

Description of Eaton TPM (Gen1B) Transmitter Features

The Eaton TPM sensor (for steel wheels) has been developed to monitor a truck's tire pressure. The sensor is used in conjunction with an on-board receiver/display to provide warning messages/indications to the driver of the vehicle when the tire pressure falls below a certain pre-defined threshold.

The sensor is designed to be fitted to steel rims in conjunction with a suitable valve stem. Each wheel unit consists of a low profile enclosure which can be mounted on the back of various conventional clamp-in truck valves and is mounted to the inside of the wheel and rim. Any one of three valve stems can be used with the TPM sensor, these are:-

TR-570

TR-572

TR-573

The enclosure houses an electronic unit consisting mainly of a battery, pressure sensor, roll switch, control electronics and a radio transmitter. The entire assembly is fully potted to protect the electronics from the environment. The overall size and weight are kept to a minimum and the entire enclosure locates down inside the drop well centre. This ensures that tire fitting and tire removal problems do not arise.

The wheel unit measures tire pressure and reports the information to the receiver via radio wave communication. To conserve battery power, the pressure is sampled periodically, typically once every 30 seconds. Also, the RF transmissions are made on a periodic basis of typically once every minute, provided that the tire pressure is not changing rapidly. Rapid changes of tire pressure, of greater than 3 PSI in a 30 second period are detected by the pressure measurements and immediately reported to the receiver. This ensures the driver is warned of a hazardous pressure level immediately it occurs.

A roll switch which detects vehicle movement is used to further save battery power. While the vehicle is in motion at a speed greater than typically 16 mph the device behaves on the above described manner regarding pressure sampling and RF transmissions.

Each wheel unit has a unique identity code which is programmed into the transmitter at assembly. Up to 16.7 million identity codes are available to prevent crosstalk between vehicles. Each RF transmission contains pressure information and the identity code of the particular wheel, to allow the receiver to both know which wheel has reported and to reject all reports from other vehicles with a similar system fitted in close proximity. This completely avoids false pressure reports from adjacent vehicles.

The Eaton TPM (Gen 1B) transmitter has the following modes of operation:-

1. Stationary Mode

Roll switch open. This is a minimum power drain mode when the tire is stationary. The TPM sensor/transmitter samples the pressure once every 15 minutes and transmits pressure data once per hour. If a pressure change of more than 3 PSI occurs

from the last transmitted pressure value then the TPM sensor/transmitter will transmit the new pressure value.

2. Roll Mode

Roll switch closed. The TPM sensor/transmitter will enter roll mode when the roll switch has closed (the roll switch is sampled every 30 seconds). When the transmitter enters roll mode from stationary mode a Wake transmission will occur after an initial pressure sample. The pressure in roll mode is sampled once every 30 seconds and the pressure transmitted every minute. If a pressure change of more than 3 PSI occurs from the last transmitted pressure value then the TPM sensor/transmitter will transmit the new pressure value.

3. Service Mode

When the TPM sensor/transmitter is in roll mode and the roll switch opens then the transmitter enters service mode. This is when the transmitter continues to monitor pressure for a further 15 minutes (as in roll mode, i.e.; the device keeps sampling the pressure every 30 seconds for 15 minutes after the vehicle stops). If the roll switch remains open for this period of 15 minutes then the transmitter enters stationary mode.

4. Program Mode

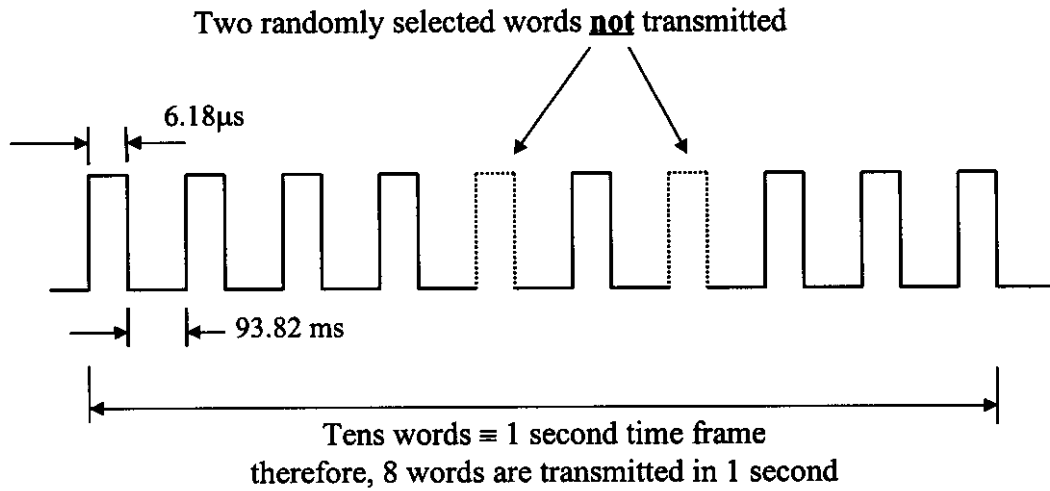
The transmitter will transmit a program/learn mode transmission only when it is activated by a transponder tool. However, this learn transmission can only be activated when the transmitter is in stationary mode.

5. Off Mode

The TPM sensor/transmitter will be shipped to the customer in off mode. This is the minimal power drain mode, when all timing functions are inhibited. The device can only be brought out of learn mode by activating it with a transponder activation tool.

**Schrader TPM sensor/transmitter
Eaton (Gen 1B)**

Word Transmission:



Function bits description:

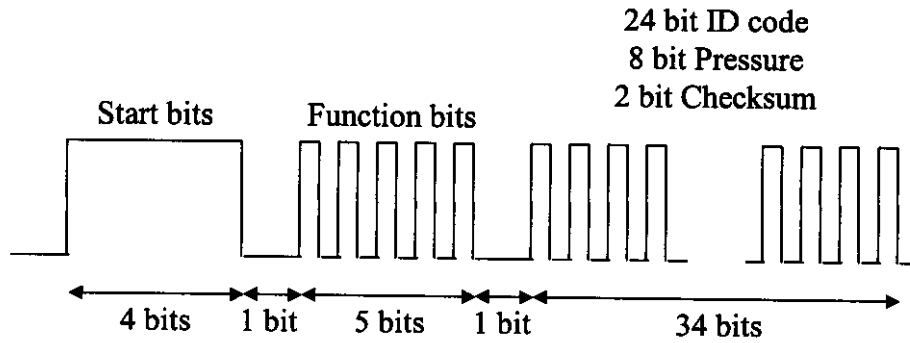
- 11000 ----- **Learn**
- 11001 ----- **Low Battery**
- 11010 ----- **Entering Off Mode**
- 11011 ----- **Pressure Remeasure (> 3psi pressure difference)**
- 11100 ----- **Reserved**
- 11101 ----- **Wake-up**
- 11110 ----- **Reserved**
- 11111 ----- **Normal**

ID Code permutations:

Number of permutations = $2^{24}-1 = 16777215$ codes

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Word Structure:



Word width = Bit period * Total Number of bits = $137.3 \mu\text{s} * 45 = 6.18 \text{ ms}$

Bit format:

Data rate = $7282 \text{ Hz} \pm 1\%$
 Period = $137.3 \mu\text{s} \pm 1\%$

