

**Attachment 1**

**Description of TIRIS LUHF Reader and Vehicle Transponder**

The battery-powered vehicle transponder (TI PN RI-TRP-VUSA) is a Radio Frequency Identification (RFID) device which is designed for use in conjunction with the LUHF Reader System (TI PN S5000, FCC ID: A92LUHF). The transponder is mounted in the back window of automobile. The vehicle transponder includes a 134.2 kHz receive antenna, 902.800 MHz transmitter and a replaceable 3 volt lithium battery mounted in an ergonomic appealing housing. The transponder comes into an 134.2 kHz magnetic field in ASK modulation generated by the LUHF reader contained in such as a fueling dispenser and is activated in inductive downlink mode. The vehicle replies back to the LUHF at 902.800 MHz and narrowband FSK modulation using power from the battery. Once transaction is complete, transponder goes into a sleep mode (clock stop). There is no current drain of the battery in the sleep mode. The replaceable lithium CR2032 battery has a three-year minimum life and is retail purchased consumable.

There may be an extension –XX in the part number RI-TRP-VUSA as in RI-TRP-VUSA-XX, which refers to software revisions in the Microcontroller PIC chip. The different software versions shall be related to data structure format differences only and shall have nothing to do with the actual emissions.

**System Overview**

The LUHF reader is mounted into an enclosure such as a fueling dispenser and includes two overhead 134.2 kHz low Q transmit antennas, one carrier assembly with two remote 134.2 kHz RF transmitters, one dispenser control board, one UHF 902.800 MHz receiver, two combination UHF receive /134.2 kHz PWB antennas, and two microReader/LED bezel boards. System configuration is shown in Figure 1 below:

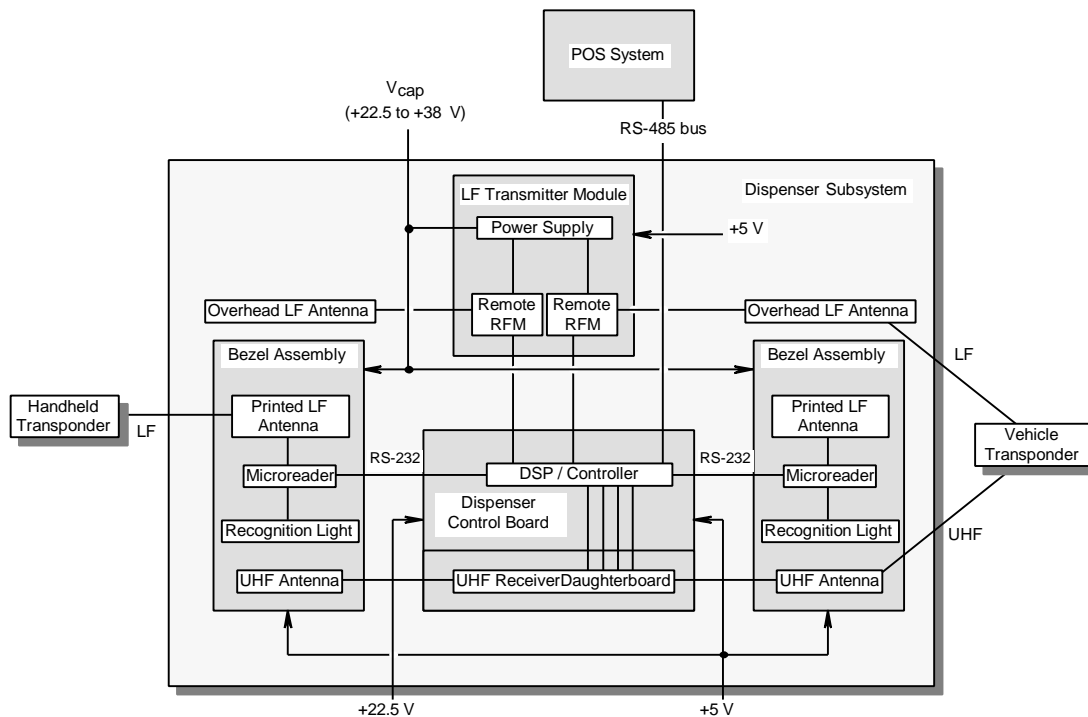


Figure 1. System Block Diagram

The reader and the transponder operate in a sequential mode with timely separated power and data transmissions cycles. The transmitter generates a single and short RF interrogation burst (76 mS firmware fix) through a low Q-factor (30) antenna. If a vehicle transponder is present in the localized zone (8 feet), the ferrite or loop antenna receives the low energy and activates the uplink circuitry to respond. The transponder echoes the reader's identification number and sends its serial number to reader. The reader sends this information through the RS-485 port to the computer/equipment operating system and is approved or disapproved to start the customer processing transaction.

**Transponder function**

The circuitry includes a downlink antenna tuned to 134.2 kHz to receive the energy from the 134.2 kHz reader antenna and triggers (activates) the controller of the uplink data transmission components. The downlink ferrite antenna does receive ASK modulation data from LUHF reader. Once the uplink circuitry is triggered, the battery powers the 902.800 MHz narrowband FSK response through the antenna formed by PWB metallization. PLL chip, external 4MHz crystal Oscillator, varactor and microcontroller (PIC) components are used in the uplink circuitry. Shown below is the block diagram of the transponder in Figure 2.

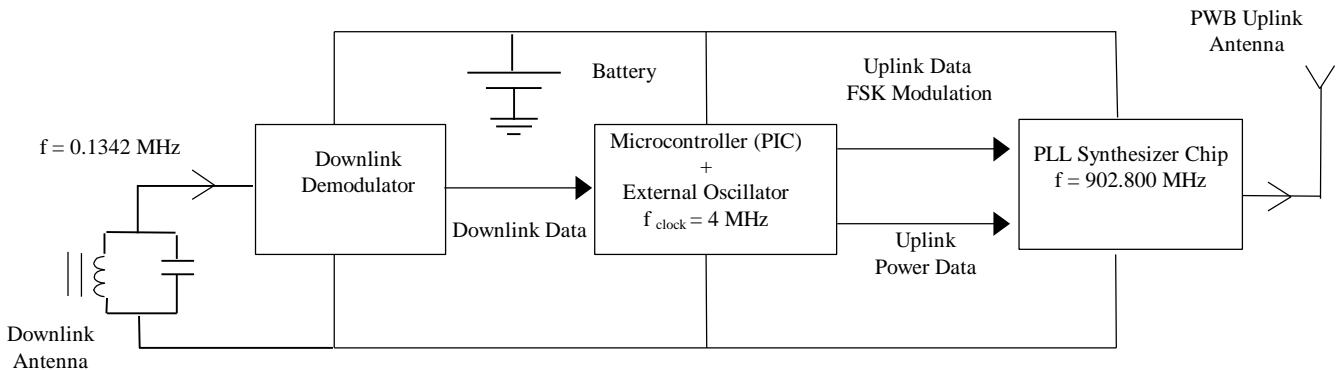


Figure 2. Block Diagram of the Transponder