. See [Figure 221](#).
13. Pull the model and support thermocouple wires through the access slot on the translator. See [Figure 221](#).

Figure 221: Head connector detail

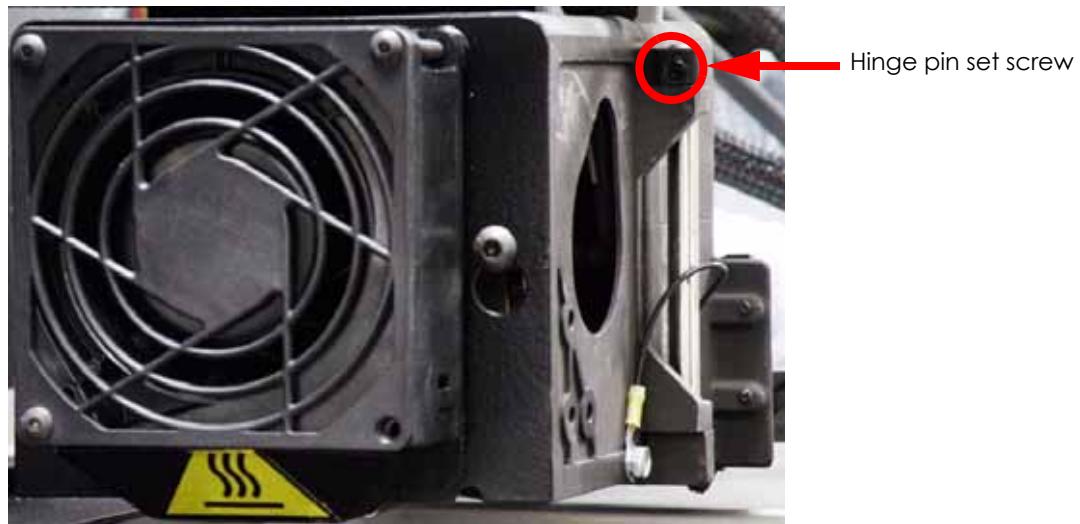


14. Using a $\frac{5}{64}$ " allen wrench, remove the head hinge pin set screw. See [Figure 222](#).



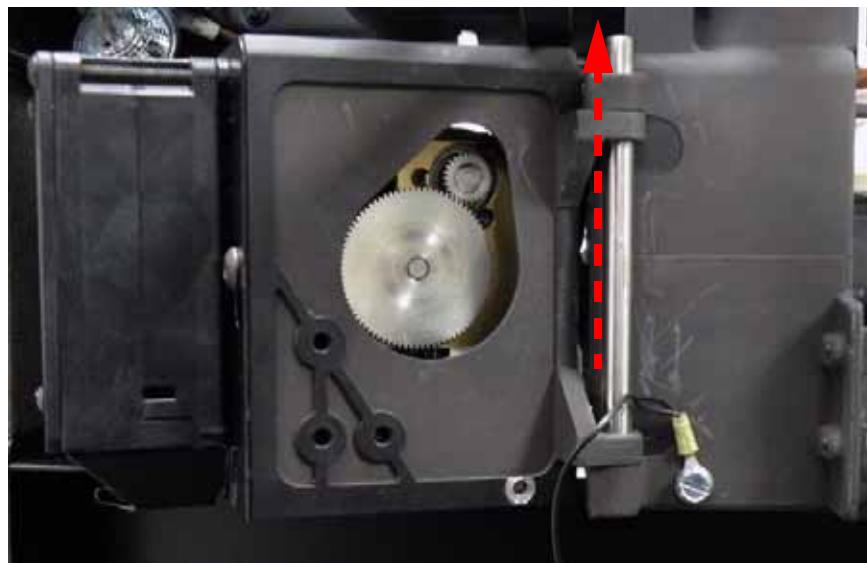
Be careful not to lose the head hinge pin set screw.

Figure 222: Head hinge pin set screw location



15. Remove the head hinge pin by lifting upwards. See [Figure 223](#).

Figure 223: Removing the head hinge pin



16. Remove the head from the printer.

Installing the BST Swivel Head:

1. Align the BST swivel head with the translator.
2. Reinstall the head hinge pin by pushing down into place.
3. Using a $\frac{5}{64}$ " allen wrench, reinstall the head hinge pin set screw.
4. Feed the model thermocouple wire through the access slot.
5. Reconnect the model thermocouple wire at the TC Amp board by pushing into place.



The model thermocouple will be connected to the upper connector.

6. Reconnect the model liquefier cable by pushing into the connector.
7. Reconnect the model motor cable by pushing into the connector.
8. Reconnect the support motor cable by pushing into the connector.
9. Reinstall the support motor wire clip.
10. Close the head and use a phillips screwdriver to tighten the 2 self retaining screws.



Inspect all wiring to ensure no wires are pinched or crushed when swivel head is closed. Open and close the head several times to test.

11. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the ground wire to the front right side of the head.
12. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
13. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
14. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
15. Power on the system. The system should reach **Idle** with no displayed errors.
16. Perform tip depth calibrations. See "[Tip Depth Calibration](#)" on page 6-2.
17. Perform tip level calibrations. See "[Leveling the Liquefier](#)" on page 6-4.
18. Perform tip offset calibrations. See "[Tip Offset Calibration](#)" on page 6-8.
19. Follow the Head Installation Checklist. See "[Head Installation Checklist](#)" on page [Appendix-20](#).
20. Run a small test part and monitor system operation during build.
21. Send bad SST head back to Stratasys, Inc.

SST Swivel Head

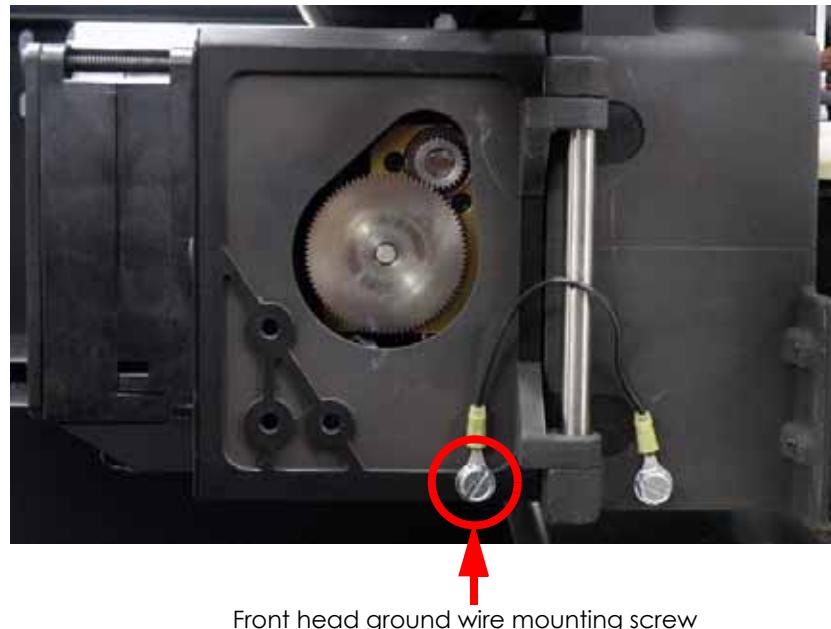
Required Tools

- Phillips screwdriver
- $\frac{5}{64}$ " allen wrench
- $\frac{1}{4}$ " nut driver or standard screwdriver

Removing the SST Swivel Head:

1. Unload both model and support material from the head.
2. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
3. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
4. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
5. Remove the side panels. See "[Side Panels](#)" on page 5-11.
6. Locate the head ground wire and use a $\frac{1}{4}$ " nut driver or standard screwdriver to remove the front mounting screw only. See [Figure 224](#).

Figure 224: Head ground wire location



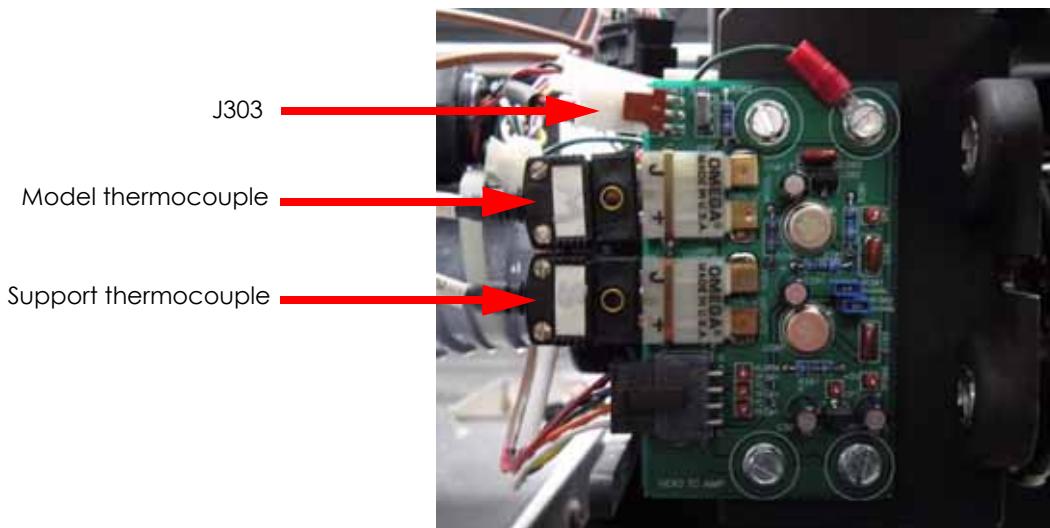
7. At the TC Amp board, disconnect the model (upper) and support (lower) thermocouples by pulling outwards. See [Figure 225](#).

8. Disconnect J303 from the TC Amp board by pulling outwards. See [Figure 225](#).



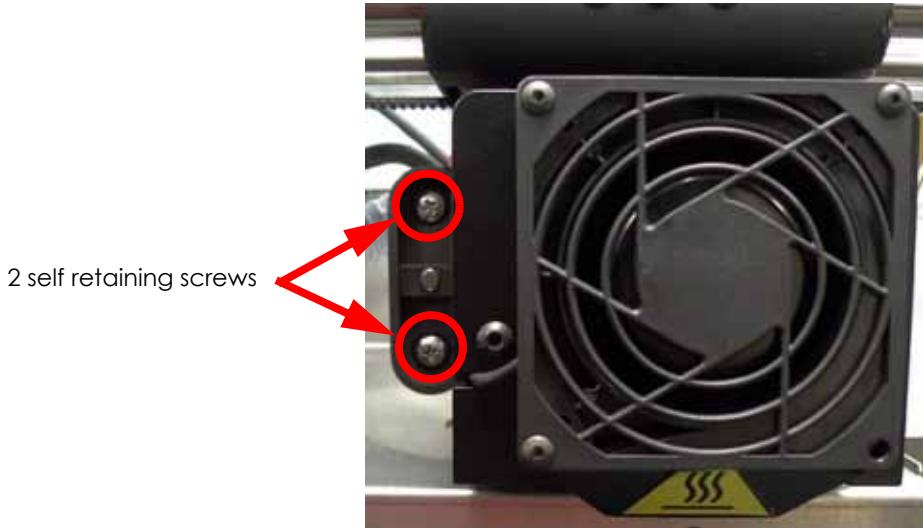
Note the location of the model and support thermocouples for reinstallation

Figure 225: Model and support thermocouple locations



9. Using a phillips screwdriver, loosen the 2 self retaining screws from the left side of the head and open the head by pulling outward. See [Figure 226](#).

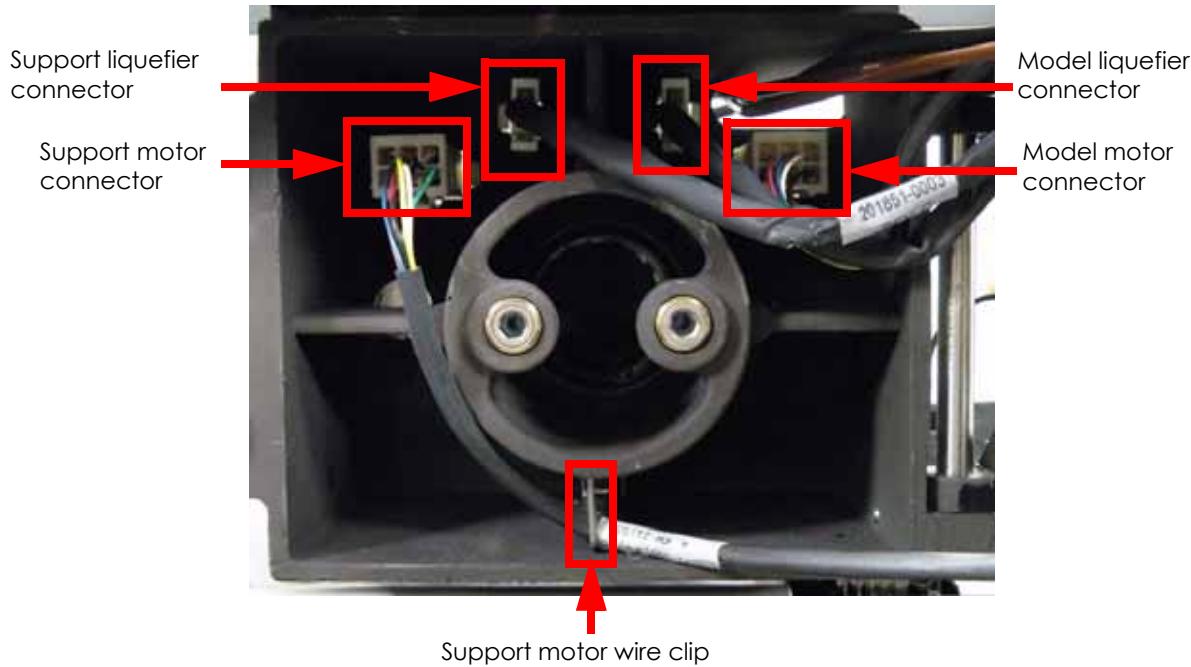
Figure 226: Head self retaining screw locations



10. Disconnect the model motor connector by pressing the tab in and pulling outwards. See [Figure 227](#).

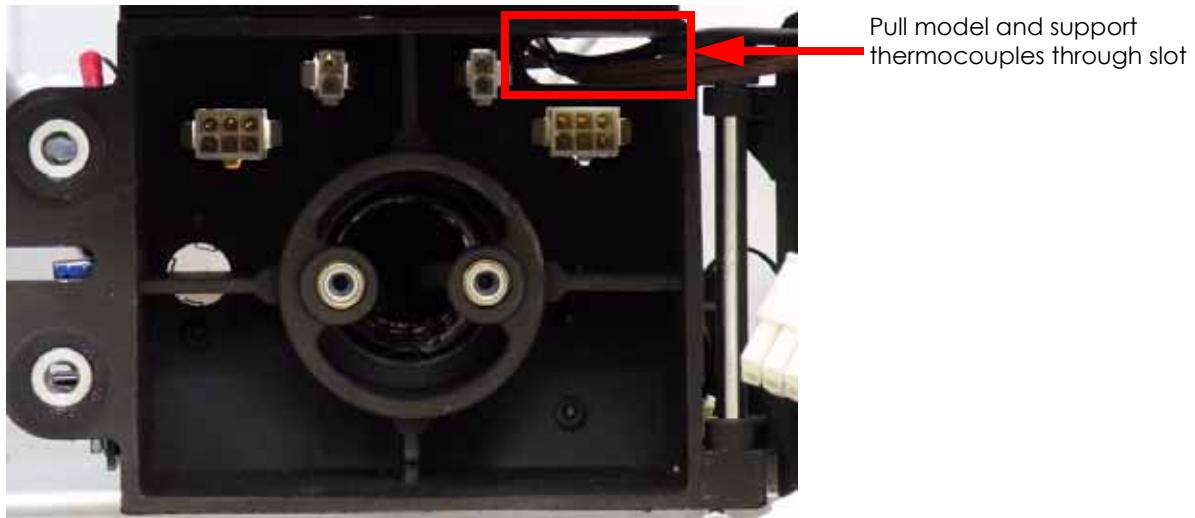
11. Disconnect the support motor connector by pressing the tab in and pulling outwards. See [Figure 227](#).
12. Pull the support motor wire clip from the translator. See [Figure 227](#).
13. Disconnect the model liquefier connector by pressing the tab in and pulling outwards. See [Figure 227](#).
14. Disconnect the support liquefier connector by pressing the tab in and pulling outwards. See [Figure 227](#).

Figure 227: Head connector detail



15. Pull the J303 fan cable, model thermocouple and support thermocouple wires through the access slot on the translator. See [Figure 228](#).

Figure 228: Translator access slot location

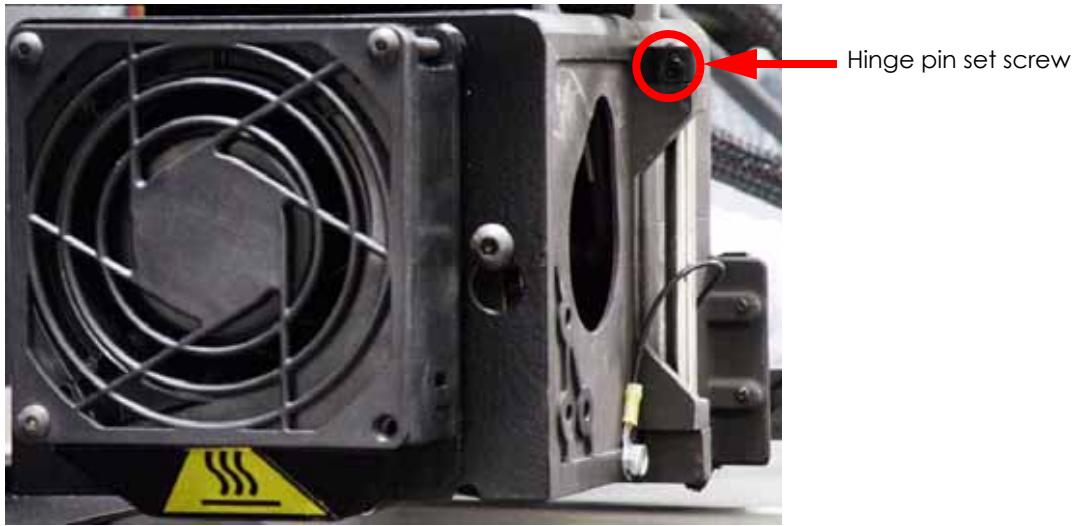


16. Using a $\frac{5}{64}$ " allen wrench, remove the head hinge pin set screw. See [Figure 229](#).



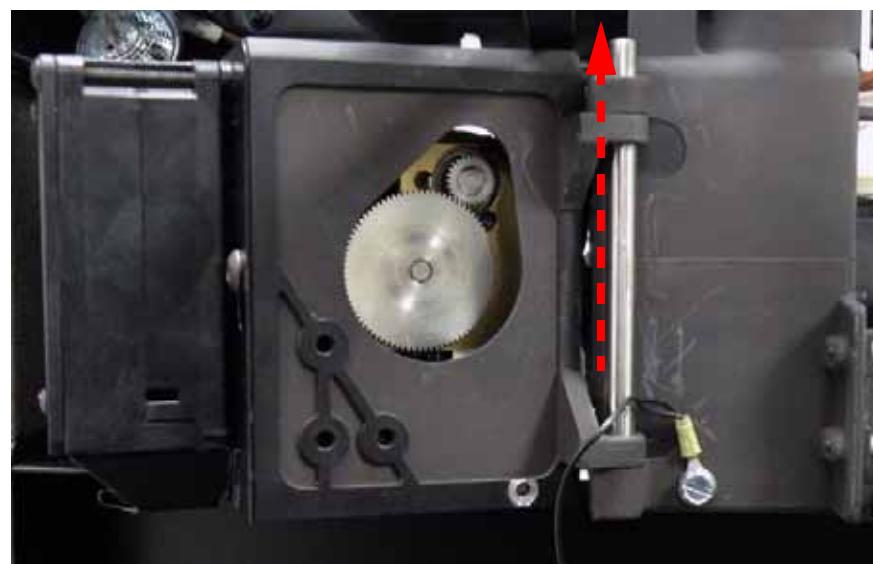
Be careful not to lose the head hinge pin set screw.

Figure 229: Head hinge pin set screw location



17. Remove the head hinge pin by lifting upwards. See [Figure 230](#).

Figure 230: Removing the head hinge pin



18. Remove the head from the printer.

Installing the SST Swivel Head:

1. Align the SST head with the translator.
2. Reinstall the head hinge pin by pushing down into place.
3. Using a $\frac{5}{64}$ " allen wrench, reinstall the head hinge pin set screw.
4. Feed the J303, model thermocouple and support thermocouple wires through the access slot.
5. Reconnect the model and support thermocouple wires at the TC Amp board by pushing into place.



The model thermocouple will be connected to the upper connector and the support thermocouple will be connected to the lower connector.

6. Reconnect the model liquefier cable by pushing into the connector.
7. Reconnect the support liquefier cable by pushing into the connector.
8. Reconnect the model motor cable by pushing into the connector.
9. Reconnect the support motor cable by pushing into the connector.
10. Reinstall the support motor wire clip.
11. Close the head and use a phillips screwdriver to tighten the 2 self retaining screws.



Inspect all wiring to ensure no wires are pinched or crushed when swivel head is closed. Open and close the head several times to test.

12. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the ground wire to the front right side of the head.
13. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
14. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
15. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
16. Power on the system. The system should reach **Idle** with no displayed errors.
17. Perform tip depth calibrations. See "[Tip Depth Calibration](#)" on page 6-2.
18. Perform tip level calibrations. See "[Leveling the Liquefier](#)" on page 6-4.
19. Perform tip offset calibrations. See "[Tip Offset Calibration](#)" on page 6-8.
20. Follow the Head Installation Checklist. See "[Head Installation Checklist](#)" on page [Appendix-20](#).
21. Run a small test part and monitor system operation during build.
22. Send bad SST head back to Stratasys, Inc.

TC Amp Board

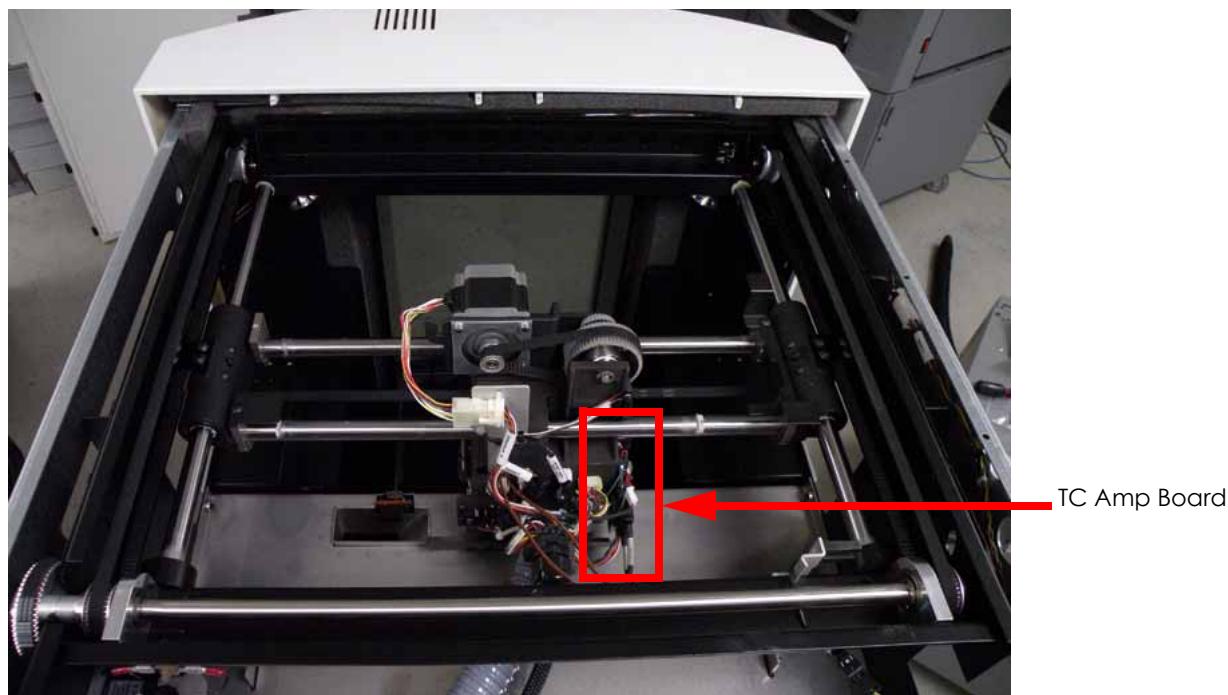
Required Tools

- $\frac{1}{4}$ " nut driver or standard screwdriver
- Grounding wrist strap

Removing the TC Amp Board for SST:

1. Lower the Z stage at least $\frac{1}{2}$ way down its travel.
2. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
3. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
4. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
5. Remove the side panels. See "[Side Panels](#)" on page 5-11.
6. Wear a grounding wrist strap and connect it to part of the frame.
7. Locate the TC Amp board. See [Figure 231](#).

Figure 231: TC Amp board location



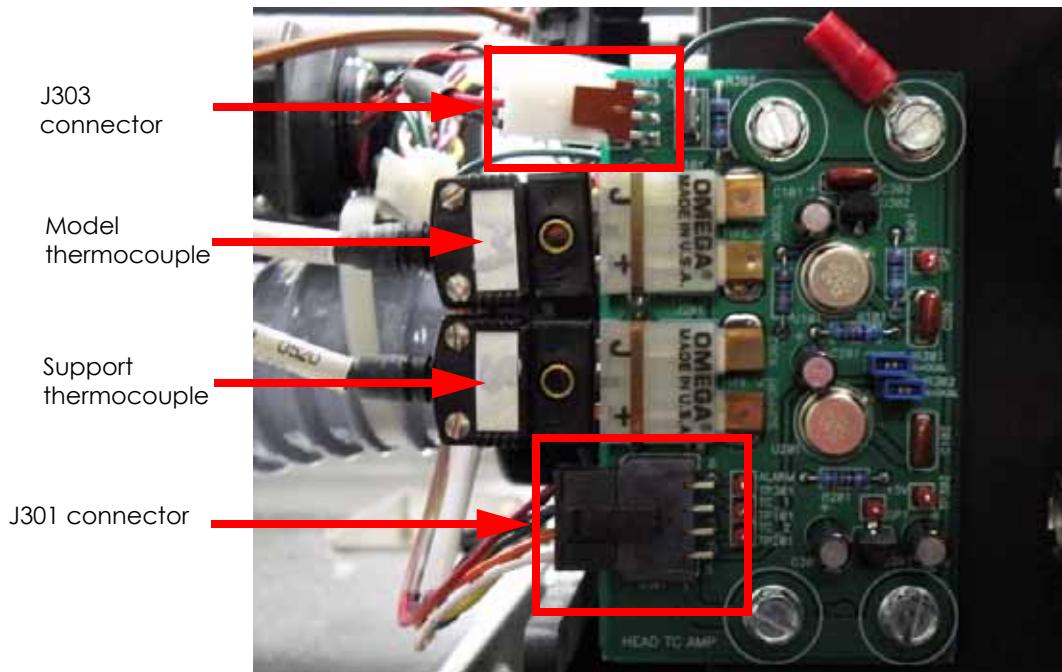
8. Disconnect J301 by pressing the tab in and pulling outwards. See [Figure 232](#).
9. Disconnect J303 by pulling outwards. See [Figure 232](#).

10. Disconnect the model (upper) and support (lower) thermocouples by pulling outwards. See [Figure 232](#).



Note the location of the model and support thermocouples for reinstallation

Figure 232: TC Amp Board Detail

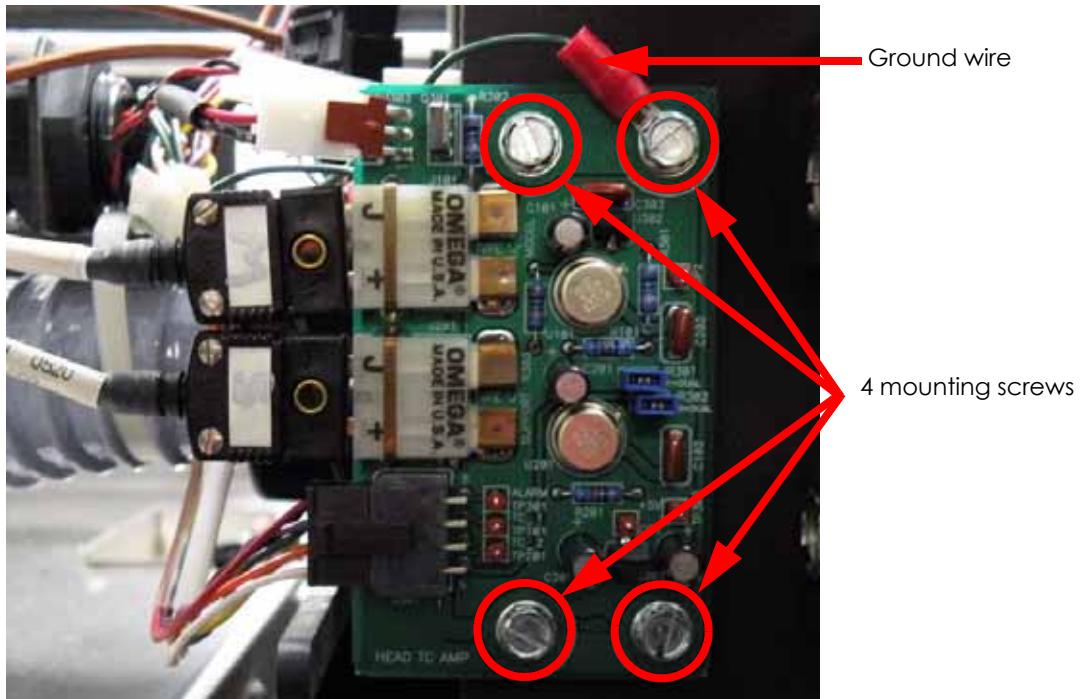


11. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 mounting screws. See [Figure 233](#).



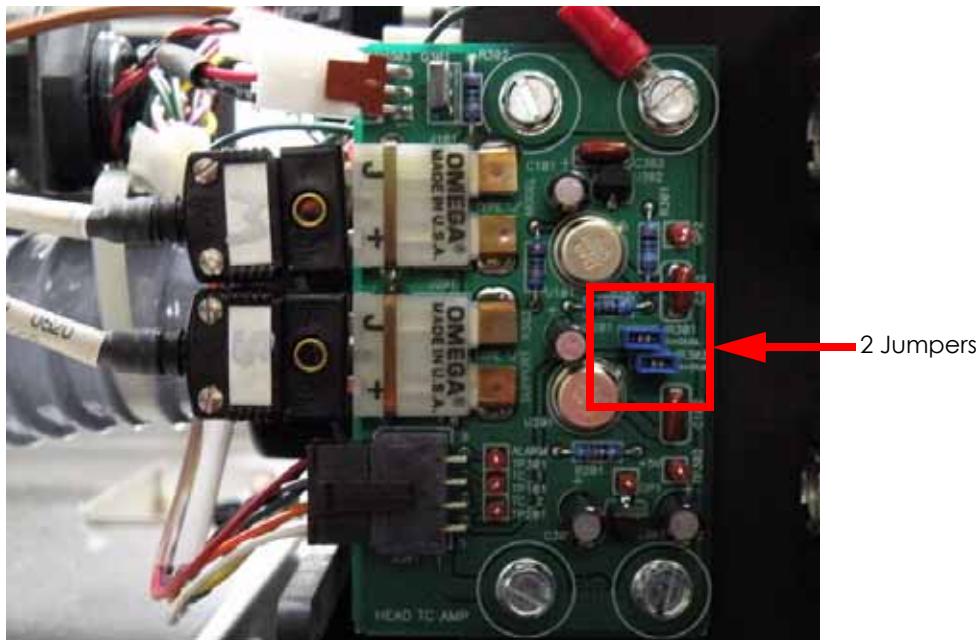
Note the location of the ground wire.

Figure 233: Mounting screw locations



12. Remove the 2 jumpers from the TC Amp board. See [Figure 234](#).

Figure 234: Jumper locations



13. Discard the TC Amp board.

Installing the TC Amp Board for SST:

1. Install the 2 jumpers removed from the bad TC Amp board on the replacement TC Amp board.
2. Align the TC Amp board with the mounting holes and reinstall the ground wire and 4 mounting screws using a $\frac{1}{4}$ " nut driver or standard screwdriver.
3. Reconnect the model and support thermocouple wires at the TC Amp board by pushing into place.



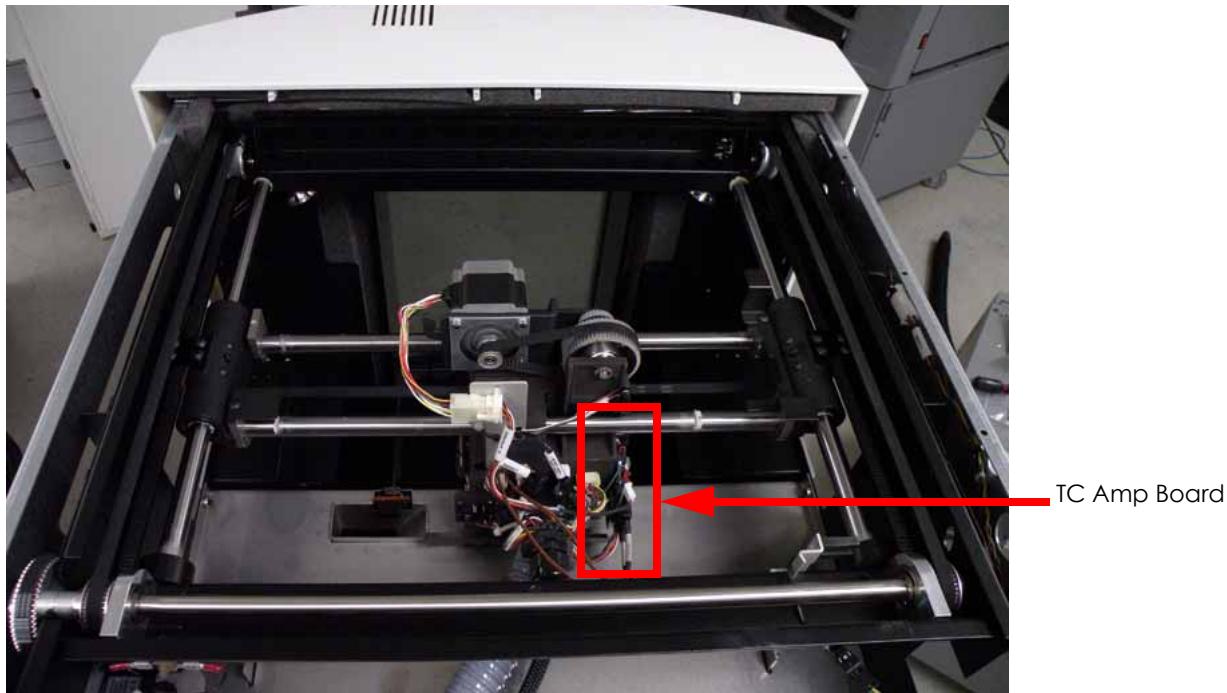
The model thermocouple will be connected to the upper connector and the support thermocouple will be connected to the lower connector.

4. Reconnect the power input cable by pushing into the connector.
5. Reconnect the umbilical cable by pushing into the connector.
6. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power on the system. The system should reach **Idle** with no displayed errors.
10. Run a small test part and monitor system operation during build.

Removing the TC Amp Board for BST:

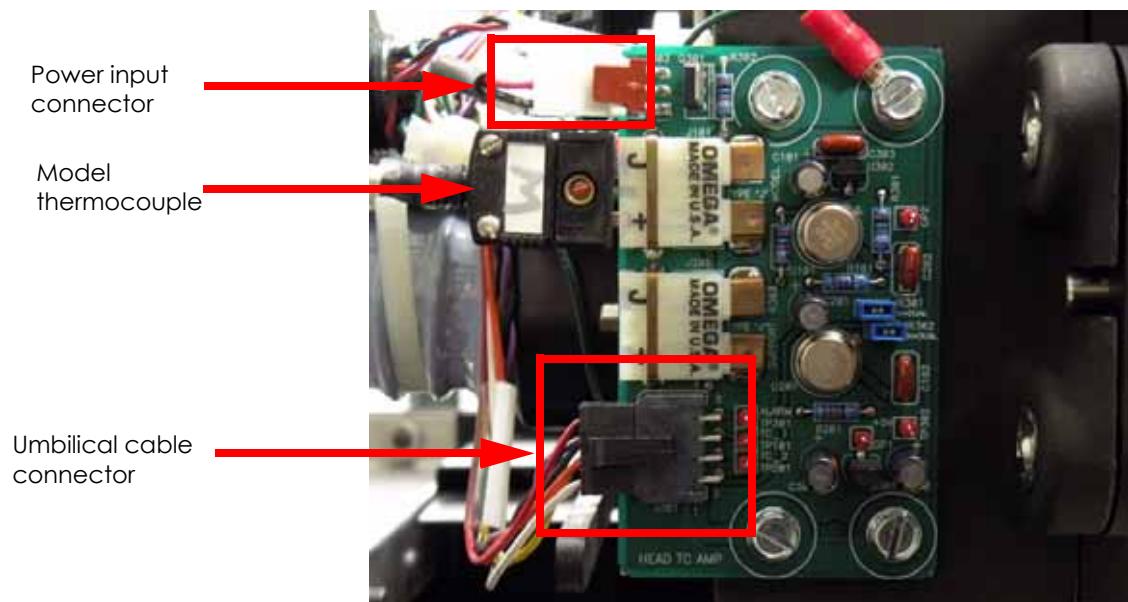
1. Lower the Z stage at least $\frac{1}{2}$ way down its travel.
2. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
3. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
4. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
5. Remove the side panels. See "[Side Panels](#)" on page 5-11.
6. Wear a grounding wrist strap and connect it to part of the frame.
7. Locate the TC Amp board. See [Figure 235](#).

Figure 235: TC Amp board location



8. Disconnect the umbilical cable by pressing the tab in and pulling outwards. See [Figure 236](#).
9. Disconnect the power input cable by pressing the tab in and pulling outwards. See [Figure 236](#).
10. Disconnect the model (upper) thermocouple by pulling outwards. See [Figure 236](#).

Figure 236: TC Amp Board Detail

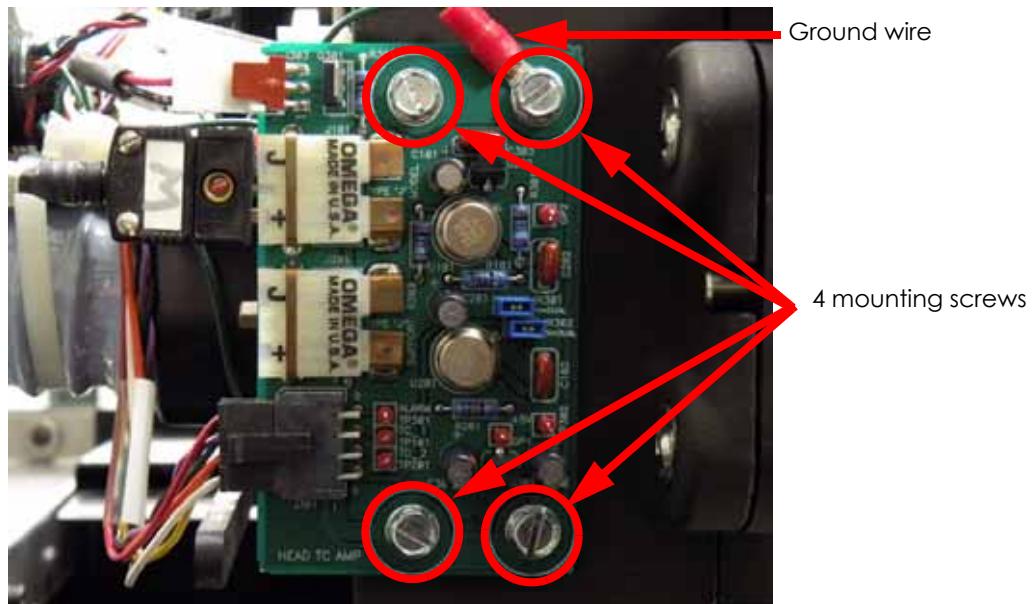


11. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 mounting screws. See [Figure 237](#).



Note the location of the ground wire.

Figure 237: Mounting screw locations



12. Discard the TC Amp board.

Installing the TC Amp Board for BST:

1. Align the TC Amp board with the mounting holes and reinstall the ground wire and 4 mounting screws using a $\frac{1}{4}$ " nut driver or standard screwdriver.
2. Reconnect the model (upper) thermocouple wire at the TC Amp board by pushing into place.
3. Reconnect the power input cable by pushing into the connector.
4. Reconnect the umbilical cable by pushing into the connector.
5. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
6. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power on the system. The system should reach **Idle** with no displayed errors.
9. Run a small test part and monitor system operation during build.

Umbilical Cable

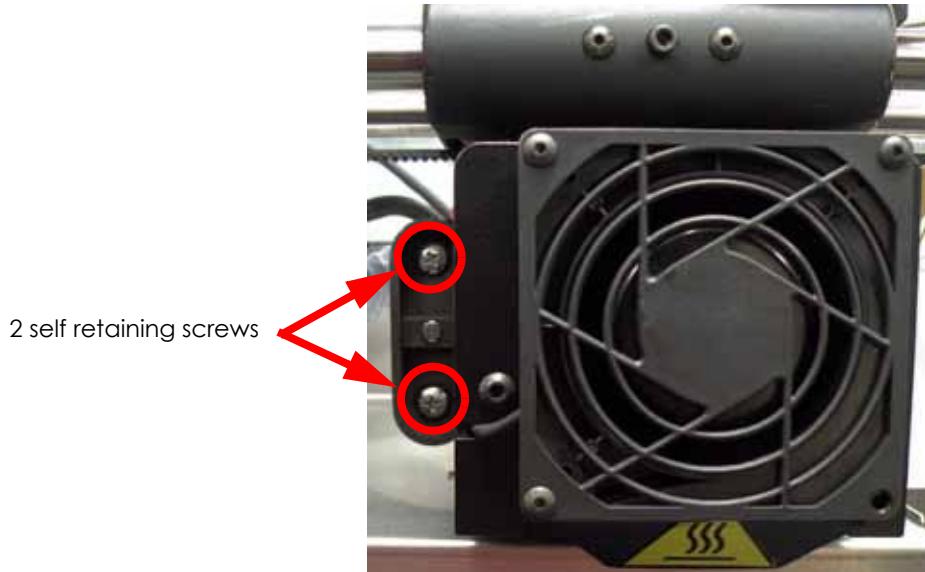
Required Tools

- $\frac{1}{4}$ " nut driver or standard screwdriver
- Phillips screwdriver
- Cutters
- Wire ties
- Grounding wrist strap

Removing the Umbilical Cable:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Wear a grounding wrist strap and connect it to part of the frame.
6. Using a phillips screwdriver, loosen the 2 self retaining screws from the left side of the head and open the head by pulling outward. See [Figure 238](#).

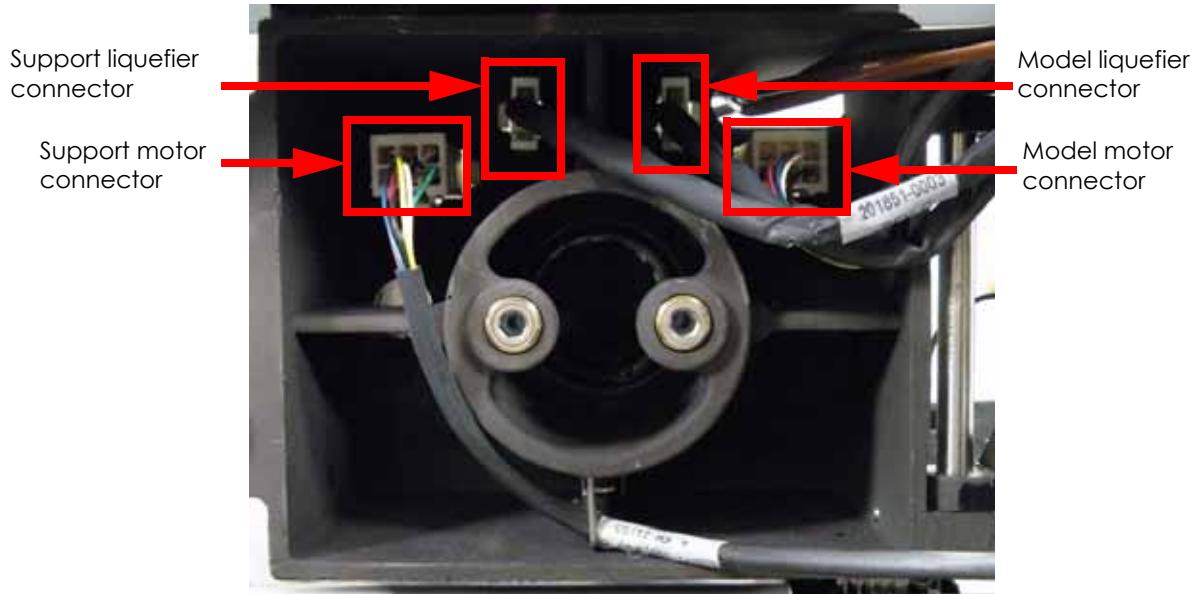
Figure 238: Head self retaining screw locations



7. Disconnect the model motor connector by pressing the tab in and pulling outwards. See [Figure 239](#).
8. Disconnect the support motor connector by pressing the tab in and pulling outwards. See [Figure 239](#).

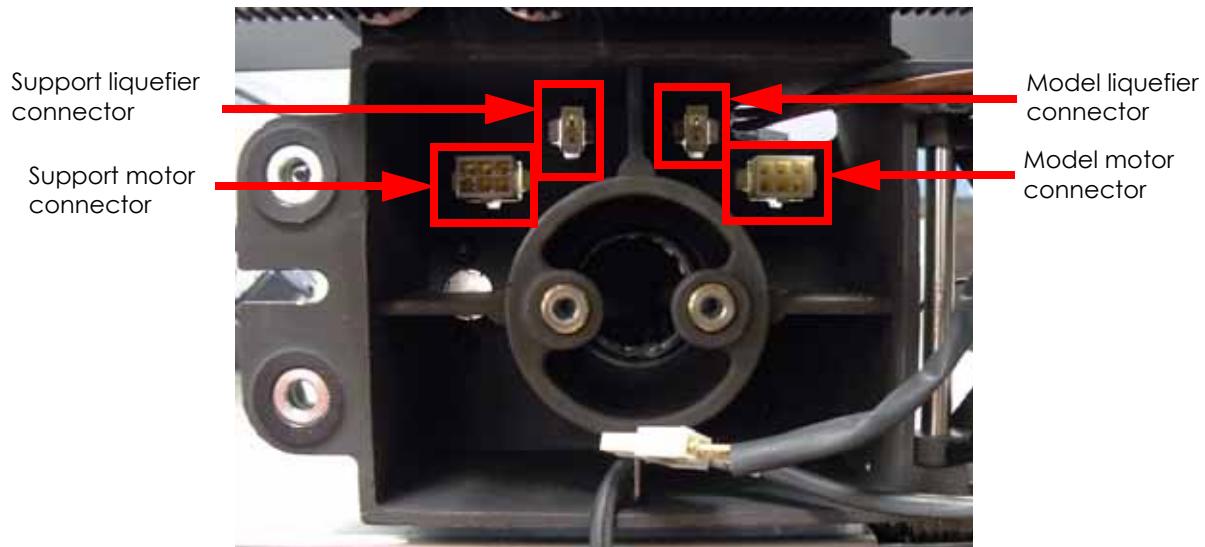
9. Disconnect the model liquefier connector by pressing the tab in and pulling outwards. See [Figure 239](#).
10. Disconnect the support liquefier connector by pressing the tab in and pulling outwards. See [Figure 239](#).

Figure 239: Head connector detail



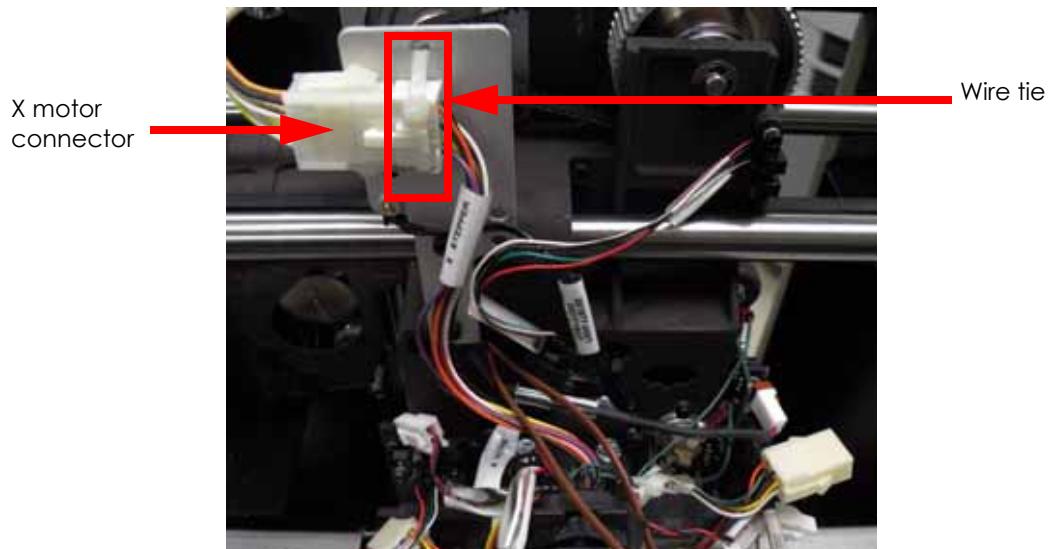
11. Remove the model and support liquefier and motor connectors from the translator by pressing the tabs in and pushing outwards. See [Figure 240](#).

Figure 240: Umbilical connector detail



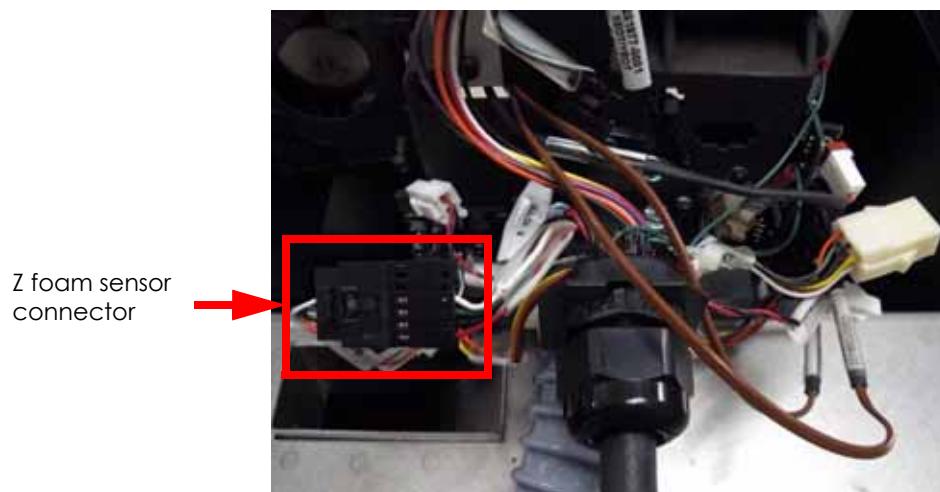
12. Using a cutters, cut and remove the wire tie from the X motor connector. Disconnect the X motor cable by pressing the tab in and pulling apart. See [Figure 241](#).

Figure 241: X motor wire tie location



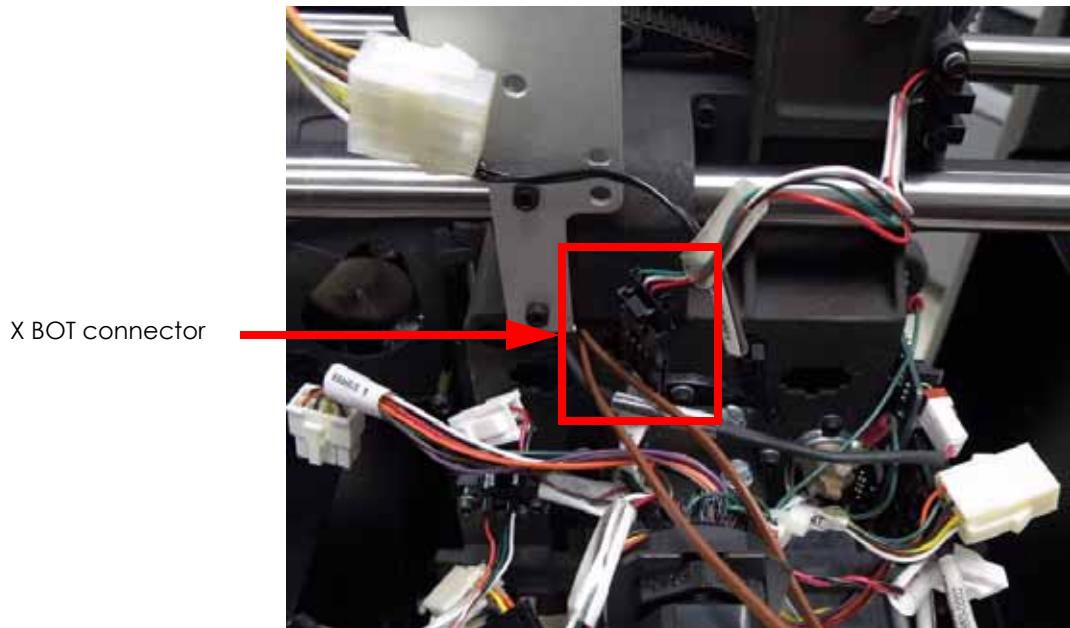
13. Disconnect the Z foam sensor by pressing the tab in and pulling apart. See [Figure 242](#).

Figure 242: Z foam sensor connector location



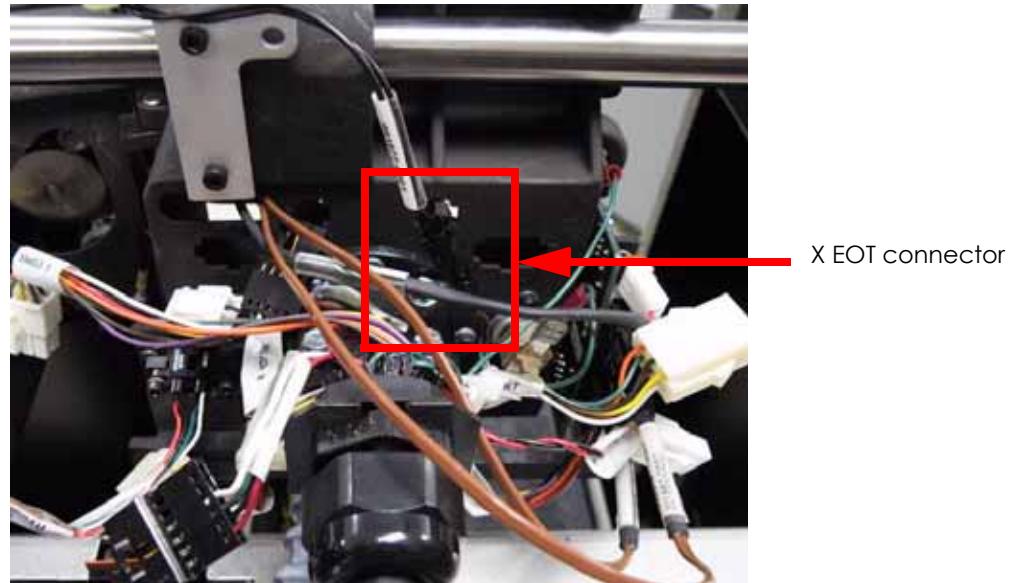
14. Disconnect the X BOT (Home) sensor by pressing the tab in and pulling apart. See [Figure 243](#).

Figure 243: X BOT (Home) sensor connector location



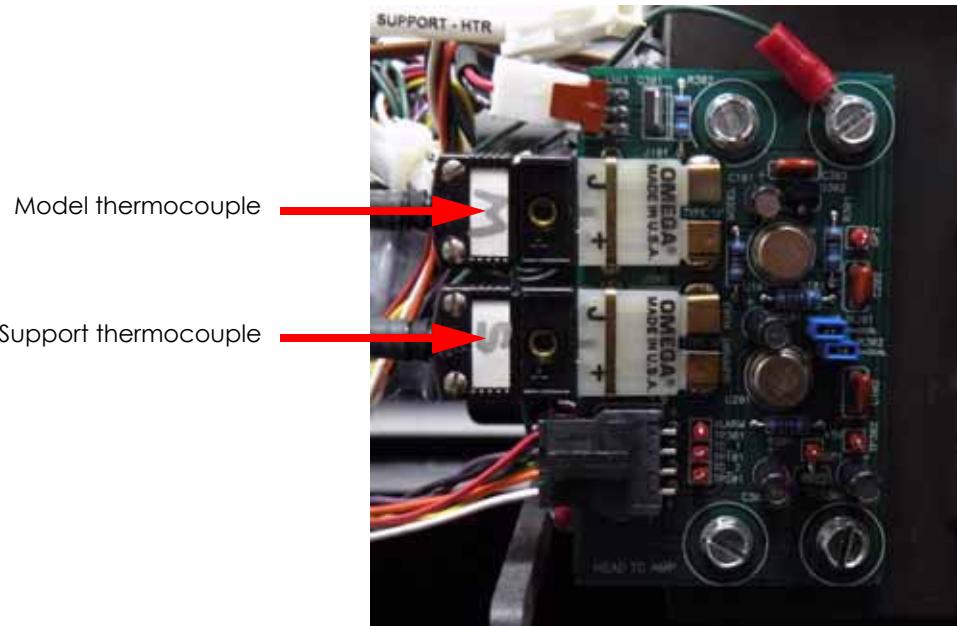
15. Disconnect the X EOT (End of travel) sensor by pressing the tab in and pulling apart. See [Figure 244](#).

Figure 244: X EOT (End of travel) sensor connector location



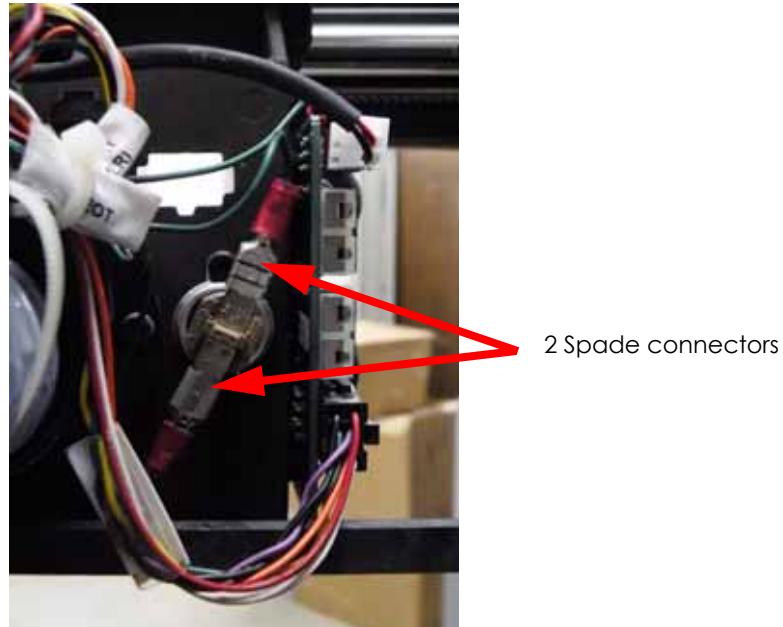
16. Disconnect the model and support thermocouples from the TC Amp board by pulling outward. See [Figure 245](#).

Figure 245: Model and support thermocouple connector locations



17. Disconnect the head thermal snap switch by pulling the 2 wires away from the spade connectors. See [Figure 246](#).

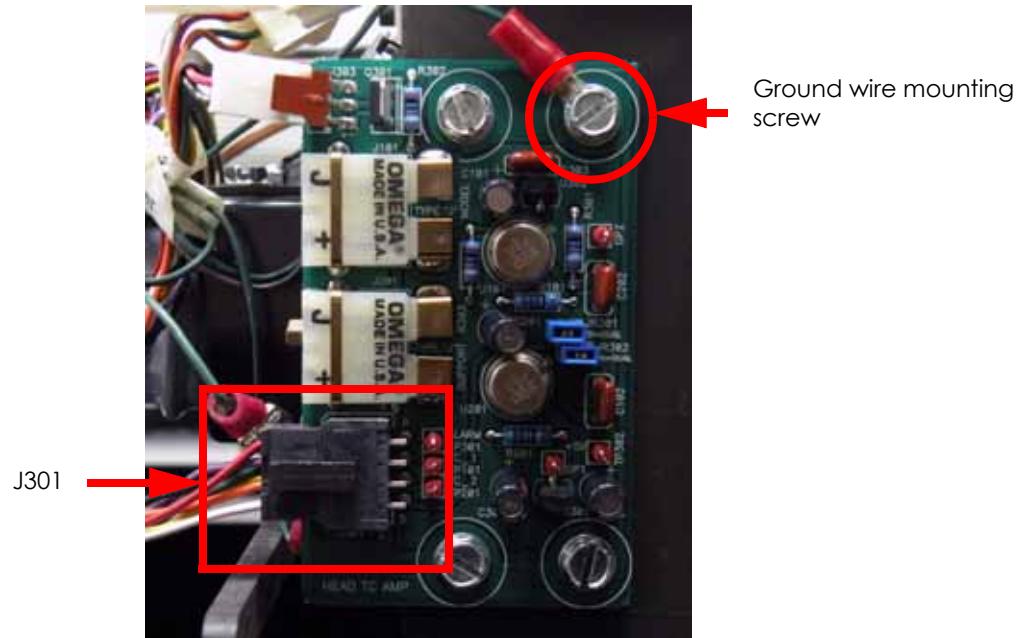
Figure 246: Thermal snap switch connector locations



18. Disconnect J301 from the TC Amp board by pressing the tab in and pulling outward. See [Figure 247](#).

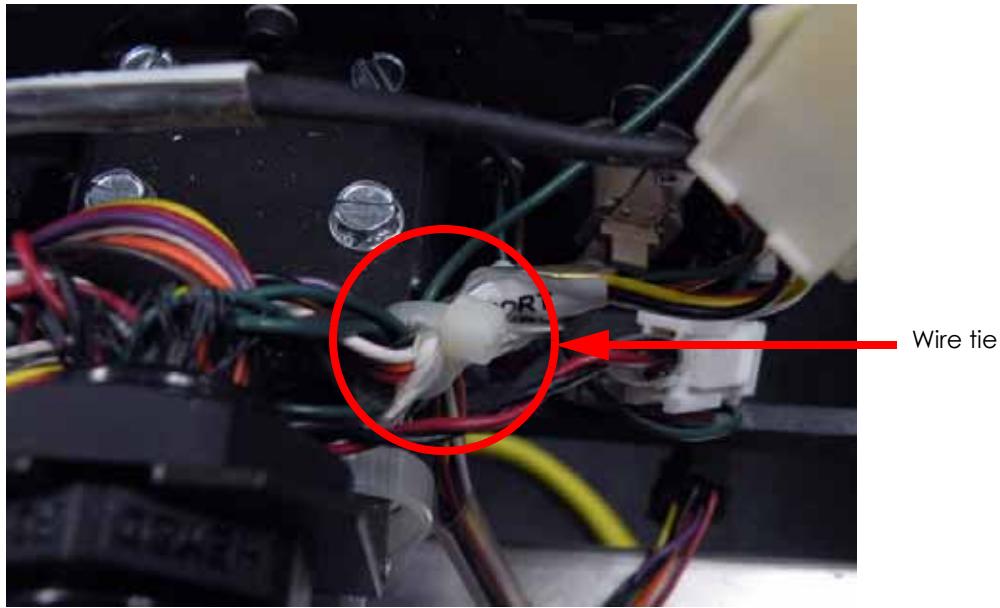
19. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the ground wire from the TC Amp board. See [Figure 247](#).

Figure 247: TC Amp board connections



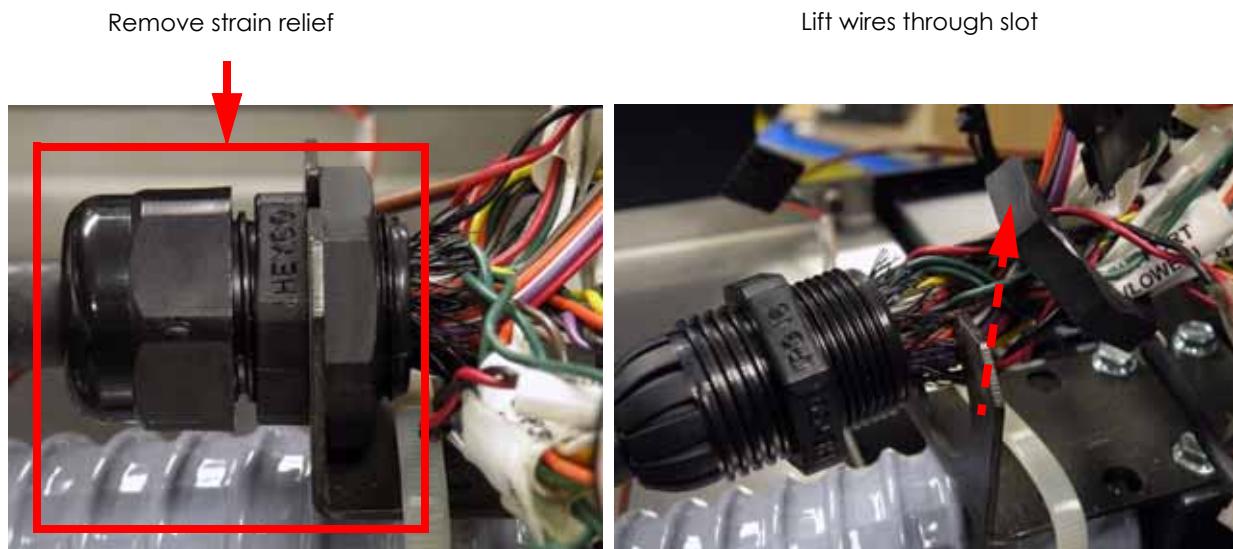
20. Using a cutters, cut the wire tie from the umbilical hose mount. See [Figure 248](#).

Figure 248: Umbilical hose wire tie location



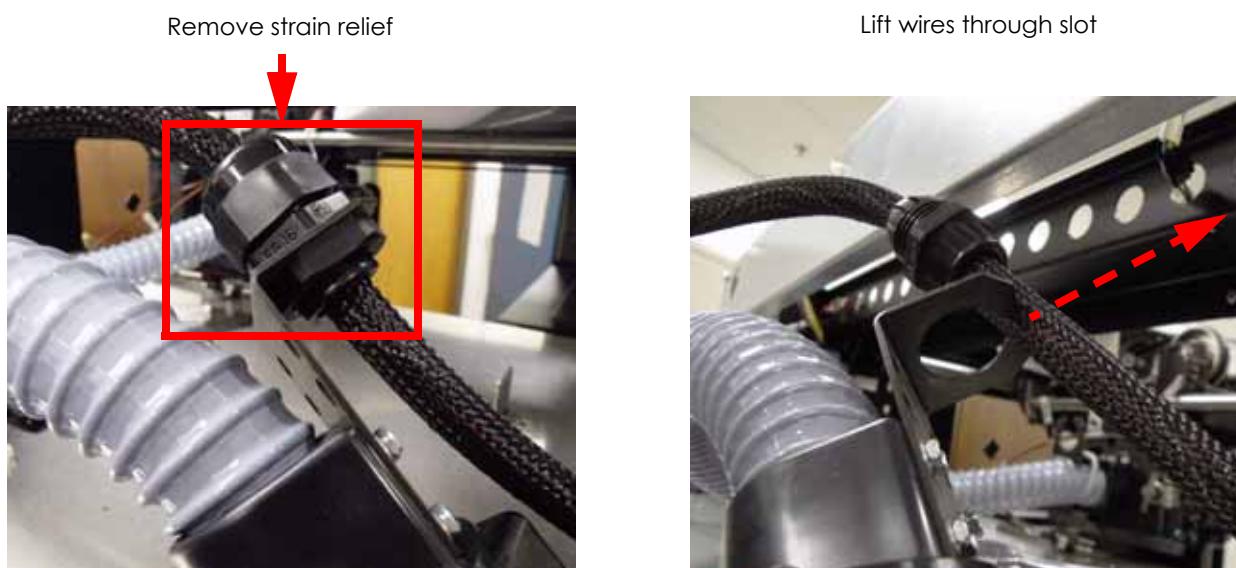
21. Using a large pliers or crescent wrench, remove the umbilical cable strain relief at the head. See [Figure 249](#).
22. Remove the umbilical cable from the strain relief mount by lifting up and out through the slot. See [Figure 249](#).

Figure 249: Umbilical cable strain relief removal



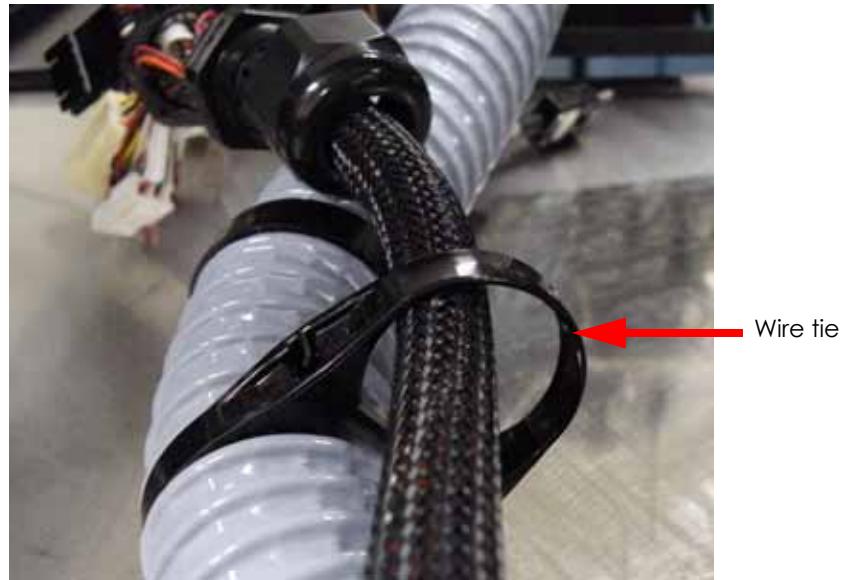
23. Using a large pliers or crescent wrench, remove the umbilical cable strain relief at the head cooling fan. See [Figure 250](#).
24. Remove the umbilical cable from the strain relief mount by lifting up and out through the slot. See [Figure 250](#).

Figure 250: Umbilical cable strain relief removal



25. Using a cutters, cut and remove the wire tie from the umbilical hose. See [Figure 251](#).

Figure 251: Umbilical cable and hose wire tie location

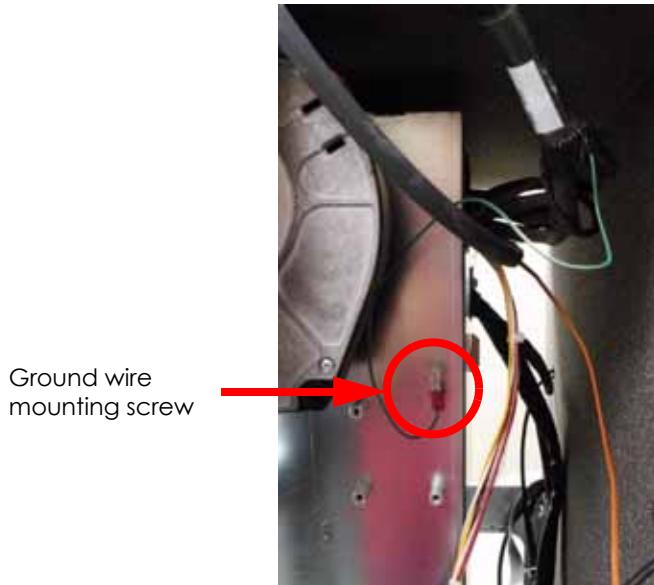


26. Disconnect the following:

a. For Gen 1 electronics:

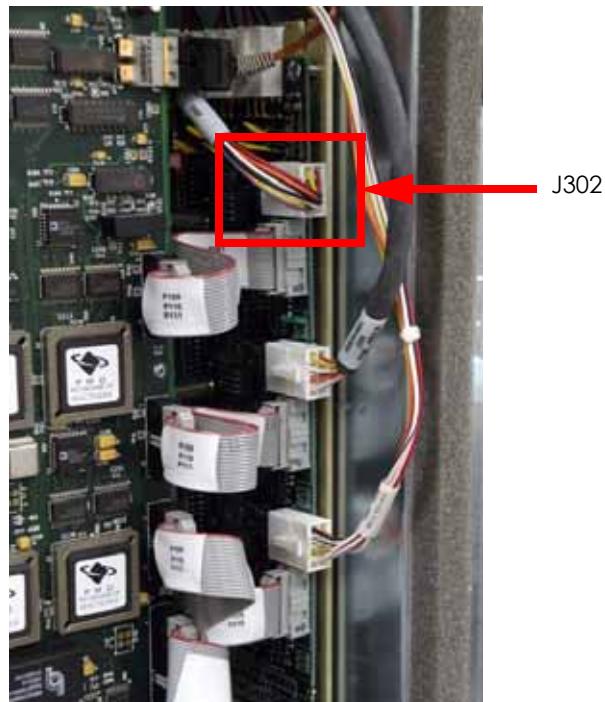
- i. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the ground wire from the back of the electronics bay. See [Figure 252](#).

Figure 252: Electronics bay ground wire location



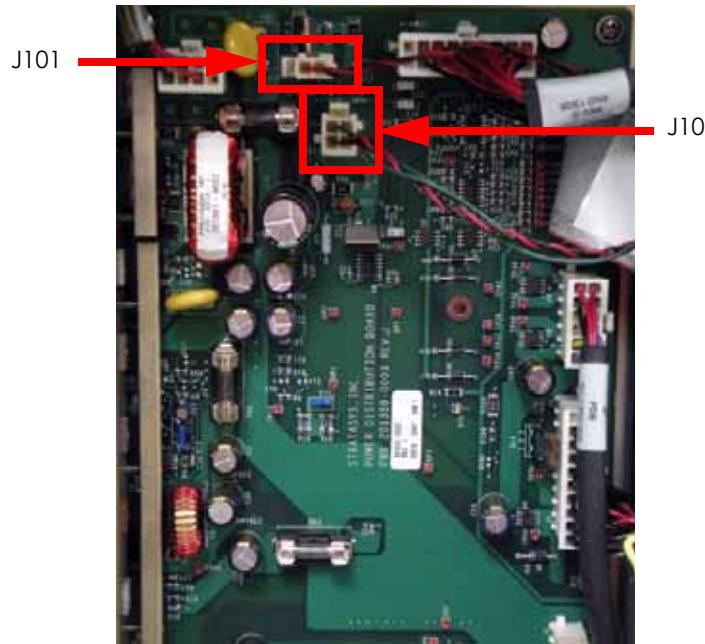
ii. Disconnect J302 from the motor driver board. See [Figure 253](#).

Figure 253: J302 location



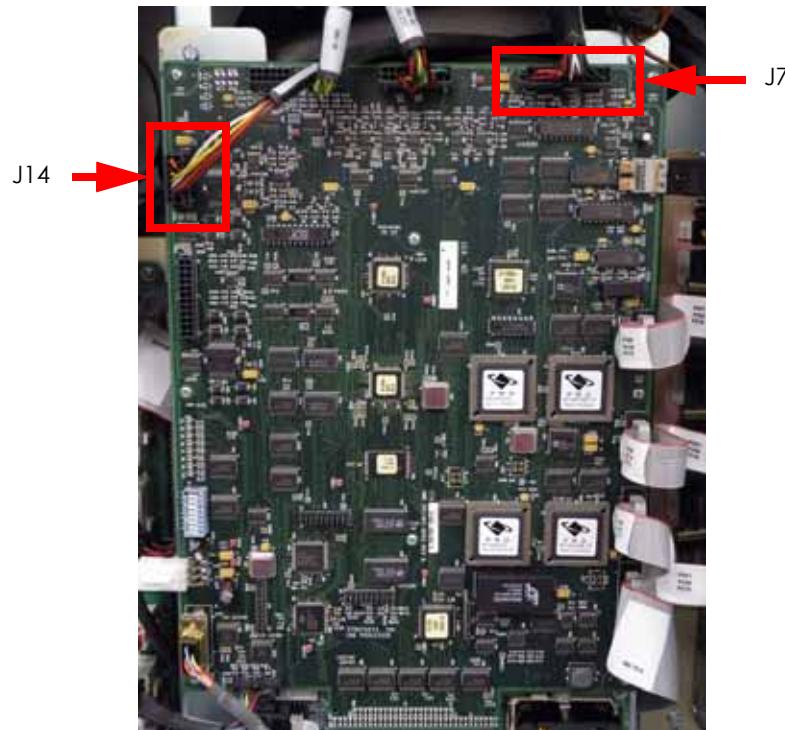
iii. Disconnect J101 and J10 from the power distribution board. See [Figure 254](#).

Figure 254: Power distribution board connections



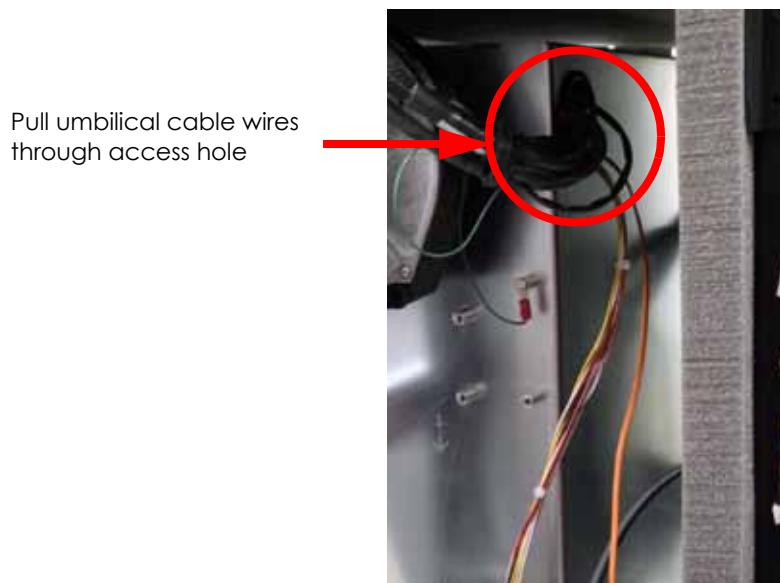
iv. Disconnect J14 and J7 from the 186 board. See [Figure 255](#).

Figure 255: 186 connections



v. Pull the wires through the access hole at the back of the electronics bay. See [Figure 256](#).

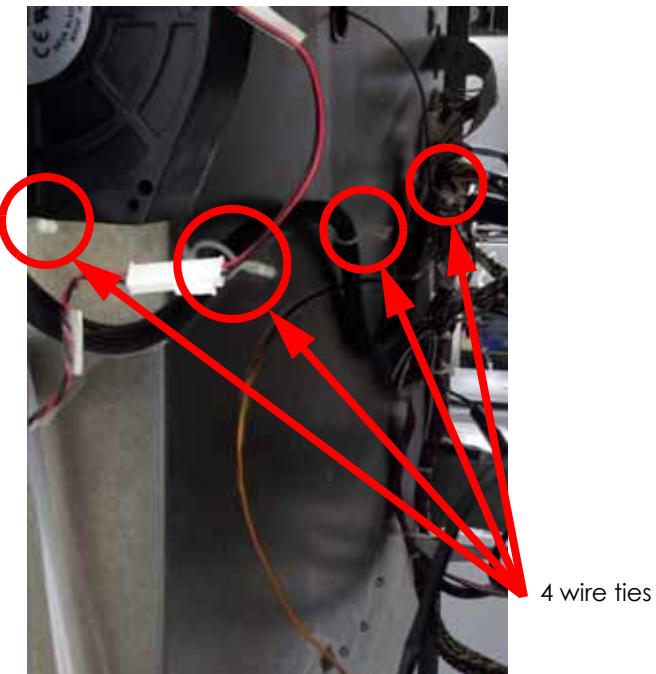
Figure 256: Electronics bay access hole



b. For Gen 2 electronics:

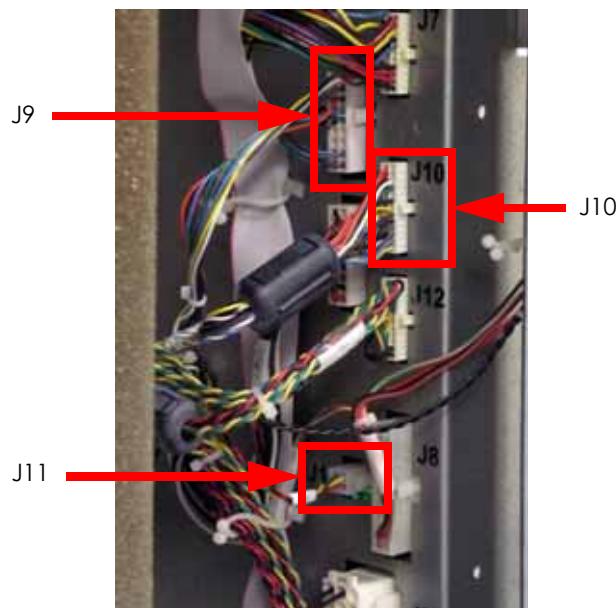
- i. Un-clip the 4 wire ties at the back of the electronics bay. See [Figure 257](#).

Figure 257: Wire tie locations



- ii. Disconnect J9, J10 and J11 from the power distribution board by pressing the tabs in and pulling outwards. See [Figure 258](#).

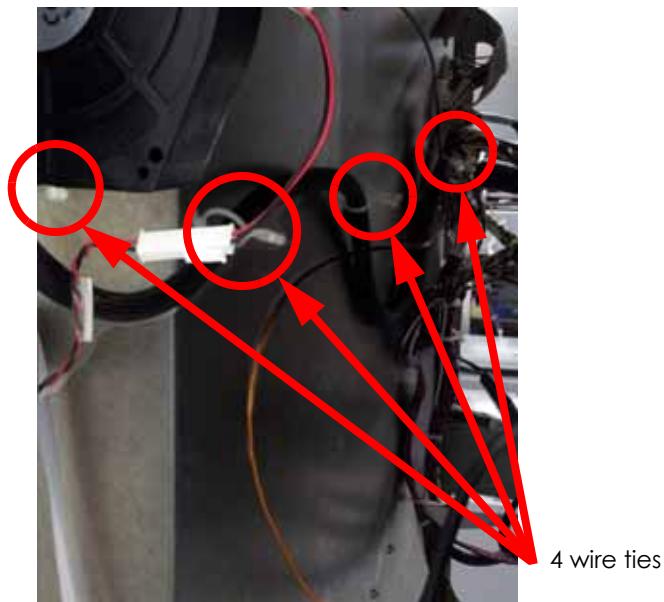
Figure 258: Power distribution board connections



c. For Gen 3 electronics:

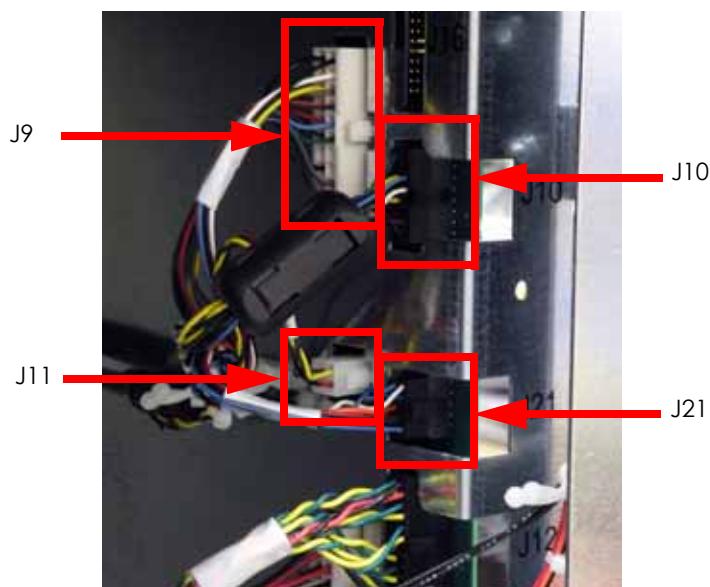
- i. Un-clip the 4 wire ties at the back of the electronics bay. See [Figure 259](#).

Figure 259: Wire tie locations



- ii. Disconnect J9, J10, J11 and J21 from the power distribution board by pressing the tabs in and pulling outwards. See [Figure 260](#).

Figure 260: Power distribution board connections



27. Remove the umbilical cable and discard.

Installing the Umbilical Cable:

1. Lay the new cable out and loosen the bushings on each of the strain relief assemblies using a large pliers or crescent wrench.
2. Remove the strain relief mounting nuts from each strain relief. It is not necessary to pull the nuts all the way off the cable.
3. Reconnect all connectors to the back of the head.
4. Slide the head cable back into the slotted head strain relief mounting bracket. Position the cable so the bushing will clamp down on the shrink-wrapped portion of the cable.
5. Thread the mounting nut back onto the assembly and tighten.
6. Position the umbilical strain relief so it is 480mm (19 inches) from the head strain relief.
7. Slide the head cable into the slotted umbilical strain relief mount. Tighten the strain relief-mounting nut and bushing.
8. Reinstall the wire tie around the umbilical cable and umbilical hose. Head cable should follow the umbilical tube with no binding, tightness, or excess slack. If needed, loosen the strain relief bushings and adjust cable length.
9. Reattach the ground wire to the back of the electronics bay and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the mounting screw.
10. Reconnect the following:
 - a. For Gen 1 electronics:
 - i. Route the cable down through the back of the electronics bay.
 - ii. Reconnect J10 and J101 (SST only) to the power distribution board.
 - iii. Reconnect J7 and J14 to the 186 processor board .
 - iv. Reconnect J302 to the motor driver board.
 - b. For Gen 2 electronics:
 - i. Reconnect J9, J10 and J11 to the power distribution board.
 - ii. Run umbilical cable through the 4 wire ties and close the wire ties.
 - c. For Gen 3 electronics:
 - i. Reconnect J9, J10, J11 and J21 to the power distribution board.
 - ii. Run umbilical cable through the 4 wire ties and close the wire ties.
11. Wire tie all wires and appropriate connectors at the rear of the head. This will eliminate cables catching on any moving parts.
12. Check all connectors to ensure they are secure.
13. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
14. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
15. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
16. Power on the system. The system should reach **Idle** with no displayed errors.
17. Run a small test part and monitor system operation during build.

Z Foam Level Sensor

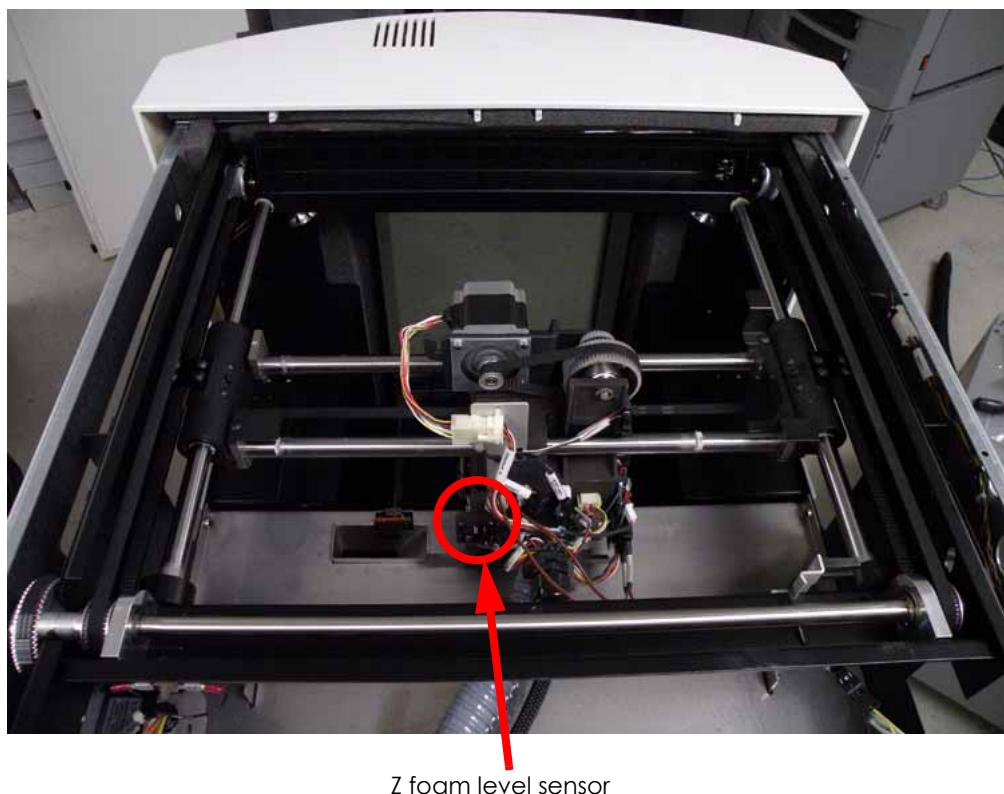
Required Tools

- $\frac{3}{32}$ " allen wrench
- Cutters
- Wire ties

Removing the Z Foam Level Sensor:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the Z foam level sensor at the back of the head. See [Figure 261](#).

Figure 261: Z foam level sensor location



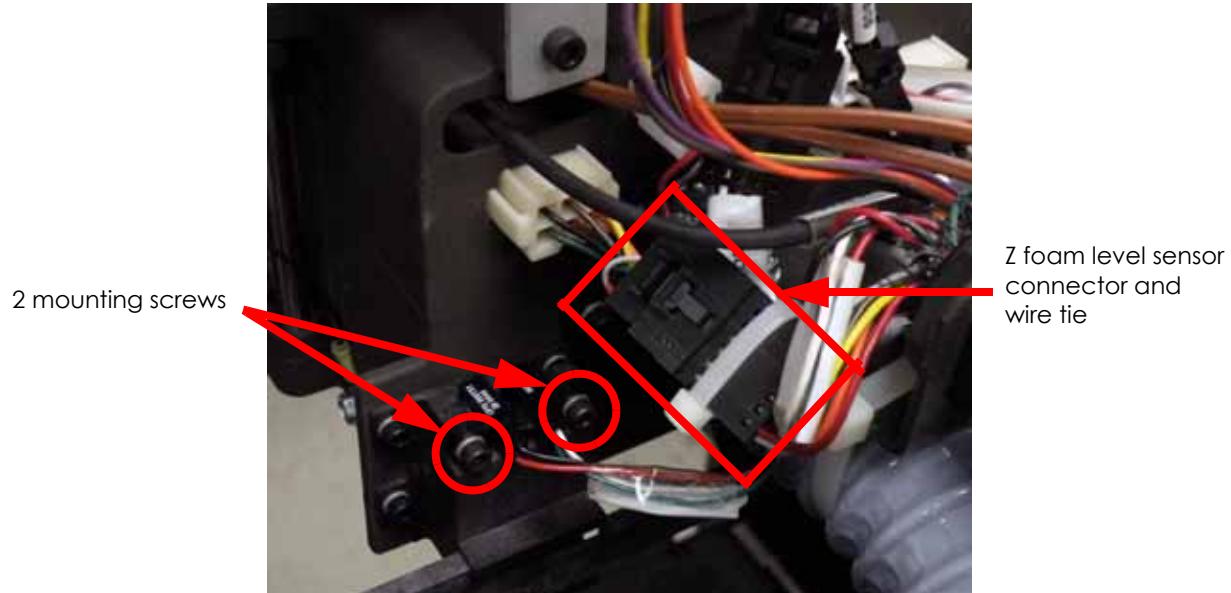
6. Using a cutters, cut the wire tie from the Z foam level sensor connector. See [Figure 262](#).

7. Disconnect the Z foam level sensor connector by pressing the tab in and pulling apart. See [Figure 262](#).
8. Using a $\frac{3}{32}$ " allen wrench, remove the 2 Z foam level sensor mounting screws and washers. See [Figure 262](#).



Be careful not to lose the washers.

Figure 262: Z foam level sensor wire tie location



9. Remove the Z foam level sensor and discard.

Installing the Z Foam Level Sensor:

1. Align the Z foam level sensor with the mounting holes and use a $\frac{3}{32}$ " allen wrench to reinstall the 2 mounting screws and washers.
2. Reconnect the Z foam level sensor cable by pushing the connectors together.
3. Reinstall a wire tie around the Z foam level sensor connector.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Z Foam Level Assembly

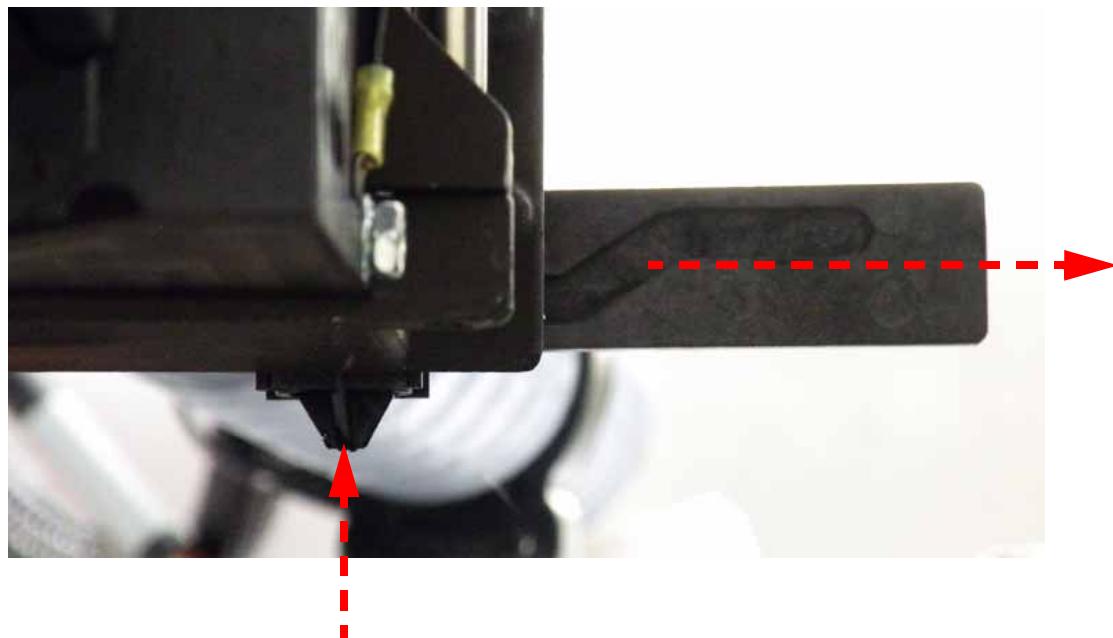
Required Tools

- $\frac{3}{32}$ " allen wrench

Removing the Z Foam Level Assembly:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the Z foam level sensor. See "[Removing the Z Foam Level Sensor:](#)" on page 5-222.
6. Push the Z foam level assembly actuator up into the assembly and slide the Z foam level bar to the right until it is clear of the assembly. See [Figure 263](#).

Figure 263: Removing the Z foam level bar

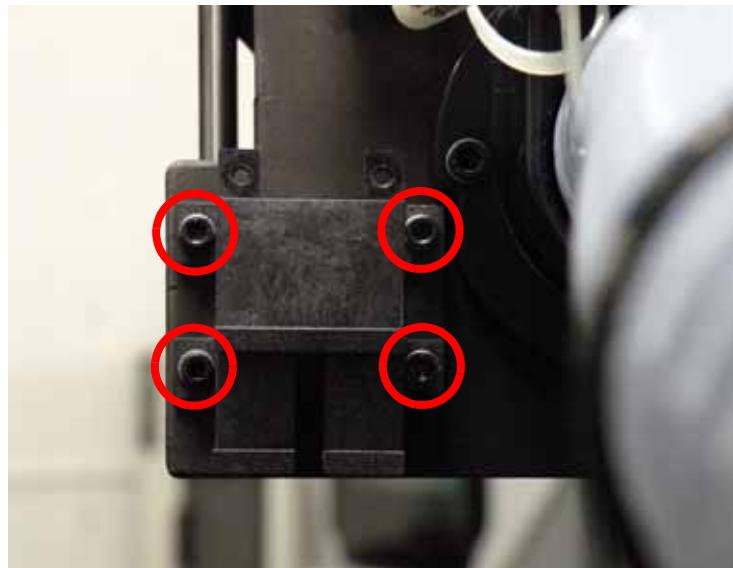


7. Using a $\frac{3}{32}$ " allen wrench, remove the 4 Z foam level assembly mounting screws and washers. See [Figure 264](#).



Be careful not to lose the washers.

Figure 264: Z foam level assembly mounting screw locations



4 mounting screws

8. Remove the Z foam level assembly and discard.

Installing the Z Foam Level Assembly:

1. Remove the Z foam level bar from the assembly by pushing the actuator into the housing and pulling the bar to the right.
2. Align the housing with the mounting holes and use a $\frac{3}{32}$ " allen wrench to reinstall the 4 mounting screws and washers.
3. Insert the actuator and spring into the housing and push all the way up.
4. Slide the bar to the left and into the housing, when installed correctly the actuator will not come out of the housing.
5. Reinstall the Z foam level sensor. See "["Installing the Z Foam Level Sensor:" on page 5-223.](#)
6. Reinstall the side panels. See "["Side Panels" on page 5-11.](#)
7. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10.](#)
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power on the system. The system should reach **Idle** with no displayed errors.
10. Run a small test part and monitor system operation during build.

Chamber Thermal Snap Switch

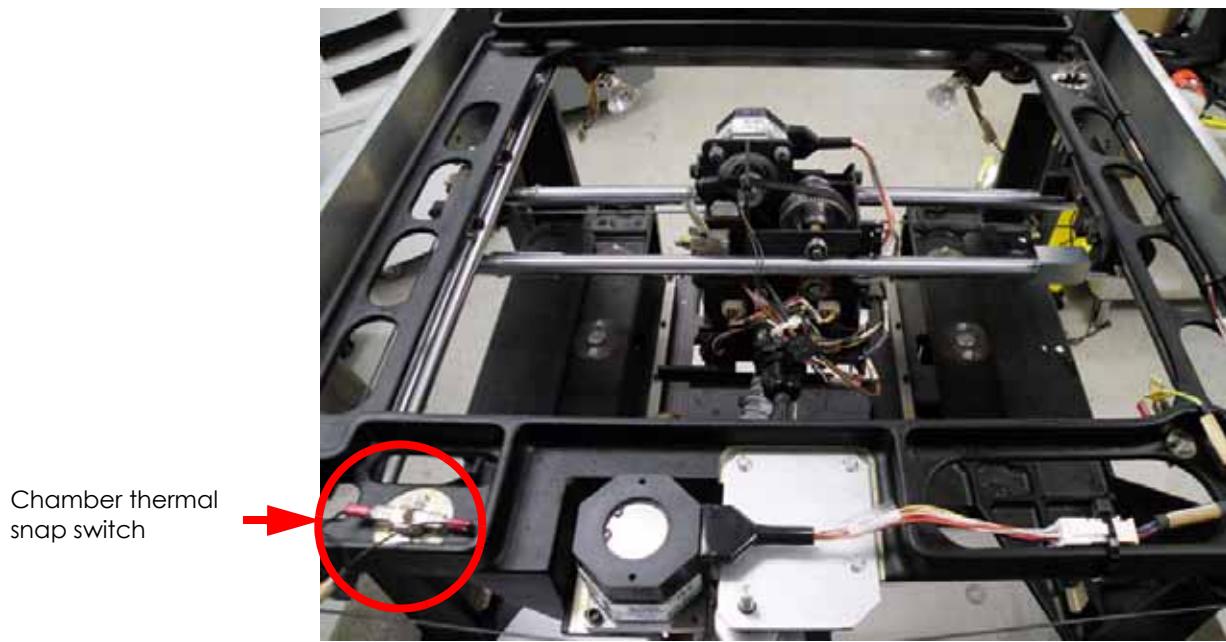
Required Tools

- $\frac{1}{4}$ " nut driver
- $\frac{5}{16}$ " nut driver
- Standard screw driver
- $\frac{3}{32}$ " allen wrench

Removing the Chamber Thermal Snap Switch for Cable Drive XY Table:

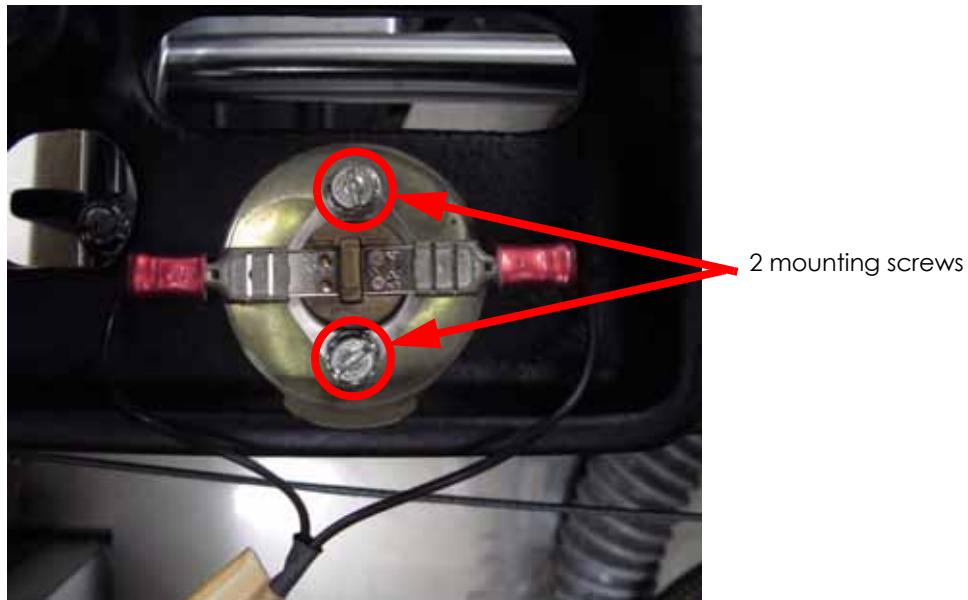
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Locate the chamber thermal snap switch. See [Figure 265](#).

Figure 265: Chamber thermal snap switch location



6. Disconnect the chamber thermal snap switch wires by pulling the spade connectors away from the switch. See [Figure 266](#).
7. Using a $\frac{1}{4}$ " nut driver or standard screw driver, remove the 2 chamber thermal snap switch mounting screws. See [Figure 266](#).

Figure 266: Chamber thermal snap switch detail



8. Discard the chamber thermal snap switch.

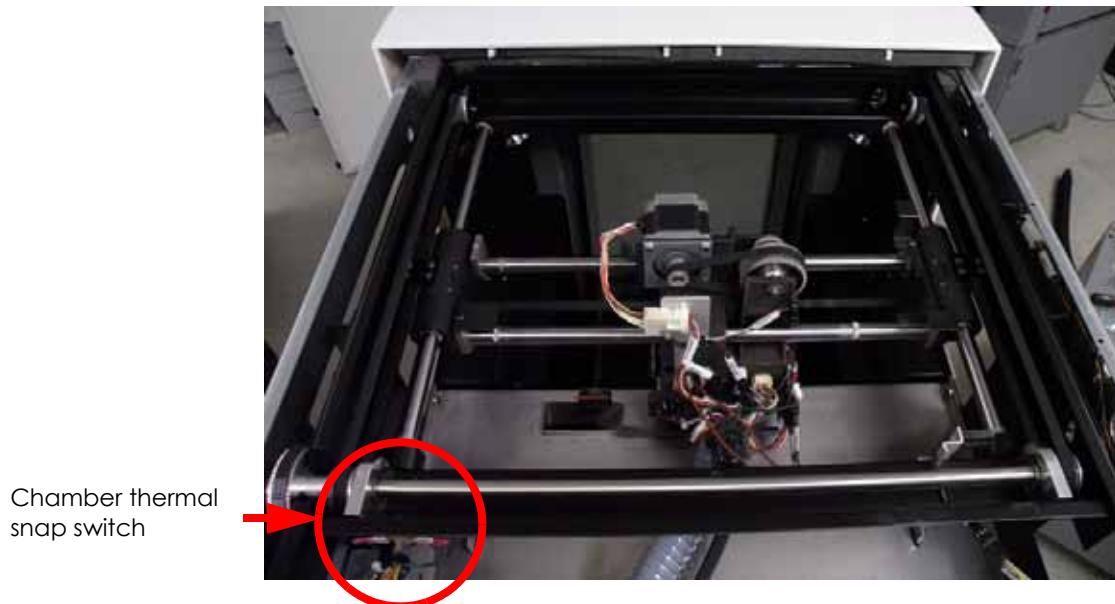
Installing the Chamber Thermal Snap Switch for Cable Drive XY Table:

1. Align the chamber thermal snap switch with the mounting holes and use a $\frac{1}{4}$ " nut driver or standard screw driver to reinstall the 2 mounting screws.
2. Reconnect the chamber thermal snap switch wires by pushing onto the spade connectors.
3. Reinstall the side panels. See "["Side Panels"](#) on page 5-11.
4. Reinstall the rear door. See "["Installing the Rear Door."](#) on page 5-10.
5. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
6. Power on the system. The system should reach **Idle** with no displayed errors.
7. Run a small test part and monitor system operation during build.

Removing the Chamber Thermal Snap Switch for Belt Drive XY Table:

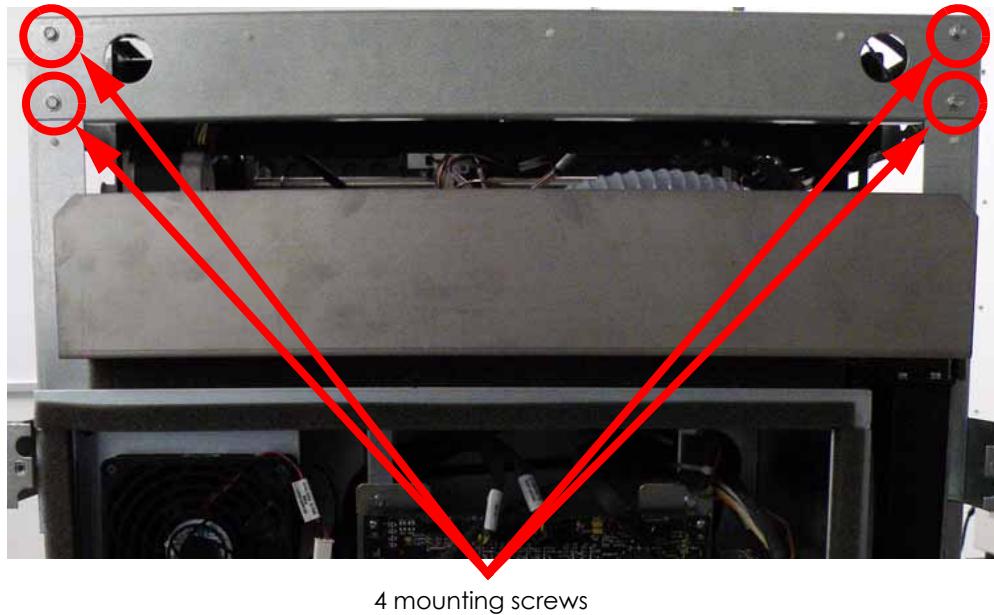
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the chamber thermal snap switch. See [Figure 267](#).

Figure 267: Chamber thermal snap switch location



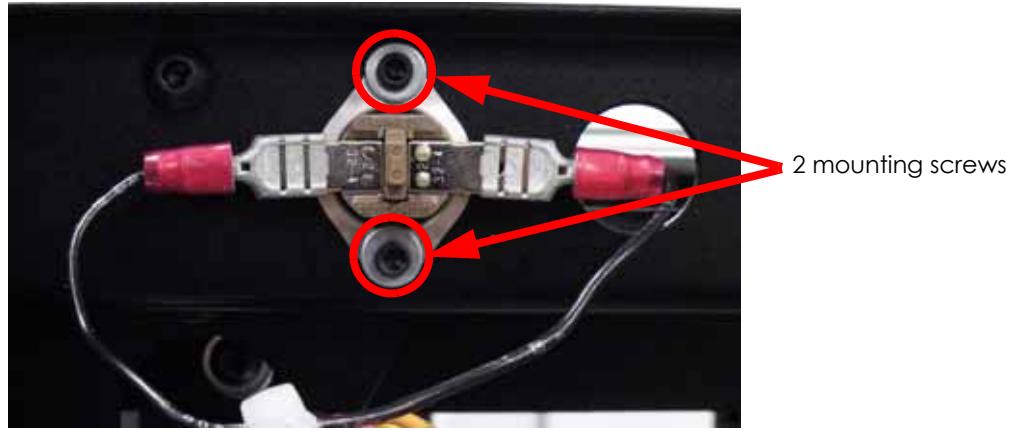
6. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 rear frame bracket mounting screws. See [Figure 268](#).

Figure 268: Rear frame bracket mounting screw locations



7. Disconnect the chamber thermal snap switch wires by pulling the spade connectors away from the switch. See [Figure 269](#).
8. Using a $\frac{3}{32}$ " allen wrench, remove the 2 chamber thermal snap switch mounting screws. See [Figure 269](#).

Figure 269: Chamber thermal snap switch detail



9. Discard the chamber thermal snap switch.

Installing the Chamber Thermal Snap Switch for Belt Drive XY Table:

1. Align the chamber thermal snap switch with the mounting holes and use a $\frac{3}{32}$ " allen wrench to reinstall the 2 mounting screws.
2. Reconnect the chamber thermal snap switch wires by pushing onto the spade connectors.
3. Align the rear frame bracket and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

XY Table Cable Drive Components

X EOT (End of Travel) Limit Switch

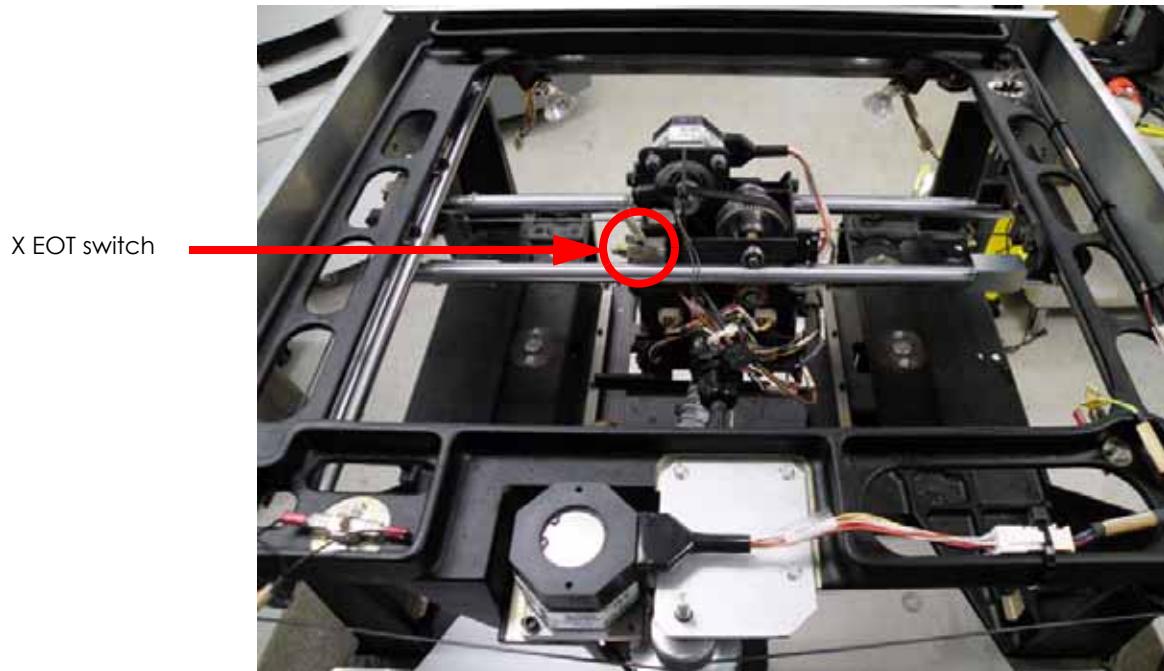
Required Tools

- Small standard screwdriver

Removing the X EOT Switch:

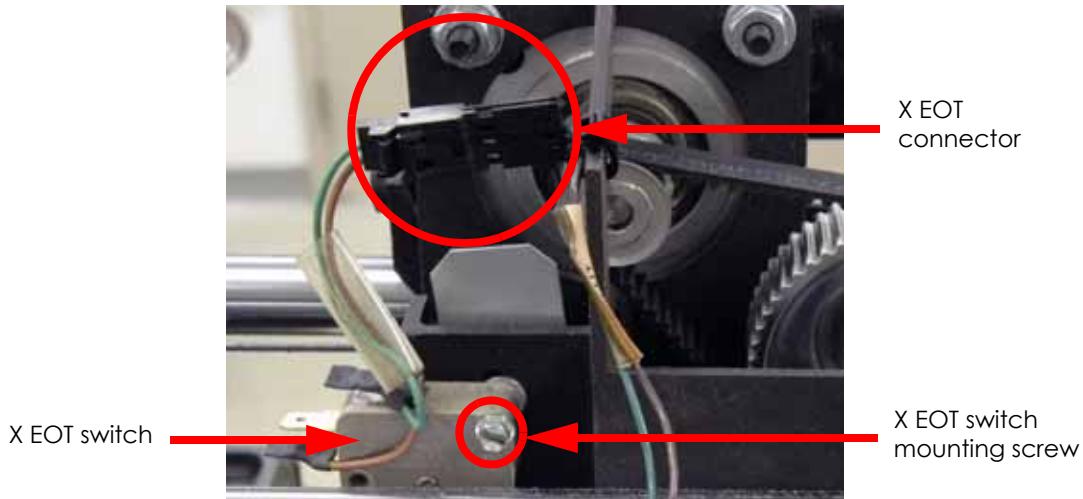
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X EOT switch. See [Figure 270](#).

Figure 270: X EOT switch location



6. Disconnect the X EOT connector by pressing the tab in and pulling outward. See [Figure 271](#).
7. Using a standard screwdriver, remove the mounting screw on the side of the switch. See [Figure 271](#).

Figure 271: X EOT switch detail

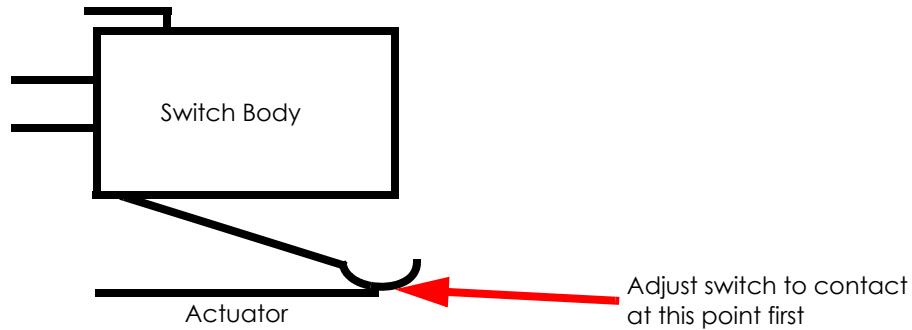


8. Remove the X EOT switch and discard.

Installing the X EOT Switch:

1. Align the X EOT switch with the mounting hole.
2. Use a small standard screwdriver to reinstall the mounting screw.
3. Adjust the switch so that the lowest point in the curve of the switch arm is the first to contact the actuator.

Figure 272: X EOT adjustment



4. Reconnect the X EOT cable by pushing the connectors together.
5. Reinstall the side panels. See "["Side Panels" on page 5-11](#).
6. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#).
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power on the system. The system should reach **Idle** with no displayed errors.
9. Run a small test part and monitor system operation during build.

X BOT (Home) Sensor

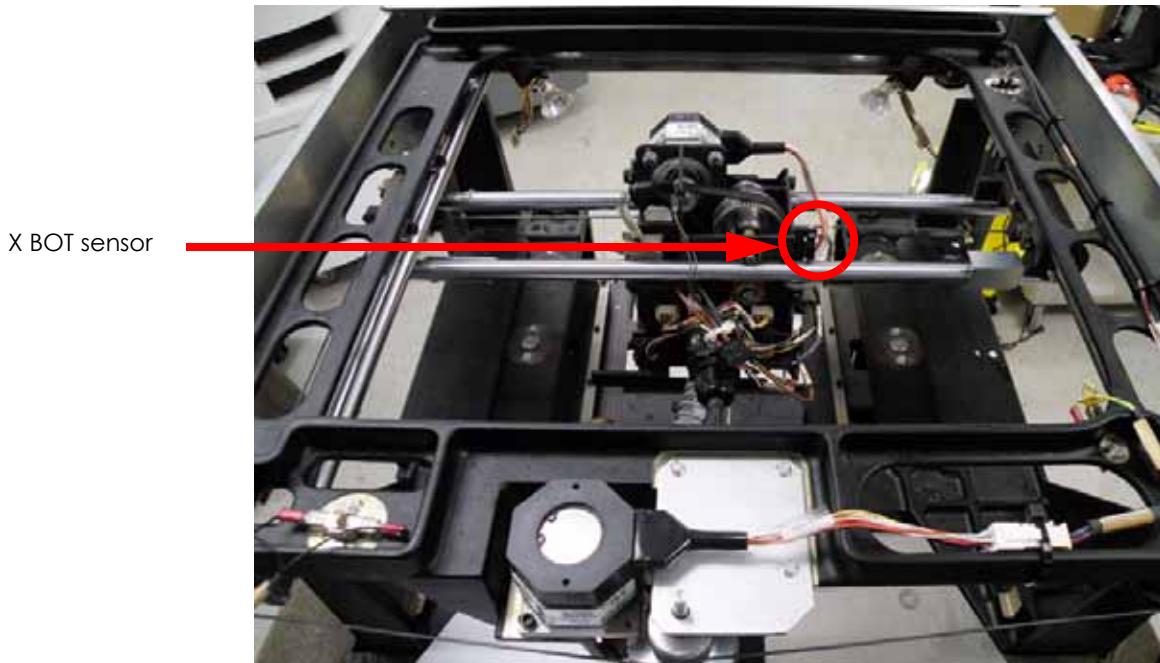
Required Tools

- $\frac{3}{32}$ " allen wrench
- Cutters
- Wire ties

Removing the X BOT Sensor:

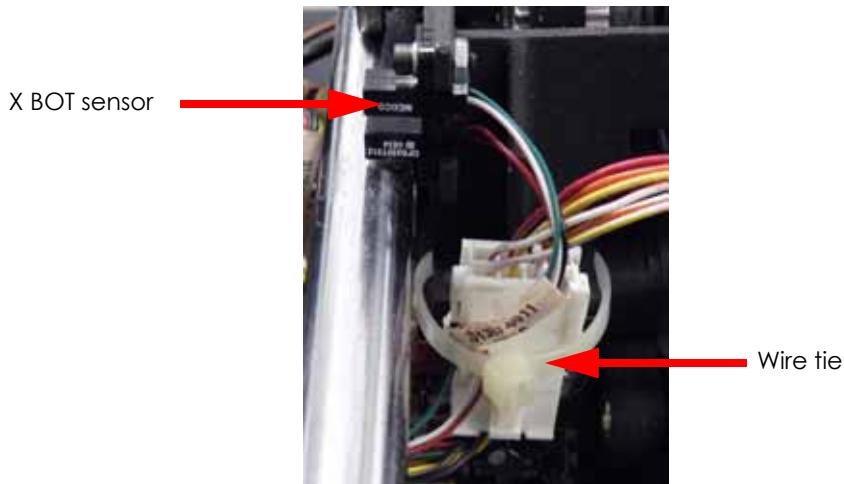
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X BOT sensor. See [Figure 273](#).

Figure 273: X BOT location



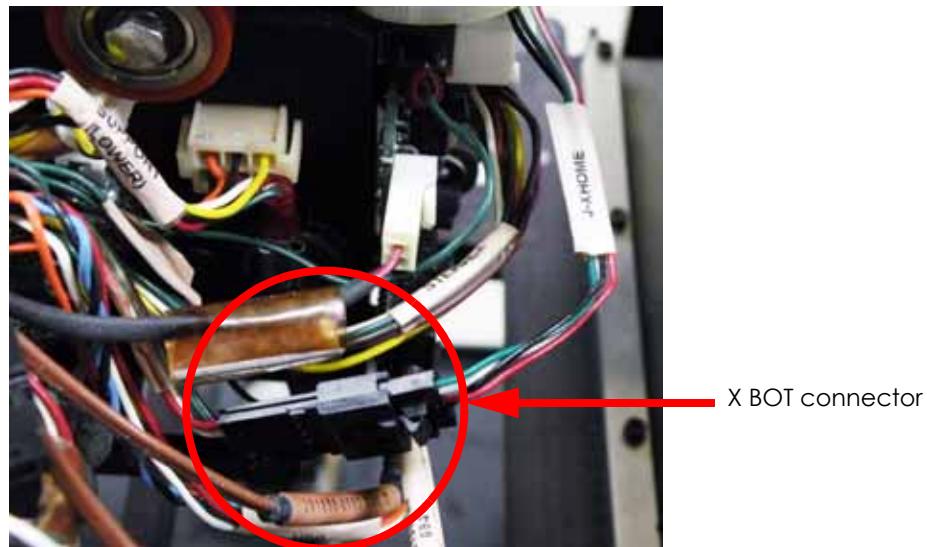
6. Cut and remove the wire tie holding the X motor connector to the head. See [Figure 274](#).

Figure 274: Wire tie location



7. Disconnect the X BOT cable by pressing the tab in and pulling the connectors apart. See [Figure 275](#).

Figure 275: X BOT connector location



8. Using a $\frac{3}{32}$ " allen wrench, remove the X BOT sensor mounting screw.
9. Remove the X BOT sensor and discard.

Installing the X BOT Sensor:

1. Align the X BOT sensor with the mounting hole and use a $\frac{3}{32}$ " allen wrench to reinstall the mounting screw.
2. Reconnect the X BOT sensor cable by pushing the connectors together.
3. Reinstall a wire tie around the X BOT sensor cable and X motor cable connector.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Y EOT (End of Travel) Limit Switch

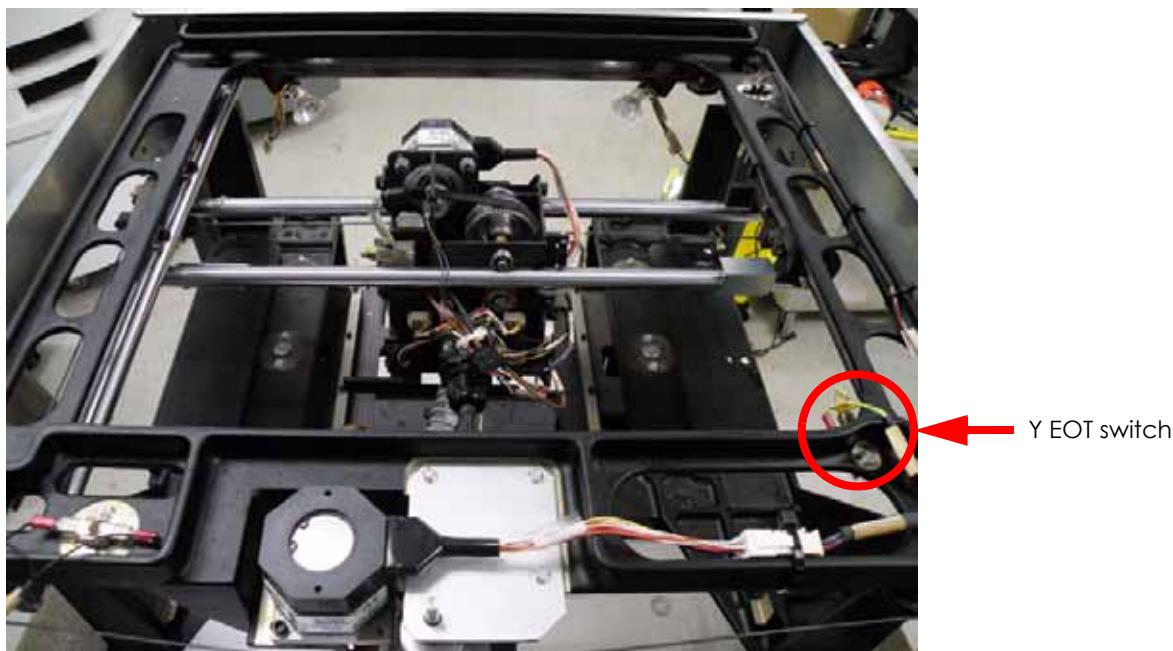
Required Tools

- Allen wrench set
- Standard screwdriver
- Phillips screwdriver

Removing the Y EOT Switch:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the Y EOT limit switch. See [Figure 276](#).

Figure 276: Y EOT switch location

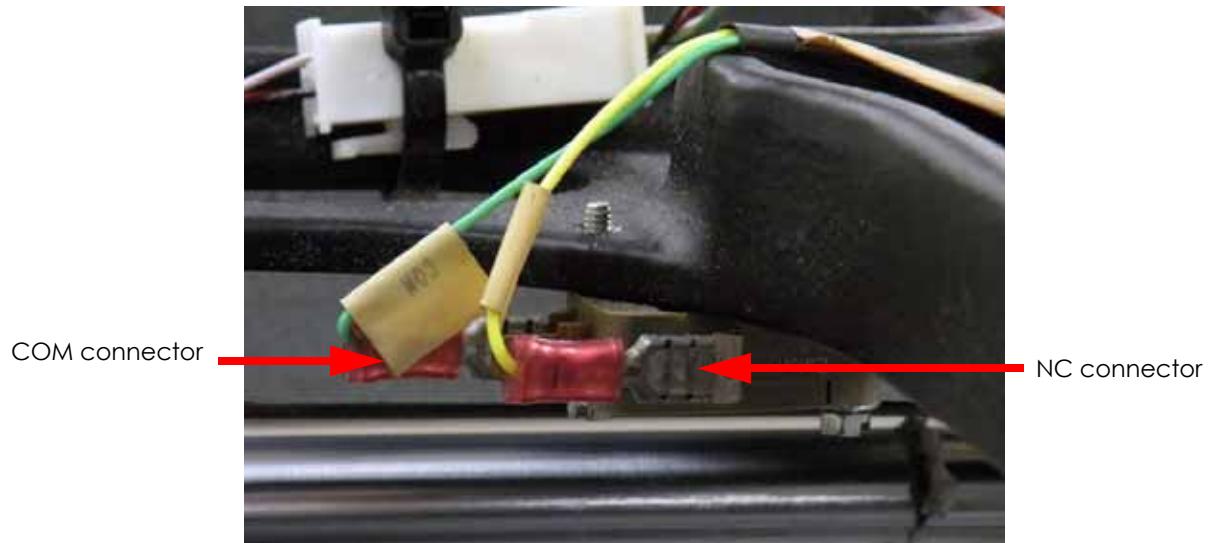


6. Disconnect the NC (yellow) and COM (green) spade connectors from the switch by pulling outwards. See [Figure 277](#).



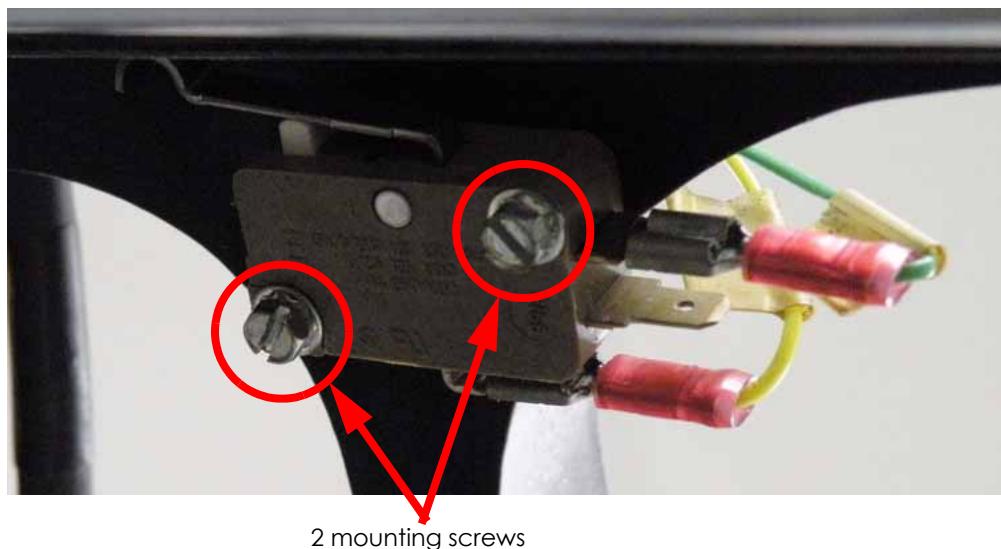
Note the location of the NC (yellow) and COM (green) wires for easy reinstallation.

Figure 277: Y EOT switch connector locations



7. Using a standard screwdriver, remove the 2 mounting screws from the Y EOT switch. See

Figure 278: Y EOT switch mounting screw locations

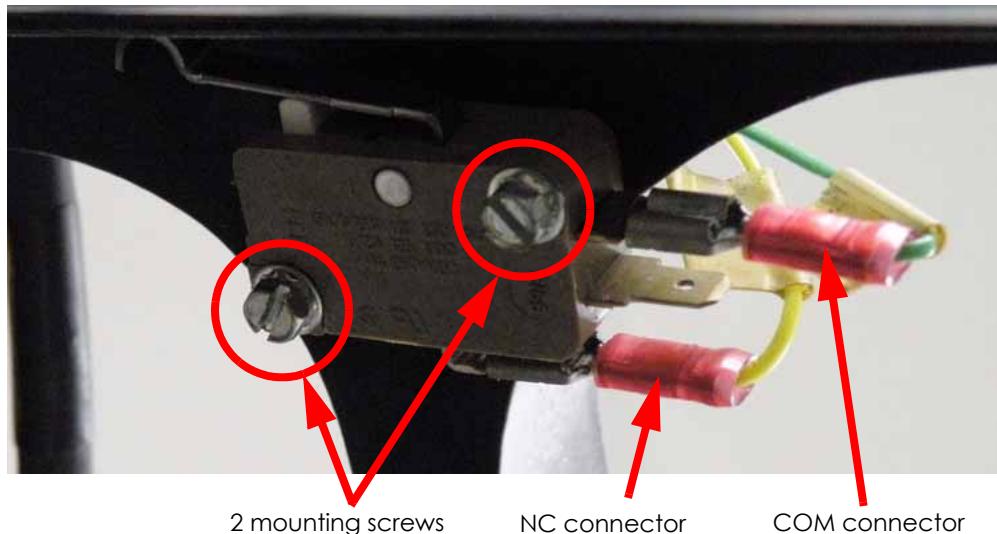


8. Remove the Y EOT switch and discard.

Installing the Y EOT Switch:

1. Align the Y EOT switch with the mounting holes and use a standard screwdriver to reinstall the 2 mounting screws. See [Figure 279](#).
2. Reconnect the NC (yellow) wire and COM (green) wire to the Y EOT switch by pushing the connector onto the spade. See [Figure 279](#).

Figure 279: Y EOT detail



3. Reinstall the side panels. See ["Side Panels" on page 5-11](#).
4. Reinstall the rear door. See ["Installing the Rear Door:" on page 5-10](#).
5. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
6. Power on the system. The system should reach **Idle** with no displayed errors.
7. Run a small test part and monitor system operation during build.

Y BOT (Beginning of Travel) Sensor

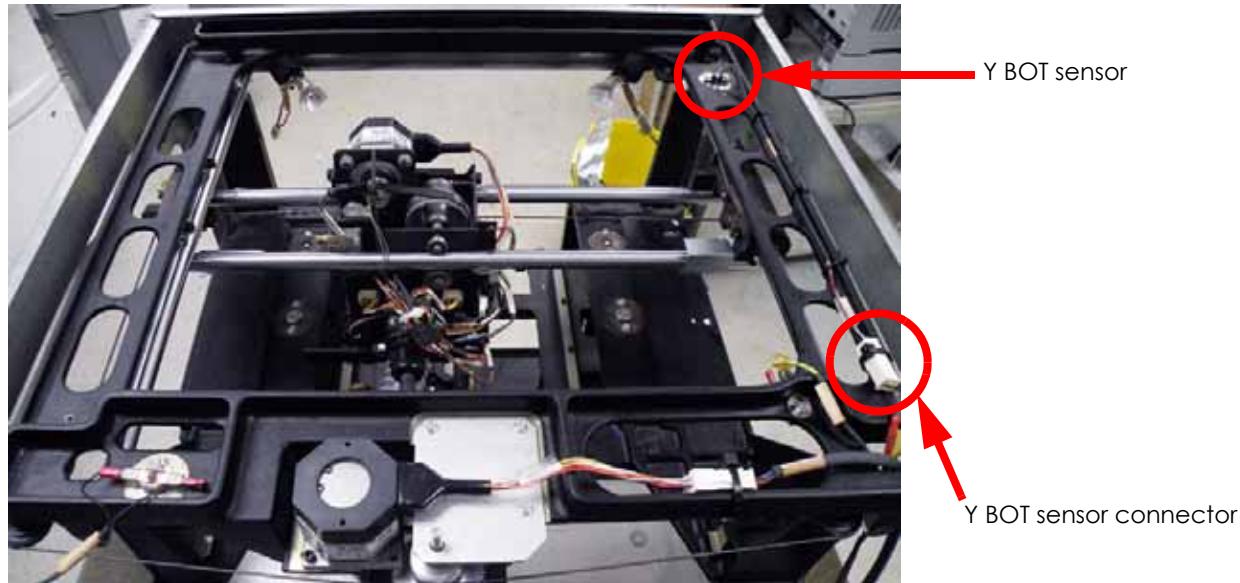
Required Tools

- Standard screwdriver
- Wire ties
- Cutters

Removing the Y BOT Sensor:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the Y BOT sensor and Y BOT sensor connector. See [Figure 280](#).

Figure 280: Y BOT location



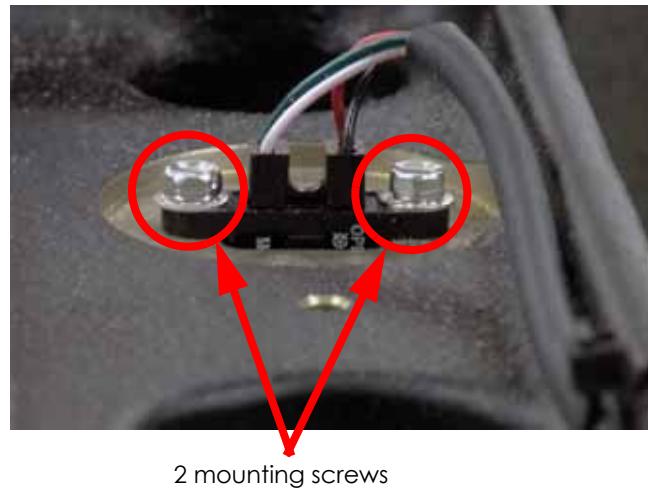
6. Using a cutters, cut and remove the 3 wire ties from the Y BOT sensor cable. See [Figure 281](#).
7. Using a cutters, cut and remove the wire tie from the Y BOT connector. See [Figure 281](#).
8. Disconnect the Y BOT sensor connector by pressing the tab in and pulling outwards. See [Figure 281](#).

Figure 281: Wire tie and Y BOT connector locations



9. Using a standard screwdriver, remove the 3 Y BOT sensor mounting screws. See [Figure 282](#).

Figure 282: Y BOT mounting screw locations



10. Remove the Y BOT sensor and discard.

Installing the Y BOT Sensor:

1. Align the Y BOT sensor with the mounting holes and use a standard screwdriver to reinstall the 2 mounting screws.
2. Reconnect the Y BOT sensor cable by pushing the connectors together.
3. Reinstall the 3 wire ties around the Y BOT sensor cable.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

XY Table Assembly (Cable Drive)

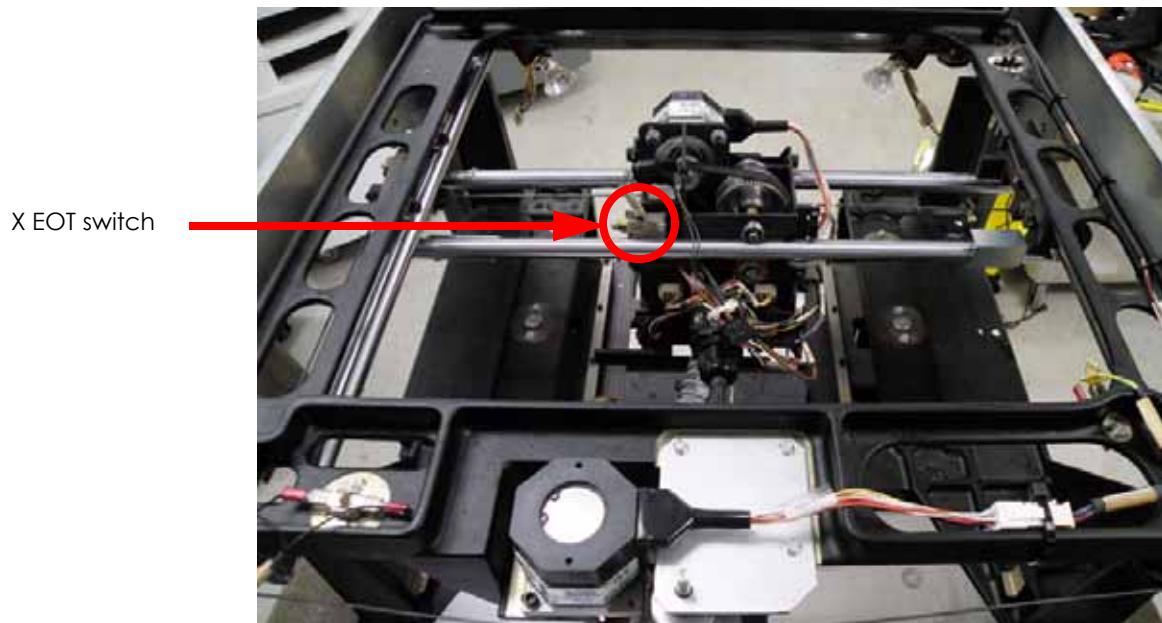
Required Tools

- Standard screwdriver
- $\frac{9}{64}$ " allen wrench
- $\frac{1}{4}$ " nut driver
- $\frac{5}{16}$ " nut driver
- Cutters
- Wire ties

Removing the XY Table Assembly:

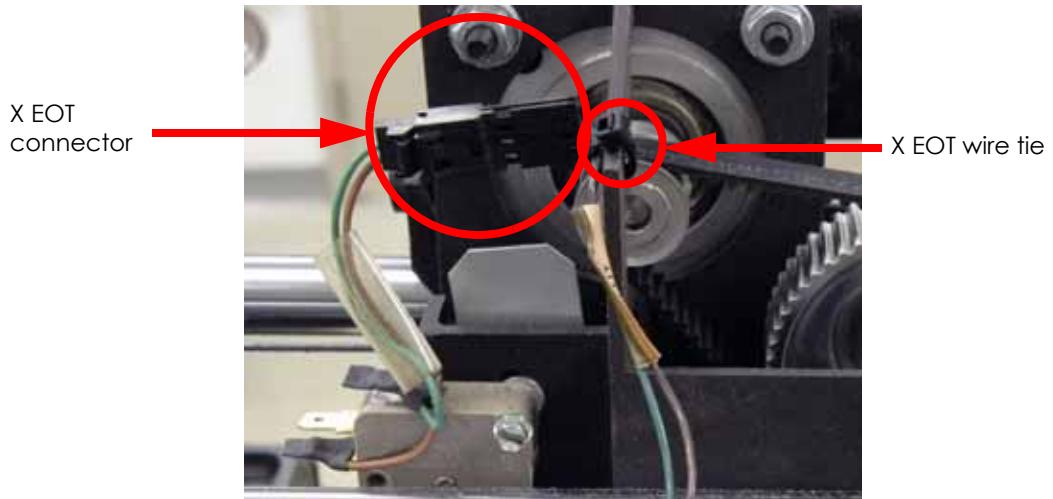
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X EOT switch. See [Figure 283](#).

Figure 283: X EOT switch location



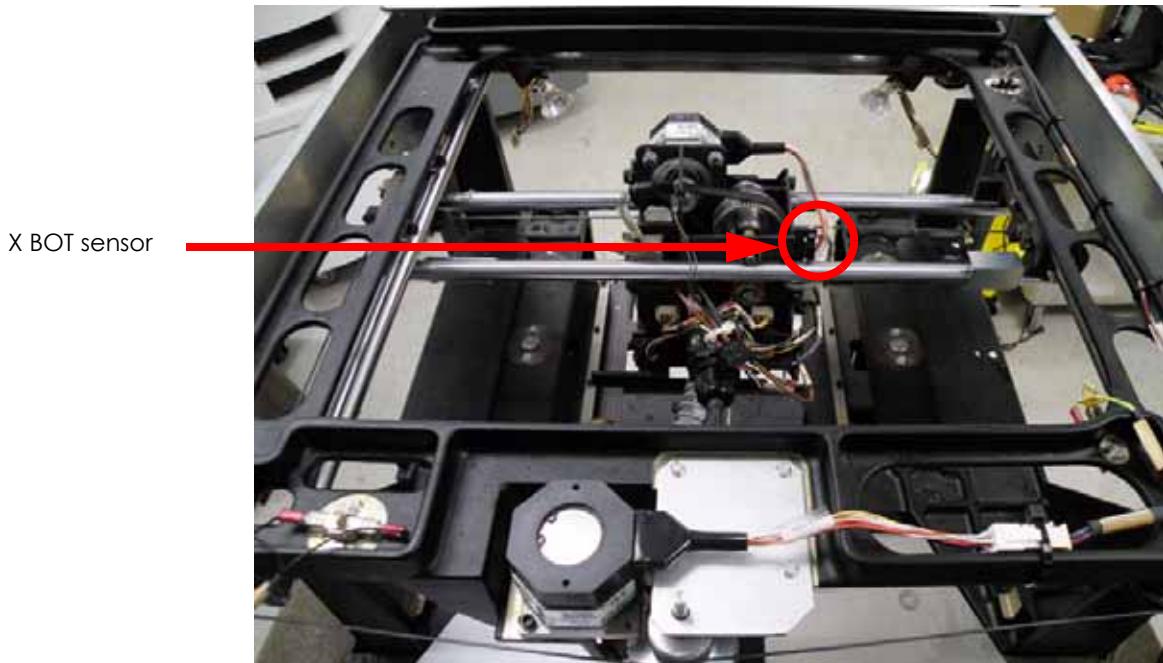
6. Disconnect the X EOT connector by pressing the tab in and pulling outward. See [Figure 284](#).
7. Using a cutters, cut and remove the X EOT wire tie. See [Figure 284](#).

Figure 284: X EOT switch detail



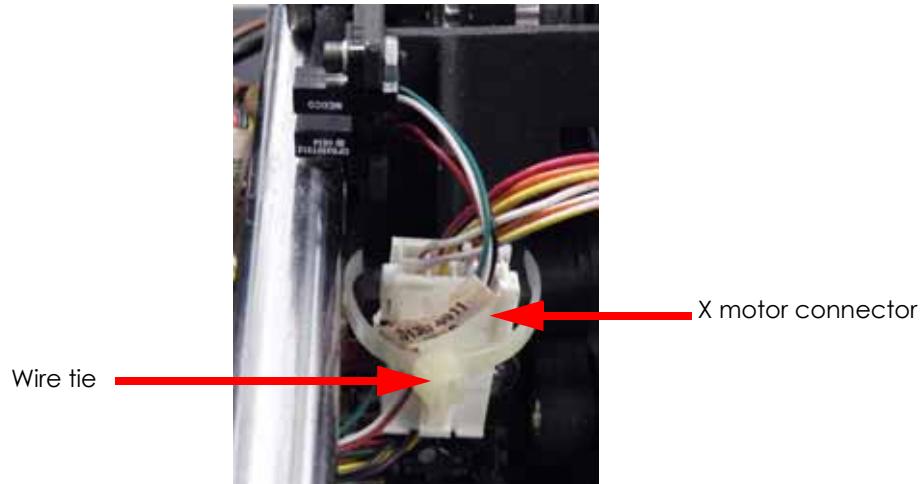
8. Locate the X BOT sensor. See [Figure 285](#).

Figure 285: X BOT location



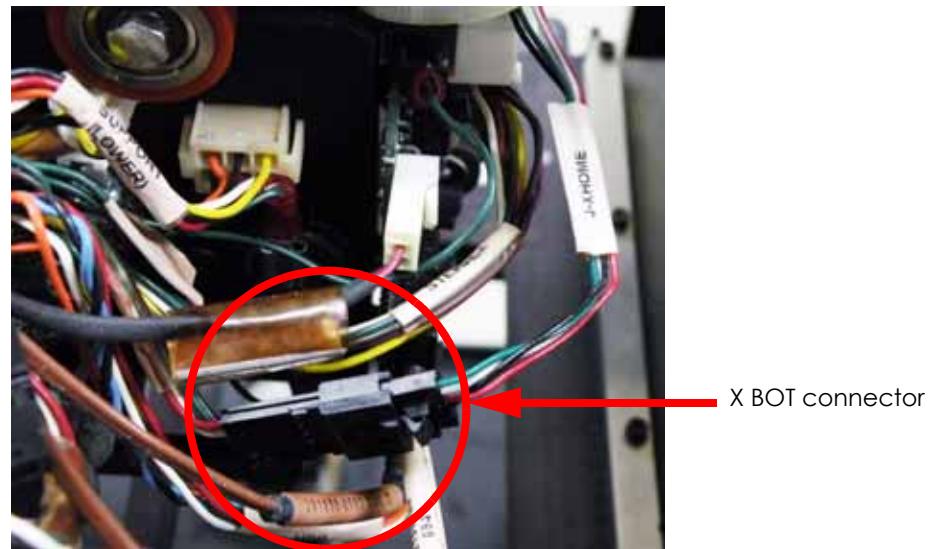
9. Cut and remove the wire tie holding the X motor connector to the head. See [Figure 286](#).
10. Disconnect the X motor by pressing the tab in and pulling the connector apart. See [Figure 286](#).

Figure 286: Wire tie location



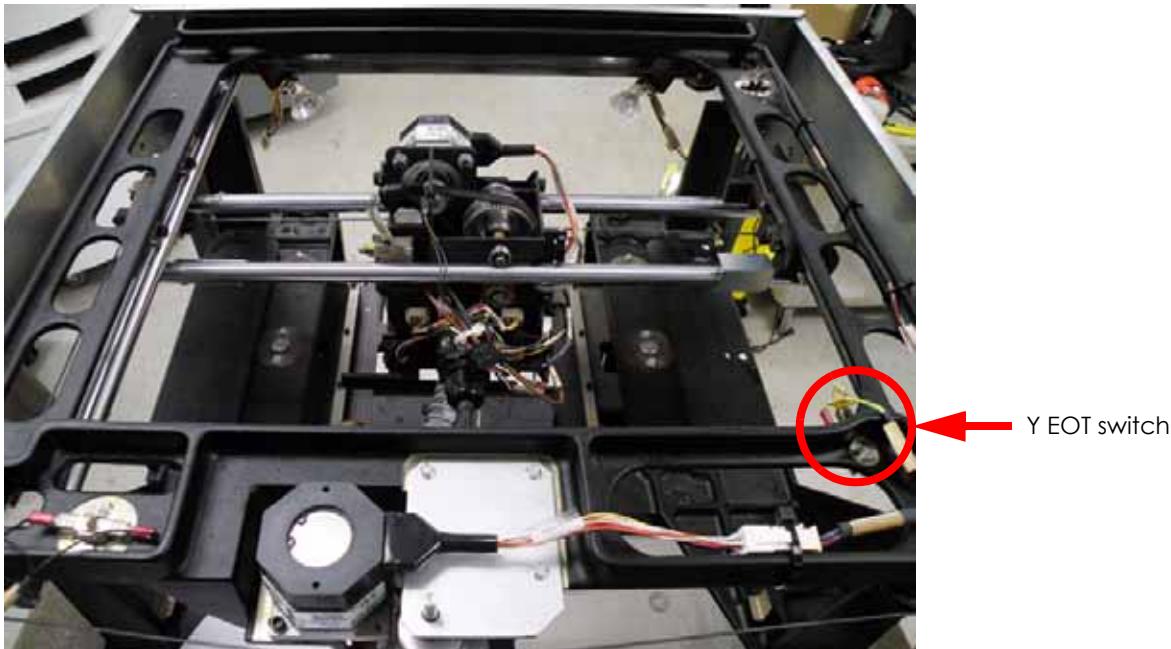
11. Disconnect the X BOT cable by pressing the tab in and pulling the connectors apart. See [Figure 287](#).

Figure 287: X BOT connector location



12. Locate the Y EOT limit switch. See [Figure 288](#).

Figure 288: Y EOT switch location

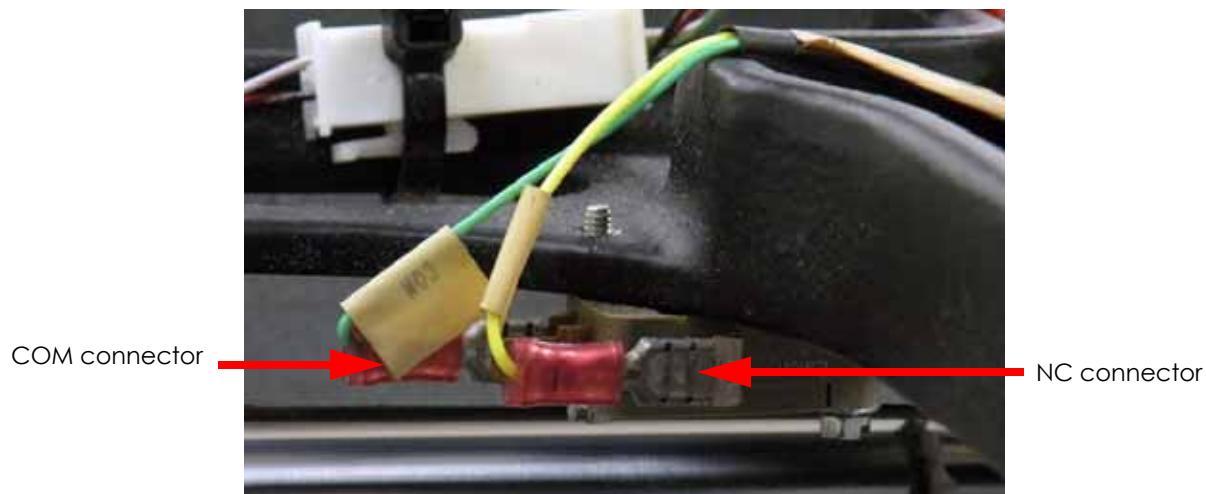


13. Disconnect the NC (yellow) and COM (green) spade connectors from the switch by pulling outwards. See [Figure 289](#).



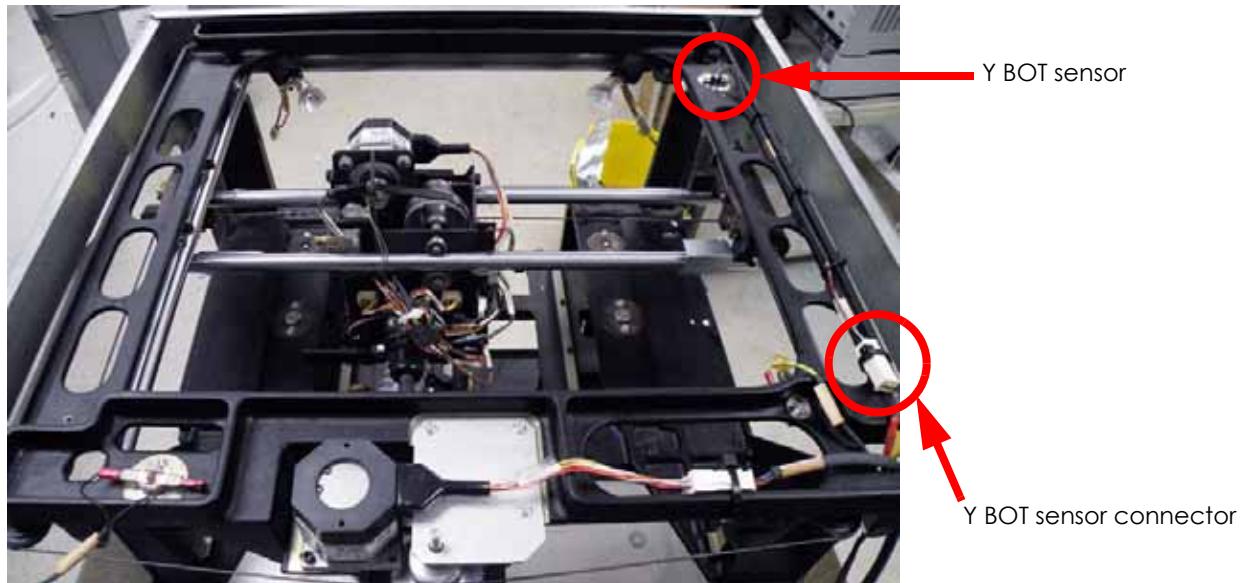
Note the location of the NC (yellow) and COM (green) wires for easy reinstallation.

Figure 289: Y EOT switch connector locations



14. Locate the Y BOT sensor and Y BOT sensor connector. See [Figure 290](#).

Figure 290: Y BOT location



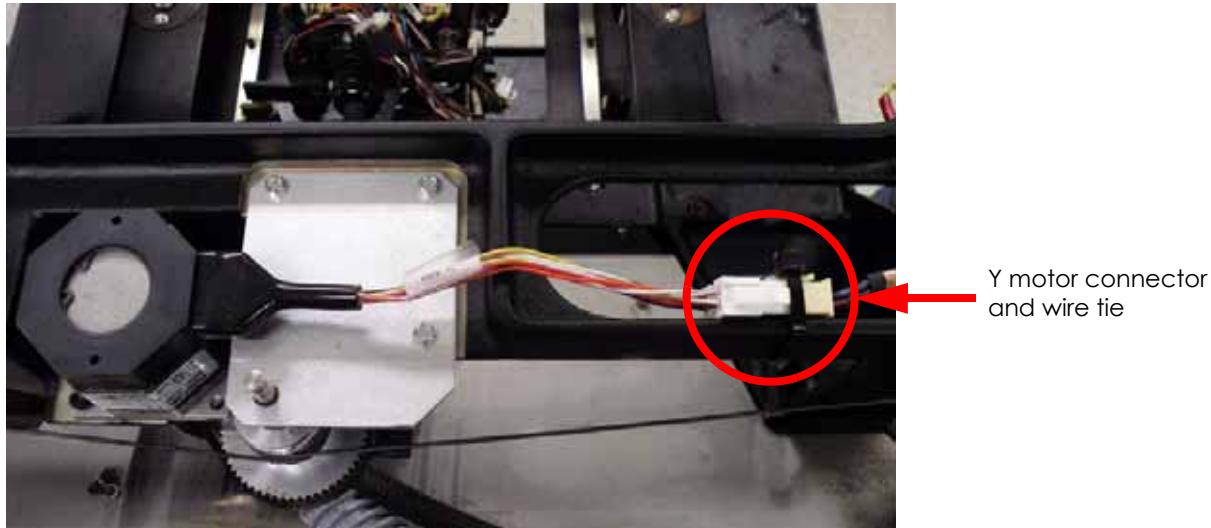
15. Using a cutters, cut and remove the wire tie from the Y BOT connector. See [Figure 291](#).
16. Disconnect the Y BOT sensor connector by pressing the tab in and pulling outwards. See [Figure 291](#).

Figure 291: Wire tie and Y BOT connector locations



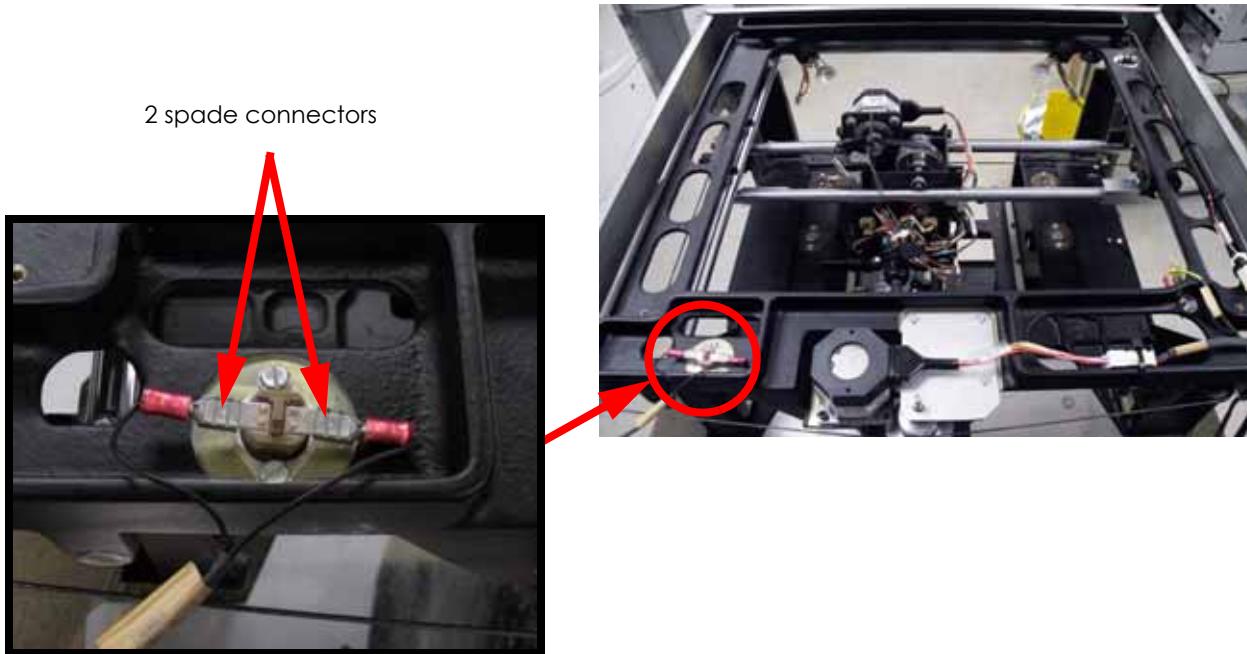
17. Using a cutters, cut the wire tie from the Y motor connector and disconnect the Y motor cable by pressing the tab in and pulling apart. See [Figure 292](#).

Figure 292: Y motor cable location



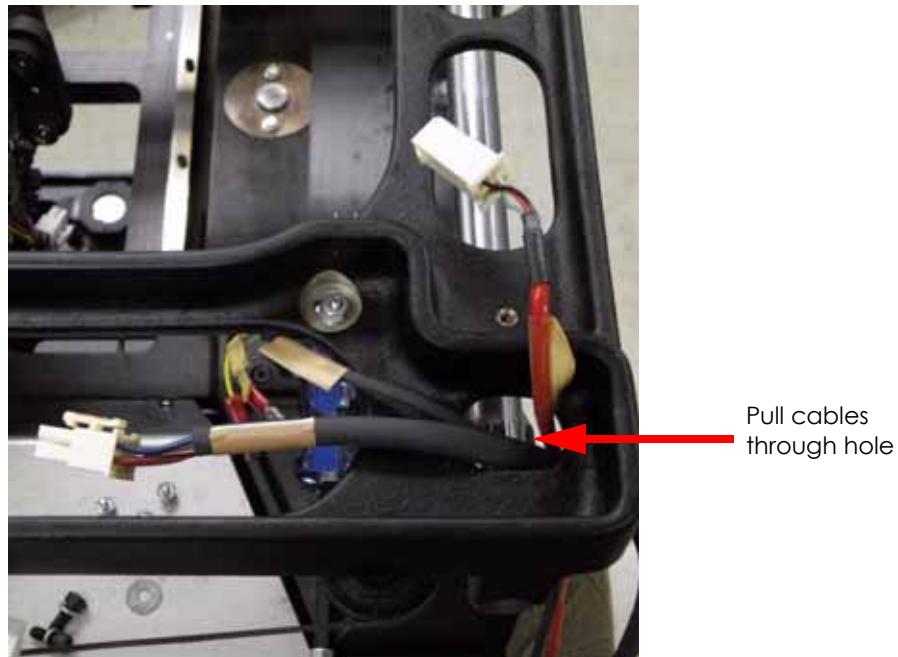
18. Locate the chamber thermal snap switch and disconnect by pulling the spade connectors apart. See [Figure 293](#).

Figure 293: Chamber thermal snap switch location



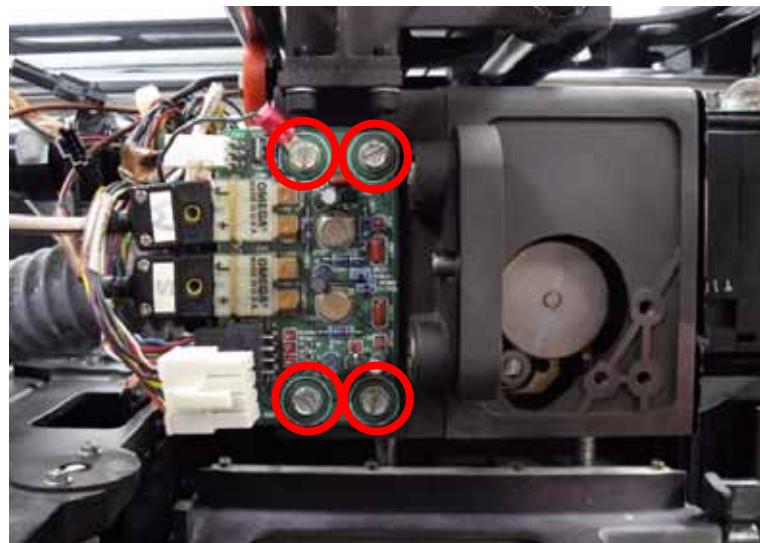
19. Pull the cables out through the hole in the rear left corner of the XY table. See [Figure 294](#).

Figure 294: Wire location



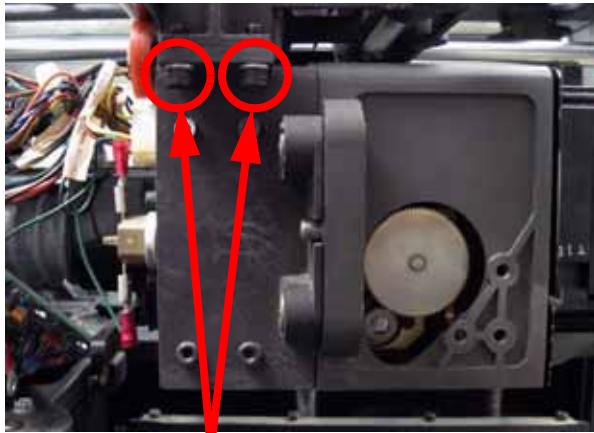
20. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 TC Amp board mounting screws and let TC Amp board hang to the side. See [Figure 295](#).

Figure 295: TC Amp board mounting screw locations

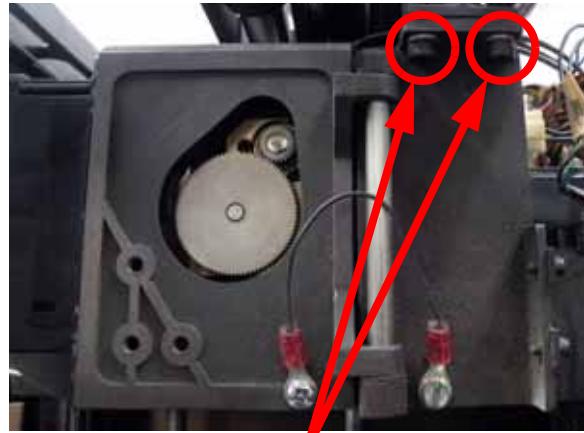


21. Using a $\frac{5}{64}$ " allen wrench, remove the 2 head mounting screws from the left side of the head and the 2 head mounting screws from the right side of the head. See [Figure 296](#).

Figure 296: Head mounting screw locations



2 left side mounting screws



2 right side mounting screws

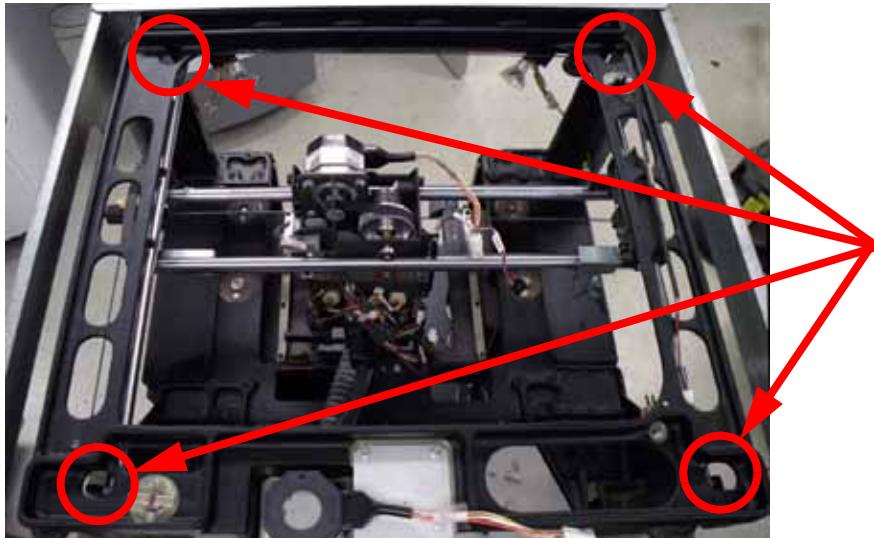
22. Gently lower the head.

23. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 XY table mounting screws and shims. See [Figure 297](#).



Be sure to keep the shims with each corner of the XY table. They will be needed for leveling after reinstallation.

Figure 297: XY Table mounting screw locations



24. Lift the XY table out of the printer.

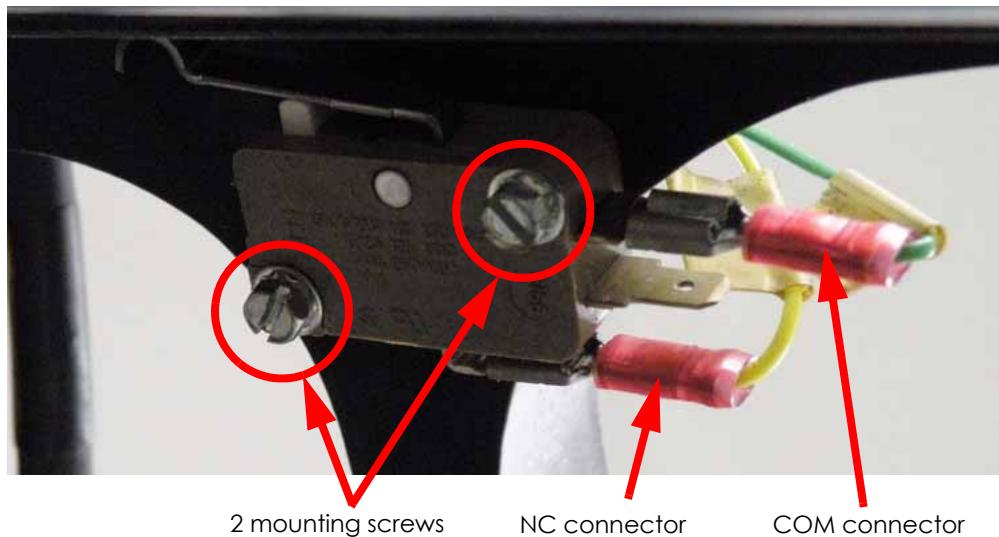


It will be easier to remove the XY table from the printer with 2 people.

Installing the XY Table Assembly:

1. Lift and align the XY table with the mounting posts.
2. Reinstall the shims for each corner of the XY table.
3. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 4 XY table mounting screws.
4. Align the head with the mounting holes and use a $\frac{9}{64}$ " allen wrench to reinstall the 4 mounting screws.
5. Align the TC Amp board with the mounting holes and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
6. Reconnect the chamber thermal snap switch by pushing the spade connectors onto the spades.
7. Feed the Y motor cable, Y EOT cable and Y BOT cable through the hole in the XY Table.
8. Reconnect the Y motor cable by pushing the connectors together and reinstall a wire tie around the Y motor cable connector.
9. Reconnect the Y BOT sensor cable by pushing the connectors together and reinstall a wire tie around the Y BOT cable connector.
10. Reconnect the NC (yellow) wire and COM (green) wire to the Y EOT switch by pushing the connector onto the spade. See [Figure 298](#).

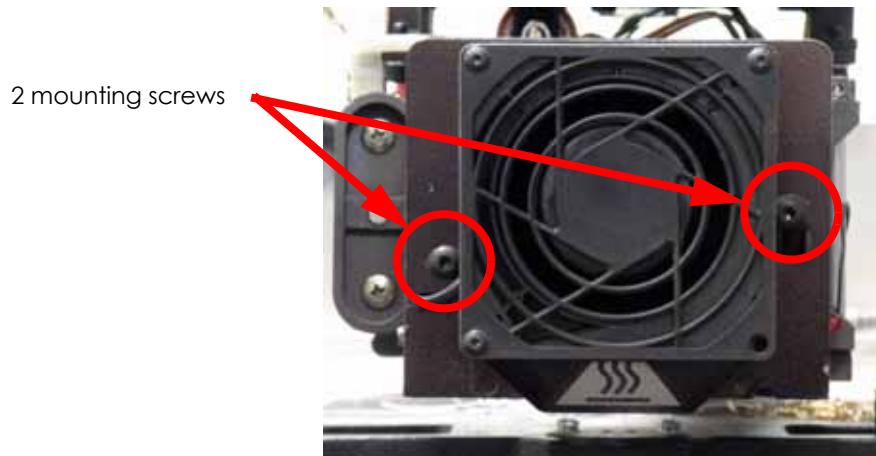
Figure 298: Y EOT detail



11. Reconnect the X BOT sensor cable by pushing the connectors together.
12. Reconnect the X motor cable by pushing the connectors together.
13. Reinstall a wire tie around the X motor cable connector and X BOT sensor cable.
14. Reconnect the X EOT limit switch cable by pushing the connectors together and reinstall a wire tie around the X EOT limit switch cable.

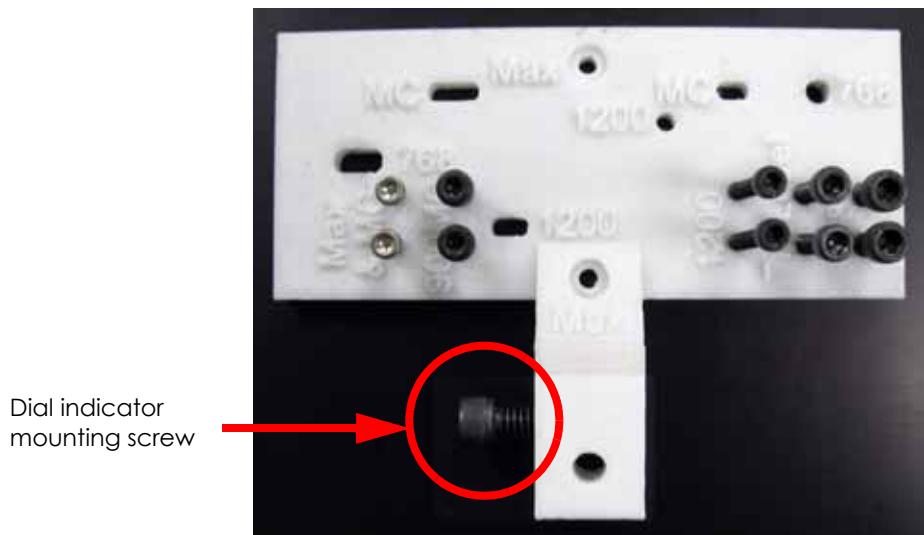
15. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 299](#).

Figure 299: Head fan mounting screw locations



16. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 300](#).

Figure 300: Head bracket mounting screws



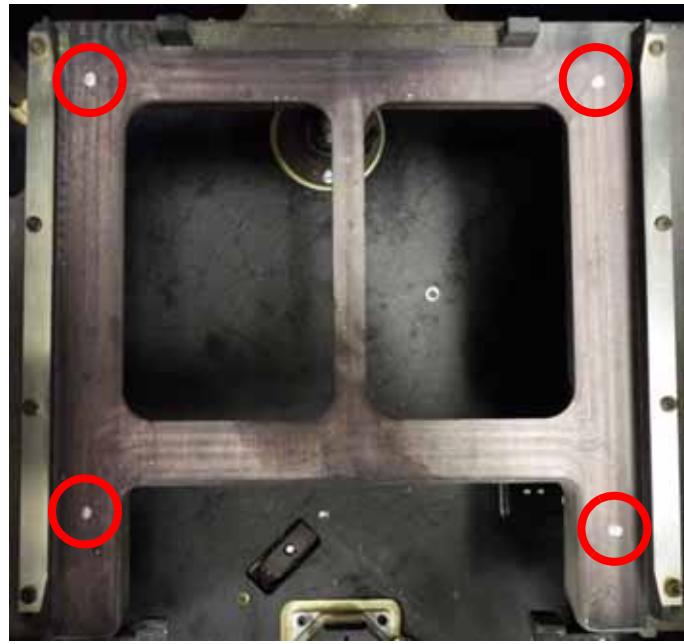
17. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 301](#).

Figure 301: Dial indicator installation



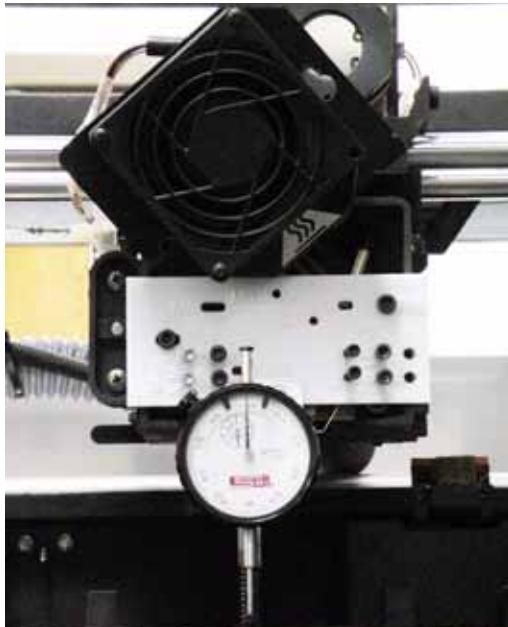
18. Using a light colored marker, mark the Z platen in the rear left, rear right, front left and front right corners. See [Figure 302](#).

Figure 302: Z platen mark locations



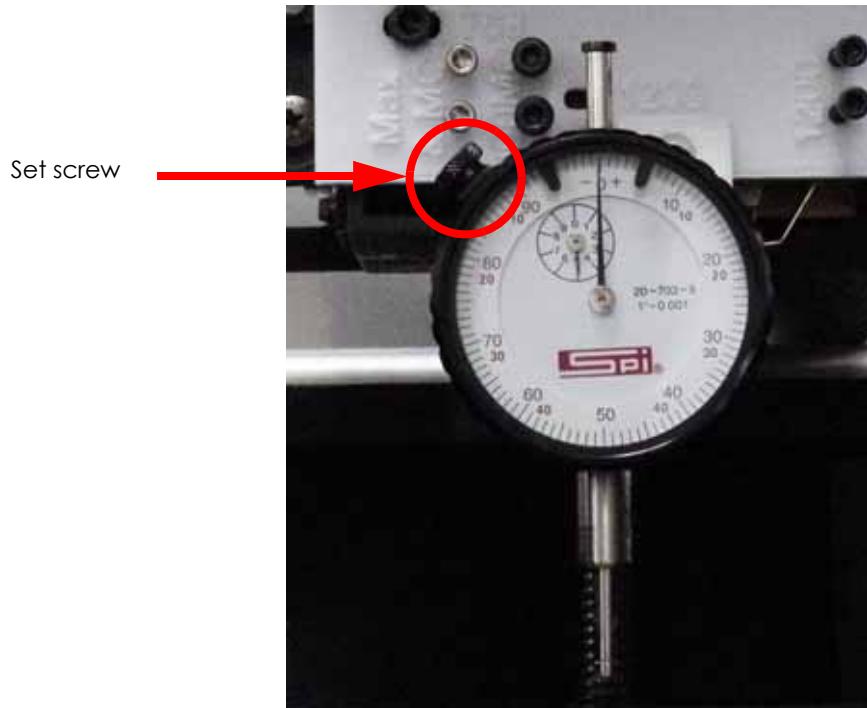
19. Align the head bracket and dial indicator with the head fan mounting holes and use a $\frac{1}{8}$ " allen wrench to install the 2 mounting screws. Position the head fan behind the head bracket. See [Figure 303](#).

Figure 303: Head bracket and dial indicator installation



20. Move the head to the left rear corner mark of the Z platen.
21. Raise the Z stage until it is 2 inches from the upper limit by turning the lead screws.
22. Carefully move head to each of the 4 corners of the platen to determine the HIGHEST corner of the XY (LOWEST indicator reading).
23. Move the dial indicator to the highest corner and zero the dial indicator by loosening the set screw and turning the dial until the long hand is at 0. Once the dial indicator is at zero, tighten the set screw. See [Figure 304](#).

Figure 304: Zero the dial indicator



24. Move indicator to the remaining 3 corners and record the height at each.

i The LOWER the XY table is, the GREATER the indicator reading will be.

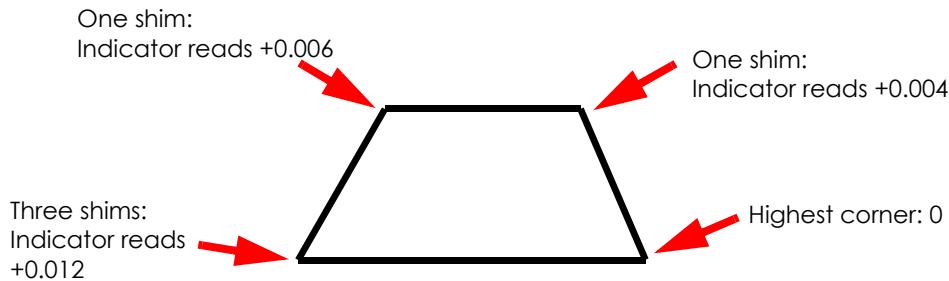
25. Each 0.010 shim will cause the head to raise approximately 0.004" at each corner.

i As an example: If a corner of the XY is low 0.012 (indicator reads +0.012) it will take three shims to raise it to the correct height.

i If the table is off by a number not divisible by 4, round to the nearest shim. (0.009" would be two shims, 0.010" would be two shims, 0.011" would be 3 shims)

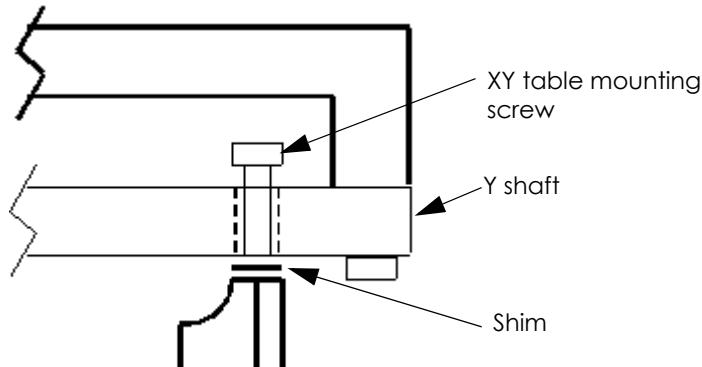
26. Calculate the number of shims needed at each of the three corners. See [Figure 305](#).

Figure 305: Shim calculation



27. Once the number of shims has been determined, loosen all four of the XY table mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
28. At one of the low corners loosen the mounting screw until it can be removed.
29. Slightly lift this end of the XY table and pull the screw upwards enough to slip shim(s) in place. Shim(s) should be located between the Y shaft and the top Z casting post. See [Figure 306](#).

Figure 306: Shim location



30. Feed mounting screw through shim(s) and into threaded hole. Loosely secure the screw by turning screw a few rotations. Do not tighten.
31. Repeat steps [28](#) and [30](#) for the remaining two corners.
32. Tighten all four XY table mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
33. Move the dial indicator to all four corners to check if table is level.
34. The table is level if it is within 0.003". If the table is NOT level, repeat steps [23](#) through [33](#).
35. Remove the 2 mounting screws from the head bracket.
36. Remove the dial indicator mounting screw from the head bracket.
37. Reinstall the side panels. See "[Side Panels](#)" on page [5-11](#).
38. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page [5-10](#).
39. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).

40. Power on the system. The system should reach **Idle** with no displayed errors.
41. Open Maraca from a lap top or workstation PC.
42. Connect to the printer.
43. Select Table from Maraca menu.
44. Table calibration window will open.
45. Insert XY Table calibration diskette into workstation floppy drive.
46. Click on the folder icon. Browse to select floppy drive.
47. Double click on the XXX.dat file. File will now appear in the table calibration field.
48. Click on the green check mark to download the file and exit Maraca.
49. Restart the printer.
50. Perform tip offset calibrations. See "[Tip Offset Calibration](#)" on page 6-8.
51. Perform part based calibration. See "[Part Based Calibration](#)" on page 6-12.
52. Run a small test part and monitor system operation during build.
53. Follow the XY Table checklist. See "[XY Table Installation Checklist](#)" on page Appendix-19.
54. Send bad cable XY table back to Stratasys, Inc.

XY Table Belt Drive Components

X BOT (Home) Sensor (Belt Drive)

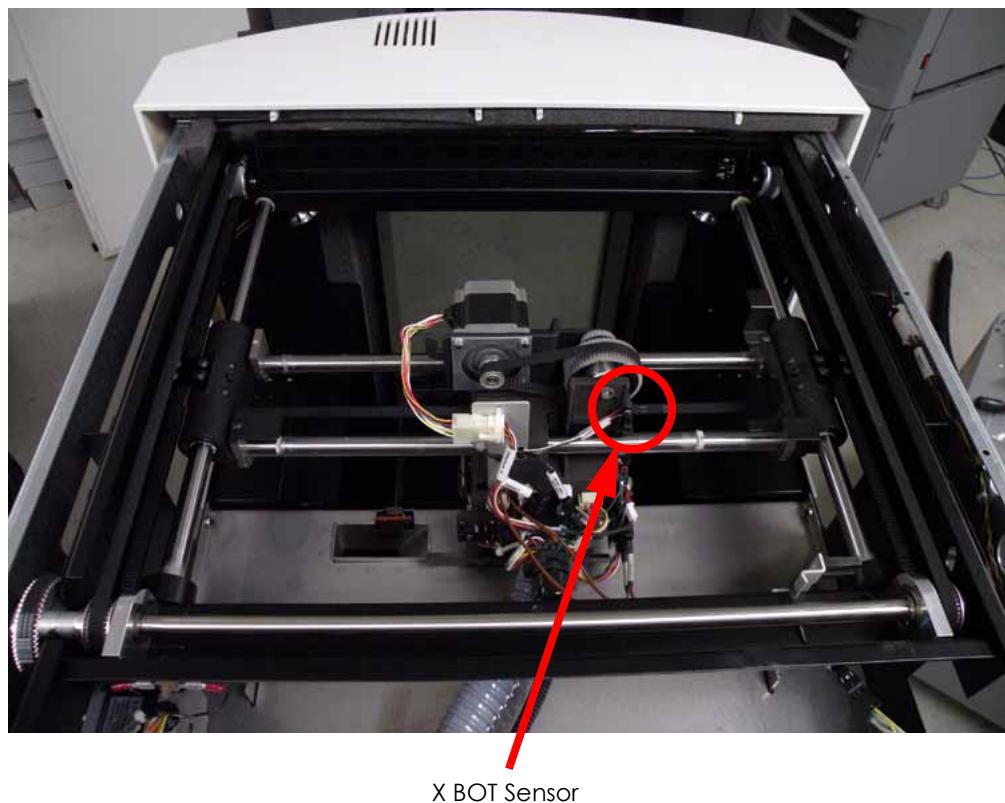
Required Tools

- $\frac{3}{32}$ " allen wrench
- Cutters

Removing the X BOT Sensor:

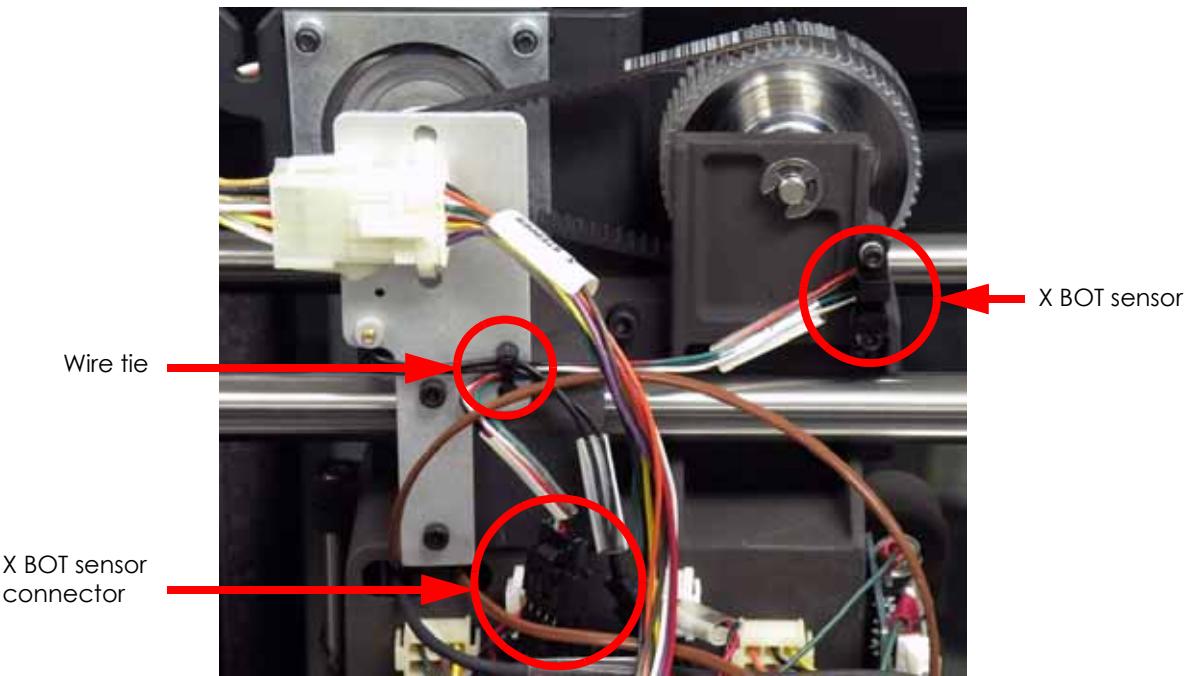
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X BOT sensor (upper left behind head). See [Figure 307](#).

Figure 307: X BOT sensor location



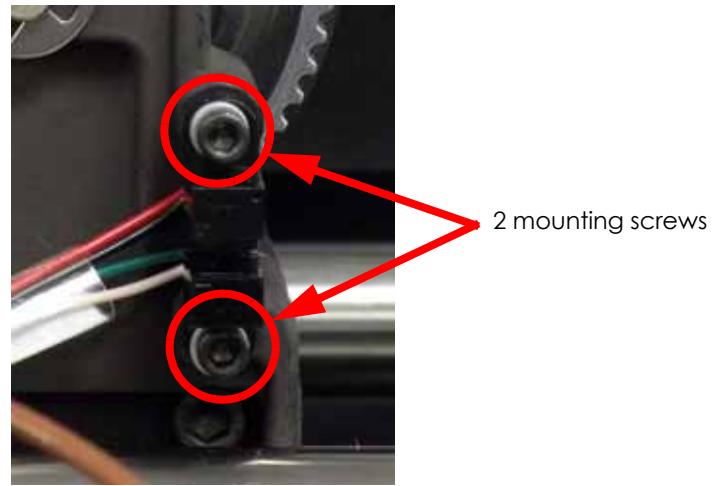
6. Using a cutters, cut and remove the wire tie securing the X BOT sensor wire. See [Figure 308](#).
7. Disconnect the X BOT sensor by pressing the tab in and pulling apart. See [Figure 308](#).

Figure 308: X BOT sensor connector location



8. Using a $\frac{3}{32}$ " allen wrench, remove the 2 X BOT sensor mounting screws. See [Figure 309](#).

Figure 309: X BOT sensor mounting screw locations



9. Remove the X BOT sensor and discard.

Installing the X BOT Sensor:

1. Align the X BOT sensor with the mounting holes.
2. Using a $\frac{3}{32}$ " allen wrench, reinstall the 2 mounting screws.
3. Reconnect the X BOT sensor wire by pushing into the connector.
4. Reinstall a wire tie around the X BOT Sensor wire.
5. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
6. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power on the system. The system should reach **Idle** with no displayed errors.
9. Run a small test part and monitor system operation during build.

X EOT (End of Travel) Sensor (Belt Drive)

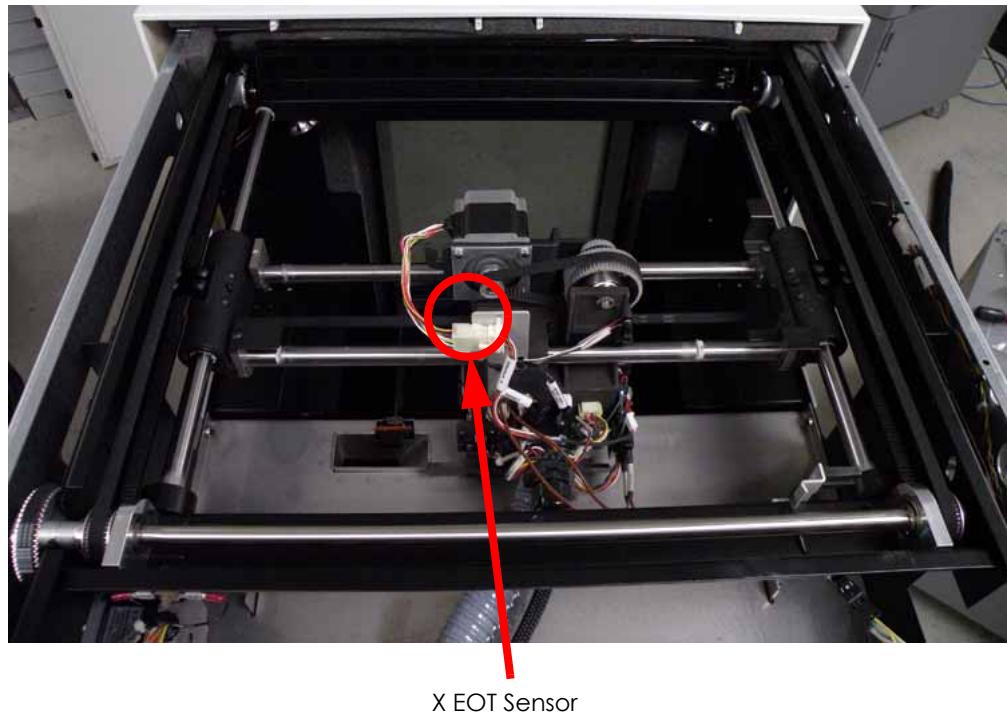
Required Tools

- $\frac{7}{64}$ " allen wrench
- Phillips screwdriver
- Cutters

Removing the X EOT Sensor:

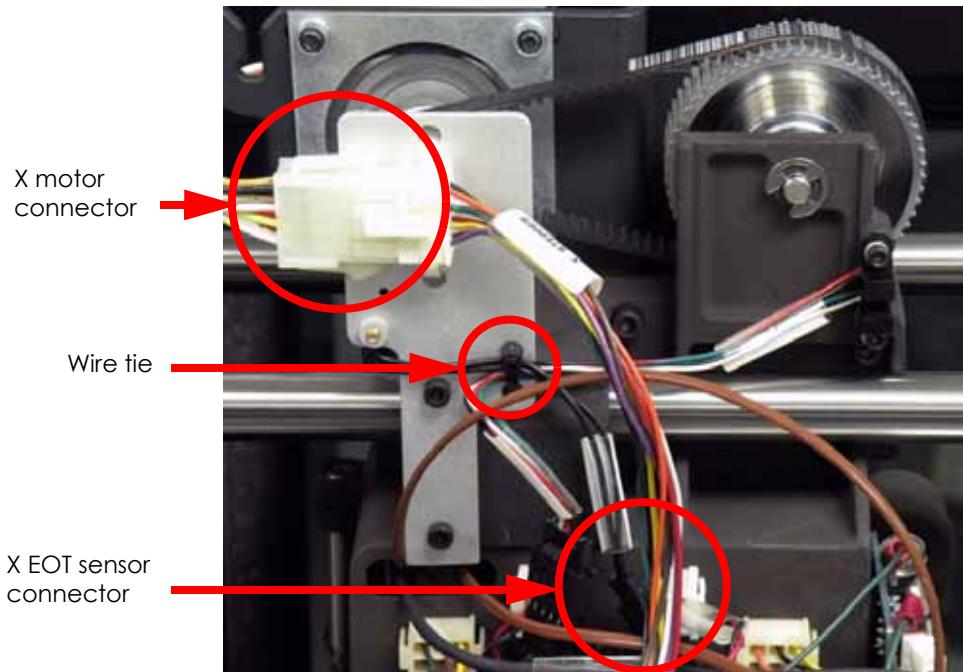
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X EOT sensor (upper right rear of the head). See [Figure 310](#).

Figure 310: X EOT sensor location



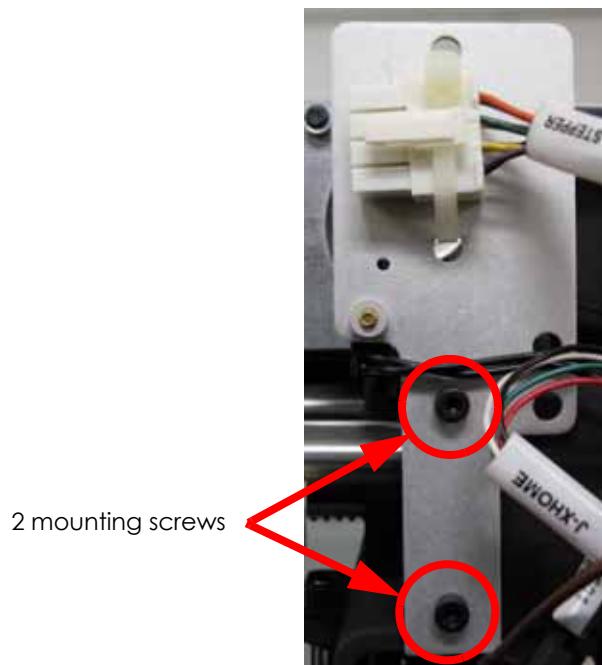
6. Using a cutters, cut and remove the wire tie securing the X EOT sensor wire. See [Figure 311](#).
7. Disconnect the X EOT sensor by pressing the tab in and pulling apart. See [Figure 311](#).
8. Disconnect the X motor cable by pressing the tab in and pulling outwards. See [Figure 311](#).

Figure 311: X EOT sensor connector location



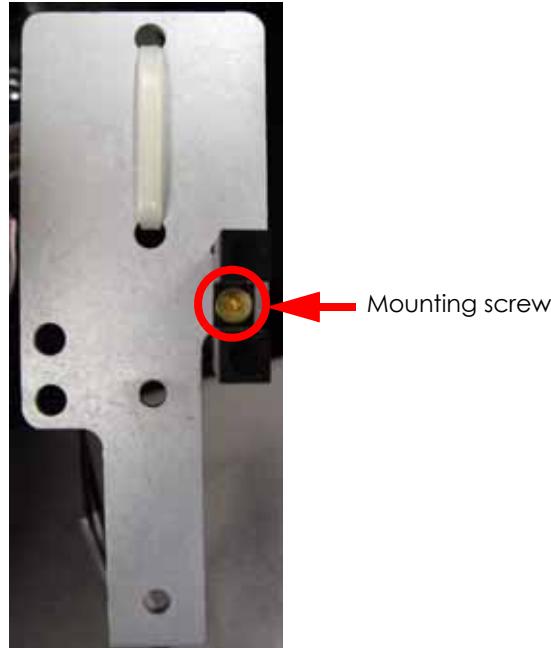
9. Using a $\frac{7}{64}$ " allen wrench, remove the 2 X EOT sensor mounting bracket mounting screws. See [Figure 312](#).

Figure 312: X EOT sensor mounting bracket mounting screw locations



10. Using a phillips screwdriver, remove the X EOT sensor mounting screw. See [Figure 313](#).

Figure 313: X EOT sensor mounting screw location



11. Remove the X EOT sensor and discard.

Installing the X EOT Sensor:

1. Align the X EOT sensor with the mounting bracket and use a phillips screwdriver to reinstall the mounting screw.



The dimple on the sensor fits into the small hole on the bracket.

2. Align the X EOT sensor mounting bracket with the translator and use a $\frac{7}{64}$ " allen wrench to reinstall the 2 mounting screws.
3. Reconnect the X EOT sensor by pushing the connectors together.
4. Reconnect the X motor cable by pushing the connectors together.
5. Reinstall a wire tie around the X EOT sensor wire.
6. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
7. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power on the system. The system should reach **Idle** with no displayed errors.
10. Run a small test part and monitor system operation during build.

X Motor (Belt Drive)

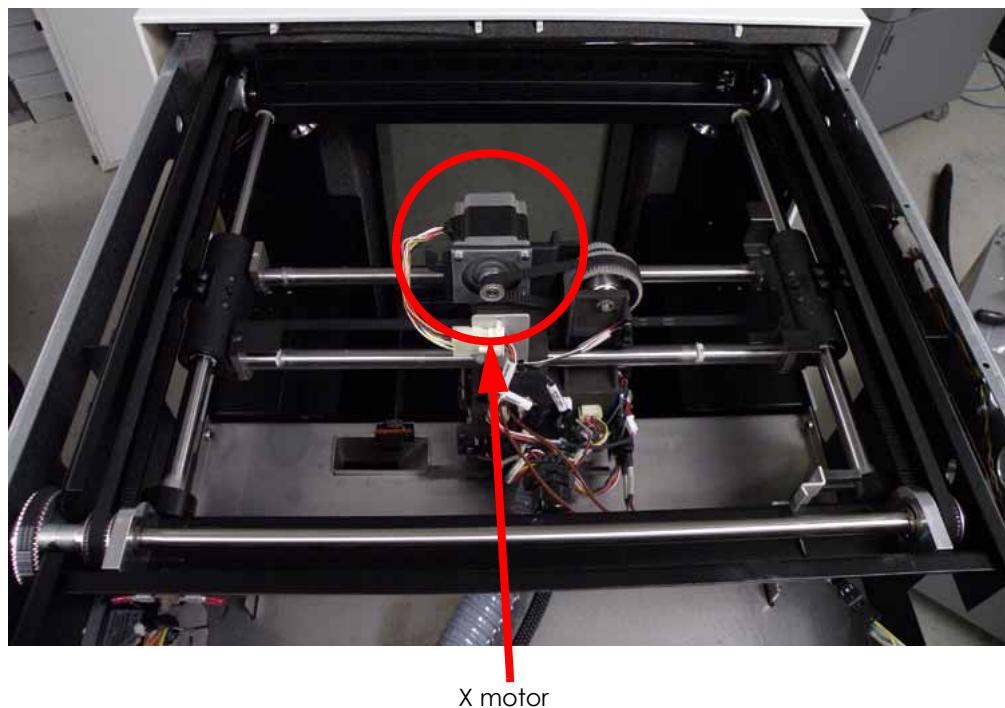
Required Tools

- $\frac{9}{64}$ " allen wrench
- Belt tension tool

Removing the X Motor:

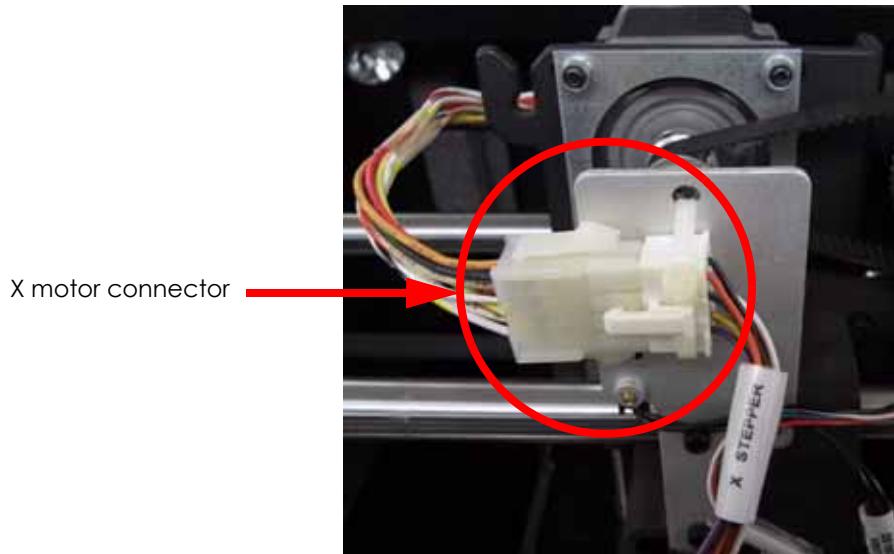
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X motor. See [Figure 314](#).

Figure 314: X motor location



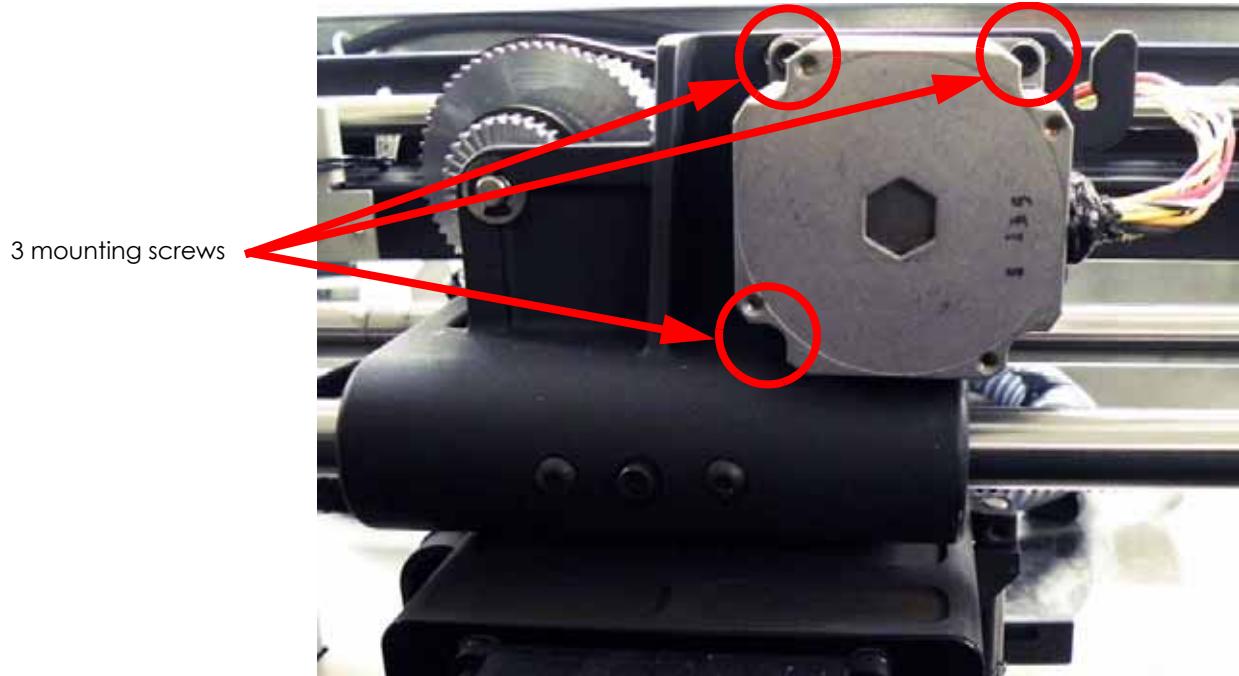
6. Disconnect the X motor cable by pressing the tab in and pulling outwards. See [Figure 315](#).

Figure 315: X motor connector location



7. Using a $\frac{9}{64}$ " allen wrench, remove the 3 X motor mounting screws. See [Figure 316](#).

Figure 316: X motor mounting screw locations



8. Slide the motor to the left and remove the X motor belt from the X motor pulley and remove the X motor.

Installing the X Motor:

1. Align the X motor with the mounting holes and use a $\frac{9}{64}$ " allen wrench to loosely reinstall the 3 X motor mounting screws.



Make sure the X motor cable is on the right side of the X motor when reinstalling.

2. Place the X motor belt around the X motor pulley.
3. Insert the XY motor belt tension tool between the X motor pulley and the X drive pulley by squeezing the tension tool and releasing pressure when in place. See [Figure 317](#).

Figure 317: XY belt tension tool placement



4. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 X motor mounting screws.
5. Remove the belt tension tool.
6. Reconnect the X motor by pushing the connectors together.
7. Secure the motor using the three mounting screws. Do not tighten screws.
8. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
9. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
10. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
11. Power on the system. The system should reach **Idle** with no displayed errors.
12. Run a small test part and monitor system operation during build.

X Motor Belt (Belt Drive)

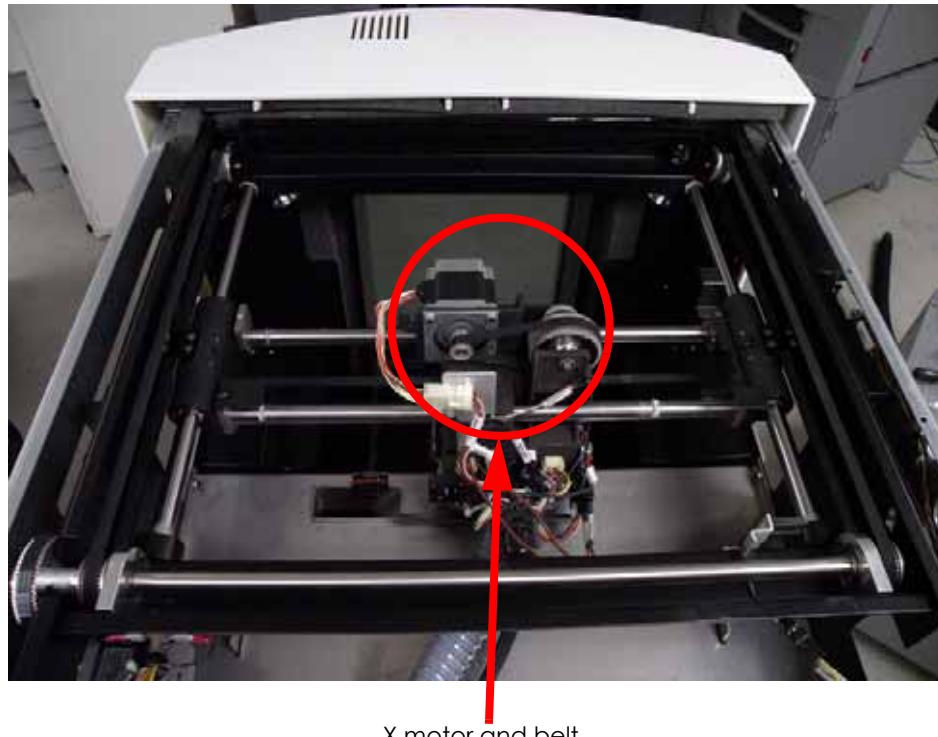
Required Tools

- $\frac{9}{64}$ " allen wrench
- $\frac{7}{64}$ " allen wrench
- $\frac{3}{8}$ " nut driver or box wrench
- Small standard screwdriver
- XY motor belt tensioning tool
- Belt tension gauge
- Dial Indicator

Removing the X Motor Belt:

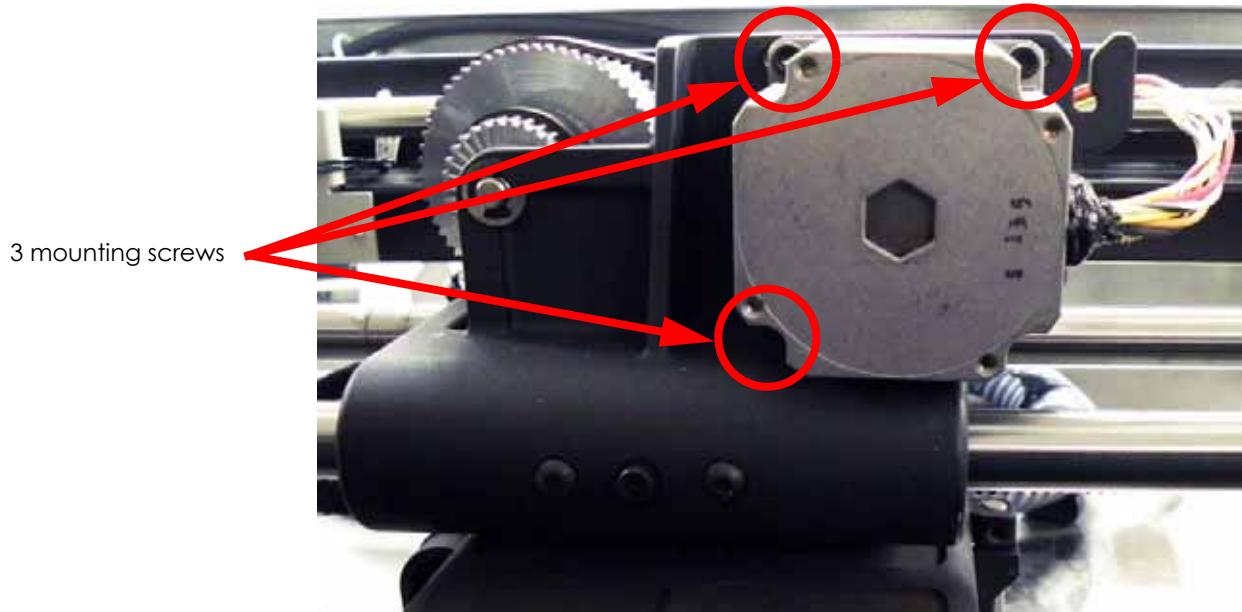
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X motor and X motor belt. See [Figure 318](#).

Figure 318: X motor belt location



6. Loosen, but do not remove, the 3 X motor mounting screws using a $\frac{9}{64}$ " allen wrench. See [Figure 319](#).

Figure 319: X motor mounting screw locations



7. Loosen the X motor belt by sliding the X motor to the right and remove the X motor belt from the X motor pulley. See [Figure 320](#).

Figure 320: Removing the X motor belt

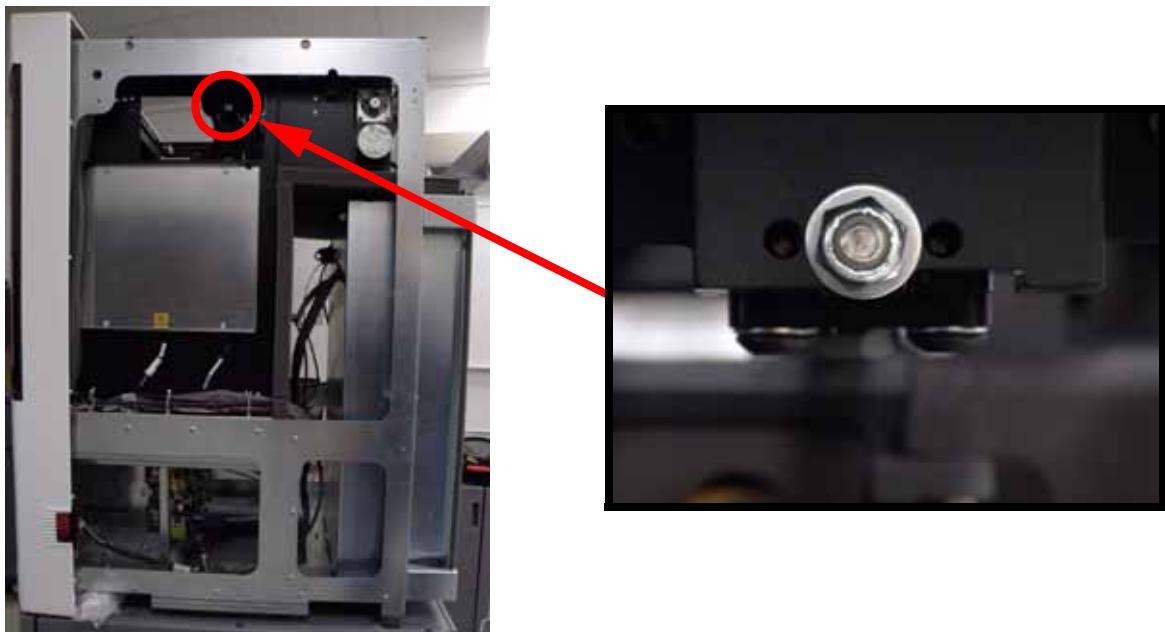


8. Using a $\frac{3}{8}$ " nut driver or box wrench, loosen the X drive belt by turning the X drive belt tensioning nut counter clockwise. See [Figure 321](#).



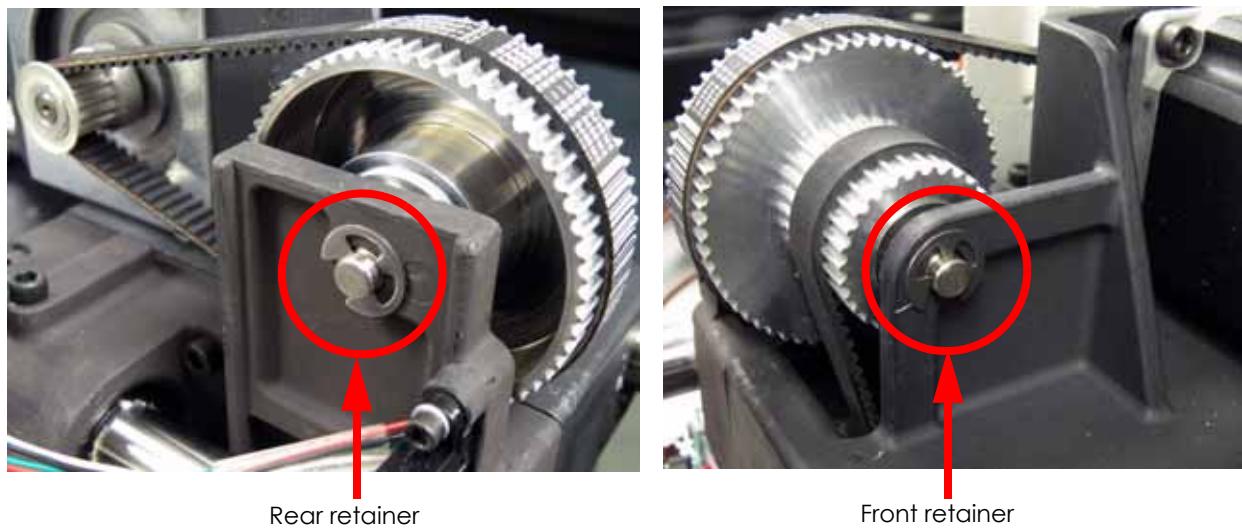
The X drive belt will need to be very loose to allow removal of the X motor belt.

Figure 321: X drive belt tensioning nut location



9. Using a small standard screwdriver, remove the two retaining rings from the X drive pulley shaft. See [Figure 322](#).

Figure 322: X drive pulley shaft location

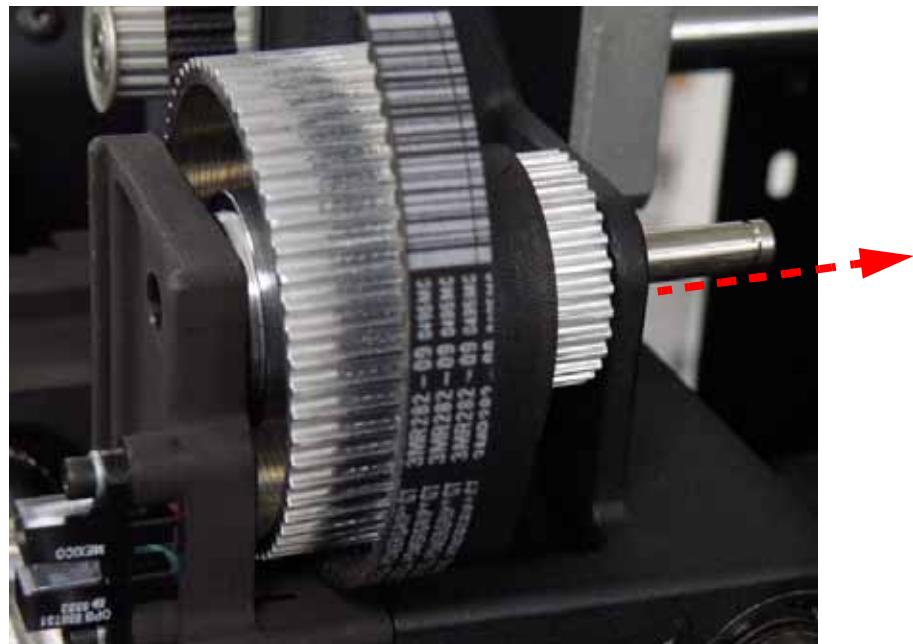


Rear retainer

Front retainer

10. Push shaft out of the pulley and set aside. See [Figure 323](#).

Figure 323: X drive pulley shaft removal



11. Roll the X drive pulley down to the right, remove the X motor belt and discard. See [Figure 324](#).

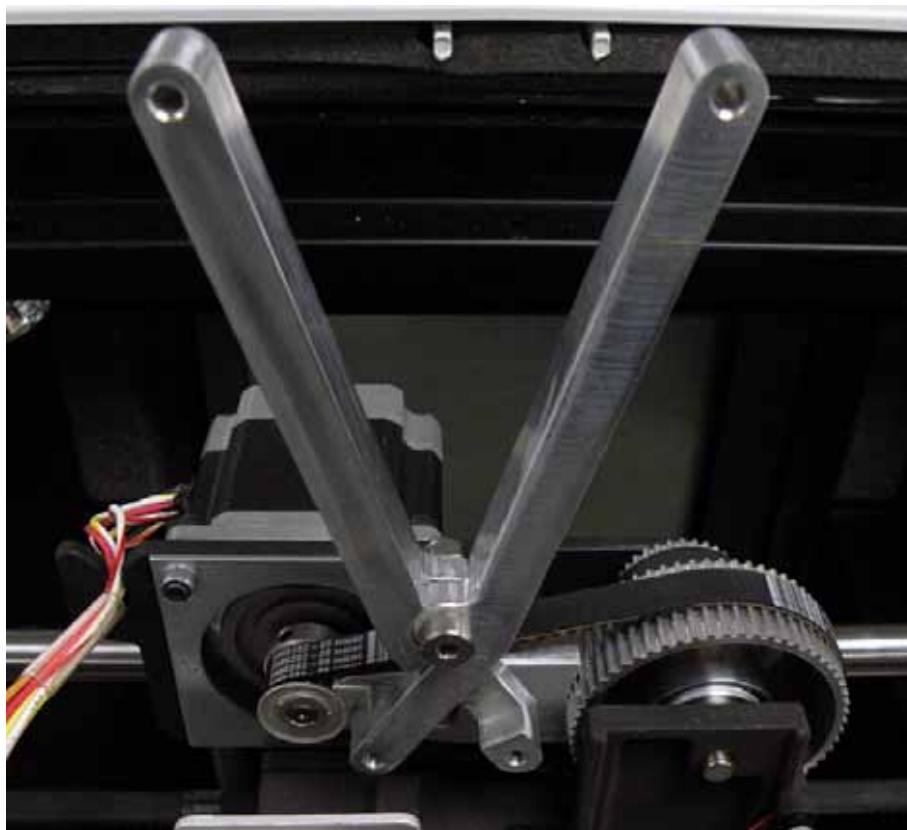
Figure 324: Removing the X motor belt



Installing the X Motor Belt:

1. Place the X belt over the X drive pulley.
2. Slide the X drive pulley back into position.
3. Reinstall the X drive pulley shaft and retaining rings.
4. Loop the X motor belt around the X motor pulley.
5. Insert the XY motor belt tension tool between the X motor pulley and the X drive pulley by squeezing the tension tool and releasing pressure when in place. See [Figure 325](#).

Figure 325: XY belt tension tool placement



6. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 X motor mounting screws.
7. Remove the belt tension tool.
8. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 326](#).

Figure 326: Belt tension gauge zero block



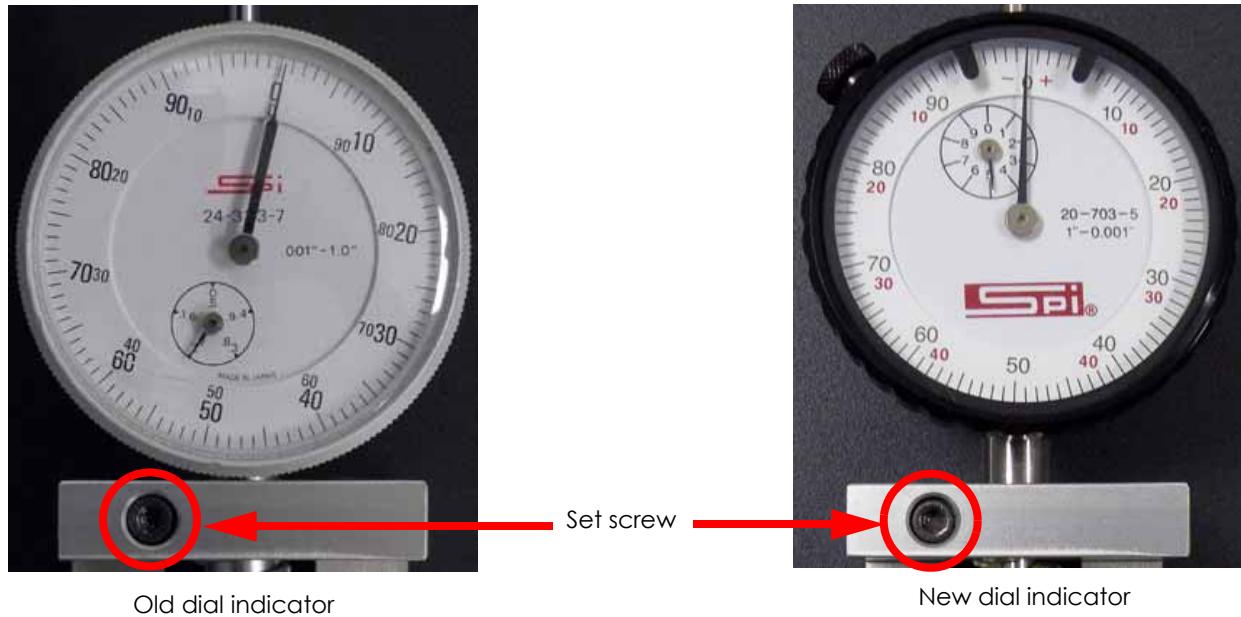
Old dial indicator



New dial indicator

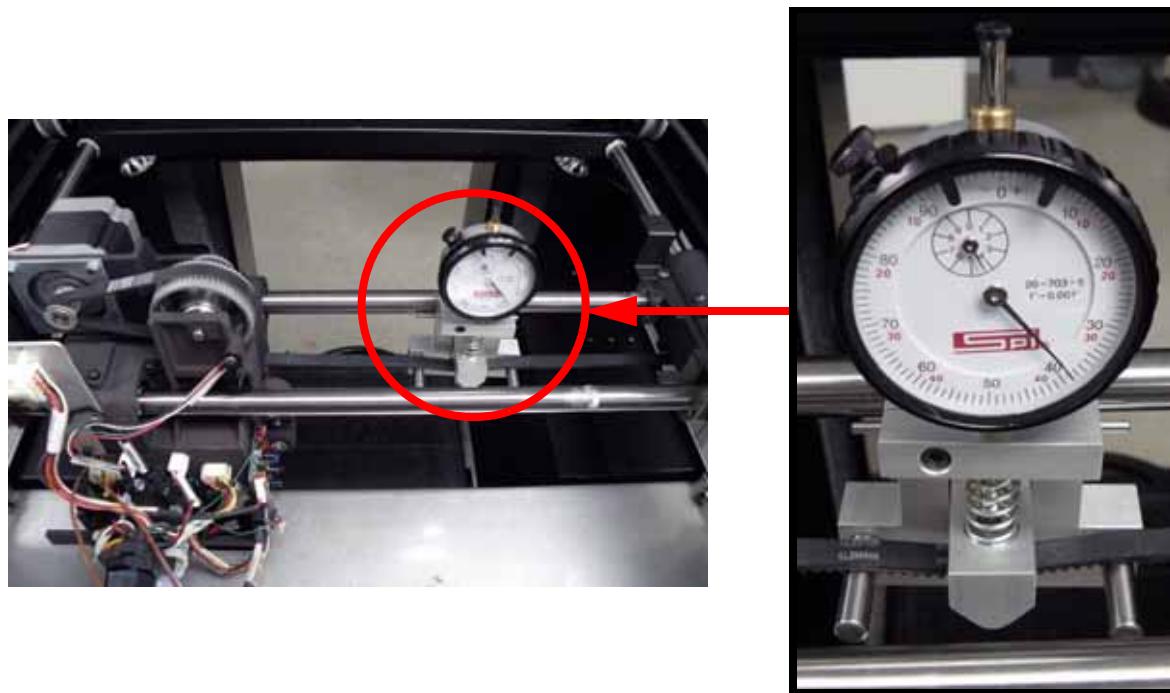
9. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 327](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 327](#).

Figure 327: Setting the dial indicator



10. Remove the zero block from the belt tension gauge.
11. Move the head to the far right side of the printer.
12. Place the belt tension gauge on the center of the X drive belt. See [Figure 328](#).

Figure 328: Belt tension gauge location



13. Using a $\frac{3}{8}$ " nut driver or box wrench, tighten the X drive belt by turning the X drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 20 and 25 mils and the small hand is nearly on 1.6. See [Figure 329](#).
 - b. The new dial indicators large hand is between 30 and 40 mils and the small hand is between 4 and 5. See [Figure 329](#).

Figure 329: Dial indicator readings



Old dial indicator



New dial indicator

14. Remove the tension gauge and move the head from left to right several times.
15. Reattach the tension gauge to the X drive belt and measure belt tension. If tension is out of specification, repeat steps [11 - 14](#) until the belt tension is within specification.
16. Reconnect the X motor by pushing the connectors together.
17. Reinstall the side panels. See "[Side Panels](#)" on page [5-11](#).
18. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page [5-10](#).
19. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
20. Power on the system. The system should reach **Idle** with no displayed errors.
21. Run a small test part and monitor system operation during build.

X Drive Belt (Belt Drive)

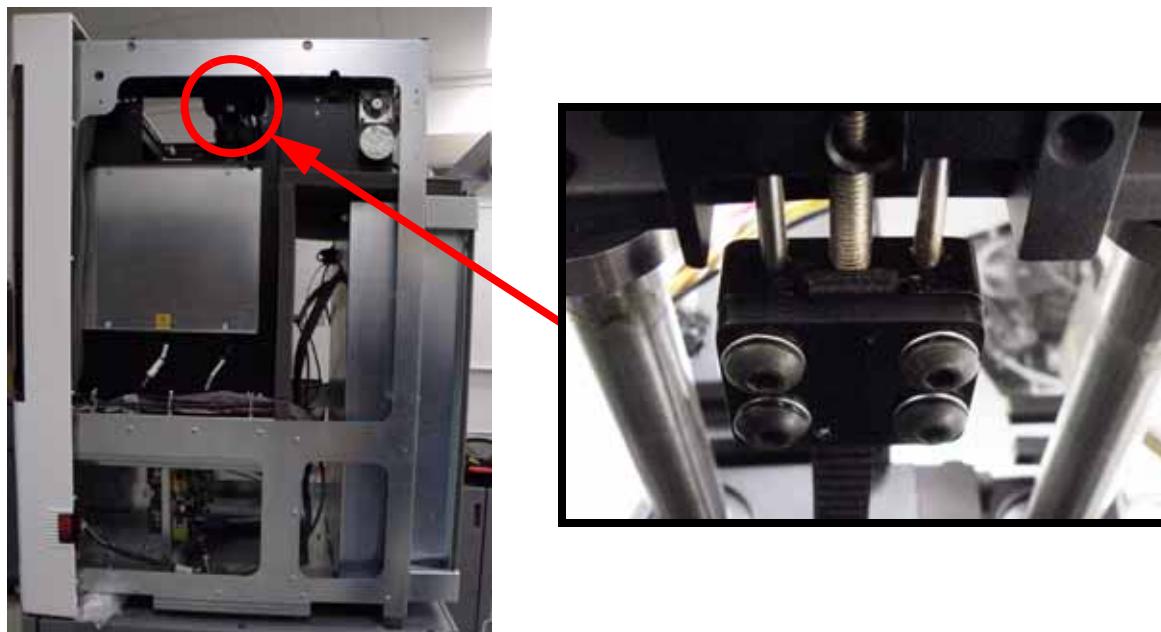
Required Tools

- $\frac{7}{64}$ " allen wrench
- $\frac{1}{8}$ " allen wrench
- Small standard screwdriver
- Belt tensioning tool
- Belt tension gauge
- Dial Indicator

Removing the X Drive Belt:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Remove the X motor belt. See “[Removing the X Motor Belt:](#)” on page 5-266.
6. Locate the right side X drive belt clamp. See [Figure 330](#).

Figure 330: Right side X drive belt clamp location



7. Loosen, but do not remove the 4 right side X drive belt clamp screws using a $\frac{1}{8}$ " allen wrench. See [Figure 331](#).

Figure 331: Right side X drive belt clamp screw locations



4 clamp screws

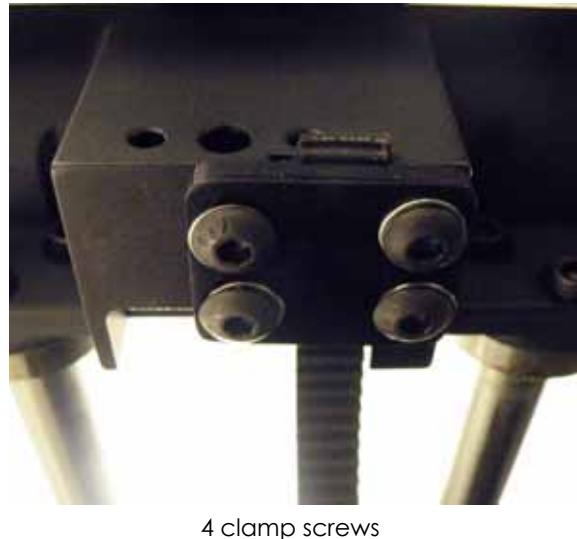
8. Remove the X drive belt from the right side belt clamp.
9. Locate the left side X drive belt clamp. See [Figure 332](#).

Figure 332: Left side X drive belt clamp location



10. Loosen, but do not remove the 4 left side X drive belt clamp screws using a $\frac{1}{8}$ " allen wrench. See [Figure 333](#).

Figure 333: Left side X drive belt clamp screw locations



11. From the left side of the printer, pull the X drive belt through the X drive and discard.

Installing the X Drive Belt:

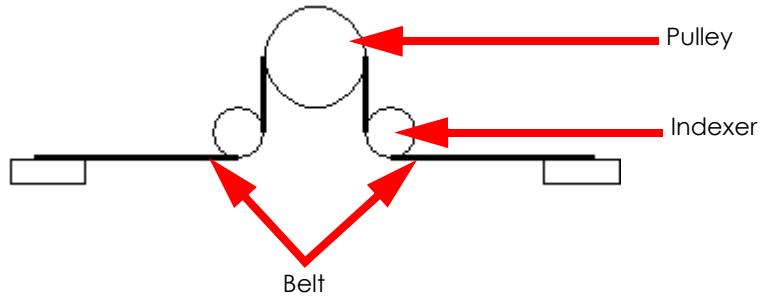
1. Insert the X drive belt into the left side belt clamp, leaving $\frac{1}{8}$ " inch protruding from the end of the belt clamp. See [Figure 334](#).

Figure 334: X drive belt placement



2. Using a $\frac{1}{8}$ " allen wrench, tighten the 4 left side belt clamp screws.
3. Route the X drive belt up though the left indexer. See [Figure 335](#).
4. Wrap the belt around the X drive pulley. See [Figure 335](#).
5. Route the X drive belt down through the right indexer and over to the right side X drive belt clamp. See [Figure 335](#).

Figure 335: Indexer locations



6. Insert the X drive belt into the right side belt clamp, leaving $\frac{1}{8}$ " inch protruding from the end of the belt clamp. See [Figure 336](#).

Figure 336: X drive belt placement



7. Using a $\frac{1}{8}$ " allen wrench, tighten the 4 right side belt clamp screws.
8. Reinstall the X motor belt. See "[Installing the X Motor Belt:](#)" on page 5-270.
9. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
10. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
11. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
12. Power on the system. The system should reach **Idle** with no displayed errors.
13. Run a small test part and monitor system operation during build.

Y BOT (Home) Sensor (Belt Drive)

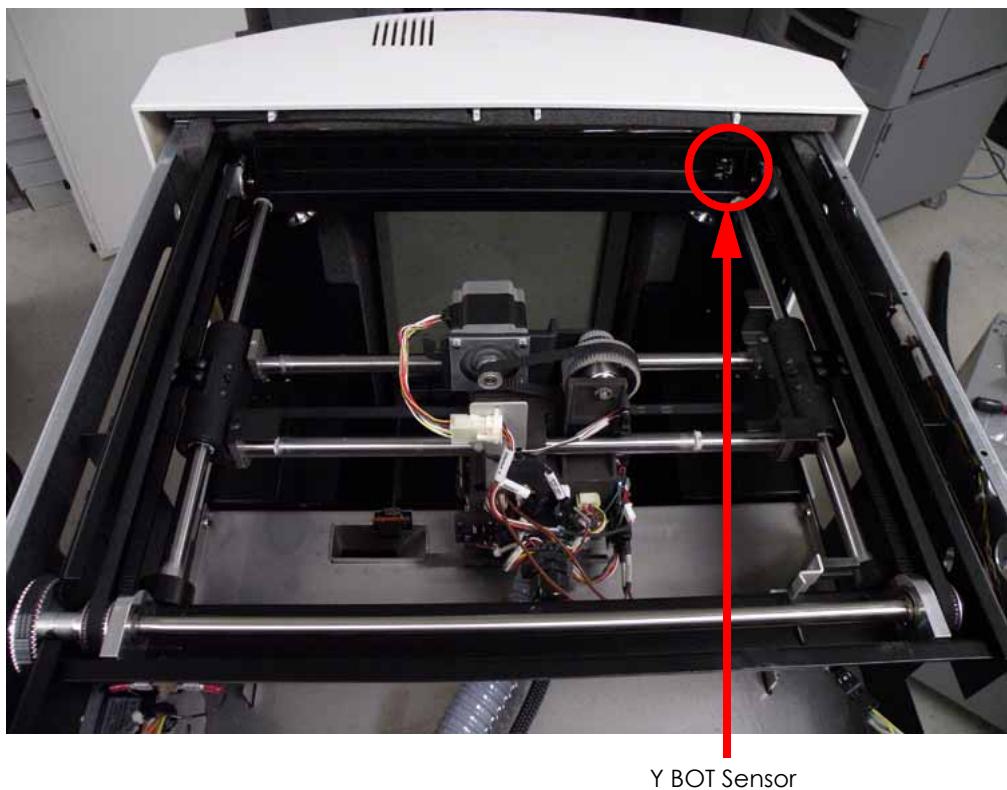
Required Tools

- $\frac{3}{32}$ " allen wrench
- Cutters

Removing the Y BOT (Home) Sensor:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Locate the Y BOT sensor. See [Figure 337](#).

Figure 337: Y BOT sensor location



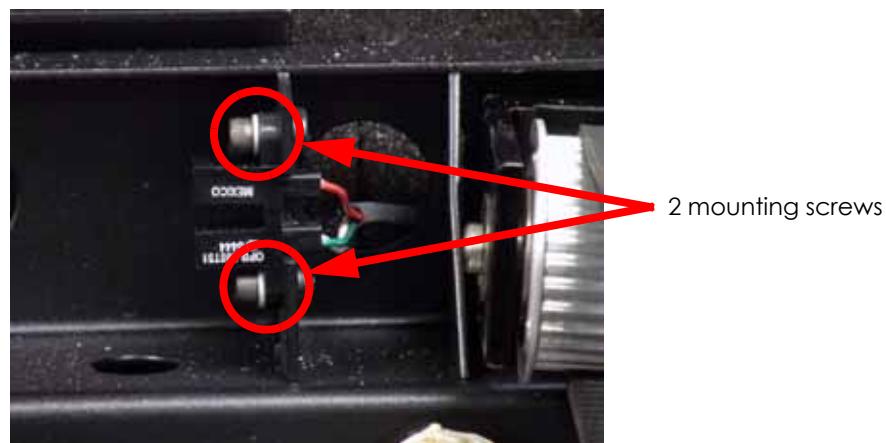
6. Using a cutters, cut the wire tie from around the Y BOT sensor. See [Figure 338](#).
7. Disconnect the Y BOT sensor by pressing the tab in and pulling apart. See [Figure 338](#).

Figure 338: Y BOT sensor connector location



8. Using a $\frac{3}{32}$ " allen wrench, remove the 2 Y BOT sensor mounting screws. See [Figure 339](#).

Figure 339: Y BOT sensor mounting screw locations



9. Remove the Y BOT sensor and discard.

Installing the Y BOT (Home) Sensor:

1. Align the Y BOT sensor with the mounting holes and use a $\frac{3}{32}$ " allen wrench to reinstall the 2 mounting screws.
2. Route the Y BOT sensor wire through the hole in the frame and reconnect by pushing the connectors together.
3. Reinstall a wire tie around the Y BOT sensor connector.
4. Reinstall the side panels. See "["Side Panels" on page 5-11](#)".
5. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Y EOT (End of Travel) Sensor (Belt Drive)

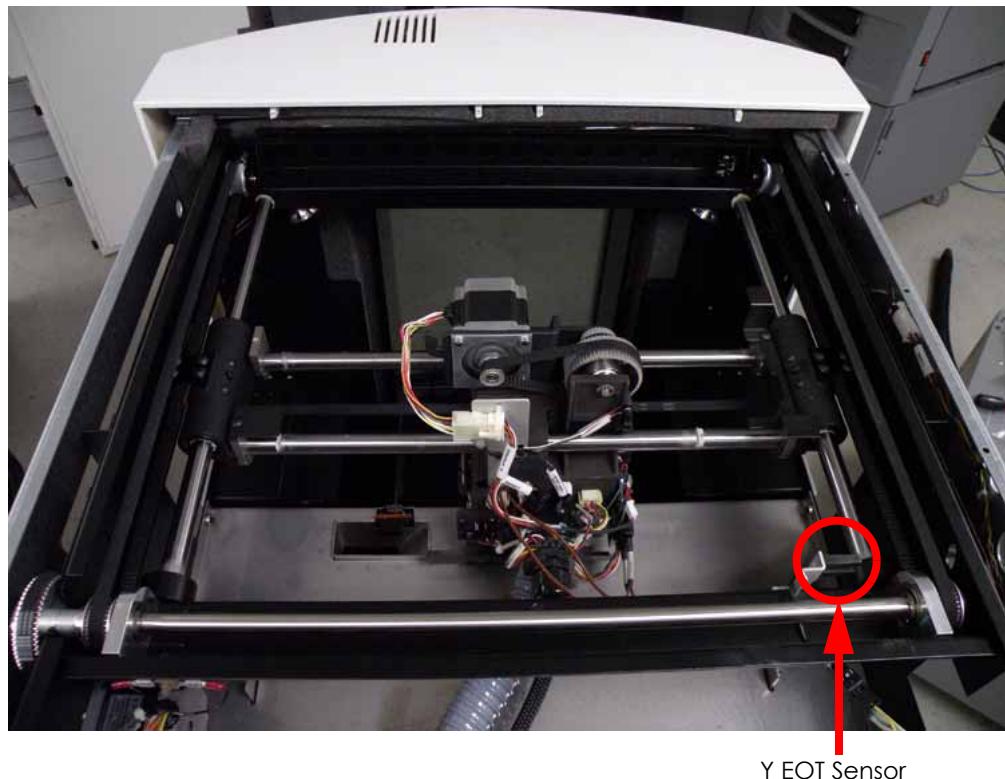
Required Tools

- Small phillips screwdriver
- Cutters

Removing the Y EOT Sensor:

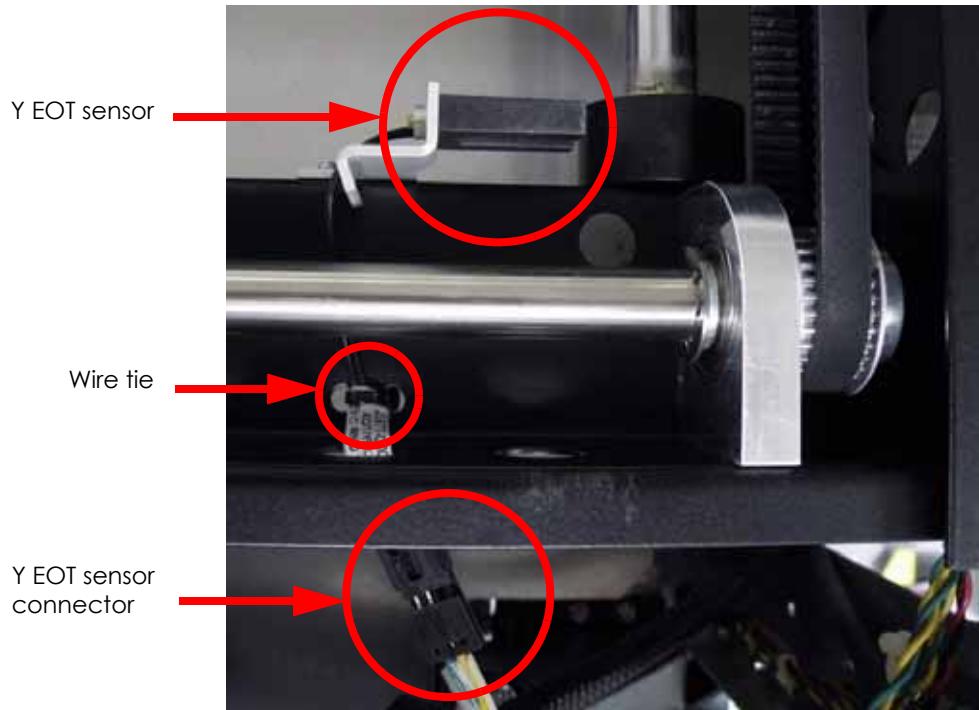
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See [“Removing the Rear Door:” on page 5-9](#).
4. Remove the side panels. See [“Side Panels” on page 5-11](#).
5. Locate the Y EOT sensor. See [Figure 340](#).

Figure 340: Y EOT sensor location



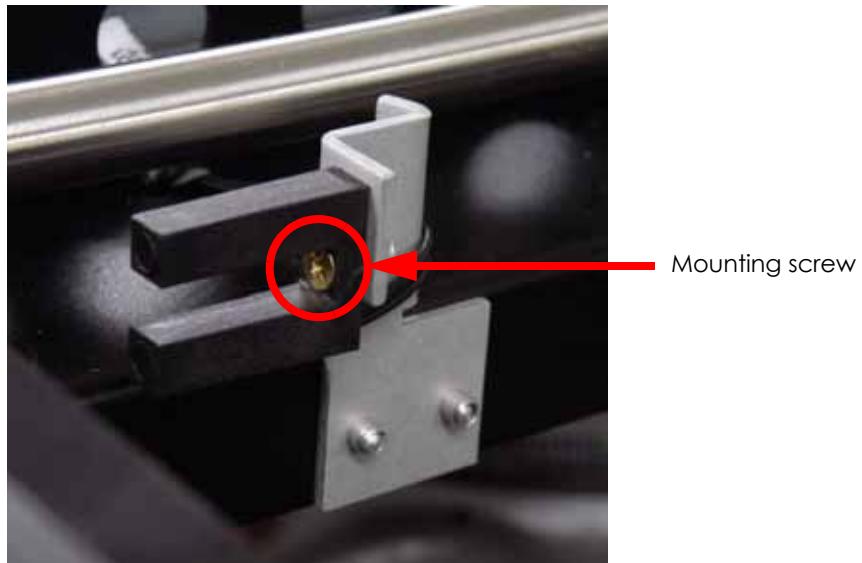
6. Using a cutters, cut the wire tie from around the Y EOT sensor. See [Figure 341](#).
7. Disconnect Y EOT sensor connector by pressing the tabs in and pulling apart. See [Figure 341](#).

Figure 341: Y EOT sensor connector location



- Using a small phillips screwdriver, remove the Y EOT sensor mounting screw. See [Figure 342](#).

Figure 342: Y EOT sensor mounting screw location



- Remove the Y EOT sensor and discard.

Installing the Y EOT Sensor:

1. Align the Y EOT sensor with the mounting holes and use a small phillips screwdriver to reinstall the mounting screw.



Be sure to use the brass mounting screw to avoid interference with the magnetic sensor.

2. Route the Y EOT sensor wire through the hole in the frame and reconnect by pushing the connectors together.
3. Reinstall a wire tie around the Y EOT sensor wire.
4. Reinstall the side panels. See “[Side Panels](#)” on page 5-11.
5. Reinstall the rear door. See “[Installing the Rear Door](#):” on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Y Motor (Belt Drive)

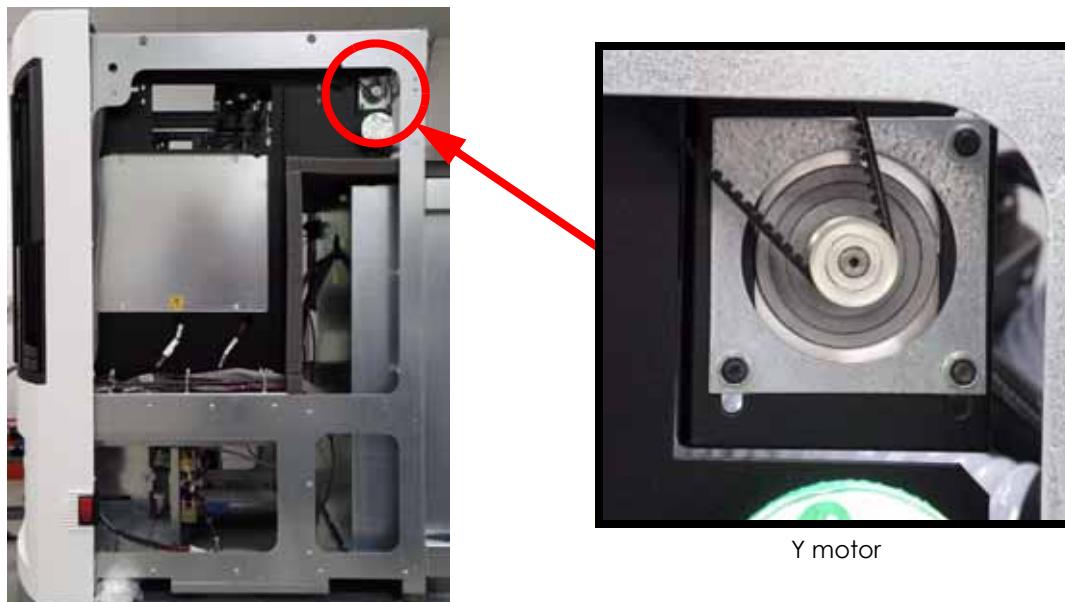
Required Tools

- $\frac{9}{64}$ " allen wrench
- XY motor belt tension tool

Removing the Y Motor:

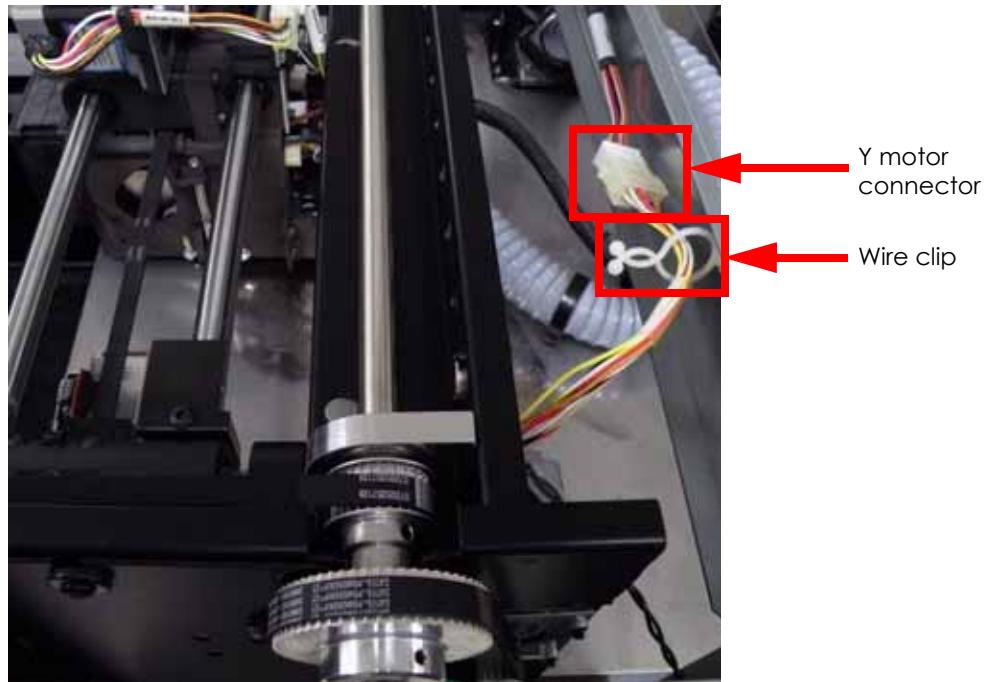
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the Y motor. See [Figure 343](#).

Figure 343: Y motor location



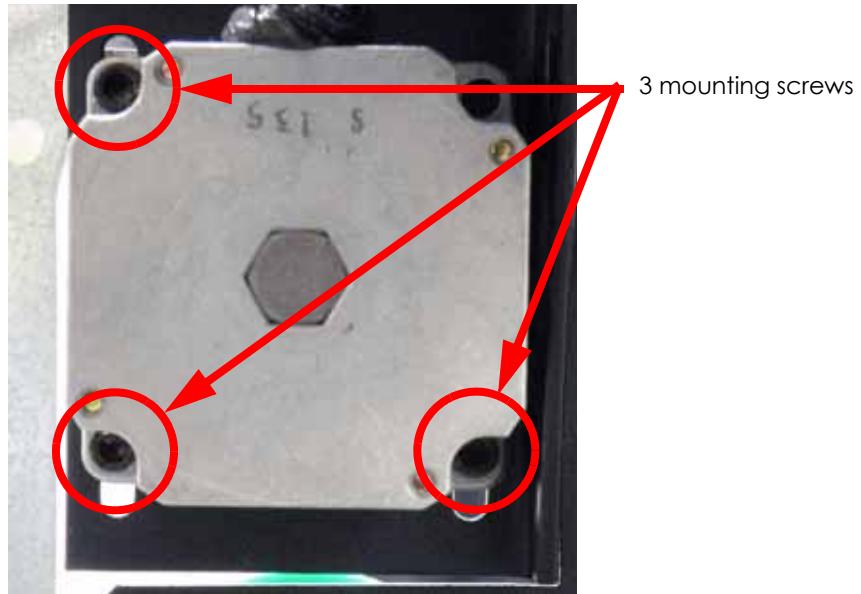
6. Disconnect the Y motor cable by pressing the tab in and pulling apart. See [Figure 344](#).
7. Un-clip the wire tie around the Y motor cable. See [Figure 344](#).

Figure 344: Y motor cable location



- Using a $\frac{9}{64}$ " allen wrench, remove the 3 Y motor mounting screws. See [Figure 345](#).

Figure 345: Y motor mounting screw locations

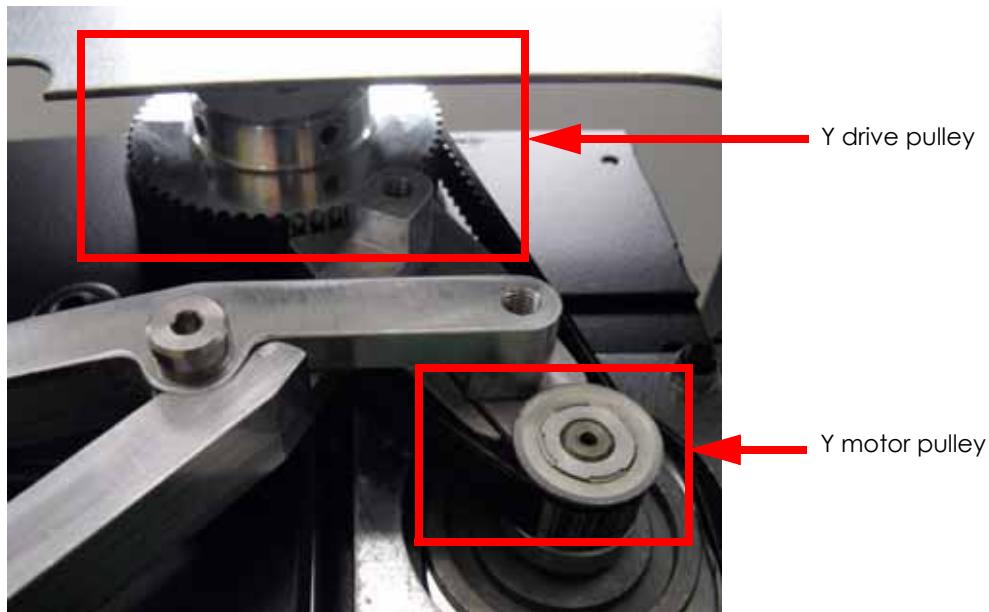


- Remove the Y motor and discard.

Installing the Y Motor:

1. Align the Y motor with the mounting holes.
-  Align the Y motor so the cable is at the top of the motor.
2. Using a $\frac{9}{64}$ " allen wrench, loosely reinstall the 3 mounting screws.
3. Raise the Y motor so the Y motor belt can be placed around the Y motor pulley.
4. Insert the XY belt tension tool between the Y motor pulley and the Y drive pulley by squeezing the handles together. When in place, release the handles to obtain tension. See [Figure 346](#).

Figure 346: XY belt tension tool location



5. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 mounting screws.
6. Remove the XY motor belt tension tool.
7. Reconnect the Y motor cable by pushing the connectors together.
8. Place the Y motor cable into the wire clip and close the wire clip.
9. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
10. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
11. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
12. Power on the system. The system should reach **Idle** with no displayed errors.
13. Run a small test part and monitor system operation during build.

Y Motor Belt (Belt Drive)

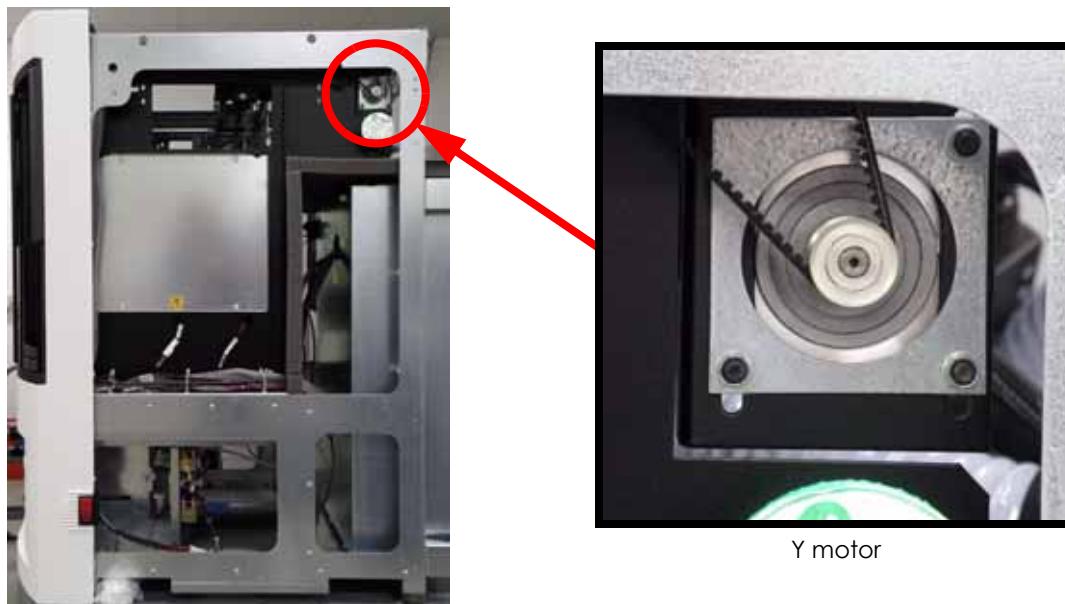
Required Tools

- $\frac{9}{64}$ " allen wrench
- XY motor belt tension tool

Removing the Y Motor Belt:

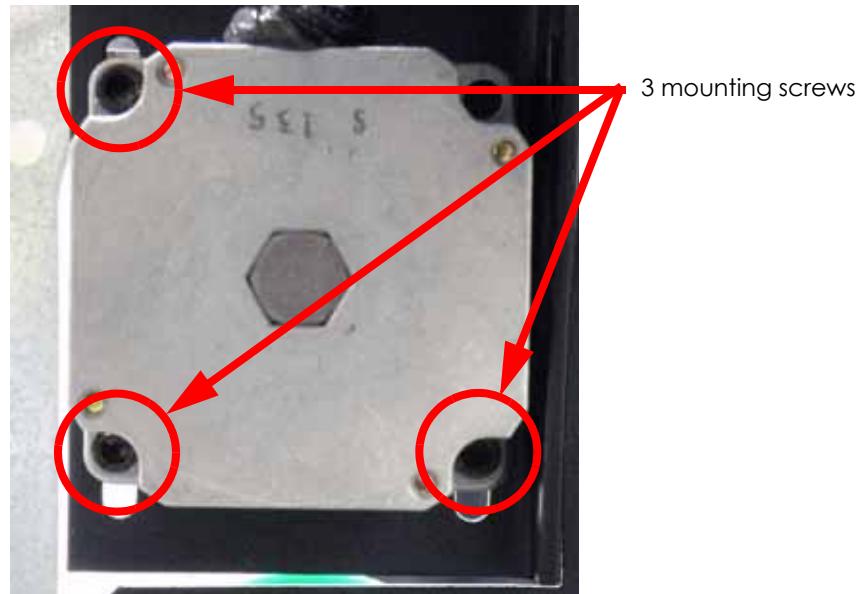
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the Y motor. See [Figure 347](#).

Figure 347: Y motor location



6. Loosen, but do not remove the 3 Y motor mounting screws using a $\frac{9}{64}$ " allen wrench. See [Figure 348](#).

Figure 348: Y motor mounting screw locations

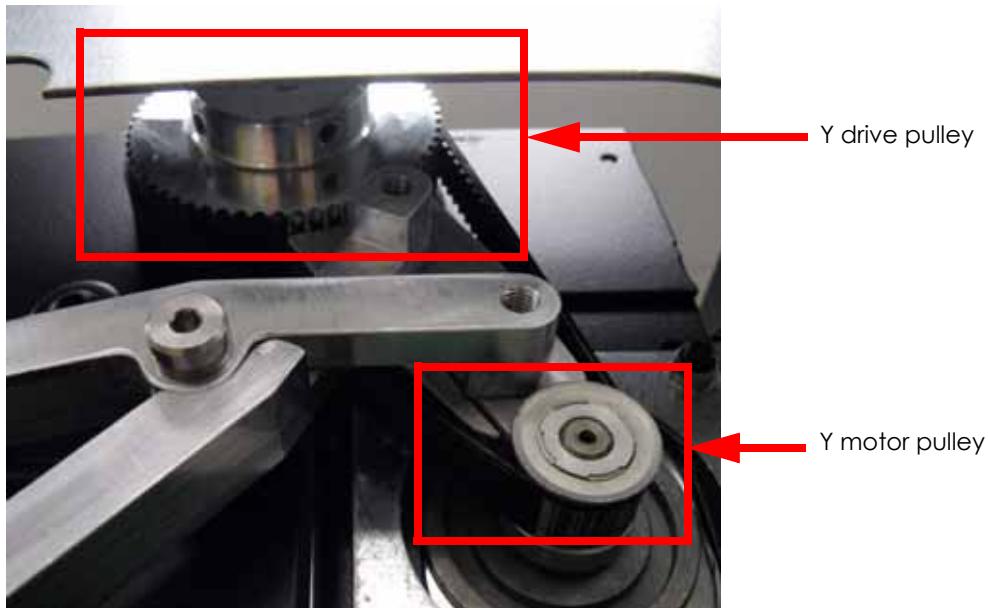


7. Raise the Y motor and remove the Y motor belt from the Y motor pulley and the Y drive pulley.

Installing the Y Motor Belt:

1. Place the Y motor belt around the Y motor pulley and the Y drive pulley.
2. Verify that the screws on the motor are loose so the Y motor can slide back and forth.
3. Insert the XY belt tension tool between the Y motor pulley and the Y drive pulley by squeezing the handles together. When in place, release the handles to obtain tension. See [Figure 349](#).

Figure 349: XY belt tension tool location



4. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 mounting screws.
5. Remove the XY motor belt tension tool.
6. Reconnect the Y motor cable by pushing the connectors together.
7. Place the Y motor cable into the wire clip and close the wire clip.
8. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
9. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
10. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
11. Power on the system. The system should reach **Idle** with no displayed errors.
12. Run a small test part and monitor system operation during build.

Y Drive Belt (Belt Drive)

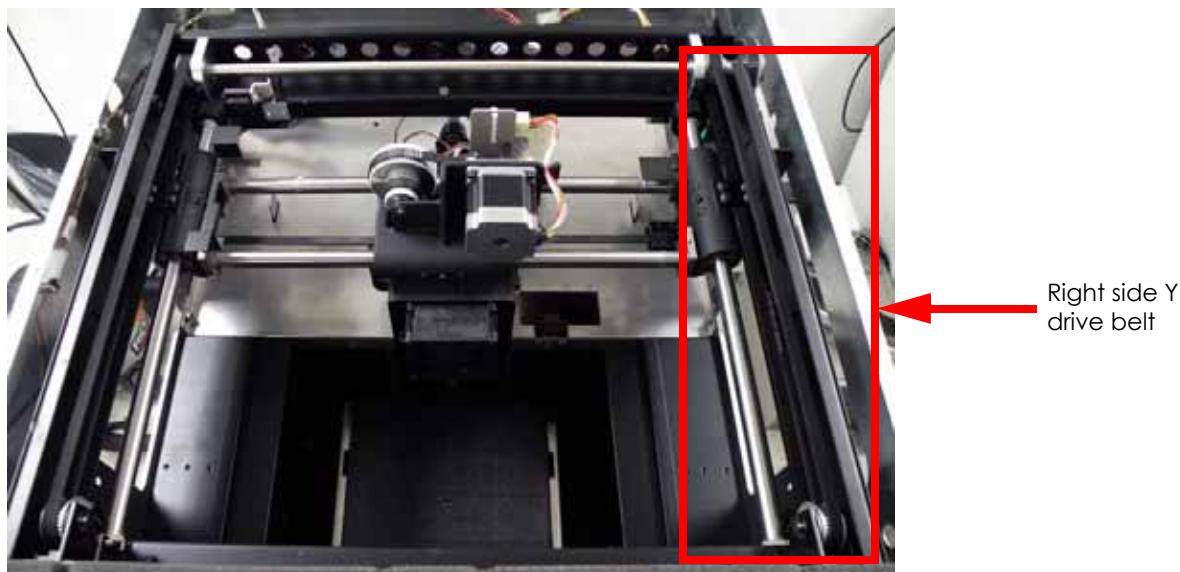
Required Tools

- $\frac{1}{2}$ " nut driver or box wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{1}{8}$ " allen wrench
- Needle nose pliers
- XY motor belt tension tool
- Belt tension gauge
- Dial Indicator

Removing the Right Side Y Drive Belt:

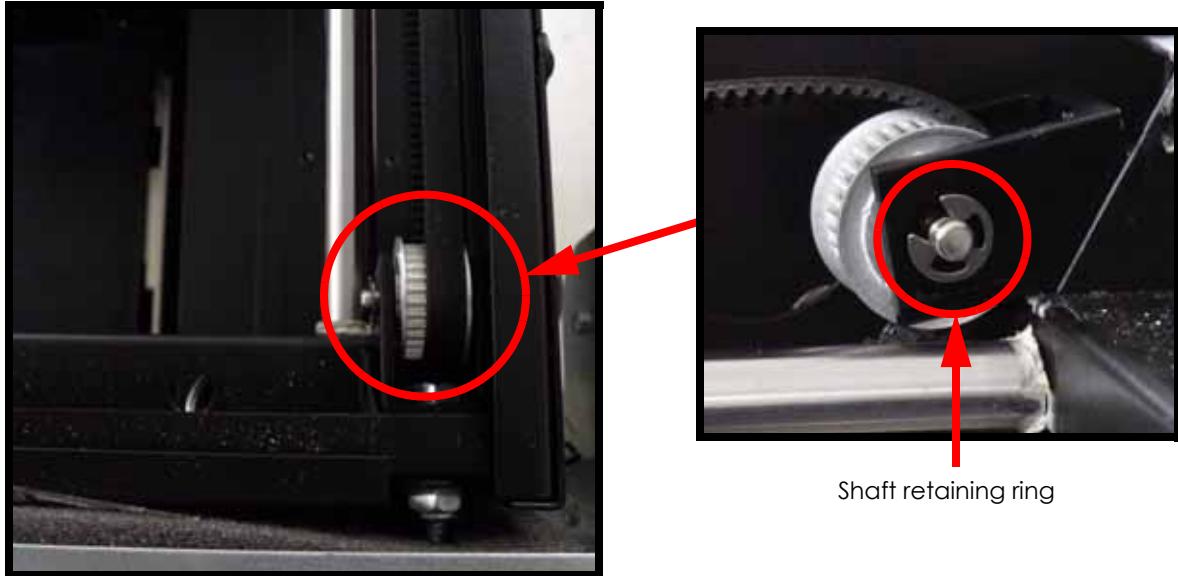
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
6. Locate the right side Y drive belt. See [Figure 350](#).

Figure 350: Right side Y drive belt location



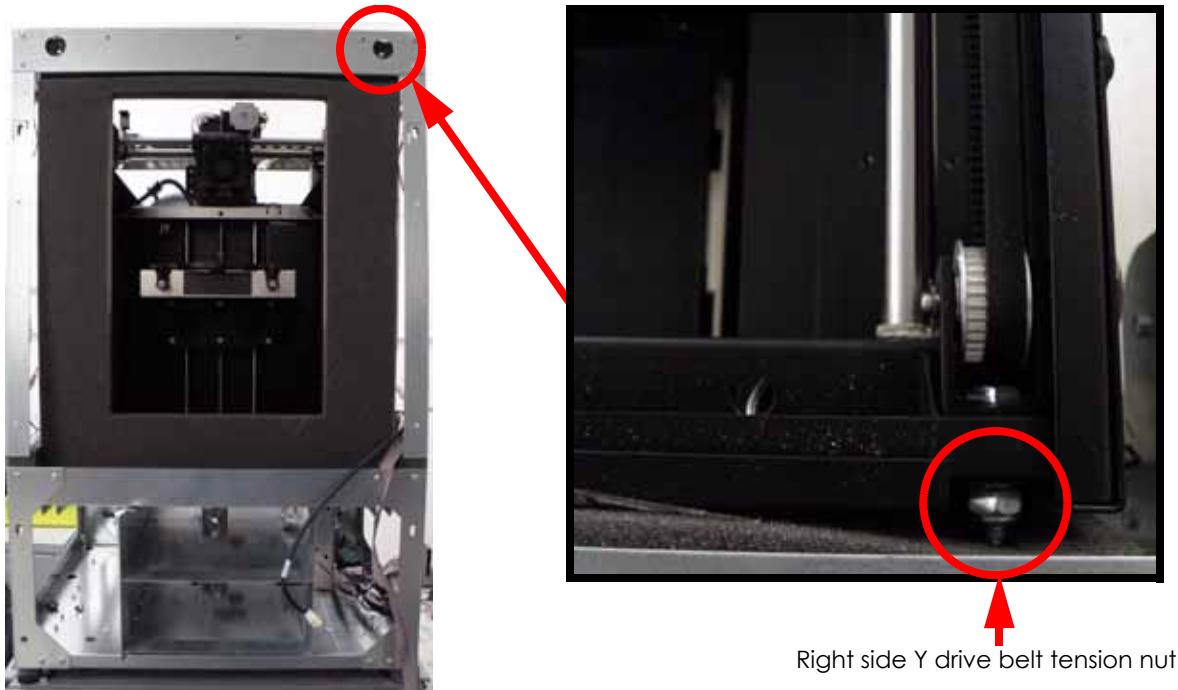
7. Using a needle nose pliers or standard screwdriver, remove the pulley shaft retaining ring from the front right pulley shaft. See [Figure 351](#).

Figure 351: Shaft retaining ring location



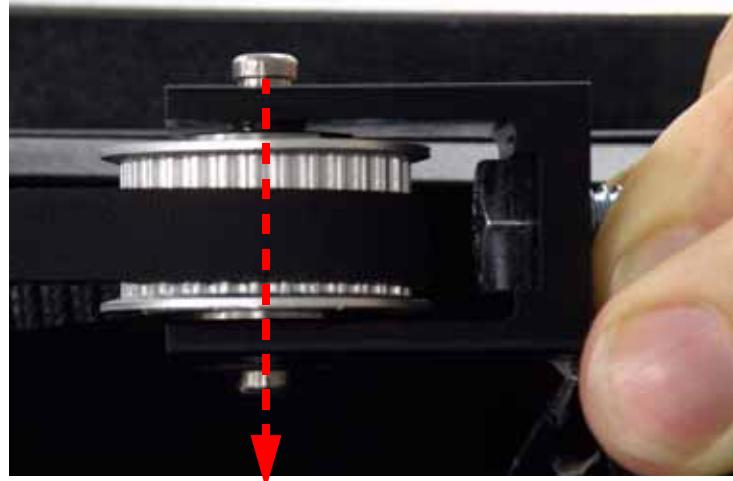
8. Using a $\frac{1}{2}$ " nut driver or box wrench, remove the right side Y belt tension nut and washer. See [Figure 352](#).

Figure 352: Right side Y drive belt tension nut location



9. Pull the clevis from the XY table and push the pulley shaft out of the front right Y pulley. See [Figure 353](#).

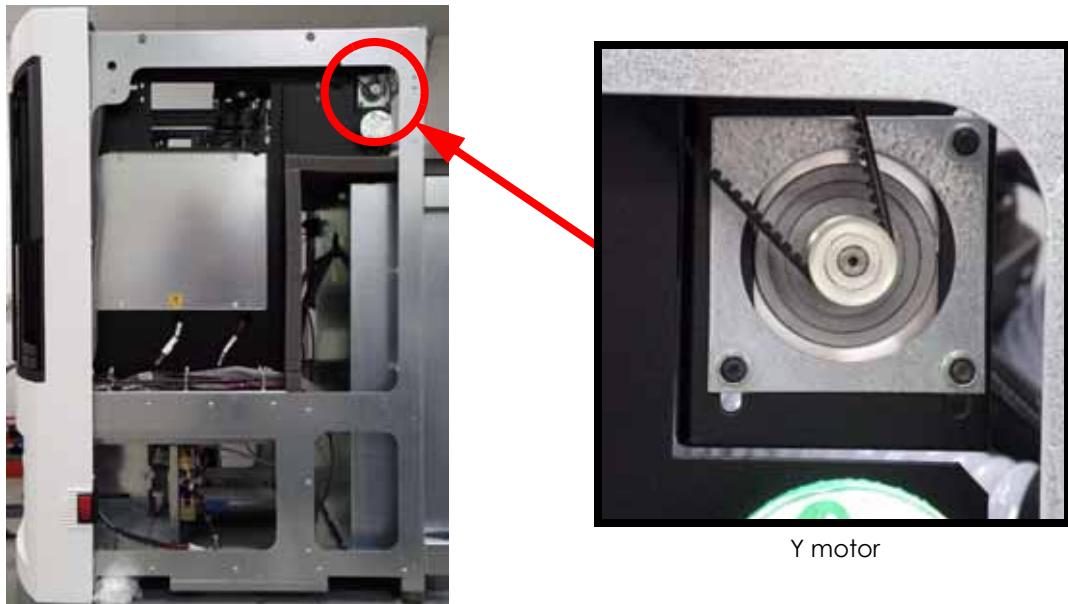
Figure 353: Pulley shaft removal



10. Remove the Y drive belt from the Y pulley.

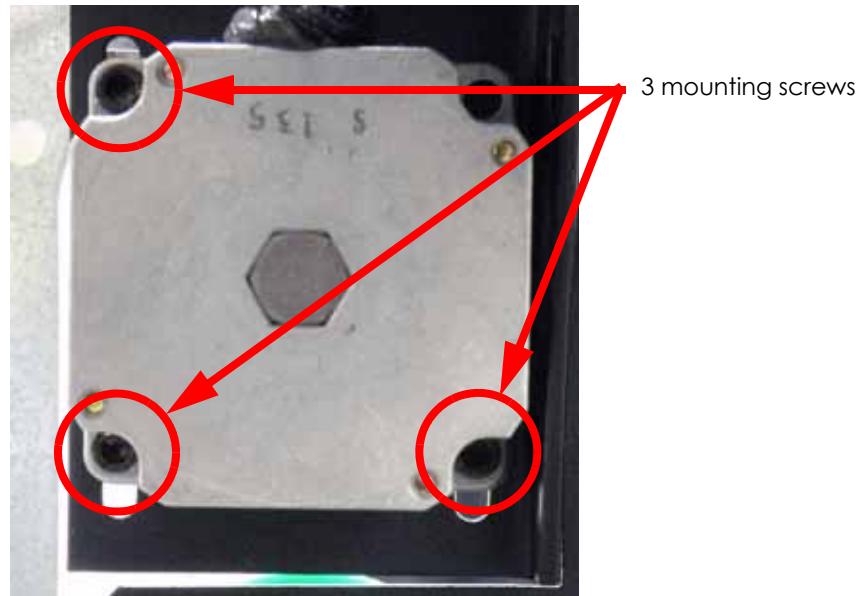
11. Locate the Y motor. See [Figure 354](#).

Figure 354: Y motor location



12. Loosen, but do not remove the 3 Y motor mounting screws using a $\frac{9}{64}$ " allen wrench. See [Figure 355](#).

Figure 355: Y motor mounting screw locations



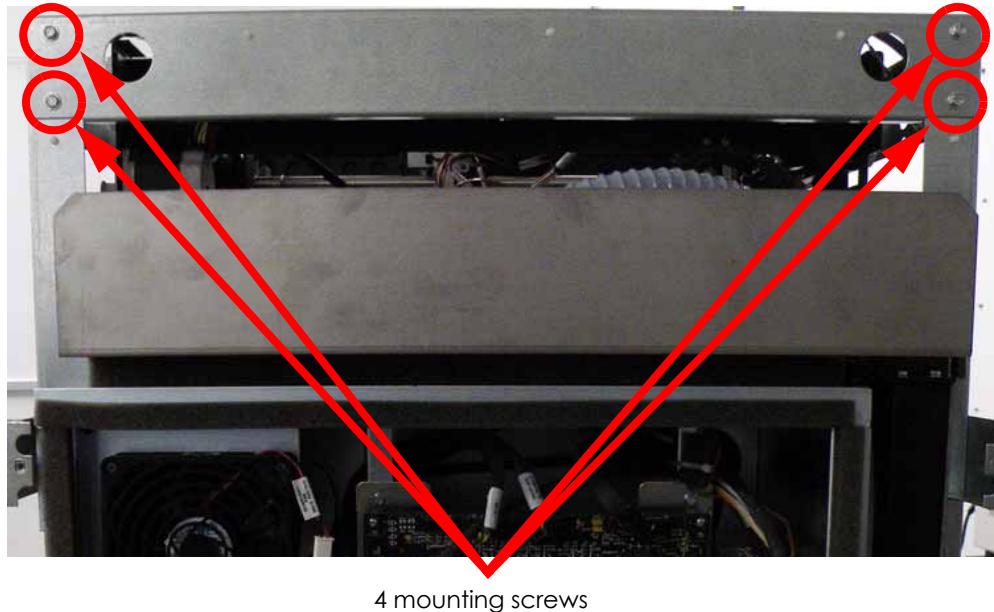
13. Raise the Y motor and remove the Y motor belt from the Y motor pulley and the Y drive pulley.
14. Using a $\frac{1}{8}$ " allen wrench, remove the 4 right side Y belt clamp mounting screws and remove the belt clamp. See [Figure 356](#).

Figure 356: Right side Y belt clamp mounting screw locations



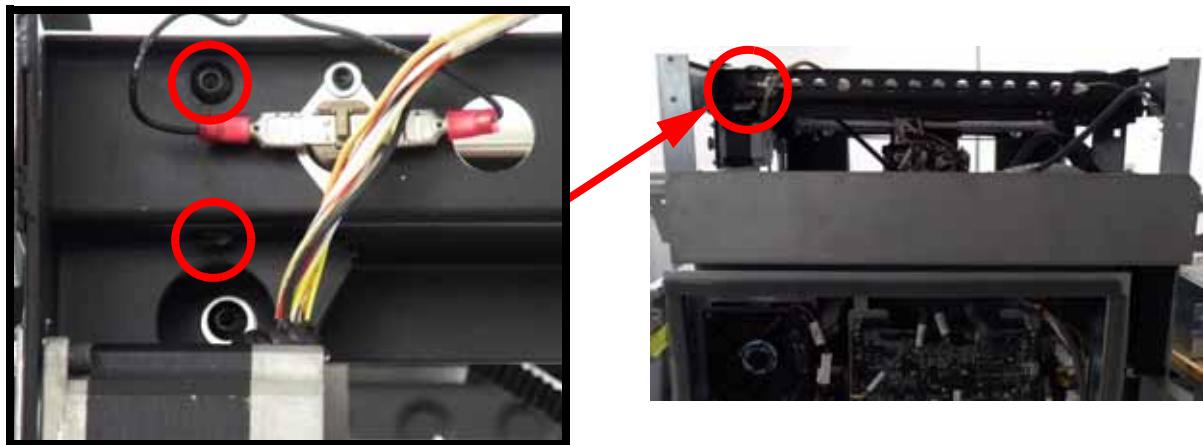
15. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 rear frame bracket mounting screws. See [Figure 357](#).

Figure 357: Rear frame bracket mounting screw locations



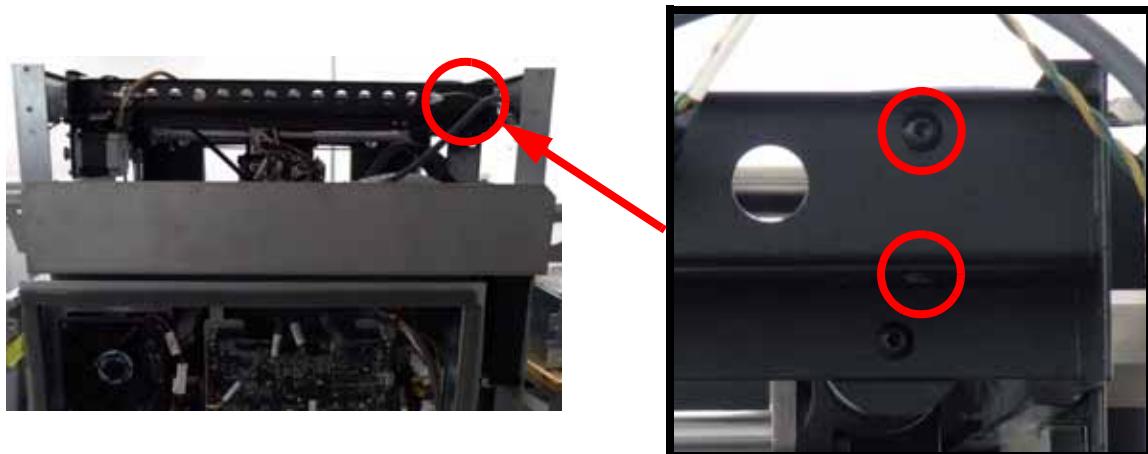
16. Using a $\frac{1}{8}$ " allen wrench, remove the 2 right side Y drive rod assembly mounting screws. See [Figure 358](#).

Figure 358: Right side Y drive rod assembly mounting screw locations



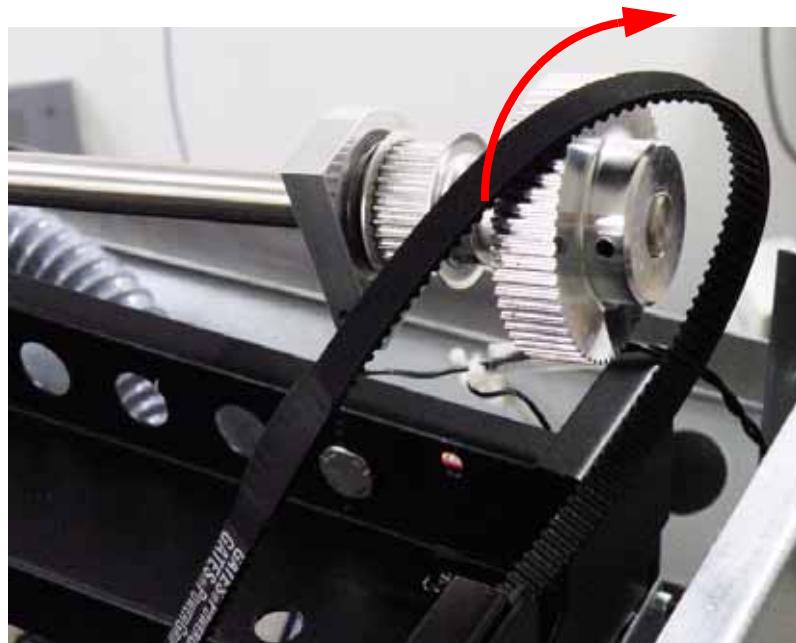
17. Using a $\frac{1}{8}$ " allen wrench, remove the 2 left side Y drive rod assembly mounting screws. See [Figure 359](#).

Figure 359: Left side Y drive rod assembly mounting screw locations



18. Lift the Y drive assembly upwards and remove the right side Y drive belt by looping over the large Y rear drive pulley. See [Figure 360](#).

Figure 360: Removing the right side Y drive belt



19. Discard the right side Y drive belt.

Installing the Right Side Y Drive Belt:

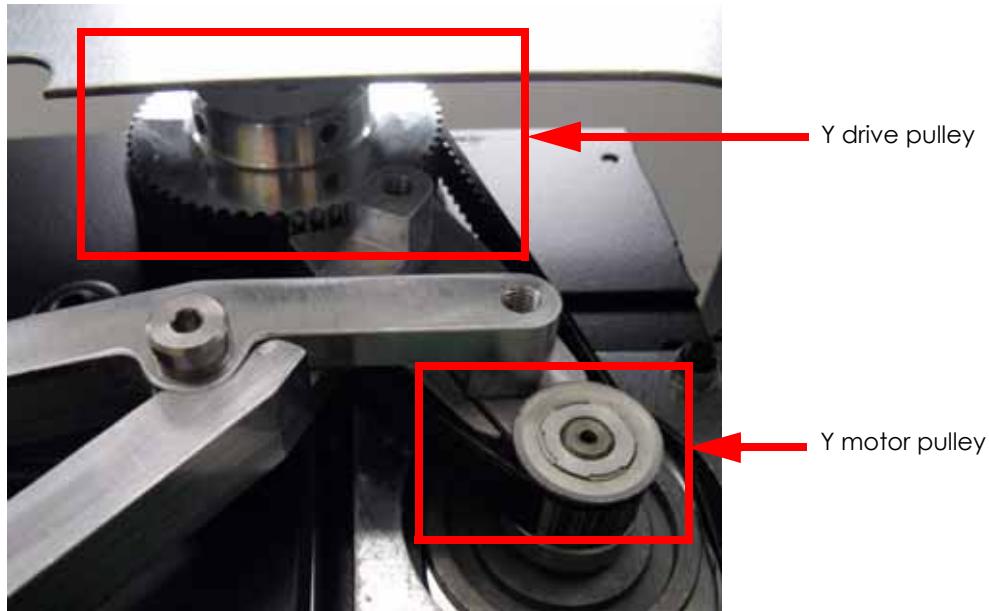
1. Loop the replacement Y drive belt over the large right side Y drive rod pulley.
2. Align the Y drive rod assembly with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
3. Align the rear frame bracket and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
4. Loop the right side Y drive belt around the front right pulley.
5. Align the front right pulley with the clevis.
6. Push the pulley shaft through the clevis and pulley.
7. Using a needle nose pliers or standard screwdriver, reinstall the shaft retaining ring to the pulley shaft.
8. Align the clevis with the XY table and use a $\frac{1}{2}$ " nut driver or box wrench to reinstall the washer and tensioning nut.



Do not tighten the tensioning nut completely. It will get tightened to the correct specification in a later step.

9. Raise the Y motor so the Y motor belt can be placed around the Y motor pulley.
10. Insert the XY belt tension tool between the Y motor pulley and the Y drive pulley by squeezing the handles together. When in place, release the handles to obtain tension. See [Figure 346](#).

Figure 361: XY belt tension tool location



11. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 mounting screws.
12. Remove the XY motor belt tension tool.
13. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 362](#).
14. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 362](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 362](#).



Turn the dial indicator to the left so the face is visible while tensioning the right side Y drive belt.

Figure 362: Belt tension gauge zero block



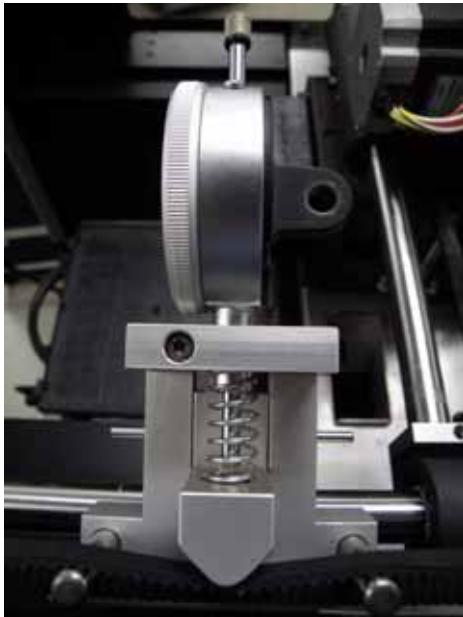
Old dial indicator



New dial indicator

15. Remove the zero block from the belt tension gauge.
16. Move the head to the rear of the printer.
17. Place the belt tension gauge on the center of the right side Y drive belt. See [Figure 363](#).

Figure 363: Belt tension gauge location



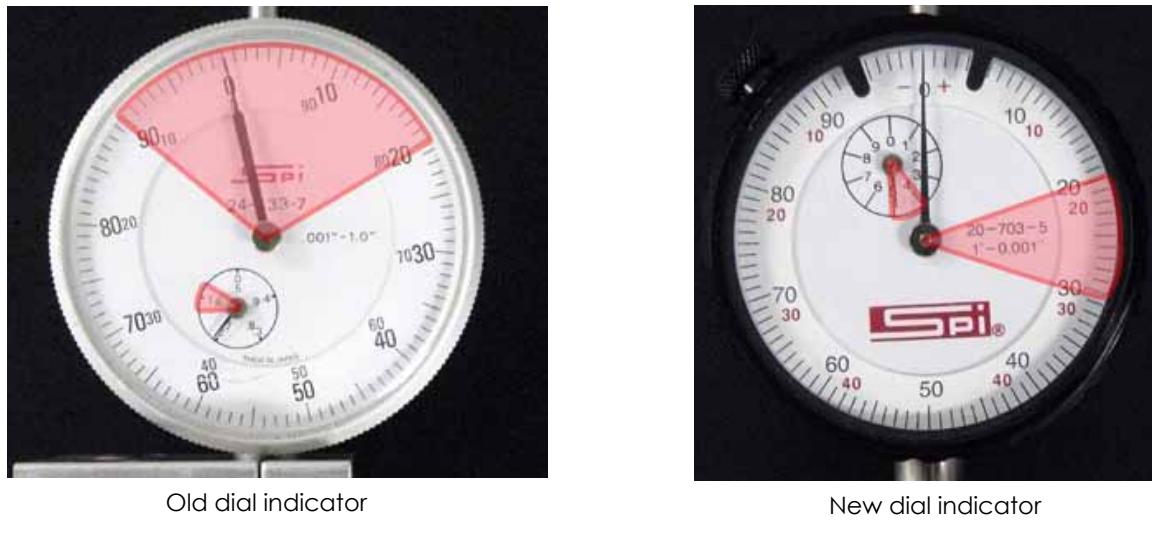
Right View



Front View

18. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the right side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 364](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 364](#).

Figure 364: Dial indicator readings

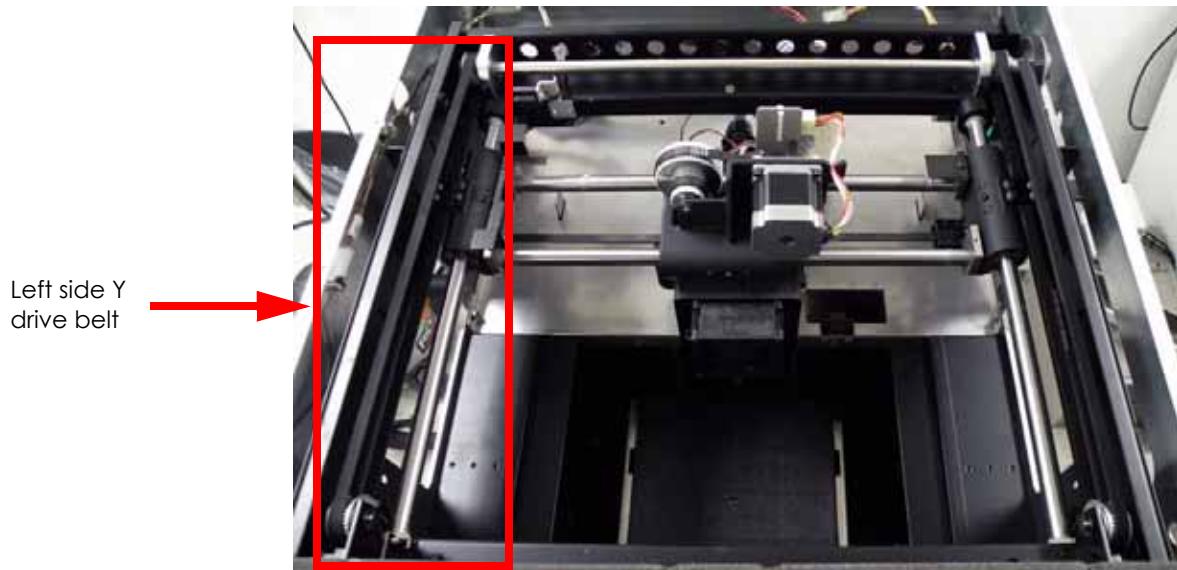


19. Remove the tension gauge and move the head from front to back several times.
20. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps 16 - 19 until the belt tension is within specification.
21. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
22. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
23. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
24. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
25. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
26. Power on the system. The system should reach **Idle** with no displayed errors.
27. Run a small test part and monitor system operation during build.

Removing the Left Side Y Drive Belt:

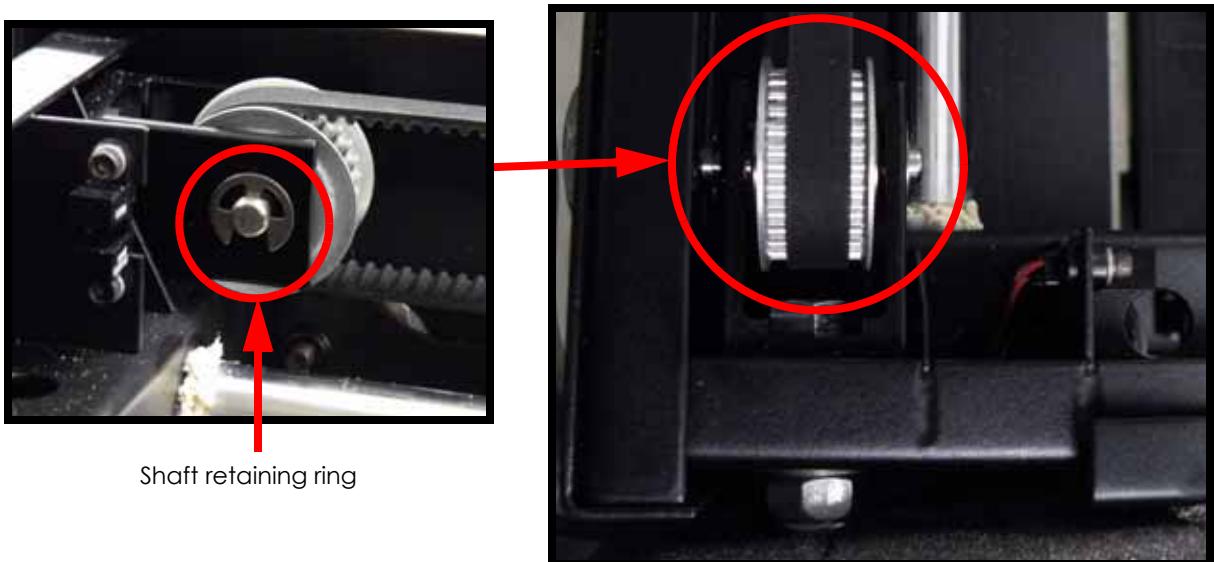
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Remove the front bezel. See “[Removing the Front Bezel:](#)” on page 5-13.
6. Locate the left side Y drive belt. See [Figure 365](#).

Figure 365: Right side Y drive belt location



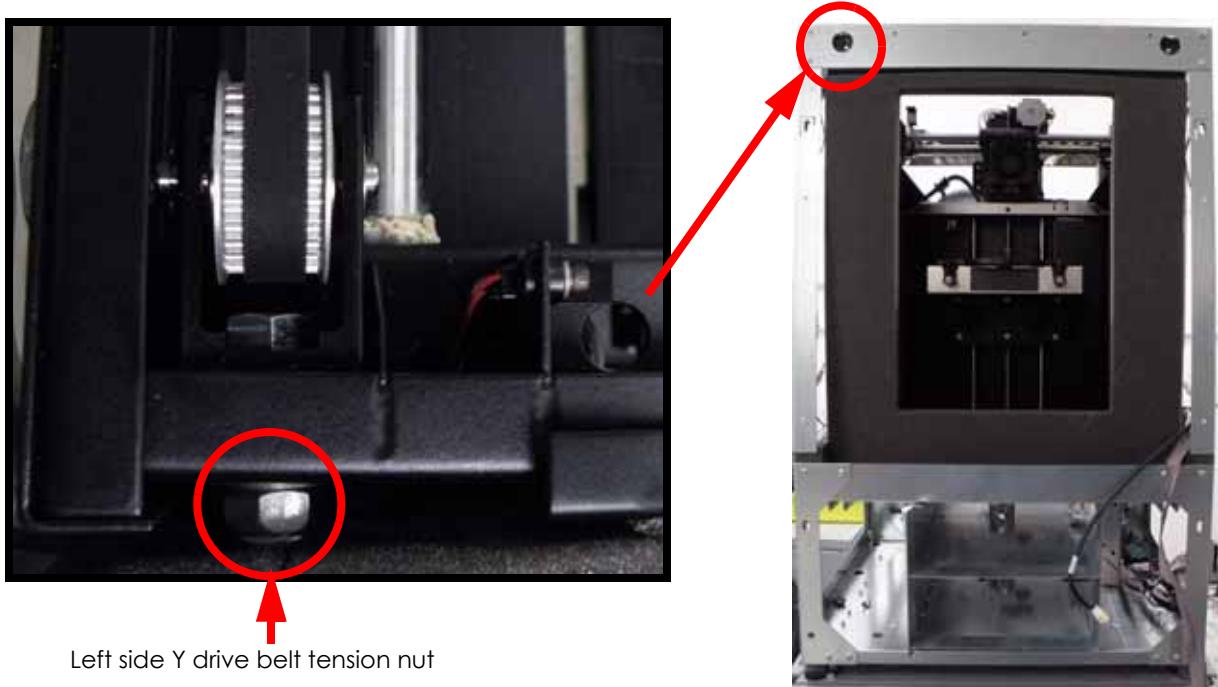
7. Using a needle nose pliers or standard screwdriver, remove the pulley shaft retaining ring from the front left pulley shaft. See [Figure 366](#).

Figure 366: Shaft retaining ring location



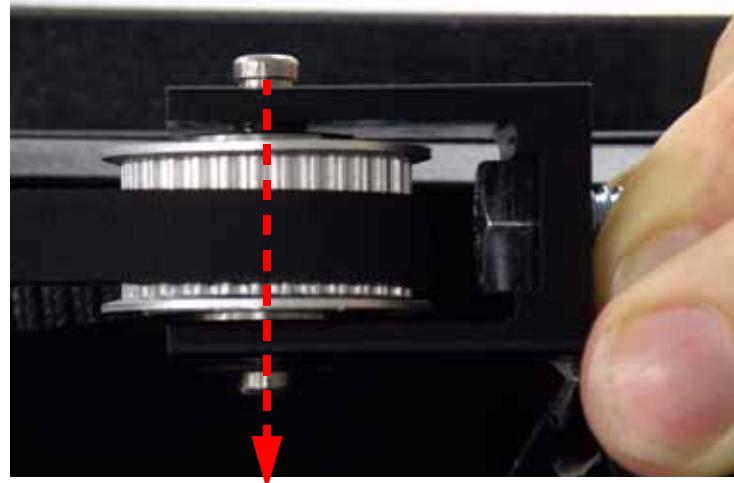
8. Using a $\frac{1}{2}$ " nut driver or box wrench, remove the left side Y belt tension nut and washer. See [Figure 367](#).

Figure 367: Left side Y drive belt tension nut location



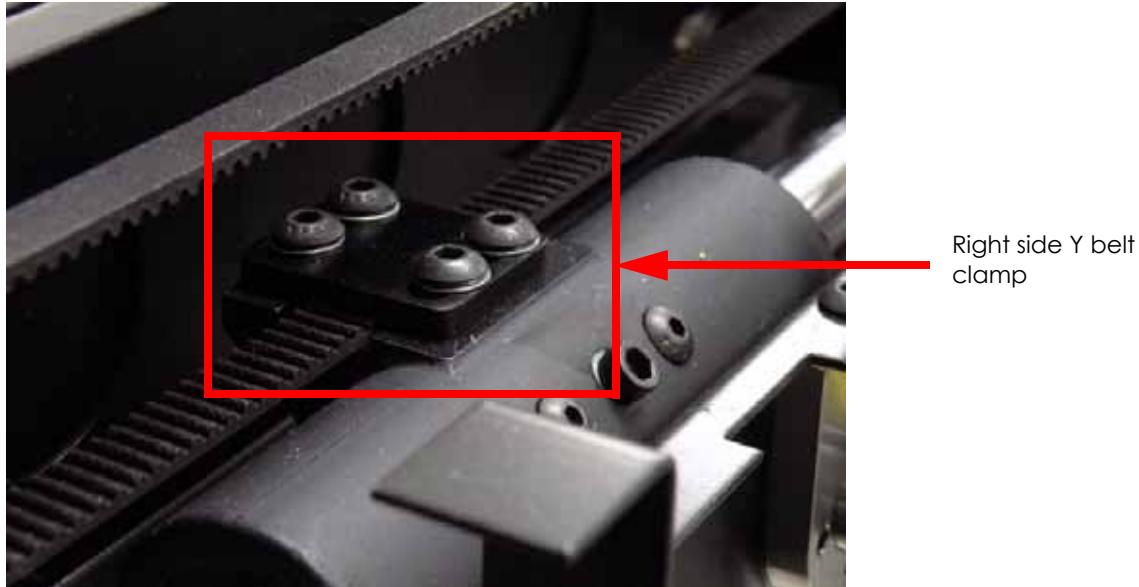
9. Pull the clevis from the XY table and push the pulley shaft out of the front left Y pulley. See [Figure 368](#).

Figure 368: Pulley shaft removal



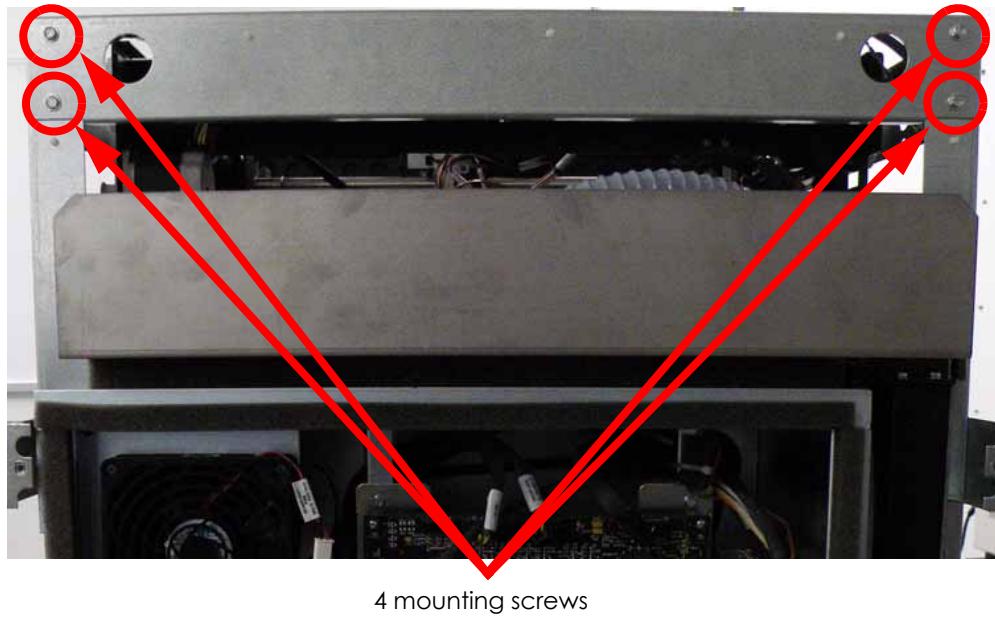
10. Using a $\frac{1}{8}$ " allen wrench, remove the 4 left side Y belt clamp mounting screws and remove the belt clamp. See [Figure 369](#).

Figure 369: Left side Y belt clamp mounting screw locations



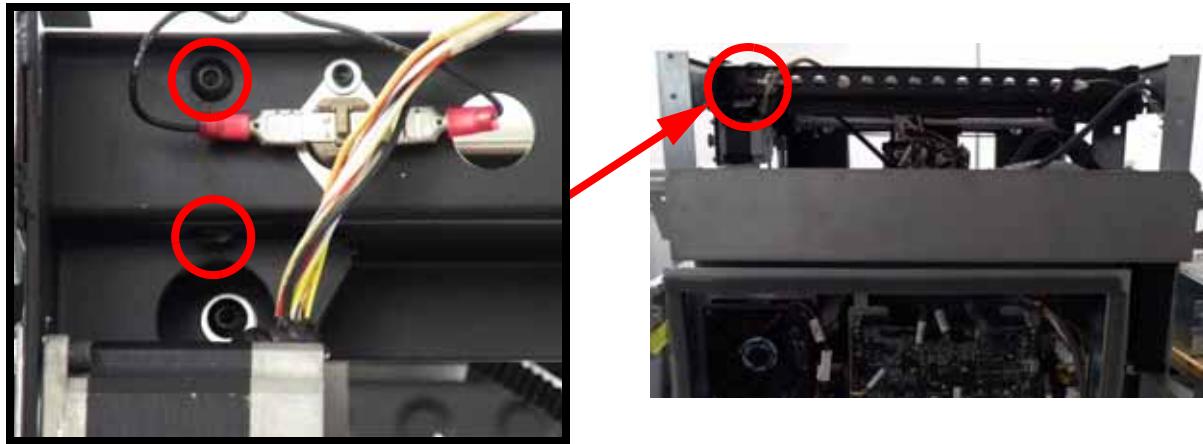
11. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 rear frame bracket mounting screws. See [Figure 370](#).

Figure 370: Rear frame bracket mounting screw locations



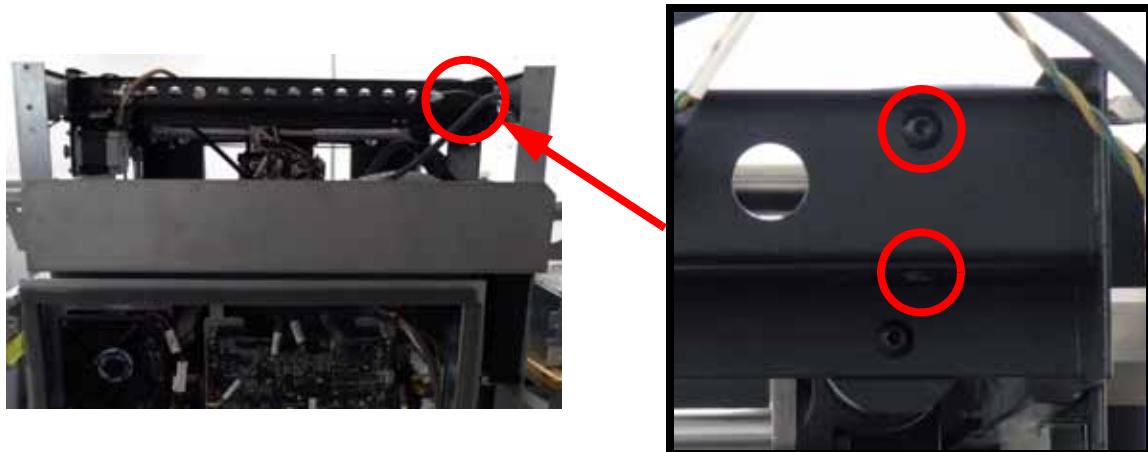
12. Using a $\frac{1}{8}$ " allen wrench, remove the 2 right side Y drive rod assembly mounting screws. See [Figure 371](#).

Figure 371: Right side Y drive rod assembly mounting screw locations



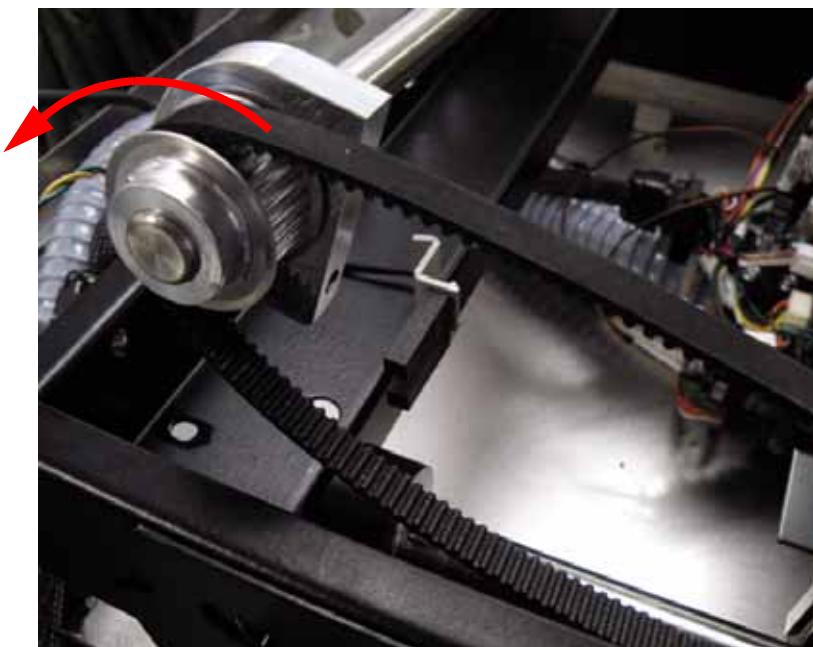
13. Using a $\frac{1}{8}$ " allen wrench, remove the 2 left side Y drive rod assembly mounting screws. See [Figure 372](#).

Figure 372: Left side Y drive rod assembly mounting screw locations



14. Lift the Y drive assembly upwards and remove the left side Y drive belt by looping over the rear drive pulley. See [Figure 373](#).

Figure 373: Removing the left side Y drive belt



15. Discard the left side Y drive belt.

Installing the Left Side Y Drive Belt:

1. Loop the replacement Y drive belt over the large right side Y drive rod pulley.
2. Align the Y drive rod assembly with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
3. Align the rear frame bracket and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
4. Loop the left side Y drive belt around the front left pulley.
5. Align the front left pulley with the clevis.
6. Push the pulley shaft through the clevis and pulley.
7. Using a needle nose pliers or standard screwdriver, reinstall the shaft retaining ring to the pulley shaft.
8. Align the clevis with the XY table and use a $\frac{1}{2}$ " nut driver or box wrench to reinstall the washer and tensioning nut.



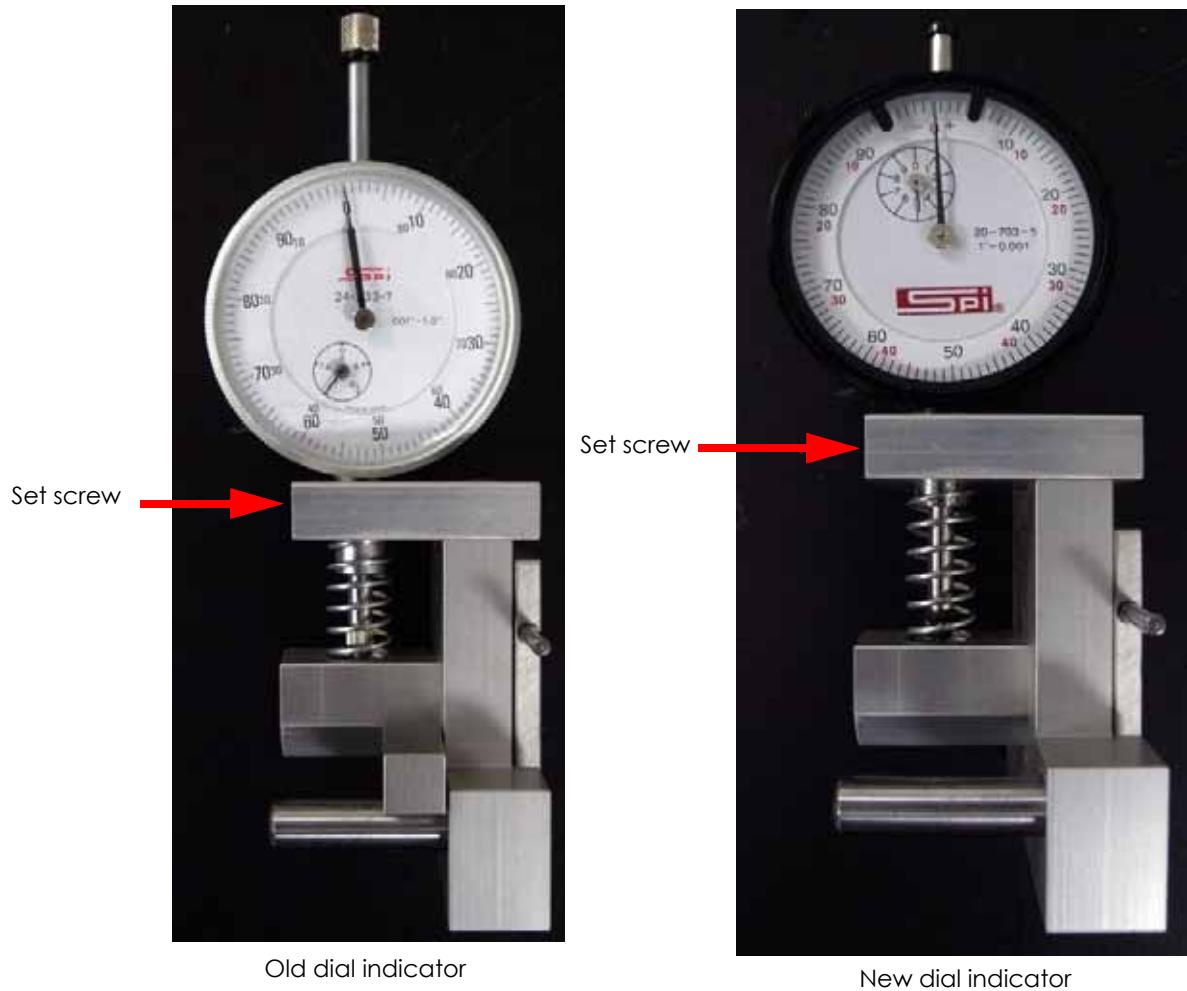
Do not tighten the tensioning nut completely. It will get tightened to the correct specification in a later step.

9. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 374](#).
10. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 374](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 374](#).



Turn the dial indicator to the right so the face is visible while tensioning the left side Y drive belt.

Figure 374: Belt tension gauge zero block



11. Remove the zero block from the belt tension gauge.
12. Move the head to the rear of the printer.
13. Place the belt tension gauge on the center of the left side Y drive belt. See [Figure 375](#).

Figure 375: Belt tension gauge location



Left View



Front View

14. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the left side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 376](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 376](#).

Figure 376: Dial indicator readings



Old dial indicator



New dial indicator

15. Remove the tension gauge and move the head from front to back several times.
16. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps 12 - 15 until the belt tension is within specification.
17. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
18. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
19. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
20. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
21. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
22. Power on the system. The system should reach **Idle** with no displayed errors.
23. Run a small test part and monitor system operation during build.

Y Pulley (Belt Drive)

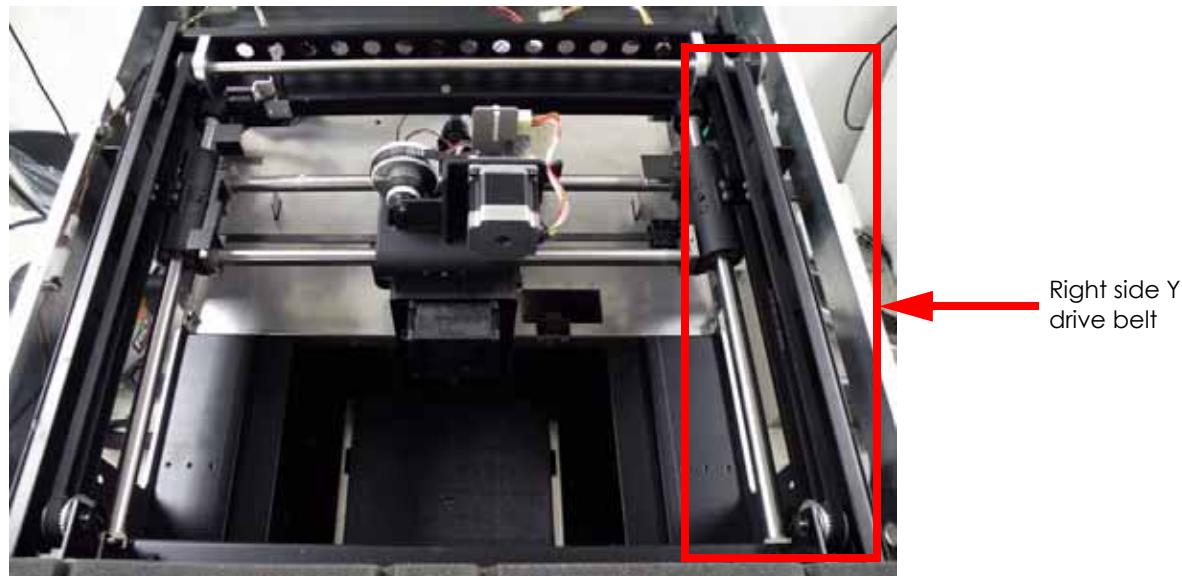
Required Tools

- $\frac{1}{8}$ " allen wrench
- $\frac{1}{2}$ " nut driver or box wrench
- Needle nose pliers or standard screwdriver
- Belt tension gauge
- Dial Indicator

Removing the Right Side Y Pulley:

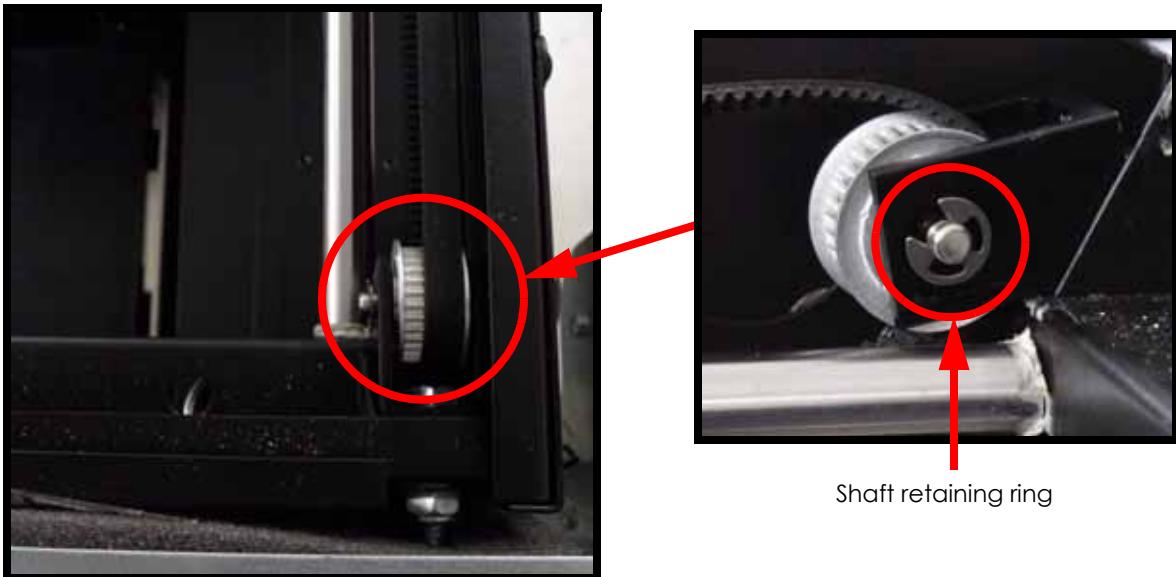
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
6. Locate the right side Y drive belt. See [Figure 377](#).

Figure 377: Right side Y drive belt location



7. Using a needle nose pliers or standard screwdriver, remove the pulley shaft retaining ring from the front right pulley shaft. See [Figure 378](#).

Figure 378: Shaft retaining ring location



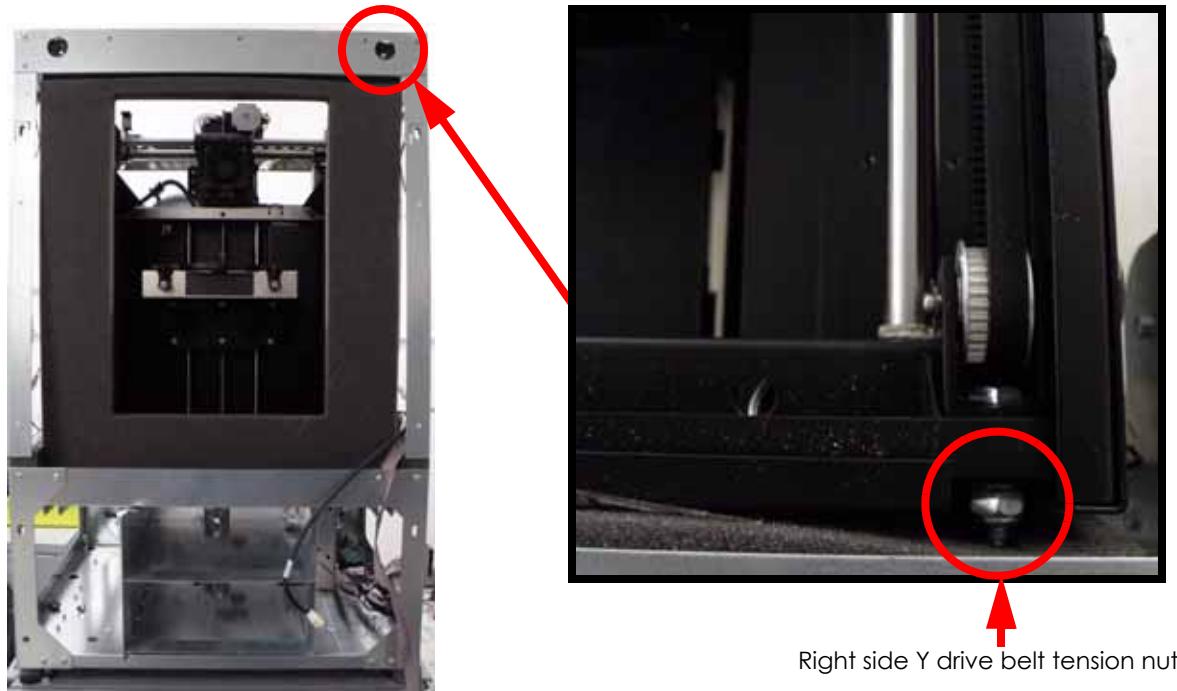
- Using a $\frac{1}{8}$ " allen wrench, remove the 4 right side Y belt clamp mounting screws and remove the belt clamp. See [Figure 379](#).

Figure 379: Right side Y belt clamp mounting screw locations



- Using a $\frac{1}{2}$ " nut driver or box wrench, remove the right side Y belt tension nut and washer. See [Figure 380](#).

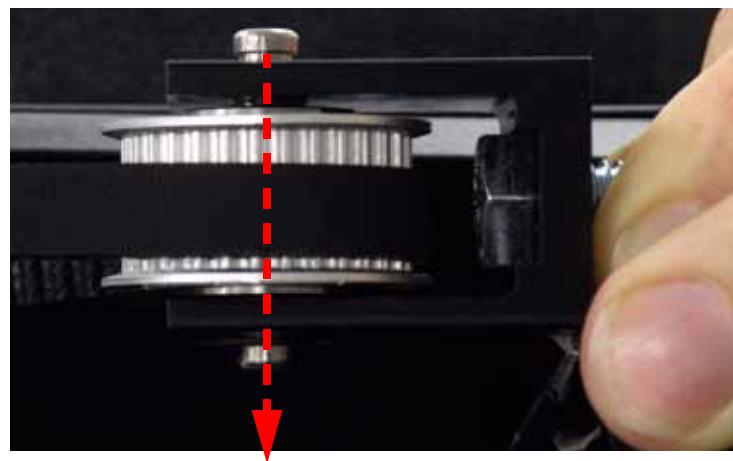
Figure 380: Right side Y drive belt tension nut location



Right side Y drive belt tension nut

10. Pull the clevis from the XY table and push the pulley shaft out of the front right Y pulley.
See [Figure 381](#).

Figure 381: Pulley shaft removal



11. Remove the Y drive belt from the Y pulley.
12. Discard the Y pulley.

Installing the Right Side Y Pulley:

1. Loop the right side Y drive belt around the front right pulley.
2. Align the front right pulley with the clevis.
3. Push the pulley shaft through the clevis and pulley.
4. Using a needle nose pliers or standard screwdriver, reinstall the shaft retaining ring to the pulley shaft.
5. Align the clevis with the XY table and use a $\frac{1}{2}$ " nut driver or box wrench to reinstall the washer and tensioning nut.



Do not tighten the tensioning nut completely. It will get tightened to the correct specification in a later step.

6. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 382](#).
7. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 382](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 382](#).



Turn the dial indicator to the left so the face is visible while tensioning the right side Y drive belt.

Figure 382: Belt tension gauge zero block



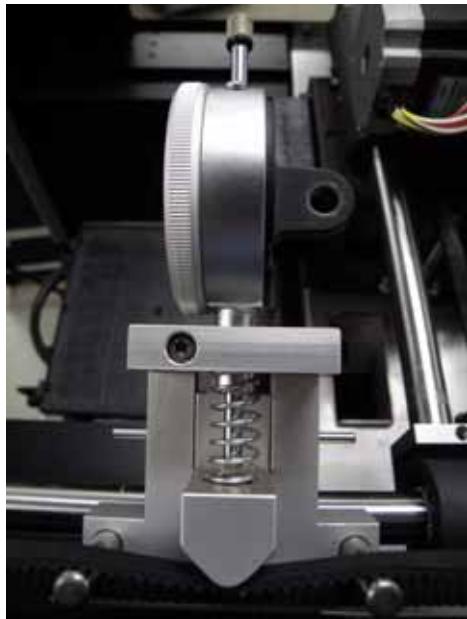
Old dial indicator



New dial indicator

8. Remove the zero block from the belt tension gauge.
9. Move the head to the rear of the printer.
10. Place the belt tension gauge on the center of the right side Y drive belt. See [Figure 383](#).

Figure 383: Belt tension gauge location



Right View



Front View

11. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the right side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 384](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 384](#).

Figure 384: Dial indicator readings



Old dial indicator



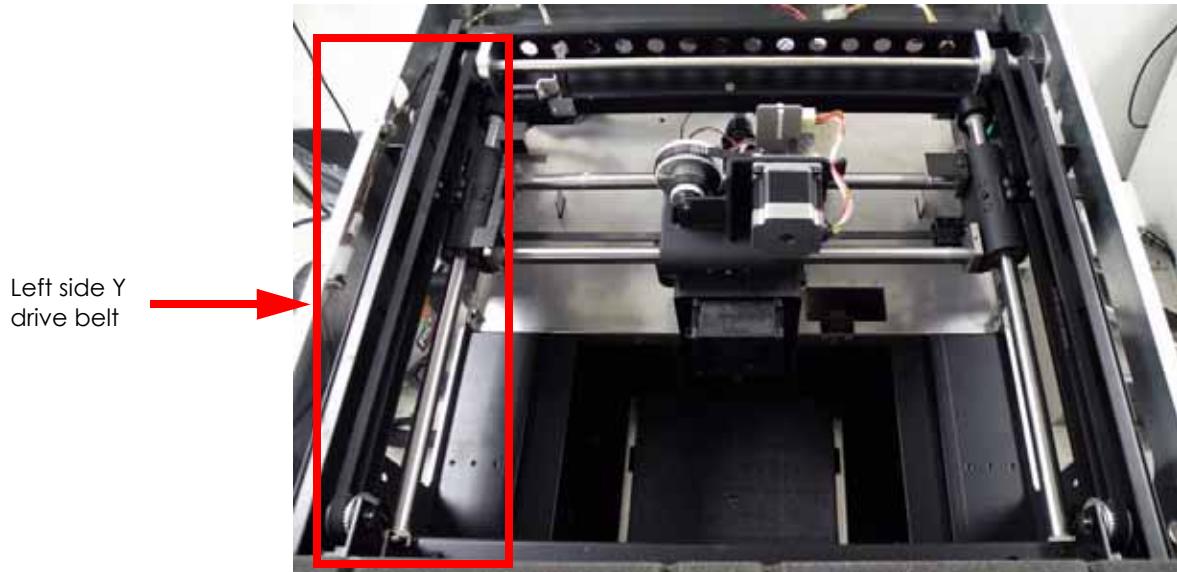
New dial indicator

12. Remove the tension gauge and move the head from front to back several times.
13. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps 9 - 12 until the belt tension is within specification.
14. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
15. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
16. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
17. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
18. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
19. Power on the system. The system should reach **Idle** with no displayed errors.
20. Run a small test part and monitor system operation during build.

Removing the Left Side Y Pulley:

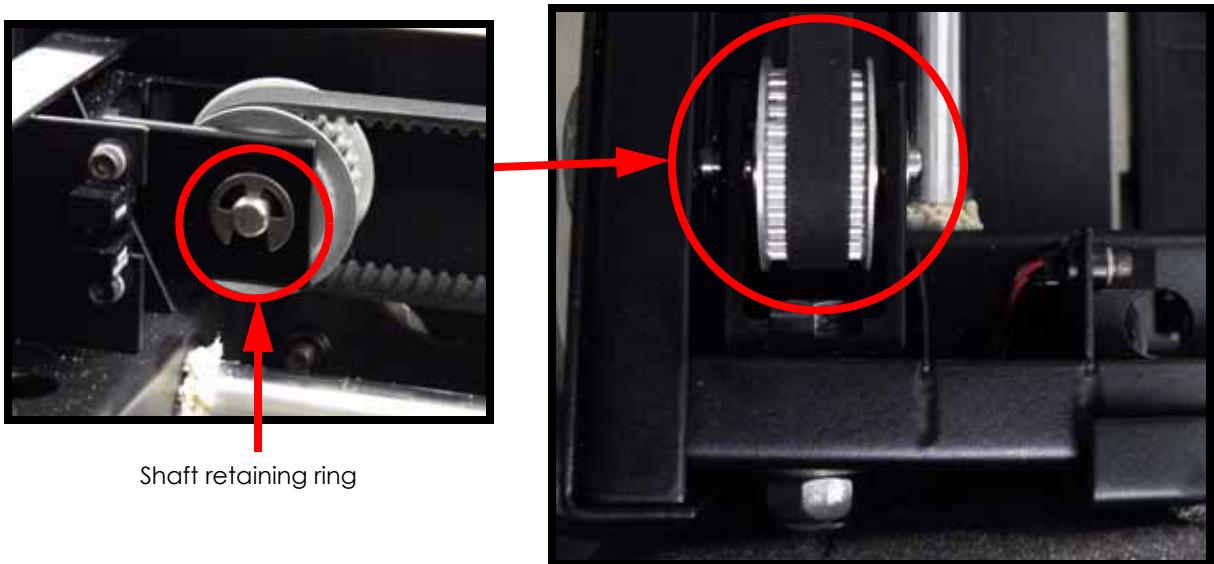
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
6. Locate the left side Y drive belt. See [Figure 385](#).

Figure 385: Right side Y drive belt location



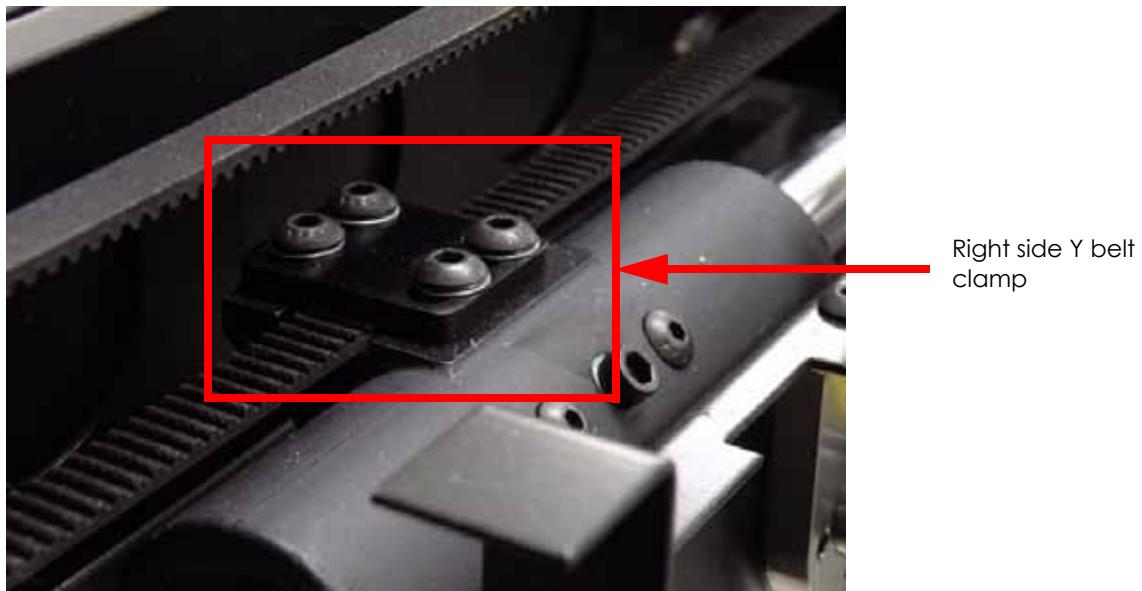
7. Using a needle nose pliers or standard screwdriver, remove the pulley shaft retaining ring from the front left pulley shaft. See [Figure 386](#).

Figure 386: Shaft retaining ring location



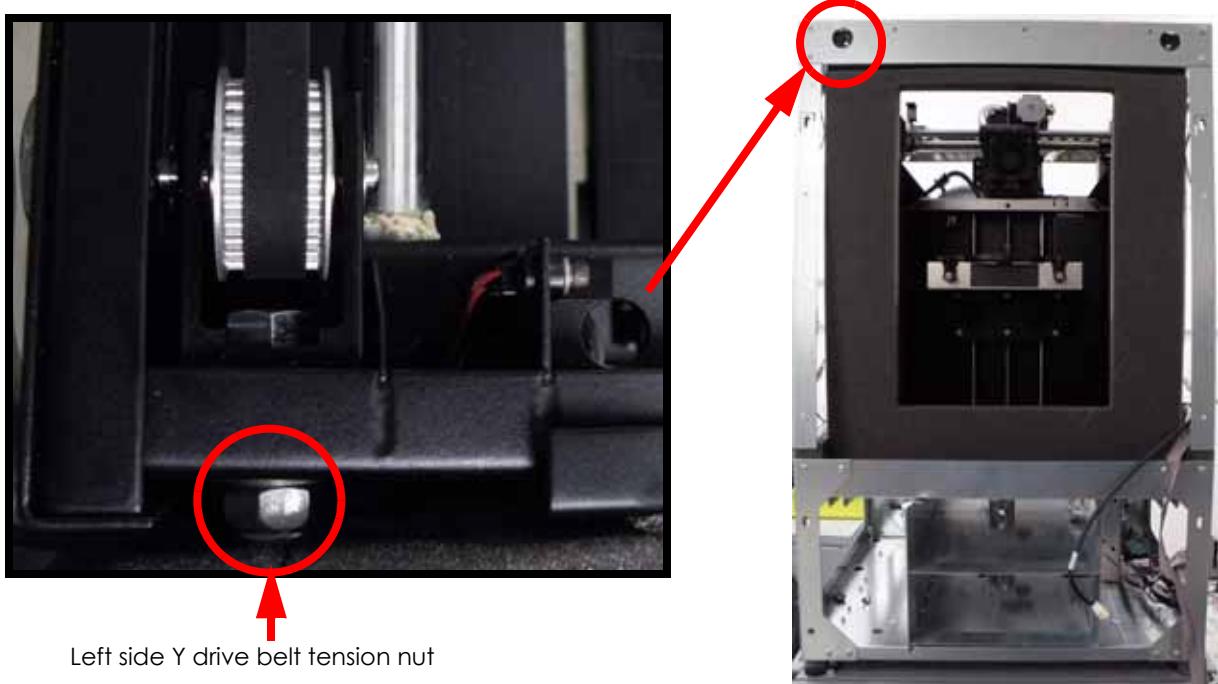
- Using a $\frac{1}{8}$ " allen wrench, remove the 4 left side Y belt clamp mounting screws and remove the belt clamp. See [Figure 387](#).

Figure 387: Left side Y belt clamp mounting screw locations



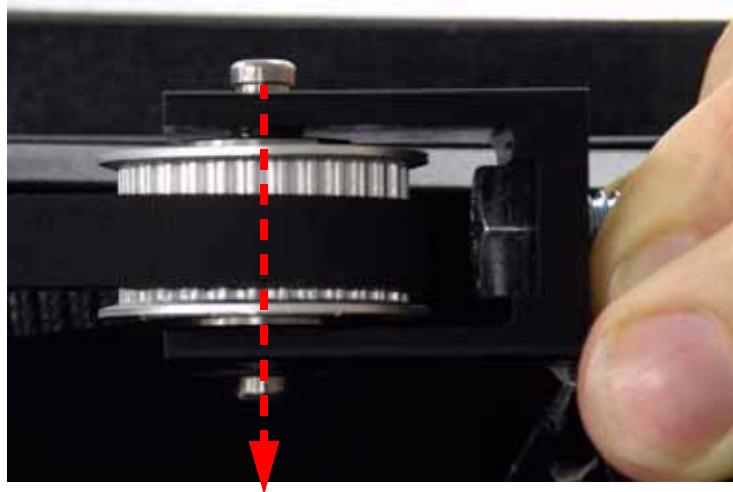
- Using a $\frac{1}{2}$ " nut driver or box wrench, remove the left side Y belt tension nut and washer. See [Figure 388](#).

Figure 388: Left side Y drive belt tension nut location



10. Pull the clevis from the XY table and push the pulley shaft out of the front left Y pulley. See [Figure 389](#).

Figure 389: Pulley shaft removal



11. Remove the Y drive belt from the Y pulley.
12. Discard the Y pulley.

Installing the Left Side Y Pulley:

1. Loop the left side Y drive belt around the front left pulley.
2. Align the front left pulley with the clevis.
3. Push the pulley shaft through the clevis and pulley.
4. Using a needle nose pliers or standard screwdriver, reinstall the shaft retaining ring to the pulley shaft.
5. Align the clevis with the XY table and use a $\frac{1}{2}$ " nut driver or box wrench to reinstall the washer and tensioning nut.



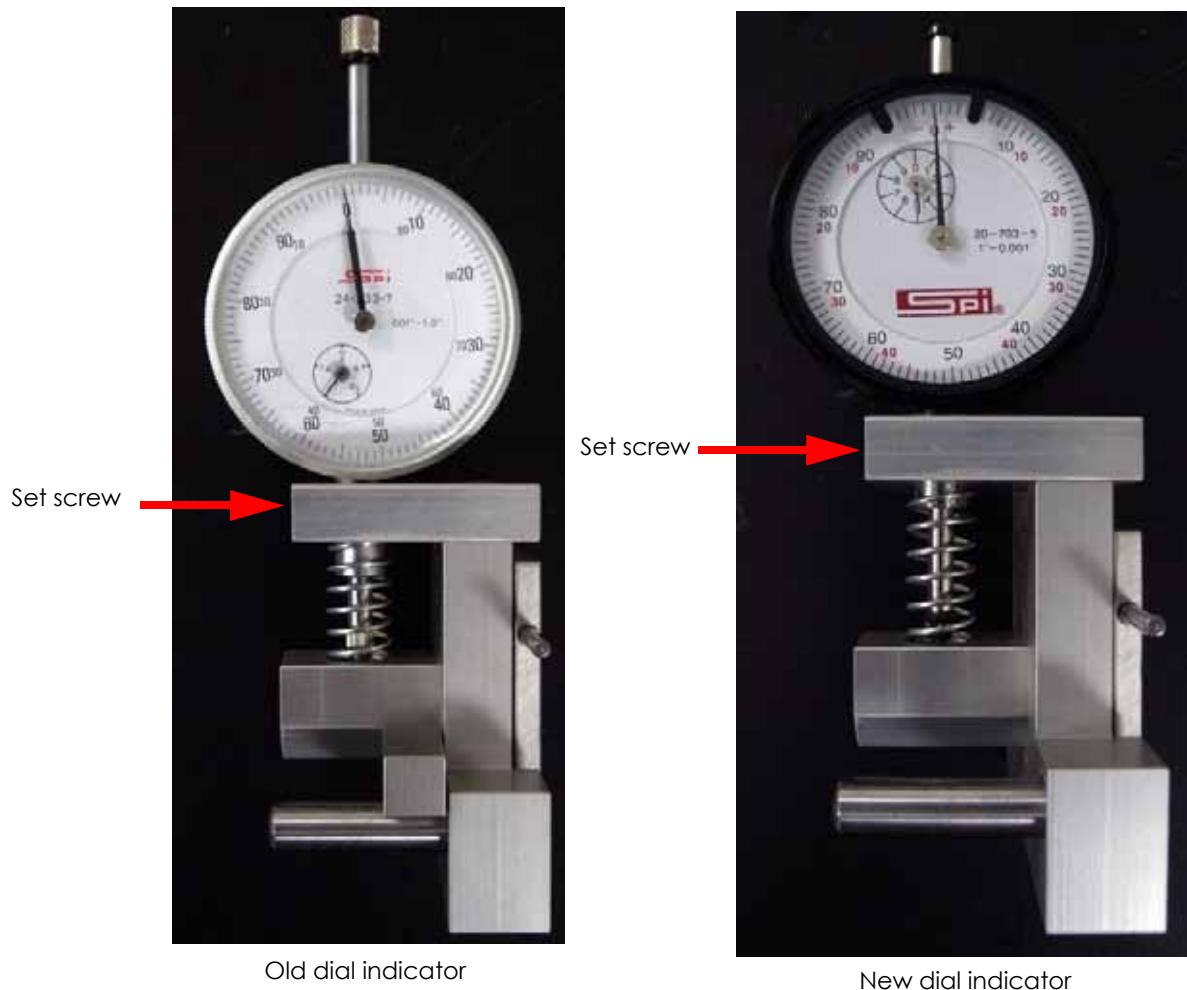
Do not tighten the tensioning nut completely. It will get tightened to the correct specification in a later step.

6. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 390](#).
7. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 390](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 390](#).



Turn the dial indicator to the right so the face is visible while tensioning the left side Y drive belt.

Figure 390: Belt tension gauge zero block



8. Remove the zero block from the belt tension gauge.
9. Move the head to the rear of the printer.
10. Place the belt tension gauge on the center of the left side Y drive belt. See [Figure 391](#).

Figure 391: Belt tension gauge location



Left View



Front View

11. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the left side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 392](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 392](#).

Figure 392: Dial indicator readings



Old dial indicator



New dial indicator

12. Remove the tension gauge and move the head from front to back several times.
13. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps [9 - 12](#) until the belt tension is within specification.
14. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
15. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
16. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
17. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
18. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
19. Power on the system. The system should reach **Idle** with no displayed errors.
20. Run a small test part and monitor system operation during build.

Y Drive Assembly (Belt Drive)

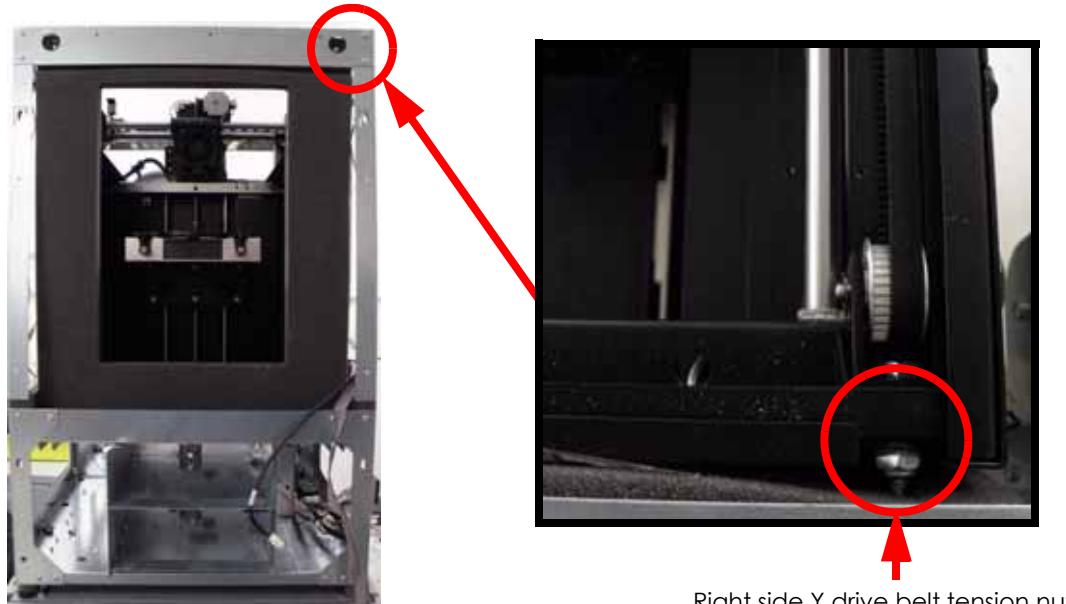
Required Tools

- $\frac{1}{8}$ " allen wrench
- $\frac{9}{64}$ " allen wrench
- $\frac{1}{2}$ " nut driver or box wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- XY motor belt tension tool
- Belt tension gauge
- Dial Indicator

Removing the Y Drive Assembly:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
6. Using a $\frac{1}{2}$ " nut driver or box wrench, loosen the right side Y belt tension nut and washer. See [Figure 393](#).

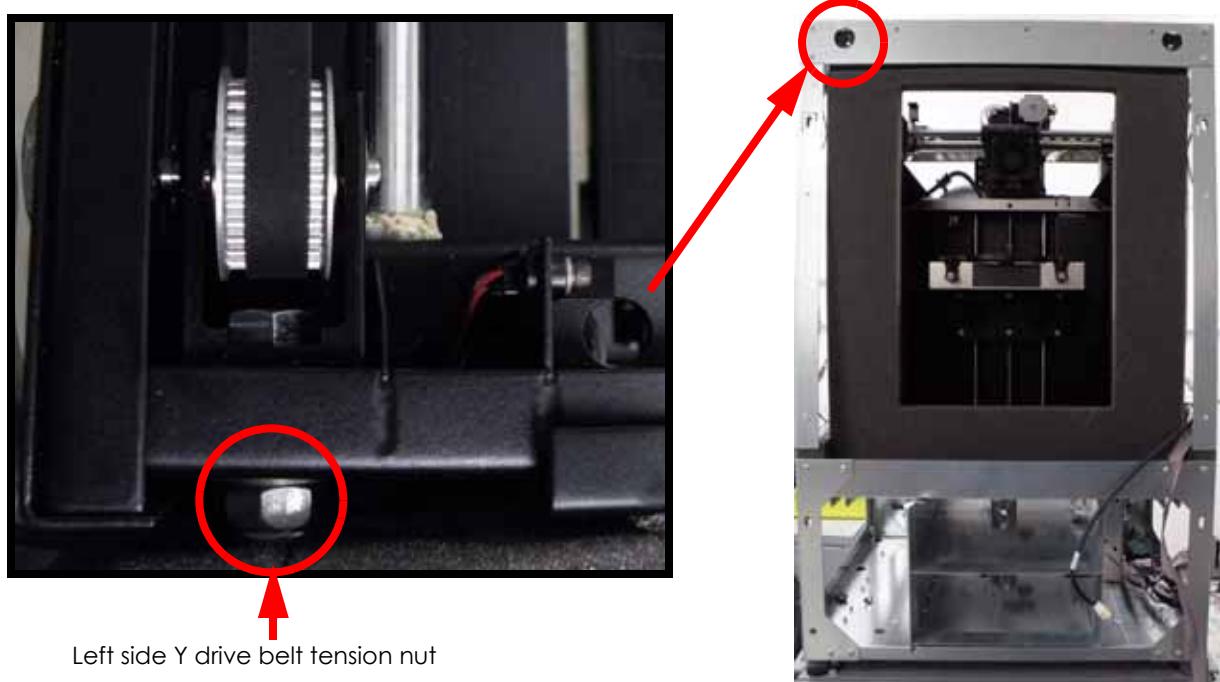
Figure 393: Right side Y drive belt tension nut location



Right side Y drive belt tension nut

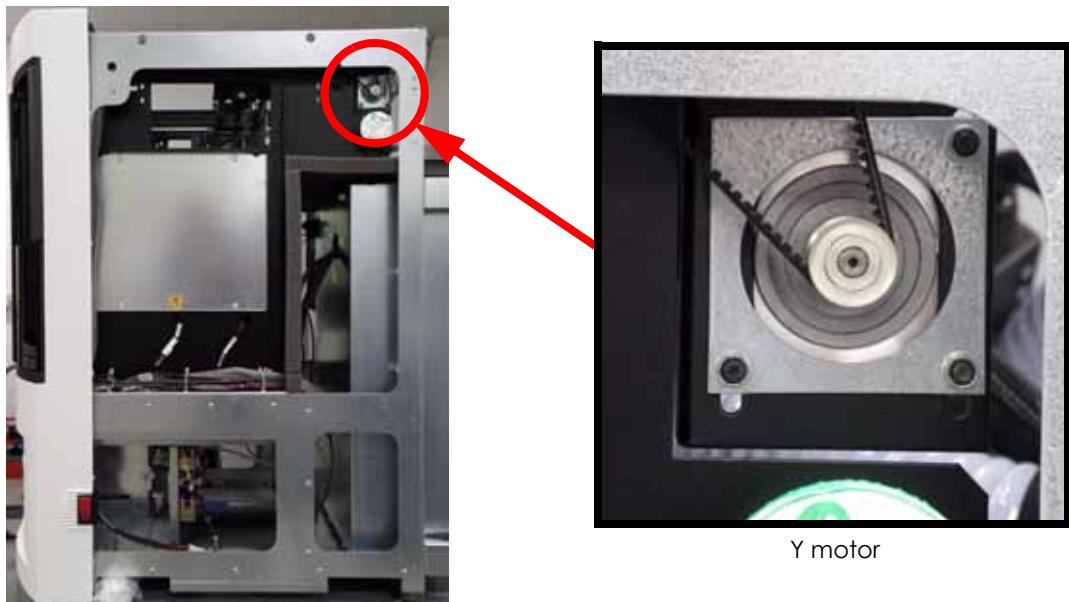
- Using a $\frac{1}{2}$ " nut driver or box wrench, remove the left side Y belt tension nut and washer. See [Figure 394](#).

Figure 394: Left side Y drive belt tension nut location



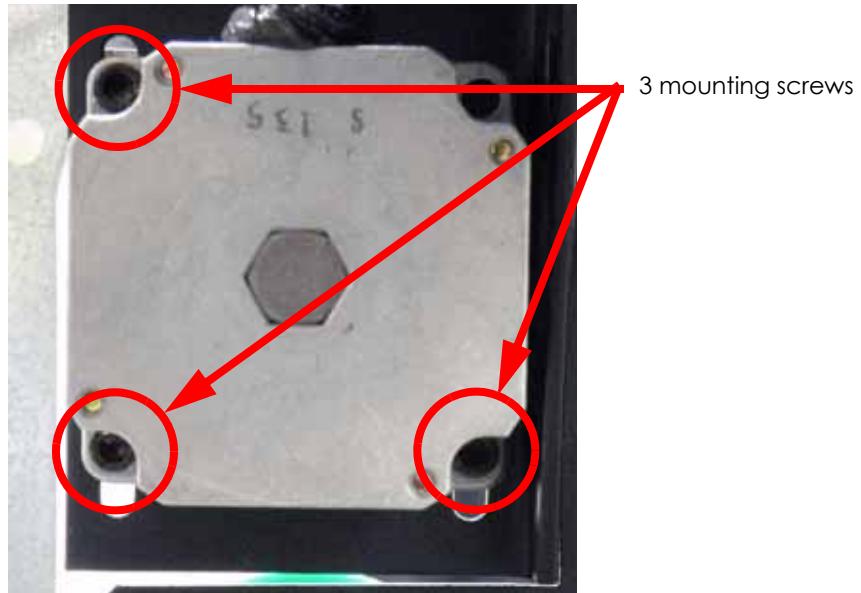
- Locate the Y motor. See [Figure 395](#).

Figure 395: Y motor location



9. Loosen, but do not remove the 3 Y motor mounting screws using a $\frac{9}{64}$ " allen wrench. See [Figure 396](#).

Figure 396: Y motor mounting screw locations



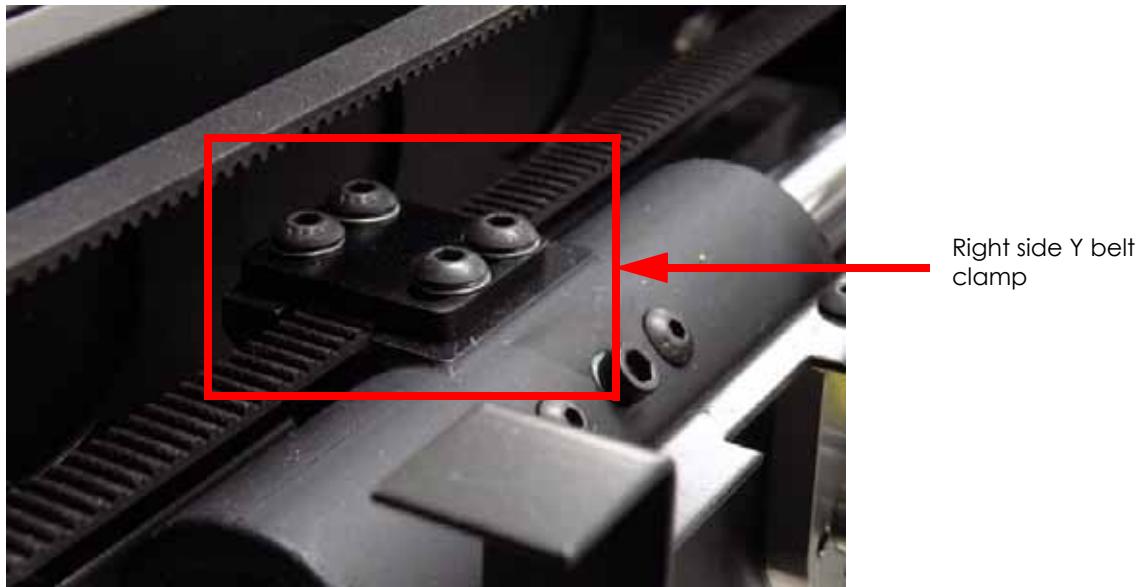
10. Raise the Y motor and remove the Y motor belt from the Y motor pulley and the Y drive pulley.
11. Using a $\frac{1}{8}$ " allen wrench, remove the 4 right side Y belt clamp mounting screws and remove the belt clamp. See [Figure 397](#).

Figure 397: Right side Y belt clamp mounting screw locations



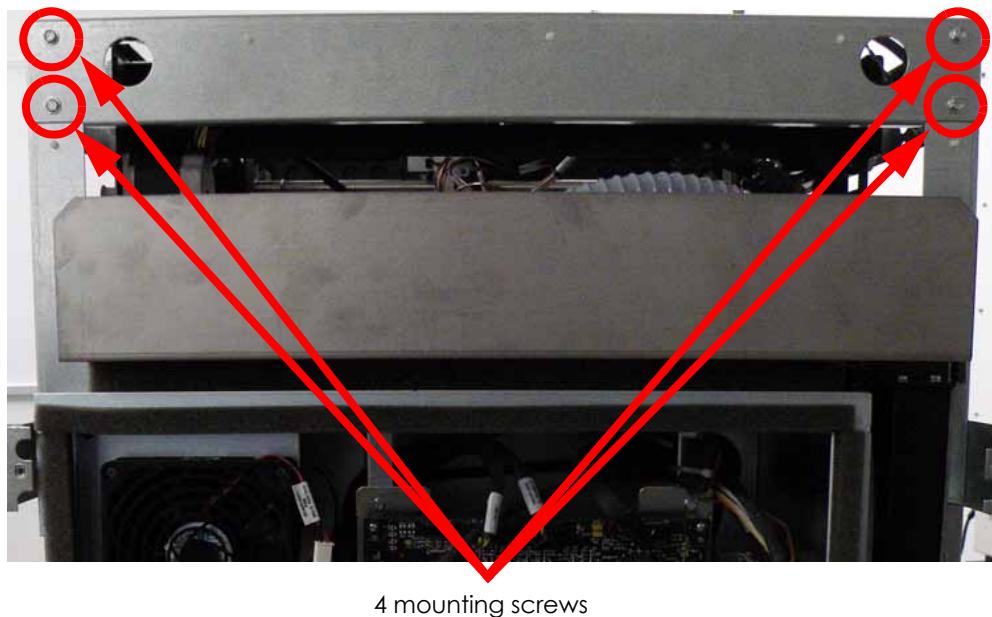
12. Using a $\frac{1}{8}$ " allen wrench, remove the 4 left side Y belt clamp mounting screws and remove the belt clamp. See [Figure 398](#).

Figure 398: Left side Y belt clamp mounting screw locations



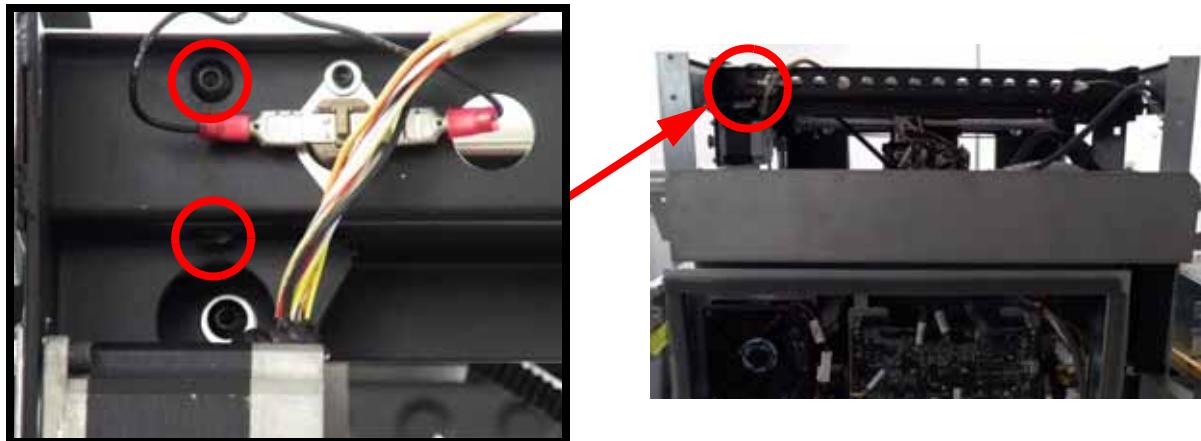
13. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 rear frame bracket mounting screws. See [Figure 399](#).

Figure 399: Rear frame bracket mounting screw locations



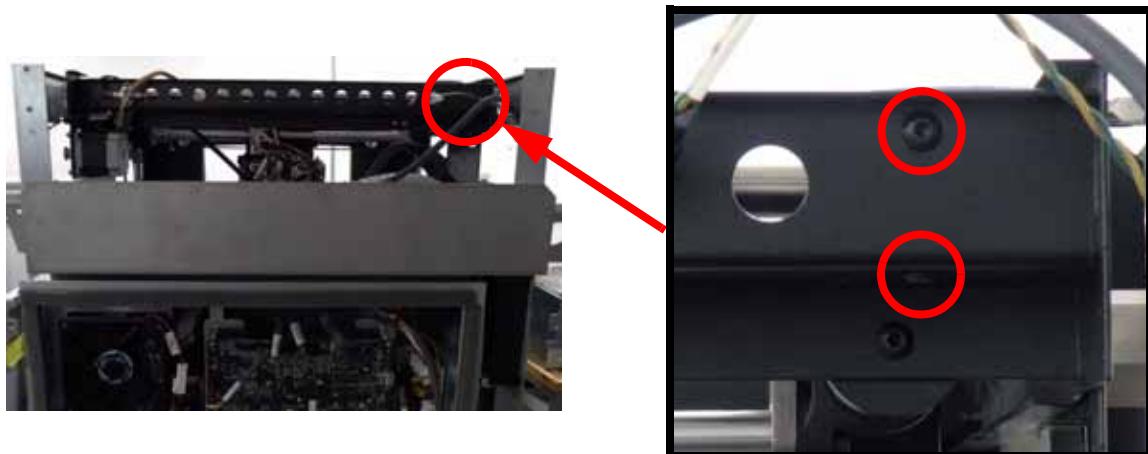
14. Using a $\frac{1}{8}$ " allen wrench, remove the 2 right side Y drive rod assembly mounting screws. See [Figure 400](#).

Figure 400: Right side Y drive rod assembly mounting screw locations



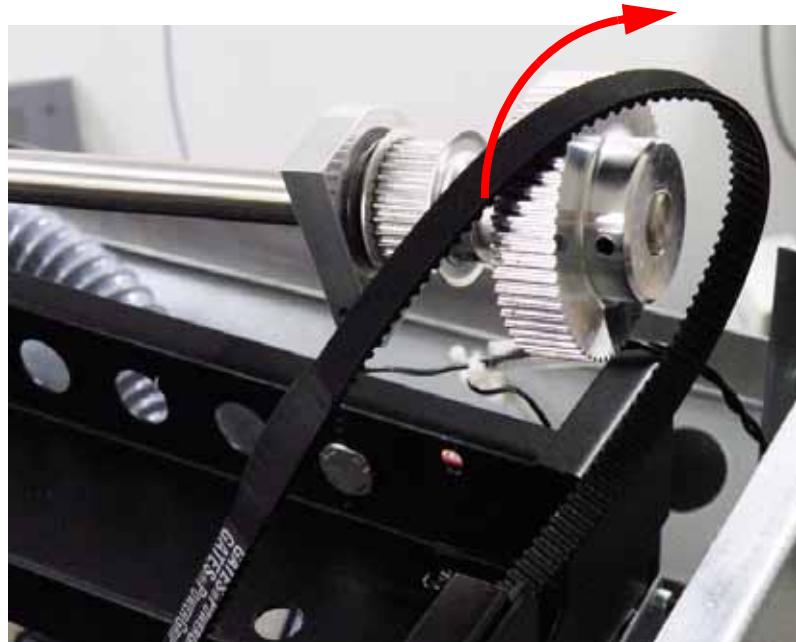
15. Using a $\frac{1}{8}$ " allen wrench, remove the 2 left side Y drive rod assembly mounting screws. See [Figure 401](#).

Figure 401: Left side Y drive rod assembly mounting screw locations



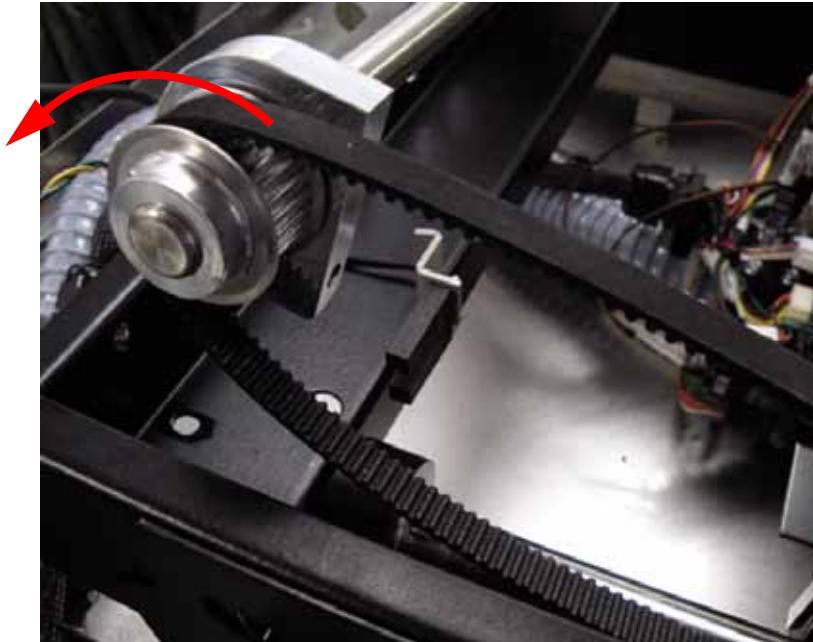
16. Lift the Y drive assembly upwards and remove the right side Y drive belt by looping over the large Y rear drive pulley. See [Figure 402](#).

Figure 402: Removing the right side Y drive belt



17. Lift the Y drive assembly upwards and remove the left side Y drive belt by looping over the rear drive pulley. See [Figure 403](#).

Figure 403: Removing the left side Y drive belt

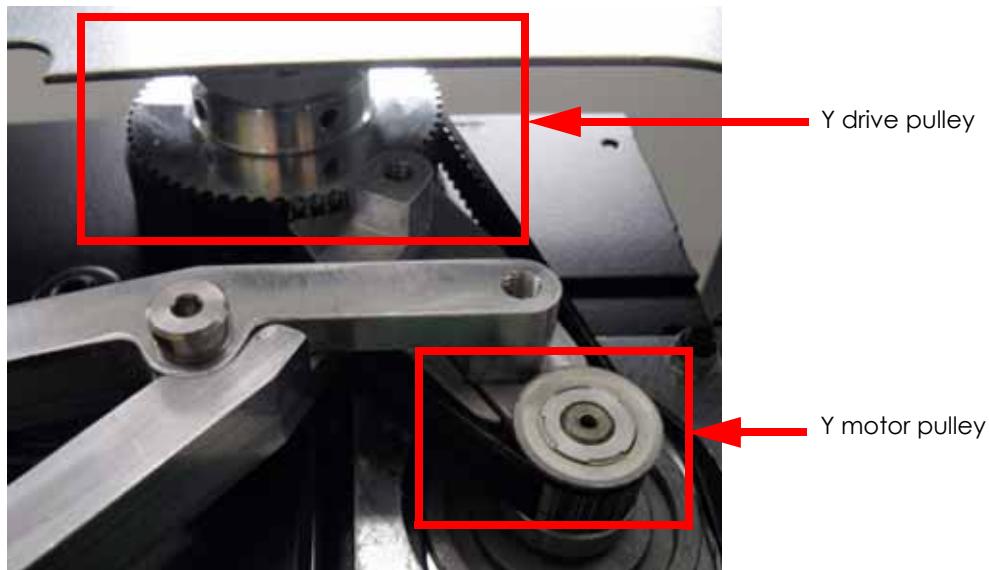


18. Remove the Y Drive Rod Assembly and discard.

Installing the Y Drive Assembly:

1. Loop the Y drive belt over the large right side Y drive pulley.
2. Loop the Y drive belt over the left side Y drive pulley.
3. Align the Y drive assembly with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
4. Align the rear frame bracket and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
5. Raise the Y motor so the Y motor belt can be placed around the Y motor pulley.
6. Insert the XY belt tension tool between the Y motor pulley and the Y drive pulley by squeezing the handles together. When in place, release the handles to obtain tension. See [Figure 404](#).

Figure 404: XY belt tension tool location

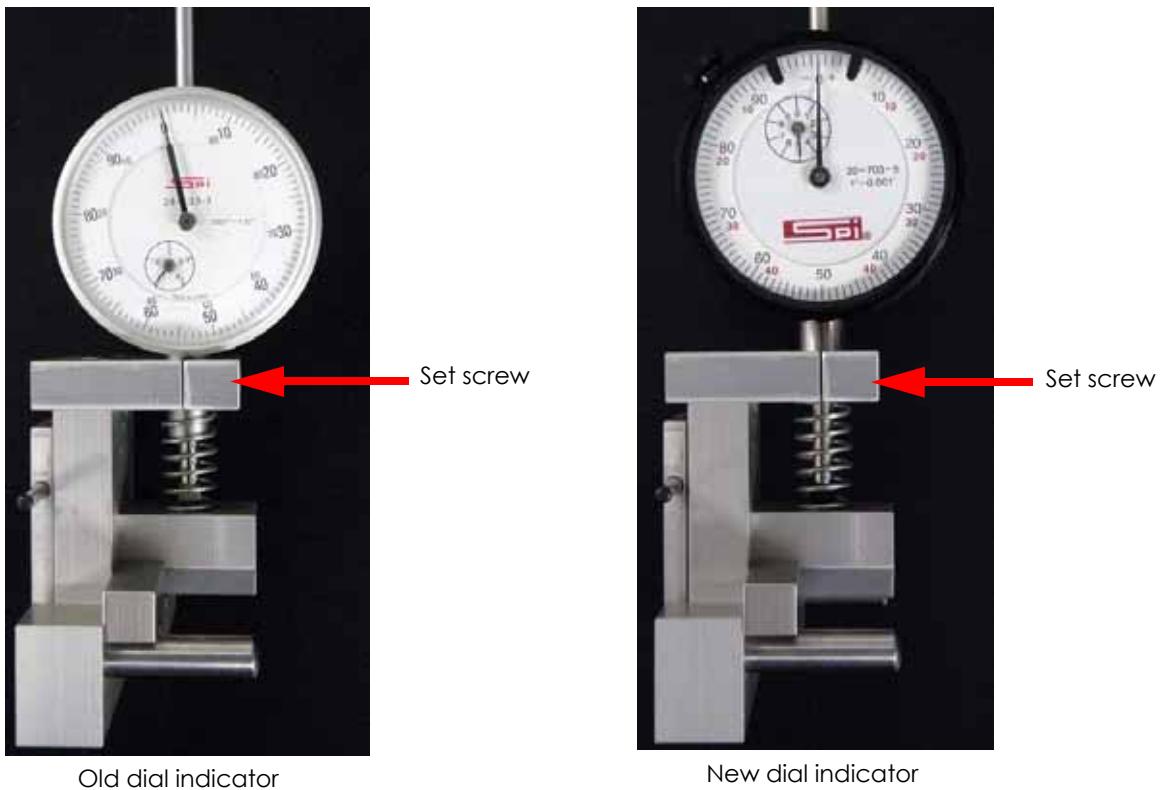


7. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 mounting screws.
8. Remove the XY motor belt tension tool.
9. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 405](#).
10. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 405](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 405](#).



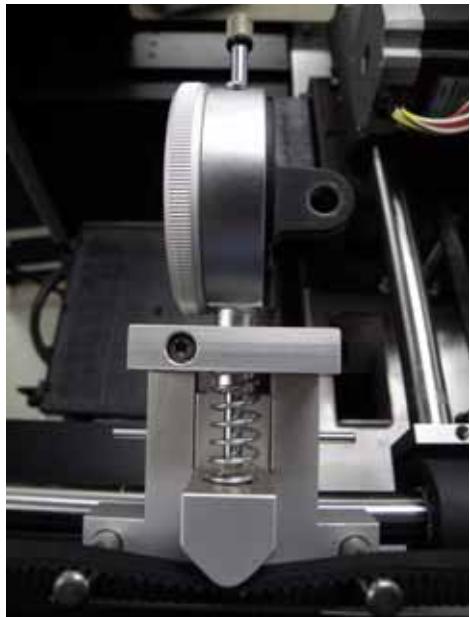
Turn the dial indicator to the left so the face is visible while tensioning the right side Y drive belt.

Figure 405: Belt tension gauge zero block



11. Remove the zero block from the belt tension gauge.
12. Move the head to the rear of the printer.
13. Place the belt tension gauge on the center of the right side Y drive belt. See [Figure 406](#).

Figure 406: Belt tension gauge location



Right View



Front View

14. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the right side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 407](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 407](#).

Figure 407: Dial indicator readings



Old dial indicator



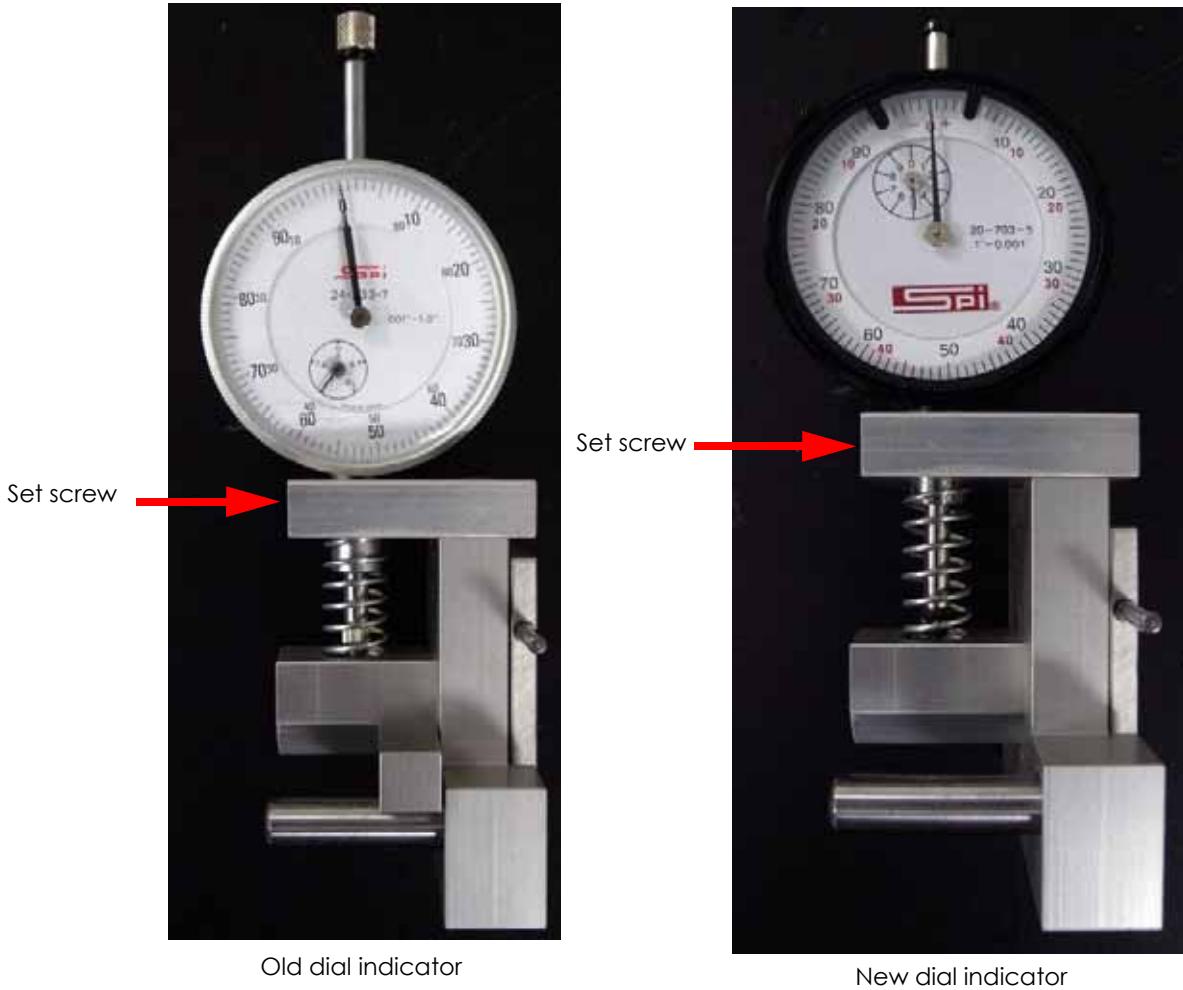
New dial indicator

15. Remove the tension gauge and move the head from front to back several times.
16. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps 12 - 15 until the belt tension is within specification.
17. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
18. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 408](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 408](#).



Turn the dial indicator to the right so the face is visible while tensioning the left side Y drive belt.

Figure 408: Belt tension gauge zero block



19. Remove the zero block from the belt tension gauge.
20. Move the head to the rear of the printer.
21. Place the belt tension gauge on the center of the left side Y drive belt. See [Figure 409](#).

Figure 409: Belt tension gauge location



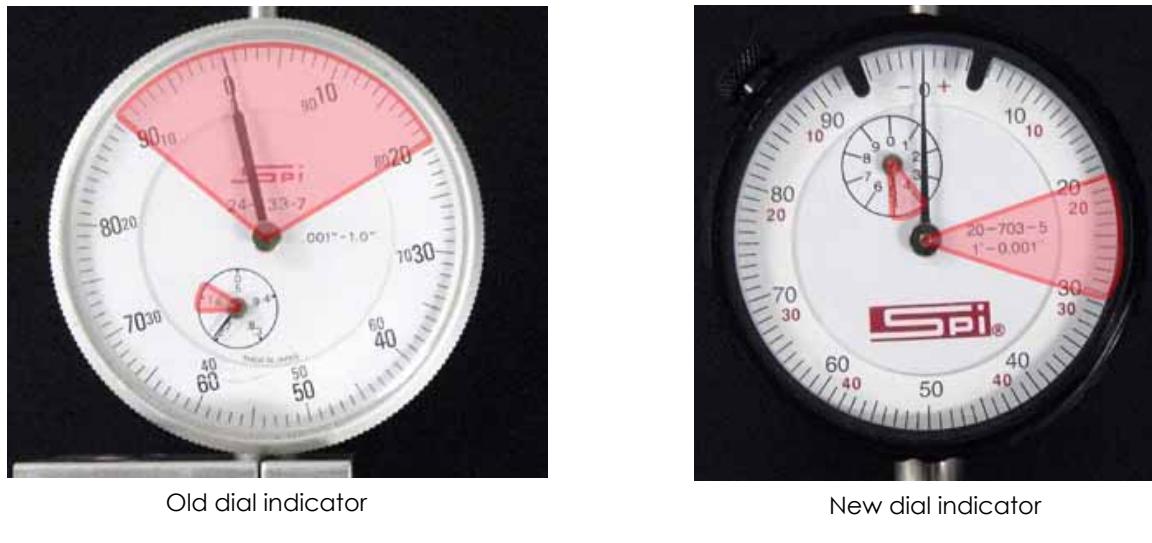
Left View



Front View

22. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the left side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 410](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 410](#).

Figure 410: Dial indicator readings



23. Remove the tension gauge and move the head from front to back several times.
24. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps 20 - 23 until the belt tension is within specification.
25. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
26. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
27. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
28. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
29. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
30. Power on the system. The system should reach **Idle** with no displayed errors.
31. Run a small test part and monitor system operation during build.

XY Table Assembly (Belt Drive)

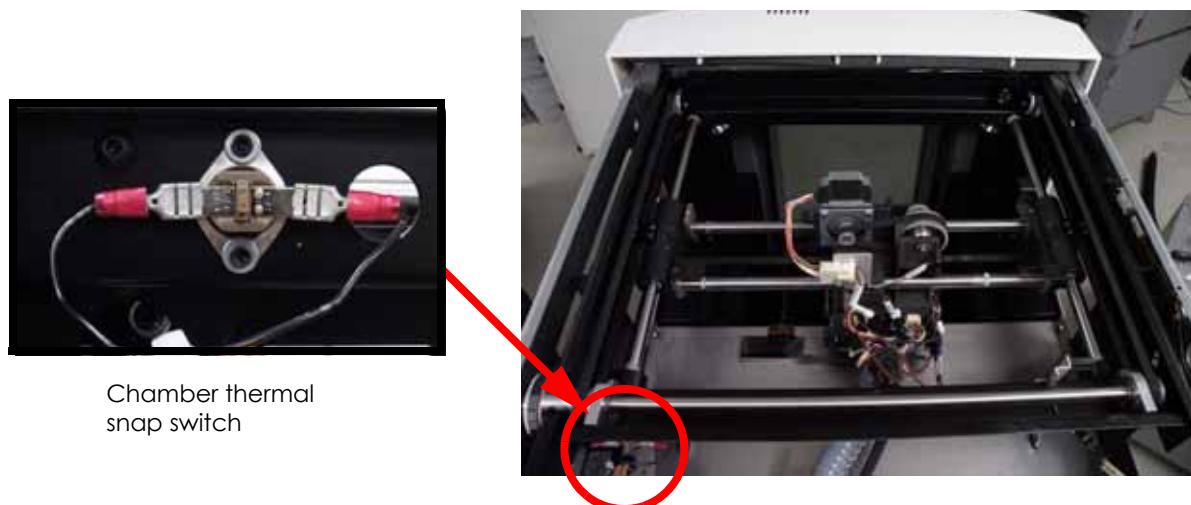
Required Tools

- $\frac{1}{8}$ " allen wrench
- $\frac{9}{64}$ " allen wrench
- $\frac{5}{64}$ " allen wrench
- $\frac{1}{4}$ " nut driver or standard screwdriver
- $\frac{5}{16}$ " nut driver
- Cam wrench or large crescent wrench
- XY motor belt tension tool
- Belt tension gauge
- Head bracket
- Dial indicator

Removing the XY Table Assembly:

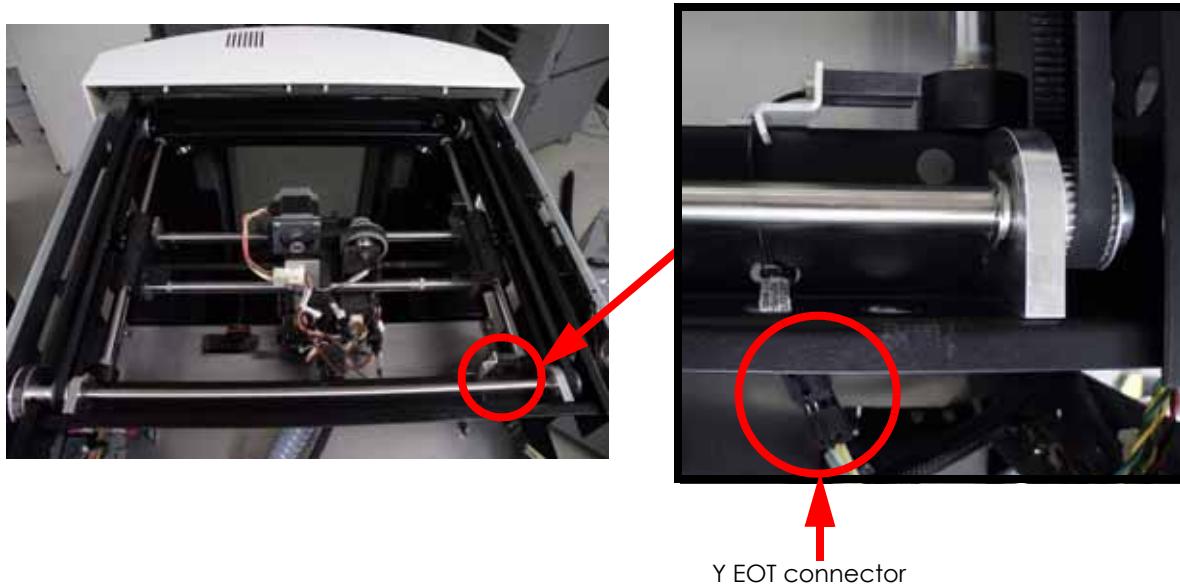
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Remove the Z foam level assembly. See “[Removing the Z Foam Level Assembly:](#)” on page 5-224.
6. Disconnect the chamber thermal snap switch by pulling the 2 wires away from the spade connectors. See [Figure 411](#).

Figure 411: Chamber snap switch location



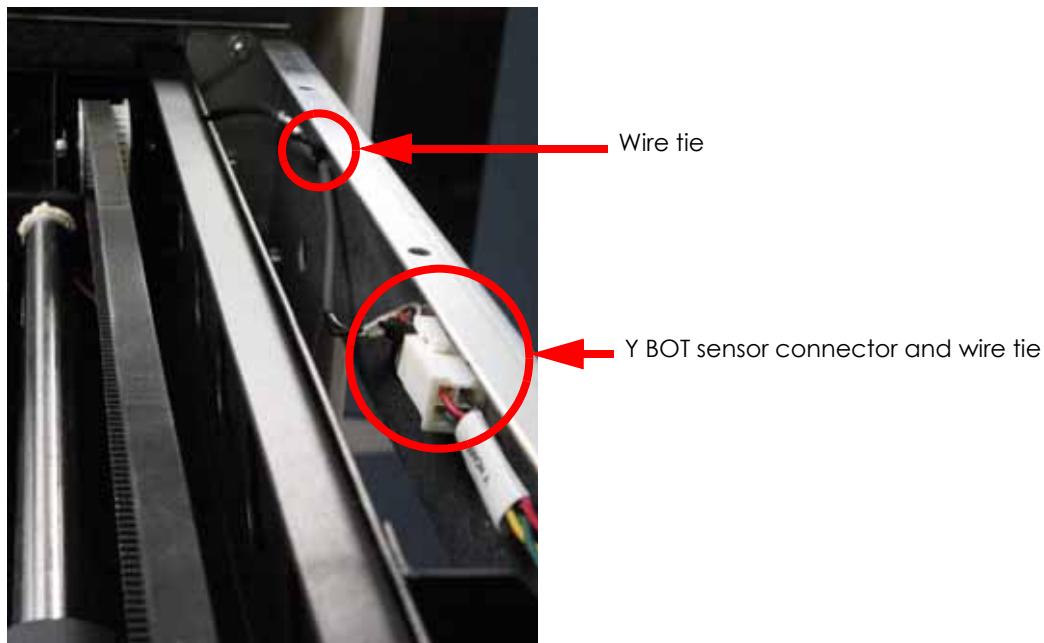
7. Disconnect the Y EOT sensor by pressing the tab in and pulling outwards. See [Figure 412](#).

Figure 412: Y EOT sensor location



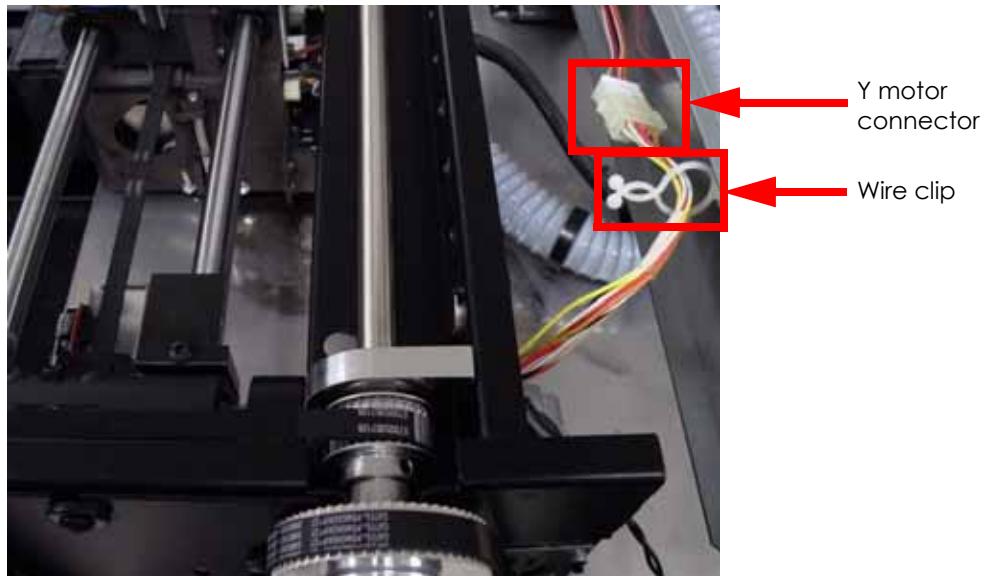
8. Using a cutters, cut the wire tie from the Y BOT sensor cable and Y BOT sensor connector. See [Figure 413](#).
9. Disconnect the Y BOT sensor by pressing the tab in and pulling outwards. See [Figure 413](#).

Figure 413: Y BOT sensor wire tie locations



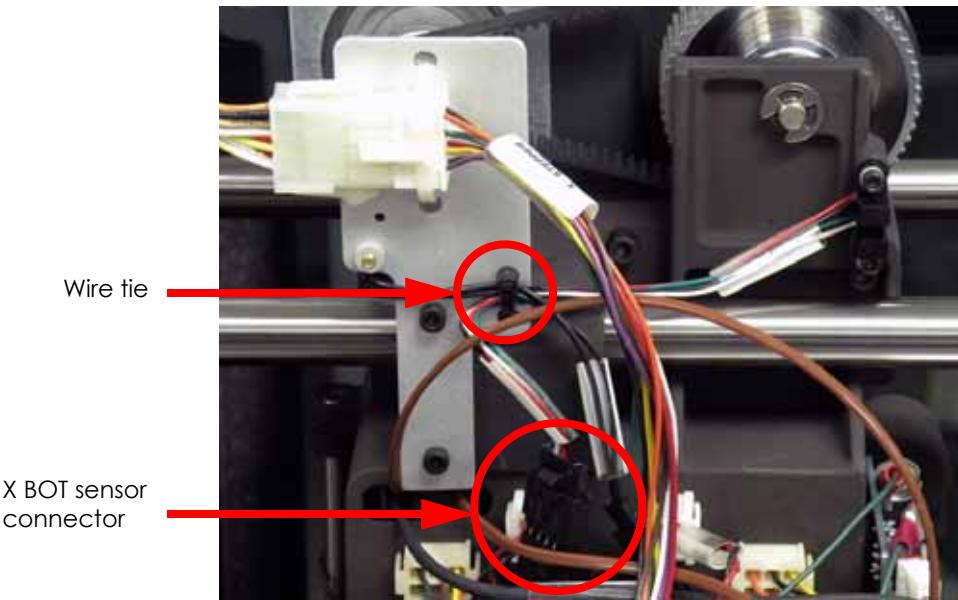
10. Disconnect the Y motor cable by pressing the tab in and pulling outwards. See [Figure 414](#).
11. Un-clip the Y motor cable wire tie and remove the Y motor cable. See [Figure 414](#).

Figure 414: Y motor connector location



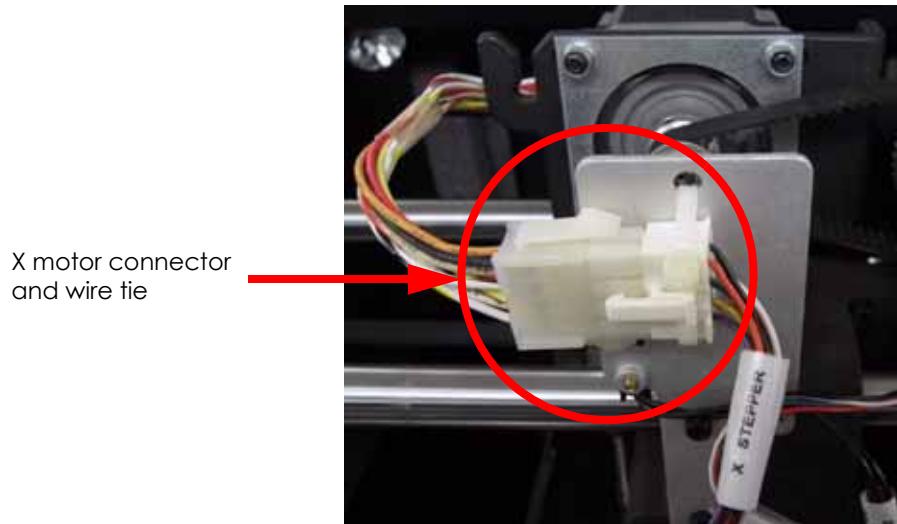
12. Using a cutters, cut and remove the wire tie securing the X BOT sensor wire. See [Figure 415](#).
13. Disconnect the X BOT sensor by pressing the tab in and pulling apart. See [Figure 415](#).

Figure 415: X BOT sensor connector location



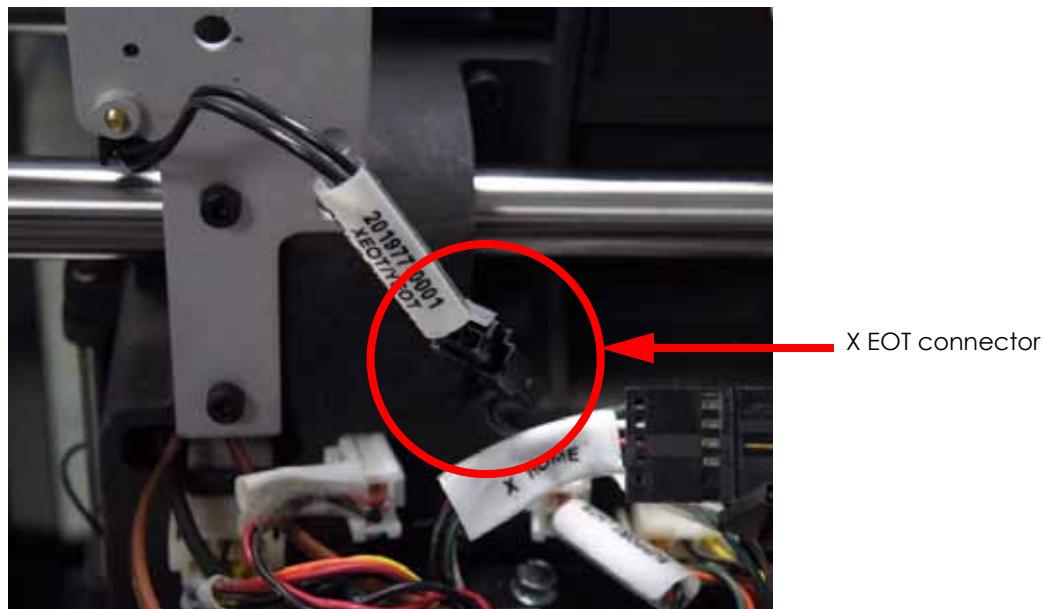
14. Using a cutters, cut the wire tie from the X motor connector. See [Figure 416](#).
15. Disconnect the X motor cable by pressing the tab in and pulling outwards. See [Figure 416](#).

Figure 416: X motor connector location



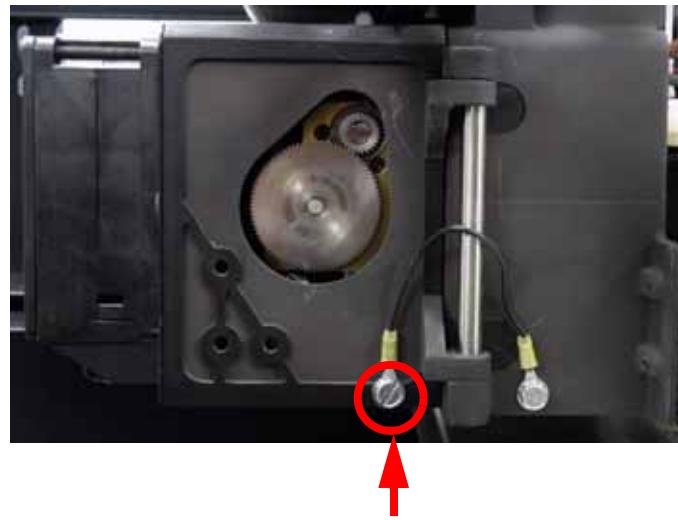
16. Disconnect the X EOT sensor by pressing the tab in and pulling outwards. See [Figure 417](#).

Figure 417: X EOT connector location



17. Locate the head ground wire and use a $\frac{1}{4}$ " nut driver or standard screwdriver to remove the front mounting screw only. See [Figure 418](#).

Figure 418: Head ground wire location



Front head ground wire mounting screw

18. At the TC Amp board, disconnect the model (upper) and support (lower) thermocouples by pulling outwards. See [Figure 419](#).

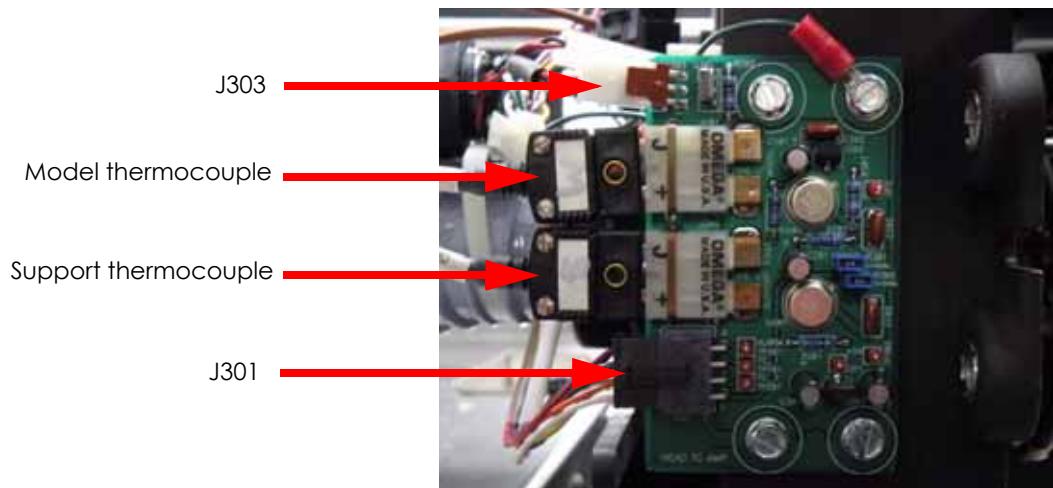


Note the location of the model and support thermocouples for reinstallation

19. Disconnect J301 from the TC Amp board by pressing the tab in and pulling outwards. See [Figure 419](#).

20. Disconnect J303 from the TC Amp board by pulling outwards. See [Figure 419](#).

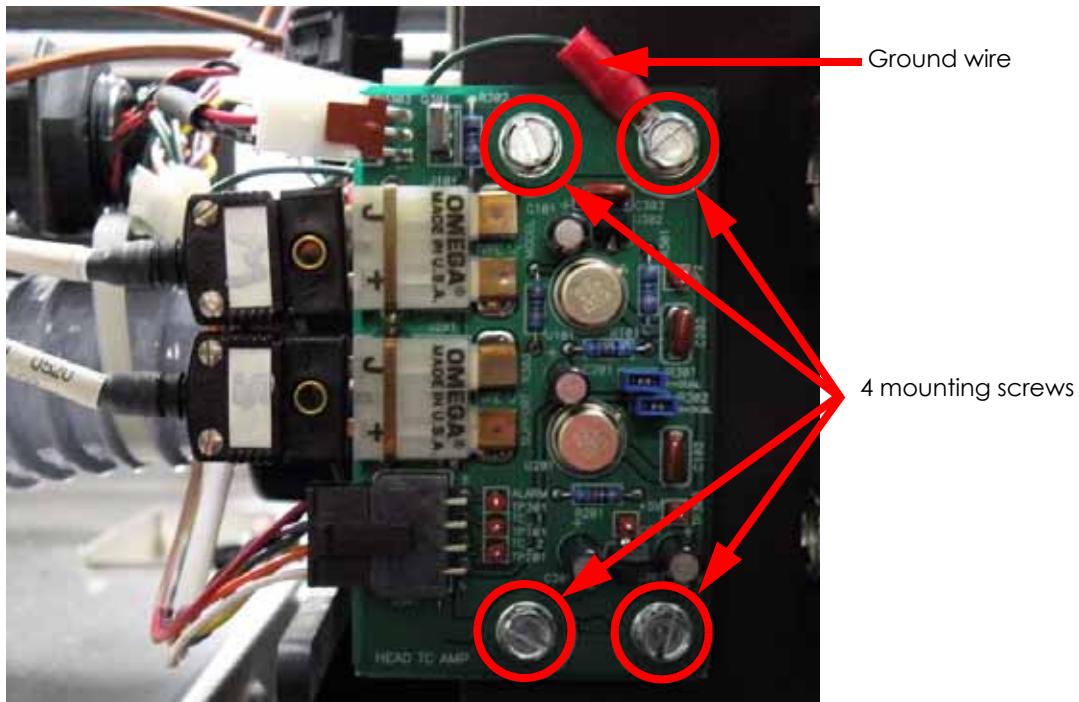
Figure 419: Model and support thermocouple locations



21. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 4 mounting screws. See [Figure 420](#).

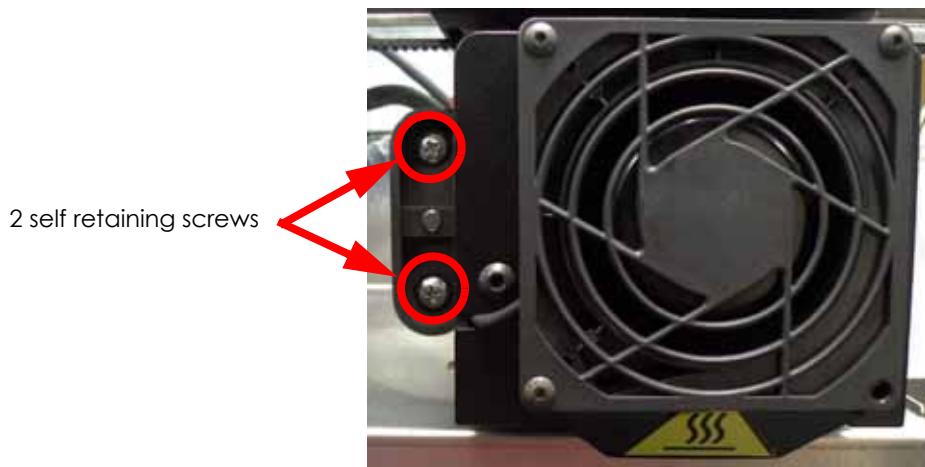
 Note the location of the ground wire.

Figure 420: Mounting screw locations



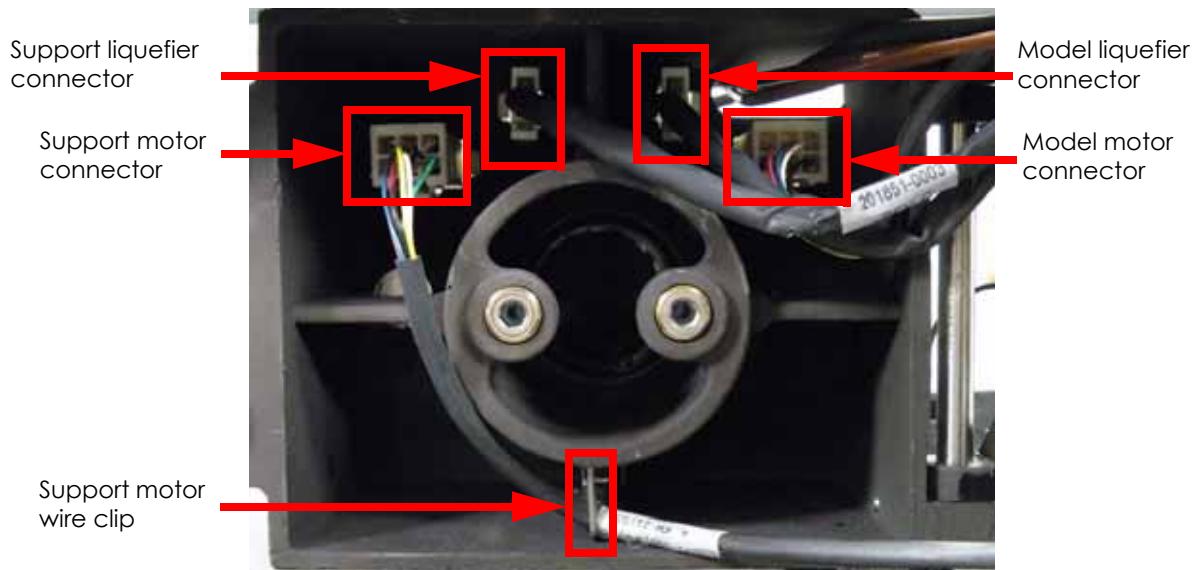
22. Using a phillips screwdriver, loosen the 2 self retaining screws from the left side of the head and open the head by pulling outward. See [Figure 421](#).

Figure 421: Head self retaining screw locations



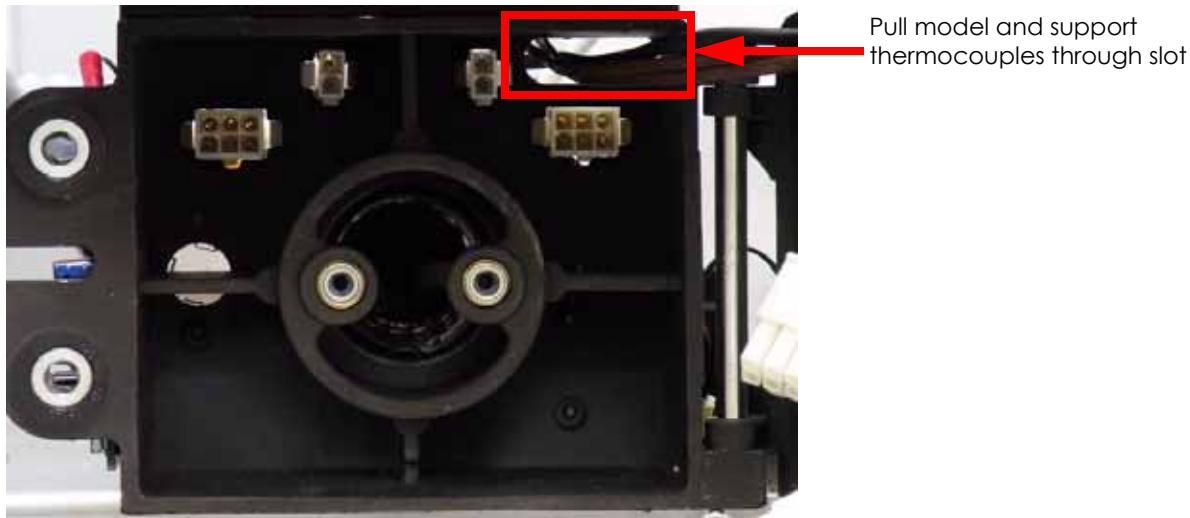
23. Disconnect the model motor connector by pressing the tab in and pulling outwards. See [Figure 422](#).
24. Disconnect the support motor connector by pressing the tab in and pulling outwards. See [Figure 422](#).
25. Pull the support motor wire clip from the translator. See [Figure 422](#).
26. Disconnect the model liquefier connector by pressing the tab in and pulling outwards. See [Figure 422](#).
27. Disconnect the support liquefier connector by pressing the tab in and pulling outwards. See [Figure 422](#).

Figure 422: Head connector detail



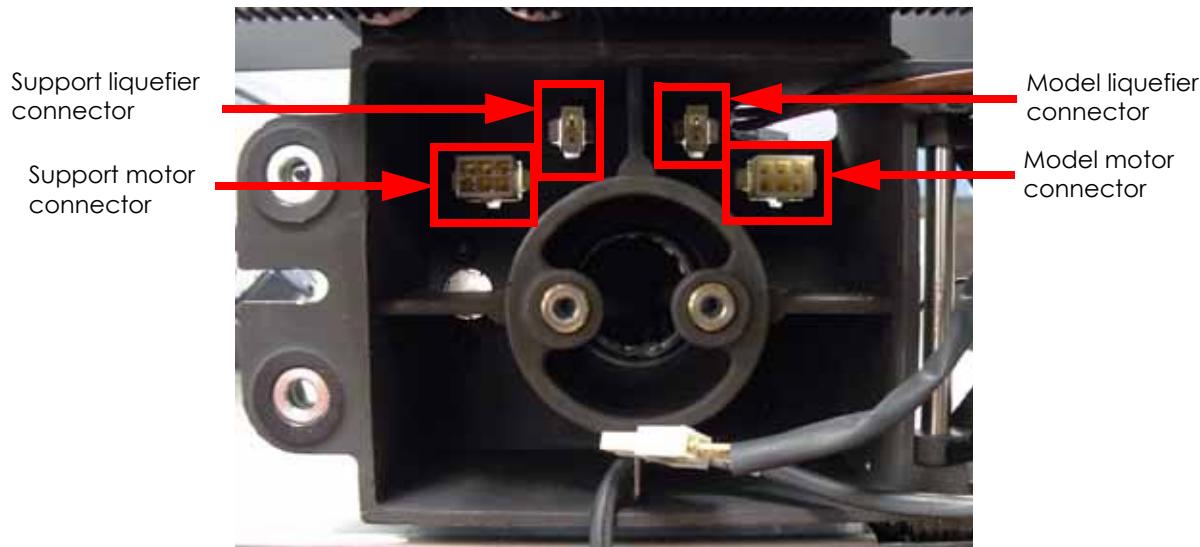
28. Pull the J303 fan cable, model thermocouple and support thermocouple wires through the access slot on the translator. See [Figure 423](#).

Figure 423: Translator access slot location



29. Remove the model and support liquefier and motor connectors from the translator by pressing the tabs in and pushing outwards. See [Figure 424](#).

Figure 424: Umbilical connector detail

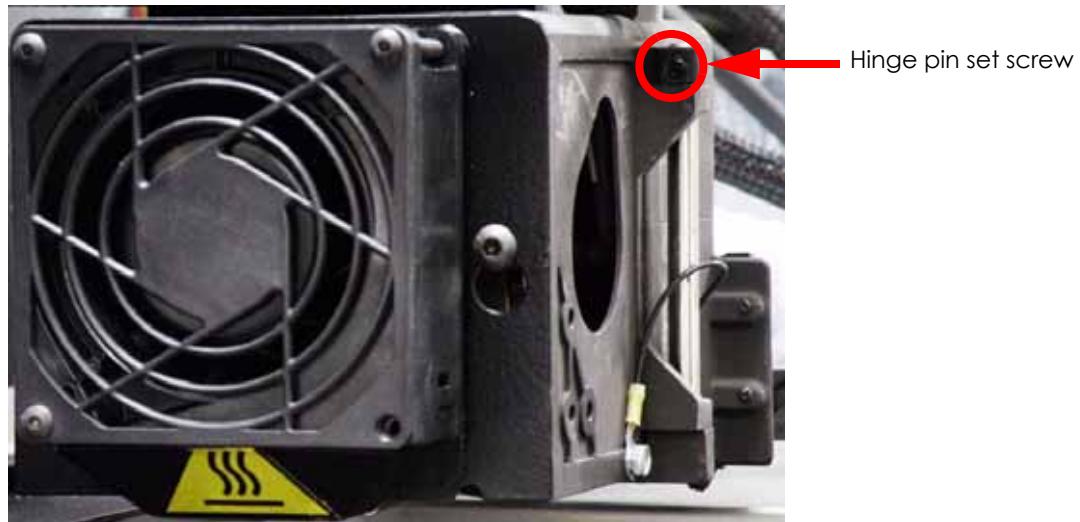


30. Using a $\frac{5}{64}$ " allen wrench, loosen the head hinge pin set screw. See [Figure 425](#).



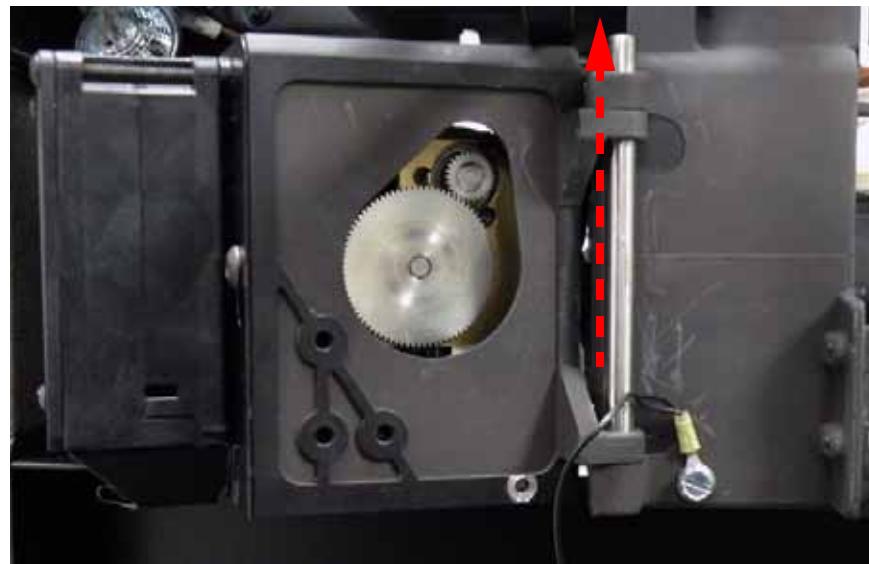
Be careful not to lose the head hinge pin set screw.

Figure 425: Head hinge pin set screw location



31. Remove the head hinge pin by lifting upwards. See [Figure 426](#).

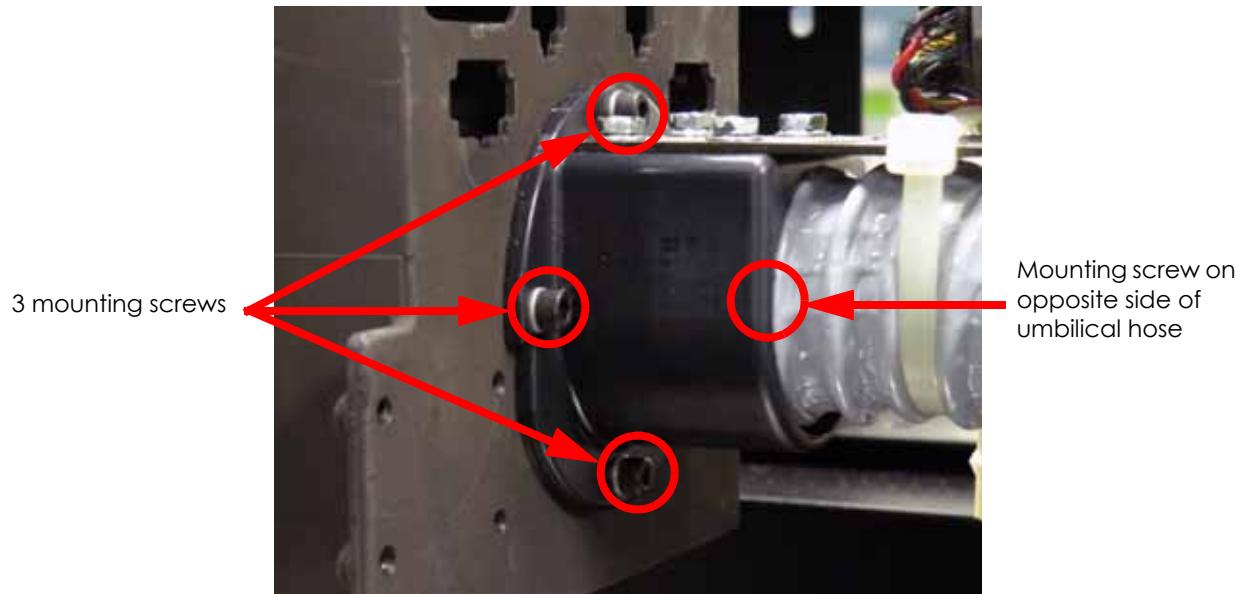
Figure 426: Removing the head hinge pin



32. Remove the head from the printer.

33. Using a $\frac{7}{64}$ " allen wrench, remove the 4 umbilical hose mounting screws from the translator. See [Figure 427](#).

Figure 427: Umbilical hose mounting screw locations

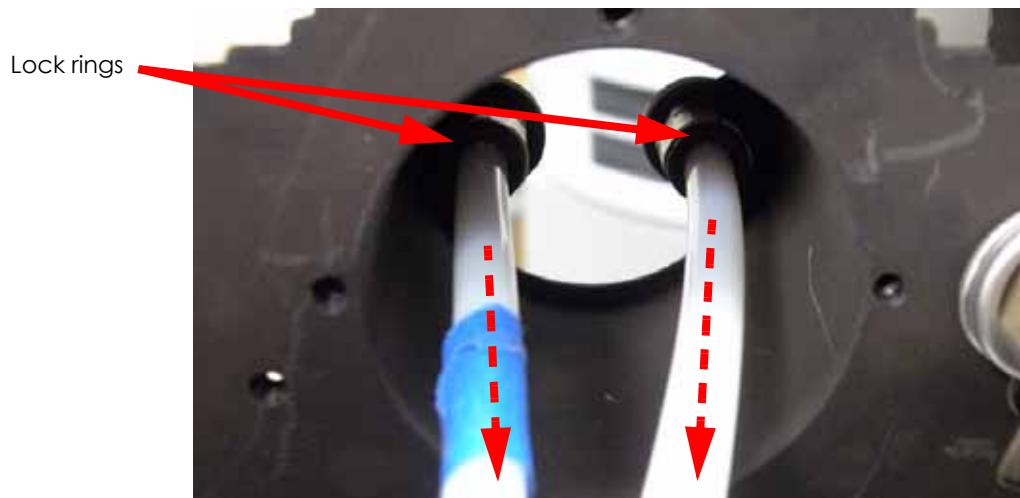


34. Pull the umbilical hose away from the translator.
35. Disconnect the material tubes by pushing the lock ring in and pulling the tubes outwards.
See [Figure 428](#).



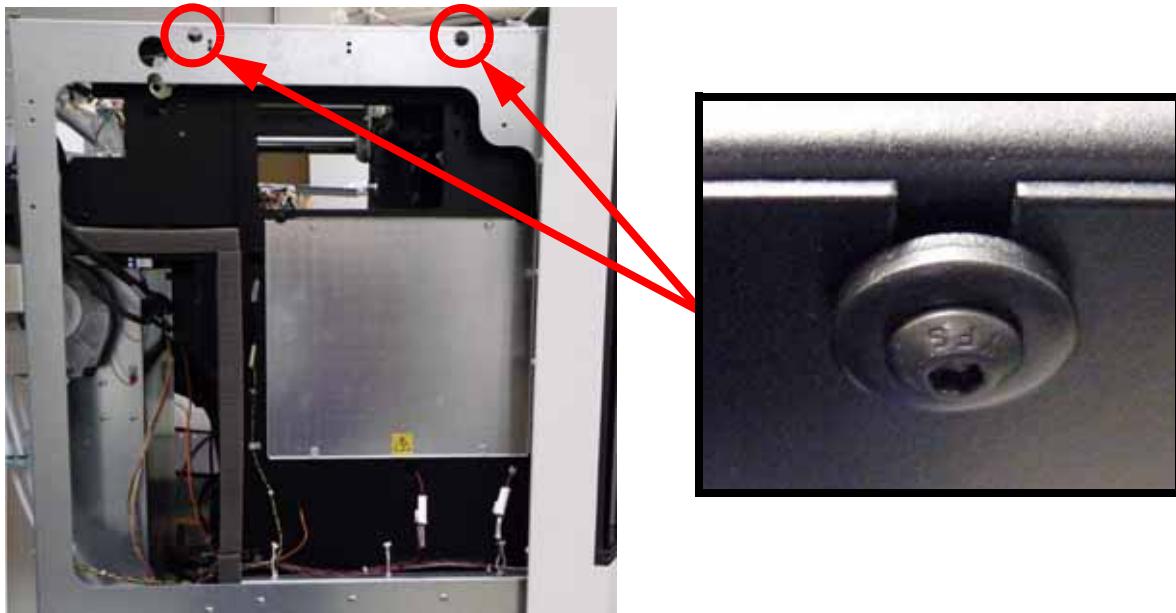
Mark the material tubes for easy reinstallation

Figure 428: Material tube connector locations



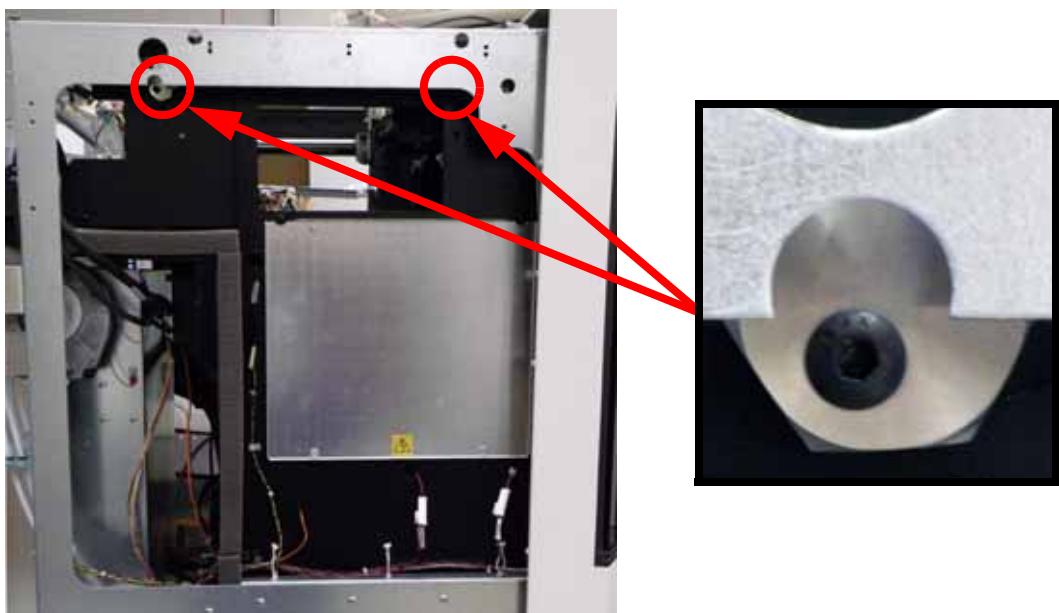
36. Using a $\frac{1}{8}$ " allen wrench, remove the 2 left side XY Table mounting screws. See [Figure 429](#).

Figure 429: Left side XY table mounting screw locations



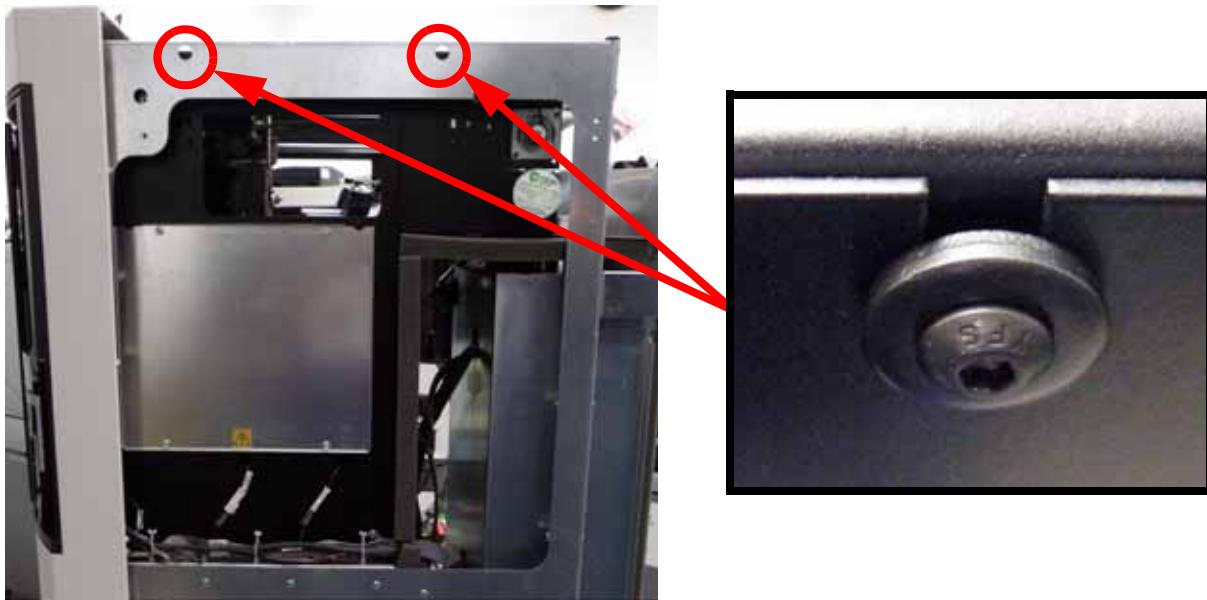
37. Using a $\frac{1}{8}$ " allen wrench, remove the 2 left side XY Table cams. See [Figure 430](#).

Figure 430: Left side XY table mounting screw locations



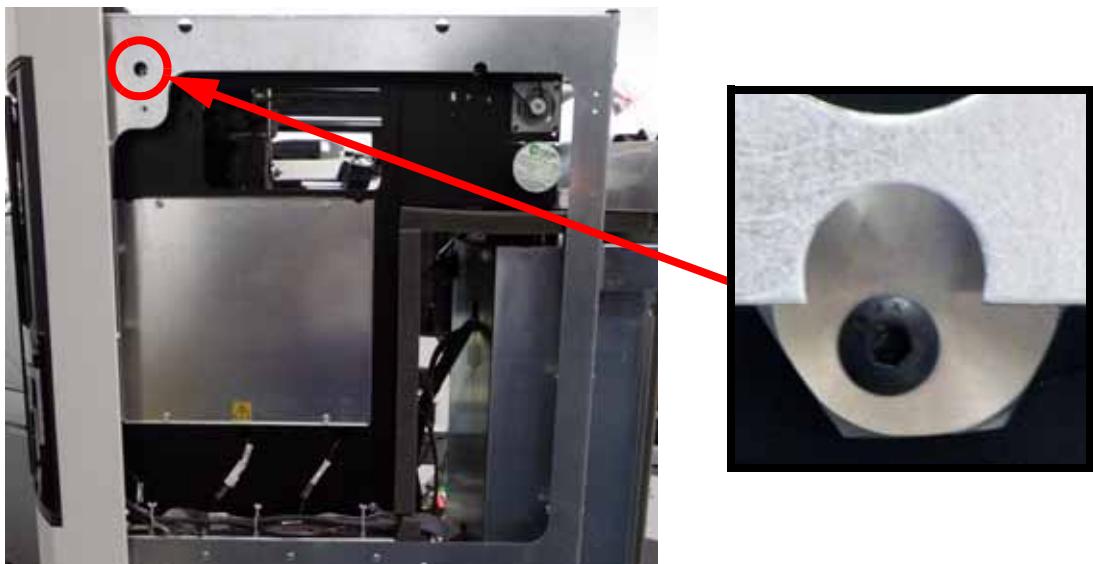
38. Using a $\frac{1}{8}$ " allen wrench, remove the 2 right side XY Table mounting screws. See [Figure 431](#).

Figure 431: Right side XY table mounting screw locations



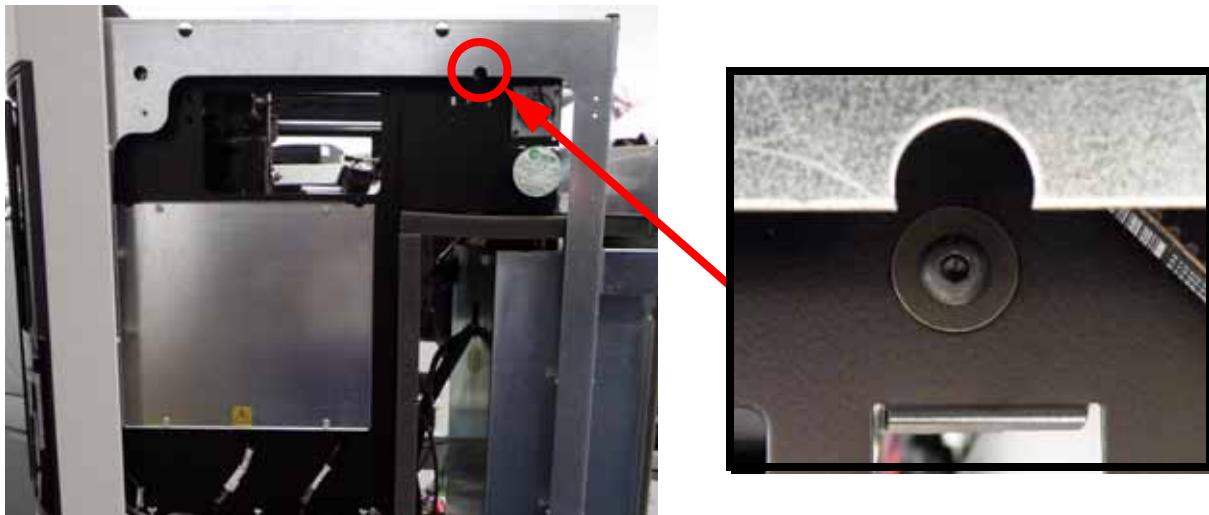
39. Using a $\frac{1}{8}$ " allen wrench, remove the right side XY Table cam. See [Figure 432](#).

Figure 432: Right side XY table cam screw location



40. Using a $\frac{1}{8}$ " allen wrench, remove the right side XY Table fixed mounting screw. See [Figure 433](#).

Figure 433: Right side XY table fixed screw location



41. Lift the XY table out of the printer.



It will be easier to remove the XY table from the printer with 2 people.

Installing the XY Table Assembly:

1. Lift the XY table and position in the printer.
2. Level the XY table with the frame of the printer by eye.
3. Using a $\frac{1}{8}$ " allen wrench, reinstall the right side XY table fixed screw.
4. Using a $\frac{1}{8}$ " allen wrench, reinstall the right side XY table cam.
5. Using a $\frac{1}{8}$ " allen wrench, reinstall the 2 right side XY table mounting screws.
6. Using a $\frac{1}{8}$ " allen wrench, reinstall the 2 left side XY table cams.
7. Using a $\frac{1}{8}$ " allen wrench, reinstall the 2 left side XY table mounting screws.
8. Reconnect the material tubes by pushing into the lock rings.



Be sure the material tubes are reinstalled in the correct place. Model on the left and support on the right.

9. Align the umbilical hose with the mounting holes on the translator.
10. Using a $\frac{7}{64}$ " allen wrench, reinstall the 4 umbilical hose mounting screws.
11. Align the TC Amp board with the mounting holes on the translator and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.



Be sure the ground wire is reconnected to the upper right mounting screw.

12. Reinstall the model and support liquefier and motor connectors by pushing into the slots on the translator.
13. Align the head with the translator.
14. Reinstall the head hinge pin by pushing down into place.
15. Using a $\frac{5}{64}$ " allen wrench, reinstall the head hinge pin set screw.
16. Feed the J303, model thermocouple and support thermocouple wires through the access slot.
17. Reconnect the model liquefier cable by pushing into the connector.
18. Reconnect the support liquefier cable by pushing into the connector.
19. Reconnect the model motor cable by pushing into the connector.
20. Reconnect the support motor cable by pushing into the connector.
21. Reinstall the support motor wire clip.
22. Close the head and use a phillips screwdriver to tighten the 2 self retaining screws.



Inspect all wiring to ensure no wires are pinched or crushed when swivel head is closed. Open and close the head several times to test.

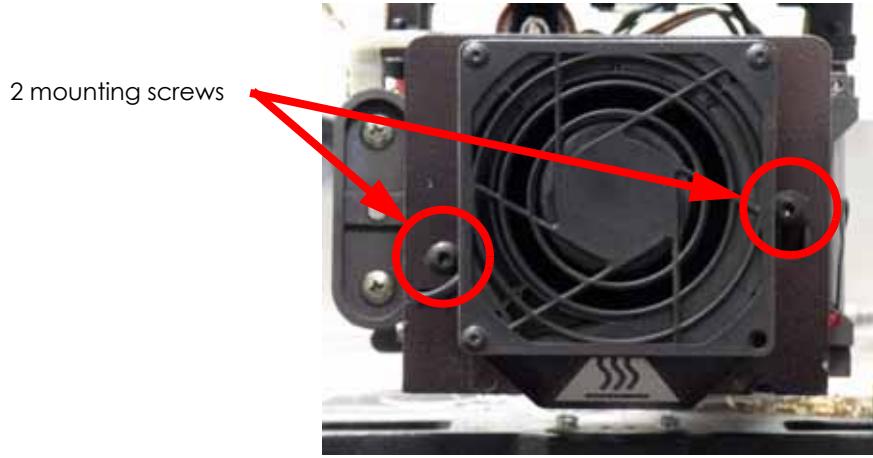
23. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the ground wire to the front right side of the head.
24. Reconnect the J301, J303, model thermocouple and support thermocouple wires at the TC Amp board by pushing into place.



The model thermocouple will be connected to the upper connector and the support thermocouple will be connected to the lower connector.

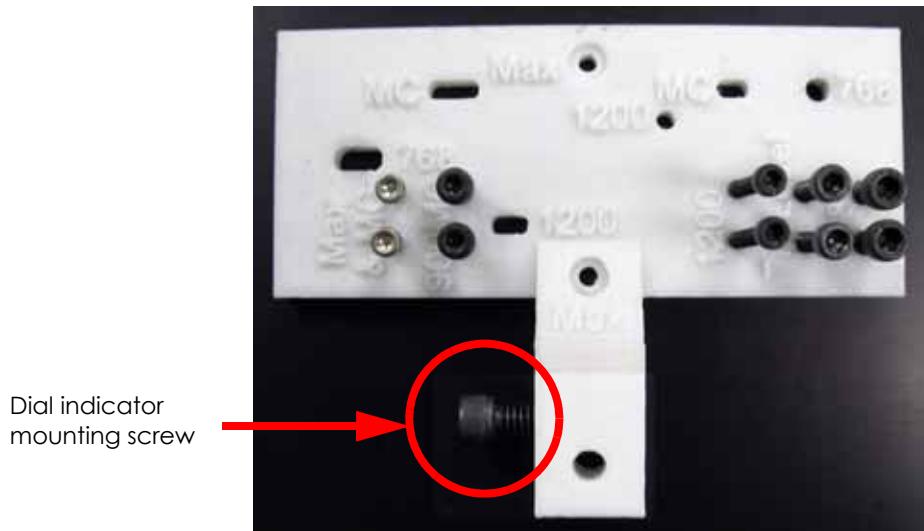
25. Reconnect the X EOT sensor by pushing the connectors together.
26. Reconnect the X BOT sensor by pushing the connectors together.
27. Reinstall the wire tie around the X BOT sensor cable.
28. Reconnect the X motor cable by pushing the connectors together.
29. Reinstall a wire tie around the X motor cable connector and the X EOT sensor mounting bracket.
30. Reconnect the Y motor cable by pushing the connectors together.
31. Reinstall the Y motor cable into the wire tie and close the wire tie.
32. Reconnect the Y BOT sensor by pushing the connectors together.
33. Reinstall wire ties around the Y BOT sensor connector and cable.
34. Reconnect the Y EOT sensor by pushing the connectors together.
35. Reconnect the thermal snap switch by pushing the 2 wires onto the spades.
36. Reinstall the Z foam level assembly. See "[Installing the Z Foam Level Assembly:](#)" on [page 5-225](#).
37. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 434](#).

Figure 434: Head fan mounting screw locations



38. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 435](#).

Figure 435: Head bracket mounting screws



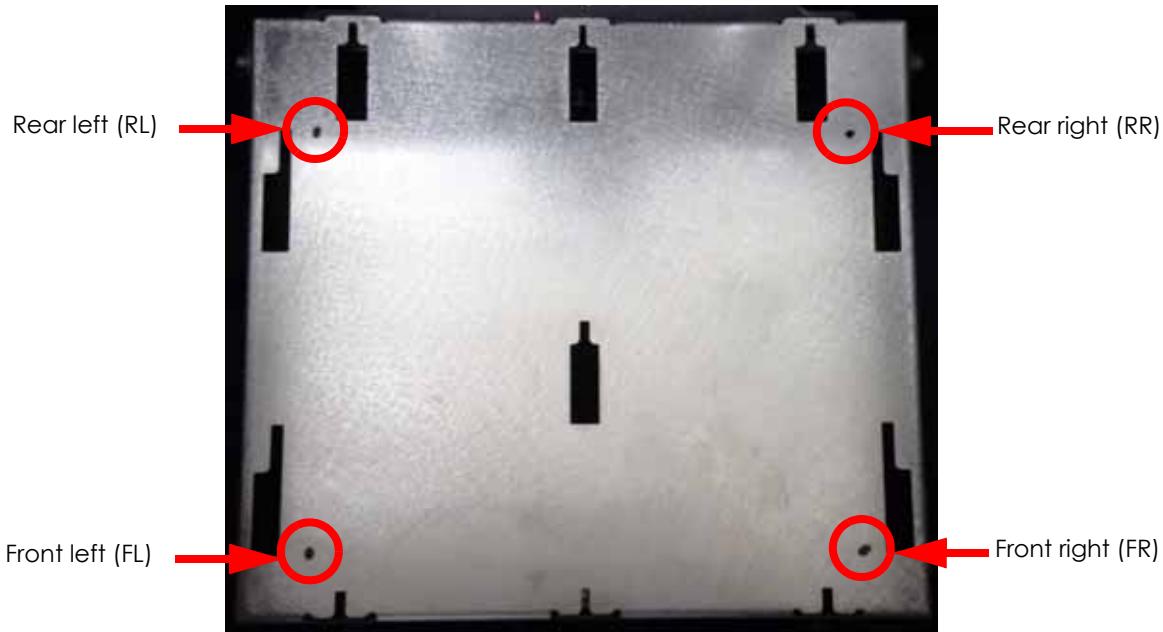
39. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 436](#).

Figure 436: Dial indicator installation



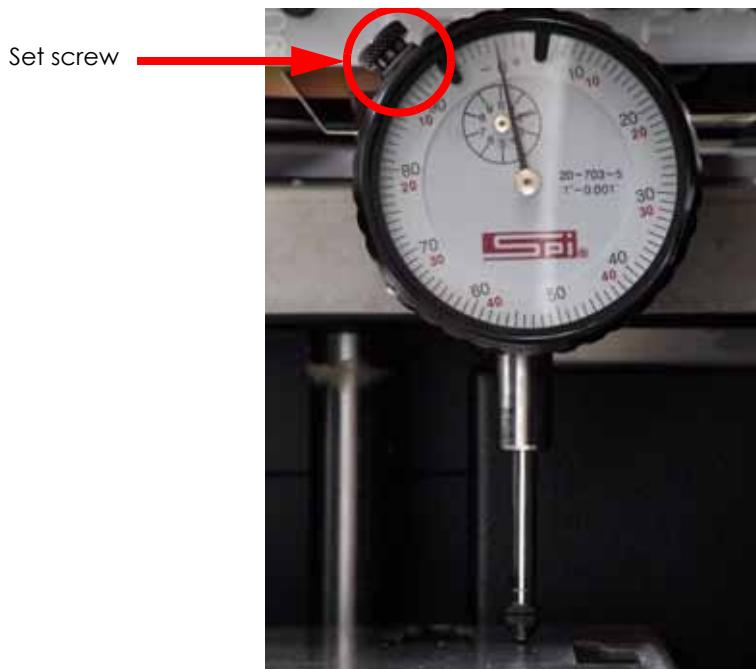
40. Using a marker, mark the Z platen in the rear left corner, rear right corner, front left corner and front right corner. See [Figure 437](#).

Figure 437: Z platen marking locations



41. Manually raise the Z stage, by turning the lead screw with a gloved hand, until the Z platen contacts the dial indicator and moves the gauge approximately 2 full rotations.
42. Move the dial indicator to the mark on the right rear corner and zero the dial indicator by loosening the set screw and turning the ring until the the dial is on the 0. See [Figure 438](#).

Figure 438: Zero the dial indicator



43. Move the dial indicator to the mark on the front right corner of the Z platen and record the value.
44. Move the dial indicator to the mark on the front left corner of the Z platen and record the value.
45. Move the dial indicator to the mark on the rear left corner of the Z platen and record the value.
46. Enter the recorded values from each corner into the indicator reading boxes of the XY Table level calculator. See [Figure 439](#).

Figure 439: XY Table level calculator

Dimension 768 Calculator		
Location	Indicator Reading	Knob Adjust
BR	0.000	-
FR	0.000	0.000
FL	0.000	0.000
BL	0.000	0.000

47. When the values have been entered into the calculator, the knob adjust values will be displayed. See [Figure 440](#).

Figure 440: XY Table level calculator adjustments

Dimension 768 Calculator		
Location	Indicator Reading	Knob Adjust
BR	0.000	-
FR	-0.020	0.046
FL	0.015	-0.021
BL	0.022	-0.006

48. Move the dial indicator to the mark on the front right corner of the Z platen.
49. Zero the dial indicator by loosening the set screw and turning the dial until the indicator is at 0.
50. Using a $\frac{1}{8}$ " allen wrench, loosen the front right XY table mounting screw and cam screw.
51. Using the cam wrench or large crescent wrench, adjust the front right cam until the dial indicator reads the value given by the XY Table level calculator.
52. Using a $\frac{1}{8}$ " allen wrench, tighten the front right XY table mounting screw and cam screw.
53. Move the dial indicator to the mark on the front left corner of the Z platen.

54. Zero the dial indicator by loosening the set screw and turning the dial until the indicator is at 0.
55. Using a $\frac{1}{8}$ " allen wrench, loosen the front left XY table mounting screw and cam screw.
56. Using the cam wrench or large crescent wrench, adjust the front right cam until the dial indicator reads the value given by the XY Table level calculator.
57. Using a $\frac{1}{8}$ " allen wrench, tighten the front left XY table mounting screw and cam screw.
58. Move the dial indicator to the mark on the rear left corner of the Z platen.
59. Zero the dial indicator by loosening the set screw and turning the dial until the indicator is at 0.
60. Using a $\frac{1}{8}$ " allen wrench, loosen the rear left XY table mounting screw and cam screw.
61. Using the cam wrench or large crescent wrench, adjust the front right cam until the dial indicator reads the value given by the XY Table level calculator.
62. Using a $\frac{1}{8}$ " allen wrench, tighten the rear left XY table mounting screw and cam screw.
63. Repeat steps 42 - 62 until each corner of the XY table is within a total tolerance band of +/- 0.003 or +/- 0.001 for each corner.
64. Remove the head bracket and dial indicator.
65. Align the head fan with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 2 mounting screws.
66. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
67. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
68. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
69. Power on the system. The system should reach **Idle** with no displayed errors.
70. Perform tip depth calibrations. See "[Tip Depth Calibration](#)" on page 6-2.
71. Perform tip level calibrations. See "[Leveling the Liquefier](#)" on page 6-4.
72. Perform tip offset calibrations. See "[Tip Offset Calibration](#)" on page 6-8.
73. Perform part based calibrations. See "[Part Based Calibration](#)" on page 6-12.
74. Build a test part to verify proper operation of the printer.
75. Return the bad XY Table to Stratasys, Inc.

Z Stage Components

Thermostat Snap Switch

Required Tools

- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{3}{32}$ " allen wrench

Removing the Thermostat Snap Switch:

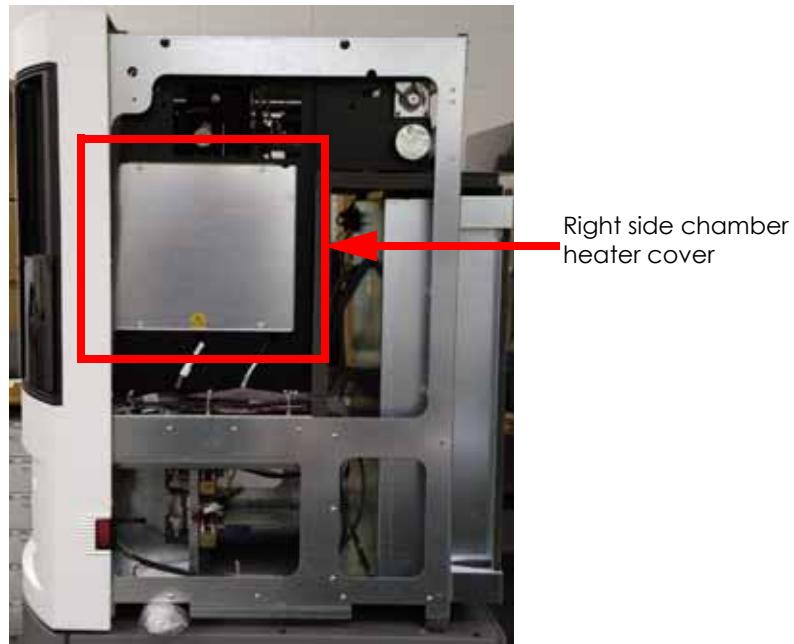
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding.

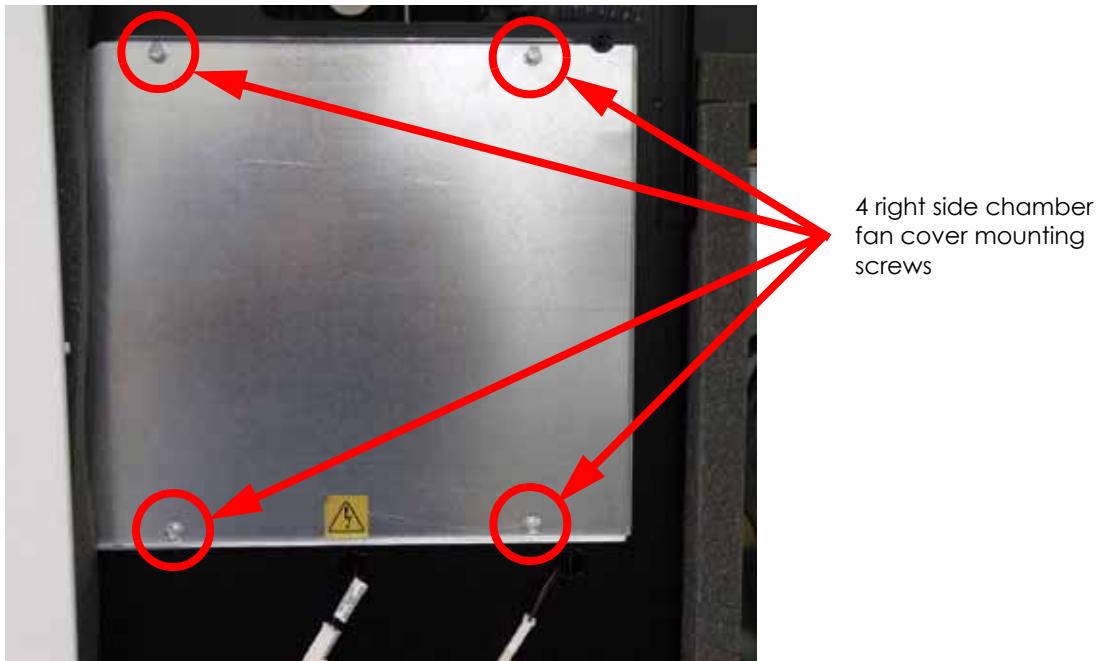
5. Locate the right side chamber heater cover. See [Figure 441](#).

Figure 441: Right side chamber heater cover location



- Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 right side chamber heater cover mounting screws. See [Figure 442](#).

Figure 442: Right side heater cover mounting screw locations

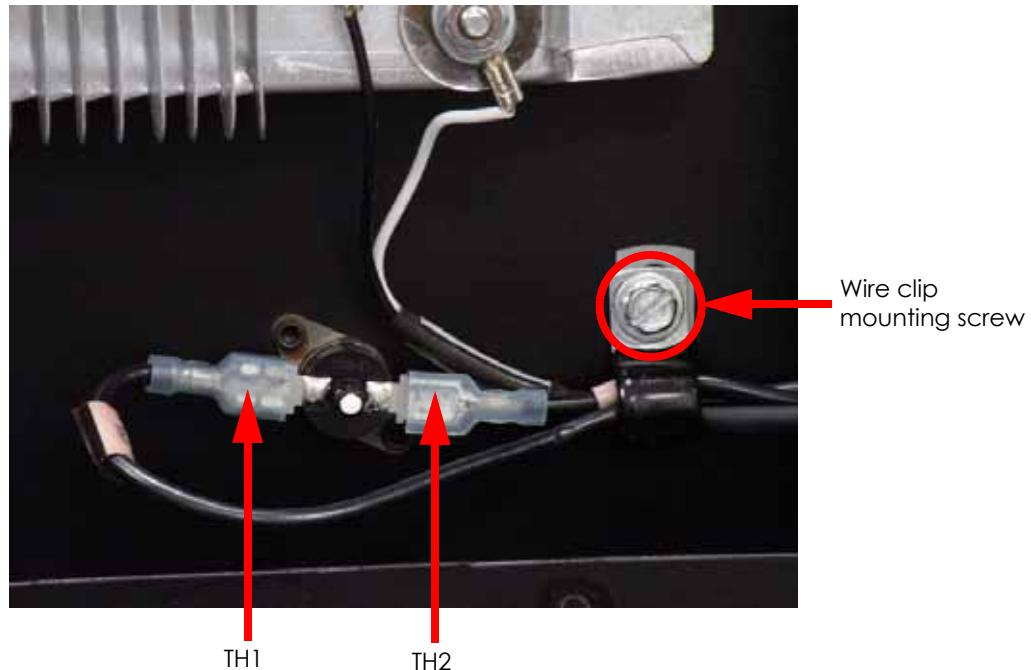


- Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the wire clip mounting screw and open the wire clip. See [Figure 443](#).
- Disconnect the TH1 and TH2 wires from the thermostat snap switch by pulling away from the spade connectors. See [Figure 443](#).



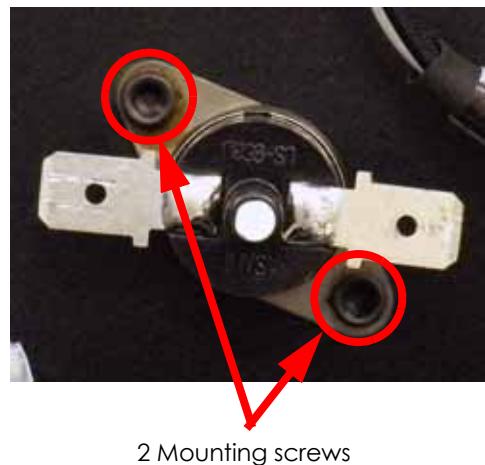
Note the location of TH1 (left) and TH2 (right) for reinstallation.

Figure 443: Thermostat snap switch detail



- Using a $\frac{3}{32}$ " allen wrench, remove the 2 mounting screws. See [Figure 444](#).

Figure 444: Thermostat snap switch mounting screw locations



- Discard the thermostat snap switch.

Installing the Thermostat Snap Switch:

1. Align the thermostat snap switch with the mounting holes and use a $\frac{3}{32}$ " allen wrench to reinstall the 2 mounting screws.
2. Reconnect TH1 and TH2 by pushing onto the spade connectors.
3. Place wires in wire clip and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the mounting screw.
4. Align the right side heater cover with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 right side chamber heater cover mounting screws.
5. Reinstall the side panels. See "["Side Panels" on page 5-11](#)".
6. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power on the system. The system should reach **Idle** with no displayed errors.
9. Run a small test part and monitor system operation during build.

Tip Wipe Assembly

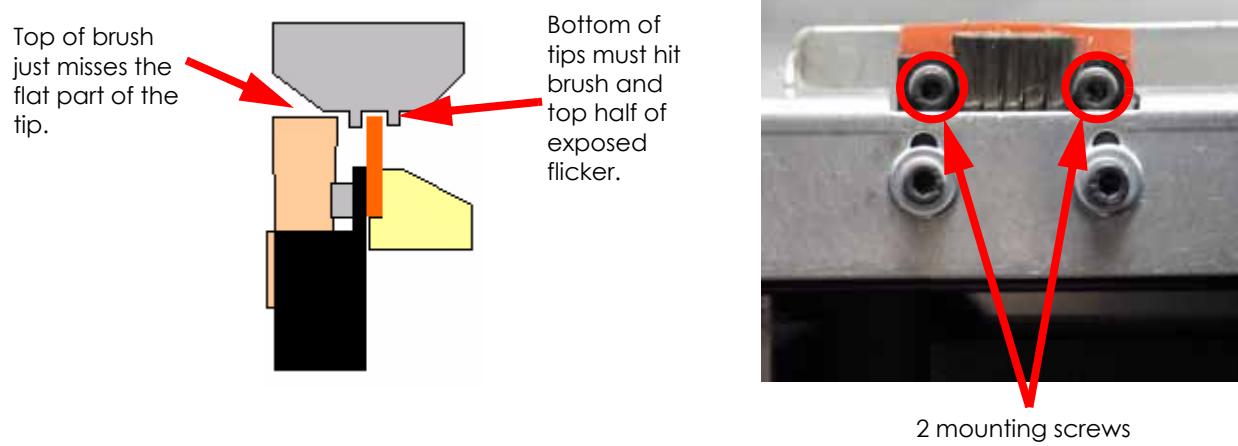
Required Tools

- $\frac{7}{64}$ " allen wrench
- Gloves

Replacing the Flicker Blade:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Use your gloved hand to move the head away from the brush-flicker assembly.
4. Using a $\frac{7}{64}$ " allen wrench, loosen the 2 flicker blade mounting screws. See [Figure 445](#).
5. Pull the flicker blade straight up to remove.
6. Insert the new flicker blade between the clamping plates. See [Figure 445](#).
7. Move the head over to the flicker blade and verify the tips hit the flicker blade.
8. Using a $\frac{7}{64}$ " allen wrench, tighten the 2 mounting screws.

Figure 445: Brush/Flicker detail

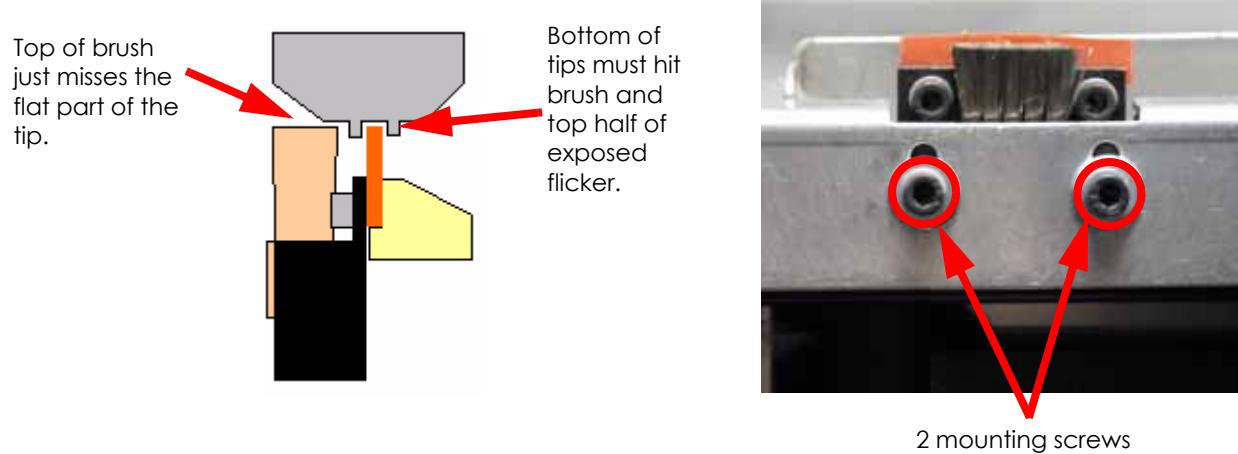


9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power on the system. The system should reach **Idle** with no displayed errors.

Replacing the Brush:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Use your gloved hand to move the head away from the brush-flicker assembly.
4. Using a $\frac{7}{64}$ " allen wrench, loosen the 2 tip wipe assembly mounting screws. See [Figure 446](#).
5. Pull the brush straight up to remove.
6. Insert the new brush. See [Figure 446](#).
7. Move the head over to the brush/flicker and verify the tips hit the brush.
8. Using a $\frac{7}{64}$ " allen wrench, tighten the 2 mounting screws.

Figure 446: Brush/Flicker detail



9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power on the system. The system should reach **Idle** with no displayed errors.

Z Stage Components - 3 Lead Screw

The following Z Stage components are for the three LS (lead screw) system.

Chamber Thermocouple (3 Lead Screw)

Required Tools

- $\frac{1}{4}$ " nut driver or standard screwdriver

Removing the Chamber Thermocouple:

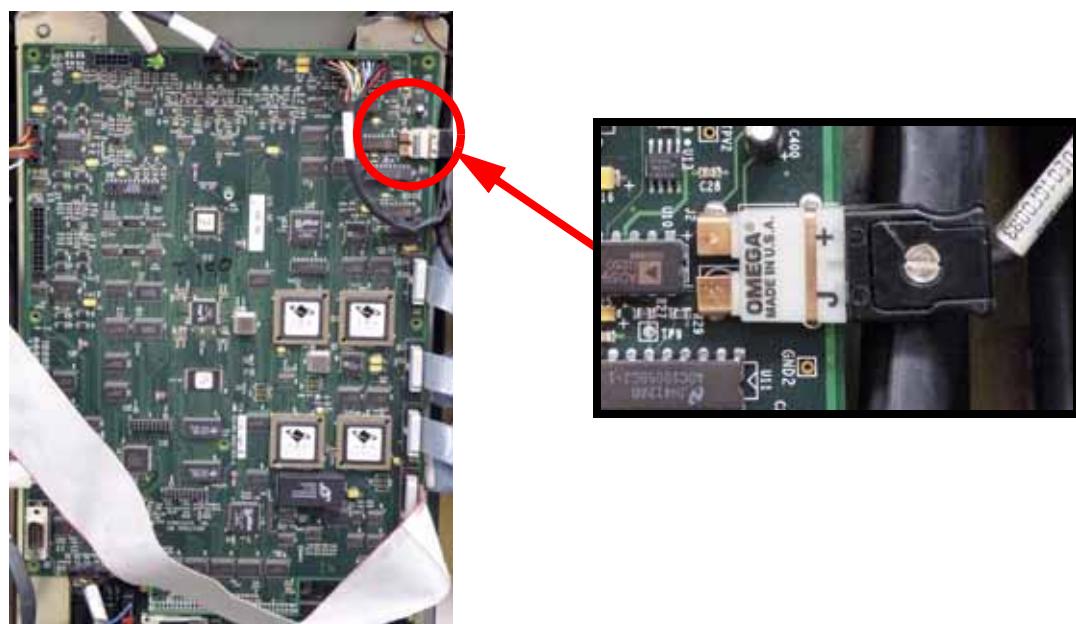
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding.

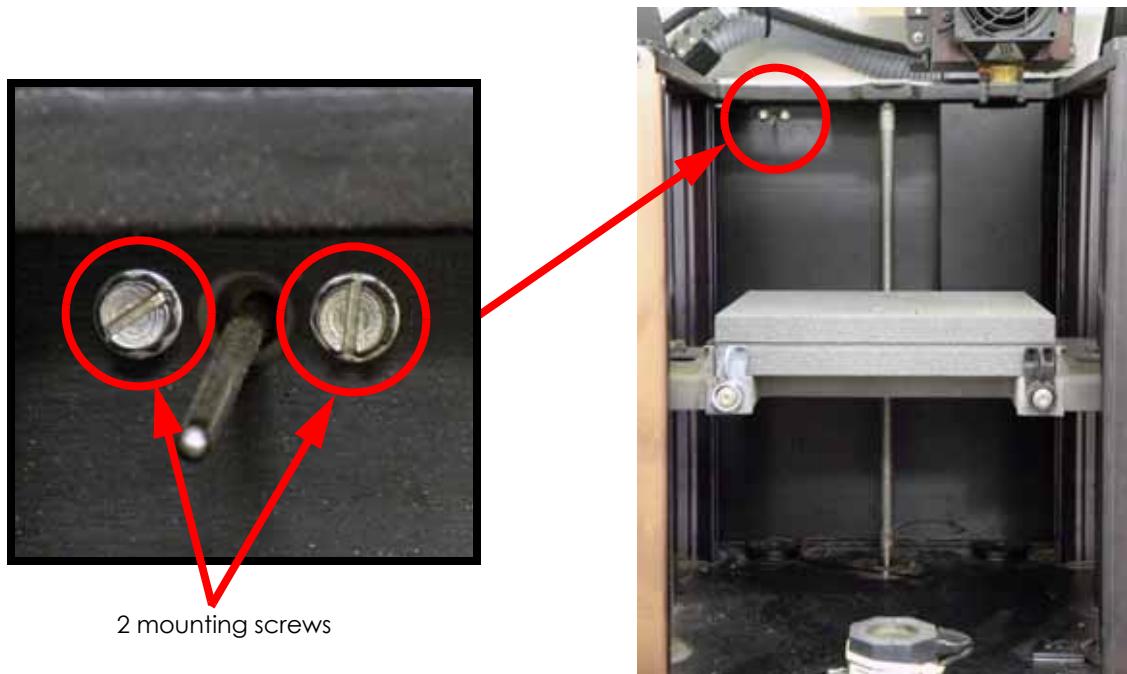
5. Disconnect the chamber thermocouple connector on the 186 processor board by pulling outwards. See [Figure 447](#).

Figure 447: Chamber thermocouple connector location



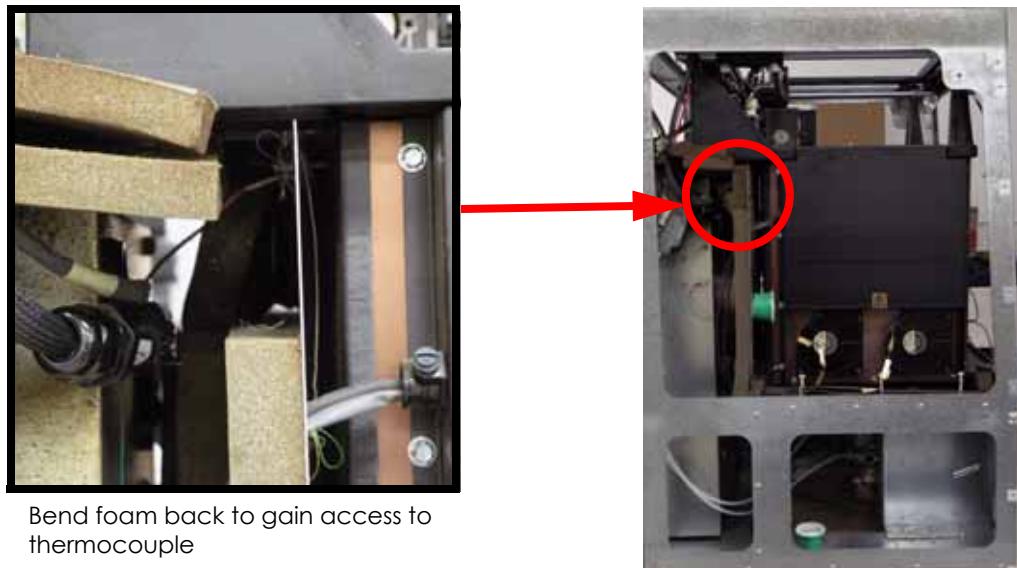
6. Locate the chamber thermocouple. See [Figure 448](#).
7. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 chamber thermocouple mounting screws. See [Figure 448](#).

Figure 448: Chamber thermocouple location



8. Working from the left side of the machine carefully pull the foam insulation slightly away from the back of the chamber thermocouple. See [Figure 449](#).

Figure 449: Foam insulation location



9. Remove the chamber thermocouple by grasping the back of the thermocouple housing then pulling back and downward until free.
10. Feed the chamber thermocouple wire out the cutout on the back of the electronics bay.
11. Discard the chamber thermocouple.

Installing the Chamber Thermocouple:

1. Align the chamber thermocouple with the mounting hole.
2. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the 2 mounting screws.
3. Feed the chamber thermocouple wire through the electronics bay and reconnect to the 186 processor board by pushing in.



Be sure the + terminal of the chamber thermocouple is at the top when reconnecting.

4. Re-position the foam behind the chamber thermocouple.
5. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
6. Reinstall the rear door. See "[Installing the Rear Door](#)." on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power on the system. The system should reach **Idle** with no displayed errors.
9. Run a small test part and monitor system operation during build.

Chamber Heaters (3 Lead Screw)

Required Tools

- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{3}{8}$ " box wrench

Removing the left side Chamber Heaters:

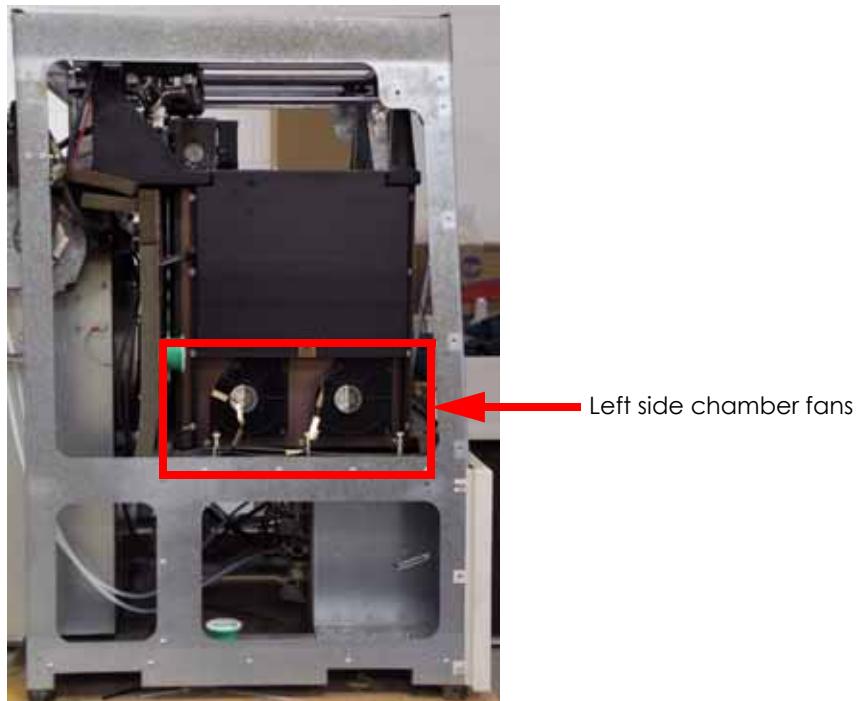
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding.

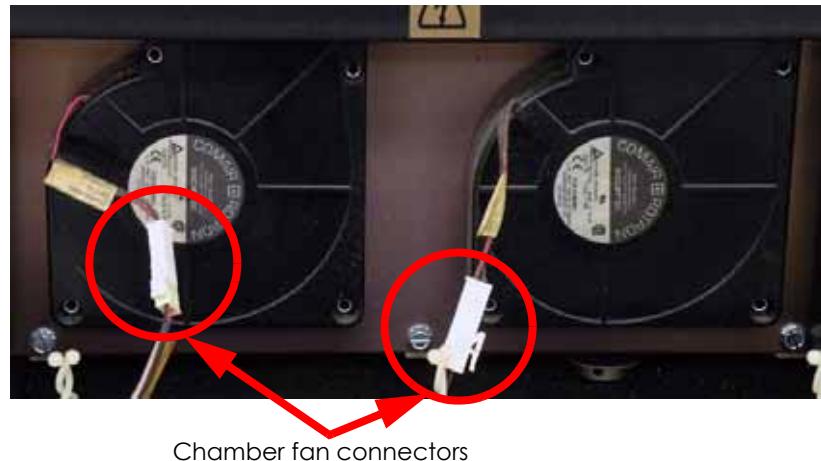
5. Locate the left side chamber fans. See [Figure 450](#).

Figure 450: Left side chamber fan locations



6. Disconnect the 2 left side chamber fans by pressing the tab in and pulling apart. See [Figure 451](#).

Figure 451: Left side chamber fan connector locations

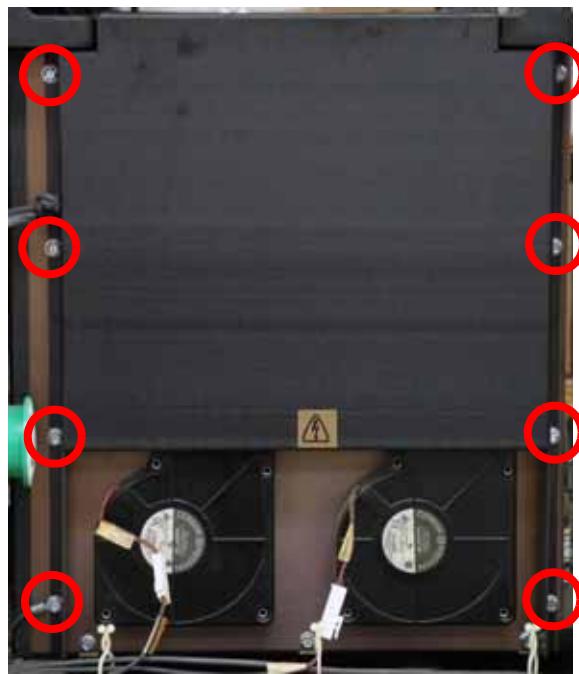


7. Using a $5/16"$ nut driver or standard screwdriver, remove the 8 chamber heater cover mounting screws. See [Figure 452](#).



Note the ground wire connected to the lower left mounting screw.

Figure 452: Chamber heater cover mounting screw locations



8. Open the chamber heater cover away from the front of the printer. See [Figure 453](#).



Do not stress the heater wires running into the housing.

Figure 453: Opening the chamber heater cover

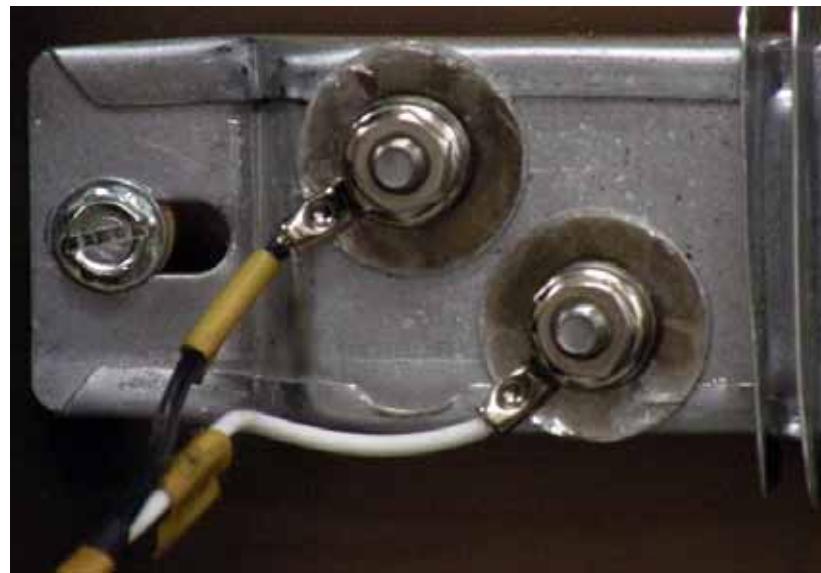


9. Using a $\frac{3}{8}$ " box wrench, remove the chamber heater wire nuts and washers from both left side chamber heaters. See [Figure 454](#).



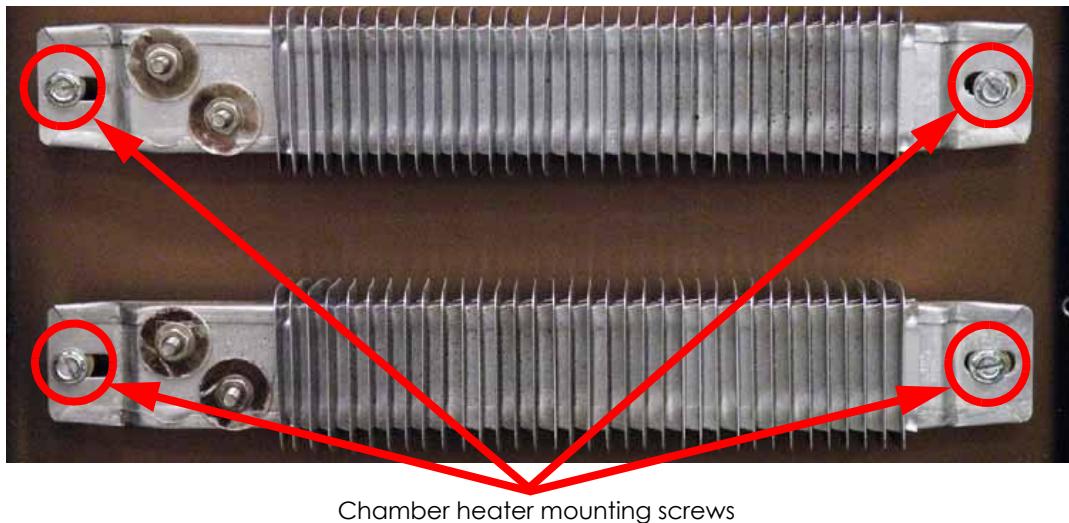
Note the orientation of the heater wires. Black on the left post and white on the right post.

Figure 454: Chamber heater locations



10. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 heater mounting screws from both left side chamber heaters. See [Figure 455](#).

Figure 455: Left side chamber heater mounting screw locations



11. Remove the chamber heaters and discard.

Installing the left side Chamber Heaters:

1. Align the left side chamber heaters with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws.
2. Place the black chamber heater wire and washer on the left post of the chamber heaters.
3. Place the white chamber heater wire and washer on the right post of the chamber heaters.
4. Using a $\frac{3}{8}$ " box wrench, reinstall the 2 chamber heater wire nuts.
5. Close the chamber heater cover and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 8 mounting screws.



Be sure to attach the ground wire to the lower left corner before reinstalling the mounting screw.

6. Reconnect the left side chamber fans by pushing the connectors together.
7. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power on the system. The system should reach **Idle** with no displayed errors.
11. Run a small test part and monitor system operation during build.

Removing the right side Chamber Heaters:

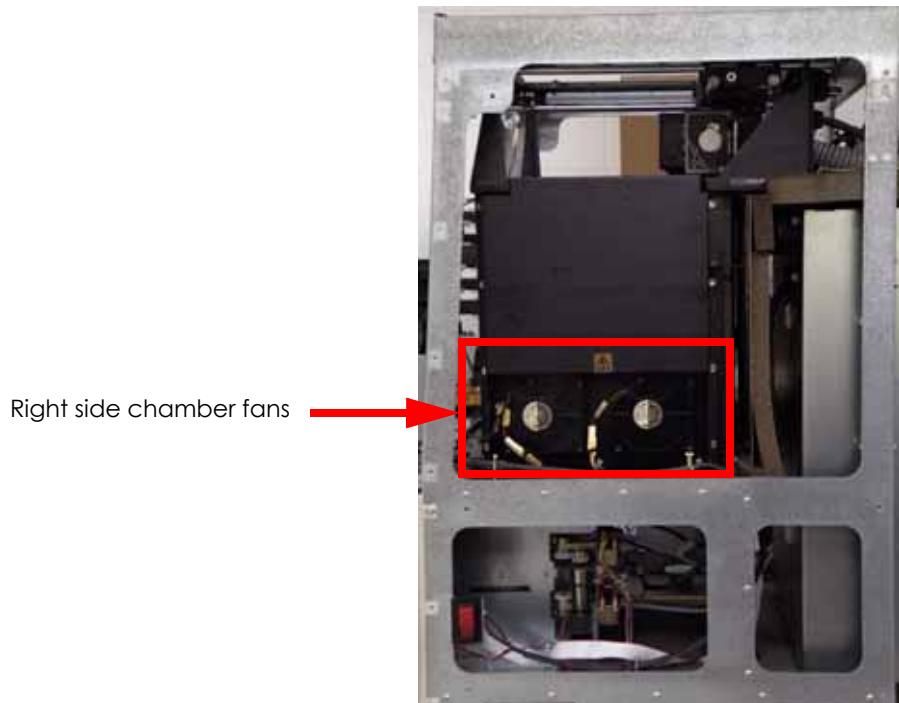
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding.

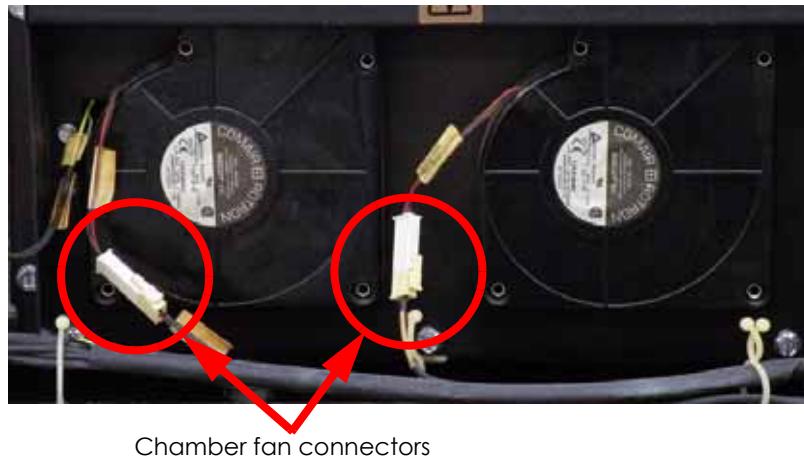
5. Locate the right side chamber fans. See [Figure 456](#).

Figure 456: Right side chamber fan locations



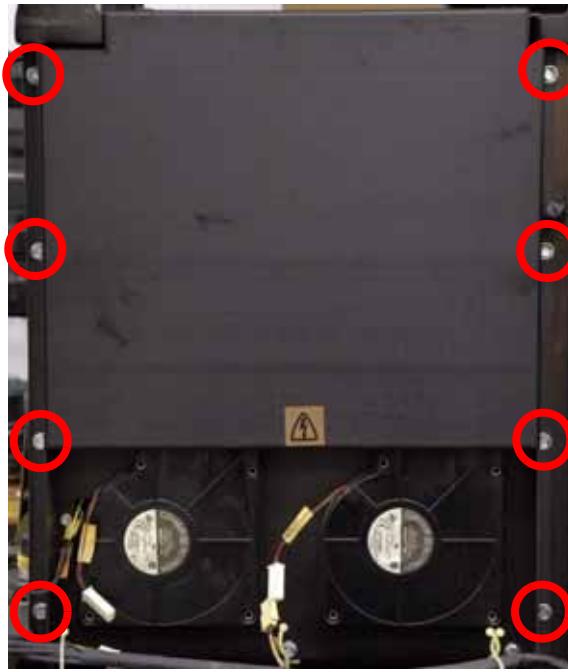
6. Disconnect the 2 right side chamber fans by pressing the tab in and pulling apart. See [Figure 457](#).

Figure 457: Right side chamber fan connector locations



7. Using a $5/16"$ nut driver or standard screwdriver, remove the 8 chamber heater cover mounting screws. See [Figure 458](#).

Figure 458: Chamber heater cover mounting screw locations



8. Open the chamber heater cover away from the front of the printer. See [Figure 459](#).



Do not stress the heater wires running into the housing.

Figure 459: Opening the chamber heater cover

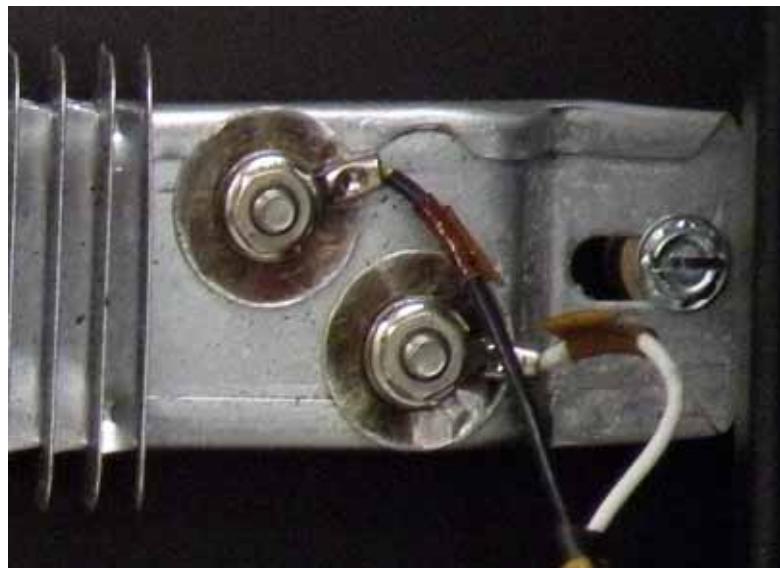


9. Using a $\frac{3}{8}$ " box wrench, remove the chamber heater wire nuts and washers from both right side chamber heaters. See [Figure 454](#).



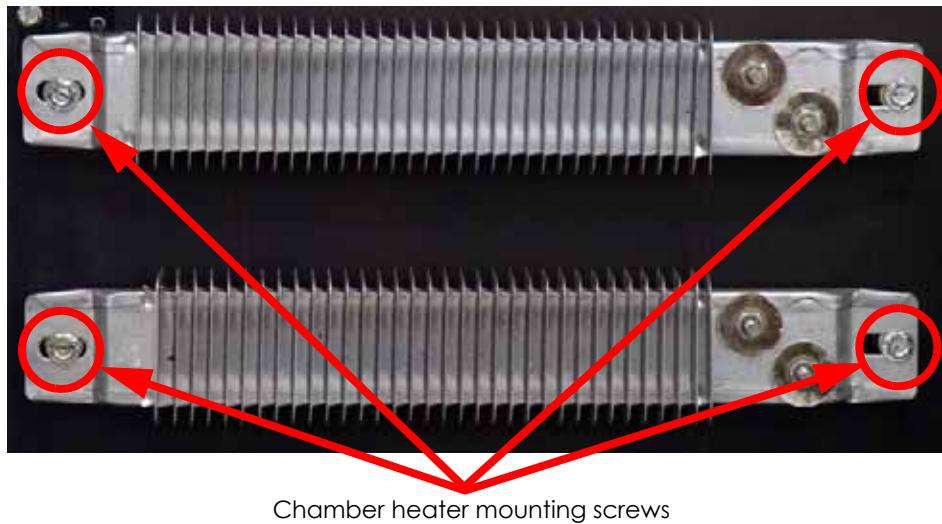
Note the orientation of the heater wires. Black on the left post and white on the right post.

Figure 460: Chamber heater locations



10. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 heater mounting screws from both right side chamber heaters. See [Figure 461](#).

Figure 461: Right side chamber heater mounting screw locations



11. Remove the chamber heaters and discard.

Installing the right side Chamber Heaters:

1. Align the right side chamber heaters with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws.
2. Place the black chamber heater wire and washer on the left post of the chamber heaters.
3. Place the white chamber heater wire and washer on the right post of the chamber heaters.
4. Using a $\frac{3}{8}$ " box wrench, reinstall the 2 chamber heater wire nuts.
5. Close the chamber heater cover and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 8 mounting screws.
6. Reconnect the right side chamber fans by pushing the connectors together.
7. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power on the system. The system should reach **Idle** with no displayed errors.
11. Run a small test part and monitor system operation during build.

Z Switches (3 Lead Screw)

Required Tools

- $\frac{5}{64}$ " allen wrench
- $\frac{1}{4}$ " nut driver or standard screwdriver
- Marker

Removing the Z BOT (Home) Switch:

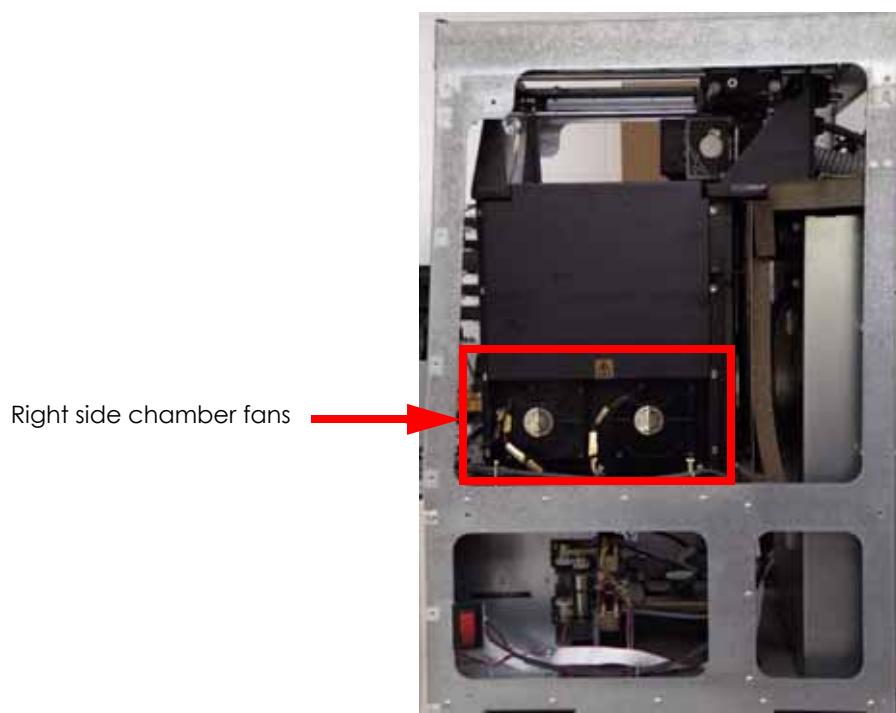
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding.

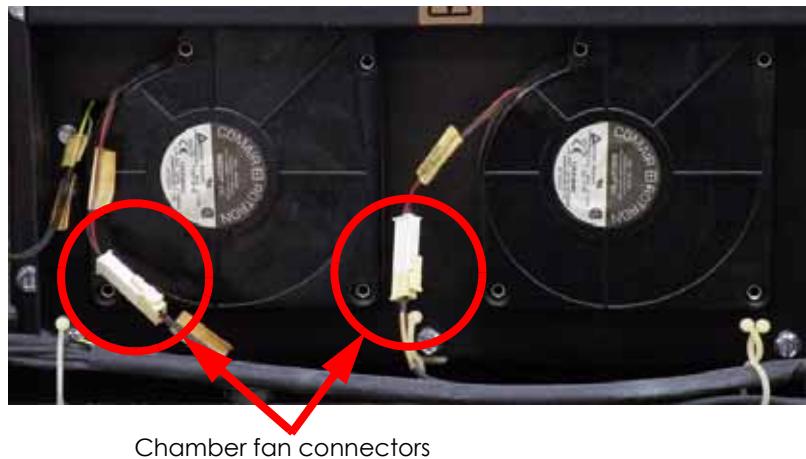
5. Locate the two right side heater fans. See [Figure 462](#).

Figure 462: Right side chamber heater fan locations



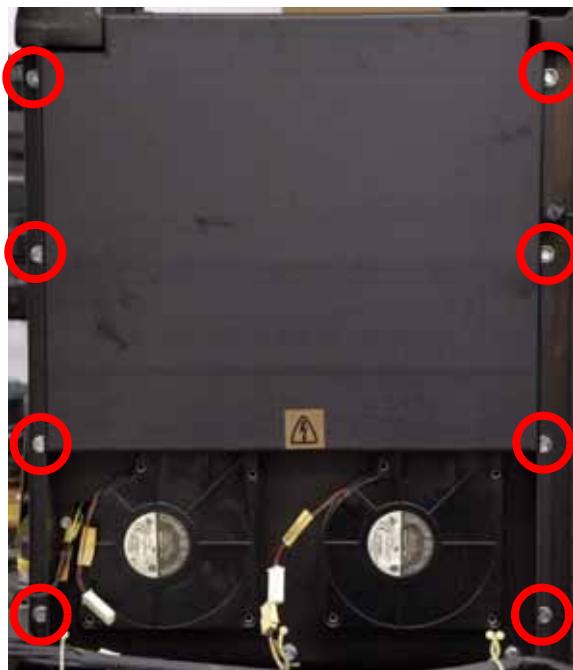
6. Disconnect the 2 right side chamber fans by pressing the tab in and pulling apart. See [Figure 463](#).

Figure 463: Right side chamber fan connector locations



7. Using a $5/16$ " nut driver or standard screwdriver, remove the 8 chamber heater cover mounting screws. See [Figure 464](#).

Figure 464: Chamber heater cover mounting screw locations



8. Open the chamber heater cover away from the front of the printer. See [Figure 459](#).



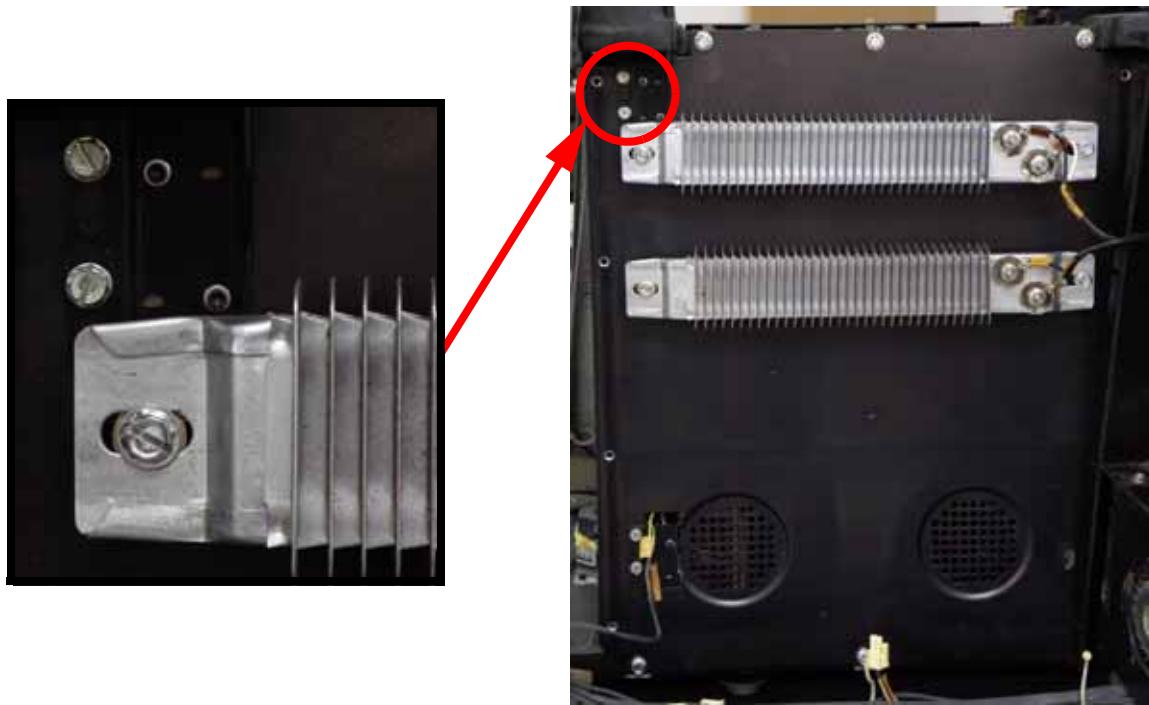
Do not stress the heater wires running into the housing.

Figure 465: Opening the chamber heater cover



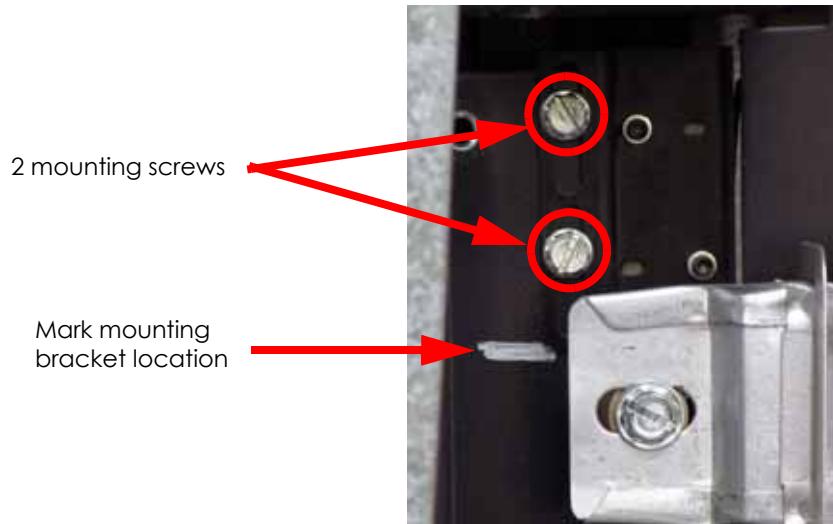
9. Locate the Z BOT switch at the upper left corner. See [Figure 466](#).

Figure 466: Z BOT location



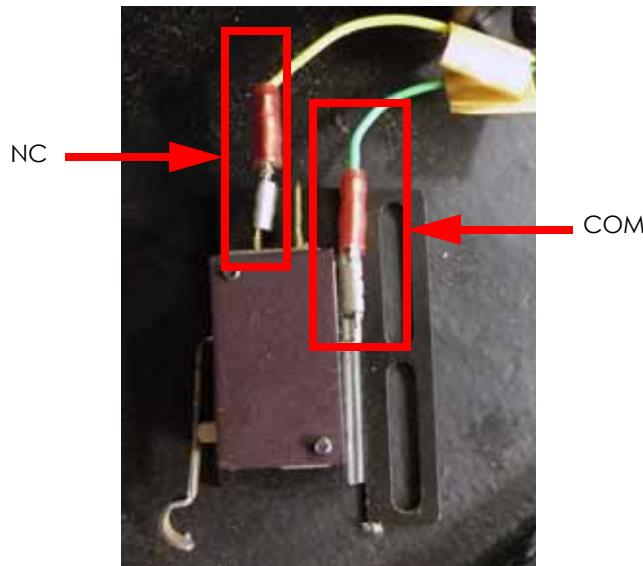
10. Mark the location of the Z BOT switch mounting bracket for easy reinstallation. See [Figure 467](#).
11. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 Z BOT switch mounting bracket mounting screws. See [Figure 467](#).

Figure 467: Marking the Z BOT switch



12. Remove the Z BOT switch from the chamber by tilting and pulling outwards.
13. Disconnect the NC (yellow) wire from the Z BOT switch by pulling away from the spade connector. See [Figure 468](#).
14. Disconnect the COM (green) wire from the Z BOT switch by pulling away from the spade connector. See [Figure 468](#).

Figure 468: Z BOT wire locations

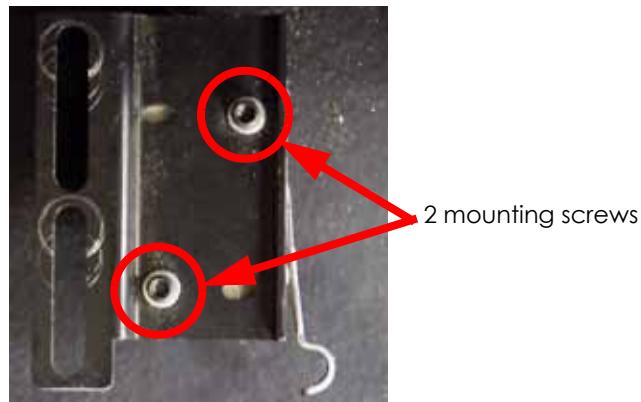


15. Using a $\frac{5}{64}$ " allen wrench, remove the 2 Z BOT switch mounting screws from the Z BOT mounting bracket. See [Figure 469](#).



Note the orientation of the Z BOT switch on the mounting bracket.

Figure 469: Z BOT mounting screw locations



16. Discard the Z BOT switch.

Installing the Z BOT (Home) Switch:

1. Align the Z BOT switch with the mounting bracket and use a $\frac{5}{64}$ " allen wrench to reinstall the 2 mounting screws.
2. Reconnect the NC (yellow) wire from the Z BOT switch by pushing onto the spade connector. See [Figure 470](#).
3. Reconnect the COM (green) wire from the Z BOT switch by pushing onto the spade connector. See [Figure 470](#).

Figure 470: Z BOT wire locations



4. Insert the Z BOT switch into the chamber by tilting and pushing inwards.
5. Align the Z BOT switch mounting bracket with the mark from step [10 on page 373](#).
6. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the 2 mounting screws.
7. Adjust the Z BOT switch:
 - a. Locate the Z drive belt. The belt is located beneath the Z stage assembly.
 - b. Reach under the Z stage and pull on the Z motor belt to raise the Z stage until the Z BOT switch engages and makes a click sound.
 - c. Look down at one of the Z stage lead screws. Mark screw with a marker.
 - d. Continue raising the Z stage. The Z stage should reach its **physical** limit when the lead screw has turned approximately $\frac{1}{4}$ turn. If the lead screw turns more than or less than $\frac{1}{4}$ turn, the limit switch will need to be adjusted:
 - i. Using a $\frac{1}{4}$ nut driver or standard screwdriver, loosen the Z BOT switch mounting screws and slide the assembly:
 - Up if the lead screw moved MORE than $\frac{1}{4}$ turn.
 - Down if the lead screw moved LESS than a $\frac{1}{4}$ turn.
 - ii. Tighten the mounting screws and repeat steps [a - d](#) until the adjustment is correct.



The Z stage will have to be lowered below the Z BOT switch each time to properly test adjustment.

- iii. Test adjustment several times to verify proper limit switch position.
8. Test switch position by repeating step [7](#) until in specification.
9. Close the chamber heater cover and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 8 mounting screws.
10. Reconnect the right side chamber fans by pushing the connectors together.
11. Reinstall the side panels. See "[Side Panels](#)" on page [5-11](#).
12. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page [5-10](#).
13. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
14. Power on the system. The system should reach **Idle** with no displayed errors.
15. Run a small test part and monitor system operation during build.

Removing the Z EOT Switch:

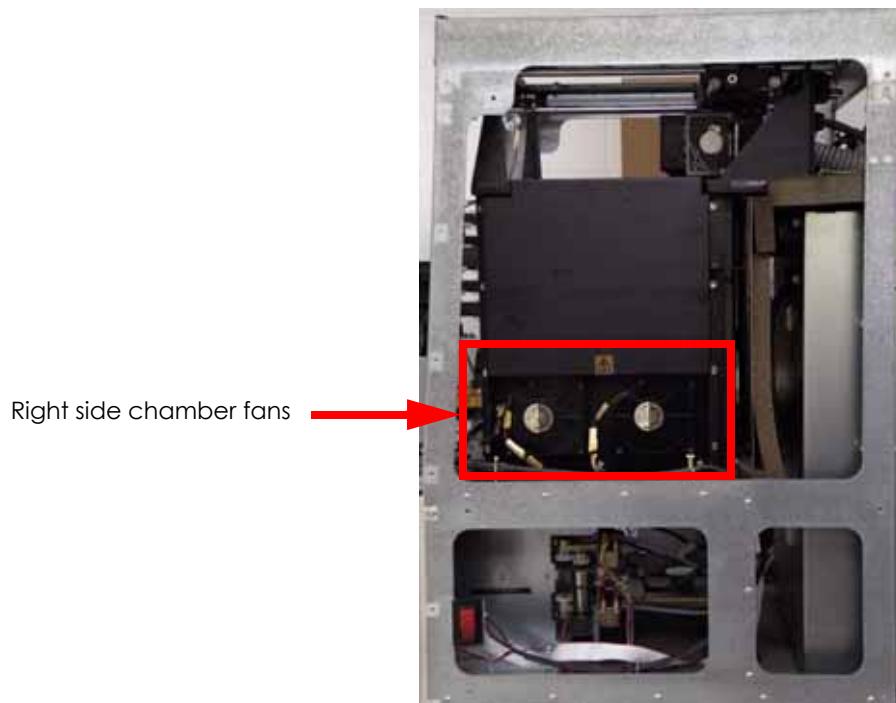
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding.

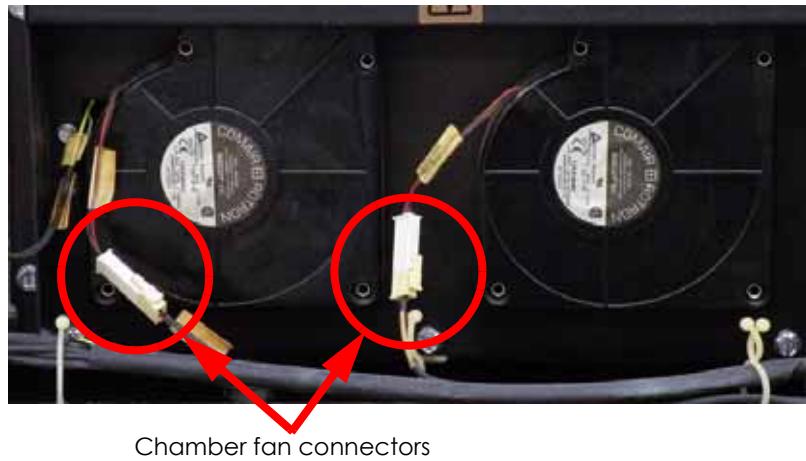
5. Locate the two right side heater fans. See [Figure 471](#).

Figure 471: Right side chamber heater fan locations



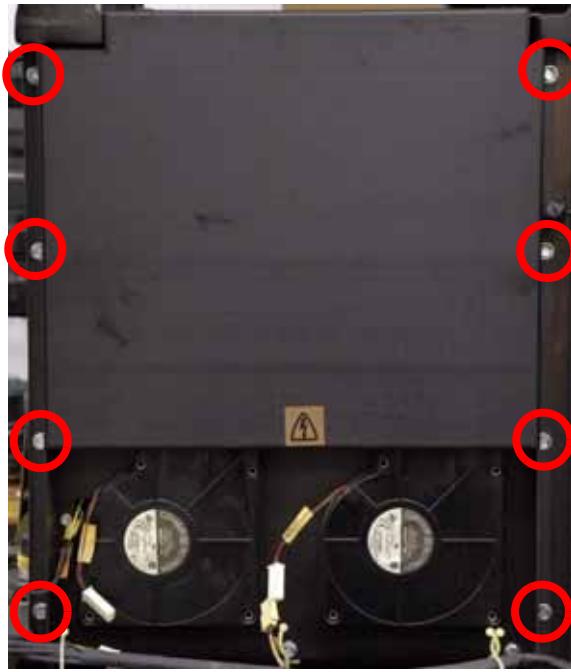
6. Disconnect the 2 right side chamber fans by pressing the tab in and pulling apart. See [Figure 472](#).

Figure 472: Right side chamber fan connector locations



7. Using a $5/16"$ nut driver or standard screwdriver, remove the 8 chamber heater cover mounting screws. See [Figure 473](#).

Figure 473: Chamber heater cover mounting screw locations



8. Open the chamber heater cover away from the front of the printer. See [Figure 474](#).



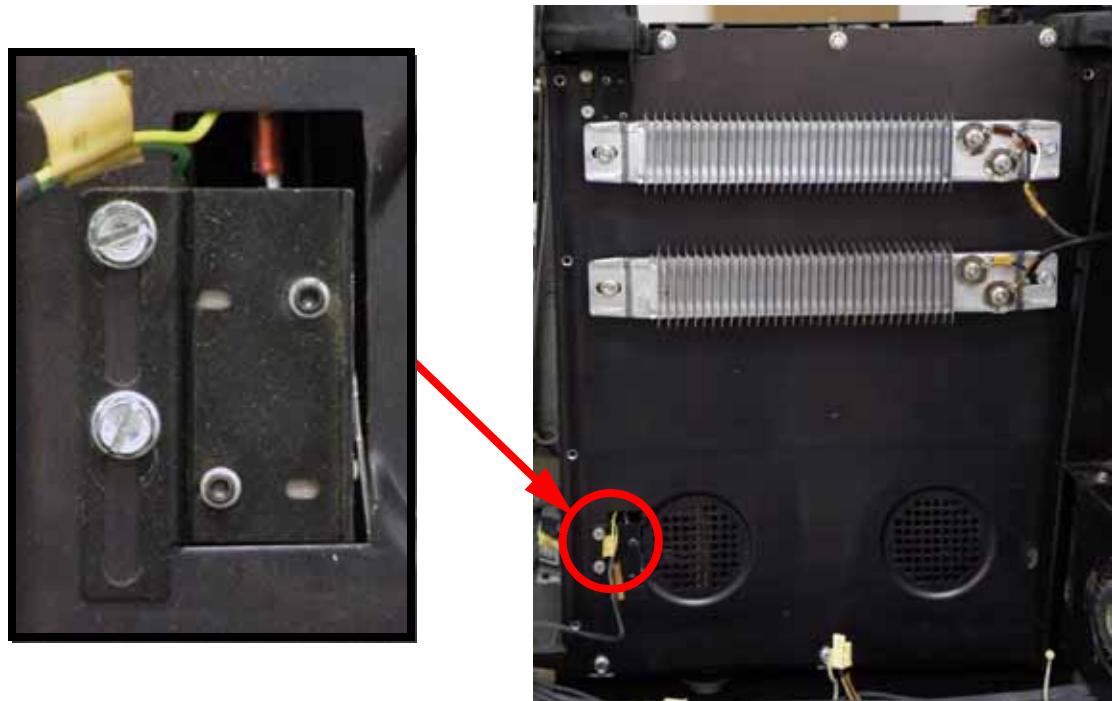
Do not stress the heater wires running into the housing.

Figure 474: Opening the chamber heater cover



9. Locate the Z EOT switch at the lower left corner. See [Figure 475](#).

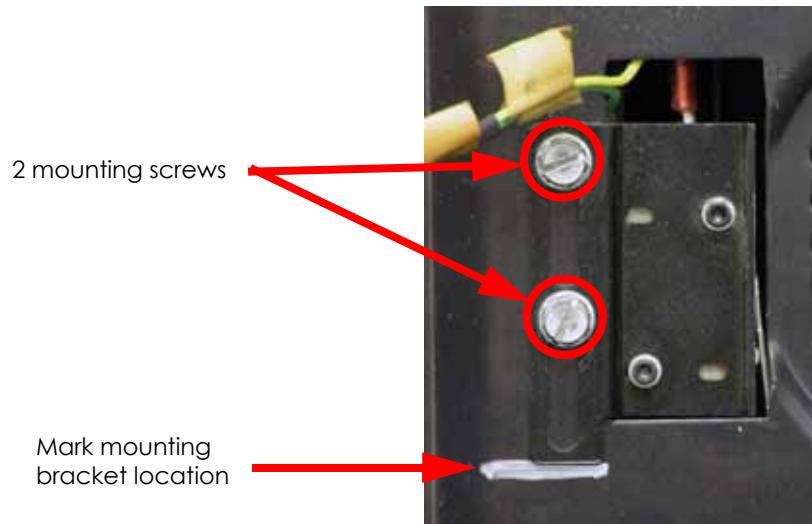
Figure 475: Z BOT location



10. Mark the location of the Z EOT switch mounting bracket for easy reinstallation. See [Figure 476](#).

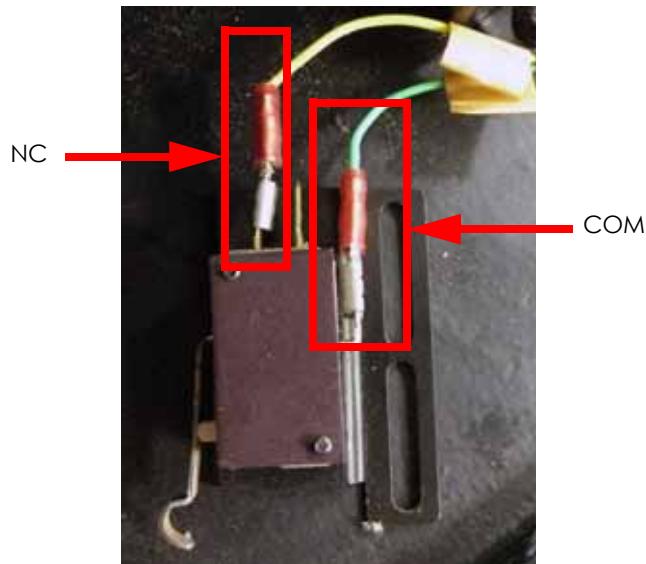
11. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 Z BOT switch mounting bracket mounting screws. See [Figure 476](#).

Figure 476: Marking the Z EOT switch



12. Remove the Z EOT switch from the chamber by tilting and pulling outwards.
13. Disconnect the NC (yellow) wire from the Z EOT switch by pulling away from the spade connector. See [Figure 477](#).
14. Disconnect the COM (green) wire from the Z EOT switch by pulling away from the spade connector. See [Figure 477](#).

Figure 477: Z BOT wire locations

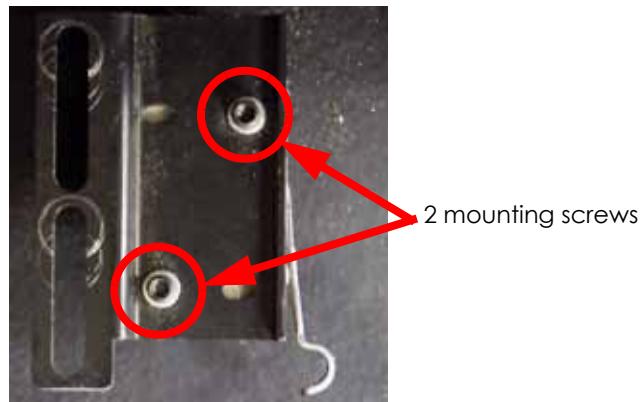


15. Using a $\frac{5}{64}$ " allen wrench, remove the 2 Z BOT switch mounting screws from the Z BOT mounting bracket. See [Figure 478](#).



Note the orientation of the Z BOT switch on the mounting bracket.

Figure 478: Z BOT mounting screw locations



16. Discard the Z BOT switch.

Installing the Z EOT Switch:

1. Align the Z EOT switch with the mounting bracket and use a $\frac{5}{64}$ " allen wrench to reinstall the 2 mounting screws.
2. Reconnect the NC (yellow) wire from the Z EOT switch by pushing onto the spade connector. See [Figure 479](#).
3. Reconnect the COM (green) wire from the Z EOT switch by pushing onto the spade connector. See [Figure 479](#).

Figure 479: Z BOT wire locations



4. Insert the Z EOT switch into the chamber by tilting and pushing inwards.
5. Align the Z EOT switch mounting bracket with the mark from step [10 on page 378](#).
6. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, reinstall the 2 mounting screws.
7. Adjust the Z EOT switch:
 - a. Locate the Z drive belt. The belt is located beneath the Z stage assembly.
 - b. Reach under the Z stage and pull on the Z motor belt to lower the Z stage until the Z EOT switch engages and makes a click sound.
 - c. Look down at one of the Z stage lead screws. Mark screw with a marker.
 - d. Continue lowering the Z stage. The Z stage should reach its **physical** limit when the lead screw has turned approximately $\frac{1}{4}$ turn. If the lead screw turns more than or less than $\frac{1}{4}$ turn, the limit switch will need to be adjusted:
 - i. Using a $\frac{1}{4}$ nut driver or standard screwdriver, loosen the Z EOT switch mounting screws and slide the assembly:
 - Up if the lead screw moved LESS than $\frac{1}{4}$ turn.
 - Down if the lead screw moved MORE than a $\frac{1}{4}$ turn.
 - ii. Tighten the mounting screws and repeat steps **a - d** until the adjustment is correct.



The Z stage will have to be lowered below the Z EOT switch each time to properly test adjustment.

- iii. Test adjustment several times to verify proper limit switch position.
8. Test switch position. See "[Adjusting Z BOT \(Home\) Switch](#)" on page 6-53.
9. Close the chamber heater cover and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 8 mounting screws.
10. Reconnect the right side chamber fans by pushing the connectors together.
11. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
12. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
13. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
14. Power on the system. The system should reach **Idle** with no displayed errors.
15. Run a small test part and monitor system operation during build.

Z Jam Sensor (3 Lead Screw)

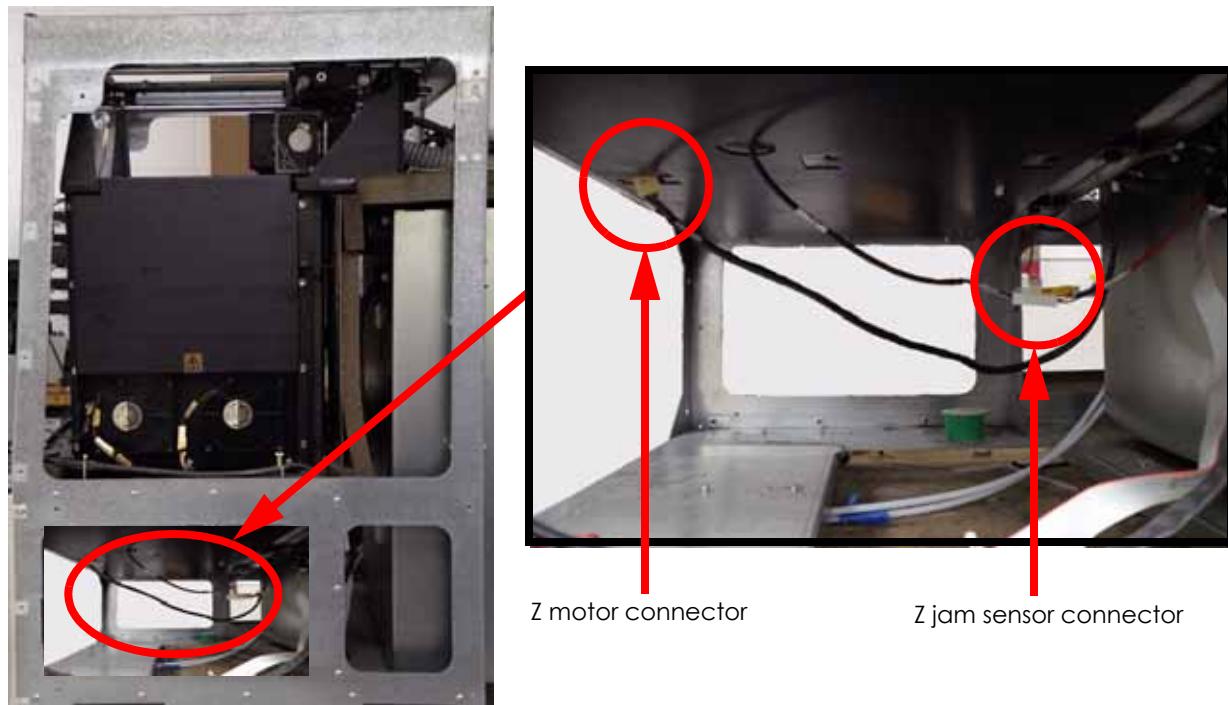
Required Tools

- $\frac{3}{32}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- Marker

Removing the Z Jam Sensor:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Remove the receiver assembly. See “[Removing the Galvanized Receiver Assembly:](#)” on page 5-470.
6. Disconnect the Z Jam sensor cable (J57/J155) by pressing the tab in and pulling apart. See [Figure 480](#).
7. Disconnect the Z motor cable by pressing the tab in and pulling apart. See [Figure 480](#).

Figure 480: Z jam sensor connector location



- Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 6 Z stage base plate mounting screws. See [Figure 481](#).

Figure 481: Z stage base plate mounting screw locations



- Lower the Z stage base plate and remove the Z jam sensor cable and Z motor cable through the slots. See [Figure 482](#).
- Slide the Z stage base plate out of the printer. See [Figure 482](#).

Figure 482: Z stage base plate removal



Guide cables out of Z base plate through slots

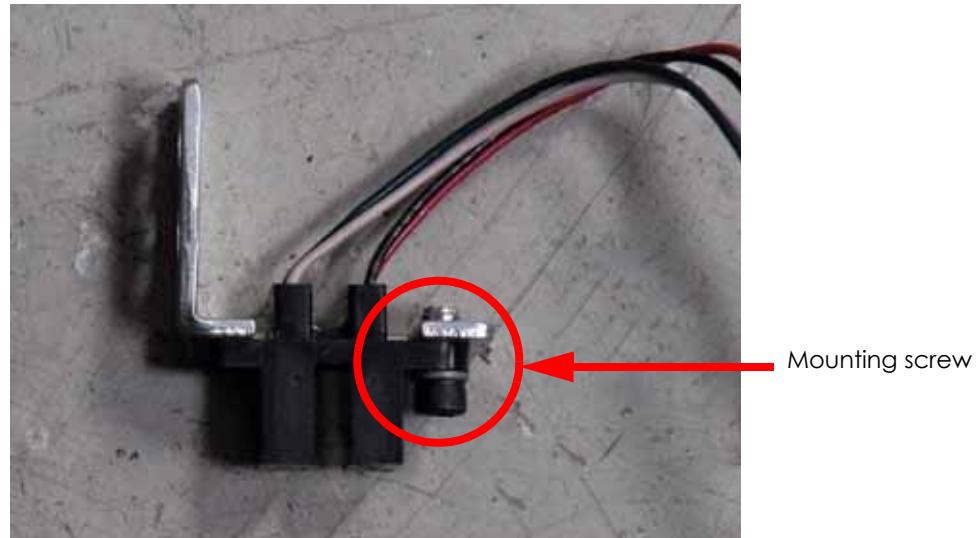
11. Using a $\frac{3}{32}$ " allen wrench, remove the 2 Z jam sensor L bracket mounting screws. See [Figure 483](#).

Figure 483: Z jam sensor L bracket mounting screw locations



12. Using a $\frac{3}{32}$ " allen wrench, remove the Z jam sensor mounting screw from the L bracket. See [Figure 484](#).

Figure 484: Z jam sensor mounting screw location

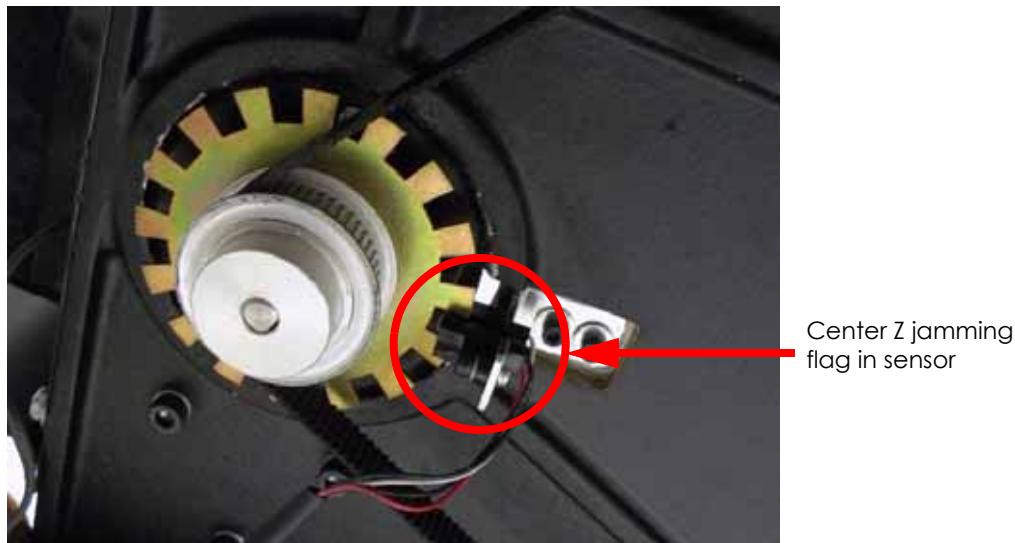


13. Discard the Z jam sensor.

Installing the Z Jam Sensor:

1. Align the Z jam sensor with the L bracket and use a
2. Align the Z jam sensor L bracket with the mounting holes and use a . Be sure the Z jamming flag is in the center of the sensor. See [Figure 485](#).

Figure 485: Z jamming flag location



3. Angle the Z base plate into position and feed the Z jam sensor and Z motor cables through the slots in the Z base plate.
4. Using a $5/16$ " nut driver or standard screwdriver, reinstall the 6 Z base plate mounting screws.
5. Reconnect the Z jam sensor and Z motor cables by pushing into the the connectors.
6. Reinstall the receiver assembly. See "[Installing the Galvanized Receiver Assembly:](#)" on [page 5-475](#).
7. Reinstall the side panels. See "[Side Panels](#)" on [page 5-11](#).
8. Reinstall the rear door. See "[Installing the Rear Door:](#)" on [page 5-10](#).
9. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
10. Power on the system. The system should reach **Idle** with no displayed errors.
11. Run a small test part and monitor system operation during build.

Z Motor Belt (3 LS)

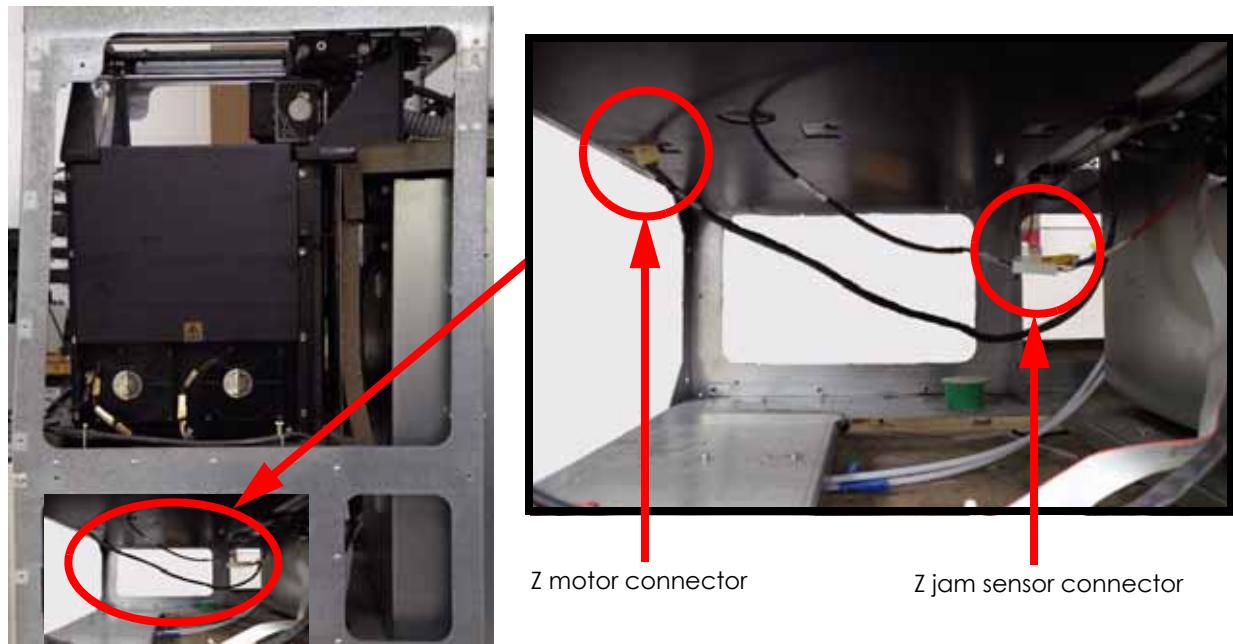
Required Tools

- $\frac{1}{8}$ " allen wrench
- $\frac{5}{32}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- Dial indicator
- Head bracket
- Marker

Removing the Z Motor Belt:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Remove the receiver assembly. See “[Removing the Galvanized Receiver Assembly:](#)” on page 5-470.
6. Disconnect the Z Jam sensor cable (J57/J155) by pressing the tab in and pulling apart. See [Figure 486](#).
7. Disconnect the Z motor cable by pressing the tab in and pulling apart. See [Figure 486](#).

Figure 486: Z jam sensor connector location



- Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 6 Z stage base plate mounting screws. See [Figure 487](#).

Figure 487: Z stage base plate mounting screw locations



- Lower the Z stage base plate and remove the Z jam sensor cable and Z motor cable through the slots. See [Figure 488](#).
- Slide the Z stage base plate out of the printer. See [Figure 488](#).

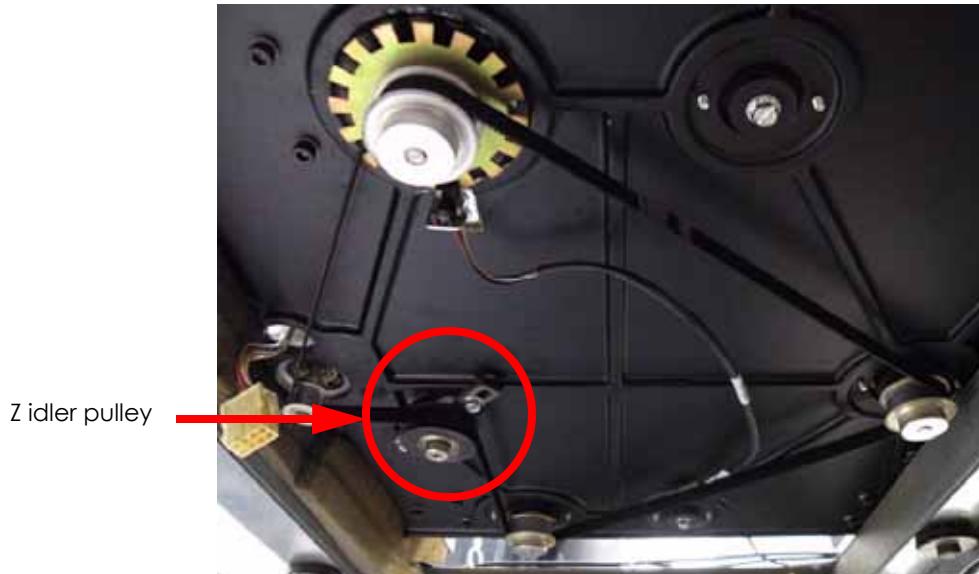
Figure 488: Z stage base plate removal



Guide cables out of Z base plate through slots

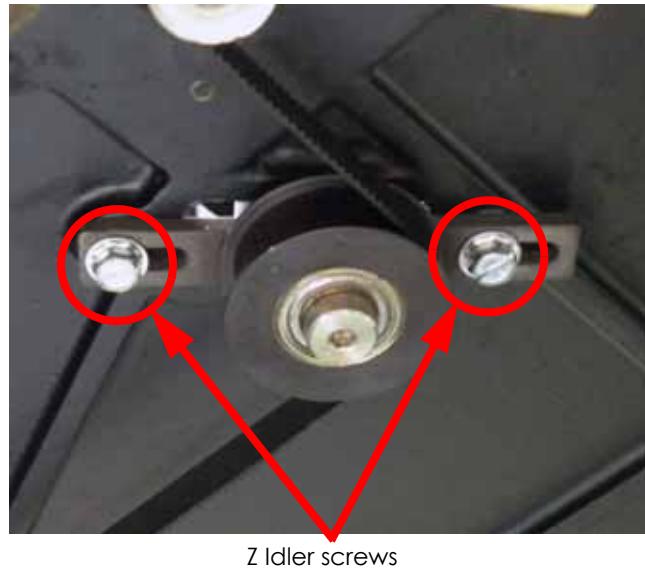
11. Locate the Z motor belt tension idler pulley. See [Figure 489](#).

Figure 489: Z motor belt tension idler pulley location



12. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, loosen, but do not remove, the 2 Z idler pulley screws. See [Figure 490](#).

Figure 490: Z motor belt tension idler pulley screw locations



13. Slide the Z motor belt tension idler pulley until there is no tension on the Z motor belt.
14. Remove the Z motor belt.

Installing the Z Motor Belt:

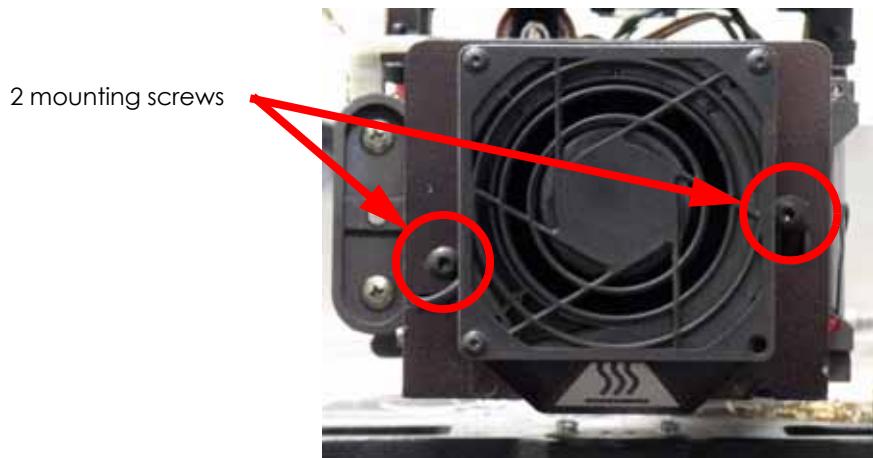
1. Place the belt around the Z pulleys. See [Figure 491](#).

Figure 491: Z motor belt installation



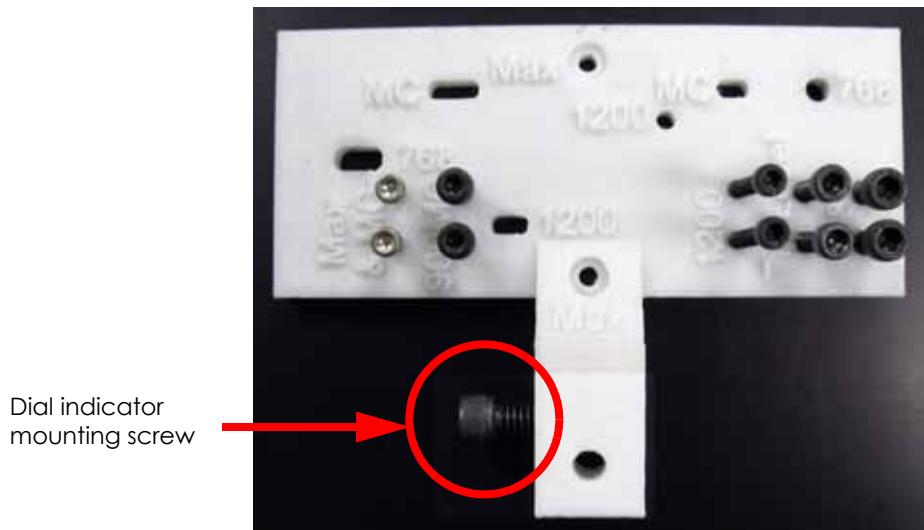
2. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
3. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
4. Check the Z platen level:
 - a. Remove the foam modelling base.
 - b. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 492](#).

Figure 492: Head fan mounting screw locations



- c. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 493](#).

Figure 493: Head bracket mounting screws



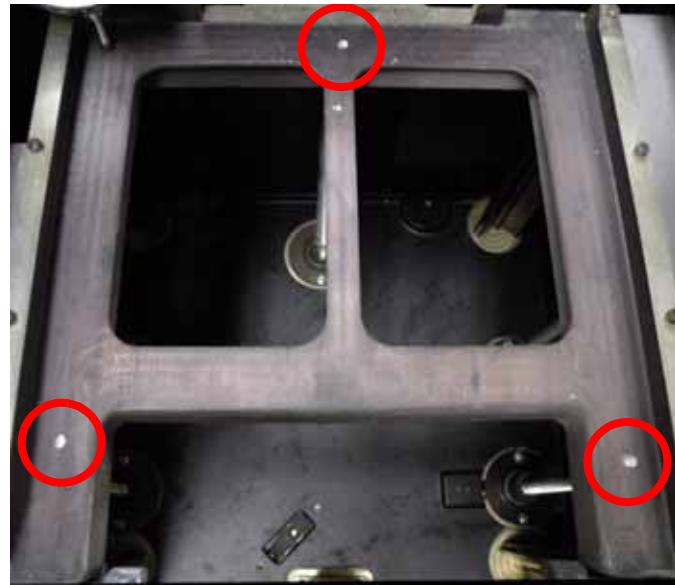
- d. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 494](#).

Figure 494: Dial indicator installation



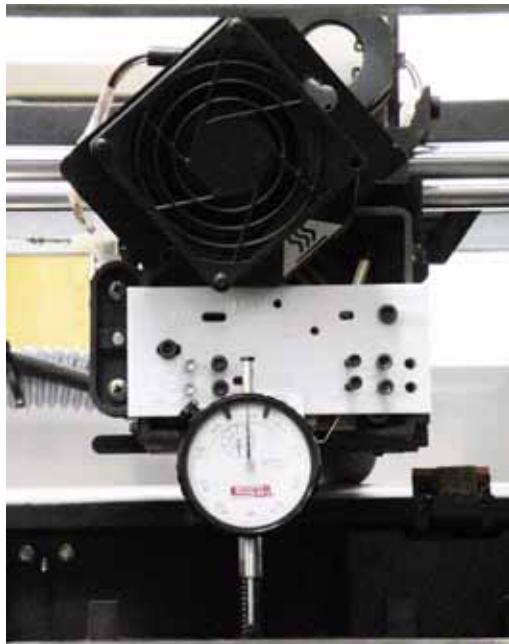
- e. Using a light colored marker, mark the Z platen in the rear center and left and right front corners. See [Figure 495](#).

Figure 495: Z platen mark locations



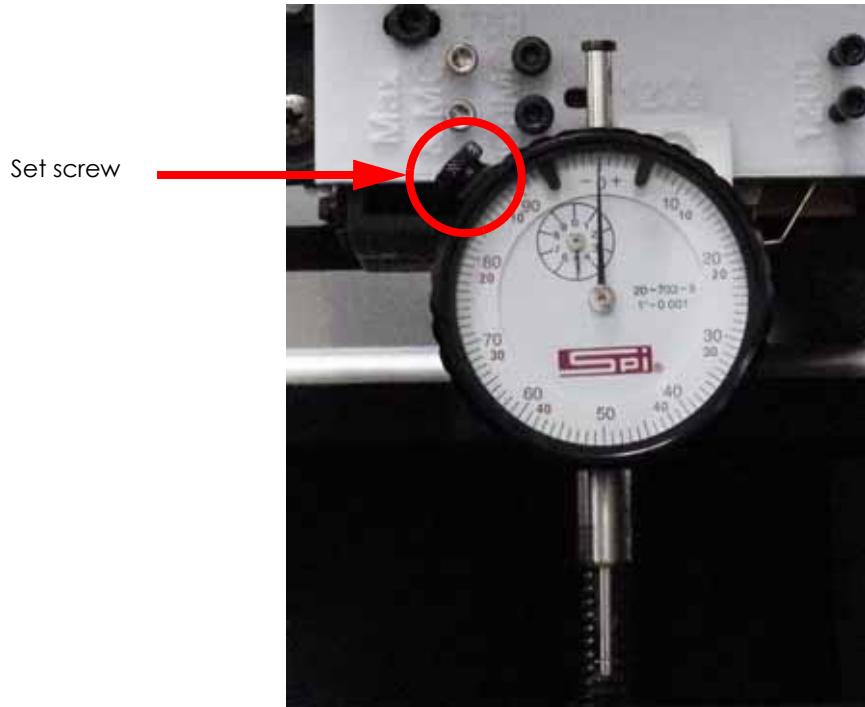
- f. Align the head bracket and dial indicator with the head fan mounting holes and use a $\frac{1}{8}$ " allen wrench to install the 2 mounting screws. Position the head fan behind the head bracket. See [Figure 496](#).

Figure 496: Head bracket and dial indicator installation



- g. Raise the Z stage until it is 2 inches from the upper limit by turning the lead screws.
- h. Move the dial indicator to the rear center mark and zero the dial indicator by loosening the set screw and turning the dial until the long hand is at 0. Once the dial indicator is at zero, tighten the set screw. See [Figure 497](#).

Figure 497: Zero the dial indicator



- i. Move the dial indicator to the front right corner and read the dial indicator. If the reading is less than .003" proceed to step p. If the reading is greater than .003" loosen the Z motor belt tension idler pulley mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
- j. Hold the Z motor belt tightly against the front left and rear center pulleys not allowing the belt to move from the pulley.



It may be easier to accomplish holding the Z belt in place with another person.

- k. Raise the front right corner by turning the lead screw until the dial indicator reads 0.
- l. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
- m. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
- n. Move the dial indicator to the rear center mark and zero the dial indicator.

- o. Move the dial indicator to the front right corner and verify the reading is still at 0. If not repeat steps [i](#) - [o](#) until the reading is 0.
- p. Move the dial indicator to the front left corner and read the dial indicator. If the reading is less than .003" proceed to step [.](#) If the reading is greater than .003" loosen the Z motor belt tension idler pulley mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
- q. Hold the Z motor belt tightly against the front right and rear center pulleys not allowing the belt to move from the pulley.



It may be easier to accomplish holding the Z belt in place with another person.

- r. Raise the front left corner by turning the lead screw until the dial indicator reads 0.
- s. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
- t. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
- u. Move the dial indicator to the rear center mark and zero the dial indicator.
- v. Move the dial indicator to the front right corner and verify the reading is still at 0. If not repeat steps [p](#) - [v](#) until the reading is 0.
- w. Using a remove the 2 mounting screws from the head bracket.
- x. Using a remove the dial indicator mounting screw from the head bracket.
- 5. Angle the Z base plate into position and feed the Z jam sensor and Z motor cables through the slots in the Z base plate.
- 6. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 6 Z base plate mounting screws.
- 7. Reconnect the Z jam sensor and Z motor cables by pushing into the the connectors.
- 8. Reinstall the receiver assembly. See "[Installing the Galvanized Receiver Assembly:](#)" on [page 5-475](#).
- 9. Reinstall the side panels. See "[Side Panels](#)" on [page 5-11](#).
- 10. Reinstall the rear door. See "[Installing the Rear Door:](#)" on [page 5-10](#).
- 11. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
- 12. Power on the system. The system should reach **Idle** with no displayed errors.
- 13. Run a small test part and monitor system operation during build.

Z Stage Motor (3 Lead Screw)

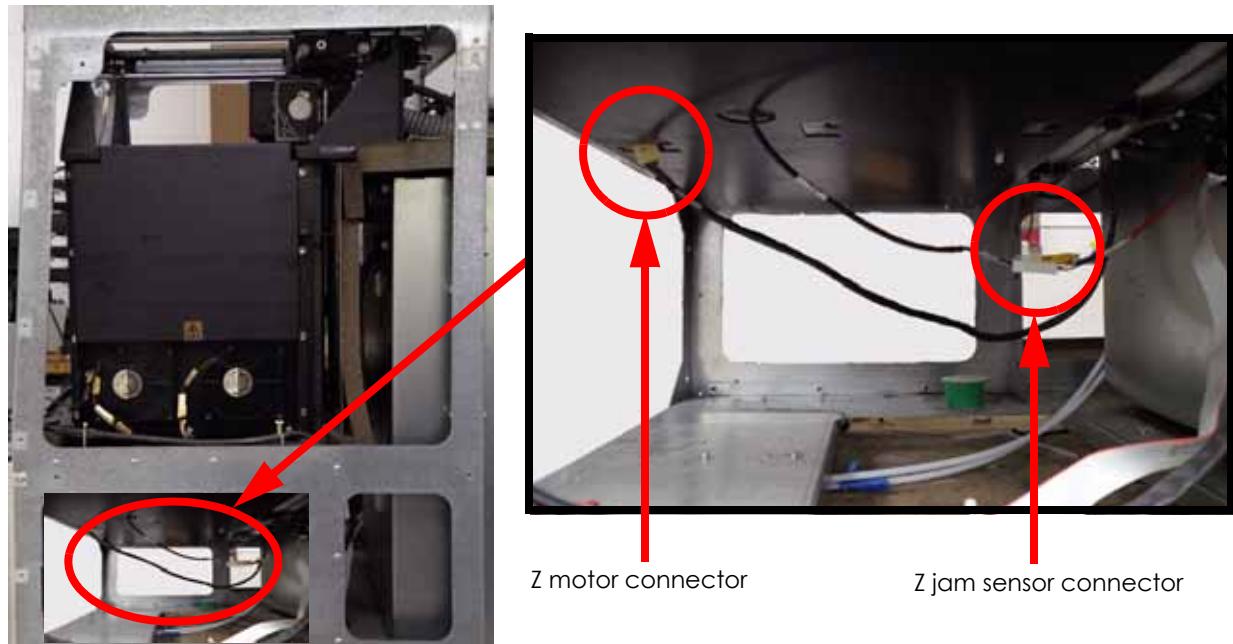
Required Tools

- $\frac{1}{8}$ " allen wrench
- $\frac{5}{32}$ " allen wrench
- $\frac{7}{64}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- Dial indicator
- Head bracket
- Marker

Removing the Z Motor:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the receiver assembly. See "[Removing the Galvanized Receiver Assembly:](#)" on page 5-470.
6. Disconnect the Z Jam sensor cable (J57/J155) by pressing the tab in and pulling apart. See [Figure 486](#).
7. Disconnect the Z motor cable by pressing the tab in and pulling apart. See [Figure 498](#).

Figure 498: Z jam sensor connector location



- Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 6 Z stage base plate mounting screws. See [Figure 499](#).

Figure 499: Z stage base plate mounting screw locations



- Lower the Z stage base plate and remove the Z jam sensor cable and Z motor cable through the slots. See [Figure 500](#).

10. Slide the Z stage base plate out of the printer. See [Figure 500](#).

Figure 500: Z stage base plate removal



Guide cables out of Z base plate through slots

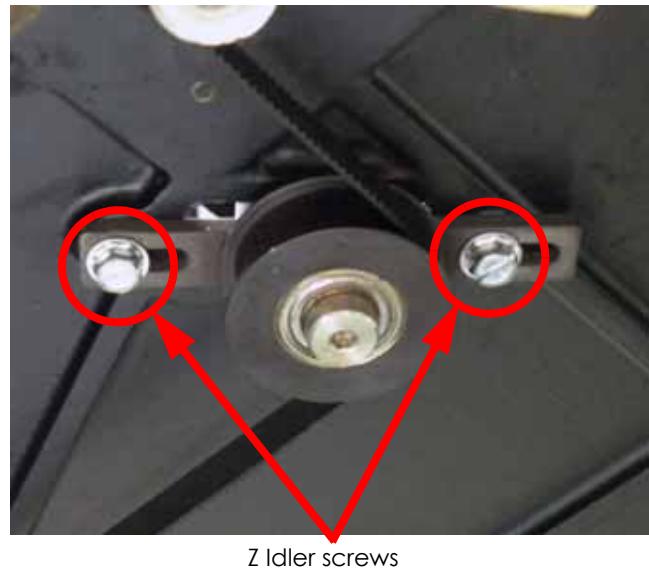
11. Locate the Z motor belt tension idler pulley. See [Figure 501](#).

Figure 501: Z motor belt tension idler pulley location



12. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, loosen, but do not remove, the 2 Z idler pulley screws. See [Figure 502](#).

Figure 502: Z motor belt tension idler pulley screw locations



13. Slide the Z motor belt tension idler pulley until there is no tension on the Z motor belt.
14. Using a $\frac{7}{64}$ " allen wrench, remove the 4 Z motor mounting screws. See [Figure 503](#).

Figure 503: Z motor mounting screw locations



15. Remove the Z motor and discard.

Installing the Z Motor:

1. Align the Z motor with the mounting holes and use a $\frac{7}{64}$ " allen wrench to reinstall the 4 mounting screws.



Make sure the Z motor cable is to the right when aligning the Z motor with the mounts.

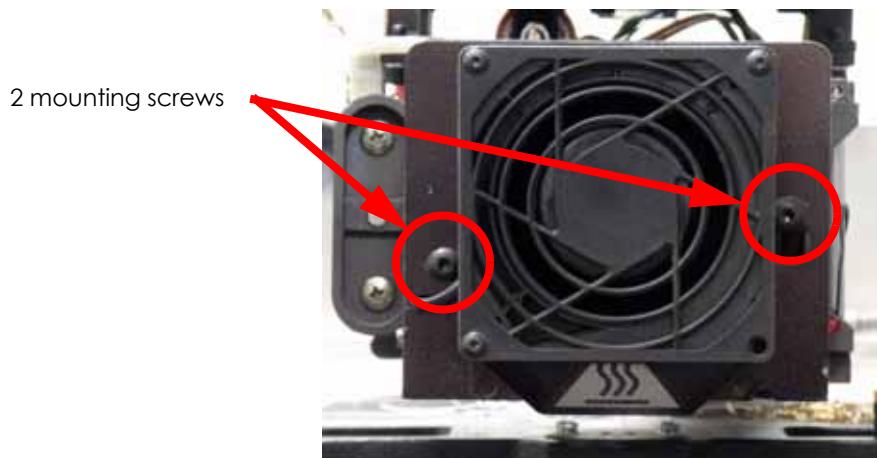
2. Place the Z belt around the Z pulleys. See [Figure 504](#).

Figure 504: Z motor belt installation



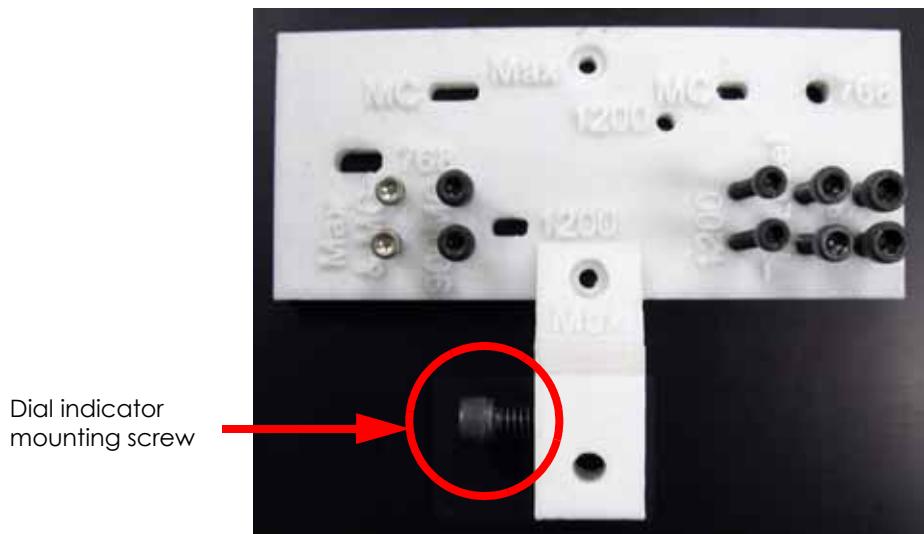
3. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
4. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
5. Check the Z platen level:
 - a. Remove the foam modelling base.
 - b. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 505](#).

Figure 505: Head fan mounting screw locations



- c. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 506](#).

Figure 506: Head bracket mounting screws



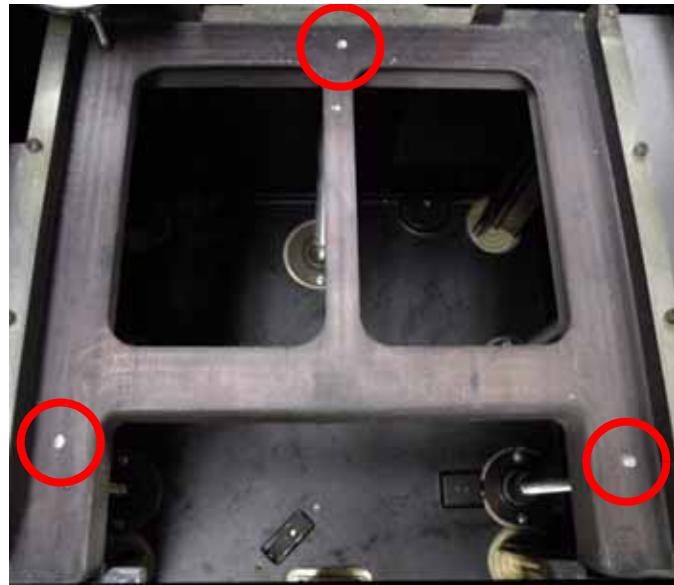
- d. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 507](#).

Figure 507: Dial indicator installation



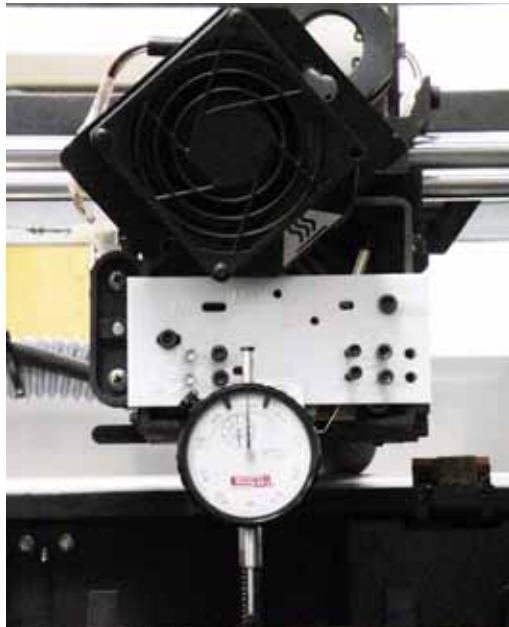
- e. Using a light colored marker, mark the Z platen in the rear center and left and right front corners. See [Figure 508](#).

Figure 508: Z platen mark locations



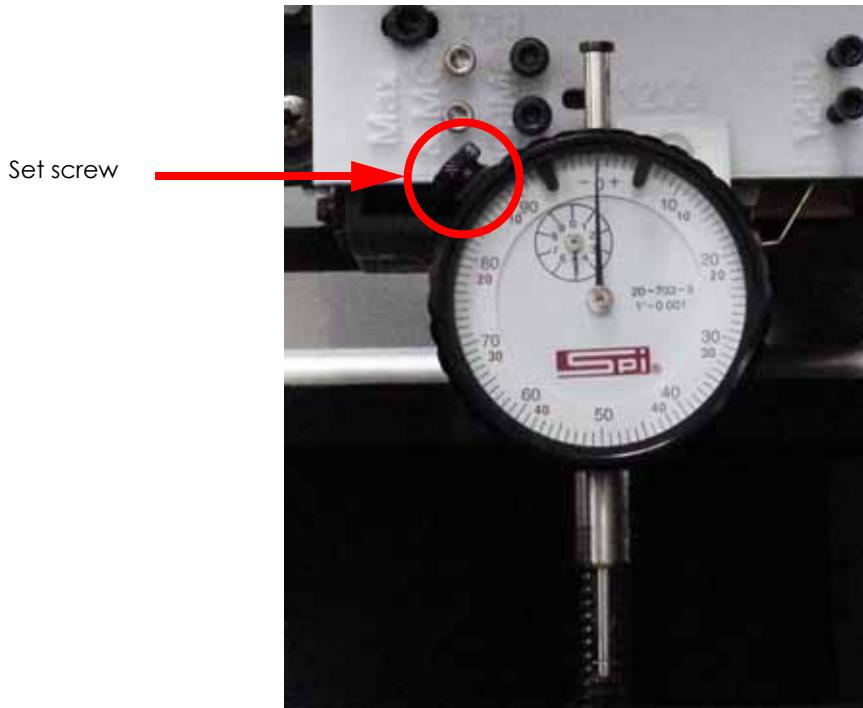
- f. Align the head bracket and dial indicator with the head fan mounting holes and use a $\frac{1}{8}$ " allen wrench to install the 2 mounting screws. Position the head fan behind the head bracket. See [Figure 509](#).

Figure 509: Head bracket and dial indicator installation



- g. Raise the Z stage until it is 2 inches from the upper limit by turning the lead screws.
- h. Move the dial indicator to the rear center mark and zero the dial indicator by loosening the set screw and turning the dial until the long hand is at 0. Once the dial indicator is at zero, tighten the set screw. See [Figure 510](#).

Figure 510: Zero the dial indicator



- i. Move the dial indicator to the front right corner and read the dial indicator. If the reading is less than .003" proceed to step p. If the reading is greater than .003" loosen the Z motor belt tension idler pulley mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
- j. Hold the Z motor belt tightly against the front left and rear center pulleys not allowing the belt to move from the pulley.



It may be easier to accomplish holding the Z belt in place with another person.

- k. Raise the front right corner by turning the lead screw until the dial indicator reads 0.
- l. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
- m. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
- n. Move the dial indicator to the rear center mark and zero the dial indicator.
- o. Move the dial indicator to the front right corner and verify the reading is still at 0. If not repeat steps i - o until the reading is 0.
- p. Move the dial indicator to the front left corner and read the dial indicator. If the reading is less than .003" proceed to step . If the reading is greater than .003" loosen the Z motor

belt tension idler pulley mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.

- q. Hold the Z motor belt tightly against the front right and rear center pulleys not allowing the belt to move from the pulley.



It may be easier to accomplish holding the Z belt in place with another person.

- r. Raise the front left corner by turning the lead screw until the dial indicator reads 0.
- s. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
- t. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
- u. Move the dial indicator to the rear center mark and zero the dial indicator.
- v. Move the dial indicator to the front right corner and verify the reading is still at 0. If not repeat steps p - v until the reading is 0.
- w. Using a remove the 2 mounting screws from the head bracket.
- x. Using a remove the dial indicator mounting screw from the head bracket.
- 6. Angle the Z base plate into position and feed the Z jam sensor and Z motor cables through the slots in the Z base plate.
- 7. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 6 Z base plate mounting screws.
- 8. Reconnect the Z jam sensor and Z motor cables by pushing into the the connectors.
- 9. Reinstall the receiver assembly. See "[Installing the Galvanized Receiver Assembly:](#)" on [page 5-475](#).
- 10. Reinstall the side panels. See "[Side Panels](#)" on [page 5-11](#).
- 11. Reinstall the rear door. See "[Installing the Rear Door:](#)" on [page 5-10](#).
- 12. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
- 13. Power on the system. The system should reach **Idle** with no displayed errors.
- 14. Run a small test part and monitor system operation during build.

Z Stage Bearings (3 Lead Screw)

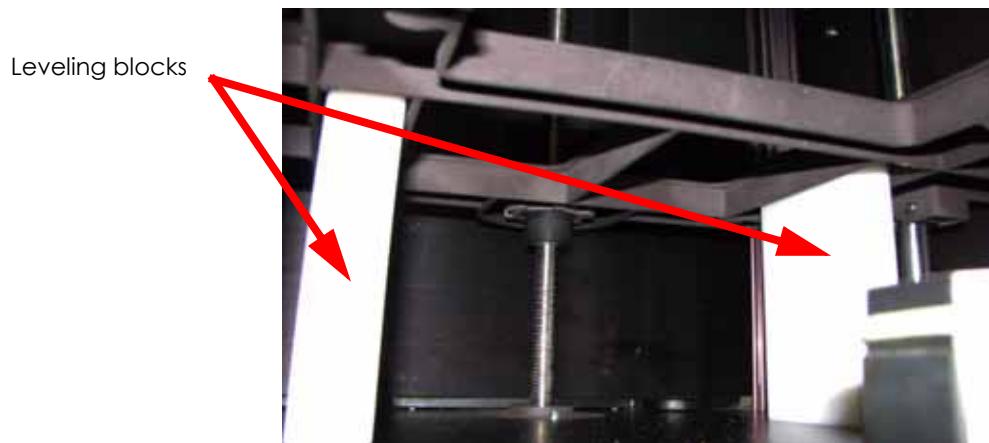
Required Tools

- $\frac{9}{64}$ " allen wrench
- $\frac{1}{4}$ " nut driver
- $\frac{5}{16}$ " nut driver
- Bearing replacement kit:
 - Snap ring tool
 - Hinged collars (4)
 - Z casting leveling blocks
 - Krytox Grease
 - Loctite 411
- Head dial indicator mounting bracket
- Dial indicator
- Marker

Removing the Z Stage Bearings:

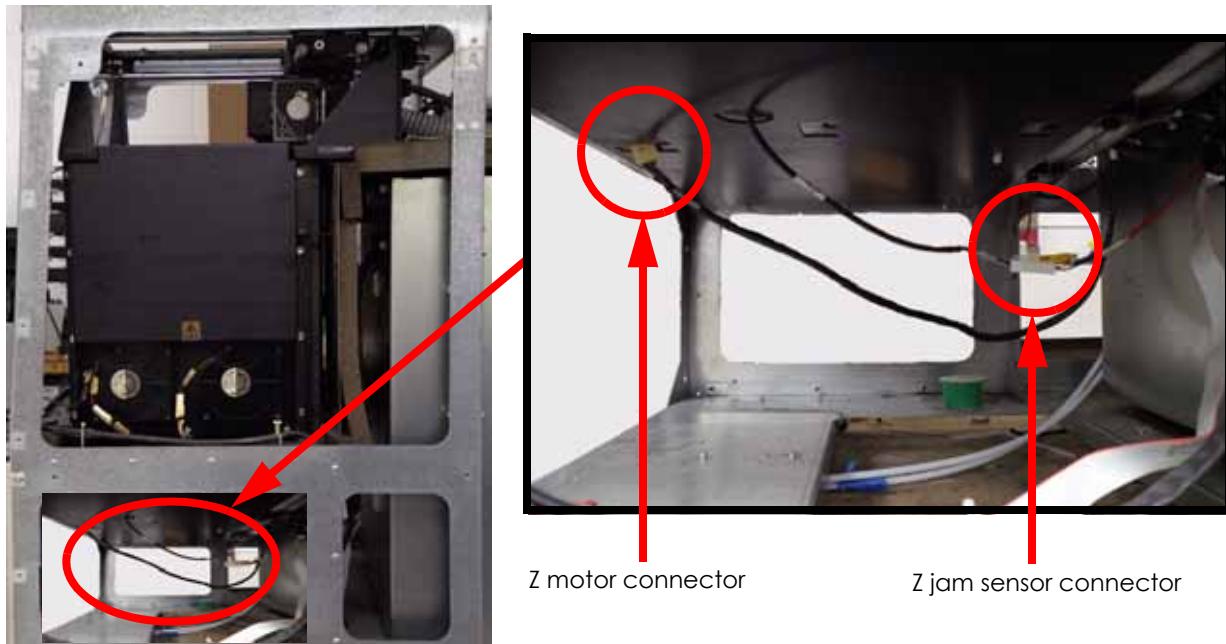
1. Unload material and remove model and support material cartridges.
2. Press **Maintenance** on the display panel.
3. Using the “Axis menu” on the keypad, move the Z stage approximately six inches from the bottom. Do NOT exit this menu.
4. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
5. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
6. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
7. Remove the side panels. See “[Side Panels](#)” on page 5-11.
8. Insert the 2 Z casting leveling blocks below the Z stage casting. See [Figure 511](#).

Figure 511: Leveling block placement



9. Manually move the Z stage down until it rests on the leveling blocks by turning the lead screw.
10. Remove the front bezel. See "[Removing the Front Bezel](#):" on page 5-13.
11. Remove the receiver assembly. See "[Removing the Galvanized Receiver Assembly](#):" on page 5-470.
12. Disconnect the Z Jam sensor cable (J57/J155) by pressing the tab in and pulling apart. See [Figure 486](#).
13. Disconnect the Z motor cable by pressing the tab in and pulling apart. See [Figure 512](#).

Figure 512: Z jam sensor connector location



14. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 6 Z stage base plate mounting screws. See [Figure 513](#).

Figure 513: Z stage base plate mounting screw locations



15. Lower the Z stage base plate and remove the Z jam sensor cable and Z motor cable through the slots. See [Figure 514](#).
16. Slide the Z stage base plate out of the printer. See [Figure 514](#).

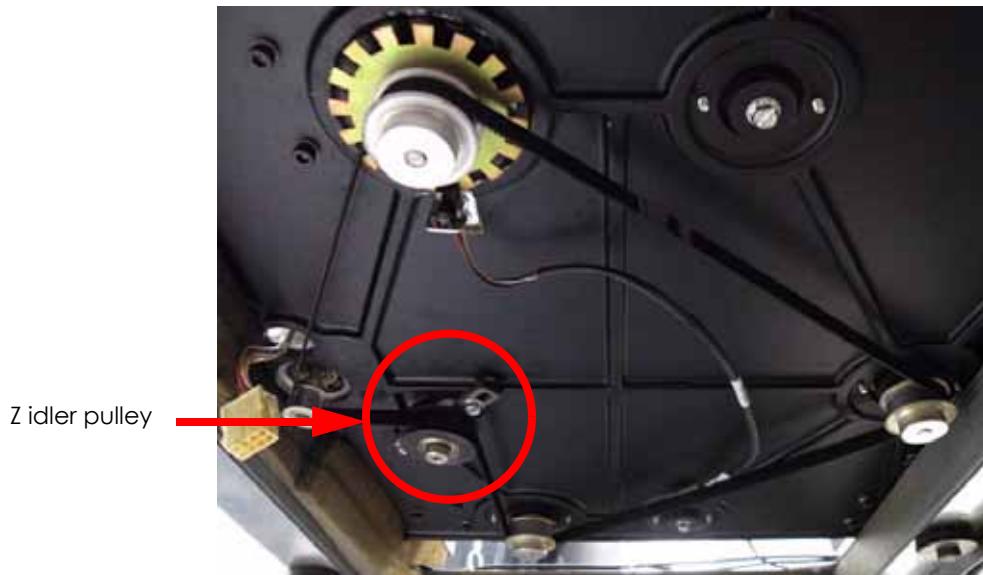
Figure 514: Z stage base plate removal



Guide cables out of Z base plate through slots

17. Locate the Z motor belt tension idler pulley. See [Figure 515](#).

Figure 515: Z motor belt tension idler pulley location



18. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, loosen, but do not remove, the 2 Z idler pulley screws. See [Figure 516](#).

Figure 516: Z motor belt tension idler pulley screw locations



19. Slide the Z motor belt tension idler pulley until there is no tension on the Z motor belt.
20. Remove the Z motor belt and set aside.
21. Remove the Z jam sensor. See "[Removing the Z Jam Sensor:](#)" on page 5-382.

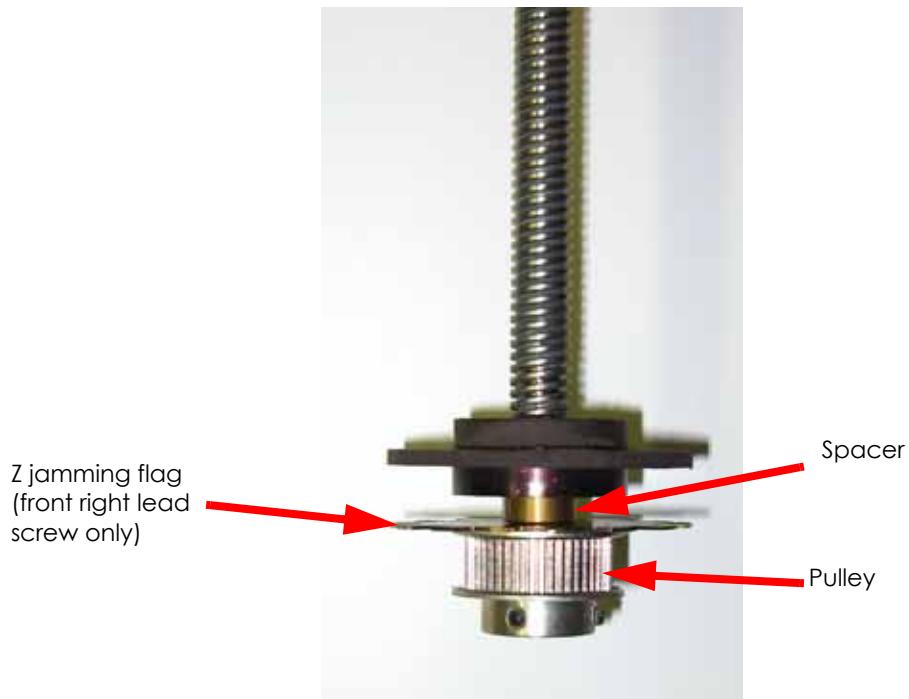
22. Using a $\frac{5}{64}$ " allen wrench, loosen the 2 set screws from each lead screw pulley (6 total). See Figure 517.

Figure 517: Lead screw pulley set screw locations



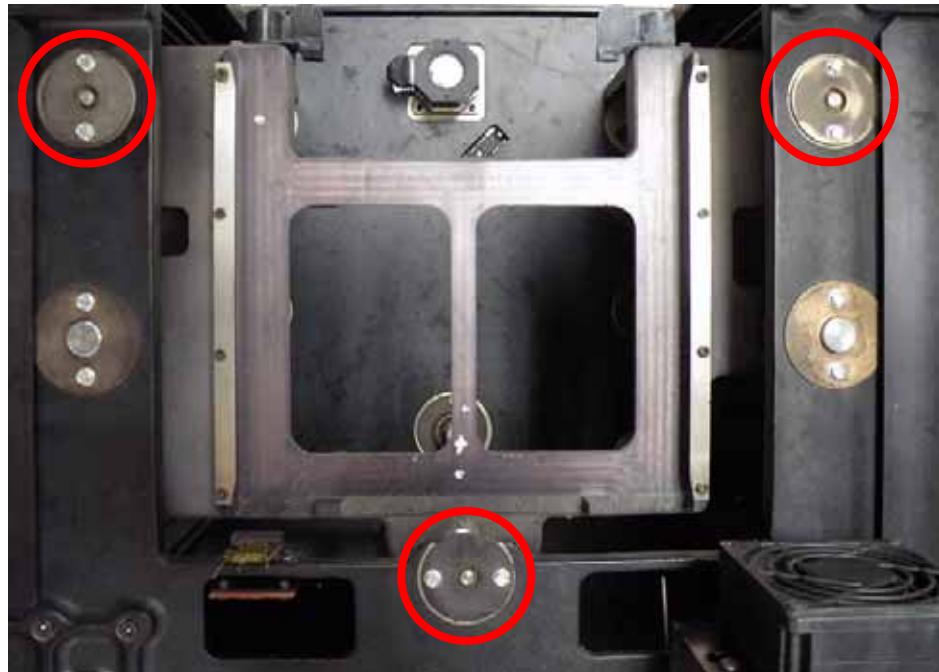
23. Remove the pulleys, spacers and Z jamming flag (front right lead screw only) by pulling down. See Figure 518.

Figure 518: Z lead screw



24. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 mounting screws from the 3 lead screw bearing caps (6 mounting screws total). See [Figure 519](#).

Figure 519: Lead screw bearing cap locations

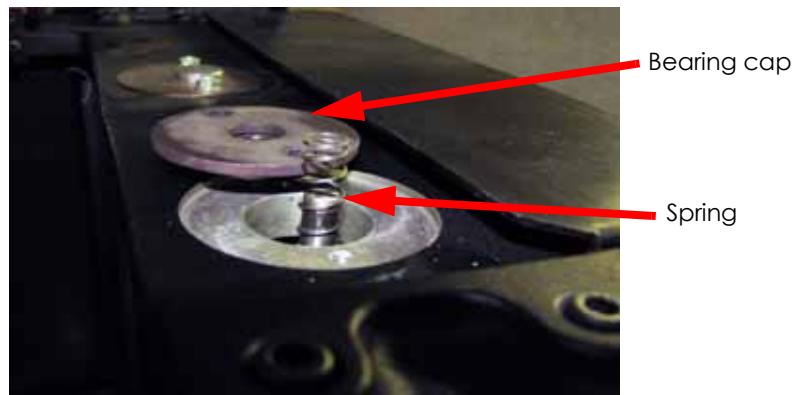


25. Remove the bearing caps and springs from the 3 lead screws by lifting upwards. See [Figure 520](#).



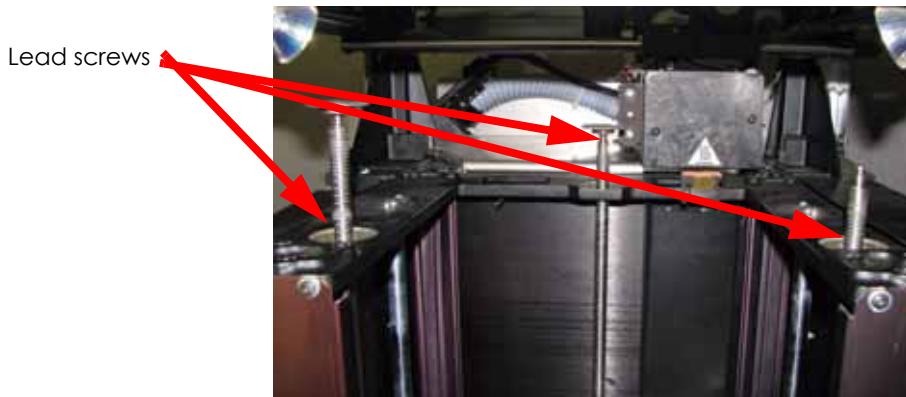
If the cap sticks to the lead screw, disassemble after the lead screw is removed from machine.

Figure 520: Removing the bearing caps and springs



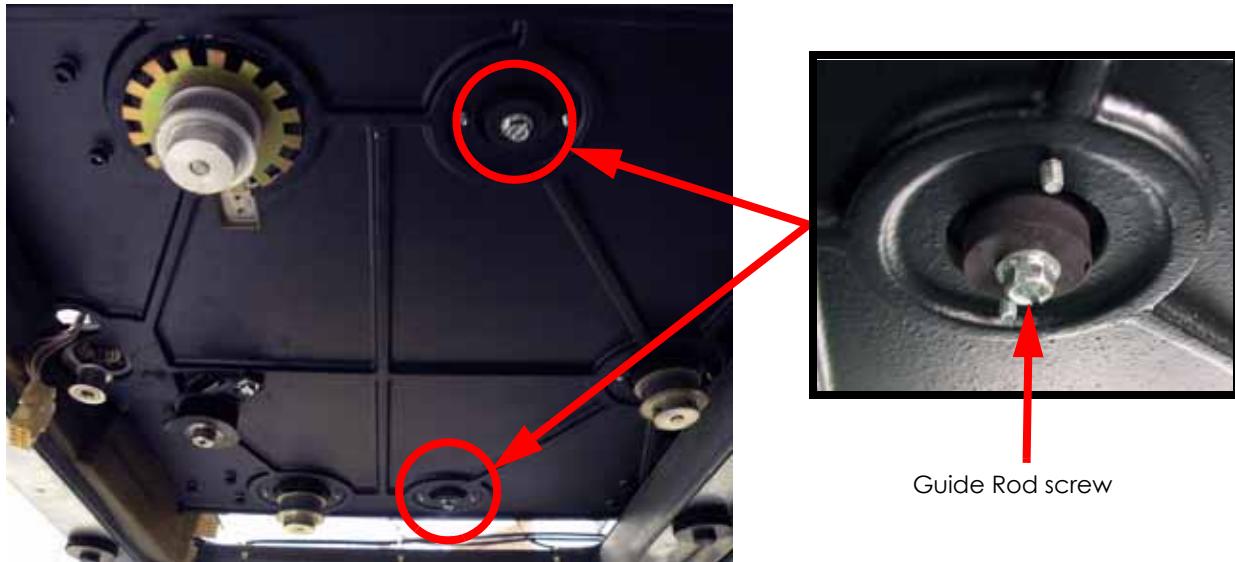
26. Remove the lead screws from the printer by turning counter clockwise. See [Figure 521](#).

Figure 521: Removing the lead screws



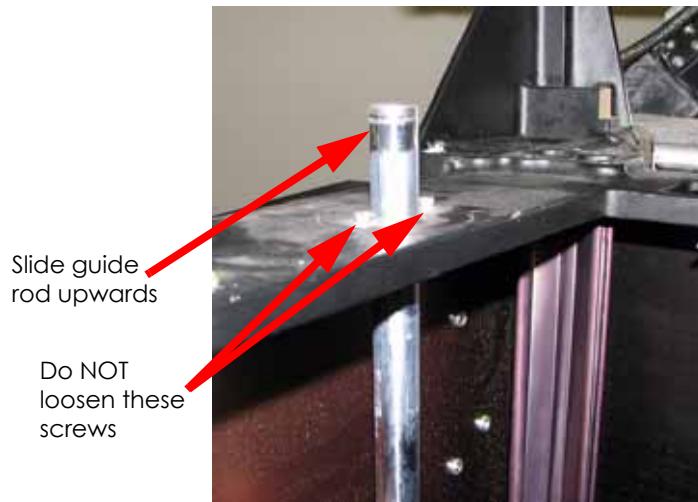
27. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 3 guide rod mounting screws from the bottom of the printer. See [Figure 522](#).

Figure 522: Guide rod mounting screw locations



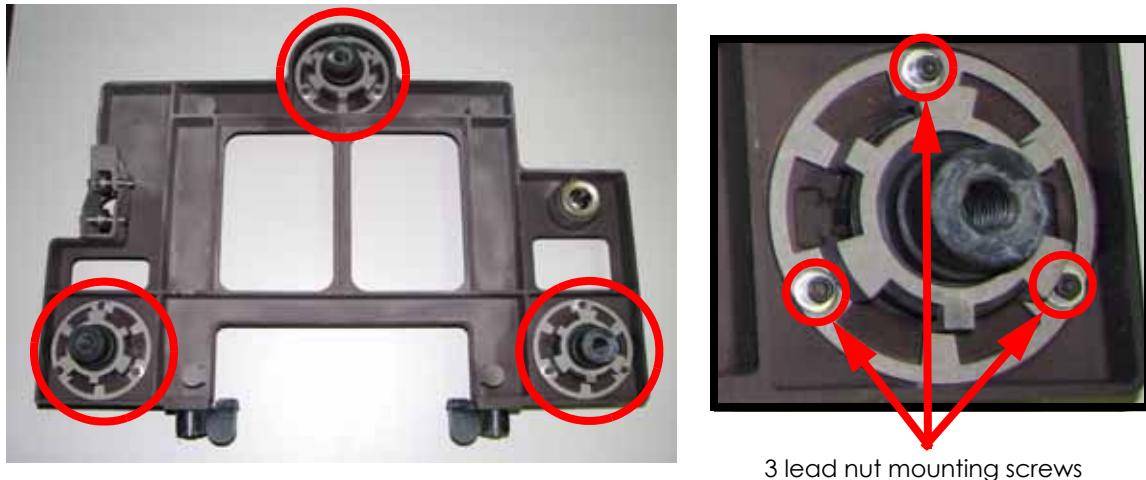
28. Remove the guide rods by pulling up through the printer. See [Figure 523](#).

Figure 523: Removing the guide rods



29. Remove the Z stage casting from the machine. Place the Z stage casting face down with the lead nuts facing up. See [Figure 524](#).
30. Using a $\frac{7}{64}$ " allen wrench, remove the 9 lead nut mounting screws from the casting. See [Figure 524](#).

Figure 524: Z stage casting



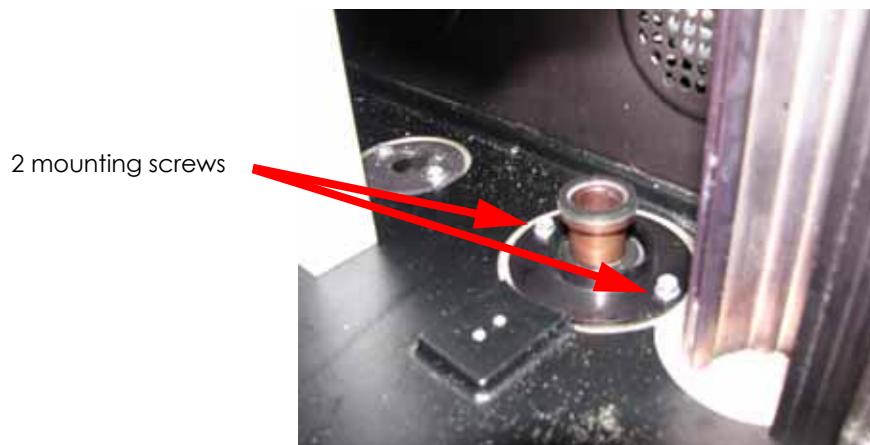
31. Remove the bearings from the casting using a snap ring tool. See [Figure 525](#).

Figure 525: Bearing retaining clip



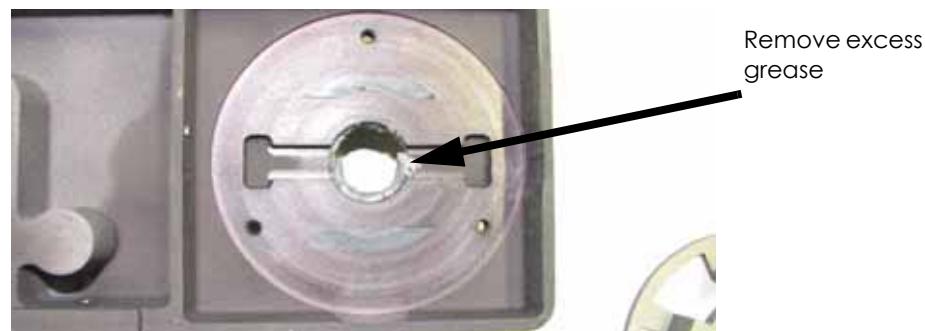
32. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 lower bearing mounting screws from the 3 lower bearings and lift upwards to remove. See [Figure 526](#).

Figure 526: Lower lead screw bearing location



33. Remove excess grease from the casting, guide rods and lead screws. See [Figure 527](#).

Figure 527: Clean excess grease



Installing the Z Stage Bearings:

1. Align the lead nuts and bearing with the Z stage casting and use a $\frac{7}{64}$ " allen wrench to reinstall the mounting screws.
2. Reinstall the lower bearings. Do not tighten screws.
3. Place the Z casting on the leveling blocks inside machine.
4. Reinstall the guide rods by feeding the rods down from the top, guiding them through the bearings in the Z casting.



Wear gloves to avoid contact with the Krytox grease.

5. Hold the guide rod with the glove and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the guide rod mounting screws.
6. Apply Krytox Grease to the left guide rod above the bearing. See [Figure 528](#).

Figure 528: Apply krytox to guide rods



7. Reinstall the lead screws by turning clockwise until they make contact with the bottom bearings.
8. Align the top bearing caps and springs. Use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the mounting screws. See [Figure 529](#).



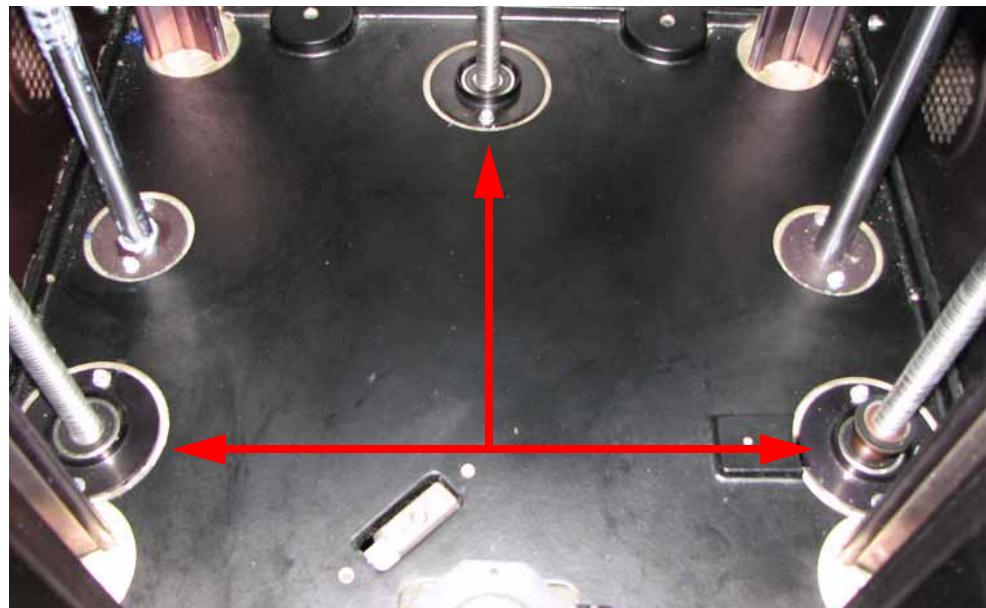
Make sure the top of the lead screw is not above the cap.

Figure 529: Top bearing



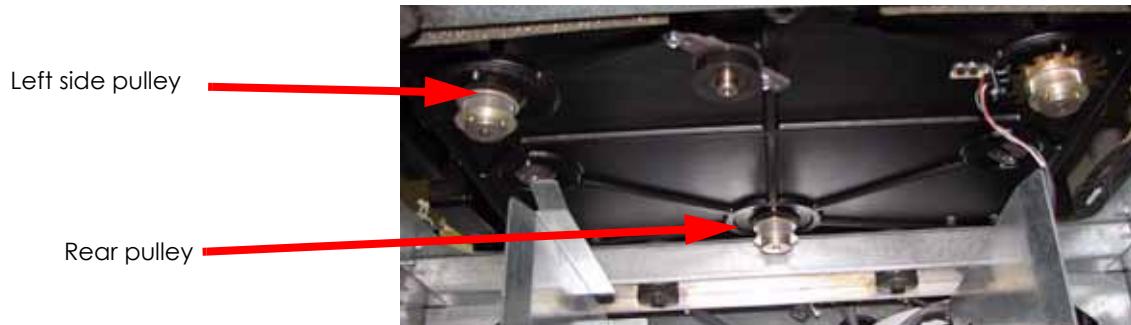
9. Use a $\frac{1}{4}$ " nut driver or standard screwdriver to tighten the lower bearing while pushing the bearing assembly out towards the exterior wall. See [Figure 530](#).

Figure 530: Bottom bearings



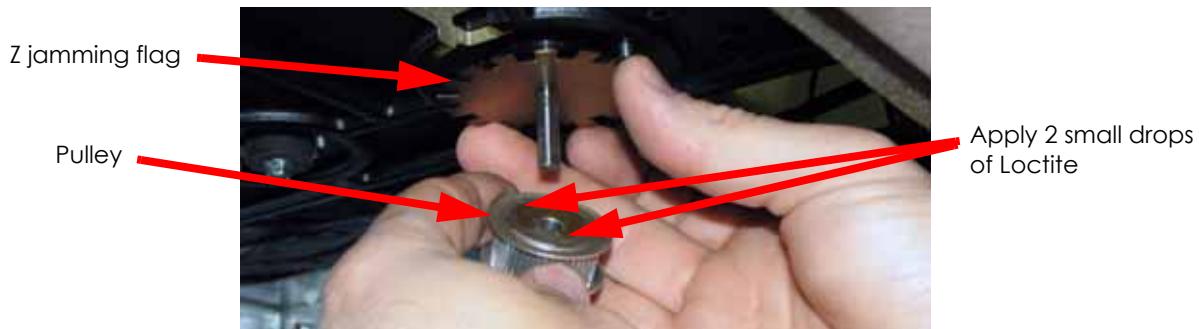
10. Install the left and rear pulleys and spacers without the Z jamming flag. Be sure you line up one lead screw with the key on the lead screw shaft. Check for movement up and down on the lead screw. See [Figure 531](#).

Figure 531: Left and rear pulleys



11. Reinstall the right pulley with the Z jamming flag and spacer, applying two drops of Loctite between the pulley and the flag. See [Figure 532](#).

Figure 532: Third pulley and flag sensor



12. Reinstall the Z jam sensor. See "[Installing the Z Jam Sensor:](#)" on page 5-385.

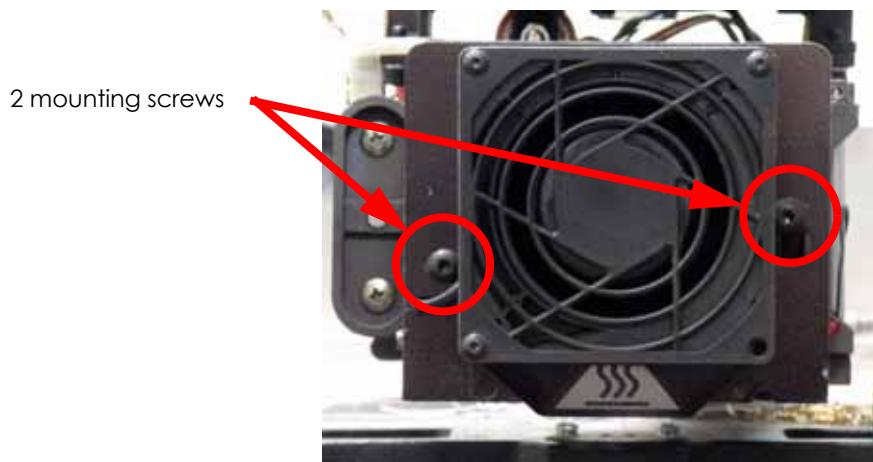
13. Place the Z belt around the Z pulleys. See [Figure 533](#).

Figure 533: Z motor belt installation



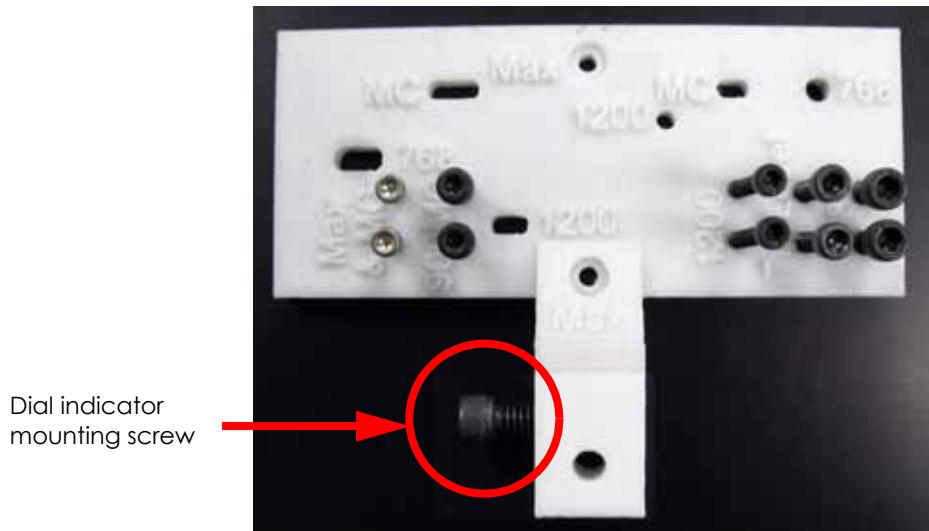
14. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
15. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
16. Check the Z platen level:
 - a. Remove the foam modelling base.
 - b. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 534](#).

Figure 534: Head fan mounting screw locations



- c. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 535](#).

Figure 535: Head bracket mounting screws



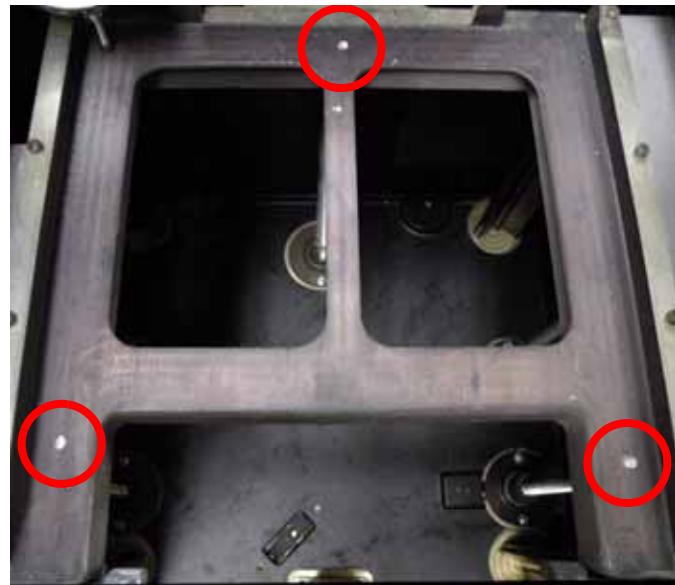
- d. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 536](#).

Figure 536: Dial indicator installation



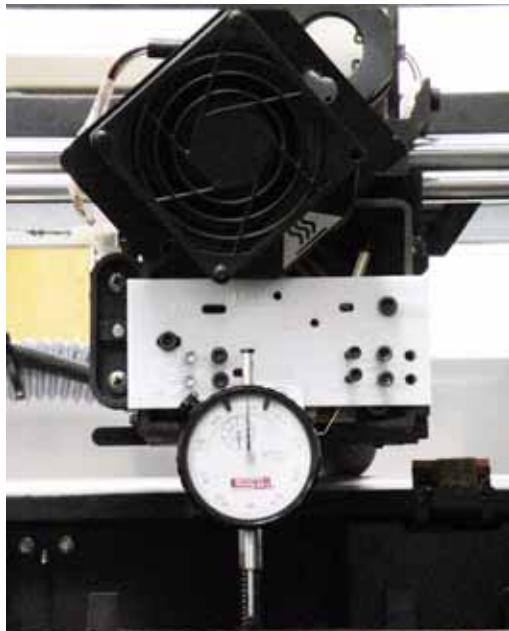
- e. Using a light colored marker, mark the Z platen in the rear center and left and right front corners. See [Figure 537](#).

Figure 537: Z platen mark locations



- f. Align the head bracket and dial indicator with the head fan mounting holes and use a $\frac{1}{8}$ " allen wrench to install the 2 mounting screws. Position the head fan behind the head bracket. See [Figure 538](#).

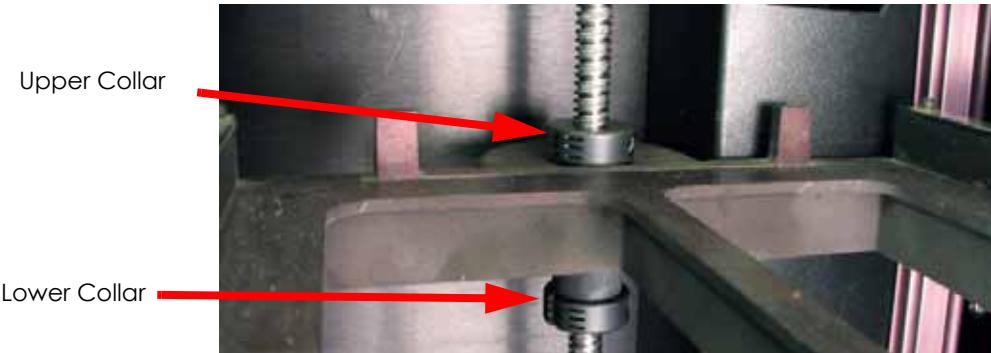
Figure 538: Head bracket and dial indicator installation



- g. Raise the Z stage until it is 2 inches from the upper limit by turning the lead screws.

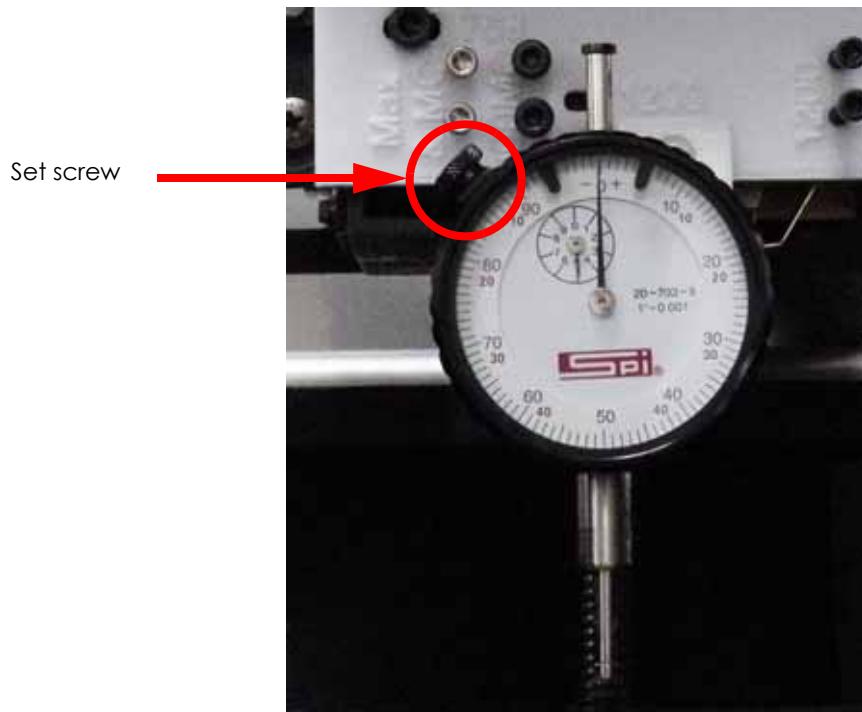
17. Attach the 2 hinged collars to the rear lead screw. Press the collars firmly toward the platen while tightening the set-screws. See [Figure 539](#).

Figure 539: Upper and lower hinged collar locations



- h. Move the dial indicator to the rear center mark and zero the dial indicator by loosening the set screw and turning the dial until the long hand is at 0. Once the dial indicator is at zero, tighten the set screw. See [Figure 540](#).

Figure 540: Zero the dial indicator



- i. Clamp the left lead screw with the 2 hinged collars. Press the collars firmly toward the platen while tightening the set-screws.

- j. Move the dial indicator to the front right corner and read the dial indicator. If the reading is less than .003" proceed to step [q](#). If the reading is greater than .003" loosen the Z motor belt tension idler pulley mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
 - k. Raise the front right corner by turning the lead screw until the dial indicator reads 0.
 - l. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
 - m. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
 - n. Move the dial indicator to the rear center mark and zero the dial indicator.
 - o. Move the dial indicator to the front right corner and verify the reading is still at 0. If not repeat steps [i - o](#) until the reading is 0.
 - p. Remove the 2 hinged collars from the left lead screw and clamp them to the right side lead screw.
 - q. Move the dial indicator to the front left corner and read the dial indicator. If the reading is less than .003" proceed to step [.](#) If the reading is greater than .003" loosen the Z motor belt tension idler pulley mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
 - r. Raise the front left corner by turning the lead screw until the dial indicator reads 0.
 - s. Using a standard screwdriver, push back on the idler pulley to tension the Z motor belt.
 - t. With the Z motor belt tight, use a $\frac{5}{16}$ " nut driver or standard screwdriver to tighten the 2 idler pulley screws.
 - u. Move the dial indicator to the rear center mark and zero the dial indicator.
 - v. Move the dial indicator to the front right corner and verify the reading is still at 0. If not repeat steps [q - v](#) until the reading is 0.
 - w. Remove the 4 hinged collars from the rear and right side lead screws.
 - x. Remove the 2 mounting screws from the head bracket.
 - y. Remove the dial indicator mounting screw from the head bracket.
18. Angle the Z base plate into position and feed the Z jam sensor and Z motor cables through the slots in the Z base plate.
19. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 6 Z base plate mounting screws.
20. Reconnect the Z jam sensor and Z motor cables by pushing into the the connectors.
21. Reinstall the receiver assembly. See "[Installing the Galvanized Receiver Assembly:](#)" on [page 5-475](#).
22. Reinstall the side panels. See "[Side Panels](#)" on [page 5-11](#).
23. Reinstall the rear door. See "[Installing the Rear Door:](#)" on [page 5-10](#).
24. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
25. Power on the system. The system should reach **Idle** with no displayed errors.
26. Run a small test part and monitor system operation during build.

Z Foam Retainers

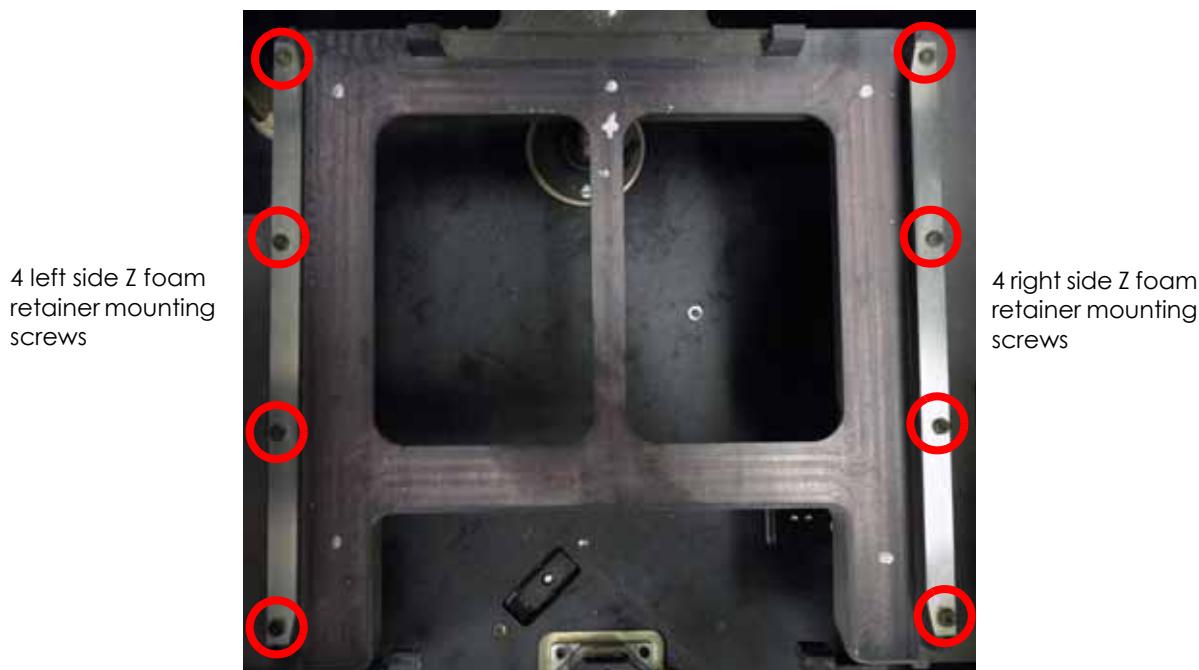
Required Tools

- $\frac{7}{64}$ " allen wrench

Removing the Z Foam Retainers:

1. Remove the foam substrate.
2. Using a $\frac{7}{64}$ " allen wrench, remove the 4 foam retainer mounting screws from the left side retainer. See [Figure 541](#).
3. Using a $\frac{7}{64}$ " allen wrench, remove the 4 foam retainer mounting screws from the right side retainer. See [Figure 541](#).

Figure 541: Foam retainer mounting screw locations



1. Remove the left and right Z foam retainers and discard.

Installing the Z Foam Retainers:

1. Align the left and right Z foam retainers with the mounting holes and use a $\frac{7}{64}$ " allen wrench to reinstall the mounting screws.
2. Insert a foam substrate.
- 3.

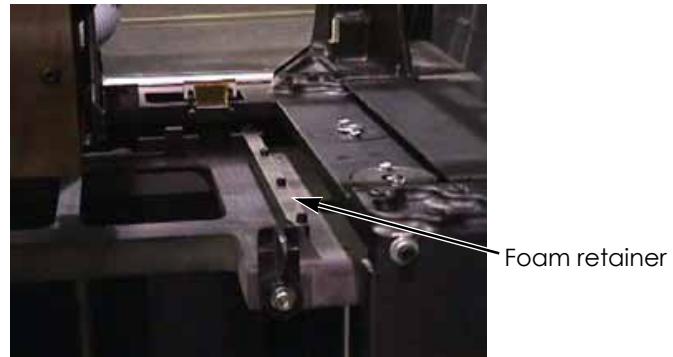


Figure 542: Foam Retainer

Z Stage Components (1 Lead Screw)

Chamber Thermocouple (1 Lead Screw)

Required Tools

- Standard screwdriver
- Needle nose pliers

Removing the Chamber Thermocouple:

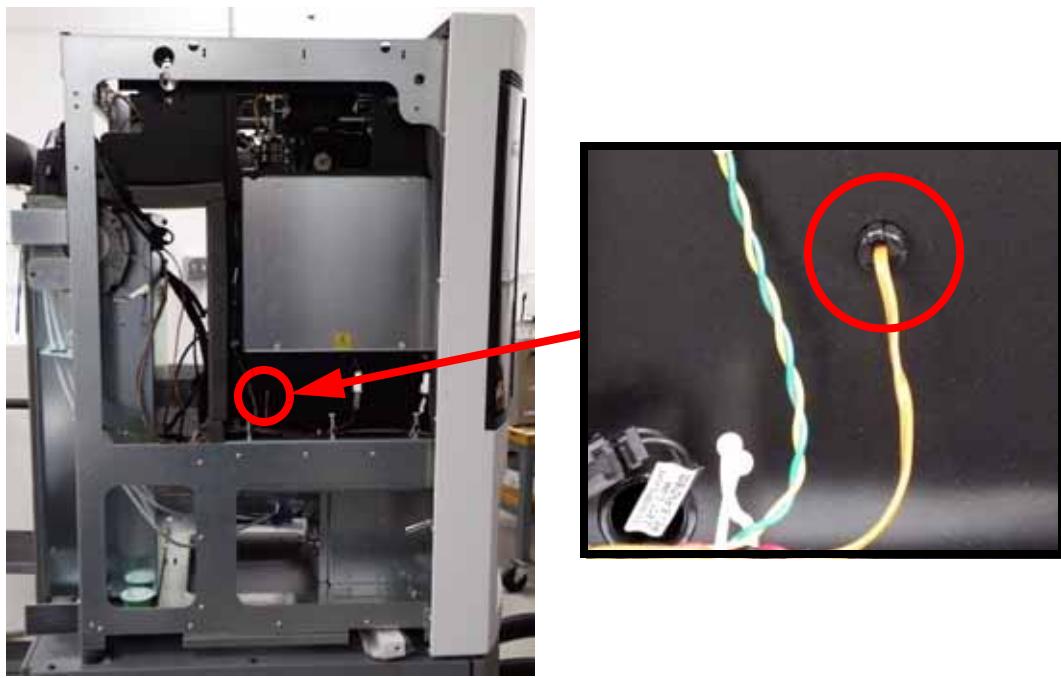
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding with fan replacement.

5. Locate the chamber thermocouple on the left side of the printer. See [Figure 543](#).

Figure 543: Chamber thermocouple location



- Using a standard screwdriver or needle nose pliers, pull the chamber thermocouple retainer out from the chamber. See [Figure 544](#).

Figure 544: Removing the chamber thermocouple



- Disconnect the chamber thermocouple by pulling outwards.
 - For Gen 2 and Gen 3 electronics, disconnect the chamber thermocouple from the power distribution board. See [Figure 545](#).

Figure 545: Gen 2 and 3 chamber thermocouple connector location



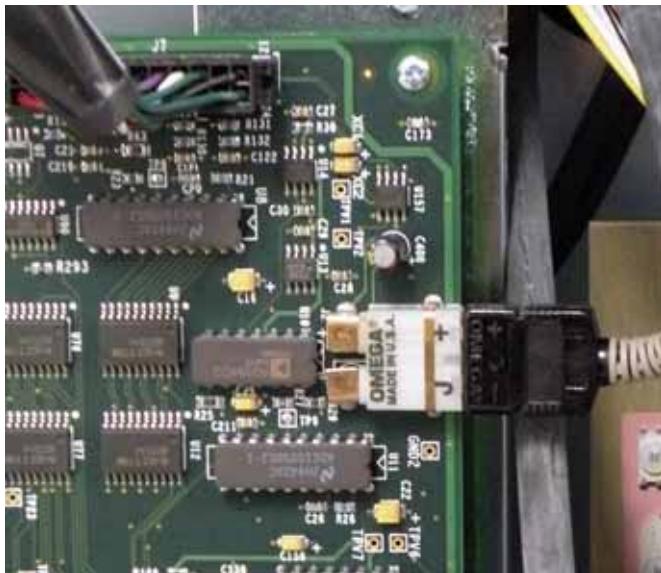
Gen 2 chamber thermocouple connection



Gen 3 chamber thermocouple connection

- b. For Gen 1 electronics, disconnect the chamber thermocouple from the 186 processor board. See [Figure 546](#).

Figure 546: Gen 1 chamber thermocouple connector location



Gen 1 chamber thermocouple connection

8. Discard the chamber thermocouple.

Installing the Chamber Thermocouple:

1. Reconnect the chamber thermocouple by pushing into the connector.



Be sure the + terminal of the chamber thermocouple is at the top when reconnecting.

2. Position the end of the chamber thermocouple in the retainer so $\frac{1}{2}$ " is protruding from the retainer.
3. Insert the chamber thermocouple retainer into the chamber by pushing in.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Chamber Fans (1 Lead Screw)

There are 4 chamber fans in the heater area, 2 on each side. In most cases all 4 chamber fans will be replaced at the same time.

Required Tools

- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{1}{4}$ " nut driver or standard screwdriver

Removing the Left Side Chamber Fans:

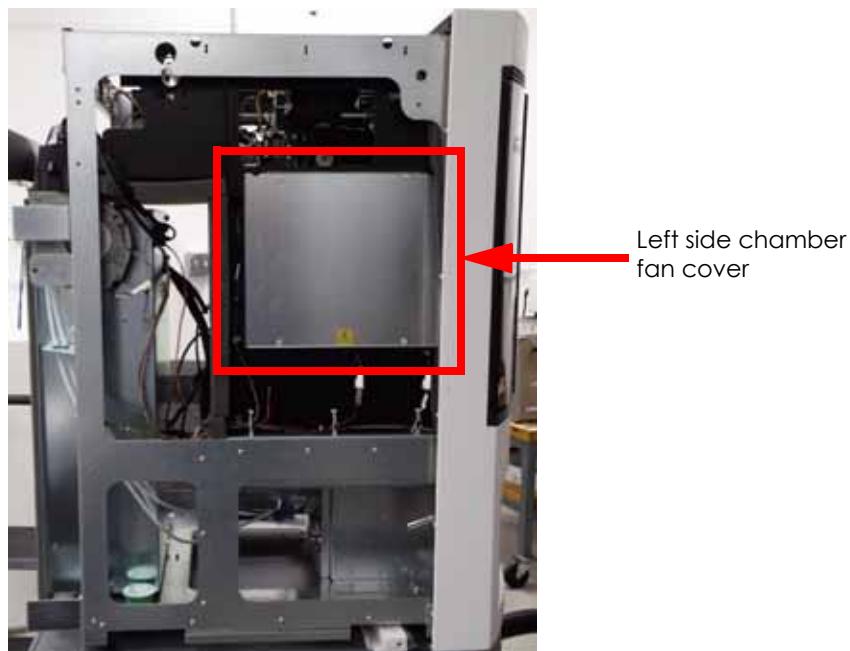
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding with fan replacement.

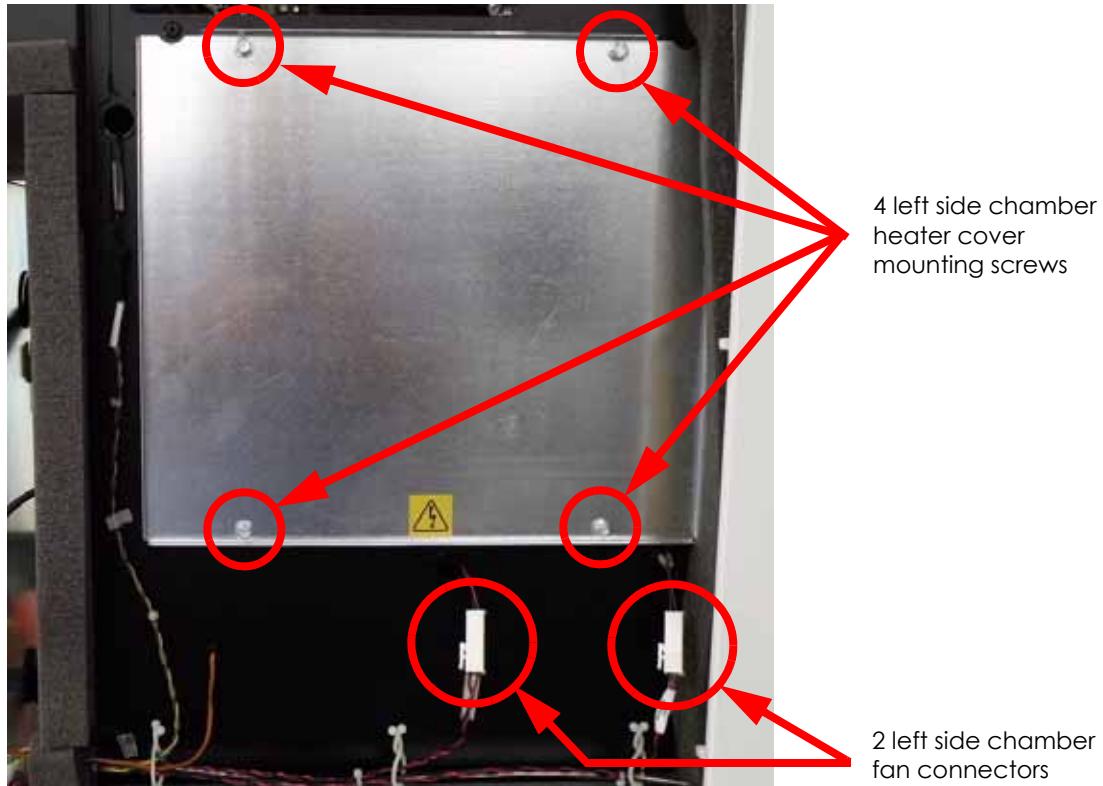
5. Locate the left side chamber heater cover. See [Figure 547](#).

Figure 547: Left side chamber heater cover location



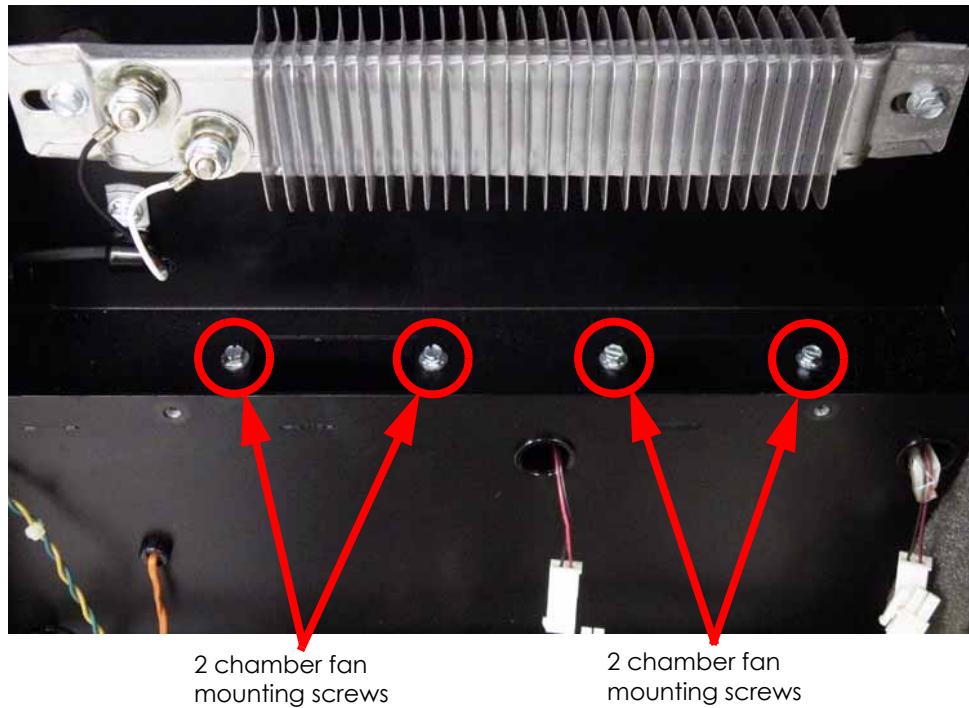
6. Disconnect the 2 left side fan cables by pressing the tab in and pulling outwards. See [Figure 548](#).
7. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 left side chamber heater cover mounting screws. See [Figure 548](#).

Figure 548: Left side chamber fan connector and mounting screw locations



8. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 chamber fan mounts for both left side fans. See [Figure 549](#).

Figure 549: Left side chamber fan mounting screw locations



9. Remove the 2 left side chamber fans from the envelope and discard.

Installing the Left Side Chamber Fans:

1. Align the chamber fans with the mounting holes and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws for each chamber fan.
2. Align the left side chamber heater cover with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
3. Reconnect the 2 left side chamber fans by pushing the connectors together.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Removing the Right Side Chamber Fans:

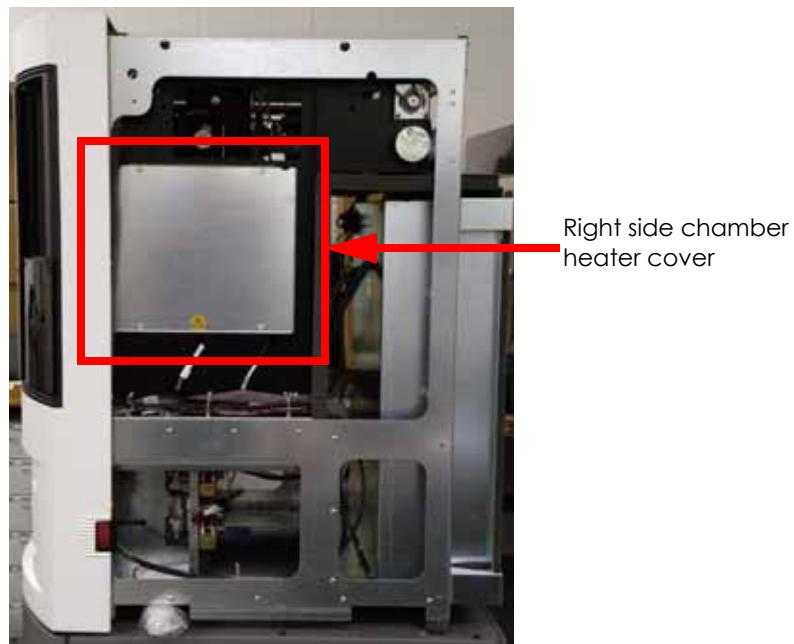
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding with fan replacement.

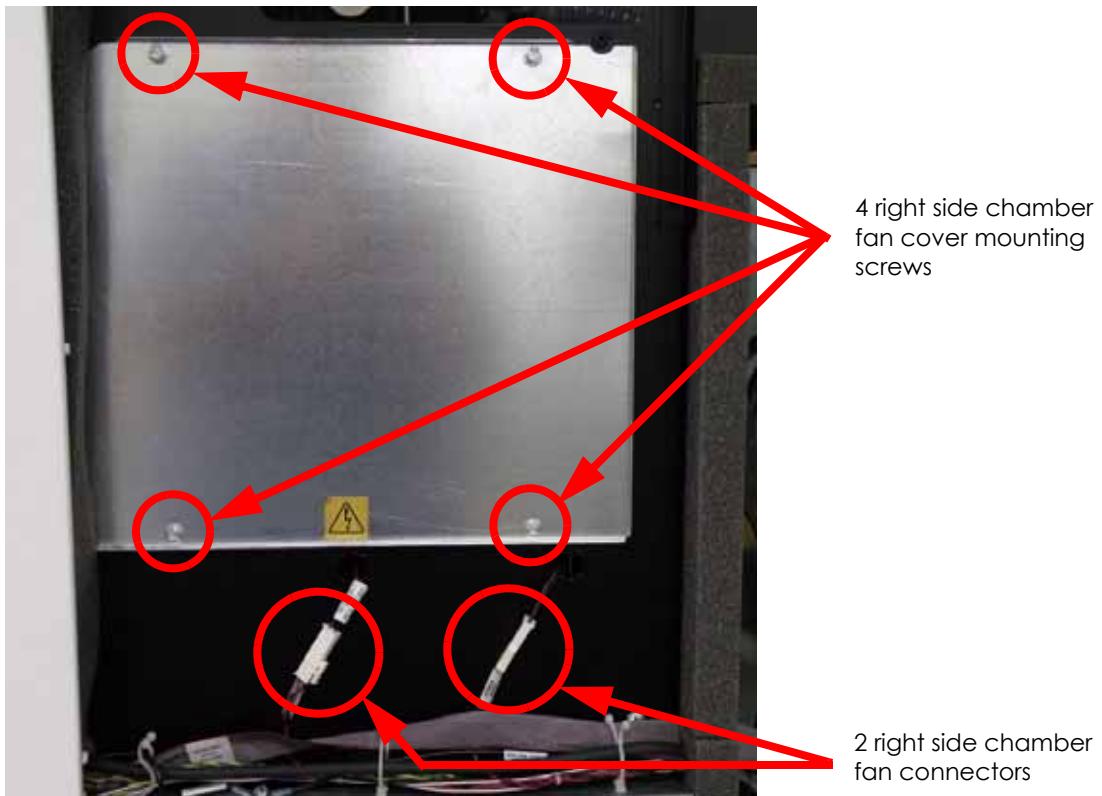
5. Locate the right side chamber heater cover. See [Figure 550](#).

Figure 550: Right side chamber heater cover location



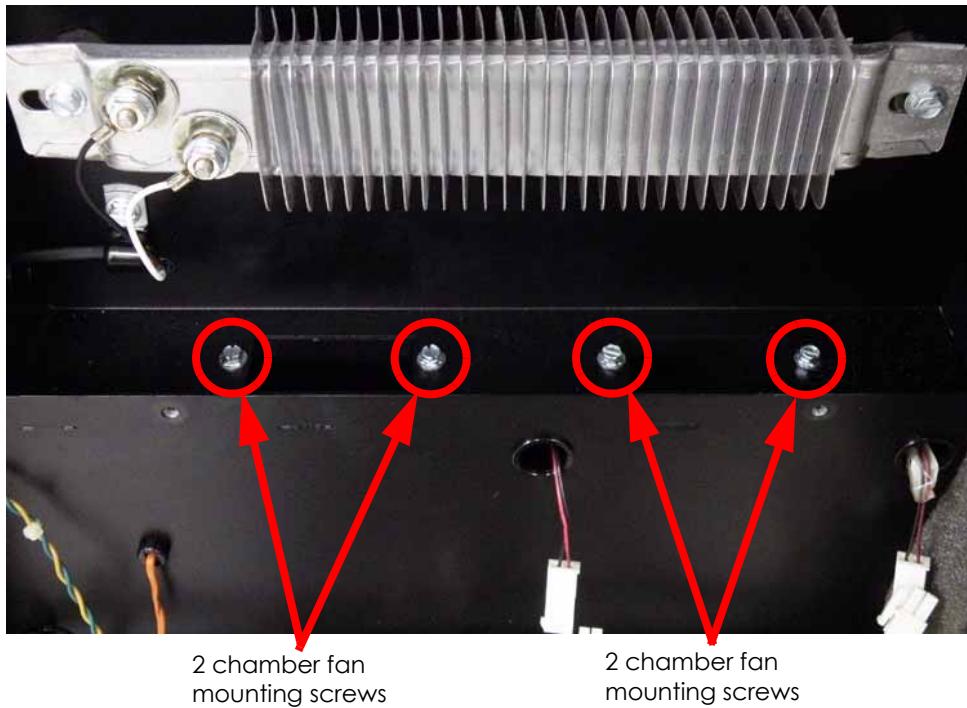
6. Disconnect the 2 right side fan cables by pressing the tab in and pulling outwards. See [Figure 551](#).
7. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 right side chamber heater cover mounting screws. See [Figure 551](#).

Figure 551: Right side chamber fan connector and mounting screw locations



8. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, remove the 2 chamber fan mounts for both right side fans. See [Figure 552](#).

Figure 552: Right side chamber fan mounting screw locations



9. Remove the 2 right side chamber fans from the envelope and discard.

Installing the Right Side Chamber Fans:

1. Align the chamber fans with the mounting holes and use a $\frac{1}{4}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws for each chamber fan.
2. Align the right side chamber heater cover with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 mounting screws.
3. Reconnect the 2 right side chamber fans by pushing the connectors together.
4. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
5. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
6. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
7. Power on the system. The system should reach **Idle** with no displayed errors.
8. Run a small test part and monitor system operation during build.

Chamber Heaters (1 Lead Screw)

Required Tools

- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{3}{8}$ " nut driver or box wrench

Removing the Left Side Chamber Heater:

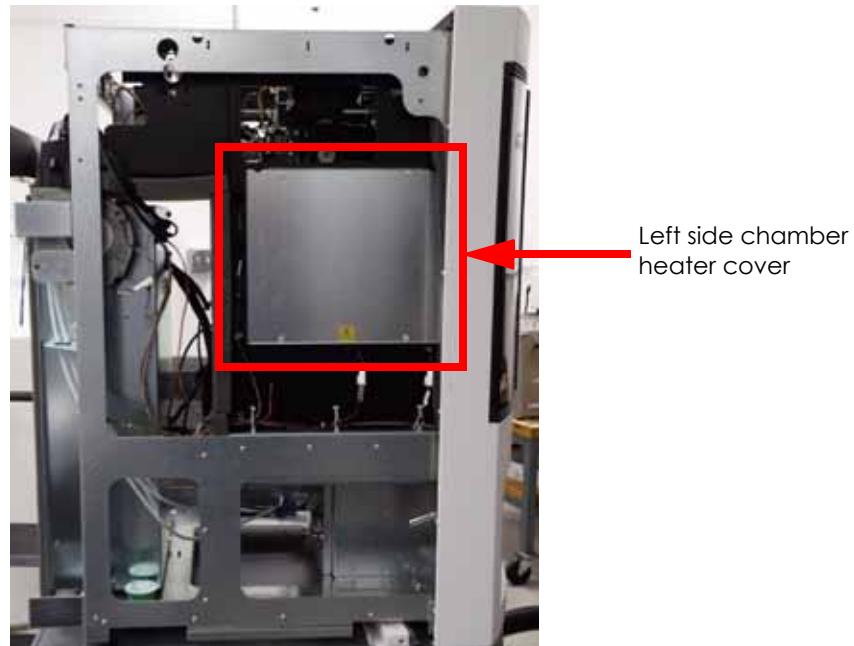
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding with fan replacement.

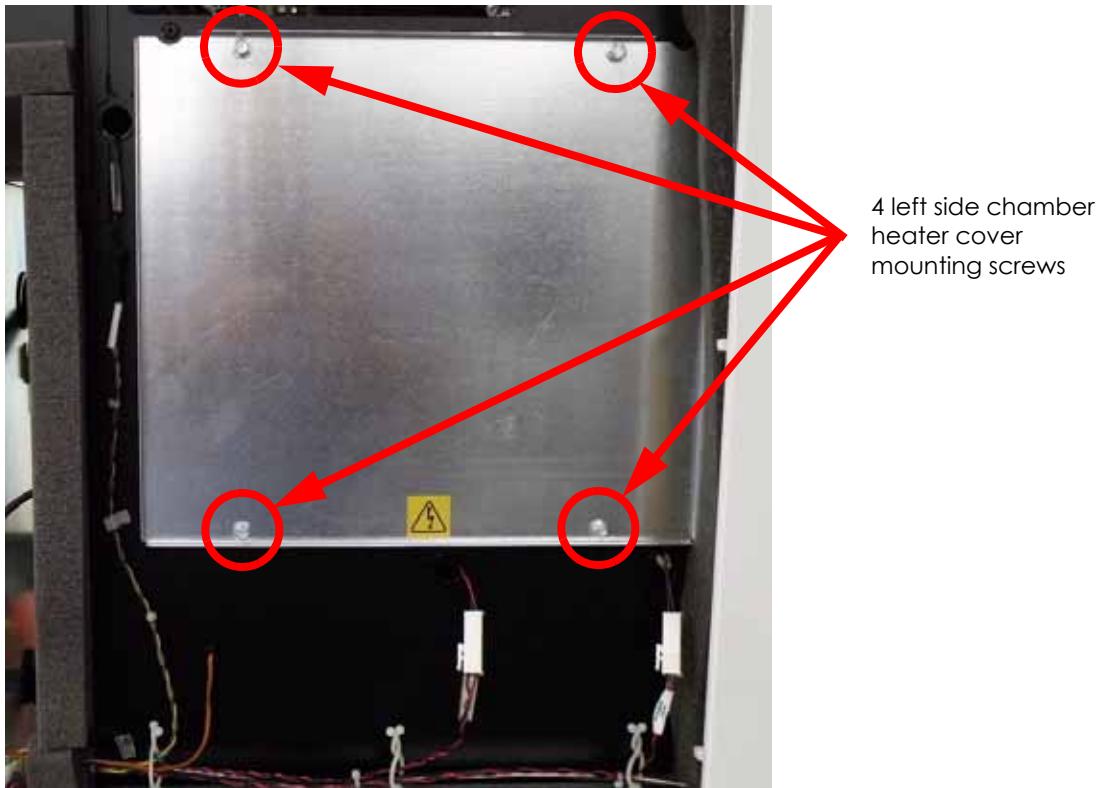
5. Locate the left side chamber heater cover. See [Figure 553](#).

Figure 553: Left side chamber heater cover location



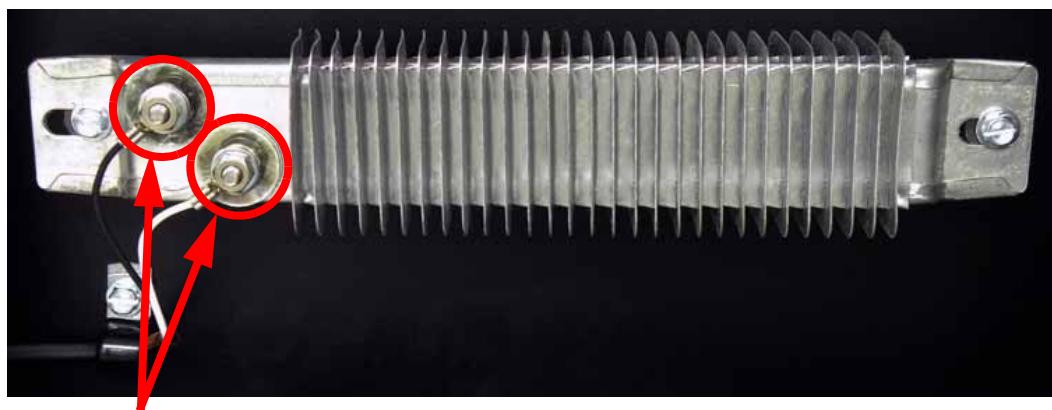
- Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 left side chamber heater cover mounting screws. See [Figure 554](#).

Figure 554: Left side chamber heater cover mounting screw locations



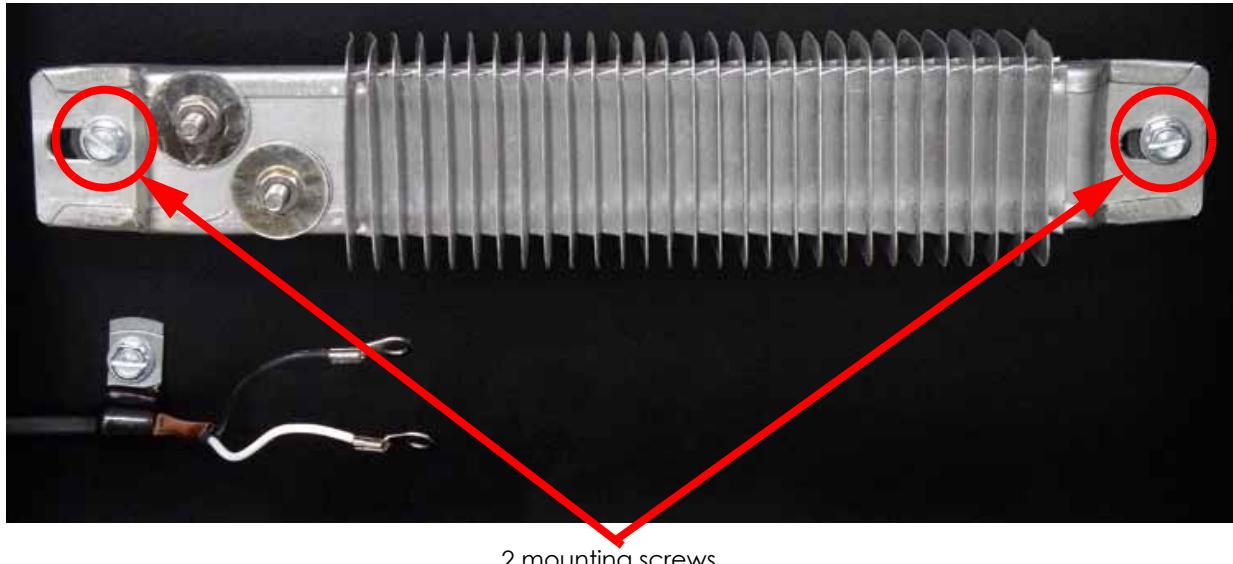
- Using a $\frac{3}{8}$ " nut driver or box wrench, remove the left side chamber heater wire nuts. See [Figure 555](#).

Figure 555: Left side chamber heater wire nut locations



8. Remove the outer washers, black and white heater wires and the inner washers from the left side chamber heater.
9. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 left side chamber heater mounting screws. See [Figure 556](#).

Figure 556: Left side chamber heater mounting screw locations



10. Remove the left side chamber heater.

Installing the Left Side Chamber Heater:

1. Align the left side chamber heater with the mounting posts.
2. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 2 left side chamber heater mounting screws.
3. Reinstall the two inner washer.
4. Reinstall the black wire and outer washer to the left post.
5. Reinstall the white wire and outer washer to the right post.
6. Using a $\frac{3}{8}$ " nut driver or box wrench, reinstall the 2 wire nuts.
7. Align the left side heater cover with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 left side chamber heater cover mounting screws.
8. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
9. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
10. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
11. Power on the system. The system should reach **Idle** with no displayed errors.
12. Run a small test part and monitor system operation during build.

Removing the Right Side Chamber Heater:

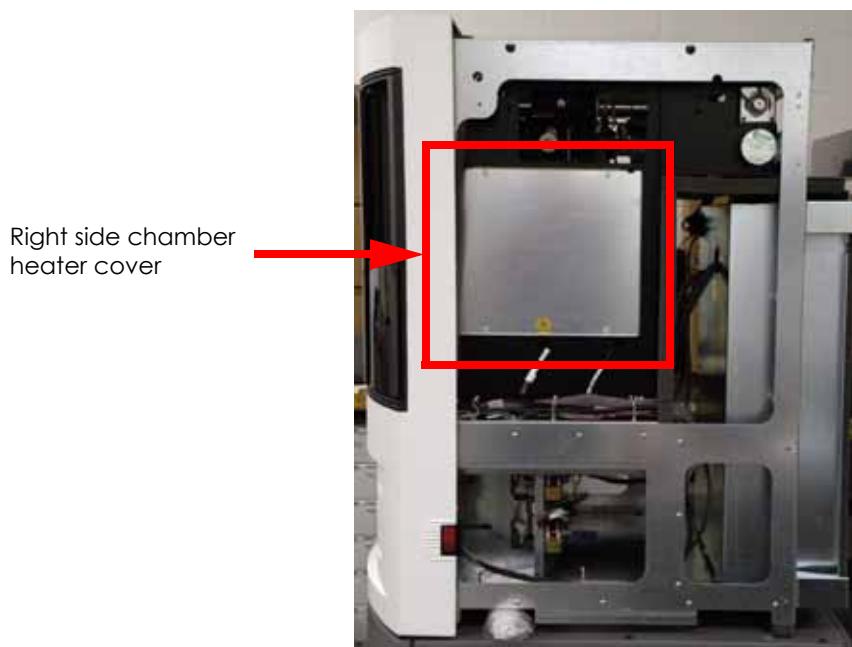
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.



Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding with fan replacement.

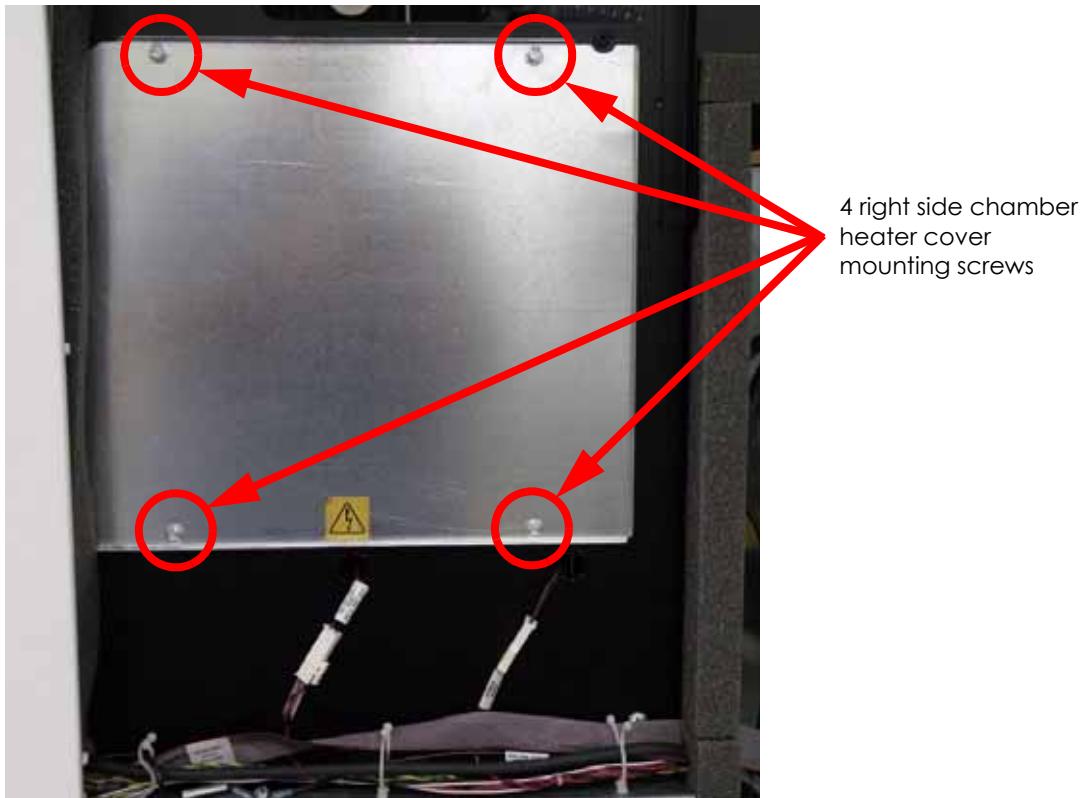
5. Locate the left side chamber heater cover. See [Figure 557](#).

Figure 557: Right side chamber heater cover location



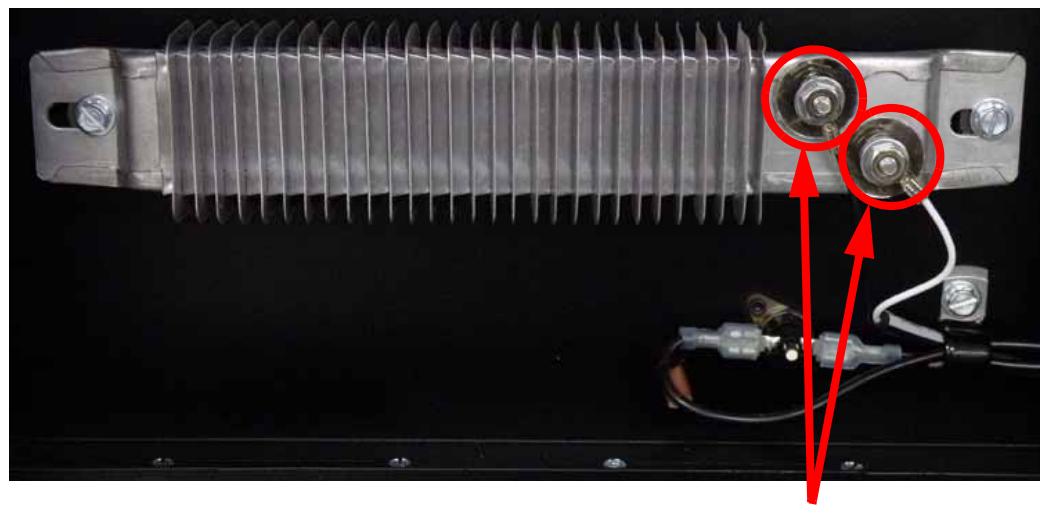
6. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 right side chamber heater cover mounting screws. See [Figure 558](#).

Figure 558: Right side chamber heater cover mounting screw locations



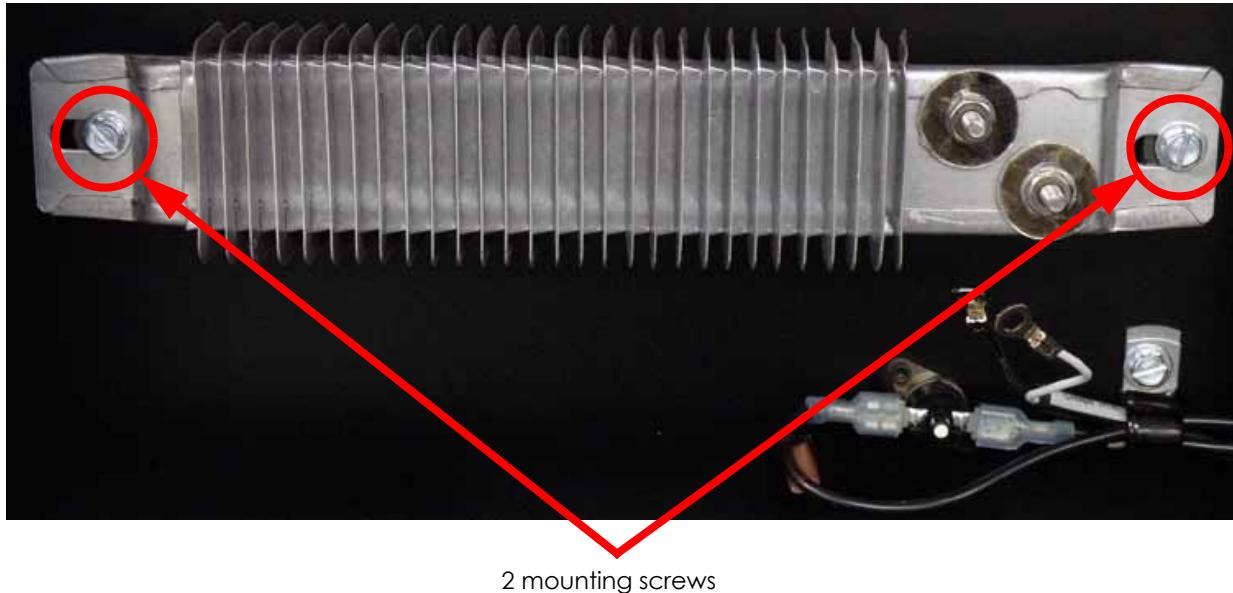
7. Using a $\frac{3}{8}$ " nut driver or box wrench, remove the right side chamber heater wire nuts. See Figure 559.

Figure 559: Right side chamber heater wire nut locations



8. Remove the outer washers, black and white heater wires and the inner washers from the right side chamber heater.
9. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 right side chamber heater mounting screws. See [Figure 560](#).

Figure 560: Right side chamber heater mounting screw locations



10. Remove the right side chamber heater.

Installing the Right Side Chamber Heater:

1. Align the right side chamber heater with the mounting posts.
2. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 2 right side chamber heater mounting screws.
3. Reinstall the two inner washer.
4. Reinstall the black wire and outer washer to the left post.
5. Reinstall the white wire and outer washer to the right post.
6. Using a $\frac{3}{8}$ " nut driver or box wrench, reinstall the 2 wire nuts.
7. Align the right side heater cover with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 4 right side chamber heater cover mounting screws.
8. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
9. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
10. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
11. Power on the system. The system should reach **Idle** with no displayed errors.
12. Run a small test part and monitor system operation during build.

Z Jam Sensor (1 Lead Screw)

The Z Jam Sensor is installed on printers with serial numbers less than P4000

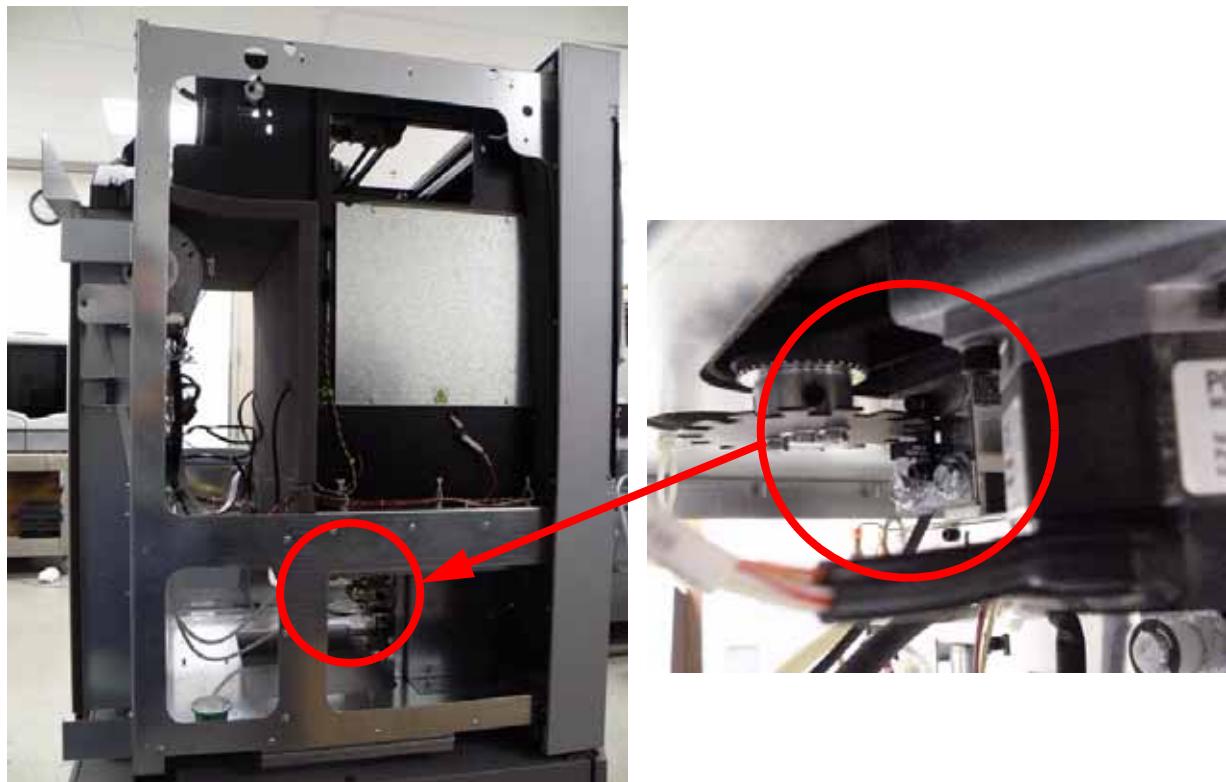
Required Tools

- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{7}{64}$ " allen wrench

Removing the Z Jam Sensor:

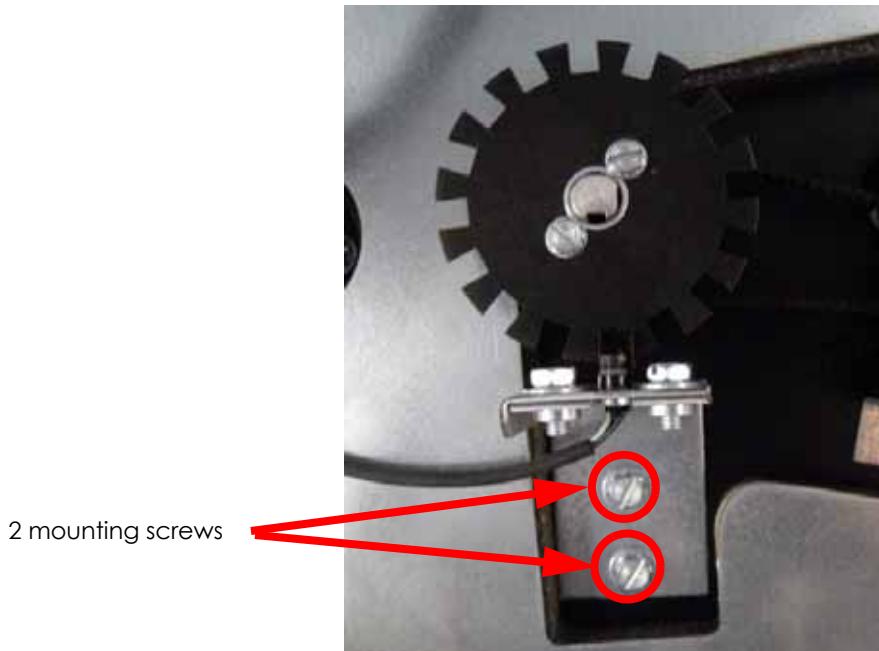
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Move the Z stage to mid travel.
6. Locate the Z jam sensor. See [Figure 561](#).

Figure 561: Z jam sensor location



7. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 Z jam sensor mounting bracket screws. See [Figure 562](#).

Figure 562: Z jam sensor mounting screw locations (looking up)



8. Follow the Z jam sensor cable to the next wire clip. Un-clip the wire clip and remove the Z jam sensor cable. See [Figure 563](#).

Figure 563: Z jam sensor wire clip location



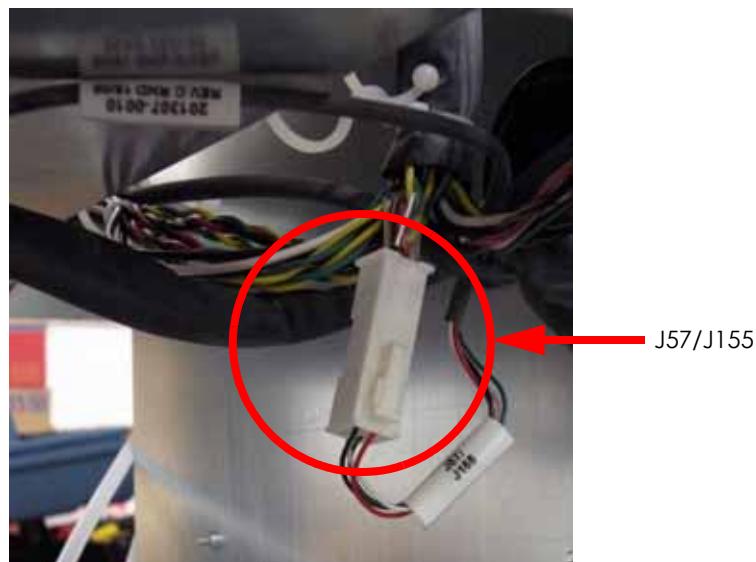
9. Follow the Z jam sensor cable to the next wire clip. Un-clip the wire clip and remove the Z jam sensor cable. See [Figure 564](#).

Figure 564: Z jam sensor wire clip location



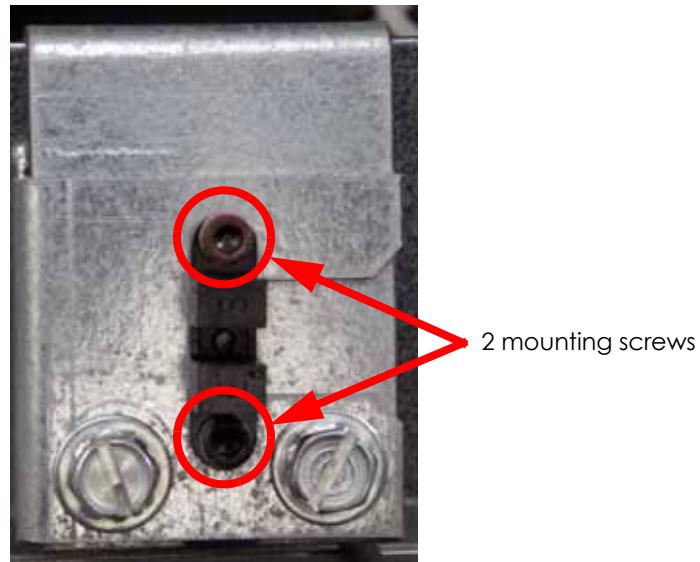
10. Disconnect the Z jam sensor cable J57/J155 by pressing the tab in and pulling outwards. See [Figure 565](#).

Figure 565: Z jam sensor cable J57/J155 location



11. Using a $\frac{7}{64}$ " allen wrench, remove the 2 Z jam sensor mounting screws from the mounting bracket. See [Figure 566](#).

Figure 566: Z jam sensor mounting screw locations



12. Discard the Z jam sensor.

Installing the Z Jam Sensor:

1. Align the Z jam sensor with the mounting bracket and use a $\frac{7}{64}$ " allen wrench to reinstall the 2 mounting screws.
2. Align the Z jam sensor mounting bracket with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 2 mounting screws.
3. Run the Z jam sensor cable through the 2 wire clips.
4. Reconnect J57/J155 by pushing together.
5. Close the 2 wire clips.
6. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
7. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
8. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
9. Power on the system. The system should reach **Idle** with no displayed errors.
10. Run a small test part and monitor system operation during build.

Z Sensors (1 Lead Screw)

Required Tools

- Phillips screwdriver

Removing the Z BOT (Home) Sensor:

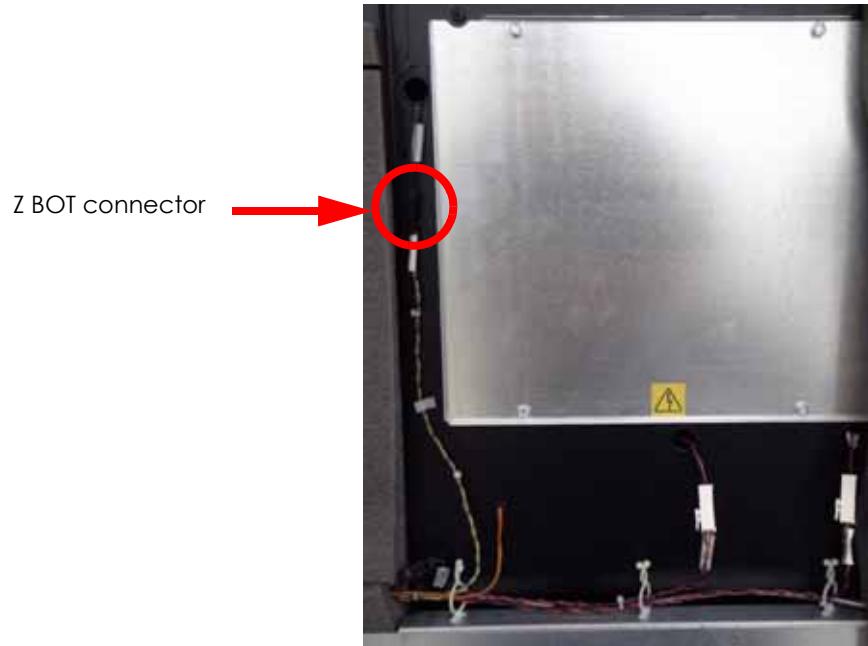
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Move the Z stage to mid travel.
6. Open the chamber door and locate the Z BOT sensor. See [Figure 567](#).

Figure 567: Z BOT sensor location



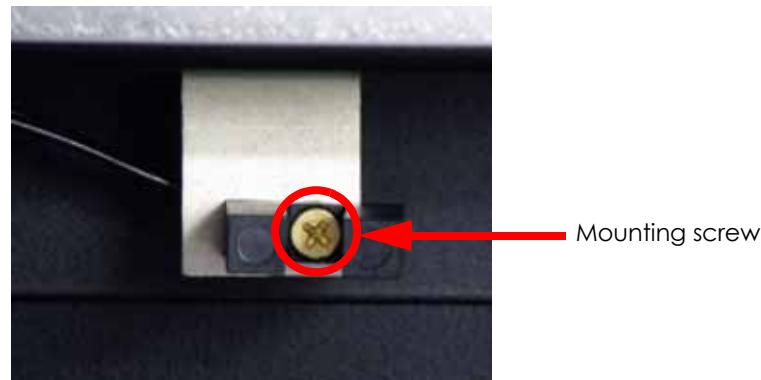
7. On the left side of the printer, locate and disconnect the Z BOT sensor wire by pressing the tab in and pulling outwards. See [Figure 568](#).

Figure 568: Z BOT sensor connector location



8. Using a phillips screwdriver, remove the Z BOT sensor mounting screw. See [Figure 569](#).

Figure 569: Z BOT sensor mounting screw location



9. Remove the sensor by pulling the wire through the frame and out of the chamber door.
10. Discard the sensor.

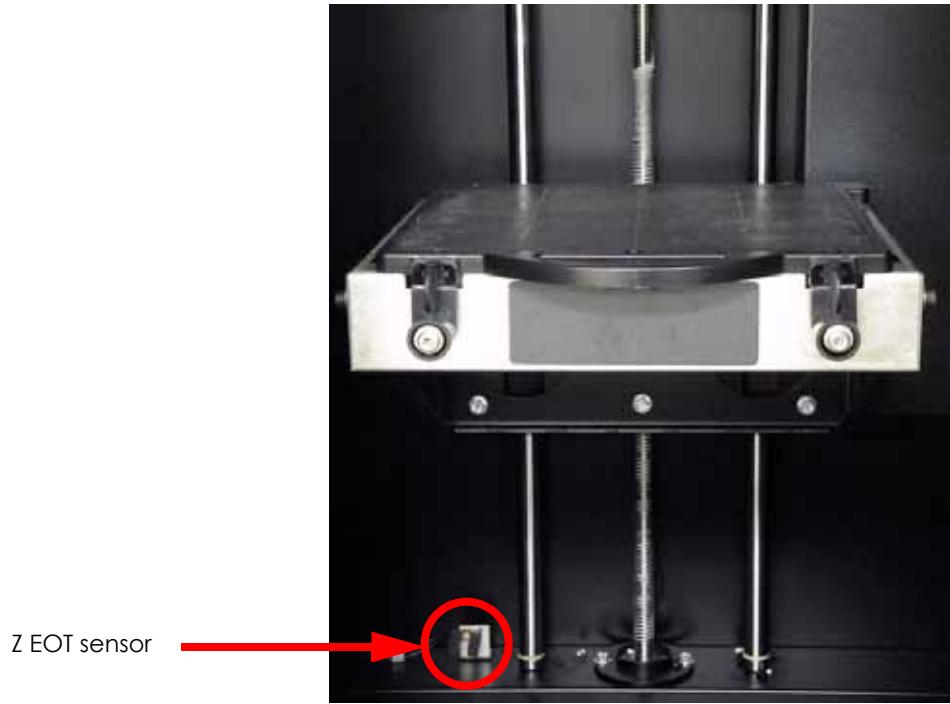
Installing the Z BOT (Home) Sensor:

1. Align the Z BOT sensor with the mounting hole and use a phillips screwdriver to reinstall the mounting screw.
2. Run the Z BOT sensor wire through the frame and reconnect by pushing the connectors together.
3. Reinstall the side panels. See “[Side Panels](#)” on page 5-11.
4. Reinstall the rear door. See “[Installing the Rear Door:](#)” on page 5-10.
5. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
6. Power on the system. The system should reach **Idle** with no displayed errors.
7. Run a small test part and monitor system operation during build.

Removing the Z EOT Sensor:

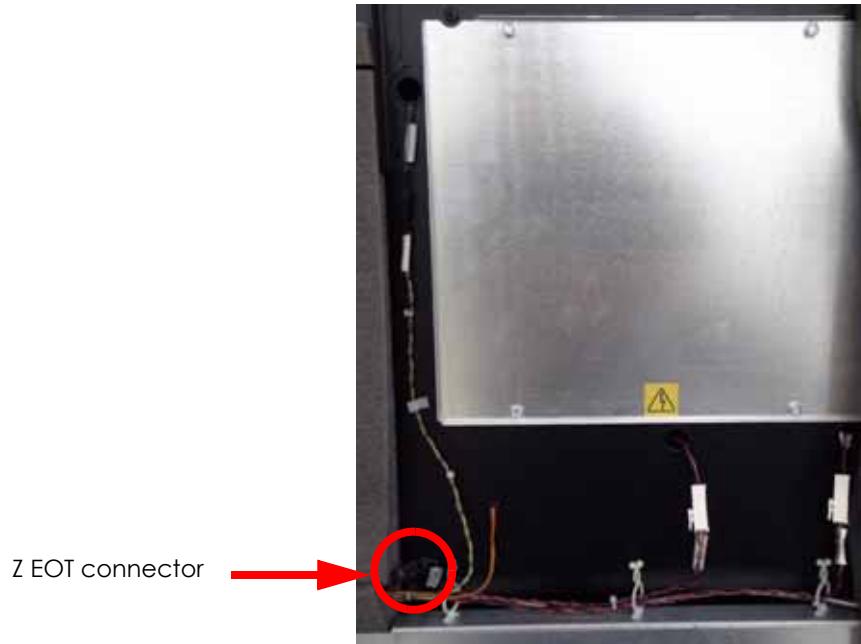
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Move the Z stage to mid travel.
6. Open the chamber door and locate the Z EOT sensor. See [Figure 570](#).

Figure 570: Z EOT sensor location



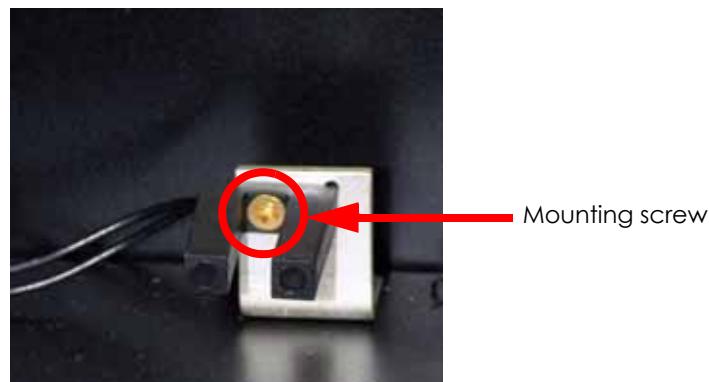
7. On the left side of the printer, locate and disconnect the Z EOT sensor wire by pressing the tab in and pulling outwards. See [Figure 571](#).

Figure 571: Z EOT sensor connector location



8. Using a phillips screwdriver, remove the Z EOT sensor mounting screw. See [Figure 572](#).

Figure 572: Z EOT sensor mounting screw location



9. Remove the sensor by pulling the wire through the frame and out of the chamber door.
10. Discard the sensor.

Installing the Z EOT Sensor:

1. Align the Z EOT sensor with the mounting hole and use a phillips screwdriver to reinstall the mounting screw.
2. Run the Z EOT sensor wire through the frame and reconnect by pushing the connectors together.
3. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
4. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
5. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
6. Power on the system. The system should reach **Idle** with no displayed errors.
7. Run a small test part and monitor system operation during build.

Z Motor Belt (1 Lead Screw)

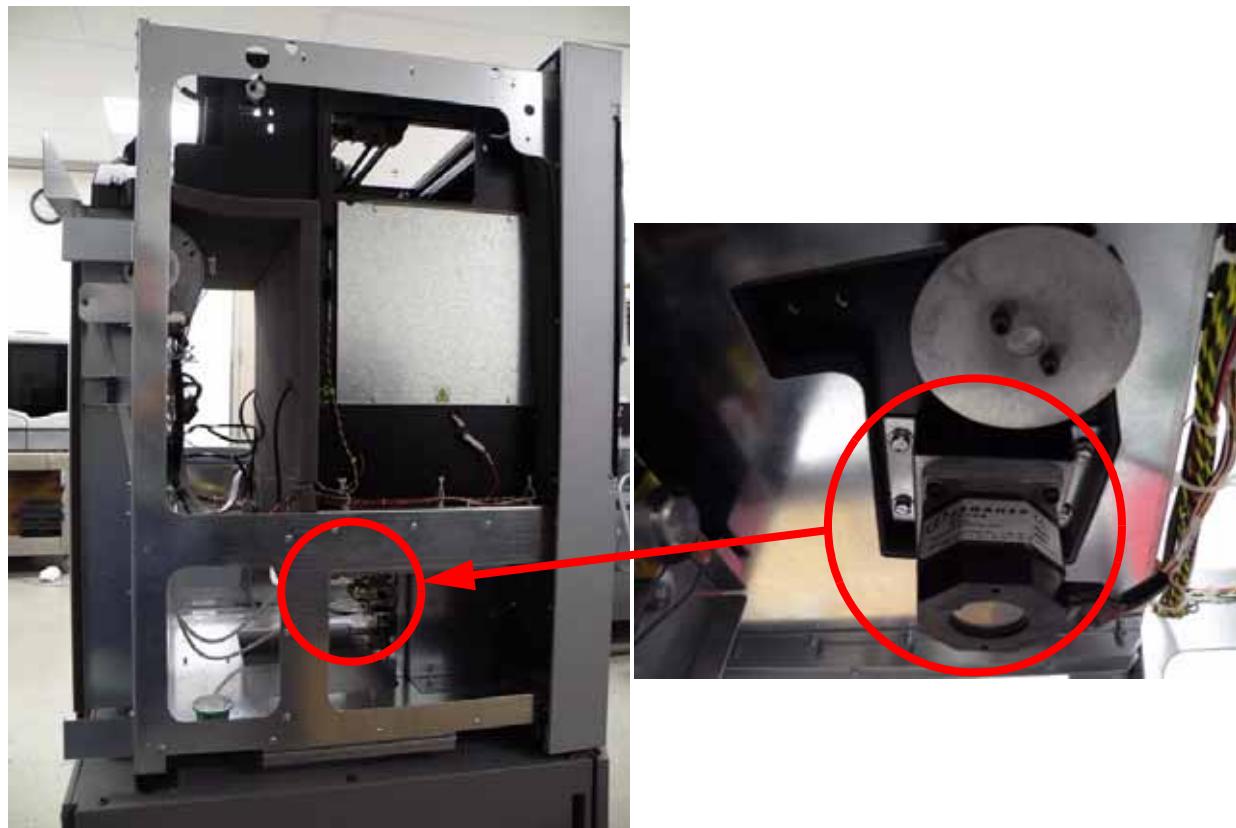
Required Tools

- $5/16"$ nut driver or standard screwdriver

Removing the Z Motor Belt:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the Z motor. See [Figure 573](#).

Figure 573: Z motor location



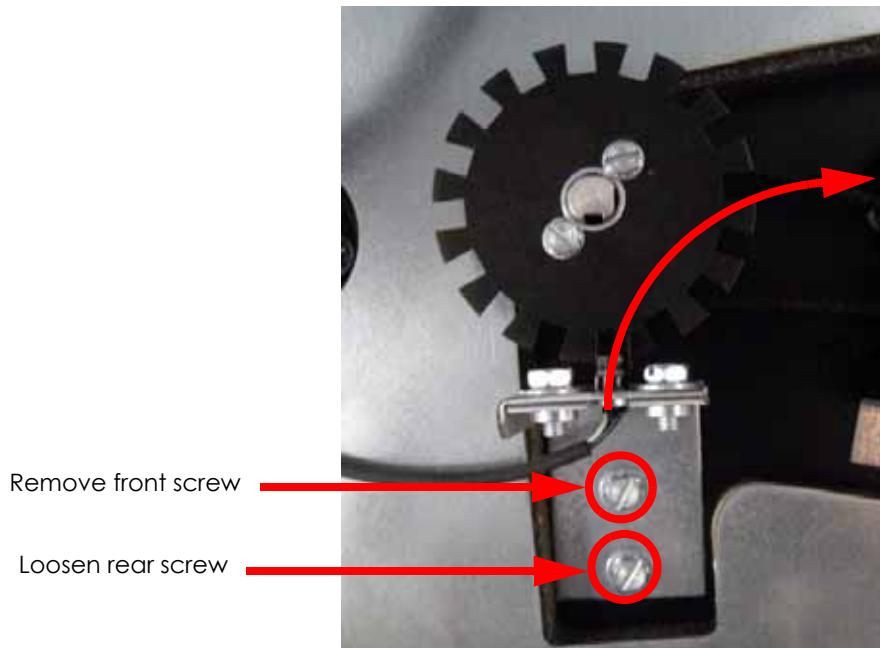
6. If printer serial number is less than P4000, locate the Z jam sensor. See [Figure 574](#). If serial number is greater than P4000 proceed to step 8.

Figure 574: Z jam sensor location



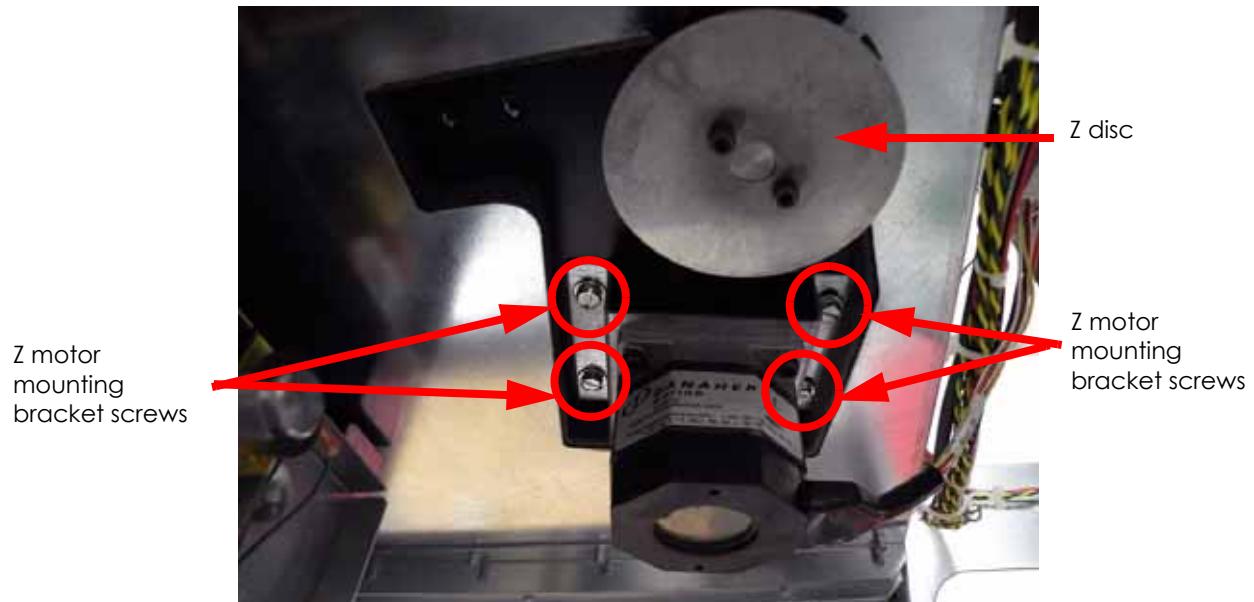
7. Using a $5/16"$ nut driver or standard screwdriver, remove the front Z jam sensor mounting bracket screw, and loosen the rear mounting bracket screw. Swing the Z jam sensor away from the mounting bracket. See Figure 575.

Figure 575: Z jam sensor mounting screw locations (looking up)



- Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 Z motor mounting bracket screws. See [Figure 576](#).

Figure 576: Z motor mounting bracket screw locations



- Pull the Z motor down and remove the Z motor belt from the lead screw pulley. See [Figure 577](#).

Figure 577: Z motor belt location



- Discard the Z motor belt.

Installing the Z Motor Belt:

1. Slide the Z motor belt around the lead screw pulley.
2. Lift the Z motor pulley up through the Z motor belt.
3. Align the Z motor bracket with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to loosely reinstall the 4 mounting screws.
4. Pull back on the Z motor bracket to tension the Z motor belt.
5. Tighten the Z motor bracket screws.
6. If printer serial number is less than P4000, align the Z jam sensor with the mounting holes.
If printer serial number is greater than P4000, proceed to [8](#).
7. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 2 Z jam sensor bracket mounting screws.
8. Reinstall the side panels. See "[Side Panels](#)" on page [5-11](#).
9. Reinstall the rear door. See "[Installing the Rear Door](#):" on page [5-10](#).
10. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
11. Power on the system. The system should reach **Idle** with no displayed errors.
12. Run a small test part and monitor system operation during build.

Z Motor (1 Lead Screw)

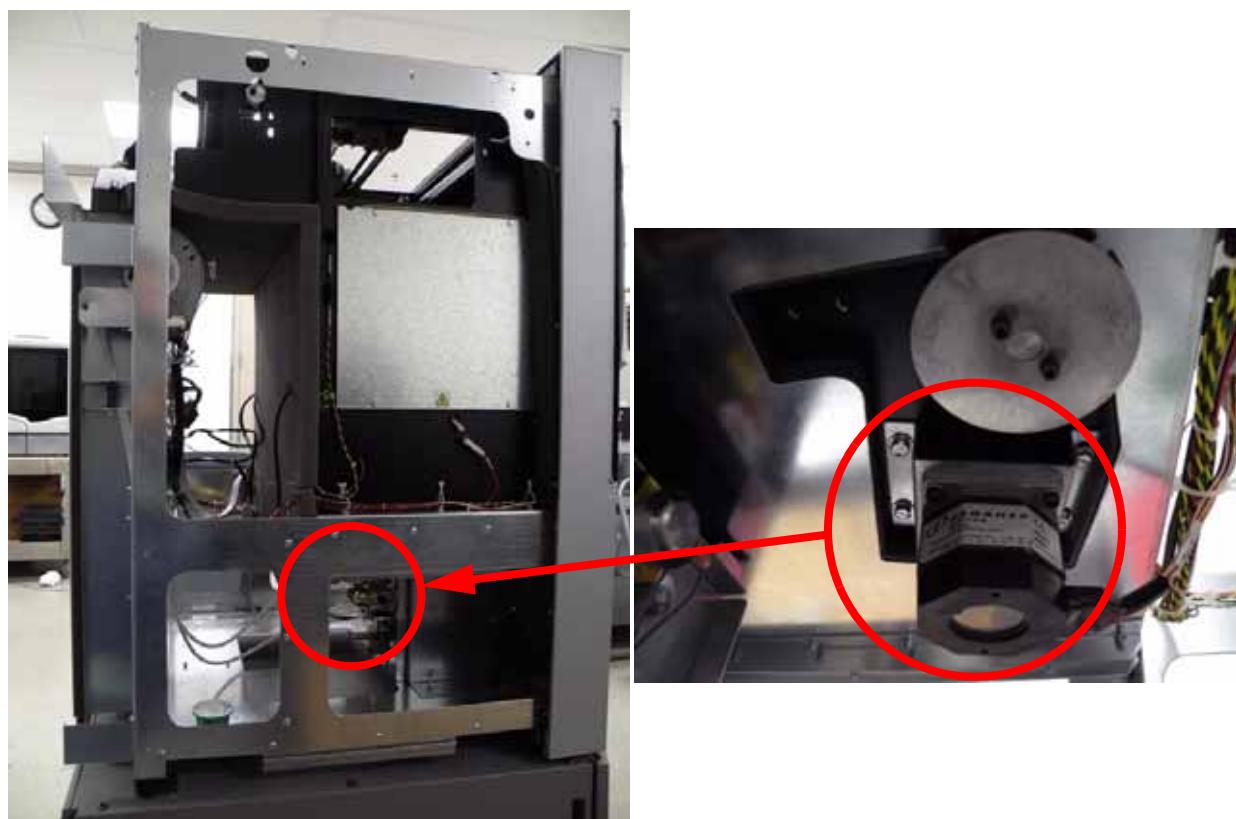
Required Tools

- $\frac{9}{64}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver

Removing the Z Motor:

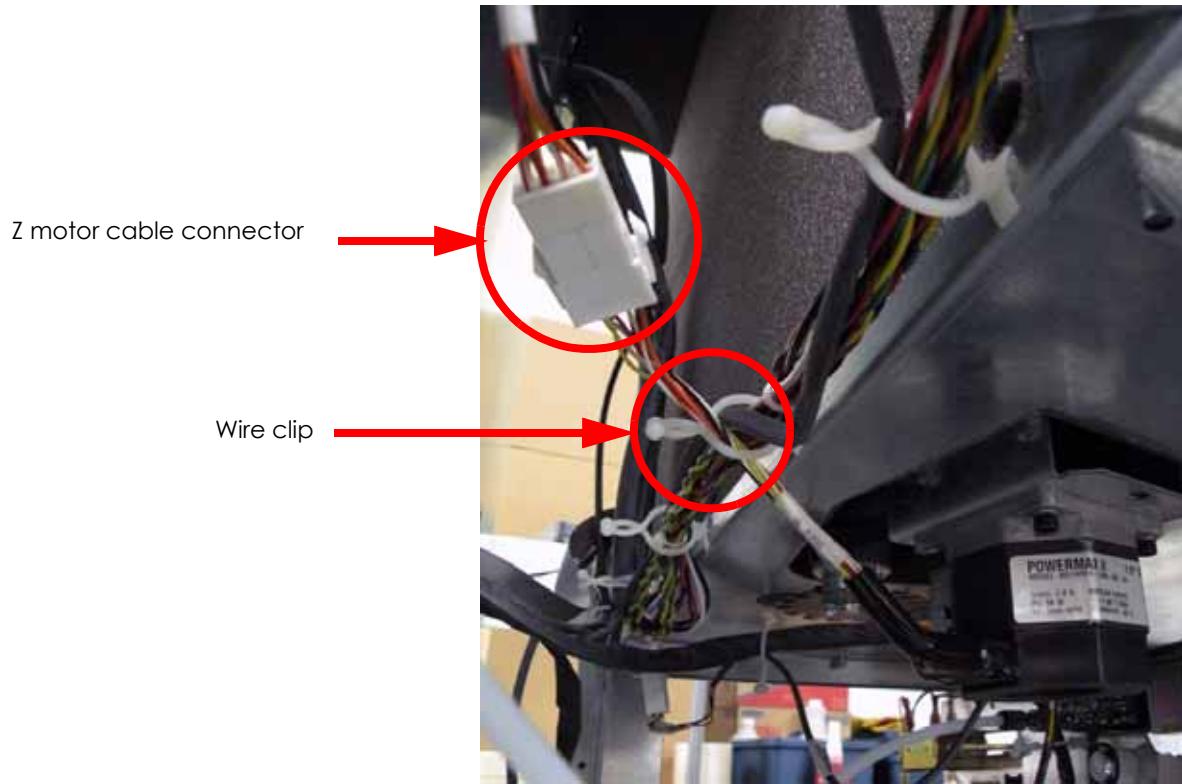
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Locate the Z motor. See [Figure 578](#).

Figure 578: Z motor location



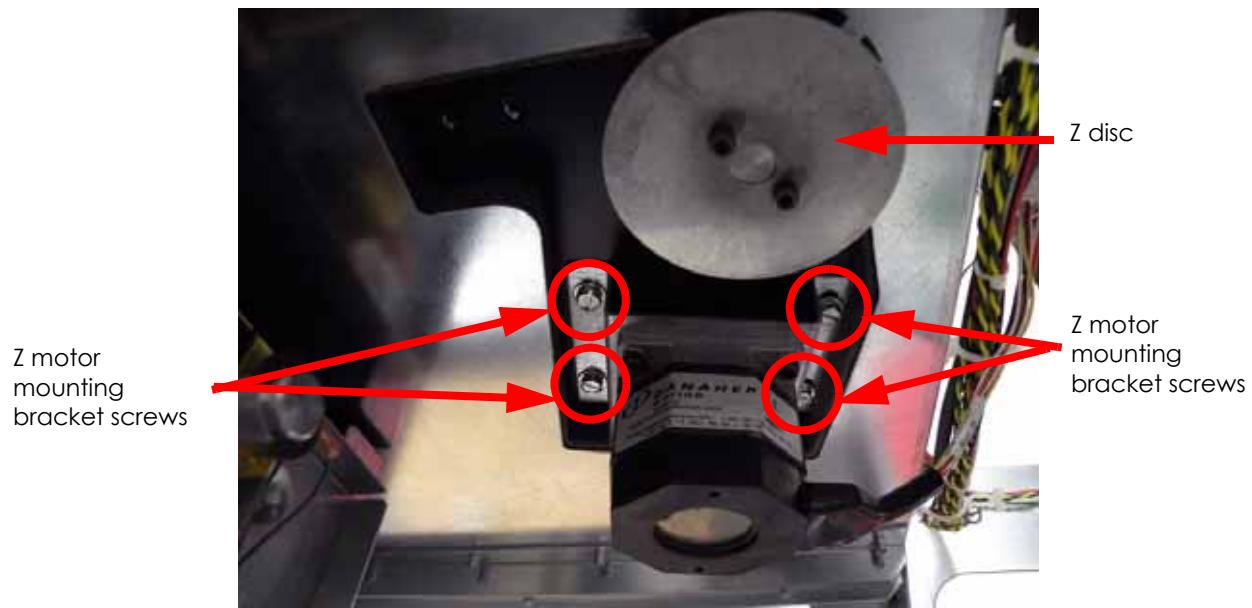
6. Follow the Z motor cable to the connector. Un-clip the wire clip and disconnect the cable by pressing the tab in and pulling outward. See [Figure 579](#).

Figure 579: Z motor cable location



7. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 4 Z motor mounting bracket screws. See [Figure 580](#).

Figure 580: Z motor mounting bracket screw locations

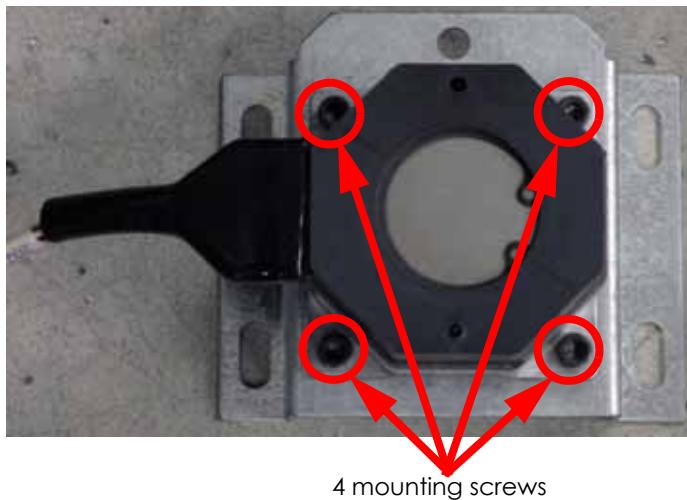


- Using a $\frac{9}{64}$ " allen wrench, remove the 4 mounting screws from the Z motor mounting bracket. See [Figure 581](#).



Note the alignment of the Z motor with the Z motor mounting bracket.

Figure 581: Z motor bracket mounting screw locations



- Discard the Z motor.

Installing the Z Motor:

- Align the Z motor with the Z motor mounting bracket and use a $\frac{9}{64}$ " allen wrench to reinstall the 4 mounting screws. See [Figure 581](#).
- Lift the Z motor pulley up through the Z motor belt.
- Align the Z motor bracket with the mounting holes and use a $\frac{5}{16}$ " nut driver or standard screwdriver to loosely reinstall the 4 mounting screws.
- Pull back on the Z motor bracket to tension the Z motor belt.
- Tighten the Z motor bracket screws.
- Reconnect the Z motor cable by pushing the connectors together.
- Place Z motor cable in wire clip and close wire clip.
- Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
- Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
- Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
- Power on the system. The system should reach **Idle** with no displayed errors.
- Run a small test part and monitor system operation during build.

Z Stage Assembly - 1 LS

- Printers with a serial number less than P4000 will have a Z jam sensor assembly. See [Figure 583](#).
- Printers with a serial number greater than P2985 will have a Z disc located below the Z jam flag. See [Figure 585](#).

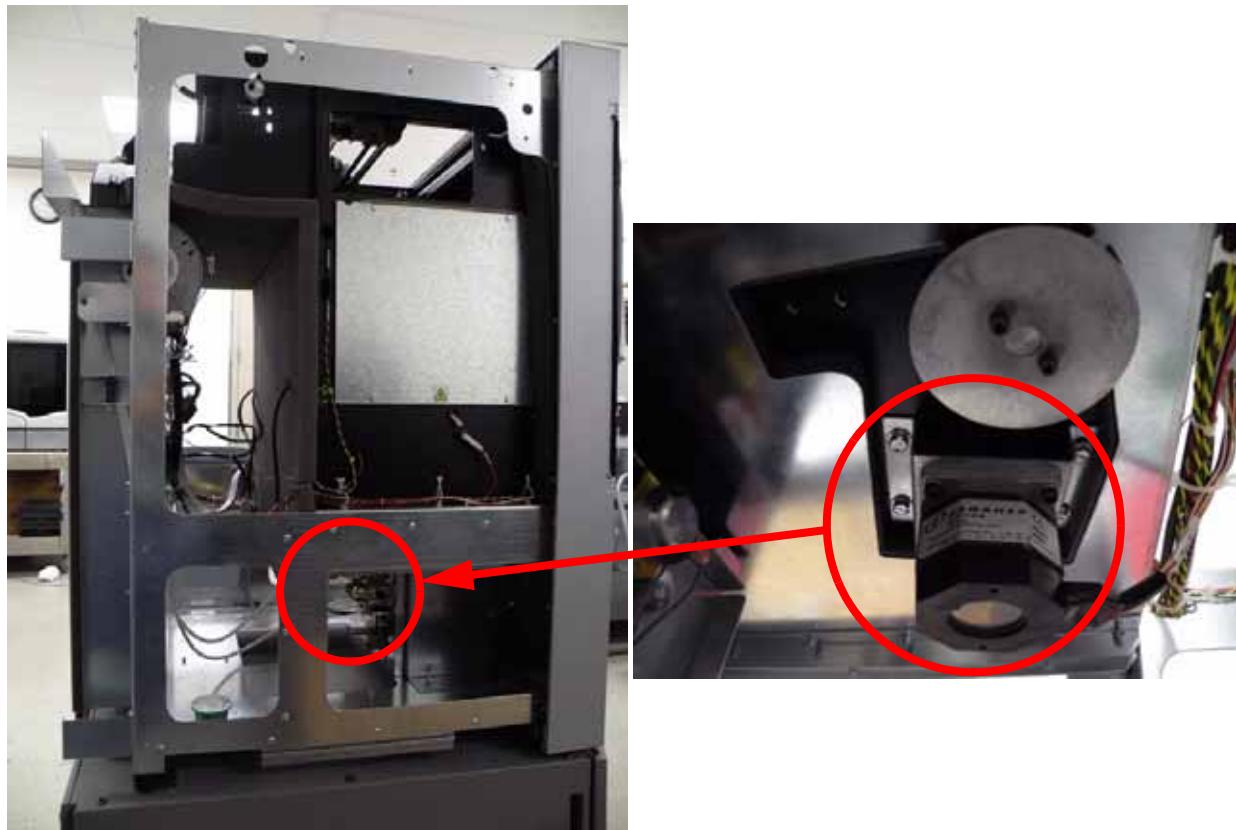
Required Tools

- $\frac{5}{32}$ " allen wrench
- $\frac{5}{64}$ " allen wrench
- $\frac{7}{64}$ " allen wrench
- $\frac{1}{8}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{5}{16}$ " ratchet driver
- $\frac{3}{8}$ " ratchet driver
- Leveling spacer
- Head Bracket
- Dial Indicator

Removing the Z Stage Assembly:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Move the Z stage to mid travel.
6. Locate the Z motor. See [Figure 582](#).

Figure 582: Z motor location



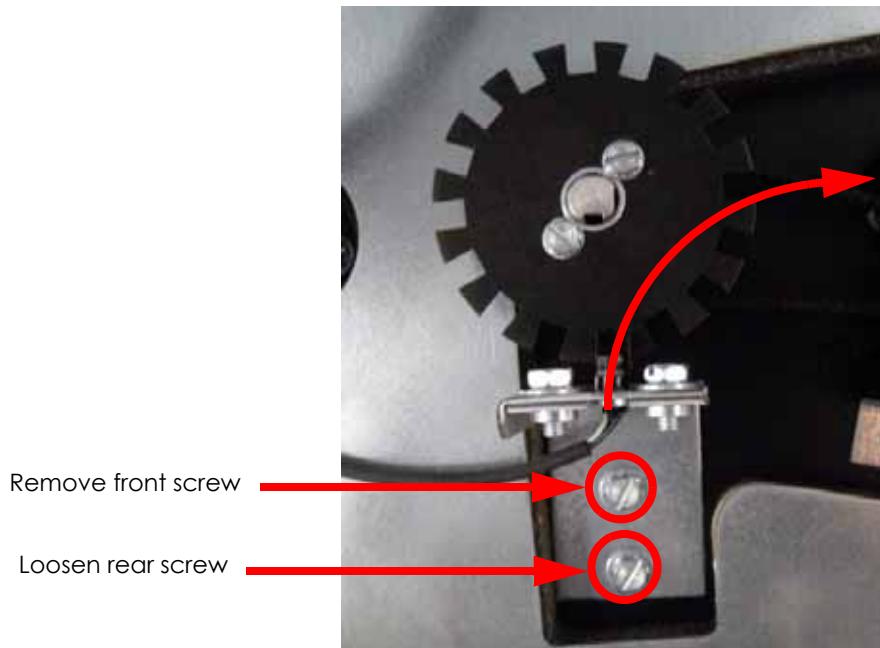
7. If printer serial number is less than P4000, locate the Z jam sensor. See [Figure 583](#). If serial number is greater than P4000 continue to step 9.

Figure 583: Z jam sensor location



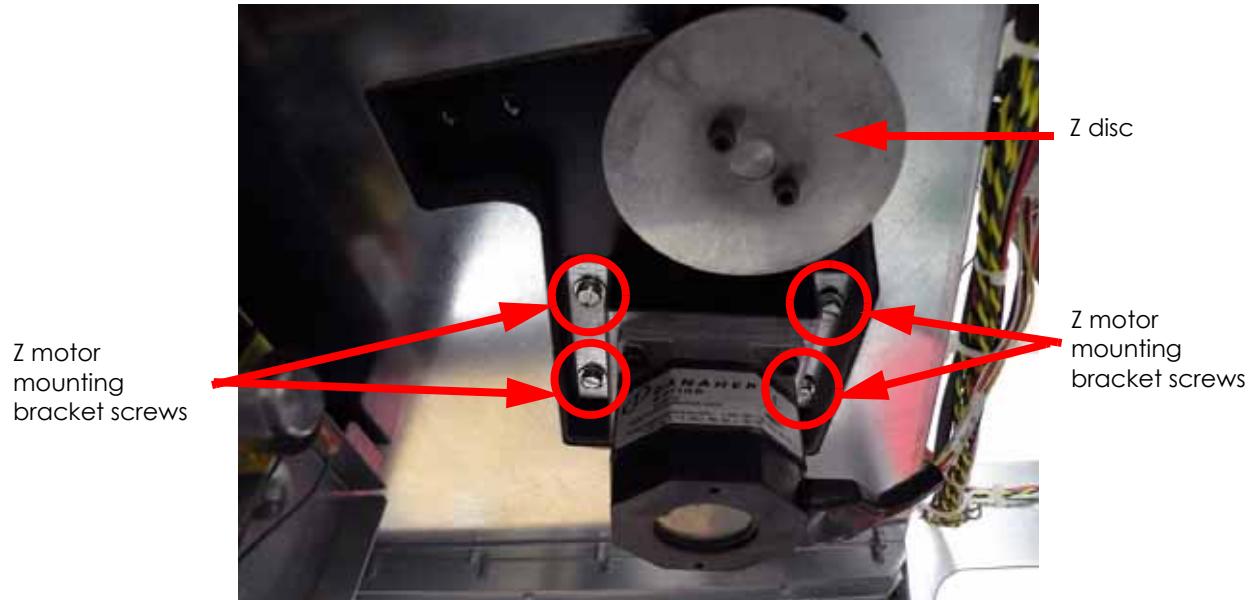
- Using a $5/16"$ nut driver or standard screwdriver, remove the front Z jam sensor mounting bracket screw, and loosen the rear mounting bracket screw. Swing the Z jam sensor away from the mounting bracket. See [Figure 584](#).

Figure 584: Z jam sensor mounting screw locations (looking up)



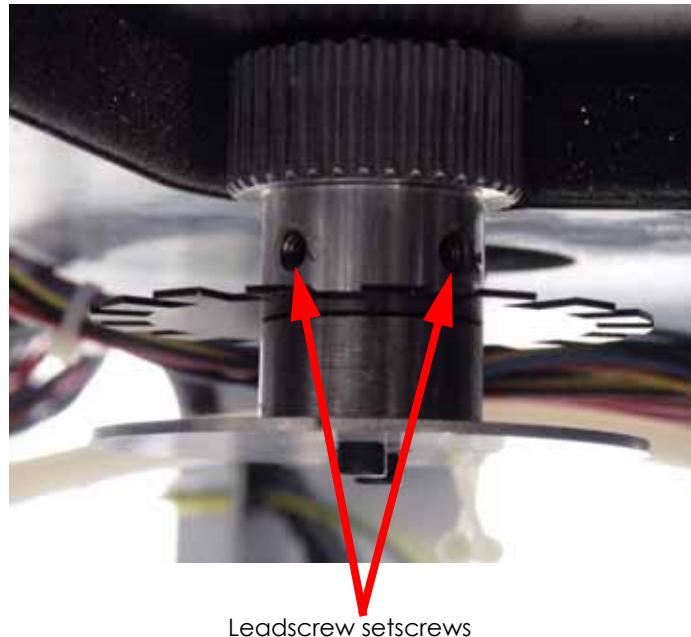
9. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, loosen, but do not remove the 4 Z motor mounting bracket screws. See [Figure 585](#).

Figure 585: Z motor mounting bracket screw locations



10. Using a $\frac{5}{64}$ " allen wrench, loosen the 2 small setscrews on the lead screw pulley. If necessary use a $\frac{7}{64}$ " allen wrench to loosen the larger allen head screw. See [Figure 586](#).

Figure 586: Lead screw pulley screw locations



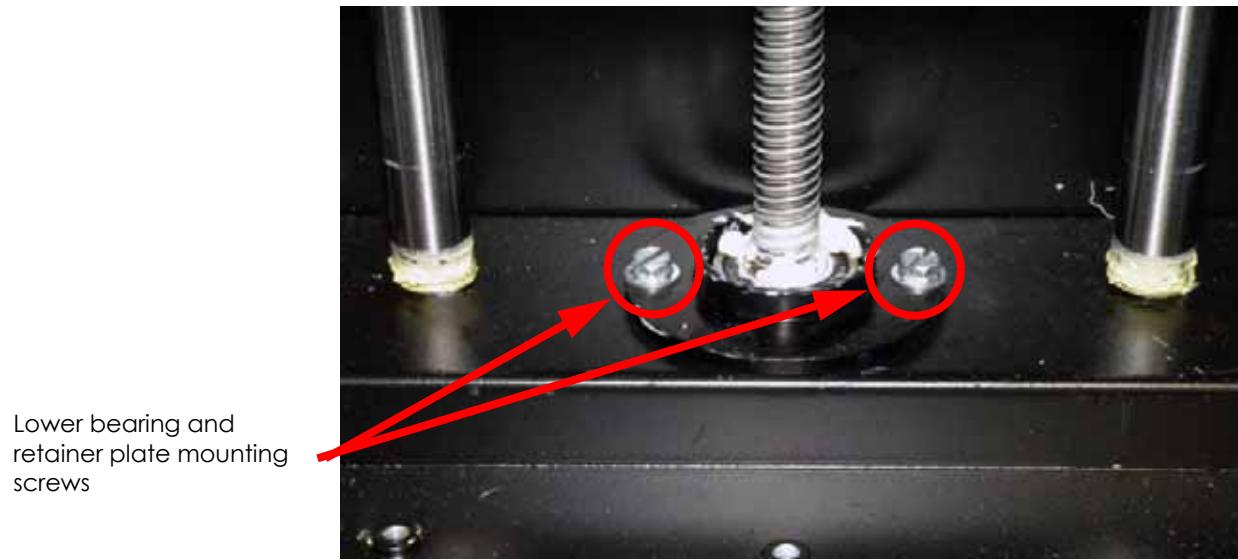
11. Slide the pulley off the lead screw shaft and out of the Z drive belt.
12. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 lower guide rod mounting screws. See [Figure 587](#).

Figure 587: Lower guide rod mounting screw locations



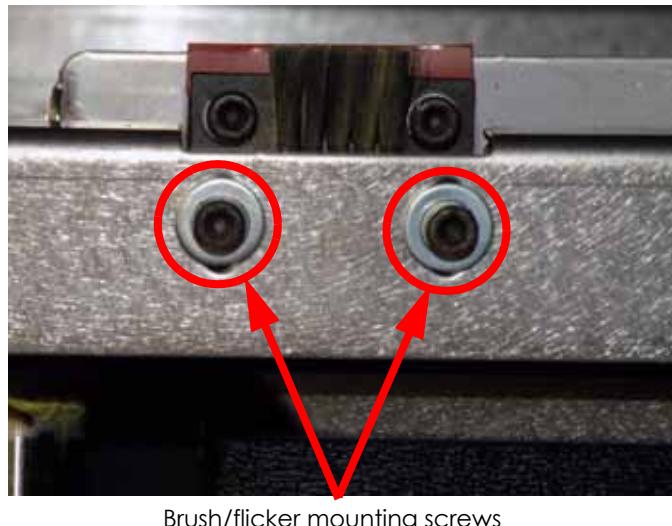
13. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 lower lead screw bearing and retainer plate mounting screws.

Figure 588: Lower lead screw bearing and retainer plate location



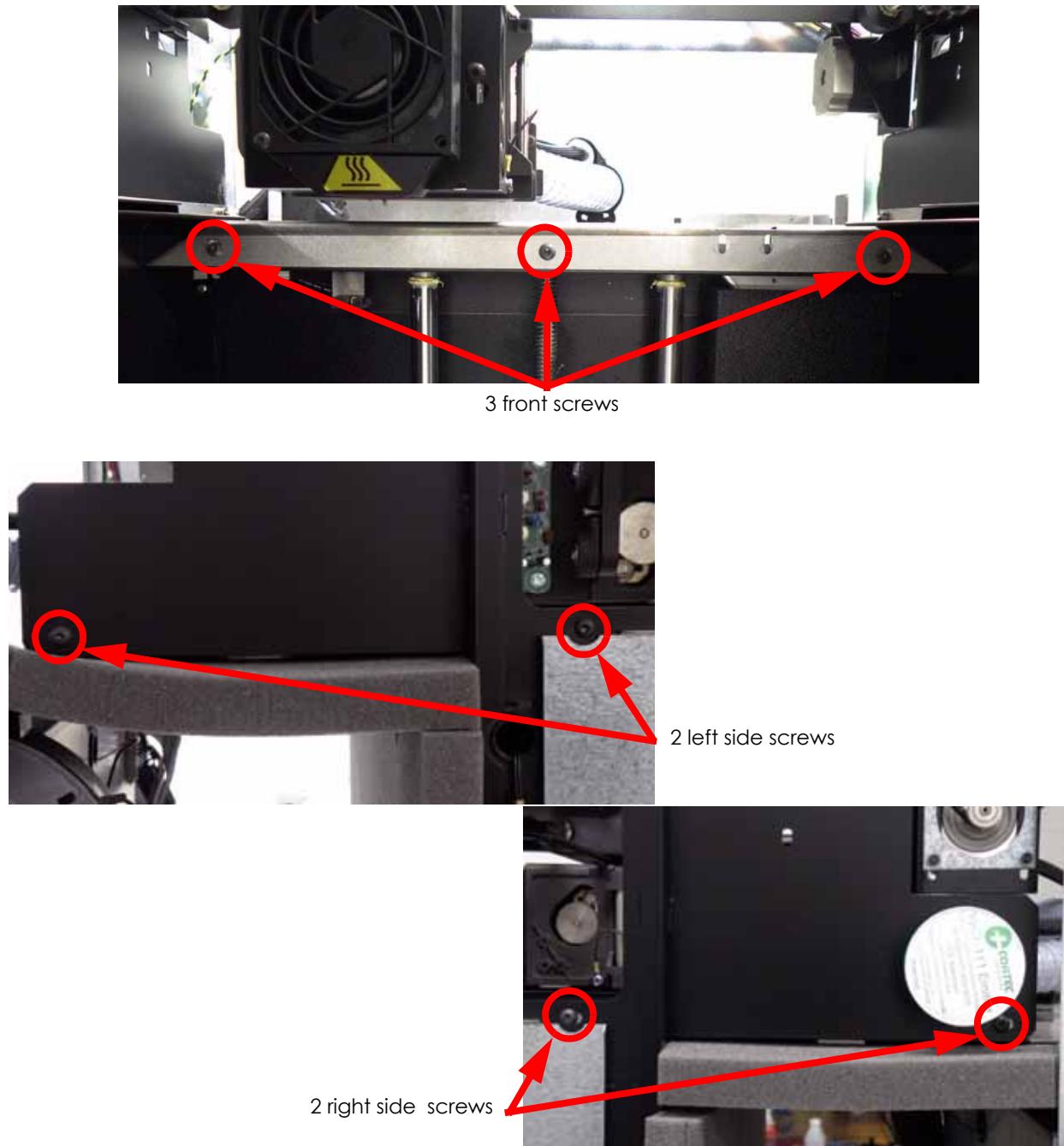
14. Using a $\frac{7}{64}$ " allen wrench, remove the tip wipe assembly mounting screws. Remove the tip wipe assembly by lifting up and set aside. See [Figure 589](#).

Figure 589: Brush/flicker mounting screw locations



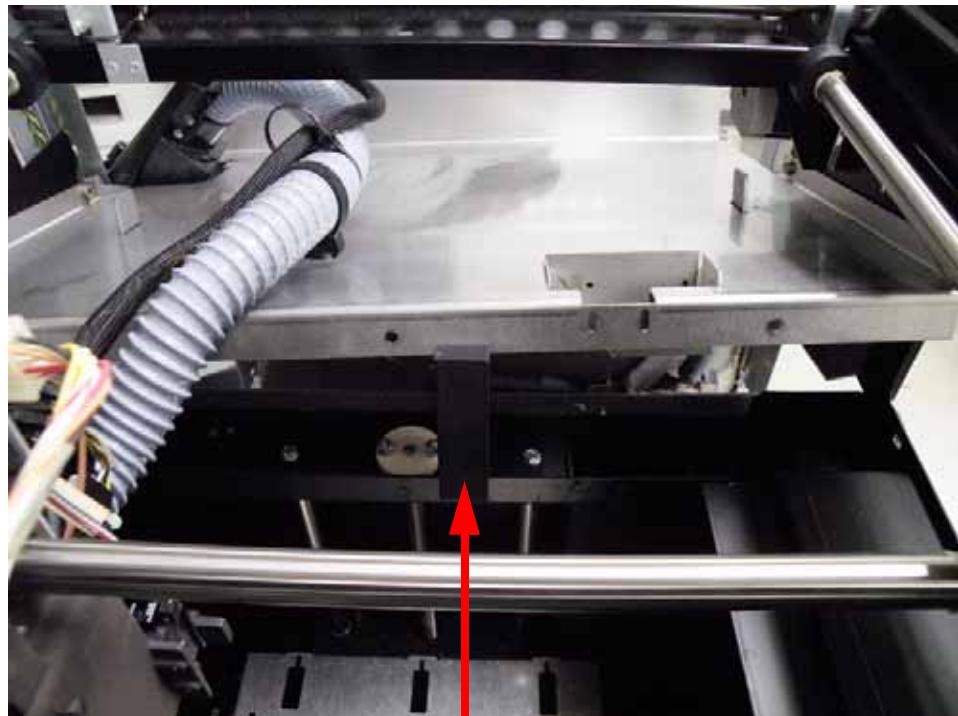
15. Using a $\frac{1}{8}$ " allen wrench, remove the 7 screws connecting the stainless steel plate (3 in front, 2 on both sides). See [Figure 590](#).

Figure 590: Steel plate mounting screw locations



16. Move the head towards the front of system and to the left side in order to lift up the stainless steel plate.
17. Lift up the front of the stainless steel plate and prop it up with an object that allows approximately 4-5 inches of clearance. See [Figure 591](#).

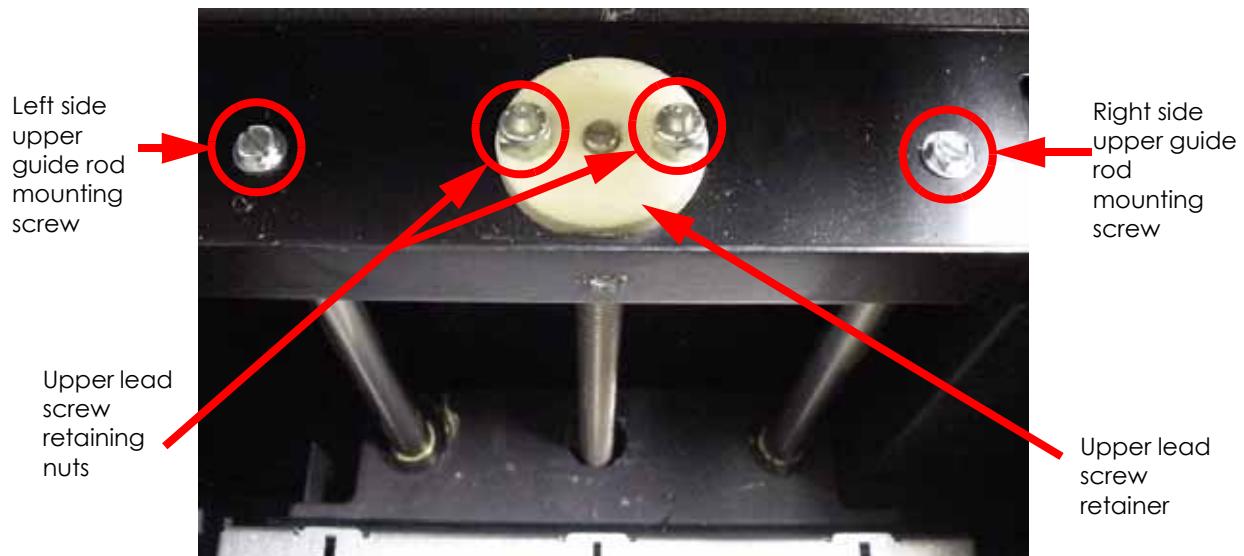
Figure 591: Propping the steel plate



Use an object that will allow 4-5 inches clearance

18. Using a $\frac{3}{8}$ " ratchet driver, remove the lead screw retaining nuts. See [Figure 592](#).
19. Using a $\frac{5}{16}$ " ratchet driver, remove the upper guide rod screws. See [Figure 592](#).
20. Remove the upper lead screw retainer. See [Figure 592](#).

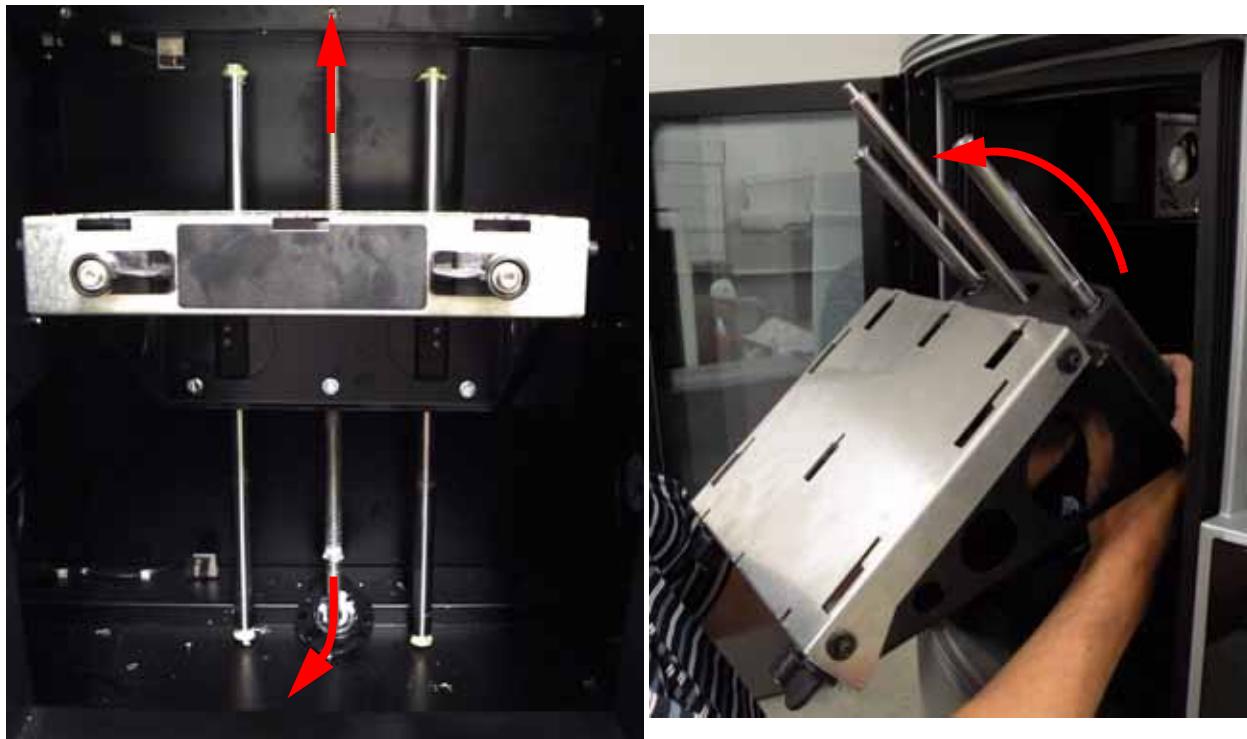
Figure 592: Upper lead screw and guide rod mounting screws



21. Remove the Z stage:

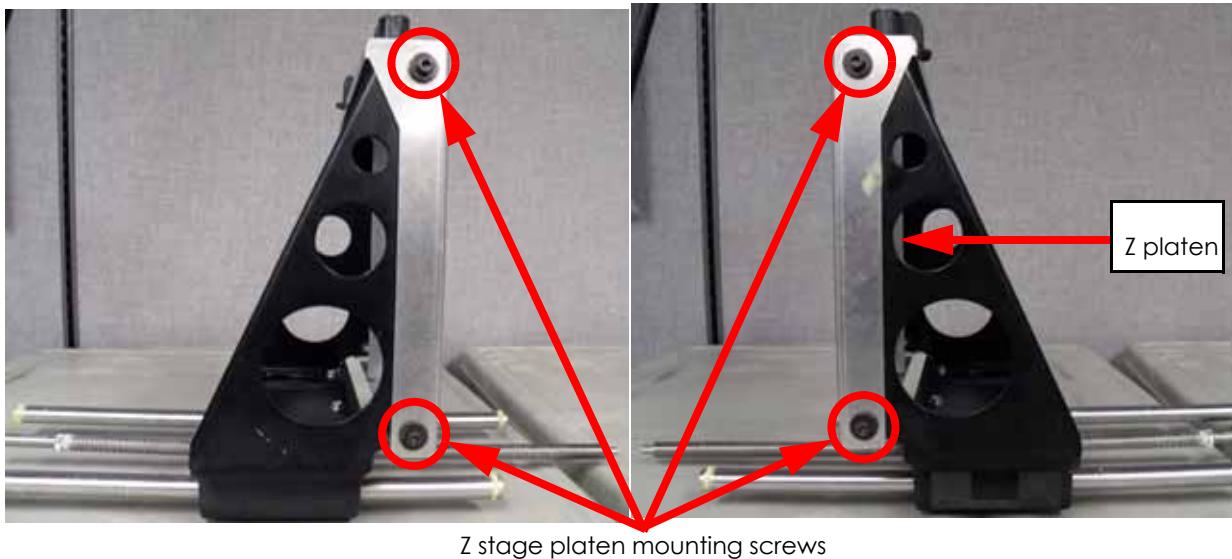
- a. Grasp both guide rods, lift up and tilt the bottom outwards. See [Figure 593](#).
- b. Angle the top of the Z stage out of the chamber door. See [Figure 593](#).

Figure 593: Removing the Z stage



22. Using a $5/32"$ allen wrench, remove the 4 Z stage platen mounting screws and set platen aside. See [Figure 594](#).

Figure 594: Z stage platen mounting screw locations



Installing the Z Stage Assembly:

1. Carefully remove the new Z Stage assembly from the shipping package.



Caution: Do not remove cardboard inserts from housing until guide rods are inserted.

2. Set the assembly on a flat surface.
3. Using a cutters, cut the 2 wire ties from the cardboard inserts. See [Figure 595](#).



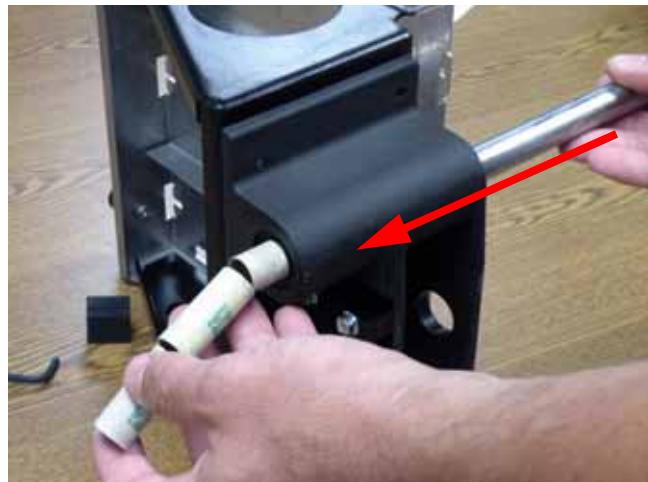
Caution: Remove the wire ties while holding the cardboard inserts in place.

Figure 595: Wire tie location



4. Carefully slide the guide rods through the translator, pushing the cardboard inserts out. See [Figure 596](#).

Figure 596: Removing the cardboard inserts



5. With the pin facing the top of the Z stage, install the lead screw into the translator until it is centered.
6. Align the Z stage platen with the translator and reinstall the 4 mounting screws with a $\frac{5}{32}$ " allen wrench. See [Figure 594](#).
7. Insert the level spacer between the translator and the platen at the left rear corner.
8. Slide the corner of the tray up or down until the underside of the tray is snug to the top of the spacer lip.
9. Using a $\frac{5}{32}$ " allen wrench secure the left rear mounting screw.
10. Repeat steps [7 - 9](#) for the remaining 3 corners.
11. Align the lower bearing retainer plate with mounting holes, cup side up.
12. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, loosely reinstall the 2 lower bearing retainer plate mounting screws. Do not tighten completely.
13. Carefully angle the Z stage assembly upwards into its position within the build envelope.



Hold the guide rods while supporting the Z stage.

14. Lower the lead screw into its bearing.
15. Align the upper lead screw retainer with its mounting holes.
16. Using a $\frac{3}{8}$ " nut driver, loosely reinstall the upper lead screw retainer nuts. DO NOT tighten at this time.

17. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, loosely reinstall the upper and lower guide rod retainer screws. Do not tighten at this time.
18. Tighten only the left upper and left lower guide screws.



The right guide rod mounting holes are slotted to allow the guide rod to self-align.

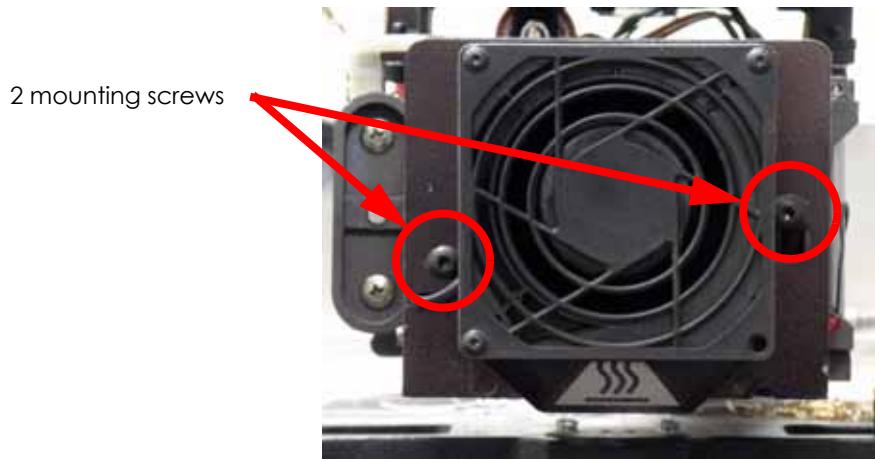
19. Move the Z stage to the top end of travel and tighten the upper right guide rod screw.
20. With the Z stage at the top of travel, tighten the 2 upper lead screw nuts.
21. Fully tighten the large set screw on the lead screw pulley with a $\frac{7}{64}$ " allen wrench. This needs to be done to assure the lead screw pulley is installed correctly.



Caution: Make sure Z stage is at top end of travel before tightening lead screw pulley set screws.

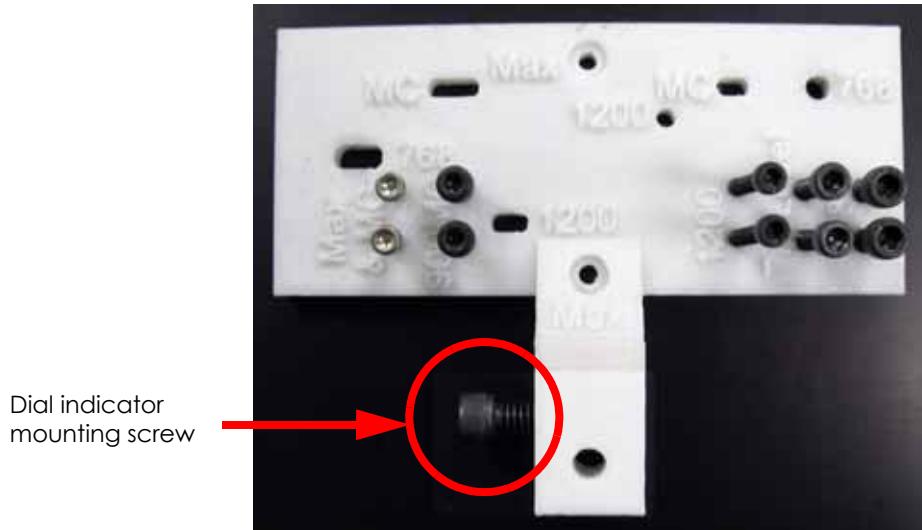
22. Reinstall the Z lead screw pulley. Align the large set screw with groove in bottom of lead screw. Push the pulley upwards to its end of travel. Tighten the 2 small set screws with a $\frac{5}{64}$ " allen wrench.
23. Lift the Z stage up to verify the lead screw does not move. If the lead screw moves, repeat steps [21](#) and [22](#).
24. Move the Z stage down to mid travel and tighten the lower right guide rod screw.
25. With the Z stage at mid travel, tighten the 2 lower bearing plate screws.
26. Pull back on the Z motor bracket to tension the Z motor belt.
27. Tighten the Z motor bracket screws.
28. If printer serial number is less than P4000, align the Z jam sensor with the mounting holes. If printer serial number is greater than P4000, proceed to step [30](#).
29. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 2 Z jam sensor bracket mounting screws.
30. Remove the object holding up the stainless steel plate and lower the plate into position.
31. Using a $\frac{1}{8}$ " allen wrench, reinstall the 7 stainless steel plate mounting screws.
32. Reinstall the tip wipe assembly. See "[Tip Wipe Assembly](#)" on page [5-357](#).
33. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 597](#).

Figure 597: Head fan mounting screw locations



34. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 598](#).

Figure 598: Head bracket mounting screws



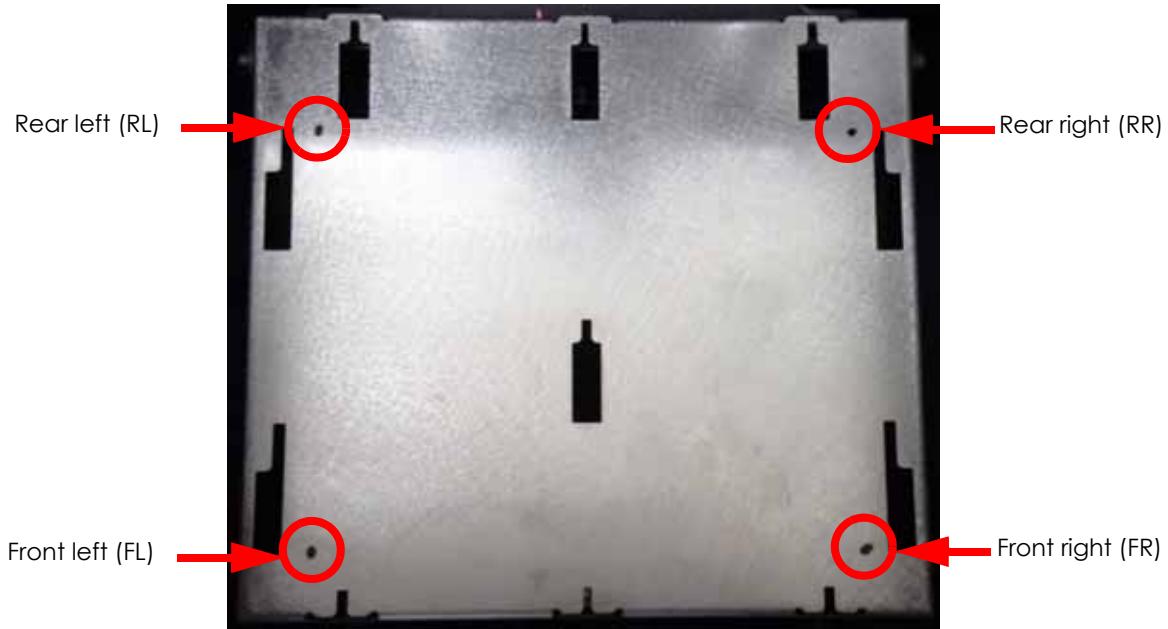
35. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 599](#).

Figure 599: Dial indicator installation



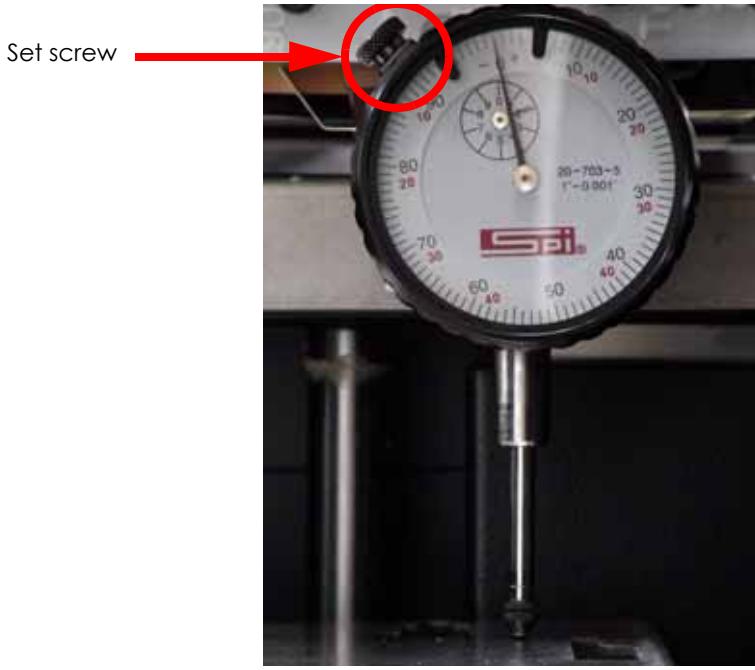
36. Using a marker, mark the Z platen in the rear left corner, rear right corner, front left corner and front right corner. See [Figure 600](#).

Figure 600: Z platen marking locations



37. Manually raise the Z stage, by turning the lead screw with a gloved hand, until the Z platen contacts the dial indicator and moves the gauge approximately 2 full rotations.
38. Move the dial indicator to the mark on the right rear corner and zero the dial indicator by loosening the set screw and turning the ring until the the dial is on the 0. See [Figure 601](#).

Figure 601: Zero the dial indicator



39. Move the dial indicator to the mark on the front right corner of the Z platen.
40. Using a $\frac{5}{32}$ " allen wrench, loosen the front right Z platen mounting screw and raise/lower the front right corner until the dial indicator reads 0 then tighten the mounting screw.
41. Move the dial indicator to the mark on the front left corner of the Z platen.
42. Using a $\frac{5}{32}$ " allen wrench, loosen the front left Z platen mounting screw and raise/lower the front left corner until the dial indicator reads 0 then tighten the mounting screw.
43. Move the dial indicator to the mark on the rear left corner of the Z platen.
44. Using a $\frac{5}{32}$ " allen wrench, loosen the rear left Z platen mounting screw and raise/lower the rear left corner until the dial indicator reads 0 then tighten the mounting screw.
45. Repeat steps [38 - 44](#) until each corner of the XY table is within a total tolerance of $+/- 0.001$ for each corner.
46. Remove the head bracket and dial indicator.
47. Align the head fan with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 2 mounting screws.
48. Reinstall the side panels. See "[Side Panels](#)" on page [5-11](#).
49. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page [5-10](#).
50. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).

51. Power on the system. The system should reach **Idle** with no displayed errors.
52. Perform tip depth calibrations. See "[Tip Depth Calibration](#)" on page 6-2.
53. Run a small test part and monitor system operation during build.
54. Send the bad Z stage back to Stratasys, Inc.

Receiver Components

Galvanized Receiver Assembly

The galvanized receiver assembly will only be used on Gen 1 electronics.

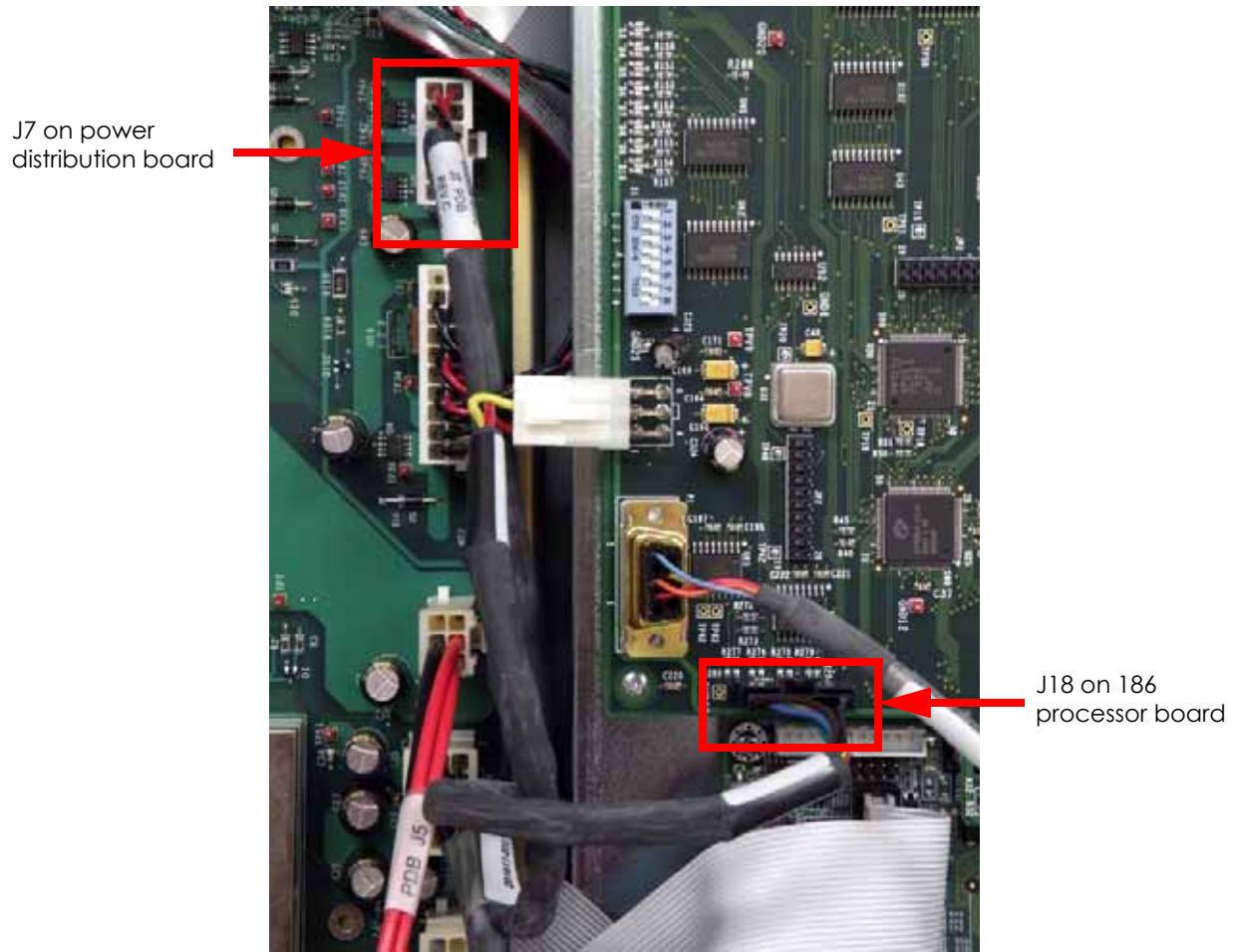
Required Tools

- $\frac{5}{16}$ " nut driver or standard screwdriver

Removing the Galvanized Receiver Assembly:

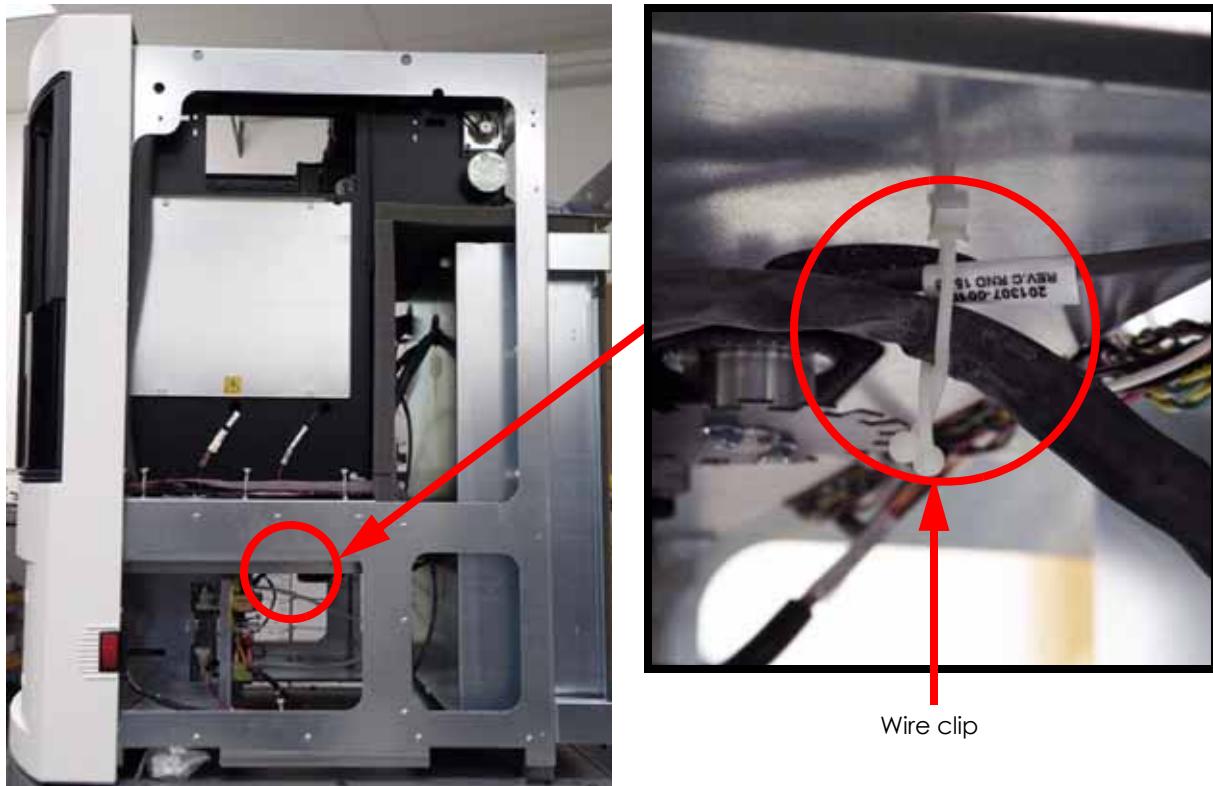
1. Unload material.
2. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
3. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
4. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
5. Remove the side panels. See "[Side Panels](#)" on page 5-11.
6. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
7. Disconnect J7 from the power distribution board by pressing the tab and pulling outwards. See [Figure 602](#).
8. Disconnect J18 from the 186 processor board by pressing the tab and pulling outwards. See [Figure 602](#).

Figure 602: J7 cable location



9. Locate the upper wire clip near the Z jam flag and un-clip. Pull the receiver cable through the electronics bay towards the receiver. See [Figure 603](#).

Figure 603: Wire clip location

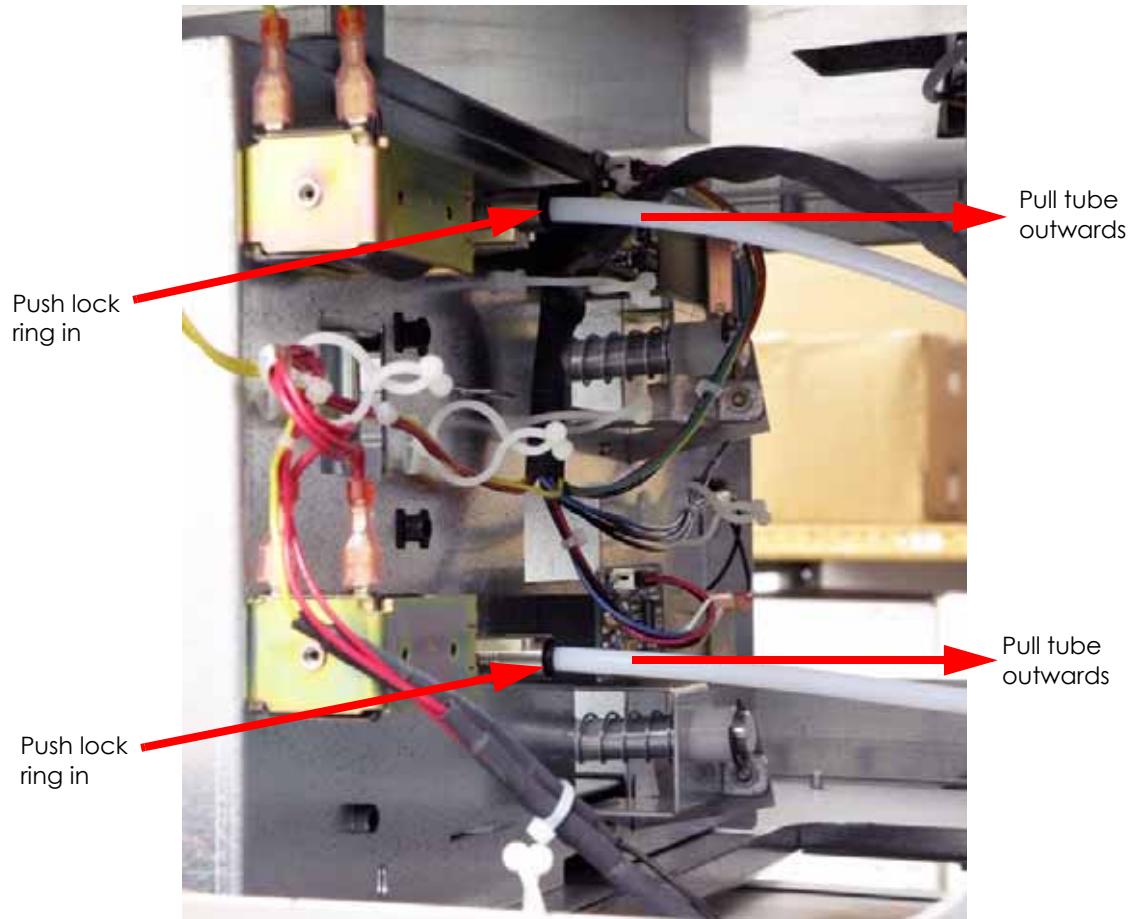


10. Disconnect the model and support material tubes from the receiver by pushing the black lock ring in and pulling the tubes outwards. See [Figure 604](#).



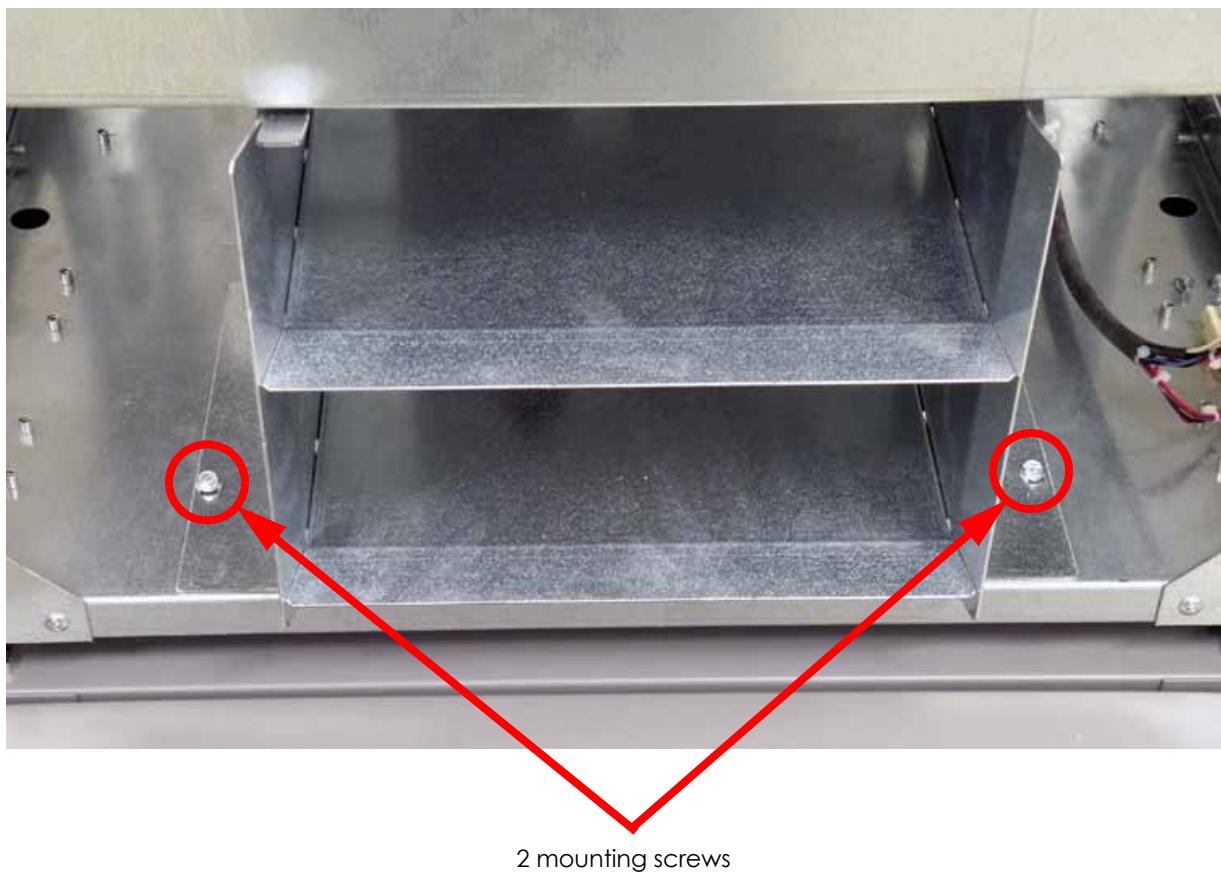
Mark the material tubes with a marker or a piece of tape for correct reinstallation.

Figure 604: Material tube locations



11. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, remove the 2 galvanized receiver mounting screws. See

Figure 605: Galvanized receiver mounting screw locations



12. Pull the galvanized receiver assembly out from the front of the printer and discard.

Installing the Galvanized Receiver Assembly:

1. Align the galvanized receiver assembly with the mounting holes on the frame.
2. Using a $\frac{5}{16}$ " nut driver or standard screwdriver, reinstall the 2 mounting screws.
3. Reconnect the model and support material tubes by pushing into the lock rings.
4. Run the drive motor wire through the lower wire clip and close the wire clip.
5. Run the receiver cable through the upper wire clip and close the wire clip.
6. Run the receiver cable through the hole on the electronics bay and up to the circuit boards.
7. Reconnect J18 to the 186 processor board by pushing into place.
8. Reconnect J7 to the power distribution board by pushing into place.
9. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
10. Install the side panels. See "[Side Panels](#)" on page 5-11.
11. Install the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
12. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
13. Power on the system. The system should reach **Idle** with no displayed errors.
14. Run a small test part and monitor system operation during build.

Galvanized Receiver Plate

The galvanized receiver plate will be used on Gen 2 and Gen 3 electronics.

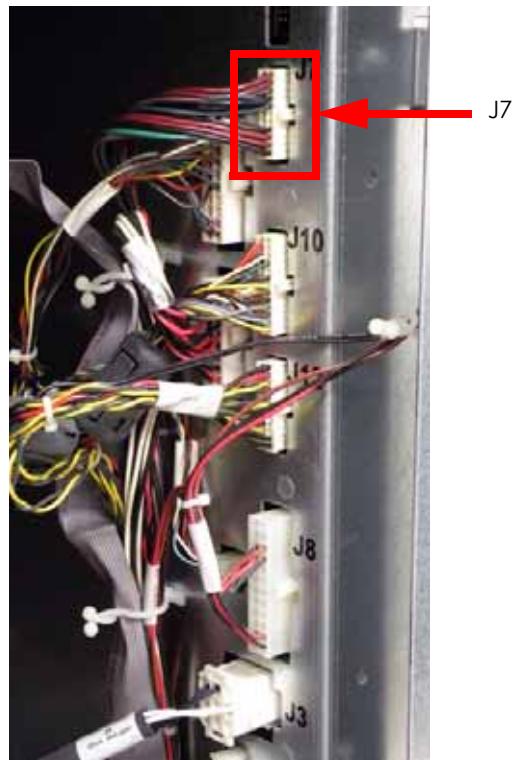
Required Tools

- $\frac{9}{64}$ " allen wrench

Removing the Galvanized Receiver Plate:

1. Unload material.
2. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
3. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
4. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
5. Remove the side panels. See “[Side Panels](#)” on page 5-11.
6. Disconnect J7 from the back side of the power distribution board. See [Figure 606](#).

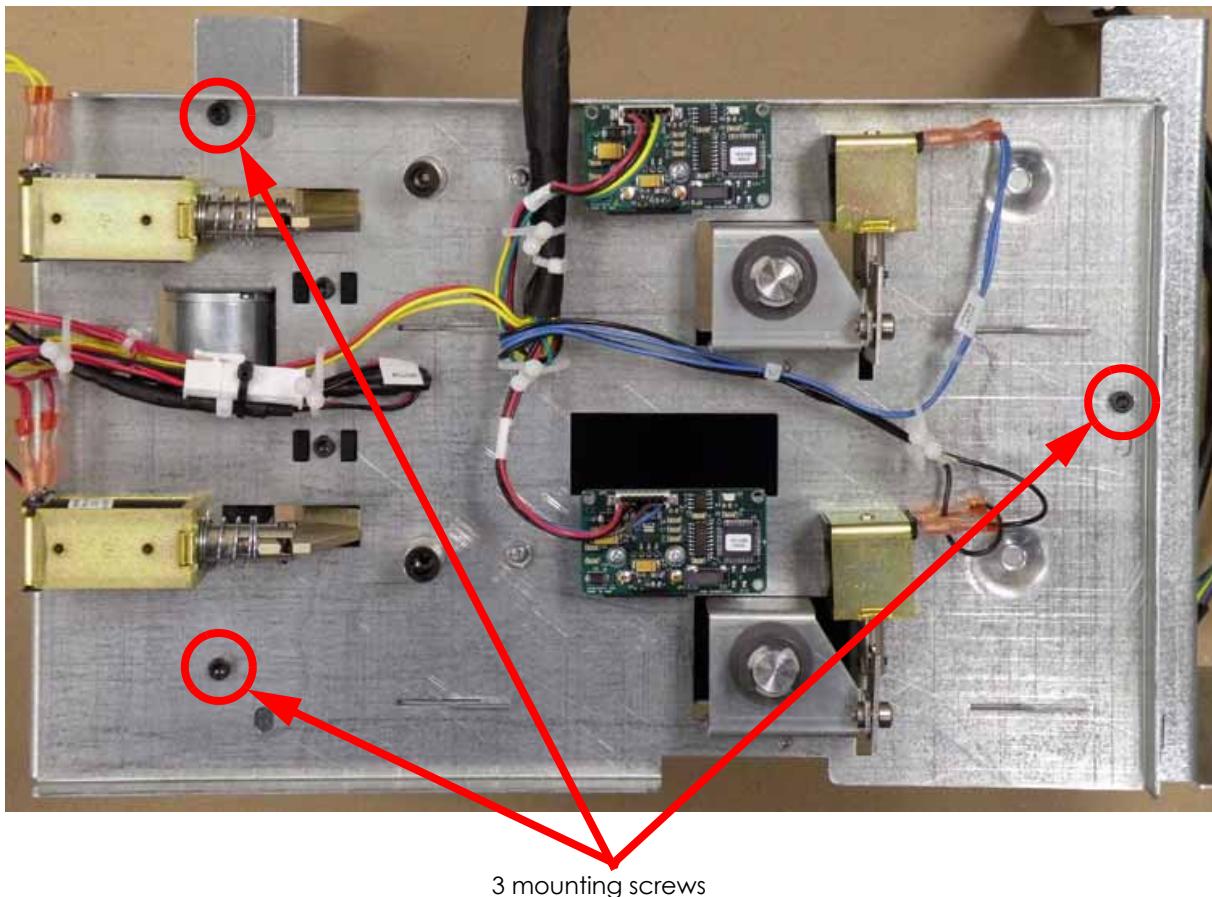
Figure 606: J7 location



7. Follow the receiver cable back to the galvanized receiver plate and un-clip and wire clips.
8. Pull the receiver cable down from the power distribution board to the receiver.

9. Using a $\frac{9}{64}$ " allen wrench, remove the 3 galvanized receiver plate mounting screws. See Figure 607.

Figure 607: Galvanized receiver plate mounting screw locations



10. Pull the galvanized receiver out of the printer and discard.

Installing the Galvanized Receiver Plate:

1. Slide the galvanized receiver plate into the printer and align with the receiver frame.
2. Using a $\frac{9}{64}$ " allen wrench, reinstall the 3 mounting screws.
3. Run the receiver cable up to the power distribution board, inserting into wire clips and closing wire clips along the way.
4. Reconnect J7 to the backside of the power distribution board.
5. Install the side panels. See "[Side Panels](#)" on page 5-11.
6. Install the rear door. See "[Installing the Rear Door](#):" on page 5-10.
7. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
8. Power on the system. The system should reach **Idle** with no displayed errors.
9. Run a small test part and monitor system operation during build.

Calibrations & Adjustments



This chapter guides you through various calibration and adjustment procedures. For Maraca instructions, see “[Maraca Help](#)” on page [3-7](#). The contents and page numbers of this chapter are as follows:

Tip Depth Calibration	6-2
Leveling the Liquefier	6-4
Tip Offset Calibration	6-8
Y Lash.....	6-11
Part Based Calibration	6-12
Tensioning the XY Cable Table.....	6-17
Leveling the XY Table (Cable Drive)	6-23
Tensioning the X & Y Motor Belts (Belt Table).....	6-31
Tensioning the X & Y Drive Belts (Belt Table).....	6-35
Leveling the XY Table (Belt Drive).....	6-48
Adjusting Z BOT (Home) Switch	6-53
Get/Send Calibration Files.....	6-57
Z Tray Leveling (Cantilever Z Stage, Foam).....	6-59
Leveling the Z platen:	6-61
Aligning Single Lead Screw Z Stage:.....	6-64

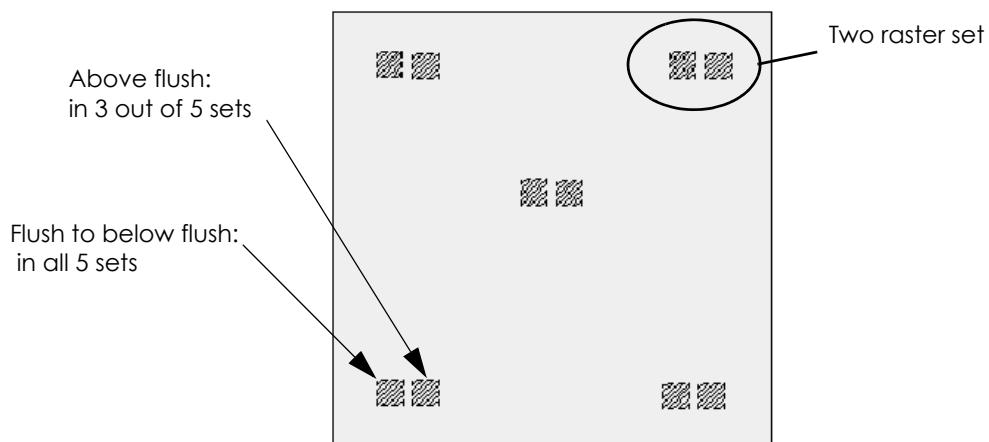
Tip Depth Calibration

Adjusting Tip Depth (Foam)

Build And Inspect the Tip Depth Calibration Model:

1. Use the control panel to build the "test_tipdepth.cmb" model.
2. After the part is completed, remove the modeling foam and inspect the raster patterns of each two raster set. For tip depth to be set correctly, the left raster pattern of each two raster set must be flush to below the surface of the foam in all 5 raster sets. The right raster pattern of each set must be partially above the surface of the foam in 3 of the 5 raster sets.

Figure 1: Tip Depth Calibration Test Part



Raster depth can be verified by running a thumbnail along the surface of the foam over the edge of the rasters. If the raster is flush or below flush, your thumbnail should not catch the edge of the pattern. If the raster is above flush, a thumbnail will catch the edge.

Update Tip Depth Compensation Value:

1. Start Maraca and select the Current Modeler from the pull down menu.
2. Click on the Tip Offsets button. A window with a Tip Depth field should appear. The tip depth value is in inches and refers to the distance from the normal Z zero that the tip will be shifted into or out of the foam. A negative correction causes the tip to build deeper into the foam.
3. In the Tip Depth field, enter the new tip depth value. Then click the check mark to accept values. New value = Old value + identified correction. For example: If the current Z offset is -0.045", and the tip is 0.015" too deep in the foam, the new Z offset should be 0.030".
4. Toggle the front panel power switch to restart the software and activate the new values.
5. After the machine returns to idle, check the Z offset using the same method described above.

Adjusting Tip Depth on Plastic Substrate

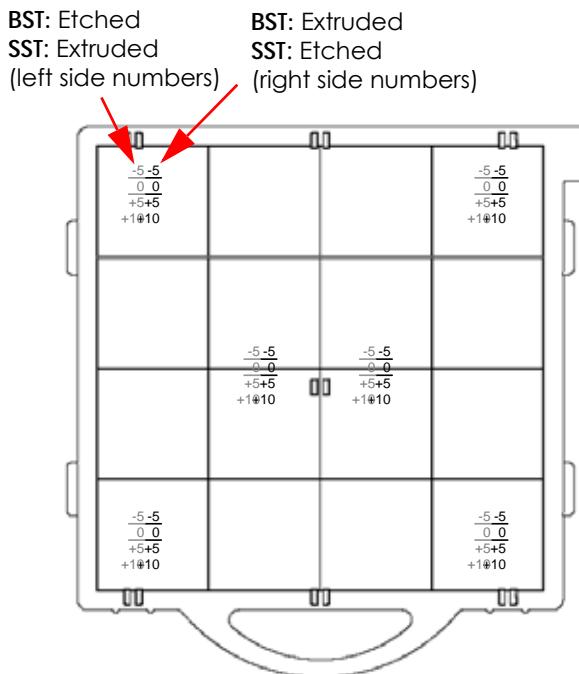
Build And Inspect the Tip Depth Calibration Model:

1. Use the control panel to build the test_tipdep_plstc.cmb model. The model will create six pairs of numbers at different Z heights as shown in Fig. 2. Each pair will have a set of numbers on the left and right. The extruded set of numbers are extruded at a very low flow rate and may not show up clearly. The etched sets of numbers are etched in the substrate by the idle support tip. It is normal for only some of these numbers to be visible.

Update Tip Depth Compensation Value:

2. Evaluate the etched set of numbers. For **BST**, the etched numbers are on the *left*. For **SST**, the etched numbers are on the *right*.
The etched numbers can be difficult to see. It may be necessary to tilt the substrate to the light to inspect.
3. The tip depth is correct when the etched numbers meet the following criteria:
 - 0 must be visible in at least one set of etched numbers.
 - +5 and +10 must not be visible in any set of etched numbers.
 - It is acceptable for some sets to have no visible etched numbers.
4. The tip depth needs to be adjusted if:
 - +5 is visible on the etched side, then adjust the tip depth +.005.
 - -5 is the highest visible etched number, then adjust the tip depth -.005.
 - No etched numbers are visible, then adjust the tip depth -.010.
5. Start Maraca and select the Current Modeler from the pull down menu.
6. Click on the Tip Offsets button. A window with a Z Offset field should appear. The tip depth value is in inches, and refers to the distance from the normal Z zero that the tip will be shifted into or away from the substrate. A negative correction causes the tip to build closer to the substrate. In the Z Offset field, enter the new tip depth value then click the check mark to accept values. New value = Old value + identified correction. For example: If the current Z offset is -.045", and the adjustment is +.005, the new Z offset should be .040".
7. Toggle the front panel power switch to restart the software and activate the new values.
8. Run the test_tipdepth_plstc.cmb as needed and evaluate the model as above.

Figure 2: Tip Depth Calibration Test Part



Leveling the Liquefier

The two main signs that the liquefier is un-leveled are:

- A ridge along the front face of a part (support tip too low).
- Support is knocked over by the model tip (support tip too high). Top exposed layer looks rough.

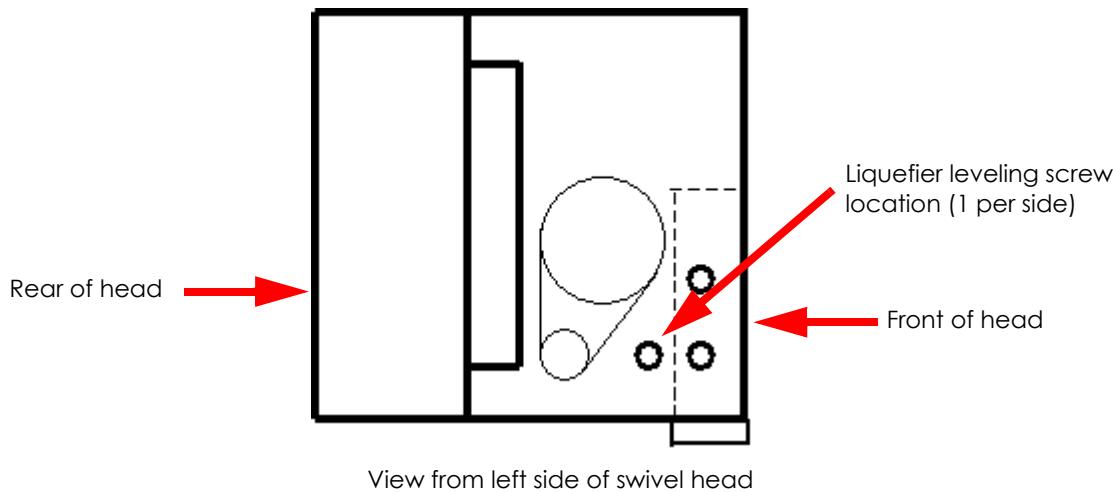
Required Tools

- $\frac{9}{64}$ " allen wrench
- 2 #8-32 x $\frac{3}{4}$ " bolts

Leveling procedure:

1. Screw one #8-32 X $\frac{3}{4}$ " bolt into each side of the swivel head. **Do not tighten.** See [Figure 3](#).

Figure 3: Liquefier leveling screw location



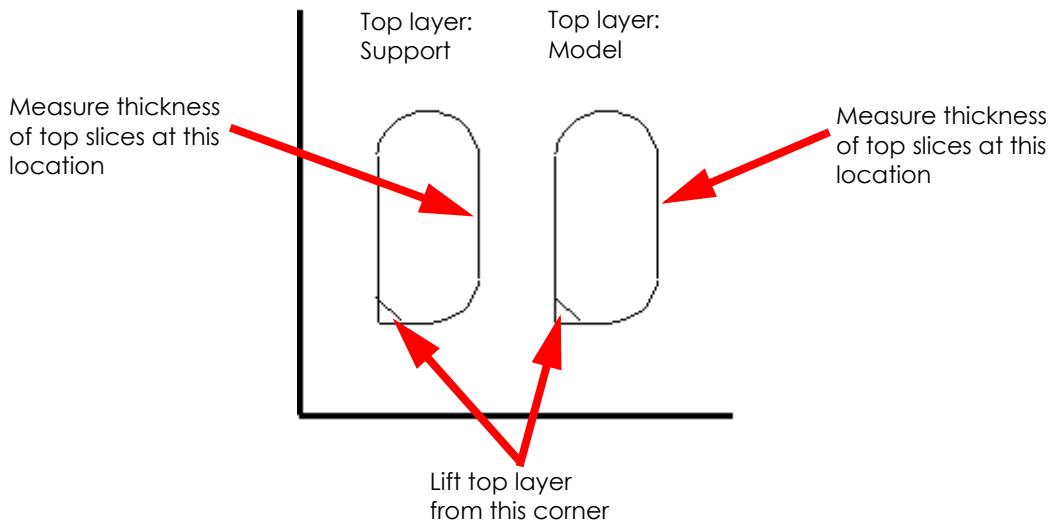
2. Insert foam and power up the system.
3. Once system has reached operating temperature, load material.
4. From the "Test Parts" menu choose "test_tiplevel".
5. The system will build two oval shaped parts in the left front corner.
6. Once the parts are complete remove foam from the machine.
7. Two parts will have been built. The part on the **left** is built from a base of model material with one layer of support as the top layer. The part on the **right** is the opposite. Base layers of support with one layer of model as the top layer.



For ease of removal, the part was designed to be able to easily peel the top most layer off.

8. Starting at the squared corner (lower left), use your fingernail to carefully lift and remove the top layer from the part on the left (support material). See [Figure 4](#).
9. Using a micrometer or digital caliper, measure the thickness of the support layer (top layer that was removed in step 8). Measurement should be taken at the location shown in [Figure 4](#). Record this measurement.

Figure 4: “test_tiplevel” part diagram

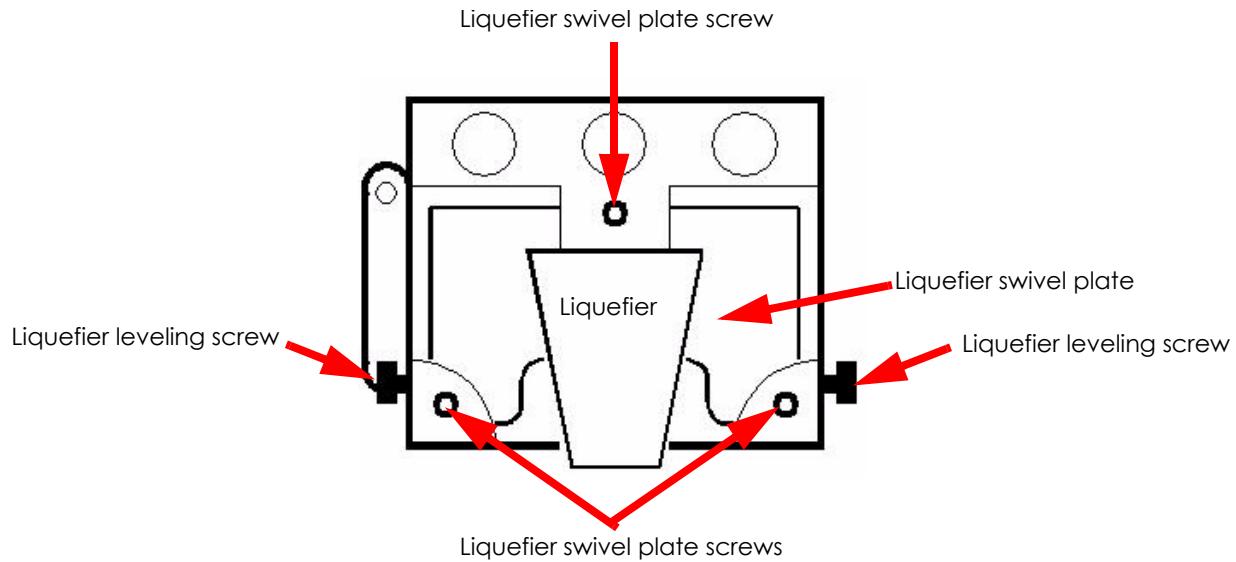


10. Now repeat steps 8 and 9 for the part on the right. Record this measurement (model material thickness) also.
11. Calculate Tip Level and record:

$$TipLevel = \frac{SupportThickness - ModelThickness}{2}$$

12. If the Tip Level is between 0 and +0.0005, no additional adjustments need to be made as the liquefier is within specifications for level. Skip to step 31. If the tip level is outside of this specification, proceed to step 13.
13. Go into Head Maintenance.
14. Remove the front head plate.
15. Hand-tighten both liquefier adjustment screws until they are tight against the side of the swivel head plate.
16. Using a $\frac{9}{64}$ " allen wrench, loosen the 3 swivel plate screws just enough to allow swivel plate to pivot. See [Figure 5](#).

Figure 5: Liquefier Swivel Plate Screw Location



17. For the following step refer to the figures derived from step 11. Assume, as an example, the support thickness was 0.008" and the model thickness was 0.012" (tip level = -0.002"). This means that the support side of the liquefier needs to be raised and at the same time the model needs to be lowered.
18. **For BST:** Each HALF turn (rotation) of the leveling screws equals 0.001 change in tip level. This would mean that the leveling screw on the left needs to be rotated counterclockwise 1 turn and the screw on the right needs to be rotated clockwise 1 turn (1 turn x 0.002= 0.002).

For SST: Each HALF turn (rotation) of the leveling screws equals 0.002 change in tip level. This would mean that the leveling screw on the left needs to be rotated counterclockwise $\frac{1}{2}$ turn and the screw on the right needs to be rotated clockwise $\frac{1}{2}$ turn ($\frac{1}{2}$ turn x 0.004= 0.002).

19. Using a $\frac{1}{64}$ " allen wrench, turn the screw on the **left** counterclockwise (1 turn for BST, $\frac{1}{2}$ turn for SST). Next turn the **right** side leveling screw clockwise by the same amount.
20. Tighten the **TOP CENTER** liquefier swivel plate screw **first**. Then tighten the left and right liquefier swivel plate screws.
21. Run the test_toplevel part again.
22. Repeat steps 8 through 11 and record these values.
23. As an example, say the new values are: 0.0120 for the support and 0.0100 for the model. This means that now the tip level is 0.001" – the support tip is too high and the model tip is too low.
24. Since tip level = 0.001 and the liquefier is too high on the support side, the **left** side adjustment screw must be turned.
25. Again loosen the three liquefier mounting screws just enough to allow mounting bracket to pivot.

26. Using a $\frac{9}{64}$ " allen wrench, turn the screw on the **right** counterclockwise ($\frac{1}{2}$ turn for BST, $\frac{1}{4}$ turn for SST). Next turn the **left** side leveling screw clockwise by the same amount.
27. Tighten the **TOP CENTER** liquefier swivel plate screw **first**. Then tighten the left and right swivel plate screws.
28. Next run the test_tplevel part again.
29. Repeat steps **8** through **11** and record these values.
30. As an example, say the new values are now: 0.0105 for the support and 0.0095 for the model. Tip Level = 0.0005. The head is within specification for "level".
31. Replace the front head plate and remove the two liquefier adjustment screws.
32. For SST only, set the Tip Clearance as described in the **Adjusting Tip Clearance** instructions below.
33. Run the **tip offset** and **tip depth** calibration tests and adjust as necessary. System is now ready to build.
34. Run several small test parts and monitor system operation during build.

Tip Offset Calibration

Adjusting Z Clearance (SST Only):

The Z Clearance parameter adjusts the Z table height at which support roads are built relative to model roads. A Z Clearance value of +0.0002 means that the Z table moves down 0.0002" when extruding support material. Calibration of this parameter on SST is important to control curl while also ensuring supports stick to the top of the model.

1. Start Maraca and select the Current Modeler from the pull down menu.
2. Click on the Tip Offsets button.
3. In the Z Clearance field, enter the final Tip Level value obtained from the liquefier leveling procedure.
4. Press the green check mark button to accept values.
5. Toggle the front panel power switch to restart the software and activate the new values.

Adjusting XY Tip Offset (For system software version prior to 1518):

The tip offset values are X and Y coordinates in inches.

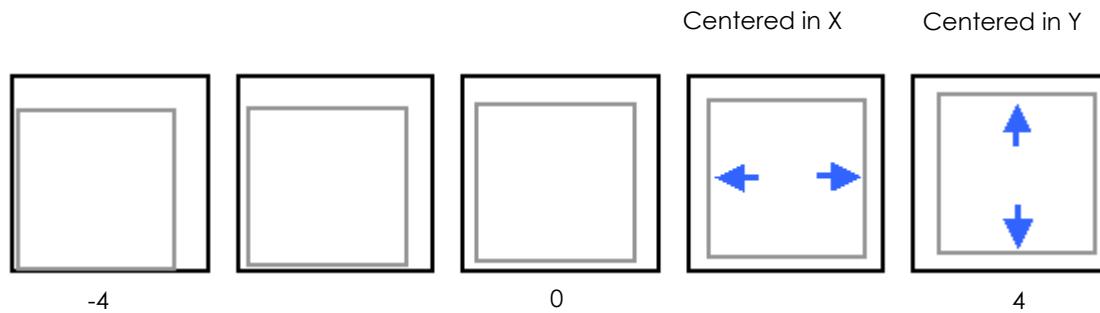


The values are not changed unless the green check mark is pressed.

Build And Inspect the Tip Offset Calibration Model:

1. Use the control panel to build the "test_tipoffset" model.

Figure 6: XY Tip Offset



2. Remove the foam or substrate from the machine. The model will contain five different sets of nested squares, each with a different amount of tip offset. The pattern in the middle represents the machine's current tip offset settings. The squares to the right have the support material shifted + .002" in X and Y and +.004" in X and Y. The squares to the left have the support material shifted -.002 in X and Y and -.004 in X and Y.

3. Inspect the nested squares and visually identify the one in which the inner square is best centered within the outer squares in the X direction (left to right). Repeat for the Y direction. Note that the square with the best X centering will not necessarily have the best Y centering. Next, determine the amount of correction associated with the selected pattern. In the above example, the X tip offset requires a correction of + .002" and the Y tip offset requires a correction of +.004. If the initial values were .100 and .000, the new values would be .102 and .004.

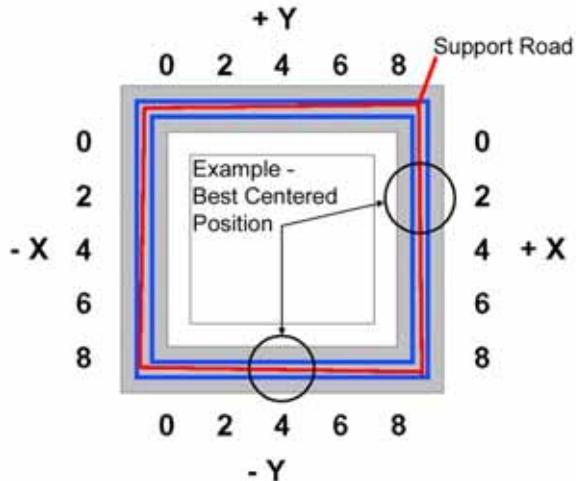
Update Tip Offset Compensation Value:

1. Start Maraca and select the Current Modeler from the pull down menu.
2. Click on the Tip Offsets button.
3. In the first tip offset field, enter the new X tip offset value. In the second tip offset field, enter the new Y tip offset value. To calculate the new values use the equation: *New value = Old value + identified correction.*
4. Click the green check mark button to accept values.
5. Toggle the front panel power switch to restart the software and activate the new values.
6. Note: Tip offset compensation IS applied to the tip offset test part, so if the part is re-run, the middle set of squares should be most centered in X and Y. Setting the tip offset parameter within approximately .002" is acceptable.

Adjusting XY Tip Offset (For system software version after 1518):

1. From the diaply panel press **Maintenance**.
2. Press **System**.
3. Press **Test Parts**.
4. Select the part labeled "**test_tipoffset**".
5. Press **Start Part**.
6. Remove the calibration part from the printer.
7. Inspect the part and calibrate the X and Y axis:
 - A. Use the magnifier from the Startup Kit to view the support road (shown in red). See [Figure 7](#).
 - B. Identify the location on the **+X or -X** side of the part where the support road is best centered within the model boundaries (shown in blue) and record the value. Each number represents values in thousandths of an inch. See [Figure 7](#).
 - C. Identify the location on the **+Y or -Y** side of the part where the support road is best centered within the model boundaries (shown in blue) and record the value. Each number represents values in thousandths of an inch. See [Figure 7](#).

Figure 7: Example XY Tip Offset Part.
This example requires an adjustment of X = + 2 mils, Y = - 4 mils



8. Once the values have been determined, open the Maraca software from a workstation or laptop connected to the printer.
9. Select the current printer from the drop down list.
10. Click on the **Tip Offsets** button.
11. In the first tip offset field, enter the new X tip offset value. In the second tip offset field, enter the new Y tip offset value. To calculate the new values use the equation: *New value = Old value + identified correction*.
12. Click the green check mark button to accept values.
13. Toggle the front panel power switch to restart the software and activate the new values.
14. Note: Tip offset compensation IS applied to the tip offset test part, so if the part is re-run, the middle set of squares should be most centered in X and Y. Setting the tip offset parameter within approximately .002" is acceptable.

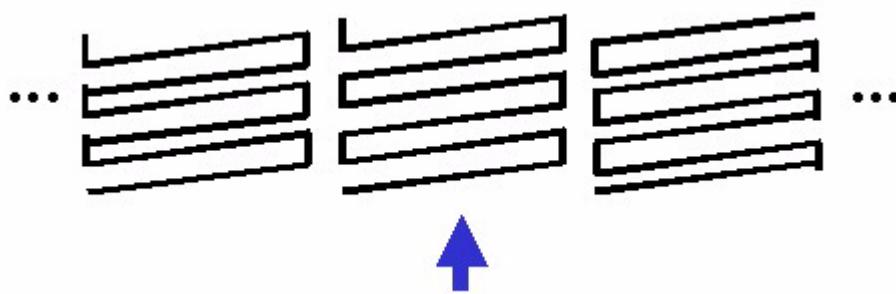
Y Lash

Mechanical lash is the tendency of the gantry to remain stationary after a change in direction until the mechanical slop in the system is taken up by the move.

Build And Inspect the Hysteresis Calibration Model:

1. Use the control panel to build the “test_lash” model.
2. Remove the foam or substrate from the machine. The model will contain six different raster patterns, each with a different amount of hysteresis compensation. The pattern on the right has no compensation, and the models to the left have progressively more compensation in 0.001” increments (up to 0.005” compensation on the left most model).

Figure 8: Hysteresis Calibration Model



3. Inspect the test patterns, and visually identify the one that has the most evenly spaced segments (least amount of twinning). Determine the amount of compensation associated with the selected pattern.

Update Y Lash Compensation Value:

1. Start Maraca and select the Current Modeler from the pull down menu.
2. Click on the Gantry button.
3. In the Y Lash field, enter the hysteresis compensation value identified from the test model (e.g. 0.003”), then click on the green check mark button to accept the value.
4. Toggle the front panel power switch to restart the software and activate the new values.



Hysteresis compensation is NOT applied to the Hysteresis test part, so each time the part is run, it should look the same regardless of the compensation setting.

Part Based Calibration

Required Tools

- Set of basic service tools
- 6" digital calipers
- Maraca CD

Part based calibration consists of building a part and then taking six measurements - front, right, left, rear, left rear and left front. Figure 5. These measurements are then entered using Maraca.

When to Perform Part Based Calibration

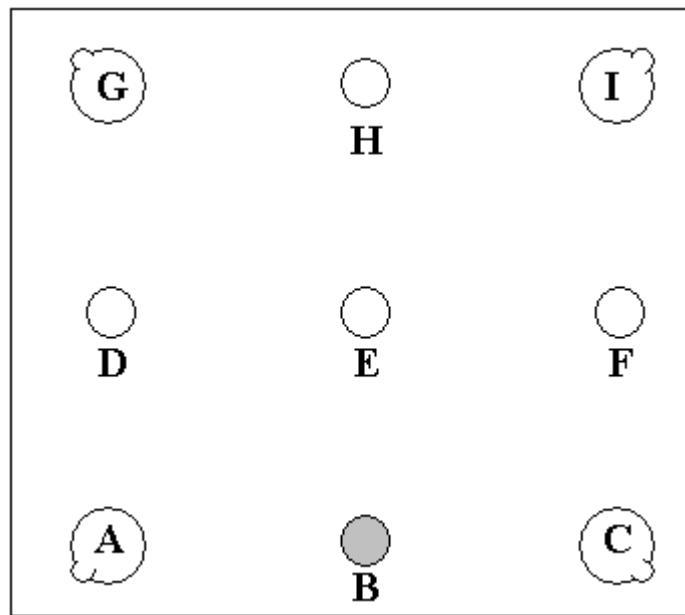
Cable drive XY table. From the floppy that ships with the replacement XY, download the .dat file from the floppy. Next perform the Part Based Calibration procedure. Both procedures must be performed for proper table operation.

Belt drive XY table. No floppy is shipped with belt XY tables. Part Based Calibration needs to be performed ONLY after replacing the table assembly, Y drive belt, Y drive assembly or the Y pulley.

Performing Part Based Calibration:

1. Start Maraca and select the Current Modeler from the pull down menu.
2. Open the Gantry Calibration Dialog box in Maraca
3. Set the X adjust value to 0.
4. In the Part Calibration section, there are six boxes: LEFT, RIGHT, FRONT, REAR, LEFT FRONT and LEFT REAR. Set these values to 0.
5. Click on the green check mark and toggle the power down switch.
6. From the modeler test parts menu run the "test_XY_cal" part.
7. When part is completed, remove from machine and let cool for ten minutes. Keep the part on the foam or substrate.
8. Locate the filled circle, this indicates the front of foam or substrate. See [Figure 9](#).

Figure 9: Locating the filled circle (B)

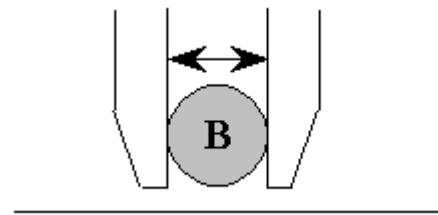


- Using a digital caliper, measure and record the diameter of circle B along the center line between A and C. See [Figure 10](#).



Reference letters are not actually “printed” on the part.

Figure 10: Measuring diameter of B

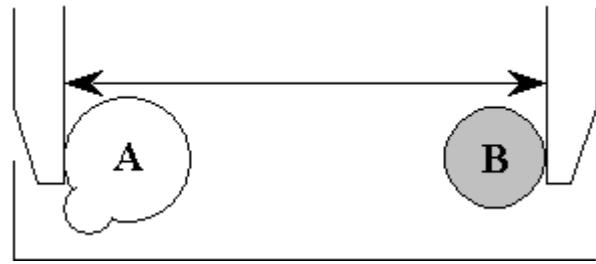


- Next measure and record the distance from the outside edges of circle A and B. See [Figure 11](#).



Ensure that the caliper is *not* seated on the small bump of circle A.

Figure 11: Measuring distance from outside edges of B & A

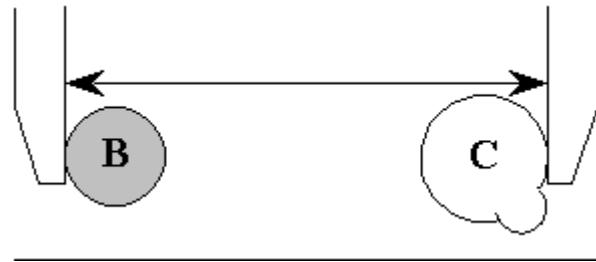


11. Next measure and record the distance from the outside edges of circle B and C. See [Figure 12](#).



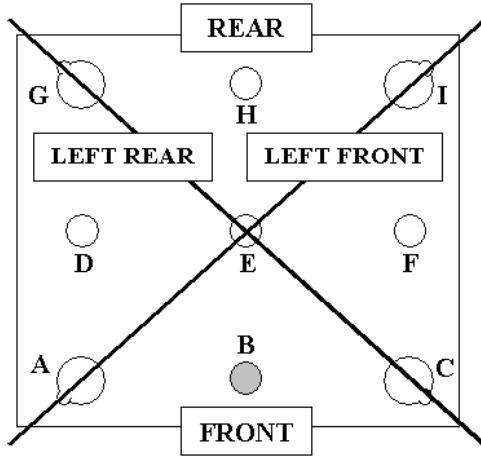
Ensure that the caliper is *not* seated on the small bump of circle C.

Figure 12: Measuring distance from outside edges of B & C



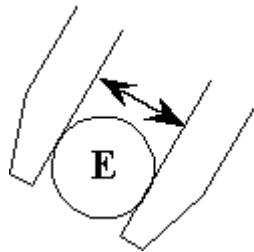
12. Add the lengths derived from steps [9](#) and [11](#) (A-B and B-C) and then subtract the width of circle B (from step [10](#)). Record this total as "Front"
13. Repeat steps [9](#) through [12](#) for the three remaining sides (Rear, Right and Left). Record these values. See [Figure 13](#).

Figure 13: Measuring all circles



14. Next measure the width of the center circle. Take the measurement at the same diagonal as the center line measurement to be taken (e.g. left rear). See [Figure 14](#).

Figure 14: Measuring width of center circle (E)

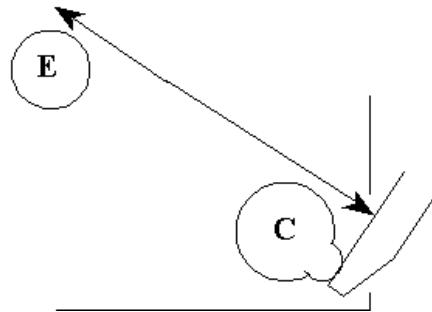


15. Next measure and record the distance from the outside edges of circle E and C as shown. See [Figure 15](#).



Ensure that the caliper *is* seated on the small bump of circle C

Figure 15: Measuring distance between outside edges of E & C



16. Next measure and record the distance from the outside edges of circle E and G. Ensure that the caliper *is* seated on the small bump of circle G. See [Figure 13](#).
17. Add the lengths derived from steps [15](#) and [16](#) (C-E and E-G) and then subtract the width of circle E (from step [14](#)). Record this total as "Left Rear".
18. Repeat steps [14](#) through [17](#) for "Left Front" (E, A-E, E-I) Record this value. See [Figure 13](#).
19. Start Maraca and select the Current Modeler from the pull down menu.
20. Open the Gantry Calibration Dialog box in Maraca.
21. In the Part Calibration section, there are six boxes: LEFT, RIGHT, FRONT, REAR, LEFT FRONT and LEFT REAR. Enter the measurements in the appropriate box.
22. Once the values have been entered, click on the green check mark.
23. Toggle the red power down switch to accept the new values.
24. Run the hysteresis test and change value if necessary.
25. Run a test part to verify system is operating correctly.

Part Measurement Equations

Use the equations below to record part measurements. Refer to these equations when entering values in Maraca.

Front: $\frac{A + B}{(A + B) + (B + C) - B} = \underline{\hspace{2cm}}$

Right: $\frac{C + F}{(C + F) + (F + I) - F} = \underline{\hspace{2cm}}$

Left: $\frac{A + D}{(A + D) + (D + G) - D} = \underline{\hspace{2cm}}$

Rear: $\frac{G + H}{(G + H) + (H + I) - I} = \underline{\hspace{2cm}}$

Left Rear: $\frac{C + E}{(C + E) + (E + G) - E} = \underline{\hspace{2cm}}$

Left Front: $\frac{A + E}{(A + E) + (E + I) - E} = \underline{\hspace{2cm}}$

Tensioning the XY Cable Table

XY cable tension is critical in the proper and accurate operation of the machine. Cable tension should be checked as part of routine field maintenance.

Parts and Tools Required

- $\frac{3}{32}$ " allen wrench
- $\frac{9}{64}$ " allen wrench
- Tension adjustment fixture with dial indicator and calibration bar
- Gauge spacers (2)

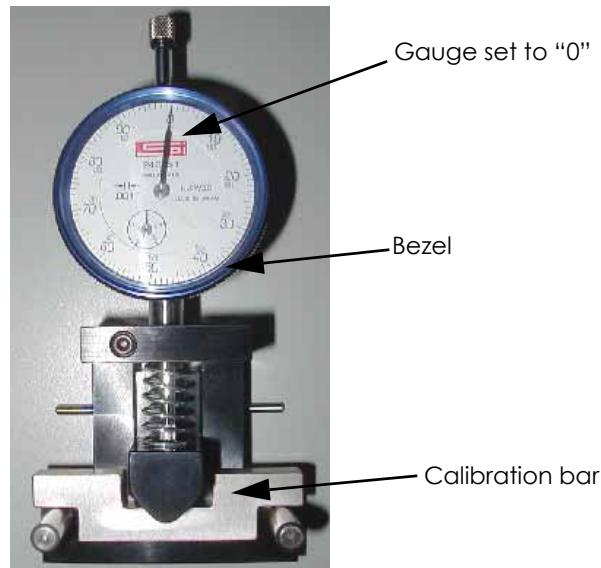
Important

- The gauge is fairly linear over the tensioning regions with a scale factor of $1 \text{ kg} = .01"$ deflection.
- The target tension of **9-10 kg** would correspond to an indicator reading of **0.090 to 0.100** (counter clockwise) deflection when indicator is zeroed using the gauge.
- When tightening X, one turn of the tensioning screw increases cable tension by about 4.5 kg (0.045").
- When tightening Y, one turn of the tensioning screw increases cable tension by about 2.5 kg (0.025")

Y Cable Adjustment:

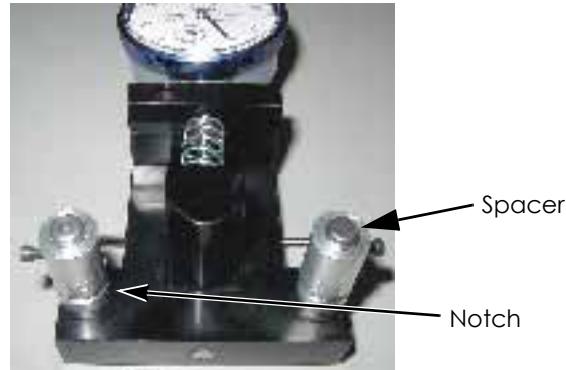
1. Shut down the machine using the "power down" switch.
2. Insert the calibration bar into the tension gauge as shown and "zero" by turning the bezel until the large hand aligns with "0". See [Figure 16](#).

Figure 16: Zeroing the Gauge



3. Remove the calibration bar from the gauge.
4. Slide the two "spacers" onto the tension gauge posts and tighten set screws. See [Figure 17](#).

Figure 17: Spacer alignment



5. Remove the right side panel.
6. Locate the Y cable clamp on the right side of the XY table. See [Figure 18](#).

Figure 18: Y cable clamp

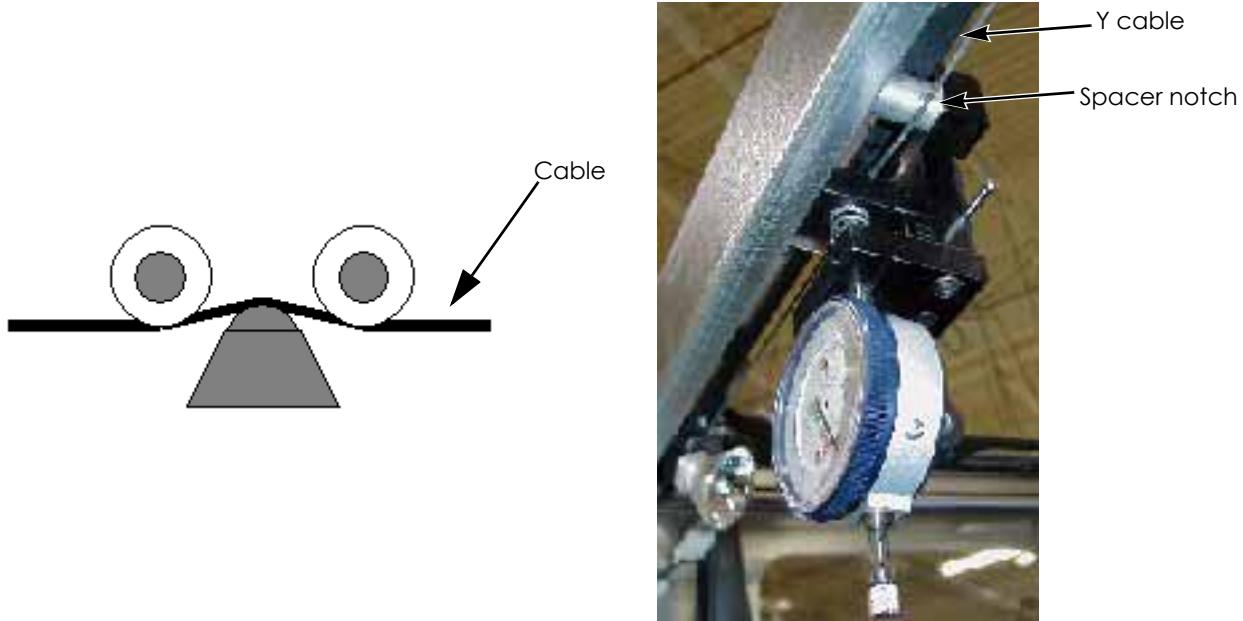


7. The Y cable clamp must be loosened to properly adjust the Y cable tension.
8. Remove the cable clamp set screw using a $\frac{3}{32}$ " allen wrench.
9. Loosen the cable clamp by backing out the two (2) mounting screws using a standard screwdriver. Ensure that the clamp is not impeding movement of the Y cable.
10. Move the swivel head to the rear of the machine (+Y).
11. While holding the gauge fixture upside down in the "open" position, guide the fixture onto the Y cable. See drawing below for proper cable routing through gauge posts.



Ensure the cable is seated in both spacer notches. See **Figure 19**.

Figure 19: Y cable and gauge



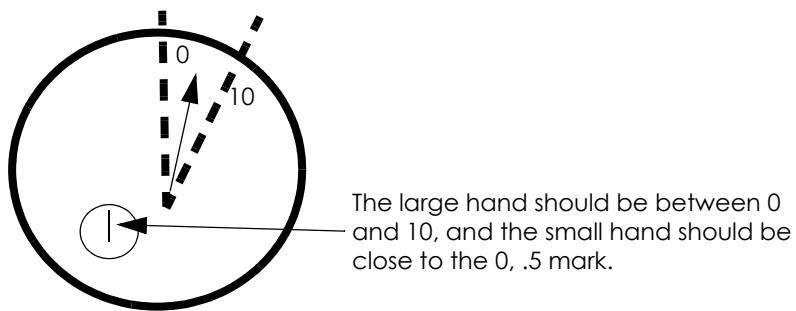
12. Gauge should read between **0.090 to 0.100** (counter clockwise) deflection when indicator is zeroed using the zero gauge, see [Figure 20](#). When reading the gauge, ensure the indicator is behind the zero point.



Always double check to ensure the reading is more negative than positive. The dial indicator shown is an example. Yours may rotate in reverse of this example.

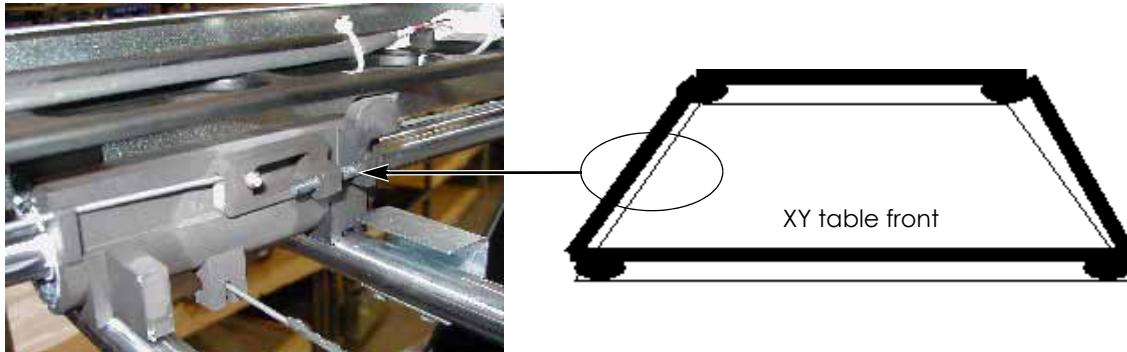
13. If the cable tension is our of tolerance, the cable will need to be adjusted.

Figure 20: Reading the dial indicator



14. Locate the Y tension adjustment screw. See [Figure 15](#).

Figure 21: Y tension screw location



15. Using a $\frac{9}{64}$ " allen wrench, turn the screw clockwise to tighten and counter clockwise to loosen. When tightening the Y cable, one turn of the tensioning screw increases cable tension by about 2.5 kg (0.025"). Continue to turn the screw until desired tension is read on the gauge.
16. Remove the fixture by squeezing the fixture to the open position.
17. Move the swivel head forward and back wards in Y the full travel length a minimum of four times.

18. Again check Y cable tension. Repeat steps 15 through 17 until correct tension is achieved. Remove gauge.
19. Secure the Y cable clamp by tightening the two mounting screws and replacing and tightening the set screw.

X Cable Adjustment:

1. Rezero the tension gauge.
2. Move the head midway in Y and to the right in X **until end of travel is reached.**
3. While holding the gauge fixture upside down in the “open” position, guide the fixture onto the X cable. Ensure the cable is seated in both spacer notches. See [Figure 22](#).

Figure 22: Gauge position on X cable



4. Record the gauge reading.
5. Remove gauge and move head to the left until end of travel is reached.
6. Again guide the fixture onto the X cable (to the right of the head). Ensure the cable is seated in both spacer notches.
7. Record this value as well.
8. The lower of the two reading should read between 0.090 to 0.100 (counter clockwise) deflection when indicator is zeroed using the zero gauge. Again, when reading the gauge, ensure the indicator is behind the zero point.



Always double check to ensure the reading is more negative than positive.

9. If the cable tension is out of tolerance, the cable will need to be adjusted.
10. Attach the gauge to the X cable on the side with the lowest value. Remember to move the head to the end of travel.
11. Locate the X tension adjustment screw. The right side panel may need to be removed to access screw.

12. Using a $\frac{9}{64}$ " allen wrench, turn the screw clockwise to tighten and counter clockwise to loosen. When tightening the X cable, one turn of the tensioning screw increases cable tension by about 4.5 kg (0.045").
13. Continue to turn the screw until desired value is reached.
14. Remove the fixture by squeezing the fixture to the open position.
15. Move the swivel head back and forth in X the full travel length a minimum of four times.
16. Again check the X cable tension. Repeat steps 2 through 16 until correct tension is achieved. Remove gauge. Both sides will **NOT** read the same. Tension is correct when the **lower** of the two reading is correct.
17. Clean and lube guide rods according to the User Guide instructions.
18. Replace any panels that may have been removed.
19. Power on the machine.
20. Run the Y-lash calibration test and adjust value if necessary.

Final Test:

1. Run a test part to verify system is building correctly.



Do not store the calibration bar attached to the gauge assembly. It will cause the fixture spring to lose tension.

Leveling the XY Table (Cable Drive)

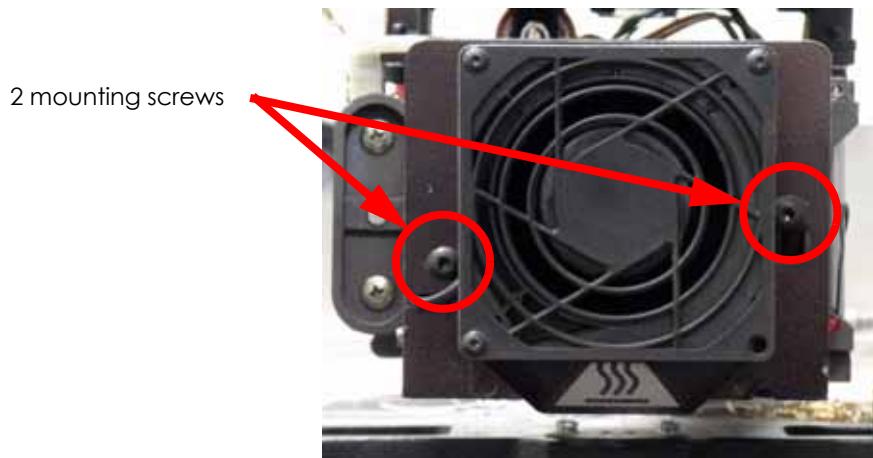
Required Tools

- $\frac{1}{8}$ " allen wrench
- $\frac{3}{8}$ " allen wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- Head bracket
- Dial indicator

Leveling Procedure:

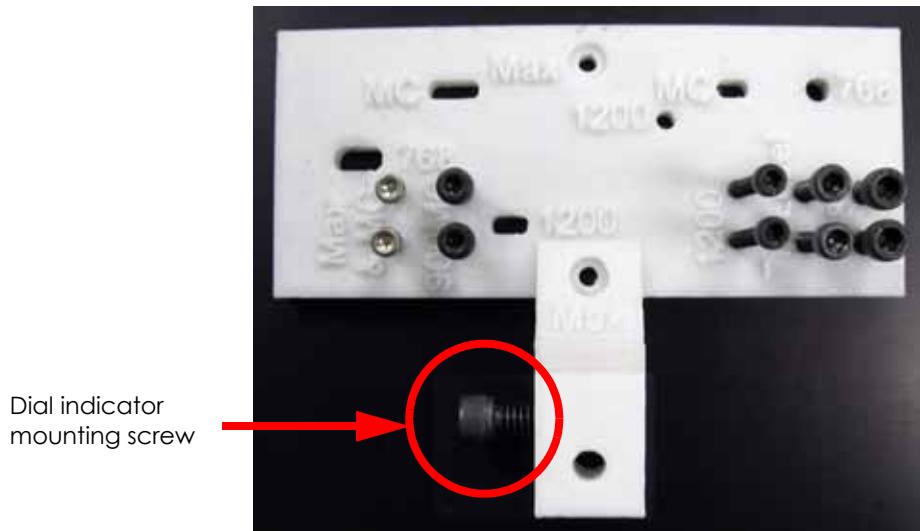
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 23](#).

Figure 23: Head fan mounting screw locations



6. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 24](#).

Figure 24: Head bracket mounting screws



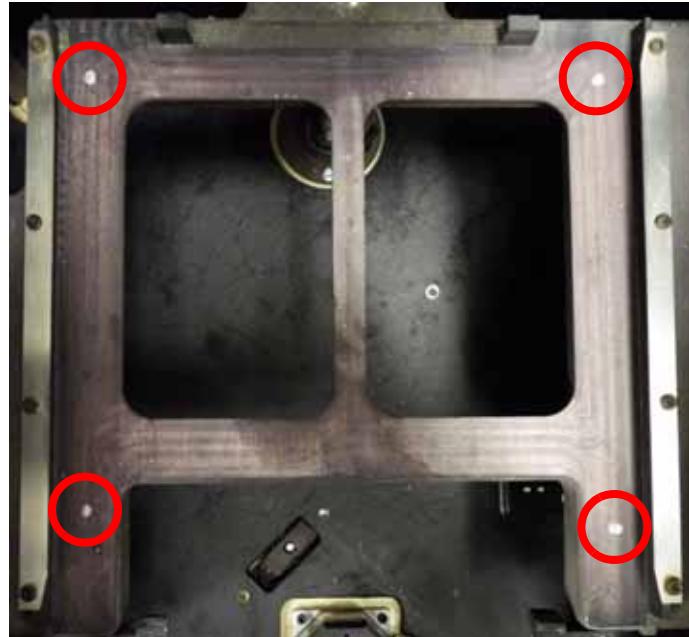
7. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 25](#).

Figure 25: Dial indicator installation



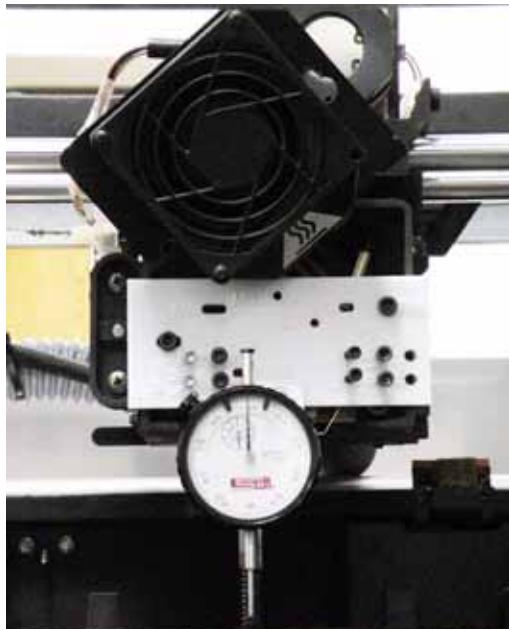
8. Using a light colored marker, mark the Z platen in the rear left, rear right, front left and front right corners. See [Figure 26](#).

Figure 26: Z platen mark locations



9. Align the head bracket and dial indicator with the head fan mounting holes and use a $\frac{1}{8}$ " allen wrench to install the 2 mounting screws. Position the head fan behind the head bracket. See [Figure 27](#).

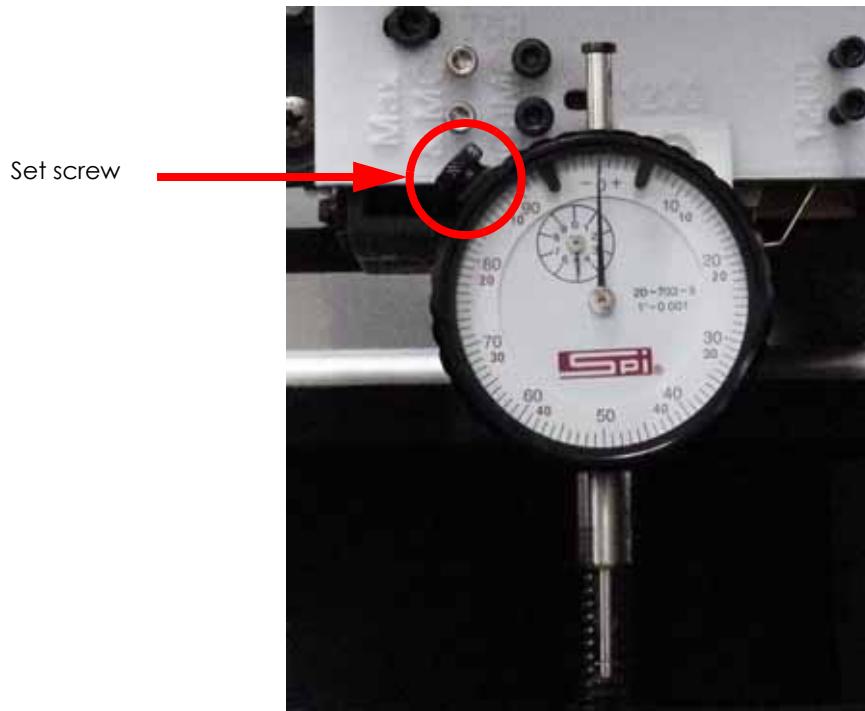
Figure 27: Head bracket and dial indicator installation



10. Move the head to the left rear corner mark of the Z platen.

11. Raise the Z stage until it is 2 inches from the upper limit by turning the lead screws.
12. Carefully move head to each of the 4 corners of the platen to determine the HIGHEST corner of the XY (LOWEST indicator reading).
13. Move the dial indicator to the highest corner and zero the dial indicator by loosening the set screw and turning the dial until the long hand is at 0. Once the dial indicator is at zero, tighten the set screw. See [Figure 28](#).

Figure 28: Zero the dial indicator



14. Move indicator to the remaining 3 corners and record the height at each.



The LOWER the XY table is, the GREATER the indicator reading will be.

15. Each 0.010 shim will cause the head to raise approximately 0.004" at each corner.



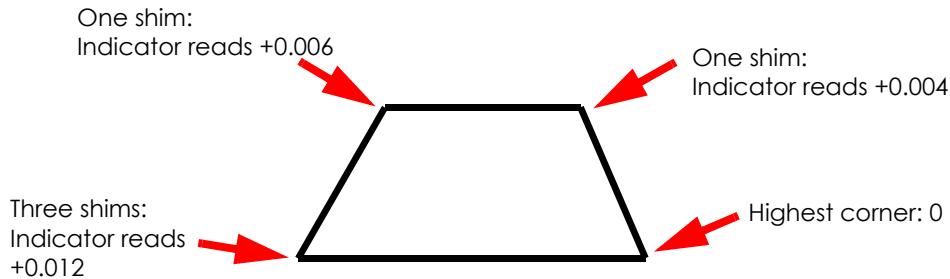
As an example: If a corner of the XY is low 0.012 (indicator reads +0.012) it will take three shims to raise it to the correct height.



If the table is off by a number not divisible by 4, round to the nearest shim. (0.009" would be two shims, 0.010" would be two shims, 0.011" would be 3 shims)

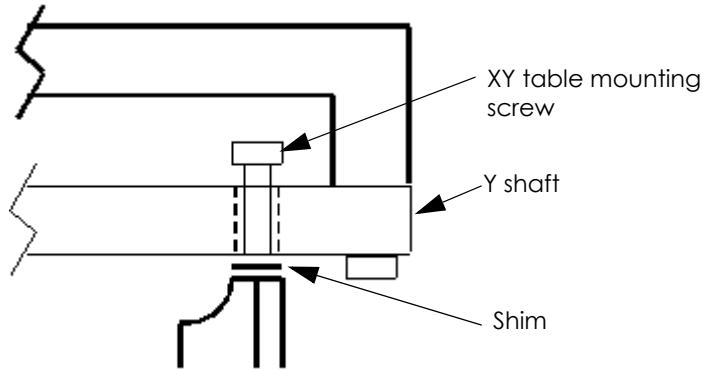
16. Calculate the number of shims needed at each of the three corners. See [Figure 29](#).

Figure 29: Shim calculation



17. Once the number of shims has been determined, loosen all four of the XY table mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
18. At one of the low corners loosen the mounting screw until it can be removed.
19. Slightly lift this end of the XY table and pull the screw upwards enough to slip shim(s) in place. Shim(s) should be located between the Y shaft and the top Z casting post. See [Figure 30](#).

Figure 30: Shim location



20. Feed mounting screw through shim(s) and into threaded hole. Loosely secure the screw by turning screw a few rotations. Do not tighten.
21. Repeat steps [18 - 20](#) for the remaining two corners.
22. Tighten all four XY table mounting screws using a $\frac{5}{16}$ " nut driver or standard screwdriver.
23. Move the dial indicator to all four corners to check if table is level.
24. The table is level if it is within 0.003". If the table is NOT level, repeat steps [13 - 23](#).
25. Remove the 2 mounting screws from the head bracket.
26. Remove the dial indicator mounting screw from the head bracket.
27. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
28. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.

29. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
30. Power on the system. The system should reach **Idle** with no displayed errors.
31. Open Maraca from a lap top or workstation PC.
32. Connect to the printer.
33. Select Table from Maraca menu.
34. Table calibration window will open.
35. Insert XY Table calibration diskette into workstation floppy drive.
36. Click on the folder icon. Browse to select floppy drive.
37. Double click on the XXX.dat file. File will now appear in the table calibration field.
38. Click on the green check mark to download the file and exit Maraca.
39. Restart the printer.
40. Perform tip offset calibrations. See "[Tip Offset Calibration](#)" on page 6-8.
41. Perform part based calibration. See "[Part Based Calibration](#)" on page 6-12.
42. Run a small test part and monitor system operation during build.

Leveling the XY Table (Belt Drive for 3 LS)

This process is only needed when installing a XY table (belt drive) into a three lead-screw system.

Required Tools

- Shims (0.010 thick)
- Dial indicator
- Head bracket
- Standard service tools
- Maraca CD

Checking the XY Table Level

1. Locate and verify the five XY table mounting screws are completely tight.

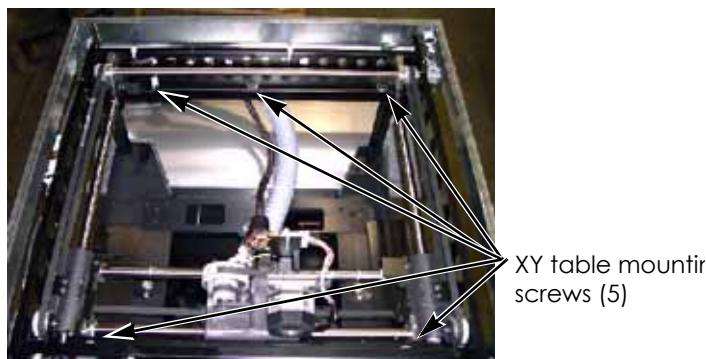


Figure 31: Mounting Screws (5) Location

2. Remove the front head panel screws and remove the panel using a 1/8" Allen wrench.
3. Attach the dial indicator to the head fixture bracket.
4. Attach the head fixture bracket (with dial indicator attached) to the front of the head.
5. Move the head to the back above the left rear corner of the Z platen.
6. Raise the Z platen up to meet the tip of the dial indicator by manually pulling on the Z drive belt.
7. Continue moving the Z platen up approximately 1/2" once the platen contacts the indicator tip.
8. Carefully move head to each corner of the platen to determine the HIGHEST corner of the XY (LOWEST indicator reading).
9. Move indicator back to the highest corner and 0 the indicator by adjusting the Z platen height.
10. Move indicator to the remaining three corners and record the height at each. The LOWER the XY table is, the GREATER the indicator reading will be.

11. Each 0.010 shim will cause the head to raise approximately 0.004" at the corner of the 8 inch build envelope.
12. As an example: If a corner of the XY is low 0.012 (indicator reads +0.012) it will take three shims to raise it to the correct height.
13. If the table is off by a number not divisible by 4, round to the nearest shim. (0.009" would be two shims, 0.010" would be two shims, 0.011" would be 3 shims)
14. Calculate the number of shims needed at each of the five screws .

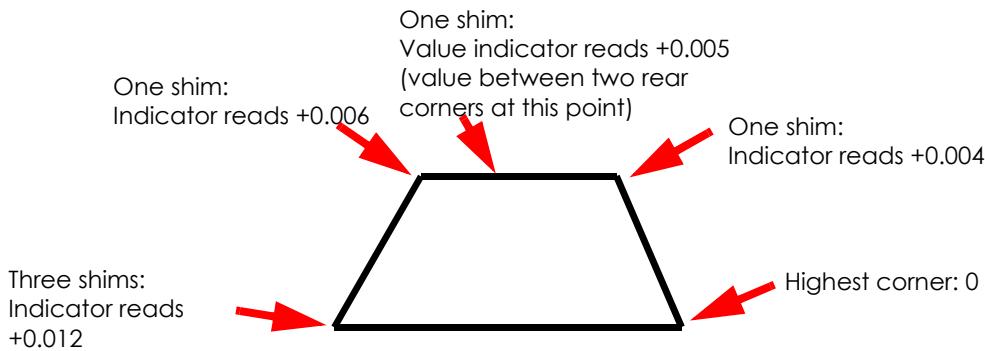


Figure 32: Shim Calculation

15. Once the number of shims has been determined, loosen all five XY table mounting screws.
16. At one of the low corners loosen the mounting screw until it can be removed.
17. Slightly lift this end of the XY table and pull the screw upwards enough to slip shim(s) in place.



You may have to remove more than one screw to properly position the shim.

18. Shim(s) should be located between the XY table frame and Z stage horizontal mounting bracket.
19. Feed mounting screw through shim(s) and into threaded hole. Loosely secure the screw by turning screw a few rotations. Do not tighten.
20. Repeat steps 18 and 19 for the remaining two corners.
21. Tighten all five XY table mounting screws.
22. Again move the indicator to all four corners to check if table is level.
23. The table is level if it is within 0.003". If the table is NOT level, repeat leveling process.
24. Once the table is level, remove the head fixture bracket (with dial indicator attached) from the front of the head.

Tensioning the X & Y Motor Belts (Belt Table)

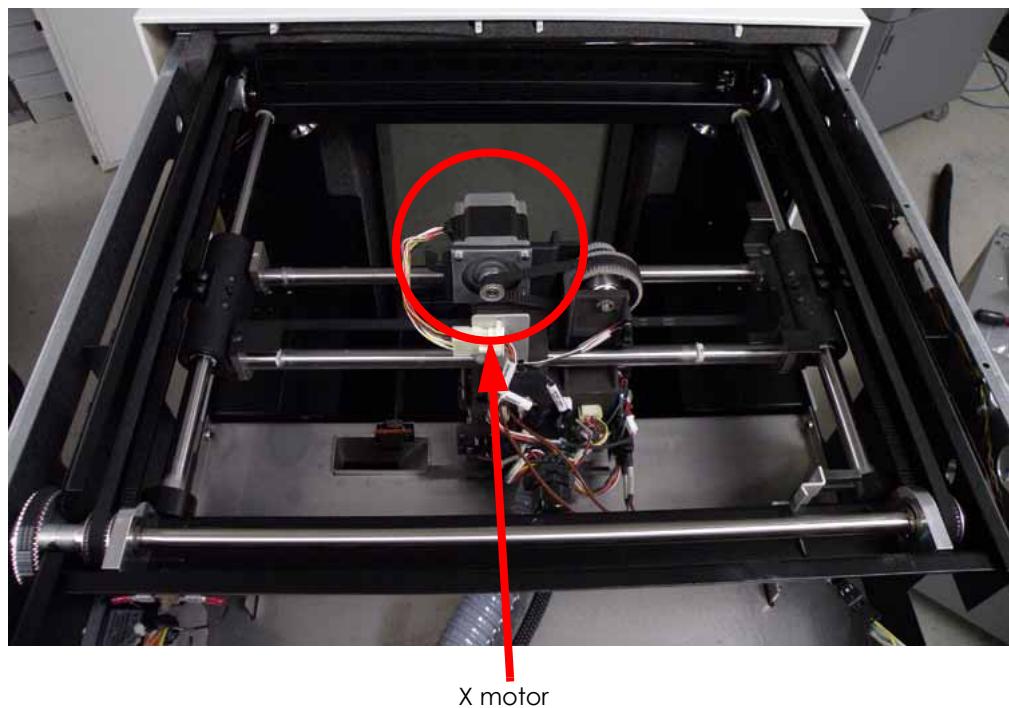
X Motor Belt

Required Tools

- $\frac{9}{64}$ " allen wrench
- Belt tension tool

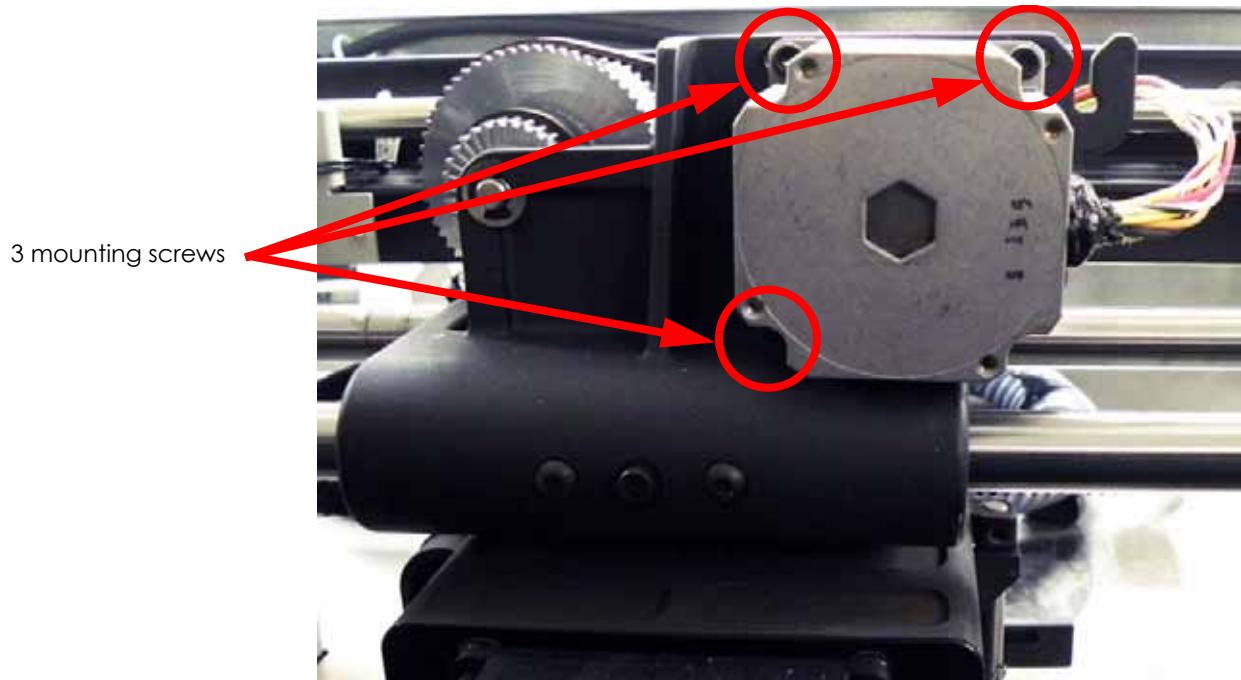
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the X motor. See [Figure 33](#).

Figure 33: X motor location



6. Using a $\frac{9}{64}$ " allen wrench, remove the 3 X motor mounting screws. See [Figure 34](#).

Figure 34: X motor mounting screw locations



7. Insert the XY motor belt tension tool between the X motor pulley and the X drive pulley by squeezing the tension tool and releasing pressure when in place. See [Figure 35](#).

Figure 35: XY belt tension tool placement



8. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 X motor mounting screws.

9. Remove the belt tension tool.
10. Reinstall the side panels. See “[Side Panels](#)” on page 5-11.
11. Reinstall the rear door. See “[Installing the Rear Door](#)” on page 5-10.
12. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
13. Power on the system. The system should reach **Idle** with no displayed errors.
14. Run a small test part and monitor system operation during build.

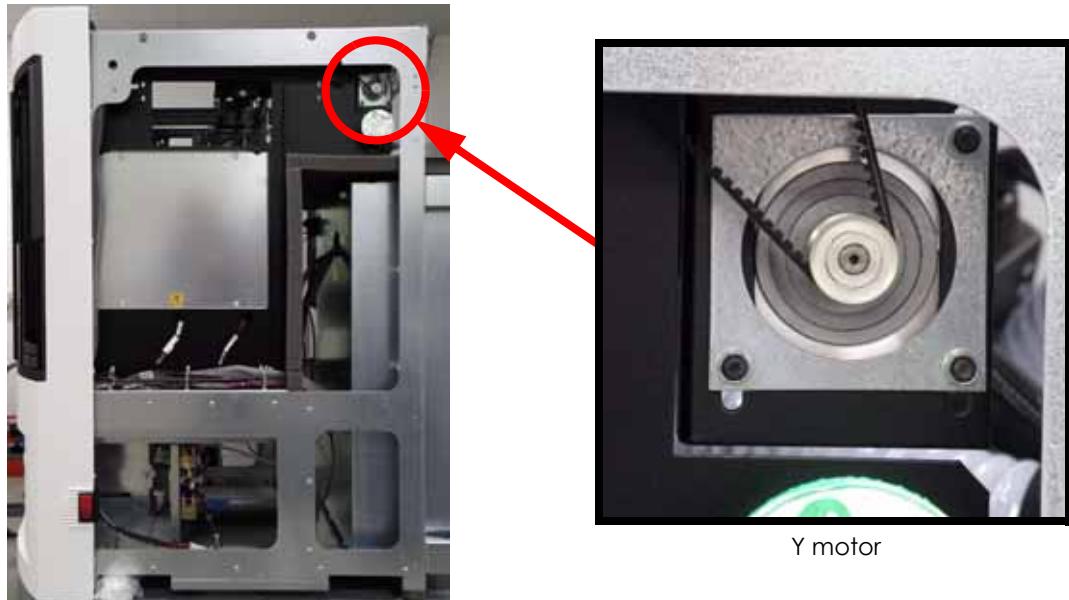
Y Motor Belt

Required Tools

- $\frac{9}{64}$ ” allen wrench
- XY motor belt tension tool

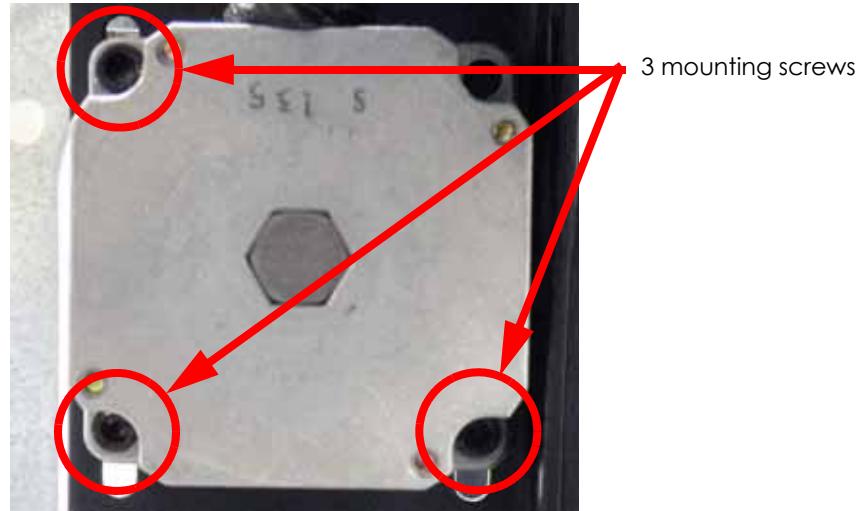
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Locate the Y motor. See [Figure 36](#).

Figure 36: Y motor location



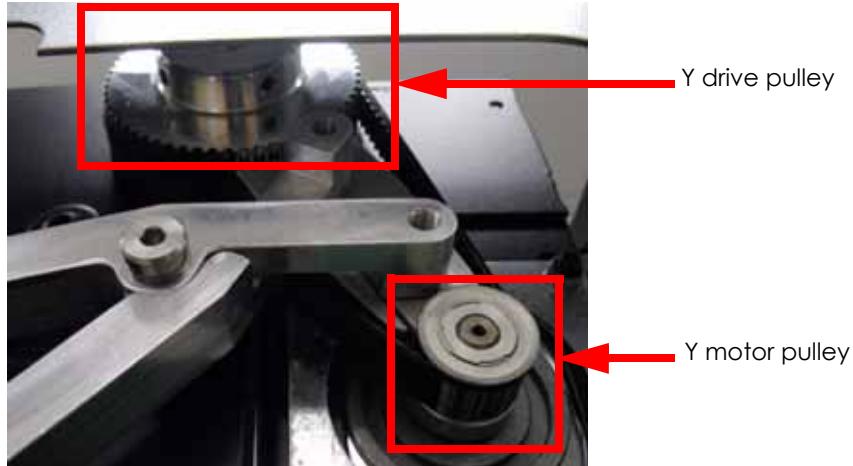
6. Using a $\frac{9}{64}$ ” allen wrench, loosen but do not remove the 3 Y motor mounting screws. See [Figure 37](#).

Figure 37: Y motor mounting screw locations



7. Insert the XY belt tension tool between the Y motor pulley and the Y drive pulley by squeezing the handles together. When in place, release the handles to obtain tension. See [Figure 38](#).

Figure 38: XY belt tension tool location



8. Using a $\frac{9}{64}$ " allen wrench, completely tighten the 3 mounting screws.
9. Remove the XY motor belt tension tool.
10. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
11. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
12. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
13. Power on the system. The system should reach **Idle** with no displayed errors.
14. Run a small test part and monitor system operation during build.

Tensioning the X & Y Drive Belts (Belt Table)

X Drive Belt

Required Tools

- $\frac{9}{64}$ " allen wrench
- $\frac{7}{64}$ " allen wrench
- $\frac{3}{8}$ " nut driver or box wrench
- Small standard screwdriver
- XY motor belt tensioning tool
- Belt tension gauge
- Dial Indicator

Removing the X Motor Belt:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Let printer cool for 1 hour.
6. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 39](#).

Figure 39: Belt tension gauge zero block



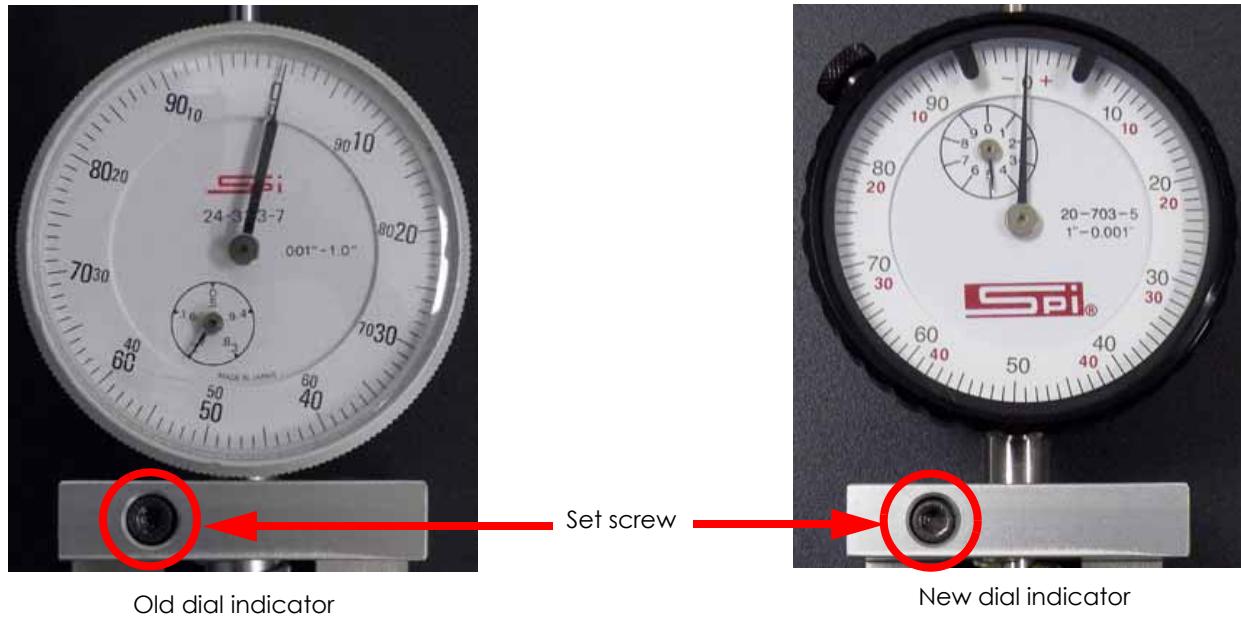
Old dial indicator



New dial indicator

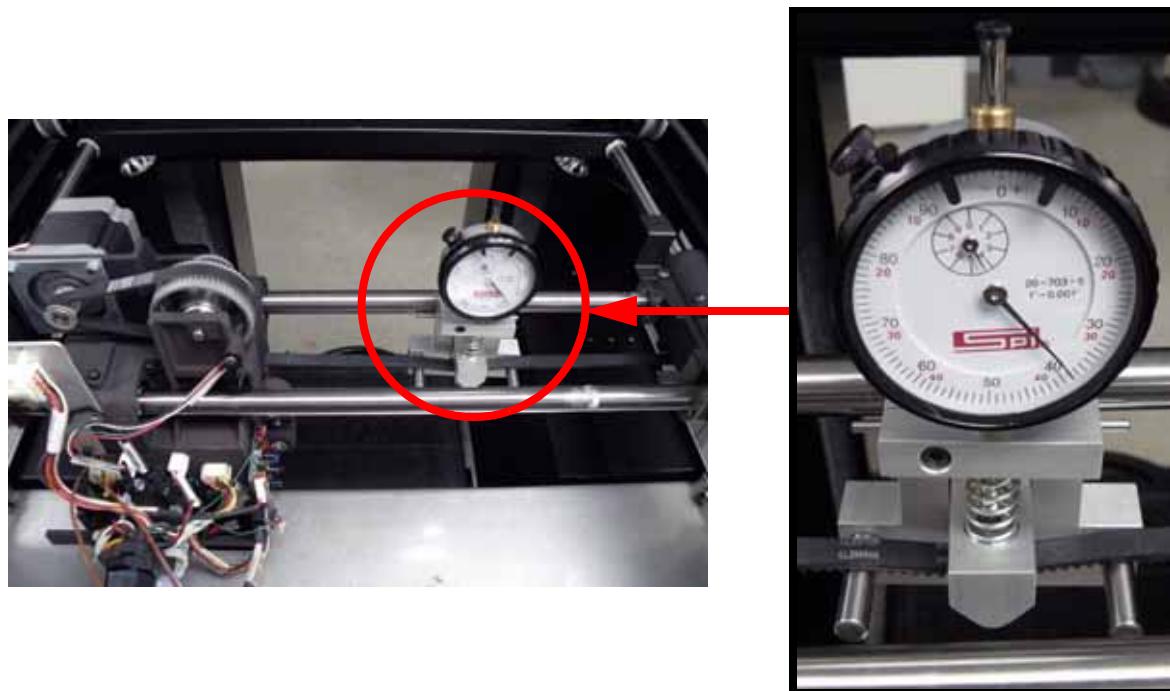
7. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 40](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 40](#).

Figure 40: Setting the dial indicator



8. Remove the zero block from the belt tension gauge.
9. Move the head to the far right side of the printer.
10. Place the belt tension gauge on the center of the X drive belt. See [Figure 41](#).

Figure 41: Belt tension gauge location



11. Using a $\frac{3}{8}$ " nut driver or box wrench, tighten the X drive belt by turning the X drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 20 and 25 mils and the small hand is nearly on 1.6. See [Figure 42](#).
 - b. The new dial indicators large hand is between 30 and 40 mils and the small hand is between 4 and 5. See [Figure 42](#).

Figure 42: Dial indicator readings



Old dial indicator



New dial indicator

12. Remove the tension gauge and move the head from left to right several times.
13. Reattach the tension gauge to the X drive belt and measure belt tension. If tension is out of specification, repeat steps [9 - 12](#) until the belt tension is within specification.
14. Reconnect the X motor by pushing the connectors together.
15. Reinstall the side panels. See "[Side Panels](#)" on page [5-11](#).
16. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page [5-10](#).
17. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
18. Power on the system. The system should reach **Idle** with no displayed errors.
19. Run a small test part and monitor system operation during build.

Y Drive Belt

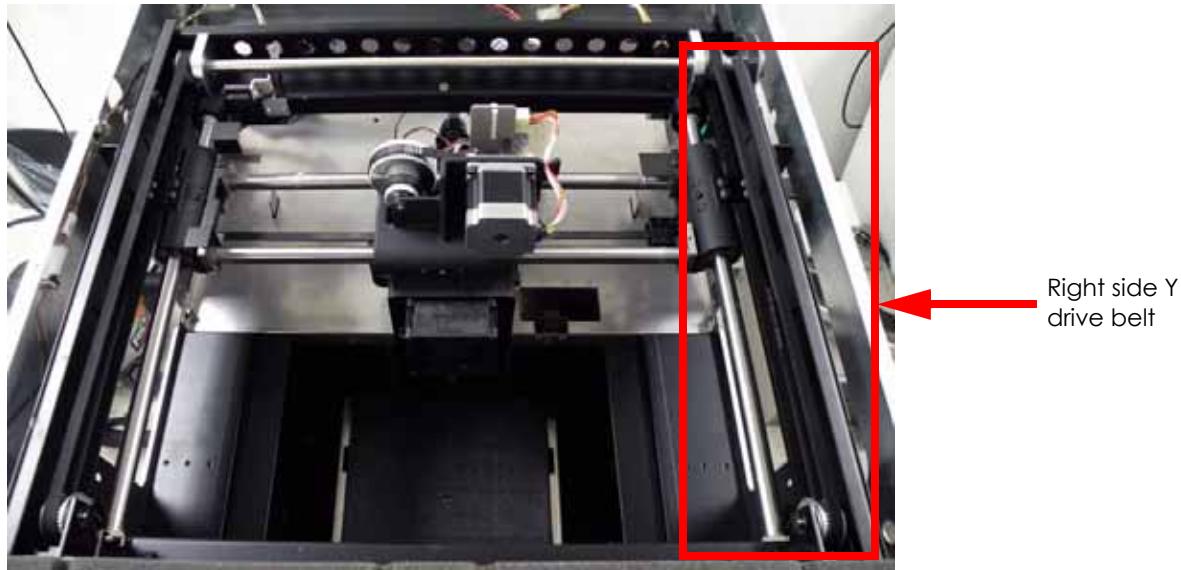
Required Tools

- $\frac{1}{2}$ " nut driver or box wrench
- $\frac{5}{16}$ " nut driver or standard screwdriver
- $\frac{1}{8}$ " allen wrench
- Belt tension gauge
- Dial Indicator

Tension the Right Side Y Drive Belt:

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See “[Removing the Rear Door:](#)” on page 5-9.
4. Remove the side panels. See “[Side Panels](#)” on page 5-11.
5. Remove the front bezel. See “[Removing the Front Bezel:](#)” on page 5-13.
6. Let printer cool for 1 hour.
7. Locate the right side Y drive belt. See [Figure 43](#).

Figure 43: Right side Y drive belt location



8. Using a $\frac{1}{8}$ " allen wrench, remove the 4 right side Y belt clamp mounting screws and remove the belt clamp. See [Figure 44](#).

Figure 44: Right side Y belt clamp mounting screw locations

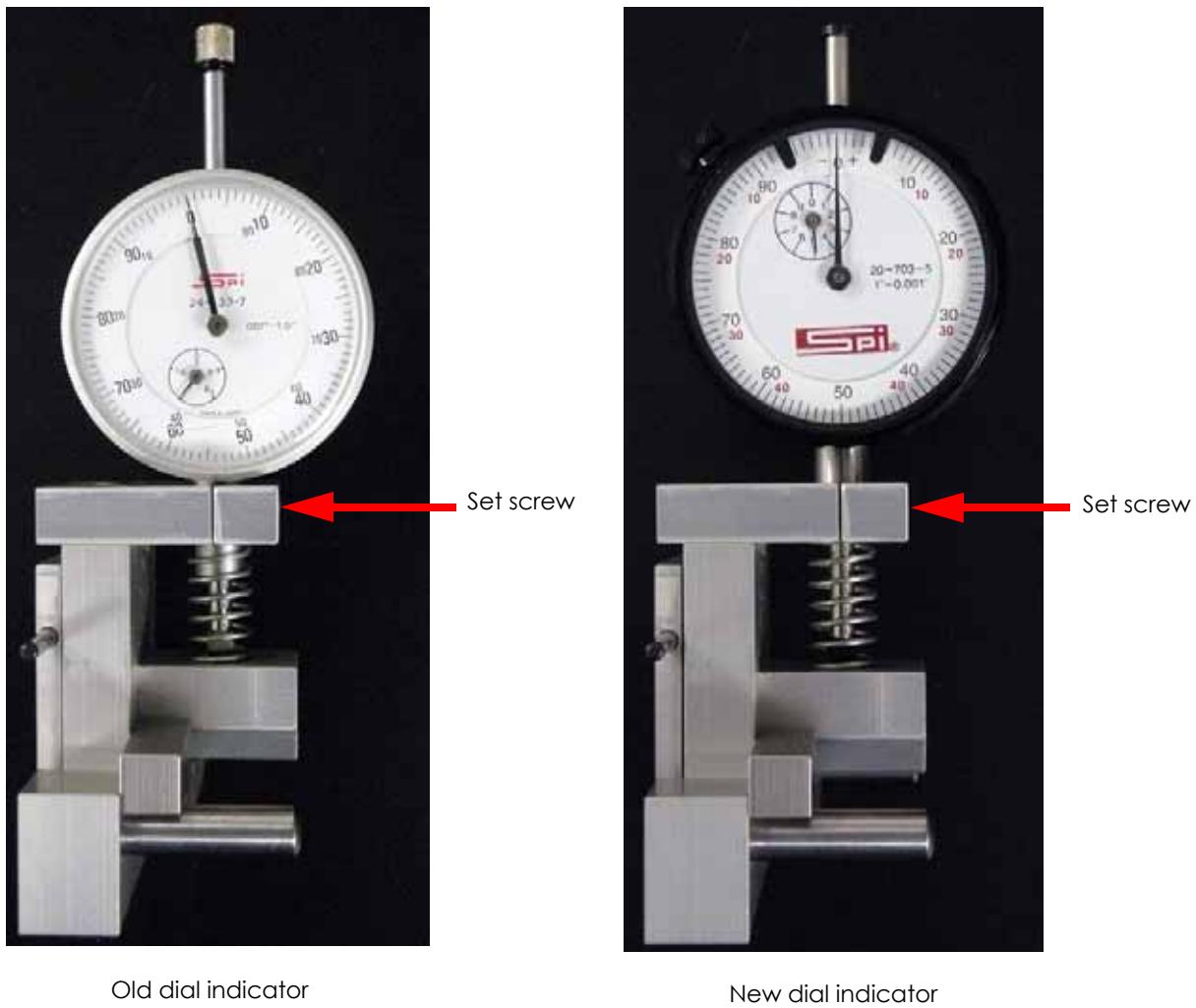


9. Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 45](#).
10. Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - a. The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 45](#).
 - b. The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 45](#).



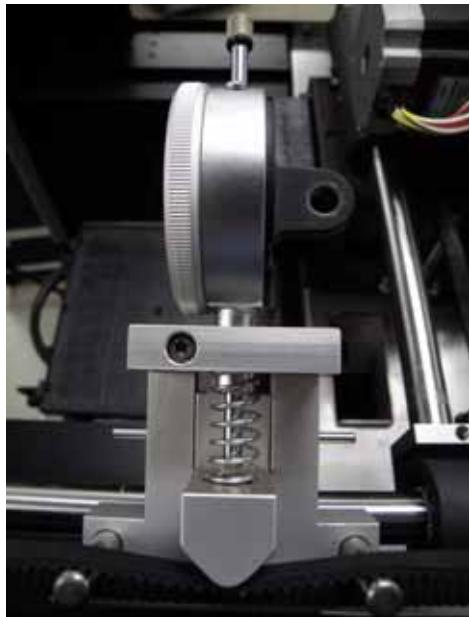
Turn the dial indicator to the left so the face is visible while tensioning the right side Y drive belt.

Figure 45: Belt tension gauge zero block



11. Remove the zero block from the belt tension gauge.
12. Move the head to the rear of the printer.
13. Place the belt tension gauge on the center of the right side Y drive belt. See [Figure 46](#).

Figure 46: Belt tension gauge location



Right View



Front View

14. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the right side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 47](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 47](#).

Figure 47: Dial indicator readings



Old dial indicator



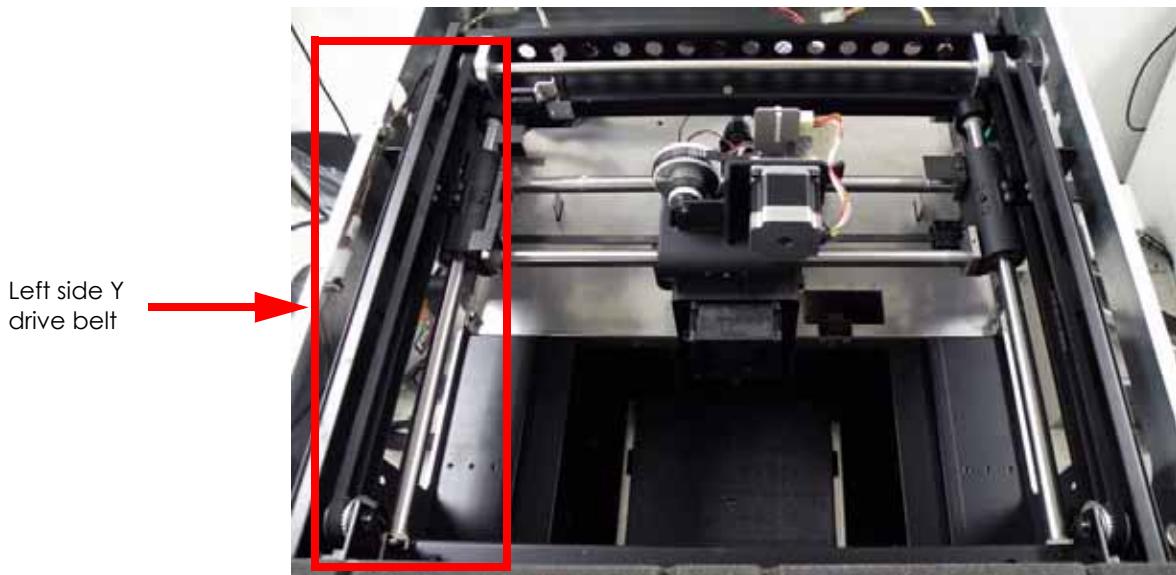
New dial indicator

15. Remove the tension gauge and move the head from front to back several times.
16. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps [12 - 15](#) until the belt tension is within specification.
17. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
18. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
19. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
20. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
21. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
22. Power on the system. The system should reach **Idle** with no displayed errors.
23. Run a small test part and monitor system operation during build.

Tension the Left Side Y Drive Belt:

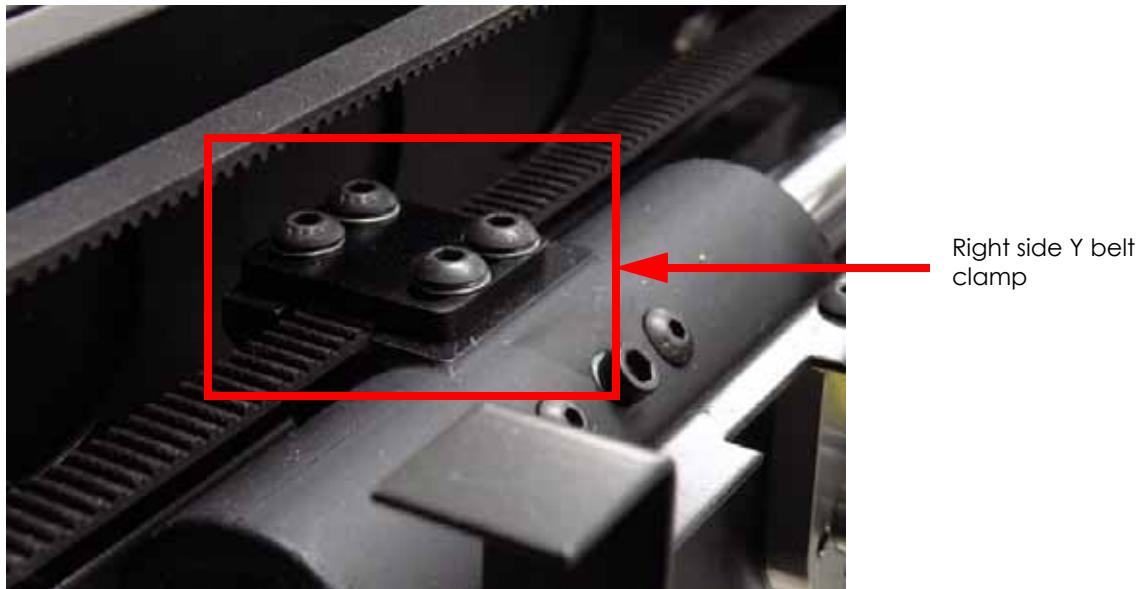
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Remove the front bezel. See "[Removing the Front Bezel:](#)" on page 5-13.
6. Let printer cool for 1 hour.
7. Locate the left side Y drive belt. See [Figure 48](#).

Figure 48: Right side Y drive belt location



- Using a $\frac{1}{8}$ " allen wrench, remove the 4 left side Y belt clamp mounting screws and remove the belt clamp. See [Figure 49](#).

Figure 49: Left side Y belt clamp mounting screw locations

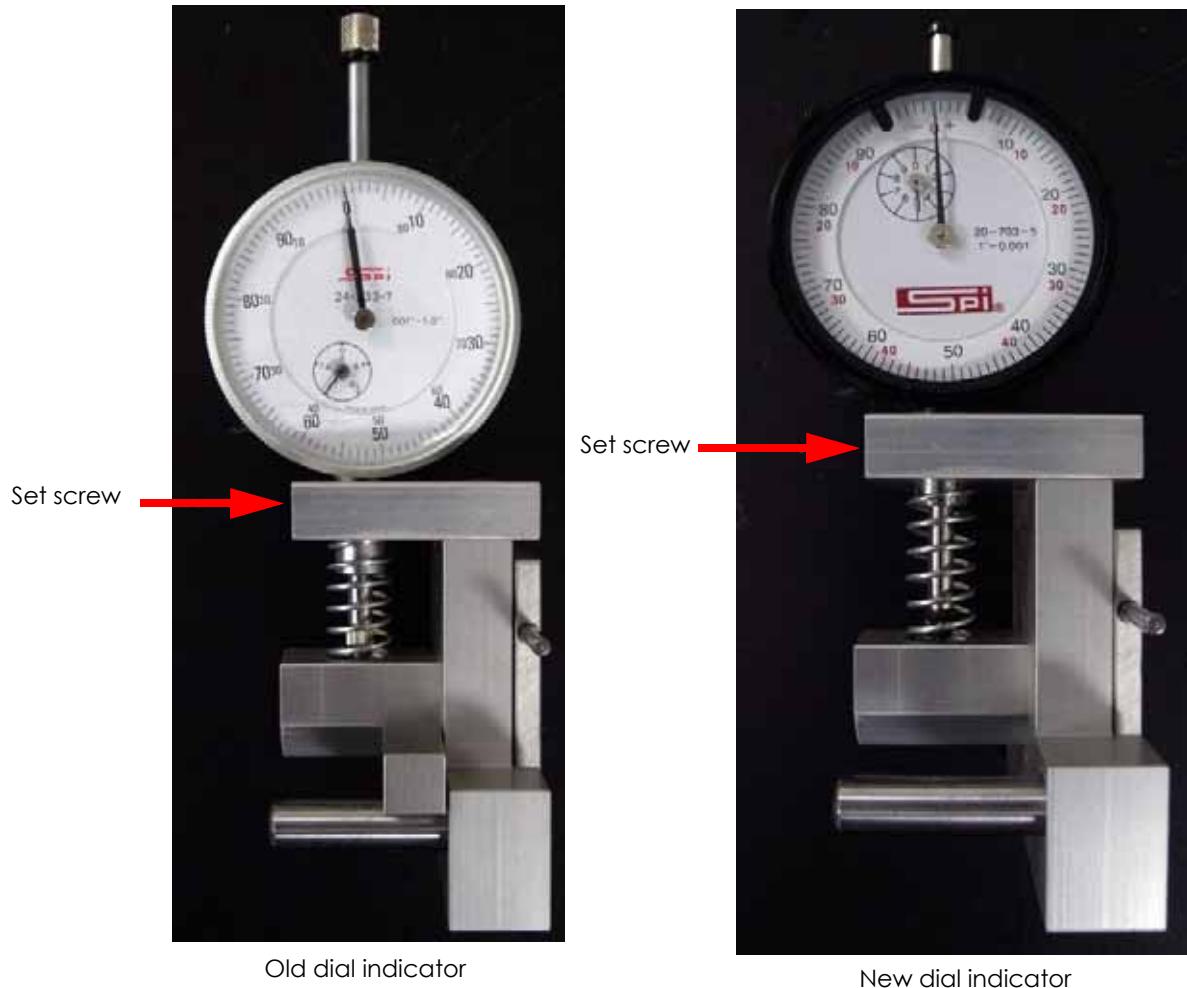


- Insert the belt tension gauge zero block into the belt tension gauge. See [Figure 50](#).
- Zero the dial indicators by adjusting the dial indicator up or down until the gauge reads:
 - The old dial indicator will be at zero when the large hand is on 0 and the small hand is on 2.7, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 50](#).
 - The new dial indicator will be at zero when the large hand is on 0 and the small hand is on 5, when at zero use a $\frac{7}{64}$ " allen wrench to tighten the set screw. See [Figure 50](#).



Turn the dial indicator to the right so the face is visible while tensioning the left side Y drive belt.

Figure 50: Belt tension gauge zero block



11. Remove the zero block from the belt tension gauge.
12. Move the head to the rear of the printer.
13. Place the belt tension gauge on the center of the left side Y drive belt. See [Figure 51](#).

Figure 51: Belt tension gauge location



Left View



Front View

14. Using a $\frac{1}{2}$ " nut driver or box wrench, tighten the left side Y drive belt by turning the drive belt tensioning nut clockwise until:
 - a. The old dial indicators large hand is between 90 and 20 mils and the small hand is nearly on 1.6. See [Figure 52](#).
 - b. The new dial indicators large hand is between 20 and 30 mils and the small hand is between 4 and 5. See [Figure 52](#).

Figure 52: Dial indicator readings



Old dial indicator



New dial indicator

15. Remove the tension gauge and move the head from front to back several times.
16. Reattach the tension gauge to the right side Y drive belt and measure belt tension. If tension is out of specification, repeat steps [12 - 15](#) until the belt tension is within specification.
17. Align the right side Y drive belt clamp with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 4 mounting screws.
18. Reinstall the front bezel. See "[Installing the Front Bezel:](#)" on page 5-20.
19. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
20. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
21. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
22. Power on the system. The system should reach **Idle** with no displayed errors.
23. Run a small test part and monitor system operation during build.

Leveling the XY Table (Belt Drive)

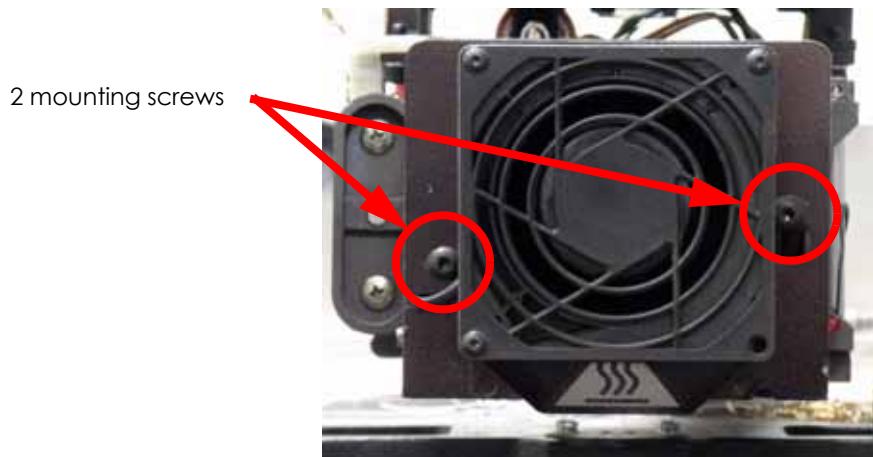
Required Tools

- $\frac{1}{8}$ " allen wrench
- Cam wrench or large crescent wrench
- Head bracket
- Dial indicator

Removing the XY Table Assembly:

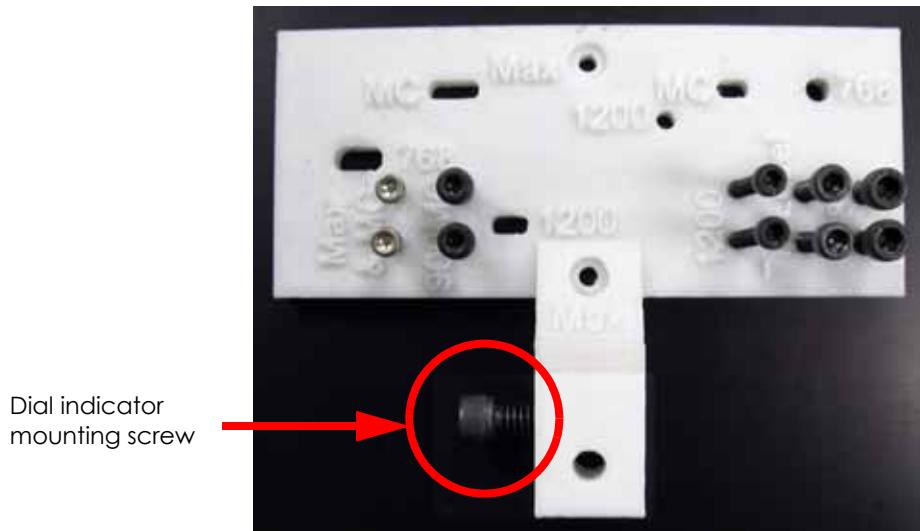
1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.
5. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 53](#).

Figure 53: Head fan mounting screw locations



6. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 54](#).

Figure 54: Head bracket mounting screws



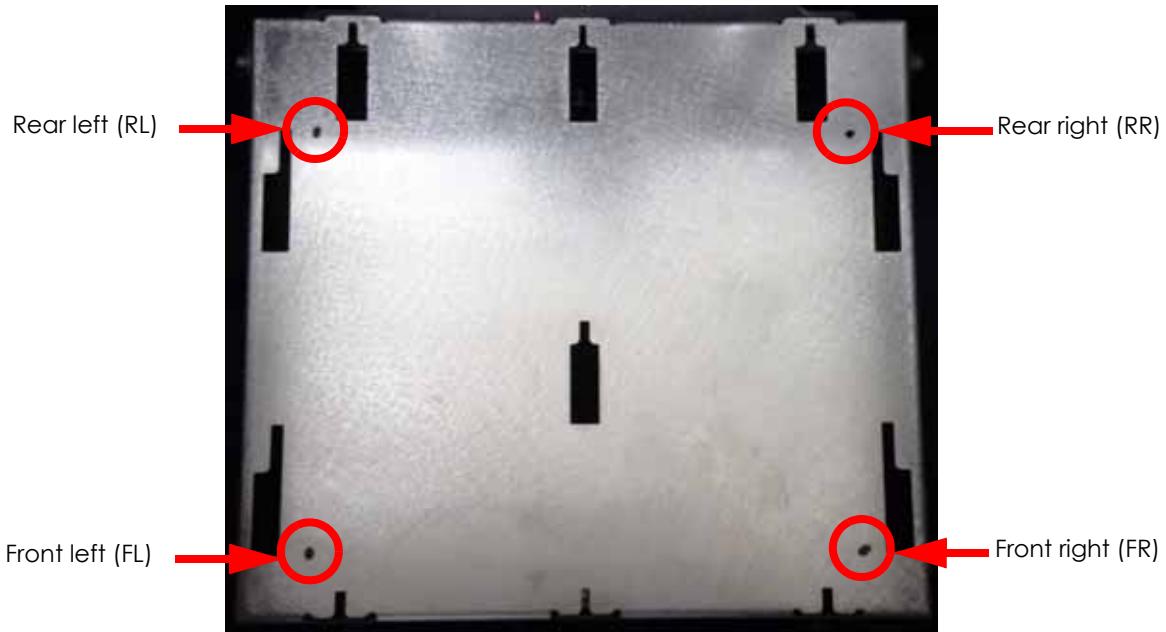
7. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 55](#).

Figure 55: Dial indicator installation



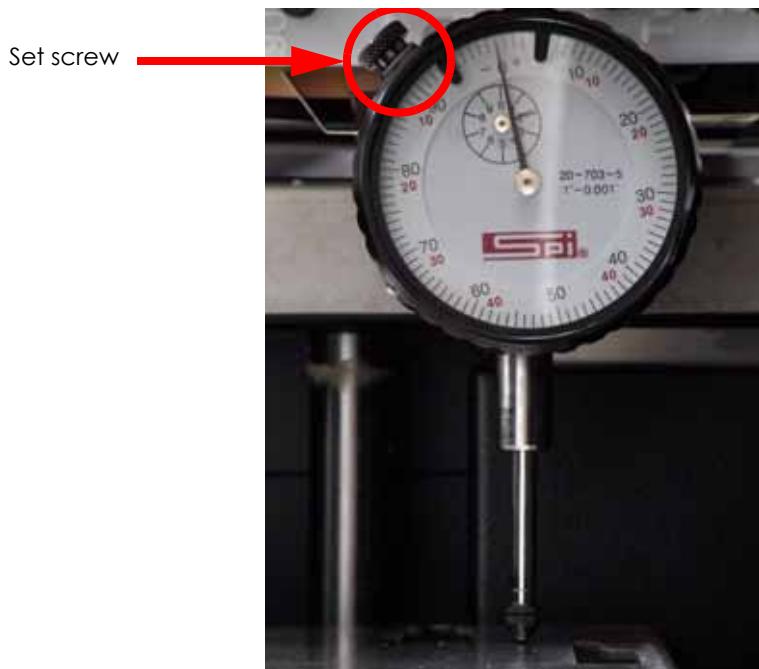
8. Using a marker, mark the Z platen in the rear left corner, rear right corner, front left corner and front right corner. See [Figure 56](#).

Figure 56: Z platen marking locations



9. Manually raise the Z stage, by turning the lead screw with a gloved hand, until it is about 2 inches from the upper limit.
10. Move the dial indicator to the mark on the right rear corner and zero the dial indicator by loosening the set screw and turning the ring until the dial is on the 0. See [Figure 57](#).

Figure 57: Zero the dial indicator



11. Move the dial indicator to the mark on the front right corner of the Z platen and record the value.
12. Move the dial indicator to the mark on the front left corner of the Z platen and record the value.
13. Move the dial indicator to the mark on the rear left corner of the Z platen and record the value.
14. Enter the recorded values from each corner into the indicator reading boxes of the XY Table level calculator. See [Figure 58](#).

Figure 58: XY Table level calculator

Dimension 768 Calculator		
Location	Indicator Reading	Knob Adjust
BR	0.000	-
FR	0.000	0.000
FL	0.000	0.000
BL	0.000	0.000

15. When the values have been entered into the calculator, the knob adjust values will be displayed. See [Figure 59](#).

Figure 59: XY Table level calculator adjustments

Dimension 768 Calculator		
Location	Indicator Reading	Knob Adjust
BR	0.000	-
FR	-0.020	0.046
FL	0.015	-0.021
BL	0.022	-0.006

16. Move the dial indicator to the mark on the front right corner of the Z platen.
17. Zero the dial indicator by loosening the set screw and turning the dial until the indicator is at 0.
18. Using a $\frac{1}{8}$ " allen wrench, loosen the front right XY table mounting screw and cam screw.
19. Using the cam wrench or large crescent wrench, adjust the front right cam until the dial indicator reads the value given by the XY Table level calculator.
20. Using a $\frac{1}{8}$ " allen wrench, tighten the front right XY table mounting screw and cam screw.
21. Move the dial indicator to the mark on the front left corner of the Z platen.

22. Zero the dial indicator by loosening the set screw and turning the dial until the indicator is at 0.
23. Using a $\frac{1}{8}$ " allen wrench, loosen the front left XY table mounting screw and cam screw.
24. Using the cam wrench or large crescent wrench, adjust the front right cam until the dial indicator reads the value given by the XY Table level calculator.
25. Using a $\frac{1}{8}$ " allen wrench, tighten the front left XY table mounting screw and cam screw.
26. Move the dial indicator to the mark on the rear left corner of the Z platen.
27. Zero the dial indicator by loosening the set screw and turning the dial until the indicator is at 0.
28. Using a $\frac{1}{8}$ " allen wrench, loosen the rear left XY table mounting screw and cam screw.
29. Using the cam wrench or large crescent wrench, adjust the front right cam until the dial indicator reads the value given by the XY Table level calculator.
30. Using a $\frac{1}{8}$ " allen wrench, tighten the rear left XY table mounting screw and cam screw.
31. Repeat steps 10 - 30 until each corner of the XY table is within a total tolerance of $+/- 0.001$ for each corner.
32. Remove the head bracket and dial indicator.
33. Align the head fan with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 2 mounting screws.
34. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
35. Reinstall the rear door. See "[Installing the Rear Door:](#)" on page 5-10.
36. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
37. Power on the system. The system should reach **Idle** with no displayed errors.
38. Perform tip level calibrations. See "[Tip Depth Calibration](#)" on page 6-2.
39. Perform tip level calibrations. See "[Leveling the Liquefier](#)" on page 6-4.
40. Perform tip offset calibrations. See "[Tip Offset Calibration](#)" on page 6-8.
41. Build a test part to verify proper operation of the printer.

Adjusting Z BOT (Home) Switch

Required Tools

- $\frac{5}{64}$ " allen wrench
- $\frac{1}{4}$ " nut driver or standard screwdriver
- Marker

1. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
2. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
3. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
4. Remove the side panels. See "[Side Panels](#)" on page 5-11.

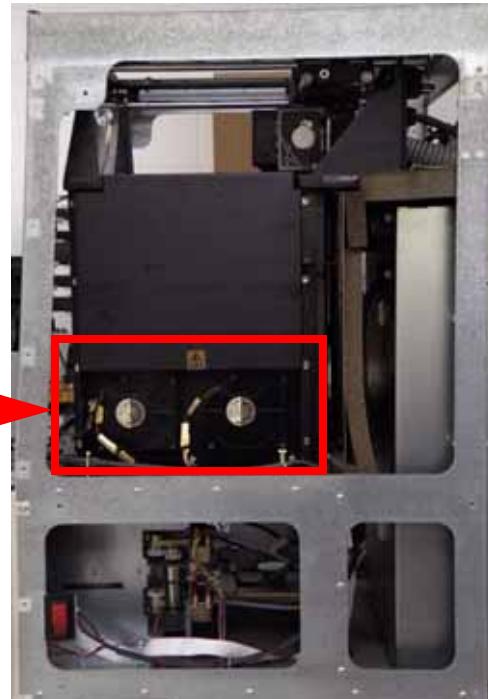


Caution: Envelope area will be hot! Allow envelope to cool down or use an insulated glove before proceeding.

5. Locate the two right side heater fans. See [Figure 60](#).

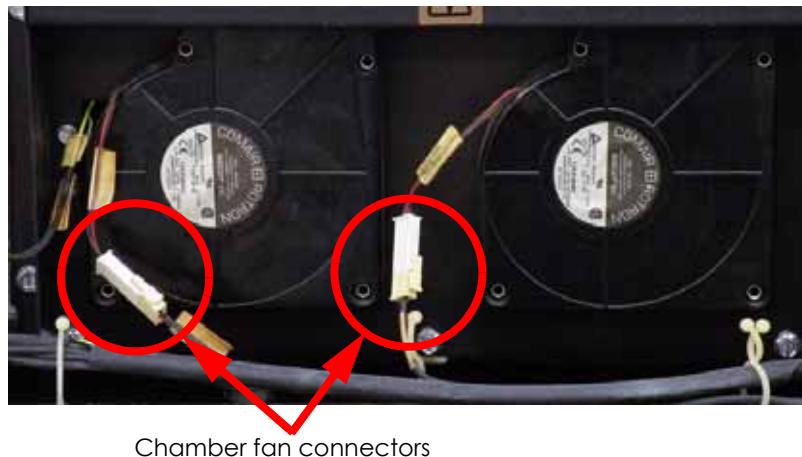
Figure 60: Right side chamber heater fan locations

Right side chamber fans



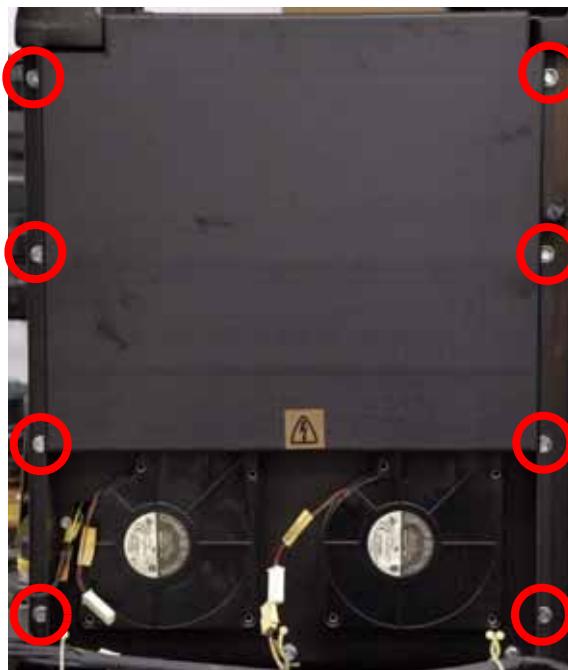
6. Disconnect the 2 right side chamber fans by pressing the tab in and pulling apart. See [Figure 61](#).

Figure 61: Right side chamber fan connector locations



7. Using a $5/16"$ nut driver or standard screwdriver, remove the 8 chamber heater cover mounting screws. See [Figure 62](#).

Figure 62: Chamber heater cover mounting screw locations



8. Open the chamber heater cover away from the front of the printer. See [Figure 63](#).



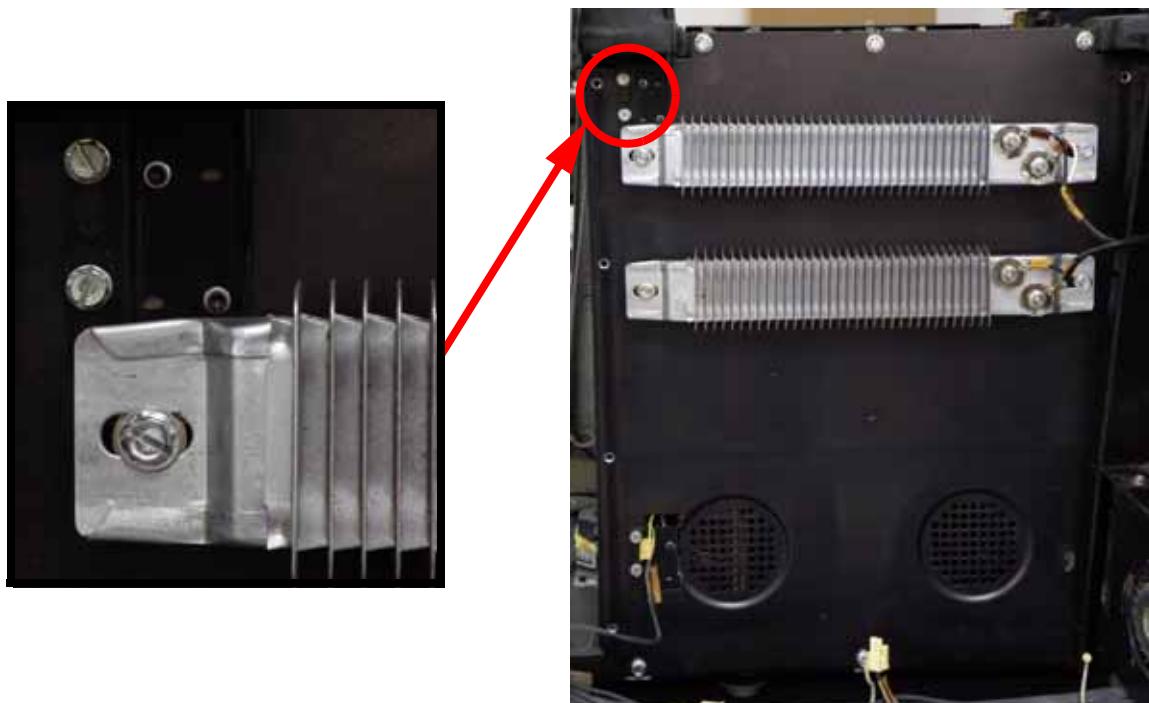
Do not stress the heater wires running into the housing.

Figure 63: Opening the chamber heater cover



9. Locate the Z BOT switch at the upper left corner. See [Figure 64](#).

Figure 64: Z BOT location



10. Using a $\frac{1}{4}$ " nut driver or standard screwdriver, loosen the 2 mounting screws.
11. Adjust the Z BOT switch:
 - a. Locate the Z drive belt. The belt is located beneath the Z stage assembly.
 - b. Reach under the Z stage and pull on the Z motor belt to raise the Z stage until the Z BOT switch engages and makes a click sound.
 - c. Look down at one of the Z stage lead screws. Mark screw with a marker.
 - d. Continue raising the Z stage. The Z stage should reach its **physical** limit when the lead screw has turned approximately $\frac{1}{4}$ turn. If the lead screw turns more than or less than $\frac{1}{4}$ turn, the limit switch will need to be adjusted:
 - i. Using a $\frac{1}{4}$ nut driver or standard screwdriver, loosen the Z BOT switch mounting screws and slide the assembly:
 - Up if the lead screw moved MORE than $\frac{1}{4}$ turn.
 - Down if the lead screw moved LESS than a $\frac{1}{4}$ turn.
 - ii. Tighten the mounting screws and repeat steps **a - d** until the adjustment is correct.



The Z stage will have to be lowered below the Z BOT switch each time to properly test adjustment.

- iii. Test adjustment several times to verify proper limit switch position.
12. Test switch position by repeating step **11** until in specification.
13. Close the chamber heater cover and use a $\frac{5}{16}$ " nut driver or standard screwdriver to reinstall the 8 mounting screws.
14. Reconnect the right side chamber fans by pushing the connectors together.
15. Reinstall the side panels. See "["Side Panels" on page 5-11](#)".
16. Reinstall the rear door. See "["Installing the Rear Door:" on page 5-10](#)".
17. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
18. Power on the system. The system should reach **Idle** with no displayed errors.
19. Run a small test part and monitor system operation during build.

Get/Send Calibration Files

The “Get” button copies the .cal file from the system hard drive to the system calibration floppy. The “Send” copies the .cal file from the system calibration floppy (located in the electronics bay of the system) to the system hard drive.

Important

- Do not use spaces in the .cal prefix name.
- The .cal file is only available (on the system calibration floppy) on systems that shipped with backend version 1132 or greater. Once the system is upgraded and anytime calibration changes are made the .cal file should be written (“Get”) from the system hard drive to the system floppy. The floppy should then be returned to the electronics bay.
- The .cal file includes, but is not limited to: Tip Offset, Tip Depth, Y Lash, X Correction, and the gantry .dat file

Parts and Tools Required

- Maraca > Build 1132
- Workstation (PC)

“Send” .cal file – from the system calibration floppy to the printer:



This would typically be used after installation of a new hard drive.

1. Remove the system calibration floppy from the electronics bay and insert into the workstation floppy drive.
2. Install and open Maraca. Ensure that communications has been established with the system.
3. Select “Send” and browse to the floppy drive.
4. Select the xxx.cal (where xxx equals machine name) from the floppy by double clicking on the file name.



If no .cal file exists on the floppy the machine was shipped with backend build 1132 or less. This means that once system calibrations are made the .cal should be written to this floppy.

5. To complete sending the file, hit the green check mark. This will write the file to the system hard drive.
6. Cycle power on the machine.
7. Run the Y lash, Tip Offset, Tip Level, and Tip Depth calibration test parts. Correct any values if necessary. If calibration values are changed, a “Get” must be performed before replacing the floppy back into the electronics bay.
8. Replace the floppy into the electronics bay.

"Get" .cal file – from the system hard drive to the calibration floppy:



This would typically be used after changing calibration values or if the .cal file has not been stored on the floppy.

1. Remove the system calibration floppy from the electronics bay and insert it into the workstation floppy drive.
2. Install and open Maraca. Ensure that communication has been established with the system.
3. Select "Get" and browse to the floppy drive.
4. Select "Save" and the file will be written to the floppy.
Spaces are not allowed in the machine name.
5. Replace the floppy back into the electronics bay.

Z Tray Leveling (Cantilever Z Stage, Foam)



This procedure should *only* be used for single lead screw Z stages with *foam* substrates.

The Z stage is initially squared at the factory using a fixture. The XY table is then installed and leveled to the Z stage. This procedure assumes that the XY is correctly installed, but the Z stage is out of adjustment. This procedure should *not* be performed as part of a XY replacement.



Both spacing and leveling must be checked and adjusted if necessary.

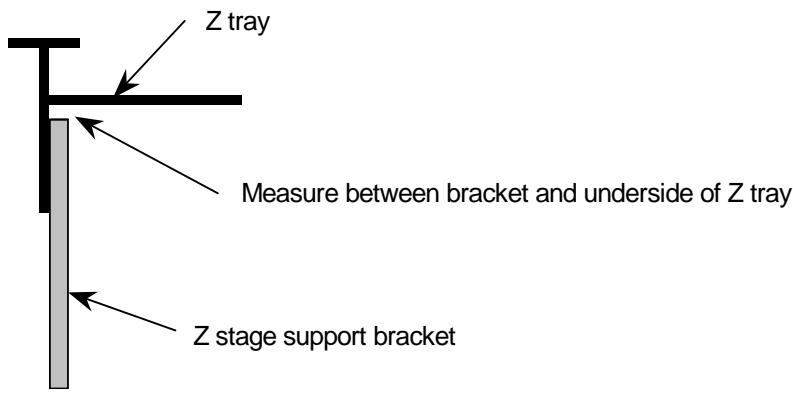
Parts and Tools Required

- Spacer gauge
- Head bracket
- Dial indicator
- $\frac{5}{32}$ " allen wrench
- $\frac{3}{8}$ " allen wrench

Checking Spacing Using a Caliper:

1. Raise the Z stage towards the top of travel and remove the foam foundation.
2. Using a caliper, measure the distance between the bracket and the underside of the Z tray. See [Figure 65](#).

Figure 65: Measuring with caliper

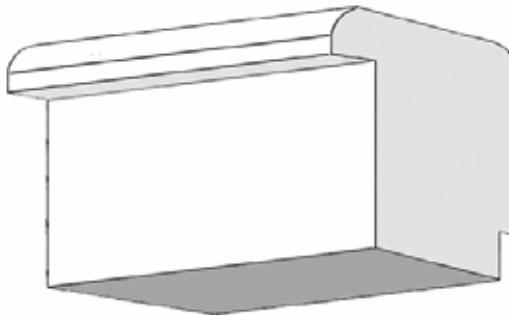


3. Spacing should be $0.180"$ $\pm 0.030"$
4. If *none* of the four locations are within specifications, the tray will require *both* the spacing and level adjustments.

Checking Spacing Using the Spacer Part:

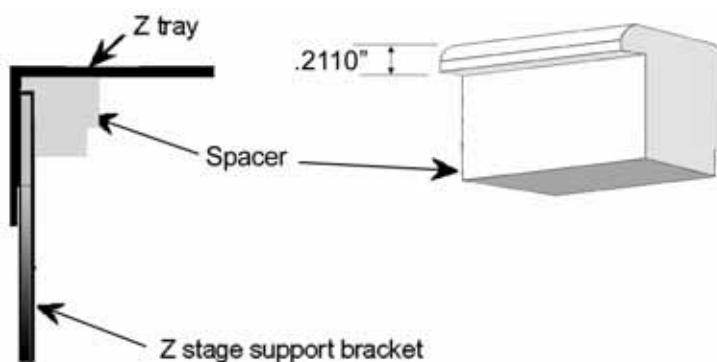
1. Build the spacer part. Two sides of the part are used to check the tray spacing. The 768/Elite side of the part is 0.150" thick. The 1200es side of the part is 0.210" thick. The side with the lip is used for adjusting the tray level, and is 0.180" thick. The gap between the Z tray and support bracket should be $0.180'' \pm 0.030''$. See [Figure 66](#).

Figure 66: Measuring with spacer



2. Raise the Z stage towards the top of travel and remove the foam.
3. Slide the GO side of the spacer part toward the *left rear* gap between the bracket and the Z tray. The spacer gauge should fit between the Z stage bracket top edge and the underside of the Z tray. If it does *not* fit the gap is set too small (tray is set too low) and will need to be adjusted. See [Figure 67](#).

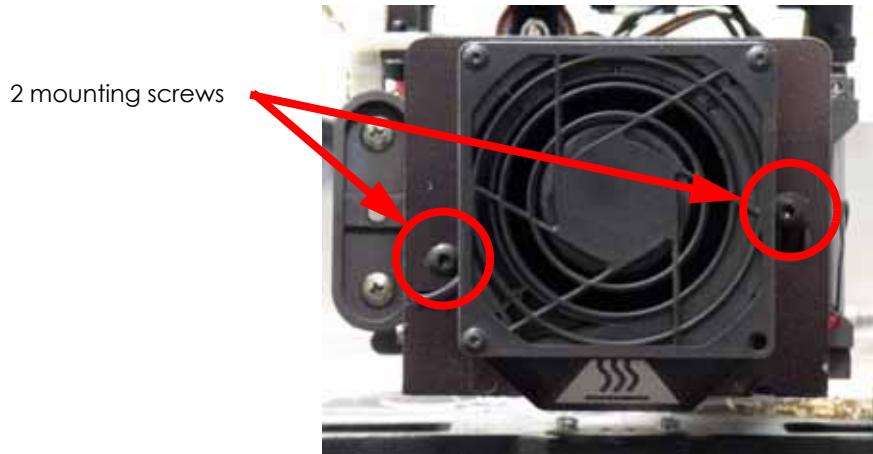
Figure 67: GO side of spacer



Leveling the Z platen:

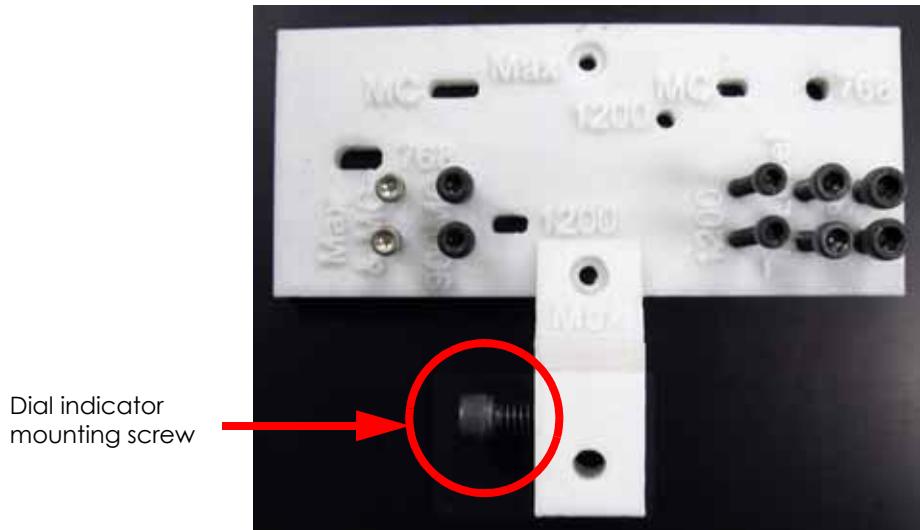
1. Using a $\frac{1}{8}$ " allen wrench, remove the 2 head cooling fan mounting screws. Set the fan off to the side. See [Figure 68](#).

Figure 68: Head fan mounting screw locations



2. Using a $\frac{3}{8}$ " allen wrench, remove the dial indicator mounting screw from the head bracket. See [Figure 69](#).

Figure 69: Head bracket mounting screws



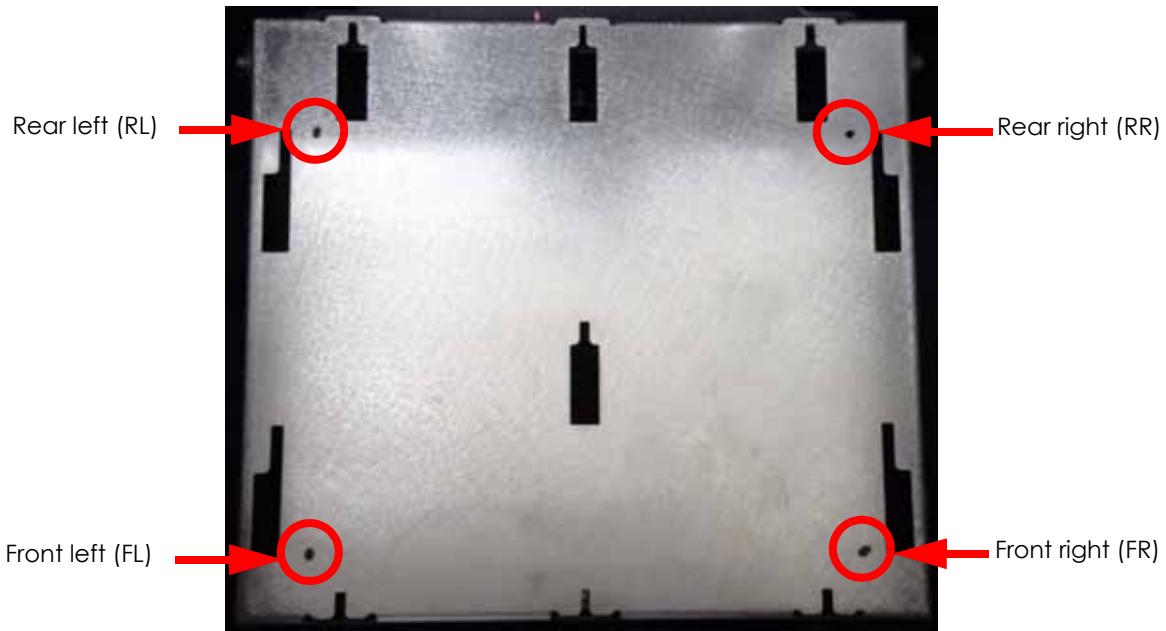
3. Align the dial indicator with the head bracket and use a $\frac{3}{8}$ " allen wrench to install the mounting screw. See [Figure 70](#).

Figure 70: Dial indicator installation



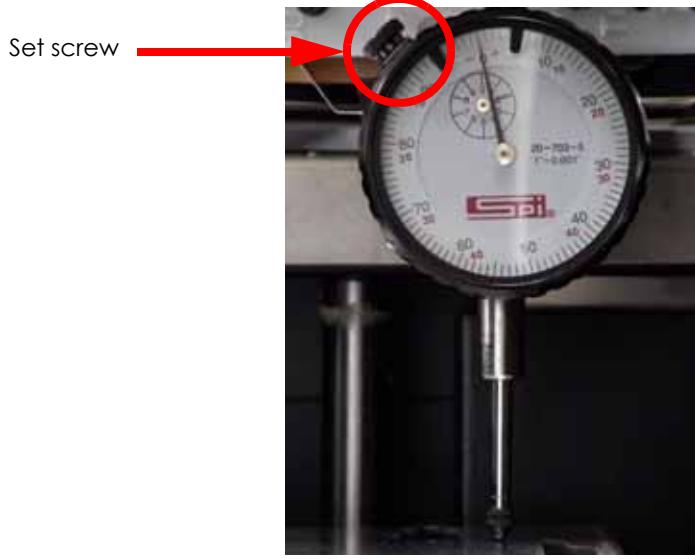
4. Using a marker, mark the Z platen in the rear left corner, rear right corner, front left corner and front right corner. See [Figure 71](#).

Figure 71: Z platen marking locations



5. Manually raise the Z stage, by turning the lead screw with a gloved hand, until it is about 2 inches from the upper limit.
6. Move the dial indicator to the mark on the right rear corner and zero the dial indicator by loosening the set screw and turning the ring until the the dial is on the 0. See [Figure 72](#).

Figure 72: Zero the dial indicator

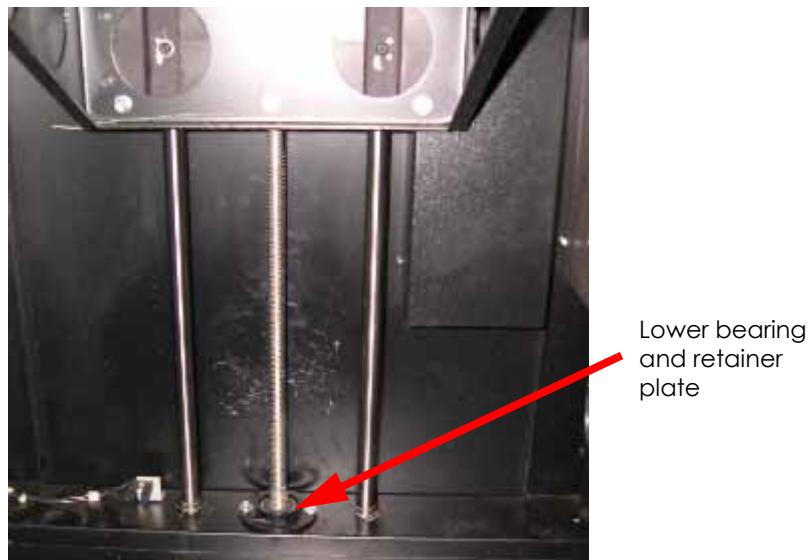


7. Move the dial indicator to the mark on the front right corner of the Z platen.
8. Using a $\frac{5}{32}$ " allen wrench, loosen the front right Z platen mounting screw and raise/lower the front right corner until the dial indicator reads 0 then tighten the mounting screw.
9. Move the dial indicator to the mark on the front left corner of the Z platen.
10. Using a $\frac{5}{32}$ " allen wrench, loosen the front left Z platen mounting screw and raise/lower the front left corner until the dial indicator reads 0 then tighten the mounting screw.
11. Move the dial indicator to the mark on the rear left corner of the Z platen.
12. Using a $\frac{5}{32}$ " allen wrench, loosen the rear left Z platen mounting screw and raise/lower the rear left corner until the dial indicator reads 0 then tighten the mounting screw.
13. Remove the head bracket and dial indicator.
14. Close the head and use a phillips screwdriver to tighten the 2 self retaining screws.
15. Align the head fan with the mounting holes and use a $\frac{1}{8}$ " allen wrench to reinstall the 2 mounting screws.
16. Reinstall the side panels. See "[Side Panels](#)" on page 5-11.
17. Reinstall the rear door. See "[Installing the Rear Door](#):" on page 5-10.
18. Reconnect the AC power cord, RJ-45 network cable and UPS cable (if used).
19. Power on the system. The system should reach **Idle** with no displayed errors.
20. Perform tip depth calibrations. See "[Tip Depth Calibration](#)" on page 6-2.
21. Run a small test part and monitor system operation during build.

Aligning Single Lead Screw Z Stage:

1. Using the keypad, go to Table Maintenance and move the Z stage to the middle.
2. Power down the system using the power-down switch. Once the system is powered down, switch the circuit breaker to the **off** position.
3. Unplug the AC power cord, RJ-45 network cable and UPS cable (if used) from the rear of the printer.
4. Remove the rear door. See "[Removing the Rear Door:](#)" on page 5-9.
5. Remove the side panels. See "[Side Panels](#)" on page 5-11.
6. Loosen the lower bearing plate screws.

Figure 73: Lower bearing and retainer plate



7. Loosen the Z motor screws.
8. Pull back on the Z motor to loosely tension the Z belt. Leave just enough tension belt to engage the Z axis pulley, which allows the Z stage to move up and down. If the belt teeth slip, slightly increase the belt tension. You will re-tension the belt in a later step as over-tensioning at this time will misalign the lead screw.
9. Tighten the Z motor screws.
10. Replace both side panels, but do not attach the screws.
11. Power up the system until it reaches idle.
12. Using the keypad, go to Table Maintenance and move the Z stage assembly to the top, bottom, and then to the middle.
13. Tighten the two (2) lower bearing plate screws. Ensure you do not move the plate.
14. Remove one side panel and re-tension the motor by loosening the motor mounting screws and pulling away from the lead screw pulley. Tighten the screws.
15. Replace the other side panel and secure both with screws.
16. Ensure that Z stage is running smoothly by moving it up and down several times.

Preventive Maintenance

7

In this chapter you will learn preventive maintenance procedures. Follow the simple procedures to ensure continued proper operation of the system. The contents and page numbers of this chapter are as follows:

Startup Kit	7-2
Daily Maintenance.....	7-2
Weekly Maintenance	7-3
Quarterly Maintenance	7-3
As Needed Maintenance	7-4

Startup Kit

Provided with the system is a Startup Kit that includes a set of tools used to help you maintain the system, as well as replacement parts.

The following lists the tools contained in the Startup Kit that are used in Maintenance and Troubleshooting procedures.

- Needle Nose Pliers
- Leather Insulated Gloves (Pair)
- Putty Knife
- Cutters
- Soft-bristled Glue Brush
- Brush (bronze)
- #2 Phillips Head Screwdriver
- Allen Wrench Set

Daily Maintenance

Emptying Purge Container

The black, plastic purge container is attached to the rear wall of the modeling chamber, on the right side.

1. Remove the purge container by grasping it and pushing it upward to release it from its three mounts.
2. Pull it towards you and out of the chamber to empty.



When reinstalling the container, ensure that it locks in all three mounts and hangs flush with the chamber wall to avoid damage.

Removing Debris Buildup

Remove any material buildup on the Z-platform and around the lead screw. Failure to do so could cause the base to become unleveled or, if the buildup is large enough, it could cause the Z-stage to jam at its upper limit.

Weekly Maintenance

Vacuum Build Chamber

Vacuum the build chamber to remove all foreign particles and purged material.

Quarterly Maintenance

Fan Filter

Cleaning the fan filter:

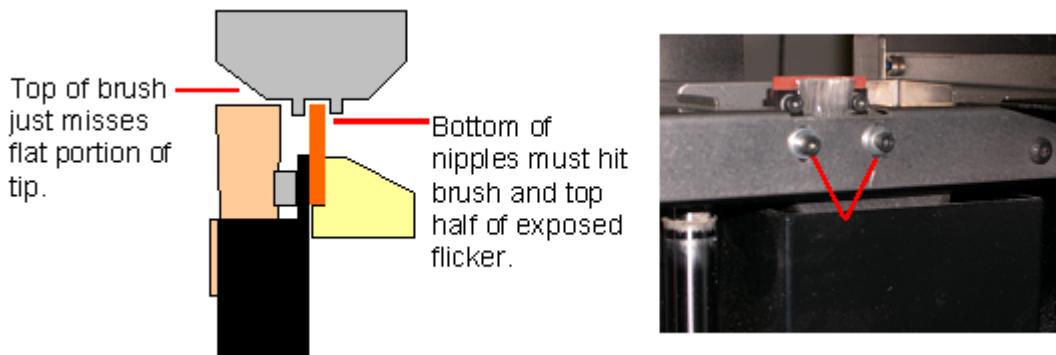
1. Locate the lower fan on the rear panel of the system and snap off the plastic frame that secures the fan filter.
2. Clean the filter with soap and water, and blot it dry.
3. Reassemble.

Tip Wipe Assembly

Replacing the tip wipe assembly:

1. Completely power down the system.
2. Remove the purge container.
3. Remove the old flicker by loosening the rear screws and pulling up on the flicker.
4. Insert the new flicker and tighten the rear screws while gently pushing down on the flicker.
5. Remove the old tip cleaning brush by loosening the two mounting screws and pulling up on the brush. See
6. Install the new tip cleaning brush, but do not tighten the mounting screws.
7. With a glove on your hand, move the head so that the tips are above the tip cleaning assembly.
8. Adjust the tip cleaning assembly until the brush contacts the tips and just barely misses the flat of the liquefier and tighten mounting screws. See

Figure 1: Replacing the tip wipe assembly



As Needed Maintenance

The following maintenance items have no routine schedule but should be tended to as needed.

Chamber Lamp

Replacing the chamber lamp:

1. Power down the system.
2. Locate the lamp socket plug about three inches beneath the lamp socket. Unplug lamp socket from wire harness.
3. Lightly pull the socket wires away from the socket while pulling lamp straight out of the socket.



Do not touch the new bulb with bare fingers. The natural oil of your skin can cause premature bulb failure. Grasp the base of the bulb instead.

Use only 24 V, 20 W bulbs.

4. Pull on the socket wires while inserting the two prongs of the new lamp into the two holes of the socket. When the lamp is seated into the socket, release the socket wires.
5. Plug the socket wires back into the wire harness.



Pulling on the socket wires releases the spring-loaded contacts in the socket. If the lamp is installed without pulling on the socket wires, the lamp might not be held securely in the socket.

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Appendix

The appendix contains the following types of documents:

- Illustrated parts breakdown
 - Reference Diagrams
 - Miscellaneous procedures
 - Checklists
-

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Illustrated Parts Breakdown

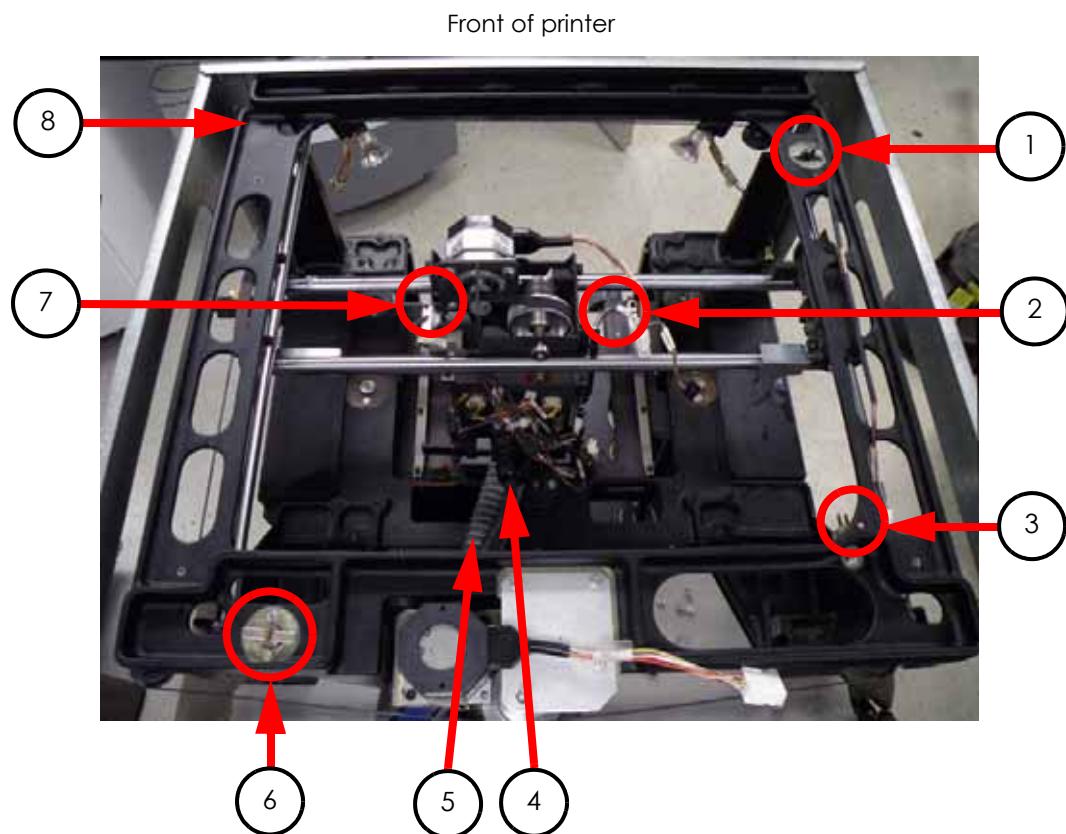
Cable Drive XY Table Components

Reference #	Part Number	Description
1	201301-0001	Y EOT limit switch
2	201307-0011	X BOT (home) sensor
3	201307-0010	Y home sensor (optical)
4	201857-0002	Head umbilical cable (gen 1 electronics)
5	201627-0001	Umbilical hose
6	202409-0001	Chamber snap switch (90 °C)
7	201473-0001	X EOT sensor (optical)
8	200100-CS01	XY table assembly (CABLE drive)



X and Y stepper motors on cable XY tables are not field replaceable.

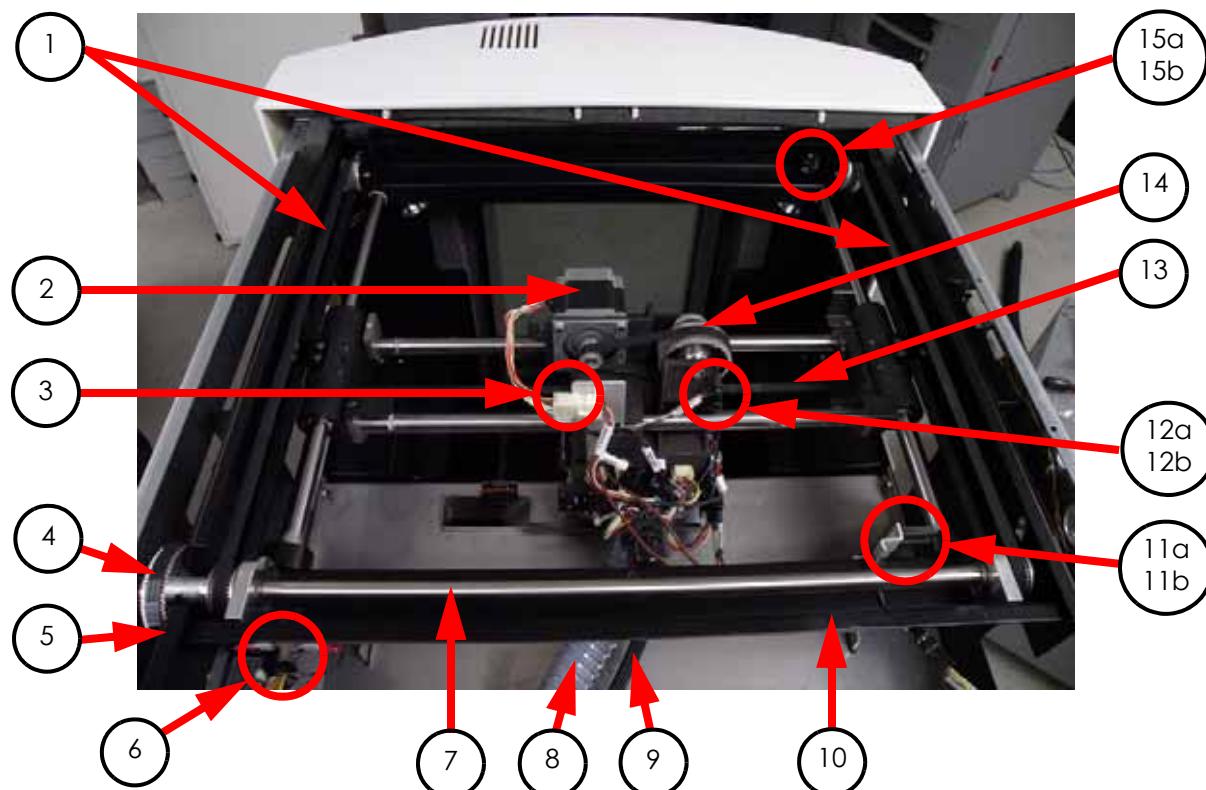
Figure 1: Cable drive XY table reference numbers



Belt Drive XY Table Components

Reference #	Part Number	Description
1	201920-0002	Y drive Belt
2	201921-0002	X motor
3	202176-0001	X EOT sensor (with bracket)
4	201924-0001	Y motor Belt
5	201921-0002	Y motor
6	202409-0001	Chamber snap switch (90 °C)
7	201898-0003	Y drive assembly
8	201627-0001	Umbilical hose
9	102537-0003	Head umbilical cable (gen 2 electronics)
10	201982-CS03	XY table assembly (belt drive)
11a	201979-0003	Y EOT sensor with adapter (gen 1 electronics)
11b	201977-0001	Y EOT sensor hall (gen 2/3 electronics)
12a	201307-0011	X BOT (home) sensor optical (gen 1 electronics)
12b	102529-0001	X BOT (home) sensor optical (gen 2/3 electronics)
13	201923-0001	X drive belt
14	201924-0001	X motor belt
15a	201307-0010	Y BOT (home) sensor optical (gen 1 electronics)
15b	102530-0001	Y BOT (home) sensor optical (gen 2/3 electronics)

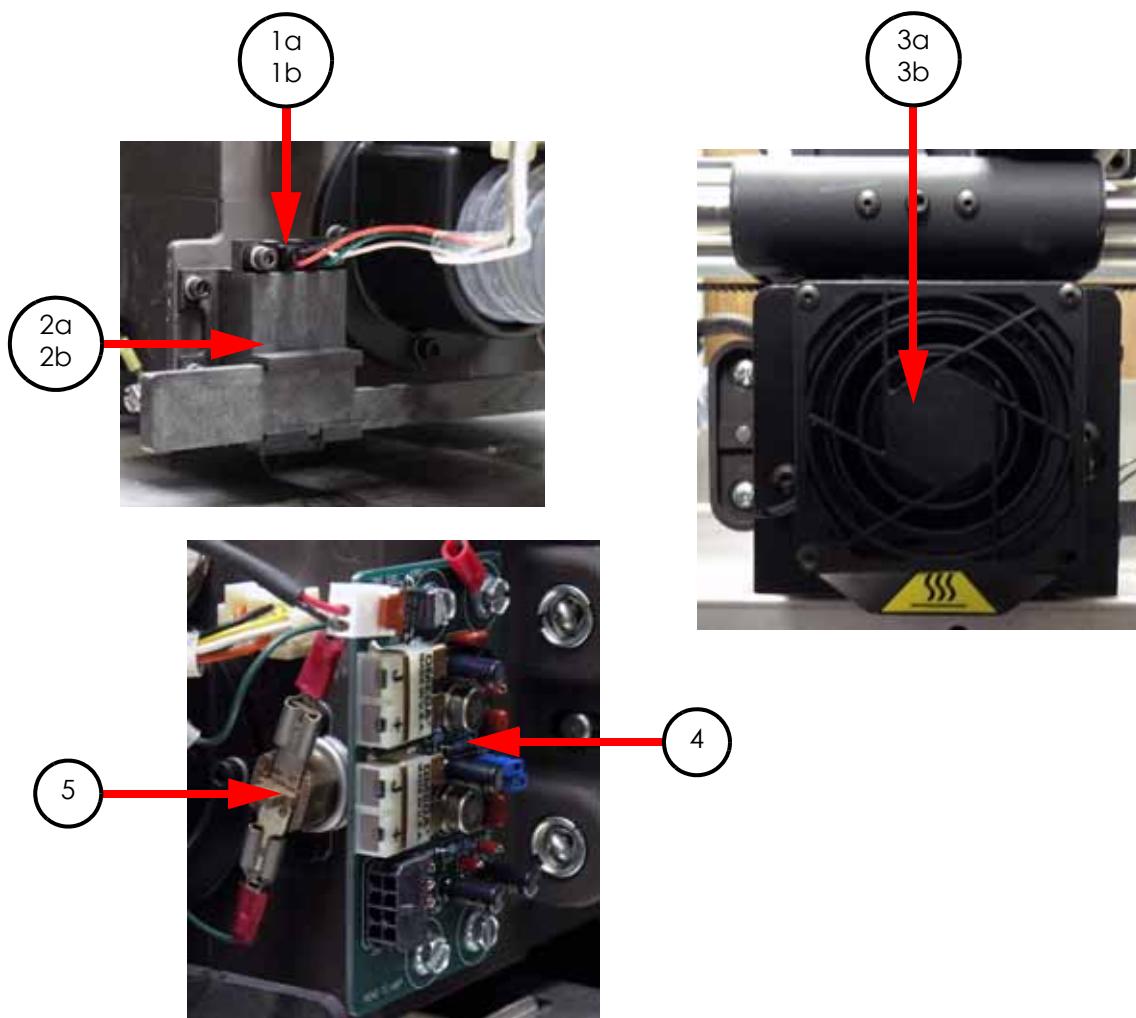
Figure 2: Belt Drive XY Table Reference Numbers



Head Area Components

Reference #	Part Number	Description
1a	201307-0012	Z foam optical sensor (gen 1 electronics)
1b	102531-0001	Z foam optical sensor (gen 2/3 electronics)
2a	201633-0001	Z foam sensor assembly (short arm, cable XY table)
2b	205156-0001	Z foam sensor assembly (long arm, belt XY table)
3a	202229-CS01	Head, swivel (BST)
3b	202230-CS01	Head, swivel (SST)
4	201747-0005	Dual head T/C Amp board
5	202410-0001	Head snap switch (149 °C)

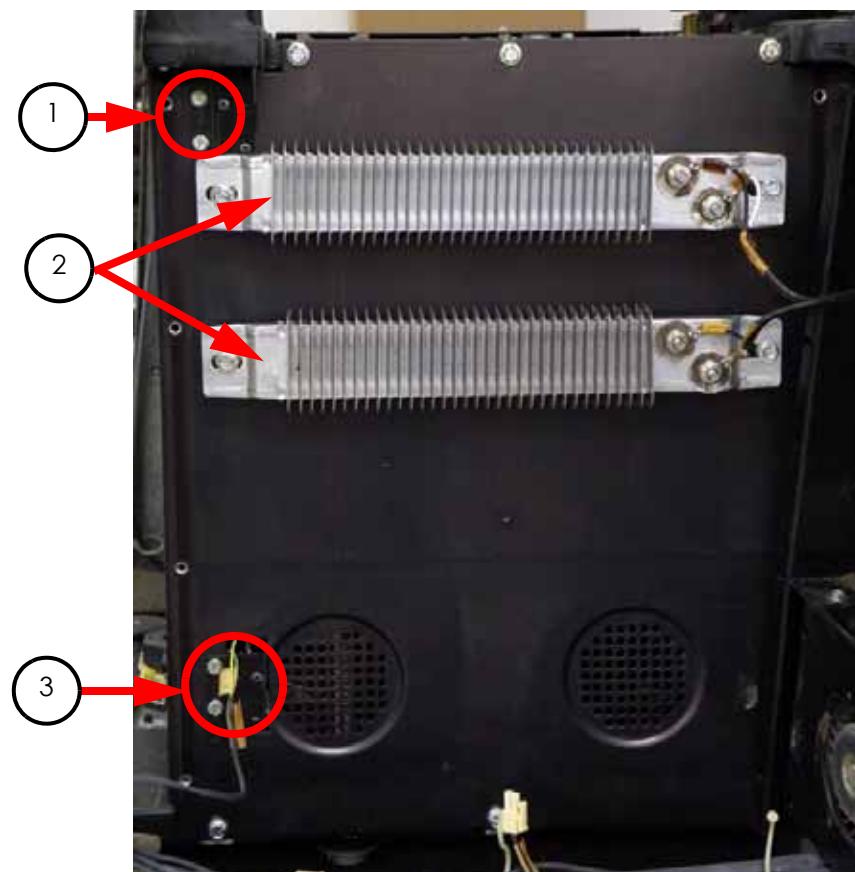
Figure 3: Head area reference numbers



Chamber Heater Area Components (3 Lead Screw Z Stage)

Reference #	Part Number	Description
1	201301-0001	Z BOT limit switch (upper)
2	30000089	Chamber heater
3	202050-0001	Z EOT limit switch (lower)
Not Shown	201402-0001	Chamber fan

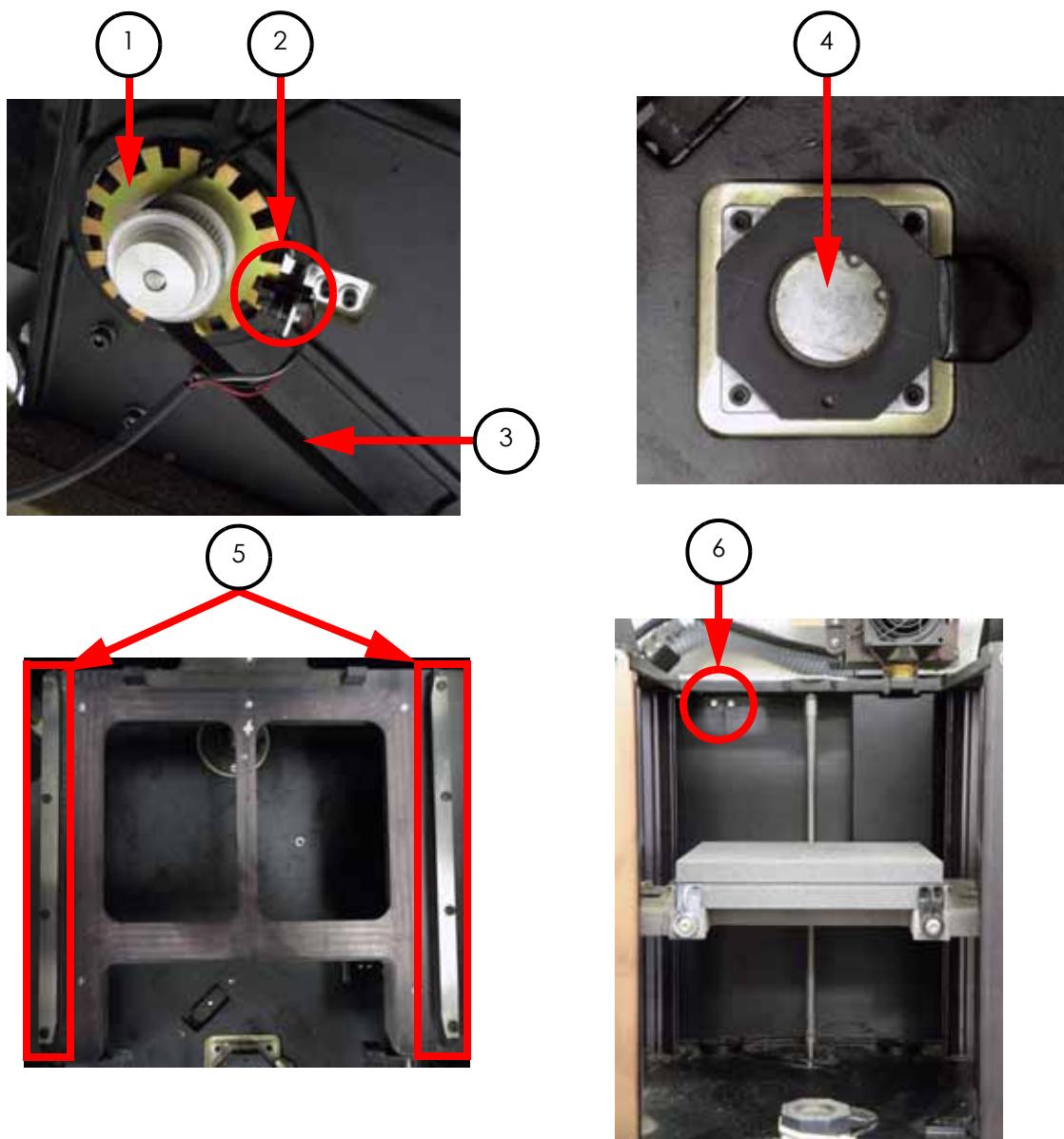
Figure 4: Chamber Heater (3 Lead Screw) Reference Numbers



Z Stage Area Components (3 Lead Screw Z Stage)

Reference #	Part Number	Description
1	200788-0001	Z jam flag
2	201307-0010	Z jam sensor
3	201302-0001	Z drive belt
4	205098-0002	Z axis stepper motor
5	200790-0002	Foam retainer
6	201308-0001	Thermocouple, chamber

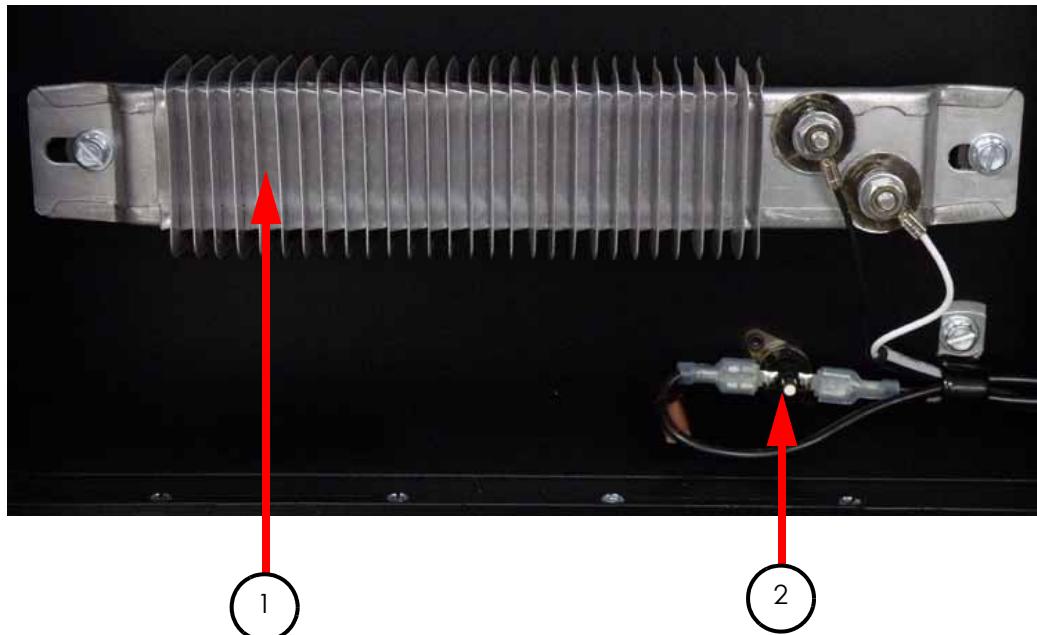
Figure 5: 3 lead Z stage area reference numbers



Chamber Heater Area Components (1 Lead Screw Z Stage)

Reference #	Part Number	Description
1	202152-0001	Chamber heater, 400 watt
2	202114-0001	Chamber thermostat main

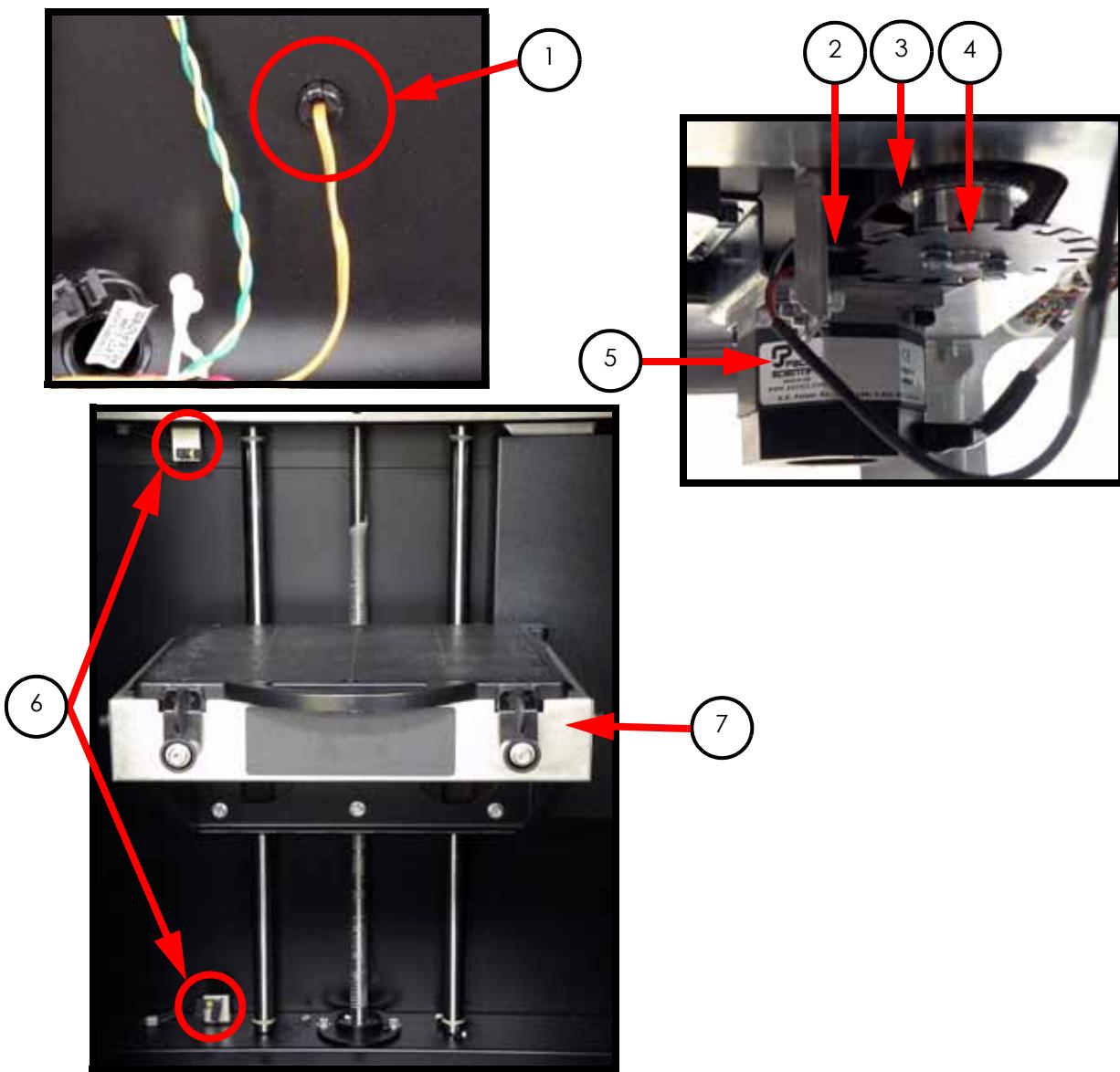
Figure 6: Chamber heater reference numbers



Z Stage Area Components (1 Lead Screw Z Stage)

Reference #	Part Number	Description
1	202150-0002	Thermocouple, chamber
2	201307-0010	Z jam sensor (serial numbers <P4000)
3	201924-0001	Z drive belt
4	202147-0002	Z jam flag (serial numbers <P4000)
5	202179-0001	Z axis stepper motor
6	202149-0001	Sensor, Z EOT, Z BOT (home)
7	206322-CS01	Z Stage assembly

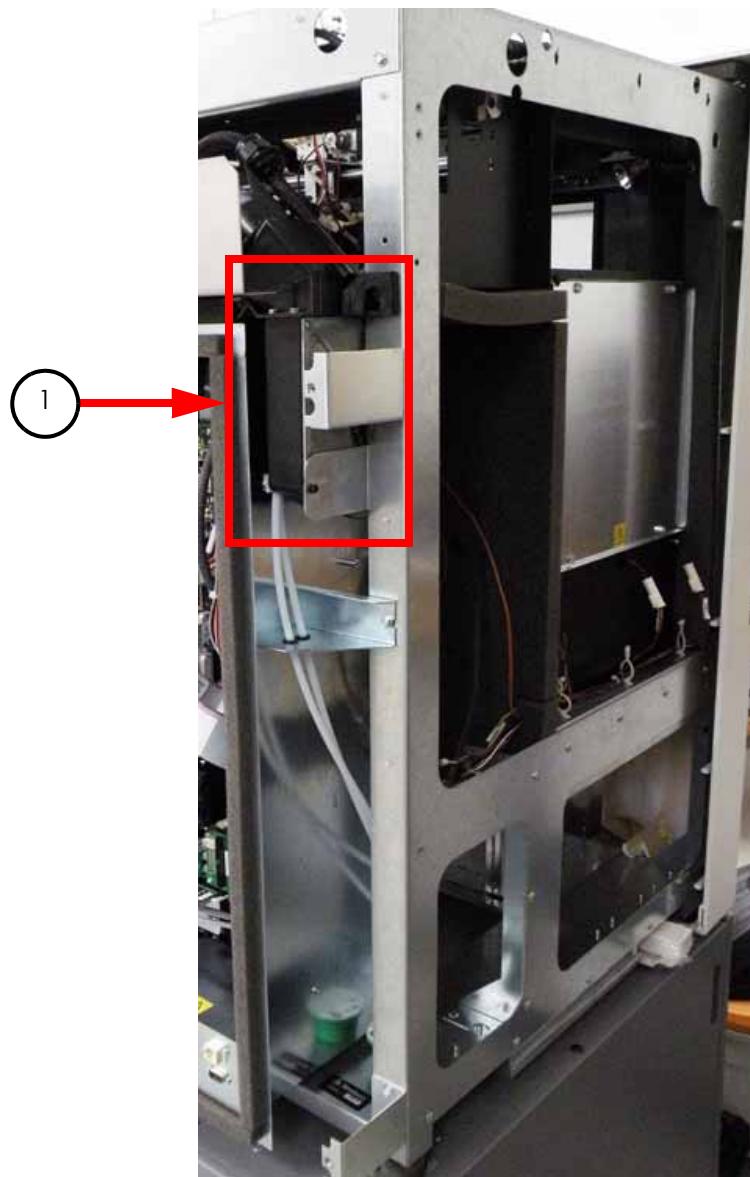
Figure 7: Z Stage (1 lead screw) reference numbers



Head Cooling Fan Components

Reference #	Part Number	Description
1	201400-0001	Head cooling fan

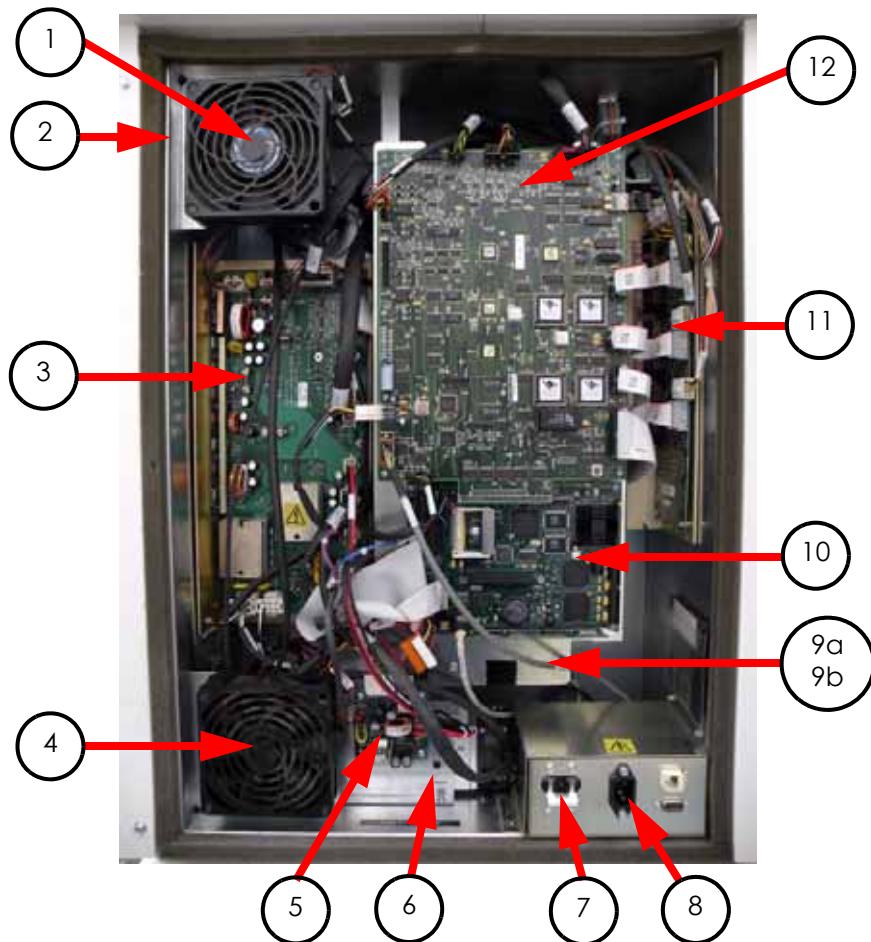
Figure 8: Head cooling fan reference numbers



Gen 1 Electronics Bay Area Components

Reference #	Part Number	Description
1	201403-0001	Upper electronics bay cooling fan
2	201976-0001	Dual 48 VDC power supplies (behind upper electronics bay cooling fan)
3	201872-CS05	Power distribution board
4	201403-0001	Lower electronics bay cooling fan
5	202003-0001	5/12 VDC power supply
6	201891-0002	24 VDC power supply
7	201525-0002	Circuit breaker
8	201598-0001	AC input
9a	201628-0006	Hard drive with software loaded S/N P0325 and below
9b	202329-CS05	Hard drive with software loaded S/N P0326 and above
10	201631-0001	Single board computer
11	201386-CS01	Motor driver board
12	211860-CS03	186 processor board

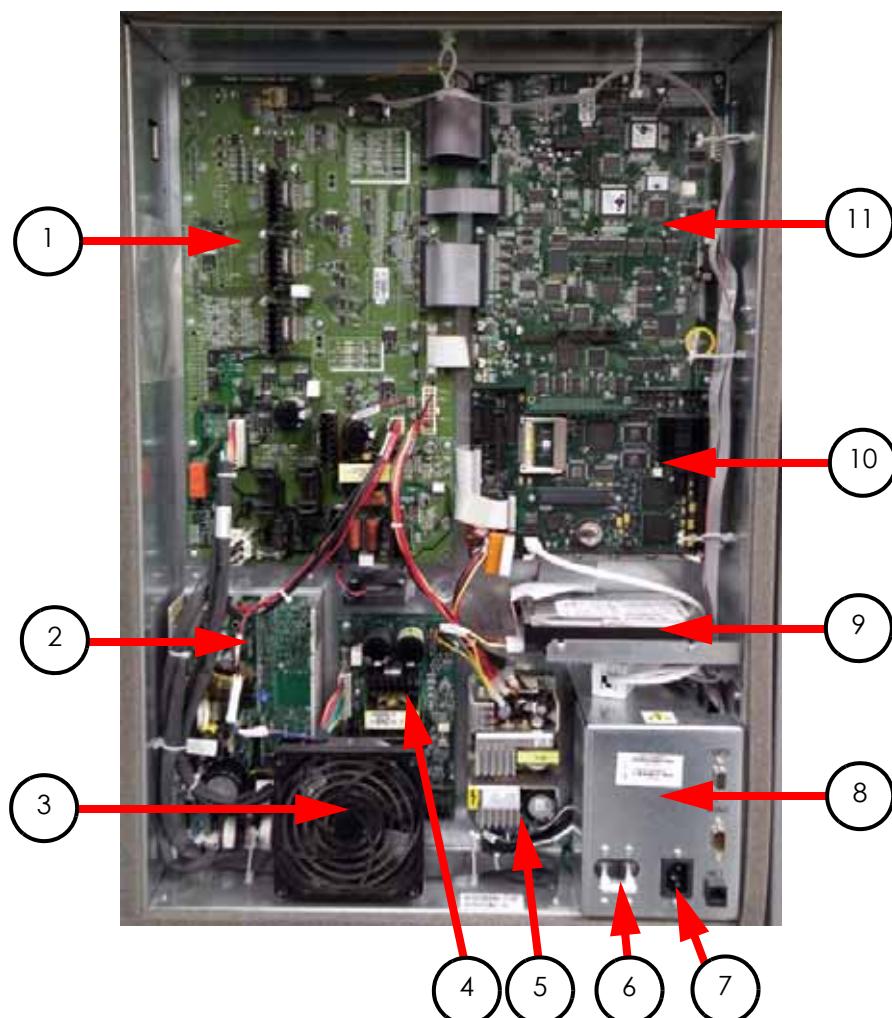
Figure 9: Gen 1 electronics bay reference numbers



Gen 2 Electronics Bay Area Components

Reference #	Part Number	Description
1	202143-CS05	Power distribution board
2	202325-0001	+24 VDC power supply
3	201403-0001	Electronics bay cooling fan
4	205503-CS01	+120 VDC aux. power supply
5	202326-0001	+5/12 VDC power supply
6	201525-0002	Circuit breaker
7	201598-0001	AC input
8	205509-0002	15 A Line filter board (behind input panel)
9	202329-CS05	Hard drive
10	201631-0001	Single board computer
11	202414-CS02	Controller board

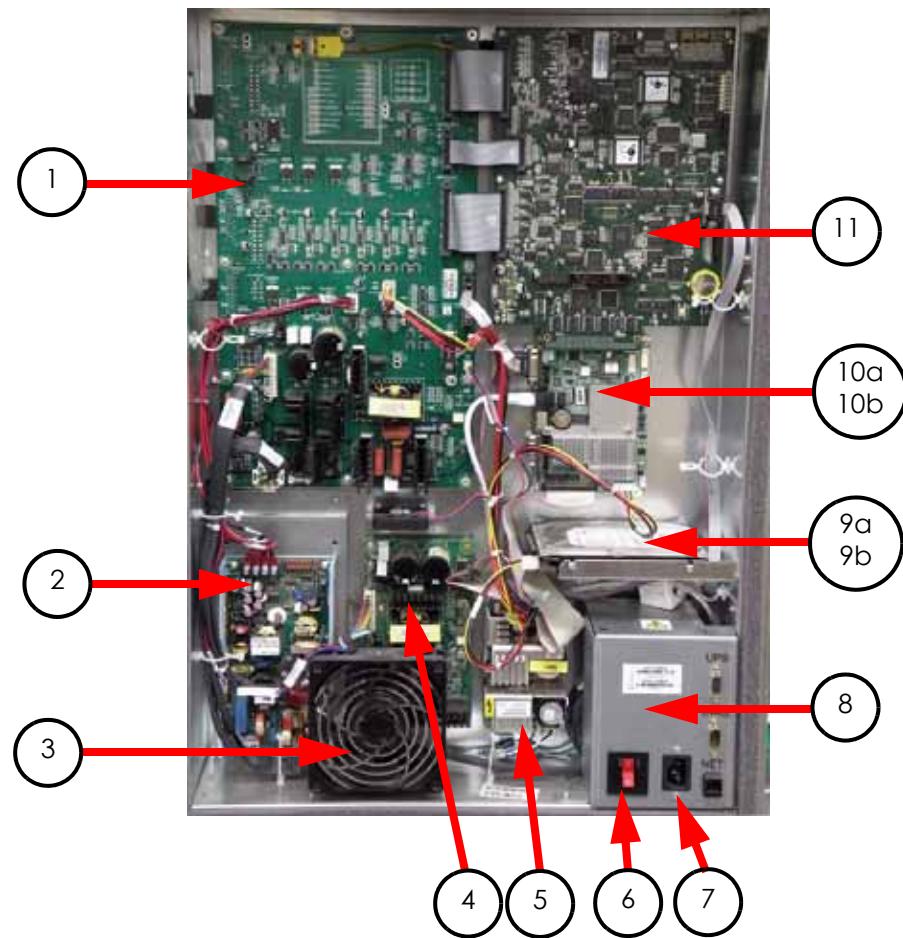
Figure 10: Gen 2 electronics reference numbers



Gen 3 Electronics Bay Area Components

Reference #	Part Number	Description
1	202569-CS01	Power distribution board (PDB)
2	205659-0001	24 VDC power supply
3	201403-0001	Electronics bay cooling fan
4	205503-0005	120 VDC aux. power supply
5	202326-0001	5/12 VDC power supply
6	205510-0002	Circuit breaker
7	202182-0001	AC input
8	205509-0002	Line filter board (behind input panel)
9a	202329-CS05	IDE hard drive
9b	206703-CS01	SATA hard drive
10a	205668-CS01	IDE Single board computer
10b	208005-CS01	SATA Single board computer
11	205627-CS03	Controller board

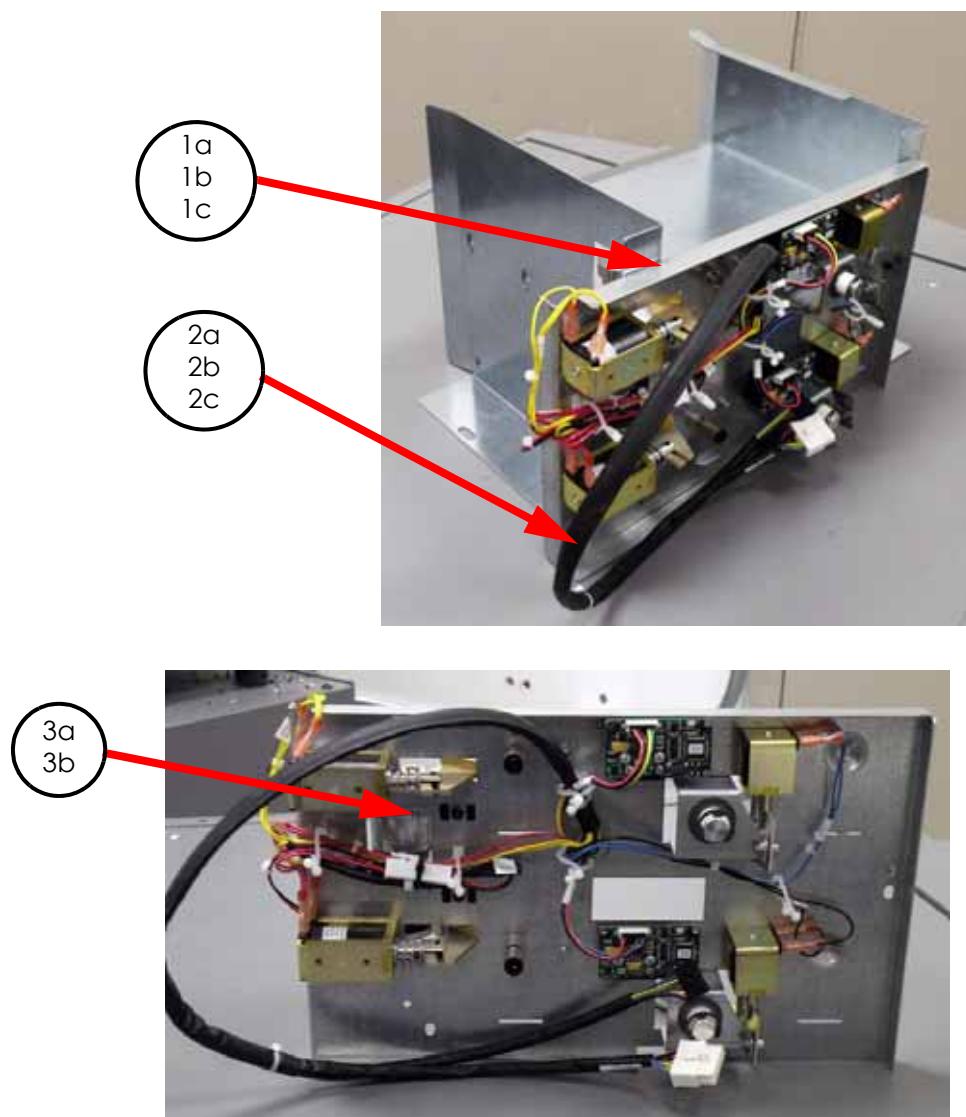
Figure 11: Gen 3 electronics reference numbers



Galvanized Receiver Area Components

Reference #	Part Number	Description
1a	202119-0001	Receiver assembly (Gen 1 electronics)
1b	206333-0001	Receiver assembly (Gen 2 electronics)
1c	206400-0001	Receiver assembly (Gen 3 electronics)
2a	202038-0002	Receiver cable single motor (Gen 1 electronics)
2b	102539-0002	Receiver cable single motor (Gen 1 electronics)
2c	202581-0001	Receiver cable single motor (Gen 1 electronics)
3a	204427-0001	Receiver back plate (Gen 2 electronics)
3b	206401-0001	Receiver back plate (Gen 3 electronics)

Figure 12: Galvanized receiver reference numbers



Printer Front (Misc. Components)

Reference #	Part Number	Description
Not shown	201780-0001	Door switch
Not shown	201786-0002	Door solenoid
Not shown	201901-0001	Door assembly
Not shown	201635-0002	LCD display
1a	206334-0001	Bezel assembly BST (white with old foam serial numbers <P1586)
1b	206337-0001	Bezel assembly BST (white with new foam serial numbers P1586-P4000)
1c	206335-0001	Bezel assembly SST (white with old foam serial numbers <P1586)
1d	206336-0001	Bezel assembly SST (white with new foam serial numbers P1586-P4000)
2a	204572-0001	Bezel assembly BST (Gray, for serial numbers >P4000)
2b	204573-0001	Bezel assembly SST (Gray, for serial numbers >P4000)
2c	204586-0001	Bezel assembly Elite

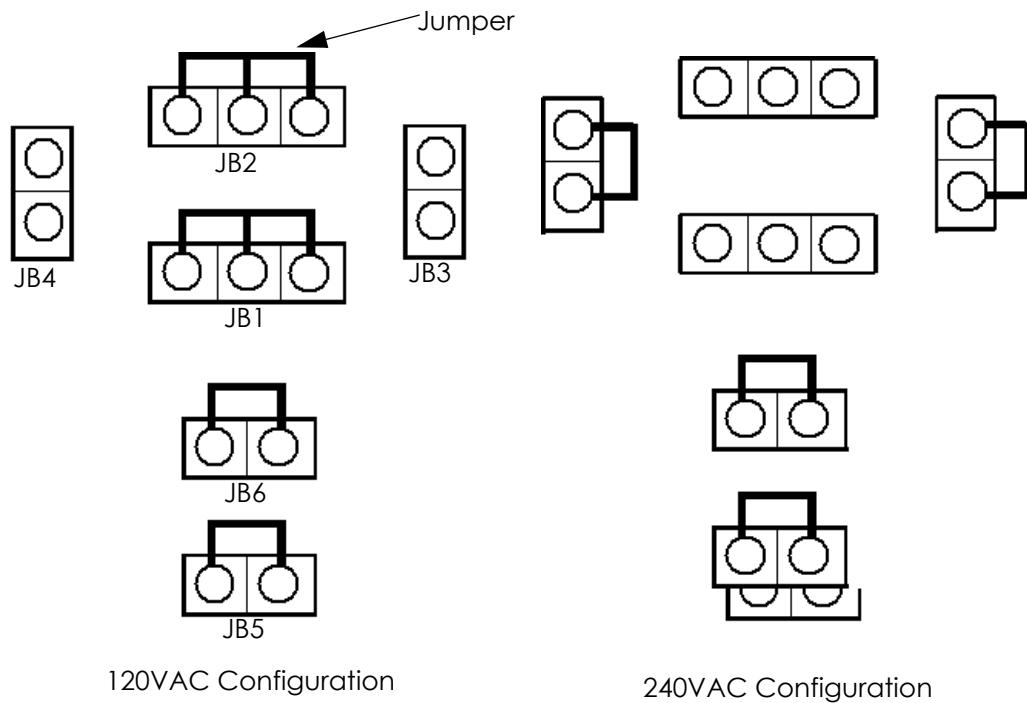
Figure 13: Printer front reference numbers



120/240 VAC Jumper Configuration

Jumpers are located towards the bottom of the Power Distribution Board.

Figure 14: 120/240VAC Jumper Configuration



Fuse Specifications

Fuses are located on the Power Distribution Board.



Fuses must be replaced with the same type and rating as listed below.

Head Thermal Cutout Fuse (Snap): Temperature cutout at 150 °C (300 °F)

Chamber Thermal Cutout Fuse (Snap): Temperature cutout at 83 °C (180 °F)

Table 1: F1

Fused Voltage	24VDC
Rating	6 Amp 250 Volt
Type	Fast acting
Size	5 x 20 mm
Mfg. P/N	<ul style="list-style-type: none">• Littelfuse #21706.3• Bussmann # GDB-6.3• Wickmann #193-6, 3

Table 2: F2

Fused Voltage	12VDC
Rating	2 Amp 250 Volt
Type	Fast acting
Size	5 x 20 mm
Mfg. P/N	<ul style="list-style-type: none">• Littelfuse #217002• Bussmann # GDB-6.3• Wickmann #193-2,0

Table 3: F3

Fused Voltage	120VDC
Rating	3.15 Amp 250 Volt
Type	Fast acting
Size	5 x 20 mm
Mfg. P/N	Littelfuse # T3.15AL250V

Device Voltages

Device	Voltage
Cartridge drive motor	12 VDC
Cartridge solenoids	24 VDC
Chamber heaters	120 VAC (parallel) 240 VAC (series)
Chamber heater fans	24 VDC
Chamber lights	24 VDC
Chamber fans	24 VDC
Door solenoid	12 VDC
Head drive motors	12 VDC
Home and EOT sensors	5 VDC
LCD display (backlight)	5 VDC
LCD display (text)	12 VDC
Liquefier	120 VDC (PWM)
X, Y and Z motors	24 VDC

Hard Drive Installation Checklist

If you have any questions before or during installation, do not hesitate to call your Customer Support provider.

- Replace the hard drive.
- Verify that all cables are connected correctly.
- If the system contains a cable drive XY table, check the cable tension and adjust if necessary.
- Clean and lube the system. See “[Preventive Maintenance](#)” on page 7-1.
- Power system up.
- After a few minutes, the LCD display will default to two options only: “Load Upgrade” or “IP Address”. Choose “IP Address” and enter the appropriate network addresses. The customer should provide this information.
- After all the addresses have been edited, select “**Done**”.
- From the system keypad, select “**Load Upgrade**”.



The controller software must be downloaded before system operation can continue.

- Download the controller software using the most current version. See “[System Software](#)” on page 3-13.
- Once download is complete, system will reach “**Idle**”.
- Load material.



Depending on the software version, the system floppy may not contain the .cal file.

- Remove the system floppy from the electronics bay. Using Maraca, “send” the .cal file from the floppy to the system hard drive.
- If the floppy does NOT contain the .cal file, you must run the following calibrations and adjust the values if necessary: Hysteresis, Part Based Cal, Tip Offset, Tip Level, and Tip Depth Calibration.
- Run a small test part to ensure part quality is acceptable and that the system is operating properly.
- Using Maraca, select “Get” to send the .cal file from the system to the floppy. Replace the floppy in the electronics bay and secure the rear door. If unable to save to floppy disc or CD, save to workstation.
- Discuss any of the customer’s questions or issues with them.
- Pack the old hard drive into the shipping box along with the RMA documentation and shipping back to Stratasy.

XY Table Installation Checklist

If you have any questions before or during installation, do not hesitate to call your Customer Support provider.

- Replace the XY table.



The existing table may be shimmed to achieve level. Note the location and number of shims used.

- Verify that all cables are connected correctly
- CABLE DRIVE ONLY:** Level the table (using shims) as shown in the Procedure section of the Service Guide. NOTE: If shims were installed with the "old" table replace the shims and then perform the leveling procedure. If needed, additional shims are shipped with the replacement table.
- SINGLE LEAD SCREW Z STAGE ONLY:** If the XY table was replaced on a system with a *single* lead screw Z stage perform the Software XY Leveling procedure.
- Manually move the table in both the X and Y direction to ensure it moves smoothly.
- Clean and lube the system. See "[Preventive Maintenance](#)" on page 7-1.
- Power system up and verify that system homes correctly.
- CABLE DRIVE ONLY:** Using Maraca, download the table calibration file (xxxxx.dat) from the supplied floppy to the printer. Remember to toggle the power down switch after the download.



For belt drive tables: No floppy is supplied with belt drive tables, so no .dat is downloaded.

- Load material.
- CABLE DRIVE ONLY:** Perform Hysteresis. See "[Y Lash](#)" on page 6-11.
- Perform the part based calibration. See "[Part Based Calibration](#)" on page 6-12.
- Perform tip depth calibration. See "[Tip Depth Calibration](#)" on page 6-2.
- Perform tip level calibration. See "[Leveling the Liquefier](#)" on page 6-4.
- Perform tip offset calibration. See "[Tip Offset Calibration](#)" on page 6-8.
- Run a small test part to ensure part quality is acceptable and that the XY table is functioning correctly.
- Remove the system floppy from the electronics bay.
- Using Maraca select "Get" to send the .cal file from the system to the floppy. Replace the floppy in the electronics bay and secure the rear door. If unable to save to floppy disc or CD, save to workstation.
- Discuss with the customer any questions or issues they may have.
- Pack the old XY table into the shipping box along with the RMA documentation and ship back to Stratasys.

Head Installation Checklist

If you have any questions before or during installation, contact Stratasys technical support.

- Replace the head.
- Verify that all cables are connected correctly.
- Clean and lube the system. See “[Preventive Maintenance](#)” on page 7-1.
- Power system up and verify that head reaches temperature and the system homes correctly.
- Load material.
- Perform tip depth calibrations. See “[Tip Depth Calibration](#)” on page 6-2.
- Perform tip level calibrations. See “[Leveling the Liquefier](#)” on page 6-4.
- Perform tip offset calibrations. See “[Tip Offset Calibration](#)” on page 6-8.
- Run a part to ensure part quality is acceptable and that head is functioning correctly.
- Remove the system floppy from the electronics bay.
- Using Maraca select “Get” to send the .cal file from the system to the floppy. Replace the floppy in the electronics bay and secure the rear door. If unable to save to floppy disc or CD, save to workstation.
- Discuss with the customer any questions or issues they may have.
- Pack the old head into the shipping box along with the RMA documentation and ship back to Stratasys.

Pre-Installation Checklist

This checklist is to be used to ensure customer will be prepared for system installation. This list should be used in conjunction with setting up an installation with the customer. This will help the install go as smoothly as possible.

Checklist

- Has the system arrived?
- Does the customer have a loading dock or receiving area to accept the system shipment?
- Customer has sufficient resources to move the system to its final location?
- Will the customer have the system unpacked and moved to its final location?
- System requires that the table (used to support the system) be rated for 300 lbs. (136 kilograms).
- If possible, confirm that startup kit, **correct** material and wash station (if purchased) is on-site.
- Remind customer that AC power must be "clean" (does not fluctuate excessively). A dedicated 20 amp circuit is recommended.
- Ensure that *no* extension cords or power strips will be connected to the system.
- Verify minimum workstation requirements.
- Network address should be determined. Static IP addresses only.
- Stratasys does not provide the network cable.
- Key contacts should be available for system training during install.

System Information

(For your records only)

Customer name _____

Customer contact _____

Customer phone _____

Customer e-mail _____

System type _____ S/N _____

BE version _____ FE version _____

Comments:

System Installation Checklist

If you have any questions before or during installation, do not hesitate to call Customer Support.

- Shipping crate in good condition, no external signs of damage.
- Tip Watch and Shock Watch indicators OK. If not call Stratasys Customer Support.
- After removing system from the crate, inspect system for scratches or dents.
- Check that start up kit, substrate, and cartridges are on-site.
- Check contents of the start up kit. Note any discrepancies on the Install Report Card.
- Door opens and closes with no binding.
- Door/glass panels are not scratched or broken.
- Check that the table (used to support the system) is rated for 300 lbs. (136 kilograms).
- Verify AC power is "clean" (does not fluctuate excessively). **A dedicated 20 amp circuit is recommended.**
- Ensure that *no* extension cords or power strips are connected to the system.
- Remove the two wire ties securing the head to Z stage.
- Manually move Z stage down approximately 2" (5 cm), ensuring that the upper limit switch will not be closed upon power up.
- Manually move the head in both the X and Y direction. Head should move smoothly.
- Install substrate and power on the system.
- Check that the lights and fans turn on.
- Check that system completes XY home and goes to Idle.
- Once up to temperature use the keypad to enter the IP address.
- Plug system into the customer's network. *Note: Stratasys does not provide the network cable.*
- Install workstation software.
- Verify workstation is communicating with the system.
- Upgrade controller software if the CD build number is **higher** than build number displayed on system.
- Instruct customer on proper controller download procedure.
- Instruct customer on proper loading and unloading of material.
- Verify material purge.
- Instruct customer on system keypad operations.
- Train customer on workstation software operation.
- Run the Tip Depth calibration part and adjust value if necessary.
- Optional: Run the Hysteresis, Tip offset, and Tip Level calibration parts. Adjust values if necessary.
- Build the gear (from the training folder) and verify that adhesion to the substrate is good and that supports are easy to remove.
- Discuss part finishing techniques.
- Demonstrate how to clear a jammed head and explain the causes for a head jam.
- Instruct customer on routine system maintenance (See User Guide).
- Review User Guide with customer.
- Complete the Delivery Form and System Install Report. Fax, e-mail, or mail copies to Stratasys Inc.

Training Checklist

Workspace

- System weights 282 lbs. (128 Kg)
- 110-120 VAC or 220-240 VAC dedicated outlet
- Ethernet 10/100 base T network. Static IP address only.
- Optional UPS for brown out conditions.

Unpacking

- Remove wire ties securing the head.
- Table needs to support 300 lbs.
- Install fork lift covers once systems is placed at intended location.

Power connections

- No extension cords or power strips.
- 110-120 VAC or 220-240 VAC dedicated outlet.

Power up/down

- Demonstrate proper power up and power down procedure.

Setting Network Addresses

- Customer needs to supply addresses.
- Instruct customer how to enter addresses
- Ethernet 10/100 base T network. **Static IP address only.**

Frontend Software

- Demonstrate how to load Catalyst on the workstation.
- Cover Catalyst operation. Focus on part build options – Types of support, fill, etc.
- Demonstrate how to send a part to the printer and managing the print queue.
- Cover pack and download
- Discuss the do's and don'ts of packing parts

Controller Software

- Demonstrate how to download controller software.
- Inform customer that they will be expected to download future software releases.

Keypad Operation

- Step customer thought all menu selection.
- Describe function of each selection.

Material

- Demonstrate the correct way to load and unload material. Have customer load and unload material.
- Discuss effect of wet material on part quality.
- Demonstrate how to install modeling base.
- Explain the effects of building on “used” modeling base.
- Instruct customer on how to remove a part.
- FDM process
- Explain the process of Fused Deposition Modeling.

Maintenance

- Cover contents of the Start-up Kit and the usage of each tool/spare part.
- Explain how to remove supports and finishing techniques.
- Cover daily, weekly, quarterly, and “as needed” maintenance. Stress the importance of proper maintenance.

Troubleshooting

- Show customer the basic components of the head assembly and their function.
- Demonstrate how to identify and clear head jams (LOE).
- Inform customer that they will be expected to clear head jams (LOE).
- Discuss error codes- what they mean and what to do if one is displayed.
- Cover the process to report system issues/questions.
- Discuss how to order material etc.
- Cover warranty and maintenance.
- Ensure customer is comfortable with using the system.
- Ask if customer has any concerns or questions.

Required Tool List

Distributor/Reseller supplied

- Standard screwdriver set
- Phillips screwdriver set
- Allen wrench set
- Pliers
- Large crescent wrench or channel locks
- Small wire cutters
- Needle nose pliers
- Assorted wire ties
- Box wrenches
- Flashlight
- Grounding strap
- Voltmeter
- Network crossover cable (for communication testing)
- Laptop computer with Ethernet port, Windows 2000, Windows XP, Windows Vista or Windows 7.
- Small hand held mirror
- Nut driver set
- Digital caliper
- Serial data cable (for issuing HyperTerminal commands).
- USB/Serial cable adapter.

Supplied by Stratasys

- Cable/belt tension gauge (for adjusting XY table drive belts and cables)
- Motor belt tensioning tool (for adjusting belt XY table motor belts)
- Dial indicator
- Head dial indicator bracket (for XY table and Z stage leveling)
- Service Guide
- Maraca CD
- Catalyst CD
- Controller software CD
- User guide

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