TABOR ELECTRONICS

LUCID SERIES

Lucid/Lucid-X Control Panel (LCP) User Manual

Revision 1.2

Simulate, Stimulate, Test...

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Revision History

Table Document Revision History

Revision	Date	Description	Author
1.2	31-Mar-2025	• 2 Installation: Changed from "te_lucid_control_panel_x.y.zzz" to ""Lucid Control Panel_x.y.z".	Jakob Apelblat
1.1	11-Mar-2025	• Supporting Lucid Control Panel Ver. 1.3.550 and TE Update Tool Ver. 1.1.270 or higher. • Updated document formatting. • Major update of all dialog boxes. • 1.3 Related Documentation: Updated. • Figure 3.2 Communication Tab: Updated. • 3.3 Simultaneous Modulation Combinations: New. • 3.8 System Tab: Added a "Log & Command Editor". • Removed "Appendix FPGA Firmware Update". Refer to the "TE Update Tool User Manual". • 5 Appendix Log File: New.	Harshit Agrawal Jakob Apelblat
1.0	27-Jan-2021	• Original release supporting Lucid Control Panel Ver. 1.3.200 and TE Update Tool Ver. 1.1.000.	Jakob Apelblat

Acronyms & Abbreviations

Table Acronyms & Abbreviations

Acronym	Description
µs or us	Microseconds
ADC	Analog to Digital Converter
AM	Amplitude Modulation
ASIC	Application-Specific Integrated Circuit
ATE	Automatic Test Equipment
AWG	Arbitrary Waveform Generators
AWT	Arbitrary Waveform Transceiver
BNC	Bayonet Neill–Concelm (coax connector)
BW	Bandwidth
CW	Carrier Wave
DAC	Digital to Analog Converter
dBc	dB/carrier. The power ratio of a signal to a carrier signal, expressed in decibels
dBm	Decibel-Milliwatts. E.g., 0 dBm equals 1.0 mW.
DDC	Digital Down-Converter
DHCP	Dynamic Host Configuration Protocol
DSO	Digital Storage Oscilloscope
DUC	Digital Up-Converter
DUT	Device Under Test
ENoB	Effective Number of Bits
ESD	Electrostatic Discharge
EVM	Error Vector Magnitude
FPGA	Field-Programmable Gate Arrays
FW	Firmware
GHz	Gigahertz
GPIB	General Purpose Interface Bus
GS/s	Giga Samples per Second
GUI	Graphical User Interface
HID	Human Interface Device
HP	Horizontal Pitch (PXIe module horizontal width, 1 HP = 5.08mm)
Hz	Hertz
IF	Intermediate Frequency
I/O	Input / Output
IP	Internet Protocol
IQ	In-phase Quadrature
IVI	Interchangeable Virtual Instrument
JSON	JavaScript Object Notation
kHz	Kilohertz
LCD	Liquid Crystal Display
LO	Local Oscillator
MAC	Media Access Control (address)

Acronym	Description
MDR	Mini D Ribbon (connector)
MHz	Megahertz
ms	Milliseconds
NCO	Numerically Controlled Oscillator
ns	Nanoseconds
PC	Personal Computer
PCAP	Projected Capacitive Touch Panel
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect
PXI	PCI eXtension for Instrumentation
PXIe	PCI Express eXtension for Instrumentation
QC	Quantum Computing
Qubits	Quantum bits
R&D	Research & Development
RF	Radio Frequency
RT-DSO	Real-Time Digital Oscilloscope
s	Seconds
SA	Spectrum Analyzer
SCPI	Standard Commands for Programmable Instruments
SFDR	Spurious Free Dynamic Range
SFP	Software Front Panel
SINAD	Signal-to-Noise-And-Distortion Ratio
SMA	Subminiature version A connector
SMP	Subminiature Push-on connector
SPI	Serial Peripheral Interface
SRAM	Static Random-Access Memory
TFT	Thin Film Transistor
T&M	Test and Measurement
TPS	Test Program Sets
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus
VCP	Virtual COM Port
Vdc	Volts, Direct Current
V p-p	Volts, Peak-to-Peak
VSA	Vector Signal Analyzer
VSG	Vector Signal Generator
WDS	Wave Design Studio

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1 General

The scope of this manual is to describe the setup and operating procedures of the Lucid Control Panel (LCP). It is a software package that can be downloaded from the Tabor web site. It enables full control and programming of your Tabor Electronics Lucid Series of devices via a user-friendly graphical user interface. LCP supports both the legacy Lucid (up to 12 GHz) and the new Lucid-X (up to 40 GHz).

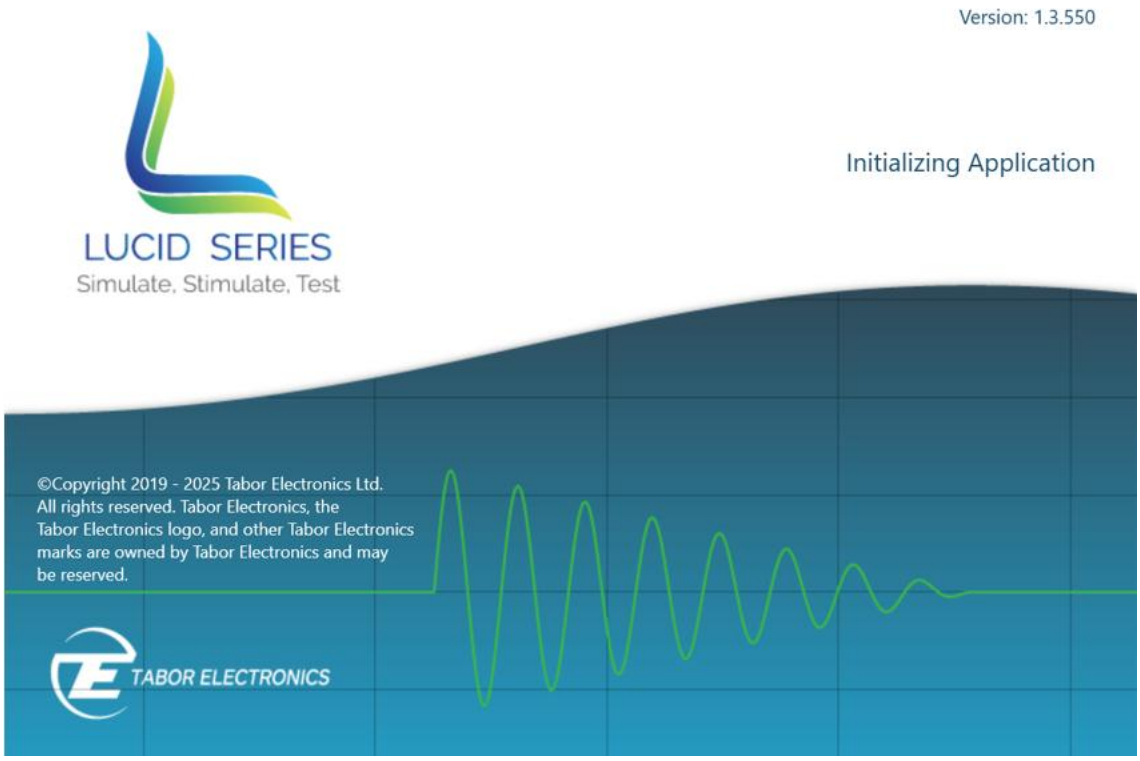


Figure 1.1 Lucid Control Panel Splash Screen

1.1 Lucid Control Panel Software Requirements

The Lucid Control Panel software installation requires the following:

- A PC running Windows 10 or Windows 7.
- A USB port for direct connection of the PC to the Lucid Benchtop, or
- An RJ45 Ethernet port.
- An optional CD device if no Internet connection is available for downloading the SW installation from the Tabor download site.

1.2 Document Conventions

1.2.1 General

Convention	Description	Example
Bold Writing	Indicates an item/message in the User Interface.	Click the **On** button.
<Angled and Bolded Brackets>	Indicates a physical key on the keyboard.	Press <Ctrl>+<B>.

Caution!

A Caution indicates instructions, which, if not followed, may result in damage to the equipment or to the loss of data.

Note

A Note provides additional information to help obtain optimal equipment performance.

Idea

An Idea provides an alternate procedure to obtain the same results.

1.3 Related Documentation

- Lucid Programming Manual
- Lucid-X Programming Manual
- TE Update Tool User Manual
- Lucid Benchtop User Manual
- Lucid-X Benchtop User Manual
- Lucid Desktop User Manual
- Lucid-X Desktop User Manual
- Lucid Portable User Manual
- Lucid-X Portable User Manual
- Lucid Rackmount User Manual
- Lucid-X Rackmount User Manual
- Lucid-X PXIe User Manual

2 Installation

The Lucid series instruments are managed by the Lucid Control Panel (LCP) software, a user-friendly program that controls instrument functions and features from a remote computer. The following installation procedure will install both the LCP software and driver that will enable controlling the instrument from remote. You can download the latest LCP from the Tabor Electronics website at https://www.taborelec.com/Downloads.

> **Note**
> The driver for the instrument is only installed if no driver is detected on the PC. When updating the LCP software to the newest version steps 12 to 19 will not be performed.

1. Locate the "Lucid Control Panel_x.y.z" installation file in the destination folder to which it was downloaded.

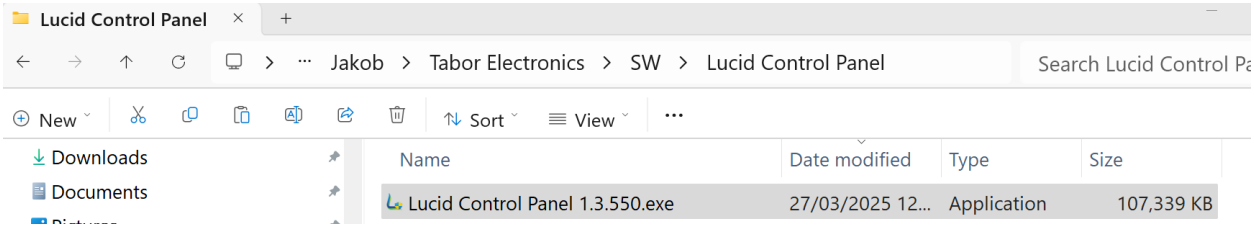


Figure 2.1 LCP Setup Installation File

2. Double-click the **Lucid Control Panel x.y.z** installation file.
3. A windows User Account Control confirmation window is displayed.

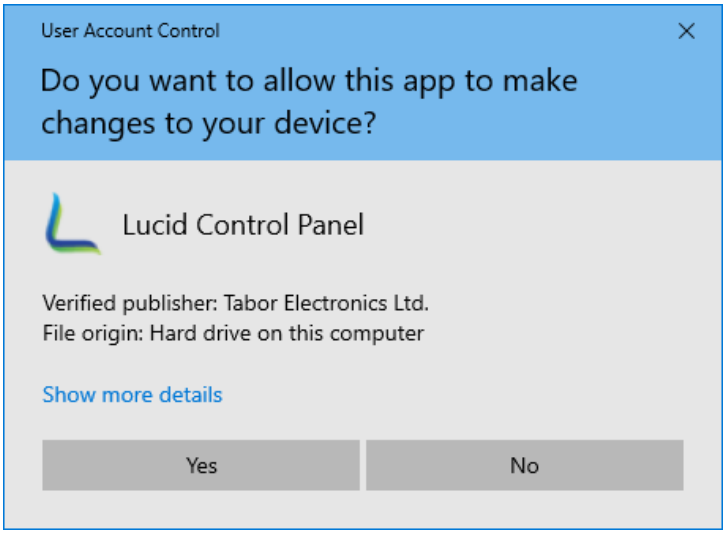


Figure 2.2 User Account Control

4. Click the **YES** button.
5. The "Welcome to the Prerequisites Setup Wizard" screen is displayed.

Note

The screen is only displayed for a first-time installation and not when updating the LCP.

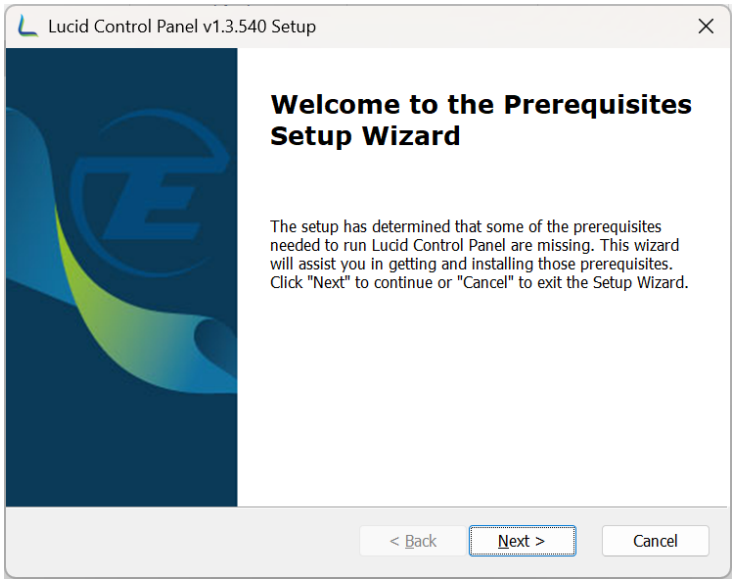


Figure 2.3 Welcome to the Prerequisites Setup Wizard

6. The Prerequisites screen is displayed.

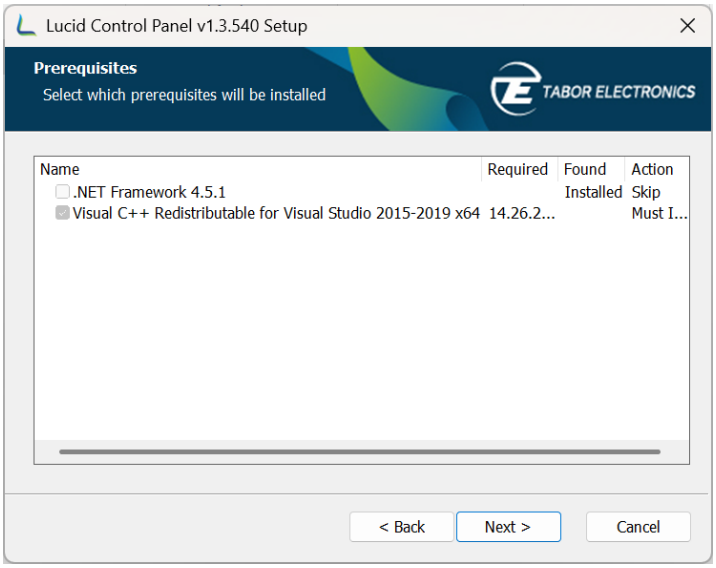


Figure 2.4 Prerequisites

7. The “Installing prerequisites for Lucid Control Panel” screen is displayed.

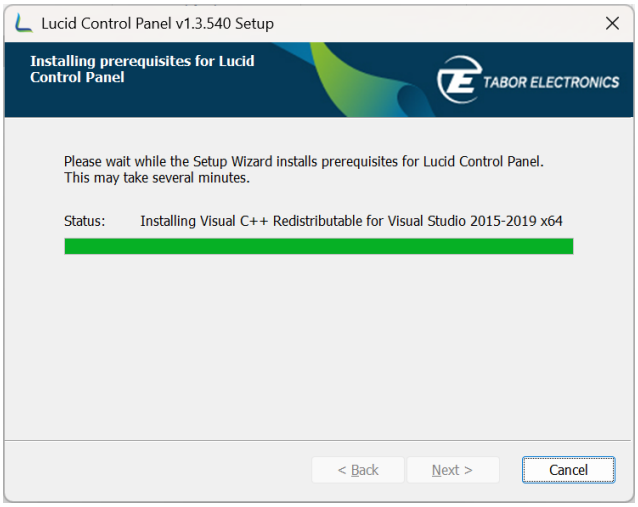


Figure 2.5 Installing prerequisites for Lucid Control Panel

8. The “Microsoft Visual C…” screen is displayed.

   a. Check I agree and click Install.

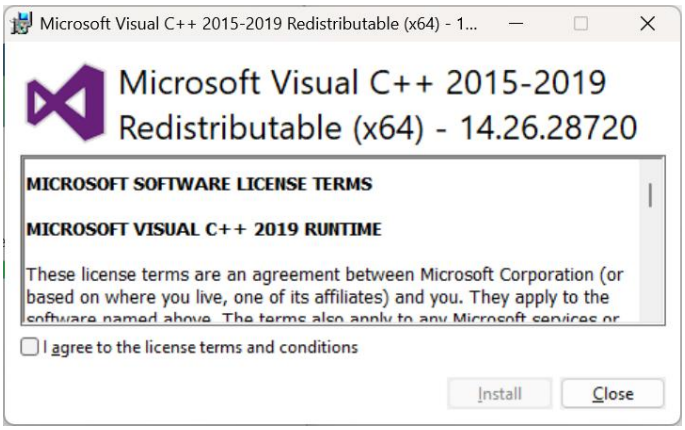


Figure 2.6 Microsoft Visual C…

9. The “Microsoft Visual C… Setup Successful” screen is displayed.

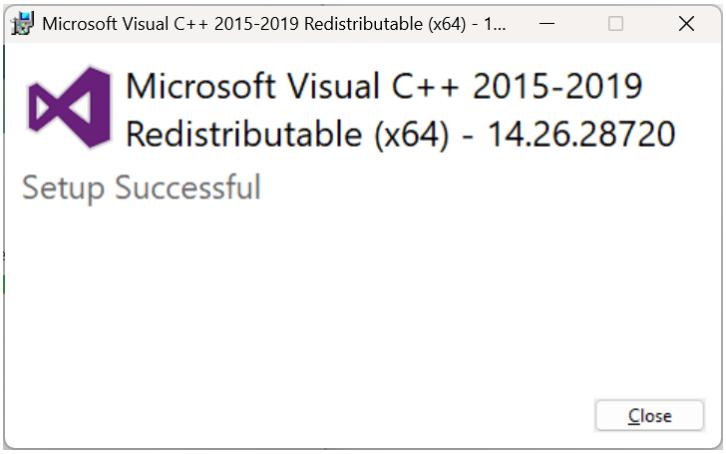


Figure 2.7 Microsoft Visual C... Setup Successful

10. The Welcome screen is displayed.

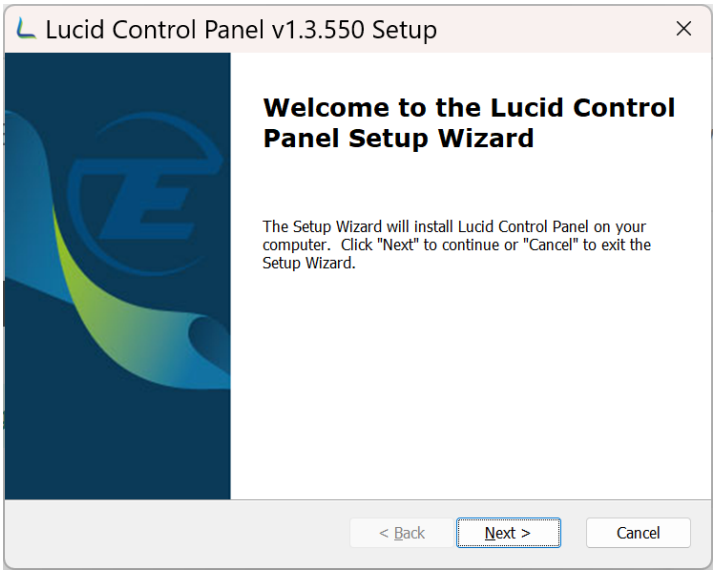


Figure 2.8 Welcome to the Lucid Setup Wizard

11. Click **Next.**

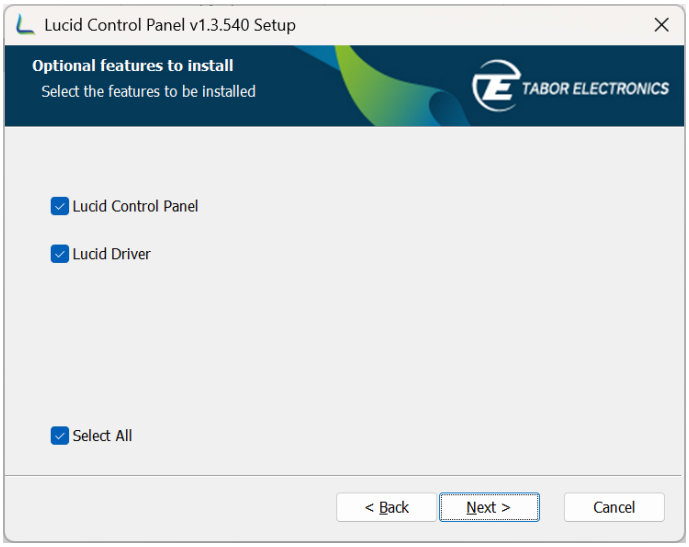


Figure 2.9 Optional features to install

12. Check **Select ALL**.
13. Click **Next**.

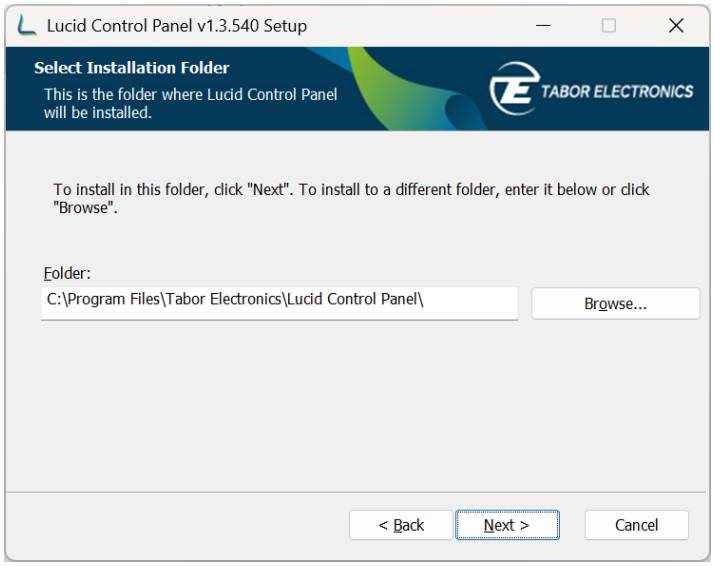


Figure 2.10 Select Installation Folder

14. Enter the destination directory for the **Lucid** software or browse to a destination directory by clicking the **Browse** button.
15. Click the **Next** button.
    The **Ready to Install** screen is displayed.

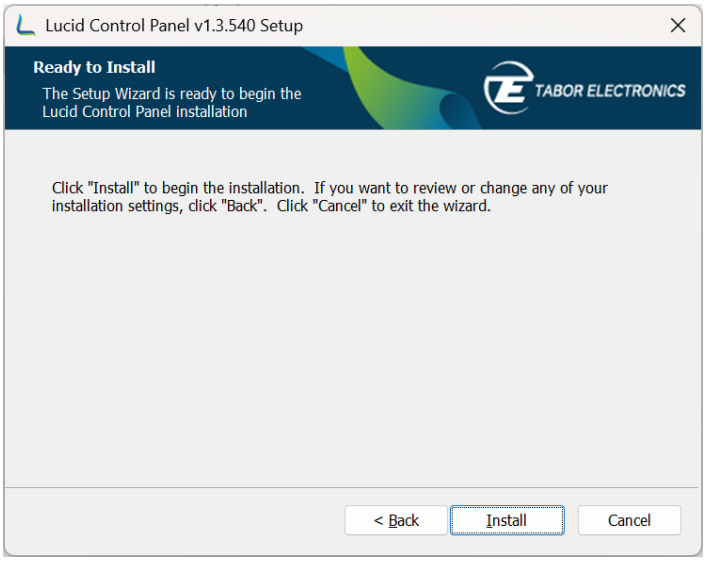


Figure 2.11 Ready to Install

16. Click the **Install** button.

17. The **Lucid** software installation starts.

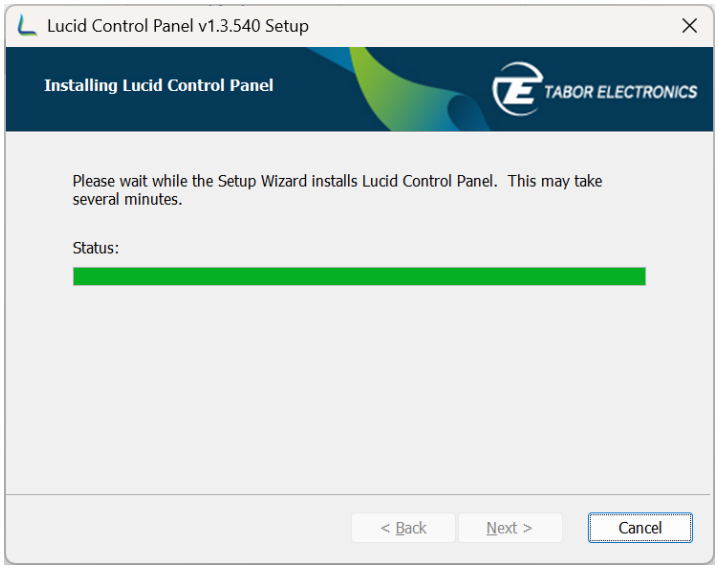


Figure 2.12 Installing Lucid

18. Wait for the installation process to complete.

19. The “Welcome to the Tabor Electronics Lucid USB Driver Installer” dialog box is displayed.

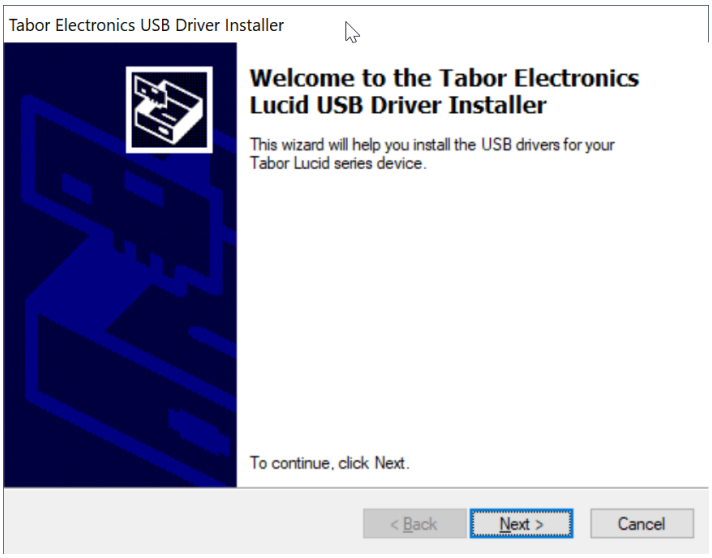


Figure 2.13 Welcome to the Tabor Electronics Lucid USB Driver Installer

20. Click the **Next** button to start the driver installation process.

21. The “License Agreement” dialog box is displayed.

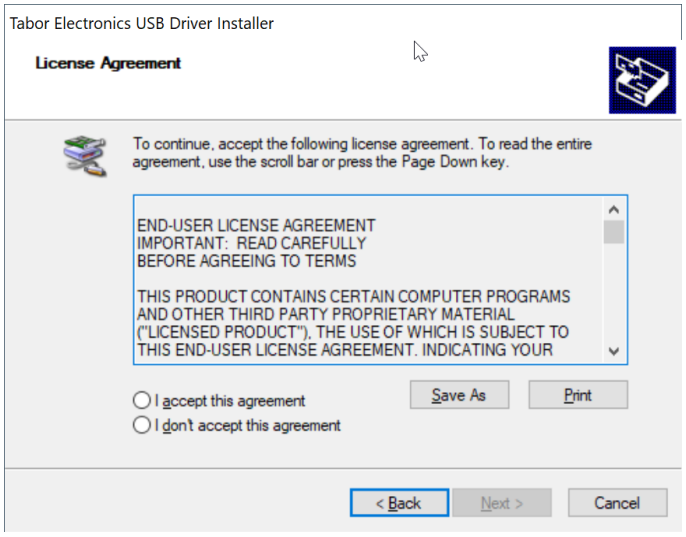


Figure 2.14 License Agreement

22. Check “I accept the agreement” and click the **Next** button.

23. The “Completing the Tabor Electronics Lucid USB Driver” dialog box is displayed.

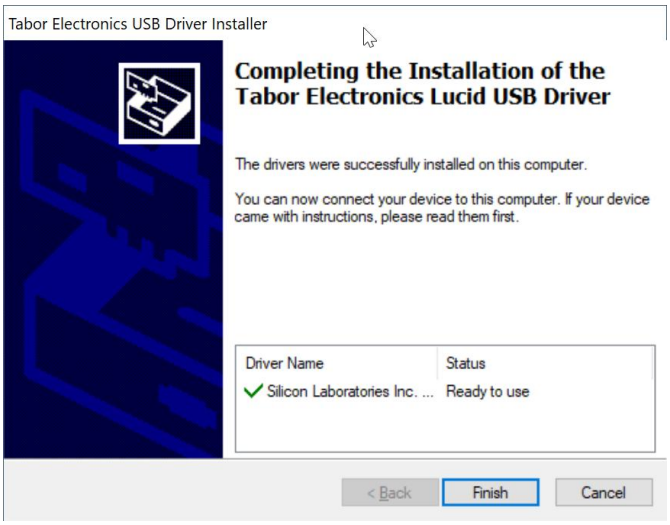


Figure 2.15 Completing the Tabor Electronics Lucid USB Driver

24. Click the **Finish** button.

25. The “Optional features to install” dialog box is displayed.

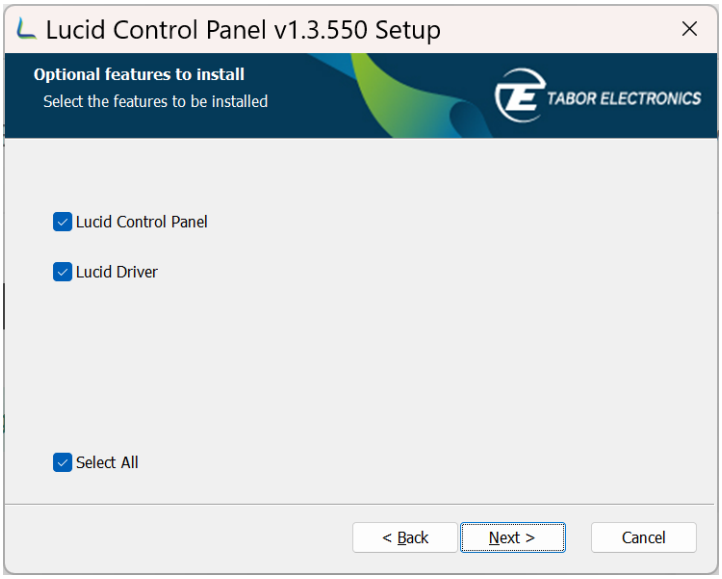


Figure 2.16 Optional features to install

26. Click the **Next** button.

27. The “Select Installation Folder” dialog box is displayed.

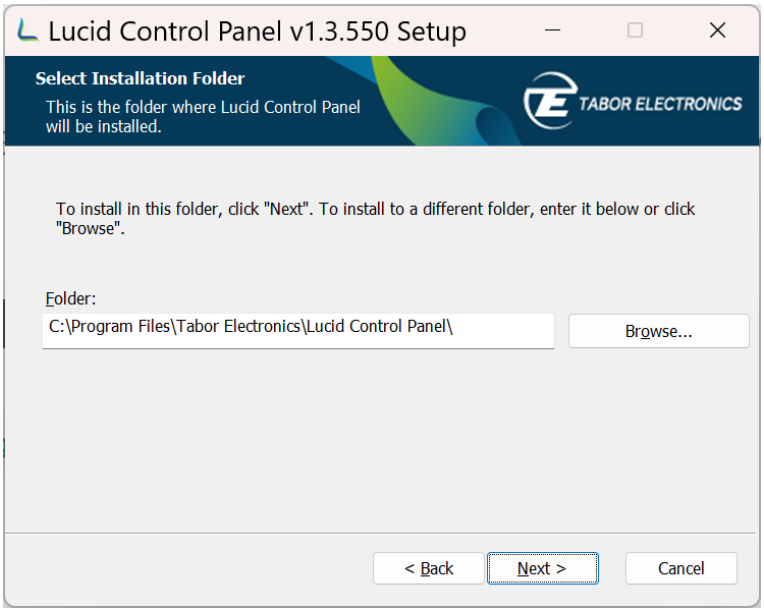


Figure 2.17 Select Installation Folder

28. Click the **Next** button. The “Ready to Install” dialog box is displayed.

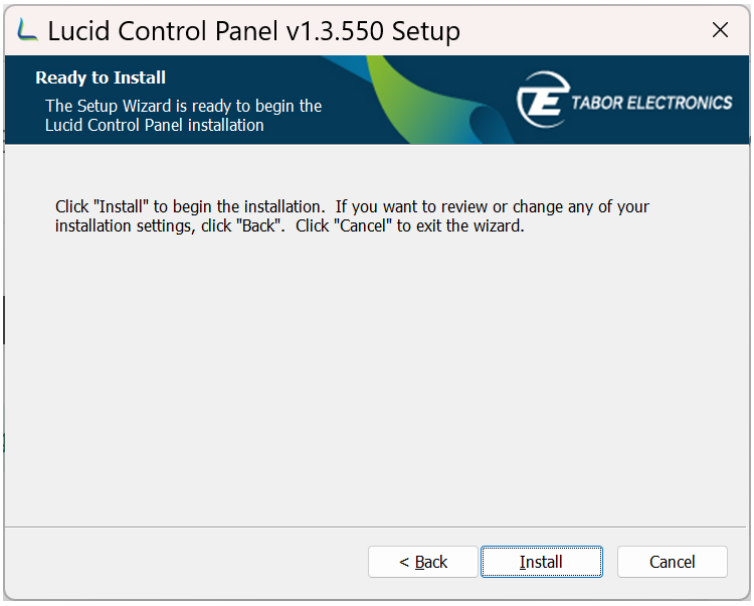


Figure 2.18 Ready to Install

29. Click the “**Install**” button. The “Installing Lucid Control Panel” dialog box is displayed.

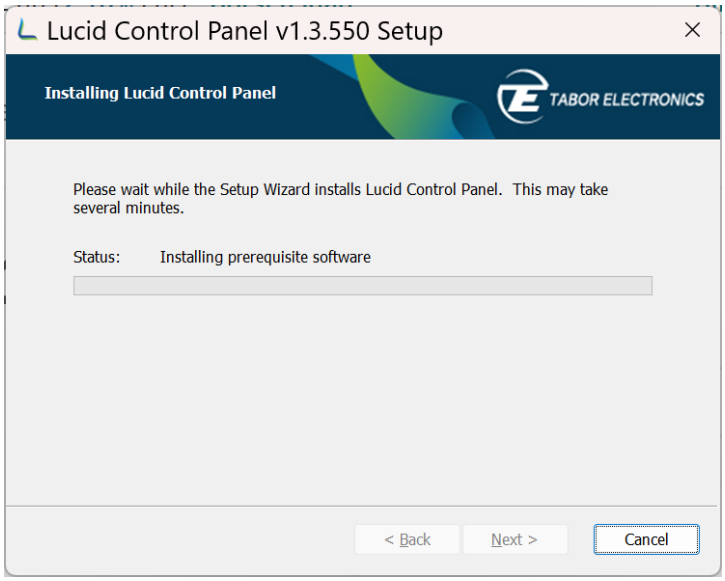


Figure 2.19 Installing Lucid Control Panel

30. The “Welcome to the Tabor Electronics Lucid USB Driver Installer” dialog box is displayed.

Figure 2.20 Welcome to the Tabor Electronics Lucid USB Driver Installer

31. The “License Agreement" dialog box is displayed. Click “I accept the agreement” and click then the **Next** button.

32. The “Completing the Installation of the Tabor Electronics Lucid USB Driver" dialog box is displayed.

Figure 2.21 Completing the Installation of the Tabor Electronics Lucid USB Driver

33. Click the "**Finish**" button.
34. The "Completing the Lucid Control Panel Setup Wizard" dialog box is displayed.

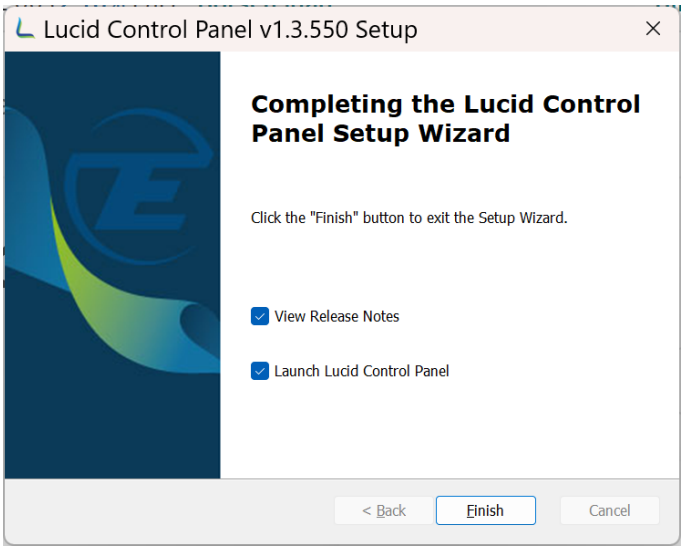


Figure 2.22 Completing the Installation of the Tabor Electronics Lucid USB Driver

35. Click the "Finish" button. The driver and software have been installed.
36. A Lucid shortcut is installed on the desktop

.
37. Use the supplied USB cable to connect the Lucid benchtop model to the PC. You can also connect Lucid to a LAN using an RJ45 cable (not supplied) and control it via a PC connected to the same LAN. Refer to 3.2 Communication Tab.
38. The instrument can now be remotely controlled. For instructions on how to control the instrument with the Lucid software refer to section 3.2 Communication Tab.

3 Operation

3.1 Program Start

1. Double-click the Lucid shortcut on the desktop . The Lucid program is initialized.

Figure 3.1 Lucid Initializing Application

2. Wait for the Communications tab to display.

3.2 Communication Tab

This is the first screen to be displayed after the software is activated. From here the user establishes communication with all the connected instruments.

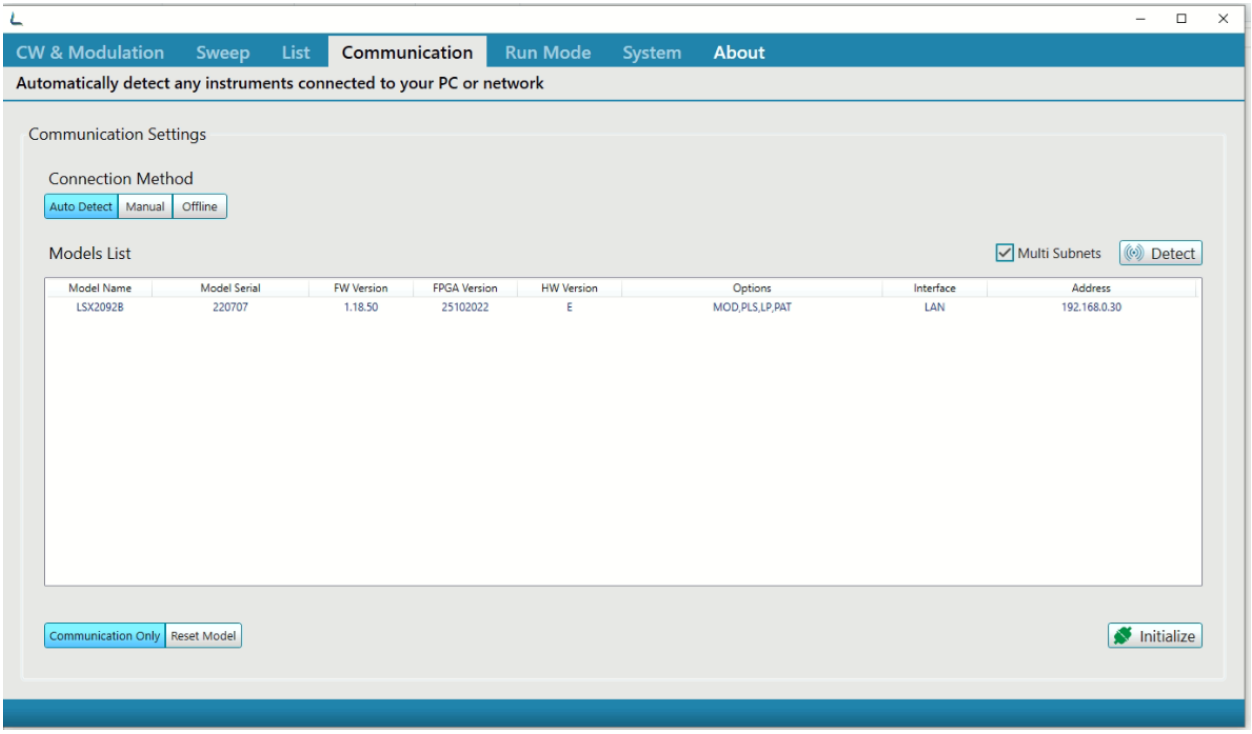


Figure 3.2 Communication Tab Auto Detect

Following is the menu description:

- **Auto Detect** –Click the button to enable the Lucid software to automatically detect all connected instruments.
  - **Multi Subnets** – Detect devices on LAN subnets.
  - **Detect** – Click the button to initialize the detection process. At the end of the process, the following information is displayed:
    - **Model Name** – The ordering information model, e.g., LS1291D.
    - **Model Serial** – The serial number of the device.
    - **FW Version** – The embedded MCU firmware version.
    - **FPGA Version** – The FPGA firmware version of the device.
    - **HW Version** – The device hardware board version
    - **Options** – The options included in the device.
      - **MOD** – Modulation package (AM, FM, PM).
      - **LP**: Low power option -70 dBm.
      - **ELP**: Extended low power range -150 dBm.
      - **EPR**: Extended power range -130dBm to +20dBm.
      - **PLS**: Pulse modulation
      - **PAT**: Pattern modulation
      - **FS**: Fast switching 100 µs
      - **EMU**: Emulator pack for Keysight, R&S, Anapico & Holzworth
    - **Interface** – Active communication interface.
      - **USB**
      - **HID** (Lucid Benchtop only)

- **LAN** (Lucid Benchtop only)
- **Address** – IP or USB physical address. For USB, the following parameters are displayed:
  - **vid** – vendor ID.
  - **pid** – product ID.
  - **serial** – A unique serial string programmed at the factory and used to distinguish between devices.

- **Manual** – Click this button to enable manually connecting to the generator. After entering the generator's address (IP address or USB address.

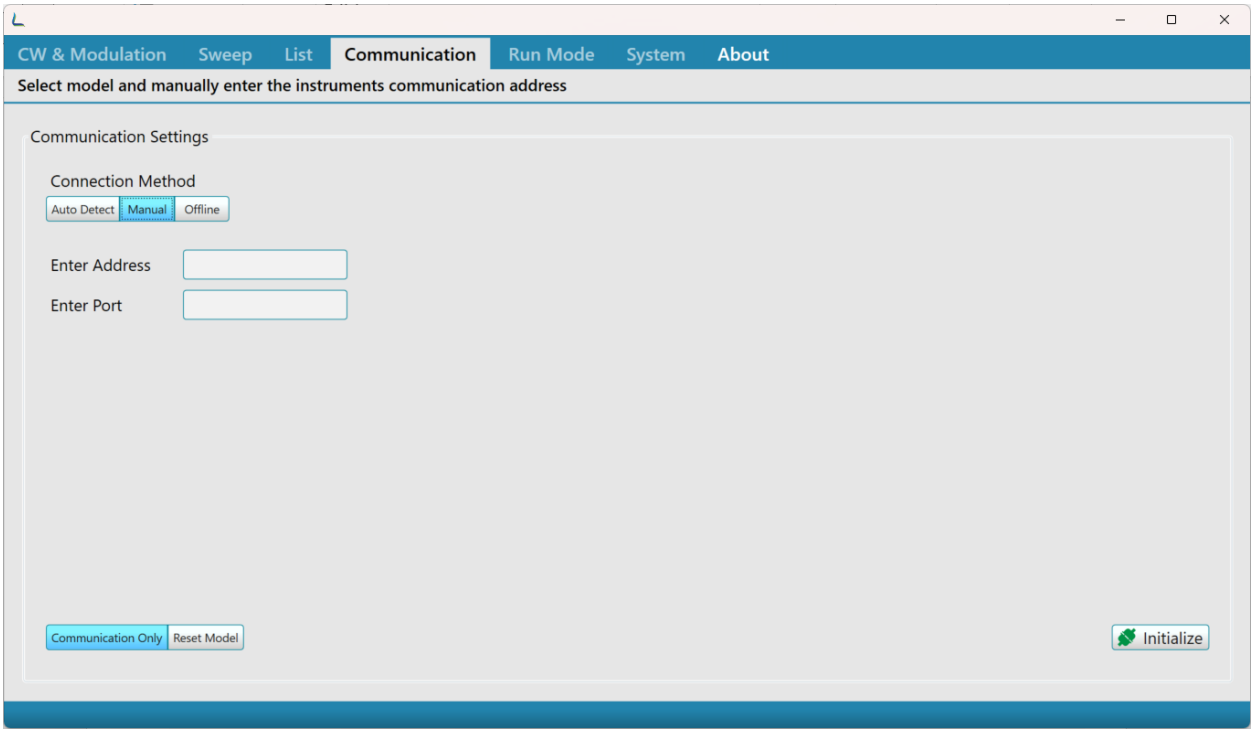


Figure 3.3 Communication Tab Manual

- **Offline** – Click this button to select a model from the drop-down list and simulate as if the software is connected is connected to the generator.

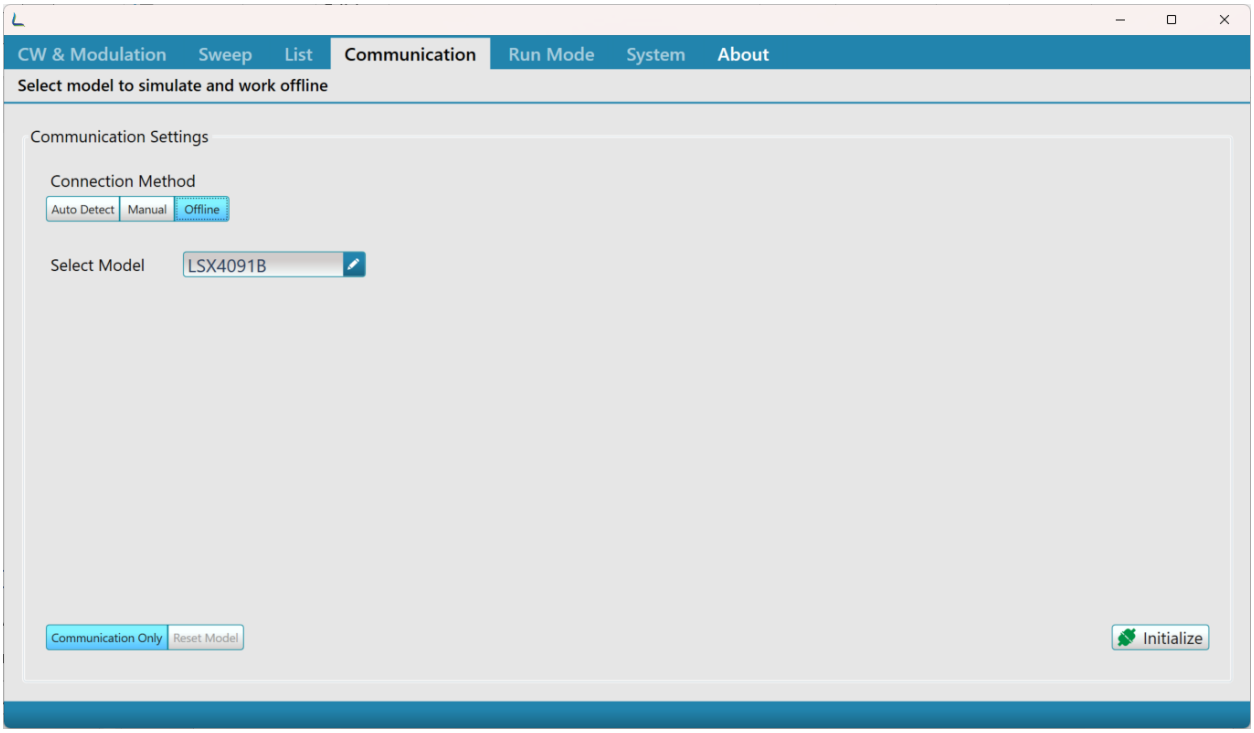


Figure 3.4 Communication Tab Offline

By selecting one of the following functions, the user sets the Initialization mode:

- **Communication Only** – When the Initialize button is clicked, communication is established, using the currently loaded setup (the last setup used).
- **Reset Model** – When the Initialize button is clicked, communication is established, the generator setup is reset.
- **Initialize** – Click to initialize communication with the selected instrument. Once clicked, other tabs of the screen become available and can be accessed.

Note

For information about options available for the Lucid Series RF Generator, refer to your Lucid device user manual.

3.3 Simultaneous Modulation Combinations

Note

The below warning will be displayed if you use Pulse, Pattern, Frequency Sweep, Power Sweep, and List simultaneously or any combination of them.

Figure 3.5 Setting Conflict

3.4 CW & Modulation Tab

The CW (Carrier Wave) & Modulation tab becomes available after connectivity with the generator is established. From here the user can set the basic output parameters of the generator. The modulation types that are available depend on the installed options.

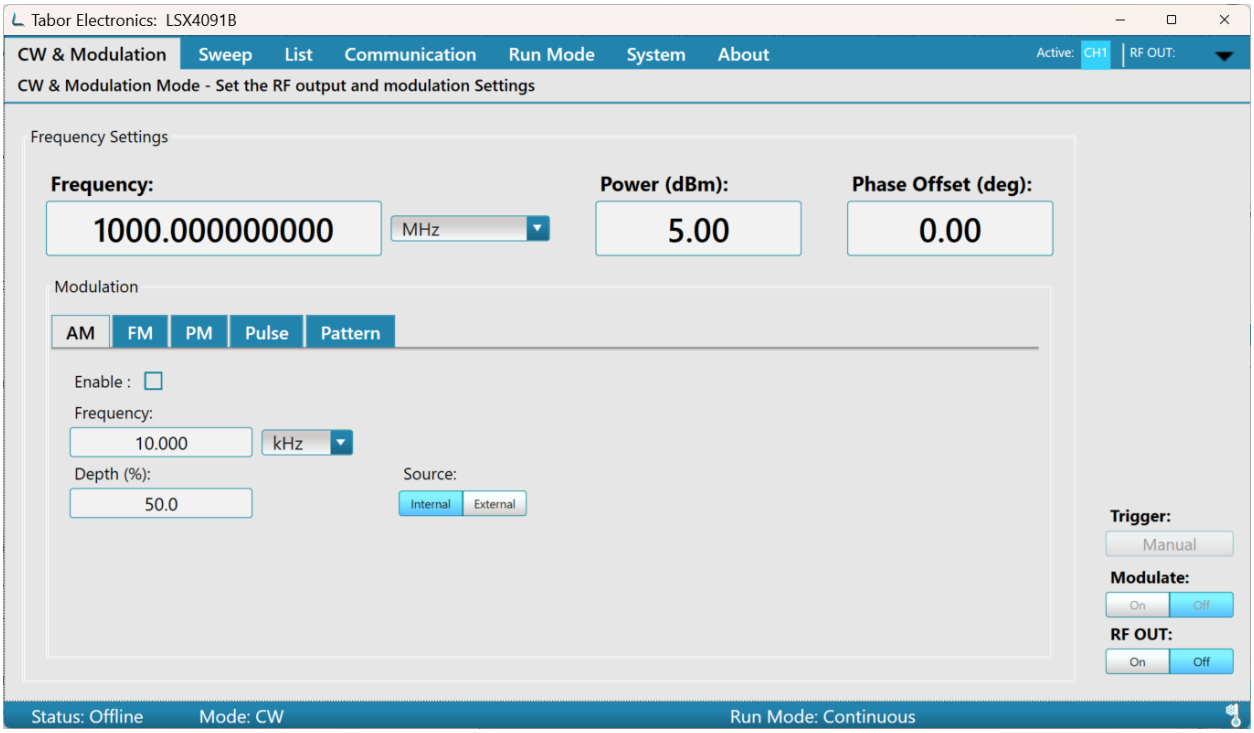


Figure 3.6 CW & Modulation Tab

- **Frequency** – Sets the generator's carrier wave frequency.
  The range of the entered value can be changed by using the drop-down list (Hz, kHz, MHz, GHz). The default frequency is 1000 MHz. Refer to the Lucid Device User Manual section Specifications for valid frequency range.

> **Idea**
> The shortcut for selecting the frequency range is ***<First Letter>***. For example, typing the value **5** and pressing **<G>** results in 5 GHz.

- **Power (dBm):** – Sets the power (amplitude) of the generator's output signal (in dBm). The default value is 5.00 dBm.

- **Phase Offset (deg):** – Sets the phase offset of the signal. Phase offset range is between **0 degrees** to **360 degrees**. The default value is 0 degrees.
- **Modulation** – Sets the signal modulation. Available modulation types depend on the installed options. For information about options available for the Lucid Series RF Generator, refer to your Lucid device user manual.
- Status Bar – The bar at the bottom of the screen displays a summary of the system status.
  - **Status**
    - **Offline** – Not connected to a device.
    - **Online** – Connected to a device.
  - **Mode** – Shows which modulation is on (press Mode ON/Off in the respective modulation window).
    - **CW** – Carrier wave (default)
    - **AM** – Amplitude modulation
    - **FM** – Frequency modulation
    - **PM** – Phase modulation
    - **PULSE** – Pulse modulation
    - **PATT** – Pattern modulation
    - **FRSW** – Frequency sweep mode is selected
    - **PRSW** – Power sweep mode is selected
    - **LIST** – List mode is selected
  - **Run Mode**:
    - **Continuous** – The device will generate a signal when the user clicks the RF OUT On button.
    - **Trigger** – The device waits for an external/internal trigger event.
  - **Source**:
    - **Internal** – The modulation source is the generator.
    - **External** – The modulation source is an external connected source.
  - **Thermometer**
    - **Blue** – Normal temperature up to 65℃.
    - **Red** – Overheated. The device temperature is above 65℃ for more than 30s. Turn off the device immediately!

3.4.1 AM – Amplitude Modulation

Select the CW & Modulation tab, and then click the AM button to show the amplitude modulation parameters. You can set the amplitude modulation frequency and the amplitude depth.

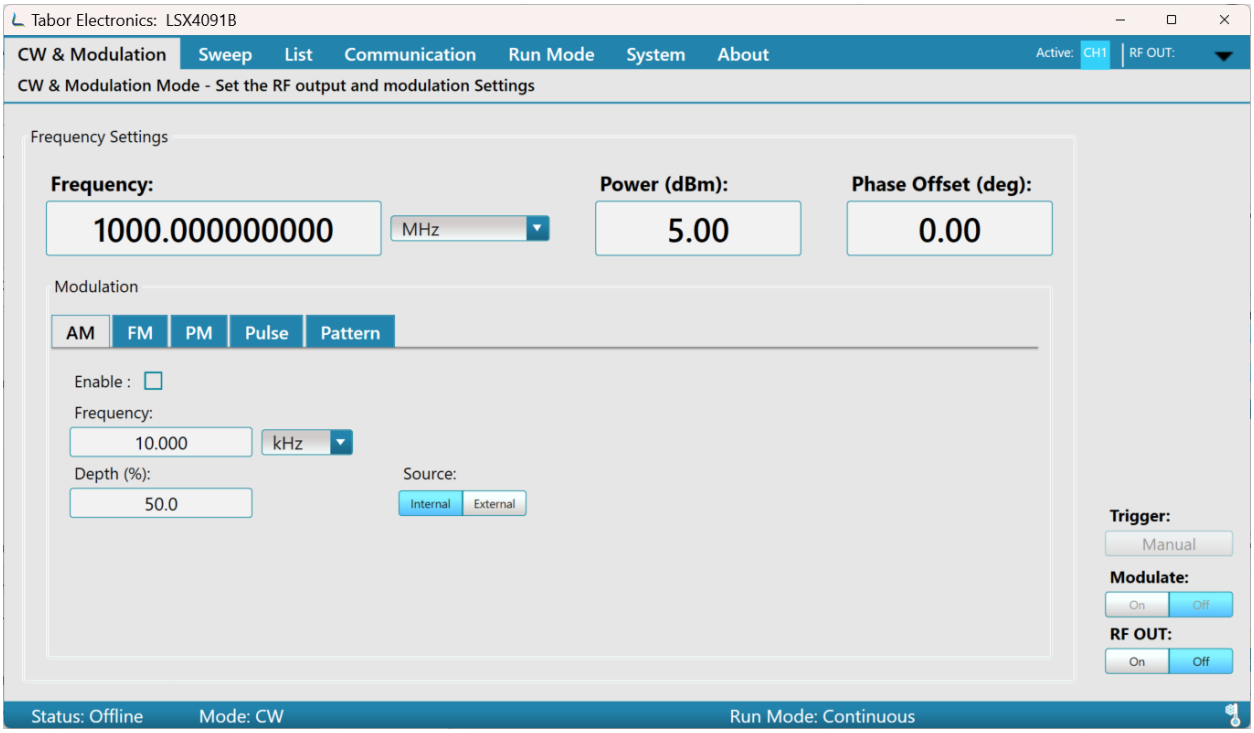


Figure 3.7 AM – Amplitude Modulation

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.
- **Frequency:** – Set the modulation frequency (Hz/kHz).
- **Depth (%):** – Set the AM modulation in percent of the carrier wave amplitude.
- **Source**:
  - **Internal** – Use the screen modulation parameters.
  - **External** – Use an AM source connected to the generator's MODULATION IN connector located on the rear panel. The Generator will accept modulating signals between DC and 100 kHz within ±1 V (2 V p-p) amplitude.
- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the **On/Off** button to start/stop the enabled modulation when setting **RF OUT On**.
- **RF OUT:** – Push the **On** button to generate the RF output signal. If the **Modulate** is **Off** only the carrier wave without modulation is generated.

3.4.2 FM – Frequency Modulation

Select the CW & Modulation tab, and then click the FM button to show the frequency modulation parameters. You can set the modulation frequency and the frequency deviation.

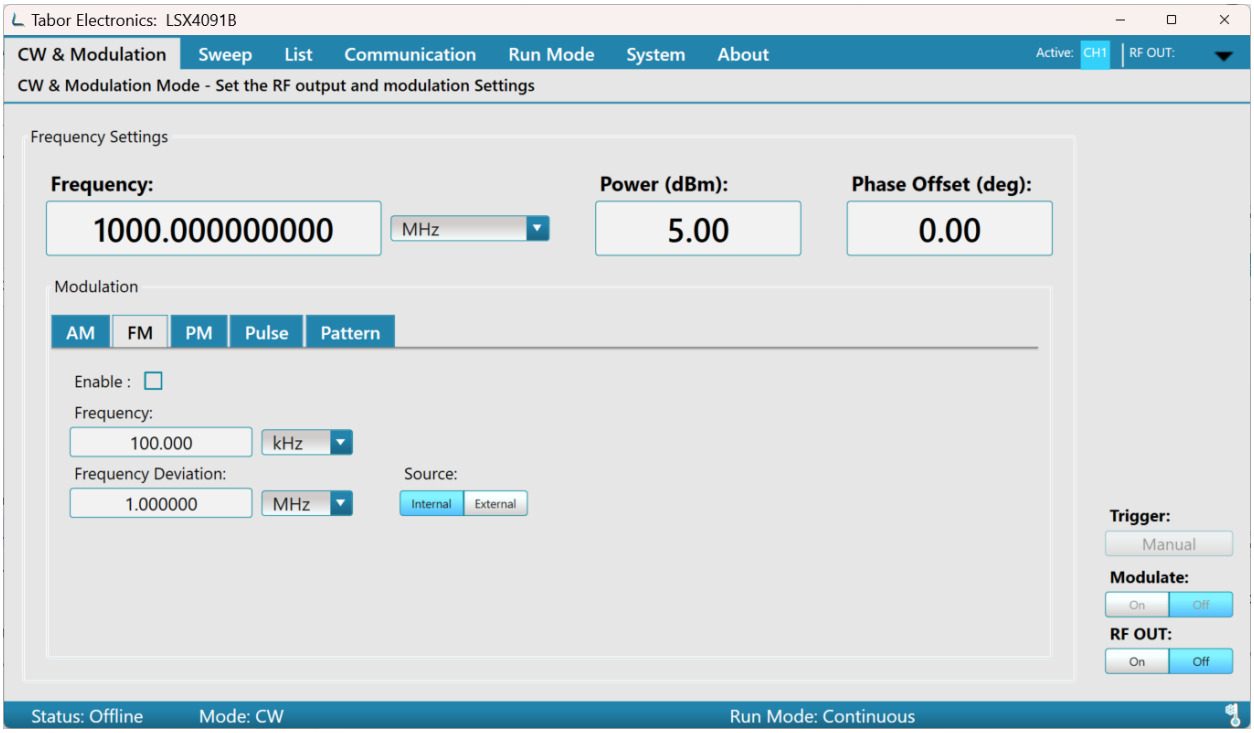


Figure 3.8 FM – Frequency Modulation

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.
- **Frequency:** – Set the modulation frequency (Hz/kHz/MHz).
- **Frequency Deviation:** – Set the frequency deviation of the carrier wave in (Hz/kHz/MHz/GHz).
- **Source**:
  - **Internal** – Use the screen modulation parameters.
  - **External** – Use an FM source connected to the generator's MODULATION IN connector located on the rear panel. The Generator will accept modulating signals between ±1 V (2 V p-p) amplitude.
- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the **On/Off** button on the device front panel to start the modulation.
- **RF OUT:** – Push the **On** button to generate the RF output signal.

3.4.3 PM – Phase Modulation

Select the CW & Modulation tab, and then click the PM button to show the phase modulation parameters. You can set the phase modulation frequency and the phase deviation.

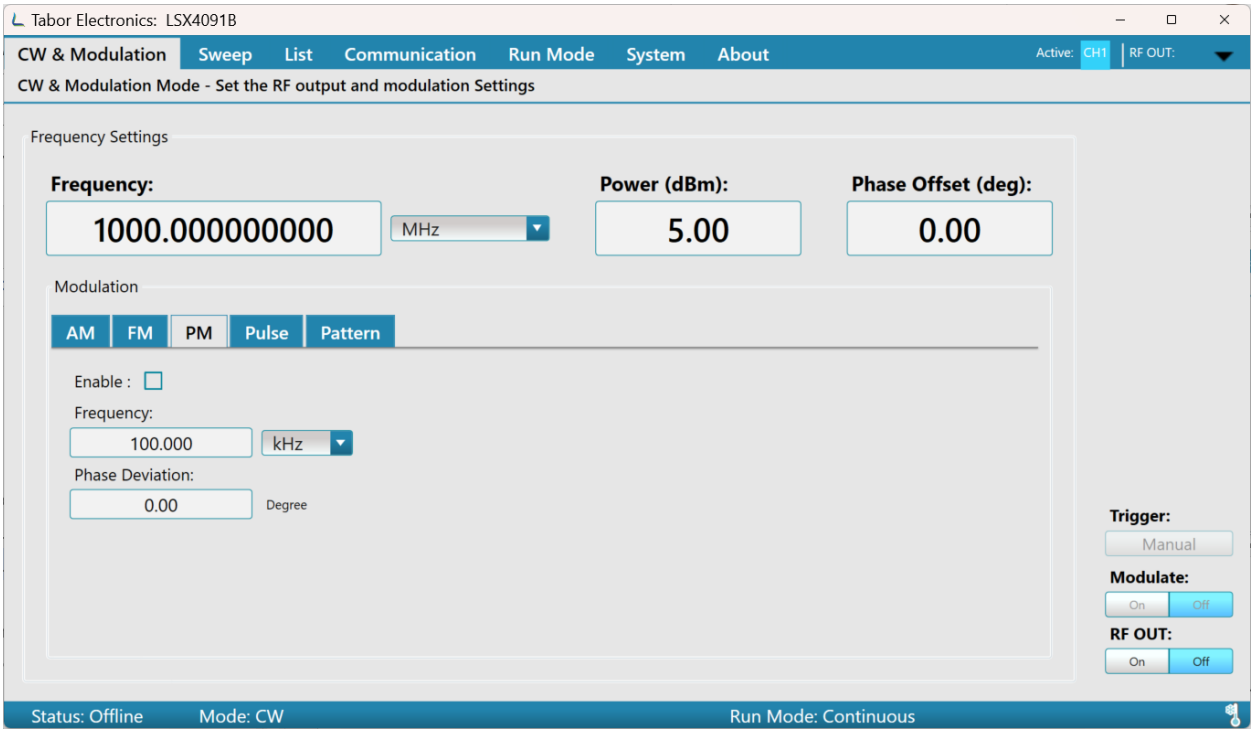


Figure 3.9 PM – Phase Modulation

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.
- **Frequency:** – Set the modulation frequency (Hz/kHz/MHz).
- **Phase Deviation:** – Set the phase deviation degree of the modulation frequency (0 to 360 degrees).
- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the **On/Off** button on the device front panel to start the modulation.
- **RF OUT:** – Push the **On** button to generate the RF output signal.

3.4.4 Pulse Modulation

Select the CW & Modulation tab, and then click the Pulse button to show the pulse parameters. You can set the pulse width and repetition rate.

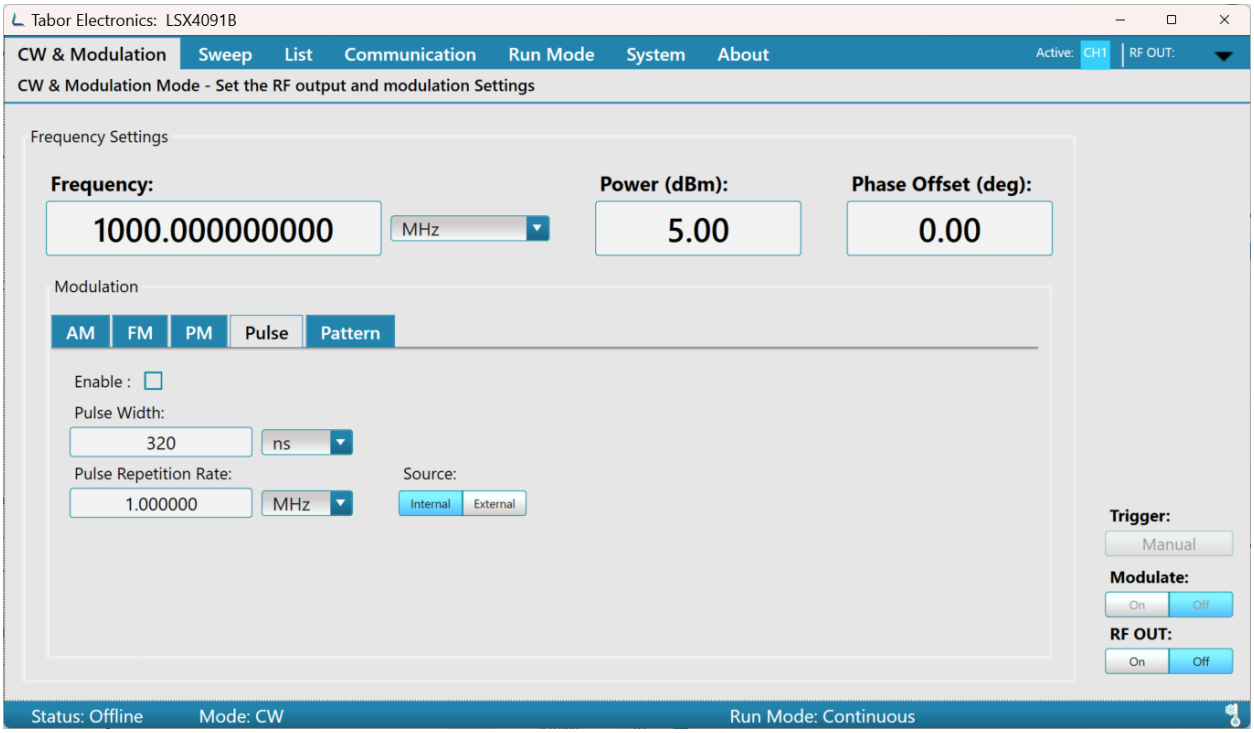


Figure 3.10 Pulse Definition

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.
- **Pulse Width:** – Set the pulse width (ns/µs/ms/s).
- **Pulse repetition rate:** – Set the pulse frequency (Hz/kHz/MHz).
- **Source**:
  - **Internal** – Use the screen modulation parameters.
  - **External** – Use a pulse source connected to the generator's MODULATION IN connector located on the rear panel. The Generator will accept modulating signals between ±1 V (2 V p-p) amplitude.
- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the **On/Off** button on the device front panel to start the modulation.
- **RF OUT:** – Push the **On** button to generate the RF output signal.

3.4.5 Pattern Sequence

Select the CW & Modulation tab, and then click the PATTERN button to show the pattern sequence parameters. You can set a sequence of pulses according to the list of pulses where each step in the list defines a pulse Time On and Time Off time and the number of step repetitions.

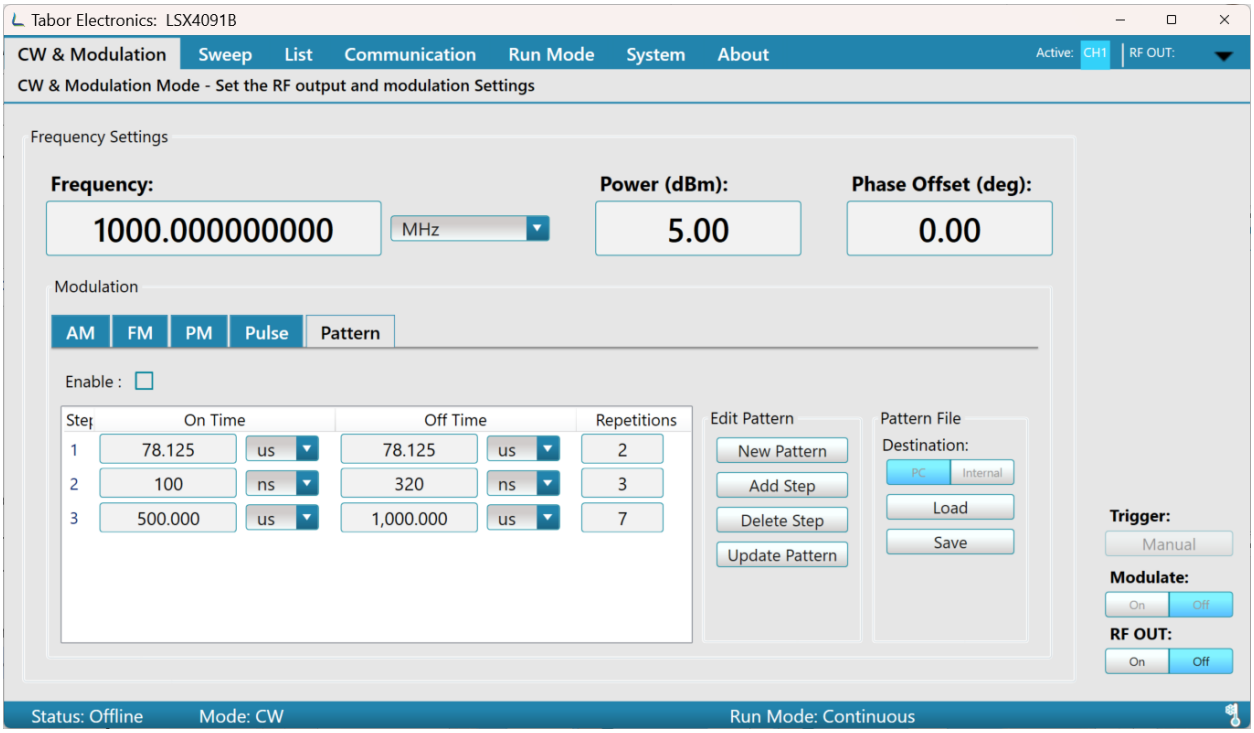


Figure 3.11 Pattern Sequence

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.

Edit Pattern

Define a pattern according to the steps below.

1. **NEW Pattern** – Click the button to create a new Pattern.

1. **Add STEP** – Click the button to add a new step.

2. Enter the duration of the pulse (On Time), the delay for next pulse (Off Time), and the number of loops (Repetitions) of this step.

3. **Delete STEP** – Click the button to delete the last step.

4. **Update Pattern** – Click the button to upload the Pattern to the instrument.

Pattern File

1. **Destination**:

   a. **PC** — Click the button to load or save a file on your PC. The pattern file is in JSON (JavaScript Object Notation) format.

   b. **Internal** — Click the button to load or save a file to the instrument's SD card.

2. **LOAD** – Click the button to select a file to load.

3. **SAVE** – Click the button to save the pattern.

- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the button to start the modulation.
- **RF OUT:** – Push the **On** button to generate the RF output signal.

3.5 Sweep Tab

The Sweep Tab menu allows the user to set frequency range and step size, sweep direction, power range and step size, frequency and power dwell time, and triggering.
Following is the menu description:
Two **Sweep Types** are available:

- **Frequency** based – where the signal sweeps from one frequency to the next, maintaining the same amplitude.
- **Power** based – where the signal sweeps from one amplitude to the next, maintaining the same frequency.

3.5.1 Frequency Sweep

Select the Sweep tab, and then click the Frequency button in the Select Sweep Type field.

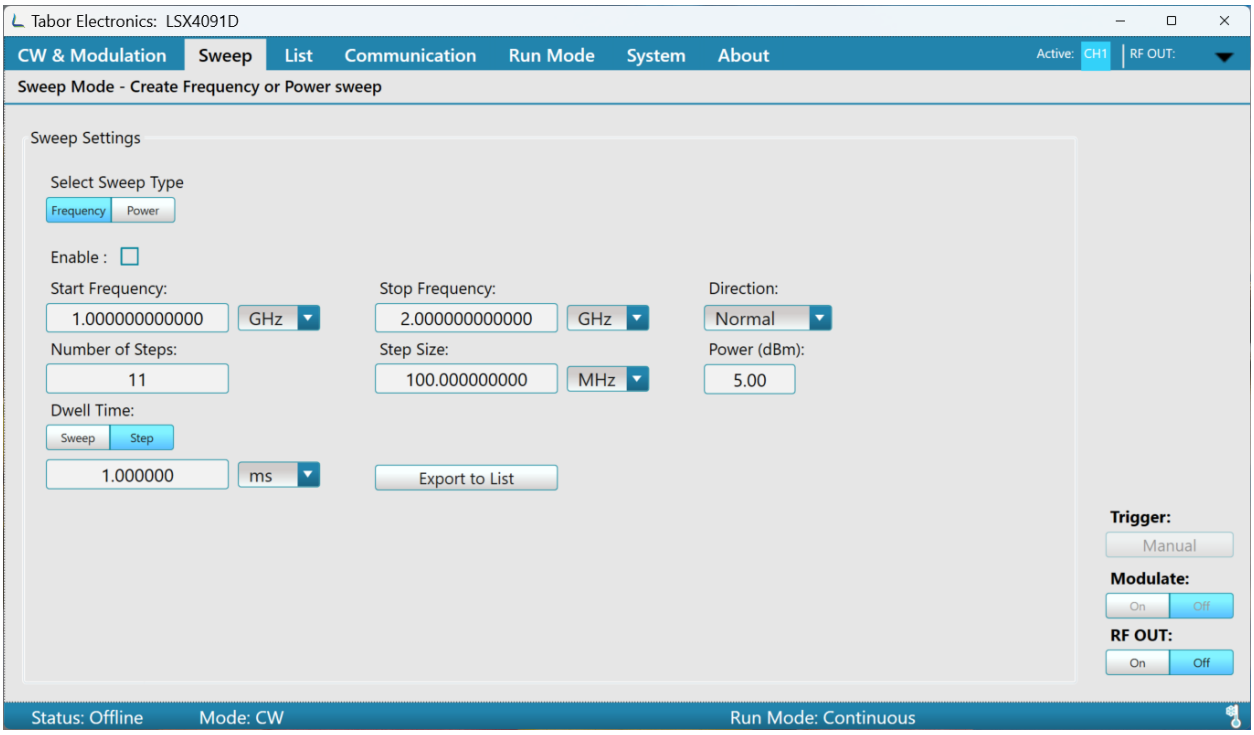


Figure 3.12 Frequency Sweep

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.
- **Start Frequency** and **Stop Frequency** – Sets the frequencies (in Hz, kHz, MHz, or GHz) on which the sweep will start and end. Type the **Start** and **Stop** values in the fields – the sweep direction is determined by the Direction field (see below).
- **Direction** – Sets the sweep direction. The following options are available:
  - **UpDown** – To sweep from Start Frequency to Stop Frequency; then, from Stop Frequency to Start Frequency .
  - **Normal** – To sweep from Start Frequency to Stop Frequency.
- **Number of Steps** – Sets the number of steps in one sweep (including **Start** and **Stop**). The value displayed in **Step Size** changes accordingly.
- **Step Size** – Sets the size of each step (in Hz, kHz, MHz, or GHz) in one sweep. The value displayed in **Number of Step** changes accordingly.
- **Power** – Sets the amplitude (in dBm) of the signal. The value set here is the same as in the CW & Modulation Tab.

Note

Multiple power levels are not allowed in frequency sweeps. Use the Power-based sweeps for power sweeps. Use the List Tab for combined Power and Frequency sweeps.

Note

Changing the value of the amplitude (Power) in the Sweep Tab will change the Power value in the CW & Modulation Tab.

- **Dwell Time** – Sets the duration of each step in the sweep or the entire sweep, before it continues to the next step or sweep. The following options are available:
  - **Sweep** – Sets the duration of one entire sweep (in µs, ms, or s).
  - **Step** – Sets the duration of each step in the sweep (in µs, ms, or s).
- **Export to List** – This button copies the displayed sweep to the List Tab.

If there is already a list, the Export to List dialog box appears notifying that the current list will be deleted.

- Click Yes to copy thee sweep data to the list table.
- Click No to cancel the action.

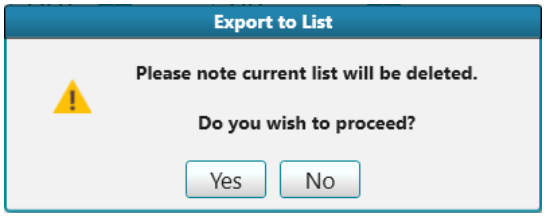


Figure 3.13 Export to List

- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the **On** button to start the modulation.
- **RF OUT:** – Push the **On** button to generate the RF output signal.

3.5.2 Power Sweep

Select the Sweep tab, and then click the Power button in the Select Sweep Type field.

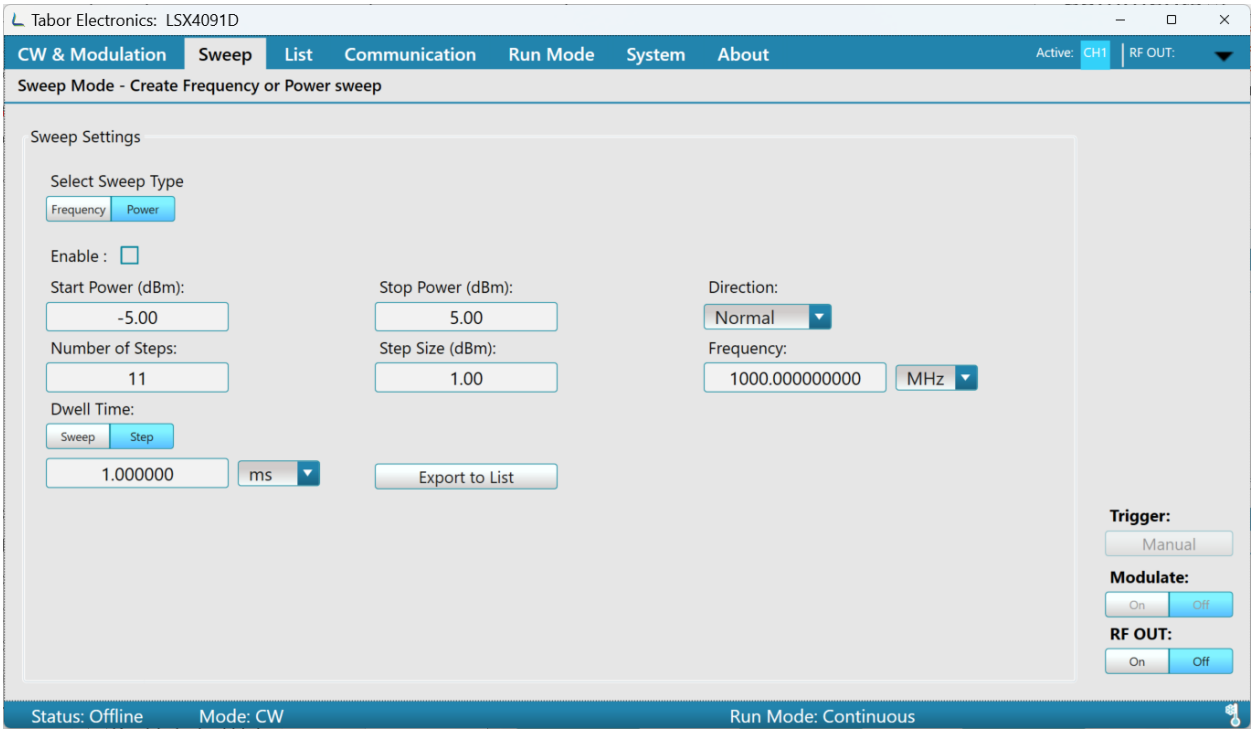


Figure 3.14 Power Sweep

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.
- **Start Power** and **Stop Power** – Sets the amplitudes (in dBm) on which the sweep will start and end. Type the **Start** and **Stop** values in the fields – the sweep direction is determined by the Direction field (see below).
- **Direction** – Sets the sweeping direction. The following options are available:
  - **UpDown** – To sweep from Start Power to Stop Power; then, from Stop Power to Start Power.
  - **Normal** – To sweep from Start Power to Stop Power.
- **Number of Steps** – Sets the number of steps in one sweep (including **Start** and **Stop**). The value displayed in **Step Size** changes accordingly.
- **Step Size** – Sets the size of each step (in dBm) in one sweep. The value displayed in **Number of Step** changes accordingly.
- **Frequency** – Sets the frequency (in Hz, kHz, MHz, or GHz) of the signal. The value set here is the same as in the CW & Modulation Tab.

Note

Multiple frequencies are not allowed in power sweeps. Use the Frequency-based sweeps for frequency sweeps. Use the List Tab for combined Power and Frequency sweeps.

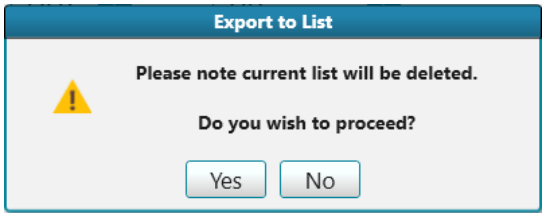
Note

Changing the value of the frequency in the Sweep Tab will change the Frequency value in the CW & Modulation Tab.

- **Dwell Time** – Sets the duration of each step in the sweep or the entire sweep, before it continues to the next step or sweep. The following options are available:
  - **Sweep** – Sets the duration of one entire sweep (in µs, ms, or s).
  - **Step** – Sets the duration of each step in the sweep (in µs, ms, or s).
- **Export to List** – This button copies the displayed sweep to the List Tab.

If there is already a list, the Export to List dialog box appears notifying that the current list will be deleted.

- Click Yes to copy the sweep data to the list table.
- Click No to cancel the action.



- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the **On** button to start the modulation.
- **RF OUT:** – Push the **On** button to generate the RF output signal.

3.6 List Tab

The List Tab enables the user to create and generate a sequence of signals that can vary in frequency, power, and dwell time.

When selecting the List tab for the first time the list table is empty unless the **Export to List** button was pressed in the Sweep tab in which case it holds the sweep list that was generated from the Sweep tab. Newly added steps are added to the end of the list. In addition, you can load previously saved lists.

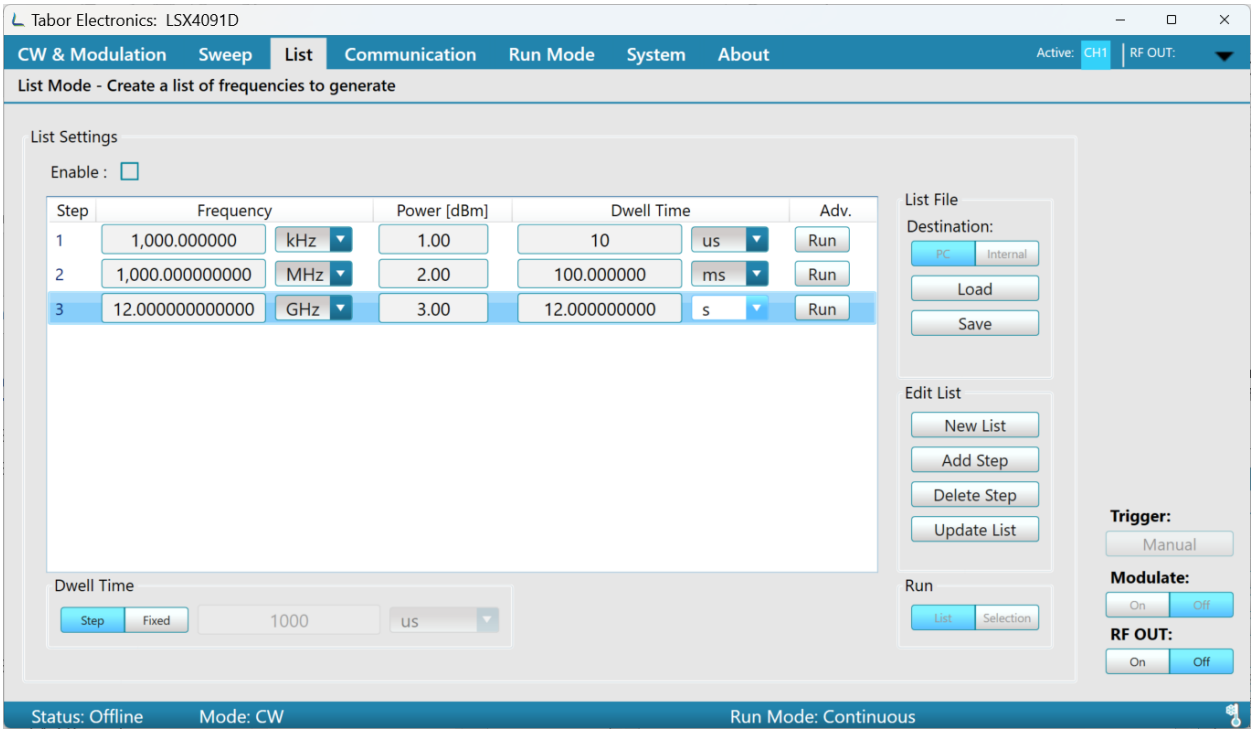


Figure 3.15 List

The List Settings parameters are:

- **Enable**: – Enable the modulation. Multiple modulation setups can be enabled. The modulation will be activated when you press the RF OUT button.
- **Frequency** (in Hz, kHz, MHz, or GHz) - Sets the step frequency.
- **Power (dBm)** – Sets the step power (dBm).
- **Dwell Time** – Sets the duration of the step (in µs, ms, or s).
- **Adv**. (Advance):
  - **Run**: – The following step will be executed after the Dwell Time has elapsed.
  - **Wait**: – This step will be executed when a trigger has been issued.

Figure 3.16 Important (List)

- **List File Destination** – Affects the entire list.
  - **PC** – The list file is stored on the PC running LCP.
  - **Internal** – The list file is stored on the Lucid device.

- **Load** – Enables the user to replace the current list by another one. The user browses to the location of the previously created file, and loads it, by clicking Open.

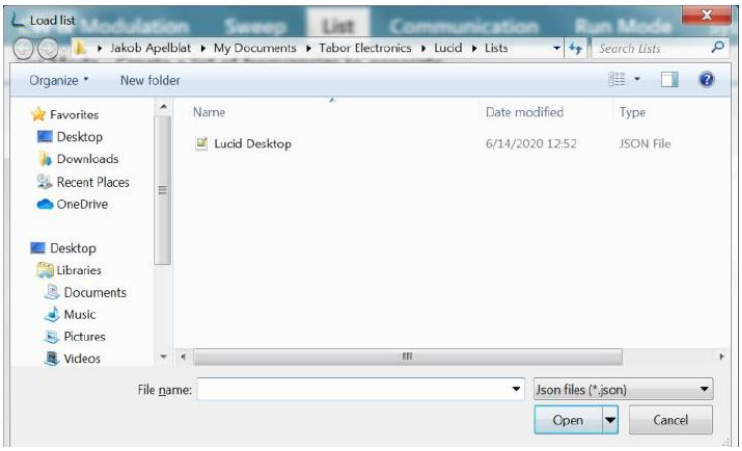


Figure 3.17 Load List

- **Save** – Enables the user to save the current list as a text file. The user browses to the desired folder; then names the file and clicks Save.

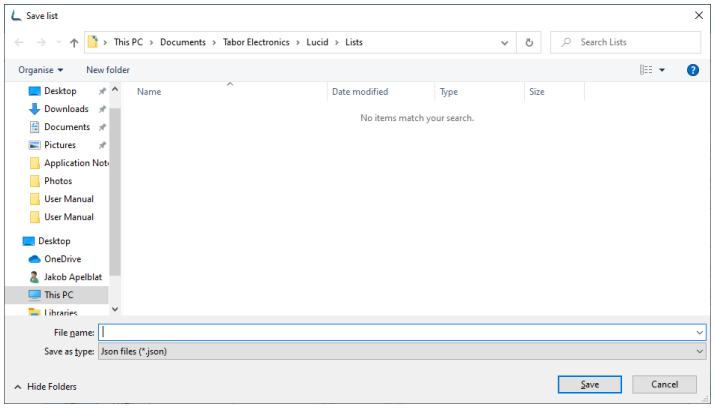


Figure 3.18 Save List

- **Edit List** – Affects the list items (steps)
  - **New** – Clears the entire list, enabling the user to start a new one. The following dialog box appears.
    - Click **Yes** to start a new list.
    - Click **No** to cancel the action.

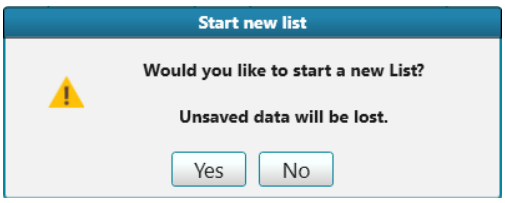


Figure 3.19 Start New List

  - **Add Step** – Adds a step to the end of the list. The default values are those set in the RF & Modulations Tab.
  - **Delete Step** – Select the step and click Delete Step to delete the selected step from the list.
  - **Update List** – After finishing editing the list, the user must click this button to activate the new parameters.
- **Dwell Time** – Sets the duration of each step in the list.
  - **Step** – Dwell time is as set in each step in the list.
  - **Fixed** –Dwell time defined in the list is disabled; will be identical in all steps, as defined here (in µs, ms, or s).
- **Run** – Sets what step will Run.
  - **List** – The entire list will run, one step after the next, in the displayed order. When reaching the end of the list, the run will restart. If the Wait switch is On, the run stops, and waits for a trigger event (as defined in the Run Mode Tab).
  - **Selection** – Only the selected step in the list will run.

Note

It is possible to select more than one step, using the same key used for multiple selection in Windows **(<Ctrl>** and **<Shift>**).

- **Trigger** – The Manual button is enabled when the instrument Run Mode is set to Trigger in the Run Mode tab, refer to 3.7 Run Mode Tab.
  - **Manual –** Push the button to send a trigger command to the instrument. The Trigger Source in the Run Mode tab shall be set to Bus, refer to 3.7 Run Mode Tab.
- **Modulate: –** Push the **On** button to start the modulation.
- **RF OUT:** – Push the **On** button to generate the RF output signal.

3.7 Run Mode Tab

The Run Mode Tab defines how the Lucid Device will generate the RF signal. E.g., to wait for a trigger event before generating signals.

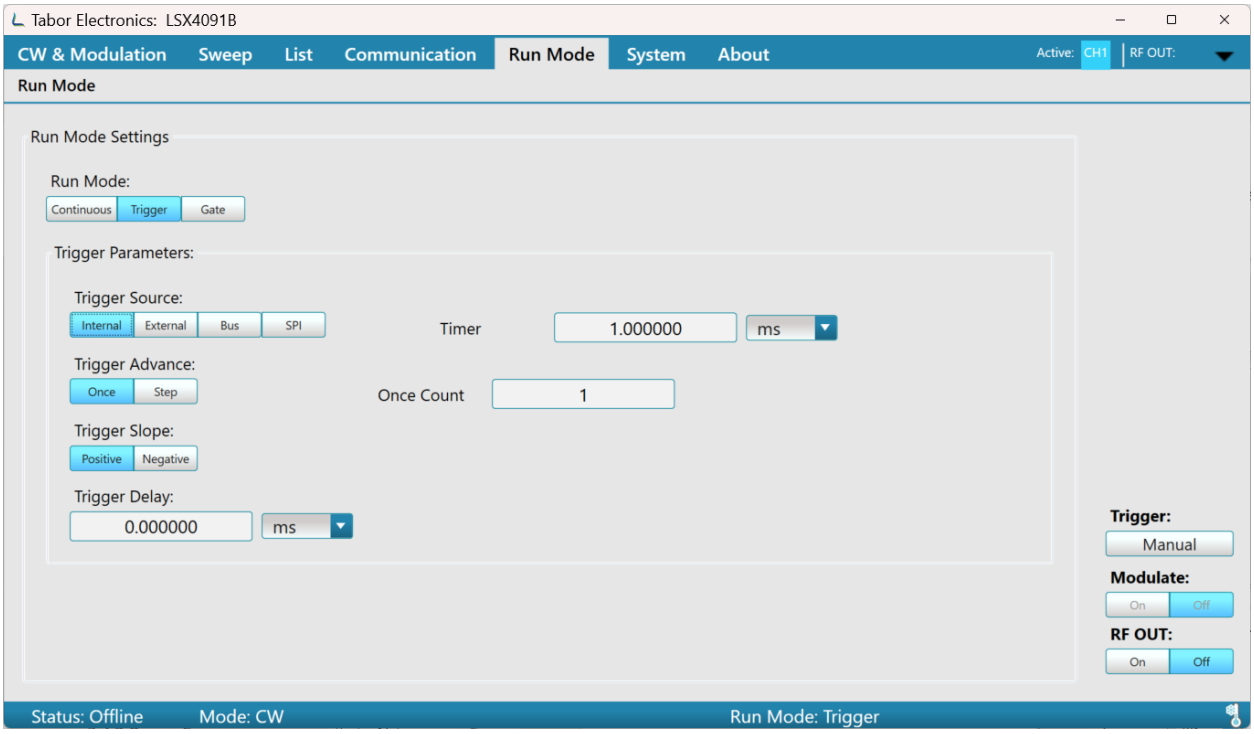


Figure 3.20 Run Mode Internal

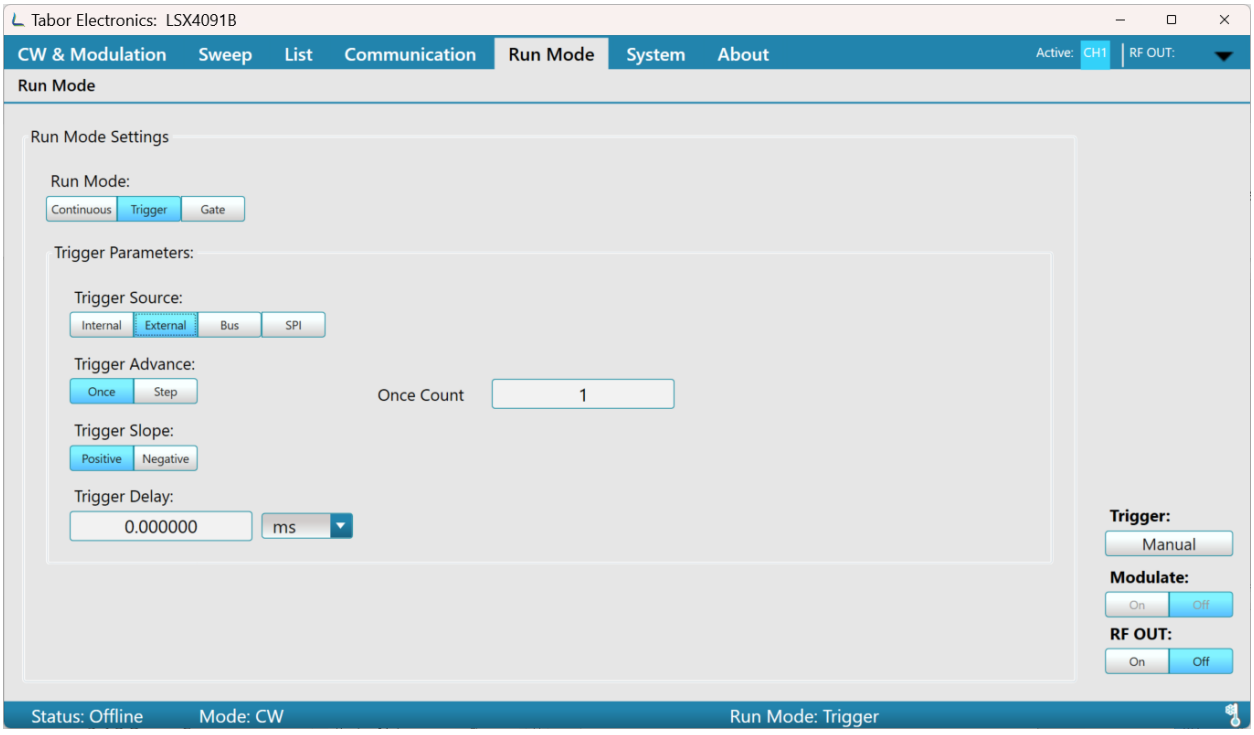


Figure 3.21 Run Mode External

The following are the details of the Run Mode menu:

- **Run Mode** – Sets the way in which the signals are generated.

- **Continuous** – Enables running the signal continuously, as defined in the other tabs, and regardless of the trigger events. All trigger-oriented parameters are not accessible.
- **Trigger** – Enables running the signal when a trigger event is detected.
- **Gate** – Gating signal is applied to the trigger input only and output waveforms will be generated only when the External or SPI (only Lucid) gate signal is valid and true.

- **Trigger Source** – Sets the source of the trigger.
  - **Internal** – The software issues triggers according to the following parameters.
    - **Timer** – Sets the rate for clocked triggers (in ns, µs, ms, or s).**Trigger** – When the trigger source is set to **Bus**, clicking **Manual** issues a trigger.
  - **External** – An external source, connected to the TRIGGER IN port, issues the triggers.
  - **Bus** – A trigger is issued when the user clicks the Manual button.
  - **SPI** – A trigger is issued through the SPI interface (Lucid Desktop only) TBD.
- **Trigger Advance** – Sets the trigger advance either in steps or as a one-time event.
  - **Once** – Sets the number of triggers that will be issued.
    - **Once Count** – Sets the number of times a sweep or list will be generated. When the count is set to 0, the device outputs a signal continuously once a trigger is accepted.
  - **Step** – For every trigger that is accepted the sweep or list is advanced by 1 step. While the step is being generated, any incoming trigger is ignored.
- **Trigger Slope** – Sets trigger slope.
  - **Positive** – Trigger on positive (rising) edge.
  - **Negative** – Trigger on negative (falling) edge.
- **Trigger Delay** – Defines a delay in units of time (ms, ns, µs, ms, s) between the receiving of the trigger signal and the generation of the output signal.
- **Trigger** – When the trigger source is set to **Bus**, clicking **Manual** issues a trigger.
- **Modulate: –** Push the **On/Off** button to start/stop the enabled modulation when setting **RF OUT On**.
- **RF OUT:** – Push the **On** button to generate the RF output signal. If the **Modulate** is **Off** only the carrier wave without modulation is generated.

3.8 System Tab

The System Tab manages the setup parameters of the entire system. Loading a system file results in the ability to re-use the Modulations, Sweeps and Lists, etc., that were used when the system file was created.

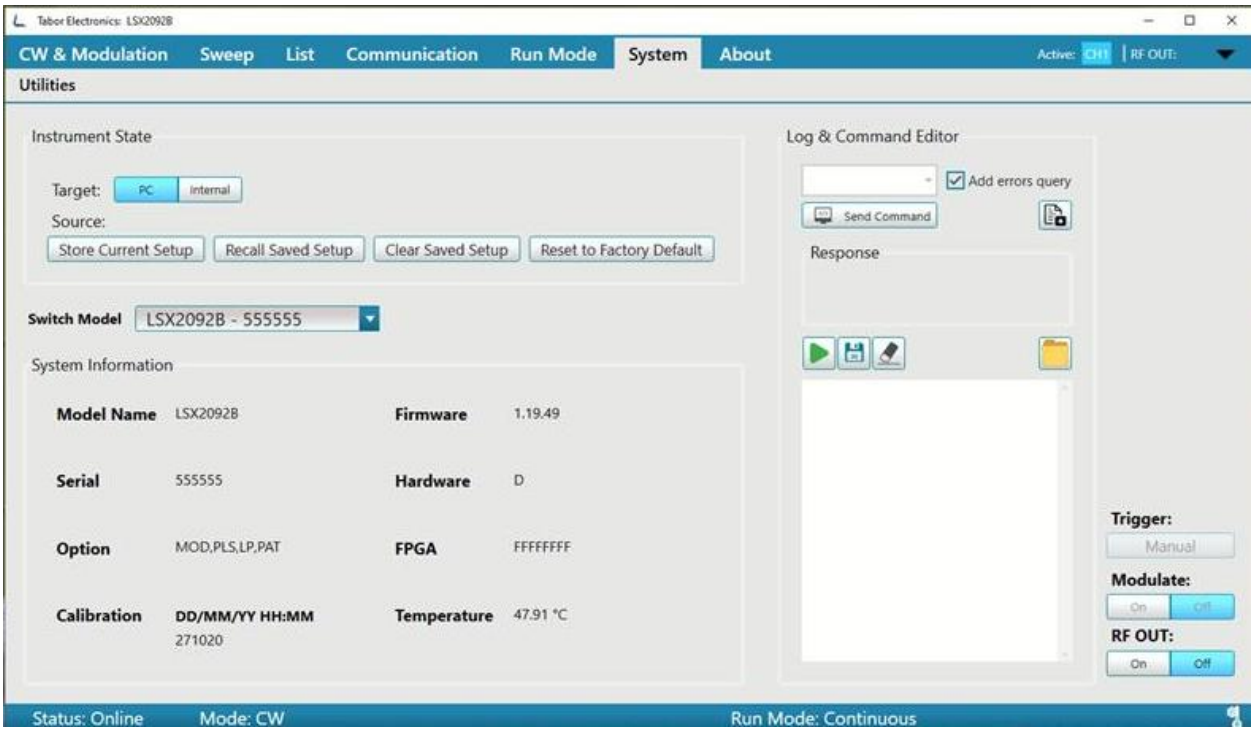


Figure 3.22 System Tab

The following are the details of the System menu:

- **Instrument State** – Enables the user access to the System State file.
  - **Target** – Select where the setup is located.
    - **PC** – The setup is located on a PC connected to the instrument.
    - **Internal** - The setup is located on the instrument.
  - **Source**:
    - **Store Current Setup** – Saves the current state of the entire system in a file.
    - **Recall Saved Setup** – Loads a previously saved System State file. The settings in all the tabs will change accordingly.
    - **Clear Saved Setup** - l
    - **Reset to Factory Default** – resets instrument and tabs to factory default settings.
- **Log & Command Editor** - It enables you to send SCPI commands and queries to the instrument and read the instrument response. It will also autocomplete the command with a list of available commands.

Note

Refer to Lucid or Lucid-X Programming Manual for a list of available SCPI commands.

- **Add errors query** – When checked every command that is sent to the instrument is followed by a :SYST:ERR query.
- **Send Command** – Click the button to send the SCPI command to the instrument.
- - Download a text file script with SCPI commands to the instrument.

- **Play/Pause** – Toggle between displaying/not displaying the SCPI commands sent to the device.
- **Save** – Save the log to a text file (.txt).
- **Erase** – Erase the log.
- **Open Log File Location** – The log file contains all the SCPI communication between the PC and the device.

- **Switch Model** – Switch between connected models that appear in Figure 3.2 Communication Tab.
- **System Information** – Displays the system information
  - **Model Name** — The ordering model name.
  - **Serial** – The serial number of the generator.
  - **Option** – The options installed in the Lucid device.
    - **MOD** – Modulation package (AM, FM, PM).
    - **PLS** – Pulse generator.
    - **FS** – Fast switching.
    - **LP** – Low Power (-90 dBc).
    - **ELP** – Extended low power range -150 dBm.
    - **EPR** – Extended power range -130dBm to +20dBm.
    - **EMU** – Includes emulators for Keysight, R&S, Anapico, and Holzworth
    - **PAT** – Pattern generator.
  - **Calibration** – The time stamp of the last calibration.
  - **Firmware** – The Lucid device firmware version.
  - **Hardware** – The hardware board version.
  - **FPGA** – The Lucid device FPGA version.
  - **Temperature** – The average temperature at critical locations inside the generator chassis.
- **Trigger** – When the Trigger Source in the **Run Mode** Tab is set to **Bus**, clicking **Manual** issues a trigger.
- **RF OUT** – turns On or Off the RF output switch.

3.9 About Tab

The About Tab displays the application version.

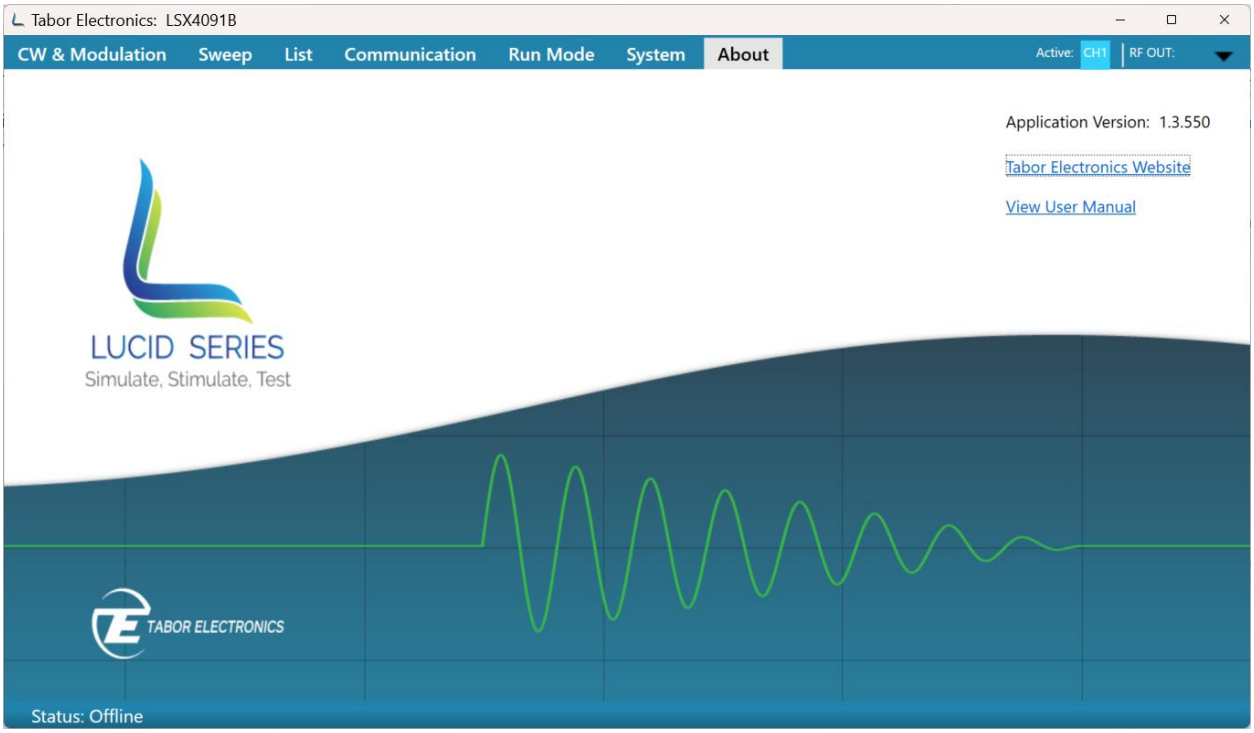


Figure 3.23 About Tab

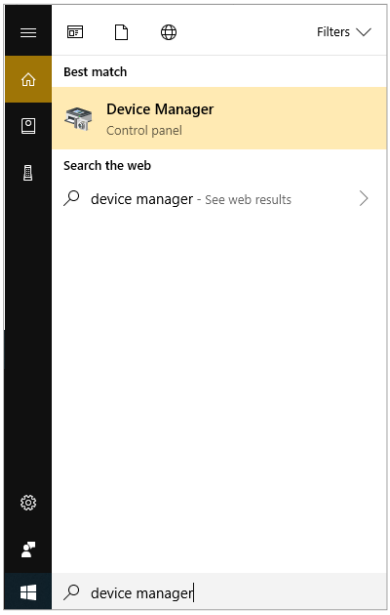
- **Tabor Electronics Website** – Click the link to access the website. Click the DOWNLOADS tab to download the latest version of manual, software, and FPGA firmware.
- **Help File** – Displays the Lucid Control Panel user manual (this manual).

4 Troubleshooting

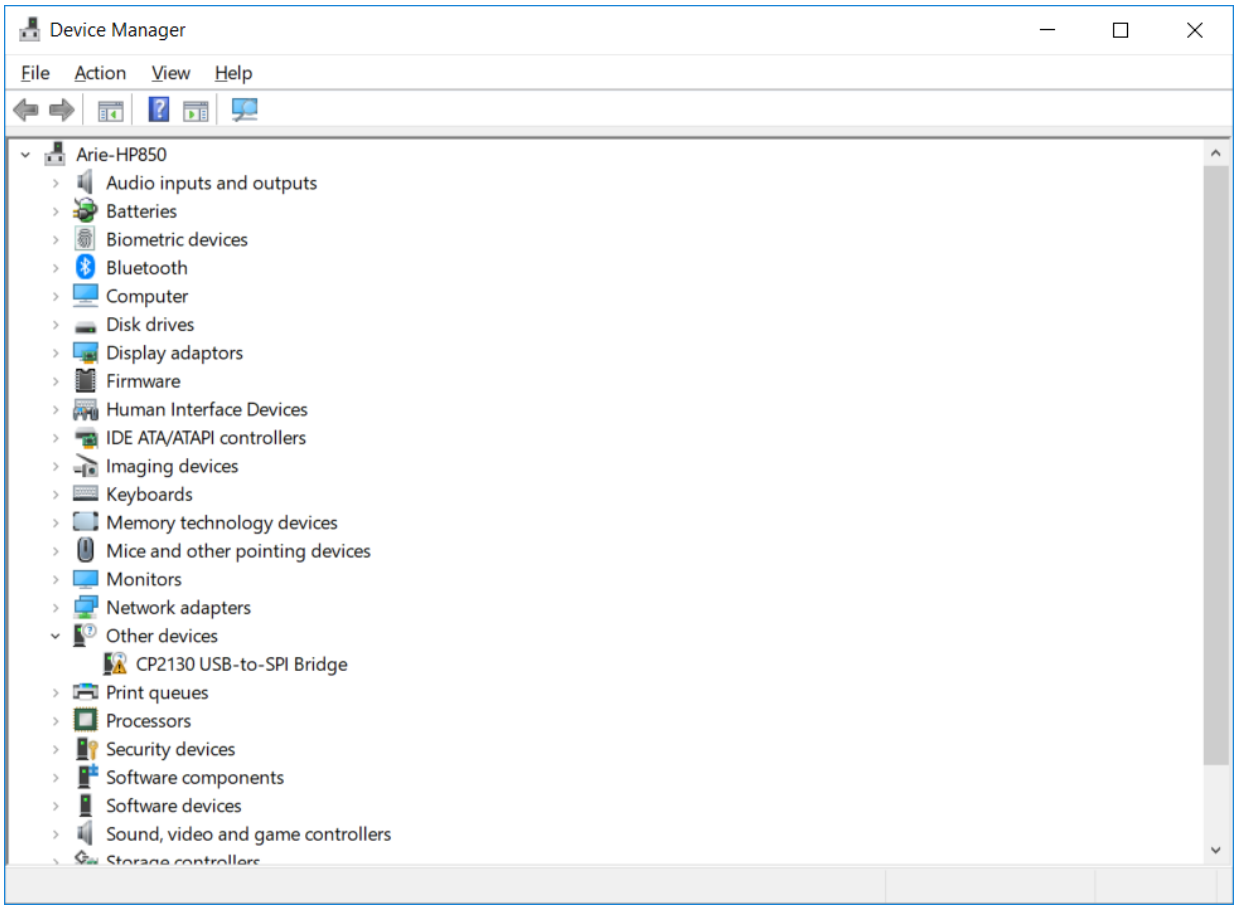
4.1 Manually Installing Instrument Drivers

4.1.1 USB Device Driver Manual Installation (Windows 10)

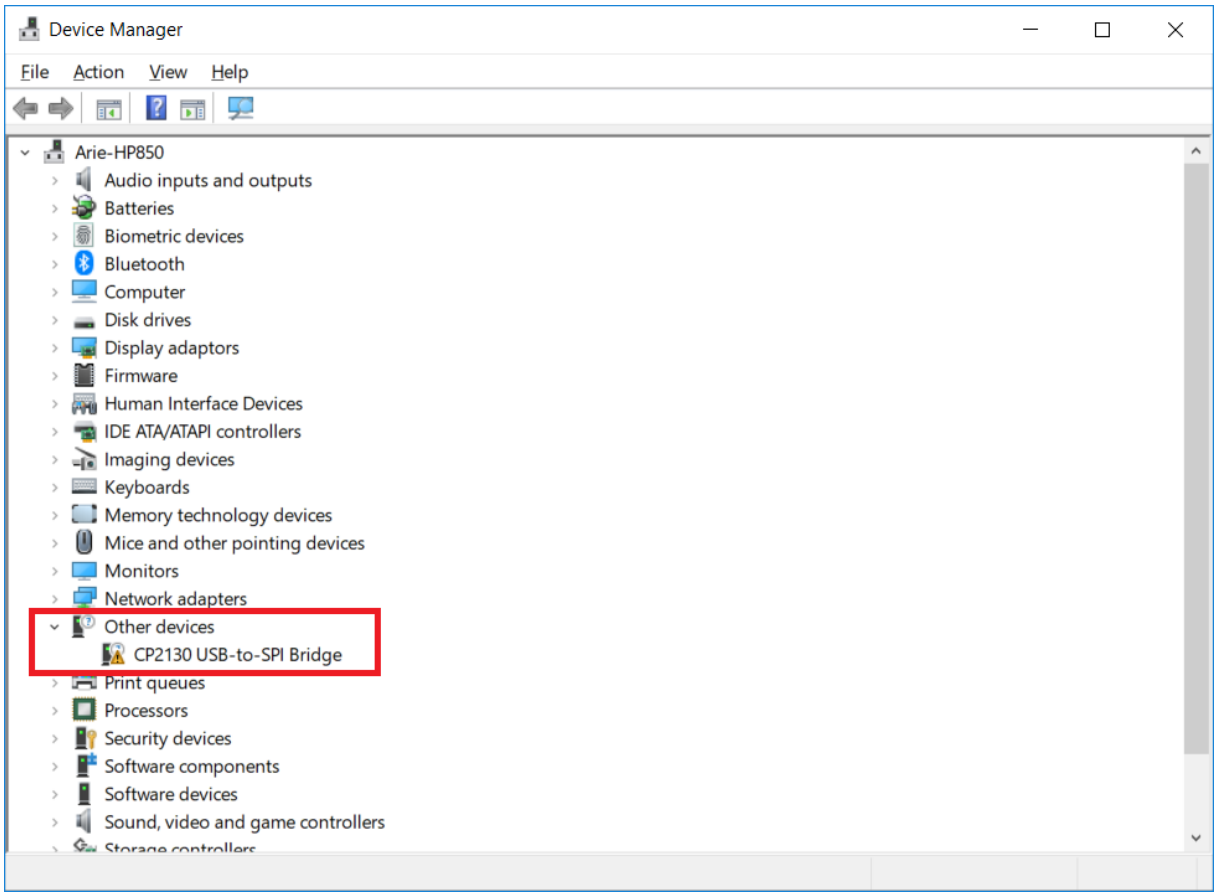
1. Download the latest Lucid series USB device driver from www.taborelec.com/downloads.
2. Using the supplied USB cable, connect the Lucid benchtop model to the PC.
3. Open the **Start** menu, and in the search field, type **Device Manager**.



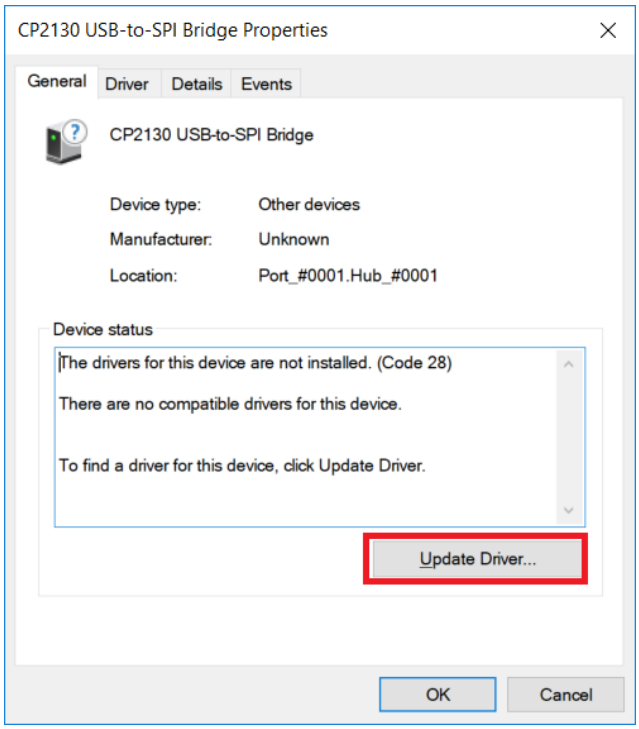
4. In the search results list, select **Device Manager**.
   The **Device Manager** window opens.



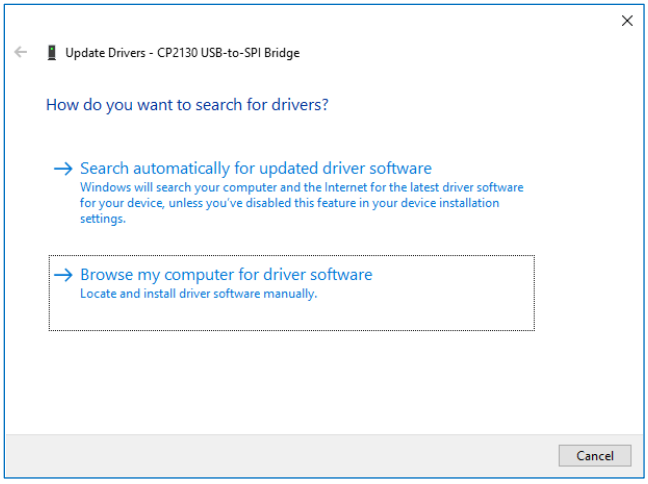
5. In the navigation tree, expand **Other devices** and double click on **CP2130 USB-to-SPI Bridge**.



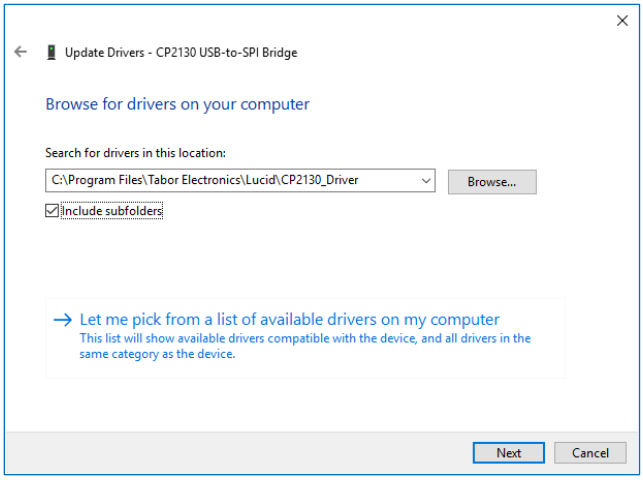
6. The **CP2130 USB-to-SPI Bridge Properties** window opens.
   Click **Update Driver**.



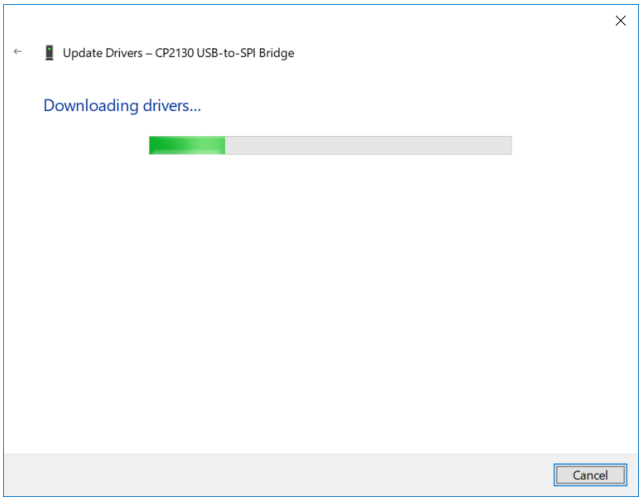
7. In the **Update Drivers - CP2130 USB-to-SPI Bridge** window, select **Browse my computer for driver software**.



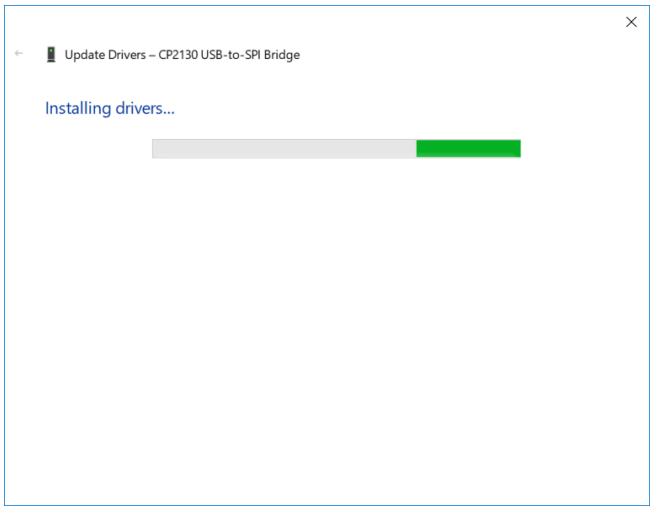
8. Browse to the driver software location on PC, select its folder and click **OK**.



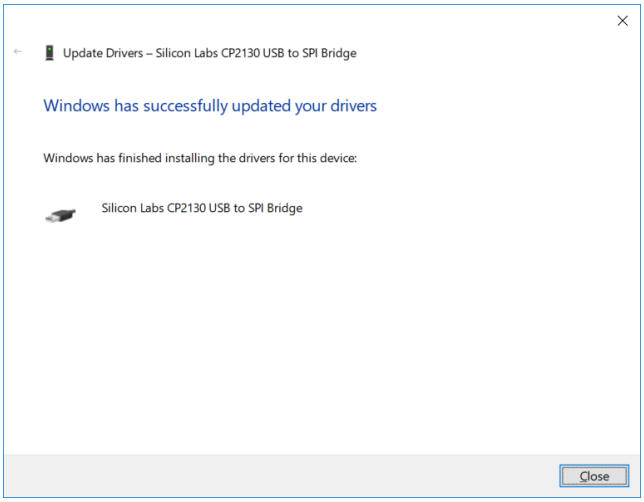
9. Driver download begins.



10. After the download is complete, the driver installation begins.

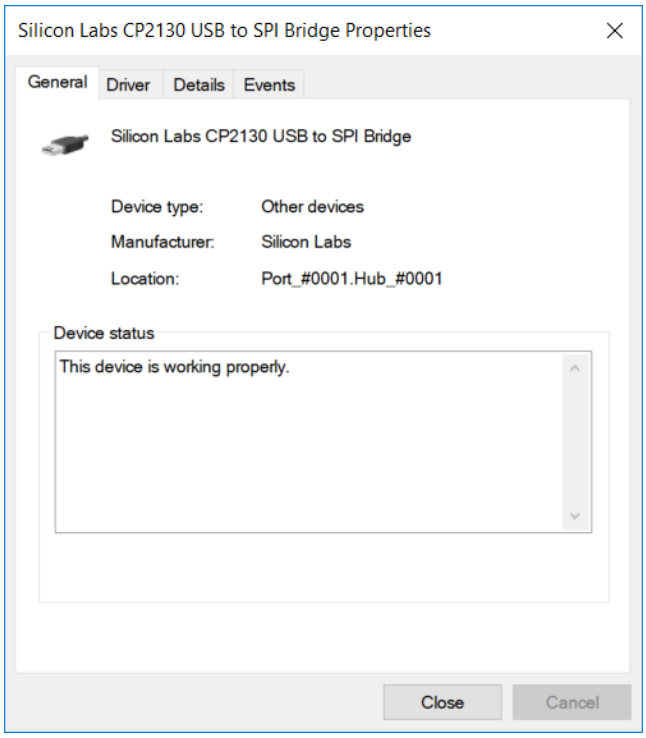


11. After the installation is complete, the following success message is displayed:



12. Click Close to close the Update Drivers window and to proceed.

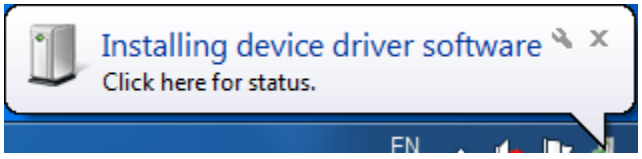
13. In the **CP2130 USB-to-SPI Bridge Properties** window the displayed device status should be: **The device is working properly**.



4.1.2 USB Device Driver Manual Installation (Windows 7)

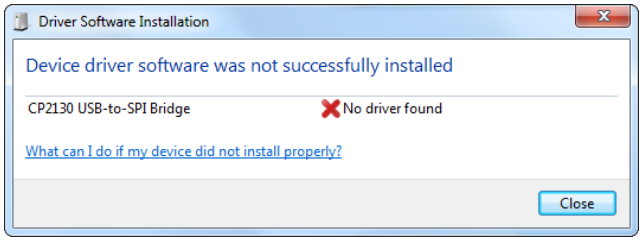
1. Download the latest Lucid series USB device driver from the Tabor Electronics Ltd., website. Device drivers are available at www.taborelec.com/downloads

2. Connect the Lucid Generator to the PC using the supplied USB Cable.



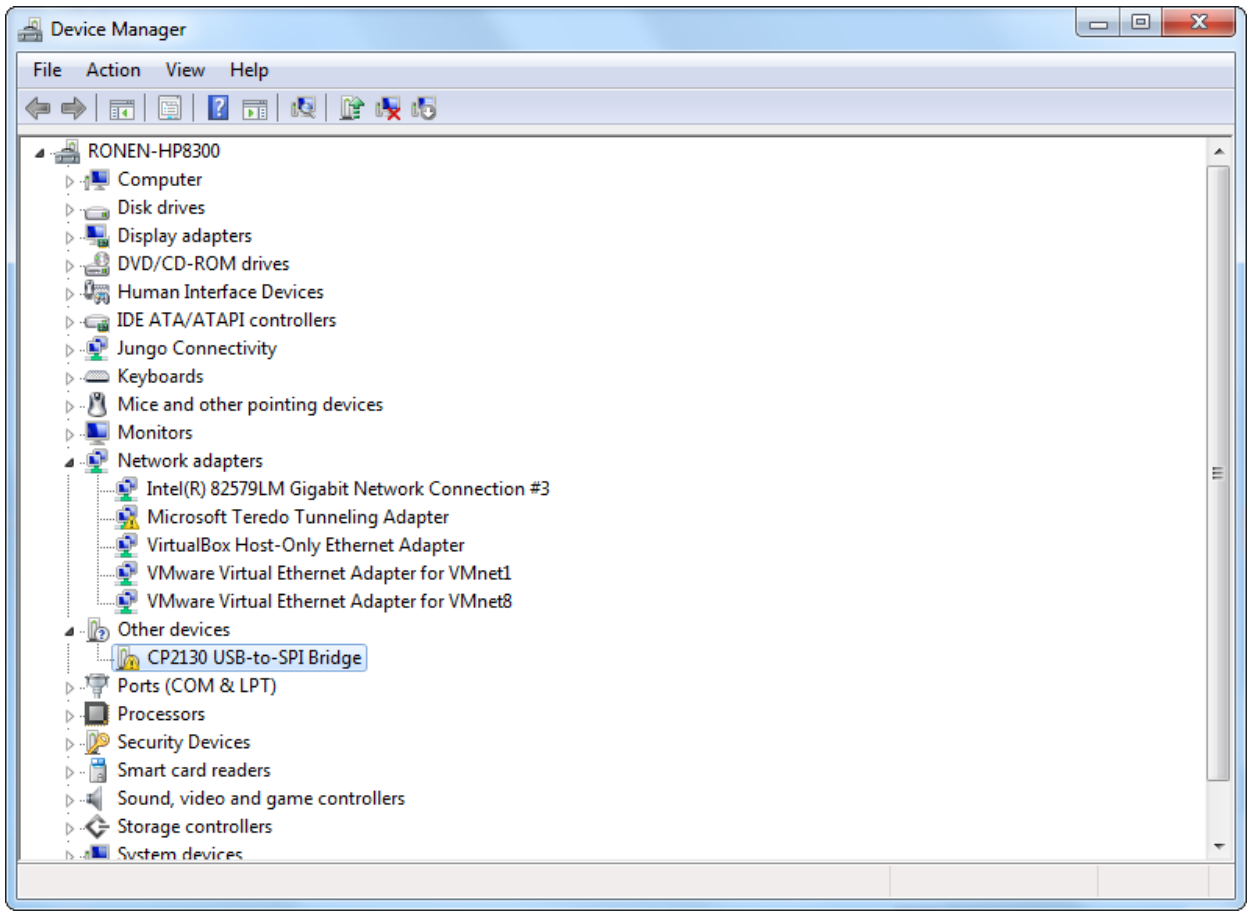
The **Installing Device Driver Software** message is displayed at the lower-right part of the screen.

3. Wait for the following messages to appear:

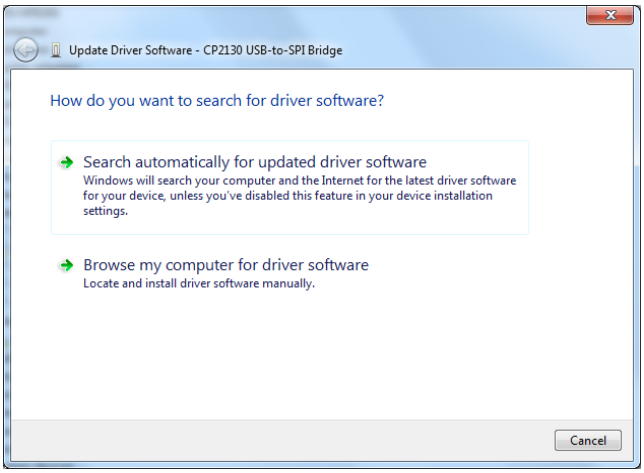


4. Click **Close**.

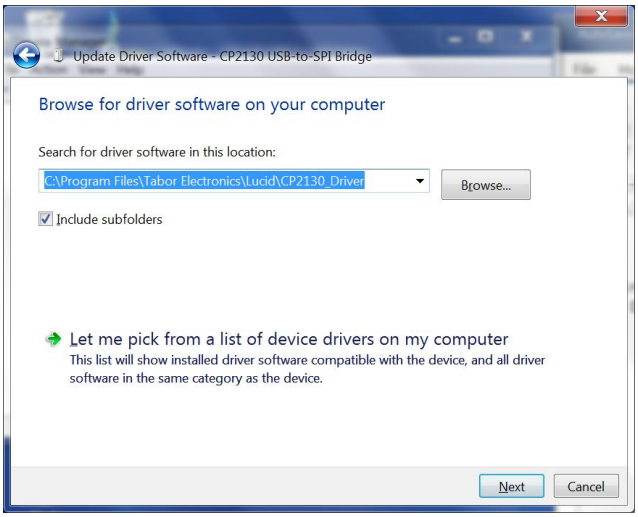
5. Open the **Start** menu, and in the search field, type **Device Manager**.
6. In the search results list, select **Device Manager**. The **Device Manager** window opens.
7. In the navigation tree, expand **Other devices** and select **CP2130 USB-to-SPI Bridge**.



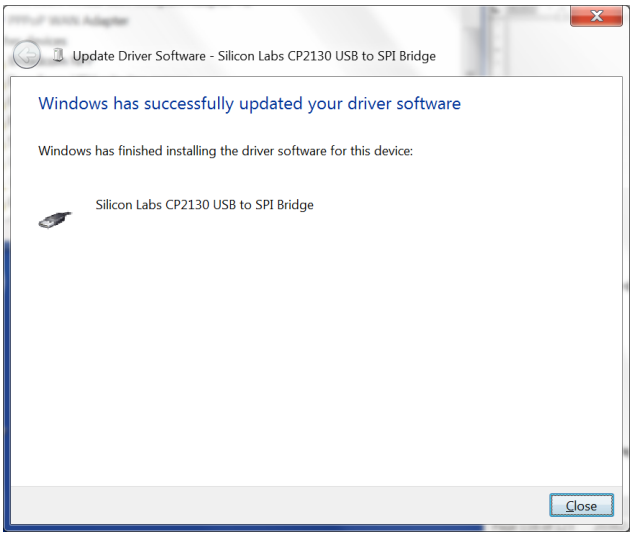
8. In the U**pdate Drivers** - **CP2130 USB-to-SPI Bridge** window, select **Browse my computer for driver software**.



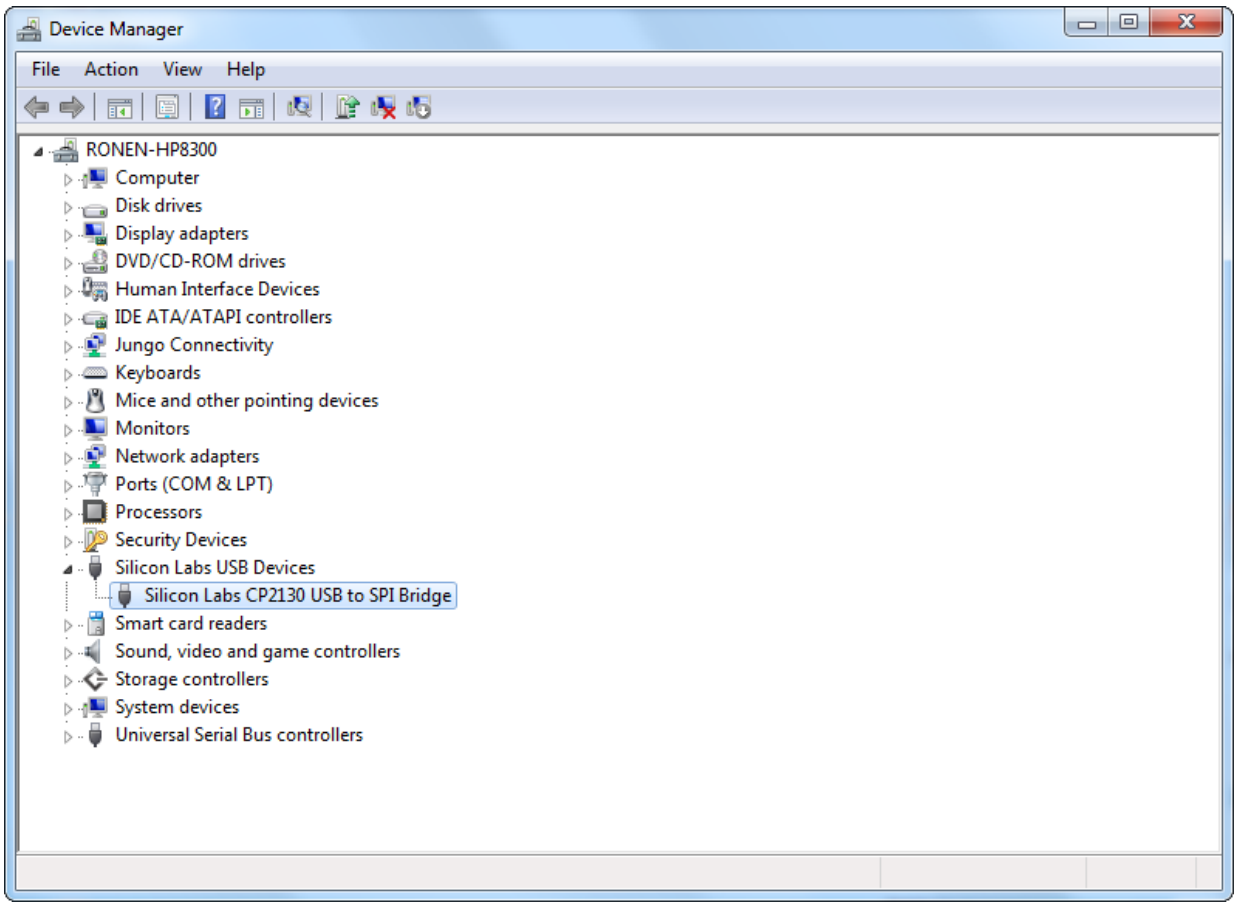
9. Browse to the driver software location on PC, select the folder and click **Next**. Driver installation begins.



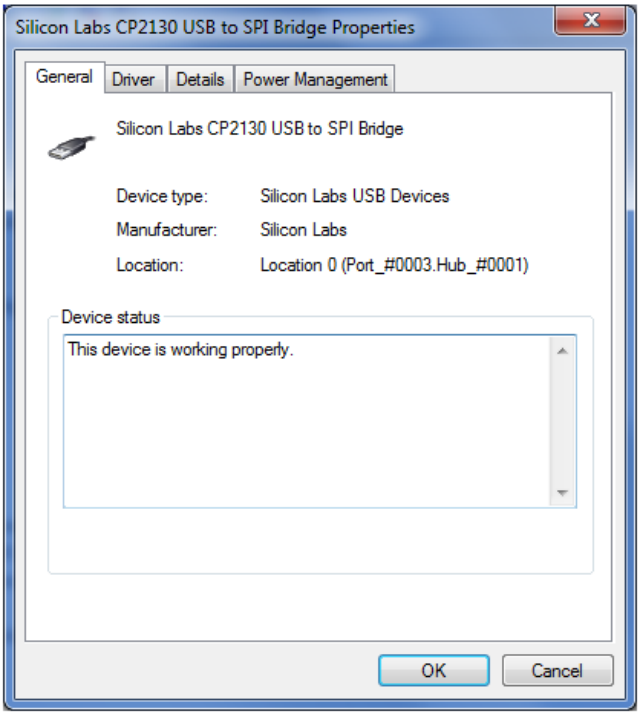
10. After the driver software installation is complete, click **Close**.



11. In the Device Manager, under Silicon Labs USB Devices, click **Silicon Labs CP2130 USB to SPI Bridge**.



12. In the **CP2130 USB-to-SPI Bridge Properties** window the device status should indicate the device is working properly.


Silicon Labs CP2130 USB to SPI Bridge Properties
General
Driver
Details
Power Management
Silicon Labs CP2130 USB to SPI Bridge
Device type:
Silicon Labs USB Devices
Manufacturer:
Silicon Labs
Location:
Location 0 (Port_#0003.Hub_#0001)
Device status
This device is working properly.
OK
Cancel

5 Appendix Log File

The log file C:\temp\Lucid_x-y-z_x.log provides an LCP log, and the log file TEUpdateTool_ x-y-z_x logs the TE Update Tool operation. If you encounter any issue, include these files when reporting to Tabor support.

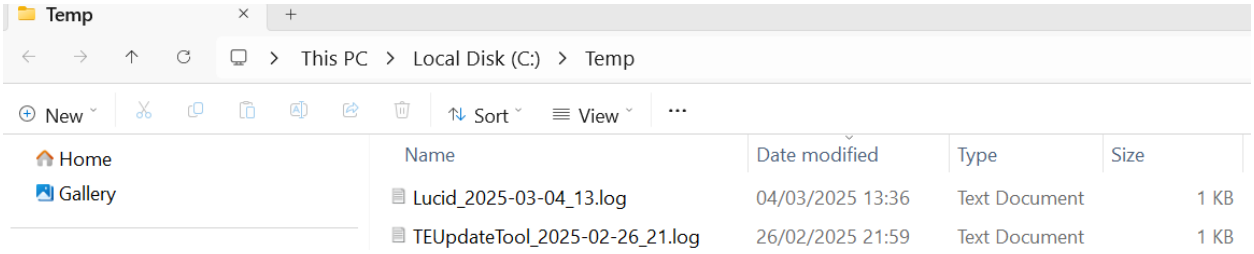


Figure 5.1 LCP Log File Folder

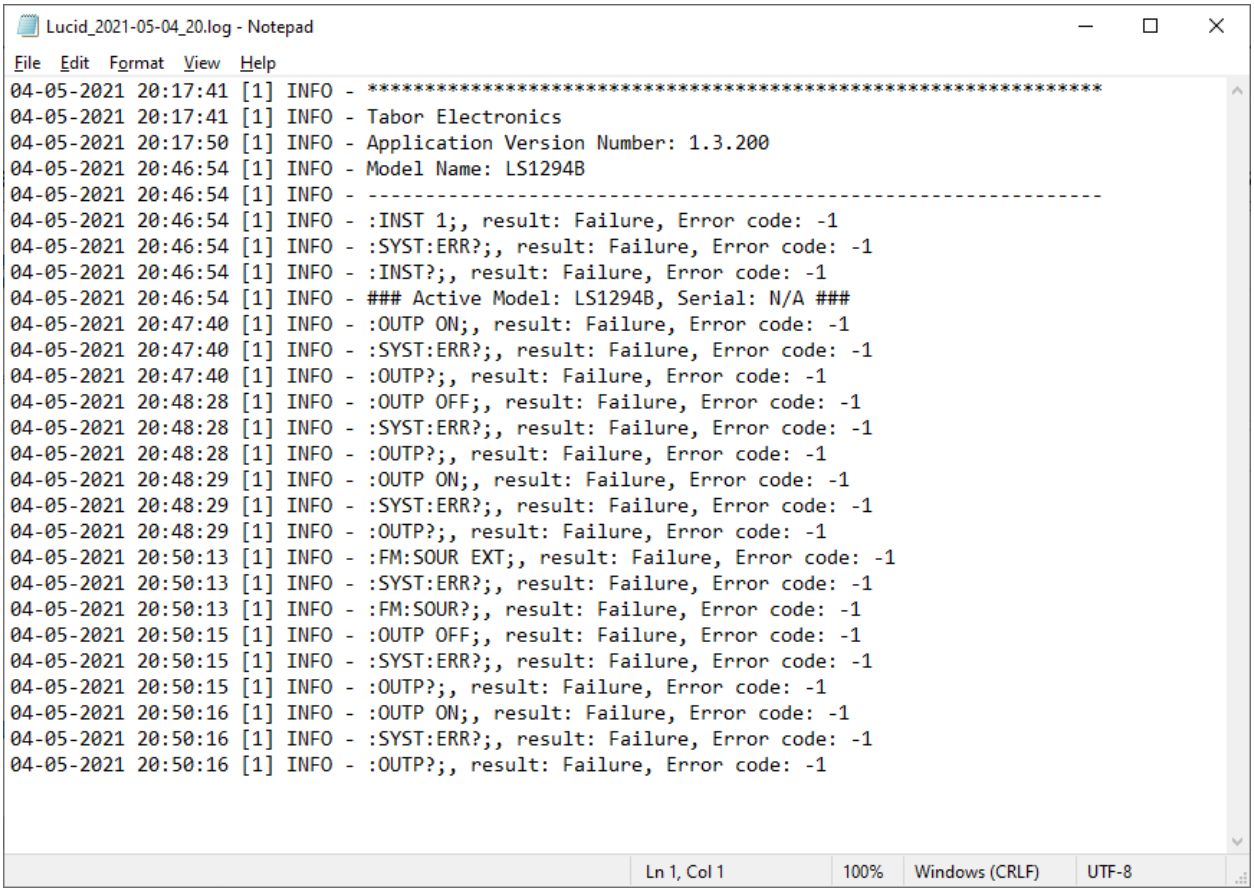


Figure 5.2 LCP Log File