

**REMOVAL AND INSTALLATION (Continued)**

(b) Remove cylinder number 1 spark plug.

(c) Hold a finger over the open spark plug hole. Rotate engine at vibration dampener bolt until compression (pressure) is felt.

(d) Slowly continue to rotate engine. Do this until timing index mark on vibration damper pulley aligns with top dead center (TDC) mark (0 degree) on timing degree scale (Fig. 31). Always rotate engine in direction of normal rotation. Do not rotate engine backward to align timing marks.

(e) Install oil pump drive into engine while aligning into slot on oil pump. If pump drive will not drop down flush to engine block, the oil pump slot is not aligned. Remove oil pump drive and align slot in oil pump to shaft at bottom of drive. Install into engine. Rotate oil pump drive back to its original position and install hold-down clamp and bolt. Finger tighten bolt. Do not do a final tightening of bolt at this time.

(f) Remove toothpick from housing.

(6) Install sensor to oil pump drive. After installation, the CMP sensor should face rear of engine 0°.

(7) Install 2 sensor mounting bolts and tighten to 2 N·m (15 in. lbs.) torque.

(8) Connect electrical connector to CMP sensor.

(9) If removed, install spark plug and ignition coil rail.

To verify correct rotational position of oil pump drive, the DRB scan tool must be used.

**WARNING: WHEN PERFORMING THE FOLLOWING TEST, THE ENGINE WILL BE RUNNING. BE CAREFUL NOT TO STAND IN LINE WITH THE FAN BLADES OR FAN BELT. DO NOT WEAR LOOSE CLOTHING.**

(10) Connect DRB scan tool to data link connector. The data link connector is located in passenger compartment, below and to left of steering column.

(11) Gain access to SET SYNC screen on DRB.

(12) Follow directions on DRB screen and start engine. Bring to operating temperature (engine must be in "closed loop" mode).

(13) With engine running at **idle speed**, the words IN RANGE should appear on screen along with 0°. This indicates correct position of oil pump drive.

(14) If a plus (+) or a minus (-) is displayed next to degree number, and/or the degree displayed is not zero, loosen but do not remove hold-down clamp bolt. Rotate oil pump drive until IN RANGE appears on screen. Continue to rotate oil pump drive until achieving as close to 0° as possible.

The degree scale on SET SYNC screen of DRB is referring to fuel synchronization only. **It is not referring to ignition timing.** Because of this, do not attempt to adjust ignition timing using this method. Rotating oil pump drive will have no effect

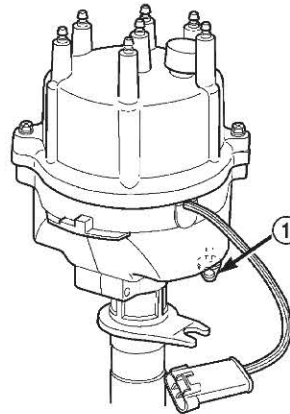
on ignition timing. All ignition timing values are controlled by powertrain control module (PCM).

(15) Tighten hold-down clamp bolt to 23 N·m (17 ft. lbs.) torque.

**DISTRIBUTOR—2.5L ENGINE**

The distributor contains an internal oil seal that prevents oil from entering the distributor housing. The seal is not serviceable.

Factory replacement distributors are equipped with a plastic alignment pin already installed. The pin is located in an access hole on the bottom of the distributor housing (Fig. 32). It is used to temporarily lock the rotor to the cylinder number 1 position during installation. The pin must be removed after installing the distributor.



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**Fig. 32 Plastic Alignment Pin—2.5L Engine**

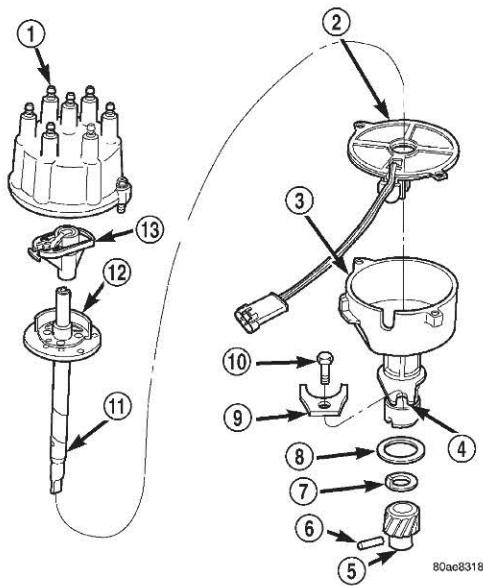
1 - PLASTIC ALIGNMENT PIN

The camshaft position sensor is located in the distributor (Fig. 33). For removal/installation procedures, refer to Camshaft Position Sensor. Distributor removal is not necessary for sensor removal.

Refer to (Fig. 33) for an exploded view of the distributor.

A fork with a slot is supplied on the bottom of the distributor housing where the housing base seats against the engine block (Fig. 33). The centerline of the slot aligns with the distributor holddown bolt hole in the engine block. Because of the fork, the distributor cannot be rotated. Distributor rotation is not necessary as all ignition timing requirements are handled by the Powertrain Control Module (PCM).

The position of the distributor determines fuel synchronization only. It does not determine ignition timing.

**REMOVAL AND INSTALLATION (Continued)****Fig. 33 Distributor—2.5L Engine—Typical**

- 1 - CAP
- 2 - CAMSHAFT POSITION SENSOR
- 3 - HOUSING
- 4 - FORK WITH SLOT
- 5 - DRIVE GEAR
- 6 - ROLL PIN
- 7 - WASHER
- 8 - GASKET
- 9 - HOLDDOWN CLAMP
- 10 - HOLDDOWN BOLT
- 11 - SHAFT
- 12 - PULSE RING
- 13 - ROTOR

**NOTE:** Do not attempt to modify this fork to attain ignition timing.

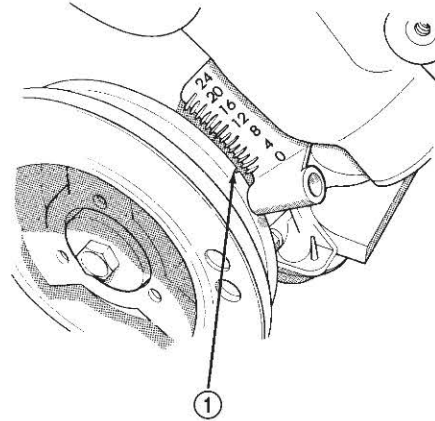
**REMOVAL**

- (1) Disconnect negative battery cable at battery.
- (2) Disconnect coil secondary cable at coil.
- (3) Remove distributor cap from distributor (2 screws). Do not remove cables from cap. Do not remove rotor.
- (4) Disconnect distributor wiring harness from main engine harness.
- (5) Remove cylinder number 1 spark plug.
- (6) Hold a finger over open spark plug hole. Rotate engine at vibration dampener bolt until compression (pressure) is felt.

(7) Slowly continue to rotate engine. Do this until timing index mark on vibration damper pulley aligns with Top Dead Center (TDC) mark (0 degree) on timing degree scale (Fig. 34). Always rotate engine in direction of normal rotation. Do not rotate engine backward to align timing marks.

(8) On models equipped with A/C, remove electrical cooling fan and shroud assembly from radiator. Refer to Group 7, Cooling System for procedures.

(9) This will provide room to turn engine crankshaft with a socket and ratchet using vibration damper bolt.



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**Fig. 34 Align Timing Marks—2.5L Engine**

- 1 - CRANKSHAFT VIBRATION DAMPER TIMING MARK

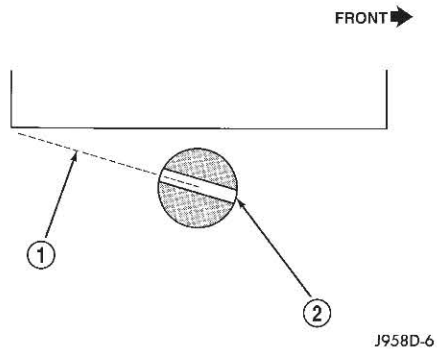
(10) Remove distributor holddown bolt and clamp.  
 (11) Remove distributor from engine by slowly lifting straight up.

(12) Note that rotor will rotate slightly in a counterclockwise direction while lifting up distributor. The oil pump gear will also rotate slightly in a counterclockwise direction while lifting up distributor. This is due to the helical cut gears on distributor and camshaft.

(13) Note removed position of rotor during distributor removal. During installation, this will be referred to as the Pre-position.

(14) Observe slot in oil pump gear through hole on side of engine. It should be slightly before (counterclockwise of) 10 o'clock position (Fig. 35).

(15) Remove and discard the old distributor-to-engine block gasket.

**REMOVAL AND INSTALLATION (Continued)****Fig. 35 Slot At 10 O'clock Position—2.5L Engine**

- 1 - 10 O'CLOCK POSITION  
2 - OIL PUMP SLOT

**INSTALLATION**

(1) If engine crankshaft has been rotated after distributor removal, cylinder number 1 must be returned to its proper firing stroke. Refer to previous REMOVAL Step 5 and Step 6. These steps must be done before installing distributor.

(2) Check position of slot on oil pump gear. On the 2.5L engine, it should be just slightly before (counter-clockwise of) 10 o'clock position (Fig. 35). If not, place a flat blade screwdriver into oil pump gear and rotate it into proper position.

(3) Factory replacement distributors are equipped with a plastic alignment pin already installed (Fig. 32). This pin is used to temporarily hold rotor to cylinder number 1 firing position during distributor installation. If pin is in place, proceed to Step 8. If not, proceed to next step.

(4) If original distributor is to be reinstalled, such as during engine overhaul, the plastic pin will not be available. A 3/16 inch drift pin punch tool may be substituted for plastic pin.

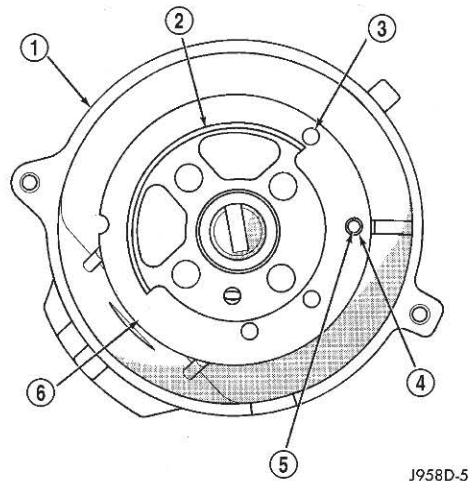
(5) Remove camshaft position sensor from distributor housing. Lift straight up.

(6) Four different alignment holes are provided on plastic ring (Fig. 36). **Note that 2.5L and 4.0L engines have different alignment holes (Fig. 36).**

(7) Rotate distributor shaft and install pin punch tool through proper alignment hole in plastic ring (Fig. 36) and into mating access hole in distributor housing. This will prevent distributor shaft and rotor from rotating.

(8) Clean distributor mounting hole area of engine block.

(9) Install new distributor-to-engine block gasket (Fig. 33).

**Fig. 36 Pin Alignment Holes—2.5L Engine**

- 1 - DISTRIBUTOR HOUSING (TOP VIEW)  
2 - PULSE RING  
3 - 4.0L 6-CYLINDER ENGINE ALIGN. HOLE  
4 - 2.5L 4-CYLINDER ENGINE ALIGN. HOLE  
5 - MATING ACCESS HOLE IN DISTRIBUTOR HOUSING  
6 - PLASTIC RING

(10) Install rotor to distributor shaft.

(11) Pre-position distributor into engine while holding centerline of base slot in 1 o'clock position (Fig. 37). Continue to engage distributor into engine. The rotor and distributor will rotate clockwise during installation. This is due to the helical cut gears on distributor and camshaft. When distributor is fully seated to engine block, the centerline of base slot should be aligned to clamp bolt mounting hole on engine (Fig. 38). The rotor should also be pointed slightly past (clockwise of) 3 o'clock position.

It may be necessary to rotate rotor and distributor shaft (very slightly) to engage distributor shaft with slot in oil pump gear. The same may have to be done to engage distributor gear with camshaft gear.

**The distributor is correctly installed when:**

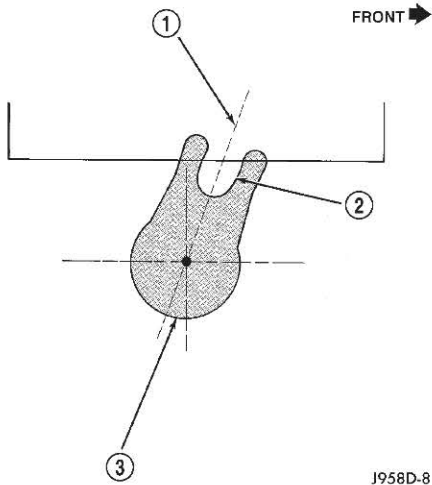
rotor is pointed at 3 o'clock position.

plastic alignment pin (or pin punch tool) is still installed to distributor.

number 1 cylinder piston is set at top dead center (TDC) (compression stroke).

centerline of slot at base of distributor is aligned to centerline of distributor holddown bolt hole on engine. In this position, the holddown bolt should easily pass through slot and into engine.

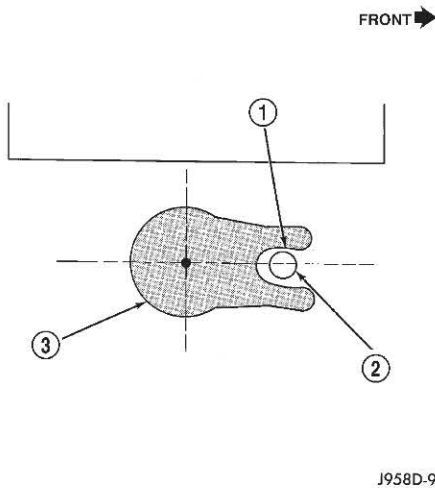
No adjustments are necessary. Proceed to next step.

**REMOVAL AND INSTALLATION (Continued)**

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**Fig. 37 Distributor Pre-position—2.5L Engine**

- 1 - 1 O'CLOCK POSITION
- 2 - BASE SLOT
- 3 - DISTRIBUTOR BASE



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**Fig. 38 Distributor Engaged Position—2.5L Engine**

- 1 - DISTRIBUTOR BASE SLOT
- 2 - CLAMP BOLT MOUNTING HOLE (ON ENGINE)
- 3 - DISTRIBUTOR BASE

(12) Install distributor holddown clamp and bolt. Tighten bolt to 23 N·m (17 ft. lbs.) torque.

(13) Remove pin punch tool from distributor. Or, if plastic alignment pin was used, remove it straight down from bottom of distributor. Discard plastic pin.

(14) If removed, install camshaft position sensor to distributor. Align wiring harness grommet to notch in distributor housing.

(15) Install rotor.

**CAUTION:** If the distributor cap is incorrectly positioned on distributor housing, cap or rotor may be damaged when engine is started.

(16) Install distributor cap. Tighten distributor cap holddown screws to 3 N·m (26 in. lbs.) torque.

(17) If removed, install spark plug cables to distributor cap. For proper firing order, refer to Engine Firing Order.

(18) Connect distributor wiring harness to main engine harness.

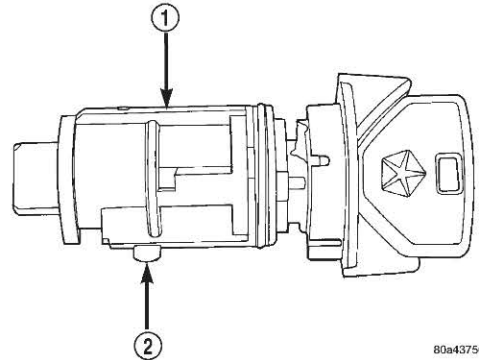
(19) Connect battery cable to battery.

**IGNITION SWITCH AND KEY CYLINDER**

The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

**KEY CYLINDER REMOVAL**

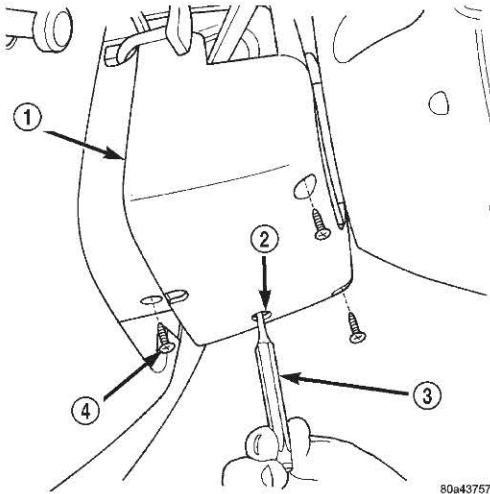
- (1) Disconnect negative battery cable at battery.
- (2) If equipped with an automatic transmission, place shifter in PARK position.
- (3) Rotate key to ON position.
- (4) A release tang is located on bottom of key cylinder (Fig. 39).



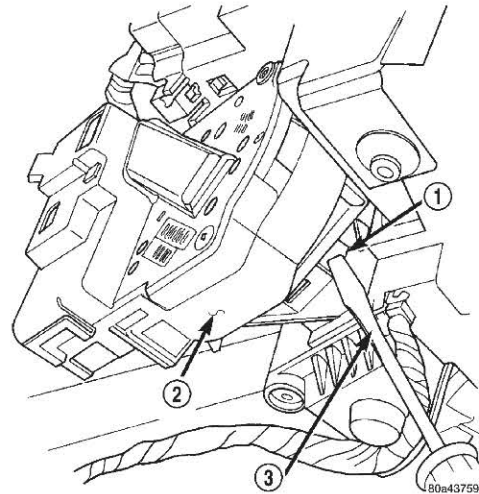
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**Fig. 39 Key Cylinder Release Tang**

- 1 - KEY CYLINDER
- 2 - RELEASE TANG

**REMOVAL AND INSTALLATION (Continued)****Fig. 40 Key Cylinder and Cover Removal**

- 1 - LOWER COVER
- 2 - ACCESS HOLE
- 3 - PIN PUNCH
- 4 - COVER SCREWS (3)

**Fig. 41 Ignition Switch Lock Tab**

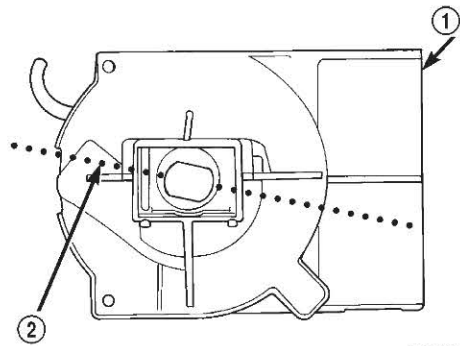
- 1 - LOCK TAB
- 2 - IGNITION SWITCH
- 3 - SCREWDRIVER

(5) Position a small screwdriver or pin punch into tang access hole on bottom of steering column lower cover (Fig. 40).

(6) Push the pin punch up while pulling key cylinder from steering column.

**IGNITION SWITCH REMOVAL**

- (1) Remove key cylinder. Refer to previous steps.
- (2) Remove lower steering column cover screws and remove cover (Fig. 40).
- (3) Remove ignition switch mounting screw (Fig. 43). Use tamper proof torx bit (Snap-On SDMTR10 or equivalent) to remove the screw.
- (4) Using a small screwdriver, push on locking tab (Fig. 41) and remove switch from steering column.
- (5) Disconnect two electrical connectors at rear of ignition switch (Fig. 43).

**Fig. 42 Switch In ON Position**

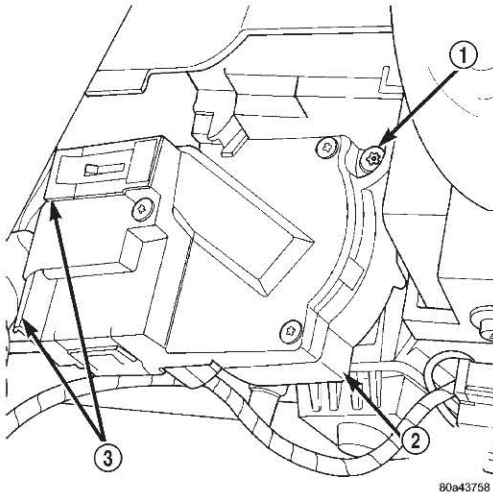
- 1 - IGNITION SWITCH
- 2 - ROTATE TO ON POSITION

**IGNITION SWITCH INSTALLATION**

- (1) Before installing ignition switch, rotate the slot in the switch to the ON position (Fig. 42).
- (2) Connect two electrical connectors to rear of ignition switch. Make sure that locking tabs are fully seated into wiring connectors.
- (3) Position switch to column and install tamper proof screw. Tighten screw to 3 N-m (26 in. lbs.).
- (4) Install steering column lower cover.

**KEY CYLINDER INSTALLATION**

- (1) If equipped with an automatic transmission, place shifter in PARK position.
- (2) Position key cylinder into steering column as it would normally be in the ON position.
- (3) Press key cylinder into column until it snaps into position.

**REMOVAL AND INSTALLATION (Continued)****Fig. 43 Ignition Switch Removal/Installation**

- 1 - TAMPER PROOF SCREW
- 2 - IGNITION SWITCH
- 3 - ELECTRICAL CONNECTORS

(4) Check mechanical operation of switch. **Automatic Transmission:** Be sure transmission lever is locked in PARK position after key removal. If key is difficult to rotate or is difficult to remove, the shift lever-to-steering column cable may be out of adjustment or defective. Refer to Group 21, Transmission for procedures. **Manual Transmission:** Be sure key cannot be removed until release lever is operated. If key can be removed, release lever mechanism may be defective. Release lever mechanism is not serviced separately. If repair is necessary, the steering column must be replaced. Refer to Group 19, Steering for procedures.

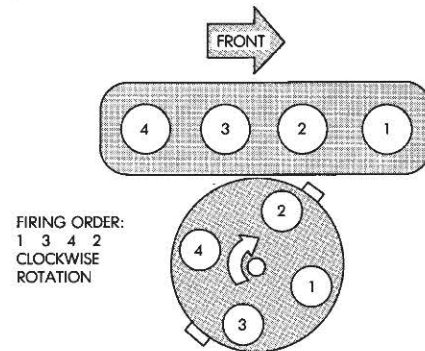
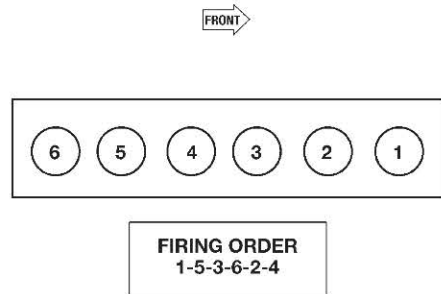
- (5) Connect negative cable to battery.
- (6) Check electrical operation of switch.

**SHIFTER/IGNITION INTERLOCK****REMOVAL/INSTALLATION**

On models equipped with an automatic transmission, a cable connects the ignition switch with the floor shift lever. The shifter will be locked in the PARK position when the shifter key is in the LOCK or ACCESSORY positions. The cable can be adjusted or replaced. Refer to Group 21, Transmissions for procedures. The ignition interlock device within the steering column is not serviceable. If service is necessary, the steering column must be replaced. Refer to Group 19, Steering for procedures.

**SPECIFICATIONS****IGNITION TIMING**

Ignition timing is not adjustable on any engine.

**ENGINE FIRING ORDER—2.5L 4-CYLINDER ENGINE****ENGINE FIRING ORDER—4.0L 6-CYLINDER ENGINE**

**COILS PAIRED:**  
**CYLINDERS 1-6**  
**CYLINDERS 2-5**  
**CYLINDERS 3-4**

**SPECIFICATIONS (Continued)****SPARK PLUGS**

ENGINE	PLUG TYPE	ELECTRODE GAP
2.5L	RC12ECC	0.89 mm (0.035 in.)
4.0L	RC12ECC	0.89 mm (0.035 in.)

**SPARK PLUG CABLE RESISTANCE**

MINIMUM	MAXIMUM
250 Ohms Per Inch	1000 Ohms Per Inch
3000 Ohms Per Foot	12,000 Ohms Per Foot

**IGNITION COIL RESISTANCE—2.5L ENGINE**

COIL MANUFACTURER	PRIMARY RESISTANCE @ 21-27°C (70-80°F)	SECONDARY RESISTANCE @ 21-27°C (70-80°F)
Diamond	0.97 - 1.18 Ohms	11,300 - 15,300 Ohms
Toyodenso	0.95 - 1.20 Ohms	11,300 - 13,300 Ohms

**IGNITION COIL RESISTANCE—4.0L ENGINE**

PRIMARY RESISTANCE 21-27°C (70-80°F)
0.71 - 0.88 Ohms

**TORQUE CHART**

DESCRIPTION	TORQUE
Camshaft Position Sensor— to-base bolts—4.0L . . . . .	28 N·m (15 in. lbs.)
Crankshaft Position Sensor Bolts— with manual transmission . . . . .	19 N·m (14 ft. lbs.)
Crankshaft Position Sensor Nuts— 2.5L with auto.trans. . . . .	19 N·m (14 ft. lbs.)
Crankshaft Position Sensor Bolt— 4.0L with auto. trans. . . . .	7 N·m (60 in. lbs.)
Distributor Hold Down Bolt—2.5L . . . . .	23 N·m (17 ft. lbs.)
Distributor Cap Screws—2.5L . . . . .	3 N·m (26 in. lbs.)
Ignition Coil Mounting (if tapped bolts are used)— 2.5L . . . . .	5 N·m (50 in. lbs.)
Ignition Coil Mounting (if nuts/bolts are used)— 2.5L . . . . .	11 N·m (100 in. lbs.)
Ignition Coil Rail Mounting Bolts—4.0L . . . . .	29 N·m (250 in. lbs.)
Oil Pump Drive Hold-down Bolt—4.0L . . . . .	23 N·m (17 ft. lbs.)
Spark Plugs (all engines) . . . . .	41 N·m (30 ft. lbs.)