AeroComm/Telxon Transmitter Operation

The AeroComm/Telxon transmitter transmits on 77 frequencies from 2402 MHz to 2479 MHz. The frequency channel carrier frequencies are separated by 1 MHz. The 20dB bandwidth of the transmitter is 900 kHz. The carrier frequencies are selected from a pseudo-random - ordered table of frequencies located in the system ROM area of memory. Each frequency has an occupancy time of 256 ms, controlled by the system microprocessor.

I. Pseudo-random Hopping Sequence

The pseudo-random - ordered sequence is chosen from one of 77 hopping patterns by setting the variable 'x' and using the index 'i' which increments every hop time (256 ms.) to look up the channel frequency to select. The following equation depicts the actual look-up and calculation of the selected frequency.

$$F_x(i) = [b(i) + x] \bmod (77)$$

Where: b(i) is defined in Table 1
i = 1 to 77
x = hopping pattern

x = 00,03,06,09,12,15,18,21,24,27,30,33,36,39,42,45,48,51,54,57,60,63,66,69,72,75
x = 01,04,07,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,61,64,67,70,73,76
x = 02,05,08,11,14,17,20,23,26,29,32,35,38,41,44,47,50,53,56,59,62,65,68,72,74,77

TABLE 1 -- The list of frequencies b(i) relative to 2402 MHz.

i	b(i)	i	b(i)	i	b(i)	i	b(i)	i	b(i)	i	b(i)	i	b(i)
1	00	12	32	23	55	34	62	45	15	56	49	67	17
2	16	13	64	24	39	35	37	46	04	57	36	68	59
3	09	14	05	25	72	36	11	47	65	58	28	69	74
4	34	15	66	26	30	37	31	48	47	59	44	70	27
5	70	16	73	27	68	38	63	49	38	60	21	71	57
6	52	17	02	28	07	39	48	50	26	61	59	72	20
7	67	18	58	29	56	40	54	51	53	62	06	73	50
8	19	19	25	30	76	41	40	52	33	63	41	74	61
9	01	20	10	31	43	42	46	53	52	64	14	75	24
10	35	21	23	32	18	43	13	54	22	65	69	76	75
11	08	22	12	33	72	44	03	55	42	66	45	77	29

II. Channel Usage

Channel usage is controlled by the Master unit. The master hops to a new channel every 256 ms. The master follows the pseudo-random sequence until all 77 frequency channels have been used. The sequence then repeats.

III. Receiver Bandwidth and Synchronization.

The receiver bandwidth matches the transmitter bandwidth. Frequency hopping is controlled by the Master unit. Receivers synchronize with a master transmitter by decoding Beacon data. Beacon data consists of preamble, address, frequency and timing information. The synchronization sequence is as follows:

1. The master unit transmits a Beacon (approx. 4ms. in duration) at approximately a 32 ms. rate.
2. Slave units scan all available hopping frequencies searching for the Beacon data.
3. Once the slave units decode the Beacon data, they load the frequency and timing information into internal timers and hop in unison with the master's hopping algorithm.

From: "langstoninc" <langstoninc@email.msn.com>
To: "Richard Fabina" <rfabina@fcc.gov>
Date: 2/2/99 10:20am
Subject: Fw: Duty Cycle

-----Original Message-----
From: Milam, Timothy <TMila@telxon.com>
To: 'langstoninc' <langstoninc@email.msn.com>
Date: Monday, February 01, 1999 8:03 PM
Subject: Duty Cycle

Wayne,

Per your request here is a short description of our position on the average time of occupancy issue.

The spec is stated as the radio remains on each frequency for 256 ms and there are 77 hopping frequencies. This suggests that the radio is on each frequency more that the allowed 400 ms every 30s. Mathematically (77*.256 = 19.712 s) and therefore many of the frequencies must be revisited for an additional 256 ms and therefore will be on these frequencies for a total of 512 ms which is over the limit.

Realism: The transmitter, when transmitting, is the emission in question here. The longest possible amount of time the transmitter can be on within the 256 ms time frame is 128 ms (in all actuality the time would be considerably less). This is because the receiving device has to acknowledge each initialization & transmission before moving on to the next frequency. Looking at this communication protocol in the time domain suggests that, in fact it would be nearly impossible for the transmitter to remain on any longer than 128 ms. Therefore: if each frequency is visited 2 times every 30 s then the maximum time the transmitter will be active is 256 ms. Even at three visits, the total would only be 384 ms and this would never be necessary.

I hope this is sufficient to answer any question the examiner may have. As we discussed earlier, if a measurement is needed we can make that & send it out. Let us know if you need it. I will have Joe gear up to make the measurement tomorrow morning just in case.

Thank You,

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