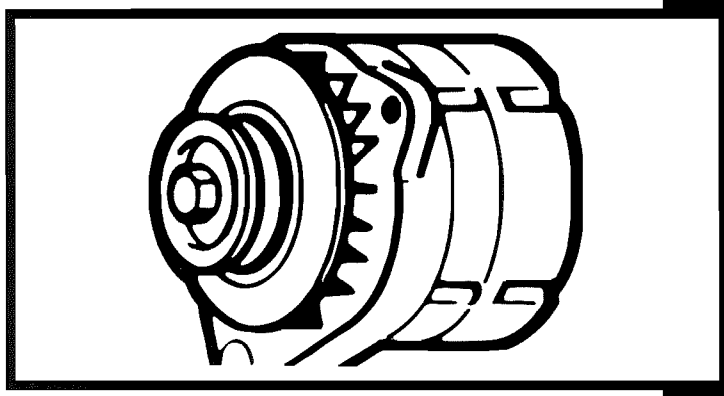
FREEDOM™ MEDIUM DUTY TRUCKS



MITSUBISHI ALTERNATOR 12V 120A

MODEL #A003TB3991
(MITSUBISHI #6GA135H 12V 120A)
(RENAULT V.I. #4103-5010480361)

SERVICE MANUAL

MAY 2001
(NEW ISSUE)
MV8-103

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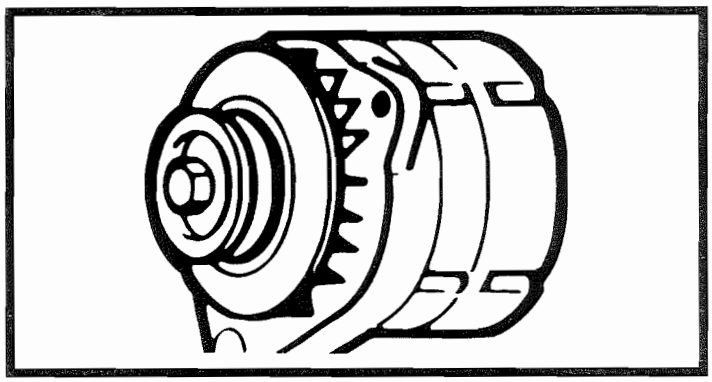

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ATTENTION

The information in this manual is not all inclusive and cannot take into account all unique situations. Note that some illustrations are typical and may not reflect the exact arrangement of every component installed on a specific chassis.

The information, specifications, and illustrations in this publication are based on information that was current at the time of publication.

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SAFETY INFORMATION

SAFETY INFORMATION

Advisory Labels

Cautionary *signal words* (Danger-Warning-Caution) may appear in various locations throughout this manual. Information accented by one of these signal words must be observed to minimize the risk of personal injury to service personnel, or the possibility of improper service methods which may damage the vehicle or cause it to be unsafe. Additional Notes and Service Hints are used to emphasize areas of procedural importance and provide suggestions for ease of repair. The following definitions indicate the use of these advisory labels as they appear throughout the manual:

⚠ DANGER

Activities associated with* Danger *indicate that death or serious personal injury may result from failing to heed the advisory. Serious personal injury may be equated to career-ending injury.

⚠ WARNING

Activities associated with *Warning* indicate that personal injury may result from failing to heed the advisory. In this case, personal injury is not equated to career-ending injury, but results in possible change in quality of life.

⚠ CAUTION

Activities associated with ***Caution*** *indicate that product damage may result from failing to heed the advisory. Caution is not used for personal injury.*

NOTE

A procedure, practice, or condition that is essential to emphasize.

SERVICE HINT

A helpful suggestion that will make it quicker and/or easier to perform a procedure, while possibly reducing service cost.

Service Procedures and Tool Usage

Anyone using a service procedure or tool not recommended in this manual must first satisfy himself thoroughly that neither his safety nor vehicle safety will be jeopardized by the service method he selects. Individuals deviating in any manner from the instructions provided assume all risks of consequential personal injury or damage to equipment involved.

Also note that particular service procedures may require the use of a special tool(s) designed for a specific purpose. These special tools must be used in the manner described, whenever specified in the instructions.

⚠ WARNING

1. **Before starting a vehicle, always be seated in the driver's seat, place the transmission in neutral, be sure that parking brakes are set, and disengage the clutch.**
2. **Before working on a vehicle, place the transmission in neutral, set the parking brakes, and block the wheels.**
3. **Before towing the vehicle, place the transmission in neutral and lift the rear wheels off the ground, or disconnect the driveline to avoid damage to the transmission during towing.**

⚠ DANGER

Engine-driven components such as Power Take-Off (PTO) units, fans and fan belts, driveshafts and other related rotating assemblies, can be very dangerous. Do not work on or service engine-driven components unless the engine is shut down. Always keep body parts and loose clothing out of range of these powerful components to prevent serious personal injury. Be aware of PTO engagement or nonengagement status. Always disengage the PTO when not in use.

REMEMBER,
SAFETY . . . IS NO ACCIDENT!

SAFETY INFORMATION

Mack Trucks, Inc. cannot anticipate every possible occurrence that may involve a potential hazard. Accidents can be avoided by recognizing potentially hazardous situations and taking necessary precautions. Performing service procedures correctly is critical to technician safety and safe, reliable vehicle operation.

The following list of general shop safety practices can help technicians avoid potentially hazardous situations and reduce the risk of personal injury. DO NOT perform any services, maintenance procedures or lubrications until this manual has been read and understood.

- Perform all service work on a flat, level surface. Block wheels to prevent vehicle from rolling.
- DO NOT wear loose-fitting or torn clothing. Remove any jewelry before servicing vehicle.
- ALWAYS wear safety glasses and protective shoes. Avoid injury by being aware of sharp corners and jagged edges.
- Use hoists or jacks to lift or move heavy objects.
- NEVER run engine indoors unless exhaust fumes are adequately vented to the outside.
- Be aware of hot surfaces. Allow engine to cool sufficiently before performing any service or tests in the vicinity of the engine.
- Keep work area clean and orderly. Clean up any spilled oil, grease, fuel, hydraulic fluid, etc.
- Only use tools that are in good condition, and always use accurately calibrated torque wrenches to tighten all fasteners to specified torques. In instances where procedures require the use of special tools which are designed for a specific purpose, use only in the manner described in the instructions.
- Do not store natural gas powered vehicles indoors for an extended period of time (overnight) without first removing the fuel.
- Never smoke around a natural gas powered vehicle.

SPECIFICATIONS

ALTERNATOR SPECIFICATIONS

Characteristics

Rotation direction: Clockwise

Rated voltage: 12V

Rated current: 120A

Pre-set voltage: 14.7 ± 0.3V

Flashover speed: 1000 rpm

Full load speed: 18000 rpm

Output

		Operating Temperature = 20°C	= 100°C
Voltage (V)	Speed (rpm)	Output Amps	
13.5	1300	30	25
	2500	80	67
	5000	110	92

Tightening Torques for Alternator Terminals

Terminal	Screw-Thread	Torque (N·m)
B+	M8 x 1.25	12.5 ± 20%
A	M6 x 1	3.0 ± 20%
B–	M6 x 1	6.0 ± 20%
W	M5 x 0.8	3.0 ± 20%

Any modification to these nuts on-vehicle will require tightening values to be revised.

Tightening Torques for Alternator Assembly

Part*	Type of Screw	Torque (N·m)
1	Pulley nut	98–137
3	M5	3.5–5.3
5	M5	3–4.4
11	M5	4.9–6.9
	M6	5.9–7.8
13	M5 (M6)	6–7.8
14	M8	12.7–16.7

*See ALTERNATOR COMPONENT PARTS for illustration.

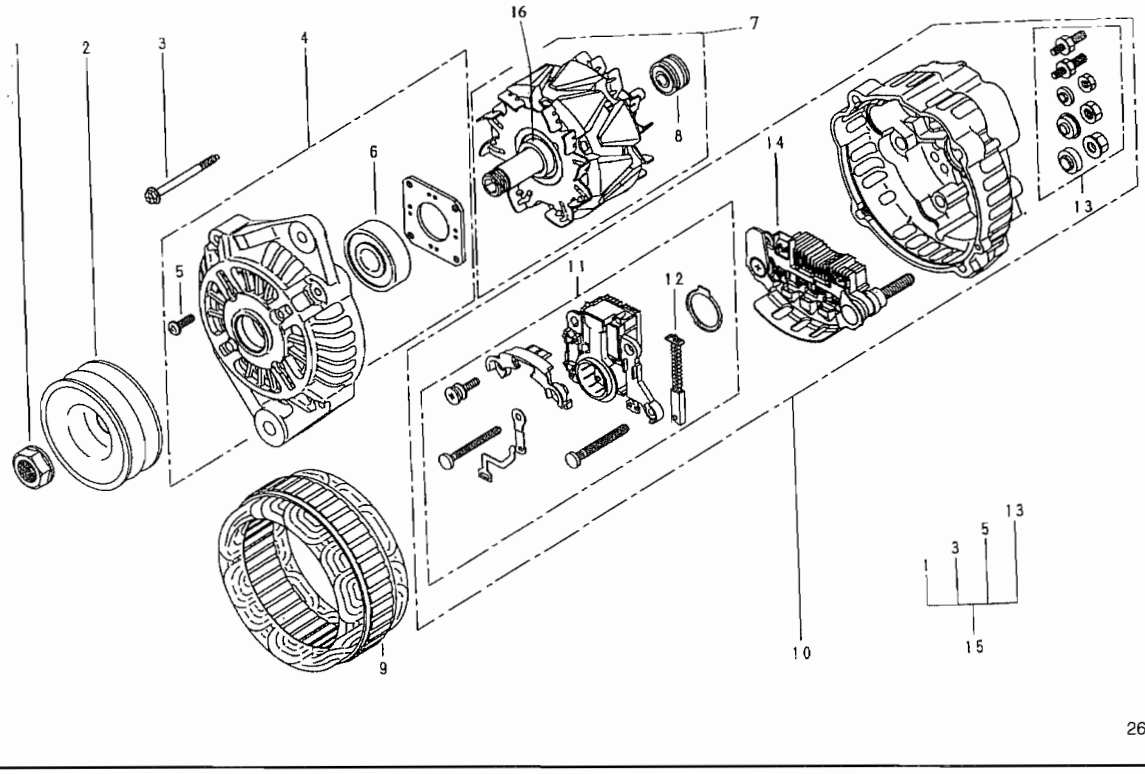
DESCRIPTION

ALTERNATOR COMPONENT PARTS

The alternator is composed of the following parts:

Part Number	Description	Part Number	Description
1	Pulley nut	10	Rear bracket assy
2	Pulley	11	Regulator
3	Setscrew	12	Brush
4	Front bracket assy	13	Screw
5	Screw	14	Rectifier bridge
6	Front bearing	15	Screw set
7	Rotor assy	16	Washer
8	Rear bearing		
9	Stator		

Exploded view of alternator part:



PRELIMINARY CHECKS

ALTERNATOR CHECKS AND TESTS

Check wiring of load circuit.

Check on vehicle regulation of battery voltage.

Voltage must be 14V for 12V battery.

Those tests being done, if alternator is faulty, proceed as follows:

Bench Test Requirements

Test with oscilloscope.

With oscilloscope, it is possible to see the curve of power to define trouble concerning stator coil and diodes.

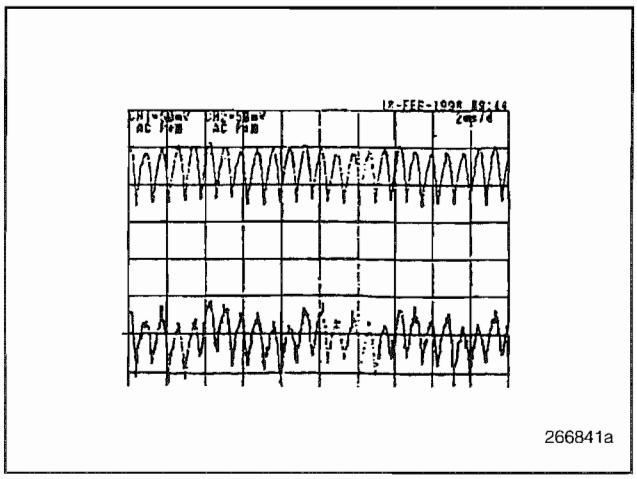
Test alternator at 2000 rpm.

Connect alternator terminal B+ with oscilloscope and observe the wave form. It should be identical to this:

Battery OFF

Without load

R = 1kΩ



If wave on oscilloscope is different from the correct one, replace the alternator.

Bench Testing

Mount alternator on test bench and test functions as follows:

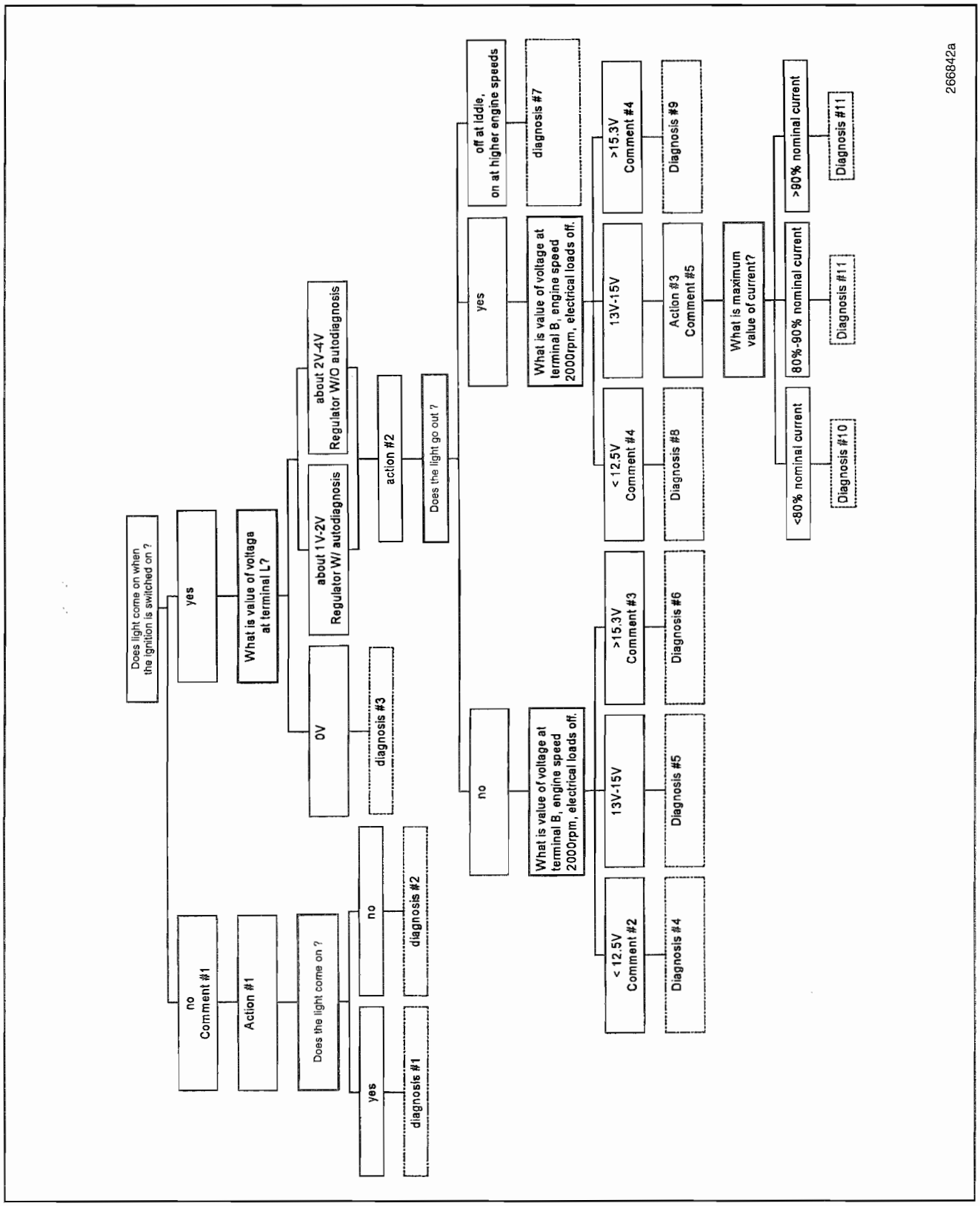
- Functioning of load diode.
- Alternator output (various speeds).
- Alternator regulation.

NOTE

Most tests can be done quickly using a modern AVR unit. It is recommended to conduct this testing before deciding to remove and replace the alternator.

TROUBLESHOOTING

Alternator Diagnostic Procedure



Actions

Action #1:

Disconnect S and L terminals. Connect L terminal of vehicle connector to the ground.

Action #2:

Start engine and let it run at idle speed for 3 minutes.

Action #3:

Power current control. Engine running at idle, switch on as many current loads as possible. Increase engine speed up to 2500 rpm–3000 rpm. Measure immediately.

Comments

Comment #1:

If induction wiring is disconnected, light does not come on for alternator W/O autodiagnosis regulator, light comes on for alternator W/ autodiagnosis regulator.

Comment #2:

When induction wiring is disconnected, alternator outputs no current and B terminal voltage decreases at 12.5V, because of auto diagnosis lamp coming on. In case of stator coil disconnected, or in case of short circuits in diodes, light comes on, as with regulator W/O autodiagnosis.

Comment #3:

When regulator does not work and induction current is not cut off, voltage at B terminal increases, battery is over loaded: this is "no-control state." When S terminal (detecting voltage) is disconnected, regulator works, "no-control state" does not occur, regulation voltage increases by 1V.

Comment #4:

In that case, because of autodiagnosis, light should come on. Regulator is then assumed to be faulty.

Comment #5:

To make sure that alternator outputs current, slightly unload battery, and measure current immediately.

Diagnosis

Diagnosis #1:

< Regulator W/autodiagnosis>

- — B terminal disconnected, or
- — Short circuit in positive diode, or
- — Faulty regulator.

< Regulator W/O autodiagnosis>

- — Induction wiring disconnected, or
- — Brush bad contact, or
- — Short circuit in positive diodes, or
- — Faulty regulator.

Diagnosis #2:

- — Vehicle electrical harness faulty.

Diagnosis #3:

- — Problem on vehicle electrical harness, or
- — Regulator faulty (in that case, light comes on, even at idle speed).

Diagnosis #4:

- — Alternator faulty (induction circuit open), or
- — Regulator faulty.

Diagnosis #5:

- — Alternator faulty, or
- — Autodiagnosis faulty (transistor driving lamp is always on).

Diagnosis #6:

< Regulator W/autodiagnosis>

- — "No-control state," or
- — S terminal disconnected.

Diagnosis #7:

- — Driving belt slipping, or
- — Alternator faulty, or
- — Regulator faulty.

Diagnosis #8:

- — Alternator faulty, or
- — Battery faulty.

Diagnosis #9:

- — "No-control state,"
- — S terminal disconnected.

Diagnosis #10:

- — Clamping of battery terminal faulty, or
- — Clamping of B terminal faulty, or
- — Electrical harness battery/alternator faulty, or
- — Battery faulty, or
- — Alternator faulty.

Diagnosis #11:

- — Current measurement has no meaning, slightly unload battery and measure again.

Diagnosis #12:

- — No trouble on alternator.

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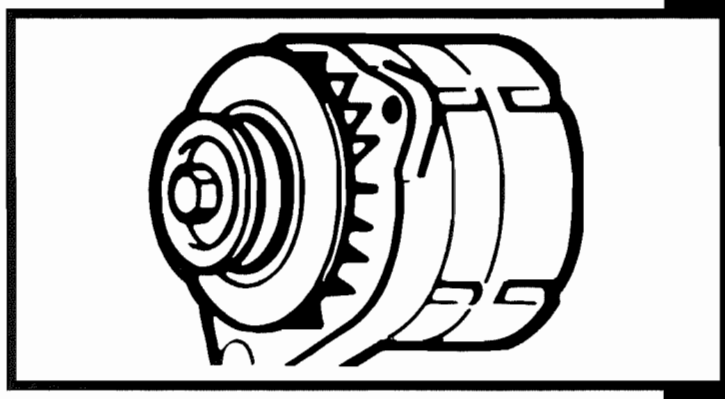

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