

SECTION 03-05 Drive Belts, Accessory

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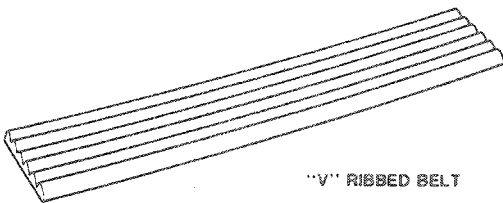
VEHICLE APPLICATION

Taurus / Sable and Taurus SHO.

DESCRIPTION

Taurus / Sable and Taurus SHO vehicles are equipped with V-ribbed belts. To ensure maximum life, replacement belts should be of the same type as originally installed. Some systems are equipped with an automatic belt tensioner on the belt and will not require any tension adjustment for the life of the belt. Loose belt(s) will result in slippage which may cause a noise complaint or improper accessory operation (generator will not charge, etc). Over-tightening accessory belts will place a severe load on accessory bearings.

NOTE: The drive belt condition should be checked at 96,000 Km (60,000 miles) and then every 24, 140 Km (15,000 miles).



"V" RIBBED BELT

Q2258-A

NOTE: When an accessory drive belt is replaced or reinstalled after a service procedure, the belt does not fully seat into pulley grooves until engine has run for several minutes. On accessory drive belt systems that do not have automatic tensioners, belt seating can cause sufficient tension loss to reduce stabilized belt tension below the specified range, resulting in excessive wear and belt squeal. The amount of belt seating cannot be compensated for by increasing the initial belt tension because this can cause damage to the belt.

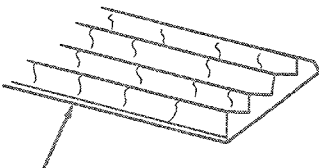
To ensure stabilized belt tensions within specification, accessory drive belt systems without an automatic tensioner should be reset after belt has been fully seated by running engine for five minutes. It is important to keep the belt seated in the pulley grooves by not allowing belt to relax while resetting belt tension. If belt does unseat from any pulley in the drive system while resetting tension, "set-reset" procedure must be repeated.

DIAGNOSIS

Belt Cracking/Chunking

Under severe operating conditions (high temperatures, low humidity), belt rib cracking can occur at less than 96,000 km (60,000 miles). Belt rib cracking is not a reason for concern and has no detrimental effect on belt performance. The belt is still perfectly functional until rib "chunking" occurs. Belt "chunking" is where the rubber material actually chunks out between the cracks. The belt should be replaced if chunking occurs.

"V" Ribbed Belt With Cracks Across Backing

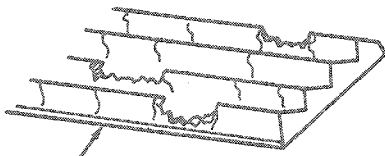


CRACKS ACROSS BACKING ARE ACCEPTABLE.
CRACKS PARALLEL TO BACKING ARE NOT.

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DIAGNOSIS (Continued)

"V" Ribbed Belt With Chunks of Rib Missing



CHUNKS OF RIBS MISSING NOT
ACCEPTABLE

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Belt Noise

Belt chirp is regularly occurring "chirping" noise that occurs due to pulley misalignment or excessive pulley runout. It can be a result of a damaged pulley or an improperly replaced pulley that was not properly aligned.

To correct, determine the area where the noise comes from. Then check each of the pulleys in that area with a straightedge to the crankshaft pulley and look for the accessory pulley to be out of position in the fore / aft direction or at an angle to the straightedge.

Belt squeal is an intermittent noise that occurs when the belt slips on a pulley during certain conditions such as: engine start up, rapid engine excels or A/C clutch engagement.

Belt squeal can occur under the following conditions:

1. If the A/C discharge pressure goes above 2895 kPa (420 psi). This can occur if:
 - a. The A/C system is overcharged.
 - b. The A/C condenser airflow is blocked.
 - c. The engine fan is not engaging fully at idle.
2. If A/C off equalized pressure (the common discharge and suction pressure that occurs after several minutes) exceeds 965 kPa (140 psi), which is a rare occurrence at high ambient temperatures with a hot engine, turn A/C OFF for a few seconds and then back ON after fan begins to cool condenser.
3. If any of the accessories are damaged, have a worn or damaged bearing or internal torsional resistance above normal for any reason. All of the accessories should be rotatable by hand in the unloaded condition. If any are not, the accessory should be inspected.

4. If fluids get on the belt. This would include power steering fluid, engine coolant, engine oil, air conditioning system lubricant.
If fluids get on the belt during service, the best policy is to clean the belt with soap and water and thoroughly rinse with clean water. The belt does not have to be replaced if no apparent damage has occurred.
5. If the belt is too long. A belt that is too long will allow the tensioner arm to go all the way to tensioner arm travel stop under certain load conditions, which will untension the belt. If the tensioner is resting on the stop, replace the belt.
6. If the tensioner is worn or damaged. Only replace the tensioner if a torque reading of under 40 N·m (30 lb-ft) is measured with a 1/2-inch drive torque wrench, in the tensioner lifting 1/2-inch hole, with the torque wrench in the vertical position.
NOTE: The tensioner arm should rotate freely without binding.

ADJUSTMENTS

To ensure proper tension, follow these procedures. Refer to the applicable adjustment illustration and belt tension specification chart.

NOTE: Use Rotunda Offset Belt Tension Gauge 021-00028-A or equivalent on 3.0L SHO engine equipped vehicles only.

3.0L SHO Engine

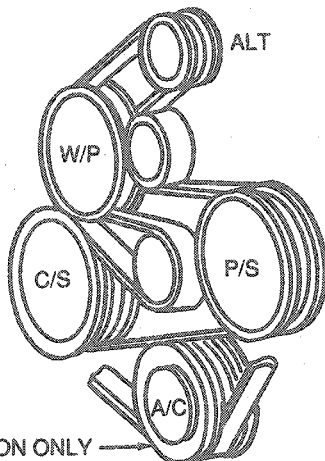
1. Loosen idler pulley nut and turn adjusting screw until belt is adjusted to specification.
NOTE: Turning wrench to right tightens belt and turning wrench to left loosens belt.
2. Tighten idler pulley nut to 34-50 N·m (25-37 lb-ft) and check belt tension.

The generator, power steering, air conditioning drive belt should be checked for proper tension after both belts are adjusted and the component retaining bolts are properly tightened.

ADJUSTMENTS (Continued)

3.0L SFI/3.0L FF Engines**With Automatic Tensioner**

Belt tension is maintained by an automatic tensioner and cannot be adjusted.



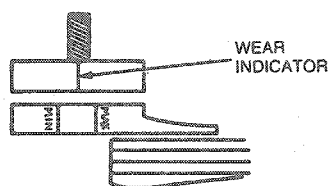
A/C APPLICATION ONLY

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Automatic belt tensioners are spring loaded devices which set and maintain the drive belt tension. The drive belt should not require tension adjustment for the life of the belt. Automatic tensioners have belt wear indicator marks. If the indicator mark is not between the MIN and MAX marks, the belt is worn or an incorrect belt is installed.

NOTE: The indicator mark inspection is done with the engine OFF.

Automatic tensioners do not have to be removed to remove a drive belt. To remove a drive belt, rotate the tensioner away from the belt.



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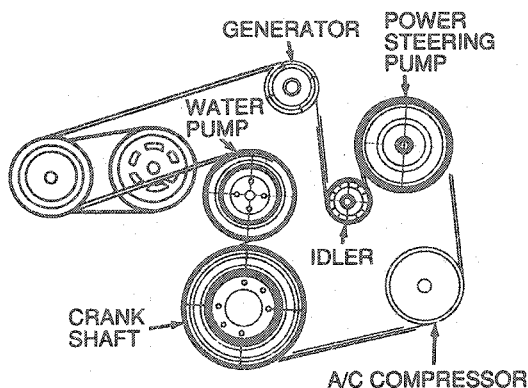
REMOVAL AND INSTALLATION

Conditions requiring belt replacement are excessive wear, rib chunkout, severe glazing, frayed cords, etc. Replace any belt exhibiting any of these conditions.

NOTE: Minor cracks in the V-grooved portion of the belt are considered normal and acceptable. If the belt has chunks missing from the ribs it should be replaced.

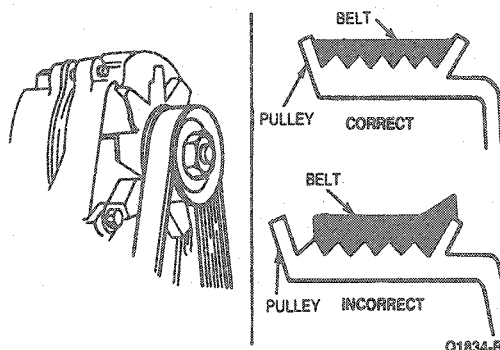
NOTE: Refer to the illustrations under Adjustments while performing the following Removal and Installation procedures.

NOTE: When installing belts on pulley, ensure that all V-grooves make proper contact with pulleys.

**SPECIAL INSTRUCTIONS:**

1. LIFT AUTOMATIC TENSIONER USING A 1/2-INCH DRIVE BREAKER BAR IN DIRECTION OF ARROW
2. INSTALL DRIVE BELT OVER PULLEYS PER APPROPRIATE BELT ROUTING

Q2392-C



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Drive Belt, Generator/A/C**3.0L SHO Engine****Removal**

1. Loosen nut in center of idler pulley.
2. Loosen idler adjusting screw until old belt can be removed.

REMOVAL AND INSTALLATION (Continued)

3. Remove belt.

Installation

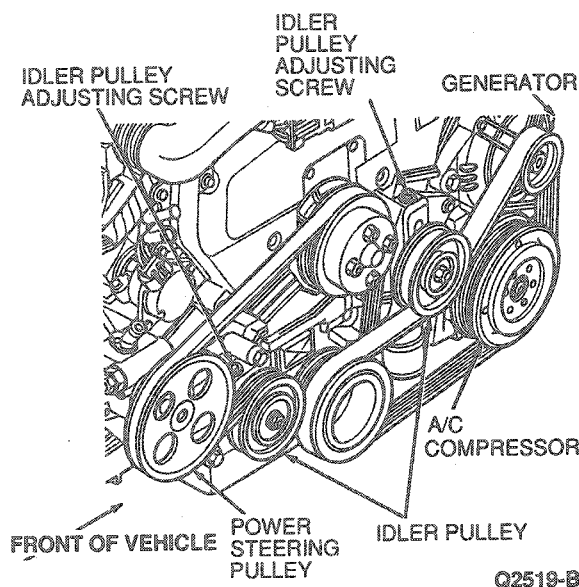
1. Install new belt over pulleys. Ensure all V-grooves make proper contact with pulleys.
2. Adjust belt tension as outlined.
3. Tighten idler pulley nut to 34-50 N·m (25-37 lb-ft).

Drive Belt, Power Steering/Water Pump**3.0L SHO Engine****Removal**

1. Remove generator belt as outlined.
2. Loosen nut on tensioner pulley.
3. Turn belt adjusting screw on tensioner counterclockwise until belt can be removed.
4. Remove belt.

Installation

1. Position belt over pulleys and belt tensioner. Ensure that all V-grooves make proper contact with pulleys.
2. Install generator belt as outlined.
3. Adjust belt tension for both belts as outlined.

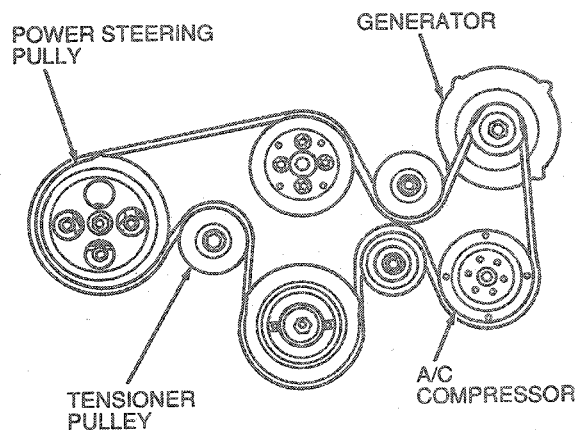
3.0L SHO Accessory Drive Belts

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3.2L SHO With Automatic Tensioner**Removal**

WARNING: USE CAUTION WHEN REMOVING/INSTALLING BELTS TO ENSURE THAT TOOL DOES NOT SLIP.

1. Place a 14mm socket over bolt on tensioner pulley and rotate clockwise (downward) to release belt tension.



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2. Remove belt from pulleys.

Installation

1. Install belt over all pulleys except power steering pump pulley.
2. Place a 14mm socket over bolt on tensioner pulley and rotate clockwise (downward) and install belt over power steering pump pulley.

NOTE: Ensure that all V-grooves make proper contact with pulleys.

3.0L SFI, 3.0L FF and 3.8L SFI Engines With Automatic Tensioner**Removal**

1. Insert a 1/2-inch flex handle in square hole in tensioner. On 3.8L engines, the tensioner has a 1/2-inch square hole cast into the rear of the tensioner arm directly behind the pulley. On 3.0L and 3.8L engines use a 15mm socket for bolt attaching tensioner pulley. Rotate clockwise to remove belt from pulleys.

WARNING: USE CAUTION WHEN REMOVING OR INSTALLING BELTS TO ENSURE THAT TOOL DOES NOT SLIP.

Installation

1. Install belt over all pulleys (except idler pulley on 3.0L).
2. Rotate tensioner as described under Removal and install belt over generator pulley. Ensure that all V-grooves make proper contact with pulleys.
3. On 3.0L, install belt over idler pulley last.

SPECIFICATIONS**BELT TENSION SPECIFICATIONS**

Engine	Belt Type	New Installation	Used Belt Reset	Allowable Minimum
3.0L SHO Engine	Air Conditioning / Generator	980-1180 N 220-265 Lbs	660-850 N 148-192 Lbs	535 N 120 Lbs
3.0L SHO Engine	Power Steering / Water Pump	690-880 N 154-198 Lbs	500-700 N 112-157 Lbs	357 N 80 Lbs

TORQUE SPECIFICATIONS

Engine	Description	N-m	Lb-Ft
3.0L SHO	Idler Pulley Nut	34-50	25-37
3.8L	Generator Pivot Bolt	40-55	30-41
3.8L	A/C Bracket to Block	40-55	30-41
3.8L	A/C Compressor to Bracket	20-30	15-22
3.8L	Tensioner to Tensioner Bracket	70-95	52-70

SPECIAL SERVICE TOOLS**ROTUNDA EQUIPMENT**

Model	Description
021-00028-A	Offset Belt Tension Gauge

SECTION 03-06 Starting System

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DISASSEMBLY AND ASSEMBLY		SPECIFICATIONS	
Armature Replacement	03-06-10	VEHICLE APPLICATION	

VEHICLE APPLICATION

Taurus / Sable.

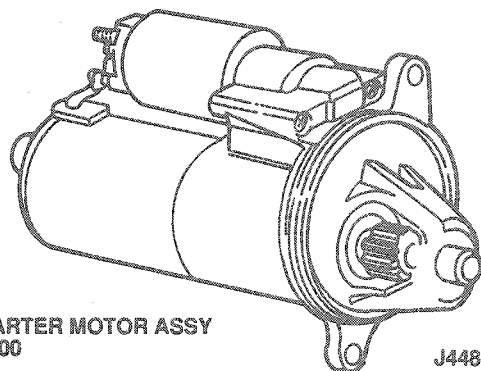
DESCRIPTION AND OPERATION

The function of the starting system is to crank the engine at a speed fast enough to permit the engine to start. Heavy cables, connectors, and switches are used in the starting system because of the large current required by the starter while it is cranking the engine. The amount of resistance in the starting circuit must be kept to an absolute minimum to provide maximum current for starter operation. A discharged or damaged battery, loose or corroded connections, or partially broken cables will result in slower than normal cranking speeds, and may even prevent the starter from cranking the engine.

In case of starting system trouble, the operator may have discharged the battery before calling for assistance. A road service procedure is presented to aid the service technician in such cases of starting trouble. Be sure to follow diagnosis procedures in the Powertrain Control / Emissions Diagnosis Manual ¹, in order to locate the cause of the starting difficulty. Road service is not a part of the diagnosis procedures.

The starting system includes the permanent magnet gear-reduction starter motor with a solenoid-actuated drive, the battery, a remote control starter switch (part of the ignition switch), the manual lever position (MLP) sensor (automatic transaxle), clutch pedal position (CPP) switch (manual transaxle) and heavy circuit wiring.

Typical Starter Shown



Vehicles equipped with a manual transaxle have a clutch pedal position (CPP) switch in the starter circuit that prevents operation of the starter unless the clutch pedal is depressed.

Vehicles equipped with an automatic transaxle have a MLP sensor in the starter control circuit, which prevents operation of the starter unless the selector lever is in the NEUTRAL or PARK position.

Sequence of Operation

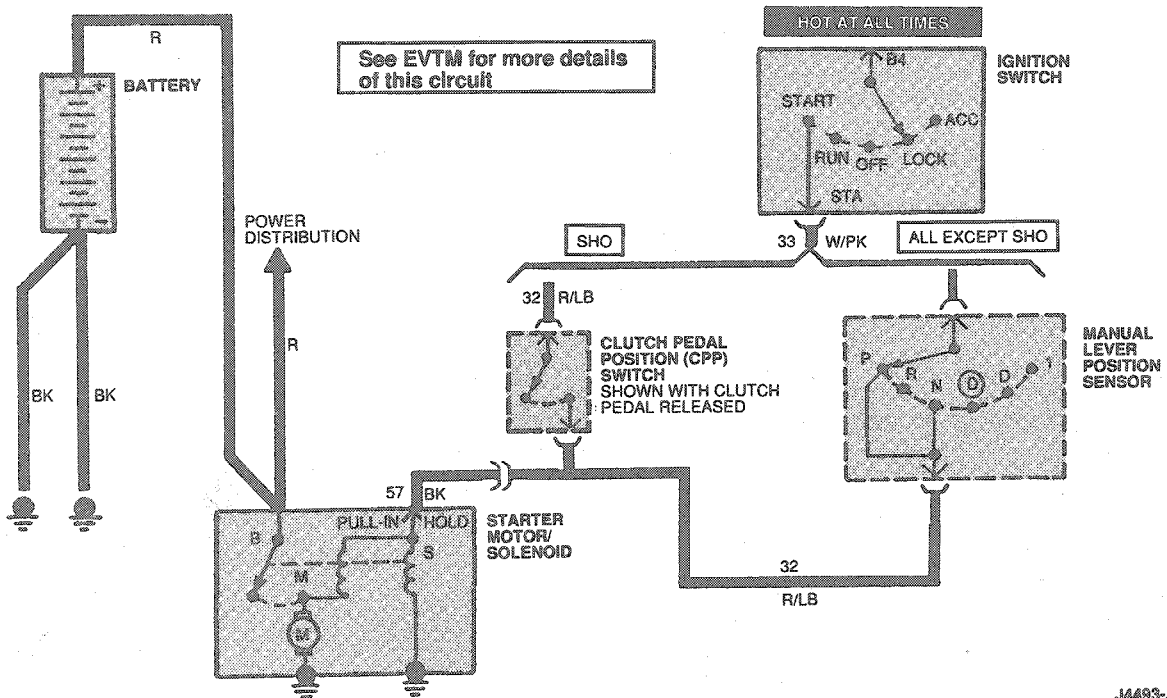
1. The ignition switch is turned to the START position.
2. The starter solenoid is energized, creating a magnetic field in the solenoid coil.
3. The iron plunger core is drawn into the solenoid coil.
4. A lever connected to the drive assembly engages the drive pinion gear to the flywheel ring gear.
5. When the iron plunger core is all the way into the coil, its contact disc closes the circuit between the battery and the motor terminals.
6. The current flows to the motor, and the drive pinion gear cranks the flywheel and the engine crankshaft.

¹ Can be purchased as a separate item.

DESCRIPTION AND OPERATION (Continued)

7. As current flows to the motor, the solenoid pull-in coil is bypassed.
8. The hold-in coil keeps the drive pinion gear engaged with the flywheel.

9. The gear remains engaged until the ignition switch is released from the START position.



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An overrunning clutch in the drive assembly protects the starter from excessive speeds during the brief period before the driver releases the ignition switch from the START position (as the engine starts).

Road Service

For cases of a starter that cranks the engine very slowly, connect a 12-volt booster battery to the system.

Jump Starting

To avoid damage to the vehicle and battery or the possibility of personal harm, follow these instructions and precautions:

WARNING: HYDROGEN AND OXYGEN GASES ARE PRODUCED DURING NORMAL BATTERY OPERATION. THIS GAS MIXTURE CAN EXPLODE IF FLAMES, SPARKS OR LIGHTED TOBACCO ARE BROUGHT NEAR THE BATTERY. WHEN CHARGING OR USING A BATTERY IN AN ENCLOSED SPACE, ALWAYS PROVIDE VENTILATION AND SHIELD YOUR EYES.

WARNING: KEEP OUT OF REACH OF CHILDREN. BATTERIES CONTAIN SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES OR CLOTHING. ALSO, SHIELD YOUR EYES WHEN WORKING NEAR THE BATTERY TO PROTECT AGAINST POSSIBLE SPLASHING OF THE ACID SOLUTION. IN CASE OF ACID CONTACT WITH SKIN, EYES OR CLOTHING, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF FIFTEEN MINUTES. IF ACID IS SWALLOWED, DRINK LARGE QUANTITIES OF MILK OR WATER, FOLLOWED BY MILK OF MAGNESIA, A BEATEN EGG, OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.

CAUTION: Do not disconnect the battery of the vehicle to be started. Disconnecting the battery could damage the vehicle's electronic system.

Negative Grounded Battery

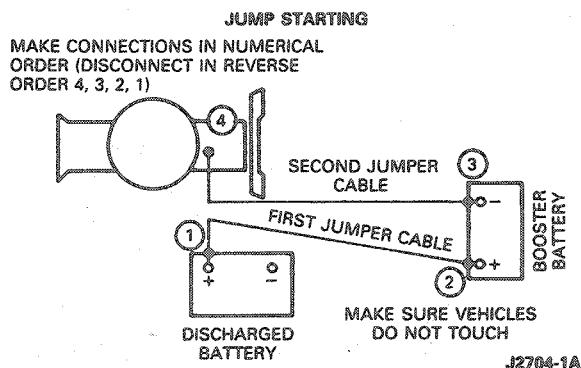
WARNING: TO AVOID ANY POSSIBILITY OF INJURY, USE PARTICULAR CARE WHEN CONNECTING A BOOSTER BATTERY TO A DISCHARGED BATTERY.

1. Position vehicles so jumper cables will reach, being careful that vehicles do not touch.
2. Turn on heater blower motor of vehicle to be started (set control on DEFROST for vehicles equipped with automatic temperature control). Turn off other switches and lamps.

DESCRIPTION AND OPERATION (Continued)

3. Make jumper cable connections.

- Connect one end of first jumper cable to the battery positive voltage (+) terminal of discharged battery and other end to the battery positive voltage (+) terminal of booster battery.
- Connect one end of second jumper cable to battery negative voltage (-) terminal of booster battery. Connect other end to an engine bolthead or good metallic contact spot on engine of vehicle to be started, NOT TO BATTERY NEGATIVE VOLTAGE (-) TERMINAL.



WARNING: MAKING THE FINAL CABLE CONNECTION COULD CAUSE AN ELECTRICAL SPARK NEAR THE BATTERY AND COULD CAUSE AN EXPLOSION. REFER TO WARNING AT THE BEGINNING OF THE JUMP STARTING PROCEDURE.

WARNING: WHEN SERVICING THE STARTER OR PERFORMING OTHER UNDERHOOD WORK IN THE VICINITY OF THE STARTER, BE AWARE THAT THE HEAVY GAUGE BATTERY INPUT LEAD AT THE STARTER SOLENOID IS "ELECTRICALLY HOT" AT ALL TIMES.

A PROTECTIVE CAP OR BOOT IS PROVIDED OVER THIS TERMINAL THAT MUST BE REPLACED AFTER SERVICING. BE SURE TO DISCONNECT BATTERY NEGATIVE CABLE BEFORE SERVICING STARTER.

- Make sure jumper cables are not in way of moving engine parts.
- Start engine of vehicle with good battery. Run engine at a moderate speed.
- Start engine of vehicle with discharged battery. Follow starting instructions in the Owner Guide.
- Leave all switches off except heater blower motor. Reduce engine speed to idle on both vehicles to prevent possible damage to vehicle electrical systems.

4. Remove cables in exact REVERSE sequence. Begin by removing cable from engine of vehicle that had discharged battery.

If the starter does not turn the engine over, even with the booster battery attached, refer to Starter System Diagnosis in this Section.

DIAGNOSIS AND TESTING

System Inspection

CAUTION: When disconnecting the plastic hardshell connector at the solenoid "S" terminal, grasp the plastic connector and pull lead off. DO NOT pull separately on lead wire.

WARNING: WHEN SERVICING STARTER OR PERFORMING OTHER UNDERHOOD WORK IN THE VICINITY OF THE STARTER, BE AWARE THAT THE HEAVY GAUGE BATTERY INPUT LEAD AT THE STARTER SOLENOID IS "ELECTRICALLY HOT" AT ALL TIMES.

A PROTECTIVE CAP OR BOOT IS PROVIDED OVER THIS TERMINAL THAT MUST BE REPLACED AFTER SERVICING. BE SURE TO DISCONNECT BATTERY NEGATIVE CABLE BEFORE SERVICING STARTER.

1. Inspect starting system for loose connections.
2. If system does not operate properly, note condition and continue diagnosis using the symptom chart.

WARNING: WHEN WORKING IN AREA OF THE STARTER, BE CAREFUL TO AVOID TOUCHING HOT EXHAUST COMPONENTS.

STARTER SYSTEM DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
Starter solenoid does not pull-in and starter does not crank (Audible click may or may not be heard).	<ul style="list-style-type: none"> ● Open fuse. ● Low battery. ● Open circuit or high resistance in external feed circuit to starter solenoid. ● Inoperative starter. 	<ul style="list-style-type: none"> ● Check fuse continuity. ● Refer to Section 14-00. ● Go to Pinpoint Test A. ● Replace starter as outlined.

DIAGNOSIS AND TESTING (Continued)

STARTER SYSTEM DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
Unusual starter noise during starter overrun.	<ul style="list-style-type: none"> Starter not mounted flush (cocked). Noise from other components. Ring gear tooth damage or excessive ring gear runout. Worn or damaged starter. 	<ul style="list-style-type: none"> Realign starter on transaxle converter housing. Refer to Section 00-04. Investigate other powertrain accessory noise contributors. Refer to Section 03-01A. Replace starter as outlined.
Starter cranks but engine does not start.	<ul style="list-style-type: none"> Concern in fuel system. Concern in ignition system. Engine related problem. 	<ul style="list-style-type: none"> Refer to Section 10-00. Refer to Section 03-07. Refer to 03-01A.
Starter cranks slowly.	<ul style="list-style-type: none"> Low battery. High resistance or loose connections in starter solenoid battery feed or ground circuit. Ring gear runout excessive. Worn or damaged starter. 	<ul style="list-style-type: none"> Refer to Section 14-00. Check that all connections are secure. Refer to Section 03-01A. Replace starter as outlined.
Starter remains engaged and runs with engine.	<ul style="list-style-type: none"> Shorted ignition switch. Battery cable touching solenoid 'S' terminal (defective or mispositioned cable). Worn or damaged starter. 	<ul style="list-style-type: none"> Refer to Section 11-05. Replace or relocate cable and replace starter as outlined. Replace starter as outlined.

TJ4464A

PINPOINT TEST A: CHECK STARTER MOTOR

TEST STEP	RESULT	ACTION TO TAKE
A1 CHECK FOR VOLTAGE TO STARTER NOTE: Hoist vehicle (if necessary) to access starter solenoid terminals. CAUTION: Remove plastic safety cap on starter solenoid and disconnect hardshell connector at solenoid 'S' terminal as described under Removal and Installation in this Section. <ul style="list-style-type: none"> Key OFF. Transmission in PARK or NEUTRAL. Check for voltage between starter B+ terminal and starter drive housing. Is voltage between 12 and 12.45 volts? 	Yes No	GO to A2. CHECK wire connections between battery and starter solenoid and the ground circuit for open or short.
A2 CHECK STARTER MOTOR <ul style="list-style-type: none"> Key OFF. Transmission in PARK or NEUTRAL. Connect one end of a jumper wire to the starter B+ terminal and momentarily touch the other end to solenoid 'S' terminal. Does starter crank? 	Yes No	CHECK connections from ignition circuitry to solenoid 'S' blade terminal for open or short. REPLACE starter as outlined.

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Starter Load Test

Tools Required:

- Rotunda Starting / Charging Tester 078-00005

Conduct this test if the starter cranks slowly and it is desired to compare current to specifications.

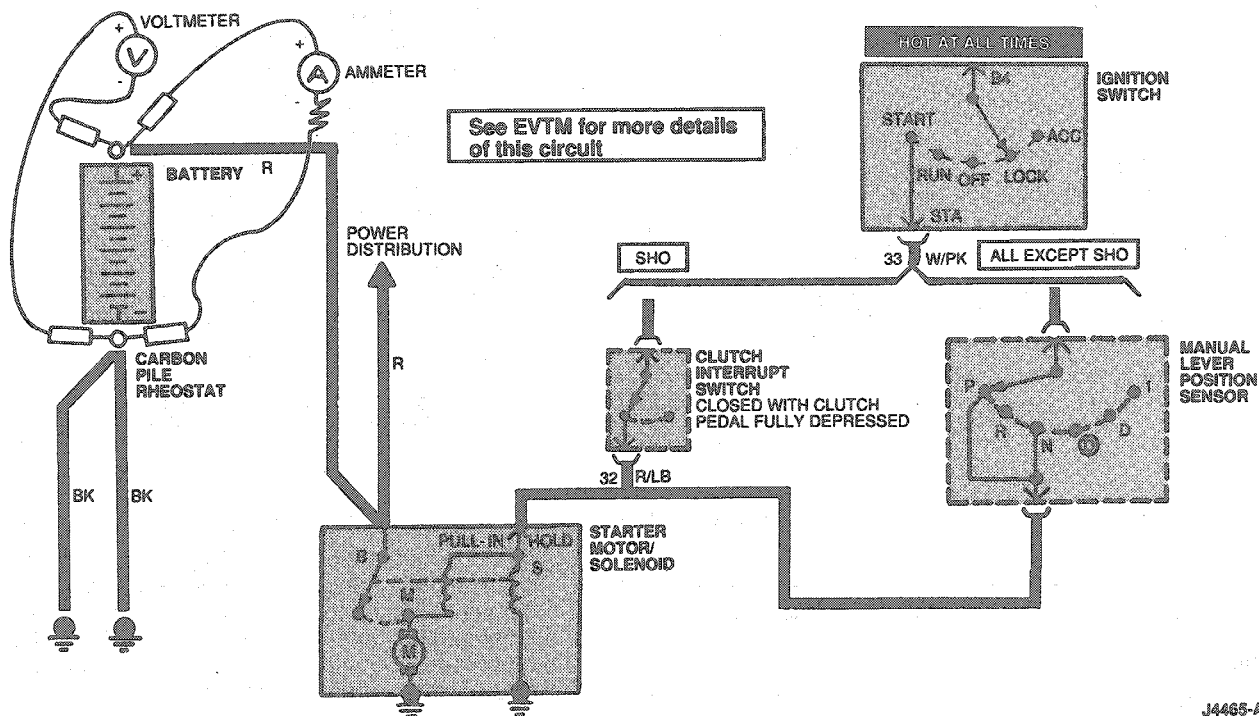
- Connect Rotunda Starting and Charging Tester 078-00005 or equivalent. Make sure that current is not flowing through ammeter and heavy-duty carbon pile rheostat portion of circuit (rheostat at maximum counterclockwise position).

- Place transaxle in NEUTRAL or PARK. Crank engine with ignition off, and determine exact reading on voltmeter. This test is accomplished disconnecting push-on connector at solenoid 'S' terminal and by connecting a remote control starter switch from positive battery terminal to solenoid 'S' terminal.

NOTE: Make sure ignition switch is in the OFF position and 'S' terminal connector has been removed so engine does not start.

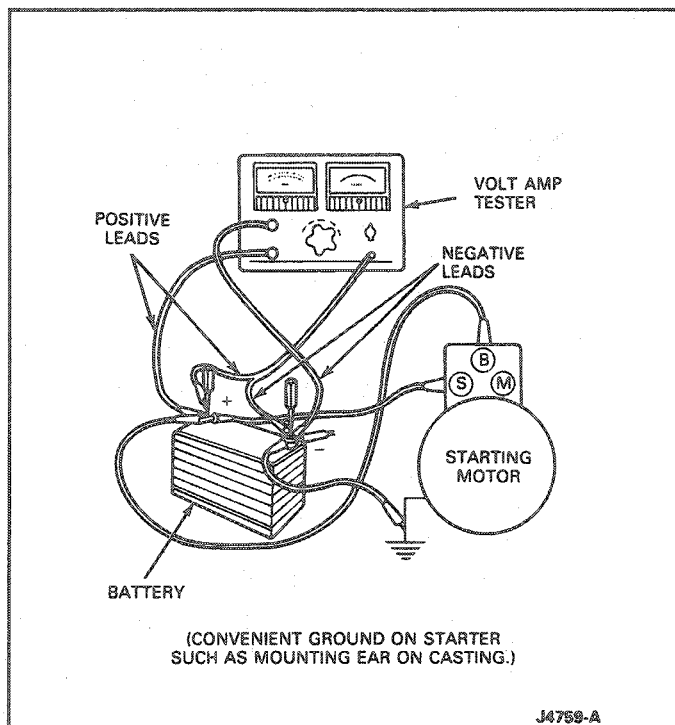
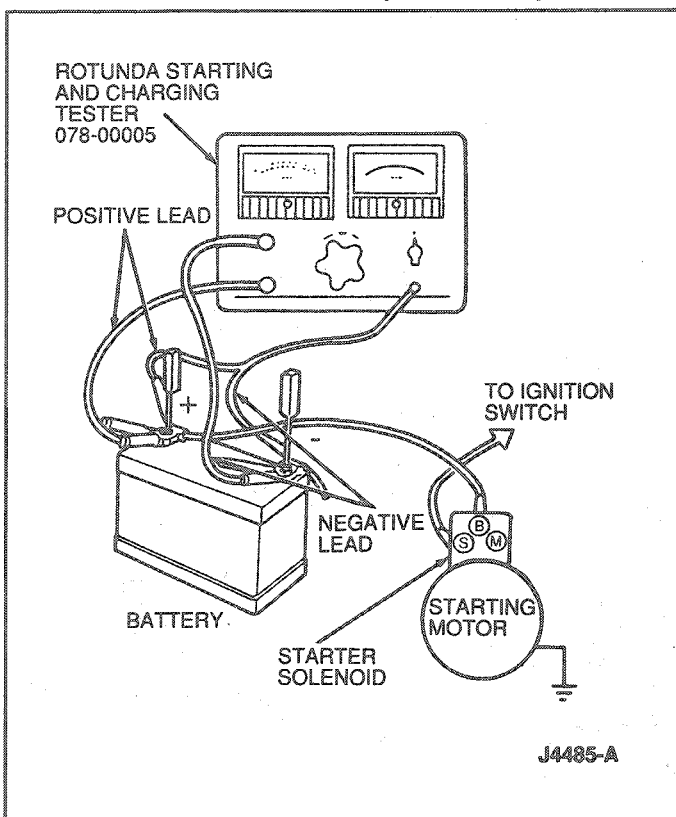
DIAGNOSIS AND TESTING (Continued)

3. Stop cranking engine, and reduce resistance of carbon pile until voltmeter indicates same reading as that obtained while starter cranked the engine. The ammeter will indicate starter current draw under load. Check this with value listed in Specifications.



J4465-A

DIAGNOSIS AND TESTING (Continued)



Bench Tests

Tools Required:

- Rotunda Starting and Charging Tester 078-00005
- Rotunda Digital Volt-Ohmmeter 007-00001

Starter No-Load Test

The starter no-load test will uncover such conditions as open or shorted windings, or rubbing armature. The starter can be tested, at no-load, on the test bench only.

1. Make test connections with Rotunda Starting and Charging Tester 078-00005 or equivalent cables connected to starter, large enough to carry high current (the same as in the vehicle). The starter will run at no-load. Be sure that no current is flowing through ammeter (rheostat at maximum counterclockwise position). Determine exact reading on voltmeter.

CAUTION: Make sure that the starter is securely mounted in bench vise while energizing, as starter will move or jump.

2. Disconnect starter from battery. Then, reduce resistance of rheostat until voltmeter indicates same reading as that obtained while starter was running. The ammeter will indicate starter no-load current draw. Refer to Specifications at the end of this Section for a comparative value.
3. If current exceeds specification, check for rubbing armature, bent shaft, binding bearings, or shorts in armature, or brush assembly.

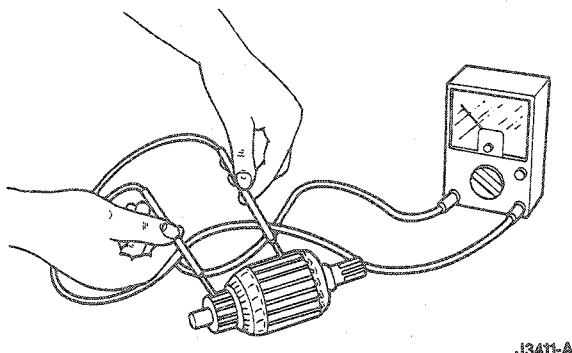
Armature Open Circuit Test

An open circuit armature may sometimes be detected by examining the commutator for evidence of burning. A burn spot on the commutator is caused by an arc formed every time the commutator segment, connected to the open circuit winding, passes under a brush.

DIAGNOSIS AND TESTING (Continued)

Grounded Armature Test

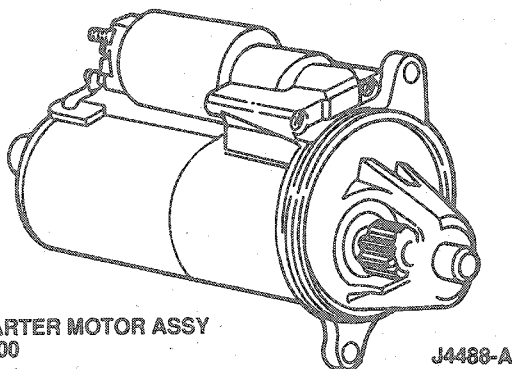
This test will determine if the winding insulation has been damaged, permitting a conductor to touch the frame or armature core. To determine if the armature windings are grounded, check with a Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent. Infinite resistance indicates a normal condition.



Starter Solenoid Test

Ensure that the solenoid is isolated electrically from the motor. Using a DVOM, check for continuity between S terminal and M terminal, and between S terminal and ground (frame). If there is no continuity, the following conditions may exist:

- (1) Open wire; replace solenoid.
- (2) Ice, dirt or other foreign material preventing contact; service as necessary.



REMOVAL AND INSTALLATION

Starter Motor

Removal

WARNING: WHEN SERVICING STARTER OR PERFORMING ANY MAINTENANCE IN THE AREA OF THE STARTER, NOTE THE HEAVY GAUGE INPUT LEAD CONNECTED TO THE STARTER SOLENOID IS HOT AT ALL TIMES. MAKE SURE THE PROTECTIVE CAP IS INSTALLED OVER THE TERMINAL AND IS REPLACED AFTER SERVICE.

NOTE: When the battery has been disconnected and reconnected, some abnormal drive symptoms may occur while the powertrain control module (PCM) 12A650 relearns its adaptive strategy. The vehicle may need to be driven 10 miles or more to relearn the strategy.

1. Disconnect the battery negative battery cable.
2. Raise the vehicle on a hoist. Refer to Section 00-02.
3. Disconnect starter cable and push-on connector from starter solenoid.

CAUTION: When disconnecting hardshell connector at 'S' terminal, grasp the plastic shell and pull off. Do not pull on wire. Be careful to pull straight off to prevent damage to the connector and 'S' terminal. If any part of the connection is damaged, replace the damaged components.

4. Remove upper bolt.
5. Remove lower bolt.

Installation

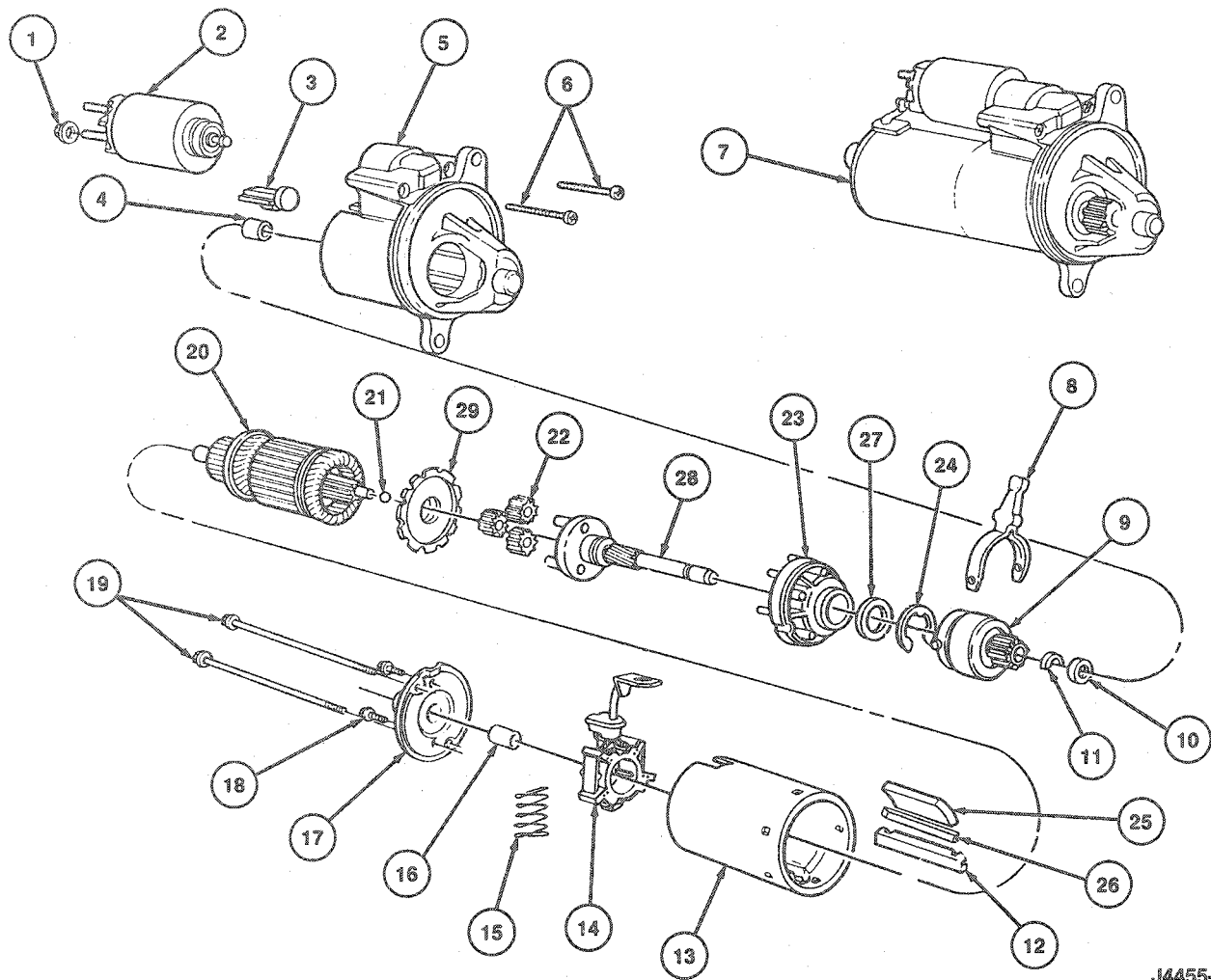
1. Position starter motor to engine and install upper and lower bolts finger-tight.
2. Tighten the upper bolt to 20-27 N·m (15-20 lb-ft).
3. Tighten the lower bolt to 20-27 N·m (15-20 lb-ft).
4. Connect starter solenoid connector. Be careful to push straight on and make sure connector locks in position with a notable click or detent.
5. Install starter cable nut to starter terminal. Tighten to 9-14 N·m (80-124 lb-in).
6. Replace red solenoid safety cap.
7. Lower vehicle to floor.
8. Connect negative battery ground cable.

DISASSEMBLY AND ASSEMBLY

NOTE: Although disassembly and service procedures are shown for the starter motor in this section, it is recommended that the starter motor be returned to Ford Return Parts Center for analysis and review.

DISASSEMBLY AND ASSEMBLY (Continued)

Starter Motor — Exploded View



J4455-A

Item	Part Number	Description
1	N805403	Terminal Nut
2	11390	Starter Solenoid
3	11A171	Housing Seal Assy
4	11135	Bushing Bearing
5	11130	Drive End Housing
6	N805405	Solenoid Screw (2 Req'd)
7	11000	Starter Motor Assy
8	11070	Drive Lever
9	11350	Drive Assy
10	11223	Stop Ring Retainer
11	11222	Stop Ring
12	11A169	Magnet Retainer (6 Req'd)
13	11076	Starter Frame
14	11434	Brush Assy
15	11059	Spring

Item	Part Number	Description
16	11135	Bushing Bearing
17	11050	Brush End Plate
18	N805406	Brush Plate Screw (2 Req'd)
19	N805428	Through-Bolt (2 Req'd)
20	11005	Armature Assy
21	11A172	Armature Thrust Ball
22	11K190	Planet Gear
23	11A165	Stationary Gear Assy
24	N805404	Truarc E-Ring
25	11A168	Magnet Pole Piece (6 Req'd)
26	11A161	Pole Shunt (6 Req'd)
27	11A075	Armature
28	11A160	Shaft Assy
29	11A167	Gear Retainer

TJ4455A

(Continued)

DISASSEMBLY AND ASSEMBLY (Continued)**Disassembly**

1. Remove positive brush connector from solenoid motor (M) terminal.
2. Remove solenoid retaining screws and solenoid.
3. Remove through-bolts and separate drive end housing from starter frame. Remove housing seal assembly from drive. Remove drive and gear assembly from drive end housing.
4. Remove drive lever from drive assembly. Remove stop ring and retainer from driveshaft, then remove drive assembly from shaft. Push E-ring off driveshaft, and separate gear assembly from driveshaft.
5. Remove brush plate screws and brush end plate from starter frame. Remove brush assembly and push armature out of frame.

Assembly

NOTE: Sealer material (ESA-M4G294-A or equivalent) should be replaced on starter during re-assembly.

1. Install armature assembly in starter frame. Apply a thin coating of ESF-M1C218-A Grease or equivalent low temperature grease on both ends of armature shaft and spline. Install brush assembly while making sure brushes fit over commutator. Apply grease to bearing bore in brush end plate. Push back grommet onto frame and attach brush end with brush plate screws. Tighten to 2-3 N·m (18-27 lb-in).
2. Apply grease to driveshaft spline and place stationary gear assembly over driveshaft. Install armature thrust washer and push E-ring onto driveshaft. Place drive assembly onto shaft and install stop ring and retainer. Attach drive lever to drive assembly.
3. Grease and install planet gears.
4. Apply grease into drive end housing bearing bore (approximately one-quarter full). Install drive gear assembly into housing, making sure to line up bolt holes in gear assembly and housing. Place gear retainer over gear assembly. Install housing seal assembly into drive end housing.
5. Position starter frame to housing and install through-bolts. Tighten to 5-10 N·m (45-89 lb-in).
6. Position solenoid to housing ensuring that solenoid plunger is attached through drive lever (bottom solenoid terminal (M) should have a metal strip attached to it). Tighten solenoid bolts to 5-10 N·m (45-89 lb-in).
7. Attach positive brush connector to solenoid (bottom terminal). Tighten nut to 9-14 N·m (80-124 lb-in).

8. Check that starter no-load current draw is within specification. Refer to Bench Tests under Diagnosis and Testing.

Starter Drive Replacement

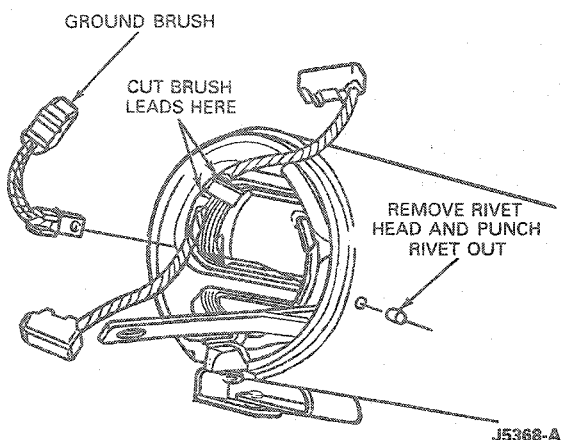
1. Remove positive brush connector from solenoid motor (M) terminal. Remove solenoid retaining screws and remove solenoid.
2. Remove through-bolts and separate motor assembly drive end housing. Remove housing seal from drive end housing. Remove drive gear assembly from housing and detach drive lever.
3. Remove stop ring and retainer from driveshaft and then remove drive assembly.
4. Apply a thin coating of ESF-M1C218-A Grease or equivalent low temperature grease on driveshaft spline. Install new drive gear assembly on driveshaft. Install new stop ring and retainer. Attach drive lever.
5. Partially fill drive end housing bearing bore with grease (approximately one-quarter full). Install drive gear assembly in housing, making sure to line up bolt holes in gear assembly and housing.
6. Install lever support and housing seal in drive end housing.
7. Position starter frame to housing and install through-bolts. Tighten to 5-10 N·m (45-89 lb-in).
8. Install solenoid. Refer to Assembly.

Starter Motor Brushes Replacement

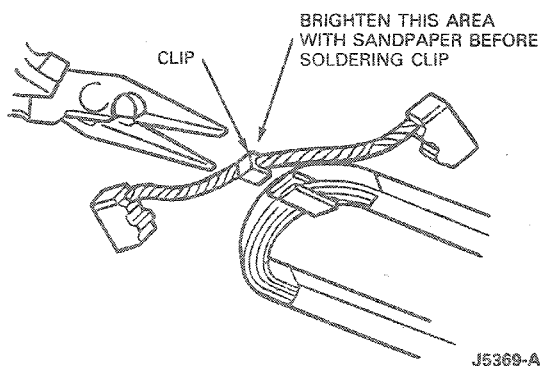
1. Remove starter drive plunger lever cover.
2. Remove the two through-bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.
7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Remove ground brush rivet head with file or chisel and remove rivet with 1/8-inch punch.

DISASSEMBLY AND ASSEMBLY (Continued)

9. Cut the brush leads from the field coils as close to the field connection point as possible.



10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.
12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery to check operation.



Armature Replacement

1. Remove positive brush connector from solenoid motor (M) terminal.
2. Remove through-bolts and separate motor from gear assembly and drive end housing.
3. Remove brush end plate screws, brush end plate and brush assembly from starter frame. Remove armature from frame.
4. Install new armature in frame. Apply a thin coating of ESF-M1C218-A Grease or equivalent low temperature grease on both ends of armature shaft and pinion.
5. Install brush assembly. Using tool, make sure that brushes fit over commutator. Push black grommet onto frame. Apply grease to bearing bore in brush end plate and attach to starter frame.
6. Position starter frame to gear assembly and drive end housing and install through-bolts. Tighten to 5-10 N·m (45-89 lb-in).
7. Attach positive brush connector to solenoid (bottom terminal). Tighten nut to 9-14 N·m (80-124 lb-in).
8. Check that starter no-load current draw is within specification. Refer to Bench Testing under Diagnosis and Testing.

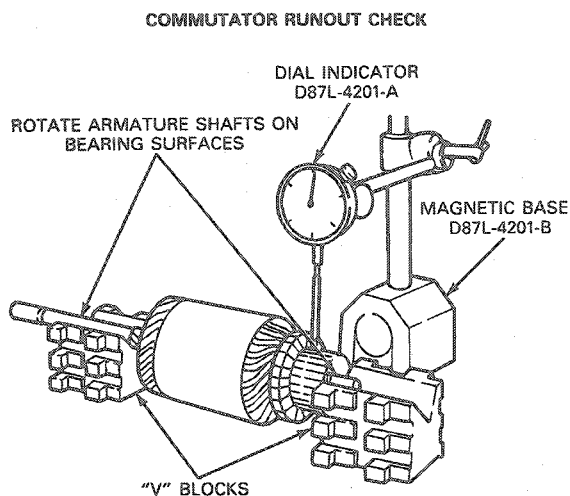
Cleaning and Inspection

CAUTION: Do not wash the drive because the solvent will wash out the lubricant causing drive to slip. Use a brush or compressed air to clean the drive, armature, brush, and gear assemblies, drive end housing, pole pieces and planet gears. Wash all other parts in solvent and dry.

1. Inspect armature windings for broken or burned insulation and unwelded or open connections.
2. Check armature for open circuits, shorts and grounds. Check for pole rub or rub on magnetic shunts.

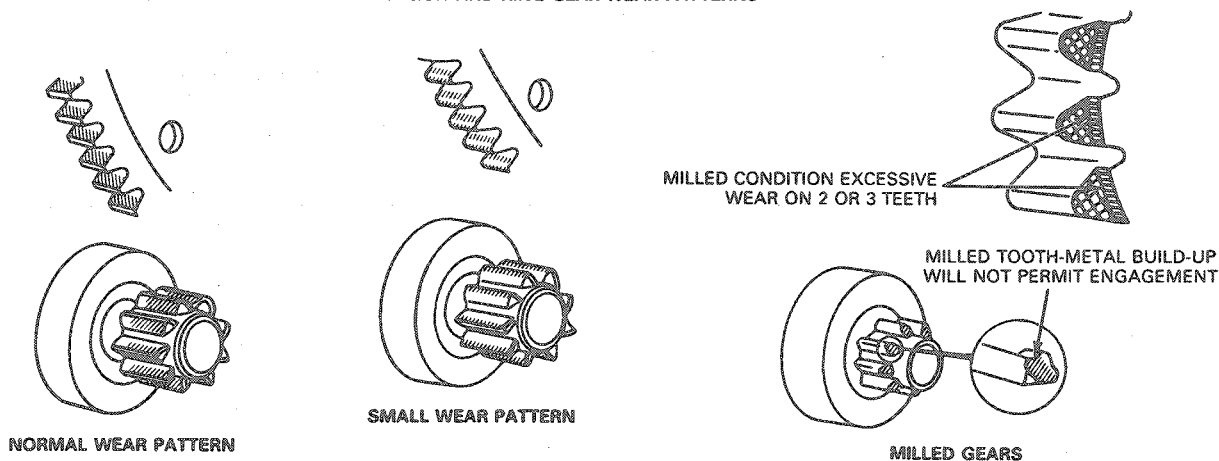
DISASSEMBLY AND ASSEMBLY (Continued)

3. Check commutator for runout. Inspect armature shaft and two bearings for scoring and excessive wear with Dial Indicator D87L-4201-A and Magnetic Base D87L-4201-B or equivalent. If commutator is rough, or more than 0.12mm (0.005 inch) out of round, it must be replaced.



4. Examine gears, spline on driveshaft, and drive pinion for chipped, broken or worn conditions. Replace if required.

PINION AND RING GEAR WEAR PATTERNS



SPECIFICATIONS

Starter Motor				Starter Brushes			
Motor Diameter	Current Draw Under Normal Load	Normal Engine Cranking Speed	Min. Stall Torque @ 5 Volts	Max. Load	No Load	Mfg. Length	Spring Tension
101.6mm (4 Inches)	130-220 Amps	140-220 RPM	14.7 N-m (11.0 Lb-Ft)	800 Amps	70 ± 10 Amps	16.8mm (0.66 Inch)	18 N (64 oz.)

Maximum commutator runout is 0.12mm (0.005 inch). Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.

TJ4456A

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS

Description	N-m	Lb-In
Solenoid Bolt	5-10	45-89
M Terminal Nut	9-14	80-124
B Terminal Nut	9-14	80-124
Through-Bolt	5-10	45-89
Mounting Bolt	20-27	15-20 (Lb-Ft)
Brush Plate Screw	2-3	18-27

TJ4459A

SPECIAL SERVICE TOOLS

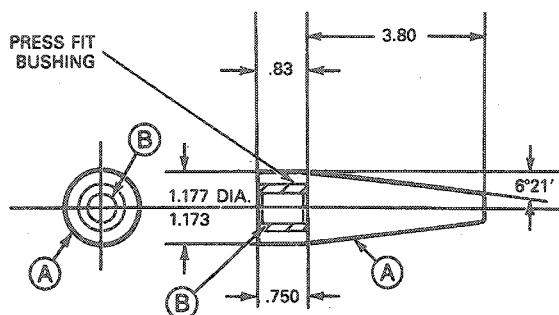
Tool Number	Description
D87L-4201-A	Dial Indicator
D87L-4201-B	Magnetic Base

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
078-00005	Starting and Charging Tester

TJ4458A

TOOL TO ASSEMBLE BRUSH HOLDER TO ARMATURE



BRUSH HOLDER ASSEMBLY

- (A) MANDREL
MAT'L: MICAATA LL221
TAN-TYPE FBL
STK: 13/8 DIA. + Δ-LG
(1) REQ'D
- (B) BUSHING
UNIVERSAL HEADLESS TYPE
PRESS FIT BUSHING
CAT. NO. GS-93
.471/.472 I.D. .7518 O.D. .750 LG.
(1) REQ'D

J4974-A

SECTION 03-07A Distributor Ignition (DI)

SUBJECT	PAGE	SUBJECT	PAGE
CLEANING AND INSPECTION		REMOVAL AND INSTALLATION (Cont'd.)	
Ignition Coil.....	03-07A-13	Distributor Cap.....	03-07A-3
Spark Plug Wires.....	03-07A-13	Distributor Rotor.....	03-07A-3
Tachometer Connection.....	03-07A-13	Ignition Control Module (ICM).....	03-07A-9
DESCRIPTION		Spark Plug Wires.....	03-07A-10
Distributor Ignition (DI) Systems		Spark Plugs.....	03-07A-11
Features.....	03-07A-1	SPECIAL SERVICE TOOLS	03-07A-14
OPERATION	03-07A-1	SPECIFICATIONS	03-07A-14
REMOVAL AND INSTALLATION		VEHICLE APPLICATION	03-07A-1
Distributor Assembly.....	03-07A-4		

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION

This Section is designed to serve as a guide in understanding, testing and servicing the Distributor Ignition (DI) system.

Distributor Ignition (DI) Systems Features

The DI system features a camshaft driven distributor which uses no centrifugal or vacuum advance. The distributor has a diecast base which incorporates a Hall effect stator assembly.

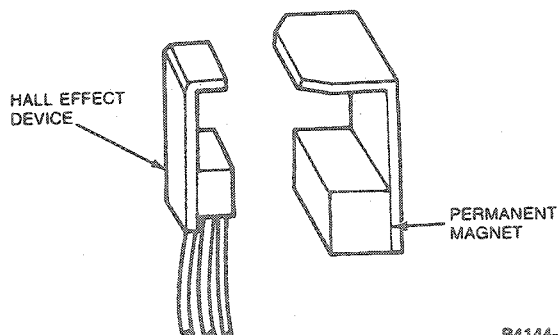
Initial timing adjustments are not required unless the distributor has been moved from its factory setting or removed from the engine. Ignition timing procedures and diagnostics are found in Section 8A of the Powertrain Control / Emissions Diagnosis Manual¹.

NOTE: Do not change timing by use of different octane rods without first having the proper authorization; federal emission requirements will be affected.

The Ignition Control Module (ICM) 12A199 with Computer Controlled Dwell (CCD), features Powertrain Control Module (PCM) 12A650 controlled ignition coil charge times.

OPERATION

The universal distributor operates by using a Hall effect vane switch assembly, causing the ignition coil to be switched off and on by the PCM and ICM. The vane switch is an encapsulated package consisting of a Hall sensor on one side and a permanent magnet on the other side.

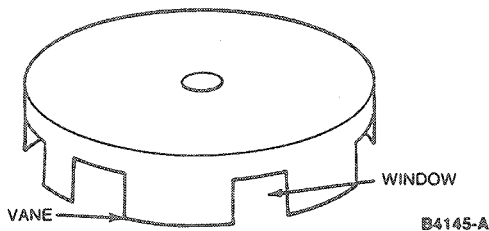


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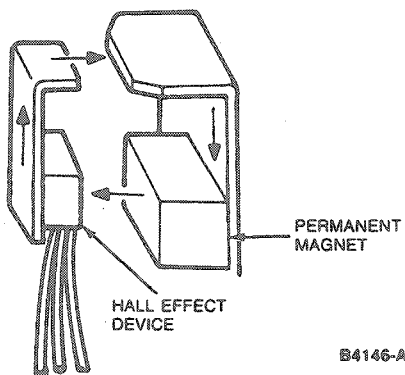
¹ Can be purchased as a separate item.

OPERATION (Continued)

A rotary vane cup, made of ferrous metal, is used to trigger the signal off and on.

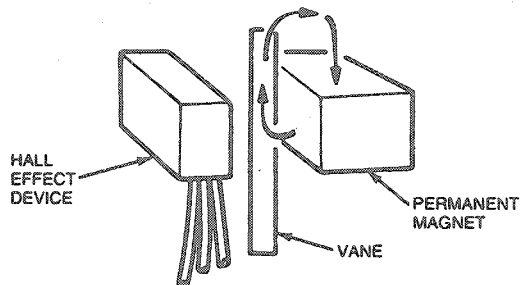


When the window of the vane cup is between the magnet and the Hall effect device, a magnetic flux field is completed from the magnet through the Hall effect device and back to the magnet.



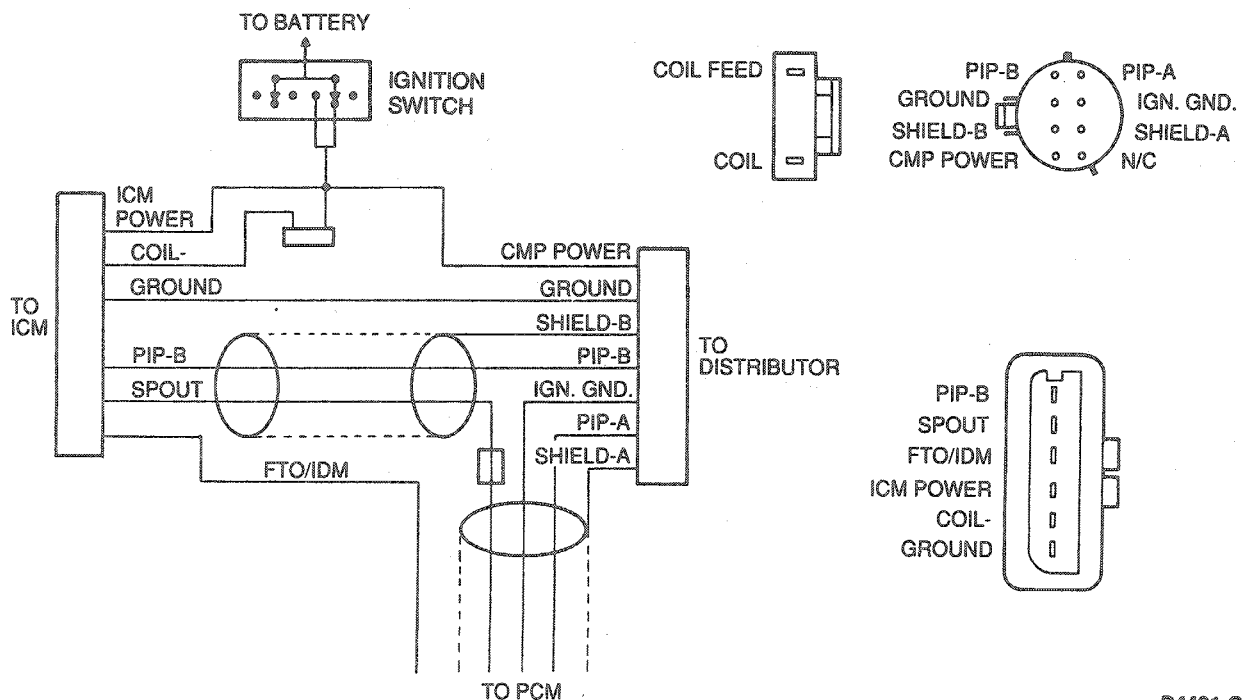
As the vane passes through this opening, the flux lines are shunted through the vane and back to the magnet.

During this time, a voltage is produced as the vane passes through the opening. When the vane clears the opening, the window edge causes the signal to go to zero volts. The signal is then used by the PCM for crankshaft position sensing and the computation of the desired spark advance based on engine demand and calibration. The conditioned spark advance and voltage distribution is accomplished through a conventional rotor, cap and ignition wires.



Distributor Ignition (DI) System and Closed Bowl Distributor

3.8L Engines

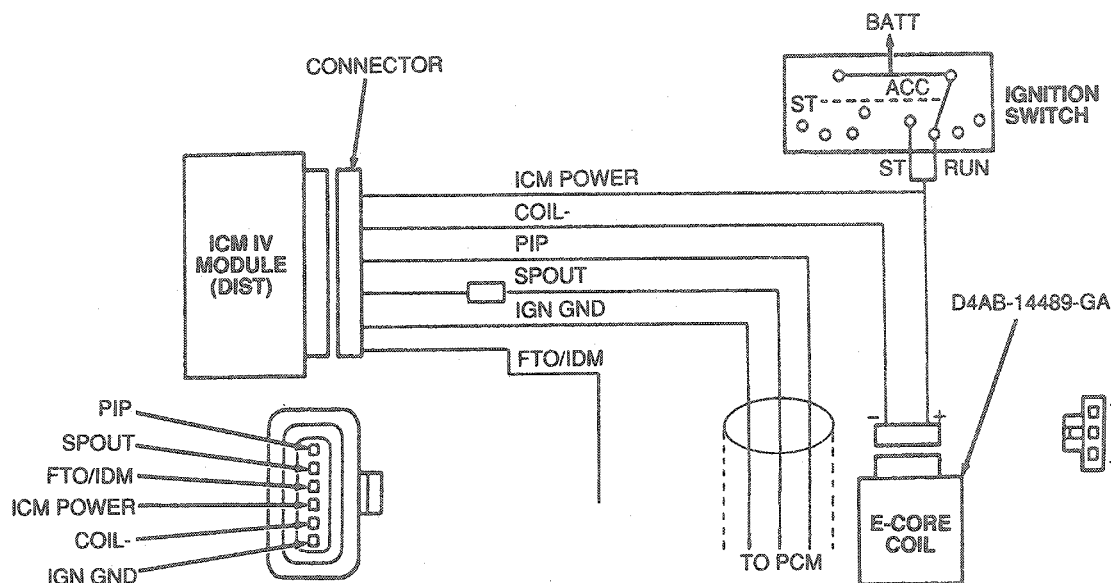


B4431-C

OPERATION (Continued)

Distributor Ignition (DI) System with Open Bowl Distributor

3.0L Engines



B4500-B

REMOVAL AND INSTALLATION

Distributor Cap

Removal

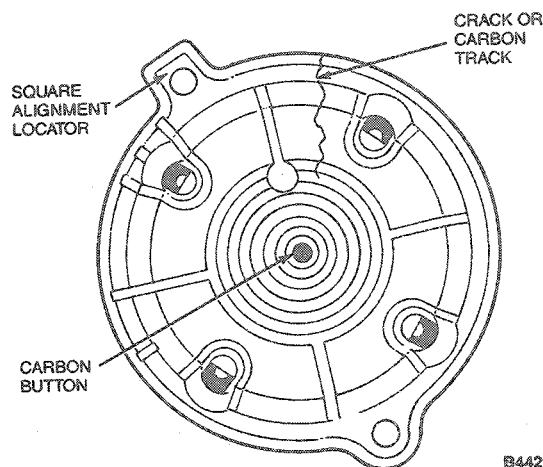
Loosen distributor cap hold-down screws. Remove cap straight off distributor to prevent damage to rotor blade and spring.

Cleaning and Inspection

Wash both inside and outside surfaces of the distributor cap with soap and water. Dry cap with compressed air. Inspect cap for cracks, broken carbon button or carbon tracks. Also, inspect cap terminals for dirt and corrosion. Replace the cap if it is damaged.

Installation

1. Position distributor cap on distributor base noting the square alignment locator. Tighten hold-down screws to 2.0-2.6 N·m (18-23 lb-in).
2. Re-install any ignition wires that were removed, noting their correct locations on the distributor cap.



B4428-A

Distributor Rotor

Removal

With distributor cap removed, pull rotor upward to remove it from distributor shaft and armature.

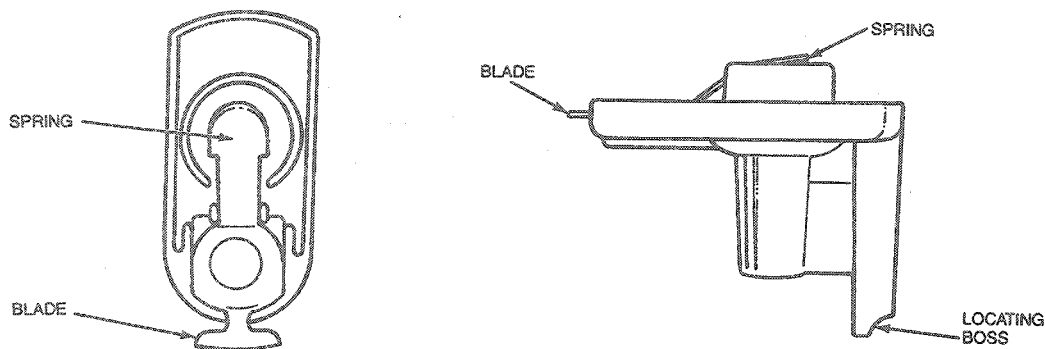
Cleaning and Inspection

Wash rotor with soap and water. Dry with compressed air. Inspect and replace rotor if cracks, carbon tracks, burns or damage to blade or spring are observed.

REMOVAL AND INSTALLATION (Continued)

Installation

Align locating boss on rotor with hole on armature. Fully seat rotor on distributor shaft. Re-install distributor cap.



B4429-A

Distributor Assembly**Removal**

1. Disconnect distributor from wiring harness.
2. Mark position of No. 1 cylinder wire tower on distributor base for reference when installing distributor.
3. Loosen distributor cap hold-down screws. Remove cap straight off distributor to prevent damage to rotor blade and spring. Position cap and attached wires aside so as not to interfere with distributor removal.
4. Remove rotor by pulling upward to remove it from the distributor shaft and armature.
5. Remove distributor hold-down bolt and clamp. Remove distributor by pulling upward.
6. Cover distributor opening in the cylinder block or head with a clean shop towel to prevent the entry of foreign material or dirt into the engine.

Installation

Before installing distributor, visually inspect distributor. Inspect O-ring. It should fit tightly and be free of cuts. The drive gear should be free of nicks, cracks and excessive wear. Rotate distributor drive shaft. It should move freely, without binding.

1. To install distributor correctly, No. 1 piston must be at Top Dead Center (TDC) of compression stroke. Remove No. 1 cylinder spark plug and rotate engine clockwise until No. 1 piston is on the compression stroke.
2. With No. 1 piston on compression stroke, align timing pointer with TDC on the crankshaft damper.
3. Align locating boss on rotor with hole on armature. Fully seat rotor on distributor shaft.

4. Rotate distributor shaft so blade on rotor is pointing toward mark on distributor base, that was previously made in Step 2 of the Removal procedure.
5. While installing distributor, continue rotating rotor slightly so leading edge of the vane is centered in vane switch stator assembly.
6. Rotate distributor in block to align leading edge of vane and vane switch stator assembly. Verify rotor is pointing at No. 1 mark on distributor base. If vane and vane switch stator cannot be aligned by rotating distributor in cylinder block, remove distributor enough to just disengage distributor gear from camshaft gear. Rotate rotor enough to engage distributor gear on another tooth of camshaft gear. Repeat Step 1 if necessary.
7. Install distributor hold-down clamp and bolt. Tighten bolt, but leave it loose enough to rotate distributor.
8. Install distributor cap, No. 1 spark plug and ignition wires. Check that ignition wires are securely connected to the cap and spark plugs. Tighten distributor cap hold-down screws to 2.0-2.6 N·m (18-23 lb-in).
9. Reconnect distributor to wiring harness.
10. Set initial timing according to procedures found in Section 13 of the Powertrain Control/Emissions Diagnosis Manual².
11. After timing is set, tighten distributor hold-down bolt. Refer to Specifications.
12. Recheck initial timing. Adjust if necessary.

3.0L Engine**Tools Required:**

- Axle Bearing / Seal Plate T75L-1165-B
- Pinion Bearing Cone Remover D79L-4621-A

² Can be purchased as a separate item.

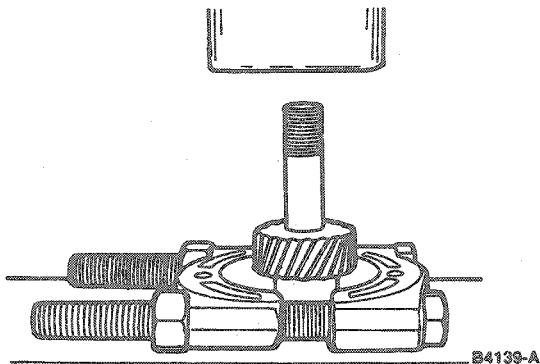
REMOVAL AND INSTALLATION (Continued)**Removal**

NOTE: Do not attempt to replace stator without an arbor press.

1. Using a screwdriver, remove distributor cap, position the cap and wires aside so as not to interfere with work area. Disconnect distributor from harness.
2. Remove distributor from block as outlined.
3. Remove rotor.
4. Remove two screws holding ICM to the base, if so equipped.
5. Remove module, wipe grease from base and module, keeping surfaces free of dirt, if so equipped.

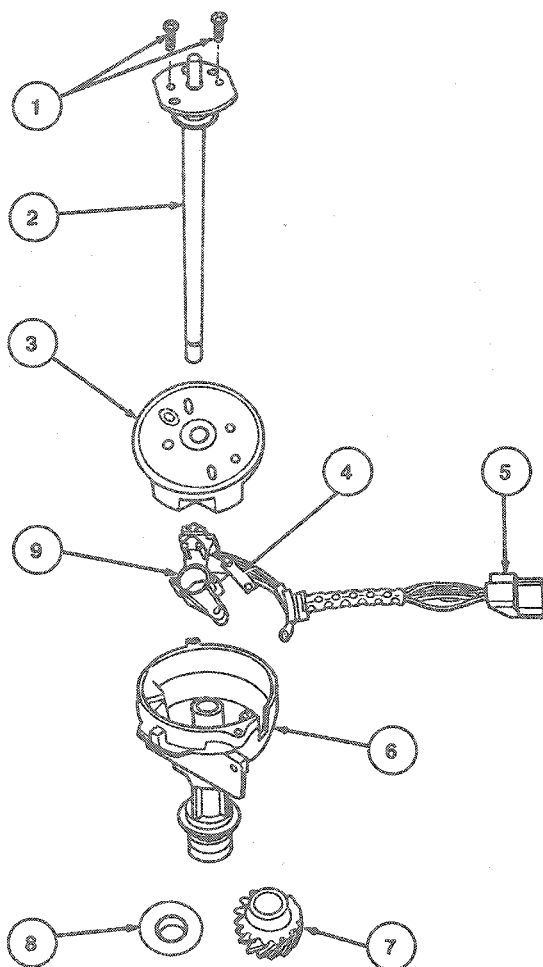
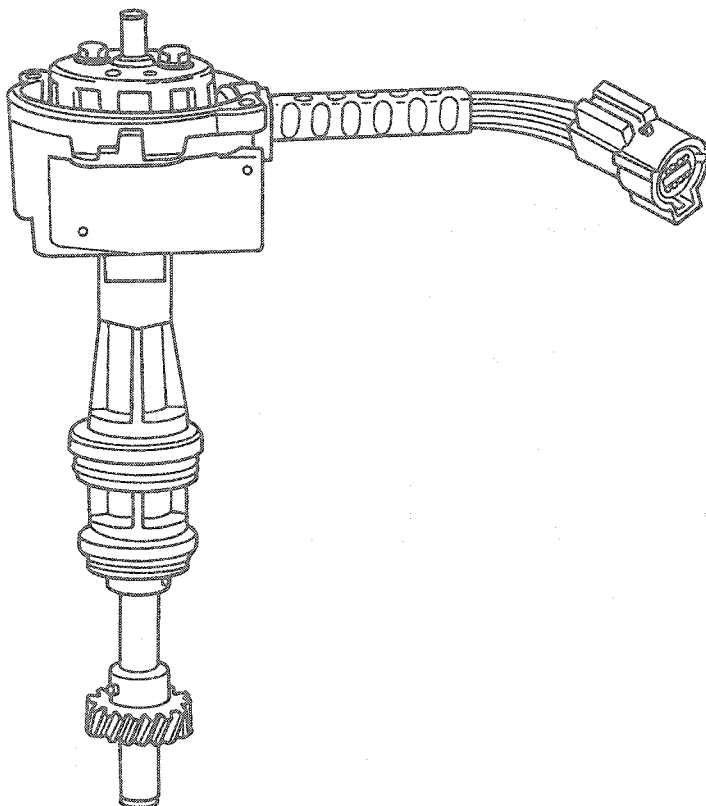
NOTE: Hold gear to loosen armature screws, do not hold armature.

6. Remove two screws holding armature and remove armature.
7. To ease assembly, mark armature and gear with a felt tip pen, to note orientation.
8. Remove and discard pin in gear.
9. Invert distributor and place in Axle Bearing / Seal Plate T75L-1165-B, and press off gear using the Pinion Bearing Cone Remover D79L-4621-A or equivalent.
10. Remove the thrust washer from the distributor and set it aside for assembly.



11. Deburr and polish shaft with emery paper and wipe such that shaft slides out freely from distributor base.
12. Remove shaft assembly.
13. Remove two stator assembly screws and retain.
14. Remove screw retaining octane rod and remove octane rod.
15. Remove stator assembly from top of bowl.
16. Inspect base bushing for wear or signs of excess heat concentration. Replace complete distributor assembly if damaged.
17. Inspect base O-ring for cuts or damage and replace O-ring if necessary.
18. Inspect base for cracks and wear. Replace complete distributor assembly if damage is found.

REMOVAL AND INSTALLATION (Continued)

DISASSEMBLED
VIEWASSEMBLED
VIEW 3.8L

B4409-C

Item	Part Number	Description
1	—	Screws (2 Req'd)
2	—	Shaft Assy
3	—	Rotary Vane
4	—	Octane Rod

(Continued)

Item	Part Number	Description
5	—	Connector
6	—	Base Assy
7	—	Gear
8	—	Collar
9	—	Hall Effect Vane Stator Switch Assy

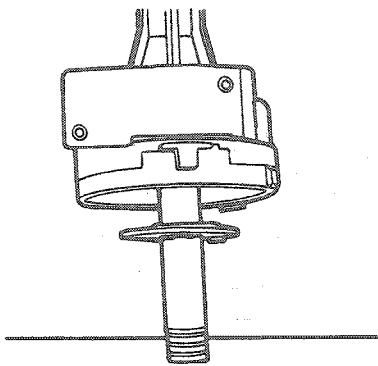
Installation

- Place stator assembly over bushing and press down to seat.
- Place stator connector in position. Tab should fit in notch on base and fastening eyelets aligned with screw holes.
- Position wires away from moving parts.
- Install two stator screws and tighten to 1.7-4.0 N·m (15-35 lb-in).

- Install octane rod and retaining screw. Tighten to 1.7-4.0 N·m (15-35 lb-in).
- Apply a light coat of Motor Oil XO-10W30-QSP (ESE-M2C153-E) or equivalent, to distributor shaft below armature.
- Insert shaft through base bushing.
- Place a 1/2-inch deep well socket over shaft, invert and place on arbor plate.

REMOVAL AND INSTALLATION (Continued)

9. Install gear thrust washer.



B4140-A

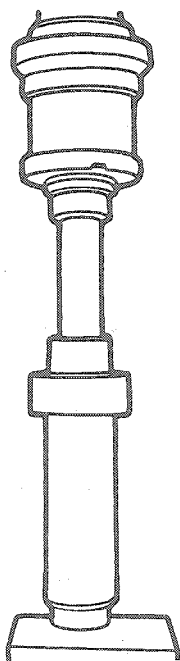
NOTE: The hole in the shaft and gear must be lined up as accurately as possible to ensure ease of roll pin insertion.

10. Place the distributor gear on shaft end. Line up the mark on armature and gear.

NOTE: If the gear holes do not align, the gear must be removed and repressed on. A drift punch will not align the holes.

11. Place a 5/8-inch deep well socket over the shaft and gear and press gear to align with original drill hole.

CAUTION: If gear is damaged, do not replace gear. Serious engine damage may result. Replace complete distributor assembly.



B4142-A

12. Insert new roll pin through gear and shaft. Pin should have proper extrusion.
13. Replace armature and tighten screws to 2.8-4.0 N·m (25-35 lb-in).
NOTE: If the armature contacts the stator, replace the entire distributor.
14. Check distributor for free movement over full rotation of shaft.
15. Wipe back of ICM and distributor ICM mounting face free of all dirt, if so equipped.
16. Apply Silicone Dielectric Compound WA-10 D7AZ-19A331-A (ESE-M1C17 1-A) or equivalent to the back of the ICM and spread thinly and evenly, if so equipped.
17. Turn distributor base upside down so that the stator connector is in full view.
18. Insert ICM and watch that the three ICM pins are inserted into the stator connector. Fully seat the module into the connector and against base.
19. Install two ICM screws and tighten to 1.7-4.0 N·m (15-35 lb-in), if so equipped.
20. Install the distributor into block per distributor replacement procedure.
21. Connect distributor module to wiring harness.
22. Replace rotor.
23. Replace cap and tighten screws to 2.0-2.6 N·m (18-25 lb-in).
24. Set engine timing.

3.8L Engine

Tools Required:

- Axle Bearing / Seal Plate T75L-1165-B
- Pinion Bearing Cone Remover D79L-4621-A

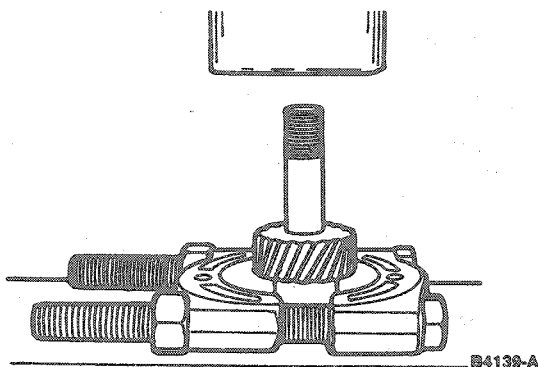
Removal

NOTE: Do not attempt to replace stator without an arbor press.

1. Using a screwdriver, remove distributor cap, position the cap and wires aside so as not to interfere with work area. Remove distributor harness connector.
2. Remove distributor from block as outlined.
3. Remove rotor.
NOTE: Hold gear to loosen armature screws. Do not hold armature.
4. Remove two screws holding armature and remove armature.
5. To ease assembly, mark armature and gear with a felt tip pen, to note orientation.
6. Remove and discard pin in gear and collar.

REMOVAL AND INSTALLATION (Continued)

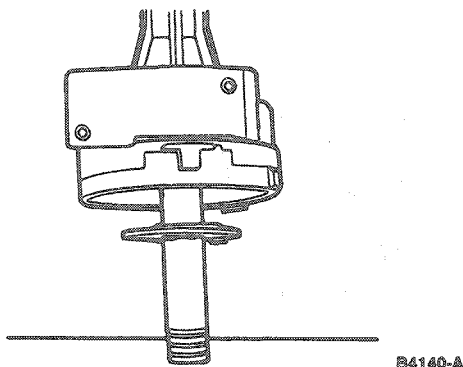
7. Invert distributor and place in Axle Bearing / Seal Plate T75L-1165-B, and press off gear using the Pinion Bearing Cone Remover D79L-4621-A or equivalent.



8. Remove collar.
9. Deburr and polish shaft with emery paper and wipe such that shaft slides out freely from distributor base.
10. Remove shaft assembly.
11. Remove stator assembly screw and retain.
12. Remove octane rod retaining screw and octane rod.
13. Remove stator assembly from top of bowl.
14. Inspect base bushing for wear or signs of excess heat concentration. Replace complete distributor assembly if damaged.
15. Inspect base O-ring for cuts or damage and replace O-ring if necessary.
16. Inspect base for cracks and wear. Replace complete distributor assembly if damage is found.

Installation

1. Place stator assembly over bushing and press down to seat.
2. Place stator connector in position. Tab should fit in notch on base and fastening eyelets aligned with screw holes.
3. Position wires away from moving parts.
4. Install stator screw and tighten to 1.7-4.0 N-m (15-35 lb-in).
5. Install octane rod and retaining screw. Tighten to 1.7-4.0 N-m (15-35 lb-in).
6. Apply a light coat of Motor Oil XO-10W30-QSP (ESE-M2C153-E) or equivalent, to distributor shaft below armature.
7. Insert shaft through base bushing.
8. Install collar and new roll pin.
9. Place a 1/2-inch deep well socket over shaft, invert and place on arbor plate.



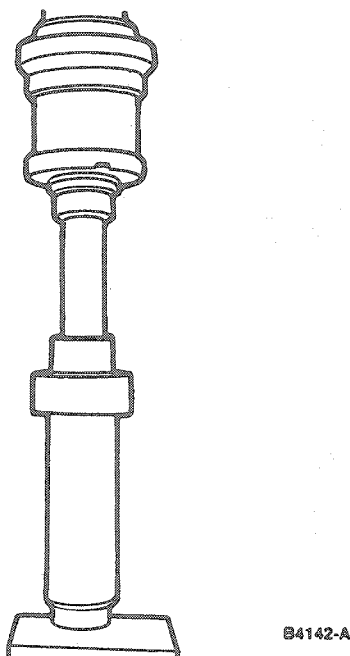
NOTE: The hole in the shaft and gear must be lined up as accurately as possible to ensure ease of roll pin insertion.

10. Place the distributor gear on shaft end. Line up the mark on armature and gear.

NOTE: If the gear holes do not align, the gear must be removed and re-installed. A drift punch will not align the holes.

11. Place a 5/8-inch deep well socket over the shaft and gear and press gear to align with original drill hole.

CAUTION: If gear is damaged, do not replace gear. Serious engine damage may result. Replace complete distributor assembly.



12. Insert new roll pin through gear and shaft. Pin should have proper extrusion.

REMOVAL AND INSTALLATION (Continued)

13. Replace armature and tighten screws to 2.8-4.0 N-m (25-35 lb-in).

NOTE: If the armature contacts the stator, replace the entire distributor.

14. Check distributor for free movement over full rotation of shaft.
15. Install the distributor into block per distributor replacement procedure.
16. Connect distributor module to wiring harness.
17. Replace rotor.
18. Replace cap and tighten screws to 2.0-2.6 N-m (18-23 lb-in).
19. Set engine timing.

Ignition Control Module (ICM)**3.0L Engine****Removal**

1. Using a screwdriver, remove distributor cap and position it and attached wires aside so as not to interfere with work area.
2. Remove ICM harness connector.
3. Remove distributor from engine.
4. Place distributor on work bench. Remove two ICM mounting screws.

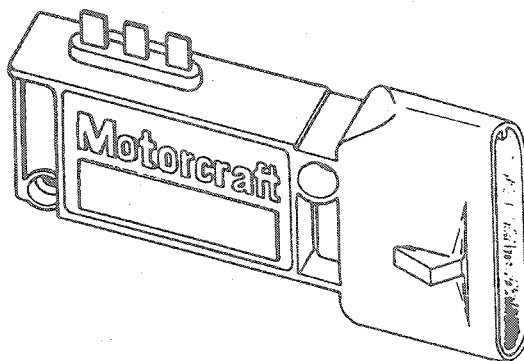
CAUTION: Do not attempt to lift ICM from mounting surface prior to moving entire ICM toward distributor flange as pins will break at distributor / module connector.

5. Pull RH side of ICM down distributor mounting flange and back up to disengage module terminals from connector in distributor base. The ICM may be pulled toward flange and away from distributor.

Installation

1. Coat metal base plate of ICM uniformly with silicone compound, approximately 0.79mm (1/32 inch) thick. Use Silicone Dielectric Compound WA-10, D7AZ-19A331-A (ESE-M1C17 1-A) or equivalent.
2. Place ICM on distributor base mounting flange.
3. Carefully position ICM toward distributor bowl and engage three distributor connector pins securely.
4. Install two ICM mounting screws and tighten to 1.7-4.0 N-m (15-35 lb-in) starting with upper RH screw.

5. Install distributor on engine.
6. Install distributor cap. Tighten cap mounting screws to 2.0-2.6 N-m (18-23 lb-in).
7. Install ICM harness connector.
8. Using an induction timing lamp, verify engine timing. Refer to Vehicle Emission Control Information decal located in the engine compartment.

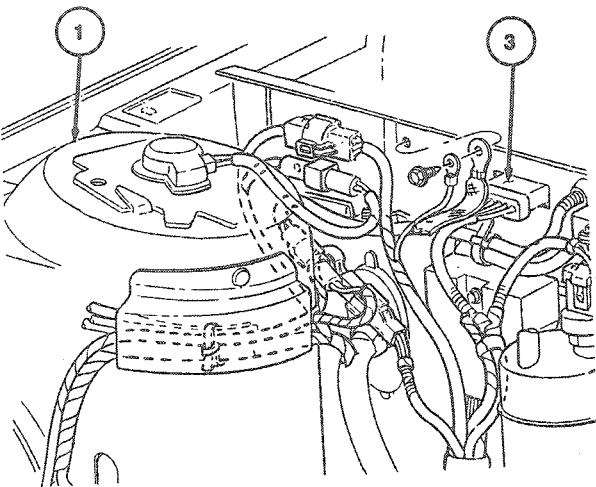
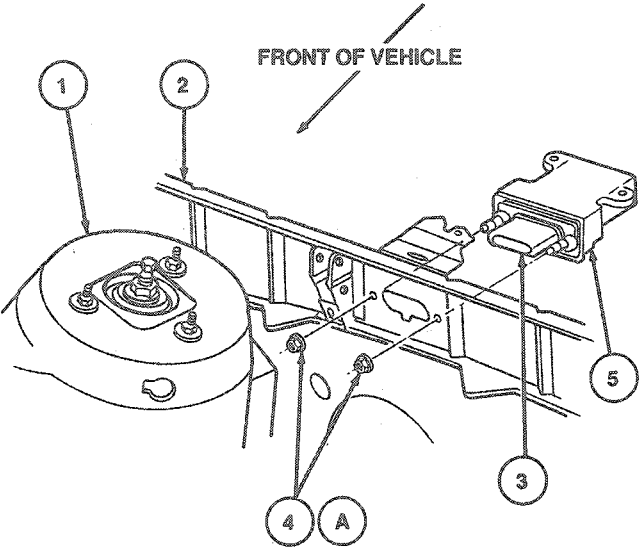


B4046-A

3.8L Engine**Removal**

1. Using a Phillips head screwdriver, remove screws attaching leaf screen to top of cowl assembly.
2. Separate engine compartment / cowl seal strip from leaf screen and cowl dash extension panel in area of ICM.
3. Lift off leaf screen to allow access to ICM.
NOTE: The connector latch is underneath ICM shroud and must be pressed upward to unlatch.
4. Disconnect harness connector from the ICM assembly.
5. Remove two nut / washer assemblies (11mm hex-head) attaching ICM / heatsink assembly to cowl dash extension panel.
NOTE: The assembly is mounted with heatsink fins pointed downward.
6. Remove ICM / heatsink assembly.
7. Remove two ICM retaining screws and remove ICM from heatsink.
8. While holding ICM connector shroud with one hand, pull seal off other end of ICM.

REMOVAL AND INSTALLATION (Continued)



INSTALLED POSITION
B4405-C

Item	Part Number	Description
1	—	RH Shock Tower
2	—	Cowl
3	12A 199	Ignition Control Module (ICM)

(Continued)

Item	Part Number	Description
4A	—	Retaining Nuts (2 Req'd)
5	—	Heat Sink
A	—	Tighten to 5-8 N·m (44-70 Lb·In)

TB4405C

Installation

1. Coat metal base plate of ICM uniformly with silicone compound, approximately 0.79mm (1/32 inch) thick. Use Silicone Dielectric Compound WA-10, D7AZ-19A331-A (ESE-M1C171-A) or equivalent.
2. Place ICM onto heatsink. Install two retaining screws. Tighten to 1.7-4.0 N·m (15-35 lb-in).
3. Push seal over ICM connector shroud and heatsink studs with metal part toward heatsink.
4. Insert ICM/heatsink assembly into cowl dash extension panel enough to have mounting studs protrude into the engine compartment side.
5. Hand-tighten previously removed nut/washer assemblies. Tighten nuts to 5-8 N·m (44-70 lb-in).
6. Connect wire harness connector to ICM.
7. Install leaf screen and screws.
8. Install engine compartment/cowl panel and seal strip.

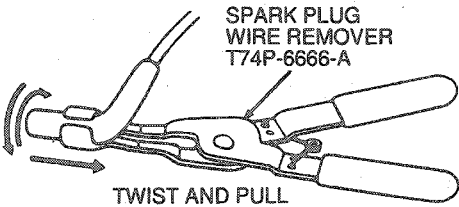
Spark Plug Wires

Tools Required:

- Spark Plug Wire Remover T74P-6666-A

Removal

1. When removing wires from spark plugs, use Spark Plug Wire Remover T74P-6666-A. Grasp and twist the boot back and forth on plug insulator to free boot. Use special tool to pull boot from plug. Do not pull on wire directly, or it may become separated from connector inside boot.



A6626-D

2. When removing wires from distributor cap or coil, grasp boot by hand and remove with twisting and pulling motion. Do not pull on wire.

REMOVAL AND INSTALLATION (Continued)**Installation**

1. Whenever a high tension wire is removed for any reason from a spark plug, coil or distributor cap, or a new high tension wire is installed, Silicone Dielectric Compound WA-10, D7AZ-19A331-A (ESE-M1C171-A) or equivalent must be applied to boot before it is reconnected. Using a small clean tool, coat entire interior surface of boot with Silicone Dielectric Compound WA-10, D7AZ-19A331-A (ESE-M1C171-A) or equivalent.
2. Insert each wire on proper terminal of distributor cap. Ensure wires are all the way down over their terminals. The No. 1 terminal is identified on cap. Install wires starting with No. 1 terminal.
3. Remove wire retaining brackets from old high tension wire set and install them on new set in same relative position. Install wires in brackets on valve rocker arm covers.

4. Connect wires to proper spark plugs.
5. Install coil wire.

Spark Plugs**Removal and Installation**

Refer to the appropriate engine section for spark plug removal and installation.

Refer to the Spark Plug Inspection Chart to determine the condition of the spark plugs.

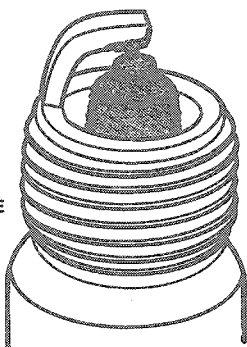
REMOVAL AND INSTALLATION (Continued)

Spark Plug Inspection Chart

GAP BRIDGED

IDENTIFIED BY DEPOSIT BUILD-UP CLOSING GAP BETWEEN ELECTRODES.

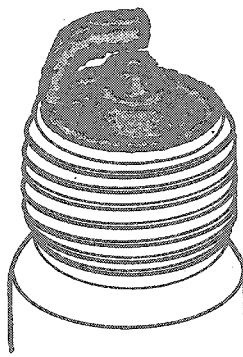
CAUSED BY OIL OR CARBON FOULING, REPLACE PLUG, OR, IF DEPOSITS ARE NOT EXCESSIVE THE PLUG CAN BE CLEANED.



OIL FOULED

IDENTIFIED BY WET BLACK DEPOSITS ON THE INSULATOR SHELL BORE ELECTRODES.

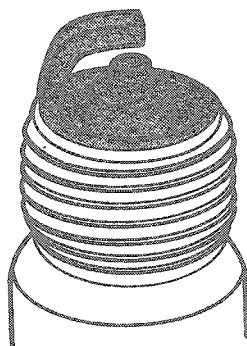
CAUSED BY EXCESSIVE OIL ENTERING COMBUSTION CHAMBER THROUGH WORN RINGS AND PISTONS, EXCESSIVE CLEARANCE BETWEEN VALVE GUIDES AND STEMS, OR WORN OR LOOSE BEARINGS. CORRECT OIL PROBLEM. REPLACE THE PLUG.



CARBON FOULED

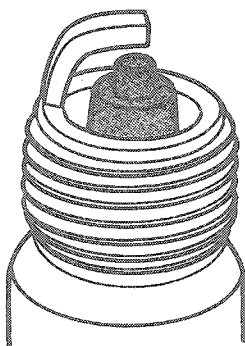
IDENTIFIED BY BLACK, DRY FLUFFY CARBON DEPOSITS ON INSULATOR TIPS, EXPOSED SHELL SURFACES AND ELECTRODES.

CAUSED BY TOO COLD A PLUG, WEAK IGNITION, DIRTY AIR CLEANER, DEFECTIVE FUEL PUMP, TOO RICH A FUEL MIXTURE, IMPROPERLY OPERATING HEAT RISER OR EXCESSIVE IDLING. CAN BE CLEANED.



NORMAL

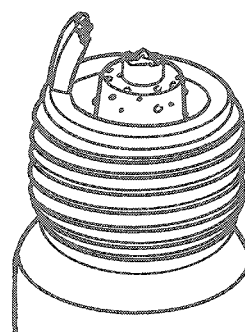
IDENTIFIED BY LIGHT TAN OR GRAY DEPOSITS ON THE FIRING TIP



PRE-IGNITION

IDENTIFIED BY MELTED ELECTRODES AND POSSIBLY BLISTERED INSULATOR. METALLIC DEPOSITS ON INSULATOR INDICATE ENGINE DAMAGE.

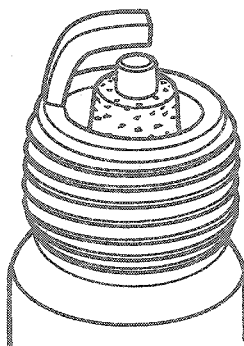
CAUSED BY WRONG TYPE OF FUEL, INCORRECT IGNITION TIMING OR ADVANCE, TOO HOT A PLUG, BURNT VALVES OR ENGINE OVERHEATING. REPLACE THE PLUG.



OVERHEATING

IDENTIFIED BY A WHITE OR LIGHT GRAY INSULATOR WITH SMALL BLACK OR GRAY BROWN SPOTS AND WITH BLuish-BURNT APPEARANCE OF ELECTRODES.

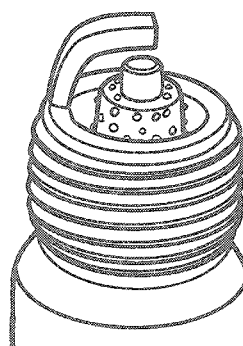
CAUSED BY ENGINE OVERHEATING, WRONG TYPE OF FUEL, LOOSE SPARK PLUGS, TOO HOT A PLUG, LOW FUEL PUMP PRESSURE OR INCORRECT IGNITION TIMING. REPLACE THE PLUG.



FUSED SPOT DEPOSIT

IDENTIFIED BY MELTED OR SPOTTY DEPOSITS RESEMBLING BUBBLES OR BLISTERS.

CAUSED BY SUDDEN ACCELERATION. CAN BE CLEANED IF NOT EXCESSIVE, OTHERWISE REPLACE PLUG.



B4084-E

REMOVAL AND INSTALLATION (Continued)

Spark Plug Hole Taperset Installation

CAUTION: Use protective eye glasses at all times.

NOTE: Cylinder head must be removed from vehicle to prevent metal shavings from entering engine.

Refer to appropriate engine Section for cylinder head removal and installation.

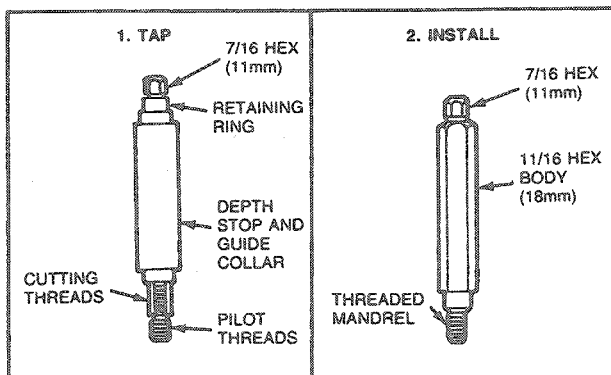
Tap

1. Thoroughly clean spark plug counterbore walls and seat of all dirt and foreign material.
2. Lubricate cutting threads of tap with cutting oil.
3. Engage tap pilot into spark plug port threads.
NOTE: Use of power tools is not approved for installation of tapersets.
4. Using ratchet wrench and keeping tap aligned, rotate tap until depth stop collar bottoms on face of port and tighten against retaining ring.
5. Using an air hose, blow out as many shavings as possible.
6. If stop collar is loose, tap has not penetrated to full depth.
7. Remove tap from hole.
8. Clear shavings from hole and cylinder with air hose.

Installation

CAUTION: Repeat Steps 1 through 8 to ensure a clean bore.

1. Lubricate mandrel threads and taperset with aluminum cutting oil. Then thread taperset onto mandrel with larger counterbore end toward 18mm (11/16 inch) hex body until one thread of mandrel shows beyond tip of taperset.



B4031-B

NOTE: Taperset should be flush to 1mm (0.039 inch) below spark plug gasket seat.

2. Install taperset into tapped hole. Tighten 18mm (11/16 inch) hex to 68 N-m (50 lb-ft).
3. Holding 11mm (7/16 inch) hex mandrel to prevent rotation, loosen 18mm (11/16 inch) hex body approximately one-half turn to achieve breakaway action.

4. Remove tool from installed taperset.
5. Thoroughly clean cylinder head before installing spark plug. Tighten spark plugs to 9-20 N-m (7-15 lb-ft).

CLEANING AND INSPECTION

Ignition Coil

Wipe coil tower with a clean cloth dampened with soap and water. Remove any soap film and dry with compressed air. Inspect for cracks, carbon tracking and dirt.

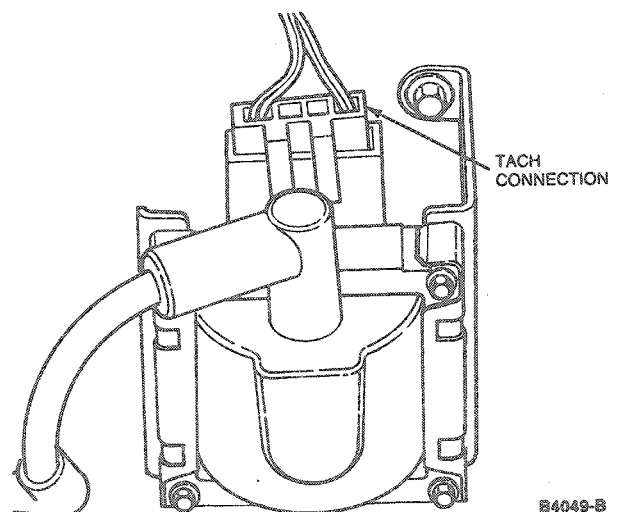
Spark Plug Wires

Without removing the high tension wires from the spark plugs, distributor cap or coil, wipe the wires with a clean, damp cloth and inspect them for visible damage such as cuts, pinches, cracks or torn boots. Replace only wires that are damaged. Refer to Spark Plug Wire, Removal and Installation.

Tachometer Connection

CAUTION: Do not allow this clip to accidentally ground to a metal surface. It may permanently damage the coil.

The ignition coil connector allows a tachometer connection using an alligator clip, without removing the coil connector. This is accomplished by inserting the alligator clip into the back of the connector, onto the dark green / yellow dotted wire.



B4049-B

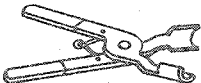

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N-m	Lb-in
Distributor Hold-Down Bolts—3.0L	19-28	14-21 (Lb-Ft)
Distributor Hold-Down Bolts—3.8L	20-30	15-22 (Lb-Ft)
Stator Assembly Screws	1.7-4.0	15-35
Spark Plugs	9-20	7-15 (Lb-Ft)
Ignition Control Module	1.7-4.0	15-35
Heat Sink to Dash Retaining Nuts	5-8	44-70
Distributor Cap Hold-Down Screws	2.0-2.6	18-23
Octane Rod Retaining Screw	1.7-4.0	15-35
Armature Retaining Screws	2.8-4.0	25-35
Octane Rod Retaining Screws	1.7-4.0	15-35

Tool Number	Description
D79L-4621-A	Pinion Bearing Cone Remover

SPECIAL SERVICE TOOLS

Tool Number/ Description	Illustration
T74P-6666-A Spark Plug Wire Remover	 T74P-6666-A
T75L-1165-B Axle Bearing / Seal Plate	 T75L-1165-B

SECTION 03-07B Electronic Ignition (EI) System

SUBJECT	PAGE	SUBJECT	PAGE
ADJUSTMENTS		DIAGNOSIS AND TESTING.....	03-07B-5
Initial Timing.....	03-07B-8	REMOVAL AND INSTALLATION	
CLEANING AND INSPECTION		Camshaft Position (CKP) Sensor	
Ignition Coils.....	03-07B-8	Assembly.....	03-07B-5
Spark Plug Wires.....	03-07B-8	Crankshaft Position (CKP) Sensor	
DESCRIPTION AND OPERATION		Assembly.....	03-07B-5
Camshaft Position (CMP) Sensor.....	03-07B-2	Ignition Coil Pack.....	03-07B-6
Components.....	03-07B-1	Ignition Control Module (ICM).....	03-07B-6
Crankshaft Position (CKP) Sensor.....	03-07B-1	Spark Plug Wires.....	03-07B-7
Failure Mode Effects Management.....	03-07B-2	SPECIAL SERVICE TOOLS.....	03-07B-8
Ignition Coil Pack.....	03-07B-2	SPECIFICATIONS.....	03-07B-8
Ignition Control Module (ICM).....	03-07B-2	VEHICLE APPLICATION.....	03-07B-1
Ignition Diagnostic Monitor.....	03-07B-2		

VEHICLE APPLICATION

Taurus with 3.0L / 3.2L SHO engines.

DESCRIPTION AND OPERATION

Components

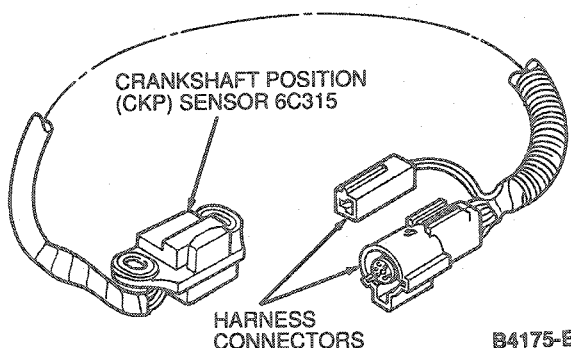
The electronic ignition (EI) system for the 3.0L / 3.2L SHO engines consists of the following components:

- Crankshaft position (CKP) sensor 6C315
- Camshaft position (CMP) sensor 12126
- Ignition control module (ICM) 12A199
- Ignition coil pack
- The spark angle portion of powertrain control module (PCM) 12A650
- Related wiring

Crankshaft Position (CKP) Sensor

The crankshaft position sensor is a single Hall effect magnetic switch, which is activated by three vanes on the crankshaft timing pulley. The signal generated by this sensor is called CKP. The CKP signal provides base timing and RPM information to the ICM and the powertrain control module (PCM).

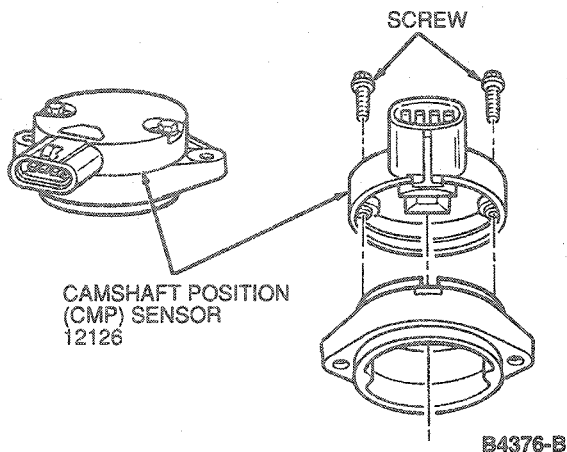
Based timing is set at 10 degrees \pm 2 degrees BTDC and is not adjustable.



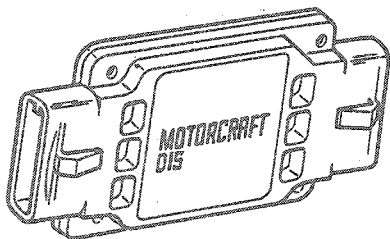
DESCRIPTION AND OPERATION (Continued)

Camshaft Position (CMP) Sensor

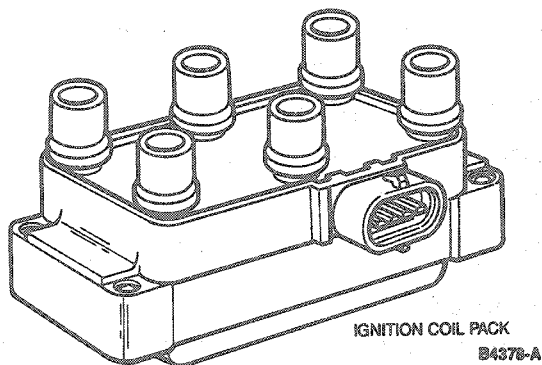
This sensor is a single Hall effect magnetic switch, which is activated by a single vane driven by the camshaft. This sensor provides camshaft position information. The ICM uses CMP for coil fire sequencing and is also used by the PCM for fuel synchronization.

**Ignition Control Module (ICM)**

The ICM receives the CKP signal from the crankshaft position sensor, the CMP signal from the camshaft position sensor, and SPOUT (spark out) signal from the PCM module. During normal operation, CKP is sent to the PCM module from the crankshaft timing sensor and provides base timing and RPM information. The CMP signal provides the ignition control module with the information required to synchronize the ignition coils so that they are fired in the proper sequence. The SPOUT signal contains the optimum spark timing and dwell time information. The spark angle is determined by the rising edge of SPOUT, this is when coil current "turns off" and spark occurs. The dwell time is controlled by varying the duty cycle (duration) of the SPOUT signal. Current flows in a coil (dwell) when SPOUT is "low". This feature is called CCD (Computer Controlled Dwell). With the proper inputs of CKP, CMP and SPOUT the ICM turns the ignition coils on and off in the proper sequence for spark control.

**Ignition Coil Pack**

The ignition coil pack contains three separate ignition coils which are controlled by the ICM through three coil leads. Each ignition coil fires two spark plugs simultaneously, one spark plug on the compression stroke and one on the exhaust stroke. The spark plug fired on the exhaust stroke uses very little of the ignition coil stored energy. The majority of the ignition coil energy is used by the spark plug on the compression stroke. Since these two spark plugs are connected in series, the firing voltage of one spark plug will be negative with respect to ground, while the other will be positive with respect to ground. Refer to the Powertrain Control/Emissions Diagnosis Manual¹ for additional information on spark plug polarity.

**Ignition Diagnostic Monitor**

The ignition diagnostic monitor (IDM) is a function of the ICM. The ICM sends information on system failures to the PCM which stores the information for diagnostic self tests. The IDM signal is also used to drive the vehicle instrument tachometer and test tachometer for system diagnosis.

Failure Mode Effects Management

During some EI system faults, the failure mode effects management (FMEM) portion of the ICM will maintain vehicle operation. If the ICM does not receive the SPOUT input, it will automatically turn the ignition coils on and off using the CKP signal. However, this will result in fixed spark timing (10 degrees BTDC) and fixed dwell time (no CCD). If the ICM does not receive the CMP input during engine cranking, random coil synchronization will be attempted by the ICM. Therefore, several start attempts (cycling ignition switch from OFF to START) may be required to start the engine. If the ICM loses CMP input while engine is running, the ICM will remember the proper firing sequence and continue to fire to maintain engine operation.

¹ Can be purchased as a separate item.

DESCRIPTION AND OPERATION (Continued)

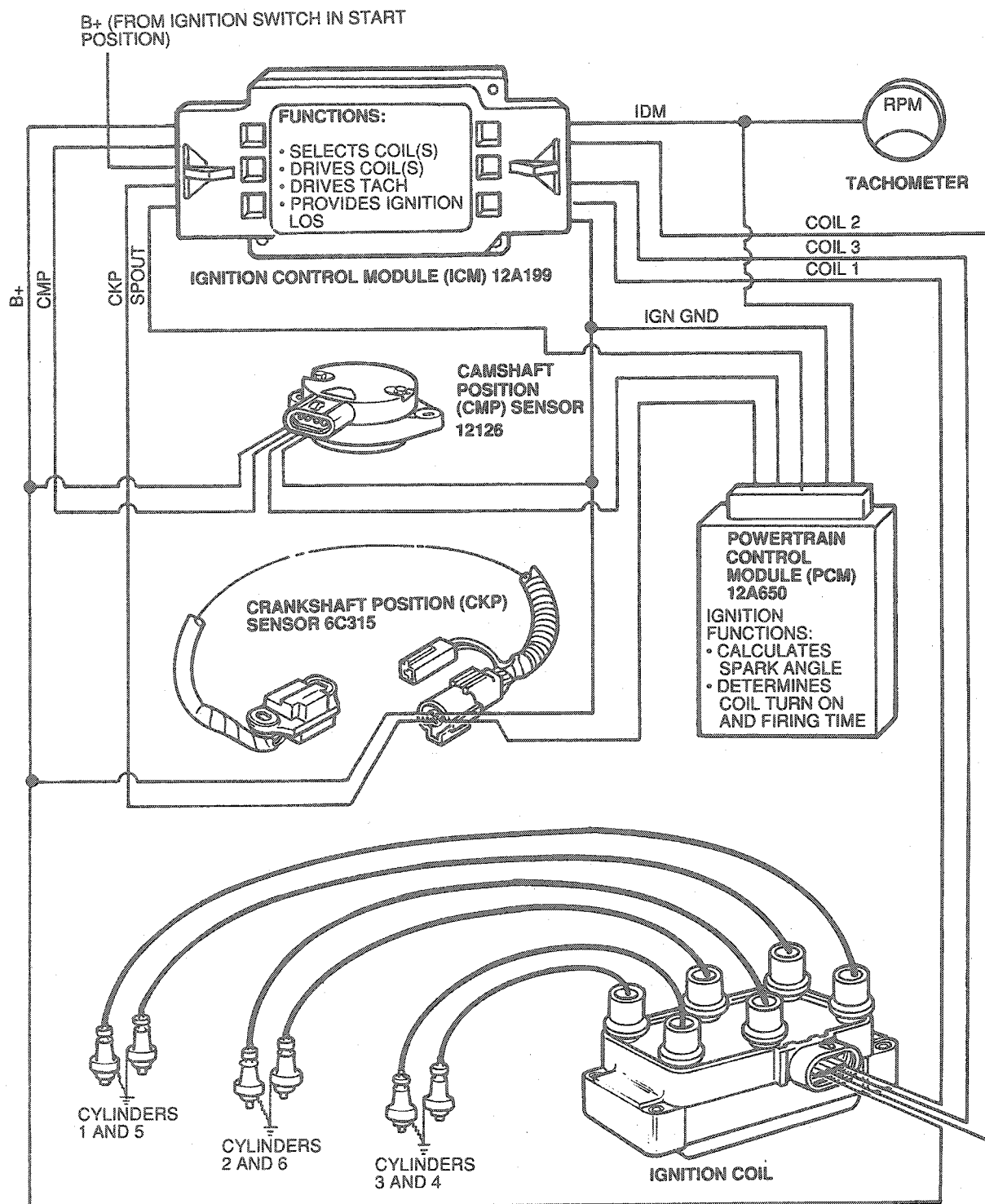
For additional information on the electronic ignition system theory of operation, refer to the Powertrain Control/Emissions Diagnosis Manual².

EI System Diagram

NOTE: This diagram is not meant to show detailed wiring interconnections. Refer to vehicle wiring diagrams for this information.

² Can be purchased as a separate item.

DESCRIPTION AND OPERATION (Continued)



B4395-D

DIAGNOSIS AND TESTING

Procedures for diagnosis and testing of the EI system can be found in the Powertrain Control/Emissions Diagnosis Manual³.

REMOVAL AND INSTALLATION

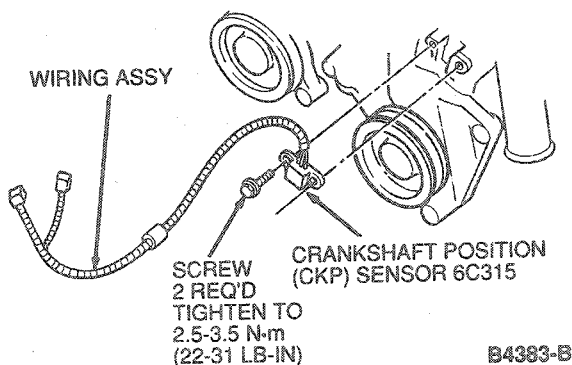
Crankshaft Position (CKP) Sensor Assembly

Tools Required:

- Universal Puller T67L-3600-A
- Crank Gear and Damper Replacer T83T-6316-B2

Removal

1. Disconnect battery ground cable.
2. Loosen tensioner pulleys for A/C compressor and power steering pump belts.
3. Remove belts from crankshaft pulley.
4. Disconnect ICM and remove intake manifold crossover tube.
5. Remove upper timing belt cover.
6. Disconnect sensor wiring harness at connector and route wiring harness through belt cover.
7. Raise vehicle and suitably support. Refer to Section 00-02.
8. Remove RH front wheel and tire assembly. Refer to Section 04-04.
9. Remove crankshaft pulley using Universal Puller T67L-3600-A.
10. Remove center and lower timing belt covers.
11. Rotate crankshaft by **HAND** to position the metal vane of shutter outside of sensor air gap.
12. Remove crankshaft sensor retaining screws and remove sensor.

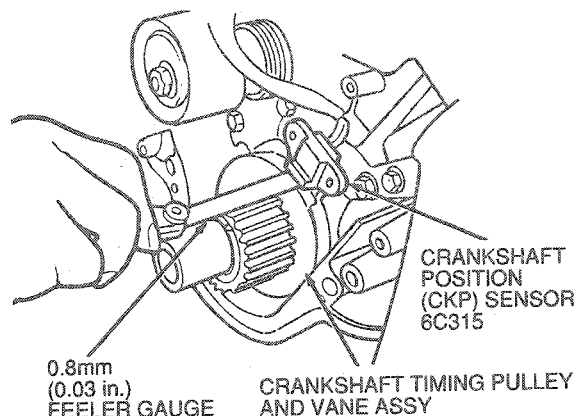


Installation

1. Route sensor wiring harness through belt cover. Install sensor assembly on mounting pad and install retaining screws loosely. Do not tighten screws at this time.

CAUTION: This is a critical torque. Overtightening can cause damage to timing sensor.

2. Set clearance between crankshaft position sensor assembly and one vane on crankshaft timing pulley and vane assembly using a 0.8mm (0.03 inch) feeler gauge. Tighten screws to 2.5-3.5 N·m (22-31 lb-in).



3. Install lower timing belt cover. Take care not to damage sensor wiring harness. Install crankshaft pulley using Crank Gear and Damper Replacer T83T-6316-B2. Tighten pulley bolt to 152-172 N·m (112-127 lb-ft).
4. Install center timing belt cover.
5. Install RH front wheel and tire assembly. Tighten wheel lug nuts to 115-142 N·m (85-105 lb-ft).
6. Lower vehicle.
7. Route and connect sensor wiring harness.
8. Install upper timing belt cover.
9. Install intake manifold crossover tube and connect ICM. Refer to Section 03-01C.
10. Install A/C and power steering belts and adjust to proper tension.
11. Connect battery ground cable.

Camshaft Position (CKP) Sensor Assembly

Removal

1. Disconnect negative battery cable.
2. Remove engine torque strut.
3. Remove power steering belt.
4. Remove power steering pump pulley.
5. Disconnect camshaft position sensor wiring connector.
6. Remove camshaft position sensor retaining bolts and remove sensor.

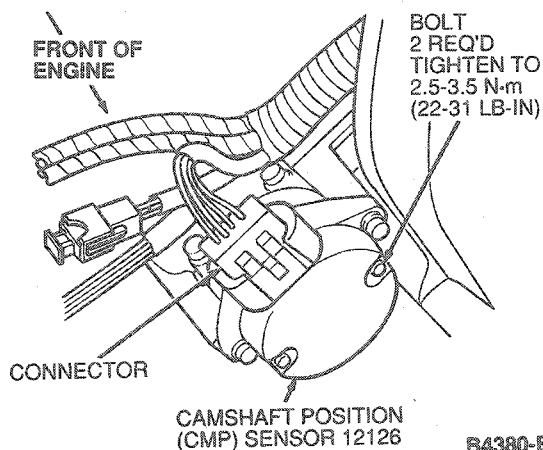
Installation

1. Install camshaft position sensor and retaining bolts. Tighten bolts to 2.5-3.5 N·m (22-31 lb-in).

³ Can be purchased as a separate item.

REMOVAL AND INSTALLATION (Continued)

2. Connect sensor wiring connector.
3. Install power steering pump pulley. Refer to Section 11-02.
4. Install power steering belt. Refer to Section 03-05.
5. Install engine torque strut.
6. Connect battery ground cable.



Ignition Control Module (ICM)

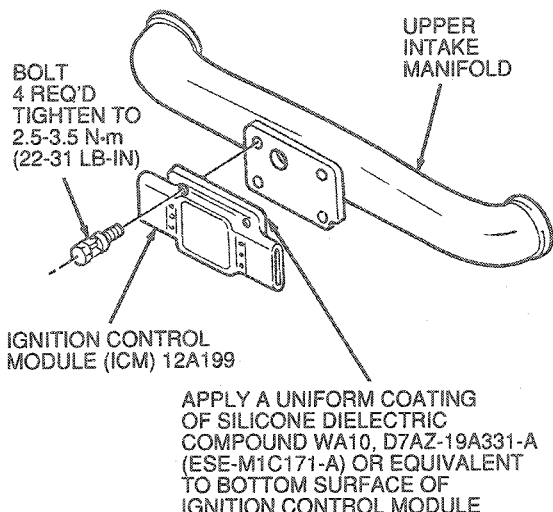
Removal

1. Disconnect battery ground cable.
2. Disconnect both electrical connectors at ICM assembly by pressing down on locking tabs where it is stamped PUSH and remove connector.
3. Remove ICM retaining bolts and remove module.

Installation

1. Apply an even coat of approximately 0.80mm (1/32 inch), of Silicone Dielectric Compound WA-10, D7AZ-19A331-A (ESE-M1C171-A) or equivalent to mounting surface of ICM. Install ICM and retaining bolts. Tighten bolts to 2.5-3.5 N·m (22-31 lb-in).
2. Connect both electrical connectors to ICM.

3. Connect battery ground cable.



Ignition Coil Pack

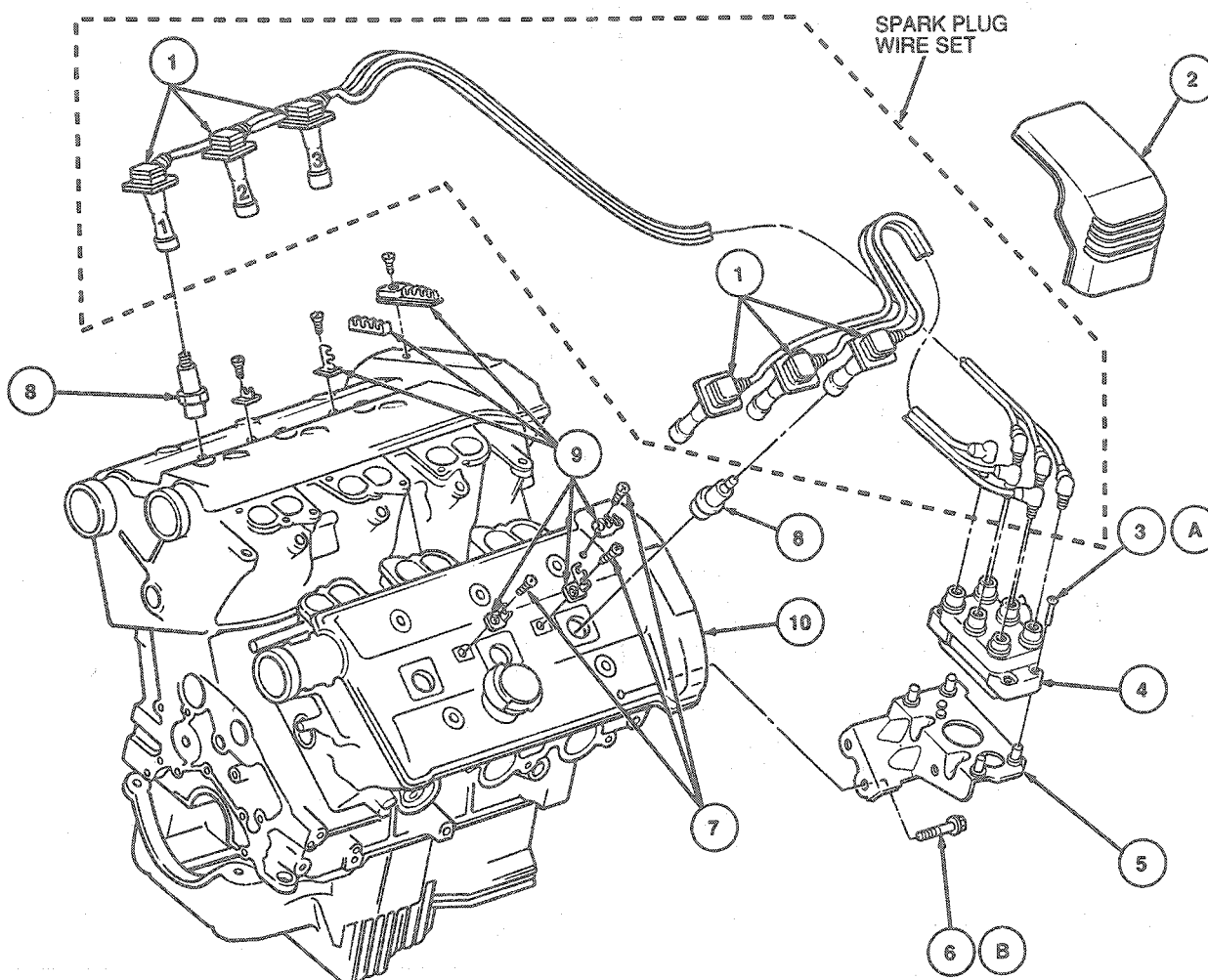
Removal

1. Disconnect battery ground cable.
2. Remove cover from coil pack and disconnect electrical connector.
3. Remove spark plug wires by squeezing locking tabs to release coil boot retainers.
4. Remove coil pack retaining screws and remove coil pack.

Installation

1. Install coil pack and retaining screws. Tighten screws to 4.5-7 N·m (40-62 lb-in).
2. Connect plug wires (see illustration for sequence) and connect electrical connector.
3. Install coil pack cover.
4. Connect battery ground cable.

REMOVAL AND INSTALLATION (Continued)



B4382-B

Item	Part Number	Description
1	12259	Spark Plug Wire Assemblies
2	—	Coil Pack Cover
3A	—	Screw and Washer (4 Req'd)
4	12029	Ignition Coil Pack
5	—	Coil Mounting Bracket
6B	—	Bolt (2 Req'd)

(Continued)

Item	Part Number	Description
7	—	Screw (3 Req'd Each Side)
8	12405	Spark Plug
9	—	Wire Clamp
10	6007	Engine Assy
A		Tighten to 4.5-7 N·m (40-62 Lb-In)
B		Tighten to 28-42 N·m (21-31 Lb-Ft)

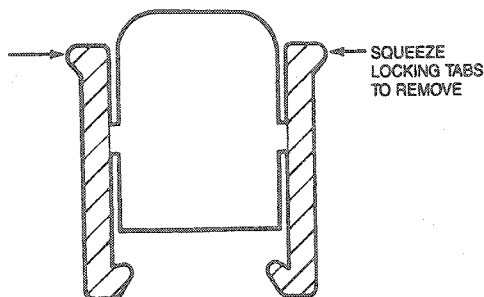
Spark Plug Wires

Removal

When removing spark plug wires from spark plug, grasp and twist the boot back and forth on the plug insulator to free the boot. Use a twisting and pulling motion to pull the boot from the plug. Do not pull on the wire directly, as it may become separated from the connector inside the boot.

REMOVAL AND INSTALLATION (Continued)

When removing wires from the ignition coil pack, squeeze the locking tabs of the coil wire retainer and remove using a twisting and pulling motion. Do not pull on the wire.



B4379-A

Installation

CAUTION: Proper installation of spark plug wires is critical to vehicle operation. If one spark plug wire is not properly installed on spark plug or ignition coil, both spark plugs connected to that ignition coil may not fire under load.

1. Whenever a high tension wire is removed for any reason from a spark plug or ignition coil, or a new high tension wire is installed, Silicone Dielectric Compound WA-10, D7AZ-19A331-A (ESE-M1C171-A) or equivalent must be applied to the boot prior to installation. Using a small clean tool, coat the entire interior surface of the boot with Silicone Dielectric Compound WA-10, D7AZ-19A331-A (ESE-M1C171-A) or equivalent.
2. Install each wire on the proper ignition coil terminal per illustration following Ignition Coil Pack, Installation. The terminal cylinder numbers are identified on the ignition coil pack. Ensure that the coil wire boots are fully seated and that both coil boot retainer locking tabs have engaged. The firing order is 1-4-2-5-3-6.
3. Route the new ignition wire set on the engine in the same relative position as the old set. Then install wires in wire routing brackets on the engine.
4. Connect wires to proper spark plugs.

CLEANING AND INSPECTION

Ignition Coils

Wipe the coil towers with a clean cloth dampened with soap and water. Remove any soap film and dry with compressed air. Inspect for cracks, carbon tracking and dirt.

Spark Plug Wires

Wipe the wires with a clean, damp cloth prior to inspection. Without removing high tension wires from the spark plugs or coils, inspect wires for visible damage such as cuts, pinches, cracks or torn boots. Replace damaged wires as necessary. Refer to Spark Plug Wires, Removal and Installation as outlined.

ADJUSTMENTS

Initial Timing

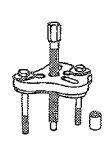
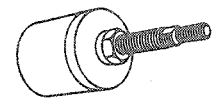
Initial timing is preset at $10^{\circ} \pm 2^{\circ}$ BTDC and is not adjustable.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N-m	Lb-Ft
Crankshaft Pulley Bolt	152-172	112-127
Crankshaft Position Sensor Retaining Screws	2.5-3.5	22-31 (Lb-In)
Camshaft Position Sensor Retaining Bolts	2.5-3.5	22-31 (Lb-In)
Ignition Control Module Retaining Bolts	2.5-3.5	22-31 (Lb-In)
Ignition Coil Pack Retaining Screws	4.5-7.0	40-62 (Lb-In)
Ignition Coil Pack Bracket-to-Cylinder Head Bolts	28-42	21-31
Wheel Lug Nuts	115-142	85-105

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T67L-3600-A Universal Puller	 T67L-3600-A
T83T-6316-B2 Crank Gear and Damper Replacer	 T83T-6316-B

SECTION 03-07C Electronic Ignition (EI) — High Data Rate System, Flexible Fuel (FF)

SUBJECT	PAGE	SUBJECT	PAGE
ADJUSTMENTS		PARTS CROSS-REFERENCE.....	03-07C-8
Initial Timing.....	03-07C-8	REMOVAL AND INSTALLATION	
CLEANING AND INSPECTION		Coil Pack Bracket.....	03-07C-5
Ignition Coil Packs.....	03-07C-7	Crankshaft Position Sensor (CKP)	
Spark Plug Wires.....	03-07C-7	Assembly.....	03-07C-4
DESCRIPTION AND OPERATION		Electronic Ignition (EI) Coil Pack.....	03-07C-5
Camshaft Position Sensor (CMP).....	03-07C-3	Ignition Control Module (ICM).....	03-07C-5
Components.....	03-07C-1	Ignition Control Module (ICM) Bracket.....	03-07C-6
Crankshaft Position (CKP) Sensor.....	03-07C-1	Spark Plug Wires.....	03-07C-6
Ignition Coil Pack.....	03-07C-3	SPECIAL SERVICE TOOLS.....	03-07C-8
Ignition Control Module (ICM).....	03-07C-2	SPECIFICATIONS.....	03-07C-8
DIAGNOSIS AND TESTING.....	03-07C-4	VEHICLE APPLICATION.....	03-07C-1

VEHICLE APPLICATION

Taurus 3.0L Flexible Fuel (FF) Vehicles.

DESCRIPTION AND OPERATION

Components

The Electronic Ignition (EI) System — High Data Rate for the 3.0L FF engine consists of the following components:

- Crankshaft position (CKP) 6C315 sensor
- Ignition control module (ICM) 12A310

- Ignition coil pack
- Desired spark angle signal from the Powertrain Control Module (PCM) 12A650
- Related wiring

Crankshaft Position (CKP) Sensor

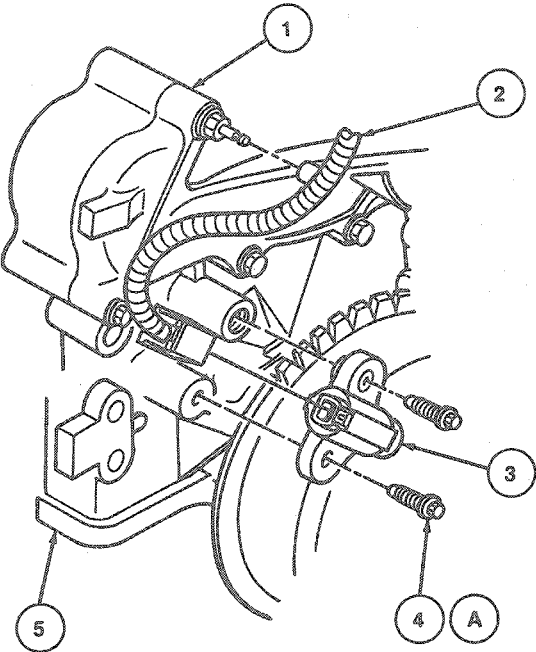
The crankshaft position (CKP) sensor is a variable reluctance sensor triggered by a 36-minus-1 tooth trigger wheel located inside the front cover.

The sine wave type signal generated from the variable reluctance sensor (VRS) provides two types of information. One is the position of the crankshaft in 10 degree increments. The other is the crankshaft speed (rpm).

The ignition control module (ICM) uses this information with the spark advance information from the powertrain control module (PCM) to determine ignition coil turn on and turn off time.

Base ignition timing is referenced to the position of the crankshaft sensor and is at 10 ± 2 degrees BTDC and is not adjustable.

DESCRIPTION AND OPERATION (Continued)



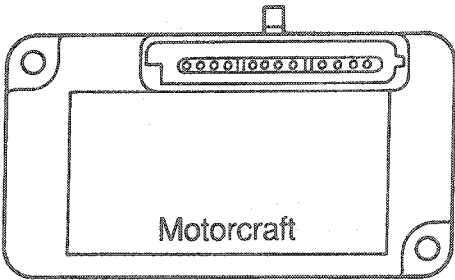
B4902-A

Item	Part Number	Description
1	—	Water Pump
2	9D930	Fuel Charging Wiring
3	6C315	Crankshaft Position Sensor
4A	N606500-S8	Bolt (2 Req'd)
5	—	Engine Front Cover
A		Tighten to 5-7 N·m (44-61 Lb·In)

Ignition Control Module (ICM)

The ignition control module (ICM) is a custom microprocessor-based thick film electronic module. The ignition control module (ICM) receives engine position and speed information from the crankshaft position (CKP) sensor, and desired spark advance information from the powertrain control module (PCM). The ignition control module (ICM) uses this information to direct which coil to fire, calculating the turn on / off times of the coils required to achieve the correct dwell and spark advance. The ignition control module (ICM) also synthesizes a Profile Ignition Pickup (PIP) signal and an Ignition Diagnostic Monitor (IDM) signal for use by the PCM. The ignition control module (ICM) sends information on system failures through the IDM signal to the powertrain control module (PCM) which stores information for Diagnostic Self Tests. The ignition diagnostic monitor (IDM) also provides the signal to drive the tachometer.

The ignition control module (ICM) is located on the cowl, in the engine compartment.



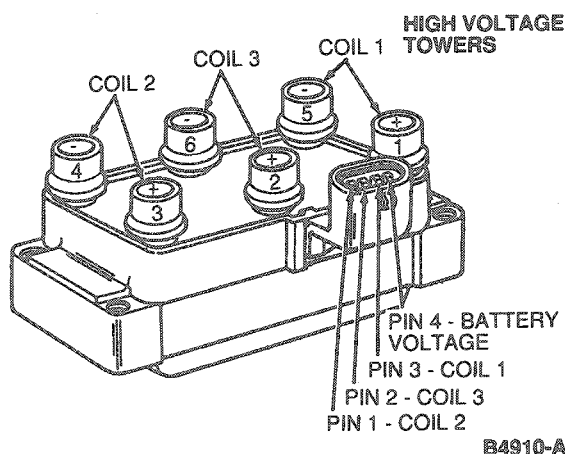
IGNITION CONTROL MODULE (ICM)
12K072

B4909-A

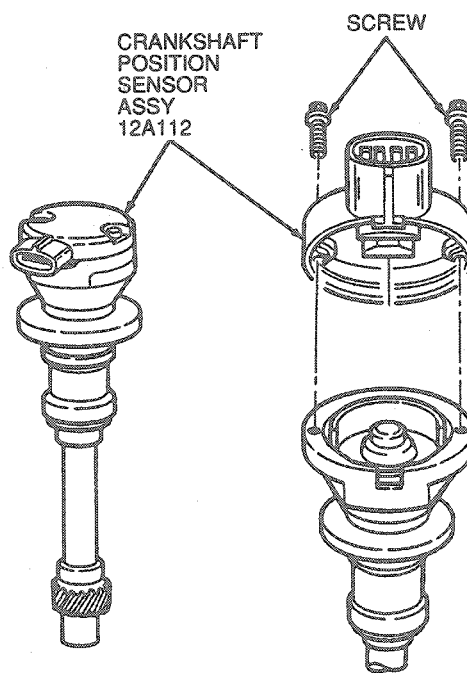
DESCRIPTION AND OPERATION (Continued)

Ignition Coil Pack

The coil pack is mounted on the rear of the LH cylinder head. The ignition coil pack contains three separate ignition coils which are controlled by the ignition control module (ICM) through three coil leads. Each ignition coil fires two spark plugs simultaneously; one plug on the compression stroke and one on the exhaust stroke. The spark plug fired on the exhaust stroke uses very little of the ignition coil's stored energy. The majority of the energy is used by the spark plug on the compression stroke. Since these two spark plugs are connected in series, the firing voltage of one plug will be negative with respect to ground, while the voltage of the other will be positive with respect to ground. Refer to the Powertrain Control/Emissions Diagnosis Manual¹ for additional information on spark plug polarity.



B4910-A



B4386-B

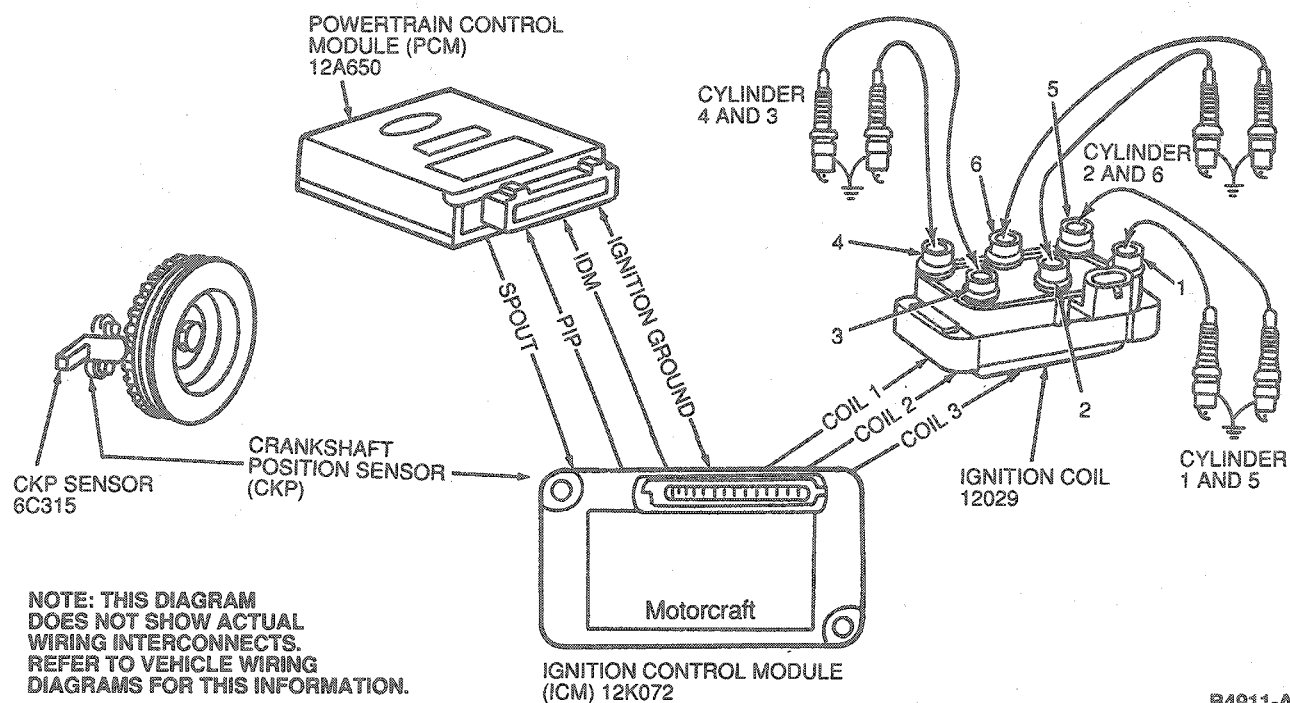
Camshaft Position Sensor (CMP)

The camshaft position sensor is a single Hall effect magnetic switch, activated by a single vane which is driven by the camshaft. This sensor provides cylinder identification (CID) information. The electronic ignition (EI) uses CID for coil fire sequencing and is also used by the powertrain control module (PCM) for fuel synchronization.

¹ Can be purchased as a separate item.

DESCRIPTION AND OPERATION (Continued)

System Block Diagram



DIAGNOSIS AND TESTING

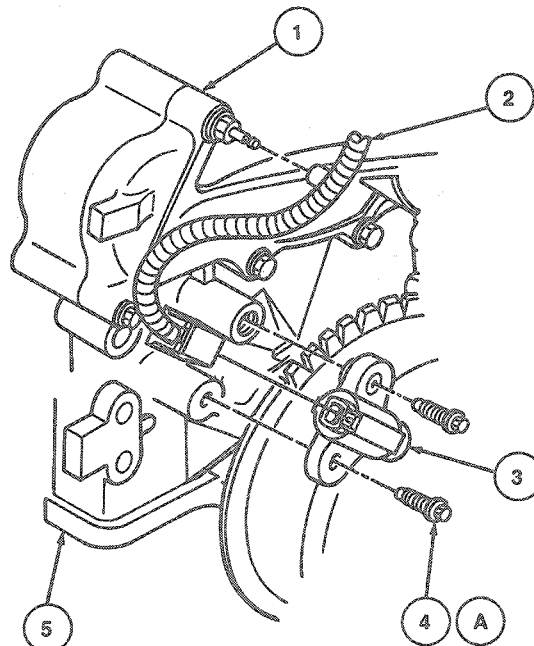
Procedures for diagnosis and testing of the EI—High Data Rate ignition system can be found in the Powertrain Control/Emissions Diagnosis Manual².

REMOVAL AND INSTALLATION

Crankshaft Position Sensor (CKP) Assembly

Removal

1. Disconnect negative battery cable.
2. Raise vehicle on a hoist. Refer to Section 00-02.
3. Disconnect CKP sensor electrical connector from the fuel charging wiring (9D930).
4. Remove crankshaft position (CKP) sensor retaining screws and remove sensor.



² Can be purchased as a separate item.

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	—	Water Pump
2	9D930	Fuel Charging Wiring
3	6C315	Crankshaft Position Sensor
4A	N606500-S8	Bolt (2 Req'd)
5	—	Engine Front Cover
A		Tighten to 5-7 N·m (44-61 Lb-In)

Installation

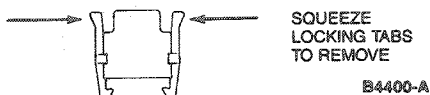
CAUTION: Do not overtighten screw.

1. Position sensor assembly and install retaining screws. Tighten to 5-7 N·m (44-61 lb-in).
2. Properly route engine fuel charging wiring and connect electrical connector to crankshaft sensor.
3. Lower vehicle.
4. Connect negative battery cable.

Electronic Ignition (EI) Coil Pack

Removal

1. Disconnect electrical connectors from coil pack and capacitor.
2. Disconnect spark plug wires by squeezing locking tabs and twisting while pulling upward.



3. Remove four coil pack retaining bolts and remove coil pack and capacitor. Save capacitor for installation with new coil pack.

Installation

1. Position coil pack and capacitor to mounting bracket.
2. Install retaining bolts and tighten to 5-7 N·m (44-61 lb-in).
3. Apply Silicone Dielectric Compound D7AZ-19A331-A (ESE-M1C171-A) or equivalent to all spark plug wire boots.
4. Install each wire connector to the proper terminal on the coil pack. Make sure boots are fully seated.
5. Connect coil pack and capacitor electrical connectors.

Coil Pack Bracket

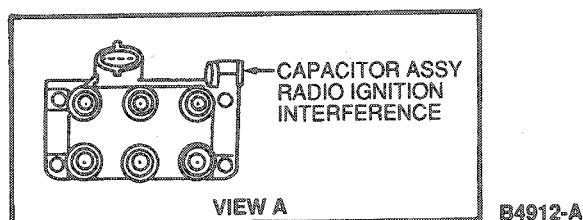
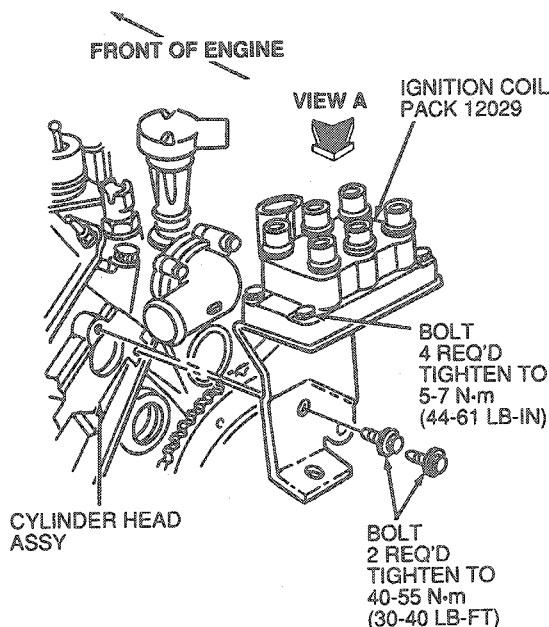
Removal

1. Remove the coil pack assembly as outlined in this section.

2. Remove the two bracket mounting bolts and bracket.

Installation

1. Position the coil pack bracket on the cylinder head and install two mounting bolts. Tighten the bolts to 44-55 N·m (30-40 lb-ft).
2. Install the coil pack assembly as outlined in this section.

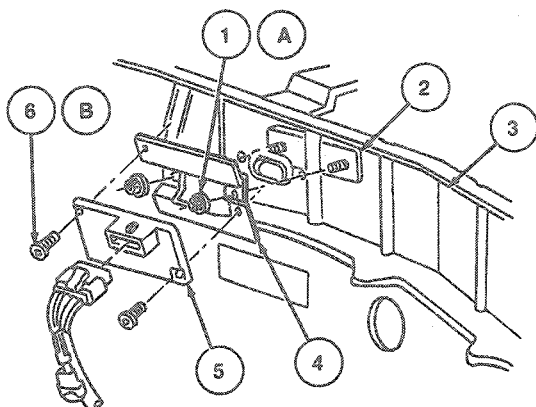


Ignition Control Module (ICM)

Removal

1. Disconnect ignition control module (ICM) electrical connector by pushing down on the connector finger ends while grasping the connector body and pulling away from the ignition control module (ICM).
2. Remove two ICM retaining screws and remove module.

REMOVAL AND INSTALLATION (Continued)



B4913-A

Item	Part Number	Description
1A	—	Nut (2 Req'd)
2	12B360	Cover and Seal Assy
3	—	Cowl
4	12A360	Ignition Control Module Bracket
5	12K072	Ignition Control Module
6B	—	Screw (2 Req'd)
A	—	Tighten to 8-11 N·m (71-97 Lb·In)
B	—	Tighten to 2.7-3.7 N·m (24-32 Lb·In)

Installation

1. Position module to bracket and install retaining screws. Tighten to 2.7-3.7 N·m (24-32 lb-in).
2. Connect module electrical connector by pushing until connector fingers are locked over locking wedge feature on ignition control module (ICM). Locking the connector is important to ensure sealing of the connector and ignition control module (ICM) interface.

Ignition Control Module (ICM) Bracket

Removal

1. Remove the ICM as outlined in this section.
2. Remove the two bracket retaining nuts that hold the bracket to the cover and seal assembly and remove bracket.

Installation

1. Clean inside the cowl area and the seal assembly to ensure a good seal.
2. Position the seal assembly through the backside of the cowl and position the bracket on the studs.
3. Install the retaining nuts and tighten to 8-11 N·m (71-97 lb-in).
4. Install the ICM as outlined in this section.

Spark Plug Wires

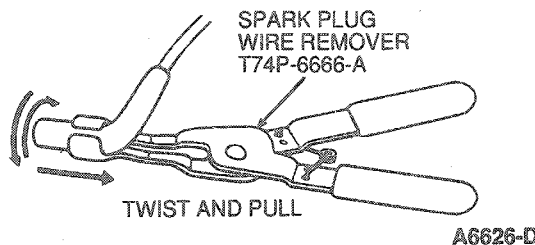
Tools Required:

- Spark Plug Wire Remover T74P-6666-A

Removal

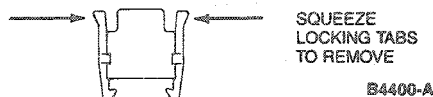
CAUTION: Do not pull on the wire as it may separate from the connector inside the boot.

1. When removing spark plug wires from spark plugs, use Spark Plug Wire Remover T74P-6666-A. Grasp and twist the boot back and forth on the plug insulator to free the boot. Do not pull on the wire directly as it may separate from the connector inside the boot.



CAUTION: Do not pull on the wire as it may separate from the connector inside the boot.

2. Disconnect the wire from the coil pack by squeezing the locking tabs and twisting while pulling upward.



3. Open wire separators and remove spark plug wire.

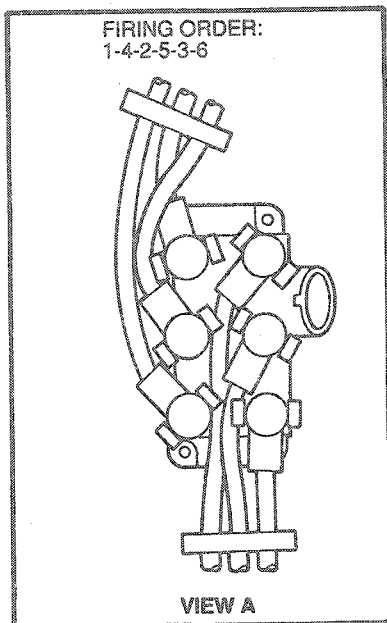
Installation

CAUTION: Proper installation of spark plug wires is critical to vehicle operation. If one spark plug wire is not properly installed on spark plug or ignition coil, both spark plugs connected to that ignition coil may not fire under load.

1. Whenever a high tension wire is removed for any reason from a spark plug or ignition coil, or a new high tension wire is installed, Silicone Dielectric Compound D7AZ-19A331-A (ESE-M1C171-A) or equivalent must be applied to the boot prior to installation. Using a small, clean tool, coat the entire interior surface of the boot with Silicone Dielectric Compound D7AZ-19A331-A (ESE-M1C171-A) or equivalent.
2. Install each wire to the proper terminal on the coil pack. The terminals on the coil pack are numbered. Make sure the boots are fully seated and that both coil boot locking tabs are engaged.
3. Route wire and close retainer clips.

REMOVAL AND INSTALLATION (Continued)

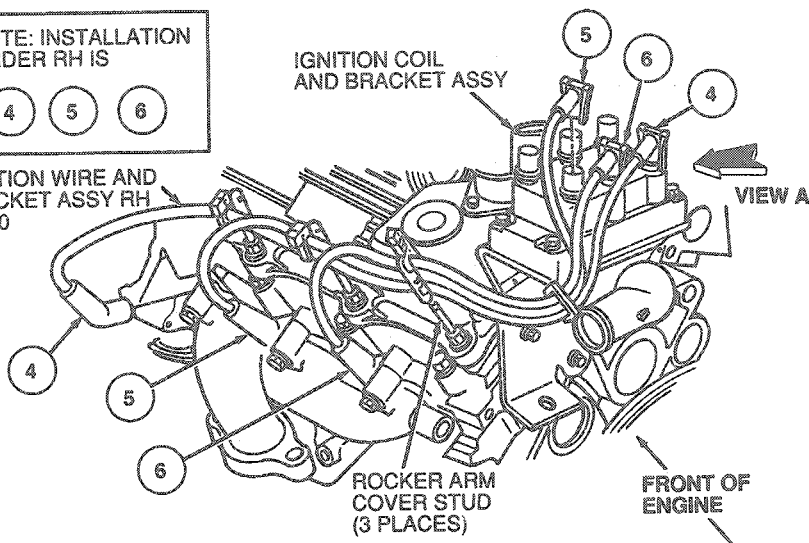
4. Connect wire to spark plug.



NOTE: INSTALLATION ORDER RH IS

4 5 6

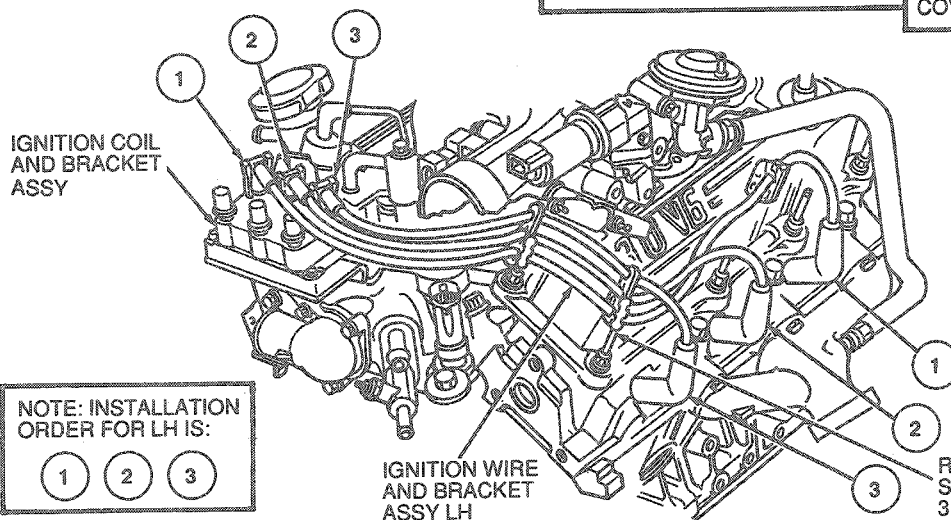
IGNITION WIRE AND BRACKET ASSY RH 12280



NOTE: ALL SPARK PLUG BOOTS TO BE POSITIONED VERTICALLY

NOTE: WIRE SEPARATORS TO BE FULLY SEATED IN ROCKER ARM COVER STUDS.

NOTE: ASSURE RETAINER CLIP IS FULLY ENGAGED ON COIL TOWER



NOTE: INSTALLATION ORDER FOR LH IS:

1 2 3

IGNITION WIRE AND BRACKET ASSY LH

B4914-A

CLEANING AND INSPECTION

Ignition Coil Packs

Wipe the coil towers with a clean cloth dampened with soap and water. Remove any soap film and dry with compressed air. Inspect for cracks, carbon tracking and dirt.

Spark Plug Wires

Wipe the wires with a clean, damp cloth prior to inspection. Without removing the high-tension wires from the spark plugs or coils, inspect the wires for visible damage such as burns, cuts, pinches, cracks or torn boots. If necessary, replace the damaged spark plug wires as outlined.

ADJUSTMENTS

Initial Timing

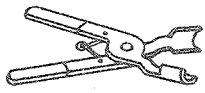
Initial timing is 10 ± 2 degrees BTDC and is NOT adjustable.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb·In
Crankshaft Position Sensor Screw	5-7	44-61
Ignition Control Module Screws	2.7-3.7	24-32
Ignition Coil Pack Screw	5-7	44-61
Coil Bracket Bolts	40-55	30-40 (Lb·Ft)
Ignition Control Module Bracket Nuts	8-11	71-97

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T74P-6666-A Spark Plug Wire Remover	 T74P-6666-A

PARTS CROSS-REFERENCE

Base Part #	Part Name	Old Part Name
9D930	Fuel Charging Wiring	