Speed HPTx

Wireless Data Link

for Meter Reading

FCC ID: **MLLSPEEDHPTX450**

User Manual

Miltel Communications Ltd. *March 2002*

Table of Contents

Chapter 1

Introduction

1.1 Purpose and Use

The ***Speed HPTx*** (FCC ID: **MLLSPEEDHPTX450**) is a data link transmitter that is used for data acquisition in Miltel's utility consumption readings collection system. This device is installed on-site by a professional field technician, thus it includes technical terms. The equipment is not to be installed by a non-professional individual that has not been trained and authorized.

1.2 System General Description

The ***Speed HPTx*** system is a computerized fully automatic radio device. It requires no human intervention after initial installation. The system enables remote, continuous and accurate reading of water or gas consumption. The ***Speed HPTx*** transmits the data acquired from water meters to a receiver connected to a regional concentrator. The concentrator transfers the data to the central computer for data collection and for further analysis and reporting.

Chapter 2

Theory of Operation

2.1 General Description

The ***Speed HPTx*** is the first link in the meter readings data collection system. It is an independent unit that does not require an external power source, wiring, or the preparation of an infrastructure.

The unit is installed in proximity to the meters and can be connected to several adjacent meters.

Figure 2-1 (see next page) shows a typical installation of a ***Speed HPTx*** unit, connected to several water meters (of various types) at a single location. The unit can be connected to any type of meter which has a pulsed output (a passive magnetic open/short reed relay), an active pulse or an encoded output.

The ***Speed HPTx*** acquires the consumption data from the water meters and stores this data in its memory. The unit includes a miniature RF transmitter which transmits data on a periodic basis to a regional concentrator.

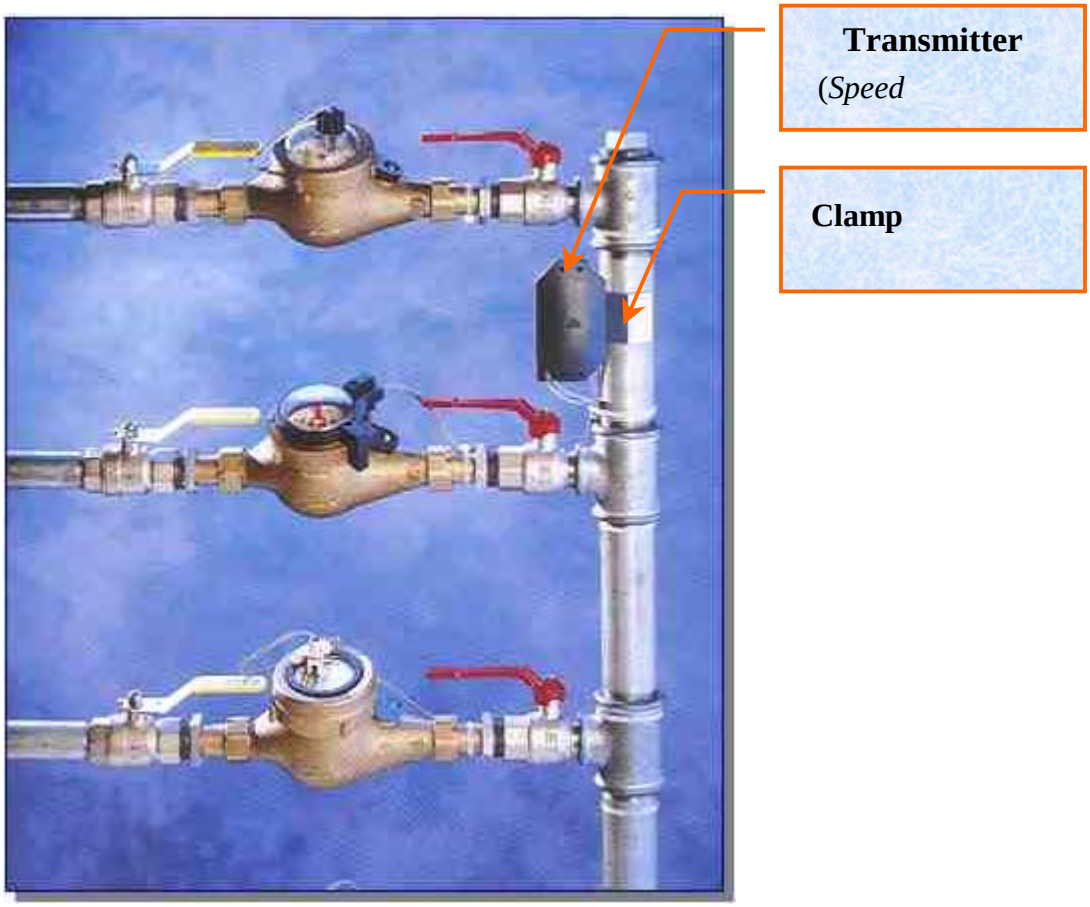

Figure 2-1: Speed HPTx Typical Installation

2.2 Block Diagram Description

2.2.1 General

Figure 2-2 describes the block diagram of the ***Speed HPTx*** unit. This device consists of two major sections, all using a common power source:

- Digital section (Micro Controller)
- RF section

A 3.6 volts Lithium battery provides power to all parts of the device. The power supply for the RF section is controlled via the Tx switch (not shown), thus cutting of power to the transmitter unless necessary for actual data transmission (standby mode).

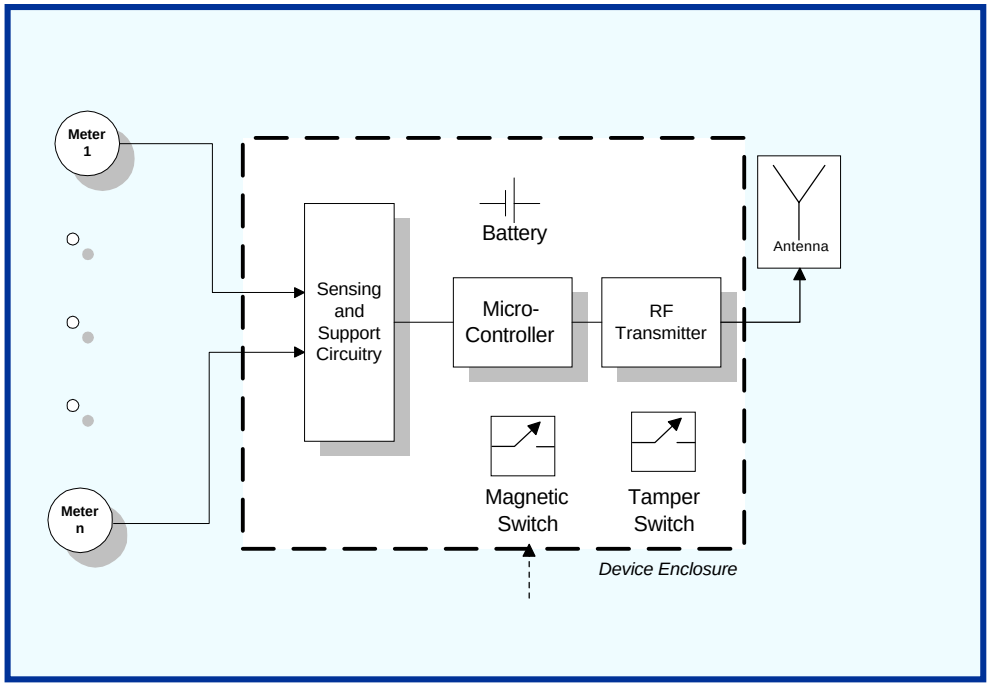

Figure 2-2: ***Speed HPTx Block Diagram***

2.2.2 Digital Section

The digital section of the ***Speed HPTx*** performs the following functions:

- Samples reed switches to detect short/open from each meter.
- Accumulates number of pulses for each meter separately
- Stores data (including battery and tamper alarms) and stores information internal memory
- Interfaces the data to the RF section

The digital section is based on a central controller which accepts the following inputs:

a. Analog inputs (from reed-relay contacts) designated INPUT1 through INPUTn, each indicating the advance of a single water meter. Alternatively, the *Speed HPTx* interfaces to an encoded meter. These are the only inputs of the controller.

b. Magnetic switch input is utilized only for testing.

c. The TAMPER SWITCH input is connected to a micro-switch that senses an opening of the unit's box. This enables the ***Speed HPTx*** to generate and transmit an alarm signal in the event of unauthorized opening of the unit casing.

d. The LOW VOLTAGE input of the controller is connected to battery via a Low Voltage Detector in order to sense and generate a low battery alarm.

Each of the external analog inputs to the controller advances a separate counter in singular steps. The counters in the controller are not pre-settable or resettable to avoid unauthorized tampering (counter matching is thus performed only by the central computer, ensuring excellent data security at the sites).

The controller gathers the data for several hours before initiating a transmission. If any of the counters has advanced by more than a preset value, or any alarm (tamper or low voltage) has been received, the controller generates a single message immediately. Any further message will include alarm information along with counter data, if alarm condition still exists. Note: The duration interval between two transmissions is always greater than 1 Hr.

e. The messages generated by the controller are 16 bytes each, and are outputed from the digital section to the RF section as serial data (RS-232 standard protocol) via the DATA OUT output of the controller.

f. The Tx control output of the controller is used for activating the TX switch for the duration of the message, to enable power supply to the RF section thus enabling the transmission of the message (transmit mode).

2.2.3 RF Section

The RF section consists of a phased-locked loop (PLL) and a low-power amplifier connected to an integral antenna.

The PLL reference is driven by a 20.0 MHz. crystal oscillator. This reference is phase-compared by the Phase Detector with the divided output frequency.

The phase detection signal from the detector is filtered by the PLL Loop Filter and then summed with the shaped signal received from the digital section by the Sum Network block. The output of the Sum Network is the control signal that modulates and locks the Voltage Control Oscillator (VCO).

Chapter 3

Technical Characteristics

3.1 Technical Specification

3.1.1 Electrical

Max Effective Radiated Power (ERP)	60 mW (Complies with FCC 90.205(g))
Output frequency	450-470 MHz
Carrier wave modulation	2 Level FSK
Power supply	Lithium battery, 3.6 Volt
Input Channels	1-10 Water Meters
Compatibility	Any type of meter which has a reed relay switch (pulsed output)
Transmission Duration	0.8 Sec. Max.
Duration between Transmissions	At least 10 Min.

3.1.2 Physical

Operating temperature	-30°C ÷+50°C
Water Resistance	Splash resistance (IP-64) (IP 68-optimal)

	(IP 68-optimal)
Length	11 cm.
Width	8 cm.
Depth	3 cm.
Weight (excluding clamp)	100 gr.
Weight (including clamp)	500 gr.
Clamp material	Stainless steel
Clamp screws	Protected from dismantling

3.2 Label Contents (see file: ***Speed HPTx ID Label***)

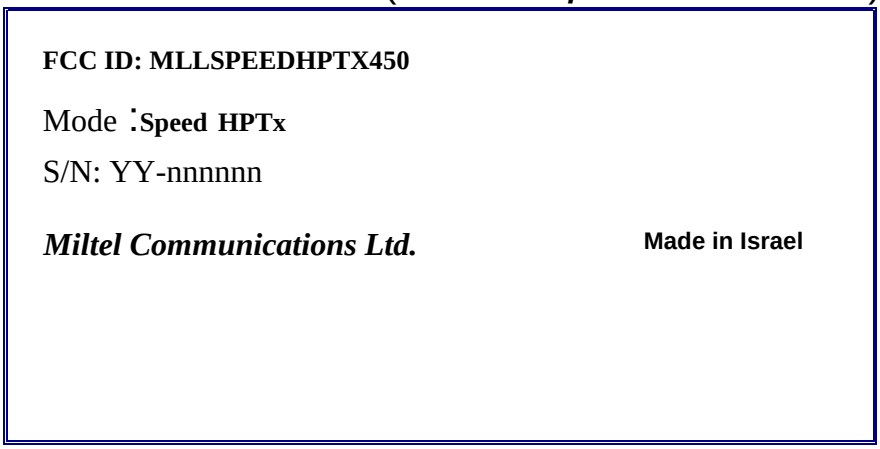

Figure 3-1: ***Label Design***

Chapter 4

Installation Instructions

4.1 General

The ***Speed HPTx*** is installed by a professional technician. Several possibilities for installation have been programmed into the system in order to provide solutions for installation of various types of water or gas meters. The ***Speed HPTx*** installation is performed using a stainless steel clamp that enables connection to pipelines of different diameters (0.75", 1.00", 1.50" or 2.00").

The ***Speed HPTx*** unit is protected so that it is impossible to open or dismantle the box without breaking the four one-time screw locks.

4.2 Installation

For on-site installation of the ***Speed HPTx*** device, proceed as follows:

1) Loosen the four screws fastening the unit's box and open the box cover.

2) Install the unit's box base as required:

3) For pipeline installations (as in Figure 2-1), first attach the stainless steel clamp (see Figure 4-1) to the pipeline, close it around the pipeline and fasten the screw in the middle of the device. Place the unit's box base on top of the screw and install it using two steel screws.

4) For wall mounting of the unit, install the base directly onto the wall or surface using the two steel screws.

5) Connect the wire pairs from the water meters to the terminal blocks on the PCB. Up to four such pairs can be connected, with unused connections left open (i.e., no termination is required).

Note

Connect each pair of wires to the respective terminals; note the connections for future reference.

6) Close the unit's box cover.

7) Perform functional radio test by touching box corner with strong magnet (trigger transmission). Verify correct reception of data at base station (concentrator). Update water actual readings for the respective meter.

8) Close the four screws fastening the cover.

9) Insert plastic protection plugs.

Figure 4-1: Speed HPTx - Pipeline Installation