



# Nest Protect Teardown

The Nest Protect was disassembled on December 4, 2013.

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## INTRODUCTION

Hip and trendy home automation startup Nest Labs has dumped some smarts into the dumbest device in your home: the smoke alarm. Curious about just what goes into this sort of thing, we did what we do best: took one apart.

Need more electronic monitoring than this teardown, or a Nest system, can offer? Follow our [Twitter](#) updates, [Facebook](#) posts, and [Instagram](#) snaps for full coverage.

## Step 1 — Nest Protect Teardown



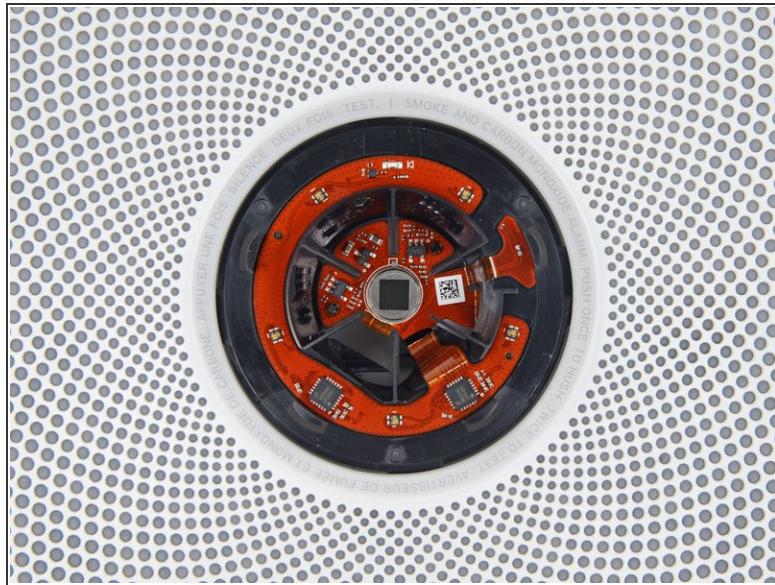
- Welcome to the world, Nest Protect. Perhaps you will vanquish the ear melting, banshee cry of the over-excited smoke detectors installed in every home we've ever cooked in. Let's see what you're packing:
  - Available with 6 AA Energizer Ultimate Lithium batteries or Wired for 120 V
  - Wi-Fi connectivity and wireless mesh networking with other Nest units
  - Photoelectric smoke sensor and carbon monoxide sensor
  - Heat and humidity sensors
  - Three activity sensors
  - Ambient light sensor

## Step 2



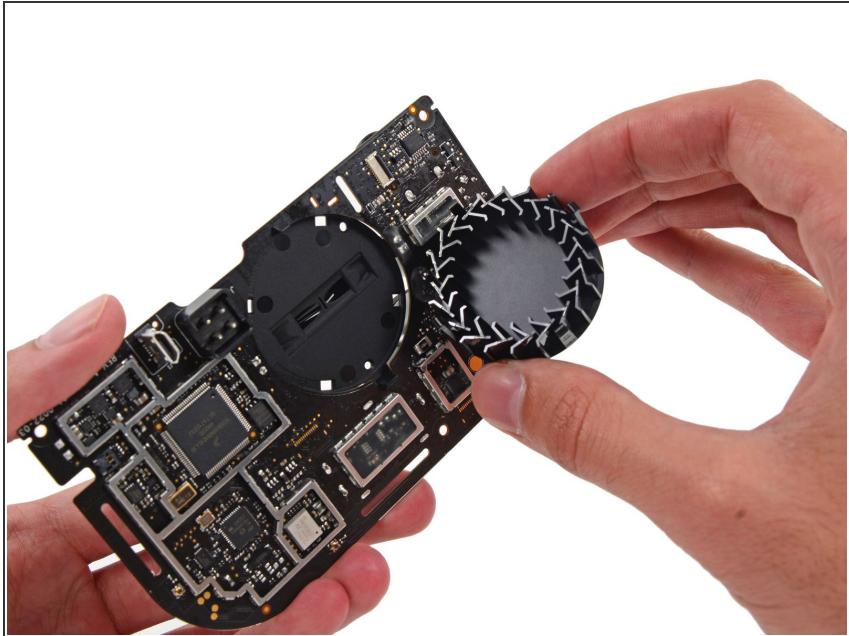
- The Nest Protect comes with a choice of power supply: battery or 120 V powered model.
- Our battery powered detector claims its six AA Energizer Ultimate Lithium batteries have juice for "multi-year operation."  
*ⓘ* We definitely like the choice to use standard, readily available batteries—even if they won't need replacing for years.

## Step 3



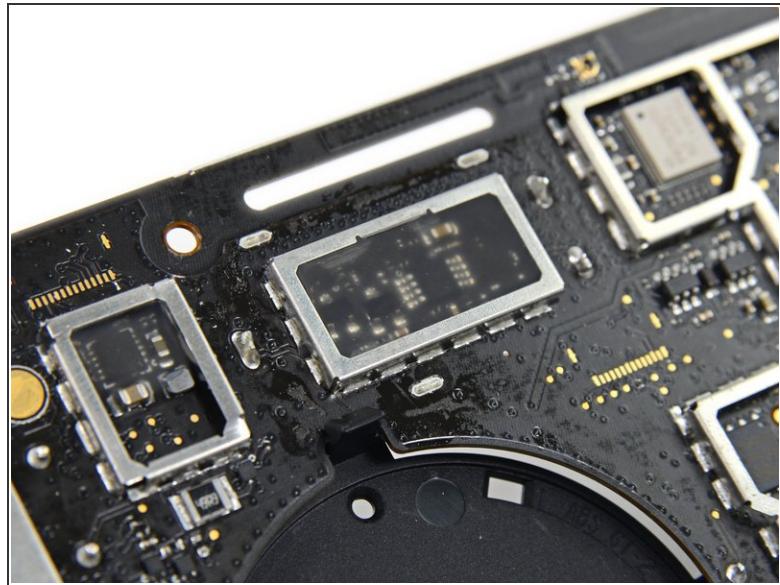
- First step: pop the top off the Nest button, the combination input switch and multi-colored sweeping light.
- An ambient light sensor sits in the center of the button, with lenses in the translucent cover to increase its viewing angle.
- A ring of RGB LEDs surround the sensor to make up the Protect's indicator glow:
  - White for the automatic night light
  - Reassuring green to indicate all's clear
  - Yellow for an early warning
  - Red for a get-out-of-town emergency

## Step 4



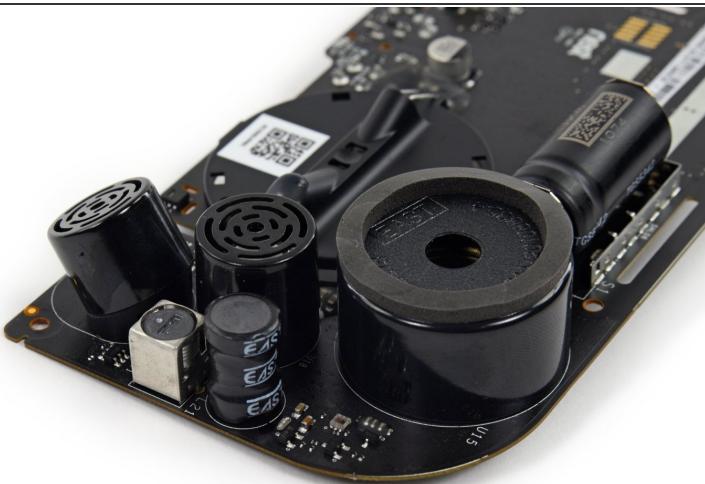
- We pull out the impressive-for-a-smoke-detector main board, and the optical smoke detector is front and center, safely under its baffled shield.
- *(i)* The sensor is comprised of an infrared LED and a photodiode (light detector), angled in such a way that they're not in direct line of sight with each other.
- As smoke enters the baffled chamber above the sensor, infrared light from the LED is scattered and reflected down into the photodiode, triggering the alarm. This sort of arrangement is standard practice for smoke detectors.
- But applying the Nest Labs touch means adding all sorts of extra features for handling the alarm, like sending a notification to your smartphone that your house is on fire. Neat.

## Step 5



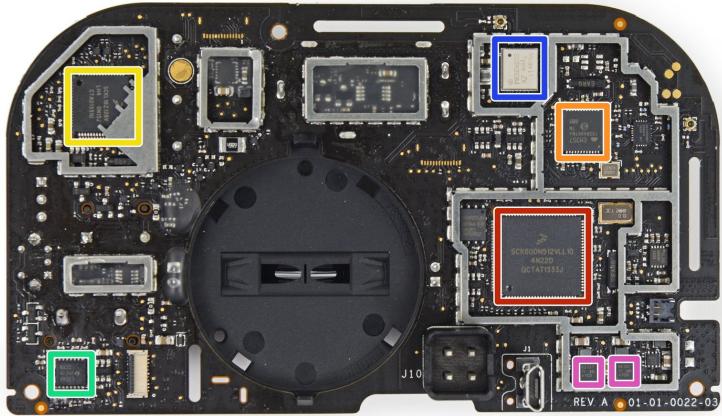
- A little further into the device, and we find the [CO](#) detector, disguised as a capacitor in a tiny metal barn.
- The Figaro [TGS5342](#) electrochemical carbon monoxide detector works like a little [fuel cell](#)—the presence of carbon monoxide drives a chemical reaction that generates current proportional to the CO concentration in the air.
- The detector's measuring circuitry is on the reverse side of the main board, encased in some clear adhesive—likely to protect it against shock and the atmosphere.

## Step 6



- If a fire or CO leak is detected, an 85 dB horn raises the alarm while a separate speaker tells you to exit the building in the talking-bomb-countdown-timer voice.
- Straight and angled motion sensors catch your waving arm when you want to silence a false alarm from cooking smoke or a steamy shower.

## Step 7



- Down now to the heart of the brain (Just ponder that metaphor for a moment. Done? Wonderful, let's move on). A quick look at the noteworthy integrated circuits running the Nest Protect:
  - Freescale [SCK60DN512VLL10](#) custom Kinetis K60 low-power 100 MHz MCU
  - Silicon Labs [EM357](#) Ember Zigbee SoC
  - Freescale [SCKL16Z128V](#) custom Kinetis KL1x general purpose MCU
  - Texas Instruments [LM324A](#) quadruple op-amp
  - Murata [Type ZX](#) 2.4 GHz Wi-Fi 802.11b/g/n module (with Broadcom BCM43362 chipset)
  - Texas Instruments [TPS62737](#) Step-Down Buck Converter

## Step 8



- The Nest Protect is straight-forward and easy to disassemble. Common screw types, user-accessible batteries, and a simple design make it a very solid, repairable product.
- That said, we won't be assigning a repairability score, considering you probably shouldn't do anything more than replace the batteries in your Nest Protect.

 Nest Protect is a piece of safety equipment, and attempting to repair or modify it could result in inadvertent damage. This is one case where we support the old adage, "don't try this at home."

To reassemble your device, follow these instructions in reverse order.