RF Monitoring System
On Time Duty Cycle Analysis

The messages sent by the RF Sensors have the following message structure:

```
typedef struct
{
    BYTE    bMsgInfo;       // Message Info
                            //   - Bit 7: = 0 to indicate the Short message form
                            //   - Bit 6: set if device in alarm
                            //           - RF_INFO_ALARM
                            //   - Bit 5: set if device has a low battery
                            //           - RF_INFO_LOW_BATTERY
                            //   - Bit 4: set if cleaning switch is active
                            //           - RF_INFO_CLN_SWITCH
                            //   - Bits 0-3: Message Type
                            //           - RF_MSG_xxx
    DWORD   dwSndAddr;      // Sender ID Address
                            //   - LSB to MSB ( Little Endian format )
    WORD    wData;          // Data
                            //   - Refer to data definition for this
                            //     message type in the STANDARD MESSAGE
                            //     FORM section.
                            //   - LSB to MSB ( Little Endian format )
    WORD    wCRC;           // Complement of a 2 byte CRC-16
                            //   - bMsgInfo through wData
                            //   - LSB to MSB format
} RF_SHORT_2_MSG;
```

The bytes are sent at 4800 baud using NRZ encoding with 1 Start Bit, 8 Data Bits, and 1 Stop Bit.

Duty Cycle: For a typical message

	Ones	
9 Bytes of Stop Bits:	9	
bMsgInfo:	0	The normal message has zero 1's. Bit 7 = 0 Bit 6 = 0 (not used by this device) Bit 5 = 0 (not used by this device) Bit 4 = 0 normally only a 1 during cleaning mode Bits 0 –3 = 0 for the normal message = 1 only if user presses the service pin
dwSndAddr:	16	32 bit unique address for each device.

		Assume half the bits are set. We should never use more than 24 bits so using an average of 12 bits is closer to reality.
wData:	6	16 bits of binary data. We are only using a maximum of 12 bits (12 bit A/D) and assume half the bits are set.
wCRC	8	16 bit CRC of the message. Assume half the bits are set.
	___	
	39	high bits in the message

9 * 10 bits = 90 Total bits in the message

Within a 100 millisecond window the typical duty cycle would be:

Duty Cycle = (One's Ratio * (Bytes in Message * 10 Bit Character Time))/ 100 msec

Duty Cycle = (39/90 * (9 * (10 * 1/4800))) / 0.100
Duty Cycle = 81.25 e –3

Duty Cycle: For a worst-case message

	Ones	
9 Bytes of Stop Bits:	9	
bMsgInfo:	1	The normal message has zero 1's. Bit 7 = 0 Bit 6 = 0 (not used by this device) Bit 5 = 0 (not used by this device) Bit 4 = 1 while in cleaning mode Bits 0 –3 = 0 for the normal message = 1 only if user presses the service pin
dwSndAddr:	16	32 bit unique address for each device. Assume half the bits are set. We should never use more than 24 bits so using an average of 12 bits is closer to reality.
wData:	12	16 bits of binary data. We are only using a maximum of 12 bits (12 bit A/D) and assume all the bits are set. This would only happen if the sensor was open (failure condition).
wCRC	12	16 bit CRC of the message. Assume ¾ of the bits are set.
	___	
	50	1 bits in the message

9 * 10 bits = 90 Total bits in the message

Within a 100 millisecond window the typical duty cycle would be:

Duty Cycle = (One's Ratio * (Bytes in Message * 10 Bit Character Time))/ 100 msec

Duty Cycle = (50/90 * (9 * (10 * 1/4800))) / 0.100
Duty Cycle = 104.2 e –3