MA300_RTT Principles of Operation and Circuit Description

This is a data transmitter that operates centered on one of five discrete frequencies. The frequencies of operation are:

2475.9 MHz
2476.8 MHz
2477.7 MHz
2478.6 MHz
2479.5 MHz

The data is produced by an external device called the Back Pack Unit (BPU) and consists of data encoded from several analog channels on the BPU. The data stream is a single digital signal at 1,200,000 bits per second (1.2 Mbps).

In addition to transmitting the data this device also provides battery power to the BPU through the same connector that receives the data from the BPU. This means that the DC path from the BPU is used for power and that the data is AC coupled into the rest of the transmitter.

After the data signal enters the transmitter it is reconstructed to remove the effects of the AC coupling. The reconstructed data is an input to a Complex Programmable Logic Device (CPLD) that is configured to scramble the data in order to prevent long runs of repetitive data. This whitens the spectrum of the transmitted RF signal.

The whitened data is scaled and filtered before being coupled into the frequency control loop of a Phase-Locked Loop frequency synthesizer where it frequency shift modulates the RF signal.

The PLL is programmed to its channel by digital signals from the microcontroller and has a reference frequency generated by a 14.4 MHz temperature-controlled crystal oscillator (TCXO). A rotary switch which sets the channel of operation is read by the microcontroller which then programs the PLL appropriately.

A circuit detects the presence of the input digital signal and disable the RF transmission if no digital signal is being received from the BPU as would happen it the transmitter were not connected to the BPU.

The RF signal from the PLL is filtered and passed to a power amplifier and then filtered again before being radiated by a ceramic chip antenna.