

Errata

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HP References in this Application Note

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Tantalum Electrolytic Capacitor Measurements

In Production and Quality Control Departments

- HP 4284A Precision LCR Meter -

Introduction

Tantalum electrolytic capacitors are widely employed in transmitters, measuring instruments, industrial equipment, and computers. As the quality demands for tantalum capacitors become more stringent (higher reliability and longer life), the instruments used for testing tantalum electrolytic capacitors will have to be highly accurate over a wide frequency range, and will have to ensure measurements of high resolution (capacitance, loss coefficient D, equivalent series resistor, impedance). The manufacturing and quality control departments require highly reliable, high resolution measurements of tantalum electrolytic capacitors, as well as efficient measurement methods to reduce production costs. Instruments for measuring tantalum electrolytic capacitors normally have the following problems.

1. They cannot provide highly accurate measurements with high measurement resolution at high speed. They cannot completely remove the additional errors caused by test fixtures and extension cables to provide reliable measurements.
2. A single instrument cannot be used to perform all of the tests over the required frequency range.
3. The bias charging time for high capacitance measurements is long and prevents efficient measurements.

Solutions Offered by the HP 4284A

1. A Basic Accuracy of 0.05% and a High Resolution 6 Digit Display.

The HP 4284A is a highly accurate LCR meter with a basic accuracy of 0.05% and has a display resolution of 6 digits with a measurement speed of 400 ms (100 Hz, MEDIUM mode, reference value). A powerful error compensation function (OPEN/SHORT/LOAD compensation) reduces additional errors caused by test fixtures and extension cables to a minimum. The discrepancy in measurement values between channels, a problem when using scanning, is compensated for by the multi-channel compensation function of the scanner interface (Option 301) over a maximum of 128 channels to ensure reliable measurements.

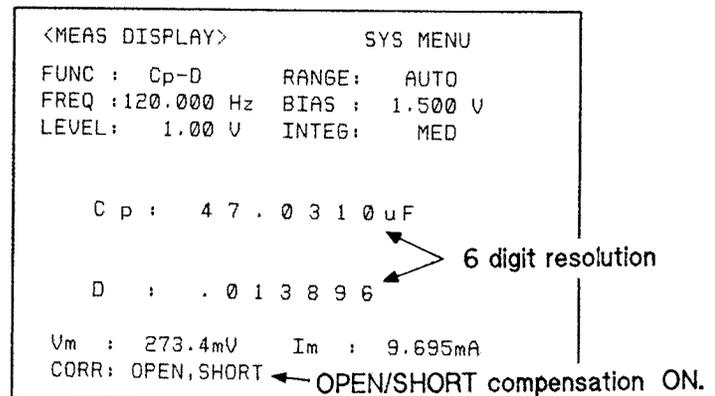


Figure 1. Highly Accurate 6 Digit Resolution Cs-D Measurement Example

2. A Wide Frequency Range from 20 Hz - 1 MHz

For certain applications of tantalum electrolytic capacitors high frequency evaluation may be required. For example, the loss coefficient (D) or the equivalent series resistance (ESR) measurements are generally performed at frequency points between 1 kHz to 1 MHz as well as capacitance measurement at 120 Hz. In this case several conventional instruments would have to be used to cover such a wide frequency range. The extremely wide frequency range of the HP 4284A - 20 Hz to 1 MHz - makes it possible to perform all of these measurements with the HP 4284A alone. In addition, the List Sweep function (a List Sweep of any of up to ten frequencies) speeds up measurements over several frequencies and improves efficiency.

<LIST SWEEP DISPLAY>		SYS MENU	
MODE : SEQ			
FREQ[Hz]	Cp[F]	D[]	CMP
120.000	2.07475u	.004448	
1.00000k	2.06617u	.011870	
10.0000k	2.04147u	.093804	
100.000k	1.13434u	.807227	
1.00000M	87.4534n	3.59225	

Figure 2. Measurement Example Using the List Sweep Function

3. Built-In 1.5 V/2 V High-Speed Charge Bias Source

The DC bias source built into conventional measuring instruments require long bias charge time when performing measurements of high value capacitors. Since large quantities of capacitors have to be tested in a shorter time for product inspection in production and quality control departments, the capacitor must be precharged to reduce total test time. The 1.5 V/2 V high speed charge bias source built into the HP 4284A can charge a 200 μ F capacitor in less than 0.1 second. This does away with the need for precharging and improves efficiency.

Conclusion

The HP 4284A Precision LCR Meter can perform highly reliable, high resolution measurements over a wide frequency range, which greatly contributes to raising the reliability of tantalum electrolytic capacitor evaluation. The List Sweep function, the high speed charge bias source, and the memory card for recording setting conditions will raise the measuring efficiency at production and quality control departments.