MCI DWES – Digital Wheel End Sensing

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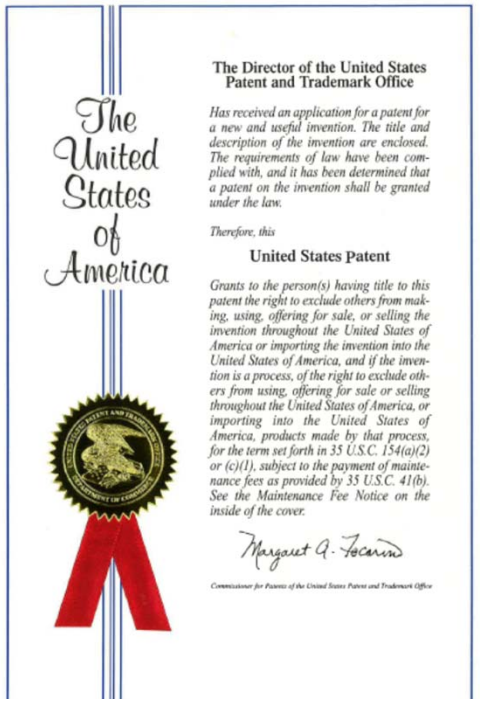
MCI Reliability DRIVEN™

Digital Wheel End Sensing - Background

- Since August 2009, a Tire Pressure Monitoring System (TPMS) has been provided as standard on all MCI coaches
- In 2011, MCI launched an enhancement to the TPMS, called Digital Wheel End Sensing (DWES) or Wheel End Monitoring (WEM)
- DWES will provide the operator with a warning and an engine shut down when the conditions to activate a wheel end fault are met
- MCI received a patent for this technology in 2013


The United States of America

The Director of the United States Patent and Trademark Office

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, or importing into the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Margaret A. Focarino

Commissioner for Patents of the United States Patent and Trademark Office

Digital Wheel End Sensing – What it is

- DWES applies logic through MCI's multiplexing system (MUX) to determine if a wheel end fault condition exists.
- The DWES logic monitors the inputs from the TPMS sensor and ABS sensor in each wheel end.

Figure 1: TPMS Sensor

Figure 2: TPMS Display (circa 2012)

Digital Wheel End Sensing – How it works

- If the DWES determines the tire air temperature is above a predetermined threshold for a given tire, and a wheel speed sensor fault code exists for the same wheel, an engine shut down is initiated. This includes a Check Message Light, a Stop Engine Light along with a buzzer, and a “WHL END” text message on the speedo.

Check Message

Stop Engine Light

“WHL END” Text Message

Figure 3: MCI Instrument Panel (Circa 2011)

Digital Wheel End Sensing – How it works

- With MY2018 J Coaches, the same engine shut down is initiated, a “Wheel End Fault” text message is displayed, along with the Stop Engine Light and buzzer.

Figure 4: MCI Instrument Panel (MY2018)

Digital Wheel End Sensing – How it works

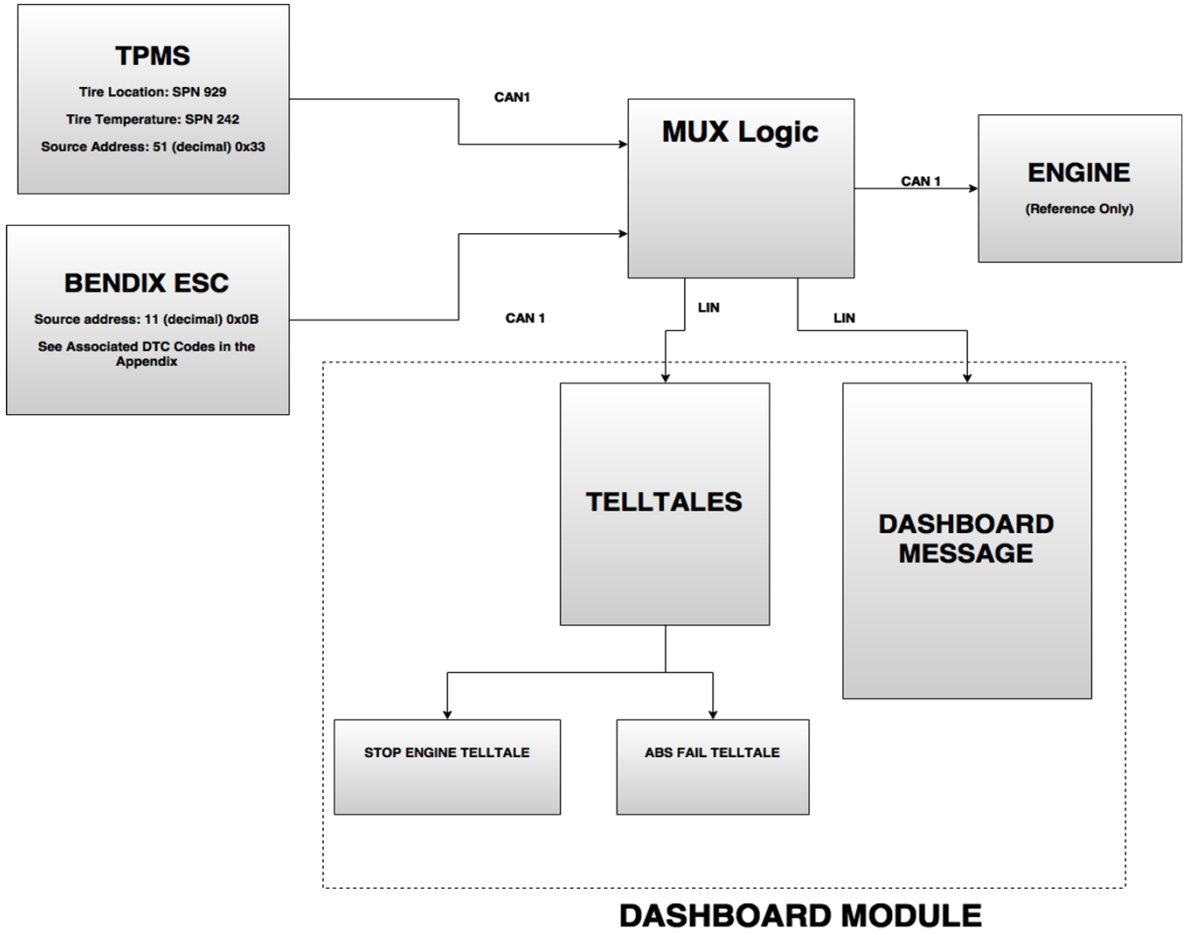


Figure 5: DWES Block Diagram

Digital Wheel End Sensing – How it works

- Once an engine shut down is initiated (using the normal engine protection shut down sequence), an operator is required to move the coach to a safe parking area. The engine override switch can extend the duration of the shut down.
- The applicable wheel can then be inspected for evidence of overheating.
- If the tire air temperature drops below 98 deg C (208 F) and all corresponding ABS faults on the applicable wheel are inactive, the Wheel End fault will cancel.
- The driver should immediately report the incident to maintenance personnel.

Digital Wheel End Sensing – Why?

- Properly functioning tires are important to the safety of any moving vehicle
- The DWES system is an enhancement to a conventional TPMS.
- The DWES can prevent a condition where a wheel end fault results in an excessive tire air temperature.