



September 6, 2001

Docket Section
National Highway Traffic Safety Administration
400 Seventh Street, SW
Washington, D.C. 20590

Re: Docket No. NHTSA-2000-8572, Tire Pressure Monitoring Systems Notice of Proposed Rulemaking for proposed FMVSS 138

Johnson Controls, Inc. ("Johnson Controls") submits the following comments to the above docket in response to the July 26, 2001 notice of proposed rulemaking. Johnson Controls, which manufactures a radio-frequency based tire pressure monitoring system, appreciates the opportunity to comment on this important rulemaking. These comments will focus primarily on the proposed test procedures, the manner in which significant under-inflation information is proposed to be displayed, replacement tires and monitoring of spare tires.

1. TPMS's Provided by Johnson Controls are able to Detect whether the Tire is Significantly Under-inflated under either Alternative Proposed.

Johnson Controls manufactures original equipment and after-market receivers and associated displays for tire pressure monitoring systems. Johnson Controls after-market system was among the "direct" systems evaluated by NHTSA in connection with this proceeding. Its receiver is intended to detect RF transmissions from transmitters installed in the tire and rim assembly of a vehicle. Utilizing existing technology, and subject to the clarification of test procedures sought in Item 2 below, that system is able to detect significant under-inflation of vehicle tires under either the 20 percent standard enumerated in alternative 1 or the 25 percent standard enumerated in alternative 2.

2. Test Procedures Currently Specified in Section 6 of the Proposed Standard Need to be Clarified

As proposed, Section 6 states a sequential test procedure for determining compliance with the requirements of the standard.

Section 6(a). This subsection sets forth the procedures for preparation of the vehicle prior to startup. It does not explicitly indicate that proper training of the system should be confirmed prior to startup. Some RF devices are not automatically trained and require that a training routine be completed to assure that the device is detecting the proper pressure in the proper tire. In Paragraph V.E. System Calibration and Reset (66 FR 38993), the agency noted that "Recalibration by the driver would typically occur only after replacing, rotating or reinflating tires." To make the requirement of proper training

prior to startup explicit in the rule, Johnson Controls suggests that Section 6(a) read as follows:

Inflate the vehicle's tires to the vehicle manufacturer's recommended cold inflation pressure. Assure that the tire pressure monitoring system has been trained as provided for in the owner's manual.

Section 6(b). Under either alternative of the proposed standard, this subsection requires that the vehicle be driven between 50 kph and 100 kph for "up to" 20 minutes prior to releasing pressure from the tires in subsection (c). "Up to" 20 minutes can be any amount of time less than or equal to 20 minutes. Under the test procedure proposed, if the air is let out immediately after the vehicle is started, an RF transmitter may, under some circumstances, not transmit pressures detecting that condition within the 10 minutes required by Section 4.2.1(b). Indeed, all current tire pressure monitoring systems require a certain time to transition from their inactive state (the condition at cold start) to their active state. To address this, Johnson Controls suggests that Section 6(b) be reworded to read as follows:

Drive the vehicle between 50 km/h and 100 km/h for not less than 20 minutes

Section 6(e). Section 6(d) is the procedure which determines whether the tire pressure monitoring system meets the 10 minute detection requirement noted above. Section 6(e) is the procedure used to validate that the tire pressure monitoring system both detects under-inflation and displays a cautionary message as long as the pressure remains below the "significantly under-inflated" threshold. This subsection proposes a pressure that is 1 psi below that threshold as the validation pressure. Johnson Controls assumes that if a cautionary message is not displayed, the tire pressure monitoring system would not pass this requirement. Johnson Controls suggests that the differential pressure being used for this validation be increased from 1 psi to 2 psi to accommodate the accuracy capability of RF transmitters that are currently in the market. RF transmitters available on the market today are typically accurate in detecting pressures +/- 1 psi for the normal operating temperatures of the tires. As a result, if the reading was off to the high end of the capability band i.e. + 1 psi, then under the current proposal, the device could detect the pressure at, but not under, the significant under-inflation threshold and display no cautionary message. See Section 4.2.1(c). Moving the pressure to 2 psi will establish a criterion that is within the capability of RF devices available on the market. Those are the devices that have been considered in the agency's economic analysis for this rule.

An additional comment relates to that portion of Section 6(e) that requires a manual reset of the TPMS device. Johnson Controls notes that for RF devices, there is no manual reset device. Manual reset is a part of ABS devices currently offered on the marketplace. To assure that the procedure is only being employed where it is relevant, Johnson Controls suggests the following language for the last sentence of Section 6(e):

For those tire pressure monitoring systems where a manual reset capability exists, if the warning telltale remains on, attempt to manually reset the system in accordance with the written instructions provided by the vehicle manufacturer.

3. Diagnostics

At Paragraph V.F. (66 FR 38993), the agency requests comment on what diagnostics are available on tire pressure monitoring systems to detect system failure. By way of example, Johnson Controls currently markets an after-market TPMS device with a receiver and display located in the vehicle mirror which provides the following diagnostics capabilities:

- ❑ **System OK**
Activates when you first get in the car if the PSI™ System is operating normally. No PSI™ System service required.

- ❑ **Mirror Batteries Low**
Activates when the AAA batteries in the display mirror need replacement. Replace the batteries at your next opportunity.

- ❑ **Tire Transmitter Battery Low**
Activates when PSI™ System is active and one of the transmitter batteries is low. Seek replacement of the affected transmitter by a qualified dealer

- ❑ **Transmitter Signal Failure**
Activates when the system is active and no pressure information is received from one or more transmitters. There is a single beep that warns of this condition.

- ❑ **No Pressure Information Received**
Activates when there is a transient loss of signal from the transmitter or after display mirror batteries have been replaced.

- ❑ **Tires Not Properly Trained**
Activates when the PSI™ System is active and the tire transmitters have not all been properly trained.

The agency has previously evaluated the after-market device on which these diagnostic features exist and reported on that evaluation in the July 2001 release entitled “An Evaluation of Existing Tire Pressure Monitoring Systems.”

4. Display of Warning Information

Johnson Controls has a number of comments related to display of the tire pressure information covered at Section 4.2.1 of both alternatives.

- **Section 4.2.1(b).** There is a requirement that the telltale symbols and colors set forth in the proposed additions to Table 2 of FMVSS 101 be used for non-tire specific and tire specific TPMS's. Johnson Controls believes that this unnecessarily restricts the abilities of manufacturers to provide displays which provide equivalent performance, is unnecessarily design restrictive and adds significant cost to existing systems. As proposed, this subsection would preclude displays that are already on the market and the flexibility to develop new displays. In vehicles that are currently being manufactured, displays for current TPMS's are located both in the overhead console and as part of the center stack. Those displays in many instances use colors that are other than yellow. In comments accompanying the rule, the agency notes that "yellow is appropriate because it conveys the message that the driver can continue driving, but should have the tire pressure checked at the earliest opportunity". See Section D.1. at 66 FR 38991.

Where console displays are involved, Johnson Controls believes that there is no basis for suggesting that a yellow telltale will convey a cautionary message to the user. The agency cites no focus group studies that support its choice of color. Manufacturers choose display colors based upon their appeal to the vehicle occupants who will use them. Current displays provide information that has a safety impact (distance to empty and compass direction) in an effective manner. A yellow display, especially in conjunction with a symbol that is not familiar to users in the center display, would undermine the effectiveness that a vehicle manufacturer seeks when communicating with vehicle occupants through console displays and compromise the manufacturer's ability to integrate the tire pressure monitoring display into a device that is already familiar to an occupant who is seeking information about the vehicle. Regarding color, Johnson Controls notes that several of the existing displays addressed in Table 2 of FMVSS 101 are *not* accompanied by a specified display color requirement e.g. the oil pressure telltale, coolant temperature telltale and electrical charge telltale. Additionally, having multicolor displays in the console would add significant cost to those displays. For these reasons, Johnson Controls proposes that the agency not require a specific color for the display and preserve the flexibility of choice currently possessed by vehicle manufacturers.

Regarding the graphical requirements currently proposed, Johnson Controls strongly believes that other current production means of conveying tire pressure cautionary information are as effective as graphical warnings. Johnson Controls currently uses displays which identify the tires by the readily understood LF, RF, RR and LR. These indications are every bit as clear as the graphical alternatives being proposed. Additionally, in many instances, the visual indication of low tire pressure is accompanied by audible warnings such as chimes or beeps.

The agency has noted publicly, and quite appropriately, that it is seeking a performance based criterion for TPMS's. To recognize the ability of other

colors and displays to achieve the same performance as that currently proposed by the agency, Johnson Controls suggests that the agency amend Section 4.2.1(b) by adding the following language at the end of that subsection:

...or other displays that contain equivalent cautionary information.

- **Section 4.2.1(d) and (e).** Johnson Controls is concerned that a strict reading of NHTSA's proposals in these section may preclude a vehicle operator's ability to access other valuable information when the significant under-inflation caution is activated within a multi-functional console display. Based on its understanding of the manner in which displays are currently being implemented in vehicles, Johnson Controls believes that the agency should apply standard that allow sufficient flexibility to permit the vehicle occupant to check other information on a multi-functional display even in a significant under-inflation situation. With current center displays in vehicles that incorporate a TPMS feature, the owner is allowed to toggle between features on the display. For example, on certain current non-tire specific displays and tire specific displays located in center consoles, the low pressure display will persist until such time as the vehicle occupant chooses to view to another display e.g. a miles to empty display. In that circumstance, the new display will remain active for a period of 60 seconds and then the pressure warning will be redisplayed. In some instances, the redisplay will be accompanied by an audible warning.

Johnson Controls believes that as long as alternative displays are selected by the vehicle occupant as a matter of conscious choice and are of sufficiently short duration, the cautionary function of the display will be preserved. Consistent with this, Johnson Controls suggests amending Section 4.2.1(e) to read as follows:

“Can be deactivated, manually or automatically, only when all of the vehicle's tires cease to be significantly under-inflated, or when the vehicle occupant chooses to view another feature on the same display provided that the pressure cautionary message is automatically redisplayed not more than 60 seconds after the display is toggled to another feature.”

- **Audible Indications.** Johnson Controls produces certain displays which have accompanying audible indicators. Audible indicators can serve to reinforce the message conveyed by the display. In its July 2001 evaluation of TPMS systems, the agency concluded at page 86 that “auditory signals were generally useful and helped ensure that the driver would notice the advisory or warning when it was presented (in some cases, visual only signals were not noticed by the driver during testing).” As Johnson Controls reads the proposed standard, audible indicators are not precluded. Johnson Controls urges that such audible indicators not be required but should be allowed at the discretion of the vehicle manufacturer. Such indicators should be used to

achieve the ends of the regulation i.e. calling the attention of the user to cautionary information associated with the pressure display.

5. Replacement Tires/Rims

Section 4.3 requires that vehicle installed TPMS's continue to meet the requirements of the standard when an original equipment tire and rim is replaced by a tire and rim recommended by the vehicle manufacturer. This is consistent with commentary at Paragraph V.H. on Replacement Tires/Rims (66 FR 38993-38994). Johnson Controls requests clarification on this requirement. Specifically, Johnson Controls understands that the requirement for the TPMS to continue to meet the proposed standard would not exist where custom tires and rims not recommended by the vehicle manufacturer are provided. This is because the capability of both ABS systems (because of tire diameter changes and different tire pressure thresholds) and RF systems (because of the potential inability to install and operate the transmitter in that environment and different tire pressure thresholds) are compromised by such installations. Johnson Controls asks that the agency confirm its understanding in commentary accompanying the final rule.

In addition, current RF systems require that a transmitter be located in the tire and wheel assembly to enable TPMS sensing for that tire. Johnson Controls requests clarification in commentary accompanying the final rule regarding the agency's expectations on the inclusion or not of RF transmitters in tires and rims sold by after-market manufacturers, distributors and dealers of replacement tires. Specifically, if a tire and rim set is sold to meet the size recommendations of the vehicle manufacturer for installation on a particular vehicle, is an RF transmitter compatible with that vehicle required to be included as part of the sale?

6. Spare Tires

The agency noted at Paragraph V.I. of the commentary that it was not requiring the monitoring of the spare tire while it was stowed. (66 FR 38994) Johnson Controls notes that in current vehicles in which it has a TPMS installed as original equipment, full sized spares that come with the vehicle do have RF transmitters and the spare is monitored when stowed. Johnson Controls is not aware of any vehicles in which an RF transmitter is installed on a minispare tire and notes that the geometric constraints of that tire could make installation of currently available RF transmitters difficult. We don't read the rule to require installation of an RF transmitter in a minispare because a minispare is not a manufacturer recommended replacement tire.

Johnson Controls appreciates the opportunity to comment on this important rulemaking.

Respectfully yours

JOHNSON CONTROLS, INC

A handwritten signature in black ink, appearing to read "Steven J. Furr". The signature is written in a cursive style with a large, stylized "S" and "F".

Steven J. Furr
Executive Director, Product Safety
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