



# SERVICE BULLETIN

Classification:

FA00-001

Reference:

NTB00-037

Date:

April 12, 2000

## STEERING PULL DIAGNOSIS AND REPAIR

**APPLIED VEHICLES:** All Nissan

### SERVICE INFORMATION

Customers use the term "vehicle pull" to describe several different incidents. This bulletin will identify different types of "vehicle pull" incidents and provide diagnostic and repair information for each, should they occur.

In some cases a vehicle may drift to one side of the road as a 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 from 1 to 1.5 percent 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. Nissan and other auto manufacturers design tires and position them on the vehicle to provide a small amount of pull to the left. This helps counteract the effect of typical road crown but may not counteract the effect of a highly crowned road.

Some freeways slope to both the left and right (from the center). A vehicle may exhibit a small amount of pull to the left when driving in the left lane of a freeway with this condition.

If a vehicle exhibits a pull incident that is not the result of road crown, use the information provided in this bulletin to identify the specific type of vehicle pull incident, and the appropriate repair.

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## Incident Description:

### Pull

The vehicle consistently drifts to one side while driving at a constant speed (60 MPH) 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 crown-sloped road of less than 1 percent. All four wheels must pass into the other lane during this time (7 seconds).

Pull can occur as a result of incorrect wheel alignment, tire condition or steering rack sliding force. It can also occur as a result of excessive tire "conicity". This refers to a condition when the tire tread surface is not parallel to the axle centerline (see Figure 1). Conicity occurs during the manufacturing process and the tire may not show noticeable tread wear. When it occurs, it has the affect of the tire taking the shape of a cone. As a result, the tire has a tendency to roll towards the point of the cone.

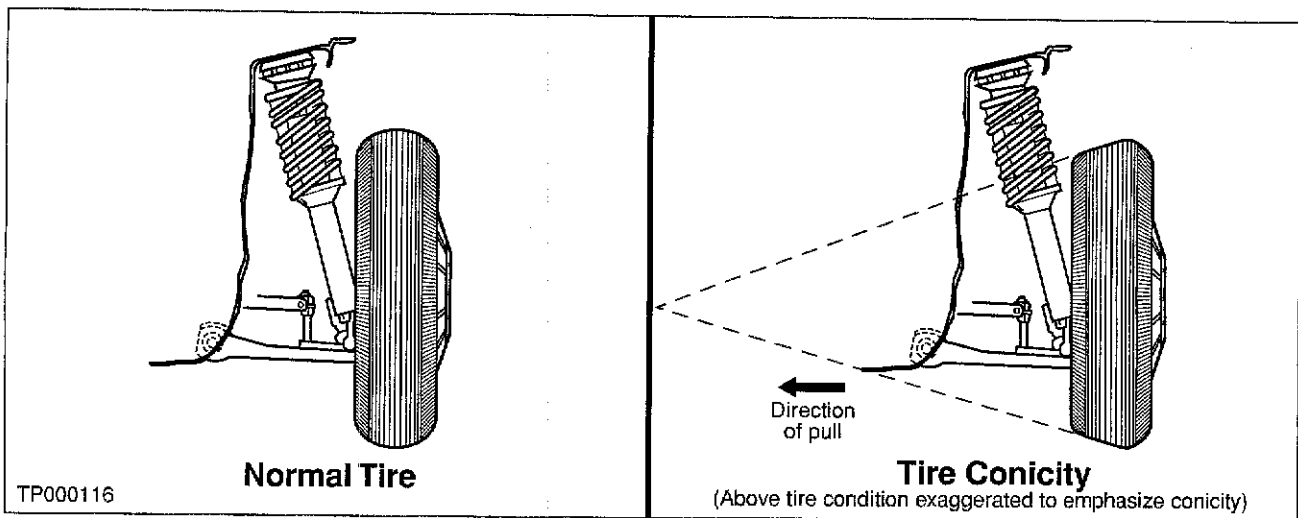


Figure 1

The vehicle will pull in the direction of the tire with the greatest conicity. If the tire conicity is equal on both sides of the vehicle, there is no effect on vehicle pull.

### Steering Wheel Off-Center

The steering wheel spokes are tilted to the left or right (see Figure 2) 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 will occur if the toe-in is out of adjustment causing the tie rod length to be uneven from side to side.

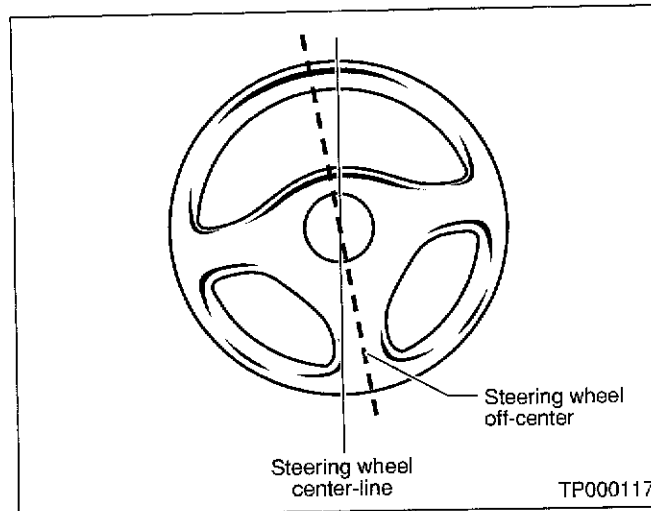


Figure 2

### Wander

The vehicle has a tendency to drift to the right or left depending on road surface conditions. Wander can occur as a result of too little caster (incorrect wheel alignment), steering rack Sliding Force setting or incorrect road wheel offset. See figure 3

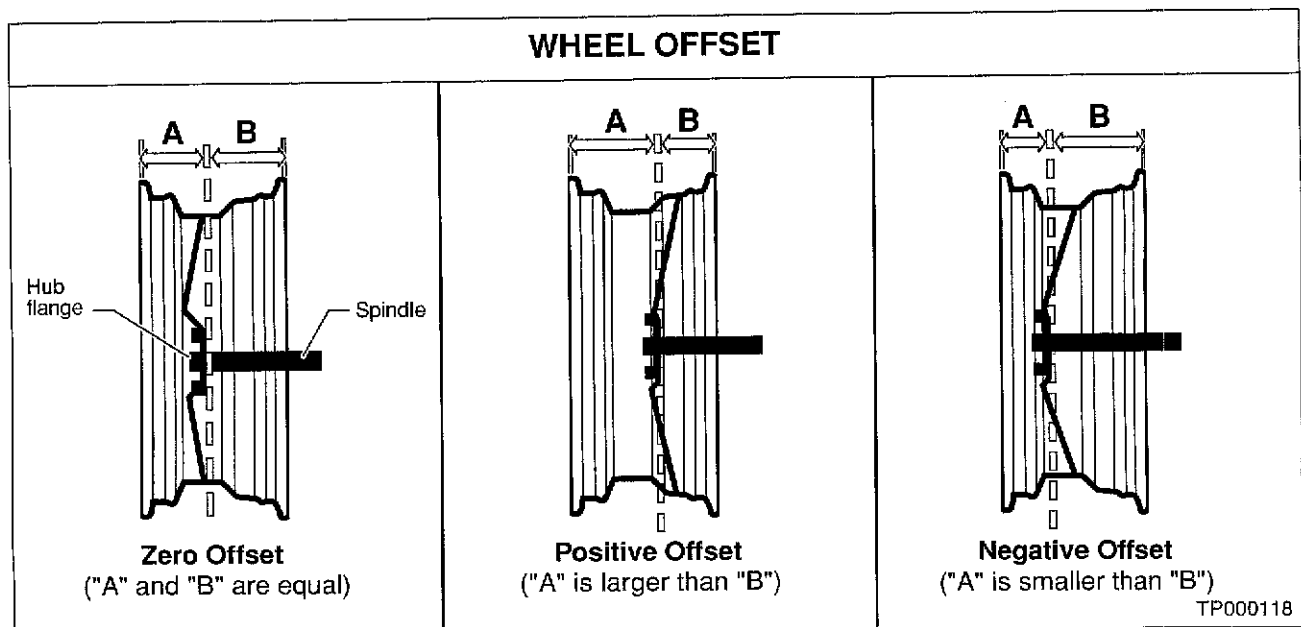


Figure 3

### Pull When Braking

The vehicle consistently drifts to one side when the brakes are applied. This condition can occur as a result of excessive play in suspension bushings or components, or because of uneven braking force.

### **SERVICE PROCEDURE**

1. Verify the condition by road testing the vehicle with the customer using the Steering Pull Diagnosis and Repair procedure below.
2. Determine the specific pull condition based on the descriptions in the service information section of this bulletin.
3. Perform the Preliminary Inspection outlined in this section of the bulletin.
4. Follow the appropriate repair procedure outlined in this section of the bulletin.

### **Preliminary Steps**

Always perform these preliminary steps before performing the other listed diagnosis and repair procedures.

1. Check and adjust tire pressure. A pressure difference of 3 psi or more from one side of the car to the other can cause the vehicle to drift toward the side with the lower pressure.
2. Determine if the wheels and tires are the same as the wheels and tires that were originally supplied on the vehicle.
3. Visually inspect the vehicle for unusual load conditions. Remove unusual loads before road testing.
4. Visually inspect the tires for wear and condition. Replace tires that show damage or have excessive or uneven wear.
5. If corrections are made to the tire pressure, vehicle load condition or tire condition, road test the vehicle again to determine if the incident continues to occur. If so, refer to the appropriate diagnosis and repair information below.

### **Steering Pull Diagnosis And Repair**

1. Confirm the direction of pull with a road test.
2. Remove the front wheels and exchange them left to right and right to left.
3. Road test the vehicle again. If the vehicle continues to pull in the same direction or in the opposite direction continue with step 4.
4. Check the vehicle's wheel alignment using accurate and properly calibrated alignment equipment. Record the caster, camber and toe-in measurements and refer to the vehicle information below.

**NOTE:** When performing a wheel alignment always use the steering wheel to change the position of the road wheels. Turning the steering from the road wheel will affect the accuracy of the readings provided by the alignment equipment.

### Passenger Cars, Quest and 1996 and later Pathfinders

- If the front wheel alignment is within specification perform the Steering Rack Sliding Force Adjustment procedure (see page # 7).
- Caster and Camber are not adjustable on these models. In some cases the Caster and Camber can be changed slightly by loosening related suspension component such as the upper strut mount and lower link pivot and shifting the strut and lower link in the direction needed to bring it into alignment. If the front wheel alignment is still out of specification, it is likely a component is bent. Determine the cause and repair as necessary.
- Adjust the toe-in to specification.

### Frontier/Xterra/Truck/1995 and earlier Pathfinder

- Adjust the camber to be equal on both sides of the vehicle.
- Adjust the caster equally on both sides of the vehicle to the high end of the specified range and road test to determine if the pull is corrected. If the vehicle continues to pull, adjust the left and right side caster as indicated below to compensate for the pull.
- Adjust the toe-in to specification.

### Effects of caster setting on vehicle pull

- If the left front caster setting is higher than the right front, the car will pull to the right.
- If the right front caster setting is higher than the left front, the car will pull to the left.

### **Steering Wheel Off-Center Diagnosis And Repair**

1. Position the vehicle on an alignment rack.
2. Set the road wheels in the straight ahead position.
3. Loosen the tie-rod lock nuts and rotate the left and right tie-rods an equal amount in opposite directions. This will center the steering wheel. If the steering wheel off-center increases, reverse the direction you are turning the tie rods.
4. Use the alignment equipment to verify and adjust the toe-in.
5. Verify the steering wheel is centered.
  - If the steering wheel is centered and the toe-in is correct, the procedure is complete.
  - If the steering wheel is still off-center or the toe-in is incorrect, repeat steps 2, 3, 4, 5.

### **Steering Wander Diagnosis And Repair**

1. Determine if the vehicle is equipped with the tires and wheels originally supplied on the vehicle.
  - If the tires and wheels are original go to step 3, next page.
  - If the vehicle has aftermarket wheels or Nissan wheels that are different from those specified for the vehicle, go to step 2, next page.

2. Temporarily exchange the wheels and tires for wheels and tires of the same type and size that were originally specified for the vehicle. Road test the vehicle to determine if the wander condition still occurs.
  - If the wander condition is eliminated by this test, advise the customer that the wander is a result of the incorrect wheel assemblies. It will be necessary to replace them with the correct wheels to eliminate the wander condition.
  - If the wander occurs during this test, reinstall the customer's wheels and continue with step 3.
3. Check the vehicle's wheel alignment using accurate and properly calibrated alignment equipment. Adjust toe-in to specification. Determine if the caster setting is in the correct range and is equal from side to side, then refer to the vehicle information below.

Passenger Cars, Quest and 1996 and later Pathfinders

- If the caster setting is correct perform the Steering Rack Sliding Force Adjustment procedure below.
- If the caster setting is not correct determine the cause and repair as necessary.

Frontier/Xterra/Truck/1995 and earlier Pathfinder

- Adjust the caster setting equally on both sides of the vehicle to the high end of the specified range.

**Steering Rack Sliding Force Measurement Procedure**

1. Disconnect the tie-rod ends from the left and right steering knuckles.
2. Start the engine and warm it to operating temperature.
3. Turn the steering wheel from lock to lock several times to circulate the fluid then return the steering wheel to the center position.
4. Pathfinder (R50) only: Disconnect the steering column lower shaft from the rack pinion.

**NOTE:** Do not turn the steering wheel after the steering column lower shaft is disconnected as this will put the steering column lower shaft and rack pinion out of phase.

5. Connect a spring scale to one tie-rod (see Figure 4).

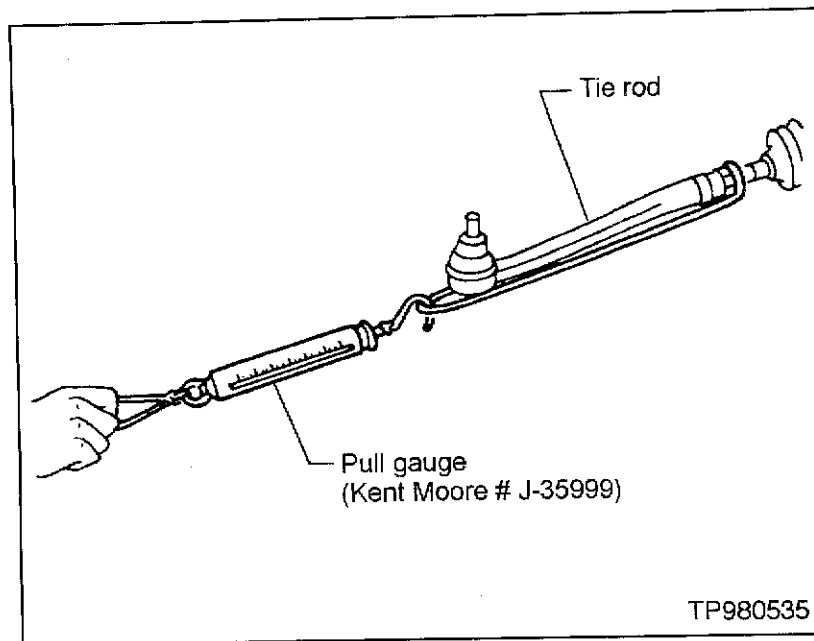


Figure 4

6. With the engine idling and the steering centered, slowly pull the spring scale until the tie-rod begins to move. Pull slowly at a rate of 3.5mm per second (0.138 in/sec).
7. Read the value on the spring scale after the tie-rod begins to move. Repeat steps 5 and 6 two or three times from the left and right side of the vehicle. Be sure to center the steering wheel each time. Write down the value each time.
8. Take an average value from step 6 and compare it to the specifications below.
  - If the measured value is below or at the low end of the specified value, perform the Steering Rack Sliding Force Adjustment procedure (below).

| MODEL      | YEAR    | SLIDING FORCE N (KGF/LBF) | LOCK NUT/ADJ. SCREW TOOL # |
|------------|---------|---------------------------|----------------------------|
| Maxima     | 1995-99 | 216-284 (22-29/49-64)     | J43477/J43687              |
|            | 2000    | 216-284 (22-29/49-64)     | J43477/J43687              |
| Altima     | 1998-00 | 186-284 (19-29/42-64)     | Not Available*             |
| Sentra     | 1995-99 | 108-245 (11-25/24-55)     | Not Available*             |
|            | 2000    | 165-305 (17-31/38-69)     | Not Available*             |
| Quest      | 1999-00 | 108-284 (11-29/24-64)     | Not Available*             |
| Pathfinder | 1996-01 | 167-255 (17-26/38-58)     | J43995/J43996              |

\* Use suitable tools.

### Steering Rack Sliding Force Adjustment Procedure

1. Loosen the steering rack sliding force adjusting screw lock nut while holding the sliding force adjusting screw (see Figure 5).

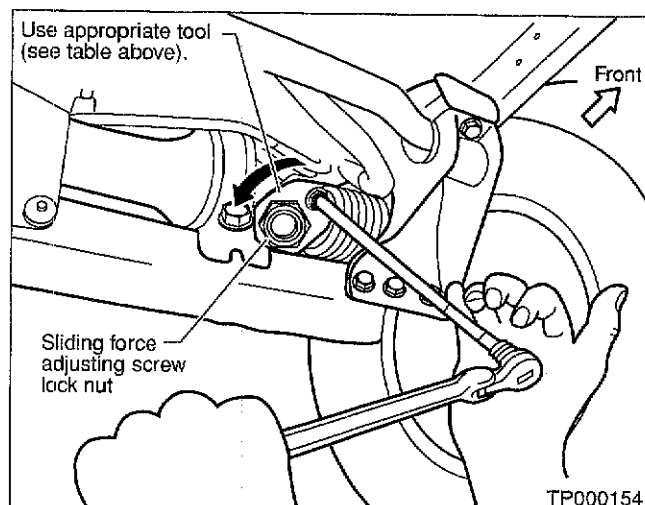


Figure 5



2. Tighten the sliding force adjusting screw slightly then re-tighten the lock nut while holding the adjusting screw (see Figure 6).

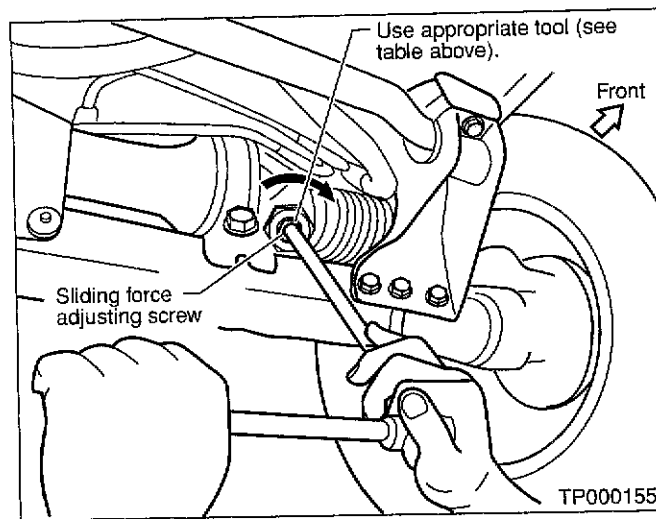


Figure 6

3. Re-check the sliding force as outlined under the Steering Rack Sliding Force Measurement procedure.
  4. Repeat steps 1, 2 and 3 as necessary until the steering rack sliding force is at the high end of the specification.
- NOTE:** Steering rack sliding force that is above specification will affect the vehicle's ability to return to the straight ahead position after a turn.
5. Reassemble the vehicle.
  6. Test drive and ensure the steering wheel returns to the straight ahead position after making right and left turns.

## CLAIMS INFORMATION

Please reference the current Nissan "Warranty Flat Rate Manual" and submit your claim(s) using the Operation Code (Op Code) or combination of Op Codes that best describes the operations performed.