SERVICE MANUAL

Loaders

680 CK

Series C

9-72595

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL

Loaders

680 CK

Series C

9-72595

1. Trim along dashed line.
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TYPE 1-4

TABLE OF CONTENTS

NOTE: Also see Sections 9011 and 9012 for exploded views of hydraulic system.

CASE CORPORATION

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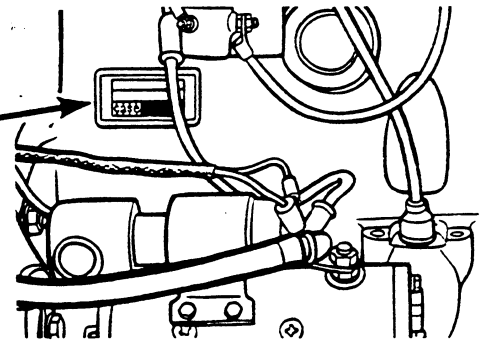
SERIES/SECTION SECTION NO.

Section 11

GENERAL ENGINE SPECIFICATIONS

680 CK Series C Loaders

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 ..... 4-3/8 Inches
Stroke ..... 5 Inches
Piston Displacement ..... 301 Cubic Inches
Compression Ratio ..... 16.5 to 1
No Load Governed Speed ..... 2360 RPM
Rated Engine Speed ..... 2200 RPM
Engine Idling Speed ..... 725 to 775 RPM
*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.

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 55 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

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 2800 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

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Section 1050

MAINTENANCE

AND

LUBRICATION

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MAINTENANCE CHART

CAUTION: The following chart is based on maximum intervals. If the machine operates in severe conditions, service more often.

INTERVAL	SERVICE	INSTRUCTIONS
Run-In: Every Two Hours Until Stabilized	Check wheel nut and bolt torque. Front - 170 foot-pounds torque. Rear - 220-240 foot-pounds torque. Check rear axle mounting bolts. 380-460 foot-pounds torque.	
Run-In: After First 20 Hours	Change engine crankcase oil. Replace engine oil filter. Check drive belt tension. Service fuel system.	 Section 25. Section 8016. Section 31.
Every 10 Hours or Daily - Whichever Occurs First	Grease loader pivot points. Grease backhoe pivot points. Check engine crankcase oil level. Check hydraulic oil level. Check radiator coolant level. Clean air cleaner dust cup. Visually inspect transfer pump sedimant bowl for water. If found, drain water from bowl, first stage filter and fuel tank. Check machine and ground under it for leaks.	
Every 50 Hours or Weekly - Whichever Occurs First	Grease front axle pivot. Grease steering cylinders. Grease brake shafts and slack adjusters. Grease inner Extendahoe dipper. Check tire pressures.	
Every 100 Hours	Check battery electrolyte level. Check drive belt tension.	Section 8014. Section 8016.
Every 150 Hours	Change engine oil.	

INTERVAL	SERVICE	INSTRUCTIONS
Every 250 Hours	Grease driveshaft universals and slip splines	
	Grease loader and backhoe control lever fittings.	
	Lubricate shuttle control lever.	
	Check power shuttle/torque converter oil level.	
	Check synchromesh transmission oil level.	
	Check rear axle oil level.	Section 6020.
	Clean alcohol evaporator filter.	Section 7020.
Every 300 Hours	Replace engine oil filter.	Section 25.
Every 500 Hours	Drain deposits from fuel tank.	
	Change fuel filters.	Section 31.
	Service electric fuel pump and transfer pump filters.	Section 31.
	Repack front wheel bearings.	
	Check ROPS as indicated.	Section 9019.
Every 1000 Hours or Yearly, Whichever Occurs First	Change hydraulic reservoir.	
	Replace hydraulic oil filter.	
	Clean hydraulic filter by-pass screen.	
	Change power shuttle/torque converter oil.	
	Clean power shuttle/torque converter screen.	
	Change synchromesh transmission oil.	
	Change rear axle oil.	Section 6020.
	Clean air compressor cylinder head (by dealer only).	
Every 2000 Hours or Yearly, Whichever Occurs First.	Disassemble and clean alcohol evaporator. (by dealer only).	Section 7020.
	Lubricate starter motor.	Section 8015.
	Drain, flush and refill cooling system.	

INTERVAL	SERVICE	INSTRUCTIONS
Every 3000 Hours	Rebuild or replace air compressor (by dealer only).	Section 7014.
As Required	Service air cleaner element when restriction indicator shows red band. After wheel has been removed for service and reinstalled, check wheel nut/bolt torque every two hours until stabilized. Replace fire extinguisher shell. Fill alcohol evaporator with clean wood alcohol.	Section 2051.

FLUIDS AND LUBRICANTS

COMPONENT	CAPACITY		SPECIFICATIONS
	U.S.	METRIC	
Fuel tank	28 gals.	106 liters	No. 2 diesel fuel
Engine crankcase oil With filter change Without filter change	11 gals.	10,4 liters	Engine oil: CD Commercial class D. (Service DS, Series 3) MIL-L-45199B Above 32° F. - SAE 30 10° to 50° F. - SAE 20W Below 40° F. - SAE 10W
Equipment/steering hydraulic system Approximate Total System	35 gals.	132,5 liters	Case TCH Fluid
Reservoir refill	13.8 gal.	52,2 liters	Alternate oils: Engine oil - SD-Service class D. CA-Commercial class A. (Service MS or DG) Above 32° F. - SAE 10W Below 32° F. - SAE 5W Type C-2 transmission and hydraulic fluid such as Tenneco Hytrans Fluid.
Power shuttle/transmission and torque converter	12 qts.	11,4 liters	Case TCH Fluid
Synchromesh transmission	6.4 qts.	6,1 liters	Multipurpose gear lubricant SAE 90 (APL-GL-4, MIL-L-2105)
Rear axle Center bowl	27 pts.	12,8 liters	Multipurpose gear lubricant SAE 90 (APL-GL-4, MIL-L-2105)
Planetaries - each side	3 pts.	1,4 liters	
Cooling system	30 qts.	28,4 liters	Ethylene glycol and water should be mixed for prevailing temperatures. Follow antifreeze manufactures specifications.
Alcohol evaporator	1 pt.	0,5 liter	Clean wood alcohol
Batteries	As required		Add colorless, oderless drinking water.

COMPONENT	CAPACITY	SPECIFICATIONS
	U.S. METRIC	
Grease fittings	As required	Above 32° F. Multipurpose or No. 2 lithium-soap base grease. Below 32° F. Multipurpose or No. 1 lithium-soap base grease.
Wheel bearings	As required	Number 2 wheel bearing grease
Drive shaft	As required	Multipurpose - Molydisulfide type grease.

Section 1051

TORQUE CHART

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U.S. AND METRIC TORQUE SPECIFICATIONS

Torque values for all situations unless special torque is specified.

Grade 5 Bolts, Nuts, Studs (Dry)

Thread Size	Torque ft. lbs.	Torque m-kg	Thread Size	Torque ft. lbs.	Torque m-kg
1/4" - 20 NC	5-10	0,7-1,4	3/4" - 10 NC	235-285	32-39
1/4" - 28 NF	10-15	1,4-2,1	3/4" - 16 NF	270-330	37-46
5/16" - 18 NC	15-20	2,1-2,8	7/8" - 9 NC	360-440	50-61
5/16" - 24 NF	15-20	2,1-2,8	7/8" - 14 NF	395-490	55-68
3/8" - 16 NC	25-35	3,5-4,8	1" - 8 NC	520-640	72-88
3/8" - 24 NF	30-40	4,1-5,5	1" - 12 NF	575-705	79-97
7/16" - 14 NC	45-55	6,2-7,6	1-1/8" - 7 NC	720-820	99-113
7/16" - 20 NF	50-60	6,9-8,3	1-1/8" - 12 NF	790-970	109-134
1/2" - 13 NC	65-85	9,0-12,0	1-1/4" - 7 NC	1010-1240	139-171
1/2" - 20 NF	80-100	11-14	1-1/4" - 12 NF	1115-1365	154-188
9/16" - 12 NC	100-120	14-17	1-3/8" - 6 NC	1315-1610	181-222
9/16" - 18 NF	110-130	15-18	1-3/8" - 12 NF	1510-1850	208-255
5/8" - 11 NC	135-165	19-23	1-1/2" - 6 NC	1745-2135	241-295
5/8" - 18 NF	160-200	22-28	1-1/2" - 12 NF	1880-2420	259-334

Grade 8 Bolts, Nuts, Studs (Dry)

Thread Size	Torque ft. lbs.	Torque m-kg	Thread Size	Torque ft. lbs.	Torque m-kg
1/4" - 20 NC	10-15	1,4-2,1	3/4" - 10 NC	340-420	47-58
1/4" - 28 NF	15-20	2,1-2,8	3/4" - 16 NF	380-460	52-63
5/16" - 18 NC	20-30	2,8-4,1	7/8" - 9 NC	540-660	75-91
5/16" - 24 NF	25-30	3,5-4,1	7/8" - 14 NF	595-725	82-100
3/8" - 16 NC	40-50	5,5-6,9	1" - 8 NC	810-990	112-137
3/8" - 24 NF	45-55	6,2-7,6	1" - 12 NF	900-1100	124-152
7/16" - 14 NC	60-80	8,3-11,0	1-1/8" - 7 NC	1150-1400	159-193
7/16" - 20 NF	70-90	9,7-12,0	1-1/8" - 12 NF	1295-1585	179-219
1/2" - 13 NC	100-120	14-17	1-1/4" - 7 NC	1640-2000	226-276
1/2" - 20 NF	110-130	15-18	1-1/4" - 12 NF	1800-2200	248-304
9/16" - 12 NC	135-165	19-23	1-3/8" - 6 NC	2140-2620	295-362
9/16" - 18 NF	155-190	21-26	1-3/8" - 12 NF	2450-3000	338-414
5/8" - 11 NC	200-240	28-33	1-1/2" - 6 NC	2845-3475	393-480
5/8" - 18 NF	215-265	30-37	1-1/2" - 12 NF	3200-3900	442-538

Hydraulic Fittings (Steel)

Dash Size	Tube O.D.	Thread Size	37° Flare Female Swivel Torque ft. lbs.	37° Flare Female Swivel Torque m-kg	Straight Thread O-Ring Torque ft. lbs.	Straight Thread O-Ring Torque m-kg
4	1/4"	7/16" - 20	6-12	0,8-1,7	12-19	1,7-2,6
5	5/16"	1/2" - 20	8-16	1,1-2,2	16-25	2,2-3,5
6	3/8"	9/16" - 18	10-25	1,4-3,5	25-40	3,5-5,5
8	1/2"	3/4" - 16	15-42	2,1-5,8	42-67	5,8-9,2
10	5/8"	7/8" - 14	25-58	3,5-8,0	58-92	8,0-12,7
12	3/4"	1-1/16" - 12	40-80	5,5-11,0	80-128	11-18
14	7/8"	1-3/16" - 12	60-100	8,3-14,0	100-160	14-22
16	1"	1-5/16" - 12	75-117	10-16	117-187	16-26
20	1-1/4"	1-5/8" - 12	125-165	17-23	165-264	23-36
24	1-1/2"	1-7/8" - 12	210-250	29-35	250-400	35-55

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Section 22

CYLINDER HEAD AND VALVES 267B, 301B, 336BD, 336BDT AND 401B DIESEL ENGINES

SPECIFICATIONS

		Maximum Limit Including Wear
CYLINDER HEAD		
Warpage		.005"
INTAKE AND EXHAUST VALVE GUIDES		
Length	3.219"	
O.D.	.7515"to .7510"	
I.D. (Installed and reamed)	.4045" to .4055"	.001"
Protrusion above cylinder head	.953"	
EXHAUST VALVE		
Tappet clearance (COLD)	.025"	
Tappet clearance (HOT)	.020"	
Face angle	45°	
Face run-out		.002"
O.D. of head (267B and 401B)	1.455" to 1.445"	
O.D. of head (336BD and 336BDT)	1.755" to 1.745"	
O.D. of head (301B)	1.567" to 1.557"	
O.D. of stem end	.402" to .403"	.002"
O.D. of taper 4.2675" from stem end	.401" to .402"	.002"
Length (301B)	6.4385" to 6.4175"	
Length (336BD and 336BDT)	6.4405" to 6.4195"	
Length (267B and 401B)	6.4235" to 6.4025"	
Insert seat angle	44°	
Seat contact width	.0800" to .1000"	
Seat run-out		.002"
Insert height	.316" to .313"	
O.D. of insert (401B and 267B)	1.635" to 1.634"	
O.D. of insert (301B)	1.723" to 1.722"	
O.D. of insert (336BD and 336BDT)	1.9465" to 1.9455"	
I.D. of insert (267B and 401B)	1.2676" to 1.2736"	
I.D. of insert (301B)	1.409" to 1.403"	
I.D. of insert (336BD and 336BDT)	1.571" to 1.577"	

SPECIFICATIONS (Continued)

		Maximum Limit Including Wear
INTAKE VALVE		
Tappet clearance (COLD and HOT)	.015"	
Face angle	45°	
Face run-out		.002"
Length (267B and 401B)	6.2845" to 6.2695"	
Length (301B)	6.4415 to 6.4205"	
Length (336BD and 336BDT)	6.4405" to 6.4195"	
O.D. of stem	.402" to .403"	.002"
O.D. of head (267B and 401B)	1.685" to 1.675"	
O.D. of head (301B)	1.755" to 1.745"	
O.D. of head (336BD and 336BDT)	2.005" to 1.995"	
Seat angle	44°	
Seat contact width	.0075" to .0975"	
Seat run-out		.002"
Insert height (336BDT)	.2775" to .2825"	
O.D. of insert (336BDT)	2.0990" to 2.1000"	
I.D. of insert (336BDT)	1.805" to 1.815"	
VALVE SPRING		
Free length	2.28"	
Total coils	7.75	
Wire diameter	.1695"	
Compressed to 1-31/64" (Valve open)	130 to 140 lbs.	
Compressed to 1-15/16" (Valve closed)	41 to 45 lbs.	
ROCKER ARM ASSEMBLY		
O.D. of shaft	.872" to .873"	
I.D. of arm bore	.8745" to .8755"	
Shaft assembly end play (both ends)	.010" to .030"	
Shaft spring:		
Total coils (working coils)	4	
Wire diameter	.080"	
Compressed to 1-9/16"	8.5 to 10 lbs.	
Lubrication	Engine oil, camshaft metering	
Shaft oil holes	Toward valve side of engine. Shaft cannot be rotated.	

SPECIAL TORQUES

Cylinder head bolts	200 to 210 ft. lbs.
Intake and exhaust manifold stud nut	25 to 30 ft. lbs.
Cylinder head valve cover stud nut	60 to 70 in. lbs.
Rocker arm bracket stud nut	40 to 45 ft. lbs.

CHECKING COMPRESSION PRESSURE

1. Clean the engine thoroughly, preferably by steam cleaning.

2. Before cranking the engine, make sure all operating controls are in neutral, brakes are set and the wheels are securely blocked.

3. There are two methods of checking compression pressure - the cranking method and the engine running method. **NOTE** The engine must be at operating temperature for either method used.

A. CRANKING METHOD - Close the needle valve at the fuel tank. Disconnect all high pressure fuel lines and leak-off lines between injectors. Remove all of the injectors. Refer to the chart on Page 3.

CHECKING COMPRESSION PRESSURE (Continued)

B. RUNNING METHOD - Disconnect the high pressure fuel line and leak-off lines from number one injector. Using an appropriate length of tubing or hose, route the fuel from these lines back to the fuel tank or a clean container. Remove the number one injector. Refer to chart below.

4. Clean the injector bores of loose carbon and residue. Replace the compression seal in the injector bore of the cylinder to be checked and install a Bacharach 70-314 (D-558) Compression Gauge Adapter, Figure 1. Secure with an original injector clamp assembly and spacer. Figure 1, Inset A. Tighten bolt to 20 foot pounds. Connect Case No. CD-504 Compression Gauge to the adapter, Figure 2.
IMPORTANT It is very important that all cylinder pressures be approximately alike. For the allowable compression pressure variation, refer to chart below.

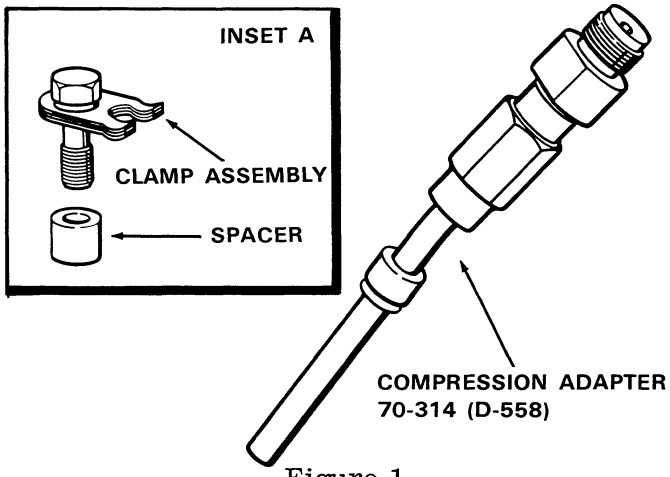


Figure 1

5. If the compression is greater than the figure mentioned, carbon deposits are indicated. If the reading is below these figures, leaking valves or excessive ring clearance is indicated. **NOTE** To make a simple check when a compression leak is indicated, squirt a small amount (a teaspoon) of oil into the cylinder and recheck the compression. If the pressure rises to near normal, compression loss is past the rings. Very little change in compression indicates leakage past the valves. A low pressure reading will cause difficulty in starting particularly at low temperatures.

NOTE Take several compression readings on each cylinder. This is done by pressing the vent valve button, Figure 2, to relieve gauge pressure. When the button is released the gauge will again indicate compression pressure.

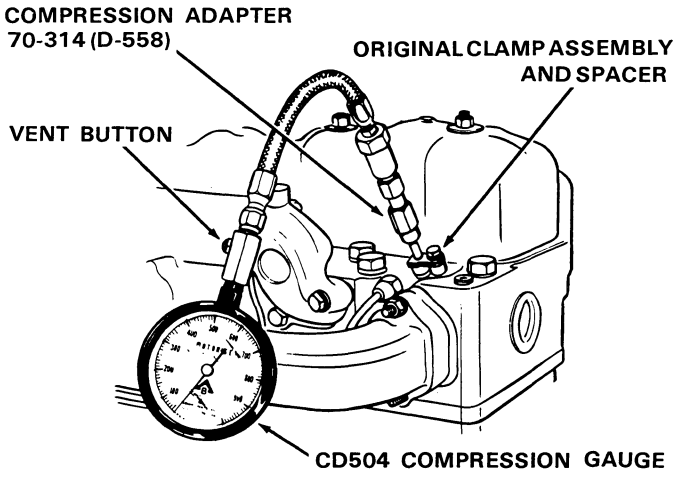


Figure 2

IMPORTANT Replace the compression seal and carbon seal on all injectors at the time of installation, Figure 3.

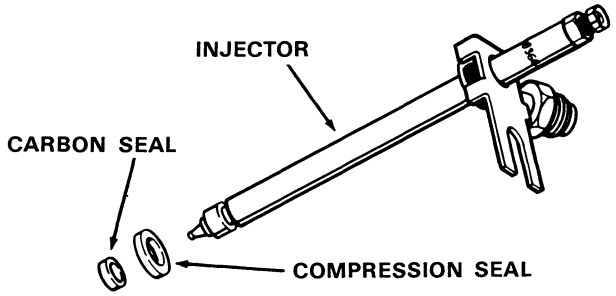


Figure 3

	ENGINE SPEED	NORMAL COMPRESSION PRESSURE	ALLOWABLE VARIATION BETWEEN CYLINDERS
CRANKING	Approximately 200 RPM	400 PSI*	25 PSI
RUNNING	800 RPM	480 PSI*	20 PSI

NOTE *A 4% reduction in PSI must be allowed for every 1000 ft. above sea level.

TURBO CHARGER SYSTEM
Four Cylinder 336BDT Engine
(Refer to Figure 4)

Removal

Remove the muffler and hood from the vehicle. Steam clean the engine thoroughly before removing any components for service.

1. Disconnect the air cleaner from the turbo-charger.
2. Disconnect the turbo and intake elbow hose clamps (1) and remove with hose (2).
3. Disconnect the turbo oil supply line (3) and remove. Disconnect hose clamps (4) and remove the oil drain tube hose (5). Remove the oil drain tube (6) with gasket (7). Discard gasket.
4. Remove the intake elbow (8) with gasket (9). Discard gasket.
5. Remove the turbo-charger (10), gasket (11) and coupler (12). Discard gasket (11).
6. Remove the bolts from the manifold brace (17). Remove the exhaust elbow (13) and spacers (18).
7. Remove the turbo adapter base (14) with gasket (15). Discard gasket.
8. Remove the oil drain tube elbow (16).

Inspection

Clean the intake and exhaust elbows, coupler and turbo adapter thoroughly and check for cracks or other damage. Replace if necessary.

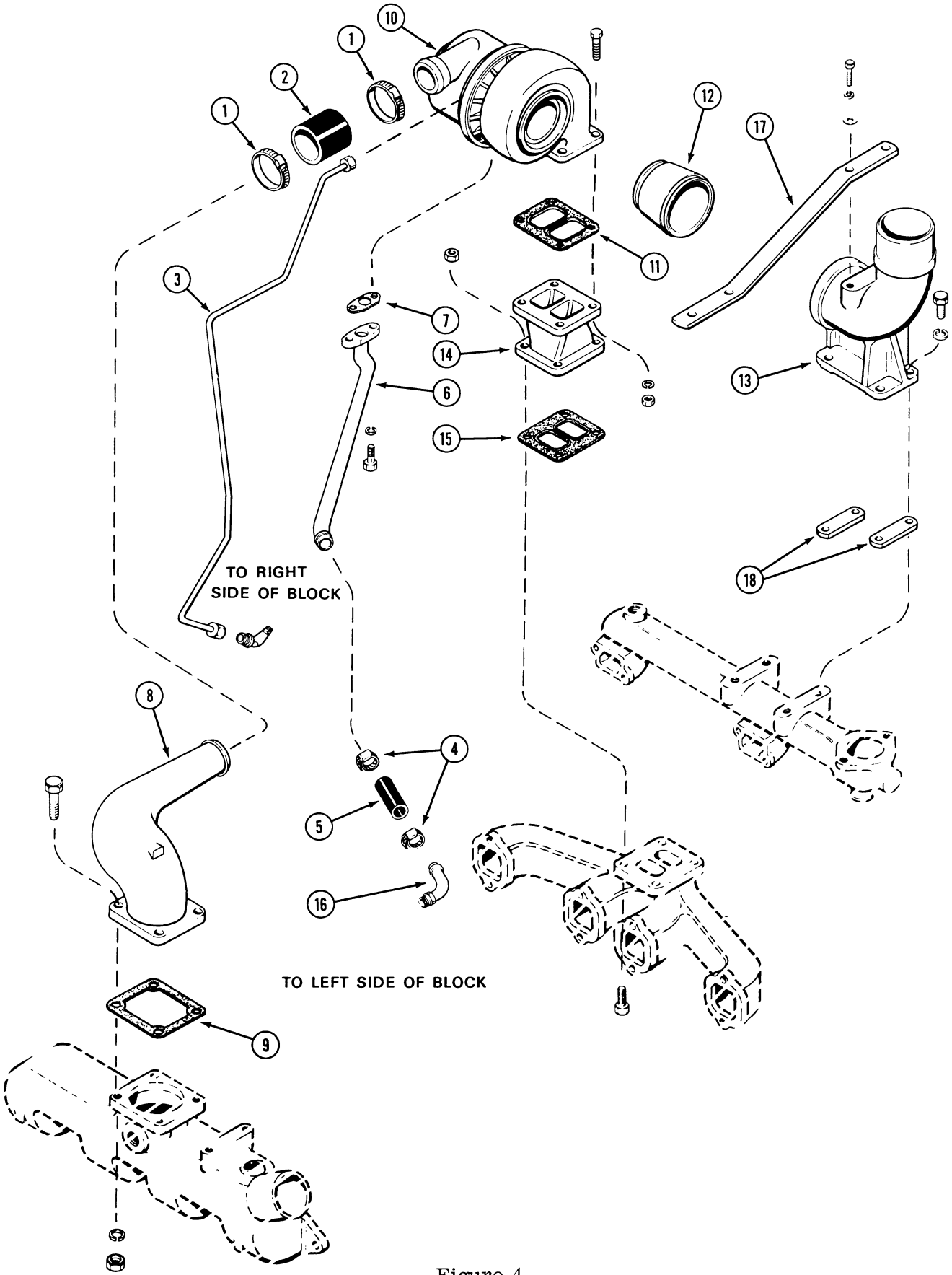
Flush and clean the oil supply line, oil drain tube and elbow. Check for any damage and replace if necessary.

Replace the hose clamps to assure air tight and leak proof connections.

Check the hoses for cracks and deterioration. Replace if necessary.

Installation

1. Install the intake elbow (8) with a new gasket (9) to the intake manifold. Retain with bolts and nuts and torque 35 to 42 ft. pounds.
2. Install the exhaust elbow (13) and spacers (18) to the water manifold. Retain with bolts finger tight.
3. Install the turbo adapter base (14) with a new gasket (15) to the exhaust manifold. Retain with bolts and nuts and torque 35 to 42 foot pounds.
4. Install a new gasket (11) to the turbo-adapter base and install the turbo-charger (10) to the adapter base with the coupler (12). Retain the turbo-charger with nuts and bolts finger tight. **IMPORTANT** - Align the turbo-charger (10), coupler (12) and and the exhaust elbow (13) so that the coupler is free to rotate 360°. Torque the exhaust elbow bolts and the turbo-charger bolts and nuts 35 to 42 ft. pounds. **NOTE** recheck that the coupler rotates 360°.
5. Install the brace (17) to the exhaust elbow (13) and retain with bolts. Torque 35 to 42 ft. pounds.
6. Install the turbo oil supply line (3).
7. Install the turbo oil drain tube (6) with a new gasket (7). Torque the retaining bolts 35 to 42 ft. pounds.
8. Install the drain tube elbow (16), with the hose end in a vertical angle position. Install new hose clamps (4) and hose (5), connecting the elbow (16) to the drain tube (6). Position the clamps and tighten securely.
9. Install the new hose clamps (1) and hose (2), connecting the intake elbow (8) and turbo-charger (10). Position the clamps and tighten securely.


10
1
2
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12
17
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13
15
TO RIGHT
SIDE OF BLOCK
18
8
4
5
16
TO LEFT SIDE OF BLOCK
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Figure 4

CYLINDER HEAD AND COMPONENTS

Four Cylinder, 267B, 301B, 336BD and 336BDT Engines

(Refer to Figure 5)

Removal

Remove the muffler and hood from vehicle. Disconnect the exhaust system and air cleaner from the manifolds. Steam clean the entire area where service work is to be performed.

1. Drain the cooling system. **CAUTION** If the engine is hot, do not remove the radiator cap until the coolant has had sufficient time to cool. Loosen the cap to the first stop carefully to relieve any excess pressure before removing it completely. Remove the upper radiator and water pump hoses.

2. Disconnect the high pressure fuel lines from the injectors and the leak-off tubes between the cylinder heads. Cap them to prevent any foreign particles from entering. Remove the injectors as described in Section 33 of the Service Manual.

3. Remove the breather tube (1) and discard the gaskets (2). Remove the manifold brace (5) and spacer (6), if equipped.

4. Remove the intake elbow (3) and gasket (4), if equipped and discarding the gasket.

5. Remove the intake manifold (7) and discard the gaskets (8).

6. Remove the exhaust stack (9) or cover plate (10) if equipped. Remove the exhaust elbow (11) if equipped.

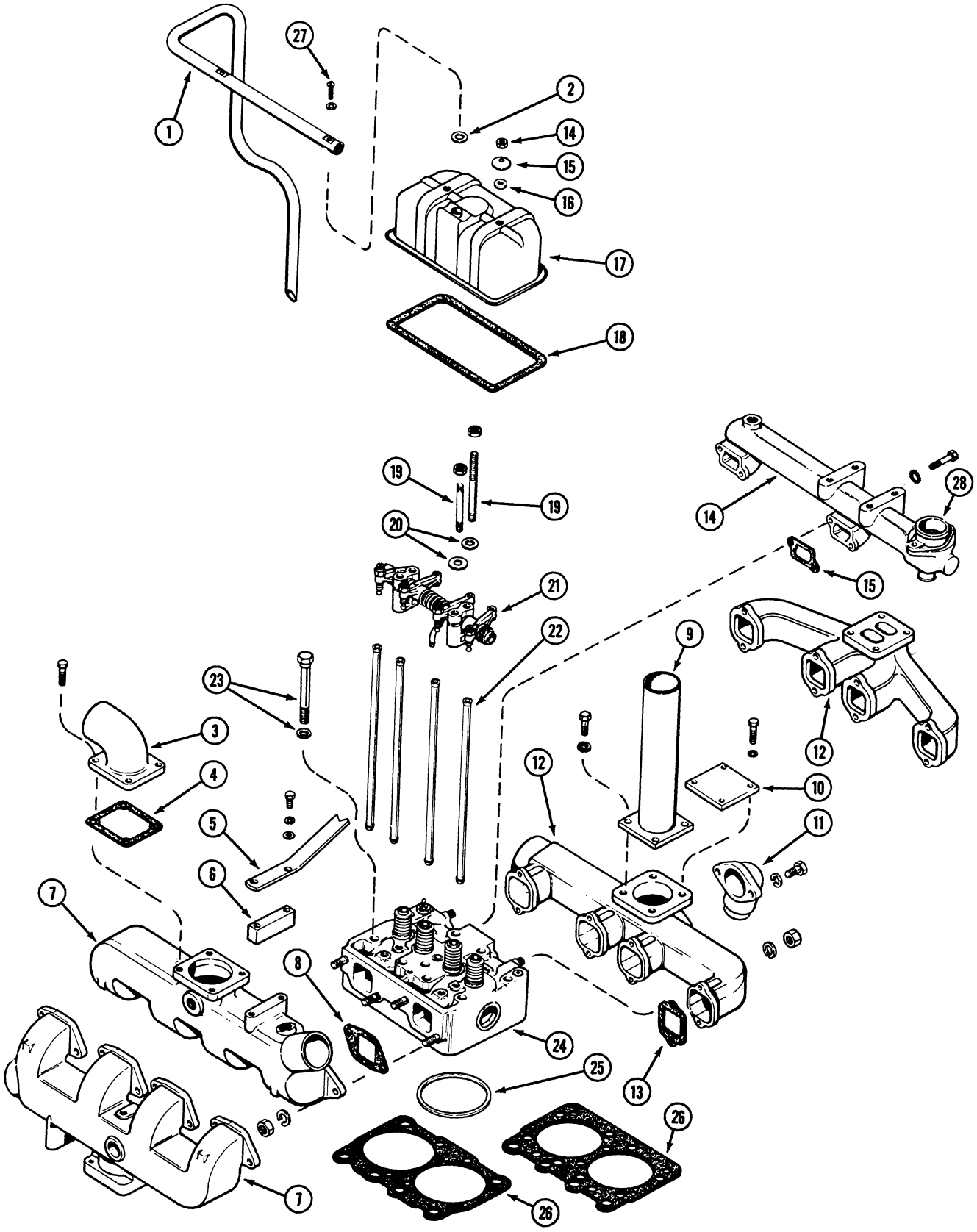
7. Remove the exhaust manifold (12) and discard the gaskets (13).

8. Remove the water manifold (14) and discard the gaskets (15). **NOTE** If the thermostat is to be serviced, remove the thermostat housing (28) and refer to Section 25 of the Service Manual.

9. Remove the valve cover nuts (14), bevel washers (15), gaskets (16), valve cover (17) and cover gasket (18). Discard gaskets (16 and 18).

10. Remove the studs (19), washers (20) and rocker arm assemblies (21). **NOTE** Tag the rocker arm assemblies for proper assembly. See Page 22-16 for servicing. Remove the push rods (22) and tag them for proper assembly.

11. Remove the cylinder head bolts and washers (23). Remove the cylinder head assembly (24), fire rings (25) and head gaskets (26). Discard the fire rings and head gaskets. See Page 22-18 for servicing of the cylinder head.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28

Figure 5

CYLINDER HEAD AND COMPONENTS

Six Cylinder 401B Engines

(Refer to Figure 6)

Removal

Remove the muffler and hood from vehicle. Disconnect the exhaust system and air cleaner from the manifolds. Steam clean the entire area where service work is to be performed.

1. Drain the cooling system. **CAUTION** If the engine is hot, do not remove the radiator cap until the coolant has had sufficient time to cool. Loosen the cap to the first stop carefully to relieve any excess pressure before removing it completely. Remove the upper radiator and water pump hoses.

2. Disconnect the high pressure fuel lines from the injectors and the leak-off lines between the cylinder heads. Cap them to prevent any foreign particles from entering. Remove the injectors as described in Section 33 of the Service Manual.

3. Remove the breather tube (1) and discard the gaskets (2).

4. Remove the intake manifold (3) and discard the gaskets (4).

5. Remove the exhaust stack (5) if equipped. Remove the exhaust manifolds (6) and discard the gaskets (7).

6. Remove the water manifold (8) and discard the gaskets (9). **NOTE** If the thermostats are to be serviced, remove the housing (10) and refer to Section 25 of the Service Manual.

7. Remove the valve cover nuts (11), bevel washers (12), gaskets (13), valve cover (14) and cover gasket (15). Discard gaskets (13 and 15).

8. Remove studs (16) and washers (17). Remove the rocker arm assembly (18). **NOTE** Tag the rocker arm assemblies for proper assembly. Refer to Page 22-16 for rocker arm servicing. Remove the push rods (19). Tag the push rods for proper assembly.

9. Remove the cylinder head bolts and washers (20). Remove the cylinder head assembly (21), fire rings (22) and head gaskets (23). Discard the fire rings and head gasket. See Page 22-18 for servicing of the cylinder head.

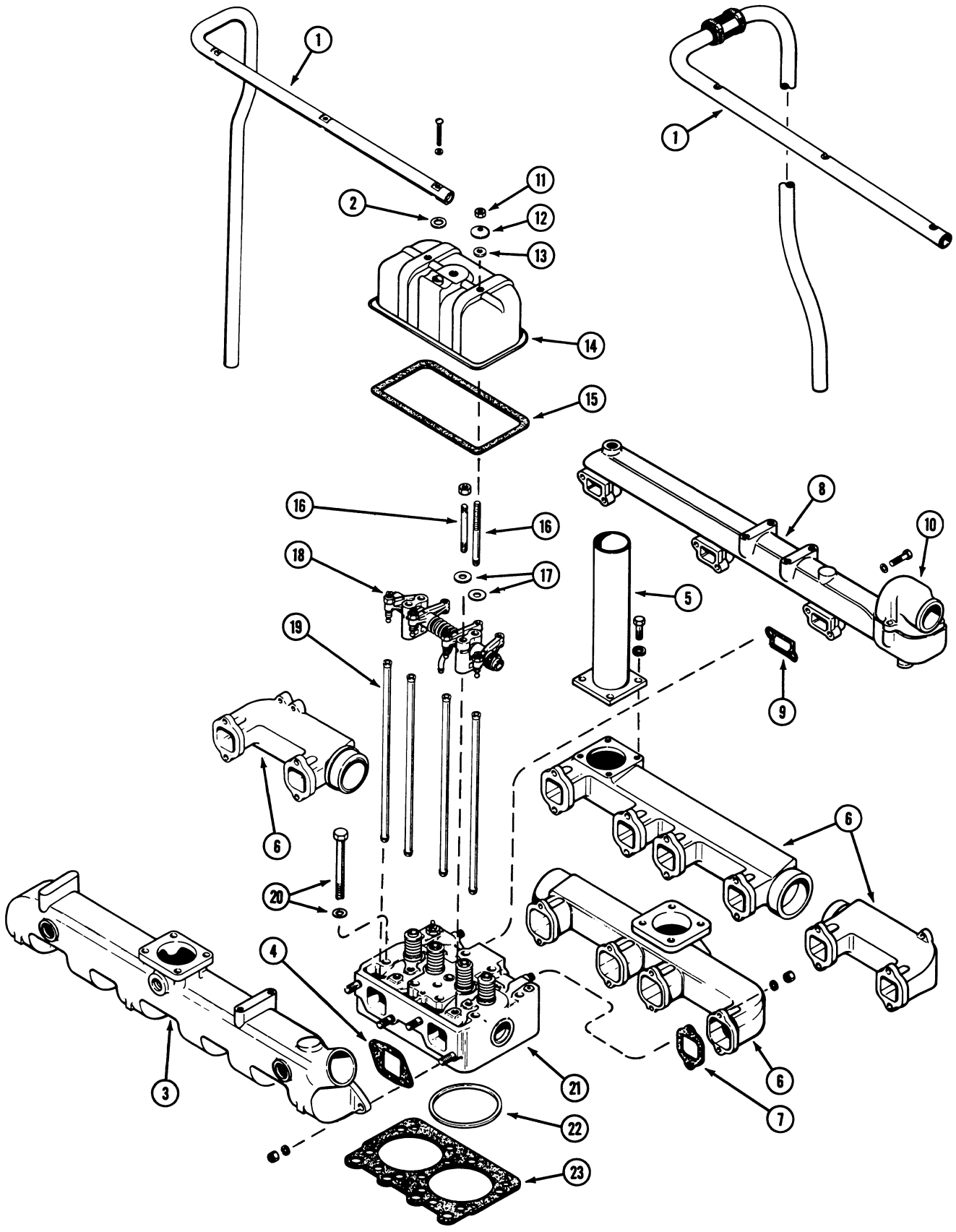


Figure 6

CYLINDER HEAD AND COMPONENTS (Continued)
Inspection

Replace all gaskets, seals and worn or defective parts.

1. Clean the top surface of the block and sleeve flange carefully. All traces of carbon and other deposits must be removed. During cleaning, the use of a rag dampened in solvent is recommended.

2. Using extreme care not to scratch surfaces. Remove any small burrs in the areas to be measured so accurate readings can be obtained.

3. Sleeve protrusion must be checked to determine which fire ring to install, Figure 7. Make sure the correct fire ring is used. Only the standard size fire ring is included in the valve grind gasket kit. However, a thicker fire ring is available if the protrusion chart indicates a need for it. The thicker fire ring can be identified by a blue marking stripe. Either a magnetic base dial indicator or a depth micrometer can be used to determine the cylinder sleeve protrusion as indicated in Figure 8. Measure cylinder sleeve protrusion at points A,B, C and D. Using plate, ball and clamping bar, clamp the cylinder sleeve in place, Figure 9. Torque the hold down capscrews 50 foot-pounds. **NOTE** Refer to Figure 9, Inset A for clamping bar dimensions. These tools are available through local Owatonna Tool dealers or the Owatonna Tool Co. Owatonna, Minnesota.

4. Clean and inspect the cylinder heads thoroughly. If evidence of fretting or erosion exists in the area of fire-ring contact or if head is warped more than .005", the head must be resurfaced or replaced.

5. Inspect push rods for straightness, cracked or worn ends. Replace if necessary.

6. Clean all bolt and stud threads.

7. Clean the rocker arm covers and discard the old gasket.

8. Replace all hoses if cracks and deterioration is found. Replace hose clamps to assure a tight connection.

CYLINDER SLEEVE PROTRUSION	USE STANDARD FIRE RING	USE OVERSIZE (THICKNESS) FIRE RING
BOTH SLEEVES UNDER ONE HEAD FLUSH TO .002"		X
BOTH SLEEVES UNDER ONE HEAD .002" OR OVER BUT LESS THAN .0025" BETWEEN SLEEVES	X	
BOTH SLEEVES UNDER ONE HEAD OVER .0025" DIFFERENCE BETWEEN SLEEVES	ON THE HIGH SLEEVE	ON THE LOW SLEEVE

Figure 7

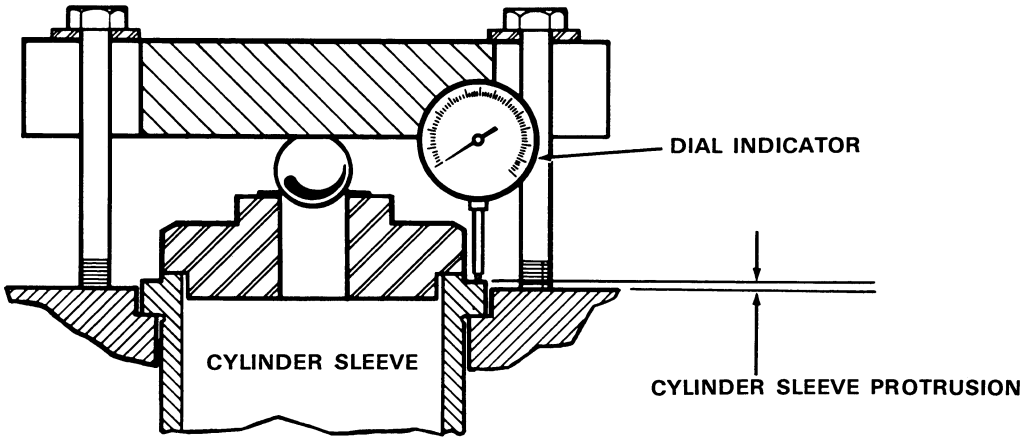


Figure 8

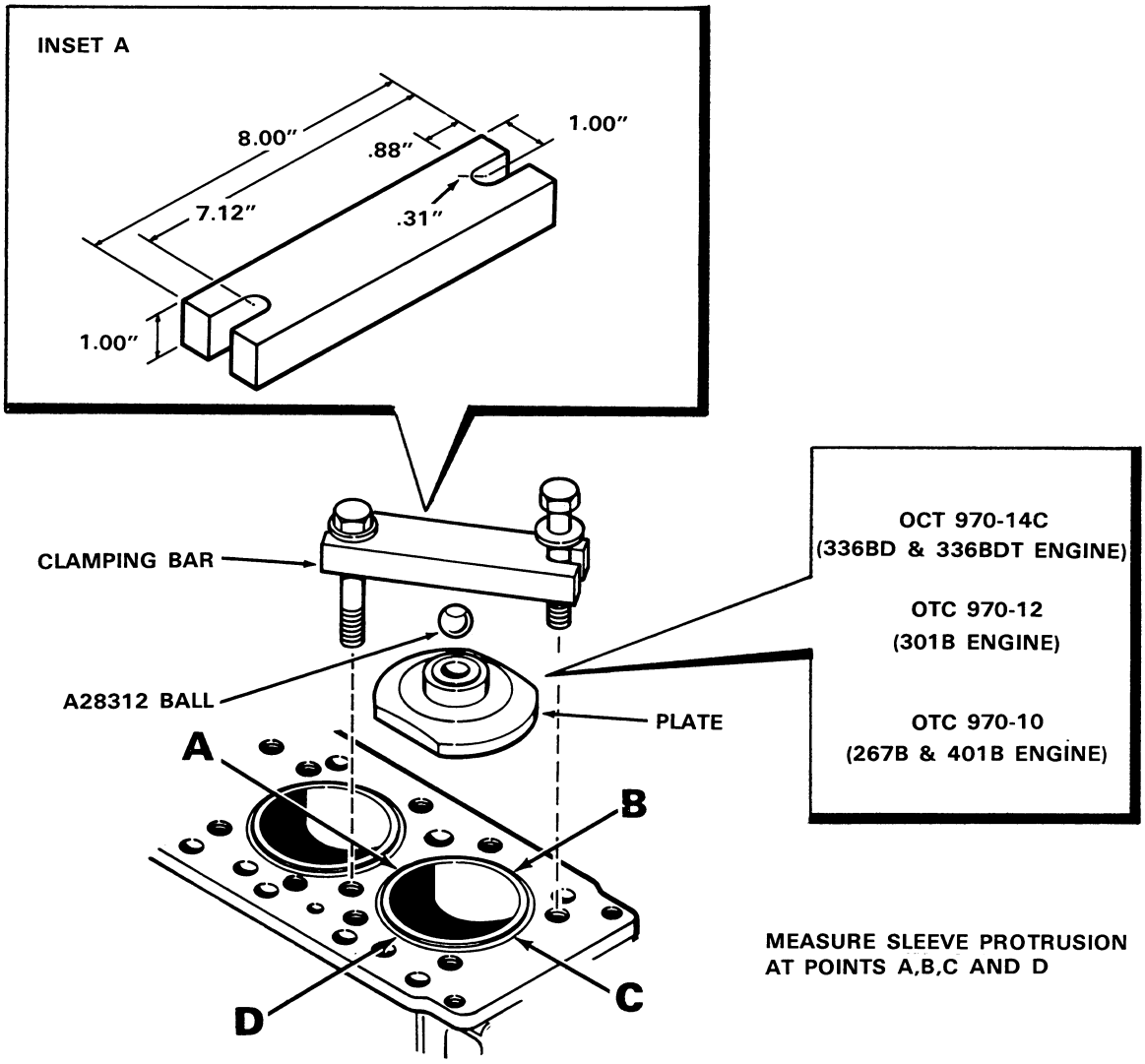


Figure 9

CYLINDER HEAD AND COMPONENTS (Continued)
Four Cylinder 267B, 301B, 336BD and 336BDT Engines
(Refer to Figure 10)

Installation

1. Place new cylinder head gaskets (26) on the engine block. **NOTE** Two of the cap-screw holes in the head gasket are slightly smaller and act as guides to position the head gasket as well as the fire rings. Regular line-up studs or dowel pins and tong, Inset A, may be used. These may be purchased through the J.I. Case Co. Service Parts Supply or a local Snap-On Tool Dealer under the following part numbers.

	Case Part No.	Snap-On Tool No.
Tong	A40952	CF83-1
Dowel	A40953	CF83-4

2. Install the new fire rings (25) with either side up. **NOTE** The fire rings must be installed dry.

3. Install the cylinder head (24) and several bolts and washers (23), finger tight. Remove the A40953 dowels using the A40952 tong or guide studs, whichever was used. Install the remaining cylinder head bolts and washers (23), also finger tight. Install new intake manifold gaskets (8), manifold (7) exhaust manifold gaskets (13) and manifold (12). Secure with stud nuts finger tight. Install the water manifold (14) with new gaskets (15). Retain with mounting bolts finger tight. **NOTE** Be sure the intake manifold is installed in the same position prior to removal.

4. Torque the cylinder head bolts (23) in the proper sequence as illustrated in Inset D. The three recommended torque steps are 70 ft. lbs., 140 ft. lbs. and 210 ft. lbs.. Torque the intake and exhaust manifold stud nuts and the water manifold bolts, 25 to 30 ft. lbs.

5. Coat all the push rods (22) with clean engine oil and install them in their original locations.

6. Install the rocker arm assemblies (21) in their original location. Make sure all of the push rods (22) are engaged with the adjusting screws on the rocker arms. Install the bracket studs (19) and washers (20) and tighten. Torque the studs nuts evenly 40 to 45 ft. lbs.

7. Check the clearance at both ends of the rocker arm shafts. Maintain clearance between .010" to .030" at each end, Inset B. Adjust the valve tappet clearance, refer to Pages 22-24 and 22-25.

8. Install the intake elbow (3) with new gasket (4) if equipped, the exhaust stack (9) or cover (10) if equipped, and the exhaust elbow (11) if equipped. Torque the retaining bolts 35 to 42 ft. lbs.

9. Reconnect the hoses to the thermostat housing (28) and clamp securely. Make sure the drain valves are closed and refill the cooling system. Reinstall the air cleaner system, making sure all connections are tight. Install the fuel injectors and fuel lines, and bleed the system.

10. Apply clean engine oil to the rocker arm assembly and start engine. Check that the rocker arms are receiving lubricating oil. Operate the engine for approximately one (1) hour, (under load if possible) to thoroughly warm up the engine and seat the head gaskets.

11. Shut engine off. Using wrench A42393, Inset C, which can be purchased through the J.I. Case Co. Service Parts Supply back off each head bolt individually 1/4 turn and retorque to 210 ft. lbs. in the proper sequence, Inset D. **NOTE** DO NOT BACK OFF ALL THE BOLTS AT THE SAME TIME. Recheck the torque to make sure all cyl. head bolts have retained the 210 ft. lbs. and bracket studs 25-30 ft. lbs.

12. Install new valve cover gaskets (18) and the valve cover (17). Install new gaskets (16) with bevel washers (15) and cover stud nuts (14). Torque nuts 65 to 70 inch lbs. Do not over torque the stud nuts. Install new breather tube gaskets (2), breather tube (1) and secure with retaining screws (27).

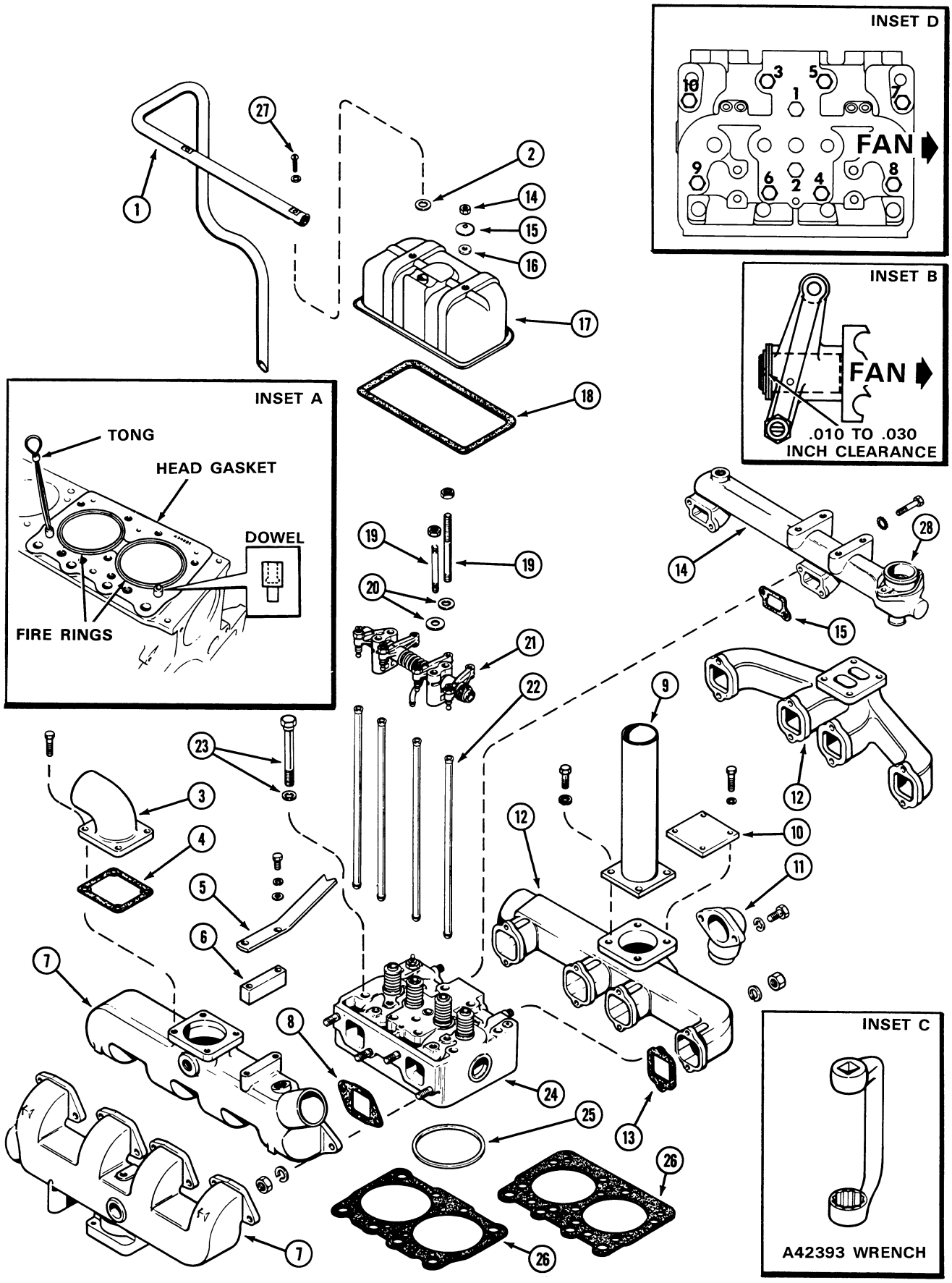

INSET D
FAN
INSET B
FAN
.010 TO .030
INCH CLEARANCE
INSET A
TONG
HEAD GASKET
DOWEL
FIRE RINGS
INSET C
A42393 WRENCH

Figure 10

CYLINDER HEAD AND COMPONENTS (Continued)
Six Cylinder 401B Engines
(Refer to Figure 11)

Installation

1. Place new cylinder head gaskets (23) on the engine block. **NOTE** Two of the bolt holes in the head gasket are slightly smaller and act as a guide to position the head gasket as well as the fire rings. Regular line-up studs or dowel pins and tong, Inset A, may be used. These may be purchased through the J.I. Case Co. Service Parts Supply or a local Snap-On Tool dealer under the following part numbers.

	Case Part No.	Snap-On Tool No.
Tong	A40952	CF83-1
Dowel	A40953	CF84-4

2. Install the new fire rings (22) with either side up. **NOTE** The fire rings must be installed dry.

3. Install the cylinder head (21) and several bolts and washers (20), finger tight. Remove the A40953 dowels using the A40952 tong or guide studs, whichever was used. Install the remaining cylinder head bolts and washers (20), also finger tight. Install new intake manifold gaskets (4), manifold (3), new exhaust manifold gaskets (7) and manifolds. Retain with stud nuts finger tight. Install new water manifold gaskets (9), manifold (8) and retain with mounting bolts finger tight.

4. Torque the cylinder head bolts (20) in the proper sequence as illustrated in Inset D. The three recommended torque steps are 70 ft. lbs., 140 ft. lbs. and 210 ft. lbs. Torque the intake and exhaust manifold stud nuts and the water manifold bolts evenly 25 to 30 ft. lbs.

5. Coat all of the push rods (18) with clean engine oil and install them in their original locations.

6. Install the rocker arm assemblies (18) in their original location. Make sure all of the push rods (19) are engaged with the adjusting screws on the rocker arms. Install the bracket studs (16) and washers (17) and tighten. Torque the studs, nuts evenly 40 to 45 ft. lbs.

7. Check the clearance at both ends of the rocker arm shafts. Maintain clearance between .010" to .030" at each end, Inset B. Adjust the valve tappet clearance, refer to Pages 22-24 or 22-25.

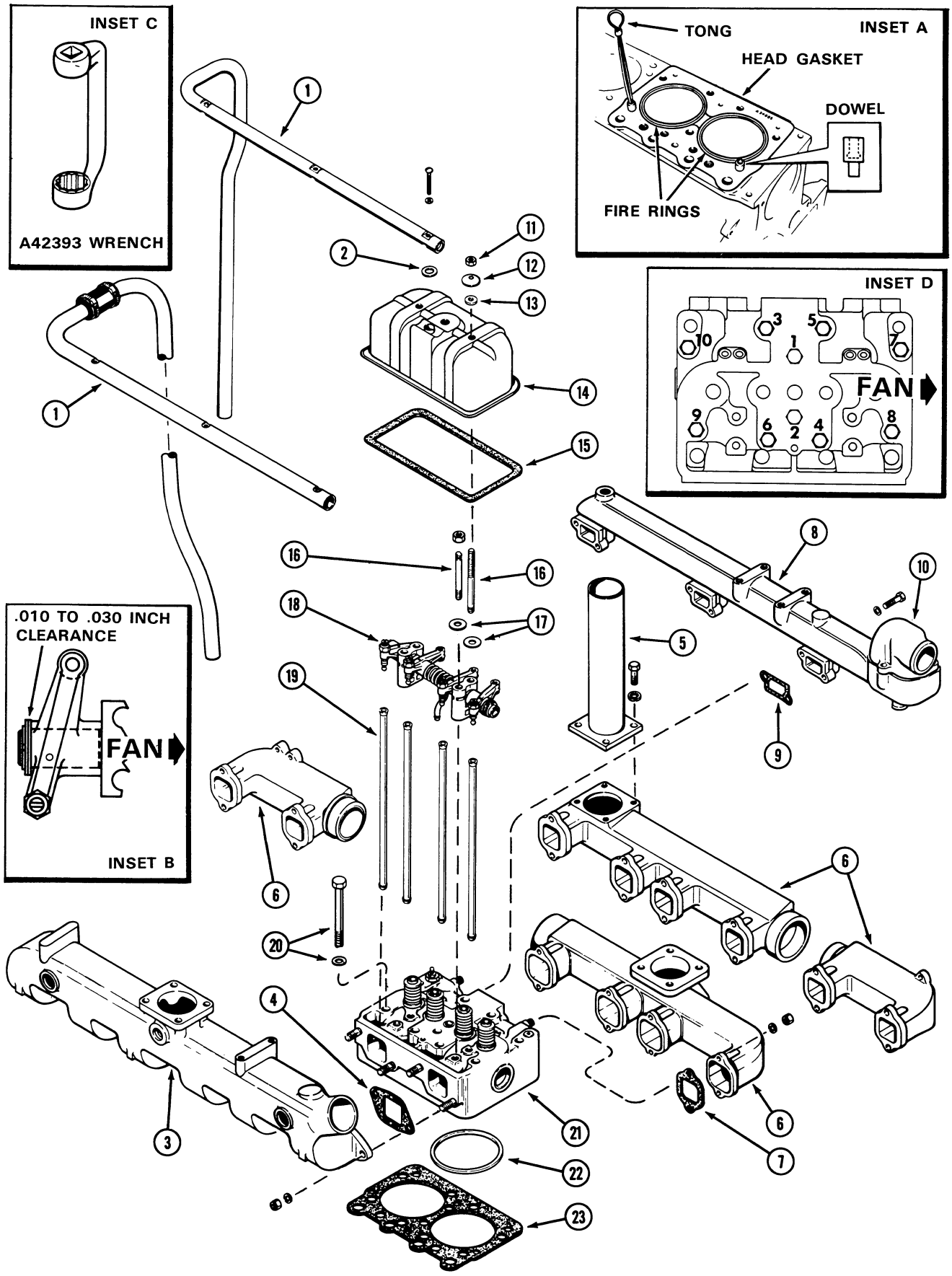
8. Install the exhaust stack (5) if equipped and torque the retaining bolts 35 to 42 ft. lbs.

9. Reconnect the hoses to the thermostat housing (10) and clamp securely. Make sure the drain valves are closed and refill the cooling system. Reinstall the air cleaner system, making sure all connections are tight. Install the fuel injectors and fuel lines and bleed the fuel system.

10. Apply clean engine oil to the rocker arm assembly and start engine. Check that the rocker arms are receiving lubricating oil. Operate the engine for approximately one (1) hour, (under load if possible) to thoroughly warm up the engine and seat the head gaskets.

11. Shut the engine off Using Wrench A42393, Inset C, which can be purchased through the J. I. Case Co. Service Parts Supply back off each head bolt individually 1/4 turn and retorque to 210 ft. lbs. in the proper sequence, Inset D. **NOTE** DO NOT BACK OFF ALL THE BOLTS AT THE SAME TIME. Recheck the torque to make sure all cylinder head bolts have retained the 210 ft. lbs. Recheck rocker arm bracket stud nuts to retain 25 to 30 ft. lbs. torque.

12. Install new valve cover gaskets (15) and the valve cover (14). Install new gaskets (13) with bevel washers (12) and cover stud nuts (11). Torque nuts 65 to 70 inch lbs. Do not over torque the stud nuts. Install new breather tube gaskets (2), breather tube (1) and secure with retaining screws.


INSET C
A42393 WRENCH
INSET A
TONG
HEAD GASKET
DOWEL
FIRE RINGS
INSET D
FAN
.010 TO .030 INCH CLEARANCE
FAN
INSET B
1
2
11
12
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14
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Figure 11

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ROCKER ARM ASSEMBLY

(Refer to Figure 12)

Disassembly

Be sure the rocker arm assemblies are tagged so they are installed on the same cylinder head they were removed from. Tag component parts for proper assembly. Do not intermix parts from one assembly to another.

1. Remove the oil tube (1) with the "O" ring (2). Remove the "O" ring and discard it. Remove the snap rings (3) and spacer washers (5). Keep count of the number of washers used at each end of the shaft (4). Tag each rocker arm for original location. Remove the exhaust rocker arms (6) and the shaft brackets (7) from the shaft (4).

2. Remove the intake rocker arms (8) and the shaft spring (9).

Inspection

Check the shaft spring for damage and proper tension.

Spring Specifications:

Total Coils (Working coils) ---------- 4
Wire Diameter ---------- .080"
Compressed to 1-9/16 -------- 10 lbs.

Flush the shaft to remove any residual material. Inspect the shaft for worn spots on the bottom side of the shaft. Replace the shaft if a worn condition exists.

Inspect the rocker arms by installing each rocker arm on the shaft in its proper location. The rocker arm must be free on the shaft without any side wobble. If any is noted, replace the rocker arms. Clean the oil holes in the rocker arms to insure free oil flow. Inspect the valve stem contact area on the rocker arm for wear. Replace if worn. Inspect the tappet adjusting screw for wear marks or pitting.

Assembly

With all components parts cleaned thoroughly and worn parts replaced, coat them with clean engine oil.

1. Install the shaft spring (9) and the two intake rocker arms (8) on the shaft (4). When installing the rocker arms, keep the shaft oil holes toward the valves, See Inset A.

2. Install the shaft brackets (7) on the shaft (4) with the split side toward the push rod side of the engine.

3. Install the exhaust rocker arms (6) on the shaft (4). Install the same number of spacer washers (5) at each end of the shaft as were removed during disassembly.

4. Install the snap rings (3) at each end of the shaft. Check the rocker arms for free movement. Install the oil tube (1) with a new "O" ring (2). Install the adjusting screws (10) and lock nuts (11) if they were removed for replacement.

5. Install the rocker arm and shaft assembly as instructed on Page 22-12 and 22-14.

6. Check the exhaust rocker arms for excessive end play. One or more spacer washers can be used between the exhaust rocker arms (6) and snap rings (3) to remove excessive end play. A clearance of .010"to .030"must be maintained at each end of the shaft and can be checked in the area shown in Inset B.