

Component Procedures: Steering Gear

Table of Contents

1. Parts and Labor (itype_189)
2. Steering Gear Boot Replacement (N41) (Article 13463)
3. Steering Gear Boot Replacement (NV9) (Article 13464)
4. Steering Gear Replacement (N41) (Article 13465)
5. Steering Gear Replacement (NV9) (Article 13466)
6. Steering Linkage Inner Tie Rod Replacement (N41) (Article 13469)
7. Steering Linkage Inner Tie Rod Replacement (NV9) (Article 13471)
8. All Technical Service Bulletins (itype_100)
9. Customer Interest Bulletins (itype_109)
10. Steering Linkage Inner Tie Rod Inspection (Article 13467)
11. Leaks (itype_149)

Component Procedures: Steering Gear

Parts and Labor (itype_189)

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Install	Power Electric > Steering Gear & Linkage > St?	B	4.2	0.0
Remove & Install	Power Electric > Steering Gear & Linkage > St?		1.5	
Remove & Install	Power Electric > Steering Gear & Linkage > St?		0.6	
Remove & Replace	Power Electric > Steering Gear & Linkage > St?	B	4.4	0.0

Steering Gear Boot Replacement (N41) (Article 13463)

Special Tools

J-22610 - Keystone Clamp Pliers

For equivalent regional tools, refer to Special Tools .

Removal Procedure

- Remove the steering linkage outer tie rod . Refer to Steering Linkage Outer Tie Rod Replacement .
- Remove the inner tie rod nut from the inner tie rod (3). Click for full-size image
- Remove the outer boot retaining clamp. Discard the clamp.
- Remove the inner boot clamp. Discard the clamp.
- Remove the boot (2) from the inner tie rod.

Installation Procedure

- Install the boot (2) to the inner tie rod (3). Click for full-size image
- Install the NEW inner boot clamp (1).
- Crimp the inner boot clamp with the J-22610 - Pliers or equivalent.
- Install the NEW outer boot retaining clamp (4).
- Install the inner tie rod nut (5) to the inner tie rod.
- Install the outer tie rod. Refer to Steering Linkage Outer Tie Rod Replacement .

Steering Gear Boot Replacement (NV9) (Article 13464)

Special Tools

J-22610 - Keystone Clamp Pliers

For equivalent regional tools, refer to Special Tools .

Removal Procedure

- Remove the steering linkage outer tie rod . Refer to Steering Linkage Outer Tie Rod Replacement .
- Remove the steering linkage inner tie rod nut (5) from the steering linkage inner tie rod (3). Click for full-size image
- Remove and discard the outer steering gear boot clamp (4).
- Remove and discard the inner steering gear boot clamp (1).
- Remove the steering gear boot (2) from the inner tie rod (3).
- Remove the boot seal (1) from the steering gear housing (2). Click for full-size image

Installation Procedure

- Apply a small amount of Lithium Grease or equivalent to the inside of both ends of the steering gear boot. Refer to Adhesives, Fluids, Lubricants, and Sealers .
- Install the steering gear boot seal (1) on the steering gear housing (2). Click for full-size image
- Install the steering gear boot (2) over the steering linkage inner tie rod (3). Click for full-size image
- Install the NEW inner steering gear boot clamp (1) and crimp with the J-22610 - Pliers or equivalent.
- Install the NEW outer steering gear boot clamp (4).
- Install the steering linkage inner tie rod nut (5) to the steering linkage inner tie rod (3).
- Install the steering linkage outer tie rod. Refer to Steering Linkage Outer Tie Rod Replacement .
- Measure and adjust the front toe. Refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment .

Steering Gear Replacement (N41) (Article 13465)

Removal Procedure

- The steering column
- The intermediate shaft (s)
- The steering gear
- LOCK the steering column and verify the front wheels are in the straight ahead position.

- Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
 - Remove the front tire and wheel assemblies. Refer to Tire and Wheel Removal and Installation .
 - Place drain pans under the vehicle.
 - Disconnect the power steering gear inlet hose from the steering gear. Plug the steering gear inlet port. Cap the power steering gear inlet hose. Refer to Power Steering Gear Inlet Pipe/Hose Replacement .
 - Disconnect the power steering gear outlet hose from the steering gear. Plug the steering gear outlet port. Cap the power steering gear outlet hose. Refer to Power Steering Gear Outlet Pipe/Hose Replacement .
 - Disconnect the 2 outer tie rod s from the steering knuckle s. Refer to Steering Linkage Outer Tie Rod Replacement .
 - Disconnect the intermediate steering shaft from the steering gear pinion shaft. Refer to Intermediate Steering Shaft Replacement .
 - On the driver's side, disconnect the front wheel speed sensor connector.
 - On the driver's side, disconnect the front lower control front arm from the steering knuckle . Refer to Front Lower Control Front Arm Replacement .
 - On the driver's side, push the front suspension toward the rear of the vehicle.
 - Remove the 4 bolts (1) from the steering gear (2). Click for full-size image
 - On the driver's side, remove the steering gear (2) from the vehicle through the front wheel house.
- Installation Procedure
- Verify the steering gear is in the straight ahead position.
 - Position the steering gear (2) on the front frame. Click for full-size image
 - Install, but do not tighten, the 4 bolts (1) in order to retain the steering gear (2) to the front frame.
 - Tighten the 4 bolts (1) in sequence to 50 Nm (37 lb ft) .
 - Tighten the 4 bolts (1) in sequence an additional 120 degrees .
 - Connect the front lower control front arm to the steering knuckle. Refer to Front Lower Control Front Arm Replacement .
 - Connect the front wheel speed sensor connector.
 - Connect the intermediate steering shaft to the steering gear pinion shaft. Refer to Intermediate Steering Shaft Replacement .
 - Connect the 2 outer tie rod end s to the steering knuckles. Refer to Steering Linkage Outer Tie Rod Replacement .
 - Remove the cap from the power steering gear outlet hose. When fluid begins to flow from the hose, cover the end of the hose with your finger. Ensure the O-ring seal is on the hose and is in good condition.
 - Remove the plug from the steering gear outlet port and quickly connect the power steering gear outlet hose to the steering gear. Refer to Power Steering Gear Outlet Pipe/Hose Replacement .
 - Remove the cap from the power steering gear inlet hose. When fluid starts to flow from the hose, cap the hose with your finger. Ensure the O-ring seal is on the hose and is in good condition.
 - Remove the plug from the steering gear. Connect the power steering gear inlet hose to the steering gear. Refer to Power Steering Gear Inlet Pipe/Hose Replacement .
 - Clean any excess power steering fluid from the vehicle.
 - Remove the drain pans.
 - Install the front tire and wheel assemblies. Refer to Tire and Wheel Removal and Installation .
 - Fill the power steering fluid reservoir . Refer to Checking and Adding Power Steering Fluid .
 - With the key in the ON position and with the engine OFF, turn the steering wheel from stop to stop 12 times.
 - Apply the park brake.
 - Using jack stands, support the front of the vehicle and position the center of the front wheels approximately 61 cm (24 in) off the ground.
 - Lower the rear of the vehicle to the ground.
 - Bleed the power steering system. Refer to Power Steering System Bleeding .
 - Measure and adjust the front toe. refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment .
 - Lower the vehicle.

Steering Gear Replacement (NV9) (Article 13466)

Removal Procedure

- Touch a metal ground point in order to remove your body's static charge before servicing any electronic component; especially after sliding across the vehicle seat.
- Do not touch exposed terminals. Terminals may connect to circuits susceptible the ESD damage.
- Do not allow tools to contact exposed terminals when servicing connectors.
- Do not remove components from their protective packaging until required to do so.
- Avoid the following actions unless required by the diagnostic procedure:

- Jumpering or grounding of the components or connectors.
- Connecting test equipment probes to components or connectors. Connect the ground lead first when using test probes.
- Ground the protective packaging of any component before opening. Do not rest solid-state components on metal workbenches, or on top of TVs, radios, or other electrical devices.
- The steering column
- The intermediate shaft (s)
- The steering gear
- LOCK the steering column and verify the front wheels are in the straight ahead position.
- Use mechanic's wire to secure the radiator and air conditioning condenser assemblies to the vehicle body.
- Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
- Remove the front tire and wheel assemblies. Refer to Tire and Wheel Removal and Installation .
- Disconnect the steering linkage outer tie rod s from the steering knuckle s. Refer to Steering Linkage Outer Tie Rod Replacement .
- Remove the driver's side electronic suspension front position sensor from the vehicle. Refer to Electronic Suspension Front Position Sensor Replacement .
- Disconnect the driver's side front lower control front arm from the drivetrain and front suspension frame assembly. Refer to Front Lower Control Front Arm Replacement .
- Disconnect the driver's side front lower control rear arm from the drivetrain and front suspension frame assembly. Refer to Front Lower Control Rear Arm Replacement .
- Disconnect the driver's side stabilizer shaft link from the stabilizer shaft . Refer to Stabilizer Shaft Link Replacement .
- Disconnect the driver's side front wheel speed sensor electrical connector from the front wheel speed sensor on the steering knuckle . Refer to Front Wheel Speed Sensor Replacement .
- Push the front suspension components on the driver's side of the vehicle toward the rear of the vehicle.
- Disconnect the intermediate steering shaft from the steering gear. Refer to Intermediate Steering Shaft Replacement .
- Disconnect the electrical connectors from steering gear power pack.
- Remove the left and right engine mount nuts that secure the engine mounts to the engine mount brackets. Refer to Engine Mount Replacement - Left Side and Engine Mount Replacement - Right Side .
- Place a screw jack with a block of wood underneath the oil pan/bell housing and lift the engine. Ensure the engine cover does not contact the cowl.
- Loosen the 6 drivetrain and front suspension frame assembly bolts and allow the frame assembly to drop approximately 1 inch. Refer to Drivetrain and Front Suspension Frame Removal and Installation .
- Remove the 4 steering gear bolts (1) from the steering gear (2). Discard the 2 bushing side bolts nearest the power steering gear motor on the right side of the drivetrain and front suspension frame assembly. Click for full-size image
- Remove the steering gear (2) from the vehicle through the left front wheel house.
- Remove the steering linkage outer tie rods from the steering gear. Refer to Steering Linkage Outer Tie Rod Replacement .
- Installation Procedure
- Verify the steering gear is in the straight ahead position.
- Install the steering linkage outer tie rods on the steering gear. Refer to Steering Linkage Outer Tie Rod Replacement .
- Position the steering gear (2) on the vehicle through the left front wheel house. Click for full-size image
- Finger tighten the 4 steering gear bolts (1) to the drivetrain and front suspension frame assembly.
- Tighten the 6 drivetrain and front suspension frame assembly bolts. Refer to Drivetrain and Front Suspension Frame Removal and Installation .
- Tighten the 4 steering gear bolts (1) in sequence to 50 Nm (37 lb ft) .
- Tighten the 4 bolts (1) in sequence an additional 120 degrees .
- Connect the electrical connectors to steering gear power pack.
- Lower the engine onto the left and right engine mounts and remove the screw jack.
- Install the left and right engine mount nuts that secure the engine mounts to the engine mount brackets. Refer to Engine Mount Replacement - Left Side and Engine Mount Replacement - Right Side .
- Connect the intermediate steering shaft to the steering gear. Refer to Intermediate Steering Shaft Replacement .
- Position the front suspension components on the driver's side of the vehicle in their appropriate places.
- Connect the driver's side front wheel speed sensor electrical connector to the front wheel speed sensor on the steering knuckle. Refer to Front Wheel Speed Sensor Replacement .
- Connect the driver's side stabilizer shaft link to the stabilizer shaft. Refer to Stabilizer Shaft Link

Replacement .

- Connect the driver's side front lower control rear arm to the drivetrain and front suspension frame assembly. Refer to Front Lower Control Rear Arm Replacement .
- Connect the driver's side front lower control front arm to the drivetrain and front suspension frame assembly. Refer to Front Lower Control Front Arm Replacement .
- Install the driver's side electronic suspension front position sensor on the vehicle. Refer to Electronic Suspension Front Position Sensor Replacement .
- Connect the steering linkage outer tie rods to the steering knuckles. Refer to Steering Linkage Outer Tie Rod Replacement .
- Install the front tire and wheel assemblies. Refer to Tire and Wheel Removal and Installation .
- Lower the vehicle.
- Remove the mechanic's wire from the radiator and air conditioning condenser assemblies.
- Program the power steering control module . Refer to Power Steering Control Module Programming and Setup .
- Measure and adjust the front toe. Refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment .

Steering Linkage Inner Tie Rod Replacement (N41) (Article 13469)

Callout Component Name

Preliminary Procedures Remove the steering gear boot. Refer to Steering Gear Boot Replacement . Inspect the rack and the inner tie rod for corrosion or contamination on the area covered by the boot. If none is evident, continue with the repair. If corrosion or contamination are evident, replace the steering gear. Refer to Steering Gear Replacement .

Preliminary Procedures

- Remove the steering gear boot. Refer to Steering Gear Boot Replacement .
- Inspect the rack and the inner tie rod for corrosion or contamination on the area covered by the boot. If none is evident, continue with the repair. If corrosion or contamination are evident, replace the steering gear. Refer to Steering Gear Replacement .

1 Steering Linkage Inner Tie Rod Caution: Refer to Fastener Caution . Procedure Use a wrench on the flat areas on the end of the rack in order to hold the rack still. Use a wrench on the flat areas of the inner tie rod housing in order to remove the inner tie rod. Clean the threads on the inner tie rod and on the rack. Remove all traces of adhesive. Evenly apply thread locking adhesive to the threads on the inner tie rod. Refer to Adhesives, Fluids, Lubricants, and Sealers . While holding the rack with a wrench, use a crow foot wrench and a torque wrench in order to install the inner tie rod. After installing the steering linkage inner tie rod, measure and adjust the front toe. refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment . Tighten 89 Nm (66 lb ft)

Procedure

- Use a wrench on the flat areas on the end of the rack in order to hold the rack still. Use a wrench on the flat areas of the inner tie rod housing in order to remove the inner tie rod.
 - Clean the threads on the inner tie rod and on the rack. Remove all traces of adhesive.
 - Evenly apply thread locking adhesive to the threads on the inner tie rod. Refer to Adhesives, Fluids, Lubricants, and Sealers .
 - While holding the rack with a wrench, use a crow foot wrench and a torque wrench in order to install the inner tie rod.
 - After installing the steering linkage inner tie rod, measure and adjust the front toe. refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment .
- 89 Nm (66 lb ft)

Steering Linkage Inner Tie Rod Replacement (NV9) (Article 13471)

Callout Component Name

Preliminary Procedures Remove the steering gear boot. Refer to Steering Gear Boot Replacement . After removing the steering gear boot, inspect the steering linkage inner tie rod for evidence of corrosion or contamination. If none is evident, continue with the repair. If corrosion or contamination is evident, replace the steering gear. Refer to Steering Gear Replacement .

Preliminary Procedures

- Remove the steering gear boot. Refer to Steering Gear Boot Replacement .
- After removing the steering gear boot, inspect the steering linkage inner tie rod for evidence of corrosion or contamination. If none is evident, continue with the repair. If corrosion or contamination is evident, replace the steering gear. Refer to Steering Gear Replacement .

1 Steering Linkage Inner Tie Rod Caution: Refer to Fastener Caution . Procedure To change the driver's side

steering linkage inner tie rod, turn the steering wheel to expose the first two inches of steering gear rack. Hold the rack with a wrench across the two recesses in the rack sides. Care must be taken to avoid any marks or damage on the teeth or on the back of the rack. Use the J-34028 - Inner Tie Rod Wrench in order to remove and install the steering linkage inner tie rod. After installing the steering linkage inner tie rod, measure and adjust the front toe. Refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment . Note: Some steering gears do not have anti-rotation flats on the driver's side of the steering gear rack. Note: To service the passenger side inner tie rod, a second person is required to hold the steering gear rack as explained in the procedure. Tighten 106–126 Nm (78–93 lb ft) Special Tools J-34028 - Inner Tie Rod Wrench For equivalent regional tools, refer to Special Tools .

Procedure

- To change the driver's side steering linkage inner tie rod, turn the steering wheel to expose the first two inches of steering gear rack. Hold the rack with a wrench across the two recesses in the rack sides. Care must be taken to avoid any marks or damage on the teeth or on the back of the rack.

- Use the J-34028 - Inner Tie Rod Wrench in order to remove and install the steering linkage inner tie rod.

- After installing the steering linkage inner tie rod, measure and adjust the front toe. Refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment .

106–126 Nm (78–93 lb ft)

Special Tools

J-34028 - Inner Tie Rod Wrench

All Technical Service Bulletins (itype_100)

Tsbs

- Steering - Power Steering Fluid Leaks (07-02-32-002N, 2013/09/18)

Customer Interest Bulletins (itype_109)

Tsbs

- Steering - Power Steering Fluid Leaks (07-02-32-002N, 2013/09/18)

Steering Linkage Inner Tie Rod Inspection (Article 13467)

Special Tools

J-8001 - Dial Indicator Set

For equivalent regional tools, refer to Special Tools .

- Turn the ignition key to the ON position with the engine OFF.

- With the aid of an assistant, turn the steering wheel to the full stop position and hold the steering wheel in that position until the test is complete. The tie rod being tested should be inside the steering gear housing seated against the steering stop.

- Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .

- If there is not a good location for the J-8001 - Dial Indicator pointer at the steering gear housing, install a large worm gear hose clamp to the steering gear housing over the larger steering gear boot clamp and align the clamp so that the screw can be a location for the J-8001 - Dial Indicator pointer.

- Install the J-8001 - Dial Indicator between the inner tie rod (2) and the steering gear housing or the worm gear clamp in such a way as to measure the lash between the inner tie rod and the steering gear housing. Click for full-size image

- Grasping the tire at the 3 o'clock (2) and 9 o'clock (1) positions, gently push in on one side of the tire in order to remove any lash. Click for full-size image

- Zero the J-8001 - Dial Indicator .

- On the same side of the tire previously pushed in, gently pull out and measure the lash.

- Record the measurement seen on the J-8001 - Dial Indicator .

- If the measured value exceeds 0.5 mm (0.02 in), replace the inner tie rod. Refer to Steering Linkage Inner Tie Rod Replacement .

- Repeat the procedure for the other side.

Leaks (itype_149)

Tsbs

- Steering - Power Steering Fluid Leaks (07-02-32-002N, 2013/09/18)