# W14 LOADER

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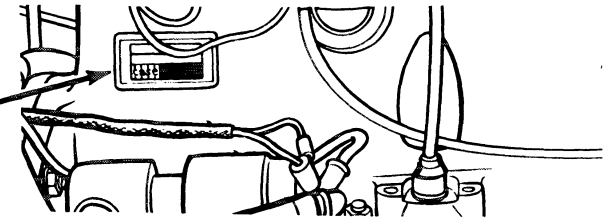
# Section 1010

## GENERAL ENGINE SPECIFICATIONS
## W14 LOADER

**THE MODEL AND ENGINE SERIAL NUMBER IS STAMPED ON A PLATE LOCATED ON THE SIDE OF THE ENGINE ABOVE THE CRANKING MOTOR.**



## DIESEL ENGINES

### General

Type ..... 4 Cylinder, 4 Stroke Cycle, Valve-in-Head
Firing Order ..... 1-3-4-2
Bore ..... 4-5/8 Inches
Stroke ..... 5 Inches
Piston Displacement ..... 336 Cubic Inches
Compression Ratio ..... 16.5 to 1
No Load Governed Speed ..... 2330 to 2370 RPM
Rated Engine Speed ..... 2200 RPM
Engine Idling Speed ..... 725 to 775 RPM
Exhaust Valve Rotators ..... Positive Type
*Valve Tappet Clearance (Exhaust) ..... (Hot) .020 Inch ..... (Cold) .025 Inch
(Intake) ..... (Hot and Cold) .015 Inch
*Hot Settings Are Made After the Engine Has Operated At Thermostat Controlled Temperature For At Least Fifteen Minutes.
Cranking Motor ..... 24 Volt Negative Ground
Thermostat Operating Range ..... 175°F. to 202°F.

### Piston and Connecting Rods

Rings per Piston ..... 3
Number of Compression Rings ..... 2
Number of Oil Rings ..... 1
Type Pins ..... Full Floating Type
Type Bearing ..... Replaceable Precision, Steel Back, Copper-Lead Alloy Liners

### Main Bearings

Number of Bearings ..... 5
Type Bearings ..... Replaceable Precision Steel Back, Copper-Lead Alloy Liners

### Engine Lubricating System

Oil Pressure ..... 45 to 60 Pounds with Engine Warm and Operating at Rated Engine Speed
Type System ..... Pressure and Spray Circulation
Oil Pump ..... Gear Type
Oil Filter ..... Full Flow Spin on Type
Engine Oil Capacity (without filter change) ..... 10 U.S. Quarts
(with filter change) ..... 11 U.S. Quarts

### Fuel System

Fuel Injection Pump ..... Robert Bosch, Type PES Multiple Plunger
Pump Timing ..... 31 Degrees Before Top Dead Center (Port Closing)
Fuel Injectors ..... Pencil Type (Opening Pressure 3200 PSI)
Fuel Transfer Pump ..... Plunger Type, Integral Part of Injection Pump
Governor ..... Variable Speed, Fly-Weight Centrifugal Type, Integral Part of Injection Pump
1st Stage Fuel Filter ..... Full Flow Spin on Type
2nd Stage Fuel Filter ..... Full Flow Spin on Type

# Section

# 1023

## SPECIFICATION DETAILS

## 336BD AND 336BDT ENGINE

Written In *Clear And Simple English*

CASE CORPORATION

Rac 9-78647

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# RUN-IN INSTRUCTIONS

## Engine Lubrication

Fill the engine crankcase with CASE HDM oil and install new engine oil filters, after an engine has been rebuilt.

**NOTE:** *Use a SERIES 3 DS or CD SERVICE CLASSIFICATION oil that has the correct viscosity rating for ambient air temperature, if CASE HDM oil is not used.*

Change the engine oil while the engine is hot and replace the engine oil filters, after the first 20 hours of operation.

Change the engine oil and filters at the given intervals, after the 20 hours, as found in the Operator's Manual.

## Run-In Procedure For Rebuilt Engines (With A Dynamometer)

The following procedure must be followed when using a PTO dynamometer to run-in the engine. The dynamometer will make sure of the control of the engine load at each speed and will remove stress on new parts during run-in.

During the run-in, continue to check the oil pressure, coolant level and coolant temperature.

| STEP | TIME | ENGINE SPEED | DYNAMOMETER SCALE LOAD* |
|---|---|---|---|
| 1 | **10 Minutes | 1000 RPM | Not Any |
| 2 | **10 Minutes | 1800 RPM | Not Any |
| 3 | 20 Minutes | 1800 RPM | 1/3 |
| 4 | 20 Minutes | 1800 RPM | 1/2 |
| 5 | ***30 Minutes | 100 RPM below rated speed | 3/4 |
| 6 | Tighten the cylinder head bolts to the torque that is found in Section 2015 of the service manual. | | |

* According to normal dynamometer scale load at rated speed for the specific vehicle model. Decrease this scale load as shown.

** The best run-in procedure will constantly change the throttle between 750 to 1000 RPM, for the first 10 minutes and from 1000 to 1800 RPM, for the next 10 minutes. The purpose of this changing RPM is to change the lubrication and coolant flow.

*** 30 minutes at 3/4 load is a minimum amount of time the engine can be run. It is best that when possible, the engine (especially a turbocharged diesel) must be run for four (4) hours or more, at the above speed and load before checking the full engine horsepower or before using the engine for heavy field work.

## Run-In Procedure For Rebuilt Engines (Without A Dynamometer)

| STEP | TIME | ENGINE SPEED | LOAD |
|---|---|---|---|
| 1 | *10 Minutes | 1000 RPM | Not Any |
| 2 | * 10 Minutes | 1800 RPM | Not Any |
| 3 | 30 Minutes | 2/3 Rated RPM | Light Load |
| 4 | 1 Hour | Full RPM (not over 2000 RPM) | 80 to 90% |
| 5 | Tighten the cylinder head bolts to the torque that is found in Section 2015 of the service manual. | | |

* If engine must then run at or near full load to operate the machine, remove the load for the first hour and run at high idle for several minutes at 15 minute intervals.

## Run-In Procedure

Keep in one gear lower than normal for the first 8 hours of field operation. DO NOT "lug" the engine for the next 12 hours. Prevent "lugging" by moving the shift lever to a lower gear. The engine must not be "lugged" below the Rated Engine RPM during the early hours of life.

# ENGINE SPECIFICATION DETAILS

## Cylinder Sleeves

| | U.S. Value | Metric Value |
|---|---|---|
| Type | Wet, Can Be Replaced | |
| Material | Cast Iron | |
| ID of Sleeve | 4.6250 to 4.6263" | 117.475 to 117.508 mm |
| Maximum Service Limit | 4.6283" | 117.5588 mm |
| Sleeve Out of Round (Installed in Block) | 0.002" | 0.0508 mm |
| Maximum Service Limit | 0.002" | 0.0508 mm |
| Taper (Installed in Block) | 0.001" | 0.0254 mm |
| Maximum Service Limit | 0.002" | 0.051 mm |
| Clearance at Bottom of Piston, 90 Degrees to Piston Pin | 0.0052 to 0.0075" | 0.1321 to 0.1905 mm |
| Maximum Service Limit | 0.0100" | 0.2540 mm |

## Piston with 1.62" (41.15 mm) Pin Bore

| | | |
|---|---|---|
| Type | Cam Ground | |
| Material | Aluminum Alloy | |
| OD At Bottom, 90 Degrees to Piston Pin | 4.6188 to 4.6198" | 117.3175 to 117.3429 mm |
| Minimum Service Limit | 4.6178" | 117.2921 mm |
| ID of Piston Pin Bore | 1.6251 to 1.6253" | 41.2775 to 41.2826 mm |
| Maximum Service Limit | 1.6258" | 41.2953 mm |
| Width of 1st Ring Groove | 0.097 to 0.098" | 2.464 to 2.489 mm |
| Maximum Service Limit | 0.0985" | 2.5019 mm |
| Width of 2nd Ring Groove | 0.097 to 0.098" | 2.464 to 2.489 mm |
| Maximum Service Limit | 0.0985" | 2.5019 mm |
| Width of 3rd Ring Groove | 0.188 to 0.189" | 4.775 to 4.801 mm |
| Maximum Service Limit | 0.190" | 4.826 mm |

## Piston with 1.80" (45.72 mm) Pin Bore

| | | |
|---|---|---|
| Type | Cam Ground | |
| Material | Aluminum Alloy | |
| OD at Bottom, 90 Degree to Piston Pin | 4.6188 to 4.6198" | 117.3175 to 117.3429 mm |
| Minimum Service Limit | 4.6178" | 117.2921 mm |
| ID of Piston Pin Bore | 1.8001 to 1.8005" | 45.7225 to 45.7327 mm |
| Maximum Service Limit | 1.8010" | 45.7454 mm |
| Width of 1st Ring Groove | Not Measureable | |
| Width of 2nd Ring Groove | Not Measureable | |
| Width of 3rd Ring Groove | 0.188 to 0.189" | 4.775 to 4.801 mm |
| Maximum Service Limit | 0.190" | 4.826 mm |

## Piston Pin for Piston with 1.62" (41.15 mm) Pin Bore

| | | |
|---|---|---|
| Type | Floats | |
| OD of Pin | 1.6244 to 1.6246" | 41.2598 to 41.2648 mm |

## Piston Pin for Piston with 1.80" (45.72 mm) Pin Bore

| | | |
|---|---|---|
| Type | Floats | |
| OD of Pin | 1.7994 to 1.7996" | 45.7048 to 45.7098 mm |

## Piston Rings

| | U.S. Value | Metric Value |
|---|---|---|
| Number One Compression (Top) | Square Type with Chrome Face | |
| End Gap in 4.625" (117.475 mm) ID Sleeve | 0.015 to 0.025" | 0.381 to 0.635 mm |
| Maximum Service Limit | 0.030" | 0.762 mm |
| Side Clearance | 0.0035 to 0.0050" | 0.0889 to 0.127 mm |
| Maximum Service Limit | 0.006" | 0.152 mm |
| Number One Compression (Top) | Keystone Type | |
| End Gap in 4.625" (117.475 mm) ID Sleeve | 0.015 to 0.025" | 0.381 to 0.635 mm |
| Maximum Service Limit | 0.030" | 0.762 mm |
| Side Clearance | Not Measureable | |
| Number Two Compression (Intermediate) | Square Type with Tapered Face | |
| End Gap in 4.625" (117.475 mm) ID Sleeve | 0.013 to 0.023" | 0.330 to 0.584 mm |
| Maximum Service Limit | 0.028" | 0.711 mm |
| Side Clearance | 0.003 to 0.005" | 0.076 to 0.127 mm |
| Maximum Service Limit | 0.006" | 0.152 mm |
| Number Two Compression (Intermediate) | Keystone Type | |
| End Gap in 4.625" (117.475 mm) ID Sleeve | 0.015 to 0.025" | 0.381 to 0.635 mm |
| Maximum Service Limit | 0.030" | 0.762 mm |
| Side Clearance | Not Measureable | |
| Number Three Oil Control Ring (Bottom) | Two Piece | |
| Width | 0.1860 to 0.1865" | 4.7244 to 4.7371 mm |
| End Gap in 4.625" (117.475 mm) ID Sleeve | 0.016 to 0.026" | 0.406 to 0.660 mm |
| Maximum Service Limit | 0.031" | 0.787 mm |
| Side Clearance | 0.0015 to 0.003" | 0.0381 to 0.0762 mm |
| Maximum Service Limit | 0.0035" | 0.0889 mm |

## Connecting Rod for Piston with 1.62" (41.15 mm) Pin Bore

| | | |
|---|---|---|
| Bushing | Replaceable | |
| Bushing ID, Installed (Ream to Size) | 1.6254 to 1.6258" | 41.2852 to 41.2953 mm |
| Maximum Service Limit | 1.6265" | 41.3131 mm |
| Bearing Liners | Replaceable | |
| Bearing Liner Width | 1.586 to 1.596" | 40.284 to 40.538 mm |
| Bore ID without Bearing Liners | 2.9003 to 2.9013" | 73.6676 to 73.6930 mm |
| Bearing Oil Clearance | 0.0013 to 0.0038" | 0.0330 to 0.0965 mm |
| Maximum Service Limit | 0.0043" | 0.1092 mm |
| Undersize Bearings for Service | 0.002, 0.010, 0.020, 0.030" | 0.051, 0.254, 0.508, 0.762 mm |
| Side Clearance | 0.007 to 0.016" | 0.178 to 0.406 mm |

## Connecting Rod for Piston with 1.80" (45.72 mm) Pin Bore

| | | |
|---|---|---|
| Bushing | Replaceable | |
| Bushing ID, Installed (Ream to Size) | 1.8004 to 1.8008" | 45.7302 to 45.7403 mm |
| Maximum Service Limit | 1.8015" | 45.7581 mm |
| Bearing Liners | Replaceable | |
| Bearing Liner Width | 1.586 to 1.596" | 40.284 to 40.538 mm |
| Bore ID without Bearing Liners | 3.1503 to 3.1513" | 80.0176 to 80.043 mm |
| Bearing Oil Clearance | 0.0013 to 0.0038" | 0.0330 to 0.0965 mm |
| Maximum Service Limit | 0.0043" | 0.1092 mm |
| Undersize Bearings for Service | 0.002, 0.010, 0.020, 0.030" | 0.051, 0.254, 0.508, 0.762 mm |
| Side Clearance | 0.007 to 0.016" | 0.178 to 0.406 mm |

## Crankshaft with 3" (76.2 mm) Main Bearing Journals

| | U.S. Value | Metric Value |
|---|---|---|
| Type | Forged, Heat Treated and Balanced | |
| End Play, Number Five Main Bearing Cap | 0.003 to 0.015" | 0.076 to 0.381 mm |
| Thrust Bearing, Standard Thickness | 0.184 to 0.186" | 4.674 to 4.724 mm |
| Thrust Bearing, Oversize Thickness for Service | 0.190 to 0.192" | 4.826 to 4.877 mm |
| Connecting Rod Journal Width | 1.9975 to 2.0025" | 50.7365 to 50.8635 mm |
| Connecting Rod Journal, Standard OD | 2.748 to 2.749" | 69.799 to 69.825 mm |
| 0.010" (0.254 mm) OD Undersize, Grind to | 2.738 to 2.739" | 69.545 to 69.571 mm |
| 0.020" (0.508 mm) OD Undersize, Grind to | 2.728 to 2.729" | 69.291 to 69.317 mm |
| 0.030" (0.762 mm) OD Undersize, Grind to | 2.718 to 2.719" | 69.037 to 69.063 mm |
| Connecting Rod Journal Maximum Taper | 0.0005" | 0.0127 mm |
| Connecting Rod Journals Out of Round | 0.0005" | 0.0127 mm |
| Main Bearing Liners | Replaceable | |
| Main Bearing Liner Width, 1st, 3rd and 5th | 2.1515 to 2.1615" | 54.6481 to 54.9021 mm |
| Main Bearing Liner Width, 2nd and 4th | 1.151 to 1.161" | 29.235 to 29.489 mm |
| Main Bearing Oil Clearance | 0.0016 to 0.0046" | 0.0406 to 0.1168 mm |
| Maximum Service Limit | 0.005" | 0.127 mm |
| Undersize Main Bearing Liners for Service | 0.002, 0.010, 0.020, 0.030" | 0.051, 0.254, 0.508, 0.762 mm |
| Main Bearing Journal, Standard OD | 2.998 to 2.999" | 76.149 to 76.175 mm |
| 0.010" (0.254 mm) OD Undersize, Grind to | 2.988 to 2.989" | 75.895 to 75.921 mm |
| 0.020" (0.508 mm) OD Undersize, Grind to | 2.978 to 2.979" | 75.641 to 75.667 mm |
| 0.030" (0.762 mm) OD Undersize, Grind to | 2.968 to 2.969" | 75.387 to 75.413 mm |
| Main Bearing Journal Bore ID without Liners | 3.191 to 3.192" | 81.051 to 81.077 mm |
| Main Bearing Journal Width | | |
| 2nd and 4th | 1.555 to 1.570" | 39.497 to 39.878 mm |
| 3rd | 2.623 to 2.627" | 66.624 to 66.726 mm |
| 5th | 2.6175 to 2.6325" | 66.4845 to 66.8655 mm |

## Crankshaft with 3.5" (88.9 mm) Main Bearing Journals

| | | |
|---|---|---|
| Type | Forged, Heat Treated and Balanced | |
| End Play, Number Three Main Bearing Cap | 0.003 to 0.015" | 0.076 to 0.381 mm |
| Thrust Bearing, Standard Thickness | 0.155 to 0.157" | 3.937 to 3.988 mm |
| Thrust Bearing, Oversize Thickness for Service | 0.161 to 0.163" | 4.089 to 4.140 mm |
| Connecting Rod Journal Width | 1.9775 to 2.0025" | 50.2285 to 50.8635 mm |
| Connecting Rod Journal, Standard OD | 2.998 to 2.999" | 76.149 to 76.175 mm |
| 0.010" (0.254 mm) OD Undersize, Grind to | 2.988 to 2.989" | 75.895 to 75.921 mm |
| 0.020" (0.508 mm) OD Undersize, Grind to | 2.978 to 2.979" | 75.641 to 75.667 mm |
| 0.030" (0.762 mm) OD Undersize, Grind to | 2.968 to 2.969" | 75.387 to 75.413 mm |
| Connecting Rod Journal Maximum Taper | 0.0005" | 0.0127 mm |
| Connecting Rod Journals Out of Round | 0.0005" | 0.0127 mm |
| Main Bearing Liners | Replaceable | |
| Main Bearing Liner Width, 1st, 3rd and 5th | 2.1515 to 2.1615" | 54.6481 to 54.9021 mm |
| Main Bearing Liner Width, 2nd and 4th | 1.214 to 1.224" | 30.836 to 31.089 mm |
| Main Bearing Oil Clearance | 0.0016 to 0.0046" | 0.0406 to 0.1168 mm |
| Maximum Service Limit | 0.005" | 0.127 mm |
| Undersize Main Bearing Liners for Service | 0.002, 0.010, 0.020, 0.030" | 0.051, 0.254, 0.508, 0.762 mm |

## Crankshaft With 3.5" (88.9 mm) Main Bearing Journals (Continued)

| | U.S. Value | Metric Value |
|---|---|---|
| Main Bearing Journal, Standard OD | 3.498 to 3.499" | 88.849 to 88.875 mm |
| 0.010" (0.254 mm) OD Undersize, Grind to | 3.488 to 3.489" | 88.595 to 88.621 mm |
| 0.020" (0.508 mm) OD Undersize, Grind to | 3.478 to 3.479" | 88.341 to 88.367 mm |
| 0.030" (0.762 mm) OD Undersize, Grind to | 3.468 to 3.469" | 88.087 to 88.113 mm |
| Main Bearing Journal Bore ID without Liners | 3.691 to 3.692" | 93.751 to 93.777 mm |
| Main Bearing Journal Width | | |
| 2nd and 4th | 1.618 to 1.633" | 41.097 to 41.478 mm |
| 3rd | 2.561 to 2.565" | 65.049 to 65.151 mm |
| 5th | 2.5855 to 2.6005" | 65.6717 to 66.0527 mm |

## Camshaft

| | | |
|---|---|---|
| Type | Parabolic | |
| Bushing | Four, Replaceable | |
| Bushing Lubrication | Under Pressure | |
| ID of Bushing | 2.2484 to 2.2514" | 57.1094 to 57.1856 mm |
| Maximum Service Limit | 2.2524" | 57.2110 mm |
| Bushing Width | | |
| 1st (Front) | 1.646 to 1.666" | 41.808 to 42.316 mm |
| 2nd and 3rd | 1.4275 to 1.4475" | 36.2585 to 36.7665 mm |
| 4th | 1.1462 to 1.1662" | 29.1135 to 29.6215 mm |
| OD of Each Bearing Surface | 2.2460 to 2.2470" | 57.0484 to 57.0738 mm |
| Minimum Service Limit | 2.2455" | 57.0357 mm |
| Thrust Washer Thickness | 0.1225 to 0.1275" | 3.1115 to 3.2385 mm |
| Minimum Service Limit | 0.1215" | 3.0861 mm |
| Thrust Plunger Spring | | |
| Free Length | 3.625" | 92.075 mm |
| OD of Spring | 0.3912 to 0.4062" | 9.9365 to 10.3175 mm |
| Compress to 2.750" (69.85 mm) | 45 to 55 lbs. | 200 to 245 N |

## Valve Push Rod Lifters

| | | |
|---|---|---|
| OD of Lifter Stem, Standard | 0.8097 to 0.8102" | 20.5664 to 20.5791 mm |
| OD of Lifter Stem, Oversize for Service | 0.8190 to 0.8195" | 20.8026 to 20.8153 mm |
| ID of Block Bore, Standard | 0.8118 to 0.8130" | 20.6197 to 20.6502 mm |
| Maximum Service Limit | 0.8135" | 20.6629 mm |
| ID of Block Bore, Oversize for Service | 0.8215 to 0.8225" | 20.8661 to 20.8915 mm |

## Gear Train

| | U.S. Value | Metric Value |
|---|---|---|
| Backlash | | |
| Crankshaft Gear to Camshaft Gear | 0.004 to 0.011" | 0.102 to 0.279 mm |
| Idler Drive Gear to Idler Gear | 0.003 to 0.010" | 0.076 to 0.254 mm |
| Idler Gear to Fuel Pump Gear | 0.004 to 0.012" | 0.102 to 0.305 mm |
| Crankshaft Gear to Oil Pump Gear | 0.006 to 0.011" | 0.152 to 0.279 mm |
| Crankshaft Gear to Fuel Pump Gear | 0.027" Max. | 0.686 mm Max. |
| OD of Idler Gear Shaft | 1.7325 to 1.7330" | 44.0055 to 44.0182 mm |
| ID of Idler Gear Bushing | 1.7345 to 1.7355" | 44.0563 to 44.0817 mm |
| Maximum Service Limit | 1.7375" | 44.1325 mm |
| Idler Gear Thrust Washer Thickness | 0.061 to 0.063" | 1.5494 to 1.6002 mm |
| Idler Gear Lateral Movement | 0.002 to 0.012" | 0.051 to 0.305 mm |

## Oil Pump and Two Gear Balancer

| | | |
|---|---|---|
| Positive Displacement Pump | Gear Type | |
| Pump Gears to Cover Clearance | 0.005 max. | 0.127 mm max. |
| Pump Gear to Housing - Radial Clearance | 0.006" max. | 0.152 mm max. |
| Backlash | | |
| Crankshaft Gear to Counterweight Gear | 0.008 to 0.013" | 0.203 to 0.330 mm |
| Counterweight Gear to Counterweight Gear | 0.003 to 0.024" | 0.076 to 0.610 mm |
| Relief Valve Spring | | |
| Free Length | 2.000" | 50.800 mm |
| Wire Diameter | 0.080" | 2.032 mm |
| Maximum OD of Spring | 0.673" | 17.094 mm |
| Number of Coils | 11 | 11 |
| Compress to 1.234" (31.344 mm) | 24.4 to 26.2 lbs. | 108 to 116 N |

## Oil Pump and Three Gear Balancer

| | | |
|---|---|---|
| Positive Displacement Pump | Gear Type | |
| Pump Gears to Cover Clearance | 0.005" max. | 0127 mm max. |
| Backlash | | |
| Crankshaft Gear to Counterweight Gear | 0.008 to 0.013" | 0.203 to 0.330 mm |
| Counterweight Gear to Counterweight Gear | 0.005 to 0.013" | 0.127 to 0.330 mm |
| Counterweight Gear and Drive Gear Bushing Wear | 0.007 max. | 0.178 mm max. |
| Relief Valve Spring | | |
| Free Length | 3.00" | 76.20 mm |
| Wire Diameter | 0.062" | 1.575 mm |
| OD of Spring | 0.515" | 13.081 mm |
| Number of Coils | 25 | 25 |
| Compress to 1.68" (42.67 mm) | 13.5 to 15.5 lbs. | 60 to 69 N |

# Oil Pump, Front Mount

| | U.S. Value | Metric Value |
|---|---|---|
| Positive Displacement Pump | Gear Type | |
| Backlash | | |
| Pump Gear To Crankshaft Gear | 0.006 to 0.011" | 0.152 to 0.279 mm |
| Pump Gears to Body Radial Clearance | 0.006" max. | 0.152 mm max. |
| Pump Gears to Pump Cover Clearance | 0.005" max. | 0.127 mm max. |
| Oil Pressure at Rated Speed, Hot Oil | 45 to 60 PSI | 310 to 413 kPa |
| Relief Valve Spring - Inner | | |
| Number of Coils | 14.5 | 14.5 |
| Direction of Coils | L.H. | L.H. |
| Wire Diameter | 0.063" | 1.600 mm |
| Maximum OD | 0.454" | 11.532 mm |
| Free Length | 1.750" | 44.450 mm |
| Compress to 1.234 (31.344) | 16.4 to 17.6 lbs. | 73 to 78 N |
| Relief Valve Spring - Outer (Also For Pumps With One Spring) | | |
| Number of Coils | 11 | 11 |
| Direction of Coils | RH | RH |
| Wire Diameter | 0.080" | 2.032 mm |
| Minimum ID | 0.493" | 12.522 mm |
| Maximum OD | 0.673" | 17.094 mm |
| Free Length | 2.000" | 50.800 mm |
| Compress to 1.234 (31.344) | 24.4 to 26.2 lbs. | 108 to 116 N |
| Relief Valve Cup Plug Depth | 0.375" | 9.525 mm |

## Cylinder Head

| | U.S. Value | Metric Value |
|---|---|---|
| Warpage | 0.005" | 0.127 mm |

## Exhaust Valve

| | | |
|---|---|---|
| Tappet Clearance | 0.025" | 0.635 mm |
| Face Angle | 44 Degrees | 44 Degrees |
| Face Run-Out | 0.002" max. | 0.051 mm |
| OD of Head | 1.745 to 1.755" | 44.323 to 44.577 mm |
| OD of Stem | 0.402 to 0.403" | 10.211 to 10.236 mm |
| Minimum Service Limit | 0.4018" | 10.2057 mm |
| OD of Taper at 4.2675" (108.3945 mm) | 0.401 to 0.402" | 10.185 to 10.211 mm |
| Minimum Service Limit | 0.4008" | 10.1803 mm |
| Length | 6.4195 to 6.4405" | 163.0553 to 163.5887 mm |
| Insert Seat Angle | 45 Degrees | 45 Degrees |
| Seat Contact Width | 0.0800 to 0.1000" | 2.0320 to 2.5400 mm |
| Seat Run-Out | 0.002" | 0.051 mm |
| Insert Height | 0.3115 to 0.3175" | 7.9121 to 8.0645 mm |
| OD of Insert | 1.9455 to 1.9465" | 49.4157 to 49.4411 mm |
| ID of Insert | 1.569 to 1.579" | 39.853 to 40.107 mm |

## Intake Valve - 45 Degree

| | | |
|---|---|---|
| Tappet Clearance | 0.015" | 0.381 mm |
| Face Angle | 44 Degrees | 44 Degrees |
| Face Run-Out | 0.002" max. | 0.051 mm |
| OD of Stem | 0.402 to 0.403" | 10.211 to 10.236 mm |
| Minimum Service Limit | 0.4018" | 10.2057 mm |
| OD of Head | 1.995 to 2.005" | 50.673 to 50.927 mm |
| Length | 6.4195 to 6.4405" | 163.0553 to 163.5887 mm |
| Seat Angle | 45 Degrees | 45 Degrees |
| Seat Contact Width | 0.0775 to 0.0975" | 1.9685 to 2.4765 mm |
| Seat Run-Out | 0.002" max. | 0.051 mm |

## Intake Valve - 30 Degree

| | | |
|---|---|---|
| Tappet Clearance | 0.015" | 0.381 mm |
| Face Angle | 29 Degrees | 29 Degrees |
| Face Run-Out | 0.002" max. | 0.051 mm |
| OD of Stem | 0.402 to 0.403" | 10.211 to 10.236 mm |
| Minimum Service Limit | 0.4018" | 10.2057 mm |
| OD of Head | 1.995 to 2.005" | 50.673 to 50.927 mm |
| Length | 6.4195 to 6.4405" | 163.0553 to 163.5887 mm |
| Seat Angle | 30 Degrees | 30 Degrees |
| Seat Contact Width | 0.075 to 0.1.000" | 1.905 to 2.540 mm |
| Seat Run-Out | 0.002" max. | 0.051 mm max. |
| Insert Height (If Equipped) | 0.2660 to 0.2670 | 6.7564 to 6.7818 mm |
| OD of Insert (If Equipped) | 2.099 to 2.100" | 53.315 to 53.340 mm |
| ID of Insert (If Equipped) | 1.777 to 1.787" | 45.136 to 45.390 mm |

## Intake and Exhaust Valve Guides

| | U.S. Value | Metric Value |
|---|---|---|
| Length | 3.219" | 81.763 mm |
| OD of Guide | 0.7510 to 0.7515" | 19.075 to 19.088 mm |
| ID of Guide (Installed and Reamed) | 0.4045 to 0.4055" | 10.2743 to 10.2997 mm |
| Maximum Service Limit | 0.4065" | 10.3251 mm |
| Protrusion Above Cylinder Head | 0.953" | 24.206 mm |

## Valve Spring

| | | |
|---|---|---|
| Free Length | 2.18" | 55.372 mm |
| Number of Coils | 7-1/4 | 7-1/4 |
| Wire Diameter | 0.192" | 4.877 mm |
| Compress Spring to 1.484" (37.694 mm), Valve Open | 153 to 167 lbs. | 681 to 743 N |
| Compress Spring to 1.937" (49.200 mm), Valve Closed | 50.5 to 60.5 lbs. | 225 to 269 N |

## Rocker Arm Assembly

| | | |
|---|---|---|
| OD of Shaft | 0.860 to 0.866" | 21.844 to 21.996 mm |
| ID of Arm Bore | 0.8745 to 0.8755" | 22.2123 to 22.2377 mm |
| Shaft Assembly Lateral Movement (Both Ends) | 0.010" to 0.030" | 0.254 to 0.762 mm |
| Shaft Spring | | |
| Number of Working Coils | 4 | 4 |
| Wire Diameter | 0.080" | 2.032 mm |
| Compress Spring to 1.562" (39.675 mm) | 8.5 to 11.5 lbs. | 38 to 51 N |
| Lubrication | Engine Oil, Camshaft Metering | |
| Shaft Oil Holes | Toward Valve Side of Engine | |
| | Shaft Can Not Be Turned | |

## Intake Valve Timing

Valve Timing ..... With the Number One Intake Valve to Rocker Arm Clearance Set at 0.015" (0.381 mm) and the Dial Indicator on the Number One Valve Retainer, 0.053" (1.346 mm) Movement of the Valve From the Seat (Clockwise Pulley Rotation) Will Give 7 Degrees After Top Center Timing Indication on the Crank Pulley.

# Section 2001

## ENGINE DIAGNOSIS

CASE CORPORATION

Rac. 9-76365

PRINTED IN U.S.A

# GENERAL INFORMATION

Before making any repairs or adjustments on an engine, a mechanic or technician must properly diagnose the trouble.

Locating the trouble and repairing it is only part of the job, a technician must find and eliminate the cause of the trouble as well. Too many repairs are made with no thought to removing the causes that made the repair necessary.

For any engine to start or perform properly, three main requirements must be present.

1. FUEL
2. COMPRESSION
3. IGNITION

When any of these requirements are not present or limited by some mechanical reason the engine will not start or fails to operate properly throughout the power range.

1. FUEL. Fuel system problems can be present anywhere from the fuel tank, through the filters and injection pump as well as the injectors. Correct injection pump timing is important in the overall fuel system performance.

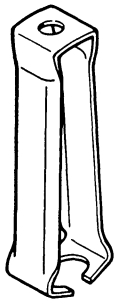
2. COMPRESSION. Compression on an engine is related to the "breathing function". Proper compression is affected by the air cleaner condition, muffler restriction, valve condition and operation including proper valve adjustment, cylinder head gaskets condition of sleeves, rings, pistons, camshaft, and camshaft timing.

3. IGNITION. Ignition is the result of adequate compression to develop enough heat in the air charge on the compression stroke to fire the fuel being injected into the engine cylinders. Proper spray pattern and atomization of the fuel by the injector is very important. Timing the fuel injection pump to the engine to a precise degree BTDC is a vital requirement for proper ignition.

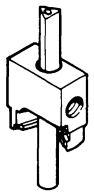
The engine diagnosis contained in the following pages covers many trouble symptoms, the causes, and what will be necessary to repair or eliminate the problem. Under each symptom are listed the most common and reoccuring problems progressively to the not so common problems. Locate your problem symptom in the diagnosis chart and refer to the pages listed for the probable causes and remedies.

# INSTALLATION INSTRUCTIONS FOR M20614 TEFLON VALVE SEAL KIT

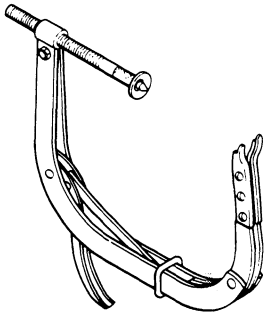
## Special Tools Required



M20624 SEAL INSTALLATION TOOL



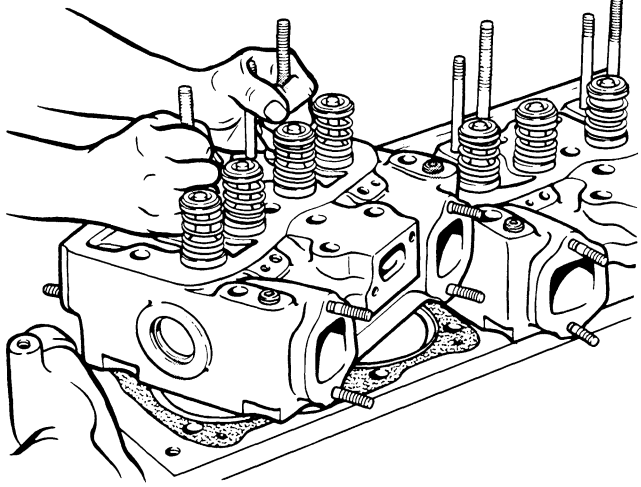
M20617 VALVE GUIDE CUTTING TOOL



VALVE SPRING COMPRESSOR

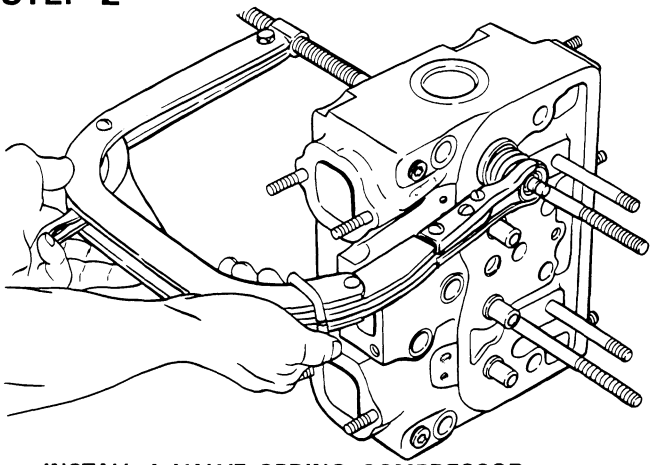
NOTE: FOUR CYLINDER ENGINES REQUIRE TWO M20614 KITS AND SIX CYLINDER ENGINES REQUIRE THREE M20614 KITS.

### STEP 1



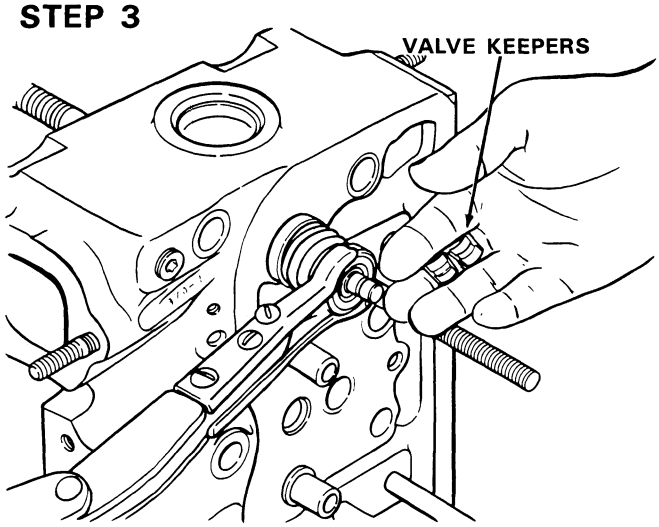
REMOVE THE CYLINDER HEADS FROM THE ENGINE, REFER TO SECTION 2015 FOR HEAD REMOVAL.

### STEP 2



INSTALL A VALVE SPRING COMPRESSOR.

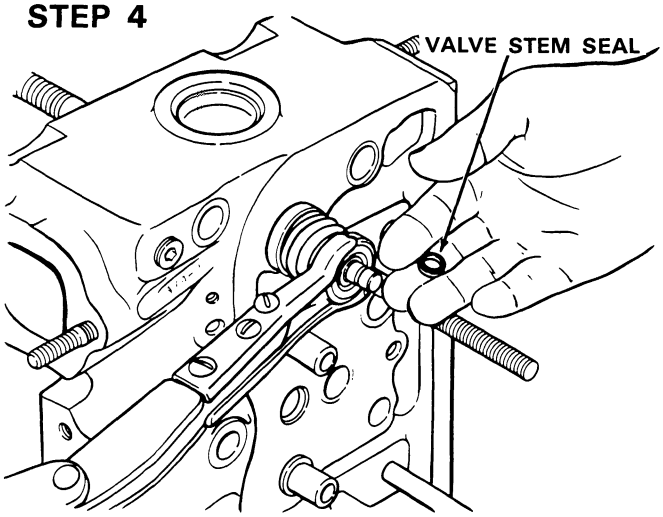
### STEP 3




COMPRESS VALVE SPRING AND REMOVE VALVE KEEPERS.

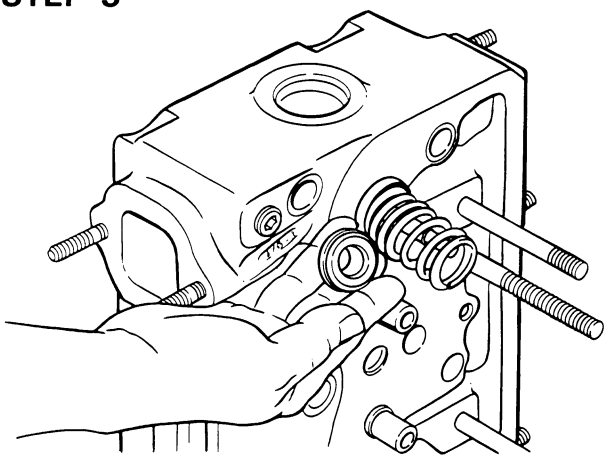
IMPORTANT: VALVES, VALVE RETAINERS OR ROTATORS AND VALVE KEEPERS SHOULD BE MARKED WHEN REMOVED, TO INSURE THAT THEY WILL BE REINSTALLED IN THEIR ORIGINAL LOCATION.

### STEP 4



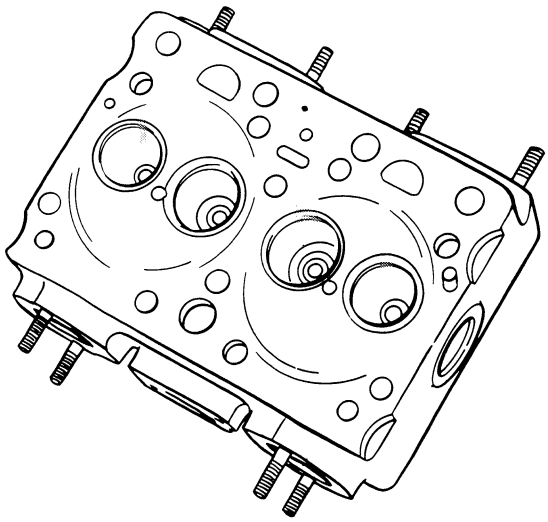

REMOVE VALVE STEM SEAL.

## STEP 5



REMOVE VALVE ROTATORS OR SPRING RETAINERS, SPRINGS, SPRING SEATS AND VALVES.

## STEP 6

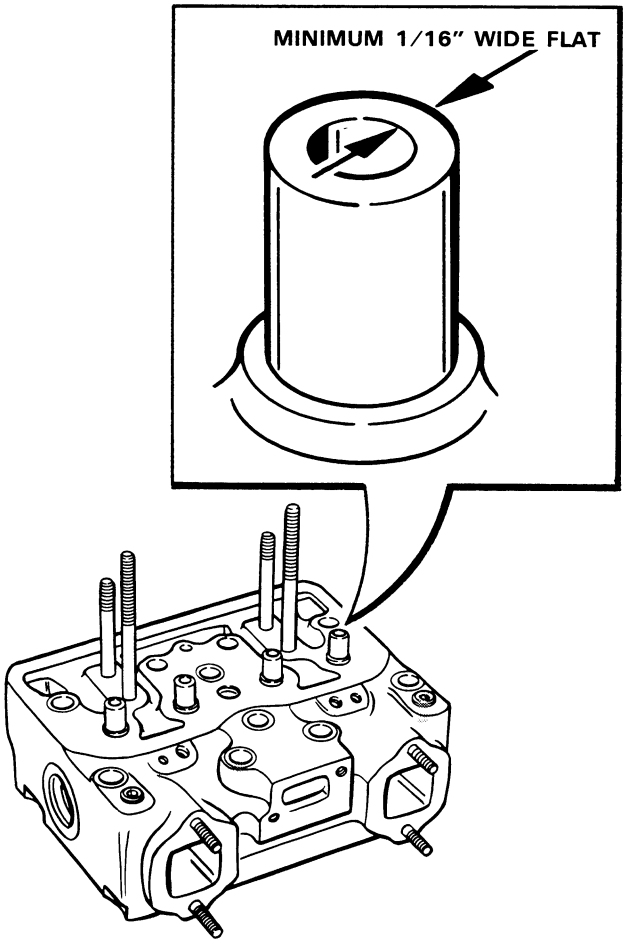


CLEAN CYLINDER HEAD COMPLETELY, REMOVING ALL TRACES OF CARBON AND OTHER DEPOSITS.

## STEP 7

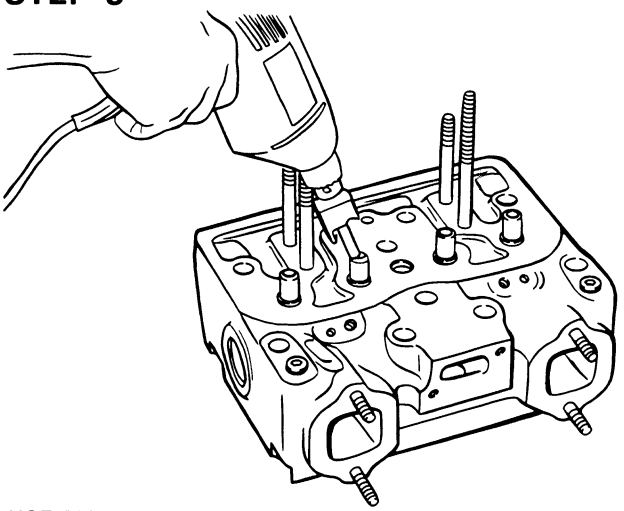
CLEAN VALVES WITH A FINE POWER DRIVEN WIRE BRUSH, REMOVING ALL CARBON AND VARNISH DEPOSITS. BE CAREFUL NOT TO SCRATCH VALVE STEMS.

## STEP 8



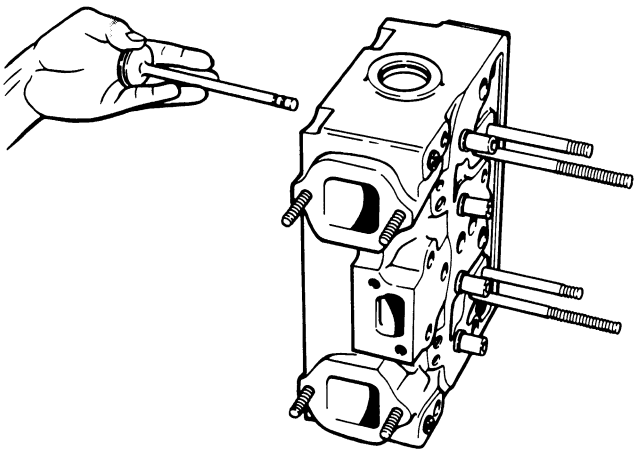

CHECK VALVE GUIDE TOP SURFACE, THERE MUST BE A MINIMUM OF A 1/16" WIDE FLAT AROUND ENTIRE TOP SURFACE.

## STEP 9



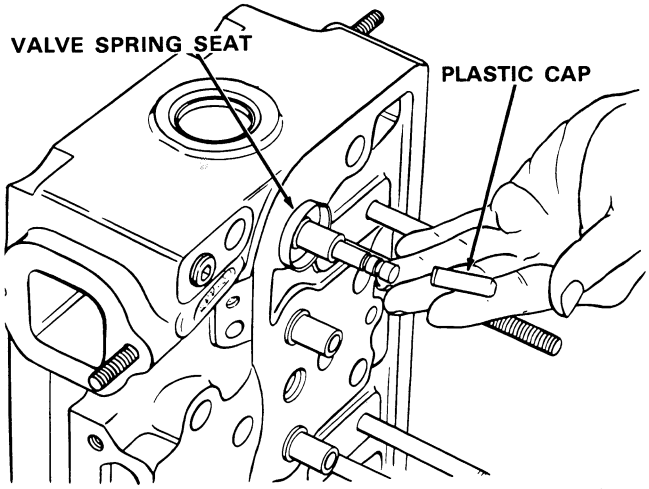
USE M20617 TOOL IN A ELECTRIC DRILL (IF REQUIRED) TO PROVIDE NECESSARY FLAT AREA ON VALVE GUIDE. IMPORTANT: DO NOT EXCEED 450 RPM WHEN DRILLING

## STEP 10



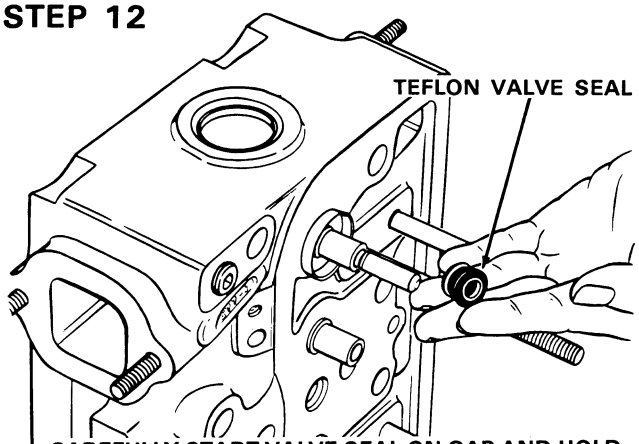
LUBRICATE VALVES WITH CLEAN ENGINE OIL BEFORE REINSTALLING INTO CYLINDER HEAD.

## STEP 11



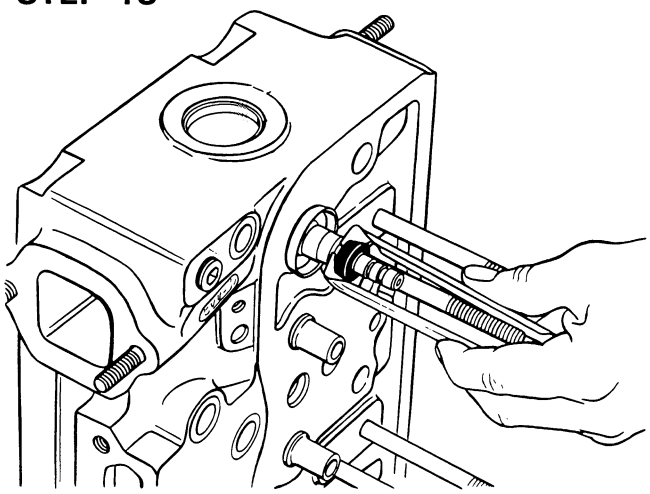

PLACE PLASTIC INSTALLATION CAP, PROVIDED IN KIT, ON THE END OF THE VALVE STEM. NOTE: CAP PREVENTS SHARP EDGES ON VALVE STEM GROOVES FROM CUTTING VALVE SEAL.

## STEP 12



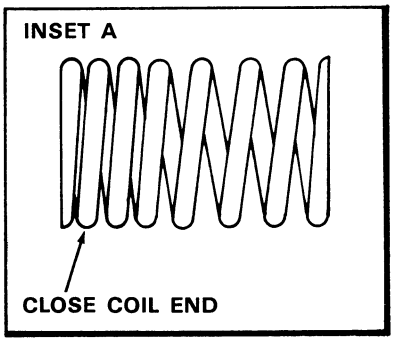

CAREFULLY START VALVE SEAL ON CAP AND HOLD THUMBS AGAINST WHITE SEAL INSERT TO AVOID DISLODGING IT, PUSH SEAL DOWN UNTIL SEAL JACKET TOUCHES TOP OF VALVE GUIDE. REMOVE INSTALLATION CAP AND SAVE, SINCE IT MUST BE REUSED.

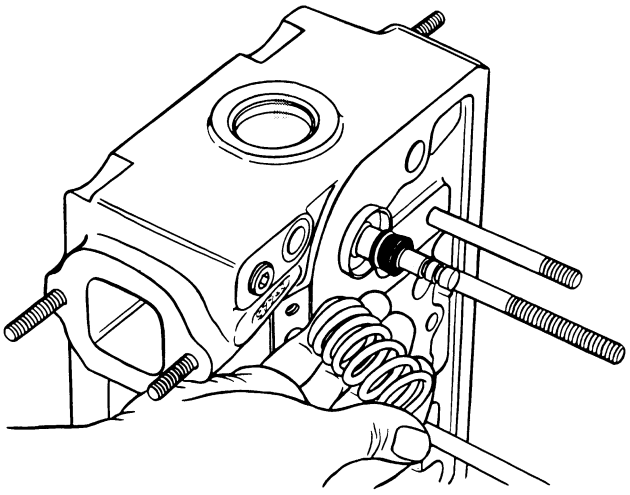
## STEP 13



USE M20624 TOOL AND PRESS SEAL DOWN OVER VALVE GUIDE UNTIL SEAL IS FLUSH WITH TOP OF GUIDE.

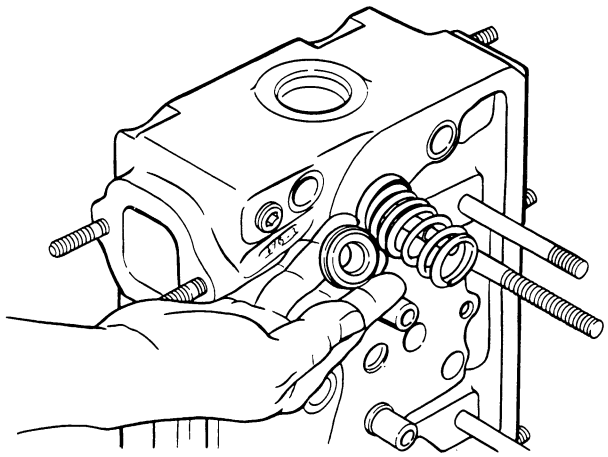
## STEP 14



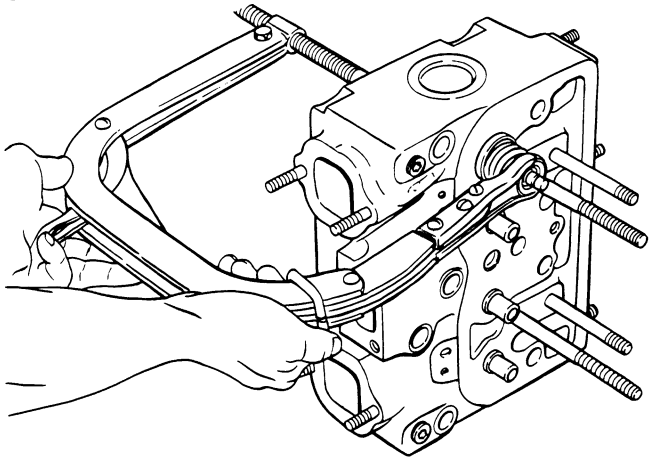
INSTALL THE VALVE SPRING. IMPORTANT: THE CLOSE COIL END OF THE SPRING MUST BE INSTALLED TOWARDS THE CYLINDER HEAD, SEE INSET A.

## STEP 15



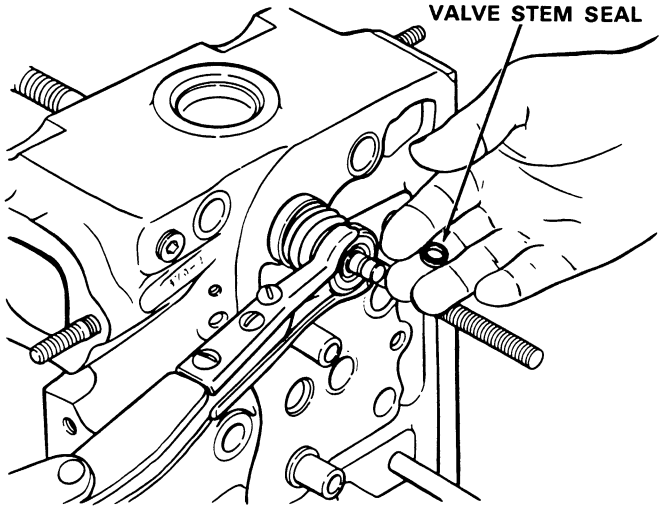
INSTALL VALVE ROTATORS OR SPRING RETAINERS. IMPORTANT: ASSEMBLE VALVE ROTATORS WITH THEIR ORIGINAL VALVES SINCE THEY TEND TO WEAR IN AS A MATCHED SET.

## STEP 16



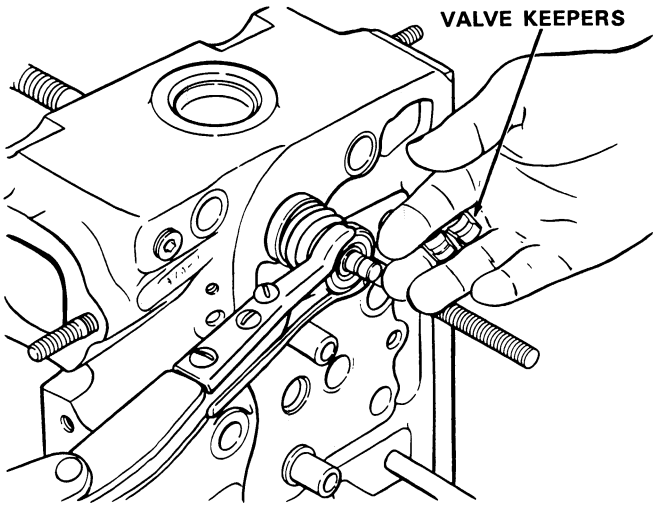
INSTALL VALVE SPRING COMPRESSOR.

## STEP 17



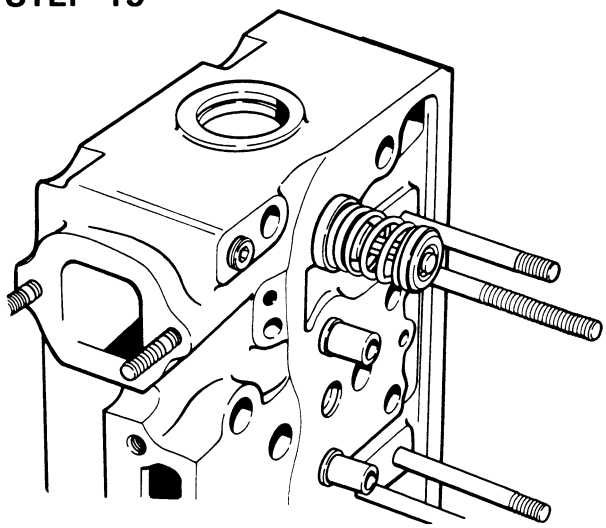

INSTALL STEM SEAL IN LOWER VALVE STEM GROOVE.

## STEP 18



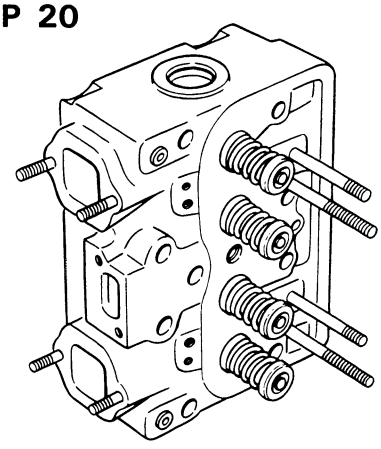

INSTALL VALVE KEEPERS IN OUTER VALVE STEM GROOVE.

## STEP 19



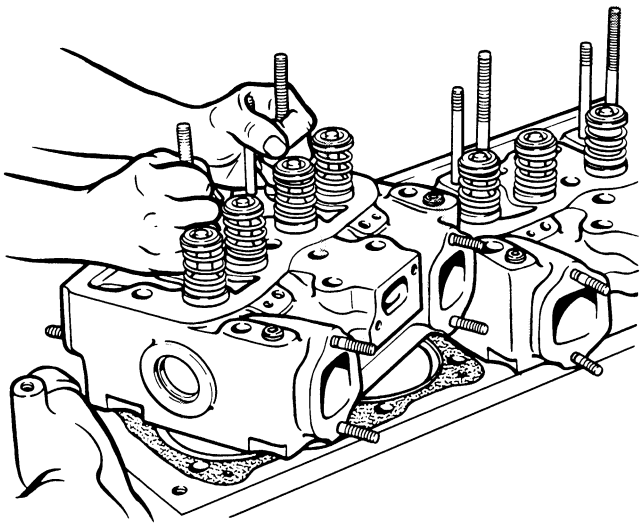
REMOVE SPRING COMPRESSOR AND TAP VALVE STEM END TO SEAT KEEPERS.

## STEP 20



INSTALL TEFLON SEALS ON THE OTHER INTAKE AND EXHAUST VALVES, FOLLOWING THE PRECEDING PROCEDURE.

## STEP 21



**REINSTALL CYLINDER HEAD ON ENGINE FOLLOWING PROCEDURE OUTLINED IN SECTION 2015.**

# Section 2002

## ENGINE TUNE-UP

Rac. 9-76379

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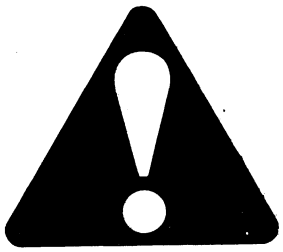
CASE CORPORATION

# ENGINE TUNEUP

A COMPLETE ENGINE TUNEUP INCLUDES THE PERFORMING OF THE FOLLOWING ITEMS:

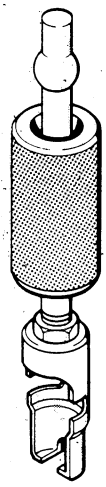




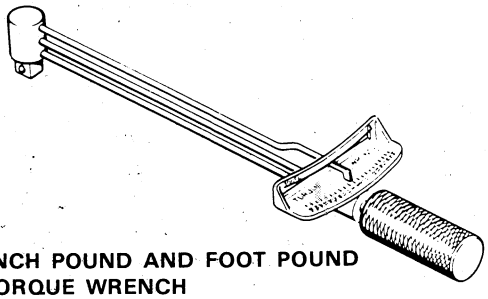
**THIS SAFETY ALERT SYMBOL INDICATES IMPORTANT SAFETY MESSAGES IN THIS MANUAL. WHEN YOU SEE THIS SYMBOL, CAREFULLY READ THE MESSAGE THAT FOLLOWS AND BE ALERT TO THE POSSIBILITY OF PERSONAL INJURY.**

# SPECIAL TOOLS

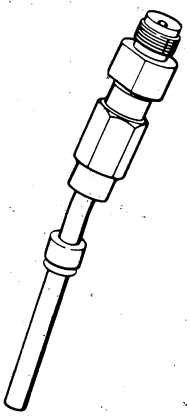
A43277 INJECTOR
BORE CLEANER
(CLAMP TYPE INJECTOR)



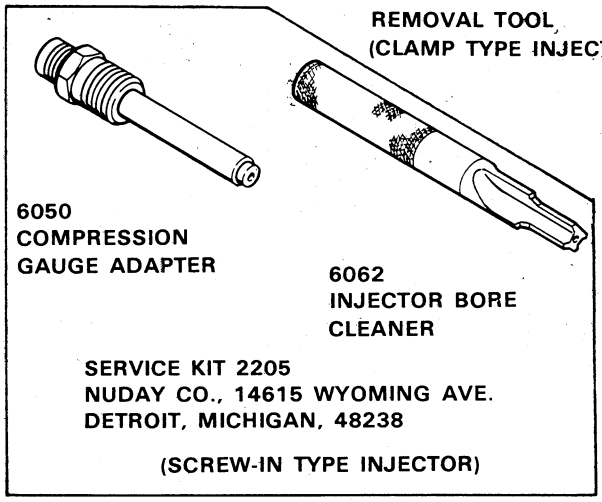
A43278 INJECTOR
REMOVAL TOOL
(CLAMP TYPE INJECTOR)



INCH POUND AND FOOT POUND
TORQUE WRENCH



COMPRESSION GAUGE
ADAPTER
BACHARACH 70-314
(D-558)
(CLAMP TYPE INJECTOR)

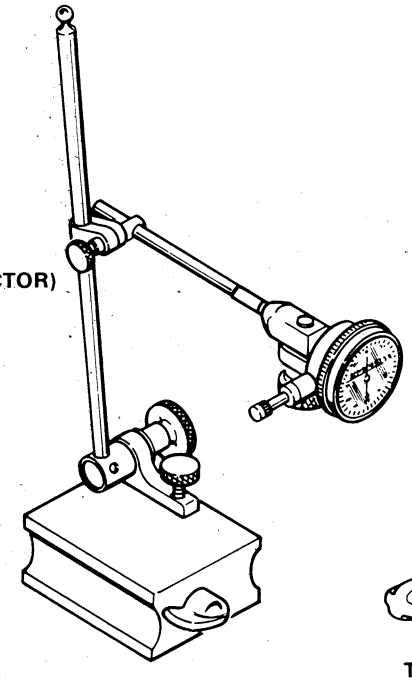


6050
COMPRESSION
GAUGE ADAPTER

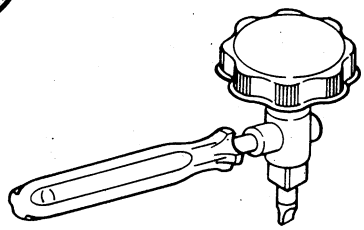
6062
INJECTOR BORE
CLEANER

SERVICE KIT 2205
NUDAY CO., 14615 WYOMING AVE.
DETROIT, MICHIGAN, 48238

(SCREW-IN TYPE INJECTOR)



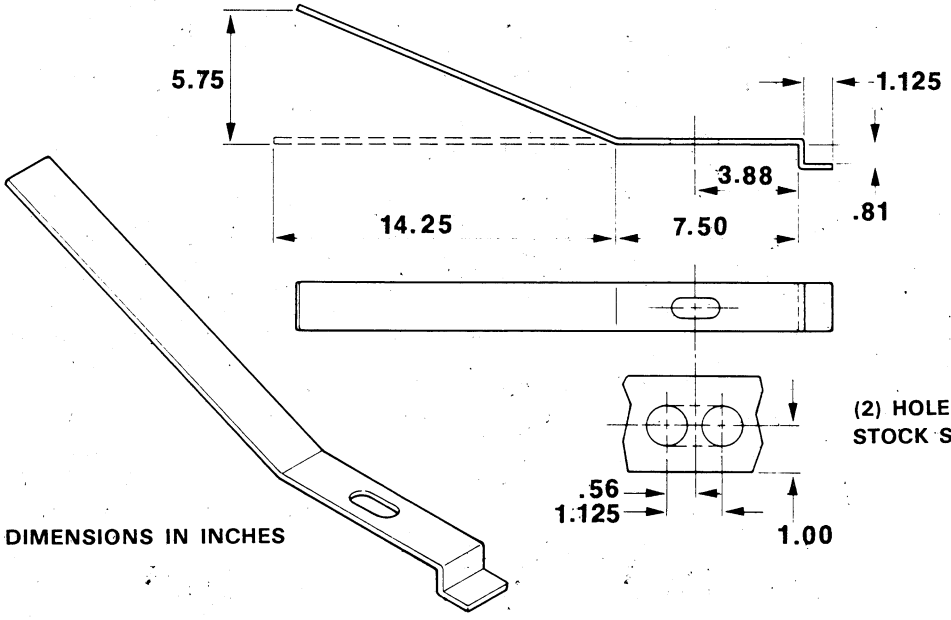
DIAL INDICATOR



TAPPET ADJUSTMENT TOOL

# SPECIFICATIONS FOR TOOLS WHICH MUST BE MADE

## Valve Spring Compressor Tool




NOTE: ALL DIMENSIONS IN INCHES

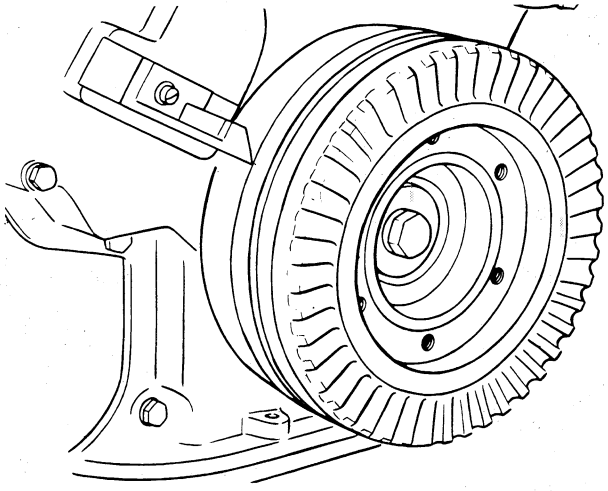
# ENGINE TUNEUP PROCEDURE

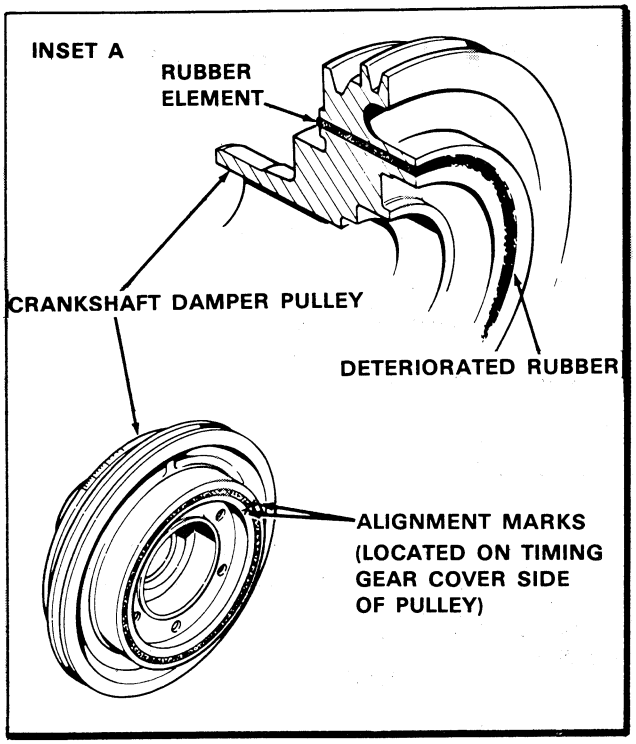
## Checking Crankshaft Damper Pulley

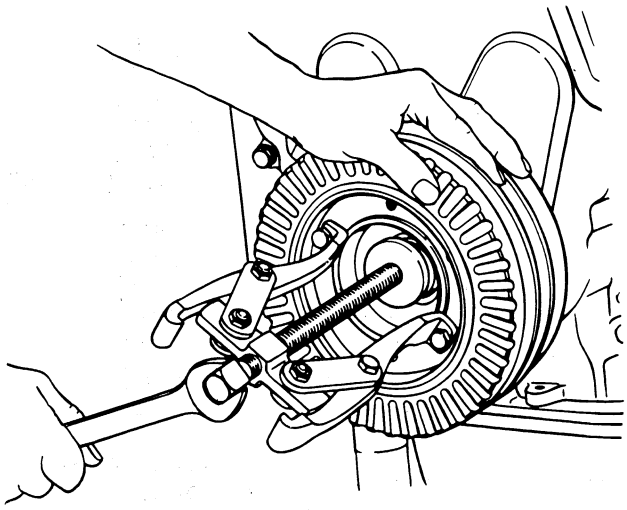
### STEP 1

THE RECOMMENDED CHANGE INTERVAL FOR THE CRANKSHAFT DAMPER PULLEY IS 2000 HOURS MAXIMUM. AT ANY TIME OVER 1500 HOURS. CONSIDER CHANGING PULLEY AT ANY MAJOR ENGINE OVERHAUL OR TUNE UP.

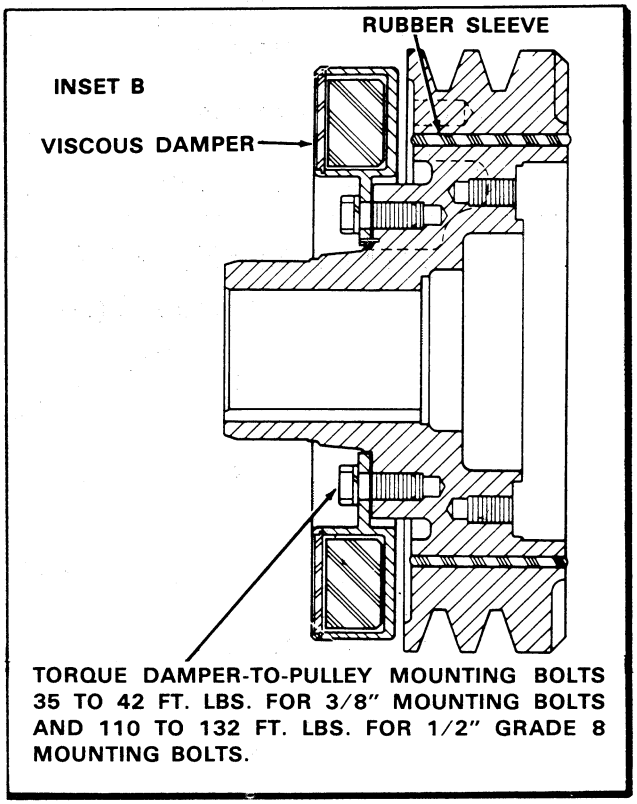
EVERY 500 HOURS AND AT ENGINE TUNEUP, VISUALLY INSPECT RUBBER ELEMENT FOR PEEL AREAS OR RUBBER MISSING. CHECK ALIGNMENT OF THE "V" MARKS BETWEEN THE INNER AND OUTER MEMBERS. IF "V" MARKS SHIFT, ENGINE TIMING WILL BE OFF AND DAMPER PULLEY MUST BE REPLACED.





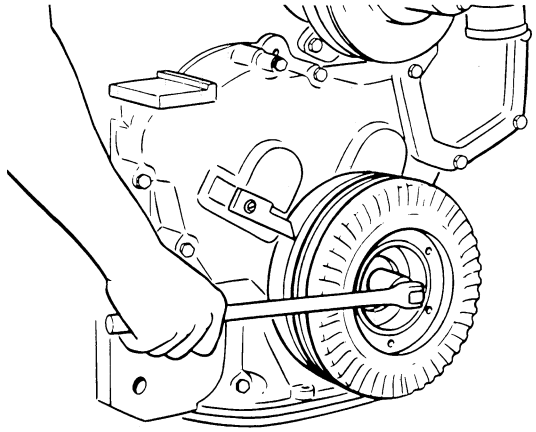



USE BOLT ON TYPE PULLER TO REMOVE PULLEY. REMOVE VISCOUS DAMPER FROM PULLEY (IF SO EQUIPPED). DO NOT PULL OR HAMMER ON OUTSIDE OF PULLEY OR VISCOUS DAMPER; SERIOUS DAMAGE TO PULLEY, DAMPER, AND RUBBER SLEEVE COULD RESULT.



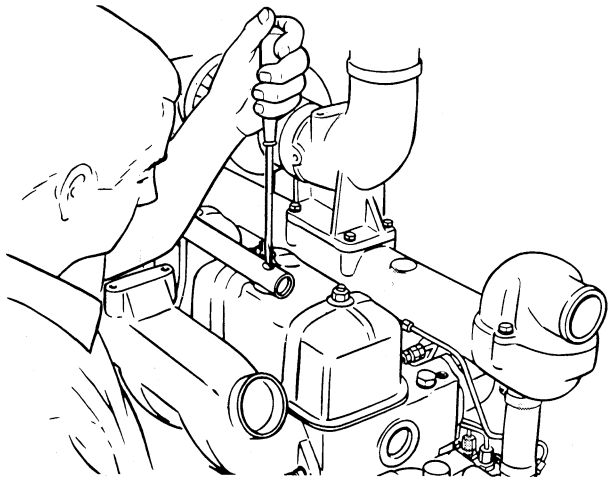
# Checking Top Dead Center

## STEP 2



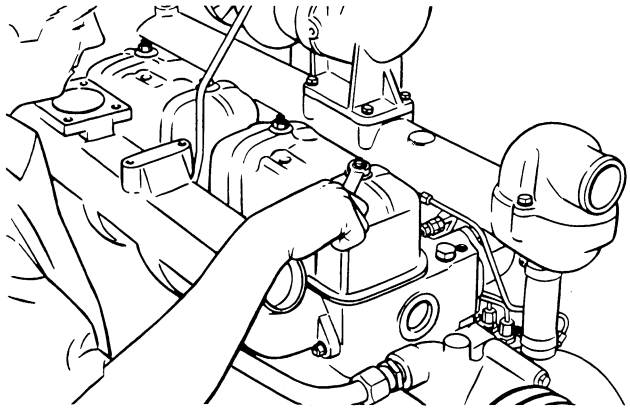
CRANK ENGINE UNTIL 10° BTDC MARK ON CRANKSHAFT PULLEY IS ALIGNED WITH TIMING POINTER.

## STEP 3



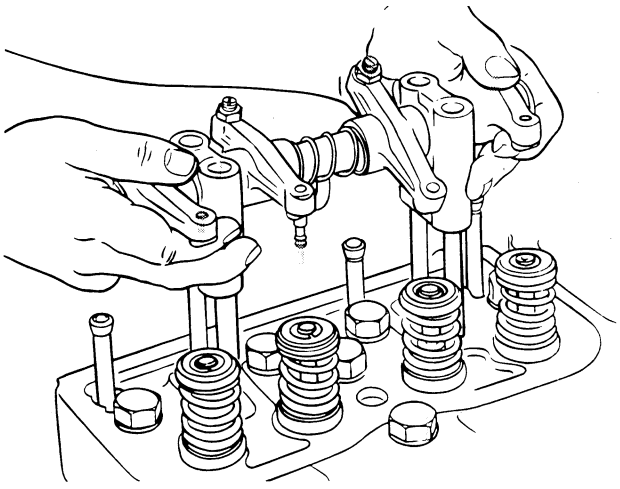
REMOVE BREATHER TUBE.

## STEP 4



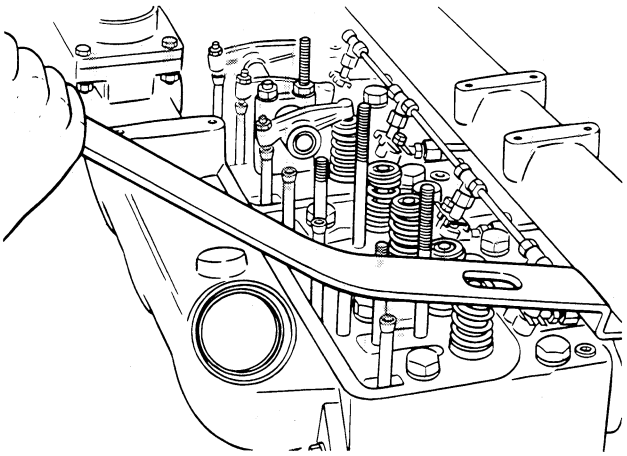
REMOVE VALVE COVER AND GASKET FROM NO. 1 AND NO. 2 CYLINDERS.

## STEP 5



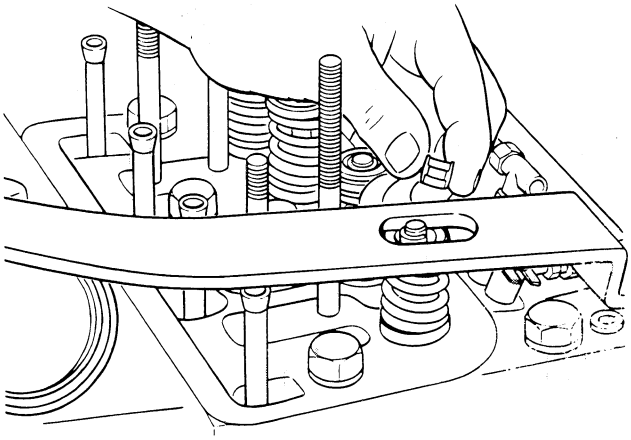
REMOVE ROCKER ARM ASSEMBLY.

## STEP 6



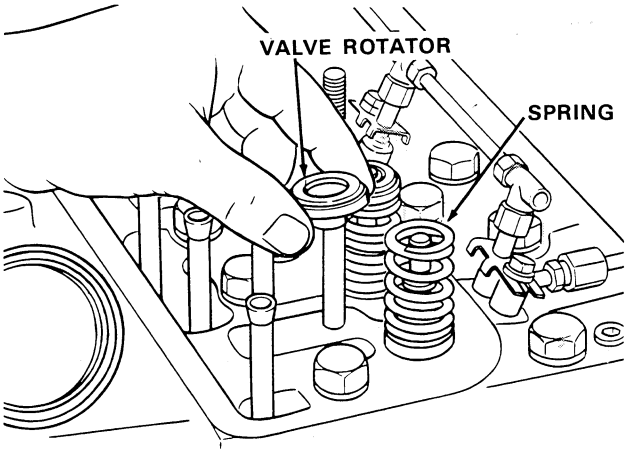
COMPRESS EXHAUST VALVE SPRING ON NO. 1 CYLINDER USING FABRICATED TOOL (SEE PAGE 3).

## STEP 7



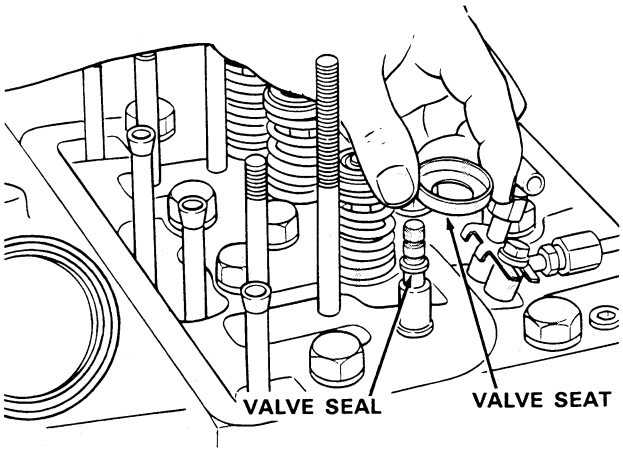
REMOVE VALVE KEEPERS

## STEP 8



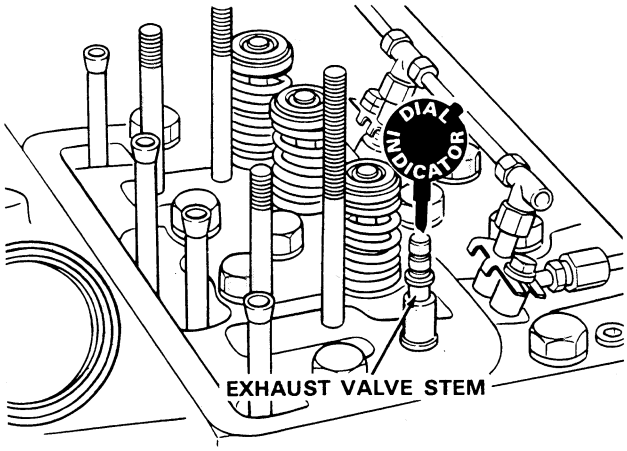

REMOVE VALVE ROTATOR, SPRING AND SEAT.

## STEP 9

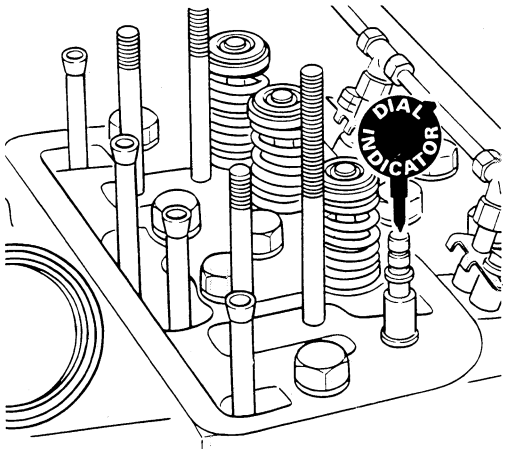



KEEP VALVE SEAL IN PLACE TO PREVENT VALVE FROM FALLING THROUGH VALVE GUIDE IF PISTON IS MOVED TOO FAR

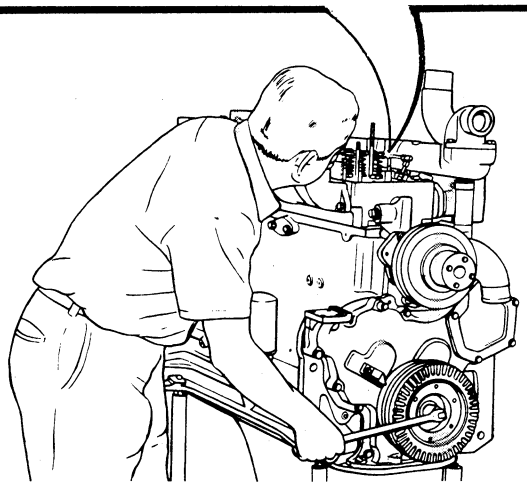
## STEP 10




INSTALL DIAL INDICATOR ON END OF VALVE STEM WITH VALVE RESTING ON TOP OF PISTON.




CRANK ENGINE CLOCKWISE UNTIL DIAL INDICATOR HAND STOPS MOVING. RESET INDICATOR TO ZERO.



CRANK ENGINE CLOCKWISE UNTIL .010" SHOWS ON DIAL. SCRIBE A MARK ON CRANKSHAFT PULLEY IN LINE WITH TIMING POINTER.

CRANK ENGINE COUNTERCLOCKWISE PAST ZERO MARK ON INDICATOR UNTIL .010" SHOWS ON DIAL. AGAIN, SCRIBE MARK ON CRANKSHAFT PULLEY.


Suggest:

If the above button click is invalid.

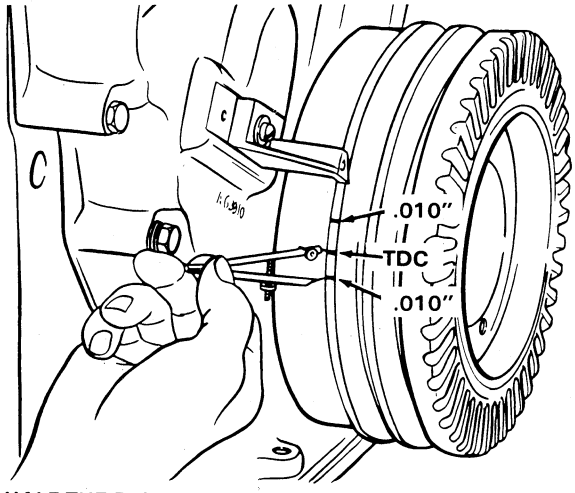
Please download this document

first, and then click the above link

to download the complete manual.

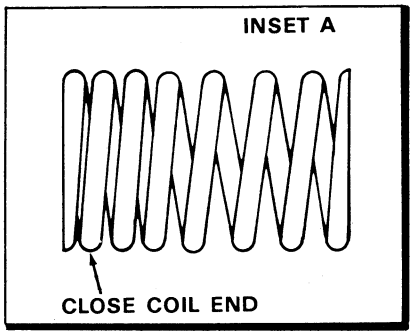
Thank you so much for reading

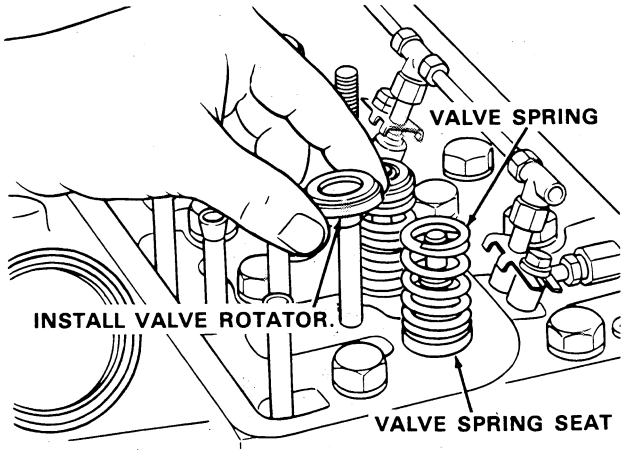
## STEP 11




HALF THE DISTANCE BETWEEN THESE TWO SCRIBE MARKS ON CRANKSHAFT PULLEY WILL BE THE TOP DEAD CENTER (TDC) MARK. IF THE SCRIBE MARKS ARE NOT THE SAME AS ORIGINAL MARKS ON PULLEY CHECK DAMPER.

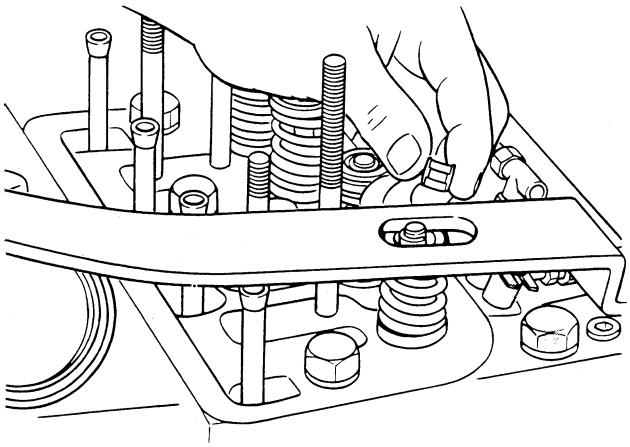
## STEP 12



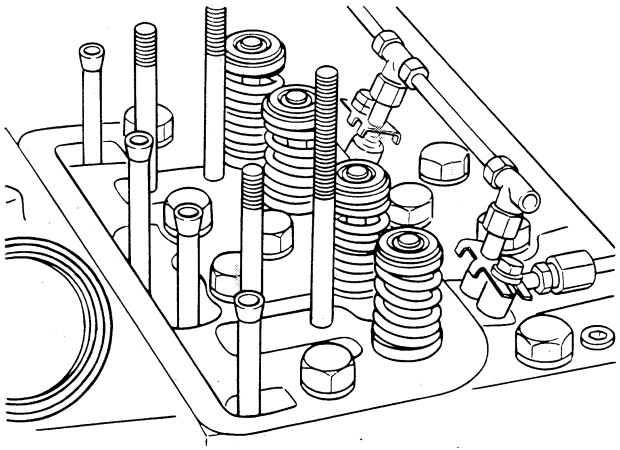

INSTALL SPRING SEAT AND VALVE SPRING. *NOTE:* IF EQUIPPED WITH VALVE SPRING HAVING ONLY ONE CLOSE COIL END, PLACE THIS END TOWARD CYLINDER HEAD, SEE INSET A.

## STEP 13



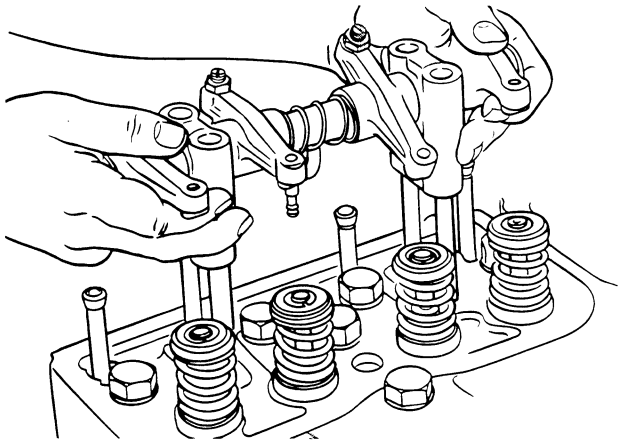
COMPRESS VALVE SPRING USING FABRICATED TOOL. INSTALL SEAL IN LOWER VALVE STEM GROOVE. INSTALL VALVE KEEPERS IN OUTER VALVE STEM GROOVE.

## STEP 14



REMOVE SPRING COMPRESSING TOOL. TAP END OF VALVE STEM TO SEAT KEEPERS.

## STEP 15



INSTALL ROCKER ARM ASSEMBLY ONTO CYLINDER HEAD.