Review of the AADE LC Meter

-- By Jim Pearce, Pegasus Technologies

I finally have an instrument that I have wanted for many years: An LC (inductance and capacitance) meter. Yes, my digital multimeter (DMM) has a capacitance measuring function, but it is not really satisfactory for the very-low picofarad capacitors that one uses every day in RF design. And, of course, the DMM has no capability of measuring inductance. The HP — no, errrr Agilent, LCR meters are just too expensive for occasional use.

There are some inexpensive capacitance meters out there that are slightly better than a DMM but they still cannot measure inductance. As a result, many engineers, and practically all hobbyists, have not had the luxury of being able to measure inductors. Before surface mount inductors were the norm, most schematics labeled coils by the number of turns, the size of wire and the diameter of the form since no one could measure the beasts!

Well, I recently came across the L/C Model IIB meter made by Almost All Digital Electronics (AADE) and after using it in the lab for a week I am in love! This meter is quite inexpensive and simple, but amazingly accurate and useful.

The AADE L/C Meter IIB

It measures capacitors with a resolution of 0.01 pF and inductors with a 1nH resolution. A simple push of a button cancels out the residual capacitance or inductance of the test leads and then you are ready to make measurements.

If you make a simple jig out of a small piece of bare copper clad PC board material you can easily measure surface mount components. I was able to measure 0402 sized capacitors this way!

The real beauty in this meter, though, is its ability to measure inductors. Just for fun, I measured a toroidal inductor from a junk computer power supply. The L/C Model IIB read 5.132 uH. I then removed one turn of wire and measured again. The inductance was now shown as 3.876 uH. Not only did I measure the inductance of an unknown coil, but I could also find the permeability of the core.

Another neat function built into the L/C IIB is the "matching" mode. You can use this mode to make one inductor or capacitor match the value of another one. You read the value of the first component and then the meter reads the difference between that value and the value of the second component. This difference is displayed either in absolute units (pF or uH) or as a percentage.

While this meter is not traceable to NIST standards, AADE claims an average accuracy of 1% and has test data to prove it. Considering that most components sitting on my bench have 5% or worse tolerance, this meter can easily classify stray parts into standard values and even differentiate them within a single standard value.

I have saved the best for the last. This meter is priced at only $129.95 in assembled and tested form. For you students and hobbyists, a kit version is available for only $99.95, and the complete instruction manual is available online. Shipping and handling is a bargain at $4.00 for the US and $10.00 internationally.

You can purchase one of these by visiting AADE's website. If you get one of these, please email me and tell me if you like yours as much as I love mine!

Specifications of the L/C Meter IIB

Description: The L/C Meter IIB is a hand-held, digital inductance / capacitance meter with a four digit display, featuring automatic ranging and self-calibration.

Maximum Resolution: 1 nHy / .01 pF

Range: .001 uHy (1 nHy) to 100 mHy (most units measure to 150 mHy) .010 pf to 1 uF (most units measure to 1.5 uF), with automatic ranging

Accuracy:

- 1% of reading is typical (Typical means the average error of 83 different components compared to:
  - HP4275A digital L/C meter (test frequency 1MHz) for components ranging from .1uHy to 1mHy and 2.7pf to .068uF
  - B&K 878 digital LCR meter (test frequency 1KHz) for components ranging from 1mHy to 100mHy and .1uF to 1.6uF
- L/C Meter II is characterized for hobby or non-critical commercial use
- Self Calibrating

- Error Analysis: 7/18/2000 error analysis against HP 16470A standard Inductor set

Display:

- 16 character LCD display module
- Four digit resolution
- Direct display in engineering units (ie: Lx= 1.234 uHy / Cx= 123.4 pF)
- jumper option to display pF, nF, uF (ie: 10 nF instead of .01 uF)

Operating modes:

- The following modes are sequentially selected
    - **READY MEASUREnMODE** - measure Lx or Cx and display in nano units when applicable
    - **READY MEASUREuMODE** - measure Lx or Cx and display in micro units (ie: .01000 uF instead of 10.00 nF)
    - **READY MATCHnMODE** -
        - first measures your reference component Lz or Cz and displays it's value in nano mode
        - measures subsequent components, Lx or Cx, and displays the difference (Lz-Lx) or (Cz-Cx) in nano mode
    - **READY MATCHuMODE** -
        - first measures your reference component Lz or Cz and displays it's value in micro mode
        - measures subsequent components, Lx or Cx, and displays the difference (Lz-Lx) or (Cz-Cx) in micro mode
    - **READY MATCH%MODE**
        - first measures your reference component Lz or Cz and displays its value in nano units
        - measures subsequent components, Lx or Cx, and displays the percentage difference
            - (Lx-Lz)/Lz*100 or
            - (Cx-Cz)/Cz*100 as percent.
                - range is -100% to +9999%
                - maximum resolution is 00.01%
- L/C Meter IIB zeros out stray inductance and capacitance by storing their values in RAM and subtracting them from the measured values. It can zero out any value in it's range allowing longer test leads and slightly improved accuracy over L/C Meter II.

L/C Meter IIB works by measuring the shift in frequency caused by inserting an unknown into it's oscillator tank circuit. A PIC16C61 micro-controller measures the frequency before and after. It then computes the value of the unknown using a floating point math package and displays the result on a 16 character intelligent LCD display.

L/C Meter IIB will NOT measure inductors designed for 60 or 120 Hz applications such as power transformers, filter chokes or motors. The minimum test frequency is about 20KHz and these devices have enormous core losses at that frequency.