

Contents

1. INTRODUCTION	6
2. SAFETY	7
2.1 General	7
2.2 Personal Protective Equipment	7
2.3 Fire and Explosion	8
2.4 Mechanical.....	8
2.5 Chemical	8
2.6 Noise	8
2.7 Electrical	9
2.8 First Aid For Electric Shock	9
3. GENERAL DESCRIPTION	11
3.1 Typical Rating Plate	11
3.2 Generating Set Description.....	12
3.3 Generating Set Description (26 – 200 kVA Range)	13
4. INSTALLATION, HANDLING, TOWING AND STORAGE	14
4.1 General.....	14
4.2 Outdoor Installation	15
4.2.1 Positioning of Walk-in Containers	16
4.2.2 Concrete Plinth.....	16
4.3 Moving the Generating Set.....	16
4.3.1 Approved Lifting Methods for ISO Walk-in Containers.....	18
4.3.2 Approved Lifting Methods for Non-ISO Walk-in Containers	18
4.4 Foundations and Vibration Isolation.....	19
4.4.1 Foundation	19
4.4.2 Vibration Isolation	19
4.5 Towing (Portable Generating Sets).....	20
4.5.1 Preparing to Tow	20
4.5.2 Towing	20
4.5.3 Parking	20
4.6 Storage	21
4.6.1 Engine Storage	21
4.6.2 Alternator Storage.....	21
4.6.3 Battery Storage.....	21
5. CONTROL SYSTEM DESCRIPTION AND TROUBLE SHOOTING	22
5.1 Control System Description	22
5.2 1002T and LCP1002T	22
5.2.1 Control Panel Instrumentation	22
5.2.2 General Information 1002T / LCP1002T Control Systems.....	24
5.2.3 Pre-Start Checks.....	24
5.2.4 Normal Startup / Shutdown – Key Start Panel (1002T / LCP1002T)	25
5.2.5 Control System Fault Finding / Trouble Shooting Guide 1002T / LCP1002T	26

5.3	PowerWizard (PW1.0 & 2.0).....	27
5.3.1	General Information	27
5.3.2	PowerWizard Control Module Description.....	27
5.3.3	Pre-Start Checks (applicable to all control systems).....	28
5.3.4	Basic Operation	29
5.3.5	Fault / Alarm Reset Process	30
5.3.6	User Interface Overview.....	30
5.3.7	Alarm Log and Resetting	32
5.3.8	Security	33
5.3.9	Real Time Clock Programming (PowerWizard 2.0).....	33
5.3.10	Fuel Priming – Engines with Electric Fuel Lift Pump	34
5.3.11	Additional Features Available.....	34
5.3.12	Trouble Shooting Guide for PowerWizard.....	34
5.4	PowerWizard (PW 1.1, 1.1+ and 2.1)	35
5.4.1	General Information	35
5.4.2	PowerWizard Control Module Description.....	35
5.4.3	Pre-Start Checks (applicable to all control systems).....	36
5.4.4	Basic Operation	37
5.4.5	Fault / Alarm Reset Process	38
5.4.6	User Interface Overview.....	38
5.4.7	Alarm Log and Resetting	40
5.4.8	Security	41
5.4.9	Real Time Clock Programming (PowerWizard 2.1).....	42
5.4.10	Fuel Transfer (PowerWizard 2.1).....	42
5.4.11	Additional Features Available.....	42
5.4.12	Trouble Shooting Guide for PowerWizard.....	42
5.5	Control System Options and Upgrades	44
5.5.1	Battery Trickle / Switch-Mode Chargers	44
5.5.2	Heaters	44
5.5.3	Electric Fuel Transfer Pumps.....	44
5.5.4	Meters / Gauges	45
5.5.5	Speed / Voltage Control	45
5.5.6	Alarm Signalling	45
5.5.7	Automatic Preheat Control	45
5.5.8	Remote Annunciator Panels	45
6.	OPERATION	46
6.1	Priming Procedure for 1100 Series	46
6.1.1	Products fitted with the small Perkins pre-filter / water separator	46
6.1.2	Products fitted with the Racor Pre-Filter / Water Separator (Option)	47
6.1.3	Troubleshooting.....	48
7.	LOAD TRANSFER PANELS	49
7.1	Engine Interface Module Description	50
7.2	Output Circuit Breaker Description	50

8. ELECTRONIC ENGINE FAULT DETECTION FLASH CODES	51
9. MAINTENANCE	52
9.1 Battery Removal and Fitting	52
9.2 Preventative Maintenance	52
9.3 Alternator Preventative Maintenance	53
9.4 Engine Preventative Maintenance	53
HAZARD LABEL LEGEND	54

1. INTRODUCTION

Thank you for choosing our company to supply your electrical power needs. In line with our policy of continuous product improvement, we reserve the right to change the information contained within this manual without notice.

This Operator Instruction Manual has been designed to help you operate and maintain your electrical generating set correctly. We recommend that the operator should take the time to read this manual.

This generating set is one of a family of heavy duty industrial generating sets designed to be ready to run when it arrives. Years of diesel generating set experience has gone into the set to produce a quality source of electrical power that is efficient and reliable.

Always ensure that maintenance, adjustments and repairs are done by personnel who are authorised to do the work and have been properly trained. Maintenance and repairs should also be carried out at regular intervals using genuine parts, this will prolong the life of the generating set. The manufacturer is not liable for any defects or claims due to the user's improper installation, maintenance or use, or for any products which have been modified in any way from the state in which they were sold.

Every generating set is uniquely defined by a model number and serial number indicated on a rating plate generally affixed to the alternator housing (See Section 3.1). This information is required when ordering spare parts or when service or warranty work is required.

2. SAFETY

2.1 General

The generating set is designed to be safe when used in the correct manner. Responsibility for safety, however, rests with the personnel who use the set. Before performing any procedure or operating technique, it is the user's responsibility to ensure that it is safe to do so.

WARNING:

- ⚠ **Read and understand all safety precautions and warnings before operating the generating set.**
- ⚠ **Failure to follow the instructions, procedures and safety precautions in this manual may increase the possibility of accidents and injuries.**
- ⚠ **Never start the generating set unless it is safe to do so.**
- ⚠ **Do not attempt to operate the generating set with a known unsafe condition.**
- ⚠ **If the generating set is unsafe, fit danger notices and disconnect the battery negative (-) lead so that it cannot be started until the condition is corrected.**
- ⚠ **Disconnect the battery negative (-) lead prior to attempting installation, repairs or cleaning on the generating set.**
- ⚠ **Install and operate this generating set only in full compliance with relevant National, Local, or Federal Codes, Standards or other requirements.**

2.2 Personal Protective Equipment



Figure 2a – Typical PPE to be worn by an Operator

- Wear a hard hat, protective glasses, and other protective equipment, as required.
- When work is performed around an engine that is operating, wear protective devices for ears in order to help prevent damage to hearing.
- Do not wear loose clothing or jewellery that can snag on controls or on other parts of the engine.
- Ensure that all protective guards and all covers are secured in place on the engine.
- Never put maintenance fluids into glass containers. Glass containers can break.
- Use all cleaning solutions with care.
- Report all necessary repairs.

Unless other instructions are provided, perform the maintenance under the following conditions:

- The engine is stopped. Ensure that the engine cannot be started.
- Disconnect the batteries when maintenance is performed or when the electrical system is serviced. Disconnect the battery ground leads. Tape the leads in order to help prevent sparks.
- Do not attempt any repairs that are not understood. Use the proper tools. Replace any equipment that is damaged or repair the equipment.

2.3 Fire and Explosion

Fuels and fumes associated with generating sets can be flammable and potentially explosive. Proper care in handling these materials can dramatically limit the risk of fire or explosion. However, safety dictates that fully charged BC and ABC fire extinguishers are kept on hand. Personnel must know how to operate them.



WARNING:

- △ Ensure the generating set room is properly ventilated.
- △ Keep the room, the floor and the generating set clean. When spills of fuel, oil, battery electrolyte or coolant occur, they should be cleaned up immediately.
- △ Never store flammable liquids near the engine.
- △ Store oily rags in covered metal containers.
- △ Do not smoke or allow sparks, flames or other sources of ignition around fuel or batteries. Fuel vapours are explosive. Hydrogen gas generated by charging batteries is also explosive.
- △ Avoid refilling the fuel tank while the engine is running.
- △ Do not attempt to operate the generating set with any known leaks in the fuel system.

2.4 Mechanical

The generating set is designed with guards for protection from moving parts. Care must still be taken to protect personnel and equipment from other mechanical hazards when working around the generating set.

WARNING:

- △ Do not attempt to operate the generating set with safety guards removed. While the generating set is running do not attempt to reach under or around the guards for any reason.
- △ Keep hands, arms, long hair, loose clothing and jewellery away from pulleys, belts and other moving parts.
 - Some moving parts can not be seen clearly when the set is running.
- △ Keep access doors on enclosures, if equipped, closed and locked when not required to be open.
- △ Avoid contact with hot oil, hot coolant, hot exhaust gases, hot surfaces, sharp edges and corners.
- △ Wear protective clothing including gloves and hat when working around the generating set.

2.5 Chemical

Fuels, oils, coolants, lubricants and battery electrolyte used in this generating set are typical of the industry. However, they can be hazardous to personnel if not treated properly. The disposal of fuels, oils, coolants, lubricants, battery electrolyte and batteries should be carried out in accordance with local government laws and regulations.

WARNING:

- △ Do not swallow or have skin contact with fuel, oil, coolant, lubricants or battery electrolyte. If swallowed, seek medical treatment immediately. Do not induce vomiting if fuel is swallowed. For skin contact, wash with soap and water.
- △ Do not wear clothing that has been contaminated by fuel or lube oil.

2.6 Noise

WARNING:

- △ Prolonged exposure to noise levels above 80 dBA is hazardous to hearing.
- △ Ear protection must be worn when operating or working around an operating generating set.

2.7 Electrical

Safe and efficient operation of electrical equipment can be achieved only if the equipment is correctly operated and maintained.

WARNING:

- ⚠ Ensure the generating set, including a mobile set, is effectively grounded/earthed prior to operation.
- ⚠ Do not touch electrically energised parts of the generating set and/or interconnecting cables or conductors with any part of the body or with any non insulated conductive object.
- ⚠ Use only Class BC or Class ABC extinguishers on electrical fires.

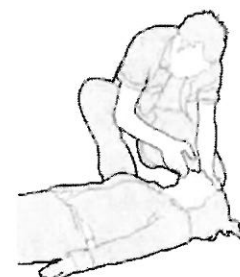
2.8 First Aid For Electric Shock

WARNING:

- ⚠ Do not touch the victim's skin with bare hands until the source of electricity has been turned off.
- ⚠ Switch off the power, if possible.
- ⚠ Otherwise pull the plug or pull the cable away from the victim.
- ⚠ If this is not possible, stand on dry insulating material and pull the victim clear of the conductor, preferably using insulated material such as dry wood.
- ⚠ If victim is breathing, turn the victim into the recovery position.
- ⚠ If victim is unconscious, perform resuscitation as required:

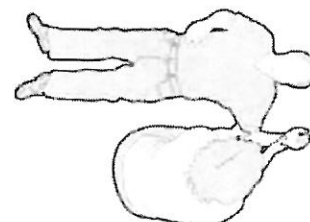
OPEN THE AIRWAY:

1. Tilt the victim's head back and lift the chin upwards.
2. Remove objects from the mouth or throat (including false teeth, tobacco or chewing gum).



BREATHING:

1. Check that the victim is breathing by looking, listening and feeling for the breath.

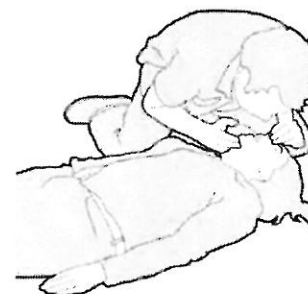


CIRCULATION:

1. Check for pulse in the victim's neck.

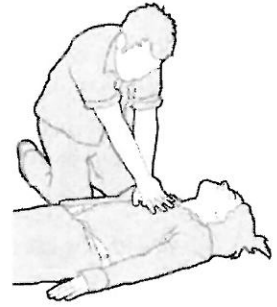
IF NO BREATHING BUT PULSE IS PRESENT:

1. Pinch the victim's nose firmly.
2. Take a deep breath and seal your lips around the victim's lips.
3. Blow slowly into the mouth watching for the chest to rise. Let the chest fall completely. Give breaths at a rate of 10 per minute.
4. If the victim must be left to get help, give 10 breaths first and then return quickly and continue.
5. Check for pulse after every 10 breaths.
6. When breathing restarts, place the victim into the recovery position described later in this section.



IF NO BREATHING AND NO PULSE:

1. Call or telephone for medical help.
2. Give two breaths and start chest compression as follows:
3. Place heel of hand 2 fingers breadth above ribcage/breastbone junction.
4. Place other hand on top and interlock fingers.
5. Keeping arms straight, press down 4–5 cm (1.5–2 inch) 30 times at a rate of 100 per minute. There should be equal timing between chest compression and release.
6. Repeat cycle (2 breaths, 30 compressions) until medical help takes over.
7. If condition improves, confirm pulse and continue with breaths. Check for pulse after every 10 breaths.
8. When breathing restarts, place the victim into the recovery position.

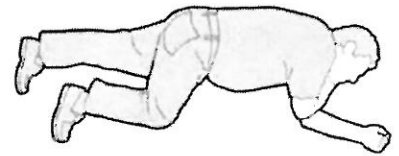


WARNING

- ⚠ Do not apply pressure over the ribs, lower tip of the victim's breastbone or the abdomen.

RECOVERY POSITION:

1. Turn the victim onto the side.
2. Keep the head tilted with the jaw forward to maintain the open airway.
3. Make sure the victim cannot roll forwards or backwards.
4. Check for breathing and pulse regularly. If either stops, proceed as above.



WARNING:

- ⚠ Do not give liquids until victim is conscious.

3. GENERAL DESCRIPTION

This generating set has been designed as a complete package to provide superior performance and reliability.

Each generating set is provided with a Rating Plate generally affixed to the alternator housing / panel enclosure. This label contains the information needed to identify the generating set and its operating characteristics. This information includes, but is not limited to, the model and serial numbers, output characteristics such as voltage, phase and frequency, output rating in kVA and kW and rating type (basis of the rating). The model and serial numbers uniquely identify the generating set.

The diesel engine powering the generating set has been chosen for its reliability and the fact that it has been specifically designed for powering generating sets. The engine is of the heavy duty industrial type with 4 stroke compression ignition and is fitted with all accessories to provide a reliable power supply.

The engine electrical system is either 12 or 24 volts DC depending on the size of the set.

The engine cooling system comprises of a radiator, a high capacity pusher fan and a thermostat. The main AC alternator has its own internal fan to cool the alternator components.

The output electrical power is produced by an alternator fine tuned to the output of this generating set.

The engine and alternator are coupled together and mounted on a heavy duty steel base frame. The base frame incorporates an integrated or polyethylene fuel tank except for the largest sets (approximately 1,000 kVA and above).

The generating set is fitted with vibration isolators which are designed to reduce engine vibration being transmitted to the foundation on which the generating set is mounted. These isolators are fitted between the engine/alternator feet and the base frame. Alternatively, on 4008, 4012 and 4016 powered models the engine/alternator is rigidly mounted on the base frame and the vibration isolators are supplied loose to be fitted between the base frame and the foundation.

An exhaust silencer is provided loose for installation with the generating sets. The silencer and exhaust system reduce the noise emission from the engine and can direct exhaust gases to safe outlets.

One of several types of control systems and panels is fitted to control the operation and output of the generating set and to protect the set from possible malfunctions. Section 5 of this manual provides detailed information on these systems and will aid in identification of the control system fitted on the generating set.

To protect the alternator, a suitably rated circuit breaker selected for the generating set model and output rating is supplied mounted in a steel enclosure.

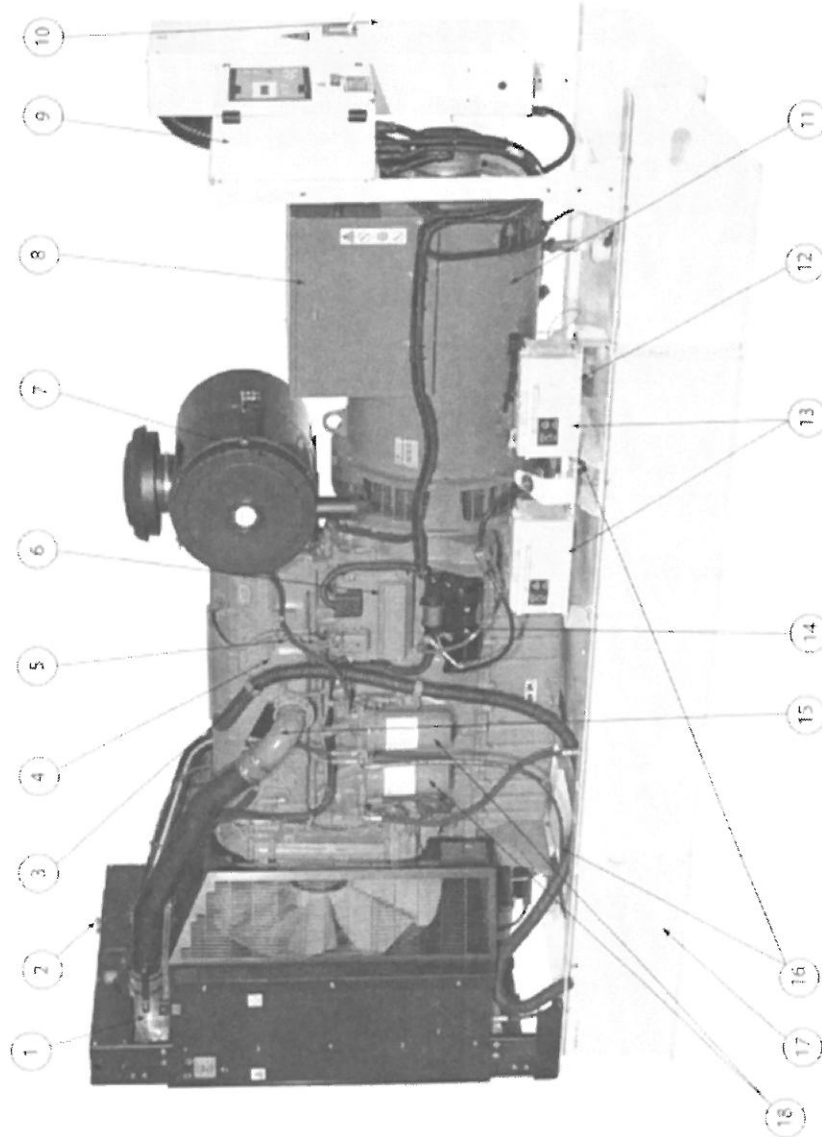
3.1 Typical Rating Plate

GENERATING SET		ISO 8528
MANUFACTURER		
MODEL		
SERIAL NUMBER	XXXXXXXXXX	1.
SALES ORDER REF	XXXXXXXX	
YEAR OF MANUFACTURE	2010	
AMBIENT TEMP	25 °C	2.
RATED POWER		
STANDBY	88.0 kVA	
	70.4 kW	
PRIME	80.0 kVA	3.
	64.0 kW	
RATED VOLTAGE	400/230 V	
PHASE	3	
RATED POWER FACTOR	0.80 cos φ	
RATED FREQUENCY	50 Hz	
RATED CURRENT - STANDBY	127 A	
RATED CURRENT - PRIME	115 A	
RATED RPM	1500 rpm	
ALTITUDE	152.4 m	4.
ALTERNATOR CONNECTION	S-STAR	
ISO 8528 - 3 RATING	PR 500HTLO S75	
ALTERNATOR ENCLOSURE	23 IP	
INSULATING CLASS	FH	5.
EXCITATION VOLTAGE	29 V	
EXCITATION CURRENT	2 A	
AVR	R478C	
MASS	1463 kg	

Figure 3a – Description of Typical Rating Plate

3.2 Generating Set Description

- 1 - Radiator
- 2 - Radiator fill
- 3 - ENGINE BREATHER
- 4 - BATTERY CHARGING ALTERNATOR (OPPOSITE SIDE)
- 5 - DIESEL ENGINE
- 6 - ECM
- 7 - AIR FILTER (INSIDE HOUSING)
- 8 - MAIN AC ALTERNATOR TERMINAL BOX
- 9 - CONTROL PANEL
- 10 - CIRCUIT BREAKER
- 11 - MAIN AC ALTERNATOR
- 12 - BATTERY RACK
- 13 - BATTERIES
- 14 - STARTER MOTOR
- 15 - TURBO CHARGER (OPPOSITE SIDE) IF EQUIPPED
- 16 - VIBRATION ISOLATORS
- 17 - BASE FRAME / FUEL TANK
- 18 - FUEL FILTERS



* DIAGRAM SHOWN IS OF A TYPICAL GENERATING SET, THIS MAY DIFFER FROM THE GENERATING SET YOU RECEIVED

Figure 3b – Typical Generating Set Description

3.3 Generating Set Description (26 – 200 kVA Range)

- 1 - Radiator
- 2 - Radiator Fill
- 3 - Battery Charging Alternator
- 4 - Exhaust
- 5 - Turbo
- 6 - Oil Filter*
- 7 - Air Filter
- 8 - Alternator
- 9 - Emergency Stop Pushbutton
- 10 - Control Panel
- 11 - Circuit Breaker
- 12 - Base Frame
- 13 - Cable Entry
- 14 - Starter Motor
- 15 - Battery
- 16 - Fuel Fill*
- 17 - Lifting Points
- 18 - Jacket Water Heater
- 19 - Anti Vibration Mounts*
- 20 - Drag Points
- 21 - Fan Guards

* = Opposite side

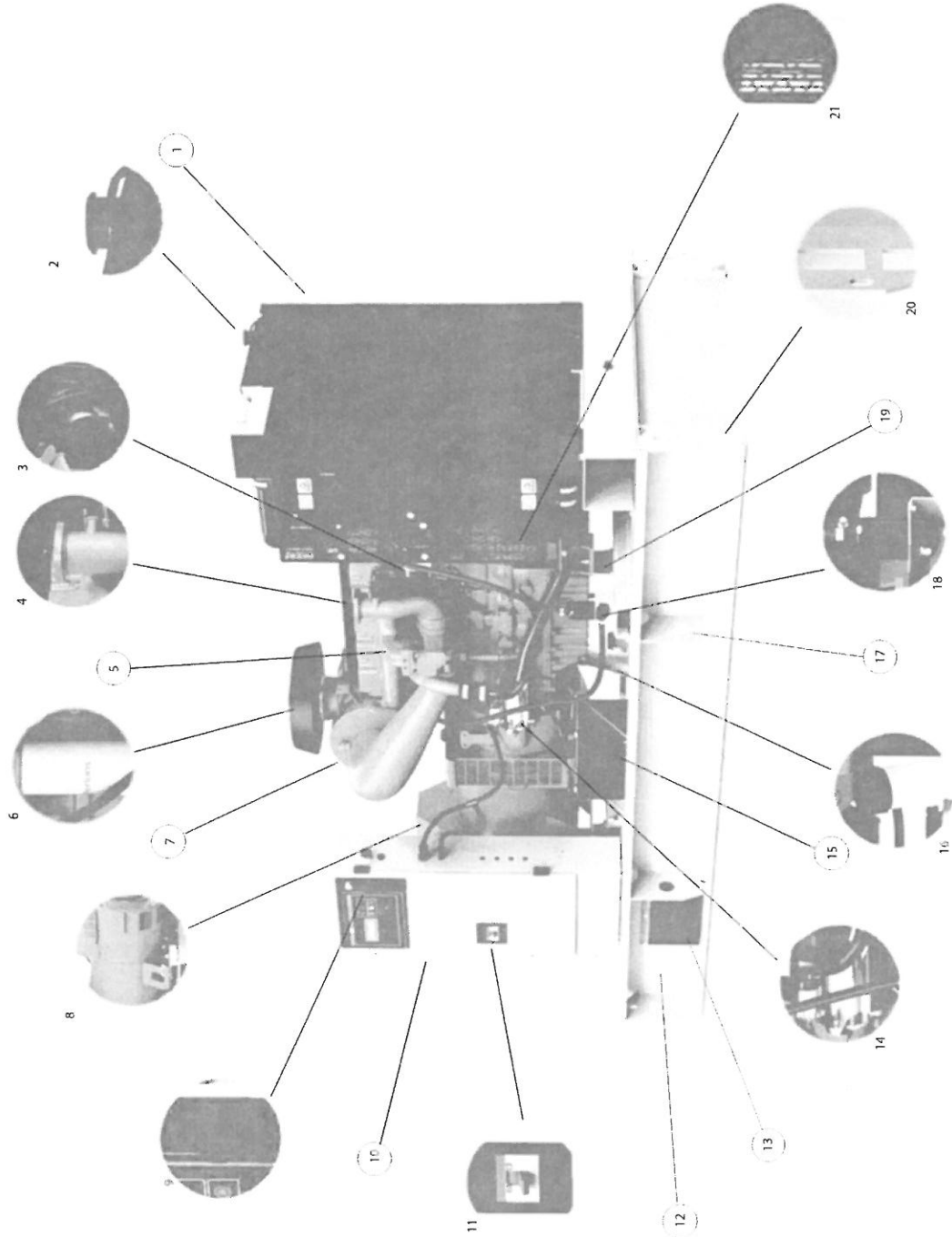


Figure 3c – Typical Generating Set Description (26 – 200 kVA)

4. INSTALLATION, HANDLING, TOWING AND STORAGE

4.1 General

This section discusses factors important in the effective and safe installation of the generating set.

Selecting a location for the generating set can be the most important part of any installation procedure. The following factors are important in determining the location:

- Adequate ventilation.

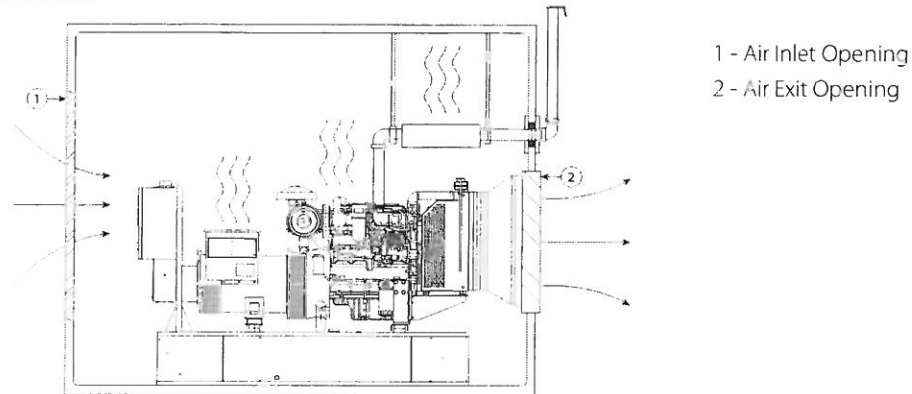


Figure 4a – Typical Installation showing generating set Ventilation

- Protection from the elements such as rain, snow, sleet, wind driven precipitation, flood water, direct sunlight, freezing temperatures or excessive heat.
- Protection from exposure to airborne contaminants such as abrasive or conductive dust, lint, smoke, oil mist, vapours, engine exhaust fumes or other contaminants.
- Protection from impact from falling objects such as trees or poles, or from motor vehicles or lift trucks.
- Clearance around the generating set for cooling and access for service: at least 1 metre (3ft 3in) around the set and at least 2 metres (6ft 6in) headroom above the set. (See Figure 4b)
- Access to move the entire generating set into the room. Air inlet and outlet vents can often be made removable to provide an access point.
- Limited access to unauthorised personnel.

If it is necessary to locate the generating set outside of the building, the generating set should be enclosed in a weatherproof canopy or container-type housing which is available for all sets.

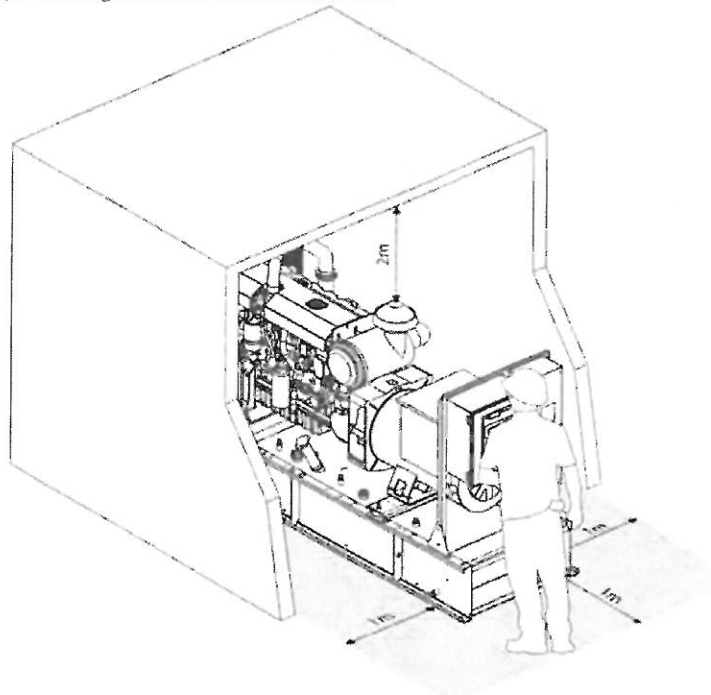


Figure 4b – Typical Installation showing generating set access and Operator Workstation

4.2 Outdoor Installation

Installation and handling is greatly simplified when the generating set has been equipped with an enclosure. Two basic types may be fitted. The first type is a close fitting canopy enclosure. This will be both weatherproof and sound attenuated. The other enclosure type is a walk-in type container, similar to a shipping container. It may be weatherproof or sound attenuated.

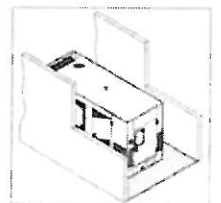
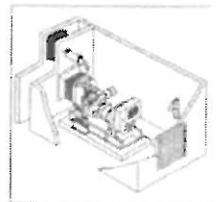
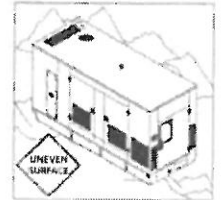
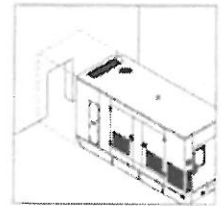
These enclosures provide a self contained generating set system that is easily transportable and requires minimal installation. They also automatically give protection from the elements and protection from unauthorised access.

WARNING:

- ⚠ **Make sure all personnel are out of the canopy or container, if equipped, before closing and latching enclosure doors.**
- ⚠ **Before closing canopy or enclosure doors, ensure all obstructions (especially hands and fingers) are clear to prevent damage or injury.**
- ⚠ **For transport purposes, some silencer outlets on generating sets housed in walk-in type enclosures will be fitted with cover plates. These are to be replaced with the supplied stub pipes complete with fitted rain hood.**
- ⚠ **Ensure there is no debris on the base frame prior to starting, as loose items will cause radiator damage.**

Because enclosed generating sets are easily transportable and may be installed and operated in a temporary location, many of the fixed installation details given in this chapter may not apply. The following considerations must be still given when temporarily installing the generating set:

- Locating the generating set where it will be protected from damage and away from the exhaust fumes of other engines or other airborne contaminants such as dust, lint, smoke, oil mist or vapours.
- Ensure the generating set is not positioned in such a way that it will obstruct the entrance or exit to the area where the it is situated.
- Locating the generating set on firm, level ground that will support its avoiding movement due to the vibration when operating the set.
- Ensuring that fumes from the exhaust outlet will not be a hazard especially when wind is taken into account.
- Ensure there is enough area around the generating set for access and serviceability.
- Electrical grounding of the generating set at all times, in accordance with local regulations.
- Providing access to refill the fuel tank when required.
- Protecting electrical cables installed between the generating set and the load. If these are laid on the ground ensure they are boxed in or covered to prevent damage or injury to personnel.



WARNING

- ⚠ **Enclosed generating sets should be installed outside. In the event that the enclosed generating set is installed inside, adequate fresh cooling air must be provided and that both engine and hot coolant air exhausts must be ducted outside the building. The ducting and exhaust pipework must be designed to minimise back pressure which would have a detrimental effect on generating set performance.**

4.2.1 Positioning of Walk-in Containers

Proper installation of the container is required if successful generation of power is to be achieved. The following information must be considered in the selection of the operating site for the container. The containerised generating set must be placed on a flat surface in order to maintain proper alignment. Containers can be successfully installed on a concrete plinth or level, natural surface. The foundation must bear the static weight of the module plus any dynamic forces from engine operation.

WARNING:

- △ For generating sets housed in walk-in type containers, crankcase breather outlets terminated at the external face of the enclosure will be plugged. These must be removed prior to operation.

4.2.2 Concrete Plinth

Setting the container on a concrete plinth is the preferred method for permanent installation for both ISO and Design to Order (DTO) containers. The concrete plinth should have been designed to withstand the weight of the container. Please consult the installer for further details.

4.3 Moving the Generating Set

The generating set base frame is specifically designed for ease of moving the set. Improper handling can seriously damage components.

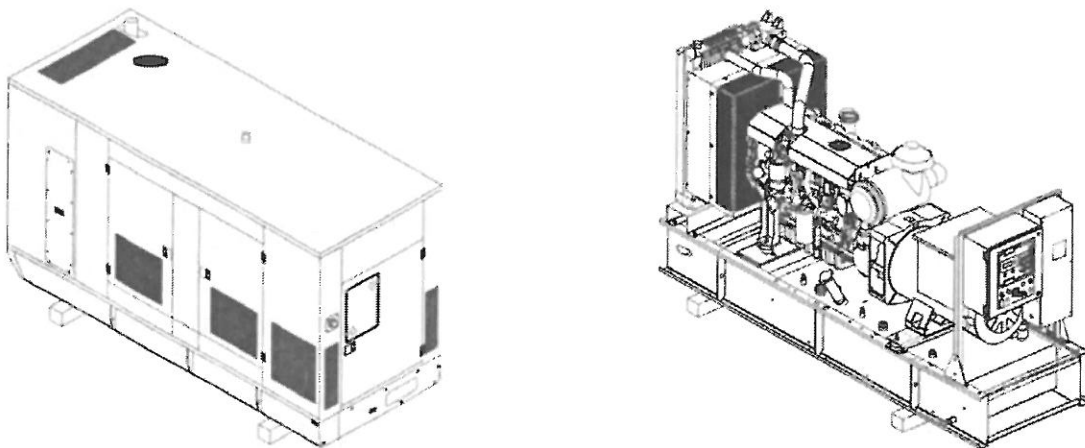


Figure 4c – Open and Closed generating sets on wooden skids

Using a forklift, the generating set can be lifted or carefully pushed/pulled by the base frame. If pushing, do not push the base frame directly with fork.

WARNING:

- △ Always use wood between forks and the base frame to spread the load and also between the forklift carriage and the side of the canopy to prevent damage.

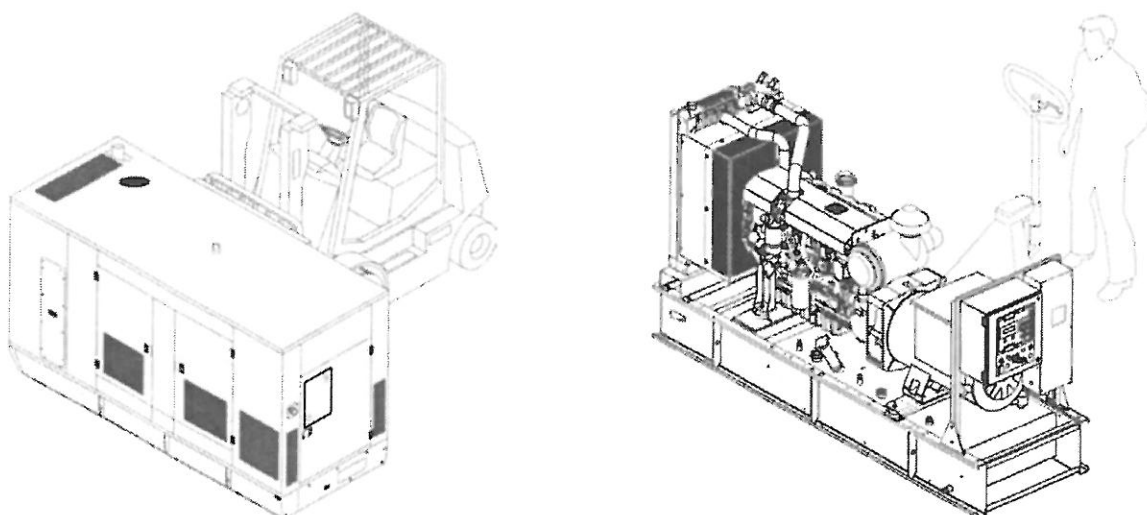
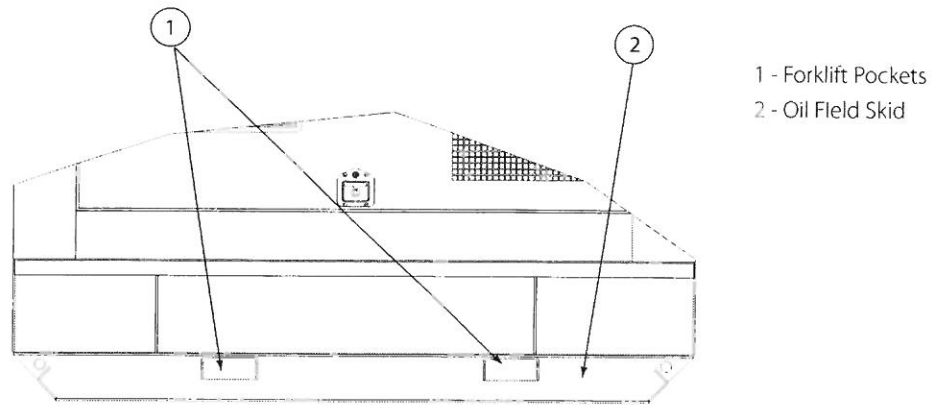


Figure 4d – Transporting a generating set using a forklift truck and forklift trolley



- 1 - Forklift Pockets
- 2 - Oil Field Skid

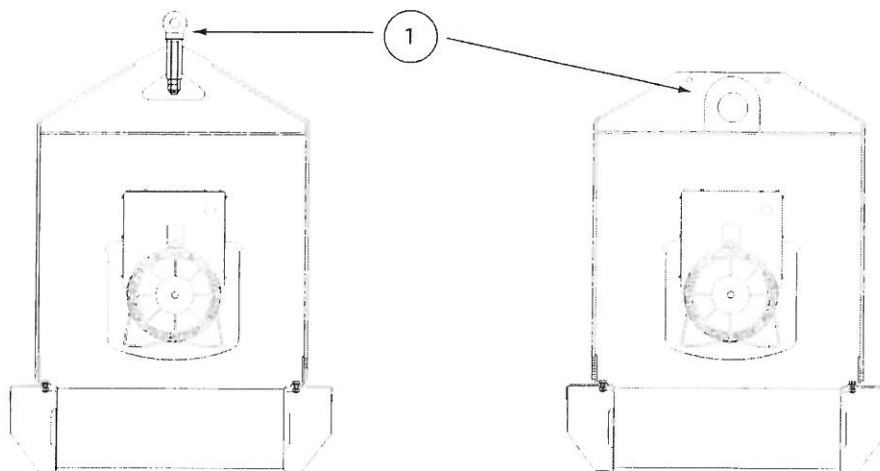
Figure 4e – Typical generating set with Oil Field Skid base option

If the generating set will be regularly moved, it should be fitted with the optional Oil Field Skid which provides forklift pockets in the base frame along with eyes for pulling. The smaller sets have forklift pockets in the base frame as standard.

WARNING:

- △ **Never lift the generating set by attaching to the engine or alternator lifting lugs.**
- △ **Ensure the lifting rigging and supporting structure is in good condition and is suitably rated.**
- △ **Keep all personnel away from the generating set when it is suspended.**

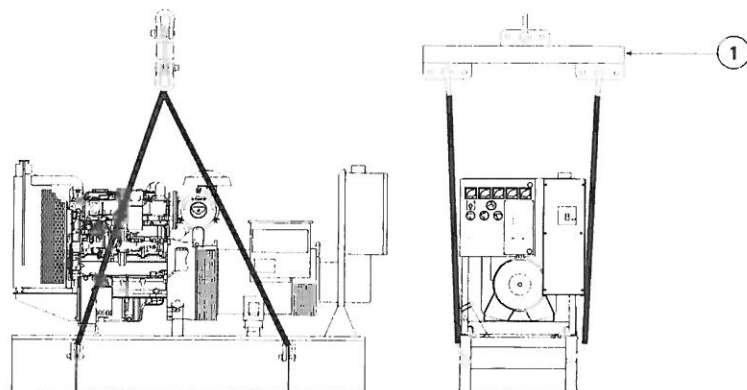
For ease of lifting, canopied sets have a single point lifting facility as standard.



- 1 - Single Point Lift
(26 – 200 kVA Range Only)

Figure 4f – Single Point lift

For a single lift, such as lifting the set to install it, the lift points provided on the base frame may be used. Points of attachment should be checked for cracked welds or loose nuts and bolts before lifting. A spreader bar is required to prevent damaging the set (see Figure 4g). It should be positioned over the centre of gravity (nearer the engine), not the centre of the generating set, to allow a vertical lift. Guide ropes should be used to prevent twisting or swinging of the generating set once it has been lifted clear of the ground – do not attempt to lift in high winds. Place the generating set down on a level surface capable of supporting its weight. This manner of lifting should only be used for a single lift for installation.



- 1 - Spreader Bar

Figure 4g – Proper lifting arrangement for installing the generating set

4.3.1 Approved Lifting Methods for ISO Walk-in Containers

Containers are manufactured to ISO dimensions, ISO 1496-4:1994(E) and ISO 668:1995(E). To ensure the safety of all personnel involved with the handling of containers, it is important that the correct lifting and handling procedures are employed. The procedures detailed below are derived from ISO 3874:1997(E) and must be followed at all times.

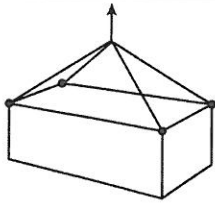
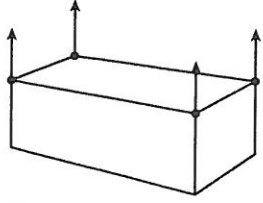
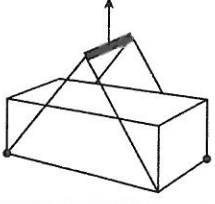
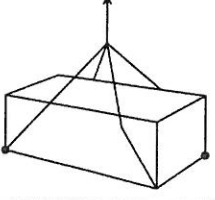
ISO Series 1 Freight Containers			
Lift Description	Loaded / Unloaded	Method	Diagram
Top Lift	Unloaded Only	A single pint lift with rated shackles	
Top Lift	Loaded	A vertical lift by means of a spreader bar and rated CAMLOK-CLB type lugs	
Bottom Lift	Loaded	Lifting from bottom four corner casting using CAMLOK-CLB type lugs and rated spreader beam	
Bottom Lift	Loaded and Unloaded	Lifting from bottom four corner castings using CAMLOK-CLB type lugs and nylon straps	

Figure 4h – Lifting method for ISO Series 1 Freight Containers

4.3.2 Approved Lifting Methods for Non-ISO Walk-in Containers

Containers can be manufactured to non-ISO dimensions. To ensure the safety of all personnel involved with the handling of containers, it is important that the correct lifting and handling procedures are employed. The procedures for handling non-ISO containers are detailed below and must be followed at all times.

ISO Series 1 Freight Containers			
Lift Description	Loaded / Unloaded	Method	Diagram
Bottom Lift	Loaded and Unloaded	Lifting from bottom four lifting lugs using rated shackles	

Figure 4i – Lifting method for Non-ISO Containers

4.4 Foundations and Vibration Isolation

The generating set is supplied on a rigid base frame that precisely aligns the alternator and engine and needs only be bolted down to a suitably prepared surface.

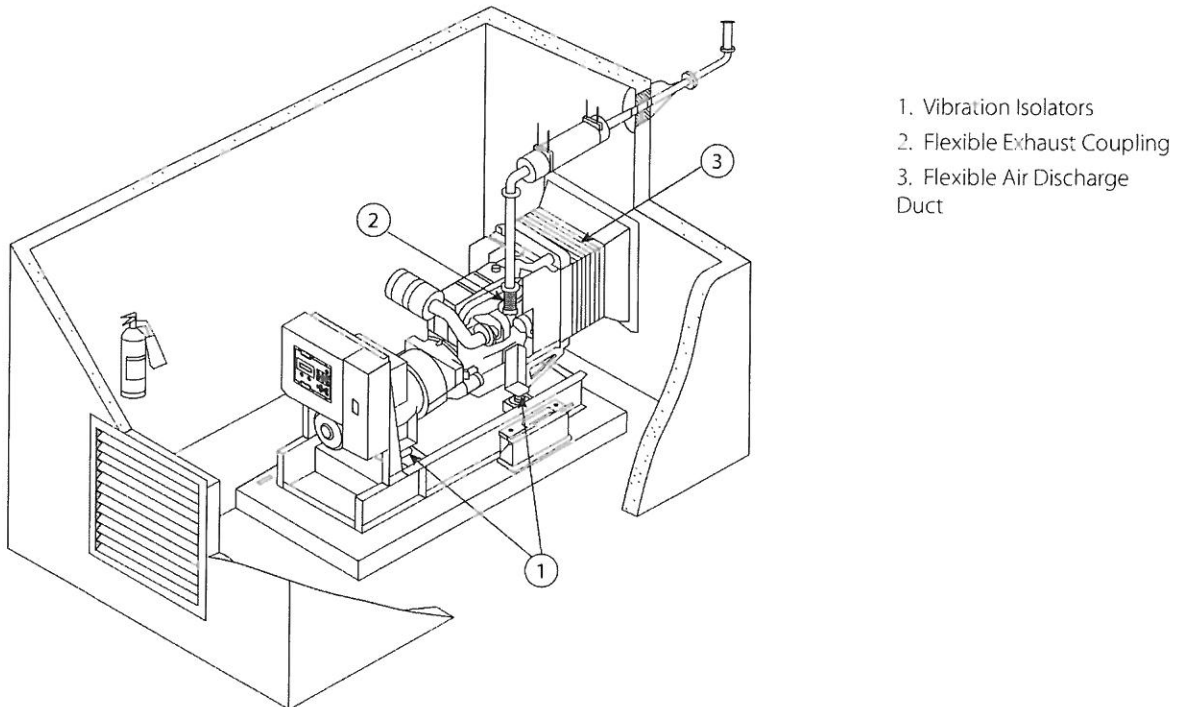


Figure 4j – Typical installation highlighting vibration reduction techniques

4.4.1 Foundation

A reinforced concrete pad makes the best foundation for the generating set. It provides a rigid support to prevent deflection and vibration. Typically the foundation should be from 150 mm to 200 mm (6 to 8 inches) deep and at least 150 mm (6 inches) wider and longer than the generating set. The ground or floor below the foundation should be properly prepared and should be structurally suited to carry the combined weight of the foundation pad and the generating set. (If the generating set is to be installed above the ground floor the building structure must be able to support the weight of the generating set, fuel storage and accessories.) Relevant building codes should be consulted and complied with. If the floor is wet from time to time, such as in a boiler room, the pad should be raised above the floor. This will provide a dry footing for the generating set and for those who connect, service or operate it. It will also minimise corrosive action on the base frame.

4.4.2 Vibration Isolation

To minimise engine vibrations being transmitted to the building, the generating set is fitted with vibration isolators. On small and medium sized generating sets these isolators are fitted between the engine/alternator feet and the base frame. This allows the frame to be rigidly bolted to the foundation. On larger generating sets the coupled engine/alternator is rigidly attached to the base frame and the vibration isolators are supplied loose for fitting between the base frame and the foundation. In all cases the sets should be securely bolted to the ground (either through the base frame or through the vibration isolators) to prevent movement.

Vibration isolation is also required between the generating set and its external connections. This is achieved by the use of flexible connections in the fuel lines, exhaust system, radiator air discharge duct, electrical conduit for control and power cables and other externally connected support systems (see Figure 4j).

4.5 Towing (Portable Generating Sets)

4.5.1 Preparing to Tow

Inspect all components of the coupling equipment on the towing vehicle and the generating set for defects such as excessive wear, corrosion, cracks, bent metal or loose bolts. Ensure that the towing vehicle is rated for towing a load of at least the weight of the mobile generating set plus a 10% safety factor.

Couple the towing vehicle to the trailer and ensure the coupling device is engaged, closed and locked. Attach electrical connector for indicator lights, etc. Attach chains, if provided, by crossing them under the drawbar and attaching to the towing vehicle. Attach any "breakaway" safety wire, if fitted.

WARNING:

- ⚠ **Mobile generating sets should be mounted using "captivation mounts". These mounts minimise vibration and include a captivation feature that prevents the generating set breaking away in case of a road accident.**

Fully retract the front screw jack, if equipped, and secure with the pin or locking device. Lock the front jockey wheel, if equipped, in the full up position. Ensure that the rear stabiliser jacks, if equipped, are raised and locked.

Inspect tyres for condition and proper inflation. Check all tail lights, if equipped, are operating properly and that all reflectors are clean and functional.

Ensure load and grounding/earthing cables are disconnected and that all windows, access doors and tool box covers are closed, latched and locked. Ensure any external fuel pipes are disconnected.

Release trailer parking brakes, if equipped, and remove any blocks or chocks under the wheels.

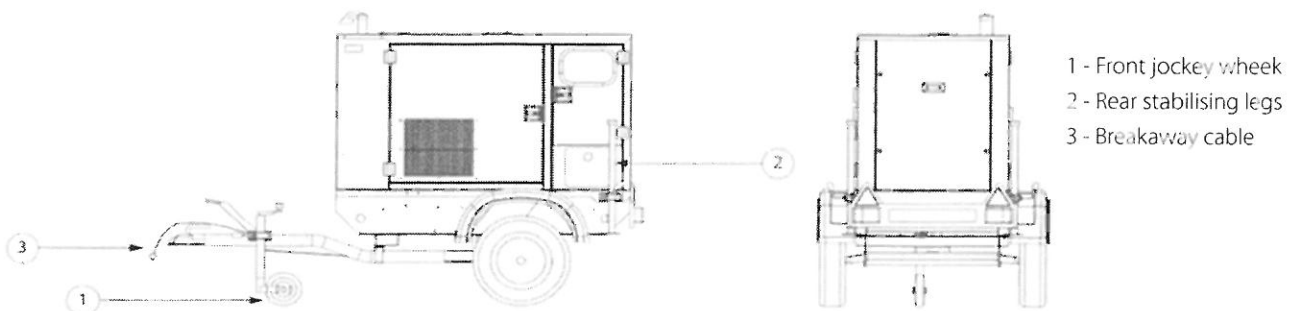


Figure 4k – General Arrangement of a mobile enclosed generating set

4.5.2 Towing

Whenever towing a mobile generating set, remember that its weight may approach or exceed the weight of the towing vehicle affecting manoeuvrability and stopping distance.

WARNING:

- ⚠ **When towing a mobile generating set, observe all Codes, Standards or other regulations and traffic laws. These include those regulations specifying required equipment and maximum and minimum speeds.**
- ⚠ **Ensure brakes, if fitted, are in good order.**
- ⚠ **All fuel should be removed before towing to enhance stability.**
- ⚠ **Do not permit personnel to ride in or on the mobile generating set. Do not permit personnel to stand or ride on the drawbar or to stand or walk between the generating set and the towing vehicle.**
- ⚠ **Avoid gradients in excess of 15° (27%), avoid potholes, rocks or other obstructions and soft or unstable terrain.**
- ⚠ **Ensure the area behind and under the mobile set is clear before reversing.**

4.5.3 Parking

Park the generating set on a dry level area that can support its weight. If it must be located on a slope, park it across the gradient preventing it from rolling downhill. Do not park the generating set on gradients exceeding 15° (27%).

Set the parking brake and block or chock both sides of all wheels. Lower front screw jack, castor wheel and/or rear stabiliser jacks, as fitted.

Unhook chains, if equipped, from the towing vehicle, disconnect electrical connection, disconnect the coupling device and move the towing vehicle clear of the mobile generating set.

4.6 Storage

Long term storage can have detrimental effects on both the engine and alternator. These effects can be minimised by properly preparing and storing the generating set.

4.6.1 Engine Storage

The engine should be put through an engine "preservation" procedure that includes cleaning the engine and replacing all the fluids with new or preserving fluids. See the Engine Manual for the proper procedure.

4.6.2 Alternator Storage

When an alternator is in storage, moisture tends to condense in the windings. To minimise condensation, store the generating set in a dry storage area. If possible use space heaters to keep the windings dry.

After removing the generating set from storage, perform an insulation check as discussed in Section 4.12.8. If the readings are lower than prior to storage, it may be necessary to dry out the windings. See the Alternator Manual for procedures.

If the megger reading is below 1M Ω after drying, the insulation has deteriorated and should be reconditioned.

4.6.3 Battery Storage

While the battery is stored, it should receive a refreshing charge every 12 weeks (8 weeks in a tropical climate) up to a fully charged condition.

5. CONTROL SYSTEM DESCRIPTION AND TROUBLE SHOOTING

5.1 Control System Description

An electronic control system has been designed and installed to control and monitor the generating set. Depending on the requirements of the generating set, one of several different standard control systems may be fitted. Other more specialised systems may be fitted for specific installations in which case separate documentation is provided.

These control systems consist of three major components working together:

Control Panel – provides a means of starting and stopping the generating set, monitoring its operation and output and automatically shutting down the generating set in the event of a critical condition arising such as low oil pressure or high engine coolant temperature to prevent major damage to the engine / alternator.

Engine Interface Module (where fitted) - provides switching relays for the Starter Motor Solenoid, Glow Plug and Fuel Solenoid. Each of these circuits is protected with individual fuses mounted in the module. Individual LED's illuminate when each circuit is energised.

Power Output Circuit Breaker - serves to protect the alternator by automatically disconnecting the load in the event of overload or short circuit. It also provides a means of switching the generating set output.

Note:

- Products within the 6.8 – 200 kVA range are not equipped with an EIM but are provided with the switching relays for Starter Motor Solenoid, glow plug and fuel solenoid in the control panel/Relay box. Each of these products is now protected with individual Miniature Circuit Breakers (MCBs) or fuses mounted inside the control panel/relay box.

5.2 1002T and LCP1002T

The 1002T Series / LCP1002T Control System provides for manual starting and stopping of the generating set and provides protection for the engine against both high engine coolant temperature and low oil pressure.

Before starting or running the generating set, the operator should become fully acquainted with the instruments and controls. The instruments should be observed from time to time while the generating set is running so that any abnormal readings can be detected before problems arise.

5.2.1 Control Panel Instrumentation

Figure 5a shows typical diagrams of each of the control panels. The addition of optional equipment will add items to the panel so the panel fitted on the generating set may be slightly different from the typical ones shown. The following descriptions explain the function of each item on the panels:

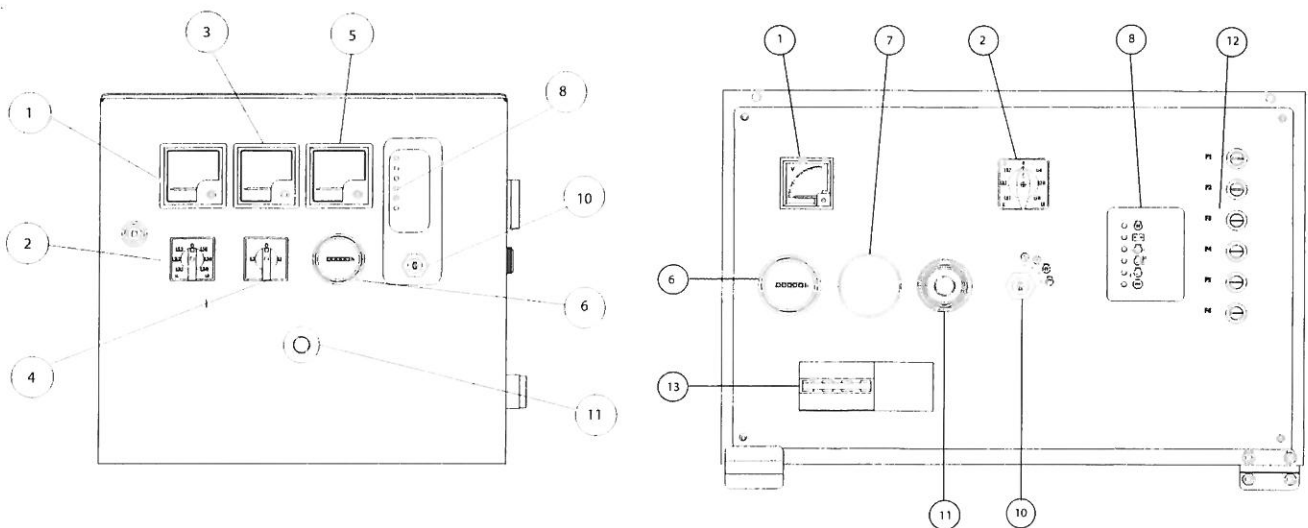
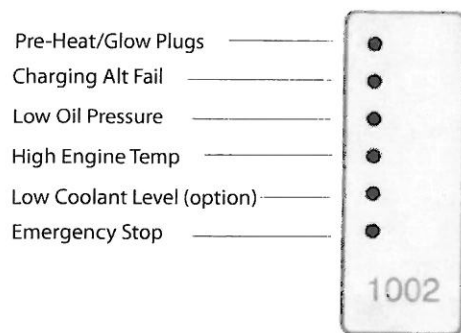


Figure 5a – Layout of 1002T Series and LCP1002T Control Panel

1. AC VOLTMETER – indicates the AC voltage generated at the alternator output terminals. The reading indicated on the voltmeter will vary depending on the position of the voltmeter selector switch (item 2). It should not, however, vary while the generating set is operating. If the meter gives no reading while the generating set is running, ensure that the AC voltmeter selector switch is not in the OFF position.
2. AC VOLTMETER SELECTOR SWITCH – allows the operator to select voltage reading between phases or between a phase and neutral. The OFF position allows the voltmeter “zero” position to be checked while the generating set is running.
3. AC AMMETER – indicates the AC electrical current being delivered which is dependant on the connected load. A separate reading from each of the phases is possible using the ammeter selection switch (item 4). If the meter gives no reading while the generating set is running, ensure that the AC ammeter selector switch is not in the OFF position.
4. AC AMMETER SELECTOR SWITCH – allows the operator to select a current reading from each of the phases. The OFF position allows the ammeter “zero” position to be checked while the generating set is running.
5. FREQUENCY METER – Indicates the output frequency of the generating set. At partial load the frequency will be slightly higher than normal, depending on the droop of the governor. In practice, no load frequencies of approximately 52 and 62 Hz for 50 Hz and 60 Hz respectively, are considered normal. The frequencies will fall, as the generating set is loaded, to 50 Hz and 60 Hz at full load.
6. HOURS RUN METER – indicates the total number of hours of generating set operation. This meter assists with maintenance.
7. DC BATTERY VOLTMETER (where fitted) – indicates the state of charge of the battery. When the engine is at standstill the normal battery voltage will be 12 to 14 volts on a 12 volt system and 24 to 28 volts on a 24 volt system. During starting, the needle will drop to about 70% of normal and oscillate as the engine cranks. Once the engine has started, the needle should return to its normal value. If the battery charging alternator is charging correctly, the voltage reading will always be higher with the generating set running than when it is stopped.
8. FAULT INDICATOR LAMPS (where fitted) – illuminate to indicate that the protective circuitry has sensed the indicated condition. The lamp should be red on conditions for which the system will initiate a shutdown of the generating set. For alarms, the lamp can be red or amber.



1002T

Figure 5b – 1002T Fault Lamps

9. KEY SWITCH – A four position switch that provides a means of starting and operating the generating set.
 - Position “0” – Off / Reset
Power is turned off and protection circuitry is reset in this position.
 - Position “1” – On
DC power is supplied to the control system and the fault protection timer relay is initiated.
 - Position “Thermostart” – Thermostart
DC power is supplied to the thermostart circuit, if fitted.
 - Position “Start” – Start
DC power is supplied to the starter motor to crank the engine. The thermostart circuit is also powered, if fitted.
10. EMERGENCY STOP Push button – A red lock-down push button that immediately shuts down the generating set and will inhibit start until the push button has been released by turning it clockwise. Prior to restarting the generating set, this fault lamp must be reset by turning the key switch to position “0” (off)
11. FUSES – A fuse interrupts excessive current so that the circuit(s) it supplies are protected.
12. OUTPUT CIRCUIT BREAKERS – To protect the alternator, a suitably rated circuit breaker selected for the generating set model output rating, is supplied.

5.2.2 General Information 1002T / LCP1002T Control Systems

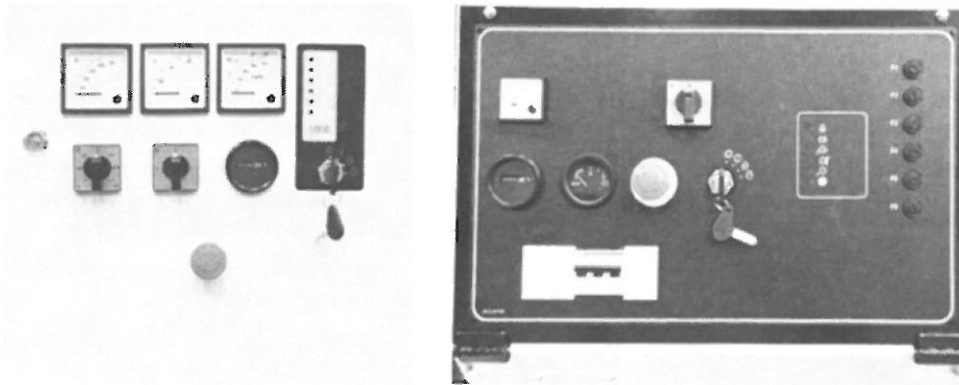


Figure 5c – 1002T & LCP1002T Control Systems

Controller version is dictated by product configuration, a 1002T or LCP1002T panel may be fitted. Both control systems provide for manual starting and stopping of the generating set and provide protection for the engine against critical failures.

5.2.3 Pre-Start Checks

The following checks should be performed prior to starting the generating set:

1. Ensure the Control Switch / Key Switch is Off on the 1002T/LCP1002T.

A visual inspection should take only a few minutes and can prevent costly repairs and accidents – For maximum generating set life, visually inspect the generating set before starting. Look for items such as:

- Loose fastenings / fixings, worn belts or loose connections. Repair as necessary.
- The fan and exhaust guards must be at the correct positions and securely fixed. Repair damaged / loose guards or renew missing guards.
- Wipe clean all filler caps before the engine is serviced or fluids are topped up to reduce the chance of any system contamination.
- For any type of leak (coolant, lubricating oil or fuel), clean away the fluid. If a leak is observed, find the source and correct the leak. If a leak is suspected, check the fluid levels frequently until the leak is found and repaired.
- Accumulated grease and/or oil on an engine is a fire hazard. Remove it by steam cleaning or by the use of a high pressure water jet. Avoid high-pressure water on the electronic / electrical components, provide suitable protection where possible.
- Ensure that the coolant pipes are fitted correctly and that they are secure. Check for leaks. Check the condition of all pipes for splits or signs of rubbing.

Fluid levels

2. Check the engine oil and coolant levels – replenish as necessary (see engine handbook for locations).

Ensure fluids used are as recommended within the engine handbook.

WARNING:

- ⚠ **Do not remove the radiator cap or any component of the cooling system while the engine is running and while the coolant is under pressure, because dangerous hot coolant can be discharged, posing a risk of personal injury. Do not add large amounts of cold coolant to a hot system as serious engine damage could result.**

Note:

- Diesel engines normally consume lube oil at a rate of 0.25% to 1% of the fuel consumption at full load.
- When adding coolant to the radiator system, always pour slowly to help prevent air from becoming trapped in the engine. Always top up when engine is cold.

WARNING:

- ⚠ **When filling the fuel tank, do not smoke or use an open flame in the vicinity.**

3. Check the fuel level – fill as necessary.

WARNING:

- ⚠ **Before tightening the fan belts, disconnect the battery negative (-) lead to ensure the engine cannot be accidentally started.**

4. Check the condition and tension of the fan and engine alternator belts – tighten as necessary.
5. Check all hoses for loose connections or deterioration – tighten or replace as necessary.
6. Check the battery terminals for corrosion – clean as necessary.

WARNING:

⚠ **When working with the batteries, do not smoke or use an open flame in the vicinity. Hydrogen gas from batteries is explosive.**

⚠ **Do not short the positive and negative terminals together.**

7. Check the battery electrolyte level – fill with distilled water as necessary.
8. Check the control panel and the generating set for heavy accumulation of dust and dirt – clean as necessary. These can pose an electrical hazard or give rise to cooling problems.
9. Check the air filter restriction indicator, if fitted – replace the filter as necessary.
10. Clear the area around the generating set of any insecure items that could inhibit operation or cause injury. Ensure cooling air ventilation screens are clear.
11. Visually check the entire generating set for signs of leaks from the fuel system, cooling system or lubrication seals.
12. Periodically drain exhaust system condensate traps, if equipped.
13. Ensure the alternator output circuit breaker is in the "OFF" (handle down) position.

5.2.4 Normal Startup / Shutdown – Key Start Panel (1002T / LCP1002T)

The following procedure should be used for normal starts on a generating set equipped with a 1002T Series Key Start Control System:

Note:

- The generating set may be stopped at any time by turning the Key Switch to Position "0" (Off).

1. Complete Pre-Start checks as per Section 5.2.
2. Check the battery voltage by turning the Key Switch from Position "0" (Off) to Position "1" (On) and reading the battery voltmeter. A fully charged battery will indicate 12 to 14 volts on a 12 volt system or 24 to 28 volts on a 24 volt system. Return the Key Switch to Position "0" (Off).

Note:

- In the event of low battery voltage the LED will indicate on the 1002T PCB (see Figure 5a – 8). There is no battery voltmeter on 1002T panel.
- The engine will not start if any fault indicators are illuminated. Reset the control system by turning the Key Switch to Position "0" (Off). Ensure the faults have been corrected prior to attempting to start the generating set.

WHEN ENGINE HAS STARTED

3. Check for any abnormal noise or vibration.
4. Carry out visual checks for system leaks.
5. Check the control panel for indications of engine temperature and oil pressure
6. Switch the alternator output circuit breaker to "ON" (handle up).

WARNING:

⚠ **The Key Switch must not be turned to position "0" or position "1", while the engine is running.**

7. Start: Turn the Key Switch from Position "0" (Off) through Position "1" (On) to Position "Thermo" (Thermo) to activate the thermostart, if fitted. Hold for 7 seconds to preheat the induction air. After this time, the Key Switch should be further turned to Position "Start" (Start) to crank the engine. When the engine starts, release the Key Switch immediately allowing it to return to Position "1" (On).

Do not crank the engine for more than 5 to 7 seconds should the engine fail to start. Allow an interval of 10 seconds and always turn the Key Switch to Position "0" (Off) between cranking attempts. If, after 4 cranking attempts, the engine still has not started, refer to a qualified generating set technician to determine the cause of failure to start.

Note:

- Load can now be applied to the generating set. However, the maximum step load that can be accepted in any one step is dependent on the operating temperature of the generating set.

SHUTDOWN:

- To shut the generating set down, turn off the load by switching the Alternator Output Circuit Breaker to "OFF" (handle down). Allow the generating set to run without load for a few minutes to cool. Then turn the Key Switch to Position "0" (Off). The generating set will shutdown.

In case of an emergency where immediate shutdown is necessary, the Key Switch should be turned to Position "0" (Off) immediately without disconnecting the load.

Note:

- Turning the Key Switch to Position "0" (Off) will also reset the protective circuits after a fault has been detected. Ensure that the fault has been rectified prior to restarting the generating set.

When high engine temperature is sensed, the red coloured fault lamp labelled "HIGH ENGINE TEMPERATURE" illuminates (see Figure 5b) and the generating set is automatically shut down. The fault lamp will remain illuminated and the engine locked out until the fault has been acknowledged and reset by turning the Key Switch to Position "0" (Off). On some larger models a low coolant level sensor will also cause the generating set to shutdown and will also illuminate the "HIGH ENGINE TEMPERATURE" fault lamp even though the temperature may be in the normal range.

When low lube oil pressure is sensed the "LOW OIL PRESSURE" fault lamp illuminates and the generating set is automatically shut down. Reset is effected by turning the Key Switch to Position "0" (Off).

WARNING

- ⚠ **If at any time the generating set stops because of a fault, the fault should be rectified before trying to restart the generating set**

5.2.5 Control System Fault Finding / Trouble Shooting Guide 1002T / LCP1002T

Fault	Symptom	Remedy
Engine Fails To Start	Engine Does Not Crank When Key Switch Turned To Position "1" (Start)	1. Check Operation Of Key Switch. 2. Check No Fault Lamps Illuminated. Reset, If Required, After Remedying Indicated Fault. 3. Refer To Your Local Dealer.
Engine Stops Due To Low Oil Pressure (All Control Systems)	"LOW OIL PRESSURE" Fault Lamp Illuminates	1. Check Oil Level 2. Refer To Your Local Dealer.
Engine Stops Due To High Coolant Temp	"HIGH COOLANT TEMP" Fault Lamp Illuminates	1. Check Coolant Level. (Be Sure To Allow The generating set To Cool First As Hot Water/Steam Can Be Present When You Remove The Radiator Cap). 2. Refer To Your Local Dealer.
Other Faults	-	Refer To Your Local Dealer.

5.3 PowerWizard (PW1.0 & 2.0)

5.3.1 General Information

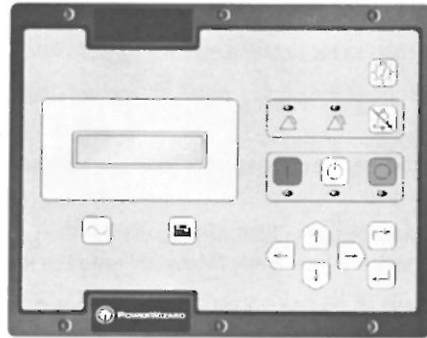


Figure 5d – PowerWizard Control System Panel

The controller is available in two versions, PowerWizard 1.0 and PowerWizard 2.0. These two versions are based on different features.

This guide is intended to cover the PowerWizard generating set control and its application in generating set systems.

5.3.2 PowerWizard Control Module Description

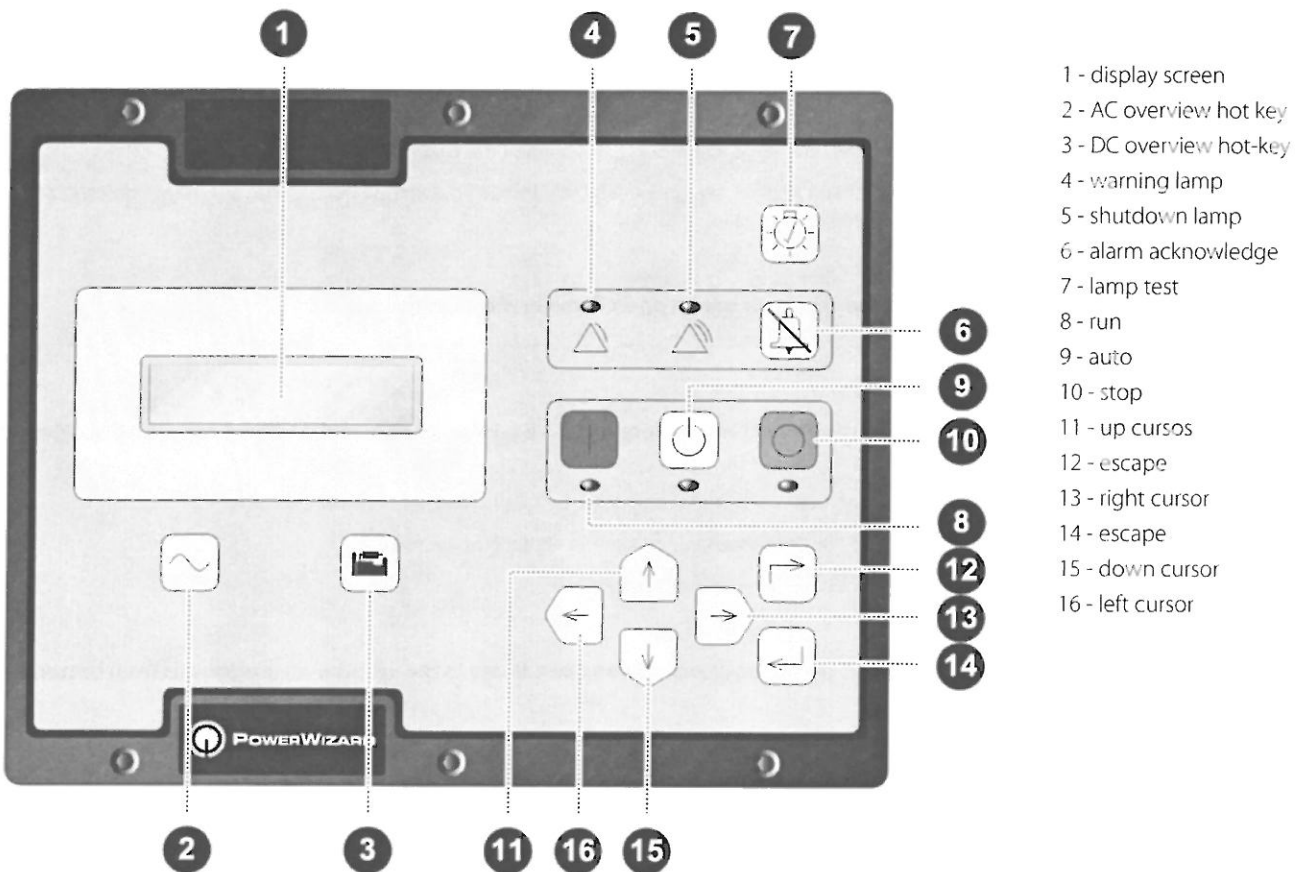


Figure 5e – PowerWizard Control Module Description

5.3.3 Pre-Start Checks (applicable to all control systems)

The following checks should be performed prior to starting the generating set:

1. A visual inspection should take only a few minutes and can prevent costly repairs and accidents – For maximum generating set life, visually inspect the generating set before starting. Look for items such as:
 - Loose fastenings / fixings, worn belts or loose connections. Repair as necessary.
 - The fan and exhaust guards must be at the correct positions and securely fixed. Repair damaged / loose guards or renew missing guards.
 - Wipe clean all filler caps before the engine is serviced or fluids are topped up to reduce the chance of any system contamination.
 - For any type of leak (coolant, lubricating oil or fuel), clean away the fluid. If a leak is observed, find the source and correct the leak. If a leak is suspected, check the fluid levels frequently until the leak is found and repaired.
 - Accumulated grease and / or oil on an engine is a fire hazard. Remove it by steam cleaning or by the use of a high pressure water jet. Avoid high-pressure water on the electronic / electrical components provide suitable protection were possible.
 - Ensure that the coolant pipes are fitted correctly and that they are secure. Check for leaks. Check the condition of all pipes for splits or signs of rubbing.

Fluid levels

2. Check the engine oil and coolant levels – replenish as necessary (see engine handbook for locations). Ensure fluids used are as recommended within the engine handbook.

WARNING:

- ⚠ **Do not remove the radiator cap or any component of the cooling system while the engine is running and while the coolant is under pressure, because dangerous hot coolant can be discharged, posing a risk of personal injury. Do not add large amounts of cold coolant to a hot system as serious engine damage could result.**

3. Check the engine oil and coolant levels – replenish as necessary.

Note:

- Diesel engines normally consume lube oil at a rate of 0.25% to 1% of the fuel consumption.
- When adding coolant to the radiator system, always pour slowly to help prevent air from becoming trapped in the engine. Always top up when engine is cold.

WARNING:

- ⚠ **When filling the fuel tank, do not smoke or use an open flame in the vicinity.**

4. Check the fuel level – fill as necessary.

WARNING:

- ⚠ **Before tightening the fan belts, disconnect the battery negative (-) lead to ensure the engine cannot be accidentally started.**

5. Check the condition and tension of the fan and engine alternator belts – tighten as necessary.
6. Check all hoses for loose connections or deterioration – tighten or replace as necessary.
7. Check the battery terminals for corrosion – clean as necessary.

WARNING:

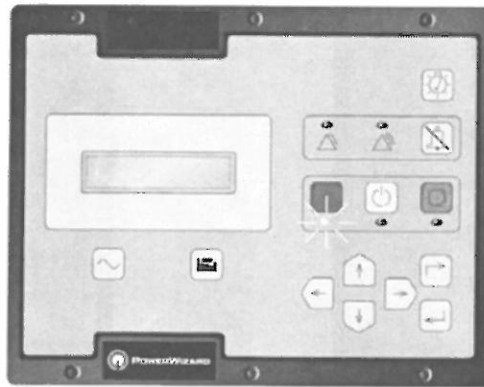
- ⚠ **When working with the batteries, do not smoke or use an open flame in the vicinity. Hydrogen gas from batteries is explosive.**

- ⚠ **Do not short the positive and negative terminals together.**

8. Check the battery electrolyte level – fill with distilled water as necessary.
9. Check the control panel and the generating set for heavy accumulation of dust and dirt – clean as necessary. These can pose an electrical hazard or give rise to cooling problems.
10. Check the air filter restriction indicator, if fitted – replace the filter as necessary.
11. Clear the area around the generating set of any insecure items that could inhibit operation or cause injury. Ensure cooling air ventilation screens are clear.
12. Visually check the entire generating set for signs of leaks from the fuel system, cooling system or lubrication seals.
13. Periodically drain exhaust system condensate traps, if equipped.
14. Ensure the Alternator Output Circuit Breaker is in the "OFF" (handle down) position.

5.3.4 Basic Operation

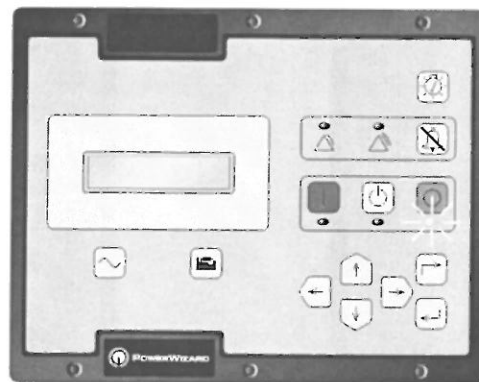
START Mode



 Press Start key

Figure 5f – Basic Operation Start Key

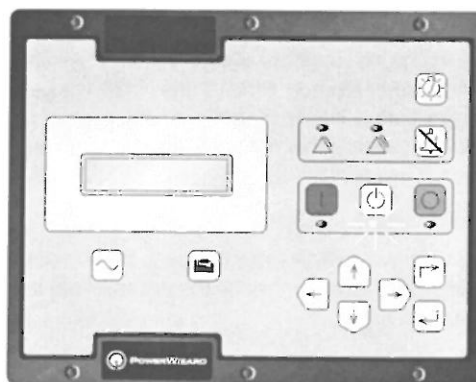
STOP Mode



 Press Stop key

Figure 5g – Basic Operation Stop Key

AUTO Mode



 Press Auto key

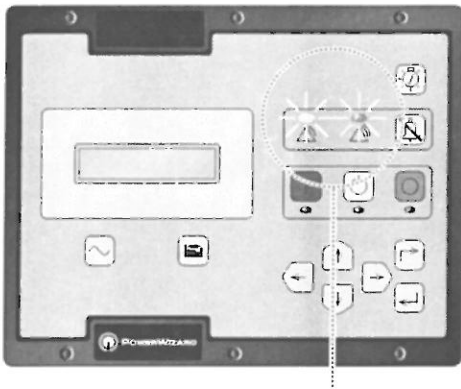
Figure 5h – Basic Operation Auto Key

Note:

- When not using PowerWizard in AUTO mode, a "Not in Auto Mode" activate alarm will sound (where enabled).

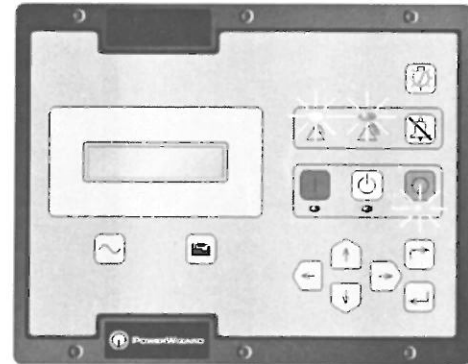
5.3.5 Fault / Alarm Reset Process

1. Fault / Alarm Reset Process



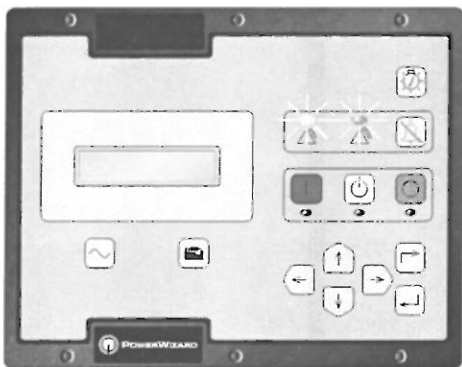
If either of these indication lamps are flashing or solid there is a warning or shutdown

2. Fault / Alarm Reset



Press STOP Key

3. Fault / Alarm Reset



Press and hold "Alarm Acknowledge" key for

4. Fault / Alarm Reset Process. The display will show:



Press ENTER Key to clear all Warnings and / or Shutdowns

Press ESCAPE Key to cancel

Figure 5i – Basic Operation Fault Alarm Reset Process

5.3.6 User Interface Overview

Before starting or running the generating set, the operator should become fully acquainted with the control module's display and push buttons. The display should be observed from time to time while the generating set is running so that any abnormal readings can be detected before problems arise. Figure 5c shows a typical layout of the PowerWizard control panel. Addition of optional equipment may add items to the panel so that the panel fitted on the generating set may be slightly different from the typical one shown. The following descriptions explain the function of each standard item on the panels:

Function Keys:



AC Overview key – The AC Overview key will navigate the display to the first screen of AC information. The AC Overview information contains various AC parameters that summarise the electrical operation of the generating set. (Use the up/down keys to navigate within the AC parameters).



Engine Overview-key – The Engine Overview key will navigate the display to the first screen of engine information. The Engine Overview information contains various engine parameters that summarise the operation of the generating set. (Use the up/down keys to navigate within the Engine parameters).



Lamp Test – Pressing and holding the Lamp Test key will cause all of the LED's and the display screen pixels to turn on.



RUN – Pressing the Run key will cause the engine to enter the run mode.



AUTO – Pressing the Auto key will cause the engine to enter the auto mode.



STOP – Pressing the Stop key will cause the engine to enter stop mode.

Menu Navigators:



Scroll Up – The Scroll Up key is used to navigate up through the various menus or monitoring screens. The Scroll Up key is also used during setpoint entry. During numeric data entry the Scroll Up key is used to increment the digits (0–9). If the setpoint requires selection from a list, the Scroll Up key is used to navigate through the list.



Escape – The Escape key is used during menu navigation in order to navigate up through the menu/sub-menu structure. Each key press causes the user to move backwards/upwards through the navigation menus. The Escape key is also used to exit/cancel out of data entry screens during setpoint programming. If the Escape key is pressed during setpoint programming, none of the changes made on screen will be saved to memory.



Scroll Right – The Scroll Right key is used during setpoint adjustment. During numeric data entry, the Scroll Right key is used to choose which digit is being edited. The Scroll Right key is also used during certain setpoint adjustments to select or deselect a check box. If a box has a check mark inside, pressing the Scroll Right key will cause the check mark to disappear, disabling the function. If the box does not have a check mark inside, pressing the Scroll Right key will cause a check mark to appear, enabling the function.



Enter – The Enter key is used during menu navigation to select menu items in order to navigate forward/downward in the menu/sub-menu structure. The Enter key is also used during setpoint programming in order to save setpoint changes. Pressing the Enter key during setpoint programming causes setpoint changes to be saved to memory.



Scroll Down – The Scroll Down key is used to navigate down through the various menus or monitoring screens. The Scroll Down key is also used during setpoint entry. During numeric data entry the Scroll Down key is used in order to decrement the digits (0–9). If the setpoint requires selection from a list, the Scroll Down key is used to navigate down through the list.



Scroll Left – The Scroll Left key is used during setpoint adjustment. During numeric data entry, the Scroll Left key is used to choose which digit is being edited. The Scroll Left key is also used during certain setpoint adjustments to select or deselect a check box. If a box has a check mark inside, pressing the Scroll Left key will cause the check mark to disappear, disabling the function. If the box does not have a check mark inside, pressing the Scroll Left key will cause a check mark to appear, enabling the function.

Alarm Indicators:



Yellow Warning Light – A flashing yellow light indicates that there are unacknowledged active warnings. A solid yellow light indicates that there are acknowledged warnings active. If there are any active warnings, the yellow light will change from flashing yellow to solid yellow after the Alarm Acknowledge key is pressed. If there are no longer any active warnings, the yellow light will turn off after the Alarm Acknowledge key is pressed.



Red Shutdown Light – A flashing red light indicates that there are unacknowledged active shutdown events. A solid red light indicates that there are acknowledged shutdown events active. If there are any active shutdown events the red light will change from flashing red to solid red after the Alarm Acknowledge key is pressed. Any condition that has caused a shutdown event must be manually reset. If there are no longer any active shutdown events, the red light will turn off.



Alarm Acknowledge – Pressing the Alarm Acknowledge will cause the horn relay output to turn off and silence the horn (if installed). Pressing the key will also cause any yellow or red flashing lights to turn off or to become solid depending on the active status of the alarms. The Alarm Acknowledge may also be configured to send out a global alarm silence on the J1939 Data Link, which will silence horns on annunciators. Pressing and holding the Alarm Acknowledge key can be used to reset all active warnings or shutdowns.



EMERGENCY STOP Push button – A red lock-down push button that immediately shuts down the generating set and will inhibit start until the push button has been released by turning it clockwise. Prior to restarting the set, this fault must be reset by pressing the “stop” button on the module and resetting the fault in the “event log menu”.

Display Preferences for PowerWizard Panels:

To change the display preferences, from the main menu scroll down to the "Preferences" item (last in the menu). Press the "Enter" Key. Scroll down through the preferences menu until the desired display preference is highlighted. Press "Enter" to adjust this preference.

CONTRAST: The display contrast may require adjustment from the factory default depending on viewing angle and ambient temperature. The contrast is adjusted between 0% and 100% by pressing the "Left" and "Right" keys. Pressing "Enter" accepts the changes and "Escape" aborts the changes.

BACKLIGHT: The backlight is usually left at 100%, however on occasions the user may wish to reduce the backlight intensity. The backlight can be adjusted between 0 to 100% by pressing the "Left" and "Right" keys. Pressing "Enter" accepts the changes and "Escape" aborts the changes.

PRESSURE UNITS: The pressure units can be adjusted between kPa/psi/bar. Use the "Left" and "Right" keys to select the preferred pressure units. Pressing "Enter" accepts the new pressure units; pressing "Escape" aborts the change in pressure units.

TEMPERATURE UNITS: The temperature units can be adjusted between °C and °F. Use the "Left" and "Right" keys to select the preferred temperature units. Pressing "Enter" accepts the change; pressing escape aborts the change.

5.3.7 Alarm Log and Resetting

Note:

- To reset the menu back to the start, press the "Escape" key three times.

Alarm Log

1. From the main menu, highlight "EVENT LOGS" and press the "Enter" key.
2. In order to scroll through the events use the "Up" and "Down" keys. Events are ordered with present events first, active events next and inactive events last. Within these classifications they are ordered by engine run hours (or real time clock on PowerWizard 2.0).
3. Press "Enter" after highlighting an event to see additional information such as SPN, FMI, time and date of first occurrence, time and date of last occurrence (PowerWizard 2.0 only), engine hours at first occurrence, and engine hours at last occurrence.

Shutdown Resetting

A flashing red shutdown light indicates there is an unacknowledged shutdown event. The red shutdown light will change from flashing red to solid red when the "Alarm Acknowledged" key is pressed. Once a fault has been checked and the cause rectified, use the following procedure in order to reset the event:

1. Press the "Stop" key.
2. Enter the "EVENT LOGS" option from the main menu.
3. Select an ECM from the list.
4. Scroll through the events in order to highlight the event to be reset.
5. Make sure the event status is active (not present).
6. Press the "Enter" key.
7. "RESET" will be highlighted if the condition is no longer present and the control is in stop.
8. Press the "Enter" key again. The fault will clear.
9. Press the "Escape" key 3 times in order to get back to the main menu.

Quick Alarm Resetting (see section 5.3.5)

In addition to the above procedure there is also a simplified process for resetting all events. To reset all events:

1. Press the "Stop" key.
2. Press and hold the "Alarm Acknowledge" key for three seconds.
3. Press Enter to reset all events, press Escape to cancel.

Note.

- The PowerWizard must be in stop mode to reset events.
- Active faults cannot be reset.

5.3.8 Security

There are three levels of password protection on the PowerWizard control panel. All of the adjustable setpoints are associated with a specific level of security required to make an adjustment to the parameter. The passwords only affect changing setpoints within the control panel.

The level of password protection that is required for each setpoint is identified on the parameter setpoint entry screen. A security level identification number "1", "2" or "3" next to a padlock symbol is displayed on the parameter setpoint entry screen. A Level 3 security is used for the most secure setpoints and Level 1 security is used for the least secure setpoints. If the PowerWizard is currently at the required level of protection when viewing a parameter, the padlock will not appear.

If a parameter is displayed with a padlock but no security level identification number next to it, the parameter cannot be changed from the PowerWizard display and the Dealer must be contacted. Level 1 and 2 passwords are disabled when installed. Level 1 and 2 passwords are user level passwords and can be used if desired.

The PowerWizard 2.0 also has a SCADA password, which can be used to secure remote communications.

To view the security menu:

MAIN MENU > CONFIGURE > SECURITY

At the top of the security menu the current security level is displayed. Within the security menu are the following options:

DROP TO MINIMUM LEVEL – used to return the current security level to the lowest level set-up. Highlight and press Enter to drop to minimum security level. If no Level 1 or 2 passwords are set-up the minimum level will be 2. If a Level 2 password is set-up, the minimum level will be 1 and if a Level 1 password is set-up the minimum level will be 0.

ENTER LEVEL 1 OR 2 – used to enter Level 1 or 2 passwords. Highlight and press Enter to proceed to the password entry screen. Passwords can be entered using the cursor keys. In PowerWizard, Level 1 and 2 passwords must be different. An entered password is compared against the stored Level 1 and 2 passwords, if the password is correct the PowerWizard will go to the corresponding security level.

ENTER LEVEL 3 – used to obtain Level 3 access. The Level 3 security password is reserved for critical setpoints that should only be changed by a skilled operative. As such you must contact your Dealer if you require a change associated with a Level 3 password.

CHANGING LEVEL 1 PASSWORD – used to set-up, change or disable a Level 1 password. In order to use this feature the control must be at current security Level 1 or higher. Highlight and press Enter to proceed to the password entry screen. To set-up or change the password, enter the new password using the cursor keys. Passwords may be 16 digits long. To disable the Level 1 security password, set the password to '0'. Press the Enter key to save.

CHANGING LEVEL 2 PASSWORD – used to set-up, change or disable a Level 2 password. In order to use this feature the control must be at current security Level 2 or higher. Highlight and press Enter to proceed to the password entry screen. To set-up or change the password, enter the new password using the cursor keys. Passwords may be 16 digits long. To disable the Level 2 security password, set the password to '0'. Press the Enter key to save.

CHANGING SCADA PASSWORD (PowerWizard 2.0 only) – used to set-up, change or disable a SCADA password. Highlight and press enter to proceed to the password entry screen. To set-up or change the password, enter the new password using the cursor keys. Passwords may be 16 digits long. To disable the SCADA security password, set the password to '0'. Press the Enter key to save.

5.3.9 Real Time Clock Programming (PowerWizard 2.0)

The real time clock provides information for the time and date of an automatic time based start/stop control. It also provides a mechanism for time stamps in the event log. The real time clock is not calibrated and is for information only. The date and time are set by the user.

1. In order to set the time or date format:
MAIN MENU > CONFIGURE > TIME/DATE.
2. To set the time, highlight the time then press the "Enter" key twice.
3. Use the cursor keys to set the time and press the "Enter" key to save. Press the "Escape" key to return.
4. To set the date, highlight the date then press the "Enter" key twice.
5. Use the cursor keys to set the date and press the "Enter" key to save. Press the "Escape" key to return.
6. To set the date format, highlight either the FORMAT DD/MM/YY or FORMAT MM/DD/YY and press the "Enter" key.
7. Use the cursor keys to select the required date format and press the "Enter" key to save.

5.3.10 Fuel Priming – Engines with Electric Fuel Lift Pump

Certain engines fitted with an electric fuel pump do not have a manual priming feature on the engine. In these circumstances the PowerWizard can be used to energise the fuel lift pump in order to prime the engine.

1. In order to prime the generating set:
MAIN MENU > CONTROL > ENGINE FUEL PRIMING.
2. To prime the generating set press the right cursor key, this will initiate a 2 minute priming cycle.
3. To exit the priming cycle press the left cursor key.

Note.

- The generating set may only be primed when the generating set is stopped and there are no active or present shutdown conditions.

5.3.11 Additional Features Available

Reduced Power Mode

In reduced power mode the screen will go blank and LED's will flash intermittently. Pressing any key will bring the panel out of reduced power mode. Reduced power mode can be disabled (Refer to your local Dealer).

Remote Annunciation of Faults

The PowerWizard Annunciator is used in remote applications, mounted separately from the generating set to provide remote indication of system operating and alarm conditions.

For further information on these features, please contact your Dealer.

5.3.12 Trouble Shooting Guide for PowerWizard

Fault	Symptom	Remedy
Engine Fails To Start	Engine Does Not Crank When Start Signal Is Given, Either Manually Via Run Key Or Automatically Via A Remote Signal	<ol style="list-style-type: none"> 1. Check All Emergency Stop Push Buttons Are Released 2. Check The Stop Button Light Is Not On 3. Check There Are No Shutdown Events Active. Reset, If Required, After Remediating The Indicated Fault 4. Refer To Your Local Dealer
Engine Stops Due To Low Oil Pressure	"LOW OIL PRESSURE" In Event Log. Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Check Oil Level 2. Refer To Your Local Dealer
Engine Stops Due To High Coolant Temp	"HIGH COOLANT TEMP" In Event Log. Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Check Coolant Level In The Radiator. Refer To Safety Section Before Removing The Radiator Cap 2. Refer To Your Local Dealer
Engine Stops Due To Overspeed	"OVERSPEED" In Event Log. Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Verify The Actual Engine Speed 2. Refer To Your Local Dealer
Engine Stops Due To Under-Voltage (Powerwizard 2.0 Only)	"UNDER-VOLTAGE" In Event Log, Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Refer To Your Local Dealer
Engine Stops Due To Over-Voltage (Standard On Powerwizard 2.0, Optional On Powerwizard 1.0)	"Over-Voltage" In Event Log, Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Refer To Your Local Dealer
Generating Set Does Not Go On Load	Generating Set Is Running But The Load Is Not Being Powered	<ol style="list-style-type: none"> 1. Refer To Your Local Dealer
Generating Set Does Not Stop Manually	Generating Set Keeps Running After Being Switched Off	<ol style="list-style-type: none"> 1. Check That The Generating Set Stops When The Emergency Stop Push button Is Depressed 2. Refer To Your Local Dealer
Generating Set Does Not Stop When In Auto Mode	Generating Set Does Not Stop After Remote Start Signal Is Removed	<ol style="list-style-type: none"> 1. Check That The Generating Set Stops When The Emergency Stop Push button Is Depressed Or The Stop Key Is Held Down For 5 Seconds And The Cooldown Time Is Skipped
Alarm For Not In Auto Mode (Standby Sets Only)	"Not In Auto Mode" Alarm In Event Log, Amber Led Illuminates	<ol style="list-style-type: none"> 1. Check The Module Is In "Auto" Mode 2. Check Emergency Stop Push buttons Are Not Pressed 3. Refer To Your Local Dealer

5.4 PowerWizard (PW 1.1, 1.1+ and 2.1)

5.4.1 General Information

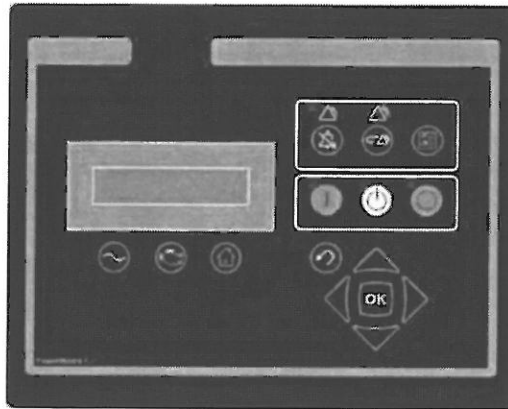


Figure 5j – PowerWizard Control System Panel

The controller is available in three versions, PowerWizard 1.1, 1.1+ and 2.1. These three versions are based on different features. This guide is intended to cover the PowerWizard generating set Control and its application in generating set systems.

5.4.2 PowerWizard Control Module Description

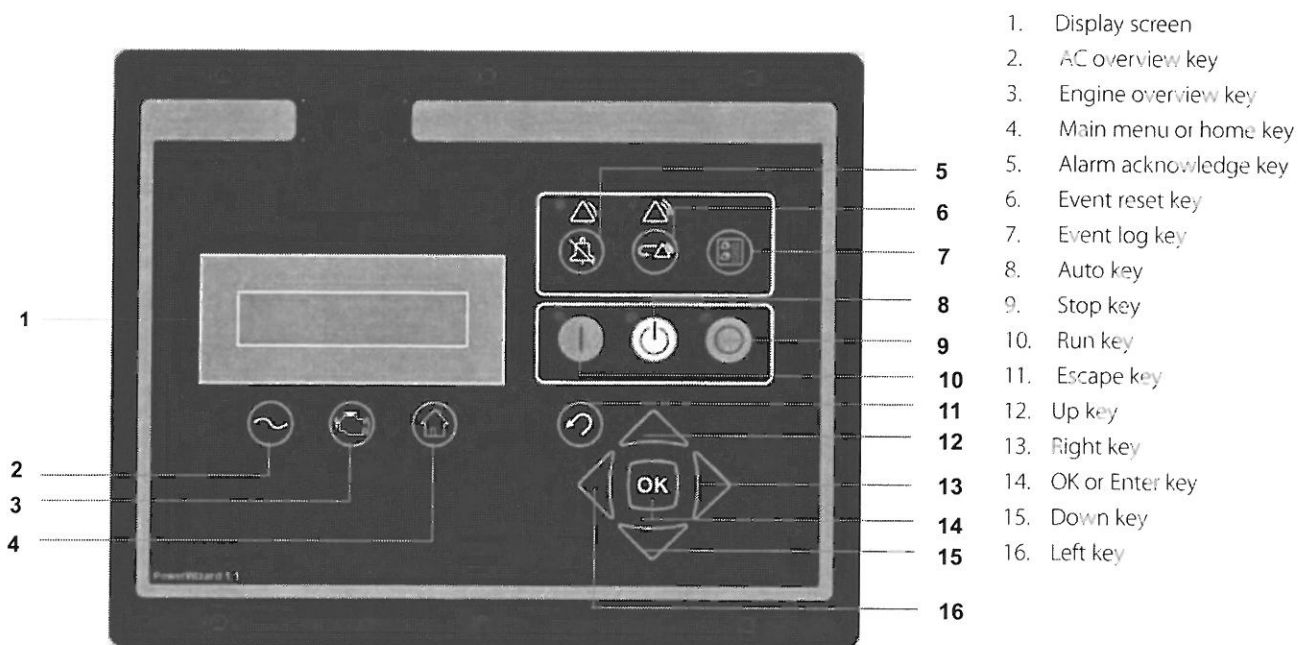


Figure 5k – PowerWizard Control Module Description

5.4.3 Pre-Start Checks (applicable to all control systems)

The following checks should be performed prior to starting the generating set:

1. A visual inspection should take only a few minutes and can prevent costly repairs and accidents – For maximum generating set life, visually inspect the generating set before starting. Look for items such as:
 - Loose fastenings / fixings, worn belts or loose connections. Repair as necessary.
 - The fan and exhaust guards must be at the correct positions and securely fixed. Repair damaged / loose guards or renew missing guards.
 - Wipe clean all filler caps before the engine is serviced or fluids are topped up to reduce the chance of any system contamination.
 - For any type of leak (coolant, lubricating oil or fuel), clean away the fluid. If a leak is observed, find the source and correct the leak. If a leak is suspected, check the fluid levels frequently until the leak is found and repaired.
 - Accumulated grease and / or oil on an engine is a fire hazard. Remove it by steam cleaning or by the use of a high pressure water jet. Avoid high-pressure water on the electronic/electrical components provide suitable protection were possible.
 - Ensure that the coolant pipes are fitted correctly and that they are secure. Check for leaks. Check the condition of all pipes for splits or signs of rubbing.

Fluid levels

2. Check the engine oil and coolant levels – replenish as necessary (see engine handbook for locations). Ensure fluids used are as recommended within the engine handbook.

WARNING:

- △ **Do not remove the radiator cap or any component of the cooling system while the engine is running and while the coolant is under pressure, because dangerous hot coolant can be discharged, posing a risk of personal injury. Do not add large amounts of cold coolant to a hot system as serious engine damage could result.**
3. Check the engine oil and coolant levels – replenish as necessary.

Note:

- Diesel engines normally consume lube oil at a rate of 0.25% to 1% of the fuel consumption.
- When adding coolant to the radiator system, always pour slowly to help prevent air from becoming trapped in the engine. Always top up when engine is cold.

WARNING:

- △ **When filling the fuel tank, do not smoke or use an open flame in the vicinity.**
4. Check the fuel level – fill as necessary.

WARNING:

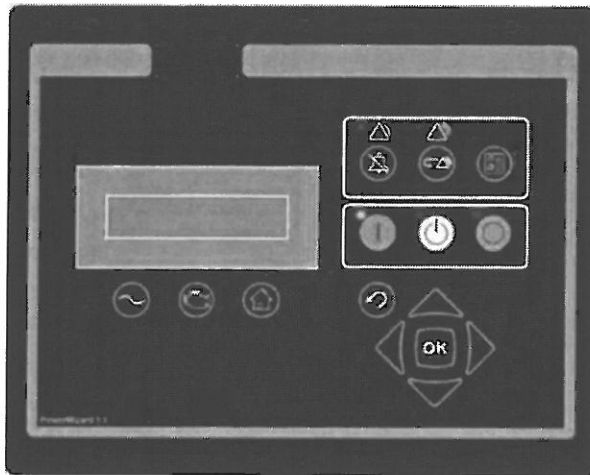
- △ **Before tightening the fan belts, disconnect the battery negative (-) lead to ensure the engine cannot be accidentally started.**
5. Check the condition and tension of the fan and engine alternator belts – tighten as necessary.
6. Check all hoses for loose connections or deterioration – tighten or replace as necessary.
7. Check the battery terminals for corrosion – clean as necessary.

WARNING:

- △ **When working with the batteries, do not smoke or use an open flame in the vicinity. Hydrogen gas from batteries is explosive.**
- △ **Do not short the positive and negative terminals together.**
8. Check the battery electrolyte level – fill with distilled water as necessary.
9. Check the control panel and the generating set for heavy accumulation of dust and dirt – clean as necessary. These can pose an electrical hazard or give rise to cooling problems.
10. Check the air filter restriction indicator, if fitted – replace the filter as necessary.
11. Clear the area around the generating set of any insecure items that could inhibit operation or cause injury. Ensure cooling air ventilation screens are clear.
12. Visually check the entire generating set for signs of leaks from the fuel system, cooling system or lubrication seals.
13. Periodically drain exhaust system condensate traps, if equipped.
14. Ensure the Alternator Output Circuit Breaker is in the "OFF" (handle down) position.

5.4.4 Basic Operation

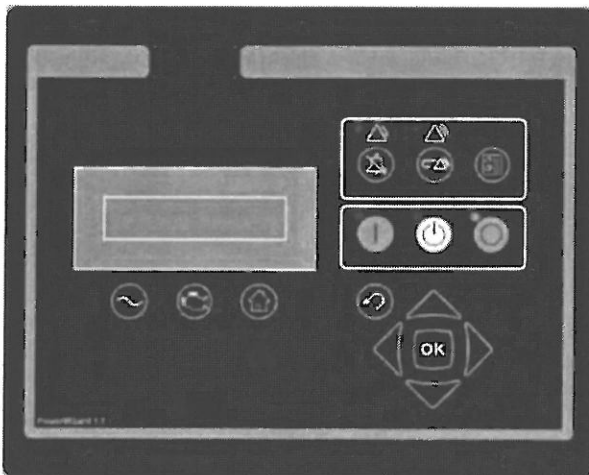
START Mode



Press **START** Key

Figure 5l – Basic Operation Start Key

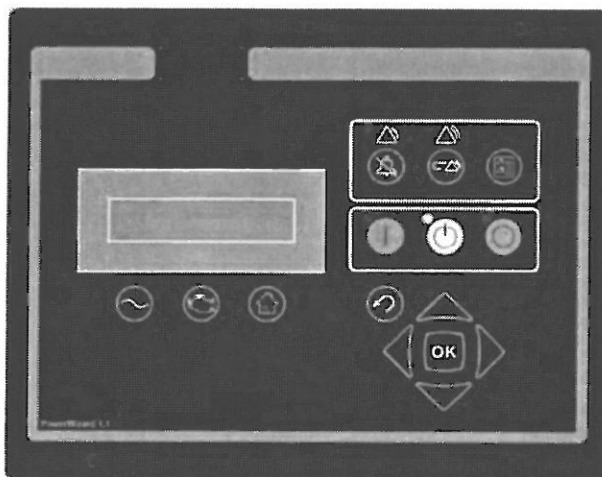
STOP Mode



Press **STOP** Key

Figure 5m – Basic Operation Stop Key

AUTO Mode



Press **AUTO** Key

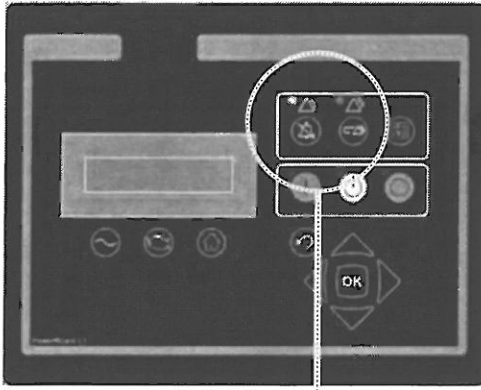
Figure 5n – Basic Operation Auto Key

Note:

- When not using PowerWizard in AUTO mode a "Not in Auto Mode" activate alarm will sound (where enabled).

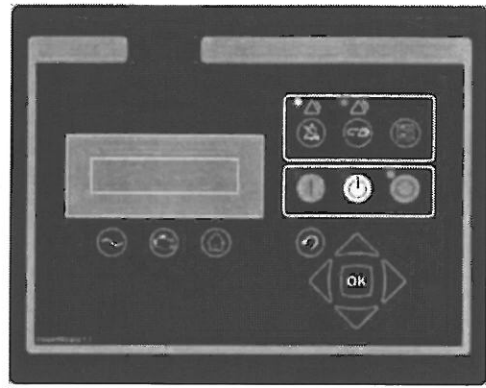
5.4.5 Fault / Alarm Reset Process

1. Fault / Alarm Reset Process



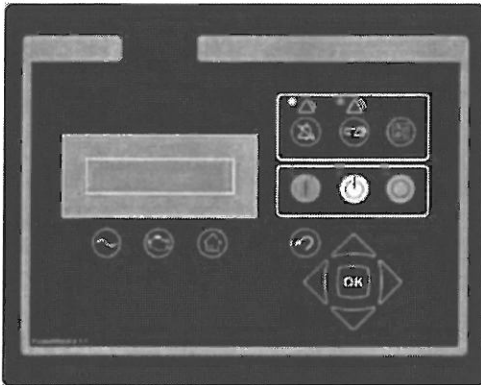
If either of these indication lamps are flashing or solid there is a warning or shutdown

2. Fault / Alarm Reset



Press **STOP** Key

3. Fault / Alarm Reset



Press and hold "Alarm Acknowledge" key for 3 seconds

4. Fault / Alarm Reset Process. The display will show:



Press **ENTER** Key to clear all Warnings and / or Shutdowns




Press **ESCAPE** Key to cancel

Figure 5b – Basic Operation Fault Alarm Reset Process




5.4.6 User Interface Overview

Before starting or running the generating set, the operator should become fully acquainted with the control module's display and push buttons. The display should be observed from time to time while the generating set is running so that any abnormal readings can be detected before problems arise. Figure 5c shows a typical layout of the PowerWizard control panel. Addition of optional equipment may add items to the panel so that the panel fitted on the generating set may be slightly different from the typical one shown. The following descriptions explain the function of each standard item on the panels:







Function Keys:

- 
 AC Overview key – The AC Overview key will navigate the display to the first screen of AC information. The AC Overview information contains various AC parameters that summarise the electrical operation of the generating set. (Use the up/down keys to navigate within the AC parameters).
- 
 Engine Overview key – The Engine Overview key will navigate the display to the first screen of engine information. The Engine Overview information contains various engine parameters that summarise the operation of the generating set. (Use the up / down keys to navigate within the Engine parameters).
- 
 Main Menu key – The Main Menu key will navigate the display to the main menu screen. Pressing the navigation keys will allow access to menus at all levels.





Control Keys:

-  RUN – Pressing the Run key will cause the engine to enter the run mode.
-  AUTO – Pressing the Auto key will cause the engine to enter the auto mode.
-  STOP – Pressing the Stop key will cause the engine to enter stop mode.

Navigation Keys:

-  Scroll Up – The Scroll Up key is used to navigate up through the various menus or monitoring screens. The Scroll Up key is also used during setpoint entry. During numeric data entry the Scroll Up key is used to increment the digits (0–9). If the setpoint requires selection from a list, the Scroll Up key is used to navigate through the list.
-  Escape – The Escape key is used during menu navigation in order to navigate up through the menu/sub-menu structure. Each key press causes the user to move backwards/upwards through the navigation menus. The Escape key is also used to exit/cancel out of data entry screens during setpoint programming. If the Escape key is pressed during setpoint programming, none of the changes made on screen will be saved to memory.
-  Scroll Right – The Scroll Right key is used during setpoint adjustment. During numeric data entry, the Scroll Right key is used to choose which digit is being edited. The Scroll Right key is also used during certain setpoint adjustments to select or deselect a check box. If a box has a check mark inside, pressing the Scroll Right key will cause the check mark to disappear, disabling the function. If the box does not have a check mark inside, pressing the Scroll Right key will cause a check mark to appear, enabling the function.
-  Enter / OK – The Enter key is used during menu navigation to select menu items in order to navigate forward/downward in the menu/sub-menu structure. The Enter key is also used during setpoint programming in order to save setpoint changes. Pressing the Enter key during setpoint programming causes setpoint changes to be saved to memory.
-  Scroll Down – The Scroll Down key is used to navigate down through the various menus or monitoring screens. The Scroll Down key is also used during setpoint entry. During numeric data entry the Scroll Down key is used in order to decrement the digits (0–9). If the setpoint requires selection from a list, the Scroll Down key is used to navigate down through the list.
-  Scroll Left – The Scroll Left key is used during setpoint adjustment. During numeric data entry, the Scroll Left key is used to choose which digit is being edited. The Scroll Left key is also used during certain setpoint adjustments to select or deselect a check box. If a box has a check mark inside, pressing the Scroll Left key will cause the check mark to disappear, disabling the function. If the box does not have a check mark inside, pressing the Scroll Left key will cause a check mark to appear, enabling the function.

Event Keys and Indicators:

-  Yellow Warning Light – A flashing yellow light indicates that there are unacknowledged active warnings. A solid yellow light indicates that there are acknowledged warnings active. If there are any active warnings, the yellow light will change from flashing yellow to solid yellow after the Alarm Acknowledge key is pressed. If there are no longer any active warnings, the yellow light will turn off after the Alarm Acknowledge key is pressed.
-  Red Shutdown Light – A flashing red light indicates that there are unacknowledged active shutdown events. A solid red light indicates that there are acknowledged shutdown events active. If there are any active shutdown events the red light will change from flashing red to solid red after the Alarm Acknowledge key is pressed. Any condition that has caused a shutdown event must be manually reset. If there are no longer any active shutdown events, the red light will turn off.
-  Alarm Acknowledge – Pressing the Alarm Acknowledge will cause the horn relay output to turn off and silence the horn. Pressing the key will also cause any yellow or red flashing lights to turn off or to become solid depending on the active status of the alarms.
-  Event Reset Key – Pressing the Event Reset key will reset all events when the control is in the stopped position. However, “Reset All Events” will not reset “Present” events.



Event Log Key – Pressing the Event Log key will navigate to the “Active Events” menu. In order to scroll through the events, use the up and down keys. After highlighting an event, press the “OK” key to see information about the event such as the SPN and the FMI.



EMERGENCY STOP Push button – A red lock-down push button that immediately shuts down the generating set and will inhibit start until the push button has been released by turning it clockwise. Prior to restarting the set, this fault must be reset by pressing the “stop” button on the module and resetting the fault in the “event log menu”.

Display Preferences for PowerWizard Panels:

To change the display preferences, from the main menu scroll down to the “Preferences” item (last in the menu). Press the “Enter” Key. Scroll down through the preferences menu until the desired display preference is highlighted. Press “Enter” to adjust this preference.

CONTRAST: The display contrast may require adjustment from the factory default depending on viewing angle and ambient temperature. The contrast is adjusted between 0% and 100% by pressing the “Left” and “Right” keys. Pressing “Enter” accepts the changes and “Escape” aborts the changes.

BACKLIGHT: The backlight is usually left at 100%, however on occasions the user may wish to reduce the backlight intensity. The backlight can be adjusted between 0 to 100% by pressing the “Left” and “Right” keys. Pressing “Enter” accepts the changes and “Escape” aborts the changes.

PRESSURE UNITS: The pressure units can be adjusted between kPa/psi/bar. Use the “Left” and “Right” keys to select the preferred pressure units. Pressing “Enter” accepts the new pressure units; pressing “Escape” aborts the change in pressure units.

TEMPERATURE UNITS: The temperature units can be adjusted between °C and °F. Use the “Left” and “Right” keys to select the preferred temperature units. Pressing “Enter” accepts the change; pressing escape aborts the change.

VOLUME: Volume is used on some optional parameters (such as fuel consumption rate). It can be selected between Litres, US Gallons and Imperial Gallons using the “Left” and “Right” keys. Pressing “Enter” accepts the new volume units; pressing “Escape” aborts the change to the volume units.

LAMP TEST: This is used to test the LEDs and display. When LAMP TEST is highlighted, pressing OK will turn on all LEDs and display screen.

5.4.7 Alarm Log and Resetting

Note:

- To reset the menu back to the start, please press the “Escape” key three times.

Event Viewing

There are two ways to view events. Pressing the “EVENT LOG” key navigates directly to the “ACTIVE EVENTS” menu. The other way is to use the Main Menu:

1. From the MAIN MENU/VIEW, highlight “EVENT LOGS” and press the “Enter” key. The “ACTIVE EVENTS” menu will be displayed in this menu.
2. In order to scroll through the events use the up and down keys. Events are ordered with present events first, active events next and inactive events last. Within these classifications they are ordered by engine run hours (or real time clock on PowerWizard 2.1).
3. Press “Enter” after highlighting an event to see additional information such as SPN, FMI, time and date of first occurrence, time and date of last occurrence (PowerWizard 2.1 only), engine hours at first occurrence and engine hours at last occurrence.

Quick Shut Down Resetting

In addition to the above procedure there is also a simplified process for resetting all events. To reset all events:

1. Ensure that the control is in the stopped position.
2. Press the “Reset Event” key from any screen.
3. A confirmation prompt will appear.
4. Press the “OK” key to reset all events on all modules. Press the “ESCAPE” key to cancel the reset operation.

Note:

- The PowerWizard must be in stop mode to reset events.

Present events cannot be reset.

Shut Down Resetting

A flashing red shutdown light indicates there is an unacknowledged shutdown event. The red shutdown light will change from flashing red to solid red when the Alarm Acknowledged key is pressed. Once a fault has been checked and the cause rectified, use the following procedure in order to reset the event:

1. Press the "Stop" key.
2. Enter the "EVENT LOGS" option from the main menu.
3. Select a "Module" from the list.
4. Scroll through the events in order to highlight the event to be reset.
5. Make sure the event status is active (not present).
6. Press the "Enter" key.
7. "RESET" will be highlighted if the condition is no longer present and the control is in stop.
8. Press the "Enter" key again. The fault will clear.
9. Press the "Escape" or "Main Menu" key in order to get back to the main menu.

5.4.8 Security

There are 3 levels of password protection on the PowerWizard control panel. All of the adjustable setpoints are associated with a specific level of security required to make an adjustment to the parameter. The passwords only affect changing setpoints within the control panel.

The level of password protection that is required for each setpoint is identified on the parameter setpoint entry screen. A security level identification number "1", "2" or "3" next to a padlock symbol is displayed on the parameter setpoint entry screen. A Level 3 security is used for the most secure setpoints and Level 1 security is used for the least secure setpoints. If the PowerWizard is currently at the required level of protection when viewing a parameter, the padlock will not appear.

If a parameter is displayed with a padlock but no security level identification number next to it, the parameter cannot be changed from the PowerWizard display and the Dealer must be contacted. Level 1 and 2 passwords are disabled when installed. Level 1 and 2 passwords are user level passwords and can be used if desired.

The PowerWizard 2.1 also has a SCADA password, which can be used to secure remote communications.

To view the security menu:

MAIN MENU > CONFIGURE > SECURITY.

At the top of the security menu the current security level is displayed. Within the security menu are the following options:

DROP TO MINIMUM LEVEL – used to return the current security level to the lowest level set-up. Highlight and press Enter to drop to minimum security level. If no Level 1 or 2 passwords are set-up the minimum level will be 2. If a Level 2 password is set-up, the minimum level will be 1 and if a Level 1 password is set-up the minimum level will be 0.

ENTER LEVEL 1 OR 2 – used to enter Level 1 or 2 passwords. Highlight and press Enter to proceed to the password entry screen. Passwords can be entered using the cursor keys. In PowerWizard, Level 1 and 2 passwords must be different. An entered password is compared against the stored Level 1 and 2 passwords, if the password is correct the PowerWizard will go to the corresponding security level.

ENTER LEVEL 3 – used to obtain Level 3 access. The Level 3 security password is reserved for critical setpoints that should only be changed by a skilled operative. As such you must contact your Dealer if you require a change associated with a Level 3 password.

CHANGING LEVEL 1 PASSWORD – used to set-up, change or disable a Level 1 password. In order to use this feature the control must be at current security Level 1 or higher. Highlight and press Enter to proceed to the password entry screen. To set-up or change the password, enter the new password using the cursor keys. Passwords may be 16 digits long. To disable the Level 1 security password, set the password to '0'. Press the Enter key to save.

CHANGING LEVEL 2 PASSWORD – used to set-up, change or disable a Level 2 password. In order to use this feature the control must be at current security Level 2 or higher. Highlight and press Enter to proceed to the password entry screen. To set-up or change the password, enter the new password using the cursor keys. Passwords may be 16 digits long. To disable the Level 2 security password, set the password to '0'. Press the Enter key to save.

CHANGING SCADA PASSWORD (PowerWizard 2.1 only) – used to set-up, change or disable a SCADA password. Highlight and press enter to proceed to the password entry screen. To set-up or change the password, enter the new password using the cursor keys. Passwords may be 16 digits long. To disable the SCADA security password, set the password to '0'. Press the Enter key to save.

5.4.9 Real Time Clock Programming (PowerWizard 2.1)

The real time clock provides information for the time and date of an automatic time based start/stop control. It also provides a mechanism for time stamps in the event log. The real time clock is not calibrated and is for information only. The date and time are set by the user.

1. In order to set the time or date format:
MAIN MENU > CONFIGURE > TIME/DATE.
2. To set the time, highlight the time then press the "Enter" key twice.
3. Use the cursor keys to set the time and press the "Enter" key to save. Press the "Escape" key to return.
4. To set the date, highlight the date then press the "Enter" key twice.
5. Use the cursor keys to set the date and press the "Enter" key to save. Press the "Escape" key to return.
6. To set the date format, highlight either the FORMAT DD/MM/YY or FORMAT MM/DD/YY and press the "Enter" key.
7. Use the cursor keys to select the required date format and press the "Enter" key to save.

5.4.10 Fuel Transfer (PowerWizard 2.1)

Fuel pump in connection with fuel level measurement can be controlled to transfer diesel to the fuel tank.

1. In order to set the Fuel Transfer operation:
MAIN MENU > CONTROL > FUEL TRANSFER
2. To start or stop the fuel pump, highlight the PUMP CONTROL then press the "OK" key.
3. Use the cursor key to select START FUEL PUMP or STOP FUEL PUMP and press the "OK" key.
4. Auto Fuel Load Pump On and Off thresholds are set at 25% and 75% respectively.

5.4.11 Additional Features Available

Reduced Power Mode

In reduced power mode the screen will go blank and LED's will flash intermittently. Pressing any key will bring the panel out of reduced power mode. Reduced power mode can be disabled (Refer to your local dealer).

Remote Annunciation of Faults

The PowerWizard Annunciator is used in remote applications, mounted separately from the generating set to provide remote indication of system operating and alarm conditions.

For further information on these features, please contact your Dealer.

5.4.12 Trouble Shooting Guide for PowerWizard

Fault	Symptom	Remedy
Engine Fails To Start	Engine Does Not Crank When Start Signal Is Given, Either Manually Via Run Key Or Automatically Via A Remote Signal	<ol style="list-style-type: none"> 1. Check All Emergency Stop Push Buttons Are Released 2. Check The Stop Button Light Is Not On 3. Check There Are No Shutdown Events Active. Reset, If Required, After Remediying The Indicated Fault 4. Refer To Your Local Dealer
Engine Stops Due To Low Oil Pressure	"LOW OIL PRESSURE" In Event Log. Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Check Oil Level 2. Refer To Your Local Dealer
Engine Stops Due To High Coolant Temp	"HIGH COOLANT TEMP" In Event Log. Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Check Coolant Level In The Radiator. Refer To Safety Section Before Removing The Radiator Cap 2. Refer To Your Local Dealer
Engine Stops Due To Overspeed	"OVERSPEED" In Event Log. Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Verify The Actual Engine Speed 2. Refer To Your Local Dealer
Engine Stops Due To Under-Voltage (Powerwizard 2.1 Only)	"UNDER-VOLTAGE" In Event Log, Red Shutdown Led Illuminates	<ol style="list-style-type: none"> 1. Refer To Your Local Dealer

Fault	Symptom	Remedy
Engine Stops Due To Over-Voltage (Standard On Powerwizard 2.1, Optional On Powerwizard 1.1+)	"Over-Voltage" In Event Log, Red Shutdown Led Illuminates	1. Refer To Your Local Dealer
Generating Set Does Not Go On Load	Generating Set Is Running But The Load Is Not Being Powered	1. Refer To Your Local Dealer
Generating Set Does Not Stop Manually	Generating Set Keeps Running After Being Switched Off	1. Check That The Generating Set Stops When The Emergency Stop Push button Is Depressed 2. Refer To Your Local Dealer
Generating Set Does Not Stop When In Auto Mode	Generating Set Does Not Stop After Remote Start Signal Is Removed	1. Check That The Generating Set Stops When The Emergency Stop Push button Is Depressed Or The Stop Key Is Held Down For 5 Seconds And The Cooldown Time Is Skipped
Alarm For Not In Auto Mode (Standby Sets Only)	"Not In Auto Mode" Alarm In Event Log, Amber Led Illuminates	1. Check The Module Is In "Auto" Mode 2. Check Emergency Stop Push buttons Are Not PreSsed 3. Refer To Your Local Dealer

5.5 Control System Options and Upgrades

A large variety of options may be fitted to customise the control system to a specific installation. The following sections cover the use and operation of some of these options.

5.5.1 Battery Trickle / Switch-Mode Chargers

Both battery chargers are designed to ensure that the starter batteries maintain their charge even if the generating set is not operated for long periods.

Control switches for the chargers are not normally fitted to prevent inadvertent switching off of the charger. However, as additional options, an "ON"/"OFF" switch and a Battery Charger Boost Control may be fitted. The Boost Control overrides the automatic control mechanism of the charger that would normally reduce charging level as the battery becomes charged. This can allow faster charging of the battery. However, care must be taken to only use the boost control for a short time to avoid overcharging the battery and/or boiling the battery dry.

The control system will automatically disconnect the charger on startup of the generating set. While the engine is running the batteries are charged by the engine driven battery charging alternator.

The switch-mode charger is an automatic battery charger, when the voltage drops below a preset voltage level it will automatically enter an increased charging voltage state (Boost). Once the batteries have reached this level, the charger will switch back to its normal 'float' voltage. This prevents the battery from over charging, which in turn prevents over gassing and subsequently maximises battery life.

5.5.2 Heaters

Immersion type heaters (engine heaters) may be fitted in the engine coolant system to ensure that the engine is easy to start and able to take load more quickly.

Alternator anti-condensation heaters (alternator heaters) may be fitted to the alternator stator winding to keep them dry in humid conditions.

Panel anti-condensation heaters (panel heaters) may be fitted in the control panel to keep moisture levels down.

Control switches are not normally fitted but may be fitted as an additional option. With or without control switches, the heaters are automatically disconnected on engine start up.

5.5.3 Electric Fuel Transfer Pumps

Fuel transfer pumps are required when fuel must be transferred from a bulk storage tank to the generating set day tank.

Note:

- Manual control of the electric fuel transfer pump or pumps (customer provides their own) is not provided with the 26 – 200 kVA product.

The controls consist of two illuminated push buttons on the control panel door or separate box under the panel. The red button is a combined trip lamp and stop button. The green button is a run lamp and manual start push button.

To operate the pump manually, ensure the red push button is in the "ON" position (pulled out). Press and hold the green push button to manually run the pump. The pump will only run in the manual mode while the green button is held in.

To operate the pump in automatic mode, ensure that the red push button is in the "ON" position (pulled out). The pump will start running automatically when the fuel level is low and will illuminate the green run lamp. When the tank is full, the pump is turned off and the green lamp is extinguished.

The red lamp will illuminate if there has been an electrical overload.

Care must be taken to ensure that the pump is primed with fuel prior to operation to lubricate the seals. Also, the pump should never be run when the bulk tanks are empty or when valves on the fuel fill lines are closed.



Figure 5p – Battery Trickle Charger

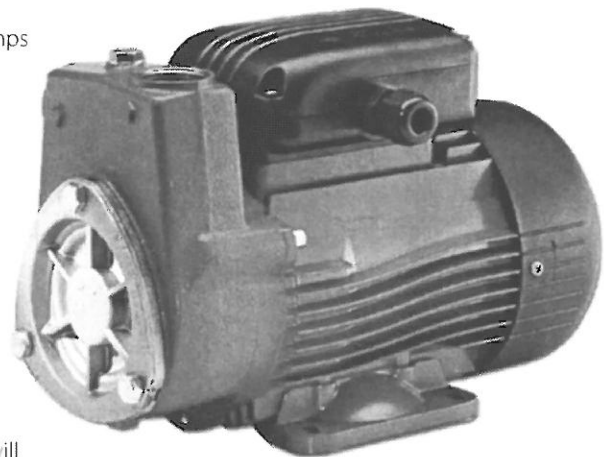


Figure 5q – Electric Fuel Pump

5.5.4 Meters / Gauges

The following additional meters or gauges may be fitted to the control panel:

- Three ammeters mounted on the panel instead of one ammeter and a selector switch. This allows a continuous indication of the current flowing in each phase, not applicable for PowerWizard as this module will display all phase currents. (Not applicable to 26 – 200 kVA product).
- Kilowatt (kW) Meter to provide accurate readings of the load being supplied by the generating set, not applicable for PowerWizard as the PowerWizard 2.1 can display kilowatts (Not applicable to 26 – 200 kVA product).
- Lube Oil Temperature Gauge to monitor the lubricating oil temperature when the engine is operating. The normal operating temperature should be approximately 90° – 110°C (195° – 230°F), not applicable for PowerWizard 1.1 and 2.1+ as the modules will display this.
- Ammeter for Battery Trickle Charger to monitor the current flow to the battery. It is used to observe the charging current being supplied by the battery trickle charger. When the batteries are fully charged this current will be small (less than 5 Amps) but with a partially discharged battery this current may be as high as 40 Amps (Not applicable to 26 – 200 kVA product).

5.5.5 Speed / Voltage Control

Three controls may be fitted to adjust the speed or voltage of the generating set: Speed Adjust Potentiometer, a Raise/Lower Switch and a Voltage Adjust Potentiometer. These should only be adjusted by a qualified generating set technician according to instructions in the Technical Manual. For some electronic engines, speed can be adjusted on the PowerWizard 2.1 and 2.1+ modules.

5.5.6 Alarm Signalling

Three options may be fitted to the control panel to supplement the standard alarm indications of the alarm lamps:

- A panel mounted alarm siren will sound when an alarm condition is indicated. An Alarm Mute push button is fitted on the panel to silence the siren.
- An audible alarm siren supplied loose will sound when an alarm condition is indicated. It can be fitted at a convenient location. An Alarm Mute push button is fitted on the panel to silence the siren.
- A set of volt free contacts for common alarm change over in the event of an alarm condition. These are for connection to an existing alarm system. These contacts remain in the "alarm" state until the control system is reset.

5.5.7 Automatic Preheat Control

Glow plugs operate automatically prior to and during engine cranking. The automatic cranking sequence will be delayed by the preheating period.

5.5.8 Remote Annunciator Panels

Available on PowerWizard.

Remote Annunciator may be fitted to PowerWizard Panels (16 channel).

6. OPERATION

6.1 Priming Procedure for 1100 Series

WARNING:

- ⚠ Please wear appropriate Personal Protective Equipment (Section 2.2) before carrying out any of the following procedures as the operator will be in direct contact with diesel fuel. There will also be a risk of spillage.

Note:

- Please see engine manual to ascertain engine model. If unsure please consult your local Dealer.
- Please see section 3.2 / 3.3 on where the fuel fill can be found on generating set

Following fuel filter servicing or draining of the low pressure fuel system for any reason, re-prime the fuel system as follows.

6.1.1 Products fitted with the small Perkins pre-filter / water separator

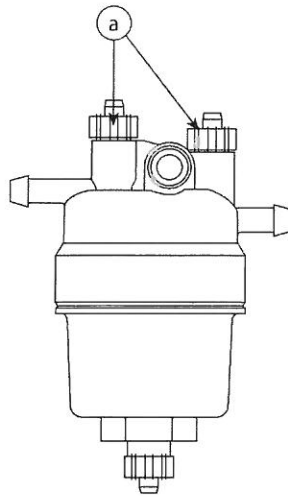


Figure 6a – Example of Pre-Filter / Water Separator

Note:

- Do not open the vent screws (a) when the fuel system is being primed, as diesel fuel will be discharged.

With Fuel Supply from the Base Tank

- Operate the priming switch for the standard pre-set 2 minute priming cycle (See section 5.3.10).
- Start engine.
- In the event of a failure to start the engine within 3 crank cycles, see the “Troubleshooting” section of this procedure for the repeat prime procedure.

With Fuel Supply from a Remote Tank

- Ensure fuel lines from the remote tank are full of fuel, the pump should never be run when bulk tanks are empty or when valves on the fuel fill lines are closed.
- With the fuel supply switched to remote tank, carry out the priming procedure.

The PowerWizard control panel can be used to energise the fuel lift pump in order to prime the engine as follows:

1. In order to prime the generating set:
MAIN MENU > CONTROL > ENGINE FUEL PRIMING.
2. To prime the set press the right cursor key, this will initiate a 2 minute priming cycle.
3. To exit the priming cycle press the left cursor key.

Note:

- The generating set may only be primed when the generating set is stopped and there are no active or present shutdown conditions.

6.1.2 Products fitted with the Racor Pre-Filter / Water Separator (Option)

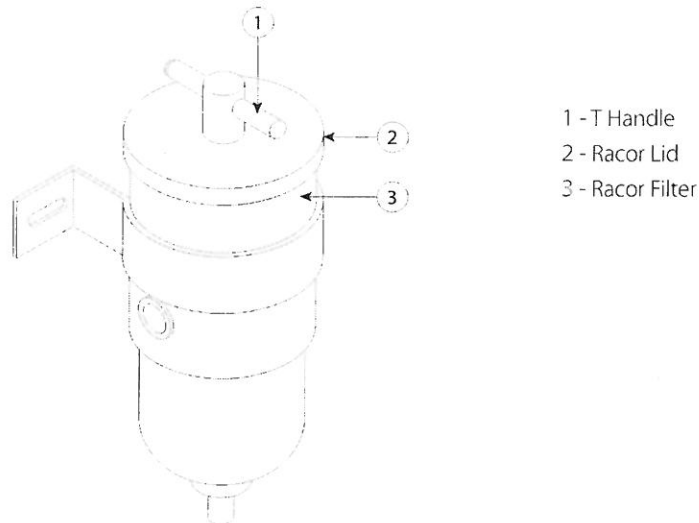


Figure 6b – Example of a Racor

With Fuel Supply from the Base Tank

Following Racor element change or if the Racor unit is drained for any reason, then repriming of the unit, as specified by Racor, will be required:

- Remove T-handle (1) and lid from the top of the unit.
- Screw T-handle into centre tube finger tight.
- Fill the assembly with clean fuel to just above the top of the element. This ensures the “dirty” side of the unit is completely filled with fuel.
- Lubricate the lid gasket (2) and T-handle (1) o-ring with clean fuel.
- Replace the lid (2) taking care to seat the gasket correctly and tighten the T-handle (1) – do not use tools.
- Operate the priming switch (if fitted) to give the system a 2 minute prime.
- Start engine.
- In the event of a failure to start the engine within 3 crank cycles, see the “troubleshooting” section of this procedure for the repeat prime procedure.

With Fuel Supply from a Remote Tank

If the fuel lines from the remote tank are empty:

- Carry out the manual filling procedure of the Racor unit as detailed above.
- Operate the priming switch for 2 minutes.
- Re-fill the Racor unit as detailed above.
- Re-prime for a further 2 minutes.
- Start engine.
- In the event of a failure to start the engine after 3 crank cycles, see the ‘troubleshooting’ section of this procedure for the repeat prime procedure.

If the fuel lines from the remote tank are full:

- Carry out the priming procedure as detailed in fuel supply from base tank.

6.1.3 Troubleshooting

Having completed the designated priming procedure, if the engine does not start, there may be air in the Pressure Regulator Valve (PRV) return loop hose.

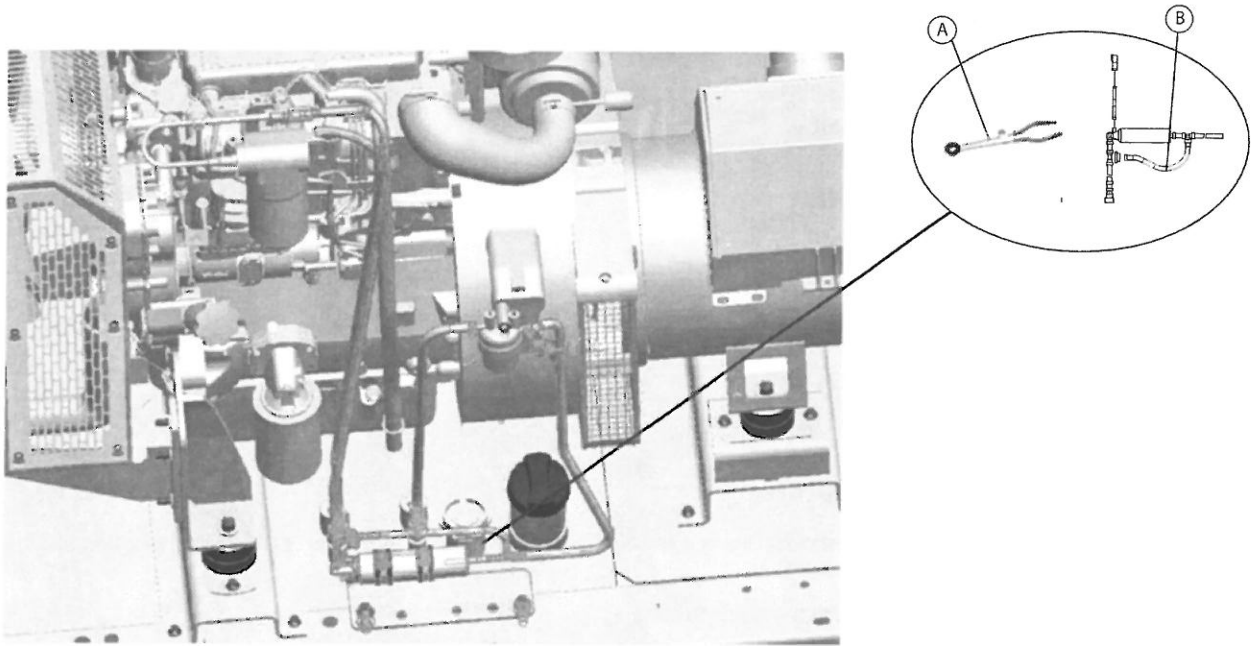


Figure 6c – Tooling (Not supplied) & Pressure Regulator Valve (PRV) return loop hose

1. Close the PRV return loop hose (B). Use Tooling (A) in order to close the PRV return loop hose (B). A typical example of Tooling (A) is shown in the illustration.
2. Repeat the priming procedure that is applicable to the configuration of the fuel system.
3. Release Tooling (A).
4. Start engine. Allow engine to run until smooth operation has been ensured and the pump is free from air.

7. LOAD TRANSFER PANELS

When the generating set is required to automatically provide switching to standby power in the event of mains failure, an optional load transfer panel is required. These transfer panels are designed to sense when the mains have failed, signal the generating set to start, switch the load from the failed mains to the generating set and then switch it back after the mains supply is re-established.

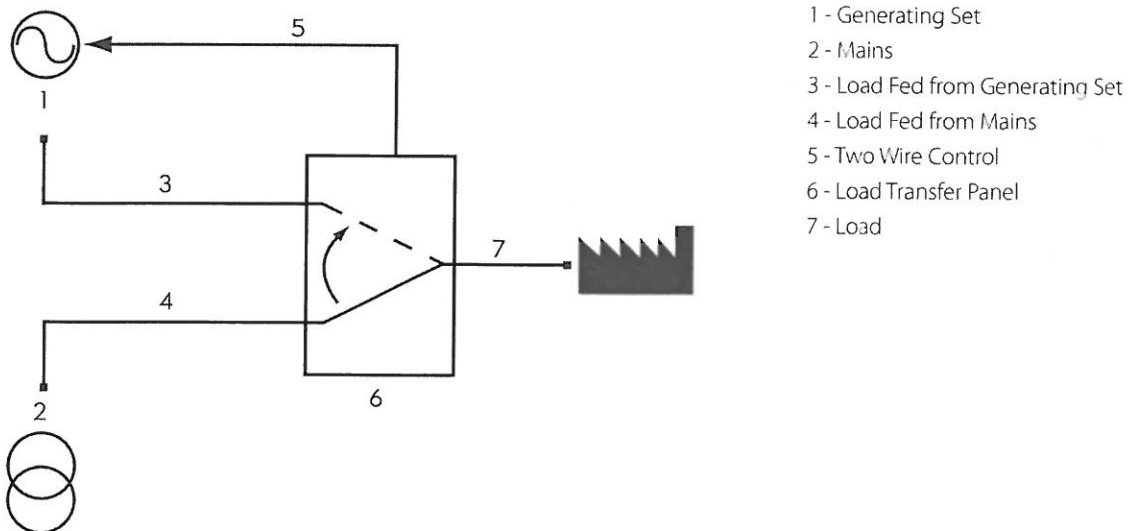


Figure 7a – Function of a Load Transfer Panel

There are two models of Load Transfer Panels available: The CTI and the ATI Series Intelligent Transfer Panels. The User Guide for these panels will be included in this manual, if chosen at time of order. Consult your local Dealership for further information.

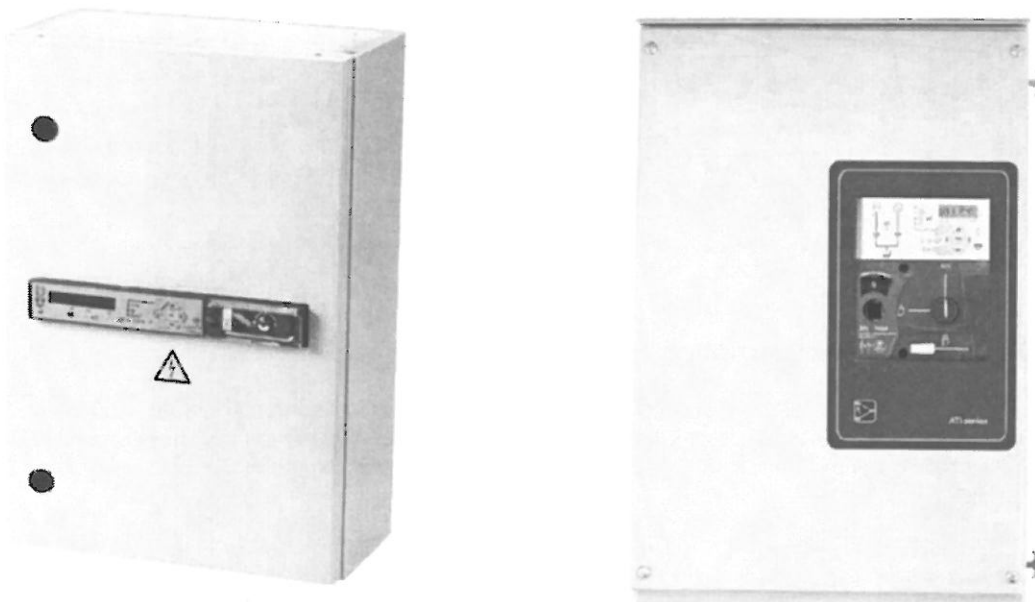


Figure 7b – CTI and ATI Series Intelligent Transfer Panels

7.1 Engine Interface Module Description (where fitted)

The Engine Interface Module is a sealed, engine mounted module that provides switching relays for the Starter Motor Solenoid, Glow Plug and Fuel Solenoid. Each of these circuits is protected with individual fuses mounted in the module. Individual LED's illuminate when each circuit is energised.

There are two versions of the Engine Interface Module available:

EIM Basic: The EIM is utilised in conjunction with the LCP1002T Keystart Panel / PowerWizard Autostart Panels. It consists of three relays to carry currents associated with the Fuel Control Solenoid, Starter Motor Solenoid and the Glow Plug. The module is powered directly from the battery.

EIM Plus: The EIM plus is used in conjunction with the LCP2 Autostart Panel and occasionally the LCP1002T keystart panel.

Overspeed Signal (EIM Plus only): The EIM Plus monitors the speed signal from the magnetic pick-up. If the engine speed rises above a certain pre-settable value, the module sends a zero volt signal to the generating set control panel to activate the Overspeed Fault circuitry.

The Overspeed Set Point is factory set at 55 Hz for 50 Hz sets and 66 Hz for 60 Hz sets. This can be adjusted using the adjustment screw accessed through the hole beside the Overspeed Set-up LED. While the engine is running at the rated speed (1500 rpm for 50 Hz or 1800 rpm for 60 Hz) the adjustment screw should be adjusted until the Overspeed Set-up LED just goes out. This sets the overspeed value at 10% above the speed at which the generating set is operating.

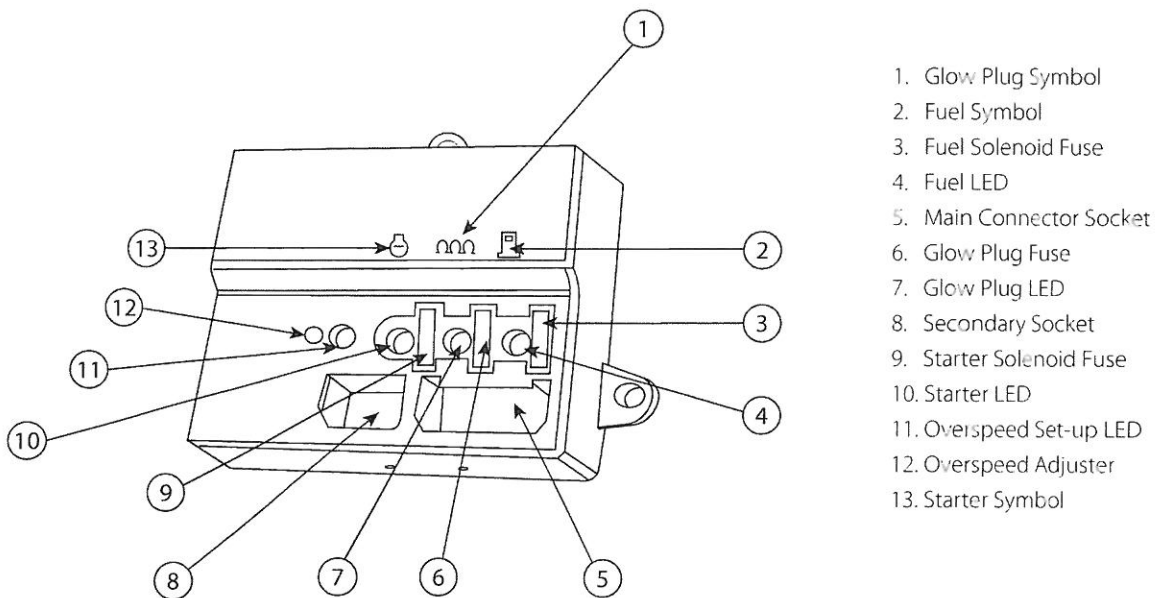


Figure 7c – Engine Interface Module (EIM)

7.2 Output Circuit Breaker Description

The alternator output circuit breaker is of sufficient rating for the generating set output. Electrical output is switchable through this device, with "ON" being indicated by the handle being up. The breaker will carry its rated current continuously but will trip to off position if the rating on any one phase is exceeded for a period depending on the percentage overload and the circuit breaker characteristics.

8. ELECTRONIC ENGINE FAULT DETECTION FLASH CODES

Perkins 1306-E87 electronic engines automatically record engine faults in the Electronic Control Module (ECM) to assist the engineer in troubleshooting. The fault codes can be read using the red and amber lamps situated on the top of the relay box, as shown in the picture below.

1. Relay Box – This interfaces between the Electronic Control Module (ECM) and the control panel.
2. Amber Light – If lit indicates an active fault. Please contact your local Dealership for assistance. The generating set may continue to run but may be on reduced power.
3. Red Light – Used for flash code reading, this will not light in normal operation.
4. Push Buttons – Push buttons 1 & 0 are used for fault code reading only.
5. Diagnostic Plug – This is used for communication with a laptop / PC. This should only be used by an authorised technician. Please consult your local Dealership.

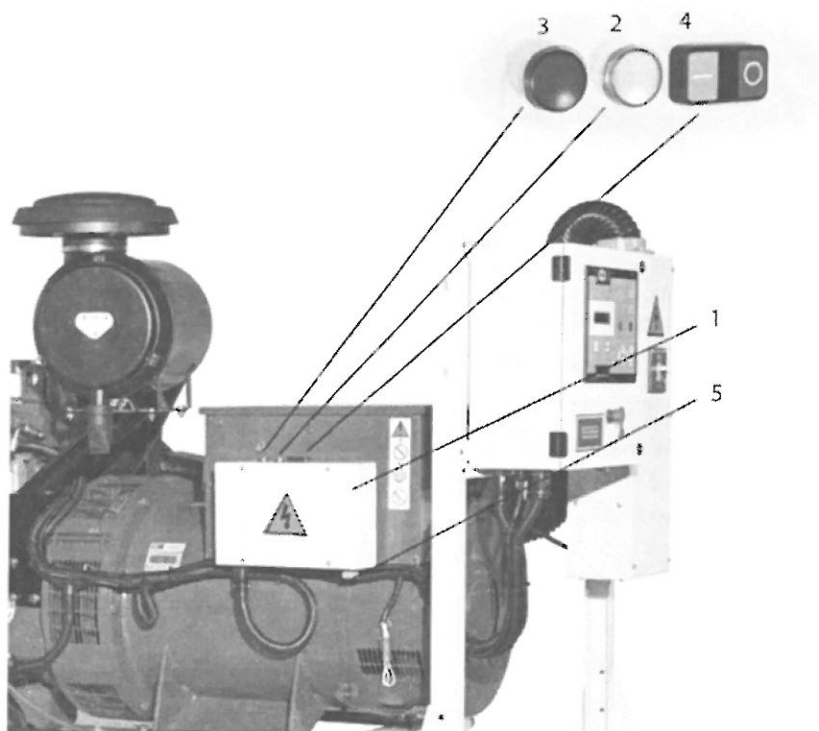


Figure 8a – 1306-E87 Electronic Engines Relay Box

Note:

- The engine protection systems e.g. low oil pressure, high coolant temperature, are within the control of the generating set control panel. These sensors will shut the engine down before the ECM sensors.

9. MAINTENANCE

A good maintenance programme is the key to long generating set life. Maintenance and service should only be carried out by qualified technicians. Records of this work should be kept to aid in developing an efficient maintenance programme.

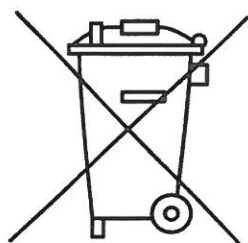
In general, the generating set should be kept clean. Do not permit liquids such as fuel or oil film to accumulate on any internal or external surfaces or on, under or around any acoustic material, if fitted. Wipe down surfaces using an aqueous industrial cleaner. Do not use flammable solvents for cleaning purposes.

Any acoustic material with a protective covering that has been torn or punctured should be replaced immediately to prevent accumulation of liquids or oil film within the material.

Refer to a qualified generating set technician for details of required preventative maintenance.

9.1 Battery Removal and Fitting

Batteries, as used in generators, by law, must not be disposed of with household waste.



Batteries contain hazardous materials and in the charged state, each cell contains electrodes of lead metal (Pb) and lead (IV) dioxide (PbO₂) in an electrolyte of about 33.5% w/w (6 Molar) sulphuric acid (H₂SO₄). In the discharged state both electrodes turn into lead (II) sulphate (PbSO₄) and the electrolyte loses its dissolved sulphuric acid and becomes primarily water.

It can be damaging to the environment to send these to landfill, burning batteries can also cause atmospheric pollution.

Dealing with lead acid batteries can be hazardous so it is important to follow all safety guidelines.

- Battery acid can burn clothing and skin and even cause blindness if it leaks, so wear protective clothing when inspecting a battery prior to its disconnection / transportation.
- Disconnect the battery safely before inspecting it (see below).
- Before removing a battery, carry out a thorough inspection of its condition. Use a torch if visibility is poor to check all sides of the battery for any marks, dents or leaks.
- If the battery has any severe dents or leaks then contact a professional battery engineering service for assistance and get it repaired or replaced, do not attempt to remove it.
- During transport, cover the terminals so they cannot be shorted out.
- Keep the battery upright at all times.
- When removing a battery for whatever reason always ensure all load is removed before disconnecting the battery so that no sparks are created. Disconnect the negative cable first followed by the positive cable to avoid short circuit against any metal framework, then remove the hold down clamp or strap securing the battery base. The battery can be fairly heavy so be careful when lifting and carrying the battery. Seek assistance if required.
- When refitting the battery, ensure the terminal posts are correctly aligned with the cables to avoid wrong connection and place the new battery into the hold-down tray and reattach the hold-down clamp or strap. Attach and tighten the positive battery cable to the positive terminal first. Then attach and tighten the negative battery cable to the negative terminal.

9.2 Preventative Maintenance

WARNING:

⚠ **The following procedures should be carried out by a qualified technician.**

Depending on the application of the generating set, requirement for preventative maintenance will vary.

The preventative maintenance requirements associated with the engine are detailed in the Engine Manual, which should be reviewed in conjunction with this section. Maintenance intervals for the engine may be more frequent than those shown in this section.

Daily or at Each Startup:

(For standby sets these procedures may be performed weekly.) A walk around inspection should be performed on a daily basis and prior to starting the engine. The Pre-Start checks contained in Section 6 should be performed during this walk around. Procedures for performing the checks on the engine can be found in the Engine Manual that may contain additional requirements to those in Section 6.

Every Two Weeks:

(For standby sets that have not been run.) Perform an operational check on the generating set by starting and running it for only 5 minutes.

WARNING:

⚠ **Do not run diesel engines at low loads for long periods.**

Every Month:

(For standby sets that have not been run on load.) Perform an operational and load check on the generating set by starting and running the generating set on at least 50% load for 1 to 2 hours.

Every Twelve Months or 500 Hours:

Repeat the daily procedures plus the following:

1. Check all control system safety devices by electrically simulating faults.
2. Clean all battery cap vents.
3. Tighten all exhaust connections.
4. Tighten all electrical connections.
5. Perform other engine maintenance as specified in the Engine Manual.
6. Start the engine and observe the instrument panel to ensure that all gauges and meters are operating properly.

9.3 Alternator Preventative Maintenance

There is no routine maintenance required on the alternator, however observe the following recommendations:

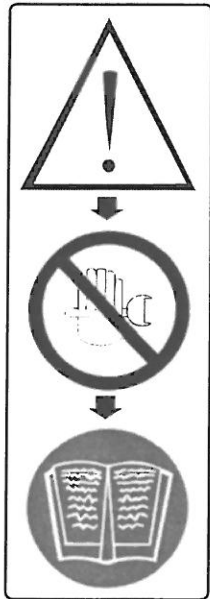
- Periodically inspect the alternator winding condition and carry out general cleaning.
- Periodically inspect the cable connections between the alternator and the circuit breaker.
- See your local Dealer.

9.4 Engine Preventative Maintenance

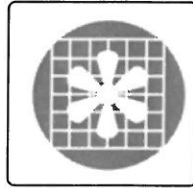
See the Engine Manual provided with this manual pack for information on regular maintenance required to keep the engine operating efficiently.

HAZARD LABEL LEGEND

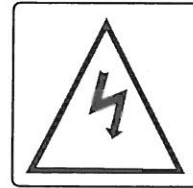
Some or all of these hazard warning labels will appear on your generating set:
For 400 series power product please see page 55



DO NOT TAMPER WITH
UNLESS YOU HAVE
READ THE INSTRUCTION
MANUAL



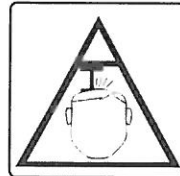
USE FAN GUARDS



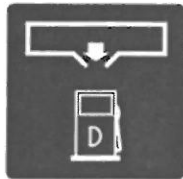
ELECTRIC SHOCK HAZARD



HOT EXHAUST GAS



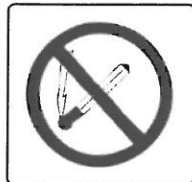
LOW OVERHEAD OBJECTS



DIESEL FUEL LINE SUPPLY



RATED SPEED



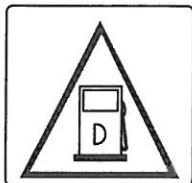
NO NAKED FLAMES



WEAR EAR PROTECTION



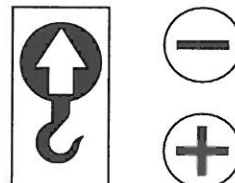
EMERGENCY / PANIC EXIT



DIESEL FUEL WARNING

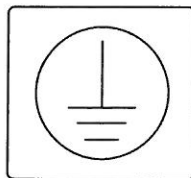


HOT SURFACES

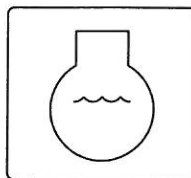


LIFT

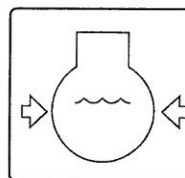
ELECTRIC TERMINALS



PROTECTIVE EARTH (GROUND)



ENGINE COOLANT



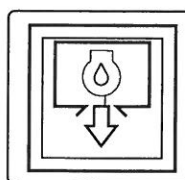
ENGINE COOLANT
PRESSURE



NO LIFTING FROM THIS POINT



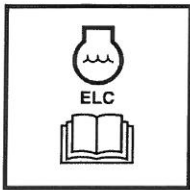
DO NOT POWERWASH



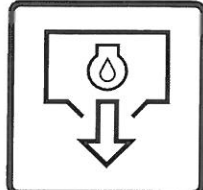
OIL DRAIN

HAZARD LABEL LEGEND

The labels below apply to products powered by 400 series powered product only:



Extended Life Coolant



Oil Drain



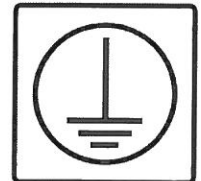
Coolant Drain



Diesel Fuel Fill



Positive & Neutral Electric Terminals



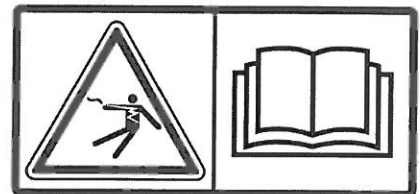
Earth



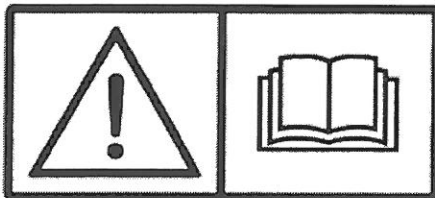
Hot Fluid Warning



Warning Auto Start



Electric Shock



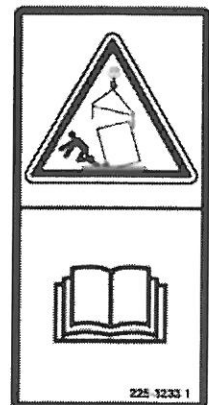
Warning -
Read the manual



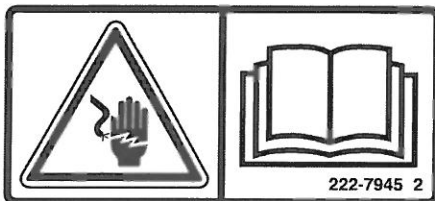
Lift Symbol



Do Not Touch Hot Surface



Warning Crush Falling Object



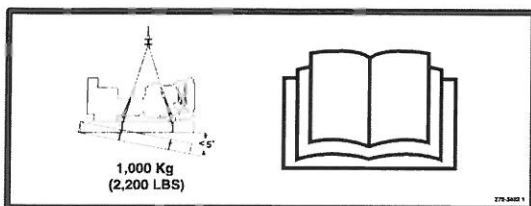
Shock Warning



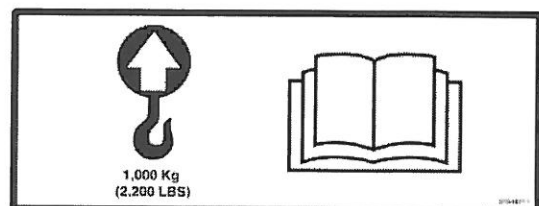
Centre of Gravity



Do NOT Powerwash



Lifting 1 Ton 4 Point



Lifting 1 Ton 1 Point

NOTES

NOTES

