# Low Cost Repeater

# RF Specification

**Rev V1**

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# 1. Introduction

The following document describes the technical specification of a Low Cost Repeater (called LCR) for the USA market.

The LCR receives the transmissions of variety types of water & gas meters and relay them to a remote collecting unit.

The LCR operates at the 900MHz ISM band. The board consists of the following units: RF Transmitter & Receiver and a Microcontroller (plus simple Digital Logic), which control the operational modes of the unit.

## 1.1. Definitions, Abbreviation and Acronyms

RFD                                              :    RF Dialog

## 2. LCR Description

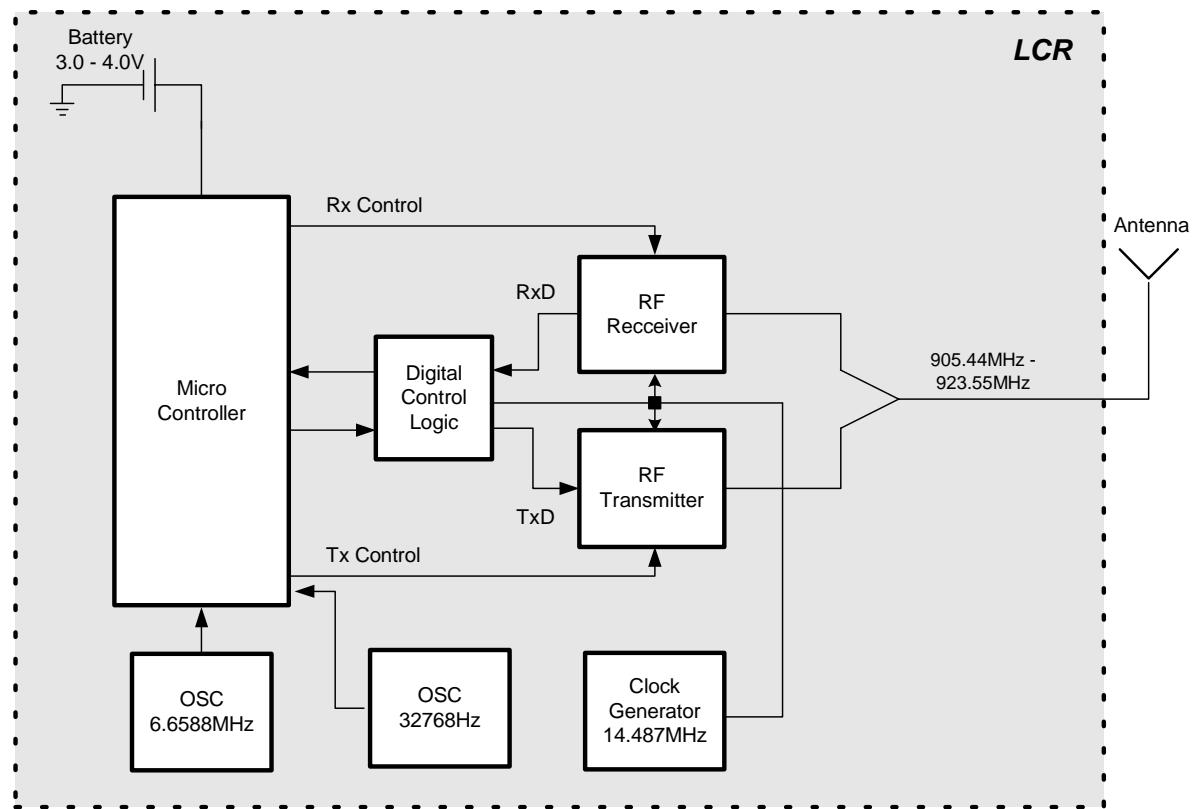### 2.1. Block Diagram

A block diagram of the LCR is described below.



**Figure 1: LCR Block Diagram**

## 2.2. Operational Modes

| Table 1 – Operational Modes | | | | | |
|------|------|------|------|------|------|
| **Mode** | **Microcontroller** | **Reed SW** | **Digital Logic** | **RF Receiver** | **RF Transmitter** |
| Transmit | On (fast clock) | Disabled | On | Off | On |
| Receive | On (fast clock) | Disabled | On | On | Off |
| Idle/Sleep | On (32768Hz clock) | Disabled | Off | Off | Off |

## 3.    Electrical Performance

### 3.1.   *Transmit Unit*

Each LCR board has two transmit modes:

- FSK (see table 2)
- PSK (see table 3)

The transmit mode is is controlled by the software.

### 3.1.1.   *FSK Parameters*

| Table  2 – FSK Transmit Parameters | |
|---|---|
| **Parameter** | **Value** |
| Transmit Frequency | Programmable in the range 905.44 MHz - 923.55 MHz |
| Modulation | Digital Modulation – Wide Band BFSK |
| Modulation Coding | Manchester |
| Bit rate (net data rate) | 59.454 kbps |
| Frequency deviation | ~170 kHz |
| Bandwidth (@6dB) | 800 kHz – 1000 kHz |
| Frequency stability (including initial stability, temperature and aging) | <15 ppm |
| Peak Output power (without Antenna) | < 14.6 dBm |
| Peak Output power spectral density (without Antenna) in any 3kHz | 3dBm to 8dBm |
| Harmonics | < - 54dBm |
| Tx Pulse duration | ~4ms |
| Transmission rate | Programmable. Duty cycle < 1.2 % |

### 3.1.2. PSK Parameters

| Table 3 – PSK Transmit Parameters | |
|---|---|
| **Parameter** | **Value** |
| Transmit Frequency | Programmable in the range 905.44 MHz  - 923.55 MHz |
| Modulation | DSSS BPSK |
| Bit rate | 60.3625 kbps |
| Chip rate | 905.4375 kChip/sec |
| Bandwidth (@6dB) | 700 kHz – 1300 kHz |
| Frequency stability (including initial stability, temperature and aging) | <12 ppm |
| Output power (without Antenna) | < 16.8 dBm |
| Output power spectral density (without Antenna) in any 3kHz | 2dBm to 8dBm |
| Harmonics | < - 54dBm |
| Tx Pulse duration | ~3.4ms |
| Transmission rate | Programmable. Duty cycle < 1.2 % |

### 3.1.3. Receive Parameters

<table>
<tr><td colspan="2">Table 4 – Receive Parameters</td></tr>
<tr><td>Parameter</td><td>Value</td></tr>
<tr><td>Receive frequency</td><td>916.3 MHz</td></tr>
<tr><td>Sensitivity (BER 1E-3)</td><td>-98 dBm</td></tr>
<tr><td>Modulation</td><td>FSK</td></tr>
<tr><td>Frequency deviation</td><td>170 kHz</td></tr>
<tr><td>Bit rate</td><td>~60 kbps @ Meter Relay mode,<br>~20kbps @ Programming mode</td></tr>
<tr><td>Coding</td><td>Manchester</td></tr>
</table>

### 3.2. Antenna

Antenna gain: maximum 3dBi (excluding cable loss).

There is no direct access to the antenna connector of the unit. In order to connect the antenna, special plastic cover of the connector should be removed by extracting two screws holding the cover. After connecting the antenna, the cover should be returned to its original position (using the same screws) with antenna connector covered completely by the cover.

The connection of the antenna shall be performed only by professional personnel responsible for the operating of the unit.



Plastic Cover
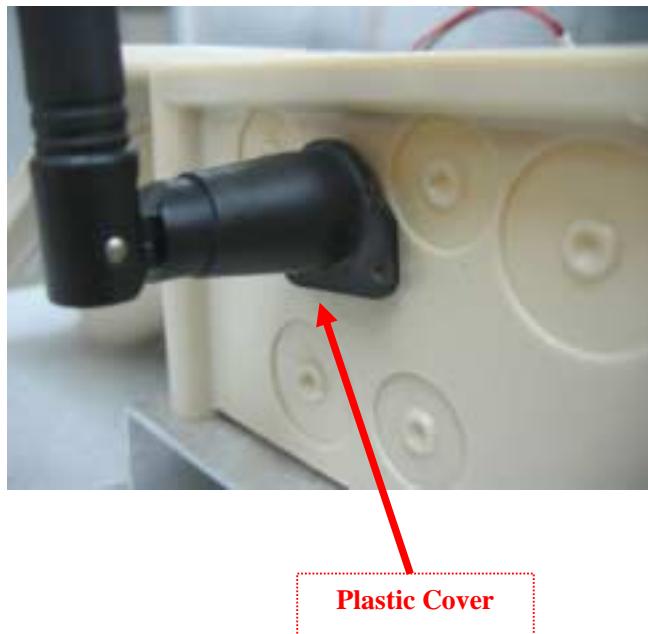
### 3.3. Power Source

Battery rated voltage 3.6V.

Operating voltage: 3.0V - 4.0V

### 3.4. Environmental Conditions

Operating Temperature: -40° C to + 85° C

Storage Temperature: : -40° C to +85° C

Humidity: Up to 95%