

## **FCC ID: MKRS512-C**

### **Functional Description**

#### **Purpose:**

This device is intended for applications in the areas of identification, verification, and inventory control. The system consists of two main parts, a reader and ID tags. The reader interrogates the tags that are attached to objects in the field created by the reader. Tags are small in size and have read/write capability.

#### **Theory of Operation:**

The ID tags derive their power from the RF energy of the reader signal. They are not internally powered. Signaling from reader to tag is accomplished by momentarily switching off the RF transmitter in a predetermined pattern. Signaling from tag to reader is accomplished through antenna backscatter. The tag momentarily shorts its antenna terminals together, which causes the transmitted power that was being absorbed into the tag to reflect back off its antenna. The receiver senses this reflected signal.

#### **Transmitter:**

The transmitter produces a phase locked CW signal that is modulated by momentarily switching off the output power. In the transmitter, the phase locked loop output is amplified and then modulated by an RF switch that is controlled by the microprocessor. The RF signal then passes through the final amplifier stage, circulator, SPDT switch, and low pass filter and ultimately is transmitted from the antenna.

#### **Receiver:**

The sensed backscatter signal from the antenna comes through the SPDT switch, through the circulator, to a power divider. The two signals from the power divider are quadrature down converted (to base band) using an LO tapped from the transmitter. The two base band signals are amplified and filtered, the absolute values are taken, and the two resultant signals are summed. This composite base band signal goes to a comparator circuit that provides an input signal to the microprocessor.

#### **Antenna:**

The MKRS512-C scanner can use up to two antennas. Only one antenna at a time can be selected to emit energy and sense the backscattered signal.

**Power:** The power conducted to the selected active antenna is less than 28.5 dBm. With an antenna gain of 8.5 dBi, the effective isotropic radiated power is rated at less than 36 dBm (4 Watts).

#### **Modulated Signal Bandwidth:**

The 20dB bandwidth of the modulated signal is less than 1 MHz.

#### **Frequency Hopping Configuration:**

There are 75 hopping channels with center frequencies located at 1 MHz intervals starting at 2401 MHz and continuing to 2475 MHz. The hopping dwell time is 300 milliseconds. The frequencies – numbered 1 through 75 – are chosen pseudorandomly. The frequency number is modulo 75 of the contents of a 7-bit maximum length feedback shift register.

#### **Equal use of all channels per paragraph 15.247(a)(1):**

The linear feedback shift register (counter) operates continuously as soon as primary power is switched on. However, power is not applied to the final amplifier stage (to begin transmitting) until the scanner receives a command from the host computer. The frequency at which the scanner actually begins to transmit is therefore uniformly distributed across the 75 channels. The shift register (counter) continues to operate which guarantees a uniform distribution of restart frequencies.