

LAB - Differential Rebuild

Students: 1. _____ Date: _____
2. _____ Block: _____

Fill in each box with the appropriate information. Place checks (✓) where applicable. Be sure to have Instructor's initials before moving on to the next step. Each team member will need to answer questions to receive credit for this lab.

DIFFERENTIAL IDENTIFICATION

Record any manufacturer or part number identification found on the alternator:

Find the following specifications for your differential:

Ring Gear Runout: _____

Pinion Preload: _____

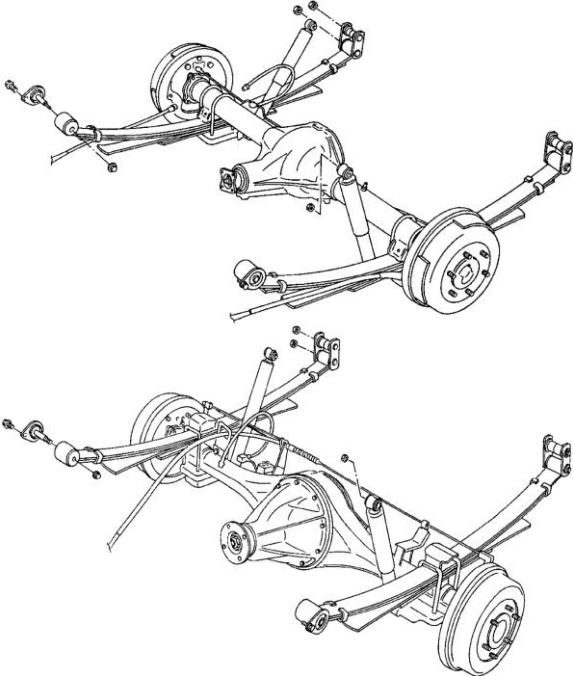
Pinion-Ring Gear Backlash: _____

DIFFERENTIAL OPERATION

1 Open the differential cover (top image), or remove the differential carrier (bottom image) to access the differential.

EXPLAIN to your instructor how the *differential*:

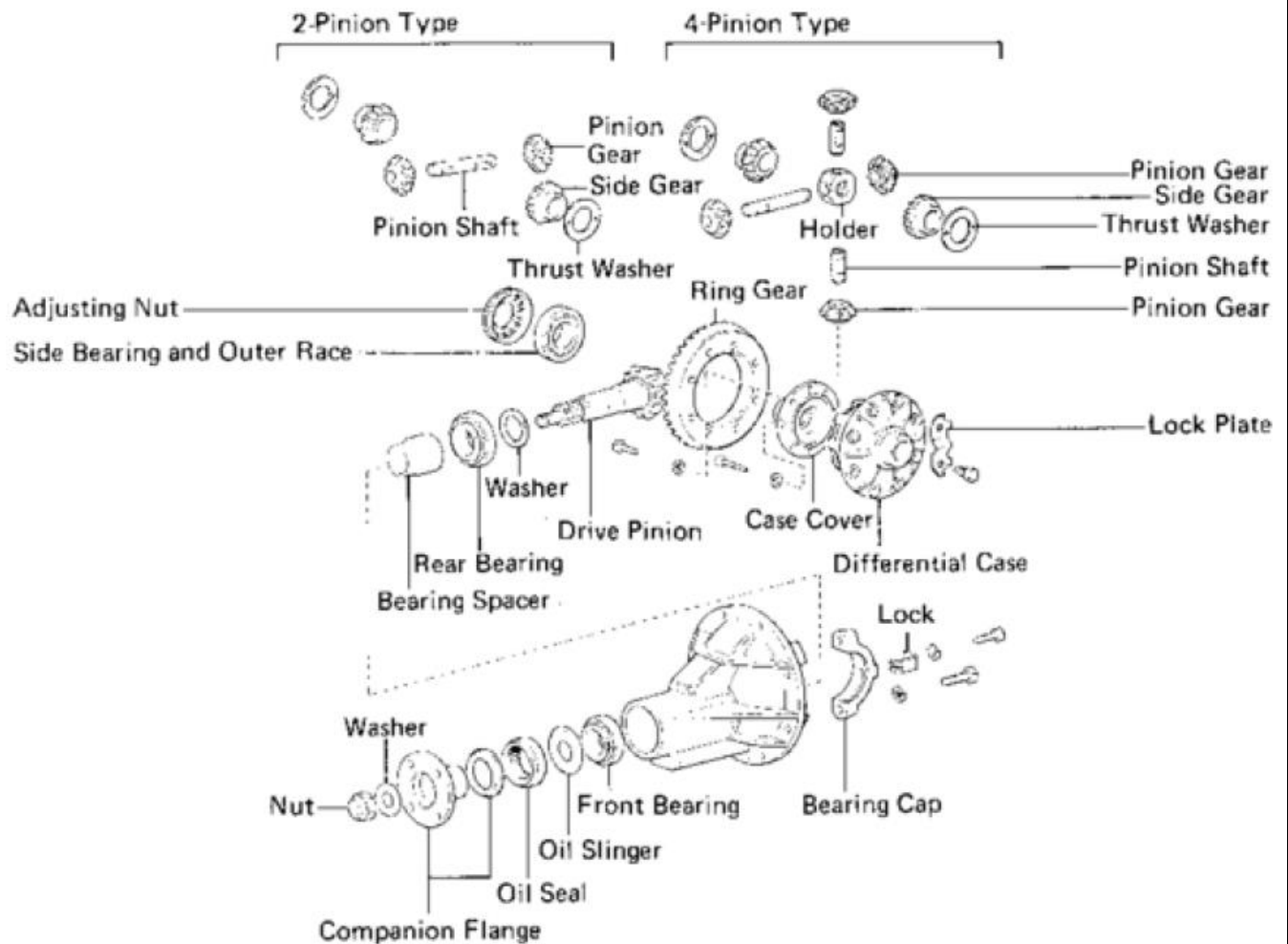
1. Allows the wheels to be driven by the driveshaft
2. Allows the wheels to be driven around a corner (inside wheel must rotate slower than outside wheel)



STOP! **INSTRUCTOR'S INITIALS:** _____

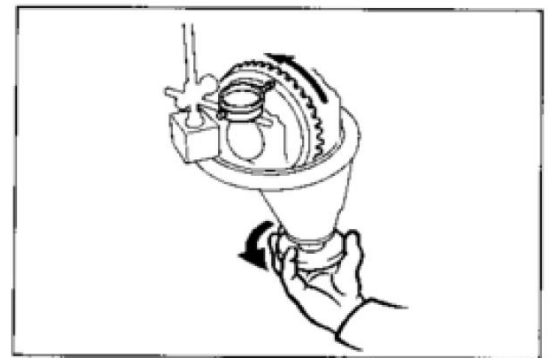
DIFFERENTIAL INVESTIGATION

This lab is written for a typical Removeable Carrier differential (shown below). Salisbury will be similar – see your instructor for details on the axle you have.



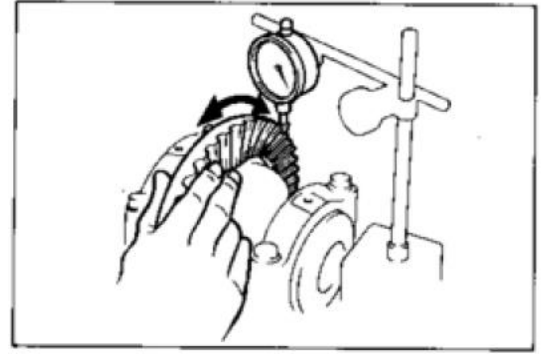
Measure ring gear runout: _____"

Ballpark: Should be less than 0.0028"



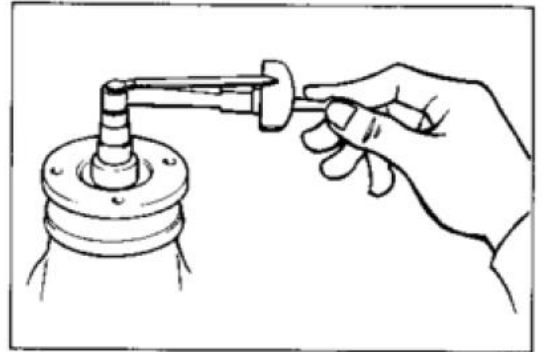
Measure ring gear backlash: _____”

Ballpark: Should be between 0.005” – 0.007”



Measure the preload of the backlash between the drive pinion and ring gear using a beam-type torque wrench

Ballpark: Should be between 4.3 – 6.9 inch-lbs



STOP!

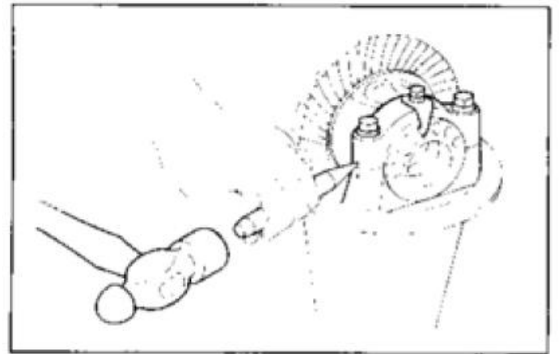
INSTRUCTOR'S INITIALS:

DIFFERENTIAL DISASSEMBLY

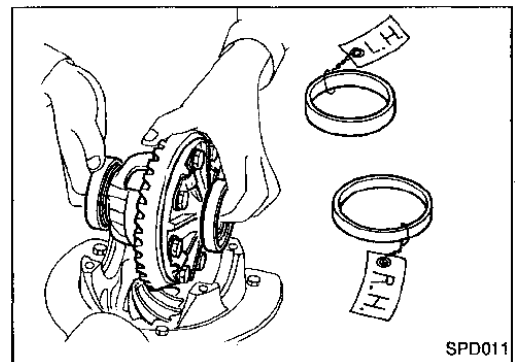
MARK the placement and alignment of the bearing caps to ensure they go back on correctly

Remove the two adjusting nut locks

Remove the two bearing caps and two adjusting nuts

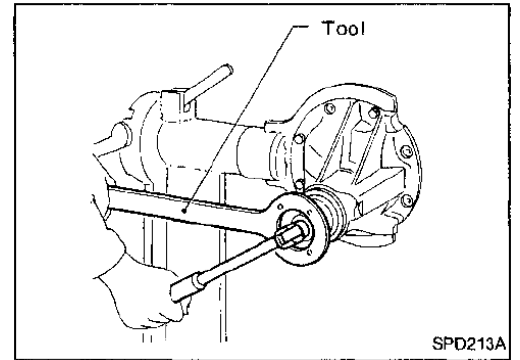


BE CAREFUL to keep the side bearing outer races together with their respective inner cones – DO NOT MIX THEM UP



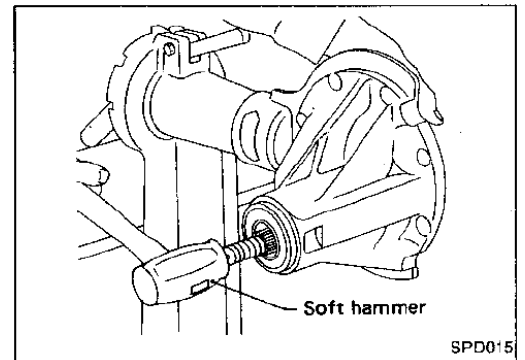
Remove Drive Pinion Nut

Remove companion flange with a puller

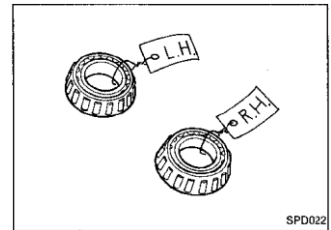
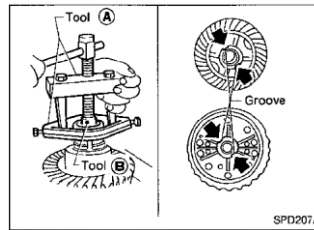
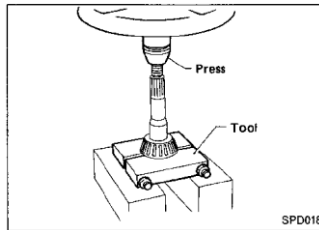
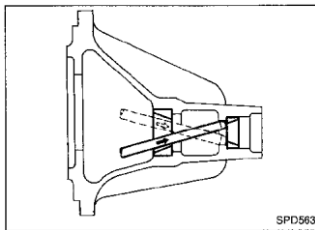


Remove drive pinion with a soft hammer

DO NOT remove or damage the oil seal unless this diff is going back into a car



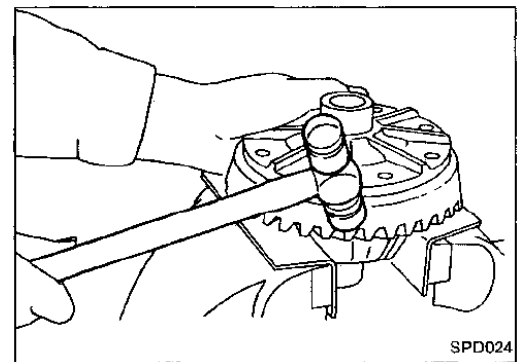
DO NOT remove the bearings unless you have been instructed to do so



Loosen ring gear bolts in a CRISS-CROSS fashion

TAP ring gear off differential case with a soft hammer

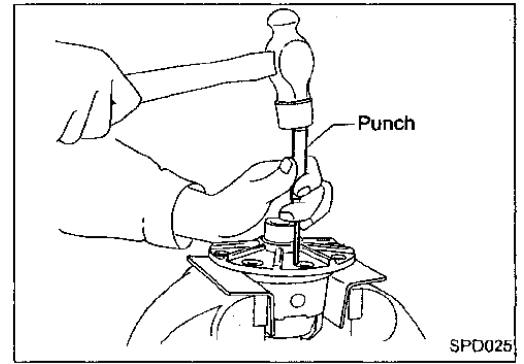
TAP EVENLY around to keep the ring gear from binding



The differential pinion shaft may be held in by a variety of ways. There are usually roll pins, or cap screws.

Some are prone to snap off, making this process difficult.

See your instructor for TIPS.



STOP!

INSTRUCTOR'S INITIALS:

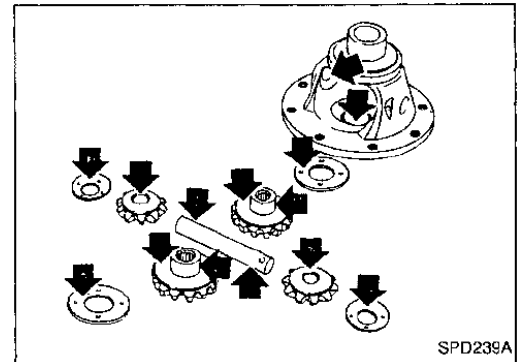
DIFFERENTIAL INSPECTION

INSPECT the gear teeth for

- Scoring
- Cracking
- Chipping

If any damaged part is evident, replace the ring gear and the drive pinion AS A SET

CHECK mating surfaces of differential case, side gears, spider gears, differential pinion shaft, and thrust washers

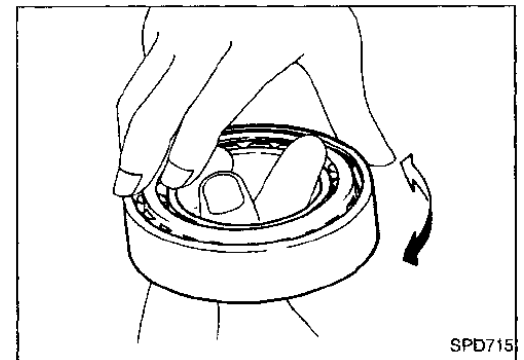


Thoroughly clean the bearings

Check the bearings for:

- Wear
- Scratches
- Pitting
- Flaking
- Smooth rotation

If any damaged part is evident, replace the outer race and inner cone AS A SET

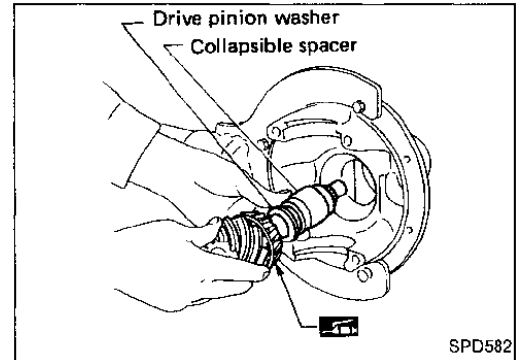


STOP!

INSTRUCTOR'S INITIALS:

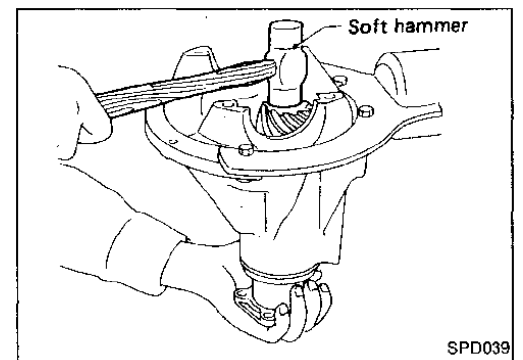
DIFFERENTIAL ASSEMBLY

Install the Pinion Washer (spacer), Collapsible Spacer and Drive Pinion into the carrier.



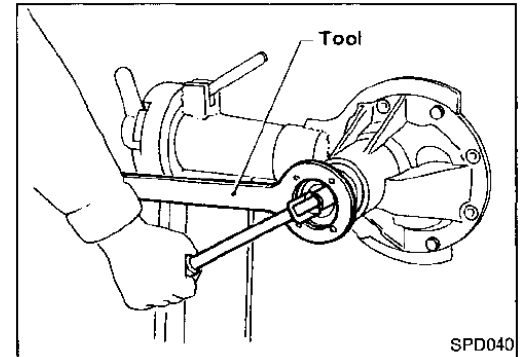
Install companion flange and hold it firmly

Insert pinion into companion flange by tapping its head with a soft hammer



Temporarily tighten pinion nut until there is NO axial play

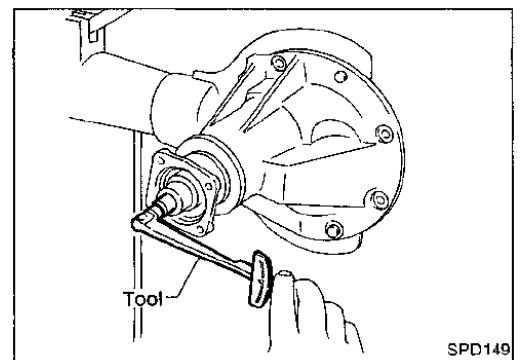
The threaded portion of the drive pinion and pinion nut should be free from oil or grease



Tighten pinion nut by degrees to the specified preload while checking preload with Tools

While checking preload, turn the drive pinion in both directions several times to seat bearing rollers correctly

CAUTION: The preload is achieved by using the permanent set of collapsible spacer. If you turn it too tight, the collapsible spacer must be replaced.



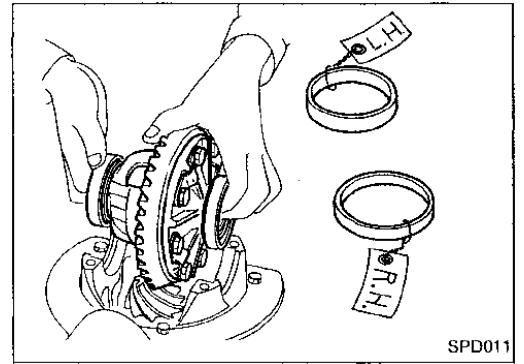
STOP!

INSTRUCTOR'S INITIALS:

Install the ring gear onto the differential carrier. I usually put the carrier in the freezer overnight, and boil the ring gear on the stove. Be quick, because it will shrink together quickly.

Assemble the side gears, spider gears, and cross shaft.

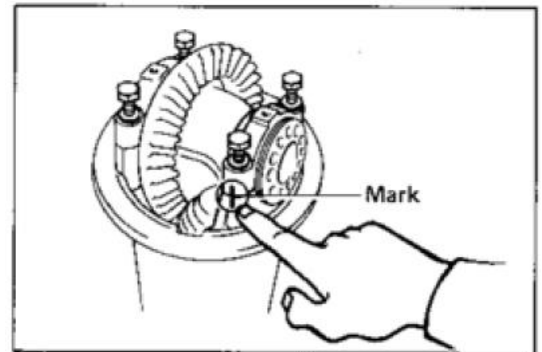
Install differential case assembly with side bearing outer races into gear carrier



Align marks on the cap and carrier

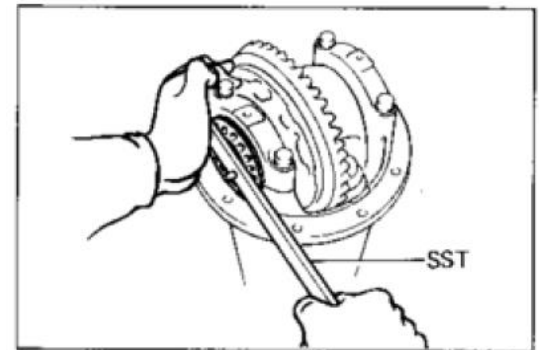
Screw in the two bearing cap bolts two or three turns and press down the bearing cap by hand

NOTE: If the bearing cap does not fit tightly on the carrier, the adjusting nut threads are not threaded properly. Reinstall adjusting nuts if necessary



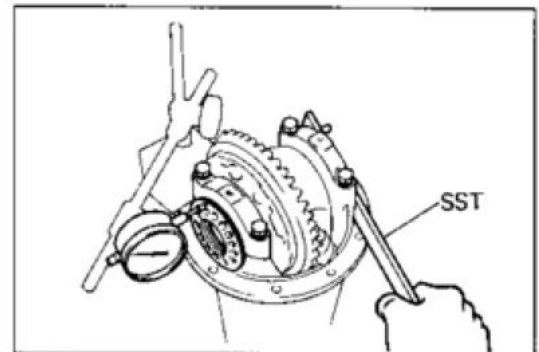
Tighten the bearing cap bolts until the spring washers are slightly compressed.

Tighten the adjusting nut on the ring gear side until the ring gear has the required backlash

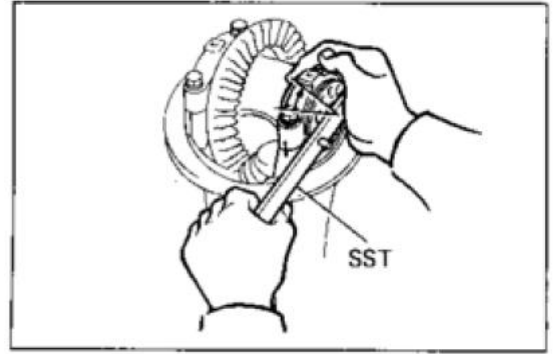


Place a dial indicator at the top of the bearing cap on the ring gear side.

Adjust the side bearing to zero preload by tightening the other adjusting nut until the pointed on the indicator begins to move.



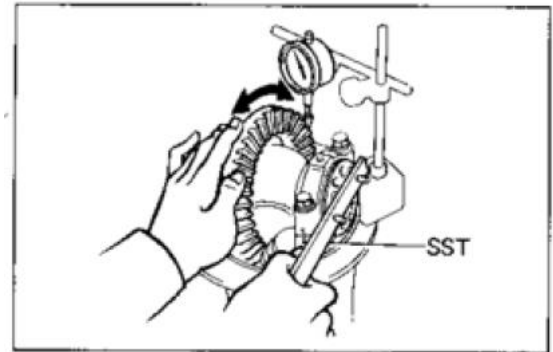
Tighten the adjusting nut 1 – 1½ notches from the zero preload position



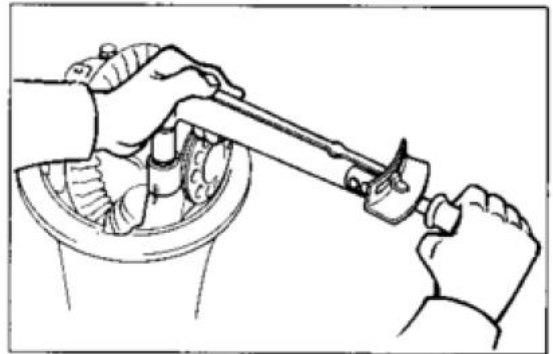
Using a dial indicator, adjust the ring gear backlash to within specification

Ballpark: Should be between 0.005 and 0.007"

NOTE: The backlash is adjusted by turning the left and right adjusting nuts EQUAL amounts. For example, loosen the nut on the left side one notch and tighten the nut on the right side one notch.



Torque the bearing cap bolts to spec



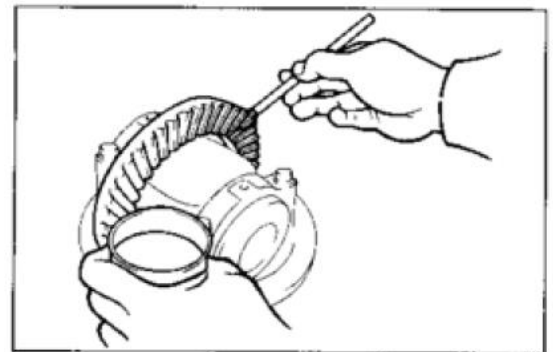
Coat lead paint on 3 or 4 teeth of the ring gear at 3 different locations

Hold the companion flange firmly and rotate the ring gear in both directions

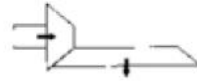
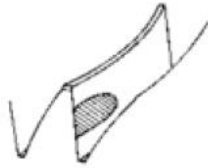
Inspect the tooth pattern and re-adjust accordingly

You already know how to adjust backlash

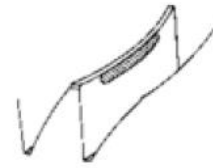
Pinion depth is adjusted with different spacers.



Heel Contact



Face Contact

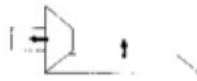


Select an adjusting shim that will bring the drive pinion closer to the ring gear.

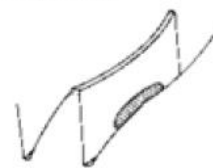
Proper Contact



Toe Contact

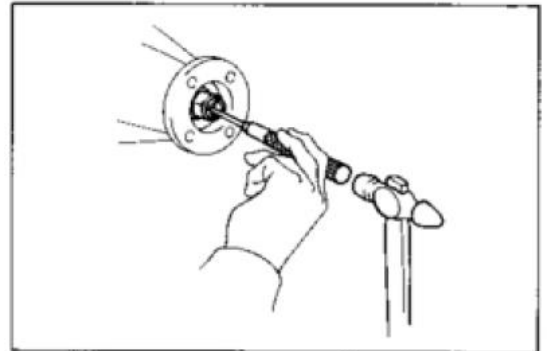


Flank Contact



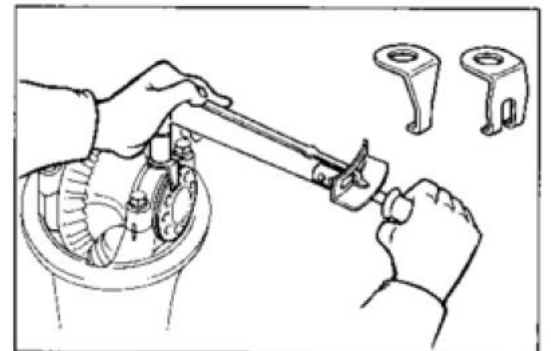
Select an adjusting shim that will shift the drive pinion away from the ring gear.

Stake the drive pinion nut



Install adjusting nut locks and tighten to specification

Ballpark: 9ft-lbs



STOP!

INSTRUCTOR'S INITIALS: