

ATTN: ATCB, Inc.
Re: Johnson Controls, FCC ID: CB2CSPSIHL3

The following has been provided by Johnson Controls as an Addendum to the CB2CSPSIHL3 submittal. The frequencies listed at the bottom of this page should be included on the certificate.

1. How do we learn a frequency and transmit it?

The Homelink 3 and Homelink 3 with PSI systems use a voltage controlled oscillator (VCO) to generate both LO (local oscillator) for receive and Tx signals. The oscillator frequency output is divided 32 and goes into a timer/counter module in the CPU. The CPU measures the frequency every 400 uS (2500 times a second). The measurement is with an 80 kHz accuracy. It then adjusts the control voltage on the VCO to set the desired frequency. The feedback is a continuous process when the device is either transmitting or receiving. The frequency reference is a 20 MHz +/- 50 ppm crystal.

To learn to another signal, the product is put into training mode by the user through a button sequence. In train mode, the system is in receiving mode. The RF section has a very conventional receiver, a single conversion mixer with a 10.7 MHz IF filter. The local oscillator sweeps across the band controlled by the CPU. When it detects an RF signal, it determines what frequency it is at. Since the mixer can receive both sides or the image frequency, we perform one more step to determine the frequency. The system goes and checks 21.4 MHz above and below to determine which side of the signal it has received. The frequency and data are stored in non volatile memory.

2. What frequencies do we not operate at?

The hardware operates continuously and seamlessly from below 270 MHz to over 430 MHz. So it is the software that controls the frequencies we operate at. The system uses a 1 MHz safety margin from any restricted band (15.209). Also, due to 2nd harmonics that can fall in the 608 to 614 MHz restricted band we also prevent operation at 303.5 to 307.5 MHz. (That's a 0.5 MHz safety margin on fundamental, but 1 MHz at the 2nd harmonic.) If we are training to a system between 303.5 and 307.5 MHz, we shift our frequency to the nearest end. Garage door opener systems typically use regenerative receivers that are very wide band and accept the up to 2 MHz shift. Lastly we stop operating at 420 MHz, because the systems we are compatible with stop at 418 MHz.

So the software allows;
286 to 303.5 MHz,
307.5 to 321 MHz,
336.4 to 398.9 MHz,
411 to 420 MHz.