NISSAN PATHFINDER TIRE PRESSURE MONITORING SYSTEM MY(2005 - 2012)

"A DIY Perspective"

The purpose of this paper is to present a simplified technical presentation for use in understanding the functional components of the Tire Pressure Measurement System (TPMS) used in a 2008 Nissan Pathfinder. The material discussed here is intended to give the reader a little more than a simple overview and will address the key components at the block diagram level . The underlying theme in any TPMS is to provide the driver safety information relating to the inflation and operating parameters of his tires. This research effort began when a newly acquired vehicle illuminated a "TPMS" lamp after a week of ownership. Initial assessment showed the left rear tire pressure low at 17 psi as opposed to the placard level of 35 psi. As this vehicle is the first one I have owned that contains a TPMS system, a curiosity as to "How Does This System Work" developed. After reading this paper, a confident DIY mechanic should be able to accomplish a "Self Check" diagnostic test and a "Relearn" exercise with only a small piece of wire or as some You-tubers say, a "Paperclip." Both actions are easy to do and will not cost hundreds of dollars. No need to buy an expensive tool to program or read a sensor. You will, however, need a tool that can "Trigger" or "Wake Up" a sleeping sensor if you plan to remove and replace a sensor. The trigger tool should cost less than $20.

MAJOR COMPONENTS

There are four major components in the system. First, there is a control module located in the dash area that receives a Radio Frequency (RF) signal from each of the four tires. Some systems will have a sensor in the vehicle spare and it will contain a fifth instrumented wheel. In-lieu of a dedicated control module, the Pathfinder's Body Control Module (BCM) is the TPMS control module. Secondly, there is a multi-functional sensor mounted as an integral part of the tire pressure fill point on each wheel. This is where the Schrader valve allows air to enter and exit the tire for servicing purposes. The third portion of this system, an alarm lamp, resides in the driver's instrument console on the left side. It is a driven lamp that lets the driver know when there is a system or tire error. The system error mentioned is one that may deal with a sensor transmitter or the control module that receives and processes the RF signal from each wheel sensor. The fourth element is a small electrical connector located in the wire harness, near the Diagnostic Trouble Connector (DTC), the OBDII connector that provides communication with the car's control modules. The connector has one white wire connected to it and the purpose of the connector is to allow for a control ground signal to manually control the module.

CONTROL MODULE (BCM)

The module gets it power from the ignition switch and under normal operation, it awaits RF signals from the wheel sensors. Initial set up of the sensors will require the control module to "Learn" the various wheel sensors' identification and location information. In some cases, a hand held scanner may be used load the sensor information into the module via the OBDII (DTC). An alternative, a more DIY oriented method, is to place the module in the "Learn" mode and let the various sensors feed information to the module. In order to have the module learn where each of the various sensors are located, the technician prepares the tires with "Calibrated" pressures in a predetermined pattern. Left front is set at 36 psi; Right Front is set to 33 psi; Right Rear is set to 30 psi and Left Rear is set to 27 psi. The module anticipates these pressures when it begins the learning process. The technician will place the module in

the learn mode by providing a ground short to the small white single wire connector located near the DTC. With the vehicle ignition placed in the Key On Engine Off position, the technician will provide a short to ground 6 times within 10 seconds of turning the switch on. This will place the module in the learn mode and the TPMS lamp on the dash will blink. If the unit will not enter the learn mode, most likely the wire inserted in the connector may not be making contact, if this happens, try a little longer piece of 20 gage single strand wire which is stripped back roughly 3/8 inch in length. The metal bracket that holds the DTC is a good source for ground. Do not connect the wire to the bracket as that action will erase the memory of the control module. Do not ask me how I know this, but trust me, a steady ground will clear the module memory. With the key on engine off condition and the TPMS lamp flashing, drive the car at speeds above 16 mph for roughly 6 minutes and the TPMS lamp will stop flashing and show a steady light. This indicates the learning is complete. Take the car to a place where the proper tire pressures can be established and drive it, the lamp should extinguish. Pressures above 75% of the placard values will be accepted by the control unit. Note that the left rear wheel initial value for a relearn is set just below the 75% threshold value. Using the pressures listed above, the module will know the initial tire positions due to the pressures. The reference position 1, is that of the left front wheel which is set to the highest pressure and by moving clockwise around the vehicle, the reader will see how the module will know where each wheel is located. If you rotate your tires, the vehicle will need to relearn the wheel locations again using the same pre-determined pressure technique. The Pathfinder display panel shows four pressure values, knowing that the values displayed from top to bottom will tell the driver from tire position 1 through 4 the pressures, he or she will know which tire to service. If you do not accomplish a relearn after tire rotation or sensor replacement, your display may not be accurate with regards to position on the car as well as not recognizing any new sensor(s). Purchasing a scan tool that will read and load the information via the OBD DTC can be costly so that may be incentive enough for the DIY mechanic to perform the learn actions manually.

SENSOR

As mentioned earlier, the sensor is an instrumented pressure and temperature device that is part of the air input valve stem assembly. The sensor has an accelerometer built in that will act as a switch to turn on or off the RF transmitter. The transmitter for a majority of the world uses a UHF frequency of 315 Megahertz (Mhz). European vehicles use sensors that have the UHF frequency assignment of 433 Mhz. The pressure, temperature and unique identifier all provide input to a frequency modulated RF which is received and demodulated in the control module. Sensors have a lithium battery which provides power to all its circuits. The battery life expectancy is between 5 and 7 years. Sensors are manufactured and delivered in a "Sleep" mode. After installation on the wheel, the sensor is awakened with a hand held scan type tool designed to "Awaken" or "Trigger" it on and allow it to enter service. A typical sensor will have a 7 year shelf life so use caution when buying them to make sure you do not purchase an out of date unit with a dead battery or one that may die in a year or two. If you want more information on the frequency modulation, take a look at what is known as FSK or frequency shift key modulation. It is used in transferring digital information from a source to a receiver where it can be converted back to a digital pulse train. This issue is not important for most DIY people.

White Connector with Single White Wire

The manual method of setting up the TPMS module or using it to display error codes that are in the unit is very cost effective and simple to use. If you noticed in an earlier part of this paper, simply touching the wire to a ground 6 times within the first 10 seconds of turning the ignition switch on will place the module in the "Learn" mode. In a similar fashion, the technician can place the module in the "Self Check" mode and it will flash codes using the TPMS lamp. In order to place the module in self check, turn the ignition switch to on and momentarily touch the wire to ground one time. Again, do not hold it at a ground level, just do a quick touch and remove. A normal system will display a continuous string of 5 flashes if no error exists. If an error code is presented, it will be presented in flashes that are either long or short in duration. There are roughly 30 codes available and a code shown such as four long pulses followed by three short pulses would translate to a code 43. The error codes are presented at the end of this paper and you will see just how much information can be gleaned by knowing how to view and decode the pulses. If you have been around for a few years, the old OBDI systems displayed Engine Control Module (ECM) codes using the "Service Engine Soon" light by shorting pins A and B in the OBDI DTC. I found it refreshing that they would still use this code display method in cars made in the latter-2000 Model Years (MY).

Scan Tool

Automotive systems are now controlled by On Board Diagnostics II technology. Hand held scan tools are made that can be used to simply provide a trigger to the sleeping sensors and they get progressively more complex until they are able to communicate with the car's OBDII modules, both the ECM and TPMS units. Many of the more powerful units can read the sensor data, program the data to another sensor creating a "Clone" which eliminates the need to perform the learn steps and even down load the data to the TPMS unit also eliminating the need to perform a learn. As you shop for the ideal scan tool, keep in mind that there are many different companies that make the tools. A few of them are universal and will program a large number of sensors while some are designed to program only their sensors. In my case, the Pathfinder uses a "Schrader" manufactured sensor which cannot be programmed by an Autel scan tool. There are several tools that can program the Schrader sensors. Atec, Bartec and Snap-On are a few names that can program a great many sensors. Autel and Smart Sensor units require the technician to use their exclusive sensor product line. Depending on what you might want to do, you could purchase the most simple unit for say $15 and wake up the sensors, but you will not extract information such as battery, pressure, temperature and identification number. You pay for what you get and for the most part, spending close to $150 should get you a universally capable tool. You might just buy a $400 or more expensive unit that is totally OBDII and TPMS capable. The link in the reference section is for the Schrader catalog and early in the document is a clear list of scan tools compatible with Schrader sensors.

CONCLUSION

DIY folks in general are brave and willing to attempt to save a few dollars doing something they know they can do. Knowing a little about how the systems are set up and interact with one another can be useful in determining whether or not to save a buck or two. If you can take a small piece of wire and use it to troubleshoot and program you car with new sensors or tire repositioning, you do not need a $150 to $1500 wonder tool that will tell you everything about anything, if you can figure out how to use it. If the wire will accommodate 95% of what you will be experiencing, keep your money for when you get that one in a thousand challenges that even the "Guru's" scratch their heads on. Who knows, you may never need a guru if you can learn the basics of using the wire and how to decode a flashing lamp. Remember, the wire in the connector may need a try or two and whatever you do, don't hold the wire to a ground , just tap it once to place the module in the Self Check mode or 6 times to place it in the Learn mode. This really does work, is simple and cost effective. ☺

Information presented in this paper is an accumulated from sources that include You-tube, Chilton Automotive Database, Google and the Pathfinder forums. The author accepts no liability for your decision to use or not use this information nor does he anticipate remuneration for you saving yourself monies for being a DIY mechanic. Hope you can use this and feel good about it, I can. On a side note, they make service kits that include new seals, nuts and caps for sensors and they are affordable.

Paul Miller
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REFERENCE NOTES:

Air Leak in tire may be caused by seal at sensor/wheel. Replacement kits are available @$4.00 each
Nissan P/N for TPMS Seal Kit UA700B014KNW Schrader TPMS Seal Kit P/N 4692001420014
Seal nut torque spec: 49 in-lb per Schrader; OEM torque spec is 62 in-lb

Nissan P/N for Schrader Sensor 40700-1AAOB 315 Mhz; Schrafer P/N 28204 Ebay at $14.50 ea
49 in-lb torque

Schrader Performance Sensors 1-800-288-1804 (Good technical support)

https://www.schradertpms.com/sites/default/files/uploads/TPMS%20Catalog_2018%202.pdf

Link above contains TPMS sensor and scan tool information compatible with Nissan Sensors
The catalog contains specification information for all makes and models on the road today.

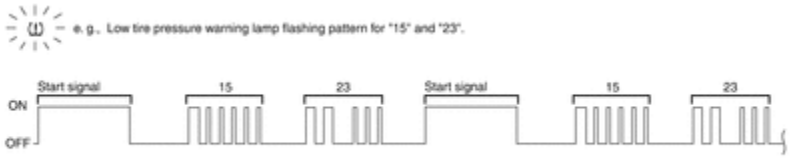
Recommend review of the following Nissan Technical Service Bulletins to enhance your knowledge of the proper care and feeding for your TPMS (Google or Chilton's are good sources for bulletins) :

NTB08-033	PRESSURE INFORMATION
NTB09-101	WARNING LAMP
NTB10-048	SIGNAL TECH II
NTB10-114	TIRE INFLATION (MAY HAVE REVISIONS, NOTE STEM FILL DEVICES)

SELF-DIAGNOSTIC PROCEDURE

1. Turn ignition switch ON.
2. Ground the tire pressure warning check connector to initiate self diagnosis.

   (Momentary contact only, one touch, then pull back.)
3. Compare the flashing pattern with the flash code chart below.



NOTE

The system is normal when the low tire pressure warning lamp flashes 5 times and continues repeating. Self-diagnosis results are erased automatically by turning the ignition switch "OFF".

Flash Code	Malfunction part	Flash Code	Malfunction part
15	Tire pressure low (FL)	37	Transmitter pressure data error (RR)
16	Tire pressure low (FR)	38	Transmitter pressure data error (RL)
17	Tire pressure low (RR)	41	Transmitter function code error (FL)
18	Tire pressure low (RL)	42	Transmitter function code error (FR)
21	Transmitter no data (FL)	43	Transmitter function code error (RR)
22	Transmitter no data (FR)	44	Transmitter function code error (RL)
23	Transmitter no data (RR)	45	Transmitter battery volts low (FL)
21	Transmitter no data (RL)	46	Transmitter battery volts low (FR)
31	Transmitter checksum error (FL)	47	Transmitter battery volts low (RR)
32	Transmitter checksum error (RF)	48	Transmitter battery volts low (RL)
33	Transmitter checksum error (RR)	52	Vehicle Speed Signal
34	Transmitter checksum error (RL)	54	Vehicle Ignition Signal
35	Transmitter pressure data error (FL)		
36	Transmitter pressure data error (FR)		

DIAGNOSTIC TROUBLE CODES

The OBDII system will have stored error codes for the TPMS troubles listed in the flashing lamp section previously. A standard OBDII scan tool will display the error codes and these codes will relate directly to the flashing lamp codes. You can consult the codes in a similar manner that you would use for any other OBDII code to seek repair instructions. A list of OBDII codes are :

Code(s)	Description
C1708 – C1711	Data from transmitter not being received
C1712 – C1715	Transmitter Malfunction
C1716 – C1719	Transmitter Pressure Malfunction
C1720 - C1723	Transmitter Malfunction
C1724 – C1727	Transmitter Malfunction
C1729	Vehicle Speed Signal
C1735	Ignition Signal