
SECTION 3A

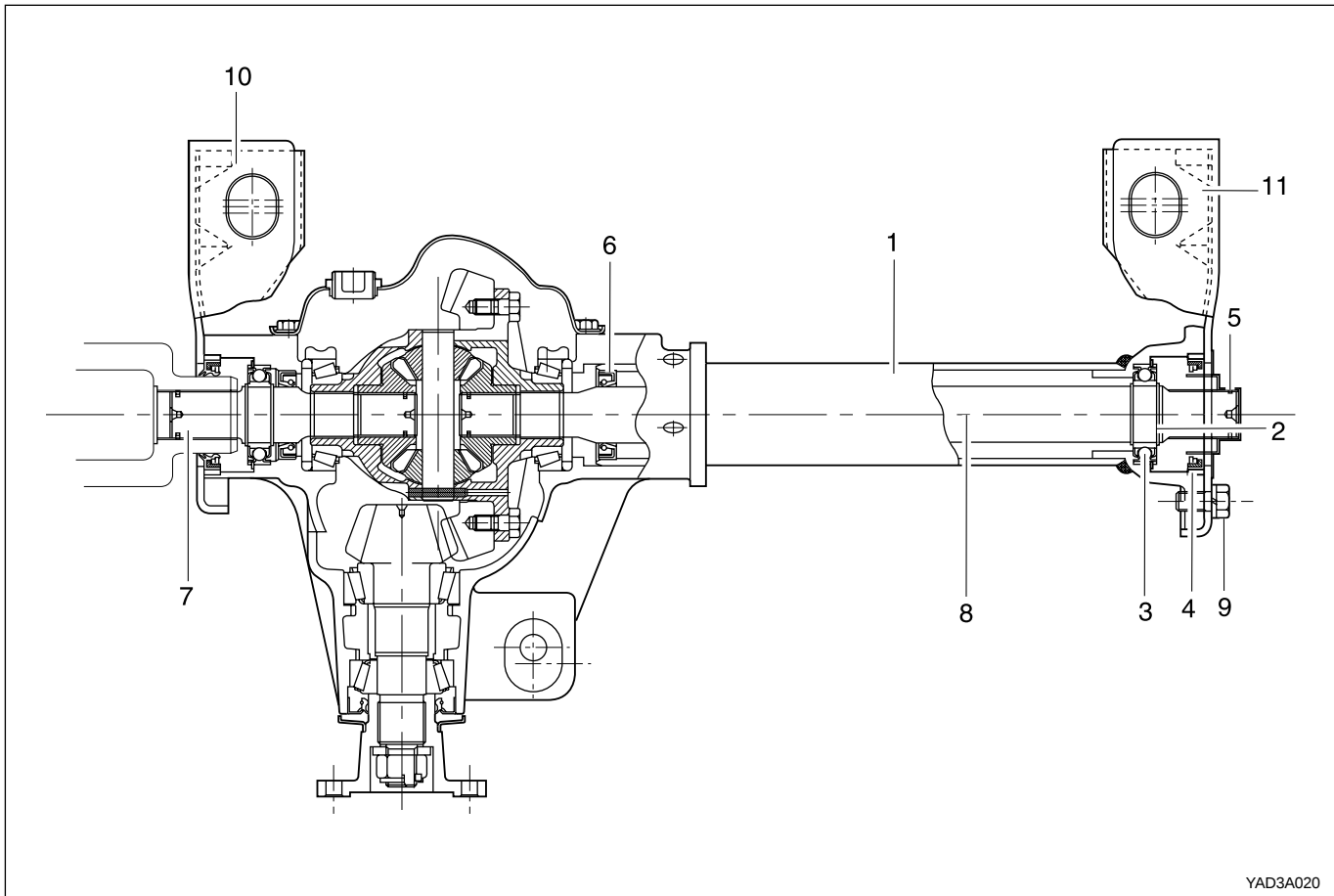
FRONT AXLE

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GENERAL DESCRIPTION AND OPERATION

FRONT AXLE HOUSING ASSEMBLY

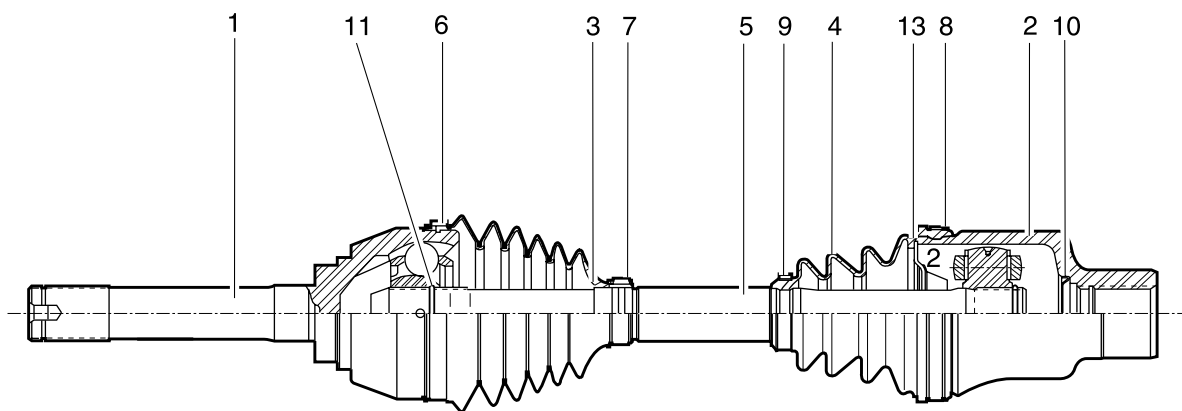


YAD3A020

- | | |
|----------------------|----------------------------|
| 1 Axle Tube Assembly | 7 Inner Shaft (LH) |
| 2 Snap Ring | 8 Inner Shaft (RH) |
| 3 Ball Bearing | 9 Bolt |
| 4 Oil Seal | 10 Front Axle Bracket (LH) |
| 5 Protector | 11 Front Axle Bracket (RH) |
| 6 Retainer | |

The front axle is installed between the left and right wheel. It have the function which transfers the power of engine to the wheels. Especially, it transfers the high power to the front wheels when driving 4-wheel.

The axle shaft connected with CV joint in left/right of axle and differential carrier in center is installed. The length of left/right axle shaft is different and the structure is independent. Both ends part of shaft is fixed with the spline.

AXLE SHAFT ASSEMBLY

YAD3A030

- | | |
|---------------------|---------------|
| 1 Drive Shaft | 7 Boot Band |
| 2 Housing (Inboard) | 8 Boot Band |
| 3 Boot (Outboard) | 9 Boot Band |
| 4 Boot (Inboard) | 10 Seal |
| 5 Shaft | 11 Ball Joint |
| 6 Boot Band | |

SPECIFICATIONS

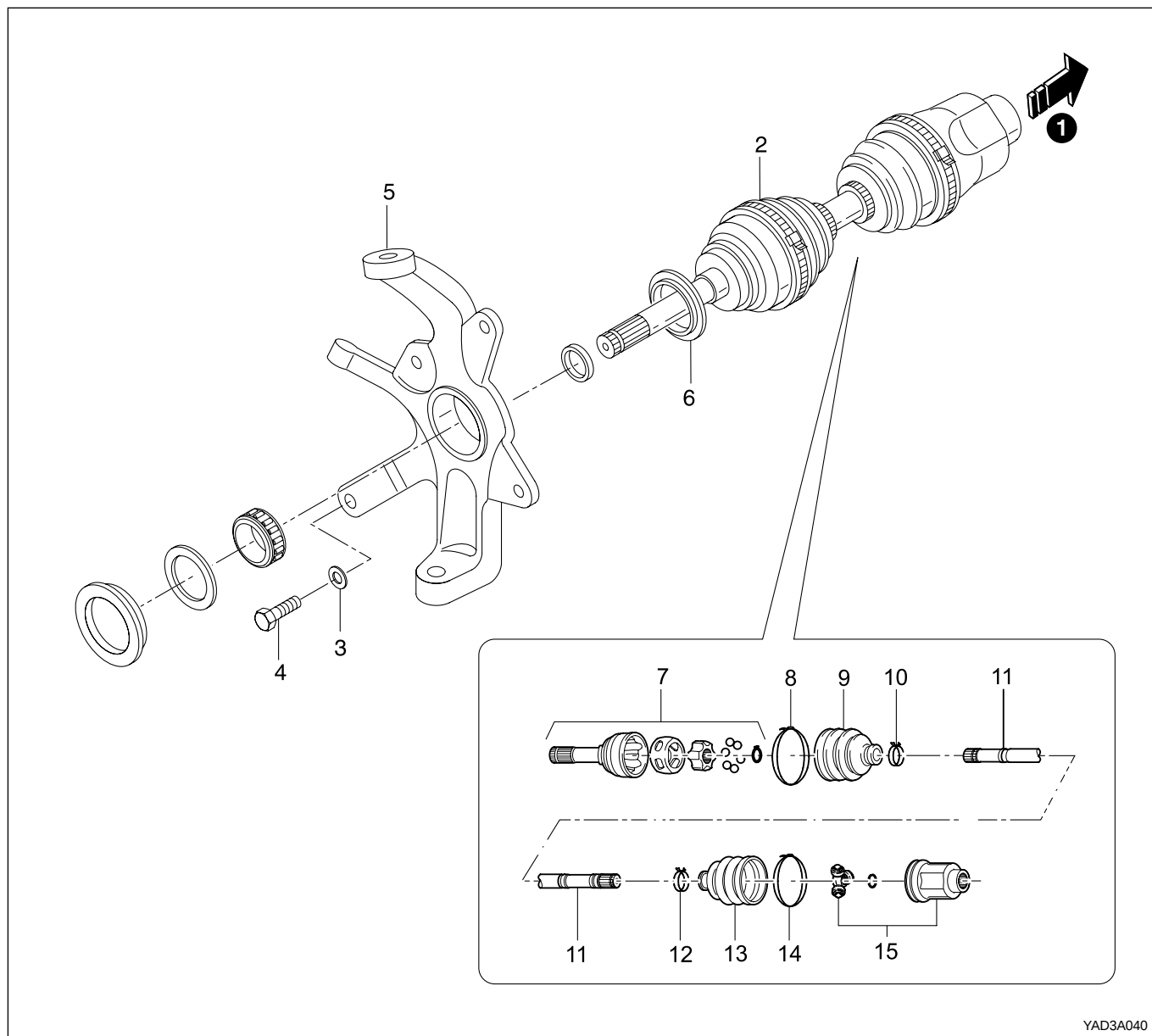
Drive Shaft Type	CV Joint	
Axle Housing Type	Build up	
Differential	Type	Conventional
	Gear Type	Hypoid Gear
Reduction Ratio Gaso. (E32 or E23)	Gasoline + M/T	3.73
	Diesel + M/T	4.27
	Gasoline + M/T	4.56
	Diesel + M/T	4.89
Oil	Capacity	1.4 L
	Specification	SAE 80W / 90 or API GI-5

DIAGNOSIS INFORMATION AND PROCEDURES

Phenomena	Checks	Action
Noise (During Straight Driving)	Lack of Oil	Replenish
	Low Viscosity of Oil	Replace
	Inferior Oil	Replace
	Excessive Backlash of Ring Gears	Adjust
	Worn or Damaged Tooth of Ring and Pinion Gear	Replace
	Worn or Damaged Tooth of Drive Pinion Gear	Replace
	Wear of Side Bearing and Side Gear Spline	Replace
	Bending of Axle Housing	Replace
	Distortion of Differential Case	Replace
	Wear of Pinion Shaft	Replace
	Incorrect Drive Pinion Preload.	Adjust
	Incorrect Contact of Ring Gear and Pinion	Reassembly
Oil Leakage	Excessive Oil	Adjust
	Fault Seal of Carrier Contact Surface	Correct
	Axle Housing Crack	Replace
	Worn or Damaged Oil Seal	Replace
Noise (During Turning)	Worn or Damaged Tooth of Pinion or Side Gear	Replace
	Wear of Pinion Shaft	Replace
	Excessive Backlash of Pinion Gear and Side Gear	Replace
	Excessive End-Play of Rear Axle Shaft	Adjust
	Incorrect Contact of Side Gear and Differential Case	Replace
	Axle Housing Crack	Replace
	Distortion or Poor Installation of Drive pinion Oil Seal	Replace
	Damaged or Torn Drive Pinion Oil Seal	Replace
	Loosened Bearing Collar	Replace
	Worn or Damaged Universal Joint	Replace
	Worn or damaged Axle Shaft Bearing	Replace
Heating	Lack of Oil	Replenish
	Insufficient Backlash of Gears	Adjust
	Excessive Preload of Bearing	Adjust

COMPONENT LOCATOR

FRONT AXLE SHAFT

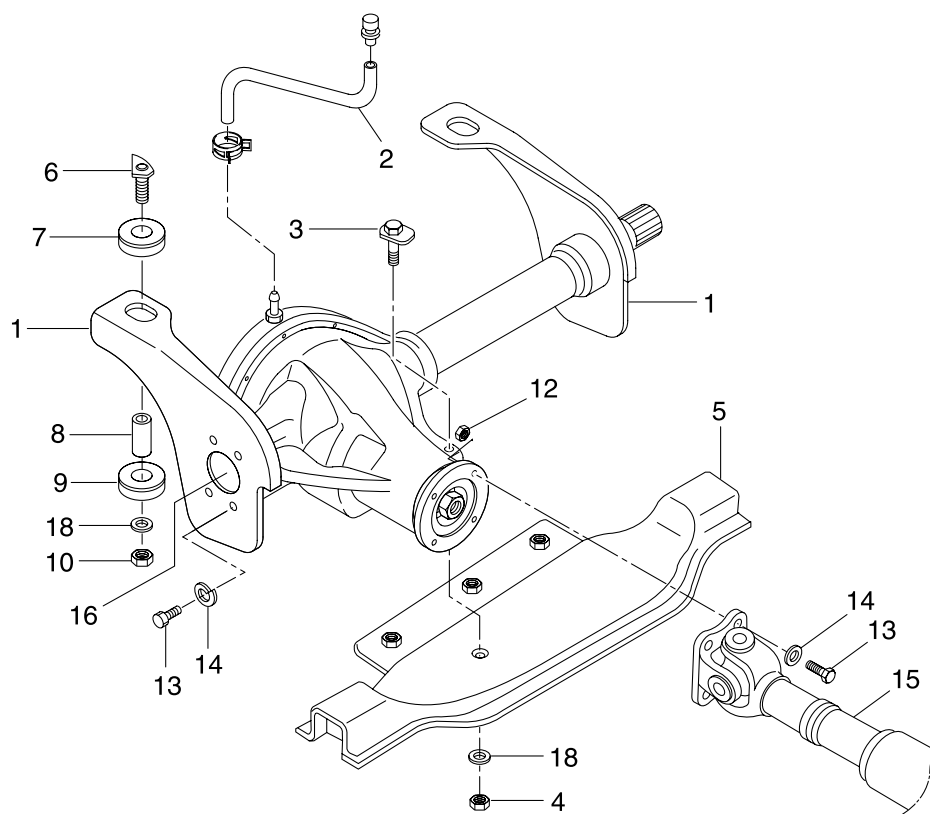


YAD3A040

- 1 Front Axle Inner Shaft Mounting (Axle Housing)
- 2 Front Axle Drive Shaft
- 3 Washer
- 4 Bolt
- 5 Steering Knuckle
- 6 Dust Seal
- 7 Outboard Joint Assembly
- 8 Boot Clamp

- 9 Outboard Boot
- 10 Boot Clamp
- 11 Shaft
- 12 Boot Clamp
- 13 Inboard Boot
- 14 Boot Clamp
- 15 Inboard Joint Assembly

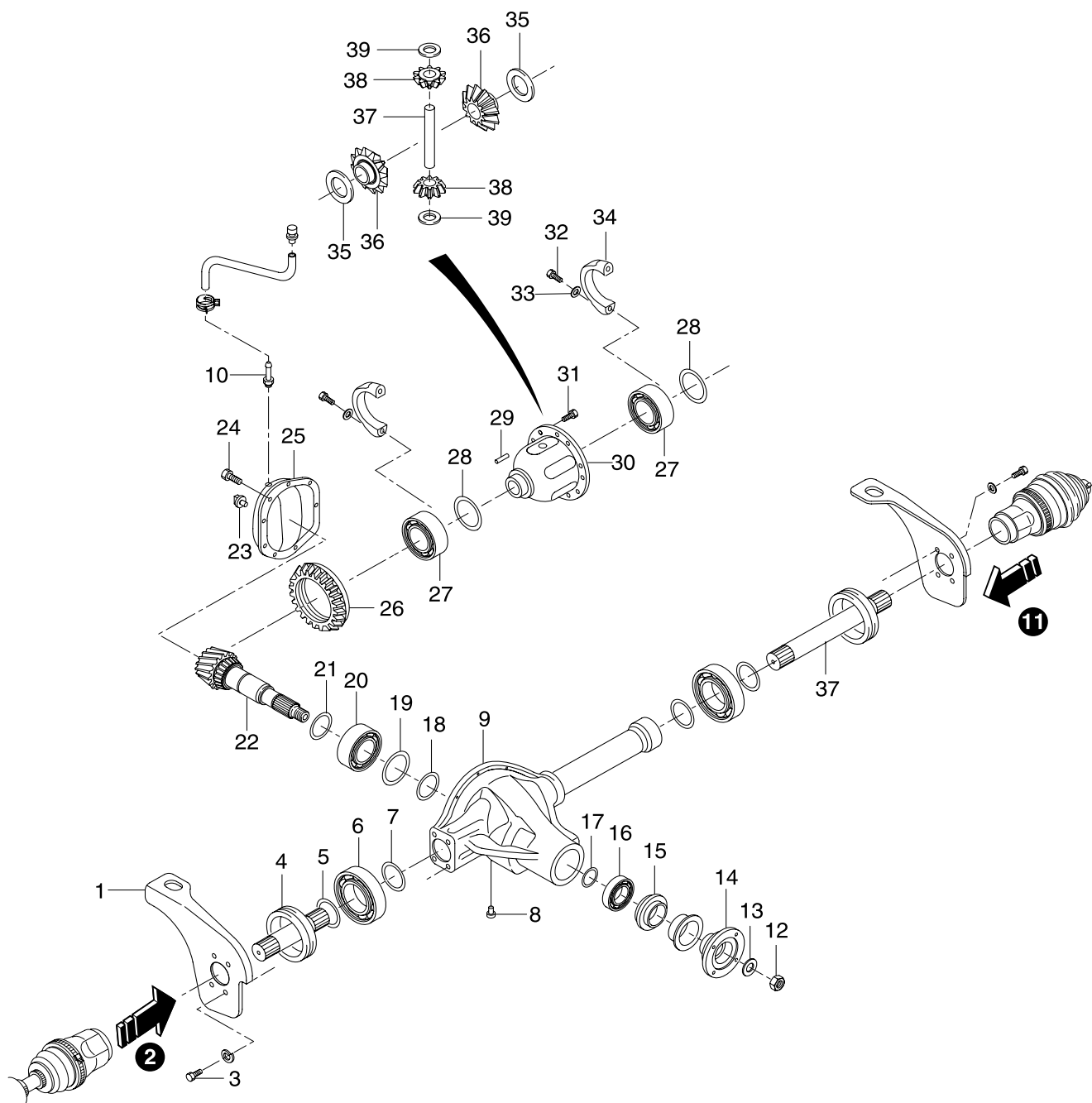
FRONT AXLE HOUSING



YAD3A330

- | | | | |
|---|-----------------------|----|---------------------|
| 1 | Axle Mounting Bracket | 10 | Nut |
| 2 | Breather Hose | 11 | Front Axle Housing |
| 3 | Bolt | 12 | Nut |
| 4 | Nut | 13 | Bolt |
| 5 | Cross Member | 14 | Washer |
| 6 | Bolt | 15 | Inner Shaft (Left) |
| 7 | Bushing | 16 | Inner Shaft (Right) |
| 8 | Spacer | 17 | Washer Plain |
| 9 | Spacer | | |

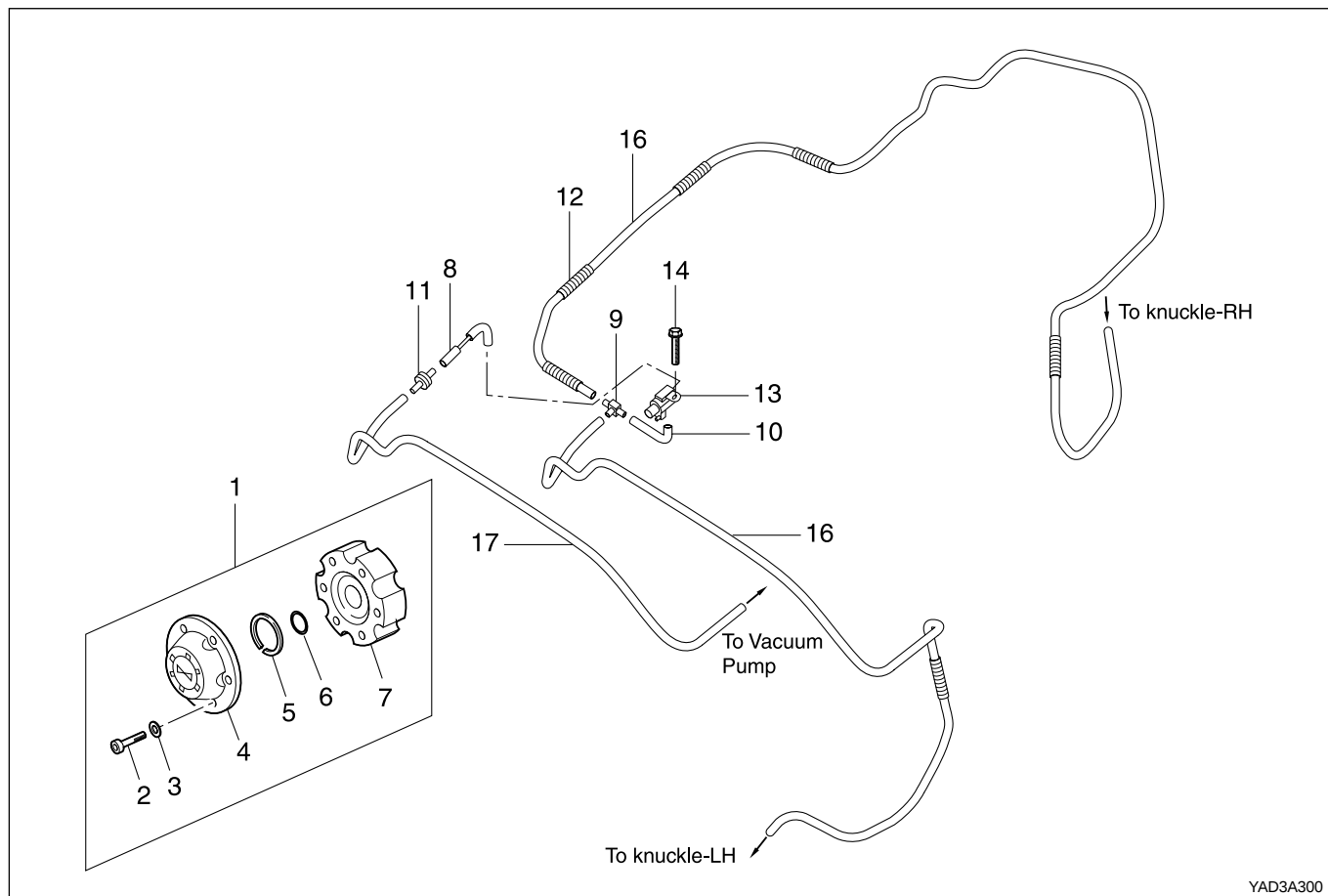
3A-8 FRONT AXLE



YAD3A380

1	Front Axle Housing Mounting Bracket	20	Bearing
2	Inner Shaft (Left)	21	Oil Slinger
3	Bolt	22	Driver Pinion
4	Oil Seal	23	Oil Filler Plug
	 Replace, Apply Grease to the Sealing Rib	24	Bolt
5	Snap Ring	25	Axle Housing Cover..... Apply Liquid Gasket
6	Bearing	26	Ring Gear
7	Snap Ring	27	Bearing
8	Oil Drain Plug	28	Shim
9	Front Axle Housing	29	Shaft Lock Pin
10	Breather Nipple	30	Differential Case
11	Inner Shaft (Right)	31	Bolt
12	Pinion Lock Nut	32	Bolt
13	Washer	33	Washer
14	Companion Flange	34	Bearing Cap
15	Oil Seal	35	Thrust Washer
	 Replace, Apply grease to the sealing Rib	36	Side Gear
16	Bearing	37	Differential shaft
17	Shim	38	Differential Pinion
18	Bearing Baffle	39	Thrust Washer
19	Shim		

VACUUM LINE



YAD3A300

- | | |
|------------------------------------|------------------------------------|
| 1 Vacuum Auto-locking Hub Assembly | 10 Hose Molded |
| 2 Bolt..... 50-60 N•m(37-44 lb-ft) | 11 Check Valve |
| 3 Washer | 12 Corrugated Tube |
| 4 Auto-locking Hub Cap | 13 Auto-locking Hub Solenoid Valve |
| 5 Retaining Ring | 14 Bolt |
| 6 Shim | 15 Hose (L:2000/Yellow) |
| 7 Locking Hub | 16 Hose (L:3200/Red) |
| 8 Hose and Tube Assembly | 17 Hose (L:1500/White) (DSL) |
| 9 T-Connector | Hose (L:800/Blue) (GSL) |

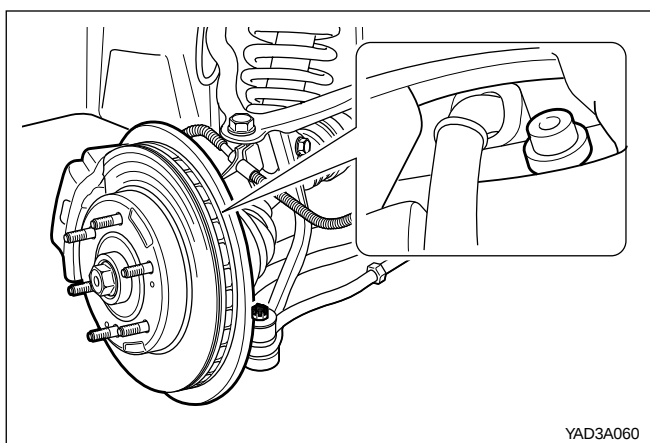
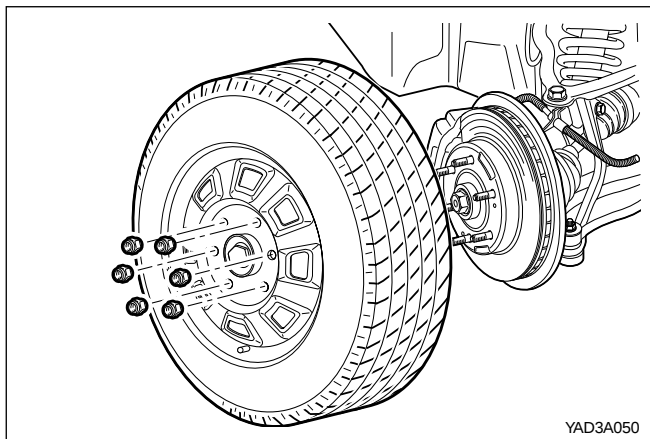
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

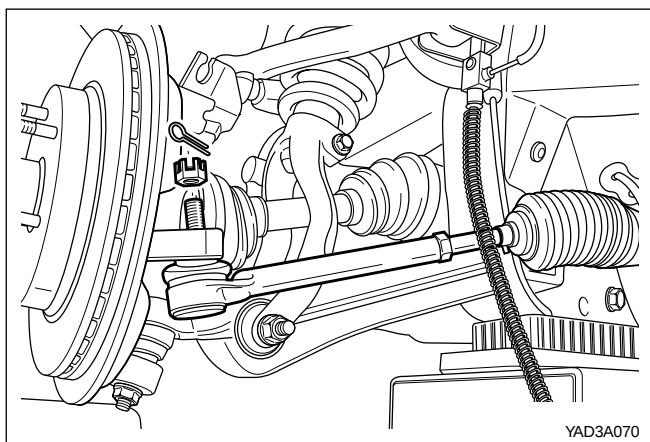
FRONT AXLE SHAFT

Removal

1. Remove the tire.



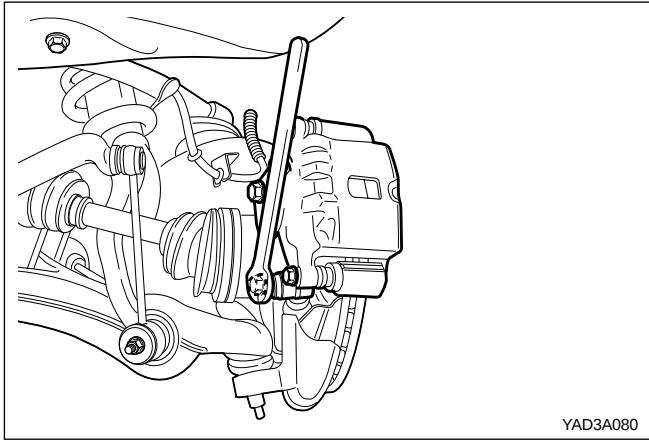
2. with ABS (Only part time vehicle)
Remove the wheel speed sensor from the steering knuckle and pull off the cable.



3. Remove the split pin from steering linkage link-knuckle mounting and pull off the slot nut and detach the link from knuckle arm.

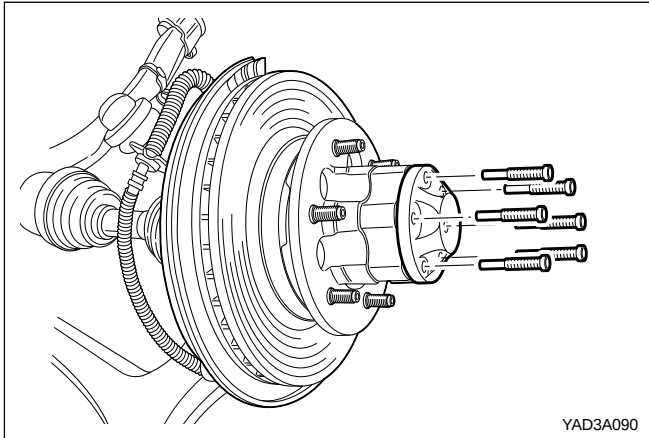
Notice: Replace the split pin with new one when it is installed again.

3A-12 FRONT AXLE



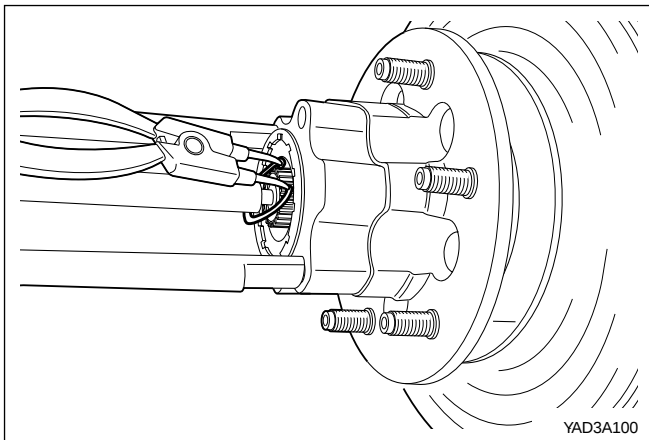
4. Remove the two knuckle-brake caliper assembly mounting bolts and pull off the caliper assembly.

Notice: Be careful not to damage the brake oil hose.



5. Vehicle with part time transfer case only

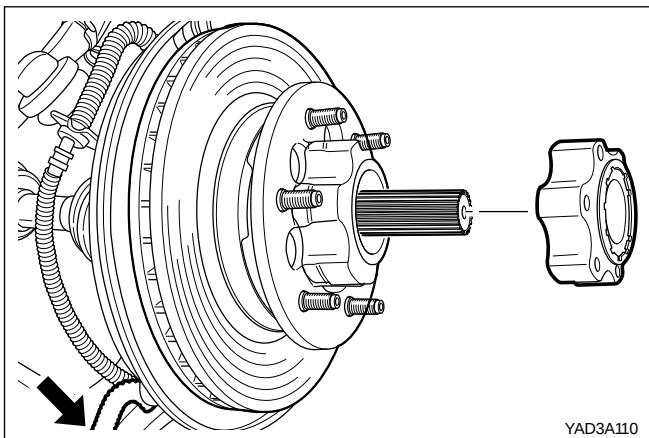
- Remove the hub mounting bolt & washer and pull off the hub cover.



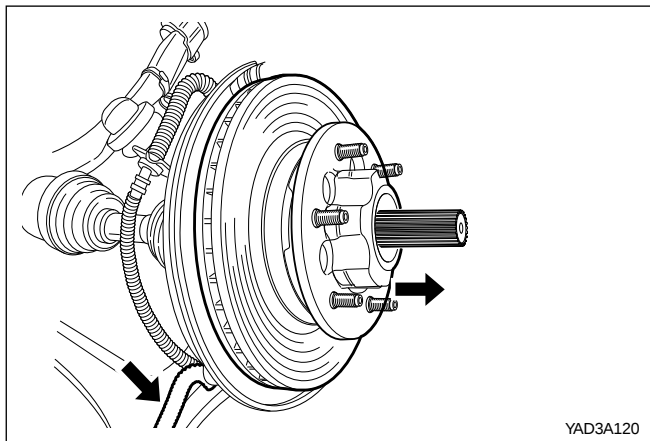
- Remove the retainer ring & outer shin in the drive shaft and pull off the lock.

Notice: For assembly, adjust the clearance between the snap ring & hub not to exceed 0.2mm. (Shim thickness : 0.2, 0.3, 0.5, 1.0mm)

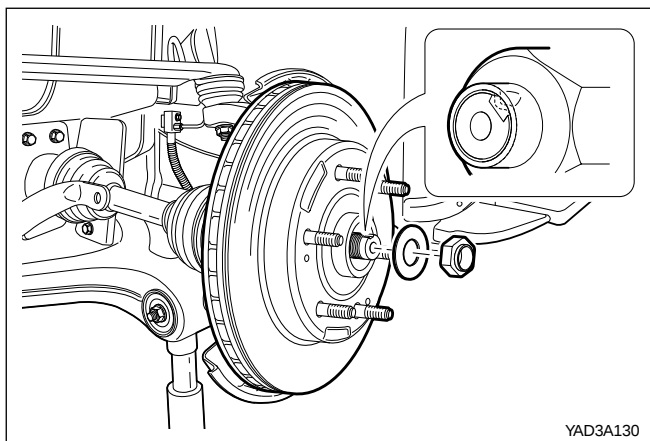
Notice: For assembly, be careful not to damage O-ring of the locking hub.



- Detach the vacuum hose of locking hub from steering knuckle.



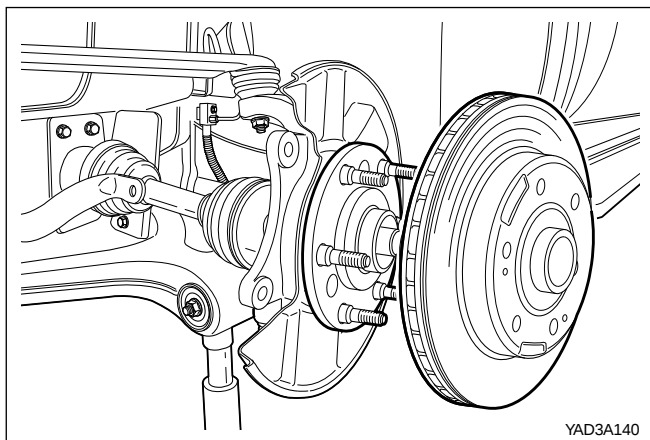
- Remove the hub & brake disc assembly.



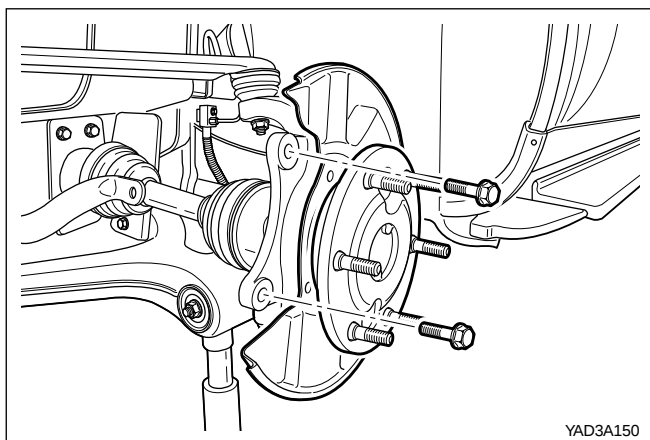
6. With full time transfer case only

- Remove the hub nut & washer.

Notice: For assembly, after you coincide the groove of drive shaft tip with the hub tip and cork, apply the paint and grease to the corking part.

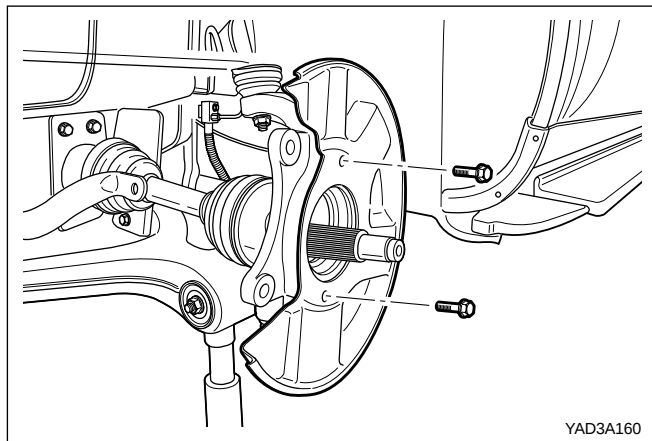


- Remove the front disc assembly from the axle shaft.

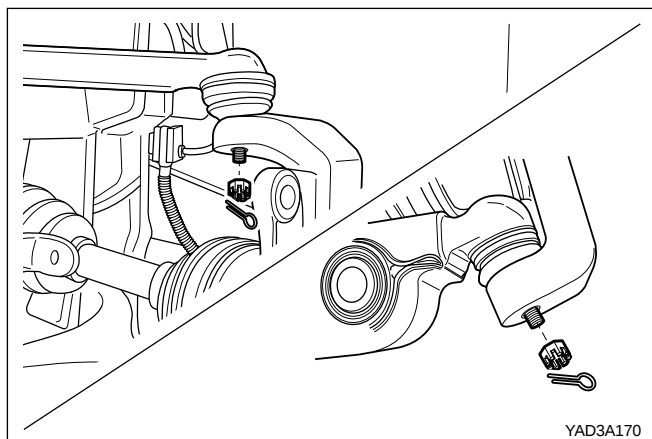


- Remove three wheel bearing bolts (M12) and pull off hub assembly by using the special tool.

Notice: For reassembly, replace the wheel bearing bolt with new one which applied the lock tight (blue color).



7. Remove two dust shield mounting bolts (M6) and pull off the dust shield.

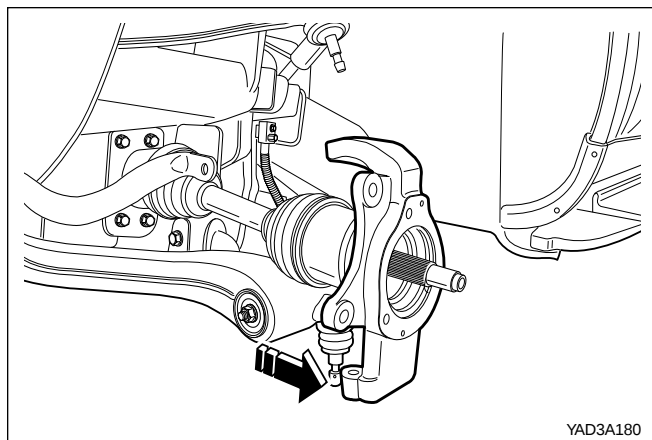


8. Remove the split pin and nut from the steering knuckle arm and upper arm ball joint connection.

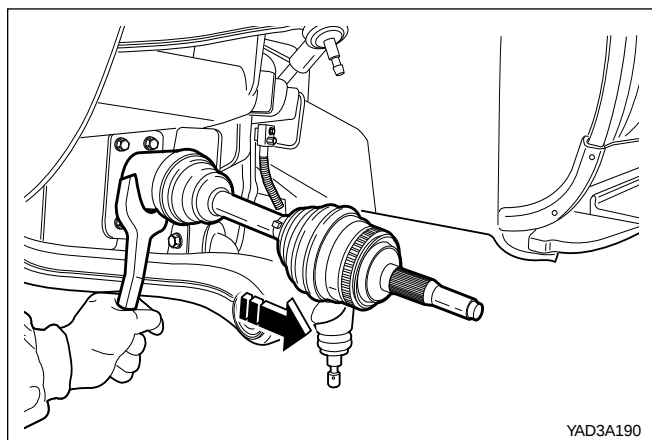
Notice: For assembly, replace the split pin with new one.

9. Remove the split pin and nut from the steering knuckle arm and lower arm ball joint connection.

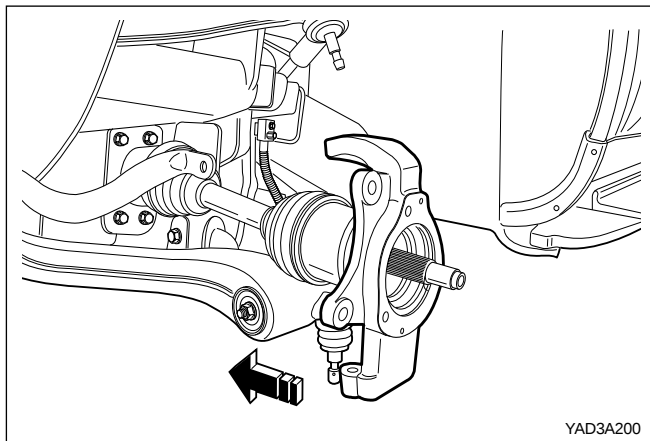
Notice: For assembly, replace the split pin with new one.



10. Carefully remove the steering knuckle assembly.



11. Remove the drive shaft using the special tool.



Installation

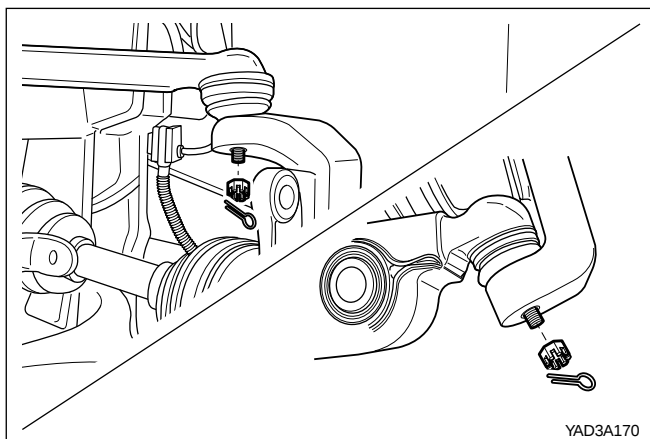
Clean all the parts. Check O-ring, snap ring for the wear and damage.

If damaged, replace them with new ones.

1. Insert the axle shaft to the axle housing. Be sure to insert the axle shaft to the housing.

Notice: When you insert the axle shaft, be careful not to damage the boots.

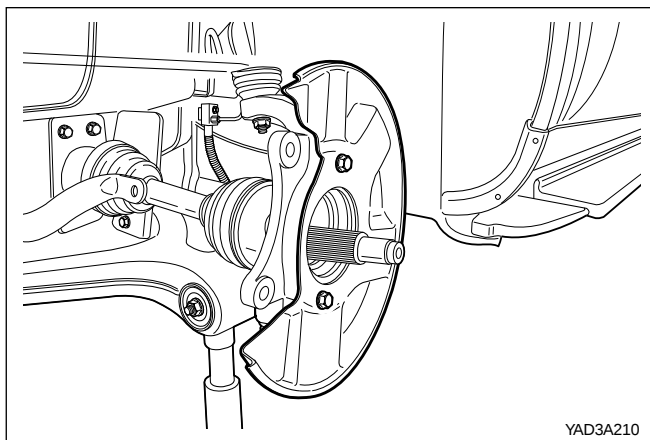
2. Install the steering knuckle to the axle shaft exactly.



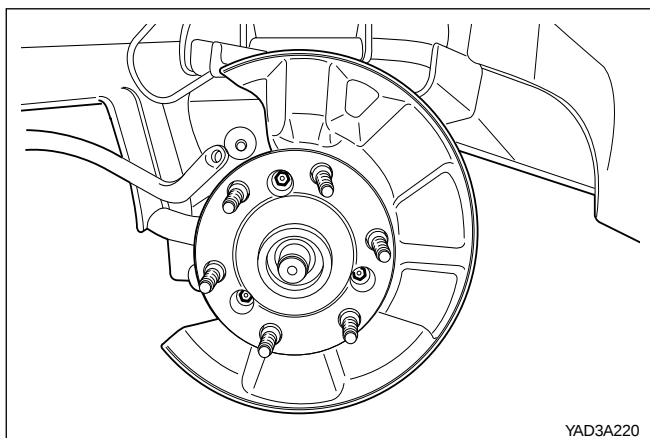
3. Install the steering knuckle to the upper/lower arm and fix the split pin.

Installation Notice

Tightening Torque	Lower arm	140 - 160 N•m
	Upper arm	140 - 160 N•m



4. Install the dust shield to the knuckle.

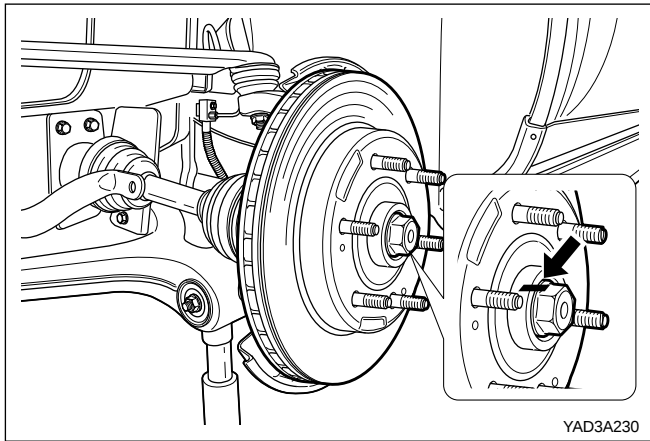


5. With full time transfer case only

- Install the hub assembly to the axle shaft and tighten the hexagon bolts applied the lock tight (Blue color).

Installation Notice

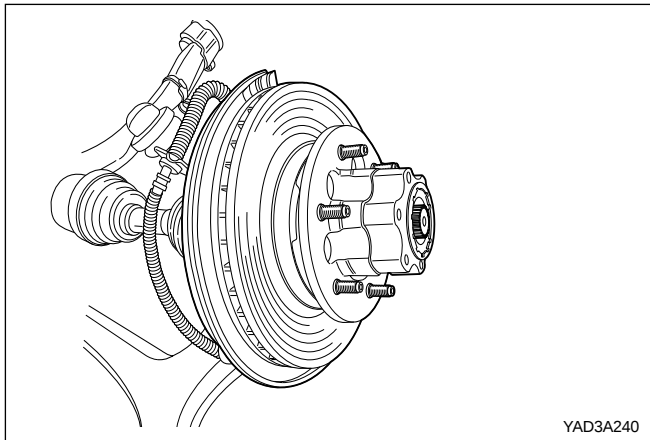
Tightening Torque	100 - 130 N•m
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- Install the front disc and tighten the hub nut & washer. When you install then, align the hub nut-washer to the shaft end and tighten the hub nut as the specified torque. After bending the groove part of shaft, apply the painting and grease to the groove part.

Installation Notice

Tightening Torque	250 - 350 N•m
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6. With part time transfer case

- Install the brake disc assembly and tighten the fixing bolts.

Installation Notice

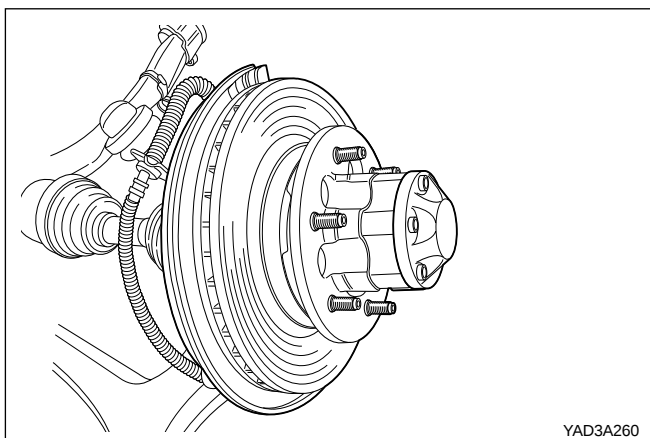
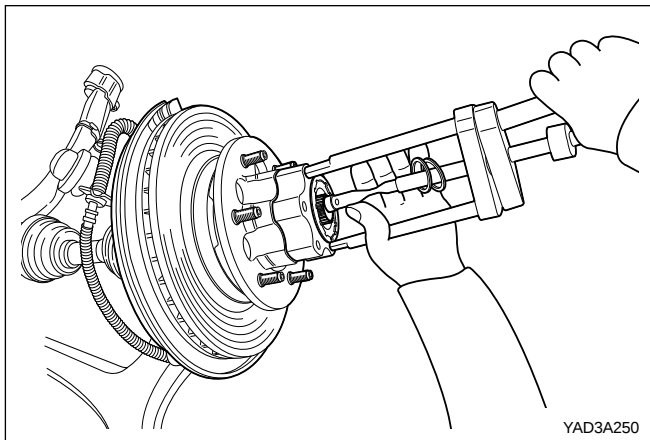
Tightening Torque	100 - 130 N•m
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- Install the disc brake caliper assembly to the brake disc.
- Align the hub body to the flange mounting hole and insert it into the shaft.

Notice: When you insert the hub body, check the o-ring for the damage.

- Insert the shin in order that the clearance between snap ring and hub cover does not exceed Max 0.2mm on condition that you pull the shaft completely in outside direction. Fix the hub body using the snap ring.

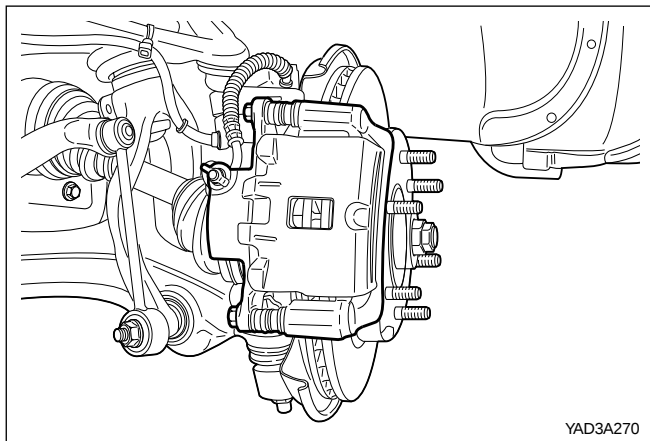
Shim thickness	0.2, 0.3, 0.5, 1.0 mm
Max. clearance	0.2 mm



- Install the hub cover to the body and tighten it as the specified torque.

Installation Notice

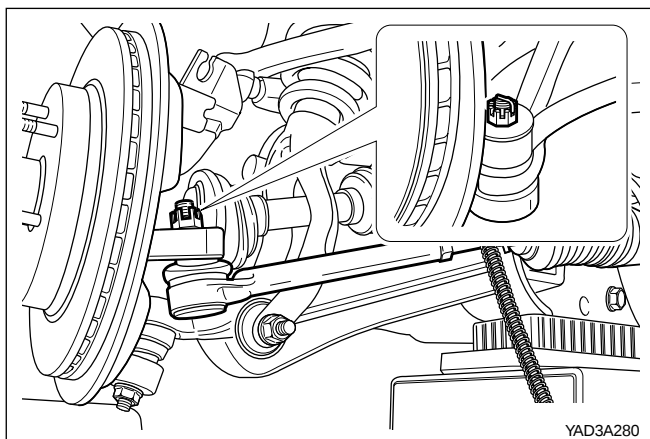
Tightening torque	50 - 60 N•m (37 - 44 lb-ft)
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7. Tighten the front disc brake caliper assembly mounting bolts on condition that the front disc is mounted.

Installation Notice

Tightening Torque	85 - 105 N•m
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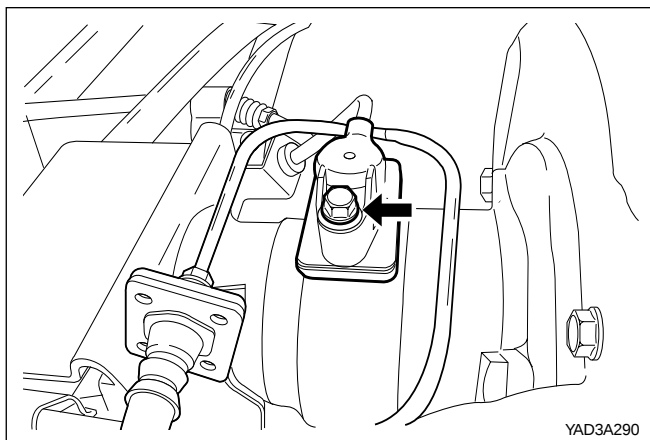


8. Insert the steering linkage ends to the steering knuckle and tighten the slot nut.

Notice: When you install, replace the split pin with new one.

Installation Notice

Tightening torque	35 - 45 N•m (26 - 33 lb-ft)
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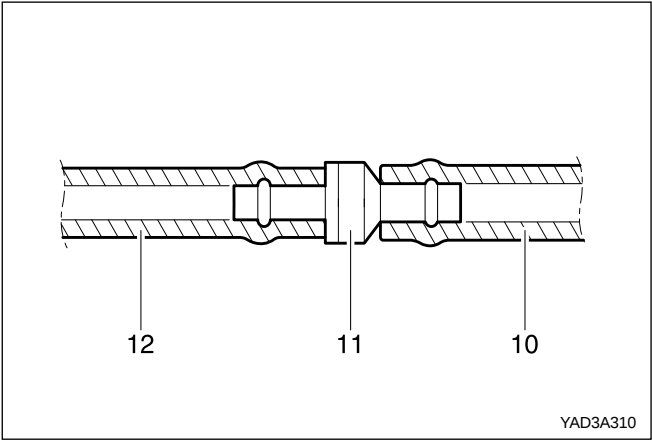


9. Install the wheel speed sensor and connect the vacuum line (with ABS only).

Installation Notice

ABS wheel speed sensor mounting bolt	6 - 8 N•m (53 - 71 lb-in)
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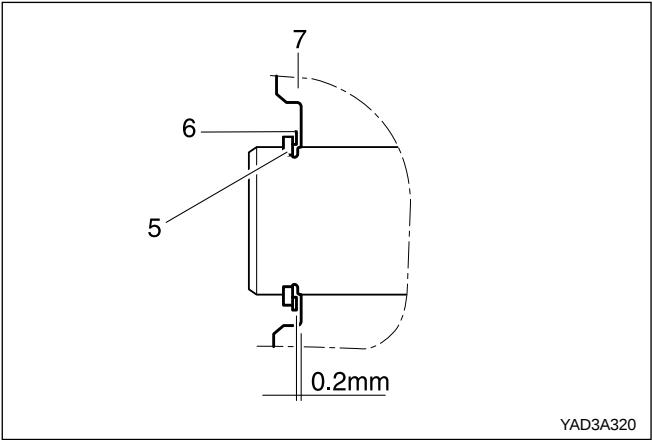
10. Install the tire and test the braking force.



VACUUM LINE

Removal/Installation

- 1. Be careful not to change the direction of valve when connecting the check valve(11) with each hose.



- 2. Adjust the clearance between the retainer ring (5) and locking hub (7) to the normal value by using the appropriate shim (6).

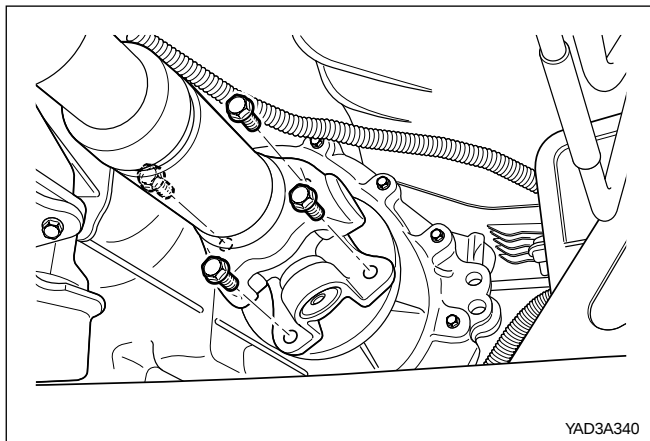
Normal	MAX. 0.2 mm
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Notice: Shim thickness 0.1, 0.2, 0.3, 0.5, 1.0 mm

- 3. Tighten the auto locking hub cap bolt to the specified torque and order.

Installation Notice

Tightening Torque	50 - 60 N•m (37 - 44 lb-ft)
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AXLE HOUSING

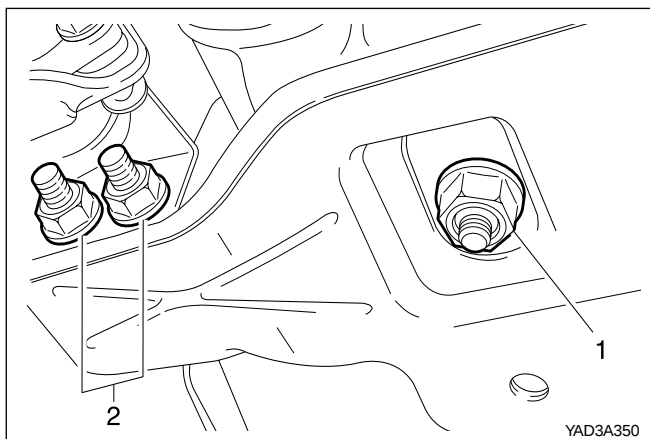
Removal/Installation

1. Remove the propeller shaft from the front axle input shaft.

Installation Notice

Tightening Torque	81 - 89 N•m (60 - 66 lb-ft)
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2. Remove the steering gear linkage.



3. Remove the breather hose.
4. Remove the cross member and axle housing mounting nut (1).

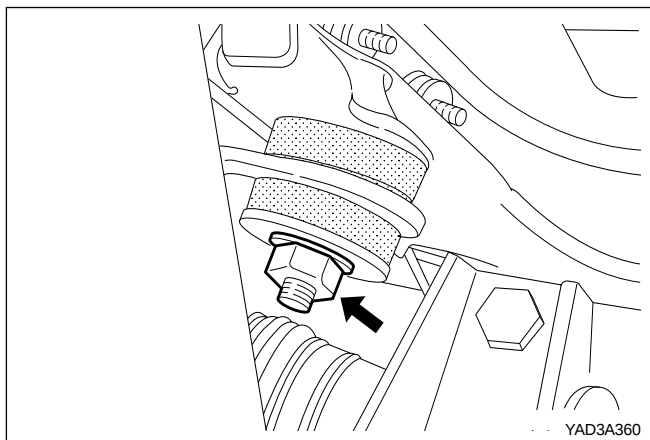
Installation Notice

Tightening torque	95 - 142 N•m
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5. Remove the frame and cross member mounting nut (2) and pull off the cross member.

Installation Notice

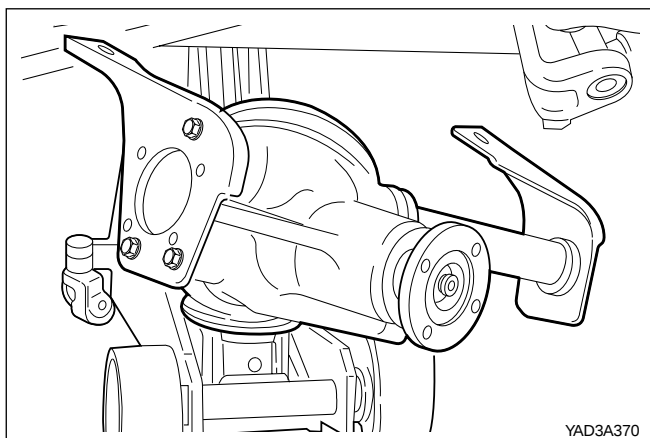
Tightening Torque	62 - 93 N•m (45 - 69 lb-ft)
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6. Support the axle housing on a suitable jack, remove the axle housing mounting bracket nuts.

Installation Notice

Tightening Torque	62 - 93 N•m (45 - 69 lb-ft)
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7. Lowering the jack carefully, remove the axle housing assembly.
8. Installation should follow the removal procedure in the reverse order.

UNIT REPAIR

AXLE HOUSING ASSEMBLY

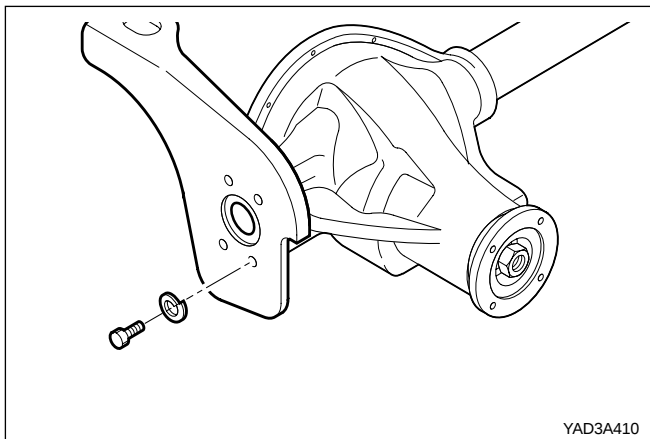
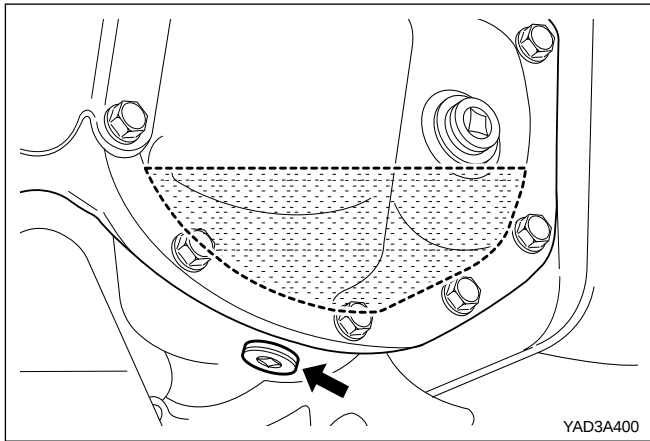
Disassembly

1. Remove the drain plug and drain the oil and than reinstall the drain plug.

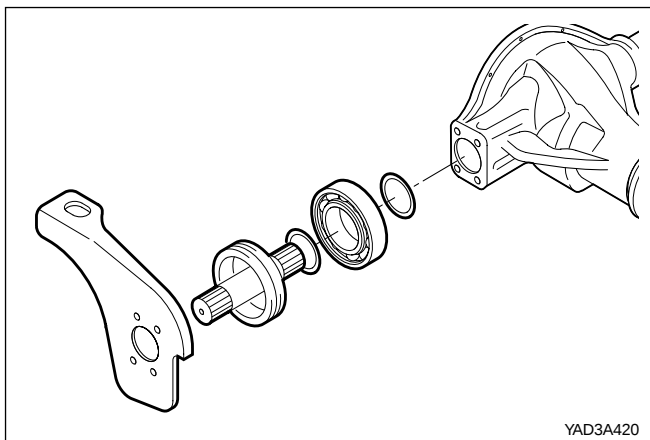
Installation Notice

Tightening Torque

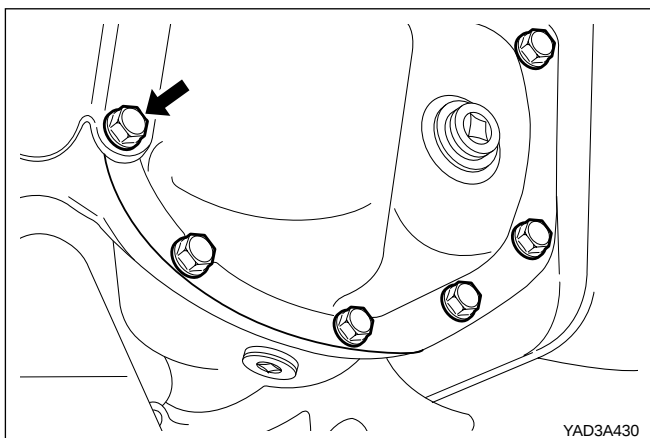
28 - 40 N•m
(21 - 30 lb-ft)



2. Remove the axle housing mounting bracket bolt and pull off the bracket and inner shaft assembly.

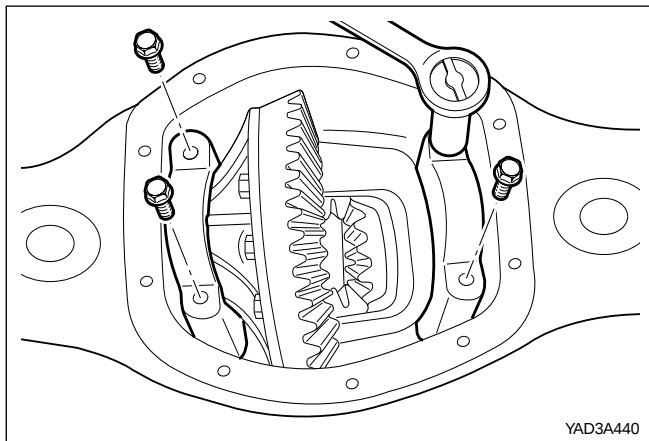


3. Remove the bearing fixing snap ring of inner shaft and pull off the bearing. Remove the inner shaft and housing bracket



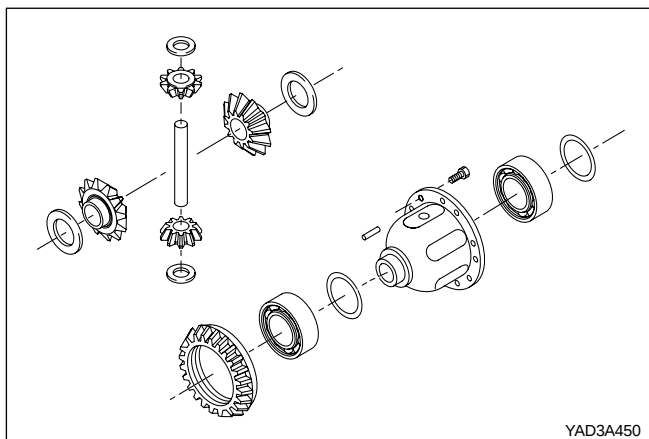
4. Remove the axle housing cover.

Notice: Clean the gasket dregs of the cover and housing contact surface.

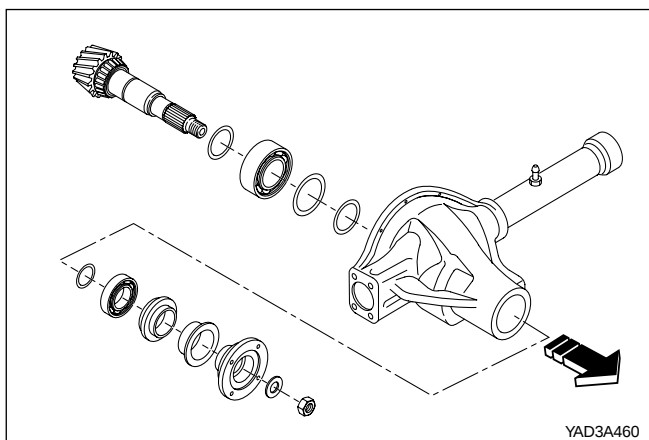


5. Remove the bearing cap mounting bolt and pull off the bearing cap. Pull out the differential carrier assembly.

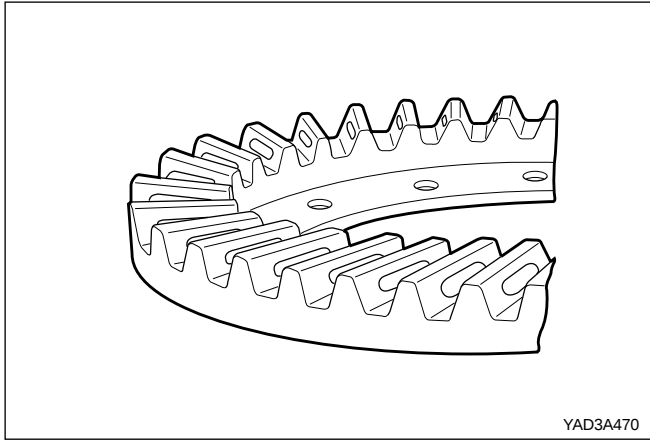
Notice: Do alignment marks on the bearing cap not to change the caps before removal. When pulling out, be careful not to damage the axle housing.



6. Disassemble the parts of differential carrier assembly.



7. Remove the drive pinion lock nut. Disassemble the parts of drive pinion.



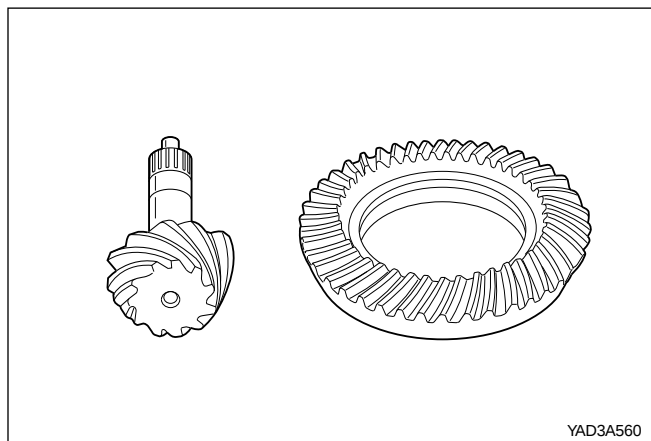
Inspection of Ring Gear Tooth Contact Pattern

1. Normal Contact

Apply gear-marking compound (Prussian blue / red lead) on the ring gear teeth. Rotate the ring gear and check the tooth contact pattern.

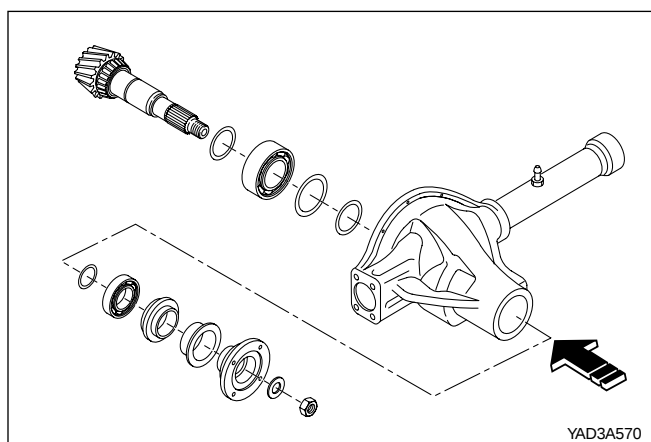
2. Abnormal Contact

Tooth contact pattern	Possible cause	Remedy
1. Heel contact A YAD3A480	Excessive backlash Noise can be occurred	Adjust backlash (Decrease backlash) Select proper shim to move the drive pinion toward the ring gear (toward toe) B YAD3A490
2. Toe contact A YAD3A500	Insufficient backlash Tooth can be damaged or broken under heavy load	Adjust backlash (Increase backlash) Select proper shim to move the drive pinion against the ring gear (toward heel) B YAD3A510
3. Face contact A YAD3A520	Excessive backlash - Drive pinion shaft is apart from the ring gear - Noise can be occurred	Adjust backlash (Increase pinion shim) Move the drive pinion toward the ring gear (toward center of ring gear) B YAD3A530
4. Flank contact A YAD3A540	Insufficient backlash - Gear contacts on the low flank - Gear can be damaged or worn - Noise can be occurred	Adjust backlash (Decrease pinion shim) Move the ring gear toward the drive pinion (toward ring gear center line) B YAD3A550



Assembly

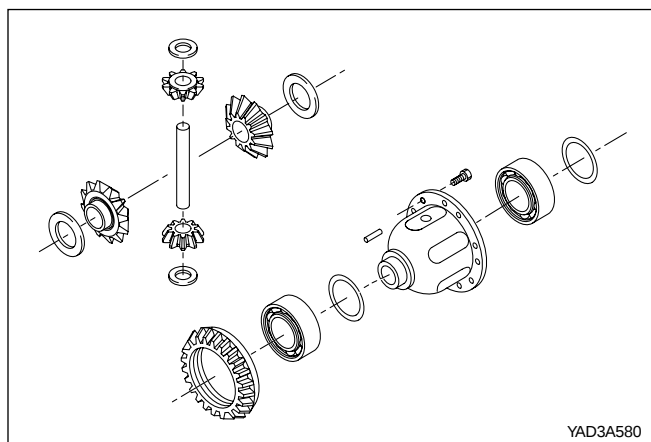
1. Clean all parts and check the followings.
 - Check the ring gear, drive pinion for wear and damage. If damaged, replace it as a set.
 - Check the bearing for sticks, wear, noise and turning resistance.
 - Check the side gear, pinion, pinion shaft and thrust washer for wear and damage.
 - Check the differential carrier for crack and wear (bearing contact surface). Check the gear case for crack.



2. Assemble the drive pinion assembly to the axle housing and then tighten the pinion lock nut.

Installation Notice

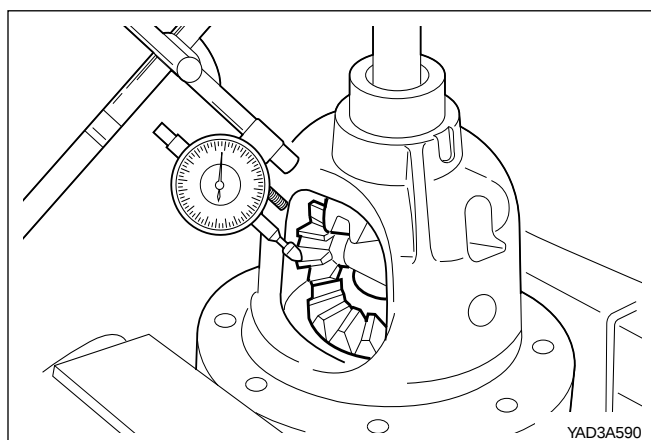
Tightening torque	240 - 310 N•m
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3. Assemble the differential carrier assembly. Align the ring gear to the mark of differential carrier, tighten the fixing bolts.

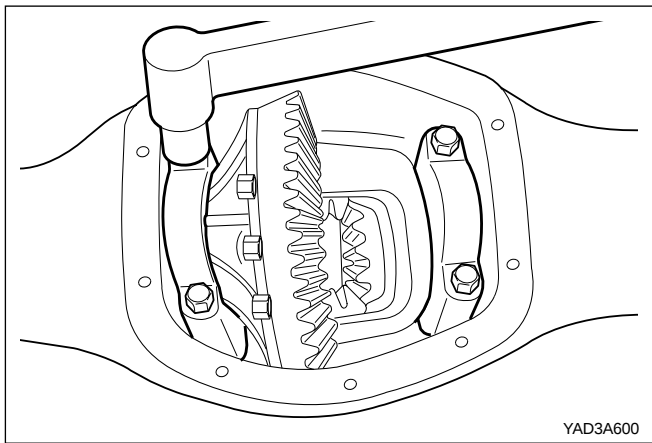
Installation Notice

Tightening Torque	75 - 90 N•m (55 - 66 lb-ft)
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4. Measure the backlash of side gear and pinion gear.

Specified value	0 - 0.5 mm
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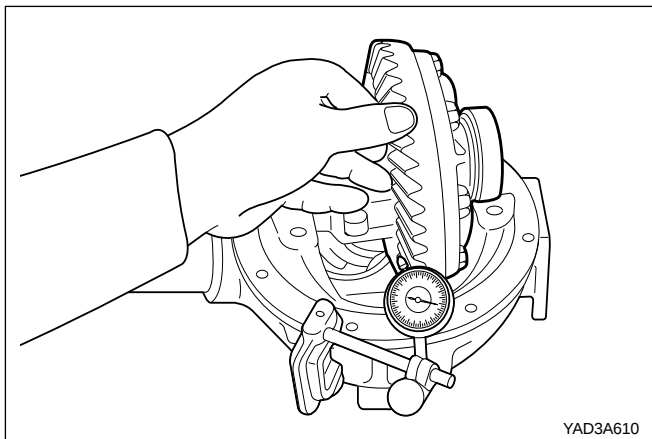


5. Install the differential carrier assembly into the axle housing. Set up the bearing cap and then tighten the cap bolts.

Installation Notice

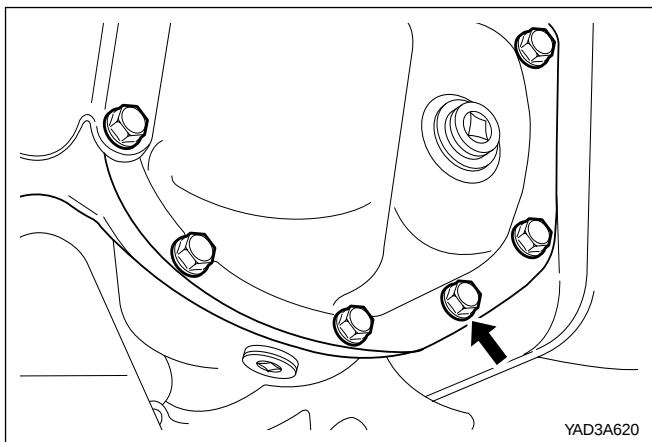
Tightening Torque	48 - 69 N•m (35 - 51 lb-ft)
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Notice: Be careful not to change the caps. Be sure to keep the original position of the caps.



6. Measure the backlash of drive pinion and ring gear.

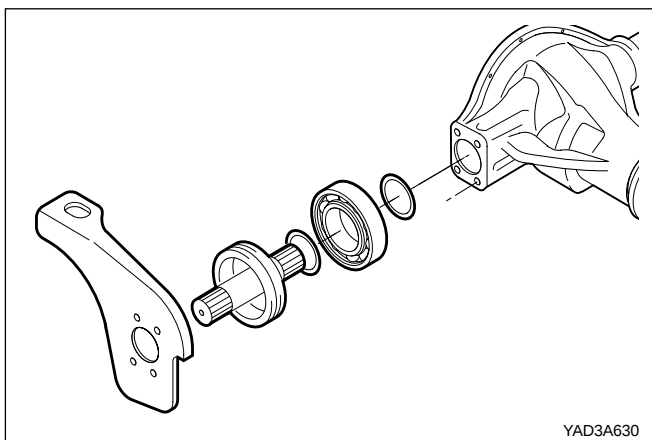
Specified value	0.13 - 0.20 mm
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7. Install the axle housing cover. Tighten the fixing bolts.

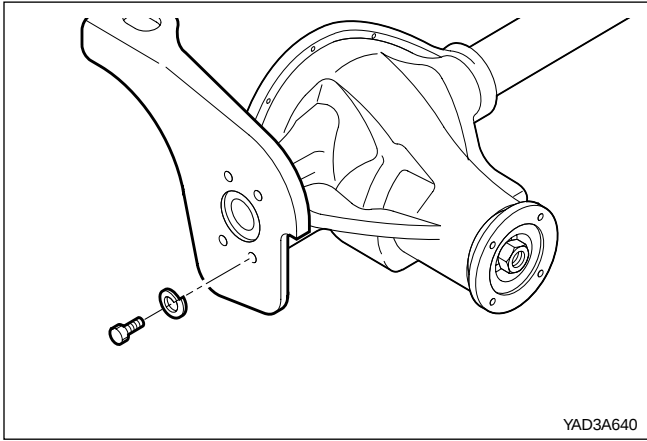
Installation Notice

Tightening Torque	39 - 46 N•m (29 - 34 lb-ft)
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8. Assemble the parts of the front axle inner shaft and housing mounting bracket.

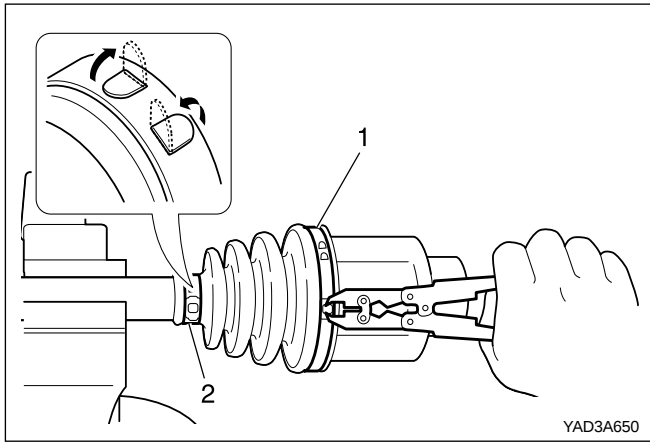
Notice: Apply the grease to the oil seal rib.



9. Align the axle shaft and differential carrier spline and insert the axle shaft. Assemble the axle housing mounting bracket to the axle housing.

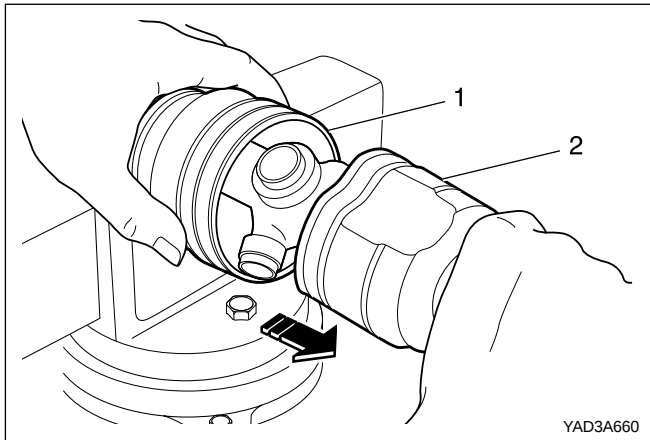
Installation Notice

Tightening Torque	80 - 100 N•m (59 - 74 lb-ft)
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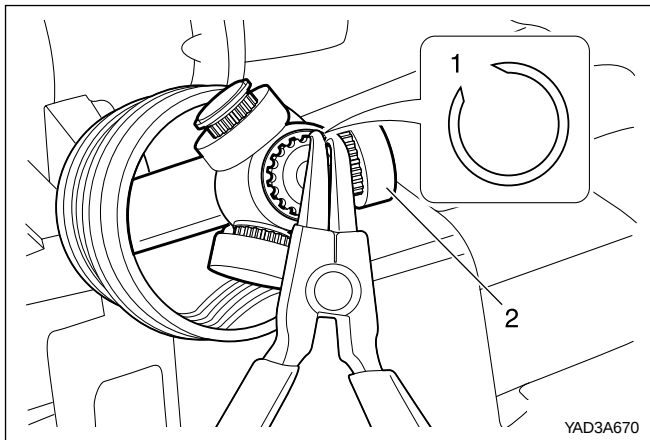


DIFFERENTIAL JOINT ASSEMBLY

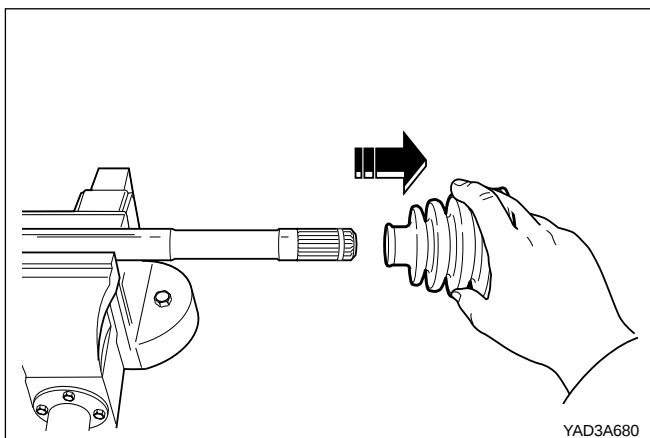
1. Remove the drive axle.
2. Detach the joint boot clamp.
 - ① Detach the boot clamp (large)
 - After pressing the clamp prominence using the special tool, detach the clamp.
 - ② Detach the boot clamp (small)
 - After unfolding the clamp holding part using the driver / hammer, detach the clamp.



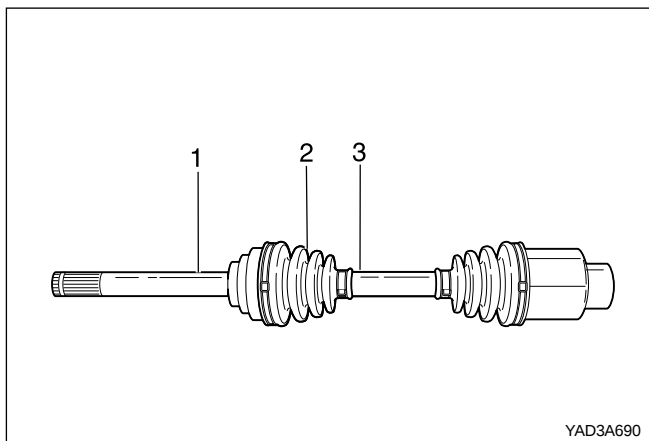
3. Detach the joint housing from the boot.
 - ① Boot
 - ② Joint housing



4. Get rid of the grease in the joint assembly.
5. Remove the triport joint.
 - ① Pull out the circlip.
 - ② Pull out the triport joint.



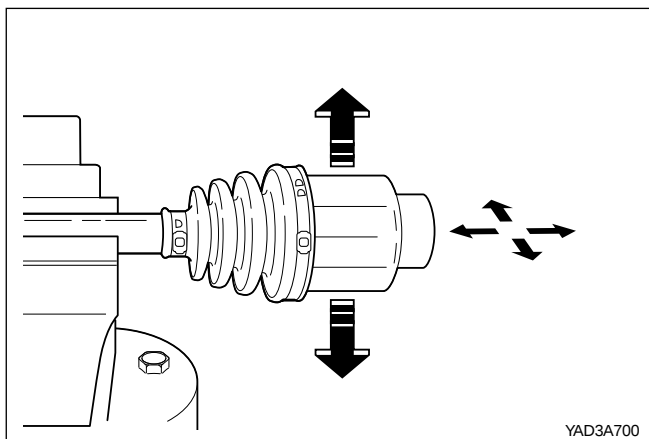
6. Remove the drive axle shaft boot.



Inspection

1. Check the shaft spline for the wear and damage.
2. Check the leakage by the boot crack, tears.
3. Check the bending of shaft.

Notice: if the defect happens in one shaft, because the other is damaged, exchange the both.



Assembly

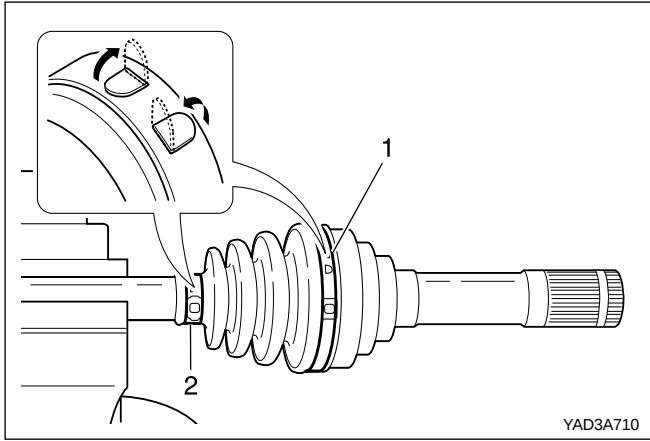
1. Assembly should follow the dismantlement in the reverse order.
2. Apply the specified grease to the joint housing.

Injection quantity	90 - 100 g
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Notice: If not use the specified grease, the joint and boot may be damaged.

Notice: For assembly, replace the boot clamp with the new one.

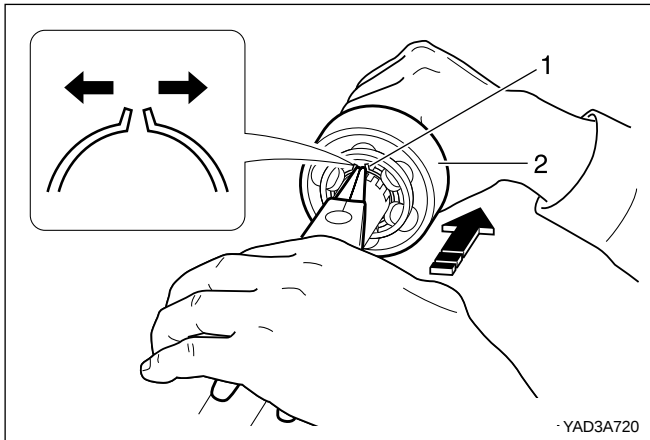
3. Check the followings after completing the assembly.
 - Check whether the joint move to up/down, left/right, forward freely.
 - Check whether the grease leak in the clamp part after checking the operation.



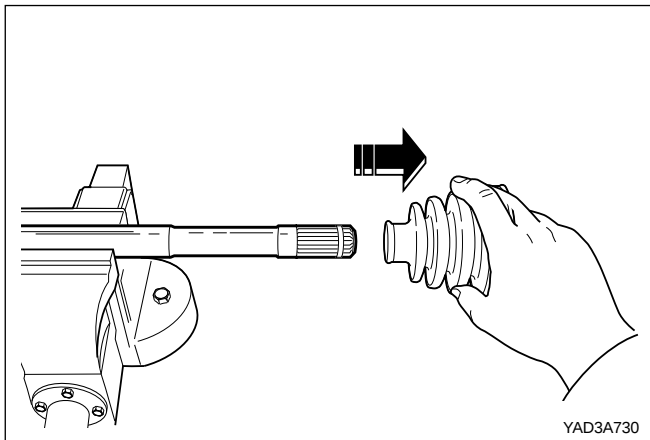
WHEEL JOINT ASSEMBLY

Disassembly

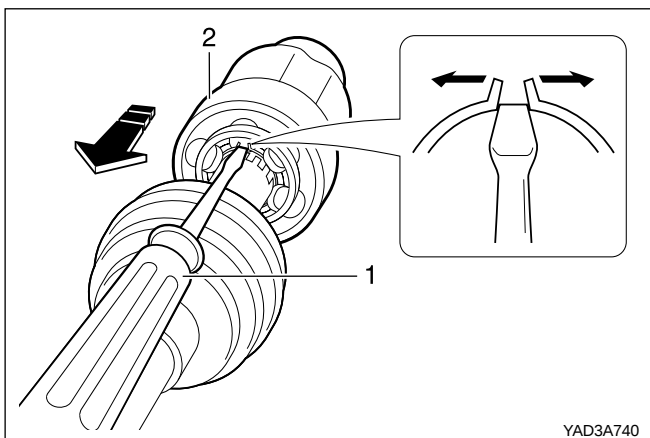
1. Remove the drive axle.
2. Detach the joint boot clamp.
 - ① Detach the boot clamp (large)
 - ② Detach the boot clamp (Small)
 - After unfolding the clamp holding part by using the driver/hammer, detach the clamp.



3. Get rid of the grease in the joint assembly.
4. Remove the joint assembly.
 - ① Spread out the circlip.
 - ② Pull out the joint assembly to the wheel side with the circlip spread out.

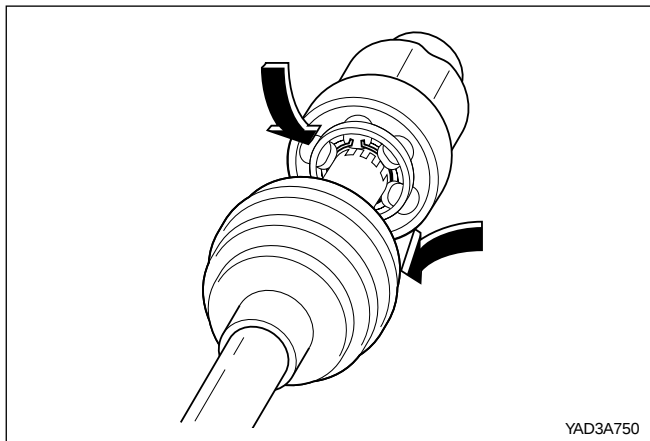


5. Remove the drive axle shaft.



Assembly

1. Assembly should follow the disassembly procedure in the reverse order.
2. Install the joint assembly.
 - Put the joint assembly in drive axle shaft to spread out the circlip opening slightly.
 - ① Insert (-) driver into the circlip opening to spread out the circlip.
 - ② Put the joint assembly in circlip home with the circlip spread out.

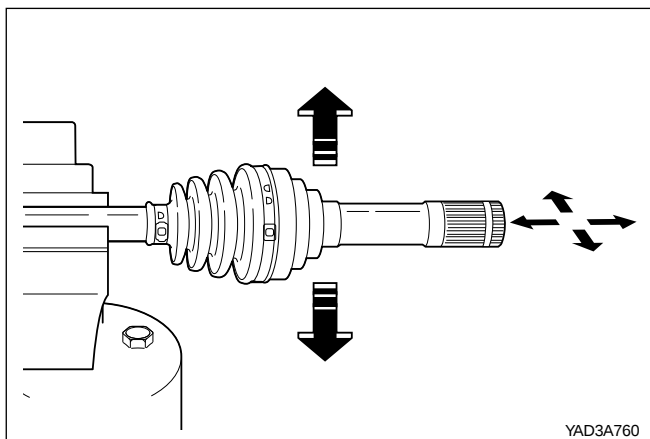


3. Apply the specified grease to the joint housing.

Injection quantity	80 - 90 g
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Notice: If not use the specified grease, the joint and boot may be damaged.

Notice: For assembly, replace the boot clamp with the new one.



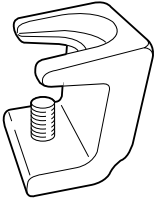
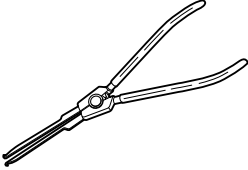
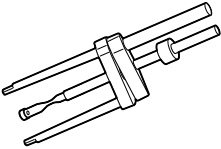
4. Check the followings after completing the assembly.

- Check whether the joint move to up/down, left/right, forward freely.
- Check whether the grease leak in the clamp part after checking the operation.

Notice: Because the wheel joint cannot be repaired in single part, if there is defect, replace it whit the new assembly.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS TABLE

 YAD3A770	661 589 13 33 00 Ball Joint Remover	 YAD3A780	Snap Ring Plier
 YAD3A790	Part Time Snap Ring Remover / Installer		