

FSK/OOK 5 Channel Transmitter Theory of Operation

The purpose of the FSK/OOK transmitter PWA is to allow for a multi-channel and dual modulation mode of operation.

The five channel low power FSK/OOK transmitter operates with an FSK deviation of +/- 35 KHz typical. The unit can transmit at the following FSK modulated frequencies (one at a time):

369.5 MHz

375.3 MHz

388.3 MHz

394.3 Mhz

In addition, the transmitter operates with OOK modulation at 384 MHz in order to support the “legacy” mode of operation. The modulation depth is in excess of 60 dB. None of the FSK transmit modes are active in this mode.

A single reference oscillator crystal of 9.8304 MHz is employed in the circuit. The custom RFIC VCO/PPL circuit multiplies up the reference frequency to produce the correct RF output frequency.

The operating mode and frequency is determined by the state of four input I/O lines. A static “low” or “high” signal is applied to each of the lines in different combinations (in truth table fashion) for each mode and frequency of operation.

The operating voltage of the circuit is 3.0 volts, which is provided by an enabled voltage regulator. The input voltage of the regulator is the series combination of (4) AAA batteries. The control signals to the RFIC are nominally 3 volts and generated by the remote control main board microcontroller.

RF output power level in FSK and OOK modes is set independently by “power set” resistors in series with ground.

FSK Mode:

A button press causes the transmitter to be sequenced ON such that the VCO is locked on channel before it starts transmitting. After 5 milliseconds the first "key code" is sent, followed by additional packets if the key is held down.

OOK Mode:

A button press causes the transmitter to be sequenced ON such that the VCO stays ON as long as button press is detected. The OOK is achieved by toggling the "PA Enable" pin of the RFIC high/low.

In-between button presses, the transmitter circuit is completely powered down by disabling the voltage regulator. The circuit is also completely powered down in-between packets when in FSK mode.

There is an impedance matching circuit followed by a multistage low pass filter at the power amp pin of the RFIC to minimize harmonic and spurious output of the transmitter. The antenna is a fractional wavelength monopole bent over the shape of a "paperclip". The antenna is not terminated, and a shunt inductor is used at the antenna connection to simulate its inductance when terminated in a short, which allows for a "shorted termination" in the model, but also increased power output from the antenna itself.