

## Technical Operational Description

### Introduction

The **Speed HPTx** device is operated under FCC part 90 provision. The battery-operated transmitter can be connected to several meters (e.g. water) in parallel. The pulses generated by the Meters (Typically, one Pulse per second) are counted by the Micro-Controller, advancing an internal counter related to each Meter. The Counters information is transmitted at regular intervals.

The transmitter includes a manual anti-tampering switch that generates a single transmission (Duration< 0.8Sec) when an intruder illegally tries to open the cover. A magnetic switch inside the unit allows a professional installer to manually check the system's integrity by initiating a single Transmission (Duration<0.8Sec) with a strong magnet attached to the unit.

The Transmitter is enclosed in a plastic enclosure. An integral wire antenna soldered to the internal Printed Circuit Board is used.

An internal 3.6 V Lithium battery powers the unit.

### Transmission Duration and Duty Cycle

Typically every 4Hrs, or upon a consumption criteria, but **not at intervals of less than 30 minutes**, all the counters are transmitted in a single Transmission. The **duration of each Transmission is less than 0.8 Sec**. The transmission duration and duty cycle is hardware programmed (burnt in) into the Controller at the manufacturing phase and can not be modified later on.

### Specific Operating Power Level

The power level of the transmitter is limited with a RF amplifier limiter (see block diagram) to value of 100 mW (20 dBm) and this power is less than 1 Watt (30 dBm) (Complies with FCC 90 .205 (d)).

### **Tune-Up Information**

The transmitter device has only one trimmer (see C7 in RF section of transmitter schematics) for adjusting and tuning the output frequency. All the other parameters (power, modulation bandwidth and timing) are pre-set to a fixed value and are not changeable or adjustable.

The alignment procedure involves a setup that includes a synthesized spectrum analyzer. The output signal is monitored on the spectrum analyzer with a scan-width of 20 KHz.. The center of the modulated output waveform is adjusted to within +/- 2 KHz. of the center frequency. This adjustment procedure is performed on the finished and complete unit as a final test before cover closure (after cover closure the transmitter parameters are verified again). This testing procedure is done while the transmitter antenna is brought to the proximity of a wire antenna connected to the spectrum analyzer.

### **Emission and Modulation Description**

The transmitter is a constant envelop 2 level FSK with an FFSK sub-carrier. The peak-to-peak frequency deviation is 20KHz. The ITU Emission designation is: **F1D**.

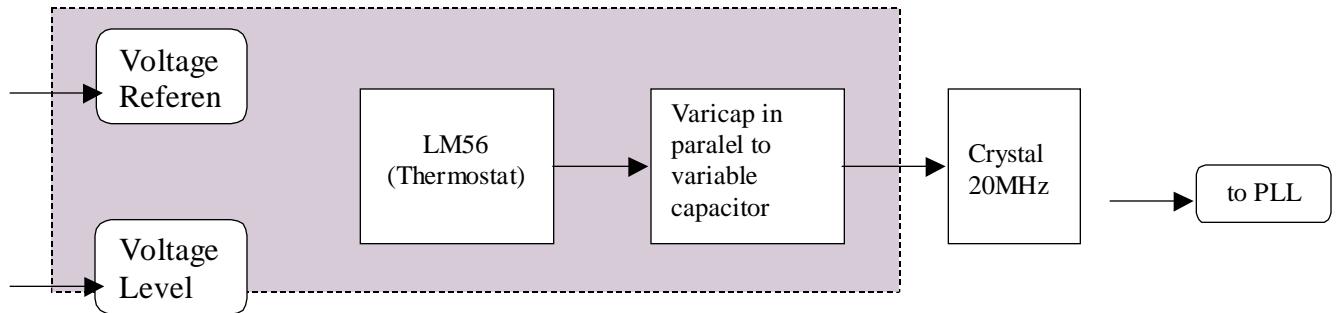
### **Complete System Description**

The Transmitter, which is described in this report, is a part of a complete AMR system (Automatic Meter Reading). The system components are:

<b>Components</b>	<b>Model</b>	<b>Description</b>	<b>Required FCC authorization</b>
Transmitter	<i>Speed HPTx</i>	Intentional Radiator Part 90 subpart C	Certification
Reciever	<i>Speed TRD</i>	Intentional Radiator Part 90 subpart C	Verification
Concentrator	CML20 (110)	Digital Device class B Part 15 subpart B	Verification

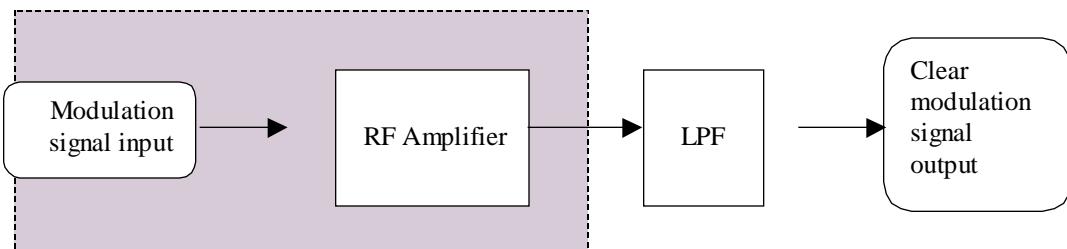
## Schematic Diagram Circuitry

### 1. Frequency stability



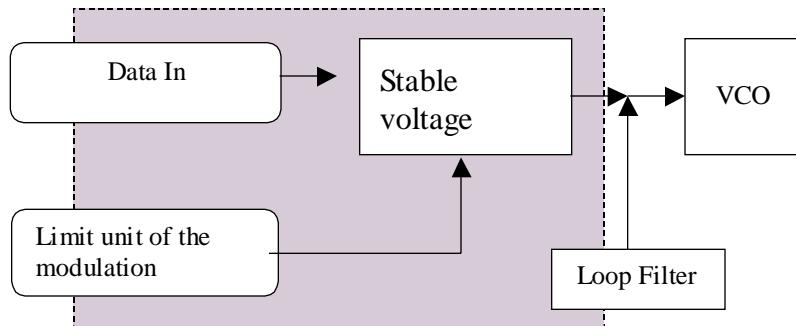
The LM56 is a thermostat device. This component controls the voltage level on the varicap (changes in voltage level, cause the varicap to change its capacity). This technique allows to maintain the crystals natural frequency.

### 2. Spurious Suppression



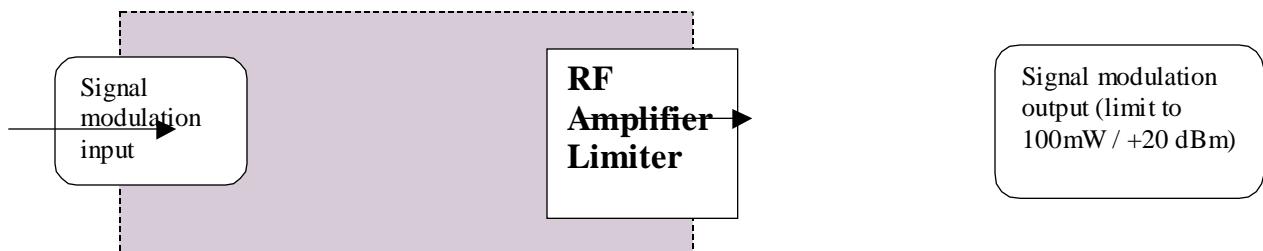
The L.P.F. (low pass filter) suppresses the spurious with zeros and poles.

### 3. Modulation limiting



To limit the modulation, a Zener Diode sets a stable voltage in the input to the VCO (volt control oscillator).

### 4. Power limiting



The power level of the *SpeedHPTx* transmitter is limited with a RF amplifier limiter (see block diagram) to the value of 100 mW (+20dBm). Transistor (Q3) in the schematics acts as a SWITCH. Whenever the consumption of VCC2 increases, the Transistor (Q3) cut off supply voltage to RF amplifier (Q4).