TransMeter Water (250FH) Specification

Rev A2

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1. Introduction

The following document describes the technical specification of the Water Meter transceiver board (called TMW-TransMeter Water) for the USA market.

The TMW is actually a water odometer, offering Automatic Meter Reading – AMR. The TMW is 2-Way RF communicator built-in water meter. The RF capabilities enable the transmission of the meter reading and some extra information to a Collecting unit. In addition specific parameters can be programmed via the RF link.

The TMW consists of the following units: RF Transmitter (Spread Spectrum Frequency Hopping) & Receiver with integral Antenna 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. TMW Description

2.1. Block Diagram

A block diagram of the TMW is described below.

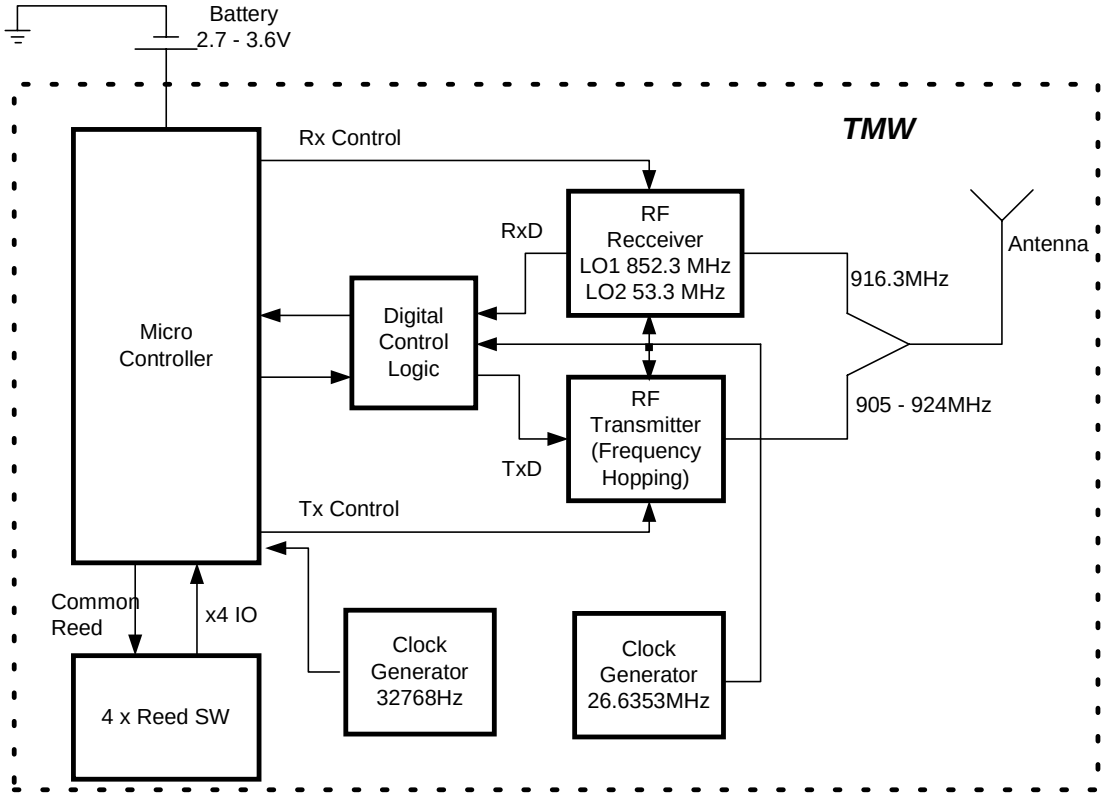


Figure 1: TMW Block Diagram

2.2. 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
Reading Reeds SW	On (32768Hz clock)	Enabled	Off	Off	Off
Idle/Sleep	On (32768Hz clock)	Disabled	Off	Off	Off

Notes:

1. When the Microcontroller reads the Reed SW it enables the *Common_Reed* signal. In this case, if the Reed SW is closed then the current via the Reed shall be ~6uA, otherwise the current shall be zero.
2. When the Reeds are disabled (*Common_Reed* = "0"), then the Reed current consumption is zero regardless of their state.

2.3. Board Dimension

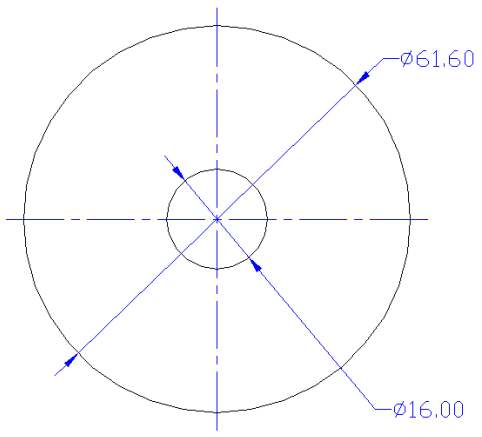


Figure 2: Board Dimension

3. Electrical Performance

3.1. Transmit Unit

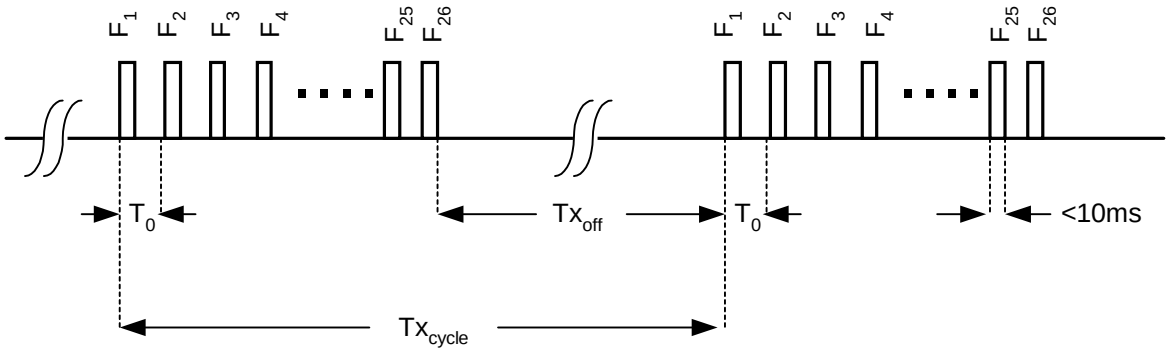
3.1.1. Transmit Parameters

Table 1 – Transmit Parameters

Parameter	Value
Transmit Frequency	905MHz – 924MHz
RF Type	Spread Spectrum Frequency Hopping (26 hopping Frequencies)
Modulation	FSK
Modulation Coding	Manchester
Bit rate (net data rate)	60 kbps
Frequency deviation	100 kHz
20dB Bandwidth of hopping channel	400kHz ± 50kHz
Frequency stability (including initial stability, temperature and aging)	±50 ppm
Peak Output power (with Antenna)	18 dBm
Harmonics	< - 54dBm
Tx Pulse duration	<10ms
Transmission rate	Programmable.

3.1.2. Frequency Hopping Parameters

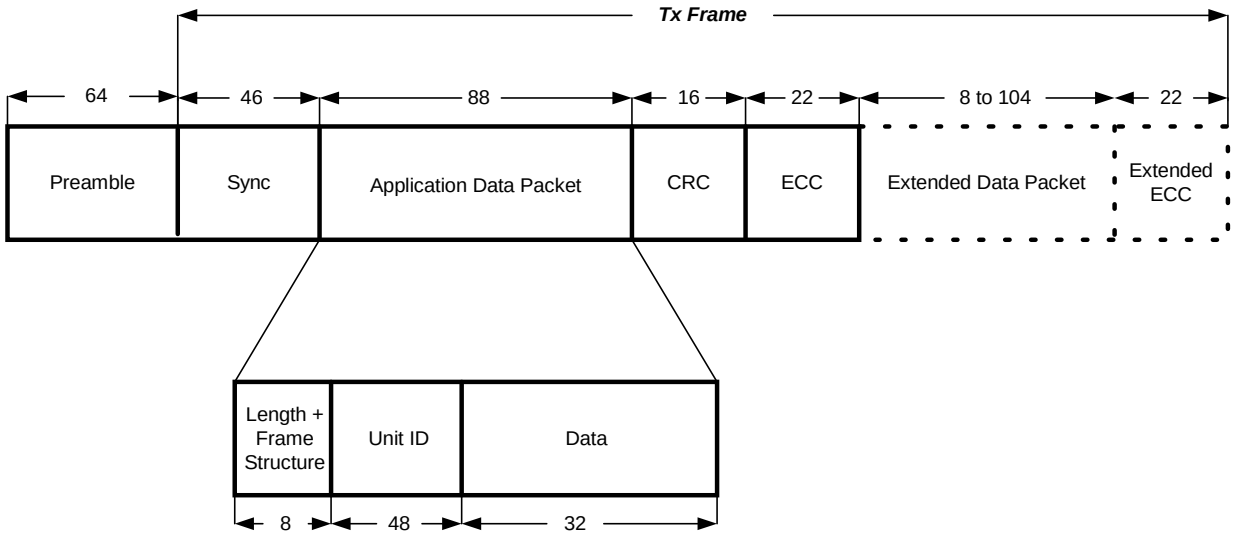
- A Transmit cycle consists of 26 consecutive transmissions, each transmission frame (less than 10ms) is performed in different frequency (1 out of 26).
- Following the 26 transmissions, the transmitter is disabled for Tx_{off} period (programmable parameter, greater than 10 sec).
- A Tx frame duration is less than 10ms and the minimum Txoff period is 10 seconds, therefore the maximum occupancy time on any frequency is less than 10ms within a 10 second period. This is under the limit of 400ms in a 10 sec window. In actual operaton, Txoff period is hundreds of seconds.
- The FH carrier hops on a predetermined, pseudo random pattern (see table below).
- All channels are used equally



Frequency Hopping Sequence Table

	Frequency [MHz]	Frequency Assignment
1.	916.2999	F1
2.	913.0274	F2
3.	909.1516	F3
4.	910.3006	F4
5.	907.3999	F5
6.	920.0465	F6
7.	914.7650	F7
8.	913.5562	F8
9.	911.3666	F9
10.	915.6513	F10
11.	917. 8524	F11
12.	908.4797	F12
13.	905.6002	F13
14.	922.4692	F14
15.	916.8810	F15
16.	919.1790	F16
17.	912.4007	F17
18.	907.9308	F18
19.	906.6656	F19
20.	910.8174	F20
21.	921.2262	F21
22.	906.1438	F22
23.	923.1750	F23
24.	921.7514	F24
25.	909.7223	F25
26.	914.1498	F26

3.1.3. Transmit Protocol



Notes:

1. All numbers indicate number of bits
2. The preamble is alternating ones and zeros. The Preamble length is ~64 bits.
3. When "Length + Frame Structure" field is all zero then the "Data Packet" field is used by the communication layer (Telematics) and not by the application layer.
4. If the "Application Data Packet" is less then 11 bytes then the communication layer shall fill this field to 11 bytes (88 bits).
5. CRC is used as an error detection code. It is calculated on the entire data packet.
6. ECC is used as an error correction code. The BCH is calculated on the Packet data + CRC.

Figure 3: Transmit Frame

3.1.4. Tx Timing

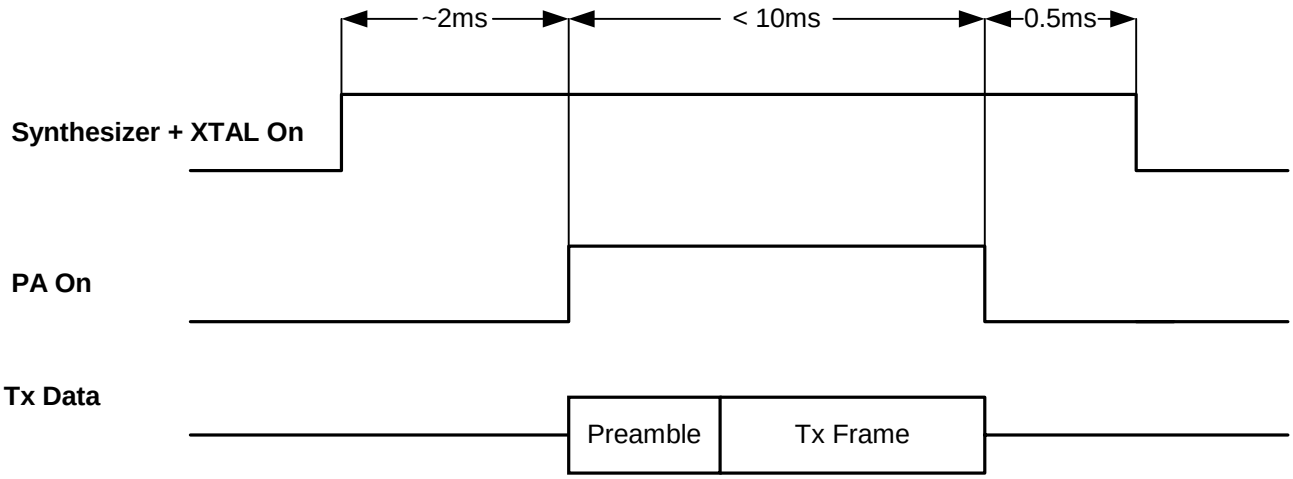


Figure 4: Transmit Timing

3.2. Receive Unit

3.2.1. Receive Parameters

Table 2 – Receive Parameters

Parameter	Value
Receive frequency	916.3 MHz
Sensitivity (BER 1E-3)	-87 dBm
Modulation	FSK
Frequency deviation	100 kHz
Bit rate	20 Kbps
Coding	Manchester

3.2.2. Receive Protocol

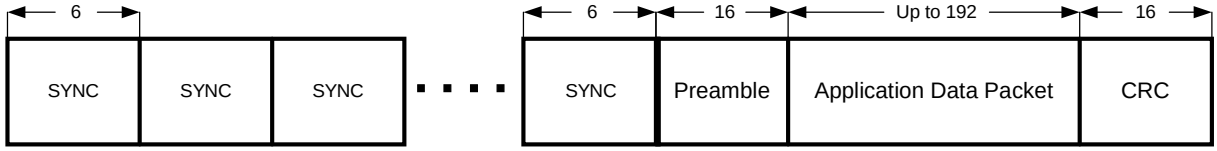


Figure 5: Wake Up Sequence and Receive Frame

Notes:

1. All numbers indicate number of bits
2. CRC is used as an error detection code. It is calculated on the entire data packet.

3.3. Antenna

The TMW has an integral Antenna. The antenna is soldered directly to the board during the manufacturing process.
The Antenna type is PIFA – Planar Inverted "F" Antenna. The Antenna is Omni Directional in horizontal plane. The max gain is 2.5 dBi. The Antenna is made of brass/tin.

3.4. Power Source

3.4.1. Operating Voltage

Battery rated voltage 3.6V.
Operating voltage: 2.7-3.6V

3.4.2. Battery Life

The battery life shall be at least 6 years

3.5. Environmental Conditions

Operating Temperature: -10° C to + 70° C
Storage Temperature: : -40° C to +85° C
Humidity: Up to 95%

Appendix A

The TMW transmissions are captured by the Receiver on any of the 26 channels and performs equally on all channels. The system Receiver has input bandwidth that matches the hopping bandwidth of the corresponding transmitters. The Receiver shifts its frequency in accordance with the same frequency hopping table and pattern as the transmitters.