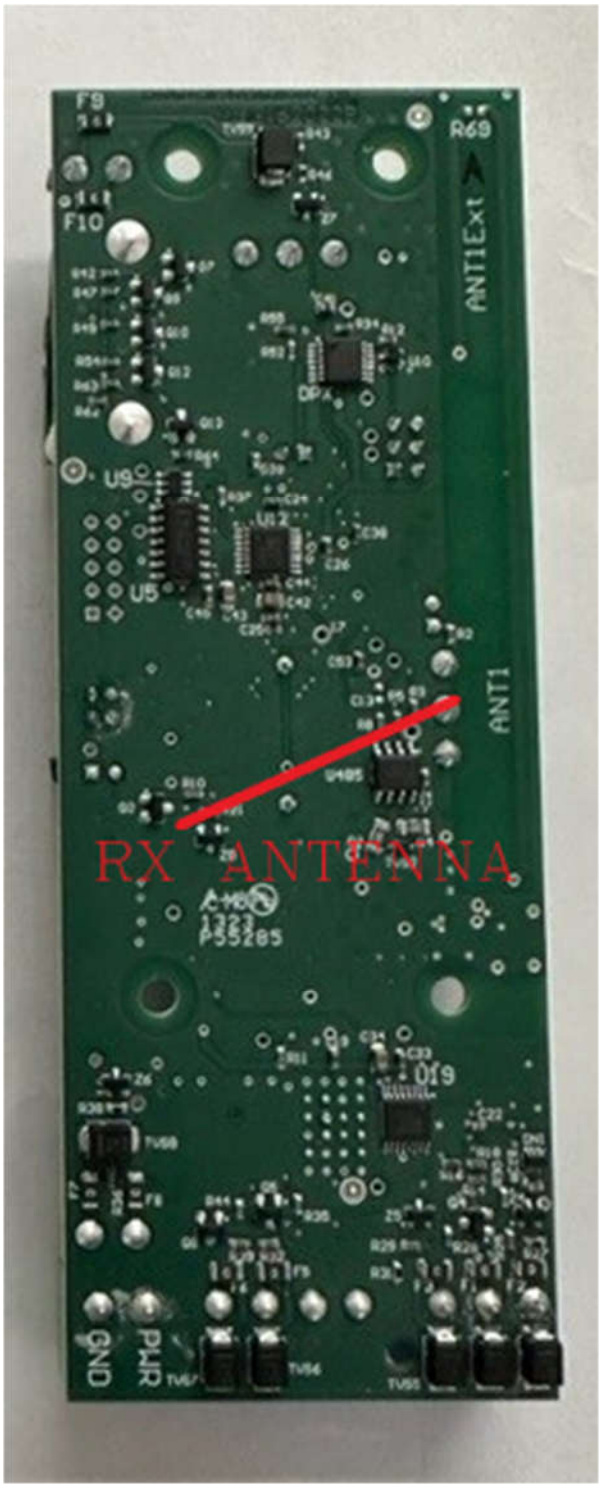
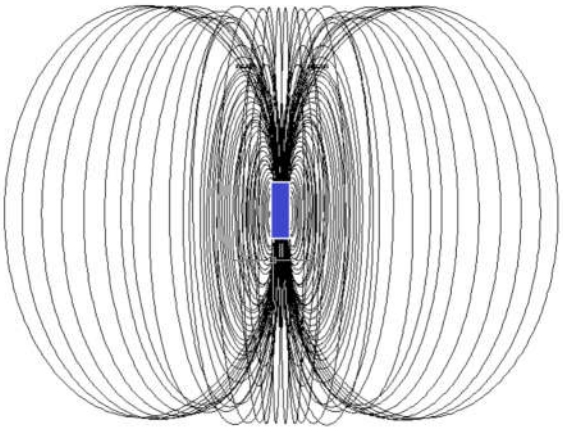
June 27, 2023

LC1400T TX Antenna/RX Antenna



TRANSMIT ANTENNA



The TX antenna coil is what's called an "autotransformer", which is a transformer where the primary and secondary are one piece of wire (18 gauge) common to a tap point wrapped around a ferrite core (4.875" x 0.125" x 0.25". The "turns ratio" makes it a step-up transformer; and the tap point is optimized for a tradeoff between "transforming up" to the highest possible voltage, and also impedance matching the antenna to the driver for maximum power transfer.

For each drive pulse, Q11 slams its collector to ground. This pulls lots of current through the shorter primary winding of the autotransformer (antenna). This creates a magnetic field that transforms into the secondary side of the winding, stepping the voltage up to two hundred volts peak-to-peak on the antenna.

When properly tuned, the antenna coil and its tuning capacitor form a load with the characteristics of a resistor, that is, the reactive elements of inductance and capacitance mirror each other and the net reactance is zero. Any residual reactance due to antenna mis-tuning can alter/affect field performance.

TX Gain setting – factory default 6
Frequencies:
Channel 1: 129010 kHz
Channel 2: 129980 kHz
Channel 3: 131030 kHz
Channel 4: 132030 kHz
Channel 5: 133030 kHz
Channel 6: 133970 kHz
Channel 7: 135010 kHz
Channel 8: 136060 kHz
Channel 9: 136960 kHz

UHF RECEIVER CIRCUITRY

The printed circuit board antenna is used to convert the electromagnetic waves into electric signals in UHF band. C10 and L5 form a matching network at 418MHz.

Central to the UHF receiver is the LINX RXM-418LR 418MHz receiver module (RX1). SAW Filter SF1 is placed between the antenna and the receiver to limit the bandwidth under 1MHz. SF1, L1, C1, L6 and C14 form a narrow bandpass filter at 418MHz.

The RSSI output of the LINX RXM-418 LR is 1V and is gained up by op-amp U4B to roughly 10V p-p. The receiver noise floor (and hence base of the data pulses) seen at U4B pin 7 are clamped to about 1.2 V by a servo loop formed by op-amp U4A, acting as a comparator. Diode DN1 packet 3-4 detects the baseline noise or data floor and C31 integrates this to a DC servo signal. This servo signal is buffered by U4A pin 1, and this becomes the AC “virtual ground” point for setting the gain (using digital pot U19A and R17) and also the DC clamping offset at U4B pin 7. U4C is used as a comparator to strip the analog baseband signal at an adaptable threshold set by DN1-6 and 2-5 which peak detects the data pulses and charges C28 as the adaptable threshold voltage. Having a “peak only” detector enables the data stripper to only strip the strongest 418MHz received. Digital pot U19B sets a divider voltage which becomes the adaptable threshold’s quiescent voltage in the absence of a 418MHz signal. This quiescent DC threshold is normally set just above the noise floor for maximum RX sensitivity. As a strong signal appears, the receiver’s sensitivity threshold voltage is set higher to decrease the sensitivity.

RX Gain – default setting 230
RX Sensitivity – default setting 50