

2002 ENGINE PERFORMANCE

CO/HC - RAV4

CO/HC

INSPECTION

NOTE: This check is used only to determine whether or not the idle CO/HC complies with specifications.

1. **Initial conditions.**

- a. Engine at normal operating temperature
- b. Air cleaner installed
- c. Air pipes and hoses of air induction system connected
- d. All accessories switched OFF
- e. All vacuum lines properly connected
- f. SFI system wiring connectors fully plugged
- g. Ignition timing check correctly
- h. Transmission in neutral position
- i. Tachometer and CO/HC meter calibrated by hand

2. **Start engine.**

3. **Race engine at 2,500 rpm for approx. 180 seconds.**

4. **Insert CO/HC meter testing probe at least 40 cm (1.3 ft) into tailpipe during idling.**

5. **Immediately check CO/HC concentration at idle and/or 2,500 rpm.**

Complete the measuring within 3 minutes.

NOTE: When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

If the CO/HC concentration does not conform to specifications, perform troubleshooting in the order given below.

1. Check the oxygen sensor operation (See **DTC P0141: HEATED OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION** , and **DTC P0161: HEATED OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION**).
2. See the table next page for possible causes, and then inspect and correct the applicable causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaky intake and exhaust valves 4. Leaky cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body • IAC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI system: • Faulty fuel pressure regulator • Defective ECT sensor • Faulty ECM • Faulty injectors • Faulty throttle position sensor • Faulty MAF meter

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Fig. 1: Displaying Possible Causes

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2002 ENGINE PERFORMANCE

On-Vehicle Adjustments - 4-Cylinder

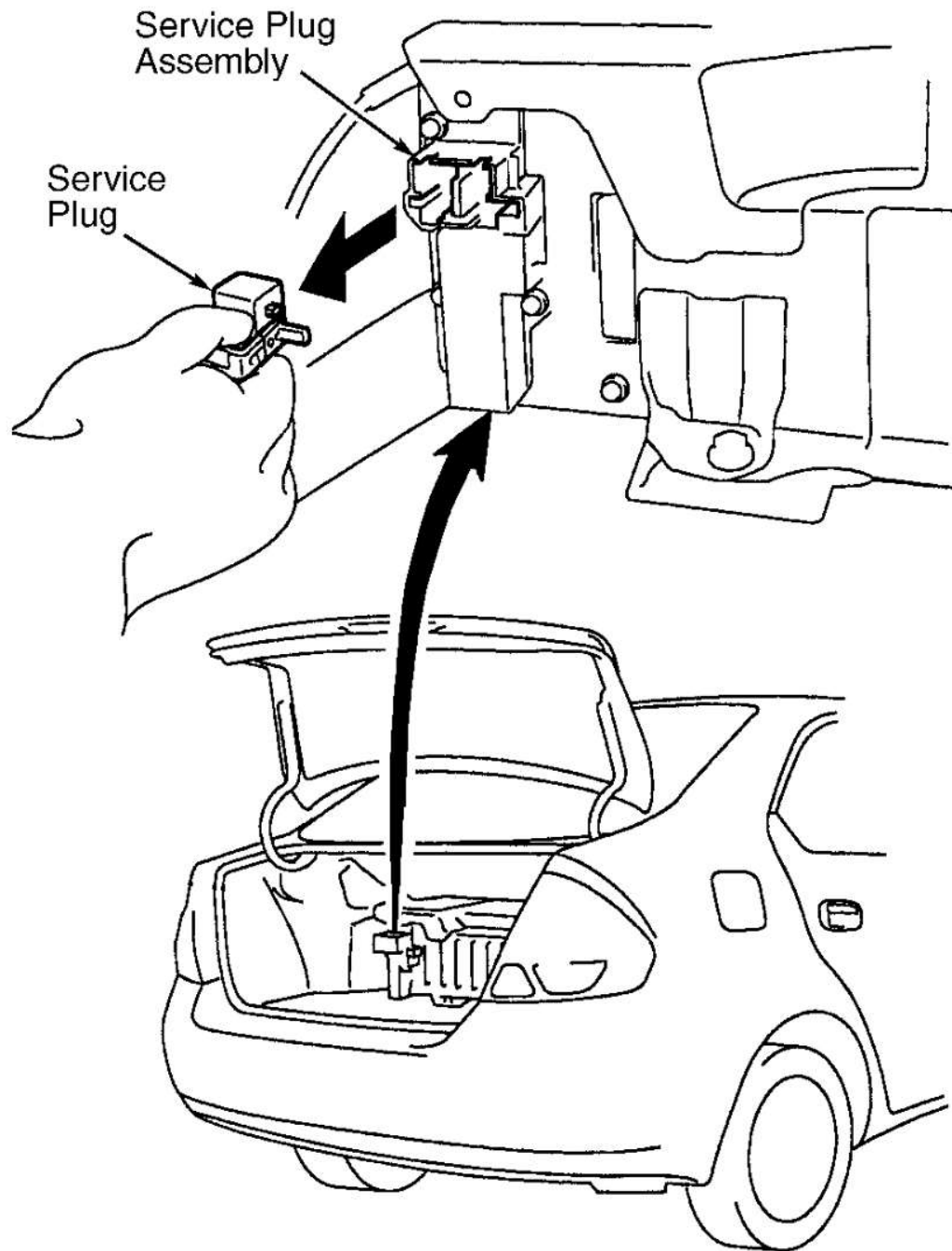
SERVICE PRECAUTIONS

PRIUS

WARNING: When performing any inspection or service procedure on this vehicle, ensure following service precautions are followed to prevent personal injury or death due to the extremely high voltage.

The following service precautions must be followed:

- Ensure ignition is off and ignition key is removed from ignition before performing any inspection or service procedure in engine compartment, as engine may automatically start and shut off when ignition is on and READY light is illuminated. READY light is displayed just above the shift lever position indicator on instrument cluster at center of instrument panel.
- Read all service and warning labels in engine compartment before performing any procedures in engine compartment.
- All high-voltage wiring harness connectors contain Orange connectors. DO NOT touch any wiring harness that contains Orange connectors.
- High-voltage battery and other high-voltage components may be identified by HIGH VOLTAGE caution labels on them. DO NOT touch these components.
- If necessary to inspect or service high-voltage system, ensure ignition is off. Remove service plug and wait at least 5 minutes to ensure high voltage is fully discharged before touching any high-voltage wiring harness, connectors or components. Service plug is located on service plug assembly at driver's side front corner of trunk compartment, near high-voltage battery. See **Fig. 1**. Ensure service plug is stored in a location in which no one may install service plug while technician is working on the vehicle.
- If necessary to touch any high-voltage wiring harness, connectors or components, ensure service plug is removed and battery voltage or less exists at electrical connector. Use Toyota insulated gloves when touching any high-voltage wiring harness, connectors or components. Ensure insulated gloves are dry and in good condition and that no holes exist by applying air pressure to insulated glove before touching any high-voltage wiring harness, connectors or components.
- DO NOT wear any metal objects while working on vehicle which may accidentally drop and cause a short circuit.
- If any high-voltage wiring harness connector is disconnected, ensure terminal on wiring harness connector is wrapped with tape to prevent wiring harness connector from contacting any surface.
- If servicing high-voltage system, place sign on roof of vehicle to indicate to other technicians that high-voltage system is being serviced.



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Fig. 1: Locating Service Plug & Service Plug Assembly (Prius)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PROGRAMMING

POWER SUN ROOF REINITIALIZATION PROCEDURE

Camry

NOTE: Following procedure should be performed if battery is disconnected and reconnected, or battery is discharged and recharged to provide proper automatic operation and jam protection operation of power sun roof.

1. Ensure ignition is on. Depress and hold TILT UP side of power sun roof switch until power sun roof tilts all the way upward and then tilts downward a little. Power sun roof switch is located on headliner, just in front of power sun roof.
2. Check proper operation of open/closing and tilt up/down function for power sun roof using power sun roof switch. Power sun roof should operate anytime ignition is on, or for 43 seconds after ignition is off provided both front doors are closed. Power sun roof will stop operating if any front door is opened. Depressing SLIDE OPEN side of power sun roof switch for one second should open power sun roof. Depressing TILT UP side of power sun roof switch for one second should close power sun roof. To tilt power sun roof upward, depress and hold TILT UP side of power sun roof switch for one second. To tilt power sun roof downward, depress and hold SLIDE OPEN side of power sun roof switch for one second.

Celica

NOTE: Following procedure should be performed if battery is disconnected and reconnected, or battery is discharged and recharged to provide proper automatic operation and jam protection operation of power sun roof.

Close power sun roof using power sun roof switch and continue to depress power sun roof switch briefly after power sun roof is fully closed. Power sun roof switch is located on headliner, just in front of power sun roof.

ENGINE MECHANICAL

NOTE: Before performing on-vehicle adjustments, check for any related Technical Service Bulletins (TSBs).

Before performing any on-vehicle adjustments to fuel or ignition systems, ensure engine mechanical condition is okay.

NOTE: On Camry and Celica, it may be possible that power sun roof may not operate properly if battery is disconnected. If power sun roof does not operate properly, perform appropriate power sun roof reinitialization procedure. See appropriate POWER SUN ROOF REINITIALIZATION PROCEDURE under PROGRAMMING.

VALVE CLEARANCE

NOTE: Check and adjust valve clearance with engine cold.

Camry & Highlander

1. Raise and support vehicle. Remove passenger's side front wheel. Remove necessary fender aprons for access to crankshaft pulley. Remove No. 2 cylinder head cover located on top of engine, above ignition coils and valve cover. Disconnect electrical connectors at ignition coils mounted on top of valve cover. Remove bolts and ignition coils from valve cover. Disconnect hoses and engine wiring harness clamp from valve cover.
2. Remove valve cover bolts/nuts, seal washers, valve cover and gasket. Rotate crankshaft clockwise (viewed from timing chain end of engine) until crankshaft pulley timing mark (groove) aligns with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing chain end of engine.
3. Ensure timing marks on camshaft sprockets are aligned with timing marks on camshaft bearing caps. See **Fig. 2** . If timing marks are not as specified, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover and then recheck timing mark alignment.

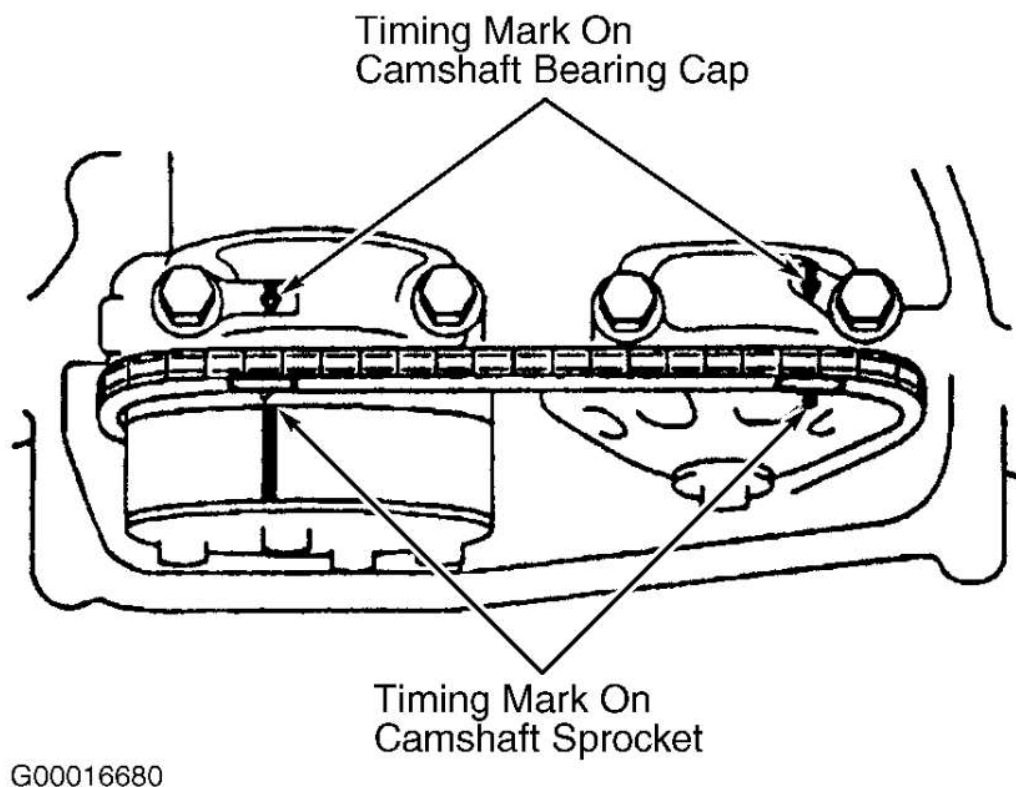
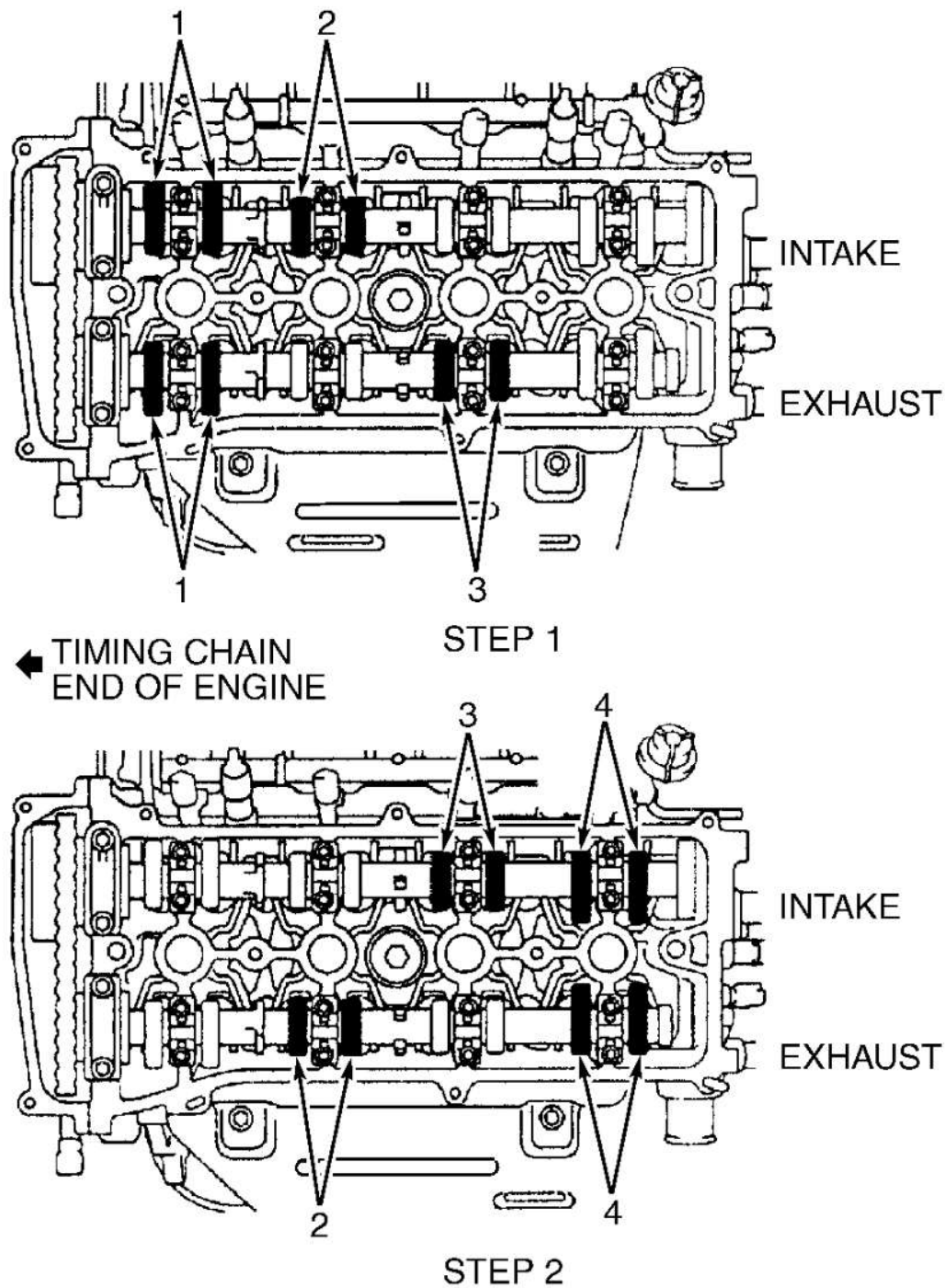


Fig. 2: Checking Timing Mark Alignment (Camry & Highlander)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. With cylinder No. 1 at TDC on compression stroke, use feeler gauge to measure valve clearance between valve lifter and camshaft on specified valves. Perform STEP 1 in illustration. See **Fig. 3** . Record valve clearance.
5. To check remaining valves, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover. Using feeler gauge, measure valve clearance between valve lifter and camshaft on specified valves. Perform STEP 2 in illustration. See **Fig. 3** . Record valve clearance.



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Fig. 3: Identifying Cylinder Numbers & Checking Valve Clearance (Camry, Camry Solara,

Highlander & RAV4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

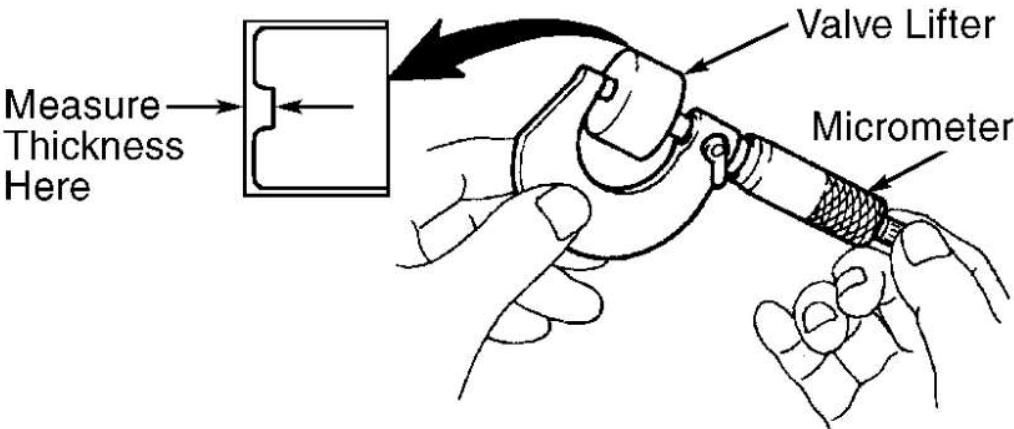
6. Ensure valve clearance is within specification. See **VALVE CLEARANCE SPECIFICATIONS (CAMRY & HIGHLANDER)** table.

VALVE CLEARANCE SPECIFICATIONS (CAMRY & HIGHLANDER)

Application	(1) In. (mm)
Intake	.007-.011 (.19-.29)
Exhaust	.012-.016 (.30-.40)

(1) Adjust valve clearance with engine cold. Verify valve clearance listed with valve clearance listed on underhood label (if available). If valve clearance on underhood label differs from valve clearance listed, use specification on underhood label.

7. If valve clearance requires adjustment, camshafts must be removed for access to valve lifters. Different thickness valve lifters are used. Manufacturer recommends placing reference mark on timing chain and camshaft sprockets, removing timing chain tensioner and then removing camshaft sprockets and camshafts for access to valve lifter while supporting timing chain. To remove camshafts, see appropriate article in ENGINES.
8. Remove valve lifter from cylinder head. Using micrometer, measure thickness of valve lifter. See **Fig. 4** . Using thickness of used valve lifter and measured clearance, determine correct thickness of valve lifter to be used by using following equation for proper valve. For intake valves, "A" (new valve lifter thickness) = "B" (used valve lifter thickness) + "C" (measured clearance) minus .0094" (.240 mm). For exhaust valves, "A" (new valve lifter thickness) = "B" (used valve lifter thickness) + "C" (measured clearance) minus .0138" (.350 mm). Valve lifters are available in 35 sizes ranging from .1992" (5.060 mm) to .2260" (5.740 mm) in increments of .0008" (.020 mm).



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Fig. 4: Measuring Valve Lifter Thickness (Camry, Camry Solara, Celica 1.8L 1ZZ-FE, Corolla, ECHO, Highlander, MR2, Prius & RAV4)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. Install replacement valve lifter, camshafts and timing chain. Recheck valve clearance. To ensure proper valve timing after reinstalling camshafts and timing chain, check that timing marks on camshaft sprockets are aligned with timing marks on camshaft bearing caps when crankshaft pulley timing mark (groove) is aligned with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. See **Fig. 2**.
10. Before installing valve cover and gasket, apply sealant at specified areas on cylinder head. See **Fig. 5**. Install gasket, valve cover, seal washers, bolts and nuts. On Camry, tighten valve cover bolts/nuts to specification. See **TORQUE SPECIFICATIONS**. On Highlander, tighten valve cover bolts/nuts to specification. See **Fig. 6**. To install remaining components, reverse removal procedure. Tighten ignition coil bolts and wheel lug nut to specification. See **TORQUE SPECIFICATIONS**.

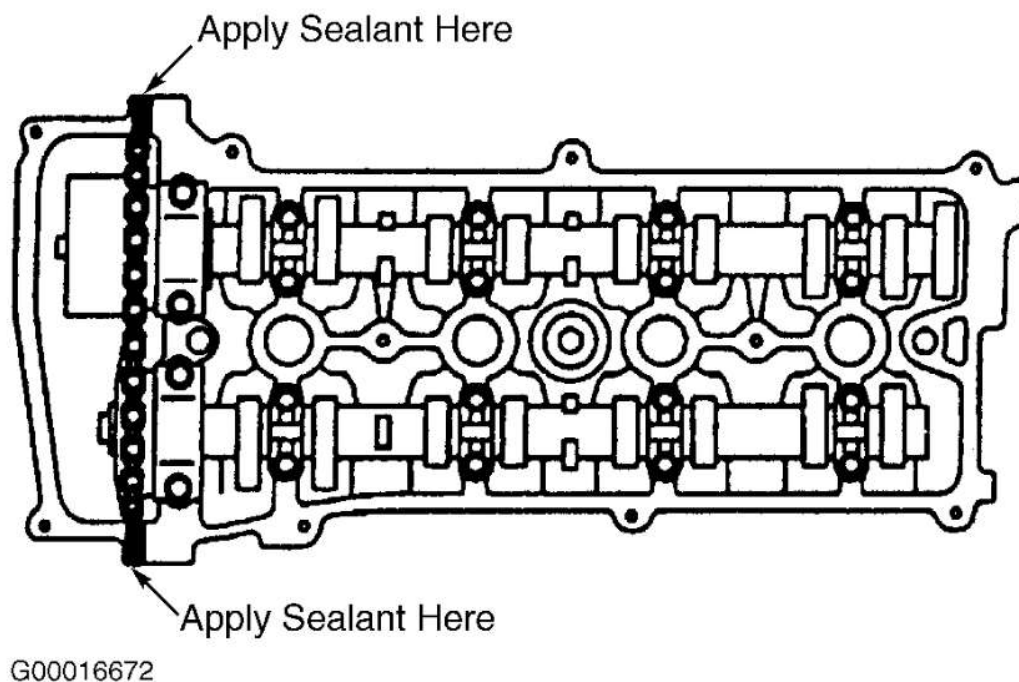
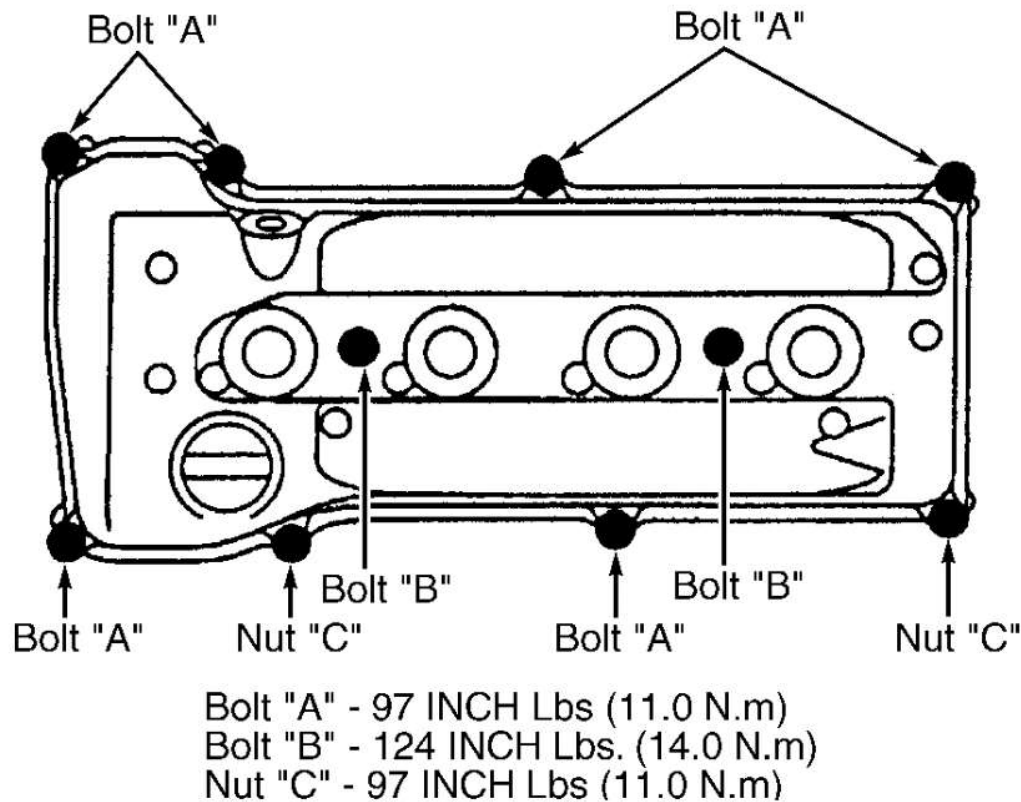


Fig. 5: Locating Valve Cover Sealant Application Areas (Camry & Highlander)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 6: Installing & Tightening Valve Cover Bolt/Nuts (Highlander)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Camry Solara & RAV4

1. Remove passenger's side lower engine cover for access to crankshaft pulley. On RAV4, remove air cleaner assembly. On all models, disconnect electrical connectors at ignition coils mounted on top of valve cover. Remove bolts and ignition coils from valve cover. Disconnect PCV hoses from valve cover.
2. Remove valve cover bolts/nuts, valve cover and gasket. Rotate crankshaft clockwise (viewed from timing chain end of engine) until crankshaft pulley timing mark (groove) aligns with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing chain end of engine.
3. Ensure timing marks on camshaft sprockets are aligned with timing marks on camshaft bearing caps. See **Fig. 7**. If timing marks are not as specified, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover and then recheck timing mark alignment.

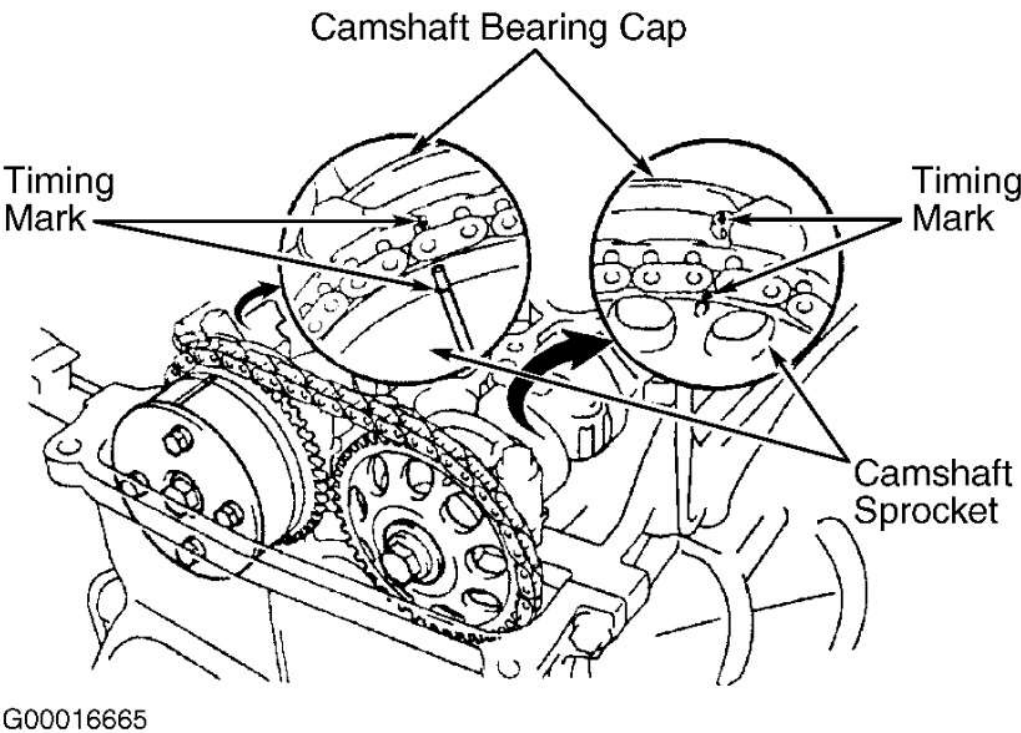


Fig. 7: Checking Timing Mark Alignment (Camry Solara & RAV4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

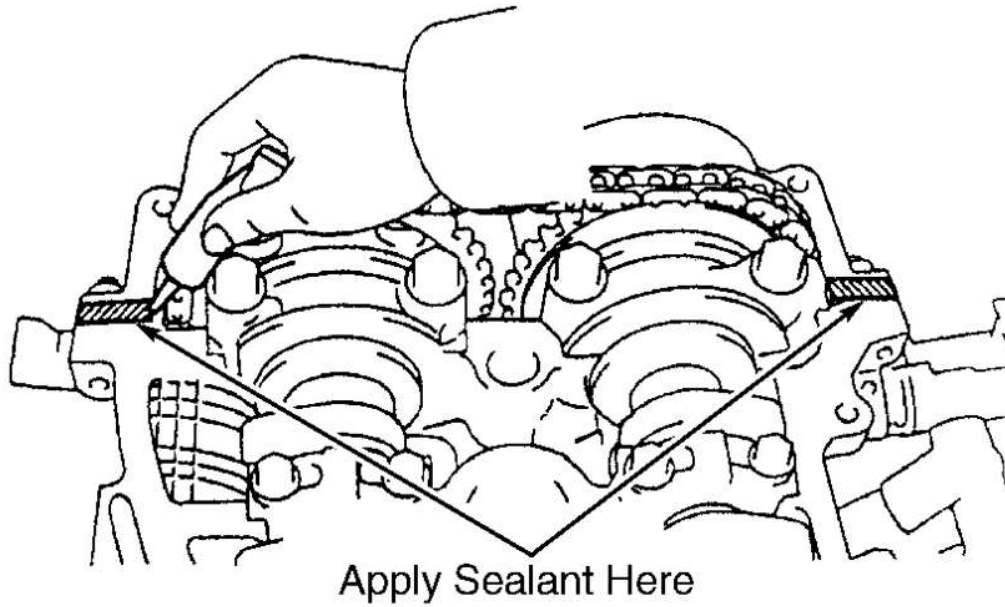
- 4. With cylinder No. 1 at TDC on compression stroke, use feeler gauge to measure valve clearance between valve lifter and camshaft on specified valves. Perform STEP 1 in illustration. See **Fig. 3** . Record valve clearance.
- 5. To check remaining valves, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover. Using feeler gauge, measure valve clearance on specified valves. Perform STEP 2 in illustration. See **Fig. 3** . Record valve clearance.
- 6. Ensure valve clearance is within specification. See **VALVE CLEARANCE SPECIFICATIONS (CAMRY SOLARA & RAV4)** table.

VALVE CLEARANCE SPECIFICATIONS (CAMRY SOLARA & RAV4)

Application	(1) In. (mm)
Intake	.007-.011 (.19-.29)
Exhaust	.012-.016 (.30-.40)

(1) Adjust valve clearance with engine cold. Verify valve clearance listed with valve clearance listed on underhood label (if available). If valve clearance on underhood label differs from valve clearance listed, use specification on underhood label.

7. If valve clearance requires adjustment, camshafts must be removed for access to valve lifters. Different thickness valve lifters are used. Manufacturer recommends placing reference mark on timing chain and camshaft sprockets, removing timing chain tensioner and then removing camshaft sprockets and camshafts for access to valve lifter while supporting timing chain. To remove camshafts, see appropriate article in ENGINES.
8. Remove valve lifter from cylinder head. Using micrometer, measure thickness of valve lifter. See **Fig. 4** . Using thickness of used valve lifter and measured clearance, determine correct thickness of valve lifter to be used for proper valve by using the follow equation, or using valve lifter selection charts. For intake valves, "N" (new valve lifter thickness) = "T" (used valve lifter thickness) + "A" (measured clearance) minus .0094" (.240 mm). For exhaust valves, "N" (new valve lifter thickness) = "T" (used valve lifter thickness) + "A" (measured clearance) minus .0138" (.350 mm). Valve lifters are available in 35 sizes ranging from .1992" (5.060 mm) to .2260" (5.740 mm) in increments of .0008" (.020 mm). For valve lifter selection charts, see **Fig. 9** and **Fig. 10** .
9. Install replacement valve lifter, camshafts and timing chain. Recheck valve clearance. To ensure proper valve timing after reinstalling camshafts and timing chain, check that timing marks on camshaft sprockets are aligned with timing marks on camshaft bearing caps when crankshaft pulley timing mark (groove) is aligned with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. See **Fig. 7** .
10. Before installing valve cover and gasket, apply sealant at specified areas on cylinder head. See **Fig. 8** . Install gasket, valve cover, bolts and nuts. Tighten valve cover bolts/nuts to specification. See **TORQUE SPECIFICATIONS** . To install remaining components, reverse removal procedure. Tighten ignition coil bolts to specification. See **TORQUE SPECIFICATIONS** .



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Fig. 8: Locating Valve Cover Sealant Application Areas (Camry Solara & RAV4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Measure clearance mm (in.)	5.005 (0.1982)	5.095 (0.2003)	5.105 (0.2008)	5.125 (0.2016)	5.145 (0.2024)	5.165 (0.2032)	5.185 (0.2040)	5.205 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.610 (0.2209)	5.620 (0.2213)	5.630 (0.2217)	5.640 (0.2221)	5.650 (0.2225)	5.660 (0.2229)	5.670 (0.2233)	5.680 (0.2237)	5.690 (0.2241)	5.700 (0.2245)	5.710 (0.2249)	5.720 (0.2253)	5.730 (0.2257)	5.740 (0.2261)	5.750 (0.2265)	5.760 (0.2269)	5.770 (0.2273)	5.780 (0.2277)	5.790 (0.2281)	5.800 (0.2285)	5.810 (0.2289)	5.820 (0.2293)	5.830 (0.2297)	5.840 (0.2301)	5.850 (0.2305)	5.860 (0.2309)	5.870 (0.2313)	5.880 (0.2317)	5.890 (0.2321)	5.900 (0.2325)	5.910 (0.2329)	5.920 (0.2333)	5.930 (0.2337)	5.940 (0.2341)	5.950 (0.2345)	5.960 (0.2349)	5.970 (0.2353)	5.980 (0.2357)	5.990 (0.2361)	6.000 (0.2365)	6.010 (0.2369)	6.020 (0.2373)	6.030 (0.2377)	6.040 (0.2381)	6.050 (0.2385)	6.060 (0.2389)	6.070 (0.2393)	6.080 (0.2397)	6.090 (0.2401)	6.100 (0.2405)	6.110 (0.2409)	6.120 (0.2413)	6.130 (0.2417)	6.140 (0.2421)	6.150 (0.2425)	6.160 (0.2429)	6.170 (0.2433)	6.180 (0.2437)	6.190 (0.2441)	6.200 (0.2445)	6.210 (0.2449)	6.220 (0.2453)	6.230 (0.2457)	6.240 (0.2461)	6.250 (0.2465)	6.260 (0.2469)	6.270 (0.2473)	6.280 (0.2477)	6.290 (0.2481)	6.300 (0.2485)	6.310 (0.2489)	6.320 (0.2493)	6.330 (0.2497)	6.340 (0.2501)	6.350 (0.2505)	6.360 (0.2509)	6.370 (0.2513)	6.380 (0.2517)	6.390 (0.2521)	6.400 (0.2525)	6.410 (0.2529)	6.420 (0.2533)	6.430 (0.2537)	6.440 (0.2541)	6.450 (0.2545)	6.460 (0.2549)	6.470 (0.2553)	6.480 (0.2557)	6.490 (0.2561)	6.500 (0.2565)	6.510 (0.2569)	6.520 (0.2573)	6.530 (0.2577)	6.540 (0.2581)	6.550 (0.2585)	6.560 (0.2589)	6.570 (0.2593)	6.580 (0.2597)	6.590 (0.2601)	6.600 (0.2605)	6.610 (0.2609)	6.620 (0.2613)	6.630 (0.2617)	6.640 (0.2621)	6.650 (0.2625)	6.660 (0.2629)	6.670 (0.2633)	6.680 (0.2637)	6.690 (0.2641)	6.700 (0.2645)	6.710 (0.2649)	6.720 (0.2653)	6.730 (0.2657)	6.740 (0.2661)	6.750 (0.2665)	6.760 (0.2669)	6.770 (0.2673)	6.780 (0.2677)	6.790 (0.2681)	6.800 (0.2685)	6.810 (0.2689)	6.820 (0.2693)	6.830 (0.2697)	6.840 (0.2701)	6.850 (0.2705)	6.860 (0.2709)	6.870 (0.2713)	6.880 (0.2717)	6.890 (0.2721)	6.900 (0.2725)	6.910 (0.2729)	6.920 (0.2733)	6.930 (0.2737)	6.940 (0.2741)	6.950 (0.2745)	6.960 (0.2749)	6.970 (0.2753)	6.980 (0.2757)	6.990 (0.2761)	7.000 (0.2765)	7.010 (0.2769)	7.020 (0.2773)	7.030 (0.2777)	7.040 (0.2781)	7.050 (0.2785)	7.060 (0.2789)	7.070 (0.2793)	7.080 (0.2797)	7.090 (0.2801)	7.100 (0.2805)	7.110 (0.2809)	7.120 (0.2813)	7.130 (0.2817)	7.140 (0.2821)	7.150 (0.2825)	7.160 (0.2829)	7.170 (0.2833)	7.180 (0.2837)	7.190 (0.2841)	7.200 (0.2845)	7.210 (0.2849)	7.220 (0.2853)	7.230 (0.2857)	7.240 (0.2861)	7.250 (0.2865)	7.260 (0.2869)	7.270 (0.2873)	7.280 (0.2877)	7.290 (0.2881)	7.300 (0.2885)	7.310 (0.2889)	7.320 (0.2893)	7.330 (0.2897)	7.340 (0.2901)	7.350 (0.2905)	7.360 (0.2909)	7.370 (0.2913)	7.380 (0.2917)	7.390 (0.2921)	7.400 (0.2925)	7.410 (0.2929)	7.420 (0.2933)	7.430 (0.2937)	7.440 (0.2941)	7.450 (0.2945)	7.460 (0.2949)	7.470 (0.2953)	7.480 (0.2957)	7.490 (0.2961)	7.500 (0.2965)	7.510 (0.2969)	7.520 (0.2973)	7.530 (0.2977)	7.540 (0.2981)	7.550 (0.2985)	7.560 (0.2989)	7.570 (0.2993)	7.580 (0.2997)	7.590 (0.3001)	7.600 (0.3005)	7.610 (0.3009)	7.620 (0.3013)	7.630 (0.3017)	7.640 (0.3021)	7.650 (0.3025)	7.660 (0.3029)	7.670 (0.3033)	7.680 (0.3037)	7.690 (0.3041)	7.700 (0.3045)	7.710 (0.3049)	7.720 (0.3053)	7.730 (0.3057)	7.740 (0.3061)	7.750 (0.3065)	7.760 (0.3069)	7.770 (0.3073)	7.780 (0.3077)	7.790 (0.3081)	7.800 (0.3085)	7.810 (0.3089)	7.820 (0.3093)	7.830 (0.3097)	7.840 (0.3101)	7.850 (0.3105)	7.860 (0.3109)	7.870 (0.3113)	7.880 (0.3117)	7.890 (0.3121)	7.900 (0.3125)	7.910 (0.3129)	7.920 (0.3133)	7.930 (0.3137)	7.940 (0.3141)	7.950 (0.3145)	7.960 (0.3149)	7.970 (0.3153)	7.980 (0.3157)	7.990 (0.3161)	8.000 (0.3165)	8.010 (0.3169)	8.020 (0.3173)	8.030 (0.3177)	8.040 (0.3181)	8.050 (0.3185)	8.060 (0.3189)	8.070 (0.3193)	8.080 (0.3197)	8.090 (0.3201)	8.100 (0.3205)	8.110 (0.3209)	8.120 (0.3213)	8.130 (0.3217)	8.140 (0.3221)	8.150 (0.3225)	8.160 (0.3229)	8.170 (0.3233)	8.180 (0.3237)	8.190 (0.3241)	8.200 (0.3245)	8.210 (0.3249)	8.220 (0.3253)	8.230 (0.3257)	8.240 (0.3261)	8.250 (0.3265)	8.260 (0.3269)	8.270 (0.3273)	8.280 (0.3277)	8.290 (0.3281)	8.300 (0.3285)	8.310 (0.3289)	8.320 (0.3293)	8.330 (0.3297)	8.340 (0.3301)	8.350 (0.3305)	8.360 (0.3309)	8.370 (0.3313)	8.380 (0.3317)	8.390 (0.3321)	8.400 (0.3325)	8.410 (0.3329)	8.420 (0.3333)	8.430 (0.3337)	8.440 (0.3341)	8.450 (0.3345)	8.460 (0.3349)	8.470 (0.3353)	8.480 (0.3357)	8.490 (0.3361)	8.500 (0.3365)	8.510 (0.3369)	8.520 (0.3373)	8.530 (0.3377)	8.540 (0.3381)	8.550 (0.3385)	8.560 (0.3389)	8.570 (0.3393)	8.580 (0.3397)	8.590 (0.3401)	8.600 (0.3405)	8.610 (0.3409)	8.620 (0.3413)	8.630 (0.3417)	8.640 (0.3421)	8.650 (0.3425)	8.660 (0.3429)	8.670 (0.3433)	8.680 (0.3437)	8.690 (0.3441)	8.700 (0.3445)	8.710 (0.3449)	8.720 (0.3453)	8.730 (0.3457)	8.740 (0.3461)	8.750 (0.3465)	8.760 (0.3469)	8.770 (0.3473)	8.780 (0.3477)	8.790 (0.3481)	8.800 (0.3485)	8.810 (0.3489)	8.820 (0.3493)	8.830 (0.3497)	8.840 (0.3501)	8.850 (0.3505)	8.860 (0.3509)	8.870 (0.3513)	8.880 (0.3517)	8.890 (0.3521)	8.900 (0.3525)	8.910 (0.3529)	8.920 (0.3533)	8.930 (0.3537)	8.940 (0.3541)	8.950 (0.3545)	8.960 (0.3549)	8.970 (0.3553)	8.980 (0.3557)	8.990 (0.3561)	9.000 (0.3565)	9.010 (0.3569)	9.020 (0.3573)	9.030 (0.3577)	9.040 (0.3581)	9.050 (0.3585)	9.060 (0.3589)	9.070 (0.3593)	9.080 (0.3597)	9.090 (0.3601)	9.100 (0.3605)	9.110 (0.3609)	9.120 (0.3613)	9.130 (0.3617)	9.140 (0.3621)	9.150 (0.3625)	9.160 (0.3629)	9.170 (0.3633)	9.180 (0.3637)	9.190 (0.3641)	9.200 (0.3645)	9.210 (0.3649)	9.220 (0.3653)	9.230 (0.3657)	9.240 (0.3661)	9.250 (0.3665)	9.260 (0.3669)	9.270 (0.3673)	9.280 (0.3677)	9.290 (0.3681)	9.300 (0.3685)	9.310 (0.3689)	9.320 (0.3693)	9.330 (0.3697)	9.340 (0.3701)	9.350 (0.3705)	9.360 (0.3709)	9.370 (0.3713)	9.380 (0.3717)	9.390 (0.3721)	9.400 (0.3725)	9.410 (0.3729)	9.420 (0.3733)	9.430 (0.3737)	9.440 (0.3741)	9.450 (0.3745)	9.460 (0.3749)	9.470 (0.3753)	9.480 (0.3757)	9.490 (0.3761)	9.500 (0.3765)	9.510 (0.3769)	9.520 (0.3773)	9.530 (0.3777)	9.540 (0.3781)	9.550 (0.3785)	9.560 (0.3789)	9.570 (0.3793)	9.580 (0.3797)	9.590 (0.3801)	9.600 (0.3805)	9.610 (0.3809)	9.620 (0.3813)	9.630 (0.3817)	9.640 (0.3821)	9.650 (0.3825)	9.660 (0.3829)	9.670 (0.3833)	9.680 (0.3837)	9.690 (0.3841)	9.700 (0.3845)	9.710 (0.3849)	9.720 (0.3853)	9.730 (0.3857)	9.740 (0.3861)	9.750 (0.3865)	9.760 (0.3869)	9.770 (0.3873)	9.780 (0.3877)	9.790 (0.3881)	9.800 (0.3885)	9.810 (0.3889)	9.820 (0.3893)	9.830 (0.3897)	9.840 (0.3901)	9.850 (0.3905)	9.860 (0.3909)	9.870 (0.3913)	9.880 (0.3917)	9.890 (0.3921)	9.900 (0.3925)	9.910 (0.3929)	9.920 (0.3933)	9.930 (0.3937)	9.940 (0.3941)	9.950 (0.3945)	9.960 (0.3949)	9.970 (0.3953)	9.980 (0.3957)	9.990 (0.3961)	10.000 (0.3965)	10.010 (0.3969)	10.020 (0.3973)	10.030 (0.3977)	10.040 (0.3981)	10.050 (0.3985)	10.060 (0.3989)	10.070 (0.3993)	10.080 (0.3997)	10.090 (0.4001)	10.100 (0.4005)	10.110 (0.4009)	10.120 (0.4013)	10.130 (0.4017)	10.140 (0.4021)	10.150 (0.4025)	10.160 (0.4029)	10.170 (0.4033)	10.180 (0.4037)	10.190 (0.4041)	10.200 (0.4045)	10.210 (0.4049)	10.220 (0.4053)	10.230 (0.4057)	10.240 (0.4061)	10.250 (0.4065)	10.260 (0.4069)	10.270 (0.4073)	10.280 (0.4077)	10.290 (0.4081)	10.300 (0.4085)	10.310 (0.4089)	10.320 (0.4093)	10.330 (0.4097)	10.340 (0.4101)	10.350 (0.4105)	10.360 (0.4109)	10.370 (0.4113)	10.380 (0.4117)	10.390 (0.4121)	10.400 (0.4125)	10.410 (0.4129)	10.420 (0.4133)	10.430 (0.4137)	10.440 (0.4141)	10.450 (0.4145)	10.460 (0.4149)	10.470 (0.4153)	10.480 (0.4157)	10.490 (0.4161)	10.500 (0.4165)	10.510 (0.4169)	10.520 (0.4173)	10.530 (0.4177)	10.540 (0.4181)	10.550 (0.4185)	10.560 (0.4189)	10.570 (0.4193)	10.580 (0.4197)	10.590 (0.4201)	10.600 (0.4205)	10.610 (0.4209)	10.620 (0.4213)	10.630 (0.4217)	10.640 (0.4221)	10.650 (0.4225)	10.660 (0.4229)	10.670 (0.4233)	10.680 (0.4237)	10.690 (0.4241)	10.700 (0.4245)	10.710 (0.4249)	10.720 (0.4253)	10.730 (0.4257)	10.740 (0.4261)	10.750 (0.4265)	10.760 (0.4269)	10.770 (0.4273)	10.780 (0.4277)	10.790 (0.4281)	10.800 (0.4285)	10.810 (0.4289)	10.820 (0.4293)	10.830 (0.4297)	10.840 (0.4301)	10.850 (0.4305)	10.860 (0.4309)	10.870 (0.4313)	10.880 (0.4317)	10.890 (0.4321)	10.900 (0.4325)	10.910 (0.4329)	10.920 (0.4333)	10.930 (0.4337)	10.940 (0.4341)	10.950 (0.4345)	10.960 (0.4349)	10.970 (0.4353)	10.980 (0.4357)	10.990 (0.4361)	11.000 (0.4365)	11.010 (0.4369)	11.020 (0.4373)	11.030 (0.4377)	11.040 (0.4381)	11.050 (0.4385)	11.060 (0.4389)	11.070 (0.4393)	11.080 (0.4397)	11.090 (0.4401)	11.100 (0.4405)	11.110 (0.4409)	11.120 (0.4413)	11.130 (0.4417)	11.140 (0.4421)	11.150 (0.4425)	11.160 (0.4429)	11.170 (0.4433)	11.180 (0.4437)	11.190 (0.4441)	11.200 (0.4445)	11.210 (0.4449)	11.220 (0.4453)	11.230 (0.4457)	11.240 (0.4461)	11.250 (0.4465)	11.260 (0.4469)	11.270 (0.4473)	11.280 (0.4477)	11.290 (0.4481)	11.300 (0.4485)	11.310 (0.4489)	11.320 (0.4493)	11.330 (0.4497)	11.340 (0.4501)	11.350 (0.4505)	11.360 (0.4509)	11.370 (0.4513)	11.380 (0.4517)	11.390 (0.4521)	11.400 (0.4525)	11.410 (0.4529)	11.420 (0.4533)	11.430 (0.4537)	11.440 (0.4541)	11.450 (0.4545)	11.460 (0.4549)	11.470 (0.4553)	11.480 (0.4557)	11.490 (0.4561)	11.500 (0.4565)	11.510 (0.4569)	11.520 (0.4573)	11.530 (0.4577)	11.540 (0.4581)	11.550 (0.4585)	11.560 (0.4589)	11.570 (0.4593)	11.580 (0.4597)	11.590 (0.4601)	11.600 (0.4605)	11.610 (0.4609)	11.620 (0.4613)	11.630 (0.4617)	11.640 (0.4621)	11.650 (0.4625)	11.660 (0.4629)	11.670 (0.4633)	11.680 (0.4637)	11.690 (0.4641)	11.700 (0.4645)	11.710 (0.4649)	11.720 (0.4653)	11.730 (0.4657)	11.740 (0.4661)	11.750 (0.4665)	11.760 (0.4669)	11.770 (0.4673)	11.780 (0.4677)	11.790 (0.4681)	11.800 (0.4685)	11.810 (0.4689)	11.820 (0.4693)	11.830 (0.4697)	11.840 (0.4701)	11.850 (0.4705)	11.860 (0.4709)	11.870 (0.4713)	11.880 (0.4717)	11.890 (0.4721)	11.900 (0.4725)	11.910 (0.4729)	11.920 (0.4733)	11.930 (0.4737)	11.940 (0.4741)	11.950 (0.4745)	11.960 (0.4749)	11.970 (0.4753)	11.980 (0.4757)	11.990 (0.4761)	12.000 (0.4765)	12.010 (0.4769)	12.020 (0.4773)	12.030 (0.4777)	12.040 (0.4781)	12.050 (0.4785)	12.060 (0.4789)	12.070 (0.4793)	12.080 (0.4797)	12.090 (0.4801)	12.100 (0.4805)	12.110 (0.4809)	12.120 (0.4813)	12.130 (0.4817)	12.140 (0.4821)	12.150 (0.4825)	12.160 (0.4829)	12.170 (0.4833)	12.180 (0.4837)	12.190 (0.4841)	12.200 (0.4845)
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Installed Lifter Thickness mm (in.)	Measure clearance mm (in.)	0.000 (0.0000)	0.001 (0.0012)	0.002 (0.0008)	0.003 (0.0012)	0.004 (0.0016)	0.005 (0.0020)	0.006 (0.0024)	0.007 (0.0028)	0.008 (0.0032)	0.009 (0.0036)	0.010 (0.0040)	0.011 (0.0044)	0.012 (0.0048)	0.013 (0.0052)	0.014 (0.0056)	0.015 (0.0060)	0.016 (0.0064)	0.017 (0.0068)	0.018 (0.0072)	0.019 (0.0076)	0.020 (0.0080)	0.021 (0.0084)	0.022 (0.0088)	0.023 (0.0092)	0.024 (0.0096)	0.025 (0.0100)	0.026 (0.0104)	0.027 (0.0108)	0.028 (0.0112)	0.029 (0.0116)	0.030 (0.0120)	0.031 (0.0124)	0.032 (0.0128)	0.033 (0.0132)	0.034 (0.0136)	0.035 (0.0140)	0.036 (0.0144)	0.037 (0.0148)	0.038 (0.0152)	0.039 (0.0156)	0.040 (0.0160)	0.041 (0.0164)	0.042 (0.0168)	0.043 (0.0172)	0.044 (0.0176)	0.045 (0.0180)	0.046 (0.0184)	0.047 (0.0188)	0.048 (0.0192)	0.049 (0.0196)	0.050 (0.0200)	0.051 (0.0204)	0.052 (0.0208)	0.053 (0.0212)	0.054 (0.0216)	0.055 (0.0220)	0.056 (0.0224)	0.057 (0.0228)	0.058 (0.0232)	0.059 (0.0236)	0.060 (0.0240)	0.061 (0.0244)	0.062 (0.0248)	0.063 (0.0252)	0.064 (0.0256)	0.065 (0.0260)	0.066 (0.0264)	0.067 (0.0268)	0.068 (0.0272)	0.069 (0.0276)	0.070 (0.0280)	0.071 (0.0284)	0.072 (0.0288)	0.073 (0.0292)	0.074 (0.0296)	0.075 (0.0300)	0.076 (0.0304)	0.077 (0.0308)	0.078 (0.0312)	0.079 (0.0316)	0.080 (0.0320)	0.081 (0.0324)	0.082 (0.0328)	0.083 (0.0332)	0.084 (0.0336)	0.085 (0.0340)	0.086 (0.0344)	0.087 (0.0348)	0.088 (0.0352)	0.089 (0.0356)	0.090 (0.0360)	0.091 (0.0364)	0.092 (0.0368)	0.093 (0.0372)	0.094 (0.0376)	0.095 (0.0380)	0.096 (0.0384)	0.097 (0.0388)	0.098 (0.0392)	0.099 (0.0396)	0.100 (0.0400)	0.101 (0.0404)	0.102 (0.0408)	0.103 (0.0412)	0.104 (0.0416)	0.105 (0.0420)	0.106 (0.0424)	0.107 (0.0428)	0.108 (0.0432)	0.109 (0.0436)	0.110 (0.0440)	0.111 (0.0444)	0.112 (0.0448)	0.113 (0.0452)	0.114 (0.0456)	0.115 (0.0460)	0.116 (0.0464)	0.117 (0.0468)	0.118 (0.0472)	0.119 (0.0476)	0.120 (0.0480)	0.121 (0.0484)	0.122 (0.0488)	0.123 (0.0492)	0.124 (0.0496)	0.125 (0.0500)	0.126 (0.0504)	0.127 (0.0508)	0.128 (0.0512)	0.129 (0.0516)	0.130 (0.0520)	0.131 (0.0524)	0.132 (0.0528)	0.133 (0.0532)	0.134 (0.0536)	0.135 (0.0540)	0.136 (0.0544)	0.137 (0.0548)	0.138 (0.0552)	0.139 (0.0556)	0.140 (0.0560)	0.141 (0.0564)	0.142 (0.0568)	0.143 (0.0572)	0.144 (0.0576)	0.145 (0.0580)	0.146 (0.0584)	0.147 (0.0588)	0.148 (0.0592)	0.149 (0.0596)	0.150 (0.0600)	0.151 (0.0604)	0.152 (0.0608)	0.153 (0.0612)	0.154 (0.0616)	0.155 (0.0620)	0.156 (0.0624)	0.157 (0.0628)	0.158 (0.0632)	0.159 (0.0636)	0.160 (0.0640)	0.161 (0.0644)	0.162 (0.0648)	0.163 (0.0652)	0.164 (0.0656)	0.165 (0.0660)	0.166 (0.0664)	0.167 (0.0668)	0.168 (0.0672)	0.169 (0.0676)	0.170 (0.0680)	0.171 (0.0684)	0.172 (0.0688)	0.173 (0.0692)	0.174 (0.0696)	0.175 (0.0700)	0.176 (0.0704)	0.177 (0.0708)	0.178 (0.0712)	0.179 (0.0716)	0.180 (0.0720)	0.181 (0.0724)	0.182 (0.0728)	0.183 (0.0732)	0.184 (0.0736)	0.185 (0.0740)	0.186 (0.0744)	0.187 (0.0748)	0.188 (0.0752)	0.189 (0.0756)	0.190 (0.0760)	0.191 (0.0764)	0.192 (0.0768)	0.193 (0.0772)	0.194 (0.0776)	0.195 (0.0780)	0.196 (0.0784)	0.197 (0.0788)	0.198 (0.0792)	0.199 (0.0796)	0.200 (0.0800)	0.201 (0.0804)	0.202 (0.0808)	0.203 (0.0812)	0.204 (0.0816)	0.205 (0.0820)	0.206 (0.0824)	0.207 (0.0828)	0.208 (0.0832)	0.209 (0.0836)	0.210 (0.0840)	0.211 (0.0844)	0.212 (0.0848)	0.213 (0.0852)	0.214 (0.0856)	0.215 (0.0860)	0.216 (0.0864)	0.217 (0.0868)	0.218 (0.0872)	0.219 (0.0876)	0.220 (0.0880)	0.221 (0.0884)	0.222 (0.0888)	0.223 (0.0892)	0.224 (0.0896)	0.225 (0.0900)	0.226 (0.0904)	0.227 (0.0908)	0.228 (0.0912)	0.229 (0.0916)	0.230 (0.0920)	0.231 (0.0924)	0.232 (0.0928)	0.233 (0.0932)	0.234 (0.0936)	0.235 (0.0940)	0.236 (0.0944)	0.237 (0.0948)	0.238 (0.0952)	0.239 (0.0956)	0.240 (0.0960)	0.241 (0.0964)	0.242 (0.0968)	0.243 (0.0972)	0.244 (0.0976)	0.245 (0.0980)	0.246 (0.0984)	0.247 (0.0988)	0.248 (0.0992)	0.249 (0.0996)	0.250 (1.0000)	0.251 (1.0004)	0.252 (1.0008)	0.253 (1.0012)	0.254 (1.0016)	0.255 (1.0020)	0.256 (1.0024)	0.257 (1.0028)	0.258 (1.0032)	0.259 (1.0036)	0.260 (1.0040)	0.261 (1.0044)	0.262 (1.0048)	0.263 (1.0052)	0.264 (1.0056)	0.265 (1.0060)	0.266 (1.0064)	0.267 (1.0068)	0.268 (1.0072)	0.269 (1.0076)	0.270 (1.0080)	0.271 (1.0084)	0.272 (1.0088)	0.273 (1.0092)	0.274 (1.0096)	0.275 (1.0100)	0.276 (1.0104)	0.277 (1.0108)	0.278 (1.0112)	0.279 (1.0116)	0.280 (1.0120)	0.281 (1.0124)	0.282 (1.0128)	0.283 (1.0132)	0.284 (1.0136)	0.285 (1.0140)	0.286 (1.0144)	0.287 (1.0148)	0.288 (1.0152)	0.289 (1.0156)	0.290 (1.0160)	0.291 (1.0164)	0.292 (1.0168)	0.293 (1.0172)	0.294 (1.0176)	0.295 (1.0180)	0.296 (1.0184)	0.297 (1.0188)	0.298 (1.0192)	0.299 (1.0196)	0.300 (1.0200)	0.301 (1.0204)	0.302 (1.0208)	0.303 (1.0212)	0.304 (1.0216)	0.305 (1.0220)	0.306 (1.0224)	0.307 (1.0228)	0.308 (1.0232)	0.309 (1.0236)	0.310 (1.0240)	0.311 (1.0244)	0.312 (1.0248)	0.313 (1.0252)	0.314 (1.0256)	0.315 (1.0260)	0.316 (1.0264)	0.317 (1.0268)	0.318 (1.0272)	0.319 (1.0276)	0.320 (1.0280)	0.321 (1.0284)	0.322 (1.0288)	0.323 (1.0292)	0.324 (1.0296)	0.325 (1.0300)	0.326 (1.0304)	0.327 (1.0308)	0.328 (1.0312)	0.329 (1.0316)	0.330 (1.0320)	0.331 (1.0324)	0.332 (1.0328)	0.333 (1.0332)	0.334 (1.0336)	0.335 (1.0340)	0.336 (1.0344)	0.337 (1.0348)	0.338 (1.0352)	0.339 (1.0356)	0.340 (1.0360)	0.341 (1.0364)	0.342 (1.0368)	0.343 (1.0372)	0.344 (1.0376)	0.345 (1.0380)	0.346 (1.0384)	0.347 (1.0388)	0.348 (1.0392)	0.349 (1.0396)	0.350 (1.0400)	0.351 (1.0404)	0.352 (1.0408)	0.353 (1.0412)	0.354 (1.0416)	0.355 (1.0420)	0.356 (1.0424)	0.357 (1.0428)	0.358 (1.0432)	0.359 (1.0436)	0.360 (1.0440)	0.361 (1.0444)	0.362 (1.0448)	0.363 (1.0452)	0.364 (1.0456)	0.365 (1.0460)	0.366 (1.0464)	0.367 (1.0468)	0.368 (1.0472)	0.369 (1.0476)	0.370 (1.0480)	0.371 (1.0484)	0.372 (1.0488)	0.373 (1.0492)	0.374 (1.0496)	0.375 (1.0500)	0.376 (1.0504)	0.377 (1.0508)	0.378 (1.0512)	0.379 (1.0516)	0.380 (1.0520)	0.381 (1.0524)	0.382 (1.0528)	0.383 (1.0532)	0.384 (1.0536)	0.385 (1.0540)	0.386 (1.0544)	0.387 (1.0548)	0.388 (1.0552)	0.389 (1.0556)	0.390 (1.0560)	0.391 (1.0564)	0.392 (1.0568)	0.393 (1.0572)	0.394 (1.0576)	0.395 (1.0580)	0.396 (1.0584)	0.397 (1.0588)	0.398 (1.0592)	0.399 (1.0596)	0.400 (1.0600)	0.401 (1.0604)	0.402 (1.0608)	0.403 (1.0612)	0.404 (1.0616)	0.405 (1.0620)	0.406 (1.0624)	0.407 (1.0628)	0.408 (1.0632)	0.409 (1.0636)	0.410 (1.0640)	0.411 (1.0644)	0.412 (1.0648)	0.413 (1.0652)	0.414 (1.0656)	0.415 (1.0660)	0.416 (1.0664)	0.417 (1.0668)	0.418 (1.0672)	0.419 (1.0676)	0.420 (1.0680)	0.421 (1.0684)	0.422 (1.0688)	0.423 (1.0692)	0.424 (1.0696)	0.425 (1.0700)	0.426 (1.0704)	0.427 (1.0708)	0.428 (1.0712)	0.429 (1.0716)	0.430 (1.0720)	0.431 (1.0724)	0.432 (1.0728)	0.433 (1.0732)	0.434 (1.0736)	0.435 (1.0740)	0.436 (1.0744)	0.437 (1.0748)	0.438 (1.0752)	0.439 (1.0756)	0.440 (1.0760)	0.441 (1.0764)	0.442 (1.0768)	0.443 (1.0772)	0.444 (1.0776)	0.445 (1.0780)	0.446 (1.0784)	0.447 (1.0788)	0.448 (1.0792)	0.449 (1.0796)	0.450 (1.0800)	0.451 (1.0804)	0.452 (1.0808)	0.453 (1.0812)	0.454 (1.0816)	0.455 (1.0820)	0.456 (1.0824)	0.457 (1.0828)	0.458 (1.0832)	0.459 (1.0836)	0.460 (1.0840)	0.461 (1.0844)	0.462 (1.0848)	0.463 (1.0852)	0.464 (1.0856)	0.465 (1.0860)	0.466 (1.0864)	0.467 (1.0868)	0.468 (1.0872)	0.469 (1.0876)	0.470 (1.0880)	0.471 (1.0884)	0.472 (1.0888)	0.473 (1.0892)	0.474 (1.0896)	0.475 (1.0900)	0.476 (1.0904)	0.477 (1.0908)	0.478 (1.0912)	0.479 (1.0916)	0.480 (1.0920)	0.481 (1.0924)	0.482 (1.0928)	0.483 (1.0932)	0.484 (1.0936)	0.485 (1.0940)	0.486 (1.0944)	0.487 (1.0948)	0.488 (1.0952)	0.489 (1.0956)	0.490 (1.0960)	0.491 (1.0964)	0.492 (1.0968)	0.493 (1.0972)	0.494 (1.0976)	0.495 (1.0980)	0.496 (1.0984)	0.497 (1.0988)	0.498 (1.0992)	0.499 (1.0996)	0.500 (1.0000)	0.501 (1.0004)	0.502 (1.0008)	0.503 (1.0012)	0.504 (1.0016)	0.505 (1.0020)	0.506 (1.0024)	0.507 (1.0028)	0.508 (1.0032)	0.509 (1.0036)	0.510 (1.0040)	0.511 (1.0044)	0.512 (1.0048)	0.513 (1.0052)	0.514 (1.0056)	0.515 (1.0060)	0.516 (1.0064)	0.517 (1.0068)	0.518 (1.0072)	0.519 (1.0076)	0.520 (1.0080)	0.521 (1.0084)	0.522 (1.0088)	0.523 (1.0092)	0.524 (1.0096)	0.525 (1.0100)	0.526 (1.0104)	0.527 (1.0108)	0.528 (1.0112)	0.529 (1.0116)	0.530 (1.0120)	0.531 (1.0124)	0.532 (1.0128)	0.533 (1.0132)	0.534 (1.0136)	0.535 (1.0140)	0.536 (1.0144)	0.537 (1.0148)	0.538 (1.0152)	0.539 (1.0156)	0.540 (1.0160)	0.541 (1.0164)	0.542 (1.0168)	0.543 (1.0172)	0.544 (1.0176)	0.545 (1.0180)	0.546 (1.0184)	0.547 (1.0188)	0.548 (1.0192)	0.549 (1.0196)	0.550 (1.0200)	0.551 (1.0204)	0.552 (1.0208)	0.553 (1.0212)	0.554 (1.0216)	0.555 (1.0220)	0.556 (1.0224)	0.557 (1.0228)	0.558 (1.0232)	0.559 (1.0236)	0.560 (1.0240)	0.561 (1.0244)	0.562 (1.0248)	0.563 (1.0252)	0.564 (1.0256)	0.565 (1.0260)	0.566 (1.0264)	0.567 (1.0268)	0.568 (1.0272)	0.569 (1.0276)	0.570 (1.0280)	0.571 (1.0284)	0.572 (1.0288)	0.573 (1.0292)	0.574 (1.0296)	0.575 (1.0300)	0.576 (1.0304)	0.577 (1.0308)	0.578 (1.0312)	0.579 (1.0316)	0.580 (1.0320)	0.581 (1.0324)	0.582 (1.0328)	0.583 (1.0332)	0.584 (1.0336)	0.585 (1.0340)	0.586 (1.0344)	0.587 (1.0348)	0.588 (1.0352)	0.589 (1.0356)	0.590 (1.0360)	0.591 (1.0364)	0.592 (1.0368)	0.593 (1.0372)	0.594 (1.0376)	0.595 (1.0380)	0.596 (1.0384)	0.597 (1.0388)	0.598 (1.0392)	0.599 (1.0396)	0.600 (1.0400)	0.601 (1.0404)	0.602 (1.0408)	0.603 (1.0412)	0.604 (1.0416)	0.605 (1.0420)	0.606 (1.0424)	0.607 (1.0428)	0.608 (1.0432)	0.609 (1.0436)	0.610 (1.0440)	0.611 (1.0444)	0.612 (1.0448)	0.613 (1.0452)	0.614 (1.0456)	0.615 (1.0460)	0.616 (1.0464)	0.617 (1.0468)	0.618 (1.0472)	0.619 (1.0476)	0.620 (1.0480)	0.621 (1.0484)	0.622 (1.0488)	0.623 (1.0492)	0.624 (1.0496)	0.625 (1.0500)	0.626 (1.0504)	0.627 (1.0508)	0.628 (1.0512)	0.629 (1.0516)	0.630 (1.0520)	0.631 (1.0524)	0.632 (1.0528)	0.633 (1.0532)	0.634 (1.0536)	0.635 (1.0540)	0.636 (1.0544)	0.637 (1.0548)	0.638 (1.0552)	0.639 (1.0556)	0.640 (1.0560)	0.641 (1.0564)	0.642 (1.0568)	0.643 (1.0572)	0.644 (1.0576)	0.645 (1.0580)	0.646 (1.0584)	0.647 (1.0588)	0.648 (1.0592)	0.649 (1.0596)	0.650 (1.0600)	0.651 (1.0604)	0.652 (1.0608)	0.653 (1.0612)	0.654 (1.0616)	0.655 (1.0620)	0.656 (1.0624)	0.657 (1.0628)	0.658 (1.0632)	0.659 (1.0636)	0.660 (1.0640)	0.661 (1.0644)	0.662 (1.0648)	0.663 (1.0652)	0.664 (1.0656)	0.665 (1.0660)	0.666 (1.0664)	0.667 (1.0668)	0.668 (1.0672)	0.669 (1.0676)	0.670 (1.0680)	0.671 (1.0684)	0.672 (1.0688)	0.673 (1.0692)	0.674 (1.0696)	0.675 (1.0700)	0.676 (1.0704)	0.677 (1.0708)	0.678 (1.0712)	0.679 (1.0716)	0.680 (1.0720)	0.681 (1.0724)	0.682 (1.0728)	0.683 (1.0732)	0.684 (1.0736)	0.685 (1.0740)	0.686 (1.0744)	0.687 (1.0748)	0.688 (1.0752)	0.689 (1.0756)	0.690 (1.0760)	0.691 (1.0764)	0.692 (1.0768)	0.693 (1.0772)	0.694 (1.0776)	0.695 (1.0780)	0.696 (1.0784)	0.697 (1.0788)	0.698 (1.0792)	0.699 (1.0796)	0.700 (1.0800)	0.701 (1.0804)	0.702 (1.0808)	0.703 (1.0812)	0.704 (1.0816)	0.705 (1.0820)	0.706 (1.0824)	0.707 (1.0828)	0.708 (1.0832)	0.709 (1.0836)	0.710 (1.0840)	0.711 (1.0844)	0.712 (1.0848)	0.713 (1.0852)	0.714 (1.0856)	0.715 (1.0860)	0.716 (1.0864)	0.717 (1.0868)	0.718 (1.0872)	0.719 (1.0876)	0
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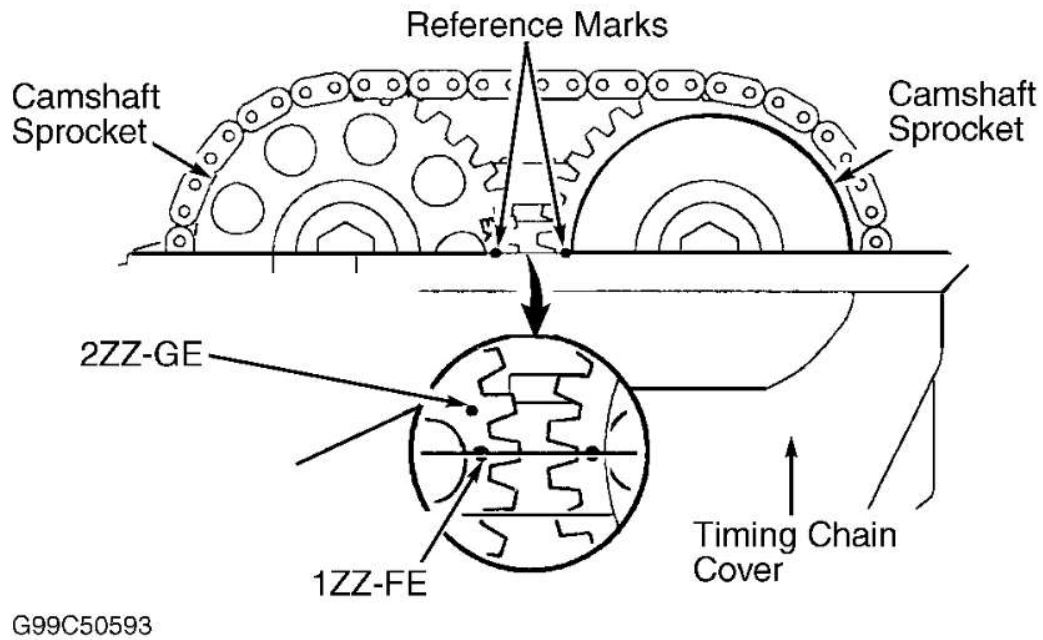
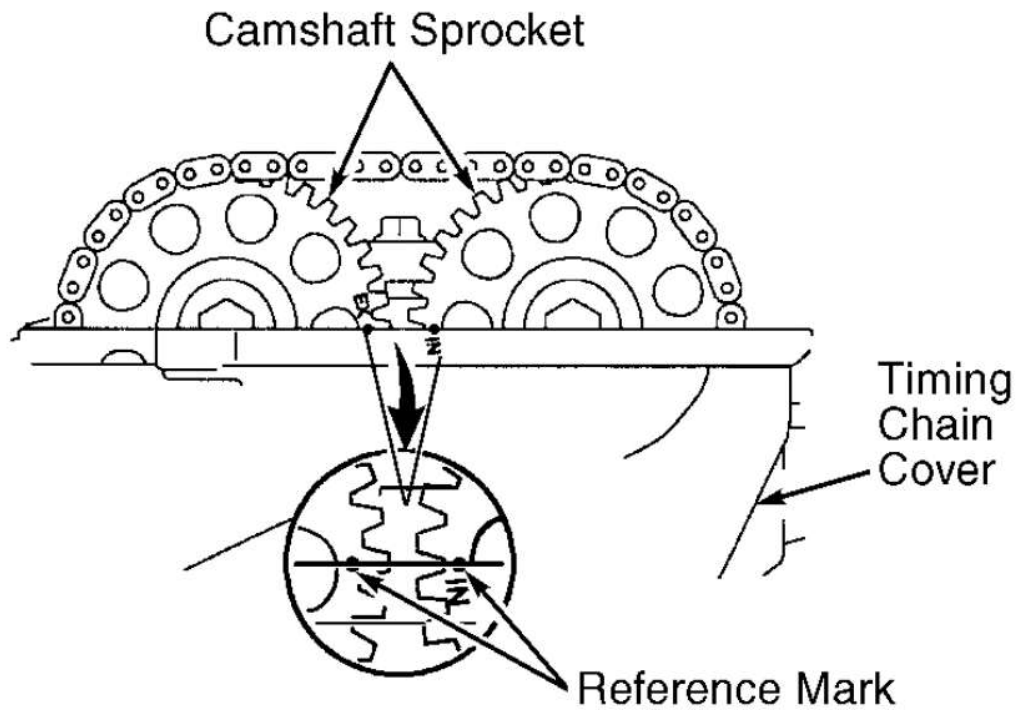
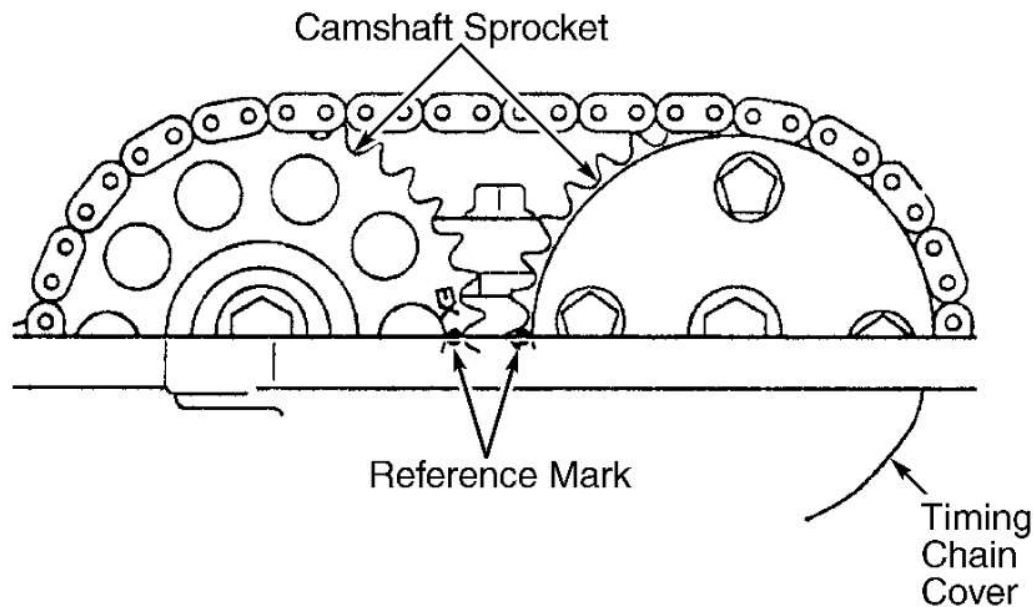


Fig. 11: Checking Reference Mark Alignment (Celica 1.8L 1ZZ-FE & 1.8L 2ZZ-GE)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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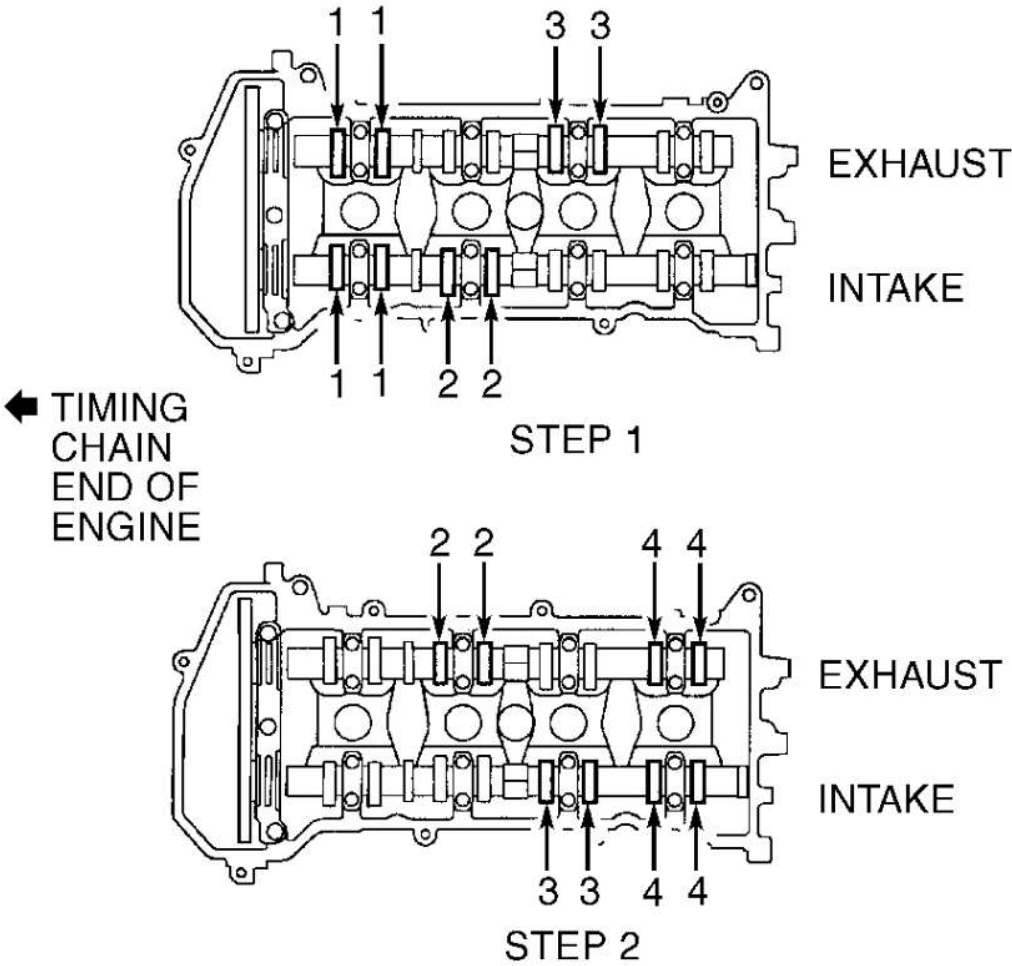
Fig. 12: Checking Reference Mark Alignment (Corolla)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 13: Checking Reference Mark Alignment (MR2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. With cylinder No. 1 at TDC on compression stroke, use feeler gauge to measure valve clearance between valve lifter and camshaft on specified valves. Perform STEP 1 in illustration. See **Fig. 14** . Record valve clearance.
5. To check remaining valves, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover. Using feeler gauge, measure valve clearance on specified valves. Perform STEP 2 in illustration. See **Fig. 14** . Record valve clearance.



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Fig. 14: Identifying Cylinder Numbers & Checking Valve Clearance (Celica 1.8L 1ZZ-FE, Corolla & MR2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. Ensure valve clearance is within specification. See **VALVE CLEARANCE SPECIFICATIONS (CELICA 1.8L 1ZZ-FE, COROLLA & MR2)** table.

VALVE CLEARANCE SPECIFICATIONS (CELICA 1.8L 1ZZ-FE, COROLLA & MR2)

Application	(1) In. (mm)
Intake	.006-.010 (.15-.25)
Exhaust	.010-.014 (.25-.35)

(1) Adjust valve clearance with engine cold. Verify valve clearance listed with valve clearance listed on

underhood label (if available). If valve clearance on underhood label differs from valve clearance listed, use specification on underhood label.

7. If valve clearance requires adjustment, camshafts must be removed for access to valve lifters. Different thickness valve lifters are used. Manufacturer recommends placing reference mark on timing chain and camshaft sprockets, removing timing chain tensioner and then removing camshaft sprockets and camshafts for access to valve lifter while supporting timing chain. To remove camshafts, see appropriate article in ENGINES.
8. Remove valve lifter from cylinder head. Using micrometer, measure thickness of valve lifter. See **Fig. 4** . Using thickness of used valve lifter and measured clearance, determine correct thickness of valve lifter to be used for proper valve by using the follow equation, or using valve lifter selection charts. For intake valves, "N" (new valve lifter thickness) = "T" (used valve lifter thickness) + "A" (measured clearance) minus .0080" (.200 mm). For exhaust valves, "N" (new valve lifter thickness) = "T" (used valve lifter thickness) + "A" (measured clearance) minus .0120" (.300 mm). Valve lifters are available in 35 sizes ranging from .1992" (5.060 mm) to .2260" (5.740 mm) in increments of .0008" (.020 mm). For valve lifter selection charts, see **Fig. 17** and **Fig. 18** .
9. Install replacement valve lifter, camshafts and timing chain. Recheck valve clearance. To ensure proper valve timing after reinstalling camshafts and timing chain, check that reference marks on camshaft sprockets are aligned and positioned in a straight line at top surface on timing chain cover when crankshaft pulley timing mark (groove) is aligned with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. See **Fig. 11 -Fig. 13** .
10. Before installing valve cover and gasket, apply sealant at specified areas on cylinder head. See **Fig. 15** . Install gasket, valve cover, seal washers, bolts and nuts. On Celica, tighten valve cover bolts/nuts to specification. See **TORQUE SPECIFICATIONS** . On Corolla and MR2, tighten valve cover bolts/nuts to specification in sequence. See **Fig. 16** . See **TORQUE SPECIFICATIONS** . On all models, to install remaining components, reverse removal procedure. Tighten ignition coil bolts to specification. See **TORQUE SPECIFICATIONS** .

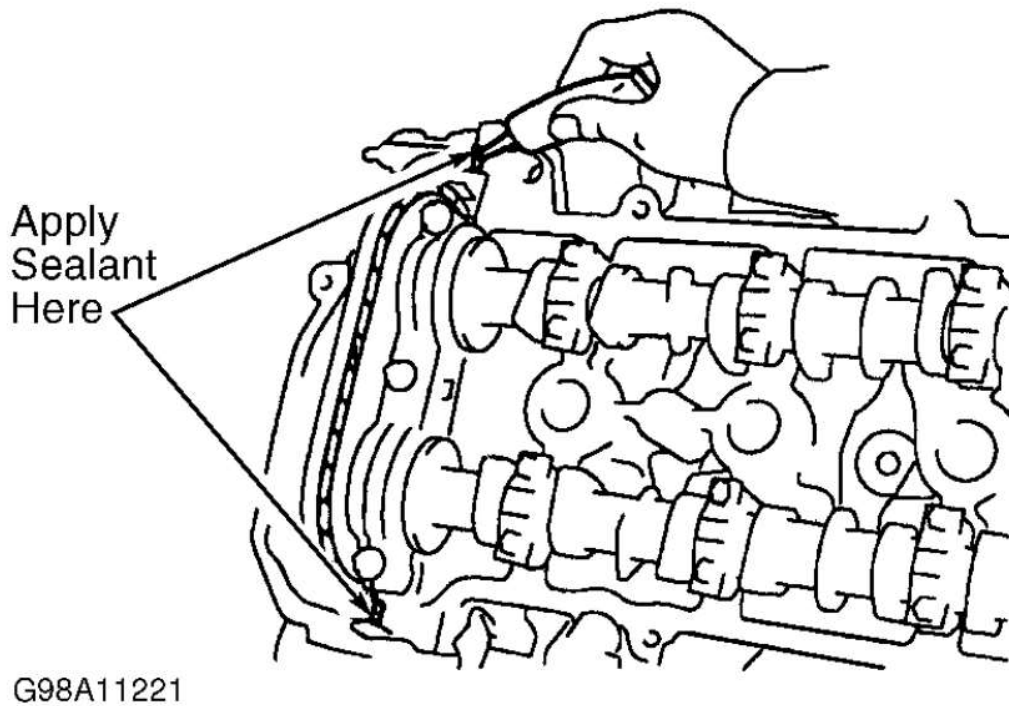
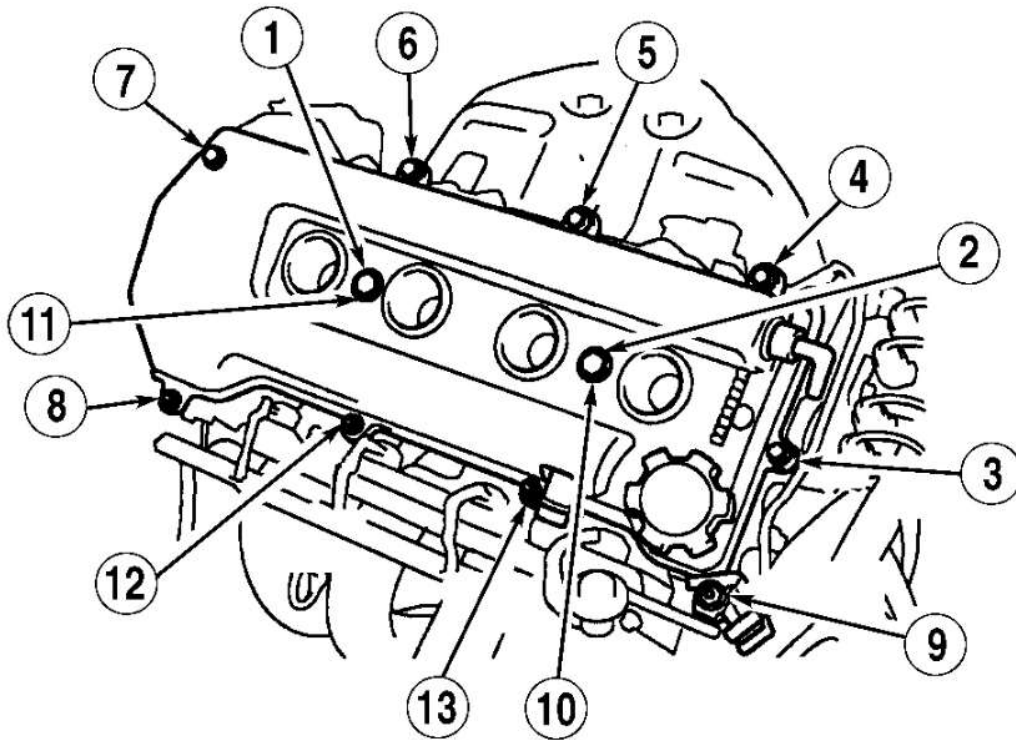


Fig. 15: Locating Valve Cover Sealant Application Areas (Celica, Corolla, ECHO, MR2 & Prius)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



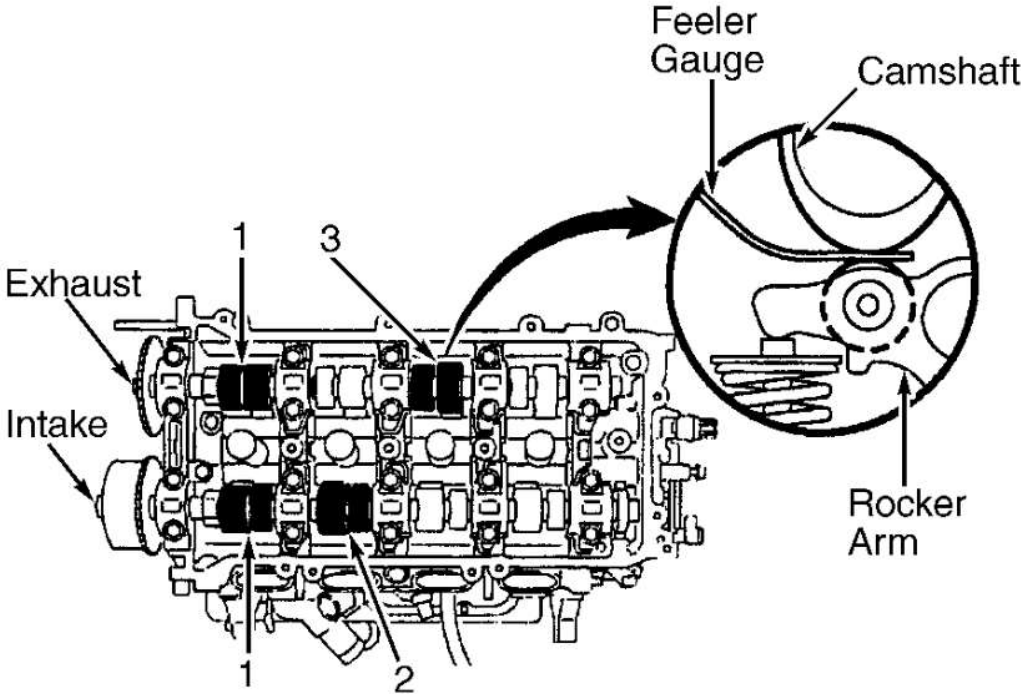
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Fig. 16: Typical Valve Cover Bolt/Nut Tightening Sequence (Corolla & MR2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

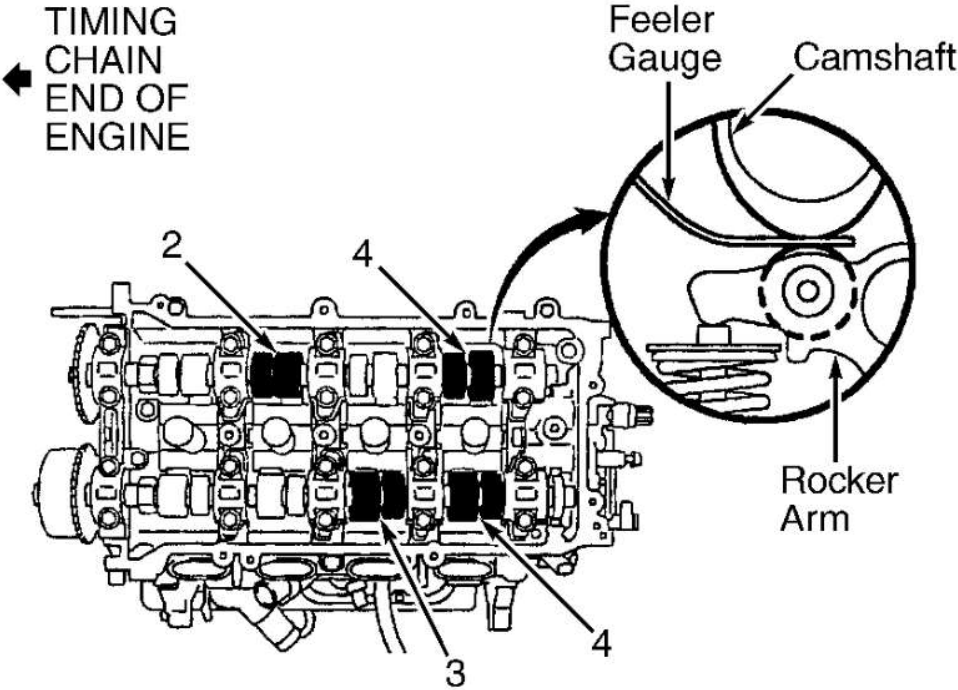
Installed (after thickness mm (in.))	0.06 (0.002)	0.10 (0.004)	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.032)	0.85 (0.034)	0.90 (0.036)	0.95 (0.038)	1.00 (0.040)	1.05 (0.042)	1.10 (0.044)	1.15 (0.046)	1.20 (0.048)	1.25 (0.050)	1.30 (0.052)	1.35 (0.054)	1.40 (0.056)	1.45 (0.058)	1.50 (0.060)	1.55 (0.062)	1.60 (0.064)	1.65 (0.066)	1.70 (0.068)	1.75 (0.070)	1.80 (0.072)	1.85 (0.074)	1.90 (0.076)	1.95 (0.078)	2.00 (0.080)	2.05 (0.082)	2.10 (0.084)	2.15 (0.086)	2.20 (0.088)	2.25 (0.090)	2.30 (0.092)	2.35 (0.094)	2.40 (0.096)	2.45 (0.098)	2.50 (0.100)	2.55 (0.102)	2.60 (0.104)	2.65 (0.106)	2.70 (0.108)	2.75 (0.110)	2.80 (0.112)	2.85 (0.114)	2.90 (0.116)	2.95 (0.118)	3.00 (0.120)	3.05 (0.122)	3.10 (0.124)	3.15 (0.126)	3.20 (0.128)	3.25 (0.130)	3.30 (0.132)	3.35 (0.134)	3.40 (0.136)	3.45 (0.138)	3.50 (0.140)	3.55 (0.142)	3.60 (0.144)	3.65 (0.146)	3.70 (0.148)	3.75 (0.150)	3.80 (0.152)	3.85 (0.154)	3.90 (0.156)	3.95 (0.158)	4.00 (0.160)	4.05 (0.162)	4.10 (0.164)	4.15 (0.166)	4.20 (0.168)	4.25 (0.170)	4.30 (0.172)	4.35 (0.174)	4.40 (0.176)	4.45 (0.178)	4.50 (0.180)	4.55 (0.182)	4.60 (0.184)	4.65 (0.186)	4.70 (0.188)	4.75 (0.190)	4.80 (0.192)	4.85 (0.194)	4.90 (0.196)	4.95 (0.198)	5.00 (0.200)	5.05 (0.202)	5.10 (0.204)	5.15 (0.206)	5.20 (0.208)	5.25 (0.210)	5.30 (0.212)	5.35 (0.214)	5.40 (0.216)	5.45 (0.218)	5.50 (0.220)	5.55 (0.222)	5.60 (0.224)	5.65 (0.226)	5.70 (0.228)	5.75 (0.230)	5.80 (0.232)	5.85 (0.234)	5.90 (0.236)	5.95 (0.238)	6.00 (0.240)	6.05 (0.242)	6.10 (0.244)	6.15 (0.246)	6.20 (0.248)	6.25 (0.250)	6.30 (0.252)	6.35 (0.254)	6.40 (0.256)	6.45 (0.258)	6.50 (0.260)	6.55 (0.262)	6.60 (0.264)	6.65 (0.266)	6.70 (0.268)	6.75 (0.270)	6.80 (0.272)	6.85 (0.274)	6.90 (0.276)	6.95 (0.278)	7.00 (0.280)	7.05 (0.282)	7.10 (0.284)	7.15 (0.286)	7.20 (0.288)	7.25 (0.290)	7.30 (0.292)	7.35 (0.294)	7.40 (0.296)	7.45 (0.298)	7.50 (0.300)	7.55 (0.302)	7.60 (0.304)	7.65 (0.306)	7.70 (0.308)	7.75 (0.310)	7.80 (0.312)	7.85 (0.314)	7.90 (0.316)	7.95 (0.318)	8.00 (0.320)	8.05 (0.322)	8.10 (0.324)	8.15 (0.326)	8.20 (0.328)	8.25 (0.330)	8.30 (0.332)	8.35 (0.334)	8.40 (0.336)	8.45 (0.338)	8.50 (0.340)	8.55 (0.342)	8.60 (0.344)	8.65 (0.346)	8.70 (0.348)	8.75 (0.350)	8.80 (0.352)	8.85 (0.354)	8.90 (0.356)	8.95 (0.358)	9.00 (0.360)	9.05 (0.362)	9.10 (0.364)	9.15 (0.366)	9.20 (0.368)	9.25 (0.370)	9.30 (0.372)	9.35 (0.374)	9.40 (0.376)	9.45 (0.378)	9.50 (0.380)	9.55 (0.382)	9.60 (0.384)	9.65 (0.386)	9.70 (0.388)	9.75 (0.390)	9.80 (0.392)	9.85 (0.394)	9.90 (0.396)	9.95 (0.398)	10.00 (0.400)	10.05 (0.402)	10.10 (0.404)	10.15 (0.406)	10.20 (0.408)	10.25 (0.410)	10.30 (0.412)	10.35 (0.414)	10.40 (0.416)	10.45 (0.418)	10.50 (0.420)	10.55 (0.422)	10.60 (0.424)	10.65 (0.426)	10.70 (0.428)	10.75 (0.430)	10.80 (0.432)	10.85 (0.434)	10.90 (0.436)	10.95 (0.438)	11.00 (0.440)	11.05 (0.442)	11.10 (0.444)	11.15 (0.446)	11.20 (0.448)	11.25 (0.450)	11.30 (0.452)	11.35 (0.454)	11.40 (0.456)	11.45 (0.458)	11.50 (0.460)	11.55 (0.462)	11.60 (0.464)	11.65 (0.466)	11.70 (0.468)	11.75 (0.470)	11.80 (0.472)	11.85 (0.474)	11.90 (0.476)	11.95 (0.478)	12.00 (0.480)	12.05 (0.482)	12.10 (0.484)	12.15 (0.486)	12.20 (0.488)	12.25 (0.490)	12.30 (0.492)	12.35 (0.494)	12.40 (0.496)	12.45 (0.498)	12.50 (0.500)	12.55 (0.502)	12.60 (0.504)	12.65 (0.506)	12.70 (0.508)	12.75 (0.510)	12.80 (0.512)	12.85 (0.514)	12.90 (0.516)	12.95 (0.518)	13.00 (0.520)	13.05 (0.522)	13.10 (0.524)	13.15 (0.526)	13.20 (0.528)	13.25 (0.530)	13.30 (0.532)	13.35 (0.534)	13.40 (0.536)	13.45 (0.538)	13.50 (0.540)	13.55 (0.542)	13.60 (0.544)	13.65 (0.546)	13.70 (0.548)	13.75 (0.550)	13.80 (0.552)	13.85 (0.554)	13.90 (0.556)	13.95 (0.558)	14.00 (0.560)	14.05 (0.562)	14.10 (0.564)	14.15 (0.566)	14.20 (0.568)	14.25 (0.570)	14.30 (0.572)	14.35 (0.574)	14.40 (0.576)	14.45 (0.578)	14.50 (0.580)	14.55 (0.582)	14.60 (0.584)	14.65 (0.586)	14.70 (0.588)	14.75 (0.590)	14.80 (0.592)	14.85 (0.594)	14.90 (0.596)	14.95 (0.598)	15.00 (0.600)	15.05 (0.602)	15.10 (0.604)	15.15 (0.606)	15.20 (0.608)	15.25 (0.610)	15.30 (0.612)	15.35 (0.614)	15.40 (0.616)	15.45 (0.618)	15.50 (0.620)	15.55 (0.622)	15.60 (0.624)	15.65 (0.626)	15.70 (0.628)	15.75 (0.630)	15.80 (0.632)	15.85 (0.634)	15.90 (0.636)	15.95 (0.638)	16.00 (0.640)	16.05 (0.642)	16.10 (0.644)	16.15 (0.646)	16.20 (0.648)	16.25 (0.650)	16.30 (0.652)	16.35 (0.654)	16.40 (0.656)	16.45 (0.658)	16.50 (0.660)	16.55 (0.662)	16.60 (0.664)	16.65 (0.666)	16.70 (0.668)	16.75 (0.670)	16.80 (0.672)	16.85 (0.674)	16.90 (0.676)	16.95 (0.678)	17.00 (0.680)	17.05 (0.682)	17.10 (0.684)	17.15 (0.686)	17.20 (0.688)	17.25 (0.690)	17.30 (0.692)	17.35 (0.694)	17.40 (0.696)	17.45 (0.698)	17.50 (0.700)	17.55 (0.702)	17.60 (0.704)	17.65 (0.706)	17.70 (0.708)	17.75 (0.710)	17.80 (0.712)	17.85 (0.714)	17.90 (0.716)	17.95 (0.718)	18.00 (0.720)	18.05 (0.722)	18.10 (0.724)	18.15 (0.726)	18.20 (0.728)	18.25 (0.730)	18.30 (0.732)	18.35 (0.734)	18.40 (0.736)	18.45 (0.738)	18.50 (0.740)	18.55 (0.742)	18.60 (0.744)	18.65 (0.746)	18.70 (0.748)	18.75 (0.750)	18.80 (0.752)	18.85 (0.754)	18.90 (0.756)	18.95 (0.758)	19.00 (0.760)	19.05 (0.762)	19.10 (0.764)	19.15 (0.766)	19.20 (0.768)	19.25 (0.770)	19.30 (0.772)	19.35 (0.774)	19.40 (0.776)	19.45 (0.778)	19.50 (0.780)	19.55 (0.782)	19.60 (0.784)	19.65 (0.786)	19.70 (0.788)	19.75 (0.790)	19.80 (0.792)	19.85 (0.794)	19.90 (0.796)	19.95 (0.798)	20.00 (0.800)	20.05 (0.802)	20.10 (0.804)	20.15 (0.806)	20.20 (0.808)	20.25 (0.810)	20.30 (0.812)	20.35 (0.814)	20.40 (0.816)	20.45 (0.818)	20.50 (0.820)	20.55 (0.822)	20.60 (0.824)	20.65 (0.826)	20.70 (0.828)	20.75 (0.830)	20.80 (0.832)	20.85 (0.834)	20.90 (0.836)	20.95 (0.838)	21.00 (0.840)	21.05 (0.842)	21.10 (0.844)	21.15 (0.846)	21.20 (0.848)	21.25 (0.850)	21.30 (0.852)	21.35 (0.854)	21.40 (0.856)	21.45 (0.858)	21.50 (0.860)	21.55 (0.862)	21.60 (0.864)	21.65 (0.866)	21.70 (0.868)	21.75 (0.870)	21.80 (0.872)	21.85 (0.874)	21.90 (0.876)	21.95 (0.878)	22.00 (0.880)	22.05 (0.882)	22.10 (0.884)	22.15 (0.886)	22.20 (0.888)	22.25 (0.890)	22.30 (0.892)	22.35 (0.894)	22.40 (0.896)	22.45 (0.898)	22.50 (0.900)	22.55 (0.902)	22.60 (0.904)	22.65 (0.906)	22.70 (0.908)	22.75 (0.910)	22.80 (0.912)	22.85 (0.914)	22.90 (0.916)	22.95 (0.918)	23.00 (0.920)	23.05 (0.922)	23.10 (0.924)	23.15 (0.926)	23.20 (0.928)	23.25 (0.930)	23.30 (0.932)	23.35 (0.934)	23.40 (0.936)	23.45 (0.938)	23.50 (0.940)	23.55 (0.942)	23.60 (0.944)	23.65 (0.946)	23.70 (0.948)	23.75 (0.950)	23.80 (0.952)	23.85 (0.954)	23.90 (0.956)	23.95 (0.958)	24.00 (0.960)	24.05 (0.962)	24.10 (0.964)	24.15 (0.966)	24.20 (0.968)	24.25 (0.970)	24.30 (0.972)	24.35 (0.974)	24.40 (0.976)	24.45 (0.978)	24.50 (0.980)	24.55 (0.982)	24.60 (0.984)	24.65 (0.986)	24.70 (0.988)	24.75 (0.990)	24.80 (0.992)	24.85 (0.994)	24.90 (0.996)	24.95 (0.998)	25.00 (1.000)	25.05 (1.002)	25.10 (1.004)	25.15 (1.006)	25.20 (1.008)	25.25 (1.010)	25.30 (1.012)	25.35 (1.014)	25.40 (1.016)	25.45 (1.018)	25.50 (1.020)	25.55 (1.022)	25.60 (1.024)	25.65 (1.026)	25.70 (1.028)	25.75 (1.030)	25.80 (1.032)	25.85 (1.034)	25.90 (1.036)	25.95 (1.038)	26.00 (1.040)	26.05 (1.042)	26.10 (1.044)	26.15 (1.046)	26.20 (1.048)	26.25 (1.050)	26.30 (1.052)	26.35 (1.054)	26.40 (1.056)	26.45 (1.058)	26.50 (1.060)	26.55 (1.062)	26.60 (1.064)	26.65 (1.066)	26.70 (1.068)	26.75 (1.070)	26.80 (1.072)	26.85 (1.074)	26.90 (1.076)	26.95 (1.078)	27.00 (1.080)	27.05 (1.082)	27.10 (1.084)	27.15 (1.086)	27.20 (1.088)	27.25 (1.090)	27.30 (1.092)	27.35 (1.094)	27.40 (1.096)	27.45 (1.098)	27.50 (1.100)	27.55 (1.102)	27.60 (1.104)	27.65 (1.106)	27.70 (1.108)	27.75 (1.110)	27.80 (1.112)	27.85 (1.114)	27.90 (1.116)	27.95 (1.118)	28.00 (1.120)	28.05 (1.122)	28.10 (1.124)	28.15 (1.126)	28.20 (1.128)	28.25 (1.130)	28.30 (1.132)	28.35 (1.134)	28.40 (1.136)	28.45 (1.138)	28.50 (1.140)	28.55 (1.142)	28.60 (1.144)	28.65 (1.146)	28.70 (1.148)	28.75 (1.150)	28.80 (1.152)	28.85 (1.154)	28.90 (1.156)	28.95 (1.158)	29.00 (1.160)	29.05 (1.162)	29.10 (1.164)	29.15 (1.166)	29.20 (1.168)	29.25 (1.170)	29.30 (1.172)	29.35 (1.174)	29.40 (1.176)	29.45 (1.178)	29.50 (1.180)	29.55 (1.182)	29.60 (1.184)	29.65 (1.186)	29.70 (1.188)	29.75 (1.190)	29.80 (1.192)	29.85 (1.194)	29.90 (1.196)	29.95 (1.198)	30.00 (1.200)	30.05 (1.202)	30.10 (1.204)	30.15 (1.206)	30.20 (1.208)	30.25 (1.210)	30.30 (1.212)	30.35 (1.214)	30.40 (1.216)	30.45 (1.218)	30.50 (1.220)	30.55 (1.222)	30.60 (1.224)	30.65 (1.226)	30.70 (1.228)	30.75 (1.230)	30.80 (1.232)	30.85 (1.234)	30.90 (1.236)	30.95 (1.238)	31.00 (1.240)	31.05 (1.242)	31.10 (1.244)	31.15 (1.246)	31.20 (1.248)	31.25 (1.250)	31.30 (1.252)	31.35 (1.254)	31.40 (1.256)	31.45 (1.258)	31.50 (1.260)	31.55 (1.262)	31.60 (1.264)	31.65 (1.266)	31.70 (1.268)	31.75 (1.270)	31.80 (1.272)	31.85 (1.274)	31.90 (1.276)	31.95 (1.278)	32.00 (1.280)	32.05 (1.282)	32.10 (1.284)	32.15 (1.286)	32.20 (1.288)	32.25 (1.290)	32.30 (1.292)	32.35 (1.294)	32.40 (1.296)	32.45 (1.298)	32.50 (1.300)	32.55 (1.302)	32.60 (1.304)	32.65 (1.306)	32.70 (1.308)	32.75 (1.310)	32.80 (1.312)	32.85 (1.314)	32.90 (1.316)	32.95 (1.318)	33.00 (1.320)	33.05 (1.322)	33.10 (1.324)	33.15 (1.326)	33.20 (1.328)	33.25 (1.330)	33.30 (1.332)	33.35 (1.334)	33.40 (1.336)	33.45 (1.338)	33.50 (1.340)	33.55 (1.342)	33.60 (1.344)	33.65 (1.346)	33.70 (1.348)	33.75 (1.350)	33.80 (1.352)	33.85 (1.354)	33.90 (1.356)	33.95 (1.358)	34.00 (1.360)	34.05 (1.362)	34.10 (1.364)	34.15 (1.366)	34.20 (1.368)	34.25 (1.370)	34.30 (1.372)	34.35 (1.374)	34.40 (1.376)	34.45 (1.378)	34.50 (1.380)	34.55 (1.382)	34.60 (1.384)	34.65 (1.386)	34.70 (1.388)	34.75 (1.390)	34.80 (1.392)	34.85 (1.394)	34.90 (1.396)	34.95 (1.398)	35.00 (1.400)	35.05 (1.402)	35.10 (1.404)	35.15 (1.406)	35.20 (1.408)	35.25 (1.410)	35.30 (1.412)	35.35 (1.414)	35.40 (1.416)	35.45 (1.418)	35.50 (1.420)	35.55 (1.422)	35.60 (1.424)	35.65 (1.426)	35.70 (1.428)	35.75 (1.430)	35.80 (1.432)	35.85 (1.434)	35.90 (1.436)	35.95 (1.438)	36.00 (1.440)	36.05 (1.442)	36.10 (1.444)	36.15 (1.446)	36.20 (1.448)	36.25 (1.450)	36.30 (1.452)	36.35 (1.454)	36.40 (1.456)	36.45 (1.458)	36.50 (1.460)	36.55 (1.462)	36.60 (1.464)	36.65 (1.466)	36.70 (1.468)	36.75 (1.470)	36.80 (1.472)	36.85 (1.474)	36.90 (1.476)	36.95 (1.478)	37.00 (1.480)	37.05 (1.482)	37.10 (1.484)	37.15 (1.486)	37.20 (1.488)	37.25 (1.490)	37.30 (1.492)	37.35 (1.494)	37.40 (1.496)	37.45 (1.498)	37.50 (1.500)	37.55 (1.502)	37.60 (1.504)	37.65 (1.506)	37.70 (1.508)	37.75 (1.510)	37.80 (1.512)	37.85 (1.514)	37.90 (1.516)	37.95 (1.518)	38.00 (1.520)	38.05 (1.522)	38.10 (1.524)	38.15 (1.526)	38.20 (1.528)	38.25 (1.530)	38.30 (1.532)	38.35 (1.534)	38.40 (1.536)	38.45 (1.538)	38.50 (1.540)	38.55 (1.542)	38.60 (1.544)	38.65 (1.546)	38.70 (1.548)	38.75 (1.550)	38.80 (1.552)	38.85 (1.554)	38.90 (1.556)	38.95 (1
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Fig. 19 . Record valve clearance.

6. To check remaining valves, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover. Using feeler gauge, measure valve clearance between rocker arm and camshaft lobe on both valves on specified cylinders. Perform STEP 2 in illustration. See **Fig. 19** . Record valve clearance.



STEP 1



STEP 2

G00014905

Fig. 19: Identifying Cylinder Numbers & Checking Valve Clearance (Celica 1.8L 2ZZ-GE)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. Ensure valve clearance is within specification. See **VALVE CLEARANCE SPECIFICATIONS (CELICA 1.8L 2ZZ-GE)** table.

VALVE CLEARANCE SPECIFICATIONS (CELICA 1.8L 2ZZ-GE)

Application	(1) In. (mm)
Intake	.003-.007 (.08-.19)
Exhaust	.008-.013 (.22-.33)

(1) Adjust valve clearance with engine cold. Verify valve clearance listed with valve clearance listed on underhood label (if available). If valve clearance on underhood label differs from valve clearance listed, use specification on underhood label.

8. If valve clearance requires adjustment, remove spark plug on cylinder in which valve clearance adjustment is required so compression is released. Rotate crankshaft so rocker arm for valve to be adjusted is pushed fully downward by the camshaft lobe. Perform STEP 1 in illustration. See **Fig. 20**.
9. Install Valve Spring Compressor (SST 09248-77010) on spark plug tube. Perform STEP 2 in illustration. See **Fig. 20**. Set screw must be loosened so valve spring compressor fully seats on spark plug tube. Operate lever so plate fully seats against valve spring retainer and tighten set screw. Perform STEP 3 in illustration. See **Fig. 20**. Ensure no clearance exists between plate and valve spring retainer, as any clearance may cause the valve keeper to be released.
10. Carefully rotate crankshaft so camshaft lobe is positioned upward, away from rocker arm. Ensure camshaft lobe does not contact valve spring compressor when rotating camshaft. Lift rocker arm assembly upward. Using Adjusting Shim Remover/Installer (SST 09248-07020), remove adjusting shim from top of valve stem. Perform STEP 4 in illustration. See **Fig. 20**.

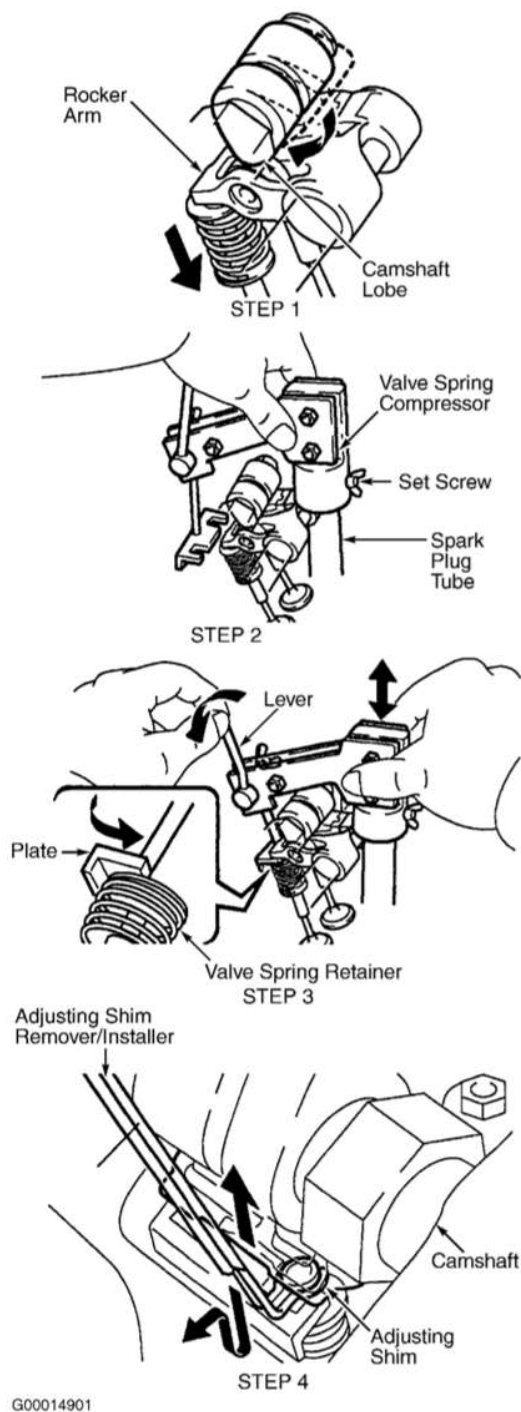


Fig. 20: Removing & Installing Adjusting Shim (Celica 1.8L 2ZZ-GE)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. Using dial indicator, measure thickness of removed adjusting shim. See **Fig. 21** . Using thickness of used

adjusting shim and measured clearance, determine correct thickness of adjusting shim to be used for proper valve by using the follow equation, or using adjusting shim selection charts. For intake valves, "N" (new adjusting shim thickness) = "T" (used adjusting shim thickness) + "A" (measured clearance) minus .0051" (.130 mm). For exhaust valves, "N" (new adjusting shim thickness) = "T" (used adjusting shim thickness) + "A" (measured clearance) minus .0106" (.270 mm). Adjusting shims are available in 41 sizes ranging from .0787" (2.000 mm) to .1102" (2.800 mm) in increments of .0008" (.020 mm). For adjusting shim selection charts, see **Fig. 22** and **Fig. 23**.

12. Lift rocker arm assembly upward. Using adjusting shim remover/installer, install replacement adjusting shim. Rotate crankshaft so rocker arm is pushed fully downward by the camshaft lobe. Ensure camshaft lobe does not contact valve spring compressor when rotating camshaft. Operate lever to remove plate from valve spring retainer. Loosen set screw and remove valve spring compressor. Recheck valve clearance.
13. Install spark plug and tighten to 13 ft. lbs. (18 N.m). Before installing valve cover and gasket, apply sealant at specified areas on cylinder head. See **Fig. 15**. Install gasket, valve cover and valve cover bolts. Tighten valve cover bolts to specification. See **TORQUE SPECIFICATIONS**.
14. Using NEW gasket, install ventilation pipe. Tighten ventilation pipe bolts/nuts to specification. See **TORQUE SPECIFICATIONS**. Install ignition coils. Tighten ignition coil bolts to specification. See **TORQUE SPECIFICATIONS**.

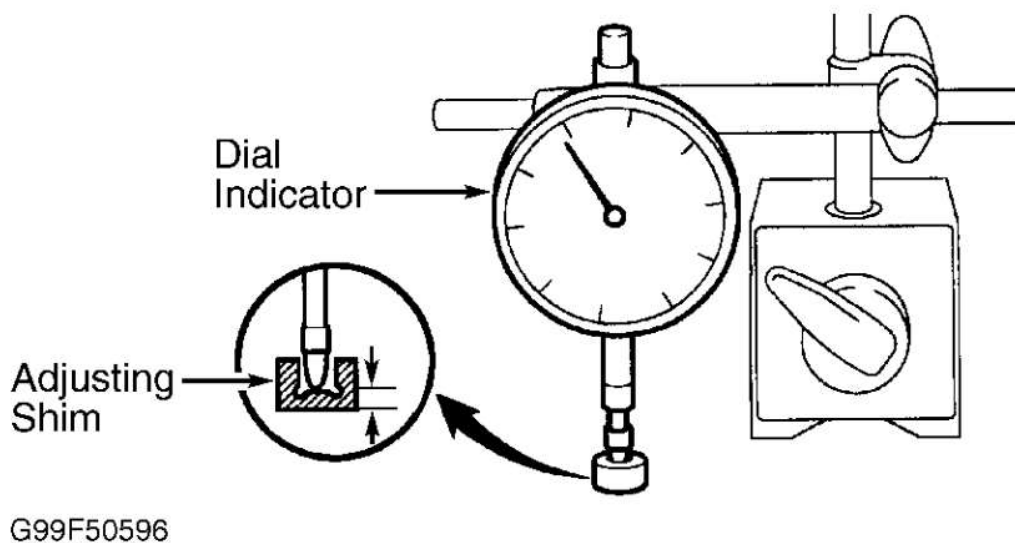


Fig. 21: Measuring Adjusting Shim Thickness (Celica 1.8L 2ZZ-GE)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

G00025381

Shim No.	Thickness	Shim No.	Thickness	Shim No.	Thickness
00	2.000 (0.0787)	28	2.280 (0.0898)	56	2.560 (0.1008)
02	2.020 (0.0795)	30	2.300 (0.0906)	58	2.580 (0.1016)
04	2.040 (0.0803)	32	2.320 (0.0913)	60	2.600 (0.1024)
06	2.060 (0.0811)	34	2.340 (0.0921)	62	2.620 (0.1031)
08	2.080 (0.0819)	36	2.360 (0.0929)	64	2.640 (0.1039)
10	2.100 (0.0827)	38	2.380 (0.0937)	66	2.660 (0.1047)
12	2.120 (0.0835)	40	2.400 (0.0945)	68	2.680 (0.1055)
14	2.140 (0.0843)	42	2.420 (0.0953)	70	2.700 (0.1063)
16	2.160 (0.0850)	44	2.440 (0.0961)	72	2.720 (0.1071)
18	2.180 (0.0858)	46	2.460 (0.0969)	74	2.740 (0.1079)
20	2.200 (0.0866)	48	2.480 (0.0976)	76	2.760 (0.1087)
22	2.220 (0.0874)	50	2.500 (0.0984)	78	2.780 (0.1094)
24	2.240 (0.0882)	52	2.520 (0.0992)	80	2.800 (0.1102)
26	2.260 (0.0890)	54	2.540 (0.1000)		

EXAMPLE: A 0.0866" (2.200 mm) shim is installed and measured clearance is 0.0157" (0.400 mm). Replace 0.0866" (2.200 mm) shim with a No. 56 shim.

Fig. 22: Intake Valve Adjusting Shim Selection Chart (Celica 1.8L 2ZZ-GE)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

G00025385

EXAMPLE: A 0.0866" (2.200 mm) shim is installed and measured clearance is 0.0197" (0.500 mm). Replace 0.0866" (2.200 mm) shim with a No. 50 shim.

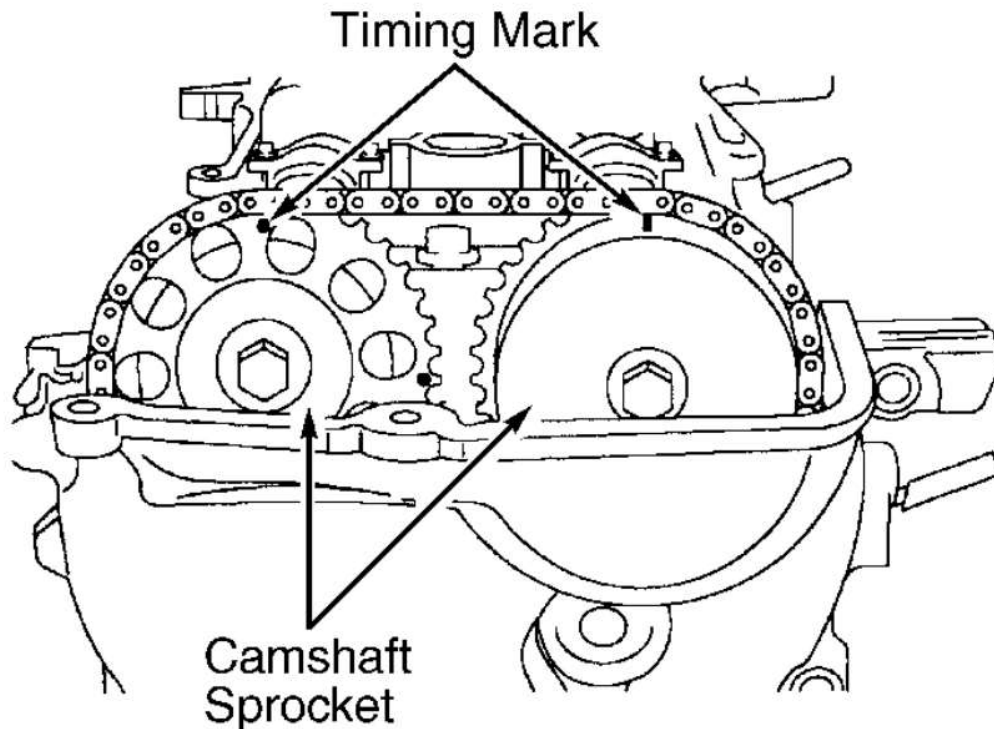
(Shim No.	Thickness	(Shim No.	Thickness	(Shim No.	Thickness
00	2.000 (0.0787)	20	2.280 (0.0898)	56	2.560 (0.1008)
02	2.020 (0.0795)	30	2.300 (0.0906)	58	2.580 (0.1016)
04	2.040 (0.0803)	32	2.320 (0.0913)	60	2.600 (0.1024)
06	2.060 (0.0811)	34	2.340 (0.0921)	62	2.620 (0.1031)
08	2.080 (0.0819)	36	2.360 (0.0929)	64	2.640 (0.1039)
10	2.100 (0.0827)	38	2.380 (0.0937)	66	2.660 (0.1047)
12	2.120 (0.0835)	40	2.400 (0.0945)	68	2.680 (0.1055)
14	2.140 (0.0843)	42	2.420 (0.0953)	70	2.700 (0.1063)
16	2.160 (0.0850)	44	2.440 (0.0961)	72	2.720 (0.1071)
18	2.180 (0.0858)	46	2.460 (0.0969)	74	2.740 (0.1079)
20	2.200 (0.0866)	48	2.480 (0.0976)	76	2.760 (0.1087)
22	2.220 (0.0874)	50	2.500 (0.0984)	78	2.780 (0.1094)
24	2.240 (0.0882)	52	2.520 (0.0992)	80	2.800 (0.1102)
26	2.260 (0.0890)	54	2.540 (0.1000)		

Fig. 23: Exhaust Valve Adjusting Shim Selection Chart (Celica 1.8L 2ZZ-GE)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ECHO & Prius

WARNING: On Prius, read service precautions before proceeding with service procedure. See **SERVICE PRECAUTIONS** .

1. On ECHO, remove No. 2 cylinder head cover located on top of engine, above ignition coils and valve cover. On Prius, remove air cleaner assembly located above the valve cover. On all models, disconnect electrical connectors at ignition coils mounted on top of valve cover. Remove bolts and ignition coils from valve cover. Disconnect PCV hoses from valve cover.
2. Remove valve cover bolts/nuts, seal washers, valve cover and gasket. Rotate crankshaft clockwise (viewed from timing chain end of engine) until crankshaft pulley timing mark (groove) aligns with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing chain end of engine.
3. Ensure timing marks on camshaft sprockets are facing upward at 12 o'clock position. See **Fig. 24** . If timing marks are not as specified, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover and then recheck timing mark alignment.



G99E52856

Fig. 24: Checking Timing Mark Alignment (ECHO & Prius)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. With cylinder No. 1 at TDC on compression stroke, use feeler gauge to measure valve clearance between valve lifter and camshaft on specified valves. Perform STEP 1 in illustration. See **Fig. 25** . Record valve clearance.
5. To check remaining valves, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover. Using feeler gauge, measure valve clearance between valve lifter and camshaft on specified valves. Perform STEP 2 in illustration. See **Fig. 25** . Record valve clearance.

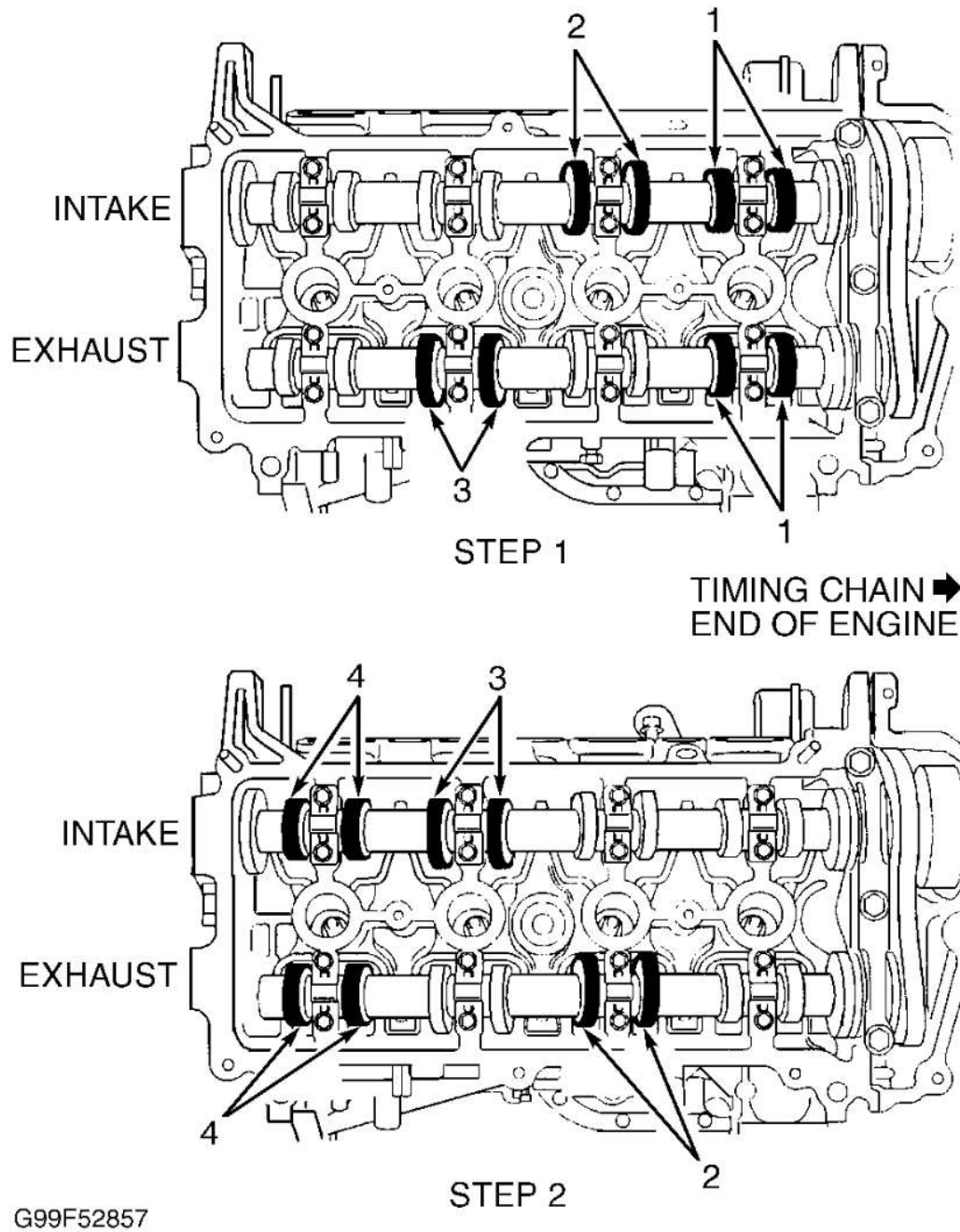


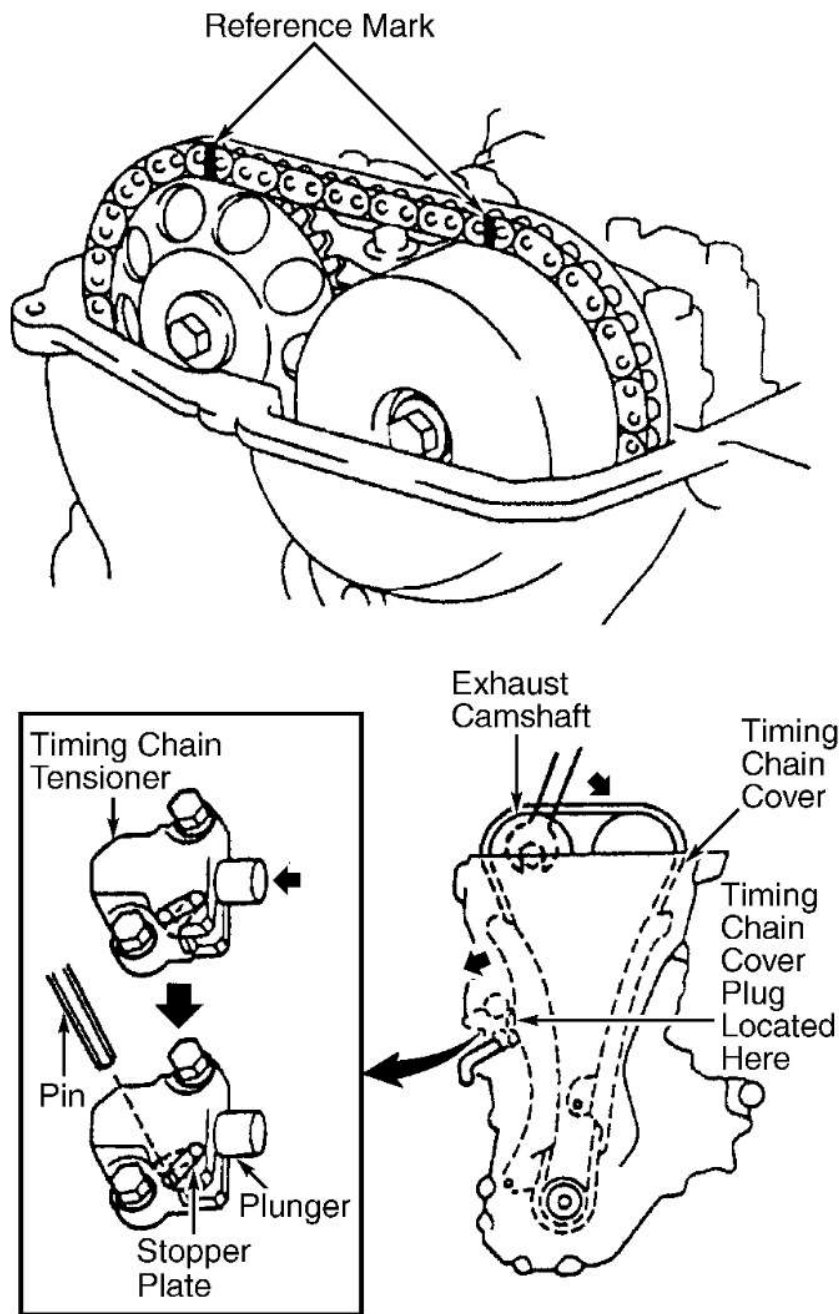
Fig. 25: Identifying Cylinder Numbers & Checking Valve Clearance (ECHO & Prius)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. Ensure valve clearance is within specification. See **VALVE CLEARANCE SPECIFICATIONS (ECHO & PRIUS)** table.

VALVE CLEARANCE SPECIFICATIONS (ECHO & PRIUS)

Application	(1) In. (mm)
Intake	.006-.010 (.15-.25)
Exhaust	.010-.014 (.25-.35)
(1) Adjust valve clearance with engine cold. Verify valve clearance listed with valve clearance listed on underhood label (if available). If valve clearance on underhood label differs from valve clearance listed, use specification on underhood label.	

7. If valve clearance requires adjustment, camshafts must be removed for access to valve lifters. Different thickness valve lifters are used. Rotate crankshaft clockwise (viewed from timing chain end of engine) until crankshaft pulley timing mark (groove) aligns with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. Ensure camshafts are positioned so timing marks on camshaft sprockets are facing upward at 12 o'clock position. See **Fig. 24**.
8. Place reference marks on timing chain at both camshaft sprockets. See **Fig. 26**. Rotate crankshaft counterclockwise 40 degrees from TDC. Remove timing chain cover plug from front of timing chain cover. See **Fig. 26**.
9. Using screwdriver, rotate stopper plate on timing chain tensioner upward while rotating exhaust camshaft slightly clockwise and pushing plunger on timing chain tensioner inward. See **Fig. 26**. Once plunger on timing chain tensioner is pushed inward, move stopper plate downward and install a .08-.12" (2.0-3.0 mm) pin through stopper plate and into hole on timing chain tensioner to retain the plunger in retracted position. See **Fig. 26**. Use tape to secure pin in place.

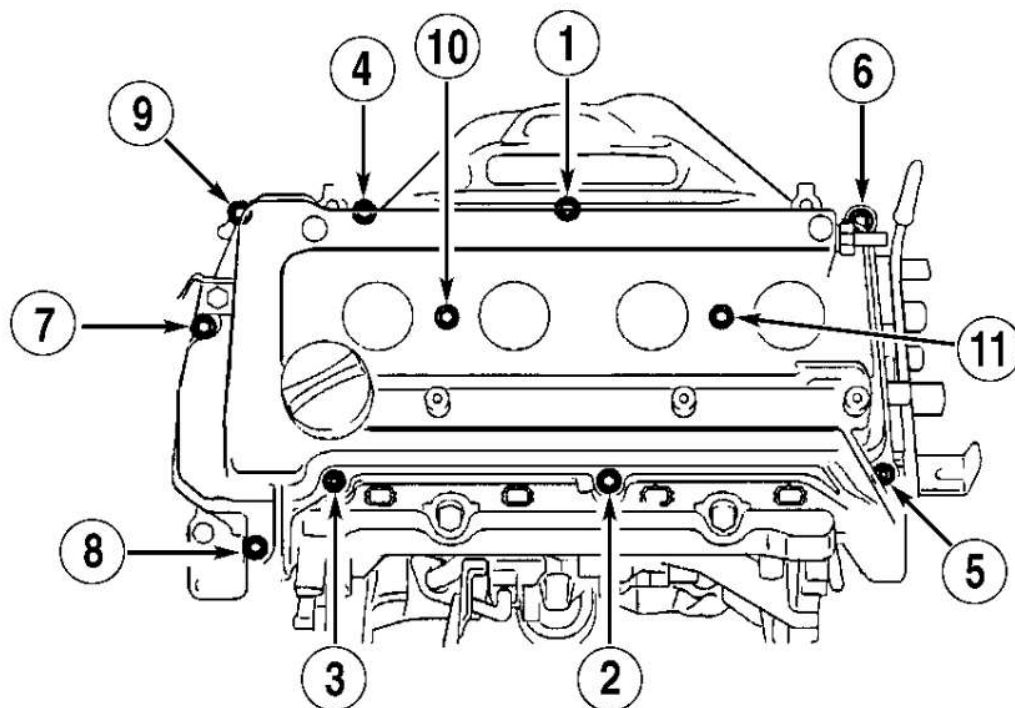


G00015579

Fig. 26: Installing Reference Marks, Locating Timing Chain Cover Plug & Releasing Timing Chain Tensioner (ECHO & Prius)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. Manufacturer recommends removing camshaft sprockets and camshafts with timing chain still engaged with crankshaft sprocket for access to valve lifter. To remove camshafts, see appropriate article in **ENGINES**. Secure timing chain aside to prevent timing chain from becoming disengaged from crankshaft sprocket. DO NOT allow timing chain to become disengaged from crankshaft sprocket.
11. Remove valve lifter from cylinder head. Using micrometer, measure thickness of valve lifter. See **Fig. 4** . Using thickness of used valve lifter and measured clearance, determine correct thickness of valve lifter to be used for proper valve by using following equation, or using valve lifter selection charts. For intake valves, "N" (new valve lifter thickness) = "T" (used valve lifter thickness) + "A" (measured clearance) minus .0080" (.200 mm). For exhaust valves, "N" (new valve lifter thickness) = "T" (used valve lifter thickness) + "A" (measured clearance) minus .0120" (.300 mm). Valve lifters are available in 35 sizes ranging from .1992" (5.060 mm) to .2260" (5.740 mm) in increments of .0008" (.020 mm). For valve lifter selection charts, see **Fig. 17** and **Fig. 18** .
12. Install replacement valve lifter, camshafts and timing chain. Remove pin from timing chain tensioner. Ensure timing marks on camshaft sprockets are facing upward at 12 o'clock position and reference marks on timing chain at both camshaft sprockets are aligned when crankshaft pulley timing mark (groove) is aligned with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. See **Fig. 24** and **Fig. 26** .
13. Install NEW timing chain cover plug and tighten to specification. See **TORQUE SPECIFICATIONS** . Recheck valve clearance. Before installing valve cover and gasket, apply sealant at specified areas on cylinder head. See **Fig. 15** . Install gasket, valve cover, seal washers, bolts and nuts. Tighten valve cover bolts/nuts to specification in sequence. See **Fig. 27** . See **TORQUE SPECIFICATIONS** . To install remaining components, reverse removal procedure. Tighten ignition coil bolts to specification. See **TORQUE SPECIFICATIONS** .

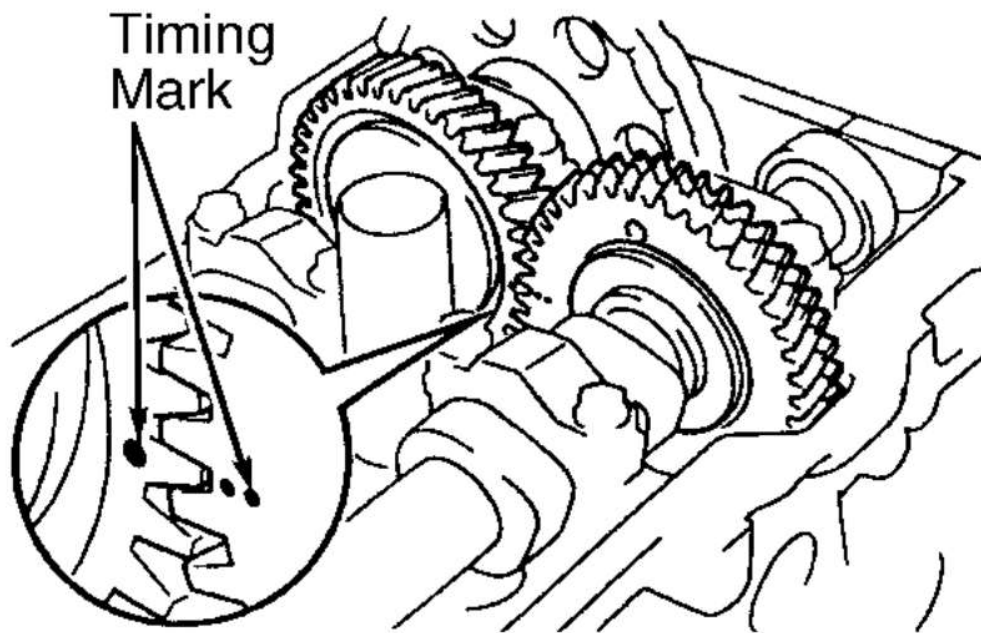


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Fig. 27: Valve Cover Bolt/Nut Tightening Sequence (ECHO & Prius)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Tacoma

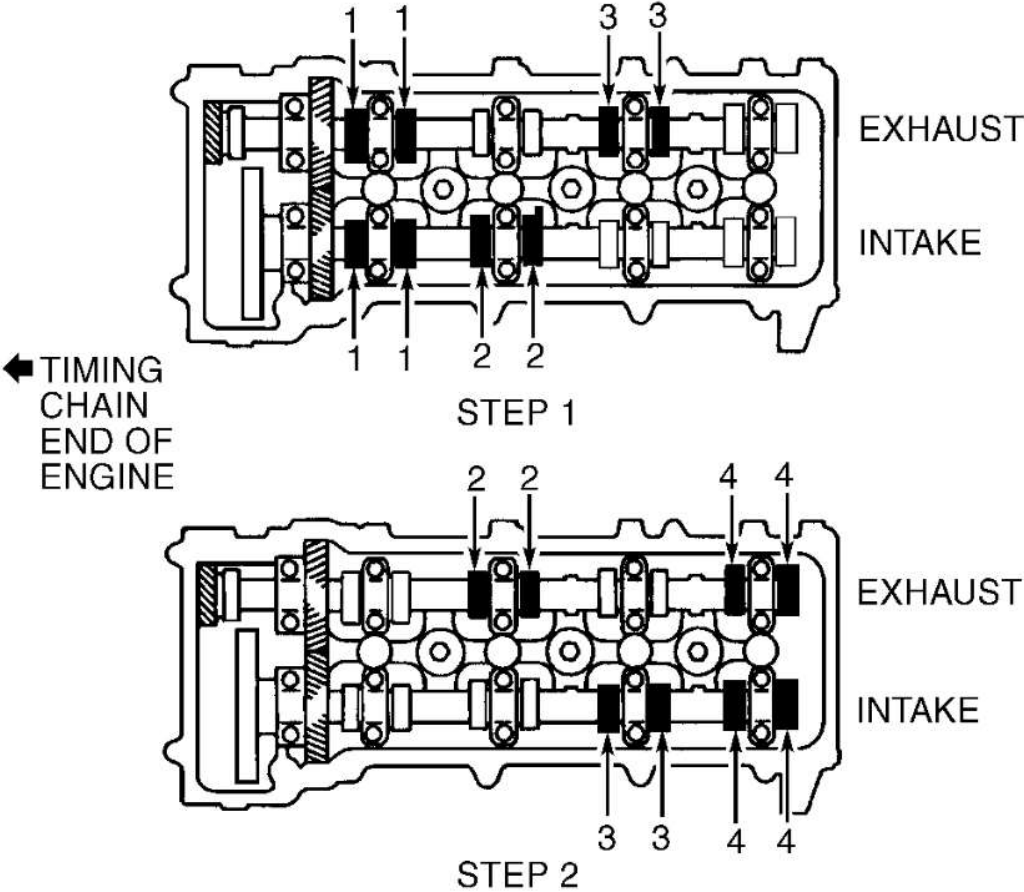
1. Remove air cleaner hose along with upper cap on air cleaner and mass airflow meter. Remove intake air connector for access to valve cover. Intake air connector fits between air cleaner hose and throttle body.
2. Disconnect electrical connectors at ignition coils mounted on top of valve cover. Remove bolts and ignition coils from valve cover. Disconnect engine wiring, clamps and PCV hose for access to valve cover. Remove bolts, seal washers, valve cover and gasket.
3. Rotate crankshaft clockwise until crankshaft pulley timing mark (groove) aligns with "0" mark on timing chain cover and cylinder No. 1 is at TDC on compression stroke. Cylinder No. 1 is front cylinder at timing chain end of engine.
4. Ensure 1-dot and 2-dot timing marks on camshaft sprockets are aligned. See **Fig. 28** . If timing marks are not aligned, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover.



G00025448

Fig. 28: Aligning Camshaft Sprocket Timing Marks (Tacoma)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. With cylinder No. 1 at TDC on compression stroke, use feeler gauge to measure valve clearance between valve lifter and camshaft on specified valves. Perform STEP 1 in illustration. See **Fig. 29** . Record valve clearance.
6. To check remaining valves, rotate crankshaft clockwise one full revolution (360 degrees) and realign crankshaft pulley timing mark (groove) with "0" mark on timing chain cover. Using feeler gauge, measure valve clearance on specified valves. Perform STEP 2 in illustration. See **Fig. 29** . Record valve clearance.



G98C11223

Fig. 29: Identifying Cylinder Numbers & Checking Valve Clearance (Tacoma)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. Ensure valve clearance is within specification. See **VALVE CLEARANCE SPECIFICATIONS (TACOMA)** table.

VALVE CLEARANCE SPECIFICATIONS (TACOMA)

Application	⁽¹⁾ In. (mm)
Intake	.006-.010 (.15-.25)
Exhaust	.010-.014 (.25-.35)

(1) Adjust valve clearance with engine cold. Verify valve clearance listed with valve clearance listed on underhood label (if available). If valve clearance on underhood label differs from valve clearance listed, use specification on underhood label.

8. If valve clearance requires adjustment, rotate crankshaft so camshaft lobe on valve to be adjusted is facing upward, away from valve lifter. Rotate valve lifter so notch on valve lifter is toward spark plug.
9. Valve Clearance Adjuster (SST 09248-55040) is used to remove adjusting shim. Using SST "A" of valve clearance adjuster, press valve lifter downward. See **Fig. 30** . Install SST "B" between camshaft and valve lifter with side marked with No. 9 at designated position. See **Fig. 30** . Remove SST "A".

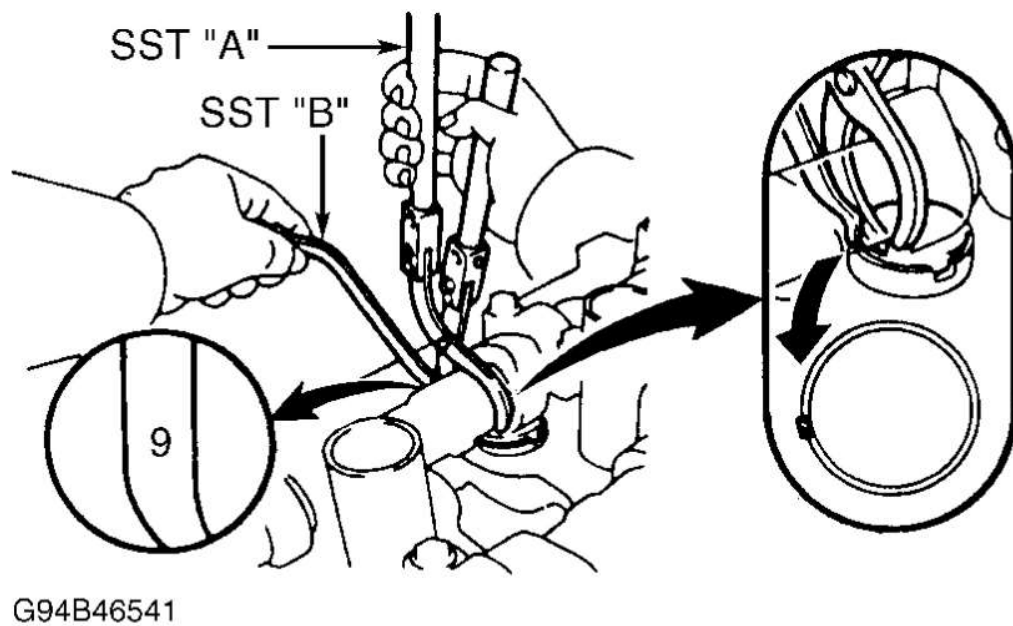


Fig. 30: Removing & Installing Valve Clearance Adjusting Shim (Tacoma)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. Using small screwdriver and magnet, remove adjusting shim. Using micrometer, measure thickness of adjusting shim removed. Using thickness of used adjusting shim and measured clearance, determine correct thickness of adjusting shim to be used for proper valve by using the follow equation, or using adjusting shim selection charts. For intake valves, "N" (new adjusting shim thickness) = "T" (used adjusting shim thickness) + "A" (measured clearance) minus .0080" (.200 mm). For exhaust valves, "N" (new adjusting shim thickness) = "T" (used adjusting shim thickness) + "A" (measured clearance) minus .0120" (.300 mm). Adjusting shims are available in 17 sizes ranging from .0984" (2.500 mm) to .1299" (3.300 mm) in increments of .0020" (.050 mm). For adjusting shim selection charts, see **Fig. 31** and **Fig. 32** .
11. Install replacement adjusting shim. Recheck valve clearance. To install remaining components, reverse removal procedure. Install and tighten ignition coil bolts to specification. See **TORQUE SPECIFICATIONS** .



Fig. 31: Intake Valve Adjusting Shim Selection Chart (Tacoma)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

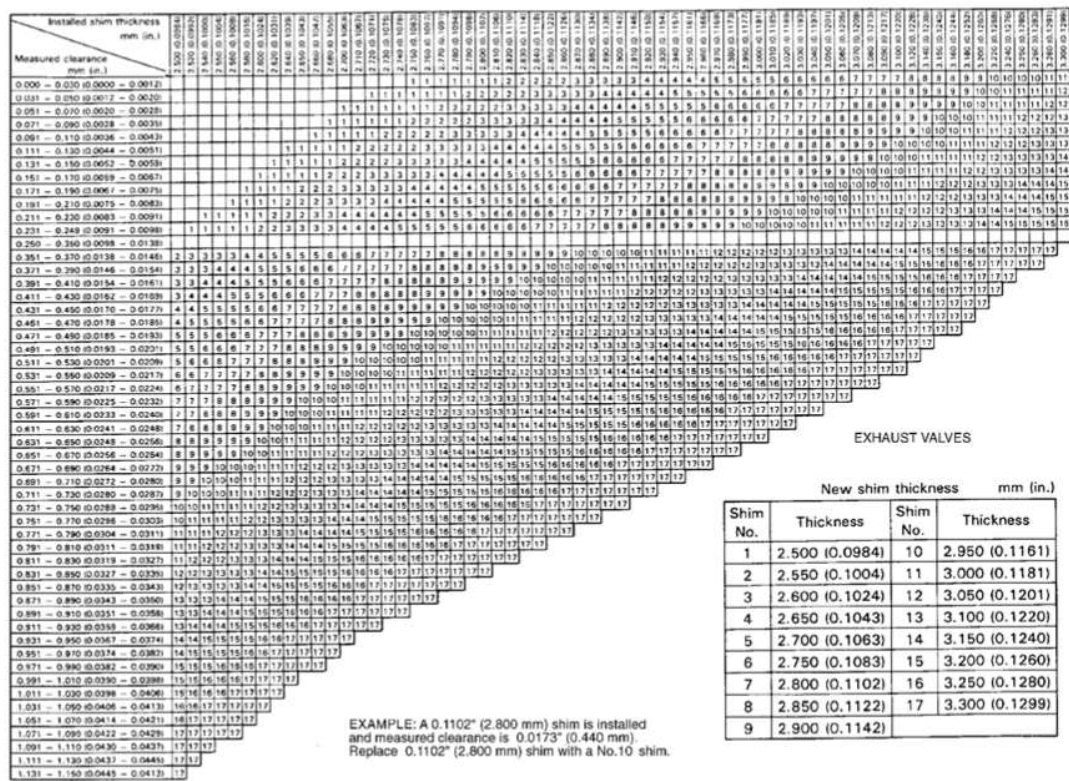


Fig. 32: Exhaust Valve Adjusting Shim Selection Chart (Tacoma)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

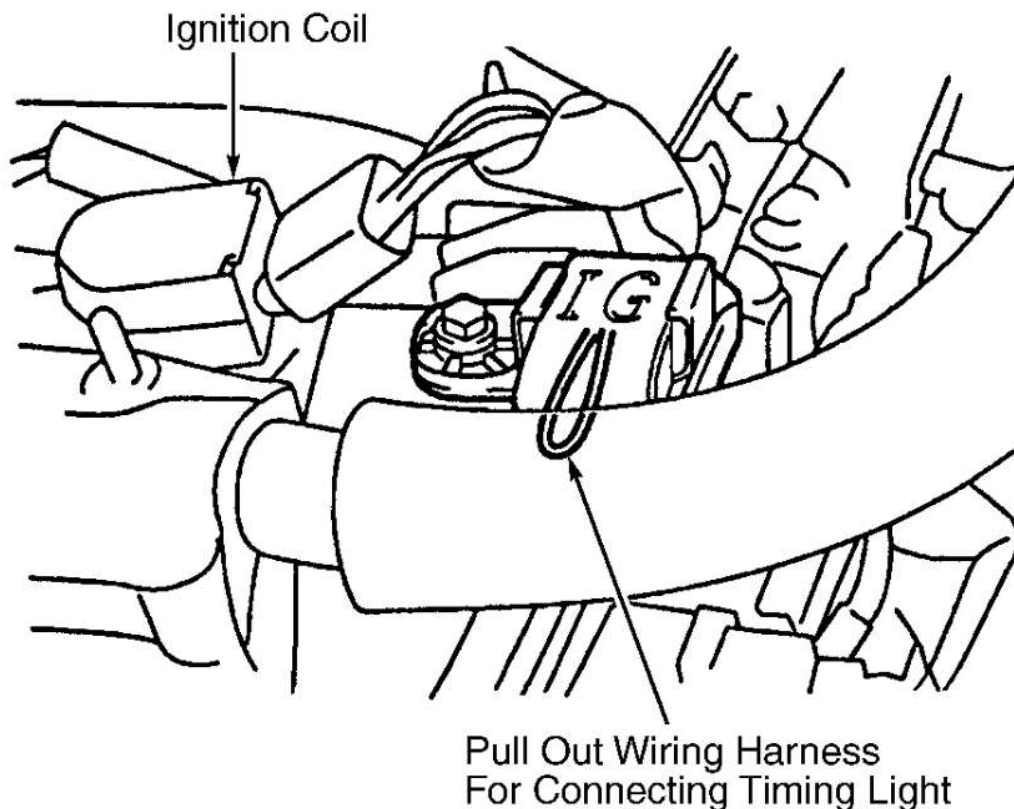
IGNITION TIMING

CAMRY

1. If Toyota hand-held tester is not available, go to next step. If Toyota hand-held tester is available, connect hand-held tester to data link connector No. 3 at driver's side of instrument panel. See **Fig. 41**. Start engine and warm engine to normal operating temperature. Using hand-held tester manufacturers instructions, read ignition timing with engine idling. Ignition timing should be 8-12° BTDC. Shut engine off. Remove hand-held tester.
2. If Toyota hand-held tester is not available, start engine and warm engine to normal operating temperature. Shut engine off. Remove No. 2 cylinder head cover located on top of engine, above ignition coils and valve cover. Pull out wiring harness near ignition coil so timing light lead may be connected. See **Fig. 33**. Connect timing light lead to the wire in wiring harness.
3. Apply parking brake. Place transaxle in Neutral. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 41**. Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34**. Start engine. Engine speed should increase to 1000-1300 RPM for 5 seconds and return to idle.
4. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near

crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Neutral, and with A/C, electric cooling fan and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table.

5. Remove jumper wire from data link connector No. 3. Ensure ECM controlled timing is within specification. See **IGNITION TIMING SPECIFICATIONS** table. Increase engine speed and check that ignition timing advances when engine speed is increased. Allow engine to idle. Shut engine off. Remove timing light. Tape wire back to wiring harness. Reinstall No. 2 cylinder head cover.



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Fig. 33: Locating Wire For Connecting Timing Light (Camry & Highlander)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

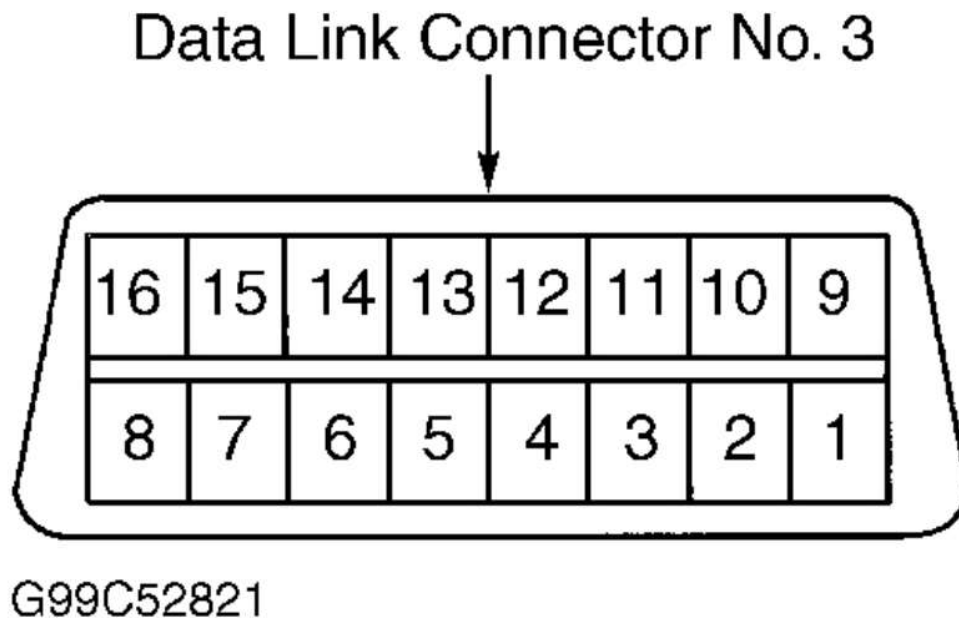


Fig. 34: Identifying Data Link Connector No. 3 Terminals (Camry, Camry Solara, Celica, ECHO, Highlander, MR2, Prius, RAV4 & Tacoma)

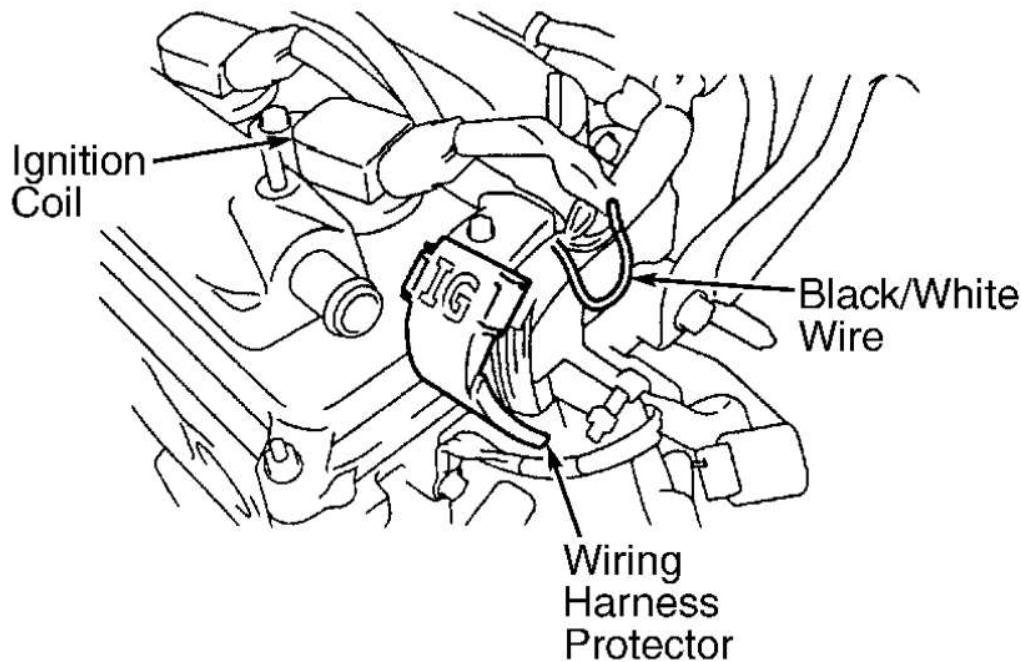
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

CAMRY SOLARA

1. If Toyota hand-held tester is not available, go to next step. If Toyota hand-held tester is available, connect hand-held tester to data link connector No. 3 at driver's side of instrument panel. See **Fig. 42** . Start engine and warm engine to normal operating temperature. Read ignition timing from CURRENT DATA on hand-held tester with engine idling. Ignition timing should be 8-12° BTDC. Shut engine off. Remove hand-held tester.
2. If Toyota hand-held tester is not available, start engine and warm engine to normal operating temperature. Shut engine off. Open wiring harness protector and pull out Black/White wire from wiring harness near ignition coil so timing light lead may be connected. See **Fig. 35** . Connect timing light lead to the Black/White wire in wiring harness.
3. Apply parking brake. Place transaxle in Neutral. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 42** . Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34** . Start engine. Engine speed should increase to 900-1500 RPM for 5 seconds and return to idle.
4. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Neutral, and with

A/C, electric cooling fan and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table.

5. Remove jumper wire from data link connector No. 3. Ensure ECM controlled timing is within specification. See **IGNITION TIMING SPECIFICATIONS** table. Allow engine to idle. Shut engine off. Remove timing light. Place wire back into wiring harness protector.



G00025456

Fig. 35: Locating Wire For Connecting Timing Light (Camry Solara)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

CELICA & ECHO

1. Start engine and warm engine to normal operating temperature. Shut engine off. Connect timing light lead to cylinder No. 1. Cylinder No. 1 is front cylinder at timing chain end of engine.
2. Apply parking brake. Place transaxle in Neutral. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 43** and **Fig. 45**. Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34**.
3. Start engine. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Neutral, and with A/C and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table. Shut engine off. Remove jumper wire and timing light.

COROLLA

1. Start engine and warm engine to normal operating temperature. Shut engine off.
2. Connect timing light lead to Black/White wire at ignition coil for cylinder No. 1. See **Fig. 36** . Cylinder No. 1 is front cylinder at timing chain end of engine.
3. Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals TE1 and E1 on data link connector No. 1. See **Fig. 37** . Data link connector No. 1 is located at driver's side of engine compartment, near strut tower.
4. Apply parking brake. Place transaxle in Neutral. Start engine. Engine speed should increase to 1000-1300 RPM for 5 seconds and return to idle.
5. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Neutral, and with A/C and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table.
6. Remove jumper wire from data link connector No. 1. Ensure ECM controlled timing is within specification. See **IGNITION TIMING SPECIFICATIONS** table. Shut engine off. Remove timing light.

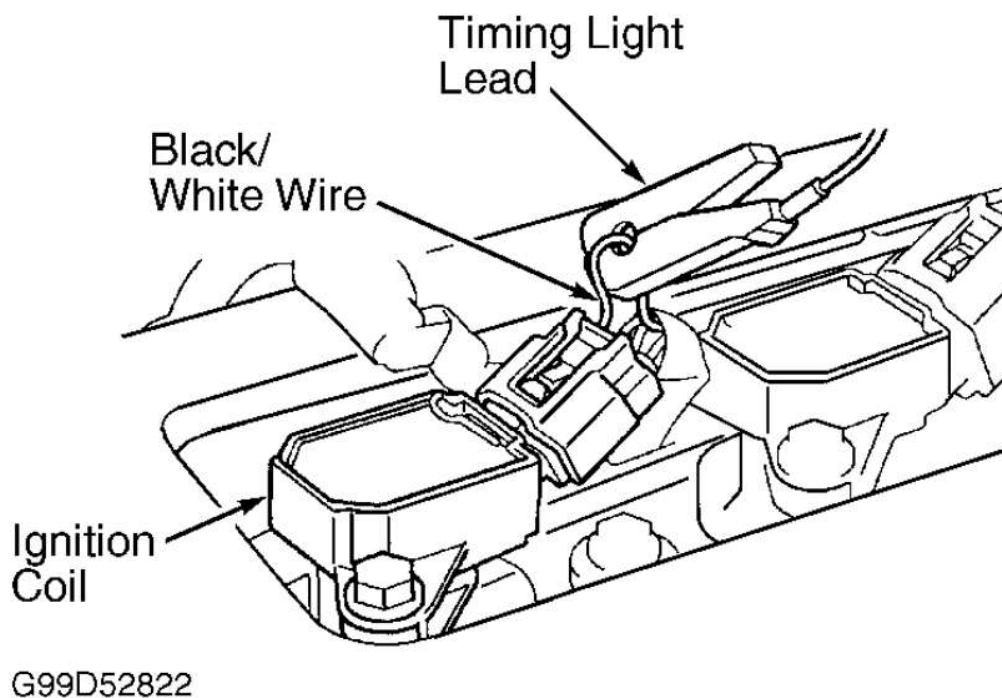


Fig. 36: Connecting Timing Light (Corolla)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

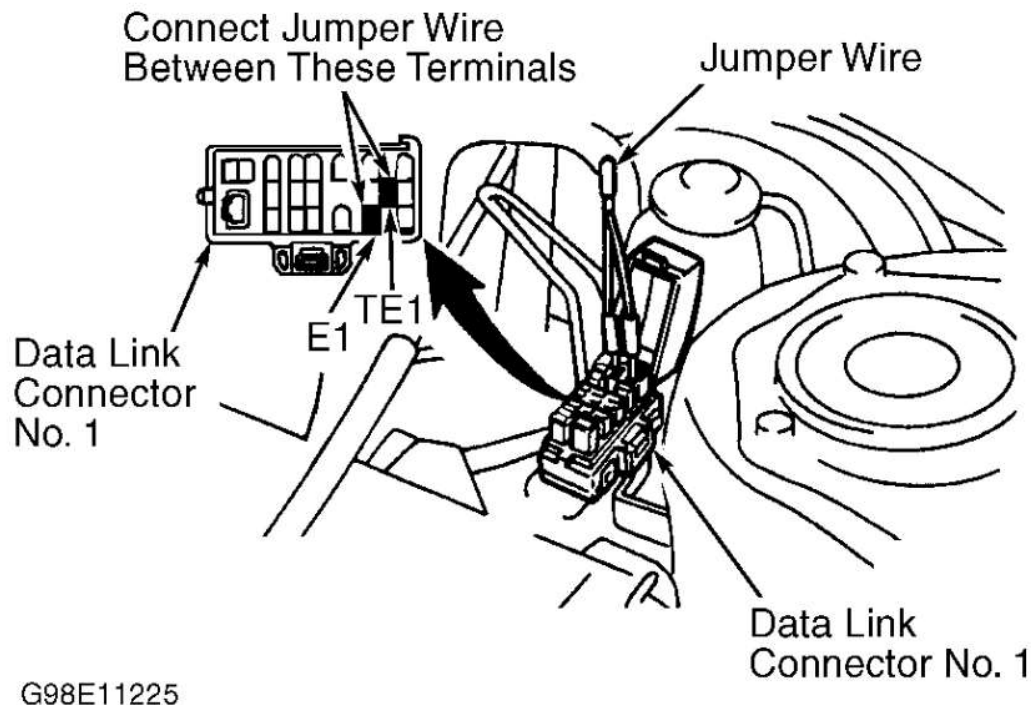


Fig. 37: Installing Jumper Wire Between Data Link Connector No. 1 Terminals (Corolla)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HIGHLANDER

1. If Toyota hand-held tester is not available, go to next step. If Toyota hand-held tester is available, connect hand-held tester to data link connector No. 3 at driver's side of instrument panel. See **Fig. 46** . Start engine and warm engine to normal operating temperature. Using hand-held tester manufacturers instructions, read ignition timing with engine idling. Ignition timing should be 8-12° BTDC. Shut engine off. Remove hand-held tester.
2. If Toyota hand-held tester is not available, start engine and warm engine to normal operating temperature. Shut engine off. Remove No. 2 cylinder head cover located on top of engine, above ignition coils and valve cover. Pull out wiring harness near ignition coil so timing light lead may be connected. See **Fig. 33** . Connect timing light lead to the wire in wiring harness.
3. Apply parking brake. Place transaxle in Neutral. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 46** . Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34** . Start engine. Engine speed should increase to 1000-1300 RPM for 5 seconds and return to idle.
4. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Neutral, and with A/C, electric cooling fan and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table.

5. Remove jumper wire from data link connector No. 3. Ensure ECM controlled timing is within specification. See **IGNITION TIMING SPECIFICATIONS** table. Increase engine speed and check that ignition timing advances when engine speed is increased. Allow engine to idle. Shut engine off. Remove timing light. Tape wire back to wiring harness. Reinstall No. 2 cylinder head cover.

MR2

1. Start engine and warm engine to normal operating temperature. Shut engine off. Remove cover from junction block No. 1 and connect timing light lead to Black/Red wire. See **Fig. 38** . Junction block No. 1 is located at driver's side rear corner of engine compartment, just in front of strut tower.
2. Apply parking brake. Place transaxle in Neutral. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 47** . Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34** . Start engine. Engine speed should increase to 1000-1500 RPM for 5 seconds and return to idle.
3. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Neutral, and with A/C, electric cooling fan and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table.
4. Remove jumper wire from data link connector No. 3. Ensure ECM controlled timing is within specification. See **IGNITION TIMING SPECIFICATIONS** table. Shut engine off. Remove timing light. Reinstall cover on junction block No. 1.

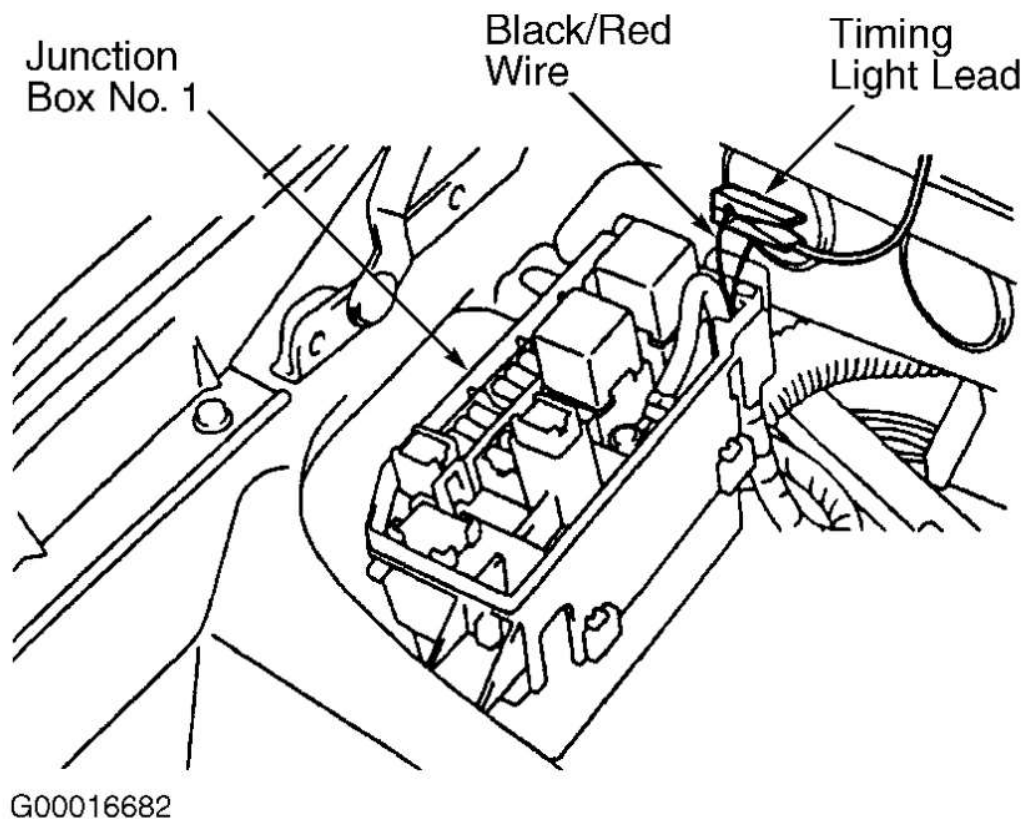


Fig. 38: Connecting Timing Light (MR2)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PRIUS

WARNING: Read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

1. Connect timing light lead to cylinder No. 1. Cylinder No. 1 is front cylinder at timing chain end of engine. On this model, the engine is shut off when engine is at normal operating temperature and battery is fully charged and A/C is not turned on. It is necessary to put transit in inspection mode so engine will run continuously when checking ignition timing. To put transit in inspection mode, perform the following steps within 60 seconds:
 - Ensure ignition is off and then turn ignition on.
 - Ensure transaxle is in Park and then fully depress accelerator pedal 2 times.
 - Place transaxle in Neutral and then fully depress accelerator pedal 2 times.
 - Place transaxle back in Park and then fully depress accelerator pedal 2 times.

- Check that master warning light on instrument cluster at center of instrument panel is flashing to indicate inspection mode operation. See **Fig. 39** . Master warning light may also be referred to as hybrid system error warning light. Turn ignition switch to START position to start engine. Engine will now start and run continuously. Warm engine to normal operating temperature.
2. Ensure transaxle is in Park. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 48** . Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34** .
 3. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Park and with A/C and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table. Shut engine off. Remove jumper wire and timing light.

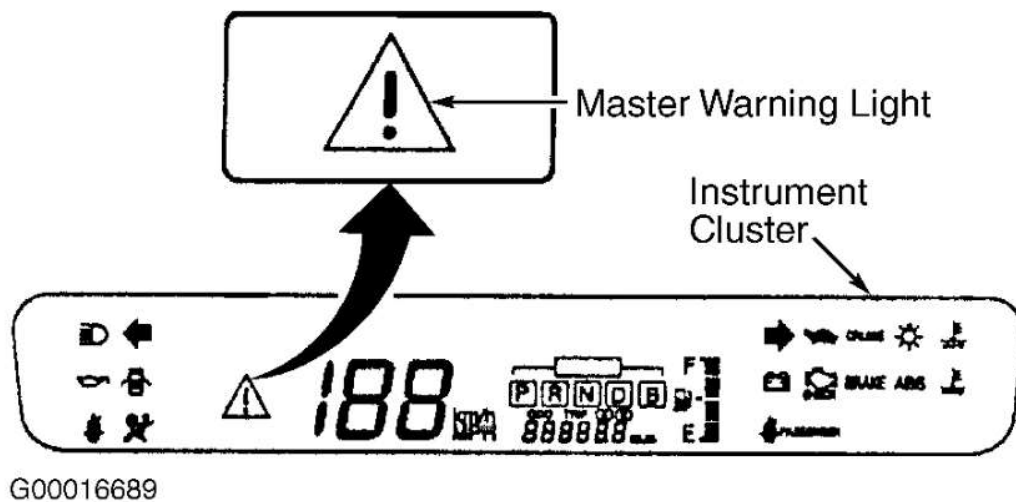
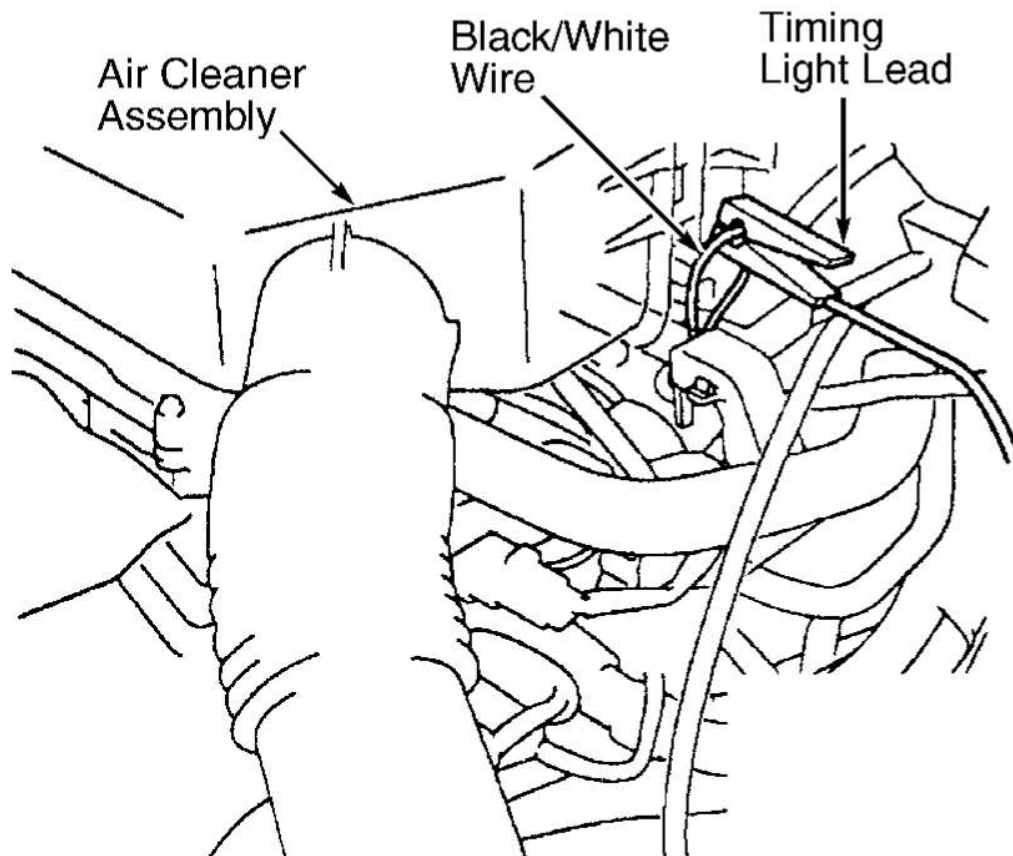


Fig. 39: Locating Master Warning Light (Prius)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

RAV4

1. Start engine and warm engine to normal operating temperature. Shut engine off. Connect timing light lead to Black/White wire in wiring harness near air cleaner assembly. See **Fig. 40** .
2. Apply parking brake. Place transaxle in Neutral. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 49** . Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34** . Start engine. Engine speed should increase to 900-1500 RPM for 5 seconds and return to idle.
3. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transaxle in Neutral, and with A/C, electric cooling fan and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table.
4. Remove jumper wire from data link connector No. 3. Ensure ECM controlled timing is within

specification. See **IGNITION TIMING SPECIFICATIONS** table. Shut engine off. Remove timing light.



G00016685

Fig. 40: Connecting Timing Light (RAV4)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TACOMA

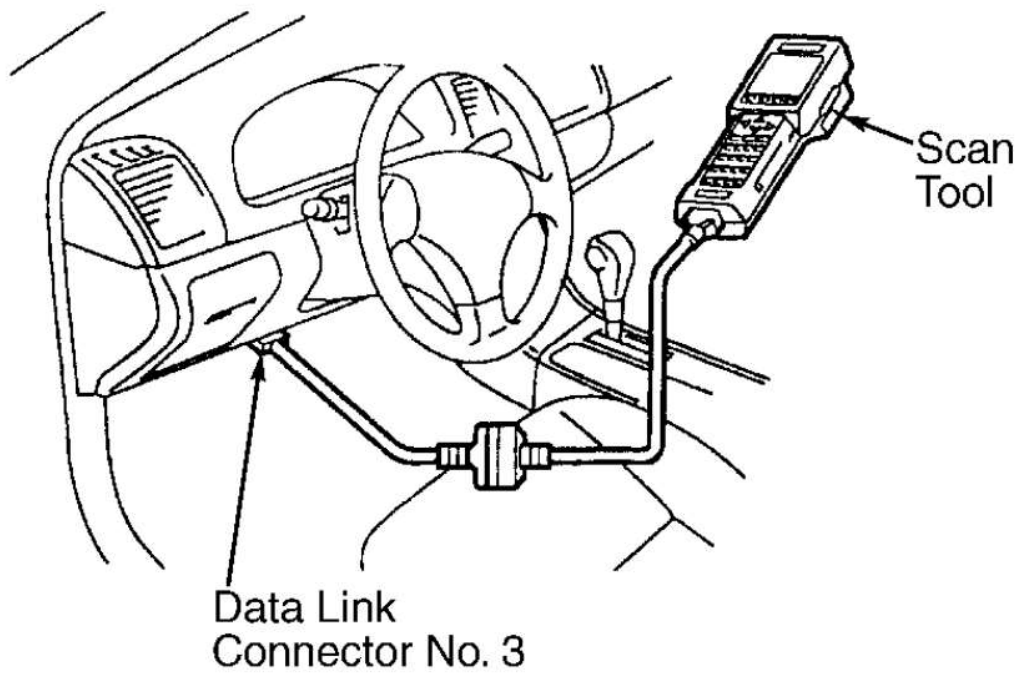
1. Start engine and warm engine to normal operating temperature. Shut engine off. Connect timing light lead to Black/Red wire at ignition coil for cylinder No. 1. Cylinder No. 1 is front cylinder at timing chain end of engine.
2. Apply parking brake. Place transmission in Neutral. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 50** . Install Jumper Wire (SST 09843-18020 or SST 09843-18040) between terminals No. 4 (CG) and 13 (TC) on data link connector No. 3. See **Fig. 34** . Start engine. Engine speed should increase to about 1000 RPM for 5 seconds and return to idle.

3. Check ignition timing with engine idling. Timing marks are located on timing chain cover, near crankshaft pulley. Ensure base timing is within specification at idle with transmission in Neutral, and with A/C and all accessories off. See **IGNITION TIMING SPECIFICATIONS** table.
4. Remove jumper wire from data link connector No. 3. Ensure ECM controlled timing is within specification. See **IGNITION TIMING SPECIFICATIONS** table. Shut engine off. Remove timing light.

IGNITION TIMING SPECIFICATIONS (Degrees BTDC @ Idle)⁽¹⁾

Application	Base Timing	ECM Controlled Timing
Camry & Camry Solara	(2) 8-12	(3) 5-15
Celica		
1.8L (1ZZ-FE)	(2) 10-18	(4)
1.8L (2ZZ-GE)	(2) 8-12	(4)
Corolla	(5) 8-12	(6) 6-15
ECHO	(2) 8-12	(4)
Highlander	(2) 8-12	(3) 5-15
MR2	(2) 8-12	(3) 6-15
Prius ⁽⁷⁾	(2) 7-15	(4)
RAV4	(2) 8-12	(3) 5-15
Tacoma	(2) 3-7	(3) 4-17

- (1) Check with engine at normal operating temperature, transaxle/transmission in Neutral (except Prius, in Park on Prius), parking brake applied, and A/C and all accessories off.
- (2) With Jumper Wire (SST 09843-18020 or SST 09843-18040) installed between terminals No. 4 (CG) and 13 (TC) CG on data link connector No. 3.
- (3) With jumper wire removed from data link connector No. 3.
- (4) Information is not available from manufacturer.
- (5) With Jumper Wire (SST 09843-18020 or SST 09843-18040) installed between terminals TE1 and E1 on data link connector No. 1.
- (6) With jumper wire removed from data link connector No. 1.
- (7) Read service precautions before proceeding with service procedure. See **SERVICE PRECAUTIONS** . Check with transit in inspection mode and transaxle in Park.



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Fig. 41: Locating Data Link Connector No. 3 (Camry)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

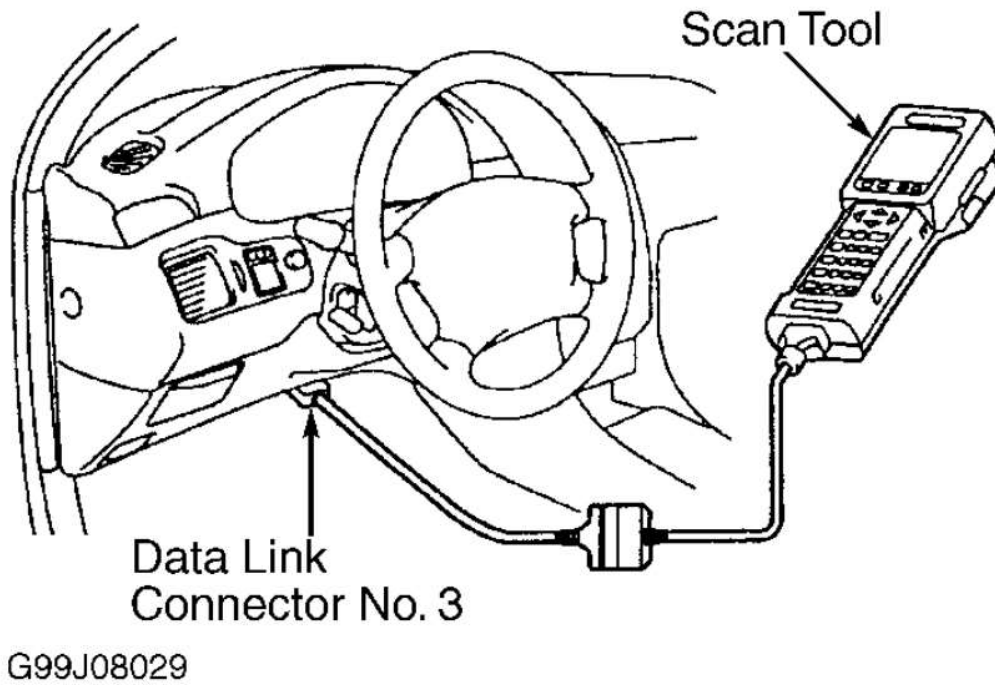


Fig. 42: Locating Data Link Connector No. 3 (Camry Solara)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

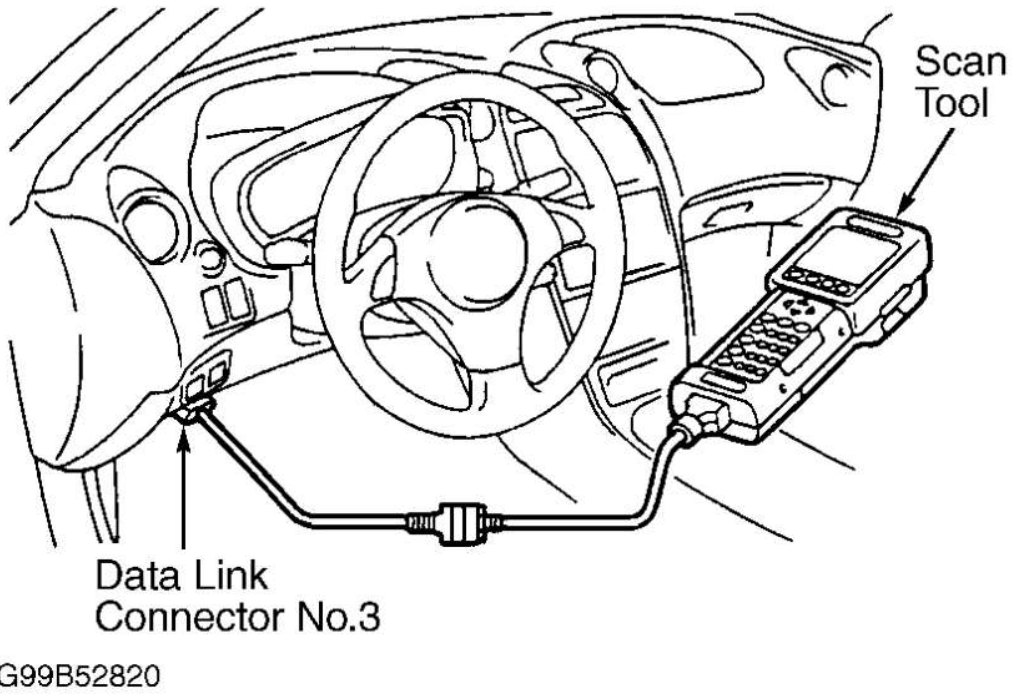


Fig. 43: Locating Data Link Connector No. 3 (Celica)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

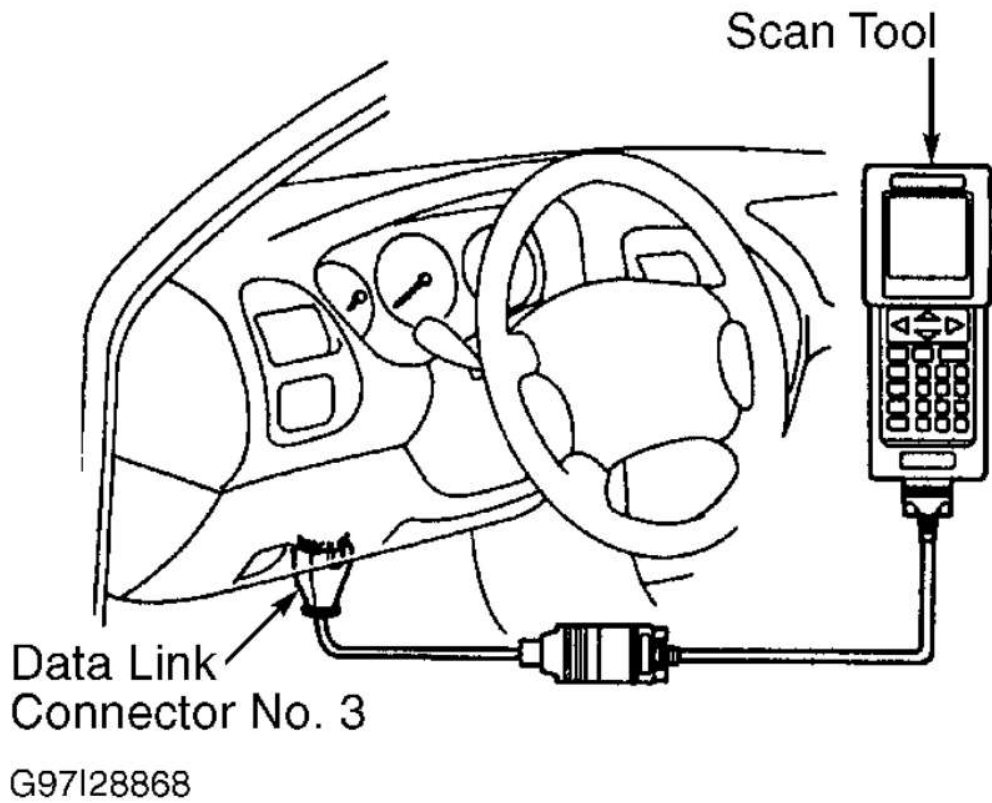
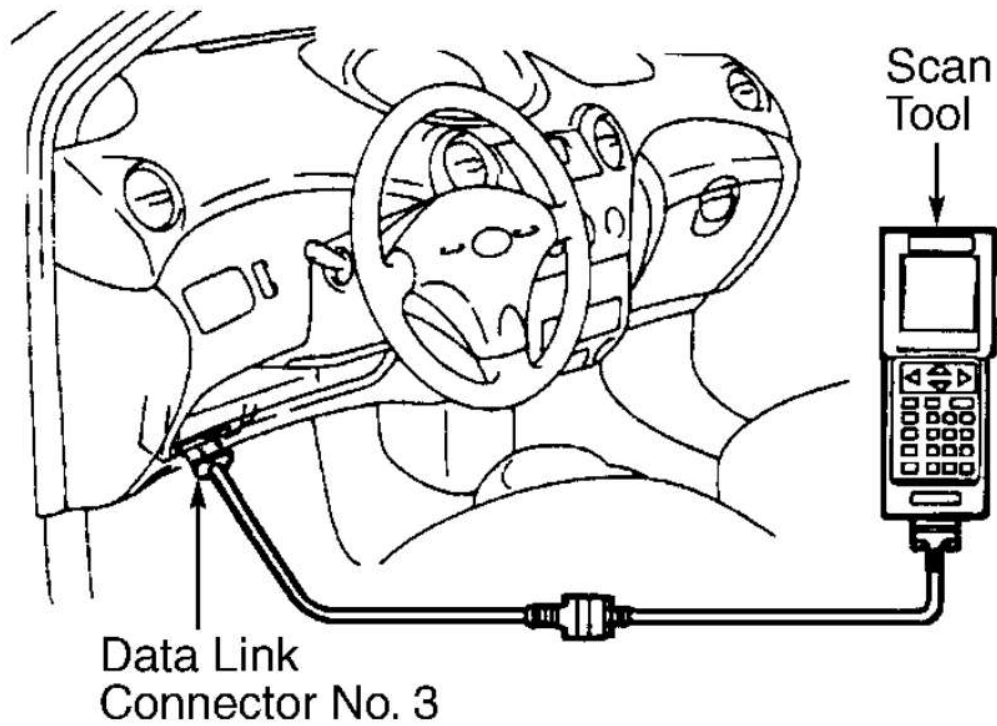
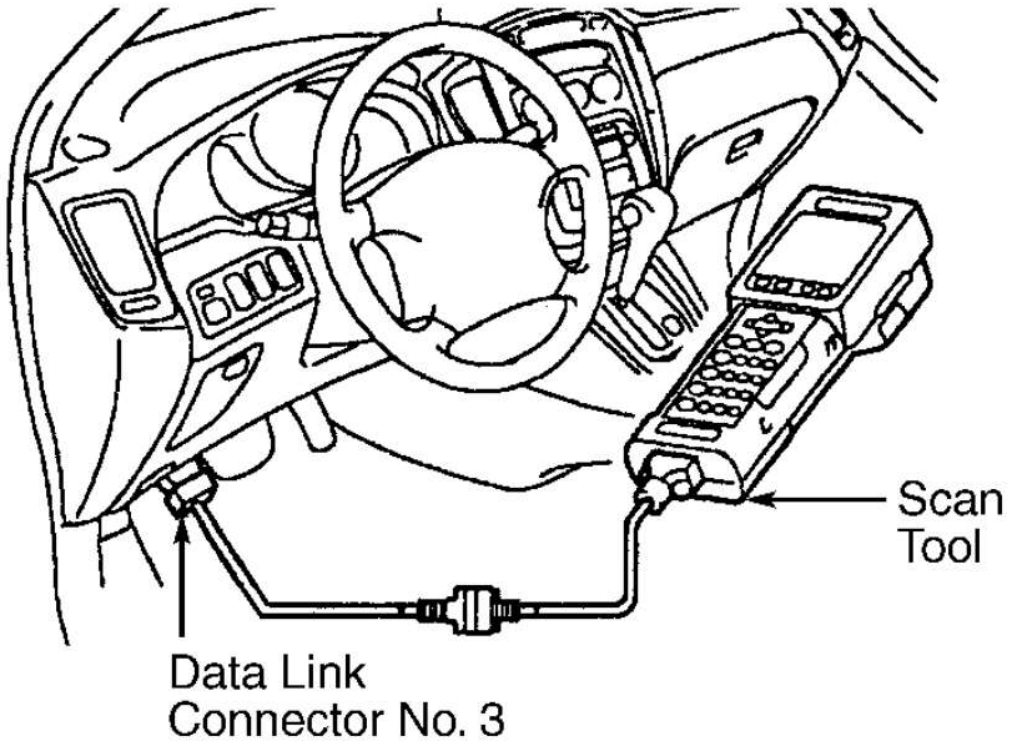


Fig. 44: Locating Data Link Connector No. 3 (Corolla)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 45: Locating Data Link Connector No. 3 (ECHO)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G00016690

Fig. 46: Locating Data Link Connector No. 3 (Highlander)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

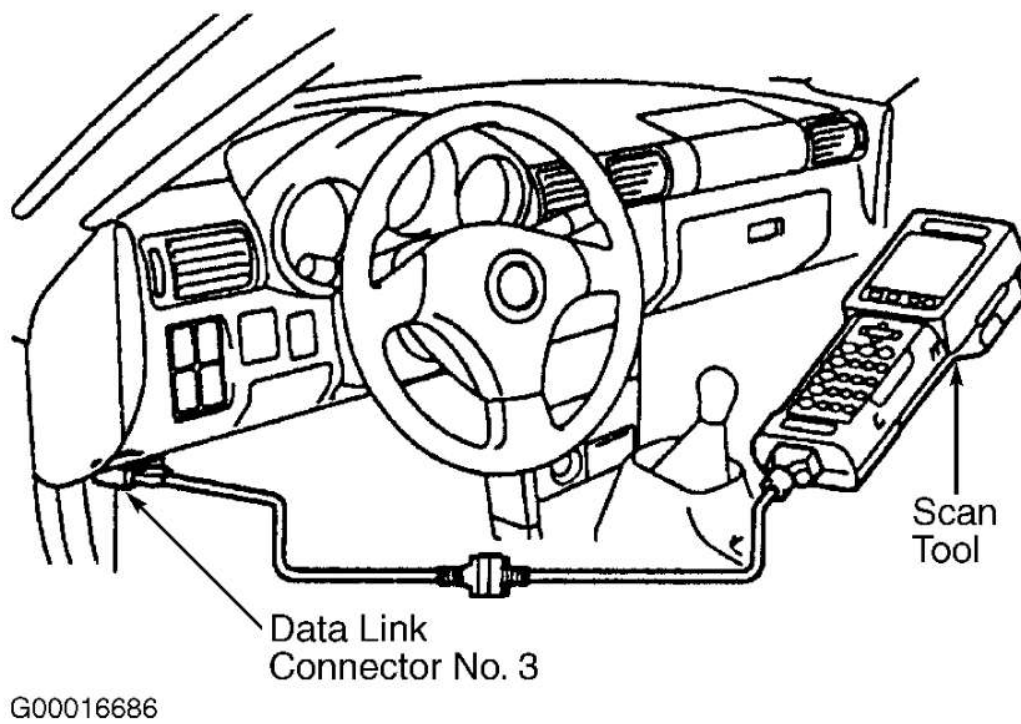


Fig. 47: Locating Data Link Connector No. 3 (MR2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

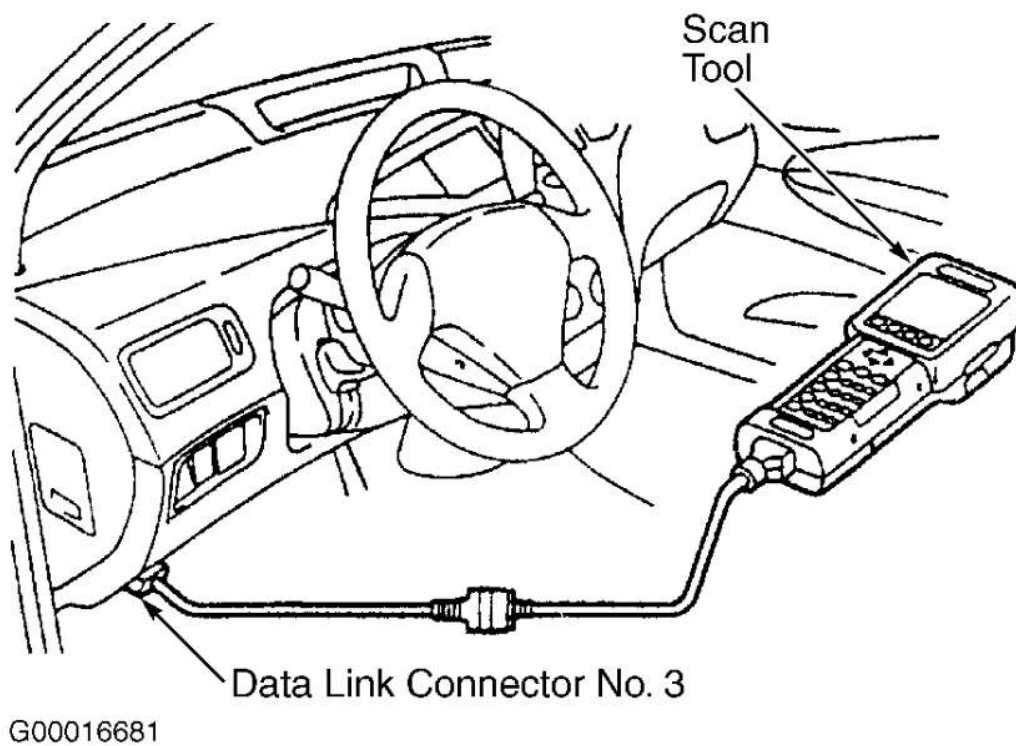
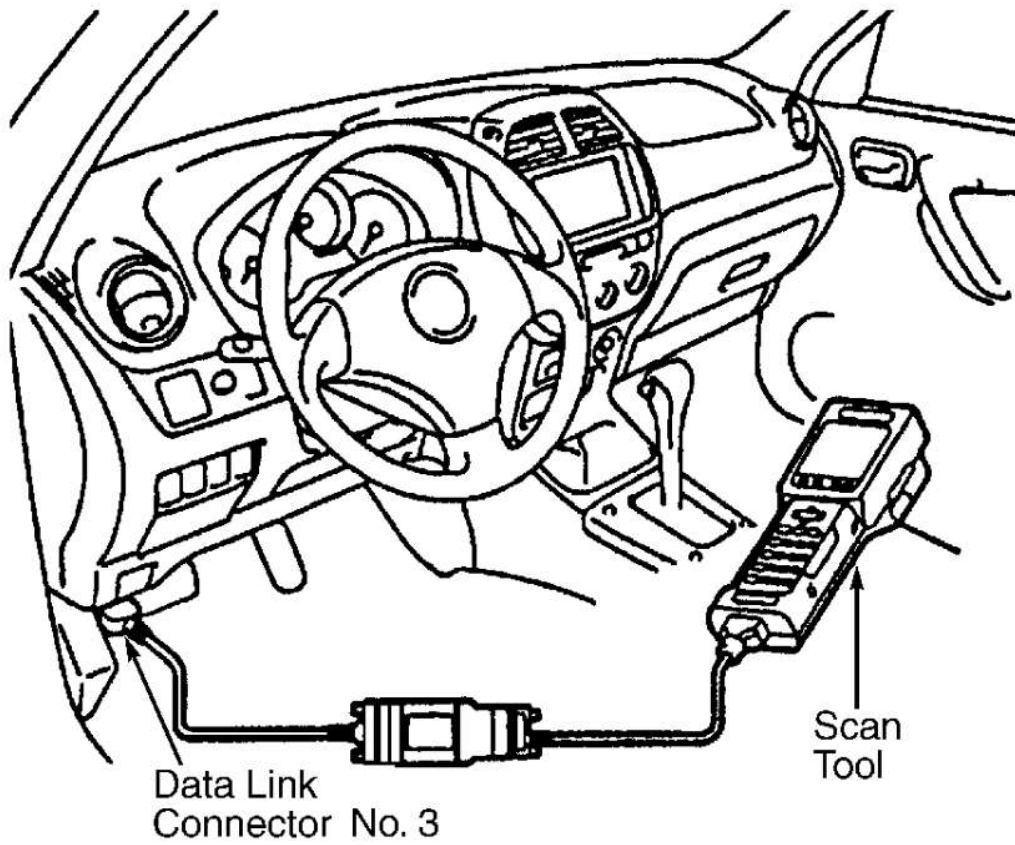


Fig. 48: Locating Data Link Connector No. 3 (Prius)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G00016677

Fig. 49: Locating Data Link Connector No. 3 (RAV4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

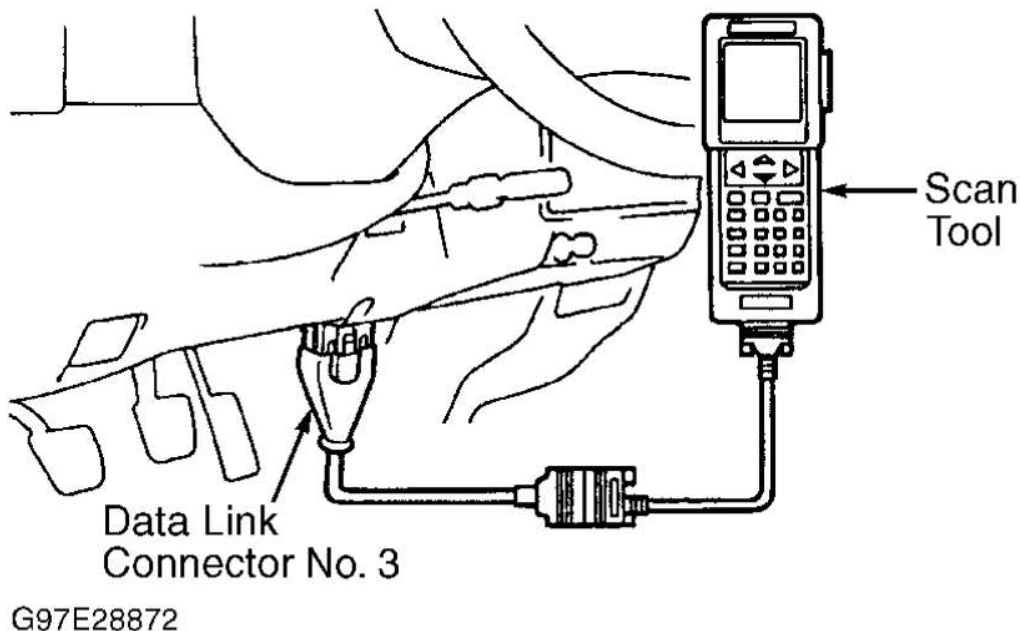


Fig. 50: Locating Data Link Connector No. 3 (Tacoma)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

IDLE SPEED & MIXTURE

NOTE: Mixture adjustment is not possible on any model.

CAMRY

1. Idle speed is controlled by Engine Control Module (ECM) and is not adjustable. Check idle speed with engine at normal operating temperature, transaxle in Neutral, parking brake applied, air cleaner and all air intake hoses installed, all vacuum hoses installed, electronic fuel injection system wiring connectors properly installed, ignition timing properly set, electric cooling fan off, and A/C and all accessories off.
2. If Toyota hand-held tester is available, go to next step. If Toyota hand-held tester is not available, go to step 5 .
3. Start engine and warm engine to normal operating temperature. Shut engine off. Connect Toyota hand-held tester to data link connector No. 3 at driver's side of instrument panel. See **Fig. 41** . Hand-held tester is used to read engine RPM. Apply parking brake. Place transaxle in Neutral. Start engine and allow engine to idle while noting idle speed. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Remove hand-held tester.
4. If idle speed is not within specification, check air intake system. If air intake system is okay, check throttle body. See IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - 4-

CYLINDER article.

5. Start engine and warm engine to normal operating temperature. Shut engine off. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 41** . Using Jumper Wire (SST 09843-18020 or SST 09843-18040), connect tachometer lead to terminal No. 9 (TAC) on data link connector No. 3. See **Fig. 34** . Apply parking brake. Place transaxle in Neutral. Start engine and allow engine to idle while noting idle speed. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Disconnect tachometer.
6. If idle speed is not within specification, check air intake system. If air intake system is okay, check throttle body. See IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

CAMRY SOLARA

1. Idle speed is controlled by Engine Control Module (ECM) and is not adjustable. Check idle speed with engine at normal operating temperature, transaxle in Neutral, parking brake applied, air cleaner and all air intake hoses installed, all vacuum hoses installed, electronic fuel injection system wiring connectors properly installed, ignition timing properly set, electric cooling fan off, and A/C and all accessories off.
2. Start engine and warm engine to normal operating temperature. Shut engine off. Connect Toyota hand-held tester to data link connector No. 3 at driver's side of instrument panel. See **Fig. 42** . Hand-held tester is used to read engine RPM.
3. Apply parking brake. Place transaxle in Neutral. Start engine and increase engine speed to 2500 RPM for 90 seconds and then allow engine to idle while reading idle speed from CURRENT DATA on hand-held tester. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Remove hand-held tester.
4. If idle speed is not within specification, check air intake system. If air intake system is okay, check throttle body. See IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

CELICA, COROLLA, ECHO, RAV4 & TACOMA

1. Idle speed is controlled by Engine Control Module (ECM) and is not adjustable. Check idle speed with engine at normal operating temperature, transmission/transaxle in Neutral, parking brake applied, air cleaner and all air intake hoses installed, all vacuum hoses installed, electronic fuel injection system wiring connectors properly installed, ignition timing properly set, electric cooling fan off (if equipped), and A/C and all accessories off.
2. Start engine and warm engine to normal operating temperature. Shut engine off. Connect Toyota hand-held tester or scan tool to data link connector No. 3 at driver's side of instrument panel. See **Fig. 43 -Fig. 50** . Hand-held tester or scan tool is used to read engine RPM.
3. Apply parking brake. Place transmission/transaxle in Neutral. Start engine and maintain engine at 2500 RPM for 90 seconds and then allow engine to idle while noting idle speed. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Remove hand-held tester or scan tool.
4. If idle speed is not within specification, check Idle Air Control (IAC) valve, wiring and Engine Control Module (ECM), and air intake system. See IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

HIGHLANDER

1. Idle speed is controlled by Engine Control Module (ECM) and is not adjustable. Check idle speed with engine at normal operating temperature, transaxle in Neutral, parking brake applied, air cleaner and all air intake hoses installed, all vacuum hoses installed, electronic fuel injection system wiring connectors properly installed, ignition timing properly set, electric cooling fan off, and A/C and all accessories off.
2. If Toyota hand-held tester is available, go to next step. If Toyota hand-held tester is not available, go to step 6 .
3. Start engine and warm engine to normal operating temperature. Shut engine off. Connect Toyota hand-held tester to data link connector No. 3 at driver's side of instrument panel. See **Fig. 46** . Hand-held tester is used to read engine RPM.
4. Apply parking brake. Place transaxle in Neutral. Start engine and allow engine to idle while noting idle speed. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Remove hand-held tester.
5. If idle speed is not within specification, check air intake system. If air intake system is okay, check throttle body. See IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.
6. Start engine and warm engine to normal operating temperature. Shut engine off. Note location of data link connector No. 3 at driver's side of instrument panel. See **Fig. 46** . Using Jumper Wire (SST 09843-18020 or SST 09843-18040), connect tachometer lead to terminal No. 9 (TAC) on data link connector No. 3. See **Fig. 34** .
7. Apply parking brake. Place transaxle in Neutral. Start engine and allow engine to idle while noting idle speed. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Disconnect tachometer.
8. If idle speed is not within specification, check air intake system. If air intake system is okay, check throttle body. See IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

MR2

1. Idle speed is controlled by Engine Control Module (ECM) and is not adjustable. Check idle speed with engine at normal operating temperature, transaxle in Neutral, parking brake applied, air cleaner and all air intake hoses installed, all vacuum hoses installed, electronic fuel injection system wiring connectors properly installed, ignition timing properly set, electric cooling fan off (if equipped), and A/C and all accessories off.
2. Start engine and warm engine to normal operating temperature. Shut engine off. Connect Toyota hand-held tester or scan tool to data link connector No. 3 at driver's side of instrument panel. See **Fig. 47** . Hand-held tester or scan tool is used to read engine RPM.
3. Apply parking brake. Place transaxle in Neutral. Start engine and maintain engine at 2500 RPM for 90 seconds and then allow engine to idle while noting idle speed. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Remove hand-held tester or scan tool.
4. There are 2 types of throttle bodies and idle control systems used depending on type of transaxle used. On models with a standard type manual transaxle in which the driver operates the clutch and shifts the transaxle, a standard type Idle Air Control (IAC) valve used. On this model, if idle speed is not within specification, check Idle Air Control (IAC) valve, wiring and Engine Control Module (ECM), and air

intake system. See **IDLE CONTROL SYSTEMS** in **SYSTEM & COMPONENT TESTING - 4-CYLINDER** article. On models with a sequential manual transaxle, the transaxle is electronically controlled and clutch is operated and transaxle is shifted hydraulically by moving shift lever forward or backward. Sequential manual transaxle may be identified by shift lever pattern which consists of "R", "N", "S" and "+" in place of conventional type shift lever pattern and no clutch pedal is used. On this model, if idle speed is not within specification, check air intake system. If air intake system is okay, check throttle body. See **IDLE CONTROL SYSTEMS** in **SYSTEM & COMPONENT TESTING - 4-CYLINDER** article.

PRIUS

WARNING: Read service precautions before proceeding with service procedure. See **SERVICE PRECAUTIONS**.

1. Idle speed is controlled by Engine Control Module (ECM) and is not adjustable. Check idle speed with engine at normal operating temperature, transaxle in Park, transit in inspection mode, air cleaner and all air intake hoses installed, all vacuum hoses installed, electronic fuel injection system wiring connectors properly installed, ignition timing properly set and A/C and all accessories off.
2. On this model, the engine is shut off when engine is at normal operating temperature and battery is fully charged and A/C is not turned on. It is necessary to put transit in inspection mode so engine will run continuously when checking idle speed. To put transit in inspection mode, perform the following steps within 60 seconds:
 - Ensure ignition is off and then turn ignition on.
 - Ensure transaxle is in Park and then fully depress accelerator pedal 2 times.
 - Place transaxle in Neutral and then fully depress accelerator pedal 2 times.
 - Place transaxle back in Park and then fully depress accelerator pedal 2 times.
 - Check that master warning light on instrument cluster at center of instrument panel is flashing to indicate inspection mode operation. See **Fig. 39**. Master warning light may also be referred to as hybrid system error warning light. Turn ignition switch to START position to start engine. Engine will now start and run continuously.
3. Ensure transaxle is in Park. Warm engine to normal operating temperature. Connect Toyota hand-held tester to data link connector No. 3 at driver's side of instrument panel. See **Fig. 48**. Hand-held tester is used to read engine RPM.
4. Maintain engine at 2250 RPM for 90 seconds and then allow engine to idle while noting idle speed. Ensure idle speed is within specification. See **IDLE SPEED SPECIFICATIONS** table. Shut engine off. Remove hand-held tester.
5. If idle speed is not within specification, check air intake system. If air intake system is okay, check throttle body. See **IDLE CONTROL SYSTEMS** in **SYSTEM & COMPONENT TESTING - 4-CYLINDER** article.

IDLE SPEED SPECIFICATIONS ⁽¹⁾

Application	RPM
Camry	

A/T	610-710
M/T	650-750
Camry Solara	
A/T	600-700
M/T	650-750
Celica	
1.8L (1ZZ-FE)	
A/T	700-800
M/T	650-750
1.8L (2ZZ-GE)	
A/T	700-800
M/T	750-850
Corolla	650-750
ECHO	
A/T	650-750
M/T	600-700
Highlander	600-700
MR2	650-750
Prius ⁽²⁾	950-1050
RAV4 & Tacoma	650-750
(1) Check with engine at normal operating temperature, transaxle/transmission in Neutral (except Prius, in Park on Prius), parking brake applied, air cleaner and all air intake hoses installed, all vacuum hoses installed, electronic fuel injection system wiring connectors properly installed, ignition timing properly set, electric cooling fan off (if equipped), and A/C and all accessories off. (2) Read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS . Check with transit in inspection mode and transaxle in Park.	

THROTTLE POSITION SENSOR

CAMRY & CAMRY SOLARA

1. Manufacturer does not list procedure for Throttle Position (TP) sensor adjustment. Only information available is for checking resistance of TP sensor.
2. Disconnect 6-pin electrical connector from throttle body for TP sensor. Using ohmmeter, check resistance between VC and E2 terminals on throttle body for TP sensor. See **Fig. 51** . Replace throttle body assembly if resistance is not within specification. See **THROTTLE POSITION SENSOR RESISTANCE** table.

CELICA, COROLLA, ECHO & HIGHLANDER

1. Manufacturer does not list procedure for Throttle Position (TP) sensor adjustment. Only information available is for checking resistance of TP sensor.

2. Disconnect electrical connector from TP sensor. Note electrical terminals on TP sensor. See **Fig. 52 -Fig. 55** .
3. Using ohmmeter, check resistance between specified terminals in relation to throttle position. See **THROTTLE POSITION SENSOR RESISTANCE** table. Replace components as necessary if resistance is not within specification.

MR2

1. There are 2 types of throttle bodies and Throttle Position (TP) sensors, depending on type of transaxle used. On models with standard type manual transaxle, the driver operates the clutch and shifts the transaxle. On models with sequential manual transaxle, transaxle is electronically controlled and clutch is operated and transaxle is shifted hydraulically by moving shift lever forward or backward. Sequential manual transaxle may be identified by shift lever pattern which consists of "R", "N", "S" and "+" in place of conventional type shift lever pattern and no clutch pedal is used. On this model, a different type TP sensor is used. On all models, manufacturer does not list procedure for TP sensor adjustment. Only information available is for checking resistance of TP sensor.
2. On models with sequential manual transaxle, it may be necessary to remove throttle body for access to electrical connector at TP sensor. If necessary to remove throttle body, see THROTTLE BODY under FUEL SYSTEMS in REMOVAL, OVERHAUL & INSTALLATION - 4-CYLINDER article. On all models, disconnect electrical connector from TP sensor. Note electrical terminals on TP sensor. See **Fig. 56** and **Fig. 57** .
3. On models with standard type manual transaxle, using ohmmeter, check resistance between specified terminals in relation to throttle position. See **THROTTLE POSITION SENSOR RESISTANCE** table. Replace components as necessary if resistance is not within specification.
4. On models with sequential manual transaxle, using ohmmeter, check resistance between VC and E2 terminals on TP sensor. Replace components as necessary if resistance is not within specification. See **THROTTLE POSITION SENSOR RESISTANCE** table.

PRIUS

WARNING: Read service precautions before proceeding with service procedure. See **SERVICE PRECAUTIONS** .

1. Manufacturer does not list procedure for Throttle Position (TP) sensor adjustment. Only information available is for checking resistance of TP sensor.
2. Disconnect electrical connector from TP sensor. Note electrical terminals on TP sensor. See **Fig. 58** . Using ohmmeter, check resistance between VC and E2 terminals on TP sensor. Replace TP sensor if resistance is not within specification. See **THROTTLE POSITION SENSOR RESISTANCE** table.

RAV4

1. Manufacturer does not list procedure for Throttle Position (TP) sensor adjustment. Only information available is for checking resistance of TP sensor.
2. Disconnect electrical connector from TP sensor. Note electrical terminals on TP sensor. See **Fig. 59** .

Using ohmmeter, check resistance between specified terminals in relation to throttle position. See **THROTTLE POSITION SENSOR RESISTANCE** table. Replace components as necessary if resistance is not within specification.

TACOMA

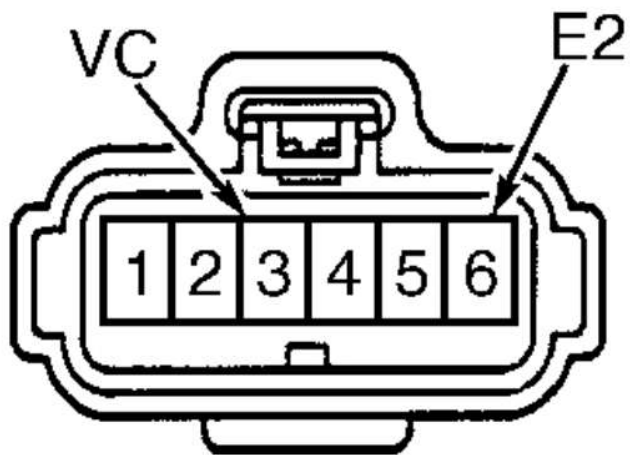
1. Manufacturer does not list procedure for Throttle Position (TP) sensor adjustment. Only information available is for checking resistance of TP sensor.
2. Disconnect electrical connector from TP sensor. Note electrical terminals on TP sensor. See **Fig. 60** . Apply vacuum to throttle opener located on throttle body. See **Fig. 60** .
3. Using ohmmeter, check resistance between specified terminals in relation to throttle position. See **THROTTLE POSITION SENSOR RESISTANCE** table. Replace components as necessary if resistance is not within specification.

THROTTLE POSITION SENSOR RESISTANCE

Application	Throttle Position	Terminals	Ohms
Camry & Camry Solara		VC & E2	⁽¹⁾ 1200-3200
Celica, Corolla & ECHO	Fully Closed	VTA & E2	200-5700
	Fully Open	VTA & E2	2000-10,200
	VC & E2	2500-5900	
Highlander	Fully Closed	VTA & E2	200-5700
	Fully Open	VTA & E2	2000-10,200
	VC & E2	2500-5000	
MR2			
Models With Standard Type Manual Transaxle	Fully Closed	VTA & E2	200-5700
	Fully Open	VTA & E2	2000-10,200
	VC & E2	2500-5900	
Models With Sequential Manual Transaxle		VC & E2	⁽¹⁾ 1200-3200
Prius		VC & E2	⁽¹⁾ 1200-3200
RAV4	Fully Closed	VTA & E2	200-5700
	Fully Open	VTA & E2	2000-10,200
	VC & E2	2500-5900	
Tacoma ⁽²⁾	Fully Closed	VTA & E2	200-5700
	Fully Open	VTA & E2	2000-10,200
	VC & E2	2500-5900	

⁽¹⁾ Resistance at 68°F (20°C).

⁽²⁾ Apply vacuum to throttle opener before checking TP sensor.



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Fig. 51: Identifying Throttle Position Sensor Terminals (Camry & Camry Solara)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

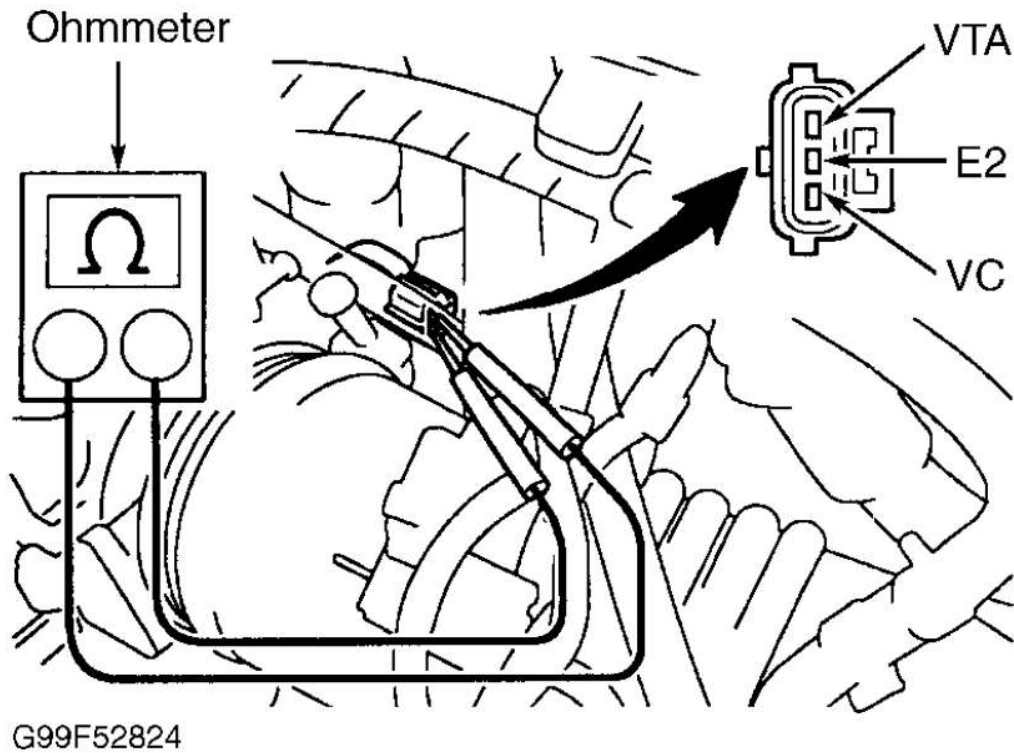


Fig. 52: Identifying Throttle Position Sensor Terminals (Celica)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

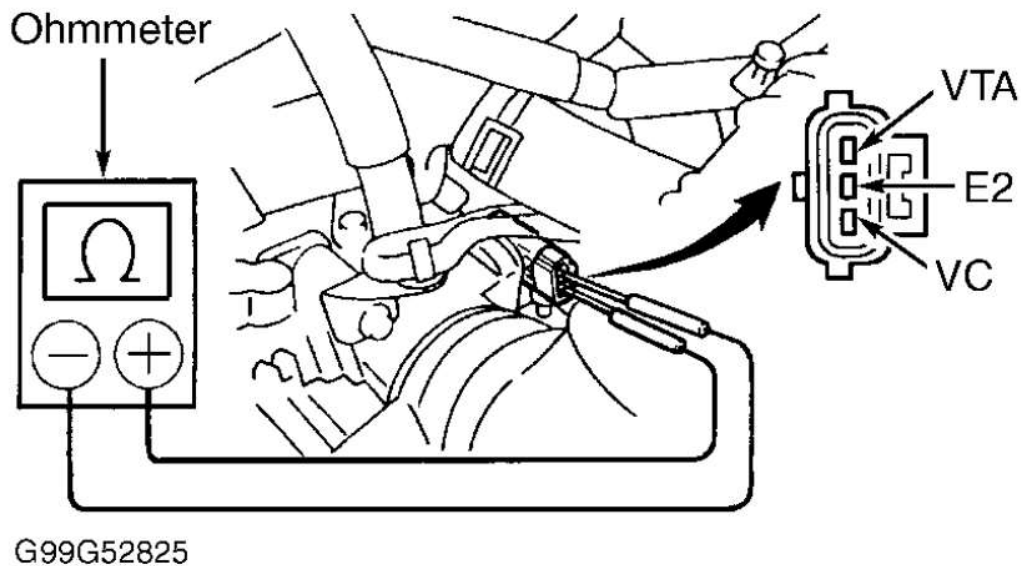


Fig. 53: Identifying Throttle Position Sensor Terminals (Corolla)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

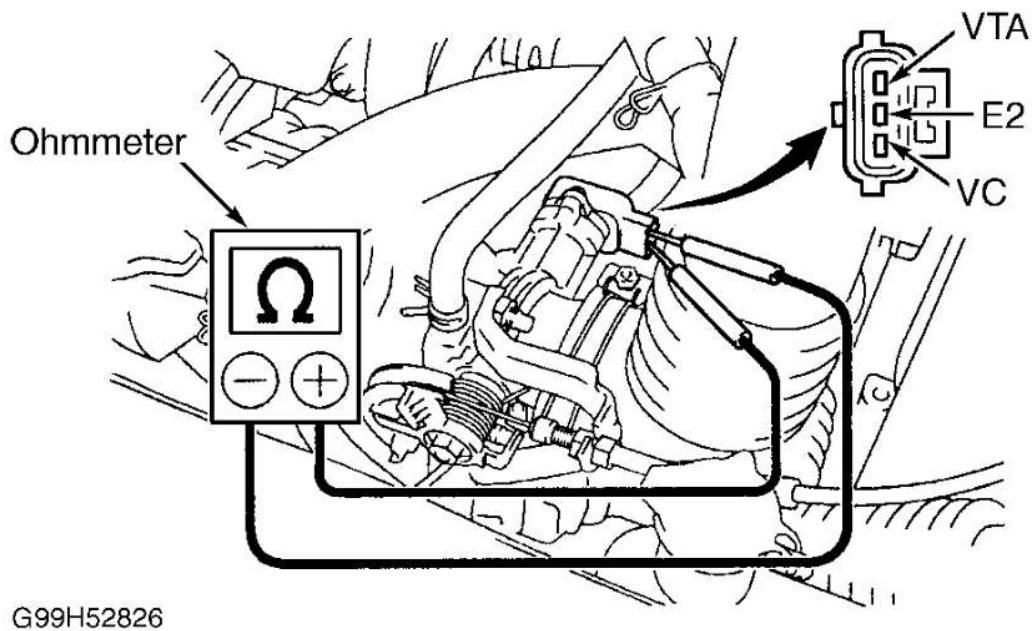


Fig. 54: Identifying Throttle Position Sensor Terminals (ECHO)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

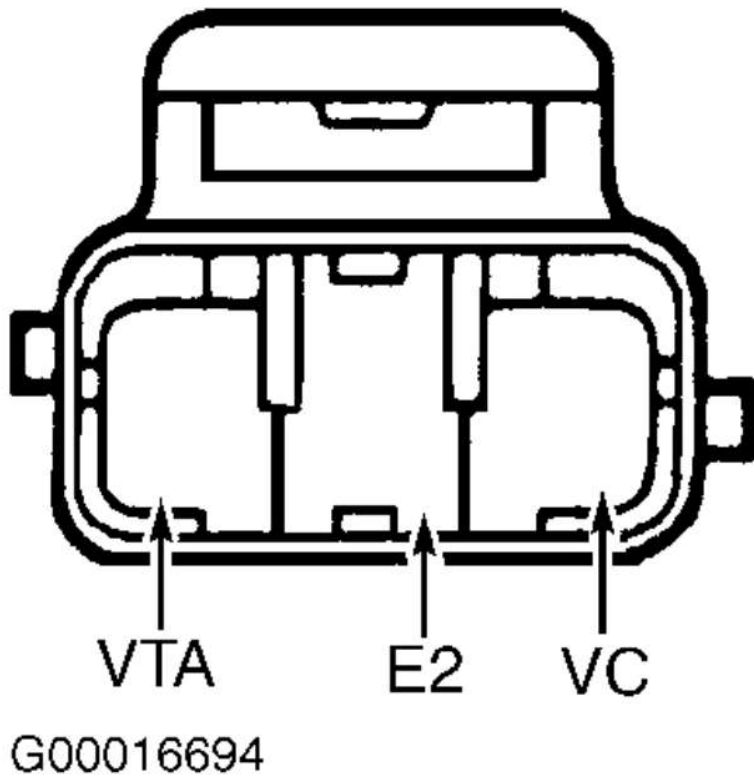
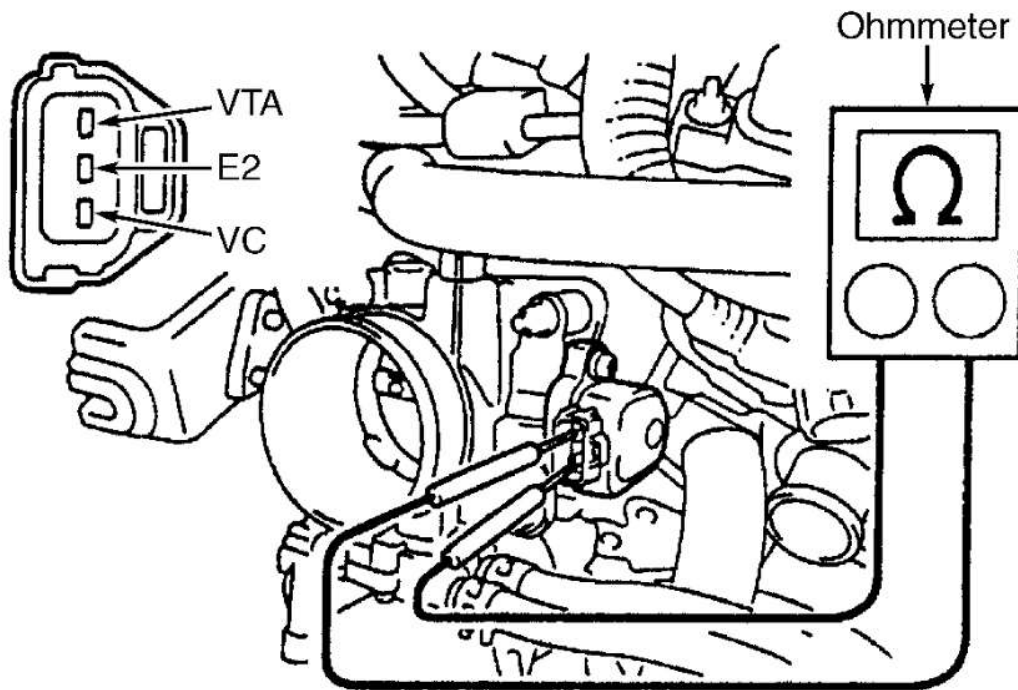


Fig. 55: Identifying Throttle Position Sensor Terminals (Highlander)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 56: Identifying Throttle Position Sensor Terminals (MR2 With Standard Type Manual Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

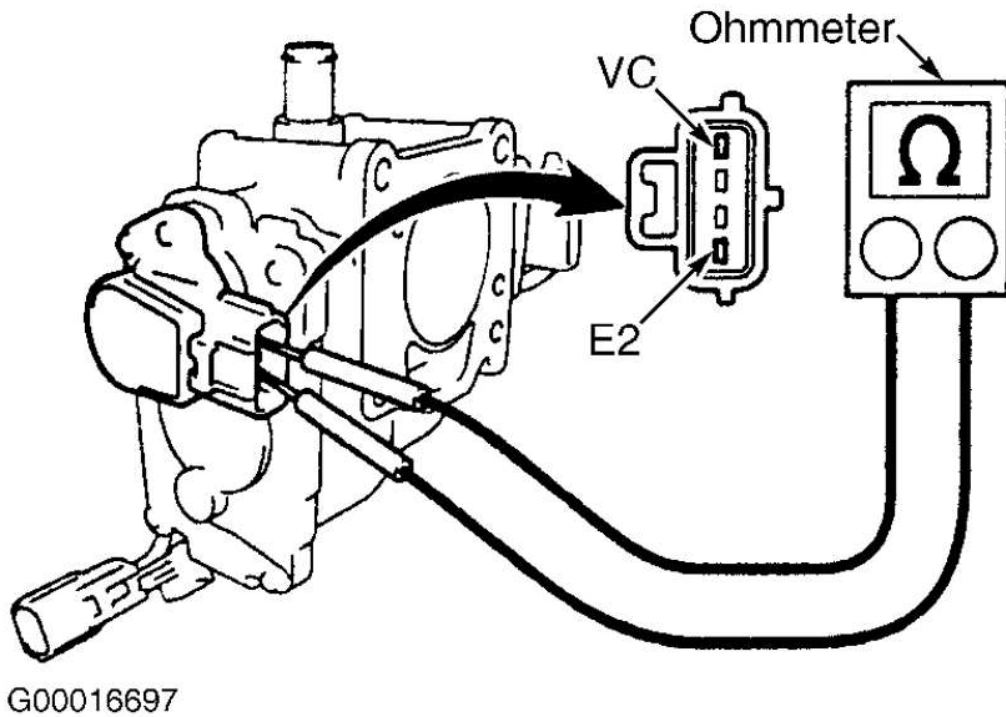


Fig. 57: Identifying Throttle Position Sensor Terminals (MR2 With Sequential Manual Transaxle)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

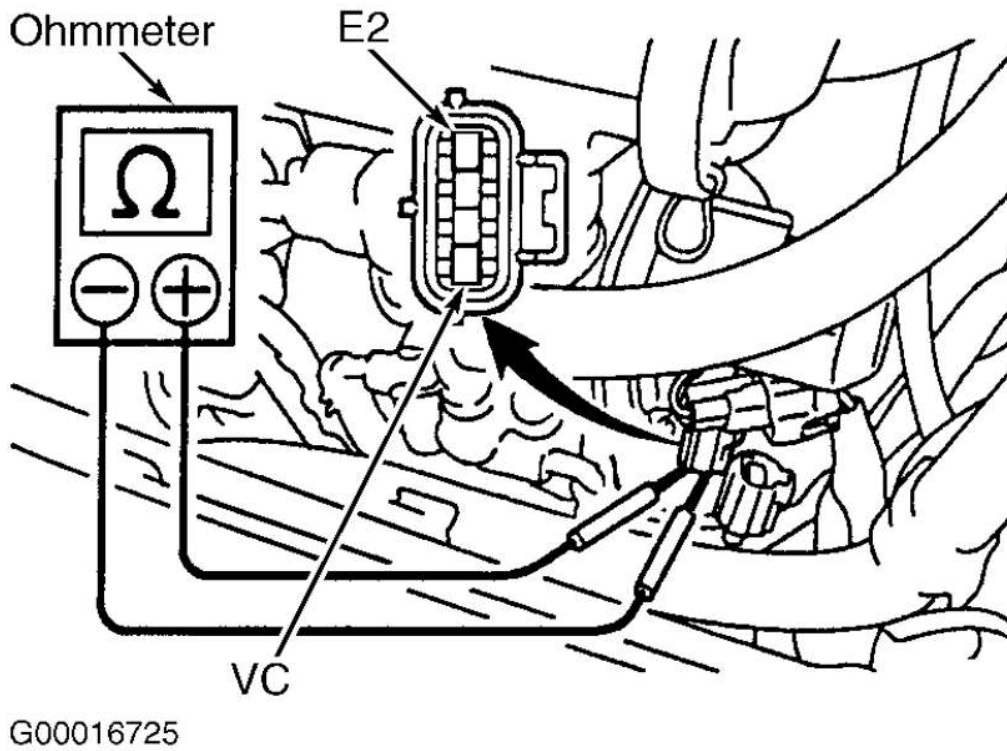


Fig. 58: Identifying Throttle Position Sensor Terminals (Prius)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

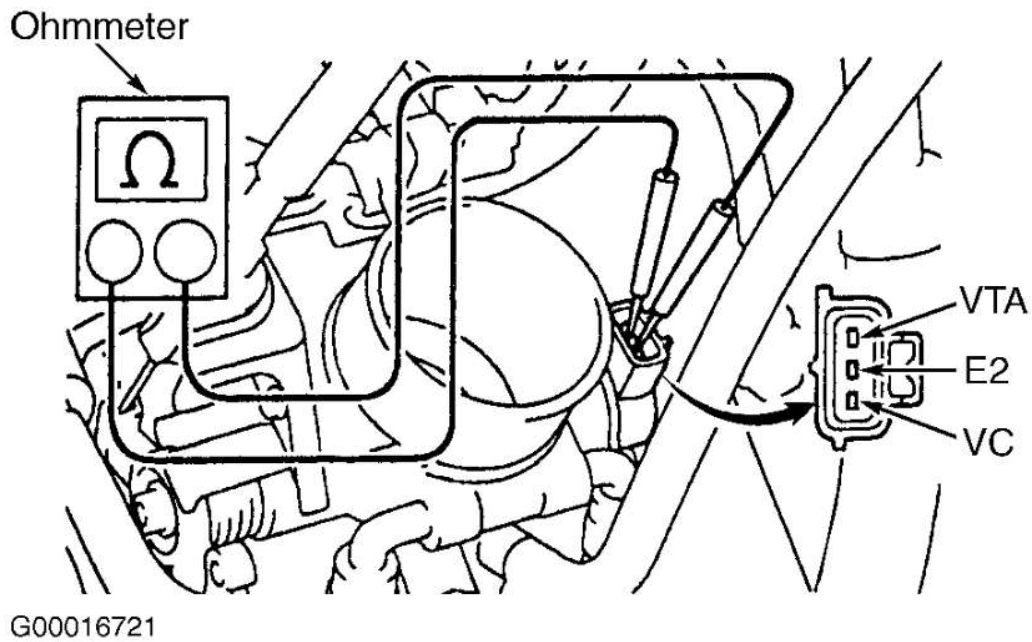
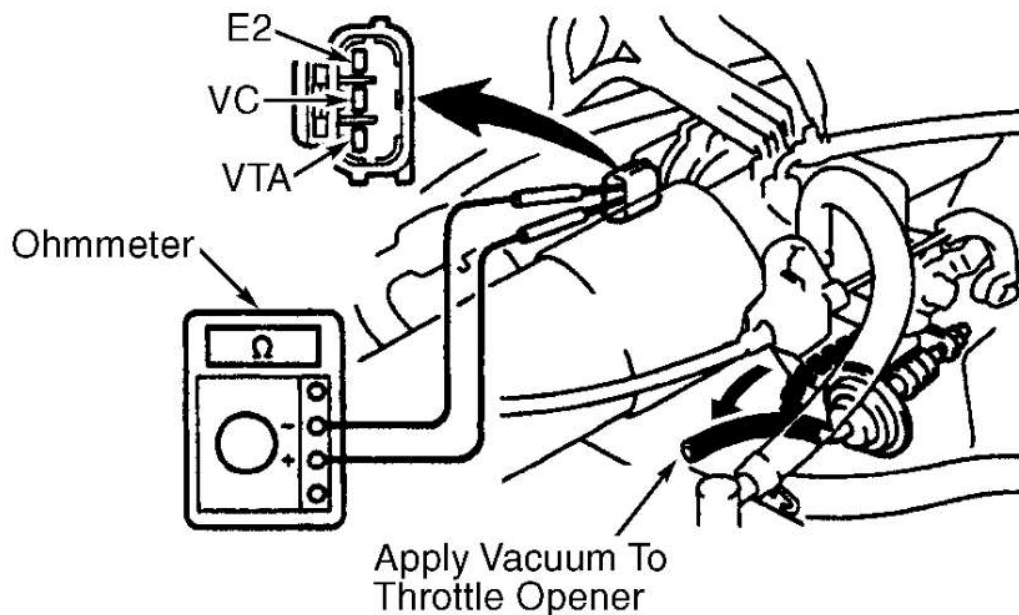


Fig. 59: Identifying Throttle Position Sensor Terminals (RAV4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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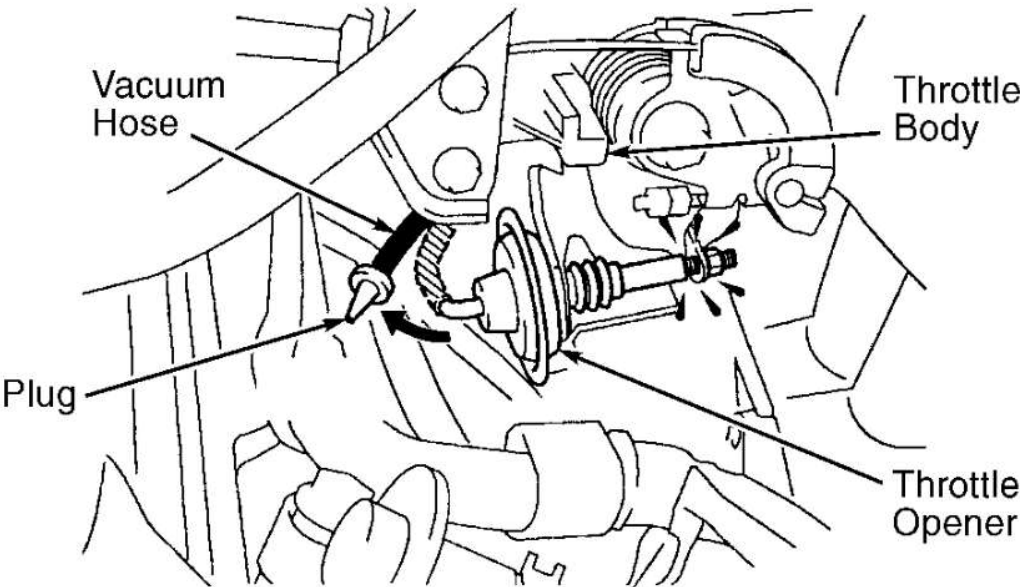
Fig. 60: Identifying Throttle Position Sensor Terminals & Locating Throttle Opener (Tacoma)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

THROTTLE OPENER

THROTTLE OPENER ADJUSTMENT

Tacoma

1. Start engine and warm engine to normal operating temperature. Ensure idle speed is within specification. See **IDLE SPEED & MIXTURE**.
2. With engine idling, disconnect and plug vacuum hose at throttle opener. See **Fig. 61**. Note engine speed with vacuum hose disconnected from throttle opener. Engine speed should be 1200-1500 RPM.
3. If engine speed is not within specification, throttle opener is nonadjustable and throttle body must be replaced. Shut engine off. Reinstall vacuum hose on throttle opener. Start engine and ensure engine returns to proper idle speed. If necessary to replace throttle body, see **THROTTLE BODY** under **FUEL SYSTEMS** in **REMOVAL, OVERHAUL & INSTALLATION - 4-CYLINDER** article.



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Fig. 61: Locating Throttle Opener & Disconnecting Vacuum Hose (Tacoma)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

MISCELLANEOUS CONTROLS

PARK/NEUTRAL POSITION SWITCH

For adjustment of Park/Neutral Position (PNP) switch, see PARK/NEUTRAL POSITION SWITCH under ENGINE SENSORS & SWITCHES in REMOVAL, OVERHAUL & INSTALLATION - 4-CYLINDER article.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Timing Chain Cover Plug	
ECHO & Prius	11 (15.0)
Ventilation Pipe Bolt/Nut	
Celica	
1.8L 2ZZ-GE	(1)
Wheel Lug Nut	
Camry & Highlander	76 (103)

INCH Lbs. (N.m)	
Ignition Coil Bolt	
Camry, Camry Solara, Celica, Corolla, ECHO, Highlander, MR2, Prius & RAV4	80 (9.0)
Tacoma	66 (7.5)
Valve Cover Bolt Or Nut	
Camry & Camry Solara	97 (11.0)
Celica	
1.8L 1ZZ-FE	(2)
1.8L 2ZZ-GE	88 (9.9)
Corolla	(3)
ECHO	(4) 88 (9.9)
Highlander	(5)
MR2	(3)
Prius	(4) 88 (9.9)
RAV4	97 (11.0)
Tacoma	(6)
(1) Tighten nuts to 88 INCH lbs. (9.9 N.m) and bolt to 18 ft. lbs. (24 N.m). (2) Tighten bolts/nuts with washer to 80 INCH lbs. (9.0 N.m). Tighten bolts/nuts without washer to 97 INCH lbs. (11.0 N.m). (3) Tighten bolts/nuts with washer to 80 INCH lbs. (9.0 N.m). Tighten bolts/nuts without washer to 97 INCH lbs. (11.0 N.m). Tighten bolts/nuts to specification in sequence. See Fig. 16 . (4) Tighten bolts/nuts to specification in sequence. See Fig. 27 . (5) Tighten bolts/nuts to specification. See Fig. 6 . (6) Information is not available from manufacturer.	