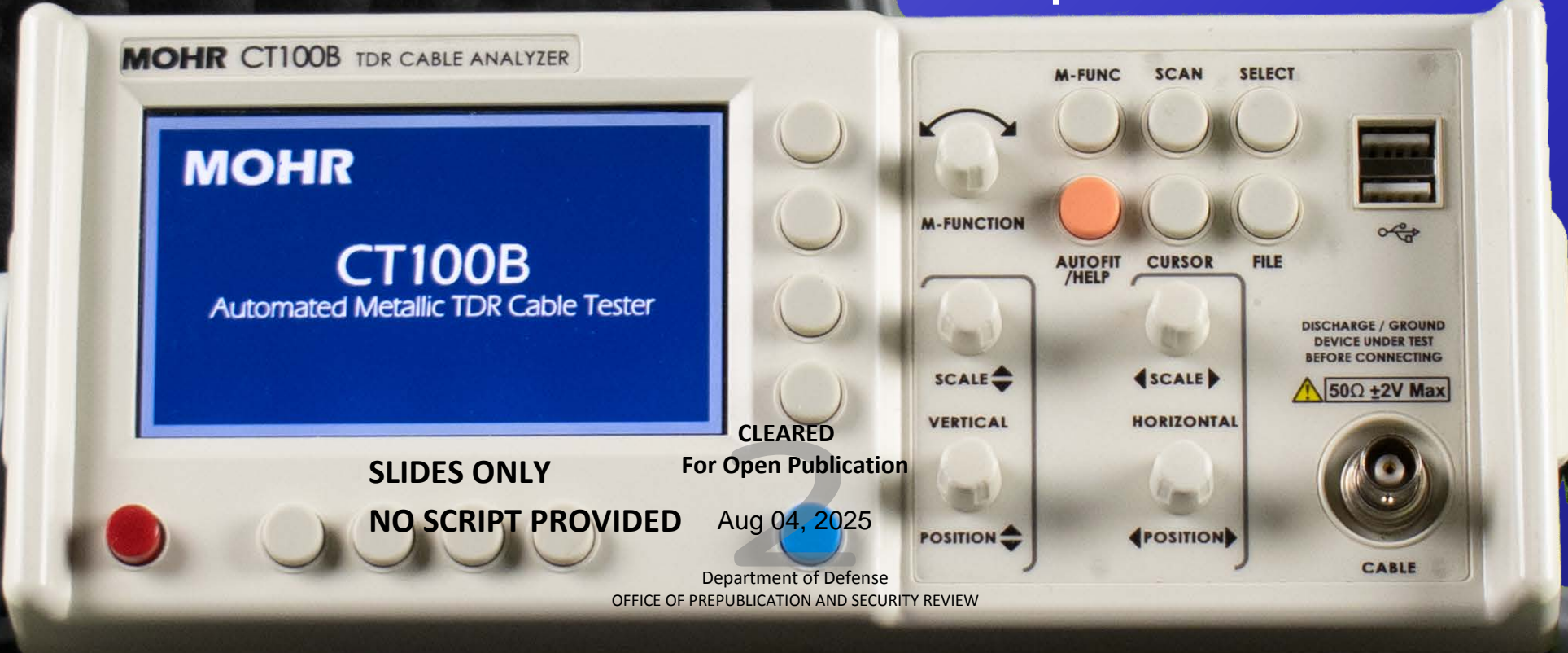


MOHR™ CT100B TDR Cable Analyzer

Industry's only high-resolution portable TDR



MOHR CT100B TDR CABLE ANALYZER

MOHR
CT100B
Automated Metallic TDR Cable Tester

SLIDES ONLY

NO SCRIPT PROVIDED

CLEARED

For Open Publication

Aug 04, 2025

Department of Defense
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

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MOHR™ CT100-Series TDR's

Control

- Basic Operation Identical to 1502C & many Oscilloscopes
- Dual Cursors for relative measurements
- 1-1024 Averaging (smoothing) for superior noise reduction

Ergonomics

- 4.3(H) x 11.5(W) x 6.9(L)in
- 4.7 lb (2.2 kg)
- 4.3" Sunlight Readable Backlit Screen

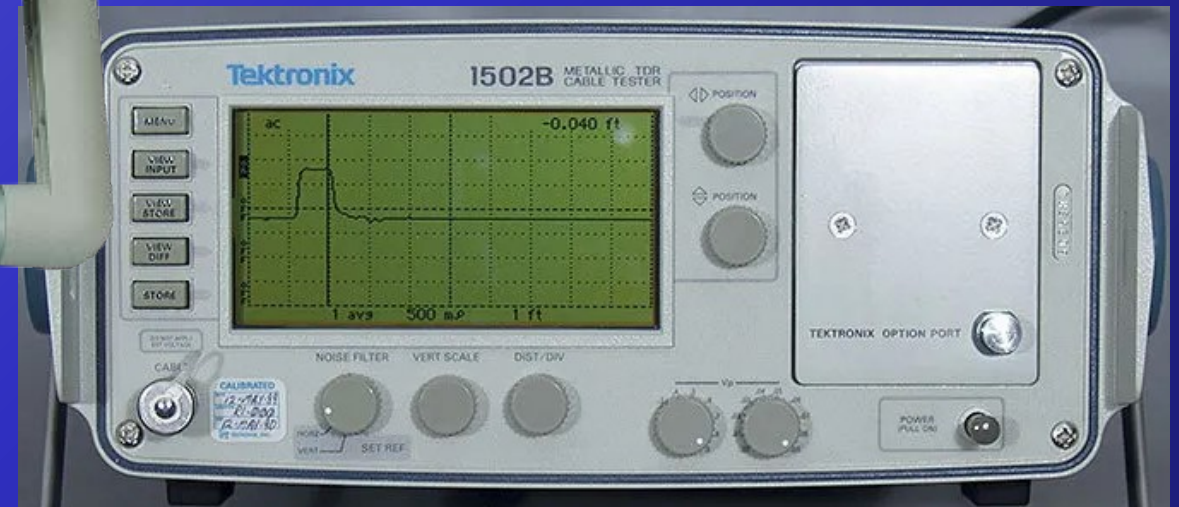
Communications

- USB host
- USB client
- Ethernet
- RS232 (with adapter)

MOHR™ CT100B Qualifications

- **EMC:** MIL-PRF-28800F, MIL-STD-461F RE102, CE102. IEC 61000
- **Shock/Vibration:** MIL-PRF-28800F (Class 3)
- **Temperature/Humidity:** MIL-PRF-28800F (Class 3)
- **Explosive Atmosphere:** MIL-STD-810G 511.5 Procedure 1 (+55°C, 0-4600 m)

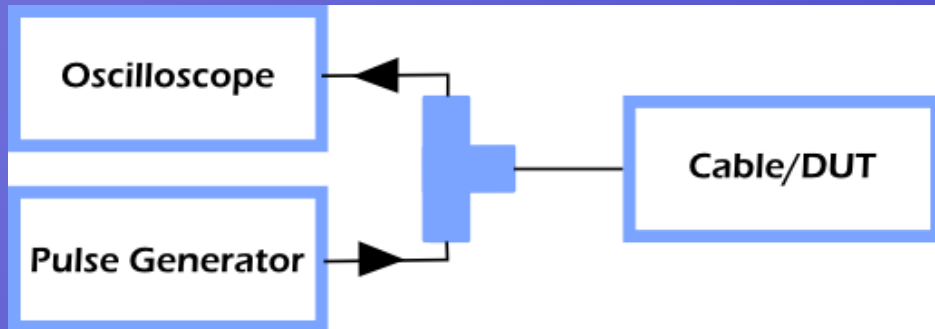
MOHR CT100 & Tektronix 1502B/C



The MOHR CT100-series TDR's are the drop-in compatible replacement for the Tektronix 1502-series TDR's.

Any 1502 process and waveforms can be replicated identically with the MOHR TDR's.

MOHR™ CT100B Technology



TDR is a specialized form of closed-circuit radar (cable radar) developed for characterizing transmission lines, and is particularly useful for testing coaxial and twisted pair cables and connectors found in modern microwave/RF and digital communications systems.

A TDR can be thought of as a combination of a pulse generator and an oscilloscope.

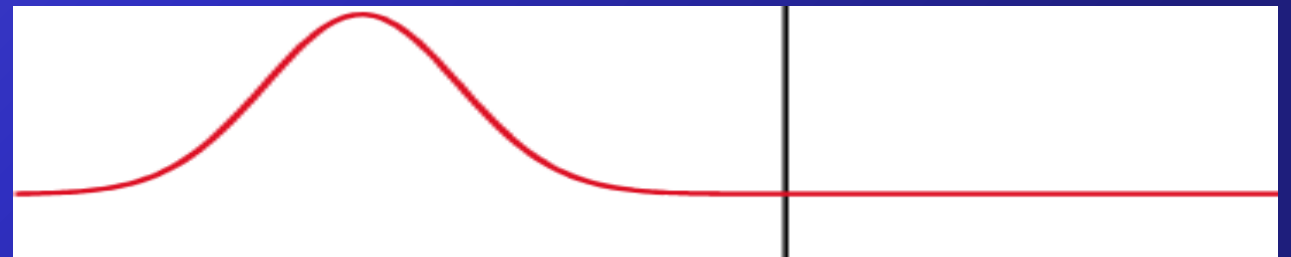
The pulse generator injects a wideband test signal into a cable, and the oscilloscope records the resultant reflections caused by impedance variations along its length.

There are two types of TDR's – Pulse TDR, and Step TDR.

The CT100B is a Step TDR, creating a fast rising edge (90ps) followed by a voltage plateau.

This provides both high spatial resolution and high signal energy for long-range propagation.

Because Step TDR's use a continuous excitation source, impedance variations along the cable are clearly defined as changes in the reflected voltage.



Using the CT100B

Basics

- Start-up and Front Buttons
- Distance to Fault Measurements

Four Use Cases

- Troubleshooting Antennas
 - Save and Recall Scans – Manual & Automatic Set-up
- Aircraft & Engine Wiring Harness
 - Pin & Socket Set useage
- 1553 Data Busses
- Fire Detection Loops

Wrap-up / Questions




STATIC CHARGE CAUTION



Any wire or cable can carry a significant static electric charge.

It is essential to discharge any cable or device **BEFORE** attaching it to the CT100B.

This is easily done by shorting the DUT conductor to the shield.



NEVER test cables carrying LIVE electrical signals.

CAUTION: This instrument is sensitive to static electricity. Always properly ground the cable before attaching to the CT100.

FIRST, connect any adapters and/or lead cables to the item being tested. **SECOND**, electrically short the test assembly. **FINALLY**, connect the test assembly to the CT100.

Press the Continue button below:

Continue



Failure to properly discharge a Device Under Test (DUT) prior to testing may cause damage to the CT100 High-Frequency components and void the Warranty.

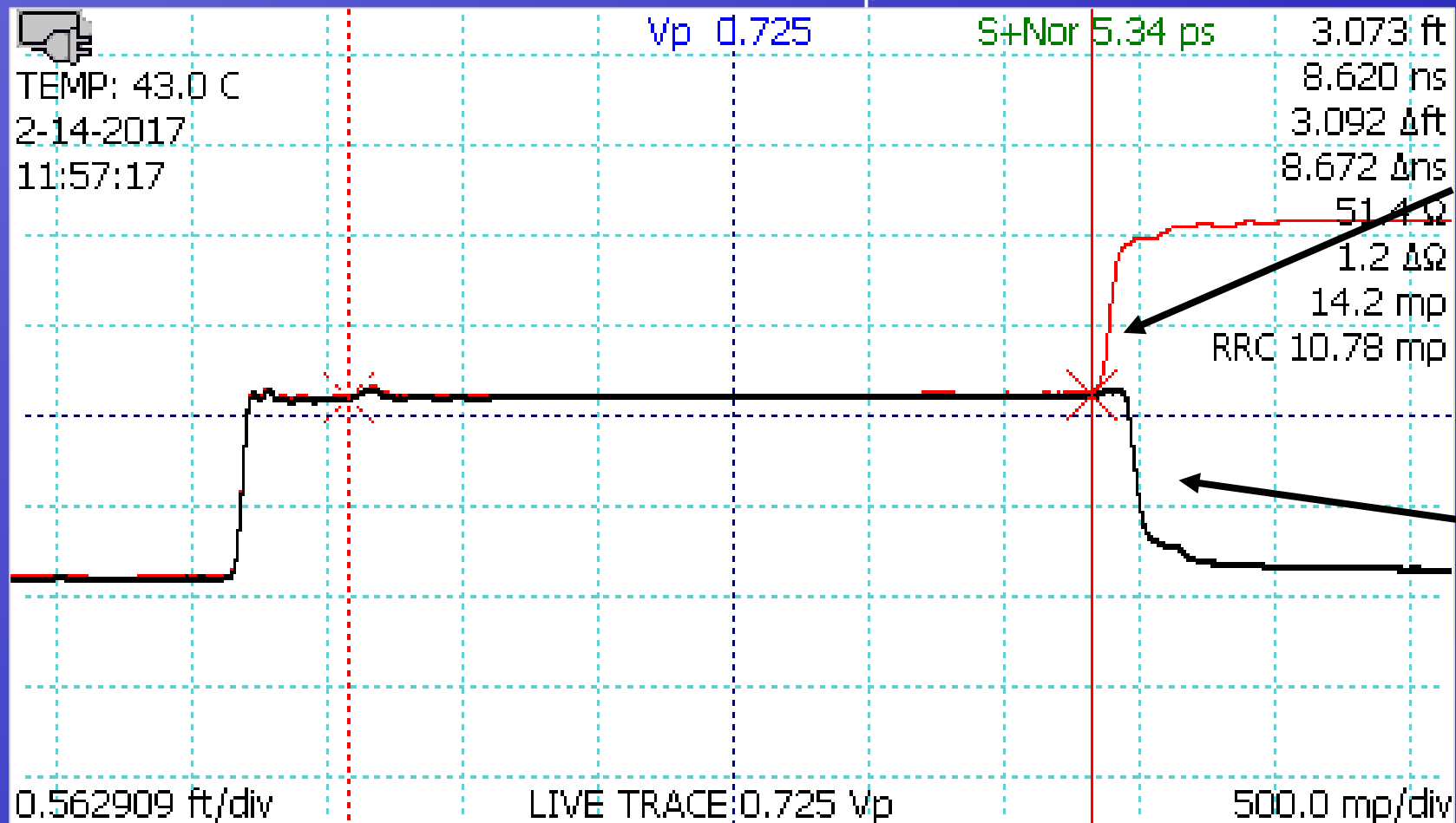
Distance to Fault Measurements

Open/Short & Vp

Three Termination Types – Open, Short, Load

Distance is determined by cable properties – the Velocity of Pulse (Vp)

$$\text{Distance} = V_p \times \text{time}$$

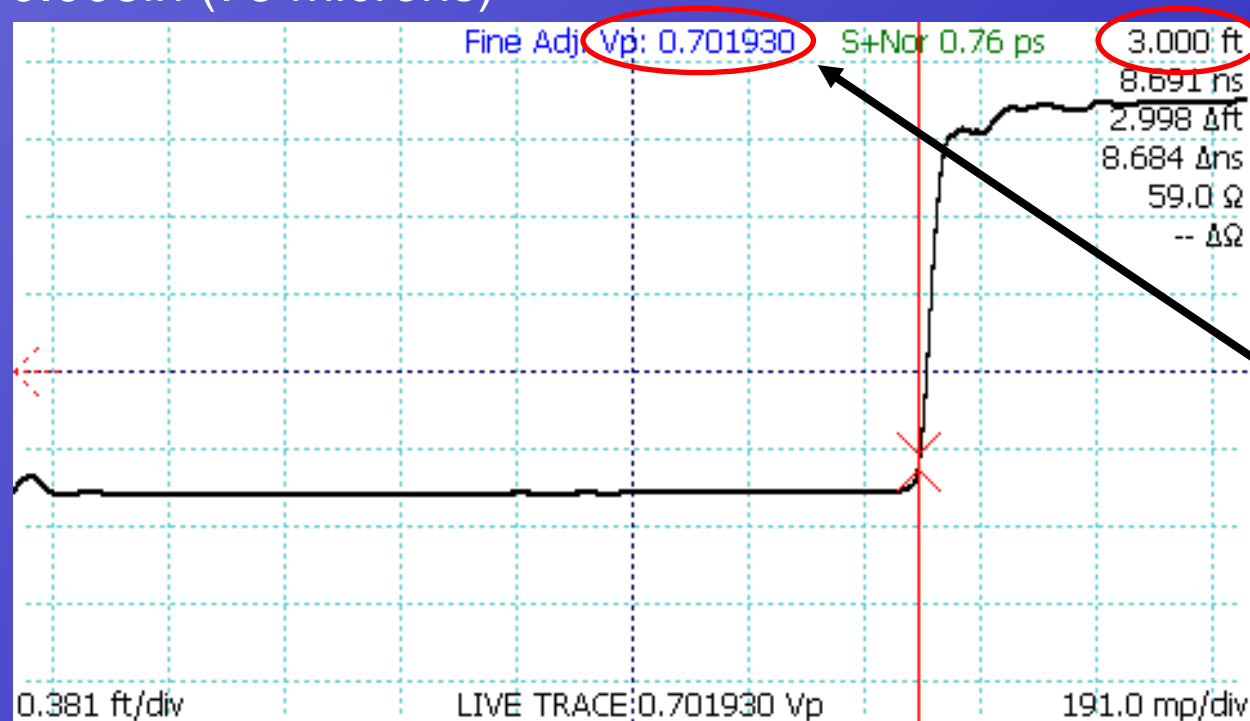


Open
indicated by
sharp rise

Short indicated
by sharp fall
(note cable is
slightly longer
because we
added a barrel
connector and
a short)

Distance to Fault Measurements

- Localizing a known or suspected fault is often the most important task in field maintenance. TDR's measure Distance to Fault (DTF) natively, and measurements are simple and quick.
- Distance to Fault measurements are performed by transmitting an incident signal onto a cable and measuring reflected voltage. Distance to Fault measurements are made by accurately measuring the time between an incident pulse and its reflections.
- The CT100B TDR's feature an internal clock with 0.76picosecond resolution – equivalent to 0.003in (75 microns)



Length measurement in both time and distance. The value is measured in nanoseconds and converted to distance by multiplying it by the cable velocity factor (V_p).

V_p is a fraction of the Speed of Light, and has a different value for different cable types.

$$\text{Distance} = V_p \times \text{time}$$

Use Case 1: Troubleshooting Antennas

Quicklook – CT100B Set-up for Antenna Troubleshooting

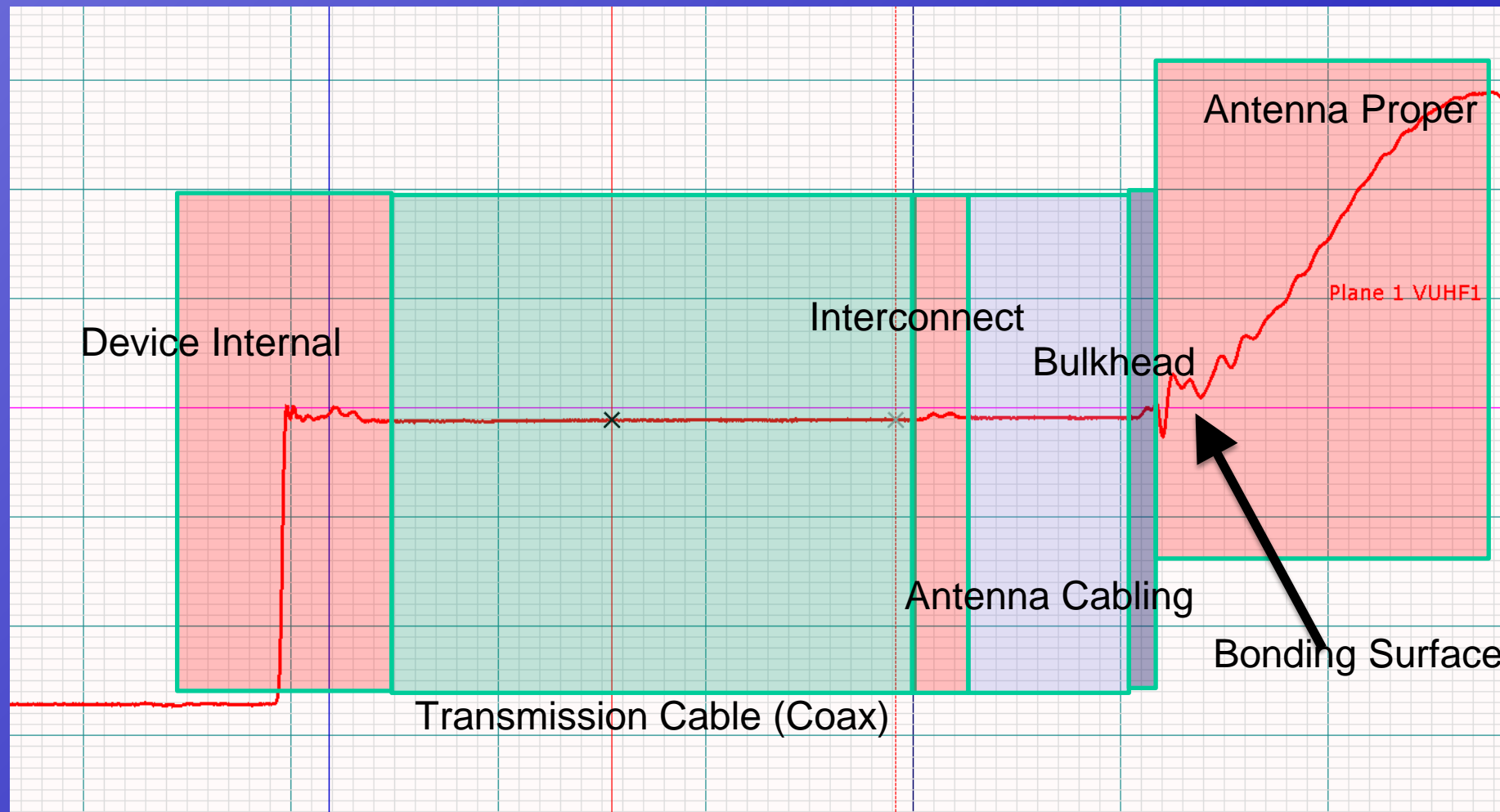
CT-100B Set up checklist for Antenna Troubleshooting

- *Step 1: Short Cable for ESD*
- *Step 2 : Connect and torque termination as needed*
- *Step 3: Press Autofit*

- *Using Autofit, the CT100 will automatically capture the entire cable length including the antenna, interconnects, relays, etc.*

- *Step 4: Analyze trace signature to ensure Antenna is connected and waveform meets known pattern*

CT-100B: Typical Graphic for Good Antenna



Discussion of Next Steps as a result of the Scan

Manual & Automatic Set-up

Save and Recall Scans

- ✓ Use the same adapter every time
- ✓ When testing loose cables, test them in the same fixed configuration (e.g. flat, coiled, etc.)
- ✓ Use Configurations to minimize operator error if possible
- ✓ Helpful to have “Gold Standard” for untrained technicians.

Use Case 2: Aircraft and Engine Wiring Harnesses

Quicklook – CT100B Set-up for Harness Troubleshooting

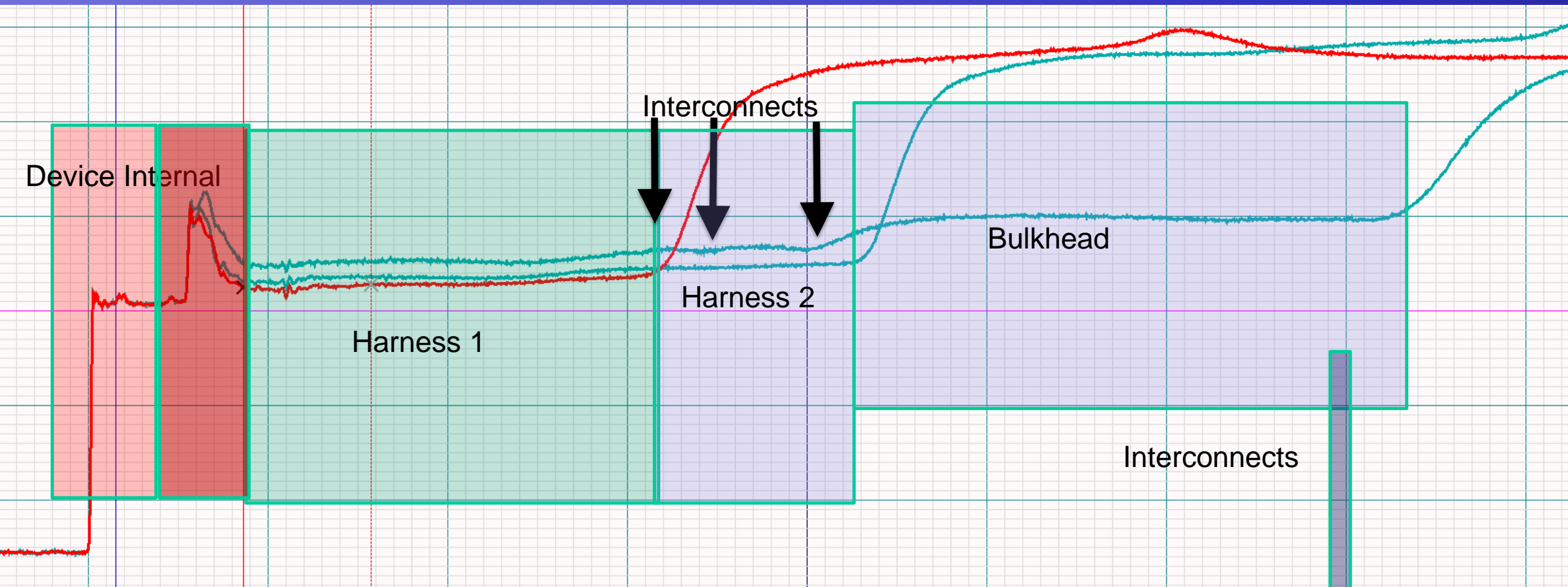
CT-100B Set up checklist for Harness Troubleshooting

- *Step 1: Short Conductors and Shield for ESD*
- *Step 2 : Connect harness using impedance-controlled adapter (such as MOHR CT100-AK–PSP kit or custom interconnect)*
- *Step 3: Press Autofit*
- *Using Autofit, the CT100 will automatically capture the entire \ cable length including all connecting harnesses, interconnects, and devices, etc.*
- *Step 4: Analyze trace signature to ensure Harness is continuous, impedances match, and system is complete.*

Pin and Socket Kit

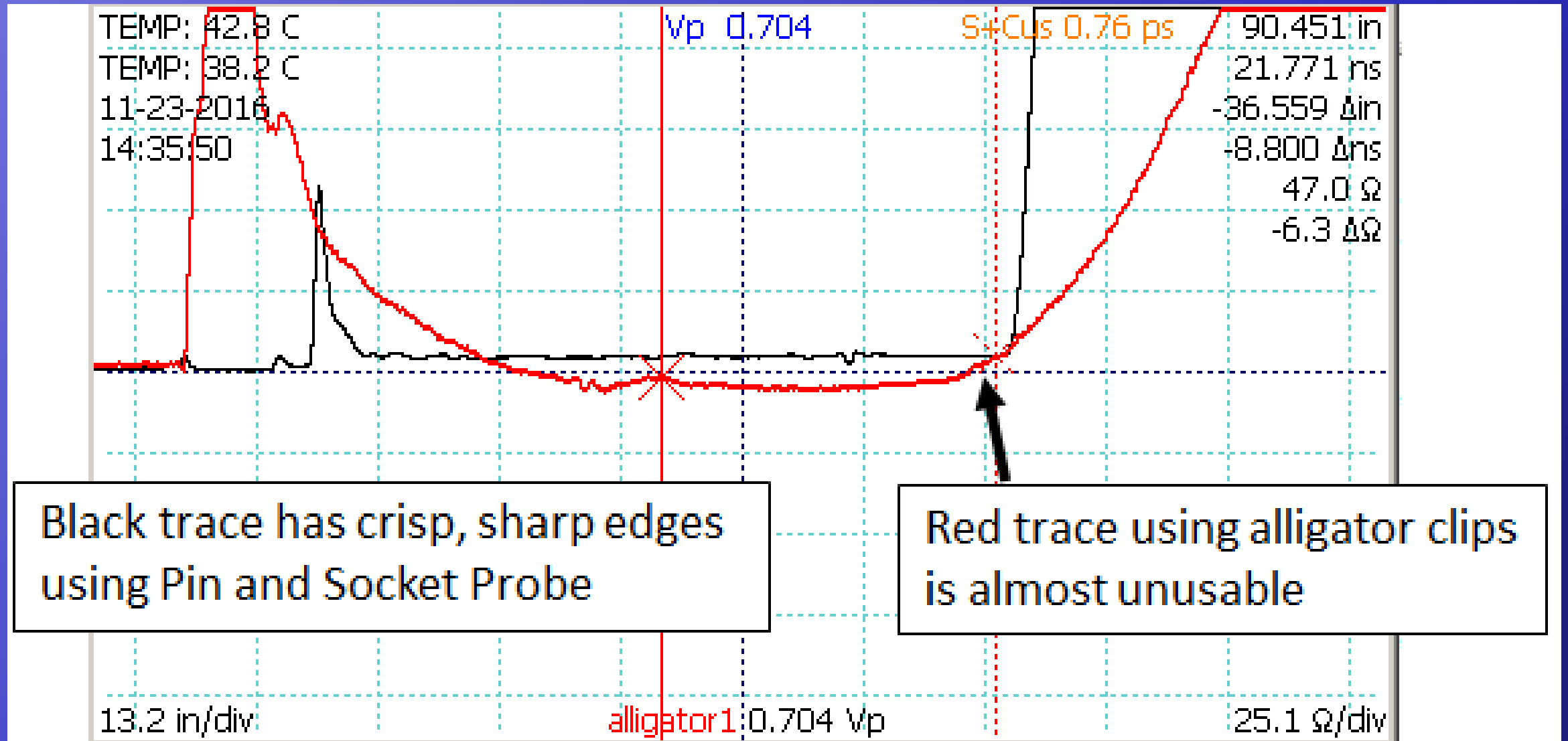


CT-100B: Typical Graphic for Multi-part Harness



Discussion of Next Steps as a result of the Scan

Pin and Socket Kit



Use Case 3: 1553 Data Bus

Quicklook – CT100B Set-up for 1553 DataBus testing

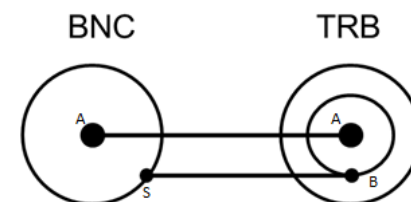
CT-100B Set up checklist for Databus / ARINC / Other networks

- *Step 1: Short Conductors and Shield for ESD*
- *Step 2: Connect harness using impedance-controlled adapter (such as MOHR 1553-TRB kit)*
- *Step 3: Scale trace manually using knobs/cursors (Autofit will not work)*
- *Step 4: Analyze trace signature to ensure Network is continuous, transformers are visible at stub locations, and system is complete.*

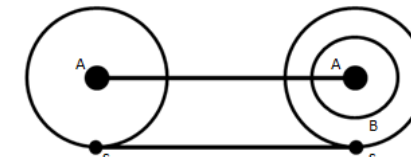
1553B TRB Adapter Kit



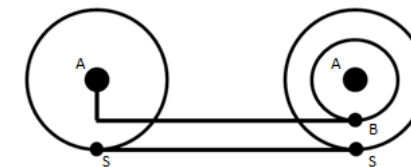
Type-A



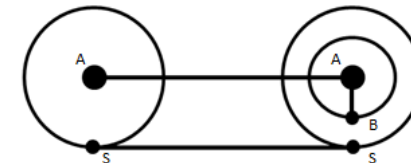
Type-B



Type-C



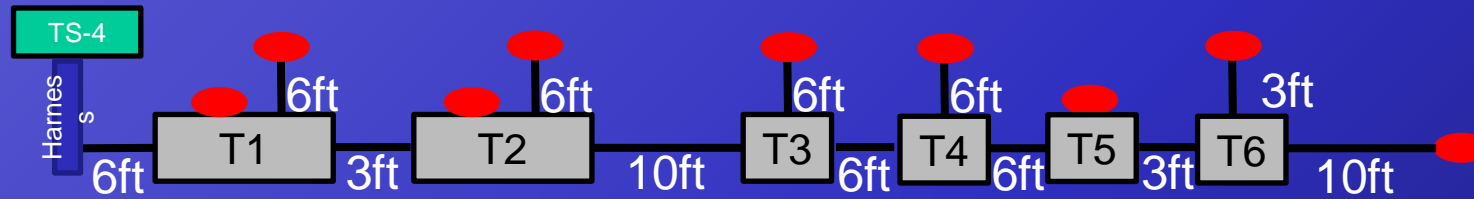
Type-D



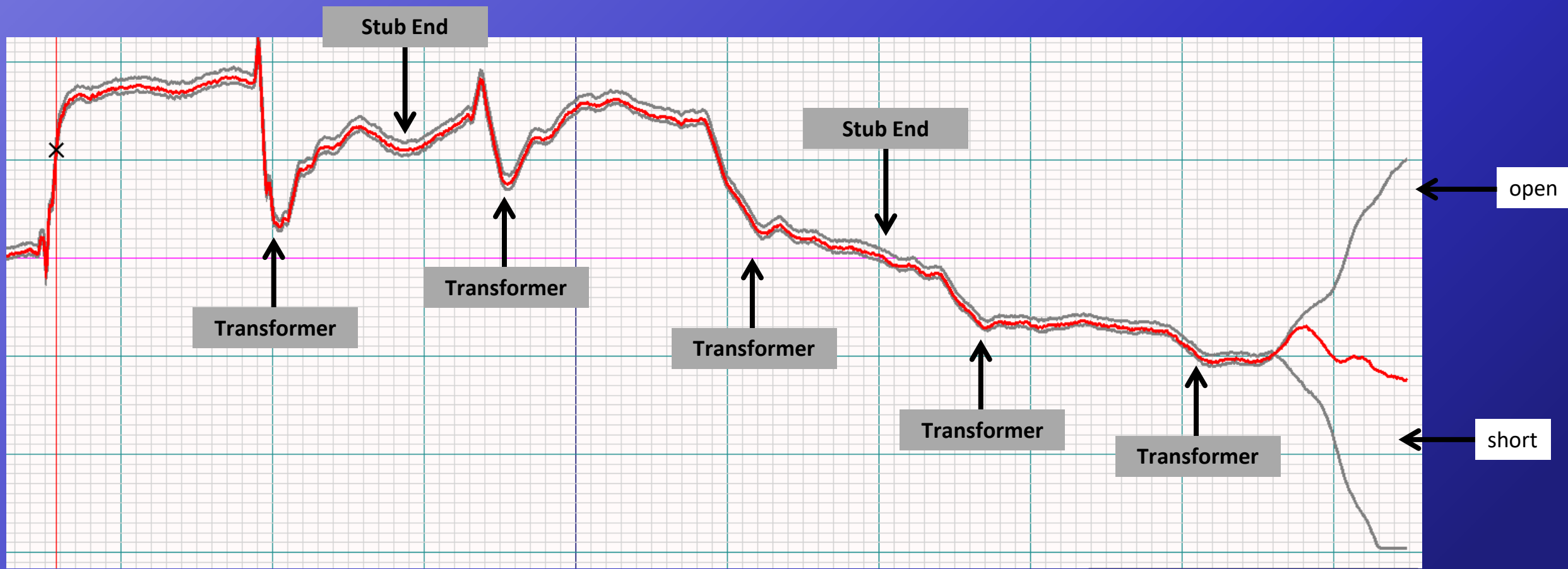
Contains a set of high bandwidth, controlled impedance BNC-TRB adapters.

- Type-A is for open/short and impedance mismatch between conductors.
- Type-B and Type-C are good general purpose and show the clearest signal when identifying system components.
- Type D is for identifying and locating shield damage.

Test Case



1553B Analysis (Scans, using CT Viewer)



Using the CT100B and a **Type-A adapter** to scan the A vs B conductors. The red trace is the nominal trace that we see with a 78 ohm termination. You can see an open or short on the main bus through six transformers.

Use Case 4: Fire Detection Loops

Quicklook – CT100B Set-up for Fire Detection Loop Testing

CT-100B Set up checklist for Fire Detection Loops

- ***Step 1: Short Conductors and Shield for ESD***
- ***Step 2: Connect loop using MOHR Fire Loop adapter***
- ***Step 3: Scale trace manually using knobs/cursors
(Autofit will not work)***
- ***Step 4: Analyze trace signature to ensure Network is continuous, sensors and interconnecting cables are visible, and Loop is continuous.***

MOHR Fire Loop Adapters (Male & Female)

- *Impedance-controlled, high resolution adapters*



MOHR Fire Loop Adapters (Eutectic Salt type)

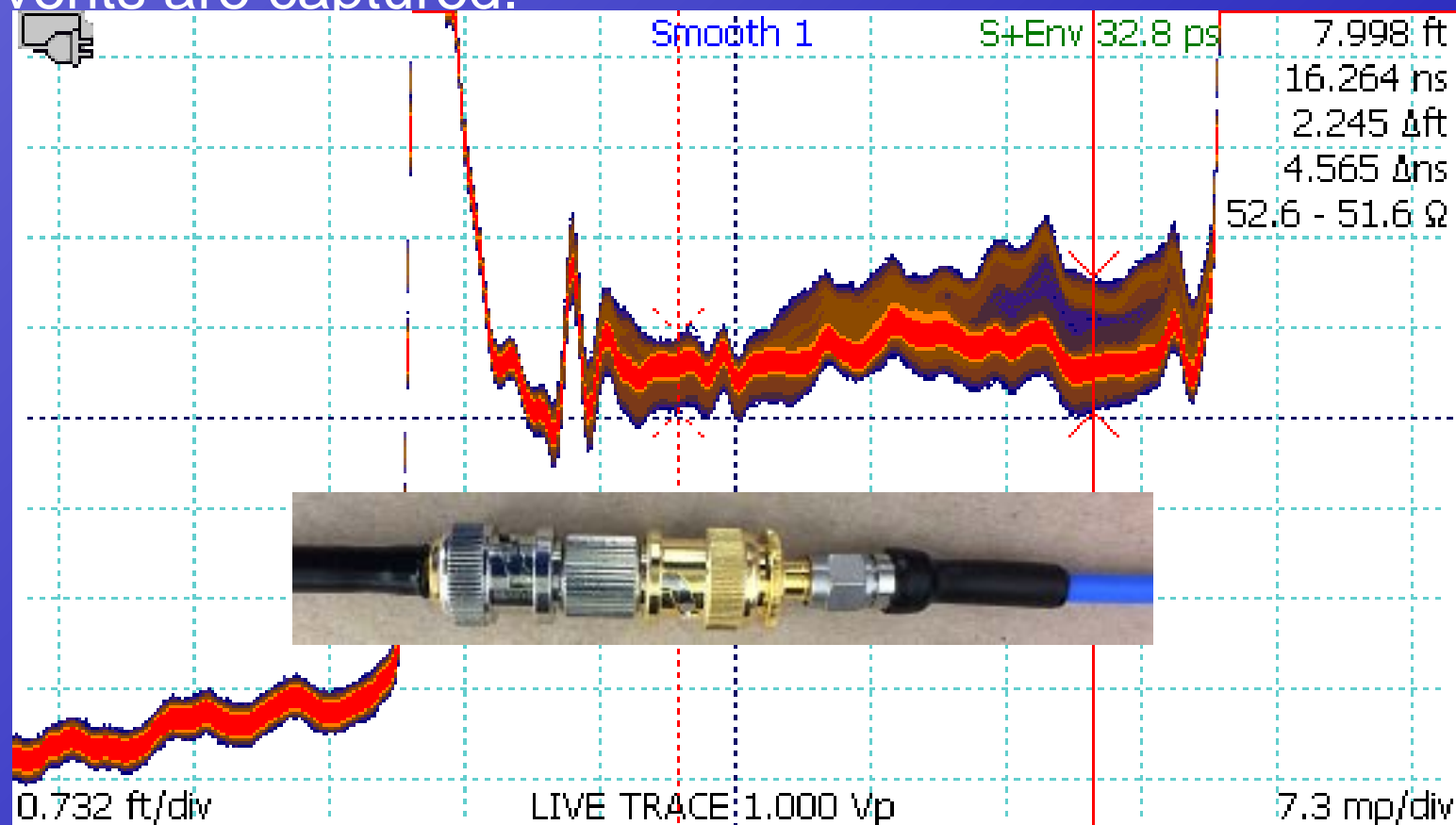


- *Difference in Cable impedance is due to salt content, which translates to less sensitivity*

Wrap-Up

Opportunity for Intermittent Fault Detection

In cases where cable faults are temporary or conditional, CT100's are able to display sequential measurements, capturing any faults and effectively "enveloping" the changes. The CT100 scans at full resolution with no time limitations so rare and minor events are captured.



SMA connector not tightened properly

MOHR™ CT100B Technology

TDR is a specialized form of closed-circuit radar (cable radar) developed for characterizing transmission lines, and is particularly useful for testing coaxial and twisted pair cables and connectors found in modern microwave/RF and digital communications systems.

MOHR TDR Technology is uniquely suited to detect minor impedance changes such as interconnects / kinks / splices / mis-twists / waterlogging.

- No impedance limits (0 to 1.5kohm)
- No minimum length – No dead zone, no “soft zone”
- Maximum length is over 10km

The CT100B combines everything MOHR Test & Measurement has learned over the last 20+ years.
For the Money, it is the best piece of troubleshooting equipment available

Reduce Component “No-Fault Found” occurrences to zero.
Use the best there is - the MOHR CT100B