
LC-meter

with blue 2 x 16 LCD display

This manual will guide you how to assemble,
test and operate this LC meter KIT.



Features:

- Measure **Inductance** 0 nH to 1mH, resolution 2nH
- Measure **Capacitance** 0 pF to 1uF, resolution 0.1pF
- Accuracy 1% of reading typical
- Automatically calibration built in
- Display 2 line 16 white chars, blue backlight display
- Software controlled contrast of display for perfect reading
- Automatic prefix pF, nF, uF, nH, uH, mH
- Factory professional made PCB
- Testing program built in
- +7.5 to 35 VDC input power supply
- Low current consumption typ 30 mA
- Easy to learn and to operate
- Extremely simple to build, one evening project

Assembly instructions

The soldering of this unit is pretty basic if you solder the parts in correct order.
I advice you to follow the instruction2 below.

Start soldering the Front side :

L1, C1, X1, 28 pin IC socket for IC1, Button for L/C, CAL, TEST, REL1, REL2, J1, J2, J3, J4, J5, J6, J7, display

Back side :

IC2, V1, R2, R6, R8, R1, R3, R4, R5, R10, R7, R9, R11, C2, C3, C6, C7, C8, C4, C5, C9, C10

Do not put PIC16F870 into its socket yet!

Power up

Take some time and control that you have no soldering bridges!
Connect power and control that you have stable + 5V at the power line (pin 20 at socket) and at display pin 2.

Power off the unit and put PIC16F870 into its socket, and connect power again.

If everything is okay you should see text on the LCD display.
The contrast voltage at pin 3 on LCD should be around 1.5V DC
There is a test function built in this LC-meter, and below you can read all details how to use it.

LCD Contrast

The contrast of the LCD display can be changed by software.
To enter the contrast menu, you must press the button **CAL** during power up.

The display will show the text as below.
In this menu you can decrease the contrast by pressing the button **L/C** and increase the contrast by pressing the button **CAL**.
To go out of the contrast menu, you press button **TEST**.

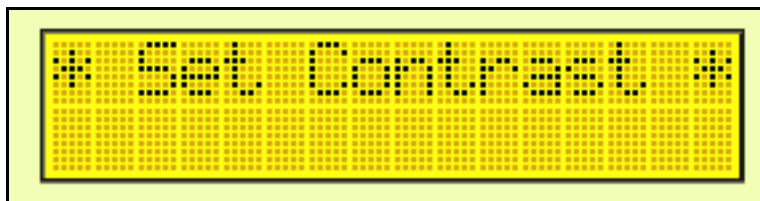


Illustration 1: Contrast Menu

Testing

There is one more menu in this LC meter, and that is the testing menu.

I have added this function to make the building and testing more easy for you.

(An option most other KIT has forgotten)

There is only one way to enter the testing menu, and that is to press the button

Test during power up.

The display will then toggle between two measurements.

The input should not be connected to any object.

The LC-meter starts to measure f1 (main oscillation).

After 1 second, the relay 2 will connect the reference capacitor and the unit will make a new measurement f2.

After another second the unit will go back to measure f1 and it all repeats until you press **Test** button again.

As you can see, my measurement was f1=896 344 Hz, and f2=652 311 Hz

There can be variation in frequency from kit to kit, but in general you should have f1=800-900kHz and f2=600-700kHz

PIC Software

Let's have a look of the different menu choices of this LC-meter.

All settings are made by the two switches **L/C** and **CAL**.

The unit will always remember the last settings even if power is switched off.

Figure below show all the different menu choices.

Menu 1	Capacitance measurement	Inductance measurement
Menu 2	Open Circuit and press calibrate	Shortcircuit and press calibrate
Menu 3	Calibration Done	Calibration Done
Menu 4	Capacitance C = 0.00 pF	Inductance L = 0.00 nH

Illustration2 Menu system

Measure Capacitance:

When the power is applied the LC-meter will enter menu 1.

The display will show Capacitance measurement

The LC-meter then enter menu 2.

Here you are asked to **Open circuit** the input (no capacitor is connected to the input).

When this is done, you should press the **calibration (CAL)** button.

The LC-meter will start the calibration procedure, and after 2 seconds the unit is ready and shows menu 3.

The LC-meter then starts to measure the input and you can connect the unknown capacitor. Every second, you will get a new measurement (menu 4).

Measure Inductance:

When the power is applied the LC-meter will enter menu 1.

The display will show Inductance measurement

The LC-meter then enter menu 2.

Here you are asked to **Short-circuit** the input (the input is connected to ground).

When this is done, you should press the **calibration (CAL)** button.

The LC-meter will start the calibration procedure, and after 2 seconds the unit is ready and shows menu 3.

The LC-meter then starts to measure the input and you can connect the unknown inductor. Every second, you will get a new measurement (menu 4).

- At any time you can press the **calibration (CAL)** button to make a new calibration.
- At any time you can press the **L/C** button to toggle between Capacitance and Inductance measurement.

Measuring object

The unknown capacitor or inductor should be connected to Y1 and Y2.

You can also use the J6 connector which also works as Y1 and Y2.

See figure 3 below.

Placement of components primary side.

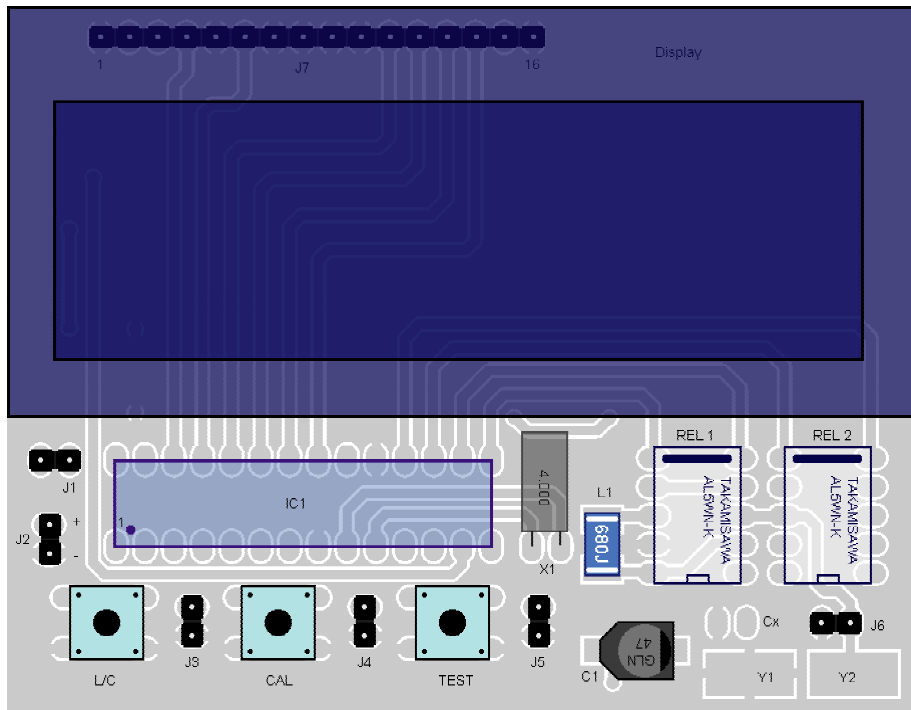


Illustration 3: Primary side of PCB

Placement of components primary side.

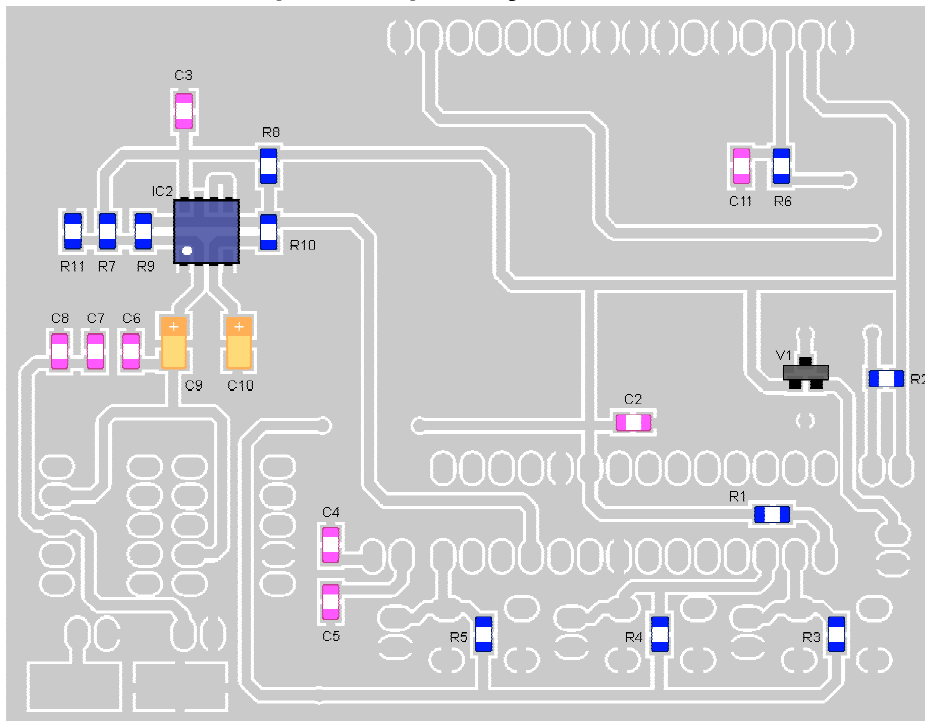


Illustration 4: Secondary side of PCB

Component list

PCB

====

1 pcs Factory made blue PCB
1 pcs LCD 16x2 Char Blue type
5 pcs 2 pin header 2.54mm pitch (J1, J2, J3, J4, J5, J6)
1 pcs 16 pin header 2.54mm pitch (J7)
1 pcs Jumper for (J1)
2 pcs REL1, REL2 (Miniature signal Latch Relay AL5WN-K)
1 pcs 28 pin IC socket for PIC16F870

RESISTORS

=====

100 = R2
1.0k = R6, R8
3.3K = R1, R3, R4, R5
42k = R10
100k = R7, R9, R11

CAPACITORS

=====

22pF = C4, C5
220pF = C7, C8
470pF = C6
100nF = C2, C3
2.2uF = C9, C10
47uF = C1

VOLTAGE REGULATOR

=====

V1 = TK15550 (+5V reg)

CRYSTALS

=====

X1 = 4.000 MHz

INDUCTOR

=====

68uH = L1

SEMICONDUCTORS

=====

IC1 = PIC16F870P (pre-programmed)
IC2 = LM311DT (smd)

SOLDERING TOOLS

=====

Soldering lead (Extra thin)
Impregnated cleaning wick

Note 1: Cx pads on pcb are **not** used for any parts.

Note 2: J3, J4 and J5 are used for external buttons.

Final Word

I hope you have had a fun time assembly this KIT.
The project may be a small one, but still it is a very powerful LC-meter.
with high accuracy and smart software functions.

Beside all that, it looks pretty cool.

Thanks for your time...
Regard
Daniel