

Appendix A

References

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Appendix B

Error Analysis

B1. Capacitance

Based from the specifications given in the Instruction Manual Model 590 CV Analyzer (1 MHz), the Capacitance Reading Limits can be calculated from the following equation

$$R = C + \Delta R \quad (1)$$

$$= C \pm [(P \times C)/100 + C_0/D] \quad (2)$$

where: R = Reading limits (pF or nF)

C = Displayed capacitance (pF or nF)

ΔR = Allowed Capacitance Error

P = Percent of reading value from specifications (percent)

[Given in the Instruction Manual, the accuracy is 0.29%]

C_0 = Fixed count value from specifications

D = Divisor to adjust count units: $D = 1,000$ (20pF); 100 (200pF);

$10,000$ (2nF / 20 nF)

As an example, using $P = 0.29\%$ from specification given in the Keithley 590/1MHz Instruction Manual for an actual of 8.9nF read using the 20nF range the allowed error is

$$\begin{aligned} \Delta R &= [(P \times C)/100 + C_0/D] \\ &= (0.29 \times 8.9000)/100 + (5/10,000) \\ &= 0.0258 + 0.0005 \\ &= 0.0263 \end{aligned}$$

If the lower and higher limits are R_L and R_H , therefore

$$R_L = 8.9000 - 0.0263 = 8.8737\text{nF}$$

and,

$$R_H = 8.9000 + 0.0263 = 8.9263\text{nF}$$

Thus, the allowable reading range for rated accuracy would be between 8.8737nF and 8.9263nF.

B2. Conductance

Conductance errors can be calculated using the same mentioned method as above (i.e using Equation 2 in Section B1) except the unit is change to uS or mS.