CAT® Lift Trucks

Service Manual

S6S-T Diesel Engine

For use with Chassis Service Manuals.

99709-8B100

MidWestTech | Caterpillar S6S-T Diesel Engine Service Manual | Publication 99709-8B100 Order the manual at mid-west-tech.com >

Chapter 1 GENERAL

1. **External View** 1-3
2. **Outline of Systems** 1-4
   - 2.1 Outline of Fuel System 1-4
   - 2.2 Outline of Lubrication System 1-4
   - 2.3 Outline of Cooling System 1-5
   - 2.4 Outline of Inlet and Exhaust System 1-5
3. **Engine Serial Number** 1-6
4. **Specifications** 1-7

MidWestTech | Caterpillar S6S-T Diesel Engine Service Manual | Publication 99709-8... Order the manual at mid-west-tech.com >

4. Specifications

Specifications Table

Engine model				S6S-T51FL
Main specifications	Type			Water cooled, 4 stroke cycle diesel engine, turbocharged
	No. of cylinders - arrangement			6 cylinders, inline
	Combustion system			Swirl chamber
	Valve mechanism			Overhead
	Cylinder bore × stroke			94 × 120 mm [3.70 × 4.72 in.]
	Total displacement			4.996 liters [305 cu. in.]
	Compression ratio			22.0 : 1
	Fuel			Diesel fuel oil with cetane Number 45 or higher (JIS K2204) light oil No. 2
	Firing order			1-5-3-6-2-4
	Direction of rotation			Counterclockwise as viewed from flywheel side
	Dimensions	Length		982 mm [38.66 in.]
		Width		591 mm [23.27 in.]
		Height		855 mm [33.66 in.]
	Dry weight			355 kg [783 lb.]
Engine body	Cylinder	Type		Dry (integral with cylinder block)
	Piston ring	Quantity		Compression ring: 2
				Oil ring (with expander) : 1
	Valve timing	Inlet valve	Open	BTDC 18°
			Close	ABDC 54°
		Exhaust valve	Open	BBDC 66°
			Close	ATDC 22°
	Starting system			Electric starter
	Starting aid system			Glow plug
Fuel system	Fuel injection pump	Type		Distribution (VE type)
		Plunger outside diameter		ø 11 mm [0.43 in.]
		Cam lift		1.741 mm [0.069 in.]
		Governor type		All speed
	Fuel feed pump	Type		Vane type
	Fuel injection nozzle	Nozzle type		Throttle type
		Number of orifices		1
		Orifice diameter		ø1.0 mm [0.039 in.]
		Cone angle		0°
		Valve opening pressure		11.77 MPa {120 kgf/cm²} [1707 psi]
	Fuel filter	Type		Cartridge type paper element
Lubrication system	Lubrication method			Forced circulation (pressure feed by oil pump)
	Engine oil	Specifications		Class CF oil (API service classification)
		Capacity		Engine total: 17.5 L [4.624 US gal.], Oil pan: 16.5 L [4.359 US gal.] (high level), Oil filter: 1 L [0.26 US gal.]
	Oil pump	Type		Trochoid type
		Speed ratio to crankshaft		0.74
		Discharge		38.7 L [10.225 US gal.]/min (at pump rotation of 2,230 min⁻¹, 0.3 MPa {3.1 kgf/cm²} [43.5 psi])
	Relief valve	Type		Piston valve type
		Valve opening pressure		0.35 ± 0.05 MPa {3.6 ± 0.5 kgf/cm²} [51 ± 7 psi]
	Oil cooler	Type		Plate type
	Oil filter	Type		Cartridge type paper element

MidWestTech | Caterpillar S6S-T Diesel Engine Service Manual | Publication 99709-8... Order the manual at mid-west-tech.com >

1. Determining Overhaul Timing

In most cases, the engine should be overhauled when the compression pressure of the engine decreases. An increase in engine oil consumption and blow-by gas should be considered when evaluating the engine condition.

Such symptoms as the output decrease, fuel consumption increase, oil pressure decrease, engine starting difficulty, and noise increase should be considered to evaluate overhaul timing, although these symptoms are often affected by various causes and are not always effective to consider overhaul timing.

Decreased compression pressure shows a variety of symptoms and engine conditions, thus making it difficult to accurately determine when the engine needs an overhaul.

Typical symptoms are:

(1) Decrease in output power
(2) Increase in fuel consumption
(3) Increase in engine oil consumption
(4) Increased blow-by gas through the breather due to worn cylinder and piston (Visually check the blow-by amount.)
(5) Increase in gas leaks due to poor seating of inlet and exhaust valves
(6) Starting problems
(7) Increase in noise of engine parts
(8) Abnormal exhaust color after engine warm-up

The engine shows above symptoms in various combinations.

Some of those symptoms are directly caused by worn engine parts, while others are not.

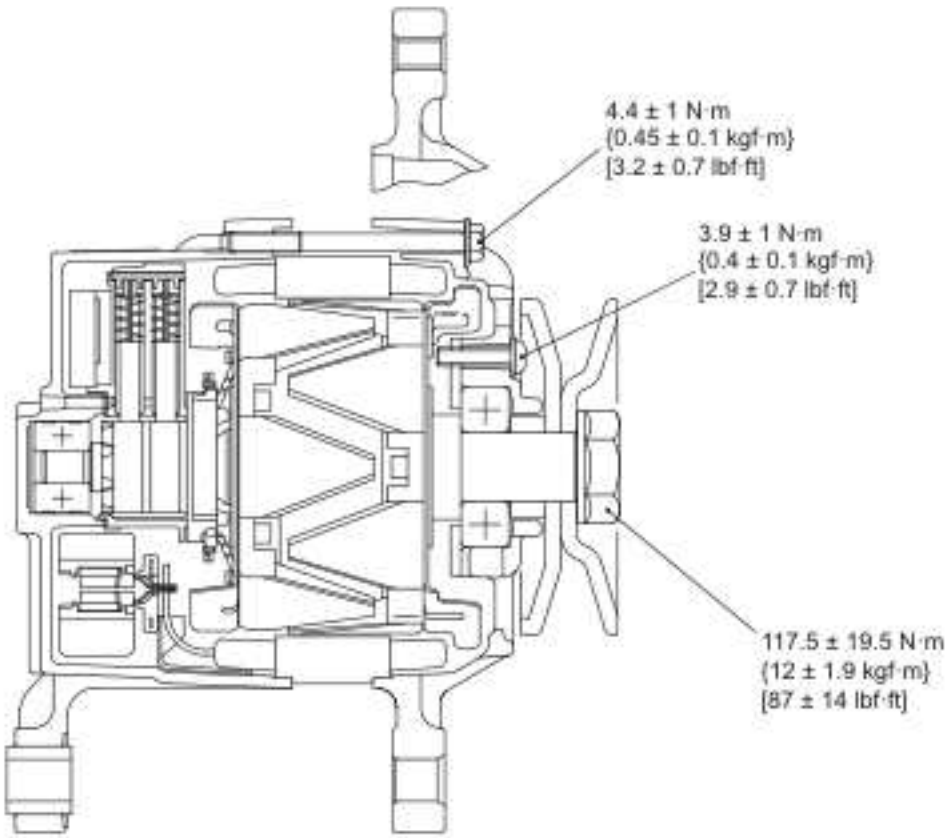
Symptoms of items (2) and (6) are affected by improper fuel injection volume and timing of the fuel injection pump, worn plunger, faulty nozzles, and also faulty conditions of electrical devices such as battery and starter.

The most valid reason to overhaul an engine is a decrease in compression pressure due to worn cylinder and piston, as described in item (4), and once this is determined, it is reasonable to take other problems into consideration for making a final evaluation.

MidWestTech | Caterpillar S6S-T Diesel Engine Service Manual | Publication 99709-8... Order the manual at mid-west-tech.com >

2.7 Alternator - Assemble

[12 V, 75 A]



Alternator - Assemble

Note: Be sure to use proper harness.

If the harness is modified, the alternator will not function properly.

MidWestTech | Caterpillar S6S-T Diesel Engine Service Manual | Publication 99709-8... Order the manual at mid-west-tech.com >

Warning Labels

⚠ CAUTION

Maintenance of Warning Labels

Make sure all warning/caution labels are legible.

Clean or replace the warning or caution label when the description or illustration is not clear to read.

For cleaning the warning/caution labels, use a cloth, water and soap. Do not use cleaning solvent, gasoline or other chemicals to prevent the label from fading and peering.

Replace a damaged or missing label with a new one.

If any engine part stuck with a warning label is replaced with a new one, attach a new identical warning label to the new part.

To get new warning labels, contact your authorized Cat lift truck dealer.



Warning Labels

MidWestTech | Caterpillar S6S-T Diesel Engine Service Manual | Publication 99709-8... Order the manual at mid-west-tech.com >

4.1.1 Fuel Filter Primary - Assemble

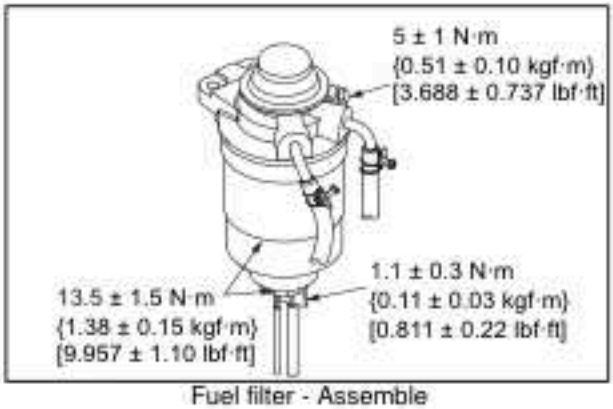
⚠ WARNING

(a) Make sure that there is no flame around the area before handling fuel.
(b) Wipe off any spilled fuel thoroughly. It may cause a fire.

CAUTION

Use the MHI genuine fuel filter. If a filter other than the MHI genuine filter, it may cause a short engine life or starting failure.

(1) Clear the fuel filter and its surroundings.
(2) Disconnect the fuel filter level sensor from its connector.
(3) Prepare the fuel plate and place it under the fuel filter.
(4) Loosen the drain plug and drain fuel from the fuel filter.
(5) Remove the level sensor from the fuel filter.
(6) Remove the fuel filter element.
(7) Wipe off any fuel on the fuel filter element mounting surface of fuel filter body with a waste cloth.
(8) Prepare a new fuel filter element and make sure that the gasket is properly seated in the groove.



Fuel filter - Assemble

⚠ WARNING

Do not use the filter that has a dent on the case. If the case is dented, it can cause damage to the filter, leading to fuel leak during operation, and result in a fire.

(9) Install the fuel filter element to the filter body.

CAUTION

Be careful not to dent or scratch the surface of the fuel filter.

(10) Install the level sensor to the fuel filter element through new O-ring.
(11) After completing the fuel filter change, bleed the fuel system.
(12) Start the engine and idle for a few minutes.
(13) Check the fuel filter element mounting surface for a fuel leak. If a leak is found, loosen the fuel filter and check the gasket for seating or damage. Then retighten the fuel filter.

MidWestTech | Caterpillar S6S-T Diesel Engine Service Manual | Publication 99709-8... Order the manual at mid-west-tech.com >