

Application Note

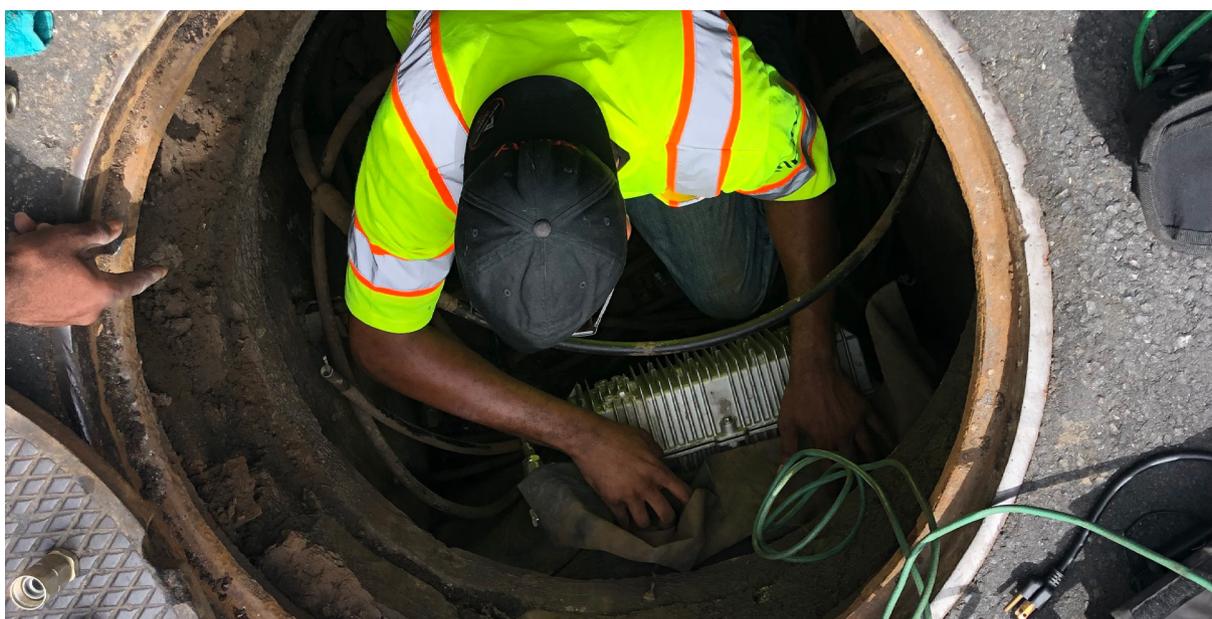
Testing Coaxial Cables with the DSP TDR (Time Domain Reflectometer)

When there's a coax cable break or fault, it can make itself known by a degradation in performance or an outage, or possibly a leak. The common and effective method for finding the break/fault is to use a TDR (Time Domain Reflectometer), and this has been the case for decades, and the instruments haven't changed much over time.

The VIAVI DSP TDR employs the latest technology to improve operational efficiencies.

Benefits of the VIAVI DSP TDR

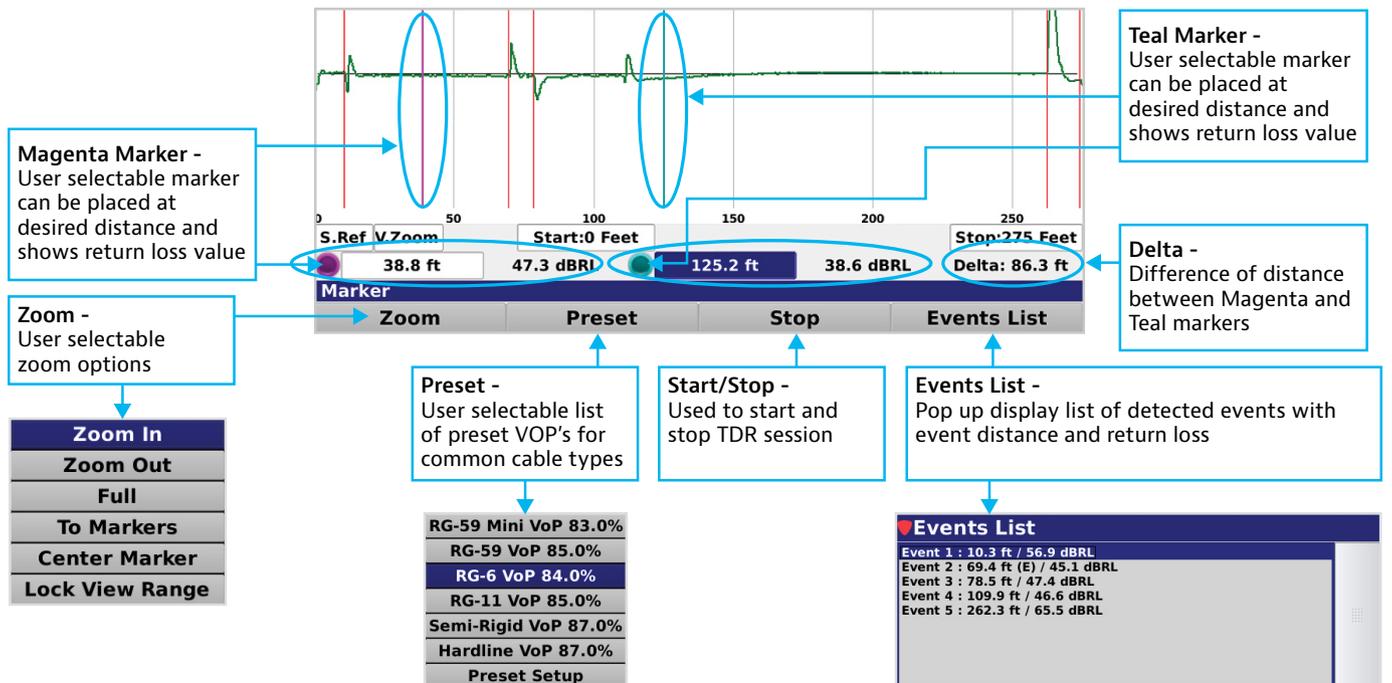
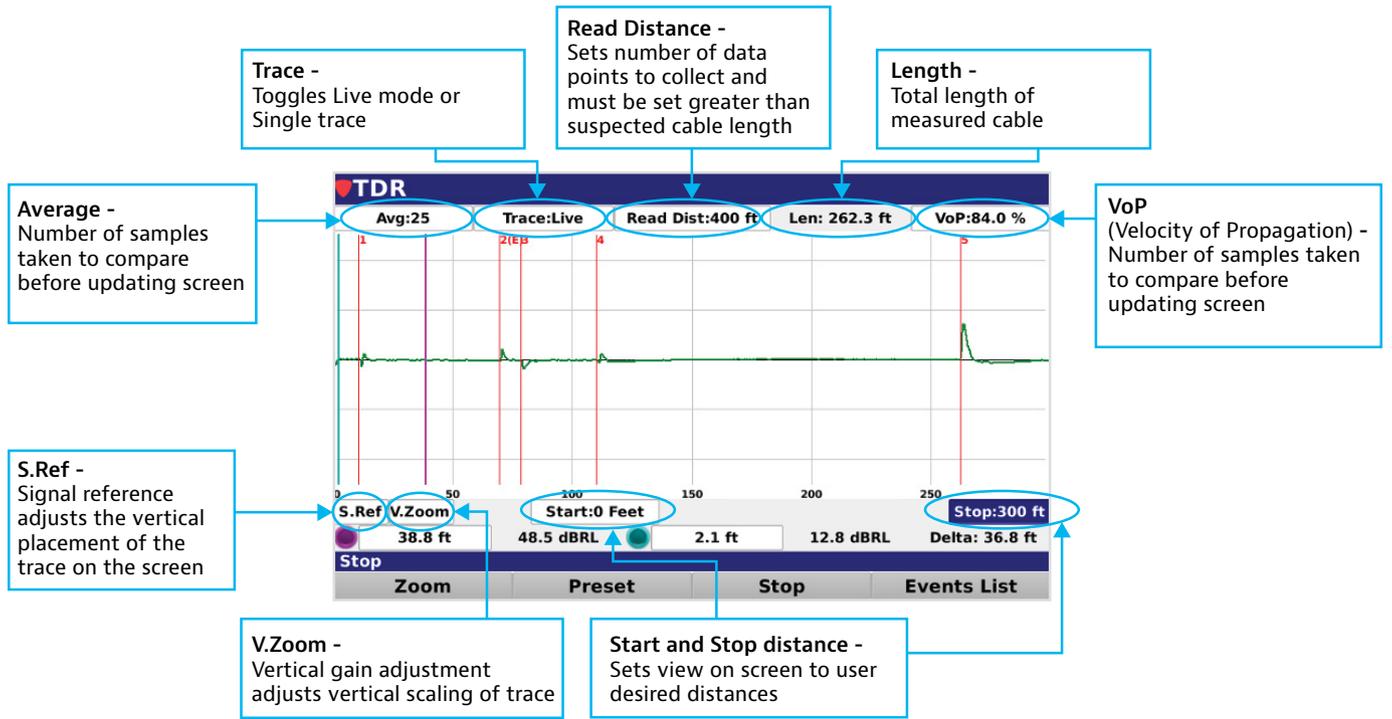
- Reduce outage and line problem troubleshooting time
- Fast, complete, and precise measurements without blind spots
- Upload and retain results with cloud based StrataSync for auditing
- Built-to-last design for the real environment of network technicians (and battery life >12 hours)



Preliminary Notes

Remember that TDR testing is an out of service test, and all signals and voltage should be removed from the cable before testing. The events presented in this paper are for example only and are not all inclusive. The size and shape of events varies based on quality of network equipment installation, type of damage, and differences in manufacturer specifications.

Display Settings, Readings, and Interpretation



Initial Setting Recommendations

- VOP – Must be set to cable manufacturers specification for each cable type.
- Read Distance – Adjusts number of data points to collect for each given distance. Always set to a greater value than suspected cable distance to be tested. Required to show end of cable length.
- Auto Range – Allows for automatically setting the stop distance and vertical scale to show the end of the cable under test. Setting is found in Function menu and should be enabled before test is started.
- AVG – Sets number of complete samples to compare before updating screen image. Setting range is 1–100. Recommended initial setting is 20 for most applications.

TDR Testing Best Practices

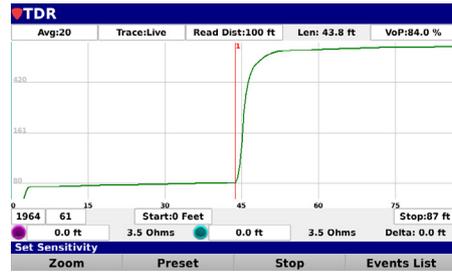
- Running a TDR test through a splitter is not recommended. TDR's do not have the ability to display more than one cable trace at a time.
- Before connecting the TDR, verify the test lead length. Setting the magenta colored marker at the test lead length enables subtracting that length from the overall cable length.
- On the first TDR measurement look for the total length of cable and verify that distances match system prints and/or confirm the correct cable.
- Applying a short (connecting center conductor to shield) at the far end of the cable can help to verify the correct piece and the correct length.
- Qualify events for any known network element locations such as taps or splices, before attempting repairs.
- Any unexpected or undesirable event should be investigated. These may be additional network elements such as splices or additional taps.
- To validate event size and distance, review the events list to get the event number, return loss and distance.
- To navigate to an event more quickly, highlight the event number in the events list and select it. This will move the teal colored marker to the event and center the event on the display.
- Once events are identified, save the TDR data log. This helps when documentation is required and can be recalled for verifying that a repair was successful.
- To determine if there are multiple cuts in a span, run a TDR test from both ends of a cable. This can also reduce the efforts digging out a cable to make repairs or help in a cable replacement decision.
- Not all cable follows the design path and can be longer/shorter than maps show. Use a TDR to verify cable lengths so system maps can be updated.
- When troubleshooting an outage, save time by using the TDR at the upstream amplifier to test from amplifier to amplifier. This reduces the need to test at every tap.
- To reduce troubleshooting time, it is not always necessary to disconnect cables from connectors. Removing the amplifier module, tap plate or splitter board allows using clips or adapters to connect directly to seizure assemblies.
- Setting the vertical gain (V.Zoom) so that the largest event fills the screen will give maximum vertical resolution (This is not needed if "auto-range" is enabled.).

Common TDR Events

Event View (Traditional view)

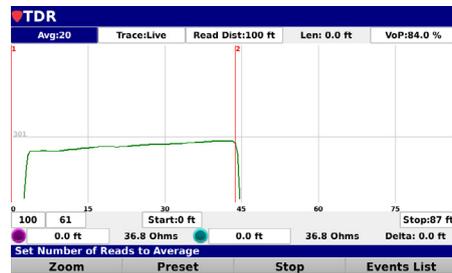
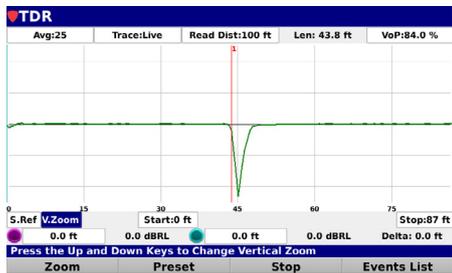


Raw View (Step view)



Open:

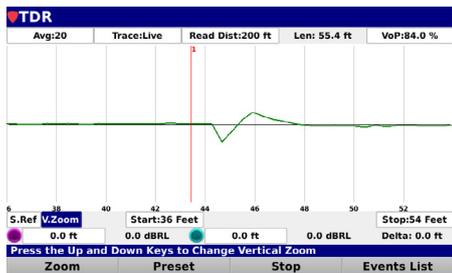
Unterminated end of cable - shows as upward spike on TDR screen



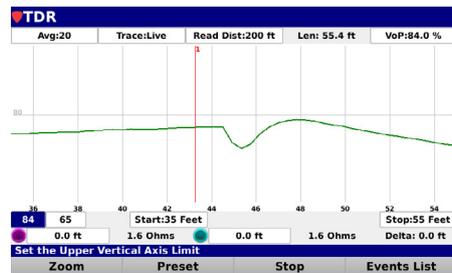
Short:

Fault type where center conductor and shield are electrically touching each other - Shows as downward spike on TDR screen

Event View (Traditional view)

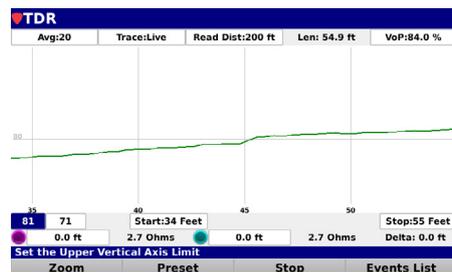
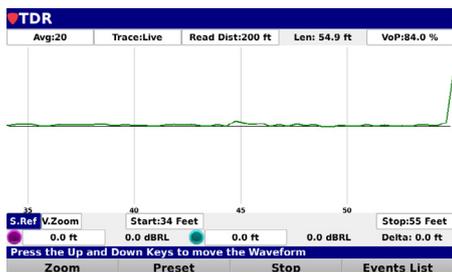


Raw View (Step view)



Tap:

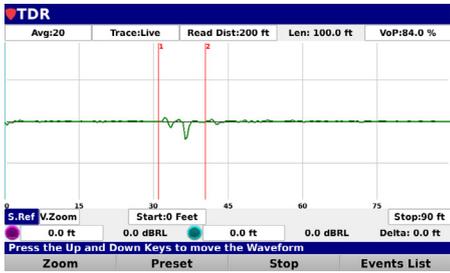
Device used to feed a small portion of signal to customer homes from main line - Shows as small short followed by small open



Splice:

Connector used to join two sections of cable - Shows as sideways "S" curve.

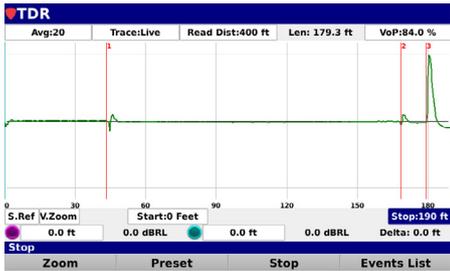
Event View (Traditional view)



Raw View (Step view)



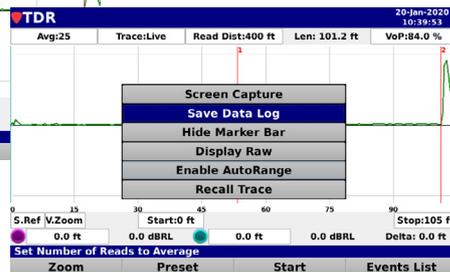
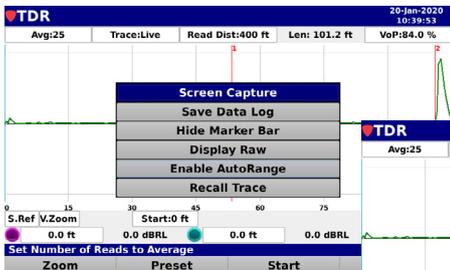
Water Damage:
Shows multiple faults within the damaged section of cable



Multiple Events:
Each event gets a red event marker and a numeric label

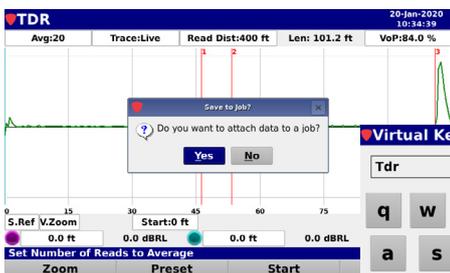
Saving a Screen Capture or Data Log

Often a cable span replacement requires TDR test documentation to prove that the replacement is needed. The DSP TDR connects to the internet directly via WiFi or Ethernet for data upload to the cloud (StrataSync) for instant analysis. This makes the same data that's available to the TDR user available to the person who must approve the cable span replacement. Saving time is critical when a cable fault/break is causing customers to be impacted.



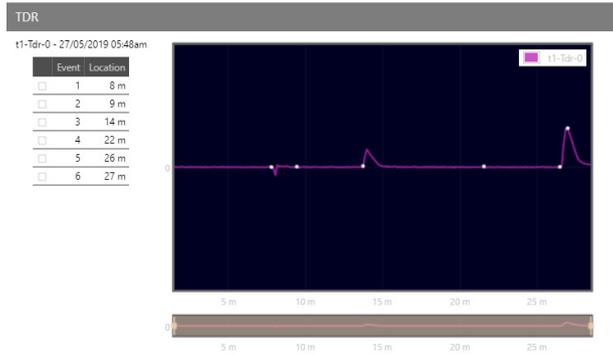
Screen Capture:
Saves a PNG file that can be attached to a work order, Viewed on the TDR or uploaded to StrataSync

Data Log:
Saves the TDR data to a lof file to be uploaded and viewed only in StrataSync. In StrataSync, the events list and trace can be manipulated

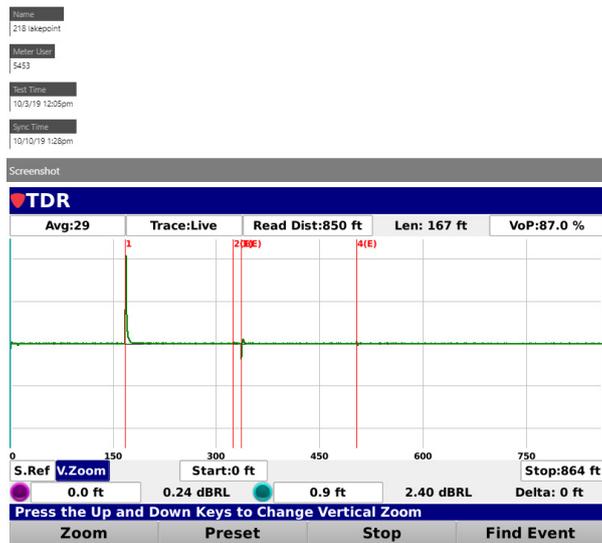


- Saving a File:
1. Press function button
 2. Select Screen Capture or Data Log
 3. Attach to a job if desired
 4. Enter file name

StrataSync Data Retention



Recalled Data Log in StrataSync allows for selecting event number, adjusting screen reference and zoom while preserving original saved data



Recalled Screen capture only displays the picture of the screen and cannot be adjusted

Conclusion

As discussed here, the [VIAVI DSP TDR](#) offers sensitive and accurate step technology built-into a rugged, hand-held field instrument, so techs can find faults anywhere in the cable span, from right up close, to the far end of the cable. This sensitivity allows for finding water migration in cables well before corrosion starts, and before conventional TDRs can see them. The up-to-date user interface makes operation simpler, speeding up fault resolution, and built-in WiFi technology and cloud-based data management enable quick decision-making to resolve issues faster.



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