Application Note

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Author(s): CableTest Systems, Inc. http://www.cabletest.com

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CableTest Technical Bulletin

MPT/Horizon - Capacitance Measurement

The built-in capacitance measurement method is available as a standard feature on all MPT and Horizon systems...

Measurement Principle:

The capacitance is measured by charging the capacitor under test with a constant current and measuring the time needed for the voltage to increase by a certain amount.

The equation that is used as a basis for Horizon's capacitance measurement is:

$$C = \frac{I}{dV} dt \qquad (1)$$

The constants in equation (1) are dV (the voltage variation) and I (the charging current), measured is dt (the time needed for the capacitor's voltage to change by a dV) and, finally, the capacitance C is computed.

A graphical representation of this measurement is shown in figure1. A normal measurement cycle includes a number of charges and discharges and the resulting dt measurements are averaged out.

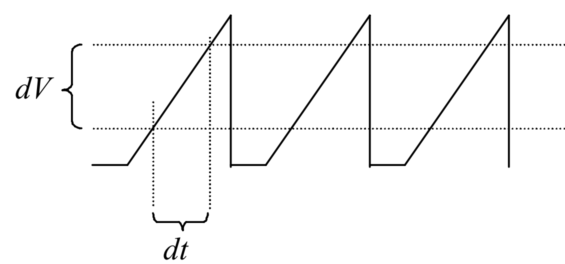

Figure 1

Advantages:

This built-in capacitance measurement method is available as a standard feature on all MPT and Horizon systems. It offers an inexpensive capacitance measurement capability, comparable to the more expensive LCR bridges using sine wave measurements.

The lower and upper voltage thresholds are carefully chosen to minimize the effect of series

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resistance or non-linear devices, such as diodes. The time is measured for the middle section of the rising ramp, which exhibits the highest linearity, thus leading to the most accurate results.

Limitations:

The lower the dissipative losses in the measured capacitor the more accurate the capacitance readings performed with the described method.

The waveform shown in figure 1 is that for a capacitor without losses. When losses are involved, the charging is no longer linear but follows an exponential curve. This translates in readings slightly larger than the real capacitance value. A magnified error effect due to dissipative losses in a capacitor is shown in figure 2.

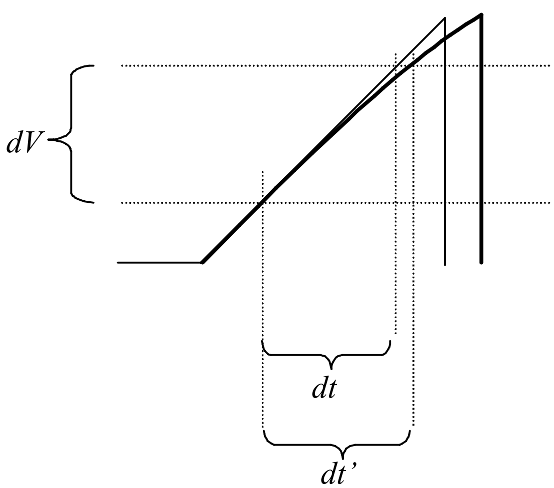

Figure 2

The measured time dt' is slightly longer than dt that would be the measured time had the capacitor been free of dissipative losses.