Theory of Operation

The 51000-001 wireless CO detector is a low power wireless transmitter which is intended to operate on a single fixed frequency of 345.000MHz. This device operates from 3 volts DC, supplied by the Apollo CO detector CR123A battery.

The Apollo CO Detector has four status bits to indicate the status of the sensor assembly. The device will send a status message via ASK data transmission on a frequency of 345.000MHz:

a) At 70 minute intervals, for supervisory purposes to assure security system integrity.
b) When status changes to a fault condition for more than 5 seconds.
c) When status changes to a restore condition

Refer to the schematic diagram and block diagram with the following description.

The processor, U1 runs on an internal oscillator which does not require an external crystal or ceramic resonator. U1 monitors the state of the status inputs (pins 3 through 6 of J1). U1 also generates the codes sent to U2 using Manchester coding with a 50 % duty cycle. All of the messages sent are by designed to be less than 10 mS of transmitter "on" time in any 100mS period for power averaging purposes. If a), b), or c) (outlined above) occurs, U1 will transmit ASK data via U2 as follows:

1. The data line from pin 2 of U1, which is connected to pin 6 of U2, will toggle high and then low. This will cause U2 to turn on and start its internal 10.78125 MHz crystal reference oscillator which is connected to crystal X1. Within 200 to 300 uS of turning on, the 345.000MHz PLL synthesizer inside U3 will be locked and stable.
2. After the data line is held low for 500 uS as described above, and the PLL is stable, U1 will then begin to send data to U2. When pin 6 of U2 goes high, the 345.000MHz PA stage will be enabled and transmit RF from pin 4 of U2 until pin 6 of U2 is set low again by pin 5 of U1.
3. When the data input pin 6 goes low, U2 will disable it's PA section and stop transmitting RF from pin4, but U2 will remain on and it's PLL will remain locked and ready to transmit when the data line goes high again.
4. This process described in 2 and 3 above is repeated thorough each data transmission.
5. After the data transmission is completed, Pin 6 is held low. U2 will return to the sleep mode 6.5 mS later.
6. Steps 1 thru 5 will repeat as needed for additional packet transmissions.

Components L1, L2, C8, C9, C10, and C11 provide impedance matching and harmonic rejection between U2 and the PCB mounted wire loop antenna. X1 provides frequency reference for U2.

This device does not have any adjustments which can be changed by the user.

The loop antenna generates an H field, with some E field utilizing the main PCA of the Apollo detector and battery for additional ground.

U2 is an integrated circuit transmitter chip, with a output frequency fixed at 32 times the crystal reference frequency. The output circuit is an open drain operated in class c mode. The power output is controlled by the voltage at TP1. A resistor in the antenna circuit limits the radiated field.