



3D Printer Safety Shutdown - Smoke Detector



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Summary

Have you ever worried about leaving your printer running for those long 20 hour prints? With a heated bed, hot...

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Have you ever worried about leaving your printer running for those long 20 hour prints? With a heated bed, hot extruder, and cheap power supply, there's a lot that could go wrong. I have worried about leaving my printer unattended and wanted an automatic smoke detection and shutdown solution. This post contains all the information you need to build a 3D Printer Safety Shutdown. I am not selling anything. This is merely the information needed to make your own printer shutdown device.

I recently became aware that there are now off the shelf solutions to do this same safety shutdown function. They weren't available before. If you would rather build your own, this Thing is a good start, otherwise see the update below with links to ready made products.

This solution uses an IOT Power Relay from Digital-Loggers.com which has an input that can turn the IOT Power Relay strip on or off with a low voltage signal. The IOT Relay also has a "Normally On" pair of receptacles and a "Normally Off" pair of receptacles. The IOT Power Relay control connector is connected to an off the shelf First Alert Dual Mode Smoke Detector which has an output that can trigger other smoke detectors. The First Alert Dual Mode Smoke Detector is a very sophisticated dual smoke detector that is far better than the Arduino smoke sensors that some people are using to build safety off devices. That trigger output is used to turn off the IOT Control Relay. The power will stay off only as long as the smoke detector senses smoke so I added a feature to latch the off action. I did this by adding a 5V wall transformer to the "Normally OFF" side of the IOT Relay. That wall transformer powers up when the printer has been shut off and keeps the input to the IOT Relay in the off state.

For safety reasons I powered the Smoke Detector with its own 3.3V wall transformer to avoid having 110 VAC in the circuit. You can use a second 5V transformer with 3 power diodes to drop the voltage to 3V. To connect power to the smoke detector, solder wires to the battery tabs inside the battery compartment. You can also just power the smoke detector with a battery. One of the photos shows a pictorial wiring diagram of the design. This device uses two power diodes to provide an "OR" function between the smoke detector output and the 5V wall transformer output. In other words "Keep power off if Smoke is detected OR the 5V wall transformer is on". The diodes block the current flow from conflicting as the device switches from the smoke detector holding the power off to the wall transformer holding the power off.

The design works smoothly and requires no Arduino, software, or special parts. The wall transformers can be old cell phone chargers. The total cost for IOT Control Relay and smoke detector is about \$50. Add another \$15 if you have to buy the wall transformers and power diodes. I've included a smoke detector spacer ring which allows the cable to exit on a flush mount installation such as under a shelf.

Here are links to the parts needed:

Power Control Strip - IOT Power Relay <https://www.adafruit.com/products/2935> <https://www.amazon.com/lot-Relay-Enclosed-High-Power-Raspberry/dp/B00WV7GMA2>

Smoke Detector - First Alert BRK 3120B <https://www.amazon.com/First-Alert-Detector-Photoelectric-Hardwired/dp/B00O8MVW44>

5V Wall Transformers <https://www.amazon.com/Njuone-Switching-Adapter-Standard-3-5mmx1-35mm/dp/B0823GNX8C>

Two 1A Power Diodes <https://www.amazon.com/SEMICONDUCTOR-1N4001G-STANDARD-DIODE-pieces/dp/B00LQPUOHW>

I present this design as a "USE AT YOUR OWN RISK" solution. I believe that it is safe and reliable. I have been using it in my home for about a year. I occasionally test my detector to make sure it is working. One match proves that my 3D printer will shutdown with just a wisp of smoke.

Here's a video showing the 3D Printer Safety Shutdown in action. The video shows that the device shuts the printer off after just a wisp of smoke and that the smoke detector doesn't continue to blare. The smoke detector also shuts off after doing its job. It is easy to reset the power and the smoke detector by cycling power to the IOT Relay.

3D Printer Safety Shutdown <https://www.youtube.com/watch?v=P-1EX5GqZd4>

What can happen without a safety shutdown: <http://forums.reprap.org/read.php?392,294850> <https://hackaday.com/2018/03/18/3d-printer-halts-and-catches-fire-analysis-finds-a-surprising-culprit/> https://www.reddit.com/r/3Dprinting/comments/5mgmox/my_ctc_printer_caught_on_fire_today_story_in/ <https://all3dp.com/fire-safety-unattended-3d-printer-nearly-burns-house-down>

Update Sept 9, 2017: Data Loggers has redesigned the IOT Relay which is thankfully available again. They changed one of the switched Normally "ON" outlets to be an "ON" always outlet. You can still use this design. Plug the Smoke detector wall transformer into the "ON" always outlet. The only difference with the newer IOT Relay is that the Smoke Detector will continue blaring until the smoke has cleared. The printer will still stay off as it did previously.

Update Feb. 10, 2018: It is acceptable to power the smoke detector with 110 VAC. If you use 110VAC, it can be plugged into the "always on" outlet of the IOT Relay. I didn't suggest this in the original design because it requires 110V in the circuit which some people may not be comfortable with assembling. It also acceptable to use a battery with the smoke detector. This design still works regardless of how the smoke detector is powered.

Update Dec 14, 2019: YouTube video regarding fire safety for 3D printers. https://www.youtube.com/watch?v=VK_K6fp4BIk&t=15s

Update Aug 18, 2021: I hadn't seen anything besides other homebrew designs so I created this thing. Since then a couple of new products have become available. You might take a look at them. Its not specifically for 3D printers but it appears to have the right features to shutdown a device when smoke is detected. I've never tried one so its up to you to decide if it

will work. <https://www.homedepot.com/p/PIONEERING-TECHNOLOGY-Safe-T-Sensor-Cooking-Fire-Solution-for-Microwave-Ovens-PTI-STS/304318130>
<https://allstatefireinc.com/safetsensor.html> <https://www.pioneeringtech.com/product/smart-micro/>

Home Depot has them for sale for \$66. I won't mind if an off the shelf product makes this Thing obsolete. Please let me know if you buy one and it works. If so, I'll change the description to point to Safe-T-Sensor at the top of the description.

Category: 3D Printer Accessories

Model files



smokedetectormountringv2.stl

[Find source .stl files on Thingiverse.com](#)

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