Theory of Operation

General

The device is a Direct Sequence Spread Spectrum burst transmitter for Automatic Meter Reading (AMR) of gas meters. This device is mechanically designed to fit on Schlumberger residential meters and is part of a family of products designed to cover the majority of meters, both residential and industrial, in use in the USA.

The interface with the meter comprises a magnet mounted on a shaft extended from the meter and two reed switches mounted on the board of the unit. This battery operated device is maintained most of the time on stand-by and wakes up to accept and count pulses from the meter interface.

Once every pre-programmed number of hours the device wakes up and generates air message containing information on the meter reading. The air message is a burst DS SPSP transmission in one of number of pre-defined channels.
These messages are collected by network of base stations that covers the area of service.

The base station decodes the upcoming messages and sends them via a backbone connection to a central computer, the Data Operation Center (DOC).

Signal Description

- •Operation frequency band - 904.6 MHz (channel 5) to 925.4 MHz (channel 57).
- •Channel spacing - 0.4 MHz.
- •Modulation technique - DBPSK, Direct Sequence Spread Spectrum.
- •Chip rate - 1 Mchip/Sec.
- •Spreading sequence - 255 Maximal Length sequence.
- •Raw data rate –3921 Bit/Sec.
- •Preamble length –300 bits.
- •Raw data length –320 bits.
- •Error correction code –Convolution code, R=1/2, K=5.
- •Interleaver depth –20 bits.
- •Message duration –158mSec.

Signal Generation

The transmitter is a direct conversation burst transmitter. The transmitter comprises synthesized local oscillator, that works with 15 MHz crystal reference and generates carrier in the 902 - 928 MHz band with channel spacing of 0.4 MHz, printed modulator that receives carrier signal from the synthesized local oscillator and base-band signal from the signal spreading module and generates direct sequence spread spectrum signal, and power amplifier module that amplifies and feeds a printed antenna with 29dBm signal.