TOYOTA
SERVICE BULLETIN
Group: 07 No.: 06 Date: Sept 08

Camry ACV40, Aurion GSV40

Power Steering Rack Overhaul Procedure

A revised overhaul procedure has been developed for the Camry 40 series and Aurion 40 series production model vehicles.

This revised procedure also introduces new SST's and a completely new overhaul parts kit.

Production Date

Kit Name	Kit Part Number	Vehicle Production
SST Kit	J49404	From June 2008
Overhaul Parts Kit	04445 – 06200	

Note: This kit will also service the 36 series Camry and the Avalon vehicles.

Flat Rate Time

The standard overhaul time for this power steering rack is 1.25 hours or 75 minutes.

Contents

POWER STEERING
- SST
- RECOMMENDED TOOLS
- EQUIPMENT
- LUBRICANT
- SSM

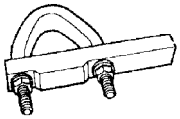
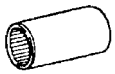
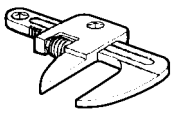
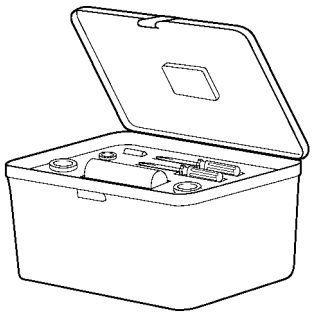
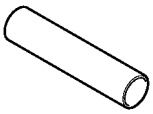
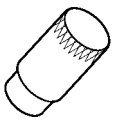
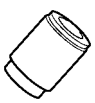
POWER STEERING
- SERVICE DATA
- TORQUE SPECIFICATIONS

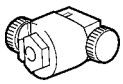
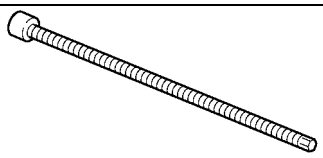
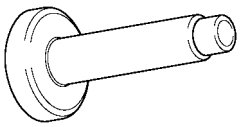
RACK & PINION POWER STEERING GEAR OVERHAUL
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- REPAIR HINT
- DISASSEMBLY
- CLEANING & INSPECTION
- REASSEMBLY

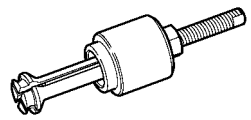
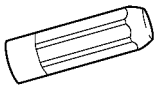
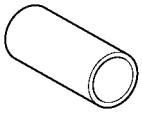
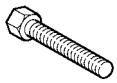
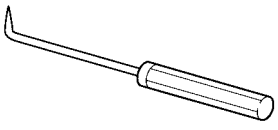
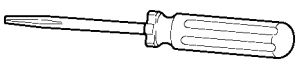
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POWER STEERING

SST

	09023-38200	Union Nut Wrench (Previously Released)
	09612-00012	Rack & Pinion Steering Rack Housing Stand (Previously Released)
	09616-00011	Steering Worm Bearing Adjusting Socket (Previously Released)
	09922-10010	Adjustable tie-rod wrench (Previously Released)
	J-49404	Steering Rack Overhaul Kit
	(J-36418-7A)	Seal Protector Sleeve
	(J-46192-1)	Pinion Seal Protector
	(J-46192-2)	Pinion Ring Sizer
	(J-46193)	Pinion Seal Installer
	(J-49330)	Bearing Protector

	(J-49332)	Piston Ring Install Sleeve
	(J-49334)	Indicator Clamp
	(J-49335)	Rack Seal Remover Mandrel
	(J-49336)	Rack Seal Remover Collar
	(J-49337)	Rack Seal Remover Spindle
	(J-49338)	Rack Seal Remover Nut Casing
	(J-49339)	Rack Seal Remover Nut
	(J-49340)	Rack Seal Remover Thimble
	(J-49341)	Seal Protector Cap
	(J-49342)	Rack Install Mandrel
	(J-49343)	Support
	(J-49344)	Rack Install Protector

	(J-49345)	Pinion Seal Remover
	(J-49346)	Pinion Seal Installer
	(J-49347)	Retaining Wire Remover Spacer
	(J-49348)	Retaining Wire Remover Bolt
	(J-49349)	Retaining Wire Remover Mandrel
	(J-49351)	Retaining Wire Remover Tube
	(J-49352)	Retaining Wire Remover Cap
	(J-49353)	Retaining Wire Remover Nut
	(J-49354)	Retaining Wire Remover Screw
	(J-49355)	Right-angle pick
	(J-49356)	Pick Lever Assist Tool
	(J-49395)	Outer Rack Seal Protector

	(J-49490)	Steering Rack Pressure Test Adaptor

EQUIPMENT

Circlip pliers	
Torque wrench	
Vernier callipers	
Dial indicator	
Feeler gauge	
Micrometer	

LUBRICANT

Power Steering Fluid	Dexron II or III or equivalent
Caltex EP Grease C2 (Cream colour)	Included in repair kit
Adams Shur Stik Multi-purpose Grease (Blue colour)	Included in repair kit

SSM

Thread-lock adhesive	Loctite 638 or equivalent

POWER STEERING

Service Data

Refer to the repair manual ST02NEQ.

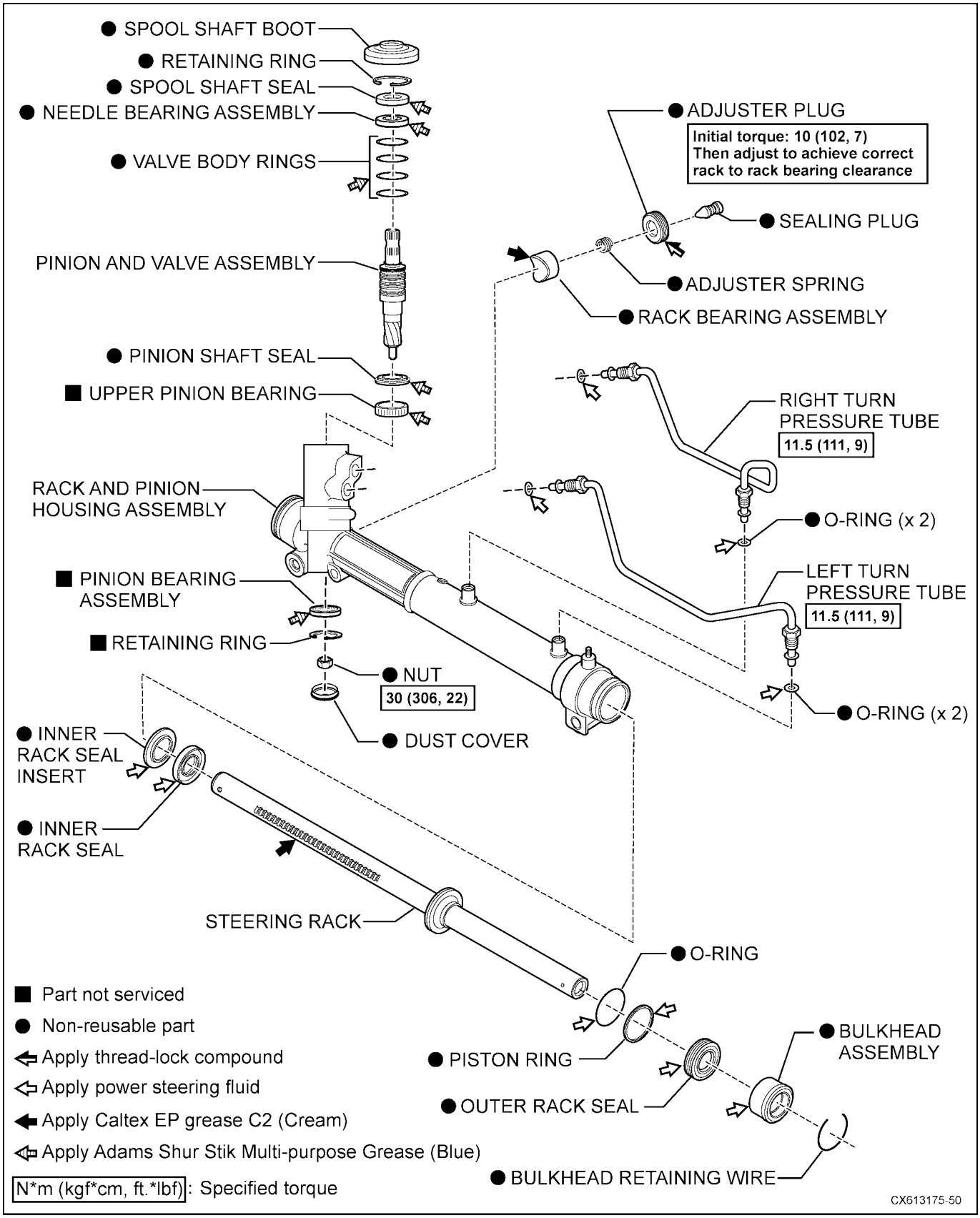
Torque Specifications

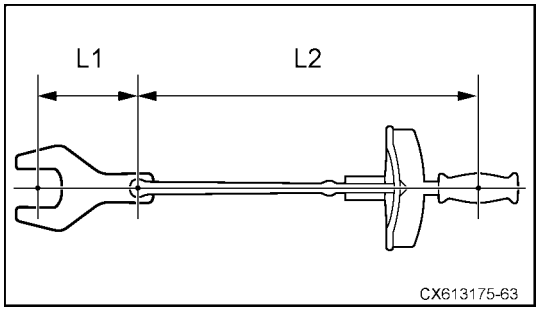
Part tightened	N*m	kgf*cm	ft.*lbf
Adjuster nut x Rack and pinion housing assembly	10 [1]	102*	7*
Right turn pressure tube x Rack and pinion housing assembly	11.5 [2]	111	9
Left turn pressure tube x Rack and pinion housing assembly	11.5 [2]	111	9
Pinion and valve assembly nut	30	306	22

1: Initial torque. Then adjust to achieve correct rack to rack bearing clearance
2: With torque wrench with a fulcrum length or 345 mm.

RACK & PINION POWER STEERING GEAR OVERHAUL

COMPONENTS





REPAIR HINT

1. TIGHTENING TORQUE WHEN USING TORQUE WRENCH WITH SST OR EXTENSION TOOL

(a) When tightening a component using a torque wrench combined with a SST or extension tool, the following formula must be used to calculate the correct torque value.

NOTICE:

If this formula is not applied to the specified torque value when using a SST or extension, the value will be excessive and parts will be damaged.

Formula:

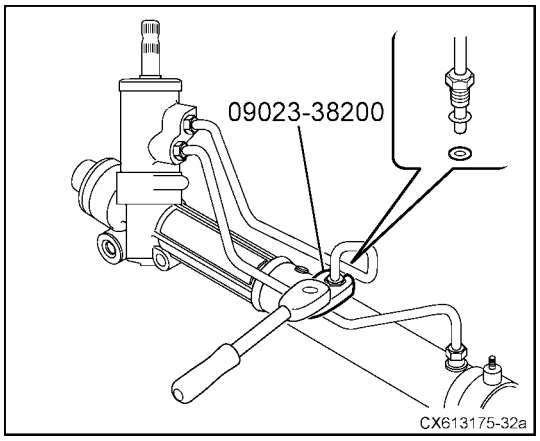
T' = L2 / (L1 + L2) x T

Item	Description	Example
T'	New torque value	—
T	Specified torque	13 Nm
L1	Length of SST or extension	50 mm
L2	Length of torque wrench	200 mm

Example:

T' = 200 / (50 + 200) x 13
(200 / 250 x 13 = 10.4)
T' = 10.4 Nm

DISASSEMBLY

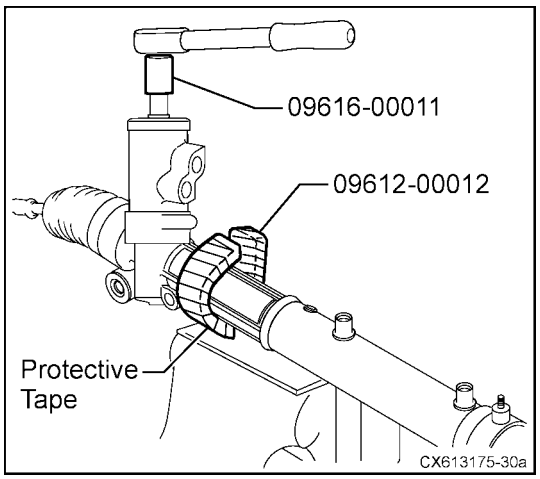


1. REMOVE PRESSURE TUBES

(a) Using SST, remove the left turn and right turn pressure tubes.
SST: 09023-38200

(b) Remove and discard the 2 O-rings from each tube.

(c) If required, drain any remaining oil from the steering rack.



2. SECURE RACK AND PINION POWER STEERING GEAR ASSEMBLY

(a) Using the SST, secure the rack and pinion housing in a vice.
SST: 09612-00012
HINT:
- Tape the SST before use.
- Fit the SST onto the pinion end of the housing.
- To prevent damage, do not over-tighten the SST onto the housing.
- If the SST is difficult to install, remove the pressure tubes.

(b) Using the SST, centre the steering rack within the housing.
SST: 09616-00011

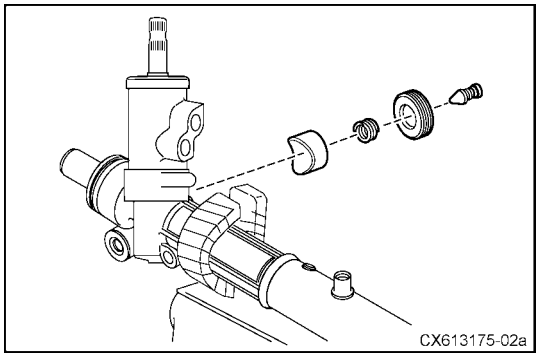
2. REMOVE STEERING RACK BOOT CLIP
(Refer to the repair manual ST02NEQ)

3. REMOVE NO. 2 STEERING RACK BOOT CLAMP
(Refer to the repair manual ST02NEQ)

4. REMOVE NO. 2 STEERING RACK BOOT
(Refer to the repair manual ST02NEQ)

5. REMOVE NO. 1 STEERING RACK BOOT
(Refer to the repair manual ST02NEQ)

6. REMOVE STEERING RACK END SUB-ASSEMBLY
(Refer to the repair manual ST02NEQ)

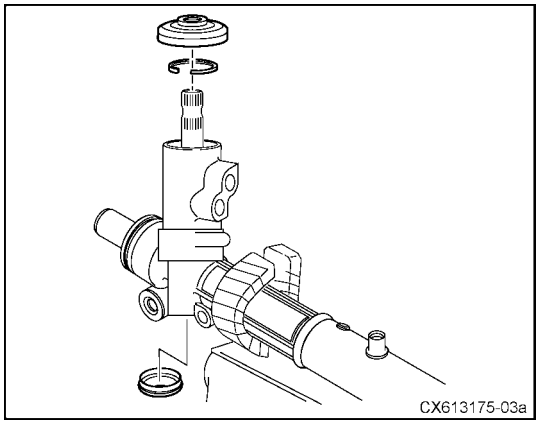


8. REMOVE RACK BEARING ASSEMBLY

(a) Remove and discard the sealing plug.

(b) Using a 19 mm hex socket, remove and discard the adjuster plug, adjuster spring and rack bearing assembly.

NOTICE:
Thread-locking compound is applied to the adjuster plug during manufacture and the plug will be difficult to remove. Carefully rotate the plug back and forth during removal to avoid damaging the housing thread.



9. REMOVE PINION AND VALVE ASSEMBLY

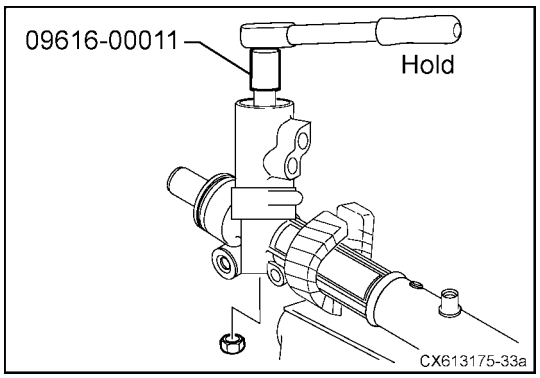
(a) Remove and discard the spool shaft boot.

(b) Remove excess grease.

(c) Remove and discard the retaining ring from the top of the rack and pinion housing.

HINT:
If required, tap the spool shaft seal with a circular punch to assist removal.

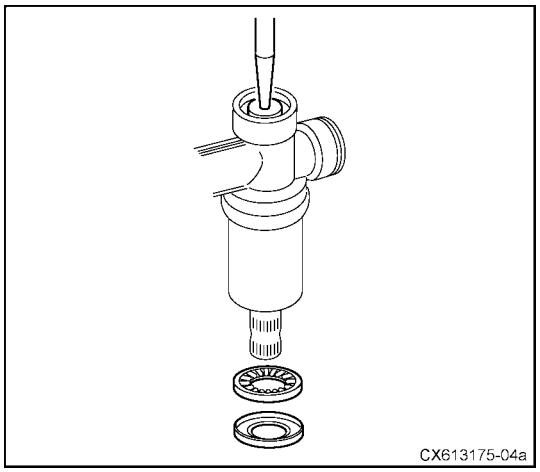
(d) Remove and discard the dust cover from the bottom of the housing.



NOTICE:
The spool shaft must be held in place during the following procedure.

(e) Using SST, hold the spool shaft.
SST: 09616-00011

(f) Remove and discard the nut from the lower end of the pinion and valve assembly.



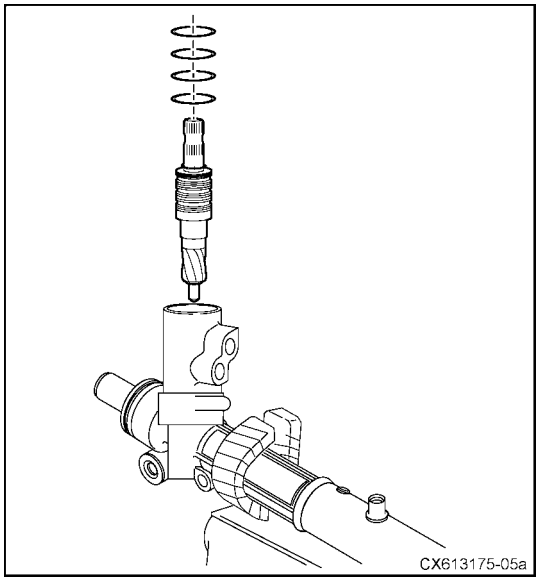
NOTICE:
When performing the following procedure, do not completely remove the pinion and valve assembly from the rack and pinion housing. Press the pinion end of the valve assembly only far enough to allow removal of the spool shaft seal and the needle bearing assembly. Put an oil pan below the rack and pinion housing.

(g) Remount the rack and pinion housing in the vice upside down.

(h) Gently tap a brass centre punch on the threaded end of the valve assembly to remove only the spool shaft seal and needle bearing assembly.

(i) Discard the spool shaft seal and the needle bearing assembly.

(j) Remount the rack and pinion housing in the vice correct way up.

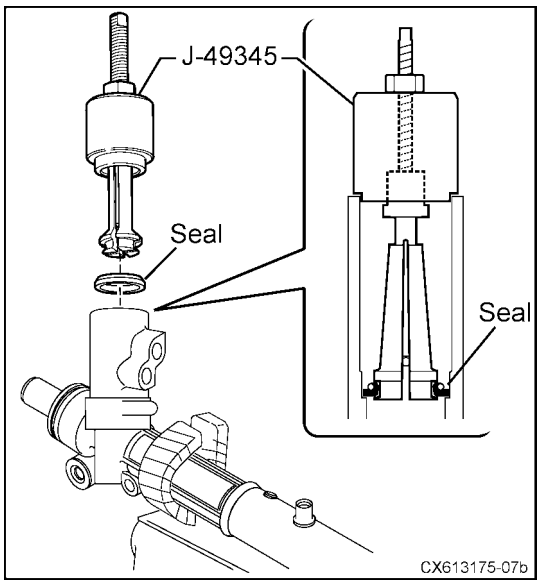


(k) Gently pull the valve assembly out of the rack and pinion housing.

NOTICE:
Do not damage the pinion and valve assembly or the inside of the rack and pinion housing during removal.

(l) Remove and discard the valve body rings from the valve assembly.

NOTICE:
Do not damage the valve assembly when removing the valve body rings.



10. REMOVE PINION SHAFT SEAL

(a) Remove the excess grease from the pinion shaft seal.

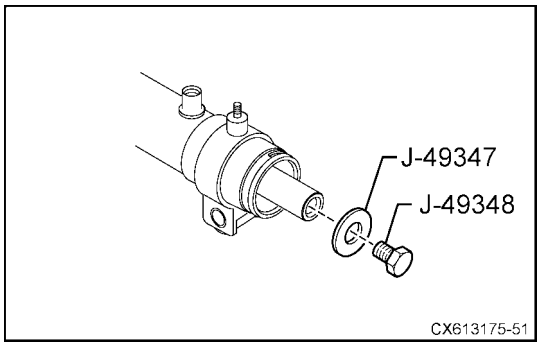
(b) Prepare the SST by loosening the nut to the top of the thread.
SST: J-49345

(c) Carefully insert the SST into the housing and while holding the top of the expander, turn the thread to expand the tool onto the seal.

(d) Lower the collar onto the housing and turn the nut to withdraw the seal from the housing.

(e) Remove the seal from the SST and discard.

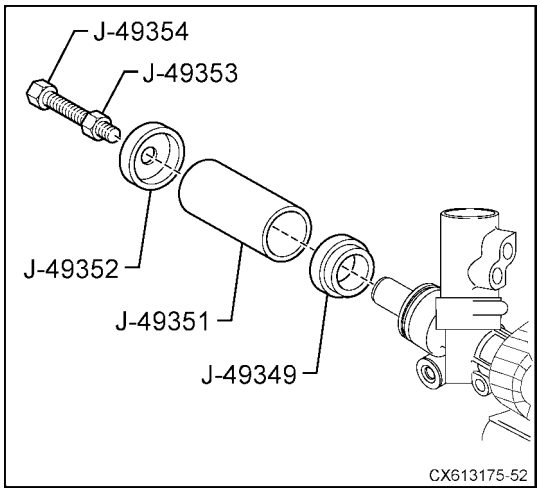
NOTICE:
Do not damage the inside of the rack and pinion housing during removal.



11. REMOVE STEERING RACK, OUTER RACK SEAL AND BULKHEAD ASSEMBLY

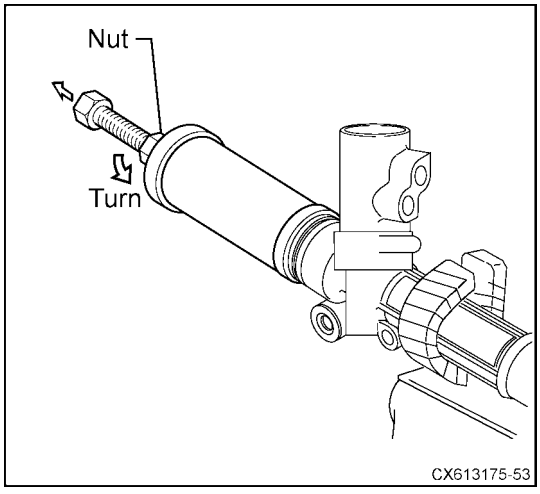
(a) Move the steering rack to the bulkhead end of the rack and pinion housing.

(b) Install the SSTs on to the steering rack.
SST: J-49347, J-49348

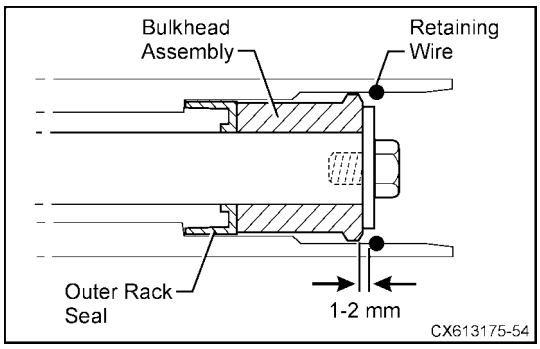


(c) Move the steering rack to the pinion housing end.

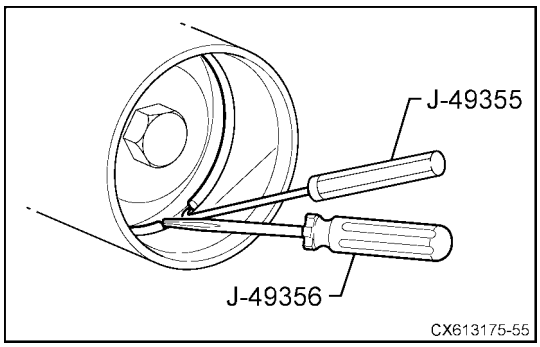
(d) Install the SSTs to the pinion end of the rack and pinion housing
SST: J-49349, J-49351, J-49352, J-49353, J-49354



(e) Tighten the SST nut (J-49353).
As the nut is tightened, the steering rack is withdrawn to the pinion end, compressing the outer rack seal and providing clearance between the bulkhead assembly and the retaining wire.

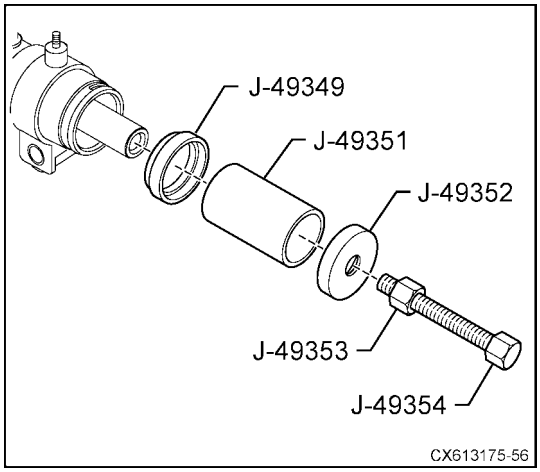


Turn the nut to provide approximately 1 – 2 mm clearance.



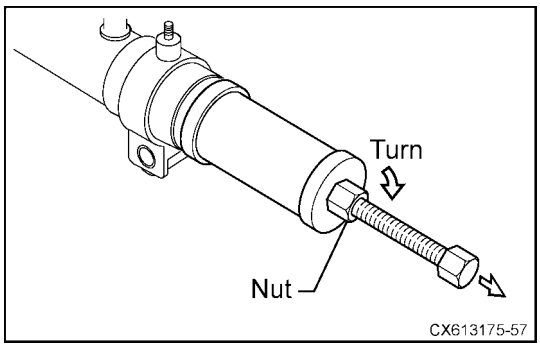
(f) Using SSTs, carefully remove the retaining wire
SST: J-49355, J-49356
HINT:
Use SST J-49355 to hook under the wire while supporting it with SST J-49356.

(g) Remove the SSTs.



(h) Move the steering rack to the bulkhead end.

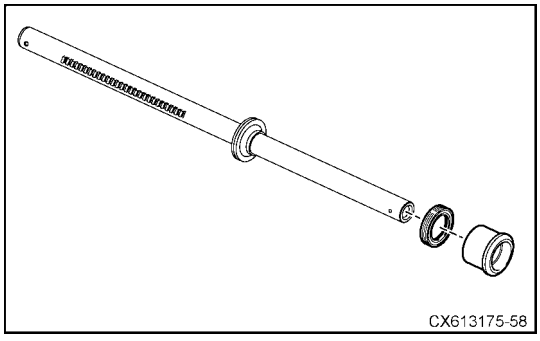
(i) Install the SSTs to the bulkhead end of the rack and pinion housing
SST: J-49349, J-49351, J-49352, J-49353, J-49354



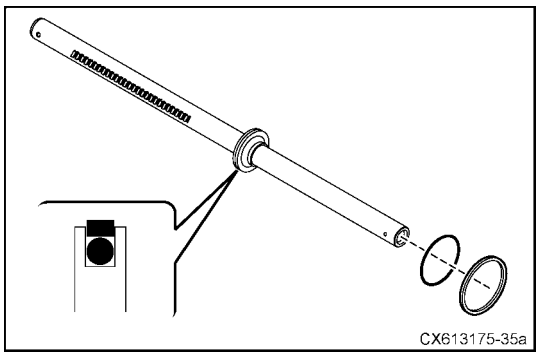
(j) Tighten the SST nut (J-49353).
As the nut is tightened, the steering rack, outer rack seal and bulkhead assembly is withdrawn from the housing.

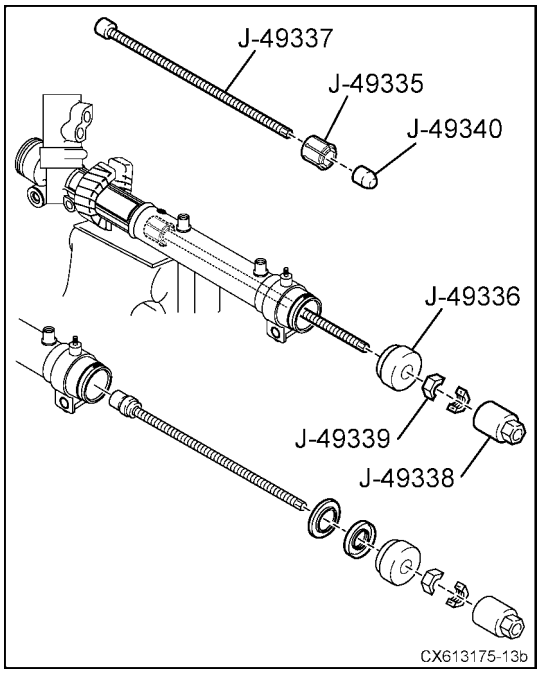
(k) When the nut becomes loose, remove the steering rack, outer rack seal and bulkhead assembly from the housing.

(l) Remove the SSTs.



(m) Remove and discard the bulkhead assembly and outer rack seal from the steering rack.





12. REMOVE PISTON RING AND O-RING

(a) Remove and discard the Teflon piston ring from the steering rack.

(b) Remove and discard the O-ring from the steering rack.

NOTICE:

Do not damage the rack and piston when removing the rings.

13. REMOVE INNER RACK SEAL AND INSERT

(a) Assemble seal remover mandrel (**SST: J-49335**) and thimble (**SST: J-49340**) onto the spindle (**SST: J-49337**).

NOTICE:

Do not damage the rack and pinion housing when using the SST.

(b) Very carefully, insert the SST assembly into the rack and pinion housing from the pinion end.

(c) Remove the thimble.

(d) Fit the collar (**SST: J-49336**) onto the thread and seat it in the end of the housing.

(e) Fit the nut halves (**SST: J-49339**) over the thread and secure with the nut casing (**SST: J-49338**).

(f) While holding the spindle, tighten the nut casing to withdraw the inner rack seal and inner rack seal insert from the housing.

NOTICE:

Initially turn the nut casing slowly.

(g) Discard the inner rack seal and the insert.

CLEANING & INSPECTION

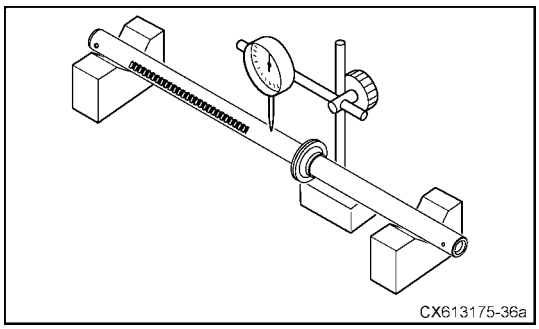
1. CLEAN AND INSPECT

NOTICE:

- **If the power steering fluid or the rack and pinion lubricating grease is not contaminated, do not wash the rack and pinion housing.**
- **Remove the thread-lock compound from the adjuster plug opening thread.**
- **Inspect the pinion bearings. If they are damaged, scratched or there are excessive wear marks, the rack and pinion power steering gear assembly will require replacement.**
- **Ensure all sharp edges and burrs are removed to prevent damage to seals during reassembly.**

(a) Thoroughly wash, clean and dry all parts.

(b) Inspect the parts for wear and damage. Repair or replace as required.



2. INSPECT STEERING RACK

(a) Using a dial indicator, check the power steering rack for run-out.
Maximum run-out: 0.3 mm (0.012 in)

(b) Check the teeth for wear and damage.

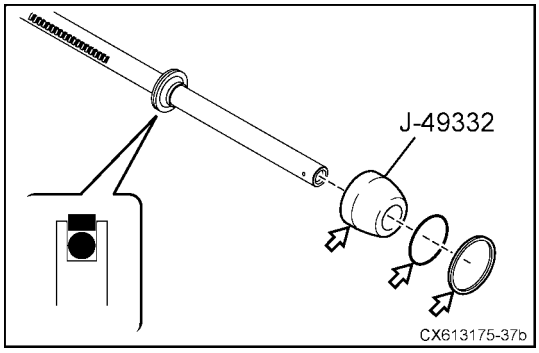
(c) Check the back surface for wear and damage.

3. INSPECT TIE ROD ASSEMBLY LH
(Refer to the repair manual ST02NEQ)

4. INSPECT TIE ROD ASSEMBLY RH
(Refer to the repair manual ST02NEQ)

5. INSPECT TOTAL PRELOAD
(Refer to the repair manual ST02NEQ)

REASSEMBLY



1. INSTALL PISTON RING AND O-RING

(a) Install the SST over the steering rack.
SST: J-49332

(b) Lubricate the outside of the SST with power steering fluid.

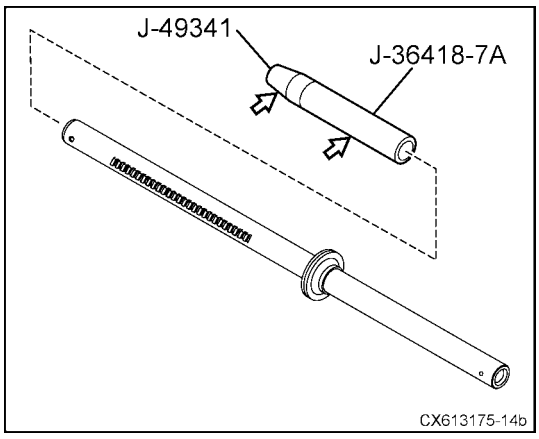
(c) Slide a new O-ring over the SST and into the piston groove.

(d) Slide a new Teflon piston ring over the SST and into the piston groove, over the O-ring.

NOTICE:
Use care when fitting the O-ring and piston ring to avoid damage to the rings and piston.

(e) Lubricate the rings once installed with power steering fluid.

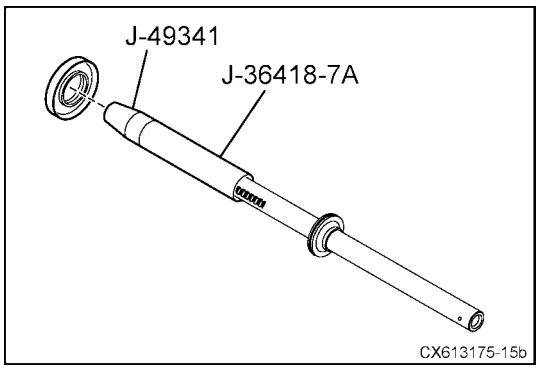
(f) Install the SST over the piston and seals for a period of time to size the seals to the correct diameter prior to installation of the steering rack into the rack and pinion housing.
SST: J-49344



2. INSTALL INNER RACK SEAL AND INSERT

(a) Assemble the SST and install over the steering rack teeth.
SST: J-49341, J-36418-7A

(b) Lubricate the outside of the SST with power steering fluid.



(c) Slide a new inner rack seal over SST J-49341 and onto SST J-36418-7A.

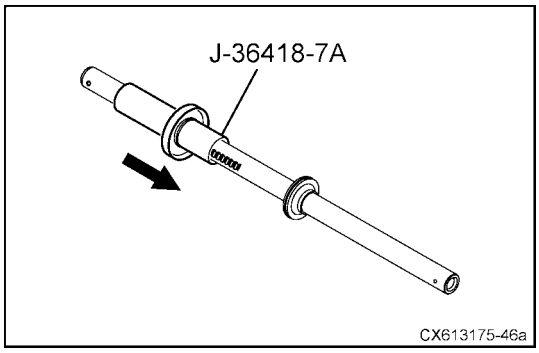
NOTICE:

Use care when fitting the inner rack seal to avoid damage to the seal.

HINT:

Ensure the seal is installed in the direction shown.

(d) Remove the SST J-49341.



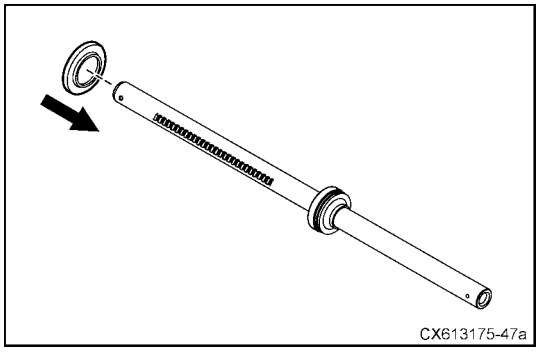
(e) Slide the SST J-36418-7A with the new seal over the rack teeth toward the piston.

HINT:

Ensure the seal does not touch the teeth.

(f) Push the seal up against the piston.

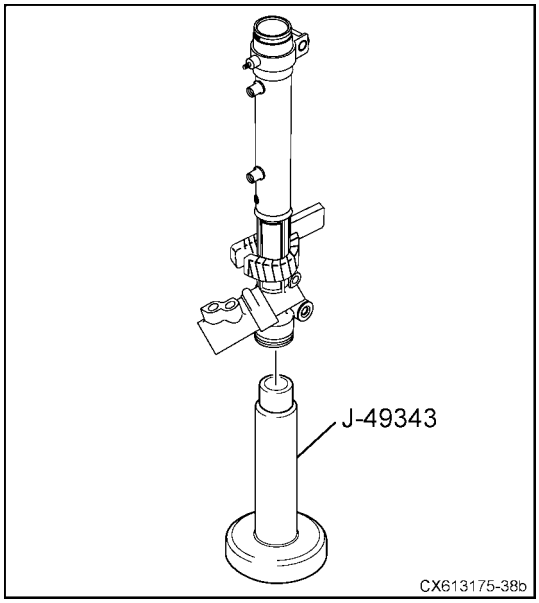
(g) Remove the SST.



(h) Install a new inner rack seal insert.

HINT:

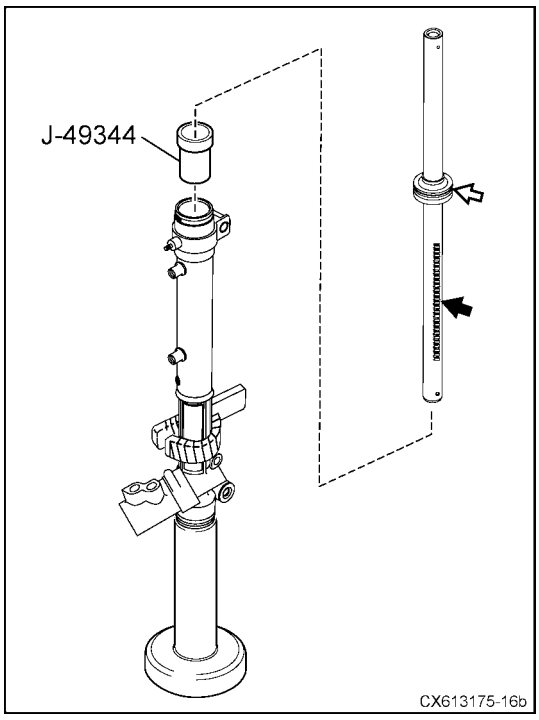
Ensure the seal insert is installed in the direction shown.



3. STEERING RACK ASSEMBLY

(a) Remove the rack and pinion housing from the vice and fit the SST into the pinion housing end.
SST: J-49343

(b) Stand the rack and pinion housing with the SST on the floor.



(c) Insert the small end of the SST into the rack and pinion housing.
SST: J-49344

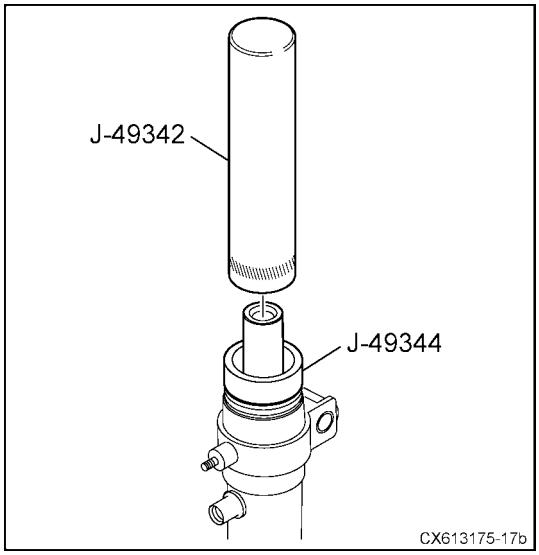
(d) Apply grease to the steering rack teeth.
Grease: Caltex EP grease C2 (Cream)

(e) Lubricate the steering rack seals and SST with power steering fluid and install the rack into the rack and pinion housing.

NOTICE:
Use care when installing the steering rack to avoid damage to the sealing surface and seals.

HINT:

Have the teeth facing away from the rack bearing opening.



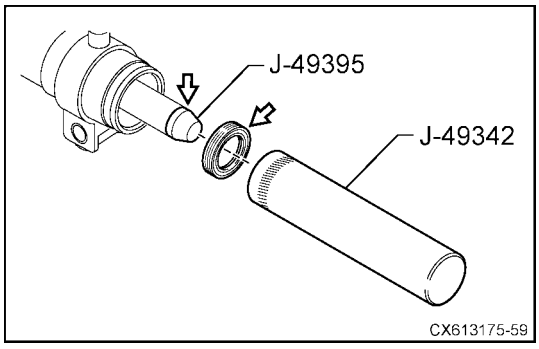
(f) Fit the SST to the end of the steering rack.
SST: J-49342

(g) Push down on the SST to install the inner rack seal and insert into the rack and pinion housing.

HINT:

- Ensure the inner rack seal and insert are fully seated.
- If required, tap the SST with a mallet.

(h) Remove the SSTs and place the rack and pinion housing back in the vice.



4. INSTALL OUTER RACK SEAL AND BULKHEAD ASSEMBLY

(a) Fit the SST onto the end of the steering rack.
SST: J-49395

(b) Lubricate the SST and a new outer rack seal with power steering fluid.

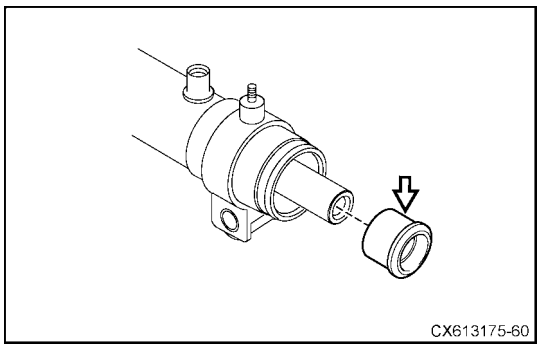
(c) Fit the seal onto the steering rack and remove the SST.

HINT:

Ensure the seal is correctly orientated.

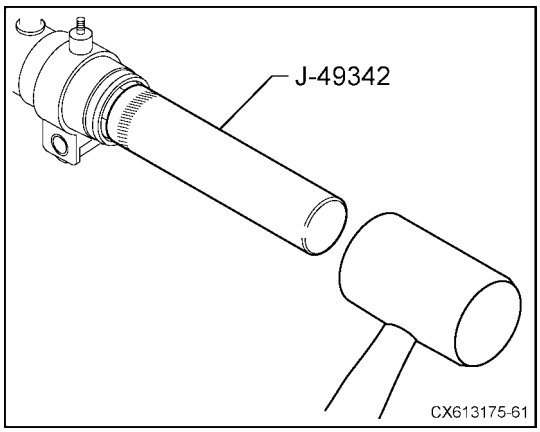
(d) Use the SST by hand to insert the seal part way into the rack and pinion housing.
SST: J-49342

NOTICE:
Use care not to damage the seal.

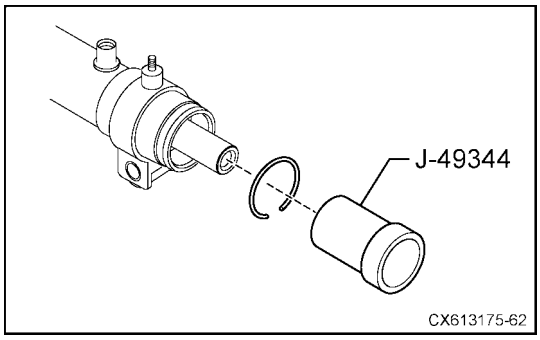


(e) Lubricate a new bulkhead assembly with power steering fluid.

(f) Fit the bulkhead assembly onto the steering rack and insert it into the rack and pinion housing.



(g) Using the SST and a rubber mallet, fully install all parts against the shoulder inside the rack and pinion housing.
SST: J-49342

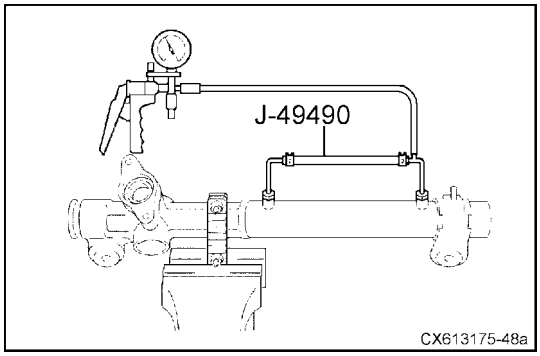


(h) Carefully insert the bulkhead retaining wire into the housing.

(i) Using the SST, push the wire into the housing until the wire is fully installed.
SST: J-49344

HINT:
An audible ‘click’ will be heard when the wire seats in its recess.

(j) Inspect the wire to ensure it is correctly seated.

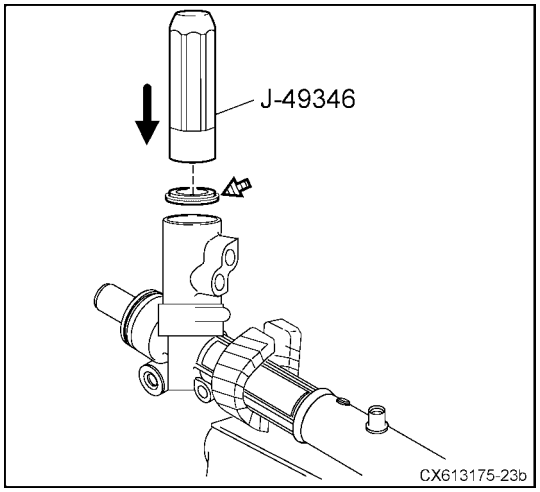


5. AIR TIGHTNESS TEST

(a) Install the SST to the rack housing.
SST: J-49490

(b) Apply vacuum of 53 kPa (400 mmHg, 15.75 in.Hg) for approximately 30 seconds.

(c) Check there is no change in the vacuum.
If there is a change in the vacuum, check the installation of the oil seals.

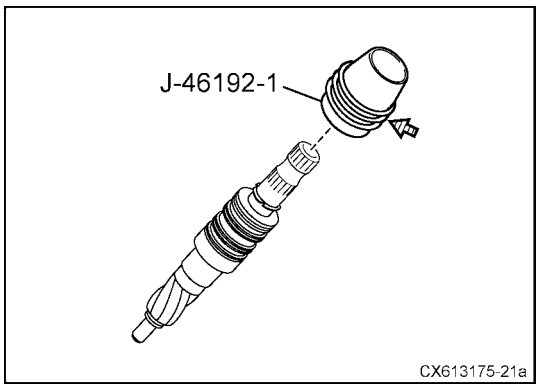


6. INSTALL PINION SHAFT SEAL

(a) Lubricate a new pinion shaft seal with grease.
Grease: Adams Shur Stik Multi-purpose (Blue)

(b) Fit seal onto the SST and fully install the seal into the housing.
SST: J-49346

HINT:
Ensure the seal is installed with the spring facing up.



7. INSTALL VALVE BODY RINGS

(a) Lubricate the SST with grease.
SST: J-46192-1
Grease: Adams Shur Stik Multi-purpose (Blue)

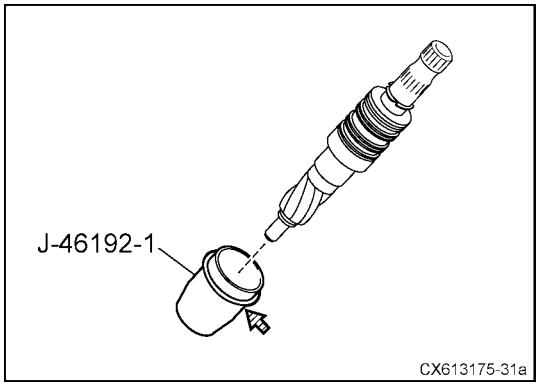
(b) Install three new upper valve body rings on the SST from the tapered end.

(c) Use the SST to install the rings on to the pinion and valve assembly starting from the third ring, then withdrawing the tool and fitting the second then first rings.

NOTICE:
Use care when installing the valve body rings to avoid damage to the rings and the pinion and valve assembly.

(d) Remove the SST.

(e) Seat the valve body rings into the grooves by hand.



(f) Lubricate the SST with grease.
SST: J-46192-1
Grease: Adams Shur Stik Multi-purpose (Blue)

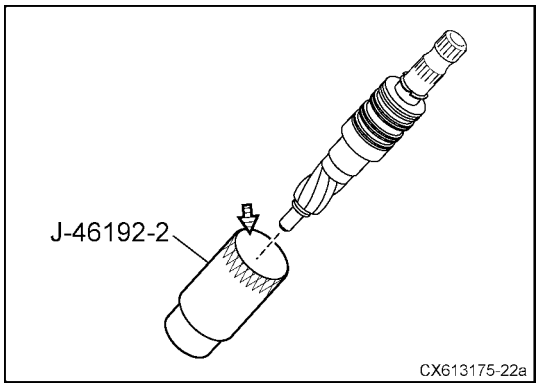
(g) Install a new lower valve body ring on the SST.

(h) Use the SST to install the ring on to the pinion and valve assembly.

NOTICE:
Use care when installing the valve body ring to avoid damage to the ring and the pinion and valve assembly.

(i) Remove the SST.

(j) Seat the valve body ring into the groove by hand.

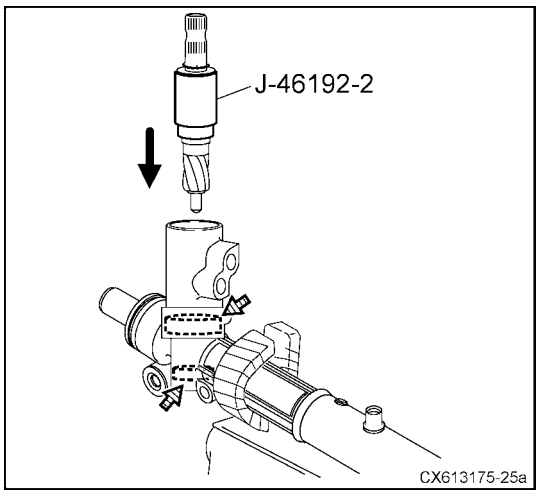


8. INSTALL PINION AND VALVE ASSEMBLY

(a) Lubricate the inside of the SST with grease.
SST: J-46192-2
Grease: Adams Shur Stik Multi-purpose (Blue)

(b) Slide the SST over the spool shaft to compress the valve body rings.

HINT:
Let it stand for at least two minutes.



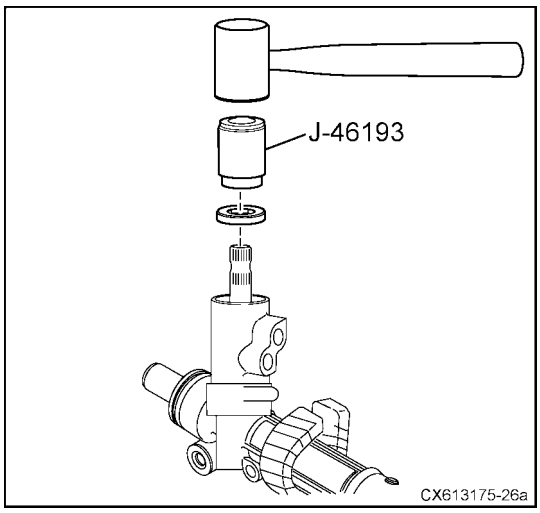
(c) Apply grease to the upper pinion bearing and pinion bearing assembly.
Grease: Adams Shur Stik Multi-purpose (Blue)

(d) Position the steering rack central within the housing.

(e) With the SST still on the pinion and valve assembly, install the assembly into the housing.

NOTICE:
- **Use care when installing the pinion and valve assembly to avoid damage to the housing and valve body rings.**
- **Ensure the rack teeth are aligned with the pinion teeth.**

(f) Remove the SST from the housing and verify the pinion and valve assembly is correctly seated.



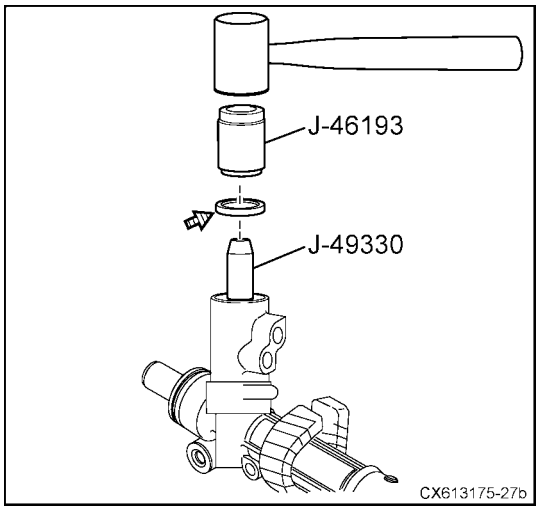
(g) Apply grease to the new needle bearing assembly.
Grease: Adams Shur Stik Multi-purpose (Blue)

(h) Install the new needle bearing assembly onto the spool shaft of the pinion and valve assembly.

HINT:
Ensure the bearings in the needle bearing assembly are facing down.

(i) Using the larger end of the SST and a mallet, gently tap the needle bearing assembly into the rack and pinion housing.
SST: J-46193

(j) Remove the SST from the housing.



(k) Install the SST onto the spool shaft.
SST: J-49330

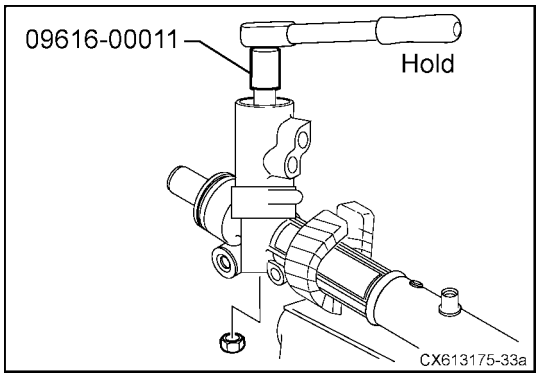
(l) Lubricate the SST and new spool shaft seal with grease.
Grease: Adams Shur Stik Multi-purpose (Blue)

(m) Install the seal onto the spool shaft of the pinion and valve assembly.

HINT:
Ensure the seal is installed with the lip facing down.

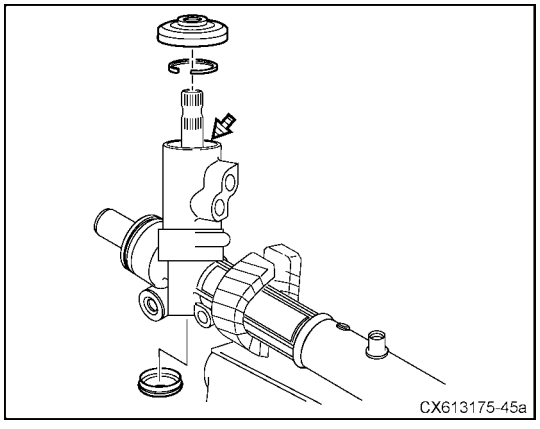
(n) Using the smaller end of the SST and a mallet, gently tap the spool shaft seal into the housing.
SST: J-46193

(o) Remove the SSTs from the housing and spool shaft.



NOTICE:
The spool shaft must be held in place during the following step.

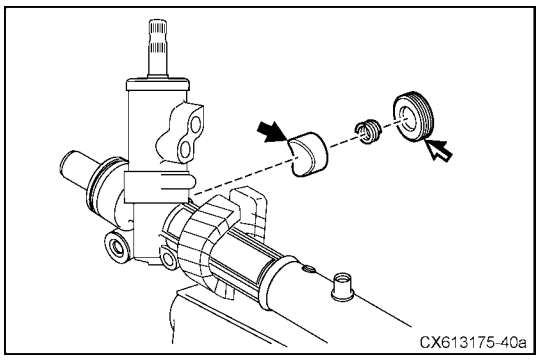
(p) Install the new nut onto the pinion and valve assembly while holding the spool shaft with the SST.
SST: 09616-00011
Torque: 30 Nm (306 kgf*cm, 22 ft.*lb)



(q) Install a new dust cover onto the housing.

(r) Install the new retaining ring into the groove in the top of the housing.

(s) Pack the top of the spool shaft seal with grease and install the new spool shaft boot.
Grease: Adams Shur Stik Multi-purpose (Blue)



9. INSTALL RACK BEARING ASSEMBLY

(a) Centre the steering rack.

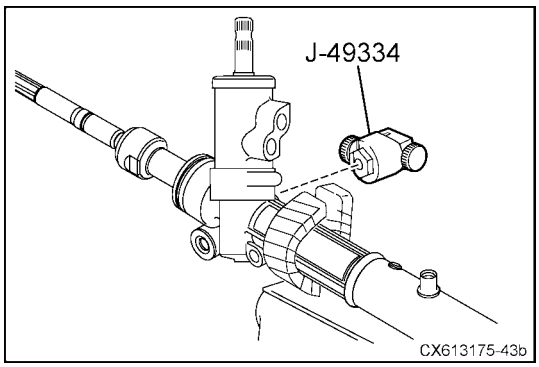
(b) Lubricate a new rack bearing assembly with grease.
Grease: Caltex EP grease C2 (Cream)

(c) Apply thread-lock compound to a new adjuster plug.
Thread-lock compound:
Loctite 638 or equivalent

(d) Install the rack bearing assembly, a new adjuster spring and the adjuster plug.

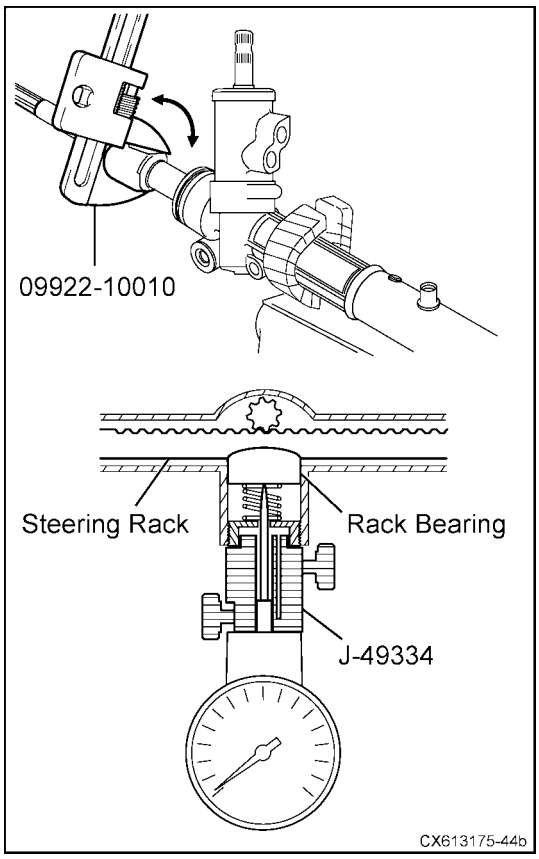
(e) Tighten the adjuster plug
Torque: 10 Nm (102 kgf*cm, 7 ft.*lb).

(f) Install steering rack end sub-assembly.
(Refer to the repair manual ST02NEQ)



(g) Fit the SST to the adjuster plug and tighten the screw to secure the SST.
SST: J-49334

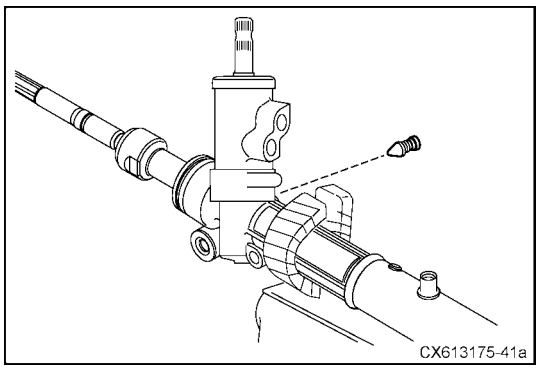
(h) Fit a dial indicator onto the SST and set the dial indicator to 0.



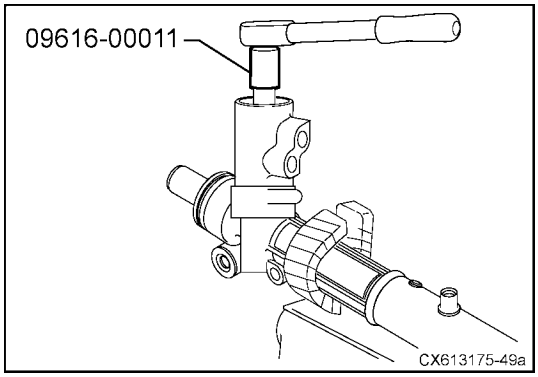
(i) Rotate the steering rack clockwise and anti-clockwise using the SST attached to the tie rod and note the reading on the dial indicator.
SST: 09922-10010
Rack guide clearance: 0.03 mm to 0.06 mm

(j) If the clearance is not as specified, tighten or loosen the adjuster plug until specification is achieved.

(k) Remove the dial indicator and SSTs.

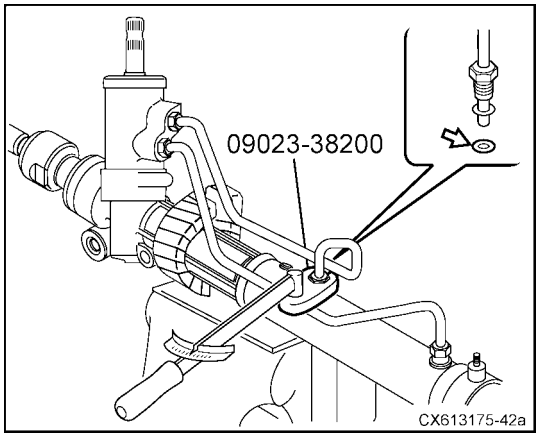


(l) Insert a new sealing plug.



10. CHECK OPERATION

(a) Using SST, rotate the pinion to move the steering rack from lock to lock and check for smooth operation with no binding or roughness.
SST: 09616-00011



11 INSTALL PRESSURE TUBES

HINT:
If required, remove the steering rack from the SST.

(a) Coat 2 new O-rings with power steering fluid and install onto each pressure tube.

(b) Install the pressure tubes and tighten with SST.
SST: 09023-38200
Torque:
(1) 11.5 Nm (111 kgf*cm, 9 ft.*lb)
(2) 13 Nm (132 kgf*cm, 9.6 ft.*lb)

HINT:
1: Torque specification when using a torque wrench with a fulcrum length of 345 mm.
2: Torque when using a torque wrench with a different fulcrum length see *'Repair Hint', on page* ***PS-2***

12. INSTALL NO. 1 STEERING RACK BOOT
(Refer to the repair manual ST02NEQ)

13. INSTALL NO. 2 STEERING RACK BOOT
(Refer to the repair manual ST02NEQ)

14. INSTALL NO. 2 STEERING RACK BOOT CLAMP
(Refer to the repair manual ST02NEQ)

15. INSTALL STEERING RACK BOOT CLIP
(Refer to the repair manual ST02NEQ)

16. INSTALL RACK AND PINION POWER STEERING GEAR ASSEMBLY
(Refer to the repair manual ST02NEQ)

17. FLUSH POWER STEERING SYSTEM
(Refer to the repair manual ST02NEQ)

18. BLEED POWER STEERING SYSTEM
(Refer to the repair manual ST02NEQ)