

Theory of Operation

***** THEORY OF OPERATION *****

; THE MICRO BASICALLY OPERATES OUT OF SLEEP MODE, BEING WOKEN UP BY PIN CHANGE
; ON I/O RB0, RB1, RB3, AND RB4 AS A RESULT OF THE USER PRESSING A KEY.
; SINCE THERE IS NO POWER SWITCH THE MICRO ALWAYS HAS POWER APPLIED. IT EXECUTES
; A POR ONLY THE FIRST TIME THE BATTERY IS INSTALLED AND THEREAFTER EXECUTES CODE
; BASED ON WAKE UP ON PIN CHANGE RESET BY TESTING THE RBWUF FLAG. THE TRANSMITTER
; CHIP IS ALWAYS POWERED DOWN UNTIL A PACKET NEEDS TO BE SENT VIA THE PA ENABLE PIN.
;
; ONCE WOKEN UP THE KEYS ARE READ AND CHECKED FOR VALIDITY THEN THE DATA PACKET IS
; CONSTRUCTED. AFTER POWER IS APPLIED TO THE TRANSMITTER (ENABLE THE POWER AMP) AND
; THE WARM UP
; TIME HAS ELAPSED TO STABILIZE THE OSCILLATOR, THE DATA IS MANCHESTER ENCODED AND
; BIT BANGED OUT TO THE TRANSMITTERS FSK INPUT PIN.
; THE TRANSMITTER CHIP IS THEN DISABLED TO CONSERVE POWER AND THE SLEEP COMMAND
; EXECUTED.
; ON MULTIPLE KEY PRESSES THE UNIT WILL BE IMMEDIATELY WOKEN BACK UP. BACK TO BACK
; PACKETS ARE
; SENT OUT EVERY 100mSEC. THE TRANSMITTER IS ALWAYS POWERED DOWN IN BETWEEN PACKETS.

; SINCE THERE IS NO TIMER INTERRUPT AND THE WATCH DOG TIMER HAS A MINIMUM FIXED
; TIMEOUT
; OF 18mSEC MULTIPLIED BY THE POST-SCALER, THE TIMER COUNTER HAS TO BE POLLED TO
; CALCULATE
; THE BIT RATE TIMES FOR THE MANCHESTER DATA STREAM. THE SYMBOL RATE IS 7.14KHz AND
; THE DATA
; IS 3.57KHz.
;
; THE SINGLE CHIP TRANSMITTER IS CONFIGURED FOR FSK MODULATION WITH A CENTER TRANSMIT
; FREQUENCY
; OF 915.2MHz WITH FSK DEVIATIONS OF +/- 60KHz. FSK MODULATION OCCURS BY SWITCHING
; CAPACITORS IN
; AND OUT OF THE CRYSTAL CIRCUIT THEREBY PULLING ITS FREQUENCY ONE WAY OR ANOTHER.
; TWO CAPACITORS ARE USED FOR EACH LEG TO FINE TUNE THE VALUE AND OBTAIN BETTER
; TOLERANCE.
; FOR FSK LOW THE SWITCH IS IN THE CLOSED POSITION SHUNTING HALF OF THE CAPACITORS
; TO GROUND. IN THIS CONDITION CAPACITANCE IS AT ITS HIGHEST VALUE AND THE CRYSTAL
; FREQUENCY
; IS AT ITS LOWEST. FOR FSK HIGH THE SWITCH IS IN THE OPEN POSITION, NOW ALL FOUR
; CAPACITORS ARE IN SERIES DROPPING THE CAPACITANCE TO ITS LOWEST VALUE AND DRIVING
; THE FREQUENCY HIGH.
; THE CRYSTAL FUNDAMENTAL FREQUENCY OF 7.150MHz IS DIVIDED BY 128 TO OBTAIN A FINAL
; OUTPUT
; NOMINAL FREQUENCY OF 915.2MHz WHICH IS FINE TUNED BY THE CAPACITORS TO OBTAIN THE
; FSK DEVIATION.
; THE INTEGRAL POWER AMP IS OF AN OPEN COLLECTOR CONFIGURATION SO IS BIASED THROUGH A
; INDUCTOR FILTER CAP COMBO PULLED HIGH TO THE BATTERY VOLTAGE OF 3.3V.
; THE OUTPUT IS LOW PASS FILTERED AND IMPEDANCE MATCHED TO 50 OHMS, CAPACITANCE IN
; SERIES
; BLOCKS BATTERY VOLTAGE FROM THE REST OF THE CIRCUITRY THAT FOLLOWS.
; ONCE IMPEDANCE MATCHED TO 50 OHMS, THE SIGNAL PASSES THROUGH A 50 OHM T-ATTENUATION
; PAD
; TO FINE TUNE THE FINAL POWER OUTPUT LEVEL. THE OUTPUT OF THE ATTENUATION PAD IS
; CONNECTED
; TO A 50 OHM 1/4 WAVE HELICAL ANTENNA THROUGH A 50 OHM MICROSTRIP TRACE.
; NETWORK ANALYZER TESTS SHOW A GOOD MATCH BETWEEN ANTENNA AND ATTENUATION PAD WITH A
; VSWR OF
; 1.2 LOOKING BACK INTO THE CIRCUIT WITH A 50 OHM LOAD.