multiLane

PULSAR

User Guide

Installation | Connection | Calibration| Measurements

Rev 1.1

Notices

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the General Safety Summary in other system manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Only use the power cord specified for this product and certified for the country of use.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal that exceeds the maximum rating of that terminal.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Do Not Operate with Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions. Do Not Operate in an Explosive Atmosphere. Keep Product Surfaces Clean and Dry.

Caution statements identify conditions or practices that could result in damage to this product or other property.

Electrostatic sensitive device. Operate in ESD supervised and controlled areas.



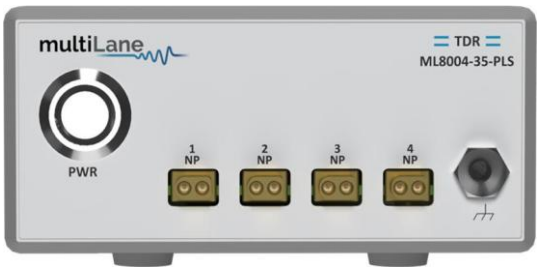


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Revision Control

Revision number	Description	Release Date
1.1	Initial Release	27/11/2025

List of Acronyms

Acronym	Definition
TDR	Time Domain Reflectometry
DUT	Device Under Test
GUI	Graphical User Interface
HW	Hardware
SI	Signal Integrity
SW	Software
SOL	Short, Open, Load

Product Overview

Pulsar is a high-performance Time Domain Reflectometry (TDR) designed for characterizing high speed interconnects, cables, PCB traces, connectors, and differential/single-ended transmission lines. It provides impedance profile analysis for evaluating signal integrity and identifying impedance discontinuities and variations.

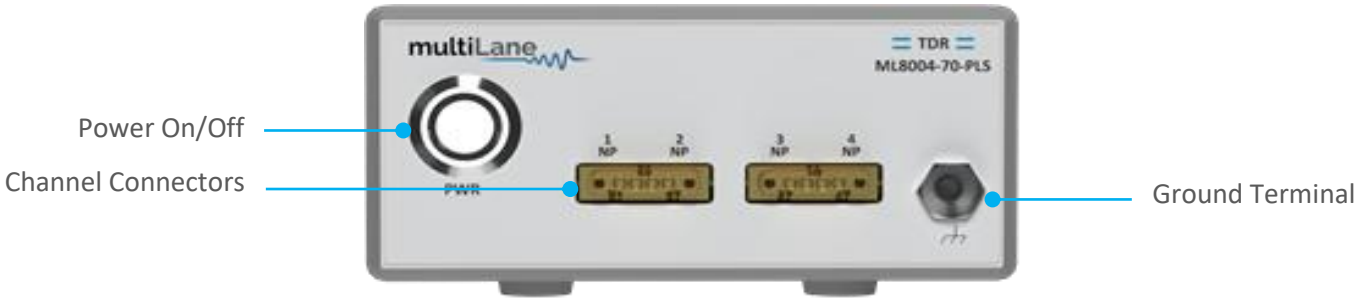
The Instrument GUI runs on Windows 11.

For product updates, visit: https://www.multilaneinc.com

Minimum PC Requirements

- **Operating System:** Windows 11 x64.
- **Memory (RAM):** Minimum 4 GB.
- **Network Interface:** Ethernet port (100 Mbps or 1 Gbps).
- **Processor (CPU):** Minimum 2.4 GHz.

Pulsar HW Overview





Operating Environment

- **Valid measurement temperature:** 18 °C – 30 °C (room temperature range).
- **Storage Temperature:** 0 °C – 70 °C.
- **Humidity**: 30% RH – 70% RH (non-condensing).

Installing Pulsar Software

Unzip ***setup_Pulsar_vx.x.x*** file and run the installation wizard.

Connecting to the Instrument

- Install the Pulsar GUI.
- Connect the power adapter. The power adapter is included in the package accessories.
- Connect the device to the network using a RJ45/LAN cable. The IP address is printed on the back of the instrument.
- Power on the instrument.
- Run Pulsar and add the device using its IP address.

NOTE

*To change the IP address of the instrument, refer to **Error! Reference source not found.** at the end of this manual.

General Overview

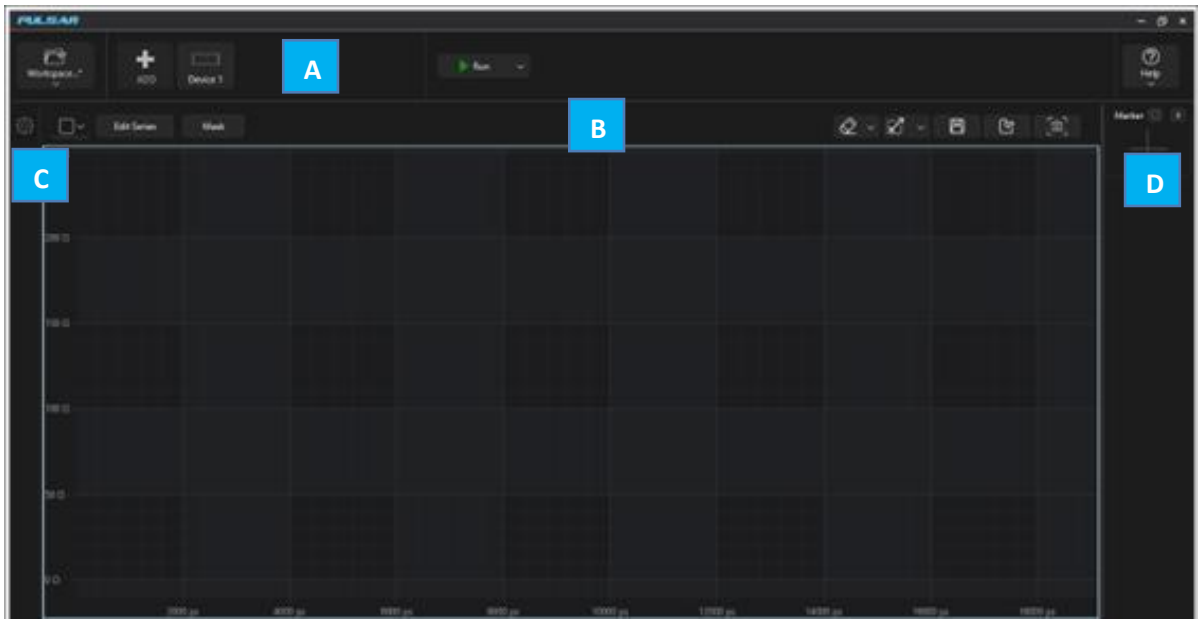


Figure 1: Pulsar GUI – Main Window

A. Device Menu.
B. Graph Settings.
C. Advanced Settings.
D. Markers.

Device Menu



Figure 2: Device Menu

1. Workspace

   Create, load, and save workspaces.

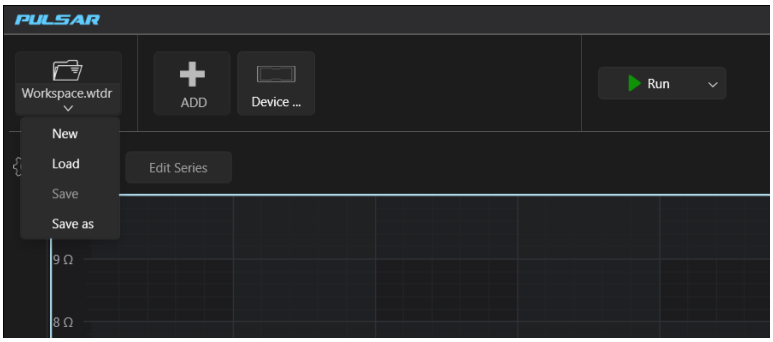


Figure 3: Workspace Menu

2. Add Device

   Specify the device name and IP address.

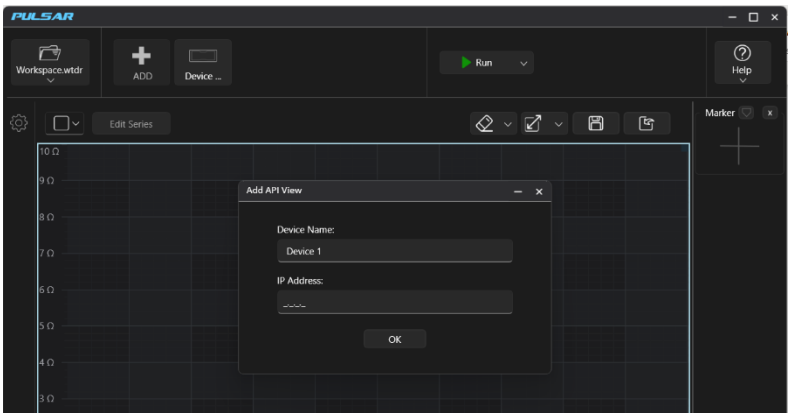


Figure 4: Add Device

3. Device Management

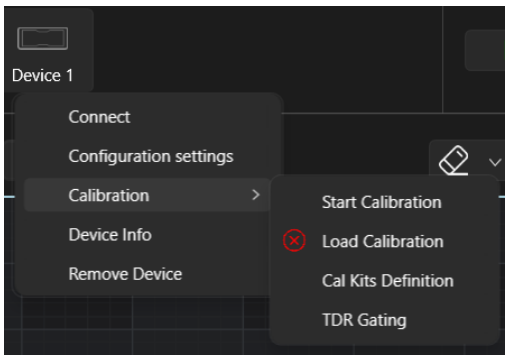


Figure 5: Device Management

i. Connect / Disconnect.

ii. Configuration settings.

   1. Channel Topology.
      a. Differential.
      b. Single Ended.
      c. Single Ended to Differential.
   2. Enable / Disable Channel.
   3. Average Factor.

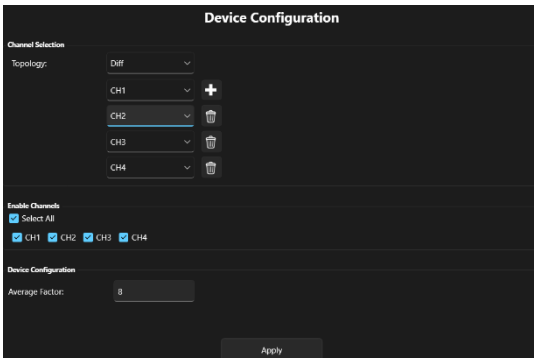


Figure 6: Device Configuration

iii. Calibration
    1. Start Calibration.
    2. Load Calibration.
    3. Cal Kits Definition.
    4. TDR Gating.
iv. Device Info.
v. Remove Device.

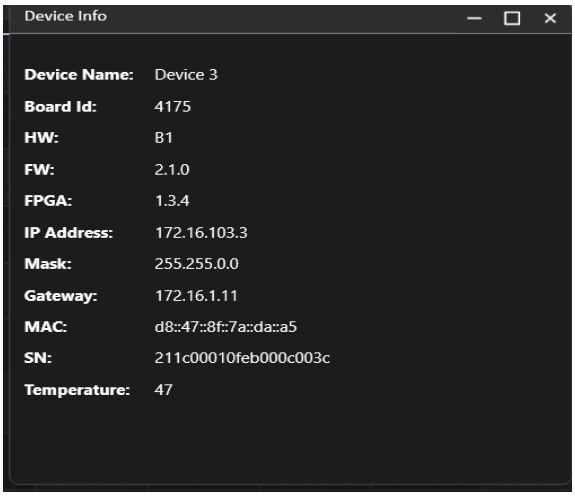


Figure 7: Device Info

4. Run
    i. Single or Continuous program execution.
5. Help
    i. About.
    ii. Release Notes.
    iii. Settings (Light Mode).

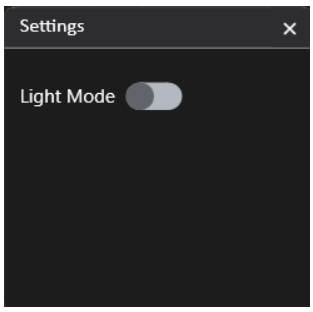


Figure 8: Light Mode

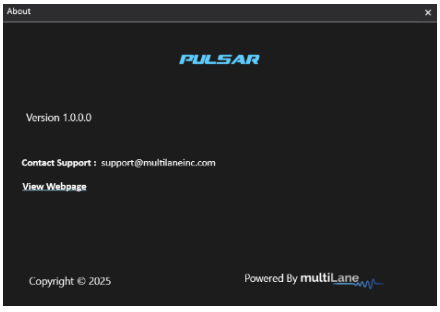


Figure 2: About

Graph Settings



Figure 3: Graph Settings

1. Number of Graphs
   - Up to 8 graphs may be displayed.
   - Each graph can show impedance Profile or return Loss.

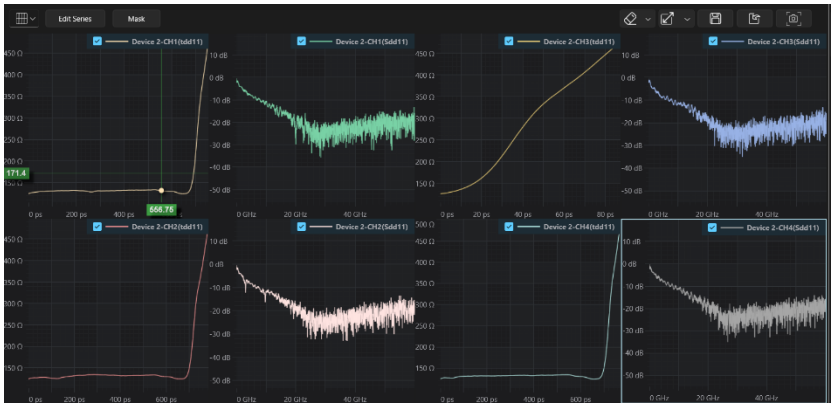


Figure 11: Multiple Graphs

2. Edit Series
   - Enable or disable individual channels.
   - Modify trace colors and plot type.

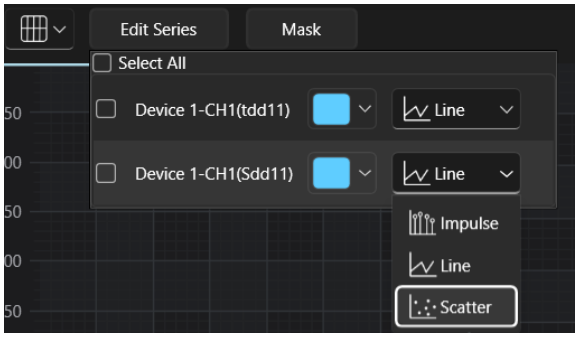


Figure 12: Edit Series

3. Mask
   - Import lower and upper mask files.
   - Apply a mask to a single graph or to all graphs by loading a mask file (.csv) formatted as shown in Figure 13.

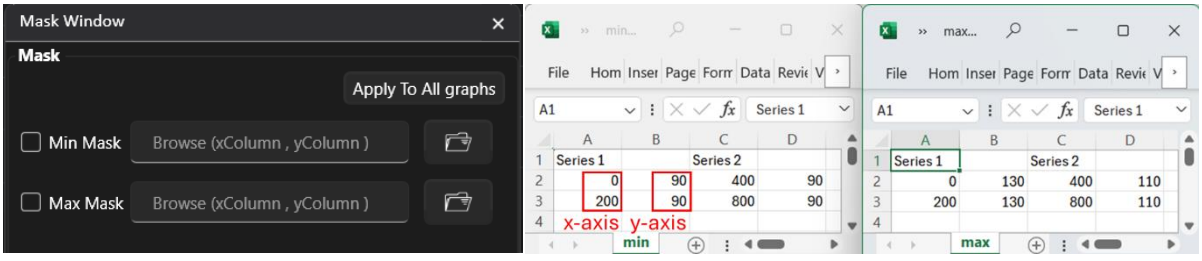


Figure 13: Mask

- Pass/Fail Verdict
    i. A Pass/Fail verdict indicates whether the impedance points are within the mask or violate it.
    ii. Example: Figure 14 illustrates a **Fail** result, while Figure 15 shows a **Pass** result.



Figure 14: Mask Example 1 "Fail"



Figure 15: Mask Example 2 "Pass"

4. Clear Data.
5. Auto Scale.
6. Save to CSV.
7. Load Series.
    - Load a csv file.
    - Load S4P, S2P or S1P files.
8. Capture Window Screenshot.

Advanced Settings

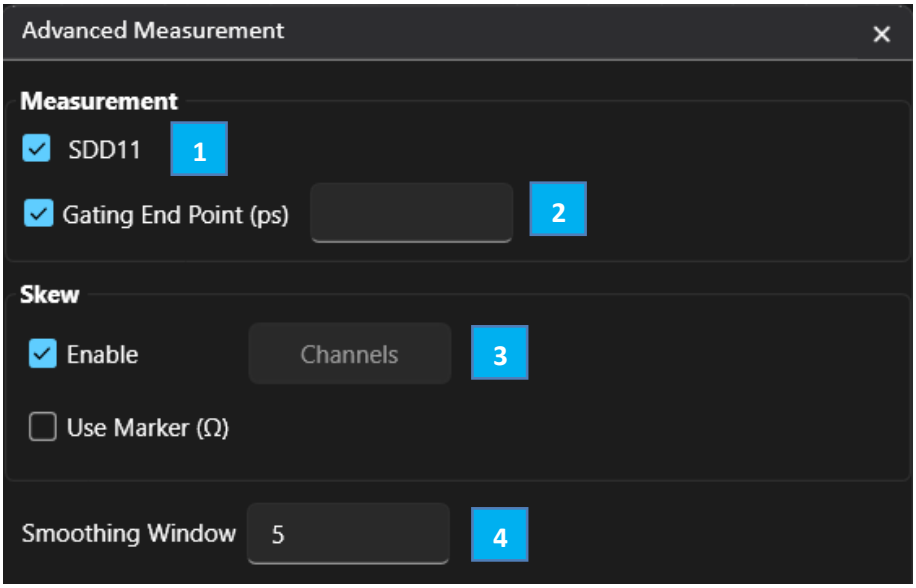


Figure 16: Advanced Settings

1. Return Loss configuration.
2. Gating endpoint.
3. Skew Enable/Disable with markers.
4. Smoothing Window.

Marker

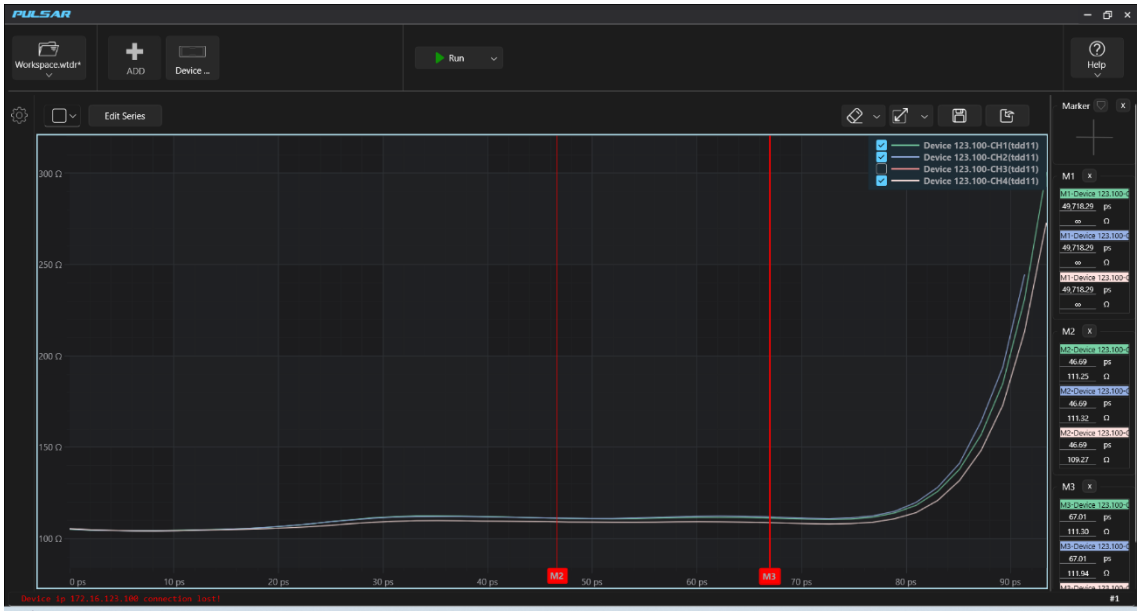


Figure 17: Mask

- Under the Marker Button, the intersection point value is displayed.
- If a marker intersects a plot multiple times, only the first intersection value is shown.

Time-Domain Reflectometry

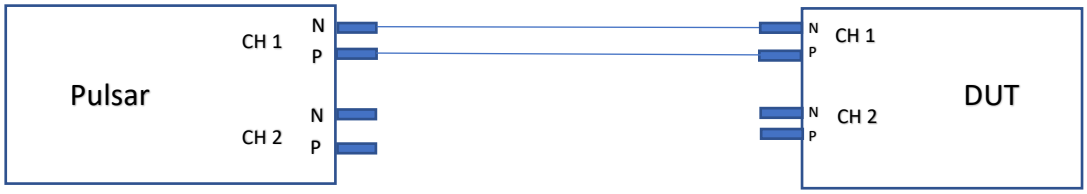
TDR device generates fast rising-edge pulses to analyze impedance discontinuities and identify open, short, faults, and impedance variations.

Measurement Topologies

- Differential measurements.
- Single-ended measurements.
- Single-ended-to-differential mode combines two channels into a differential signal.

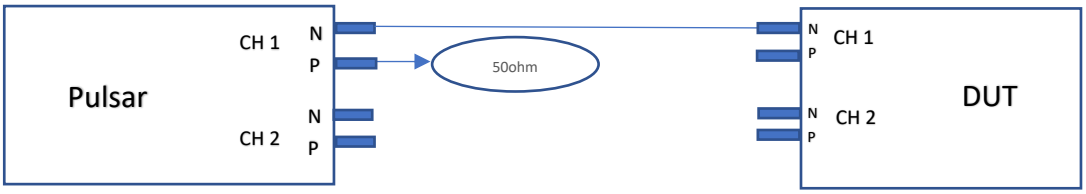
Differential Measurement

In a differential measurement, both positive and negative ports are actively driven with complementary signals (180° out of phase). This configuration accurately measures the DUT's differential impedance (Zdiff) and return loss (Sdd11 making it ideal for testing balanced lines, differential pairs, and high-speed interfaces.



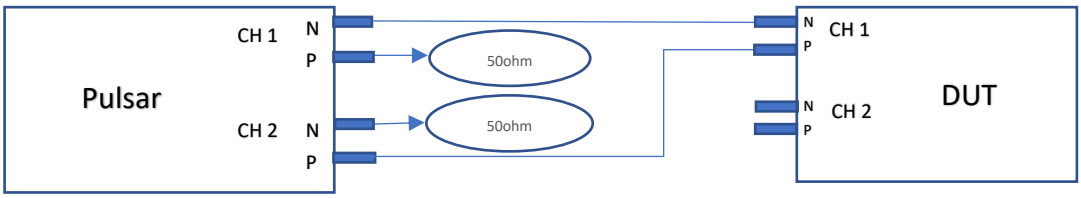
Single-Ended Measurement

In a single-ended measurement, only one port of each channel is actively used to drive or sense the signal. The complementary port is terminated with a short cable and a 50 Ω load to ensure proper impedance matching and minimize reflections that could affect measurement accuracy.



Single-Ended to Differential Configuration

In the single-ended to differential setup, two single-ended outputs—each from a separate channel (CH1 and CH2)—are combined at the DUT input to generate a differential signal. Each unused port (positive or negative) on the source side is terminated with a 50 Ω load to maintain impedance balance and suppress unwanted reflections.
This configuration enables single-ended and differential characterization of the DUT using single-ended signal sources**.** SOL calibration is required for both single-ended channels in this configuration.



Calibration

Gating | Align

Gating is the default calibration method for return loss measurements. It employs Time Domain Reflectometry (TDR) to identify the DUT's start and end point and define a gating window. Applying this gate removes the effects of external impedances, ensuring that the measured return loss (S_{11}) reflects only the DUT's impedance characteristics.

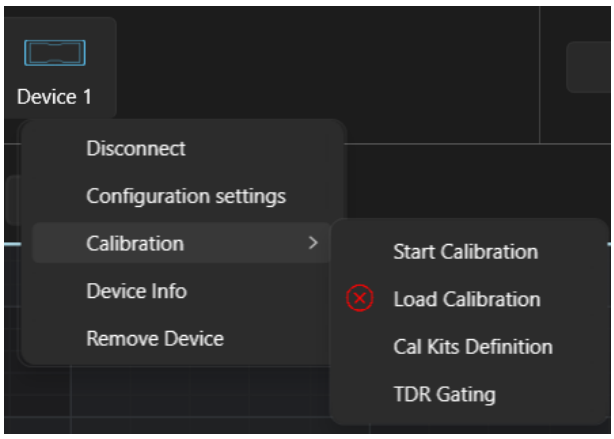


Figure 18: TDR Gating

- Press "Calibration" then "TDR Gating" to initiate the calibration process
- When the calibration window appears, click on start calibration.



Figure 19: "Gating", Calibration Window

SOL Calibration

The Short-Open-Load (SOL) Calibration process is used to establish an accurate reference plan and correct for systematic errors in the measurement setup. The procedure begins by defining the calibration kit, which specifies the electrical characteristics of the reference standards. Next, three reference measurements—Short, Open, and Load—are performed. These standards allow the instrument to determine and compensate for reflection, offset, and mismatch errors, ensuring precise and repeatable measurements of the Device Under Test (DUT).

Calibration Kit Definition

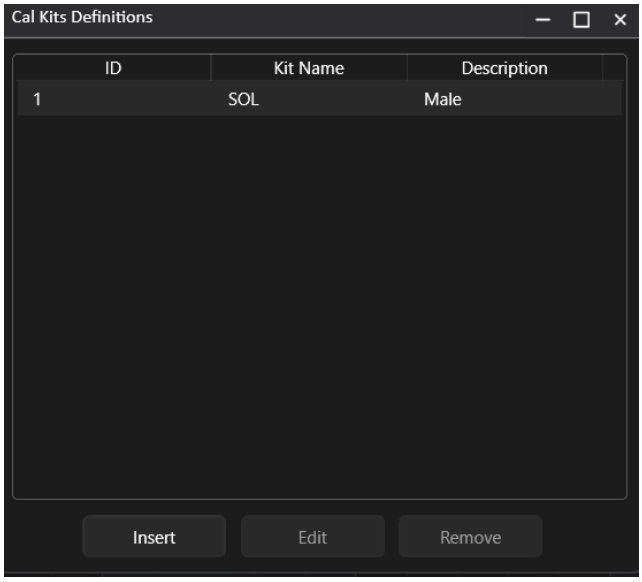


Figure 20: Cal Kits Definitions

To perform SOL Calibration, the Calibration Kit (CalKit) must first be defined. Click on Insert, and two options for CalKit definition will appear. Select the appropriate calibration standard to continue:

1. Using S1p files:
   Specify the CalKit name and connector gender, then, import the corresponding S1P files for each of the Short, Open, and Load calibration standards.

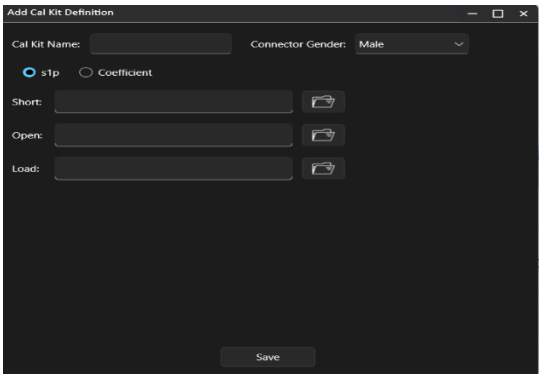


Figure 21: S1P Cal Kit

2. Using Calibration Coefficient:

Cal kit coefficients can either be entered manually or imported from a (.ccf) file.

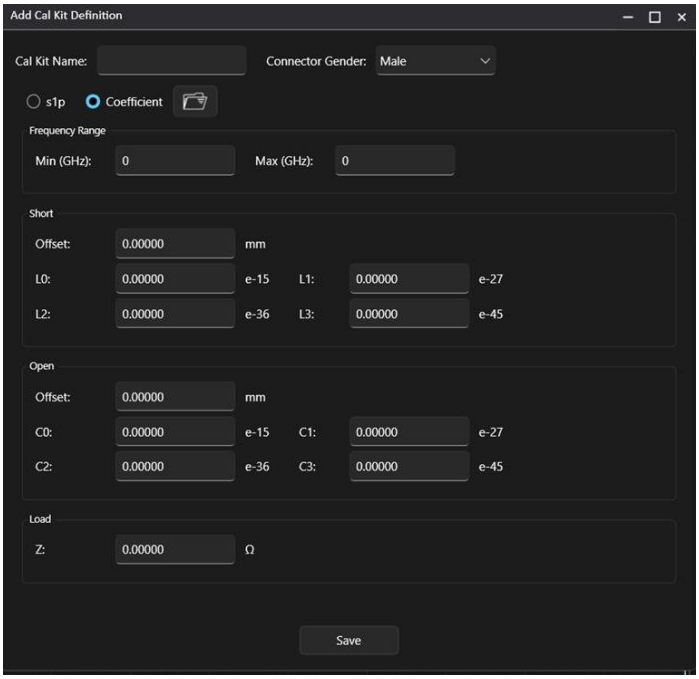


Figure 22: CalKit Definition Using Calibration Coefficients

Start SOL Calibration

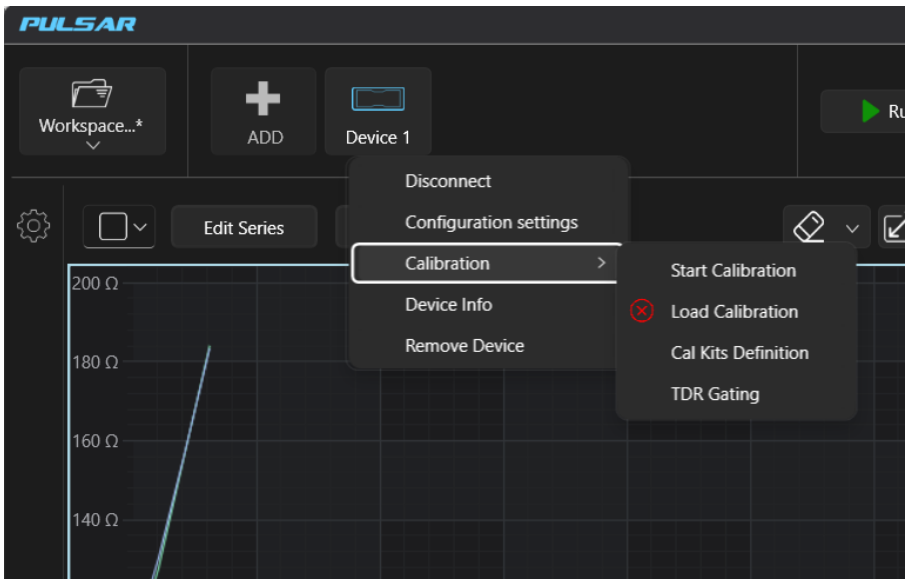


Figure 23: Start SOL Calibration

After defining the Cal Kits, click on the device, then navigate to Calibration → Start Calibration. A window with the calibration wizard will appear.

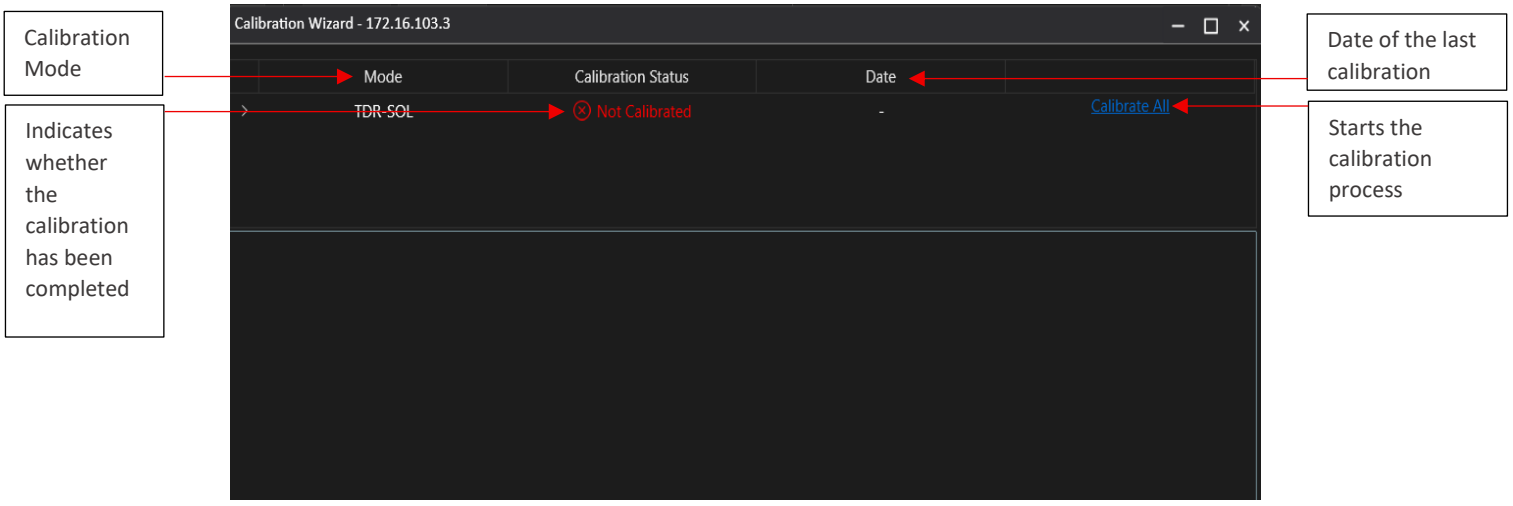


Figure 24: Calibration Wizard

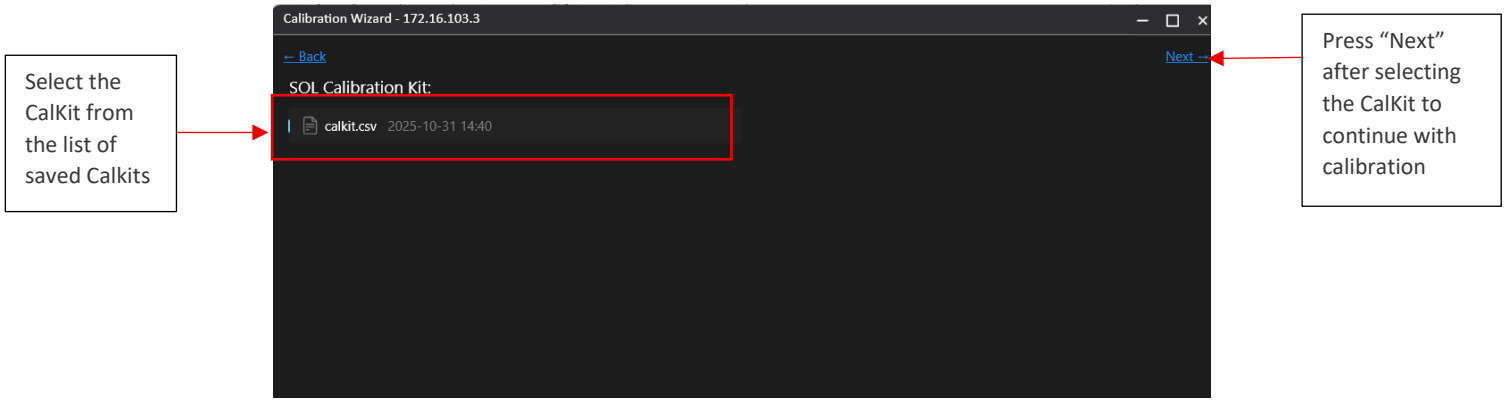


Figure 25: SOL Calibration- CalKit Selection



Figure 26: Guided SOL Calibration

After the calibration process is completed, a pop-up will appear prompting the user to apply the calibration.

Load Calibration

A previously performed calibration can be loaded directly.

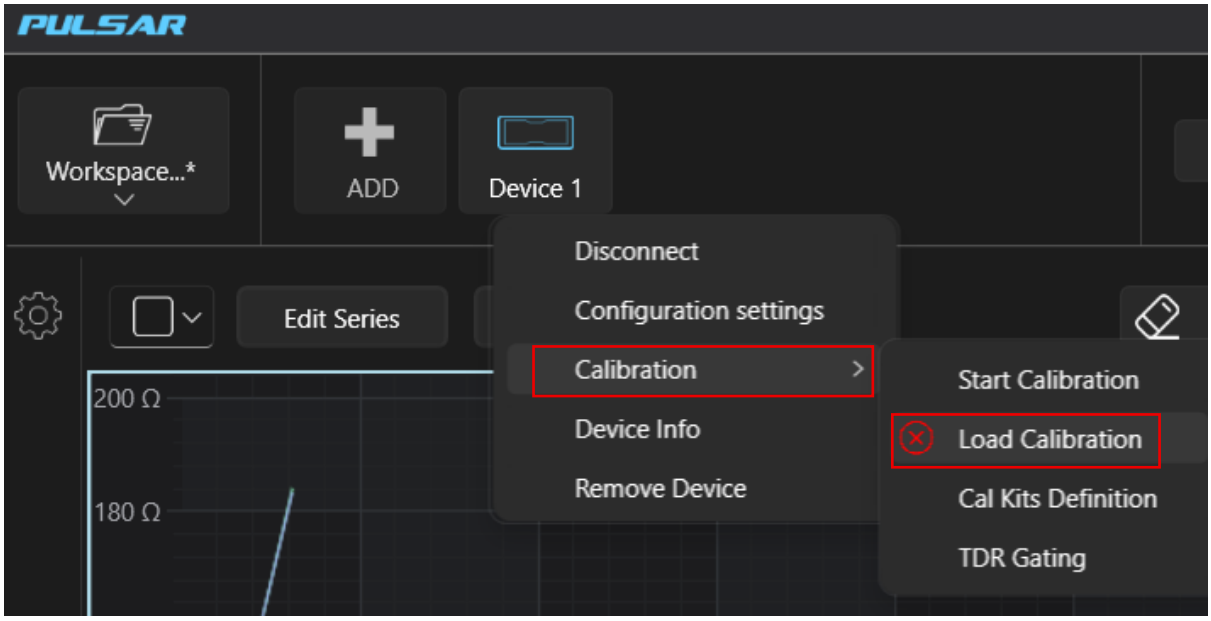


Figure 4: Load SOL Calibration

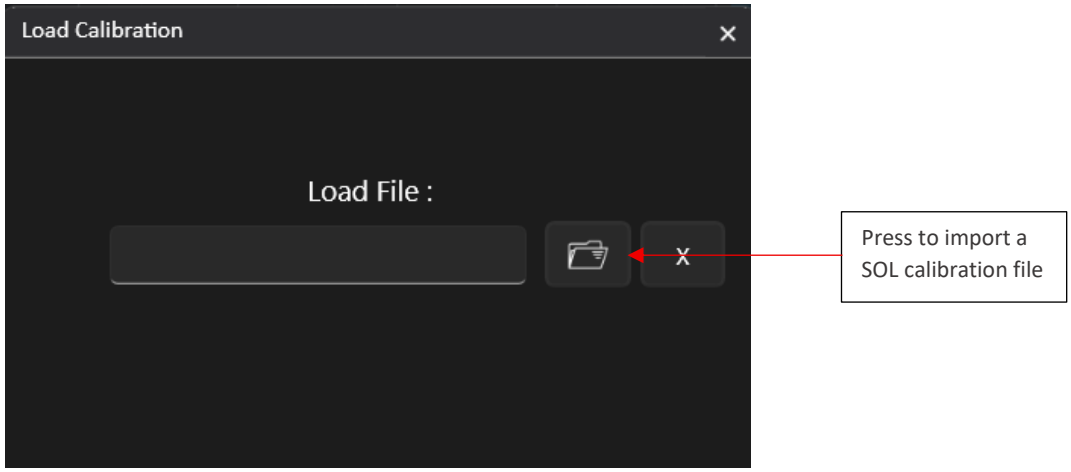


Figure 28: Load SOL Calibration Window

Return Loss

Similar to the impedance profile process, Pulsar conducts a Time Domain Reflectometry measurement in the time domain and then applies a Fourier Transform to convert the data into the frequency domain, providing accurate return loss measurements (SDD11 and S11).

Return Loss Measurement

- Enable S11/ SDD11 in the Advanced Settings.
- Select Edit Series to choose the desired channel.

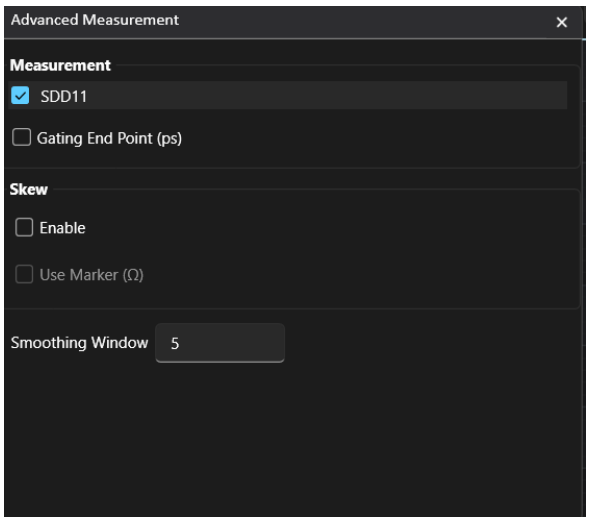


Figure 29: Enable SDD11

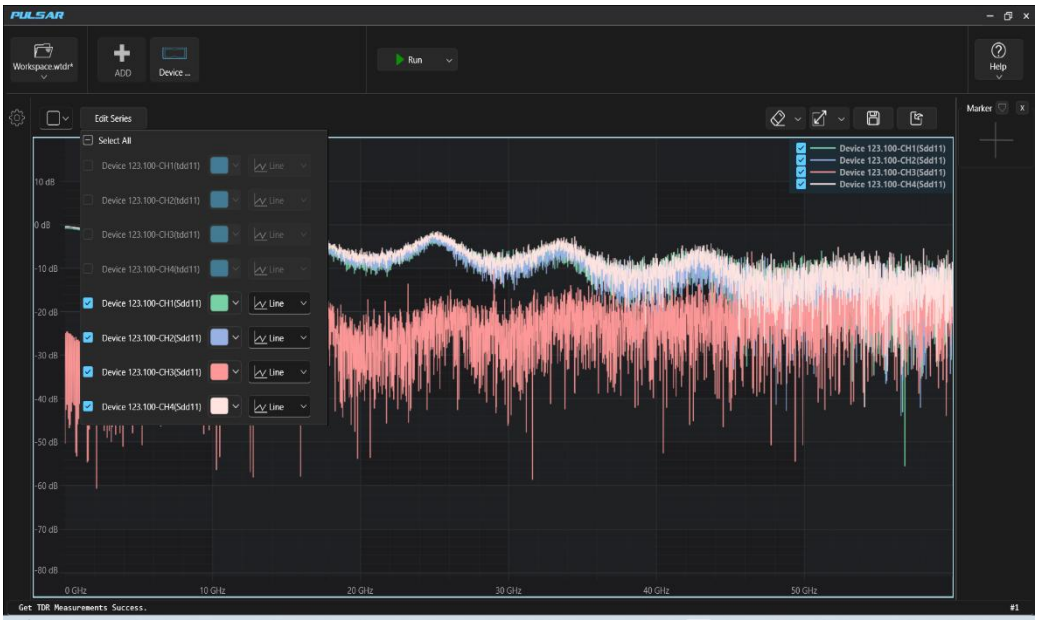


Figure 30: Return Loss Measurements

APPENDIX 1 – CHANGING DEVICE IP ADDRESS USING LANE CONTROL

This section explains the steps required to change the IP address of the device.

- Download and install Lane Control software (if not already installed), then launch the Lane Control GUI.
- Connect the PULSAR device to the PC using a USB cable.
- In the Lane Control GUI, click the arrow next to 'Scan ML Devices' and select scan USB devices.

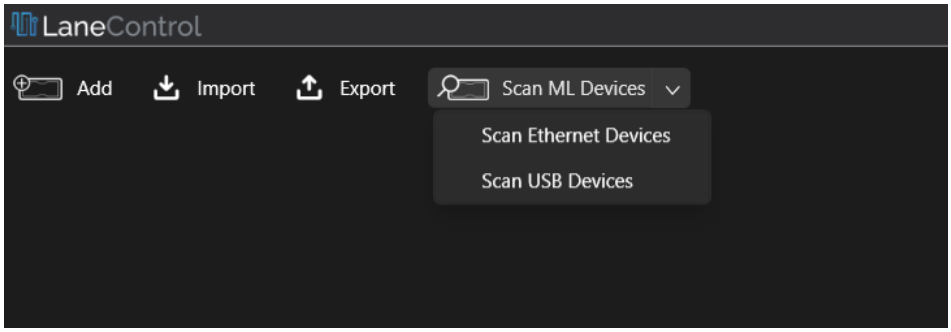


Figure 31: Scan USB devices on Lane Control

- The device Info and Ethernet Settings will appear on the screen. Click the Edit icon to change the Ethernet settings.

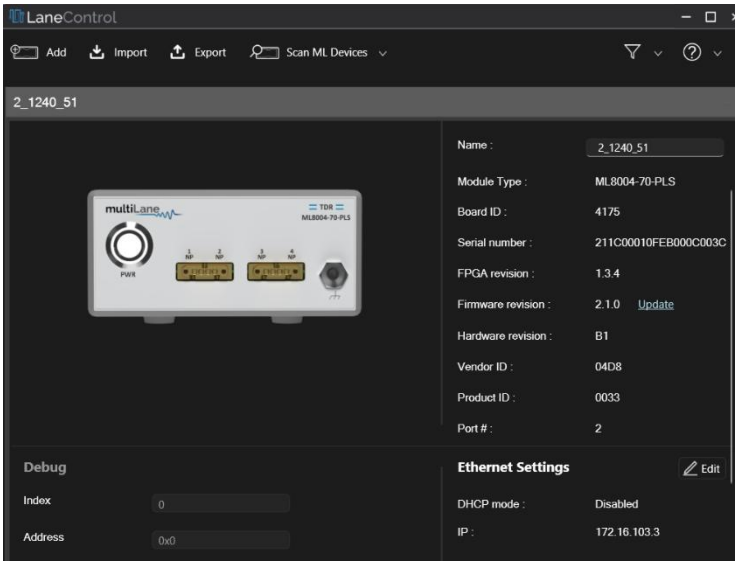


Figure 32: Device Info and Ethernet Settings

- Modify the Ethernet settings as needed and click change to apply the modifications.
- Reboot the device to apply the new Ethernet configurations.

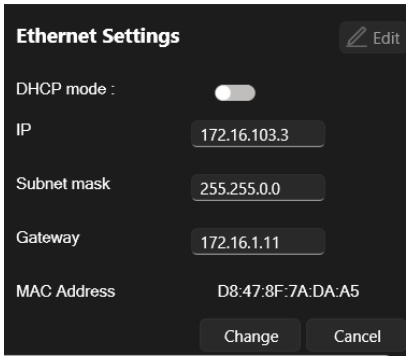


Figure 33: Edit Ethernet Settings