WSM

WORKSHOP MANUAL
DIESEL ENGINE

03-M-E3B SERIES,
03-M-DI-E3B SERIES,
03-M-E3BG SERIES

Kubota

KiSC issued 10, 2007 A

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Model		V2203-M-BG	
Number of Cylinders		4	
Type		Vertical, Water-cooled, 4 cycle diesel engine	
Bore × Stroke		87.0 X 92.4 mm (3.43 X 3.64 in.)	
Total Displacement		2197 cm^3 (134.1 cu.in.)	
ISO Net Continuous		18.8 KW / 1500 min^{-1} (rpm) (25.2 HP / 1500 min^{-1} (rpm))	22.6 KW / 1800 min^{-1} (rpm) (30.3 HP / 1800 min^{-1} (rpm))
ISO/SAE Net Intermittent		21.7 KW / 1500 min^{-1} (rpm) (29.1 HP / 1500 min^{-1} (rpm))	26.0 KW / 1800 min^{-1} (rpm) (34.9 HP / 1800 min^{-1} (rpm))
SAE Gross Intermittent		22.2 KW / 1500 min^{-1} (rpm) (29.8 HP / 1500 min^{-1} (rpm))	26.9 KW / 1800 min^{-1} (rpm) (36.1 HP / 1800 min^{-1} (rpm))
Maximum Bare Speed		2120 min^{-1} (rpm)	
Minimum Bare Idling Speed		2120 min^{-1} (rpm)	
Combustion Chamber		Spherical Type (E-TVCS)	
Fuel Injection Pump		PFR 4M Type Mini Pump (DENSO)	
Governor		Mechanical all speed governor + Electronic Governor	
Direction of Rotation		Counter-clockwise (viewd from flywheel side)	
Injection Nozzle		OPD Mini Nozzle (DENSO)	
Injection Timing		0.2487 rad (14.25 °) before T.D.C.	
Firing Order		1-3-4-2	
Injection Pressure		13.73 MPa (140.0 kgf/cm^2, 1991 psi)	
Compression Ratio		22.0 : 1	
Lubricating System		Forced Lubrication by Trochoid Pump	
Oil Pressure Indicating		Electrical type switch	
Lubricating Filter		Full flow paper filter (cartridge type)	
Cooling System		Pressurized radiator, forced circulation with water pump	
Starting System		Electric Starting with Starter	
Starting Motor		12 V, 1.4 kW	
Starting Support Device		By glow plug in combustion chamber	
EGR		NONE	
Battery		12 V, 88 AH equivalent	
Charging Alternator		12 V, 480 W	
Fuel		Diesel Fuel No.2-D (ASTM D975)	
Lubricating Oil		Class CF lubricating oil as per API classification is recommended. For details on recommended lubricating oils, see page G-7, 10	
Lubricating Oil Capacity	Oil Pan Depth 90 mm (3.5 in.)	7.6 L (2.0 U.S.gals)	
	Oil Pan Depth 124 mm (4.88 in.)	9.5 L (2.5 U.S.gals)	
Weight (Dry)		195 kg (430 lbf)	

* The specification described above is of the standard engine of each model.
* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

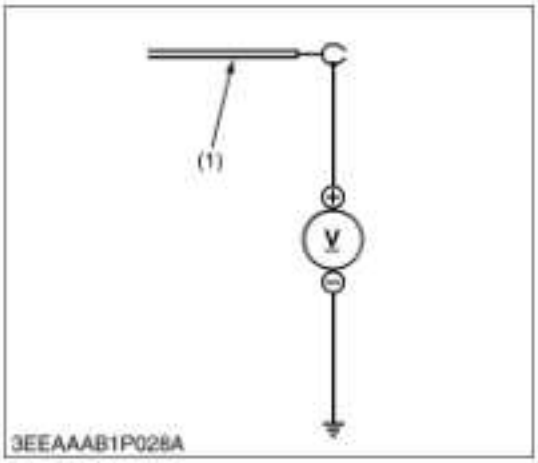
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Symptom	Probable Cause	Solution	Reference Page
Low Oil Pressure	Engine oil insufficient	Replenish	G-8
	Oil strainer clogged	Clean	S-63
	Relief valve stuck with dirt	Clean	–
	Relief valve spring weaken or broken	Replace	–
	Excessive oil clearance of crankshaft bearing	Replace	S-70, 92, 93
	Excessive oil clearance of crankpin bearing	Replace	S-64, 65, 91
	Excessive oil clearance of rocker arm	Replace	S-50, 80
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	5 to 15, G-10
	Oil pump defective	Replace	S-24, 62, 97
High Oil Pressure	Different type of oil	Use specified type of oil	5 to 15, G-10
	Relief valve defective	Replace	–
Engine overheated	Engine oil insufficient	Replenish	G-10
	Fan belt broken or elongated	Replace or adjust	G-14, 24
	Coolant insufficient	Replenish	G-9
	Radiator net and radiator fin clogged with dust	Clean	–
	Inside of radiator corroded	Clean or replace	G-23
	Coolant flow route corroded	Clean or replace	G-23, 24
	Radiator cap defective	Replace	S-23
	Overload running	Reduce the load	–
	Head gasket defective	Replace	S-51, 52
	Incorrect injection timing	Adjust	S-27, 28
	Unsuitable fuel used	Use specified fuel	5 to 15
Battery Quickly Discharged	Battery electrolyte insufficient	Replenish distilled water and charge	G-13, 25
	Fan belt slips	Adjust belt tension or replace	G-13, 14, 24
	Wiring disconnected	Connect	–
	Rectifier defective	Replace	S-71, 102
	Alternator defective	Replace	S-72, 101
	Battery defective	Replace	–

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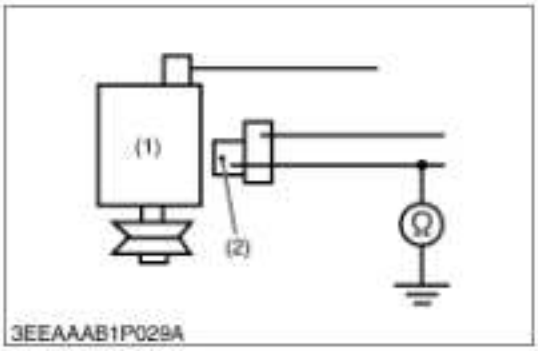
Glow Plug Harness

1. Disconnect the glow plug terminal (1).
2. Check the state of the harness and if it is abnormal, please replace it.
3. Turn the key switch to the ACC position.
4. Measure the voltage between the glow pulg terminal (1) of the connector (harness side) and chassis.
5. When the measurements are the below table value.
   The ECU is normal. Some of the glow plugs are failure, then please replace them.
6. When the measurements are out of the below table value.
   The ECU is failure, then please replace it.

Voltage	Terminal - Chassis	12 V

(1) Glow Plug Terminal

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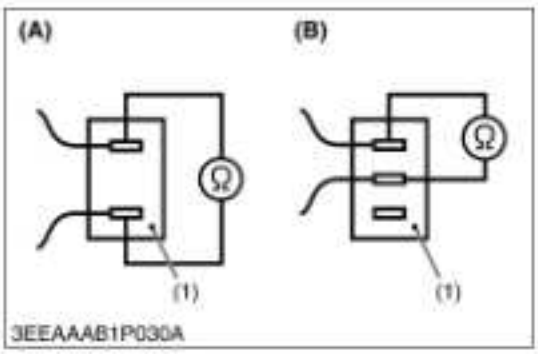
Alternator

1. Disconnect the terminal **L** (2) of the alternator (2P).
2. Check the state of the harness and if it is abnormal, please replace it.
3. Measure the resistance between the terminal **L** (2) of the connector (harness side) and chassis.
4. When the measurements are the below table value.
   The ECU is normal. The alternator is failure, then please replace it.
5. When the measurements are out of the below table value.
   The ECU is failure, then please replace it.

Resistance	Terminal **L** - Chassis	Infinity

(1) Alternator (2) Terminal **L** (Harness Side)

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Speed Switch

1. Check the state of the harness and if it is abnormal, please replace it.
2. When the speed switch is turned **ON** and **OFF**, measure the resistance between the speed switch (terminal side) (1) of it each time.
3. When the measurements are the below table value.
   The speed switch is normal. The ECU is failure, then please replace it.
4. When the measurements are out of the below table value.
   The speed switch is failure, then please replace it.

Resistance	**ON**	0 Ω
	OFF	Infinity

(1) Speed Switch (Terminal Side)
(A) Single Pole, Single Throw
(B) Single Pole, Double Throw

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Alternator on Unit Test

(Before testing)

- Before alternator on unit test, check the battery terminal connections, circuit connection, fan belt tension, charging indicator lamp, fuses on the circuit, and abnormal noise from the alternator.
- Prepare full charged battery for the test.

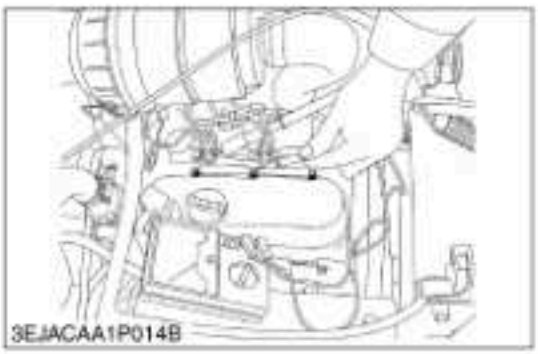
■ **NOTE**

- **Be careful not to touch the rotating engine parts while engine is running.**
  Keep safety distance from the engine rotating parts.

1. Start the engine.
2. When the engine is operating measure the voltage between two battery terminals. If the voltage is between 13.8 V and 14.8 V, the alternator is operating normally.
3. If the results of alternator on unit test are not within the specifications, disassemble the alternator and check the each component part for finding out the failure. See the "DISASSEMBLING AND ASSEMBLING" and "SERVICING" for alternator.

Regulating voltage at no load	Factory spec.	13.8 to 14.8 V at 25 °C (77 °F)

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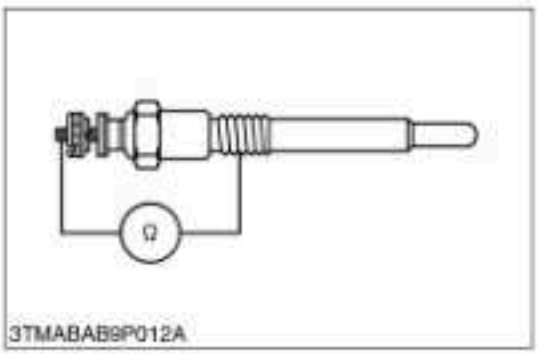


Glow Plug Lead Terminal Voltage

1. Turn the key switch to the "**GLOW** (or **PREHEAT**)" position, and measure the voltage with a circuit tester between the lead terminal and the engine body.
2. If the voltage differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage	Main switch key at **GLOW** (or **PREHEAT**)	Approx. battery voltage

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Glow Plug Continuity

1. Remove the glow plug.
2. Measure the resistance with a circuit tester between the glow plug terminal and the glow plug housing.
3. If the factory specification is not indicated, glow plug is faulty.

Resistance	Factory spec.	Approx. 0.9 Ω

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[2] ELECTRONIC GOVERNOR

■ **IMPORTANT**

- **The engine trouble divides into an electronic governor, the main body of the engine, and the operating constancy.**
  This manual describes it concerning the check of an electronic governor.
  Refer to WSM of engine and operator's manual if you cannot find trouble related to an electronic governor by checking an electronic governor.

Engine will not start.

Cause	Corrections	Refer to Checking
Starter Operating but Not Cranking the Engine	Check operation of the solenoid	Solenoid
	Check harness of the solenoid	Solenoid
	Check harness of the glow plug	Glow plug
Starter Does Not Operate	Check emergency stop switch	Emergency stop switch

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Engine stopped automatically. Engine can be started again and stops again 10 seconds later.

Cause	Corrections	Refer to Checking
Trouble in the electronic governor composition parts	Check blinking pattern of the glow lamp (1) 	Signal pattern sheet (1) Glow Lamp

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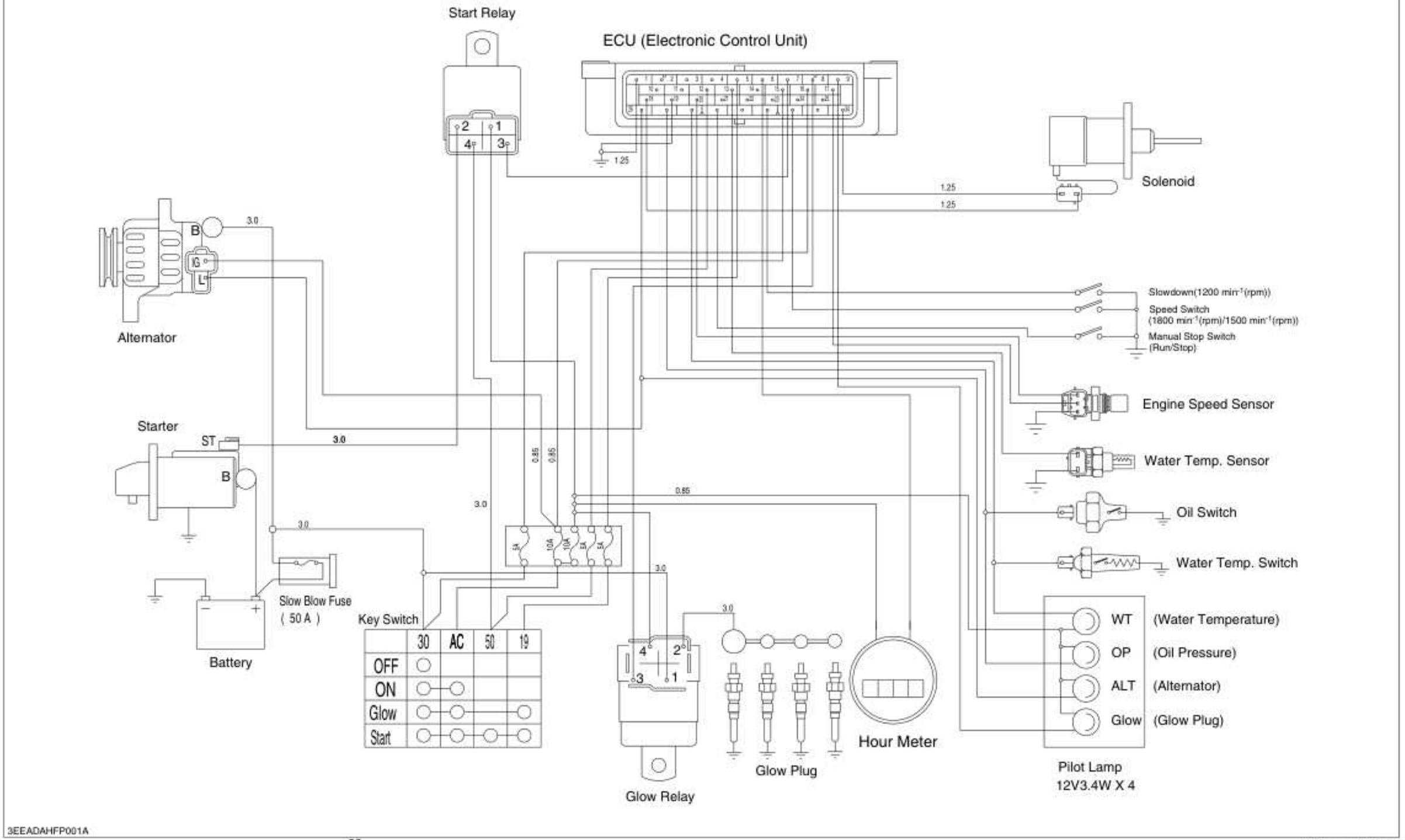
Engine speed cannot be controlled.

Cause	Corrections	Refer to Checking
Engine speed does not increase/ decrease	Check slow down switch	Slow down switch
	Check speed switch	Speed switch
	Check operation of the solenoid	Solenoid
	Check harness of speed sensor	Harness
Engine runs rough	Check operation of the solenoid	Solenoid
	Check harness of speed sensor	Harness

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WIRING DIAGRAM



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