**653515     Revision D,     May 2016**

# RET Master®

# Operations Manual

CE

## Notices and Precautions

### WARRANTY NOTICE

Proper installation procedures must be followed when installing and operating RET equipment. Failure to assure installations are done properly by trained installation personnel and to follow procedures discussed in this bulletin may cause warranty for such products to be void.

CommScope requires pre-testing actuators on the ground prior to installation using the CommScope portable controller and the latest version of the controller software. This will verify proper actuator functionality and also ensure that the latest available actuator firmware release is installed on the actuator. Failure to conduct pre-test and pre-installation procedures defined by CommScope will void warranty.

### SAFETY NOTICE

The installation, maintenance, or removal of an antenna requires qualified, experienced personnel. CommScope installation instructions are written for such installation personnel. Antenna systems should be inspected once a year by qualified personnel to verify proper installation, maintenance, and condition of equipment.

CommScope disclaims any liability or responsibility for the results of improper or unsafe installation practices.

It is recommended that transmit power be turned off when the field installation is performed. Follow all **applicable** safety precautions as shown on this page
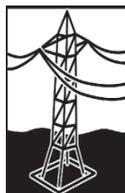


Do not install near power lines. Power lines, telephone lines, and guy wires look the same. Assume any wire or line can electrocute you.



Do not install on a wet or windy day or when lightning or thunder is in the area. Do not use metal ladder.



Wear shoes with rubber soles and heels. Wear protective clothing including a long-sleeved shirt and rubber gloves

### GENERAL INSTRUCTIONS

- It is recommended to turn off the transmit power when working around an installed antenna.
- RET connections are weather resistant and must not be weatherproofed.
- **It is required to connect the RET antenna system to the controller and to test it ON THE GROUND before installing the antenna.**
- Register online at www.commscope.com to receive e-mail announcements for software updates.
- Please contact the CommScope Customer Support Center (see bottom of cover page) for any questions.

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## About This Document

The RET Master Operation Manual describes the setup and operation of the RET Master unit and guidance for the RET Master iOS app.

## Revision History

| Version | Date Issued | Scope |
|---|---|---|
| 653515 A | May 2014 | Initial version |
| 653515 B | Oct 2014 | Updated LED Color Chart |
| 653515 C | Nov 2015 | Correct Picture And Spelling Error On Page 8 & 9 |
| 653515 D | May 2016 | Update Document With Latest CommScope Template |

# 1 Getting Started

## 1.1 System Description

RET Master allows for monitoring and control of base station antennas equipped with AISG-compliant Remote Electrical Tilt (RET) actuators, TMAs, and SmartBeam devices using a handheld device, such as an iPhone.

This manual describes the setup and operation of a RET Master unit.

## 1.2 Package Contents

In addition to your RET Master unit, your package includes:

- A/C power adapter
- Rubber holster
- RET Master Quick Guide

## 1.3 Front View



*Figure 1 RET Master Front View*

- Battery Charging LED – When the power adapter is connected and plugged into an A/C source, this LED is red while the battery pack is charging, and green when the battery pack reaches full charge. It is off when the unit is running on battery.
- Power LED – This LED is solid green while running on A/C power or if on battery, and the battery charge is more than 20% capacity. The LED is solid red when the unit is running on battery and the battery charge is 20% or less of capacity.

- ON/OFF switch – Use to turn unit power on/off. Battery pack may be charged regardless of this switch state.

- A/C Power plug – Connect the included AC adapter to this port to power the unit while simultaneously charging the battery pack.

- USB port – Use this port to recharge your handheld device (iPhone, etc.).

- Reset button – Press and release to reset the unit processors. Press and hold for more than 5 seconds to reset the unit's Wi-Fi settings to factory defaults. This button is accessible from a small hole along the side of the RET Master unit.

- Carabiner loop – The rubber holster provides this feature to attach the RET Master unit to a belt or utility bag.

## 1.4 Back View



*Figure 2 RET Master Back View*

- AISG port – Connect your AISG-compliant actuators and/or tower-mounted amplifiers to this port to monitor and control.

- DIAG port – This port is used for the Diagnostic Loopback Test.

- AISG COM LED – Blinking green indicates the RET Master unit is communicating with AISG devices. Blinking red indicates a short circuit has been detected on the AISG bus. In this case, the AISG bus may not be powered. To clear this condition, remove the AISG cable, and then power the unit off and back on.

# 2 Setup

## 2.1 Configuring the RET Master Wi-Fi Settings

The RET Master is configured with a default SSID based on its serial number. This can be changed using the web interface resident on the unit.

1.  Connect to the unit's Wi-Fi by selecting its SSID in the network settings on a PC or handheld device.
2.  Open a web browser.
3.  Type in the URL "192.168.1.1" and enter.
4.  Select the "Wireless" tab.
5.  Enter a new SSID and click "Save".

Note that the SSID can be reset to the factory default by holding the Reset button for more than 5 seconds.

## 2.2 Supported Mobile Devices

The RET Master app is currently available for Apple iPhone, iPod, and iPad, with iOS 7.x or 8.x.

## 2.3 Downloading the CommScope RET Master App

Search for "RET Master" in the Apple Store. The RET Master app is free.


## 2.4 Connecting to the RET Master Unit

From the mobile device system settings, select the RET Master SSID as noted on its label or configured in Configuring the RET Master Wi-Fi Settings.

Launch the RET Master app. The app will automatically establish a connection with the RET Master unit.

Only one RET Master app may be connected to a RET Master unit at a time.

## 2.5 Updating the RET Master Unit Software

The RET Master app will automatically update the RET Master unit with newer software, if it is available from the app. This action is required to keep the app and RET Master unit synchronized, as well as to provide the user with the latest feature set and bug fixes.

## 2.6 Power Considerations

The RET Master unit may be powered using the AC adapter or using the battery. The RET Master provides power to AISG devices on the bus, thus the battery life will be shorter when more devices are attached. It is recommended to use AC power when using the RET Master for an extended period of time, when performing time-consuming functions such as multiple device upgrades, or when controlling many devices, especially TMAs.

# 3 A Guide to the RET Master App

## 3.1 Welcome Screen

The RET Master app briefly displays a Welcome Screen while it is establishing a connection with the RET Master unit.  However, if the connection fails, the Welcome Screen allows the operator to enter view helpful connection tips, or go into Demo Mode, which demonstrates the RET Master app features with simulated AISG equipment.

## 3.2 Navigation

The tab bar along the bottom of the app facilitates navigation to the major functions of the app.  The navigation options are Device Management, Diagnostics, Alarms, Battery, Settings, Site Reports, Help, and About.

## 3.3 Device Management View

### 3.3.1 Finding AISG Devices

After the RET Master app connects to a RET Master unit, the initial screen displayed is the Device Management screen.  To find AISG devices, tap on the "Find Devices" button.  Device searches may take several minutes, depending on how many devices are present.  The search can be stopped (by tapping "Cancel") after all known devices have been found, or can be left to complete the discovery.

The RET Master unit supports up to 32 bus addresses.  A single RET requires one bus address per tilt, and is listed as a single device in the device list.  A multiRET device also requires one bus address, but it usually supports multiple tilts, each listed in the device list using the device id with a suffix indicating the antenna number.  Similarly, AISG 2.0 TMAs require one bus address, but usually support 2 or 4 bands, each of which is listed in the device list and identified with a suffix.  Thus the device list could potentially be populated with more than 32 devices.

The RET Master does not maintain a device list over a power cycle.  A new search must be executed each time the unit is powered on.

### 3.3.2 Tools Options

The "Tools" menu, on the top left corner of the Device Management View, provides some control options based on the devices found on the bus.  Not all options are available for all device types.

#### 3.3.2.1 Sort By…

This allows the operator to selecting a sorting preference for the devices.  This option can also be configured in the Settings tab.

#### 3.3.2.2 Update All Devices

The RET Master app bundles device software for CommScope RETs and some CommScope TMAs. The "Update All Devices" tool checks each device to determine if it can be updated, and performs the software update if necessary.  Each update takes several minutes, and progress of the update is continually displayed.

Bundled device software and versions are displayed on the About View.

### 3.3.2.3 AISG 2.0 Reset and AISG 1.1 Revert

Some CommScope AISG RETs and TMAs support a protocol mode switch between AISG 1.1 and AISG 2.0 protocols.

Note:  The protocol mode switch from AISG 1.1 to AISG 2.0 is accomplished by broadcasting an AISG 2.0 reset to all devices on the bus.  This will cause all AISG 2.0 devices to reset as well.  If TMAs are present on the bus and carrying RF traffic, this action will be service-affecting.

Note:  After a TMA has switched AISG protocol modes, a new scan must be performed.

### 3.3.2.4 Changing AITM Operational Mode

CommScope devices with product type AITM can operate as either multiRET devices (Type 17) or as multiple single RET devices (Type 1).  RET Master allows this operating mode to be changed.

Note:  After an AITM has switched operating modes, a new scan must be performed.

This tool option is only available if an AITM device was found on the bus.

### 3.3.2.5 Changing to Ericsson Mode

CommScope devices with product type ATM3 and AccuRET support the Ericsson protocol mode.   When one (and only one) of these devices is found on the bus, RET Master allows changing its protocol mode between AISG 2.0 and Ericsson mode.  Functionality in Ericsson mode is limited to movement and configuration.

### 3.3.3 Controlling an AISG Device

### 3.3.3.1 Viewing Device Details

Select a RET device from the device list to view detailed information and perform configuration changes.

### 3.3.3.2 Viewing Device Alarms

AISG devices in alarm conditions are easily viewed in the device list.  To view a device's current alarm(s) and detail on the alarm, select the device, then tap the alarm button to expand the alarm list and view alarm detail.

### 3.3.3.3 Clear Alarms on a Device

AISG devices set alarms when error conditions are detected, and clear alarms as those conditions clear.  However, RET Master allows an operator to force a device to clear its alarms.  Select "Clear Alarms" to send this command to an AISG device.

### 3.3.3.4 Changing the Position of a RET

To change a RET's electrical tilt, tap on the RET's current position, and enter the new position in the associated text field.  The range allowed for the new position is determined by the RET's configured antenna model.   No other AISG functions may be executed during a RET movement.

Movement will fail when a RET's antenna model is not configured or when the RET requires calibration. A RET requiring configuration will report a "Not Configured" AISG error.  A RET requiring calibration will report a "Not Calibrated" AISG error.

### 3.3.3.5   Configuring the Antenna Model Configuration of a RET

Each RET must be configured with the correct data for its antenna model.  Internal RETs and factory-installed external RETs are already configured with the correct data.  However, field-installed RETs require antenna model configuration before they can be calibrated or moved.

If a RET requires configuration, it will report the AISG error "Not Configured" on any attempt to move or calibrate it.

To configure a RET, select the RET from the device list, and then select "Antenna Model."  Choose the correct antenna model for the RET.  To narrow the antenna model options, scroll to the top and enter a part of the model name – this can be from the beginning, middle, or end of the model name, then select from the listed models.

Some RETs require calibration after antenna model configuration.

Internal CommScope RETs are factory-configured and may not be configured using RET Master.

A non-CommScope RET may be configured only if antenna model configuration data is available for its vendor and device type.

### 3.3.3.6   Calibrating a RET

To calibrate a RET, select the RET from the device list, and then tap the "Calibrate" button.  No other AISG functions may be executed during a RET calibration.  Calibration typically takes 1-2 minutes, depending on the RET.

A RET must be configured with antenna model data to be calibrated.  A RET requiring configuration will report a "Not Configured" AISG error.

Calibration is not available for some CommScope RETs.  For these devices, the "Calibration" button is not available.

### 3.3.3.7   Configuring AISG Data for a RET

RET Master allows configuration of the following AISG data fields using standard text entry:  Antenna Serial, Sector, BaseStation ID, Installer ID, and Install Date.  The number of characters allowed is defined by the AISG specifications, and is indicated when the field is selected for modification.

The AISG field Operating Frequency Bands may be modified by selecting all operating bands that apply for the RET.

These AISG fields are for informational purposes only.  They do not affect operation of the RET or antenna, and they optionally may be left blank.

### 3.3.3.8 Configuring AISG Data for a TMA

RET Master allows configuration of the following AISG data fields using standard text entry: Sector, BaseStation ID, Installer ID, and Install Date. The number of characters allowed is defined by the AISG specifications, and is indicated when the field is selected for modification.

These AISG fields are for informational purposes only. They do not affect operation of the TMA or antenna, and they optionally may be left blank.

TMA-specific fields are also displayed, but are not available for modification.

### 3.3.3.9 Changing the Gain of a TMA

Variable-gain TMAs allow their gain to be changed. Gain options are dependent on reported minimum and maximum gain values, and the reported gain resolution.

To change the gain on a variable-gain TMA, select the TMA from the device list, then tap on the current gain value. When other bands on the same TMA have identical transmit and receive frequency bands, they will be listed on the Set Gain View, along with an on/off option to also set their gain at the same time, and to the same value. Choose a new gain value and tap on "Set Gain".

Note that when a TMA band is in bypass mode, the set gain command will indicate failure and show a gain value of "0". However, if the amplifier is set back to normal mode (Amplifier ON), the new gain value will actually take effect.

### 3.3.3.10 Changing the Amplifier Mode of a TMA

To change the amplifier mode of a TMA band, select the TMA from the device list, then tap on the current Amplifier Mode. Select "Set Amplifier ON" or "Set Amplifier Bypass" to change the mode.

Note that when a TMA band is in bypass mode, its gain will display a value of "0".

## 3.4 Diagnostics View

RET Master provides built-in AISG diagnostic tests. They may be accessed by selecting the Diagnostics tab on the RET Master app.

### 3.4.1 Loopback Test

The Diagnostic Loopback Test writes a data sequence to the AISG port, and then verifies the data has no errors when read back on the DIAG port.

To setup for this test, daisy-chain any combination of AISG devices and connect the top of the chain to the AISG port and the end of the chain to the DIAG port. Then select "Start" to run the test.

The results of the test are displayed on test completion, along with the detected voltage and current readings, or notification of a short on the bus.

Though TMAs may be in the AISG bus loopback, it is advised to not daisy-chain more than one TMA.

### 3.4.2    Tilt Range Test

The Diagnostic Tilt Range Test first scans for all devices on the bus, then moves each RET to its maximum position, then minimum position, then back to original position.  Test feedback and progress are provided at each step of the process, and final results are displayed on test completion.  The test can be cancelled at any time, though a move already initiated by a RET will complete.

To set up for this test, daisy-chain one or more RETs to the female AISG port using AISG cables.  Do not attach to the male DIAG port.  TMAs may be on the AISG bus, but will not be affected by the test.  When equipment is ready, click on the "Diagnostic" function and select "Tilt Range Test".

Though TMAs may be on the AISG bus for the range test, it is advised to not daisy-chain more than one TMA.

### 3.4.3    Dither Test

The Diagnostic Dither Test is very similar to the Tilt Range Test.  It first scans for all devices on the bus, then moves each RET up .2 degrees, then down .2 degrees (from the original position), then back to original position.  Test feedback and progress are provided at each step of the process, and final results are displayed on test completion.  The test can be cancelled at any time, though a move already initiated by a RET will complete.

To set up for this test, daisy-chain one or more RETs to the female AISG port using AISG cables.  Do not attach to the male DIAG port.  TMAs may be on the AISG bus, but will not be affected by the test.  When the equipment is ready, click on the "Diagnostic" function and select "Dither Test".

Though TMAs may be on the AISG bus for the range test, it is advised to not daisy-chain more than one TMA.

### 3.4.4    AISG Pin Test

The Diagnostic AISG Pin Test reports the following information from the attached AISG cable.

- Female AISG port Pin 3 RS485 B voltage
- Female AISG port Pin 5 RS485 A voltage
- Female AISG port Pin 6 24V DC voltage
- Female AISG port DC Current
- Male AISG port Pin 3 RS485 B voltage
- Male AISG port Pin 5 RS485 A voltage
- Male AISG port Pin 6 24V DC voltage

To set up for this test, daisy-chain one or more AISG devices to the female AISG port using AISG cables then attach to the male DIAG port.  When the equipment is ready, click on the "Diagnostic" function and select "AISG Pin Test".

## 3.5   Alarms View

The Alarms tab will display all current alarms detected by the RET Master.

## 3.6 Battery View

Select the Battery tab to display the current battery usage level and voltage. When the RET Master unit is being charged, the Battery Level will indicate "AC ON", otherwise, it will display the percentage of battery remaining.

## 3.7 Settings View

The Settings tab provides options for the RET Master app.

## 3.8 Site Reports

The RET Master app provides a reporting tool to capture a snapshot of all AISG devices a site, along with each device's configuration and status. The Site Report can then be shared via email from the app.

### 3.8.1 Creating a Site Report

Create a new Site Report by tapping on the "+" button. Enter a name and a description for the report, then "Save". The report is created in PDF format, and is saved on the handheld until manually deleted.

### 3.8.2 Sharing a Site Report

While viewing a report, tap on "Send" to email the report.

### 3.8.3 Deleting a Site Report

Reports created on a handheld can be deleted by tapping on "Edit", selecting the report, and tapping on the delete icon.

## 3.9 Help Center

This document is viewable from the Help option.

## 3.10 About

The About tab provides version information for the iOS app and RET Master embedded software, as well as versions of the bundled antenna model definitions and device firmware.

The About View also reports the RET Master unit detailed information, such as the unit name, model, and serial number.

# 4 Troubleshooting Guide

## 4.1 My RET Master app won't connect to the RET Master unit, or keeps disconnecting from the RET Master unit.

1. Verify your RET Master is powered ON.
2. Verify your handheld device is connected to your RET Master Wi-Fi in the device Settings.
3. Decrease the distance to your RET Master unit.
4. Try resetting the Wi-Fi on your handheld device by turning OFF, then ON, and reconnecting to the RET Master Wi-Fi.
5. Try resetting the unit, the app, and the Wi-Fi.  Close the app, turn OFF the handheld Wi-Fi, and power OFF the RET Master unit; then turn ON the RET Master, wait for the LEDs to stop blinking, turn on the handheld Wi-Fi and connect to the RET Master, and launch the app.

Note that only one RET Master app can connect to the RET Master unit at a time.

## 4.2 My RET Master SSID is not showing up as a Wi-Fi network.

Your default RET Master SSID may have been changed.  It can be restored to factory default, as labeled on the RET Master unit, by pressing and holding the Factory Reset button along the side of the RET Master unit for at least 5 seconds.

## 4.3 My RET Master Wi-Fi password doesn't work.

Your RET Master Wi-Fi password may have been changed.  The factory default Wi-Fi password is not set.  To return to this configuration, press and hold the Factory Reset button along the side of the RET Master unit for at least 5 seconds.

## 4.4 I can't connect to the RET Master Wi-Fi because I don't know the password.

The RET Master can be reset back to factory defaults by powering on the unit and using a paper clip or similar tool to hold down the reset button located on the side of the unit for at least five seconds after which the unit will automatically reboot itself.  Once the unit is back to defaults, the Wi-Fi security is disabled and no password is required to connect to it.

## 4.5 I can't find any AISG devices.

- Ensure the devices are connected to the RET Master using the female AISG port.
- Do not loop back the AISG cable to the male DIAG port.
- Try connecting a known good device with a known good AISG cable.
- When a device search is started, verify the AISG COM LED starts blinking green.  If not, try turning the RET Master unit off and back on again using the on/off switch.
- To communicate with a TMA, the AISG cable must be connected to a bias-tee attached to the AISG control port of the TMA, not the antenna port.

## 4.6 My RET won't allow movement.

If the RET is reporting it is "Not Configured", then configure the RET's antenna model before attempting movement.  See Configuring the Antenna Model Configuration of a RET.

If the RET is reporting it is "Not Calibrated", then calibrate the RET before attempting movement.  See Calibrating a RET.  Most RETs must be attached to an antenna to be calibrated.

If the RET is reporting a "jam" error, then it has a mechanical issue.

# 5  LED Color Reference Chart

| LED State/Color | Power LED<br><br>(Software Controlled) | Battery Charging LED<br><br>(Hardware Controlled) | AISG COM LED<br><br>(Software Controlled) |
|---|---|---|---|
| **Off** | RM Unit Off | Not plugged in to A/C | No communication on AISG bus |
| **Solid Green** | RM Unit On, > 20% battery power remaining AND running on battery<br><br>OR<br><br>Running on A/C power | Plugged in, fully charged | --- |
| **Flashing Green** | --- | --- | Communication on AISG bus |
| **Solid Red** | --- | Plugged in, charging | --- |
| **Flashing Red (FAST)** | RM Unit On, <= 20% power remaining AND running on battery | --- | Overcurrent condition detected |
| **Flashing Red (SLOW)** | RM Unit On, 1% power remaining AND running on battery. (Sleep Mode - AISG bus power off) | --- | --- |

*Table 1 LED Color Chart*

# 6  Certifications

**NTS ®**

NTS Test Report No. PR026791 Rev. 2-CE

## TEST SUMMARY

This test record demonstrates that the RET Master has passed "CE" Mark compliance with the following EMC requirements:

| EMISSIONS | IMMUNITY |
|---|---|
| European Regions:<br>♦ EN55022; 2010, CISPR 22 Ed. 6.0: 2008 Class B Emissions (Radiated & Conducted)<br>♦ EN61000-3-2: 2006 + A2 2009 : Harmonics EN61000-3-3:2008: Flicker<br>North America Regions:<br>♦ CFR 47, Part 15, Subpart B, Class B, 2011<br>♦ ICES-003 Issue 4, 2004 CAN/CSA-CEI/IEC CISPR 22;02, Class B | European Regions: EN55024 : 2010<br>• EN61000-4-2 Ed. 2.0;2008: ESD ± 8 kV Air, ± 4 kV Contact<br>• EN61000-4-3 Ed. 3.2;2010: RF Immunity, 3 V/m<br>• EN61000-4-4 Ed. 2.0 Amd.1; 2010 EFT, 1 kV<br>• EN61000-4-5 Surge; 2005: 1Kv line to line, 2Kv line to earth<br>• EN61000-4-6 Ed. 3.0; 2009: Conducted Susceptibility, 3 Vrms<br>• EN61000-4-8 Ed. 2.0; 2009: Power Frequency Magnetic Field 1 A/m<br>• EN61000-4-11Ed. 2.0; 2004:Voltage DIP and Interruptions |

**Andrew Wireless Solutions** is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products, as required.

This is to certify that the following report is true and correct to the best of my knowledge.
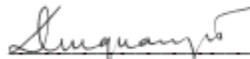
_Dieu Vo_
Dieu Vo
EMI Operations Supervisor
FCC, CE, Telecommunication

_Kimberly Zavala_
Kimberly Zavala
Quality Assurance Manager

_Jessie Guerra_
Jessie Guerra
EMC Technician

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CE

**TCB**

**GRANT OF EQUIPMENT AUTHORIZATION**

Certification

Issued Under the Authority of the

Federal Communications Commission

By:

**TCB**

TUV Rheinland of North America, Inc.
Product Safety Division 762 Park Avenue
Youngsville, NC 27596

Date of Grant: 07/01/2013

Application Dated: 06/27/2013

Redpine Signals Inc
2107 N.First Street, Suite 680
San Jose, CA 95131-2019

Attention: Sekhar Abburi , Vice President - Systems
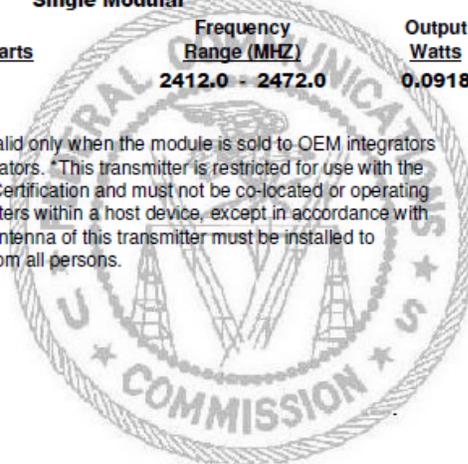& Software

**NOT TRANSFERABLE**

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

**FCC IDENTIFIER:** XF6-RSWC201
**Name of Grantee:** Redpine Signals Inc
**Equipment Class:** Digital Transmission System
**Notes:** 802.11 bgn WiSeConnect MODULE
**Modular Type:** Single Modular

| Grant Notes | FCC Rule Parts | Frequency Range (MHZ) | Output Watts | Frequency Tolerance | Emission Designator |
|---|---|---|---|---|---|
| | 15C | 2412.0 - 2472.0 | 0.0918 | | |

Output power listed is conducted. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators. *This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification and must not be co-located or operating in conjunction with any other antenna or transmitters within a host device, except in accordance with FCC multi-transmitter product procedures. The antenna of this transmitter must be installed to provide a separation distance of at least 20cm from all persons.

## TECHNICAL ACCEPTANCE CERTIFICATE

**TÜVRheinland®**
Precisely Right.

| | | | |
|---|---|---|---|
| **CERTIFICATE NO.:** No. DE CERTIFICATION: | IC: 8407A -RSWC201 | **MODEL** MODELE | RS-WC-201 |
| **CERTIFICATE TYPE:** TYPE DE CERTIFICATION: | Single New Model Single Modular Approval | **TYPE OF EQUIPMENT** GENRE DE MATÉRIEL | WiFi device |

**ISSUED TO:**
DÉLIVRÉ A:
Redpine Signals Inc
2107 N. First Street, Suite 680
San Jose
California
United States

**TESTED BY:** TUV Rheinland (India) Private Limited   **IC OATS No:** 3466E
TESTÉ A: No. 108, Electronics City,Phase 1,Bangalore,India,Postal Code:560100

**CONTACT:**
CONTACT:
Mr. Guruprasad BR   **Email** guruprasad.br@ind.tuv.com
Tel. +91 (80) 3055 4311   **Fax** +91-80- 3055 4342

| Frequency range in MHz Low | High | RF power or Field Strength (Watt or V/m) | Occupied Bandwidth 99% in kHz | Emission Designator | Specification Standard RSS No. & Issue No. |
|---|---|---|---|---|---|
| 2412 | 2472 | 0.07870 Watt | 12130 | 12M1G1D | RSS-210, Issue 8, Dec 2010 |
| 2412 | 2472 | 0.09183 Watt | 17930 | 17M9D1D | |
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| | | | | | |

**ANTENNA TYPE & GAIN :** Chip Antenna , 0.5 dBi and External Antenna , 2 dBi

**TRANSMITTER SPURIOUS :** 53.28 **UNITS:** dBuV/m **DISTANCE:** 3 meter **FREQUENCY:** 2483.5 MHz
(worst case)

**RECEIVER SPURIOUS :** 33.59 **UNITS:** dBuV/m **DISTANCE:** 3 meter **FREQUENCY:** 450 MHz
(worst case)

Certification of equipment means only that the equipment has met the requirements of the above-noted specification. Licence applications, where applicable to use certified equipment, are acted on accordingly by the Industry Canada issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements and procedures issued by Industry Canada. The equipment for which this certificate is issued shall not be manufactured, imported, distributed, leased, offered for sale or sold unless the equipment complies with the applicable technical specifications and procedures issued by Industry Canada.

TUV Rheinland of North America Inc., North American Headquarters, 12 Commerce Road, Newtown, CT 06470
Tel: (203) 426-0888, Fax: (203) 426-4009
QF094222   Product Approval Certificate   Revision 3

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## TECHNICAL ACCEPTANCE CERTIFICATE

△ **TÜVRheinland**®
Precisely Right.

*La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci-dessus. Les demandes de licences nécessaires pour l'utilisation du matériel certifié sont traitées en conséquence par le bureau de délivrance d'Industrie Canada et dépendent des conditions radio ambiantes, du service et de l'emplacement d'exploitation. Le présent certificat est délivré à la condition que le titulaire satisfasse et continue de satisfaire aux exigences et aux procédures d'Industrie Canada. Le matériel à l'égard duquel le présent certificat est délivré ne doit pas être fabriqué, importé, distribué, loué, mis en vente ou vendu à moins d'être conforme aux procédures et aux spécifications techniques applicables publiées par Industrie Canada.*

*I hereby attest that the subject equipment was tested and found in compliance with the above-noted specification.*
*J'atteste, par la présente, que le matériel a fait l'objet d'essai et a été jugé conforme à la spécification ci-dessus.*

Certifier: Rene Charton                 Date: February 22, 2013

Signature: _____

Title: Senior Project Manager

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