

### Description of the Duty Cycle for the @ctivelink Wireless Messaging Module

The worst case duty cycle for the @ctivelink module transmitter occurs on a collapse of 1 when it is sending messages from the module to the infrastructure. For this calculation, assume infinite messages are queued in the module, each message is the maximum length allowed (2000 characters), and the back channel is running at its slowest speed (800 bps).

The ReFLEX protocol is timed on frames, each of which is 1.875 seconds long. The sequence for transmitting a message from the module is shown in the following table. Also shown are transmitter on times and elapsed time.

Frame	Event	Transmitter on time	Elapsed time
1	Module signals request to transmit to system	0.1705	1.875
2	Request goes to system controller and is scheduled	0	1.875
3	Unusable frame	0	1.875
4	Grant for data unit is sent to Module	0	1.875
5	Module sends first data unit (100 characters) to system	1.875	1.875
6	Data unit goes to system controller and next data unit is scheduled	0	1.875
7	Unusable frame	0	1.875
8	Grant for next data unit is sent to Module	0	1.875
9	Module sends data unit to system	1.875	1.875
10-81	steps 6-9 repeat unit entire message is transmitted (18 more data units for a total of 20)	18 X 1.875	72 X 1.875
82	Last data unit goes to system controller and end of transmission is scheduled	0	1.875
83	Unusable frame	0	1.875
84	End of transmission is sent to module	0	1.875
85	Ack to end of transmission is transmitted from module to system	0.1705	1.875
	<b>Totals</b>	37.841 seconds	159.375 seconds

Thus, the maximum duty cycle for the @ctivelink is  $37.841 / 159.375 = 23.74 \%$

Note this is not achievable in a real system due to delays in computing and traffic delays, and is only a theoretical maximum based on the protocol.