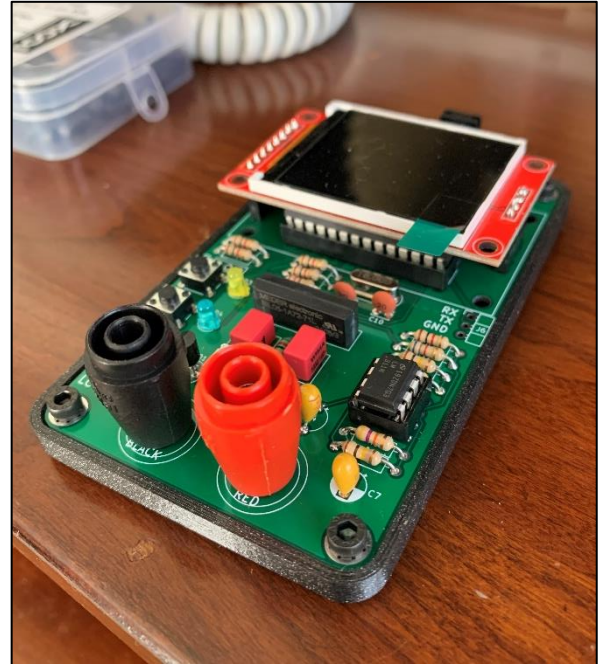


# Build your own LC Meter

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## Part 2: User's Guide

The W8BH LC meter is an electronic instrument for measuring inductance and capacitance. Its useful range is roughly 0.1pf to 0.1uF capacitance and 1uH to 0.1H inductance. Accuracy is roughly 1%. This User's Guide describes basic operation of the meter. See [Part 1](#) for the builder's guide and [Part 3](#) for description of the software.



### Power

The LC Meter accepts 6-10 VDC input via a 2.1mm DC barrel connector (center pin positive). You will need to provide a suitable AC power adapter. A 9V adapter is ideal. The DC connector and on/off switch are located along the top edge of the meter.



### Quick Start Guide

- Apply 9VDC power with an AC power adapter
- Plug your test leads into the two front-panel jacks.
- Turn the slide switch to the ON position.
- Wait for the meter to warm up and calibrate.
- Connect an unknown inductor or capacitor to your test leads.
- Press S1 to measure capacitance, or S2 to measure inductance.

### Basic Operation

The meter's functions are controlled by two tactile buttons, S1 and S2. Press S1 for Capacitance and S2 for Inductance. The other meter functions are enabled by pressing and holding the buttons. See chart at right.

Button	Tap	Hold
S1 ("C")	Capacitance Meter	Calibration
S2 ("L")	Inductance Meter	Engineering Mode

## **Calibration**

Calibration is automatically done when the meter is turned on. Thereafter, to recalibrate the meter, press and hold the S1 button. The meter will first ask you to remove any device under test. Any probes or test leads that you are using should remain connected during calibration. The meter will then calibrate itself using an internal calibration capacitor. The calibration procedure takes approximately 20 seconds.

The accuracy of this meter depends on the accuracy of C2, the internal 1000pF calibration capacitor. Its value should be known with 1% accuracy. The easiest way to achieve this accuracy is to purchase a component with 1% tolerance. If, however, you have an independent way of accurately determining the value of C2, you may specify its value in the LC meter sketch. Alternatively, you can add a small capacitor in parallel to C2, at label "C5", so that the sum of the capacitances equals 1000pF. This two-capacitor method was used in the original AADE meter.

## **Capacitance**

Connect an unknown component between the jacks J1 and J2 and press the S1 button. After a few seconds of analysis, the meter takes 4 consecutive measurements, one second apart. Observe the displayed values. If there is significant variation in the displayed values, run the measurements again. Keep in mind that the meter requires about 15 minutes of warmup, followed by recalibration, to achieve optimum performance.

## **Inductance**

Connect an unknown component between the jacks J1 and J2 and press the S2 button. After a few seconds of analysis, the meter takes 4 consecutive measurements, one second apart. Observe the displayed values. If there is significant variation in the displayed values, run the measurements again. Keep in mind that the meter requires about 15 minutes of warmup, followed by recalibration, to achieve optimum performance.

## **Engineering Mode**

This mode is for those who want to see "all the data, all the time". In addition to a continuous display of capacitance/inductance, this mode shows the meter's internal frequency measurements, input voltage, and operating time. While in this mode, press S2 to switch to inductance measurement and S1 to switch to capacitance measurement. Hold both buttons down to recalibrate and return to normal meter mode.

## Serial Data Output

Every time a measurement is made, the measurement value is sent to the serial data port, J6, as an ASCII string, one string per measurement. The output is 9600 baud (no parity, 8 data bits, 1 stop bit) at 5V TTL logic levels. A typical measurement string looks this:

*Time 9438, Batt 8.72, F3 519099 Hz, Msmt 331.69 pF*

The string has four components: the acquisition time (in seconds since startup), the battery voltage, the current oscillator frequency (F3, in Hz), and the acquired measurement (in pF or pH).

The baud rate is configurable in the sketch.

To access the serial data, fit a 1x3 right angle male header at J6, and connect the labelled RX, TX, and GND lines to a USB-to-serial converter. I use an [Adafruit #954](#) adapter, connecting TX to the white wire and GND to the black wire. You can monitor the LC meter output with any serial console program, such as [PuTTY](#).

## Customization

The following parameters are easily modified: owner name/call (displayed on startup), device name, warmup period, audio output, battery monitoring, and serial data baud rate. Display colors for the warmup, calibration, inductance, and capacitance screens can also be easily changed. See [Part 3](#) "Under the Hood" for more information.

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