Subject: General Sensors, Inc. Transmission Scheme

Sp. Topic: Determination and Calculation of the 100ms Segment of Transmission with the Largest Number of HI's

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The schematic labeled *Transmission Code Format* (version 7) provides us with all the information required to determine the 100 ms segment of a transmission that has the largest number of HI's in the transmission.

From the diagram in the upper portion of the schematic, we can see that a "transmission" is made up of four 24-bit messages where the same 24-bit message is repeated. There is a preamble to the transmission where we send a HI-LO-LO-LO-LO-LO-HI-LO to get the receiver ready to receive code, but we can ignore that for now in our determination of the largest number of HI's in a 100 ms period of time.

HI's and LO's are always of the same time duration, that is, 4.3945ms. This makes life a little simpler. If one HI or one LO takes 4.3945 ms to accomplish, then in 100 ms there must be 22.76 HI's or LO's. We will look for a segment of transmission where 23 HI's or LO's are present and the number of HI's is the greatest.

From the diagram in the lower portion of the schematic, we can see a blown-up portion of one message (of the four messages). Note that we can send coded information that specifies the System Address (Is this sensor part of our system?), the Sensor Number (Identifies a particular sensor) as well as the Condition of the Sensor (Do we have a problem or are you just checking-in?).

The determination becomes clearer now because all we have to do is find the binary code for each of the System Address, Sensor Number and Condition of the Sensor which maximizes the HI count.

- The largest binary number of a Sensor is 1111
- The largest binary number of HI's in the Condition of Sensors is a Warning with 1110.

- The System Address is made up of 4 bits, but only two are variable, meaning we can change them. Consequently, the largest binary number is 0011 since the Fixed System Address is always 00.

Putting this segment of code together from LSB to MSB we get 0011-1111-1110.

We now look to the bits before this segment of code or after this segment where we have the greatest number of HI's. The bits that follow this segment of code are filled with LO's but the 8 bit segment before has a binary code that indicates the total number of HI's in the (System Address + Sensor Number + Condition of Sensor). When we review the largest number of HI's in the transmission, as shown in the paragraph above, we see that we have 9 HI's and the binary code for a count of 9 would be 1001. Therefore, the 8 bit binary code would be 1001-0000 (LSB-MSB)

We now add that last binary portion to the segment already derived and get the following: 1001-0000-0011-1111-1110 (LSB-MSB)

To get the full 23 bits required for a 100 ms segment, we again look to both sides of the binary code derived to pick up some more HI's. The repeated messages all have LO's on both sides of this segment, but the preamble for the very first message in a transmission does have one HI bit as part of that code. Consequently, we add 010 to our code.

The fully developed code would be 010-1001-0000-0011-1111-1110 (LSB-MSB)

In summary, we have developed a transmission code segment of twelve (12) HI's out of a total of twenty-three bits which is the HI worst-case scenario for any transmission. Q.E.D.

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