

Work Instructions – FL513P

Subject: Rack and Pinion Steering – Steering Stops

Models Affected: Specific Freightliner Cascadia, Century Class S/T, and Columbia vehicles manufactured November 1, 2004, through September 26, 2007, with rack and pinion steering. (Note: One Freightliner Classic XL vehicle and one Freightliner Coronado vehicle are also involved in this recall.)

This Work Instruction includes the following procedures:

- Replace Tie Rod Arms

Recall Procedures

1. Check the base label (Form WAR259) for a completion sticker for campaign FL513 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger-side door about 12 inches (30 cm) below the door latch. If a completion sticker is present, no further action is necessary. If a completion sticker is not present, go to the next step.
2. Shut down the engine, apply the parking brake, and chock the rear tires.
3. Raise the hood.
4. Remove and discard the cotter pins and castle nuts from the outer tie rod ends, then separate the ball studs from the tie rod arms.
5. Replace the tie rod arms.
 - 5.1 Remove and discard the fasteners that hold the tie rod arms to the steering knuckles. See **Fig. 1** and **Fig. 2**.

IMPORTANT: Make sure that the new tie rod arms are installed on the correct side. The raised number on each arm will end in an "L" or an "R," which refers to left (driver) side or right (passenger) side of the vehicle.
 - 5.2 Using a solvent, remove all dirt, oil, and other foreign material from the female threads on the steering knuckles. Let the solvent dry completely.
 - 5.3 Apply Loctite 277 to the threads of the new M20 flanged hexbolts and install the new tie rod arms. Tighten the flanged hexbolts 387 to 461 lbf·ft (525 to 625 N·m).
6. Attach the tie rods to the tie rod arms. Tighten the new castle nuts 240 lbf·ft (325 N·m), then install and lock a new cotter pin in each of the ball studs and nuts. If needed, continue tightening each nut until a slot on the nut aligns with the cotter-pin hole in the ball stud. Do not back off the nut to align it with the cotter pin hole.
7. Raise the vehicle and place the front wheels on turnplates.
8. Center the rack and pinion gear.
 - 8.1 Measure the length of the bellows from clamp to clamp on each side of the gear. See **Fig. 3**. If measurements are not within 1 inch (25 mm) of each other, move the tires until the bellows lengths are within range.
 - 8.2 Align the pointers on the input shaft seal cover and the input shaft housing. See **Fig. 4**.

Recall Campaign

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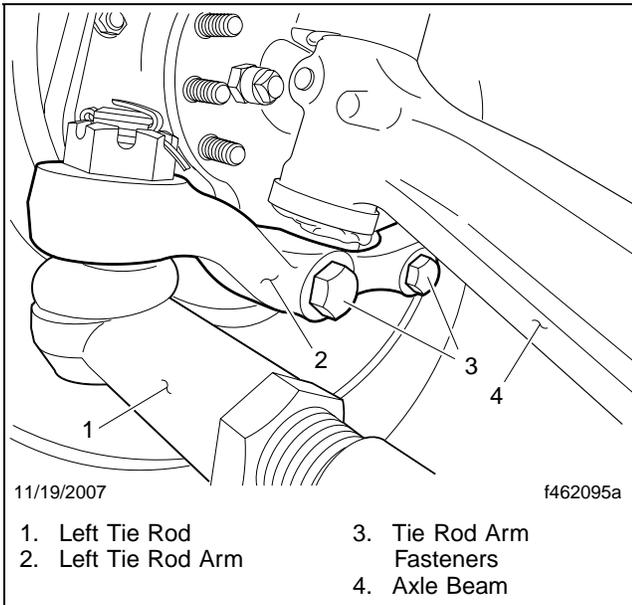


Fig. 1, Left Side of Vehicle

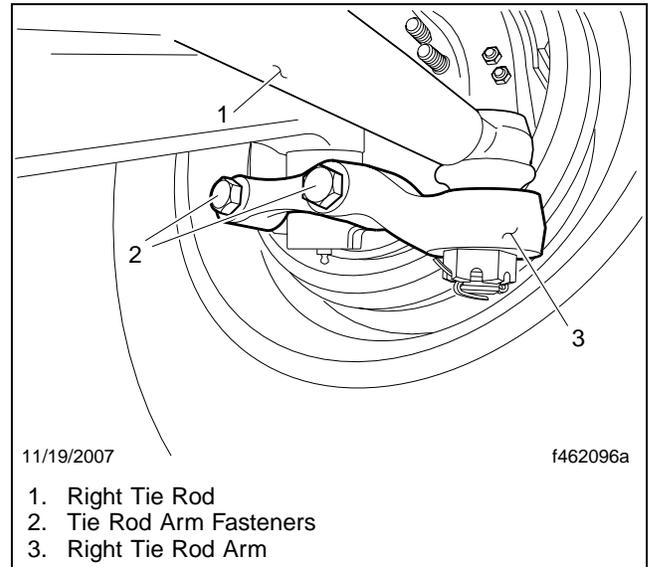


Fig. 2, Right Side of Vehicle

9. Align the front wheels using a computerized alignment tool.

NOTE: If you do not have access to this type of tool, the alignment procedure must be done by a facility that does.

- 9.1 Complete the setup needed for the computerized alignment tool (identical to the setup for integral steering gears).

- 9.2 With the wheels on turnplates, center the rack travel by aligning the timing pointers on the input shaft seal cover and the input shaft housing. See **Fig. 4**.

Whenever the computerized alignment program requires that the steering wheel be pointed straight ahead, the steering rack on-center pointers should be aligned.

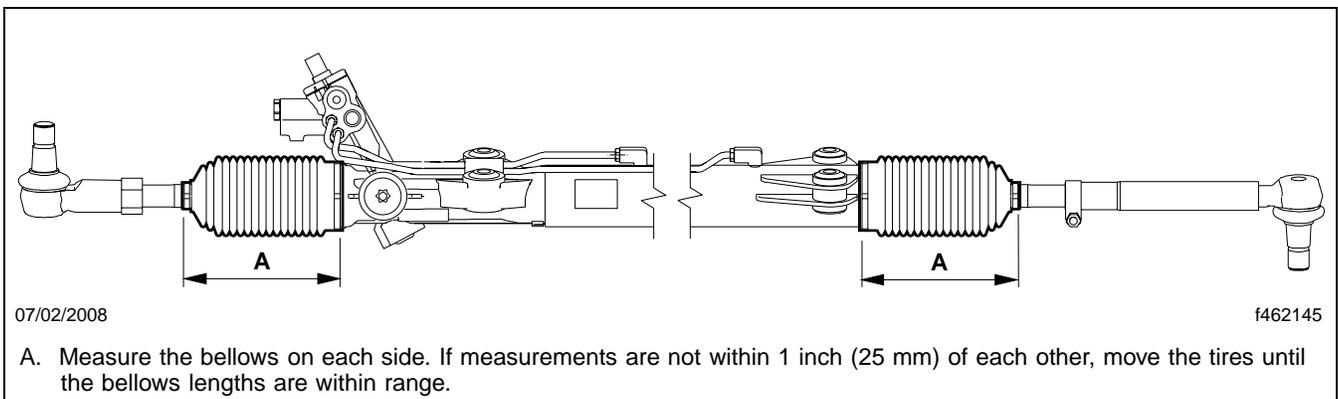


Fig. 3, Measuring the Tie Rod Bellows

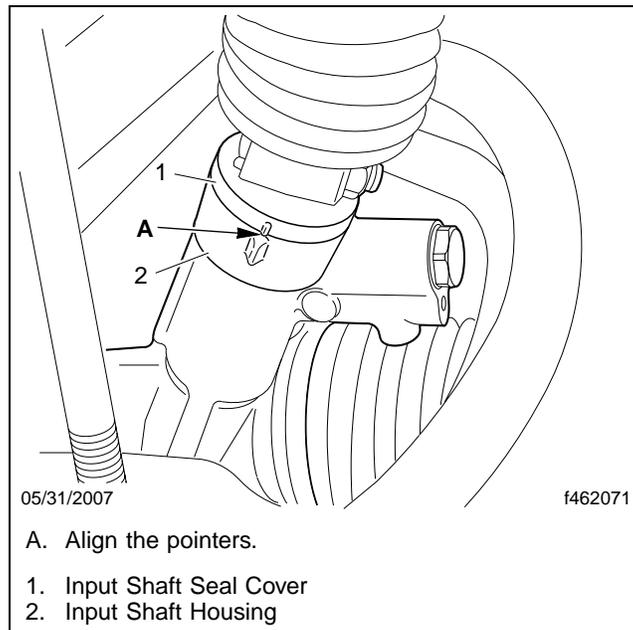


Fig. 4, Pointer Alignment

NOTE: Do not center the steering wheel; it must be centered at the end of the procedure.

- 9.3 Loosen the driver-side tie rod jam nut. If necessary, hold the inner tie rod in place with a backup wrench on the inner tie rod flat.
 - 9.4 With the gear on-center, place a wrench on the driver-side inner tie rod flat and align the left tire by rotating the inner tie rod.
Total left side toe-in should be between 0 and 1/16 inch (1.58 mm).
 - 9.5 Tighten the tie rod jam nut 285 to 305 lbf-ft (386 to 413 N·m)
 - 9.6 Loosen the passenger-side tie rod clamp nut.
 - 9.7 With the gear on-center, place a wrench on the passenger-side inner tie rod flat and align the right tire by rotating the inner tie rod.
Total right side toe-in should be between 0 and 1/16 inch (1.58 mm).
 - 9.8 Tighten the tie rod clamp nut 30 to 36 lbf-ft (41 to 48 N·m).
- IMPORTANT:** Total toe-in for both sides should be between 0 and 1/8 inch (3.18 mm), and the target should be 1/16 inch (1.58 mm).
- 9.9 Check the clearance of the front wheels. With the wheels turned all the way to the right and left, there must be at least 1/2-inch (13-mm) clearance between the wheels and any stationary components, and at least 3/4-inch (19-mm) clearance between the wheels/tires and any moving components.
If the clearance is inadequate, back out the stop bolts and adjust the jam nuts to limit the turning angles and to prevent possible contact with components.
 - 9.10 Tighten the stop-bolt jam nuts 80 to 120 lbf-ft (108 to 163 N·m).
 - 9.11 Return the wheels to the straight-ahead position.

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10. Make sure that the steering wheel is within 10 degrees of center as shown in **Fig. 5**. If it is not, remove and center the steering wheel.

IMPORTANT: The spline/pinch bolt connections between the steering gear and the steering wheel fit in only one position. Clocking the splined connections after alignment is not possible.

- 10.1 If the vehicle has an air bag, deactivate and remove the air bag according to the instructions in the applicable vehicle workshop manual. If the vehicle does not have an air bag, remove the horn button by prying it out around the edges.

IMPORTANT: The steering wheel does not have threaded wheel-puller holes. The tapered fit between the steering wheel and the column is designed to be removed by hand.

- 10.2 Loosen the nut that holds the steering wheel on the steering column, but leave it on the shaft until the wheel has been released from the tapered fit.
- 10.3 Remove the wheel from the tapered fit by striking it from below, at the rim/spoke intersections, with both hands.
- 10.4 Remove and discard the steering wheel nut, and install and center the steering wheel.
- 10.5 Install a new steering wheel nut and tighten it 33 to 41 lbf-ft (45 to 55 N-m).
- 10.6 If the vehicle has an air bag, install and reactivate the air bag according to the instructions in the applicable workshop manual. If the vehicle does not have an air bag, install the horn button.

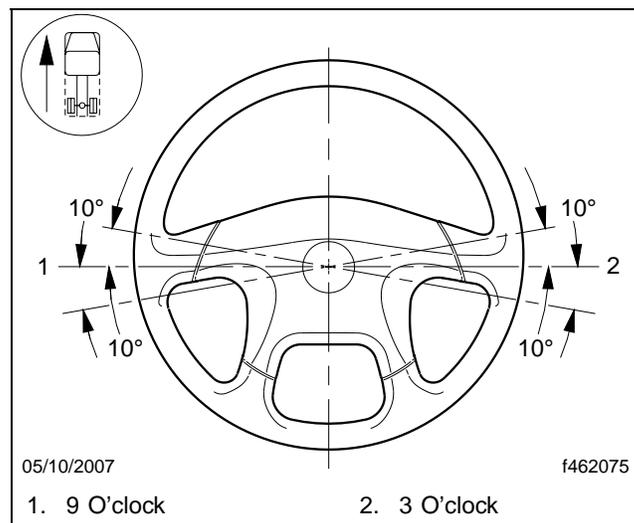


Fig. 5, Steering Wheel Centered

11. Remove the turnplates and alignment equipment.
12. Clean a spot on the base label (Form WAR259), write the recall number, FL513, on a blank completion sticker (Form WAR260), and attach it to the base label.