

# 2Wire 802.11g/b Theory of Operation

The 2Wire 802.11b/g WLAN circuitry consists of several major sections:

- 1) Baseband and MAC
- 2) Radio
- 3) Antenna

Each of these sections will be described in more detail in the following paragraphs

## **Baseband and MAC**

This section consists of U800, the Atheros AR2413, and associated support components. This IC performs both the MAC and baseband processing functions, and it also contains the mixers, oscillators, and IF and RF circuitry. The IC is a dual mode processor, meaning it supports both 802.11b and 802.11g transmission modulations at a max rate of 11Mbps/sec for B mode and 54 Mbps/sec for G mode.

For transmission of data, the baseband processor is responsible for taking data from the MAC, applying appropriate error correction and encryption, and modulating the baseband carrier appropriately. The data is encoded in I,Q format. The modulated baseband is then sent to the radio section of the IC for up conversion and amplification.

The baseband processor is also responsible for setting the transmit power of the signal. This is accomplished via a closed loop power correction circuitry, accompanied by appropriate factory calibration of the output signal.

## **Radio**

The mixers and IF amplifiers are also contained in U800. The IF frequency is 1/3 the carrier frequency.

For transmission, the IQ signal modulates an IF carrier or subcarriers. This is then up-converted to the desired frequency of operation. The amplitude of the transmit RF from U800 is modest, and requires external amplification..

Before external amplification, the signal is filtered by FL801. This removes unwanted products of up-conversion. External amplification is provided by U804 (Skyworks Sky65132), the final power amplifier. A directional coupler is used between the final power amplifier and the antenna. Diode D804 samples the forward power for use by the AR2413 power control feedback loop. Maximum power output is +26dBm.

For reception, U800 contains the down-converters (mixers) and frequency synthesizer necessary to first convert the signal to IF frequency, and then to baseband.

The external receive components comprise the Low Noise Amplifiers Q801 and Q802. Each of these amplifiers is dedicated to one receive antenna. Diversity switch U802 selects between the outputs of the 2 amplifiers.

### **Antenna**

Three antennas are used for this product. Two are for receiving and one is dedicated for transmission. The two receive antennas operate through a diversity switch to automatically select the antenna that has the best signal quality.

The three antennas are classic PIFA (Planar Inverted "F" Antenna) structures fabricated at the edge of the PCB. They are (approximately) one quarter wavelength in length, grounded at one end and fed at their 50 ohm point. The antennas length was chosen to give good VSWR across the band of interest. The transmit antenna has a connector in series with it which can be used to measure the conducted power sent to the antenna.