### Abbreviations

The following are the abbreviations used in Lister Petter Power Systems operators’ handbooks.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>alternating current</td>
</tr>
<tr>
<td>AL</td>
<td>battery-charge alternator</td>
</tr>
<tr>
<td>ASU</td>
<td>automatic control module</td>
</tr>
<tr>
<td>BC</td>
<td>battery charger</td>
</tr>
<tr>
<td>CCR</td>
<td>charge circuit relay</td>
</tr>
<tr>
<td>CT1</td>
<td>current transformers</td>
</tr>
<tr>
<td>DC</td>
<td>direct current</td>
</tr>
<tr>
<td>DCCB</td>
<td>DC circuit breaker</td>
</tr>
<tr>
<td>DCS</td>
<td>DC control switch</td>
</tr>
<tr>
<td>EPB</td>
<td>emergency stop pushbutton</td>
</tr>
<tr>
<td>ETX</td>
<td>engine temperature sender</td>
</tr>
<tr>
<td>F1</td>
<td>fuses</td>
</tr>
<tr>
<td>FCS</td>
<td>fuel control solenoid</td>
</tr>
<tr>
<td>HP1</td>
<td>heater plug</td>
</tr>
<tr>
<td>HR</td>
<td>heater relay</td>
</tr>
<tr>
<td>LED</td>
<td>light-emitting diode</td>
</tr>
<tr>
<td>MC</td>
<td>mains contactor</td>
</tr>
<tr>
<td>MCB</td>
<td>AC circuit breaker</td>
</tr>
<tr>
<td>MOL</td>
<td>mains-on-load lamp</td>
</tr>
<tr>
<td>OPS</td>
<td>oil pressure switch</td>
</tr>
<tr>
<td>OPX</td>
<td>oil pressure sender</td>
</tr>
<tr>
<td>PC</td>
<td>plant contactor</td>
</tr>
<tr>
<td>POL</td>
<td>plant-on-load lamp</td>
</tr>
<tr>
<td>SB</td>
<td>starter battery</td>
</tr>
<tr>
<td>SM</td>
<td>starter motor</td>
</tr>
<tr>
<td>SS</td>
<td>starter solenoid</td>
</tr>
</tbody>
</table>

### Statement of Indemnity

The information, specifications, illustrations, instructions and statements contained within this publication are given with our best intentions and are believed to be correct at the time of going to press. Our policy is one of continued development and we reserve the right to amend any technical information with or without prior notice.

Whilst every effort is made to ensure the accuracy of the particulars contained within this publication, neither the Manufacturer, the Distributor nor the Dealer shall in any circumstances be held liable for any inaccuracy or the consequences thereof. The information given is subject to the Company’s current Conditions of Tender and Sale; is for the assistance of users; and is based upon results obtained from tests carried out at the place of manufacture. This Company does not guarantee that the same results will be obtained elsewhere under different conditions.

Parts that have not been approved by the Lister Petter Power Systems organisation cannot be relied upon for correct material, dimensions or finish. The Company cannot therefore be held responsible for any damage arising from the use of such parts, and the guarantee will be invalidated.

P027-10623

Copyright © Lister Petter Power Systems
## CONTENTS

Model designation ........................................................................................................... 4

1. Introduction and Precautions .................................................................................. 5

2. The Control Module ............................................................................................... 9

3. The Control System ............................................................................................... 19

4. Standard Electric Start Sets .................................................................................. 21

5. Automatic Mains Failure Sets ............................................................................... 23

6. Dummy Load .......................................................................................................... 25

7. Long Run Sets ........................................................................................................ 26

8. Routine Maintenance .............................................................................................. 28

9. Troubleshooting ..................................................................................................... 28

10. Replacement Parts ................................................................................................. 29

Appendix 1. Installation and Commissioning .............................................................. 30

Appendix 2. List of Drawings ..................................................................................... 32
### MODEL DESIGNATION

<table>
<thead>
<tr>
<th>Model</th>
<th>Engine type</th>
<th>r/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWA 10</td>
<td>LPW2</td>
<td>1500/1800</td>
</tr>
<tr>
<td>LWA 15</td>
<td>LPW3</td>
<td>1500/1800</td>
</tr>
<tr>
<td>LWA 20</td>
<td>LPW4</td>
<td>1500/1800</td>
</tr>
<tr>
<td>LWA 27</td>
<td>LPWT4</td>
<td>1500/1800</td>
</tr>
<tr>
<td>LWA 14</td>
<td>LPW2</td>
<td>3000/3600</td>
</tr>
<tr>
<td>LWA 22</td>
<td>LPW3</td>
<td>3000/3600</td>
</tr>
<tr>
<td>LWA 30</td>
<td>LPW4</td>
<td>3000/3600</td>
</tr>
<tr>
<td>LWA 41</td>
<td>LPWT4</td>
<td>3000</td>
</tr>
<tr>
<td>LWX 13</td>
<td>LPWX2</td>
<td>1500/1800</td>
</tr>
<tr>
<td>LWX 20</td>
<td>LPWX3</td>
<td>1500/1800</td>
</tr>
<tr>
<td>LWX 27</td>
<td>LPWX4</td>
<td>1500/1800</td>
</tr>
<tr>
<td>LWX 30</td>
<td>LPWXT4</td>
<td>1500/1800</td>
</tr>
</tbody>
</table>
1. INTRODUCTION AND PRECAUTIONS

This handbook covers the operation and routine maintenance of LWA generating sets powered by Lister Petter Power Systems Alpha LPW series engines in the following versions:

- Electric Start;
- Electric Start + Dummy Load;
- Automatic Mains Failure (AMF);
- AMF + Dummy Load

There is a separate handbook for the engine.

Some features and facilities of the generating set are specific to certain models, as indicated in the text. To determine the version of generating set that you are using refer to the serial number stamped on the nameplate and read section 1.1 Nameplates.

1.1 NAMEPLATES

There are nameplates on the generating set, engine and alternator. They tell you what each item or equipment can do. The generating set nameplate defines the performance of the complete generating set and its limits.

An example of a generating set serial number is:

11 12345 G LPW4 22 6

which is interpreted as follows:

11 ...............Year of manufacture code
12345 .............Consecutive number of genset
G .............Lister Petter Power Systems diesel genset
LPW4 .............Engine model
2 ............Starting mode 2 (electric start)
2 ...............Electrical output mode 2 (3-phase, 4-wire, 50Hz)
6 ..................Lister Petter Power Systems alternator

For future reference write your genset serial number in the box below.

The engine nameplate defines the capabilities of the engine.

The alternator nameplate defines the maximum capabilities of the alternator at specific power ratings for the voltage, frequency, connection arrangement, ambient temperature and conditions shown.

Where there are differences between the nameplates, the generating-set nameplate data should be used.
1.2 SAFETY SYMBOLS

Take note of, and be familiar with, the ISO 8999 symbols used by Lister Petter Power Systems, shown in figure 1.2.

1.3 CAUTIONS AND WARNINGS

When a diesel engine is being serviced there are risks that must be avoided. If you do not take proper safety precautions you may be injured or killed, or the product may be damaged. Warning messages are used throughout this publication to alert you, as follows:

⚠️ CAUTION

This caution draws attention to special instructions or procedures which, if not correctly followed, can result in damage to, or destruction of, equipment.

⚠️ WARNING

A warning with this type of text draws attention to special instructions or procedures which, if not correctly followed, can result in personal injury.

⚠️ WARNING

A WARNING SYMBOL WITH THIS TYPE OF TEXT DRAWS ATTENTION TO SPECIAL INSTRUCTIONS OR PROCEDURES WHICH, IF NOT CORRECTLY FOLLOWED, CAN RESULT IN SEVERE PERSONAL INJURY, OR LOSS OF LIFE.

1.4 GENERAL PRECAUTIONS

⚠️ WARNING

Before your generating set can be used it must be correctly installed by qualified engineers. See Appendix: Installation and Commissioning.
WARNING

Untrained people must not start or operate any diesel generating set. It is dangerous. Operators must read and follow the instructions contained in this manual as well as the engine and alternator handbooks supplied.

Before the first start, and at regular intervals, check the fuel, lubricating oil and coolant levels. For full details refer to the Engine Operators’ Handbook.

When the Set is Running
- Wear ear defenders.
- Do not touch any electrical connections.
- Do not run the set with any covers or guards removed or damaged.
- Do not smoke near the generating set.
- Do not touch any part of the exhaust system.
- Do not breathe exhaust fumes.

When the Set is at Rest
- Do not touch the exhaust system immediately after the engine has stopped. It will still be very hot.
- Do not attempt any maintenance or adjustments unless you have the necessary knowledge and qualifications. See 7. Routine Maintenance and read the precautions in this chapter.
- Do not work on the set before disconnecting the starter battery. Always disconnect the negative terminal first, reconnect the negative terminal last and use insulated tools.
- If work is to be carried out inside control or contactor cubicles they must be isolated from both AC and DC supplies.

1.5 PREPARING THE BATTERY

If batteries are supplied they can be supplied 'wet' or dry-charged. Wet batteries need to be charged. Dry-charged batteries can normally be used for operation after filling with battery acid without initial charging.

WARNING

Battery electrolyte is corrosive. Batteries must be handled with care, and protective clothing should be worn.

Preparing a Dry-Charged Battery

The following procedure should be used to prepare a battery with factory-sealed charge.
1. Remove the vent plugs.
2. Fill the individual cells of the battery with sulphuric acid in accordance with VDE 0510 of density 1.280 kg/l (for tropical countries 1.230 kg/l) up to the maximum acid level mark, or 15 mm above upper edge of plates. The temperature of the battery and acid should be at least 10°C before filling.
3. Allow the batteries to stand for 20 minutes, tilt slightly several times and top up with acid to correct level if required.
4. Clean and dry the outside of the battery. Thinly coat the terminals with petroleum jelly and fit the vent plugs.
5. Clean the plant connections, thinly coat with petroleum jelly and connect the battery, making sure that the positive cable is connected to the positive terminal and the negative terminal cable to the negative terminal.

If the battery does not provide an
adequate starting performance then it must be charged.

Charging a Battery
1. Use a charge rate of approximately 6A. Discontinue the charging if the acid temperature exceeds 55°C. The battery is fully charged when the acid density and charging voltage have stopped rising for two hours.
2. After charging check the acid level and if required top up with distilled water to the maximum acid level mark, or 15 mm above the upper edge of the separators.
3. The battery should be checked within a week to ensure that the specific gravity is uniform throughout the battery and that no cell has a specific gravity below 1.280 kg/l. If this is not the case then the battery must be recharged as in steps 1 and 2 above.

Care of Batteries
- Never allow the battery to stand for long periods in the discharged state. Always recharge the battery promptly.
- Check the level of the battery acid at regular intervals and adjust by adding distilled or de-ionized water.

**CAUTION**
*Do not use impure water or so-called 'Improving agents'.*

- Keep the top of the battery clean and dry. Inspect the terminals, and if necessary clean them and coat them with petroleum jelly.
- Do not allow metal objects to short-circuit the cells. Take special care when using spanners near a battery.

**WARNING**
*Never allow battery cells to become short-circuited by metal objects. Severe burns and electric shock can result.*

1.6 USING THIS HANDBOOK
Refer to the table of contents (page 3) to find the section you need.
It is recommended that the individual steps contained in the various maintenance or repair operations are followed in the sequence in which they appear.
When a diesel engine is operating or being overhauled there are a number of associated practices which may lead to personal injury or product damage. Your attention is drawn to the caution and warning messages used throughout this publication (section 1.3).
Work should be carried out only if the necessary hand and service tools are available. When the user has insufficient tools, experience or ability to carry out adjustments, maintenance or repairs, this work should not be attempted.
Where accurate measurements or torque values are required they can only be made using calibrated instruments.

**WARNING**
*Under no circumstances should makeshift tools or equipment be used as their use may adversely affect safe working procedures and operation.*

1. Tropical rates apply to those countries or areas where the average temperature of any month of the year exceeds 27°C (80°F).
2. THE CONTROL MODULE

2.1 THE CONTROL MODULE

The control module is used to start and stop the engine, either manually or automatically and to indicate operational status and fault conditions. Front panel mounted push buttons provide Automatic, Manual, Start, Stop/Reset, Lamp Test and Display Scroll facilities.

It monitors various engine and generator parameters. Under out of limit conditions it will either show a warning alarm or shut the engine down, indicated by a LCD symbol or LED display.

Figure 2.1 Typical Control Module
2.2 CONTROLS AND INDICATORS

Figure 2.1 Electric Start Control Module

Figure 2.2 Typical AMF Control Module
The LED display shows the selected parameter code and function as indicated by the icon.

<table>
<thead>
<tr>
<th>Code</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Automatic mode selection</td>
</tr>
<tr>
<td>2</td>
<td>Manual mode selection</td>
</tr>
<tr>
<td>3</td>
<td>Start under manual control</td>
</tr>
<tr>
<td>4</td>
<td>Stop/Reset - this will clear any alarm condition or stop the engine if it is running</td>
</tr>
<tr>
<td>5</td>
<td>Alarm mute/Lamp test button</td>
</tr>
<tr>
<td>6</td>
<td>Display scroll buttons - used to step through measured parameters</td>
</tr>
<tr>
<td>7</td>
<td>Generator available LED</td>
</tr>
<tr>
<td>8</td>
<td>Connect to load LED</td>
</tr>
<tr>
<td>9</td>
<td>Main Status LCD display</td>
</tr>
<tr>
<td>10</td>
<td>Configurable alarms indicators</td>
</tr>
<tr>
<td>11</td>
<td>Transfer to generator button</td>
</tr>
<tr>
<td>12</td>
<td>Open generator button (ES), transfer to mains (AMF)</td>
</tr>
<tr>
<td>13</td>
<td>Connect to mains (LED)</td>
</tr>
<tr>
<td>14</td>
<td>Test mode button</td>
</tr>
<tr>
<td>15</td>
<td>Mains available LED</td>
</tr>
</tbody>
</table>

2.3 VIEWING THE INSTRUMENTS

At power up, the display will show the software version and then show the default screen, which will display Generator Voltage. It is possible to scroll to display the different pages of information by repeatedly operating the next / previous page buttons.

The contents of each information page is shown below.

Once selected the page will remain on the LCD display until the user selects a different page, or after an extended period of inactivity, the module will revert to the status display.

Metering:
- Engine Speed
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Run Time
- Number of Engine Starts
- Generator Voltage (ph-N)
- Generator Voltage (ph-ph)
- Generator Frequency
- Generator Current
- Generator Load
• Generator kVA
• Generator Power Factor
• Generator Load (kVAR)
• Generator Load (kWh, kVAh, kVArh)
• Generator Phase Sequence
• Mains Voltage (ph-N)
• Mains Voltage (ph-ph)
• Mains Frequency
• Events Log

Not all parameters are available on all of the control modules.

### 2.4 EVENT LOG

Press the left or right scroll button to gain access. Pressing the down button on this display will move to the previous event, the event log entry at position 1 being the most recent. On moving from the instrumentation to the event log the unit will display the most recent entry. A number in the bottom left indicates the event log entry currently displayed. The number of event log entries varies on control modules. When the event log is displayed the icon in the alarm icon area indicates the alarm type at that position of the event log. The hours run at the time of the alarm shows in the instrumentation area. The bottom right icon indicates the current mode as normal.

Example of Auxiliary Input Shutdown Alarm (see Figure 2.4). Note display may vary depending on control module.

![Figure 2.4 Example of Auxiliary Input Shutdown Alarm](image)

**Controls**

**Stop / Reset**

This button places the module into its Stop/Reset mode. This will clear any alarm conditions for which the triggering criteria have been removed. If the engine is running and the module is in Stop mode, the module will automatically instruct the changeover device to unload the generator (**Close Generator** becomes inactive (if used)). The fuel supply de-energises and the engine comes to a standstill. Should a **remote start signal** be present while operating in this mode, a remote start will not occur.
## Manual
This mode allows manual control of the generator functions. Once in **Manual mode** the module will respond to the start button, start the engine, and run off load. If the engine is running off-load in the **Manual mode** and a **remote start signal** becomes present, the module will automatically instruct the changeover device to place the generator on load ('**Close Generator**' becomes active (if used)). Upon removal of the **remote start signal**, the generator remains on load until either selection of the 'STOP/RESET' or 'AUTO' modes.

## Auto
This button places the module into its '**Automatic**' mode. This mode allows the module to control the function of the generator automatically. The module will monitor the remote start input and mains supply status and once a start request is made, the set will be automatically started and placed on load. Upon removal of the starting signal, the module will automatically transfer the load from the generator and shut the set down observing the stop delay timer and cooling timer as necessary. The module will then await the next start event.

### 2.4.1 TEST (DSE7x20 only)
This button places the module into its '**Test**' mode. This allows an on load test of the generator. Once in **Test mode** the module will respond to the start button, start the engine, and run on load.

### 2.4.2 START
This button is only active in **STOP/RESET** or **MANUAL** mode. Pressing this button in manual or test mode will start the engine and run off load (manual) or on load (test). Pressing this button in **STOP/RESET** mode will turn on the CAN engine ECU (when correctly configured and fitted to a compatible engine ECU)

## Mute / Lamp Test
This button silences the audible alarm if it is sounding and illuminates all of the LEDs as a lamp test feature.

## Transfer to generator
Allows the operator to transfer the load to the generator (when in Manual mode only)

## Open generator (DSE7x20 only)
Allows the operator to open the generator (when in Manual mode only)

## Transfer to mains (DSE7x20 only)
Allows the operator to transfer the load to the mains (when in Manual mode only)

## Menu navigation
Used for navigating the instrumentation, event log and configuration screens. For further details, please see the more detailed description of these items elsewhere in this manual.
2.5 MODULE DISPLAY
The display is segmented into areas for instrumentation, units, alarm icons and various other icons.

<table>
<thead>
<tr>
<th>Inst. Icon</th>
<th>Instrumentation</th>
<th>Units</th>
<th>Alarm Icon</th>
<th>Mode Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active config event index</td>
<td>Instrumentation</td>
<td>Units</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.5.1 Display Example
This example shows Generator Volts as shown by the Generator symbol.

![Figure 2.5.1 Display Example](image)

2.5.2 Mode Icon
An icon is displayed in the mode icon area of the display to indicate what mode the unit is currently in.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Graphic</th>
<th>Details</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopped</td>
<td><img src="image" alt="Stopped" /></td>
<td>Appears when the engine is at rest and the unit is in stop mode.</td>
<td></td>
</tr>
<tr>
<td>Auto</td>
<td><img src="image" alt="Auto" /></td>
<td>Appears when the engine is at rest and the unit is in auto mode.</td>
<td></td>
</tr>
<tr>
<td>Manual</td>
<td><img src="image" alt="Manual" /></td>
<td>Appears when the engine is at rest and the unit is in manual mode.</td>
<td></td>
</tr>
<tr>
<td>Timer Animation</td>
<td><img src="image" alt="Timer Animation" /></td>
<td>Appears when a timer is active, for example cranking time, crank rest etc.</td>
<td></td>
</tr>
<tr>
<td>Running Animation</td>
<td><img src="image" alt="Running Animation" /></td>
<td>Appears when the engine is running, and all timers have expired, either on or off load. The animation rate is reduced when running in idle mode.</td>
<td></td>
</tr>
<tr>
<td>Front Panel Editor</td>
<td><img src="image" alt="Front Panel Editor" /></td>
<td>Appears when the unit is in the front panel editor.</td>
<td></td>
</tr>
</tbody>
</table>
2.5.3 Auto Run Icon
When the engine is running in AUTO mode, an icon is displayed to indicate the reason for the set being run.

<table>
<thead>
<tr>
<th>Auto Run Reason</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Start Input</td>
<td>►</td>
</tr>
<tr>
<td>Low battery run</td>
<td>◀</td>
</tr>
<tr>
<td>Scheduled run</td>
<td></td>
</tr>
<tr>
<td>Mains failure (7x20 only)</td>
<td>▲</td>
</tr>
</tbody>
</table>

2.5.4 Instrumentation Icons
When displaying instrumentation a small icon is displayed in the instrumentation icon area to indicate what value is currently being displayed.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Graphic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator</td>
<td>🌋</td>
<td>Used for generator voltage and generator frequency</td>
</tr>
<tr>
<td>Mains</td>
<td>🌋</td>
<td>Used for mains voltages and mains frequency</td>
</tr>
<tr>
<td>Engine Speed</td>
<td>🌋</td>
<td>Engine speed instrumentation screen</td>
</tr>
<tr>
<td>Hours Run</td>
<td>🕒</td>
<td>Hours run instrumentation screen</td>
</tr>
<tr>
<td>Battery Voltage</td>
<td>🌋</td>
<td>Battery voltage instrumentation screen</td>
</tr>
<tr>
<td>Engine Temperature</td>
<td>🌋</td>
<td>Coolant temperature instrumentation screen</td>
</tr>
<tr>
<td>Oil Pressure</td>
<td>🌋</td>
<td>Oil pressure instrumentation screen</td>
</tr>
<tr>
<td>Flexible sensor</td>
<td>🌋</td>
<td>Flexible sensor instrumentation screen</td>
</tr>
<tr>
<td>Event Log</td>
<td>🍀</td>
<td>Appears when the event log is being displayed</td>
</tr>
<tr>
<td>Unit time</td>
<td>🕒</td>
<td>Current time held in the unit</td>
</tr>
<tr>
<td>Scheduler setting</td>
<td>🌋</td>
<td>The current value of the scheduler run time and duration</td>
</tr>
<tr>
<td>Generator Current</td>
<td>🌋</td>
<td>Generator current instrumentation screen</td>
</tr>
</tbody>
</table>
2.6 PROTECTIONS
When an alarm is present the LCD display will jump from the ‘Information page’ to display the Alarm Page. In the event of a warning alarm, the LCD will display the appropriate icon. If a shutdown then occurs, the module will again display the appropriate icon, flashing.

2.7 WARNING ALARMS
Warnings are non-critical alarm conditions and do not affect the operation of the generator system, they serve to draw the operators attention to an undesirable condition.

<table>
<thead>
<tr>
<th>Display</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Battery High Voltage" /></td>
<td>Battery High Voltage</td>
</tr>
<tr>
<td><img src="image" alt="Battery Low Voltage" /></td>
<td>Battery Low Voltage</td>
</tr>
<tr>
<td><img src="image" alt="Charge Alternator Failure" /></td>
<td>Charge Alternator Failure</td>
</tr>
<tr>
<td><img src="image" alt="Digital Input A-D" /></td>
<td>Digital Input A-D</td>
</tr>
<tr>
<td><img src="image" alt="Analogue Input A-C" /></td>
<td>Analogue Input A-C</td>
</tr>
<tr>
<td><img src="image" alt="Fail to Stop" /></td>
<td>Fail to Stop</td>
</tr>
<tr>
<td><img src="image" alt="Generator High Voltage Warning" /></td>
<td>Generator High Voltage Warning</td>
</tr>
<tr>
<td><img src="image" alt="Generator Low Voltage Warning" /></td>
<td>Generator Low Voltage Warning</td>
</tr>
<tr>
<td><img src="image" alt="High Coolant Temperature Warning" /></td>
<td>High Coolant Temperature Warning</td>
</tr>
</tbody>
</table>
Low Oil Pressure Warning  The module detects that the engine oil pressure has fallen below the low oil pressure pre-alarm setting level after the Safety On timer has expired.

Low Fuel Level  The module detects that the fuel level is below the configured setting.

Over Frequency Warning  The generator output frequency has risen above the pre-set prealarm setting.

Over Speed Warning  The engine speed has risen above the overspeed pre alarm setting.

Under Frequency Warning  The generator output frequency has fallen below the pre-set prealarm setting after the Safety On timer has expired.

Under Speed Warning  The engine speed has fallen below the underspeed pre alarm setting.

Flexible Sensor  The flexible sensor warning alarm has been triggered.

2.8 SHUTDOWN ALARMS
Shutdowns are latching alarms and stop the Generator. Clear the alarm and remove the fault then press Stop/Reset to reset the module.

<table>
<thead>
<tr>
<th>Display</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>![ Digital Input A-D ]</td>
<td>Auxiliary Digital inputs can be user configured as Digital inputs and will display the relevant icon.</td>
</tr>
<tr>
<td>Analogue Input A-C</td>
<td>Auxiliary Analogue inputs can be user configured as Digital inputs and will display the relevant icon.</td>
</tr>
<tr>
<td>Emergency Stop</td>
<td>The emergency stop button has been depressed. This is a failsafe (normally closed to battery negative) input and will immediately stop the set should the signal be removed. <strong>NOTE:</strong> The Emergency Stop Negative signal must be present otherwise the unit will shutdown.</td>
</tr>
<tr>
<td>Fail to Start</td>
<td>The engine has not fired after the preset number of start attempts.</td>
</tr>
<tr>
<td>Generator High Voltage Shutdown</td>
<td>The generator output voltage has risen above the preset level.</td>
</tr>
<tr>
<td>Generator Low Voltage Shutdown</td>
<td>The generator output voltage has fallen below the preset level.</td>
</tr>
<tr>
<td>High Coolant Temperature Shutdown</td>
<td>The module detects that the engine coolant temperature has exceeded the high engine temperature shutdown setting after the Safety On timer has expired.</td>
</tr>
<tr>
<td>Icon</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>🛑</td>
<td>Low Oil Pressure Shutdown</td>
</tr>
<tr>
<td>🛑</td>
<td>Low Fuel Level</td>
</tr>
<tr>
<td>🔥</td>
<td>Over Frequency Shutdown</td>
</tr>
<tr>
<td>🔥</td>
<td>Over Speed Shutdown</td>
</tr>
<tr>
<td>🔥</td>
<td>Under Frequency Shutdown</td>
</tr>
<tr>
<td>🔥</td>
<td>Under Speed Shutdown</td>
</tr>
<tr>
<td>🌡️</td>
<td>Temperature Sensor Open Circuit</td>
</tr>
<tr>
<td>🥤</td>
<td>Oil Pressure Sensor Open Circuit</td>
</tr>
<tr>
<td>🛑</td>
<td>Flexible Sensor</td>
</tr>
</tbody>
</table>

**Note:**
When the fault condition has been rectified press the stop/reset button to reset the module.
3. THE CONTROL SYSTEM

The generating set is governed by the control panel (Figure 3.1), the operation of which is described in 4. Electric Start Sets and 5. Automatic Mains Failure Sets. Automatic mains failure sets have an additional wall-mounted automatic transfer cubicle.

The principal element in the control system is the control module (Figure 2.1 or 2.2).

3.1 CONTROL SYSTEM FEATURES

The set-mounted control system features:

- Automatic engine control module
- Emergency stop button (open sets only)
- DC control switch

Figure 3.1 Control Cubicle

Figure 3.2 AMF Control Cubicle
• DC circuit breaker
• 2-, 3- or 4-pole AC circuit breaker
• AC instrumentation protection fuses
• Current transformers
• Terminal connection points for the following remote input and output circuits:
  - Emergency stop
  - Common alarm
  - Control contact input
  - Load transfer signal
• Battery charger standard on AMF, optional on electric start.

3.2 THE CONTROL MODULE
The control module is used to start and stop the engine, either manually or automatically, and to indicate operational status and fault conditions. Instructions as to its specific use are given in the following two chapters.

3.2.1 Controls and Indicators
The controls and indicators are illustrated and labelled in Figure 3.1 and 3.2. In both electric start and automatic mains failure sets there is a choice between manual mode and automatic mode (refer to sections 4 & 5).
4. STANDARD ELECTRIC START SETS

4.1 FEATURES
Standard electric start sets have the following features:
• Set-mounted control system (see 3. The Control System).
• Lister Petter Power Systems water cooled engine, close coupled to a brushless alternator
• Fabricated steel base frame with anti vibration mountings
• Starter battery and leads
• 12-volt starter motor and solenoid
• 12-volt charging alternator
• Fuel solenoid, energised to run
• Oil, air and fuel filters
• Fuel-lift pump
• Integral fuel tank (44 or 66 litre)
• Integral silencer

4.2 EMERGENCY STOP
An emergency stop button is fitted to the control cubicle on open sets. On housed sets, an emergency stop button is fitted externally on the housing.
The operation of an emergency stop device will initiate a controlled shutdown. Any attempt to restart the set will be prevented until the emergency stop device has been reset.

4.3 MANUAL CONTROL
This section describes the manual control and operation of the generating set.

4.3.1 Starting
1. Ensure the AC circuit breaker is in the off position before starting.
2. Turn the DC control switch to the on position.
3. Press the manual mode button on the control module. An LED indicator by the side of the button will illuminate.
4. Press the start button on the control module. On LPWT4 sets there will be a ten-second pre-heat period.
5. The generating set will start and run up to speed and voltage.
6. When the generator available LED illuminates the set can be connected to the load circuit by closing the AC circuit breaker (switching to on position).
Also press the Transfer to generator push button, this will illuminate the Transfer to load LED and the configurable alarm LED (Load Transfer). It is important that this is done as some functions of the Control module will not operate if it is not.

4.3.2 Monitoring
Electrical outputs and engine conditions can be monitored on the control module display by successive operation of the scroll button; see Figure 2.1 Control Module.

4.3.3 Stopping
1. Open the AC circuit breaker (switch to off) to disconnect the load circuits.
2. Press the stop button on the control module. The engine will shut down and come to rest.
3. If the generating set is not going to be used again for more than eight hours it is recommended that the DC control switch is turned to the off position.
4.3.4 Alarm and Fault Conditions
During the running period the engine control module monitors the set for the alarm and shutdown faults detailed in 2.6 Protections.
A 12V DC signal for remote indication of an alarm can be taken across terminals B3(+) and B4(-).

4.3.5 AC Circuit Breaker Trip
If the AC circuit breaker trips, investigate and rectify the cause, then wait two minutes before re-closing it. The set will continue to run.

4.4 AUTOMATIC CONTROL
This section describes the automatic control and operation of the standard generating set.
A remote switch or contact has to be connected across terminals B5 and B6. The contact is arranged to close to start and run the set, and to open to stop it.
A 12v DC signal for remote indication of plant available (load transfer) can be taken across terminals B7(+) and B8(-).

4.4.1 Starting
1. Turn the DC control switch to the on position.
2. Press the automatic mode button on the control module. An LED indicator by the side of the button will illuminate.
3. On closure of the remote contact and after a short delay, plus a further ten-second pre-heat period (LPWT4 only), the set will start and run up to speed and voltage.

4. When the set is ready, the generator available LED illuminates and the 12V DC signal becomes available at B7 and B8. At this point the load can be connected to the generating set.

4.4.2 Monitoring
Electrical outputs and engine conditions can be monitored on the control module display by successive operation of the scroll button; refer to Figure 2.1 Control Module.

4.4.3 Stopping
1. Disconnect the load from the generating set.
2. Open the remote contact.
3. After a one-minute cooling-down period the engine will shut down and come to rest.
4. If the generating set is not going to be used again for more than eight hours it is recommended that the DC control switch is turned to the off position.

4.4.4 Alarm and Fault Conditions
During the running period the engine control module monitors the set for the alarm and shutdown faults detailed in 2.6 Protections.
A 12v DC signal for remote indication of an alarm can be taken across terminals B3(+) and B4(-).

4.4.5 AC Circuit Breaker Trip
If the AC circuit breaker trips, investigate and rectify the cause, then wait two minutes before re-closing it. The set will continue to run.
5. AUTOMATIC MAINS FAILURE SETS

5.1 FEATURES
Automatic Mains Failure (AMF) sets have the following features:
- Set-mounted control system with integral ATS. The features of the control system and the operation of the control module are described in 3. The Control System.
- Lister Petter Power Systems water-cooled engine close-coupled to a brushless alternator
- Fabricated steel base frame with anti-vibration mountings
- Starter battery and leads
- 12-volt starter motor and solenoid
- 12-volt charging alternator
- Fuel solenoid, energised to run
- Oil, air and fuel filters
- Fuel-lift pump
- Integral fuel tank (44 or 66 litre)
- Integral silencer
- Battery charger (mains-operated, for battery maintenance)

5.1.1 Automatic Start and Transfer System
The integral automatic transfer system contains:
- Mechanically and electrically interlocked plant and mains contactors
- Plant-on-load and mains-on-load indicator lamps
- AC protection fuses
- Terminal blocks for power and auxiliary circuits

5.2 AUTOMATIC OPERATION

**WARNING**
Automatic sets can start without warning. Keep clear of the set at all times.

1. Turn the **DC control switch** to the **on** position.
2. Press the **automatic mode** button on the control module. An LED indicator by the side of the button will illuminate.

5.2.1 Mains (Utility) Failure
On receipt of a mains failure condition there is a ten second start delay. The engine preheat circuit is then energised for ten seconds (LPWT4 only) after which the set will start and run up to speed and voltage.

When the set is ready the **changeover contactor** operates to isolate the mains (utilities) circuit and then transfers the load circuit on to the generator.

During this operation the **mains-on-load lamp** is extinguished and the **plant-on-load lamp** is illuminated.

5.2.2 Monitoring
Electrical outputs and engine conditions can be monitored on the control module display by successive operation of the **scroll** button; refer to 2.1 Control Module.
5.2.3 Mains (Utility) Returns
The mains (utility) supply must remain healthy for five minutes before the load circuit is transferred back to it from the set. At the end of this time the plant-on-load lamp is extinguished and the mains-on-load lamp is illuminated. The set will continue to run for a further one minute on no load to allow for engine cooling.

5.2.4 Alarm and Fault Conditions
During the running period the engine control module monitors the set for the alarm and shutdown faults detailed in 2.6 Protections.

5.2.5 AC Circuit Breaker Trip
If the AC circuit breaker trips, investigate and rectify the cause, then wait two minutes before re-closing it. The set will continue to run.

5.3 MANUAL OPERATION

5.3.1 Starting
1. Turn the DC control switch to the on position.
2. Press the manual mode button on the control module. An LED indicator by the side of the button will illuminate.
3. Press the start button on the control module.

On LPWT4 sets there will be a ten-second preheat period. The generating set will then start and run up to speed and voltage. It will automatically connect to the load circuit if the mains (utility) supply has failed. Otherwise it will run off-load.

5.3.2 Stopping
1. Press the stop button on the control module. The engine will shut down and come to rest.

5.3.3 Mains (Utility) Failure
If the mains (utility) supply fails while the set is under manual control, the set will connect automatically to the load circuit. On mains (utility) return, the set will continue to run on load until the automatic mode button is pressed. After a five minute delay the load will then be transferred back to the mains supply. The set will continue running on no load for the one minute cooling period. If the stop button on the control module is pressed before the mains returns, the set is immediately disconnected from the load and will shut down.
6. DUMMY LOAD

The Dummy load comprises of a number of resistive elements, to suit the configuration of the genset, mounted in front of the radiator and a control system to turn the load on and off. The control system is via the control module fitted in the genset control panel.

When the genset is started, the Control module will monitor the load and control when the dummy load is required. If the load level is below the ‘trip’ setting for the duration of the 'trip delay' (initially set to 10 minutes) then the dummy load control is activated.

If the load level rises above the 'return' setting for the duration of the 'return delay' (initially set to 1 second) then the dummy load is deactivated and the timer is reset.
7. LONG RUN SETS

7.1 FEATURES
Long run sets have the following standard features:
• Available in either Electric start and AMF control systems.
• Fabricated steel base frame with anti vibration mountings
• Lister Petter Power Systems water cooled engine close coupled to a brushless alternator
• 55 litre steel fabricated lube oil tank (in place of standard fuel tank)
• Starter battery and leads
• 12 volt starter motor and solenoid
• 12 volt charging alternator
• Inspection cover for lube tank for ease of access and cleaning
• Heavy duty fuel agglomerator
• Heavy Duty oil filter
• 7” Air Cleaner
• High Performance Oil bypass filter
• Radiator with expansion tank bottle
• Bulk Head fittings for “external” fuel supply

7.2 LONG RUN SETS COMMISSIONING
To be read in conjunction with Appendix 1 of this handbook

7.2.1
Ensure the 55 litre lube tank contains 20 litres of running oil.
Generator sets manufactured at Lister
Petter Power Systems will come as standard with 20 litres of running oil. If the set arrives without this oil then the following oil is recommended:
• Naturally aspirated engines: API CC or CD 15W40.
• Turbocharged engines: Shell Rimula X 10W-30 or equivalent.

7.2.2
Connect a suitable fuel supply and run the leak-off back to tank.

7.2.3
Fill the cooling system with coolant concentrate. A mix of 50% protects the system from damage and corrosion under all operating conditions. Ensure that the radiator level is full right up to and into the filler neck. Unless the cooling system is totally full the expansion bottle system will not operate correctly.
The radiator is fitted with a twin seal closed system filler cap.
Fill the expansion bottle to the level marked.

7.2.4
Connect the unit to a suitable load bank to ensure that the unit can operate at 75% of its rated load.

7.2.5
To ensure that the engine oil system is primed prior to starting the engine, motor the engine with the fuel control solenoid de-energised for 15 seconds.
The engine may then be started.

7.2.6
Once the engine has obtained operating speed apply 75% load and run for 100hrs.

This exercise is essential to ensure that the engine is run in prior to commissioning. It also necessary as this will reduce the future risk of problems linked to light-load running.

7.2.7
On completion of the 100 hours:
• Drain the oil tank and then refill with 55 litres of new lubricating oil as specified in 1. above.
• Renew the engine-mounted oil filter. (The bypass filter element does not need replacing at this time.)
• Check the coolant level and top up if necessary.
• Check all connections to ensure the integrity of the system.

NOTE
Running hours (2000) are based on the following parameters:
• Engine is maintained in good operational condition.
• Engine installation is correct and well ventilated.
• Oil consumption does not exceed 0.5% of the fuel consumption.
• Fuel is clean and to the correct specification, BSS2869 Class A1.
• Engine has an adequate supply of clean combustion air (In dusty operating conditions additional air filtration may be necessary).
• Average running load of the unit does not drop below 40% of its rated load
8. ROUTINE MAINTENANCE

⚠️ WARNING
Only qualified engineers should attempt any maintenance or adjustments. Refer to 1.2 Safety Symbols, 1.4 Safety Precautions and the equivalent sections of your engine Operators’ Handbook.

⚠️ WARNING
Do not work on the set before disconnecting the starter battery. Always disconnect the negative terminal first, reconnect the negative terminal last and use insulated tools.

8.1 GENERAL
On a regular basis, check and replenish if necessary:
- The fuel level;
- The lubricating oil level;
- The coolant level.

⚠️ WARNING
Do not check the coolant level when the engine is hot, or running.

Refer to the engine Operators’ Handbook, P027-08270, supplied with the set, for capacities and specifications.

8.2 DIESEL ENGINE
Refer to the Engine Operators’ Handbook, P027-08270, supplied with the set, for details of routine maintenance to be carried out after prescribed periods.

8.3 ALTERNATOR
No routine maintenance by the user is required, nor should it be attempted. The alternator manufacturer’s manual is provided for use only by specialised personnel employed to undertake maintenance work on the alternator.

8.4 BATTERY
To keep terminals and connections free from corrosion, coat with petroleum jelly or other suitable protective. Also refer to 1.5 Preparing the Battery.

⚠️ WARNING
Battery electrolyte is corrosive and must not be splashed on your skin. Batteries must be handled with care, and protective clothing should be worn.

9. TROUBLESHOOTING

⚠️ WARNING
Fault finding and rectification should be undertaken only by competent professional engineers.

9.1 DIESEL ENGINE
The engine Operators’ Handbook supplied with the set suggests possible causes for the most common faults, for the guidance of specialised diesel engine maintenance engineers.

9.2 ALTERNATOR
The alternator manual supplied with the set suggests possible causes for the most common faults, for the guidance of specialised electrical engineers.

9.3 ELECTRICAL SYSTEM
In the case of a suspected fault employ a qualified professional electrical engineer to resolve the fault. The wiring diagrams supplied with this manual are for use only by specialised electrical engineers.
10. REPLACEMENT PARTS

10.1 SOURCE OF SUPPLY
When purchasing parts or giving instructions for repairs users should, in their own interests, always specify genuine parts and quote the part number, description of the part and the serial number. Replacement parts are available from the worldwide network of Lister Petter diesel gensets distributors. For the name and address of the distributor nearest to you, contact the manufacturer (see 10.5). Always use genuine parts supplied by Lister Petter Power Systems through our distribution network. Use of non genuine parts can damage your set and invalidates the warranty.

**IMPORTANT**
Your distributor will need to know the generating set type and serial number stamped on the generating set nameplate to ensure that the correct parts are supplied.

10.2 ENGINE PARTS
A Master Parts Manual, P027-08041, is available from Lister Petter Power Systems or your local distributor.

10.3 ALTERNATOR PARTS
Consult Lister Petter Power Systems (see 10.5).

10.4 Cubicle Parts
Consult Lister Petter Power Systems (see 10.5).

10.5 CONTACTING LISTER PETTER POWER SYSTEMS
We are confident that you will obtain excellent safe service from your generating set. To achieve this however it is important that the installation, commissioning and maintenance of the set is undertaken by relevant competent engineers. If in doubt consult your local Lister Petter Power Systems gensets distributor. To obtain advice on any aspect of the ownership of your Lister Petter Power Systems diesel generating set please contact your local distributor or the manufacturer:

**Head Office**
Lister Petter Power Systems Limited
Unit 14 Estuary Court, Broadmeadow Industrial Estate, Teignmouth
TQ14 9FA
T: +44 (0) 1285 702211

**Production Facility**
Lister Petter Power Systems Limited
Units 13-15 Quadrant Distribution Centre, Hardwicke, Gloucester
GL2 2RN

sales@listerpetter.com
www.listerpetter.com
SITE INSTALLATION

**WARNING**

All installation work should be undertaken by a competent professional engineer.

1. The generating set must be installed in a suitable building or enclosure. This is essential to attenuate noise; protect the generating set from the environment; and prevent unauthorised access. The enclosure must have sufficient and suitable means to provide air for combustion and cooling and to remove hot air and exhaust gases.

2. Foundations must be of solid construction (usually concrete), with adequate load-bearing capabilities. If in doubt, consult a structural engineer.

3. The base frame must be securely fixed to a level and solid foundation to limit vibration to the base frame and cubicle assemblies. Distortion of the fabricated base frame must not occur when tightening down the foundation bolts. Packing shims should be used to ensure there are no irregularities occurring between the base frame and the foundations.

4. Separate floor trenches must be provided for fuel pipework and cabling.

5. When the installation is indoors, ensure that combustion and cooling-air inlets and hot-air outlets are provided with adequate ventilation. Heat from the engine must be expelled from the building, otherwise the engine can become damaged due to overheating.

6. Exhaust fumes are dangerous. Ensure that the fumes are safely piped to the outside of the building.

**WARNING**

DO NOT BREATHE EXHAUST GASES AS THEY CONTAIN CARBON MONOXIDE, A COLOURLESS, ODOURLESS AND POISONOUS GAS THAT CAN CAUSE UNCONSCIOUSNESS AND DEATH.

7. The bulk storage of fuel oil should be sited in outbuildings if possible.

8. Check that the fire precautions are adequate and that the installer provides appropriate warning notices to ensure the safety of all personnel regarding all aspects of generating set operation.

9. Only lift the set by means of the identified lifting points, using certified lifting equipment. Open and housed sets have forklift pockets. Housed sets also have a centre-point lift option.

**WARNING**

Never attempt to lift the set by the engine or alternator lifting eyes.

WIRING AND COMMISSIONING

**WARNING**

All wiring installation, connecting up and commissioning of the generating set should be carried out by a competent electrical engineer.
1. It is the responsibility of the installer to ensure that the generating set is adequately earthed to a low-resistance earthing rod or earth plate.

2. Ensure that the battery is fully charged and serviceable, that the engine coolant level is correct and that the engine has the correct quantity of the correct lubricating oil (see the Engine Operators' Handbook).

3. Ensure that the battery connections are secure. Make the final battery connection only when everything is ready for the first start, connecting the negative battery terminal last.

APPENDIX 2:
LIST OF DRAWINGS

Electric Start Sets
LPW/LWX 2,3,4 (open) ................................................................. 084-27396
LPW/LWX 2,3,4 (acoustic) ............................................................ 084-27397
LPW/LWX 2,3,4 + dummy load (open) ........................................... 084-27398
LPW/LWX 2,3,4 + dummy load (acoustic) ...................................... 084-27399
LPW/LWX 2,3,4 + battery charger (open) ......................................... 084-27400
LPW/LWX 2,3,4 + battery charger (acoustic) .................................... 084-27401
LPW/LWX 2,3,4 + battery charger + dummy load (open) .................... 084-27402
LPW/LWX 2,3,4 + battery charger + dummy load (acoustic) ............... 084-27403

LPWT4/LPWXT4 (open) ................................................................. 084-27408
LPWT4/LPWXT4 (acoustic) .......................................................... 084-27409
LPWT4/LPWXT4 + dummy load (open) ........................................... 084-27410
LPWT4/LPWXT4 + dummy load (acoustic) ...................................... 084-27411
LPWT4/LPWXT4 + battery charger (open) ....................................... 084-27412
LPWT4/LPWXT4 + battery charger (acoustic) ................................... 084-27413
LPWT4/LPWXT4 + battery charger + dummy load (open) ................. 084-27414
LPWT4/LPWXT4 + battery charger + dummy load (acoustic) .......... 084-27415

LPWS/T (open) ........................................................................... 084-27420
LPWS/T (acoustic) ..................................................................... 084-27421
LPWS/T + dummy load (open) .................................................... 084-27422
LPWS/T + dummy load (acoustic) ............................................... 084-27423
LPWS/T + battery charger (open) ............................................... 084-27424
LPWS/T + battery charger (acoustic) ........................................... 084-27425
LPWS/T + battery charger + dummy load (open) ............................ 084-27426
LPWS/T + battery charger + dummy load (acoustic) ....................... 084-27427

Automatic Mains Failure (AMF) Sets
LPW/LWX 2,3,4 (open) ................................................................. 084-27404
LPW/LWX 2,3,4 (acoustic) .......................................................... 084-27405
LPW/LWX 2,3,4 + dummy load (open) ........................................... 084-27406
LPW/LWX 2,3,4 + dummy load (acoustic) ...................................... 084-27407
<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPWT4/LPWXT4 (open)</td>
<td>084-27416</td>
</tr>
<tr>
<td>LPWT4/LPWXT4 (acoustic)</td>
<td>084-27417</td>
</tr>
<tr>
<td>LPWT4/LPWXT4 + dummy load (open)</td>
<td>084-27418</td>
</tr>
<tr>
<td>LPWT4/LPWXT4 + dummy load (acoustic)</td>
<td>084-27419</td>
</tr>
<tr>
<td>LPWS/T (open)</td>
<td>084-27428</td>
</tr>
<tr>
<td>LPWS/T (acoustic)</td>
<td>084-27429</td>
</tr>
<tr>
<td>LPWS/T + dummy load (open)</td>
<td>084-27430</td>
</tr>
<tr>
<td>LPWS/T + dummy load (acoustic)</td>
<td>084-27431</td>
</tr>
</tbody>
</table>