CAT® Lift Trucks

Service Manual

S4S Diesel Engine

194618-up

DP20N	P4000
DP25N	P5000
DP30N	P6000
DP35N	P7000

For use with DP20N, DP25N, DP30N, DP35N,
P4000, P5000, P6000, P7000 Chassis Service Manual. 99729-88100

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >

GENERAL CONTENTS

Group Name	Contents	Group No.
General	External view System flow diagrams Engine serial number location Main specifications Tips on disassembling and reassembling	1
Service data	Maintenance service data Tightening torque table	2
Service tools	Special tool	3
Determination of overhaul	Determining overhaul timing Testing compression pressure	4
Disassembly of basic engine	Disassembling and inspecting cylinder head and valve mechanism Disassembling and inspecting flywheel Disassembling and inspecting gear case, timing gear and camshaft Disassembling and inspecting piston, connecting rod, crankshaft and crankcase	5
Inspection and repair of basic engine	Inspecting and repairing cylinder head and valve mechanism Inspecting and repairing flywheel Inspecting and repairing timing gear and camshaft Inspecting and repairing piston, connecting rod, crankshaft and crankcase	6
Reassembly of basic engine	Reassembling piston, connecting rod, crankshaft and crankcase Reassembling timing gear and camshaft Reassembling flywheel Reassembling cylinder head and valve mechanism	7
Fuel system	Removing fuel system Disassembling, inspecting and reassembling fuel system Installing fuel system	8
Lubrication system	Removing lubrication system Disassembling, inspecting and reassembling lubrication system Installing lubrication system	9
Cooling system	Removing cooling system Disassembling, inspecting and reassembling cooling system Installing cooling system	10
Inlet and exhaust systems	Removing inlet and exhaust systems Disassembling, inspecting and reassembling inlet and exhaust systems Installing inlet and exhaust systems	11
Electrical system	Removing electrical system Disassembling, inspecting and reassembling electrical system Installing electrical system	12
Adjustment and operation	Adjusting engine Break-in operation Performance test (JIS standard)	13

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >

GENERAL

1. External view 1-2

2. System flow diagrams 1-3
2.1 Fuel system - flow diagram 1-3
2.2 Lubrication system - flow diagram 1-3
2.3 Cooling system - flow diagram 1-4
2.4 Inlet and exhaust system
- flow diagram 1-4

3. Engine serial number location 1-5

4. Main specifications 1-6

5. Tips on disassembling and reassembling 1-8
5.1 Disassembling 1-8
5.2 Reassembling 1-8

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >

4. Main specifications

Table 1-1 Main specifications (1 / 2)

Engine model				S4S
Main specification	Type			Water cooled, 4 cycle diesel engine
	No. of cylinders - arrangement			4 cylinder in-line
	Combustion system			Swirl chamber type
	Valve mechanism			Overhead
	Cylinder bore × stroke			94 × 120 mm [3.70 × 4.72 in.]
	Displacement			3.331 L [203 cu. in.]
	Compression ratio			22.0 : 1
	Fuel			ASTM diesel fuel oil No.2-D
	Firing order			1 - 3 - 4 - 2
	Direction of rotation			Counterclockwise when viewed from flywheel side
	Dimensions (varies depending on the specifications)	Length		753 mm [29.65 in.]
		Width		543 mm [21.38 in.]
		Height		726 mm [28.58 in.]
	Dry weight			245 kg [540 lb]
Basic engine	Cylinder	Type		Dry (integral with cylinder block)
	Piston ring	Number of rings		Compression rings: 2
				Oil ring (w/expander): 1
	Valve timing (when warm)	Inlet valve	Open	BTDC 30°
			Close	ABDC 50°
		Exhaust valve	Open	BBDC 74°
			Close	ATDC 30°
	Starting system			Electric
	Starting aid system			Glow plug
Fuel system	Fuel injection pump	Type		Distribution (Bosch VE type)
		Plunger diameter		ø 11 mm [0.43 in.]
		Cam lift		2.7 mm [0.106 in.]
		Governor		Bosch, All speed type
	Fuel injection nozzle	Nozzle type		Denso, Throttle type
		Number of spray holes		1
		Spray hole diameter		ø 1.0 mm [0.039 in.]
		Spray angle		0°
		Valve opening pressure		11.77 MPa {120 kgf/cm²} [1706.80 psi]
	Fuel filter	Type		Cartridge type paper element

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >

2.3.13 Inspecting magnetic switch

Inspect the magnetic switch for following items. Replace the magnetic switch if it is defective.

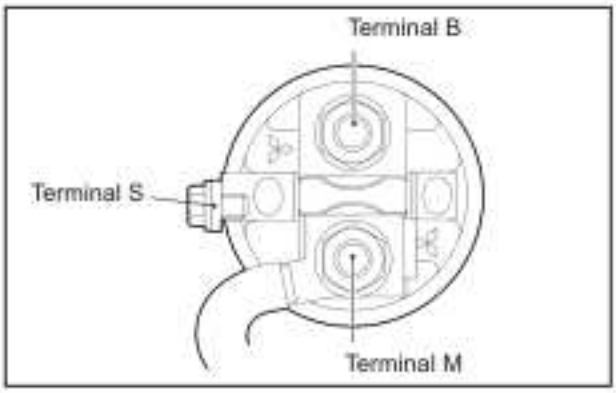
(1) Open circuit of coil

Check continuity between terminal S and terminal M, also check continuity between terminal S and ground. if continuity does not exist, the coil has an open circuit.

(2) Adhesion of contactor

Check for no continuity between terminal B and terminal M.

If continuity is found, the contactor is welded closed.

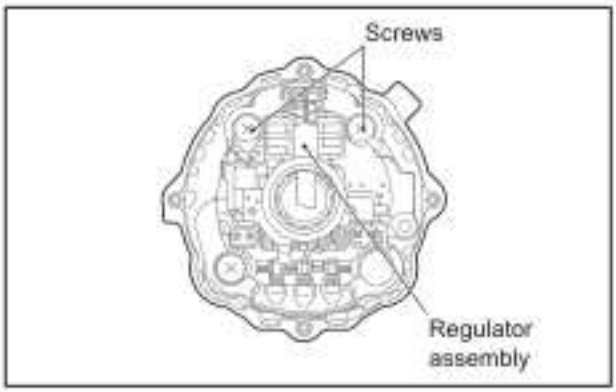


Inspecting magnetic switch

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >

2.8.6 Removing regulator assembly

Remove the screws of the regulator assembly and then remove the regulator assembly.

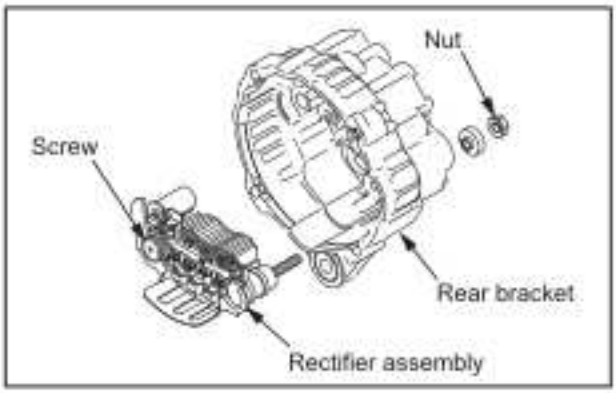


Removing regulator assembly

2.8.7 Removing rectifier assembly

(1) Remove the screw and nut from the rectifier.

(2) Remove the rectifier assembly.



Removing rectifier assembly

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >

2.8 Inspecting and cleaning gauze filter of distribute type fuel injection pump

⚠ WARNING

Keep flames away when handling a diesel fuel. Wipe off any spilled fuel thoroughly.
Spilled fuel could cause a fire.

CAUTION

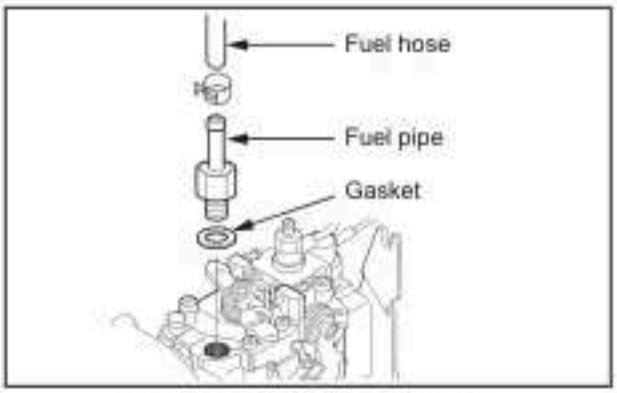
Cover the openings on the fuel injection pump to prevent dust from entering the fuel system.

When output shortage and/or hunting of the engine occurred, the gauze filter may be dirty. Clean the gauze filter accordingly.

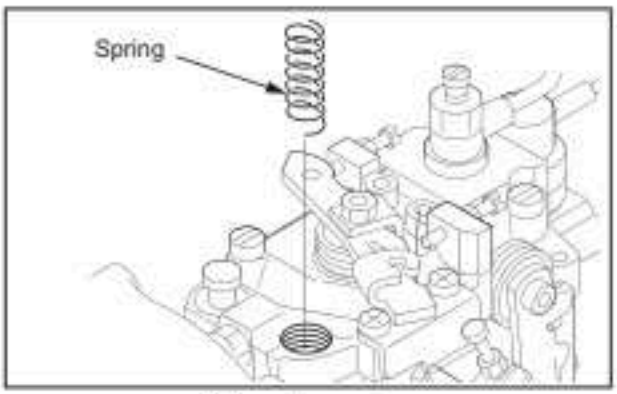
(1) Clean around the injection pump.
(2) Drain the fuel in the injection pump, and remove the fuel hose and fuel pipe.
(3) Remove the spring with a tweezer.
(4) Remove the gauze filter with a tweezer.

Note: When removing the gauze filter, be careful not to damage the metal mesh of the gauze filter.

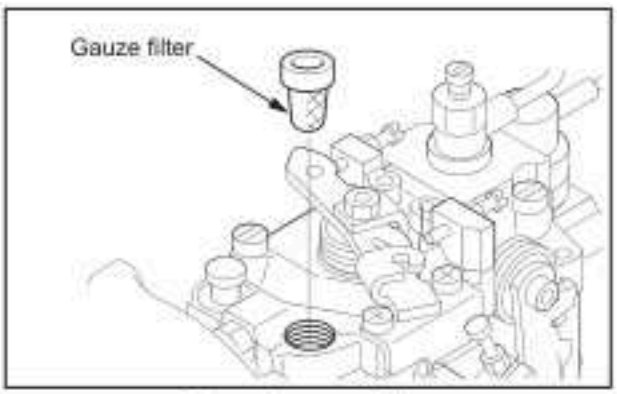
(5) Remove the dirt and dust from the gauze filter cleaning with compressed air or diesel fuel. When damage is found, or when the gauze filter is still dirty after cleaning, replace the gauze filter with a new one.
(6) Install the cleaned gauze filter and new gasket, and in reverse order of disassembly, install the fuel pipe and fuel hose.



Removing fuel hose and fuel pipe



Removing spring



Removing gauze filter

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >

⚠ WARNING

Be careful of burns

Do not touch the engine during or immediately after operation



Do not touch the engine during or immediately after operation to avoid risk of burns.

To conduct maintenance and inspection work, wait until the engine has cooled sufficiently, checking the temperature gauge.

Slowly and carefully open radiator cap

Never attempt to open the radiator cap while the engine is running or immediately after the engine stops. Give a sufficient cooling time to the engine coolant before opening the cap.

When opening the radiator cap, slowly turn the cap to release internal pressure. To prevent scalds with steam gushing out, wear thick rubber gloves or cover the cap with a cloth.

Close the radiator cap tightly without fail.

The coolant is very hot and under pressure during engine running or just after the engine stops. If the radiator cap is not closed tightly, steam and hot coolant may gush out and can cause scalds.

Add coolant only after the coolant temperature dropped

Do not add coolant immediately after the engine stops. Wait until the coolant temperature lowers sufficiently to avoid a risk of burns.

Never remove heat shields

The exhaust system, which becomes extremely hot while the engine is operating, is provided with various heat shields. Do not remove these heat shields. If any of these heat shields have been removed owing to unavoidable circumstances during the work, be sure to restore them after the work is completed.

⚠ WARNING

Be careful of exhaust fume poisoning

Operate engine in well-ventilated area



If the engine is installed in an enclosed area and the exhaust gas is ducted outside, ensure that there is no exhaust gas leak from duct joints.

Take care that the exhaust gas is not discharged toward plants or animals.

Exhaust gas from the engine contains carbon monoxide and other harmful substances. Operating the engine in an ill-ventilated area can produce gas poisoning.

⚠ WARNING

Protect ears from noises

Wear ear plugs



Always wear ear plugs when entering the machine room (engine room). Combustion sound and mechanical noise generated by the engine can cause hearing problems.

MidWestTech | Caterpillar S4S Diesel Engine Service Manual | Publication 99729-88100 Order the manual at mid-west-tech.com >