7a. Module Description of Operation

The product for which certification is pursued will be manufactured for General Motors Corporation by Lear Corporation for automotive applications. This 315 MHz Super Heterodyne receiver module is mounted in an automobile and works in conjunction with a hand held transmitter and wheel mounted TPM (Tire Pressure Monitoring) transmitters. . The receiver is permanently mounted in the vehicle and is powered by the vehicle battery.
This receiver performs the following functions:

Remote Engine Start/Engine Stop
Lock/unlock
Trunk
Panic/alarm
TPM Message Reception

The module is designed to receive 315MHz RF signals which are ASK modulated. The module's RF Circuit receives an RF message and demodulates the RF message into a digital message that is then sent to the microcontroller. The microcontroller will decrypt the message and will send a digital message to the bus communication circuitry; the bus communication circuitry will then send the message at the proper voltage levels over the communication bus to other devices. The power regulation circuitry supplies a 5V regulated voltage to the rest of the circuits on the module. There are 2 oscillator circuits in the design; oscillator circuit 1 is at 9.5094 MHz and oscillator circuit 2 is at 8.00 MHz.

7b. RF Receiver Description of Operation

The RFA module's RF receiver consists of an integrated low noise amplifier coupled to an integrated low power superheterodyne receiver. The low noise amplifier and superheterodyne receiver are tuned to receive amplitude-shift-keyed (ASK) data in the 315MHz frequency range. The receiver IC contains a low noise amplifier, double balanced mixer, fully integrated VCO, crystal oscillator, limiter with RSSI generation, data filter, data comparator, and peak detector. The signal at the receiver IC input is amplified by an internal LNA which has a voltage gain of 16 dB. A double balanced mixer then down-converts the 315MHz signal to a 10.7MHz intermediate frequency (IF) by low side injection at the mixer with a division ratio of 32. A 9.504 MHz crystal oscillator frequency is used for the IF generation; the local oscillator (LO) frequency of the receiver is 304.3 MHz. The receiver has a series of AC-coupled limiting amplifiers which produce a gain of 65dB centered near the IF frequency with Received Signal Strength Indication (RSSI). The RSSI circuit demodulates the IF data by producing a DC output proportional to the log of the IF input signal. The demodulated data is then filtered and fed into a data slicer. The data slicer is a fast comparator with a bandwidth of 100 kHz. It compares the analog input data with a self adjusting reference level generated by an RC term. The output of the data slicer, which is the receiver data out, is a digital signal (CMOS-like levels).