TDR Calibration

Abstract

Here we explain how you can perform your own calibration check on Tempo's TDR units. Tempo believes that its TDR products need no periodic formal calibration in normal use. Tempo believes that performance will be unchanged for many years. However, should a user or their organisation wish to perform a calibration check this can be achieved easily and at low cost.

By

Mark Govier, February 2025

What Can be Calibrated

The TDR outputs a pulse of energy into a cable and analyses what comes back from any reflection from a discontinuity of impedance. The timing of the returned energy pulse is directly related to the speed of light in the cable, known as the velocity factor or velocity of propagation. Therefore we can examine both the pulse shape and the timing of the reflection when testing a known cable to prove the time-base and pulse generator of the TDR.

Standard Cable

Keep a length of typical cable available to perform all calibrations; it can be on a drum. Example, 50 to 100m of RG6U with the far end open circuit. This cable should be retained and marked up as your "calibration standard"; it is not sufficient to take "any" similar drum each year as manufacturing tolerances of the cable are much greater than those of the TDR, particularly in terms of timing and calculation of range from velocity factor, particularly for foam cored cables, or even due to variation of finished cut length between drums.

Testing

Set the TDR (cable settings) to the correct cable type to eliminate any "velocity factor" calculation errors. Ensure these instrument are the same settings as used when making the original test. If this is the first test, use enough gain to get the end-of-cable event pulse amplitude to about 50% to 80% of full scale.

Using a "standard" patch cord. Test with each TDR recording (saving) traces that can be compared again in the future. Test with each pulse width that is important to you, as a minimum use the 2, 5 and 25ns pulses. Save these "reference" traces in a central location that is backed up and searchable as these will be needed next year or whenever your next calibration is to take place. Ensure that the "event return loss" at the end of the cable is approximately zero (0 to 3 should be acceptable). This represents that the "fault" is a "100%" break and that ALL energy is being reflected.

Result Storage

Perhaps keep a folder of results for each tester, with each recorded trace being named with the unit's serial number, pulse width and date.

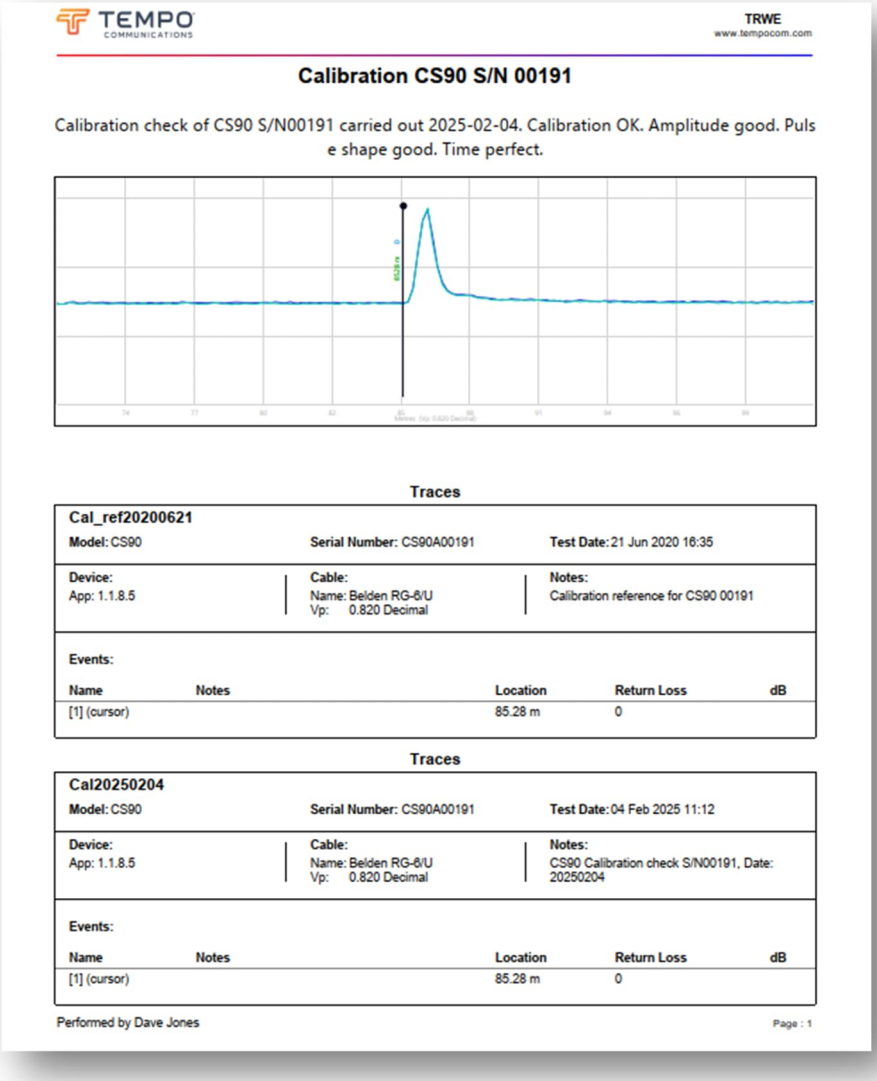
Interpreting Future Tests

Differences in the trace recorded from one test to the next should be minimal, with the same overall length being recorded (within ±0.5%) and the shape of the trace being largely unchanged (amplitude and width of pulses being comparable). Also that the reported "Event Return Loss" remains in the range 0 to 3. It is easy to utilise the "saved & live" mode of operation of the TDR to show this. First load into the trace buffer the "saved" reference trace and then test the same cable using the same patch cord and compare the two traces.

Creating a PDF Calibration Report

Utilise Tempo Report Writer Enhanced (TRWE) to bring together the "original" and "new" trace files into one report where the distance to "end of cable" and the magnitude of the event at the end of cable can be seen. Export the report as a PDF file and store in the calibration folder for the instrument

Example Report



TEMPO COMMUNICATIONS

TRWE
www.tempocom.com

Calibration CS90 S/N 00191

Calibration check of CS90 S/N00191 carried out 2025-02-04. Calibration OK. Amplitude good. Puls e shape good. Time perfect.

Traces

Cal_ref20200621

Model: CS90 **Serial Number:** CS90A00191 **Test Date:** 21 Jun 2020 16:35

Device:	Cable:	Notes:
App: 1.1.8.5	Name: Belden RG-6/U Vp: 0.820 Decimal	Calibration reference for CS90 00191

Events:

Name	Notes	Location	Return Loss	dB
[1] (cursor)		85.28 m	0	

Traces

Cal20250204

Model: CS90 **Serial Number:** CS90A00191 **Test Date:** 04 Feb 2025 11:12

Device:	Cable:	Notes:
App: 1.1.8.5	Name: Belden RG-6/U Vp: 0.820 Decimal	CS90 Calibration check S/N00191, Date: 20250204

Events:

Name	Notes	Location	Return Loss	dB
[1] (cursor)		85.28 m	0	

Performed by Dave Jones

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Traces Not Matching?

If you suspect that there may be something different between the initial and recent checks; ensure that the unit is the same serial number, that you are using the same patch cord, has the same cable type selected and that the “gain” is adjusted to the same value. If you still have questions, please contact Tempo’s support team for guidance (contact details below).

Tempo Report Writer

Tempo has created a set of applications called “Tempo Report Writer Enhanced” (TRWE) that are available for download from the application stores for Android, iOS and Windows. The application is available through these channels as deployment can be better controlled by your own company’s IT team and we can make updates available to everyone more easily.

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Get

Tempo Communications

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Our expertise and innovative solutions address all stages of network deployment enabling the development, installation and maintenance of xDSL, Fibre, and COAX Cable networks. Through our strategic acquisitions in Fibre & Ethernet segments, Tempo has emerged as the leading provider of next generation test & measurement solutions in the global communications industry.

To learn more about Tempo Communications, visit https://www.tempocom.com

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