

Finding Faults with Voice and Data Communications

INTRODUCTION

For locating faults rapidly on voice and data communications installations, a time domain reflectometer (TDR) is likely an invaluable tool. Yet, all too often, TDRs fail to live up to their potential, largely as a result of the limitations inherent in older instruments.

The latest generation of TDRs has effectively removed these limitations, making the new instruments more useful – and easier to use – than ever.

LIMITATIONS

Let's take a look at some of the shortcomings that have often been associated with TDRs in the past, and how these have been addressed. The first, and possibly most significant, issue is the location of near-end faults. Put simply, for faults close to the instrument, the signal reflected from the fault often arrived at the instrument before the launch pulse had finished and, therefore, could not be detected.

This is particularly problematic as the majority of faults on communications networks near-end faults. In principle, the remedy is straightforward – make the launch pulse shorter so that it no longer masks the return signal from a nearby fault. It has taken recent advances in technology to make this possible, however, and the best of the new generation of TDRs can work with launch pulses as short as 2 nS.

In practical terms, this means that the new instruments can locate faults as close as 0.1 m (around 4 inches) from the point of connection. Given that TDRs are almost always used with test leads that are a foot or more long, the near-end fault location problem has been comprehensively solved! The next problem commonly encountered with older TDRs is complicated set up. What is the cable impedance? What is the best pulse width to use for a particular operating range? How should the gain be set? Experienced users will have the answers, but for others, and particularly for those who use TDRs only infrequently, the multiplicity of options can be daunting.



Auto set up is a real time saver for occasional and experienced users alike.

SOLUTION

The solution is auto set-up, where the TDR itself determines the cable impedance, and sets the optimum gain and pulse width for each range. Not only is this ideal for ensuring that novice users get the best from the instrument, it's also a big time saver for experienced users. Naturally, the best instruments also provide a manual operating mode for tackling unusual or complex situations where fine-tuning the operation of the TDR can help to wring the last ounce of performance from it.

Interpreting the trace produced by the TDR is another issue that sometimes poses challenges. One very effective solution is to compare the trace from a known good pair and the faulted pair but in the past, instruments offering dual-channel operation with a trace comparison facility have typically been bulky and expensive.

A slightly different but equally effective approach is to provide a single-channel instrument with the facility for storing a trace on screen. This means that the instrument can first be used on the good pair and the resulting trace stored. It can then be used on the faulted pair, and the new trace compared with the first one, which is still on the screen. This arrangement allows all the benefits of visual trace comparison to be provided in a compact and cost-effective single-channel instrument. Another issue that can be a problem is the quality of the display used in the TDR. Getting good results involves interpreting the fine detail of the traces and setting the cursor accurately. This can only be done if the display has good resolution, particularly in a handheld instrument where the overall display dimensions are necessarily limited. Fortunately, very high resolution displays are now available at reasonable prices and the best TDRs use these.

SUMMARY

The conclusion is clear: the best of the new generation TDRs, of which Megger's CFL510G is an excellent example, offer greatly enhanced usability and performance, allowing these remarkably useful instruments to live up to their full potential, even in the hands of inexperienced users. Auto set up is a real time saver for occasional and experienced users alike.

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Information on Megger TDRs can be found on the website at www.megger.com.



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