\[ R_P = \text{resistance of the parallel model} \]

\[ V_{\text{out}R} = \text{voltage measurement returned by the 3253A real (in phase) detector} \]

\[ Q = Q \text{ of the inductor under test (Q series = Q parallel)} \]

\[ L_P = \text{parallel inductance} \]

\[ F = \text{frequency of the internal source used (100 Hz, 1 kHz, 10 kHz)} \]

\[ L_S = \text{series inductance} \]

\[ X_L = \frac{R_{\text{ref}} V_{\text{in}}}{V_{\text{out}I}} \text{ for a parallel model} \]

\[ R_P = \frac{R_{\text{ref}} V_{\text{in}}}{V_{\text{out}R}} \]

\[ Q = \frac{R_P}{X_L} = \frac{R_{\text{ref}} V_{\text{in}}}{V_{\text{out}R}} = \frac{R_{\text{ref}} V_{\text{in}}}{V_{\text{out}I}} \]

\[ L_P = \frac{X_L}{2\pi F} = \frac{R_{\text{ref}} V_{\text{in}}}{2\pi F V_{\text{out}I}} \]

\[ L_S = \frac{L_P}{1 + \frac{1}{Q^2}} = \frac{R_{\text{ref}} V_{\text{in}}}{2\pi F} \times \frac{V_{\text{out}I}}{(V_{\text{out}I})^2 + (V_{\text{out}R})^2} \]

\[ R_S = \frac{R_P}{1 + Q^2} = \frac{R_{\text{ref}} V_{\text{in}}}{2\pi F} \times \frac{V_{\text{out}R}}{(V_{\text{out}I})^2 + (V_{\text{out}R})^2} \]

3-17. T3—Capacitance Test. The Capacitance Test, like the Inductance Test, Figure 3-6 measures capacitance for a parallel model. A synchronous A/D imaginary detector is used to measure MOA output voltage. The voltage measurement is displayed on the front panel or returned on the HP-IB as a negative voltage. Because most capacitors, with the exception of electrolytics and very large capacitors, are measured in the parallel mode, it is not necessary to convert to a series mode. However, if an electrolytic capacitor or a large capacitor is being measured, a second measurement should be made to determine the real part, and the formulas listed below should be used to convert the parallel capacitance to series capacitance.

![Figure 3-6. T3 Functional Block.](image-url)
\[ XC = \frac{R_{\text{ref}} V_{\text{in}}}{V_{\text{outI}}} \quad RP = \frac{R_{\text{ref}} V_{\text{in}}}{V_{\text{outR}}} \quad RS = \frac{RP}{1 + Q^2} \]

\[ D = \frac{1}{Q} \quad Q = \frac{RP}{XC} = \frac{V_{\text{outI}}}{V_{\text{outR}}} \quad CP = \frac{1}{2\pi F XC} = \frac{V_{\text{outI}}}{2\pi F R_{\text{ref}} V_{\text{in}}} \]

\[ CS = CP \left(\frac{1}{Q^2} + 1\right) = CP \frac{V_{\text{outR}}^2 + V_{\text{outI}}^2}{V_{\text{outI}}^2} = \frac{V_{\text{outR}}^2 + V_{\text{outI}}^2}{2\pi FR_{\text{ref}} V_{\text{in}} V_{\text{outI}}} \]

\[ XC = \text{Capacitance reactance for a parallel model of the capacitor under test} \]

\[ R_{\text{ref}} = \text{Resistance of the reference element used} \]

\[ V_{\text{in}} = \text{Source amplitude} \]

\[ V_{\text{outI}} = \text{Voltage measurement returned by the 3253A imaginary (90° phase shift) detector} \]

\[ RP = \text{Parallel resistance} \]

\[ V_{\text{outR}} = \text{Voltage measurement returned by the 3253A real (in phase) detector} \]

\[ CP = \text{Parallel capacitance} \]

\[ F = \text{Frequency of the internal source used (100 Hz, 1 kHz, 10 kHz)} \]

\[ CS = \text{Series capacitance} \]

\[ D = \text{Dissipation factor} \]