STEPScope™ (STEPSCOPEA)

BitWise STEPScope™

Key Features

- Compact TDR/TDT Solution Including Integrated Pulser and Sampler
- 20 psec Edge Rate (10/90)
- 20 GHz Bandwidth
- Fast Averaged Waveform Capture and Download
- Single-ended or Differential
- Optional Return Loss (S11) and Insertion Loss (S21) S-parameter Measurements
- Use Two STEPScopes™ for Through-channel TDT and Insertion Loss (S21) Applications
- DC voltage outputs for Convenient Powered Component Testing

Applications

- PCB, Cable and Component Test
- RF Signal Path Debug
- Trace Delay/Skew Measurement
- S-Parameters

BitWise Laboratories STEPScope™ is a compact device integrating a fast output pulser with a high-bandwidth low jitter input sampler to perform step response analysis on *Reflected* and *Through-channel* pulses for calculating Time Domain Reflectometry (TDR) and Time Domain Transmissometry (TDR) analysis.

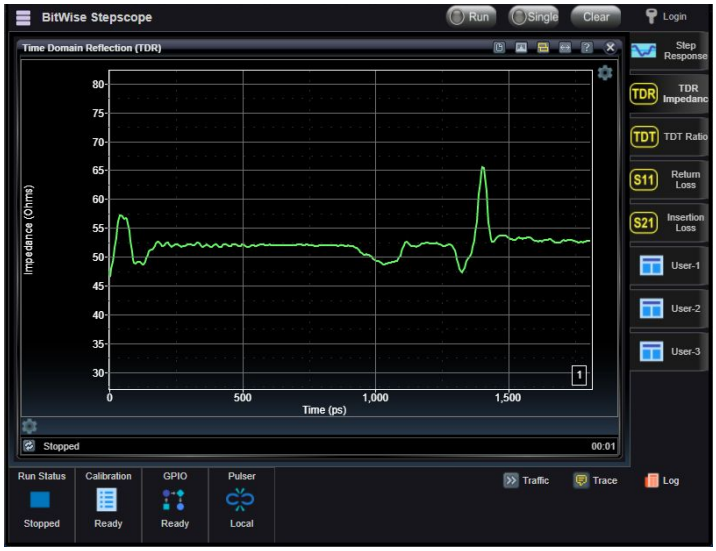
Optional S-parameter analysis converts step response analysis into Return Loss (S11) and Insertion Loss (S21) results.

TDR, TDT, and S-Parameter analyses are proven techniques for testing RF circuits used to communicate digital information through cables, backplanes, connectors, PCB traces, wire bonding and integrated circuits. These techniques isolate impedance problems that adversely impact signal performance.

A single STEPScope™ performs TDR analysis by sending an *Incident* pulse into the circuit and analyzing the pulse that is *Reflected* back. Using two STEPScopes™, TDT analysis can be performed by sending a pulse through the channel under test, and receiving it in a second unit that analyzes the *Through-Channel* pulse.

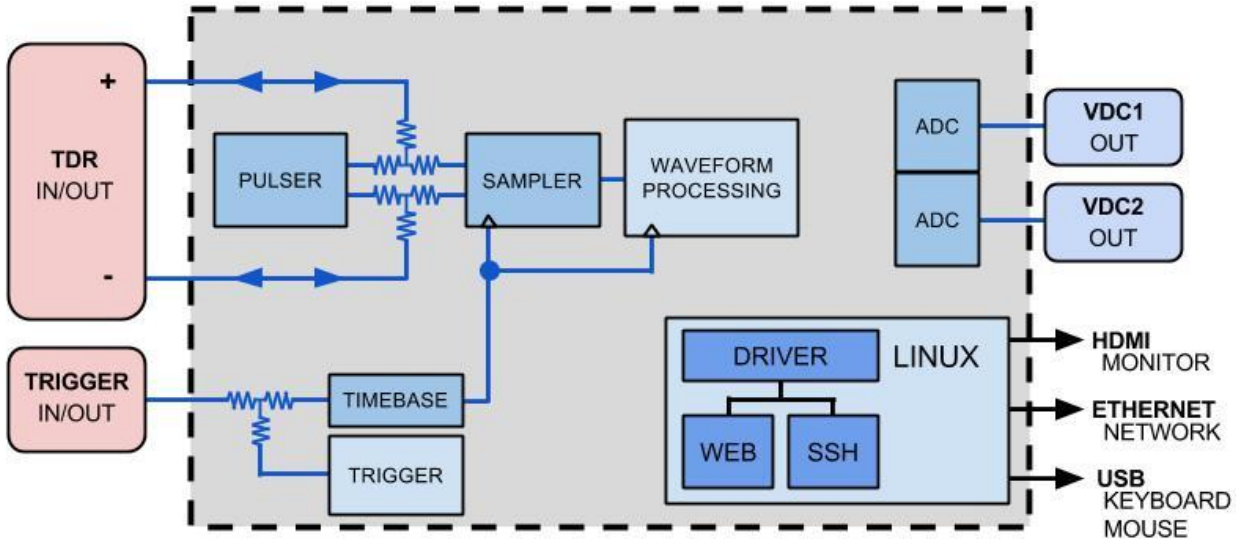
High-performance SiGe technology is used to generate fast 20 psec pulses (10/90), and to provide a finely-calibrated very low-jitter timebase, and waveform capture with 20 GHz bandwidth.

Waveform data and analysis results can be easily downloaded to your browser. The user interface is served as a website from the device and is accessible from any desktop or mobile web browser. The device does not require connection to the Internet. Automation control is provided via TCP/IP socket interface using ASCII commands.



Web Browser User Interface

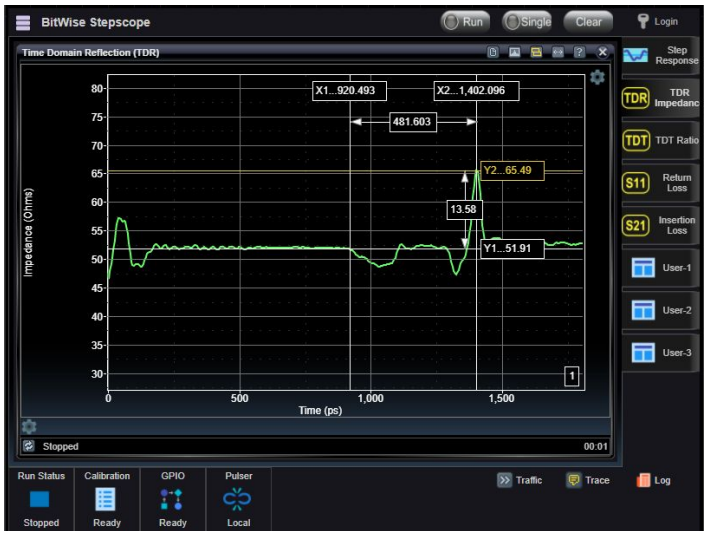
TDR results show impedance Ohms as the signal is transmitted through the channel. Impedance disruptions cause reflections that are responsible for degraded performance. STEPScope™ settings are configured using the web browser user interface. Status Bar indicators along the bottom show the current operating status. On the right, the user can easily access other pages of the user interface.



STEPScope Block Diagram

The Step Response view shows the captured Voltage vs. Time waveform acquired by the internal sampler. Panning and zooming and cursors are fully supported to allow sub-picosecond measurements. In this image, the rising edge of the Incident pulse is zoomed-in on and cursors are used to measure the 10/90 rise time. Fundamentally, it is Step Response data that is used to compute all TDR, TDT and S-parameter results.

Step Response View; Inlay: 10/90 Step Response Rise Time



TDR Measurement Including Cursors

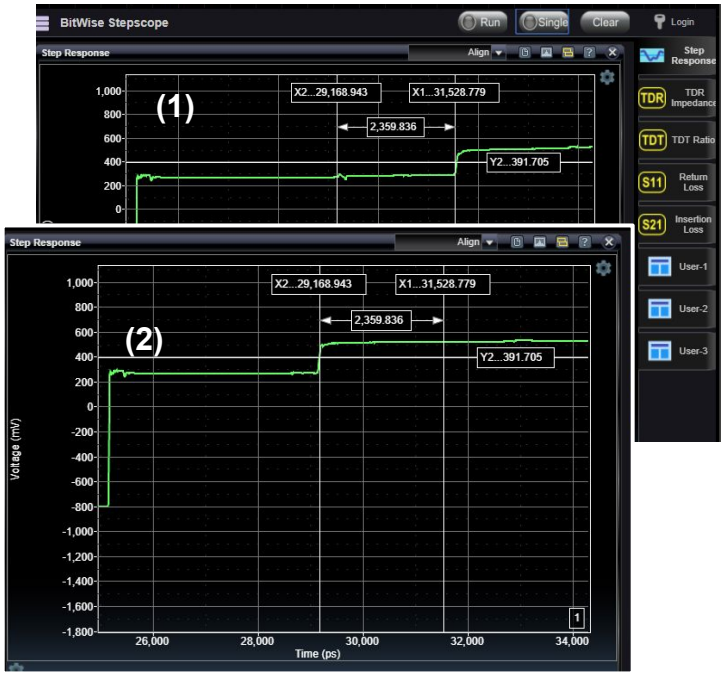
TDR shows the Impedance (Ohms) vs. Time waveform allowing users to identify impedance discontinuities resulting in inductive and capacitive impacts. The pulser's fast edge rate allows fine details to be resolved. Waveforms can be easily downloaded as .CSV files. TDR calibration is supported to select your Reference Plane to be the end of your test cables.

Application Note:
HOW TO MEASURE PROPAGATION DELAY

al signaling through PCB traces and connectors, it is increasingly important to accurately measure the propagation delay of each trace and each conductor because too much aggregate skew between the differential signals can adversely impact system performance.

The STEPScope™ TDR is an excellent instrument for measuring this delay. A cable that is driven on one end and left Open circuit on the other will reflect an Incident pulse back to its source. On a Step Response plot, this will show as the original Incident pulse on the left and an echo of the Incident pulse on the right. The location of the echo will be twice as far away from the Incident pulse to the Open circuit because of the round-trip delay represented in the Step Response plot.

To measure Cable Delay, we can operate the Step Response analyzer without the cable and mark the time of the Open circuit with one cursor, then operate the analyzer again with the cable and mark the new time of the Open circuit. The precise delay through the cable will be half the difference between the two cursor values.

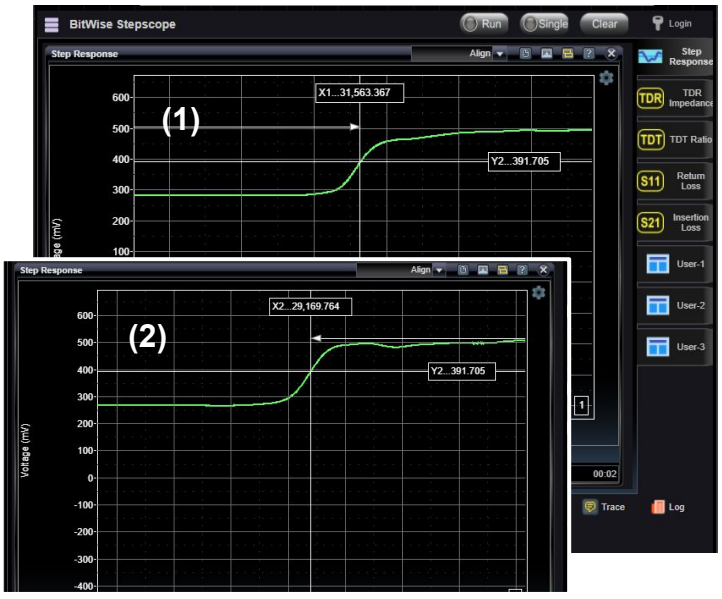


Step Response With Open-Terminated Cable (1) and Without Cable (2)

See the characteristic Step Response shape of a rising-edge pulse encountering an Open circuit. The STEPScope™ can easily identify the time of this upward transition for comparison.

Comparing step responses of one conductor with a second conductor allows a precision difference measurement to be made. Because a STEPScope™ measures waveforms with thousands of individual measurements, zooming can employed to achieve very fine measurement resolution at the exact location of the upward transition caused by the Open circuit. This resolution produces a delta time measurement with sub-picosecond resolution.

The unique sampling architecture inside the STEPScope™ means that all measured waveforms have built-in averaging to further increase their precision.



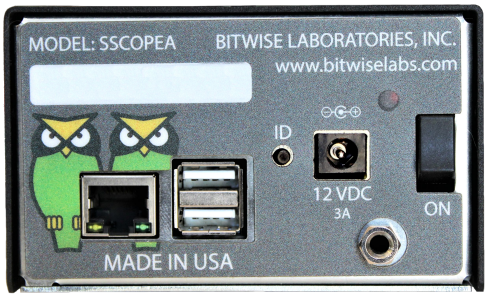
Measuring Time Of Open-Termination With (1) and Without Cable (2)

By using Pan & Zoom features, resolution can be increased precisely at the subject transition for highly-accurate delay measurements with sub-picosecond resolution.

Performance

Pulse Edge Rate	*20 psec 10/90 (typical)*
Sampler Bandwidth	*20 GHz (typical)*
Measurement Edge	*Selectable Rise or Fall*
Timebase Resolution	*< 100 fsec*
Pulser Rate	*4.8 - 78 Mhz (selectable, 16 steps)*
Pulser Amplitude	*150-250 mVpp Single-ended*
Export Format	*ASCII .CSV file*
TDR I/O	*50 Ohm DC, 2.92 mm, Static Protected*
Trigger I/O	*50 Ohm AC, SMA, 2.5 GHz Sinewave*
Vdc1 and Vdc2	*+/- 5V into 50 Ohms, 50 mA Max*
Network	*10/100Mb Ethernet, RJ45*
Power Supply	*100-240 VAC to 12 V, 3A CE/FCC/UL Certified*
Power	*16 Watts (typical)*
Dimensions	*2.5" x 6" x 4"*

Performance subject to change



BitWise STEPScope™ Rear Panel

Ethernet, USB and Power connections are made at the rear panel. Power switch and Identification (ID) switch are also on rear panel.

Warranty

Products from BitWise Laboratories. come with a one year limited warranty. BitWise Laboratories will repair or, at its option, replace any defective product returned to BitWise Laboratories within one year of the date of purchase. This warranty applies to defects that are not due to misuse, neglect, accident or by abnormal operating conditions. Contact us for return material authorization. An additional 2-year warranty extension is available at the time of purchase.

Ordering Information

STEPSCOPEA	**STEPScope™**
WARRANTY2YR	**Additional 2 year warranty**

Send email request to: sales@bitwiselabs.com

Reference Short, Through and 50 Ohm Termination RF devices are not supplied with the STEPScope™ and are required for platform and Reference-plane calibrations. While laboratory grade terminations can be used for increased accuracy, general purpose terminations can usually be employed to obtain very useful measurements economically.

Company

BitWise Laboratories is located in California USA in the heart of Silicon Valley. Our founders have spent decades in Test & Measurement specializing in creating innovative tools that are easy to use and provide more diagnostic information for development and test engineering. The BitWise Laboratories line of products builds on this legacy and provides RF and PAM4 tools for today's communications engineering challenges. We provide compact and economical instruments that utilize world-class SiGe technology to achieve uncompromising performance. We provide innovative software with convenient multi-user web browser user interfaces for viewing and easy data download with complete remote control automation. And we listen to our customers to help us define the next generation of features that will make our tools even better.