Engine Disassembly Sequence

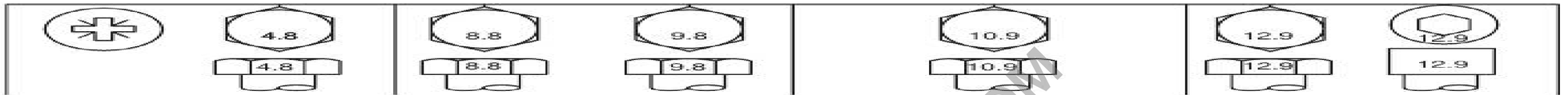
The following sequence is suggested when complete disassembly for overhaul is required. Refer to the appropriate repair group when removing individual engine components.

1. Drain all coolant and engine oil. Check engine oil for metal contaminates (see Groups 25 and 30).
2. Remove fan belts, fan, and alternator (see Group 30).
3. Remove turbocharger (if equipped) and exhaust manifold (see Group 35).
4. Remove rocker arm cover with vent tube. On engines having an Option Code label on rocker arm cover, be careful not to damage label (see Group 05).
5. Remove rocker arm assembly and push rods. Keep rods in sequence (see Group 05). Check for bent push rods and condition of wear pad contact surfaces on rockers.
6. Remove thermostat housing and by-pass tube (see Group 30).
7. Remove oil cooler piping and water pump (see Groups 25 and 30).
8. Remove dipstick, oil filter, and engine oil cooler. Discard standard-flow oil cooler if oil contained metal particles (see Group 25).
9. Remove starting motor.
10. Remove fuel filter, fuel transfer pump, and fuel lines (see Group 40).
11. Remove injection lines, injection pump, and injection nozzles (see Group 40).
12. Remove cylinder head (see Groups 05 and 10).
13. Remove cam followers. Keep in same sequence as removed (see Group 20).
14. Remove oil pan (see Group 25).
15. Remove crankshaft pulley (see Group 15).
16. Remove oil pressure regulating valve assembly (see Group 25).
17. Remove timing gear cover (see Group 20).
18. Remove oil pump drive gear, outlet tube (and its O-ring in block) and pump body (see Group 25).
19. Remove oil deflector, timing gears and camshaft. Perform wear checks (see Group 20).
20. Remove engine front plate (see Group 20).
21. Remove lube oil system by-pass valve (see Group 25).
22. Remove flywheel and flywheel housing (see Group 15).
23. Stamp cylinder number on rod (if required). Remove pistons and rods. Perform wear checks with PLASTIGAGE® (see Group 10).
24. Remove main bearings and crankshaft. Perform wear checks with PLASTIGAGE® (see Group 15).
25. Remove cylinder linersand mark each one with cylinder number from which removed (see Group 10).
26. Remove piston cooling orifices (see Groups 10 and 15).
27. Remove camshaft bushings (if equipped), see Group 10.

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Continued on next page

Metric Bolt and Screw Torque Values



TS1670 -UN-01MAY03

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Cylinder Head and Valves Specifications

Item	Measurement	Specification
Valve lift		
Intake valve	Valve lift at 0.00 mm (in.) clearance	11.56—12.37 mm (0.455—0.487 in.)
	Wear Tolerance	11.13 mm (0.438 in.)
Exhaust valve	Valve lift at 0.00 mm (in.) clearance	11.28—12.12 mm (0.444—0.477 in.)

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- Group 03—Engine Rebuilt Guide
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- Group 15—Crankshaft, Main Bearings and Flywheel
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- Group 110—Engine System - Diagnosis and Tests
- Group 115—Air Intake System - Operation and Tests
- Group 120—Fuel System - Operation and Tests
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- Group 300—Repair Specifications
- Group 305—Diagnostic and Test Specifications

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



TS227 –UN–23AUG88

DX,FLAME –19–29SEP98–1/1

Prevent Battery Explosions

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



TS204 –UN–23AUG88

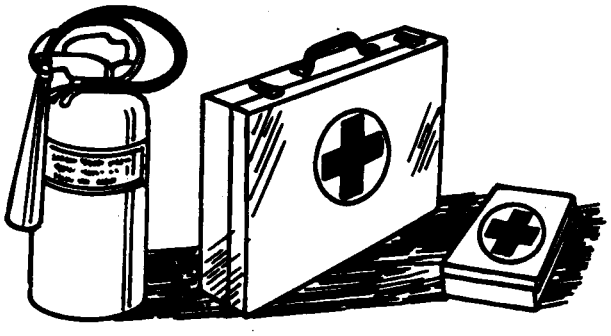
DX,SPARKS –19–03MAR93–1/1

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



TS291 –UN–23AUG88

DX,FIRE2 –19–03MAR93–1/1

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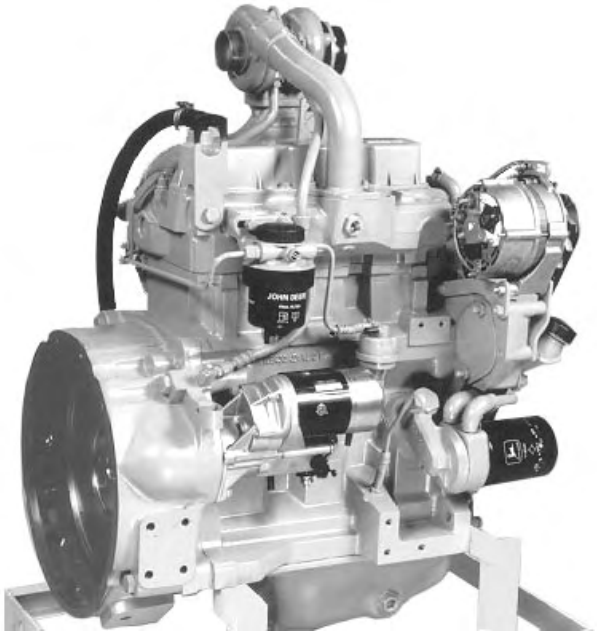
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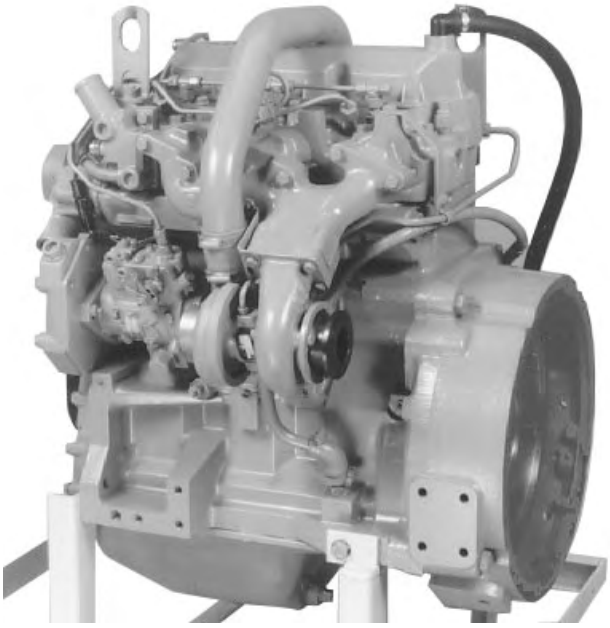
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POWERTECH® 2.9 L Engines



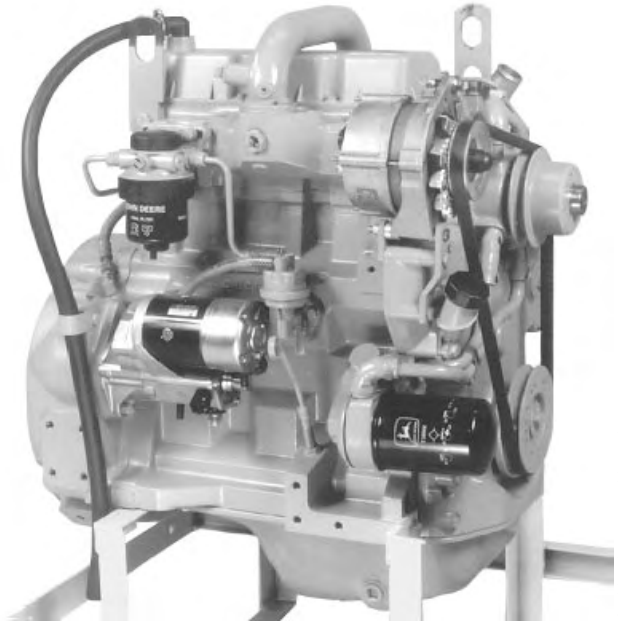
CD30517A –UN–23FEB01

3/4 Right Rear View



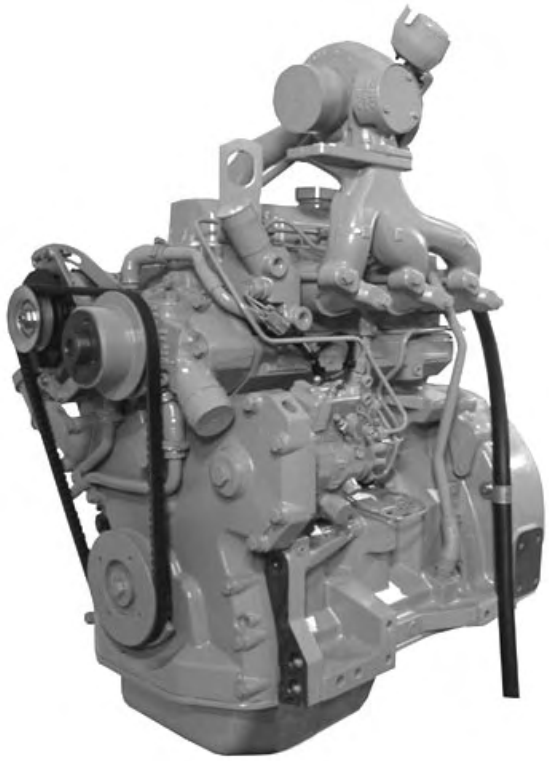
CD30518A –UN–22FEB01

3/4 Left Rear View



CD30519A –UN–23FEB01

3/4 Right front View



RG12835 –UN–05MAR03

3/4 Left Front View

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DPSG,OUOE003,33 –19–20SEP04–1/1

01
10

Handling and Storing Diesel Fuel

CAUTION: Handle fuel carefully. Do not fill the fuel tank when engine is running.

DO NOT smoke while you fill the fuel tank or service the fuel system.

Fill the fuel tank at the end of each day's operation to prevent water condensation and freezing during cold weather.

Keep all storage tanks as full as practicable to minimize condensation.

Ensure that all fuel tank caps and covers are installed properly to prevent moisture from entering.

Monitor water content of the fuel regularly.

When using bio-diesel fuel, the fuel filter may require more frequent replacement due to premature plugging.

Check engine oil level daily prior to starting engine. A rising oil level may indicate fuel dilution of the engine oil.

IMPORTANT: The fuel tank is vented through the filler cap. If a new filler cap is required, always replace it with an original vented cap.

When fuel is stored for an extended period or if there is a slow turnover of fuel, add a fuel conditioner to stabilize the fuel and prevent water condensation. Contact your fuel supplier for recommendations.

DX,FUEL4 –19–19DEC03–1/1

05
10

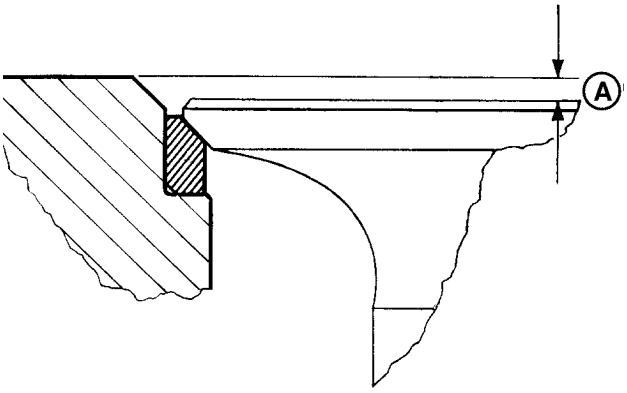
Check Valve Recess

After lapping valve seat or remachining combustion face, install refaced or new valves in cylinder head and check valve recess (A).

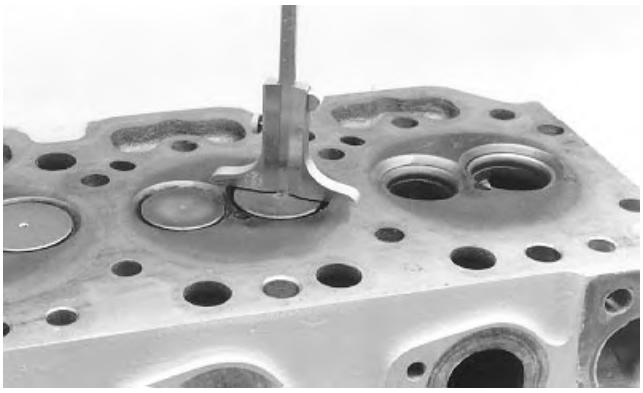
Specification

Intake Valve—Recess	0.61—1.11 mm (0.024—0.044 in.)
Wear tolerance	1.63 mm (0.064 in.)
Exhaust Valve—Recess	1.22—1.72 mm (0.048—0.068 in.)
Wear tolerance	2.26 mm (0.089 in.)

When maximum valve recess is reached, replace valve seat inserts.



RG4756 –UN–31OCT97



CD30541 –UN–04MAY98

CD,CTM125,029 –19–04JAN01–1/1

Remove Valve Seat Inserts

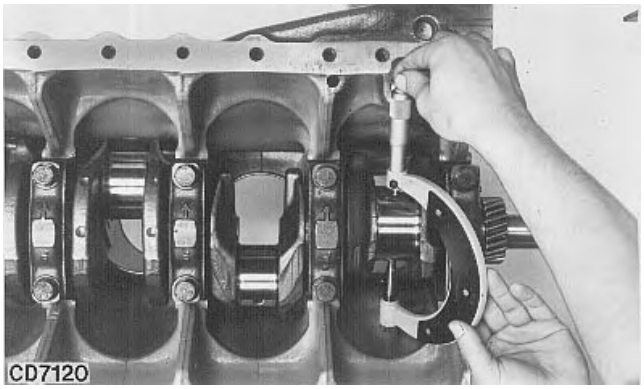
Valve seat inserts are made of sintered metal. Following methods, performed by experienced personnel or specialized workshop, can be used to remove inserts.

Continued on next page

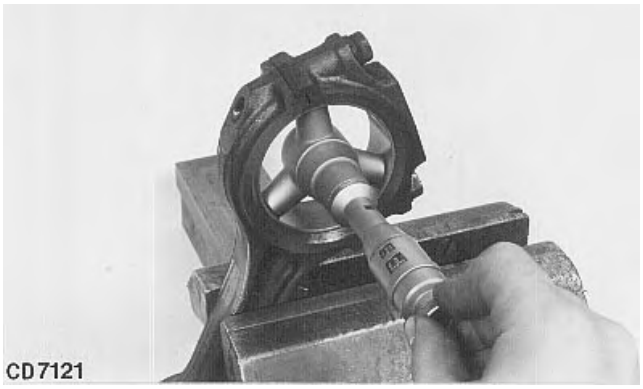
CD,CTM125,031 –19–04JAN01–1/3

10
14

Measure Connecting Rod Bearing



CD7120 –UN–07MAR95



CD7121 –UN–07MAR95

NOTE: Before measuring, connecting rod cap screws must be tightened according to specifications.

Specification

Connecting rod cap screw—
Torque ..... 56 N•m (40 lb-ft)
Torque Turn ..... 90—100 °

1. Measure diameters then compare with specifications.

Specification

Connecting rod bearing
(assembled)—Diameter .....69.848—69.898 mm
(2.7499—2.7519 in.)
Crankshaft journal—Diameter .....69.799—69.825 mm
(2.748—2.749 in.)
Maximum permissible
clearance ..... 0.16 mm (0.006 in.)

2. If clearance is not within specifications, grind crankshaft journals to match undersized bearings specified.

Specification

Undersized connecting rod
bearing—1st Size .....0.25 mm (0.01 in.)

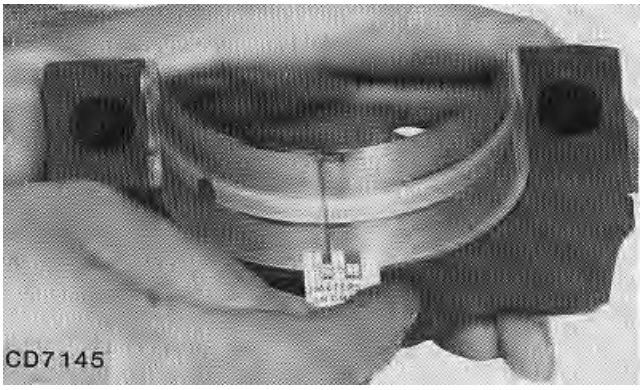
NOTE: Undersized crankshafts may be also available through the regular service parts channel.

CD,CTM125,060 –19–12JAN01–1/1

15
14

Determine Crankshaft Main Bearing Clearance Using PLASTIGAGE®

1. Place a strip of PLASTIGAGE® in the center of the bearing.
2. Install cap and tighten cap screws to 135 N•m (100 lb-ft).
3. Remove cap and compare the width of PLASTIGAGE® with scale provided on side of package to determine clearance.
4. Maximum permissible clearance is 0.15 mm (0.006 mm).



CD7145 –UN–23MAY95

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CD,CTM125,101 –19–16JAN01–1/1

Regrind Crankshaft

If journals are worn, tapered, out-of-round, scored or damaged, the crankshaft journals can be reground and correct undersize bearing inserts installed.

Specification	
Undersized crankshaft main bearing—1st Size	0.25 mm (0.01 in.)
2nd Size	0.50 mm (0.02 in.)
3rd Size	0.76 mm (0.03 in.)

IMPORTANT: Crankshaft grinding should be carried out ONLY by experienced personnel on equipment capable of maintaining crankshaft size and finish specifications.

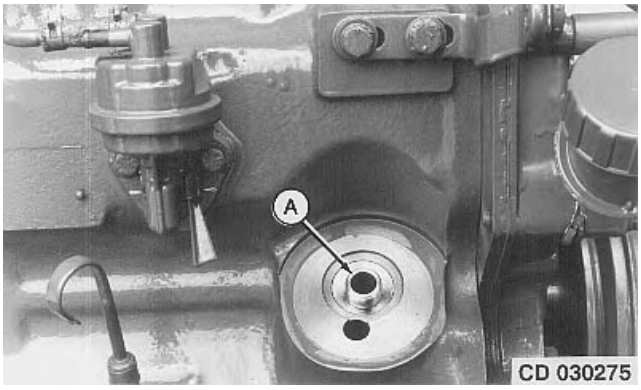
NOTE: This cast iron crankshaft can be reground only once to 0.25 mm (0.01 in.) under standard size. Crankshaft must be lapped afterwards according to the micro-finishing specifications given in this group.

CD,CTM125,102 –19–16JAN01–1/1

25
2

Replace Oil Cooler Nipple

1. Remove oil cooler nipple (A).
2. Press in new nipple so that threaded end faces outward (farthest point from cylinder block).



CD,CTM125,138 –19–01DEC97–1/1

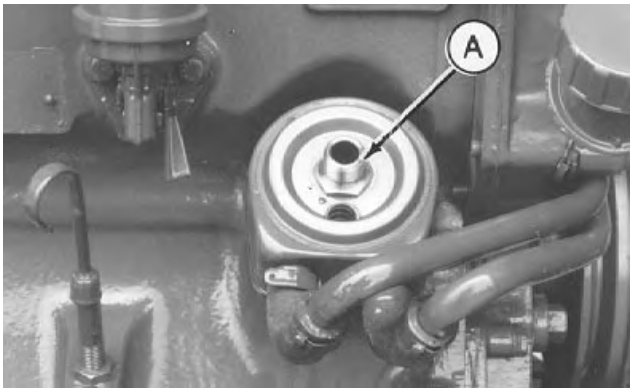
Install Oil Cooler on Standard Engine

1. Install new packing between oil cooler and cylinder block.
2. Attach oil cooler with nipple (A). Tighten to specification.

Specification

Oil cooler nipple—Torque .....35 N•m (25 lb-ft)

3. Connect coolant lines to oil cooler.
4. Install oil filter.



CD,CTM125,139 –19–24JAN01–1/1

35
6

Check Axial Clearance

1. Using a dial indicator with indicator rod against shaft, measure axial end play.

2. Move shaft axially back and forth by hand. Compare reading with specification.

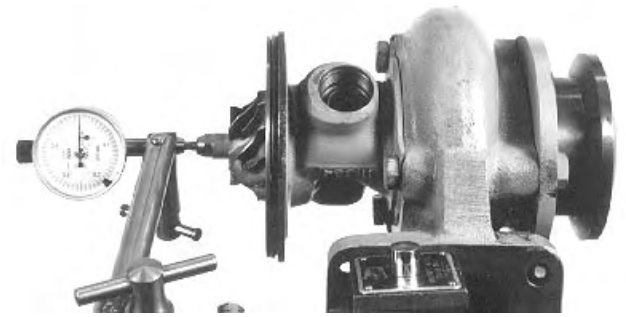
Garrett Turbocharger—Specification

TA25 model—Axial clearance..... 0.025—0.09 mm (0.001—0.0035 in.)

Borg-Warner/Schwitzer Turbocharger—Specification

S1B model—Axial clearance.....0.14 mm (0.0055 in.) Maxi

If axial clearance is not within specifications, replace turbocharger.



CD30659 –UN–04MAY98

CD,CTM125,177 –19–31AUG04–1/1

Repair Turbocharger

Due to special tooling and highly specialized personnel required, turbochargers can be serviced only by an authorized workshop.

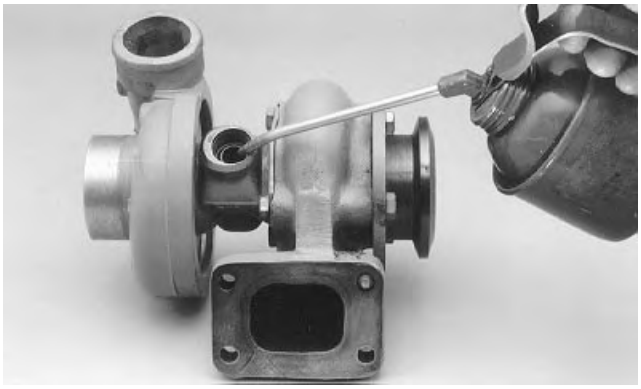
Only complete turbochargers are available through service parts channel. Individual components for repair are not available.

CD,CTM125,178 –19–01DEC97–1/1

Prelube Turbocharger

IMPORTANT: DO NOT spin the rotor assembly with compressed air. Rotor may seize due to high speed reached.

Fill oil inlet or drain port with clean engine oil and spin rotating assembly **(by hand)** to properly lubricate bearings.



CD30660 –UN–04MAY98

CD,CTM125,179 –19–01DEC97–1/1

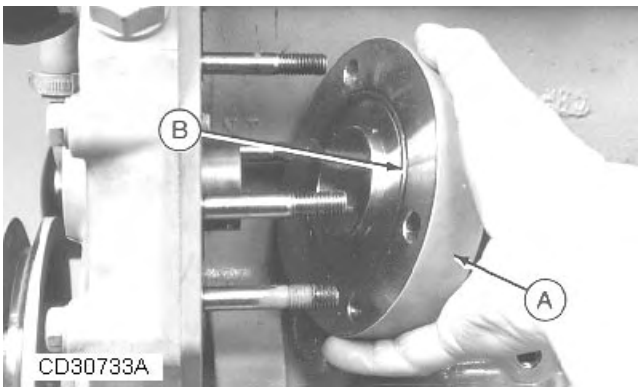
Install MICO in-Line Fuel Injection Pump

NOTE: Before installation, ensure that the injection pump has no engine in the housing. This will allow to fill injection pump with the proper oil quality and quantity.

1. Slide spacer (A) with O-ring (B) over the four studs. Align timing marks.

2. Slide injection pump over studs, inserting shaft in drive gear.

NOTE: Make sure that the shaft key is seated properly.



CD30733A –UN–27SEP04

Install MICO fuel injection pump - Spacer

Continued on next page

CD03523,000013E –19–07SEP04–1/3

From here oil is forwarded under pressure to the main bearings (R) and spray jets (H) to cool the pistons. Drilled cross passages in the crankshaft (U) distribute oil from the main bearings to connecting rod bearings (T).

Lube oil holes in Nos. 1, 2, 3 main bearing oil grooves are provided to direct oil to the camshaft bearings (B). The lower idler gear is lubricated by splash oil.

A drilled passage from the rear camshaft bearing through the cylinder block and cylinder head supplies lubricating oil to the rocker arm shaft (C).

Turbocharger shaft is lubricated by an external oil line connected to the main oil gallery (port A or Q).

Continued on next page

CD,3274,G205,3 –19–03NOV92–2/3

120
12

DELPHI/LUCAS Cold Start Advance

The cold start advance system is a wax motor (A) in relation with the advance piston, and connected through the wire (B) to a thermo-switch (C) located in thermostat cover.

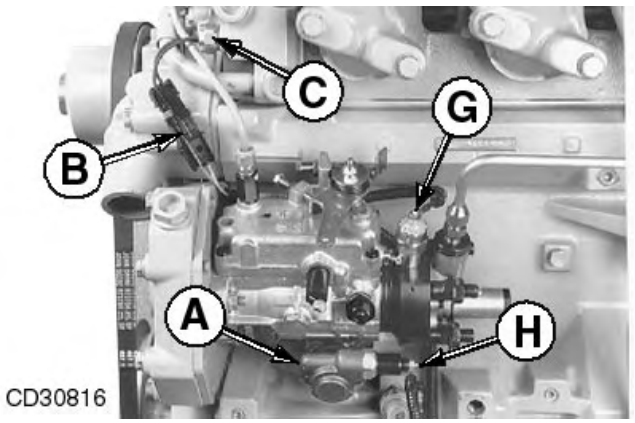
The switch is normally open at coolant temperature below 50°C (122°F). At cold start-up, there is no current flow to the wax motor and therefore the transfer pump pressure is applied to the cold advance piston toward the fully advanced position.

When coolant temperature reaches 50°C (122°F), the thermo-switch (C) closes and current flows to the wax motor. A heating element in the wax motor heats the wax (D), causing it to expand. As the wax expands, the wax motor plunger (E) extends, opening a ball valve (F) which allows fuel to escape. As fuel escapes, the pressure on the cold advance piston decreases until normal advance is obtained.

The cold start advance system harness is connected as follows:

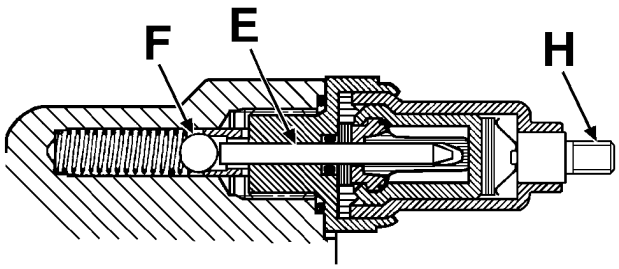
- Red wire to fuel shut-off solenoid terminal (G)
- Orange wire to wax motor terminal (H)

A—Wax motor
B—Electrical wire for thermo-switch connection
C—Thermo-switch
D—Heated wax
E—Wax motor plunger
F—Ball valve
G—Fuel shut-off solenoid terminal
H—Wax motor terminal



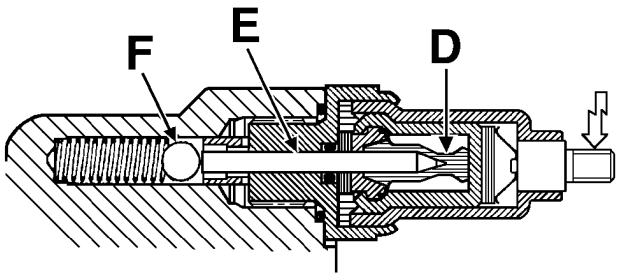
CD30816 –UN–17APR01

Cold Start advance system (Delphi/Lucas)



CD30817 –UN–22MAR01

Delpi/Lucas cold start advance operation (UNENERGIZED)



CD30818 –UN–22MAR01

Delphi/Lucas cold start advance operation (ENERGIZED)

CD,3274,G220,11 –19–20FEB01–3/3

Service Equipment & Recommended Tools

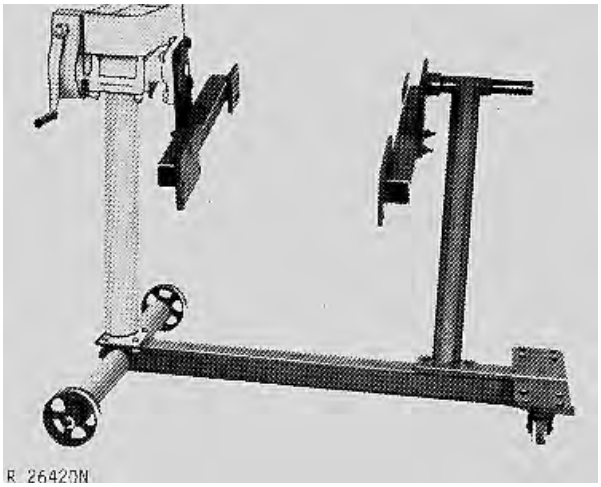
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

CD03523,00000F3 –19–13SEP04–1/31

Engine Repair Stand D01003AA

To support engine during repair



R26420N –UN–22MAY95

CD03523,00000F3 –19–13SEP04–2/31

Bushing, Bearing and Seal Driver Set D01045AA

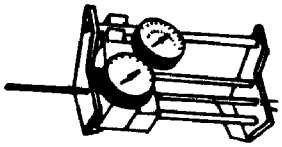
Install pilot bearing in flywheel.

CD03523,00000F3 –19–13SEP04–3/31

RG5061 –UN–05DEC97

Spring Compression Tester D01168AA

Test valve spring compression.



RG5061

Continued on next page

CD03523,00000F3 –19–13SEP04–4/31

OEM Engines (Non-Certified)	Option code	Dipstick guide height
	4025	408 mm (16.06 in.)
CD3029TF123	4006	205 mm (8.07 in.)
CD3029TF160	4006	205 mm (8.07 in.)
	4021, 4026	156 mm (6.14 in.)
	4023	212 mm (8.35 in.)
	4024	136 mm (5.35 in.)
	4033	155 mm (6.10 in.)
CD3029TF161	4021	156 mm (6.14 in.)
	4022	141 mm (5.55 in.)
CD3029TF162	4006	205 mm (8.07 in.)
	4026	156 mm (6.14 in.)
	4027	208 mm (8.19 in.)
CD3029TF163	4006	205 mm (8.07 in.)
	4024	136 mm (5.35 in.)
	4027	208 mm (8.19 in.)
PE3029TF120	4006	205 mm (8.07 in.)
	4023	212 mm (8.35 in.)
	4025	408 mm (16.06 in.)
PE3029TF160	4023	212 mm (8.35 in.)
	4026	156 mm (6.14 in.)

Continued on next page

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