SERVICE MANUAL

S4L2, S4L

Engine

Part number 84373329
English
August 2010

NEW HOLLAND AGRICULTURE

Contents

INTRODUCTION

Contents

INTRODUCTION

Foreword

This service manual describes the specifications, maintenance and service procedures for Mitsubishi diesel engines.

To maintain the performance of the engine for many years and to ensure safe operation, it is important to use the engine correctly and conduct regular inspection and maintenance, and also to take necessary measures which involves the disassembly, inspection, repair and reassembly of the engine and engine parts.

Read this manual carefully and understand the work procedures fully before disassembling, inspecting, repairing or reassembling the engine.

The contents of the manual are based on the engine models that are being produced at the time of publication. Due to improvements made thereafter, the actual engin that you work on may differ partially from the one described in this manual.

Safety rules

Standard safety precautions

Be informed and notify personnel of the laws in force regulating safety, and provide documentation available for consultation.

- Keep working areas as clean as possible.
- Ensure that working areas are provided with emergency boxes. They must be clearly visible and always contain adequate sanitary equipment.
- Fire extinguishers must be properly identified and always be clear of obstructions. Their efficiency must be checked on a regular basis and personnel must be trained on proper interventions and priorities.
- Keep all emergency exits free of obstructions and clearly marked.
- Smoking in working areas subject to fire danger must be strictly prohibited.

Prevention of injury

- Wear suitable work attire and safety glasses with no jewelry such as rings and chains when working close to engines and equipment in motion.
- Wear safety gloves and goggles when performing the following operations:
  - Topping off or changing lubrication oils.
  - Using compressed air or liquids at a pressure greater than **2 bar** (**29 psi**).
- Wear a safety helmet when working close to hanging loads or equipment working at head level.
- Always wear safety shoes and fitting clothes.
- Use protection cream for hands.
- Change wet clothes as soon as possible.
- In the presence of voltages exceeding **48 - 60 V**, verify the efficiency of the ground and mass electrical connections. Ensure that hands and feet are dry and use isolating foot boards. Workers should be properly trained to work with electricity.
- Do not smoke or start an open flame close to batteries and any fuel material.
- Place soiled rags with oil, diesel fuel or solvents in specially provided anti-fire containers.
- Do not use any tool or equipment for any use other than what it was originally intended for. Serious injury may occur.
- If running an engine indoors, make sure there is a sufficient exhaust fan in use to eliminate exhaust fumes.

During maintenance

- Never open the filler cap of the cooling system when the engine is hot. High temperature liquid at operating pressure could result in serious danger and risk of burn. Wait until the temperature decreases under **50 °C** (**122 °F**).
- Never add coolant to an overheated engine and use only appropriate liquids.
- Always work when the engine is turned off. Certain circumstances require maintenance on a running engine. Be aware of all the risks involved with such an operation.
- Always use adequate and safe containers for engine fluids and used oil.
- Keep engine clean of any spilled fluids such as oil, diesel fuel, and or chemical solvents.
- Use of solvents or detergents during maintenance may emit toxic vapors. Always keep working areas aerated. Wear a safety mask if necessary.
- Do not leave soiled rags that may contain any flammable substances close to the engine.
- Always use caution when starting an engine after any work has been performed. Be prepared to cut off intake air in case of engine runaway.
- Never disconnect the batteries while the engine is running.

- Disconnect the batteries prior to performing any work on the equipment.
- Disconnect the batteries to place a load on them with a load tester.
- After any work is performed, verify that the battery clamp polarity is correct and that the clamps are tight and safe from accidental short circuit and oxidation.
- Before disconnecting any pipelines (pneumatic, hydraulic, fuel pipes, etc.), verify that all pressure has been released. Take all necessary precautions bleeding and draining residual pressure. Always wear the proper safety equipment.
- Do not alter the lengths of any wires.
- Do not connect any electronic service tool to the engine electrical equipment unless specifically approved by Iveco.
- Do not modify the fuel system or hydraulic system unless approved by Iveco, Any unauthorized modification will compromise warranty assistance and may affect engine operation and life span.

For engine equipped with an electronic control unit

- Do not weld on any part of the equipment without removing the control unit.
- Remove the in case of work requiring heating over **80 °C** (**176 °F**).
- Do not paint the components and the electronic connections.
- Do not alter any data filed in the electronic control unit driving the engine. Any manipulation or alteration of electronic components will void engine warranty assistance and may affect the correct working order and life span of the engine.

Respect of the Environment

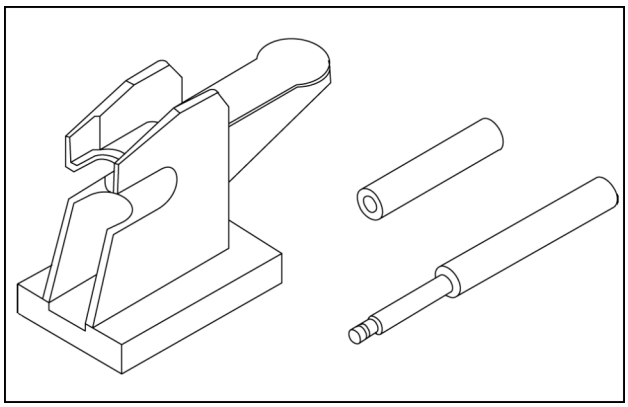
- Respect of the environment should be of primary importance. Take all necessary precautions to ensure personnel's safety and health.
- Inform the personnel of the laws regarding the dispensing of used engine fluids.
- Handle batteries with care, storing them in a well ventilated environment and within anti-acid container.

Special tools

31A91-00100

Piston pin setting tool

- For removal and installation of the piston pin

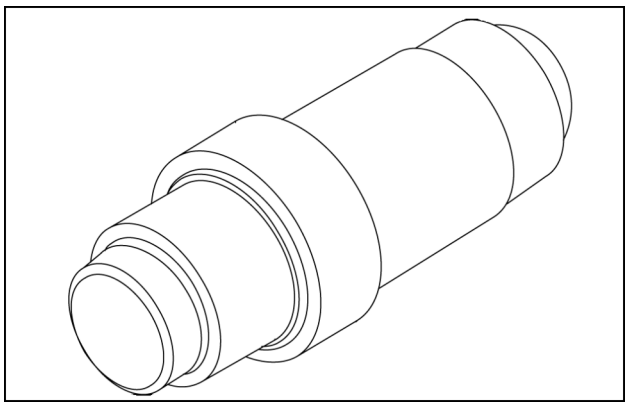


93101124 1

ST332340

Camshaft bushing installer

- For punching and press-fitting of the front camshaft bushing

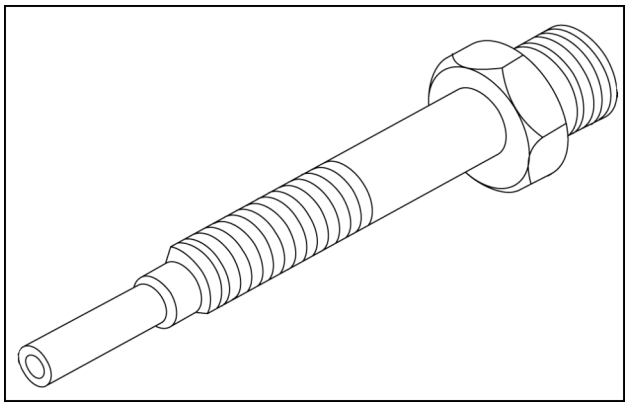


93101127 2

ST332270

Compression gauge adapter

- For measuring compression

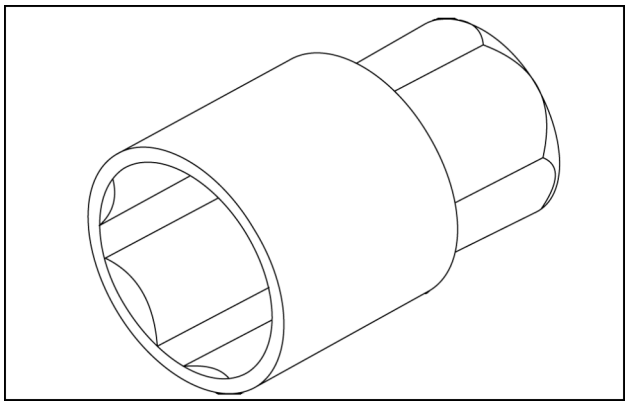


93101126 3

MD998054

Oil pressure switch socket wrench

- For removal and installation of the oil pressure switch

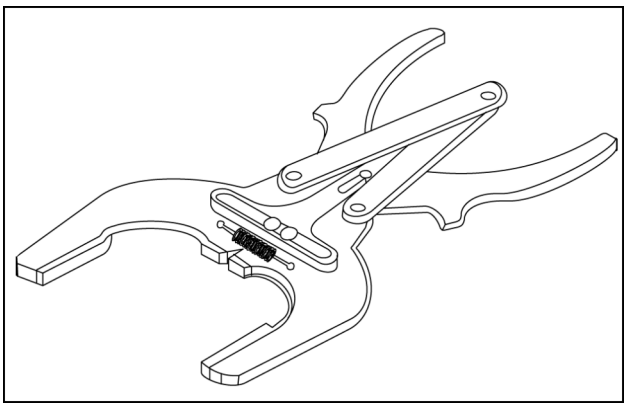


93101129 4

31391-12900

Piston ring pliers

- For removal and installation of the piston rings



93101123 5

General specification

S4L

Refer to the following table for links to the specifications pages.

Engine	**ENGINE - General specification (B.10.A)**
Lubrication system	**LUBRICATION SYSTEM - General specification (B.60.A)**
Fuel and injection system	**FUEL AND INJECTION SYSTEM - General specification (B.20.A)**
Engine coolant system	**ENGINE COOLANT SYSTEM - General specification (B.50.A)**
Air intake system	**AIR INTAKE SYSTEM - General specification (B.30.A)**
Electrical power system	**ELECTRICAL POWER SYSTEM - General specification (A.30.A)**

General specification

S4L2

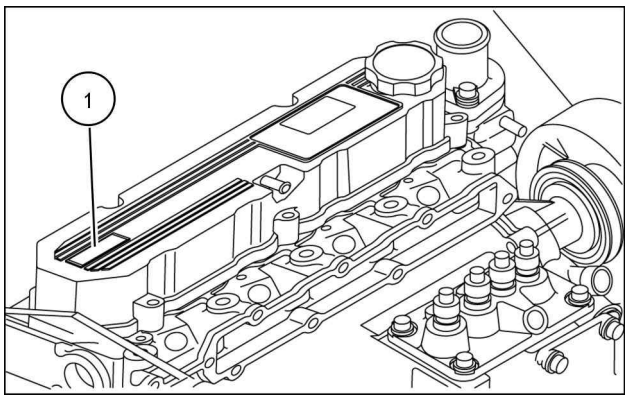
Refer to the following table for links to the specifications pages.

Engine	**ENGINE - General specification (B.10.A)**
Lubrication system	**LUBRICATION SYSTEM - General specification (B.60.A)**
Fuel and injection system	**FUEL AND INJECTION SYSTEM - General specification (B.20.A)**
Engine coolant system	**ENGINE COOLANT SYSTEM - General specification (B.50.A)**
Air intake system	**AIR INTAKE SYSTEM - General specification (B.30.A)**
Electrical power system	**ELECTRICAL POWER SYSTEM - General specification (A.30.A)**

Product identification

Engine serial number location

The engine serial number **(1)** is stamped on the label of the upper side of the rocker cover.

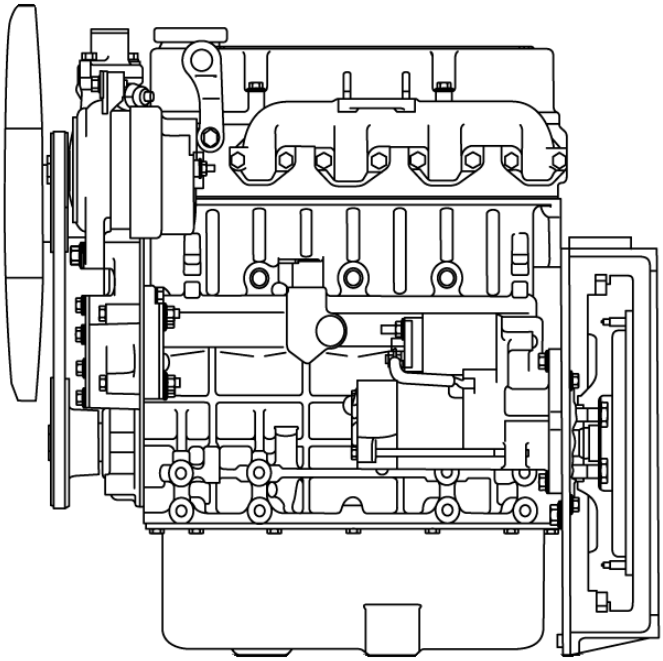


93101555 1

NEW HOLLAND AGRICULTURE

SERVICE MANUAL

HYDRAULIC - PNEUMATIC - ELECTRICAL - ELECTRONIC SYSTEMS



SL Series

Contents

HYDRAULIC - PNEUMATIC - ELECTRICAL - ELECTRONIC SYSTEMS - A

HYDRAULIC - PNEUMATIC - ELECTRICAL - ELECTRONIC SYSTEMS - A

ELECTRICAL POWER SYSTEM - 30.A

SL Series

Contents

HYDRAULIC - PNEUMATIC - ELECTRICAL - ELECTRONIC SYSTEMS - A

ELECTRICAL POWER SYSTEM - 30.A

ELECTRICAL POWER SYSTEM - General specification

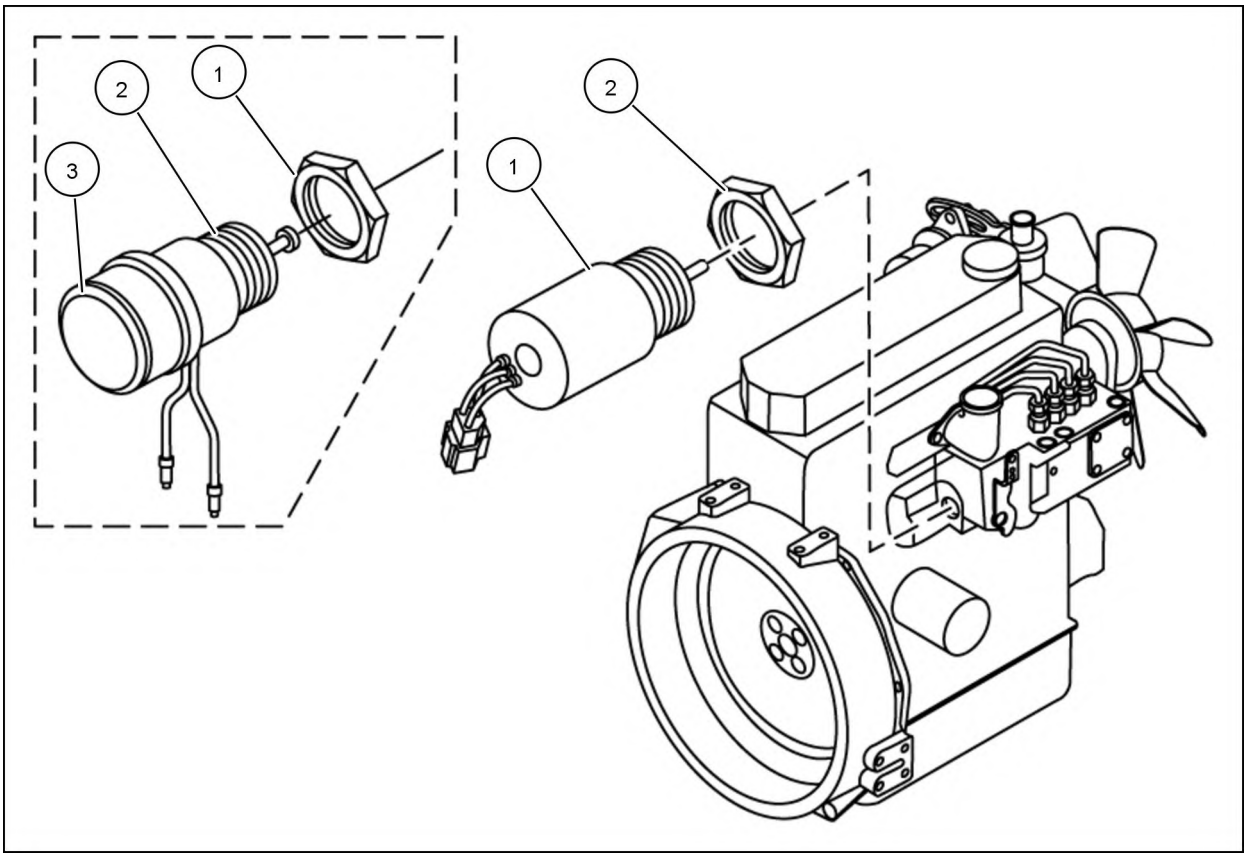
S4L, S4L2

Engine model	S4L, S4L2
Voltage - polarity	**12 V**- negative (-) ground
Starter	
- Type	M008T70471A
- Manufacturer	Mitsubishi Electric Corporation
- Pinion engagement type	Pinion shift (reduction type)
- Output	**12 V** - **2.0 kW**
- Number of units	1
- Pinion / ring gear ratio	13/120
Alternator	
- Type	Three-phase alternating generator, internal IC regulator
- Manufacturer	Mitsubishi Electric Corporation
- Output	**12 V** - **50 A**
- Rated voltage generating speed	**13.5 V** - **47 A @ 5000 RPM**
- Regulator adjusting voltage	**14.4 - 15 V**
Glow plug	
- Type	Sheathed
- Rated voltage - armature current	**10.5 V** - **9.7 A** @ 30 second duration
Stop solenoid	
- Type	Run on type
- Working voltage	**12 V**
- Insulating resistance	100 MΩ or more @ **500 V** DC
- Stroke	**13 - 14 mm** (**0.512 - 0.551 in**)

ELECTRICAL POWER SYSTEM - Torque

Description	Threads Diameter x pitch	Torque	Remark
Starter terminal B	M8 x 1.25	**10 - 12 N·m** (**7 - 9 lb ft**)	
Stop solenoid fixing nut	M30 x 1.5	**39 - 49 N·m** (**29 - 36 lb ft**)	
Stop solenoid blind plug	M30 x 1.5	**39 - 49 N·m** (**29 - 36 lb ft**)	
Glow plug	M10 x 1.25	**15 - 20 N·m** (**11 - 15 lb ft**)	
Glow plug connection plate fixing nut	M4 x 0.7	**1 - 1.5 N·m** (**9 - 13 lb in**)	
Alternator terminal B	M5 x 0.8 M6 x 1.0 M8 x 1.25	**3 - 5 N·m** (**27 - 44 lb in**) **4 - 6 N·m** (**35 - 53 lb in**) **7 - 13 N·m** (**62 - 115 lb in**)	

ELECTRICAL POWER SYSTEM - Remove - Stop solenoid

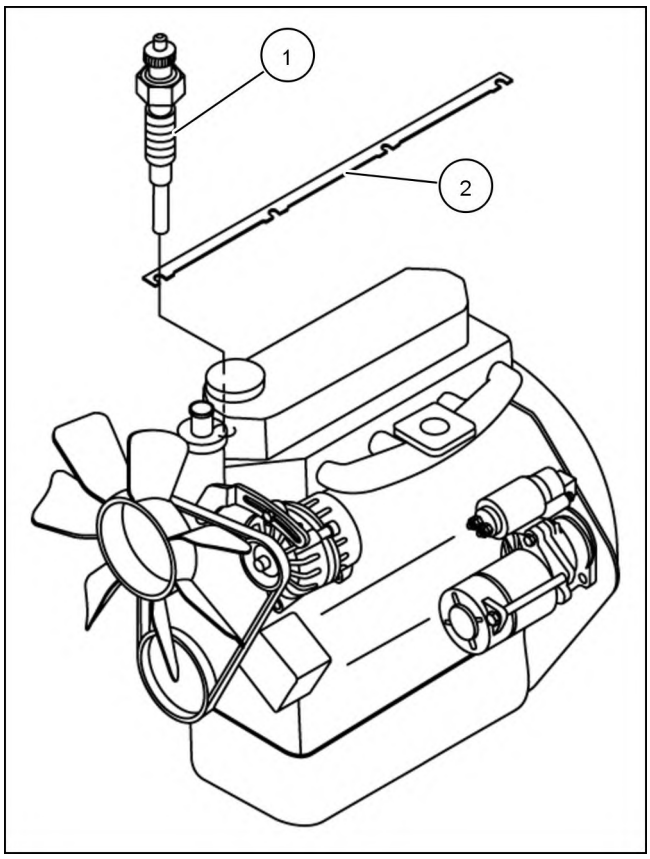


93101324 1

Removing sequence

1. Nut
2. Stop solenoid
3. Rubber cap

ELECTRICAL POWER SYSTEM - Remove - Glow plugs

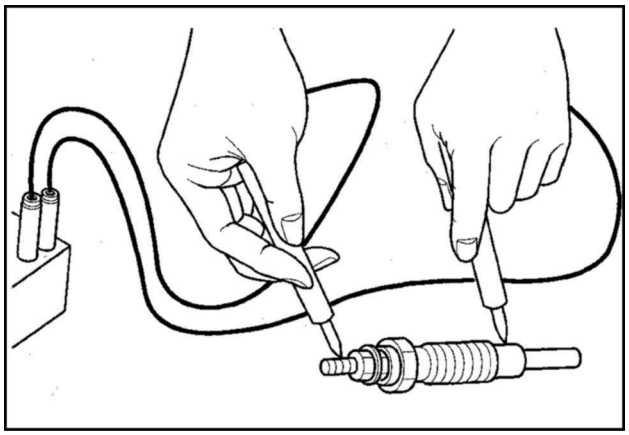


93101320 1

1. Glow plug
2. Glow plug plate

ELECTRICAL POWER SYSTEM - Inspect - Glow plugs

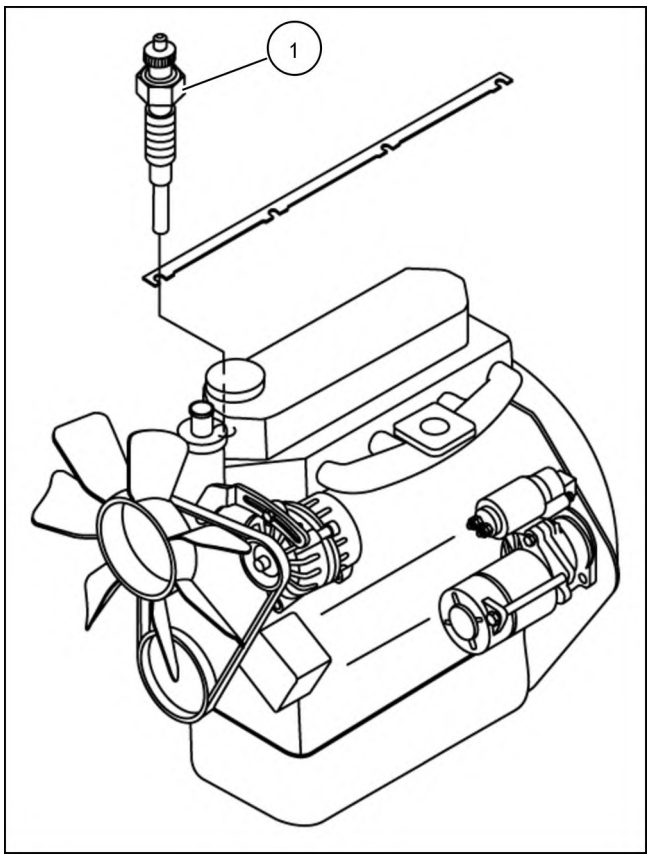
1. Check continuity between the terminal and the body as shown in the illustration. If no continuity is indicated, or the resistance is large, replace the glow plug with a new one.



79103830 1

Item	Standard
Resistance value	0.55Ω

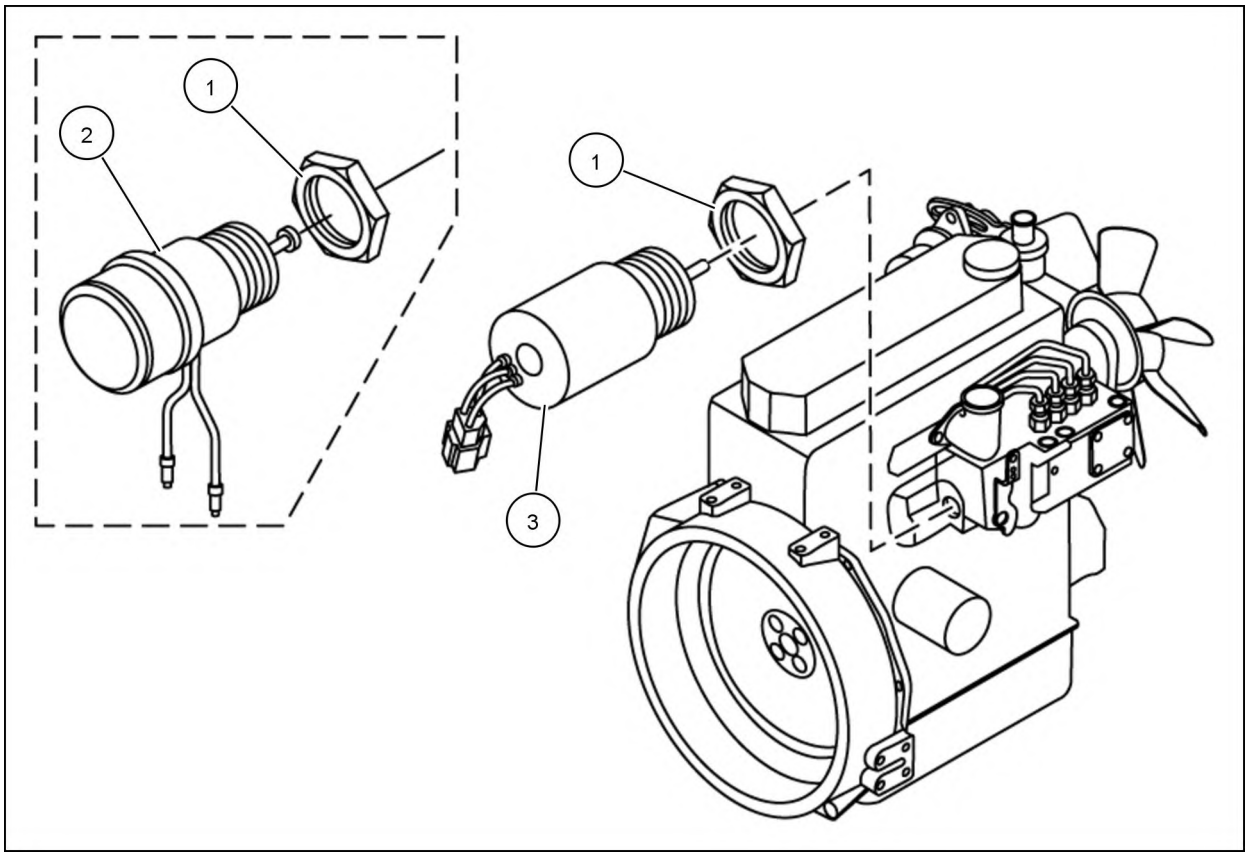
ELECTRICAL POWER SYSTEM - Install - Glow plugs



93101320 1

1. Torque glow plugs **(1)** to **14.7 - 19.6 N·m** (**10.8 - 14.5 lb ft**).

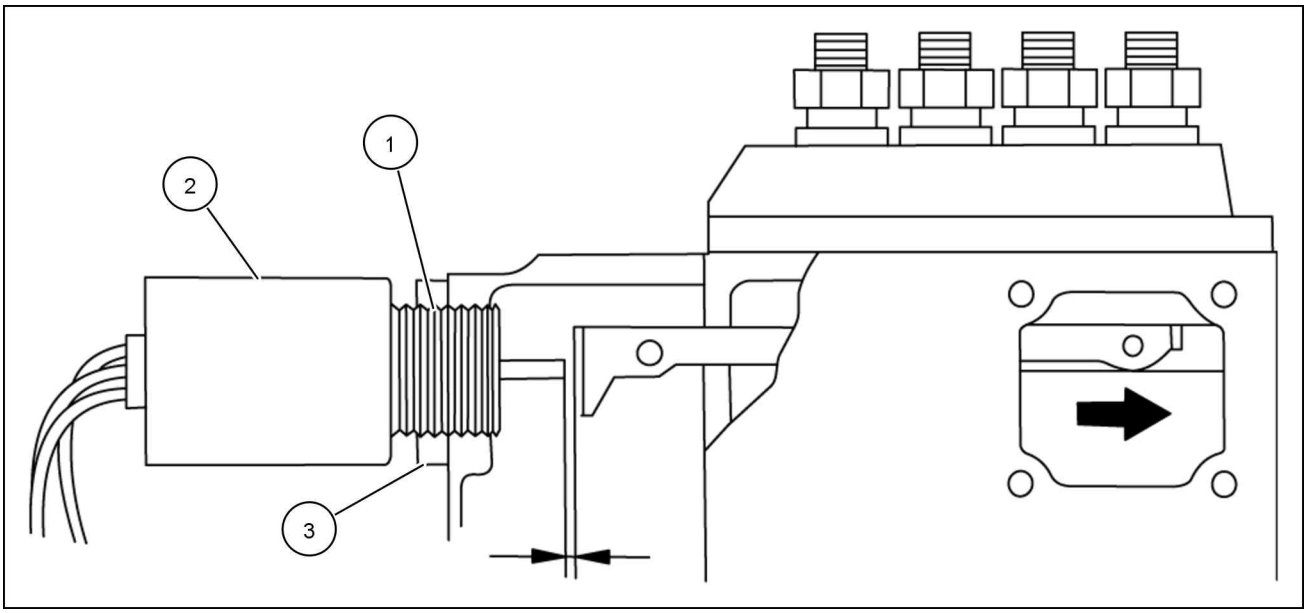
Installing stop solenoid



93101324 2

2. Torque the stop solenoid retaining nuts **(1)**of the ETS type **(2)**and ETR type **(3)**stop solenoids to **39.2 - 49.0 N·m** (**28.9 - 36.2 lb ft**).

Installing stop solenoid (ETR type)



93101328 3

Procedure for installing stop solenoid (ETR type)

1. Apply Threebond 1212 or 1211 sealant to the threaded portion **(1)** of the stop solenoid **(2)**.

NOTE: *Apply the sealant up to the position where the stop solenoid is screwed into the governor case.*

2. Temporarily reassemble the stop solenoid and the nut **(3)** to the governor case.
3. Move the control rack of the fuel injection pump fully in the stop direction.
4. Screw in the stop solenoid until the shaft contacts the tie rod.
5. Turn the stop solenoid in the reverse direction by 30 to 45° from the above condition and temporarily tighten the nut.
6. Move the control rack side to side and make sure that there is play of approximately **0.15 - 0.20 mm** (**0.0059 - 0.0079 in**).
7. Tighten the nut to the specified torque.

Verification after reassembling (ETR type)

1. After starting the engine, turn the starter switch key to the OFF position, and make sure that the stop solenoid activates and the engine stops.
2. After starting the engine, make a short circuit between the terminal of the oil pressure switch and the switch body, and make sure that the engine stops.

Alternator - Inspect

Inspecting alternator operation

Locate the cause of faulty charging from malfunctions described below. Do not remove the alternator for inspection and repair unless inspection cannot be performed with the alternator installed on the engine.

Overcharge	Adjusted value of voltage regulator is high.
	Faulty battery.
Over-discharge	Low adjusted value of voltage relay.
	Faulty alternator output.
	Electric power consumption is extremely high.
	Special load is used.
	Faulty wiring.

Handling precaution

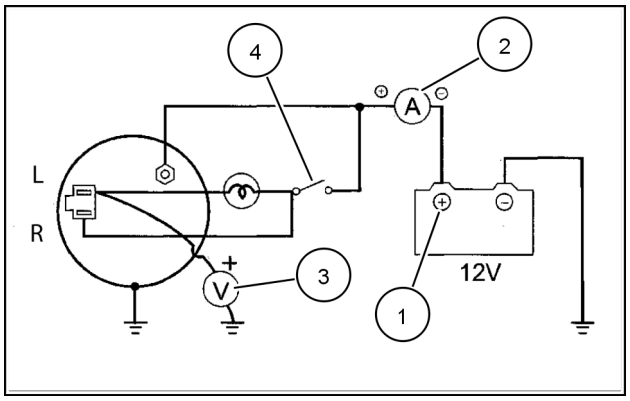
Improper handling could cause damage or failure to the alternator.

1. Connect battery cables correctly. The (-) cable is for grounding.
2. Do not use any high voltage tester such as megger.
3. Disconnect battery cables before recharging.
4. Do not disconnect lead wire from B terminal of the alternator while the engine is running.
5. Battery voltage is constantly applied to B terminal of the alternator. Do not ground at this terminal.
6. Do not short circuit or ground at L terminal. (For a built-in IC regulator type)
7. When a steam cleaner is used, do not allow the steam directly contact the alternator.

Inspecting regulated voltage (IC regulator integral type)

1. Disconnect (+) battery terminal **(1)** and connect an ammeter **(2)** across the line.
2. Connect a voltmeter **(3)** between terminal L and ground.
3. The indication of the voltmeter must be 0 when the starter switch **(4)** is OFF.

   The indication of the voltmeter must be considerably lower than the battery voltage when the starter switch is ON (engine OFF).
4. Start the engine with the ammeter terminals disconnected.
5. Read the voltmeter (regulated voltage) while the ammeter reading is 5 A or lower, 2500 min^{-1}, and lamp switches OFF.

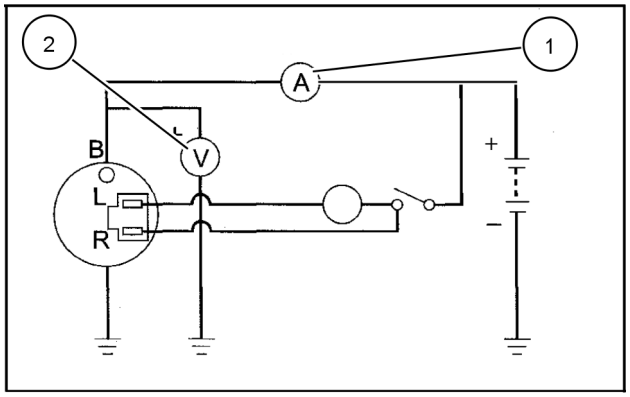


76103784 1

Item	Spec.	Standard	Condition
Regulated voltage (at **20 °C** (**68 °F**)	12 V - 50 A	14.4 to 15.0 V	5000 min^{-1}, 5 A or lower, **20 °C** (**68 °F**)

Inspecting output (a built-in IC regulator type)

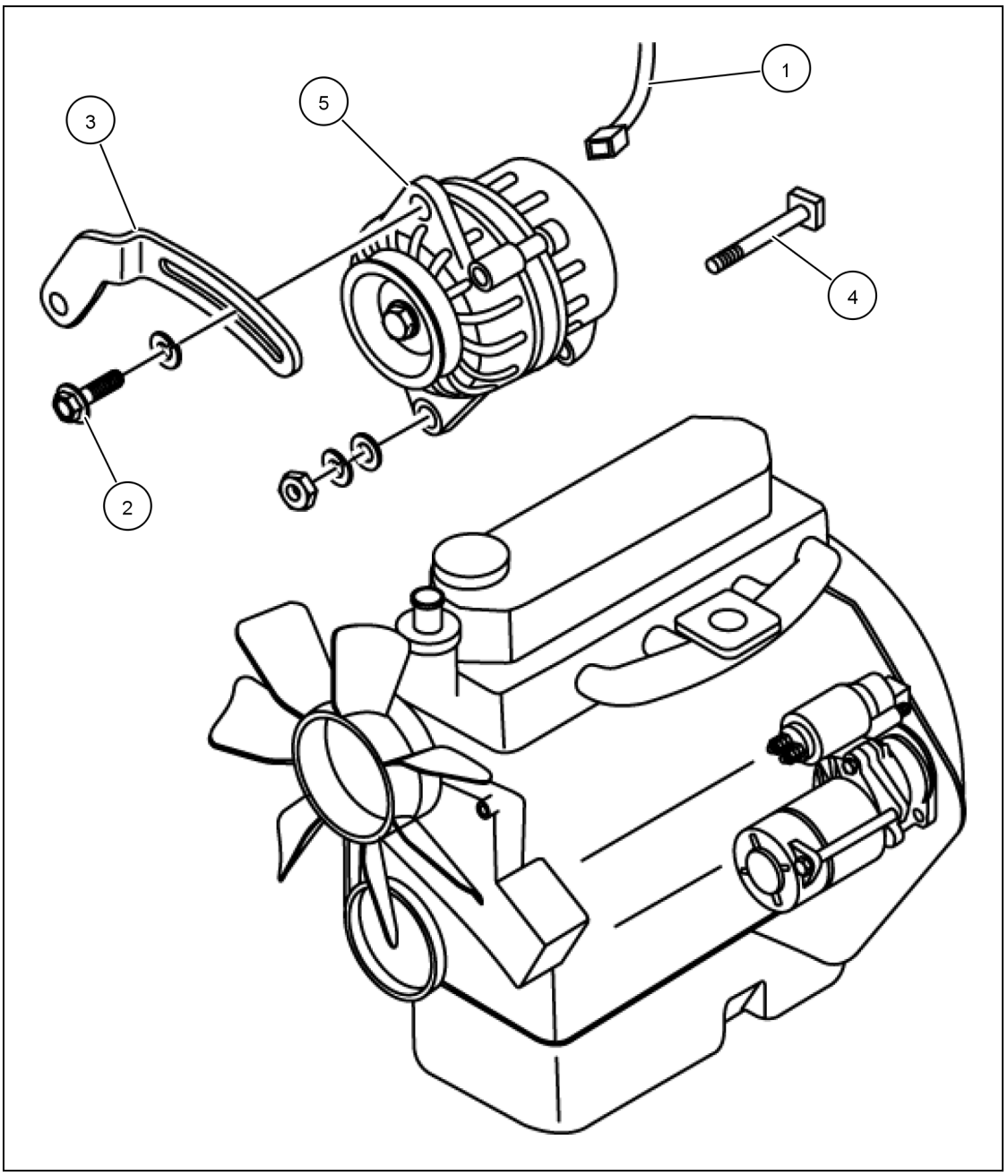
1. Disconnect the battery ground cable.
2. Connect B terminal of the alternator to the ammeter **(1)**, then connect the voltmeter **(2)** between B terminal and ground.
3. Connect the battery ground cable.
4. Start the engine.
5. Immediately apply all loads such as lamps.
6. Increase the engine speed and measure the maximum output current at the specified alternator rotation speed with the voltmeter indicated the specified value.
7. If the measured value meets the standard, the output is normal.



76103785 2

Item	Spec.	Standard	
		Terminal voltage/current	Alternator rotation speed
Output characteristics (when hot)	12 V - 50 A	13.5 V/33 A or higher	2500 min^{-1}
		13.5 V/47 A or higher	5000 min^{-1}

Alternator - Remove

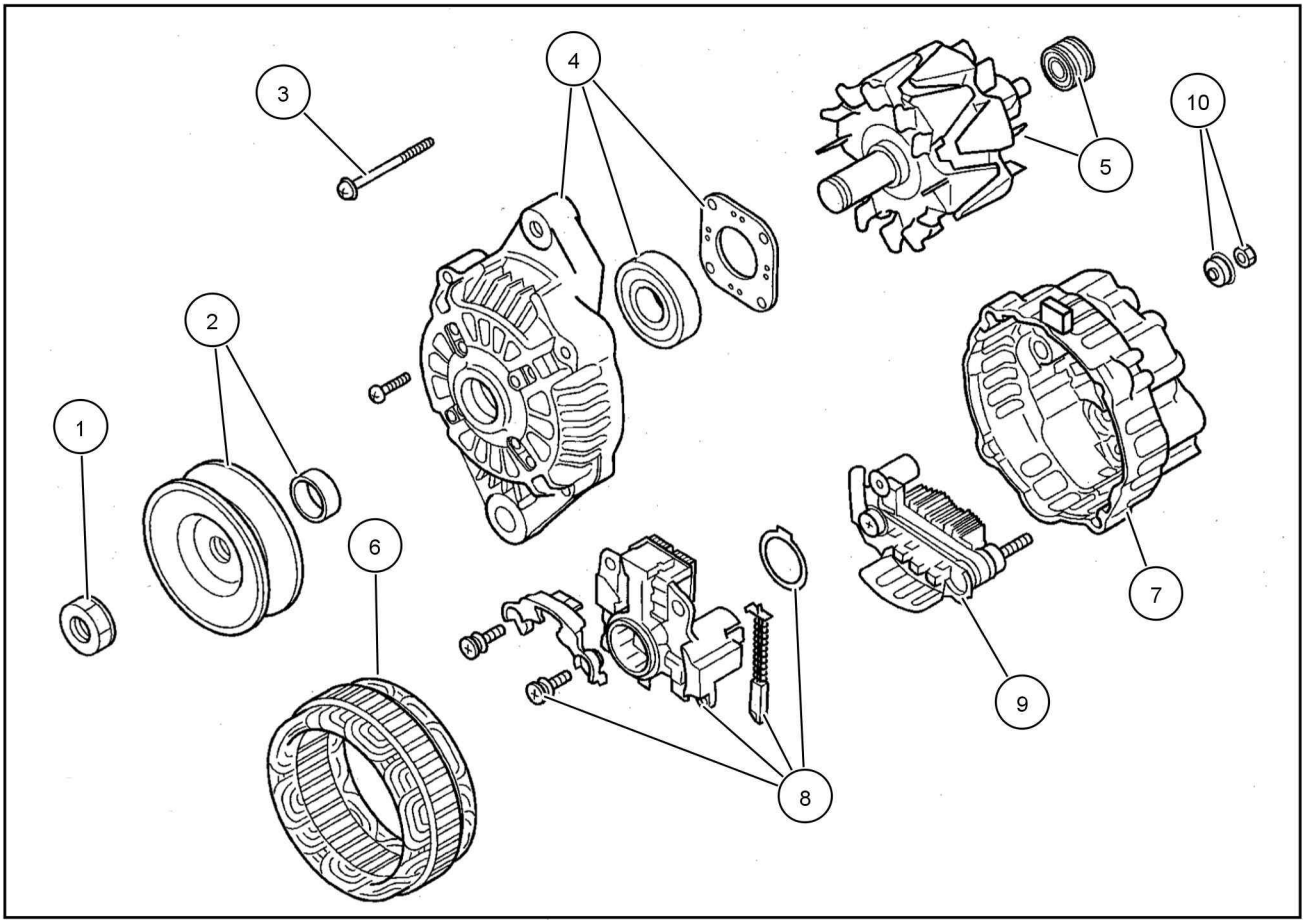


93101321 1

Removing sequence

1. Harness
2. Flange bolt
3. Generator brace
4. Bolt
5. Alternator

Alternator - Disassemble



79103817 1

Disassembling sequence

1. Nut
2. Pulley, spacer, check for deformation and damage
3. Through bolt
4. Front bracket, bearing, check for rotation
5. Rotor, bearing, check for dirt, damage and seizure of slip ring and coil resistance and rotation of bearing
6. Stator, check for broken wire and ground of coil
7. Rear bracket, check for crack or damage
8. Regulator, check for sliding state and wear of brushes
9. Rectifier, check for short circuit or open circuit
10. Nut set