SHOP MANUAL

KOMATSU®

94E,98E SERIES

DIESEL ENGINE

As a part of revision of this shop manual, special descriptions of the engines certified by the EPA (Environmental Protection Agency) are added to the latter half of the manual (Chapter 20).
For the descriptions other than the above, see the first half, since they are the same as those of the conventional engines.

MidWestTech | Komatsu 94E, 98E Series Diesel Engine Service Manual | Publication SEBM013001
Order the manual at mid-west-tech.com >

CONTENTS

1. GENERAL 1-1
2. TROUBLESHOOTING 2-1
3. INSPECTION AND ADJUSTMENT 3-1
4. ENGINE BODY 4-1
5. LUBRICATION SYSTEM 5-1
6. COOLING SYSTEM 6-1
7. FUEL INJECTION PUMP/GOVERNOR 7-1
8. STARTING MOTOR 8-1
9. ALTERNATOR 9-1
10. SPECIAL SERVICE TOOLS 10-1
11. SERVICE STANDARDS 11-1
20. EPA CERTIFIED ENGINE 20-1

MidWestTech | Komatsu 94E, 98E Series Diesel Engine Service Manual | Publication... Order the manual at mid-west-tech.com >

2.1 Quick reference table for troubleshooting

The following table summarizes the general trouble symptoms and their causes. If any trouble symptom occurs, take corrective action before it developes into a serious problem so as not to shorten the engine service life.

	Trouble symptom / Cause	Starting failure				Insufficient engine output			Poor exhaust color		High knocking sound during combustion	Abnormal engine noise	Uneven combustion noise	Hunting		Large engine vibration	Poor return to low speed
			Engine starts but stops soon.			Exhaust color			During work								
		Engine will not start.	Exhaust smoke														
			Nil	Less	More	Regular	White	Black	White	Black				During idling	During work		
Engine system	Improper clearance of intake/exhaust valve	○	○			○						○					
	Compression leakage from valve seat					○		○		○		○					
	Seized of intake/exhaust valve	○			○	○		○		○		○			○	○	
	Blowout from cylinder head gasket					○											
	Seized or broken piston ring	○			○		○		○			○		○		○	
	Worn piston ring, piston or cylinder	○			○		○		○								
	Seized crankpin metal or journal	○	○									○		○	○	○	
	Improper arrangement of piston ring joints		○				○										
	Reverse assembly of piston rings						○		○								
	Worn crankpin and journal bearing					○						○		○	○	○	
	Loosened connecting rod cap bolt											○				○	
	Foreign matter trapped in combustion chamber	○										○					
	Excessive gear backlash											○					
	Worn intake/exhaust valve guide						○										
	Defective governor		○											○	○	○	○
	Improper open/close timing of intake/exhaust valves	○					○	○	○	○		○					
Turbocharger																	
Cooling water system	Excessive cooling effect of radiator								○								
	Insufficient cooling effect of radiator							○									
	Insufficient cooling water level							○									
	Cracked water jacket																
	Slackened fan belt							○									
	Defective thermostat							○	○								

MidWestTech | Komatsu 94E, 98E Series Diesel Engine Service Manual | Publication... Order the manual at mid-west-tech.com >

9.8 Performance test

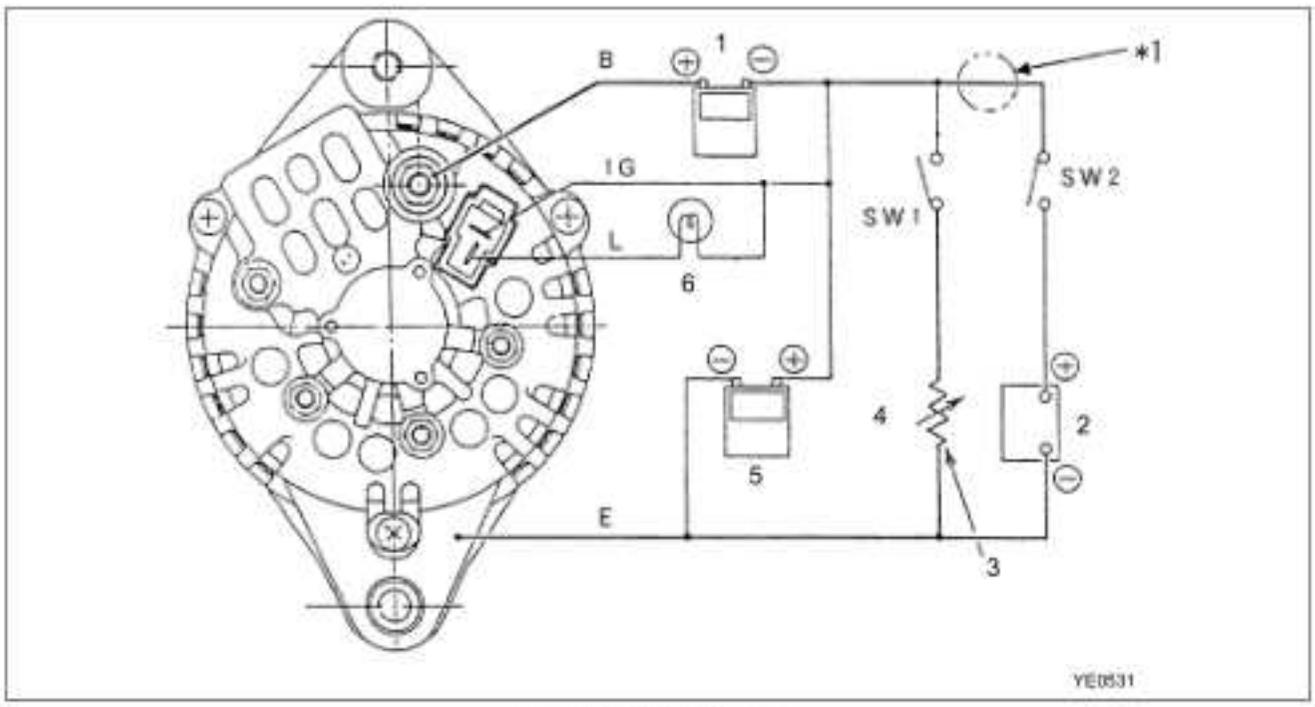


Fig. 20 Test Circuits

1) Ammeter
2) Variable resistor
3) Battery
4) Voltmeter
5) Minimum position
6) Lamp

∗1. The 0.25 Ω resistor is connected when the battery is discharging.

Measurement Jigs required:

1.	Voltmeter	: DC voltmeter 0 to 30V, Class 0.5	(1 set)
2.	Ammeter	: DC ammeter 0 to 100A, Class 1	(1 set)
3.	Variable resistor	: 0 to 0.25 Ω, 1kW	(1)
4.	Resistor	: 0.25 Ω, 25W	(1)

(1) Voltage measurement for adjustment

With the test circuits shown in Fig. 20, open SW1 and close SW2, increase the alternator revolution to the rated speed of 5,000 rpm and measure the voltage.
Adjustment voltage: Acceptable if the measured value is between 14.2 V and 14.8V.

(2) Revolution at 13.5V

With the test circuits shown in Fig. 20, open SW1 and close SW2, gradually increase the alternator revolution until the voltmeter reads 13.5V and measure the revolution. The measured value is the operating speed at 13.5V.
Operating speed: Acceptable if the measured value is 1,050 rpm or less.

(3) Output current measurement

With the test circuits shown in Fig. 20, set the variable resistor to the min. position, close SW1 and SW2, and increase each output of the alternator. Adjust the variable resistor so the the voltmeter reads 13.5V and measure the current. The measured value is at each output current.

(4) Cautions on performance test

(a) Use thick wires having a min. Cross section of 8 mm^2 and max. length of 2.5 m long connecting the alternator B and battery (+) terminals, and the E and battery (–) terminals.
(b) Use switches having small contact resistances.

MidWestTech | Komatsu 94E, 98E Series Diesel Engine Service Manual | Publication... Order the manual at mid-west-tech.com >

11.1 Engine tuning

No.	Inspection item			Unit	Standard		Limit	Reference page
1	Gap at intake/exhaust valve heads			mm	0.15 – 0.25		—	3-4
2	V-belt tension Finger pressure: 98N {10kg}	Used part		mm	10 – 15		—	3-3
		New part		mm	7 – 9		—	3-3
3	Fuel injection pressure			MPa {kg/cm²}	21.57 – 22.55 {220 – 230}		—	3-4
4	Fuel injection timing (FID)			degrees (B.T.D.C)	10 – 12		—	3-8
5	No-load revolution	Specification/Model		—	4D94E	4D98E		—
		Max.	2,000	rpm	2,155 – 2,205			3-9
			2,200	rpm	2,373 – 2,423			3-9
			2,400	rpm	2,567 – 2,617			3-9
			2,500	rpm	2,675 – 2,725			3-9
		Min.	2,000	rpm	800 or less			3-9
			2,200	rpm	800 or less			3-9
			2,400	rpm	800 or less			3-9
			2,500	rpm	800 or less			3-9
6	Compression (at 250 rpm)			MPa {kg/cm²}	3.4 ± 0.1{35 ± 1}		2.7±0.1 {28±1}	2-6
7	Top clearance			mm	0.737 – 0.869		—	—
8	Cooling water capacity			ℓ	4.2 (engine only)		—	3-2
9	Lubricating oil capacity (oil pan)	Total		ℓ	10.2		—	3-2
		Effective		ℓ	4.5		—	3-2
10	Lubricating oil pressure	Max. (in cold state)		MPa {kg/cm²}	0.59 {6.0} or less		—	—
		At rated output		MPa {kg/cm²}	0.29 – 0.39 {3.0 – 4.0}		—	—
		At idling		MPa {kg/cm²}	0.06 {0.6} or above		—	—
11	Oil pressure switch operating pressure			MPa {kg/cm²}	0.05 {0.5 ± 0.1}		—	—
12	Thermostat valve opening temperature			°C	69.5 – 72.5		—	3-10
13	Themoswitch actuating temperatue			°C	107 – 113		—	3-10

MidWestTech | Komatsu 94E, 98E Series Diesel Engine Service Manual | Publication... Order the manual at mid-west-tech.com >