STEERING GEAR - POWER

1988 Toyota Celica

1988 STEERING
Toyota - Power Steering & Linkage - Rack & Pinion

Celica, Celica 4WD (All-Trac)

DESCRIPTION

System consists of a frame mounted rack and pinion assembly, a flow control valve, hydraulic pump and high pressure hoses. Flow control valve regulates hydraulic pressure in proportion to steering effort.

The power steering pump is a belt-driven vane-type. Pump components include an engine-driven eccentric rotor with vane plates, an eccentric cam ring, and a flow control valve to regulate amount of oil flow and maximum oil pressure.

LUBRICATION

FLUID TYPE

Fluid type is Dexron II ATF.

SYSTEM BLEEDING

1) Raise and support vehicle. Fill fluid to proper level in reservoir. Turn wheels fully in both directions. Recheck fluid level. Start engine and let idle. Turn steering from lock-to-lock 2 or 3 times. Lower vehicle. Run engine at 1000 RPM or less.

2) Turn wheel from lock-to-lock 2 or 3 times. Center steering wheel. If fluid level does not rise and no foaming of fluid is evident, bleeding is complete. If level rises more than .20" (5.0 mm), or if foaming is evident, repeat procedure until air is released.

ADJUSTMENTS

BELT TENSION

Using a belt tension gauge, adjust belt tension. See BELT TENSION SPECIFICATIONS table.

BELT TENSION SPECIFICATIONS TABLE

Application	Lbs. (kg)
New	100-150 (45-68)
Used (1)	60-100 (27-45)

(1) - Belt that has been used more than 5 minutes.

TESTING

AIR CONTROL VALVE TESTING

Start engine. Ensure A/C is off. Turn steering wheel right and left. Ensure engine RPM does not decrease more than 50 RPM. Pinch

air hose shut. Turn steering wheel right and left. Ensure engine RPM decreases about 200 RPM. If system fails any of these tests, check vacuum hoses and air control valve.

HYDRAULIC PRESSURE TESTING

1) Disconnect pressure line at line joint. Attach pressure gauge with gauge side connected to vane pump. Attach valve side of gauge to rack and pinion side. Bleed air from system. Check fluid level. With engine at idle and with valve closed, check fluid pressure. See HYDRAULIC PRESSURE table.

HYDRAULIC PRESSURE TABLE

Application	psi (kg/cm²)
Celica	1067-1136 (75-80)

NOTE: Do not keep pressure gauge valve closed for more than 10 seconds. Fluid testing temperature should be 176°F (80°C).

2) Open valve fully. Note pressure with engine at idle, and again at 3000 RPM. Pressure difference should be less than 71 psi (5 kg/cm²). If more, check flow control valve.

3) With steering wheel at lock position and pressure valve open, recheck pressure. See HYDRAULIC PRESSURE table. With vehicle on flat surface, turn steering wheel to center position.

5) Center steering engine. With engine idling, using an INCH lbs. torque wrench, measure steering turning force at steering wheel nut. Turning force should not exceed 61 INCH lbs. (6.9 N.m). If turning force exceeds specification, replace power steering pump.

REMOVAL & INSTALLATION

POWER STEERING PUMP

Removal (Celica)

1) Raise and support vehicle on safety stands. Remove engine undercover. Remove right front wheel. Remove lower crossmember. Remove air control valve vacuum hose.

2) Remove pressure and return lines, plug lines and elevate to prevent loss of fluid. Push down on drive belt and remove pulley nut. Remove 2 mounting bolts, belt and pump.

Removal (Celica 4WD)

Raise and support vehicle. Remove right front wheel. Disconnect pressure line at joint. Plug line opening. Disconnect right tie rod from steering knuckle. Remove pump bracket. Remove pump stay. Disconnect return line and plug openings. Remove pump.

Installation (All Models)

To install, reverse removal procedure. Fill and bleed system. See SYSTEM BLEEDING in this article. Check front end alignment (if necessary) on FWD models.

STEERING GEAR

Removal (FWD Models)

1) Raise and support vehicle on safety stands. Remove wheel assemblies. Remove engine undercover. Remove tie rod end nuts and press out of steering arm.

2) Match mark steering coupler "U" joint, remove bolt and disconnect. Remove pressure and return lines. Remove air control vacuum valve hose (if equipped). Remove engine mount bracket and center crossmembers. Disconnect exhaust pipe.

3) On Celica 4WD (All-Trac), match mark drive shaft and remove. Remove right-hand stabilizer bar bracket. Disconnect stabilizer link from lower arm. On all models, remove steering gear mounting brackets. Remove steering gear. Use care to not tear rack boots when removing from chassis.

Installation

To install, reverse removal procedure. Check front end alignment.

Installation

1) To install steering gear, reverse removal procedure. To install front differential on 4WD, raise differential assembly with jack. Install right and left supports-to-front crossmember, but DO NOT tighten support bolts. Install rear crossmember, surge tank bolts, rear cushion and support bolt.

2) Tighten cushion support bolt and right and left support bolts to 50 ft. lbs. (68 N.m). Tighten rear crossmember mounting bolts to 70 ft. lbs. (95 N.m). Install engine undercover. Install driveshafts to side gear shafts and tighten to 50 ft. lbs. (68 N.m). Align match mark and install front driveshaft, tighten to 31 ft. lbs. (42 N.m).

Removal (RWD Models)

1) Raise and support vehicle on safety stands. Remove wheel assemblies. Remove tie rod end nuts and press out of steering arm. Remove engine undercover (if equipped). Match mark steering coupler and disconnect at "U" joint.

2) Remove steering damper. Remove any line clamp bolts that may interfere with gear removal. Remove steering gear mounting brackets and remove steering gear. Use care to not tear rack boots when removing from chassis.

Installation

To install, reverse removal procedure.

OVERHAUL

POWER STEERING PUMP

Disassembly (Celica)

1) Remove pulley. Remove air control valve (if equipped). Remove return line union. Remove flow control valve and "O" ring. Remove snap ring retaining flow control spring seat. Install a bolt in spring seat and remove seat. Remove snap ring retaining rear housing.

2) Using a plastic hammer, remove rear housing and wave washer. Remove "O" ring. Using a plastic hammer, tap shaft rearward. Remove rear plate, pump shaft, cam ring and vane plate. Disassemble pump shaft.

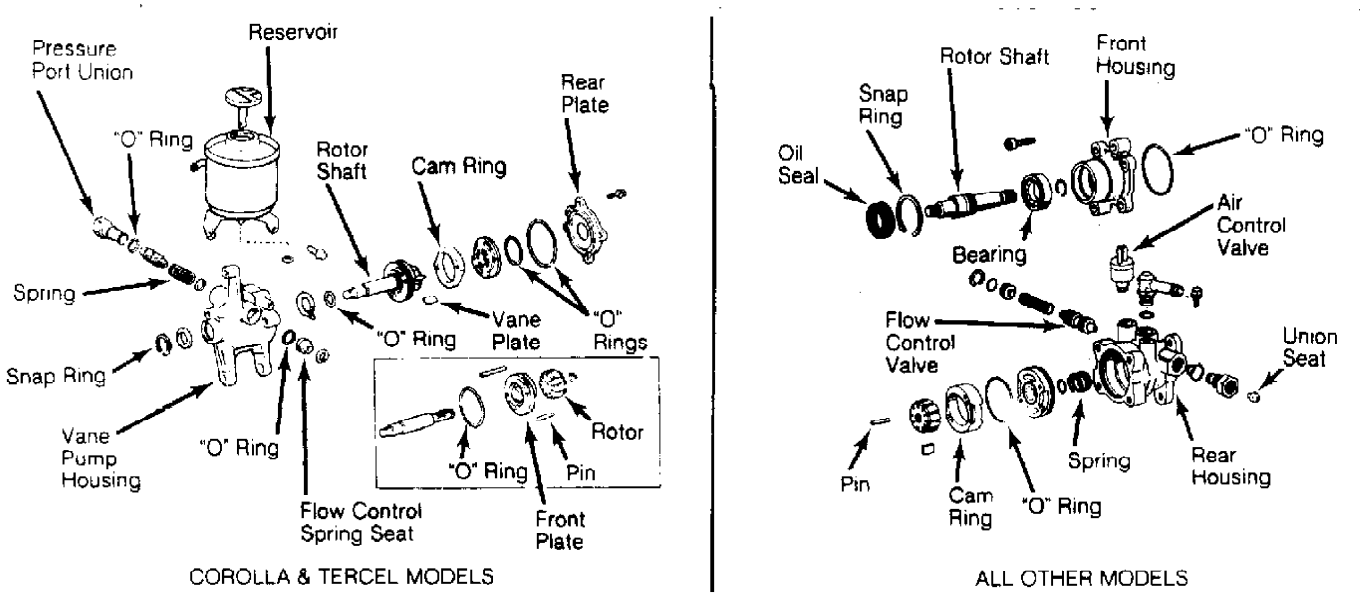

Fig. 1: Exploded View of Toyota Power Steering Pump Assemblies
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Inspection

1) Check oil clearance between pump housing bushing and rotor shaft. See Fig. 2. If difference is greater than .0028" (.07 mm), replace complete pump assembly. Discard all "O" rings and replace with new ones.

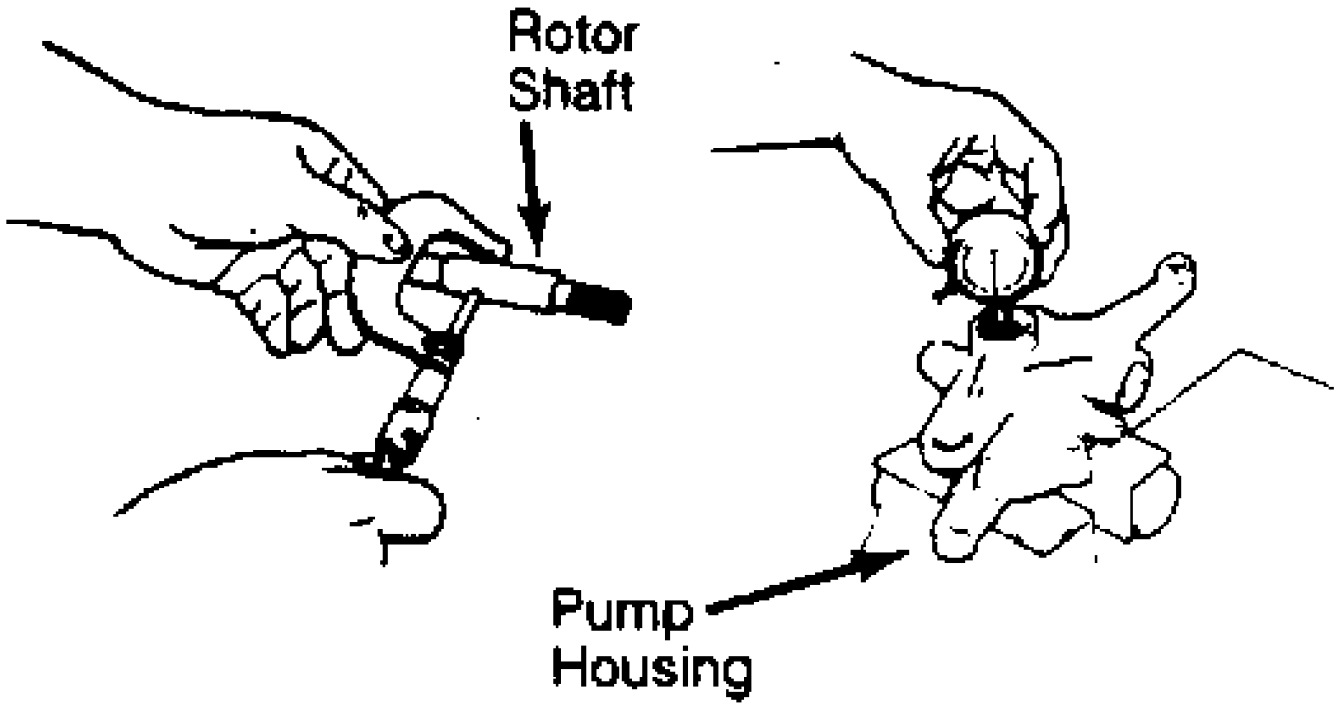

Fig. 2: Checking Pump Housing Bushing-to-Rotor Shaft Clearance
Courtesy of Toyota Motor Sales, U.S.A., Inc.

2) Check vane plates for wear or damage. See VANE PLATE SPECIFICATIONS table. Maximum clearance between vane plate and rotor

groove is .0011" (.028 mm). If clearance exceeds specification, replace rotor and pump plate as an assembly.

3) Check flow control valve for leakage, using 57-71 psi (4.0-5.0 kg/cm^2) of compressed air. See Fig. 3. On Celica models, control valve spring length should be 1.42-1.49" (36-38 mm). Replace spring, if length is not as specified.

VANE PLATE SPECIFICATIONS TABLE

Application	In. (mm)
Minimum Height	.315 (8.00)
Minimum Thickness	.070 (1.77)
Minimum Length	.589 (14.96)

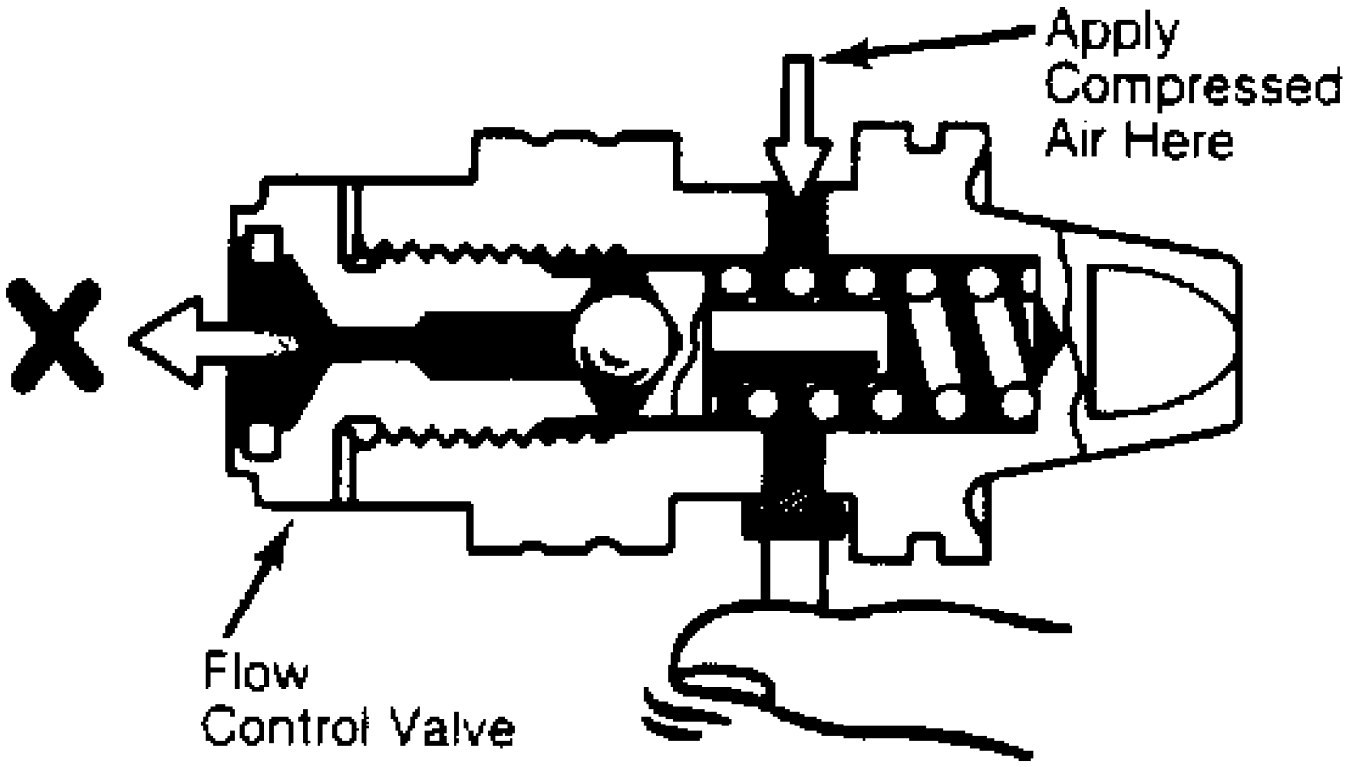

Fig. 3: Checking Flow Control Valve
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Reassembly

1) Coat all sliding surfaces with ATF. Assemble front plate and rotor assembly on pump shaft. Ensure rotor is installed properly. See Fig. 4. Coat grease to shaft seal. Install longer pin into housing. Align pin and hole in front plate.

2) Using a plastic hammer, tap pump shaft into housing. Install cam ring, with inscribed mark facing toward rear of pump. Install vane plates, with rounded end facing rear of pump. Install rear side plate and "O" ring. Install wave washer, "O" ring and rear housing.

3) Using a torque wrench, measure pump shaft rotating preload. If preload exceeds 2.4 INCH lbs. (.27 N.m), disassemble pump and check assemble. If preload is okay, install spring seat. Bolt hole should be facing outward.

4) Install snap ring. Install spring and flow control valve. Tighten pressure port to 51 ft. lbs. (69 N.m). Install return line

port to 108 INCH lbs. (12 N.m). Install air control valve and pulley.

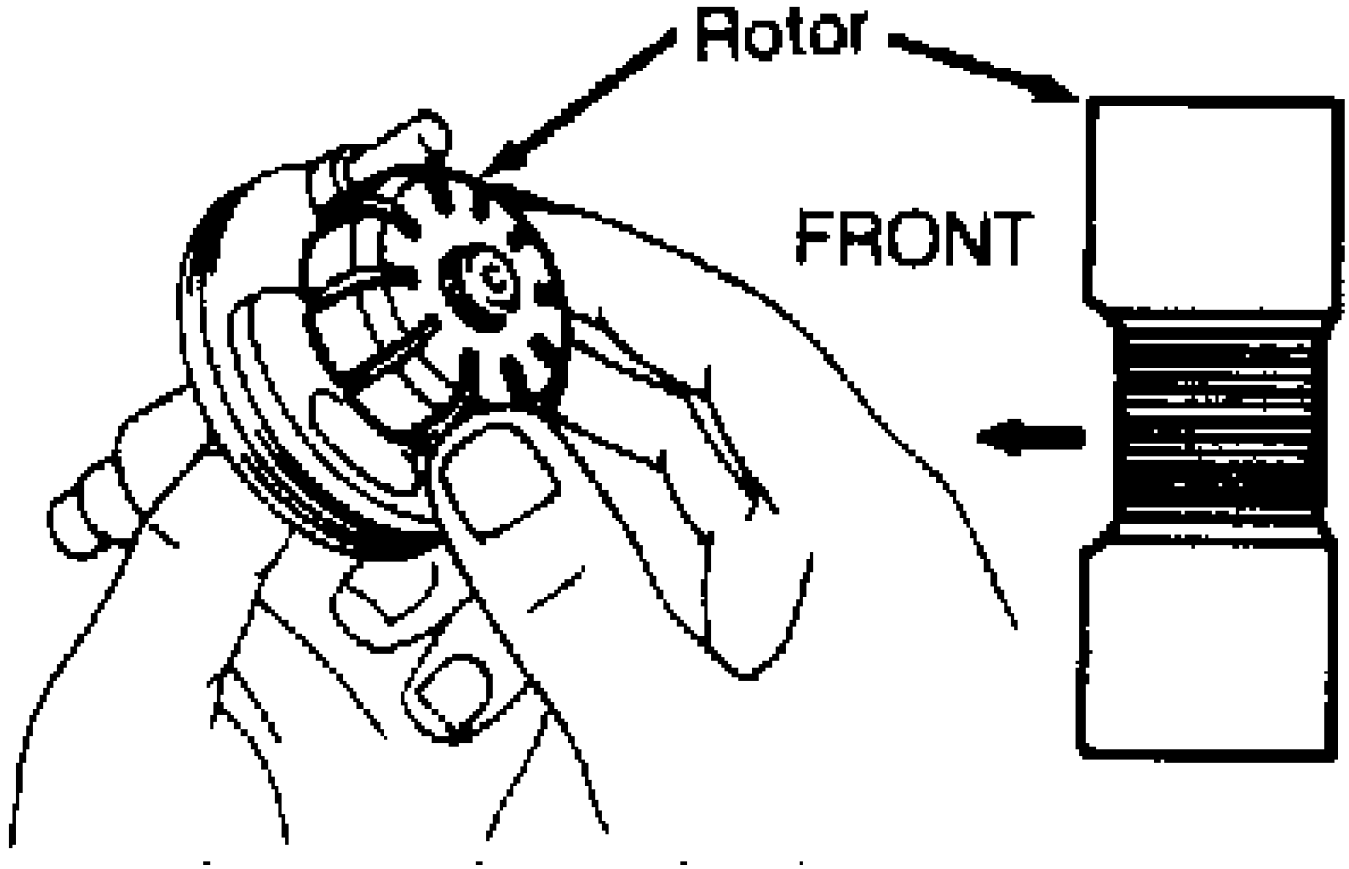

Fig. 4: Installing Rotor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

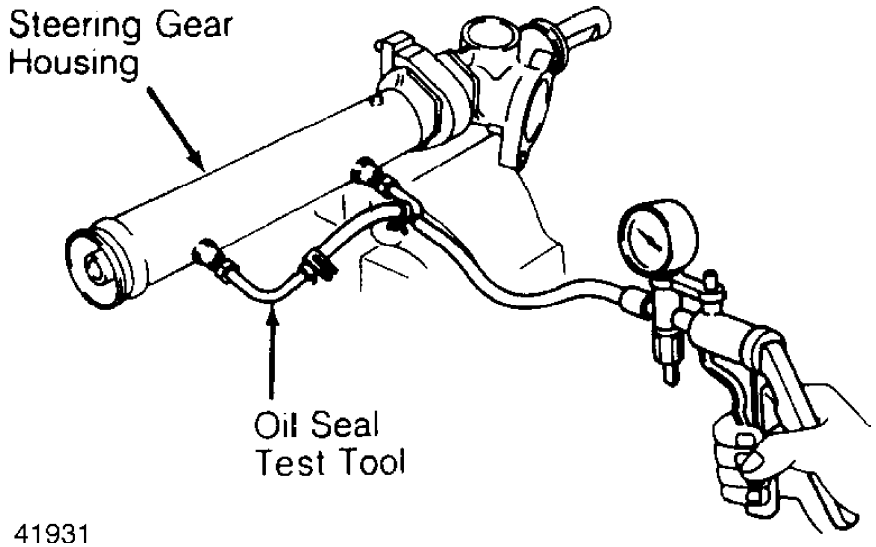

Fig. 5: Testing Oil Seal
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Fig. 6: Installing Upper Bearing
Courtesy of Toyota Motor Sales, U.S.A., Inc.

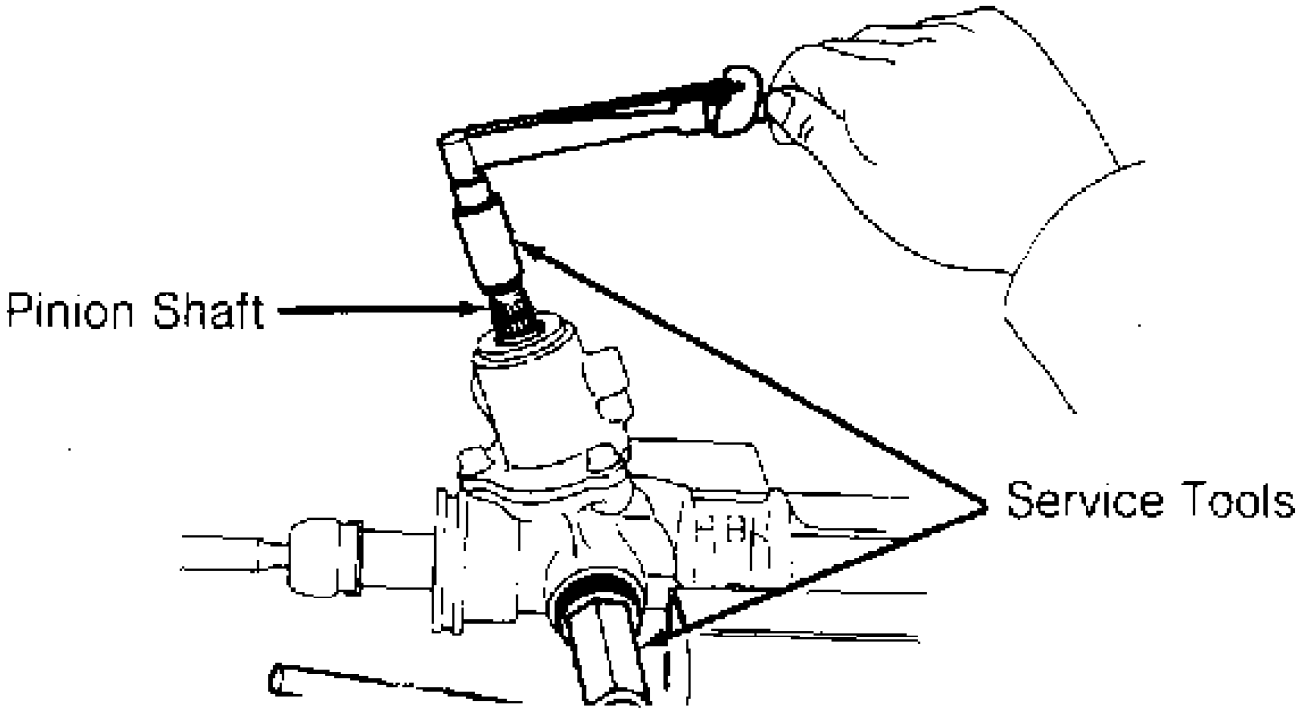

Fig. 7: Setting Rack & Pinion Total Preload
Courtesy of Toyota Motor Sales, U.S.A., Inc.

STEERING GEAR (Celica)

Disassembly

1) Using Rack Housing Stand (09612-00012), mount steering gear in vise and remove left and right turn tubes. Match mark tie rod ends position and remove. Remove outer clips and inner clamps and remove rack boots. See Fig. 8.

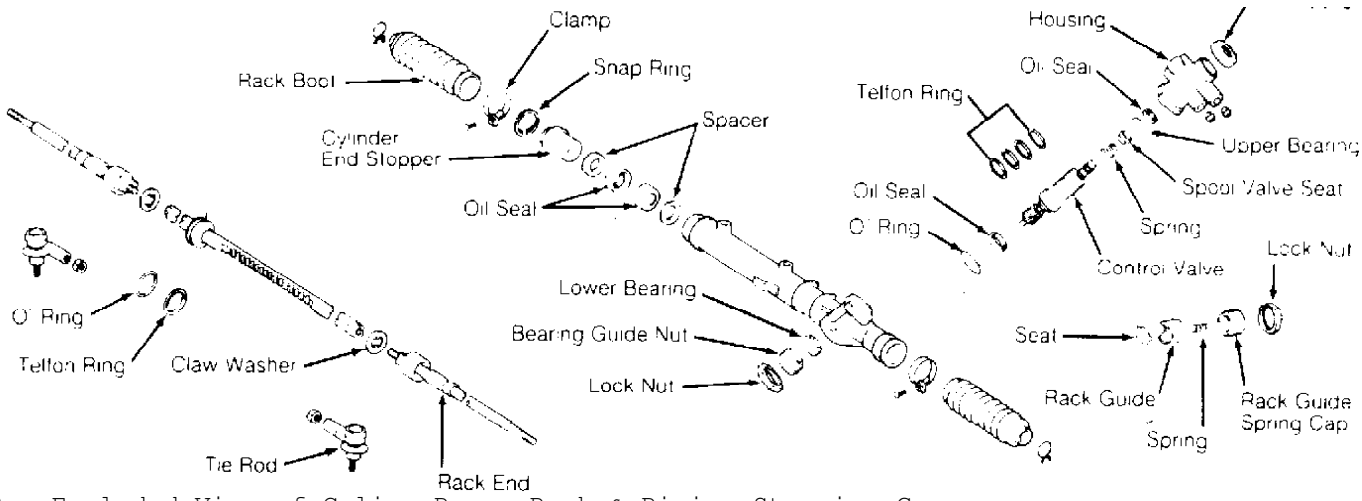

Fig. 8: Exploded View of Celica Power Rack & Pinion Steering Gear
Courtesy of Toyota Motor Sales, U.S.A., Inc.

2) Unstake claw washers. Mark left and right rack ends position. Using Wrench (09628-10020), remove rack ends and claw washers. Remove rack guide spring cap lock nut. Remove spring cap. Remove rack guide spring, guide and seat.

3) Remove bearing guide lock nut. Remove bearing guide nut. Remove dust cover. Match mark control valve housing and rack. Remove control valve housing. Remove control valve and bearing. Remove "O" ring from housing. Remove spool valve spring and seat (if equipped).

4) Remove snap ring in end of housing. Using Bearing Replacer (09612-10061), press cylinder end stopper out until end stopper touches press plate. Pull out rack with cylinder end stopper, spacer and oil seal.

Inspection & Repair

1) Check steering rack for runout by placing rack on "V" blocks and using a dial indicator, measure runout at center of rack. Maximum runout is .012" (.30 mm). Check all bearings and seals for damage. Replace control valve bearing and housing oil seal, press out oil seal with bearing. Install oil seal. Press in new bearing.

2) To replace Teflon rings on rack piston, using a small screwdriver remove Teflon rings. Coat Teflon ring with power steering fluid. Install rings on Adapter (09631-24020) and expand it. Install Telfon ring on piston. Coat the Teflon rings with power steering fluid and slide tapered end of Installer (09631-24030) over rings to seat.

3) To replace Teflon rings on control valve, use a small screwdriver and remove rings. Install new Teflon rings on Seal Ring Guide (09631-20070) and expand it.

4) Install expanded rings to control valve and snug down. Coat the Teflon rings with power steering fluid and slide tapered end of Installer (09631-24050) over rings to seat. Install new cylinder housing oil seal and spacer.

NOTE: Coat all Teflon rings and "O" rings with power steering fluid.

Reassembly & Adjustments

1) Install Rack Cover (09631-20101) to rack and coat with power steering fluid. Insert rack into cylinder and remove rack cover. Wind vinyl tape on steering rack end and coat with power steering fluid.

2) Push oil seal into cylinder, install spacer and drive in cylinder end stopper using Bearing Replacer (09612-22011). Install

snap ring. Insert new wire in hole and turn stopper clockwise until wire disappears.

3) Perform air tightness test. Install Oil Seal Test Tool (09631-12070) and apply 15.75 in. Hg. (53.3 kPa) of vacuum for 30 seconds. If vacuum drops, recheck seals in rack housing. See Fig. 5.

4) Coat control valve Teflon rings with power steering fluid and push valve into steering housing. Coat new "O" ring with power steering fluid and install with spring and spring seat. Align match marks on control valve housing. Install control valve lower bearing.

5) Using Socket (09616-00010), install new self-locking nut to bottom of control valve and tighten to 18 ft. lbs. (25 N.m). Apply liquid sealer to a new rack housing cap, install cap and tighten to 43 lbs. (58 N.m). Stake the housing cap in 2 places.

6) Loosen spring cap until there is no preload. Now turn the spring cap in until the turning preload is 6.9-11.3 INCH lbs. (0.8-1.3 N.m). See Fig. 7. Apply liquid sealer to threads of lock nut and install. Tighten lock nut 43 ft. lbs. (58 N.m). Recheck preload and ensure preload has not changed.

7) Apply liquid sealer to bearing guide nut and install. Using Hexagon Wrench (09612-10022) torque guide nut to 11 ft. lbs. (15 N.m). Loosen bearing guide nut until a turning preload of 3.9-5.6 INCH lbs. (0.4-0.6 N.m) is reached. See Fig. 7. Apply liquid sealer to bearing guide lock nut. Using Lock Nut Wrench (09617-24020), install lock nut and tighten to 41 ft. lbs. (56 N.m).

8) Install rack guide, guide spring and seat. Apply liquid sealer to threads of rack guide spring cap. Install cap using Hexagon Wrench (09612-10022) and tighten to 18 ft. lbs. (25 N.m). Back off spring cap 12-15 degrees and turn control valve shaft left and right 2 times.

9) Loosen spring cap until there is no preload. Now turn the spring cap in until the turning preload is 7.8-10.4 in. lbs. (0.9-1.2 N.m). Apply liquid sealer to threads of lock nut and install. Tighten lock nut to 41 ft. lbs. (56 N.m).

10) Align the claw of the new claw washers with the rack grove. Install the claw washer and rack end. Tighten track end to 53 ft. lbs. (72 N.m). Stake the claw washers.

11) Install steering damper (if equipped). Install new "O" ring seals and install left and right turn tubes. Tighten fluid tubes to 11 ft. lbs. (15 N.m). Coat rack end dust seals with grease, remove any grease in housing tube hole. Install boots, clamps and clips. Install outer clips with ends facing up. Install tie rod ends using match marks. Tie rod lock nuts are to be tightened when alignment is performed.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Air Control Valve	27 (37)
Control Valve Bearing Guide Lock Nut	41 (56)
Control Valve Lower Bearing Self-Locking Nut	18 (25)
Control Valve Housing Bolts	23 (31)
Pulley Bolt or Nut	32 (43)
Pump Bracket Bolt	29-33 (39-45)
Pressure Port	51 (69)
Rack Guide Spring Cap Lock Nut	51 (69)
Rear Housing Bolt	34 (46)
Stabilizer Bar Bracket Bolt	
Celica 4WD	14 (19)
Stabilizer Bar Link Bolt	

Celica 4WD	26 (35)
Steering Damper	20 (26)
Steering Damper Bracket Lock Nut	61 (83)
Steering Gear-to-Chassis	43 (58)
Steering Rack Tie Rod	61 (83)
Tie Rod-to-Steering Arm Nut	36 (49)
Tie Rod Lock Nut	41 (56)
Tie Rod Clamp Bolt (Supra)	14 (19)
Turn Tubes	14 (19)
"U" Joint Pinch Bolt	24 (32)
Wheel Lug Nuts	76 (103)
	INCH Lbs. (N.m)
Return Port Bolt	108 (12)

TORQUE SPECIFICATIONS TABLE (CRESSIDA & VAN)

Application	Ft. Lbs. (N.m)
Air Control Valve	27 (36)
Bevel Gear Housing Mount Bolts	29 (39)
Bevel Gear Adjusting Lock Nut	80 (109)
Control Valve Bearing Guide Nut	18 (25)
Control Valve Housing Bolts	13 (17)
Pressure Port Union	51 (69)
Pressure Port Union Bolt	34 (46)
Pulley Nut	32 (44)
Pump Housing Bolt	34 (46)
Pump Mounting Bolt	
Through Bolt	43 (58)
All Others	29 (39)
Rack Guide Spring Cap Lock Nut	51 (69)
Steering Damper Bolt	20 (26)
Steering Damper Lock Nut	
Cressida	61 (83)
Van	43 (59)
Steering Gear-to-Chassis	56 (76)
Steering Rack Tie Rod	
Cressida	61 (83)
Van	76 (103)
Tie Rod Lock Nut	41 (56)
Tie Rod Clamp Bolt	13 (18)
Tie Rod-to-Steering Arm Nut	43 (59)
Torque Shaft-to-Pinion Shaft Bolts	26 (35)
Turn Tubes	18 (25)
"U" Joint Pinch Bolt	26 (35)
Wheel Lug Nut	76 (103)