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Circuit Description of Equivital EQ-01 40.68MHz Transmitter

The transmitter is a single transistor fundamental quartz crystal controlled Pierce type oscillator.

The transistor Q1 provides 180 degrees phase shift (by inversion) and the second 180 degrees is provided by R16 in conjunction with C13 and the net capacitance of C14, Varicap D2 and C12. The total phase shift of 360 degrees between collector and base leads to oscillation.

The circuit oscillates at the net series resonant frequency (40.68MHz) of the quartz crystal Y2 at which frequency the phase shift created by the crystal is zero. As the series resonance of the crystal has a very high Q factor, the frequency is precisely controlled and is not significantly affected by other component changes in the feedback path.
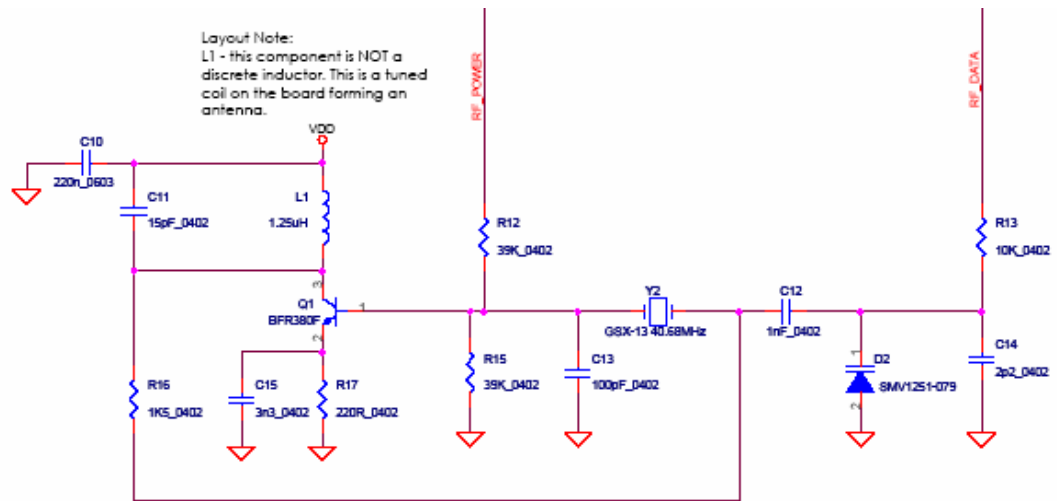
The FSK modulation is generated by the data signal fed via R13 to the Variable capacitance diode D2. This introduces small phase shifts around the loop leading to the required level of frequency modulation (+/-4Khz).

The radiated RF field is created by the collector current of Q1 flowing in the inductance of the 4 turn antenna loop L1.
C11 optimises the radiation at the transmitter frequency and attenuates the higher harmonics.

The radiation from the antenna loop is largely in the form of a magnetic field which couples into the antenna loop of the receiver unit. This field will fall by 12dB for each doubling of distance.

The transmitter is turned ON and OFF by controlling the base bias of Q1 with data via R12.

The transmitter is driven by a PIC16F88 microcontroller which provides a data packet to send nominally ever 15 seconds. The data packet is approximately 10bytes in length and is sent at a data rate of 2400 bits per second.

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Transmitter Circuit Diagram (excluding PIC data driver)