



# **ERASynth: An Open Source, Arduino-Compatible RF Signal Generator with Wi-Fi Connectivity**

## **USER'S GUIDE**



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## 2. ERASynth Details

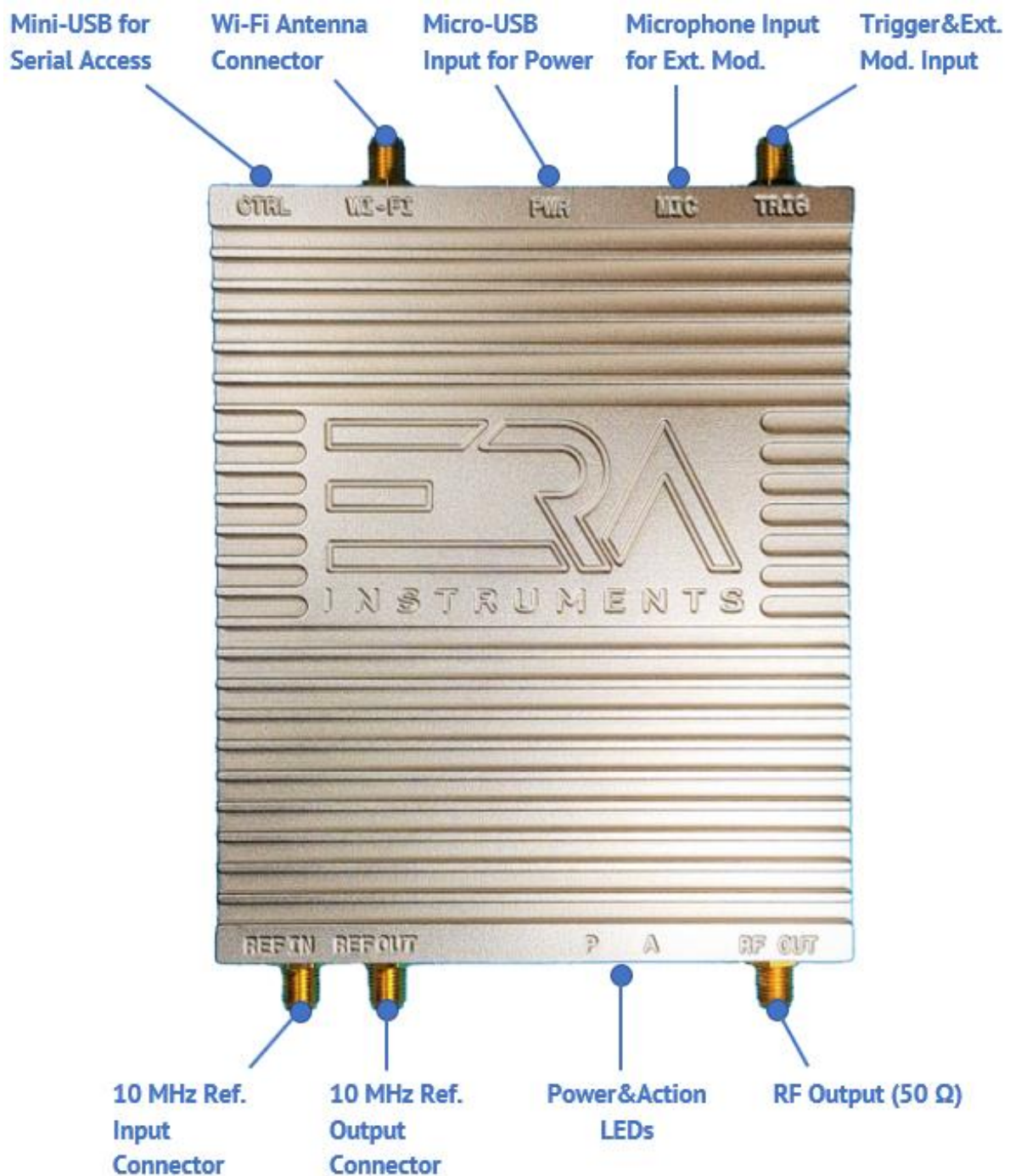


Figure 1. ERASynth Details

### 3. Powering the ERASynth

ERASynth can be powered via a micro-USB connector. A power bank or a mobile device charger that can supply 5V and at least 1.5A of current can be used to power ERASynth. It is recommended to use a stable, short and high quality cable.

When powered up properly, ERASynth's power LED on the front panel will emit green light and the action LED will blink with red light



Figure 2. Powering the ERASynth

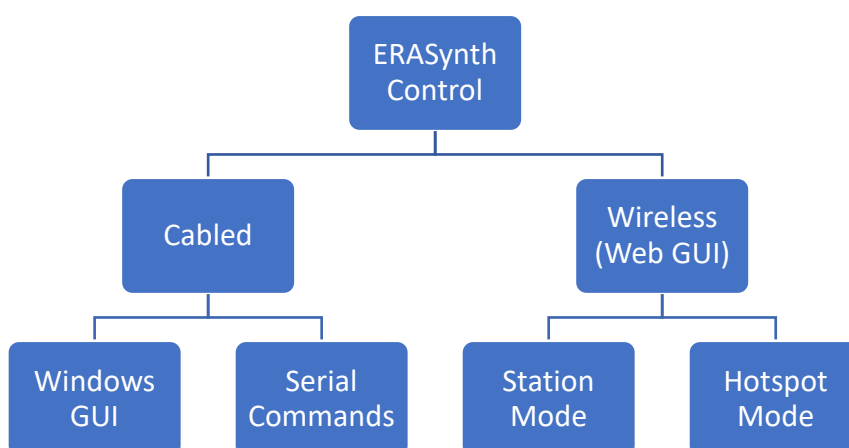
## 4. Controlling the ERASynth

There are mainly two ways to control ERASynth: Wireless and cabled.

ERASynth can be connected with a PC via mini-USB connector and can be controlled with ERASynth Control Panel software or with serial commands through any serial terminals. The Windows based ERASynth Control Panel software can be downloaded from [<https://github.com/era instruments>]. If desired, internal wireless module can be powered-off by using this software.

If wireless control preferred, there are two modes of operation: Station mode and hotspot mode. Hotspot mode is the default mode set at the factory.

A summary of the control modes of ERASynth is outlined below:



### 4.1 Web GUI

A Wi-Fi antenna must be installed to the ERASynth's Wi-Fi antenna connector for wireless control.

By default and after a factory reset, ERASynths are set for wireless control with hotspot mode.





Figure 3. ERASynth with Wi-Fi Antenna

## Hotspot Mode

In this default mode, ERASynth serves a Wi-Fi connection. Any WiFi-enabled device can be used to connect ERASynth with these default settings:

*Hotspot SSID:* **ERASynth**

*Hotspot Password:* **erainstruments**

*IP Address:* **192.168.1.150**

*Subnet Mask:* **255.255.255.0**

*Default Gateway:* **192.168.1.1**

To reach the web GUI of ERASynth, a web browser such as Safari, Chrome, Firefox and IE can be used with default IP address above. After a successful connection, these settings can be changed as desired by the user.

## Station Mode

In this mode, user has to provide a Wi-Fi network for ERASynth. Once ERASynth is successfully connected to user's local Wi-Fi network, the web GUI can be reached by using

a WIFI-enabled device in the same network. IP settings can be applied by using the web GUI itself, Windows GUI or serial commands.

#### 4.1.1 ERASynth Control Panel

ERASynth can be controlled through an embedded Wi-Fi module. This is an ESP8266 module and a web server is running inside it. This server can be reached by a html browser.

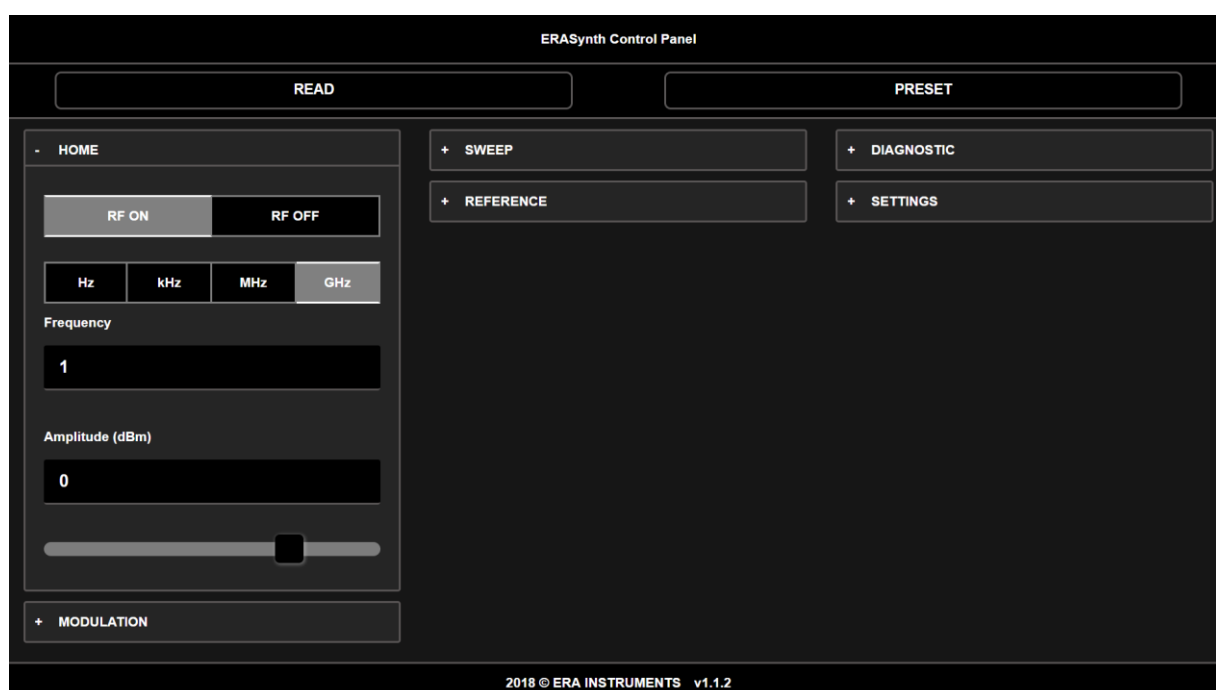


Figure 4. Web GUI: ERASynth Control Panel

Almost all settings can be made via this interface.

It has a responsive design. So ERASynth can be used with a PC, a tablet or a mobile phone.

There are 6 tabs and several text boxes. After a field update pressing/clicking/tapping the “Enter” button is required.

“READ” button is used to get values stored inside the ERASynth. After initial loading of the page or changing any values, using this button is recommended to see situation of the ERASynth.

“PRESET” button is used to set default values into the ERASynth. This button sets all values except “Settings” tab to the default values. Because “Settings” tab values are used for communication with the ERASynth. Factory reset is used to change all values to default and this can be done using Windows GUI or serial commands.

The version of this page can be seen on the bottom of the page. New versions can be found on [<https://github.com/era instruments>].

### 4.1.2 Home Tab

Frequency and amplitude controls can be done in this tab.

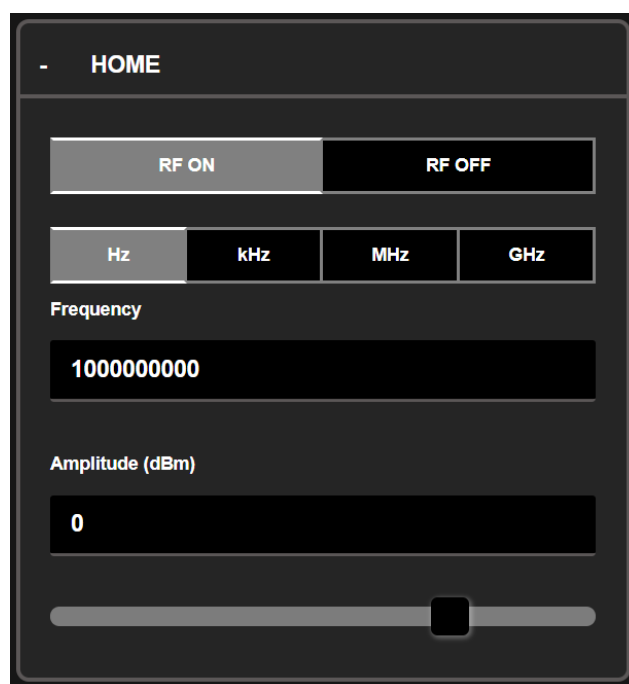


Figure 5. Home tab in the web GUI

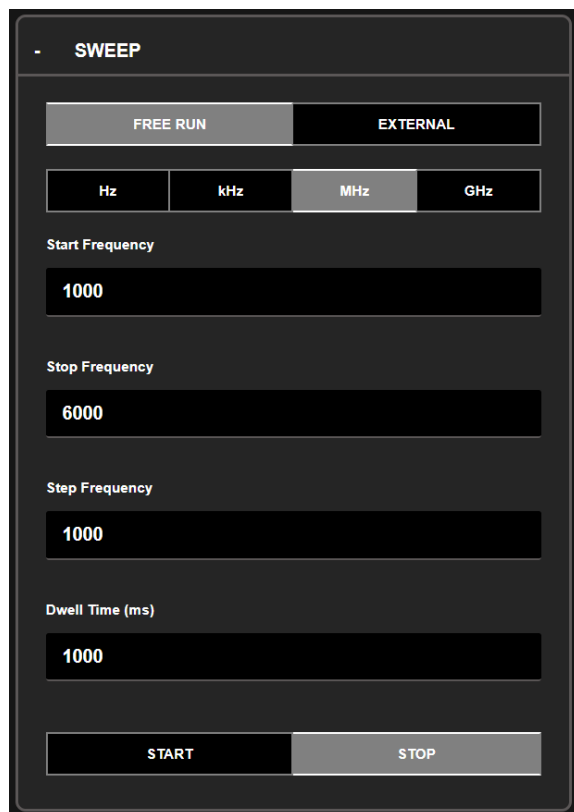
Frequency can be written in 1 Hz resolution. Also frequency display format can be changed by “Hz”, “kHz”, “MHz” and “GHz” buttons. Frequency values are updated automatically after clicking/tapping the buttons.

Amplitude can be written in 0.1 dB resolution. A slider can be also used for changing amplitude in 1 dB steps.



### 4.1.3 Sweep Tab

Sweep parameters can be changed in this tab.



The screenshot shows the 'SWEEP' tab in a web GUI. It features two main mode buttons: 'FREE RUN' (selected) and 'EXTERNAL'. Below these are four frequency unit buttons: 'Hz', 'kHz', 'MHz' (selected), and 'GHz'. The 'Start Frequency' field is set to '1000'. The 'Stop Frequency' field is set to '6000'. The 'Step Frequency' field is set to '1000'. The 'Dwell Time (ms)' field is set to '1000'. At the bottom, there are 'START' and 'STOP' buttons.

Figure 6. Sweep tab in the web GUI

Frequency values in this tab can be written in 1 Hz resolution. Also frequency display format can be changed by “Hz”, “kHz”, “MHz” and “GHz” buttons. Frequency values are updated automatically after clicking/tapping the buttons.

Dwell time can be written in 1 ms resolution.

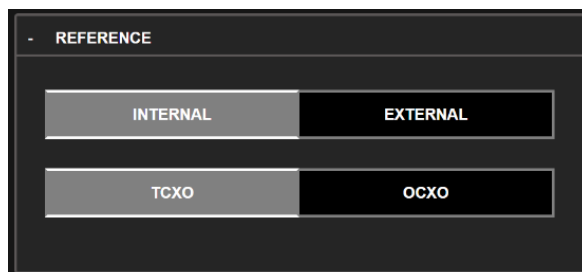
Sweep source can be external or free run. If “FREE RUN” is selected sweep is performed with dwell time.

If external source is selected “Dwell Time (ms)” value disappears and waits for external trigger signal from ERASynth’s “Trigger&Ext Mod. Input” after a sweep start.

After a sweep start, parameters can’t be changed. If any change is desired sweep must be stopped.

#### 4.1.4 Reference Tab

Reference sources can be changed in this tab.



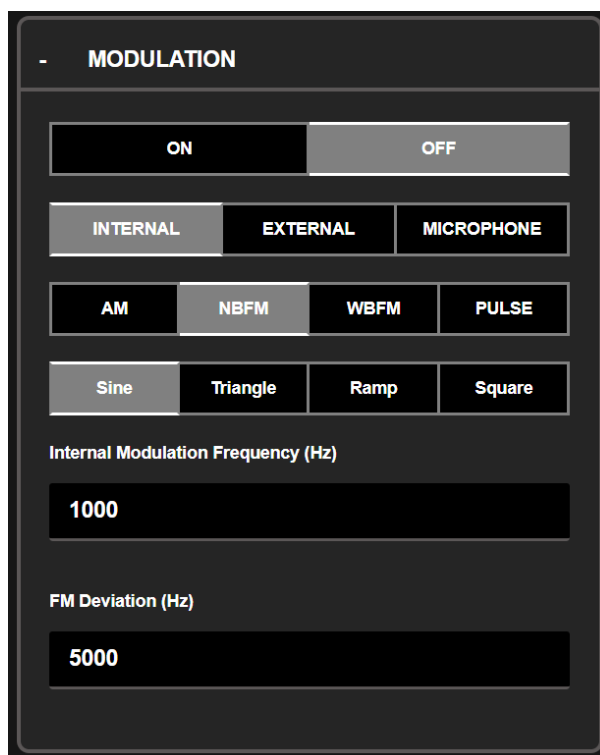
*Figure 7. Reference tab in the web GUI*

Reference of the ERASynth can be an external source or internal.

If internal source is selected internal TCXO or OCXO (for ERASynth+ & ERASynth++) can be used.

If external source is selected, a proper 10 MHz signal must be installed to the “10 MHz REF Input Connector”.

### 4.1.5 Modulation Tab



The screenshot shows the 'MODULATION' tab in a web GUI. It features several control elements: a toggle switch for 'ON' and 'OFF'; three buttons for modulation sources: 'INTERNAL', 'EXTERNAL', and 'MICROPHONE'; four buttons for modulation types: 'AM', 'NBFM', 'WBFM', and 'PULSE'; and four buttons for waveform shapes: 'Sine', 'Triangle', 'Ramp', and 'Square'. Below these buttons are two input fields: 'Internal Modulation Frequency (Hz)' with the value '1000' and 'FM Deviation (Hz)' with the value '5000'.

Figure 8. Modulation tab in the web GUI

For each modulation type, necessary text boxes are shown and others are disappears.

Modulation sources can be “INTERNAL”, “EXTERNAL” or “MICROPHONE”.

If internal source is selected modulation signal is generated inside the ERASynth with various type: Sinusoidal, triangular, ramp and square.

If external source is selected modulation signal cable must be installed to the “Trigger&Ext Mod. Input” connector.

If microphone source is selected an electret microphone must be installed to the “Microphone Input” connector.

NOT: Do NOT plug a line-in signal to the ERASynth.

#### 4.1.6 Diagnostic Tab

There is a diagnostic section in the GUI to detect faults and obtain information about the module. The “Read All” button at the bottom of the tab is used to update the values.

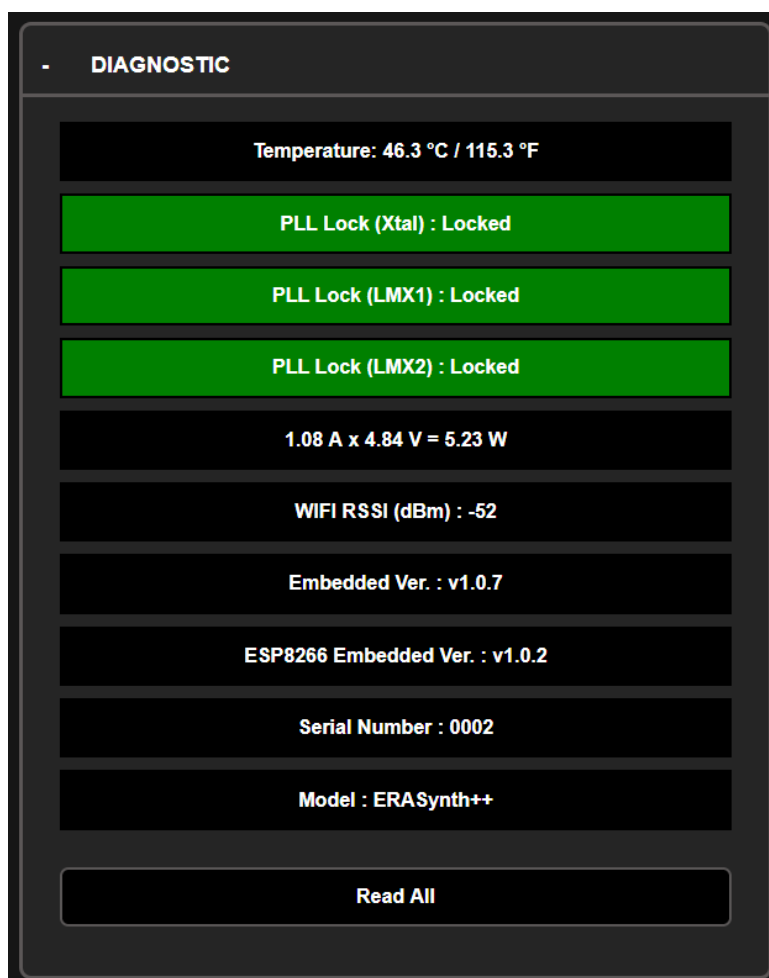


Figure 9. Diagnostic tab in the web GUI with locked status

There are three PLL (phase lock loop) inside the ERASynth and lock status of PLLs can be checked.

If a PLL is LOCKED it is shown with a green color.

If a PLL is NOT LOCKED it is shown with a red color.

For example, if external reference input is selected and this input doesn't exist, Xtal PLL i.e. reference PLL can't be locked and it is shown as below.

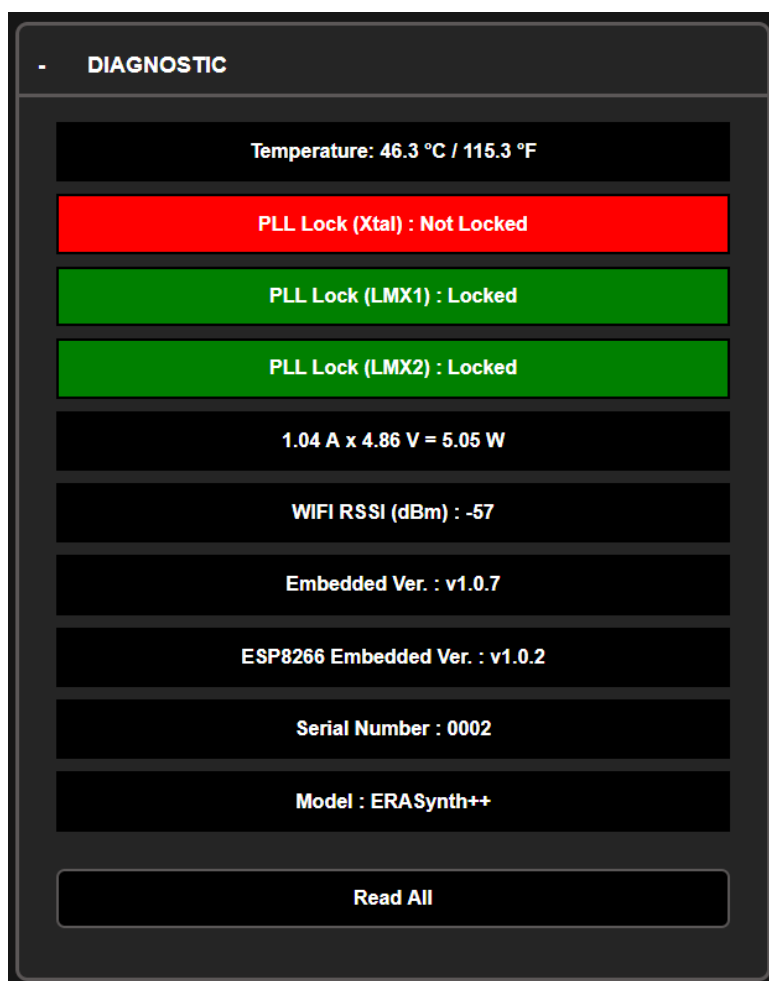


Figure 10. Diagnostic tab in the web GUI with a not locked status

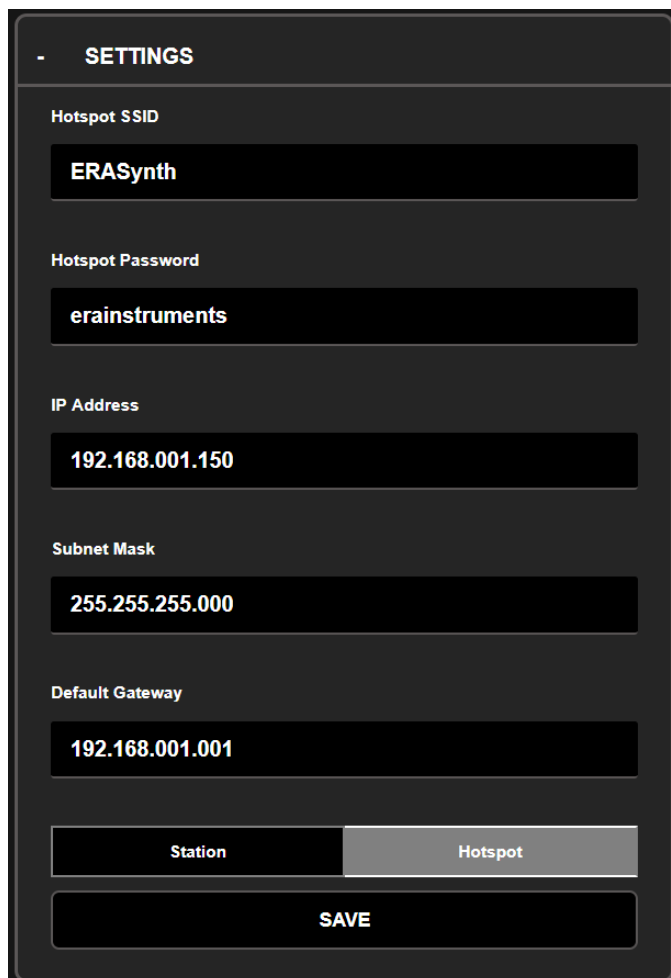
In station mode Wi-Fi RSSI (dBm) value shows the received power that comes from the station ERASynth connected. However in hotspot mode Wi-Fi RSSI (dBm) value is meaningless.

Firmware versions can be seen in this tab. New versions can be found on [<https://github.com/era instruments>].

### 4.1.7 Settings Tab

In this tab Wi-Fi connection type can be checked and changed.

By default and after a factory reset, settings are shown below.



The screenshot shows a web GUI settings page titled "SETTINGS". It contains several input fields for configuration:

- Hotspot SSID:** A text box containing "ERASynth".
- Hotspot Password:** A text box containing "era instruments".
- IP Address:** A text box containing "192.168.001.150".
- Subnet Mask:** A text box containing "255.255.255.000".
- Default Gateway:** A text box containing "192.168.001.001".

At the bottom, there are two radio buttons: "Station" (which is selected) and "Hotspot". Below these is a large "SAVE" button.

Figure 11. Settings tab in the web GUI with hotspot mode

If Wi-Fi mode is to be changed to other mode all values must be written by pressing/clicking/tapping the “Enter” button each time. After that “SAVE” button must be used to send the new settings to the ERASynth. After a while ERASynth starts with the new settings. If the IP address is changed, remember to change the browser’s IP address too.