

**TORQUE SPECIFICATIONS**
**Engine**

ITEM	SIZE	N-m	Lb-Ft
Auxiliary Shaft Gear Bolt	M-10	38-54	28-40
Auxiliary Shaft Thrust Plate Bolt	M-6	8-12	6-9
Belt Tensioner (Timing Pivot Bolt)	M-10	38-54	28-40
Belt Tensioner (Timing Adjusting Bolt)	M-8	19-28	14-21
Camshaft Gear Bolt	M-12	68-96	50-71
Camshaft Thrust Plate Bolt	M-6	8-12	6-9
Carburetor to Spacer Stud	M-8	10-20	7.5-15
Carburetor to Spacer Nut	M-8	14-19	10-14
Carburetor Spacer — to Manifold Bolt	M-8	19-28	14-21
Connecting Rod Nut (1)	M-9	41-49	30-36
Crankshaft Damper Bolt	M-14	136-162	100-120
Cylinder Head Bolt (2)	M-12	108-122	80-90
Distributor Clamp Bolt	M-10	19-28	14-21
Distributor Vacuum Tube to Manifold Adapter		7-11	5-8
Exhaust Manifold to Cylinder Head Bolt, Stud or Nut (3)	M-10	22-31	16-23
Flywheel to Crankshaft Bolt	M-10	73-87	56-64
Fuel Pump to Cylinder Block	M-8	19-28	14-21
Intake Manifold to Cylinder Head Bolt Nut	M-8	19-28	14-21
Main Bearing Cap Bolt (4)	M-12	108-122	80-90
Oil Pressure Sending Wire to Block		11-24	8-18
Oil Pump Pickup Tube to Pump	M-18	19-28	14-21
Nut — Turbo to Manifold		38-54	28-40
Nut — Oil Supply Line		27-40	20-30
Nut — Oil Supply Line Fitting		12-16	9-12
Nut — Oil Return Fitting to Block		8-12	6-9
Bolt — Intake Manifold — Upper to Lower		19-29	14-21
Nut — Throttle Body to Upper Intake		19-29	14-21
Oil Pump to Block	M-8	19-28	14-21
Oil Pump Cover		10-15	90-130
Oil Pan Drain Plug to Pan	M-14	21-33	15-25
Oil Pan to Block	M-6	7-11	6-8
	M-8	11-13	8-10
Oil Filter Insert to Cylinder Block		28-33	20-25
Oil Filter to Engine	(5)		
Rocker Arm Cover to Cylinder Head	M-6	7-11	5-8
Spark Plug to Cylinder Head	M-14	7-13	5-10
Temperature Sending Unit to Block		11-24	8-18
Water Jacket Drain Plug to Block		32-37	23-28
Water Pump to Block Bolt	M-8	19-28	14-21
EGR Valve to Spacer Bolt	M-8	19-28	14-21
EGR Tube to Exhaust Manifold Conn.		13-14	9-11
EGR Tube Nut		13-14	9-11
Auxiliary Shaft Cover Bolt	M-6	8-12	6-9
Water Outlet Connection Bolt	M-8	19-28	14-21
Cylinder Front Cover Bolt	M-6	8-12	6-9
Inner Timing Belt Cover Stud	M-8	19-28	14-21
Outer Timing Belt Cover Bolt	M-6	8-12	6-9
Rocker Arm Cover Shield Bolt	M-10	38-54	28-40
Thermactor Check Valve to Manifold	17	24-27	17-20
Fuel Filter to Carburetor Assembly — Bolt		9-11	80-100 Lb-In

**TORQUE SPECIFICATIONS — CONT'D**

1. Torque in sequence in two steps:
  - Step 1 — 34-41 N-m (25-30 lb-ft)
  - Step 2 — 41-49 N-m (30-36 lb-ft)
2. Torque cylinder head bolts in sequence in two steps:
  - Step 1 — 68-81 N-m (50-60 lb-ft)
  - Step 2 — 108-122 N-m (80-90 lb-ft)
3. Torque in sequence in two steps:
  - Step 1 — 7-9 N-m (5-7 lb-ft)
  - Step 2 — 23-31 N-m (16-23 lb-ft)
4. Torque in sequence in two steps:
  - Step 1 — 68-81 N-m (50-60 lb-ft)
  - Step 2 — 108-122 N-m (80-90 lb-ft)
5. 1/2 turn after gasket contacts surface — oil gasket.

**Ignition System**

Description	N-m	Lb-Ft
Distributor Holddown Bolts	8-11.5	6-9
Octane Rod Retaining Screw	2.3-3.4	20-30 lb-in
Distributor Cap Holddown Screws	2.0-2.6	18-23 lb-in
Distributor Rotor Holddown Screws	2.8-3.9	25-35 lb-in
TFI Ignition Module Mounting Screws	2.3-3.4	20-30 lb-in

**Electronic Fuel Injection**

Description	N-m	Lb-Ft
Lower Intake Manifold to Head	16-20	12-15
EGR Tube	8-11.5	6-8.5
Air Supply Tube Clamps	2-3	15-23 lb-in
Upper Intake Manifold to Lower Intake Manifold Bolts	20-30	15-22
Throttle Body to Upper Intake Manifold	16-20	12-15
Air Bypass Valve to Throttle Body	8-11	71-102 lb-in
Throttle Position Sensor to Throttle Body	1.2-1.8	14-16 lb-in
Fuel Pressure Relief Valve	6-10	48-84 lb-in
Fuel Pressure Regulator to Injector Manifold	3-4.5	27-40 lb-in
Fuel Injector Manifold to Fuel Charging Assembly	16-20	12-15
Vane Air Meter Mounting Screws	20-30	15-22
Air Cleaner Housing to Vane Air Meter	20-30	15-22
Water Bypass Line	1.4-2.2	12-20
Cast Tube to Turbocharger	19-29	14-21
Injector Wiring Harness Bracket	20-30	15-22

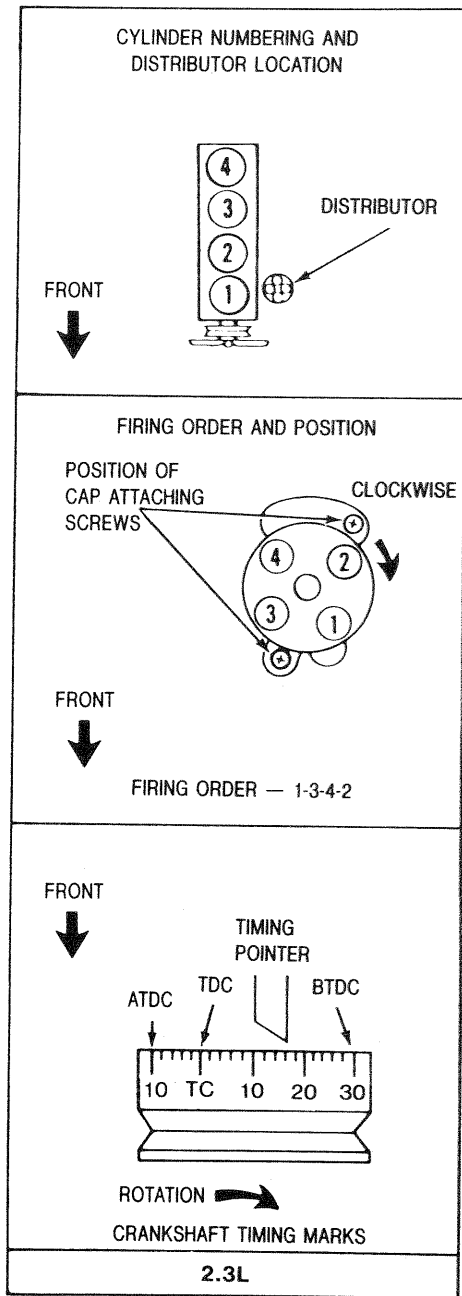
# Powertrain — Gasoline Engine — 2.3L EFI Turbocharged

## TORQUE SPECIFICATIONS — CONT'D

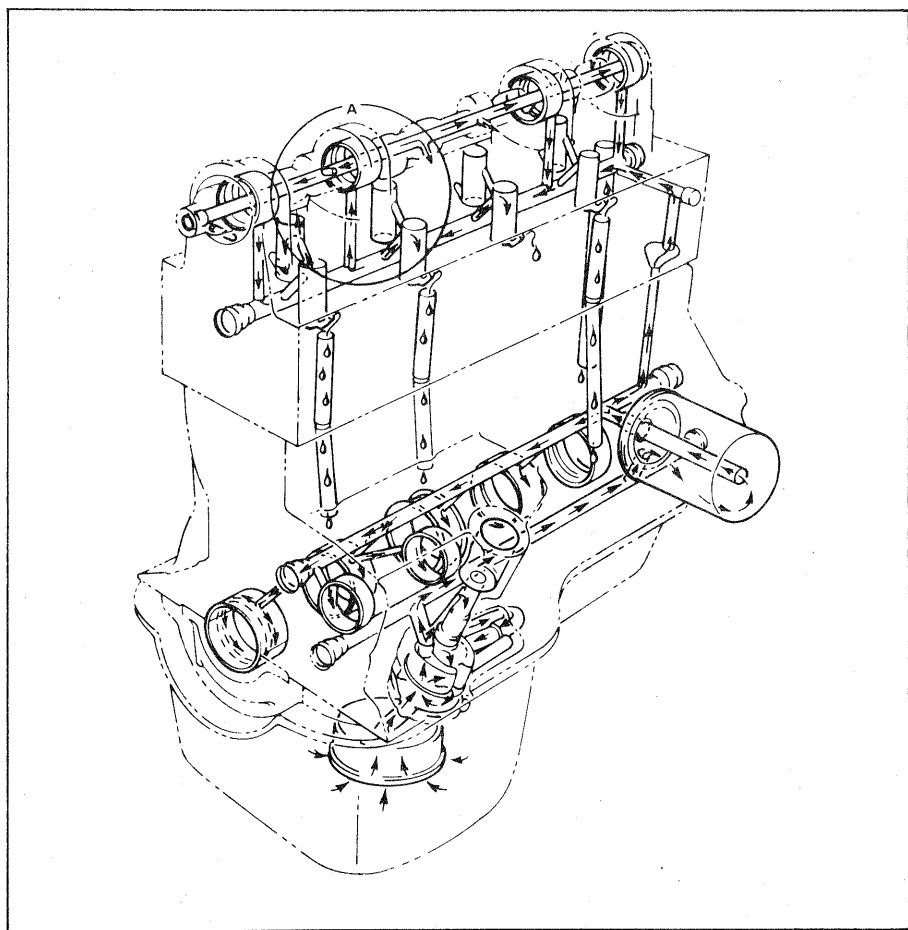
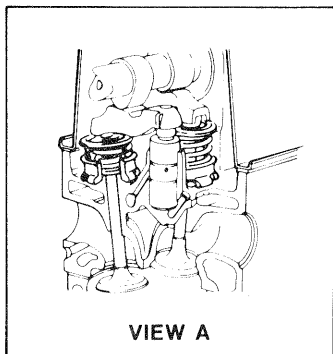
### Turbocharger

Description	N-m	Lb-Ft
Turbocharger Air Inlet Tube	20-30	15-22
Hose Clamp	1.36-2.5	15-22 lb-in
P.C.V. Tube Fitting	1.7-2.3	15-20 lb-in
Oil Supply Line — Fitting	12-16	9-16
Oil Return Line — Fitting	12-16	9-12
Oil Return Fitting — Block	8-12	6-9
Oil Supply Line	27-40	20-30
Oil Return Line	19-29	14-21
Exhaust Pipe	34-47.4	25-35
Turbocharger to Exhaust Manifold	5-10	3.7-7.4
Outlet Elbow to Turbocharger Housing	18.5-20.4	164-181 lb-in
Lower Bracket to Block	38-54	28-40
Tube Assembly — Water Inlet	14-20	10-14
1/4" Pipe at Block	16-24	11-17
Tube Assembly — Water Outlet	14-20	10-14
Hose Clamps (4)	1.7-2.5	15-22 lb-in

**ENGINE TIMING AND CYLINDER FIRING ORDER**



ENGINE OIL FLOW



**SERVICE SPECIFICATIONS**

<b>GENERAL SPECIFICATIONS</b>	
DISPLACEMENT .....	2.3L
NUMBERS OF CYLINDERS .....	4
BORE AND STROKE .....	3.780 x 3.126
FIRING ORDER .....	1-3-4-2
OIL PRESSURE (HOT @ 2000 RPM) .....	40-60
<b>CYLINDER HEAD AND VALVE TRAIN</b>	
COMBUSTION CHAMBER VOLUME (cc) .....	59.8-62.8
VALVE GUIDE BORE DIAMETER .....	0.3433-0.3443
<b>VALVE SEATS</b>	
Width — Intake .....	0.060-0.080
Width — Exhaust .....	0.070-0.090
Angle .....	45°
RUNOUT LIMIT (T.I.R. MAX.) .....	0.0016
VALVE ARRANGEMENT (Front to Rear) .....	E-I-E-I-E-I-E-I
VALVE LASH ADJUSTER BORE DIAMETER .....	0.8430-0.9449
<b>VALVE STEM TO GUIDE CLEARANCE</b>	
Intake .....	0.0010-0.0027
Exhaust .....	0.0015-0.0032
Service Clearance Limit .....	0.0055 Max.
<b>VALVE HEAD DIAMETER</b>	
Intake .....	1.723-1.747
Exhaust .....	1.49-1.51
VALVE FACE RUNOUT LIMIT .....	0.002 Max.
VALVE FACE ANGLE LIMIT .....	44°
<b>VALVE STEM DIAMETER (STANDARD)</b>	
Intake .....	0.3416-0.3423
Exhaust .....	0.3411-0.3418
(0.015 Oversize)	
Intake .....	0.3566-0.3573
Exhaust .....	0.3561-0.3568
(0.030 Oversize)	
Intake .....	0.3716-0.3723
Exhaust .....	0.3711-0.3718
<b>VALVE SPRINGS</b>	
Compression Pressure (Lb. @ Spec. Length)	
Intake and Exhaust (Installed Load) .....	71-79 @ 1.56
Exhaust and Intake Valve (Open Load) .....	152-156 @ 1.52
Free Length (Approximate) .....	1.877
Assembled Height .....	1-17/32"-1-19/32"
Service Limit .....	5% Pressure Loss @ Specified Length
Out of Square Service Limit .....	5/64 (0.078)
<b>ROCKER ARM (Cam Follower)</b>	
Ratio .....	1.4-1.6:1

# Powertrain — Gasoline Engine — 2.3L EFI Turbocharged

## SERVICE SPECIFICATIONS — CONT'D

GENERAL SPECIFICATIONS — CONT'D	
<b>VALVE TAPPET, LIFTER OR ADJUSTER</b>	
Diameter (Standard) .....	0.8422-0.8427
Clearance-to-Bore .....	0.0007-0.0027
Service Limit .....	0.005 Max.
Hydraulic Leakdown Rate (1) .....	2-8 Seconds
<b>Collapsed Tappet Gap</b>	
Allowable .....	0.035-0.055 @ Cam
Desired .....	0.040-0.050 @ Cam
CAMSHAFT	
<b>LOBE LIFT</b>	
Intake .....	0.2381
Exhaust .....	0.2381
Allowable Lobe Lift Loss .....	0.005 Max.
<b>THEORETICAL VALVE LIFT @ ZERO LASH</b>	
Intake .....	0.390
Exhaust .....	0.390
<b>END PLAY</b> .....	
Service Limit .....	0.001-0.007
<b>JOURNAL-TO-BEARING CLEARANCE</b> .....	
Service Limit .....	0.001-0.003
<b>JOURNAL DIAMETER</b>	
#1 .....	1.7713-1.7720
#2 .....	1.7713-1.7720
#3 .....	1.7713-1.7720
#4 .....	1.7713-1.7720
Runout Limit .....	0.005 Max. T.I.R.
Out-of-Round Limit .....	0.0005 In. Max.
Front Bearing Location .....	(2) 0.000-0.010
CYLINDER BLOCK	
<b>HEAD GASKET SURFACE FLATNESS</b> .....	
0.003 in any 6"-0.006 overall	
<b>HEAD GASKET SURFACE FINISH (RMS)</b> .....	
60-150	
<b>CYLINDER BORE</b>	
Diameter .....	3.7795-3.7825
Surface Finish (CLA) .....	8-24
Out-of-Round Limit .....	0.0015
Out-of-Round Service Limit .....	0.005
Taper Service Limit .....	0.010
<b>MAIN BEARING BORE DIAMETER</b> .....	
2.5902-2.5910	
<b>DISTRIBUTOR SHAFT BEARING BORE DIAMETER</b> .....	
.5155-.5170	
CRANKSHAFT, FLYWHEEL AND CONNECTING ROD	
<b>MAIN BEARING JOURNAL DIAMETER</b> .....	
2.399-2.3982	
Out-of-Round Limit .....	0.0006 Max.
Taper Limit .....	0.0006 Per Inch
Journal Runout Limit .....	0.002 Max.
Surface Finish (RMS) .....	12 Max.
Runout Service Limit .....	0.005
<b>THRUST BEARING JOURNAL</b>	
Length .....	1.2010-1.1990

**SERVICE SPECIFICATIONS — CONT'D**

**CRANKSHAFT, FLYWHEEL AND CONNECTING ROD — CONT'D**

**CONNECTING ROD JOURNAL**

Diameter .....	2.0465-2.0472
Out-of-Round Limit .....	0.0006 Max.
Taper Limit .....	0.0006 Per Inch Max.
Surface Finish (RMS) .....	12 Max.

**MAIN BEARING THRUST FACE**

Surface Finish (RMS) .....	35 Front 25 Rear (Max.)
Runout Limit .....	0.001 Max.

**FLYWHEEL CLUTCH FACE**

Runout Limit .....	0.005
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**FLYWHEEL RING GEAR LATERAL RUNOUT (T.I.R.)**

Standard Transmission .....	0.025
Automatic Transmission .....	0.060

**CRANKSHAFT FREE END PLAY LIMIT**

Service Limit .....	0.004-0.008
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**AUXILIARY SHAFT END PLAY**

.....	0.001-0.007
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**CONNECTING ROD BEARINGS**

Clearance Crankshaft — Desired .....	0.0008-0.0015
— Allowable .....	0.0008-0.0026
Bearing Wall Thickness (Standard)(3) .....	0.0619-0.0624

**MAIN BEARINGS**

Clearance to Crankshaft — Desired .....	0.0008-0.0015
— Allowable .....	0.0008-0.0026
Bearing Wall Thickness (Standard)(3) .....	0.0956-0.0951

**AUXILIARY SHAFT BEARINGS**

Clearance to Shaft .....	0.0006-0.0026
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**CONNECTING ROD**

Piston Pin Bore Diameter .....	.9096-.9012
Crankshaft Bearing Bore Diameter .....	2.1720-2.1728
Out-of-Round Limit .....	0.0004
Taper Limit .....	0.0004
Length (Center-to-Center) .....	5.2031-5.2063
Alignment (Bore-to-Bore Max. Difference)(4)	
Twist .....	0.024
Bend .....	0.012
Side Clearance (Assembled to Crank)	
Standard .....	0.0035-0.0105
Service Limit .....	0.014

**PISTON**

**PISTON**

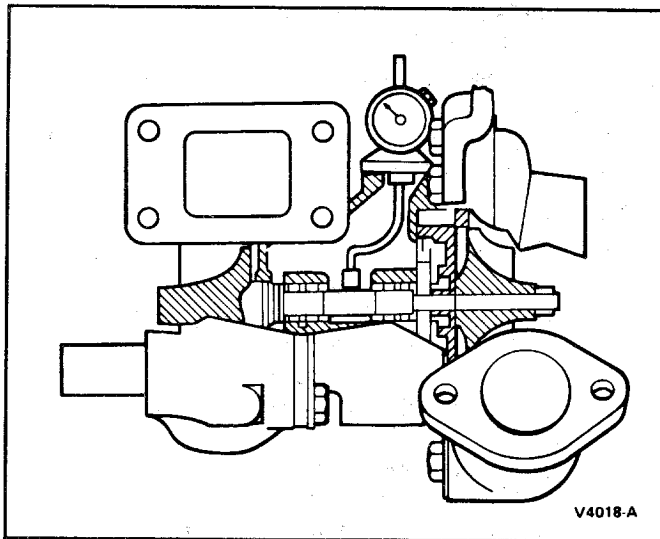
Diameter(5)	
Coded Red .....	3.7764-3.7770
Coded Blue .....	3.7776-3.7782
0.003 Oversize .....	3.7788-3.7794
Piston-to-Bore Clearance (Select Fit) .....	0.0014-0.0022
Pin Bore Diameter .....	0.9123-0.9126
Ring Groove Width	
Compression (Top) .....	0.080-0.081
Compression (Bottom) .....	0.080-0.081
Oil .....	0.188-0.189



## SERVICE SPECIFICATIONS — CONT'D

<b>Piston, Cont'd</b>	
<b>PISTON PIN</b>	
Length .....	3.010-3.040
Diameter	
Standard .....	0.9118-0.9124
0.001 Oversize .....	0.9130-0.9133
0.002 Oversize .....	0.9140-0.9143
Piston-to-Pin Clearance .....	0.0002-0.0004
Pin-to-Rod Clearance .....	Interference Fit
<b>PISTON RINGS</b>	
Ring Width	
Compression (Top) .....	0.077-0.078
Compression (Bottom) .....	0.077-0.078
Side Clearance	
Compression (Top) .....	0.002-0.004
Compression (Bottom) .....	0.002-0.004
Oil Ring .....	Snug Fit
Service Limit .....	0.006 Max.
Ring Gap	
Compression (Top) .....	0.010-0.020
Compression (Bottom) .....	0.010-0.020
Oil (Steel Rail) .....	0.015-0.055
<b>Lubrication System</b>	
<b>OIL PUMP</b>	
Relief Valve Spring Tension (Lbs. Spec. Length) .....	15.2-17.2 @ 1.20"
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.) .....	5.0

- (1) Time required for plunger to leak down 1/8" of travel with 50 lb. load leakdown fluid in lash adjuster.
- (2) Distance in inches that front bearing is installed below front face of bearing lower.
- (3) 0.002 undersize = Add 0.001 to Standard Thickness.
- (4) Pin bore and crank bearing bore must be parallel and in the same vertical plane, within the specified total difference when measured at the ends of an 8" bar — 4" on each side of rod centerline.
- (5) Measured at the piston pin bore, centerline — 90° to the pin.



**FIG. 17 Bearing Radial Clearance Check**

1. Disconnect turbocharger down pipe at outlet elbow and wastegate assembly.
2. Remove clip attaching actuator rod to wastegate linkage.
3. Remove five bolts attaching outlet and wastegate elbow assembly.

#### Installation

Refer to Fig. 15.

1. Install five bolts attaching outlet elbow and wastegate assembly to turbine housing and tighten to 18.5 to 20.4 N·m (164-181 lb-in).
2. Install clip attaching wastegate linkage to actuator rod.
3. Connect turbocharger exhaust down pipe to outlet elbow and wastegate assembly.

NOTE: If an outlet elbow is replaced, an actuator service kit should be used to provide wastegate actuator setting.

#### Bearing Axial Clearance Check

1. Remove turbocharger assembly from engine.
2. Remove five bolts connecting the turbine outlet elbow assembly and remove the elbow.
3. Attach Dial Indicator TOOL 4201-C or equivalent to the center housing so that the indicator plunger contacts shaft (Fig. 16).
4. Manually push the turbine wheel assembly as far away from dial indicator tip as possible.
5. Set dial indicator to zero while holding turbine wheel away from plunger tip.
6. Manually push turbine wheel assembly toward dial indicator tip as far as possible.
7. Repeat Step 4 and note that dial indicator returns to zero.
8. Repeat Steps 4, 5, 6 and 7 to make sure an accurate measurement has been made. If bearing axial clearance is less than 0.025mm (0.001 inch) or greater than 0.076mm (0.003 inch), replace the turbocharger assembly.

#### Bearing Radial Clearance Check

1. Remove turbocharger assembly from engine.
2. Remove wastegate actuator rod retaining clip and remove rod from wastegate arm.
3. Remove turbine oil outlet line to center housing.
4. Attach Dial Indicator TOOL 4201-C or equivalent to center housing so that indicator plunger Tool T79L-4201-A or equivalent extends through oil outlet port and contacts shaft (Fig. 17).
5. Manually apply pressure equally and simultaneously to both compressor and turbine wheels to move shaft away from dial indicator plunger as far as it will go.
6. Set dial indicator to zero while holding shaft away from plunger tip.
7. Manually apply pressure equally and simultaneously to both compressor and turbine wheels to move shaft toward dial indicator plunger as far as it will go.
8. Repeat Step 5 and note that dial indicator returns to zero.
9. Repeat Steps 5, 6, 7 and 8 to make sure an accurate measurement has been made. If bearing radial clearance is less than 0.076mm (0.003 inch) or greater than 0.152mm (0.006 inch), replace the turbocharger assembly.

#### SPECIAL SERVICE TOOLS

Tool Number	Description
T00L-4201-C	Boost Pressure Dial Indicator
T79L-4201-A	Turbo Bearing Check Tool
Rotunda 021-00014	Hand Vacuum Pump Tester
Rotunda 059-00008	Vacuum Gauge

CV4020-B

#### SPECIFICATIONS

Description	N·m	Lb·Ft
Turbocharger Air Inlet Tube	20-30	15-22
Hose Clamp	1.7-2.5	15-22 lb-in
P.C.V. Tube Fitting	1.7-2.2	15-20 lb-in
Oil Supply Line — Fitting	12-16	9-12
Oil Return Line — Fitting	12-16	9-12
Oil Return Fitting — Block	8-12	6-9
Oil Supply Line	27-40	20-30
Oil Return Line	19-29	14-21
Exhaust Pipe	34-47.4	25-35
Turbocharger to Exhaust Manifold	38-54	28-40
Outlet Elbow to Turbocharger Housing	18.5-20.4	164-181 lb-in
Lower Bracket to Block	38-54	28-40
Tube Assembly — Water Inlet (Turbo)	14-20	11-14
1/4 Inch Pipe at Block	16-24	12-17
Tube Assembly — Water Outlet (Turbo) Hose Clamps	14-20	11-14

CV4021-C

2. Install the exhaust manifold-to-cylinder head bolts. Torque them in two steps. During the first step, tighten to 20 to 23 N·m (177 to 204 lb-in.); during the final step, tighten to 27 to 41 N·m (20 to 30 lb-ft). Be sure to follow the proper torque sequence.

