

Drive Axles

TOYOTA INTEGRAL HOUSING — I.R.S.

Supra

DESCRIPTION

Toyota I.R.S. (Independent Rear Suspension) axle assembly is the hypoid gear-type with integral carrier housing. The pinion bearing preload adjustment is made with a spacer and washer between the front and rear bearing cones.

The differential side bearing preload and the pinion depth adjustment are made by shims. Driving power is transmitted to the axles by ball spline type drive shafts with universal joints at both ends.

AXLE RATIO & IDENTIFICATION

The integral carrier type drive axle may be identified by the inspection cover on the rear of the carrier housing. To determine axle ratio, divide number of ring gear teeth by number of pinion gear teeth.

REMOVAL & INSTALLATION

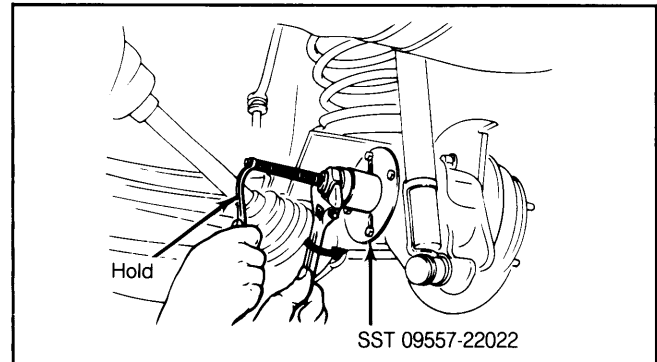
AXLE SHAFTS & BEARINGS

Removal

1) Raise and support vehicle. Remove rear wheel. Disconnect drive shaft from pinion flange. Pull

parking brake lever all the way up. Remove axle flange nut and washer and remove axle flange using puller (SST 09557-22022).

Fig. 2: Removing Rear Axle Shaft Flange from Inside of Wheel

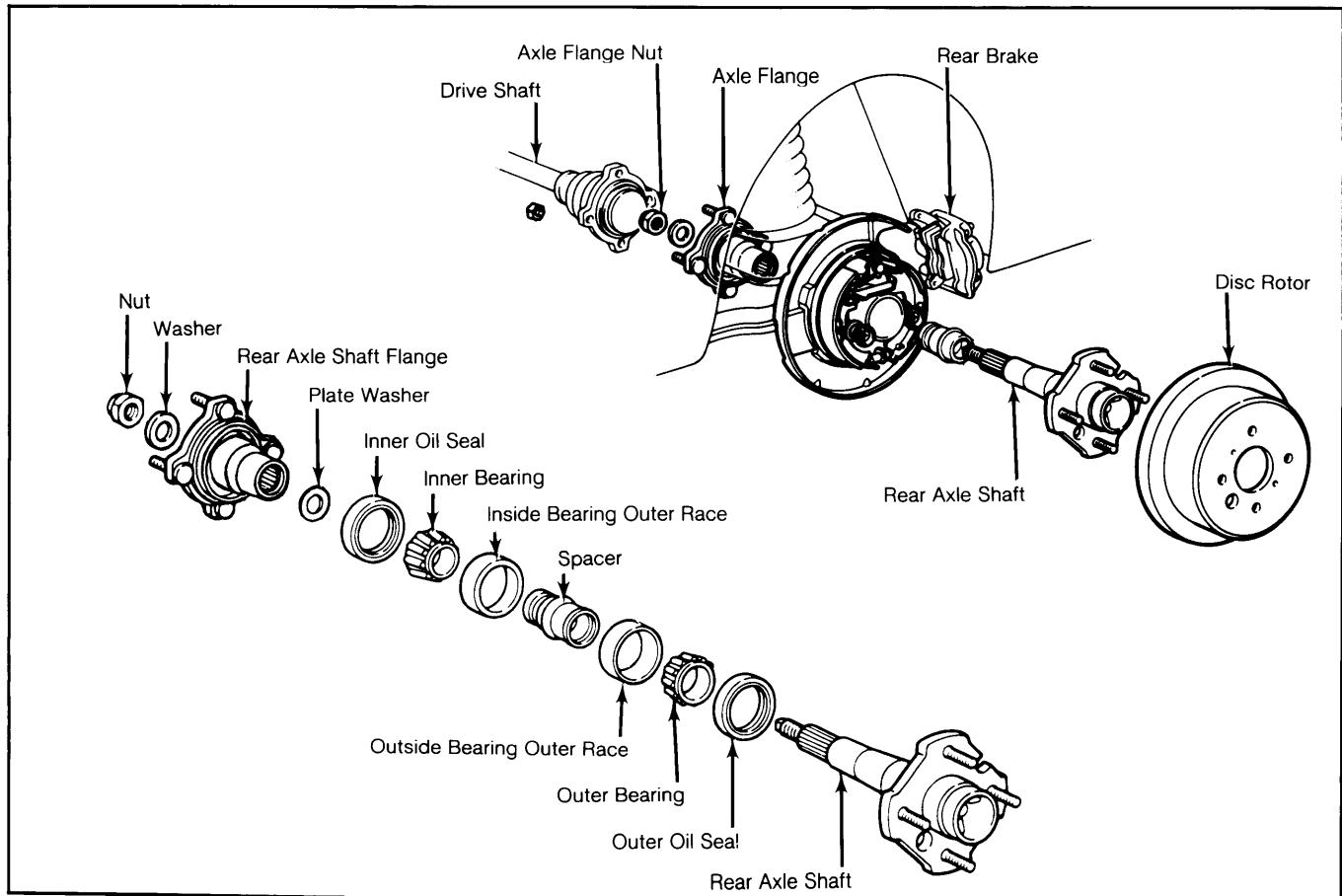


Be careful not to lose the plate washer located on the tip of the axle flange (bearing side).

2) Remove rear brake caliper assembly and rotor. Remove parking brake shoe hold-down springs, pins, front shoe and adjusting screw. Disconnect parking brake cable from shoe lever and remove the rear shoe.

3) Using a puller, pull out axle shaft with oil seal and outer bearing. Remove spacer.

Fig. 1: Toyota I.R.S. Type Rear Axle Shaft

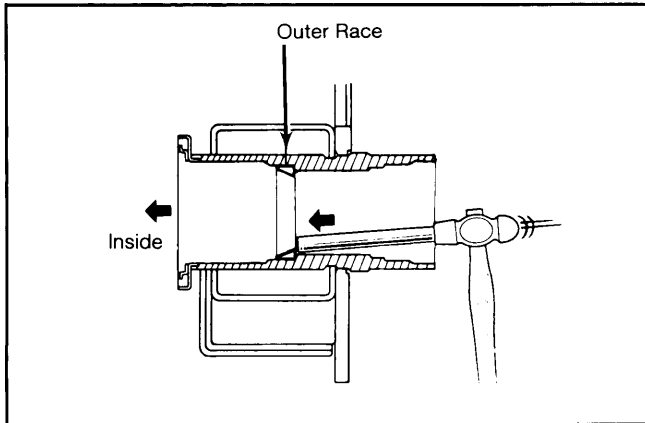


Note the drum type parking brake located inside the disc brake rotor.

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4) Pull out inner oil seal and inner bearing from axle housing. Using a brass drift remove inside bearing outer race. If necessary replace the outer race.

Fig. 3: Removing Inside Bearing Outer Race



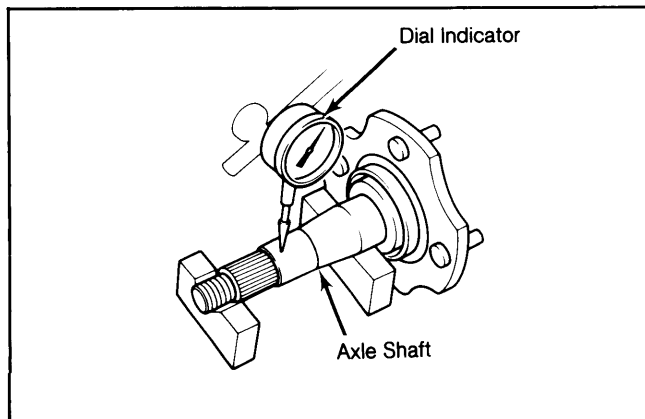
Use a brass drift.

5) Remove outer bearing and oil seal from axle shaft with a puller. Remove outside bearing outer race in same manner as in Fig. 3.

Installation

1) Check rear axle shaft for wear or damage. Check runout. If runout exceeds .004" (.1 mm) replace axle shaft.

Fig. 4: Checking Axle Shaft Runout



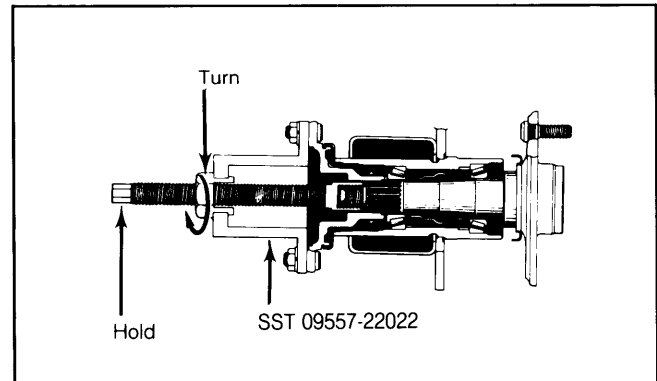
If runout exceeds .004" (.10 mm) replace axle shaft.

2) Pack bearings with grease. Install inside bearing outer race and bearing in housing. Pack oil seal lips with grease and install oil seal to a depth of 1.22" (31 mm). Install outside bearing outer race in rear axle housing.

3) Coat inside of rear axle housing and outside of new spacer with grease. Install new outer bearing. Pack oil seal lips with grease and install outer bearing oil seal to a depth of .217" (5.5 mm).

4) Install rear axle shaft into housing. Coat inside of axle flange with a thin coat of grease and install axle flange and plate washer. Pull axle shaft into flange using puller (SST 09557-22022). Tighten to the point where axle shaft tip is aligned with the flange.

Fig. 5: Pulling Axle Shaft Flush with Flange



Use Puller SST 09557-22022.

NOTE: Do not allow grease to get on axle shaft threads.

5) Install axle shaft flange nut and tighten to 22-36 ft. lbs. (30-49 N.m). Revolve the shaft back and forth to snug it down. Measure the rotation resistance. Retighten the nut to 58 ft. lbs. (77 N.m).

6) Using a torque wrench, check the preload through rotation. Preload should be .9-3.5 INCH lbs. (.10-.40 N.m) as flange is rotated once in 6 seconds. If preload is less, retighten nut 5-10° at a time until correct preload is reached.

7) If preload is greater than maximum torque of 145 ft. lbs. (196 N.m) replace the bearing spacer and repeat the procedure. Use a punch and stake the nut. Install parking brake shoes, drive shaft, and rear wheel.

REAR DRIVE SHAFT

NOTE: There are 2 types of drive shafts. One type is manufactured by Toyota and the other by NTN. Confirm which you have before beginning work.

Removal

Disconnect the drive shaft from the differential and the axle shaft.

Installation

Install drive shaft with the narrow distance between flange and boot band at the differential side. Use care not to damage the dust boots when installing drive shaft. Tighten nuts 44-57 ft. lbs. (60-77 N.m).

COMPANION FLANGE & OIL SEAL

Removal

1) Using a hammer and chisel, loosen the staked portion of the nut. Remove pinion nut and flange. Remove oil seal from housing and remove oil slinger.

2) Using a puller remove the front bearing from the housing and replace if necessary. Remove old bearing spacer and replace with a new one.

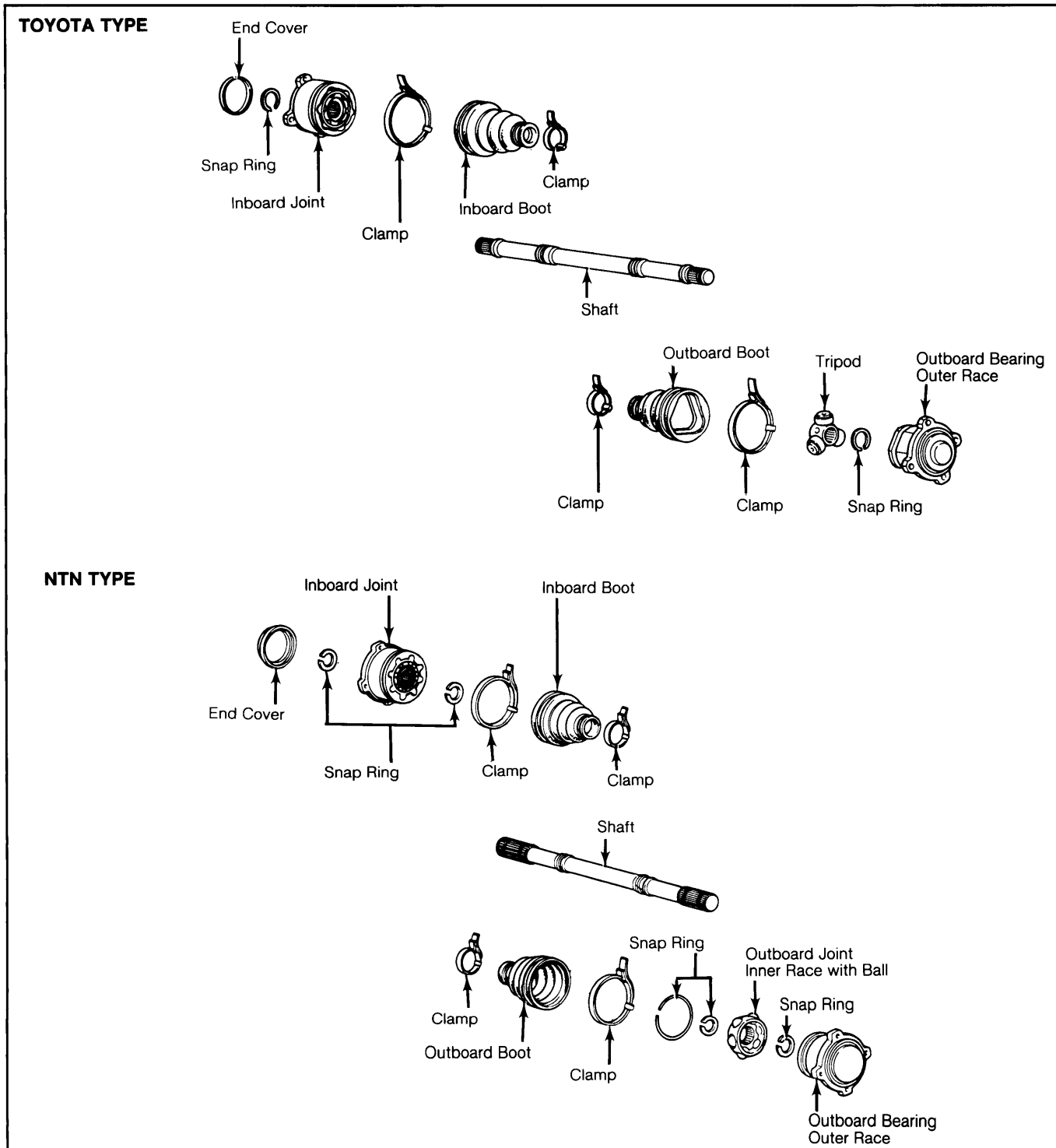
Installation

Install front bearing and oil slinger. Apply grease to the seal lips and install a new oil seal to a depth of .059" (1.5 mm). Install flange and nut. Tighten to 80 ft. lbs. (108 N.m). Measure preload.

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Fig. 6: Two Types of Toyota Rear Drive Shaft



Toyota type outboard joint is triangular-shaped and NTN type is round-shaped.

AXLE ASSEMBLY

Removal

1) Remove drain plug and drain gear oil. Disconnect rear drive shaft. Disconnect propeller shaft flange from companion flange.

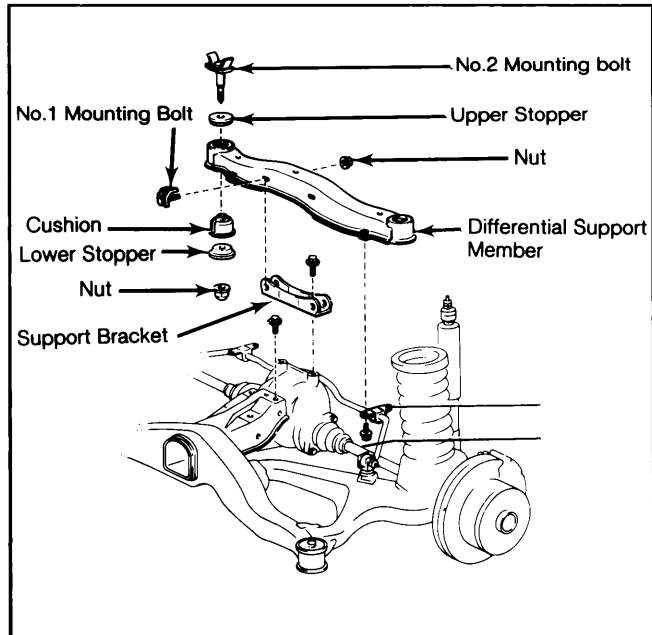
2) Remove differential support bolt number 1 mounting bolt. Jack up differential and remove 8 carrier bolts. Lower the differential carrier from the vehicle.

Installation

Reverse removal procedure. Tighten carrier and mounting bolts 51-72 ft. lbs. (69-98 N.m).

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Fig. 7: Differential Support Member



Note position of the bolts.

OVERHAUL

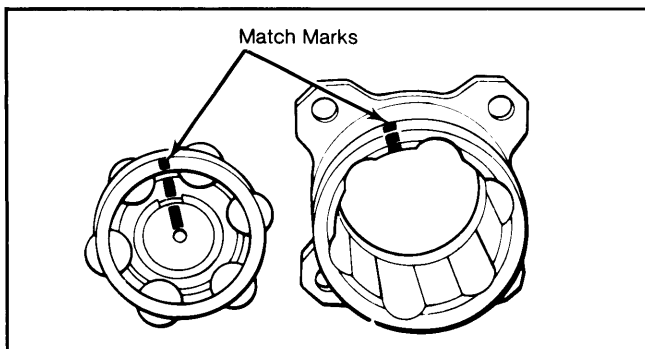
NTN-TYPE DRIVE SHAFT

Disassembly

1) Check drive shaft for excessive radial play in both outboard and inboard joints. Check to see that outboard joint slides smoothly in the thrust. Remove 4 boot clamps outboard and inboard joints and slide boots to center of shaft.

2) Remove outboard joint outer race. Remove snap ring. Place match marks on outer race and drive shaft. If end cover is worn or damaged, replace it.

Fig. 8: Match Mark Location on NTN Type



Mark drive axle joint with paint or marking pen.

3) Remove outboard joint inner race by tapping out ball bearings with a plastic hammer. Lower the bearing cage to the inboard side of the axle shaft. Remove outboard snap ring and press off inner race from drive shaft. Remove inboard snap ring. Remove outboard and inboard joint boots.

4) Disassemble the inboard joint by using a screwdriver to remove plate from end. Place match marks

on inboard joint and drive shaft. Remove snap ring and press joint from drive shaft. Clean all parts. Check parts for cracks, wear, or damage, and replace as necessary.

Reassembly

1) Wrap the shaft serrations with vinyl tape so as to prevent damage to the boot. Assemble new clamps on boots and install on drive shaft. Lock the clamps so that strap is bent in opposite direction of rotation. Install new inboard snap ring.

2) Place the outboard joint inner race cage onto the shaft with larger diameter facing outward. Align the match marks and press the inner race onto drive shaft. Install the outboard snap ring.

3) Position ball bearings in cage over inner race. Lightly tap balls and cage in place with a plastic hammer. Coat the inner race, cage, and balls with grease.

4) Align the match marks on inboard joint and drive shaft. Install new inboard snap ring. Press inboard joint onto drive shaft and install outboard snap ring.

5) Pack grease into flange side and apply seal packing around inboard side of end plate. Install end plate on joint by tapping around it. Apply grease to outer race and boot. Install snap ring to outer race.

6) Apply grease to inboard joint. Clamp boots in position and lock clamps. Position the lock between the flange bolt holes. Install drive shaft with the narrow distance between the boot band and the flange at the differential side.

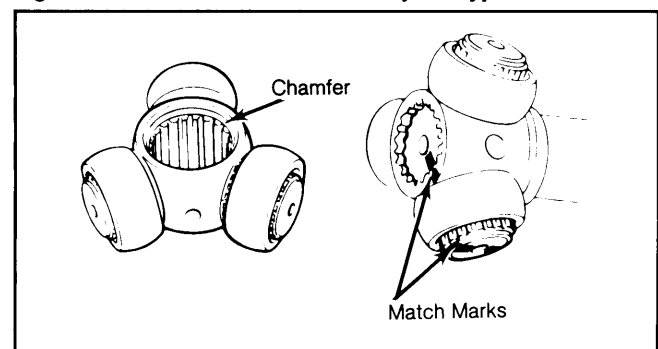
TOYOTA-TYPE DRIVE SHAFT

Disassembly

1) Check drive shaft for excessive radial play in both outboard and inboard joints. Check to see that outboard joint slides smoothly in the thrust. Remove 4 boot clamps of outboard and inboard joints and slide boots to center of shaft.

2) Place match marks on outer race and drive shaft. Do not punch marks. If end cover is worn or damaged, replace it. Place match marks on the tripod joint and shaft.

Fig. 9: Match Mark Location for Toyota Type



Do not press on roller.

3) Remove snap ring and remove tripod from drive shaft. Do not press on roller. Remove outboard and inboard joint boot.

4) Using a screwdriver, remove end plate from inboard joint. Place match marks on inboard joint and drive shaft. Remove snap ring and press inboard joint from shaft. Clean all parts. Check parts for cracks, wear or damage and replace as necessary.

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Reassembly

CAUTION: Wrap the shaft serrations with vinyl tape so as to prevent damage to the boot.

1) Assemble new clamps on boots and install on drive shaft. Lock the clamps so that strap is bent in opposite direction of rotation. Install new snap ring.

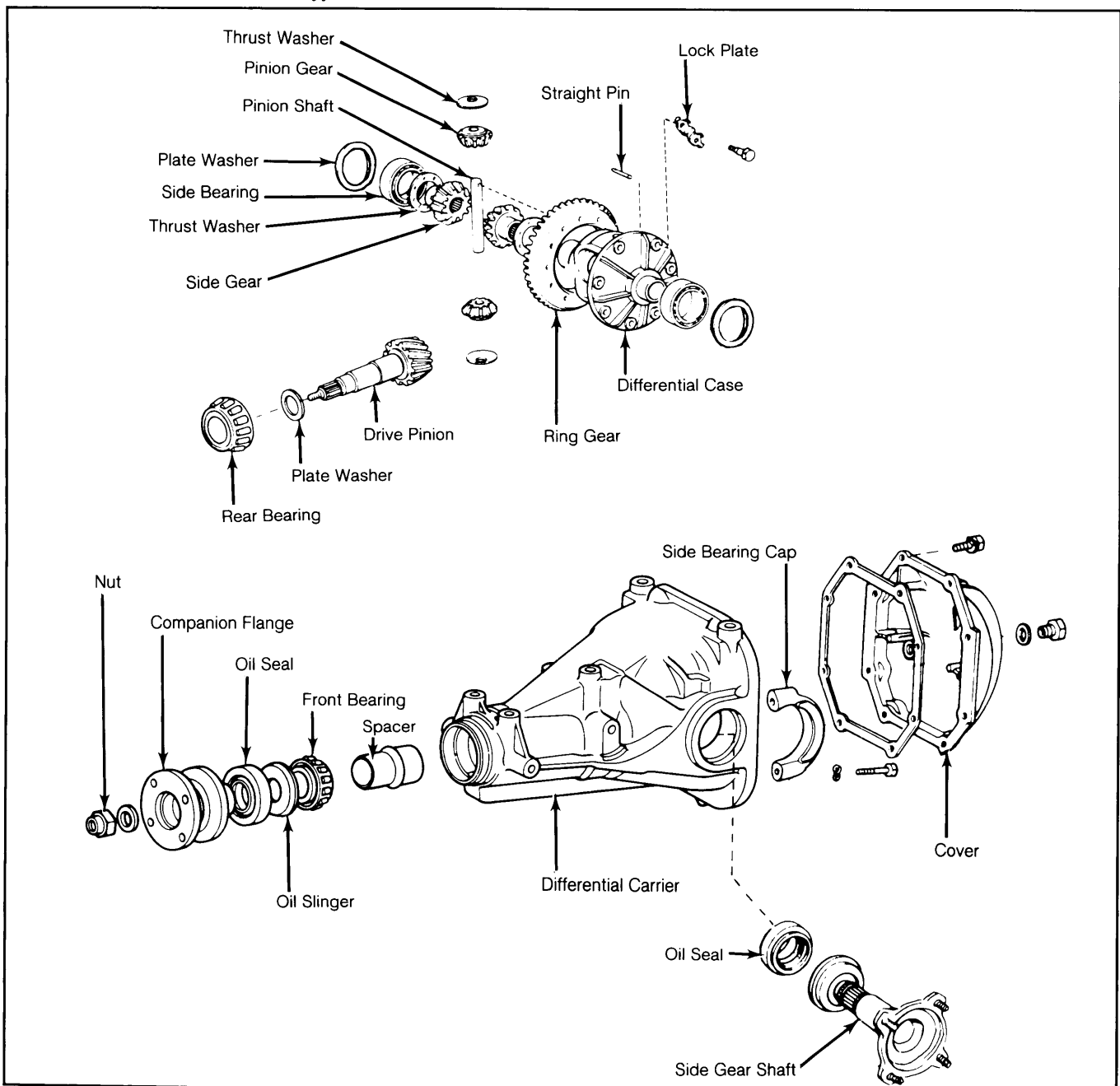
NOTE: Toyota manufactured boots are designed to fit only the inboard or outboard side. Be careful not to interchange them.

2) Align match marks and press outboard joint tripod with chamfered side inboard onto drive shaft. Do not press on roller. Install outboard snap ring.

3) Align match marks on inboard joint and press onto drive shaft. Install outboard snap ring. Pack grease into flange side and apply seal packing around inboard side of end plate. Install end plate on joint by tapping around it.

4) Apply grease to outer race and boot. Apply grease to the tripod and inboard joint. Clamp boots in position and lock clamps. Position the lock between the flange bolt holes.

Fig. 10: Exploded View of I.R.S. Type Differential



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DISASSEMBLY

Differential

1) Remove differential carrier cover. Remove side gear shaft and oil seal. Check ring gear runout and backlash. Check gear tooth contact pattern. Check side gear backlash while holding one pinion gear toward the case. Measure drive pinion preload and total preload.

2) Put alignment marks on the bearing cap and differential carrier. Remove caps. Remove the two side bearing preload adjusting plate washers. Measure the plate washers and record their thickness. Remove differential case and ring gear. Remove differential case bearing outer race and tag for reassembly.

3) Remove companion flange and oil seal. Remove front bearing and bearing spacer. Remove drive pinion from differential carrier. Remove front bearing and bearing spacer.

4) Remove drive pinion from differential carrier. Remove bearing from pinion shaft. Remove drive pinion front and rear bearing outer race. Pull side bearing from differential case.

5) Put alignment marks on ring gear and differential case. Remove ring gear bolts and locking tabs. Remove ring gear by tapping on gear with a plastic hammer.

6) Using a hammer and punch, drive out straight pin. Remove pinion shaft, pinion gears, side gears, and thrust washers. Thoroughly clean and inspect all parts for wear or damage and repair or replace as necessary.

CAUTION: Mark gears and thrust washers for installation in their original position.

REASSEMBLY & ADJUSTMENT

Differential Case Assembly

1) Select thrust washer that will bring backlash within .003-.008" (.05-.20 mm). Thrust washers are available in thicknesses from .0394-.0512" (1.00-1.30 mm) in .004" (.10 mm) increments.

2) Install thrust washer, side gears, and pinion shaft in differential case. Drive straight pin in and stake in place. Measure the side gear backlash while holding one pinion gear toward the case.

3) Drive new side bearings on the differential case. Heat ring gear to about 212°F (100°C) in an oil bath. Clean contact surface of the ring gear and quickly install it on the differential case. Align marks on ring gear and differential case.

CAUTION: Do not heat ring gear more than 230°F (110°C).

4) Coat ring gear bolts with gear oil. Install lock plates, and tighten bolts to 67-75 ft. lbs. (91-102 N.m). Stake lock plates using a hammer and drift punch.

5) Install the differential case into the carrier and tighten the adjusting nut just to where there is no play in the bearing. Check that ring gear runout is no greater than .0028" (.07 mm).

Drive Pinion Bearing Preload

1) Drive pinion preload must be accomplished in 2 stages. A temporary adjustment and final adjustment. Final adjustment cannot be made until after ring and pinion backlash are set and differential case is installed.

2) Install front and rear bearing outer races into carrier. Assemble drive pinion with rear bearing installed into carrier.

3) Install front bearing, companion flange, and pinion nut. Adjust drive pinion preload to 10.4-16.5 INCH lbs. (1.17-1.86 N.m) for new bearing, and 5.2-8.7 INCH lbs. (.58-.98 N.m) for reused bearings.

CAUTION: As there is no spacer installed at this time, tighten pinion nut a little at a time until desired preload is obtained. Be careful not to overtighten.

4) Adjust ring and pinion gear backlash. See Ring Gear Backlash & Side Bearing Preload in this article.

5) Remove companion flange and front bearing. Install new bearing spacer, front bearing, oil slinger, and oil seal. Install companion flange, pinion nut, and check drive pinion preload. Check that companion flange deviation does not exceed .0039" (.10 mm).

6) Stake drive pinion nut. Install side gear shaft oil seal. Drive the side gear shaft in until it contacts the pinion shaft. Install differential carrier cover.

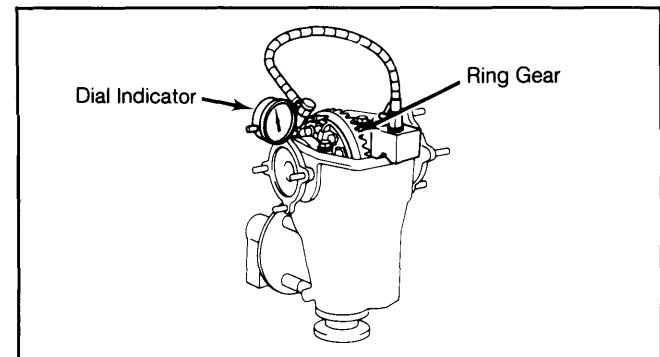
NOTE: Since the shaft cannot be checked visually, check that the shaft is fully seated by the sound it makes when tapped with a hammer.

Ring Gear Backlash & Side Bearing Preload

1) Place the bearing outer races on their respective bearings and install the differential case into carrier. Install only the plate washer on the ring gear (back side). Tap on the ring gear with a plastic hammer to seat washer and bearing.

2) Install a dial indicator, with plunger on tooth surface of ring gear. Apply a downward pressure on the side bearing boss and measure ring-to-pinion gear backlash. Backlash should be .0039" (.10 mm).

Fig. 11: Checking Ring Gear Backlash



3) Select a ring gear (back side) plate washer using backlash as reference. Select a ring gear (tooth side) washer thick enough to eliminate the clearance between the outer race and case. Remove the plate washers and case from the carrier.

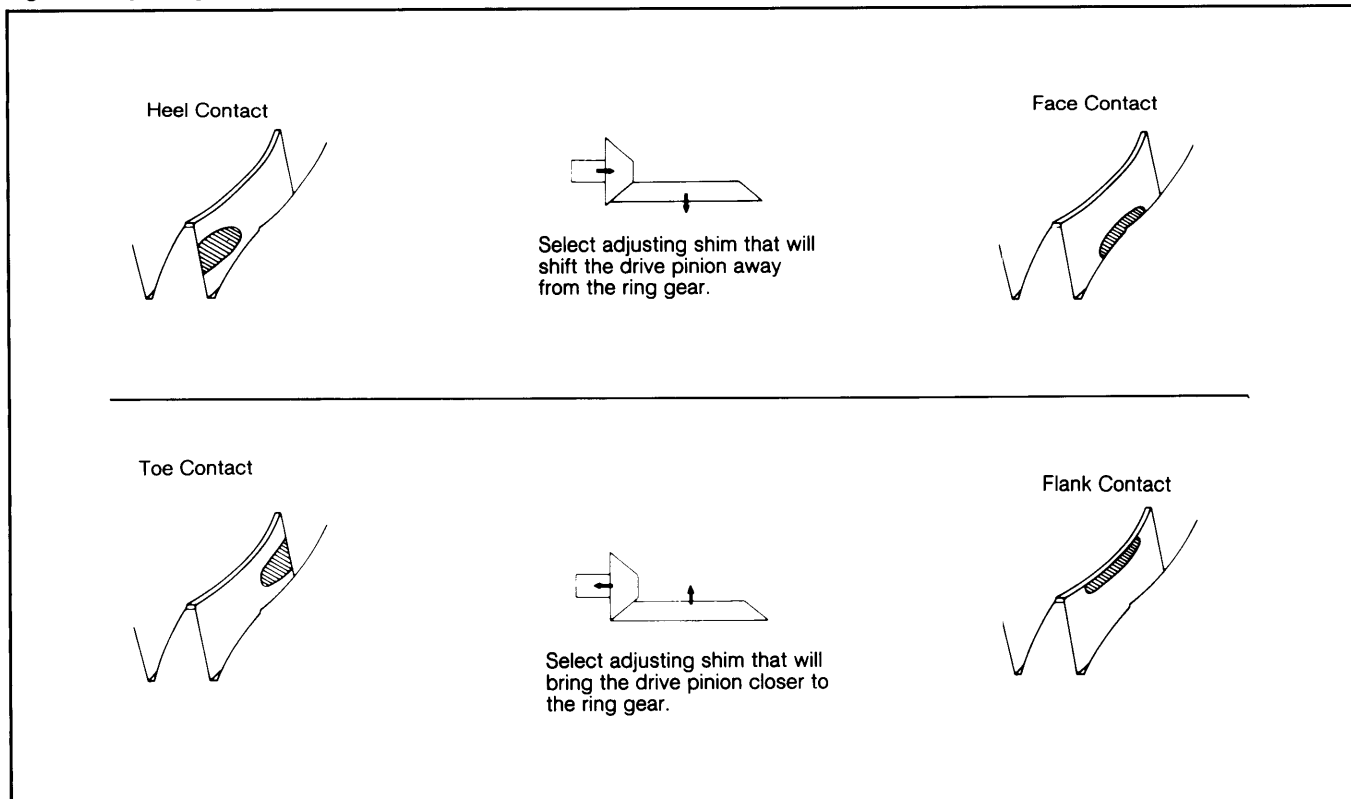
4) Install the plate washer into the lower part of the carrier. Place the other plate washer onto the differential case with the outer race. Install the case assembly into the carrier housing. Measure ring gear backlash. Backlash should be .005-.007" (.13-.18 mm).

5) Adjust backlash by increasing or decreasing washers on both sides of case by equal amounts. There

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Fig. 12: Adjusting Gear Tooth Contact



Contact pattern is changed by adding or removing drive pinion shims.

should be no clearance between plate washer and case. There must be ring gear backlash.

6) After adjustment of plate washers has been made, remove the ring gear (tooth side) washer and measure the thickness. Install a new washer of .0024-.0035" (.06-.09 mm) thicker than the washer removed.

NOTE: Select a washer which can be pressed 2/3 of the way in by finger.

7) Using a plastic hammer, tap the washer in place. Recheck ring gear backlash. Backlash should be

within .005-.007" (.13-.18 mm). Adjust as necessary. Align marks on cap and carrier. Install side bearing caps and tighten 51-65 ft. lbs. (69-88 N.m).

8) Measure total preload. Total preload should equal drive pinion preload plus 3.5-5.2 INCH lbs. (.39-.58 N.m).

9) Coat 3-4 teeth at 3 different positions on the ring gear with red lead. Hold the companion flange firmly and rotate the ring gear in both directions. Inspect the gear tooth contact pattern and adjust as necessary.

AXLE ASSEMBLY SPECIFICATIONS

Application	In. (mm)
Axle Shaft Flange Runout	.004 (.10)
Companion Flange Deviation	.004 (1.0)
Inner Oil Seal Depth	1.22 (31)
Outer Oil Seal Depth	.217 (5.5)
Pinion Oil Seal Depth	.059 (1.5)
Ring Gear Backlash	.005-.007 (.13-.18)
Ring Gear Runout	.003 (.07)
Side Gear Backlash	.002-.008 (.05-.20)
Side Gear Shaft Runout	.008 (.20)

Capacity

Gear Oil Capacity1.3 Qts. (1.2 L)

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Axle Shaft Flange Nut	58-144 (79-195)
Differential Carrier Bolts	51-72 (69-98)
Differential Support Member	
Mounting Bolt	51-72 (69-98)
Drive Shaft Bolts	44-57 (60-77)
Pinion Nut	80-174 (108-236)
Ring Gear Bolts	67-75 (91-102)

INCH Lbs. (N.m)

Front Bearing Preload	
New Bearing	10.4-16.5 (1.17-1.86)
Reused Bearing	5.2-8.7 (.58-.98)
Total Preload ¹	3.5-5.2 (.39-.59)

¹ — Add to drive pinion preload.