Reflow Toaster Oven Project

Purpose: This project is to convert a toaster oven to a solder reflow station.

Description: In September 2014, I purchased an Oster 1400 watt toaster oven from the Ann Arbor Reuse Center. The intention was to convert the oven to a solder reflow station, so it didn’t matter that the electronics did not work. The heater elements and convection fan are the components of interest.

The electronics were removed and replaced with:

* Arduino Mega ADK
* SeeedStudio Relay Shield V2.0
* Adafruit MAX3885 thermocouple

The existing heater connections could be wired directly to the relays. The relays used are:

* Top heater elements
* Lower heater elements
* Convection fan

Using a spare Arduino prototyping shield, I mounted the MAX31855 module and used the Arduino power and GPIO pins.

Software description:

The MAX31885 has an Arduino library online and it needs to be downloaded and installed into the Arduino library folder. The thermocouple uses SPI to communicate with the controller. The relays can be controlled with Arduino digital outputs.

The control program on the Arduino communicates with the IDE over serial for program control and monitoring. From the IDE serial console, two commands are supported:

* g – Start the solder reflow cycle for one iteration
* s – Stop the cycle, this aborts the cycle and shuts down the relays / oven

The control cycle consists of:

* Ramp the temperature to 100 degC
* For two minutes, increase the temperature to 150 degC for flux activation and uniform heat distribution
* For 100 seconds, raise the temperature to 183 degC for soak
* Quickly ramp the temperature to 215 degC for reflow
* On the event of reaching 215 degC, shut down the relays for the cooldown phase.
* After the oven temperature falls below 100 degC, the circuit can be carefully removed

After the cycle, the Arduino program is in “Not Running” state. The oven and controller temperature continue to be received on the IDE and the cycle can be started again with the “g” command.