



# SERVICE BULLETIN

Classification: ST08-001b	Reference: NTB08-097b	Date: August 26, 2009
------------------------------	--------------------------	--------------------------

## ALIGNMENT AND ROAD CROWN

This bulletin has been amended. The "Date" has been changed so the Applied Vehicles include the latest Models. No other changes have been made. Please discard previous versions of this bulletin.

**APPLIED VEHICLES:** All Nissan - except GT-R

### SERVICE INFORMATION

Customers may report that their vehicle "pulls" or the steering wheel is "off-center". This bulletin discusses these subjects and provides diagnostic and repair information.

If a vehicle drifts to one side of the road, it may be the normal result of road crown. Most roads in the United States are built with a "crown" to help rain water drain from the road surface. The slope of the road crown varies from place to place. In most cases the crown slopes 2 to 3 degrees to the right.

Vehicles have a natural tendency to drift to the low side of the crown. The greater the slope of the crown, the faster the vehicle will drift in that direction.

Tires and vehicles are designed to counteract the effect of typical road crown, but may not fully counteract the effect of a highly crowned road.

Some freeways slope to both the left and right from the center. When driving on a freeway that slopes in both directions, a vehicle may exhibit a small amount of drift to the left when driving in the left lane and a small amount of drift to the right when driving in the right lane.

**This bulletin does not address road crown issues because they are not vehicle related**, although the customer may incorrectly perceive them to be. Use the information provided in this bulletin to identify and repair other types of "vehicle pull".

### Incident Description:

#### Pull

The vehicle consistently drifts to one side while driving at a constant speed on a straight, flat road.

- A vehicle is said to "pull" if it completes a lane change in less than 7 seconds (with no steering correction from the driver) when driving at 60 MPH on a road with less than 2 degrees road crown slope. All four wheels must pass into the other lane during this time (7 seconds).

Nissan Bulletins are intended for use by qualified technicians, not 'do-it-yourselfers'. Qualified technicians are properly trained individuals who have the equipment, tools, safety instruction, and know-how to do a job properly and safely. NOTE: If you believe that a described condition may apply to a particular vehicle, DO NOT assume that it does. See your Nissan dealer to determine if this applies to your vehicle.

## Steering Wheel Off-Center

The steering wheel spokes are tilted to the left or right (see example in Figure 1) when driving straight ahead on a straight flat road.

- Although the vehicle does not pull in either direction, the customer may perceive that the vehicle pulls because it will respond if he or she tries to bring the steering wheel back to center. This condition can occur if the tie rod length is uneven from side to side.

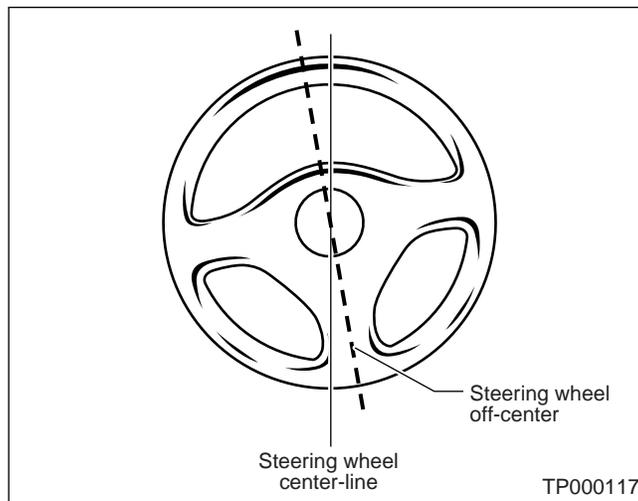
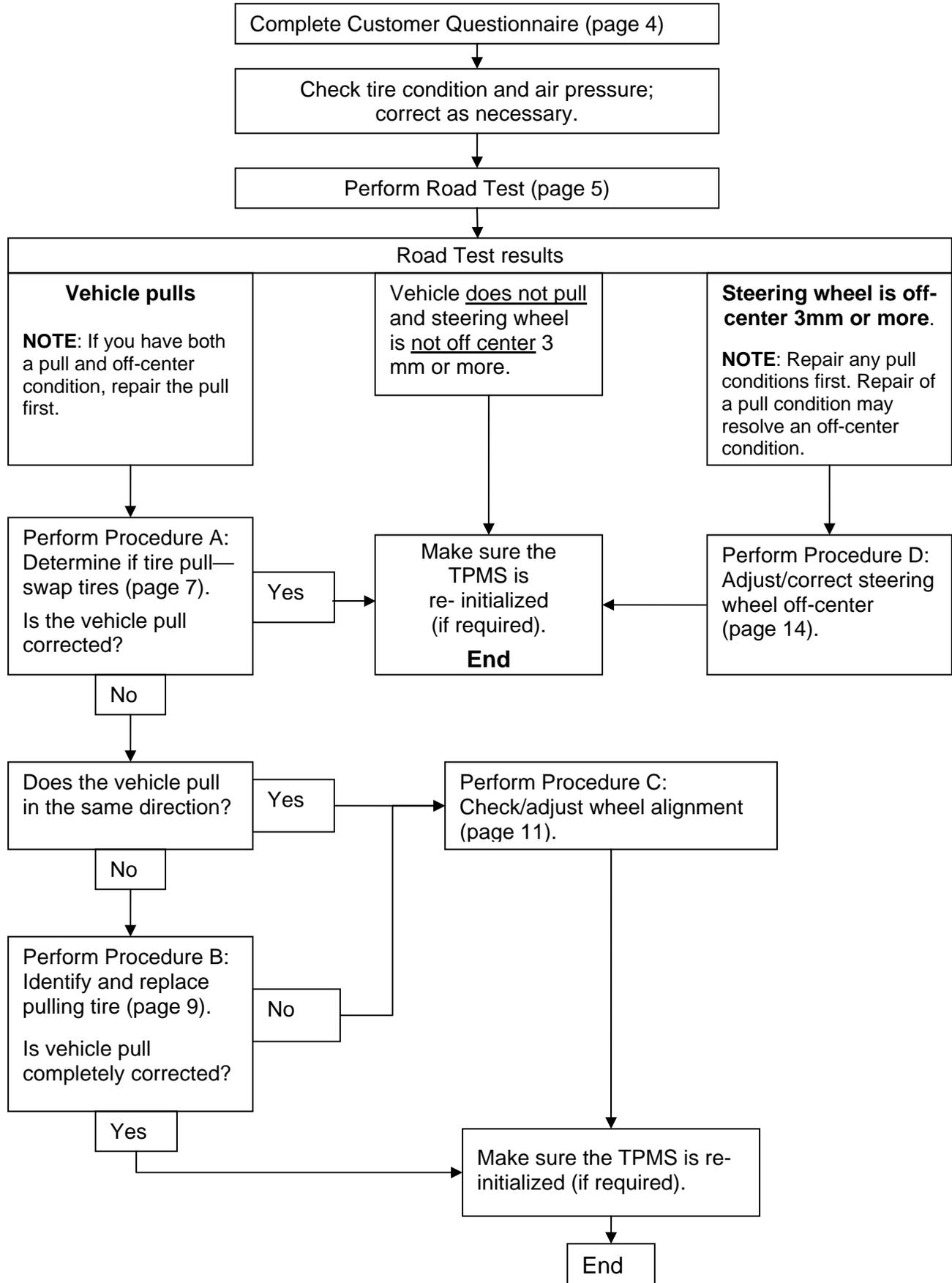


Figure 1

- When driving straight on a highly crowned road, the steering wheel may be turned (off-center) to counteract the affect of the road crown. When road testing for an off-center condition, the vehicle should be driven on a straight flat road.

# SERVICE PROCEDURE

## Repair Flow Chart



## Customer Questionnaire

- This questionnaire should be completed by the Service Manager or Service Advisor during the customer interview.
- Attach a completed copy to the Repair Order.

1	While driving straight, is the steering wheel straight?	Yes	No
	If "NO", is the steering wheel off center to the left or the right?	Left	Right
2	When driving straight on a flat smooth road, does the vehicle drift or pull to the side (left or right)?	Yes	No
If the answer to question 2 is Yes, complete the rest of the questionnaire.			
3	Which direction does the vehicle drift or pull. If it is both Left and Right, circle both.	Left	Right
4	Does the vehicle pull all the time?	Yes	No
5	If the vehicle pulls on a particular road, describe the road and/or location.		
6	Does the vehicle pull during acceleration, deceleration, or cruising?	Acceleration and/or Deceleration	Cruising
7	When driving with one or more passengers does the pull go away or stay the same?	Goes away	Stays the same
8	Have the tires recently been rotated?	Yes	No

## Road Test

(Determine if the vehicle has a pull, drift, or steering wheel off-center issue that requires repair)

### **IMPORTANT:**

- If the vehicle has any tire issues, such as:
  - Tires that are different sizes (except when specified from the factory)
  - Significant difference in the amount of wear between any of the tires
  - Any other tire irregularity or damage to any tire

Replace the tire(s) or use known good tires from another vehicle for all road tests and diagnostics in this bulletin.

- Make sure tire pressure is set to the correct specification.

1. Take the vehicle for a road test and confirm the customers concern.

**NOTE:** If you adjusted the tire pressure or changed the tires before the road test, the issue may have been resolved.

2. Install the following measuring tools on the vehicle:

- Road Crown Gauge
- Steering Wheel Offset Gauge
- Holding Force Gauge; if the vehicle pulls

**NOTE:** See pages 15, 16, and 17 for a description of these tools and an explanation of their use.

3. Take the vehicle for another road test; use the results / readings from the measuring tools to answer the questions in Table 1 on the next page.

4. When the road test is completed, remove the Road Crown Gauge and the Holding Force Gauge. Leave the Steering Wheel Off-set Gauge in place until the Service Procedure is complete.

**TABLE 1**

1	Which direction is the road crown?	Left	Right
2	What is the average amount of road crown? Enter the reading from the Road Crown Gauge. Round the reading to the nearest whole number (0, 1, 2, 3, ....). The negative or positive symbol is not needed.		
3	Is the steering wheel off-center?	Yes	No
4	Which direction is the steering wheel off-center?	Left	Right
5	How much is the steering wheel off-center? Enter the reading from the Steering Wheel Offset Gauge. Round the reading to the nearest whole number (0, 1, 2, 3, ....). If the reading is 9 mm or more, enter 9.		
6	Does the vehicle pull?	Yes	No
7	Which direction does the vehicle pull?	Left	Right
8	How many weights on the steering wheel did you use? Enter the number or weights you used to get the vehicle to go straight (bracket counts as one weight). Enter 0 if the vehicle does not pull.		

## Procedure A

(Determine if a pull condition is caused by a tire).

**NOTE:** Always torque wheel lug nuts using a torque wrench to the specified torque. Refer to the appropriate Service Manual for torque specifications.

1. Swap the front tires side to side (Left to Right and Right to Left).
2. Swap the rear tires side to side (Left to Right and Right to Left).

For vehicles with “directional” tires (tires designed to rotate in only one direction):

- Swap all four tires from a known good vehicle (known good tires).
  - Make sure to mark the tires to indicate their original side of the vehicle (left or right).
3. Make sure the tire pressure is set to the correct specification.
  4. Road test the vehicle.
    - If the TPMS warning light comes ON, ignore it for now.

For vehicles with “directional” tires (tires designed to rotate in only one direction):

- If the pull goes away or is reduced, perform Procedure B on page 9 to determine which tire is causing the pull.
5. Refer back to the Repair Flow Chart on page 3 for the next step.

To claim diagnostic Procedure A (OP-CODE PX35AA), complete Diagnostic Worksheet A on the next page.

To claim diagnostic Procedure A (OP-CODE PX35AA), use the information from Table 1 on page 6 to complete Diagnostic Worksheet A.

**Diagnostic Worksheet A**

Example

Repair code.	A	A
Direction of Road Crown (enter L or R).		R
Average Road Crown.		3
Direction of Pull (enter L or R).		L
How many weights did you use?		3
Enter the DOT number from either of the front tires on the incident vehicle.		ABCD23456789 (The number of characters may vary)

The letters and numbers from the worksheet create a code that will be entered at the beginning of the first line of the Technician Comments in the Warranty Claim.  
Code example: AR3L3ABCD23456789

- Figures A and B below are examples of DOT numbers. The DOT number is all of the characters (letters and numbers) following DOT.
- The number of characters in a DOT number can vary between tire manufactures.

Example of DOT number

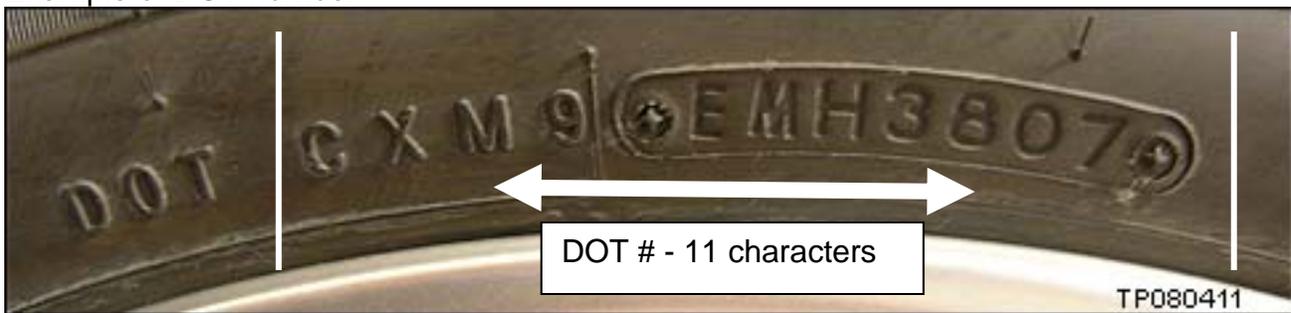


Figure A

Example of DOT number

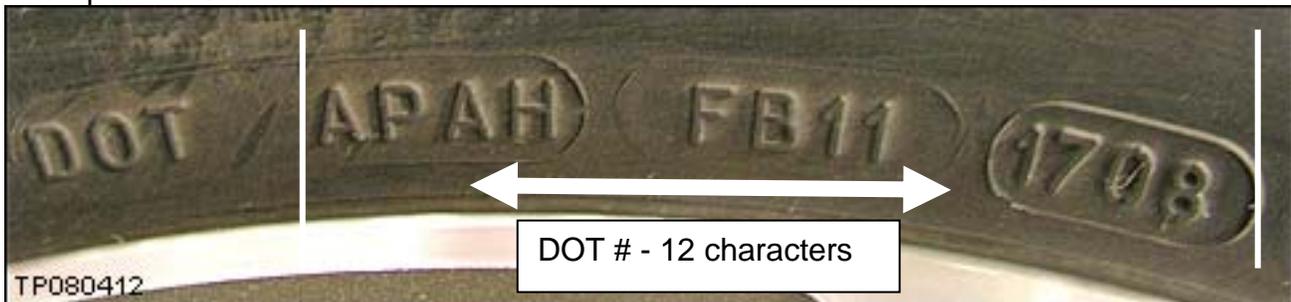


Figure B

## Procedure B

(Determine which tire is causing the pull.)

### NOTE:

- Procedure B is done only if there is a tire pull issue.
- The steps in Procedure B should identify which tire is causing the pull.
- Make sure the tire pressure is set to the correct specification.
- Always torque wheel lug nuts using a torque wrench to the specified torque (refer to the appropriate Service Manual for torque specifications).
- If the TPMS warning light comes ON, ignore it for now.

1a. For vehicles equipped from the factory with tires that are different sizes between the front and rear, or vehicles with “directional” tires:

- A. Put all of the tires/wheels back to original positions. The vehicle should now pull the same as it did on your first road test.
- B. Install / swap only one tire with known good, and road test.
- C. Repeat step B for each tire until the pull goes away or is reduced.
- D. Replace the tire that reduced or eliminated the pull.

**NOTE:** Make sure directional tires are reinstalled on the same side of the vehicle from which they were removed.

1b. For all other vehicles:

- a. Rotate tires 2 and 4 on the passenger side (see Figure 2) and road test.
  - Pull goes away or is reduced; replace tire 2 (which is now on the rear).
  - Pull gets worse; replace tire 4 (which is now on the front).
  - No change; put tires 2 and 4 back to their original positions.
- b. Rotate tires 1 and 3 on the driver side (see Figure 2) and road test.
  - Pull goes away or is reduced; replace tire 1 (which is now on the rear).
  - Pull gets worse; replace tire 3 (which is now on the front).
  - No change; put tires 1 and 3 back to their original positions.

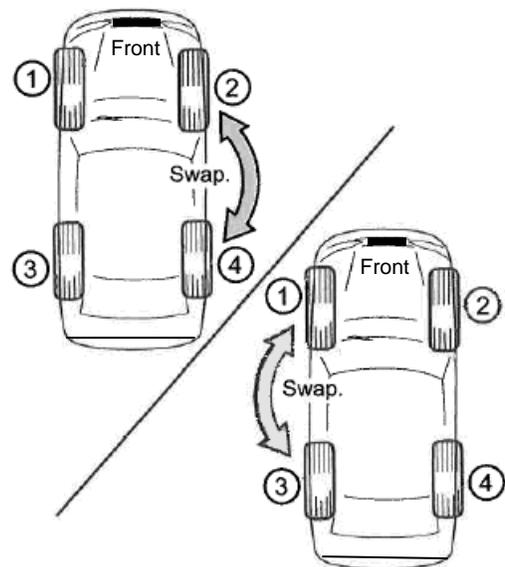


Figure 2

**NOTE:** When replacing a tire, if there is significant tread wear it is good practice to replace tires in sets (both front, both rear, or all 4).

2. Procedure B should have been done only if there is a tire pull issue:
  - If an incident tire was identified and replaced, go to step 3.
  - If an incident tire was not identified, diagnostics were not done correctly. Go back to the Flow Chart on page 3 and start over.
  
3. After replacing a tire, road test the vehicle. You may have completely corrected the pull or you may have only reduced the pull. Return to the Repair Flow Chart on page 3 for the next step.

To claim diagnostic Procedure B (OP-CODE PX36AA, PX37AA, PX38AA, PX39AA, or PX40AA), use the information from Table 1 on page 6 to complete Diagnostic Worksheet B.

**Diagnostic Worksheet B**

Example

Repair code.	B	B
Direction of Road Crown (enter L or R).		R
Average Road Crown.		3
Direction of Pull (enter L or R).		L
How many weights did you use?		3
Enter the DOT number from the tire that was replaced.		ABCD23456789 (The number of characters may vary)

The letters and numbers from the worksheet create a code that must be entered at the beginning of the first line of the Technician Comments in the Warranty Claim.

Code example: BR3L3ABCD23456789

## Procedure C

1. Check the vehicles four-wheel alignment using accurate and properly calibrated computerized alignment equipment.
  - a. Attach to the work order a copy of the alignment machine calibration record showing the date the alignment machine was last serviced and calibrated.
  - b. Record the following measurements:
    - Front Caster: *Left* \_\_\_\_\_ *Right* \_\_\_\_\_ Rear Caster: *Left* \_\_\_\_\_ *Right* \_\_\_\_\_
    - Front Camber: *Left* \_\_\_\_\_ *Right* \_\_\_\_\_ Rear Camber: *Left* \_\_\_\_\_ *Right* \_\_\_\_\_
    - Front Total Toe-in \_\_\_\_\_
    - Thrust Angle \_\_\_\_\_

Reference the appropriate Service Manual for alignment specification.

2. If any of the alignment measurements are out of specification, inspect the suspension and chassis for any damage. Repair the damaged components before continuing.
3. Adjust any front and/or rear adjustable alignment components that are out of specification.
  - Reference the appropriate Service Manual for information regarding the proper steps to adjust the alignment.

**NOTE:** Relationship of alignment settings to vehicle pull:

### **Camber:**

The camber thrust direction will be to the side with the “most positive” camber setting.  
Example: If the left camber is significantly higher (more positive) than the right, the vehicle will tend to drift or pull to the left.

### **Caster:**

The caster thrust direction will be to the side with “most negative” caster setting.  
Example: If the left caster is significantly higher (more positive) than the right, the vehicle will tend to drift or pull to the right.

### **Thrust Angle:**

The Thrust Angle should be close to 0. Out of spec thrust angle is caused by rear wheel or axle misalignment and causes the steering to pull or lead to one side or the other. Excessive thrust angle may cause the steering wheel to be off-center.

**NOTE:**

There are no provision provided for adjusting caster and camber on many Nissan models, but some adjustment may be achieved by the following methods:

**Strut Suspension Camber Adjustment**

- a. Raise the vehicle and remove the front tires.
- b. Loosen the upper steering knuckle bolts and nuts.
- c. Adjust the camber by moving the steering knuckle within the range of the free play of the bolts.
- d. Tighten the bolts to the specified torque.
- e. Reinstall the front wheels and lower the vehicle. Bounce the front and rear of the vehicle several times to stabilize the suspension.

**Strut Suspension Camber & Caster Adjustment**

- a. Raise the vehicle and remove the front wheels.
- b. Loosen the upper strut mount bolts.
- c. Adjust camber and caster by moving the upper strut mount within the range of the free play of the bolts.
- d. Tighten the bolts to the specified torque.
- e. Reinstall the front wheels and lower the vehicle. Bounce the front and rear of the vehicle several times to stabilize the suspension.

To claim diagnostic Procedure C (OP-CODE WD44A or WD49A), use the information from Table 1 on page 6 and the alignment measurements you wrote down in step 1 on page 11 to complete Diagnostic Worksheet C.

**Diagnostic Worksheet C**

Example

Repair code.	C	C
Direction of Road Crown (enter L or R).		R
Average Road Crown.		3
Direction of Pull (enter L or R).		L
How many weights did you use.		3
Left camber (positive "P" or negative "N")		P
Left camber measurement in degrees. <i>Example; reading = 0.53 degrees enter 053</i>		053
Right camber (positive "P" or negative "N")		N
Right camber measurement in degrees. <i>Example; reading = 0.53 degrees enter 053</i>		053
Left caster measurement in degrees. <i>Example; reading =2.84 degrees enter 284</i>		284
Right caster measurement in degrees. <i>Example; reading =2.84 degrees enter 284</i>		284
Thrust Angle (enter the decimal reading) <i>Example; 0.06, enter 06</i>		06

The letters and numbers from the worksheet create a code that must be entered at the beginning of the first line of the Technician Comments in the Warranty Claim.

Code example: CR3L3P053N05328428406

## Procedure D

(Adjust/correct steering wheel off-center)

1. Is the steering wheel 3 mm or more off-center?
  - Yes; proceed to step 2.
  - No; you are finished.
2. Use an alignment rack to measure and adjust front wheel toe with steering wheel straight.
3. Road test to confirm the steering wheel is straight (not off-center 3 mm or more).
4. Remove the steering wheel off-set gauge.

To claim diagnostic procedure D (OP-CODE WD34A), use the information from Table 1 on page 6 to complete Diagnostic Worksheet D.

### Diagnostic Worksheet D

Example

Diagnostic Worksheet D		Example
Repair code.	D	D
Direction of Road Crown (enter L or R).		R
Average Road Crown.		3
Which direction is the steering wheel off-center (enter L or R)		L
How many mm is the steering wheel off center		5

The letters and numbers from the worksheet create a code that must be entered at the beginning of the first line of the Technician Comments in the Warranty Claim.  
Code example: DR3L5.

## SPECIAL TOOLS

Additional special tools can be ordered from TECH-MATE at 1-800-662-2001.

The Drift and Pull Gauge (J-49286) contains the following individual tools:

### **Holding Force Gauge (Weights & Bracket Assembly) – Tool # J-49286-1**

The Holding Force Gauge consists of:

- A bracket that mounts to the steering wheel, and
- Five removable weights.

This gauge measures the amount of pull on the vehicle.

**NOTE:** For measuring purpose, the bracket counts as one weight.



Figure 3

### Tool Use

Attach the bracket and the weights to the steering wheel on the side opposite the pull direction.

For example, if the vehicle pulls to the right, attach the bracket and weights to the left side of the steering wheel (see Figure 4).

For the road test, start with all the weights removed. Add weights one at a time until the vehicle drives in a straight line.



Figure 4

**NOTE:** When recording the road test results, write down the direction of the pull and the number of weights (1 to 6) used to counteract the pull. Remember, the bracket counts as one weight.

## Road Crown Gauge – Tool # J-49286-2

The Road Crown Gauge measures the amount of road crown in degrees.

The suction cup is used to attach the Road Crown Gauge to a secure spot on the vehicle dash.

### Tool Use

Before the road test, calibrate the gauge:

**NOTE:** The gauge must be calibrated with the same weight in the vehicle as there will be during the road test. For example, if you plan to have an assistant in the vehicle during the road test, calibrate the gauge while both of you are sitting in the vehicle.

There are two ways to calibrate the gauge:

- Preferred method: Park the vehicle on a level surface, such as an alignment rack and calibrate the gauge by moving the gauge until the ball is on the zero mark.
- If you do not have a perfectly flat level surface:
  - a. Park the vehicle on a reasonable flat level surface and note the gauge reading.
  - b. Turn the vehicle 180 degrees so the vehicle is in the same spot but facing the opposite direction and note the gauge reading.
  - c. Move / calibrate the gauge so it reads half the difference between the two readings.

For example; if the first reading is -1 and the second reading (after moving the vehicle) is +3, half way between the two is +1.

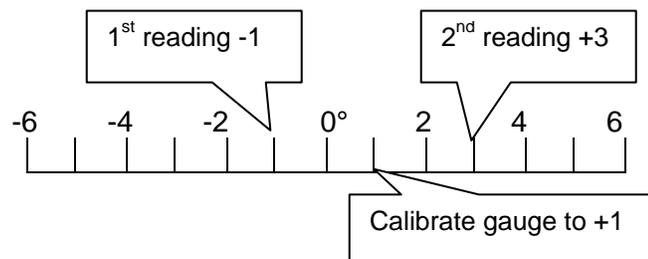


Figure 5



Figure 6

## Steering Wheel Offset Gauge (Stickers) – Tool # J-49286-3

The Steering Wheel Offset Gauge is a set of one-time use stickers that are attached to the steering wheel and the steering column cover.

### Tool Use

Turn / adjust the steering wheel to the straight position (spokes of steering wheel are straight across).

Attach the sticker with numbers on the steering column cover.

Attach the arrow sticker on the steering wheel. Make sure the arrow lines up with the 0 (zero) mark.

When you road test the vehicle you can read how many millimeters the steering wheel is off-center.

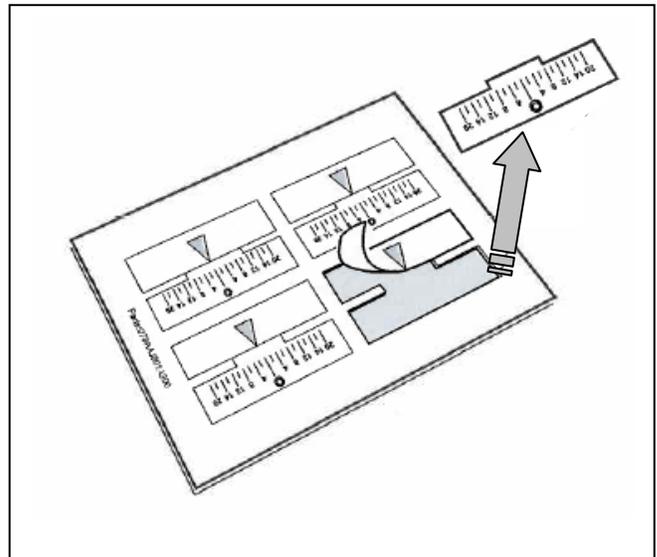


Figure 7



Figure 8

**NOTE:** Repairing a vehicle pull may correct a steering wheel offset condition.

## CLAIMS INFORMATION

**NOTE:** When submitting Warranty Claims for Procedures A through D, a diagnostic procedure code must be entered at the beginning of the first line of the Technician Comments. See Diagnostic Worksheets on pages 8, 10, 13, and 14.

Submit a Primary Operation (PO) line claim using the following claims coding:

### IF REQUIRED:

DESCRIPTION	OP CODE	SYM	DIA	FRT
Procedure A: Swap front and rear tires (side to side) and re-initialize TPMS	PX35AA	CA	44	0.5 hrs

### IF REQUIRED:

DESCRIPTION	OP CODE	SYM	DIA	FRT
Procedure B: Swap tires per procedure B, perform up to two test drives, and re-initialize TPMS.	PX36AA	CA	02	0.9 hrs

OR

For vehicles with different size tires or directional tires.

DESCRIPTION	OP CODE	SYM	DIA	FRT
Procedure B: Swap tires per procedure B, perform test drive and re-initialize TPMS.				
If 1 tire is swapped use	PX37AA	CA	02	0.4 hrs
If 2 tires are swapped use	PX38AA	CA	02	0.8 hrs
If 3 tires are swapped use	PX39AA	CA	02	1.1 hrs
If 4 tires are swapped use	PX40AA	CA	02	1.5 hrs

**IF REQUIRED:** If Procedure C is claimed, you cannot claim Procedure D.

DESCRIPTION	OP CODE	SYM	DIA	FRT
Procedure C: Adjust wheel alignment	(2)	CA	44	(1)

- (1) Reference the current Nissan Warranty Flat Rate Manual and use the indicated FRT.
- (2) Reference the WD-Chassis Adjustment section in the current Nissan Warranty Flat Rate Manual, use the OP-CODE that matches the vehicle and operation performed.

Continued on the next page

**IF REQUIRED:** If Procedure D is claimed, you cannot claim Procedure C.

<b>DESCRIPTION</b>	<b>OP CODE</b>	<b>SYM</b>	<b>DIA</b>	<b>FRT</b>
Procedure D: Adjust steering wheel off center.	WD34AA	EC	41	(1)

(1) Reference the current Nissan Warranty Flat Rate Manual and use the indicated FRT.

**IF REQUIRED:**

For tire replacement claims information, reference the current Nissan Warranty Flat Rate Manual.

