Proof-of-Concept Woodstove Monitoring System - Components

Arduino Starter Kit

Arduino starter kits costs between USD 45 and USD 90. I used the Seeedstudio ARDX kit. Whichever kit you buy, make sure it contains an Arduino Uno R3 (or compatible) board, a breadboard, some jumper wires, and some 10k Ohm resistors. A base plate for fixing the Arduino and the breadboard side-by-side would also be good. The kit should explain how to install and download the Arduino I(ntegrated) D(evelopment) E(nvironment), which you'll need to upload the software (sketch) to your Arduino).

I'd encourage you to buy a genuine Arduino board if you can. It's a good project.

https://store.arduino.cc/product/GKX00007
http://www.seeedstudio.com/depot/ARDX-The-starter-kit-for-Arduino-p-1153.html
http://www.ebay.com/itm/New-Ultimate-UNO-R3-Starter-Kit-for-Arduino-1602-LCD-Servo-Motor-LED-Relay-RTC-/361455980929?hash=item5428749181:g:TLsAAOSwrklVFowh

Thermocouples

I used two inexpensive (USD 5) K type thermocouples like these:
http://www.ebay.com/itm/2M-M6-K-Type-Screw-Thermocouple-Temperature-Controller-0-600-Sensor-Probe-/201449212651?hash=item2ee74f0aeb:g:~yoAAOSw9mFWHxiu

The thermocouples are unlikely to last long, but so far so goog. Please note that you cannot use earthed thermocouples with the Adafruit amplifier boards.

Amplifier boards

2 x Adafruit thermocouple amplifier breakout board (MAX31855) @ USD 14.95 each.
https://www.adafruit.com/product/269
There are other MAX31855 boards that you could use, costing nearer USD 7, but I haven't tried these (and they may not work with the Arduino sketch I cobbled together - a sketch is a bit of software):
http://www.ebay.com/itm/MAX31855K-Thermocouple-Sensor-Module-Temperature-Detection-Development-Module-/400985311319?hash=item5d5c964857:g:EdkAAOSwDNdV1oRs

In theory, you can use as many thermocouples as the Arduino has pins, but if you want a larger number of thermocouples, a bespoke breakout may be your best option (they generally come with their own Arduino sketch). I will explore this at a future stage:
http://www.ebay.co.uk/itm/Quad-MAX31855-thermocouple-breakout-board-for-5V-systems-type-K-K-type-/301200852126?hash=item4620f8449e:g:r-AAAOSw8d9UwUaq

Wideband oxygen sensor

1 x Innovate Motorsports LC-2 digital wideband oxygen sensor and controller (USD 189). This is the expensive bit. The sensor comes with its own (LM) software, which allows you to program the sensor to operate in a suitable range for your stove. The LC-2 kit comes with a Bosch LSU 4.9 sensor.
http://www.innovatemotorsports.com/products/lc2.php

There are other EOM sensor controllers available, but I have not tried any of these yet.

Ambient temperature and humidity sensor
1 x SparkFun humidity and temperature sensor breakout - HTU21D (USD 14.95). This sensor is not strictly necessary and is used to register/monitor ambient test conditions.
https://www.sparkfun.com/products/12064

Screw header
You'll need a vertical screw header to fix the probe to the board. They cost a couple of dollars (the link below is just an example - I sourced mine elsewhere).
http://www.ebay.com/itm/20x-3-Pin-Way-Vertical-Screw-Header-3-5mm-137mil-pitch-For-Arduino-PCB-Shield-/251530781097?hash=item3a906721a9:g:~aEAAMXQLoZR2crY

10k Ohm resistors
You'll need three 10K Ohm resistors. These should be included in the starter kit, but may not be (worth checking).

Data logging software
There are several options available, including Adafruit IO and Freeboard IO. I went for a serial port solution from an organisation that appealed to me: MakerPlot (USD 39). I will explore the other options at some stage, if only because they look ludicrously elegant.
http://www.makerplot.com/

Total cost of the system described above is approximately **USD 375**. If you create your own IO, already have a 12V power supply, use an Arduino clone, source the least expensive thermocouples and amplifier boards, and leave out the ambient temperature and humidity sensor, this can be lowered to nearer **USD 270**.