Speed TxRx

Tranceiver

FCC ID - **SPEEDTRD433L1**

User Manual

Miltel Communications Ltd. *June 1998*

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Chapter 1

Introduction

1.1 Purpose and Use

The ***Speed TxRx*** Transceiver (FCC ID - **SPEEDTRD433L1**) is a low-power data link transceiver that relays digital data from low power **Transmitters** (FCC ID - MLLTX433L1), which are connected to water meters, to a **Regional Concentrator**. It is also used in the receive mode as a front-end to the Concentrator. The information in this manual is provided only as instructions for installation and does not entitle user to make any modifications or adjustments.

1.2 System General Description

The ***Speed TxRx*** system is a computerized fully automatic radio device. It requires no human intervention after initial installation. The device includes the following parts:

1. Transmitter
2. Receiver
3. Controller
4. Antennas and cables
5. DC regulator
6. Enclosure

The Transceiver receives DC power and digital data from the Repeater or Concentrator and Transmit \ Receive RF through coaxial cables which are connected to half wavelength Dipole antennas.

Note: 1) The system, including transmitters, transceivers and concentrators, is installed and maintained only by qualified professional technicians.

2) The device is not adjustable by user and is supplied by manufacturer ready for installation witout provisions for adjustmant.

Chapter 2

Theory of Operation

2.1 General Description

In receive mode, the ***Speed TxRx*** receives data from the ***Speed Tx*** Transmitters which are deployed near the water meter/s or from other ***Speed TxRx*** units which are in Transmit mode. The received data is processed differently whether the unit is connected to a Repeater control device or as a front-end to a Concentrator. When connected to a Repeater, the received data is processed in the Repeater's controller. Only messages, which need to be relayed, are transferred to the Transceiver's controller.

The Controller initiates a transmission only if 30 sec. have elapsed from the previous transmission. Upon validation, the Controller switches the Transceiver to Transmit mode and transmits the data. The controller also selects the antenna from which the message will be transmitted/received.

When connected as a Concentrator front-end, the Transceiver operates in receive mode. The received data is transferred to the concentrator for further processing of the meter data.

2.2 Block Diagram Description

2.2.1 General

Figure 2-1 describes the block diagram of the ***Speed Tx Rx*** unit. RF is received or transmitted from either antennas upon the controller selection. Two antennas are used to improve performance in urban environment where shadowing, due to tall buildings, generates sever *multipath* effect. This effect can reduce the received signal by more than 30dB, thus by switching antennas periodically the transceiver improves reception.

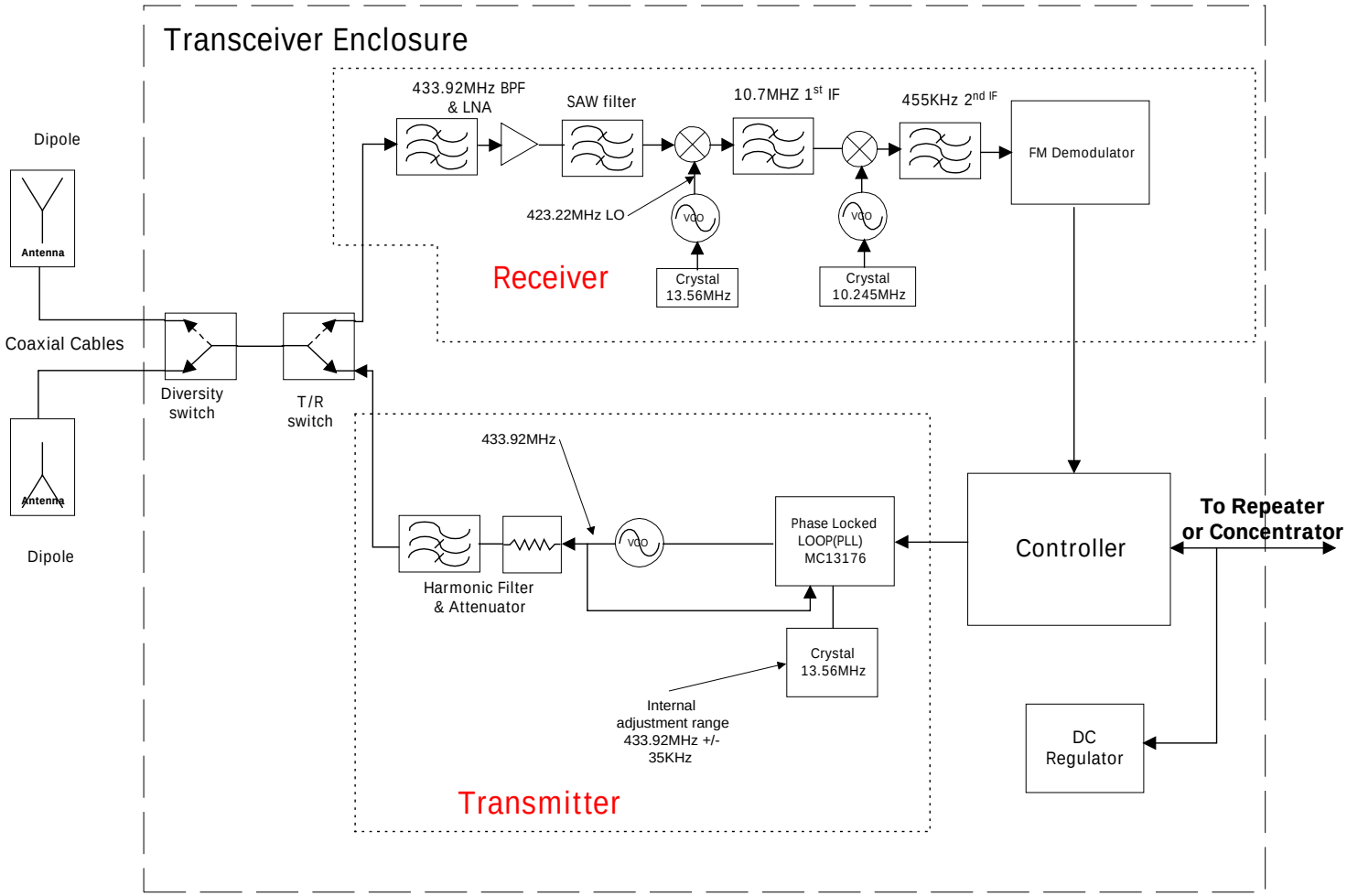
2.2.2 Transmitter

A PLL IC (MC13176 from Motorola Semiconductors) gets the reference, 13.56MHz, from a crystal oscillator and locks the VCO output, divided by 32, to the crystal frequency. Therefore, the output frequency equals Crystal_frequency x 32 = 433.92 MHz.

The message digital data from the Controller is shaped and modulates the VCO frequency. The VCO output is attenuated by a resistive Π Attenuator. A 6 pole low pass filter that rejects the harmonics, further filters the output. The output is routed through a T/R switch and a diversity switch to the output/input UHF connectors.

Coaxial cables connect the half-wavelength dipole antennas with the Transceiver. All the emissions parameters are in compliance with FCC part15C specifically the limitations set by 15.231(e). When the Transceiver is in the receive mode the voltages to the Transmitter are off.

Figure 2-2: ***Speed TxRx Block Diagram***



2.2.3 Receiver

The input signal from either ports is routed with the T/R switch to the receiver section. The signal is filtered, amplified and further filtered by a high selectivity SAW filter. Local Oscillator leakage is greatly reduced by the reverse isolation of the amplifier and mostly by the Narrow band SAW filter.

The Receiver is a double down converter super_het receiver. The 2nd IF output is applied to an FM discriminator that demodulates the signal and reproduces the digital data which is transferred to the Repeater. A shielded 5-wire cable connects the Transceiver to a Repeater or a Concentrator.

2.2.4 Controller

The controller receives and sends data to and from the Repeater or the Concentrator. When a data should be transmitted, The Controller turn on the voltages to the Transmit section and modulates the transmitter VCO. The Controller is a single chip with integral RAM and ROM.

2.2.5 Regulator

The DC regulator filters The DC voltage from the Repeater or the Concentrator and distributes the power accordingly.

Chapter 3

Technical Characteristics

3.1 Technical Specification

3.1.1 Electrical

Transmitter

Max. Effective Radiated Power (ERP) including Dipole antennas	1.4µW peak (Complies with FCC 15.231(e))
Output frequency	433.92 MHz. Crystal Controlled.
Carrier wave modulation	2 levels FSK with a subcarier
Bandwidth	50KHz max. At –20dBc points
Transmit Duration	0.8 Sec Max.
Duration between Transmissions	30 Seconds Min.

Receiver

Type	Crystal Controlled, Super-Heterodyne
Frequency Conversions	Two, 1st IF: 10.7MHz, 2nd IF: 455KHz
FM Demodulator	Quadrature detector with a video filter and a Compartor.
Sensitivity	-117dBm at transceiver ports. Measured with 10 messages with no errors,

General

Interface to Repeater/Concentrator	Shielded 5-wire cable
Antennas	Half wavelength Dipoles, 50ς better than 2:1 VSWR
Power Supply	110V AC / 12V DC UL Certified Converter

3.1.2 Physical

Operating temperature	-10÷+60°C
Water Resistance	Splash resistance (IP-64)
Length	160 mm.
Width	120 mm.
Depth	75 mm.
Weight (excluding Antennas)	420 gr.
Enclosure	An inner shielded steel box in a plastic box housing. UHF connectors for RF and a 5-wire shielded cable for Data and DC.

3.2 Label Contents

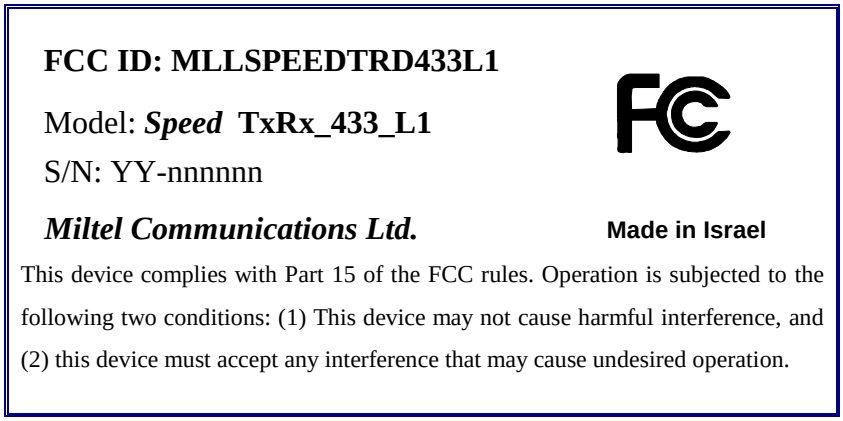


Figure 3-1: ***Label***

Chapter 4

Installation Instructions

4.1 General

The ***Speed TxRx Transceiver*** should be installed only by a **professional technician**. Once installed, the **Antennas and Coax Cables should not be modified** as this may effect performance and will violate the FCC requirements. The ***Speed TxRx*** unit should be installed in a secure location so that it is not accessible.

4.2 Installation

Before installing the ***Speed TxRx Transceiver*** complete the antenna installation. The antennas should be installed by a qualified installer according to the appropriate guidelines and regulations. Antennas should be installed vertically. Distance between antennas should be 40 cm. (min). After antenna installation coax cables should be connected and secured. Once antennas are installed and coax cables are put in place the ***Speed TxRx*** device can be installed as follows:

1) Loosen the four screws fastening the unit's box and open the box cover.
2) Install the box base at a secure location as close as possible to Antenna location.
3) Connect the ***Speed TxRx Transceiver*** to the Repeater or to the Concentrator using approved 5 wire shielded cable.
4) Connect the ***Speed TxRx Transceiver*** to external Power Supply.
5) Connect both coax cables to ***Speed TxRx Transceiver*** and secure them in place.
6) Close the unit's box cover.
7) Perform functional radio test and verify correct reception of data at concentrator.