Theory of Operation for RCM5400W, RCM5450W
(Both referred to as RCM54XXW)

The Wi-Fi transmission is controlled by the onboard processor (U1) which contains a Wi-Fi MAC. The primary Wi-Fi function of this processor is to implement the 802.11b/g baseband Media Access Control (MAC) functionality and to control the 802.11b/g integrated Airoha AL2236 transceiver. U1 also has built in D/A and A/D converters to handle baseband signals to and from the transceiver.

Program code is stored in parallel flash and loaded into fast SRAM for execution when power is applied to the unit. Serial Flash and low power SRAM is available for data storage.

The data interface between the processor MAC baseband signals and the Airoha AL2236 802.11b/g radio section consists of internal D/A and A/D converters. Both devices convert "I" and "Q" data samples at a rate of 40 MHz.

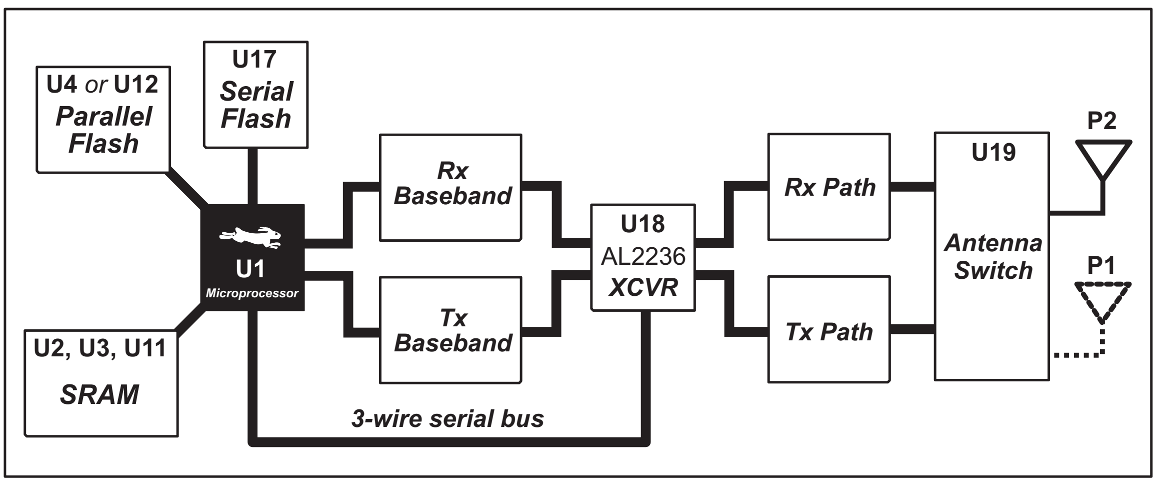

Figure 1. RCM54XXW Wi-Fi Block Diagram

The Airoha AL2236 is a single-chip transceiver with integrated power amplifier for the 2.4 GHz Industrial, Scientific, and Medical (ISM) band. It is configured and controlled by the processor via a 3-wire serial data bus. The AL2236 contains the entire receiver, transmitter, VCO, PLL, and power amplifier necessary to implement an 802.11b/g radio.

The AL2236 can transmit and receive data at up to 11MBits/s in the 802.11b mode and up to 54MBits/s in the 802.11g mode. It supports 802.11b/g channels 1–13 (2.401 GHz to 2.472 GHz). Channel 14 is not used. For FCC jurisdictions, only channels 1-11 will be supported. The data modulates the channel carrier in such a way so as to produce a spread spectrum signal within the 22 MHz channel bandwidth of the selected channel. The channel numbers and associated frequencies are listed below in Table 1.

Table 1. Wi-Fi Channel Allocations		
Channel	**Center Frequency (GHz)**	**Frequency Spread (GHz)**
1	2.412	2.401–2.423
2	2.417	2.406–2.428
3	2.422	2.411–2.433
4	2.427	2.416–2.438
5	2.432	2.421–2.443
6	2.437	2.426–2.448
7	2.442	2.431–2.453
8	2.447	2.436–2.458
9	2.452	2.441–2.463
10	2.457	2.446–2.468
11	2.462	2.451–2.473
12	2.467	2.456–2.478
13	2.472	2.461–2.483
14(not used)	2.484	2.473–2.495

The Wi-Fi channels have a certain amount of overlap with each other. The further apart two channel numbers are, the less the likelihood of interference. If interference is encountered with a neighboring WLAN, one can change to a different channel. For example, use channels 1, 6, and 11 to minimize any overlap.

The same omni-directional antenna is used to transmit and receive the 802.11b/g RF signal. The antenna is tuned to operate best at 2.45 GHz with a gain of 2dBi. An antenna switch isolates the high-power RF Tx signal path from the RF Rx signal path. The antenna switch works by alternately connecting the antenna to either the AL2236 Tx output path or to the AL2236 Rx input path. In order to support this antenna sharing scheme, the module operates the radio in a half-duplex mode so that receive and transmit operations never occur at the same time. The antenna switch (U19) switches the receive/transmit functionality at the P2 antenna (P1 is not used).

The RF connector on P2 is a RPSMA with its outer casing attached to module ground. It is recommended that the OEM integrator of this device improve ESD protection by attaching P2 to chassis ground.

There are two LEDs close to the RPSMA antenna connector at P2, a green LED at DS2 (**LINK**) to indicate association with the Wi-Fi access point, and a yellow LED at DS1 (**ACT**) to indicate activity.

The proper RPSMA antenna is attached directly to P2 with another antenna assembly available that can extend the antenna approximately 2 feet via an integrated coax cable and RPSMA connector.

This is not a Software Defined Radio.

Regulator Operation

The regulated +3.3 V supplied to the RCM54XXW via header J1 directly powers some of the onboard circuits. In addition, there is a +1.8 V DC linear regulator that provides the core voltage to the Rabbit 5000 microprocessor (U1). A charge pump and other linear regulators supply the additional voltage levels needed by the Wi-Fi circuits and performing voltage isolation. See figure 2 and Table 2.

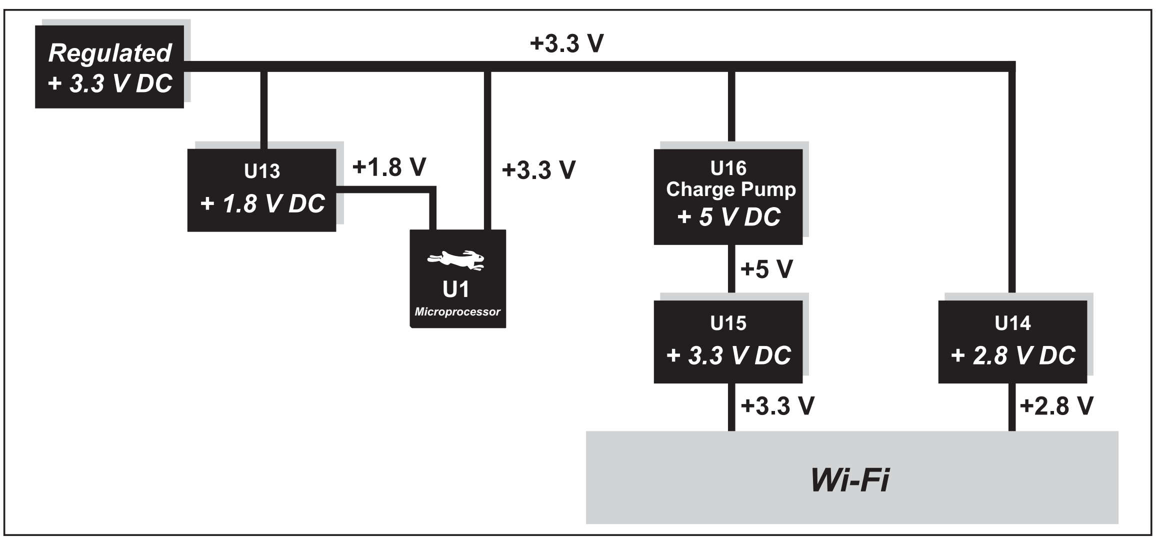

Figure 2. RCM54XXW Onboard Power Supplies

Voltage	Power Supply Use
+3.3 V DC	VDD_PA
+2.8 V DC	VDD_XCVR
+5.0 V DC	VDD_RAD

Table 2. Power Supply Net Names

Oscillator Operation

The device has three oscillators it uses during operation. The 32.768 KHz oscillator is used for the microprocessor Real Time Clock circuit, the 36.864 MHz oscillator is used for the microprocessor main functions, and the 20.000 MHz oscillator is used by the Processor and transceiver for establishing the required internal Wi-Fi timing. This 20.000 MHz oscillator is powered by the isolated 2.8V VDD_XCVR supply.

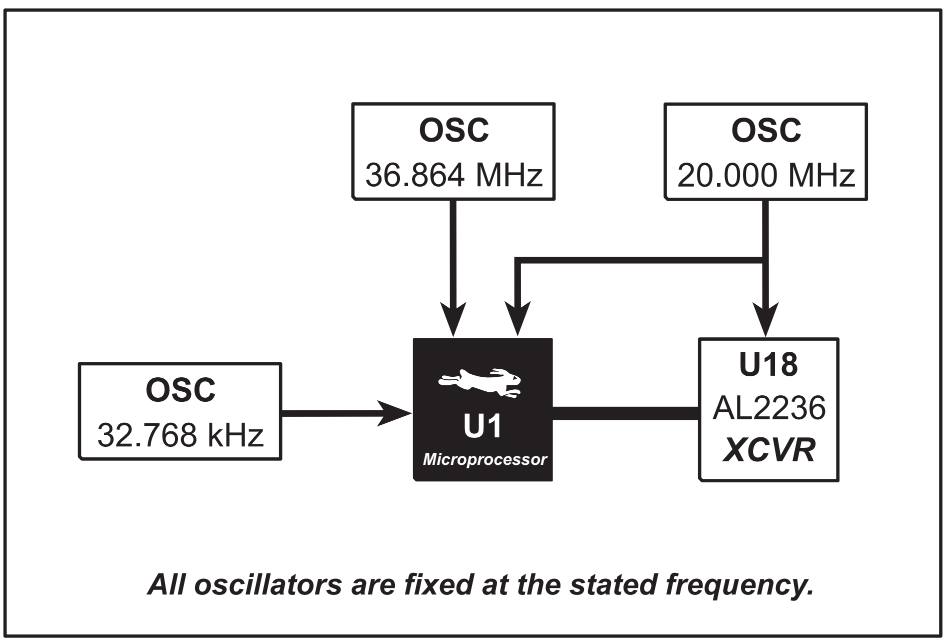

Figure 3. RCM54XXW Oscillator signal paths

Industry Canada
Emission designator = 22M0G1D, type of modulation=DSSS

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Japan Information

The device models are called the RCM5400W and the RCM5450W, and it is not Blue Tooth. It will operate in the channel range of 1-13. Channel 14 will not be tested.