Hooklet3D  
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Monticello, MN 55362

**MEMORANDUM**

**Date:** March 27, 2017

**To:** Community

**From:** Hooklet Development Team

**Subject:** Temperature fluctuations due to active cooling.

**Summary**:

In routine testing it was shown that wide ranging temperature fluctuations to include a failure to heat could be caused by an incorrectly installed active cooler. In this case the issue triggered the Thermal Runaway failsafe.

**Background:**

A failure was induced that resulted in the thermal protection system halting the machine upon activation of the active cooling fan. During observation, it was shown that upon activation of active cooling the primary extruder reduced its temp from its current set point to approximately 20c below set point. The sustained lowered temperature triggers the thermal runaway failsafe.

This implies a lack of current to the primary extruder, which would prevent the heater from reaching its full output. In this case we know our input voltage remained static, and also that the standard load of a 12v active cooling fan is not beyond the threshold of our power supply.

The failure is due to a loose connection. Given we use cable terminators, it is possible to under tighten these connections without notice.

**Test Conditions**

This failure was created by intentionally loosening the active cooling fan’s positive connection to the control board. This loose connection resulted in additional power draw as well as heat (resistance) at the Fan connection. This was enough to effectively limit the output of the primary heater.

Although the bed is also affected, its thermal mass and ability to maintain a smooth thermal profile prevents it from triggering any failsafe or exhibiting any abnormal behavior.

**Impact**

This issue will most likely trigger a thermal protection failsafe. It isn’t always immediately obvious as best practices involve not enabling the fan until several layers into the print. In this case the printer will appear to perform fine until the fan is enabled. The user may return to a machine that has been halted and is displaying a thermal error message.

This issue should be a consideration when handling any reported thermal runaway issues. Verification process should include first determining what type of termination the wire has, and then ensuring it is tight.

**Solution**

Ensure all connections are tight, especially those delivering power from the 12v rail. This will always be the most likely cause of thermal problems.

This may also be inaccurately identified as being the result of the cooling fan blowing on the extruder itself.