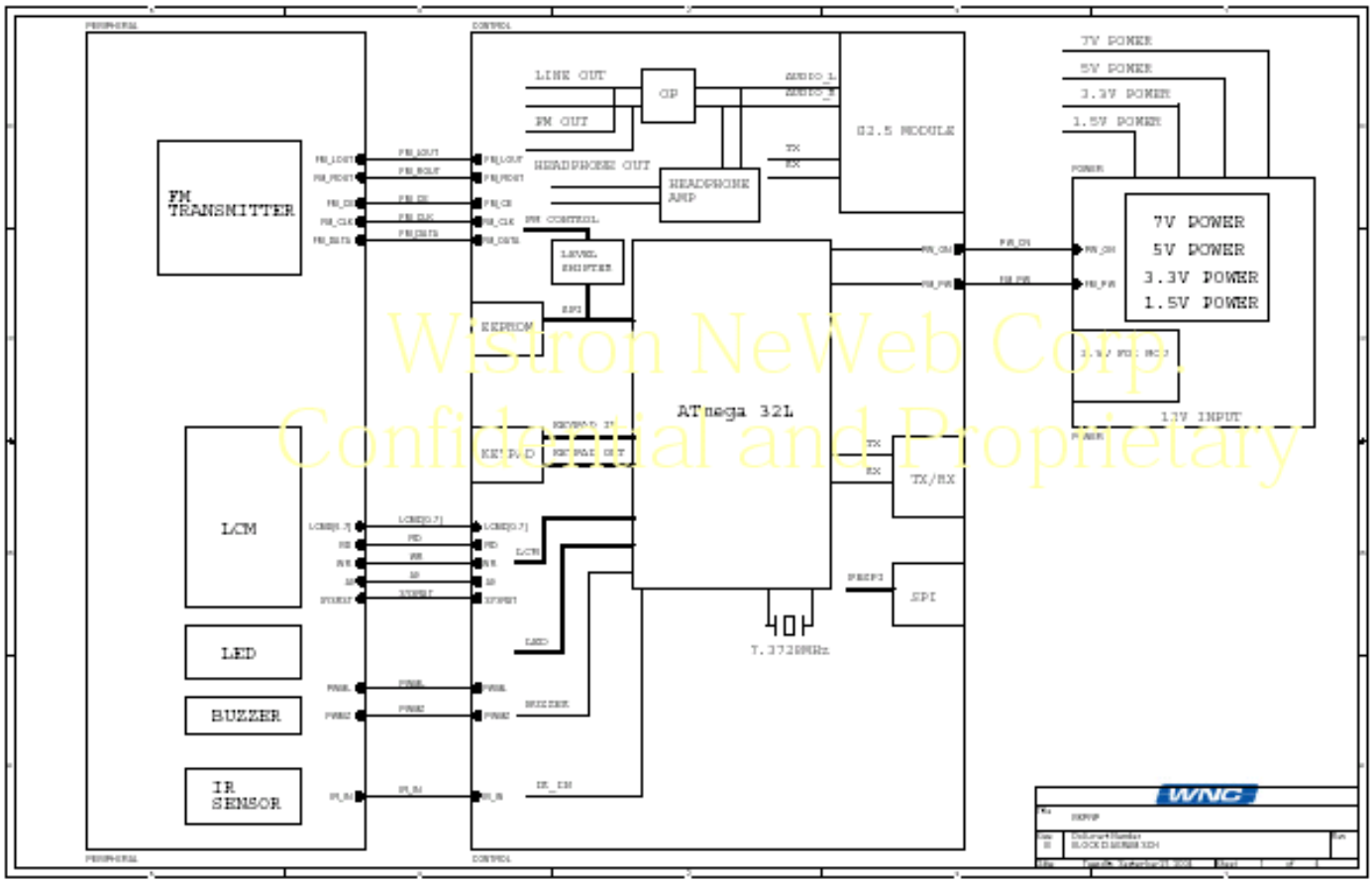
Operation Description

The device contemplated by this document, referred to as the ‘ROAD KILL ’ PnP describes a product that will be a lower-cost, self-contained Sirius Satellite Radio receiver capable of operating via an external power supply and antenna. The ‘ROAD KILL ’ PnP shall possess the operating controls, a simple user interface, and display making it easy to use, and most important, easy to transport. It shall include simple mounting mechanisms that give it the ability to easily operate via the existing architecture of a vehicle, home, office, or boat. The ‘ROAD KILL ’ PnP unit shall have low-level audio stereo outputs allowing it to interface into various homes, mobile and personal audio playback devices. The main unit shall incorporate a wireless “FM transmitter” and an FM out jack for hard-wired needs. The antenna shall be able to be used in both mobile and home applications. The system shall include both car and home power supply accessories.

The ‘ROAD KILL ’ PnP unit will incorporate the SIRIUS Gen 2.5D Chipset in the Sirius Standard Module.

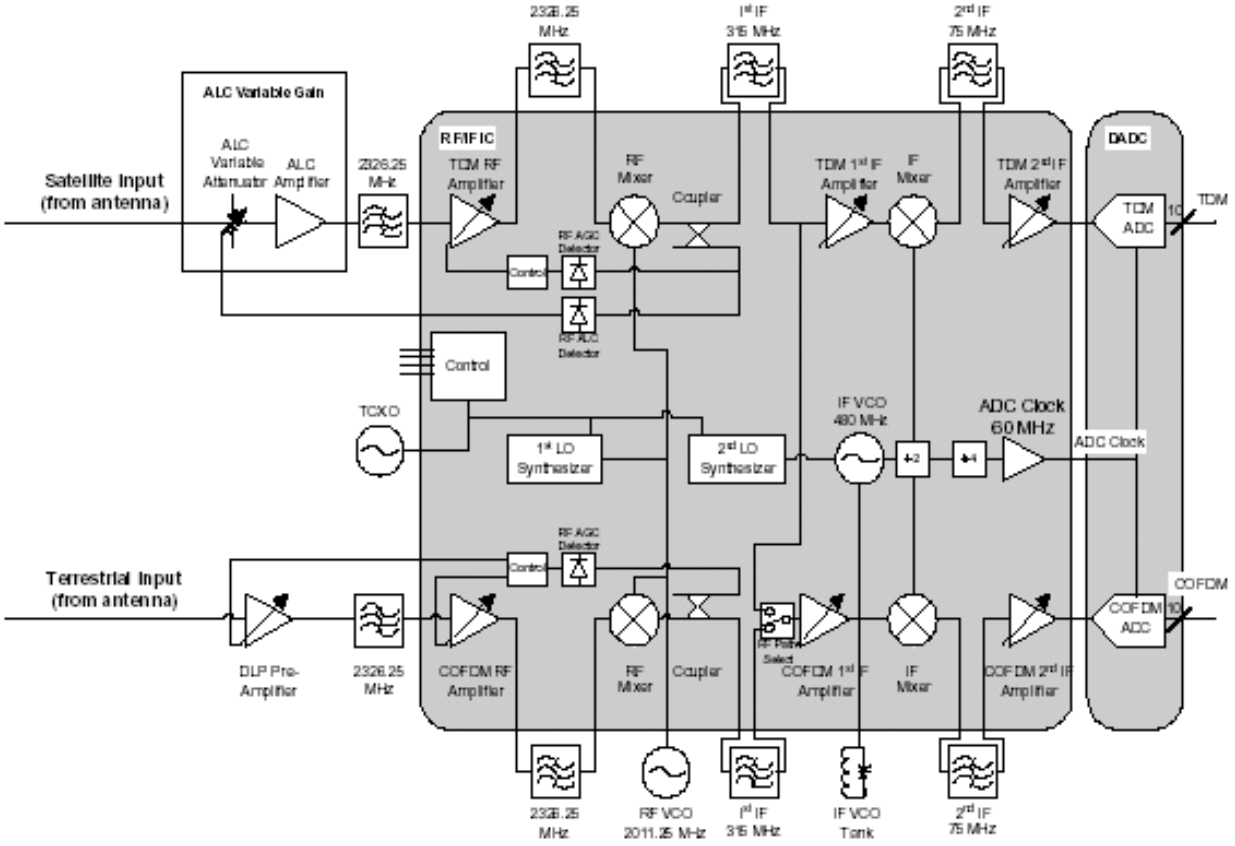


1 Features

- Dual 2.3 GHz to 315 MHz and 315 MHz to 75 MHz downconverters.
- Single or dual RF path circuitry to support either single or dual antenna cable configurations. Integrated IF splitter for dual IF AGC in single RF path mode.
- 3.3 V operation.
- RF PLL circuitry for RF LO synthesis.
- Internal IF VCO amplifier and PLL circuitry for IF LO synthesis.
- A/D sampling clock output.
- Dual low-noise RF amplifier with three gain states for wide dynamic range.
- 71 dB IF AGC amplifier range with 1 dB steps for accurate digital set point adjustment.
- Modular BiCMOS 0.25 µm technology.
- Designed to be compatible with Agere Systems *Sirius Satellite Radio*™ receiver baseband IC.

2 Applications

- *Sirius Satellite Radio* digital audio satellite and terrestrial receiver.



3 Functional Description

The *Sirius Satellite Radio* receiver tuner architecture is a dual downconversion topology, single-chip solution incorporating AGC in both the RF and IF sections to maximize the dynamic range and A/D set point accuracy. This IC is used with an external single-path or dual-path antenna, LNA, and baseband control IC to implement a complete radio section. In addition, several other external components are necessary for the complete tuner, particularly filters, RF VCO, and a reference oscillator, as recommended in the *Agere Systems* Sirius Satellite Radio *RF Chip Set Implementation* Application Note. These components are also referenced in application schematics available through Agere Systems.

The CDIFRF IC consists of two low-noise RF amplifiers (2320 MHz—2332.5 MHz) with three gain states. These amplifiers are intended for reception from the external antenna and LNA unit through some amplification and filtering. If a single-path antenna is used, only one RF amplifier and mixer are used, otherwise both will be active. The amplifier's three gain states are max, mid, and min gain where each stage is balanced for minimum noise figure (max gain), maximum dynamic range (min gain), or a balance (mid gain). The RF amplifier outputs are brought off-chip for external image rejection filtering, and then the signals should be connected to each RF mixer input. These mixers will downconvert the signal from the *Sirius* band, 2320 MHz—2332.5 MHz, to 308.75 MHz—321.25 MHz. The internal synthesizer uses an external RF VCO and reference oscillator to generate the first LO.

Next, each signal is filtered appropriately for adequate channel selection. The signals are brought back on-chip either separately or to be split into two paths (satellite and terrestrial, if the single-path antenna is used) and amplified by the first IF AGC amplifiers. The amplifier gains are independent of each other and can control gain over a 40 dB range in 8 dB increments. After this, each signal is mixed down to a nominal 75 MHz. The signals are brought off-chip for final channel selection (4 MHz bandwidth for the terrestrial path and 12.5 MHz for the satellite path) and input to the second IF amplifiers. The second IF amplifier gains are independent of each other and can control gain over a 31 dB range in 1 dB increments. In conjunction with the first IF amplifiers, the IF gain is selectable over a 71 dB range for the satellite and terrestrial paths.

A 4-wire bus is used to control the configuration of the IC, including the gain states of the RF amplifier and IF amplifiers. An overload detector to allow control of the RF AGC gain states is placed at each RF mixer output. An independent logarithmic detector to control the satellite ALC variable attenuator is also placed at the satellite RF mixer output.

Satellite path blocks are typically abbreviated to TDM and terrestrial path blocks are abbreviated to COFDM throughout this document in reference to their transmission standards.