TABOR ELECTRONICS

LUCID SERIES

Lucid Series Analog RF Signal Generator Portable Model User Manual

Revision 1.3

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Document Revision History

Table Document Revision History

Revision	Date	Description	Author
1.3	16-Jan-25	• Release supporting Lucid Control Panel Ver. 1.3.500 and TE Update Tool Ver. 1.1.212, LS4091M SPI_SCPI Commands Rev 1.0, TESG SPI_SCPI Commands Rev 1.18, Lucid FPGA version 03092023. • Removed Lucid-X that now has a separate user manual. • 1.6.2.1 Battery Storage Guidelines— New. • 2.4 Left Side Panel — Removed CLK OUT 3GHz. • Table 5.5 Modulation Specifications — Added note. • Table 5.8 General Specifications — Changed "Battery Maximum Load" from 60 minutes to 75 minutes.	Jakob Apelblat
1.2	23-Oct-23	• Preliminary • Updated document format. • Added Lucid-X Portable • Release supporting Lucid Control Panel Ver. 1.3.400 and TE Update Tool Ver. 1.1.212, LS4091M SPI_SCPI Commands Rev 1.0, TESG SPI_SCPI Commands Rev 1.18, Lucid FPGA version 03092023 and Lucid-X FPGA version 03092023 or higher. • 1.2 Related Documentation – New. • Table 1.1 Ordering Information – Added Lucid-X series. • 2.1 Unpacking – Updated. • 5 Lucid Portable Specifications – Added Lucid-X series.	Jakob Apelblat
1.1	26-Mar-21	• 1.3 Software Support – New. • Removed sections "Lucid Software Requirements", "Installation, "PC Control Software", 'Troubleshooting", and "FPGA Firmware Update" that are included in the new "Lucid Control Panel User Manual". • Removed section SCPI Programming that is included in the new "Lucid Programming Manual". • Table 5.5 Modulation Specifications – Changed Sweep Dwell Time from "10 µs to 1,000 s" to "100 µs to 1,000 s".	Jakob Apelblat
1.0	6-Aug-20	• Original release supporting Lucid SW Rev. 1.2.0 and SPI & SCPI Commands List Summary Rev. 1.14.	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
ENoB	Effective Number of Bits
ESD	Electrostatic Discharge
EVM	Error Vector Magnitude
FPGA	Field-Programmable Gate Arrays
GHz	Gigahertz
GPIB	General Purpose Interface Bus
GS/s	Giga Samples per Second
GUI	Graphical User Interface
HP	Horizontal Pitch (PXIe module horizontal width, 1 HP = 5.08mm)
Hz	Hertz
IF	Intermediate Frequency

Acronym	Description
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)
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
SMA	Subminiature version A connector

Acronym	Description
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

1.1 Scope

The scope of this manual is to describe the setup and operating procedures of the Lucid portable. The manual covers the following models listed in the below ordering information.

Table 1.1 Ordering Information

Model	Description
LS3081P	3 GHz, 1 channel, portable analog RF signal generator
LS6081P	6 GHz, 1 channel, portable analog RF signal generator
LS1291P	12 GHz, 1 channel, portable analog RF signal generator
Options	
BAT	4-cell, replaceable extra battery
CHA	External charger
PLS	Pulse modulation
PAT	Pattern modulation
LP	Low power

Figure 1.1 LS1291P – 12GHz One Channel Analog RF Signal Generator

1.2 Related Documentation

- Lucid Control Panel User Manual

- TE Update Tool User Manual
- Lucid Programming Manual
- Tabor Lucid Multi-Channel RF Signal Generators White Paper
- Lucid Series Performance Verification Manual

1.3 Software Support

The **Lucid Control Panel** is a software package that enables full control and programming of your Tabor Electronics Lucid series analog RF signal generators via a user-friendly graphical user interface. The **TE Update Tool** is a utility for updating the Lucid device FPGA. The **Lucid Programming Manual** lists and describes the set of SCPI-compatible (Standard Commands for Programmable Instruments) remote commands used to operate the Lucid devices.
The programs and the user manuals can be downloaded from the Tabor Electronics website at http://www.taborelec.com/downloads.

1.4 Document Conventions

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.

1.5 Safety

To avoid Electrical Shock, fire or personal injury:

- Use only the proper power cord and certified for the country of use.

- This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, the grounding conductor must be connected to the ground. Before connecting to the power input or output, ensure that the product is properly grounded.
- Do not operate this product with removed covers or panels.
- Observe all the ratings and markings on the product. Search this manual for further rating information, before connecting to it. Do not apply potential that is higher than the maximum rating.
- Do not operate in dark or wet conditions.
- Do not operate in an explosive environment. Keep product clean and dry.

1.6 Maintenance

1.6.1 Preventive Maintenance

There are no hardware adjustments within Lucid Generators. Tabor Electronics Ltd. recommends that the Lucid Generator is calibrated every 12 months or whenever a problem is suspected. The specific calibration interval depends upon the accuracy required. No periodic preventive maintenance is required.

1.6.2 Long Term Storage or Repackaging For Shipment

If the instrument is to be stored for a long period of time or shipped immediately, proceed as directed below. If you have any questions, contact your local Tabor Electronics representative or the Tabor Electronics Customer Service Department.

1. Repack the instrument using the wrappings, packing material and accessories originally shipped with the unit. If the original container is not available, purchase replacement materials.
2. Be sure the carton is well sealed with strong tape or metal straps.
3. Mark the carton with the model and serial number. If it is to be shipped, show the sending and return address on two sides of the box.
4. If the instrument is to be shipped for service or repair, the following information must be included with the shipment:

- Name and address of the owner.
- Record the model and serial number of the instrument, options, and firmware version.
- Note the problem and symptoms – detailed information will help in verifying the problem
    - What was the instrument setup?
    - Did the unit work; then fail?
    - What other equipment was connected to the generator when the problem occurred?
- The name and telephone number of someone familiar with the problem who can be contacted by Tabor Electronics if any further information is required.
- Show the returned authorization order number (RMA) as well as the date and method of shipment.

Note

Always obtain a return authorization number from the factory before shipping the instrument to Tabor Electronics.

1.6.2.1 Battery Storage Guidelines

- Before storing, charge or discharge the battery to about 50% of its capacity.
- Recharge the battery to approximately 50% of its capacity at least once every six months.
- Remove the battery from the product and store it separately.

- Keep the battery in a temperature range of 5 °C to 20 °C (41 °F to 68 °F).

Note

Batteries naturally self-discharge during storage. Storing at higher temperatures (above 20 °C or 68 °F) can significantly reduce their lifespan.

2 Introduction

The Lucid Series portable platform offers a modern design capable of operating either as a benchtop or a portable signal generator. The series features 3, 6, and 12 GHz single channel versions, all sharing the very same industry leading highlighted features. It provides extremely fast switching speed, superior signal integrity and purity, all the necessary modulated signals for analog communication systems, with built in USB interface and removable micro-SD card. The Lucid Series is designed to meet today's most demanding applications, whether in the lab or out in the field.

2.1 Unpacking

Check that the packaging is undamaged. If packaging is damaged, notify the carrier immediately. The Lucid Portable model instrument is supplied with:

- Power supply. Input 90 – 264 V AC, 1 A, 47-63 Hz. Output 12.0 V DC, 3.0 A, 36 W,
  Outside  Inside
- USB cable for connecting a control PC to the instrument.
- Lucid software, user manual and instrument drivers can be downloaded from https://www.taborelec.com/Downloads.

Caution!

The Lucid Series RF Signal Generator ships in an antistatic package to prevent damage from electrostatic discharge (ESD). When storing the unit, use the antistatic case.

2.2 Front Panel

Figure 2.1 LS1291P Front Panel

- **10.1" Touch LCD Display** – 1280x800 TFT display PCAP(Projected Capacitive Touch Panel) touch screen for controlling the device.

2.3 Right Side Panel

Remove the right-side cover of the ruggedized case to replace the battery.

Figure 2.2 Right Side Panel

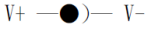
- **Battery** – Rechargeable battery 14.4 V, Lithium Ion, 3.35 Ah

2.4 Left Side Panel

Remove the left-side cover of the ruggedized case to access the connectors.

Figure 2.3 Left Side Panel

- **RF OUT** - A SMA type connector for RF signal output.
- **PWR** – Power button to turn on or off the device.

- **CLK IN 10/100MHz** – A SMA type connector for external 10 MHz or 100 MHz signal. This input is normally used for synchronizing system components to a single clock reference.
- **TRIG IN** – A SMA type connector, for an input from an external trigger source.
- **AM IN** – A SMA type connector for an input from an external amplitude modulation source.
- **FM IN** – A SMA type connector for an input from an external frequency modulation source.
- **Micro SD CARD** – Removable SD card for instrument security. It is used for storing all data about used frequencies for PATTERN in the Modulation, the List, and System tabs.
  - Min capacity 4GB
  - Max capacity 16GB
  - Speed grade 10
- **PWR IN** – 12V DC power supply connector. Plug type 

- **LAN ADAPTOR** – One micro-USB 2 for a USB to RJ45 LAN adapter.
- **USB DEVICE** – One USB 2 Type B connector for connecting a control PC.
- **USB HOST** – Two USB 2 Type A interfaces for connecting a USB device such as a memory device for storing and recalling instrument setups, keyboard or mouse.

Note

The Lucid generator will automatically revert to external reference when a signal is detected at its input.

3 Portable GUI

3.1 CW Tab

The CW (Carrier Wave) tab becomes available on the front panel display after power-up of the generator. From here the user can set the basic output parameters of the generator.

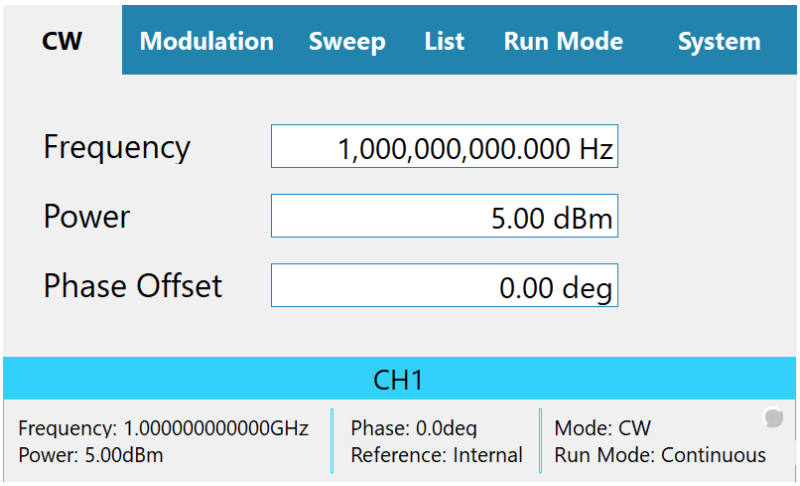


Figure 3.1 CW & Modulation Tab

- **Status Bar** – The bar at the bottom of the screen displays a summary of the system status and is shown in all tabs.
  - **Frequency** – The CW frequency.
  - **Power** – The power (amplitude) of the output signal (in dBm).
  - **Phase** – The phase offset of the signal (0 – 360 deg.).
  - **Reference:**
    - **Internal** – The modulation source is the generator.
    - **External** – The modulation source is an external connected source.
  - **Mode** – Shows which modulation is on (press Mode ON/Off in the respective modulation window).
    - **CW** – Carrier wave (default)
    - **AM,ON** – Amplitude modulation
    - **FM, ON** – Frequency modulation
    - **PM, ON** – Phase modulation
    - **PULSE ON** – Pulse modulation
    - **PATT,ON** – Pattern modulation
    - **FRSW,ON** – Frequency sweep mode is selected.
    - **PRSW,ON** – Power sweep mode is selected.
    - **LIST,ON** – 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 trigger event.

- **LED** –
  - **Gray** – The output RF channel is off.
  - **Green** – The output RF channel is on.

- **Frequency** – Sets the generator's basic frequency in Hz. You cannot enter a frequency smaller than the minimum frequency. Refer to 5 Lucid Portable Specifications, page 45 for valid frequency range.
- **Power** – Sets the power (amplitude) of the generator's output signal (in dBm).
  The default value is 5.00 dBm.
- **Phase Offset** – Sets the phase offset of the signal. Phase offset range is between **0 degrees** to **360 degrees**.
  The default value is 0 degrees.

3.2 Modulation Tab

The user can set the basic output parameters of the generator in the Modulation tab. The modulation types that are available depend on the installed options.

3.2.1 AM – Amplitude Modulation

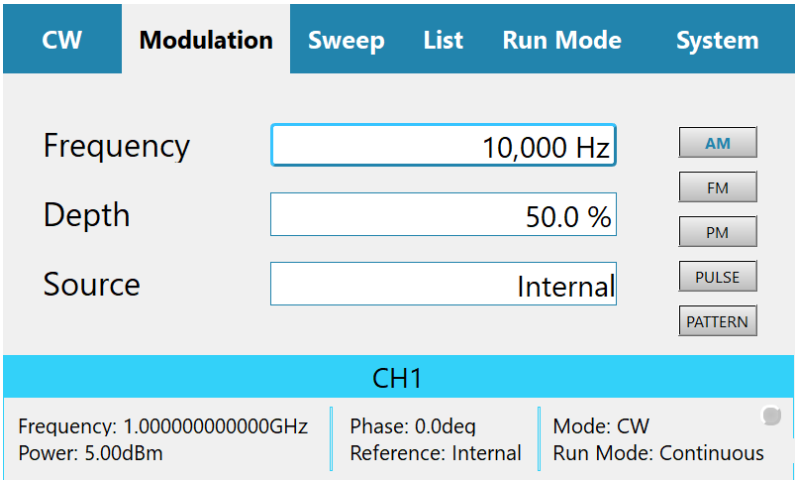


Figure 3.2 AM – Amplitude Modulation

- **Frequency** – Set the modulation frequency (Hz/kHz).
- **Depth** – Set the AM modulation in percent of the carrier wave amplitude.
- **Source** – The Enter key of the front panel will toggle the values.
  - **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.

- Push the **Mod On/Off** button on the device front panel to start the modulation and then **RF On/Off** button to output the signal.

3.2.2 FM – Frequency Modulation

Select on the device display the Modulation tab, and then click the FM button to show the frequency modulation parameters. You can also push the FM button on the front panel to show the screen.

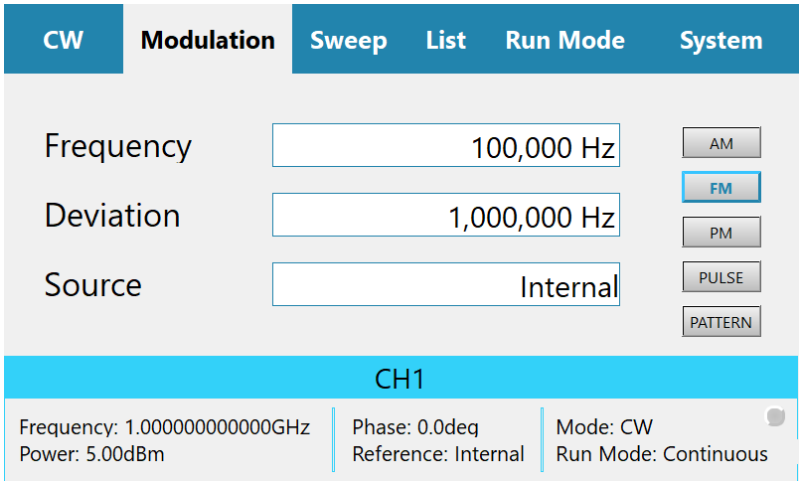


Figure 3.3 FM – Frequency Modulation

- **Frequency** – Set the modulation Frequency (Hz).
- **Deviation** – Set the frequency deviation of the carrier wave in (Hz).
- **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.
- Push the **Mod On/Off** button on the device front panel to start the modulation and then **RF On/Off** button to output the signal.

3.2.3 PM – Phase Modulation

Select on the device display the Modulation tab, and then click the PM button to show the phase modulation parameters. You can also push the PM button on the front panel to show the screen.

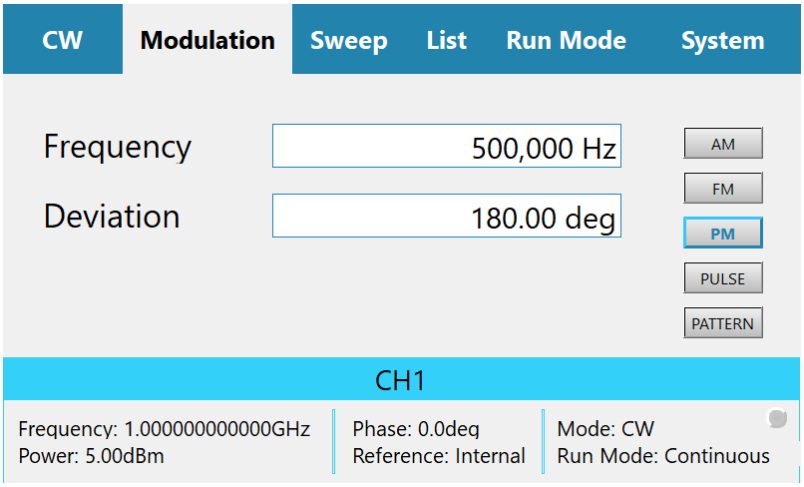


Figure 3.4 PM – Phase Modulation

- **Frequency** – Set the modulation Frequency (Hz).
- **Deviation** – Set the phase deviation degree of the modulation frequency.
- Push the **Mod On/Off** button on the device front panel to start the modulation and then **RF On/Off** button to output the signal.

3.2.4 Pulse Definition

Select on the device display the Modulation tab, and then click the PULSE button to show the pulse parameters.

Note

The **PULSE** button is only available if the device has the Pulse option installed.

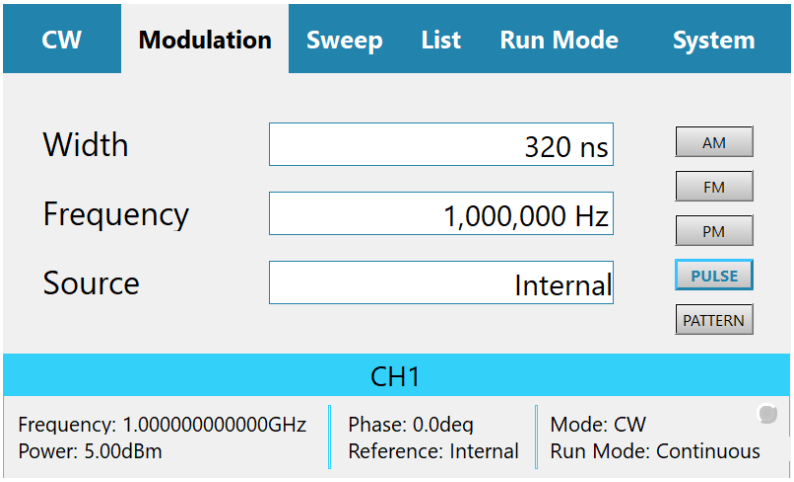


Figure 3.5 Pulse Definition

- **Width** – Set the pulse modulation width. Use the push buttons on the front panel to select units.

- **Frequency** – Set the pulse frequency in Hz.
- **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.
- Push the **Mod On/Off** button on the device front panel to start the modulation and then **RF On/Off** button to output the signal.

3.2.5 Pattern Sequence

Select on the device display the 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 Loops.

Note

The **PATTERN** button is only available if the device has the PAT option installed.

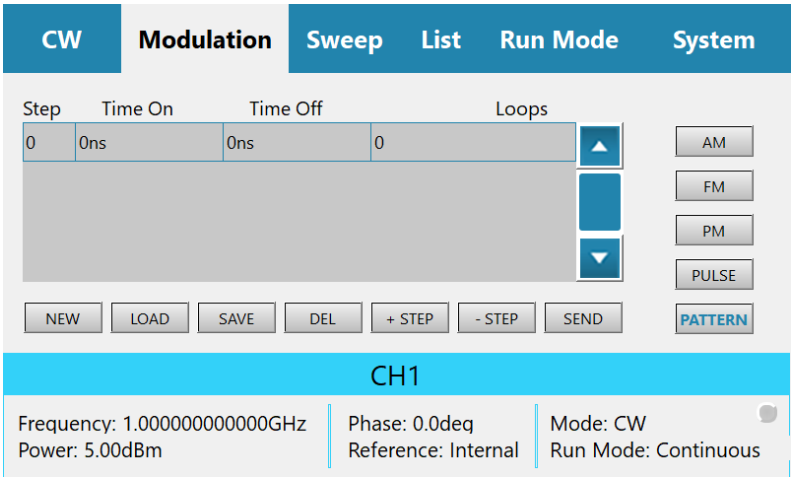


Figure 3.6 Pattern Sequence

Define a pattern according to the steps below.

1. **NEW** – Click the button to create a new Pattern.
2. **LOAD** – Click the button to select a file to load.
3. **SAVE** – Click the button to save the Pattern in a JSON (JavaScript Object Notation) format. You can save to a new name (valid name is only numbers) or overwrite an old file. You can select to store the data on the SD card.
4. **DEL** – Click the button to select a file to delete.
5. **+STEP** – Click the button to add a new step.

6. Enter the duration of the pulse (Time On), the delay for next pulse (Time Off), and the number of repetitions (Loops) of this step.
7. **-STEP** – Click the button to delete the last step.
8. **SEND** – Click the button to upload the Pattern to the instrument.

3.3 Sweep Tab

The Sweep tab menu allows you to define a signal that sweeps over a frequency or power range. You can also push the Sweep button on the front panel to show the screen.
Two **Sweep Types** are available:

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

3.3.1 Frequency Sweep

Select the Sweep tab, and then click the FREQ button. You can now define a signal that sweeps from one frequency to the next, maintaining the same amplitude.

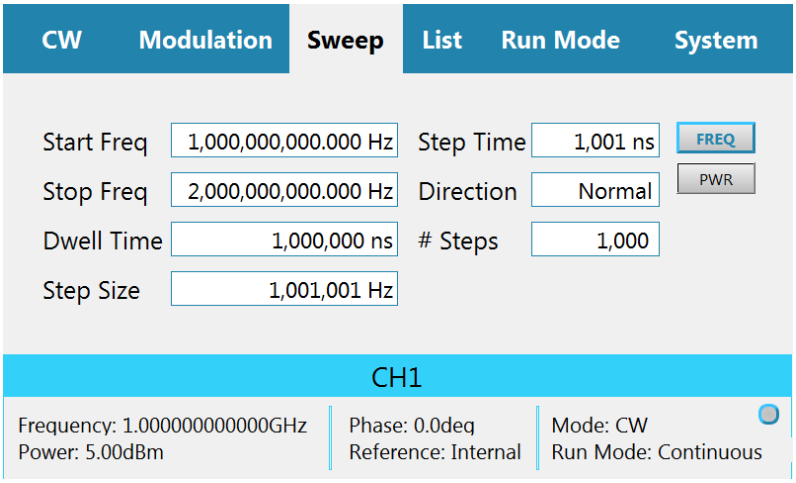


Figure 3.7 Frequency Sweep

Following are the details of the frequency-based Sweep menu:

- **Start Freq** – sets the sweep start frequency (in Hz).
- **Stop Freq** – sets the sweep stop frequency (in Hz).
- **Dwell Time** – sets the sweep dwell time that is the duration of the entire sweep.
- **Step Size** – sets the size of each step (in Hz) in the sweep. The value displayed in **# Steps** changes accordingly.
- **Step Time** – sets the step dwell time. The value displayed in **Dwell Time** changes accordingly.
- **Direction** – sets the sweeping direction:
  - **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.

- **# Steps** – sets the number of steps in one sweep (including **Start** and **Stop**). The value displayed in **Step Size** changes accordingly.

3.3.2 Power Sweep

Select the Sweep tab, and then click the PWR button. You can now define a signal that sweeps from one amplitude to the next, maintaining the same frequency.

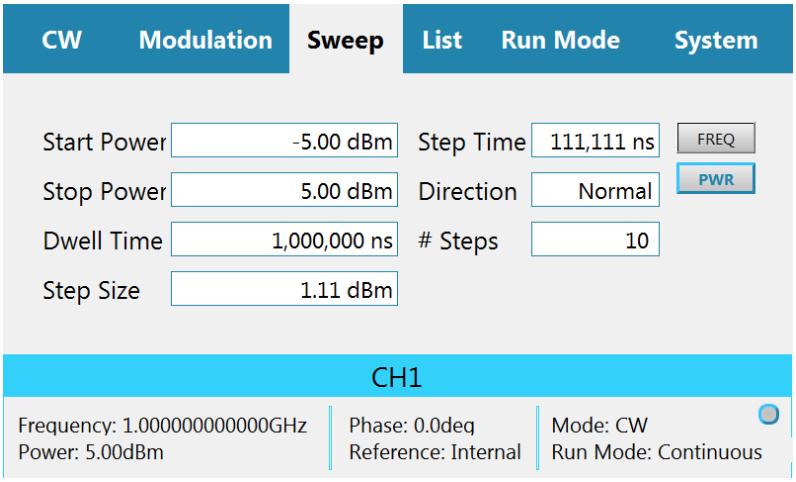


Figure 3.8 Power Sweep

- **Start Pwr** – start power sets the start sweep amplitude (in dBm).
- **Stop Pwr** – stop power sets the stop sweep amplitude (in dBm).
- **Dwell Time** – sets the sweep dwell time that is the duration of the entire sweep.
- **Step Size** – sets the size of each step (in dBm) in the sweep. The value displayed in **# Steps** changes accordingly.
- **Step Time** – sets the step dwell time. The value displayed in **Dwell Time** changes accordingly.
- **Direction** – sets the sweeping direction:
  - **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.
- **# Steps** – sets the number of steps in one sweep (including **Start** and **Stop**). The value displayed in **Step Size** changes accordingly.

3.4 List Tab

The List tab enables you to create and generate a sequence of signals that can vary in frequency, power and dwell time. You can also push the List button on the front panel to show the screen.

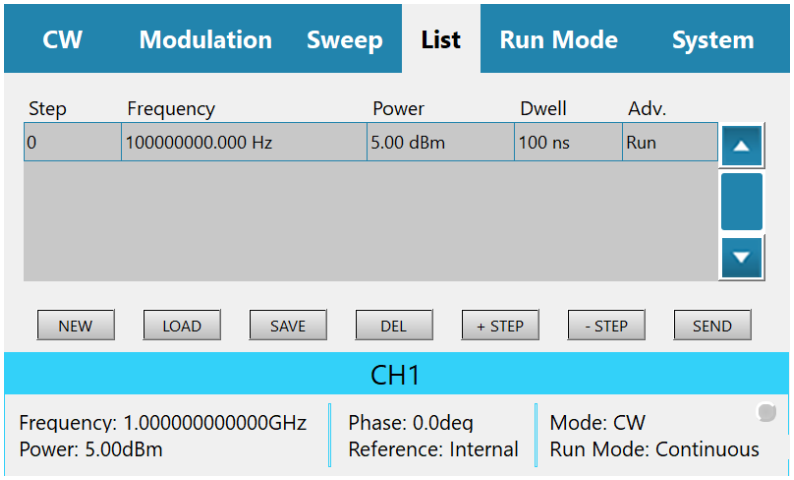


Figure 3.9 List

Define a pattern according to the steps below.

1. **NEW** – Click the button to create a new list.
2. **LOAD** – Click the button to load a previously saved list.
3. **SAVE** – Click the button to save the list in a JSON (JavaScript Object Notation) format. You can select to store the data on the SD card or on the internal.
4. **DEL** – Click the button to delete selected step.
5. **+STEP** – Click the button to add a new step. Enter the following parameters:
   a. Frequency (in Hz, kHz, MHz, or GHz) - sets the step frequency.
   b. Power (in dBm) – sets the step power.
   c. Dwell – sets the duration of the step (in µs, ms, or s).
   d. Adv. – Advance, toggle the values by pushing the Enter button:
      i. Run – the Dwell Time is followed by a Run to the next step
      ii. Wait – the Dwell Time is followed by a Wait for a Trigger that advances it to the next step.
6. **-STEP** – Click the button to delete selected line.
7. **SEND** – Click the button to upload the list to the instrument.

3.5 Run Mode Tab

The Run Mode Tab sets the mode by which the unit will run. E.g., if the sweep starts generating the signals when the user clicks the **Run** button, or it will wait for an external trigger event. You can also push the Run Mode button on the front panel to show the screen.

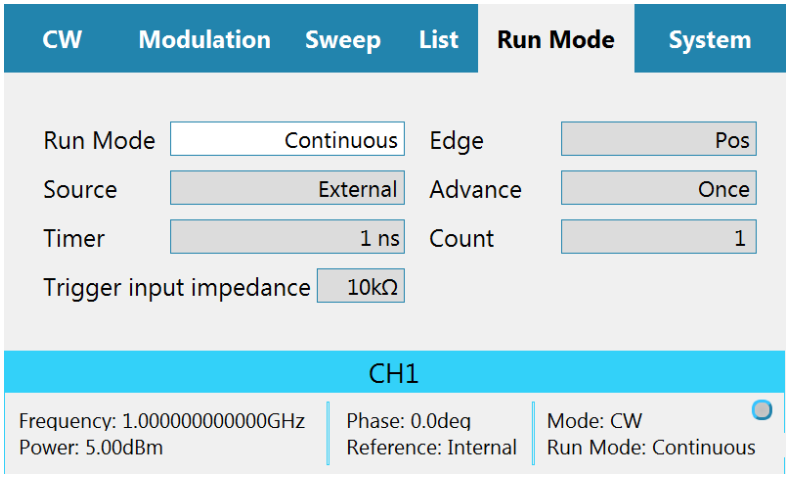


Figure 3.10 Run Mode

- **Run Mode** – sets the way in which the signals are generated. The Enter key of the front panel will toggle the values.
  - **Continuous** – enables running the signal continuously, as defined in the other tabs, and regardless of the trigger events. All Trigger oriented parameters are hidden.
  - **Trigger** – enables running the signal, when a trigger event is detected.
- **Source** – sets the source of the trigger. The Enter key of the front panel will toggle the values.
  - **Timer** – sets the rate for clocked triggers (in ns, µs, ms, or s).
  - **External** – an external source, connected to the Pulse/Trig-In port, issues the triggers.
  - **Bus** – a trigger is issued when the user clicks the **Man Trigger** button.
- **Timer** – sets the rate for clocked triggers (in ns, µs, ms, or s).
- **Trigger input impedance** – Sets the trigger input impedance value, selectable between 50 Ω and high Z (10 kΩ).
  Note: An input voltage exceeding 5 V may damage the instrument.
- **Count** – sets the number of triggers that will be issued.
- **Edge**:
  - **Pos** – trig on the trigger positive rising edge.
  - **Neg** – trig on the trigger negative (falling) edge.
- **Advance** – sets the trigger advance either in steps or as a one-time event.
  - **Once** – sets the number of times a sweep or list will be generated. When the count is set to 0, unit outputs 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 until the step is completed.

3.6 System Tab

The System Tab manages the setup parameters of the entire system. You can load a system file to use a previously used system configuration.

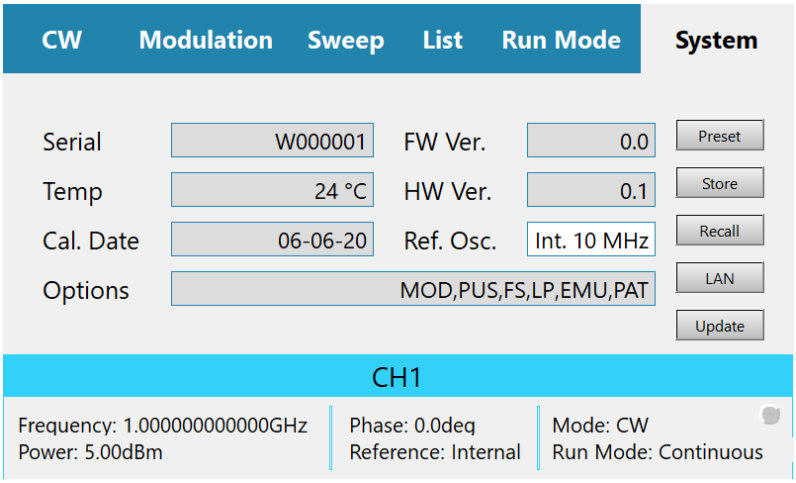


Figure 3.11 System Tab

Following are the details of the System menu:

- **Serial** – the serial number of the generator.
- **Temp** – the temperature of the generator (℃).
- **Cal. Date** – the time stamp of the last calibration.
- **Option**s – the options available in this generator.
  - **MOD** – Modulation package (AM, FM, PM).
  - **PUS** – Pulse generator.
  - **FS** – Fast switching.
  - **LP** – Low Power (-90 dBc).
  - **EMU** – Emulation, includes emulators for Keysight, R&S, Anapico, and Holzworth
  - **PAT** – Pattern generator.
- **FW Ver.** – the firmware version.
- **HW Ver.** – the hardware version.
- **Ref. Osc.** – the clock to use for synchronizing system components.
  - **Int. 10 MHz** – use an internal 10 MHz clock.
  - **External** – use an external connected clock connected to the 10/100 MHz BNC connector on the rear panel.

3.6.1 Preset

Select on the device display the System tab, and then click the **Preset** button to set the system settings to factory defaults. A confirmation pop-up message is displayed.

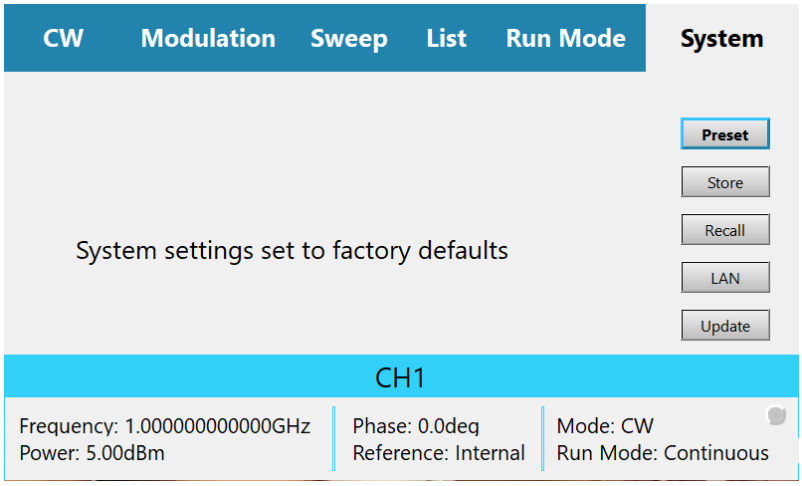


Figure 3.12 Preset Confirmation Pop-up

3.6.2 Store

Select on the device display the System tab, and then click the Store button to save the current settings of the entire system in a JSON (JavaScript Object Notation) format. You can select to store the data on the SD card.

- **BACK** – Click the button to return to the System dialog box.

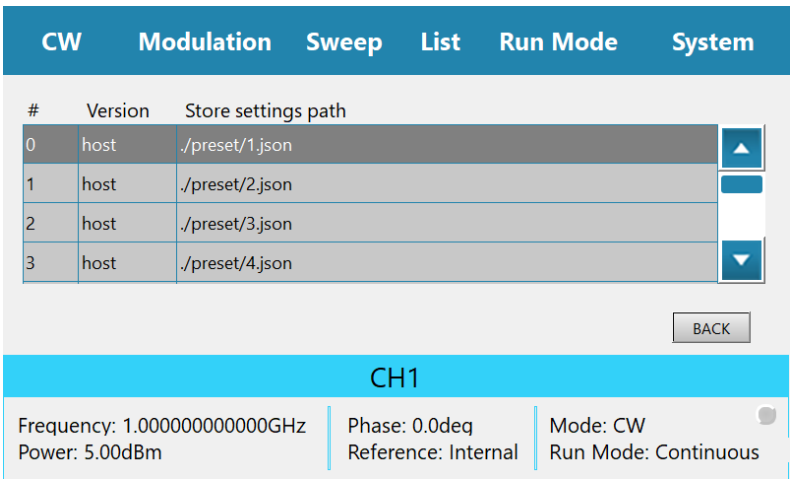


Figure 3.13 Store Settings

3.6.3 Recall

Select on the device display the System tab, and then click the **Recall** button to restore the stored settings of the entire system in a JSON (JavaScript Object Notation) format. You can select to restore the data from an SD card.

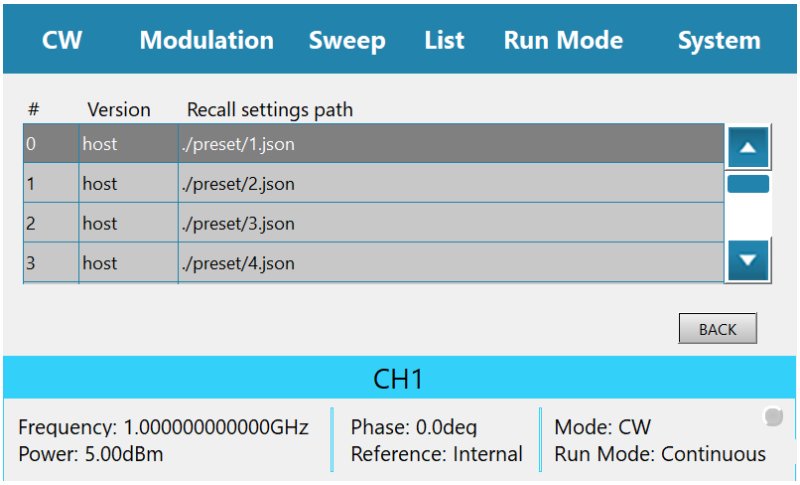


Figure 3.14 Recall Settings

- **BACK** – Click the button to return to the System dialog box.

3.6.4 LAN

Select on the device display the System tab, and then click the LAN button to show or modify the IP parameters.

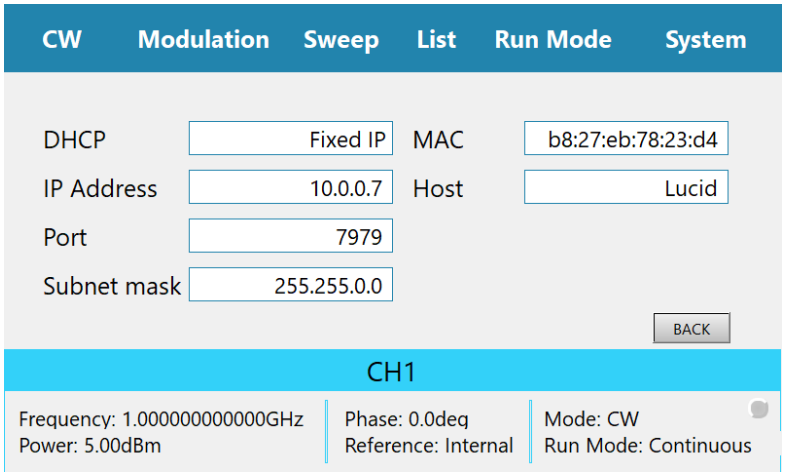


Figure 3.15 System Tab LAN

- **DHCP** – Dynamic Host Configuration Protocol.
  - **Fixed** – Define a static IP Address. Verify that the PC running Lucid software is on the same network (default).
  - **Dynamic** – Get an IP address from the DHCP server. The IP Address, Port and Subnet Mask fields are not accessible.
- **IP Address** – Define a static IP address.
- **Port** – Define the SCPI port for communication. User should use a free port in the range 1 to 65535.
- **Subnet Mask** – Verify that the PC running Lucid software is on the same network.

- **MAC** – The device MAC address.
- **Host** – The device computer name.
- **BACK** – Click the button to return to the System dialog box.

3.6.5 Update

Device FW Update Sequence

1. Prepare on a PC a USB flash memory with a folder containing two files. You can download the files from the Tabor Electronics website at http://www.taborelec.com/downloads.
   a. portable.fw.tar.gz
   b. Manifest
2. Insert the flash memory in a free USB connector on the device.
3. Select on the device display the System tab, and then click the Update button to select the firmware for updating the device.

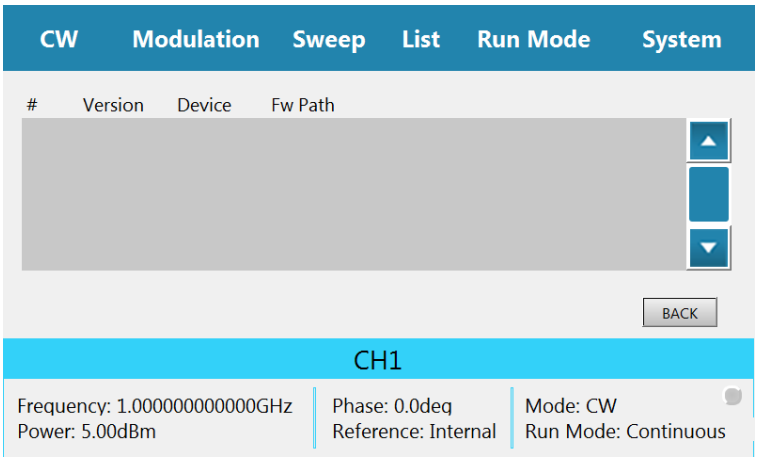


Figure 3.16 System Update

4. Wait for the operation to be completed.
5. Reboot the device manually by power-down/up.

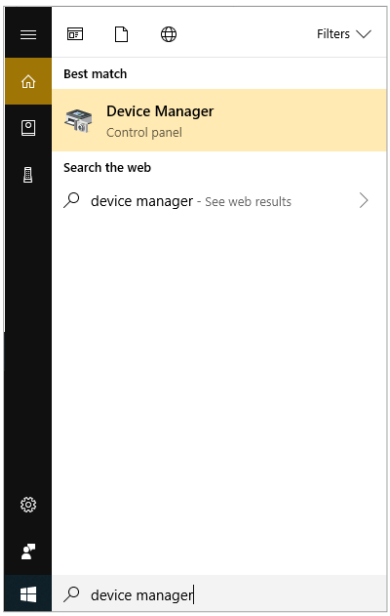
- **BACK** – Click the button to return to the System dialog box.

4 Troubleshooting

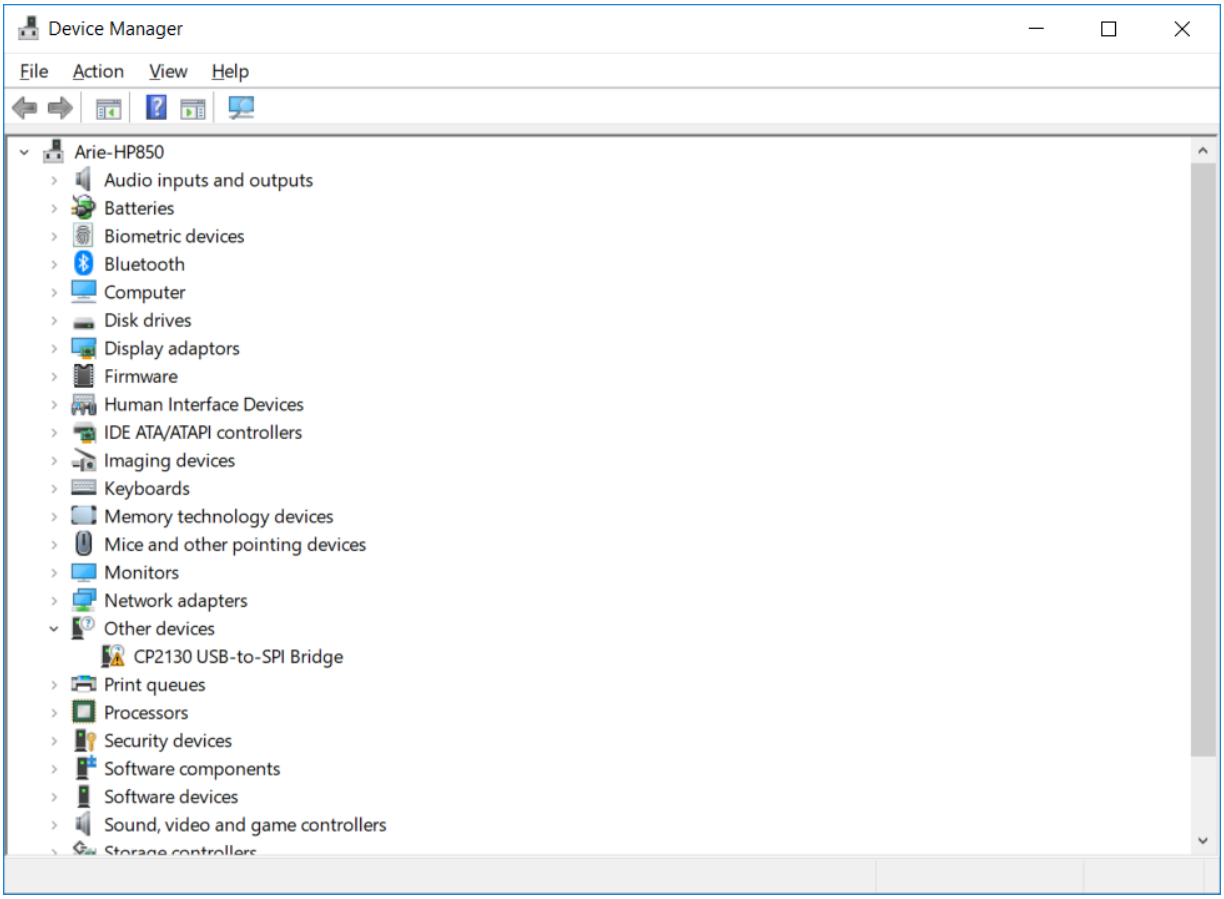
4.1 Manually Installing Instrument Drivers

4.1.1 USB Device Driver Manual Installation (Windows 10)

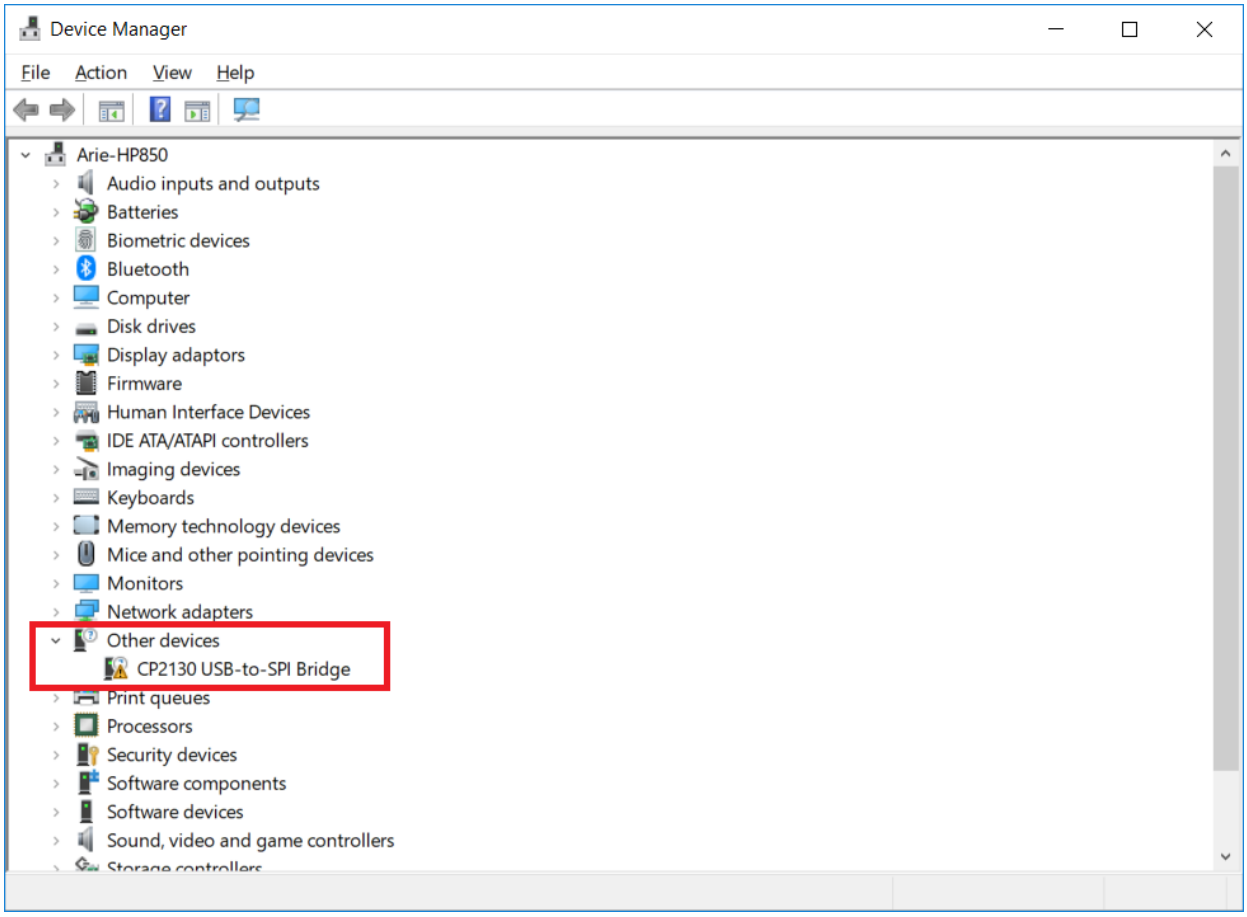
1. Download the latest Lucid series USB device driver from www.taborelec.com/downloads.
2. Using the supplied USB cable, connect the Lucid Portable model to the PC.
3. Open the **Start** menu, and in the search field, type **Device Manager**.



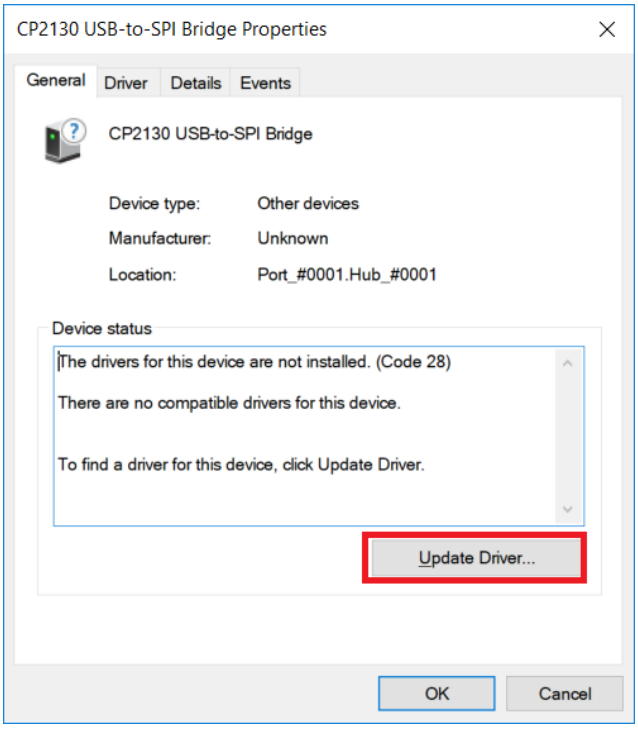
4. In the search results list, select **Device Manager**.
   The **Device Manager** window opens.



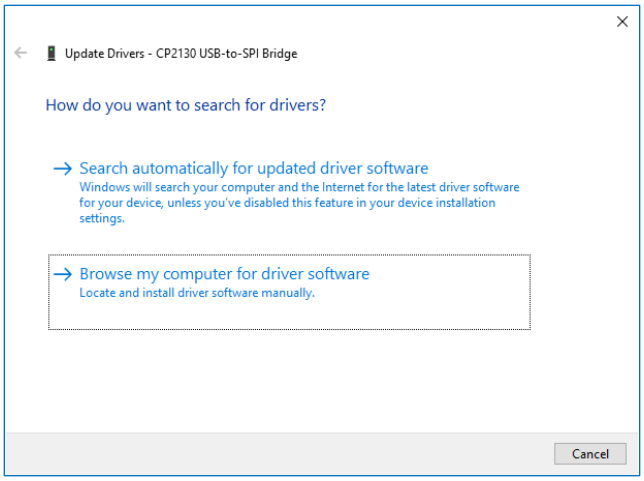
5. In the navigation tree, expand **Other devices** and double click on **CP2130 USB-to-SPI Bridge**.



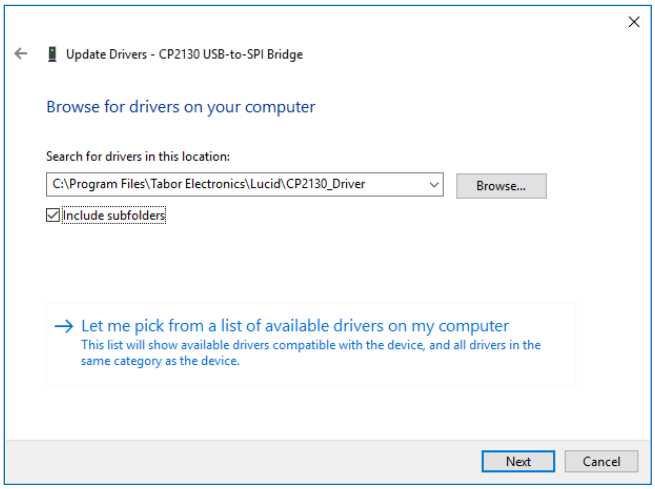
6. The **CP2130 USB-to-SPI Bridge Properties** window opens.
   Click **Update Driver**.



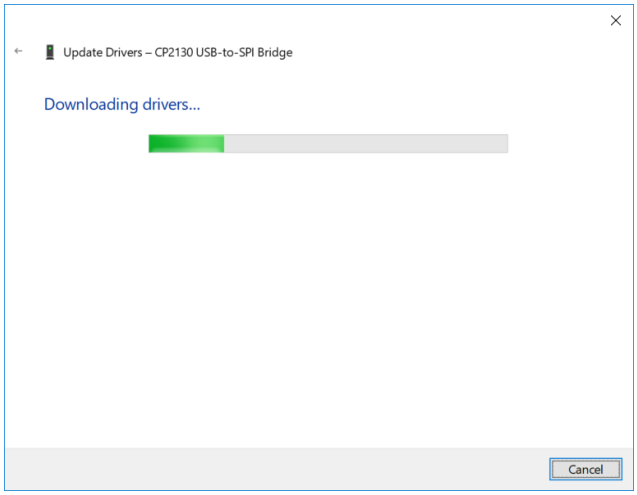
7. In the **Update Drivers** - **CP2130 USB-to-SPI Bridge** window, select **Browse my computer for driver software**.



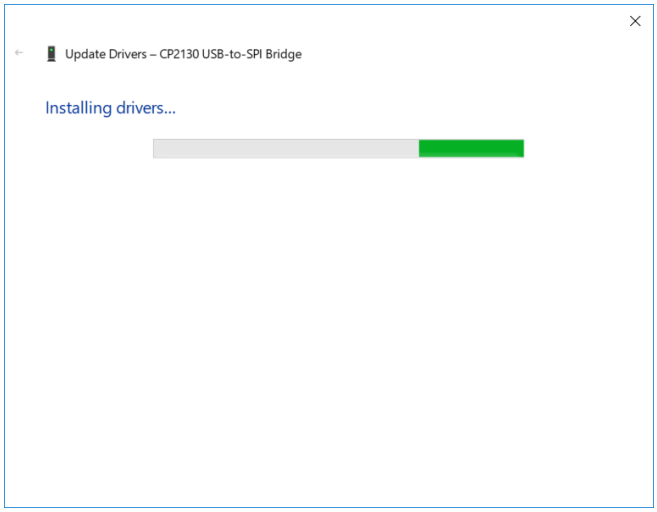
8. Browse to the driver software location on PC, select its folder and click **OK**.



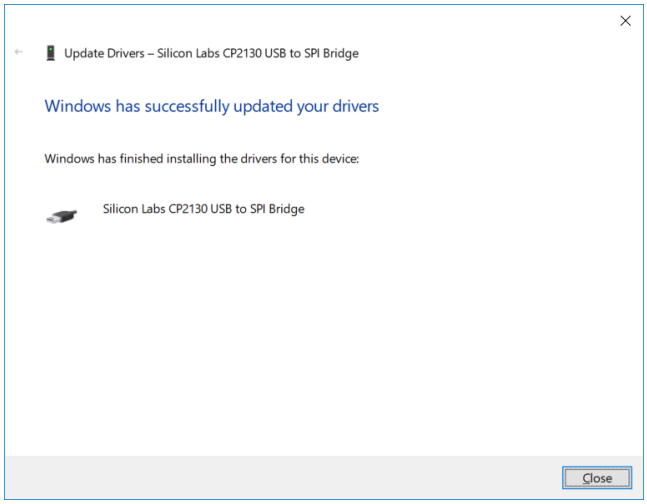
9. Driver download begins.



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

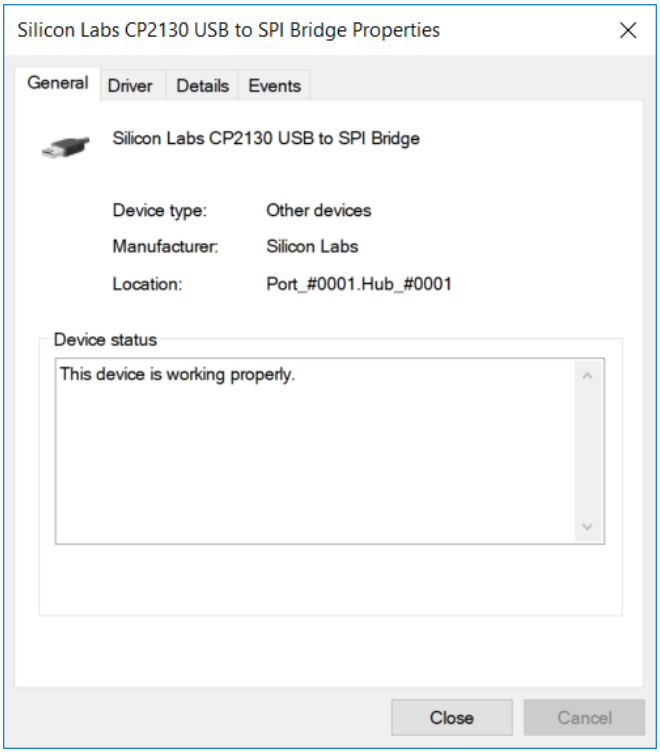


11. After the installation is complete, the following success message is displayed:



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

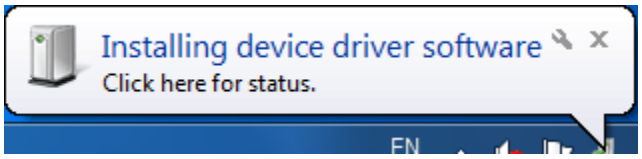
13. In the **CP2130 USB-to-SPI Bridge Properties** window the displayed device status should be: **The device is working properly**.



4.1.2 USB Device Driver Manual Installation (Windows 7)

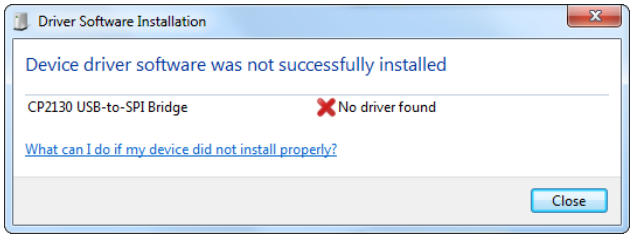
1. Download the latest Lucid series USB device driver from the Tabor Electronics Ltd. website. Device drivers are available at www.taborelec.com/downloads

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:

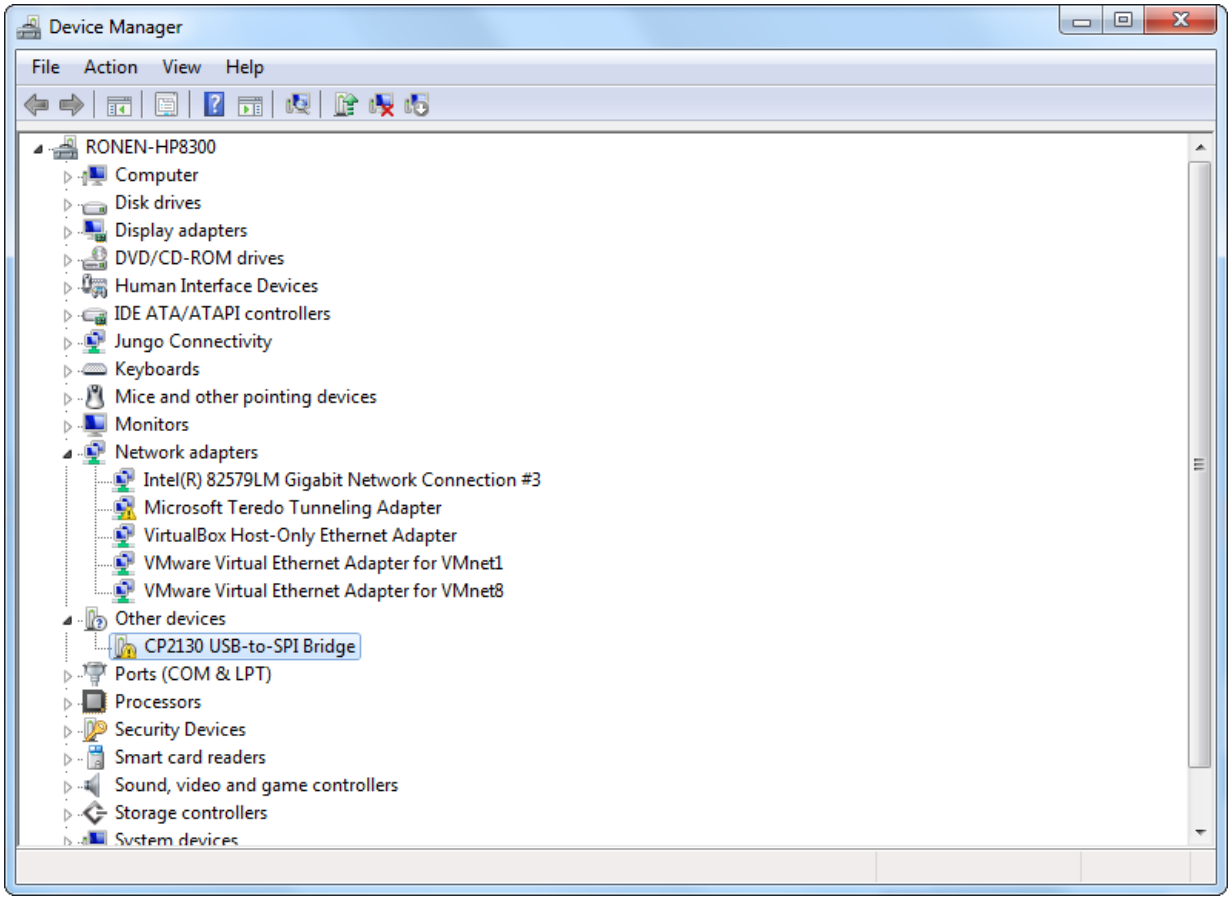


4. Click **Close**.

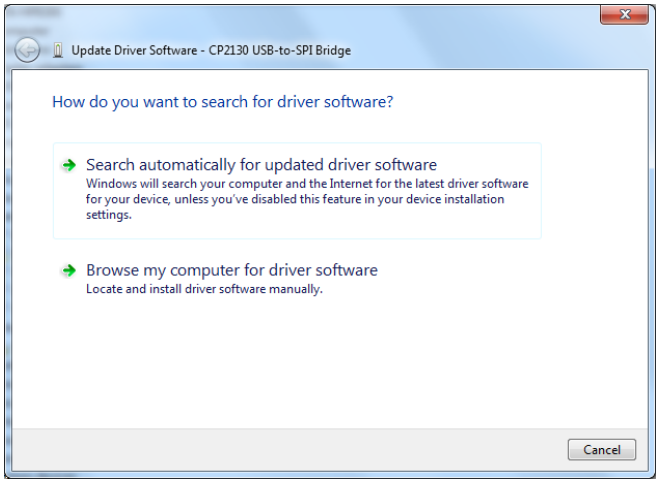
5. Open the **Start** menu, and in the search field, type **Device Manager**.

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

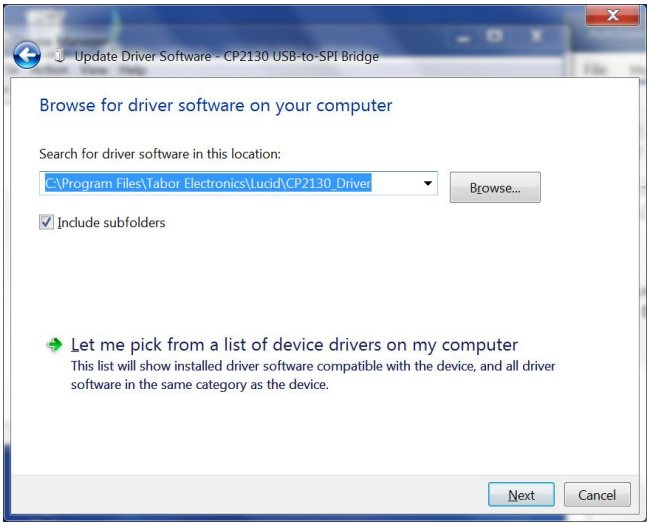
7. In the navigation tree, expand **Other devices** and select **CP2130 USB-to-SPI Bridge**.



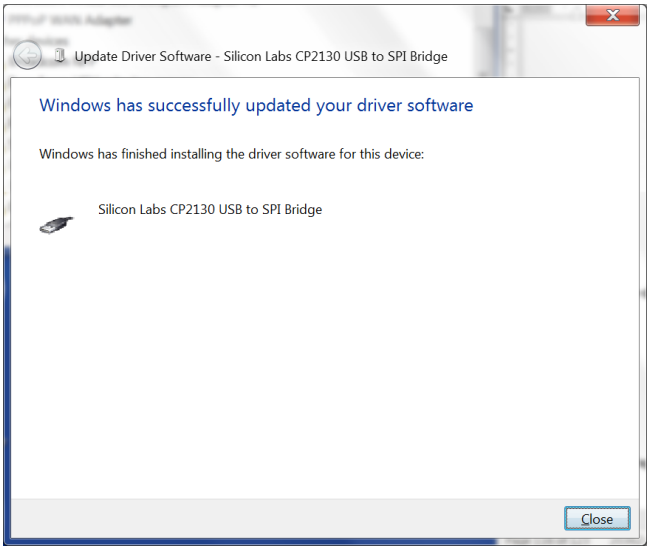
8. In the U**pdate Drivers** - **CP2130 USB-to-SPI Bridge** window, select **Browse my computer for driver software**.



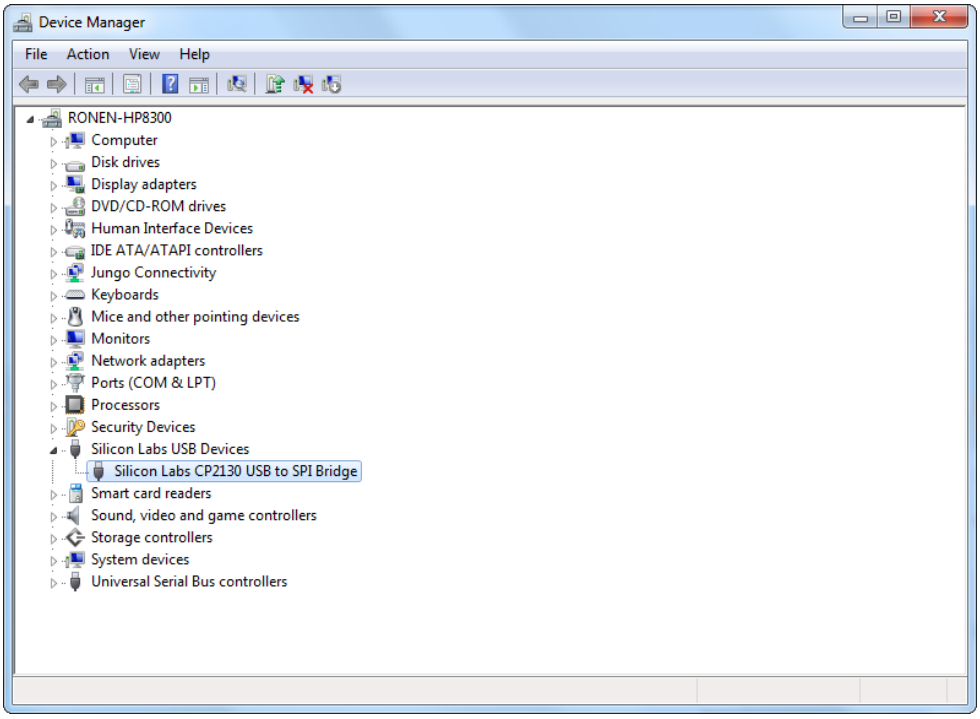
9. Browse to the driver software location on PC, select the folder and click **Next**. Driver installation begins.



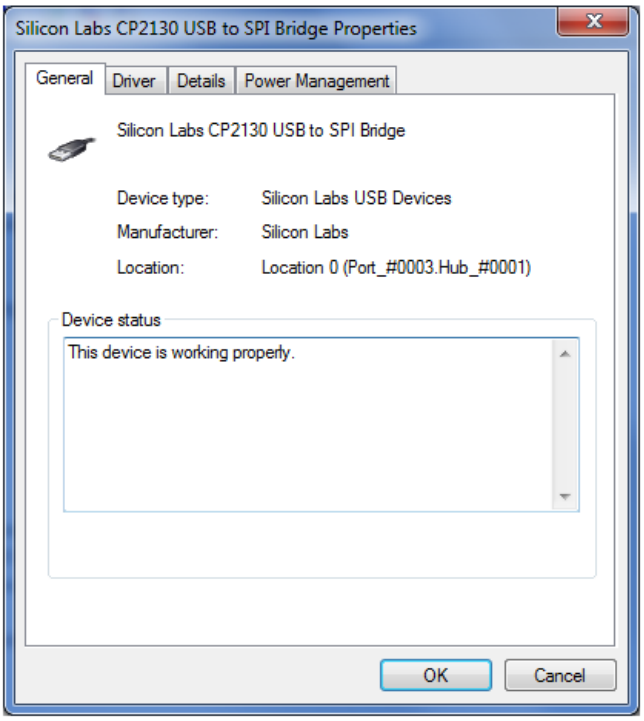
10. After the driver software installation is complete, click **Close**.



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.



5 Lucid Portable Specifications

5.1 Frequency

Table 5.1 Frequency Specifications

Frequency	
Range	
LS3081P	9 kHz to 3 GHz
LS6081P	9 kHz to 6 GHz
LS1291P	9 kHz to 12 GHz
Resolution	0.001 Hz
Phase Offset	0.01 deg
Switching Speed	500 µs

5.2 Frequency Reference

Table 5.2 Frequency Reference Specifications

Frequency Reference	
Temperature Stability	±25 ppb max
Aging	±3 ppm max for 20 years
Warm Up time	30 min

5.3 Amplitude

Table 5.3 Amplitude Specifications

Amplitude		
Max Output Power		
Settable	+20 dBm	
Calibrated	+15 dBm[1]	
Min Output Power	Base	LP Opt.
Settable	-30 dBm	-100 dBm
Calibrated	-20 dBm	-80 dBm
Resolution	0.01 dB	
Power Mute	-95 dBm	
Output Return Loss	-10 dBm	
Accuracy (dB)	-50 dBm to +15 dBm	-90 dBm to -50 dBm
Up to 100 MHz	±0.3 (typ.)	±0.5 (typ.)
100 MHz to 3 GHz	±0.4 (typ.)	±0.6 (typ.)
3 GHz to 9 GHz	±0.7 (typ.)	±0.9 (typ.)

Amplitude		
Above 9 GHz	±1 (typ.)	±1.5 (typ.)

[1] Above 25 kHz.

5.4 Phase Noise and Harmonics

Table 5.4 Phase Noise and Harmonics Specifications

Phase Noise (dBc/Hz)	
Measured @ 10 kHz Offset)	
100 MHz	
250 MHz	
500 MHz	
1 GHz	-138 (typ.)
2 GHz	-133 (typ.)
3 GHz	-130 (typ.)
4 GHz	
6 GHz	-124 (typ.)
8 GHz	
10 GHz	
12 GHz	-118 (typ.)
Harmonics (dBc)	
Range	
Up to 100 MHz	-30 dBc
Up to 8 GHz:	-50 dBc
100 MHz to 12 GHz	-50 dBc[2]
Sub-harmonics (dBc)	
6 to 12 GHz:	-55 dBm
Non-harmonics (dBc)	
Up to 12 GHz	-90 dBc (typ.)[3,4], -60 dBc (max.)[5]

[2] 750 MHz to 900 MHz -35dBc (typ.).
[3] -60 dBm max. @ 1 GHz, 1.5 GHz, 2.5 GHz and 3 GHz.
[4] -75 dBm max. @ -15 dBm to +15 dBm and f> 6 GHz.
[5] Boundary spurs which may appear @ -100 MHz to +100 MHz offset from CW.

5.5 Modulation

Table 5.5 Modulation Specifications

Modulation	
Frequency Modulation	
Maximum Deviation	10 MHz
Resolution	0.1 % or 1 Hz (the greater)

Modulation	
Modulation Rate	1 MHz
Resolution	1 Hz
Amplitude Modulation[6]	
AM Depth	
Type	Linear
Maximum Settable	90 %
Resolution	0.1 % of depth
Modulation Rate	DC to 100 kHz
Phase Modulation	
Peak Deviation	360 deg
Modulation Rate	DC to 100 kHz
Pulse Modulation (PLS Option)	
On/off Ratio	60 dB
Rise/fall Time (10%-90%)	15 ns (typ.)
Resolution	6.4 ns
Minimum Width	32 ns
Repetition Frequency	DC to 10 MHz
Pattern Modulation (PAT Option)	
Number of Steps	1 to 2,048
Step Repetitions	1 to 65,535
ON/Off Time	32 ns to 20 days
Sweep	
Range	Same as frequency range
Modes	Frequency and amplitude step, list
Dwell Time	100 µs to 1,000 s
Resolution	1 µs
Number of Points	
List	2 to 4,096
Step	2 to 65,535
Step Change	Linear
Trigger	Free run, External, Bus, Timer

[6] Specified for CW>100MHz

5.6 Inputs

Table 5.6 Inputs Specifications

Inputs	
10/100 MHz Input	CLK IN 10/100MHz
Connector Type	1 x SMA
Input Impedance	50 Ω

Inputs	
Waveform	Sine or Square
Frequency	10 MHz/100 MHz
Power	-3 dBm to +10 dBm
Absolute Maximum Level	+15 dBm
Pulse/Trigger Input	TRIG IN
Connector Type	1 x SMA
Input Impedance	50 Ω
Input Voltage	TTL, CMOS compatible
Threshold	1.5 V
Damage Level	-0.42 V or +5.42 V
AM Input	AM IN
Connector Type	SMA
Input Impedance	50 Ω
Maximum Input Voltage	±1 V
Input Damage Level	±3.5 V
FM Input	AM IN
Connector Type	SMA
Input Impedance	50 Ω
Maximum Input Voltage	±1 V
Input Damage Level	±3.5 V

5.7 Outputs

Table 5.7 Outputs Specifications

Outputs	
RF Out	
Impedance	50 Ω
Connector Type	SMA
Number of Outputs	1

5.8 General

Table 5.8 General Specifications

General	
Power Supply	Input 90 – 264 V AC, 1 A, 47-63 Hz Output 12.0 V DC, 3.0 A, 36 W
Power Consumption	
Normal Operation	45 W nom.
Max	60 W max.
Display Type	10.1", 1280x800 TFT capacitive touch screen
Battery	
Type	4-cell, replaceable
Standby	Up to 120 minutes
Maximum Load	Up to 75 minutes
Interface	
Host	2 x USB type A
Device	1 x USB type B 1 x micro-USB for LAN adapter
Storage	16 GB removable SD card
Dimensions (WxHxD)	280 x 225 x 65 mm
Weight	
Without Package	3 kg
Shipping Weight	4.5 kg
Temperature	
Operating	0°C to +40°C
Storage	-40°C to +70°C
Warm up time	15 minutes
Humidity:	85% RH, non-condensing
Safety	CE Marked, IEC61010-1:2010
EMC	IEC 61326-1:2013
Calibration	2 years
Warranty	3 years