

OPERATION & MAINTENANCE MANUAL

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MITSUBISHI DIESEL ENGINES S6R, S6R2

The operator and supervisor are requested to read this Operation and Maintenance Manual carefully before operating the engine or conducting inspection and maintenance.
Never operate the engine or conduct maintenance work without completely understanding this manual.

FOREWORD

This operation and maintenance manual contains detailed operation, inspection and maintenance information for engines from Mitsubishi Heavy Industries, Ltd. Please be forewarned that there are contents which are overlapping between the chapters.

Please read this manual thoroughly before proceeding with operation, inspection, and maintenance work for correct use and servicing.

Failure to follow directions in this manual may result in serious accidents.

Please observe the contents of the controls which are applied in the countries or areas when using the engines from Mitsubishi Heavy Industries, Ltd.

LIMITED WARRANTY

If Mitsubishi Heavy Industries, Ltd. examines the returned parts and any failure at manufacturing is found, Mitsubishi Heavy Industries, Ltd. shall repair or exchange the parts.

Mitsubishi Heavy Industries, Ltd.'s warranty is limited to the compensation work of repair or replacement of parts.

The warranty coverage is effective for the original purchaser only. Those to whom ownership is later transferred are not provided with the warranty. However the warranty coverage is effective for the ultimate purchaser and each subsequent purchaser for emission-related parts.

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- ♦Mitsubishi Heavy Industries, Ltd. makes no warranties, either expressed or implied, except as provided in this manual, including, but not limited to, warranties as to marketability, merchantability, fitness for a particular purpose or use, or against infringement of any patent.
 - ♦Mitsubishi Heavy Industries, Ltd. will not be liable for any damages or consequential damages, including, but not limited to, damages or other costs resulting from any abuse, misuse, misapplication of the engine and devices supplied from us.
 - ♦Mitsubishi Heavy Industries, Ltd. will not be liable for any damages or personal injuries resulting from any modification, without our written permission, of the engine and devices supplied from us.
 - ♦Mitsubishi Heavy Industries, Ltd. will not be liable for any damages or production losses caused by the use of fuel, engine oil and/or long life coolant (LLC) that we are not recommended.
 - ♦The owner of the engine is responsible for the performance of the required maintenance listed in this operation manual.

When performing the maintenance, follow the service manual published by Mitsubishi Heavy Industries, Ltd.

Mitsubishi Heavy Industries, Ltd. may deny the warranty coverage if the engine or part has failed due to inadequate or improper maintenance.

EMISSION WARRANTY

IMPORTANT

The following warranty applies to the engines that are approved of the emission regulation of the U.S. Environmental Protection Agency.

Warranty Coverage

Mitsubishi Heavy Industries, Ltd. warrants to the first owner and each subsequent purchaser of a new non-road diesel engine that the emission control system of your engine:

- ♦is designed, built and equipped so as to conform at the time of sales with all applicable regulation of the U.S. Environmental Protection Agency. If the vehicle in which the engine is installed is registered in the state of California, a separate California emission regulation also applies.
- ♦is free from the defects in material and workmanship which will cause the engine to fail to meet these regulations within the warranty period.

Warranty Period

Then its warranty period is 5 years or 3000 hours, whichever comes first.

However, if your engine warranty period is longer than the emission warranty period, the emission warranty period extends to same as the engine warranty period.

Below warranty period shall begin on the date the engine is delivered to the first owner.

Warranted pParts

Mitsubishi Heavy Industries, Ltd. warrants the parts which will increase the emission of pollutants when they become defective.

The followings are examples.

- ♦Inlet/Exhaust manifold
- ♦Crankcase ventilation system
- ♦Fuel system

Limited Warranty

It conforms to "[LIMITED WARRANTY](#)" (page ii).

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT YOU WARRANTY RIGHTS AND OBLIGATIONS

IMPORTANT

The following warranty applies to the engines that are approved of the emission regulation of the California Air Resources Board (CARB).

The **California Air Resources Board (CARB) and Mitsubishi Heavy Industries, Ltd.** are pleased to explain the **emission control system warranty** on you 2011 or later engine. In California, new heavy-duty off-road engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. Mitsubishi Heavy Industries, Ltd. must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel-injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, Mitsubishi Heavy Industries, Ltd. will repair your heavy-duty off-road engine at no cost to you including diagnosis, parts, and labor.

Manufacturer's warranty coverage:

The **2011** and later heavy-duty off-road engines are warranted for the warranty period. If any emission-related part on your engine is defective, the part will be repaired or replaced by Mitsubishi Heavy Industries, Ltd.

Owner's warranty responsibilities

- ♦As the heavy-duty off-road engine owner, you are responsible for the performance of the **required maintenance listed in your owner's manual**. Mitsubishi Heavy Industries, Ltd. recommends that you retain all receipts covering maintenance on your heavy-duty off-road engine, but Mitsubishi Heavy Industries, Ltd. can not deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.
- ♦As the heavy-duty off-road engine owner, you should however be aware that Mitsubishi Heavy Industries, Ltd. may deny you warranty coverage if your heavy-duty off-road engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.
- ♦Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.
- ♦You are responsible for initiating the warranty process. The Air Resources Board suggests that you present your heavy-duty off-road engine to a Mitsubishi Heavy Industries, Ltd. dealer or distributor dealer as soon as problem exists. The warranty repairs will be completed by the dealer or distributor as expeditiously as possible.

If you have any questions regarding your warranty rights and responsibilities, you should contact Mitsubishi Engine North America at **1-630-268-0750**.

Warranty coverage

- (a) The warranty period shall begin on the date the engine or equipment is delivered to an ultimate purchaser.
- (b) Mitsubishi Heavy Industries, Ltd. warrants to the ultimate purchaser and each subsequent purchaser of the engine registered in the state of California that the engine is:
 - (1) Designed, built and equipped so as to conform with all applicable regulations adopted by the Air Resources Board.
 - (2) Free from defects in materials and workmanship which cause the failure of a warranted part to be identical in all material respects to the parts as described in Mitsubishi Heavy Industries, Ltd.'s application for certification for a period of 5 years or 3,000 hours of operation, whichever occurs first. In the absence of a device to measure hours of use, the engine shall be warranted for a period of 5 years. For all engines rated less than 19 kW, and for constant-speed engines rated under 37 kW with rated speeds higher than or equal to 3,000 min⁻¹, the period of 2 years or 1,500 hours of operation, whichever occurs first, shall apply. In the absence of a device to measure hours of use, the engine shall be warranted for a period of 2 years.
- (c) The warranty on emission-related parts shall be interpreted as follows:
 - (1) Any warranted part which is not scheduled for replacement as required maintenance in the written instructions required by Subsection (e) shall be warranted for the warranty period defined in Subsection (b) (2). If any such part fails during the period of warranty coverage, it shall be repaired or replaced by Mitsubishi Heavy Industries, Ltd. according to Subsection (4) below. Any such part repaired or replaced under the warranty shall be warranted for the remaining warranty period.
 - (2) Any warranted part which is scheduled only for regular inspection in the written instructions required by Subsection (e) shall be warranted for the warranty period defined in Subsection (b) (2). A statement in such written instructions to the effect of "repair or replace as necessary" shall not reduce the period of warranty coverage. Any such part repaired or replaced under the warranty shall be warranted for the remaining warranty period.
 - (3) Any warranted part which is scheduled for replacement as required maintenance in the written instructions required in Subsection (e) shall be warranted for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part shall be repaired or replaced by Mitsubishi Heavy Industries, Ltd. according to Subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remainder of the period prior to the first scheduled replacement point for the part.
 - (4) Repair or replacement of any warranted part under the warranty provisions shall be performed at no charge to the owner at a warranty station.
 - (5) Notwithstanding the provisions of Subsection (4) above, warranty services or repairs shall be provided at all Mitsubishi Heavy Industries, Ltd. distribution centers that are franchised to service the subject engines.
 - (6) The owner shall not be charged for diagnostic labor that leads to the determination that a warranted part is in fact defective, provided that such diagnostic work is performed at a warranty station.
 - (7) Mitsubishi Heavy Industries, Ltd. shall be liable for damages to other engine components proximately caused by failure under warranty of any warranted part.
 - (8) Throughout the engine's warranty period defined in Subsection (b) (2), Mitsubishi Heavy Industries, Ltd. shall maintain a supply of warranted parts sufficient to meet the expected demand for such parts.
 - (9) Any replacement part, as defined in Section 1900(b)(13), Title 13, may be used in the performance of any maintenance or repairs and must be provided without charge to the owner. It is not necessary for replacement parts to be the same brand or by the same manufacturer as the original part sold with the engine. Such use shall not reduce the warranty obligations of the engine manufacturer.

- (10) Add-on or modified parts, as defined in Section 1900(b)(1) and (b)(10), Title 13, that are not exempted by the Air Resources Board may not be used. The use of any non-exempted add-on or modified parts shall be grounds for disallowing a warranty claim made in accordance with this article. The engine manufacturer shall not be liable under this article to warrant failures of warranted parts caused by the use of a non-exempted add-on or modified part.
 - (11) The Air Resources Board may request and, in such case, Mitsubishi Heavy Industries, Ltd. shall provide, any documents which describe that Mitsubishi Heavy Industries, Ltd.'s warranty procedures or policies.
- (d) Warranted parts list.
- (1) Fuel metering system
 - (A) Fuel injection system.
 - (B) Air/fuel ratio feedback and control system.
 - (C) Cold start enrichment system.
 - (2) Air induction system
 - (A) Controlled hot air intake system.
 - (B) Intake manifold.
 - (C) Heat riser valve and assembly.
 - (D) Turbocharger/supercharger systems.
 - (E) Charged air cooling systems.
 - (3) Exhaust gas recirculation (EGR) system
 - (A) EGR valve body, and carburetor spacer if applicable.
 - (B) EGR rate feedback and control system.
 - (4) Air injection system
 - (A) Air pump or pulse valve.
 - (B) Valves affecting distribution of flow.
 - (C) Distribution manifold.
 - (5) Catalyst or thermal reactor system
 - (A) Catalytic converter.
 - (B) Thermal reactor.
 - (C) Exhaust manifold.
 - (6) Particulate controls
 - (A) Traps, filters, precipitators, and any other devices used to capture particulate emissions.
 - (B) Regenerators, oxidizers, fuel additive devices, and any other device used to regenerate or aid in the regeneration of the particulate control device.
 - (C) Control device enclosures and manifolding.
 - (D) Smoke puff limiters.
 - (7) Advances oxides of nitrogen (NOx) controls
 - (A) NOx absorbers.
 - (B) Lean NOx catalysts.
 - (C) Selective catalyst reduction.
 - (D) Reductant (urea/fuel) containers/dispensing systems.
 - (8) Positive crankcase ventilation (PCV) system
 - (A) PCV valve.
 - (B) Oil filler cap

(9) Miscellaneous items used in above systems

- (A) Vacuum, temperature, and time sensitive valves and switches.
- (B) Electronic control units, sensors, solenoids, and wiring harnesses.
- (C) Hoses, belts, connectors, assemblies, clamps, fittings, tubing, sealing gaskets or devices, and mounting hardware.
- (D) Pulleys, belts and idlers.
- (E) Emission control information labels.
- (F) Any other part with the primary purpose of reducing emissions or that can increase emission during failure without significantly degrading engine performance.

- (e) Mitsubishi Heavy Industries, Ltd. shall furnish with each new engine written instructions for the maintenance and use of the engine by the owner.

Limited warranty

Refer to "[LIMITED WARRANTY](#)" (Page ii).

IMPORTANT INFORMATION

- ♦To avoid the potential hazard, accident prevention activities must be planned methodically and conducted continually by considering all aspect of engine operation, maintenance and inspection. All related personnel, including managers and supervisors, should actively participate, recognize their roles and organize themselves and their work to ensure a safe environment.
- ♦The foremost safety objective is to prevent accidents which may result in injury or death, or equipment damage.
- ♦Always observe laws or regulations of the local or federal/national government.
- ♦Mitsubishi Heavy Industries, Ltd. cannot foresee all potential dangers of the engine, potential danger resulting from human error and other causes, or danger caused by a specific environment in which the engine is used. Since there are many actions that cannot be performed or must not be performed, it is impossible to indicate every caution in this manual or on warning labels. As such, it is extremely important to follow directions in this manual and also to take general safety measures when operating, maintaining and inspecting the engine.
- ♦When the engine is used by individuals whose native language is not English, the customer is requested to provide thorough safety guidance to the operators. Also add safety, caution and operating signs that describe the original warning label statements in the native language of the operators.
- ♦The engine must be operated, maintained and inspected only by qualified persons who have thorough knowledge of engines and their dangers and who also have received risk avoidance training.
- ♦To prevent an accident, do not attempt to carry out any operation other than those described in this manual, and do not use the engine for any unapproved purpose.
- ♦When the ownership of the engine is transferred, be sure to provide this manual with the engine to the new owner. Also inform Mitsubishi Heavy Industries, Ltd. of the name and address of the new owner of the engine.
- ♦This manual is copyrighted and all rights are reserved. No part of this manual, including illustrations and technical references, may be photocopied, translated, or reproduced in any electronic medium or machine readable form without prior written consent from Mitsubishi Heavy Industries, Ltd.
- ♦The contents in this manual are subject to change at any time without notice for improvement of the engine.
- ♦Pictures or illustrations of the product in this manual may differ from those of product you have. Please note that, depending on specifications, items described in this manual may differ from those on your engine in shape, or may not be installed on your engine.
- ♦Please contact a dealer of Mitsubishi Heavy Industries, Ltd. if you need more information or if you have any questions.
- ♦If you lost or damaged this manual, obtain a new copy at a dealer of Mitsubishi Heavy Industries, Ltd. as soon as possible.
- ♦Mitsubishi Heavy Industries, Ltd. recommends the engine owner to install an hour meter on the engine due to monitor correct running intervals and to perform the maintenance at the appropriate timing.