

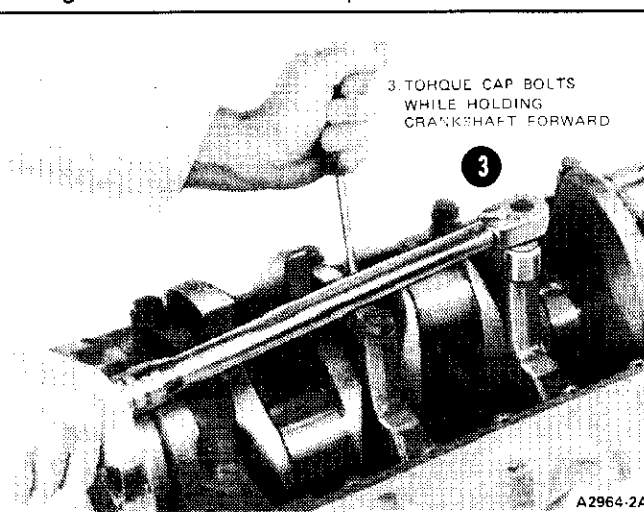
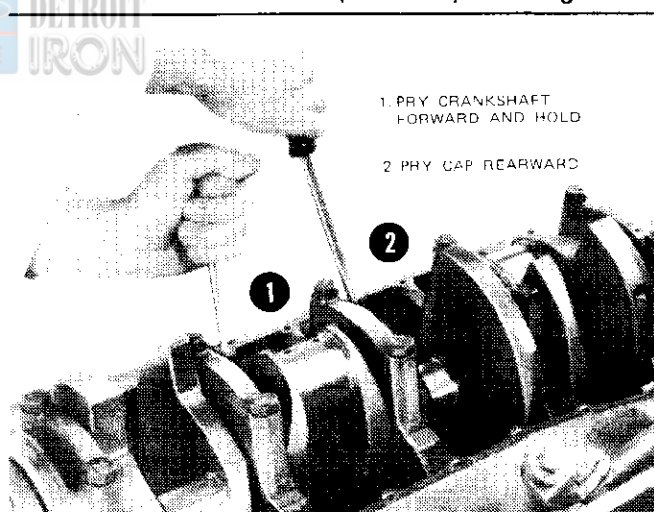


FIG. 29 Aligning Thrust Bearing

Installation

1. Fit connecting rod bearings as detailed in Part 21-01 under Fitting Bearings with Plastigage.
2. Install the bearing inserts in the connecting rod and cap with tangs in the slots provided.
3. Pull the connecting rod assembly down firmly on the crankshaft journal.
4. Apply a light coat of engine oil to the journal and bearings. Install the connecting rod cap. Be sure the connecting rod bolt heads are properly seated in the connecting rod. Torque the nuts to specification.
5. Repeat the procedure for the remaining connecting rods that require new bearings.
6. To complete installation, follow instructions under Main Bearing Installation.

Refer to Part 21-01 for cleaning and inspection procedures.

PISTONS AND CONNECTING RODS

Removal

1. Drain the cooling system and crankcase. Remove the intake manifold, cylinder heads, oil pan and oil pump, following procedures in this section.
2. Remove any ridge and/or deposits from upper end of cylinder bores as follows:
Turn the crankshaft until the piston to be removed is at bottom of its travel. Place a cloth on top of the piston to collect cuttings. Remove any ridge and/or deposits from the upper end of the cylinder bore. Remove the cylinder ridge with a ridge cutter. Follow instructions furnished by tool manufacturer. **Never cut into ring travel area in excess of 1/32 inch when removing ridges.** Repeat the procedure at the remaining cylinders.
3. Make sure that all connecting rod caps are marked so they can be installed in their original positions.
4. Turn the crankshaft until the connecting rod being removed is down.
5. Remove the connecting rod nuts and cap.
6. Push the connecting rod and piston assembly out through the top of the cylinder with the handle end of a hammer. **Avoid damage to the crankshaft**

journal or cylinder wall when removing the piston and rod.

7. Remove the bearing inserts from the connecting rod and cap.
8. Install the cap on the connecting rod from which it was removed.

Installation

1. If new piston rings are to be installed, remove the cylinder wall glaze. Follow instructions as detailed in Part 21-01.
2. Oil the piston rings, pistons and cylinder walls with light engine oil. **Be sure to install pistons in the same cylinders from which they were removed or to which they were fitted. Connecting rod and bearing caps are numbered from 1 to 4 in the right bank, and 5 to 8 in the left bank, beginning at the front of engine. Numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder number.**
3. Make sure that ring gaps are properly spaced around circumference or piston (Fig. 30).
4. Install piston ring compressor on piston and push in with hammer handle until it is slightly below top of cylinder (Fig. 31). Be sure to guide connecting rods while tapping them into position to avoid damaging crankshaft journals. **Install piston with indentation notch in piston head toward front of engine.**
5. Check clearance of each bearing, following procedure under Fitting Connecting Rod Bearings, Part 21-01.
6. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.
7. Turn the crankshaft throw to the bottom of the stroke. Push the piston all the way down until the connecting rod bearings seat on the crankshaft journal.

8. Install the connecting rod cap. Be sure connecting rod bolt heads are properly seated in the connecting rod. Torque the nuts to specifications.
9. After the piston and connecting rod assemblies have been installed, check the side clearance between the connecting rods on each crankshaft journal.
10. Disassemble, clean and assemble the oil pump. Clean the oil pump inlet tube screen, and oil pan and the block gasket surfaces.
11. Prime the oil pump by filling the inlet port with engine oil and rotating the pump shaft to distribute oil within the housing. Install the oil pump. Install the oil pan, following the procedure under Oil Pan Installation.
12. Install the cylinder heads, following instructions under Cylinder Head Installation.
13. Install the intake manifold, following instructions under Intake Manifold Installation.
14. Fill and bleed the cooling system. Fill the crankcase to the correct level with the specified engine oil.
15. Start the engine and adjust the ignition timing. Connect the distributor vacuum line.
16. Operate the engine at fast idle and check for oil and coolant leaks. With the engine temperatures stabilized, adjust the engine curb idle speed and mixture.
17. Install the air cleaner and intake duct assembly.

CRANKSHAFT

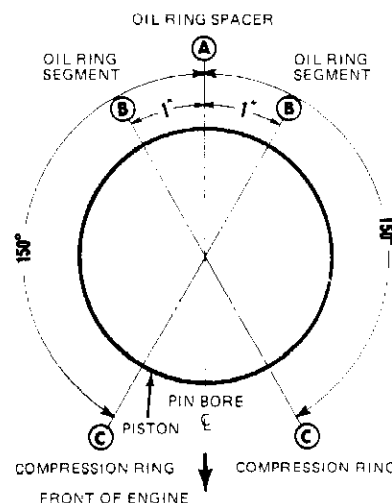
To perform the following operation, it is necessary to remove the engine and install it on a work stand.

Crankshaft and related parts are shown in Fig. 32.

Removal

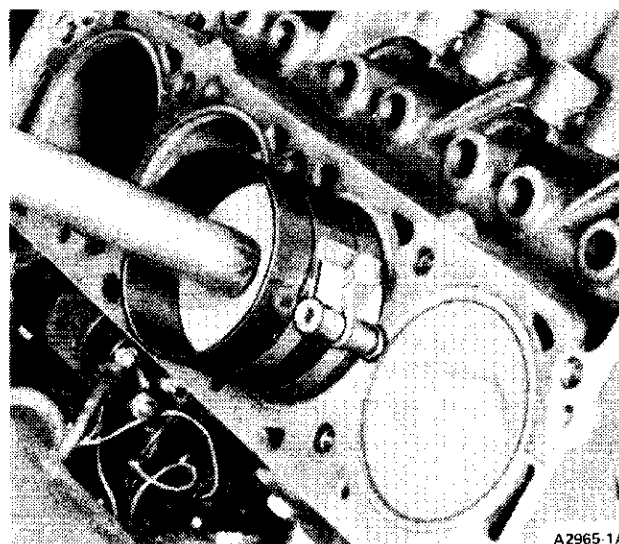
1. Disconnect the wires from the spark plugs. Remove the spark plugs to allow easy rotation of crankshaft. Drain the oil and coolant from the engine.
2. Remove the fuel pump and the oil filter. Slide water pump by-pass hose clamp toward the water pump.
3. Remove the crankshaft pulley from the vibration damper.
4. Remove the cap screw and washer from the end of the crankshaft. Install a puller on the crankshaft vibration damper (Fig. 19) and remove damper. Remove Woodruff key.
5. Remove the cylinder front cover and water pump as an assembly. Check the timing chain deflection. Remove the timing chain and sprockets as detailed in Cylinder Front Cover and Timing Chain Removal.
6. Invert the engine on a work stand. Remove the flywheel and the engine rear cover plate. Remove the oil pan and gasket. Remove the oil pump.
7. Make sure that all bearing caps (main and connecting rod) are marked so they can be installed in their original locations.

Turn the crankshaft until the connecting rod from which cap is being removed is down, then remove the bearing cap. Push the connecting rod and piston



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FIG. 30 Piston Ring Spacing



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FIG. 31 Installing Piston Assembly

assembly up out of the cylinder. Repeat this procedure until all connecting rod bearing caps are removed.

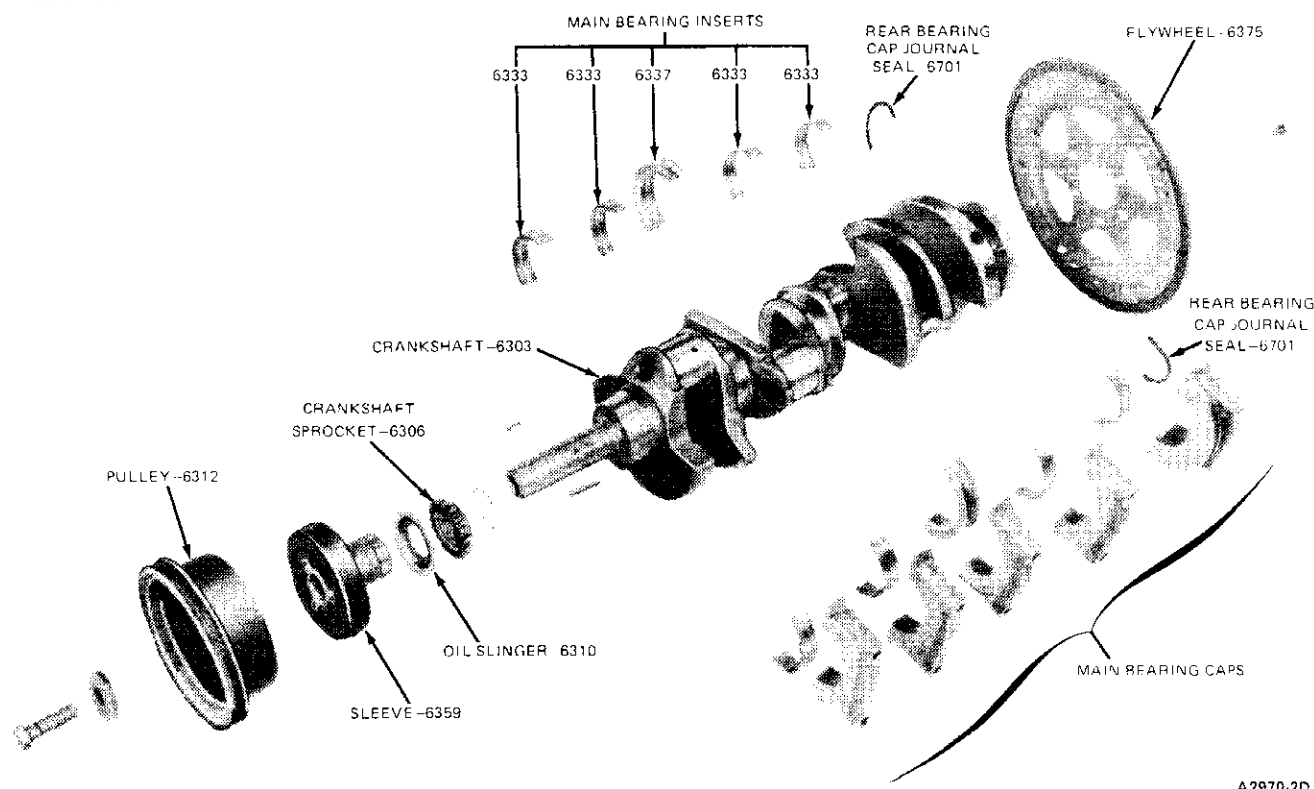
8. Remove the main bearing caps.
9. Carefully lift the crankshaft out of the block so thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to finished surfaces.**

Refer to Part 21-01 for cleaning and inspection procedures. Clean the crankshaft damper.

To refinish journals, dress minor imperfections, etc., refer to Part 21-01.

Installation

1. Remove the rear journal oil seal from block and rear main bearing cap.
2. Remove the main bearing inserts from the block and bearing caps.
3. Remove the connecting rod bearing inserts from the connecting rods and caps.



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FIG. 32 Crankshaft and Related Parts

4. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearing. Be sure that bearing inserts and bearing bores are clean. Foreign material under inserts will distort the bearing and cause failure.
5. Place the upper main bearing inserts in the bores with tang in slot.
6. Install lower main bearing inserts in bearing caps.
7. Clean the rear journal oil seal groove and mating surfaces of the block and rear main bearing cap.
8. Install a new rear main bearing oil seal in the block and cap as detailed in Part 21-01.
9. Carefully lower the crankshaft into place. **Be careful not to damage bearing surfaces.**
10. Check the clearance of each main bearing as detailed in Part 21-01.
11. After bearings have been fitted, apply light coat of engine oil to journals and bearings. Install a new seal in the rear main bearing cap and install the rear main bearing cap. Install all bearing caps except thrust bearing cap (No. 3 bearing). **Be sure that main bearing caps are installed in original locations.** Torque the bearing cap bolts to specification.
12. Install the thrust bearing cap with bolts fingertight.
13. Pry the crankshaft forward against thrust surface of upper half of bearing (Fig. 29).
14. Hold crankshaft forward and pry thrust bearing cap to rear. This aligns thrust surfaces of both halves of bearing.
15. Retain forward pressure on the crankshaft. Tighten cap bolts to specifications.
16. Force the crankshaft toward the rear of engine.
17. Check the crankshaft end play (refer to Part 21-01).
18. Install new bearing inserts in the connecting rods and caps. Check clearance of each bearing, following procedure detailed in Part 21-01, Fitting Bearings with Plastigage.
19. After the connecting rod bearings have been fitted, apply light coat of engine oil to journals and bearings.
20. Turn the crankshaft throw to bottom of its stroke. Push the piston all the way down until rod bearing seats on the crankshaft journal.
21. Install the connecting rod cap. Be sure that connecting rod bolt heads are properly seated in connecting rod. Torque nuts to specifications.
22. After piston and connecting rod assemblies have been installed, check side clearance between connecting rods on each connecting rod crankshaft journal.
23. Install timing chain and sprockets, cylinder front cover, and crankshaft damper as detailed in Cylinder Front Cover and Timing Chain Installation.
24. Install the engine rear cover plate. Coat flywheel attaching bolt threads with oil-resistant sealer. Position flywheel on crankshaft flange. Install and torque the bolts to specifications.
25. Clean the oil pan, oil pump and oil pump screen. Prime the oil pump by filling inlet port with engine oil and rotating pump shaft to distribute oil within housing. Install oil pump and oil pan by following procedures under Oil Pan and Oil Pump Installation.

26. Install the oil filter and fuel pump, and connect the fuel lines.
27. Install the spark plugs and connect the spark plug wires.
28. Install the engine in vehicle.

CAMSHAFT BEARINGS

Camshaft bearings are available prefinished to size for standard and undersize journal diameters.

Removal

1. Remove the camshaft, flywheel, and crankshaft, following the appropriate procedures in this part. Push pistons to top of cylinders.
2. Remove the camshaft rear bearing bore plug as detailed under "Core Plugs" in Part 21-01. Remove camshaft bearings using special tool shown in Fig. 33.

Installation

1. Select the proper size expanding collet and back-up nut and assemble on expanding mandrel. With the expanding collet collapsed, install the collet in the camshaft bearing, and tighten back-up nut on expanding mandrel until collet fits camshaft bearing.
2. Assemble the puller screw and extension (if necessary) as shown in Fig. 33 and install on expanding mandrel. Wrap a cloth around threads of the puller screw to protect the front bearing or journal. Tighten pulling nut against the thrust bearing and pulling plate to remove camshaft bearing. Hold a wrench on the end of puller screw to prevent it from turning.
3. Repeat the procedure for each bearing. To remove the front bearing, install puller screw from rear of cylinder block.
4. Position new bearings at bearing bores, and press in place with the tool shown in Fig. 33. Be sure to center the pulling plate and puller screw to avoid bearing damage. **Failure to use correct expanding collet can cause severe bearing**

damage. Align oil holes in bearings with oil holes in cylinder block before pressing them into block. Be sure front bearing is installed specified distance below front face of cylinder block (Fig. 34).

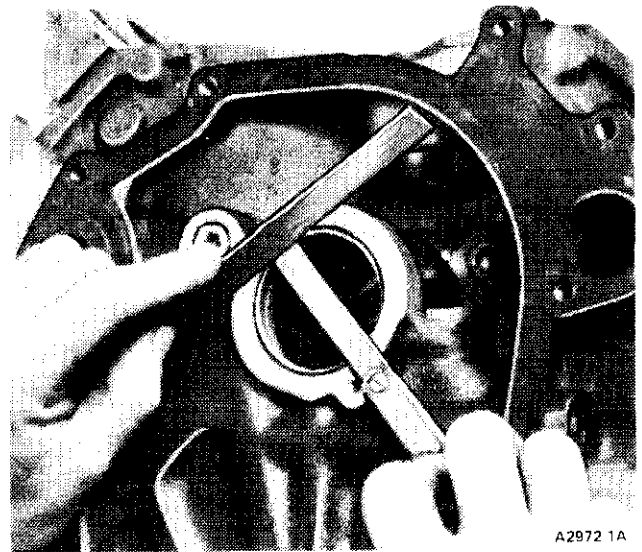
5. Install the bearing bore plug as detailed under "Core Plugs" in Part 21-01.
6. Install the camshaft, crankshaft, flywheel and related parts, following appropriate procedures in this part, except do not check connecting rod and main bearing clearances.

OIL FILTER

Removal

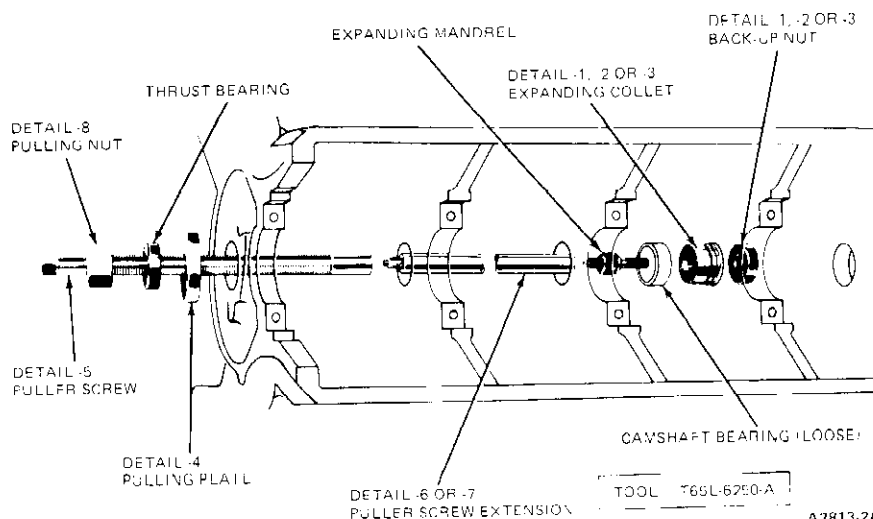
The oil filter assembly is shown in Fig. 35.

1. Place a drip pan under the filter. Unscrew the filter from the adapter fitting with a suitable filter wrench and clean the adapter recess. Clean the oil filter gasket surface.



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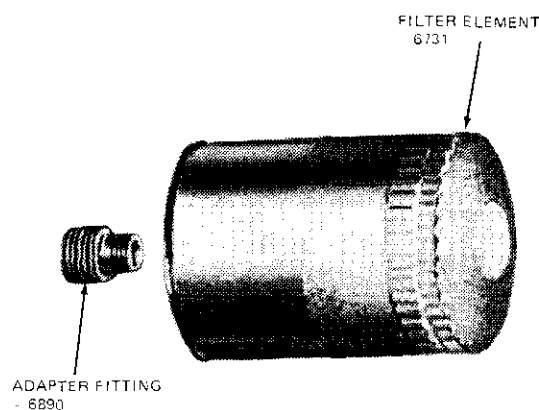
FIG. 34 Measuring Depth of Camshaft Front Bearing



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FIG. 33 Replacing Camshaft Bearing

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FIG. 35 Oil Filter

DISASSEMBLY AND ASSEMBLY

When installing nuts or bolts that must be torqued, refer to Specifications. Oil the threads with light engine oil. **Do not oil threads that require oil-resistant or water-resistant sealer.**

HYDRAULIC TAPPETS

Each tappet is a matched assembly. If parts of one are intermixed with those of another, improper valve operation may result. Disassemble and assemble each tappet separately. Tappets should be tested after assembly as described in Part 21-01. Keep the tappet assemblies in proper sequence so they can be installed in their original bores.

Disassembly

A typical hydraulic tappet assembly is shown in Fig. 36.

1. Grasp the lock ring with needle nose pliers to release it from the groove. It may be necessary to depress the plunger to fully release lock ring.
2. Remove the push rod cup, metering valve (disc), plunger and spring.
3. Remove the plunger assembly and the plunger spring. Carefully remove the plunger spring, check valve retainer spring, check valve retainer and check valve disc from the plunger.

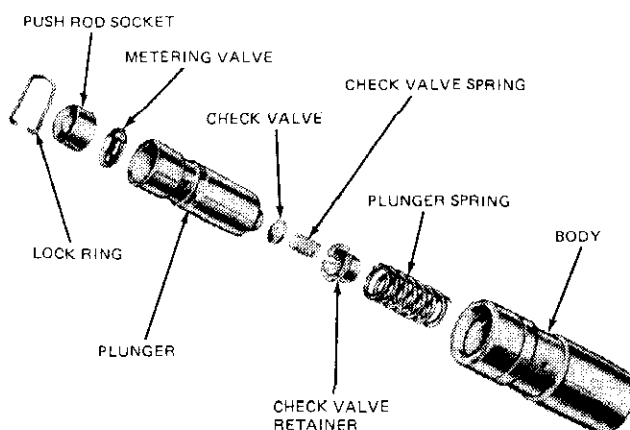
Refer to Part 21-01 for cleaning and inspection procedures.

Assembly

1. Place the plunger upside down on a clean work bench.
2. Place the check valve (disc or ball check) in position over the oil hole on the bottom of the plunger. Set the check valve spring on top of the check valve (disc or ball check).
3. Position the check valve retainer over the check valve and spring then push the retainer down into place on the plunger.

Installation

1. Coat the gasket on a new filter with oil. Place a new filter on the adapter fitting. Hand tighten the filter until the gasket contacts the sealing surface then tighten 1/2 turn more.
2. Operate the engine at fast idle and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase to the correct level.



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FIG. 36 Typical Hydraulic Tappet

4. Place the plunger spring and the plunger (open end up) into tappet body.
5. Position the metering valve (disc) in the plunger, and place push rod seat in the plunger.
6. Depress the plunger and position the closed end of lock ring in the groove of the tappet body. With the plunger still depressed, position the open ends of lock ring in the groove. Release the plunger, and then depress it again to fully seat the lock ring.
7. Use a hydraulic tappet leak-down tester to fill the tappet with test fluid.

CYLINDER HEAD

Disassembly

1. Remove rocker arm bolts, oil deflectors, fulcrum seats and rocker arms. Remove exhaust manifolds and spark plugs.

2. Clean carbon from combustion chambers before removing valves.
3. Compress valve springs (Fig. 37). Remove spring retainer locks and release springs. Remove retainers, springs, stem seals, and valves. Discard stem seals.

Clean and inspect cylinder head(s) and related components, using pertinent procedures in Part 21-01.

Refer to Part 21-01 for repair procedures for cylinder heads and valves.

Assembly

Lubricate all valves, valve stems and valve guides with heavy oil SE. The valve tips are to have Lubriplate or equivalent applied. The lubricant is to be applied before installation.

1. Install each valve in port from which it was removed or to which it was fitted. Install new stem seal on each valve.
2. Set valve spring and retainer over valve stem. Compress spring (Fig. 37) and install retainer locks.
3. With dividers, measure assembled height of valve spring from surface of spring pad on cylinder head to underside of spring retainer (Fig. 38). Check dividers with accurate scale. If assembled height exceeds specification, install spacer(s) below spring to reduce height to recommended dimension. **Reducing assembled height below specification can cause spring breakage and rapid wear of cam lobe.**
4. Coat the fulcrum seats and sockets with Lubriplate or equivalent. Make certain that the rocker arm bolts are in serviceable condition before installing them. Install rocker arms, fulcrum seats, oil deflectors and bolts as detailed under Valve Rocker Arm Installation.
5. Install exhaust manifolds and spark plugs. Refer to Part 21-01 for cleaning and inspection procedures.

PISTON AND CONNECTING ROD

Disassembly

1. Remove the bearing inserts from the connecting rod and cap.
2. Mark the pistons to assure assembly with same rod and installation in the same cylinders from which they were removed.
3. Using an arbor press and tool shown in Fig. 39, press the piston pin from the piston and connecting rod. Remove the piston rings.

Refer to Part 21-01 for cleaning and inspection procedures.

Refer to Part 21-01 for repair procedures.

Assembly

Check the fit of a new piston in the cylinder bore before assembling piston and piston pin to connecting rod. Piston pin bore of connecting rod and diameter of piston pin must be within specification.

1. Apply a light coat of engine oil to all parts. Assemble the piston to the connecting rod with the

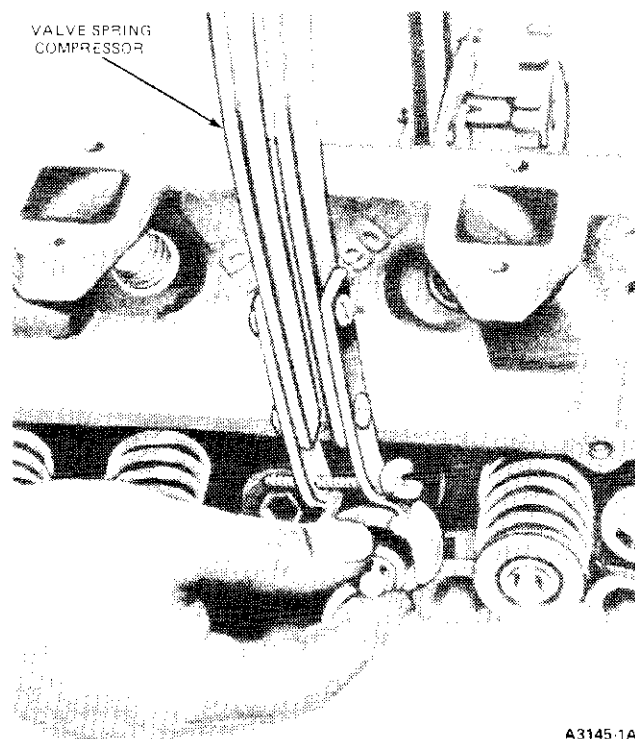


FIG. 37 Compressing Valve Spring—On Bench

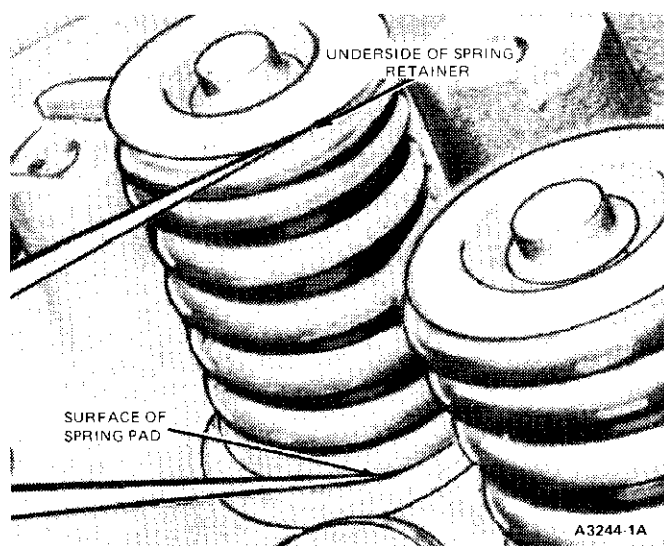


FIG. 38 Measuring Valve Spring Assembled Height

cylinder number side of the connecting rod and indentation notch in piston positioned as shown in Fig. 40.

2. Start the piston pin in the piston and the connecting rod. Using an arbor press, press the piston pin through the piston and connecting rod until the end of pin is 1/16-inch to 1/8-inch below chamfer of the pin bore in the piston.
3. Check the end gap of all piston rings. End gap must be within specification. Follow the instructions contained on piston ring package and install the piston rings.
4. Check the ring side clearance of compression rings with a feeler gauge inserted between the ring and

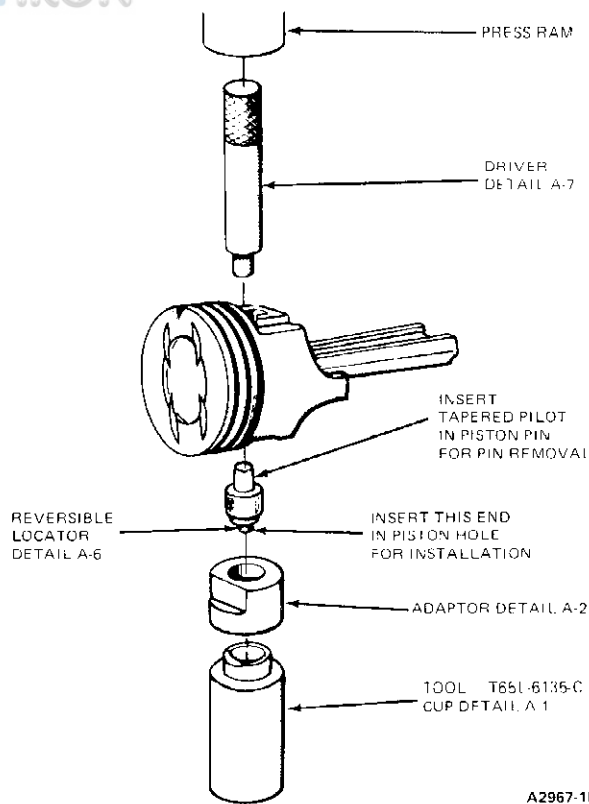


FIG. 39 Removing or Installing Piston Pin—Typical

the lower land. Feeler gauge should slide freely around the ring circumference without binding. Any wear will form a step at the inner portion of the lower land. **If the lower lands have high steps, replace the piston.**

5. Be sure the bearing inserts and bearing bore in the connecting rod and cap are clean. Foreign material under the inserts will distort the bearing and cause failure. Install bearing inserts in connecting rod and cap with tangs fitting in slots provided.

CYLINDER ASSEMBLY

Disassembly

1. Mount the old engine in a work stand and remove all the parts not furnished with the new cylinder assembly, following the procedures given in the Removal and Installation Section of this Part.
2. Remove the 4 cylinder head locating dowels and the block drain plugs.
3. Remove the old cylinder assembly from the work stand.

Assembly

1. Clean the gasket and seal surfaces of all serviceable parts and assemblies.

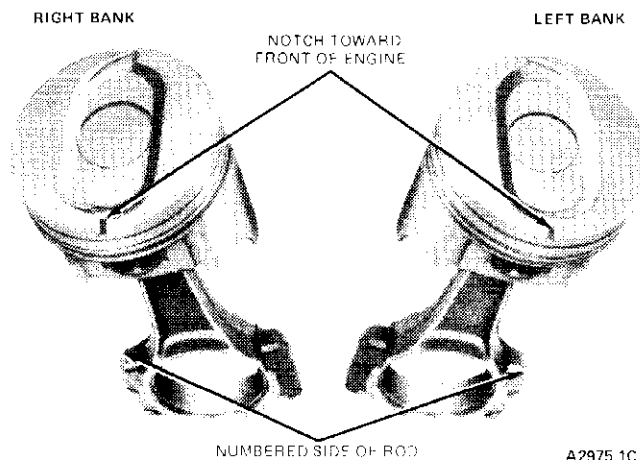


FIG. 40 Correct Piston and Rod Positions

2. Position the new cylinder assembly in a work stand and install the cylinder head locating dowels and block drain plugs.
3. Transfer all serviceable parts removed from the old cylinder assembly, following the procedures given in the Removal and Installation Section of this Part.
4. Check all assembly clearances and correct as necessary.

CYLINDER BLOCK

Before replacing a cylinder block, determine if it is repairable. If so, make the necessary repairs, following the procedures given in Part 21-01.

Disassembly

1. Mount the old engine in a work stand and completely disassemble it, following the procedures given in the Removal and Installation Section of this Part.
2. Remember to ridge-ream the cylinder bores before removing piston assemblies.
3. Remove the cylinder head locating dowels and the block drain plugs.

Assembly

1. Clean the gasket and seal surfaces of all serviceable parts and assemblies.
2. Position the new cylinder block in a work stand and install the cylinder head locating dowels and the block drain plugs.
3. Transfer all serviceable parts removed from the old cylinder block, following the procedures given in the Removal and Installation Section of this Part.
4. Check all assembly clearances and correct as necessary.

SPECIFICATIONS

GENERAL SPECIFICATIONS			
DISPLACEMENT	7.5L (460 CID)		
NUMBER OF CYLINDERS/TYPE	V8-OHV		
BORE AND STROKE	4.36 x 3.85		
FIRING ORDER	1-5-4-2-6-3-7-8		
OIL PRESSURE (Hot @ 2000 RPM)	40-65		
DRIVE BELT TENSION	①		
COMPRESSION PRESSURE	②		
CYLINDER HEAD AND VALVE TRAIN			
COMBUSTION CHAMBER VOLUME (cc)	94.7-97.7		
VALVE GUIDE BORE DIAMETER	0.3433-0.3443		
VALVE SEATS			
Width - Intake	0.060-0.080		
Width - Exhaust	0.060-0.080		
Angle	45°		
Runout Limit (T. I. R. Max.)	0.002		
VALVE ARRANGEMENT (Front to Rear)	(RH) I-E-I-E-I-E-I-E (LH) I-E-I-E-I-E-I-E		
VALVE STEM-TO-GUIDE CLEARANCE			
Intake	0.0010-0.0027		
Exhaust	0.0010-0.0027		
Service Clearance	0.0055		
VALVE HEAD DIAMETER			
Intake	2.075-2.090		
Exhaust	1.546-1.661		
VALVE FACE RUNOUT LIMIT	0.002 Max.		
VALVE FACE ANGLE	44°		
VALVE STEM DIAMETER (Std)			
Intake	0.3416-0.3423		
Exhaust	0.3416-0.3423		
(0.003 Oversize)			
Intake	0.3446-0.3453		
Exhaust	0.3446-0.3453		
(0.015 Oversize)			
Intake	0.3566-0.3573		
Exhaust	0.3566-0.3573		
(0.030 Oversize)			
Intake	0.3716-0.3723		
Exhaust	0.3716-0.3723		
VALVE SPRINGS			
Compression Pressure (Lb. @ Spec. Length)	76-84 @ 1.81 218-240 @ 1.33		
Free Length (Approximate)	2.07		
Assembled Height	1.51/64 - 1.53/64		
Service Limit	③		
Out-Of-Square Limit	5/64 (0.078)		
ROCKER ARM			
Ratio	1.73:1		
PUSH ROD RUNOUT (T. I. R. Max.)	0.015		
VALVE TAPPET OR ADJUSTER			
Diameter (Std)	0.8740-0.8745		
Clearance To Bore	0.0007-0.0027		
Service Limit	0.005		
Hydraulic Leakdown Rate	5-50 Seconds ④		
Collapsed Tappet Gap - Allowable	0.075-0.175		
- Desired	0.100-0.150		
① Drive Belt Tension (Lbs.)			
Size	Newly Installed (A)	Used	
		Up to 10 Min.	Over 10 Min.
1/4"	50-80	40-80 (B)	40-80 (B)
Exc. 1/4"	120-160	90-160 (C)	75-120 (D)
② Read tension immediately after belt is installed, before it stretches or seats in pulley grooves.			
③ If less than 40 pounds, readjust to 40-60 pounds.			
④ If less than 90 pounds, readjust to 90-120 pounds.			
⑤ If less than 75 pounds, readjust to 90-120 pounds.			
⑥ PSI if lowest cylinder must be 75% of highest.			
⑦ 10% Pressure loss @ specified length.			
⑧ To leak down 1/16", with 50 lb. load and tappet filled with leakdown fluid.			
⑨ Distance front edge of bearing is below front face of block.			
⑩ 0.003 in any 6 inches; 0.006 overall.			
⑪ For 0.002 Undersize, add 0.001 to standard.			

CAMSHAFT	Police Interceptor	Pass.
LOBE LIFT		
Intake	0.278	0.253
Exhaust	0.290	0.278
Allowable Lobe Lift Loss	0.005 Max.	0.005 Max.
THEORETICAL VALVE LIFT @ ZERO LASH		
Intake	0.481	0.437
Exhaust	0.502	0.481
END PLAY		0.001-0.006
Service Limit		0.009
JOURNAL-TO-BEARING CLEARANCE		0.001-0.003
Service Limit		0.006
JOURNAL DIAMETER		
# 1		2.1238-2.1248
# 2		2.1238-2.1248
# 3		2.1238-2.1248
# 4		2.1238-2.1248
# 5		2.1238-2.1248
Runout Limit (T. I. R. Max.)		0.005
Out-Of-Round Limit (T. I. R. Max.)		0.0005
BEARING INSIDE DIAMETER (ALL)		2.1258-2.1268
FRONT BEARING LOCATION ⑤		0.040-0.060
CYLINDER BLOCK		
HEAD GASKET SURFACE FLATNESS		⑥
HEAD GASKET SURFACE FINISH (RMS)		60-150
CYLINDER BORE		
Diameter		4.3600-4.3638
Surface (RMS)		18-38
Out-Of-Round Limit		0.0015
Out-Of-Round Service Limit		0.005
Taper Service Limit		0.010
TAPPET BORE DIAMETER		0.8752-0.8767
MAIN BEARING BORE DIAMETER		3.1922-3.1930
DISTRIBUTOR SHAFT BEARING BORE DIAMETER		0.5160-0.5175
CRANKSHAFT AND FLYWHEEL		
MAIN BEARING JOURNAL DIAMETER		2.9994-3.0002
Out-Of-Round Limit		0.0006 Max.
Taper Limit		0.0006 per inch
Journal Runout Limit		0.002 Max.
Runout Wear Limit		0.005
Surface Finish (RMS)		12 Max.
THRUST BEARING JOURNAL		
Length		2.1124-1.126
CONNECTING ROD JOURNAL		
Diameter		2.4992-2.5000
Runout Service Limit		0.0006 Max.
Taper Limit		0.0006 Max.
Surface Finish (RMS)		12 Max.
MAIN BEARING THRUST FACE		
Surface Finish (RMS)		25 Front/23 Rear
Runout Limit		0.001 Max.
FLYWHEEL RING GEAR LATERAL RUNOUT (T. I. R.)		
Automatic Transmission		0.060
CRANKSHAFT FREE END PLAY		0.004-0.008
Service Limit		0.012
CONNECTING ROD BEARINGS		
Clearance To Crankshaft - Desired		0.0008-0.0015
- Allowable		0.0008-0.0026
Bearing Wall Thickness (Std) ⑦		0.0756-0.0761
MAIN BEARINGS		
Clearance To Crankshaft - Desired		0.0008-0.0015
- Allowable		No. 1 = 0.0004-0.0021
		All others = 0.0008-0.0026
Bearing Wall Thickness (Std) ⑦		No. 1 (Upper) = 0.0960-0.0965
		All others = 0.0935-0.0960

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CONNECTING ROD, PISTON AND RINGS

CONNECTING ROD

Piston Pin Bore Diameter	1.0386-1.0393
Crankshaft Bearing Bore Diameter	2.6530-2.6522
Out-Of-Round Limit	0.0004 Max.
Taper Limit	0.0004 Max.
Length (Center-to-Center)	6.6035-6.6065
Alignment (Bore-to-Bore Max. Diff.) ⁽⁸⁾	
Twist	0.024
Bend	0.012
Side Clearance (Assembled to Crank)	
Standard	0.010-0.020
Service Limit	0.023

PISTON

Diameter ⁽⁹⁾	
Coded Red	4.3585-4.3591
Coded Blue	4.3597-4.3603
0.003 Oversize	4.3609-4.3615
Piston-To-Bore Clearance	0.0014-0.0022
Pin Bore Diameter	1.0402-1.0405
Ring Groove Width	
Compression (Top)	0.0805-0.0815
Compression (Bottom)	0.0805-0.0815
Oil	0.188-0.189

PISTON PIN

Length	3.290-3.320
Diameter	
Standard	1.0398-1.0403
0.001 Oversize	1.0410-1.0413
Pin-To-Piston Clearance	0.0002-0.0004
Pin-To-Rod Clearance	Interference Fit

PISTON RINGS

Ring Width	
Compression (Top)	0.077-0.078
Compression (Bottom)	0.077-0.078
Side Clearance	
Compression (Top)	0.0025-0.0045
Compression (Bottom)	0.0025-0.0045
Service Limit	0.006
Oil Ring	Snug Fit
Ring Gap	
Compression (Top)	0.010-0.020
Compression (Bottom)	0.010-0.020
Oil Ring (Steel Rail)	0.015-0.055

LUBRICATING SYSTEM

OIL PUMP

Relief Valve Spring Tension (Lbs. at Spec. Length)	20.6-22.6 @ 2.49
Drive Shaft-To-Housing Bearing Clearance	0.0015-0.0030
Relief Valve-To-Bore Clearance	0.0015-0.0030
Rotor Assembly End Clearance (Assembled)	0.004 Max.
Outer Race-To-Housing Clearance	0.001-0.013
OIL CAPACITY (Quarts U. S.)	4 ⁽¹⁰⁾

FUEL PUMP

STATIC PRESSURE (P. S. I.) ⁽¹¹⁾	5.7-7.7
MINIMUM VOLUME FLOW ⁽¹¹⁾ ⁽¹²⁾	1 pt./20 sec
ECCENTRIC TOTAL LIFT (Inches)	0.890-0.910

⁽⁸⁾ Pin and crank bearing bore must be parallel and in same vertical plane within the specified total difference when measured at ends of an 8" bar, 4" on each side of rod centerline.

⁽⁹⁾ Measured at piston pin bore centerline; at 90° to the pin.

⁽¹⁰⁾ Add 1 quart when changing filter.

⁽¹¹⁾ With new filter in line and pump-to-tank return line pinched off.

⁽¹²⁾ No orifice in test circuit smaller than 0.220" I. D.

⁽¹³⁾ Torque in sequence: Step 1 = 70-80; Step 2 = 100-110; Step 3 = 130-140.

⁽¹⁴⁾ Retorque to specification after engine is hot.

⁽¹⁵⁾ 1/2 turn after oiled gasket contacts sealing surface.

TORQUE SPECIFICATIONS - SPECIAL APPLICATION

CAMSHAFT SPROCKET TO CAMSHAFT	40-45
CAMSHAFT THRUST PLATE TO BLOCK	9-12
CONNECTING ROD NUTS OR BOLTS	40-45
CYLINDER FRONT COVER BOLTS	12-18
CYLINDER HEAD BOLTS	13
DAMPER OR PULLEY TO CRANKSHAFT	70-90
DISTRIBUTOR VACUUM CONTROL VALVE	15-18
EGR VALVE TO CARBURETOR SPACER OR INT MANIFOLD	12-18
FUEL PUMP TO CYLINDER BLOCK OR FRONT COVER	19-27
FLYWHEEL TO CRANKSHAFT	75-85
MAIN BEARING CAP BOLTS	95-105
MANIFOLD TO CYLINDER HEAD (Intake)	22-32 ⁽¹⁴⁾
MANIFOLD TO CYLINDER HEAD (Exhaust)	28-33
OIL FILTER INSERT TO CYLINDER BLOCK	20-30
OIL FILTER TO BLOCK OR ADAPTER	15
OIL INLET TUBE TO OIL PUMP	Press Fit
OIL PAN DRAIN PLUG	15-25
OIL PAN TO CYLINDER BLOCK	5/16 = 9-11/16 = 7-9
OIL PUMP TO CYLINDER BLOCK	22-32
PULLEY TO DAMPER (Bolt)	35-50
ROCKER ARM STUD OR BOLT TO CYLINDER HEAD	18-25
SPARK PLUG TO CYLINDER HEAD	10-15
VALVE ROCKER ARM COVER	5-6
ALTERNATOR BRACKET TO CYLINDER BLOCK (Bolt)	35-50
ALTERNATOR PIVOT BOLT	45-57
ALTERNATOR ADJUSTING ARM TO CYLINDER BLOCK	35-50
ALTERNATOR ADJUSTING ARM TO ALTERNATOR	24-40
THERMACTOR PUMP BRACKET TO CYLINDER BLOCK	35-50
THERMACTOR PUMP PIVOT BOLT	25-35
THERMACTOR PUMP ADJUSTING ARM TO PUMP	22-32
THERMACTOR PUMP ADJUSTING ARM TO CYLINDER BLOCK	29-37
THERMACTOR PUMP PULLEY TO SHAFT	130-180 In.-Lb.
POWER STEERING PUMP PULLEY TO DAMPER (Bolt)	35-50
FAN TO WATER PUMP HUB (Bolt)	12-18
OIL COOLER/FILTER ADAPTER TO CYLINDER BLOCK	40-50
OIL COOLER LINES TO OIL FILTER ADAPTER	
AND COOLER (POLICE INTERCEPTOR)	35-45
COOLANT HOSE TO OIL COOLER AND	
ENGINE FITTINGS (CLAMP)	12-20 In.-Lb.
CARBURETOR MOUNTING NUTS	12-15
CARBURETOR MOUNTING STUD	15 Max.
FUEL FILTER TO CARBURETOR	29-31

TORQUE SPECIFICATIONS - General Applications

U. S. THREAD SIZES	TORQUE
1/4-20	6-9
5/16-18	12-18
5/16-18	14-20
3/8-16	22-32
3/8-24	27-38
7/16-14	40-55
7/16-20	40-60
1/2-13	55-80

METRIC THREAD SIZES	TORQUE
M-6	6-9
M-8	14-21
M-10	28-40
M-12	50-71
M-14	80-114

PIPE THREAD SIZES	TORQUE
1/8	5-8
1/4	12-18
3/8	22-33
1/2	25-35

- o All values are in ft.-lb. unless otherwise noted.
- o Oil threads with engine oil unless fasteners require sealers.

IGNITION SYSTEM

GROUP
23
(12000)

CB3518-2A

General Ignition Service

PART
23-01

All Models Except Versailles with EEC System

SUBJECT	PAGE	SUBJECT	PAGE
GENERAL INFORMATION		REMOVAL AND INSTALLATION (Cont'd.)	
Centrifugal Advance	01-3	Fixed Base Plate	01-9
Circuit Operation	01-3	Distributor — I-4, V-6 and I-6 Engines	01-9
Distributor	01-3	Magnetic Pickup Assembly	01-9
Dual Mode Timing Ignition Module	01-2	Vacuum Advance Unit	01-10
Vacuum Advance	01-3	Replacing Spark Plugs	01-11
ADJUSTMENTS	01-5	Spark Plug Boot Replacement — All Engines ..	01-11
TESTING		Spark Plug Wires — Secondary (High Tension) Wires	01-10
Ignition Timing	01-5	CLEANING AND INSPECTION	
REMOVAL AND INSTALLATION		Distributor	01-13
Connecting To Coil Connector For		Spark Plugs	01-11
Tachometer — All Engines	01-11	SPECIFICATIONS	01-16
Distributor, Rotor and Cap	01-10	SPECIAL TOOLS	01-17
Distributor — V-8 Engines	01-7		
Magnetic Pickup Assembly	01-7		
Vacuum Advance Unit	01-7		

CB3519-2B

GENERAL INFORMATION

All California passenger cars (except the Versailles) equipped with a 5.0L (302 CID) V-8 are equipped with the high energy "Dura Spark I" ignition system.

All other California, 49 States and Canadian vehicles are equipped with the "Dura Spark II" ignition system.

Dura Spark I features special vehicle primary wiring, a unique coil and electronic control module, a distributor cap and adapter, high energy secondary wiring and special wide-gap spark plugs. In operation, it senses current flow through the coil, adjusting "dwell" for maximum spark intensity. Thus, coil "on" time is adjusted for best efficiency related to engine rpm. If the module senses that the ignition switch is ON and the

distributor is not turning, it will automatically turn the coil current OFF after about one second. To reestablish the module cycle, turn the key to START or to OFF and then to ON again.

Dura Spark II is basically a solid state ignition system with two major differences: the ballast resistor value has been changed from 1.35 to 1.10 ohms to boost coil current and energy output, and the system now uses the new Dura Spark I rotor, distributor cap and adapter, ignition secondary wires and wide-gap spark plugs to take advantage of the higher energy produced.

Both systems (except Versailles with the EEC System) use the same distributor (Fig. 1) and both control

modules have the same exterior appearance (Fig. 2). See Part 29-06 for operation and servicing of the EEC system components not covered in this Part.

Dual Mode Timing Ignition Module

On some applications, a special Dura Spark II ignition module is used, with altitude compensation and economy features (Fig. 2). This special module, plus the altitude sensor or economy distributor modulator, allows the base engine timing to be modified to suit either altitude or engine load conditions. All other elements and performance characteristics of this module are identical to both modes of operation of other Dura Spark II systems. All Dura Spark II modules equipped with altitude feature have three connectors instead of the normal two.

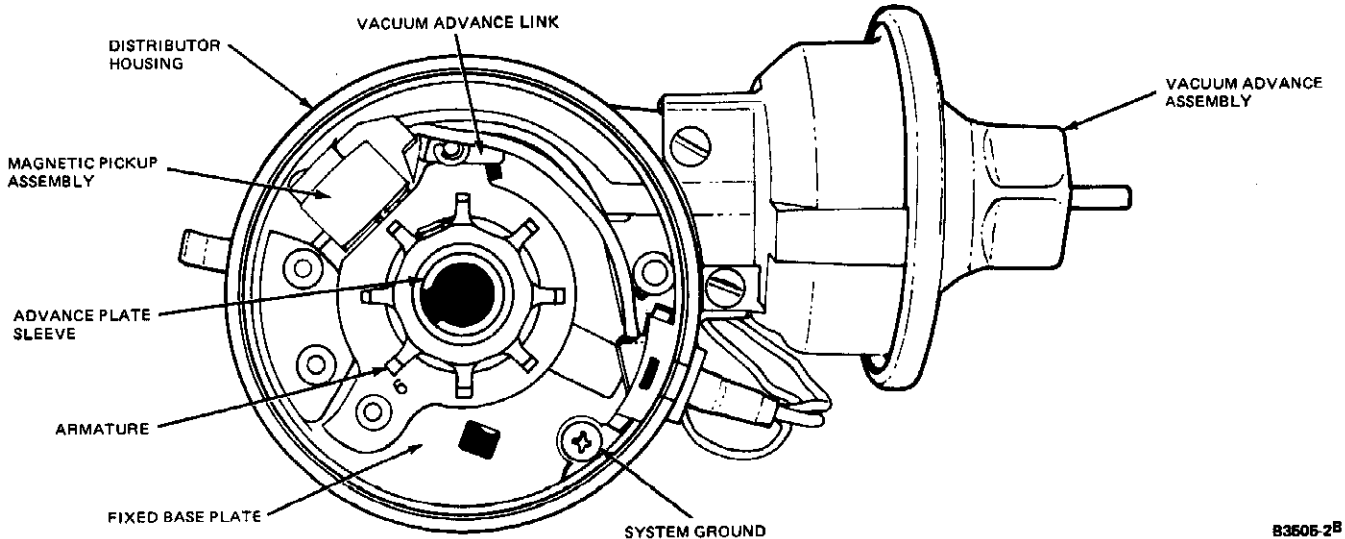
Altitude Compensation

An aneroid switch (Fig. 2) provides an automatic retard signal to the module at different altitudes, giving appropriate advanced timing at higher altitudes and retard mode for spark knock control at lower altitudes.

Economy Calibrations

A vacuum switch (Fig. 2) sensing intake manifold vacuum provides an automatic retard signal to the distributor under heavy engine load, while allowing spark advance under light to moderate engine loads.

It is important to note that the Dura Spark II amplifier module and coil are "on" when the ignition switch is "on". Because of this, the ignition system will generate a spark when the key is turned "off". This feature may be used as a diagnostic tool, to verify continuity of



B3505-2B

FIG. 1 Distributor—V-8 Shown—Others Similar

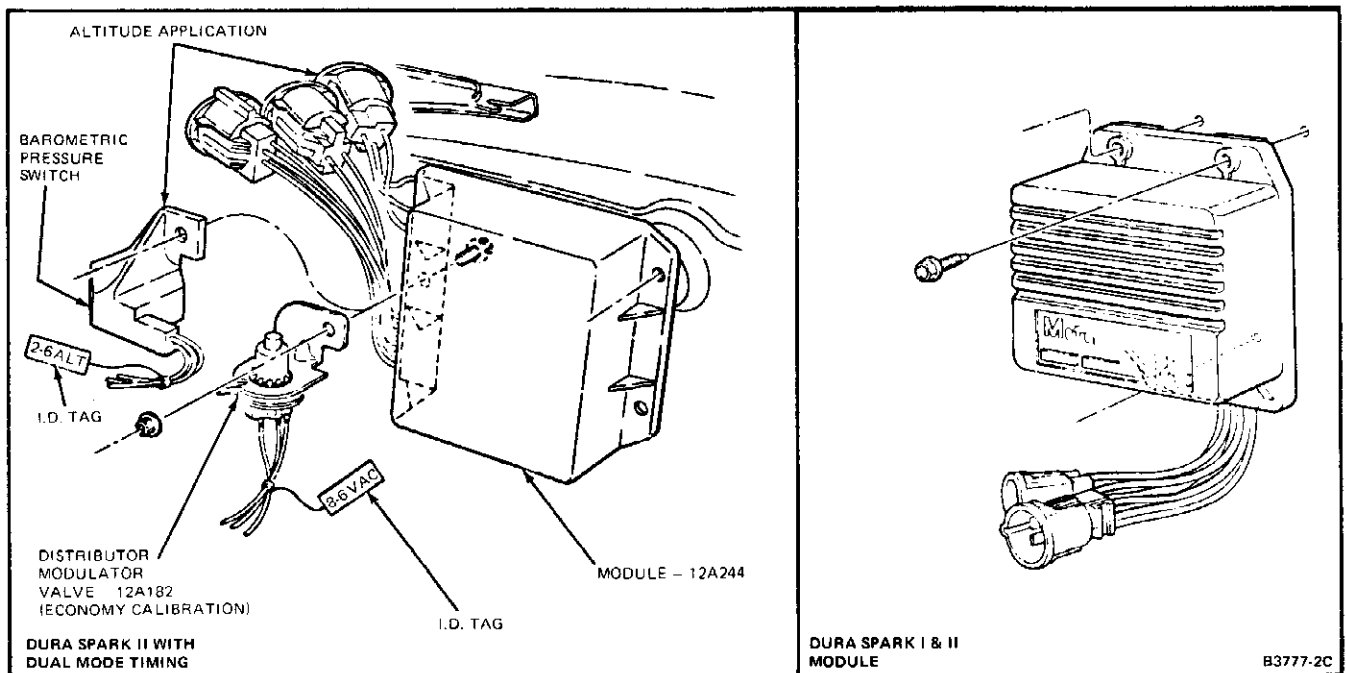


FIG. 2 Typical Dura Spark Modules

circuit, coil and ignition switch. Certain other service actions such as removing the distributor cap with the ignition switch "on" may also cause the system to fire. **For this reason, the ignition switch should remain "off" during any underhood operations unless the intent is to start the vehicle engine, or to perform a specific test that requires the ignition switch to be "on". This procedure will prevent the possibility of inadvertent engine rotation caused by triggering of the ignition system during servicing.**

Dura Spark I systems automatically shut down when the system senses no distributor rotation within one second.

DISTRIBUTOR

The armature turns with the distributor shaft, causing fluctuations in the magnetic field generated by the pickup coil assembly. These fluctuations cause the amplifier to turn the ignition coil current off and on, generating high tension spark needed to fire the spark plugs. The distributor is equipped with a new high energy cap and adapter (Fig. 3).

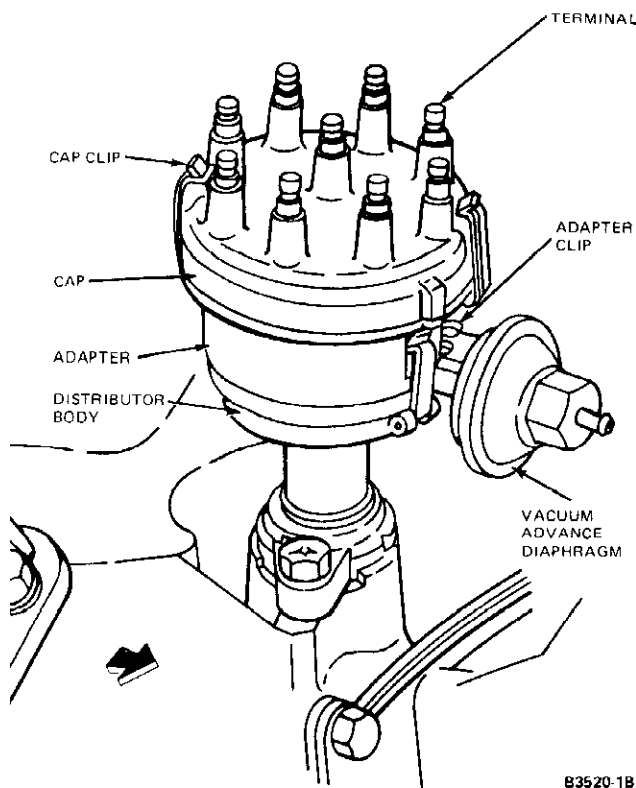


FIG. 3 Typical Dura-Spark Distributor

All distributors except Versailles with EEC System are equipped with both vacuum and centrifugal spark advance control units. The vacuum advance unit governs ignition timing according to engine load, while the centrifugal advance unit governs ignition timing according to engine speed (rpm). A dual diaphragm vacuum advance unit is used on some engines to provide additional ignition timing retard during engine closed throttle operation. This occurs both at curb idle and during engine coast-down with closed throttle.

Retarding the timing during these periods helps control engine emissions.

The distributor on four or six cylinder engines rotates in a clockwise direction. To advance timing; rotate the distributor counterclockwise. The distributor on V-8 engines rotates counterclockwise. To advance timing, rotate the distributor clockwise.

CENTRIFUGAL ADVANCE

The distributor advance units operate independently, with vacuum advance operating the base plate assembly and centrifugal advance operating the position of the armature in relation to the distributor shaft. The centrifugal advance assembly, located below the base plate, has centrifugal weights that move inward or outward with changes in engine speed.

As engine speed increases, the weights move the sleeve and plate assembly ahead of the distributor shaft, thus advancing the position of the armature. The rate of advance is controlled by calibrated springs.

VACUUM ADVANCE

The dual diaphragm unit consists of two diaphragms that operate from two independent sources of vacuum (Fig. 4). The outer (primary) diaphragm operates from carburetor venturi vacuum to provide timing advance during normal off-idle driving conditions. This diaphragm is connected to the distributor magnetic pickup coil assembly by the vacuum advance link.

The inner (secondary) diaphragm operates from intake manifold vacuum and acts to retard ignition timing. This retard diaphragm is connected to the outer diaphragm by means of a sliding linkage. Since intake manifold vacuum is stronger than carburetor venturi vacuum during closed throttle operation, the secondary diaphragm will retard the spark during these periods. In all other phases, the larger primary diaphragm operates from venturi vacuum and pulls the base plate against distributor rotation, advancing the spark timing.

On some A/C applications, a fast-idle compensator applies intake manifold vacuum to the primary side of the diaphragm during hot engine conditions, acting to increase engine idle speed as an aid to cooling.

Return springs in both the advance and retard portions center the diaphragms when vacuum drops.

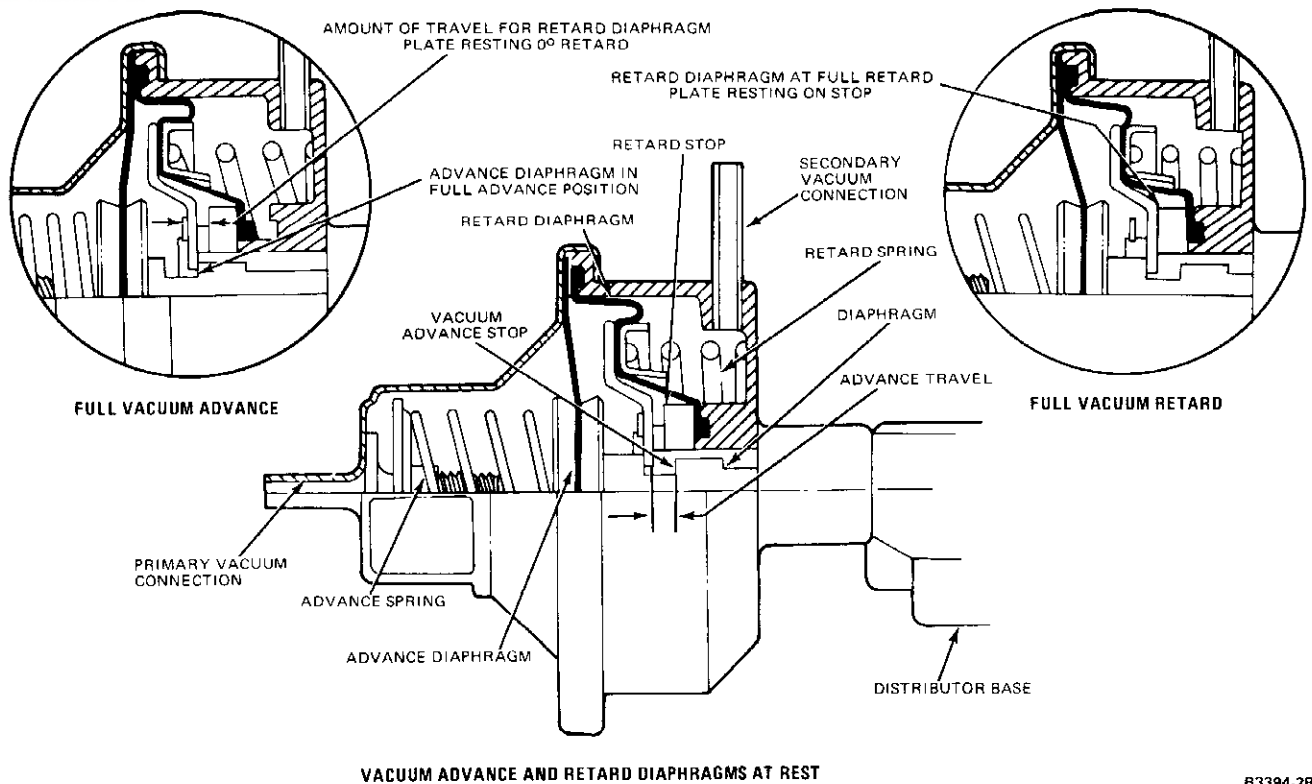
Vacuum modulators installed in the vacuum supply lines from the carburetor and intake manifold will vary the operation of the advance and retard diaphragms. These modulators are covered in Group 29 and Group 50.

CIRCUIT OPERATION

The Dura Spark System consists of a primary (low voltage) and a secondary (high voltage) circuit (Fig. 5).

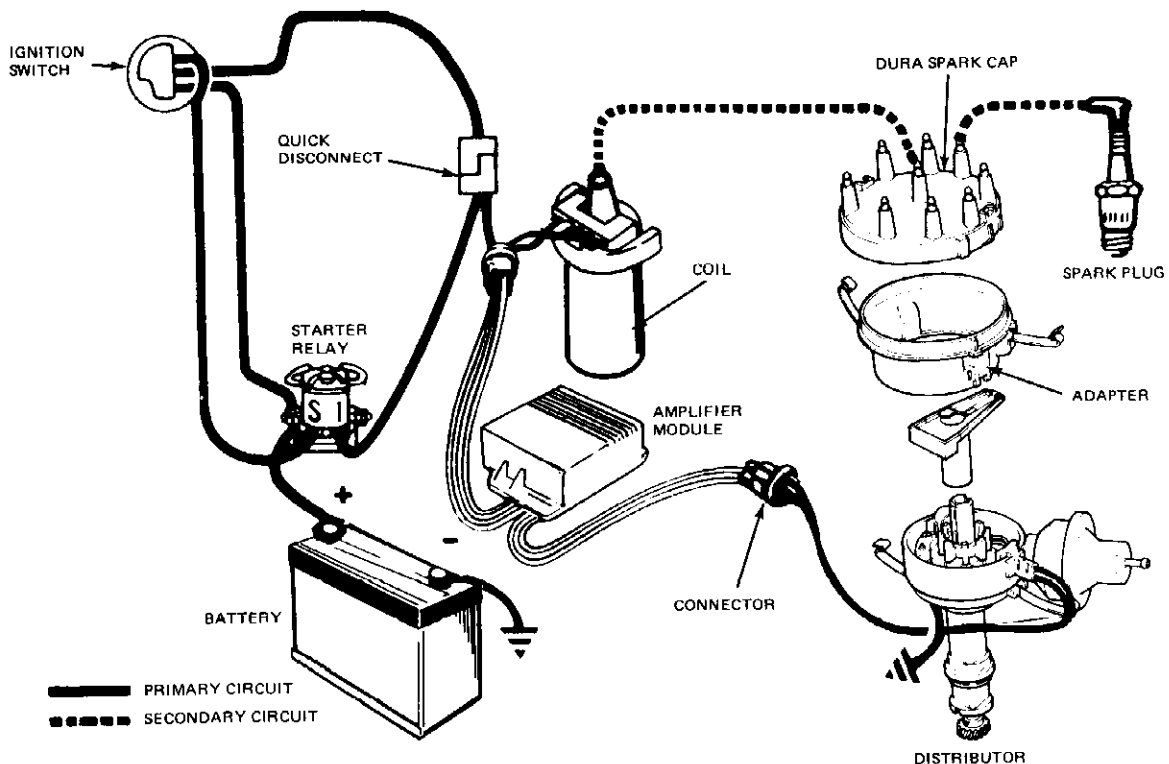
The primary circuit consists of the:

1. Battery.
2. Ignition Switch.
3. Primary Circuit Resistance Wire (in Dura Spark II).
4. Primary Windings of the Ignition Coil.
5. Magnetic pickup coil assembly.
6. Ignition Module.



B3394-2B

FIG. 4 Dual Diaphragm Vacuum Advance Mechanism



B3741-2C

FIG. 5 Typical Dura Spark System

The secondary circuit consists of the:

1. Secondary windings of the ignition coil.
2. Distributor rotor.
3. Distributor cap.
4. High tension (spark plug) wires.
5. Spark plugs.

With the ignition switch "on", the primary circuit is on and the ignition coil is energized. When the armature "spokes" approach the magnetic pickup coil assembly, they induce a voltage which tells the amplifier to turn the coil primary current off. A timing circuit in the amplifier module will turn the current on again after the coil field has collapsed. When the current is "on", it flows from the battery through the ignition switch, the primary windings of the ignition coil, and through the amplifier module circuits to ground. When the current is off, the magnetic field built up in the ignition coil is allowed to collapse, inducing a high voltage into the secondary windings of the coil. High voltage is produced each time the field is thus built up and collapsed.

The high voltage flows through the coil high tension lead to the distributor cap where the rotor distributes it to one of the spark plug terminals in the distributor cap. This process is repeated for every power stroke of the engine.

Ignition system troubles are caused by a failure in the primary and/or the secondary circuit; incorrect ignition timing; or incorrect distributor advance. Circuit failures may be caused by shorts, corroded or dirty terminals, loose connections, damaged wire insulation, cracked distributor cap or rotor, damaged pick-up coil assembly or ignition module, or fouled spark plugs.

If an engine starting or operating trouble is attributed to the ignition system, start the engine if possible and verify the complaint. On engines that will not start, be sure there is gasoline in the fuel tank and that fuel is reaching the carburetor. Then locate the ignition system problem by an oscilloscope test, spark intensity test, or by means of the ohmmeter test procedure.

ADJUSTMENTS

No adjustments are to be made to the ignition system except initial engine timing and spark plug gap (Part 50-29).

TESTING

For testing and system diagnosis, refer to Part 29-02.

IGNITION TIMING

All engines are equipped with conventional ignition timing marks and pointers. Engines sold in California are also equipped with the new "monolithic" timing features. The conventional system employs degree numbers on the crankshaft vibration damper, a timing pointer near the damper, and an index mark on both the distributor rotor and distributor body.

The "monolithic" system employs a timing receptacle designed to accept an electronic probe (Fig. 6) that is connected to digital read-out equipment. Thus, the timing is determined electronically. The receptacle is located at the front of all engines except the 2.3L I-4 which has a boss for monolithic timing in the left rear of the cylinder block.

To check and adjust timing, follow the procedures outlined in Groups 50 and 29.

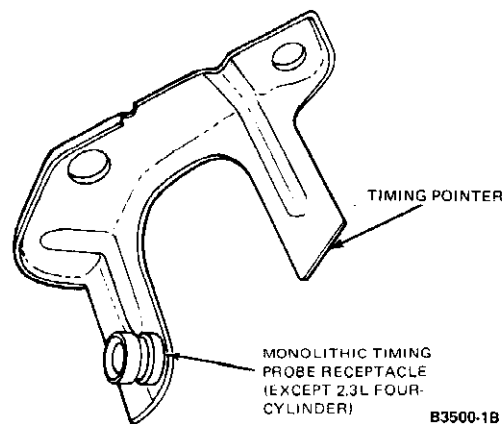


FIG. 6 Typical Timing Pointer and Probe Receptacle

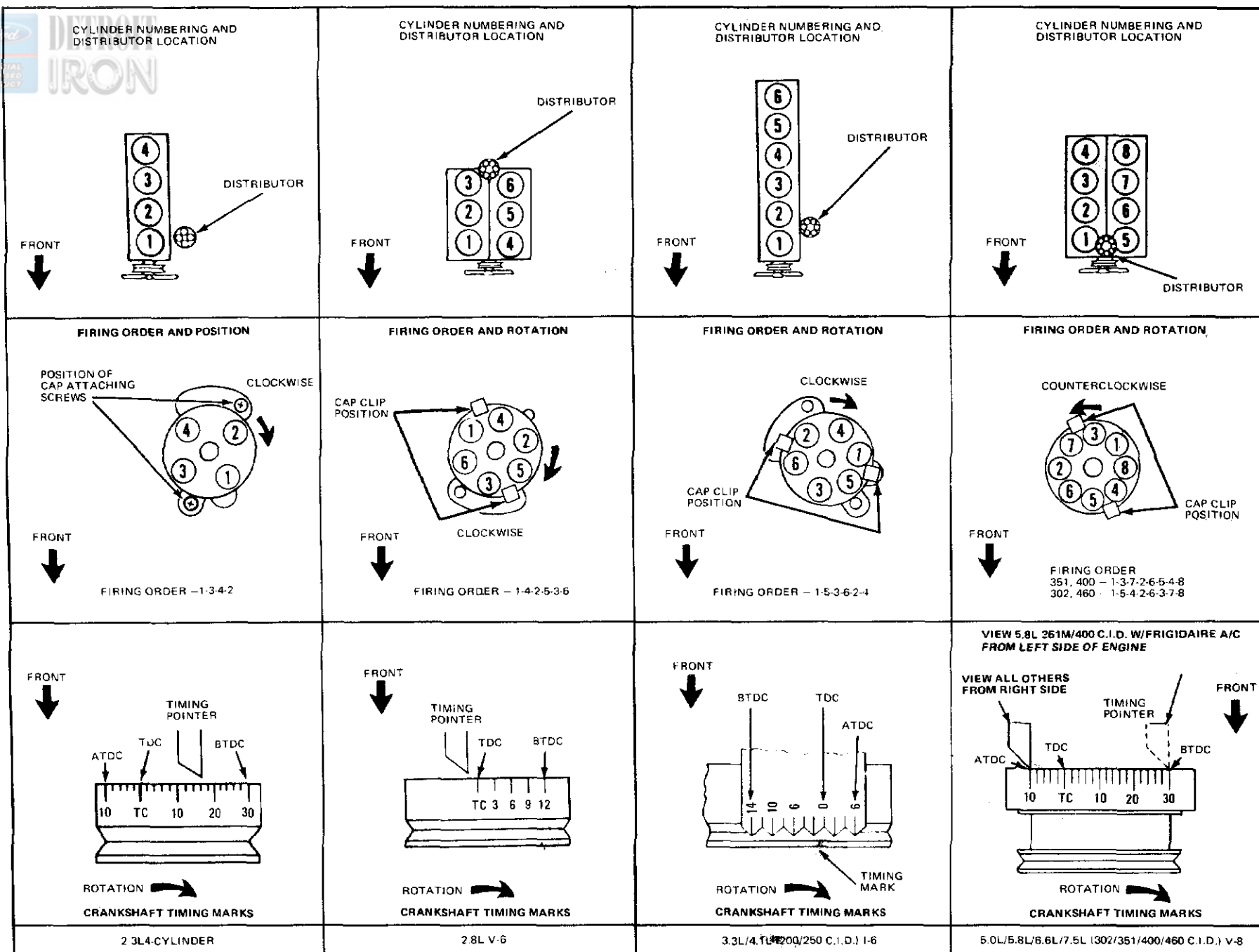


FIG. 7 Engine Timing and Cylinder Firing Order

83435-2H

REMOVAL AND INSTALLATION

DISTRIBUTOR—V-8 ENGINES

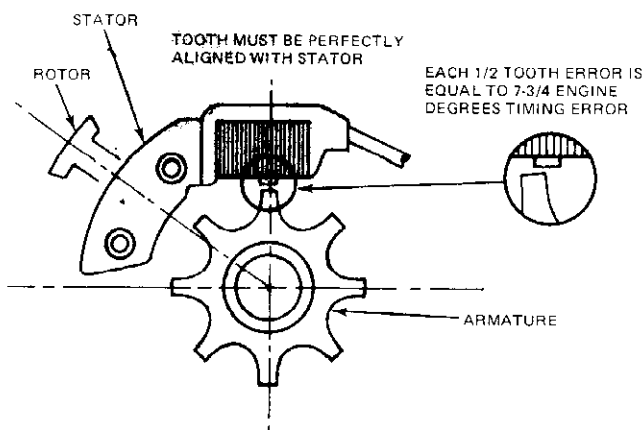
Removal

1. Remove the air cleaner. Disconnect the distributor wiring connector from the vehicle wiring harness.
2. Disconnect the vacuum advance lines at the distributor. Remove the distributor cap and place it and wires to one side.
3. Scribe a mark on the distributor body and the cylinder block indicating the position of the rotor in the distributor and the distributor in the block. These marks will be used as guides when installing the distributor.
4. Remove the distributor hold-down bolt and clamp. Lift the distributor out of the block. Do not rotate the engine while the distributor is out of the block, or it will be necessary to time the engine.

Installation

1. If the crankshaft was rotated while the distributor was removed from the engine, it will be necessary to time the engine as follows: Rotate the crankshaft until No. 1 piston is on TDC after the compression stroke. Align the correct initial timing mark on the timing pointer with the timing pointer on the crankshaft damper. Position the distributor in the block with one of the armature segments as shown in Fig. 8, and the rotor at number one firing position.

Make sure the oil pump intermediate shaft properly engages the distributor shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the oil pump intermediate shaft. Install, but do not tighten, the retaining clamp and bolt. Rotate the distributor to advance the timing to a point where the armature tooth is aligned properly. Tighten the clamp.



B3509-1A

FIG. 8 Static Timing Position—8-Cylinder Engine Distributor

2. If the crankshaft has not been moved position the distributor in the block with the rotor aligned with

the mark previously scribed on the distributor body and the marks on the distributor body and cylinder block in alignment.

3. Install the distributor cap and wires.
4. Connect the distributor wiring connector to the vehicle harness.
5. Check the ignition timing with a timing light and adjust to specifications. NOTE: Due to the higher coil charging currents inherent in the new Dura Spark system, it may be necessary to use a timing light specifically designed for this type system. Existing inductive pickup type lights might also work satisfactorily if an insulated standoff such as a piece of split vacuum hose is first put around the plug wire. Connect the vacuum line(s), and check the advance with the timing light when the engine is accelerated.
6. Install the air cleaner.

MAGNETIC PICKUP COIL ASSEMBLY

Removal

1. Remove the distributor cap, rotor and adapter, and disconnect the distributor harness plug (Fig. 9).
2. Using a small gear puller or two screwdrivers, lift or pry the armature from the advance plate sleeve. Remove the roll pin.
3. Remove the large wire retaining clip from the base plate annular groove.
4. Remove the snap ring that secures the vacuum advance link to the pickup assembly.
5. Remove the magnetic pickup assembly ground screw and lift the assembly from the distributor.
6. Lift the vacuum advance arm off the post on the pickup assembly and move it out against the distributor housing.

Installation

1. Place the new pickup assembly in position over the fixed base plate and slide the wiring in position through the slot in the side of the distributor housing.
2. Install the fine wire snap ring securing the pickup assembly to the fixed base plate.
3. Position the vacuum advance arm over the post on the pickup assembly and install the snap ring.
4. Install the grounding screw through the tab on the wiring harness and into the fixed base plate.
5. Install the armature on the advance plate sleeve, making sure the roll pin is engaged in the matching slots.
6. Install the distributor adapter, rotor and cap.
7. Connect the distributor wiring plug to the vehicle harness.

VACUUM ADVANCE UNIT—DUAL DIAPHRAGM

Refer to Fig. 9 for proper relationship of internal parts.

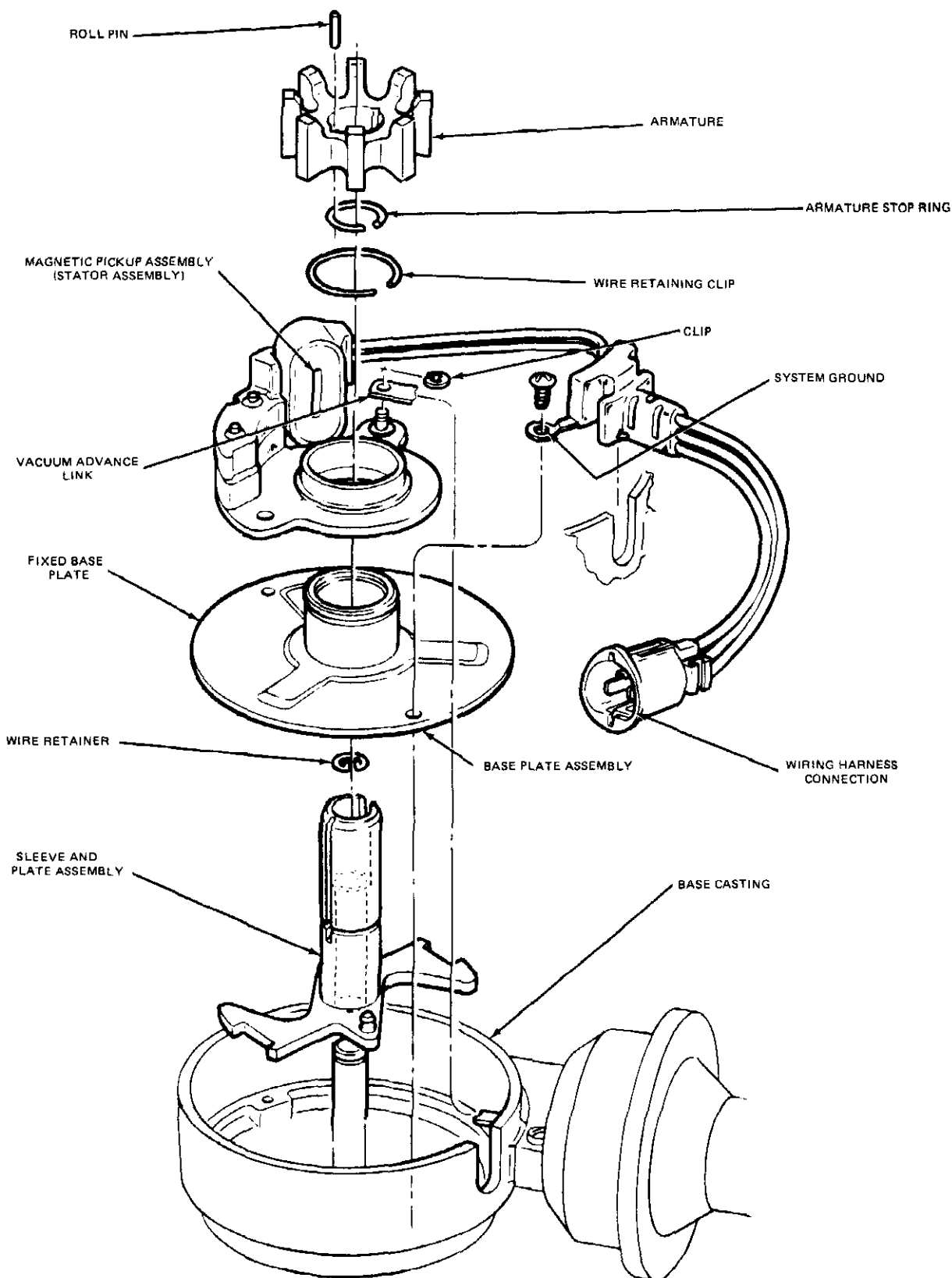


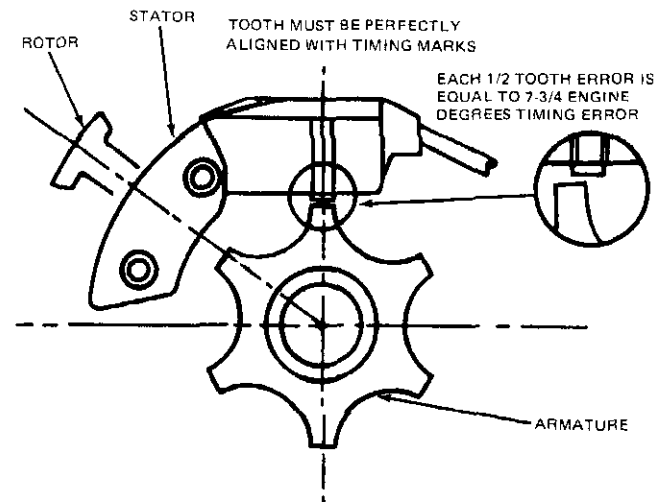
FIG. 9 Typical Dura Spark Distributor—Disassembled

Removal

1. Remove the cap, rotor and adapter.
2. Disconnect the vacuum lines.
3. Remove the spring clip that secures the diaphragm link to the movable advance plate.
4. Remove the diaphragm unit attaching screws and carefully remove the unit by tilting downward to disengage the link from the post on the movable advance plate.

Installation

1. Position the diaphragm unit on the distributor and hook the diaphragm link in position.
2. Install the spring clip that secures the diaphragm link to the movable advance plate. Install the diaphragm unit attaching screws.
3. Connect the vacuum lines.
4. Install the rotor, adapter and distributor cap.



TIMING POSITION - 6-CYLINDER SHOWN,

B3739-1B

FIXED BASE PLATE

Removal

1. Remove the distributor cap, adapter and rotor.
2. Remove the vacuum advance diaphragm unit.
3. Remove the magnetic pickup assembly.
4. Remove the remaining attaching screw from the fixed base plate and lift it out of the distributor.

NOTE: Do not remove sleeve and plate assembly, weights or weight springs.

Installation

1. Position fixed base plate in distributor and install first attaching screw.
2. Install pick-up assembly and wiring.
3. Install vacuum advance unit.
4. Install the distributor adapter, rotor and cap.

DISTRIBUTOR—I-4, V-6 AND I-6 ENGINE

Removal

1. Remove the air cleaner assembly on V-6 engines. On 4-cylinder and 6-cylinder in-line engines, remove one thermactor pump mounting bolt, and the drive belt; then, swing the pump to one side to allow access to the distributor. It may also be necessary to disconnect the Thermactor air filter and lines.
2. Using a remote starter switch or rotating the engine by hand, position the proper timing mark on the engine crankshaft damper with the timing pointer.
3. Remove the distributor cap and check to see that the rotor and armature are lined up with the index mark on the top of the magnetic pickup (Fig. 10), and the marks on the side of the distributor body.
4. Disconnect the vacuum hose(s) from the distributor. Disconnect the ignition lead from the wiring harness.
5. Remove the distributor hold-down bolt and remove the distributor from the block. The hex shaft that drives the oil pump may stick in the distributor shaft and be withdrawn from the pump.

FIG. 10 Static Timing Position—6-Cylinder Shown—4-Cylinder Similar

Installation

1. Make sure the engine is still aligned with the proper timing marks. Align the distributor rotor with the marks on the distributor and the armature with the marks on the top of the magnetic pickup (Fig. 10). If the oil pump drive shaft was withdrawn with the distributor, coat one end with heavy grease, insert that end into the hex hole in the distributor shaft and position the distributor into the cylinder block. Make sure the oil pump drive shaft is fully seated in the pump, and that the distributor rotor and body are in the proper position.
2. Install the distributor hold-down bolt and bracket.
3. Install the vacuum hose(s) and connect the ignition wire to the wiring harness.
4. Install the rotor, adapter and distributor cap.
5. Install the thermactor belt on four and in-line 6-cylinder engines, and adjust belt tension to specification. Connect all Thermactor hoses and the filter.
6. Check engine timing as covered in Part 29-02 or 50-29 under Ignition Timing.

MAGNETIC PICKUP COIL ASSEMBLY

Removal

1. Remove the distributor cap, adapter and rotor and disconnect the distributor harness plug.
2. Using a small gear puller or two screwdrivers, lift or pry the armature from the advance plate sleeve. Remove the roll pin.
3. Remove the snap ring, washer and wave washer that secure the pickup coil assembly to the lower plate.
4. Remove the magnetic pickup assembly ground screw and lift the assembly from the distributor.

Installation

1. Place the pickup assembly in position over the fixed base plate and insert the pickup assembly post into the vacuum advance arm.

2. Slide the wiring grommet into the slot at the edge of the lower plate and install the ground screw. Install the washers and snap ring to secure the pickup coil assembly to the lower plate.
3. Install the armature on the advance plate sleeve, making sure the roll pin is engaged in the matching slots.
4. Install the distributor rotor, adapter and cap and connect the distributor wiring plug to the vehicle harness.

VACUUM ADVANCE UNIT

Removal

1. Remove the distributor cap, rotor and adapter.
2. Disconnect the vacuum line(s).
3. Remove the diaphragm unit attaching screws and carefully remove the unit by tilting downward to disengage the link from the advance plate.

Installation

1. Hook the diaphragm link in position and position the diaphragm unit on the distributor.
2. Install the diaphragm unit attaching screws.
3. Connect the vacuum line(s).
4. Install the adapter, rotor and distributor cap.

SPARK PLUG WIRES

SECONDARY (HIGH TENSION) WIRES

The secondary wires include the wires connecting the distributor cap to the spark plugs and the wire connecting the center terminal of the distributor cap to the center terminal of the ignition coil.

These wires are the radio resistance-type which filter out the high frequency electrical impulses that are the source of ignition noise interference.

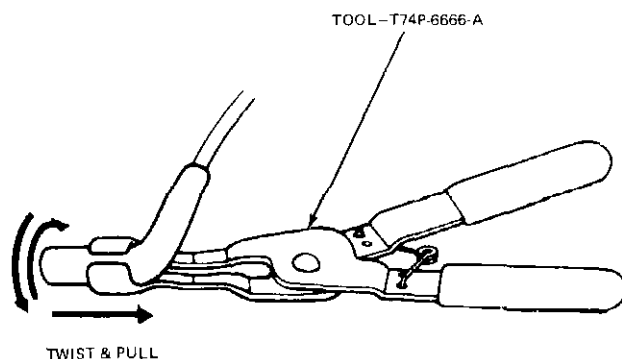
Check ignition wire resistance through the distributor cap. To check the secondary wire resistance, turn the ignition switch "off" and then remove the distributor cap. It is important that the ignition system be "off" to prevent inadvertent engine rotation due to firing of the ignition system.

Do not, under any circumstance, puncture an ignition cable when checking resistance. Do not use a commercial probing device, but measure resistance only from the ends of the wire or the wire terminals inside the distributor cap.

If the resistance of a wire exceeds 5,000 ohms per inch, it should be completely removed from the distributor cap and the resistance measured directly from the wire ends. If the resistance still exceeds 5,000 ohms per inch, the wire should be replaced.

When removing wires from spark plugs, use Tool T74P-6666-A or equivalent. (Fig. 11.) Grasp and twist the molded cap back and forth on the plug insulator to free cap. Use the special tool to pull the cap from the plug. Do not pull on the wire directly, or it may become separated from the connector inside the cap.

Whenever a high tension wire is removed for any reason from a spark plug, coil or distributor terminal housing, silicone grease must be applied to the boot



83496-1A

FIG. 11 Removing Wires from Spark Plugs

before it is reconnected. Using a small clean tool, coat the entire interior surface of the boot with Ford silicone grease D7AZ-19A331-A or equivalent.

Installation

1. Insert each wire on the proper terminal of the distributor cap. Be sure the wires are forced all the way down over their terminals. The No. 1 terminal is identified on the cap. Install the wires starting with No. 1. Each spark plug wire is numbered. Cylinders are numbered 1-2-3-4-5-6 on all I-6 engines and from front to rear; right bank 1-2-3-4, left bank 5-6-7-8 on all V-8 engines. V-6 engines are numbered from front to rear; right bank 1-2-3, left bank 4-5-6. I-6 engines are numbered from front to rear, 1-2-3-4.
2. Remove the wire retaining brackets from the old spark plug wire set and install them on the new set in the same relative position. Install the wires in the brackets on the valve rocker arm covers (V-8 and V-6).
3. Connect the wires to the proper spark plugs. Install the coil high tension lead. Be sure the No. 7 spark plug wire is positioned in the bracket.

Notice that the wires are positioned in this bracket in a special order from front to rear (7-5-6-8). This applies to all V-8 engines except the 5.8L (351 CID) and 6.6L (400 CID) engine. The wires for the 5.8L (351 CID) and 6.6L (400 CID) should be positioned in the bracket from front to rear (5-7-8-6). Arranging the wires in this manner will prevent cylinder cross-fire.

DISTRIBUTOR ROTOR AND CAP

When installing a new distributor cap or rotor, coat the brass rotor electrode surfaces on all sides outboard of the plastic, including the outer edge, with D7AZ-19A331-A silicone grease (or equivalent Dow Corning No. 111 or General Electric G-627 compounds) to approximately 1/16" thickness. Do not reapply or attempt to remove any silicone coating from the distributor cap electrodes. As this compound ages, it has

the appearance of being a contaminant of the cap and rotor electrodes. This condition is normal and causes no performance loss.

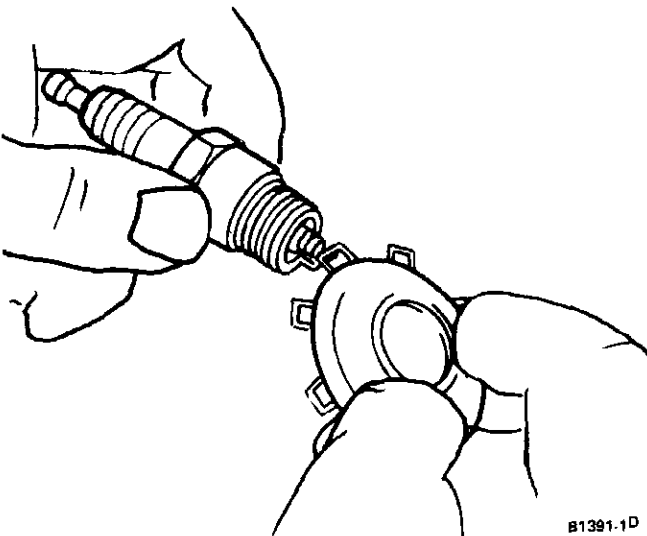
REPLACING SPARK PLUGS

Removal

1. Remove the wire from each spark plug by grasping the molded boot with Tool T74P-6666-A (Fig. 11). Twist the boot until it loosens and then pull it off the spark plug. Do not pull on the wire, as the connection may become damaged.
2. Any wire damaged must be replaced. Each original spark plug wire is numbered for the cylinder to which it is designed. If wires are not numbered, each wire should be numbered as to the plug from which it was removed.
3. Clean the area around each spark plug port with compressed air.
4. Using the proper size spark plug socket remove the spark plugs.

Installation

1. Check the gap on each new spark plug and set to specification, if necessary (Fig. 12).



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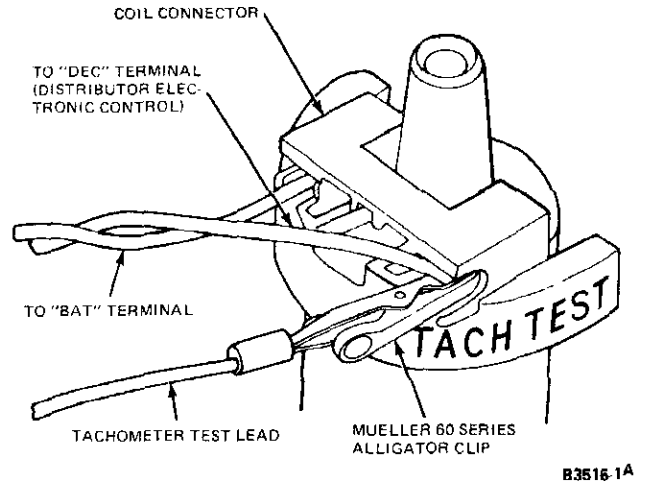
FIG. 12 Checking and Setting Spark Plug Gap

2. Install each spark plug and torque to specification.
3. Coat the inside of each spark plug boot with silicone grease D7AZ-19A331-A or equivalent, using a small screwdriver blade. Connect each spark plug wire to the plug from which it was removed. Be sure each wire is fully depressed on each plug and molded boot is firmly in place.

CONNECTING TO COIL CONNECTOR FOR TACHOMETER TEST—ALL VEHICLES

The ignition coil connector allows a tachometer test lead with an alligator-type clip to be connected to the DEC (Distributor Electronic Control) terminal without removing the connector (Fig. 13).

When engine rpm must be checked, install the tachometer alligator clip into the "TACH TEST" cavity as shown. If the coil connector must be removed, grasp the wires and pull in the direction of the wires until it disconnects from the terminals.



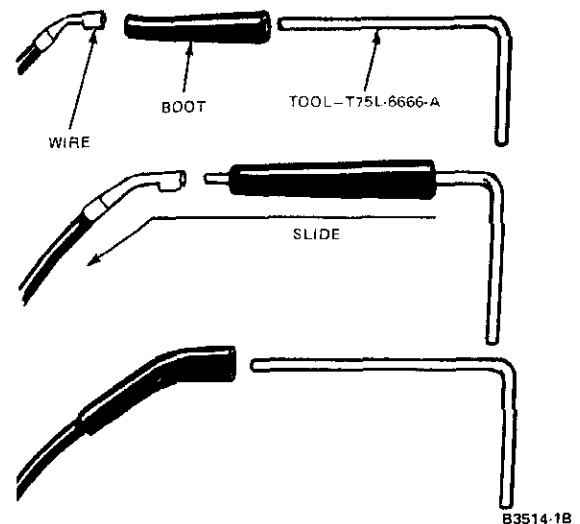
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FIG. 13 Attaching Tachometer Lead to Coil Connector

SPARK PLUG BOOT REPLACEMENT—ALL ENGINES

When it is necessary to replace only the boot on a particular spark plug wire, proceed as follows:

1. Cut off the old boot. Apply silicone lubricant D7AZ-19A331-A or equivalent to that area of the old wire that will contact the new boot.
2. Position the new boot onto Tool T75L-6666-A as shown in Fig. 14.



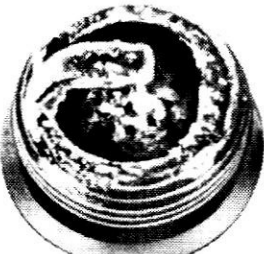
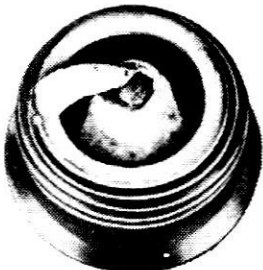
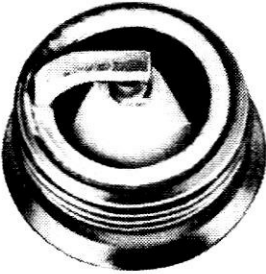
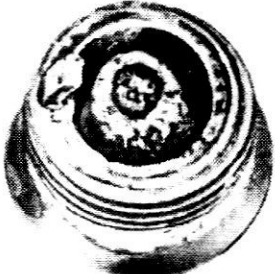
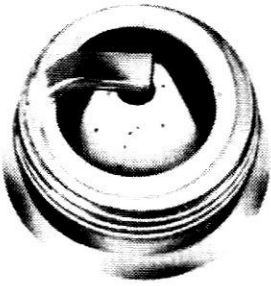
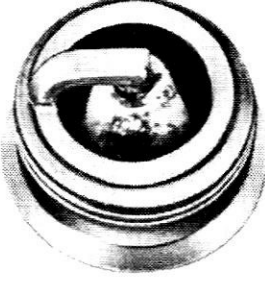
B3514-1B

FIG. 14 Installing Spark Plug Wire Boot on Wire

3. Position the tool onto the wire terminal and slide the boot onto the wire. Remove the tool from the end of the wire terminal.

CLEANING AND INSPECTION SPARK PLUGS

Examine the firing ends of the spark plugs, noting the type of deposits and the degree of electrode erosion. Refer to Fig. 15 for the various types of spark plug fouling and their causes.

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. REPLACE THE PLUG. IF ENGINE IS NOT REPAIRED, USE A HOTTER 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.
WORN  IDENTIFIED BY SEVERELY ERODED OR WORN ELECTRODES. CAUSED BY NORMAL WEAR. SHOULD BE REPLACED	NORMAL  IDENTIFIED BY LIGHT TAN OR GRAY DEPOSITS ON THE FIRING TIP.	LEAD FOULED  IDENTIFIED BY DARK GRAY, BLACK, YELLOW OR TAN DEPOSITS OR A FUSED GLAZED COATING ON THE INSULATOR TIP. CAUSED BY HIGHLY LEADED GASOLINE. REPLACE THE PLUG.
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.

B3235-2B

FIG. 15 Spark Plug Inspection

Clean the plugs on a sand blast cleaner, following the manufacturer's instruction. **Do not prolong the use of the abrasive blast as it will erode the insulator and electrodes.**

Examine the plug carefully for cracked or broken insulators, badly pitted electrodes, and other signs of failure. Replace as required.

DISTRIBUTOR

Inspect distributor components to see that all snap rings are in place, and that the magnetic pickup assembly moves freely on the fixed base plate. Blow assembly clean with compressed air. Make sure no filings or metal chips adhere to pickup magnet face.

DISTRIBUTOR CAP

Wipe the distributor cap with a clean, damp cloth. Dry the cap with compressed air. Inspect the cap for cracks, burned contacts, broken carbon button, carbon tracks or dirt or corrosion in the sockets. Replace the cap if it is damaged.*

ROTOR

Wipe the rotor with a clean, damp cloth. Dry the rotor with compressed air. Inspect the rotor for breaks, cracks, carbon tracks or burns. Replace the rotor if it is corroded or damaged.*

***NOTE: When it is necessary to clean a distributor cap or rotor for inspection, or when a new cap or rotor is being installed, silicone grease must be applied as outlined under distributor Rotor and Cap Installation.**

SECONDARY WIRING

Without removing from the engine, inspect the secondary wires for visible damage such as cuts, pinches, cracks or torn boots. Do not remove wires from distributor cap. Replace wires that are damaged. If spark plug boot is damaged, replace it (refer to Spark Plug Boot Replacement—All Engines, in this Part).

COIL

Wipe the coil with a damp cloth and check for any cracks or other defects.

IGNITION RESISTOR WIRE

(Vehicles equipped with Dura Spark II)

The special ignition resistance wire must be of a specified length and diameter to reduce the operating voltage of the ignition system. Due to its special resistance, under no circumstances should it be replaced by any other wire other than the correct service resistor wire. When a new resistor wire is installed, the old one should be isolated from the system.

Note: Although the Lincoln Continental system is shown, all other systems are similar in operation and repair. The only difference will be in the disconnect points in the 14401 wiring harness. See the latest service information for other vehicles not contained in this manual.

Lincoln Continental

The procedure which follows should be used when making a replacement of a damaged ignition resistor

wire (part of 14401 wiring harness). The resistor wire is fed from a circuit weld in the harness approximately 3" from the connector to the ignition switch on the steering column, and is routed to the connector on the back of the fuse panel which connects with the 14398 engine compartment wiring harness on the left side of the dash panel.

1. Disconnect the battery cable.
2. In the engine compartment, disconnect the 14398 wiring connector from the 14401 wiring and fuse panel (on the left side of the dash panel). See Fig. 16.
3. To facilitate easier access to the fuse panel and the ignition switch connection, remove the lower trim panel and disconnect the steering column from the instrument panel.
4. Inside the car, detach the 14401 wiring connector that mates with the 14398 wiring connector from the back of the fuse panel.
5. Drop or pull the connector detached from the fuse panel below the instrument panel to facilitate the removal of the damaged resistor wire from the connector.
6. Locate the No. 16A red-light green stripe wire in the connector and retract the terminal retaining tab with a small screwdriver or a large paper clip. Now pull the female terminal from the connector (Fig. 17).
7. Cut the damaged resistor wire as close to the harness as possible and insulate the exposed ends with C1AZ-19627-A electrical tape or equivalent.
8. Now locate the ignition switch connector and about 3 inches from the connector unwrap the tape covering and expose the circuits welded into the harness.
9. Cut the damaged No. 16A (red-light green stripe) wire from the 14401 harness at the weld. Approximately 1 1/2" from the connector, cut the 16 gage red-light green wire, strip about 3/8" of insulation from each cut end and install a C5AZ-14294-B bullet connector to each end. Re-connect the circuit by plugging both bullet connectors into a B6A-14487-A double connector (Fig. 18).
10. Install one end of a new -12250-resistor wire into the remaining opening in the double connector. Re-wrap the exposed welded circuits previously exposed in the 14401 harness using appropriate plastic tape.
11. Route the new resistance wire to the connector behind the fuse panel and tape it to the harness.
CAUTION: Do not fold, loop or overlap the resistor wire onto itself under the harness covering.
12. Cut a 4" piece of No. 16 gage wire (B6A-14296-C) from bulk stock, strip 3/8" of insulation from each end. Install a D20B-14474-CB female terminal on one end and a C5AZ-14294-B bullet terminal on the other end (Fig. 18).
13. Install the female terminal into the vacated cavity of the fuse panel connector, where the damaged 16A circuit was removed (Fig. 17). Push the terminal firmly into place until the locking tab snaps into place.

14. Connect the free end of the new resistor wire to the free end of the jumper, using a B7A-14487-A single connector (Fig. 18).
15. Reassemble the connector to the back of the fuse panel and connect it with the 14389 wiring harness at the dash panel.
16. Reconnect the battery cable to the battery.
17. Start the vehicle and see if the engine will continue running when the lock cylinder is released to the RUN position. If not, check for proper voltage at the ignition coil IGN terminal. Voltage should be about 6.4 volts, or resistance to ground should read from 1.05-1.15 ohms at 75°F. The new resistor allows for a slightly higher current to the coil.

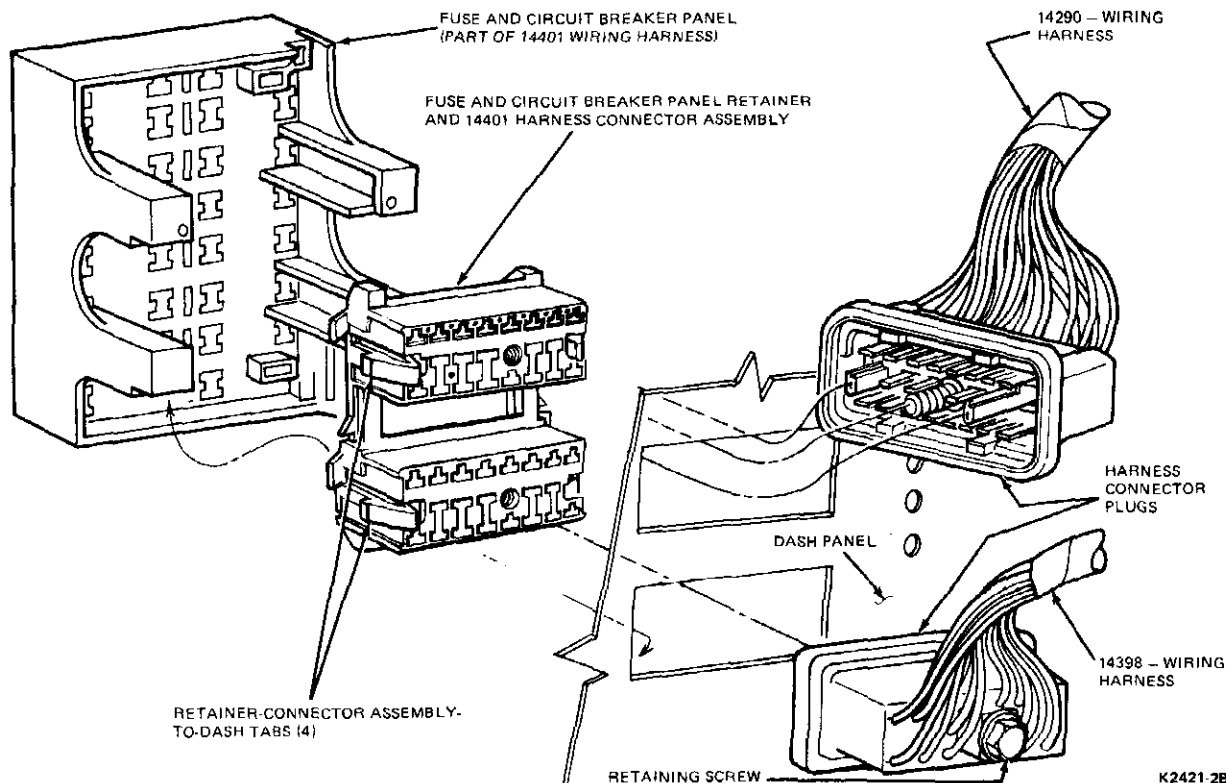
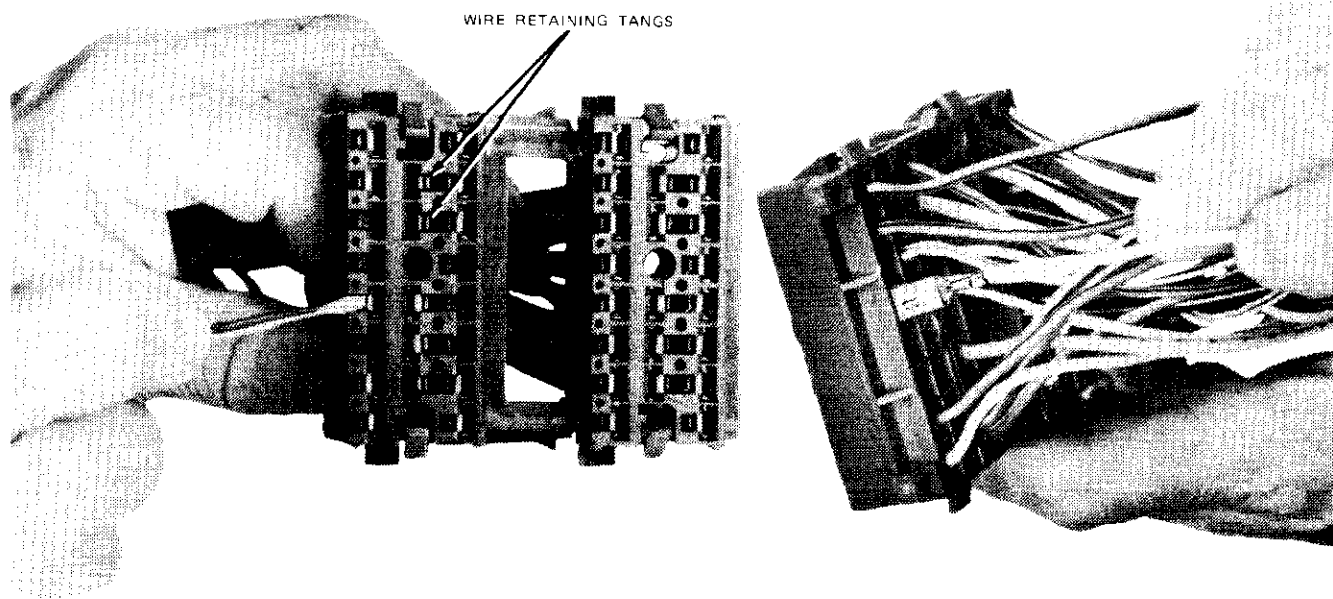


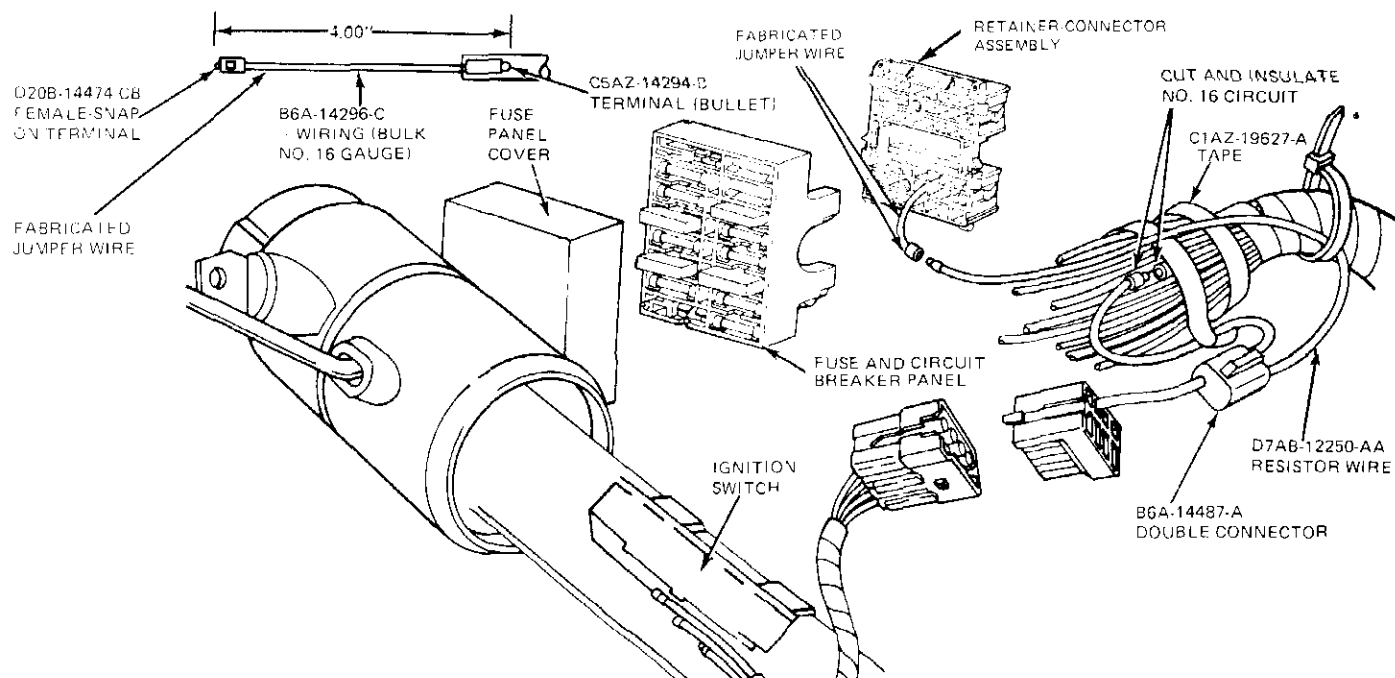
FIG. 16 Disconnecting 14398 Wiring From Fuse Block—Typical



UNLOCKING WIRE FROM RETAINER-CONNECTOR ASSEMBLY

INSTALLING WIRE TERMINAL TO RETAINER-CONNECTOR ASSEMBLY

K2591-2A

FIG. 17 Removing Female Terminal From Fuse Block Connector**FIG. 18 New Resistor Wire Installation—Lincoln Continental Shown, Others Similar**

B3743-2A

SPECIFICATIONS

DISTRIBUTOR GENERAL INFORMATION

Engine	Distributor Shaft End Play ①	Gear Location ②	Engine	Distributor Shaft End Play ①	Gear Location ②
2.3L	0.022-0.033	2.220-2.230	5.8L (351 CID)	0.024-0.035	4.031-4.038
2.8L	0.022-0.033	2.655-2.660	6.6L (400 CID)	0.024-0.035	4.031-4.038
3.3L (200 CID)	0.022-0.033	2.510-2.515	7.5L (460 CID)	0.024-0.035	4.031-4.038
4.1L (250 CID)	0.022-0.033	2.510-2.515	7.5L (460 CID)	0.024-0.035	4.031-4.038
5.0L (302 CID)	0.024-0.035	4.031-4.038	Police Interceptor		

① Measured with distributor removed. ② Distance from bottom of mounting flange to bottom of gear.

IGNITION SYSTEM GENERAL INFORMATION

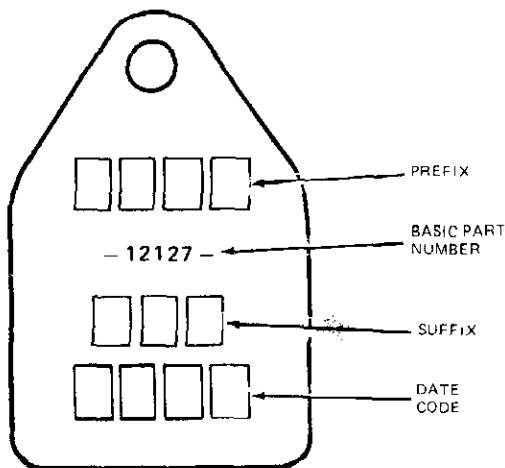
Application	Coil Primary Resistance (Ohms)	Coil Secondary Resistance (Ohms)	Primary Circuit Ballast Resistor (Ohms)	Rotor Air Gap Voltage Drop (Kv Max)
Dura Spark I	.71-.77	7350-8250	Not Required	8.0
Dura Spark II	1.13-1.23	7700-9300	1.05-1.15	8.0

CB3742-2D

DISTRIBUTOR IDENTIFICATION

The distributor identification number is stamped on the metal tag attached to the distributor vacuum advance diaphragm assembly attaching screw (Fig. 19). The basic part number for distributors is 12127. To

procure replacement parts, refer to the part number prefix and suffix stamped on the distributor tag, identifying the particular distributor. If the Master Parts Catalog lists a change date relating to the part needed, it may also be necessary to refer to the date code stamped on the distributor tag.



B3401-1B

FIG. 19 Distributor Identification Tag

SPECIAL TOOLS

Tool Description	Tool No.
Spark Plug Boot Replacing Tool	T77L-6666-A
Engine Analyzer	36-0036 or 02-0305

Tool Description	Tool No.
Spark Plug Wire Removing Tool	T74P-6666-A

CB1098-2F

FUEL SYSTEM

GROUP
24
(9500)

PART TITLE	PART NO.	PART TITLE	PART NO.
Air Cleaner and Duct Systems	24-41	General Fuel System Service	24-01
Carter Model YFA 1-V Carburetor	24-06	Holley Model 1946 1-V Carburetor	24-08
Fuel Filter	24-51	Holley/Weber Model 6500 Feedback Carburetor ..	24-12
Fuel Pump – Electric	24-31	Motorcraft Model 5200 2-V Carburetor	24-10
Fuel Pump – Mechanical	24-30	Motorcraft Model 4350 4-V Carburetor	24-26
Fuel Tank, Fuel Lines and Evaporative		Motorcraft Model 2150 2-V Carburetor	24-25
Emission System	24-50	Motorcraft Model 2700 VV Carburetor	24-27
		Throttle Linkage	24-60

CV2260-2B

General Fuel System Service

PART
24-01

SUBJECT	PAGE	SUBJECT	PAGE
DESCRIPTION		CLEANING AND INSPECTION	
Fuel System	01-1	Air Cleaner	01-2
TESTING AND ADJUSTMENT	01-2	Carburetor	01-2
		Fuel Pump	01-2

CV2261-2B

DESCRIPTION

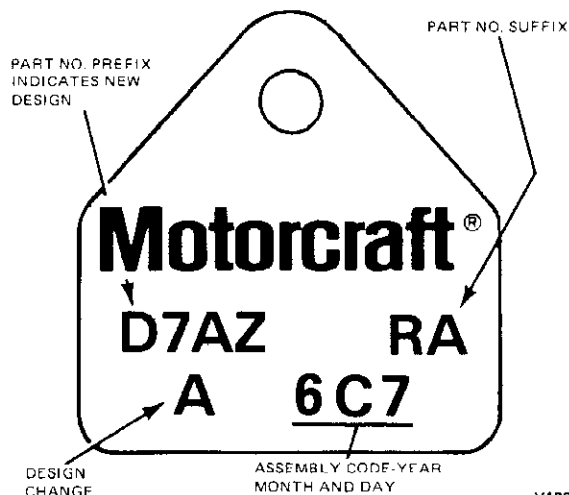
FUEL SYSTEM

Ford Motor Company vehicles manufactured for domestic sale are equipped with a variety of emission control systems. Modification or adjustment of these systems so as to render them inoperative constitutes a violation of federal law.

This Part of the shop manual will cover those test and adjustment procedures related directly to carburetors. Other emission systems related to the fuel system, but not directly to the carburetor, will be covered in Group 29 or in Volume 5, Part 50-29.

Carburetor Identification

A carburetor identification tag is attached to each carburetor, usually under one of the fuel bowl cover attaching screws. The basic part number for carburetors is 9510. To procure replacement parts, it is necessary to supply the proper prefix and suffix. In some instances, the design change code (Fig. 1) must also be supplied. Always refer to the master parts list for parts usage and interchangeability before replacing a carburetor or any of its component parts.



V1290-1F

FIG. 1 Typical Carburetor Identification Tag

TESTING AND ADJUSTMENT

All adjustments affect engine emissions and should be performed by competent personnel using specified equipment. Refer to Part 50-29 of Volume 5 before performing critical fuel system adjustments.

Refer to each carburetor section for specific adjustment points for individual carburetors. Refer to

Groups 29 and 50 for test and adjustment procedures for decel valves, EGR valves, PVS switches and all other emission control systems equipment.

CLEANING AND INSPECTION

AIR CLEANER

Refer to Volume 5 for the recommended air cleaner assembly maintenance mileage interval. **Cleaning the air cleaner or crankcase ventilation filter elements is not recommended.** They should be replaced at the specified mileage intervals. Clean the air cleaner body and the cover with a solvent or compressed air. Wipe the air cleaner body and cover dry if a solvent is used. Inspect the air cleaner body and cover for distortion or damage at the gasket mating surfaces. Replace the cover or body if they are damaged beyond repair. Hold the filter in front of a light and carefully inspect it for any splits or cracks. If the filter is split or cracked, replace it.

CARBURETOR

Dirt, gum, water or carbon contamination in the carburetor or the exterior moving parts of the carburetor are often responsible for unsatisfactory performance. Efficient carburetion depends upon careful cleaning and inspection.

The cleaning and inspection of those parts not included in the carburetor overhaul repair kit are covered here. All gaskets and parts included in the repair kit should be installed when the carburetor is assembled and the old gaskets and parts should be discarded.

Wash all the carburetor parts (except the accelerating pump diaphragm, the enrichment valve, the choke pulldown diaphragm, and the anti-stall dashpot assembly) in clean commercial carburetor cleaning solvent. If a commercial solvent is not available, lacquer thinner or denatured alcohol may be used.

Rinse the parts in kerosene to remove all traces of the cleaning solvent, then dry them with compressed air. Wipe all parts that can not be immersed in solvent with a clean, soft, dry cloth. Be sure all dirt, gum, carbon, and other foreign matter are removed from all parts.

Force compressed air through all passages of the carburetor. **Do not use a wire brush to clean any**

parts, or a drill or wire to clean out any openings or passages in the carburetor. A drill or wire may enlarge the hole or passage, changing the calibration of the carburetor.

Check the choke shaft for grooves, wear and excessive looseness or binding. Inspect the choke plate for nicked edges and for ease of operation, and free it if necessary. Make sure all carbon and foreign material has been removed from the automatic choke housing and the piston. Check the operation of the choke piston in the choke housing to make certain it has free movement.

Check the throttle shafts in the bores for excessive looseness or binding and check the throttle plates for burrs which prevent proper closure. Inspect the main body, throttle body, air horn, nozzle bars and booster venturi assemblies, choke housing and thermostatic spring housing, enrichment valve cover and accelerating pump cover for cracks.

Check metallic float(s) for leaks by holding them under water that has been heated to just below the boiling point. Bubbles will appear if there is a leak. Shake the float to check for the entry of fuel or water. If a float leaks, replace it. Replace the float if the arm needle contact surface is grooved. If the floats are serviceable, polish the needle contact surface of the arm with crocus cloth or steel wool. Replace the float shafts if they are worn. Replace all screws and nuts that have stripped threads. Replace all distorted or broken springs.

Inspect all gasket mating surfaces for nicks and burrs. Repair or replace any parts that have a damaged gasket surface.

FUEL PUMP

Clean the exterior of the fuel pump with a cloth. Inspect the fuel pump for cracks or damage. Inspect the mounting flange for distortion. Inspect the rocker arm and pin for wear, cracks or damage. Replace the pump if any of these conditions are noted.