

DRIVE AXLE - INTEGRAL HOUSING

1993 Toyota Celica

1993 DRIVE AXLES

Toyota Differentials & Axle Shafts - Integral Housing

Toyota; Celica All-Trac

DESCRIPTION

Drive axle assembly is a hypoid type with integral carrier housing. Drive pinion preload is adjusted using collapsible spacer. Side bearing preload is adjusted using shims.

INTEGRAL HOUSING DIFFERENTIAL APPLICATION TABLE

Application	Location
Celica All-Trac	Rear

AXLE RATIO & IDENTIFICATION

Integral carrier-type drive axle is identified on inspection cover, on rear of carrier housing. Axle ratio is determined by dividing number of ring gear teeth by number of pinion gear teeth.

AXLE RATIO SPECIFICATIONS TABLE

Application	Ratio
Celica All-Trac	2.928:1

LUBRICATION

FLUID TYPE & CAPACITY

All standard models should use SAE 90 (API GL-5) for temperatures greater than 0°F (-18°C) and SAE 80W-90 (API GL-5) for temperatures less than 0°F (-18°C). Models with Automatic Disconnecting Differential should use SAE 75W-90 (API GL-5). See FLUID CAPACITY SPECIFICATIONS table.

FLUID CAPACITY SPECIFICATIONS TABLE

Application	Pts. (L)
Celica All-Trac	2.4 (1.1)

TROUBLE SHOOTING

NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in the GENERAL INFORMATION section.

REMOVAL & INSTALLATION

NOTE: During removal and installation procedures, refer to Fig. 1.

AXLE SHAFT & BEARING

NOTE: For Celica All-Trac installation procedure, see appropriate DRIVE AXLE - REAR article in DRIVE AXLES.

DIFFERENTIAL ASSEMBLY

Removal

1) Drain gear oil. Remove rear crossmember.
2) Disconnect vacuum hoses and electrical connector (if equipped). Support differential assembly using jack. Remove differential assembly mounting bolts and nuts. Lower differential assembly from vehicle.

Installation

To install, reverse removal procedure. Ensure reference marks on axle shaft and companion flange align. Tighten all fasteners to specification. See TORQUE SPECIFICATIONS.

PINION FLANGE & OIL SEAL

Removal

1) Drain gear oil. On Celica All-Trac, remove rear crossmember. Mark drive shaft and drive pinion companion flange for installation reference. Remove drive shaft. Reverse staked portion of companion flange nut. Remove flange nut.
2) Remove companion flange. Remove oil seal from housing. Remove oil slinger. Using a puller, remove front bearing from housing. Remove and discard collapsible spacer.

NOTE: Always replace collapsible spacer whenever companion flange nut is loosened or removed.

Installation

1) Install NEW collapsible spacer and front bearing. Install oil slinger with concave side facing front drive pinion bearing. Apply grease to seal lips. Install new oil seal to correct depth. See DRIVE PINION SEAL DEPTH INSTALLATION SPECIFICATIONS table.

DRIVE PINION SEAL DEPTH INSTALLATION SPECIFICATIONS TABLE

Application	In. (mm)
Celica All-Trac	.08 (2.0)

2) Install companion flange. Install companion flange nut. Tighten flange nut to specification, and measure pinion preload. See TORQUE SPECIFICATIONS and AXLE ASSEMBLY SPECIFICATIONS tables at end of article.

3) If preload is greater than specification, replace collapsible spacer, and repeat procedure. If preload is less than specification, tighten nut in increments of 108 INCH lbs. (12 N.m) until preload is correct. If maximum torque is exceeded, replace spacer and repeat procedure.

4) Check pinion nut torque. Check longitudinal and latitudinal runout of companion flange using dial indicator. Replace companion flange if runout is greater than .004" (.10 mm) on all models.

SIDE GEAR SHAFT & OIL SEAL

Removal

- 1) Drain gear oil. Remove axle shaft. See DRIVE AXLE - REAR in DRIVE AXLES. Remove differential cover.
- 2) Remove side gear shaft snap ring. Remove side gear shaft. Remove oil seal.

Installation

Install and grease oil seal. Install side gear shaft and tube (if equipped) to differential. Install NEW snap ring on side gear shaft. Ensure side gear shaft cannot be pulled out by hand.

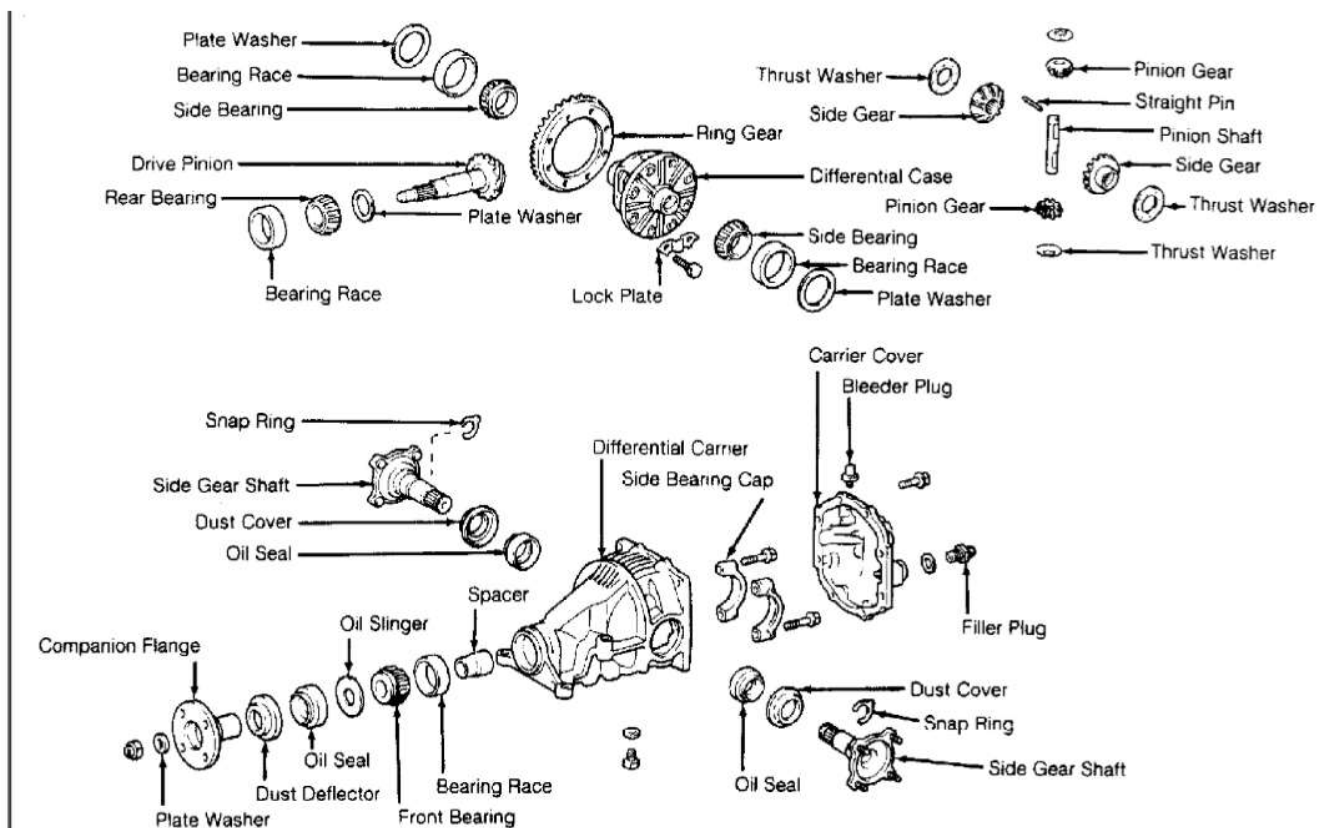


Fig. 1: Exploded View Of Rear Differential Assembly
Courtesy of Toyota Motor Sales, U.S.A., Inc.

OVERHAUL**DIFFERENTIAL ASSEMBLY**

NOTE: Refer to Fig. 1 during overhaul procedures.

Disassembly

- 1) Remove differential carrier cover. Check pinion companion flange lateral and radial runout. If runout exceeds .004" (.10 mm).
- 2) Using INCH-pound torque wrench, measure drive pinion starting preload and total preload. See AXLE ASSEMBLY SPECIFICATIONS table at end of article.
- 3) Check ring gear runout and backlash. See AXLE ASSEMBLY SPECIFICATIONS table. Check gear tooth contact pattern. See appropriate GEAR TOOTH CONTACT PATTERNS article in GENERAL

INFORMATION.

4) On 2-pinion conventional differentials, check side gear backlash. See AXLE ASSEMBLY SPECIFICATIONS table. Remove side gear shafts, oil seals and differential tube (if equipped). See SIDE GEAR SHAFT & OIL SEAL under REMOVAL & INSTALLATION.

5) Remove drive pinion flange and oil seal. See PINION FLANGE & OIL SEAL under REMOVAL & INSTALLATION. Paint mating marks on bearing caps, and remove caps. Remove 2 side bearing preload adjusting plate washers. Measure washers, and record thicknesses.

6) Remove differential case and ring gear. Remove differential case side bearing outer races. Index mark bearings, gears and thrust washers. Remove drive pinion shaft from differential carrier. Press rear bearing from pinion shaft.

7) Drive front and rear drive pinion bearing outer races from carrier. Inspect bearings, outer races and pinion shaft for wear and damage. Discard collapsible spacer. Ring gear and drive pinion must be replaced as a set.

8) Remove side bearings from differential case using puller. Keep side bearings together with correct outer races, and mark for reassembly. Place alignment marks on ring gear and differential case.

9) Remove ring gear bolts and locking tabs. Tap ring gear using plastic hammer to remove. Disassemble differential case (except limited slip type). See DIFFERENTIAL CASE under OVERHAUL.

Reassembly

1) Reassemble differential case. See DIFFERENTIAL CASE under OVERHAUL. Clean contact surfaces of differential case. Heat ring gear to 212°F (100°C) in water. DO NOT heat ring gear warmer than 230°F (110°).

2) Install ring gear on differential case while it is still hot. Align index marks on ring gear and case. Temporarily install NEW ring gear bolts with NEW lock plates (if equipped).

3) When ring gear has cooled, tighten ring gear bolts gradually in diagonal sequence to specification. See TORQUE SPECIFICATIONS. Stake lock plates with one tab flush against flat of bolt head. Tab resting on point should be staked on tightening side of point.

4) Press side bearings onto differential case. Install case, with side bearings, into carrier. Install plate washers until no play exists in bearing. Temporarily install bearing caps.

5) Check ring gear runout using dial indicator against back of gear (opposite teeth). See AXLE ASSEMBLY SPECIFICATIONS table at end of article. If runout exceeds specification, rotate ring gear on case, and remeasure. If runout cannot be brought within specified range, case or ring gear must be replaced.

6) Remove bearing caps, plate washers, differential case from carrier. Install front and rear bearing outer races into carrier. Press rear drive pinion bearing, with depth shim under bearing, onto drive pinion. Install drive pinion into carrier. Install front bearing.

NOTE: Drive pinion preload is set in 2 stages. Initial adjustment is made without collapsible spacer, oil slinger or oil seal installed. Final adjustment is made with differential case installed and ring and pinion backlash set.

7) Install companion flange, and lightly grease threads of flange nut. Install flange nut, and adjust drive pinion preload by slowly tightening nut. Measure preload using torque wrench. See AXLE ASSEMBLY SPECIFICATIONS table.

CAUTION: Since spacer is not yet installed, tighten pinion nut slowly until desired preload is obtained. DO NOT exceed

torque specification. See TORQUE SPECIFICATIONS.

8) Place bearing outer races on respective bearings, and install differential case into carrier. Install plate washer only on side opposite ring gear teeth. Tap ring gear using plastic hammer to seat washer and bearing.

9) Install dial indicator with plunger on tooth surface of ring gear. Apply downward pressure on side bearing boss. Measure ring gear-to-drive pinion reference backlash. See RING GEAR INITIAL BACKLASH SPECIFICATIONS table.

RING GEAR INITIAL BACKLASH SPECIFICATIONS TABLE

Application	In. (mm)
Celica All-Track	.005 (.13)

10) Using initial backlash as reference, select ring gear (back side) plate washer. Select ring gear side (tooth side) plate washer just thick enough to eliminate clearance between outer race and case. Remove plate washers and differential case from carrier.

11) Install plate washer into lower part of carrier. Place other plate washer on differential case with outer race. Install case assembly into carrier housing. Seat washer and bearing by tapping ring gear using plastic hammer.

12) Measure ring gear backlash using dial indicator. See AXLE ASSEMBLY SPECIFICATIONS table. Adjust backlash by increasing or decreasing washers on both sides by equal amounts. Ensure no clearance exists between plate washer and case. Ensure ring gear backlash exists at all times.

13) After adjustment, remove ring gear (tooth side) plate washer, and measure thickness. Install washer .0024-.0035 (.06-.09 mm) thicker than washer removed.

NOTE: Select washer which can be pressed in 2/3 of way by finger pressure. Backlash will change approximately .0008" (.020 mm) for every .0012" (.030 mm) change in washer thickness.

14) Using a plastic hammer, tap washer in place. Recheck ring gear backlash. See AXLE ASSEMBLY SPECIFICATIONS table. Adjust as necessary. Align index marks on caps and carrier. Install cap bolts, and tighten to specification. See TORQUE SPECIFICATIONS.

15) Measure total drive pinion preload. Ensure total preload equals drive pinion preload plus assembled preload. See AXLE ASSEMBLY SPECIFICATIONS table. Coat 3 or 4 teeth at 3 different positions on ring gear with Red lead.

16) Hold companion flange firmly and rotate ring gear in both directions. Inspect gear tooth contact pattern. Adjust as necessary by changing shims on drive pinion. See GEAR TOOTH CONTACT PATTERNS article in GENERAL INFORMATION.

17) Remove companion flange and front bearing. See PINION FLANGE & OIL SEAL under REMOVAL & INSTALLATION. Install new bearing collapsible spacer, front bearing, oil slinger and oil seal. Install companion flange, and tighten pinion nut to minimum specification. See TORQUE SPECIFICATIONS.

18) Check total differential preload. Total preload range equals measured drive pinion preload plus assembled preload. See AXLE ASSEMBLY SPECIFICATIONS table.

19) If preload is greater than specification, replace collapsible spacer, and repeat procedure. If preload is less than specification, tighten pinion companion flange nut in increments of 108 INCH lbs. (13 N.m).

NOTE: If maximum pinion flange nut torque is reached before minimum preload is attained, replace collapsible spacer, and repeat procedure. See TORQUE SPECIFICATIONS.

20) Ensure companion flange longitudinal and latitudinal runout do not exceed .004" (.10 mm). Stake drive pinion flange nut. Install side gear oil seals, differential tube (if equipped) and gear shafts. See SIDE GEAR SHAFT & OIL SEAL under REMOVAL & INSTALLATION.

21) Apply sealant to differential cover, and install cover. Tighten bolts to specification. See TORQUE SPECIFICATIONS.

DIFFERENTIAL CASE

Disassembly (Conventional Differential)

1) On 2-pinion differentials, use hammer and punch to drive out pinion shaft-to-case lock pin. On 4-pinion differentials, mark case halves for reassembly reference, and remove bolts retaining case halves.

2) On all differentials, remove pinion shaft, pinion gears, side gears and thrust washers. Thoroughly clean and inspect all parts for wear and damage. Repair or replace parts as necessary.

Reassembly

1) Install side gears and thrust washers in case. See Fig. 1. Thrust washers should be same size for both sides. Install pinion gears with thrust washers. Tap pinion shaft into place. Hold pinion gear toward case. Check side gear backlash.

2) Change thickness of thrust washers until side gear backlash is .002-.008" (.05-.20 mm). On 2-pinion differentials, install lock pin through case and hole in pinion shaft. Stake pin to differential case.

3) On 4-pinion differentials, align marks, and install case halves. Alternately tighten bolts to specification. See TORQUE SPECIFICATIONS.

AXLE ASSEMBLY SPECIFICATIONS

AXLE ASSEMBLY SPECIFICATIONS TABLE

Application	In. (mm)
Pinion Flange Runout	
Latitudinal	.004 (.10)
Longitudinal	.004 (.10)
Ring Gear Backlash	.005-.007 (.13-.18)
Ring Gear Runout	.003 (.07)
Side Gear Backlash	.002-.008 (.05-.20)
	INCH Lbs. (N.m)
Assembled Preload (1)	
Celica All-Trac	2.6-4.3 (.3-.5)
Drive Pinion Preload	
Celica All-Trac	
New Bearings	8.7-13.9 (1.0-1.6)
Used Bearings	4.3-6.9 (.5-.8)
(1) - Add this amount to drive pinion preload to obtain total preload.	

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
ADD Actuator Bolts	15 (20)
Clutch Case Bolts (With ADD)	58 (78)
Differential Carrier Retainer	16 (22)
Differential Case Bolts	35 (47)
Drain Plug	36 (49)
Differential Mounting Bolt & Nut	
Celica All-Trac	
Front	70 (95)
Rear	108 (146)
Differential Tube Bolts	65 (88)
Drive Shaft Flange Bolts	54 (73)
Filler Plug	29 (39)
Pinion Flange Nut	
Celica All-Trac	(1) 80-174 (108-236)
Rear Cover Bolt	34 (46)
Rear Crossmember Bolt	
Celica All-Trac	53 (72)
Ring Gear Bolts	71 (96)
Side Bearing Cap Bolts	58 (78)

(1) - Minimum and maximum torque for adjustment of drive pinion preload. See DIFFERENTIAL ASSEMBLY under OVERHAUL.