

TPRM Duty Cycle

There are several levels to note regarding the duty cycle for transmissions from a TPRM, which implements the CDPD protocol. First is the duty cycle range allowable from the CDPD protocol itself. Second is the method of transport of transmission packets. Lastly, the end application controls the amount of data that is transmitted.

At the first level, the absolute maximum duty cycle possible from the CDPD spec is 98.3%, which is derived from an absolute maximum ON time of 1.288458 seconds and an absolute minimum OFF time of 0.021875 seconds. In practice, the maximum ON time and the minimum OFF time are both parameters dictated by the operators of the network on which the device is operating. For the ATT network, the typical maximum duty cycle is 73.8%, which is derived from their typical broadcast maximum ON time of 0.325958 seconds and their minimum OFF time of 0.115625 seconds. For the GTE network, the typical maximum duty cycle is 93.2%, based on their broadcast parameters.

These maximum times assume that the user has an infinite amount of data to transmit, that the transmission channel is error free, that the transmission channel and frequency is always available when needed (not being used by another transmitting device), and that the data can be delivered to the TPRM faster than the rate that it is being transmitted. In addition, it assumes that the TPRM does not wait for responses from the transmissions. For any practical transport protocol, the continuous transmission assumption is unrealistic because there needs to be a mechanism from the receiving endpoint to signal back to the transmitter that particular portions of the data have or have not been correctly received. For CDPD, the most common transports are ICMP, TCP, or UDP. These protocols either have built in feedback mechanisms, or mechanisms built in by the user. In TCP for instance, packets must be acknowledged by the recipient before additional packets are sent. This feedback requires at least a round trip air time at the minimum, which translates into additional idle (transmitter OFF) time in the TPRM.

Lastly, the application will dictate when and how often transmission of data is required. Typical applications for TPRM include security monitoring, telemetry, utility meter reading, and point of sale. The first 3 applications are very low duty cycle, at transmission rates typically much less than one burst of limited data every hour. The point of sale application is dependent on the user, but can proceed no faster than once every 8 seconds as dictated by the point of sale terminal itself. With a typical point of sale transmission burst of 200 bytes (0.083 seconds at the 19200 baud rate of the CDPD airlink), the maximum duty cycle becomes approximately 2%. The first 3 applications present duty cycles typically far much lower than this amount.