Datel Design & Development

Xbox Wireless Steering Wheel Modulation Scheme Overview

The product communicates to an Xbox 360 using a proprietary wireless protocol in the 2.4Ghz ISM band.

The transmission scheme employed is an adaptive frequency hopping TDMA scheme, making use of 40 distinct channels spaced 2Mhz apart at frequencies 2402Mhz, 2404Mhz, 2406Mhz … 2480Mhz.

Each channel is modulated using GFSK with BT=0.5 at a symbol rate of 1.333Mbps.

The protocol uses a maximal length LFSR of order 19 to produce a pseudo-randon hopping sequence. There are 27594 different polynomials that can be chosen, and each polynomial repeats after 524287 radio frames of 8ms.

In each frame of 8ms, there are at most 2 transmissions of 650us and one transmission of 240us. There is also at most 2 packets of 350us received, and two packets of 240us received. These transmissions and receptions take place over 4 different frequencies per frame, derived from the last 3 LFSR cycles. This gives an average hopping frequency of 500 hops/sec.

The adaptive frequency hopping scheme used can reduce the number of available channels to a minimum of 15 channels. When operating with any number of channels, in the allowable range the maximum occupancy of any given channel in a 16.0 second window (0.4s x 40 channels) is below 0.4s.

The maximum transmitted output power is 4dBm.