

16. REAR DRIVING MECHANISM

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SERVICE INFORMATION

GENERAL

- Perform the gear contact pattern and backlash inspection whenever you replace the bearings, gears or gear case. The extension lines from the gear engagement surfaces should intersect at one point.
- Protect the gear case with a shop towel or soft jaws while holding it in vise. Do not clamp it too tight as it could damage the gear case.
- When using the lock nut wrench, use a deflecting beam type torque wrench 20 inches long. The lock nut wrench increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the lock nut. The specification given is the actual torque applied to the lock nut, not the reading on the torque wrench. Do not overtighten the lock nut. The specification later in the text gives both actual and indicated.
- Replace the ring and pinion gears as a set.

SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Axle runout		_____	3.0 (0.12)
Rear final drive	Oil capacity	After draining	85 cm ³ (2.9 US oz , 3.0 Imp oz)
		After disassembly	100 cm ³ (3.4 US oz , 3.5 Imp oz)
	Recommended oil		Hypoid gear oil SAE # 80
	Gear backlash		0.05 – 0.25 (0.002 – 0.010)
	Backlash difference		_____
	Ring gear-to-stop pin clearance		0.3 – 0.6 (0.01 – 0.02)

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TORQUE VALUES

Final gear case pinion bearing lock nut	98 N·m (10.0 kgf·m , 72 lbf·ft)	Stake/Lock nut
Final gear case cover bolt (10 mm)	49 N·m (5.0 kgf·m , 36 lbf·ft)	Apply locking agent to the threads
(8 mm)	25 N·m (2.6 kgf·m , 19 lbf·ft)	
Final gear case mounting bolt	54 N·m (5.5 kgf·m , 40 lbf·ft)	
Left axle housing nut	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut
Skid plate bolt	32 N·m (3.3 kgf·m , 24 lbf·ft)	
Rear wheel hub nut	137 N·m (14.0 kgf·m , 101 lbf·ft)	
Rear brake panel nut	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut

REAR DRIVING MECHANISM

TOOLS

Driver	07749-0010000
Attachment, 22 × 24 mm	07746-0010800
Attachment, 52 × 55 mm	07746-0010400
Attachment, 62 × 68 mm	07746-0010500
Pilot, 14 mm	07746-0041200
Pilot, 28 mm	07746-0041100
Pilot, 35 mm	07746-0040800
Pilot, 40 mm	07746-0040900
Pilot, 32 × 35 mm	07MAD-PR90200
Driver, 40 mm I.D.	07746-0030100
Attachment, 30 mm I.D.	07746-0030300
Lock nut wrench, 30 × 64 mm	07916-MB00002
Pinion puller set	07HMC-MM80101 not available in U.S.A.
– puller shaft	07931-ME40000 or 07931-ME4010B and 07931-HB3020A (U.S.A. only)
– pinion puller base	07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)
Remover shaft, 14 mm	07YMC-001010A (U.S.A. only) can use collet of 07936-KC10500
Remover shaft, 15 mm	07936-KC10100
Bearing remover, 14 mm	07WMC-KFG0100
Bearing remover, 15 mm	07936-KC10200
Remover weight	07741-0010201
Remover weight	07936-3710200 or 07936-371020A (U.S.A. only)
Remover handle	07936-3710100
Oil seal driver	07965-KE80200 or 07947-KA50100
Driver attachment	07LAD-PW50500
Differential bearing ring compressor	07YME-HN4010A (U.S.A. only)

TROUBLESHOOTING

Excessive noise

- Worn or scored ring gear shaft and axle
- Worn or scored pinion and splines
- Worn pinion and ring gears
- Excessive backlash between pinion and ring gears
- Oil level too low

Wobble or vibration in vehicle

- Axle not tightened properly
- Bent axle

Oil leak

- Oil level too high
- Clogged breather
- Damaged seals
- Loose case cover bolt

REAR AXLE REMOVAL

Remove the following:

- rear wheels ([page 13-3](#))
- rear brake drum ([page 14-14](#))
- breather tube
- adjusting nuts
- joint pins
- springs
- brake cables
- four nuts (discard them)
- brake panel assembly
- O-ring

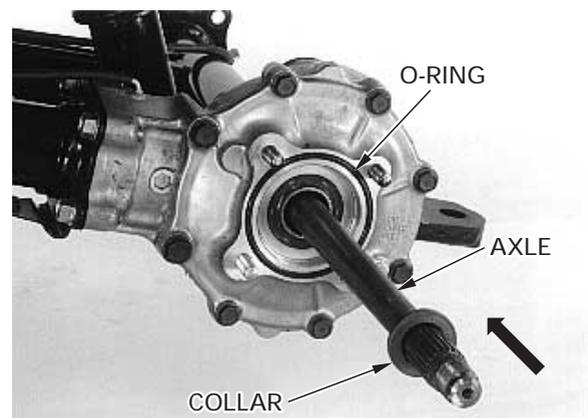
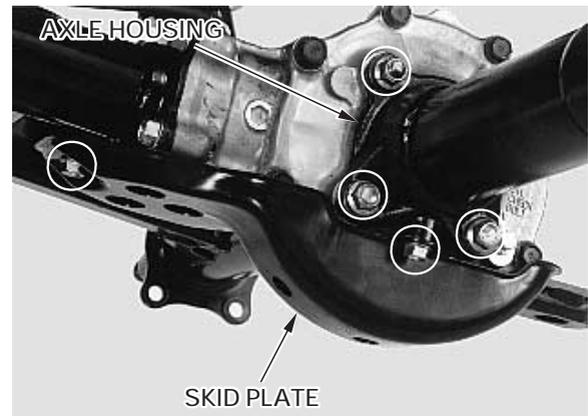
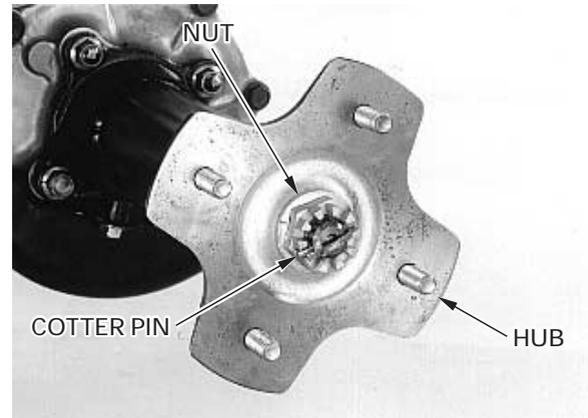
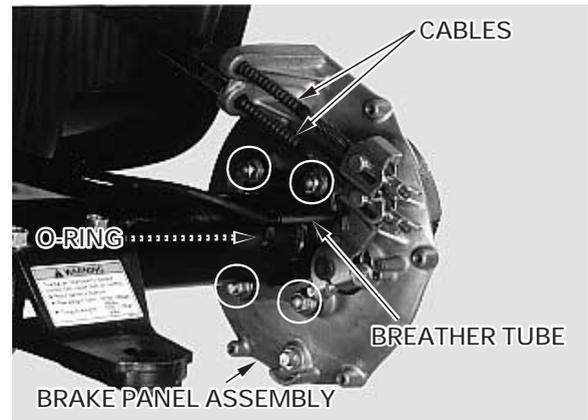
Do not get grease onto the shoe linings.

- cotter pin
- hub nut
- left wheel hub

- three bolts
- skid plate
- four left axle housing bolts (discard them)
- left axle housing

- O-ring
- left side collar

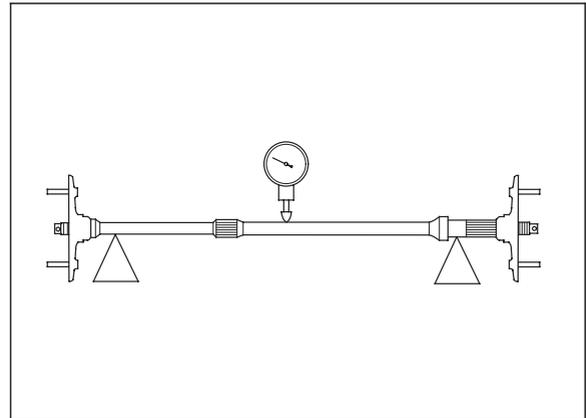
Remove the axle by driving the axle from left side using a rubber mallet.



INSPECTION

Set the axle in V-blocks and measure the axle runout with a dial indicator.
Axle runout is 1/2 the total indicator reading.

SERVICE LIMIT: 3.0 mm (0.12 in)



AXLE BEARING

Remove the dust seals from the axle housing and brake panel.
Turn the inner race of each bearing with your finger.
The bearings should turn smoothly and quietly.
Also check that the bearing outer race fits tightly in the housing or panel.



BEARING REPLACEMENT

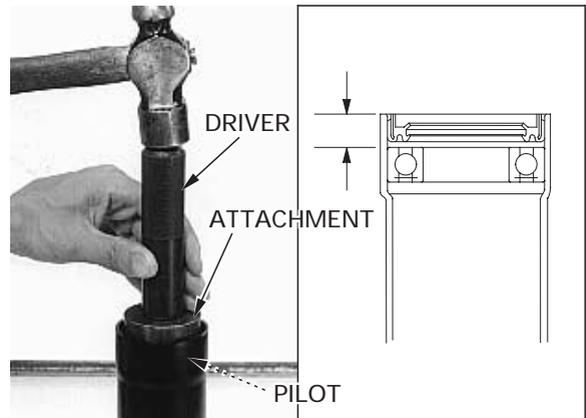
AXLE HOUSING

Drive the axle bearing out of the axle housing.

Press the bearing into the axle housing with the sealed side facing down until the depth from the housing edge is 11.0 mm (0.43 in).

TOOLS:

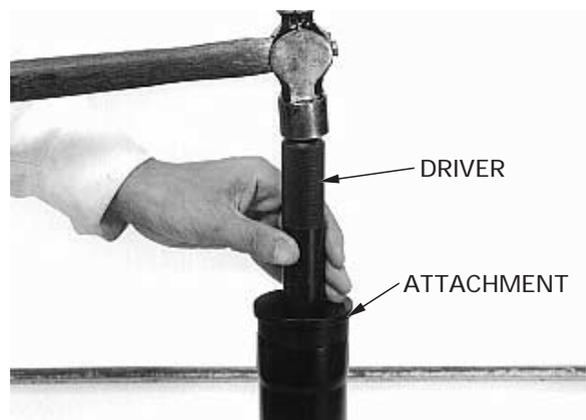
Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Pilot, 32 × 35 mm	07MAD-PR90200



Apply grease to a new dust seal lips.
Install the dust seal with the metal plate side facing up until it is flush with the housing end.

TOOLS:

Driver	07749-0010000
Attachment, 62 × 68 mm	07746-0010500



BRAKE PANEL

Remove the snap ring.
Drive the axle bearings out of the brake panel.

Support the bearing housing section of the brake panel when installing.

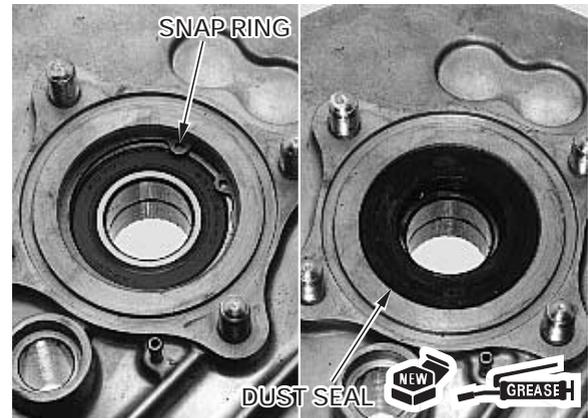
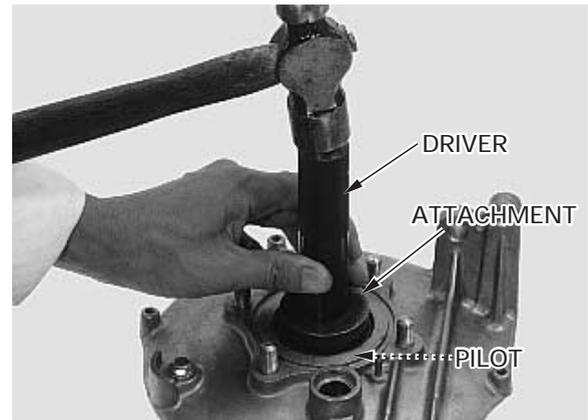
Drive the outer bearing (brake drum side) squarely with the sealed side facing down until it is fully seated, then the inner bearing with the sealed side facing up.

TOOLS:

Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Pilot, 28 mm	07746-0041100

Install the snap ring with the chamfered side facing to the bearing securely.

Apply grease to a new dust seal lips.
Install the dust seal with the flat side facing up until it is flush with the brake panel.



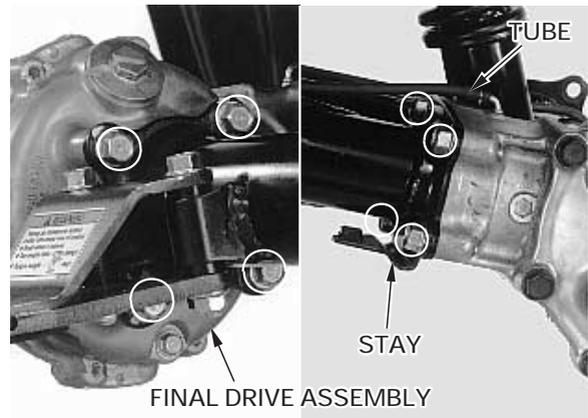
FINAL DRIVE REMOVAL

Drain the final gear case oil ([page 3-12](#)).

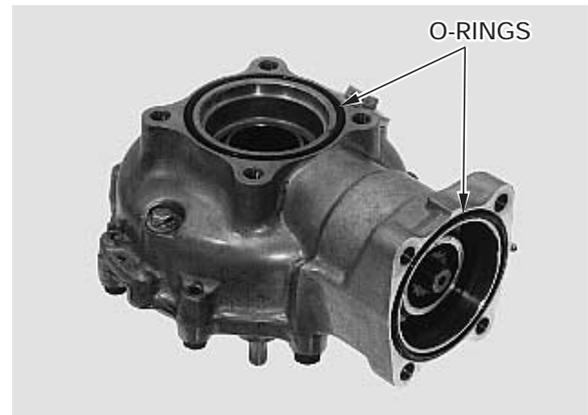
Remove the rear axle ([page 16-3](#)).

Disconnect the breather tube.

Remove the eight gear case mounting bolts with the skid plate stay, then remove the final drive assembly.



Remove the O-rings.



REAR DRIVING MECHANISM

Remove the spring and drive shaft from the swingarm.

INSPECTION

DRIVE SHAFT

Check the splines of the drive shaft for wear or damage.
If the splines are damaged, check the pinion and universal joint splines also.
For universal joint removal, see [page 13-4](#) "Swingarm"

FINAL DRIVE

Turn the pinion gear and check that the gear turns smoothly and quietly without binding.

If the gears do not turn smoothly or quietly, the gears and/or bearing may be damaged or faulty. They must be checked after disassembly; replace them if necessary.

FINAL DRIVE DISASSEMBLY/ INSPECTION

BACKLASH INSPECTION

Hold the pinion gear with the special tools.

TOOLS:

Pinion puller set	07HMC-MM80101
– puller shaft	07931-ME40000
– pinion puller base	07HMC-MM80110
or U.S.A. only:	
Puller shaft	07931-ME4010B
Special nut	07931-HB3020A
Pinion puller base	07HMC-MM8011A

Set the differential case into a jig or vise with soft jaws.

Remove the oil filler cap and set a horizontal type dial indicator on the ring gear through the filler hole.

Turn the ring gear back and forth to read backlash.

STANDARD: 0.05–0.25 mm (0.002–0.010 in)

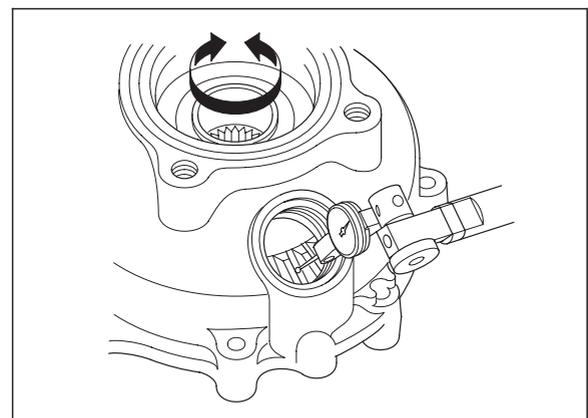
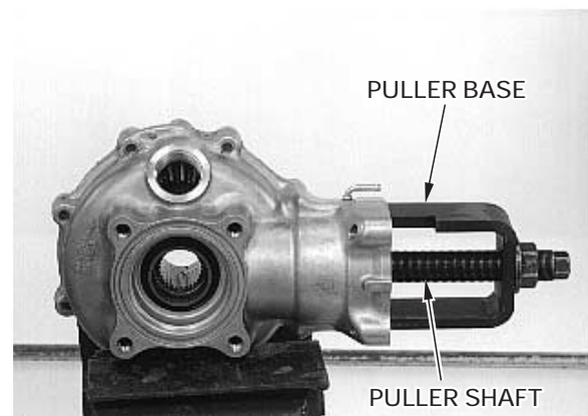
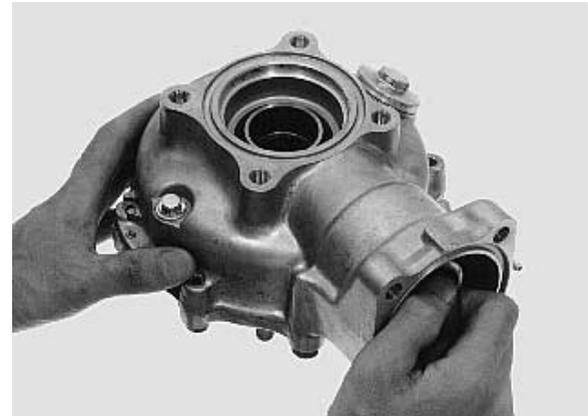
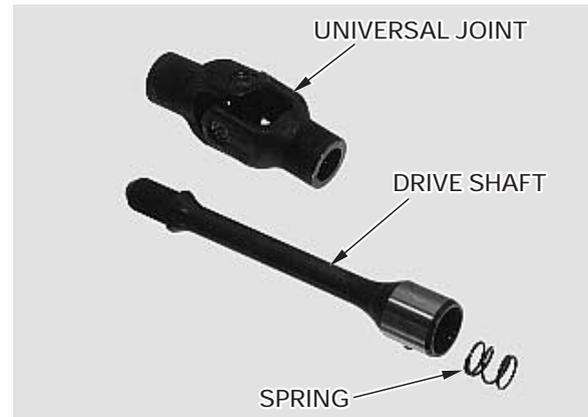
SERVICE LIMIT: 0.4 mm (0.02 in)

Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more.

Compare the difference of the three measurements.

SERVICE LIMIT: 0.2 mm (0.01 in)

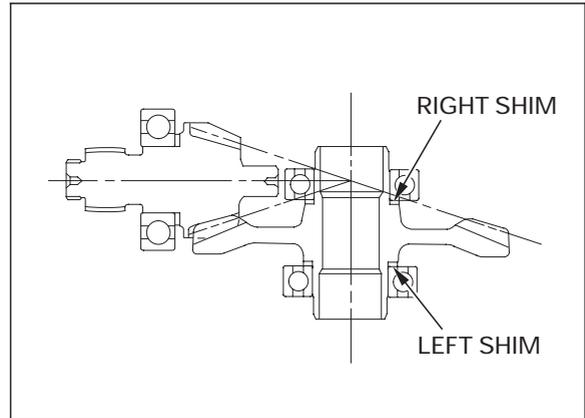
If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed. Inspect the bearings and case.



If the backlash is excessive, replace the ring gear right side shim with a thinner one.
 If the backlash is too small, replace the ring gear right side shim with a thicker one.
 Backlash changed by about 0.06 mm (0.002 in) when thickness of the shim is changed by 0.12 mm (0.005 in).

NOTE:

- Eleven different thickness right shims are available from the thinnest (1.26 mm thickness: A) shim to the thickest (1.86 mm thickness: K) in intervals of 0.06 mm.
- Nine different thickness left shims are available from the thinnest (1.82 mm thickness: A) shim to the thickest (2.30 mm thickness: I) in intervals of 0.06 mm.



Right ring gear shims:

- A: (thinnest)** : 1.26 mm (0.050 in) –
- E: (standard)** : 1.50 mm (0.059 in) –
- K: (thickest)** : 1.86 mm (0.073 in)

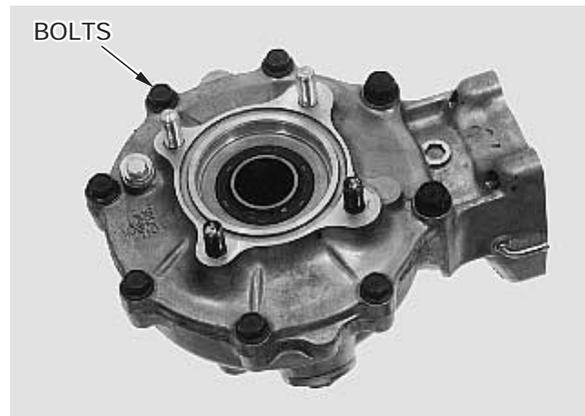
Left ring gear shims:

- A: (thinnest)** : 1.82 mm (0.072 in) –
- D: (standard)** : 2.00 mm (0.079 in) –
- I: (thickest)** : 2.30 mm (0.091 in)

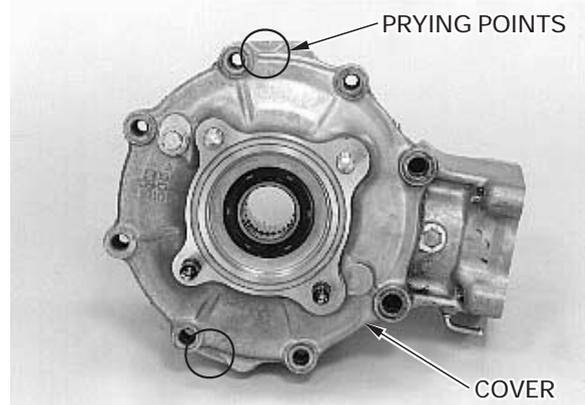
Change the left side shim and equal thickness and opposite amount of what the right side shim was changed; If the right shim was replaced with a 0.12 mm (0.005 in) thicker shim, replace the left shim with one that is 0.12 mm (0.005 in) thinner.

FINAL GEAR CASE DISASSEMBLY

Remove the cover bolts in a crisscross pattern in several steps.

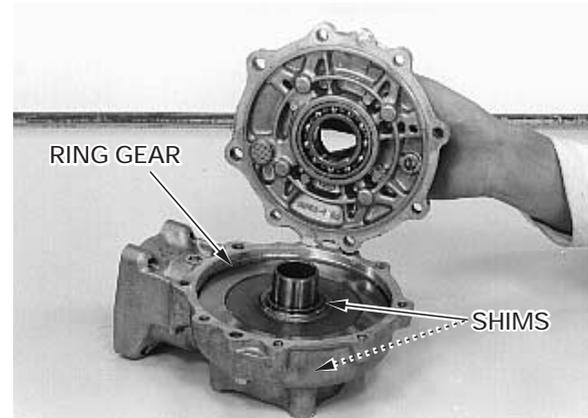


Pry the cover at the prying points using a screwdriver and remove the case cover.



REAR DRIVING MECHANISM

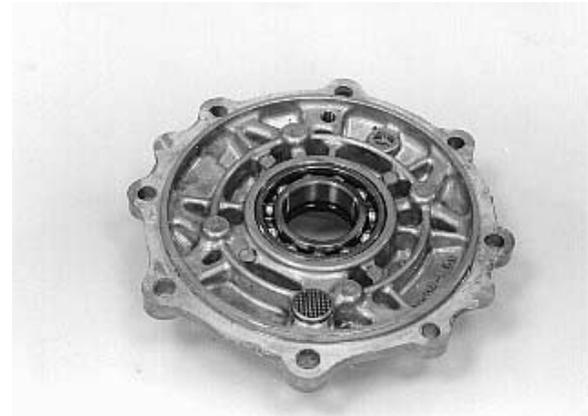
Remove the ring gear and shims.



BEARING INSPECTION

Turn the inner race of each bearing in the gear case and case cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case or cover.

For ring gear bearing replacement, see [page 16-11](#). For pinion gear removal and bearing replacement, see [page 16-10](#) and [16-12](#).

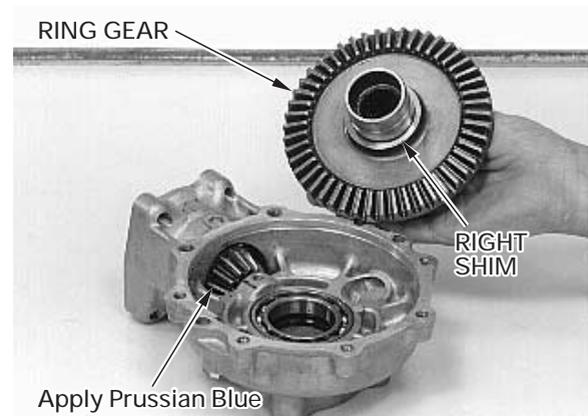


GEAR TOOTH CONTACT PATTERN CHECK

Keep dust and dirt out of the case and cover. Clean sealing material off the mating surfaces of the gear case and cover, being careful not to damage them.

Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the ring gear shims onto the ring gear.



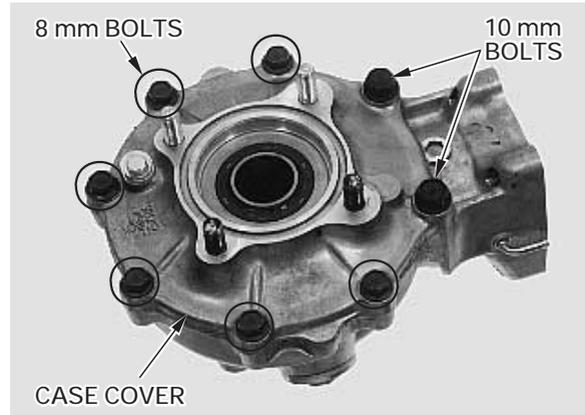
Install the ring gear with the shims into the gear case.



It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Install the case cover and tighten the bolts in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m , 36 lbf·ft)
8 mm bolt: 25 N·m (2.6 kgf·m , 19 lbf·ft)



Remove the oil filler cap.

Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.

The pattern is indicated by the Prussian Blue applied to the pinion.

Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.

Replace the pinion shim with a thicker one if the contact pattern is too high, toward the face.

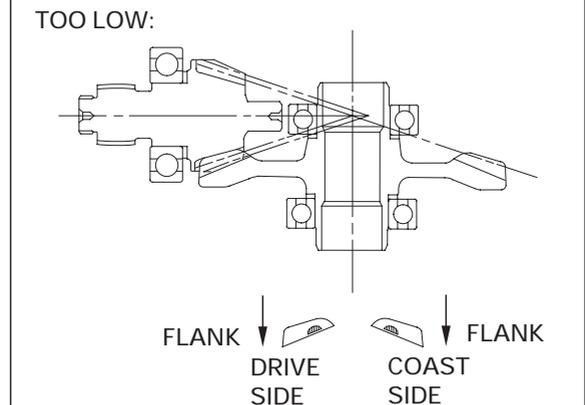
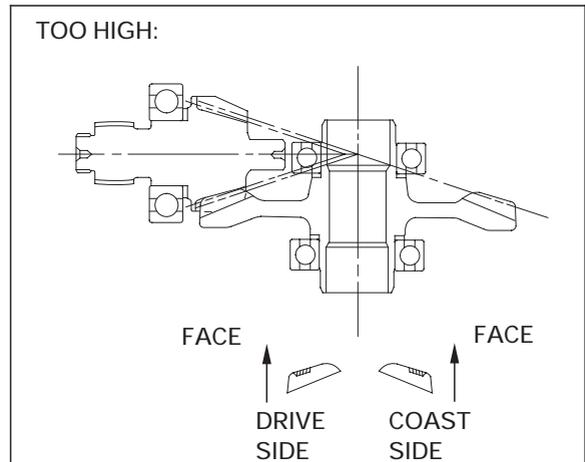
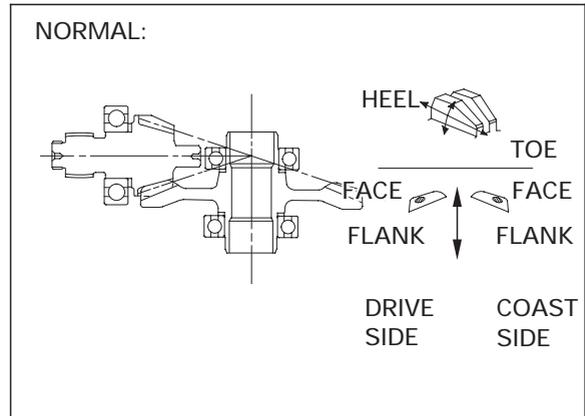
Replace the pinion shim with a thinner one if the contact pattern is too low, toward the flank.

The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

Pinion shims:

- A: 1.64 mm(0.064 in) F: 1.94 mm(0.076 in)
- B: 1.70 mm(0.067 in) G: 2.00 mm(0.079 in)
- C: 1.76 mm(0.069 in) H: 2.06 mm(0.081 in)
- D: 1.82 mm(0.072 in) I: 2.12 mm(0.083 in)
- E: 1.88 mm(0.074 in) J: 2.18 mm(0.086 in)

For pinion shim replacement, see [page 16-10](#).



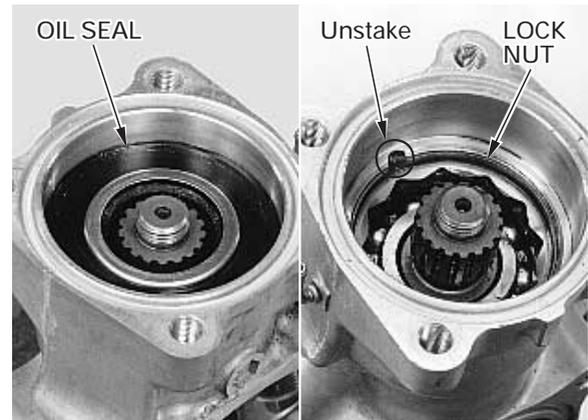
REAR DRIVING MECHANISM

PINION GEAR REMOVAL

Remove the oil seal from the gear case.

Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.

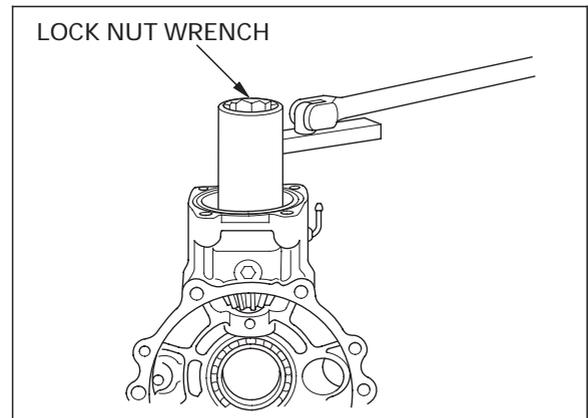
Unstake the pinion bearing lock nut with a drill or grinder.



Remove the lock nut and discard it.

TOOL:

Lock nut wrench, 30 × 64 mm 07916-MB00002

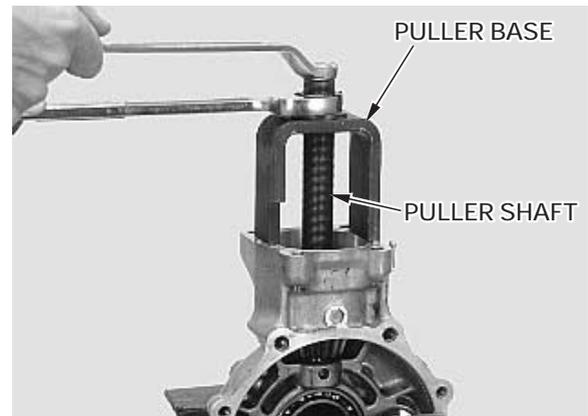


Install the special tools onto the pinion gear shaft and gear case.

TOOLS:

Pinion puller set	07HMC-MM80101
— puller shaft	07931-ME40000
— pinion puller base	07HMC-MM80110
or U.S.A. only:	
Puller shaft	07931-ME4010B
Special nut	07931-HB3020A
Pinion puller base	07HMC-MM8011A

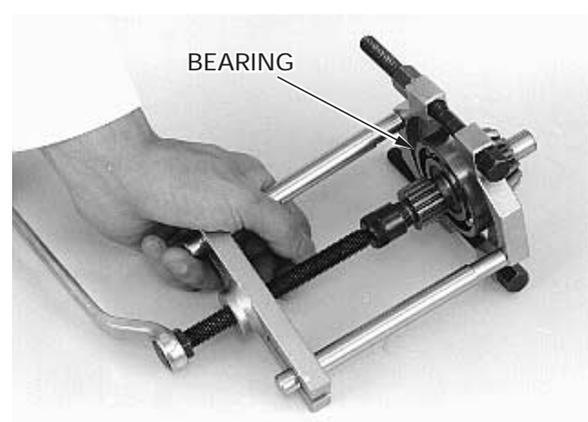
Pull the pinion assembly out from the case.



PINION GEAR BEARING AND SHIM REPLACEMENT

Pull the pinion bearing from the shaft with a commercially available bearing puller.

Remove the pinion shim.



Install the shim and bearing onto the pinion gear.

NOTE:

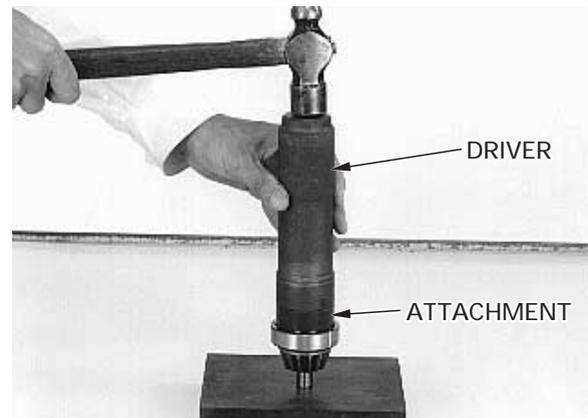
- When the gear set, ring gear bearing, and/or gear case has been replaced, use a 2.00 mm (0.79 in) thick shim for initial reference.



Drive the bearing with the marking side facing up.

TOOLS:

Driver, 40 mm I.D.	07746-0030100
Attachment, 30 mm I.D.	07746-0030300



CASE BEARING REPLACEMENT

RING GEAR BEARING

Remove the oil seal.
Drive the bearings out of the case and cover.



Drive each bearing into the case and cover.

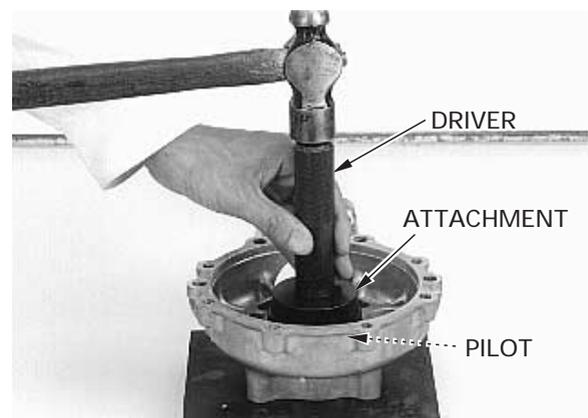
TOOLS:

Gear Case:

Driver	07749-0010000
Attachment, 62 × 68 mm	07746-0010500
Pilot, 40 mm	07746-0040900

Case Cover:

Driver	07749-0010000
Attachment, 62 × 68 mm	07746-0010500
Pilot, 35 mm	07746-0040800

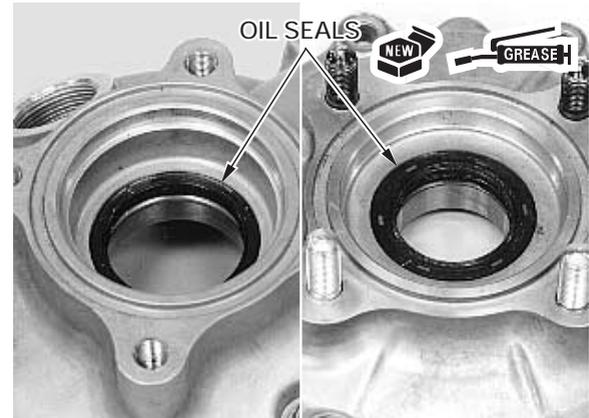


REAR DRIVING MECHANISM

Apply grease to new oil seal lips.
Install each oil seal with the flat side facing out until it is flush with the case or cover.

TOOL:

Driver 07749-0010000
Attachment, 52 × 55 mm 07746-0010400



PINION NEEDLE BEARING

Remove the stopper ring by rotating it until the end of the stopper ring appears in the access hole.
Bend up the end of the ring with a screwdriver.
Grasp the end of the ring with needle-nose pliers and pull the stopper ring out through the access hole.
Remove the filler cap.

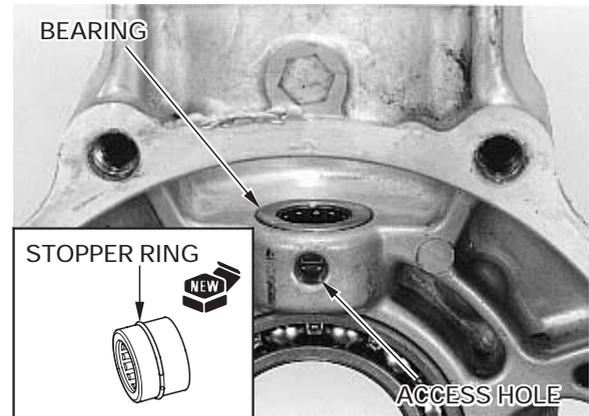
Heat the gear case to 80 °C (176 °F) and remove the needle bearing by using the special tools.

TOOL:

Bearing remover, 14 mm 07WMC-KFG0100
Remover shaft, 15 mm 07936-KC10100
Remover weight 07741-0010201

U.S.A. only:

Bearing remover, 15 mm 07936-KC10200
Remover shaft, 14 mm 07YMC-001010A
Remover weight 07936-371020A or 07936-3710200
Remover handle 07936-3710100



Be sure to wear heavy gloves to avoid burns when handling the heated gear case.

Using a torch to heat the gear case may cause warpage.

Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.

Install the stopper ring into the groove in the bearing.
Install the bearing into the compressor until the bearing is flush with the end of the tool.
Place the driver on top of the bearing and tape the driver to the compressor. Place the assembly into a freezer for at least 30 minutes.

Make sure the ring stays in the groove.

TOOLS:

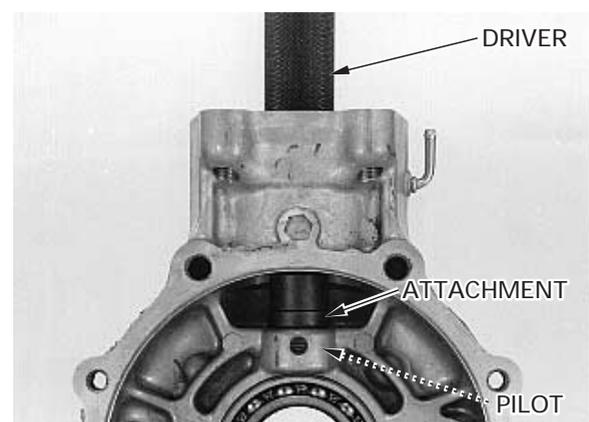
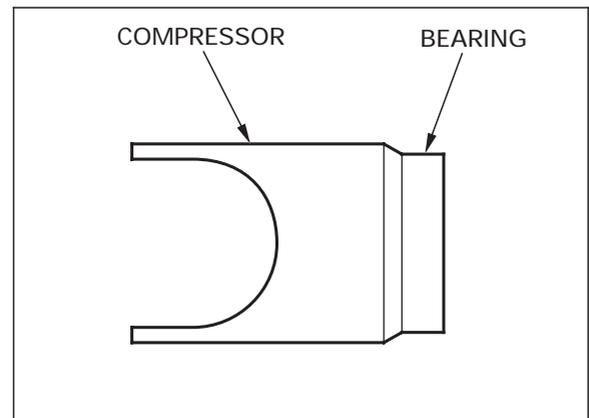
Driver 07749-0010000
Differential bearing ring compressor 07YME-HN4010A
Attachment, 22 × 24 mm 07746-0010800
Pilot, 14 mm 07746-0041200

Heat the gear case to 80 °C (176 °F).

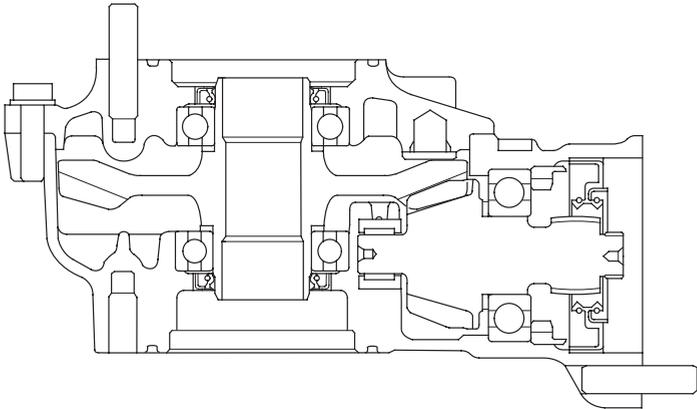
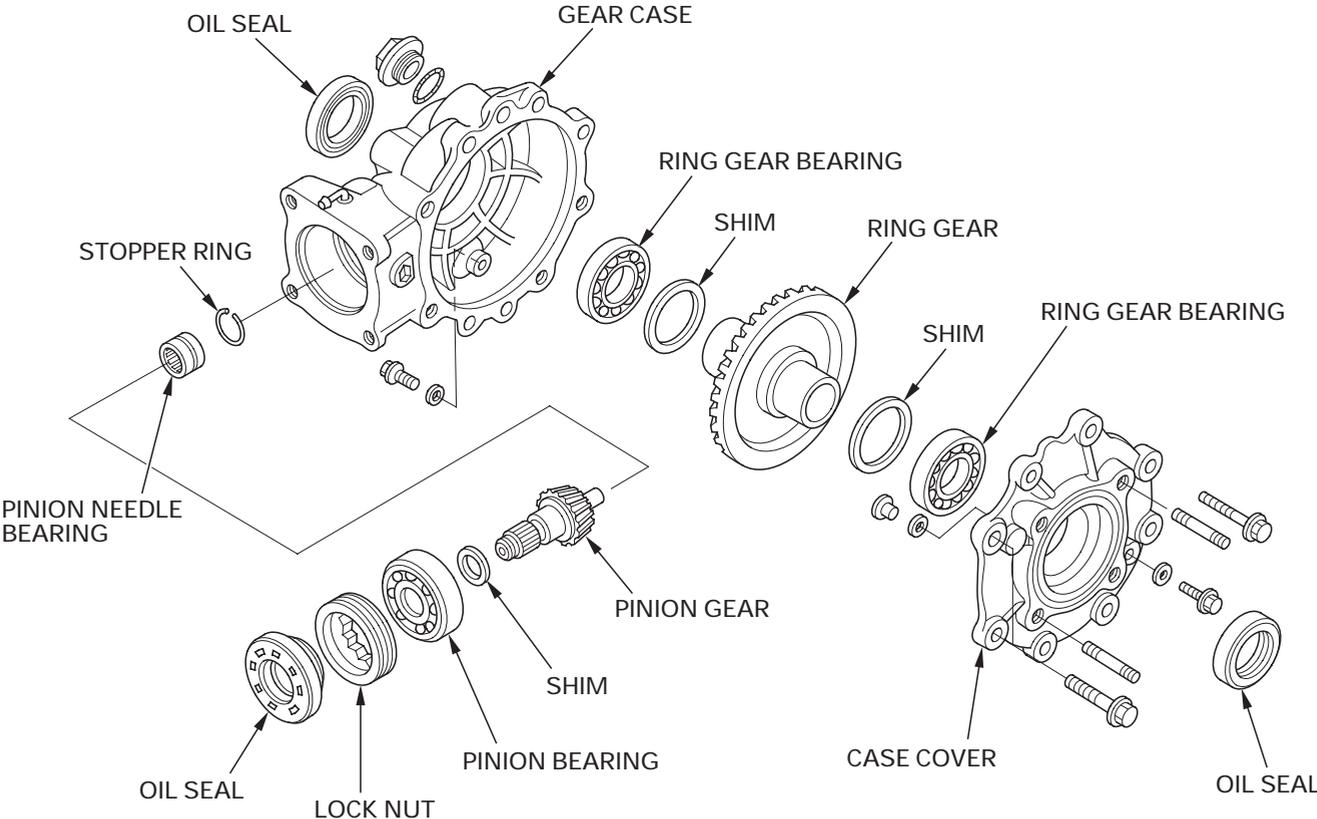
Remove the needle bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

Only strike the driver once. If you strike it more than once, the ring may slip out of the groove. If this happens, remove the ring and bearing, and install a new one.

Make sure the stopper ring is securely set in the groove of the gear case.



FINAL DRIVE ASSEMBLY

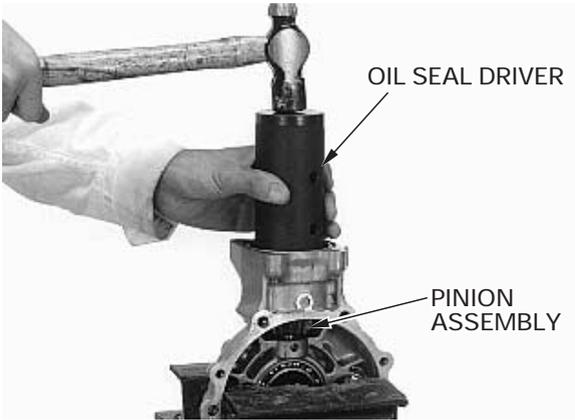


PINION GEAR INSTALLATION

Drive the pinion assembly into the gear case.

TOOL:
 Oil seal driver 07965-KE80200 or
 07947-KA50100

NOTE:
 • Keep the driver centered with the bearing outer race during installation.



REAR DRIVING MECHANISM

Install a new lock nut and tighten it.

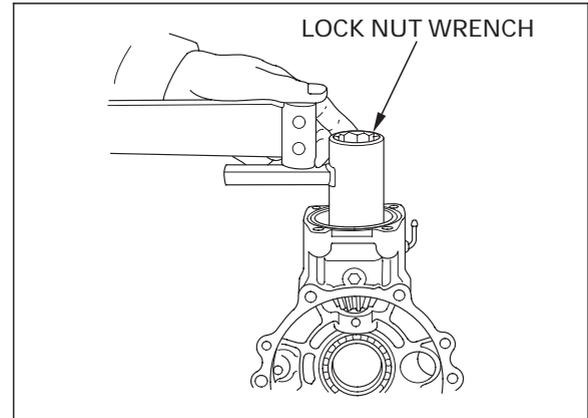
TOOL:

Lock nut wrench, 30 × 64 mm 07916-MB00002

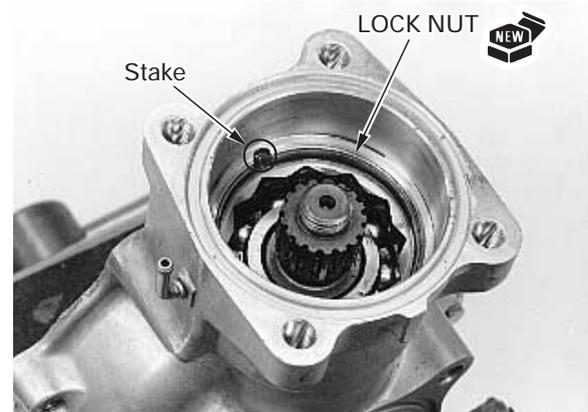
Refer to torque wrench reading information on [page 16-1](#)

“Service information”.

TORQUE: Actual: 98 N·m (10.0 kgf·m , 72 lbf·ft)
Indicated: 89 N·m (9.1 kgf·m , 66 lbf·ft)



Stake the lock nut into the case groove.



Apply grease to a new oil seal lips and install it into the gear case until it is fully seated.

TOOL:

Driver attachment 07LAD-PW50500

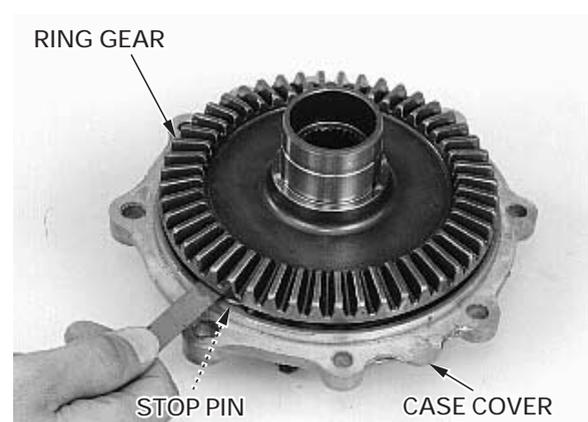


RING GEAR CLEARANCE INSPECTION

Install the ring gear with the shim into the case cover.

Measure the clearance between the ring gear and stop pin with a feeler gauge.

CLEARANCE: 0.3–0.6 mm (0.01–0.02 in)



Remove the ring gear.

Be sure to wear heavy gloves to avoid burns when handling the heated case cover. Using a torch to heat the case cover may cause warpage.

If the clearance exceeds the standard value, heat the case cover to approximately 80°C (176°F) and remove the stop pin by tapping the cover.

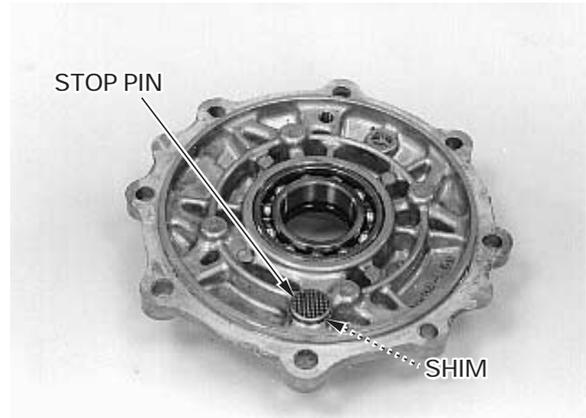
Install a stop pin shim to obtain the correct clearance.

Stop pin shims:

A: 0.10 mm (0.004 in)

B: 0.15 mm (0.006 in)

Install the shim and drive the stop pin into the case cover.



FINAL GEAR CASE ASSEMBLY

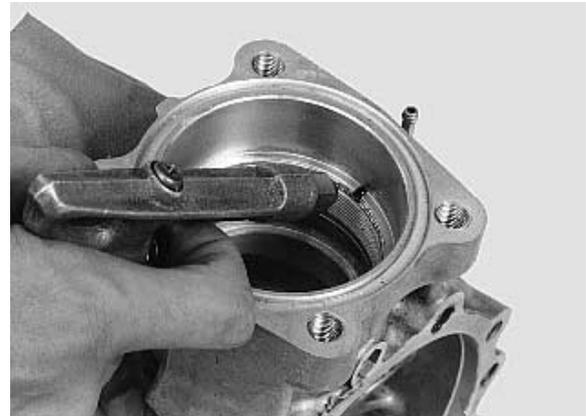
NOTE:

- When the gear set, bearing, and/or gear case has been replaced, check the tooth contact pattern check ([page 16-8](#)) and gear backlash ([page 16-6](#)).

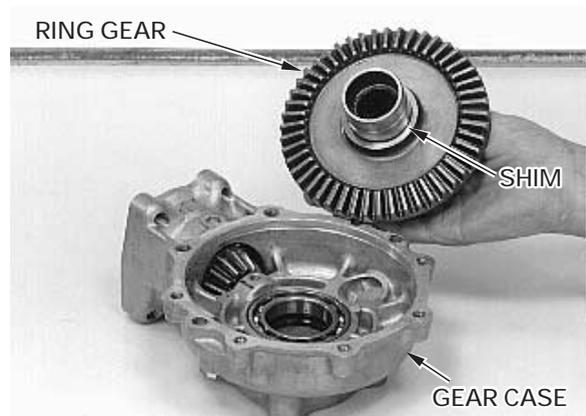
Keep dust and dirt out of the case and cover.

Clean the mating surface of the gear case and cover, being careful not to damage them.

Blow compressed air through the breather hole in the gear case.

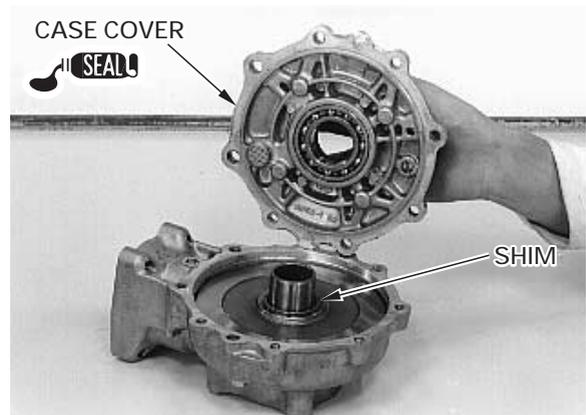


Install the proper ring gear shims onto the ring gear and install them into the gear case.



Apply liquid sealant to the mating surface of the case cover.

Install the cover over the gear case.



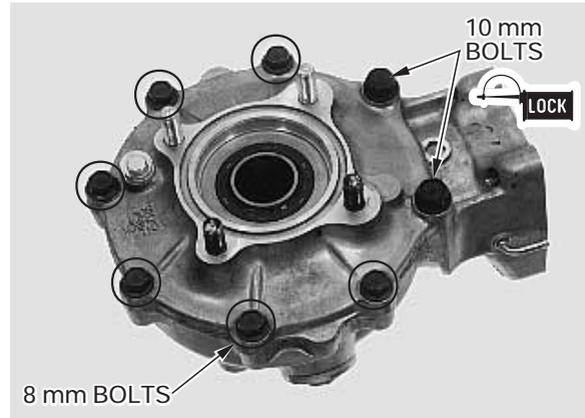
REAR DRIVING MECHANISM

It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Apply locking agent to the threads of the two 10 mm bolts.
Install the bolts and tighten them several steps until the cover evenly touches the case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m , 36 lbf·ft)
8 mm bolt: 25 N·m (2.6 kgf·m , 19 lbf·ft)

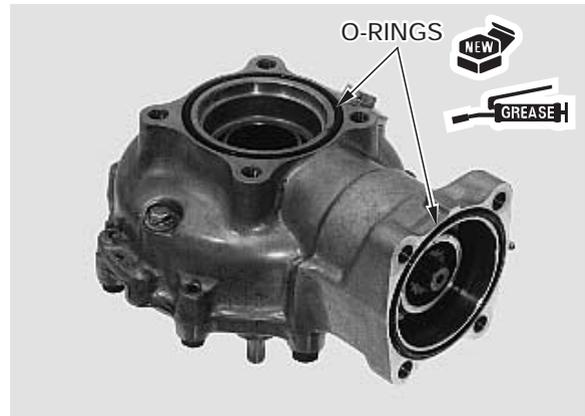
Make sure that the gear assembly rotates smoothly without binding.



FINAL DRIVE INSTALLATION

Clean the mating surfaces of the gear case and swingarm.

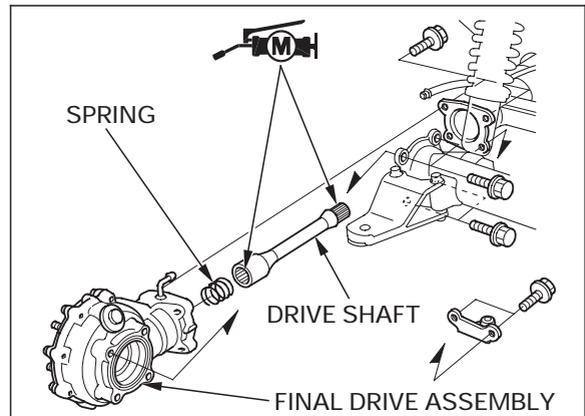
Coat new O-rings with grease and install them into the grooves in the gear case.



Apply molybdenum disulfide grease to the drive shaft splines.

Insert the drive shaft into the swingarm and carefully align the splines with the universal joint to install it.

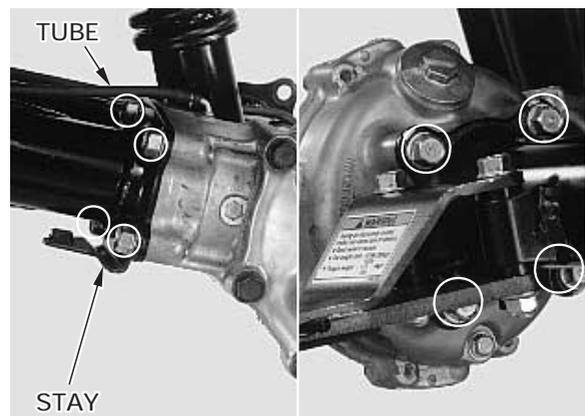
Install the spring into the drive shaft and set the final drive assembly onto the swingarm, then secure it with at least two mounting bolts.



Install the mounting bolts with the skid plate stay and tighten them in several steps.

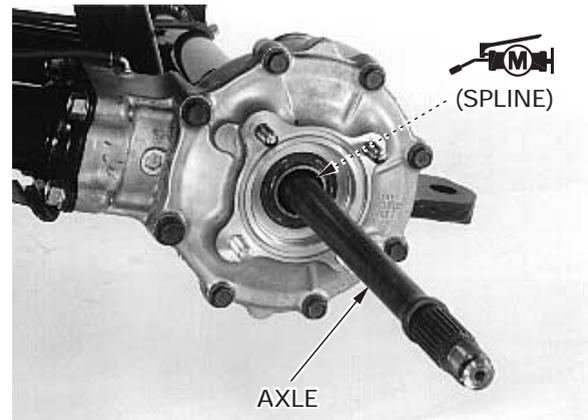
TORQUE: 54 N·m (5.5 kgf·m , 40 lbf·ft)

Connect the breather tube to the tube joint.



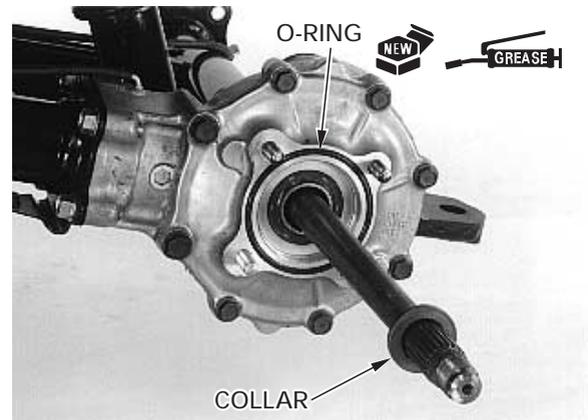
REAR AXLE INSTALLATION

Apply molybdenum disulfide grease to the center spline of the axle.
Install the axle into the final gear case from right side until it is fully seated.



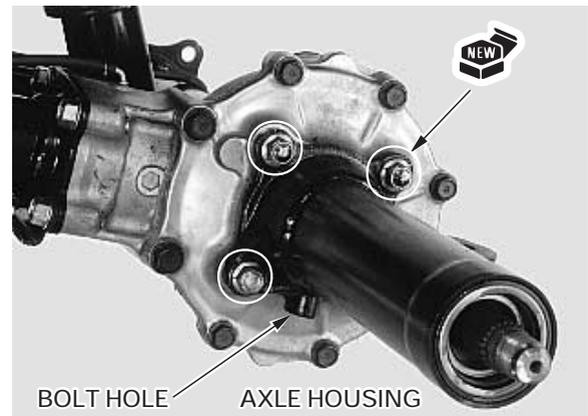
Coat a new O-ring with grease and install it into the gear case groove.

Install the side collar onto the axle with the tapered side facing inward.



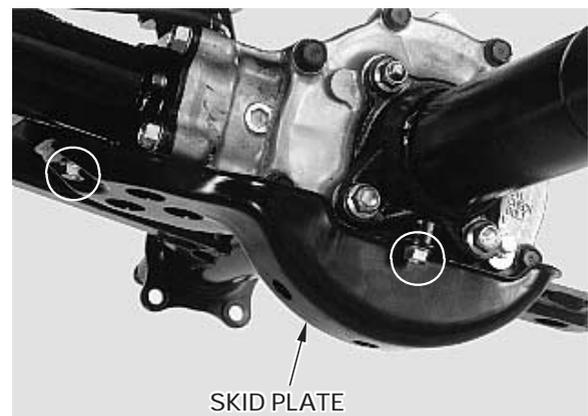
Install the left axle housing with the skid plate bolt hole facing down.
Install four new housing nuts and tighten them.

TORQUE: 44 N·m (4.5 kgf·m , 33 lbf·ft)



Install the skid plate and tighten the three bolts.

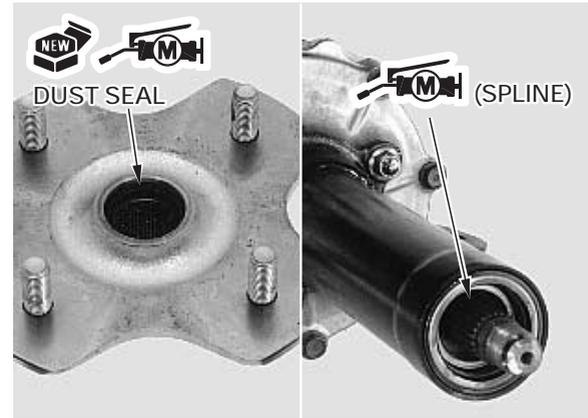
TORQUE: 32 N·m (3.3 kgf·m , 24 lbf·ft)



REAR DRIVING MECHANISM

Apply molybdenum disulfide grease to the seal lips of a new hub dust seal and install it with the flat side facing in until it is fully seated.

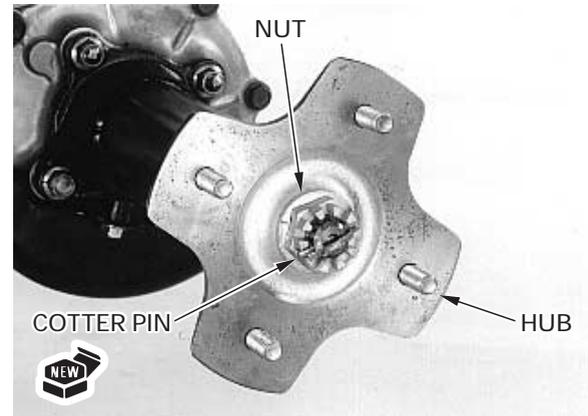
Apply molybdenum disulfide grease to the left spline of the axle and install the wheel hub.



Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 137 N·m (14.0 kgf·m , 101 lbf·ft)

Install a new cotter pin.



Coat a new O-ring with grease and install it into the brake panel groove.

Do not get grease to the shoe linings.

Install the brake panel assembly onto the axle.



Install new brake panel nuts and tighten them.

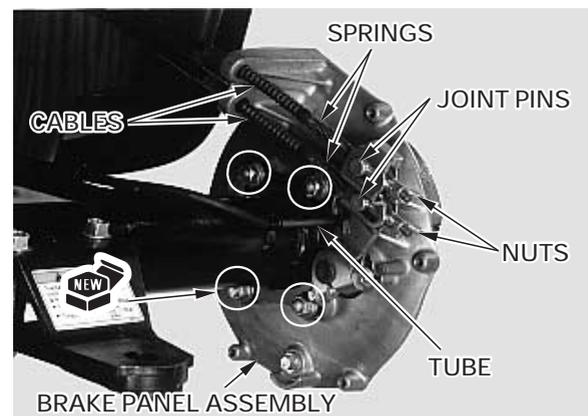
TORQUE: 44 N·m (4.5 kgf·m , 33 lbf·ft)

Install the brake cables into the cable holders on the brake panel (upper holder for parking brake cable and lower holder for pedal brake cable).

Install the cable springs onto the cables and the joint pins into the brake arm. Connect the brake cables to the brake arm with the adjusting nuts.

Install the rear brake drum ([page 14-17](#)).

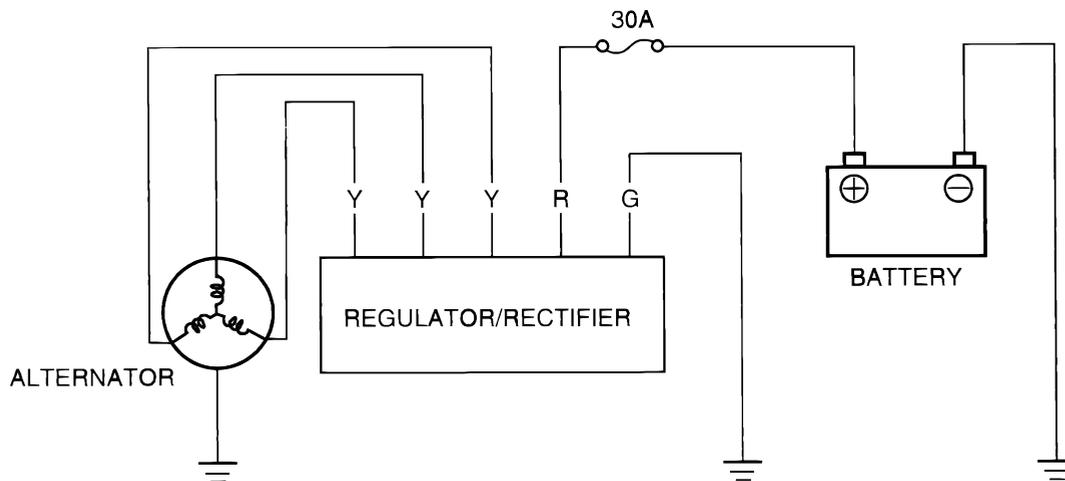
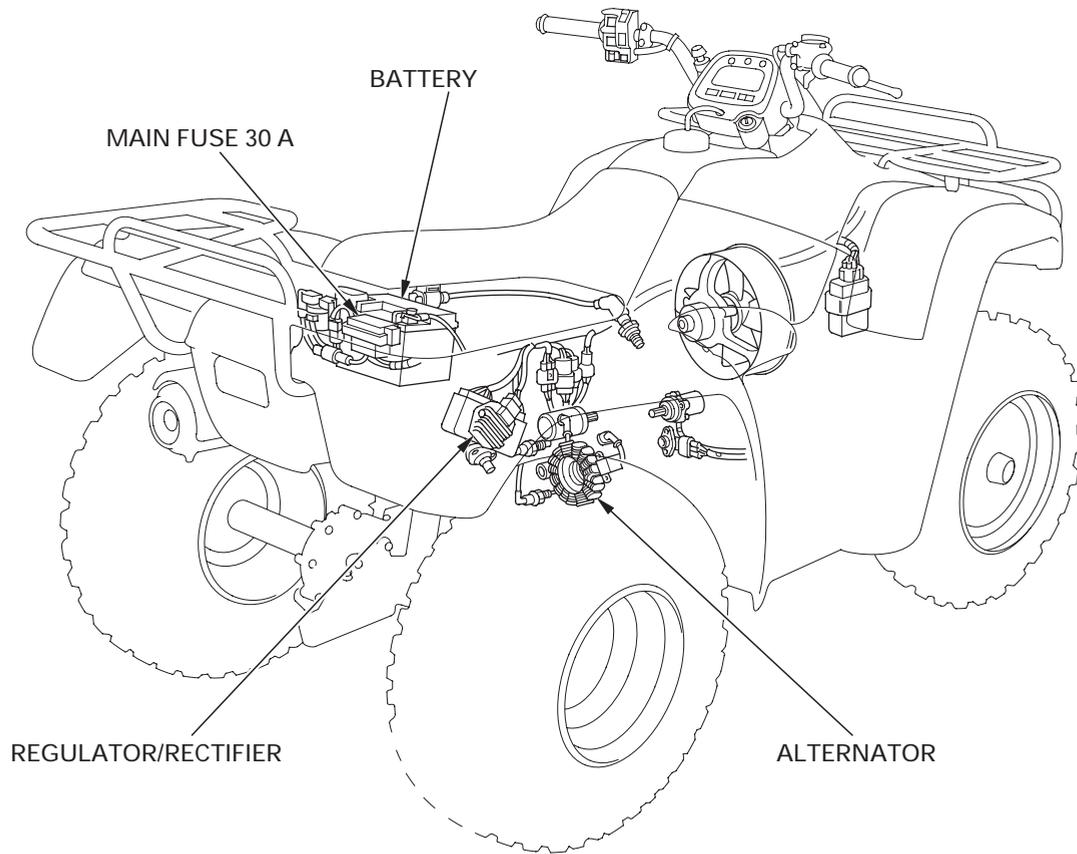
Fill the gear case with the recommended oil ([page 3-12](#)).



MEMO

BATTERY/CHARGING SYSTEM

TE/FE model shown:



Y : Yellow
G : Green
R : Red