



Clip-On Reefer Generator

Diesel Generator Set

User Manual

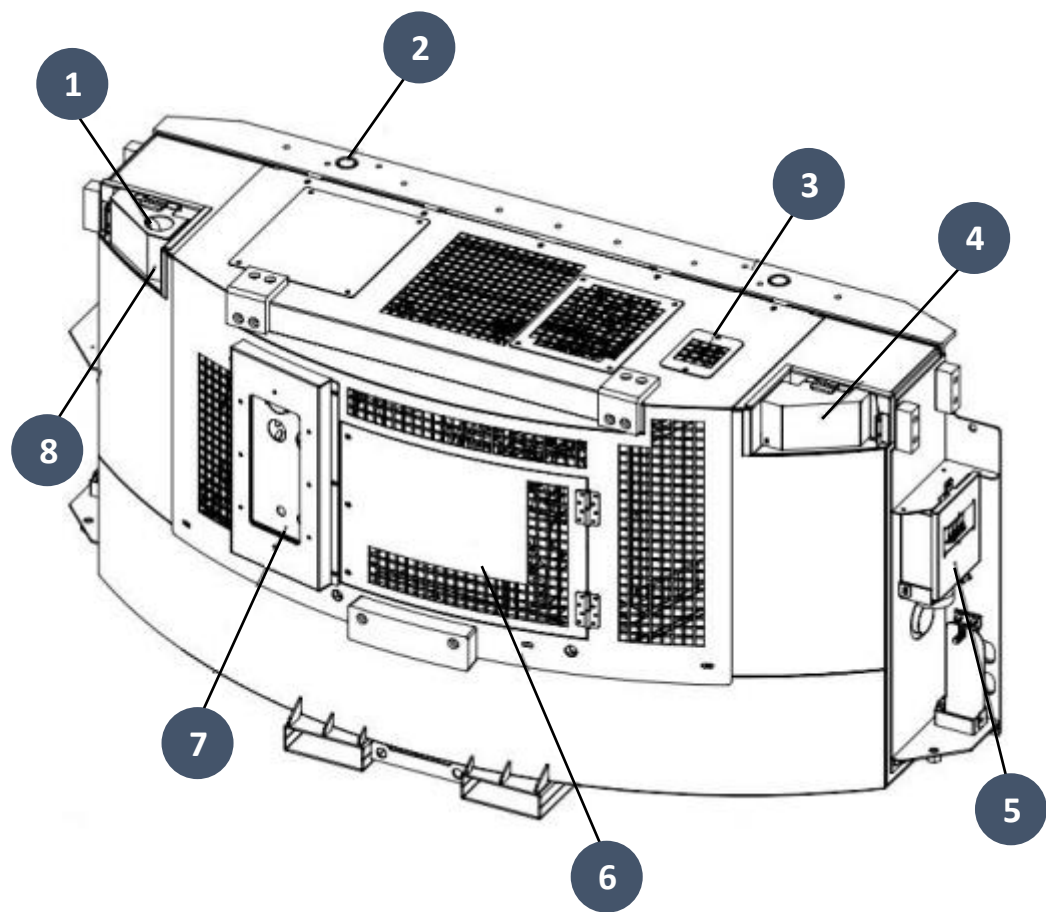
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Product information

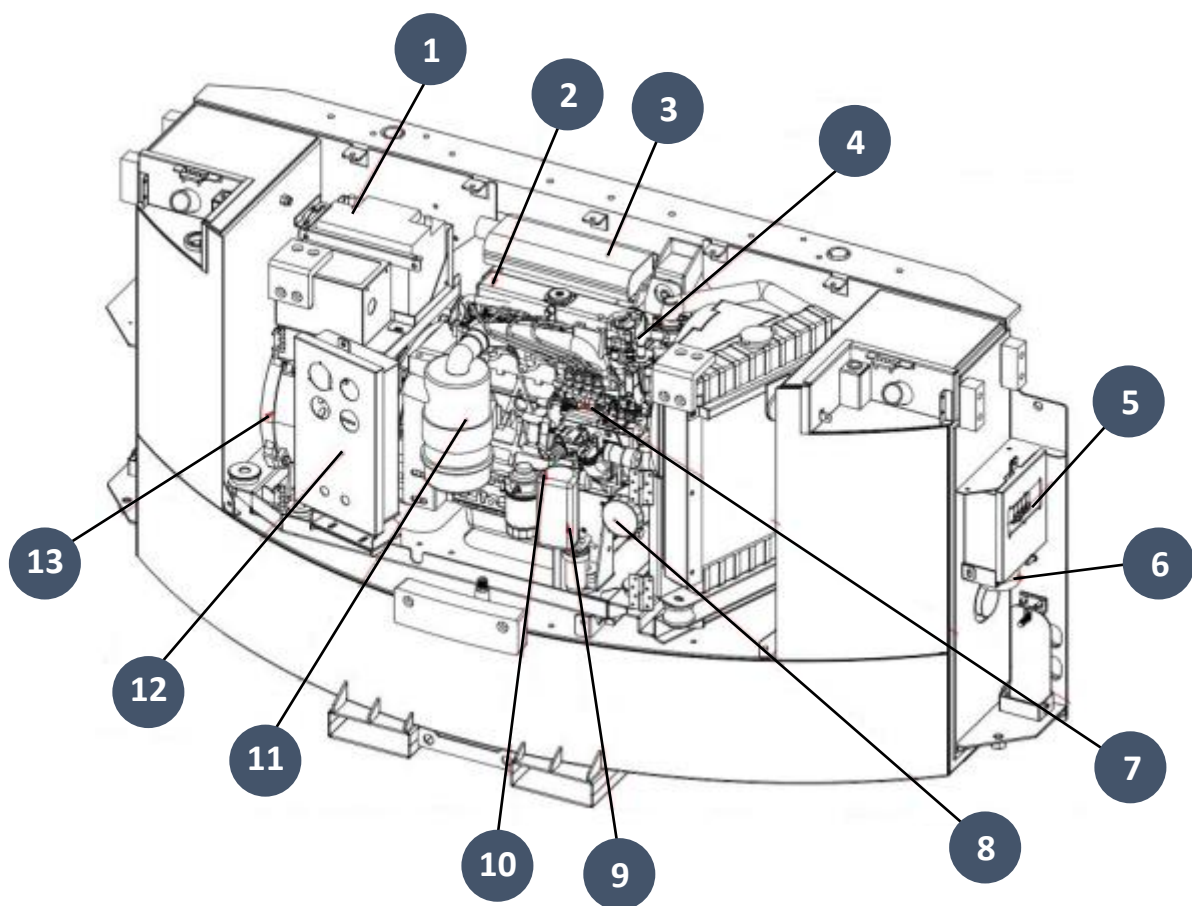
Views

External



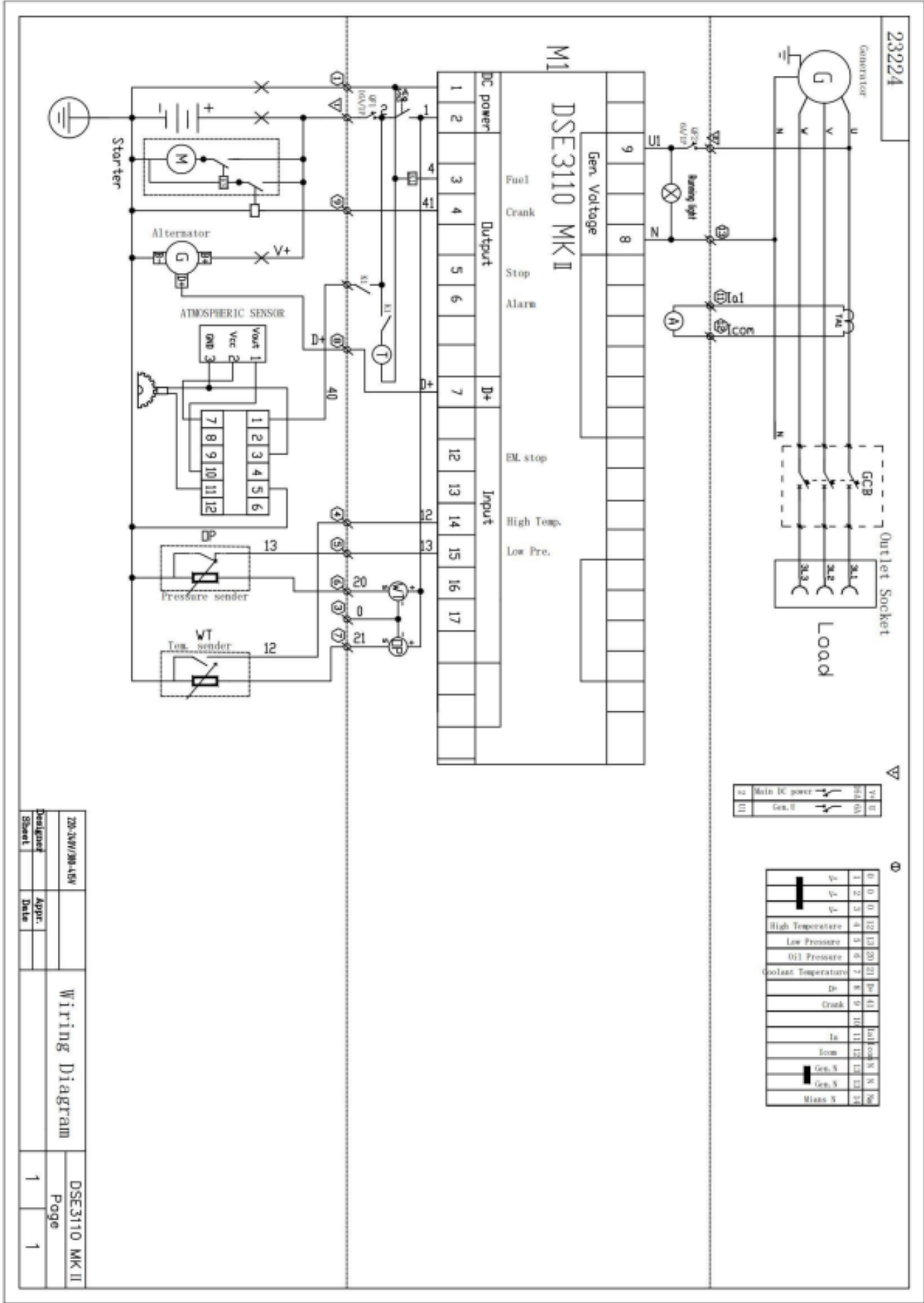
1. Fuel cap	5. Receptacle box
2. Mounting	6. Access door
3. Radiator cap	7. Control box
4. Fuel cap	8. Fuel gauge

Internal

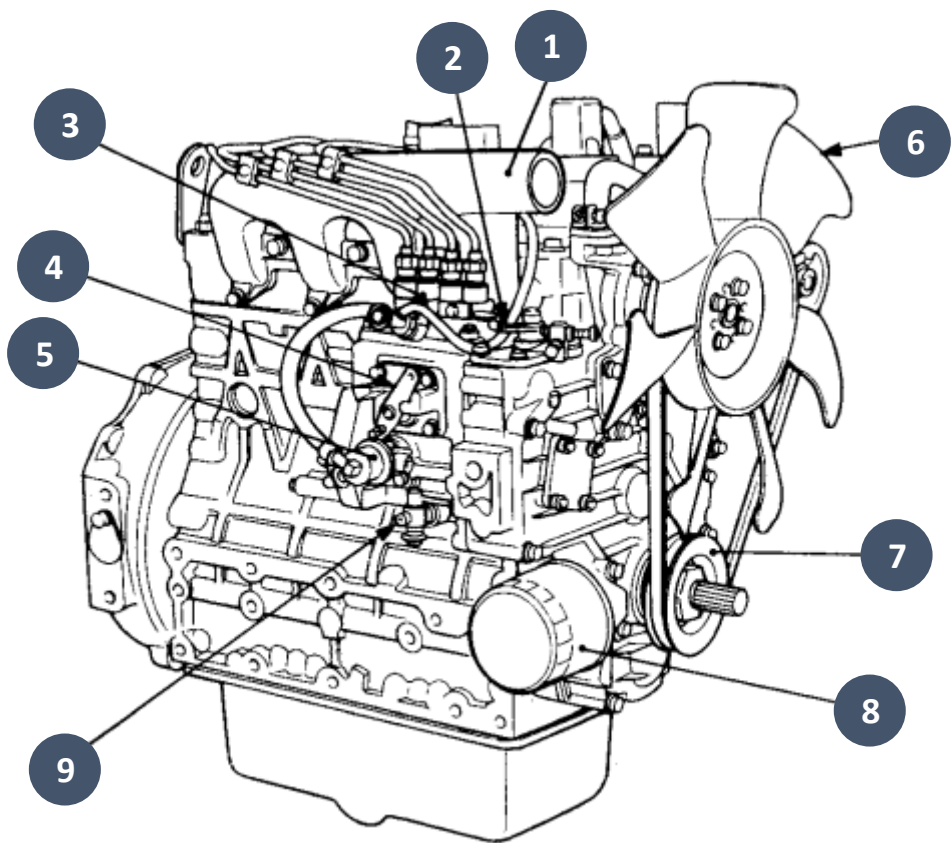


1. Battery	8. Engine oil filter
2. Engine	9. Coolant recovery bottle
3. Exhaust muffler	10. Lube oil dip stick
4. Water temp sender	11. Air cleaner
5. Circuit breaker	12. Control panel
6. Receptacle	13. AC generator
7. Inject pump	

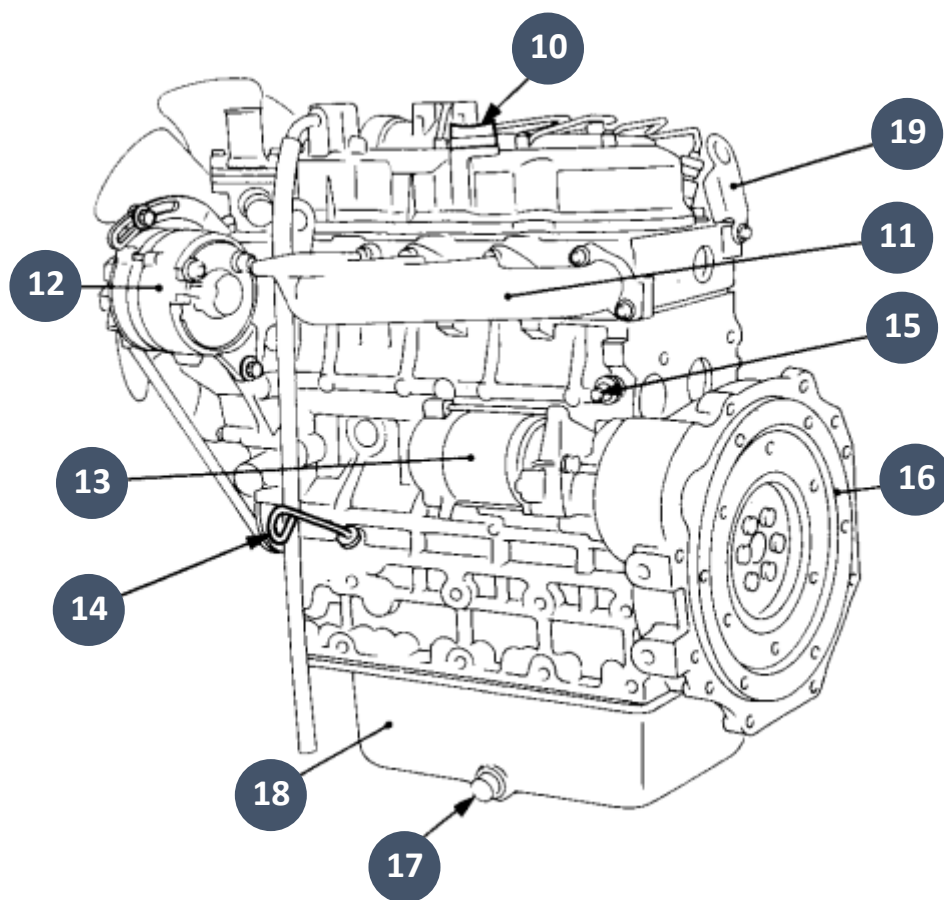
Wiring diagram



Engine



1. Intake manifold	6. Cooling fan
2. Speed control lever	7. Fan drive pulley
3. Injection pump	8. Oil filter cartridge
4. Engine stop lever	9. Water drain cock
5. Fuel feed pump	



10. Oil filter plug	15. Oil pressure switch
11. Exhaust manifold	16. Flywheel
12. Alternator	17. Oil drain plug
13. Starter	18. Oil pan
14. Oil level gauge	19. Engine hook

General specifications (Engine)

MITSUBISHI CORPORATION ENGINE ENGINEERING DEPARTMENT

General Specification

Standard	All items, unless otherwise specified, are in accordance with JIS and maker's standards	
Model	Mitsubishi S4L2 S4L2-W46 1LTSH MHIET No. 31A00-02880 (1/2-CHG 0, 2/2-CHG 0)	
Regulations	EPA & CARB Tier4 certified Engine family ; *MVXL01.8EBA (* : Model year code) Engine model ; S4L2 Engine code ; S4L2-P18-2	
	CHINA Export Only	
Use	LIGHT TOWER	
Type	4 cycle water-cooled, vertical overhead valve, cylinder in line, swirl chamber type	
Number of cylinders	4	
Bore × Stroke	78mm × 92mm	
Piston displacement	1.758 liters	
Compression ratio	22 : 1	
Rotation	Anti-Clockwise rotation as viewed from flywheel side	
Firing order	1-3-4-2	
Engine weight(Dry)	Approx. 160kg	
Dimensions(Length)	Approx. 669mm	
(Width)	Approx. 442mm	
(Height)	Approx. 572mm	
Inclination(Continuous)	15°	
(Temporary)	30°(Max 30 min.)	
Fuel	ASTM diesel fuel oil No.2-D(JIS K2204 gas oil specification No.2 or 3)	
Lubricating oil	API classification service CF or CH-4 class	
Output(Without fan)	Spec.Rating	Rating at delivery
	Breaking in around 50hr	Breaking in around 0.25hr
	St-by; 18.4kW {25.0PS}/1800rpm	17.5kW {23.8PS}/1800rpm
	Prime; 17.0kW {23.1PS}/1800rpm	
	(With Fan St-by; 18.1kW {24.6PS}/1800rpm)	
	(With Fan Prime; 16.7kW {22.7PS}/1800rpm)	
Rating tolerance	±5% of nominal	
Fuel consumption (Without fan)	Approx. 250g/kW·h at St-by output.	263g/kW·h at St-by output.
Tolerance	±8%	
Idling engine speed	1800 rpm (Fixed at rated speed)	
Speed regulation	Isochronous control	
Rating conditions (Without fan)	ISO 15550	
	Total barometric pressure : 100kPa	
	Air temperature : 298K	
	Relative humidity : 30%	
Oil consumption	Approx. 0.1 ~ 0.3% of fuel consumption <Reference value> @ Full load, Rated speed	
Fuel injection timing	15° BTDC	
Mean effective pressure	0.70MPa {7.1kgf/cm ² } at St-by output	
Piston speed	5.5m/s at 1800rpm	

Fuel system

Fuel injection pump	In-Line type(ND-PFR M type)
Fuel injection nozzle	Throttle type
Governor	Electric type * Speed signal that is 120 pulses per one revolution is required. [the acceptable amplitude range is from 1 to 42 Vrms.]
Fuel filter	No
Fuel pump	No
Min. required fuel feeding head	100mm
Max.static head of leak pipe (return)	200mmHg

Lubricating system

Lubricating system	Forced circulation by trochoid pump
Lubricating oil filter	Filtering paper type, full flow
Oil pressure	0.29MPa~0.39MPa{3~4kgf/cm ² } at duty run 0.098MPa{1.0kgf/cm ² } min. at low idling
Oil capacity	Approx.6.0 liters (Oil pan 5.5 liters, high level,Oil filter etc. Approx. 0.5 liters, High~Low Approx. 1.8 liters)
Oil dipstick	Standard dipstick
Oil pressure switch	Yes
Oil pressure unit	No

Cooling system

Cooling system	Forced circulation of fresh water by centrifugal pump with thermostat
Engine water capacity	Approx. 2.5 liters
Cooling fan	360mm diameter,6 blades, pusher
Water pump pulley	PCD 87mm
Pulley ratio	1.33(Crankpulley : Water pump pulley = 116 : 87)
Fan spacer	No
Water temp. switch	Yes
Thermo. Unit	No
Thermostat	Open at 76.5deg.C - full open at 90deg.C

Electrical system

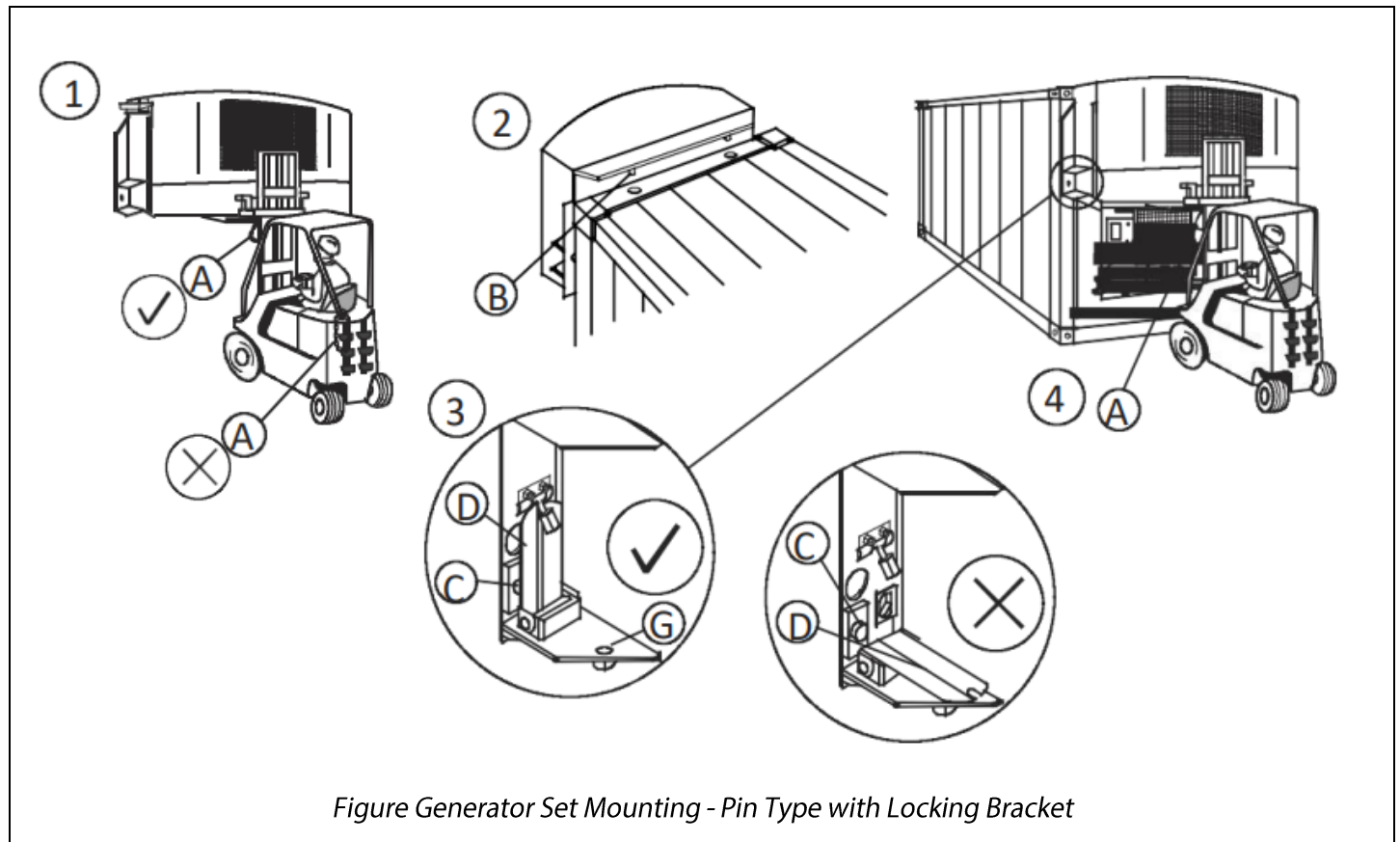
Alternator	12V - 50A
Voltage regulator	IC type (Built in alternator)
Regulator set voltage	14.7 ±0.3V
Alternator pulley	PCD 65mm
Starting system	Electric starting
Starter motor	12V-2.0kW
Glow plug	10.5V,9.7A x 4
Engine shut off system	Mechanical included in the electronic governor system

Intake and Exhaust system

Intake manifold(cover)	Upper side way
Exhaust manifold	Upper side way
Induction Resistance	Max 3.5kPa{357mmHz0}
Exhaust Back Pressure	Max 10.0kPa{1020mmHz0}

Operating instructions

Installation and removal instructions



WARNING

To prevent injury, the procedures provided for installation and removal of the generator set must be followed carefully.

NOTICE

This generator set is equipped with special pins and mounting bolts and can be installed only on containers with matching installation points.

Installation

1. Place the forks into the fork pockets of the generator set. Attach the safety chain (A) between the fork pockets on the generator set and the fork truck. Be sure chain (A) is short enough to retain the generator set on the forks.
2. Line up the generator set with the refrigeration unit and container. Raise the generator set until the top is several inches above the top edge of the container. Move the generator set against the container and lower into position. Ensure the two pins (B) are fully inserted into the holes of the container.

3. Keep the forks in pockets on the generator set and tighten the mounting bolt (C) on each side of the generator set into the container frame. Torque the mounting bolts to 125 + 25 ft. lbs (17.3 + 3.5 mkg). Ensure that the locking brackets (D) are locked into position so as to capture bolt heads (C) and prevent turning.
4. Remove the safety chain (A) before removing the forks. Place the forks into the fork pockets of the generator set. Attach the safety chain (A) between the fork pockets on the generator set and the fork truck. Be sure the chain (A) is short enough to retain the generator set on forks. Ensure that the generator set clamps (B) are in the unlocked position and actuating handle (C) in the horizontal position.
5. Move the generator set against the container and fully engage the clamps into the holes in the container castings. On both clamps, turn the actuating hand lever (C) into the vertical down position (locked). Using the ratchet handle (D), tighten the hand nut. Tightening should continue until the face of the clamp is pressed firmly against the corner casting and the actuating hand lever is moved over the locking tabs. Leave the ratchet handle (D) engaged in the tightening direction with the ratchet handle in the vertical down position.



Double-check that the generator set clamp (B) is securely tightened against the face of the corner casting and that the generator set clamp hand nut is tight before transporting the container. A loose fit could cause damage to both the generator set and the generator set clamp, and cause serious injury during transport.

6. Keeping the forks in pockets on the generator set, tighten bolt (E) into container frame on each side of the generator set. Torque mounting bolts to 125 + 25 ft. lbs (17.3 + 3.5 mkg). Ensure that the locking brackets (F) are locked into position so as to capture bolt heads (E) and prevent turning.
7. Remove the safety chain (A) before removing the forks.

Removal



Disconnect the power plug before removing the generator set.

1. Place the forks into the fork pockets on generator set. Attach the safety chain (A) between the fork pockets on the generator set and the fork truck.
2. Release the retaining plate from the locking bracket on each side of the generator set.
3. Remove the mounting bolt (E) on each side of the generator set and tighten into the threaded hole (G).
4. Loosen the ratchet handle (D) to disengage the clamps (B). Loosen the hand nut until the actuating hand lever is clear of the locking tabs.
5. Turn the actuating hand lever (C) upward into the horizontal position.
6. Carefully remove the generator set from the container.

Starting the stopping instructions

Pre-start inspection

1. Check the engine lubrication and fuel filters, oil lines, and connections for leaks. If required, tighten connections and/or replace gaskets.
2. Check the engine lubricating oil level.
3. Check the poly V-belt for fraying or cracks and proper tension.
4. Check the radiator hoses for leaks and check the radiator coolant level.
5. Check the radiator coil and generator air intake screen for cleanliness. If required, clean using compressed air, reversing the normal air flow.
6. Check the air cleaner for cleanliness and clean if necessary.
7. Check the in-line fuel strainer and clean if necessary.
8. Drain water from fuel filter bowl.
9. Check the battery terminals for cleanliness and secureness. If required, clean, then coat with a battery terminal sealant.
10. Check and if required, tighten all electrical connections.
11. Check and if required, tighten all hardware (brackets, etc.).
12. Ensure that the main generator set circuit breaker is in the OFF position.

Starting instructions

Before start up, both the genset circuit breaker and the refrigerated unit should be OFF. After start up, the genset unit should be run for at least two (2) minutes to allow the power source to stabilize before supplying power to the refrigerated unit. This will eliminate the potential of any cold start transient spikes from reaching the refrigerated unit. Cold start transient spikes can potentially cause nuisance over voltage alarms on refrigerated units that are sensitive to electrical spikes or transients.



- *Beware of moving the poly V-belt, belt-driven components, and hot exhaust components.*
- *Under no circumstances should ether or any other unauthorized starting aids be used in conjunction with the intake heater.*

NOTICE

Piston rings in engines that have operated less than 100 hours may not be fully seated. This may lead to the possibility of oil seepage from the exhaust pipe. To properly seat the rings, operate the engine under full load for a period of 24 hours. If condition persists, check valve clearance when engine is cold. (Refer to engine workshop manual).

Standard units

1. Make sure that CB-1 is in the OFF position.
2. Hook up the 460 volt cable from the refrigerated unit to the Genset receptacle.
3. Hold intake heater switch in the PREHEAT position. See below for the suggested hold times for a cold engine:

COLD ENGINE PREHEAT TIMES	
Ambient temperature	Time
Above 10°C/50°F	0 second
-5°C to 10°C (23°F to 50°F)	5 seconds
Below -5°C/23°F	10 seconds
Continuous use shall not exceed 20 seconds	

4. With the heater switch held in the PREHEAT position, place the ignition switch in the START position.
5. After the engine has started, continue to hold the heater switch in the PREHEAT position for approximately five (5) seconds until the engine develops sufficient oil pressure to close the oil pressure safety switch. When released, the heater switch will automatically return to the OFF position.
6. If the engine fails to start running after the ignition switch is in the starting position for eight (8) seconds, please try to start again after an interval of 30 seconds. Do not keep the starting motor running for more than 15 seconds.

Post-start inspection

1. Allow the Genset unit to run for at least two (2) minutes.
2. Turn on CB-1.
3. Check the generator output with a volt meter. Voltage output at start up with no load at 50Hz operation should be 1500 RPM, 360-460 VAC. Voltage output may vary and fall with ISO specifications based on ambient.
4. Start the refrigeration unit.
5. Run the engine for ten (10) minutes and check the total time meter operation.
6. Listen for any abnormal bearing noise from the AC generator.
7. Check the fuel lines, lube oil lines, and filters for leaks.
8. Check the exhaust system for leaks.

Stopping instructions

1. Place CB-1 in the OFF position.
2. Place the ignition switch in the OFF position.

Sequence of operation



Beware of moving the V-Belt and belt-driven components.

Standard units

To start the engine, the ignition switch (IGN) is held in the START position. With the switch in the START position, current flows to the start solenoid (SS).

The starter motor turns over the engine resulting in pumping of fuel to the engine cylinders by the injection pump. This fuel is ignited by heat of compression, thus starting the engine. When the engine has developed sufficient oil pressure, the low oil pressure (LOP) switch contacts off.

The generator set provides power to the safety relay (S). Once the engine has started and the start switch has been released, the starter motor will stop cranking. With the engine running, the battery charger provides DC power to operate the control system and charge the battery.