Dimension BST/SST/768/Elite, FDM 200mc, Prodigy Plus, and Prodigy Troubleshooting Guide

Revised 9/14/09

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1.0 How to Use the Guide

1.1 Determine what type of error you are experiencing; either a Code Error or Non-Code Error.

1.2 If you are experiencing a Code Error:

- **A)** Refer to the Code Error Section of the guide (Section 3.0)
- **B)** Match the code number with the number in the guide.
- **C)** Follow the corrective actions to fix the error.

1.3 If you are experiencing a Non- Code Error:

- **A)** Refer to the Non-Code Error Section of the guide (Section 4.0)
- **B)** If the display on the machine displays an error message, match that message to one of the buckets in the guide.
- **C)** If a message does not appear, match the problem to one of the buckets in the guide.

Note: The Non-Code Errors are listed in alphabetical order.

1.4 If you have any suggestions, additions or changes that need to be made to this guide please e-mail **ProdigyTSGuideTeam@Stratasys.com**.
The suggestions and changes will be brought to the troubleshooting meeting, where they will be discussed and approved.

1.5 There have been changes made to the electronics of the Dimension Printers. These changes will improve the operation and serviceability of the Dimension Printers. Since new versions are being released and will continue to be released, Dimension has changed the naming structure of the system electronics as follows:

"Old Electronics" will now be referred to as Generation 1 Electronics, or Gen 1 Electronics.
Gen 1 Electronics are installed in machines with serial numbers ranging from P0001 to P3999.

"New Electronics" will now be referred to as Generation 2 Electronics, or Gen 2 Electronics.
Gen 2 Electronics are installed in machines with serial numbers ranging from P4000 to P08999

The third version of electronics will be referred to as Generation 3 Electronics, or Gen 3 Electronics.
Gen 3 Electronics are installed in machines with serial numbers ranging from P09000 and above.

2.0 Special Notes

2.1 Field Special Notes

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 build software. Upgrade the software if necessary.

C. Power the machine down. Shut the machine off at the breaker.
Move the head & Z-Stage away from the sensors. Power up the machine.

D. Check and reset connectors and pins.
· Give special attention to J7, J10, and J12 connectors. Make sure pins are not protruding from rear of connector housings.
(If pin protrudes, disconnect connector, push pin fully into connector, re-install connector.)

E. When measuring DC voltages and signals using chassis ground is preferred.
Do NOT measure AC voltages using chassis ground.

F. Gen 2 electronics only :
Check/reseat the three ribbon cables between the PDB (J14, J17, J19) and the controller board (J1, J2, J3) as part of the troubleshooting process.

G. Hyperterminal move commands are in mico-steps using the Gen 1electronics and are in inches for Gen 2/3 electronics.

H. Limit switch states are not displayed in Maraca for Gen 2 and 3 electronics (due to PMD changes).
Check limit switch states using the test points and/or LED's on the PDB.

I. Replacement Hard Drive may take up to 45 minutes to boot. HD is running File System Check.

3.0 Code Errors

NOTE: Gen 1 = P0001 to P3999, Gen 2 = P4000 to P08999, Gen 3 = P09000 and above

3.1 Major Codes

Note: These codes are displayed on the system LCD.

01: Unknown Error - No data on what error occurred
02: PUC Error - Path, utilities and controller development library (Used for software testing)
03: No Display - Process that runs LCD display generated error
04: Memory Error - Single board computer experienced memory error
05: LCD Display - Failed to write to LCD display board from SBC - Replace LCD
06: LCD Keypad - Failed to read from LCD keypad to SBC - Replace LCD
07: Manager Channel - Socket from manager internal manager process was on, SBC (Software error, will not be displayed)
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). If this occurs nearly every time a part is started:
1. Reslice the part 2. Replace the SBC and/or the hard drive.
12: Joblog Message Buffer - Failed to write to job log (Software error)
13: Joblog File -Failed to create the job log (Software error)
14: Controller Abort -186 controller failure (See sub errors below)
15: Starting Up Failed - Some part of the start up procedure failed
5.1: Using HyperTerminal check to make sure the controller gender matches the systems gender. If not, replace controller and load upgrade.
16: Find Z Failed - Failed to find Z limit switch
17: Controller Load Failed - Unable to load global parameters (exp. Temp values, flow control)
18: Temperature Failed to Regulate - Liquifier or chamber failed to reach temperature within time constraints (No change in 7 min.)
19: Controller Initialization Failed - Controller failed to reboot or start
20: Door Latch Command Failed.
21: Ldrool Failed.
22: Controller Communications Failed - 186 has stopped communicating with the SBC. BE version 1164/1166 only.
23: Universal Device Name error

3.2 Major Codes with Minor Codes

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

Errors	**Corrective Actions**
Controller Abort Minor Errors (Code: 14, XX)	**NOTE: Gen 1 = P0001 to P3999, Gen 2 = P4000 to P08999, Gen 3 = P09000 and above**
14, 01: Abort : Z axis is jammed	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 will allow you to move the Z stage without tripping the Z jam sensor. + is down, - is up. 6. **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**- Check Z jam sensor, Z jam cable and/or Mid-Unit Harness. 8. Z stage motor maybe bad. Does motor "groan" when attempting to move the Z stage?
14, 02: Report: Attempt to raise foam/substrate sensor failed	1. Replace substrate. 2. Power cycle machine. 3. **Gen 1** - Check connector J7 on the 186 board for loose pins **Gen 2** - Check connector J10 (pin 19) on the PDB board for loose pins. **Gen 3** - Check connector J10 (pin 13) on the PDB board for loose pins. 4. Using Maraca/LED's/test points: Check to see Z foam box toggles when switch is activated. If not, check foam sensor and/or Umbilical Cable. **Gen 2** - Check signal at TP27 **Gen 3** - TP23. 5. 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** - TP9 6. Check Z home switch position. Adjust if needed.
14, 03: Report: Foam/substrate sensor up when it should be down.	1. Check the foam/substrate sensor assembly for free operation. 2. Check to see if the sensor arm is broken. 3. **Gen 1** - Check connector J7 on the 186 board for loose pins. 4. **Gen 2/3** - Check connector J10 (pin 19) on the PDB board for loose pins. 5. 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 Umb cable. **Gen 2/3** - Check signal at TP27.
14, 04: Report: Foam/substate sensor down when it should be up.	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.
14, 05: Abort : Unexpected contact with X axis home sensor. **14, 06: Abort : Unexpected contact with X axis EOT sensor.** **14, 07: Abort : Unexpected contact with Y axis home sensor.** **14, 08: Abort : Unexpected contact with Y axis EOT sensor.**	1. Using Maraca/LED's/test points: Check if home & limit boxes are checked. If so check limit switches and/or Umbilical Cable (for X) / Mid-Unit Harness (for Y). 2. Power Cycle the machine 3. **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. 4. Check for an obstruction hitting the model. 5. Manually move the XY table in X and Y checking for smooth operation. 6. Check the XY table cable tension. Adjust if necessary. 7. Incorrect length substrate arm installed. Replace substrate arm with the correct length. 8. Check to make sure the homing sensors are clean.

14, 09: Abort : Unexpected contact with Z axis home sensor. **14, 10: Abort : Unexpected contact with Z axis EOT sensor.**	1. Check the to make sure the switches are adjusted correctly per the service guide procedure. 2. Check to see if the switch is operating correctly (See if the switch is loose or broken). 3. **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 4. Check the Z motor - Run the TZ command using HyperTerminal 5. Check the Z belt condition and tension. 6. If error occurs when running the "Find Z" command (FZ), replace the Z Foam Sensor.
14, 11: Abort : Door opened while axis in motion	1. Check to see if door latch is activating using 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 the magnet with movement to the door. 9. Check that the door magnet is present.
14, 12: Abort : One second timer late. <u>Gen 1 electronics only</u> (Housekeeper needs to be preformed every second but did not, Software sends pulse from the 186 every second -software has hung up)	1. Power cycle machine. 2. If problem continues check/reseat ribbon cable from 186 to the PDB. 3. If problem still continues send outfile to SSYS CS, 186 may need to be replaced.
14, 13: Abort : Under Run at vertex buffer (Asked for another vector interrupt, but none was available) **14, 14: Abort : Under Run not in tool path** (Asked for another vector interrupt, when it shouldn't have)	1. Reprocess the part and send again. 2. 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	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. (vector is corrupted)	1. Communication error between 186/controller board and the SBC - Power cycle system
14, 17: Abort : User abort.	1. Build was cancelled through the keypad
14, 18: Abort : User panic stop.	1. Will not be displayed on LCD (Opening door during build can cause this error)
14, 19: Abort : Idle loop is slow. (Housekeeper needs to be preformed every second but did not)	1. Power cycle machine. 2. If problem still continues send outfile to SSYS CS.
14, 20: Abort : XY axis not ready. (Chip that controls the PMD chip not ready) **14, 21: Abort : Z axis not ready.** (PMD chip not ready)	1. Power cycle machine. 2. Using the HyperTerminal, type SS. "X Axis Ready" <u>should</u> be displayed. If it is <u>not displayed</u>, then type the "FH" & "FZ" commands. Finally type "SS" again. If "X Axis Ready" still is not displayed, then replace the 186/contoller Board. 3. Battery could be bad on 186/Controller Board. Open Hyper Terminal, look for boot error. Replace 186/Controller Board.

14, 22: Abort : Head temperature set-point too low. (Head temperature set to below 220C)	1. Go to Maraca and change temperature 2. Verify the head temperature set point using Maraca. - The model must be above 240 degrees. - The support must be above 220 degrees (Prodigy Plus only).
14, 23: Report: Begin curve parameters not in sequence.	1. Communication error between 186/contoller & SBC - Cycle power 2. If problem still continues send outfile to SSYS CS.
14, 24: Abort : X axis command error (PMD error) **14, 25: Abort : Y axis command error (PMD error)** **14, 26: Abort : Z axis command error (PMD error)**	1. Check to see if machine software is current release. If not, upgrade software to current build. 2. Power cycle machine. 3. If error continues - possible memory problem, replace SBC Ram. 4. If the frequency of the error is greater than once every three months, replace the 186/controller board.
14, 27: Abort : X axis motion error (PMD error) **14, 28: Abort : Y axis motion error (PMD error)** **14, 29: Abort : Z axis motion error (PMD error)**	1. Check to see if machine software is current release. 2. Power cycle machine. 3. If the frequency of the error is greater than once every three months, replace the 186/controller board.
14, 30: Abort : PMD axis command was not X, Y, or Z. (Tried to command axis other than X,Y or Z)	1. Check to see if machine software is current release. If not, upgrade to current build.
14, 31: Abort : Move absolute error. (Failed to move when commanded)	1. Check connectors to the X and Y motors. 2. Check home and EOT switches for correct operation. Replace if defective.
14, 32: Abort : PMD checksum error. (Corrupted PMD command)	1. Check to see if machine software is current release. If not, upgrade to current build. 2. Power cycle machine. 3. If the frequency of the error is greater than once every three months, replace the 186/controller board. 4. Check the 186/controller version using Maraca.
14, 33: Abort : Invalid being send to PMD chip. (Error in format of data sent to PMD)	1. Check to see if machine software is current release. If not, upgrade to current build. 2. Power cycle machine. 3. If the frequency of the error is greater than once every three months, replace the 186/controller board.
14, 34: Abort : Z axis table jammed **Gen 1 electronics only** **Note: Z stage is not moving.** **Note2: Z jam sensor removed in G2 & G3 electronics**	1.Check for objects/parts on Z stage. 2. Check for purge material around lead screws. Remove material, clean and lube. 3. Toggle power switch. 4. Manually move the table away from the upper and lower Z limit switches then cycle power. 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. 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. + is down, - is up. If the motor moves, the jam sensor is the problem 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) 8. Check Z jam sensor and/or Mid-Unit Harness. 9. Table is not level. Check and level 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. Z channel of the MDB has failed - replace the MDB. 13. Z belt has damaged Z jam sensor wire. Check wire for damage.

14, 35: Report: Time out while loading cartridge. (Waited too long for filament to reach head drive motor)	1. See Load Failed Section (K) in the Non-Error Code Section.
14, 36: Report: Modeling material not moving in head. **14, 37: Report: Support material not moving in head.** Gen 1 - LM629 chip on the 186 controls head drive motor movement Gen 2/3 - PMD chip on the controller board controls movement	**Gen 1 electronics only** 1. LM629 IC on the 186 may have crashed or is bad. 2. Cycle power at the breaker. 3. If error continues, then replace the 186. **Gen 2/3 electronics only** 1. Check/reseat J9 on the PDB. 2. Cycle power at the breaker. 3. If error continues, then replace the controller board.
14, 38: Abort : Hardware turned off power supply. Gen 1 - PDB watchdog timer not refreshed every second from the 186 board Note: Symptoms of this error will be that system will power down after a few seconds.	**Gen 1 electronics only** 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- 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/reseat ribbon cable from the 186 to the PDB. **Gen 2/3 electronics only** 1. Check head, envelope snap switches, and cables. Head - TP17 normally is high. Envelope - TP19 normally is low. 2. Check/reseat J9 and J12 conncectors on the PDB J9 pin 19 for head snap switch. J12 pin 14 for envelope snap switch. 3. Replace the cable 4. Replace the controller board 5. Replace the PDB
14, 39: Abort : Head thermocouple fault. **Steps 1-8:** Head Thermocouple is OPEN **Step 9:** Head Thermocouple is CLOSED	1. Check thermocouple wire for damage. 2. Using a meter, check to see if thermocouple is open at head. 3. Open may be in umbilical head cable. **Gen 1** - Check J7 on the 186 for spread pins. **Gen 2 -** Check J10 on the PDB **Gen 3 -** Check J9 on the PDB 4. Check TC Head Board for correct jumper configuration. (Jumpers are used only on SST or Prodigy Plus) 5. Check the ground wire (connection) at head TC Board. 6. Check the component leads on back of Head TC Board are not shorting to head 7. Check signal voltage at T/C - if incorrect replace T/C board. a. Single heater board - TPALR and GND should be <3VDC. b. Dual heater board - TP301 and GND should be <3VDC. 8. Replace the head 9. Check snap switches and snap switch wires. Replace as necessary.
14, 40: Abort : Chamber thermocouple fault.	1. Check to see if chamber thermocouple is plugged in. **Gen 1**- Plugged into 186. **Gen 2/3** - Plugged into the PDB 2. Using a meter check if thermocouple is open. If so, replace thermocouple. 3. Check chamber thermocouple and wire for damage.
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.**	1. Close door 2. Check to see if door solenoid is operating properly. Toggle solenoid using Maraca. 3. Look at LCD display, should read "Door Open" when machine is idle and door is open. 4. Cycle power. 5. Using Maraca/LED's/test points: Check to see Door open toggles when switch is activated. If not, check door switch and/or Mid-Unit Harness. 6. **Dimension Only-** Make sure door magnet is present. 7. Check to see if door has warped.

14, 45: Report: Unable to write to modeling material cartridge **14, 46: Report: Unable to write to support material cartridge** NOTE: Will see in log file only	1. Try a different cartridge. Also verify that material is the correct type for system. 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 -** Reseat and check pins on J18 on the 186. **Gen 2/3** - Reseat 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. (Illegal command on vertex channel)	1. If this message is displayed on LCD ONLY, replace SBC Ram. 2. If this message is not displayed on the LCD, (seen in outfile), RAM is NOT the root cause. 3. 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: Abort : Model material not loaded. **14, 52: Abort : Support material not loaded.** **14, 53: Abort : Model head motor not ready.** Gen 1 - 629 chip not initialized **14, 54: Abort : Support head motor not ready.** Gen 1 - 629 chip not initialized	**Note:** System does not recognize material is loaded 1. Reload material
14, 55: Abort : Find home failed, X home and X eot both on **14, 56: Abort : Find home failed, Y home and Y eot both on**	1. Power cycle machine - remember to move head away from switches. 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).
14, 57: Abort : Find home failed, X home timeout **14, 58: Abort : Find home failed, Y home timeout** **Note:** These errors occur most often due to a problem with the motor, not the switch	1. Power cycle machine - remember to move head away from switches. 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 home sensor toggles when sensor is activated. If not, check sensor and/or umbilical cable (for X) / mid-unit harness (for Y).
14, 59: Abort : Find home failed, X home not tripped **14, 60: Abort : Find home failed, Y home not tripped** **Note:** These errors occur most often due to a problem with the motor, not the switch	1. Power cycle machine - remember to move head away from switches. 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 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, 61: Abort : Find home failed, X home tripped **14, 62: Abort : Find home failed, Y home tripped**	1. Power cycle machine - remember to move head away from switches. 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, 63: Abort : Find home failed, X eot tripped **14, 64: Abort : Find home failed, Y eot tripped**	1. Power cycle machine - remember to move head away from switches. 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, 65: Abort : Find home failed, X eot not tripped **14, 66: Abort : Find home failed, Y eot not tripped** Note: Receive interrupt but switch not tripped.	1. Power cycle machine - remember to move head away from switches. 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 sensor toggles when switch is activated.
14, 67: Abort : Head temperature too high **- Liquifier is too hot, smell burning plastic (+300deg)**	1. T/C is bad reporting below set point temperature.. 2. Head TC Board is bad 3. Head T/C cables are swapped or not plugged in.
14, 68: Abort: Illegal PMD Command	1. If error occurs more than once a month replace the 186/controller board.
14, 69: Abort: XY PMD Read Checksum error	1. If error occurs more than once a month replace the 186/controller board.
14, 70: Abort: XY PMD Write Checksum error	1. If error occurs more than once a month replace the 186/controller board.
14, 71: Abort: Z PMD Read Checksum error	1. If error occurs more than once a month replace the 186/controller board.
14, 72: Abort: Z PMD Write Checksum error	1. If error occurs more than once a month replace the 186/controller board.
14, 73: Abort: Head TC Board Configuration error	1. Check jumper configuration on Head TC board. See 14, 39
14, 74: Unexpected contact with unknown limit. This message occurs when we interrupt for contact with a limit switch, but when we read which limit we interrupted for, there are no limit switches set. This is normally associated with an intermittent wire in the harness to one of the limit switches.	1. Power cycle machine - remember to move head away from switches. 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 swithc toggles when switch is activated. If not, check switch and/or umbilical cable (for X) / mid-unit harness (for Y).
14, 75: Unknown	No error code associated with an error
14, 76: Software bug (Internal software bug)	Cycle power.
14, 77: Buffer is larger than the data **14, 78: Buffer is smaller than the data** (Command channel formatting issue between controller and SBC)	1. Cycle power. 2. Replace single board computer.
14, 79: Run-time error	Cycle power.
14, 80: Index out of bounds	Cycle power.
14, 81: Invalid argument **14, 82: Invalid channel** **14, 83: Invalid command** **14, 84: Invalid command opCode** (Malformed commands)	Cycle power.
14, 85: The operation is not implemented (Command not applicable for that gender)	Software error; will not be displayed.
14, 86: Timeout (System failed to complete a task)	Cycle power.

14, 87: Resource already in use (System trying to use resource already in use)	Cycle power.
14, 88: The dual-port memory is corrupted (header stamped on dual-port memory (DPM) is corrupt)	Cycle power.
14, 89: No valid ISR callback routine set (Failed to setup interrupt)	Cycle power.
14, 90: An internal queue has overflowed	Cycle power.
14, 91: Address not properly aligned	Cycle power.
14, 92: Message too big for queue	Cycle power.
14, 93: Data unit size violation	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. Repalce 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. Repalce controller board
14, 96: Unidentified interrupt occurred	Cycle power.
14, 97: Invalid data type	Cycle power.
14, 98: Find home failed, X EOT timeout **14, 99: Find home failed, Y EOT timeout** Note: No interrupt detected.	1. Power cycle machine - remember to move head away from switches. 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 sensor toggles when switch is activated. If not, check switch and/or umbilical cable (for X) / mid-unit harness (for Y).
14, 100: Find home failed, Z HOME (BOT) not tripped **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**	1. Check for objects/parts on Z stage. 2. Check for purge material around lead screws. Remove material, clean and lube. 3. Toggle power switch. 4. Manually move the table away from the upper and lower Z limit switches then cycle power. 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. . 6. **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 7. **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 8. **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. 9. **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) 10. **Gen 1** -Check Z jam sensor and/or Mid-Unit Harness. 11. Table is not level. Check and level per the service manual using the head leveling fixture. 12. Z-axis motor has failed (see 14.1) 13. Z-axis belt is loose or worn. Adjust tension or replace belt. 14. **Gen 1** -Z channel of the MDB has failed - replace the MDB. 15. **Gen 1** -Z belt has damaged Z jam sensor wire. Check wire for damage. 16. Sensor flag has possibly become magnetized - check for magnetism. Replace flag if magnetized. 17. **Gen 2/3**- Check pins on Z-axis motor connectors (both ends) to make sure that they are fully seated in connector housing. 18. 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 (Substrate didn't find switch)	1. No modeling base 2. Modeling base is used/defective, has low spot. 3. Verify substrate sensor is working.
14, 105: Controller not ready to build a model	Cycle power
14, 106: BOT offset is higher than the BOT switch (Find home completed)	1. Calibration error occurred. 2. Forgot a minus sign in the Z offset value. 3. Customer may be shaving the foam and adjusted Z offset accordingly. Use new foam and readjust tip depth. 4. Check/adjust 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 controller board.
14, 112: EEPROM communication error	Software error; will not be displayed.
14, 113: Door not latched (Solenoid current not detected)	1. Inspect solenoid and wiring. Note: Solenoid may be catching on spring - rotate spring. 2. Replace solenoid 3. Replace PDB 4. Possible bad 24VDC supply, replace supply.
14, 114: Thermostat snap switch tripped	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. Hear or chamber thermostat wires are open. 4. **Gen 2/3** - Reseat connectors on PDB. 5. **Gen 2/3** - Replace PDB.
14, 115: Z stage planarity beyond tolerance	1. Substrate may be out of level or damaged, replace substrate. 2. XY table or tray out of level.
14, 116: I2C configuration info is corrupt	Software error; will not be displayed.
14, 117: A command failed while modeling	1. Reprocess part. 2. Gantry/part calibration values have been set to zero - check using Maraca. Download CAL files to restore values.
14, 118: Invalid cyclic redundancy check	Cycle power.
14, 119: Operaiton already active	Software error; will not be displayed.
14, 120: Invalid vector detected	1. Reprocess the part and send again. 2. If the frequency of the error is greater than once every three months, then replace the SBC or hard drive.

14, 121: Processor Exception	Cycle power.
14, 122: Processor halted	Cycle power.
14, 123: Watchdog timeout	1. Cycle power. 2. Check 5/12 VDC power (5 and 12VDC LEDs will repeatedly dim). Replace 5/12 VDC power supply
14, 124: Stack overflow	1. Cycle power.
	2. Replace Controller Board
14, 125: Runtime error	Cycle power.
14, 126: Operation active - try again	Cycle power.
14, 127: Invalid gender	Cycle power.
14, 128: Invalid platform	1. Cycle power. 2. Replace Controller Board
14, 129: Toggle head failure	Cycle power.
14, 130: Temperature setback is active	Cycle power.
14, 131: Toggle when head motor is running	Cycle power.
14, 132: UPS low power	1. UPS is shutting down. Check UPS and AC power.
14, 133: Head liquefier is not heating up Note: 14:133 error differs from code 18 errors in that the 14:133 error signal is sent from the Controller instead of the SBC.	1. Liquefier heater is open (infinite resistance). 2. Liquifier 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 machine 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 outut voltage to support. If support voltage is low, auxillary 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 Note: Software is not finding a hardware device	1. Use LE command in HyperTerminal

Starting Up Failed Minor Errors (15.XX)

15, 01: Unable to Enter Start Up	Software use only
15, 02: Startup timeout period expired	Software use only

Controller Load Failed Minor Errors (17.XX)

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)

Note: SW Build 1040 only shows "Code:18" on the display. It does not differentiate between Chamber and Head temperature regulation failures.

18, 01: Temperature not changing fast enough.	1. Status-Details: Check to see if current envelope temperature is above 50C for Prodigy, 65 C for all other systems, before starting a model. 2. Status--Details: Check to see if envelope temperature set point is 70C for Prodigy, 75C for all other systems. If not, toggle power switch. 3. Check heaters, chamber fans, and heater cables. 4. Check chamber thermocouple - see 14.40. 5. Check if head T/C board grounding wire is connected (not grounded).
- Liquifier won't heat up (its cold). **Note: 102 Deg = 0 Deg.**	1. Liquefier heater is open (infinite resistance). 2. Liquifier 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 back of head, if OK heater is bad. Replace head. 4. **Gen 1** -Fuse on the 120 VDC supply is blown (on PDB). 5. The umbilical cable to the heater is broken or has a bad connector. 6. Make sure the machine is plugged directly into a wall outlet. 7. **Gen 1** -Check for 120VDC out on the PDB (fuse OK). If no 120VDC output replace PDB. 8. **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. 9. **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. 10. Check the thermocouple connectors, heater connectors, and J7 on the 186 board. 11. Use Maraca to check to see if the temp is going over 182 Deg.
- Liquifier is warm but doesn't reach operating temperature.	1. Check AC input and that no extension cords or power strips are attached to the system. 2. Liquifier heater has higher than normal resistance, **correct value should be about 98 ohms for non-SS systems, about 75 ohms for SS system**s. If incorrect - replace head. 3. The umbilical cable has an intermittent connection 4. Replace the head T/C board. 5. Grounding problem at head T/C board. Check ground wire to T/C board.
- Chamber temperature too high (over 75 degrees)	1. Chamber T/C has failed. 2. Chamber temperature offset is incorrect. Correct using Maraca.
18, 02: Temperature failed to regulate within 7 degrees	1. Status--Details: Check to see if head temperature set point is 270 degrees C. 2. Check Liquifier Thermocouple wire and/or Heater wires 3. Check for torn or damaged insulation on the liquifier, especially around the tip area. 4. Check head T/C and umbilical cable for a loose connection.
18, 03: Incorrect model head temperature. *ALSO SEE 18.01*	1. Using Maraca, set model temperature to default to 280C
18, 04: Incorrect support head temperature	1. Using Maraca, set support temperature to default to 280C
18, 05: Incorrect chamber temperature	1. Incorrect chamber temperature. Using Maraca, set chamber temperature to default of 75C

Controller Initialization Failed Minor Errors (19.XX)

19, 01: IN_COMMAND Rejected by Controller	Software use only
19, 02: IN_COMMAND Timeout Failed to load globals	1. Cycle power 2. Replace 186/controller board 3. Replace hard drive

Door Unlatch Failed (20.XX)

20, 01: Unlatch command rejected **20, 02: Timeout period expired waiting for head to stop**	1. Check door latch solenoid wiring 2. Check ability of door to latch

Controller Communications Failed Sub Errors (22.XX)

22, 01: FC-SERVICE Note: Command not processed by the controller. This error Occurs when the 186 stops communicating with SBC. This error is incorporated on controller software build 1164 or 1166. **22, 02: Insufficient material to complete job**	1. Install controller software built 1204 or higher.

Universal Device Name Error (23.XX)

23, 00: UDN controller command failed **23, 01: UDN controller command timed out** Note: Device name cannot be stored on Controller	1. Reboot system 2. Replace Controller Board

4.0 Non-Code Errors

NOTE: Gen 1 = P0001 to P3999, Gen 2 = P4000 to P08999, Gen 3 = P09000 and above

A) "Build Error" displayed on LCD
B) Tip Depth Incorrect
C) "Corrupted Upgrade" displayed on LCD
D) "Could Not Read Cartridge" displayed on LCD
E) Door Latch
F) "Door Open" displayed on LCD
G) Download
H) Loss of Extrusion (LOE)
I) Lights
J) Load Failed
K) Network Communications
L) Part Quality
M) Pauses During Build
N) Power Down
O) Power Up / Boot
P) "Can't Find Home - Check Modeling Base/Foam" displayed on LCD
Q) System VERY slow to reach temperature
R) Calibration Issues
S) Unexpected behavior

Errors	**Corrective Actions**
A). "Build Error" displayed on LCD	**NOTE: OE=Old electronics NE=New electronics**
1. Part stops building before complete.	1. Partial or bad model file sent to unit. - Check and reprocess the STL and redownload the file.

B). Tip depth is incorrect

1. Tip Depth is wrong (too deep or above the substrate)	1. Check the substrate - replace if necessary. 2. Cycle the power at the breaker. 3. Adjust the Z Offset Calibration using Maraca / Data Status 4. Check and/or clean the Z foam sensor. - See the Service Data Bulletin 00044 5. Replace the Z foam assembly and sensor.
2. Builds above the foam consistently.	1. Verify Z foam sensor value changes using HT. Possibly intermittent open in umbilical cable 2. Check Tip Depth value in Maraca. Should be less than -0.10 3. Replace Z foam sensor and assembly. 4. Replace 186/controller board (noise on signal)

C). "Corrupted Upgrade" Displayed on LCD

	1. Verify the CD is the correct gender. (Same as the system) 2. If using build 1204 download the controller upgrade/.upg, not Intialinstall/.upg file. 3. Cycle power and try download again. If not possible or fails again replace hard drive. 4. Verify the Hard Drive and the 186 board are not from a different "class" system.

D). "Could Not Read Cartridge" Displayed on LCD

1. Cartridge reads empty (with more than 5 wraps left).	1. Remove the cartridge & cycle the power. Reload the cartridge. 2. Cartridge spool e-prom has failed. Load a different cartridge. 3. Check 'heartbeat' LED on card-reader card. If slower than 1 beat per second, replace card-reader assembly. 4. **Gen 1** -Loose J8 on the 186 Board. Check for spread pins and reseat conncector. 5. **Gen 2/3** -Loose J7 on the controller board. Check for spread pins and reseat conncector. 6. Loose connector on the card reader. Remove and reseat the card reader connector. 7. Check to make sure the cartridge reader board LCD is blinking 8. **Gen 1** - MUX has failed on the 186 Board. Swap the cables, if the error moves, the 186 Board is bad. If the error stays, the cartridge reader board is bad.

E). Door Latch

1. Door doesn't latch/unlatch.	1. Check to see if door has delaminated or is bowed. If so replace door. 2. Door solenoid (rod) has been bent. 3. Door solenoid has failed. Check by toggling using Maraca. 4. Cable (wire) to solenoid is open. 5. PDB has failed (won't latch only).

F). "Door Open" Displayed on LCD

	1. The door is open. 2. The door switch is bad. Check using Maraca/DataStat/LED's/meter. 3. The latch mechanism is not contacting the switch. 4. The door is warped. Replace door. 5. Misaligned or missing magnet.

G). Download

1. Model sent to system, but did not appear in queue.	1. Send the file again. 2. Reprocess and send the file again. 3. Cycle power on both the system and the work station. 4. Check the STL file. 5. Downloading starts but fails during download process. External or internal network cable bad. Try different network cable or replace pigtail (internal) network cable.

H). Loss of Extrusion (LOE)

1. Liquefier doesn't extrude material	1. Drive wheel or mushroom jam. Refer to Loss of Extrusion section in the Users Guide 2. Material jammed in cartridge. Replace or repair cartridge. 3. Filament motor or 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 loss of extrusion). Replace head assembly. 6. Liquifier heater has higher than normal resistance, value should be about 98 ohms for non-SS systems, about 75 ohms for SS systems. If not replace head. 7. Umbilical cable to filament motor is bad. Replace umbilical cable
2. Filament motor is running very fast.	1. Make sure the pin connectors on the head bracket are seated properly. 2. Bad Motor. Test by swapping motor cables at the head. 3. Broken wire in the umbilical cable.
3. <u>Waterworks</u> filament frequently breaking (More than once per 1000 hours)	1. Drive wheel or mushroom jam. Refer to Loss of Extrusion section in the Users Guide 2. Material jammed in cartridge. Replace or repair cartridge. 3. Clean drive wheels of excess material. 4. Check filament guide alignment. See SDB00084. 5. Check for twisted feed tubes. See SDB00084. **NOTE: If twisted the support tube must be replaced** 6. Filament drive wheel block timing off - replace head.
4. Filament slips at head	1. High pull force or jammed cartridge - replace cartridge. 2. Plugged Liquefier - replace head. 3. Worn filament tubes - replace filament tubes.

I). Lights

1. Chamber lights won't come on. Note: Unit is otherwise functioning normally	1. Lights are burnt out - replace bulb 2. Open wire to light - check for continuity 3. Light socket has failed - replace socket 4. **Gen1** - FET Q14 (center right of board) on the PDB has failed - replace the PDB

J). Load Failed

1. Cartridge won't load (no movement) after pressing load.	1. Smart spool e-prom has failed. Replace cartridge. 2. Receiver encryption board has failed. Replace cartridge. 3. Pogo pins bent or failed. 4. Cartridge not in all the way and latched. 5. Insure the Z stage is not on the lower or upper limit switches.
2. Cartridge failed to load after three tries.	1. Cartridge is defective (e.g. material jammed in cartridge, worn drive wheel). Replace 2. Cartridge is empty. Replace cartridge. 3. Filament left in head or needs to be cleaned. 4. Load solenoid or motor not working. Check connections to motor/solenoid. 5. Filament is being cut off too long at cartridge. Less than 1/4" should be exposed. 6. Filament guide tubes are kinked or bad. Replace filament tubes. 7. Head filament motor not running. Verify that motor runs though head maintenance. 8. Filament guides are out of alignment with motor blocks.
3. "Load Failed" is displayed shortly after hitting "Load"	1. Check that the Z stage is not hitting the lower Z limit switch. Manually raise the Z stage several inches above the lower Z limit switch.
Load Failed - Galvanized receiver only **1. Model filament loads 6 feet (2 meters), but support filament doesn't move on dual autoload.**	1. There is filament left in head or it needs to be cleaned. Remove filament and clean. 2. Filament guides are out of alignment with motor blocks. Check alignment. 3. Model drive pivot arm didn't disengage with cartridge - replace receiver back panel.
2. Filament leaves cartridge but doesn't make it all the way to the head, less than 6 feet (2 meters)	1. MODEL ONLY - Adjust the location of the model drive solenoid. Move solenoid toward cartridge if motor is bogging down, away from cartridge if drive wheel is slipping. 2. Straighten bend of receiver back panel. 3. Check for loose receiver drive wheels. Align drive wheels and tighten set screw.

K). Network Communication

1. System boots, but won't talk to network.	1. Wrong IP address - check that IP Address in machine and Admin are the same. 2. Make sure the IP address is static on the customer's network. 3. Network Internal (Pigtail) cable bad. Plug network cable directly into SBC to test. 4. Check pin alignment on rear RJ45 socket. 5. OS on Hard Drive maybe corrupt - replace the hard drive. 6. Network interface on SBC has failed - green LED on SBC should blink when system is pinged, or green LED stays on when network cable is unplugged. Replace the SBC.
2. Cannot communicate using a crossover cable with XP. Microsoft Small Business Server adds a piece of software called Firewall Client. This must be turned off.	1. From Control Panel open the Firewall Client Options dialog box. 2. Uncheck the box that says "Enable Firewall Client". 3. Also remember to change the TCP/IP settings from DHCP to an IP address (static IP)
3. Need to find MAC address (SBC)	1. From a DOS prompt type arp -a and hit return. 2. If system is running controller software build 1204 or higher go to "Setup" menu.
4. When sending a part, an error window displays	1. From a DOS prompt type arp -a and hit return. 2. If system is running controller software build 1204 or higher go to "Setup" menu. 3. "Missing close-brace" in error window - replace both cartridges.
5.' Loss of communication' displayed and/or part disappears after 'Start Part' is selected	1. Symbol in file name.

L). Part Quality

1. Part surface is rough.	
1.1 Part is overfilled.	1. Part processed with old version of Software, (without length based raster penetration) 2. Filament diameter is too large (should be between .068 - .072). - Try another **WHITE** cartridge.
1.2 Just Plain Rough	1. Liquefier is loose - tighten liquefier and check calibration. Adjust if necessary. 2. Swivel Head not secured - check the 1/4 turn screws. 3. Fixed Head not secured on XY - Tighten the screws. 4. Check liquefier tip level.
1.3 Hysteresis Problem	1. Lube the XY Guide Rods. 2. Check and adjust cable tension. 3. Power off the machine and manually move the XY. Ensure the movement is smooth and consistent - if not smooth, could have bad bearings, bushings or belts. 4. Build Rob's test part (part pending).
1.4 Extreme over extrusion.	1. Filament motor runaway. - Check motor connection and connectors on 2. Umbilical cable to the filament motor is bad - test by swapping the Molex connectors on back of the head. 3. Reprocess the part and resend
1.5 Witness Mark (a vertical scar/groove on the part) from trailing tip.	1. Check Tip Level
1.6 Surface appears very slightly shifted	1. Check cable tension. 2. Replace motors (belt drive tables) 2. Replace XY table (cable drive tables)
2. Support is embedded in model.	1. Check and adjust Tip Offset 2. Check and adjust Tip Level.
3. Model has shifted during build.	1. Problem with XY table - Check cables, belts bushing and bearings. Check lubracation. 2. Replace motor (belt drive tables) 3. Foam wasn't latched (multiple shifts in y-axis). 4. Check for loose swivel plate - Tighten plate mounting screws and run tip level test. 5. Loose liquefier - Tighten mounting screws and run tip level and tip offset tests. 6. Umbilical cable failing (x-axis shift only). 7. Reprocess part and resend 8. Axis motor or connector is bad (x,y) 9. Bad motor drive belts. 10. Shifting in X - Verify that X drive gears are in one piece and not separated (belt drive xy)
4. Burn marks in part	1. Check tip wipe brush and flicker. 2. Part geometry's are such that model tip sits idle for over 5 minutes. Change orientation. 3. Loose head or liquefier.
5. Part Fell Over	1. Check the tip depth - maybe set too high. 2. Bad Z motor - test with HyperTerminal and running the TZ command.
6. Wavy Roads	1. Problem with XY table - Check cable tension, belts bushing and bearings. 2. Check for missing cable clamp (bogie). Cable drive tables only.

7. Part Curl	1. Check the tip depth. 2. Check that all chamber fans are working 3. Check for loose heater covers 4. Verify the chamber temperature using a thermometer 5. Check Z clearance value. 6. **Gen 1** -Bad U10 chip on the 186 Board. Date code of 9607 on chip. If so replace the 186
8. Part shifts in the Z Direction	1. Check that lead screws are clean and well lubricated 2. Binding Z stage nuts -replace nuts. 3. Check that the Z stage is level. 4. Bad Z motor - test with HyperTerminal and running the TZ command. 5. Z drive belt is worn or loose 6. Install Z dampener disk assembly. 7. Replace Z Stage.
9. Random, BB sized, smooth blobs of material on part, rest of part looks ok. **Note: Problem caused by 186 timing issue.**	1. **Gen 1** -Replace the 186 Board.
10. Wavy parts	1. Check for missing/loose cable clamp (bogie). Cable drive tables only. 2. Replace head
11. Underfill	1. Install a new material cartridge. 2. If head is over one year old - replace head 3. Replace head T/C board 4. Replace XY motors (belt drive) or XY table (cable drive) 5. Replace 186/controller board
12. Model material sagging on curved parts	Change material.
13. Smeared layers in only one axis on the tip offset part Part looks as if the issue is tip level or a head issue	1. Double check tip level 2. Replace XY table

M). Pauses During Build

1. Chamber won't heat up to at least 70 degrees	1. Heater element(s) are burnt out. Using a thermometer check if one side is blowing cooler air than the other 2. **Gen 1** - PDB strapped for the wrong power. Jumper PDB to proper AC input voltage. 3. Check heaters conncetions. **Gen 1**- J7 on the 186. **Gen 2/3**- J3 on the controller 4. Heater bad. Check heater resistance - Old about 65ohms. New about 36ohms. 5. Check chamber fans.
2. Head not maintaining temperature.	1. Head T/C board ground wire loose or not attached. Using a meter, ohm to head chassis 2. Low AC input power. Make sure system is NOT attached to an ext. cord/power strip 3. Check for 120VDC output from the PDB. If voltage is not present or low - replace the PDB. 4. Liquefier foil insulation is missing or torn - if so replace head. 5. Head T/C board is bad. Replace head T/C board 6. Prodigy Plus/SST/Elite only - **Gen 1**- One or both dual 48VDC power supplies are bad. Check voltage at J11 on the PDB. Should be about 96VDC. **Gen 2**- Auxiliary 120VDC supply is bad. Check con. J22 on the PDB (120VDC) **Gen 3**- Auxiliary 120VDC supply is bad. Check con. J8 on the PDB (120VDC) 7. Head T/C wire is shorted to the head chassis. Check or torn or damaged wire insulation. 8. The umbilical cable to the heater is broken or has a bad connector. 9. Head T/C is not fully inserted into liquefier. Check that T/C is installed correctly. 10. Head T/C is crushed. Check by ohming from the T/C connector pin to the head body Reading should show open.

3. Pausing during build and temperatures are correct. **NOTE:** Pausing may be caused by multiple read/write errors not temperature issues.	1. Check cfg for valid (over 60) R/W errors. If errors are noted: a. Check card reader LED for heartbeat - if none check connector J18 on the 186. b. Replace card reader c. Replace receiver cable/receiver d. Replace the 186/controller board
4. STOPS during build, display still shows building, does not start to build again.	1. Cycle power 2. Follow TS instructions for Pausing issues (see above) 3. If issue continues (randomly) replace SBC (SBC is unexpectedly rebooting)

N). Power Down

1. Fails to shutdown.	1. Toggle the power down switch again. 2. Shut system off at the breaker.
2. Unexpected power down.	1. AC power was interrupted. Check customers AC power. 2. **Gen 1**- Jumper out the watch dog timer on the PDB. (See O3) 3. Bad control power down switch cable.
3. Shuts down immediately after the control power down switch is thrown.	1. Check to make sure all connectors are seated on the SBC. 2. Replace the PDB. 3. Replace the SBC.
4. Brown out.	1. Check the chamber bulbs for the correct wattage, should be 20 watts. 2. If SBC is a Nova, check for the additional 5V power supply.

O). Power UP / Boot

1. Chamber won't heat up to at least: **50 degrees - Prodigy** **65 degrees - BST, SST, PP, Elite**	1. Heater bad. Check heater resistance - Old about 65 ohms. New about 36 ohms 2. **Gen 1**- PDB jumpered for wrong AC input power. 3. Replace PDB (loose SS Relay).
2. Head won't heat up.	1. Liquefier heater is bad. Check for 120VDC at head. If OK replace head. 2. Fuse on the 120 VDC supply is blown (on PDB). 3. No 120VDC out from PDB (fuse OK) Replace PDB. 4. AC input power is inadequate. Check AC input power. 5. Liquefier heater is open (infinite resistance).
3. No fans, lights, text and no LCD back light (no nothing)	1. Check if the main thermostat is open. 2. One of two thermal safety switches has popped. Reset switches and test. Switches maybe temporarily bypassed by jumpering HT or CT on the PDB. Jumpers MUST be removed after testing. 3. 24VDC power supply is bad. Replace 24VDC supply. 4. Check cable from 24VDC supply to PDB. 5. PDB has failed, no 24 volt output. Replace PDB.
4. No fans, lights, text and LCD back light is ON	1. **Gen 1**- Check that ALL the dip switch on the 186 are in the OFF position. 2. **Gen 1**- Jumper WD timeout on PDB to override error. Remove jumper after testing! 3. Use HyperTerminal and/or CFG File to check for additional error codes (**root cause**). 4. One of two thermal safety switches has popped. Reset switches and test. Switches maybe temporarily bypassed by jumpering HT or CT on the PDB. Jumpers MUST be removed after testing. 5. Replace thermal switches, mid-unit and/or umbilical cable

5. System won't boot, no display after 5 minutes. Fans and lights are operating **NOTE:** Replacement Hard Drive may take up to 45 minutes to boot.	1. If system homes: Check LCD ribbon cable, if OK replace LCD 2. If system does NOT home: Power on for at least 10 minutes, repeat 2 more times if there is still no text. If after three power cycles of 10 minutes each and there is still no text replace the hard drive. 3. Measure for 12VDC from the PDB (to the hard drive). Replace PDB 4. Verify the hard drive mounting screws are no longer than 1/4". 5. Replace SBC.
6. System powers off after a few seconds.	1. Check that ALL the dip switches on the 186/contoller board are in the OFF position. 2. **Gen 1**- Jumper WD timeout on PDB to override error. Remove jumper after completing testing! 3. Use HyperTerminal and/or CFG File to check for additional error codes (**root cause**). 4. 24VDC power supply may be crow-baring. Measure resistance at the PDB If resistance is within tolerance replace supply, if not there is most likely a short in the system.
7. System reaching temp, does not go to "Idle" screen and head hits into the right side of the machine	1. Modeling base sensor broken. System is attempting to retract sensor. Replace sensor

P). "Can't Find Home - Check Modeling Base" displayed on LCD

1. Head stops over Z stage/modeling base	1. No modeling base 2. Modeling base is used/defective, has low spot. 3. Upper Z limit switch is adjusted too low.
2. Head moves to lower modeling base sensor but does NOT move over foam	1. Modeling base sensor is NOT turning off before performing touchdown (verify using Maraca) a. Modeling base sensor plunger is hitting umbilical support tray. Move modeling base sensor assembly up or move tray down. 2. Y EOT sensor is not operating correctly. Check using Maraca or DataStat
3. Head completes finding modeling base routine then displays error message.	1. Z home (upper limit switch) is out of adjustment. 2. Z offset value is incorrect (out of operating range) Check/adjust value using Maraca. Plastic substrate only - 1. 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 substrate. 2. 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) If values are out of spec: Check for loose tray mounting screws. If so level per procedure. If screw are tight, level the XY table per procedure. 4. If failure reoccurs the X rear guide rod may be out of alignment. Replace XY table.
4. Head stops moving while attempting to lower Z detect sensor plunger	1. Using Maraca/LEDs 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 Maraca.

Q). System VERY slow to reach temperature

1. Envelope takes unusually long (over 40 minutes) to reach temperature.	1. Replace PDB (Loose SS relay)

R) Calibration Issues

1. Tip offset cal part - support and model over .25" offset	1. Check that tipoffset values are close to default values. BST, Prodigy default = 0.10, 0.00 SST, Prodigy Plus, Elite default = 0.25, 0.00 2. Check that head motor drive cables are not swapped at the rear of the head housing.

2. Tip offset values change but do not take.	Tip offset is changed in Maraca and the change is stored correctly in the hard drive (verififed by viewing the cfg file). When the tip_offset part is run though, the offset does not change. Replace SBC.

S) Unexpected Behavior

1. System continues to display "load upgrade" after performing upgrade (upgrade loop)	1. Try loading upgrade at lease three times. 2. 186/controller firmware is not upgrading. Verify by reading the cfg file. Upgrade firmware using HT and running sndbin

2. Substrate sensor arm does not fully retact sensor after finding substrate.	1. Substrate sensor is turning on prematurely. 2. Check if sensor assemble is loose. 3. Sensor is hitting stainless steel plate. Raise sensor assembly and/or lower plate.

3. When sending job to printer or, after install of new hard drive and clicking 'install new software' - Status application displays "missing close-brace".	1. Bad info on material cartridge card - Replace cartridge. 2. Make sure cartridge was manufactured by Stratasys and not a third party. 3. Hardware problem reading cartridge.