

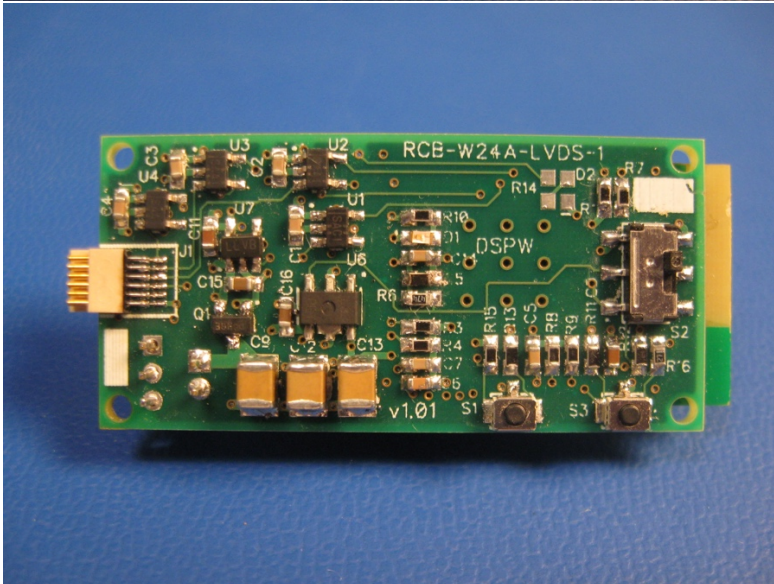


DSP Wireless, Inc.

RCB-W24A-LVDS

RCB-W24A-LVDS

User Guide



RCB-W24A-LVDS User Guide V0.3

TABLE OF CONTENTS

Overview	1
Features:	1
Description	1
Materials	3
Wi-Fi Router	3
Battery	3
USB Power Cable	4
Wi-Fi	5
Wi-Fi Provisioning	5
Profiles	5
AP mode (Access Point)	5
First time power up configuration	5
STA mode (Station)	6
Setup	7
Switches	8
LED Indicator	8
Module Drawing	8
Power Connector	8
RCB-W24A-LVDS Web Browser Interface	9
Status page	9
Device Configuration page	10
IP Configuration Page	11
Profiles Configuration Page	12
User interface	13
Differences between Intan GUI and DSPW GUI	13
DSPW GUI added features and behaviors	13
Warranty	14
Simple Terms	14
Official Terms	14
Software and Firmware License	16



OVERVIEW

The DSPW RCB-W24A-LVDS module is a Wi-Fi interface for the Intan Technologies LLC, RHD2000 series of Amplifier boards.

Features:

- *2.4GHz bgn Wi-Fi interface.*
- *Up to 32 RHD2000 channels at 20ksps, 16 bits.*
- *Up to 16 RHD2000 channels at 30ksps, 16 bits.*
- *LVDS – SPI differential signal interface.*
- *12 Pin Omnetics physical connector interface.*
- *JST 2mm battery connector.*
- *Module footprint is 0.85" x 1.75".*
- *Open Source Qt GUI. Subset of the Intan Qt GUI.*
- *Embedded webserver for Wi-Fi Provisioning and configuration.*

DESCRIPTION

Each RCB-W24A-LVDS module connects to one (1) Intan Technologies amplifier board (headstage). For ex. Intan RHD2132 Amplifier Board part number C3314. The RCB-W24A-LVDS module interfaces to the headstage via LVDS SPI signals on a 12-Pin Omnetics connector. Headstage can be direct connected to the RCB module or connected via a cable. Cable length must be less than 1m. The RCB module has been tested to work with the Intan 1m SPI blue cable.

The RCB module is designed to work with rechargeable lithium protected batteries with nominal voltage of 3.7v. Do not connect a battery or power supply with voltage above 5.25v or you will damage the RCB module. See Battery section for more information.

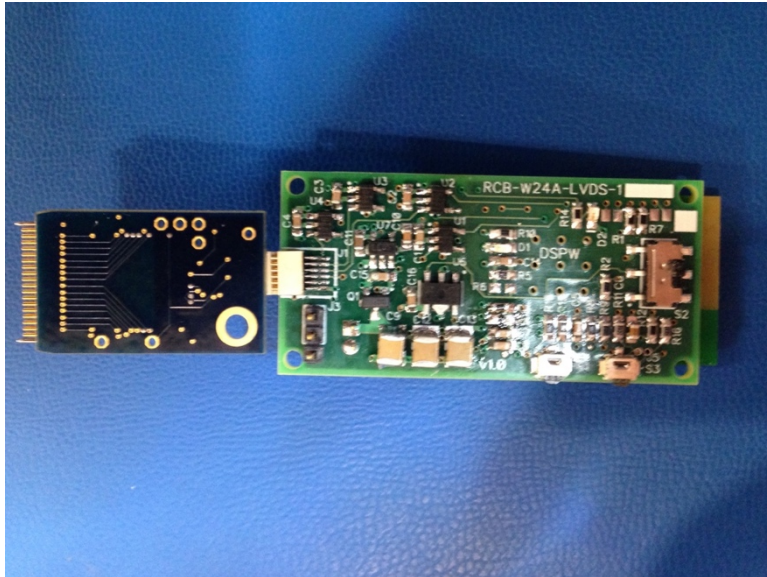
Depending on the RCB module type the Wifi antenna is either a squiggly trace on the module or an external antenna connected via a short cable. See WiFi Antenna for more information. Antenna should not be obscured behind metal or other RF limiting material.

The RCB module is provisioned or installed using web pages that are accessed with a browser. See WiFi Provisioning for more information. Once provisioned, the RCB system is controlled via the Qt GUI. The DSPW Qt GUI is a modified version of the Intan Technologies Qt GUI. See User Interface for more information.

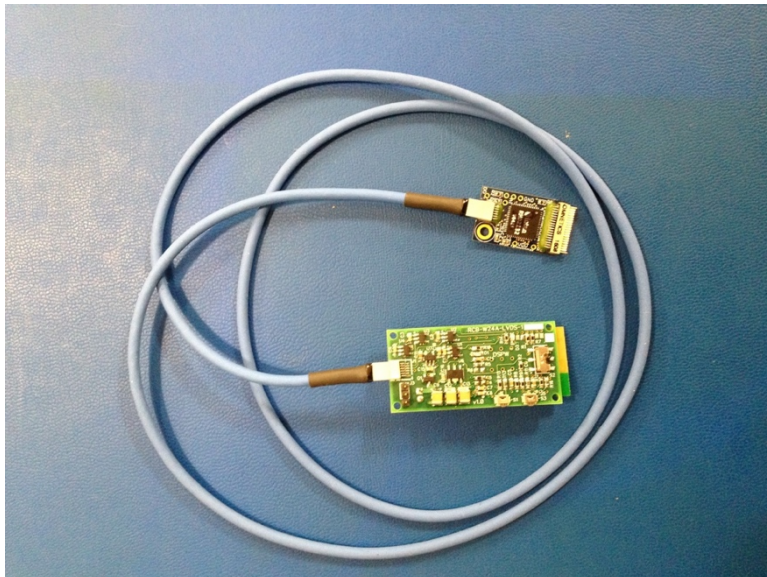
You will need a dedicated WiFi router. The RCB system transmits large amounts of streaming data. It is advised to have a private network that is only used for the RCB system. See WiFi Router for more information.

RCB-LVDS Module direct connected to Intan amplifier board.

RCB-LVDS Module direct connected to Intan amplifier board.



RCB-LVDS Module connected to Intan amplifier board using 1m blue cable.



MATERIALS

Wi-Fi Router

Get a good one. With both 2.4G and 5G if you are going to connect your PC to the router via Wi-Fi. We often use Apple® Airport Express units in our lab for testing.

The RCB-LVDS module and GUI computer should be on their own private network. Large amounts of streaming data will be flowing over the network. The RCB-LVDS module data stream is UDP based with minimal buffering. If there is network congestion you will lose RHD2000 ADC data.

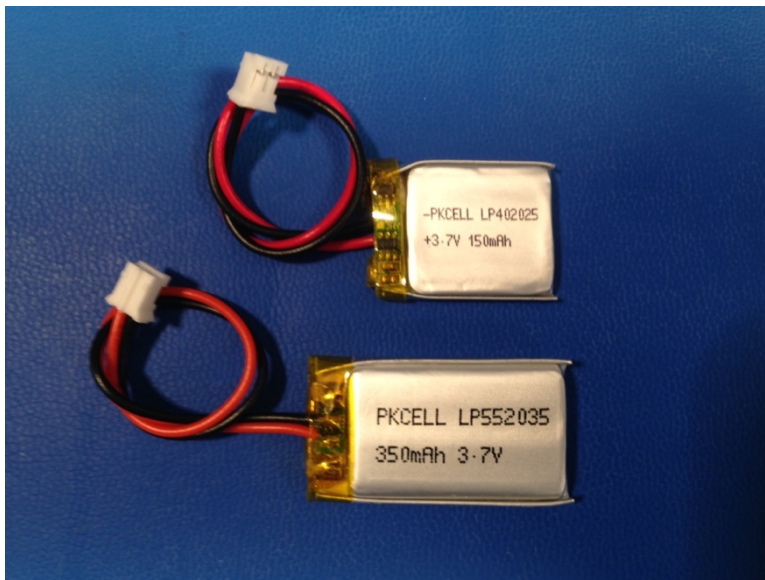
Battery

Use only protected lithium rechargeable batteries with voltage of 3.7v (nominal). We test with “bag” batteries available at SparkFun and AdaFruit.

Battery capacity must be 150 mAh or larger. A 150mAh battery will give approx. 1 hour of 32 channel 20ksps streaming time.

If you need to use a smaller amp hour capacity battery to address weight concerns, contact DSPW support.

Be careful to match the polarity of the battery connector. A battery inserted backwards will damage your module and will void the warranty.
Batteries we test with.



Battery capacity will determine the standby and streaming time you can achieve before needing to recharge.

Power usage will depend on number of channels, sample rate and PA power setting. For 32 channels at 20ksps with PA power set to 4, expect approximately 130mA rms when streaming. Expect approximately 6mA rms when not streaming (standby).

USB Power Cable

A cable is supplied for ease of provisioning and to help a new user get familiar with the RCB module features and operation.

- *USB to JST 2mm*
- *5v DC only.*
- *No USB data.*

Plug into a known good USB power source that is in spec. Less than 5.25v. Connecting to a power source greater than 5.25v will damage the RCB module and void your warranty. Don't do this.

The supplied USB to JST 2mm power cable has a diode in series with the plus side. This is to drop the voltage a bit and protect the module. Use of a power cable without diode will void your warranty.

Supplied USB to JST 2mm power cable.



WI-FI

Wi-Fi Provisioning

Initial configuration of RCB Module Wi-Fi parameters is done using the on-board RCB module Http webserver and webpages. In particular, you must associate your Wi-Fi SSID and password with the RCB module.

The RCB-LVDS module will operate in AP (Access Point) mode until provisioned with valid SSID Profile.

Profiles

The RCB module can store up to 4 Wi-Fi "profiles". These profiles numbered 1-4 are associated with a certain Wi-Fi network SSID and Password. Profiles are set up by the user. This is done using the RCB-LVDS module webpages.

AP mode (Access Point)

In AP mode the RCB module will broadcast a Wi-Fi SSID that is a combination of "dspwlink-abcdef" where "abcdef" is the last 6 digits of your module Wi-Fi MAC address. The Wi-Fi MAC address is located on the DSP-W24A Wi-Fi module label. For example, if your module label indicates a MAC number of 12:34:56:78:9A your AP mode SSID would be: dspwlink-56789A.

To connect to the RCB-LVDS module in AP mode, use a computer that has Wi-Fi capability and a browser. Win7 PC, Mac, Linux PC.

On your PC scan for available Wi-Fi connections using the usual methods that you use to find a certain Wi-Fi network or hotspot.

You should see the RCB-LVDS module SSID in the list of available Wi-Fi connections. It will be dspwlink-abcdef where "abcdef" is equal to the last 6 digits of your RCB-LVDS module MAC address.

The RCB-LVDS module AP mode SSID is open, no password is needed to connect.

Using your computer and favorite browser connect to the RCB-LVDS module configuration webpages. The setup webpages are located at 192.168.1.1.

First time power up configuration

The first time the RCB module is powered up it will default to AP mode. This is so that you can connect to the RCB-LVDS internal configuration webpages to set up the Wi-Fi SSID and password "Profile" to match those of your network.

When setting up the Profile, be sure that the Wi-Fi router that matches the Profile SSID and Password that you will be entering into the webpage is powered up and working.

When you save the Profile, RCB-LVDS will check for valid SSID and Password. If either is incorrect, or the Wi-Fi router is not powered up, the Profile you entered will be deleted and you will have to enter again. This is only true for the first time you enter the Profile and power cycle. After that your network Profile will be remembered by the RCB-LVDS module.

STA mode (Station)

Once you have set up a Profile using the webpages, power cycle the RCB adapter.

Once configured with a Profile and network information, normal RCB-LVDS operation is done using STA (Station) mode. The RCB-LVDS will only stream data when in STA mode.

STA mode can distinguished from AP mode by the LED blink rate. Continuous slow blink is AP mode. Continuous fast blink is STA mode looking for WiFi router.

Once RCB-LVDS has connected to the WiFi router and is waiting for commands, the LED blink will be more of a twinkle to save power.

STA mode can also be verified by connecting to the RCB-LVDS configuration web page at 192.168.0.93 (default value).

SETUP

When setting up (provisioning) a new RCB-LVDS unit we recommend using the supplied USB-to-JST-2mm power cable and not use a battery. However, the USB power cable should not be used when a headstage is connected to an animal or human.

During the setup data will be written to the module Flash. It is best if power is constant during this setup procedure to avoid attempts to write to Flash with a low battery. If you are confident that your battery is fully charged, then it is ok to use the battery instead of the USB cable.

To setup a new RCB-W24A-LVDS unit:

Steps.

1. *Make sure that your Dual Band Wi-Fi router with correct SSID is turned on and functional.*
2. *Connect Power cable to RCB-LVDS module J2. Be careful to match the polarity of the JST 2mm battery connector. A power cable or battery inserted backwards will damage the RCB-LVDS module and your Intan headstage.*
3. *Turn on the RCB-W24A-LVDS power switch. You should see the Blue LED turn on.*
4. *Count to 5. The RCB-LVDS interface should have booted and is now in AP mode. LED should be Flashing Slowly (800ms rate). The RCB-LVDS interface is now ready for Provisioning.*
5. *On your PC scan for available Wi-Fi connections using the usual methods that you use to find a certain Wi-Fi network or hotspot.*
6. *The RCB-W24A-LVDS module will be broadcasting a Wi-Fi SSID of dspwlink-abcdef where abcdef is the last 6 digits of the MAC address printed on the DSP-W24A module sticker.*
7. *Connect your PC to the dspwlink-abcdef Wi-Fi network.*
8. *Open a browser on PC, enter 192.168.1.1. You should see the RCB-W24A-LVDS Status webpage.*
9. *Go to Profiles Tab. Enter your router SSID, **WPA2** Security Password, Priority (7 is highest priority). Save your Profile.*
10. *Power Cycle the RCB-LVDS module. Important! Possible it may require 2 Power Cycles.*
11. *Connect your PC to your Wi-Fi router. Use wired Ethernet or a 5GHz channel to avoid traffic on the 2.4GHz Wi-Fi channels that the RCB-LVDS will use.*
12. *After Power cycle reboot, the RCB-LVDS should connect to the Wi-Fi router. RCB-LVDS LED will twinkle slowly.*
13. *You can now connect to the RCB-LVDS using browser at 192.168.0.93*

Once setup is successful the RCB-LVDS module can be controlled using the DSPW GUI. See User Interface section for more information.

Switches.

S1- Pushbutton. Force AP mode. Hold down while toggling S2 to enter AP Mode.

S2- Slide switch. Enable power. Reset module.

S3- Pushbutton. – Factory use only. Do not use.

LED Indicator.

Slow blink. – In AP mode. 1.25Hz blink rate.

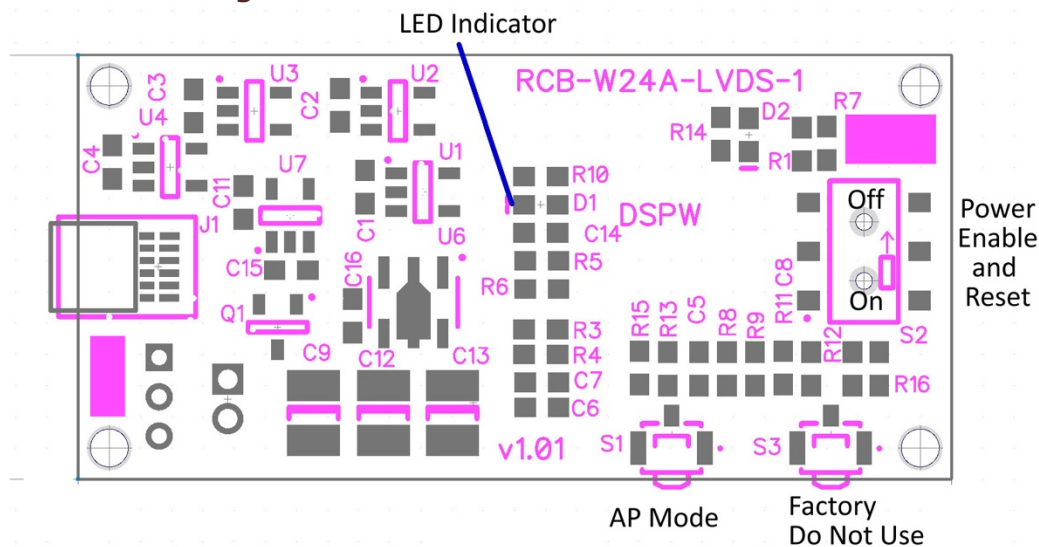
Fast blink. – In STA mode and looking for Router. 10Hz (100msec) blink rate.

Twinkle. – Normal operation. Waiting for commands. Approx 1Hz (1sec) blink rate.

Steady On. – Streaming data.

Steady OFF. – No Power.

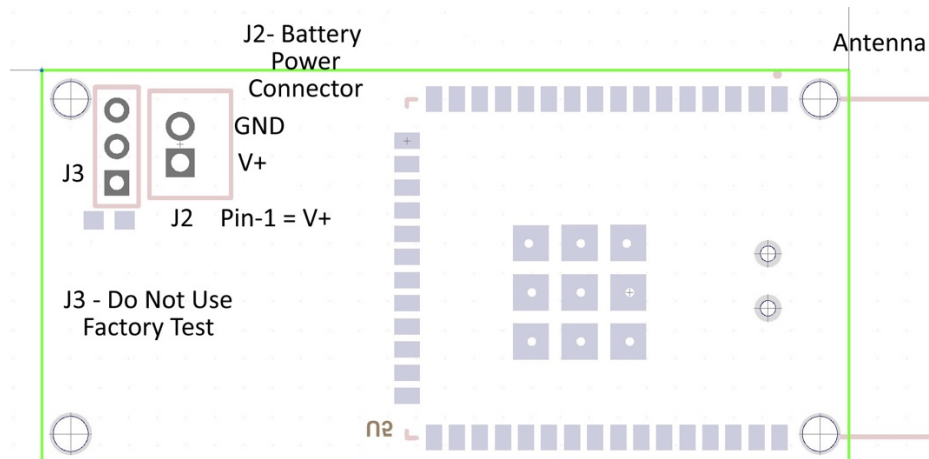
Module Drawing



Power Connector

J2 – 2mm JST

Pin-1 is V+ = Red Battery Wire. Caution - reverse battery connection will damage module and void warranty.



RCB-W24A-LVDS WEB BROWSER INTERFACE

Status page

Set browser URL to 192.168.0.93. Status is the Default page or press "Status" button to display this page.

The screenshot shows a web browser window with the address bar set to 192.168.0.93. The page title is 'RCB-W24A-LVDS' and the navigation menu includes 'Status', 'Device Config', 'IP Config', and 'Profiles'. The 'Status' page is displayed, showing the following configuration details:

Device	
Device Name:	RCB-W24A-LVDS
Device Mode:	Station
MAC Address:	D8:B0:4C:D2:7D:BA

Station	
DHCP State:	Disabled
IP Address:	192.168.0.93
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.0.1
DNS server:	192.168.0.1

Access Point	
Channel No:	6
SSID:	dspwlink-d27dba
Security Type:	Open
Domain Name:	dspwlink.net
IP Address:	192.168.1.1
DHCP Server:	
Start Address:	192.168.1.2
Last Address:	192.168.1.254
Lease Time:	86400

Version	
2.9.0.000 _ 31.1.4.0.1 _ 1.0.3.25 _ 0x4000010	

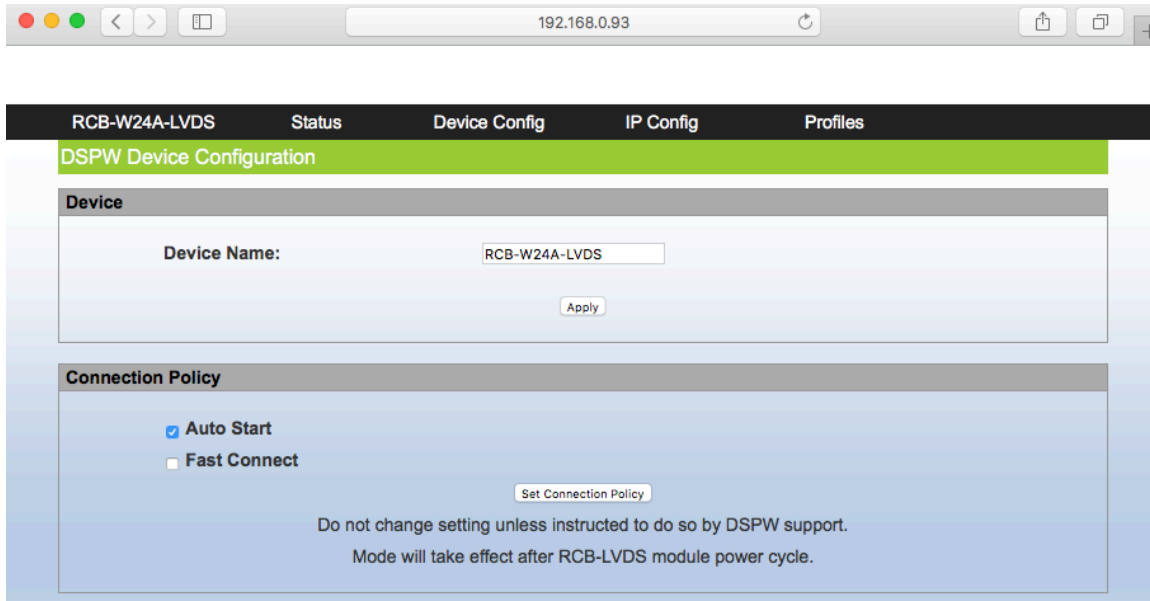
Device Configuration page.

Press "Device Config" button.

Used to set RCB module Device Name and Connection policy.

If useful, Device Name can be set to a friendly name to help identify a particular RCB module. Most helpful if you have multiple RCB modules.

Please do not change Connection Policy unless instructed to do so by DSPW support.



IP Configuration Page.

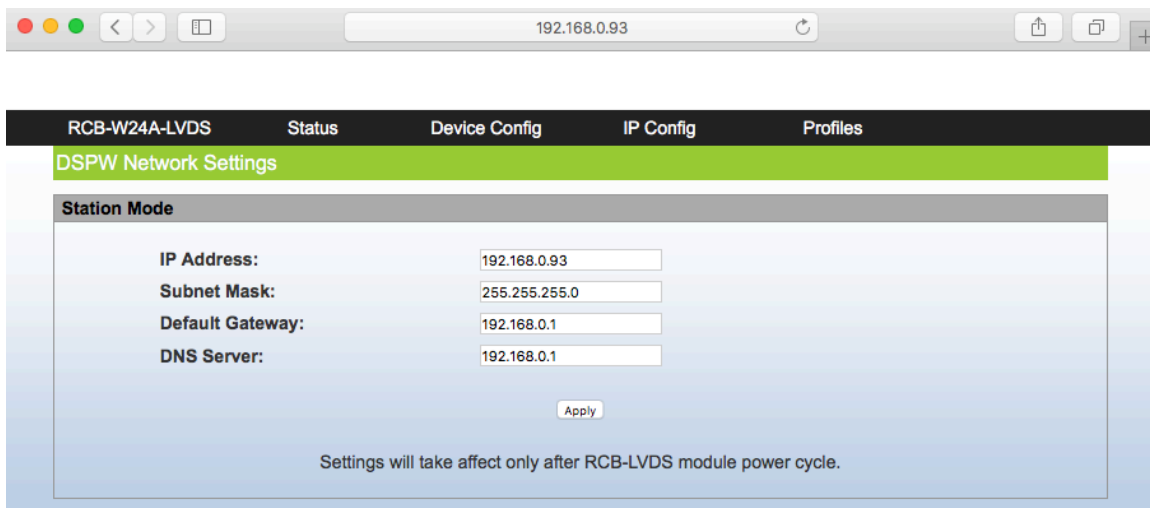
Press "IP Config" button.

Used to set RCB module Fixed IP number that is used in STA mode.

The default factory setting is:

IP Address: 192.168.0.93
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.0.1
DNS Server: 192.168.0.1

We assume that your Wi-Fi router is set for a local network of 192.168.0.xxx. if this is not how you are set up please adjust either your network settings or change the RCB-LVDS network IP setting to match your router settings.



If the network settings changed to a wrong setting, ex. Wrong IP address, and the RCB module cannot connect to the router in STA mode. Use AP mode recovery as described below. Or contact DSPW support for help.

Profiles Configuration Page.

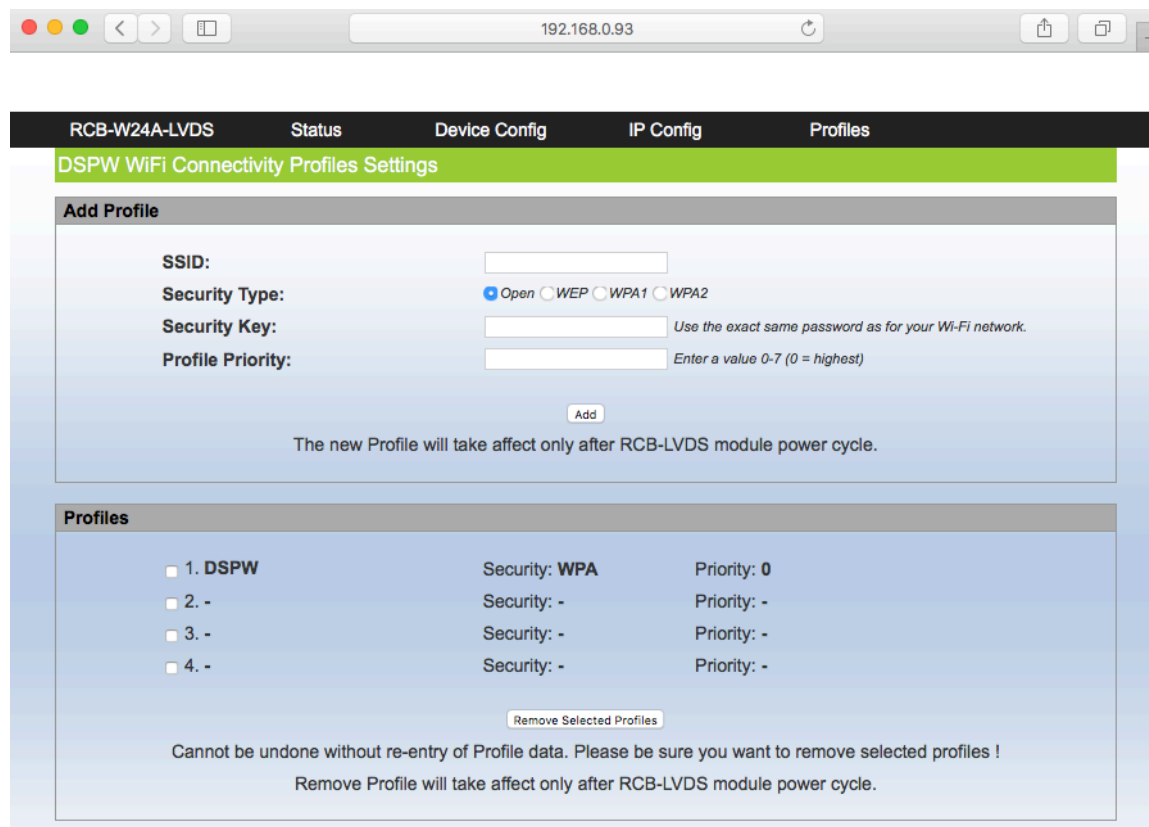
Press "Profiles" button.

Used to associate your Wi-Fi network SSID with the RCB module. Four profiles can be saved. For most users only one profile will be used.

Enter your Wi-Fi network SSID, Security Type, and Security Key (password).

Also enter a priority. Use 0 if only one profile.

After pressing "Add" button the profile should be listed in the Profiles list.



The screenshot shows a web browser window with the address bar displaying 192.168.0.93. The page title is "RCB-W24A-LVDS" and the navigation menu includes "Status", "Device Config", "IP Config", and "Profiles". The main content area is titled "DSPW WiFi Connectivity Profiles Settings".

Add Profile

SSID:

Security Type: Open WEP WPA1 WPA2

Security Key: Use the exact same password as for your Wi-Fi network.

Profile Priority: Enter a value 0-7 (0 = highest)

The new Profile will take affect only after RCB-LVDS module power cycle.

Profiles

Profile	Security	Priority
1. DSPW	WPA	0
2. -	-	-
3. -	-	-
4. -	-	-

Cannot be undone without re-entry of Profile data. Please be sure you want to remove selected profiles !

Remove Profile will take affect only after RCB-LVDS module power cycle.

When the RCB module reboots (power cycle) it will attempt to connect to the SSID in the first profile, then the second, ... If you enter incorrect information and the module cannot connect the profile may be deleted. Try again.

If successful, the module will connect to the SSID and will be in STA mode. In STA mode LED will twinkle.

USER INTERFACE

The DSPW GUI is a modified version of the Intan Qt GUI. Many of the features of the Intan GUI are intact and operate the same. Some Intan features are not included. There are new features that are specific to the network configuration of the RCB-LVDS module.

It is assumed that users are familiar with the Intan GUI. Intan's GUI is a free download from the Intan website. Included is a mode with simulated data that can be used to become familiar with streaming data file saving and data file formats.

Before starting the GUI make sure you are connected to the Wi-Fi network that the RCB-LVDS module is connected to.

When the GUI is started you will see the Network Tab. To setup the GUI –

On the Network Tab

1. *Set up the module IP Number in the "Enter RCB IP Number" editBox. Default IP number is 192.168.0.93*
2. *Set PA Backoff. Default is 4.*
3. *Select GUI Host IP. In most cases the default number displayed will be correct.*
4. *Enter Port Number. Default is 4407. If your W-iFi network is already using port 4407 then change to an unused port.*

Configure the Bandwidth Tab for your usual settings. Default sample rate is 20ksps.

Press the "Init" button located in the upper left corner of the GUI. Once Init has passed OK the "Run" button will be enabled.

Press "Run" button to start streaming.

Additional information on the DSPW GUI is being written and will be available soon.

Differences between Intan GUI and DSPW GUI

DSPW GUI does not include or allow use of:

- *Impedance features*
- *Fast settle features*
- *DAC outputs*

These features may be added in future releases of the DSPW GUI.

DSPW GUI added features and behaviors.

The DSPW GUI has additional features and settings related to configuration of IP numbers, network ports required for Wi-Fi streaming data.

- *network configuration tab*
- *Init module with correct IP numbers*
- *Status*
- *DigIn*

WARRANTY

Simple Terms

Below is a simple summary of the key points of our warranty policy, for ease of reading.

This form is *not* legally binding. It is provided for your convenience only, and is not an official statement. For the official warranty statement, please see "Official Terms" below.

1. *We guarantee our products to be free of material defects for 90 days of normal use within specification.*
2. *You must get approval from DSPW Support before sending a product for repair. You can reach support at www.dspwi.com/support. You may be asked to provide additional information related to your problem with DSPW products.*
3. *When you ship the product for repair, you must include a written note explaining what the problem is.*
4. *Disassembling the product, for whatever reason, is not allowed and unconditionally voids the warranty.*
5. *The warranty does not cover obvious misuse, like wrong power supply voltage or integration in a way which is contradictory to the specifications and directions set forth in the product manual.*
6. *When you send us goods for repair (replacement) you pay for shipping to Massachusetts. We pay for shipping repaired goods back to you.*

Official Terms

DSP Wireless, Inc. (DSPW) products are made to exacting specifications and tested using stringent quality control procedures. Each device is subjected to individual tests as well as a burn-in test, prior to leaving our manufacturing facility.

If you suspect that your DSPW product is malfunctioning, please contact our Technical Support Team (www.dspwi.com/support). If DSPW Support agrees that your device might be defective, the following shall apply (as per your device):

We guarantee our products to be free of material defects for 90 days of normal use within specification. Because our products are used in conjunction with customer hardware, we have to assess each situation on a case-by-case basis. This warranty does not apply to products that have been modified in design or function, subjected to abuse, misuse, mishandling, or unauthorized repair. Within the 90-day use period, however, if the failure is found to be strictly from our product from normal use within specification of components on-board, we will repair or replace (at our option) the product if returned to us in its original condition. Contact us for return information prior to returning any products. We do not refund shipping costs.

During this 90 day period, if a Customer is unable to resolve a product problem and DSPW Support determines that the product is defective, a Return Material Authorization (RMA) will be issued. Following receipt of an RMA from DSPW Support, the Customer shall return the product to DSPW. Defective product is shipped to DSPW at Customer's expense. Customer must include a written record of the defect with returned product.

Upon receipt of defective product, warranty verification will be conducted. This includes visual inspection and testing for normal wear and tear, alteration, and functional compliance of the product. The production label must be present and intact.

Upon verification of warranty, DSPW will repair or replace the product and ship it back to the Customer within 30 business days or best effort. Repaired (or replacement) product is shipped back to the Customer at DSPW's expense.

If the product is not under warranty, the Customer may have DSPW repair the unit on a fee basis or return it.

Repairs are conducted at DSPW facility in Massachusetts, USA. This warranty does not cover repair at the Customer's site.

This warranty is voided under the following conditions:

- *It is determined by DSPW Support that the product was used in an unauthorized or improper way.*
- *It is determined that the product was deployed in an environment for which it was not designed (per specifications and product documentation).*
- *It is determined that the product was disassembled by the Customer.*

Customers will not be charged for repairs while the product is under warranty. However, if a returned product does not meet warranty verification then testing, repair, and/or shipping fees will apply.

SOFTWARE AND FIRMWARE LICENSE

This license applies to DSP Wireless Inc. proprietary firmware or software. In particular, it applies to the firmware code installed in the RCB-W24A-LVDS unit.

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Do not use or load this firmware image (the "Software") until you have carefully read the following terms and conditions. By loading or using the Software, you agree to the terms of this Agreement. If you do not wish to so agree, do not install or use the Software.

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