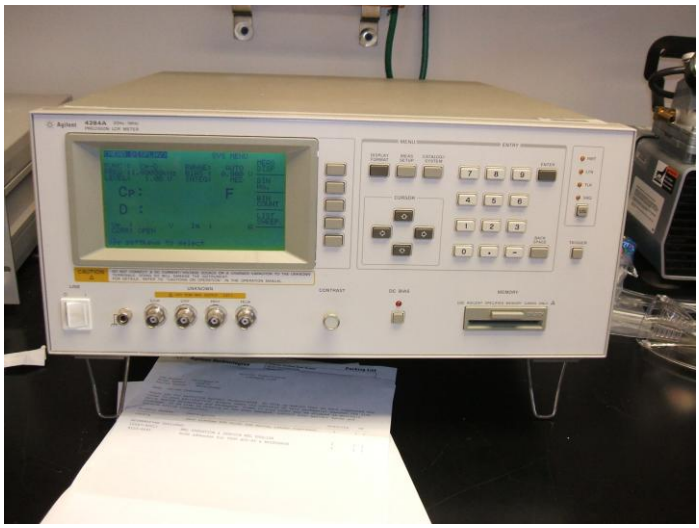
Standard Operation Measurement

Dielectric measurement by LCR

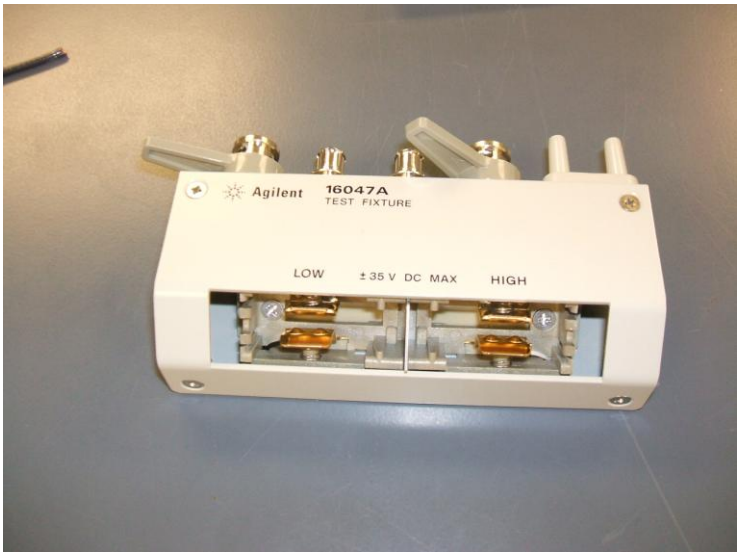
1. Press the main power button on the left corner of the LCR.
2. **Set up.**
   a) Connect the test fixture[1] to the machine (Agilent 16334 A).
   b) Insert the socket axial[2] into the test fixture.
3. **Calibration.**
   a) Press MEAS SETUP and choose CORRECTION to enter correction page.
   b) Use an insulating spacer to separate the two electrodes in the box holder. Move CURSOR arrow keys to the OPEN field (shown as "OPEN: OFF" or "OPEN: ON"). Press MEAS OPEN.
   c) During the OPEN correction measurement, ABORT key is used to stop an OPEN correction data measurement.
   d) After the measurement, press ON to perform the OPEN correction calculations on subsequent measurements (or press OFF not to perform the correction data)
   e) Remove the spacer and connect two electrodes with the shorting bar[3]. Move CURSOR to the SHORT field and press MEAS SHORT.
   f) After the measurement, press ON to perform the SHORT correction calculations on subsequent measurements (or press OFF not to perform the correction data).
4. **Taking Single Measurements**
   a) Insert the two wires[4] into the socket axial and secure your sample between them, ensuring proper contact.
   b) Press DISPLAY to enter display page.
   c) Use CURSOR arrow keys to move the cursor to the FUNC field and choose the proper measurement function such as Cp – D, Cp - Q.
   d) Move the cursor to the FREQ. field and change the test frequency. The frequency range is from 20 Hz to 1 MHz.
5. **Taking a Sweep of Measurements**
   a) Press the MEAS SET-UP key
      i. Use the soft keys to select LIST SET UP
      ii. Use CURSOR arrow keys to move the cursor to the first blank line below the FREQUENCY field
      iii. Input your desired frequencies in a column, one below the other using the unit (Hz, KHz, or MHz) from the soft keys
   b) Press the DISPLAY FORMAT key
   c) Press LIST SWEEP on the soft keys, measurements should appear
   d) To return to the regular single measurement screen, press the MEAS DISPLAY key
6. After the measurement, turn off the main power and remove the holder.

Agilent 16334 A

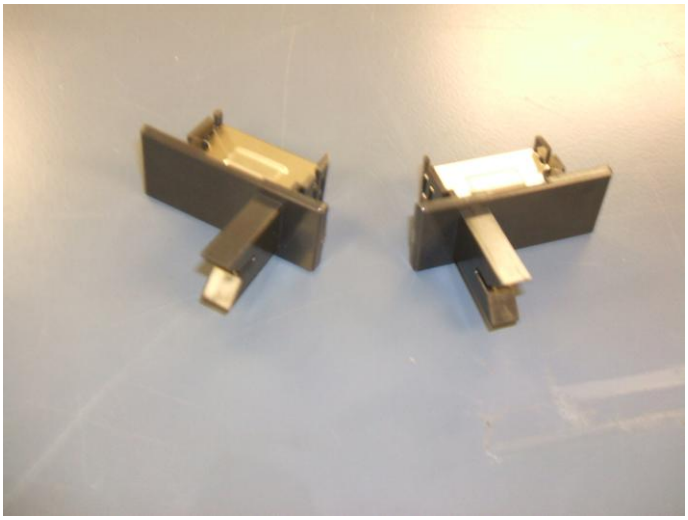


Connection Point

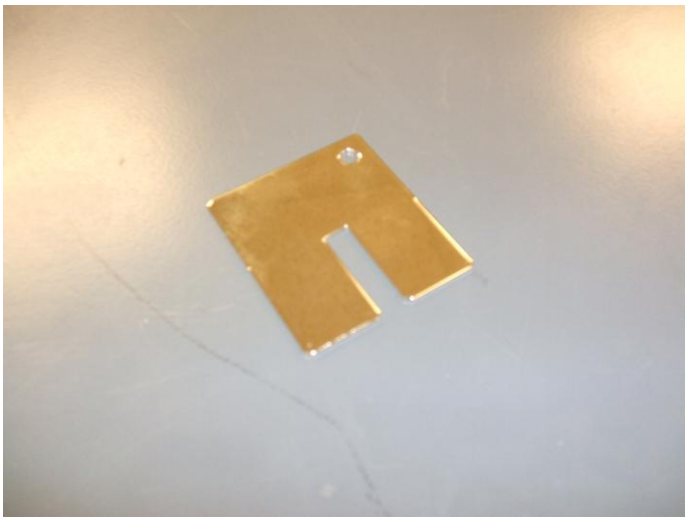
1. Test fixture



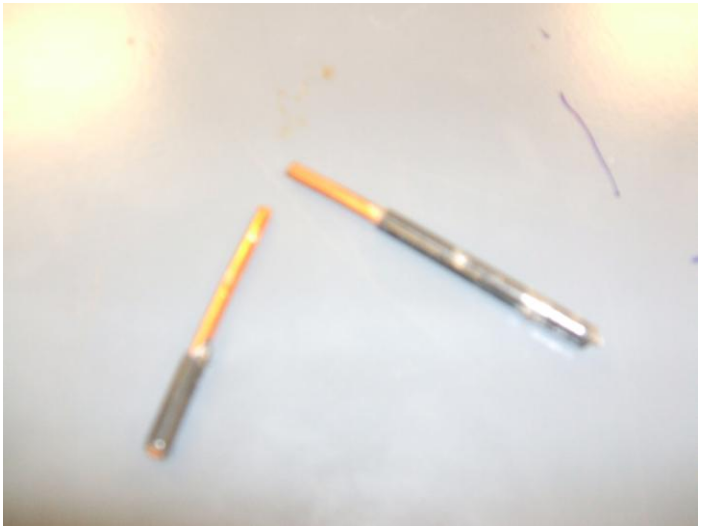
2. Socket axial



3. Shorting bar



4. Wires



Symbol	Parameter Name	Equation	Definition	Notes
Z	Impedance	$Z=R+jX$ $Z=V/I$		
R	Resistance	$R=Z\cos\theta$	Resistance is the real part of the impedance	
X	Reactance	$X=Z\sin\theta$	Reactance is the imaginary part of the impedance	
Y	Admittance	$Y=G+jB$ $Y=1/Z$		
G	Conductance	$G=1/R$	Conductance is the real part of the admittance	
B	Susceptance	$B=1/X$	Susceptance is the imaginary part of the admittance	
C	Capacitance	$C= \varepsilon_r \varepsilon_o (A/d)$	capacitance is the ability of a body to hold an electrical charge	$\boldsymbol{\varepsilon_r} = C/[\varepsilon_o (A/d)]$ $\mathbf{P}= \varepsilon_o (\boldsymbol{\varepsilon_r} -1) \mathbf{E}$
L	Inductance	$v(t)=-L(di/dt)$	change in the current flow that induces a voltage that opposes the change in current	
D	Dissipation Factor	$D=1/Q$	(Loss Tangent)	
Q	Quality Factor	$Q=\omega*(\text{EnergyStored}/\text{PowerLoss})$ $Q=\lvert X/R\rvert$ $Q=\lvert\tan\varphi\rvert$	compares the frequency a system oscillates to the rate it dissipates energy	
φ	Phase Angle		The angle the voltage sine curve leads or lags the current sine curve	
Θ	Phasor Angle	$\theta=\omega t$		