DSPW RCB Wi-Fi Plugin for Open Ephys GUI

Overview

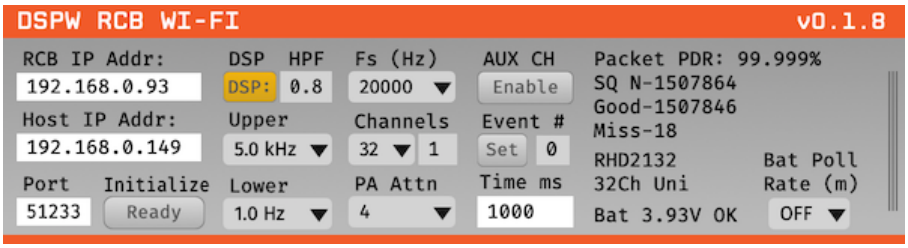
The RCB Wi-Fi plugin is an open-source Source plugin for the Open Ephys GUI that enables seamless wireless data acquisition from DSPW's RCB-W24x-LVDS product line. Stream electrophysiology data in real-time directly into your Open Ephys workflow for visualization, processing, and recording.

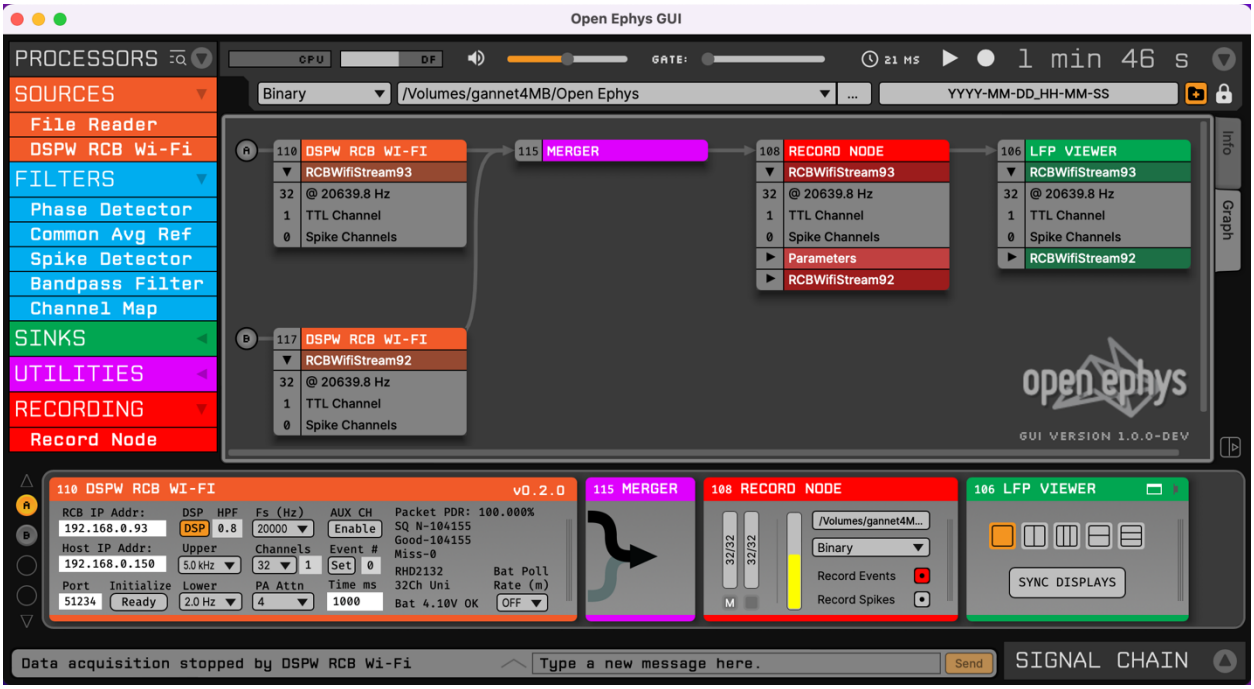
This plugin is not yet available on the OE GUI Plugin Installer. Contact DSPW for download and installation help.

Important!
There are two(2) versions of RCB W-Fi plugin.

- V0.1.8 is for use with Open Ephys GUI v0.6.7 or earlier
  - Win10/11, MacOs, Linux available for download.

- V0.2.0 is for use with Open Ephys GUI v1.0 or later
  - Win10/11 and Linux available for download
  - MacOs is in development





DSPW has tested this plugin on Win10/11 (x86 and ARM), MacOS Monterey (x86) & Ventura (x86, M2) and Ubuntu 22.04.02 (x86). Other OS versions may work as well.

We test Win/10/11 and Linux using Parallels VM on iMac and MacBook.

DSPW assumes that users are familiar with the Open Ephys GUI. Open Ephys GUI is a free download from the Open Ephys website - open-ephys.org. Please refer to the Open Ephys GUI docs and wiki for support and help with OE GUI behaviors.

The DSPW RCB Wi-Fi Plugin has a few controls that are similar to the Plugin used with the Intan USB board. Such as Upper/Lower bandpass filter settings and sample rate. For details on Intan RHD2000 product behaviors check on the Intan Technologies website.

Most DSPW Plugin controls and status are specific to the DSPW RCB Wi-Fi Plugin.

How to Install the Plugin

DSPW RCB Wi-Fi Plugin is currently available on the DSPW website downloads area. Plugin files are different for each OS. Contact DSPW support for help with plugin installation.

Instructions for installation depends on if Win10/11 vs MacOS vs Linux.

- **Win10/11:** Copy RCB-WiFi.dll to - C:\Program Files\Open Ephys\plugins
- **MacOS:** Copy RCB-WiFi.bundle to - Home/Library/Application Support/open-ephys/plugins-api8. Directory is hidden. Command/shift/period to show in Finder.
- **Linux:** Copy RCB-WiFi.so to – your open-ephys-gui-v0.6.7.deb. extraction dir - /usr/local/bin/open-ephys-gui/plugins/plugins

At a future date DSPW RCB Wi-Fi Plugin will be available using the OE GUI Plugin Installer.

Getting Started

Prerequisites

- Open Ephys GUI installed on your system
- DSPW RCB-W24x-LVDS hardware
- Wi-Fi network connection between host computer and RCB device
- Download and Install RCB Wi-Fi Plugin

Before You launch the Open Ephys GUI

- Connect your computer to the same network as the RCB-W24A-LVDS device.
- Turn on the RCB-W24A-LVDS and verify that it has connected to the Wi-Fi Router.
    - Blue LED will flash a few times and then twinkle at a low duty cycle.
    - RCB-W24A-LVDS should be available on the network. Open browser or ping 192.168.0.93 (default IP) to verify connectivity if needed.

Plugin First time use vs after Modification

- First time use – When plugin is first dragged into the Signal Chain area, plugin will have default values. Ex. Default RCB IP Addr is 192.168.0.93 as is shown above.

- Once Plugin has been saved it will reopen with last used values for Ip Number etc.
- For example, if modified RCB IP Addr is 192.168.0.94, that number will be used upon restarting the GUI.

DSPW RCB Wi-Fi Plugin Setup

1. Launch the Open Ephys GUI v0.6.7 or v1.x
2. Drag the **DSPW RCB Wi-Fi** Plugin to the Signal Chain area.
3. Plugin will try to find the correct IP address of the Host PC.
    a. If Host IP Address is not correct, edit the Host IP Addr: in the space provided.

4. On the DSPW Plugin enter correct configuration information for your system:
    a. **RCB IP Address**: Default is 192.168.0.93. Update if changed during setup.
    b. **GUI Host IP Address**: Verify the correct IP Address for your Host computer.
    c. **Port**: Default is 51234. Change only if a conflict occurs or if you have multiple RCB-W24x-LVDS devices.
    d. **DSP HPF** - Filter On/Off and cutoff value.
    e. RHD2000 **Upper** filter – default is 7.5 kHz - ***Lower*** *filter – default is 1.0 Hz*
    f. Sample rate **Fs** – default 20000 Hz nominal. Actual Fs will be different.
    g. **Channels** – Number of data channels, starting channel – Default 32,1
    h. **PA Attn** - Reduces max Wi-Fi Power Amp Tx Power. Default is 4.
    i. **AUX** Button - Enable/Disable display of Intan RHD headstage AUX channels.
    j. **Event #** Button – Set Event # TTL Events. If 0 then Broadcast Sync.
    k. **Samples/ Time** – Enter samples for Event toggle/ Sync Time msec.
    l. **Bat Poll Rate -** Poll rate of network message to query Battery voltage.

5. Once Plugin has been saved it will reopen with last used values for IP Address etc.
    a. See Open Ephys GUI docs, wiki, for information regarding OEGUI behaviors.

View RHD2000 Data

- Click the **Configure (Init)** button in the lower-left corner of the plugin.
- If Init is successful,
    - the Configure button will indicate "Ready",
    - the DSPW RCB Wi-Fi plugin border will turn Orange.
    - the Open Ephys GUI "**Start/Stop Acquisition**" button will be enabled.
- Press **Start/Stop Acquisition** button to Start continuous UDP streaming data from RCB-W24x-LVDS to PC.
- Press **Start/Stop Acquisition** button again to Stop continuous UDP streaming data from RCB-W24x-LVDS to PC.

Monitoring Status

- **Packet Delivery Ratio (PDR%)**:
  - Should exceed 95% for reliable performance.
  - SQ N: - Each UDP Packet contains an incrementing Packet Sequence Number
  - Good: - number of good packets received from RCB-W24A-LVDS.
  - Miss: - number of missed or lost packets. This data cannot be recovered.
  - PDR% is updated as UDP packets are received.

- **Battery Voltage**:
  - Displays in real-time when streaming, on request when standby.
  - If RCB-W24x-LVDS is streaming data, voltage is reported in each UDP packet.
  - When not sending UDP packets the voltage is updated when the Configure (Init) button is pressed or at the Bat Poll Rate.

- **RHD Status**:
  - Detects headstage type and SPI connection issues.
  - Shows type of RHD headstage that is connected via SPI cable.
  - Shows Error if no Intan headstage is connected.
  - Updated when the Configure (Init) button is pressed.

Multiple RCB devices using Multiple GUI Signal Chains

- Multiple RCB devices can be used with Open Ephys GUI.
- Add an instance of the DSPW Plugin to each GUI Signal Chain.
- **Each RCB device** must have a **unique** IP Address.
- PC Host IP Address must be the same for Each signal Chain.
- **PC Host Port number** must be **unique** for Each signal Chain.
- Contact DSPW Support for help with setting up multiple RCB devices.
  - Not all combinations of Sample Rate and Number of Channels are supported.
  - For information on various Broadcast Synchronization methods please see the Synchronization Docs and App note. Contact DSPW Support for help.

Unsupported RHD2000 features

The DSPW RCB Wi-Fi Plugin currently does not support these RHD2000 features:

- **Impedance Testing**: Impedance measurements are unavailable in this version.
- **Fast Settle**: The fast-settle function is not supported.

Note: These features may be added in future release. Check for updates at DSPW Support.

Support & Documentation

For plugin downloads, installation instructions, troubleshooting, or technical support, please contact DSPW:

- **Website:** www.dspw.io
- **Email:** support@dspw.io
- **Documentation:** www.dspw.io/downloads
- **GitHub:** github.com/dspw/RCBWiFi