

## 2400 - Measuring Capacitance using Charge Time - why small C's are off.docMethod

Scenario: Capacitance can be measured with a SourceMeter by sourcing current and measuring voltage as a function of time (internal time stamp). Capacitance can be computed from the following equation:  $C = \text{current} \times \text{time} / \text{Voltage}$

However, when measuring values of capacitance less than 2000 pF, the input characteristic of the SourceMeter must be taken into account else significant error can be introduced.

The SourceMeter has an internal capacitance you will need to account for when you employ  $C = it/V$  method. The internal capacitance will be in parallel with the capacitor under test (i.e. add the values). You can find out the internal capacitance of the 2400 by following method.

- Disconnect all inputs.
  - Set: I-source ~ 0.01 uA (you want the current to be as small as possible without severely affecting the accuracy).
  - V-Compliance~500V (or whatever largest available)
  - Measure voltage
- Set up the buffer to take about 50 readings
- Turn the output on until the buffer is filled. If it goes into V-compliance quickly, increase V-comp or reduce I-source.
- Now recall your readings. We are of course interested in voltage value with corresponding time stamp. So if the unit goes into compliance, discard those compliance values. You may also find voltage no longer increasing. If that is the case, we are only interest in the first charge cycle where voltage is sequentially increasing.
- Now we have all variables for  $C = it/V$ , where  $i = I\text{-source}$ ,  $t = \text{relative time stamp}$ ,  $V = \text{charged voltage at corresponding time stamp}$ .
- You should get an input capacitance around 270pF – 300pF (not accounting all the source & measure errors).
- So when you actually measure the capacitance of your device under test, you should subtract this value from the measured value.

Notes:

- Same scenario applies for model 236, 237 or 238 Source-Measure Units
- On Model 4200, this capacitance is buffered so we don't have this issue