Beacon – Circuit Description.

With Reference to circuit schematics:

Transmitter Unit EPCB101003

The transmitter consists of a microcontroller IC2, a quad NAND gate that provides a voltage doubling function and a simple on-off keyed UHF transmitter based around a single NPN RF transistor T1. The microcontroller can illuminate an LED and make an audio tone via a small loudspeaker.

The microcontroller is of the MSP430 flash programmable time and is programmed on board via the JTAG header J3. An expansion header J6 gives access to all the unused microcontroller lines. In this application a low cost 20 pin device is fitted, but for other applications the 28 pin larger par could be fitted to allow other functions.

The unit is powered from 2 AA alkaline cells and diode D1 provides reverse voltage protection. IC1 and diodes D2, D3 and capacitors C3, C4 and C5 provide the voltage doubling circuit. The RF stage is supplied by approximately 5V, allowing improved range and performance when the battery voltage drops.

T1 provides a simple Colpitts type UHF oscillator, frequency stabilised to 433.92MHz by SAW device. On-off keyed (OOK) data is applied to the base of the transistor via resistors R10 and R11. When the base is suitably positively biased by high level data, the transistor goes into conduction and begins to oscillate. Inductor L1 provides RF decoupling from the power supply and inductor L2 couples in the antenna E1, a simple quarter wave antenna made from 175mm of multi-strand wire.

Operation

The transmitter is programmed with a unique 11 digit serial number, by way of a serial link J1, during the factory programming process.

When the reset button SW1 is depressed, the microcontroller begins to execute code and emits a short beep and illuminates the green LED. It sends the unique ID serial number in the form of a 1200 baud data packet to the input of the RF stage. It repeats this packet twenty times for a duration not exceeding 4 seconds. At the end of the transmission, the microcontroller turns off the LED and returns to sleep mode so as to conserve power.

When the transmitter is activated, the microcontroller also determines the state of battery charge by comparing the battery voltage against a reference voltage derived from the voltage drop across the green LED. If the battery voltage is low, the transmitter will continuously blink its LED every 15 seconds to warn the user of low battery condition.