



Commercial Vehicle Safety Alliance

North American Standard Inspection Program

I N S P E C T I O N B U L L E T I N

2010-03

Revised: May 19, 2010

Rack and Pinion Steering System Inspection

Summary

This *Inspection Bulletin* explains how to inspect trucks and truck tractors equipped with rack and pinion steering. There are many similarities between the rack and pinion system and the reciprocating ball system currently utilized in the majority of heavy use vehicles. Rack and pinion systems have been utilized on passenger vehicles for decades, their recent adaption to heavy vehicles brought forth the need for clarification of the systems functions and proper inspection points.

Background

Freightliner developed heavy duty rack and pinion for use in several large truck models. It is designed to reduce weight and enhance the driving feel and responsiveness for drivers. An additional benefit is that there is approximately a 45 pound weight reduction for this steering system compared to the other steering system. The rack and pinion unit mounts directly to the steering axle housing.

As the name implies, rack and pinion steering consists of two components (the rack and pinion). The rack is a horizontal shaft with teeth, which intersects the pinion at a 90-degree angle. Turning the steering wheel turns the pinion, moving the rack to the left or right, thus steering the wheels.

With the location of the steering gear and universal shaft being moved from the frame, it results in a much different appearance to inspectors. Other significant differences are that this system is not equipped with a pitman arm, drag link or a common gear box and there are inner ball joints on this system inside the bellows.

Inspection Guidance

ADDITIONAL INSPECTION POINTS FOR RACK AND PINION STEERING SYSTEMS

- Inspect the rack and pinion mounting bolts at the gear housing and to the steering axle. These bolts serve the same function as the steering box mounting bolts. Any rack mounting bolts loose or missing would result in an out-of-service (OOS) condition.
- Inspect outer ball and socket connections. Movement other than rotational that exceeds 1/8" (hand pressure only) would result in an OOS condition.
- The inner ball joints are protected by bellows (boots) which protect them from contamination. The bellows also block a visual inspection of these components. The inner joints are considered hidden parts for the purposes of the Part II Policy Statement of the *North American Standard Out-of-Service Criteria* (OOSC).

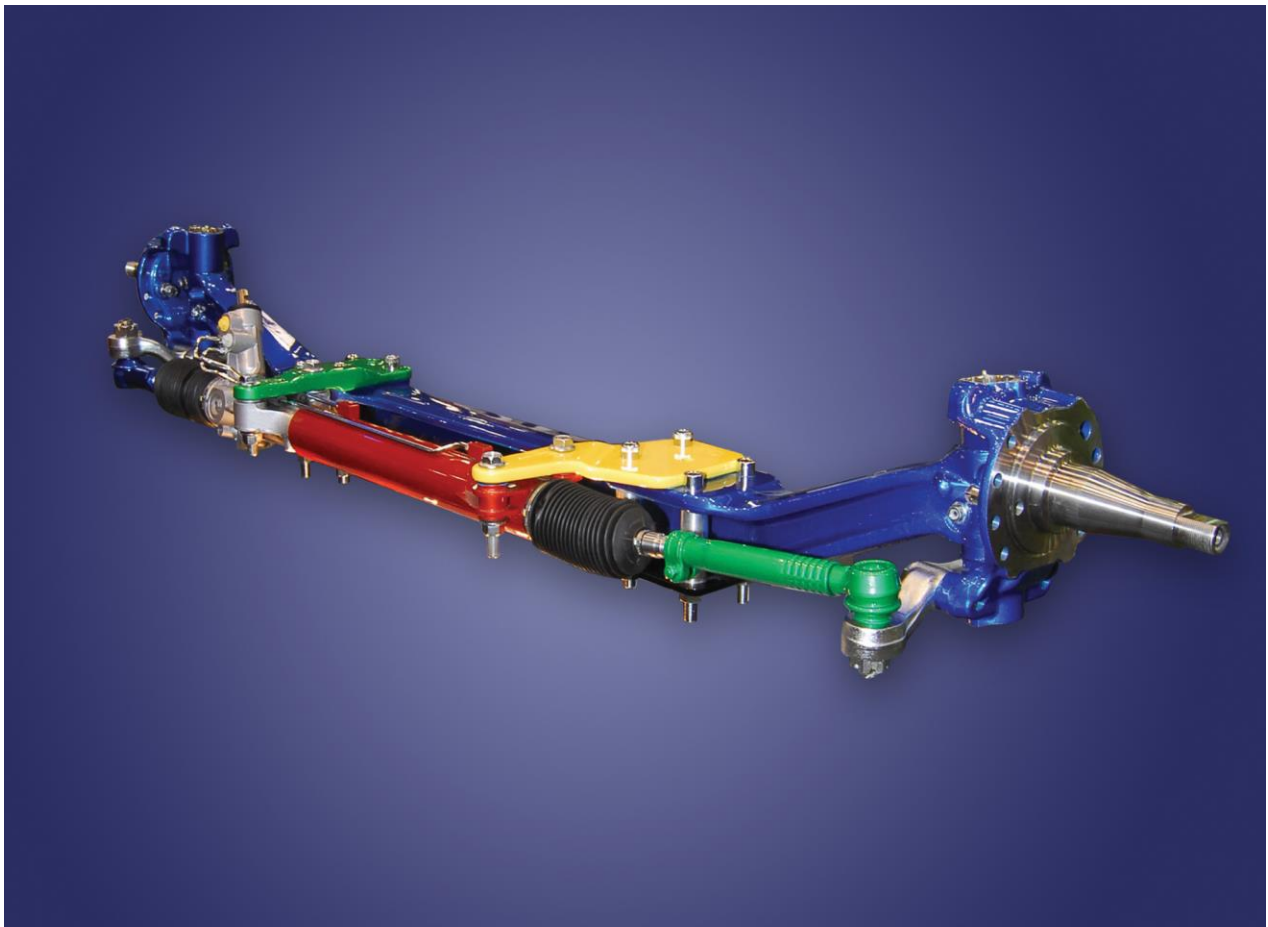
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- Any excessive movement at other connections may result in excessive steering wheel lash (free play). The amount of allowable free play varies with the diameter of the steering wheel. Refer to the chart in item 9. 'Steering Mechanisms', a. 'Steering Wheel Lash (Free Play)', of the OOSC.
- Step 28 of the North American Standard Inspection Procedure covers all the components of this type of steering system. Item 9. 'Steering Mechanisms', d. 'Steering Gear Box (Including Rack and Pinion)', of the OOSC has been amended slightly to include rack and pinion steering.

New Equipment

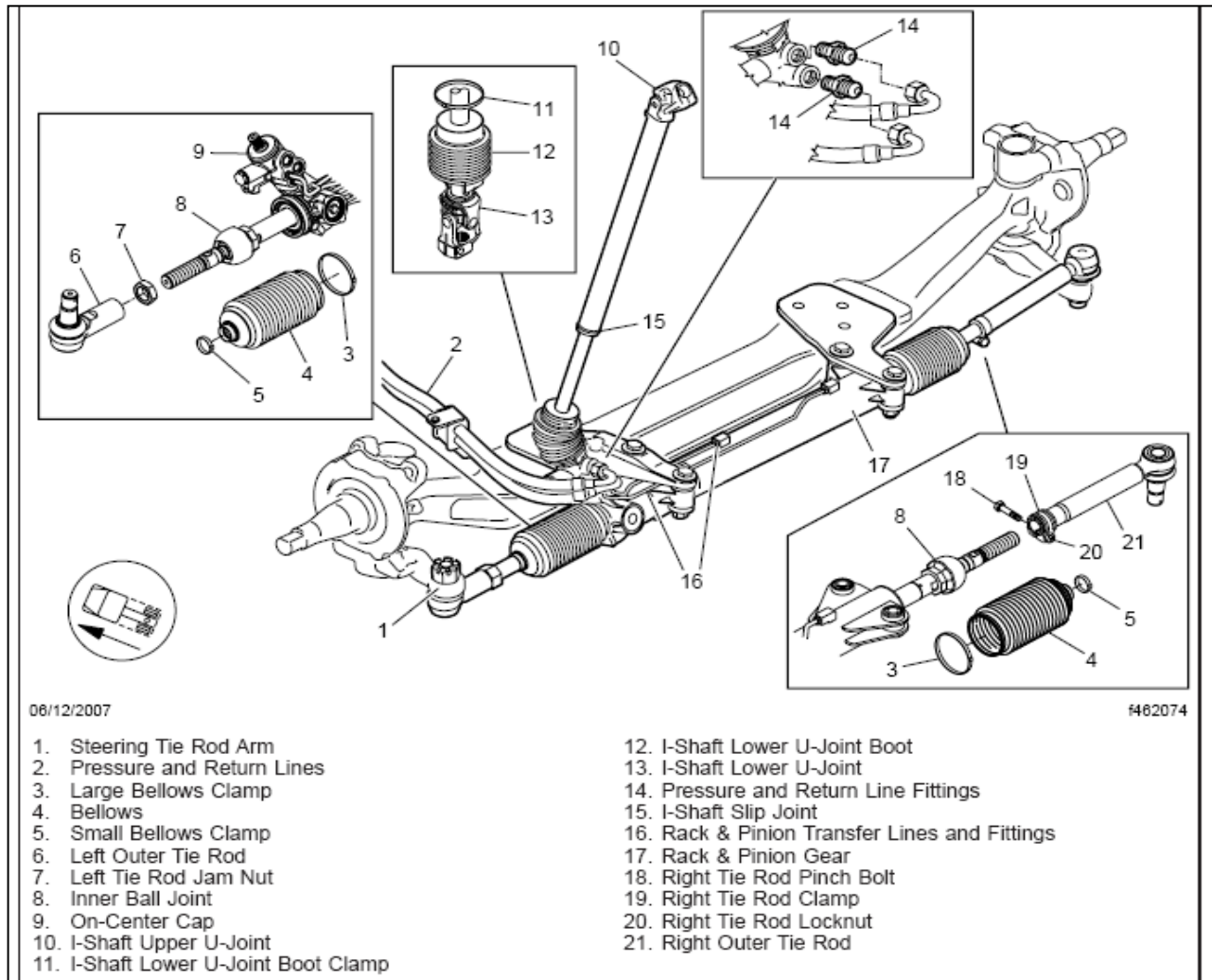


INSPECTION BULLETIN

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06/12/2007

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- 1. Steering Tie Rod Arm
- 2. Pressure and Return Lines
- 3. Large Bellows Clamp
- 4. Bellows
- 5. Small Bellows Clamp
- 6. Left Outer Tie Rod
- 7. Left Tie Rod Jam Nut
- 8. Inner Ball Joint
- 9. On-Center Cap
- 10. I-Shaft Upper U-Joint
- 11. I-Shaft Lower U-Joint Boot Clamp

- 12. I-Shaft Lower U-Joint Boot
- 13. I-Shaft Lower U-Joint
- 14. Pressure and Return Line Fittings
- 15. I-Shaft Slip Joint
- 16. Rack & Pinion Transfer Lines and Fittings
- 17. Rack & Pinion Gear
- 18. Right Tie Rod Pinch Bolt
- 19. Right Tie Rod Clamp
- 20. Right Tie Rod Locknut
- 21. Right Outer Tie Rod

