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Title: Calculating Pulses Per Mile - includes online calculator

Applies To: All International, MaxxForce®, and Navistar Electronic Controlled Engines except CV

CHANGE LOG

Please refer to the change log text box below for recent changes to this article:

07/16/2015 - Spanish translation was fixed.
03/08/22 - Updated Format, added parameter ID numbers, added additional method to fix programming

DESCRIPTION

This article describes how to fix a speedometer that does not read accurately. An inaccurate speedometer can be caused by chaning the tire size, changing rear axle ratio (RAR), or by parameters being inadvertently changed during a programming event.
Use the formulas and calculator below to correct the pulses per mile (PPM)

SYMPTOMS

- Rear Axle Ratio Change
- Tire Size Change
- Speedometer not reading correctly.

ASSOCIATED PARAMETERS

8000x two speed axle
8001x tire revs/mile
8002x rear axle ratio low
8003x rear axle ratio high
8004x tail shaft teeth (on the VSS tone wheel)
8005x pulses per mile (PPM) low (only applies to medium duty engines)
8006x pulses per mile (PPM) high (only applies to medium duty engines)

RESOLUTION

MEDIUM DUTY

The ECM has dedicated parameters 8005x & 8006x for Pulses Per Mile (PPM) that it uses to calibrate the speed signal sent out on the data link. You have to determine the correct values for the PPM parameters using the equations below (or the calculator further below) and then program those values into the ECM for parameters 8005x & 8006x. For medium duty, the ECM does not reference parameters 8001x, 8002x, 8003x, or 8004x to send the speed signal on the data link. It only references 8005x & 8006x to determine the speed signal to send on the data link. You can use the calculations below to determine the PPM parameters.

8001x (tire revs/mile) x 8002x (rear axle ratio low) x 8004x (tail shaft teeth) = 8005x PPM low
8001x (tire revs/mile) x 8003x (rear axle ratio high) x 8004x (tail shaft teeth) = 8006x PPM high

Ex.	16	X	4.44	X	499	=	35448.96	Round that up to 35449
	Teeth on the Trans Tailshaft		Axle Ratio		Tire Revs per Mile		Pulses per Mile	

You can use the calculator below to calculate your pulses per mile. Just enter your information into the boxes below and click on the "Calculate" button.
(Use the chart below for the Tire Revs Per Mile)

Tailshaft Teeth	X	Tire Revs Per Mile	X	Rear Axle Ratio	=	Pulses Per Mile
	X		X		=	

Calculate

HEAVY DUTY

The ECM does not use a dedicated parameter for PPM. Instead, it references 4 individual parameters and the ECM calculates the PPM on its own. See the calculation below. If you want the speedometer to be accurate, you need to make sure parameters 8001x, 8002x, 8003x, & 8004x are all programmed to the correct values in the ECM.

8001x (tire revs/mile) x 8002x (rear axle ratio low) x 8004x (tail shaft teeth) = (this calculation is done internally in the ECM)
8001x (tire revs/mile) x 8003x (rear axle ratio high) x 8004x (tail shaft teeth) = (this calculation is done internally in the ECM)

ALTERNATE METHOD

When the above methods do not get the speedometer to read correctly then follow these steps:

1. Test drive the vehicle to calculate the percent that the speedometer is inaccurate (while driving at appropriate speed limit for local road - 55 or 60 mph is ideal). You will need to either use a GPS or a pace vehicle to know what the actual vehicle speed is
2. Adjust ECM parameter by that same percent
   A. Medium Duty - adjust PPM parameters 8005x & 8006x by the same percent that the speedometer is inaccurate. Raising the PPM parameter will lower the speedometer needle and vice versa.
   B. Heavy Duty - adjust the tire revs/mile parameter 8001x by the same percent that the speedometer is inaccurate. Raising the PPM parameter will lower the speedometer needle and vice versa.
3. Test drive vehicle again to see if the speedometer is accurate.
4. Follow Steps 2a/2b and 3 again if necessary.

If there are any problems. Please open an iKNow Case file, assign to Programming Support, and put in what you have done so far, what has changed, and your axle ratio, tire size and whether or not the vehicle has a transfer case.

Reference Material

Tire Size / Tire Revs (associated with parameter 8001x)

If you are unable to locate tire type in the list below, you can use this calculator to calculate the tire revs/mile. This calculator may be up to 2% off from manufacturer listed tire revs due to manufacturing tolerances.The tire size numbers break down as follows:

Example: 225 / 70 R 19.5

Tire Width	Aspect Ratio	Rim Diameter	Revs/Mile

Calculate

Non-Michelin Tires	
Tubeless type	Revs/Mile
8R19.5	613
8R22.5	563
9R22.5	543
10R22.5	520
11R22.5	506
12R22.5	492
11R24.5	482
12R24.5	470
225/70R19.5	647
245/70R19.5	624
265/70R19.5	609
255/70R22.5	564
245/75R22.5	561
265/75R22.5	541
295/75R22.5	517

Michelin Tires	
Tubeless type	Revs/Mile
9R22.5	543
10R22.5	520
11R22.5	506
12R22.5	492
11R24.5	482
12R24.5	470
245/70R19.5	624
255/70R19.5	561
275/70R22.5	547
235/80R22.5	556
255/80R22.5	543
275/80R22.5	516
295/80R22.5	501
275/80R24.5	501

Tire Revs/Mile (associated with parameter 8004x)

The number of teeth on the transmission tailshaft (these are the teeth that the speed sensor sits over) is 16 for most transmissions, but if the vehicle has a transfer case the speed sensor is usually in the transfer case and most transfer cases have 43 teeth. If it is a workhorse chassis it has 18 teeth on the tailshaft. If you are ever in doubt about the number of teeth, you can count them.

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