

2.0L 4-CYL TURBO - VIN [S]

1993 Toyota Celica

1993 TOYOTA ENGINES
2.0L Turbo 4-Cylinder

Celica All-Trac, MR2

* PLEASE READ THIS FIRST *

NOTE: For engine repair procedures not covered in this article,
see ENGINE OVERHAUL PROCEDURES - GENERAL INFORMATION article
in the GENERAL INFORMATION section.

ENGINE IDENTIFICATION

Engine serial number is stamped on flywheel end of cylinder
block, below cylinder head surface.

ENGINE IDENTIFICATION CODE

Application	Engine Code	VIN Code
Celica All-Trac & MR2 2.0L Turbo 4-Cylinder	3S-GTE	S

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

- CAUTION: To prevent air bag deployment, disconnect negative battery
cable at least 20 seconds before working on vehicle.
- CAUTION: When battery is disconnected, vehicle computer and memory
systems may lose memory data. Driveability problems may
exist until computer systems have completed a relearn cycle.
- NOTE: Adjust valve clearance with engine cold.
- 1) Disconnect negative battery cable. On MR2, remove No. 1
air intake connector from throttle body. See Fig. 30.
- 2) On Celica All-Trac, remove intercooler. See INTERCOOLER
under REMOVAL & INSTALLATION.
- 3) On all models, disconnect spark plug wires from spark
plugs. Drain cooling system. Remove EGR vacuum modulator and Vacuum
Switching Valve (VSV) assembly. Remove EGR valve and pipe. Remove
intake air connector and intake air connector brace from throttle
body. See Fig. 16.
- 4) Disconnect electrical connections, control cables, vacuum
hoses and coolant hoses from throttle body. Remove throttle body and
gasket. Remove retaining bolts, seal washers, valve cover and gaskets.
- 5) Rotate crankshaft clockwise so cylinder No. 1 is at TDC on
compression stroke. Cylinder No. 1 is front cylinder at timing belt
end of engine. Ensure timing mark on crankshaft pulley aligns with "0"
mark on timing belt cover.
- 6) Ensure valve lifters are loose on cylinder No. 1 and tight
on cylinder No. 4. If conditions are not as described, rotate
crankshaft one complete revolution (360 degrees).
- 7) With cylinder No. 1 at TDC, check valve clearance on
specified valves. See VALVE CLEARANCE ADJUSTMENT SEQUENCE table. Using

feeler gauge, measure and record clearance between valve lifter and camshaft.

VALVE CLEARANCE ADJUSTMENT SEQUENCE TABLE

Cylinder No. At TDC	Adjust Intake Valves	Adjust Exhaust Valves
1		
.....	1 & 2	1 & 3
4	3 & 4	2 & 4

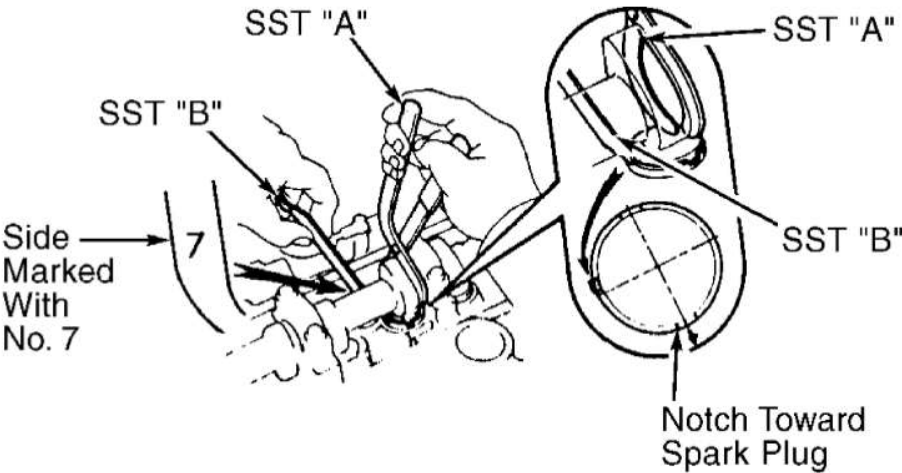
8) To check remaining valves, rotate crankshaft 360 degrees (one revolution) until cylinder No. 4 is at TDC on compression stroke. Measure and record valve clearance on specified valves. See VALVE CLEARANCE ADJUSTMENT SEQUENCE table. Ensure valve clearance is within specification. See VALVE CLEARANCE SPECIFICATIONS table.

VALVE CLEARANCE SPECIFICATIONS (1) TABLE

Application	In. (mm)
Exhaust Valve	.011-.015 (.28-.38)
Intake Valve	.006-.010 (.15-.25)

(1) - Adjust valve clearance with engine cold.

- 9) If valve clearance requires adjustment, rotate camshaft so lobe on valve to be adjusted is facing upward, away from valve lifter.
- 10) Rotate valve lifter so notch on valve lifter is toward spark plug. See Fig. 1. DO NOT align notch with camshaft.
- 11) Use Valve Clearance Adjuster (SST 09248-55020) to remove adjusting shim. Using SST "A" of valve clearance adjuster, push downward on valve lifter. Place SST "B" between camshaft and valve lifter with side marked with No. 7 at designated position. See Fig. 1. Remove SST "A".



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Fig. 1: Adjusting Valve Clearance
Courtesy of Toyota Motor Sales, U.S.A., Inc.

12) Using small screwdriver and magnet, remove adjusting shim. Measure and record thickness of removed adjusting shim. Using

measured clearance and adjusting shim thickness, select proper replacement adjusting shim. See Figs. 3, 4, 5 & 6.

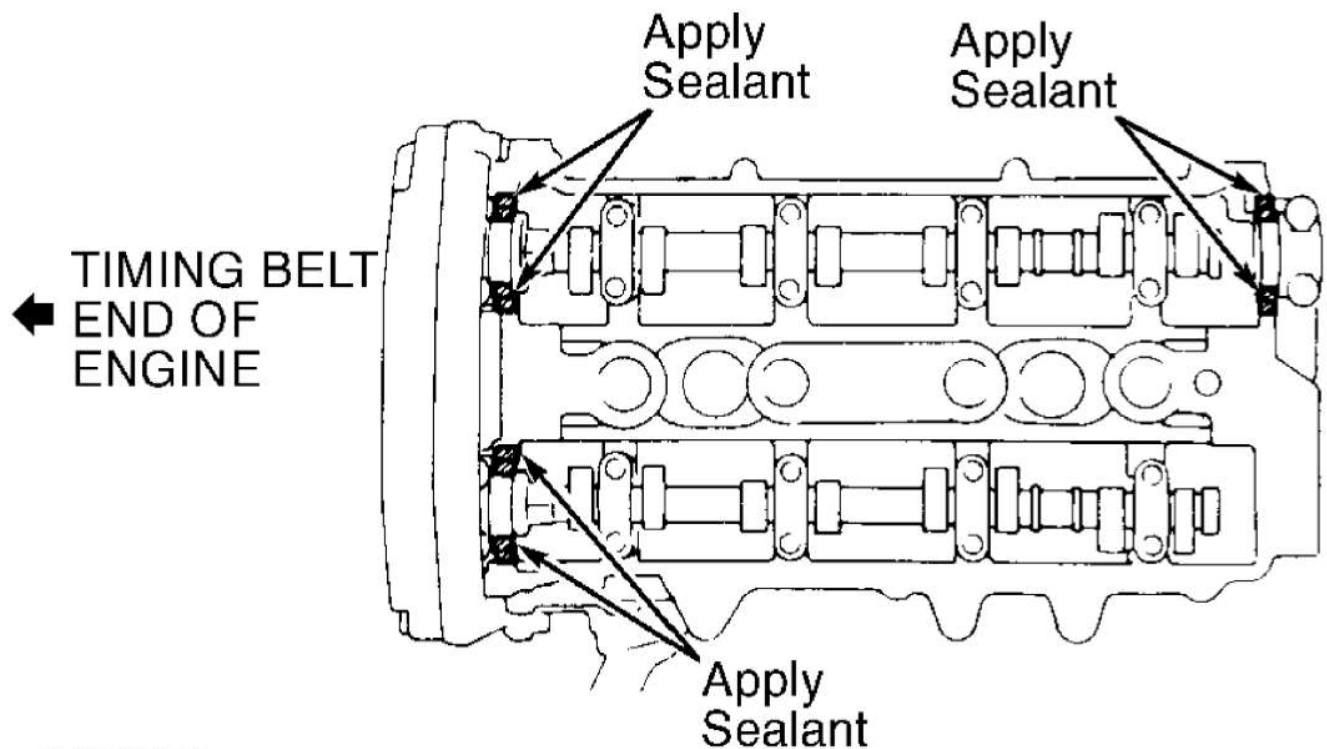
13) Install replacement adjusting shim. Recheck valve clearance. Before installing valve cover and gasket, apply sealant at front and rear areas of cylinder head. See Fig. 2.

14) Using NEW gasket, install valve cover. Install seal washers. Install and tighten retaining bolts to specification. See TORQUE SPECIFICATIONS.

15) To install remaining components, reverse removal procedure. Tighten all bolts to specification. See TORQUE SPECIFICATIONS.

16) Install NEW throttle body gasket with protruding area on gasket toward top of throttle body (opposite coolant line connections). Note that the 2 longer throttle body bolts are used in lower throttle body mounting holes. Install and tighten bolts to specification. See TORQUE SPECIFICATIONS. Fill cooling system. On MR2 cooling system must be bled. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.

CAUTION: On MR2, ensure cooling system is bled to prevent engine damage. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.



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Fig. 2: Applying Valve Cover Sealant
Courtesy of Toyota Motor Sales, U.S.A., Inc.

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Fig. 3: Exhaust Valve Adjusting Shim Selection Chart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

EXHAUST VALVES

NEW SHIM THICKNESS

Shim No.	Thickness mm (in.)	Shim No.	Thickness mm (in.)
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

EXAMPLE: A 0.1102" (2.800 mm) shim is installed and measured clearance is 0.0177" (0.450 mm).
Replace 0.1102" (2.800 mm) shim with a No. 9 shim.
Note: New shims are marked in millimeters.

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Fig. 4: Exhaust Valve New Shim Thickness Chart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

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Fig. 5: Intake Valve Adjusting Shim Selection Chart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

INTAKE VALVES

NEW SHIM THICKNESS

Shim No.	Thickness mm (in.)	Shim No.	Thickness mm (in.)
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

EXAMPLE: A 0.1102" (2.800 mm) shim is installed and measured clearance is 0.0177" (0.450 mm).
Replace 0.1102" (2.800 mm) shim with a No. 12 shim.
Note: New shims are marked in millimeters.

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Fig. 6: Intake Valve New Shim Thickness Chart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

REMOVAL & INSTALLATION

- NOTE:** For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies before removal.
- CAUTION:** When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle.
- CAUTION:** To prevent air bag deployment, disconnect negative battery cable at least 20 seconds before working on vehicle.

FUEL PRESSURE RELEASE

With ignition off, disconnect negative battery cable. Place suitable container under fuel line. Cover fuel line connection with shop towel. Slowly loosen fuel line connection and release fuel pressure. Once fuel pressure is released, fuel system components can be removed.

COOLING SYSTEM BLEEDING

Celica All-Trac

No special cooling system bleeding procedure is required.

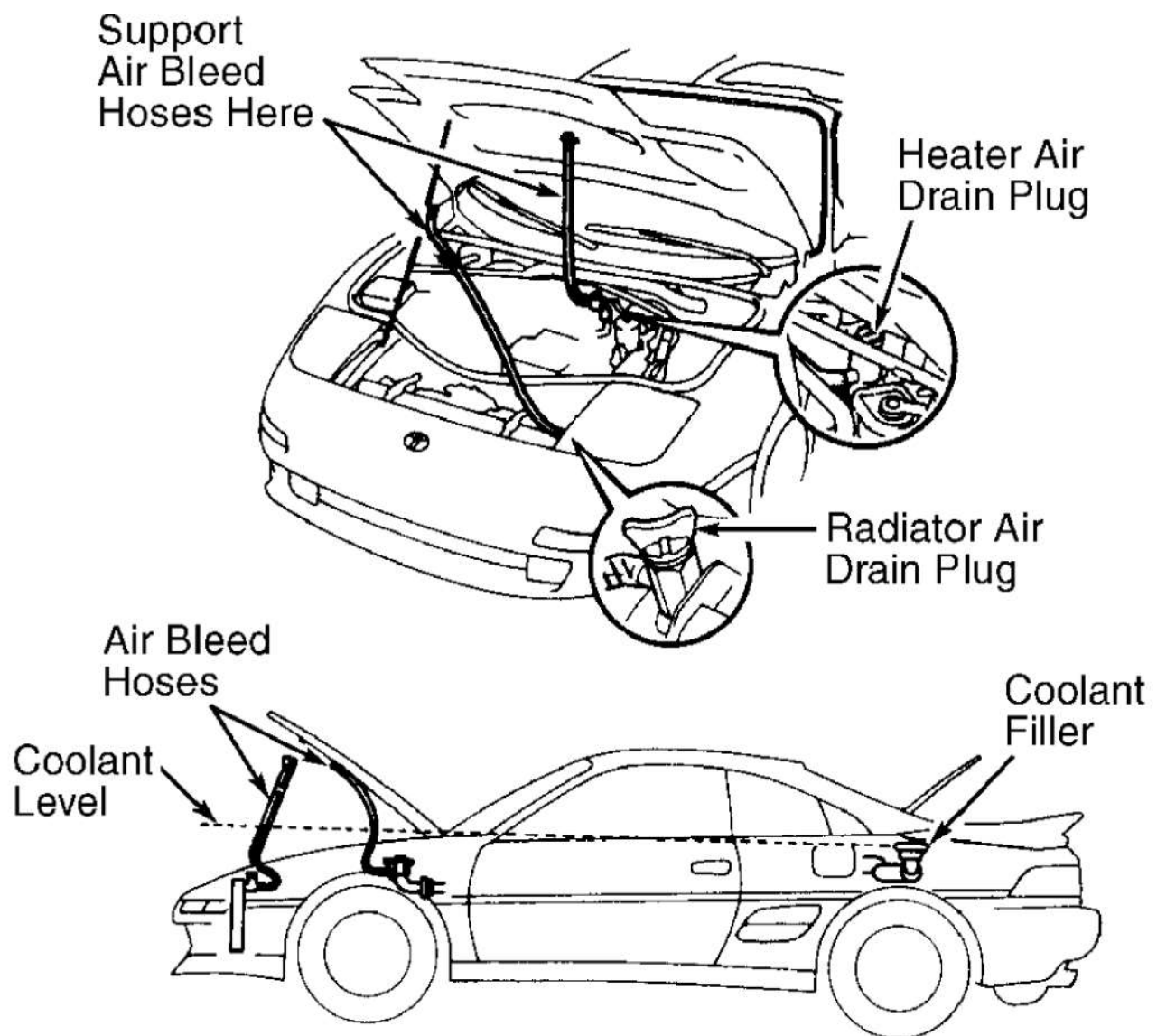
MR2

- 1) Remove spare tire, front luggage compartment trim and upper radiator support seal. Connect air bleed hoses to heater and radiator air drain plugs. See Fig. 7. Attach and support opposite end of air bleed hoses to hood or hood support. Ensure air bleed hoses are not pinched.
- 2) Place heater control lever to the warmest position. Open heater and radiator air drain plugs at least 3 turns.
- 3) Slowly add coolant through coolant filler. See Fig. 7. Air will bleed from air bleed hoses on heater and radiator air drain plugs. Ensure coolant level in air bleed hoses and coolant filler are at the same level. See Fig. 7.
- 4) If coolant level in air bleed hoses is lower, air still exists in cooling system. Check for pinched or restriction in air

bleed hoses and repeat step 3). When proper coolant level is obtained in air bleed hoses, close heater and radiator air drain plugs. Remove air bleed hoses.

5) Install radiator cap on coolant filler to the first stop point. DO NOT fully tighten radiator cap to the second stop point. Start engine and allow to idle for 3 minutes. Shut engine off. Recheck coolant level in coolant filler.

6) Add coolant if necessary and repeat step 5). Recheck coolant level. If proper coolant level exists, install radiator cap and fully tighten to the second stop point. Fill coolant reservoir tank to the FULL line. Reinstall upper radiator support seal.



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Fig. 7: Bleeding Cooling System & Identifying Coolant Filler (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ENGINE

NOTE: Remove engine and transaxle as an assembly.

Removal (Celica All-Trac)

1) Disconnect negative battery cable. Release fuel pressure. See FUEL PRESSURE RELEASE under REMOVAL & INSTALLATION.

2) Drain cooling system, engine oil and transaxle oil. Remove hood and lower engine covers. Remove air intake duct, airflow meter and air cleaner cap as an assembly. Remove air cleaner case. Disconnect control cables from throttle body.

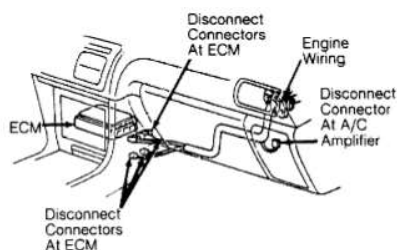
3) Disconnect relay box from battery. Remove lower cover from relay box. Disconnect fusible link assembly and engine wiring connectors from relay box. Remove A/C relay box from bracket, located near passenger's side corner of radiator.

4) Remove battery. Remove injector solenoid resistor and fuel pump resistor located in front of battery, left of radiator. Remove radiator cooling fans, radiator and coolant reservoir tank.

5) Remove cruise control actuator, located near brake master cylinder. Remove ignition coil. Remove strut tower-to-firewall braces. Disconnect necessary coolant hoses, fuel lines, vacuum hoses and electrical connections. Remove charcoal canister.

6) Raise and support vehicle. Remove starter. Disconnect speedometer cable, oil cooler hoses, electrical connections and control cables at transaxle. Remove clutch release cylinder with hose attached and secure aside.

7) Disconnect wiring and remove turbocharger pressure sensor and A/C vacuum switching valve from firewall. Disconnect electrical connectors from Engine Control Module (ECM) located left of glove box, behind center console. See Fig. 8. Disconnect electrical connector at A/C amplifier near glove box. See Fig. 8.



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Fig. 8: Identifying ECM & Engine Wiring (Celica All-Trac)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

8) Remove retaining nuts and pull engine wiring through firewall. Remove suspension crossmember bolted to both lower suspension arms. Disconnect exhaust pipe at catalytic converter (located at bottom of turbocharger) and center pipe. Remove exhaust pipe.

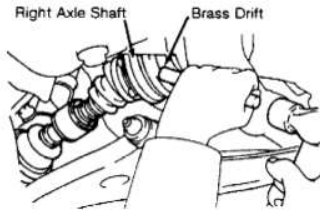
9) Remove front wheels. Remove cotter pin and retainer from end of axle shaft. Loosen axle shaft nut while applying the brakes. Remove axle shaft nut. Remove nut and separate tie rod from steering knuckle.

10) Remove ball joint-to-steering knuckle bolts/nuts. Wrap threads on end of axle shaft with tape. Cover axle shaft boot with shop towel. Using puller attached to hub assembly, press axle shaft from hub assembly.

11) Pull steering knuckle outward and separate axle shaft from hub assembly. To remove left (driver's side) axle shaft, pry between transaxle case and axle shaft until axle shaft disengages from transaxle.

12) To remove right (passenger's side) axle shaft, remove bolts and transaxle case protector, located just above axle shaft at

the transaxle case. Using brass drift and hammer, drive right axle shaft from transaxle. See Fig. 9.



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Fig. 9: Removing Right Axle Shaft (Celica All-Trac)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

13) Place reference marks on front and rear drive shaft flanges at center bearing. Remove drive shaft flange bolts. Remove drive shaft from transfer case. Remove seal deflector from rear of transfer case. Remove dynamic damper from transfer case. See Fig. 10.

14) Remove accessory drive belt, alternator and idler pulley bracket. Remove A/C compressor and power steering pump with hoses attached and secure aside.

15) Support engine with hoist. Remove engine mount crossmember located below engine. Remove catalytic converter braces, catalytic converter, cushion, retainer and gasket. See Fig. 16.

16) Disconnect engine mounts. Note direction of mount installation for reassembly reference. Mounts must be installed in original direction. Lift engine and transaxle from vehicle.

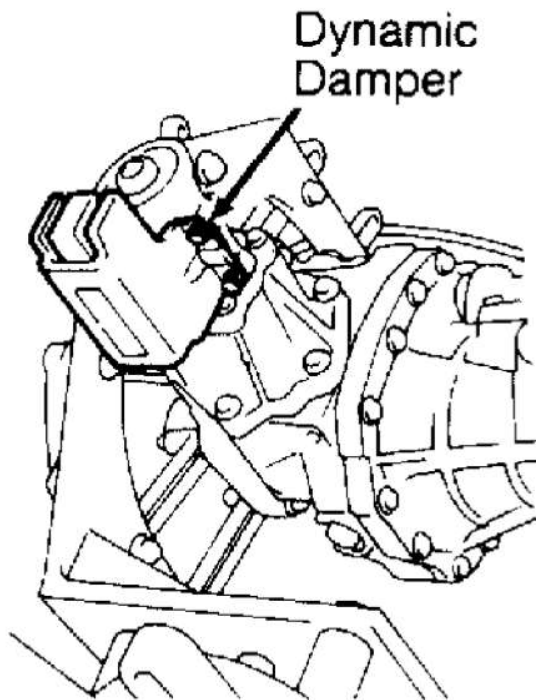


Fig. 10: Identifying Dynamic Damper (Celica All-Trac)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Installation

- 1) To install, reverse removal procedure. Tighten all

fasteners to specification. See TORQUE SPECIFICATIONS. When installing engine mounts, install all bolts and nuts before tightening to specification.

2) Use NEW gasket when installing catalytic converter. Before installing axle shaft, install NEW snap ring on end of axle shaft. Ensure opening of snap ring faces downward. Ensure axle shaft fully engages in transaxle.

3) Ensure reference marks are aligned on drive shaft flanges. Adjust all control cables and fluid levels.

NOTE: Remove engine and transaxle as an assembly from bottom of engine compartment.

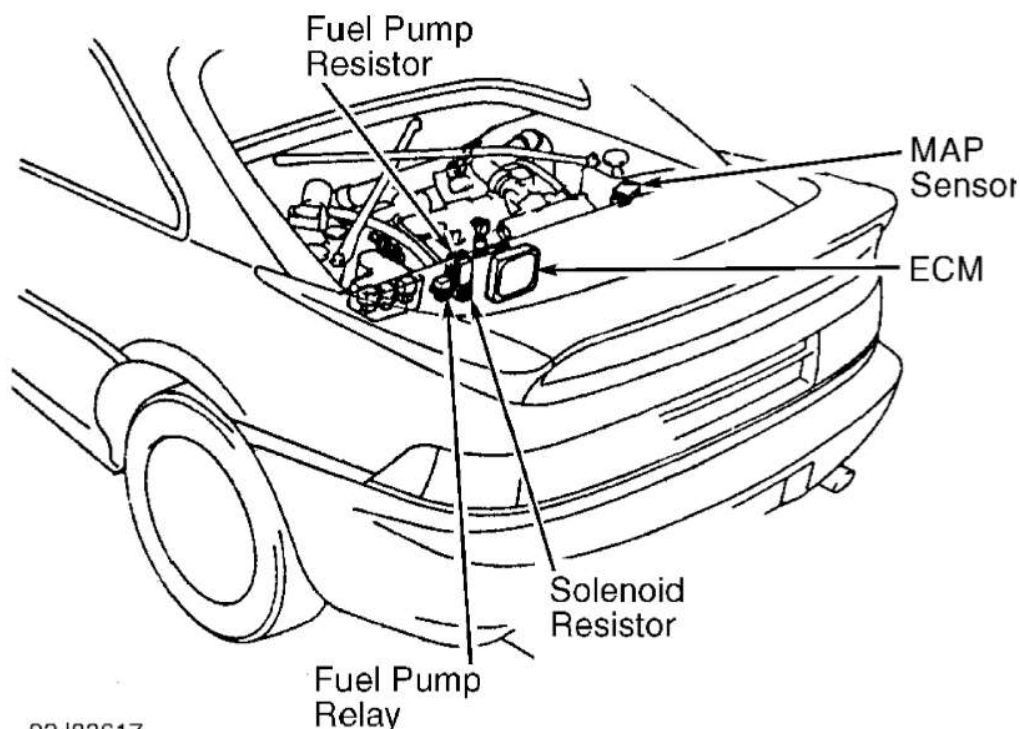
Removal (MR2)

1) Disconnect negative battery cable. Release fuel pressure. See FUEL PRESSURE RELEASE under REMOVAL & INSTALLATION.

2) Drain cooling system, engine oil and transaxle oil. Remove hood, hood side panels and lower engine covers. Remove strut tower-to-firewall braces. Remove air cleaner cap and airflow meter as an assembly. Remove air cleaner case.

3) Remove No. 1 and 2 air intake connectors to intercooler. See Fig. 30. Remove cruise control actuator. Disconnect necessary control cables, coolant hoses, fuel lines, vacuum hoses and electrical connections.

4) Remove Manifold Absolute Pressure (MAP) sensor from the body. See Fig. 11. Remove data link connector, located near MAP sensor, from the body. Disconnect electrical connectors and remove solenoid resistor, fuel pump relay and fuel pump resistor assembly. See Fig. 11.



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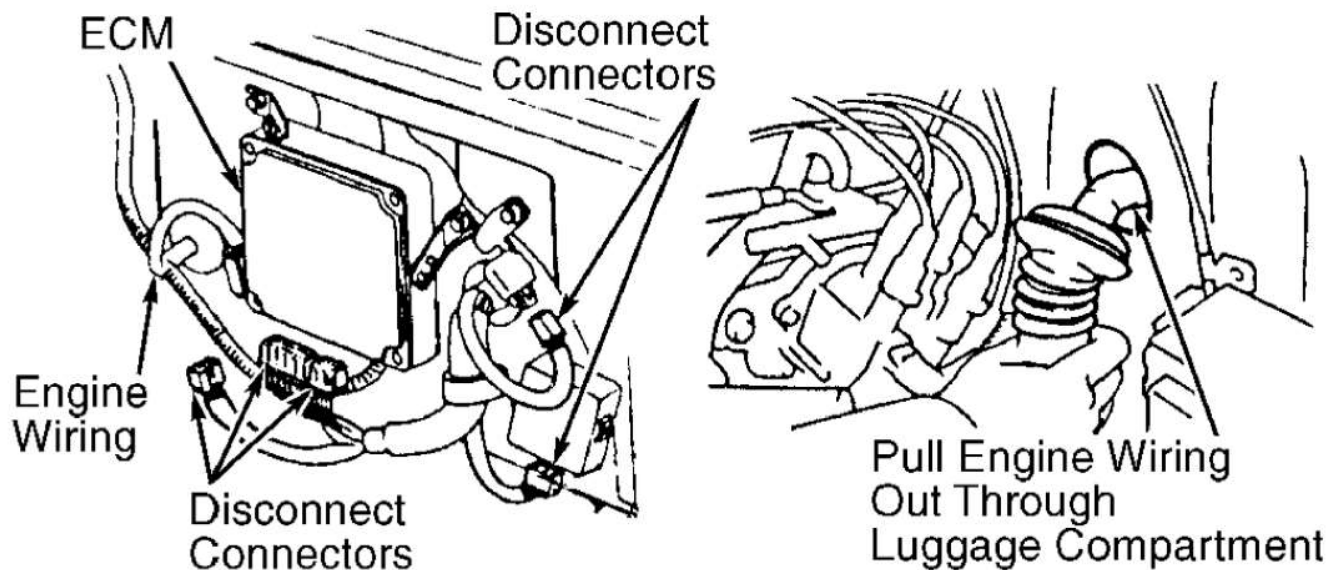
Fig. 11: Identifying Electrical Components (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

5) Remove coolant filler and hose. See Fig. 7. Remove charcoal canister. Remove retaining bolts from relay box located near

strut tower. Disconnect luggage compartment cable near relay box. Remove upper and lower covers from relay box.

6) Disconnect positive cable and electrical connections from relay box. Disconnect electrical connections from igniter and coil wire from ignition coil. Disconnect electrical connectors from Engine Control Module (ECM) located near luggage compartment. See Fig. 12.

7) Disconnect remaining electrical connectors near ECM for removal of engine wiring. See Fig. 12. Pull engine wiring out through opening in luggage compartment.



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Fig. 12: Identifying ECM & Removing Engine Wiring (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

8) Raise and support vehicle. Disconnect control cables and electrical connections at transaxle. Remove tailpipe and muffler assembly.

9) Disconnect exhaust pipe and gasket from catalytic converter. Remove exhaust by rotating exhaust pipe between rear suspension crossmember and the body. Remove engine compartment cooling fan assembly, located in passenger's side of engine compartment, near the intercooler.

10) Remove drive belt and idler pulley bracket. Remove A/C compressor with hoses attached and secure aside. Remove intercooler. See INTERCOOLER under REMOVAL & INSTALLATION. Remove rear (intake manifold side) engine mount.

11) Remove rear wheels. Remove cotter pin and retainer from end of axle shaft. Apply parking brake. Remove axle shaft nut. Release parking brake.

12) Remove brake caliper with hose attached and secure aside. Place reference marks on hub assembly and brake rotor for reassembly reference. Remove brake rotor.

13) Remove retaining nut and disconnect stabilizer link from strut assembly. On models with Anti-Lock Brake System (ABS), remove retaining bolt and pull ABS speed sensor from axle carrier.

14) On all models, remove ball joint-to-axle carrier bolts. Separate ball joint with lower control arm from axle carrier. Remove suspension rod-to-axle carrier bolt/nut. Suspension rod is attached to rear of axle carrier. Separate suspension rod from axle carrier.

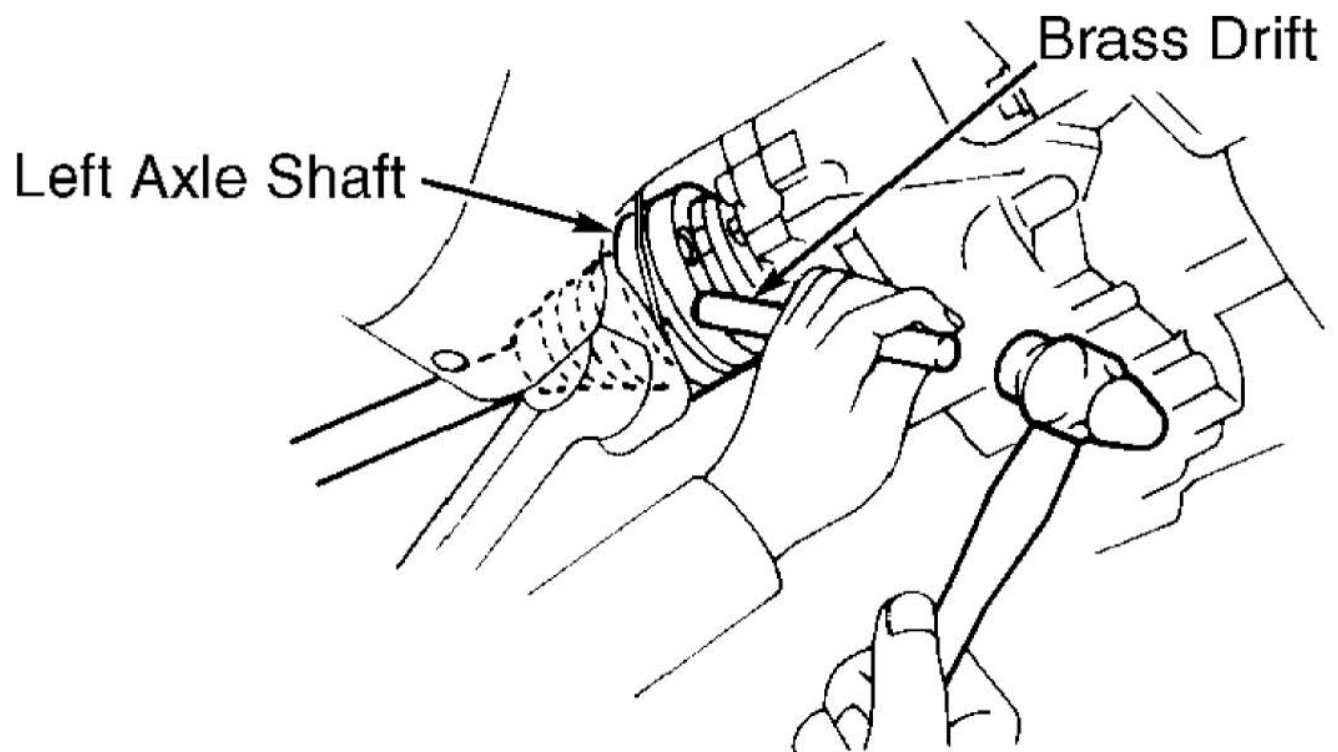
15) Both lower control arms must be removed. Remove strut rod-to-lower control arm retaining nut, retainers and insulators.

Remove lower control arm-to-body bolts/nuts. Remove lower control arms.

16) Wrap threads on end of axle shaft with tape. Cover axle shaft boot with shop towel. Using puller attached to hub assembly, press axle shaft from hub assembly.

17) To remove left (driver's side) axle shaft, use hammer and brass drift to drive axle shaft from transaxle. See Fig. 13. To remove right (passenger's side) axle shaft, remove snap ring and bearing retaining bolt from bearing bracket. See Fig. 14.

18) Remove right axle shaft assembly. Remove retaining bolts and bearing bracket (if necessary).



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Fig. 13: Removing Left Axle Shaft (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

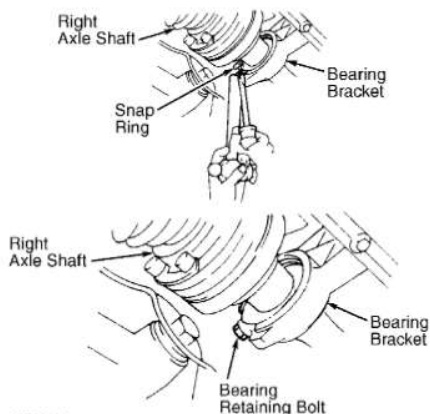


Fig. 14: Removing Right Axle Shaft (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

19) Support rear suspension crossmember with floor jack. Disconnect ABS sensor wiring from rear suspension crossmember. Remove retaining bolts and rear suspension crossmember.

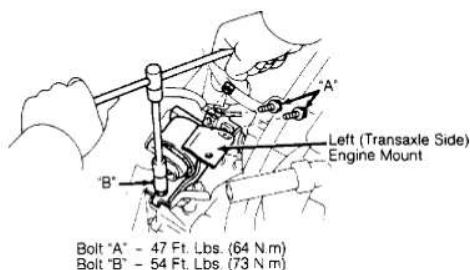
20) Remove through-bolt and retaining bolts from front (exhaust manifold side) engine mount. Remove clutch release cylinder from transaxle with hose attached and secure aside.

21) Support engine with hoist. Remove remaining engine mounts, support rods and through-bolts. Lower engine and transaxle through bottom of engine compartment.

Installation

1) Raise engine into position. Install right (timing belt side) engine mount to body with through-bolt loosely installed. Secure right (timing belt side) engine mount insulator to mounting bracket with nuts loosely installed.

2) Install left (transaxle side) engine mount to body with through-bolt loosely installed. Install left (transaxle side) engine mount insulator to mounting bracket and tighten bolts to specification. See Fig. 15.



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Fig. 15: Installing Left (Transaxle Side) Engine Mount Bolts (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

3) Tighten through-bolt on left (transaxle side) engine mount to specification. See TORQUE SPECIFICATIONS. Tighten right (timing belt side) engine mount insulator to mounting bracket nuts and then the through-bolt to specification. See TORQUE SPECIFICATIONS.

4) Install support brace on top of right (timing belt side) engine mount. Install and tighten bolts to specification. See TORQUE SPECIFICATIONS. Install support rod and support brace and on top of left (transaxle side) engine mount. Install and tighten bolts to specification. See TORQUE SPECIFICATIONS.

5) Install clutch release cylinder and front (exhaust manifold side) engine mount-to body bolts. Tighten bolts to specification. See TORQUE SPECIFICATIONS. Loosely install front (exhaust manifold side) engine mount through-bolt.

6) Install rear suspension crossmember. Tighten bolts to specification. See TORQUE SPECIFICATIONS. Install bearing bracket for right axle shaft (if removed). Install and tighten bearing bracket and support bracket bolts/nuts to specification. See TORQUE SPECIFICATIONS.

7) Coat lip of axle shaft oil seal with grease. Position snap ring on end of axle shaft, with opening facing downward. Install left axle shaft by lightly tapping axle shaft into transaxle. Ensure axle shaft fully engages transaxle.

8) Install right axle shaft. Install and tighten bearing retaining bolt to specification. See TORQUE SPECIFICATIONS. Install NEW snap ring in the bearing bracket.

9) Install lower control arms and strut rods. Install NEW nut on strut rod. DO NOT tighten lower control arm-to-body bolts/nuts and

strut rod nut at this time. Install and tighten ball joint-to-axle carrier bolts to specification. See TORQUE SPECIFICATIONS. Install suspension rod on axle carrier. DO NOT tighten bolt at this time.

10) Once all suspension components are installed, install and tighten rear (intake manifold side) engine mount bolts to specification. See TORQUE SPECIFICATIONS. Install and tighten front (exhaust manifold side) engine mount through-bolt to specification. See TORQUE SPECIFICATIONS.

11) Install stabilizer link on strut assembly. Tighten nut to specification. Install ABS speed sensor in axle carrier. Install and tighten retaining bolt to specification. See TORQUE SPECIFICATIONS.

12) Install brake rotor. Ensure reference mark is aligned with mark on hub assembly. Install brake caliper. Apply parking brake. Install and tighten axle shaft nut to specification. See TORQUE SPECIFICATIONS.

13) Install retainer and NEW cotter pin on axle shaft. Install rear wheels. Tighten lug nuts to specification. See TORQUE SPECIFICATIONS.

14) To install remaining components, reverse removal procedure. Lower vehicle and bounce it several times to stabilize suspension components. Tighten lower control arm-to-body bolts/nuts, strut rod-to-lower control arm nut and suspension rod bolt/nut to specification. See TORQUE SPECIFICATIONS.

15) Adjust all control cables and fluid levels. Fill and bleed cooling system. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION. Check rear wheel alignment.

CYLINDER HEAD & MANIFOLDS

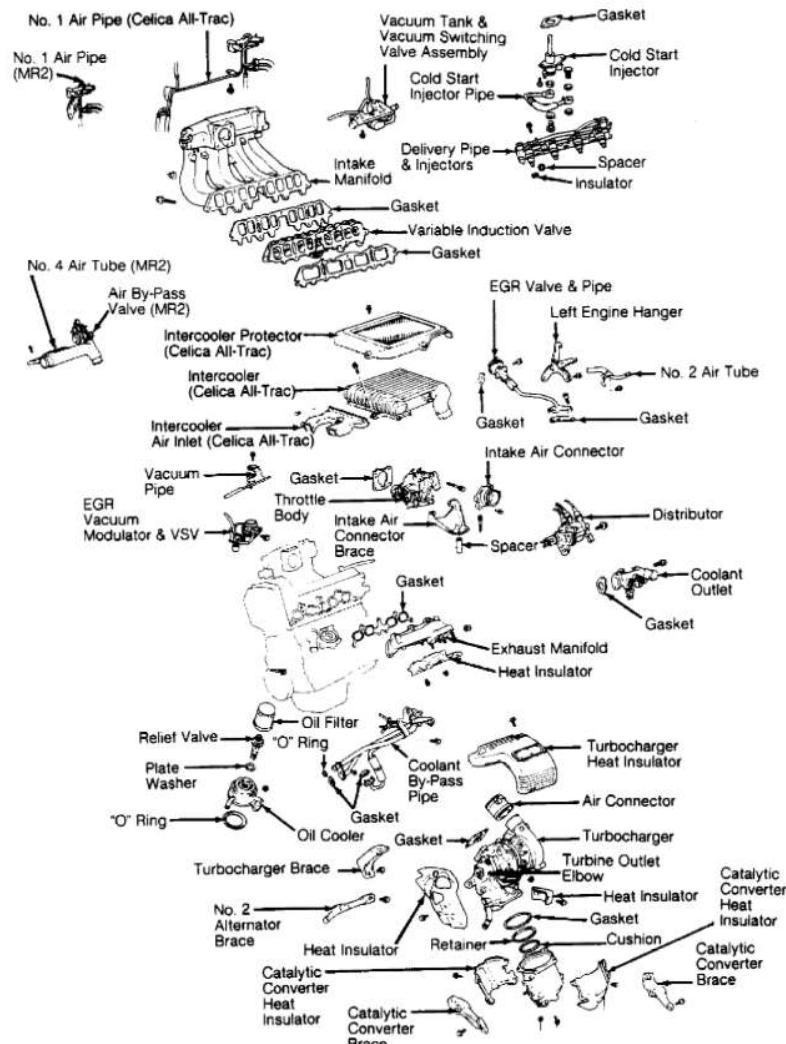
Removal (Celica All-Trac)

1) Disconnect negative battery cable. Release fuel pressure. See FUEL PRESSURE RELEASE under REMOVAL & INSTALLATION. Drain cooling system.

2) Disconnect accelerator cable at throttle body. Remove air intake duct, airflow meter and air cleaner cap as an assembly. Remove intercooler. See INTERCOOLER under REMOVAL & INSTALLATION.

3) Remove alternator. Raise and support vehicle. Remove lower engine cover. Remove suspension crossmember bolted to both lower suspension arms. Disconnect exhaust pipe at catalytic converter (located at bottom of turbocharger) and center pipe. Remove exhaust pipe.

4) Remove alternator mounting bracket and right engine hanger from cylinder head. Remove catalytic converter braces, catalytic converter, cushion, retainer and gasket. See Fig. 16.



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Fig. 16: Exploded View Of Intake & Exhaust Manifolds & Components
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

5) Remove turbocharger. See TURBOCHARGER under REMOVAL & INSTALLATION. Remove intake air connector and intake air connector brace from throttle body. See Fig. 16.

6) Disconnect electrical connectors and hoses from throttle body. Remove accelerator cable bracket. Remove throttle body retaining bolts.

7) Disconnect remaining hoses from throttle body. Remove throttle body. Note position of throttle body gasket for reassembly reference. Remove throttle body gasket.

8) Remove cold start injector pipe, cold start injector and gasket from bottom of intake manifold. See Fig. 16. Remove exhaust manifold and gasket.

9) Remove distributor and spark plug wires. Disconnect hoses from intake manifold and No. 1 air pipe. See Fig. 16. Remove No. 2 air tube, left engine hanger, EGR vacuum modulator and Vacuum Switching Valve (VSV). Remove EGR valve and pipe.

10) Remove vacuum pipe, coolant outlet and gasket. See Fig. 16. Remove oil cooler. See OIL COOLER under ENGINE OILING. Remove

coolant by-pass pipe and "O" ring from rear of water pump cover. See Fig. 16. Remove intake manifold braces, located between intake manifold and cylinder block.

11) Remove No. 1 air pipe, vacuum tank and vacuum switching valve assembly. See Fig. 16. Disconnect necessary hoses and electrical connections for access to intake manifold.

12) Remove retaining bolts/nuts, intake manifold, variable induction valve and gaskets. See Fig. 16. Remove charcoal canister.

13) Disconnect electrical connectors at injectors. Disconnect engine wiring harness from No. 2 (upper timing belt cover). Disconnect fuel inlet line at fuel filter. Disconnect vacuum hose and fuel return line at pressure regulator on delivery pipe.

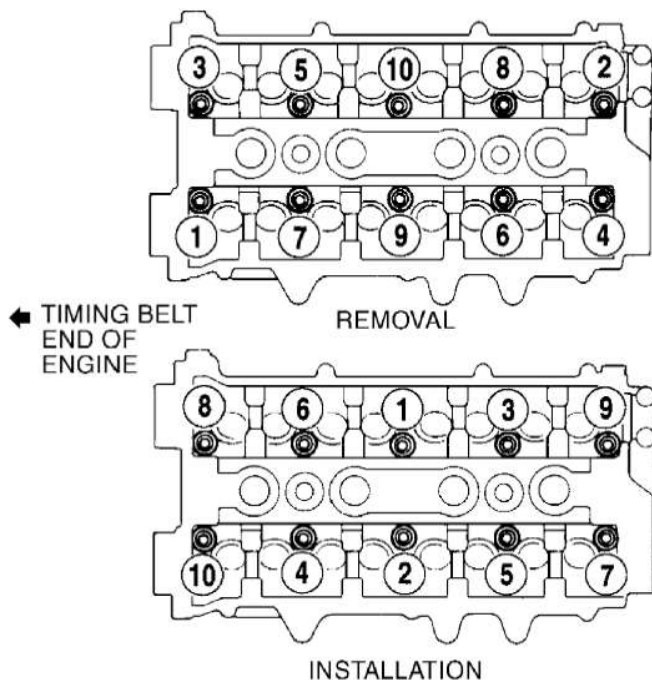
14) Remove retaining bolts, delivery pipe and injectors, spacers and insulators. See Fig. 16. Remove retaining bolts, seal washers, valve cover and gaskets.

15) Remove timing belt, camshaft sprockets and No. 1 idler pulley. See TIMING BELT under REMOVAL & INSTALLATION. Remove No. 3 timing belt cover from front of cylinder head. See Fig. 21. Remove camshafts. See CAMSHAFT under REMOVAL & INSTALLATION.

CAUTION: Cylinder head bolts must be loosened in proper sequence to prevent cylinder head warpage or cracking.

16) Using Cylinder Head Bolt Wrench (SST 09043-38100), loosen cylinder head bolts in proper sequence using several steps. See Fig. 17. Remove cylinder head bolts, washers, cylinder head and cylinder head gasket.

17) Note location of adjusting shims and valve lifters for reassembly reference. Remove adjusting shims and valve lifters from cylinder head (if necessary).



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Fig. 17: Cylinder Head Bolt Removal & Installation Sequence
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Inspection

- 1) Inspect cylinder head warpage at cylinder block, exhaust

manifold and variable induction valve surfaces. Replace cylinder head if warpage exceeds specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

2) Inspect cylinder block deck for warpage. Replace cylinder block if deck warpage exceeds specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

3) Inspect intake manifold, exhaust manifold and variable induction valve machined surfaces for warpage. Replace component if warpage exceeds .0079" (.200 mm).

4) Apply 15.75 in. Hg of vacuum to variable induction control valve, located at center of variable induction valve. Ensure valves fully close. Release vacuum. Ensure valves fully open quickly. Replace variable induction valve assembly if it does not function as described.

5) Inspect camshaft and components. See CAMSHAFT under REMOVAL & INSTALLATION. Measure valve lifter diameter and bore diameter. Ensure oil clearance is within specification. Replace components if not within specification. See VALVE LIFTERS table under ENGINE SPECIFICATIONS.

Installation

1) Install adjusting shims and valve lifters in original location on cylinder head (if removed). Install NEW cylinder head gasket on cylinder block. Ensure all holes in cylinder head gasket align with holes in cylinder block.

2) Install cylinder head. Apply engine oil on cylinder head bolt threads and cylinder head bolt-to-cylinder head contact surfaces. Install and tighten cylinder head bolts to specification in sequence. See Fig. 17. See TORQUE SPECIFICATIONS. Install camshafts using proper procedure. See CAMSHAFT under REMOVAL & INSTALLATION.

3) Install No. 3 timing belt cover. Install and tighten bolts to specification. See TORQUE SPECIFICATIONS.

4) To install remaining components, reverse removal procedure using NEW gaskets, "O" rings and insulators. If camshaft or cylinder head components are serviced, adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS.

5) Before installing valve cover and gasket, apply sealant at front and rear areas of cylinder head. See Fig. 2.

6) Install gasket, valve cover and seal washers. Install and tighten retaining bolts to specification. See TORQUE SPECIFICATIONS.

7) If installing injector in delivery pipe, replace "O" rings and insulator on injector. Coat "O" rings with gasoline. Install "O" rings on and insulator on bottom of injector.

8) Install injectors in delivery pipe so electrical connectors are facing pressure regulator side of delivery pipe. Install insulator on top of injector. Install injector cover on delivery pipe. Install and tighten injector cover bolts to specification. See TORQUE SPECIFICATIONS.

9) Use insulator on bottom of injector when installing injectors and delivery pipe. Install throttle body gasket with protruding area toward top of throttle body (opposite coolant line connections). Install throttle body with 2 longer bolts in lower throttle body mount holes.

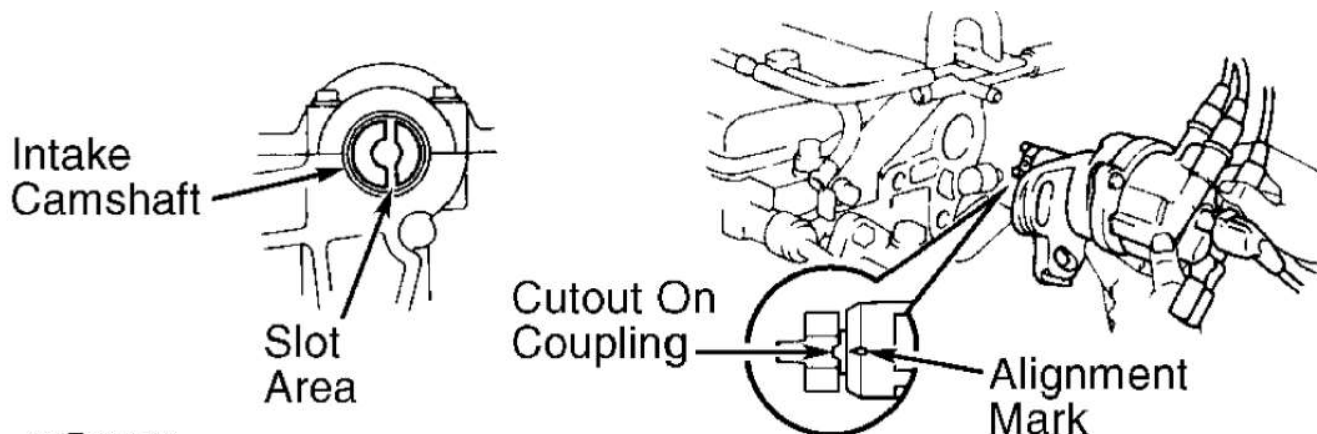
10) Coat coolant by-pass pipe "O" ring with soapy water before installing. Coat distributor "O" ring with engine oil. When installing distributor, rotate crankshaft clockwise so cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing belt end of engine.

11) Ensure timing mark on crankshaft pulley aligns with "0" mark on timing belt cover. Ensure slot area of intake camshaft is positioned vertically.

12) Position cutout on coupling with alignment mark on distributor housing. See Fig. 18. Install distributor so center of

flange is aligned with bolt hole on cylinder head. Install distributor hold-down bolts.

13) Use NEW gasket when installing catalytic converter. To install remaining components, reverse removal procedure. Tighten all fasteners to specification. Adjust control cables and ignition timing. Fill cooling system.



92F01115

Fig. 18: Installing Distributor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Removal (MR2)

1) Disconnect negative battery cable. Release fuel pressure. See FUEL PRESSURE RELEASE under REMOVAL & INSTALLATION. Drain cooling system.

2) Remove hood, hood side panels and lower engine covers. Remove strut tower-to-firewall braces. Remove air cleaner cap and airflow meter as an assembly. Remove air cleaner case.

3) Remove No. 1 and 2 air intake connectors to intercooler. See Fig. 30. Remove cruise control actuator. Disconnect accelerator cable at throttle body. Remove right engine hanger from front of cylinder head. Remove engine compartment cooling fan assembly, located in passenger's side of engine compartment, near the intercooler.

4) Remove drive belt and idler pulley bracket. Remove A/C compressor with hoses attached and secure aside. Remove intercooler. See INTERCOOLER under REMOVAL & INSTALLATION.

5) Raise and support vehicle. Remove tailpipe and muffler assembly. Disconnect exhaust pipe and gasket from catalytic converter. Remove exhaust by rotating exhaust pipe between rear suspension crossmember and the body.

6) Remove through-bolt and retaining bolts from front (exhaust manifold side) engine mount. Remove clutch release cylinder from transaxle with hose attached and secure aside.

7) Remove catalytic converter braces, catalytic converter, cushion, retainer and gasket. See Fig. 16. Remove turbocharger. See TURBOCHARGER under REMOVAL & INSTALLATION.

8) Remove intake air connector and intake air connector brace from throttle body. See Fig. 16. Disconnect electrical connectors and vacuum hoses from throttle body. Remove throttle body retaining bolts.

9) Disconnect remaining hoses from throttle body. Remove throttle body. Note position of throttle body gasket for reassembly reference. Remove throttle body gasket.

10) Remove cold start injector pipe, cold start injector and gasket from bottom of intake manifold. See Fig. 16. Remove exhaust manifold and gasket.

11) Remove distributor and spark plug wires. Remove No. 2 air tube, left engine hanger, EGR vacuum modulator and Vacuum Switching

Valve (VSV). Remove EGR valve and pipe.

12) Remove vacuum pipe, coolant outlet and gasket. See Fig. 16. Remove oil cooler. See OIL COOLER under ENGINE OILING. Remove coolant by-pass pipe and "O" ring from rear of water pump cover. See Fig. 16. Remove intake manifold braces, located between intake manifold and cylinder block.

13) Remove No. 1 air pipe, vacuum tank and vacuum switching valve assembly. See Fig. 16. Disconnect necessary hoses and electrical connections for access to intake manifold.

14) Remove retaining bolts/nuts, intake manifold, variable induction valve and gaskets. See Fig. 16. Disconnect electrical connectors at injectors. Disconnect engine wiring harness from No. 2 (upper timing belt cover).

15) Disconnect vacuum hoses and fuel lines at delivery pipe. Remove retaining bolts, delivery pipe and injectors, spacers and insulators. See Fig. 16. Remove retaining bolts, seal washers, valve cover and gaskets.

16) Remove timing belt, camshaft sprockets and No. 1 idler pulley. See TIMING BELT under REMOVAL & INSTALLATION. Remove No. 3 timing belt cover from front of cylinder head. See Fig. 21. Remove camshafts. See CAMSHAFT under REMOVAL & INSTALLATION.

CAUTION: Cylinder head bolts must be loosened in proper sequence to prevent cylinder head warpage or cracking.

17) Using Cylinder Head Bolt Wrench (SST 09043-38100), loosen cylinder head bolts in proper sequence using several steps. See Fig. 17. Remove cylinder head bolts, washers, cylinder head and cylinder head gasket.

18) Note location of adjusting shims and valve lifters for reassembly reference. Remove adjusting shims and valve lifters from cylinder head (if necessary).

Inspection

1) Inspect cylinder head warpage at cylinder block, exhaust manifold and variable induction valve areas. Replace cylinder head if warpage exceeds specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

2) Inspect cylinder block deck for warpage. Replace cylinder block if deck warpage exceeds specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

3) Inspect intake manifold, exhaust manifold and variable induction valve machined surfaces for warpage. Replace component if warpage exceeds .0079" (.200 mm).

4) Apply 15.75 in. Hg of vacuum to variable induction control valve, located at center of variable induction valve. Ensure valves fully close. Release vacuum. Ensure valves fully open quickly. Replace variable induction valve assembly if it does not function as described.

5) Inspect camshaft and components. See CAMSHAFT under REMOVAL & INSTALLATION. Measure valve lifter diameter and bore diameter. Ensure oil clearance is within specification. Replace components if not within specification. See VALVE LIFTERS table under ENGINE SPECIFICATIONS.

Installation

1) Install adjusting shims and valve lifters in original location on cylinder head (if removed). Install NEW cylinder head gasket on cylinder block. Ensure all holes in cylinder head gasket align with holes in cylinder block.

2) Install cylinder head. Apply engine oil on cylinder head bolt threads and cylinder head bolt-to-cylinder head contact surfaces. Install and tighten cylinder head bolts to specification in sequence.

See Fig. 17. See TORQUE SPECIFICATIONS.

3) Install camshafts using proper procedure. See CAMSHAFT under REMOVAL & INSTALLATION. Install No. 3 timing belt cover. Install and tighten bolt to specification. See TORQUE SPECIFICATIONS.

4) To install remaining components, reverse removal procedure using NEW gaskets and "O" rings. If camshaft or cylinder head components are serviced, adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS.

5) Before installing valve cover and gasket, apply sealant at front and rear areas of cylinder head. See Fig. 2.

6) Install gasket, valve cover and seal washers. Install and tighten retaining bolts to specification. See TORQUE SPECIFICATIONS.

7) If installing injector in delivery pipe, replace "O" rings and insulator on injector. Coat "O" rings with gasoline. Install "O" rings on and insulator on bottom of injector.

8) Install injectors in delivery pipe so electrical connectors are facing pressure regulator side of delivery pipe. Install insulator on top of injector. Install injector cover on delivery pipe. Install and tighten injector cover bolts to specification. See TORQUE SPECIFICATIONS.

9) Use NEW insulator on bottom of injector when installing injectors and delivery pipe. Install NEW throttle body gasket with protruding area toward top of throttle body (opposite coolant line connections). Install throttle body with 2 longer bolts in lower throttle body mount holes.

10) Coat coolant by-pass pipe "O" ring with soapy water before installing. Coat distributor "O" ring with engine oil. When installing distributor, rotate crankshaft clockwise so cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing belt end of engine.

11) Ensure timing mark on crankshaft pulley aligns with "0" mark on timing belt cover. Ensure slot area of intake camshaft is positioned vertically.

12) Position cutout on coupling with alignment mark on distributor housing. See Fig. 18. Install distributor so center of flange is aligned with bolt hole on cylinder head. Install distributor hold-down bolts.

13) Use NEW gasket when installing catalytic converter. To install remaining components, reverse removal procedure. Tighten all fasteners to specification. Adjust control cables and ignition timing. Fill and bleed cooling system. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.

TURBOCHARGER

Removal (Celica All-Trac)

1) Disconnect negative battery cable. Drain cooling system. Remove air intake duct, airflow meter and air cleaner cap as an assembly.

2) Raise and support vehicle. Remove lower engine covers. Remove suspension crossmember bolted to both lower suspension arms. Disconnect exhaust pipe at catalytic converter (located at bottom of turbocharger) and center pipe. Remove exhaust pipe.

3) Support engine with hoist. Remove engine mount crossmember located below engine. Remove front (radiator side) engine mount and bracket. Remove clutch release cylinder with hose attached and secure aside.

4) Remove accessory drive belt, alternator and idler pulley bracket. Remove A/C compressor with hoses attached and secure aside. Remove catalytic converter braces, catalytic converter, cushion, retainer and gasket. See Fig. 16.

5) Remove intercooler. See INTERCOOLER under REMOVAL & INSTALLATION. Remove turbocharger heat insulator. See Fig. 16.

Disconnect electrical connector at oxygen sensor located on turbine outlet elbow on turbocharger.

6) Remove retaining nuts, oxygen sensor and gasket from turbine outlet elbow on turbocharger. Remove heat insulators from turbine outlet elbow on turbocharger. See Fig. 16.

7) Disconnect necessary coolant and vacuum hoses from turbocharger. Disconnect oil hose for turbocharger from oil pan. Remove turbocharger brace. See Fig. 16.

8) Remove turbocharger oil pipe-to-cylinder block union bolt and gaskets. Remove turbocharger oil pipe support bracket-to-cylinder bolt. Remove retaining nuts, turbocharger and gasket.

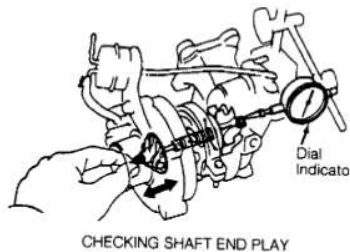
9) Remove turbocharger oil pipe, turbocharger coolant pipe, turbocharger bearing side plate, turbine outlet elbow and gaskets from turbocharger (if necessary).

Inspection

1) Ensure impeller wheel and shaft rotates smoothly. Replace turbocharger if impeller wheel and shaft fail to rotate smoothly. Using dial indicator, check shaft end play. See Fig. 19. Replace turbocharger if shaft end play exceeds .0051" (.130 mm).

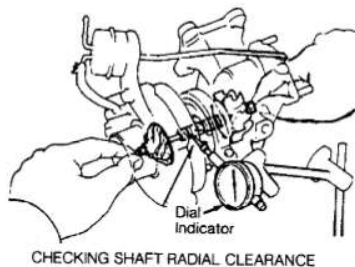
2) Place tip of dial indicator through oil return hole. Tip of dial indicator must be positioned through opening in bearing and on the shaft.

3) Move shaft toward turbocharger mounting flange and then toward outside of turbocharger, noting the shaft radial clearance. See Fig. 19. Replace turbocharger if shaft radial clearance exceeds .0071" (.180 mm).



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Fig. 19: Checking Turbocharger Shaft End Play
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93H83624

Fig. 20: Checking Turbocharger Radial Clearance
Courtesy of Toyota Motor Sales, U.S.A., Inc.

CAUTION: When installing turbocharger, pour about 20 cc of engine oil in turbocharger oil supply pipe opening while rotating impeller wheel and shaft.

Installation

1) Using NEW gaskets, install turbocharger oil pipe, turbocharger coolant pipe, turbocharger bearing side plate and turbine outlet elbow (if removed). Tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS.

2) Pour about 20 cc of engine oil in turbocharger oil supply pipe opening while rotating impeller wheel and shaft. Using NEW gasket, install turbocharger, oil pipe and turbocharger brace with all fasteners loosely installed. Tighten all turbocharger fasteners using the following sequence.

3) Tighten turbocharger-to-exhaust manifold nuts to specification. See TORQUE SPECIFICATIONS. Tighten turbocharger oil pipe-to-turbocharger nuts to specification. See TORQUE SPECIFICATIONS.

4) Tighten turbocharger oil pipe-to-cylinder block union bolt to specification. Tighten turbocharger oil pipe support bracket-to-cylinder block bolt to specification. See TORQUE SPECIFICATIONS.

5) Tighten turbocharger brace bolts to specification. See TORQUE SPECIFICATIONS. To install remaining components, reverse removal procedure. Tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS. Use NEW gasket when installing catalytic converter. Fill cooling system.

Removal (MR2)

1) Disconnect negative battery cable. Drain cooling system. Remove hood, hood side panels and lower engine covers. Remove strut tower-to-firewall braces. Remove No. 1 and 2 air intake connectors to intercooler. See Fig. 30.

2) Remove cruise control accelerator linkage (if equipped). Remove engine compartment cooling fan assembly, located in passenger's side of engine compartment, near the intercooler.

3) Remove drive belt and idler pulley bracket. Remove A/C compressor with hoses attached and secure aside. Raise and support vehicle. Remove tailpipe and muffler assembly.

4) Disconnect exhaust pipe and gasket from catalytic converter. Remove exhaust by rotating exhaust pipe between rear suspension crossmember and the body. Remove air intake hose between air cleaner and mass airflow sensor.

5) Remove through-bolt and retaining bolts from front (exhaust manifold side) engine mount. Remove clutch release cylinder from transaxle with hose attached and secure aside.

6) Remove catalytic converter braces, catalytic converter, cushion, retainer and gasket. See Fig. 16. Remove air by-pass valve and "O" ring from No. 4 air tube. See Fig. 16.

7) Remove No. 4 air tube. See Fig. 16. Remove right engine hanger from front of cylinder head. Remove turbocharger heat insulator. See Fig. 16.

8) Disconnect electrical connector at oxygen sensor located on turbine outlet elbow on turbocharger. Remove retaining nuts, oxygen sensor and gasket from turbine outlet elbow on turbocharger. Remove heat insulators from turbine outlet elbow on turbocharger. See Fig. 16.

9) Disconnect necessary coolant and vacuum hoses from turbocharger. Disconnect oil hose for turbocharger from oil pan. Remove turbocharger brace. See Fig. 16.

10) Remove turbocharger oil pipe-to-cylinder block union bolt and gaskets. Remove turbocharger oil pipe support bracket-to-cylinder bolt. Remove retaining nuts, turbocharger and gasket.

11) Remove turbocharger oil pipe, turbocharger coolant pipe, turbocharger bearing side plate, turbine outlet elbow and gaskets from turbocharger (if necessary).

Inspection

1) Ensure impeller wheel and shaft rotates smoothly. Replace turbocharger if impeller wheel and shaft fail to rotate smoothly.

Using dial indicator, check shaft end play. See Fig. 19. Replace turbocharger if shaft end play exceeds .0051" (.130 mm).

2) Place tip of dial indicator through oil return hole. Tip of dial indicator must be positioned through opening in bearing and on the shaft.

3) Move shaft toward turbocharger mounting flange and then toward outside of turbocharger, noting the shaft radial clearance. See Fig. 19. Replace turbocharger if shaft radial clearance exceeds .0071" (.180 mm).

CAUTION: When installing turbocharger, pour about 20 cc of engine oil in turbocharger oil supply pipe opening while rotating impeller wheel and shaft.

Installation

1) Using NEW gaskets, install turbocharger oil pipe, turbocharger coolant pipe, turbocharger bearing side plate and turbine outlet elbow (if removed). Tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS.

2) Pour about 20 cc of engine oil in turbocharger oil supply pipe opening while rotating impeller wheel and shaft. Using NEW gasket, install turbocharger, oil pipe and turbocharger brace with all fasteners loosely installed. Tighten all turbocharger fasteners using the following sequence.

3) Tighten turbocharger-to-exhaust manifold nuts to specification. See TORQUE SPECIFICATIONS. Tighten turbocharger oil pipe-to-turbocharger nuts to specification. See TORQUE SPECIFICATIONS.

4) Tighten turbocharger oil pipe-to-cylinder block union bolt to specification. Tighten turbocharger oil pipe support bracket-to-cylinder block bolt to specification. See TORQUE SPECIFICATIONS.

5) Tighten turbocharger brace bolts to specification. See TORQUE SPECIFICATIONS. To install remaining components, reverse removal procedure. Tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS.

6) Install NEW "O" ring on air by-pass valve. Coat "O" ring with soapy water solution before installing air by-pass valve. Use NEW gasket when installing catalytic converter. Fill and bleed cooling system. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.

CRANKSHAFT FRONT SEAL

Removal & Installation (Oil Pump Installed)

1) Remove timing belt and crankshaft sprocket. See TIMING BELT under REMOVAL & INSTALLATION. Using a knife, cut off lip of seal. Pry seal from oil pump housing. Use care not to damage sealing surfaces.

2) To install, apply grease to lip of NEW seal. Using hammer and Seal Installer (SST 09226-10010), install seal until seal outer surface is even with oil pump housing. To install remaining components, reverse removal procedure.

Removal & Installation (Oil Pump Removed)

Using hammer and drift, remove seal from oil pump housing. To install, use hammer and Seal Installer (09226-10010) to install NEW seal. Install seal until seal surface is even with oil pump housing. Apply grease lip of seal.

TIMING BELT

Removal

1) Disconnect negative battery cable. Drain cooling system. Raise and support vehicle. On Celica All-Trac, remove right front wheel, right lower engine cover and alternator.

2) On MR2, remove right rear wheel, right hood side panel and lower engine covers. Remove strut tower-to-firewall braces. Remove cruise control actuator and linkages. Remove engine compartment cooling fan assembly, located in passenger's side of engine compartment, near the intercooler.

3) On all models, remove intercooler. See INTERCOOLER under REMOVAL & INSTALLATION. Remove EGR valve modulator and Vacuum Switching Valve (VSV). Remove EGR valve and pipe. See Fig. 16.

4) Disconnect control cables, electrical connections, vacuum hoses and coolant hoses from throttle body. Remove intake air connector and intake air connector brace from throttle body. See Fig. 16. Remove accelerator cable bracket (if necessary).

5) Remove throttle body and gasket. Remove retaining bolts, seal washers, valve cover and gaskets. Remove spark plugs. Remove accessory drive belts. Slightly raise engine to remove engine weight from right (timing belt side) engine mount.

6) Remove right (timing belt side) engine mount support brace. Remove right (timing belt side) engine mount. Remove right (timing belt side) engine mount bracket from front of engine.

7) Remove retaining bolts, No. 2 timing belt cover and gasket. See Fig. 21. Rotate crankshaft clockwise so cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing belt end of engine.

8) Ensure timing mark on crankshaft pulley aligns with "0" mark on timing belt cover. Ensure timing marks on camshaft sprockets align with timing marks on No. 3 timing belt cover. See Fig. 22. If timing marks are not aligned, rotate crankshaft one complete revolution (360 degrees).

9) If reusing timing belt, mark direction of timing belt rotation and location on camshaft sprockets for reassembly reference. Also place reference mark on timing belt at upper edge of No. 1 timing belt cover.

10) Remove retaining bolts and timing belt tensioner. See Fig. 21. Remove timing belt from camshaft sprockets. Using Pulley Holder (SST 09213-54015) and Handle (SST 09330-00021), hold crankshaft pulley. Remove crankshaft pulley retaining bolt.

11) If reusing timing belt, ensure reference mark placed on timing belt aligns with upper edge of No. 1 timing belt cover when timing mark on crankshaft pulley is aligned with "0" mark on No. 1 timing belt cover.

12) Using puller, remove crankshaft pulley. Remove No. 1 timing belt cover and gasket. See Fig. 21. Note direction of timing belt guide installation for reassembly reference. See Fig. 21. Remove timing belt guide.

13) If reusing timing belt, mark direction of timing belt rotation and place reference marks on timing belt and crankshaft sprocket for reassembly reference. Remove timing belt.

14) Remove No. 1 and 2 idler pulleys (if necessary). If removing camshaft sprocket, hold hexagonal area at front of camshaft with wrench. Remove retaining bolt and camshaft sprocket.

15) If removing crankshaft sprocket, place shop towels against oil pump housing. Using 2 screwdrivers, pry crankshaft sprocket from crankshaft.

16) If removing oil pump sprocket, hold oil pump sprocket by installing Sprocket Holder (SST 09616-30011) in holes on front of oil pump sprocket. Remove oil pump sprocket retaining nut. Remove sprocket holder and oil pump sprocket.

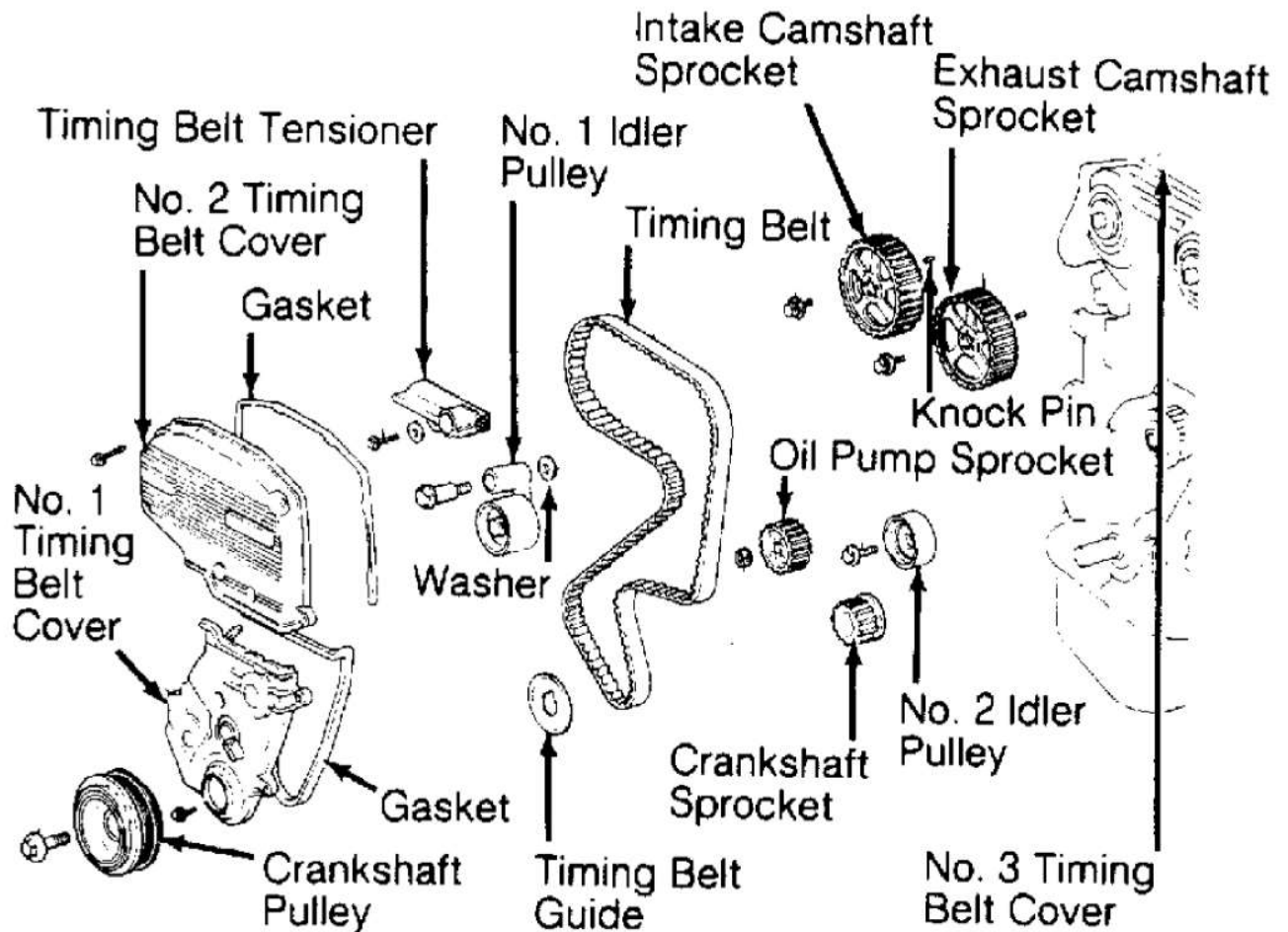
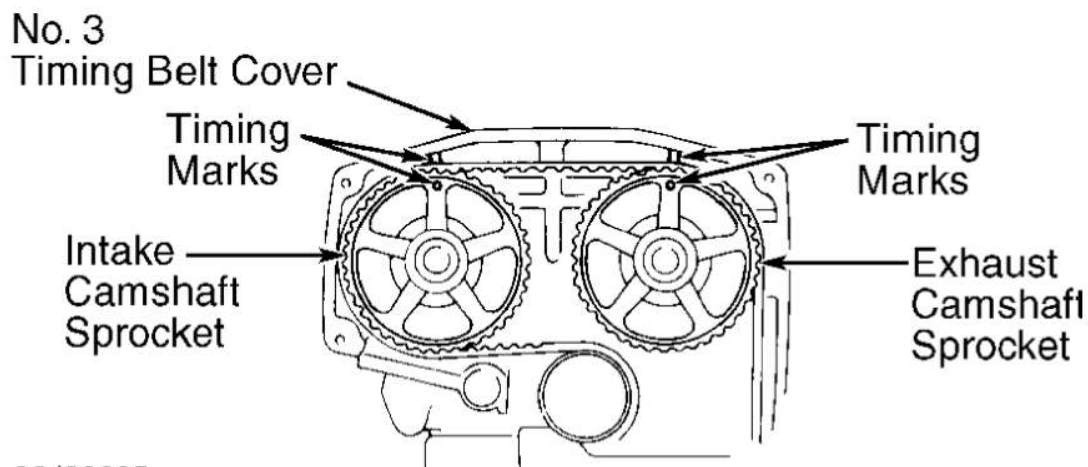


Fig. 21: Exploded View Of Timing Belt & Components
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



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 Fig. 22: Aligning Timing Marks
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

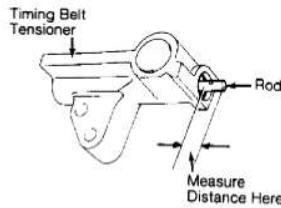
Inspection

- 1) Inspect timing belt for damaged teeth, cracks or oil

contamination. Ensure idler pulleys rotate freely. Replace damaged components.

2) Inspect timing belt tensioner for signs of oil leakage. Replace timing belt tensioner if oil leakage exists. Hold timing belt tensioner body. Press rod against solid surface. Replace timing belt tensioner if rod moves.

3) Measure timing belt tensioner rod protrusion from end of rod to edge of housing on timing belt tensioner. See Fig. 23. Replace timing belt tensioner if distance is not .335-.374" (8.50-9.50 mm).



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Fig. 23: Measuring Timing Belt Tensioner Rod Protrusion
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Installation

1) If installing oil pump sprocket, align cutouts of oil pump sprocket and shaft on drive rotor of oil pump. Install oil pump sprocket. Install and tighten retaining nut to specification. See TORQUE SPECIFICATIONS.

2) If installing crankshaft sprocket, align crankshaft sprocket with key in crankshaft. Install crankshaft sprocket with flange toward the cylinder block.

3) Install No. 2 idler pulley (if removed). Install and tighten retaining bolt to specification. See TORQUE SPECIFICATIONS.

4) Install No. 1 idler pulley and washer (if removed). Apply Loctite to No. 1 idler pulley bolt. Install and tighten retaining bolt to specification. See TORQUE SPECIFICATIONS. Ensure No. 1 and 2 idler pulleys are clean and rotate smoothly.

5) Rotate crankshaft so keyway of crankshaft is at 12 o'clock position. Install timing belt on crankshaft sprocket, oil pump sprocket, No. 2 idler pulley, water pump sprocket and then No. 1 idler pulley.

CAUTION: If reusing timing belt, ensure reference marks are aligned on crankshaft sprocket and timing belt is installed in original direction of rotation.

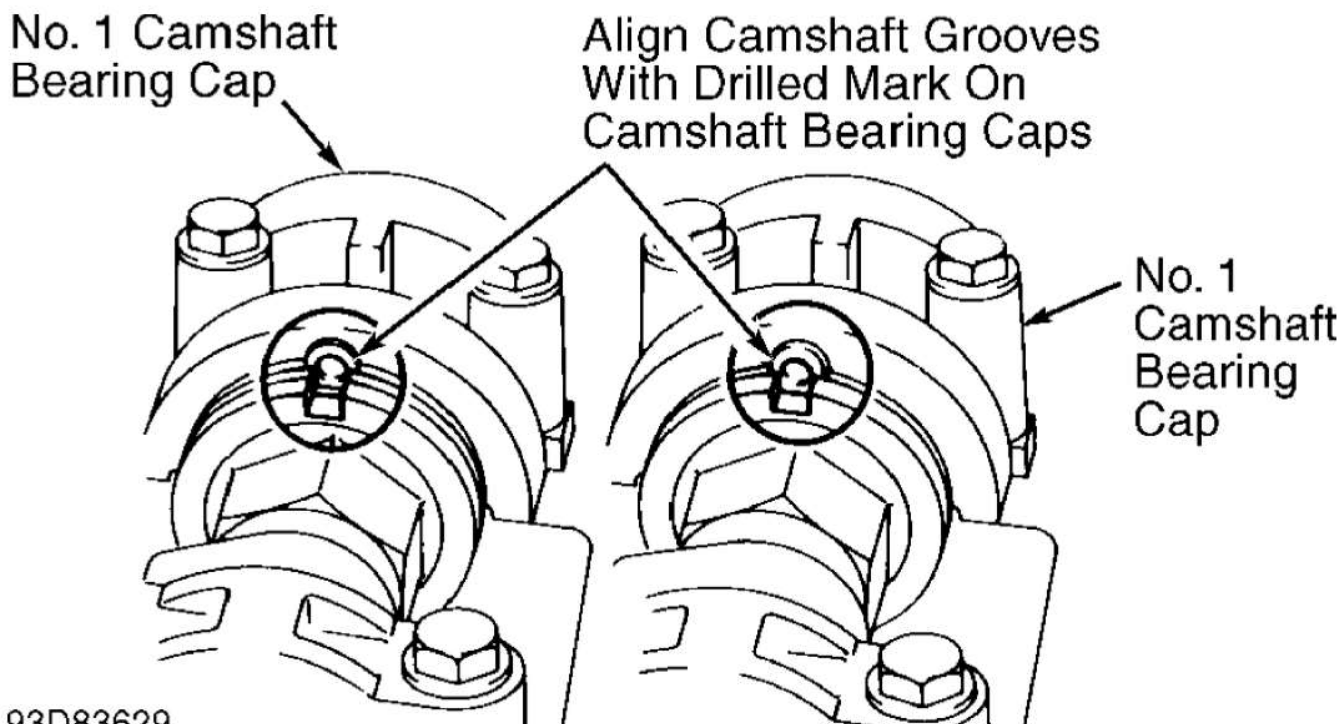
6) Install timing belt guide with cupped side away from crankshaft sprocket (flat side against timing belt). Install No. 1 timing belt cover and gasket.

7) Align crankshaft pulley groove with key in crankshaft. Install crankshaft pulley. Install and tighten retaining bolt to specification. See TORQUE SPECIFICATIONS.

8) Rotate camshafts so camshaft grooves align with drilled mark on No. 1 camshaft bearing cap. See Fig. 24. If installing camshaft sprockets, install camshaft sprockets on camshafts with "S" mark facing outward, away from top of cylinder head.

NOTE: The "S" mark is located on camshaft sprocket, near center hub of camshaft sprocket.

9) Align knock pin holes. Install knock pin. See Fig. 21. Install and tighten camshaft sprocket retaining bolt to specification. See TORQUE SPECIFICATIONS.



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Fig. 24: Aligning Camshafts

Courtesy of Toyota Motor Sales, U.S.A., Inc.

10) Rotate crankshaft pulley so timing mark on crankshaft pulley aligns with "0" mark on No. 1 timing belt cover. Rotate camshafts so timing mark on camshaft sprocket is aligned with timing mark on No. 3 timing belt cover. See Fig. 22.

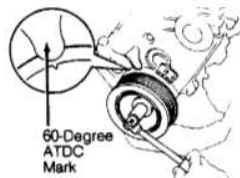
11) Install timing belt on camshaft sprockets. If reusing timing belt, ensure reference marks are aligned on camshaft sprockets and upper edge of No. 1 timing belt cover.

12) Using press, press rod back into timing belt tensioner housing until hole in rod aligns with holes of timing belt tensioner housing. Install a .050" (1.27 mm) Allen wrench through holes of timing belt tensioner housing and rod. Remove timing belt tensioner from press.

13) Place torque wrench on bolt located at center of No. 1 idler pulley. DO NOT use No. 1 idler pulley-to-cylinder block bolt. Torque wrench must be installed on bolt located at center of No. 1 idler pulley with handle near camshaft sprocket to obtain correct torque reading.

14) Rotate bolt and No. 1 idler pulley counterclockwise (viewed from front of engine) to obtain torque reading of 13 ft. lbs. (18 N.m). Install timing belt tensioner with retaining bolts temporarily tightened.

15) Rotate crankshaft clockwise 5 to 6 revolutions and align crankshaft pulley timing mark with 60-degree ATDC timing mark on No. 1 timing belt cover. See Fig. 25. DO NOT rotate crankshaft counterclockwise.



93G83630

Fig. 25: Aligning 60-Degree ATDC Timing Mark
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

16) Install a .075" (1.90 mm) feeler gauge between timing belt tensioner and No. 1 idler pulley stopper. See Fig. 26. Place torque wrench on bolt located at center of No. 1 idler pulley. DO NOT use No. 1 idler pulley-to-cylinder block bolt.

17) Rotate bolt and No. 1 idler pulley counterclockwise again to obtain torque reading of 13 ft. lbs. (18 N.m). Push timing belt tensioner inward, toward timing belt. Tighten timing belt tensioner retaining bolts to specification. See TORQUE SPECIFICATIONS.

18) Remove .050" (1.27 mm) Allen wrench from timing belt tensioner. Rotate crankshaft clockwise one complete revolution (360 degrees) so timing mark aligns with 60-degree ATDC mark.

19) Using feeler gauge, recheck clearance between the No. 1 idler pulley stopper and timing belt tensioner. If clearance is not .071-.087" (1.80-2.20 mm), remove timing belt tensioner and reinstall.

20) Rotate crankshaft clockwise so No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing belt end of engine. Ensure timing mark on crankshaft pulley aligns with "0" mark on timing belt cover.

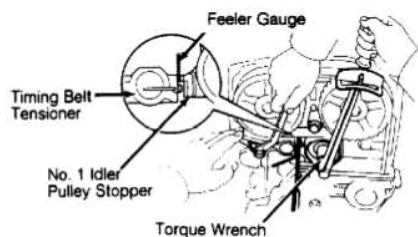
21) Ensure timing marks on camshaft sprockets align with timing marks on No. 3 timing belt cover. See Fig. 22. If timing marks are not aligned, remove timing belt and reinstall.

22) To install remaining components, reverse removal procedure. Before installing valve cover and gasket, apply sealant at front and rear areas of cylinder head. See Fig. 2.

23) Using NEW gasket, install valve cover. Install seal washers. Install and tighten retaining bolts to specification. See TORQUE SPECIFICATIONS.

24) Install NEW throttle body gasket with protruding area on gasket toward top of throttle body (opposite coolant line connections). Note that the 2 longer throttle body bolts are used in lower throttle body mounting holes. Fill cooling system. On MR2 cooling system must be bled. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.

CAUTION: On MR2, ensure cooling system is bled to prevent engine damage. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.



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Fig. 26: Determining Timing Belt Tensioner Clearance
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

VALVE LIFTER

Removal

Remove camshaft. See CAMSHAFT under REMOVAL & INSTALLATION. Note location of adjusting shims and valve lifters for reassembly reference. Remove adjusting shims and valve lifters from cylinder head.

Inspection

Inspect components for damage. Measure valve lifter diameter and bore diameter. Ensure oil clearance is within specification. Replace components if not within specification. See VALVE LIFTERS table under ENGINE SPECIFICATIONS.

Installation

To install, reverse removal procedure. Ensure components are installed in original locations. If camshaft, adjusting shims or valve lifters are replaced, check valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS.

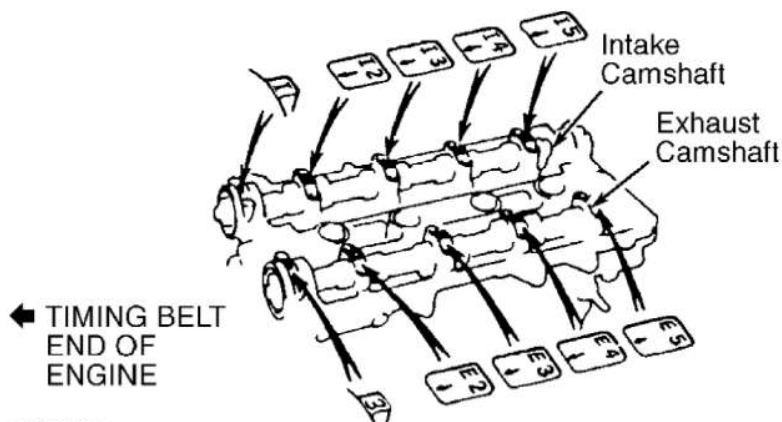
CAMSHAFT

Removal

1) Remove timing belt and camshaft sprockets. See TIMING BELT under REMOVAL & INSTALLATION. Remove No. 3 timing belt cover. See Fig. 21. If removing intake camshaft, remove distributor.

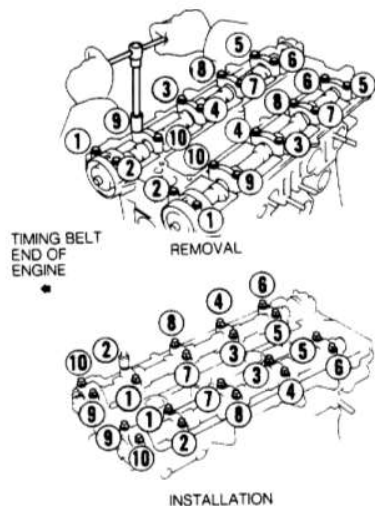
NOTE: Camshaft bearing caps are numbered for location with No. 1 at timing belt end and No. 5 at flywheel end of engine. Top of camshaft bearing cap is marked with "I" for intake camshaft or "E" for exhaust camshaft. Arrow on camshaft bearing cap must point toward timing belt end of engine. See Fig. 27.

2) Loosen camshaft bearing cap bolts in sequence using several steps. See Fig. 28. Remove camshaft bearing caps, camshafts and oil camshaft seals. Note location of adjusting shims and valve lifters for reassembly reference. Remove adjusting shims and valve lifters from cylinder head (if necessary).



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Fig. 27: Identifying Camshaft Bearing Cap Locations
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93J83633

Fig. 28: Camshaft Bearing Cap Bolt Removal & Installation Sequence
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Inspection

- 1) Inspect components for damage. Check camshaft journal diameter, lobe height and runout. Replace camshaft if not within specification. See CAMSHAFT table under ENGINE SPECIFICATIONS article.
- 2) Install camshaft in cylinder head. Using Plastigage, check camshaft oil clearance with camshaft bearing cap bolts tightened to specification in sequence. See Fig. 28. See TORQUE SPECIFICATIONS.
- 3) Replace camshaft and/or cylinder head if oil clearance is not within specification. See CAMSHAFT table under ENGINE SPECIFICATIONS.
- 4) Check camshaft end play with camshaft bearing cap bolts tightened to specification. Replace camshaft and/or cylinder head if camshaft end play is not within specification. See CAMSHAFT table under ENGINE SPECIFICATIONS.

Installation

- 1) Install camshafts with lobes for the front cylinder pointing toward outside of cylinder head. Apply sealant on outer edge of each No. 1 camshaft bearing cap-to-cylinder head surface. See Fig. 29.
- 2) Install camshaft bearing caps in original location with arrow pointing toward timing belt end of engine. See Fig. 27.

CAUTION: Ensure arrow on camshaft bearing cap points toward timing belt end of engine and caps are in proper location. See Fig. 27.

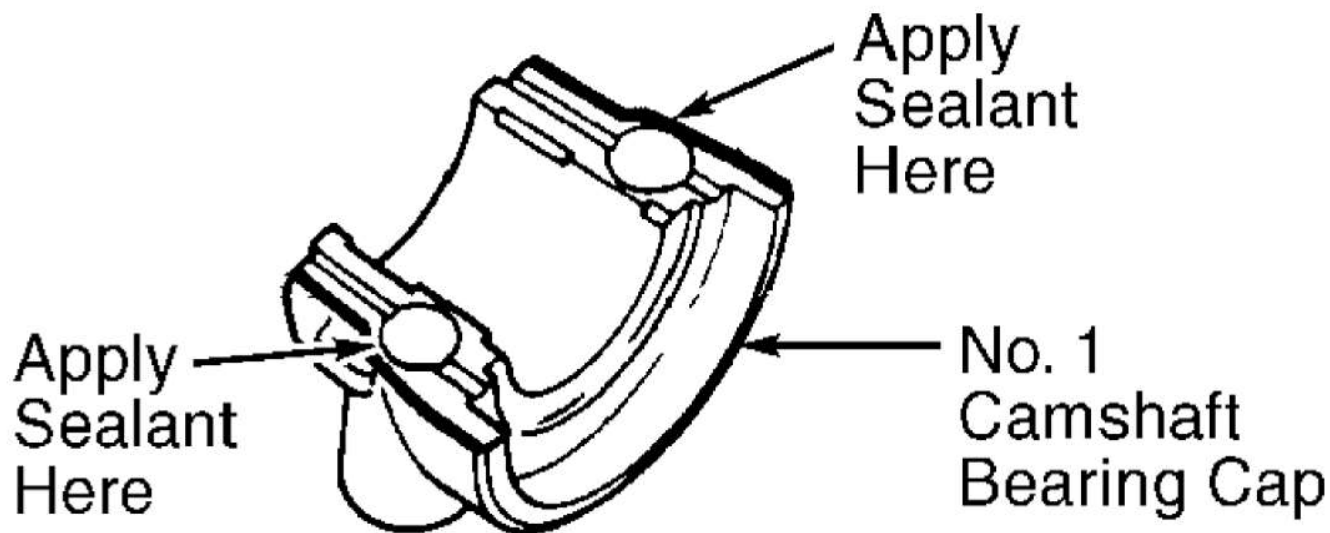
- 3) Apply engine oil to bolt threads and bolt head-to-camshaft bearing cap area. Install and tighten camshaft bearing cap bolts to specification in sequence using several steps. See Fig. 28. See TORQUE SPECIFICATIONS.
- 4) Apply grease to seal lip of NEW camshaft oil seal. Install camshaft oil seal on camshaft. Using hammer and Oil Seal Installer (SST 09223-50010), install camshaft oil seal.
- 5) If cylinder head or camshaft is serviced or replaced, valve clearance must be adjusted. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS. To install remaining components, reverse removal procedure. Tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS.

6) Before installing valve cover and gasket, apply sealant at front and rear areas of cylinder head. See Fig. 2. Using NEW gasket, install valve cover.

7) When installing distributor, coat NEW distributor "O" ring with engine oil. Rotate crankshaft clockwise so cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing belt end of engine.

8) Ensure timing mark on crankshaft pulley aligns with "0" mark on timing belt cover. Ensure slot area of intake camshaft is positioned vertically.

9) Position cutout on coupling with alignment mark on distributor housing. See Fig. 18. Install distributor so center of flange is aligned with bolt hole on cylinder head. Install distributor hold-down bolts. Adjust ignition timing.



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Fig. 29: Applying Sealant On No. 1 Camshaft Bearing Cap
Courtesy of Toyota Motor Sales, U.S.A., Inc.

CRANKSHAFT REAR OIL SEAL

Removal

Remove transaxle, clutch assembly (if equipped) and flywheel. Using a knife, cut off oil seal lip. Pry oil seal from rear seal housing. Use care not to damage sealing surfaces.

Installation

1) Ensure all sealing surfaces are clean. Apply grease to seal lip of NEW oil seal. Using Oil Seal Installer (SST 09223-63010), install oil seal in rear seal housing until oil seal surface is even with rear seal housing surface.

2) Install flywheel. Apply Loctite to flywheel bolts. Install and tighten flywheel bolts to specification in a crisscross pattern. See TORQUE SPECIFICATIONS. To install remaining components, reverse removal procedure.

INTERCOOLER

Removal & Installation (Celica All-Trac)

1) Disconnect negative battery cable. Remove retaining clips

and intercooler air inlet. See Fig. 16. Remove intercooler protector. See Fig. 16.

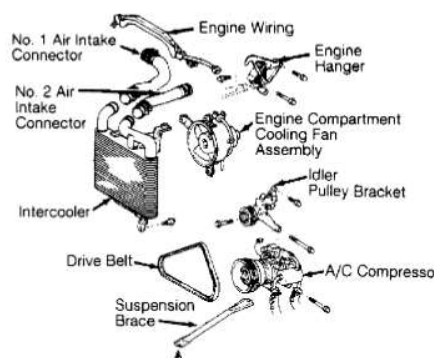
2) Remove intercooler retaining bolts. Loosen hose clamps at intercooler. Disconnect intercooler from turbocharger air connector. Remove intercooler. To install, reverse removal procedure.

Removal (MR2)

1) Disconnect negative battery cable. Raise and support vehicle. Remove right hood side panel and lower engine covers. Remove No. 1 and 2 air intake connectors to intercooler. See Fig. 30. Remove cruise control actuator and accelerator linkage.

2) Remove engine compartment cooling fan assembly, located in passenger's side of engine compartment, near the intercooler. Remove suspension brace. See Fig. 30. Remove accessory drive belt and idler pulley bracket.

3) Remove A/C compressor with hoses attached and secure aside. Remove retaining bolts and intercooler. To install, reverse removal procedure.



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Fig. 30: Exploded View Of Intercooler & Components (MR2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

WATER PUMP

Removal

1) Disconnect negative battery cable. Drain cooling system. Remove timing belt and No. 2 idler pulley. See TIMING BELT under REMOVAL & INSTALLATION.

2) Remove drive belt idler pulley bracket (if equipped). Disconnect necessary coolant hoses. Remove coolant by-pass pipe-to-water pump cover retaining nuts. See Fig. 31.

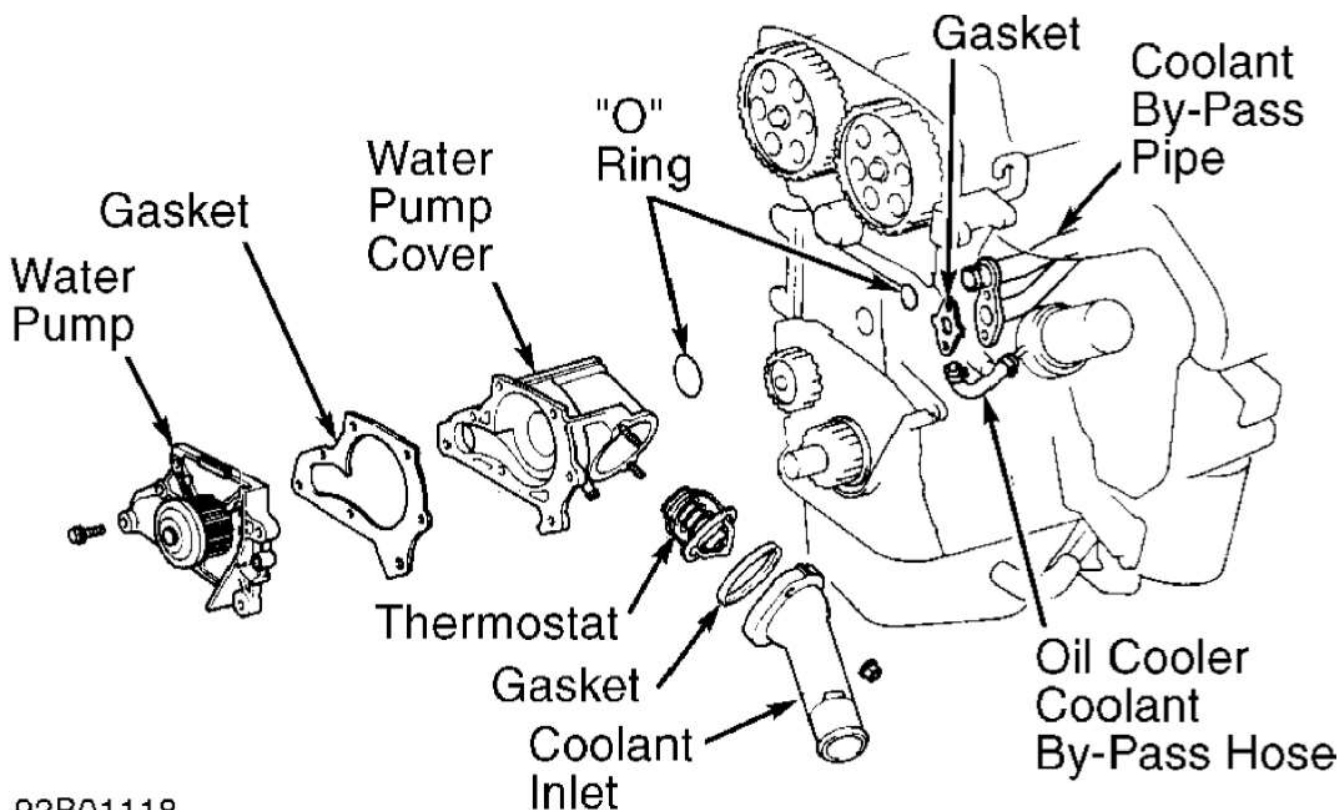
3) Remove bracket bolt (large bolt) from water pump if not previously removed. See Fig. 32. Remove remaining small water pump bolts in sequence. See Fig. 32. Remove water pump, water pump cover and "O" rings as an assembly. Remove retaining bolts and separate water pump with gasket from water pump cover. See Fig. 31.

Installation

1) To install, reverse removal procedure using NEW gaskets and NEW "O" rings. Apply soapy water solution to coolant by-pass pipe "O" ring before installing water pump. DO NOT tighten coolant by-pass pipe-to-water pump cover retaining nuts until water pump bolts are tightened to specification.

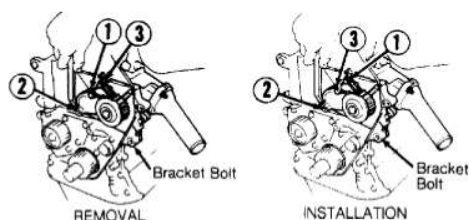
2) Tighten water pump bolts to specification in sequence. See Fig. 32. See TORQUE SPECIFICATIONS. To install remaining components, reverse removal procedure. Fill cooling system. On MR2 cooling system must be bled. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.

CAUTION: On MR2, ensure cooling system is bled to prevent engine damage. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.



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Fig. 31: Exploded View Of Water Pump & Components
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 32: Water Pump Bolt Removal & Installation Sequence
Courtesy of Toyota Motor Sales, U.S.A., Inc.

OIL PAN

Removal

- 1) Disconnect negative battery cable. Raise and support vehicle. Remove lower engine cover. Drain engine oil.
- 2) On Celica All-Trac models, disconnect exhaust pipe at catalytic converter (located at bottom of turbocharger) and center pipe. Remove exhaust pipe.
- 3) On MR2, remove tailpipe and muffler assembly. Disconnect exhaust pipe and gasket from catalytic converter. Remove exhaust by rotating exhaust pipe between rear suspension crossmember and the

body.

4) On all models, remove necessary crossmembers for access to oil pan. Remove catalytic converter braces, catalytic converter, cushion, retainer and gasket if necessary for access to oil pan. See Fig. 16.

5) Remove stiffener support brace near rear of oil pan. Remove dipstick. Disconnect turbocharger oil return hose at oil pan. Remove retaining bolts/nuts and oil pan.

Installation

1) Ensure sealing surfaces are clean. Apply bead of sealant at center of oil pan sealing surface, between bolt/nut holes and on inside of bolt/nut holes.

2) Install oil pan. Install and tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS. To install remaining components, reverse removal procedure. Use NEW gasket when installing catalytic converter (if removed). Fill crankcase with oil.

OVERHAUL

CYLINDER HEAD

Cylinder Head

1) Inspect cylinder head warpage at cylinder block, exhaust manifold and variable induction valve areas. Replace cylinder head if warpage exceeds specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

2) Install camshaft in cylinder head. Using Plastigage, check camshaft oil clearance with camshaft bearing cap bolts tightened to specification in sequence. See Fig. 28. See TORQUE SPECIFICATIONS.

3) Replace camshaft and/or cylinder head if oil clearance is not within specification. See CAMSHAFT table under ENGINE SPECIFICATIONS.

4) Check camshaft end play with camshaft bearing cap bolts tightened to specification. Replace camshaft and/or cylinder head if camshaft end play is not within specification. See CAMSHAFT table under ENGINE SPECIFICATIONS.

5) Ensure valve lifter bore diameter in cylinder head is within specification. See VALVE LIFTERS table under ENGINE SPECIFICATIONS.

Valve Springs

Ensure valve spring free length, pressure and out-of-square are within specification. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS. Install valve springs with White painted area away from cylinder head surface.

CAUTION: Ensure valve springs are installed with White painted area away from cylinder head surface.

Valve Stem Oil Seals

Intake valve stem oil seal is Brown and exhaust valve stem oil seal is Green. Ensure proper valve stem oil seal is installed. Lubricate valve stem oil seal with engine oil. Install valve stem oil seal using Oil Seal Installer (SST 09201-41020).

Valve Guides

1) Ensure valve guide inside diameter is within specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS. Replace valve guide if inside diameter exceeds specification.

2) To replace valve guide, wrap tape around stem of an old valve, about .51" (13.0 mm) from end of valve stem. From top of

cylinder head, insert old valve into valve guide until tape area rests on valve guide.

3) Using hammer, hit old valve to break off top of old valve guide. Remove snap ring from valve guide. Heat cylinder head to 176–212°F (80–100°C). Using hammer and Valve Guide Remover/Installer (SST 09201–70010), drive valve guide from camshaft side of cylinder head.

4) Measure cylinder head valve guide bore inside diameter. If bore inside diameter is .4326–.4333" (10.988–11.006 mm), use standard valve guide. If bore inside diameter is .4346–.4353" (11.038–11.056 mm), use oversize valve guide.

5) If bore inside diameter exceeds .4333" (11.006 mm), machine valve guide bore to .4346–.4353" (11.038–11.056 mm) for oversize valve guide. If bore inside diameter exceeds .4353" (11.056 mm), replace cylinder head.

6) To install valve guide, heat cylinder head to 176–212°F (80–100°C). Using hammer and valve guide remover/installer, drive valve guide in from camshaft side of cylinder head until snap ring on valve guide contacts the cylinder head.

7) Using .236" (6.00 mm) reamer, ream valve guide to obtain correct valve stem-to-guide oil clearance. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

Valve Seat

Ensure valve seat angle and seat width are within specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS. Valve seat replacement information is not available from manufacturer.

Valves

Ensure minimum refinish length, stem diameter and valve margin are within specification. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS.

Valve Seat Correction Angles

Use 30-degree and 45-degree stones to lower valve seat contact area. Use 45-degree and 75-degree stones to raise valve seat contact area.

VALVE TRAIN

Valve Lifters

Ensure valve lifter diameter, bore diameter and oil clearance are within specification. See VALVE LIFTERS table under ENGINE SPECIFICATIONS.

CYLINDER BLOCK ASSEMBLY

Piston & Rod Assembly

1) Ensure connecting rod and connecting rod cap are marked with matching cylinder numbers for reassembly reference. Before disassembling piston and connecting rod, try to move piston back and forth on piston pin. Replace piston and piston pin if any movement is felt.

2) When removing piston from connecting rod, remove snap rings from piston. Heat piston to 176–194°F (80–90°C) in water. Remove piston pin. Separate piston from connecting rod.

3) Ensure piston pin diameter is within specification. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS. Ensure connecting rod bend, twist and piston pin bushing bore diameter are within specification. See CONNECTING RODS table under ENGINE SPECIFICATIONS.

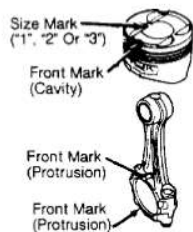
4) Bushing in connecting rod can be replaced if bore diameter is not within specification. Ensure bushing oil hole aligns with connecting rod oil hole. Bushing must be honed to obtain correct

piston pin-to-rod clearance.

NOTE: With piston at 140°F (60°C), piston pin should be able to be pressed into piston using thumb pressure.

5) To reassemble, position piston and connecting rod so front mark (cavity) on top of piston aligns with front mark (protrusion) on connecting rod. See Fig. 33.

6) Install one NEW snap ring in piston. Heat piston to 176-194°F (80-90°C) in water. Coat piston pin with engine oil. Install piston pin into piston and connecting rod using thumb pressure. Install remaining NEW snap ring.



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Fig. 33: Identifying Piston Size Mark & Aligning Piston With Connecting Rod

Courtesy of Toyota Motor Sales, U.S.A., Inc.

Fitting Pistons

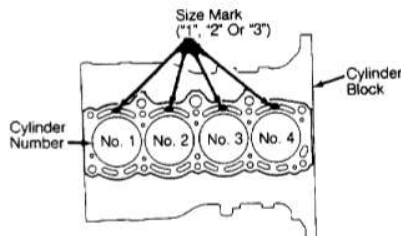
1) To determine piston-to-cylinder clearance, measure piston skirt diameter 1.185" (30.10 mm) from top of piston at 90-degree angle from piston pin.

2) Different piston sizes are used. Piston size can be identified by size mark ("1", "2" or "3") stamped on top of piston. See Fig. 33. Ensure piston diameter is within specification. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.

3) Measure cylinder bore diameter at .39" (9.9 mm) from top and bottom of cylinder bore and at middle of cylinder bore. Different cylinder bore sizes are used. Cylinder bore diameter can be identified by size mark ("1", "2" or "3") stamped on the cylinder block deck surface. See Fig. 34.

4) Ensure cylinder bore diameter is within specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS. Determine piston clearance.

5) Replace piston or cylinder block if clearance is not within specification. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS. If replacing piston, ensure replacement piston contains same size mark as cylinder block size mark.

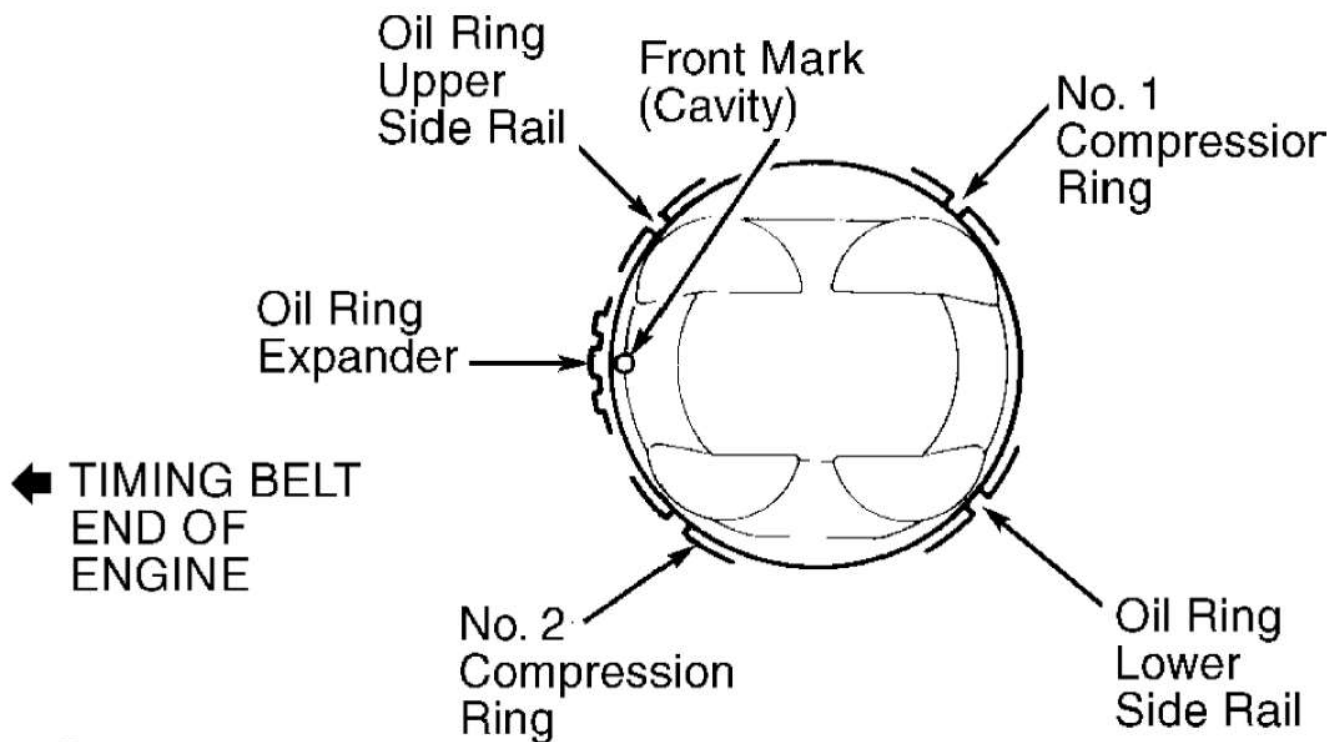


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Fig. 34: Identifying Cylinder Bore Size Marks
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Piston Rings

Ensure piston ring end gap and side clearance are within specification. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS. Position piston ring with ring end gaps in proper areas with identification mark on piston ring toward top of piston. See Fig. 35.



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Fig. 35: Positioning Piston Rings
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Rod Bearings

1) Mark connecting rod cap and connecting rod with cylinder number before disassembly. Connecting rod must be installed in original location with front mark (protrusion) at center of connecting rod toward timing belt end of engine. Front mark (protrusion) on connecting rod cap must face toward timing belt end of engine. See Fig. 33.

2) Connecting rod cap and rod bearing are stamped with size mark ("1", "2" or "3"). See Fig. 36. Ensure size marks on connecting

rod cap and rod bearing are same.

NOTE: If replacing rod bearing, ensure size mark on replacement rod bearing is same as size mark on original rod bearing.

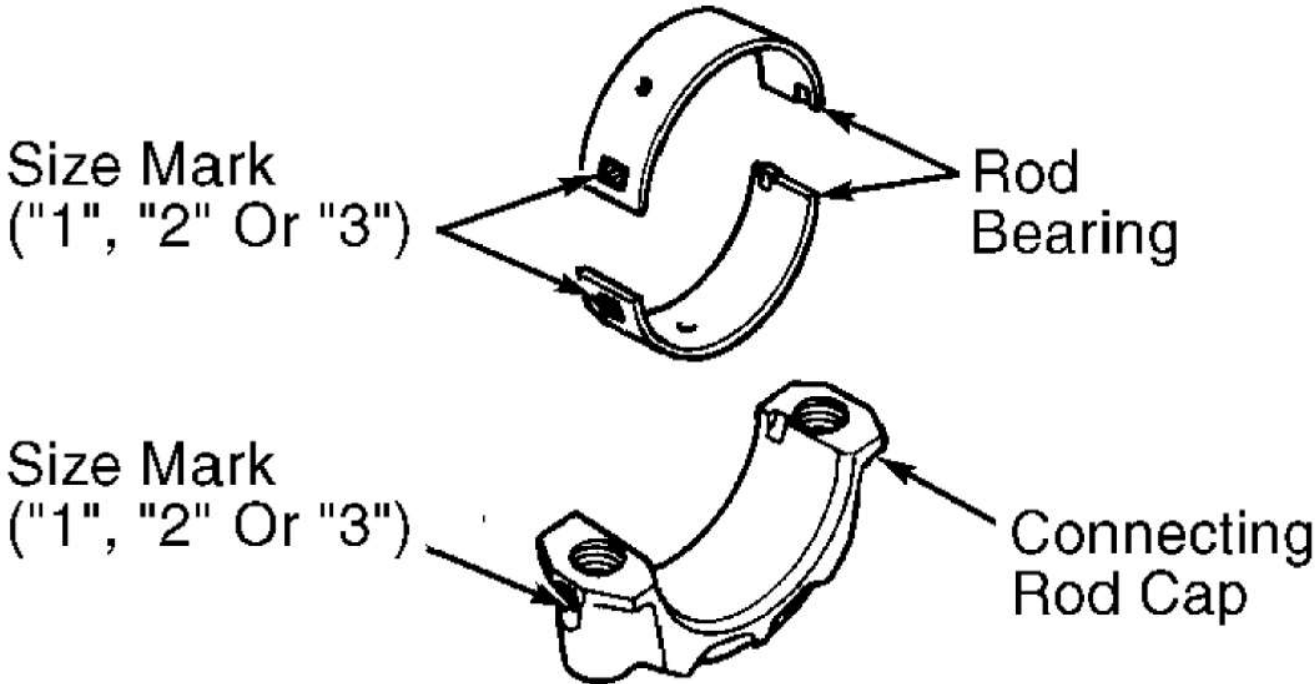
3) Rod bearing thickness is determined by the size mark. See ROD BEARING SPECIFICATIONS table. Install connecting rod cap with front mark (protrusion) toward timing belt end of engine. See Fig. 33.

4) Coat threads of connecting rod bolts and nut-to-connecting rod cap surface with engine oil before tightening nuts to specification. See TORQUE SPECIFICATIONS.

5) Ensure bearing oil clearance and connecting rod side play are within specification. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS and CONNECTING RODS tables under ENGINE SPECIFICATIONS.

ROD BEARING SPECIFICATIONS TABLE

Bearing Size Mark		Bearing Thickness	
		In.	(mm)
"1"		.0584-.0586	(1.484-1.488)
"2"		.0586-.0587	(1.488-1.492)
"3"		.0587-.0589	(1.492-1.496)



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Fig. 36: Identifying Connecting Rod Cap & Rod Bearing Size Marks
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Crankshaft & Main Bearings

1) Main bearing caps are numbered on top of cap for location reference. No. 1 main bearing cap is at timing belt end of engine and No. 5 is at flywheel end. Arrow on top of main bearing cap must point toward timing belt end of engine.

2) Remove main bearing cap bolts in sequence. See Fig. 37.

Remove main bearing caps, crankshaft, thrust bearing and main bearings.

3) Cylinder block main bearing bore inside diameter is identified by main bearing bore size mark ("1", "2" or "3") stamped on cylinder block. See Fig. 38. Front size mark indicates No. 1 main bearing bore and rear size mark indicates No. 5 main bearing bore.

4) Crankshaft main bearing journal diameter is identified by main bearing journal size mark ("0", "1" or "2") located on crankshaft counterweight. See Fig. 38.

5) Ensure main bearing journal diameter, taper and out-of-round are within specification. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

6) Main bearing size mark ("1", "2", "3", "4" or "5") is located on side of main bearing. See Fig. 38. If replacing main bearing, ensure size mark on replacement main bearing is same as size mark on original main bearing.

7) If main bearing size mark cannot be obtained, add size marks on cylinder block and crankshaft to determine size mark of main bearing to be used. For example, if size mark on cylinder block is "2" and size mark on crankshaft is "1", use main bearing with size mark "3".

8) Main bearing thickness is determined by size mark. See MAIN BEARING SPECIFICATIONS table. Install main bearings, thrust bearing, crankshaft and main bearing caps.

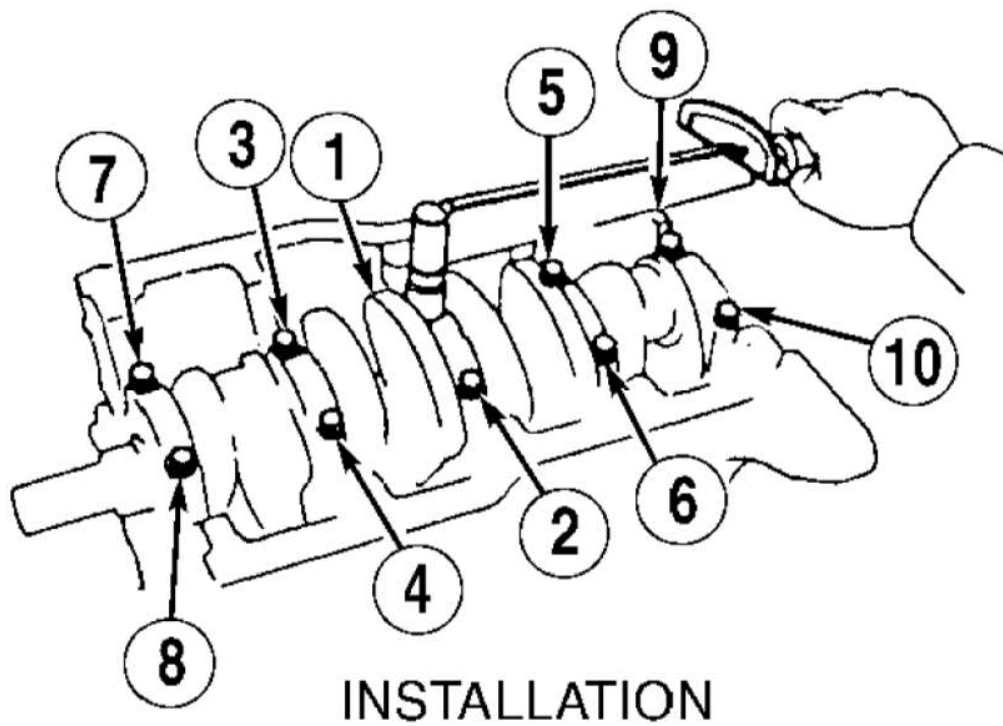
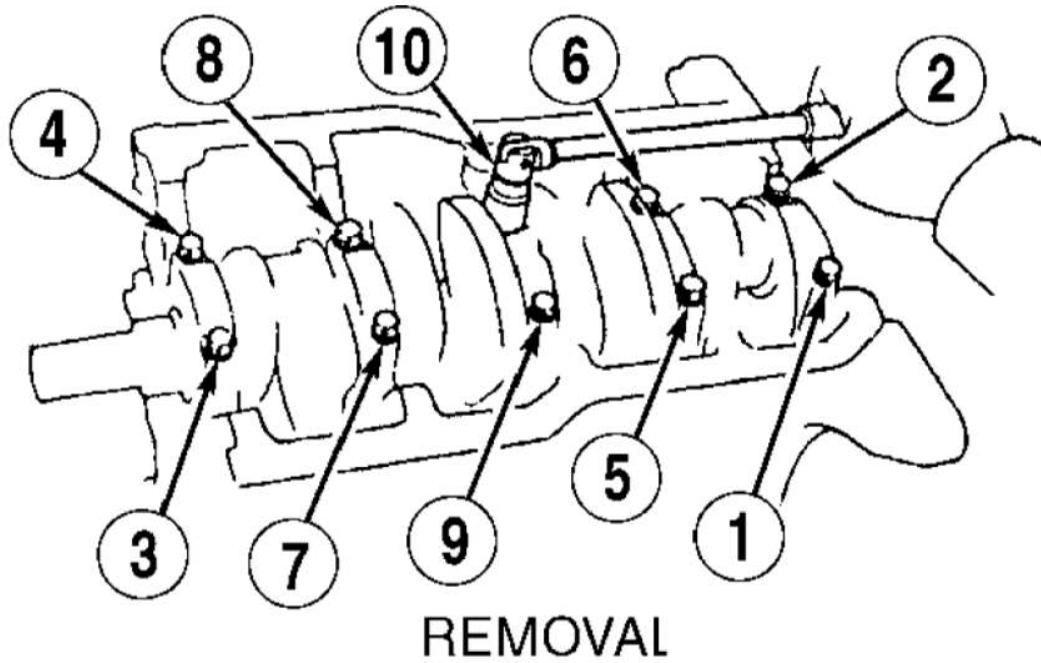
9) Ensure main bearings caps are properly installed in numerical sequence with No. 1 at timing belt end and No. 5 at flywheel end of engine. Ensure arrow on top of main bearing cap points toward timing belt end of engine.

10) Coat main bearing cap bolt threads and seat area of bolt with engine oil before installing. Install and tighten main bearing cap bolts to specification in sequence. See Fig. 37. See TORQUE SPECIFICATIONS.

11) Ensure crankshaft main bearing oil clearance and crankshaft end play are within specification. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS. Replace thrust bearing if crankshaft end play is not within specification.

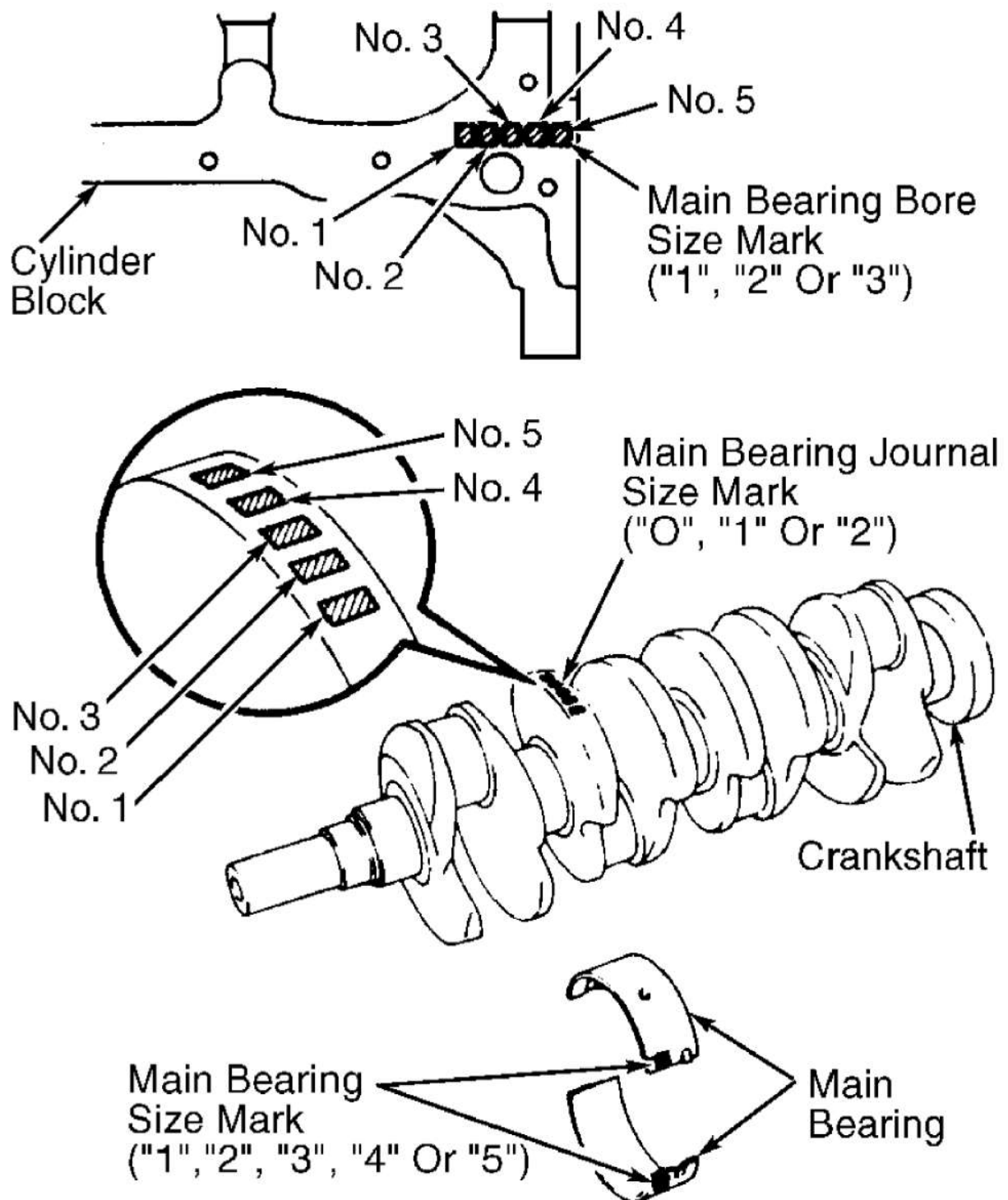
MAIN BEARING SPECIFICATIONS TABLE

Bearing		Bearing Thickness	
Size Mark		In. (mm)	
No. 3 Main Bearing			
"1"	.....	.0784-.0785	(1.992-1.995)
"2"	.....	.0785-.0787	(1.995-1.998)
"3"	.....	.0787-.0788	(1.998-2.001)
"4"	.....	.0788-.0789	(2.001-2.004)
"5"	.....	.0789-.0790	(2.004-2.007)
All Others			
"1"	.....	.0786-.0787	(1.997-2.000)
"2"		.0787-.0789	(2.000-2.003)
"3"		.0789-.0790	(2.003-2.006)
"4"		.0790-.0791	(2.006-2.009)
"5"		.0791-.0792	(2.009-2.012)



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Fig. 37: Main Bearing Cap Bolt Removal & Installation Sequence
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93A83642

Fig. 38: Identifying Cylinder Block, Crankshaft & Main Bearing Size Marks

Courtesy of Toyota Motor Sales, U.S.A., Inc.

Thrust Bearing

Install thrust bearing on No. 3 main bearing with grooves facing toward crankshaft away from cylinder block and main bearing cap. Replace thrust bearing if crankshaft end play is not within specification. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

Cylinder Block

1) Inspect cylinder block deck surface warpage. Replace cylinder block if deck warpage exceeds specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

2) Different cylinder bore sizes are used and are identified by size mark ("1", "2" or "3") on cylinder block deck surface. See Fig. 34. Measure cylinder bore diameter at .39" (9.9 mm) from top and bottom of cylinder bore and at middle of cylinder bore.

3) Ensure cylinder bore diameter is within specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS. Replace cylinder block if cylinder bore exceeds specification.

4) Install main bearing caps in numerical sequence with No. 1 at timing belt end and No. 5 at flywheel end of engine. Ensure arrow on top of main bearing cap points toward timing belt end of engine.

5) Install and tighten main bearing cap bolts to specification in sequence. See Fig. 37. See TORQUE SPECIFICATIONS. Ensure main bearing bore inside diameter is within specification. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

NOTE: Main bearing bore inside diameter is identified by main bearing bore size mark ("1", "2" or "3") stamped on cylinder block. See Fig. 38.

ENGINE OILING

ENGINE LUBRICATION SYSTEM

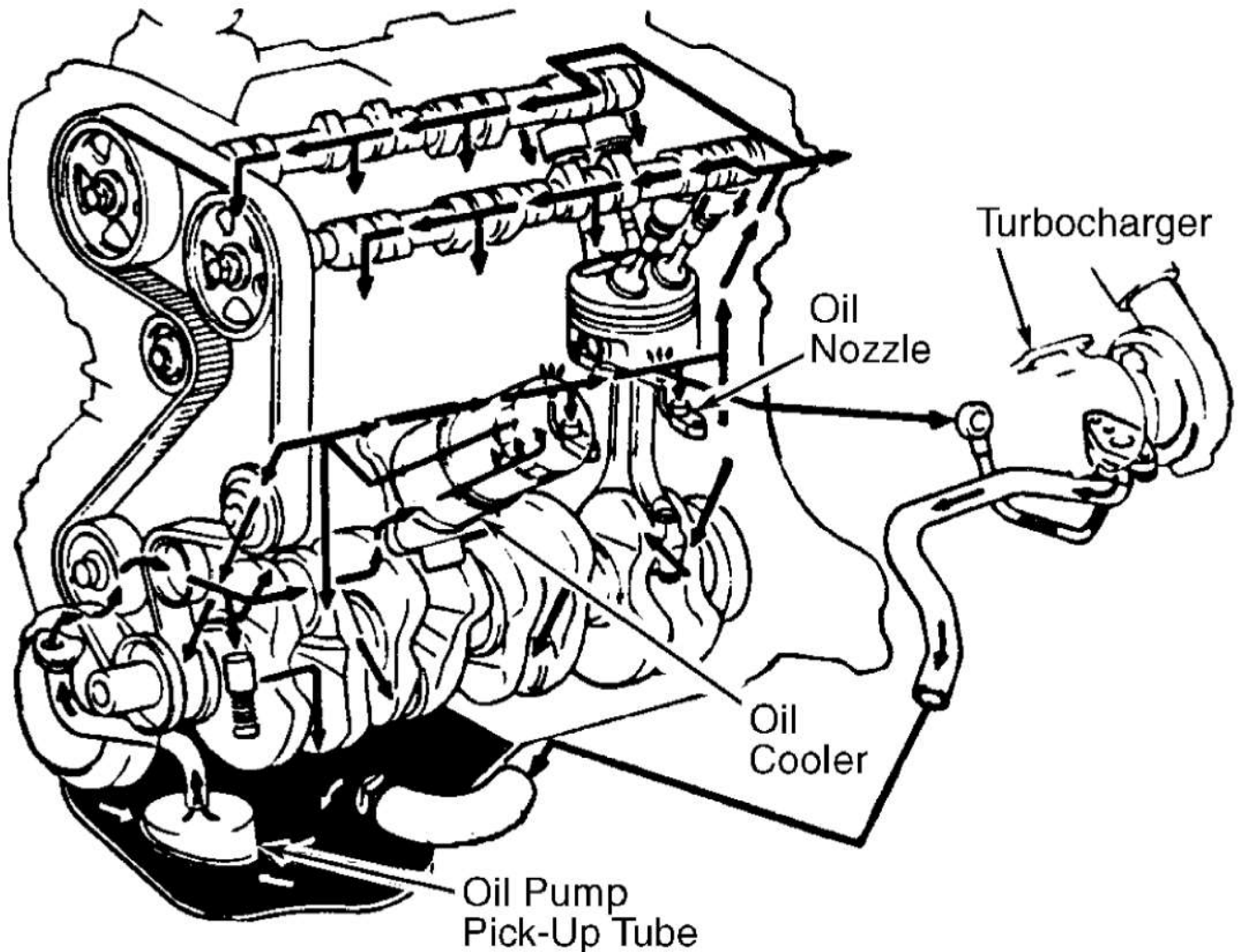
The crankshaft-driven oil pump provides pressurized lubrication. See Fig. 39. Oil nozzles are mounted inside cylinder block directly above crankshaft. Oil nozzles spray oil on bottom and inside of piston to aid in cooling and lubrication.

Crankcase Capacity

Crankcase capacity with oil filter is 4.1 qts. (3.9L).

Oil Pressure

With engine at normal operating temperature, oil pressure should be at least 4.3 psi (0.3 kg/cm²) at idle and 36-71 psi (2.5-5.0 kg/cm²) at 3000 RPM.



93B83643

Fig. 39: Cross-Sectional View Of Engine Oil Circuit
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

OIL PUMP

Removal & Disassembly

1) Remove timing belt, crankshaft sprocket, oil pump sprocket and No. 2 idler pulley. See TIMING BELT under REMOVAL & INSTALLATION. Remove oil pan. See OIL PAN under REMOVAL & INSTALLATION.

2) Remove oil pump pick-up tube. Remove oil pump housing-to-cylinder block retaining bolts. Using soft-faced hammer, tap oil pump housing from cylinder block.

3) To disassemble, remove oil pump body cover retaining bolts, oil pump body cover and "O" ring. Disassemble oil pump components. See Fig. 40. Remove oil pump seal and crankshaft front seal from oil pump housing (if necessary).

Inspection

1) Inspect components for damage. Ensure relief valve slides freely in bore of oil pump housing. Install rotors in oil pump housing.

2) Using feeler gauge, measure driven rotor-to-oil pump

housing clearance. Replace rotor assembly or oil pump housing if clearance exceeds specification. See OIL PUMP SPECIFICATIONS table.

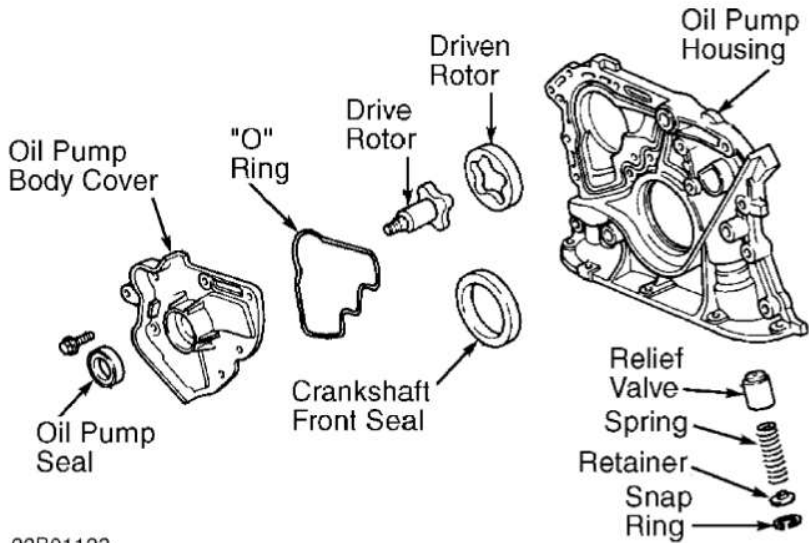
3) Measure rotor tip clearance between tip of both rotors. Replace rotor assembly if clearance exceeds specification. See OIL PUMP SPECIFICATIONS table.

OIL PUMP SPECIFICATIONS TABLE

Application	In. (mm)
Driven Rotor-To-Oil Pump Housing Clearance	
Standard	.0039-.0063 (.099-.160)
Wear Limit	.0079 (.200)
Rotor Tip Clearance	
Standard	.0016-.0063 (.040-.160)
Wear Limit	.0079 (.200)

Reassembly & Installation

- 1) To reassemble, reverse disassembly procedure. Ensure reference marks (dot area) on rotors face toward outside of oil pump body (away from cylinder block surface).
- 2) Using Seal Installer (SST 09226-10010), install NEW crankshaft front seal (if removed) until seal surface is even with oil pump housing. Coat seal lip with grease.
- 3) Using Seal Installer (SST 09627-30010) and Handle (SST 09631-00020), install NEW oil pump seal (if removed) until seal surface is even with oil pump body cover. Coat seal lip with grease.
- 4) Using NEW "O" ring, install oil pump body cover. Install and tighten oil pump body cover bolts to specification. See TORQUE SPECIFICATIONS.
- 5) Using NEW gasket, install oil pump on cylinder block. Install oil pump housing-to-cylinder block bolts. Ensure the 2 longest bolts are located in the lowest outside holes nearest to oil pan flange. Tighten bolts to specification. See TORQUE SPECIFICATIONS. To install remaining components, reverse removal procedure.



92B01123
Fig. 40: Exploded View Of Oil Pump & Components
Courtesy of Toyota Motor Sales, U.S.A., Inc.

OIL COOLER

Removal (Celica All-Trac)

- 1) Disconnect negative battery cable. Oil cooler is mounted between oil filter and cylinder block. See Fig. 39.
- 2) Remove alternator and oil filter. Drain cooling system. Disconnect coolant hose from oil cooler. Remove relief valve and plate washer from center of oil cooler. See Fig. 16.
- 3) Remove retaining nuts, oil cooler and "O" ring. If removing oil cooler bracket from cylinder block, remove bolt and disconnect coolant by-pass pipe bracket from oil cooler bracket. Remove retaining bolts, oil cooler bracket and "O" rings.

Inspection

- 1) Inspect oil cooler for damage or restriction. Replace oil cooler if damage or restricted.
- 2) Using wooden stick push inward on check valve located in center of relief valve. Push inward from threaded end (opposite oil filter threads) of relief valve. Replace relief valve if check valve fails to move.

Installation

- 1) To install, reverse removal procedure using NEW "O" rings. Coat all "O" rings with engine oil. Coat relief valve threads and area below head of relief valve with engine oil.
- 2) Tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS. Add engine oil (as required). Fill cooling system. Add engine oil as required.

Removal (MR2)

- 1) Disconnect negative battery cable. Oil cooler is mounted between oil filter and cylinder block. See Fig. 39.
- 2) Drain cooling system. Remove lower engine covers and right hood side panel. Remove No. 1 and 2 air intake connectors. See Fig. 30.
- 3) Disconnect cruise control actuator linkage. Remove engine compartment cooling fan assembly, located in passenger's side of engine compartment, near the intercooler.
- 4) Remove drive belt and idler pulley bracket. Remove A/C compressor with hoses attached and secure aside. Remove oil filter. Remove dipstick guide from coolant inlet.
- 5) Disconnect coolant hose from oil cooler. Remove relief valve and plate washer from center of oil cooler. See Fig. 16.
- 6) Remove retaining nuts, oil cooler and "O" ring. If removing oil cooler bracket from cylinder block, remove bolt and disconnect coolant by-pass pipe bracket from oil cooler bracket. Remove retaining bolts, oil cooler bracket and "O" rings.

Inspection

- 1) Inspect oil cooler for damage or restriction. Replace oil cooler if damage or restricted.
- 2) Using wooden stick push inward on check valve located in center of relief valve. Push inward from threaded end (opposite oil filter threads) of relief valve. Replace relief valve if check valve fails to move.

Installation

- 1) To install, reverse removal procedure using NEW "O" rings. Coat all "O" rings with engine oil. Coat relief valve threads and area below head of relief valve with engine oil.
- 2) Tighten bolts/nuts to specification. See TORQUE SPECIFICATIONS. Add engine oil as required. Fill and bleed cooling system. See COOLING SYSTEM BLEEDING under REMOVAL & INSTALLATION.

OIL NOZZLES

NOTE: Cylinder block contains 4 oil nozzles, one for each piston.
 A relief valve check ball is located in each oil nozzle.

Removal

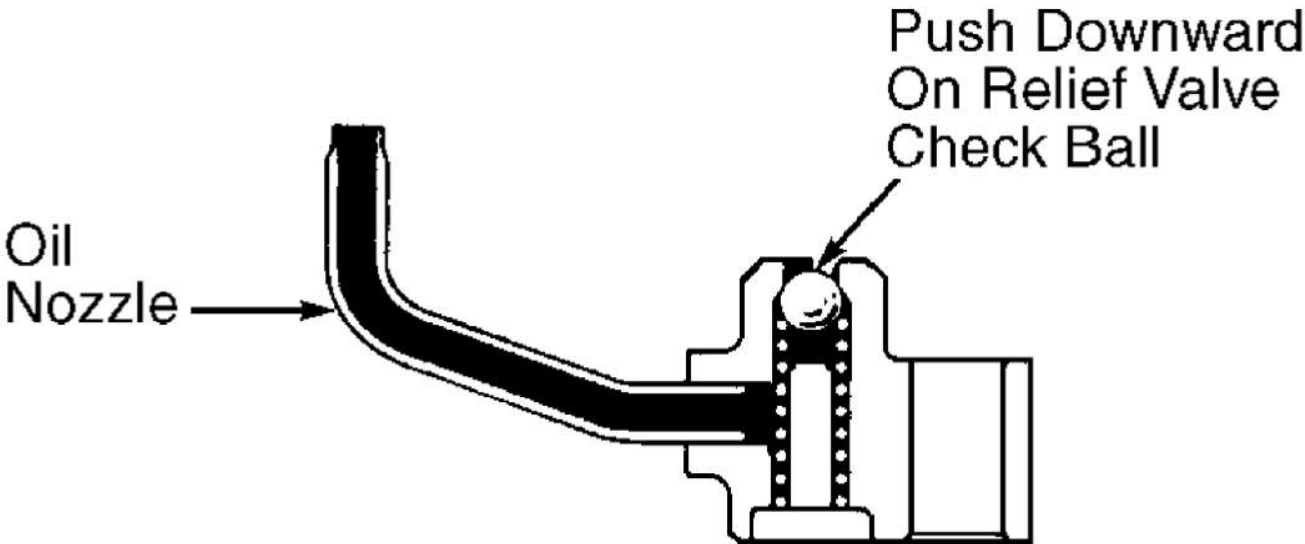
Remove crankshaft. See CYLINDER BLOCK under CYLINDER BLOCK ASSEMBLY under OVERHAUL. Remove oil nozzle retaining bolt that secures the oil nozzle to the cylinder block. Remove oil nozzle.

Inspection

Inspect oil nozzle for damage or restriction. Using small wooden object, ensure relief valve check ball in oil nozzle moves when pressure is applied against relief valve check ball. See Fig. 41. Replace oil nozzle if relief valve check ball fails to move.

Installation

Install oil nozzle in cylinder block. Install and tighten oil nozzle bolt to specification. See TORQUE SPECIFICATIONS. Install crankshaft using proper procedure. See CYLINDER BLOCK under CYLINDER BLOCK ASSEMBLY under OVERHAUL.



93C83644

Fig. 41: Checking Oil Nozzle Relief Valve Check Ball Operation
Courtesy of Toyota Motor Sales, U.S.A., Inc.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS - CELICA ALL-TRAC

TORQUE SPECIFICATIONS TABLE - CELICA ALL-TRAC

Application	Ft. Lbs. (N.m)
A/C Compressor Bolt	20 (27)
Alternator Bracket & Right Engine Hanger Bolt	29 (39)
Axle Shaft Nut	166 (226)
Ball Joint-To-Steering Knuckle Bolt/Nut	94 (127)
Camshaft Bearing Cap Bolt (1)	14 (19)
Camshaft Sprocket Bolt	43 (58)
Catalytic Converter Brace Bolt	43 (58)
Catalytic Converter-To-Turbocharger Bolt/Nut	21 (29)

Connecting Rod Nut	49 (66)
Coolant Outlet Bolt	29 (39)
Crankshaft Pulley Bolt	80 (109)
Cylinder Head Bolt (2)	
Step 1	36 (49)
Step 2	Additional 90 Degrees
Delivery Pipe Bolt	14 (19)
Distributor Hold-Down Bolt	29 (39)
Drive Shaft Flange Bolt	54 (73)
Dynamic Damper Bolt	19 (26)
EGR Valve & Pipe Bolt	
At Cylinder Head	18 (24)
At Intake Manifold	14 (19)
Engine Mount Bolt/Nut	
Engine Mount-To-Engine Mount Crossmember Bolt ...	54 (73)
Front (Radiator Side) Engine Mount Through-Bolt ..	64 (87)
Left (Transaxle Side)	
Engine Mount-To-Bracket Bolt	46 (62)
Left (Transaxle Side) Engine Mount Through-Bolt ..	64 (87)
Left (Transaxle Side) Engine Mount Support	
Brace Bolt/Nut	15 (20)
Rear (Firewall Side) Engine Mount Through-Bolt ..	64 (87)
Right (Timing Belt Side)	
Engine Mount Bracket Bolt	38 (52)
Right (Timing Belt Side) Engine Mount Nut	38 (52)
Right (Timing Belt Side) Engine Mount Support	
Brace Bolt/Nut	54 (73)
Right (Timing Belt Side)	
Engine Mount Through-Bolt	64 (87)
Engine Mount Crossmember-To-Body Bolt	38 (52)
Exhaust Manifold Nut	38 (52)
Exhaust Pipe-To-Catalytic Converter Nut	46 (62)
Flywheel Bolt	80 (109)
Fuel Inlet Line-To-Delivery Pipe Union Bolt	22 (30)
Fuel Inlet Line-To-Fuel Line Union Bolt	22 (30)
Intake Air Connector Brace Bolt/Nut	
Bolt	14 (19)
Nut	(3)
Intake Air Connector-To-Throttle Body Bolt	14 (19)
Intake Manifold Bolt/Nut	14 (19)
Intake Manifold Brace Bolt	19 (26)
Knock Sensor	32 (43)
Left Engine Hanger Bolt	
12-mm Bolt	14 (19)
14-mm Bolt	29 (39)
Main Bearing Cap Bolt (4)	43 (58)
No. 1 Idler Pulley Bolt	38 (52)
No. 2 Idler Pulley Bolt	32 (43)
Oil Cooler Relief Valve	58 (79)
Oil Pump Sprocket Nut	26 (35)
Oxygen Sensor Nut	32 (43)
Power Steering Pump Bolt	
Adjusting Bolt	29 (39)
All Others	32 (43)
Spark Plug	13 (18)
Stiffener Support Brace Bolt	27 (37)
Strut Tower-To-Firewall Brace	
Bolt	15 (20)
Nut	47 (64)
Suspension Crossmember Bolt/Nut	112 (152)
Throttle Body Bolt	14 (19)
Tie Rod Nut	36 (49)
Timing Belt Tensioner Bolt	15 (20)

Transaxle Case Protector Bolt	13 (18)
Turbine Outlet Elbow-To-Turbocharger Nut	47 (64)
Turbocharger Brace Bolt	
Cylinder Block Side	43 (58)
Turbocharger Side	51 (69)
Turbocharger Oil Pipe Support Bracket-To-Cylinder	
Block Bolt	32 (43)
Turbocharger Oil Pipe-To-Cylinder Block Union Bolt ..	38 (52)
Turbocharger Oil Pipe-To-Turbocharger Nut	13 (18)
Turbocharger-To-Exhaust Manifold Nut	47 (64)
Wheel Lug Nut	76 (103)

INCH Lbs. (N.m)

Coolant By-Pass Pipe-To-Water Pump Cover Nut	69 (7.8)
Cold Start Injector Bolt	52 (5.9)
Cold Start Injector Pipe Union Bolt	106 (12.0)
No. 3 Timing Belt Cover Bolt	78 (8.8)
Injector Cover Bolt	69 (7.8)
Oil Cooler Bracket-To-Cylinder Block Bolt	69 (7.8)
Oil Cooler Retaining Nut	78 (8.8)
Oil Cooler-To-Coolant By-Pass Pipe Bracket Nut ..	106 (12.0)
Oil Nozzle Bolt	81 (9.1)
Oil Pan Bolt/Nut	48 (5.4)
Oil Pump Body Cover Bolt	78 (8.8)
Oil Pump Housing-To-Cylinder Block Bolt	69 (7.8)
Oil Pump Pick-Up Tube Bolt/Nut	48 (5.4)
Rear Plate-To-Cylinder Block Bolt	82 (9.3)
Rear Seal Housing Bolt	82 (9.3)
Turbocharger Bearing Side Plate Nut	97 (11.0)
Turbocharger Coolant Pipe Bolt/Nut	97 (11.0)
Valve Cover Bolt	22 (2.5)
Water Pump Bolt	
Small Bolt (5)	69 (7.8)
Large Bracket Bolt	(6)
Water Pump-To-Water Pump Cover Bolt	82 (9.3)

- (1) - Tighten bolts to specification in sequence.
See Fig. 28.
- (2) - Tighten bolts to specification in sequence.
See Fig. 17.
- (3) - Tighten bolt to 69 INCH lbs. (7.8 N.m).
- (4) - Tighten bolts to specification in sequence.
See Fig. 37.
- (5) - Tighten bolts to specification in sequence.
See Fig. 32.
- (6) - Tighten large bracket bolt to 14 ft. lbs. (19 N.m).

TORQUE SPECIFICATIONS - MR2

TORQUE SPECIFICATIONS TABLE - MR2

Application	Ft. Lbs. (N.m)
A/C Compressor Bolt	18 (24)
Air By-Pass Valve Bolt	14 (19)
Axle Shaft Nut	217 (294)
Ball Joint-To-Axle Carrier Bolt	83 (113)
Bearing Bracket Support Brace Bolt/Nut	55 (75)
Bearing Bracket-To-Cylinder Block Bolt	47 (64)
Bearing Retaining Bolt	24 (33)
Brake Caliper Bolt	43 (58)

Camshaft Bearing Cap Bolt (1)	14	(19)
Camshaft Sprocket Bolt	43	(58)
Catalytic Converter Brace Bolt	43	(58)
Catalytic Converter-To-Turbocharger Bolt/Nut	21	(29)
Connecting Rod Nut	49	(66)
Coolant Outlet Bolt	29	(39)
Crankshaft Pulley Bolt	80	(109)
Cylinder Head Bolt (2)		
Step 1	36	(49)
Step 2	Additional 90	Degrees
Delivery Pipe Bolt	14	(19)
Distributor Hold-Down Bolt	29	(39)
EGR Valve & Pipe Bolt		
At Cylinder Head	18	(24)
At Intake Manifold	14	(19)
Engine Mounts & Brackets		
Front (Exhaust Manifold Side) Engine Mount Through-Bolt	71	(96)
Front (Exhaust Manifold Side) Engine Mount-To-Body Bolt	54	(73)
Left (Transaxle Side) Engine Mount Bolt		(3)
Left (Transaxle Side) Engine Mount Support Brace Bolt		
Mount Side	54	(73)
Transaxle Side	18	(24)
Left (Transaxle Side) Engine Mount Through-Bolt	58	(79)
Rear (Intake Manifold Side) Engine Mount-To-Crossmember Bolt	47	(64)
Rear (Intake Manifold Side) Engine Mount Through-Bolt	64	(87)
Right (Timing Belt Side) Engine Mount Bracket Bolt	45	(61)
Right (Timing Belt Side) Engine Mount Insulator Nut	38	(52)
Right (Timing Belt Side) Engine Mount Support Brace Bolt	54	(73)
Right (Timing Belt Side) Engine Mount Through-Bolt	58	(79)
Exhaust Manifold Nut	38	(52)
Flywheel Bolt	80	(109)
Fuel Inlet Line-To-Delivery Pipe Union Bolt	22	(30)
Fuel Inlet Line-To-Fuel Filter Union Bolt	22	(30)
Intake Air Connector Brace Bolt		
10-mm		(4)
12-mm Bolt	14	(19)
Intake Air Connector-To-Throttle Body Bolt/Nut	14	(19)
Intake Manifold Bolt/Nut	14	(19)
Intake Manifold Brace Bolt	19	(26)
Knock Sensor	27	(37)
Left Engine Hanger Bolt		
12-mm Bolt		(5)
14-mm Bolt	29	(39)
Lower Control Arm-To-Body Bolt/Nut	97	(132)
Main Bearing Cap Bolt (6)	43	(58)
No. 1 Idler Pulley Bolt	38	(52)
No. 2 Idler Pulley Bolt	32	(43)
No. 4 Air Tube Brace Bolt	14	(19)
Oil Cooler Relief Valve	58	(79)
Oil Pump Sprocket Nut	26	(35)
Oxygen Sensor Nut	33	(45)
Rear Suspension Crossmember Bolt	83	(113)
Spark Plug	13	(18)
Stabilizer Link-To-Strut Nut	36	(49)
Stiffener Support Brace Bolt	27	(37)

Strut Rod-To-Lower Control Arm Nut	87 (118)
Strut Tower-To-Firewall Brace	
Bolt	54 (73)
Nut	47 (64)
Suspension Rod-To-Axle Carrier Bolt/Nut	76 (103)
Throttle Body Bolt	14 (19)
Timing Belt Tensioner Bolt	15 (20)
Turbine Outlet Elbow-To-Turbocharger Nut	47 (64)
Turbocharger Brace Bolt	
Cylinder Block Side	43 (58)
Turbocharger Side	51 (69)
Turbocharger Oil Pipe Support Bracket-To-Cylinder	
Block Bolt	32 (43)
Turbocharger Oil Pipe-To-Cylinder Block Union Bolt .	38 (52)
Turbocharger Oil Pipe-To-Turbocharger Nut	13 (18)
Turbocharger-To-Exhaust Manifold Nut	47 (64)
Wheel Lug Nut	76 (103)

INCH Lbs. (N.m)

ABS Speed Sensor Bolt	65 (7.4)
Coolant By-Pass Pipe-To-Water Pump Cover Bolt/Nut .	69 (7.8)
Cold Start Injector Bolt	52 (5.9)
Cold Start Injector Pipe Union Bolt	106 (12.0)
Injector Cover Bolt	69 (7.8)
No. 3 Timing Belt Cover Bolt	78 (8.8)
Oil Cooler Bracket-To-Cylinder Block Bolt	69 (7.8)
Oil Cooler Retaining Nut	78 (8.8)
Oil Cooler-To-Coolant By-Pass Pipe Bracket Nut .	106 (12.0)
Oil Nozzle Bolt	81 (9.1)
Oil Pan Bolt/Nut	48 (5.4)
Oil Pump Body Cover Bolt	78 (8.8)
Oil Pump Housing-To-Cylinder Block Bolt	69 (7.8)
Oil Pump Pick-Up Tube Bolt/Nut	48 (5.4)
Rear Plate-To-Cylinder Block Bolt	82 (9.3)
Rear Seal Housing Bolt	82 (9.3)
Turbocharger Bearing Side Plate Nut	97 (11.0)
Turbocharger Coolant Pipe Bolt/Nut	97 (11.0)
Valve Cover Bolt	22 (2.5)
Water Pump Bolt	
Small Bolt (7)	69 (7.8)
Large Bracket Bolt	(8)
Water Pump-To-Water Pump Cover Bolt	82 (9.3)

- (1) - Tighten bolts to specification in sequence.
See Fig. 28.
- (2) - Tighten bolts to specification in sequence.
See Fig. 17.
- (3) - Tighten bolts to specification. See Fig. 15.
- (4) - Tighten bolt to 69 INCH lbs. (7.8 N.m).
- (5) - Tighten bolt to 115 INCH lbs. (13.0 N.m).
- (6) - Tighten bolts to specification in sequence.
See Fig. 37.
- (7) - Tighten bolts to specification in sequence.
See Fig. 32.
- (8) - Tighten large bracket bolt to 20 ft. lbs. (27 N.m).

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS TABLE

Application	Specification
Displacement	122 Cu. In. (2.0L)
Bore	3.39" (86.1 mm)
Stroke	3.39" (86.1 mm)
Compression Ratio	8.8:1
Fuel System	PFI
Horsepower @ RPM	200 @ 6000
Torque Ft. Lbs. @ RPM	200 @ 3200

CRANKSHAFT, MAIN & CONNECTING

ROD BEARINGS SPECIFICATIONS

CRANKSHAFT, MAIN & CONNECTING
ROD BEARINGS SPECIFICATIONS TABLE

Application	In. (mm)
Crankshaft	
End Play	
Standard	.0008-.0087 (.020-.220)
Wear Limit	.0118 (.300)
Maximum Runout	.0024 (.060)
Main Bearings	
Journal Diameter (1)	
Size Mark "0"	2.1653-2.1655 (54.998-55.003)
Size Mark "1"	2.1651-2.1653 (54.993-54.998)
Size Mark "2"	2.1649-2.1651 (54.988-54.993)
Journal Out-Of-Round	.0008 (.020)
Journal Taper	.0008 (.020)
Oil Clearance	
Standard Crankshaft Journal	
No. 3 Journal	
Standard	.0010-.0017 (.025-.044)
Wear Limit	.0031 (.080)
All Other Journals	
Standard	.0006-.0013 (.015-.034)
Wear Limit	.0031 (.080)
.010" (.25 mm) Undersize Crankshaft Journal	
No. 3 Journal	
Standard	.0008-.0024 (.021-.061)
Wear Limit	.0031 (.080)
All Other Journals	
Standard	.0011-.0027 (.029-.069)
Wear Limit	.0031 (.080)
Connecting Rod Bearings	
Journal Diameter	1.8892-1.8898 (47.985-48.000)
Journal Out-Of-Round	.0008 (.020)
Journal Taper	.0008 (.020)
Oil Clearance	
Standard Crankshaft Journal	
Standard	.0009-.0022 (.024-.055)
Wear Limit	.0031 (.080)
.010" (.25 mm) Undersize Crankshaft Journal	
Standard	.0009-.0027 (.023-.069)
Wear Limit	.0031 (.080)

(1) - Main journal diameter is determined by main bearing journal size mark on crankshaft. See Fig. 38.

CONNECTING RODS SPECIFICATIONS

CONNECTING RODS SPECIFICATIONS TABLE

Application	In. (mm)
Bore Diameter	
Pin Bushing	.8663-.8668 (22.005-22.017)
Maximum Bend	.0020 Per 3.94 (.051 Per 100.1)
Maximum Twist	.0059 Per 3.94 (.150 Per 100.1)
Side Play	
Standard	.0063-.0123 (.160-.312)
Wear Limit	.0138 (.350)

PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS SPECIFICATIONS TABLE

Application	In. (mm)
Pistons	
Clearance	
Standard	.0028-.0035 (.070-.090)
Wear Limit	.0043 (.110)
Diameter (1)	
Size Mark "1"	3.3827-3.3831 (85.920-85.930)
Size Mark "2"	3.3831-3.3835 (85.930-85.940)
Size Mark "3"	3.3835-3.3839 (85.940-85.950)
Pins	
Diameter	.8660-.8665 (21.997-22.009)
Piston Fit	(2)
Rod Fit	
Standard	.0002-.0004 (.005-.011)
Wear Limit	.0020 (.050)
Rings	
No. 1	
End Gap	
Standard	.0130-.0217 (.330-.550)
Wear Limit	.0335 (.850)
Side Clearance	.0016-.0031 (.041-.080)
No. 2	
End Gap	
Standard	.0177-.0264 (.450-.670)
Wear Limit	.0382 (.970)
Side Clearance	.0012-.0028 (.030-.070)
No. 3 (Oil)	
End Gap	
Standard	.0079-.0236 (.200-.600)
Wear Limit	.0354 (.900)

- (1) - Piston diameter is determined by size mark stamped on top of piston. See Fig. 33.
 (2) - With piston heated to 140°F (60°C), piston pin should slide onto piston using thumb pressure.

CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK SPECIFICATIONS TABLE

Application	In. (mm)
-------------	----------

Cylinder Bore			
Standard Diameter (1)			
Size Mark "1"	.....	3.3858-3.3862	(86.000-86.010)
Size Mark "2"	.....	3.3862-3.3866	(86.010-86.020)
Size Mark "3"	.....	3.3866-3.3870	(86.020-86.030)
Maximum Deck Warpage	.....	.002	(.05)
Main Bearing Bore I.D. (2)			
Size Mark "1"	.....	2.3236-2.3239	(59.020-59.026)
Size Mark "2"	.....	2.3239-2.3241	(59.026-59.032)
Size Mark "3"	.....	2.3241-2.3243	(59.032-59.038)

- (1) - Cylinder bore diameter is determined by cylinder bore size mark on cylinder block deck surface.
See Fig. 34. Maximum bore diameter is 3.3949" (86.230 mm).
- (2) - Main bearing bore I.D. is determined by size mark on cylinder block. See Fig. 38.

VALVES & VALVE SPRINGS SPECIFICATIONS

VALVES & VALVE SPRINGS SPECIFICATIONS TABLE

Application	Specification
Intake Valves	
Face Angle	 44.5 °
Minimum Margin	020" (.50 mm)
Minimum Refinish Length	
Celica	 3.9291" (99.800 mm)
MR2	 4.1260" (104.800 mm)
Stem Diameter	2346-.2352" (5.960-5.975 mm)
Exhaust Valves	
Face Angle	 44.5 °
Minimum Margin	020" (.50 mm)
Minimum Refinish Length	 3.8917" (98.849 mm)
Stem Diameter	2344-.2350" (5.955-5.970 mm)
Valve Springs	
Free Length	 1.749" (44.43 mm)
Out-Of-Square	079" (2.00 mm)
	Lbs. @ In. (kg @ mm)
Pressure	 45-53 @ 1.354 (20-24 @ 34.40)

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD SPECIFICATIONS TABLE

Application	Specification
Maximum Warpage	
Cylinder Block Surface	0079" (.200 mm)
Exhaust Manifold Surface	0118" (.300 mm)
Variable Induction Valve Surface	0079" (.200 mm)
Valve Seats	
Intake Valve	
Seat Angle	 45 °
Seat Width	039-.055" (.99-1.40 mm)
Exhaust Valve	
Seat Angle	 45 °
Seat Width	039-.055" (.99-1.40 mm)

Valve Guides

Intake Valve

Valve Guide Cylinder Head Bore I.D.

Standard Valve Guide 4326-.4333" (10.988-11.006 mm)

Oversize Valve Guide 4346-.4353" (11.038-11.056 mm)

Valve Guide I.D. 2362-.2369" (6.000-6.018 mm)

Valve Stem-To-Guide Oil Clearance

Standard 0010-.0023" (.025-.058 mm)

Wear Limit 0031" (.080 mm)

Exhaust Valve

Valve Guide Cylinder Head Bore I.D.

Standard Valve Guide 4326-.4333" (10.988-11.006 mm)

Oversize Valve Guide 4346-.4353" (11.038-11.056 mm)

Valve Guide I.D. 2362-.2369" (6.000-6.018 mm)

Valve Stem-To-Guide Oil Clearance

Standard 0012-.0025" (.030-.063 mm)

Wear Limit 0039" (.099 mm)

CAMSHAFT SPECIFICATIONS

CAMSHAFT SPECIFICATIONS TABLE

Application	In. (mm)
End Play	
Standard 0047-.0094 (.120-.240)	
Wear Limit 0118 (.300)	
Journal Diameter 1.0614-1.0620 (26.959-26.975)	
Journal Runout 0024 (.060)	
Lobe Height	
Exhaust Valve	
Celica	
Standard 1.6177-1.6217 (41.090-41.190)	
Wear Limit 1.5740 (39.980)	
MR2	
Standard 1.6146-1.6185 (41.010-41.110)	
Wear Limit 1.5709 (39.991)	
Intake Valve	
Celica & MR2	
Standard 1.6146-1.6185 (41.010-41.110)	
Wear Limit 1.5709 (39.991)	
Oil Clearance	
Standard 0010-.0024 (.025-.062)	
Wear Limit 0031 (.080)	

VALVE LIFTERS SPECIFICATIONS

VALVE LIFTERS SPECIFICATIONS TABLE

Application	In. (mm)
Bore Diameter	
Celica 1.2205-1.2213 (31.000-31.021)	
MR2 1.1024-1.1032 (28.000-28.021)	
Lifter Diameter	
Celica 1.2195-1.2199 (30.975-30.985)	
MR2 1.1014-1.1018 (27.975-27.985)	
Oil Clearance	
Standard 0006-.0018 (.015-.046)	
Wear Limit 0028 (.070)	

