



# Bison Tech Team

## #14444A

Reverse Engineering Design Entry

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## Why This Antique?

We chose to reverse engineer the Electrical Section from the Dimension SST 768 3D Printer. We felt it was fitting to review the inner workings because it was created before widespread use of microcontrollers, therefore easy to see the inner components, and we hope to fix it.



## Power Supplies

Some of the most well known electromagnetic laws are the Power Law and Ohm's Law. Power is equal to voltage times current. That means for a given conductor transmitting a given power, the higher the voltage, the less current is required, and the smaller conductor is needed. This means the printer has to supply 5 volts DC, 12 volts DC, 24 volts DC, 170 volts DC, and 120 volts AC from the power supplies shown below.. Most devices now run on just one voltage.

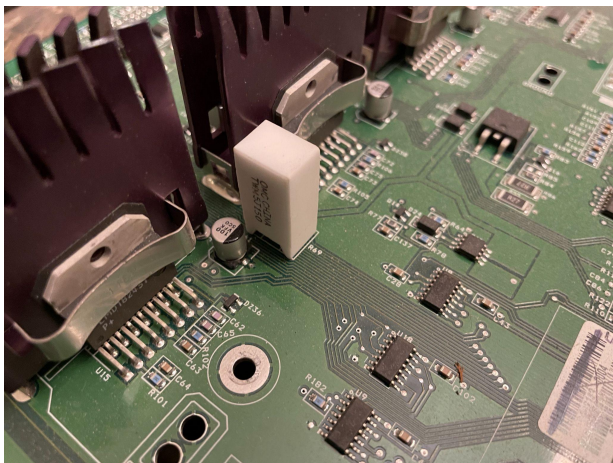


## Power Distribution Board

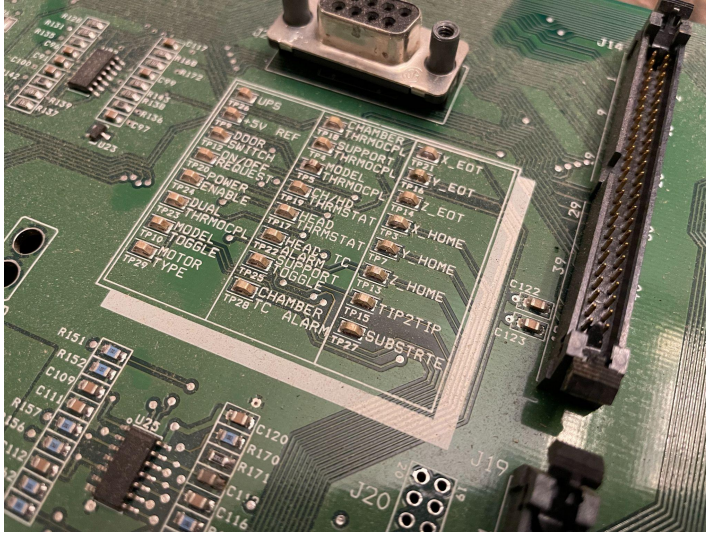
This is the muscle of the printer. It takes digital inputs from ribbon cables in the top right, and sends power out the back side to the rest of the printer.



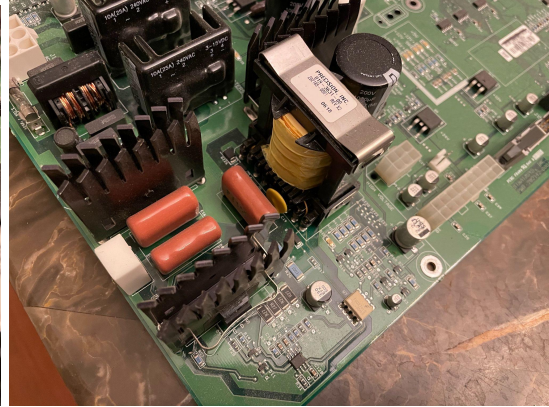
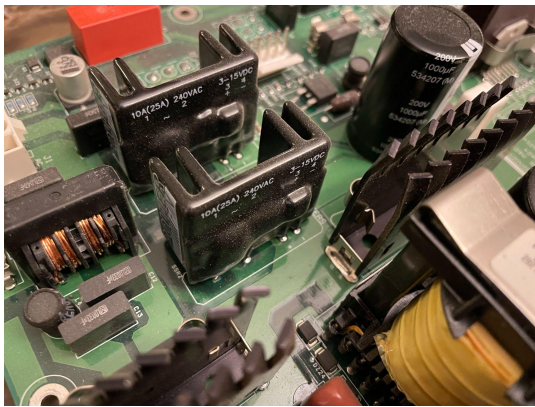
The distribution board contains the motor drivers, located in the middle of the board, that send the proper voltage variations to drive the stepper motors. They take inputs regarding direction of the motor and when to move to the next step, and they cycle/step (hence stepper motor) the voltage of the motor to move it at regular amounts..



The test points are directly above the motor drivers. The printer has a 3x16 character LCD, but it is very limited for all the systems to monitor on this printer, so the makers of the printer had a solution: measure voltage at these terminals manually.



Speaking of high power, the printer has dual 1000 watt chamber heaters to provide the most consistent prints possible. This is switched on and off by two large solid state relays.



## Single Board Computer (CBS)

If the power distribution board is the muscle, then the CBS is the eyes. It is a whole computer with a hard drive, ram, and an intel processor. Its whole purpose is to download, store, and queue print jobs for the Controller Board. It also had a PCMCIA slot, that we assume would have been for a wifi card.



## Controller Board

The brain of the printer is the control board. Based around the Coldfire Microprocessor, and a dual port memory system this board is what really controls the printer. The Coldfire processor shares memory directly with PMD motion control chips, which is unusual for the time, considering Smart Access Memory, sharing ram from CPU to GPU, is a cutting edge feature here in 2022.



## What We Learned

We were able to see some creative problem solving used to allow this printer to be high end for the time. From using unorthodox power supplies, to multi-access memory, the Dimension SST 768 is truly unique. We learned about the basic principles that govern the world of electronics, and what engineers had to do to make due with very limited computing power.



Resources Used:

Service Manual-

<https://www.manualslib.com/manual/1107146/Stratasys-Dimension-768-Elite.html>