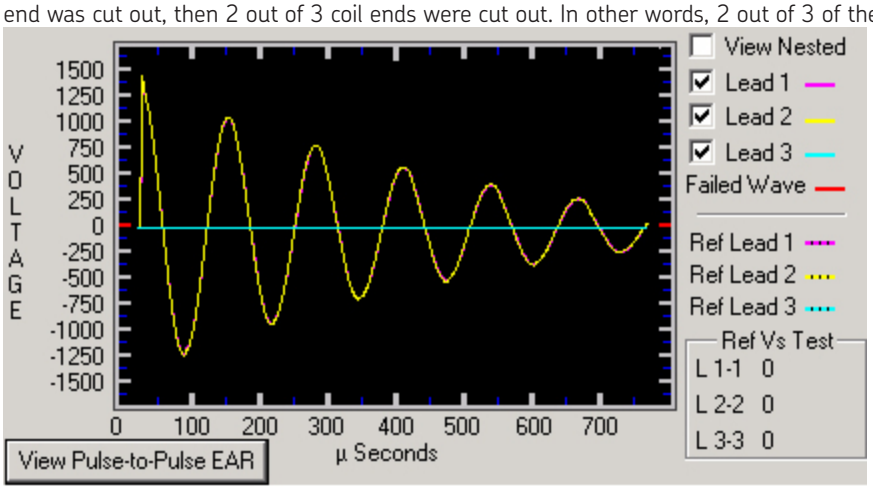
Capability Comparisons between Modern & Vintage Testers with Finding Open Coils

Question: Why can my motor have a coil with a "hole blown in it" and still give a stable trace on a surge test? The Baker surge test works GREAT for detecting shorts, why not a blown open coil?

Answer: There may be several reasons:

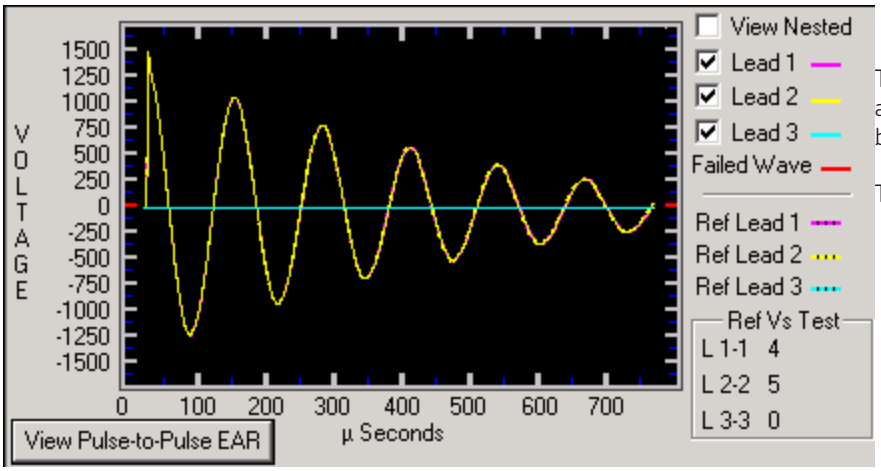
1) The particular motor might be designed and wound with multiple coils in parallel or "in hand". This is one method to allow, for manufacturing purposes, a suitable amount of copper to be easily placed into the motor. Sometimes 5 or more parallel conductors make up each coil in the motor. If for example, one of these parallel conductors shorts to the core of the motor, it might actually be blown open, and then clear it's own fault. This is because the single strand by itself is not capable of sustaining the fault current for more than a few moments before vaporizing. In some cases it might not actually even trip the motor protection breakers.
2) The trace might be stable because when 1 wire of the coil blew open, it welded itself to another parallel wire of the same coil next to it. The inductive coupling between the remaining parallel turns may be very significant. In other words, the remaining length of good wire still remains magnetically coupled with the blown open wire, masking the influence of the open path.
3) You might be using an obsolete surge tester. Baker Instrument Company has been in business for over 40 years, with many thousands of units produced. A vintage 1984 unit is simply not as sensitive as a 2008 unit.

To illustrate advancements in technology, here are some examples of the capabilities of modern Baker Instrument Company test equipment:
A coil wound 3 "in hand" was used to present these results, first the coil was tested with all 3 parallel conductors making contact, then 1 coil end was cut out, then 2 out of 3 coil ends were cut out. In other words, 2 out of 3 of the parallel coils were then present, but not making contact.



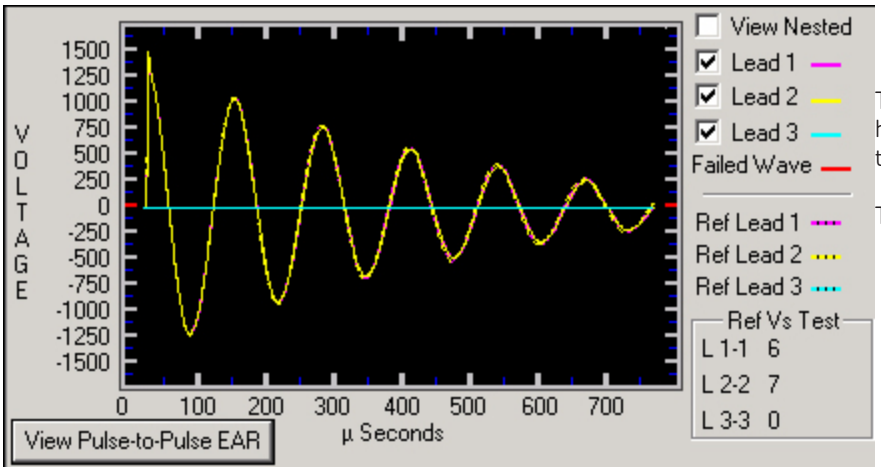
This plot shows the coil, all 3 wires in hand, tested consecutively against itself, with no difference detected between the successive tests.

The test values are: Ref Vs. Test. L 1-1=0 and l 2-2=0



This plot shows the coil, 2 or 3 wires in hand, tested against the reference waveform stored in the memory bank. Difference exists.

The test values are: Ref Vs Test. L1-1 = 4 and L 2-2=5



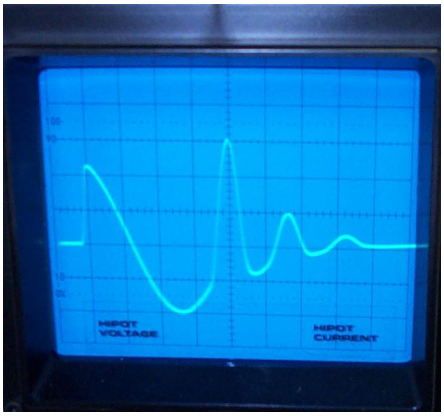
The plot shows the coil, now with only 1 of 3 wires in hand, tested against the reference waveform stored in the memory bank. Now:

The test values are: ref vs Test L 1-1=6 and l 2-2=7

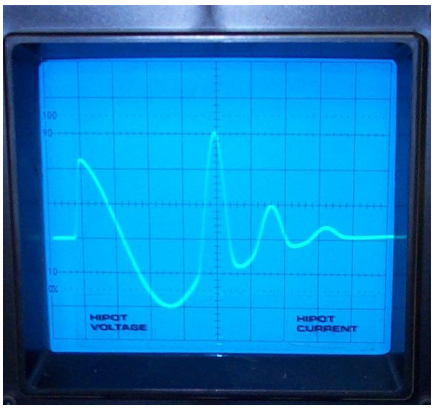
This method Ref Vs Test method allows a repeatable numeric value to be assigned to the test waveforms, this allows detection of previously undetectable faults.

For comparison sake, a vintage 1984 surge tester was used to display data on the exact same coil under the same test conditions.

All 3 wire in hand.



Only 1 in hand, 2 open

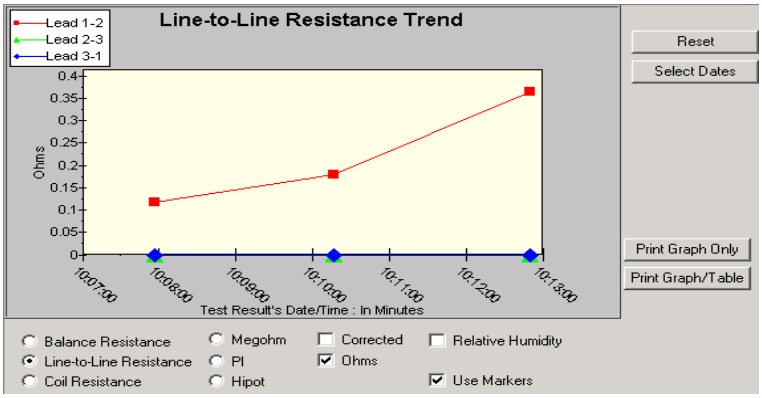


There is no way for the operator to discern the difference between the two traces. For all intents and purposes the traces are identical.

This is representative of 20-30 year old electronic designs, and does not fault the capability of the design in any way. If technology never improved, we would still be driving Model T cars, using the Wright Flyer, Coal Fired Steam Locomotives, Sail Ships, and the Telegraph.

Coil Resistances

All 3 in hand	2 in hand, 1 open	1 in hand 2 and 3 open
0.118 ohm	0.178 ohm	0.365 Ohm



As can be clearly seen, modern advancements in Baker Instrument Company test equipment have vastly increased the sensitivity of fault detection.

Faults are clearly and unmistakably identified. Competitor claims about the lack of effectiveness of the surge test appear to be based upon capabilities of decades old equipment.