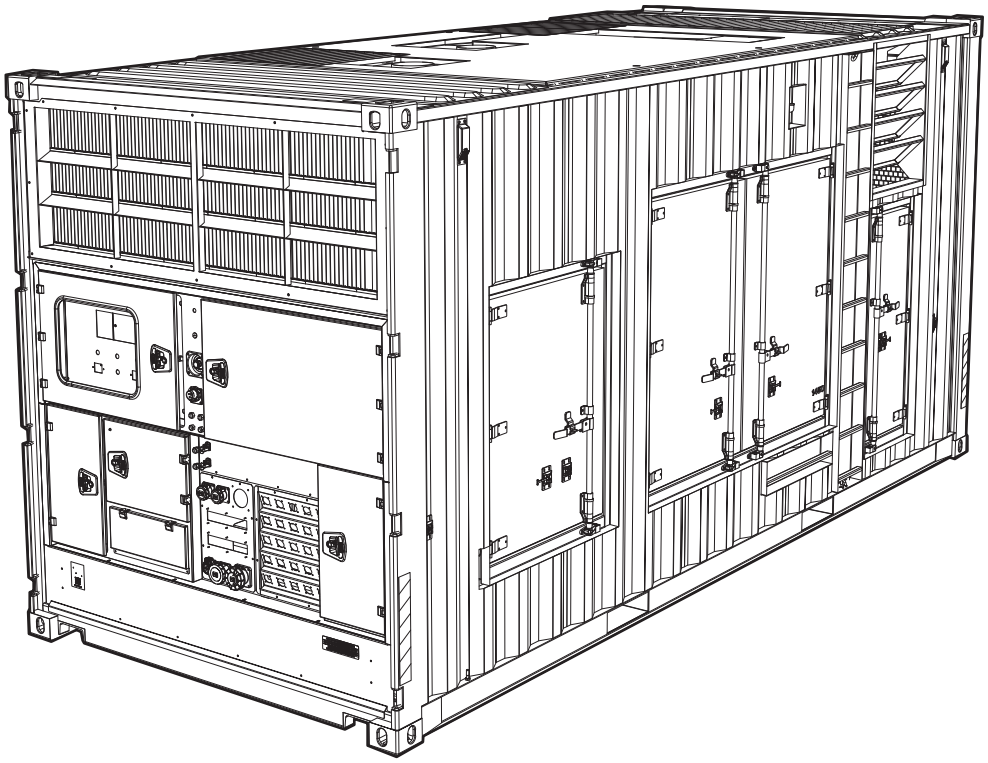
GENERAC® | MOBILE

MDE1450 TwinGen

Diesel Generator Owners Manual



For technical assistance contact:

www.generacmobileproducts.com

Technical Support

1-800-926-9768

SAVE THIS MANUAL FOR FUTURE REFERENCE

Use this page to record important information about your unit.

Unit Model No.	
Unit Serial No.	
Engine Model No.	
Engine Serial No.	
Generator Model No.	
Generator Serial No.	

Record the information found on your unit data label on this page. See unit serial number location (***Unit Serial Number Locations***). The label plate is affixed to the inside partition, to the left of the control panel console.

Engine and generator serial numbers are located on separate data plates affixed to the engine and generator.

When contacting a Generac Mobile Authorized Service Dealer (GMASD) about parts and service, supply the complete model number and serial number of the unit.

Operation and Maintenance: Proper maintenance and care of the unit minimizes operating expenses and errors. It is the operator's responsibility to perform all safety checks, to verify that all maintenance for safe operation is performed promptly, and to have the equipment checked periodically by a GMASD. Normal maintenance, service and replacement of parts are the responsibility of the owner or operator and, as such, are not considered defects in materials or workmanship within the terms of the warranty. Individual operating habits and usage may contribute to the need for additional maintenance or service.

⚠WARNING

CANCER AND REPRODUCTIVE HARM
www.P65Warnings.ca.gov.

(000393a)

⚠WARNING

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65Warnings.ca.gov/diesel. (000394)

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Specifications

Description	MDE1450
ENGINE	
Make (Model)	Volvo TWD1683GE
EPA	Tier 4 Final
Cylinders: Configuration-Qty	Inline 6
Displacement: in^3 (L)	983.8 (16.1)
Bore: in (mm)	5.7 (144)
Stroke: in (mm)	6.5 (165)
Compression Ratio	16:8:1
Intake Air Method	Turbocharged & After-cooled
ENGINE GOVERNING	
Governor	Electronic
LUBRICATION	
Oil Pump Type	Gear type lubricating oil pump, gear driven by the transmission
Oil Filter Type	40 micron
Crankcase Capacity qt (L)	50 (48)
ALTERNATOR	
Make (Model)	Mecc Alte ECO40 3L4 C
Poles - qty	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	<3.5%
Telephone Interference	<40
Standard Excitation	DER1
Bearings	1
Coupling	14
Prototype Short Circuit Test	Yes
Voltage Regulator Type	Digital AVR
Number of Sensed Phases	3
Regulation Accuracy (Steady State)	0.5%

Description	MDE1450
FUEL SYSTEM	
Fuel Type	Ultra Low Sulfur Diesel
Fuel Specifications	ASTM D975 D2 and D1
Fuel Filtering	5 micron Double Fuel Pre-filter with water separator
Fuel Specifications	ASTM D975 D2 and D1
Injector Type	Unit Injector Delphi
ENGINE ELECTRICAL SYSTEM	
System Voltage - VDC	24
Battery - CCA	975
Battery - V (Qty)	12 (4)
Polarity	Negative (-)
COOLING SYSTEM	
Cooling System Type	Water Cooled
Water Pump Type	Centrifugal Pump Belt 1.85/1
Fan Type	Electric with Inverter
Fan Speed - rpm	Variable: min 150 - max 1250
Fan Diameter - in (mm)	(n°2 Ø800 mm)
Coolant System Capacity	Total Two Engines: 103 US gal (390 L)

General Information

POWER RATINGS

		(A)	Standby: kW/kVA (A)	Prime: kW/kVA (A)
60 Hz	3-phase, 480/277 VAC @ 0.8 pf - high wye		1,271/1,589	1,158/1,447
50 Hz	3-phase, 400/230 VAC @ 0.8 pf - high wye		1,127/1,409	1,039/1,299
60 Hz	Max Current for Single Genset (A)	956		
50 Hz	Max Current for Single Genset (A)	1,017		
60 Hz	Max Current for both Gensets (A)	1,912		
50 Hz	Max Current for both Gensets (A)	2,033		

FUEL & DEF CONSUMPTION RATES

	Prime	Fuel: US gph (L/hr)	DEF: US gph (L/hr)
60 Hz	75%	58.4 (221.2)	4 (15.5)
	100%	76.6 (290)	5.3 (20.3)
50 Hz	75%	52.1 (197.3)	3.6 (13.8)
	100%	68.7 (260)	4.8 (18.2)

Section 1: Introduction and Safety

Introduction

Thank you for having purchased this generator!

This manual is an integral part of the purchased generator and provides useful guidelines for its correct operation and maintenance. It is mandatory to refer to the instructions provided for your own safety and that of the persons involved in its use. Always contact the manufacturer if any doubt should arise from the lack of or difficulty in understanding the instructions.

This manual does NOT replace the laws and local regulations in any way. Always comply with the law and local regulations in the place where the generator set is used.

- This manual must always accompany the generator throughout the operating period.
- The original instructions are compiled in ITALIAN.
- Any other language is a translation of the original instructions in compliance with that stipulated by the *EU Directive 2006/42/EC*.
- All rights for reproduction of this manual are reserved to the manufacturer.
- The descriptions and illustrations provided in this publication are not binding. The manufacturer reserves the right to make any change deemed necessary at any time and without prior notice.
- This manual cannot be reproduced or disclosed to third parties without written authorization from the manufacturer.

The information in this manual is accurate based on products produced at the time of publication. The manufacturer reserves the right to make technical updates, corrections, and product revisions at any time without notice.

Read This Manual Thoroughly

⚠WARNING

Consult Manual. Read and understand manual completely before using product. Failure to completely understand manual and product could result in death or serious injury. (000100a)

This generator is designed and built to transform the energy produced by internal combustion engines into electrical energy provided as low-voltage alternating current.

List of Documents Provided With the Generator.

Quick Start Procedure

Preliminary instruction manual: this manual. It contains the risk analysis and the list of RESIDUAL RISKS

With the main warnings that the operator must know in depth before using the generator.

This manual also provides a summary of the most important information that needs to be consulted for injury prevention: some of this information may be repeated in other documents included in the supply. In case of incomplete data matching, the references in this manual prevail over any others.

Generator Use and Maintenance Manual:

This manual contains all the information you need to properly insert the machine into the system, and to maintain it in accordance with the *Machinery Directive 2006/42* and *Legislative Decree 81*.

The manual can also be completed with separate data sheets, diagrams and drawings.

The manual can be provided directly on paper or digital support.

CE Declaration(s) of Conformity:

This documentation consists of the use and maintenance manuals and the CE declarations of conformity of the machines and/or equipment that have been incorporated into the generator. The documentation is provided when necessary for the proper use of the entire generator.

All documentation provided with each supply can be delivered on paper or digital format.

Permitted Use of the Generator

It must be used in outdoor environments and be adequately protected from atmospheric discharges.

It must be positioned on support platforms with a maximum slope of 1.5%, with a total and specific load-bearing rate appropriate to the size and weight of the model purchased.

It must be properly anchored to the supporting platform.

It must be refueled with fuels of reliable origin and proven quality fuel.

It can only be used for low voltage power supply after it has been regularly connected to the proper systems.

Symbols

The following symbols and styles of the text listed below are used in the manual to communicate information regarding:

DANGER

Indicates a situation of imminent risk, which can cause serious or fatal injuries if not avoided.

WARNING

Indicates a situation of potential risk, which can cause serious or fatal injuries if not avoided.

CAUTION

Indicates a situation of potential risk, which can cause slight to moderate injuries if not avoided.

NOTE

Indicates the obligation for certain behavior or special activities for the machine to be handled safely.

Purpose of the Manual and It's Preservation

In compliance with that stipulated in the Machinery Directive 2006/42/EC, this manual provides the information regarding safety and the lifetime phases of the generator (transport, installation, use, maintenance and disposal).

- Carefully read and understand this technical publication before operating on the generator and/or making adjustments and/or maintenance.
- If in doubt while consulting this manual, always contact the manufacturer before commencing any operation.
- Please contact the expert personnel of the manufacturer to resolve any problem that may arise during the operating lifetime of the generator as soon as possible, which has not been covered in this technical publication.
- The manufacturer declines any liability related to non-compliance of that stipulated in this manual.
- Keep this manual and all the attached publications in a safe place, which is accessible and known to all the users of the generator.

Who This Manual is Intended For and Qualification of Personnel

The generator has been designed for use by duly qualified personnel qualified to use and maintain it, and the content of this manual is intended for such personnel.

The personnel must receive adequate technical training and be familiar with commonly used tools: spanners, screwdrivers, etc.

The personnel must have read and understood this entire manual. The operator must be aware of the operating modes of the generator, be able to follow the user instructions provided in the manual and pay utmost attention when using the generator. Besides hazards deriving from electricity, those related to explosive and flammable substances must be considered (fuel and lubricating oils) as well as those related to moving parts, combustion gases, hot parts and waste products with which one may come into contact (e.g. waste lubricants, coolants, etc.).

Contradictions Regarding the Use of the Generator

- Should not be activated unless the correct installation and connection procedures have been applied and verified;
- Cannot be activated in environments exposed to the risk of explosion, of any class or category, as indicated in Directive 2014/34/EC. This rule is void if the MACHINE is reconditioned and CE-Atex certified by a qualified entity;
- Cannot be operated or used on any moving means of transport, on either land, sea or air;
- Cannot be operated or used by people under the age of 18 (eighteen) years;
- Cannot be operated or used by personnel that is not belonging to / unknown or unauthorized by the UNIT responsible for the site;
- Cannot be used without wearing PPE (where required) for the various operating phases
- Cannot be used in case of very low visibility (fog, smoke, etc.);

- Cannot be touched or handled with bare hands without wearing adequate ppe in the case of metal parts temperature equal to or greater than 54°C, (as indicated in the diagram of the uni-en-13732-1/ 2009 standard in 4.1, Figure 2, page 17/50. surface temperature and contact times, for example, temperature of 60 °C - contact for max. 2 seconds, 55°c - contact for max. 8 seconds).

Safety Notes and Warnings

Risk Analysis (According to Machinery Directive 2006/ 42)

 **CAUTION**

In the following chapters, the abbreviation (MD) followed by the number refers to the specific chapter of the *Machinery Directive*.

Protective Measures Against Mechanical Hazards (Machinery Directive 2006/42, ANN. I 1.3.1 - 1.3.9)

Risk of Loss of Stability:

- Measures taken / recommendations:

  The machine structure must be rigidly secured to a supporting frame and/or to an industrial floor safely and securely, using self-locking screws and nuts (or nuts and lock nuts) and/or adequate anchoring system

Risk of Breakage During Operation:

- Measures taken / recommendations:

  Machine parts subjected to cyclic stress are suitably sized in accordance with the various calculation criteria in force, always applying safety parameters or discretionary margins and taking into account the machine model, specific service conditions and also any particular application.
- Precautionary measures to be taken by the user: **NO CORROSIVE PRODUCT OF ANY KIND MAY BE INTRODUCED INSIDE and/or DEPOSITED NEAR THE MACHINE.**

Risks Due to Falling or Ejected Objects: Not Existing

- Measures taken / recommendations:

  None

Risks Due to Surfaces, Edges or Corners:

- Measures taken / recommendations:

  In the design and construction, all edges or cutting profiles have been eliminated; any burring due to adjustment and assembly operations has also been eliminated during the assembly phases.

Risks Related to Combined Machines:

- Measures taken / recommendations:

  The machine must be properly connected:
  - to fume exhaust ducts
  - to the electrical systems of competence through connections compliant with Directive 2014/35/EU.

Risks Related to Variations in Operating Conditions:

- Measures taken / recommendations:

  Please keep in mind the installation conditions that are mentioned in the use and maintenance manual of each component of the machine.

Risks Related to Moving Parts:

- Measures taken / recommendations:

  The dangerous moving parts (engine and alternator) are contained within the machine frame and can be reached by means of protective panels secured with screws and/or with snap-locks and properly signaled with a hazard warning sign. In some cases, the panels may also be equipped with an electromechanical locking system.

Choice of Protection Against Risks Related to Moving Parts:

- Measures taken / recommendations:
  Protections have been selected and applied in accordance with the harmonized standards.

Risk of Uncontrolled Movements: Not Existing

- Measures taken / recommendations:

  None

Protective Measures Against Mechanical Hazards (Machinery Directive 2006/42, ANN. I 1.5.1 - 1.5.3.)

Electric Energy:

- Measures taken / recommendations:

  The machine must be connected to systems designed and manufactured with **CE-IMQ** marked materials and equipment, with construction methods and mounting techniques as indicated in Directive 2014-35 and the related technical standards. For each phase of use of the machine, the following must be guaranteed:

  - Total protection from direct accidental electrical contacts
  - Total protection from indirect accidental electrical contacts
  - Certainty of compliance with the temperature limits specified in the machine manuals
  - Protection against any direct or indirect lightning strikes
  - Protection against any other reasonably foreseeable fault

The load-bearing frame of the machine must be properly connected to the grounding system.

Static Electricity:

- Measures taken / recommendations:

  Mechanical design has avoided all situations that can generate accumulations of electrostatic charges.

  That phenomenon cannot be completely eliminated (even simple ventilation, in particular environmental conditions, can generate electrostatic charges).

  It is therefore appropriate to provide adequate connections to the grounding system in accordance with the procedures laid down in the relevant harmonized standards. The position of the connection points is indicated in the technical documentation supplied with the machine.

Energy Other than Electricity:

- Measures taken / recommendations:

  All stages of correct integration of the engine have been taken care of in the design. The engine is installed in compliance with the relevant risk analysis and in accordance with the requirements of the Manufacturer.

Protective Measures Against Mechanical Hazards (Machinery Directive 2006/42, ANN. I, 1.5.4 - 1.5.14)

Errors of Fitting:

- Measures taken / recommendations:

  Instructions for use and maintenance, assembly and dismantling, detailed and described with technical drawings and trigonometric projections. Technical assistance and on line documentation available for each market area.

Fire:

- Measures taken / recommendations:

  Refueling operations (with diesel) must be carried out with particular care and attention . Other precautionary measures to be taken by the User: NO CONTAINER WITH FLAMMABLE PRODUCT, COMBUSTIVE AGENT AND/OR FUEL CAN BE PLACED NEAR THE MACHINE.

  Except for the refueling phase, no flammable product of any type, form or quantity can be placed near the machine. The minimum distance to be respected is at least 2 meters. Any supplies of fuel specific for the engine should be stored in separate premises and at least 2 meters away from the machine.

Explosion:

- Measures taken / recommendations:

  No explosive product of any type, form or quantity may be placed near the machine. The minimum distance to be respected is at least 2 meters.

Noise:

- Measures taken / recommendations:

  The noise of the machine depends essentially on the type of engine applied. Carefully read the values indicated in the engine documentation (Declaration of Conformity, CE plate, data card). The emitted sound pressure also depends on possible resonance phenomena related to the installation environment. Therefore, it is recommended to perform new general noise tests on the machine at the installation site. **If the values exceed 84 dB, it is mandatory to use appropriate PPE for hearing protection.**

Vibrations:

- Measures taken / recommendations:

  The machine does not produce vibrations of considerable intensity. The engine can generate localized vibrations (see engine manual). The machine may suffer vibrations caused by any nearby sources in the installation area.

Radiation: Not Existing

- Measures taken / recommendations:

  None

External Radiation: Not Existing

- Measures taken / recommendations:

  None

Laser Radiations: Not Existing

- Measures taken / recommendations:

  None

Emissions of Hazardous Materials and Substances:

- Measures taken / recommendations:

  The emission source of hazardous substances is the exhaust of the engine combustion fumes.

Risk of Being Trapped in a Machine: Not Existing

- Measures taken / recommendations:

  None

Risk of Slipping, Tripping or Falling:

- Measures taken / recommendations:

  If the machine is installed in a place that is close to areas of possible transit of operators, the user must set up the appropriate signs and/or must segregate the hazardous area with protective frames.

  Electrical connection cables could present a trip hazard. Do not step on these electrical cables.

List of Residual Risks

An accurate analysis of operation related risks has been applied in the design and construction of each machine. The analysis has been developed on the types of risk referred to in Annex 1 to Machinery Directive 2006/42/EC-17/05/2006.

With reference to the final installation situation of the machine, we highlight here the operations/situations that may be subject to Residual Risk that cannot be eliminated.
Before starting up the machine, the safety officer of the entire plant and/or the end user must implement or enforce appropriate prevention standards and procedures and evaluate the need to use any PPE, even if not expressly indicated in this manual.

 **CAUTION**

Before starting up or using the machine, carefully assess residual risks .

Fuel and/or Ad Blue/DEF Refilling:

This operation is particularly risky (also due of its high frequency compared to other use and maintenance operations). The fuel and/or AdBlue/DEF refilling must be performed as follows:

- With all electrical appliances disconnected (on alternator side).
- With the combustion engine switched off and stopped
- Only if the temperature of the engine surfaces near the fuel and/or AdBlue/DEF refilling point is lower than 50 °C

Engine Operations:

All operations on the engine, including fuel and/or Ad Blue/DEF refueling operations, can create a risk of leakage of fuel and/or Ad Blue/DEF and/or lubricating oil. Contact with fuel and/or Ad Blue/DEF or synthetic oils can cause dermatitis, irritation, loss of visibility, loss of consciousness and symptoms of asphyxia and panic. THE OPERATOR MUST WEAR ADEQUATE PPE TO THE OPERATION BEING PERFORMED. IF THE ACTIVITY OCCURS IN “CONFINED SPACES”, ALL RELEVANT PROCEDURES MUST BE ADOPTED AND RESPECTED.

Overheating of the External Surfaces of the Engine and/or Other Machine Parts:

The engine and other machine parts may overheat until exceeding the danger threshold. THE OPERATOR WHO HAS TO TOUCH CERTAIN MACHINE PARTS MUST MAKE SURE IN ADVANCE THAT THE TEMPERATURE OF SURFACES IS NOT HIGHER THAN THE DANGER THRESHOLD. IF HIGHER, THE OPERATOR MUST

WEAR ADEQUATE WORKING GLOVES (see standard UNI-ISO-13732-1).

Static Electricity (cont):

Even if the machine is properly connected to a grounding system, it may occasionally accumulate low intensity Static Electricity:

electrostatic charges. Before starting any work involving direct contact with the machine parts, it is advisable to ground the machine area where you want to intervene, by means of temporary connections.

Fuel and/or AdBlue/DEF Overflow During Refilling:

Any dripping of fuel and/or Ad Blue/DEF during the refilling phases must be prevented by using suitable pouring systems (funnels, gaskets, etc.). All machine parts near the refueling point must always be clean and dry. The presence of fuel and/or Ad Blue/DEF residues on surfaces cannot be tolerated. Any part of the machine that has been wetted or soiled with fuel and/or Ad Blue/DEF must be properly dried and cleaned before starting the machine again. Each surface should be wiped with absorbent cloths and/or crepe paper.

Refilling of Unsuitable Fuel or AdBlue/DEF:

The characteristics of the fuel / Ad Blue/DEF to be used are clearly defined in the documentation supplied with the machine. In the event that the operator fills the tank with any fuel and/or Ad Blue/DEF that is NOT SUITABLE, the machine must be switched off and overhauled. A sign with the wording “DO NOT USE-MACHINE IN FAILURE” must be affixed to the machine until the complete revision of the relevant parts (tank, ducts, etc.)

Noise Generated by the Generator.

The equivalent sound pressure data found in the tests performed on the various models is indicated in the use and maintenance manual. In the final installation, there may be situations where the actual noise may become higher than the safety threshold. **THEREFORE, THE EXACT NOISE LEVEL OF THE MACHINE IN ITS OPERATIONAL STATE MUST BE DETERMINED BEFORE AUTHORIZING THE PRESENCE OF OPERATORS IN THE PROXIMITY OF THE MACHINE, PROVIDING THE SAME WITH THE NECESSARY PPE.**

Safety and Operating Decals

The generator is equipped with decals and signs close to the parts concerned. For each model, the placement diagram of the warning signs is indicated in the appropriate technical data sheet attached to this manual, together with the *CE Declaration of Conformity*.

NOTE

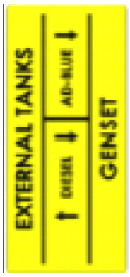
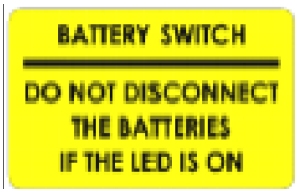
Replace missing and hard-to-read decals. Use care when washing or cleaning the unit. See the parts manual at *www.generacmobileproducts.com* for

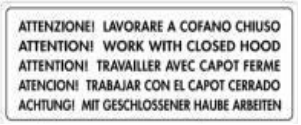
Description	Precaution
 Electrical hazard deriving from the presence of live parts.	• Cam Locks energized while unit is running
 Hazards deriving from contact with hot parts. The engine and the silencer become hot during use and remain so for over an hour after being switched off.	• Risk of burns. Allow engine to cool before draining oil. Failure to do so could result in death or serious injury.

Description	Precaution
 Electrical hazard deriving from contact with machine	• Limited head space. Please use proper safety equipment

Description	Precaution
 Electrical hazard deriving from the presence of live parts. The generator supplies power when it is switched on, so be very careful not to come into contact with parts of the electrical system.	• Pay attention to the areas close to the alternator and electrical connection points. • Maintain a safe distance to avoid hazards arising from direct or indirect contact with live parts or equipment. • Comply with the safety regulations and use the relative PPE in case of operations (protective gloves against electrical hazards). • Implement the connections of the cables with the generator switched off. • Perform maintenance on the electrical parts with the generator switched off and after having verified there is no voltage residue. • Do not use water if the generator catches fire.
 Hazards deriving from contact with hot parts. The engine and the silencer become hot during use and remain so for over an hour after being switched off.	• Do not touch the hot parts when the generator is switched on and for at least one hour after being switched off. • Wait for the hot parts to cool down before performing maintenance.

Description	Precaution
 Indication of automatic generator.	• Indicates that the generator has automatic start/stop equipment, it is advisable to take all necessary measures to exclude unwanted starts before carrying out work on the generator. • The generator must always be supervised by qualified personnel (during start-up, operation and shutdown).
 Multiple diesel nameplate	• General indications for the correct filling of the tank (see explanatory table for the meaning of the individual symbols).
 Indication of the filling of the diesel.	• It is applied next to the nozzle for manual filling of diesel.
 Indication of AdBlue filling.	• It is applied next to the nozzle for manual filling of tank 1 of the AdBlue/DEF
 Indication of AdBlue filling.	• It is applied next to the nozzle for manual filling of tank 2 of the AdBlue/DEF

Description	Precaution
 Positioned near the diesel and AdBlue/DEF automatic filling nozzles.	• Indicates the position of the automatic filling points of diesel and AdBlue/DEF. • Indicates the position of the return of the automatic filling of the diesel.
 Positioned on the battery cut-off switch.	• Indicates the position of the battery cut-off switch. • It is forbidden to operate the battery cut-off switch if the LED light is on.
 Indicates the point from which the exhaust oil of the engine can be discharged.	• Shut down the engines • Wait for the engines to cool down. • Drain only when the engines switched off • Make sure that the generator is on a support surface with a slope not exceeding 1.5°.
 Grounding connection	• In the vicinity of the symbol is the ground screw to connect the metal parts, by conductor, to the ground.
 Positioned on the electrical panel	• Indicates that the electrical panel has been approved after performing the necessary tests.

Description	Precaution
 Indication of a lifting anchor point. Identify the devices and lifting anchor points on the generator.	• Read and understand the lifting instructions provided in the specific paragraph of this manual before proceeding with the lifting operations.
 Indication to work with the hood closed.	• The machine must operate, compulsorily, with the hood closed, since the hood itself constitutes a protection device for the machine

The Meaning of Individual Symbols of the Multiple Diesel Nameplate

Description	Precaution
 Risk of fire Fuels are highly flammable products	• It is forbidden to operate the battery cut-off switch if the LED light is on. • Refuel in a well-ventilated area and always dry any fuel leak before starting the engine.
 Hazards deriving from inhalation of toxic and harmful substances. Fumes containing poisonous substances are emitted from the silencer into the air while the generator engine is switched on. The fumes contain substances that are hazardous to health, such as nitrogen oxides, carbon monoxide, unburned hydrocarbons, etc.	• Use the generator in well ventilated environments to disperse the fumes. • If used indoors, convey the fumes outside following the guidelines provided in the installation diagram. • Do not stop near the silencer and do not breathe in the emitted fumes.
 Hazards deriving from keeping the engine on during refueling	• Switch the engines off before refueling the generator. • Refuel only with the engine switched off. • Make sure the generator set is in a horizontal position.

Description	Description
 DIESEL fuel use indication.	• Use only diesel fuel • Choose the fuel based on the outside temperature. Use winter type of diesel for temperatures below 0° C and as low as -20° C
 Indication of general danger Various hazards described in the instruction manual Indication to always refer to the instruction manual.	• Pay attention to all the safety precautions and warnings as well as to the information regarding the intended use and reasonably foreseeable misuse described in this manual.
 The complete instructions to use and maintain the generator are present in the use and maintenance manual.	• Read and understand the instructions provided in the instruction manual. • If the instructions are missing or not clear, always contact the manufacturer before operating on the generator • Always keep a copy of the use and maintenance manual near the generator, in a place that is known and accessible to all the users.

Reference Regulations and Directives

The generator has been designed and constructed in compliance with industry-specific European and/or national standards, as applicable.

Main Harmonized Reference Standards:

■ UNI EN 349: 2008. ■ UNI EN 547-1: 2009. ■ UNI EN 547-2: 2009. ■ UNI EN 547-3: 2009. ■ UNI EN 953: 2009. ■ UNI EN 1037: 2008. ■ UNI EN ISO 4871: 2009. ■ UNI EN ISO 8528-13: 2016. ■ UNI EN ISO 12100: 2010. ■ UNI EN ISO 12601: 2011. ■ EN CEI 13463: 2010. ■ UNI EN ISO 13732-1: 2009. ■ UNI EN ISO 13850: 2015. ▪ UNI EN ISO 14119: 2013. ■ UNI EN ISO 14123-1: 2015. ■ EN CEI 60204: 2010. ■ EN CEI 61439-1: 2012. ■ EN CEI 61439-2: 2012.

EU Directives of Reference:

Directive 2000/14/EC of 8 May 2000

on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors

Directive 2006/42/EC of 17 May 2006

on machinery, and amending Directive 95/16/EC (recast)

Directive 2008/88/EC of 20 March 2000,

amending Council Directive 70/221/EC on the approximation of the laws of the Member States relating to liquid fuel tanks and rear under-run protection of motor vehicles and their trailers.

Directive 2014/30/EC of 26 February 2014,

on the harmonization of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 2004/108/EC

Directive 2014/35/EC of 26 February 2014,

on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits and repealing Directive 2006/95/EC.

Generator Identification

The generator is identified by a special identification plate (**1**), which is compliant with the requirements of the Machinery Directive 2006/42/EC, affixed to the metal frame

NOTE

The identification plate (1) is designed to last. However, it is recommended to take note of the data on the plate in order to preserve them. Contact the manufacturer if the plate must be replaced.

WARNING

It is strictly prohibited to remove the identification plate (1) from the generator or to alter or delete the data on the plate itself.

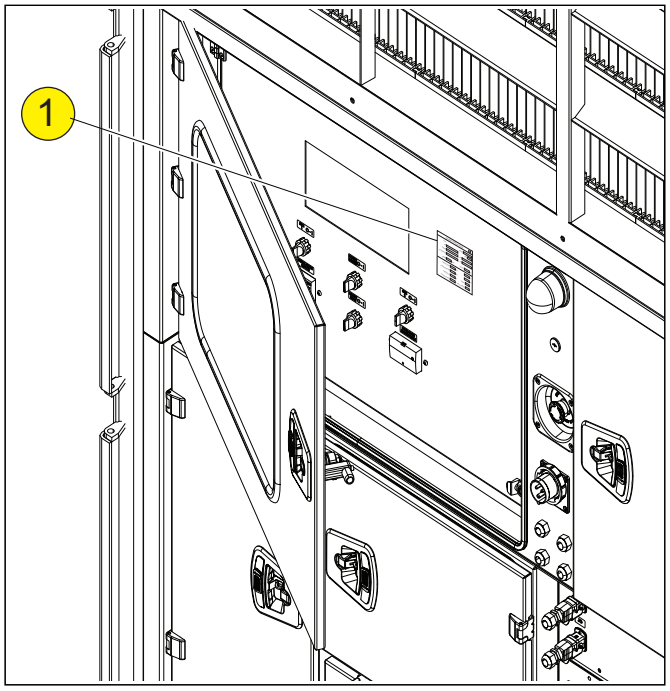
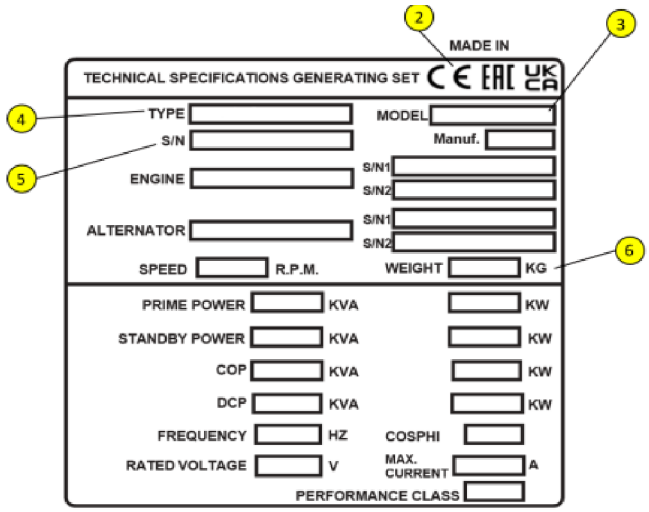


Figure 1-1. Identification Plate

The **“CE”** (**2**) symbol may not be present on the plate. Refer to the following “Generator Certification” paragraph for further details.



The generator is uniquely identified according to the model (**3**), machine code (**4**), and serial number (**5**).

NOTE

The model data plate (3), machine code (4), serial number (5) and year of manufacture (6) may be asked for if technical assistance is requested. The plate also indicates the weight (7) of the generator including the circuit liquids (oil, coolant, etc.) excluding the fuel. Consult this information before proceeding with the lifting operations.

Generator Certification

The generators marketed within the European Community are accompanied by the relative CE Declaration of Conformity, Annex IIA, of the EU Directive 2006/42/EC. In this case, the identification plate bears the “CE” symbol (see the “Generator Identification” paragraph).

Generators not belonging to the category described above are constructed in compliance with the technical standards harmonized with the EU Directive 2006/42/EC, however, they are not accompanied by the CE Declaration of Conformity; in this case, the identification plate does not bear the “CE” symbol (see the “Generator Identification” paragraph).

CE Declaration of Conformity

The CE Declaration of Conformity is attached to this instruction manual.

Generator Description

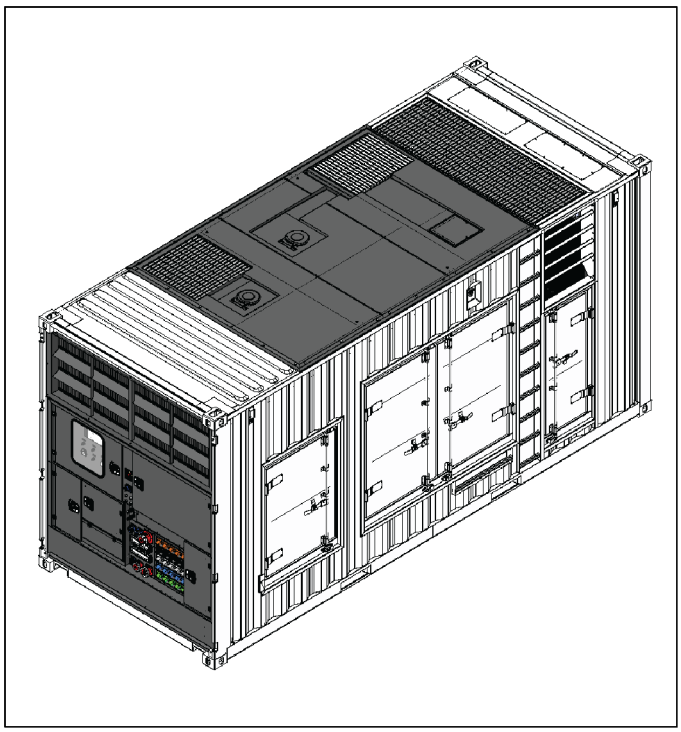


Figure 1-2. MDE1450 TwinGen

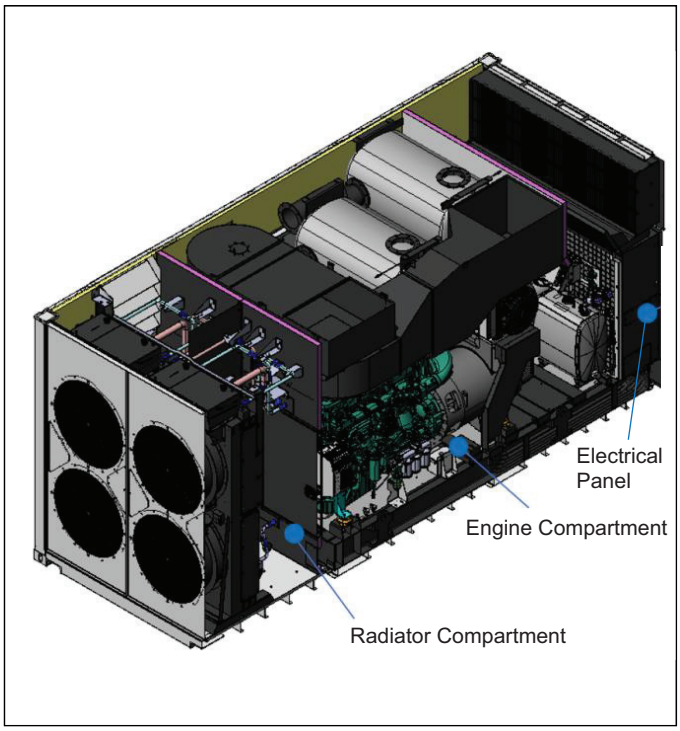


Figure 1-3. Compartments

General Air Flows

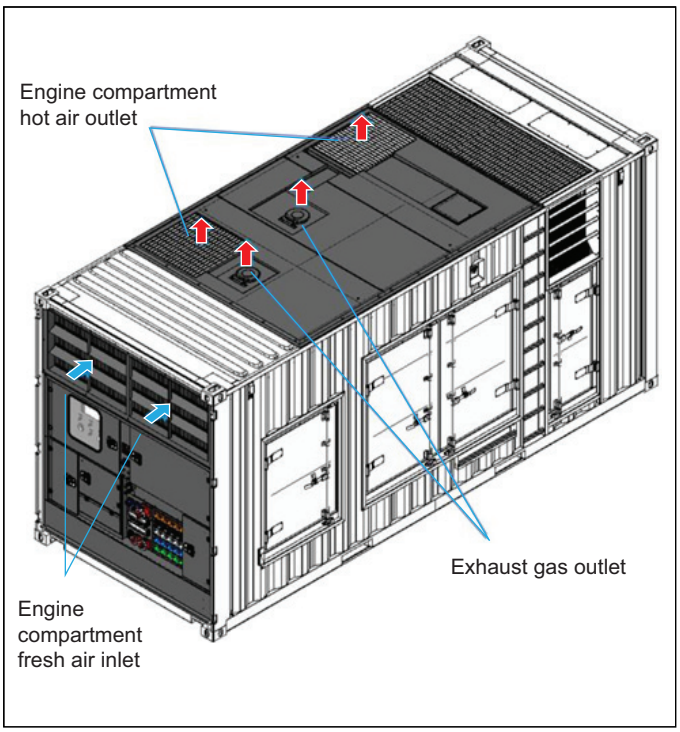


Figure 1-4. Engine Compartment Air Flow

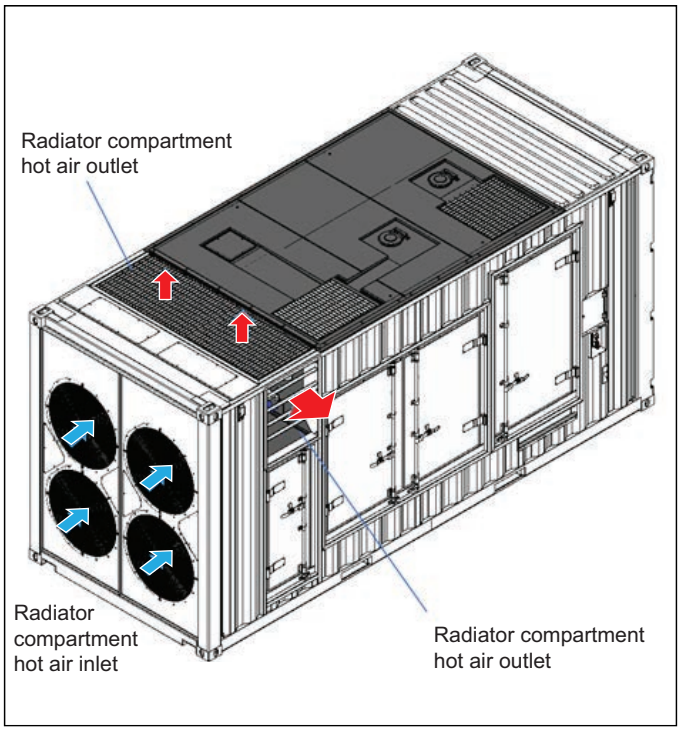


Figure 1-5. Radiator Air Flow

Engine Compartment

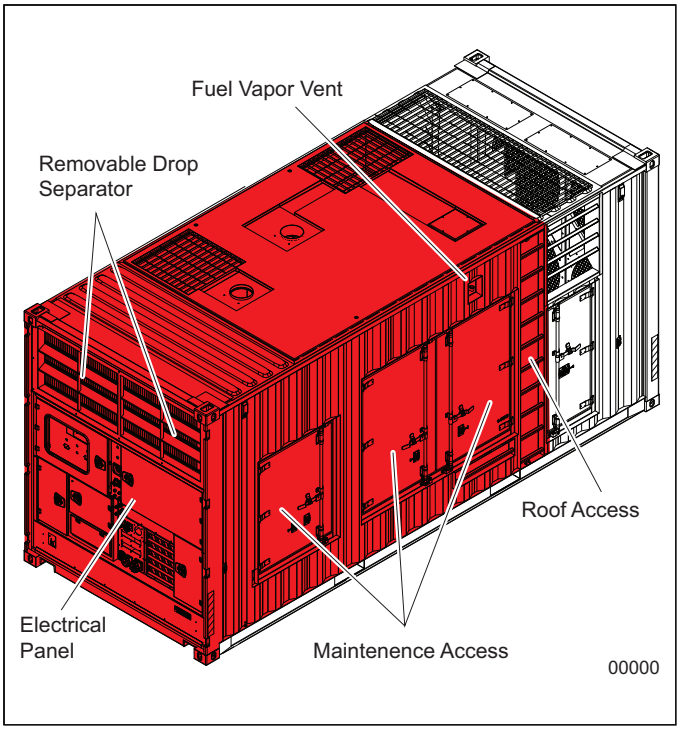


Figure 1-6. Compartments

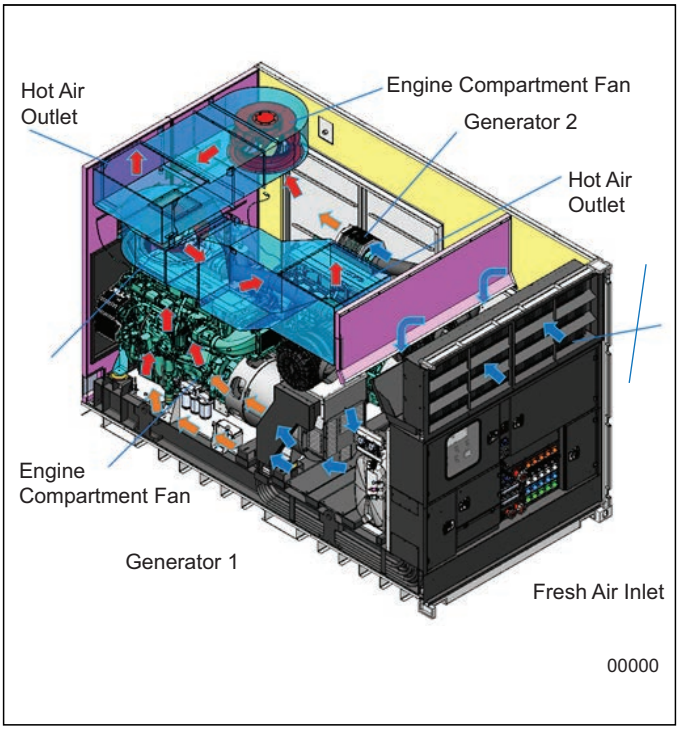


Figure 1-8. Internal Components

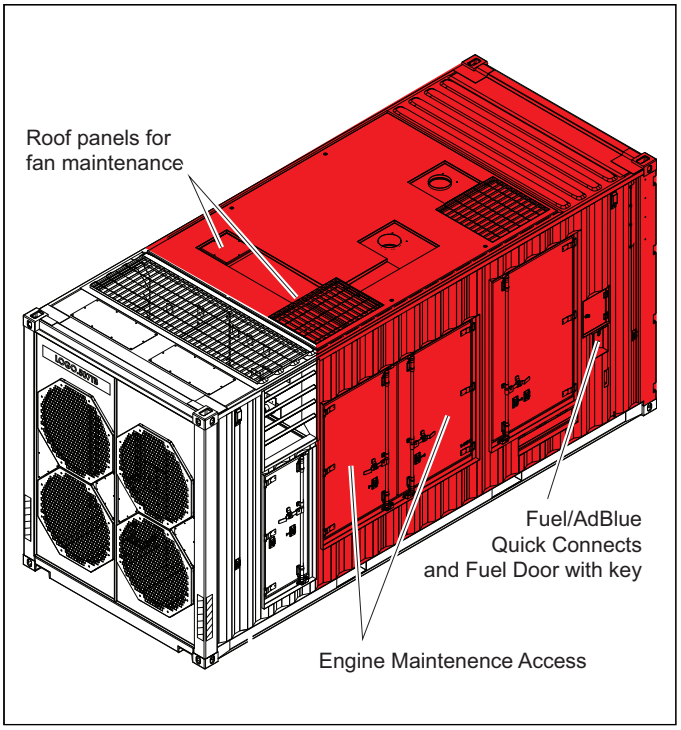


Figure 1-7. Access Points

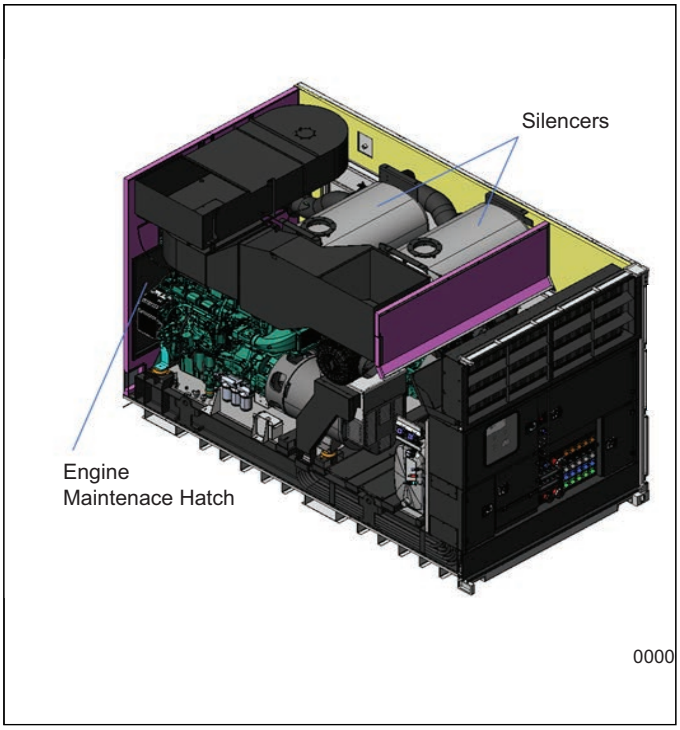


Figure 1-9. Maintenance Access

Radiator Compartment

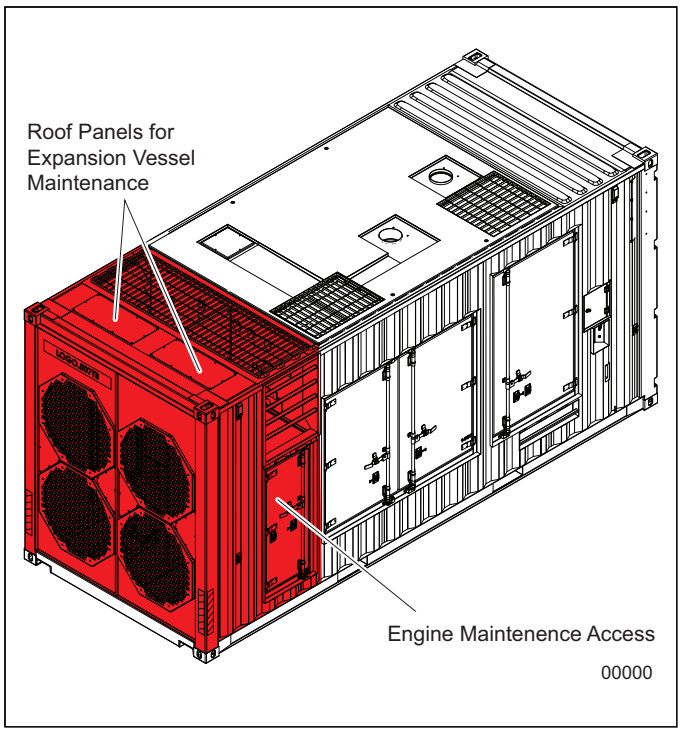


Figure 1-10. Radiator Access

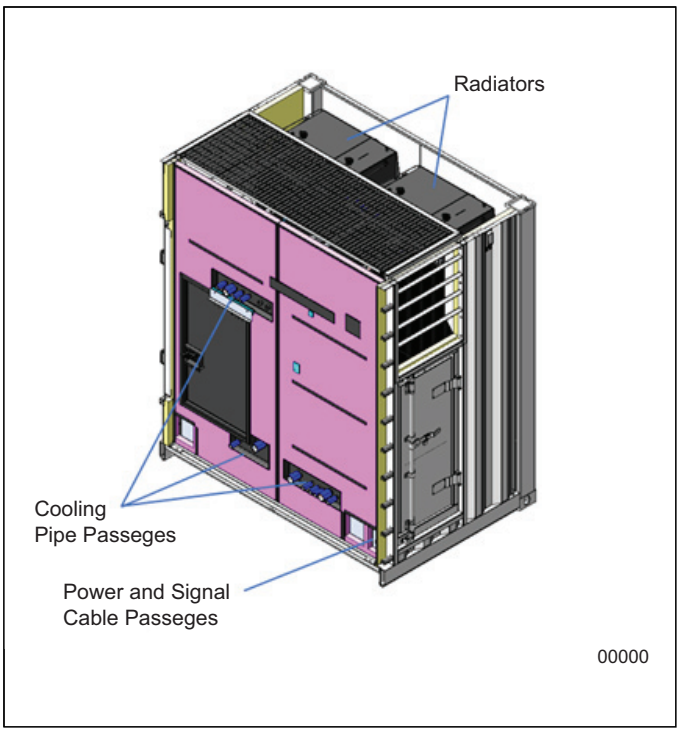


Figure 1-12. Radiators

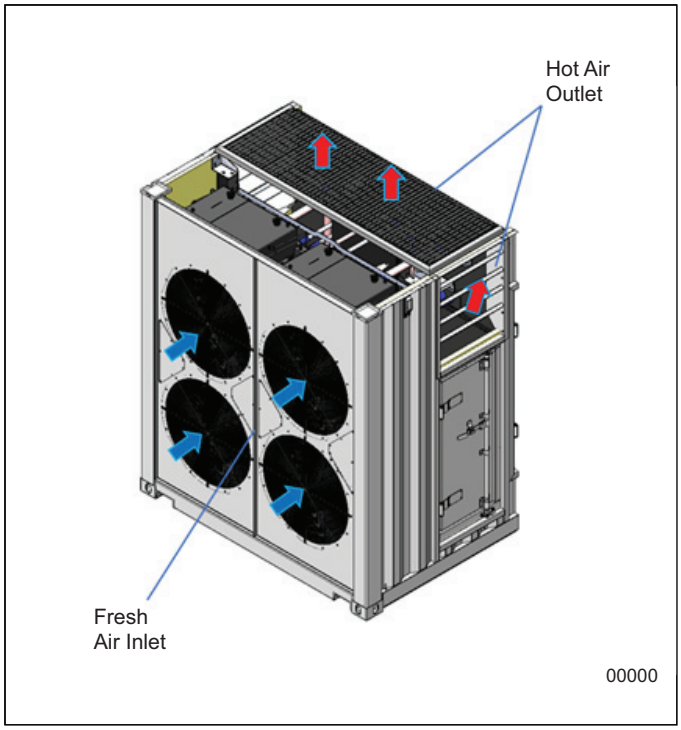
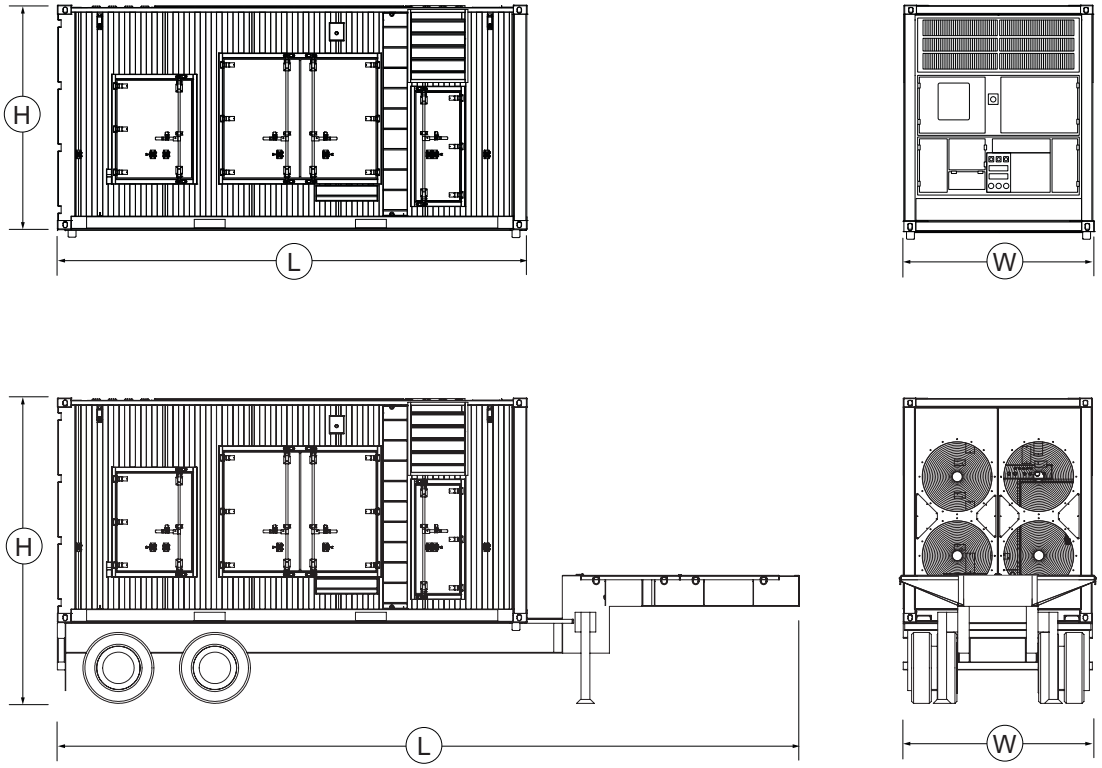


Figure 1-11. Air Inlet/Outlet

Technical Data

Overall Dimensions

Refer to the data provided in the technical installation drawing supplied for the overall dimensions. For weight and sound emission level (measured according to the reference standard in the EC Certificate) refer to the plate applied to the machine



	Run Time: hr*	Usable Fuel Capacity: gal (L)	Dimensions – L × W × H: in (mm)	Weight: lb (kg)	
Skid	8	475.5 (1800)	238 (6.0) × 96.0 (2.40) × 114 (2.90)	Dry: Operating:	37,700 (17,100) 41,076 (18,631)
Trailer	8	475.5 (1800)	377 (9.60) × 99 (2.50) × 155 (3.90)	Dry: Operating:	PENDING PENDING

Transport and Positioning

WARNING

The following lifting, transport and positioning operations should only be carried out by qualified personnel in full compliance with the safety rules concerning handling in general and suspended loads.Always place the generator on a flat, non-slippery surface with a maximum slope of 1.5%.

Check in advance that the load bearing capacity of the supporting surface is adequate to the total weight of the generator, also considering the weight of a full fuel tank.

Handle the generator with empty tanks.

NOTE

The lifting procedures described in the manual are information provided in the manual in cases of handling the generator both during initial installation and when removing and moving it to a different location.

NOTE

The generator must be handled with adequate lifting means for the total mass to be lifted, taking into account the environment and/or logistical situation in which the lifting is carried out.

The weight of the generator is indicated on the identification plate (see paragraph “Identification Plate”).

Handling the Generator With a Crane

To lift the generator by means of a crane, proceed as follows

NOTE

The lifting points (1) are located on the corner blocks.

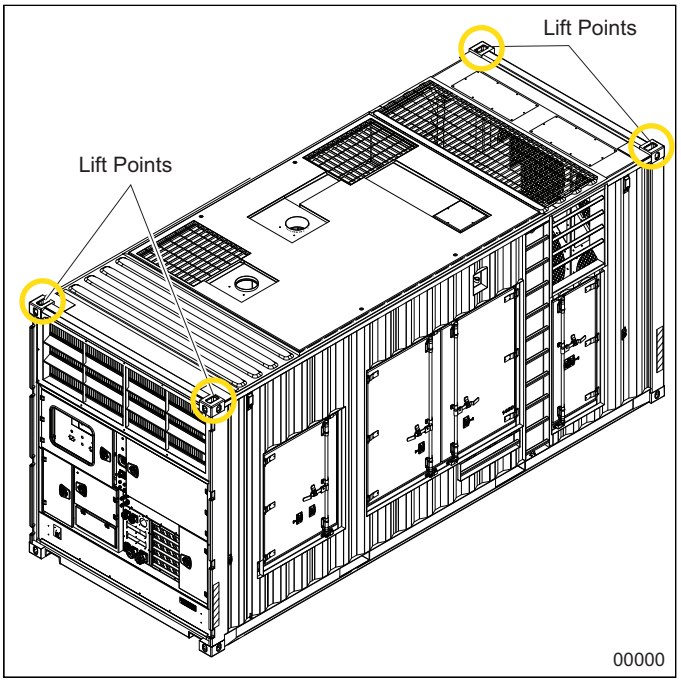


Figure 1-13. Lift Points

To lift the generator by means of a crane, proceed as follows

Handling the Generator With a Forklift

To lift the generator by means of a forklift, proceed as described below:

- Carefully check that the forklift capacity is above the total weight to be lifted;
- Carefully check that the length of the forks is equal to or greater than the width of the generator;
- Insert the forklift forks into the appropriate openings (1) of the container;
- Make sure the forks of the forklift are sufficiently inserted under the generator so to support it along its entire width.

NOTE

The openings used to handle the unit by forklift are NOT available if the container has the CSC (naval transport) certification.

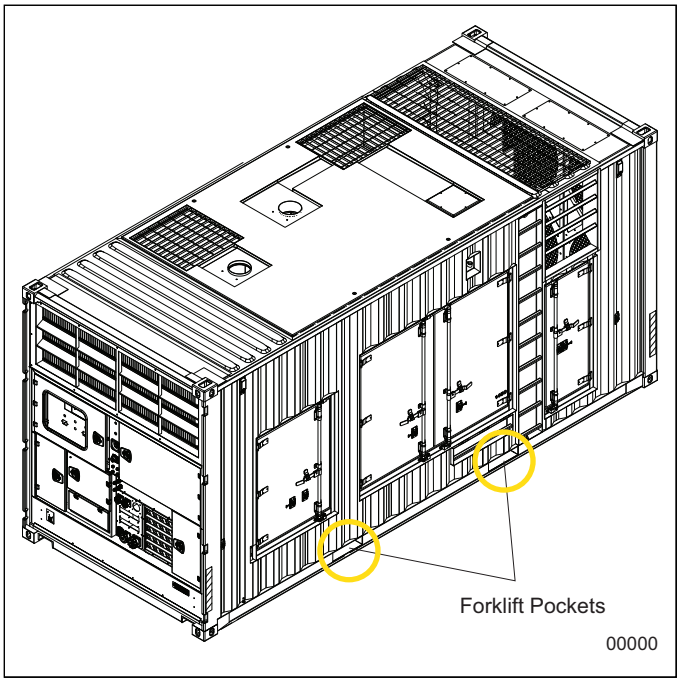


Figure 1-14. Forklift Pockets

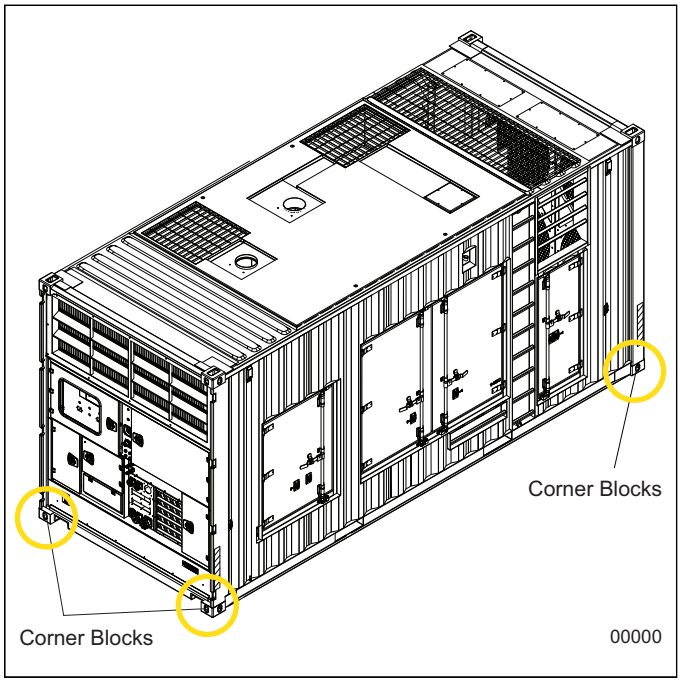


Figure 1-15. Corner Blocks

Transport on Wheels

For all handling operations, it is recommended to meet the following conditions:

- The generator may ONLY be transported with fuel on vehicles authorized and certified for the transport of appliances with fuel according to the legislation in force in the country's) crossed. Otherwise, empty the fuel tank completely before transporting the generator.
- Firmly block the generator on the means of transport using anchoring systems suitable for the purpose, positioned so as to prevent movement or overturning during the movement of the vehicle.

For transport on wheels (truck), the generator can be anchored via the lower corner blocks (1) by means of Twist-Lock devices.

NOTE

Anchoring by Twist-Lock in the lower corner blocks is NOT available if the container has the CSC (naval transport) certification.

Naval Transport

Naval transport requires the CSC (Convention of Safe Container) certification.

Transport can only be carried out if the generator has received the CSC certification. This provides for the closure of the lower corner blocks (3) and the lower openings of the container (4).

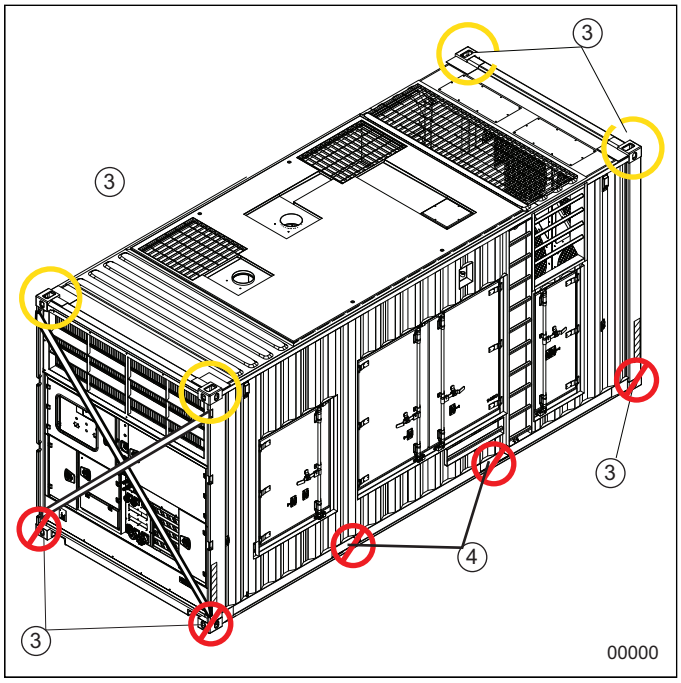


Figure 1-16. Naval Transport

The generator MUST be equipped with cross tie rods (2) for naval transport.

NOTE

Anchoring by twist lock in the lower corner blocks and the openings used to move the unit by forklift are NOT available if the container has the CSC (naval transport) certification.

Storage

For all storage operations, it is recommended to meet the following conditions:

The generator can be stacked during storage, as long as the limit of 2 generators is not exceeded (see figure).

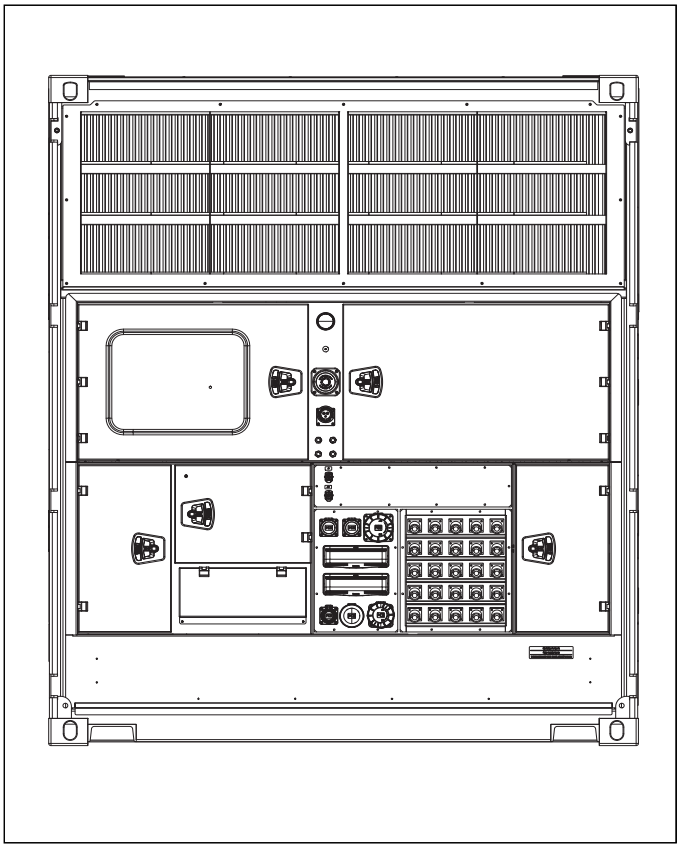


Figure 1-17. Storage - Single

Positioning

Refer to the installation diagram supplied with the generator to learn how to position the generator set

NOTE

If the generator is to be stored for a long time after being transported (over 30 days), follow the guidelines provided in the “Decommissioning for long periods of time” paragraph).

WARNING

During the operation of the generator, keep a distance of at least 1 meter from the radiator fans.

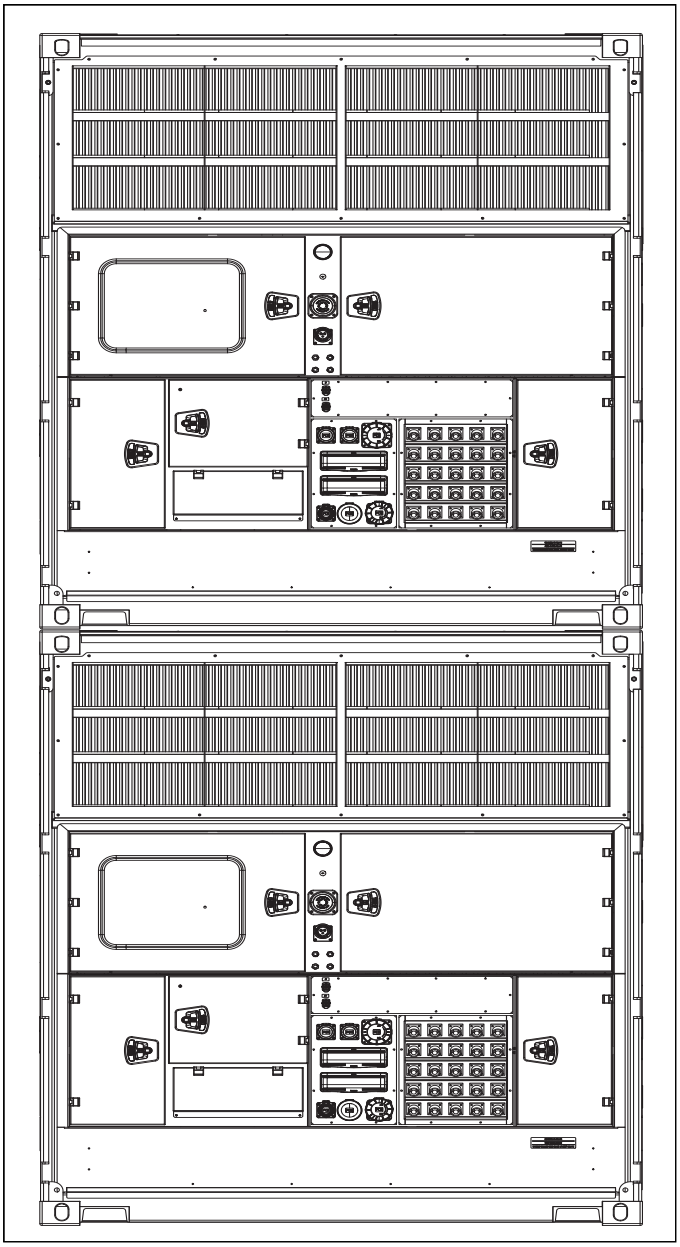


Figure 1-18. Storage - Stacked

Connecting Utilities

Sizing of Connection Cables

The selection and sizing of the cables is responsibility of the installer of the system carrying out the installation. Cables with an inadequate section cause excessive drops in voltage, overheating and damage in general.

Installation of Utilities Connected to the Generator

The entire connection system to the utilities served by the generator must be made in a workmanship manner and

WARNING

PRAMAC adds some recommendations to the legal safety requirements, aimed at avoiding risks to people and damage to the generator.
Every electrical connection operation to the generator terminals can only be done **IF THE GENERATOR IS DEACTIVATED.**

- Connect the generator ONLY TO UTILITIES WITH KNOWN GENERAL TECHNICAL DATA, which must be fully compatible with the generator data.
- Take extreme caution regarding any contemporaneity factors in calculating the maximum absorption of utilities downstream of the generator.
- Although all generators are equipped with excess current, excess voltage and short-circuit protections, ABSOLUTELY AVOID intentionally connecting systems that do not comply with technical standards.
- The possible connection of generators in parallel must be done through a suitable control panel.

NOTE

All the connection operations of the utilities must be carried out in compliance with the technical and operational guidelines provided on the wiring diagrams included in the supply.

WARNING

The electrical connection operations described below must be carried out only by qualified personnel in full compliance with the safety regulations for the electrical industry.

in accordance with the regulations in force and all components must carry conformity markings.Electrical connection cables could present a trip hazard. Do not step on these electrical cables.

Grounding Connections

NOTE

The grounding connection must be performed in accordance with the harmonized standards by qualified personnel: the sizing must be made based on the specific technical characteristics of the generator indicated for each supply.

The connection point/s for the grounding cable/s are marked with the symbol:

Implementing the Electrical Connections

Depending on the type of the electrical panel installed on the machine, there can be differences with respect to the images shown on these pages, even though not significant. If any doubt should arise, do not hesitate to contact the generator set supplier for clarification.

Operations for Initial Start-up

The operations described in the following paragraphs must be carried out before proceeding with the initial start-up of the engine.

Visual Checks

- Check that the generator has not been damaged during transport.
- Check that no parts of the generator have been disassembled, such as the protections, the air filter, the tank cap, etc. Otherwise, restore the optimal conditions.

Checking the Engine Oil Level

Generally, the generator is shipped with oil in the engine; however, check the level, according to the instructions provided in the Checking and *Topping Off the Engine Oil Level* paragraph.

WARNING

Running the engine without oil or with oil below the minimum level will seriously damage it.

First Refueling

- The generator is shipped without fuel; thus, it is necessary to fill the tank before start-up.
- Fill the fuel tank at least to above the minimum level alarm threshold according to the instructions given in the *Refueling* paragraph with the generator positioned on a perfectly horizontal surface.
- It is recommended to also fill the diesel intake circuit through the special pump. Further information can be found in the engine manual.

First Refueling of AdBlue/DEF

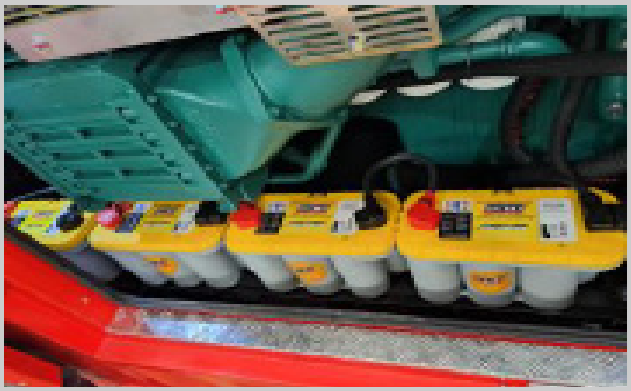
- The generator is shipped without Ad Blue/DEF; thus, it is necessary to fill the AdBlue/DEF tank before start-up.
- Fill the Ad Blue/DEF tank at least to above the MIN level alarm threshold is exceeded according to the instructions provided in the paragraph AdBlue/DEF Refueling, with the generator positioned on a perfectly horizontal surface.

Connecting the Battery Cables

- Batteries are shipped by the manufacturer charged and ready for use.
- Check that they have not been damaged during transport. There must be no signs of impact or acid leaks. Otherwise, replace the batteries.
- Connect the red cable to the positive pole of the battery.
- Check the position of the battery cut-off switch.

NOTE

If necessary, disconnect the battery. It is recommended to always disconnect the negative pole first and then the positive pole.



Start-up Operations After a Long Idle Period

WARNING

The operations described below must only be carried out by specialized personnel.
The following operations require an in-depth knowledge of certain parts of the engine. See the manufacturer's documentation of the engine for further information or, if necessary, refer to specialized personnel.

NOTE

Oil preservatives are marketed by oil companies. Check the manual of the engine or contact the engine manufacturer for type selection.

Check that all the windings of the alternator are isolated before operating the generator after a long idle period. If incorrect isolation values are detected, it is recommended to consult the nearest assistance center The main operations that must be carried out are:

- Remove any covers from the engine, air filter and drain pipe.
- If necessary, top-up the lubricating oil as recommended by the manufacturer of the engine. Unless done previously, take the opportunity to replace the oil filters.
- Fit the new fuel filters and bleed the system.
- Check the transmission belt(s).
- Check the condition of all the sleeves and tighten the clamps.
- Close the drain taps and fit any caps.
- Check the level of the coolant. Top up if necessary.
- Connect the batteries after they have been fully charged.
- Start the engine and let it warm up on minimum before loading it.
- Check that there is no oil, fuel or coolant leak.

Section 3 - Use

Safety Precautions for Use

WARNING

Failure to comply with the instructions for use and precautions could cause serious injuries or death. Always follow the procedures and precautions indicated in this manual.

WARNING

The generator can only be used by qualified personnel.

The following are the main safety precautions which the user must comply with. However, since it is impossible to report all the dangers which can arise when using the generator, remember that the decision whether or not to perform an operation is strictly personal.

Comply with the following precautions when using the generator:

- Before operating on the generator, read and understand the contents of this manual.
- Comply with the warnings affixed near the danger zones.
- Use clothing suitable for the task to be carried out, without any loose-fitting parts or accessories which can get hooked, to avoid the risk of entanglement and dragging.
- Always wear personal protective equipment (PPE), when necessary, in accordance with the specific guidelines in the manual and legislation in force in the country of use.
- Before carrying out any operation near the generator, remove watches, bracelets, rings and chains and tie or gather long hair in a net.
- Use suitable hearing protection devices (protective plugs or earmuffs) in the presence of loud noise, in accordance with the noise risk assessment of the relative work environment and legislation in force in the country of use.
- Check the efficiency of all generator protections and safety devices daily and before use.
- Do not operate if the protections and/or safety devices have been removed.
- Do not intentionally bypass protections and safety devices. Preserve the characteristics of the generator by avoiding to implement modifications, altering the functionality and tampering with protections or safety devices.
- Do not use the generator in the presence of malfunctions or persistent faulty conditions.

WARNING

During the operation of the generator, keep a distance of at least 1 meter from the radiator fans.

Preliminary Checks for Use

- Perform a visual check around and underneath the engine looking for traces of oil or fuel leakage. If needed, resolve the problem and dry the engine well before starting it.
- Remove any excess slag or dirt, especially around the silencer.
- Check that all protections and covers are in place and that all nuts, bolts and screws are tightened.
- Check the fuel and the Ad Blue/DEF level and refuel if necessary (see paragraphs Refueling and Ad Blue/DEF Refueling. Starting the engine with a full tank helps to eliminate or reduce work interruptions for refueling.
- Check the engine oil level (see the Checking and Replacing the Engine Lubricating Oil, paragraph). Starting the engine with a low oil level may damage it.
- Check the coolant level (see the Checking the Coolant Level and Topping Off paragraph). The engine may be damaged if started with the coolant level below the minimum level.
- Check the air filtering element (refer to the engine manual for details): a dirty air filtering element limits the air flow, thereby reducing engine performance.
- Do not connect all the single-phase loads on the same phase. They must be distributed to avoid damaging the alternator: do not apply a single-phase load with >40% of the generator's rated power on a single phase. This helps keep a balance between the current circulating on the three phases within approximately 33%, thereby reducing the voltage drop on the phase with the higher load within approximately 5%.

Refueling

CAUTION

Wait before approaching and/or working on the engine, as it remains very hot even after being switched off. Ensure that the generator has sufficient ventilation when stopped to allow it to cool down.

WARNING

During refueling, the risk of fire persists due to the flammability of the fuels used. The following is FORBIDDEN during the entire operation:

- Use naked flames
- To smoke

WARNING

During refueling, there is the risk of the fuel coming in contact with skin or eyes or inhalation of fumes. Use the specific personal protective equipment (PPE) such as protective gloves and goggles, remain away from the filler hole of the tank and do not breathe in fumes.

NOTE

Choose fuel depending on the ambient temperature in which the generator is used. Purchase and use winter type of diesel oil for temperatures below 0 °C and as low as -20 °C.

NOTE

Do not pour fuel on the hot engine or on other parts of the generator. Remove any fuel spills from painted surfaces with a rag. Be careful not to touch or hit the hot parts of the engine. Never use fuels that are old or contaminated with other elements (e.g. water or oil). Prevent dirt or water from entering the fuel tank.

To fill the Diesel tank and the AdBlue/DEF tanks, access the relevant nozzles through the dedicated door

Figure 1-19. Refueling Nozzles

NOTE

Before refueling, make sure that the generator set is switched off and in a horizontal position.

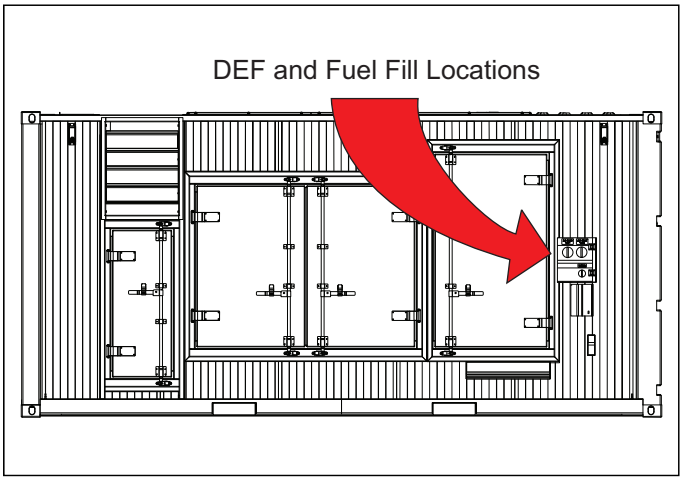


Figure 1-20. Refueling Access

- **DO NOT** fill the tank beyond the maximum level. Check the fuel level inside the tank using the analogue or digital instrument on the control panel of the panel and check that the minimum level alarm threshold is exceeded.
- If the machine is equipped for refueling with an external tank, top up the fuel according to the relative type of refueling system (e.g. open the outer tank valve, internal 6-way valve, etc.). Please refer to the engine technical documentation to check the maximum permissible diesel circuit back-pressure.

AdBlue/DEF Refueling

CAUTION

Wait before approaching and/or working on the engine, as it remains very hot even after being switched off. Ensure that the generator has sufficient ventilation when stopped to allow it to cool down.

WARNING

During refueling, there is the risk of the fuel coming in contact with skin or eyes or inhalation of fumes. Use the specific personal protective equipment (PPE) such as protective gloves and goggles, remain away from the filler hole of the tank

NOTE

Use AdBlue/DEF according to ISO 22241.The use of AdBlue/DEF not in accordance with ISO 22241 compromises the functionality of the exhaust gas treatment system. In case of use of AdBlue/DEF that does not comply with ISO 22241, compliance with the emission limits is not guaranteed and any requests for repair under warranty will be rejected.

NOTE

Take great care when refueling not to spill the AdBlue/DEF as it is extremely corrosive to many materials. If a spill occurs, absorb the AdBlue/DEF with dry sand or other non-flammable material and dispose of it according to local and national regulations. Avoid spills of the AdBlue/DEF on the ground and in waterways.

NOTE

The AdBlue/DEF tank has a blue cap and an adhesive with the word AdBlue/DEF and is sized with respect to that of diesel to prevent the AdBlue/DEF from running out before the diesel when filled.

•

NOTE

Before refueling, make sure that the generator set is switched off and in a horizontal position.

- Check the level of the Ad Blue/DEF inside the tank on the electronic board screen. Refer to the electronic board manual for details.
- If the machine is set up for automatic filling of Ad Blue/DEF from an external tank, make the connection using the respective quick connector as shown in the figure below.

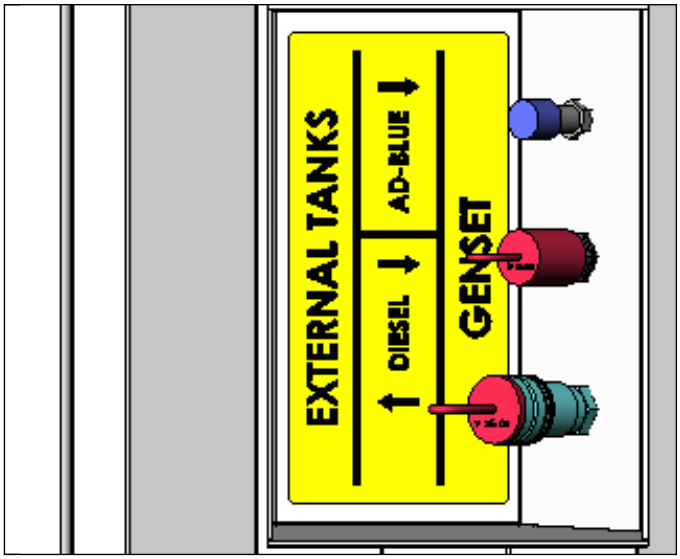


Figure 1-21. Refueling Connectors

NOTE

Place the external tank of the Ad Blue/DEF at a maximum distance from the machine of:

- - 1[m] horizontally
- - 1[m] vertically (with the external tank placed lower than the machine to avoid Ad Blue/DEF leakage from the pump of the automatic filling system when the machine is switched off).

Using the Generator At High Altitudes or At High Ambient Temperatures

NOTE

Should it be necessary to perform modifications to adapt operation of the generator, always request the manufacturer's assistance.

It is FORBIDDEN to adjust engine parameters and/or to add additives to the fuel to enhance engine power over the limits recommended by the manufacturer.

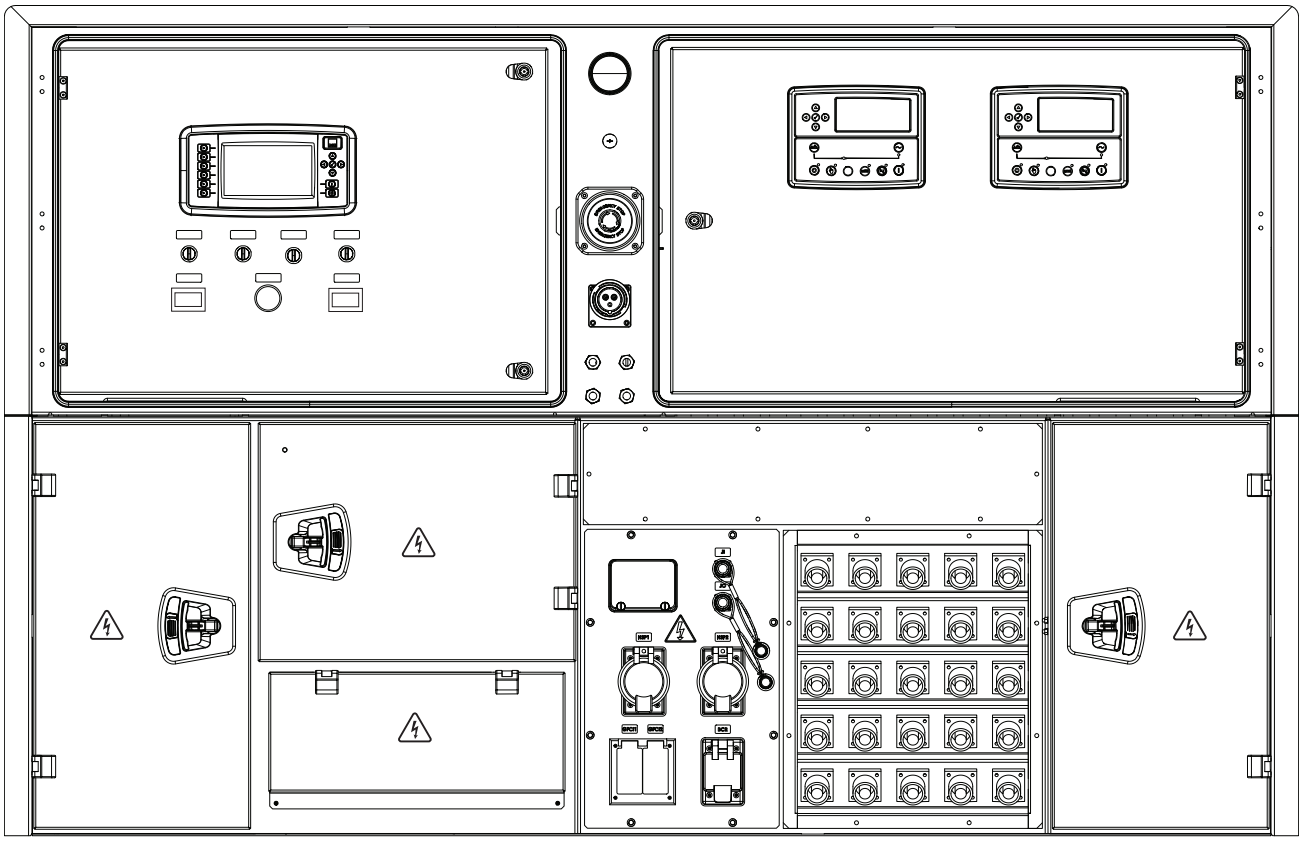
As the altitude or ambient temperature increases, the air density decreases. This rarefaction of the air has an adverse effect on engine operation, decreasing the maximum power, deteriorating the quality of the exhaust gases, increasing temperatures and in extreme cases, making it hard to start up.

If the actual environmental conditions are not specified when drafting the contract, the power of the unit is intended to refer to standard environmental conditions indicated in the technical data, as stipulated in the reference standard ISO8528-1.

If the actual environmental conditions should subsequently change, you must contact the manufacturer to calculate the new downgrading values and for the necessary calibrations (when possible).

Section 4: Electrical Components

Overview



"Detail A" "Detail B"

Socket Kit

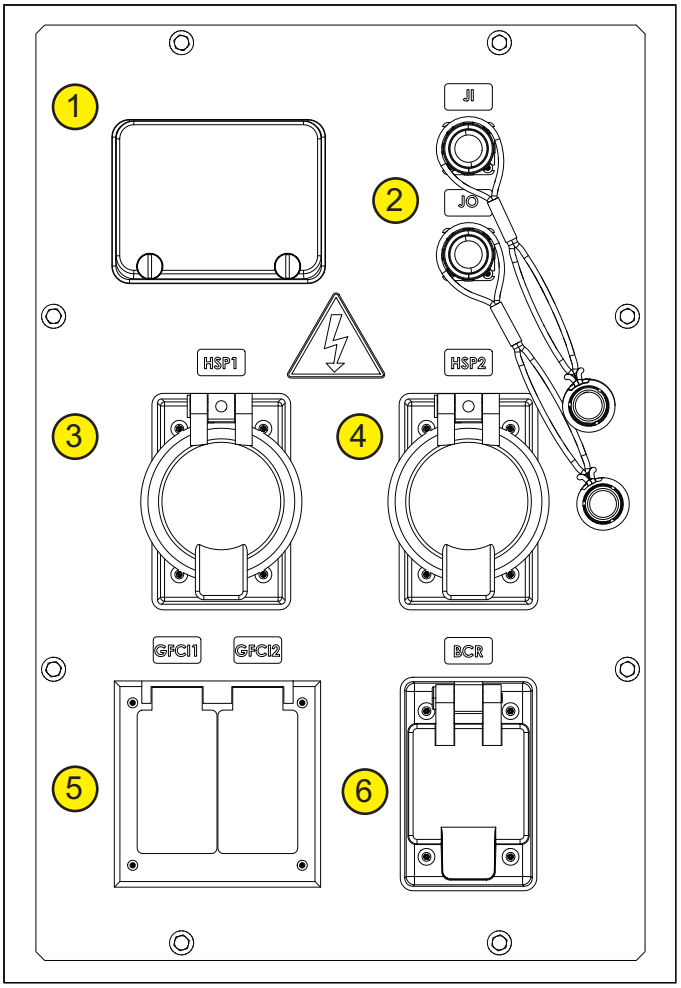


Figure 1-22. Sockets

Ref	Description	Qty
1	Breaker/Fuse Panel	1
2	CAN/Bus Connector	2
3	HSP 1 - Heater Shore Power Block Heaters	1
4	HSP 2 - Heater Shore Power Battery Heaters, Oil Pan Heaters DEF Heaters, Alternator Heater Systems	1
5	Receptacle 15A/125V	2
6	Battery Charger Receptacle	1

Miscellaneous Connectors

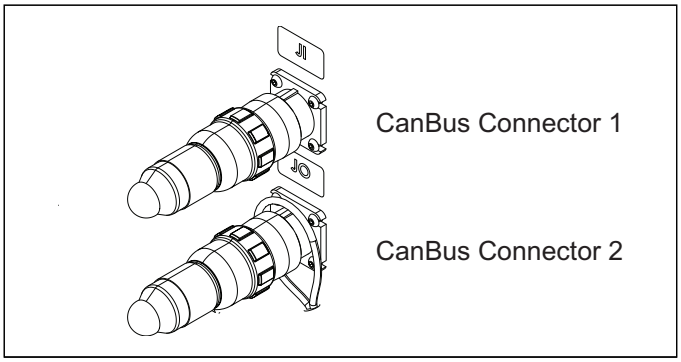


Figure 1-23. CanBus Connectors

Main Control Panel

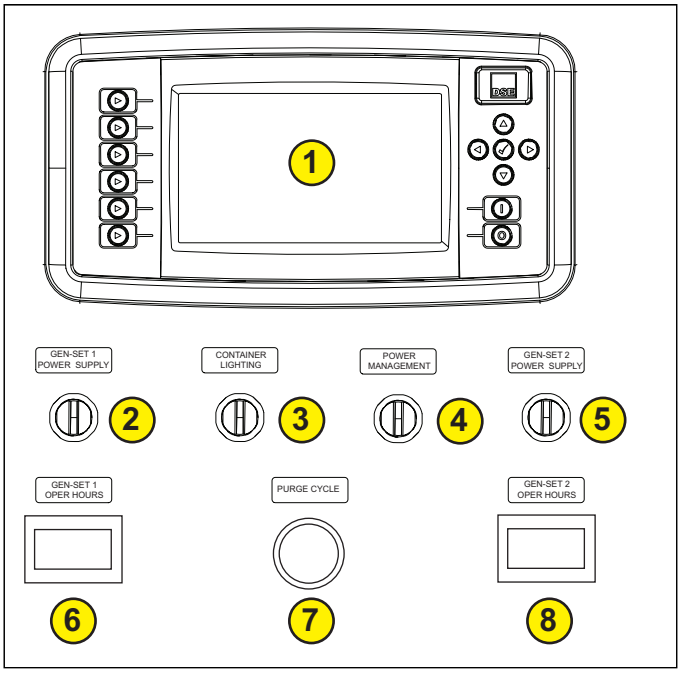


Figure 1-24. Main Control Panel

Ref	Description	Qty
1	Control Panel	1
2	Gen 1 Power Supply	1
3	Container Lighting	1
4	Power Management	1
5	Gen 2 Power Supply	1
6	Gen Set 1 Operating Hours	1
7	Purge Cycle	1
8	Gen Set 2 Operating Hours	1

Secondary Control Panel

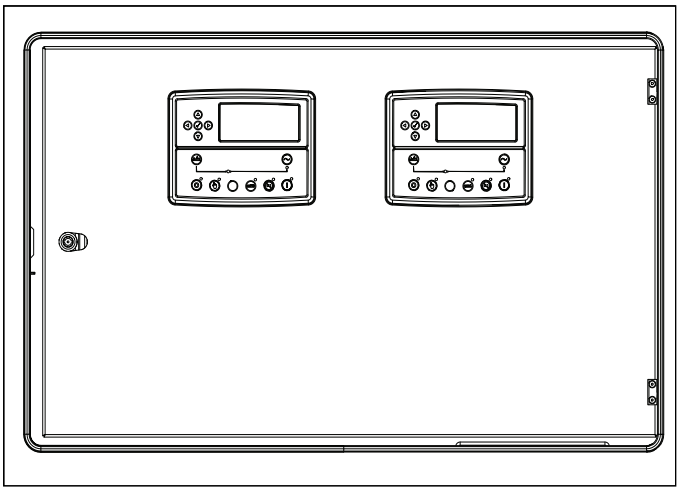


Figure 1-25. Secondary Control Panel

Powerlock 400A CAM Locks

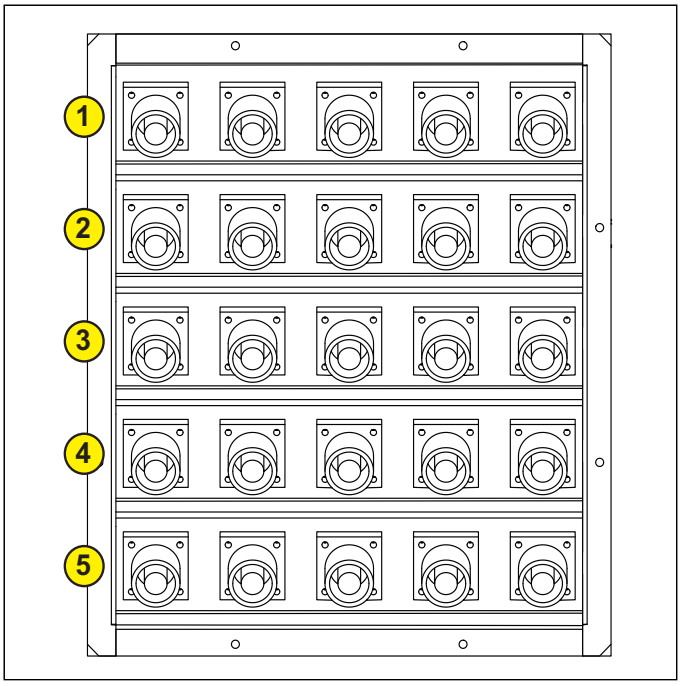


Figure 1-26. Cam Locks

Ref	Description	Qty
1	L1 U - 400A Cam Lock - Black	5
2	L2 V - 400A Cam Lock - Red	5
3	L3 W - 400A Cam Lock - Blue	5
4	Neutral (0) - 400A Cam Lock - White	5
5	Ground - 400A Cam Lock - Green	5

WARNING

Cam locks are energized while unit is running

Emergency Button and Auxiliary Service Plugs

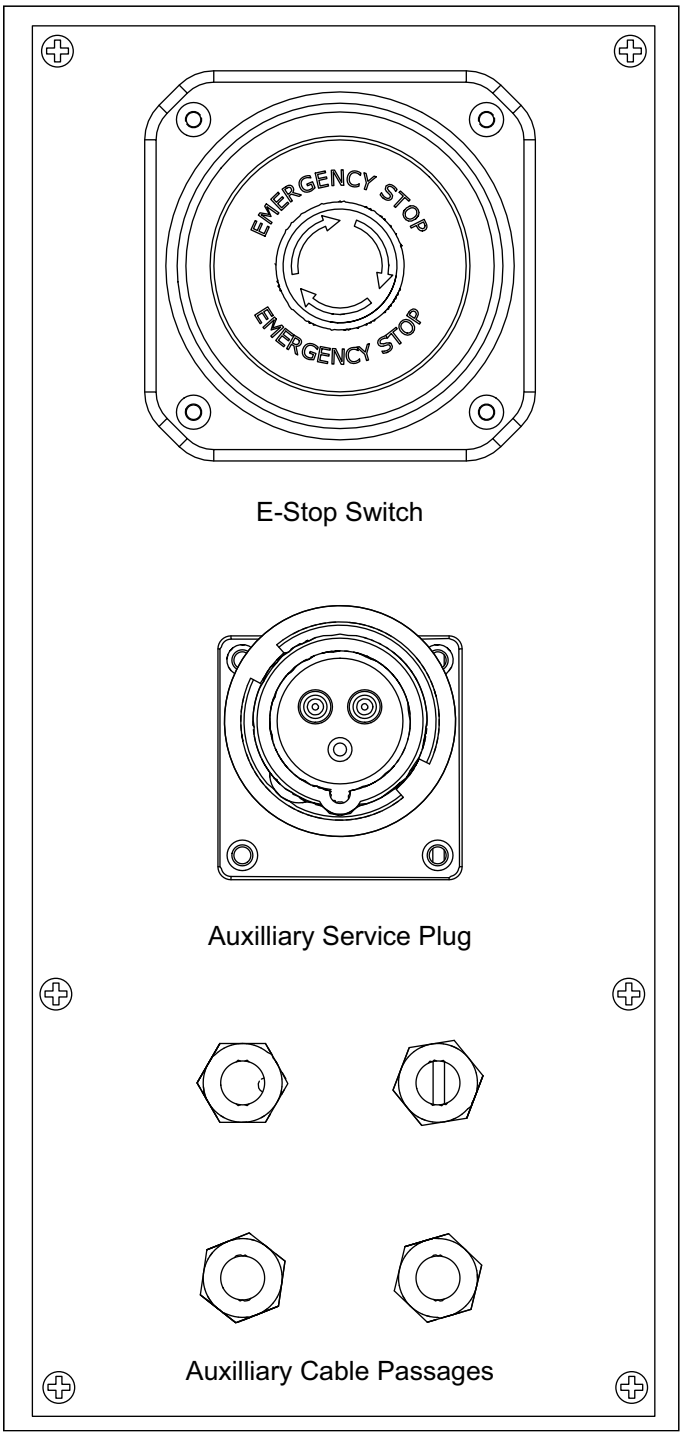


Figure 1-27. E-Stop / Auxiliary Access

Power Cable Compartments

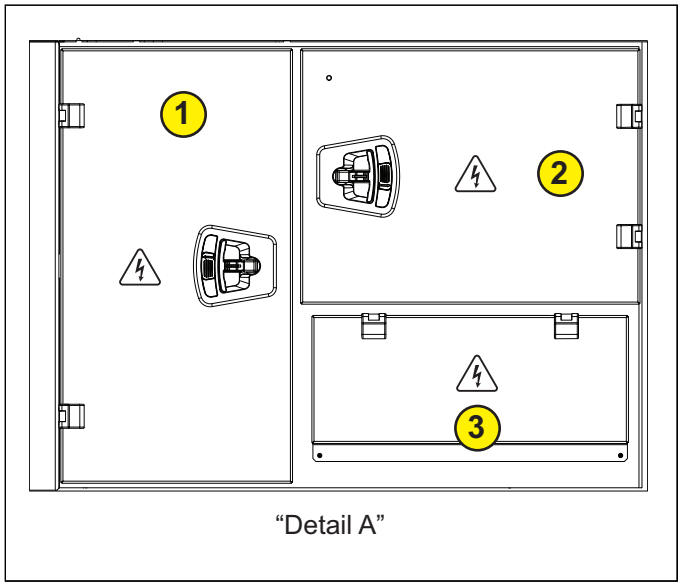


Figure 1-28. Power Compartments

Ref	Description
1	Breaker Access1
2	Power Cable Connection
3	Power/Neutral Cable Access
4	Breaker Access 2

Power Cable Connection(s)

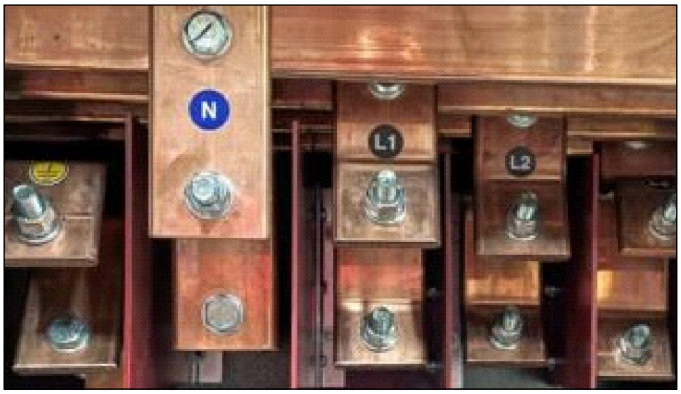
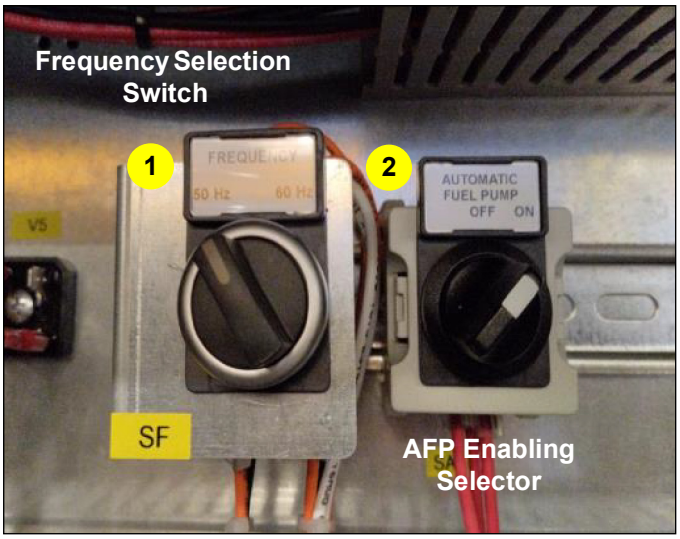


Figure 1-29. Power Cable Connections

Selectors Inside the Panel



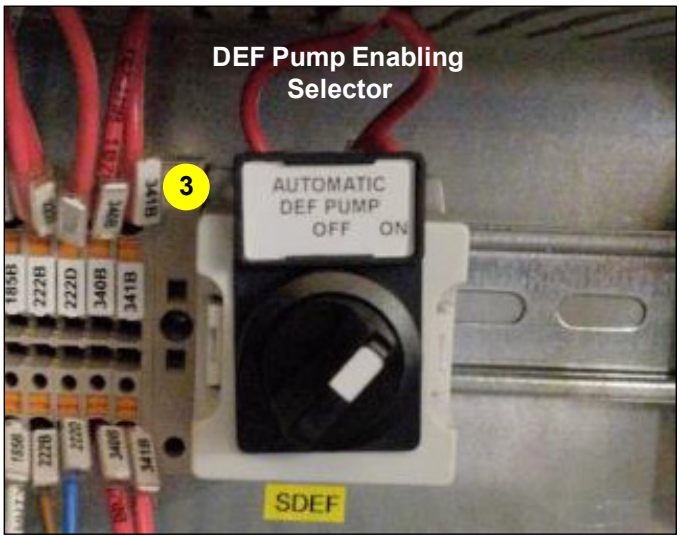
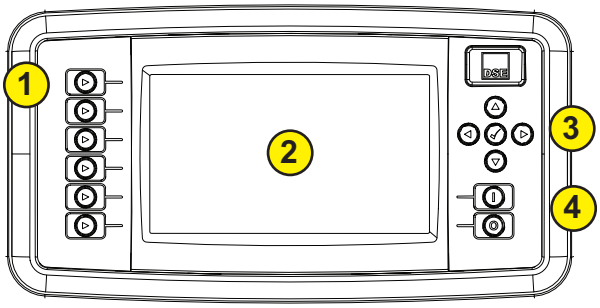


Figure 1-30. Internal Selector Switches

Ref	Description
1	Frequency Selector
2	Local/distant toroid choice selector
3	DEF pump enabling selector

Operating Logic of the Electrical Panel



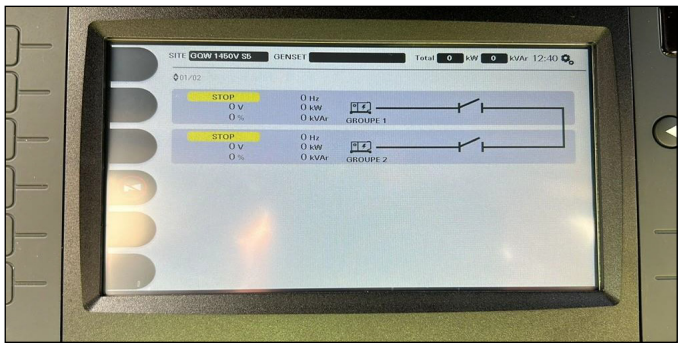


Figure 1-31. Operating Logic

Ref	Description
1	Misc. controller management buttons
2	Instrumentation display and group information
3	Navigation button
4	Start & Stop/Reset buttons

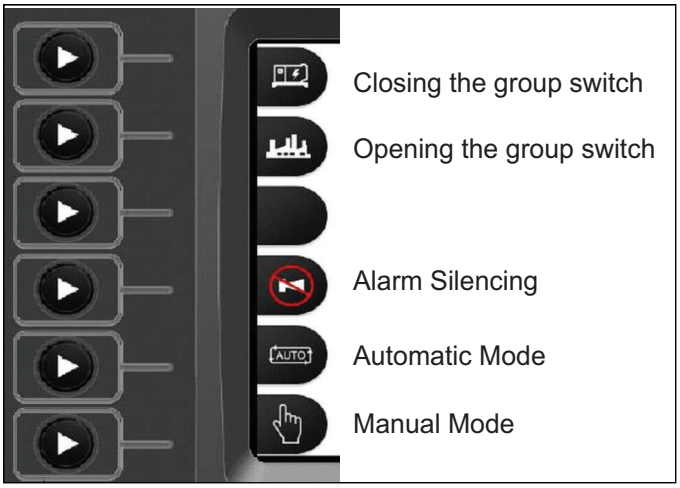


Figure 1-32. Display Button

Single Generator Operation

Manual Operation

1. On the main control panel, enable the generator that you intend to operate with the relative selector
2. Make sure the ‘Power Management’ selector is off
3. Select the enabled generator on the touch screen display overview
4. Select the manual mode with the button
5. Power on: press the start button to start the unit & press the close button of the group switch
6. Power off: press the group switch open button & press the stop button to stop the group

Automatic Operation

1. On the main control panel, enable the generator that you intend to operate with the relative selector
2. Make sure the ‘Power Management’ selector is off
3. Select the enabled generator on the touch screen display overview
4. Select the automatic mode with the button
5. Power on: using the connection of an external contact on the start/stop terminals, the generator starts automatically and the machine switch closes (refer to the wiring diagram)
6. Power off: by opening the external contact referred to in point 5 at the start/stop terminals, the machine switch opens and the generator stops automatically

Manual Parallel Operation

1. On the main control panel, power the control units of the two generators by enabling the relative selectors
2. Make sure the ‘Power Management’ selector is off
3. Select one generator at a time on the touch screen display overview and set it to manual mode
4. Power on Press the start button to start the first generator & press the close button of the relative switch.
5. Repeat the same operation for the second generator, the relative switch will close after the two generators have reached synchronization
6. Power off: press the switch open button of the first chosen generator & press the stop button to stop it.
7. Repeat the same operation for the second generator

Parallel Operation with Power Management

1. On the main control panel, power the control units of the two generators by enabling the relative selectors
2. Power on. Activate the ‘Power Management’ after the respective selector, the two generators start, synchronize and close the respective switches.
3. After the time set on the control unit, the generator with the lowest priority will turn off if the load falls below the threshold set on the control unit
4. Power off Turn off the ‘Power Management’ after the respective selector, the two generators will open the respective switches and turn off with cooling.
5. The frequency choice selector does not affect the various operating modes The choice selector for the neutral connection system does not affect the various operating modes

WARNING

If the After Run Sequence LED is installed on the battery cut-off switch, it is FORBIDDEN to disconnect the battery before the LED has turned off.
If this LED is on, it means that some operations are in progress after the engine is switched off (data communication to the ECU, AdBlue/DEF system purge/cooling cycle) whose interruption could cause damage to the engine.

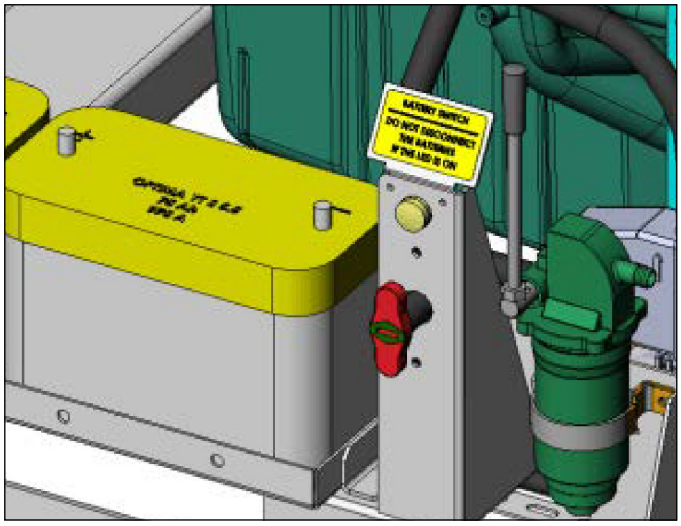
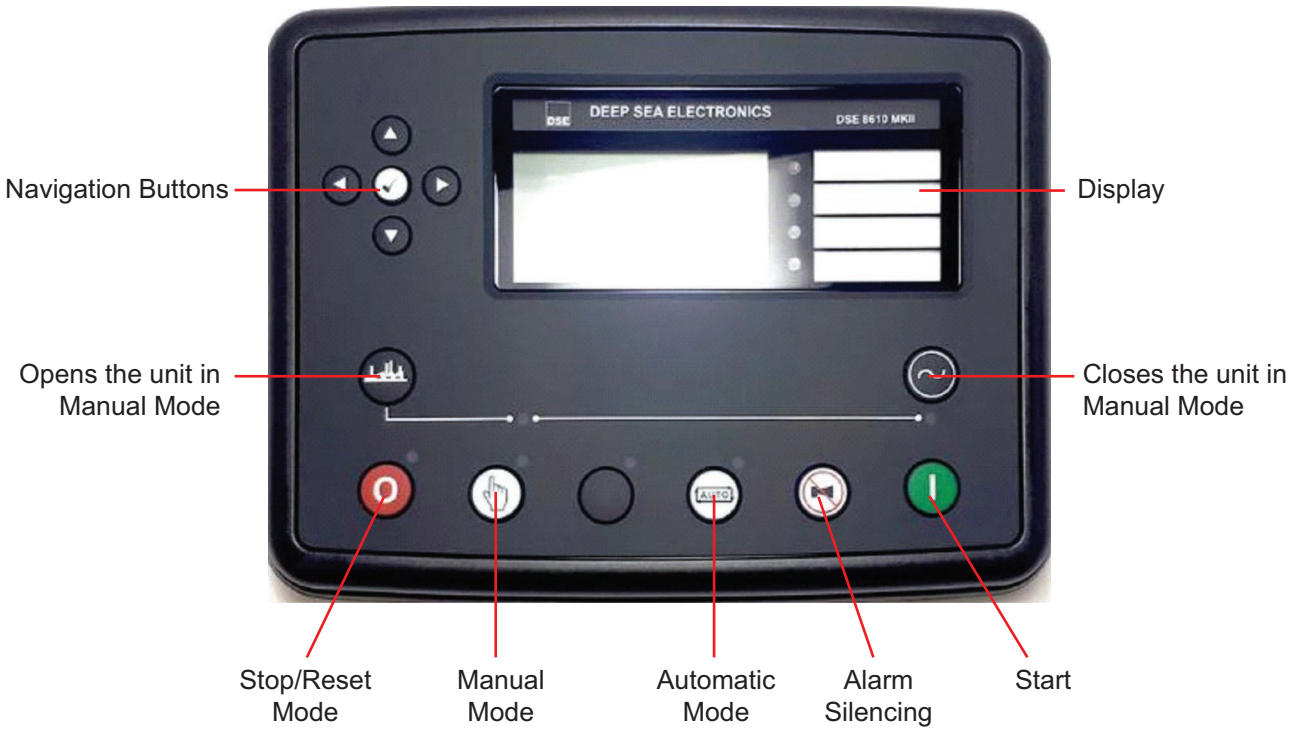


Figure 1-33. Battery Disconnect

Operating Logic of the Electrical Panel From the Single Generator Controller



Single Generator Operation

Manual Operation

1. On the main control panel, enable the generator that you intend to operate with the relative selector
2. Make sure the ‘Power Management’ selector is off
3. On the control unit of the chosen generator, press the manual mode button
4. Power on: press the start button to start the generator.
5. Press the switch close button
6. Power off: press the switch open button & press the stop button to stop the generator

Automatic Operation

1. On the main control panel, enable the generator that you intend to operate with the relative selector
2. Make sure the ‘Power Management’ selector is off
3. On the control unit of the chosen generator, press the automatic mode button
4. Power on: using the connection of an external con tact on the start/stop terminals, the generator starts automatically and the machine switch closes (refer to the wiring diagram)
5. Power off: by opening the external contact referred to in point 5 at the start/stop terminals, the machine switch opens and the generator stops automatically

Manual Parallel Operation

1. On the main control panel, power the control units of the two generators by enabling the relative selectors
2. Make sure the ‘Power Management’ selector is off
3. Make sure that the two ‘secondary control units are switched on and set them in manual mode
4. Power on
5. Press the start button on the control unit to start the first generator & press the close button of its switch.
6. Power off: press the switch open button of the first chosen generator & press the stop button to stop it.

Repeat the same operation for the second generator, its switch will close after both have reached synchronization

Parallel Operation with Power Management

1. On the main control panel, power the control units of the two generators by enabling the relative selectors
2. Power on. Activate the ‘Power Management’ after the respective selector, the two generators start, synchronize and close the respective switches. After the time set on the control unit, the generator with the lowest priority will turn off if the load falls below the threshold set on the control unit
3. Power off. Turn off the ‘Power Management’ after the respective selector, the two generators will open the respective switches and turn off with cooling.

Miscellaneous Notes on Selectors:

- The frequency choice selector does not affect the various operating modes

Procedure for Changing Frequency From 50 to 60HZ and Vice Versa

1. Make sure that the two generators are switched off
2. Choose the type of working frequency with the selector inside the compartment
3. Follow one of the operating logics described above to start.

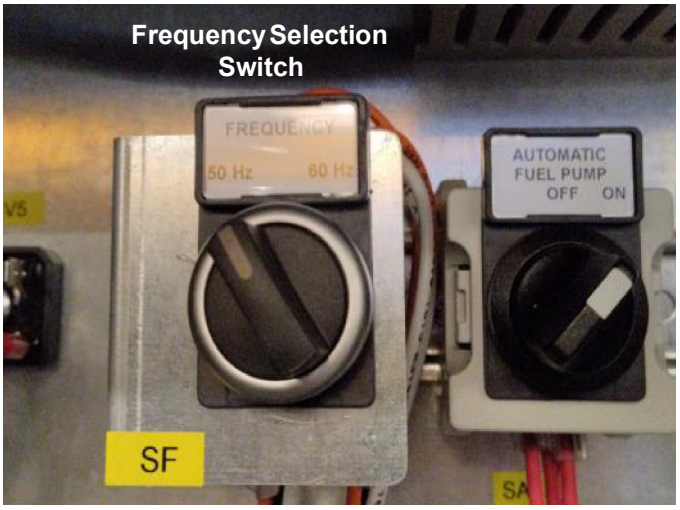


Figure 1-34. Frequency Selection Switch

CANBUS Connectors Operation

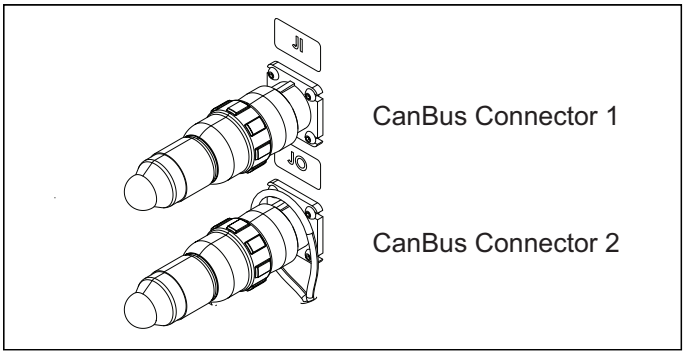


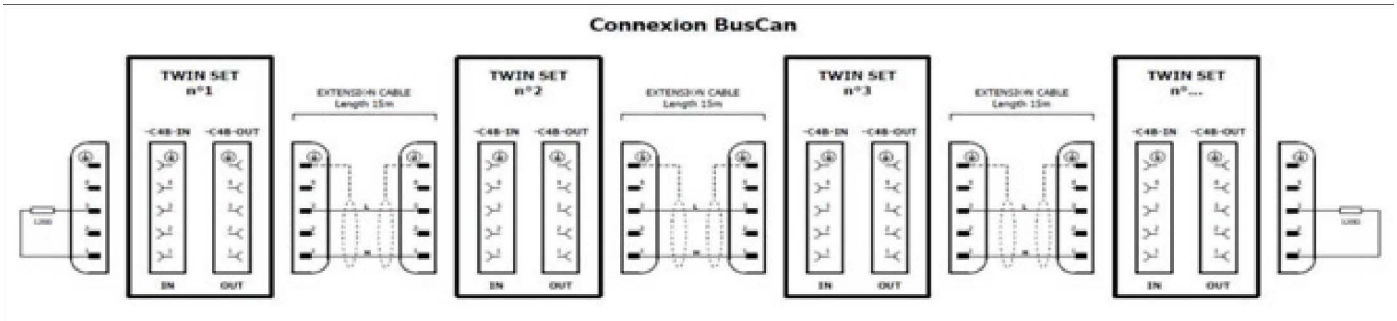
Figure 1-35. CanBus Connector

The counter-connectors shown in the image are provided with an internal resistance and must always be mounted when the machine works in standalone mode. In the case of one or more parallel units, refer to the following image for the connection mode using the appropriate wiring supplied.

Safety Micro switch of the Bars Compartment

Figure 1-36. Micro Switch

IMPORTANT NOTE: The connection of the power cables to the power drawing bars must only be carried out with the generator stopped.



Safety Micro Switch of the Bars Compartment (cont)

If one or both generators are running with the relative switch closed, the opening of the access door to the power bars compartment causes it to open immediately and a consequent alarm signal.

Emergency Button Operation

The intervention of the emergency button causes the immediate release of the machine switches and the shutdown of the relative generators. The 'emergency stop's will be displayed on the control units.

Section 5 - Maintenance and Troubleshooting

Importance of Maintenance

WARNING

If maintenance is performed incorrectly or if a problem is not resolved before activating the generator, this could lead to a malfunction that could cause serious or fatal injuries.

Always follow the recommendations and inspection and maintenance schedules provided in this manual. Check the state of the generator daily and immediately replace the worn or damaged parts.

The following pages include a maintenance schedule, inspection and maintenance procedures that are to be performed with essential manual tools in order to help you take good care of the generator.

Other maintenance activities that may be more complex or that require special tools are reserved for the manufacturer and therefore, not described in this manual.

Always contact the manufacturer for this type of intervention.

NOTE

Before performing maintenance, it is mandatory to always refer to the manuals of the relative manufacturers of the components installed in the generator (e.g. engine, alternator, etc.).

WARNING

All the maintenance operations must only be carried out by qualified personnel.

WARNING

Failure to comply with the instructions for maintenance and precautions could cause serious injuries or death. Always follow the procedures and precautions indicated in this manual. Do not perform maintenance that is not described in his manual, for which it is necessary to contact the manufacturer.

The following are the main safety precautions which the user must comply with. However, since it is impossible to report all the dangers that could arise during maintenance, remember that the decision whether an operation is to be performed is strictly personal.

Comply with the following precautions when performing maintenance on the generator:

- Before operating on the generator, read and understand the contents of this manual.
- Learn and comply with the safety precautions for use of the generator (see the specific paragraph).
- Learn and comply with all the operations intended to set the generator in safety.
- Do not perform maintenance or lubrication with generator switched on and with the disconnecting switch closed.
- Place the generator on a flat surface, disconnect all the utilities and switch the engine off before proceeding with any maintenance.
- Use adequate tools and any equipment to repair the generator.
- Remove all the tools for maintenance used in the working area, and set them in their relative places before restarting the generator.
- Restore all the protections and safety devices possibly removed and restart the generator.
- Be very careful when handling the fuel so as to reduce the risk of fire or explosion.
- Only use non-flammable solvents and never gasoline.
- Keep cigarettes, sparks and flames away from all the components that are related to fuel.

Safety Precautions for Maintenance

WARNING

Before any maintenance operation, rotate to OFF position the removable key selector and disconnect the battery. This operation guarantees against the untimely restart of the generator.

WARNING

Prevent risks of an electrical nature by disconnecting the power from the panel before performing any maintenance by means of the specific selector switch, isolating both the main disconnecting switch (CP.1) and the load disconnecting switch. Then, disconnect the battery.

Electrical Maintenance Interventions

DANGER

Check there are no residual voltages before disassembling a device or coming into contact with parts of it. Pay particular attention when working on circuits connected to capacitive loads (capacitors) or on external connections whose isolation is uncertain.

NOTE

Pay attention when handling electronic circuits. Many components are subject to faults and breakage caused by electrostatic charges and therefore also by contact with the human body. Touch a grounded metal structure to discharge your potential charge before working on the component.

NOTE

Do not use compressed air to remove the dust during the cleaning operations of the electrical system. Blowing compressed air inside the panel can cause the components to break and the conductors to loosen from their clamps.

General Control of the Electrical System

Check That There is No Water or Condensation Infiltration

- Check the absolute absence of water infiltration or hazardous condensation formations.
- Promptly check the sealing systems (gaskets).
- Immediately remove water and perform the necessary repairs.

Check the Tightness of Cables and Components

- Check the tightness of the power cables and connecting bars.
- Check the tightness of the clamps and wires on the terminal boards by pulling the cables lightly.
- Check the tightness of all the fixing screws of the components, both in the control panel and on the generator.
- Tighten the screws when necessary.

Internal Cleaning of the Electrical Panels and Control Panel

- Use a vacuum cleaner to remove dust from inside the electrical panel.

Visual Check of the Condition of the Equipment and Devices

- Check the good condition of the equipment and devices inside the panel, on the control panel and on the generator.

Check of the Electric Wires State and/or Replacement

- Check the state of the electric wires and replace them if their ideal flexibility and insulation conditions are altered.
- Pay particular attention when checking electric wires in adverse environments (e.g. in high or cold temperatures, humidity).
- When necessary, replace the electric wires while referring to the wiring diagrams.
- Check the state of the power cables and connectors. Check that there is no contact with metal parts.

Battery Check

The battery poles should be checked periodically. A check every 15 days is recommended.

If the poles show signs of corrosion, remove it using ammonium diluted with water and a hard brush.

Once the corrosion has been removed and the terminals reconnected, lubricate the poles with suitable grease.

If the generator is not to be used for a long time (more than 30 days), disconnect the poles of the battery to prevent discharge. Always disconnect the negative pole first and then the positive pole.

Generator Check

Connections Check

Make sure that the electrical connection cables are secured to the connection terminals; tighten the screws if necessary.

Windings Check

The condition of the windings can be determined by measuring the earth insulation resistance.

NOTE

It is mandatory to refer to the documentation of the manufacturer of the alternator to implement the necessary connections to carry out the above-mentioned measurement and to know the resistance values that are to be checked. Should the resistance value of the windings be incorrect, have it repaired as required by the manufacturer of the device.

Bearings Check and Maintenance of the Generator

Refer to the supplied alternator manual before performing any operation on it.

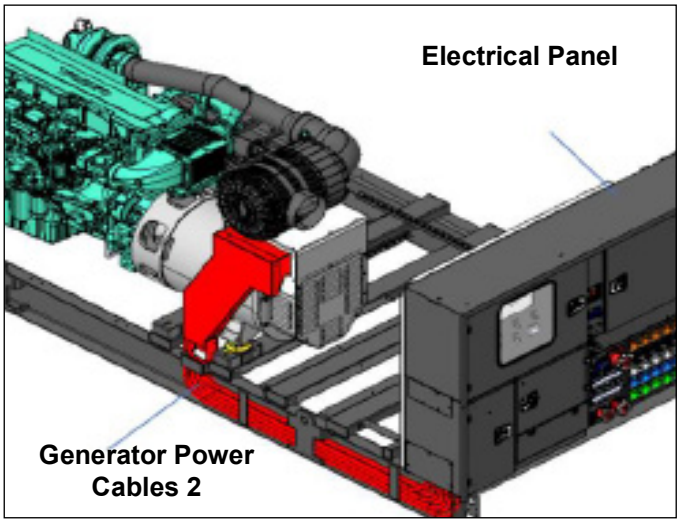


Figure 1-37. Power Cable Location

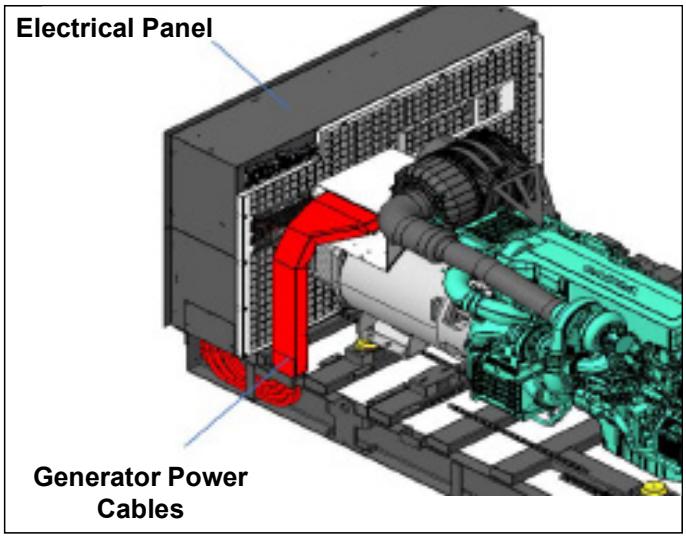


Figure 1-38. Power Cable Location Gen 2

Mechanical Maintenance Interventions

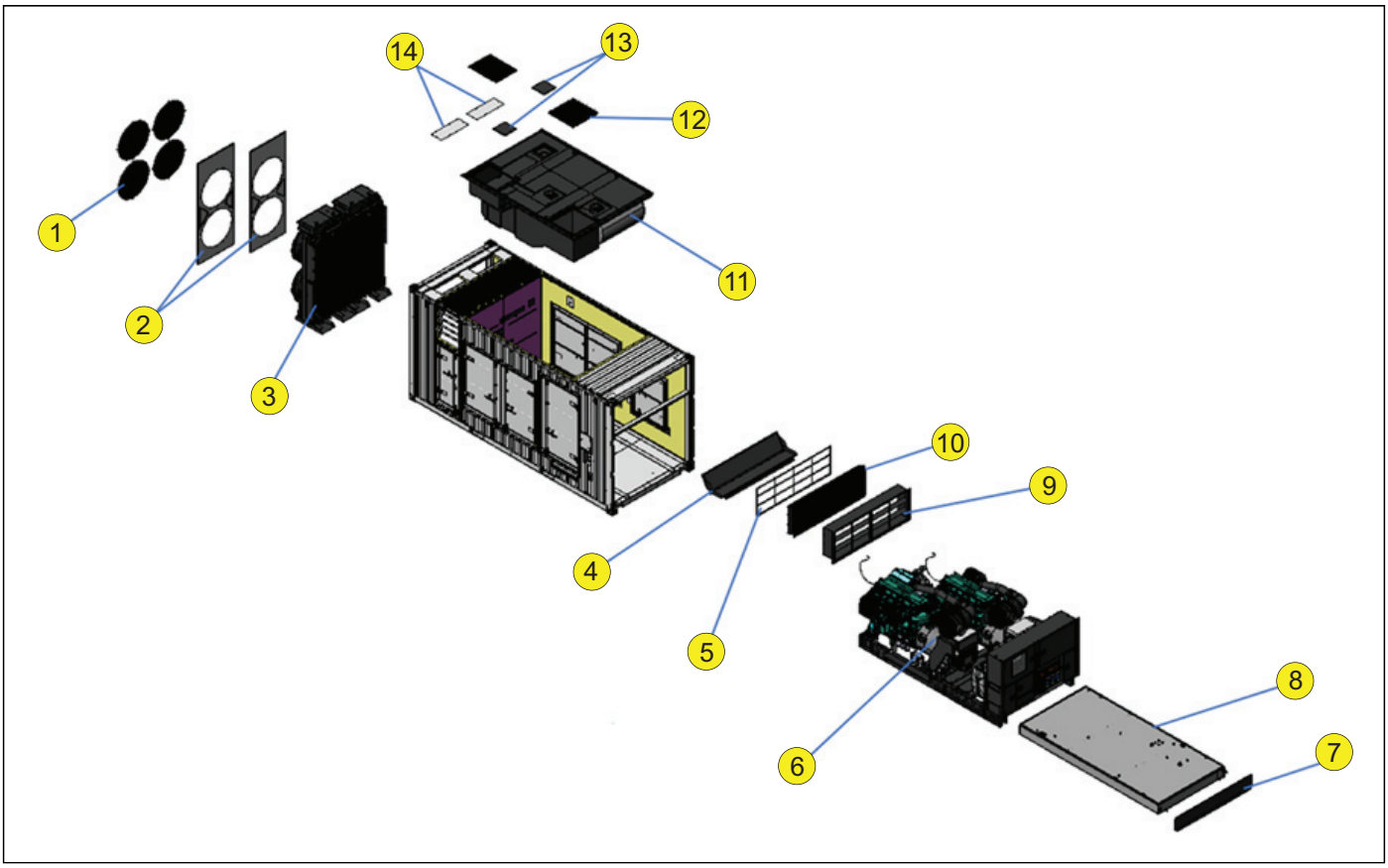


Figure 1-39.

Ref	Description
1	Removable radiator grids
2	Separator panels
3	Radiators
4	Removable water collection suction tank
5	Removable drop separator fixing grid
6	Genset
7	Removable tank panel
8	Fuel tank 1,800 liters
9	Removable drop separator frame
10	Removable drop separator
11	Roof/Ventilation system/exhaust system
12	Removable walkable roof grid
13	Removable fan maintenance panels
14	Removable panels- exp vessel maintenance

Checking and Topping-Off the Engine Oil Level

CAUTION

Pay attention to contact with hot parts and splashes of hot oil which could cause burns.
Refer to the supplied engine manual before performing any operation on it.

NOTE

Running the engine without oil or with oil below the minimum level will seriously damage it.

WARNING

Risk of burns. Allow engine to cool before draining oil or coolant. Failure to do so could result in death or serious injury.

(000139)

Checking and Topping-Off the Engine Oil Level (cont)

WARNING
LIMITED HEADSPACE. PLEASE USE PROPER SAFETY EQUIPMENT.

ADVERTENCIA
ESPACIO DE CABEZA LIMITADO. UTILICE EL EQUIPO DE SEGURIDAD ADECUATO

NOTE

Oil is a harmful substance to the environment. Store it, use it and dispose of it in compliance with use of the generator.

Check and top up the oil level for the engine model installed on the generator. Refer to the documentation of the manufacturer of the engine before performing any operation on it.

Check Engine Oil Level

- Stop the generator and wait a few minutes for the oil to return from the pipes to the engine sump.
- Refer to the supplied use and maintenance manual of the engine before performing any operation on it.

Topping-Off the Engine Oil

Use engine oil of type and viscosity that conforms to the operating environment temperature and time of use of the engine.

Follow the guidelines provided in the supplied use and maintenance manual of the engine to choose the SAE oil viscosity rating according to the external operating temperature.

Engine Oil and Oil Filter Replacement

NOTE

Whenever oil is changed, the filter must also be replaced.

Refer to the supplied manual of the engine to replace the engine oil and the oil filter.

Engine Oil Replacement

Refer to the use and maintenance manual supplied with the engine.

Engine Oil Filter Replacement

Refer to the use and maintenance manual supplied with the engine.

Cooling System Maintenance

Description of Cooling System

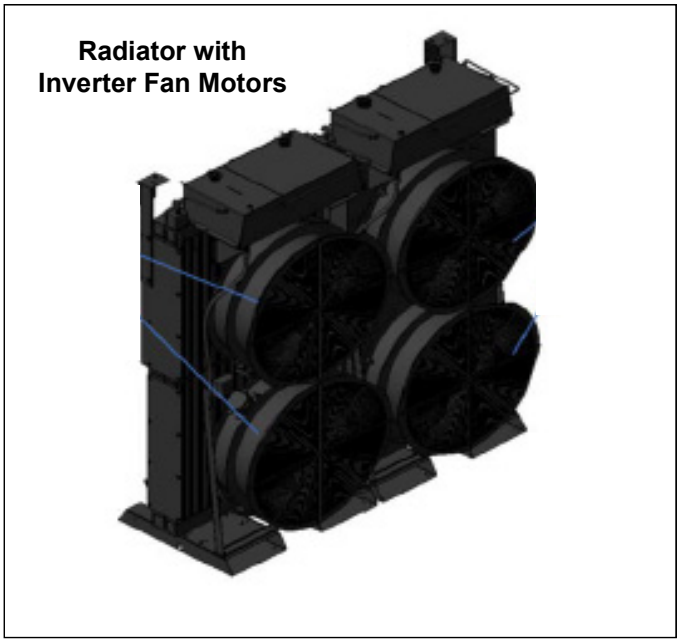


Figure 1-40. Radiator

CAUTION

Do not open the filler cap with the engine hot. When the engine is hot, steam and boiling water could be violently ejected.

NOTE

Do not operate the engine without coolant

Description of Cooling System (cont.)

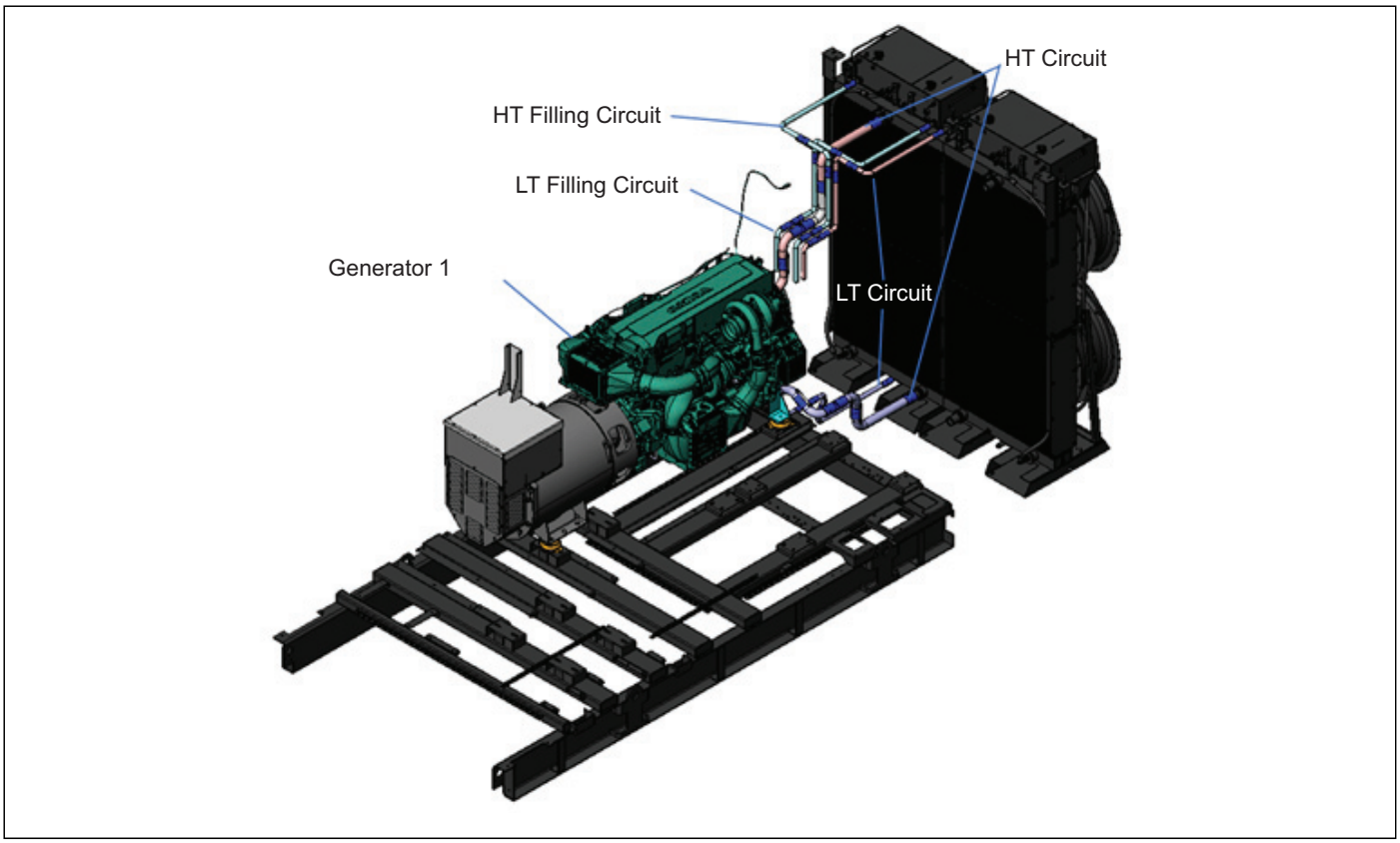


Figure 1-41.

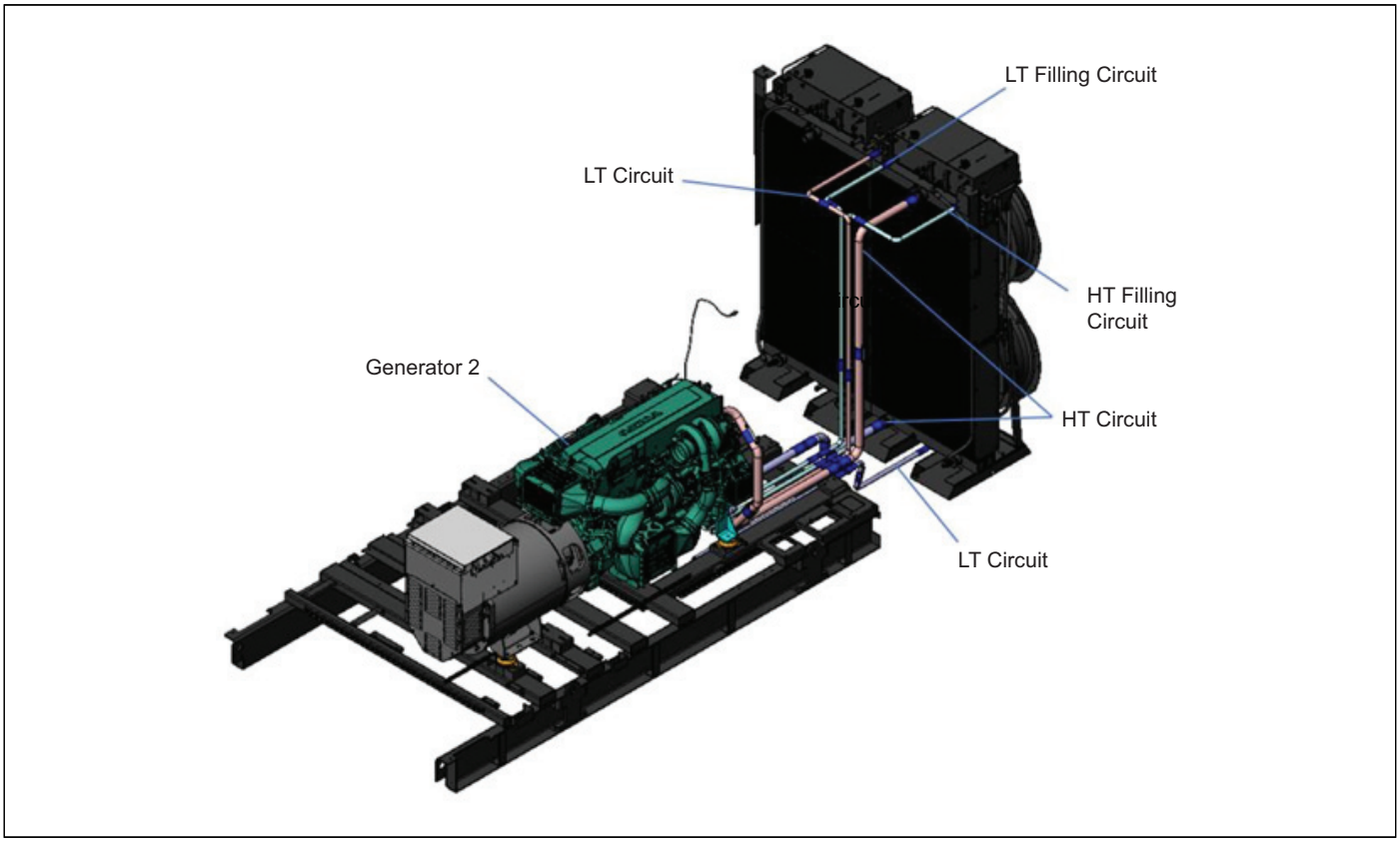


Figure 1-42.

Coolant Level Check

To check the coolant level, use the appropriate visual indicators placed on the expansion vessels. Each expansion vessel has two indicators. The left indicator indicates the level of the high temperature circuit (1). The right indicator indicates the level of the low temperature circuit (2).

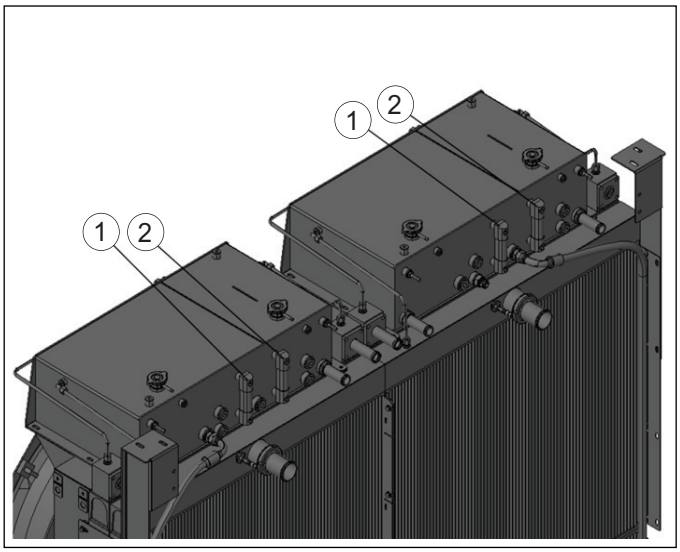


Figure 1-43. Check Coolant Levels

Topping Off the Coolant

To top up the coolant, follow the procedure described below.

- Stop the generator and wait for the engine to cool down completely.
- Disassemble the panels (1) above the expansion vessels.
- Top up the coolant from the caps (2) located on the expansion vessels.

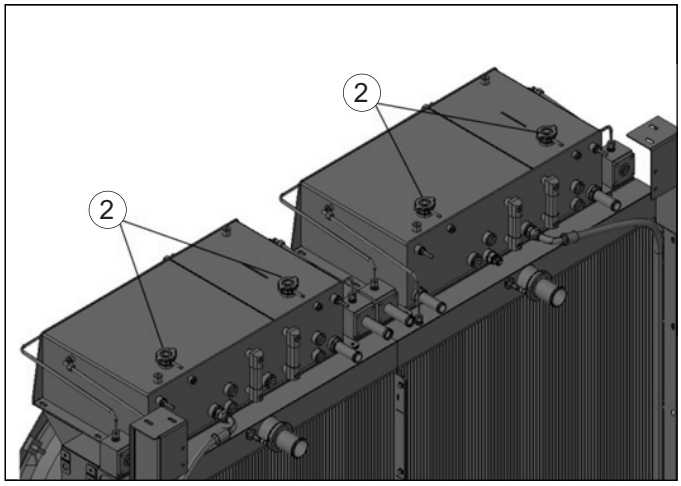


Figure 1-44. Top Off Points

Replacing the Coolant

To replace the coolant, follow the procedure described below:

Stop the generator and wait for the engine to cool down completely.

Empty the circuit using the radiator valves (1) and then the pipe valves (2).

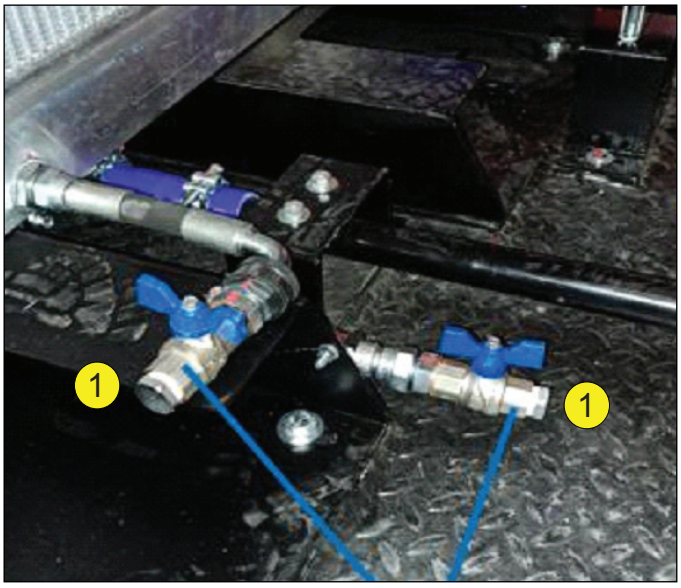


Figure 1-45. Radiator Valves

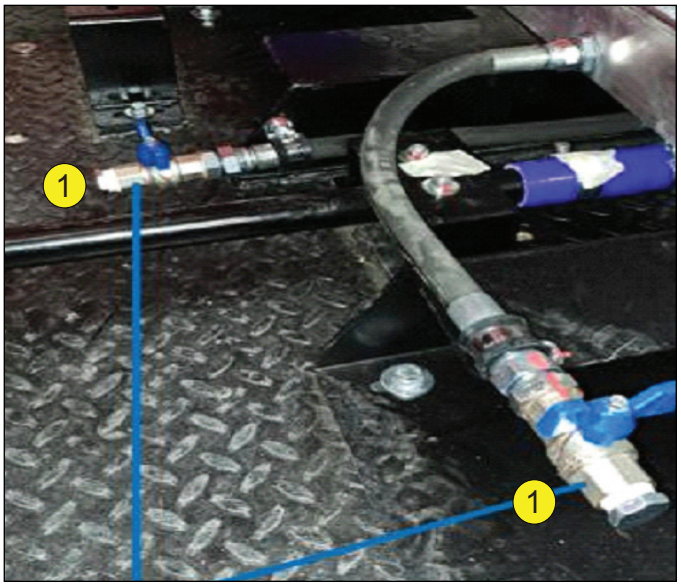


Figure 1-46. Pipe Valves

Replacing the Coolant ((cont)

Figure 1-47. Check Valves

- Fill the circuit using the valves (1). Complete the filling by refilling the liquid from the caps of the trays as per the procedure.

Cleaning of Radiant Masses

For the good efficiency of the machine, it is necessary to perform a periodic cleaning of the radiant masses. These, in fact, can accumulate debris and dirt capable of degrading their performance. Cleaning can be performed with compressed air or pressurized water. Washing with water under pressure by means of a pressure washer is preferable; however, in the presence of organic residues of agricultural or woody type, it is advisable to use compressed air. If water is used for this purpose, there is a risk that encrustations of hard material will form which are difficult to remove. radiator.

NOTE

The air filter must always be clean and in good condition, otherwise it must be replaced. Eliminate old filters; old filters must not be cleaned or reused. Do not run the engine without the air filter as dust or other substances could be drawn into the engine causing premature wear and possible damage.

To carry out the washing, it is necessary to direct the jet of air or water under pressure from inside the radiator compartment on all the free surfaces of the radiant masses. The lower part of the radiator carpentry is provided with drainage holes for washing residues

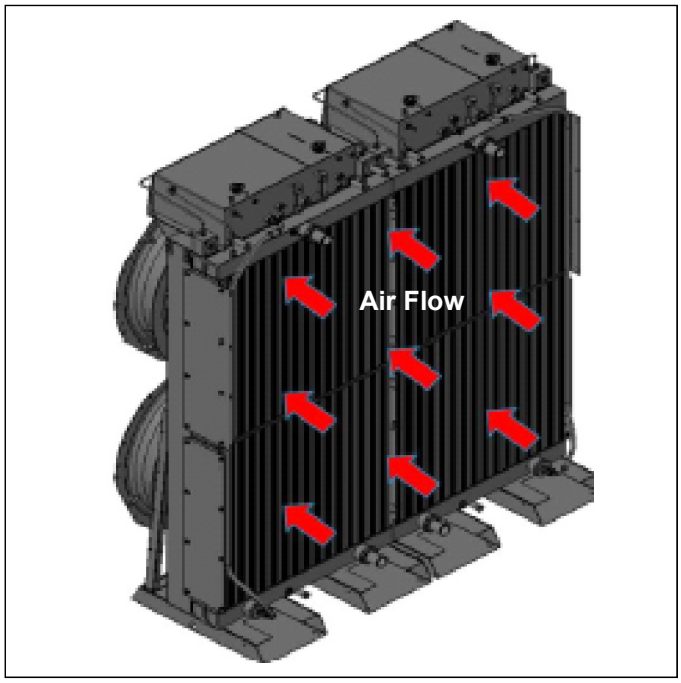


Figure 1-48. Radiator Air Flow

Replacing the Air Filter Element

To replace the air filter, remove the cover of the filter box by acting on the respective blocking elements. Remove the cartridge to be replaced and clean the relative housing, eliminating any dust residues. Insert the new cartridge and reposition the cover of the filter box, fixing it with the respective locking elements.

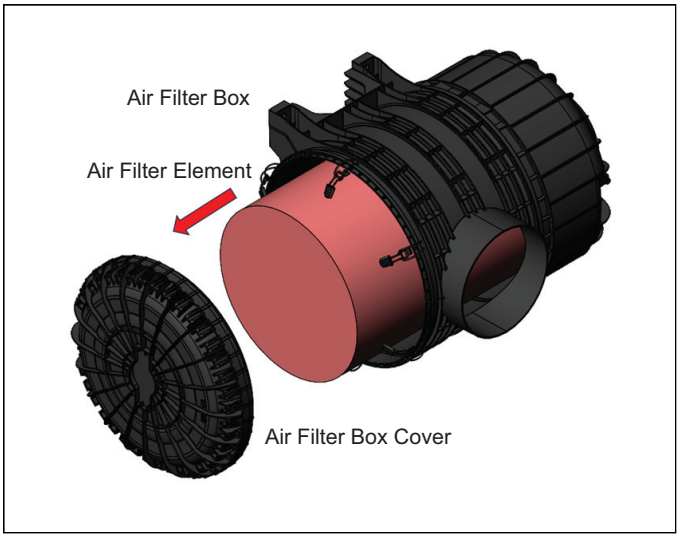


Figure 1-49. Air Filter Element

Replacing the Air Filter (cont)

NOTE

The air filter must always be clean and in good condition, otherwise it must be replaced. Eliminate old filters; old filters must not be cleaned or reused. Do not run the engine without the air filter as dust or other substances could be drawn into the engine causing premature wear and possible damage.

Replacement

- Wait for the engine to cool down completely before replacing the filter.
- Refer to the use and maintenance manual supplied with the engine.

Replacement of Fuel Filter and Volvo Water Separator Filter

WARNING

The fuel pre-filter and filter must be replaced when the engine is cool to prevent the risk of fire caused by a fuel leak on red-hot surfaces.

NOTE

Do not fill the new filter with fuel before mounting it as there is a risk of impurities entering the system, with consequent damage and malfunction.

Replace the fuel filter referring to the supplied use and maintenance manual of the engine.

Replacement of the Volvo Fuel Filter

- Stop the engine.
- Allow the necessary time for the components to cool down.
- Refer to the use and maintenance manual supplied with the engine.

Replacement of the Volvo Water Separator Filter

- Stop the engine.
- Allow the necessary time for the components to cool down.
- Refer to the use and maintenance manual supplied with the engine.

Replacement of the Original AdBlue/DEF Filter

- Stop the engine.
- Allow the necessary time for the components to cool down.
- Refer to the use and maintenance manual supplied with the engine.

QFC-S5 Kit / AFP Kit Maintenance

- Stop the engine.
- Allow the necessary time for the components to cool down.
- Replace and/or clean the filter.

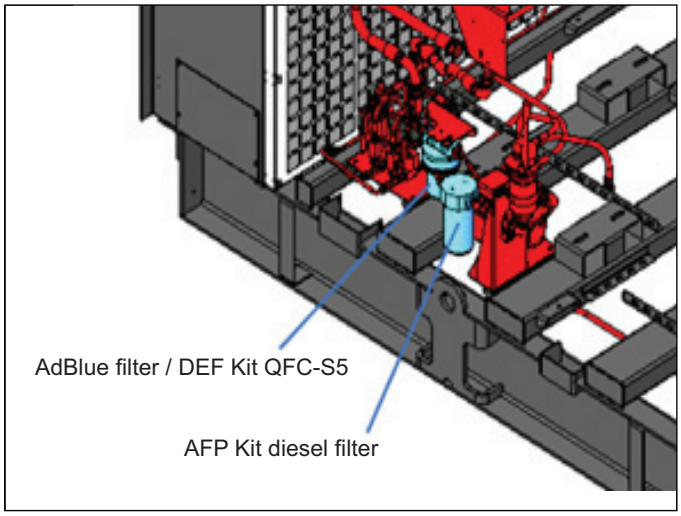


Figure 1-50. Filter Location

Draining Fuel From The Tank

WARNING

The fuel must be drained when the engine is cool, to prevent the risk of fire caused by a fuel leak on red-hot surfaces. Allow the necessary time for the components to cool down.

Draining Fuel From The Tank

To empty the tank or its containment tank, use an external pump (not supplied with the generator).

NOTE

Do not dispose of fuel in the environment. Use a suitable container to collect the fuel from the tank.

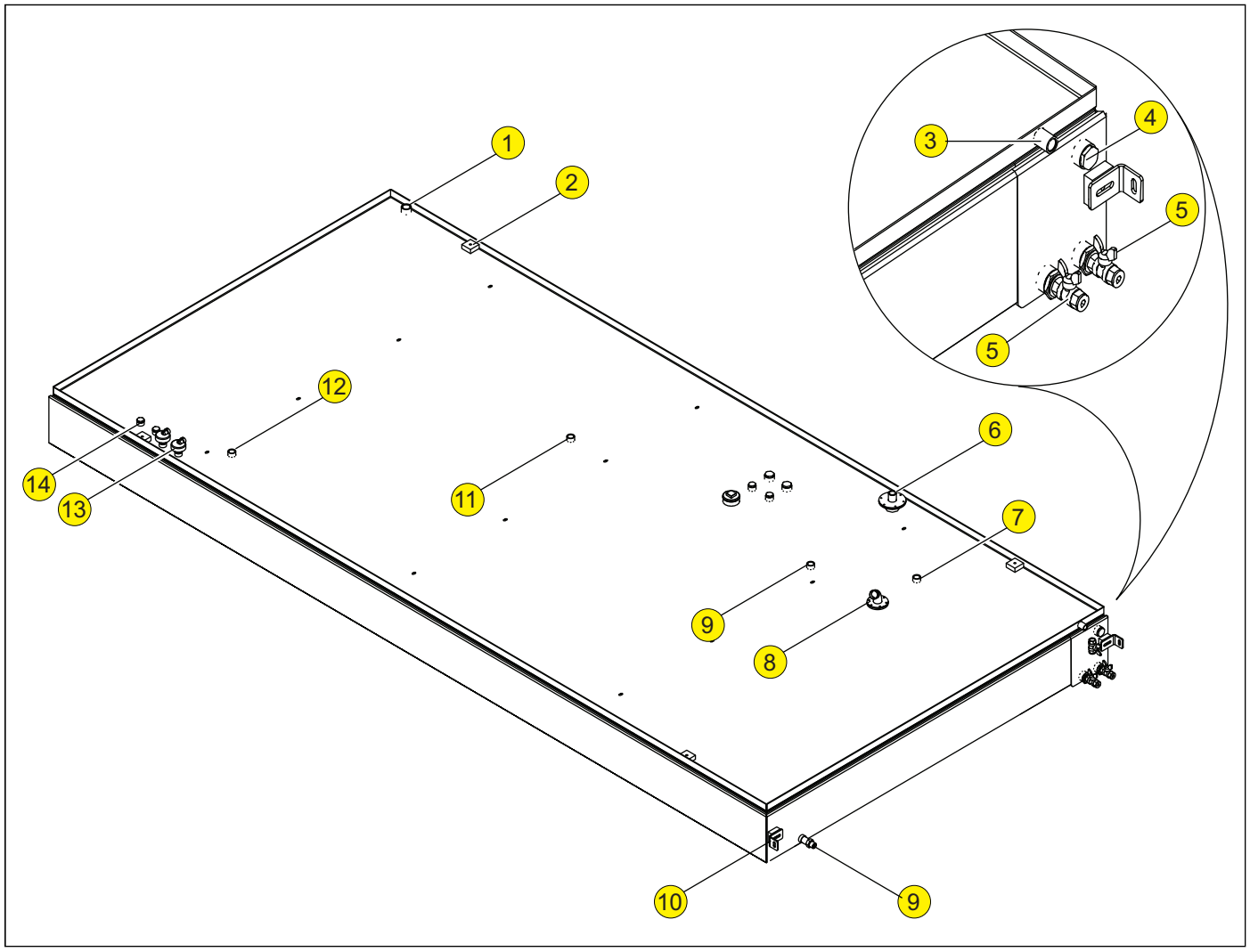


Figure 1-51. Fuel Tank

Ref	Description
1	Fuel vent
2	Fitting for Tank Lifting/Moving Eye Bolt
3	Leakage Tray Drain
4	Gap Vent
5	Fuel Drain
6	Fuel Delivery
7	Automatic Fueling Return

Ref	Description
8	Manual Filling Nozzle
9	Automatic Filling Delivery
10	Leak Sensor
11	Fitting for Tank Extraction Eye Bolt
12	Manual Filling Nozzle
13	Fuel Level Gauge Fitting
14	Auxiliary Level Gauge Fitting

Suction System Maintenance

For the good efficiency of the machine, it is necessary to check the presence of foreign bodies in the suction tray. In particular, it is necessary to check that the water drainage ducts are not obstructed.

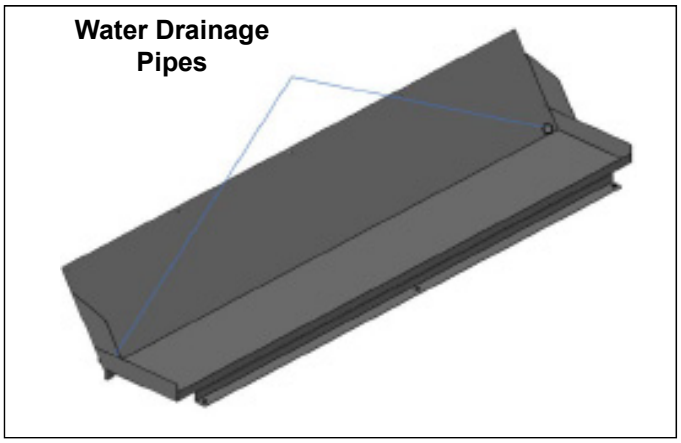


Figure 1-52. Suction Tray

Figure 1-53. Tray Drainage

Figure 1-54. Tray Drainage

Figure 1-55. Water Drainage Pipe

Ventilation System Maintenance

For the good efficiency of the machine, it is necessary to check the presence of foreign bodies inside the ventilation pipes. In particular, it is necessary to check that the water drainage ducts are not obstructed.

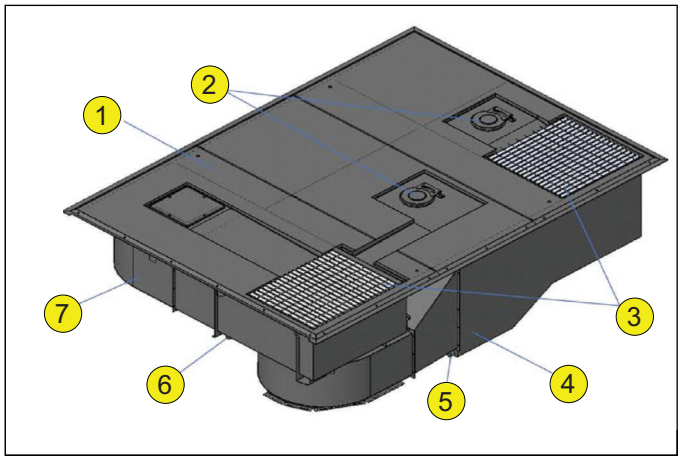


Figure 1-56. Vent Location

Ref	Description
1	Roof
2	Exhaust Gas outlets
3	Removable Walkable Roof Grates
4	Engine 1 Ventilation Exhaust Duct
5	Engine 1 Ventilation Water Discharge Duct
6	Engine 2 Ventilation Water Discharge Duct
7	Engine 2 Ventilation Exhaust Duct

Ventilation System Maintenance

For the good efficiency of the machine, it is necessary to check the presence of foreign bodies in the suction tray. In particular, it is necessary to check that the water drainage ducts are not obstruction

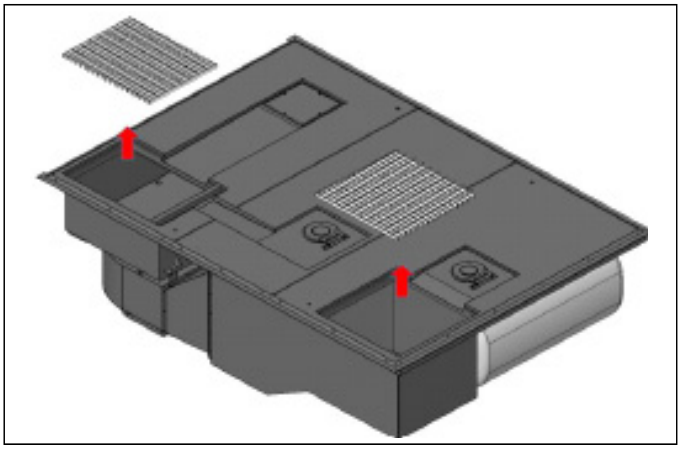


Figure 1-57. Check Suction Drains

Figure 1-58. Remove Ventilation Grate

Figure 1-59. Discharge Duct

Figure 1-60. Water Discharge Duct Locations

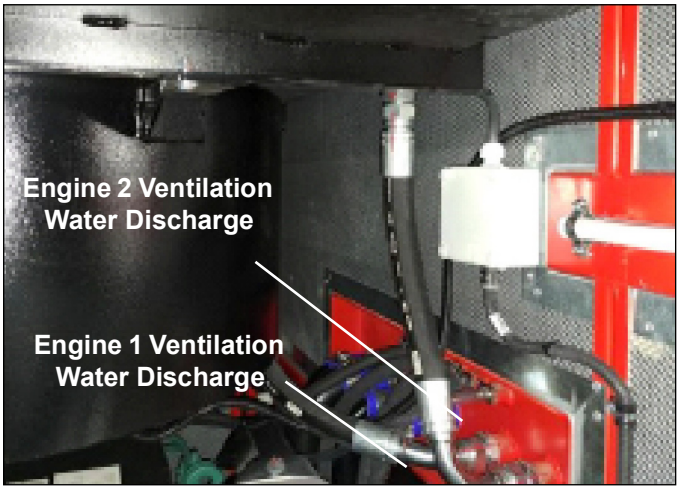


Figure 1-61. Water Discharge Duct Location

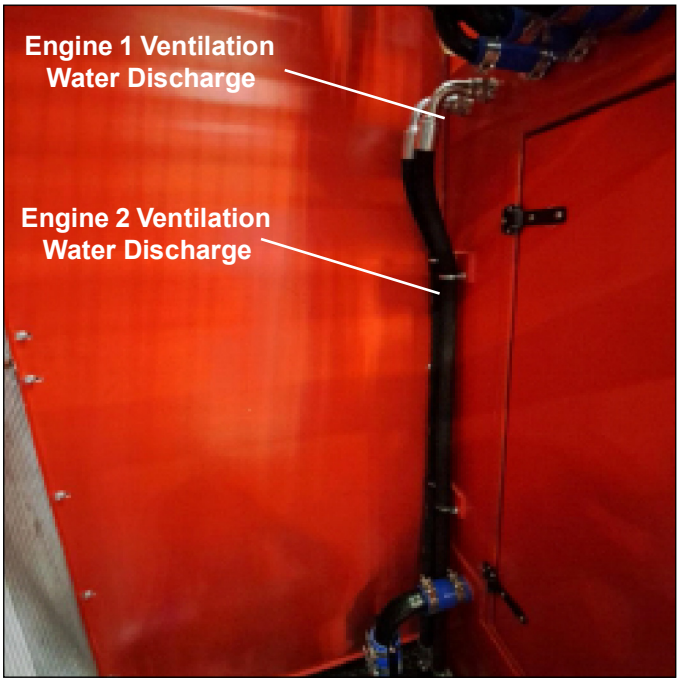


Figure 1-62. Ventilation Discharge Duct

Maintenance Schedule

The maintenance interventions are divided between those on the electrical system and those on the mechanical parts. All the interventions are summarized in the following tables forming part of the routine maintenance schedule of the generator.

Electrical System Maintenance Schedule

Frequency	Element to be serviced	Action
8 hours/daily	Check the connections of the utilities (cable installation, tightness of the terminals and electrolyte level in the battery).	**I**
	Check that the emergency stop button works before each use.	**I**
40 hours/weekly	Check there is no water or condensation infiltration.	**I**
	Visually check the state of the equipment and devices.	**I**
200 hours/monthly	Check the tightness of cables and components.	**I**
	Check the state of the battery poles and the electrolyte level.	**I**
1000 hours/six-monthly	Check the tightness of the alternator terminals	**R**
2000 hours/yearly	Check the state of the power cable connectors	**I**
	Internal cleaning of the electrical panels and control panel.	**P**
	Check the state of the electric wires and/or replace them.	**I**
	(I) Inspect (R) Regulate or Replace (C) Clean	

Mechanical Parts Maintenance Schedule

The maintenance schedule is based on an average use condition. If the engine is started under adverse conditions, such as heavy and prolonged loads or high temperatures, or used in unusually wet or dusty conditions, contact your dealer for recommendations applicable to each individual need and use. Refer to the use and maintenance manual supplied with the engine.

Frequency	Element to be serviced	Action
8 hours/daily	Check the coolant and oil levels and top up if below the minimum level.	**I**
40 hours/weekly	Check for leaks of coolant from the sleeve joints of the cooling system and, if present, tighten the respective clamps.	**I**
100 hours/every two months	Periodic cleaning of radiant masses.	**P**
100 hours/every two months	Check for foreign bodies in the suction tray and, if present, clean the tray and the water drainage ducts.	**P**
100 hours/every two months	Check for foreign bodies in the ventilation ducts and, if present, clean the ventilation ducts and the water drain ducts.	**P**
200 hours/monthly	Check the tightness of the coupling screws of the silent blocks that secure the engine and alternator to the frame.	**I**
	(I) Inspect (R) Regulate or Replace (C) Clean	

Optional Kit Maintenance

Below is a diagram of the optional components for their correct identification.

For the maintenance of the BAT/MBS Kit, it is sufficient to replace the batteries already installed with new batteries,

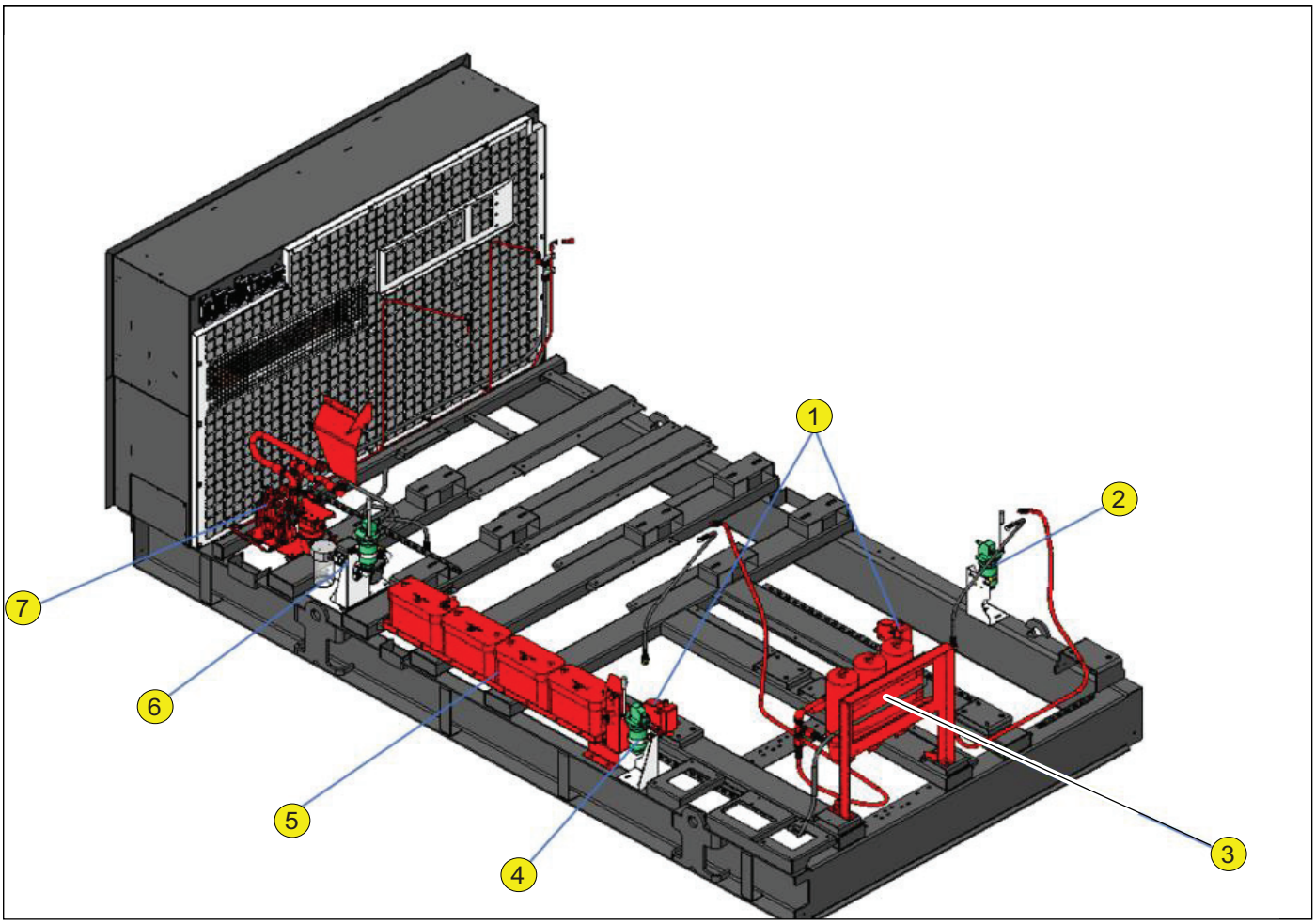


Figure 1-63.

Ref	Description
1	Pre-Heating System PHS (Optional)
2	Manual Oil Pump MOP (Standard)
3	Water Separator Pre-filter WSP (Standard) Redundant Water Separator RWS (Optional)
4	Manual Oil Pump MOP (Standard)
5	Bat/MBS Battery Kit and Battery cut-off switch (Standard)
6	6-Way Valve (Standard) Automatic Fuel Pump AFP (Optional)
7	Quick Fit Fuel Connectors Stage V QFC-S5 (Optional)

Troubleshooting Causes and Solutions

It does not start	The engine is running but it does not start correctly	It does not reach the correct operating speed	VOLTAGE AND/OR FREQUENCY low or zero	The auxiliary services do not work	The generator does not produce voltage	Low oil pressure	High water temperatures	Excessive speed	Low fuel level	Discharged battery	Black smoke	Noisy engine	Possible cause	Solution
●													The generator is blocked following a malfunction.	Find the problem and contact the after-sales center if necessary.
●	●												Discharged batteries.	Check and recharge the batteries. If necessary, replace them.
●	●												Corroded or loose battery connections.	Check the cables and terminals. If the terminals and bolts are corroded, replace them. Fix them in safe conditions.
●										●			Inefficient connections, damaged batteries or battery charger.	Check the connections to the battery charger and the batteries.
●													Faulty starter motor.	Contact the after-sales service center to request assistance.
●	●												No fuel.	Check the fuel tank and add fuel if there is no leakage.
	●								●				Air in fuel line.	Empty air from the fuel line.
	●												Blocked fuel filter.	Replace the filter.
	●	●	●										Fuel system malfunction.	Contact the after-sales service center to request assistance.
	●	●	●								●	●	Blocked air filter.	Replace the filter.
	●										●		Cold weather conditions.	Check the viscosity of the specific SAE lubricating oil and the fuel characteristics.
	●												Speed regulator malfunction.	Contact the after-sales service center to request assistance.

WARNING

Perform the troubleshooting operations according to the safety information provided in this manual.

Do not try to resolve problems whose possible causes are not described in this paragraph so as to safeguard the persons exposed and prevent the generator from being damaged. Contact the qualified personnel of the manufacturer.

Troubleshooting Causes and Solutions

It does not start	The engine is running but it does not start correctly	It does not reach the correct operating speed	Voltage and/or frequency low or zero	The auxiliary services do not work	The generator does not produce voltage	Low oil pressure	High water temperatures	Excessive speed	Low fuel level	Discharged battery	Black smoke	Noisy engine	Possible cause	Solution
	●	●	●					●					Voltage regulator malfunction.	Contact the after-sales service center to request assistance.
		●	●		●								Speed is too low.	Check the speed regulator if the engine is equipped with it. If the engine is not equipped with a mechanical speed regulator, contact the after-sales assistance center to request assistance.
		●	●										Relative instruments malfunction.	Check and replace if necessary.
			●										Instrument connections.	Check the connections of the instruments.
			●										The switch has tripped due to excess voltage.	Reduce the excess voltage.
			●										The safety switch of the access door to the load cables is open.	Lock the access door to power cables
					●		●	●			●		Power surge.	Check that the generator is not in overload conditions, even in relation to the ambient temperature which could be higher than normal.
				●	●								The main switch has been activated. Short-circuit or grounding malfunction.	Check all the circuits in relation to any type of damage to machines or connected cables.
				●									Auxiliary services malfunction.	Contact the after-sales service center to request assistance.
				●									No power supply.	Check the power circuits.
											●		The oil level is high.	Remove excess oil.
						●							The oil level is low.	Add oil to restore the oil level in the engine block. Check that there is no leakage.
						●							Blocked oil filter.	Replace the filter.
						●							Oil pump malfunction.	Contact the after-sales service center to request assistance.
							●						The coolant level in the radiator is low.	Wait for the machine to cool off and check the liquid level in the radiator; add coolant if necessary. Check that there is no leakage.
							●						Water pump malfunction.	Contact the after-sales service center to request assistance.
						●	●	●	●	●			A malfunction in the relative alarm: the sensor, electric control panel or electric connections are faulty	Check the electric connections between the sensor and the panel. Check that the electric connections of the sensor are not earthed. Check the sensor and replace it if necessary.
							●						Dirty or blocked radiator/heat exchanger.	Check that the radiator/heat exchanger is clean. Check that no blocks occur in the air circulation or recirculation of outgoing air at the air inlet.
●	●	●	●	●	●	●	●	●		●	●	●	Other possible causes.	Contact the after-sales assistance center for a solution.

Section 6: Decommissioning and Scraping

Safety During Decommissioning and Scrapping Operations

The following are the main safety precautions which the user must comply with. However, since it is impossible to report all the dangers that could arise when decommissioning and scrapping, remember that the decision whether an operation is to be performed is strictly personal.

WARNING

Failure to comply with the instructions and precautions provided could cause serious or fatal injuries. Always follow the procedures and precautions indicated in this manual. Do not perform maintenance that is not described in this manual, for which it is necessary to contact the manufacturer.

Perform the following operations according to the safety information provided in the MAINTENANCE chapter, especially in the “Safety Precautions for Maintenance” paragraph.

Decommissioning for Long Periods of Time

WARNING

The operations described below must only be carried out by specialized personnel.

The following operations require an in-depth knowledge of certain parts of the engine. See the manufacturer's documentation of the engine for further information or, if necessary, refer to specialized personnel.

NOTE

Should the generator be stored in conditions other than those described, refer to the nearest assistance center.

NOTE

The fuel and oil used in the engine of the generator and therefore, any oil preservatives used, are harmful to the environment; dispose of them in compliance with the legislation in force in the country of use and if present, by contacting collection and disposal associations.

If the generator is not to be used for long periods of time, perform the following operations to make sure it is stored and protected correctly.

Follow the specific guidelines provided in the manuals of the relative manufacturers, according to the type of engine, in order to carry out the operations correctly. The main operations that must be carried out are:

- Disconnect all the utilities.
- Empty the fuel and AdBlue/DEF tanks completely.
- Drain the engine oil and the coolant.
- Disconnect the battery cables
- If the generator is of the Open Set type, clean. Clean the engine and the generator and cover them.

Once the preparation phases are completed, store the generator, remembering that:

- The storage place must have a temperature and humidity characteristics that comply with extremely cold and/or hot/humid climates.
- The storage place must be covered and must not be dirty and exposed to dust accumulation.

Final Decommissioning and Scrapping

WARNING

Scrapping and final decommissioning of the generator must be carried out by qualified personnel who work in a specialized waste treatment center, to which the generator must be handed or requested to be collected. The generator cannot be disposed of in the environment, regardless whether intact or partially disassembled or demolished; it must be disposed of in accordance with the requirements stipulated by the law in force in the country of use.

Waste is defined as any substance or object that may be the product of human activity or natural cycles, abandoned or intended to be abandoned.

The following waste categories must be considered as special waste:

- Machinery and equipment generally deteriorated or obsolete;
- Motor vehicles and their out-of-order components.

All products that contain or are contaminated with the substances indicated in the EU Directives 75/442/EC, 76/403/EC and 78/319/EC are considered as harmful-toxic waste.

Special Requirements for Disposal

Application of Directive 2002/96/EC (WEEE)

Waste from electrical and electronic equipment may contain hazardous substances with potentially harmful effects on the environment and human health. Please dispose of it in compliance with the law in force in the country of use. With reference to Directive 2002/96/EC WEEE (Waste Electrical and Electronic Equipment), when decommissioning, the electrical and electronic components must be separated and disposed of adequately in centers specialized in waste treatment.

Application of Directive 2002/95/EC (ROHS)

- In relation to the restrictions on the use of hazardous substances, it should be noted that the electrical and electronic components used in the generator do not contain harmful or hazardous substances in percentages that exceed the legally accepted limits.

In case of fire and/or improper use of the generator or its components, the possible release of substances harmful to humans and the environment has been verified.

Disposal of Fuel, AdBlue/DEF and Waste Oils

The fuel, AdBlue/DEF and oil used in the engine of the generator are harmful to the environment. Dispose of them when in use and, if present, contact collection and disposal associations.

Section 7: Specifications

Information on Lubricants, Liquids and Coolants

Engine Oil

Refer to the use and maintenance manual supplied with the engine.

Engine Oil Viscosity

Refer to the use and maintenance manual supplied with the engine.

Fuel

The fuel must comply with national and international standards for commercial fuels. Refer to the use and maintenance manual supplied with the engine.

Engine Coolant

The radiator coolant even protects against internal corrosion, erosion and damage caused by freezing. Refer to the use and maintenance manual supplied with the engine.

AdBlue/DEF

Refer to the use and maintenance manual supplied with the engine.

NOTE

Use AdBlue/DEF according to ISO 22241. The use of AdBlue/DEF not in accordance with ISO 22241 compromises the functionality of the exhaust gas treatment system. In case of use of AdBlue/DEF that does not comply with ISO 22241, compliance with the emission limits is not guaranteed and any requests for repair under warranty will be rejected.

Derating Due to Environmental Conditions

Performance could be subject to downgrading with respect to the nominal values as a result of the environmental conditions being different from the nominal conditions stipulated by the reference standard (ISO8528-1), such as different temperature, altitude and humidity. This applies to both the engine and the alternator it is coupled to and therefore, for the overall performance of the generator set.

It is important for the user or customer to clearly inform the manufacturer concerning the environmental conditions in which the generator will operate just as performance reduction and derating of the generator set must be established when placing the order. This will make it possible to appropriately adjust the engine and alternator before being commissioned.

It is very important for the user or customer to specify the following data (ref. ISO8528-1) when indicating the environmental conditions in which the generator will operate:

- The minimum, maximum and average monthly temperature during the coldest and hottest months of the year.
- The lowest and highest ambient temperature around the generator set engine.
- The relative humidity or, alternatively, the water vapor pressure or wet and dry bulb temperatures, measured at the maximum ambient temperature.
- Any other environmental condition which could require special solutions or shorter maintenance cycles, such as:
  - Environments full of dust and/or sand
  - Marine environments
  - Environments with particularly high solar radiation
  - Environments with the possibility of chemical pollution
  - Environments with the presence of radiations
  - Operating conditions in the presence of strong vibrations (for example, zones affected by earthquake or vibrations generated by high equipment operating nearby).

Contact the generator manufacturer should you require further details concerning de-rating due to environmental conditions.

ROUTINE AND EXTRAORDINARY MAINTENANCE LOG

Purchase date (Year/Month/Day):___/___/___

Purchased from (Dealer): _____

Installed by (Installer): _____

Date of installation and commissioning

(Year/Month/Day):___/___/___

Affected Components:

Reason for intervention:

Supplier of the service:

Relative components (code and description)	Reason for intervention and/or problem component(s)	Supplier of the intervention service	Date of detection(s)	**Date of intervention**

Section 8: NHTSA Trailer Equipment Requirements

Reporting Safety Defects to the United States Government

If you believe your trailer has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Generac Mobile.

If NHTSA receives similar complaints, it may open an investigation; and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in an individual problem between you, your GMASD, or Generac Mobile.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-888-327-4236 (TTY:1-800-424-9153), go to ***http://www.safercar.gov***; or write to:

Administrator
NHTSA
400 Seventh Street, SW.
Washington, DC 20590

You can also obtain other information about motor vehicle safety from ***http://www.safercar.gov***.

Tire Safety Information

The following section contains tire safety information as required by 49 CFR 575.6. It will cover the following:

- Tire labeling, including a description and explanation of each marking on tires provided with the vehicle, and information about the location of the Tire Identification Number (TIN);
- Recommended tire inflation pressure, including a description and explanation of:
  - Recommended cold tire inflation pressure,
  - The vehicle placard and tire inflation pressure label and their location in the vehicle
  - Adverse safety consequences of underinflations (including tire failure), and
  - Measuring and adjusting air pressure to achieve proper inflation;
- Glossary of tire terminology, including “cold tire pressure”, “maximum inflation pressure,” and “recommended inflation pressure,” and other non-technical terms;
- Tire care, including maintenance and safety practices;
- Vehicle load limits, including a description and explanation of:
  - Locating and understanding load limit information, total load capacity, seating capacity, towing capacity, and cargo capacity,
  - Calculating total and cargo load capacities with varying seating configurations including quantitative examples showing/illustrating how the vehicle’s cargo and luggage capacity decreases as the combined number and size of occupants increases,
  - Determining compatibility of tire and vehicle load capabilities,
  - Adverse safety consequences of overloading on handling and stopping on tires.

Steps for Determining Correct Load Limit – Trailer

Determining the load limits of a trailer includes more than understanding the load limits of the tires alone. On all trailers there is a Federal certification / VIN label that is located on the forward half of the left (road) side of the unit. This certification / VIN label will indicate the trailer’s Gross Vehicle Weight Rating (GVWR). This is the most weight the fully loaded trailer can weigh. It will also provide the Gross Axle Weight Rating (GAWR). This is the most a particular axle can weigh. If there are multiple axles, the GAWR of each axle will be provided.

If your trailer has a GVWR of 10,000 pounds or less, there is a vehicle placard located in the same location as the certification label described above. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity. Cargo can be added to the trailer, up to the maximum weight specified on the placard. The combined weight of the cargo is provided as a single number. In any case, remember: the total weight of a fully loaded trailer cannot exceed the stated GVWR.

For trailers with living quarters installed, the weight of water and propane also need to be considered. The weight of fully filled propane containers is considered part of the weight of the trailer before it is loaded with cargo, and is not considered part of the disposable cargo load. Water, however, is a disposable cargo weight and is treated as such. If there is a fresh water storage tank of 100 gallons, this tank when filled would weigh about 800 pounds. If more cargo is being transported, water can be off-loaded to keep the total amount of cargo added to the vehicle within the limits of the GVWR so as not to overload the vehicle. Understanding this flexibility will allow you, the owner, to make choices that fit your travel needs.

When loading your cargo, be sure it is distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire. The best way to know the actual weight of the vehicle is to weigh it at a public scale. Talk to your dealer to discuss the weighing methods needed to capture the various weights related to the trailer. This would include the weight empty or unloaded, weights per axle, wheel, hitch or king-pin, and total weight.

Excessive loads and/or underinflation cause tire overloading and, as a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load, so proper inflation is critical. The proper air pressure may be found on the certification / VIN label and/or on the Tire Placard. This value should never exceed the maximum cold inflation pressure stamped on the tire.

Trailers 10,000 lbs (4,536 kg) GVWR or Less

1. Locate the statement “The weight of cargo should never exceed XXX kg or XXX lbs.” on your vehicle’s placard.
2. This figure equals the available amount of cargo and luggage load capacity.
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

Trailers over 10,000 lbs (4,536 kg) GVWR

NOTE: These trailers are not required to have a tire information placard on the vehicle.

4. Determine the empty weight of your trailer by weighing the trailer using a public scale or other means. This step does not have to be repeated.
5. Locate the GVWR of the trailer on your trailer’s VIN (Certification) label.
6. Subtract the empty weight of your trailer from the GVWR stated on the VIN label. That weight is the maximum available cargo capacity of the trailer and may not be safely exceeded.

Steps for Determining Correct Load Limit – Tow Vehicle

1. Locate the statement “The combined weight of occupants and cargo should never exceed XXX kg or XXX lbs.” on your vehicle’s placard.
2. Determine the combined weight of the driver and passengers that will be riding in your vehicle.
3. Subtract the combined weight of the driver and passengers from XXX kg or XXX lbs.
4. The resulting figure equals the available amount of cargo and luggage load capacity. For example, if the “XXX” amount equals 1400 lbs. and there will be five 150 lb passengers in your vehicle, the amount of available cargo and luggage load capacity is 650 lbs. (1400-750 (5x150) = 650 lbs.)
5. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity calculated in Step 4.
6. If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult the tow vehicle’s manual to determine how this reduces the available cargo and luggage load capacity of your vehicle.

Glossary of Tire Terminology

Accessory weight means the combined weight (in excess of those standard items which may be replaced) of automatic transmission, power steering, power brakes, power windows, power seats, radio, and heater, to the extent that these items are available as factory-installed equipment (whether installed or not).

Bead means the part of the tire that is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim.

Bead separation means a breakdown of the bond between components in the bead.

Bias ply tire means a pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread.

Carcass means the tire structure, except tread and sidewall rubber which, when inflated, bears the load.

Chunking means the breaking away of pieces of the tread or sidewall.

Cord means the strands forming the plies in the tire.

Cord separation means the parting of cords from adjacent rubber compounds.

Cracking means any parting within the tread, sidewall, or inner liner of the tire extending to cord material.

Curb weight means the weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, and, if so equipped, air conditioning and additional weight optional engine.

Cold inflation pressure means the tire pressure when the vehicle hasn’t been driven for at least three hours.

Extra load tire means a tire designed to operate at higher loads and higher inflation pressure than the corresponding standard tire.

Groove means the space between two adjacent tread ribs.

Gross Axle Weight Rating or GAWR means the value specified by the vehicle manufacturer as the load-carrying capacity of a single axle system, as measure at the tire-ground interfaces.

Gross Vehicle Weight Rating or GVWR means the value specified by the manufacturer as the loaded weight of a single vehicle.

Hitch weight means the downward force exerted on the hitch ball by the trailer coupler.

Inner liner means the layer(s) forming the inside surface of a tubeless tire that contains the inflating medium within the tire.

Inner liner separation means the parting of the inner liner cord material in the carcass.

Light truck (LT) tire means a tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles.

Load rating means the maximum load that a tire is rated to carry for a given inflation pressure.

Maximum load rating means the load rating for a tire at the maximum permissible inflation pressure for that tire.

Maximum permissible inflation pressure means the maximum cold inflation pressure to which a tire may be inflated.

Maximum loaded vehicle weight means the sum of (a) Curb weight; (b) Accessory weight; (c) Vehicle capacity weight; and (d) Production options weight.

Measuring rim means the rim on which a tire is fitted for physical dimension requirements.

Non-pneumatic rim means a mechanical device which, when a non-pneumatic tire assembly incorporates a wheel, supports the tire, and attaches, either integrally or separably, to the wheel center member and upon which the tire is attached.

Non-pneumatic spare tire assembly means a non-pneumatic tire assembly intended for temporary use in place of one of the pneumatic tires and rims that are fitted to a passenger car in compliance with the requirements of this standard.

Non-pneumatic tire means a mechanical device which transmits, either directly or through a wheel or wheel center member, the vertical load and tractive forces from the roadway to the vehicle, generates the tractive forces that provide the directional control of the vehicle and does not rely on the containment of any gas or fluid for providing those functions.

Non-pneumatic tire assembly means a non-pneumatic tire, alone or in combination with a wheel or wheel center member, which can be mounted on a vehicle.

Normal occupant weight means 68 kilograms (150 lbs.) times the number of occupants specified in the second column of Table I of 49 CFR 571.110.

Occupant distribution means distribution of occupants in a vehicle as specified in the third column of Table I of 49 CFR 571.110.

Open splice means any parting at any junction of tread, sidewall, or inner liner that extends to cord material.

Outer diameter means the overall diameter of an inflated new tire.

Overall width means the linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs.

Passenger car tire means a tire intended for use on passenger cars, multipurpose passenger vehicles, and trucks, that have a gross vehicle weight rating (GVWR) of 10,000 pounds or less.

Pin weight means the downward force applied to the 5th wheel or goose neck ball, by the trailer kingpin or goose neck coupler.

Ply means a layer of rubber-coated parallel cords.

Ply separation means a parting of rubber compound between adjacent plies.

Pneumatic tire means a mechanical device made of rubber, chemicals, fabric and steel or other materials, that, when mounted on an automotive wheel, provides the traction and contains the gas or fluid that sustains the load.

Production options weight means the combined weight of those installed regular production options weighing over 2.3 kilograms in excess of those standard items which they replace, not previously considered in curb weight or accessory weight, including heavy duty brakes, ride levelers, roof rack, heavy duty battery, and special trim.

Radial ply tire means a pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the centerline of the tread.

Recommended inflation pressure means the proper Cold Inflation Pressure as shown on the Tire Information label.

Reinforced tire means a tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard fire.

Rim means a metal support for a tire or a tire and tube assembly upon which the tire beads are seated.

Rim diameter means nominal diameter of the bead seat.

Rim size designation means rim diameter and width.

Rim type designation means the industry of manufacturer's designation for a rim by style or code.

Rim width means nominal distance between rim flanges.

Section width means the linear distance between the exteriors of the sidewalls of an inflated tire, excluding elevations due to labeling, decoration, or protective bands.

Sidewall means that portion of a tire between the tread and bead.

Sidewall separation means the parting of the rubber compound from the cord material in the sidewall.

ST tire means a tire designed for use only on trailers drawn on a road.

Test rim means the rim on which a tire is fitted for testing, and may be any rim listed as appropriate for use with that tire.

Tread means that portion of a tire that comes into contact with the road.

Tread rib means a tread section running circumferentially around a tire.

Tread separation means pulling away of the tread from the tire carcass.

Tread wear indicators (TWI) means the projections within the principal grooves designed to give a visual indication of the degrees of wear on the tread.

Vehicle capacity weight means the rated cargo and luggage load plus 68 kilograms times the vehicle's designated seating capacity.

Vehicle maximum load on the tire means that load on an individual tire that is determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two.

Vehicle normal load on the tire means that load on an individual tire that is determined by distributing to each axle its share of the curb weight, accessory weight, and normal occupant weight (distributed in accordance with Table I of 49 CFR 571.110) and dividing by two.

Wheel center member means, in the case of a non-pneumatic tire assembly incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic rim and provides the connection between the non-pneumatic rim and the vehicle; or in the case of a non-pneumatic tire assembly not incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic tire and provides the connection between the tire and the vehicle.

Wheel-holding fixture means the fixture used to hold the wheel and tire assembly securely during testing.

Tire Safety

The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by 49 CFR 575.6. This brochure is reproduced in part below. It can be obtained and downloaded from NHTSA, free of charge, from the following website:

http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents
- Improve fuel economy
- Increase the life of your tires

This booklet presents a comprehensive overview of tire safety, including information on the following topics:

- Basic tire maintenance
- Uniform Tire Quality Grading System
- Fundamental characteristics of tires
- Tire safety tips

Use this information to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

Basic Tire Maintenance

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle. Under-inflated tires and overloaded vehicles are a major cause of tire failure. Therefore, as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

Finding Your Vehicle's Recommended Tire Pressure And Load Limits

Tire information placards and vehicle certification labels contain information on tires and load limits. These labels indicate the vehicle manufacturer's information including:

- Recommended tire size
- Recommended tire inflation pressure
- Vehicle capacity weight (VCW – the maximum occupant and cargo weight a vehicle is designed to carry)
- Front and rear gross axle weight ratings (GAWR – the maximum weight the axle systems are designed to carry)

Both placards and certification labels are permanently attached to the trailer near the left front.

Understanding Tire Pressure And Load Limits

Tire inflation pressure is the level of air in the tire that provides it with load-carrying capacity and affects the overall performance of the vehicle. The tire inflation pressure is a number that indicates the amount of air pressure – measured in pounds per square inch (psi) – a tire requires to be properly inflated. (You will also find this number on the vehicle information placard expressed in kilopascals (kpa), which is the metric measure used internationally.)

Manufacturers of passenger vehicles and light trucks determine this number based on the vehicle's design load limit, that is, the greatest amount of weight a vehicle can safely carry and the vehicle's tire size. The proper tire pressure for your vehicle is referred to as the "recommended cold inflation pressure." (As you will read below, it is difficult to obtain the recommended tire pressure if your tires are not cold.)

Because tires are designed to be used on more than one type of vehicle, tire manufacturers list the "maximum permissible inflation pressure" on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

Checking Tire Pressure

It is important to check your vehicle's tire pressure at least once a month for the following reasons:

- Most tires may naturally lose air over time.
- Tires can lose air suddenly if you drive over a pothole or other object or if you strike the curb when parking.
- With radial tires, it is usually not possible to determine underinflation by visual inspection.

For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.

The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours.

When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for the extra pressure in warm tires.

Steps For Maintaining Proper Tire Pressure

1. Locate the recommended tire pressure on the vehicle's tire information placard, certification label, or in the owner's manual.
2. Record the tire pressure of all tires.
3. If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure.
4. If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These "missing" pounds of pressure are what you will need to add.
5. At a service station, add the missing pounds of air pressure to each tire that is under inflated.
6. Check all the tires to make sure they have the same air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure).

If you have been driving your vehicle and think that a tire is under inflated, fill it to the recommended cold inflation pressure indicated on your vehicle's tire information placard or certification label. While your tire may still be slightly under inflated due to the extra pounds of pressure in the warm tire, it is after to drive with air pressure that is slightly lower than the vehicle manufacturer's recommended cold inflation pressure than to drive with a significantly under inflated tire. Since this is a temporary fix, don't forget to recheck and adjust the tire's pressure when you can obtain a cold reading.

Tire Size

To maintain tire safety, purchase new tires that are the same size as the vehicle's original tires or another size recommended by the manufacturer. Look at the tire information placard, the owner's manual, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with the tire dealer.

Tire Tread

The tire tread provides the gripping action and traction that prevent your vehicle from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tires have built-in tread wear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear "even" with the outside of the tread, it is time to replace your tires. Another method for checking tread depth is to place a penny in the tread with Lincoln's head upside down and facing you. If you can see the top of Lincoln's head, you are ready for new tires.

Tire Balance And Wheel Alignment

To avoid vibration or shaking of the vehicle when a tire rotates, the tire must be properly balanced. This balance is achieved by positioning weights on the wheel to counterbalance heavy spots on the wheel-and-tire assembly. A wheel alignment adjusts the angles of the wheels so that they are positioned correctly relative to the vehicle's frame. These adjustments require special equipment and should be performed by a qualified technician.

Tire Repair

The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

Tire Fundamentals

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

Information on Passenger Vehicle Tires

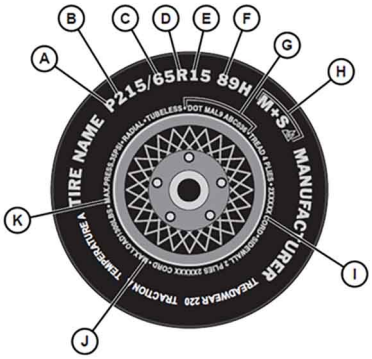


Figure 1-1. Passenger Vehicle Tires

A	“P” indicates the tire is for passenger vehicles.
B	This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.
C	This two-digit number, known as the aspect ratio, gives the tire’s ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.
D	“R” stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.
E	This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you will have to purchase new tires to match the new wheel diameter.
F	(Number) This two- or three-digit number is the tire’s load index. It is a measurement of how much weight each tire can support. You may find this information in your owner’s manual. If not, contact a local tire dealer. **NOTE:** You may not find this information on all tires because it is not required by law. (Letter) The speed rating denotes the speed at which a tire is designed to be driven for extended periods of time. The ratings range from 99 miles per hour (mph) to 186 mph. These ratings are listed below. **NOTE:** You may not find this information on all tires because it is not required by law. **NOTE:** See <Cross Reference>Figure 1-1 for complete list of letter and speed ratings.
G	U.S. DOT Tire Identification Number. This begins with the letters “DOT” and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer’s discretion. This information is used to contact consumers if a tire defect requires a recall.
H	The “M+S” or “M/S” indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.
I	Tire Ply Composition and Materials Used. The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.
J	Maximum Load Rating. This number indicates the maximum load in kilograms and pounds that can be carried by the tire.
K	Maximum Permissible Inflation Pressure. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

Table 1-1. Tire Letter and Speed Rating

Letter Rating	Speed Rating
Q	99 MPH
R	106 MPH
S	112 MPH

Table 1-1. Tire Letter and Speed Rating

Letter Rating	Speed Rating
T	118 MPH
U	124 MPH
H	130 MPH
V	168 MPH
Y	186 MPH

NOTE: For tires with a maximum speed capability over 149 mph, tire manufacturers sometimes use the letters ZR. For those with a maximum speed capability over 186 mph, tire manufacturers always use the letters ZR.

Uniform Tire Quality Grading (UTQGS)

Quality grades can be found where applicable on the tire sidewall between tread shoulder and maximum section width. For example: TREADWEAR 200 TRACTION AA.

Temperature A

All passenger car tires must conform to federal safety requirements in addition to these grades.

Tread Wear

The tread wear grade is a comparative rating based on the wear rate of the tire when tested under controlled conditions on a specified government test course. For example, a tire graded 150 would wear one and one-half (1.5) times as well on the government course as a tire graded 100. The relative performance of tires depends upon the actual conditions of their use, however, and may depart significantly from the norm due to variations in driving habits, service practices and differences in road characteristics and climate.

Traction

The traction grades, from highest to lowest, are AA, A, B, and C. Those grades represent the tire's ability to stop on wet pavement as measured under controlled conditions on specified government test surfaces of asphalt and concrete. A tire marked C may have poor traction performance.

NOTE: The traction grade assigned to this tire is based on straight-ahead braking traction tests, and does not include acceleration, cornering, hydroplaning, or peak traction characteristics.

Temperature

The temperature grades are A (the highest), B, and C, representing the tire's resistance to the generation of heat and its ability to dissipate heat when tested under controlled conditions on a specified indoor laboratory test wheel. Sustained high temperature can cause the material of the tire to degenerate and reduce tire life, and excessive temperature can lead to sudden tire failure. The grade C corresponds to a level of performance which all passenger car tires must meet under the Federal Motor Safety Standard No. 109. Grades B and A represent higher levels of performance on the laboratory test wheel than the minimum required by law.

NOTE: The temperature grade for this tire is established for a tire that is properly inflated and not overloaded. Excessive speed, under-inflation, or excessive loading, either separately or in combination, can cause heat buildup and possible tire failure.Additional Information on Light Truck Tires

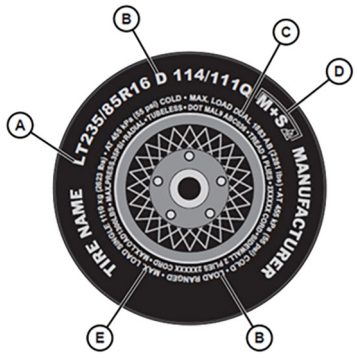


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Figure 1-2. Light Truck Tires

A	The "LT" indicates the tire is for light trucks. An "ST" is an indication the tire is for trailer use only.
B	Load Range. This information identifies the tire's load-carrying capabilities and its inflation limits.
C	Maximum Load Dual. This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle).*
D	The "M+S" or "M/S" indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.
E	This information indicates the maximum load and tire pressure when the tire is used as a single.*

* Maximum load is presented in kilograms and pounds (kg/lbs). Maximum tire pressure is presented in kilo-pascals and pounds per square inch (kPa/psi) for when the tire is cold.

Preventing Tire Damage

- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs of foreign objects in the roadway, and try not to strike the curb when parking.

Tire Safety Checklist

- Check tire pressure regularly (at least once a month), including the spare.
- Inspect tires for cracks, foreign objects, uneven wear patterns on the tread, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Verify your tire valves have valve caps.
- Check tire pressure before going on a long trip.
- Do not overload your vehicle. Check the tire information placard or owner's manual for the maximum recommended load for the vehicle.

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