System Operational Description

I. Transceiver Circuitry (same for all devices)

The transceiver is based on Texas Instruments(R) TRF6901 900 MHz transceiver IC. Oscillator: a 20.0 MHz oscillator provides the reference frequency for the integer-N PLL to produce an internal, "local oscillator" frequency of 892.3 MHz - 927 MHz. This reference oscillator's frequency is shifted by means of a capacitor being keyed into and out of the circuit, accomplishing FM modulation.

Receiving: The local oscillator is set to (RF frequency - 10.7 MHz) and mixed with the input signal. This is amplified, filtered using a 10.7 MHz IF filter, amplified again, and passed to an FM discriminator for data recovery.

Transmitting: The local oscillator is set to (RF frequency). The 20.0 MHz reference oscillator frequency is shifted slightly by means of a capacitor, providing frequency modulation. This is passed to an RF power amplifier, then to the antenna. Typical EIRP is around -6 dBm. The frequency range is from 903.0 MHz to 927.0 MHz.

Channels assigned: Channels 1-25 are mapped to frequencies 903.0 to 927.0 MHz, 1.00 MHz channel spacing.

II. Baseband Processor (same for all devices)

The recovered data is processed by a PIC16F873A microcontroller, operating with a reference oscillator of 3.6864 MHz. The RF data rate is 28.8 Kbps.

III. Handset Description

The handset is simply a transceiver board (HandTI Rev. G) with a keypad and battery attached, and placed into a Serpac M-8 enclosure.

IV. Base Station Description

The base station is simply a transceiver board attached to a "host interface" board, which contains a microcontroller and USB interface circuitry. The USB circuitry contains a 6.000 MHz reference oscillator. The microcontroller, a PIC18F252, uses a 3.6864 MHz oscillator.

V. System Behavior

In essence, this system is a wireless voting system, where one base station collects votes from N handsets. It accomplishes this by polling up to 250 handsets for any new keypresses.

The base station (SerTI) polls handsets (HandTI) by sending a 6 ms RF message approximately every 48 ms. If a handset has keypress data to report to the base station, it reports the information only when it is polled, in its assigned time slice.

The base station collects keypress information, and reports it to the host twice per second. Software then compiles this information and displays the vote summary.

Each handset wakes up when a key is pressed, records the value of the key pressed, then stays awake only long enough to report the keypress. After it receives confirmation that the vote was received, the handset goes to sleep to conserve battery life.