SENCORE®

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tech tips

Understanding The Ringing Test

The 1987 Electronic Industries Association's reports show that coil use has increased over the 1985 level of 1.08 billion by almost 6 percent (See Figure 1). The 1987 U. S. Industrial Outlook predicts the annual growth of coil usage to average 3 percent through 1991. Let's see what these numbers mean to you.

If the number of coils being used is increasing, aren't the number of defective coils also going to increase? In order to analyze defective coils with 100% reliability, an understanding of how coils are tested is essential. This Tech Tip answers some commonly asked questions on how the ringing test works and how to use it for testing coils.

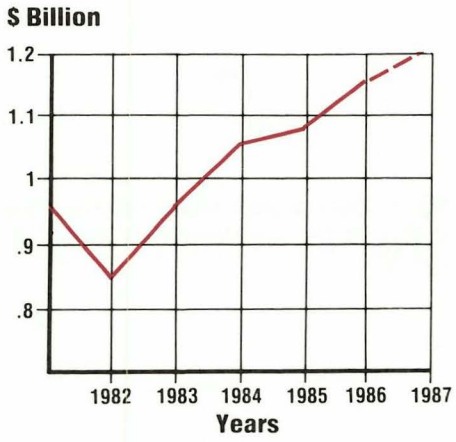

Fig. 1: Electronic Industries Association reports show the use of coils is growing rapidly.

Why Does The Ringing Test Find Bad Coils That Other Equipment Can't?

Have you ever suspected a coil as being bad, but had no method of testing it? You may have tried to use some of the equipment around your shop, and found you're still not sure if the coil is bad.

A single shorted turn is one of the most common failures and the hardest to detect. A shorted turn doesn't affect the resistance or the value of the coil enough to tell if the coil is bad. Most meters (value and ohms) don't have the resolution needed to show a single shorted turn. Even if they did, would you know what the exact value is supposed to be?

The short does, however, reduce the quality of the coil. This effect is shown by a reading of less than 10 by the ringing test. The ringing test is the only method that tests all three types of failures; an open winding, to a completely shorted coil, and a single shorted turn.

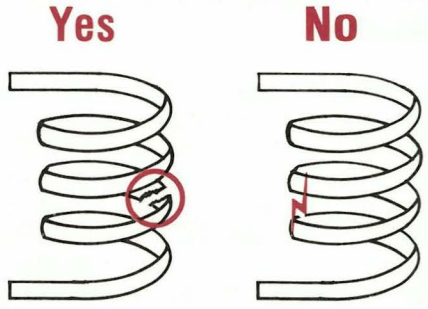

Fig. 2: An ohmmeter can test for continuity of a coil, but does nothing for a single shorted turn or a completely shorted coil.

Why Is 10 Rings The Number To Determine If A Coil Is Good Or Bad?

A coil with a single shorted turn may not show much change from a good coil when tested with other equipment. A coil with a shorted turn rings between one and nine times with Sencore's ringing test. Extensive testing proves Sencore's ringing test to verify 10 rings as the point for good/bad cutoff between a coil with no shorted turns and one that has even one shorted turn.

How Does The Ringing Test Test A Coil?

Looking back at what was done before Sencore's ringing test answers this question. The old method of testing coils involved the use of an oscilloscope and a pulse generator. The generator is used to pulse the coil. The oscilloscope displays the coil's oscillations on the CRT.

This method has several problems. The biggest problem is: how do you decide what is good or bad when there are many variables related to the scope display? The good/bad decision is dependent on the accuracy of the oscilloscope and how good you are at counting graticules. You must manually make measurements. When you finally have something on the scope, it's not going to be 100% reliable.

Sencore's ringing test eliminated the troubles and questions with the old methods of ringing coils. Sencore's ringing test uses the same basic principles of pulsing the coil and counting the oscillations. However, it is automated and removes any chances for error for a 100% reliable test.

What Does The Impedance Matching Control Do?

The Impedance Matching control matches the test circuit impedance to the coil under test. The impedance matching works with the principles of resonance. If a capacitor and a coil are such that they have equal impedances, they oscillate when hit with

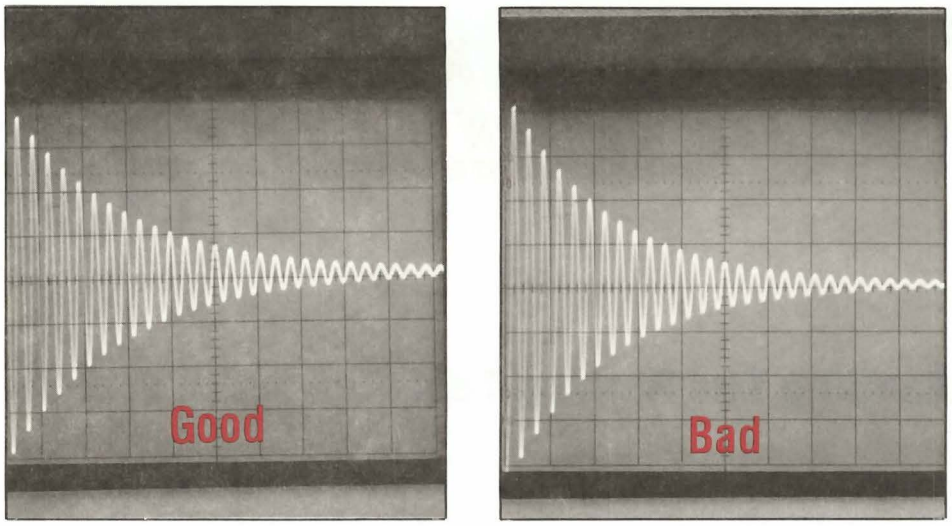

Fig. 3: Old methods of ringing coils don't have the dependability needed for modern component testing. Can you tell which waveform is from a good coil?

an exciting pulse. The Impedance Matching control simply places different capacitors in parallel with the coil.

You must test a coil with all the different positions of the Impedance Matching control to see if any of the readings are 10 or greater. When doing the ringing test, you may notice that each individual impedance position gives a different number of rings. But, if one position gives a good reading the coil has no shorts.

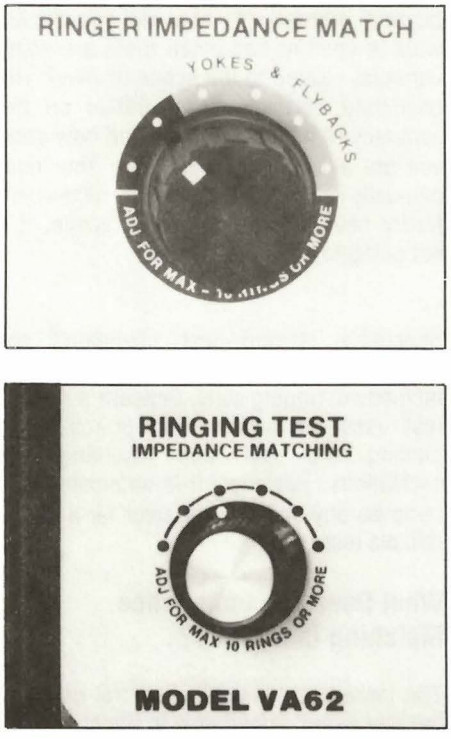

Fig. 4: The Impedance Matching control switches different capacitors in parallel with the coil under test.

What Is Different About The YOKES & FLYBACKS Positions Of The Impedance Matching Control?

Yokes and flybacks typically have different impedances than coils. Different capacitors must be used in parallel with the different coils. Also, yokes and flybacks oscillate at stronger levels. To compensate for this, the ringing test must also choose different amplitude levels for the cutoff points. If any of the impedance matching positions, for the type of coil you are testing, give a reading of 10 or greater the coil is good.

Can The Ringing Test Be Done On All Coils?

Let's look at where the ringing test does work, and the coil parameters that must be present to answer this question. The ringing test works on coils with non-iron cores ranging in value from 10 micro-henries to 20 henries. This includes: flybacks (IHVT), yokes, switching transformers, RF chokes, postage stamp inductors, axial lead inductors and free form coils to name a few.

Each ringing instrument has certain parameters for the test. The VA62 and VA48 video analyzers test yokes and flybacks. The Z METERs™ test yokes, flybacks, and other coils. (see individuals specifications for inductance value ranges)

NOTE: For proper ringing of a transformer you should always leave the core in place. This allows the test to catch both shorted turns in the primary and the secondary with one connection.

Can The Ringing Test Be Done In-Circuit?

To save time, servicers look for methods of testing components in-circuit. Testing components in-circuit requires an understanding of what happens when components are in parallel. Parallel components affect both value and impedance.

Good inductors may not ring good if connected in-circuit, unless the paralleled impedance is quite high. This is because the impedances of other components in the circuit decrease the amplitude of the ringing pulses. If ringing a coil in-circuit results in less than 10 rings (bad), disconnect the coil from the circuit and ring it again. If the coil then rings 10 or greater the coil has no shorted turns.

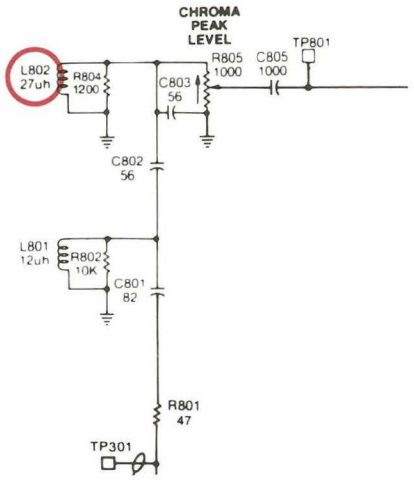

Fig. 5: External components can cause the ringing test to show bad when testing in-circuit.