



ML BERT Series: ML4079ELN

Installation | Connection | Calibration | Measurement

User Manual Revision 1.0.0, August 2024



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Contents

Notices	2
Revision Control	4
List of Acronyms	5
Introduction	6
GUI Introduction	7
Installation	7
Connecting to the Instrument	8
Launching the GUI	9
GUI Overview	9
BERT Configurations	10
GUI Navigation	11
Instrument Control	11
Title Tab.....	11
BERT Settings Tab.....	11
Tx Control	13
TX Control in optimal Mode	13
TX Control in Advanced Mode	14
Rx Control	16
Rx Diagnostics	17
Clock Configuration	18
Supported Measurements	19
Measurement Controls	19
Generic Measurements	20
Platform Specific Measurements	23
Activating a purchased Real Hardware FEC License, PCIE License, or Noise License:	24
Real Hardware FEC Measurements.....	26
Appendix 1 – Adding a BERT to the Network	30
Appendix 2 – Using LaneControl to enable DHCP	32
Appendix 3 – Changing the IP Address to Suit a Corporate Network	34
Changing the IP Address of the Instrument Using LaneControl.....	34
Appendix 4 – Firmware Upgrade: Step by Step Guide	36
Upgrading Firmware of the Instrument Using LaneControl	36

Revision Control

Revision number	Description	Release Date
1.0.0	▪ Initial Release	8/28/2024

List of Acronyms

Acronym	Definition
BW	Bandwidth
BERT	Bit Error Rate Tester
Conf	Configuration
DUT	Device Under Test
FEC	Forward Error Correction
FW	Firmware
GBd	Gigabaud
Gbps	Gigabits per Second
GUI	Graphical User Interface
HW	Hardware
ISI	Inter-symbol Interference
NRZ	Non-Return to Zero
PAM4	Pulse Amplitude Modulation (4-level)
SI	Signal Integrity
SNR	Signal-to-Noise Ratio
Sim	Simulation
SW	Software
FFE	Feed-Forward Equalization
CTLE	Continuous-Time Linear Equalization
DFE	Decision Feedback Equalization

Introduction

The rapid growth of cloud computing economies demands the need for stable and high-speed data center interconnect solutions. With the widespread adoption of 400G – and move towards 800G and beyond – errors have become an inherent part of any HSIO system. Success now lies not only in identifying where errors occur, but also in determining which errors are critical to correct.

A key player in the test and measurement industry, MultiLane provides an essential high-value instrumentation that ensures vendors can keep up with demand and bring their designs to market. Our ThunderBERT line-up of BERTs, which covers virtually any desired line rate up to 800Gbps, offers an extensive array of diagnostic and tuning capabilities.

By generating specific signals to determine the actual bit error rate (BER) of the target channel, BERTs are mandatory instruments for communication testing. The brand new ThunderBERT GUI provides you with an intuitive and comprehensive tool to validate your designs.

In this upgraded implementation of our BERT user guide, MultiLane provides a fully revised and unified manual for the ML BERT series compatible with the ThunderBERT GUI.

GUI Introduction

To install and start using the ThunderBERT interface for the first time, follow this step-by-step installation guide (with pictures) below:

1. **Run** the ThunderBERT setup file.
2. **Install** ThunderBERT.
3. **Connect** the ML BERT to the local network.
4. **Launch** the GUI.
5. **Start** the measurements.

Installation

After downloading the ThunderBERT setup file, select run and follow this easy step-by-step installation procedure:

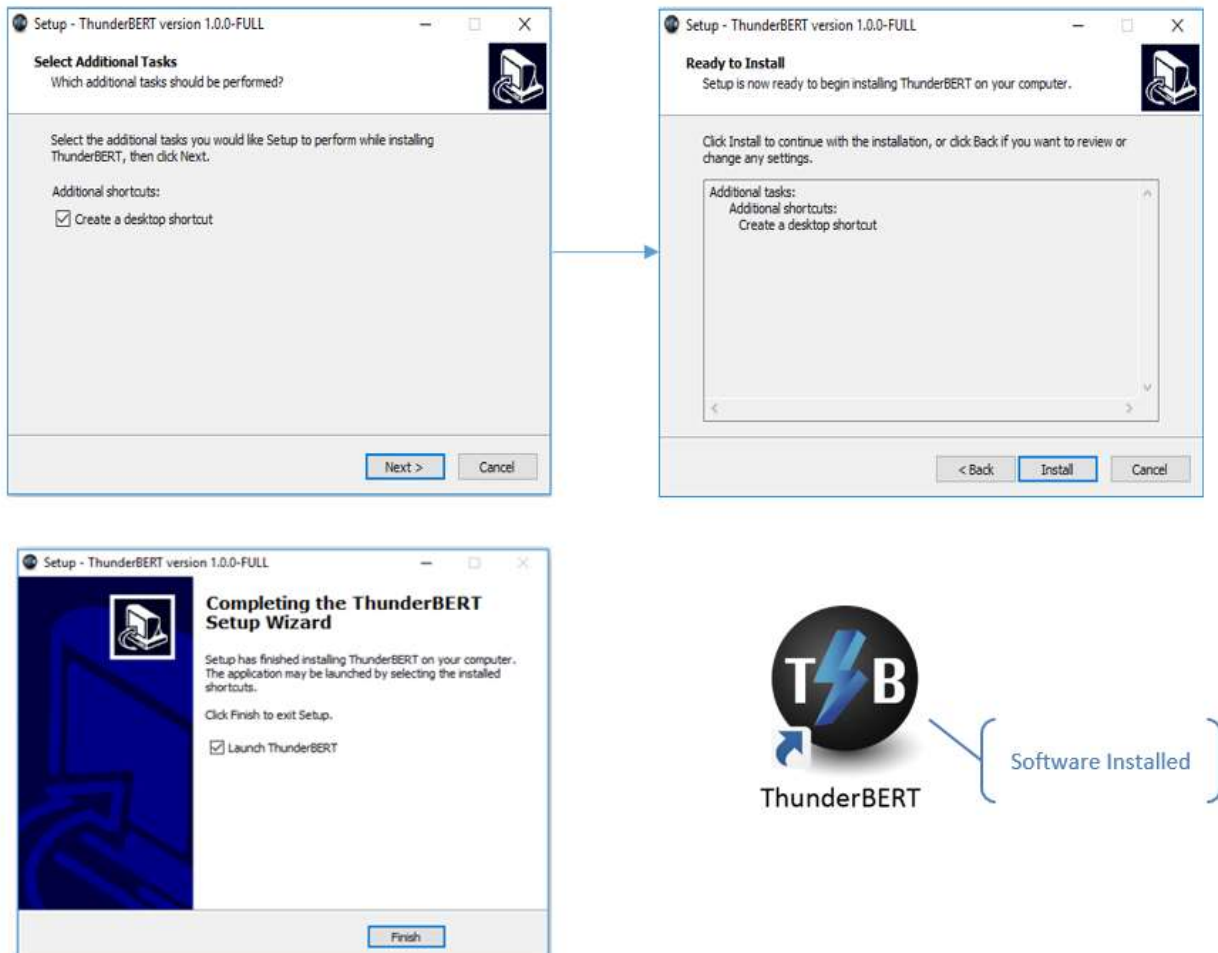


Figure 1: Setup Installation Procedure

ThunderBERT should now be ready to run, with a shortcut button on the Desktop.

Connecting to the Instrument

To connect to the instrument, follow this sequence of steps:

- **Install** the ThunderBERT GUI software.
- **Connect** the power cable to the power jack of the BERT and plug it into an AC outlet. The power cable is already included in the package accessories.
- **Power Up** the BERT.
- **Connect** the device to the network* using a RJ45/LAN cable. LAN connections can be validated with a ping to the static instrument IP.
- **Run** ThunderBERT software.
- **Connect** using the IP address of the target instrument (Figure 2). The IP address is printed on the back side of the BERT.

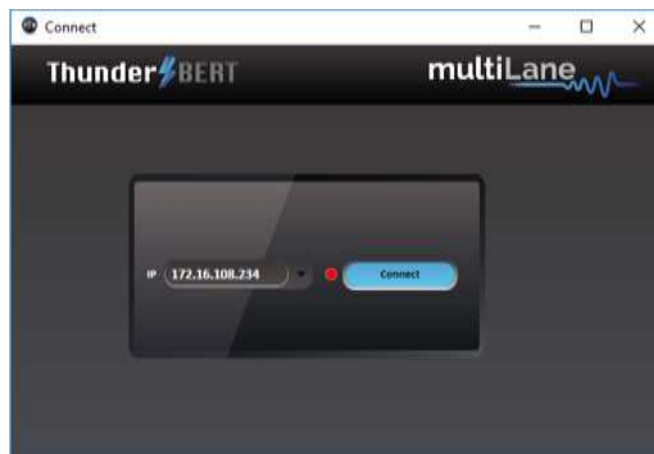


Figure 2: Connection Box

NOTES:

- The previously connected IP addresses will appear in the drop-down list next to the type of box.
- The red-light indicator (R) will remain red while no connection is established (Figure 2).
- In the case of a connection failure, a pop-up message will appear indicating a connection error (Figure 3).



Figure 3: Connection Box

*To add the device to the network, consult [Appendix 1](#) at the end of this manual

Launching the GUI

After establishing connection to the BERT, the GUI is initialized immediately, and all the BERT features are ready for use.

The general display of the ThunderBERT GUI will appear and you can commence testing.



Figure 4: General GUI Overview

GUI Overview

ThunderBERT provides end users with the ability to navigate and configure instruments from the ML BERT product family. The provision of a responsive and intuitive GUI enables you to perform different kinds of tests and measurements as well as control every aspect of the BERT platform.

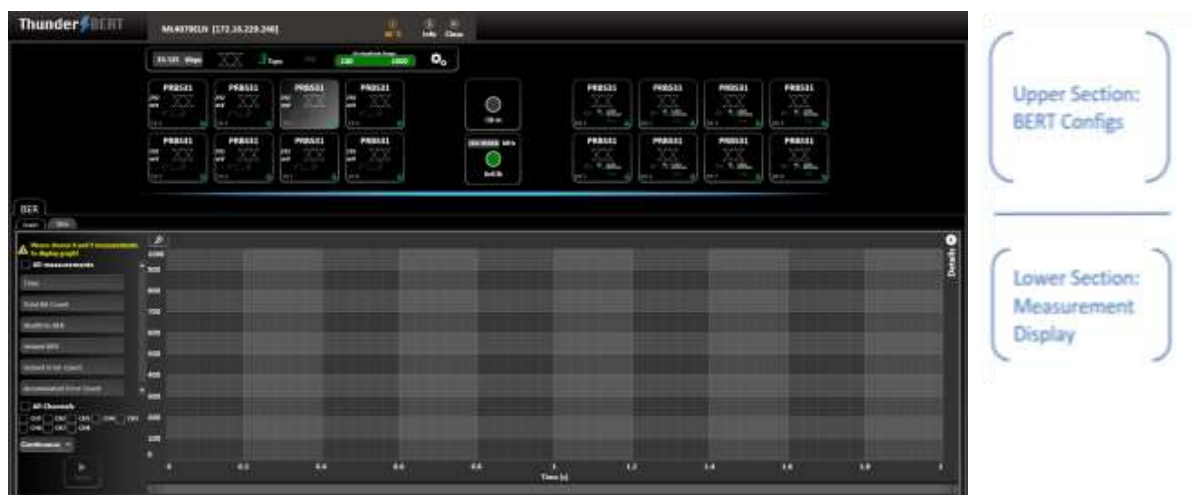
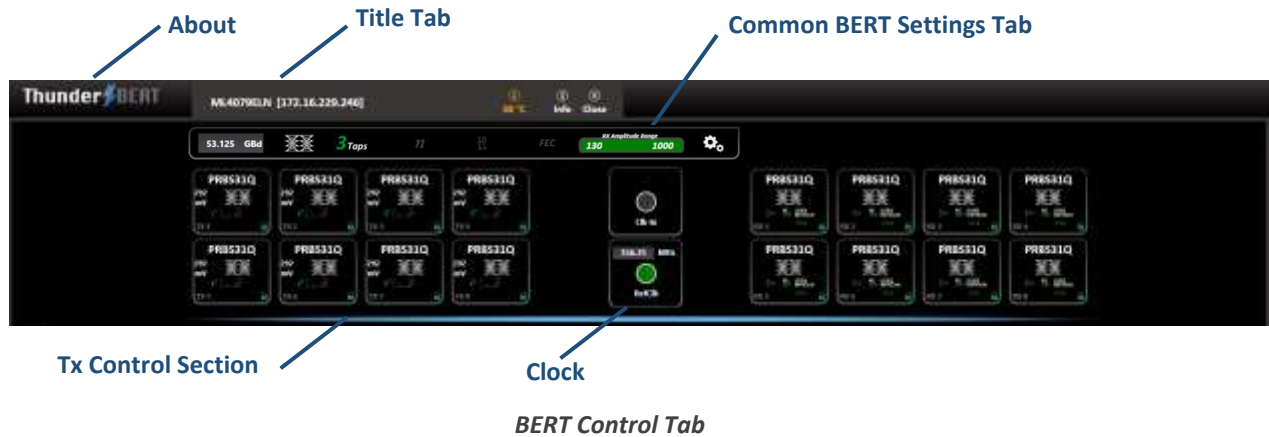


Figure 5: Segmented GUI Display (ML4079ELN)

BERT Configurations

This section is used to parameterize BERT measurements and to control the TX/RX configurators of each channel in addition to clock rate and other common BERT settings.



- **About Window** (Figure 6) will give you access to the necessary information about the product including:
 - SW and API versions and Release Note
 - A link to this User Guide
 - Logs and configuration Files
- **Title Tab** contains:
 - Instrument ID, Instrument IP address, and Temperature display
 - “Info” tab
 - “Close” button
- **Common BERT Settings Tab** contains:
 - Baud rate configuration
 - Signal modulation selection (NRZ/PAM4)
 - FFE tap selection (3- or 7-tap modes)
 - Noise Injection Enable Button
 - Grey Coding Enable Button
 - Real Hardware FEC Enable Button
 - RX Amplitude/Sensitivity Range
 - Load + Save Configurations Options
- **TX Control Section Tab** contains:
 - Pattern and Amplitude control
 - Error insertion in optimal or advanced mode
- **Clock Configuration Tabs** contain:
 - Reference Clock Out
 - High Frequency Clean Clock
 - Clock-In
- **RX-side Control Section Tab** contains:
 - RX invert, RX pattern selection and RX diagnostics
 - Equalization block



Figure 5: About Window

GUI Navigation

Instrument Control



Figure 6: Title Tab

Title Tab

- Displays general information of the BERT (BERT PN, instrument IP, instrument temperature) (Figure 7).
- The device tab where all board details are displayed (Figure 8).
- Close button: disconnect from the BERT and close GUI instance (Figure 9).



Figure 7: Device Tab

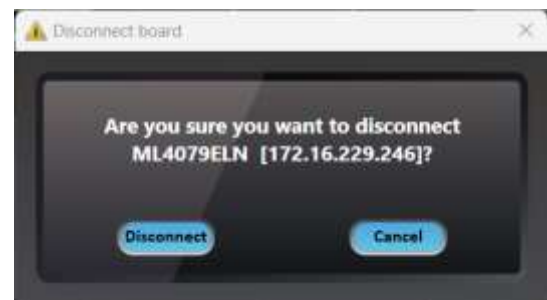


Figure 8: Disconnect Popup Window

BERT Settings Tab

The **BERT Settings Tab** shows all primary BERT configurations which you can set.

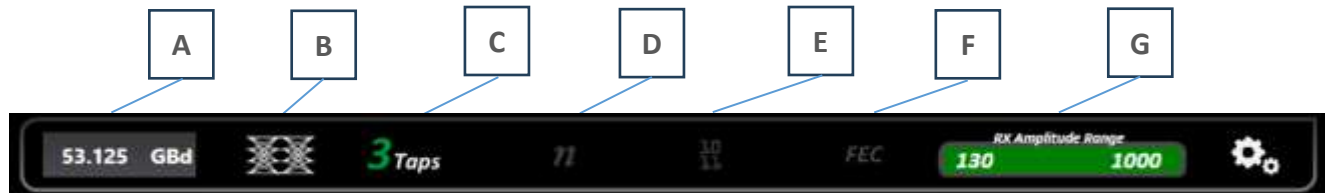


Figure 9: BERT Settings Tab

A: Baud rate Selection – **B:** Modulation Selection – **C:** FFE Taps Selection – **D:** Noise Injection Enable
E: Gray Coding Enable – **F:** Real Hardware FEC – **G:** RX Amplitude Range – **H:** Additional Settings

The common **BERT Settings Tab** reflects enabled features; whenever a feature is enabled (gray coding, 3/7-tap, and FEC) the corresponding button turns green as shown in Figure 11.

From this tab, select/configure to control the following features:

- Specify the Baud rate (Figure 11)
- Specify the signal modulation type: NRZ/PAM4 (if available/supported) (Figure 12)
- Select the 3 or 7 taps FIR filter mode
- Enable/Disable the Noise Injection
- Enable/Disable the gray code option
- Enable/Disable the FEC feature
- Check the Rx amplitude range supported by the error detector
- Load/Save the configurations through the gearbox button (Figure 13)

A
B
C
D
E
F
G
H

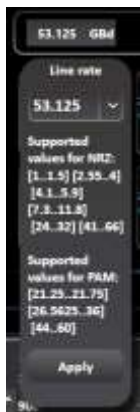


Figure 11: Set Baud Rate



Figure 10: Signal Modulation Selection



Figure 13: Additional Options

- The 'Apply' button should be pressed after any rate change; the new line rate is set within one second (Figure 11).
- Switching between NRZ and PAM4: Modulation Type available based on the selected baud rate (Figure 12). The 'Apply' button should be pressed after switching between NRZ and PAM4.
- Additional Options let you save and load test configurations including bit rate, pattern, signal modulation, number of taps and their values, inversion, etc., for all channels (Figure 13).

Tx Control

TX Control in optimal Mode

TX channel settings can be controlled individually. A display window reflecting all the enabled features and the applied TX settings per channel is displayed after clicking on each TX channel tab (Figure 16)

- **Enable/Disable TX control for each channel (TX ON/OFF).** Once turned off, the control of TX settings is disabled: channel control is locked from any selections, and TX output is turned off (Figure 17).
- **Specify the TX signal pattern.** The supported TX patterns are all available in the dropdown list, for the ML4079ELN the Supported PRBS Pattern are (PRBS7-9-13Q-15Q-23-31Q). As for square wave the supported dividers are: rate/(2, 4, 8, 10, 16, 20)
- **Specify the TX amplitude.** In optimal mode, the slider shows the calibrated differential eye amplitude range, each displayed value is the combination of the optimal FFE taps. Pre-Emphasis, Main, and Post-Emphasis taps are calculated during calibration.
- **Specify Error insertion rate.** The actual rate of errors per second depends on architecture capabilities (Figure 14).

To insert Errors:

- **Enable Error Insertion mode** $e \rightarrow e$ (the green color indicates that error insertion feature is enabled).
- **Select the Bit at which the error shall be added**
- **Click on the Update button to apply changes.**



Figure 14: Error Insertion in Optimal Mode


Tx Control in Advanced Mode

While operating in Advanced Mode, you can fine-tune the transmitter signal with high granularity. You will be able to specify the following TX settings and parameters:

- **TX Pattern:** Supported TX patterns are all available in the dropdown list, depending on the BERT model in use.
- **FFE Taps:** Tap control offers the following on TX:
 - Scaling between 60% and 120%
 - 3 FFE taps (in 3-tap mode) and FIR filter 7 taps (in 7-tap mode). Supported tap values range between -1000 and 1000.
 - Inner and Outer Eye: Controls only available in PAM4 mode (Inner eye value is between 500 and 1500, while Outer eye is in between 1500 and 2500).

To start optimizing the TX setting, follow these steps:

- **Enable the TX settings control** of the channel (TX button ON/OFF).
- **Select a TX pattern.**
- **Customize the FFE taps.** Scaling, FFE taps, and Inner and Outer Eye can be controlled in this tab.
- **Apply the changes** by clicking on the “Set” button.

You can load/save FFE Taps file to load and use a previous FFE configuration or save it for later use by clicking on the  buttons in the corner.

Note that if a channel is not in use, it is imperative that it be turned off. As an alternative to turning off unused channels, these channels can be looped back to the receiver side (RX). This is particularly useful for preventing reflections that could potentially harm the transmitter (TX).



Figure 15: Tx Advanced Mode Control

NOTES:

Optimal configurations and calibration are only available in 3-tap mode. The Channel Emulation feature is only supported in 7-tap mode.


- Channel emulation.** To emulate channel loss, start by clicking the emulation button. When enabled, the emulation button will turn to green.  You can insert the magnitude of the loss at the Nyquist frequency (half of the configured baud rate) in decibels. In addition, an S-parameter file can be selected, loaded, and used to calculate the taps creating the entered loss value.



Figure 16: Channel Emulation Enabled + 7-Tap Filter with Channel Emulation Enabled

Tx Auto-Optimization Mode

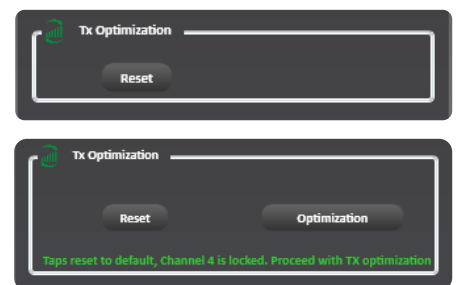
Operate in 7-tap mode to enable TX auto-optimization mode. After enabling 7-tap mode, you can now apply the auto-optimization settings where the ThunderBERT GUI will calculate the optimized FFE taps for the current setup.

To **apply** the TX Optimization settings:

- Enable TX Optimization** by clicking on the button right next to the Tab. When enabled, the button turns green.
- Click on the Optimization** button to calculate the optimal FFE Taps for the testing setup.

You can reset the **FFE Taps** values anytime by clicking on the **Reset** button.

To perform the Optimization process on the current setting, a lock must be detected on the channel in question.



Apply To all Channels Option

This option is used for the TX and RX settings, and transceiver control if available. When selected, it applies the configuration of the current channel to all BERT channels. For example, pressing “Apply to all” on the TX window will apply all TX configurations displayed in this window to every other channel.



Rx Control

RX settings can also be controlled on a per-channel basis. A window reflecting all the enabled features and applied receiver settings per channel is displayed after clicking on each RX channel tab.

Using the Rx Control, you will be able to select/configure the following settings:

- **RX Pattern** (PRBS 7, 9, 13Q, 15Q, 23 and 31Q).
- **RX Invert:** Inverts the RX polarity. The button becomes green indicating that RX polarity is inverted.
- **Equalization type:** Includes DFE and CTLE. The button “Set” should be clicked after any change (ticking/unticking) of DFE and CTLE.
 - **DFE** is used for strenuous links
 - **CTLE** is used to counteract the channel losses. CTLE is adaptive: it adjusts its frequency response to match the level of degradation, ensuring that the received signal is as clean and clear as possible.
- **RX Diagnostics** ^{RX-1}: This Window monitors FFE Taps, SNR and Histogram graphs over time.
- **RX Pattern Lock:** The button is usually red but turns green when the pattern is locked and identified successfully.

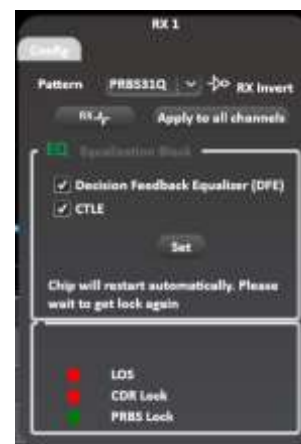


Figure 17: Rx Channel Display & Control Tab

The RX channel tab employs green shading to highlight the enabled RX features (RX polarity inversion, DFE, CTLE).



Figure 18: Rx Side with Different EQ Types Enabled

Rx Diagnostics

To access the RX diagnostics graph section, select the RX button found in the RX configuration window of each channel

After pressing the button, RX diagnostics button is shaded in green, and a graph section will appear as shown in Figure 18.

The Rx diagnostics features 3 measurement tabs:

- **FFE Taps:** Displays the Feed Forward Equalizer tap values.
- **SNR:** Measures Signal to Noise Ratio in decibels (dB).
- **Histogram:** Measures density distribution of the samples.

Screenshots of the available RX diagnostics measurements graphs are shown in Figures 19-21.

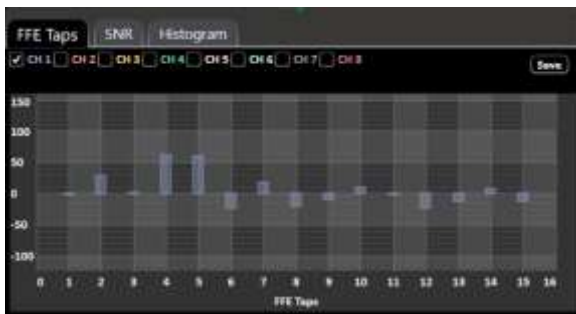


Figure 19: Rx Diagnostics FFE Taps

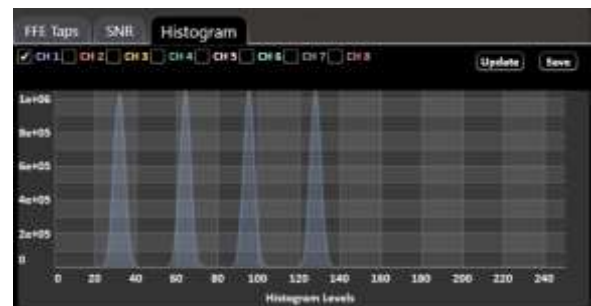


Figure 20: Rx Diagnostics Histogram

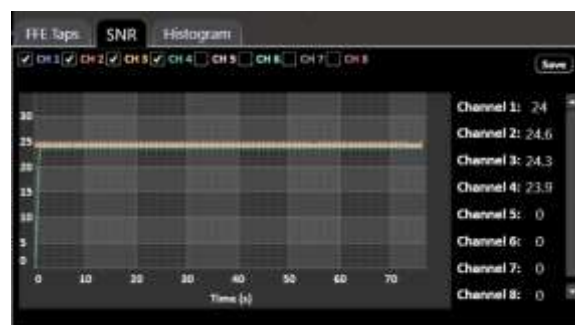


Figure 21: Rx Diagnostics SNR Measurements

NOTES:

- You can save the graphs with the save button in the upper righthand corner of the window.
- You also have the option to view all the channels at once for selected measurements

Clock Configuration

With ThunderBERT, you can choose between different clock configuration options:

- **Internal Clock Mode or CleanClk:** Choose between reference clock or high frequency clean clock. In the high frequency clean clock mode, the multipliers range from 2 to 30.
- **External Clock Rate or Clk-In:** When the Clk-In mode is enabled, you cannot use the BERT as a reference clock generator (Clk-Out). The permissible analog clock input range for the ML BERT platforms varies between 136.36 and 178.78 MHz with an optimal value of 156.25 MHz. Optimal frequency will be visible within the Clk-In menu of ThunderBERT.

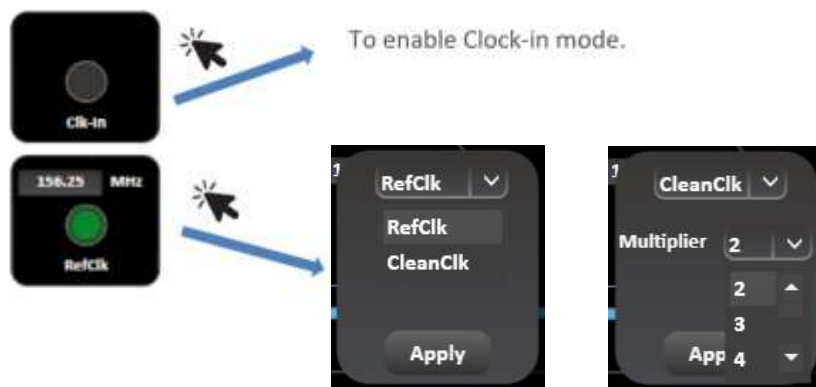


Figure 22: Clock Options

Supported Measurements

The ThunderBERT platform provides comprehensive control of all supported measurements including BER, FEC, SER and Rx Diagnostics

Measurement Controls




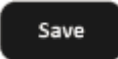


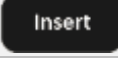
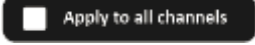






Control	Definition
	Start and Stop BER, FEC, and SER measurements
	RX diagnostics: RX FFE taps, SNR, and Histogram Control
	Capture histogram and update error insertion rate
	Save RX FFE taps, SNR values, histogram captures
	Save and Load FFE taps, Save and Load BERT settings
	Set FFE taps
	Insert Errors
	Apply unified settings on all channels (supported on both TX and RX sides)
	Apply bit rate, clock rates, FEC, and 3- and 7-tap mode
	Graph Autoscale
	TX ON/OFF AND Enable/ Disable History navigation measurements to be listed in details tab
	Enable Noise
	BER/ FEC Measurement Timer
	Additional Options

Table 1: Measurement Controls

Generic Measurements

You can execute BER measurements according to the channels you select. While the test is running, you can change the X and Y axis according to the supported graph combinations.

You have the choice to measure/visualize different options such as:

- Single and Multichannel BER
- Accumulated and Instant BER
- Continuous BER Test
- Time-defined BER Test

Supported measurements are grouped in the following table:

Instant Measurements	Accumulated Measurements
Instant BER	Real Time BER
Instant Error Count	Accumulate Error Count
Instant BER MSB	Real Time BER MSB
Instant BER LSB	Real Time LSB
Instant Error Count MSB	Accumulated Count MSB
Instant Error Count LSB	Accumulated Error Count LSB

Table 2: Supported BER Measurements

To start visualizing the selected BER results/measured data, select the channel(s) on which the measurement(s) are to be displayed and press the Start button to run the measurement.

There is also an option to select/deselect all channels.

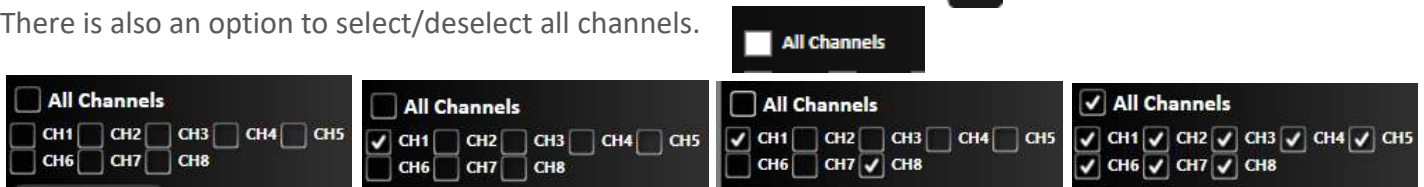


Figure 23: Channels Selection

Instant and accumulated measurements can be displayed simultaneously in the details panel and on the graph. In addition, you can navigate through the measurement behavior at any past time in the test using **History Navigation** in the details panel at 100 ms intervals.

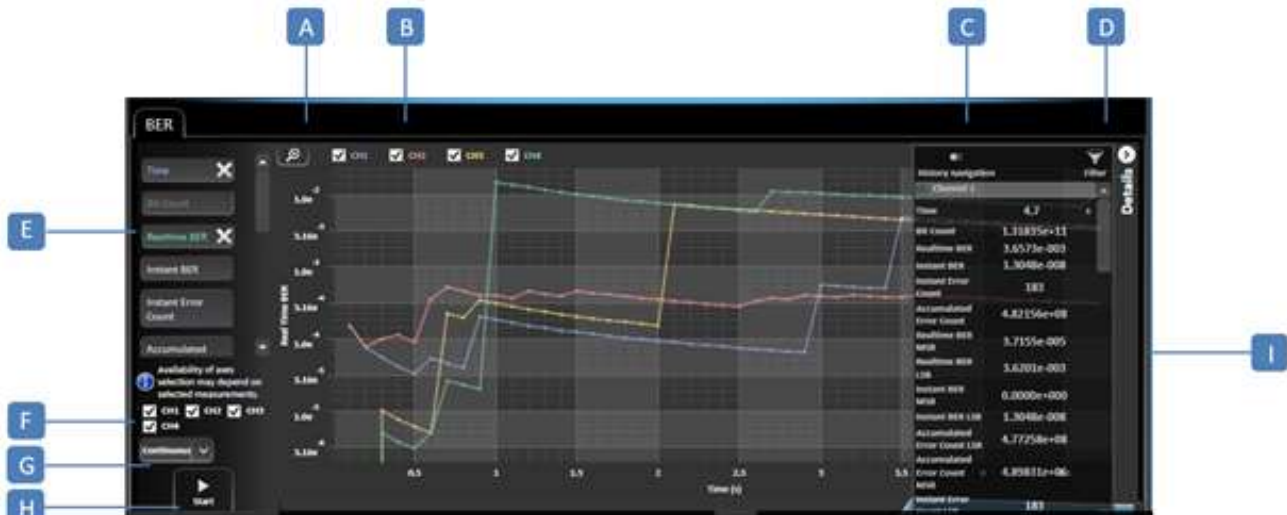


Figure 24: Measurement Display

- A: Graph Autoscale – B: Channel Selection – C: History Navigation – D: Measurement Filtering –
- E: Graph Display Measurements Selection (axes) – F: Channel Selection – G: Timer/Continuous Mode –
- H: Stop/Start BER – I: Details panel

! X-axis selection: To enable measurements, select a value for both the X and Y axis. Different options for the X axis selection are supported, but only one can be selected per measurement, while more than one Y axis can be selected and displayed simultaneously. The scale of each Y axis selected will be displayed on the left of the graph.

A display of supported NRZ/PAM4 BER graph combinations is shown below depending on the measurement type:

- PAM4 Measurements:

X axis	Y axis
Time	Total Bit Count
	RealTime BER
	Instant BER
	Instant Error Count
	Accumulated Error Count
	Bit Count MSB/LSB

Table 3: PAM4 Graph Combinations

- NRZ Measurements:

X axis	Y axis
Time	Total Bit Count
	RealTime BER
	Instant BER
	Instant Error Count
	Accumulated Error Count

Table 4: NRZ BER Graph Combinations

After selecting the desired graph configuration, data will be plotted instantly (make sure to choose the desired channel and click on the Start button).

You can access the instant and accumulated measurements data using the BER measurements table. You can switch from graph to table measurements with no test interruptions. You can save the table of result onto your desktop using the save button.

BER graphs and table measurements are displayed below in Figure 25.



Figure 25: Error Tracking Vs Time and BER Table Measurements

The “LOL log” button will show all the Lost Of Lock (LOL) that happened during one BER start – stop. At the end of the test, the first table will have all the information of the LOL on all 8 channels as displayed and the second table which is a summary table shows the total number of times where channels encountered a LOL and the maximum duration of all LOL encountered on a given channel as displayed in Figure 26.

LOL log

Save

Rx Loss of Lock Log

Channel	Date of losing lock	Duration of losing lock
1	4/24/2024 1:15:19 PM	00:00:02
1	4/24/2024 1:15:27 PM	00:00:01
2	4/24/2024 1:15:53 PM	00:00:02
3	4/24/2024 1:15:41 PM	00:00:02

Summary

Channel	Maximum time	Number of LoL
1	00:00:02	4
2	00:00:02	2

Figure 26: Loss Of Lock

Platform Specific Measurements

Activating a purchased Real Hardware FEC License, PCIE License, or Noise License:

To Enable FEC, PCIE licenses, or the Noise feature, you can request a License by placing a Purchase Order to operation@MultiLaneinc.com by sending a screenshot of your BERT info tab. The 3 licenses are sold separately: you can purchase one, two, or all of them.

After purchasing a license, you will be eligible for a license key (LK). This LK is needed to unlock all the features.

After clicking on “Add License” available in Info tab, a pop-up window will appear, where your LK should be copied and applied.



Figure 28: Add License Available in Info tab

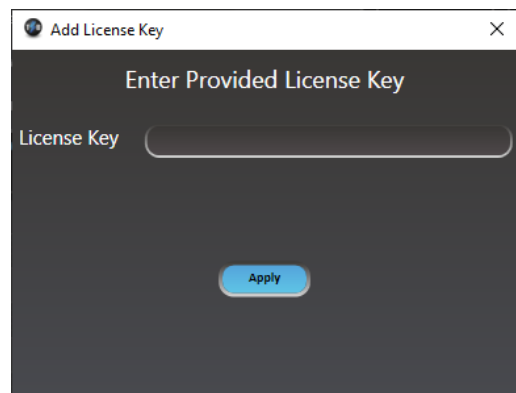


Figure 29: Pop-up window to Add License

If the LK is valid, another pop-up window will appear, informing you that the LK has been applied.



Figure 30: License Key Added

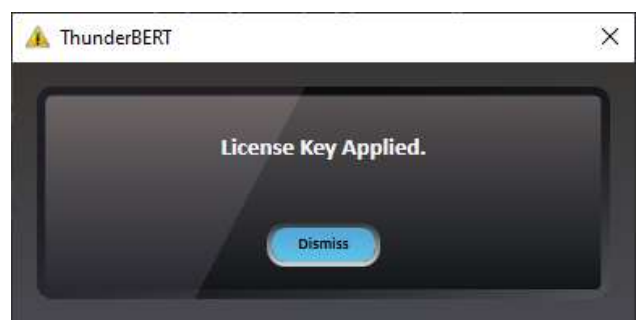


Figure 30: FEC Features Enabled

After you have applied your LK, the BERT **should be disconnected**, and **power cycled**. Full features will then be accessible and ready to use.



You will be notified if a wrong LK is entered (figure 31). The GUI will disconnect directly if a wrong LK is entered four times consecutively (figure 32)

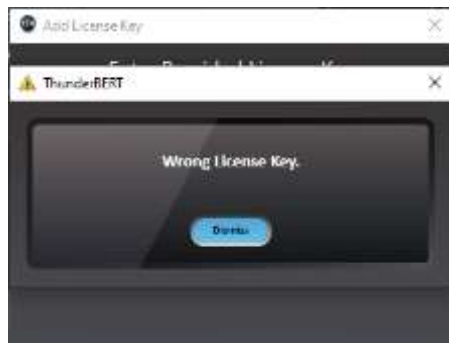


Figure 31: Wrong License Key

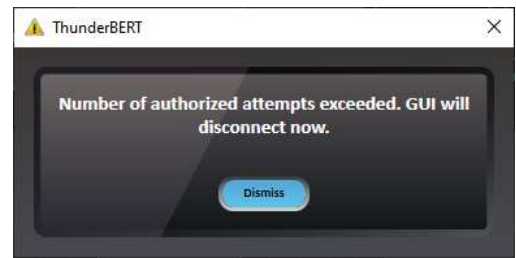


Figure 32: Number of Authorized Attempts Exceeded

Real Hardware FEC Measurements

After entering an applicable FEC license code into ThunderBERT, enable the FEC measurements from the drop-down list and then press apply. Once enabled, the FEC button will become green and display the FEC type selected.



Figure 33: Enabling FEC

When FEC is enabled, you can change the X and Y axes to the supported graph combinations where instant and accumulated bit counts are supported and can see the results of the measurements in the details section. SER measurements are also supported in FEC mode; corrected codewords with symbol error distribution are displayed.

Instant and Accumulated Measurement	Measurement Description
Instant Corrected Bit Count	Sum of corrected “0” and “1” bits after decoding.
Instant Processed Codeword Count	Number of codewords, correctable and uncorrectable processed by the decoder.
Instant Corrected Codeword Count	Number of codewords (FEC blocks) that were corrected by the decoder, which means the number of codewords that were determined to have a correctible magnitude of symbol errors.
Instant Uncorrected Codeword Count	Number of codewords that were deemed uncorrectable by the decoder, which means number of codewords that were determined to have more than the correctible magnitude of symbol errors.
Accumulated Processed Codeword Count	Total number of codewords, correctable and uncorrectable processed by the decoder.
Accumulated Corrected Codeword Count	Total number of codewords (FEC blocks) that were corrected by the decoder, which means the number of codewords that were determined to have a correctible magnitude of symbol errors.
Accumulated Uncorrected Codeword Count	Total number of codewords that were deemed uncorrectable by the decoder, which means number of codewords that were determined to have more than the correctible magnitude of symbol errors.

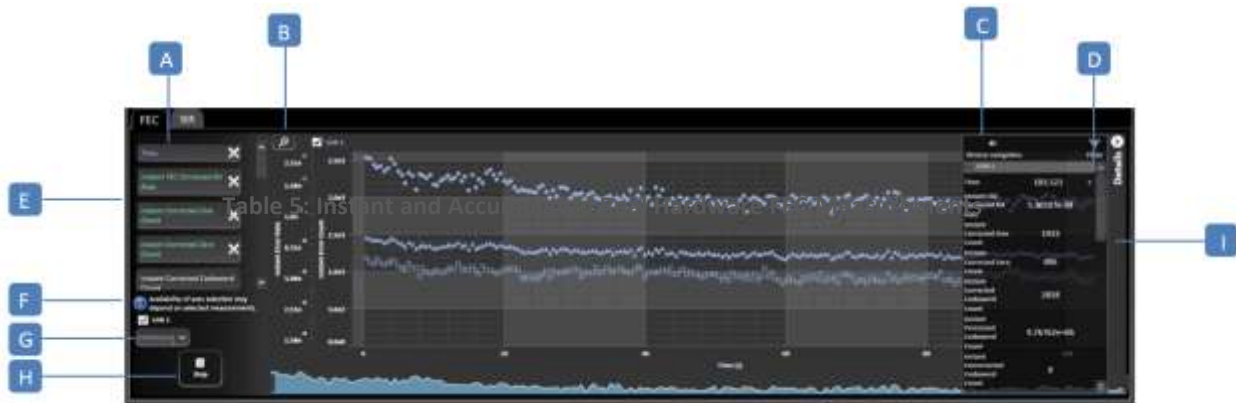



Figure 34: Measurement Display

- A: FEC/SER graphs – B: Graph Auto Scale – C: History Navigation – D: Measurement Filtering
- E: Graph Display Measurements Selection – F: Link Selection – G: Timer/Continuous Mode
- H: Stop/Start FEC/SER – I: Details panel



To enable measurements, select a value for both the X and Y axes*. Different options for the X axis selection are supported, but only one can be selected per measurement, while more than one Y axis can be selected and displayed simultaneously. The scale of each Y axis selected will be displayed on the left of the graph.

You can choose between visualizing instant and accumulated measurements, and measurements table under the FEC and SER tabs. You can save the table of result on your desktop using the save  button. Some FEC and SER screenshots are shown below:

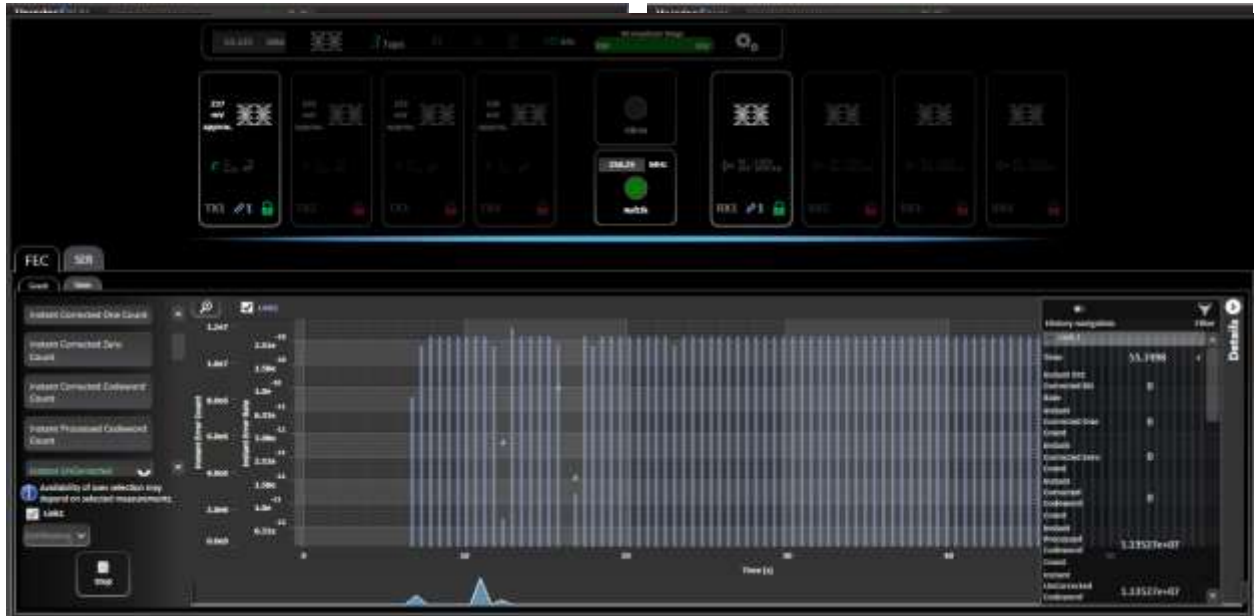


Figure 35: FEC Graph with Details Panel

The screenshot shows a table with multiple columns and rows of data. The columns represent different time intervals, and the rows represent various data metrics. The data is presented in a grid format, with numerical values for each cell.

Figure 36: FEC Table

The screenshot shows a table with multiple columns and rows of data. The columns represent different time intervals, and the rows represent various data metrics. The data is presented in a grid format, with numerical values for each cell.

Figure 37: SER Table

There are three measurement blocks for SER:

1. Instant Codeword Symbol: the symbol error rate distribution for the link under test in a specific 100 ms window. Refreshes 10 times per second.
2. Accumulated Codeword Symbol: the sum of total symbol error rate distribution for the link under test, accumulating from t =0.
3. Accumulated Symbol Error (%): the percentage distribution of total symbol error rate for the link under test, accumulating from t=0.
4. The measurements will display:
 - a. Symbols ranging from 0 to 7 or from 0 to 15 (depending on the mode).
 - b. Symbols greater than 7 or 15 (depending on the mode).
 - c. The SER margin (metric indicating available margin before codewords become uncorrectable).
 - d. The post-FEC FER (Frame Error Rate).
 - e. The FEC link.

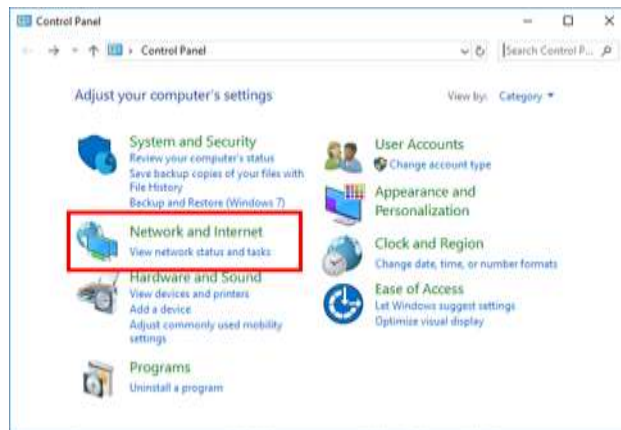
In the following table, the supported measurements in Real Hardware FEC graph are shown:

X axis	Y axis
Time	Instant Corrected Codeword Count
	Instant Processed Codeword Count
	Instant Uncorrected Codeword Count
	Instant Corrected Bit Count
	Accumulated Corrected Codeword Count
	Accumulated Processed Codeword Count
	Accumulated Uncorrected Codeword Count

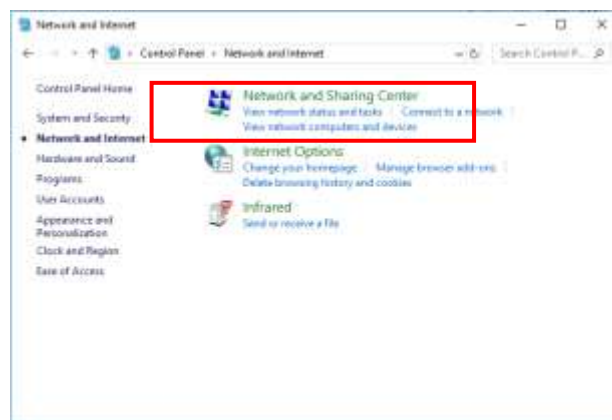
Appendix 1 – Adding a BERT to the Network

To create a local network connection, please follow these steps:

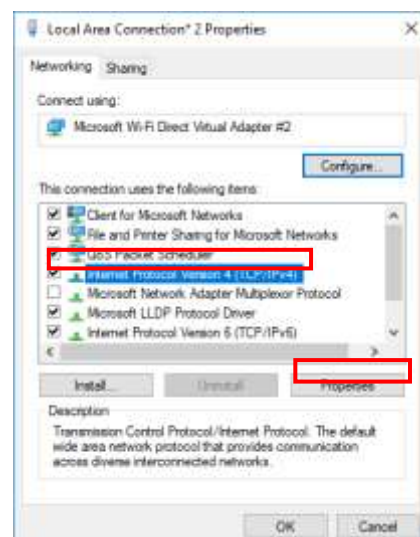
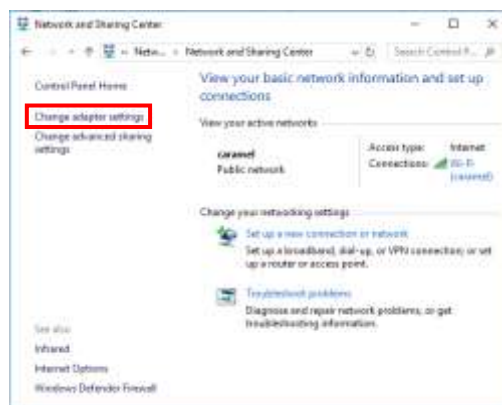
- **Create a local network connection** between the laptop and the BERT using Internet Protocol Version 4 (TCP/IPv4).
 - **Open** Control Panel and **choose** Network and Internet.
 - **Open** Network and Sharing Center.



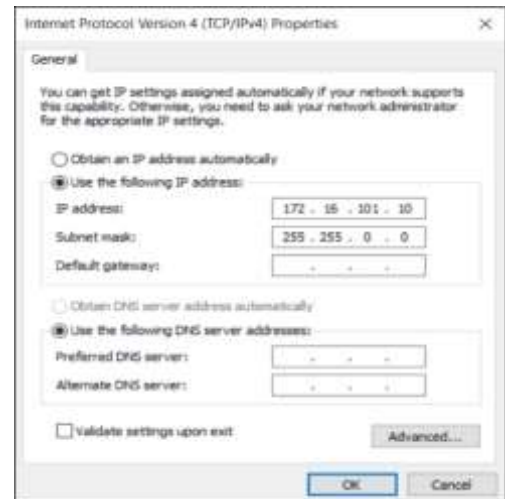
- **Click on** Change Adapter Settings, then **choose** Local Area Connection.



- In the Networking Tab, **click on** Internet Protocol Version 4 (TCP/IPv4) then Properties.



- **Add a similar IP Address** that shares a subnet with the instrument IP in the Advanced tab.
This will be used to ping the instrument once the IP Address is changed to match that of the network.
- **Connect the laptop** directly to the BERT using an Ethernet cable.
- **Copy the IP Address** found on the back of the unit.
- **Ping the device** to make sure that the connection is successful.
- Now a new local network has been successfully defined.



NOTES:

These steps are illustrated using Windows 10. Note that previous versions of Windows have a similar procedure with slight differences in tabs or folder names.

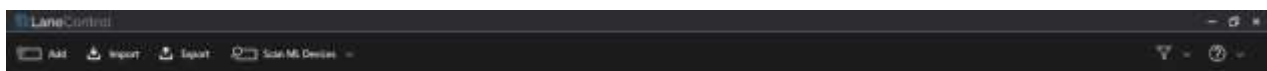
Appendix 2 – Using LaneControl to enable DHCP

The process can be completed using [LaneControl GUI](#).

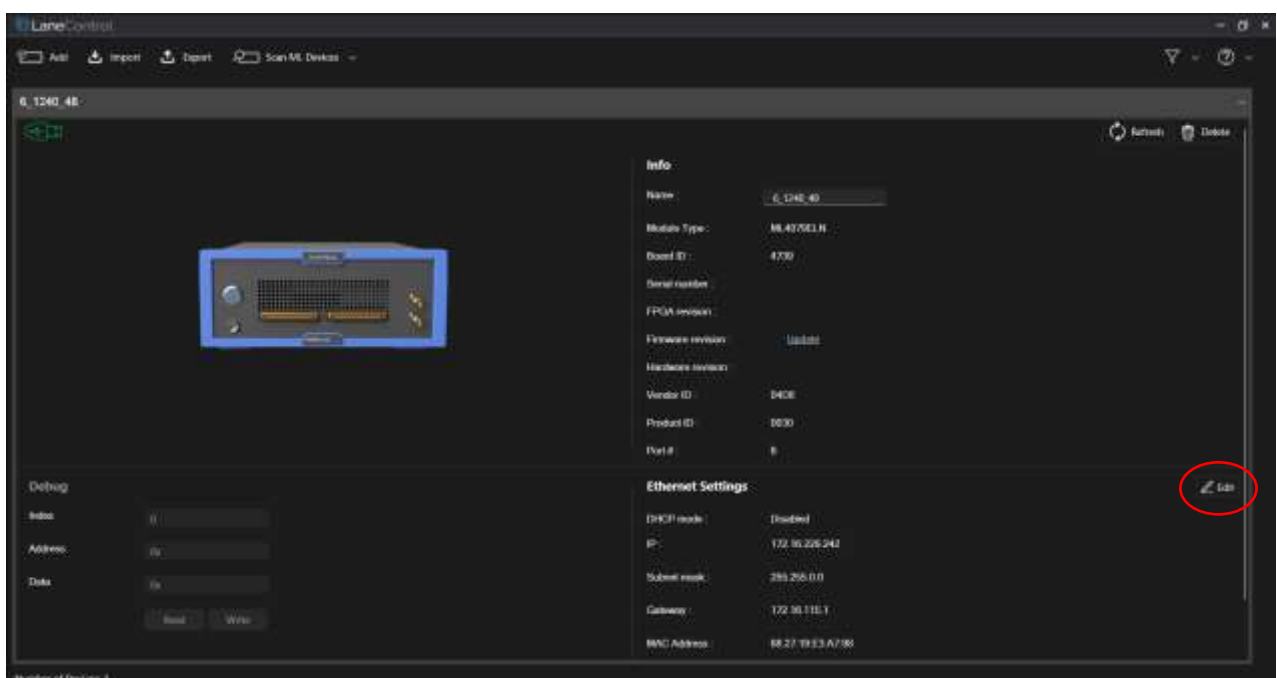
Follow the [LaneControl user guide](#) to install the GUI.

To access all the ML4079ELNs available, the user has 2 options, to connect the instrument to his PC via USB or Via Ethernet:

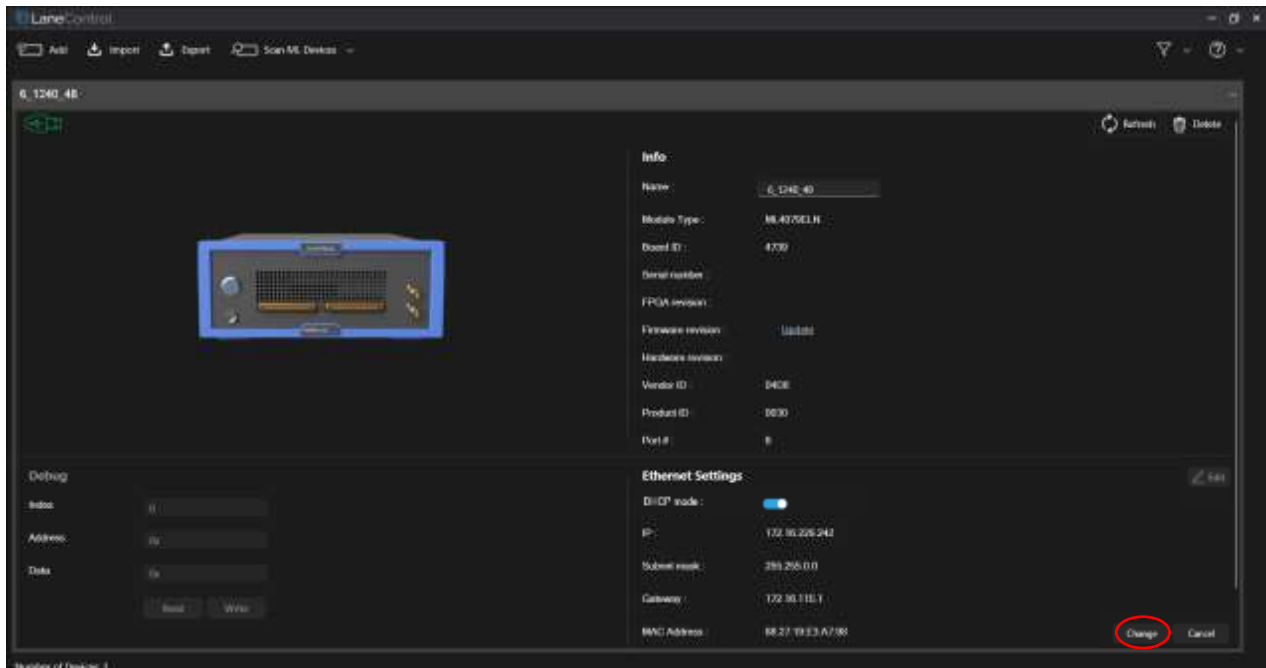
- Make sure the PC is connected via Ethernet/USB
- Click on Scan ML Devices at the TOP of the GUI



- The instrument you are using will be shown with all its information, in addition to the Ethernet or USB Icon depending in the used mode
- To enable DHCP, click on Edit



- Turn the DHCP Mode Tuggle on, then click on Change and power cycle your instrument



- A new IP address will be shown
- Open the ThunderBERT GUI and connect to you instrument Via the new IP
- To disable DHCP, Click on Edit next to Ethernet Settings, turn the DHCP Mode Tuggle off, then click on Change and power cycle your instrument
- Connect to the ThunderBERT GUI using the default IP

Appendix 3 – Changing the IP Address to Suit a Corporate Network

MultiLane does not recommend changing the IP address of the BERT instrument. However, this appendix will detail the steps for each operation.

Before starting the IP address change operation, please contact your IT department/support. You should be provided an available IP on the network. If the IP is the same as another device on the network, you can still ping the device but you will not be able to use it.

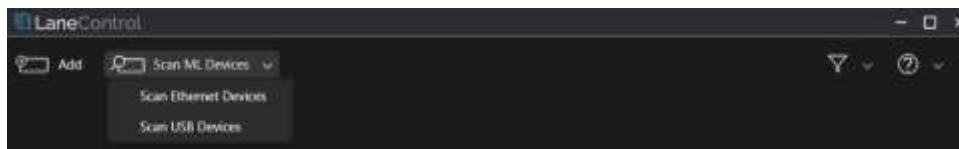
The process can be completed using [LaneControl GUI](#), using ethernet connection.

Follow the [LaneControl user guide](#) to install the GUI.

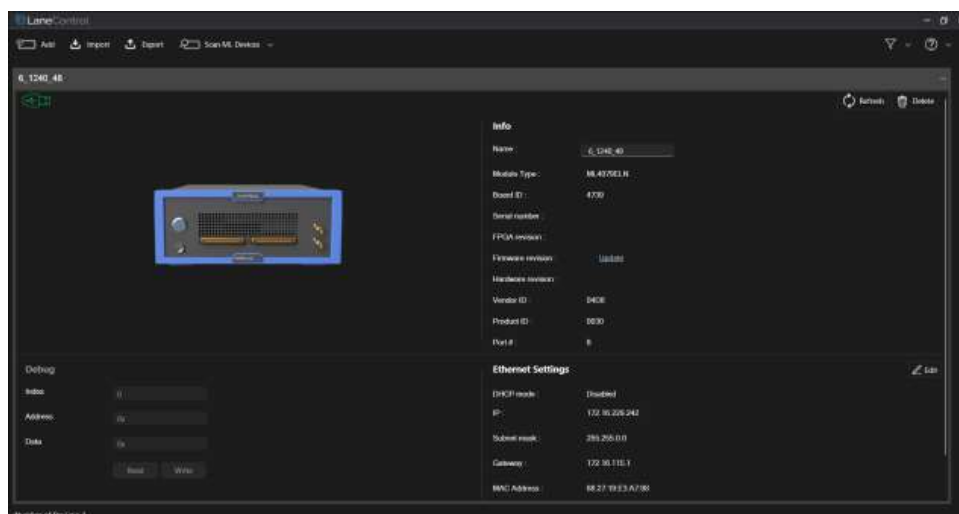
Note: IP addresses that begin with 169 will be considered not valid.

Changing the IP Address of the Instrument Using LaneControl

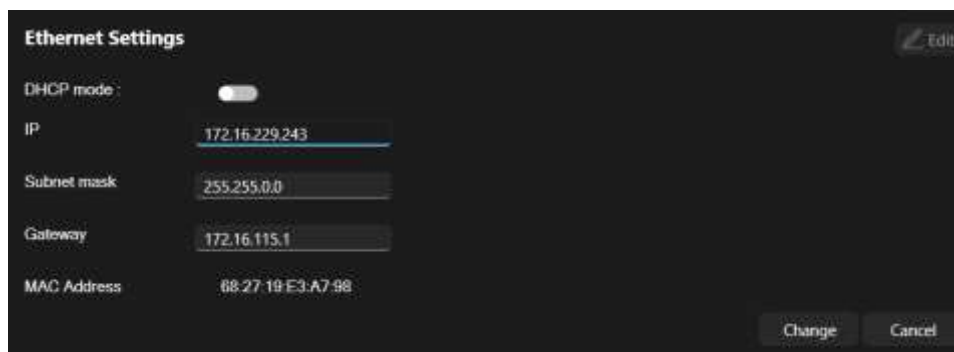
- **Follow** appendix 1 to add the BERT to the network
- **Connect** to the instrument using **Ethernet**
- **Launch** the LaneControl GUI
- **Scan** Ethernet Devices



- **Choose** the instrument from the list of instruments that appear



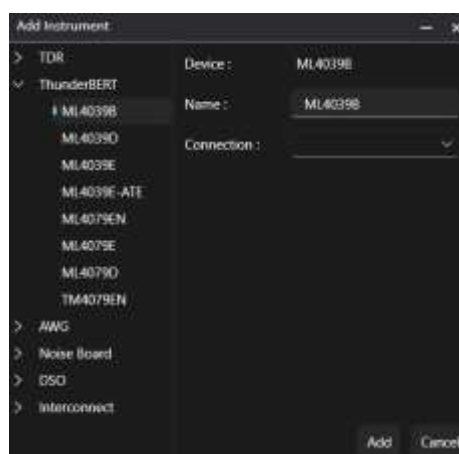
- **Edit** the device IP in the Ethernet Settings section



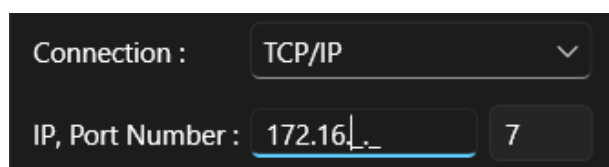
- **Click** Change
- **Power cycle** the instrument

Alternative way to add your instrument:

- **Add** an instrument manually through the Add window
- **Choose** on the left tree from the supported instruments



- **Choose** to connect through Ethernet
- **Provide** the IP address



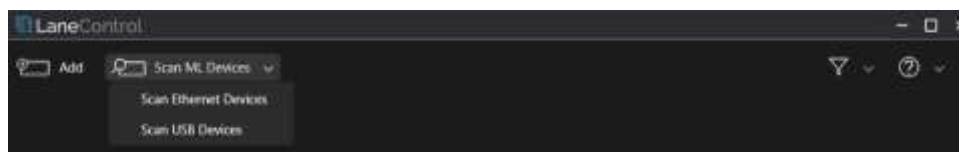
Appendix 4 – Firmware Upgrade: Step by Step Guide

The process can be completed using [LaneControl GUI](#), using USB connection.

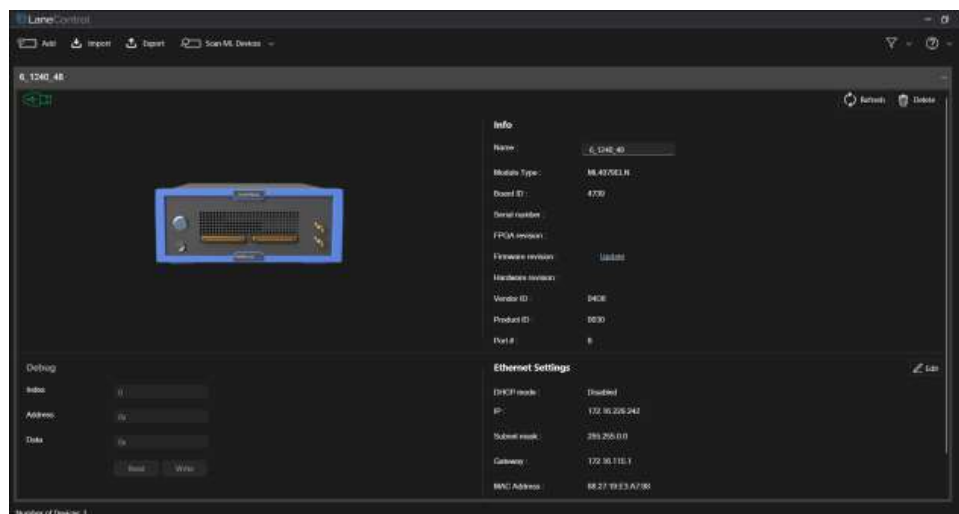
Follow the [LaneControl user guide](#) to install the GUI.

Upgrading Firmware of the Instrument Using LaneControl

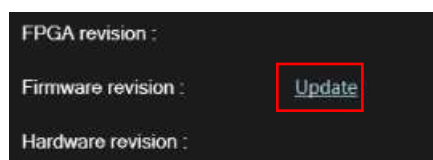
- **Launch** the LaneControl GUI
- **Connect** to the instrument using **USB**
- **Scan** USB Devices



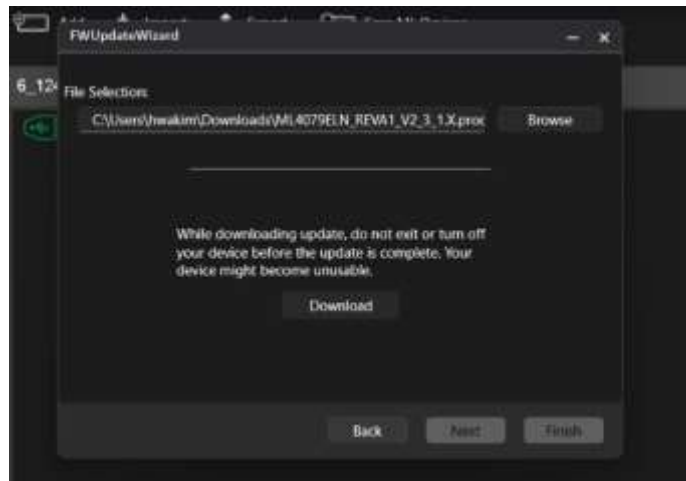
- **Choose** the instrument from the list of instruments that appear



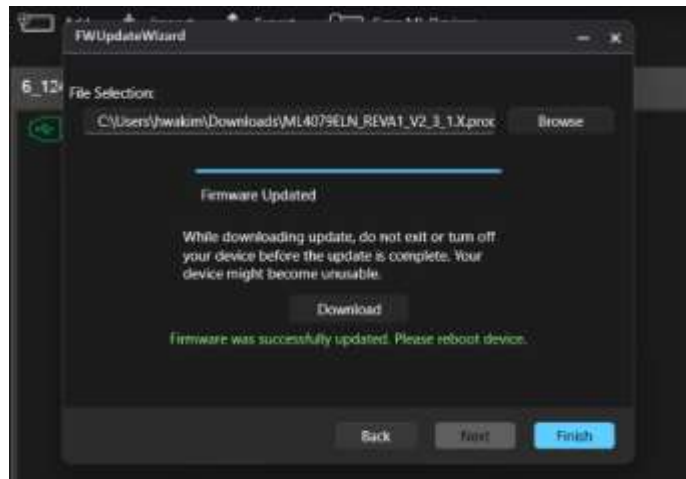
- **Click** Update in the Info section, next to Firmware revision



- **Read carefully** the instructions of the FWUpdateWizard
- **Select** "I have read and ensured FW update conditions are met"
- **Click** Next to proceed
- **Browse** for the .bin file of the new FW



- **Click** Download
- **Click** Finish once the download is completed



- **Power cycle** the instrument

For more information please contact our support team at: support@multilaneinc.com

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