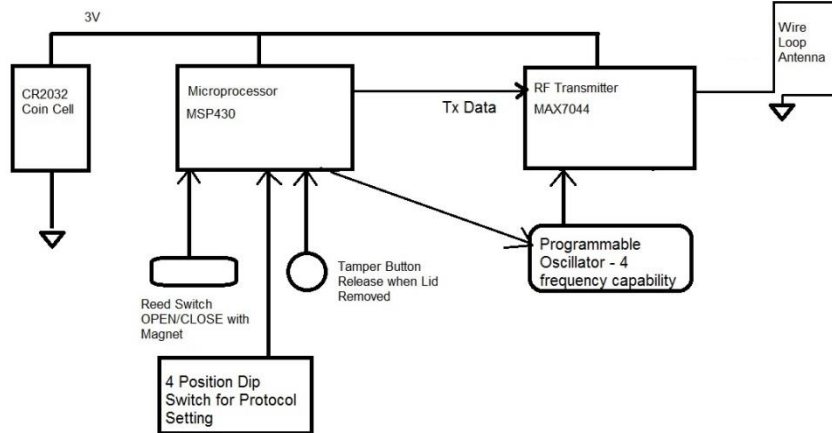**VERSA WIRELESS**
Versa-X
Block Diagram

Versa-X
Sensor with RF Transmitter
Block Diagram

Amplitude Modulation: Three Settings:

1. 319.5 MHz +/- 50 KHz
2. 344.97 MHz +/- 50 KHz
3. 433.92 MHz +/- 50 KHz

Versa Wireless

Operational Description:

1.   Overview

The device is a security sensor for windows. It has the ability to be set to any 1 of 4 frequency and protocol settings, although only 3 frequency and protocol setting are used for this version of the product.

Versa-X (G)   319.5 MHz
Versa-X (H)   344.97 MHz
Versa-X (D) 433.92 MHz

The basic functionality is the same for all 3 frequencies, but the protocol is different for each and each is outlined below.

When the window is opened, a magnet is separated from the reed switch on the sensor, which triggers a change of state on the sensor's microprocessor. The microprocessor then powers up the RF transmitter (Pulse Width Modulated OOK) and sends a series of identical packets that flag the change of state to a receiver. The packets are sent with a random delay between them.

When there is no change of state occurring, the device goes into a very low-power mode, and wakes up 4x a second to check and see if there is a change of state on the reed switch. The sensor times out every 72 minutes and transmits a "heartbeat" message to allow the receiver to know it is still operational. Further, a

battery level indicator (ok, or low) is sent with every message packet allowing a service technician to change the battery when it gets low.

2. Battery Section

The battery is a Lithium Coin cell (CR2032) size, and is replaceable in the package (clips are J2 & J3). The device operates in three modes, Idle, Monitor, and Transmit. The majority of the time the device is in the "Idle" state, and this is the major contributor to battery life, which is expected to be greater than 7 years typical. C23 provides filtering on the input voltage

3. Microprocessor Section

The microprocessor is a TI MSP430G2433 (U1) with onboard Flash and RAM. U1 has a startup delay provided by R1 & C1. The microprocessor samples the Reed Switch (S2) and Tamper Switch (S3) 4x per second and in the event of a change of state will transmit its packets to report this change.

When a change of state is detected, or a "heartbeat timeout" occurs, the microprocessor modulates the Tx data line (U1-p7) which powers up and modulates the output of the Max7044 (U2) transmitter. It also powers up a Programmable Oscillator (U5) and sets the appropriate output frequency to meet the RF transmit frequency (32x basic input frequency).

4. RF Transmitter

The RF transmitter is a single frequency OOK transmitter, and R2, R9, C11, C12, C20, C21, & C22 provide filtering to the RF transmitter chip U2 (Max7044).

U2 uses a fixed Phase Locked Loop on chip to generate the transmit frequency from a Programmable Oscillator IC (U5) by x32. C16 & C18 are pass through caps to connect the Programmable Oscillator output to the RF chip (U2). U3 & U4 are digitally programmable Capacitor chips that are used to tune the antenna match at each different frequency. Also used in the antenna matching circuit are : L2, C3, L1, C9, & C15. The remaining parts R11, R13, C2, C13, C19, C17 are not populated.

5. Protocols

Three separate protocols can be set by choosing the appropriate 4 position dip setting on the bottom of the sensor. These are as follows:

G Setting: Frequency 319.5 MHz

Modulation Type is Amplitude Shift Keyed – On/Off keyed   (ASK-OOK)

The carrier is modulated directly by the data coming from the microprocessor. .Each bit in the protocol begins with a carrier pulse of one-half bit-time. In a zero bit, the pulse is followed by a gap of one-half bit-time; in a one bit it's followed by a gap of one full bit-time.

Peak frequency deviation is not applicable to ASK

The transmission rate is 4.1 Kbits/sec.

The rated output power into the antenna is 13dBm or 20milliWatts.

H Setting: Frequency 344.97 MHz

Modulation Type is Amplitude Shift Keyed – On/Off keyed   (ASK-OOK)
The carrier is modulated directly by the data coming from the microprocessor. It is a Phase Encoded (Manchester) baseband signal.

Peak frequency deviation is not applicable to ASK

The transmission rate is 3.7 Kbits/sec.

The rated output power into the antenna is 13dBm or 20milliWatts

D Setting: Frequency 433.92 MHz

Modulation Type is Amplitude Shift Keyed – On/Off keyed   (ASK-OOK)

The carrier is modulated directly by the data coming from the microprocessor. The protocol uses a form of return-to-zero coding in which the carrier is turned on for the second half of a one-bit, and not turned on at all for a zero bit.

Peak frequency deviation is not applicable to ASK

The transmission rate is 2 Kbits/sec.

The rated output power into the antenna is 13dBm or 20milliWatts.