

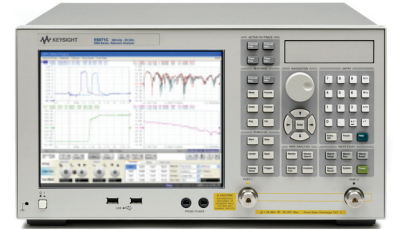
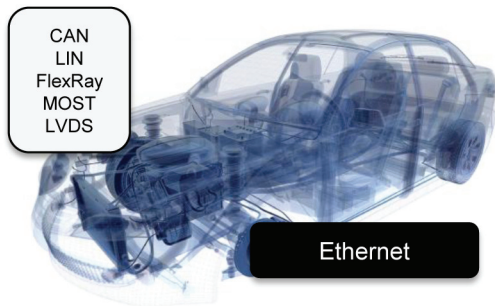
# Keysight Technologies E5071C ENA Option TDR Enhanced Time Domain Analysis

## Comprehensive signal integrity measurement solution for next generation standards

### Automotive Ethernet PHY layer analysis and debug

To meet the demand for higher security in automobiles, a faster and more reliable in-vehicle network is required to improve vehicle control. In addition, simultaneous streaming of high quality video and sound, and the digitization of camera systems have increased network traffic for vehicle information systems.

Automotive Ethernet, which can cover both control and information systems, is gaining attention. Investigation into the automotive Ethernet specification is based on the IEEE802.3 100BASE Ethernet standard. ENA Option TDR provides a solution for 100BASE physical layer evaluation (cable measurement, return loss measurement).



### 100BASE-TX PHY layer test items

#### ANSI X3.263-1995

- Vout overshoot <sup>[1]</sup>
- Vout rise time and fall time <sup>[1]</sup>
- Duty cycle distortion <sup>[1]</sup>
- Transmit jitter <sup>[1]</sup>
- AOI template <sup>[1]</sup>
- Vout differential output voltage <sup>[1]</sup>
- Transmitter return loss <sup>[2]</sup>
- Receiver return loss <sup>[2]</sup>

#### IEEE Std 802.3TM-2008

- Insertion loss <sup>[3]</sup>
- Differential characteristic impedance <sup>[3]</sup>
- Return loss <sup>[3]</sup>
- Differential near-end crosstalk (NEXT) <sup>[3]</sup>

1. Infiniium Series Oscilloscope
2. ENA Option TDR (Return Loss)
3. ENA Option TDR (Cable)

### ENA Option TDR Introduction

Features	Values
Multi-domain analysis	Frequency domain and time domain analysis is available in a single instrument. By observing both the time and frequency domain response at the same time, deeper signal integrity insight can be obtained.
Simple and intuitive operation	The user interface is designed to provide a similar look-and-feel to traditional TDR oscilloscopes. You can easily measure with equal or greater operability compared to the TDR oscilloscope. Following the Setup Wizard menu, complex measurements can be set up in four simple steps.
Fast and accurate measurements	Due to the low noise architecture, oftentimes averaging is not required as in traditional TDR oscilloscopes. Real-time analysis allows for more efficient troubleshooting of designs.
ESD Robustness	High ESD robustness (up to 3 kV) is achieved through internal protection circuits.
Certified for a variety of high speed digital standards	Certified equipment for USB, HDMI, Display-Port, SATA, MHL cable/connector compliance test. Method of Implementation (MOI) documents are also available free of charge.

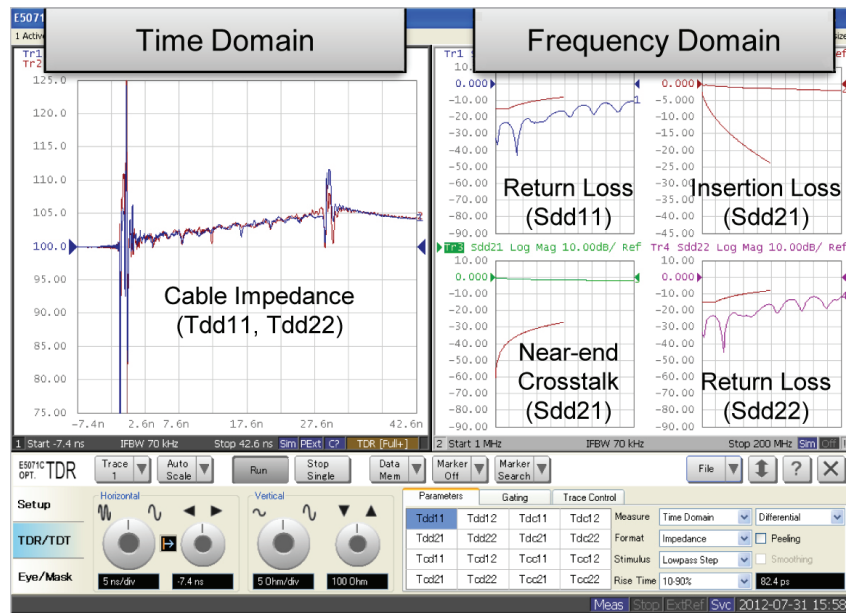
## Cable evaluation

Traditionally, a TDR oscilloscope was used for time domain measurements and a vector network analyzer for frequency domain measurements. With ENA Option TDR, both the time and frequency domains can be analyzed with a single instrument.

The U7237A (Ethernet test fixture) is used to connect to the device under test.

For more accurate measurements, calibration is possible with the calibration kit (RJ-45 type Open, Short, Load standards).

By recalling the necessary state file, you can easily setup, measure, and perform limit testing for pass/fail judgment.



100BASE cable measurement example

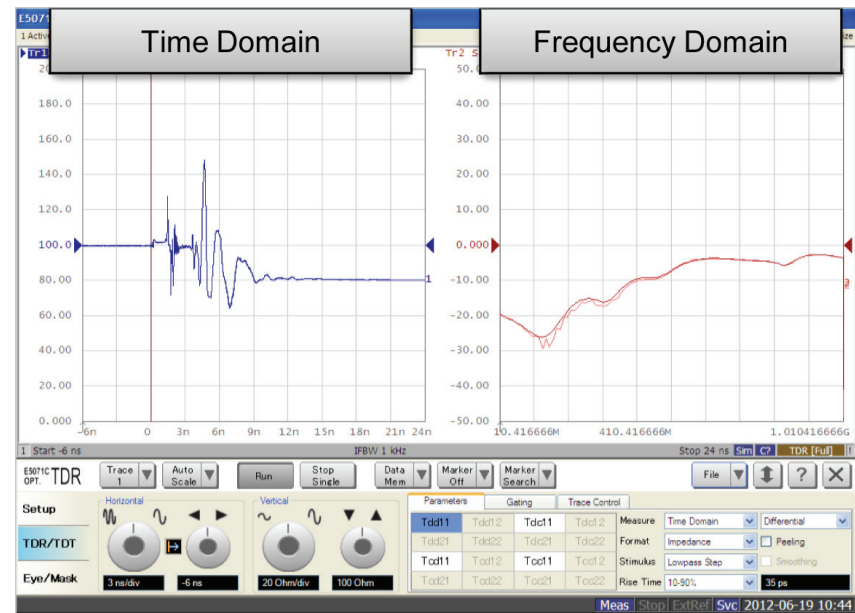
[www.keysight.com/find/e5071a](http://www.keysight.com/find/e5071a)  
[www.keysight.com/find/ena-tdr](http://www.keysight.com/find/ena-tdr)

## Hot TDR (Return Loss) evaluation

Impedance is a parameter indicating the ratio of the amount of reflected voltage to the incident voltage and is an important parameter for system evaluation. For poorly impedance matched systems, transmission waveform quality is deteriorated due to multiple reflections.

Hot TDR is the impedance measurement of active devices under actual operating conditions. Typically, the impedance is significantly different between the OFF state and operating state (Hot TDR).

By evaluation Hot TDR, complex design issues can be solved more efficiently.



100BASE Hot TDR (Return Loss) measurement example

## Ordering information

### E5071C ENA Series Network Analyzer

Option 440	4-port test set, 9 kHz to 4.5 GHz without bias tees
Option 480	4-port test set, 9 kHz to 8.5 GHz without bias tees
Option TDR	Enhanced Time Domain Analysis