REVISION RECORD			
LTR	DESCRIPTION	DATE	APPROVED

TITLE: MSRY OPERATIONAL/ TECHNICAL DESCRIPTION

INTRODUCTION

Qual-Tron, Inc. of Tulsa Oklahoma manufactures a full range of unattended ground sensors and monitoring systems used to detect intrusion activity. The mechanical and electrical sensors include Breakwire, Magnetic, Seismic, IR Break Beam, Passive IR Sensors and Hydrophones. These sensors are used in combination with the MIDS single channel system, MIDS-II (modified) single channel system and EMIDS Multi-channel system. These systems utilize transmitters, relays and receivers to provide digitally encoded messages of alarm activity. Qual-Tron also manufactures base station equipment, power supplies and auxiliary equipment to provide a complete functional system.

PURPOSE

The purpose of this document is to provide a brief description of the circuit functions of the MSRY EMIDS Multi-Channel Relay (Repeater) along with a statement describing how the MSRY operates.

MSRY OPERATIONS

The EMIDS multi-channel MSRY relay is a self-contained unit that will receive and re-transmit RF signals from compatible transmitters. The receiver channel, transmit channel, and unit ID code may be set up using a PC and the supplied software. While programming the unit, the receive channel, transmit channel, unit ID code, and voltage level from internal batteries are displayed. The unit will transmit a test message using the selected ID code when the test button is activated. After programming, the unit may be deployed for operation. The internal batteries may be charged through the external connector, using a solar panel or external power supply

CIRCUIT FUNCTIONS

BLOCK 1: The RF receiver front end consists of an input antenna, a preamp and filter.

BLOCK 2: The output of the front end drives the input of the multi-channel synthesized dual conversion FM receiver. The first mixer of the receiver amplifies the RF signal and converts the RF input to 21.4 MHz. This IF signal is filtered and fed into the second mixer, which further amplifies the

signal and converts it to a 455 KHz IF signal by mixing with the 2nd LO of 20.945 MHz. This signal is fed into a Low pass filter and then into the limiting amplifier and detection circuitry. The audio is recovered using a conventional quadrature detector, converted to digital using a bitslicer circuit and then fed into a microprocessor.

BLOCK 3: The synthesizer drives the 1st stage local oscillator of the receiver with the fundamental frequency derived by a TCVCXO crystal, a Colpitts temperature compensated circuit with a stability of 2.5 PPM over the operating temperature range. The 12.8 MHz output of the TCVCXO drives the single-chip synthesizer PLL. The PLL uses this frequency to establish a reference frequency for the phase/frequency detection circuit. The PLL uses the TCVCXO output to establish a reference frequency for the phase/frequency detection circuit and to develop the voltage necessary to drive the VCO. The VCO operates at the microprocessor selected output frequency in the range of 116 MHz to 132.6 MHz and is controlled by applying a voltage to a Tuning Diode.

BLOCK 4: The microprocessor decodes the message and then re-sends the encoded message to the transmitter. The microprocessor also programs (controls) the frequency dividers within the PLL to set the desired LO frequency for the receiver and the desired carrier frequency for the transmitter. The received encoded message is a 1200 baud Manchester code that includes 8 bits of preamble, a start bit, the message type, the ID code and the rest of the received message.

The data out from the microprocessor is used to modulate the low pass filter and amplifier in the transmitter. This results in a deviation to the carrier frequency by +/- 3 KHz. The low frequency component of the modulating signal is also used to modulate the TCVCXO for improved DC response.

BLOCK 5: The fundamental frequency of the transmitter is derived by a TCVCXO crystal, a Colpitts temperature compensated circuit with a stability of 2.5 PPM over the operating temperature range. The 12.8 MHz output of the TCVCXO drives the single-chip synthesizer PLL. The PLL uses the TCVCXO output to establish a reference frequency for the phase/frequency detection circuit, for channel spacing and to develop the voltage necessary to drive the VCO. The VCO operates at the microprocessor selected output carrier frequency in the range of 138 MHz to 154 MHz and is controlled by applying a voltage to a Tuning Diode. The PLL compares the VCO frequency divided by the dual-modulus divider and internal dividers to the reference frequency and outputs a series of correcting pulses to the low pass filter to correct the VCO frequency.

BLOCK 6: The signal is then fed into the Power Amp, which is set for 1 watt output. The antenna is a Rod, ½ wave, 3 dB BNC antenna.

BLOCK 7: This antenna is normally used as a receive antenna and is switched to transmit before transmitting the encoded message.

MODULATION SYSTEM DESCRIPTION

The modulation of this system employs Frequency Shift Keying at 1200 Baud. The transmission of data is typically event driven in short-bursts of 25 ms or less. The modulation uses a 29-bit Manchester code that includes 8-bits of preamble, a start bit, 4-bit message type, 10-bits of ID, 5-bits of status and a parity bit.