



User Guide for the KAPtery Nano Logger Kit

This kit can be quickly assembled into a data logger which will save temperature and barometric pressure data to a microSD card. It comes complete with everything needed to start logging data. A program is loaded on the Arduino Nano and will begin running and saving data as soon as the logger is turned on. The clock on the logging shield has been set and the clock battery is installed.

Parts List:

- Arduino Nano compatible microcontroller
- Logging shield for Arduino Nano
- BMP280 sensor for barometric pressure and temperature (3.3v only)
- MicroSD card (1 GB or 2 GB)
- Switched case for four AA or four AAA alkaline batteries
- Phone charger (AC-DC converter), supplies 5 volts from wall power
- USB type A to mini USB cable
- 20 cm four-wire cable with single female DuPont connectors on both ends
- CR1220 coin cell battery for real time clock

Assembly:

1. Attach the Arduino Nano to the logging shield.
 - a. The USB port on the Nano must be near the green screw-terminal on the shield.
 - b. Line up the 30 pins on the Nano and press them into the headers on the shield.
2. Insert the microSD card in the slot on the shield.
3. Connect BMP280 (or other I2C) sensor. The supplied BMP280 requires 3.3 volts only.
 - a. Use the 4-wire cable to connect pins (Sensor – Shield):
 - i. SDA – A4
 - ii. SCL – A5
 - iii. GND -- GND
 - iv. VCC – 3V3
4. Some other sensors require 5 volts, so VCC connects to the 5V pin.

Using the Nano Logger:

1. Start the Nano Logger and display data on your computer monitor.
 - a. Start the Arduino IDE or web editor (<https://www.arduino.cc/en/Main/Software>)
 - b. Use a USB data cable (not included) to connect the port on the Nano to your computer (the cable in the kit is for power only, not data).
 - c. Red LEDs on the Nano and logging shield will be lit.
 - d. The specifics below are for the Arduino IDE, but the web steps are similar.
 - e. Under Tools/Board select “Arduino Nano.”
 - f. Under Tools/Port select the COM port that appears when you connect the logger.
 - g. Start the serial monitor (Tools/Serial Monitor).
 - h. In the serial monitor ensure that 9600 baud is selected.
 - i. Data should be displayed.
 - j. Data will also be saved to the microSD card.

2. Start the Nano Logger using the phone charger.
 - a. Plug in the phone charger and USB power cable.
 - b. Plug the mini USB into the Arduino Nano.
 - c. Red LEDs on the Nano and logging shield will be lit.
 - d. Data will be saved to the microSD card.
3. Start the Nano Logger on battery power.
 - a. Insert the red and black wires of the battery case into the terminal block.
 - i. Red to +
 - ii. Black to –
 - b. Use a small flat screwdriver to tighten the screws holding the leads in place.
 - c. **Don't use a screwdriver while the power is on.**
 - d. Put four alkaline batteries into the battery case.
 - e. Turn the switch to "ON."
 - f. Red LEDs on the Nano and logging shield will be lit.
 - g. Data will be saved to microSD card.
4. Transferring the data to your computer.
 - a. Move the microSD card from the logger to a card slot on your computer.
 - b. The included adapter allows use of a standard SD card slot.
 - c. Copy the file "datalog.txt" to your computer.
 - d. The first lines of each data logging episode include the column names.
 - e. The data are comma separated, so if you change the file extension to .csv, double clicking the filename will open and parse the data in Excel (default MS Office install).
5. Modifying the sketch (Arduino program).
 - a. Download a sketch from the KAPtery Guides page: <http://kaptery.com/guides/>
 - b. Open the sketch in the Arduino IDE.
 - c. Modify the sketch (e.g., to save data at different intervals or to use different sensors).
 - d. Load the new sketch to the Nano Logger using a USB data cable.
6. Setting the real-time clock. The real-time clock has been set. To reset the clock:
 - a. Open a copy of the sketch in the IDE.
 - b. Edit the sketch as described in the sketch by uncommenting one line (delete the "//").
 - c. The line to change is: `// RTC.adjust(DateTime((__DATE__), (__TIME__)));`
 - d. Upload the edited sketch onto the Nano. The sketch will start to run on the Nano.
 - e. Start the serial monitor to watch the output on your computer monitor.
 - f. The time and date should be correct.
 - g. Edit the sketch so that line is once again commented out (preceded by "//").
 - h. Immediately load the sketch again onto the Nano. If the Nano is restarted before the sketch is reloaded, the time will be wrong and the procedure must be repeated.

Many types of external sensors will work with the Nano Logger. It is easy to add multiple I2C sensors like the ones on this page: <http://kaptery.com/product/addon-sensors-etc>. The Nano Logger will work with either 3.3V or 5V sensors (if connected to the appropriate power pin). The sketch must be modified to operate each different type of sensor. To connect more than one sensor at a time, a splitter or hub is required. This requires soldering or a hub is available at the KAPtery.

Examples of how this data logger can be used are at Public Lab: <https://publiclab.org/tag/nano-data-logger>. Feel free to post comments on those research notes if you have questions about the Nano Logger or want to share your progress.