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DSE871x Mono Display

Document number 057-129

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1   *Part No. 057-129   DSE871x mono remote display ISSUE 2.1 21/09/2010 ADM*

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DSE871x mono remote display

Amendments since last publication

Issue no.	Comments
1	First Release
2	Added ROCOF & Vector shift
2.1	Changed test on load function

Clarification of notation used within this publication.

⚠**NOTE:**	Highlights an essential element of a procedure to ensure correctness.	
⚠**CAUTION!**	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.	
☠**WARNING!**	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.	

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TABLE OF CONTENTS

1 BIBLIOGRAPHY

This document refers to and is referred to by the following DSE publications which can be obtained from the DSE website www.deepseaplc.com

1.1 INSTALLATION INSTRUCTIONS

Installation instructions are supplied with the product in the box and are intended as a 'quick start' guide only.

DSE PART	DESCRIPTION
053-071	DSE871x mono remote display Installation Instructions
053-073	DSE8710 Installation Instructions
053-032	DSE2548 LED Expansion Annunciator Installation Instructions
053-033	DSE2130 Input Expansion Installation Instructions
053-034	DSE2157 Output Expansion Installation Instructions

1.2 TRAINING GUIDES

Training Guides are produced to give 'handout' sheets on specific subjects during training sessions.

DSE PART	DESCRIPTION
056-001	Four Steps to Successful Synchronising
056-005	Using CTs With DSE Products
056-010	Overcurrent Protection
056-011	MSC Link
056-013	Load Demand Scheme
056-022	Breaker Control
056-018	Negative Phase Sequence
056-019	Earth Fault Protection
056-020	Loss of Excitation
056-021	Mains Decoupling
056-022	Breaker Control
056-024	GSM Modem
056-026	kW and kVAr
056-029	Smoke Limiting
056-030	Module PIN Codes
056-033	Synchronising Requirements
056-036	DSE Modules Expansion
056-043	Sync Process
056-057	SW1 and SW2

1.3 MANUALS

DSE PART	DESCRIPTION
057-004	Electronic Engines And DSE Wiring Manual
057-045	Synchronising and Load Sharing Part 1
057-046	Synchronising and Load Sharing Part 2
057-047	Load Share Design and Commissioning
057-082	DSE2130 Input Expansion Manual
057-083	DSE2157 Output Expansion Manual
057-084	DSE2548 Annunciator Expansion Manual
057-124	DSE8710 Controller Manual
057-127	DSE87xx Series Configuration Software Manual

2 INTRODUCTION

This document details the installation and operation requirements of the DSE871x series mono display modules, part of the DSEPower® range of products.

The manual forms part of the product and should be kept for the entire life of the product. If the product is passed or supplied to another party, ensure that this document is passed to them for reference purposes.

This is not a *controlled document.* You will not be automatically informed of updates. Any future updates of this document will be included on the DSE website at www.deepseaplc.com

DSE871x display module is used in conjunction with DSE87xx controller. The DSE871x display is NOT a standalone module.

The **DSE871x series** is designed to provide differing levels of functionality across a common platform. This allows the generator OEM greater flexibility in the choice of controller to use for a specific application.

The **DSE871x series** module has been designed to allow the operator to start and stop the generator, and if required, transfer the load to the generator either manually (via fascia mounted push buttons) or automatically.

Synchronising and Load Sharing features are included within the controller, along with the necessary protections for such a system.

The user also has the facility to view the system operating parameters via the LCD display.

The **DSE87xx** module monitors the engine, indicating the operational status and fault conditions, automatically shutting down the engine and giving a true first up fault condition of an engine failure by a COMMON AUDIBLE ALARM. The LCD display indicates the fault.

The powerful microprocessor contained within the module allows for incorporation of a range of enhanced features:

- *Text based LCD display (supporting multiple languages).*
- **True RMS** *Voltage, Current and Power monitoring.*
- *Engine parameter monitoring.*
- *Fully configurable inputs for use as alarms or a range of different functions.*
- *Engine ECU interface to* **electronic engines***.*
- *Direct connection to governor / AVR for synchronising and load sharing*
- *R.O.C.O.F. and Vector shift for detection of mains failure when in parallel with the mains supply.*

Using a PC and the Configuration Suite software allows alteration of selected operational sequences, timers and alarms.

Additionally, the module's integral fascia configuration editor allows adjustment of a subset of this information.

A robust plastic case designed for front panel mounting houses the module. Connections are via locking plug and sockets.

3 SPECIFICATIONS

3.1 PART NUMBERING

$$8711 - 001 - 00$$

Variant

Product type

| | | Standard product | 00 |

| DSE8711 Mono remote display for DSE8710 | 8711 |

| DSE8716 Mono remote display for DSE8760 | 8716 |

Hardware revision

Initial module release | 001 |
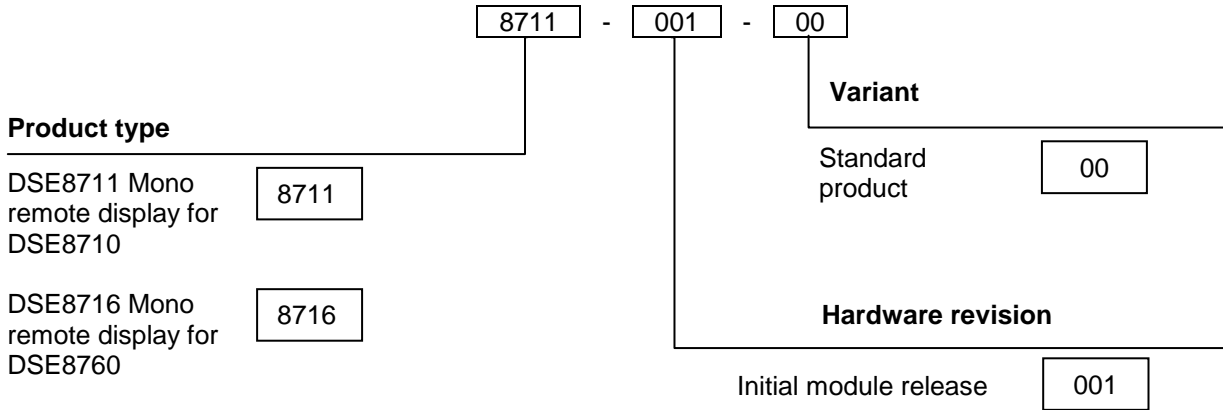
At the time of this document production, there are no variants of this product.

3.1.1 SHORT NAMES

Short name	Description
DSE8700, DSE87xx	All modules in the DSE8700 Series

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3.2   TERMINAL SPECIFICATION

Connection type	Two part connector. • Male part fitted to module • Female part supplied in module packing case - Screw terminal, rising clamp, no internal spring.	Example showing cable entry and screw terminals of a 10 way connector
Minimum cable size	0.5mm² (AWG 24)	
Maximum cable size	2.5mm² (AWG 10)	

NOTE: For purchasing additional connector plugs from DSE, please see the section entitled *Maintenance, Spares, Repair and Servicing* elsewhere in this document.

3.3   POWER SUPPLY REQUIREMENTS

Minimum supply voltage	8V continuous
Cranking dropouts	Able to survive 0V for 50mS providing the supply was at least 10V before the dropout and recovers to 5V afterwards. This is more than sufficient to allow the module to operate during engine cranking where the battery supply often falls as low as 4V (on a 12V system!) This is achieved without the need for internal batteries or other external requirements.
Maximum supply voltage	35V continuous (60V protection for surges)
Reverse polarity protection	-35V continuous
Maximum operating current	70mA at 24V 140mA at 12V
Maximum standby current	70mA at 24V 140mA at 12V

Plant supply instrumentation display

Range	0V-70V DC (note Maximum continuous operating voltage of 35V DC)
Resolution	0.1V
Accuracy	±1% full scale (±0.7V)

3.4 OUTPUTS

Ten (10) digital outputs are fitted to the DSE8710 controller. Additional outputs are provided for by adding up to ten (10) external relay boards (DSE2157). This allows for up to 80 additional digital outputs.

3.4.1 OUTPUTS A & B

Type	Fully configurable
Rating	15A resistive @ 35V

3.5 COMMUNICATION PORTS

RS232 Serial port	Non – Isolated port Max Baud rate 115K baud subject to S/W TX, RX, RTS, CTS, DSR, DTR, DCD Male 9 way D type connector Max distance 15m (50 feet)
RS485 Serial port	Isolated Data connection 2 wire + common Half Duplex Data direction control for Transmit (by s/w protocol) Max Baud Rate 115K External termination required (120Ω) Max common mode offset 70V (on board protection transorb) Max distance 1.2km (¾ mile)

3.6 COMMUNICATION PORT USAGE

3.6.1 RS232 CONNECTION

Used for connecting the DSE871x display to the host controller.

PIN No	NOTES
1	Received Line Signal Detector (Data Carrier Detect)
2	Received Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request To Send
8	Clear To Send
9	Ring Indicator

View looking into the male connector on the DSE871x series module

3.6.2 RS485 CONNECTION

Used for connecting the DSE871x display to the host controller.

PIN No	NOTES
A	Two core screened twisted pair cable. 120Ω impedance suitable for RS485 use. Recommended cable type - Belden 9841. Max distance 1200m (1.2km) when using Belden 9841 or direct equivalent.
B	
SCR	

3.6.3 USB CONNECTIONS

Reserved for future use. Currently fitted to the controller but not used.
User applicable firmware update file will be made available in the future to activate these ports.

3.6.4 ETHERNET CONNECTION

Reserved for future use. Currently fitted to the controller but not used.
User applicable firmware update file will be made available in the future to activate this port.

3.7 SOUNDER

DSE871x module features an internal sounder to draw attention to warning, shutdown and electrical trip alarms.

Sounder level	64db @ 1m

3.7.1 ADDING AN EXTERNAL SOUNDER TO THE APPLICATION

Should an external alarm or indicator be required, this can be achieved by using the DSEDSE871x front panel editor to configure an auxiliary output for "Audible Alarm", and by using the DSE Configuration Suite, to configure an auxiliary input for "Alarm Mute" (if required).
The audible alarm output activates and de-activates at the same time as the module's internal sounder. The Alarm mute input and internal alarm mute button activate 'in parallel' with each other. Either signal will mute both the internal sounder and audible alarm output.

3.8 DIMENSIONS AND MOUNTING

3.8.1.1 DIMENSIONS
240.0mm x 181.1mm x 41.7mm (9.4" x 7.1" x 1.6")

PANEL CUTOUT
220mm x 160mm (8.7" x 6.3")

WEIGHT
0.7kg (1.4lb)
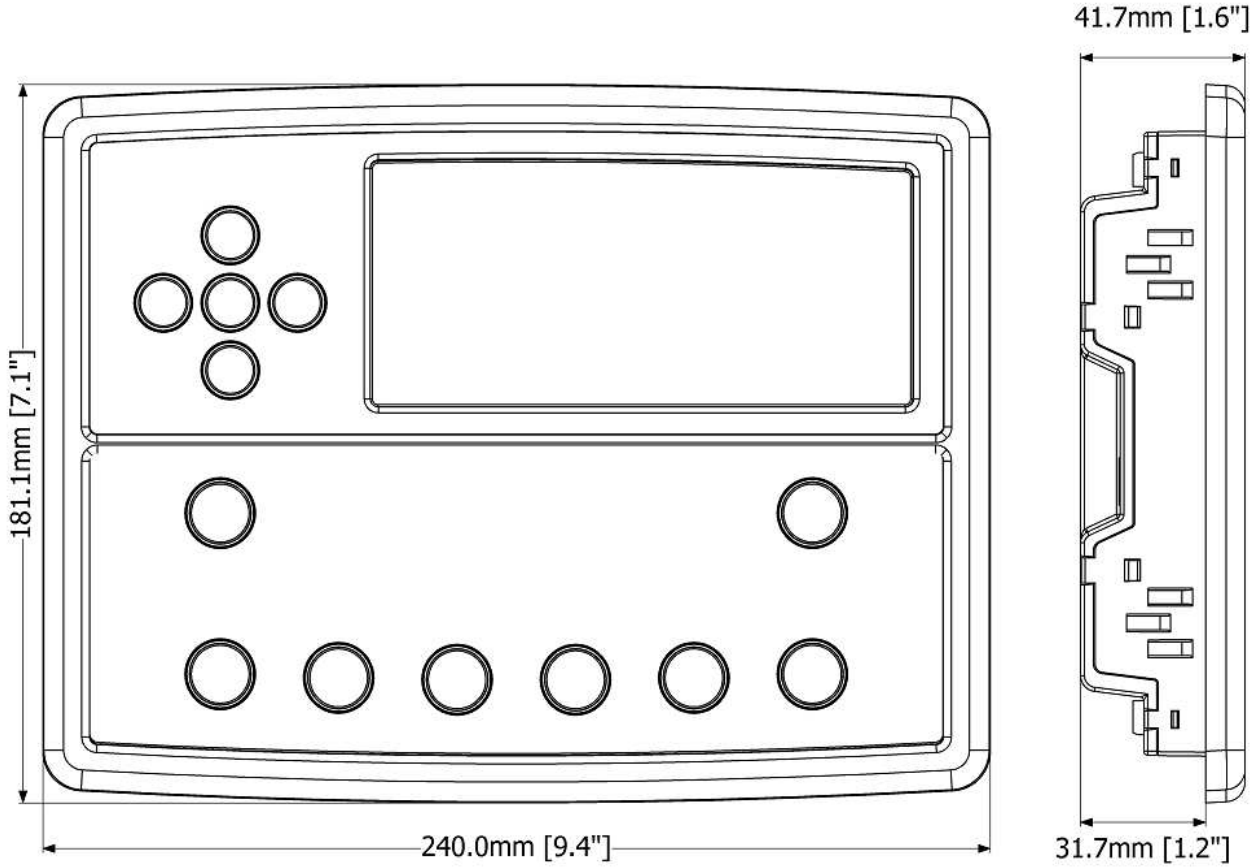
3.8.2 FIXING CLIPS

Supplied fixing clips hold the module into the panel fascia.

Withdraw the fixing clip screw (turn anticlockwise) until only the pointed end is protruding from the clip.

- Insert the three 'prongs' of the fixing clip into the slots in the side of the DSE87xx series module case.
- Pull the fixing clip backwards (towards the back of the module) ensuring all three prongs of the clip are inside their allotted slots.
- Turn the fixing clip screws clockwise until they make contact with the panel fascia.
- Turn the screws a little more to secure the module into the panel fascia. Take care not to over tighten the fixing clip screws.

Fixing clip

Fixing clip fitted to module
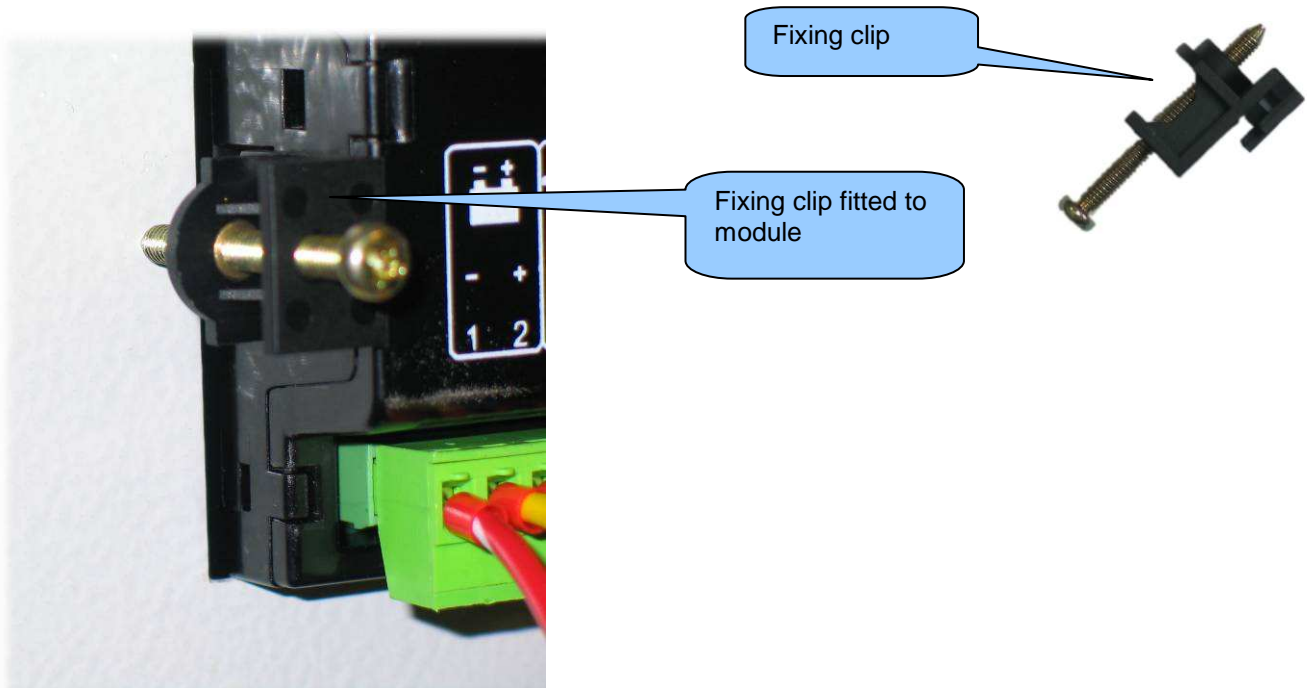
⚠NOTE - In conditions of excessive vibration, mount the module on suitable anti-vibration mountings.

3.8.3   CABLE TIE FIXING POINTS

Integral cable tie fixing points are included on the rear of the module's case to aid wiring. This additionally provides strain relief to the cable loom by removing the weight of the loom from the screw connectors, thus reducing the chance of future connection failures.

Care should be taken not to over tighten the cable tie (for instance with cable tie tools) to prevent the risk of damage to the module case.

Cable tie fixing point
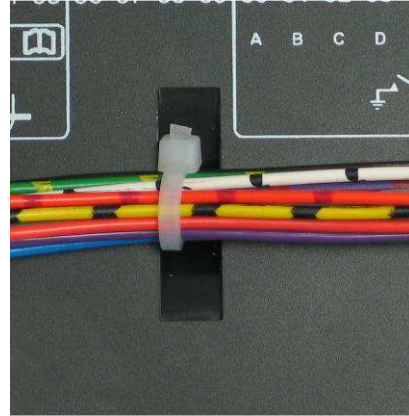
With cable and tie in place

3.8.4   SILICON SEALING GASKET

The supplied silicon gasket provides improved sealing between the DSE87xx series module and the panel fascia.
The gasket is fitted to the module before installation into the panel fascia.
Take care to ensure the gasket is correctly fitted to the module to maintain the integrity of the seal.

Sealing gasket

Gasket fitted to module

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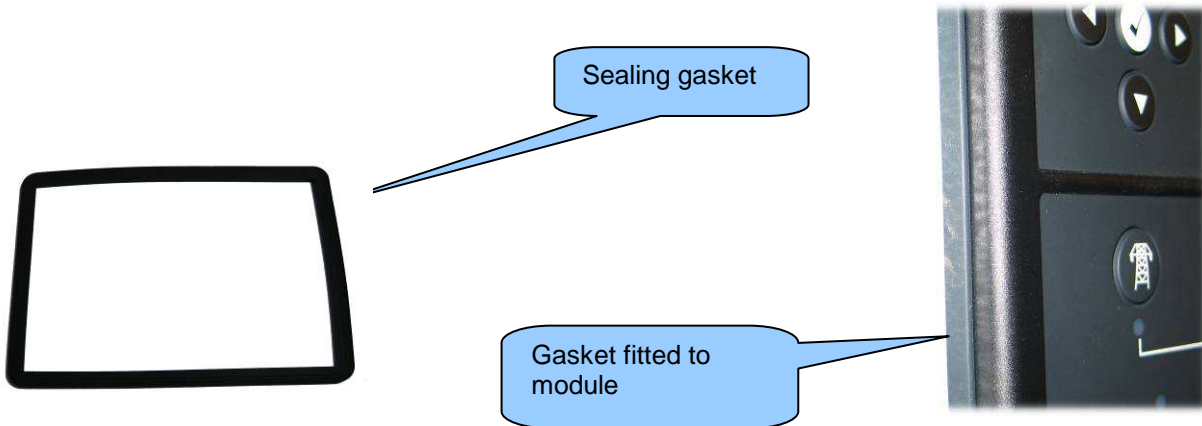
3.9 APPLICABLE STANDARDS

BS 4884-1	This document conforms to BS4884-1 1992 Specification for presentation of essential information.
BS 4884-2	This document conforms to BS4884-2 1993 Guide to content
BS 4884-3	This document conforms to BS4884-3 1993 Guide to presentation
BS EN 60068-2-1 (Minimum temperature)	-30°C (-22°F)
BS EN 60068-2-2 (Maximum temperature)	+70°C (158°F)
Vibration	2g, 10-500Hz, amplitude 0.15mm, 6g
Mechanical Shock	26 drops (6 sides, 8 corners, 12 edges) onto a concrete floor from 300mm.
Humidity	93%, relative, non-condensing.
Chemical resistance	Resistant to automotive and industrial chemicals and fluids.
Ingress protection	
BS EN 60950	Safety of information technology equipment, including electrical business equipment The unit is designed to comply with European directive 72/23/EEC by complying with harmonised European safety standard BS EN 60950
BS EN 61000-6-2 **BS EN 61000-6-4**	The unit is designed to comply with European directive 2004/108/EEC by complying with harmonised European standards EN 61000-6-2 (Generic Immunity) and EN 61000-6-4 EMC (Generic Emissions).
BS EN 60529 (Degrees of protection provided by enclosures) (see overleaf)	IP65 (front of module when installed into the control panel with the supplied sealing gasket) IP42 (front of module when installed into the control panel WITHOUT being sealed to the panel)
UL NEMA rating (Approximate) (see overleaf)	UL approval to FTPM2 with enclosure type 1
Harmonic Distortion immunity	Resistant to typical levels prevalent in UPS, Inverter Drives, VSD's etc. in accordance with EWI/26.
IEEE C37.2 (Standard Electrical Power System Device Function Numbers and Contact Designations)	DSE871x is a display module only. For IEEE C37.2 designation of the host controller, see the relevant operator manual.

In line with our policy of continual development, Deep Sea Electronics, reserve the right to change specification without notice.

3.9.1   ENCLOSURE CLASSIFICATIONS

IP CLASSIFICATIONS

DSE871x series specification under BS EN 60529 Degrees of protection provided by enclosures

IP65 (Front of module when module is installed into the control panel with the optional sealing gasket).
IP42 (front of module when module is installed into the control panel WITHOUT being sealed to the panel)

First Digit		Second Digit	
Protection against contact and ingress of solid objects		Protection against ingress of water	
0	No protection	0	No protection
1	Protected against ingress solid objects with a diameter of more than 50 mm. No protection against deliberate access, e.g. with a hand, but large surfaces of the body are prevented from approach.	1	Protection against dripping water falling vertically. No harmful effect must be produced (vertically falling drops).
2	Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach.	2	Protection against dripping water falling vertically. There must be no harmful effect when the equipment (enclosure) is tilted at an angle up to 15° from it s normal position (drops falling at an angle).
3	Protected against ingress of solid objects with a diameter of more than 2.5 mm. Tools, wires etc. with a thickness of more than 2.5 mm are prevented from approach.	3	Protection against water falling at any angle up to 60° from the vertical. There must be no harmful effect (spray water).
4	Protected against ingress of solid objects with a diameter of more than 1 mm. Tools, wires etc. with a thickness of more than 1 mm are prevented from approach.	4	Protection against water splashed against the equipment (enclosure) from any direction. There must be no harmful effect (splashing water).
5	Protected against harmful dust deposits. Ingress of dust is not totally prevented but the dust must not enter in sufficient quantity to interface with satisfactory operation of the equipment. Complete protection against contact.	5	Protection against water projected from a nozzle against the equipment (enclosure) from any direction. There must be no harmful effect (water jet).
6	Protection against ingress of dust (dust tight). Complete protection against contact.	6	Protection against heavy seas or powerful water jets. Water must not enter the equipment (enclosure) in harmful quantities (splashing over).

NEMA CLASSIFICATIONS

DSE871x series NEMA Rating (Approximate)

12 (Front of module when module is installed into the control panel with the optional sealing gasket).	
2 (front of module when module is installed into the control panel WITHOUT being sealed to the panel)	

⚠️**NOTE: - There is no direct equivalence between IP / NEMA ratings. IP figures shown are approximate only.**

1 IP30	Provides a degree of protection against contact with the enclosure equipment and against a limited amount of falling dirt.
2 IP31	Provides a degree of protection against limited amounts of falling water and dirt.
3 IP64	Provides a degree of protection against windblown dust, rain and sleet; undamaged by the formation of ice on the enclosure.
3R IP32	Provides a degree of protection against rain and sleet:; undamaged by the formation of ice on the enclosure.
4 (X) IP66	Provides a degree of protection against splashing water, windblown dust and rain, hose directed water; undamaged by the formation of ice on the enclosure. (Resist corrosion).
12/12K IP65	Provides a degree of protection against dust, falling dirt and dripping non corrosive liquids.
13 IP65	Provides a degree of protection against dust and spraying of water, oil and non corrosive coolants.

4 INSTALLATION

The DSE87xx Series module is designed to be mounted on the panel fascia. For dimension and mounting details, see the section entitled *Specification, Dimension and mounting* elsewhere in this document.

4.1 TERMINAL DESCRIPTION

4.1.1 DC SUPPLY, FUEL AND START OUTPUTS

Icon	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	1	DC Plant Supply Input (Negative)	2.5mm² AWG 13	
	2	DC Plant Supply Input (Positive)	2.5 mm² AWG 13	(Recommended Maximum Fuse 15A anti-surge) Supplies the module (2A anti-surge requirement) and Output relays E - K
	3	Output A	2.5mm² AWG 13	Plant Supply Positive from terminal 2. 15 Amp rated. Fixed as FUEL relay if electronic engine is not configured.
	4	Output B	2.5mm² AWG 13	Plant Supply Positive from terminal 2. 15 Amp rated. Fixed as START relay if electronic engine is not configured.

4.1.2 PC CONFIGURATION INTERFACE CONNECTOR

For PC configuration of the display module.

⚠ **CAUTION!: This socket has no purpose in version 1 display modules'**

This configuration cable is the same as normally used between a PC and a USB printer!

	DESCRIPTION	CABLE SIZE	NOTES	
USB	Socket for connection to PC with DSE87xx series PC software.	0.5mm² AWG 20	This is a standard USB type A to type B connector.	

⚠ **NOTE:- The USB connection cable between the PC and the DSE87xx series module must not be extended beyond 5m (yards). For distances over 5m, it is possible to use a third party USB extender. Typically, they extend USB up to 50m (yards). The supply and support of this type of equipment is outside the scope of Deep Sea Electronics PLC.**

⚠ **CAUTION!: Care must be taken not to overload the PCs USB system by connecting more than the recommended number of USB devices to the PC. For further information, consult your PC supplier.**

⚠ **CAUTION!: This socket must not be used for any other purpose.**

4.1.3   RS485 CONNECTOR

PIN No	NOTES
A	Two core screened twisted pair cable.
	120Ω impedance suitable for RS485 use.
B	Recommended cable type - Belden 9841
SCR	Max distance 1200m (1.2km) when using Belden 9841 or direct equivalent.

Location of RS485 connector

Location of RS232 connector
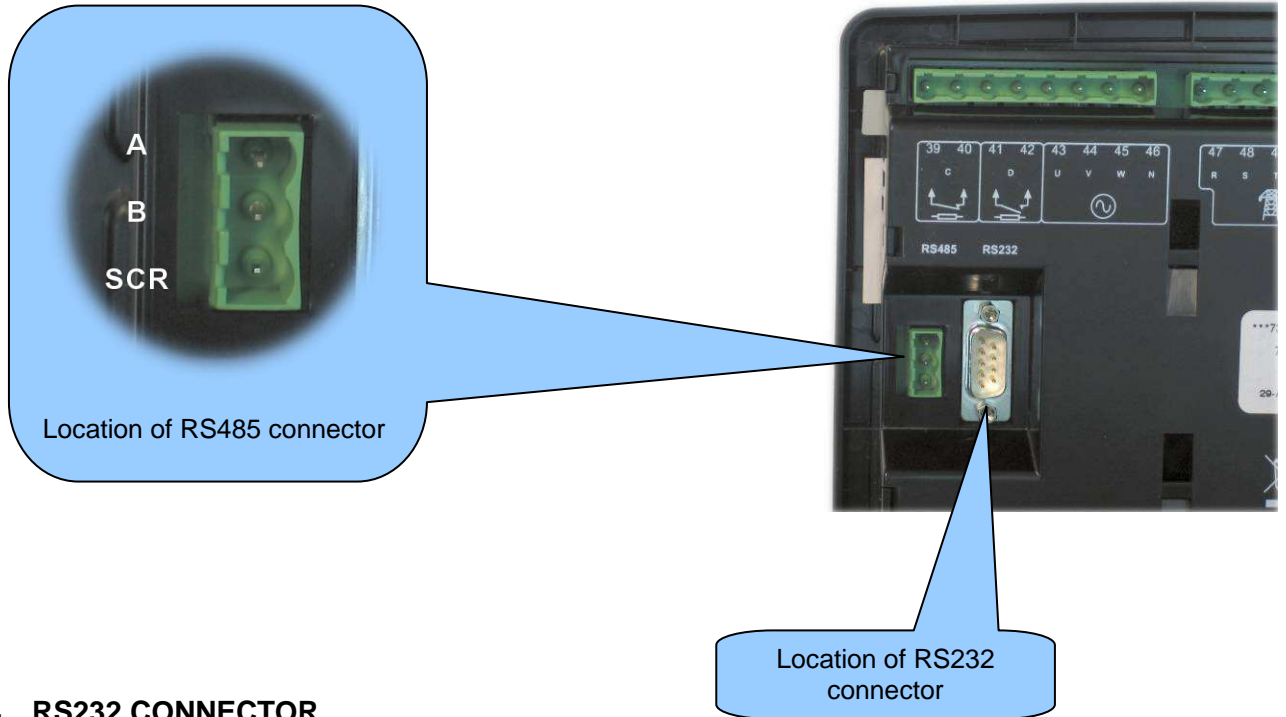
4.1.4   RS232 CONNECTOR

PIN No	NOTES
1	Received Line Signal Detector (Data Carrier Detect)
2	Received Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request To Send
8	Clear To Send
9	Ring Indicator

View looking into the male connector on the DSE87xx series module

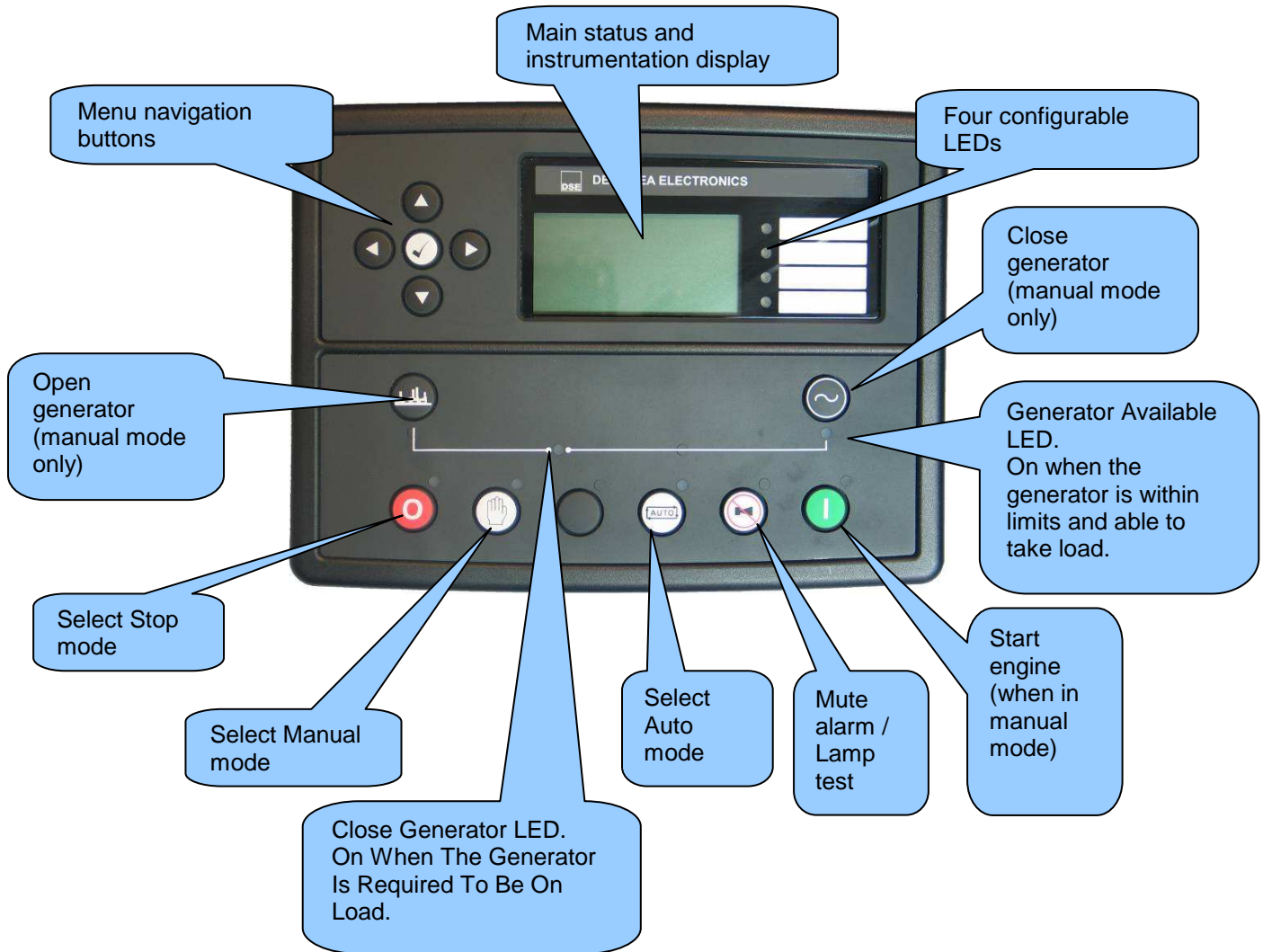## 4.2   DESCRIPTION OF CONTROLS

The following section details the function and meaning of the various controls on the module.

4.3   DSE8711 DISPLAY FOR DSE8710 AUTOSTART

NOTE:- "Generator on load" LED has two modes of operation depending upon the configuration of the controllers digital inputs.
1)   Digital input configured for "Generator closed auxiliary" – The LED illuminates when the generator closed auxiliary input is active – The LED shows the state of the auxiliary contact.
2)   There is NO input configured for "Generator closed auxiliary" (factory default setting) – The LED illuminates when the DSE8710 gives the loading signal to the generator – The LED shows the state of the DSE8710s loading request.

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4.4   DSE8716 DISPLAY FOR DSE8760 MAINS CONTROLLER

The following section details the function and meaning of the various controls on the module.
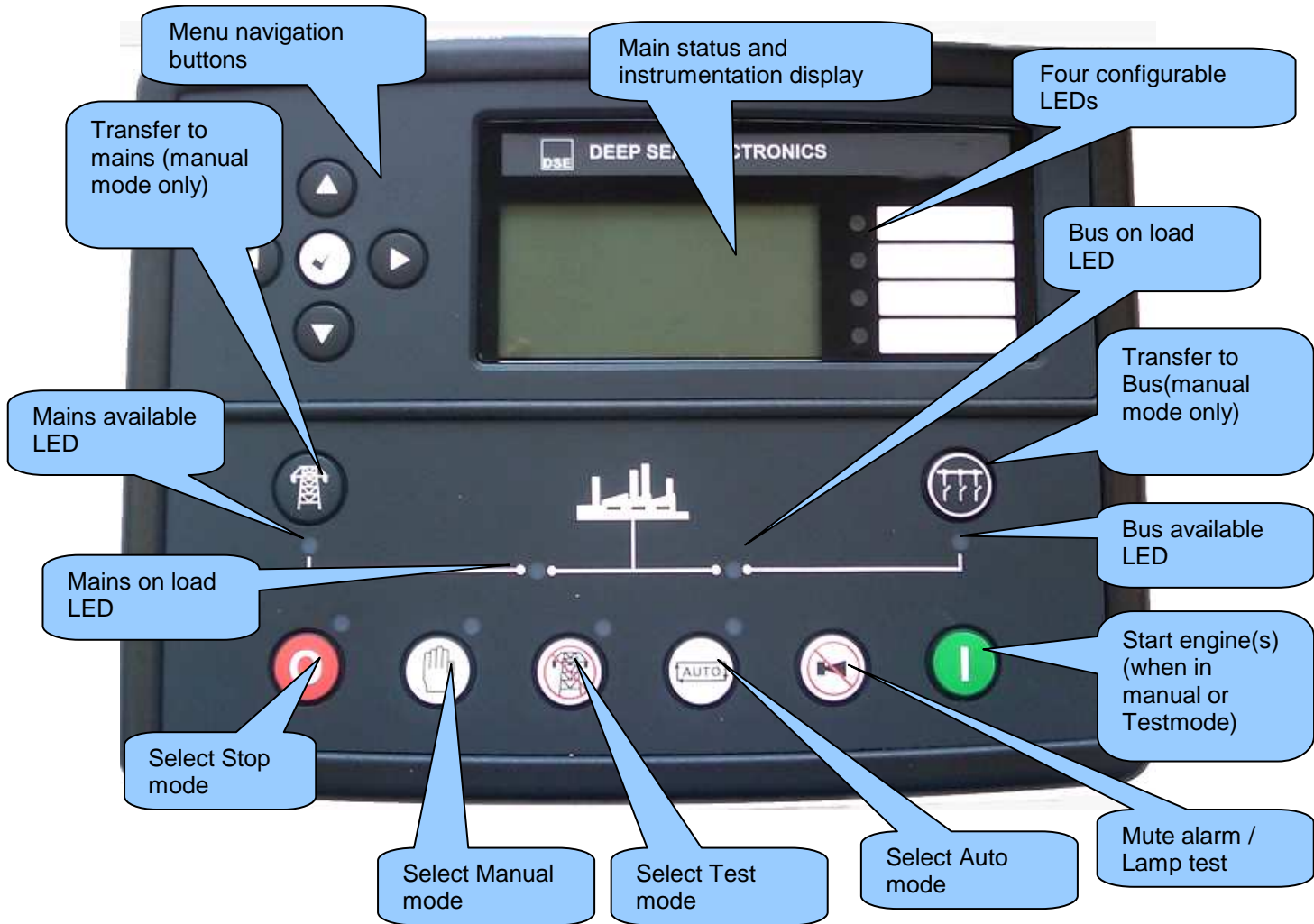
4.5   QUICKSTART GUIDE

This section provides a quick start guide to the module's operation.

4.5.1   STARTING THE ENGINE

First, select manual mode…

…then press the Start button to crank the engine.

⚠NOTE:- For further details, see the section entitled 'OPERATION' elsewhere in this manual.

4.5.2   STOPPING THE ENGINE

Select Stop/Reset mode. The generator is stopped.
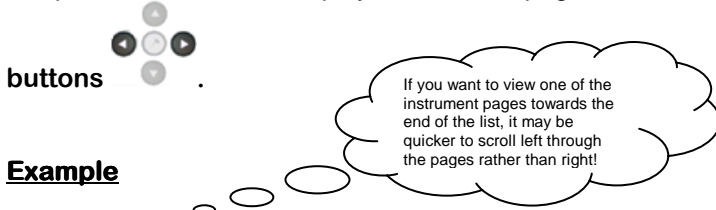
⚠NOTE:- For further details, see the section entitled 'OPERATION' elsewhere in this manual.

4.6   VIEWING THE INSTRUMENT PAGES

It is possible to scroll to display the different pages of information by repeatedly operating the next / previous page

buttons   .

If you want to view one of the instrument pages towards the end of the list, it may be quicker to scroll left through the pages rather than right!

Example

Status   Engine   Generator   And so on until the last page is reached.
A Further press of the scroll right button returns the display to the Status page.

The complete order and contents of each information page are given in the following sections

Once selected the page will remain on the LCD display until the user selects a different page, or after an extended period of inactivity (*LCD Page Timer*), the module will revert to the status display.
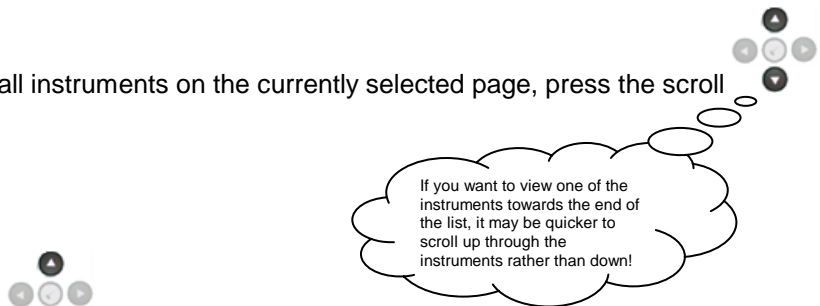
If no buttons are pressed upon entering an instrumentation page, the instruments will be displayed automatically subject to the setting of the *LCD Scroll Timer*.

The *LCD Page* and *LCD Scroll* timers are configurable using the DSE Configuration Suite Software or by using the Front Panel Editor.

Module Timers

Interface Timers

| LCD Page Timer | 5m |
| LCD Scroll Timer | 5s |
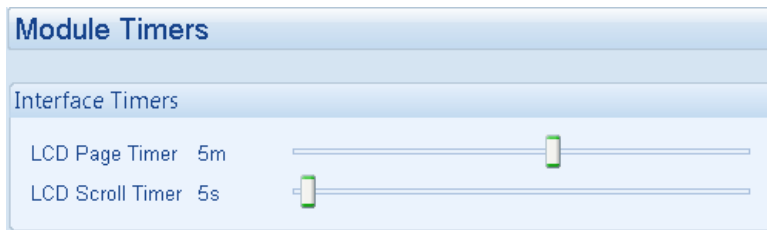
The screenshot shows the factory settings for the timers, taken from the DSE Configuration Suite Software.

Alternatively, to scroll manually through all instruments on the currently selected page, press the scroll buttons. The 'autoscroll' is disabled.

If you want to view one of the instruments towards the end of the list, it may be quicker to scroll up through the instruments rather than down!

To re-enable 'autoscroll' press the scroll   buttons to scroll to the 'title' of the instrumentation page (ie Engine). A short time later (the duration of the *LCD Scroll Timer*), the instrumentation display will begin to autoscroll.

When scrolling manually, the display will automatically return to the Status page if no buttons are pressed for the duration of the configurable *LCD Page Timer*.

If an alarm becomes active while viewing the status page, the display shows the Alarms page to draw the operator's attention to the alarm condition.

4.6.1   STATUS

This is the 'home' page, the page that is displayed when no other page has been selected, and the page that is automatically displayed after a period of inactivity (*LCD Page Timer)* of the module control buttons.

This page is configurable using the DSE Configuration Suite Software.

```
      Status    22:31
Generator at Rest

Stop Mode
```
Factory setting of Status screen showing engine stopped...

```
Safety on Delay 00:04
L-N   215V      43A
L-L   373V     47.5Hz
         0kW      0.0pf
```
...and engine running

The contents of this display may vary depending upon configuration by the generator manufacturer / supplier.

The display above is achieved with the factory settings, shown below in the DSE Configuration suite software:

Configurable Status Screens

Home Page

Home Page Mode

'Stop Mode' etc is displayed on the Home Page

Displayed Pages

Page 1	Summary screen	Page 6	Not Used
Page 2	Not Used	Page 7	Not Used
Page 3	Not Used	Page 8	Not Used
Page 4	Not Used	Page 9	Not Used
Page 5	Not Used	Page 10	Not Used

With a summary of the instrumentation shown when the engine is running.

Other pages can be configured to be shown, automatically scrolling when the set is running.

⚠**NOTE:- The following sections detail instrumentation pages, accessible using the scroll left and right buttons, regardless of what pages are configured to be displayed on the 'status' screen.**

4.6.2   ENGINE

Not applicable to DSE8716 display

Contains instrumentation gathered about the engine itself, some of which may be obtained using the CAN or other electronic engine link.

- Engine Speed
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Run Time
- Oil Temperature*
- Coolant Pressure*
- Inlet Temperature*
- Exhaust Temperature*
- Fuel Temperature*
- Turbo Pressure*
- Fuel Pressure*
- Fuel Consumption*
- Fuel Used*
- Fuel Level*
- Auxiliary Sensors (If fitted and configured)
- Engine Maintenance Due (If configured)
- Engine ECU Link*

*When connected to suitably configured and compatible engine ECU. For details of supported engines see 'Electronic Engines and DSE wiring' (DSE Part number 057-004).

Depending upon configuration and instrument function, some of the instrumentation items may include a tick ✓ icon beside them. This denotes a further function is available, detailed in the 'operation' section of this document.

Example:

The tick ✓ icon denotes that manual fuel pump control is enabled in this system.
Press and hold to start the fuel transfer pump, release to stop the pump. This is detailed further in the section entitled 'operation' elsewhere in this document.

Engine Fuel Level

✓   **65** %
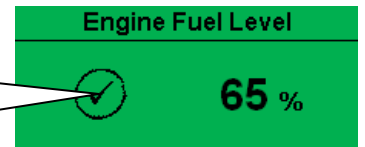
4.6.3 GENERATOR

Contains electrical values of the generator (alternator), measured or derived from the module's voltage and current inputs.

- Generator Voltage (ph-N)
- Generator Voltage (ph-ph)
- Generator Frequency
- Generator Current
- Generator Earth Current
- Generator Load (kW)
- Generator Load (kVA)
- Generator Power Factor
- Generator Load (kVAr)
- Generator Load (kWh, kVAh, kVArh)
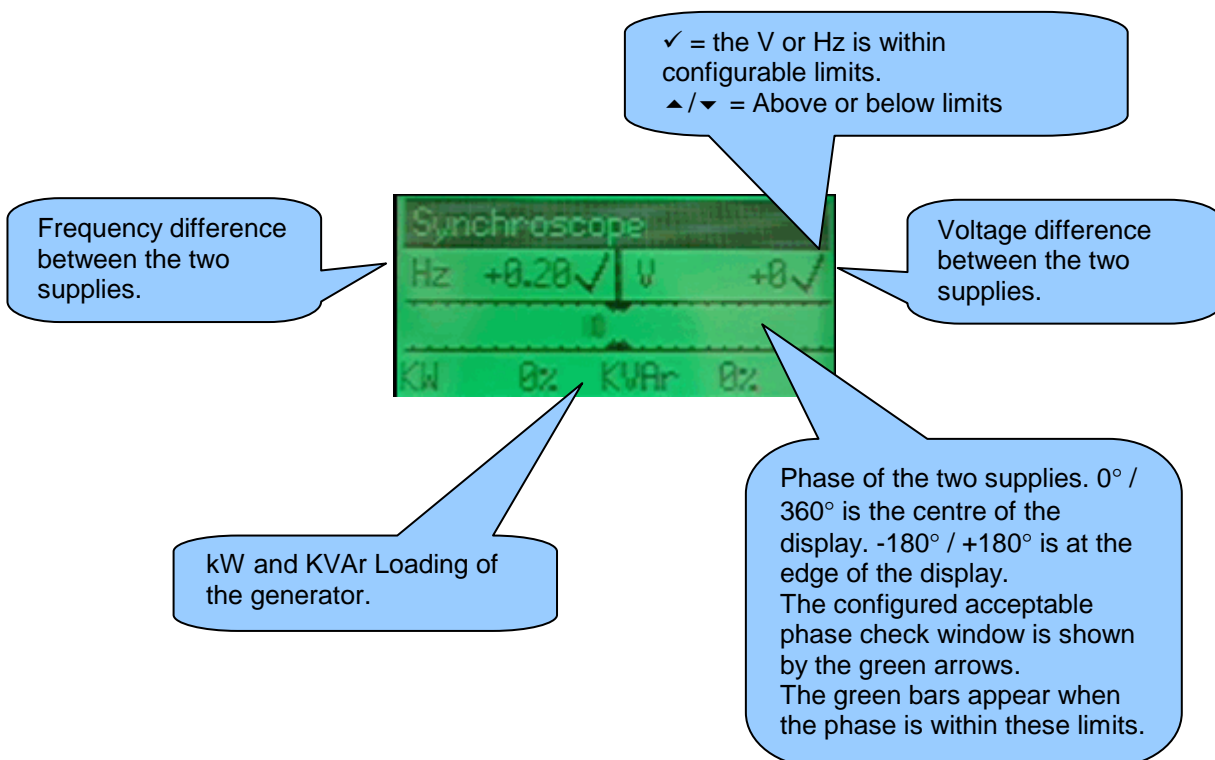- Generator Phase Sequence
- Synchroscope display

4.6.4 BUS

Contains electrical values of the common generator bus measured or derived from the module's bus inputs.

- Bus Voltage (ph-N)
- Bus Voltage (ph-ph)
- Bus Frequency
- Bus Phase Sequence

4.6.5 SYNCHROSCOPE DISPLAY

When synchronising is in progress, the synchroscope display automatically appears. Alternatively it can be scrolled to manually and found in the Generator (DSE8711) or Mains (DSE8716) instrumentation page.

✓ = the V or Hz is within configurable limits.
▲ / ▼ = Above or below limits

Frequency difference between the two supplies.

Voltage difference between the two supplies.

kW and KVAr Loading of the generator.

Phase of the two supplies. 0° / 360° is the centre of the display. -180° / +180° is at the edge of the display.
The configured acceptable phase check window is shown by the green arrows.
The green bars appear when the phase is within these limits.

4.6.6 RS232 SERIAL PORT

⚠️**NOTE:- The RS232 port instrument shows status of the host controller's (8710/8760) serial port.**

This section is included to give information about the RS232 serial port and external modem (if connected).
The items displayed on this page will change depending upon configuration of the module. You are referred to your system supplier for further details.

⚠️**NOTE:- Factory Default settings are for the RS232 port to be enabled with no modem connected, operating at 19200 baud, modbus slave address 10.**

Example 1 – Module connected to an RS232 telephone modem.

When the DSE8710 series module is power up, it will send 'initialisation strings' to the connected modem. It is important therefore that the modem is already powered, or is powered up at the same time as the DSE87xx series module. At regular intervals after power up, the modem is reset, and reinitialised, to ensure the modem does not 'hang up'.

If the DSE8710 series module does not correctly communicate with the modem, "Modem initialising' appears on the Serial Port instrument screen as shown overleaf.

If the module is set for "incoming calls" or for "incoming and outgoing calls", then if the modem is dialled, it will answer after two rings (using the factory setting 'initialisation strings)'. Once the call is established, all data is passed from the dialling PC and the DSE8710 series module.

If the module is set for "outgoing calls" or for "incoming and outgoing calls", then the module will dial out whenever an alarm is generated. Note that not all alarms will generate a dial out; this is dependant upon module configuration of the event log. Any item configured to appear in the event log will cause a dial out.

Serial Port	
Baud	**9600**
SlaveID	**10**
Modem	

Press down ⊙ to view the modem status....

Indicates that a modem is configured. Shows 'RS232' if no modem is configured.

Example 1 continued – Modem diagnostics

Modem diagnostic screens are included; press   when viewing the *RS232 Serial Port* instrument to cycle the available screens. If you are experiencing modem communication problems, this information will aid troubleshooting.

```
     Serial Port
   RTS          DTR
   CTS          DCD
   DSR
```
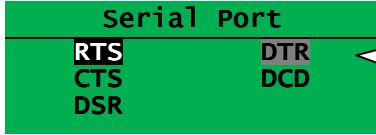
Shows the state of the modem communication lines. These can help diagnose connection problems.

Example:

RTS A dark background shows the line is active.
RTS a grey background shows that the line is toggling high and low.
RTS No background indicates that the line is inactive

| Line	Description	
RTS	Request To Send	Flow control
CTS	Clear To Send	Flow control
DSR	Data Set Ready	Ready to communicate
DTR	Data Terminal Ready	Ready to communicate
DCD	Data Carrier Detect	Modem is connected

```
    Modem Commands
  Rx: OK
  Tx: AT+IPR=9600
  Rx: OK
```
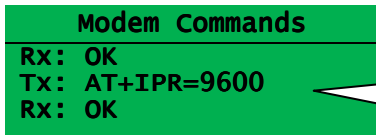
Shows the last command sent to the modem and the result of the command.

Modem Setup Sequence

1)
```
      Serial Port

   Modem Initialising
```
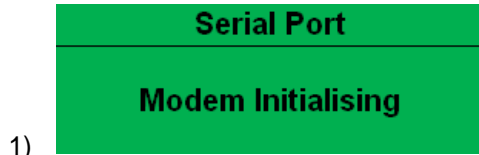
If the Modem and DSE87xx series communicate successfully:

2)
```
      Serial Port

     Modem ready
```
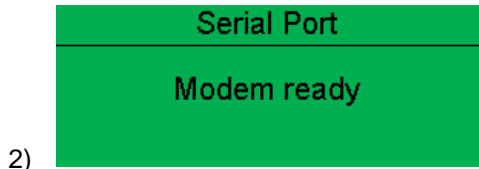
In case of communication failure between the modem and DSE87xx series module, the modem is automatically reset and initialisation is attempted once more:

3)
```
      Serial Port            ⟷            Serial Port

    Modem Reset                         Modem Initialising
```
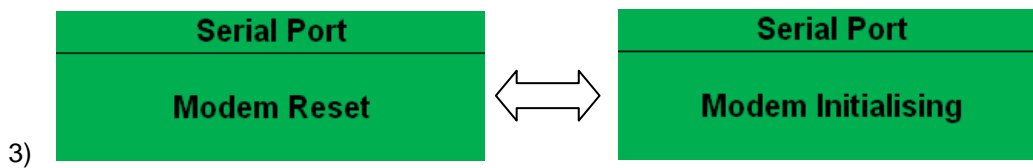
In the case of a module that is unable to communicate with the modem, the display will continuously cycle between 'Modem Reset' and 'Modem Initialising' as the module resets the modem and attempts to communicate with it again, this will continue until correct communication is established with the modem. In this instance, you should check connections and verify the modem operation.

Example 2 – Module connected to a modem.

```
      Serial Port
Baud          9600
SlaveID         10
             Modem
```
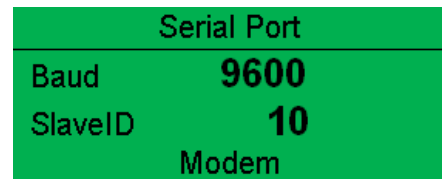
Example 3 – Modem status of a GSM modem

Currently connected GSM operator and signal strength.

```
      Serial Port
 ▽ₗₗ  Orange
       Modem Ready
```
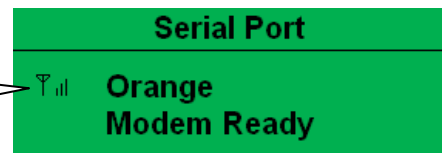
Many GSM modems are fitted with a status LED to show operator cell status and ringing indicator. These can be a useful troubleshooting tool.

In the case of GSM connection problems, try calling the DATA number of the SIMCARD with an ordinary telephone. There should be two rings, followed by the modem answering the call and then 'squealing'. If this does not happen, you should check all modem connections and double check with the SIM provider that it is a DATA SIM and can operate as a data modem. DATA is NOT the same as FAX or GPRS and is often called Circuit Switched Data (CSD) by the SIM provider.

⚠**NOTE: In the case of GSM modems, it is important that a DATA ENABLED SIM is used. This is often a different number than the 'voice number' and is often called Circuit Switched Data (CSD) by the SIM provider.**

If the GSM modem is not purchased from DSE, ensure that it has been correctly set to operate at 9600 baud. You may need to install a terminal program on your PC and consult your modem supplier to do this. GSM modems purchased from DSE are already configured to work with the DSE87xx series module.

4.6.7 RS485 SERIAL PORT

⚠ **NOTE:- The RS485 port instrument shows status of the host controller's (8710/8760) serial port.**

This section is included to give information about the currently selected serial port.
The items displayed on this page will change depending upon configuration of the module. You are referred to your system supplier for further details.

⚠ **NOTE:- Factory Default settings are for the RS485 port to operating at 19200 baud, modbus slave address 10.**

Module RS485 port configured for connection to a modbus master.

DSE87xx series modules operate as a modbus RTU slave device.
In a modbus system, there can be only one Master, typically a PLC, HMI system or PC SCADA system.
This master requests for information from the modbus slave (DSE87xx series module) and may (in control systems) also send request to change operating modes etc. Unless the Master makes a request, the slave is 'quiet' on the data link.
The factory settings are for the module to communicate at 19200 baud, modbus slave address 10.
To use the RS485 port, ensure that 'port usage' is correctly set using the DSE Configuration Suite Software.
Required settings are shown below.

'Master inactivity timeout' should be set to at least twice the value of the system scan time. For example if a modbus master PLC requests data from the DSE87xx modbus slave once per second, the timeout should be set to at least 2 seconds.

The DSE Modbus Gencomm document containing register mappings inside the DSE module is available upon request from support@deepseaplc.com. Email your request along with the serial number of your DSE module to ensure the correct information is sent to you.

Typical requests (using Pseudo code)

`BatteryVoltage=ReadRegister(10,0405,1)` : reads register (hex) 0405 as a single register (battery volts) from slave address 10.

`WriteRegister(10,1008,2,35701, 65535-35701)` : Puts the module into AUTO mode by writing to (hex) register 1008, the values 35701 (auto mode) and register 1009 the value 65535-35701 (the bitwise opposite of auto mode)

`Shutdown=(ReadRegister(10,0306,1) >> 12) & 1` : reads (hex) 0306 and looks at bit 13 (shutdown alarm present)
`Warning=(ReadRegister(10,0306,1) >> 11) & 1` : reads (hex) 0306 and looks at bit 12 (Warning alarm present)
`ElectricalTrip=(ReadRegister(10,0306,1) >> 10) & 1` : reads (hex) 0306 and looks at bit 11 (Electrical Trip alarm present)

`ControlMode=ReadRegister(10,0304,2);` reads (hex) register 0304 (control mode).
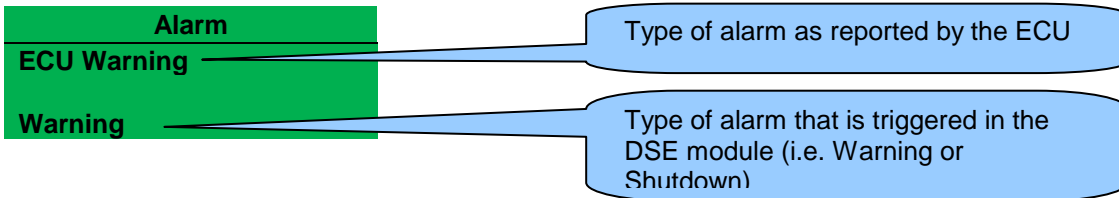
4.6.8   ABOUT

Contains important information about the module and the firmware versions. This information may be asked for when contacting DSE Technical Support Department for advice.

- Module Type (i.e. 8710)
- Application Version – The version of the module's main firmware file – Updatable using the Firmware Update Wizard in the DSE Configuration Suite Software.
- USB ID – unique identifier for PC USB connection
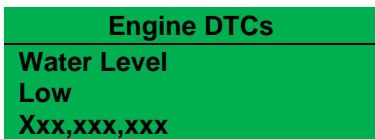- Analogue Measurements software version
- Firmware Update Boot loader software version

4.6.9   CAN ERROR MESSAGES

Not applicable to DSE8716 display

When connected to a suitable CAN engine the DSE871x series controller displays alarm status messages from the ECU.

Alarm
ECU Warning
Warning

Type of alarm as reported by the ECU

Type of alarm that is triggered in the DSE module (i.e. Warning or Shutdown)

Press ⬇ to access the list of current active Engine DTCs (Diagnostic Trouble Codes).

Engine DTCs
Water Level
Low
Xxx,xxx,xxx

The code interpreted by the module shows on the display as a text message. Additionally, the manufacturer's code is shown.

⚠️**NOTE: - For details on these code meanings, refer to the ECU instructions provided by the engine manufacturer, or contact the engine manufacturer for further assistance.**

⚠️**NOTE: - For further details on connection to electronic engines please refer to** *Electronic engines and DSE wiring.* **Part No. 057-004**

4.7   VIEWING THE EVENT LOG

The DSE87xx series modules maintain a log of past alarms and/or selected status changes.
The log size has been increased in the module over past module updates and is always subject to change. At the time of writing, the DSE87xx series log is capable of storing the last 250 log entries.

Under default factory settings, the event log only includes shutdown and electrical trip alarms logged (The event log does not contain Warning alarms**);** however, this is configurable by the system designer using the DSE Configuration Suite software.

Event Log

Display Options

Module display   ◉ Date and time
                 ◯ Engine hours run

Logging Options

Log the following events to the event log

Power up	☐	Shutdown alarms	☑
Mains fail	☑	Electrical trip alarms	☑
Mains Return	☑	Latched warnings	☐
ECU Shutdown alarms	☐	Unlatched warnings	☐

Example showing the possible configuration of the DSE87xx series event log (DSE Configuration Suite Software)
This also shows the factory settings of the module (Only shutdown alarms and the mains status are logged).

Once the log is full, any subsequent shutdown alarms will overwrite the oldest entry in the log.
Hence, the log will always contain the most recent shutdown alarms.
The module logs the alarm, along with the date and time of the event (or engine running hours if configured to do so).
If the module is configured and connected to send SMS text

To view the event log, repeatedly press the next page button   until the LCD screen displays the Event log :

Event log   1

**Oil Pressure Low
Shutdown**
12 Sep 2007, 08:25:46
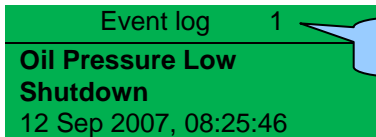
This is event 1.

Press down   to view the next most recent shutdown alarm:

Continuing to press down   cycles through the past alarms after which the display shows the most recent alarm and the cycle begins again.
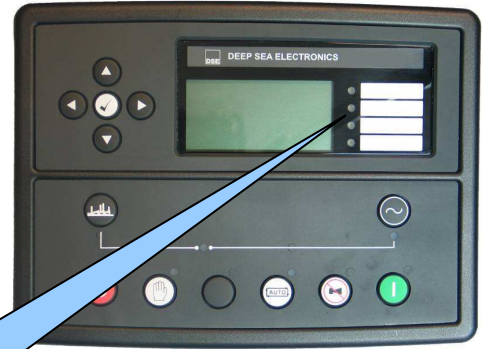
To exit the event log and return to viewing the instruments, press the next page   button to select the next instrumentation page.

4.8   USER CONFIGURABLE INDICATORS

These LEDs can be configured by the user to indicate any one of *100+ different functions* based around the following:-

- **Indications** - Monitoring of a digital input and indicating associated functioning user's equipment - *Such as Battery Charger On or Louvres Open, etc.*
- **WARNINGS a**nd **SHUTDOWNS** - Specific indication of a particular warning or shutdown condition, backed up by LCD indication - *Such as Low Oil Pressure Shutdown, Low Coolant level, etc.*
- **Status Indications** - Indication of specific functions or sequences derived from the modules operating state - *Such as Safety On, Pre-heating, Panel Locked, Generator Available, etc.*

User configurable LEDs

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4.9 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 <u>no</u>t 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. *For further details, please see the more detailed description of 'Manual operation' elsewhere in this manual.*	
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. *For further details, please see the more detailed description of 'Auto operation' elsewhere in this manual.*	
Test (DSE8760/8716 only) This button places the module into its **'Test'** mode. This allows an on load test of the generator(s). Once in **Test mode** the module will respond to the start button, sending a start request to the engine(s) over the MSC link, and run on load, in parallel with the mains supply or in island mode. *For further details, please see the more detailed description of 'Test operation' elsewhere in this manual.*	
4.9.1.1 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/ When correctly configured and fitted to a compatible engine ECU, pressing this button in STOP/RESET mode after pressing the START button (to power the ECU) will cancel any "passive" alarms on the engine ECU.	

Transfer to generator (DSE8710/8711 only) Allows the operator to transfer the load to the generator, synchronising first if required. (when in Manual mode only)	
Open generator (DSE8710/8711 only) Allows the operator to open the generator breaker (when in Manual mode only)	
Close mains (DSE8760/8716 only) This push button is used to control the closure of the mains load switching device and has two modes of operation : 1. Synchronising is NOT enabled. Pressing this button when the mains is available off load and in MANUAL mode, the bus load switch is opened and the mains load switch is closed. Further presses of this button will have no effect. 2. Synchronising is enabled. Pressing this button when the mains is available and in MANUAL mode, the 8760 controller, will volts match and synchronise with the Bus. The mains load switch is then closed in parallel with the Bus. ⚠ **NOTE:- This button is only active in MANUAL mode.** ⚠ **NOTE:- If the bus is live when the manual button is pressed, synchronising will take place before the load switch is closed.**	
Close bus (DSE8760/8716 only) This push button is used to control the closure of the bus load switching device and has two modes of operation : 3. Synchronising is NOT enabled. Pressing this button when the bus is off load and in MANUAL mode, the mains load switch is opened and the bus load switch is closed. Further presses of this button will have no effect. 4. Synchronising is enabled. Pressing this button when the bus is live and in MANUAL mode, the 8760 controller, will volts match and synchronise with the Mains. The bus load switch is then closed in parallel with the mains. ⚠ **NOTE:- This button is only active in MANUAL mode.** ⚠ **NOTE:- If the bus is live when the manual button is pressed, synchronising will take place before the load switch is closed.**	
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.	

5 OPERATION

The following description details the sequences followed by a module containing the standard 'factory configuration'.

Remember that if you have purchased a completed generator set or control panel from your supplier, the module's configuration will probably have been changed by them to suit their particular requirements.

Always refer to your configuration source for the exact sequences and timers observed by any particular module in the field.

5.1 ALTERNATIVE CONFIGURATIONS

Depending upon the configuration of your system by the generator supplier, the system may have selectable configurations (for example to select between 50Hz and 60Hz running). If this has been enabled your generator supplier will advise how this selection can be made (usually by externally operated selector switch or by selecting the required configuration file in the DSE87xx series front panel configuration editor).

5.2   DUMMY LOAD / LOAD SHEDDING CONTROL

Not applicable to DSE8716 display

This feature may be enabled by the system designer to ensure the loading on the generator is kept to a nominal amount. If the load is low, 'dummy loads' (typically static load banks) can be introduced to ensure the engine is not too lightly loaded. Conversely, as the load increases towards the maximum rating of the set, non-essential loads can be shed to prevent overload of the generator.
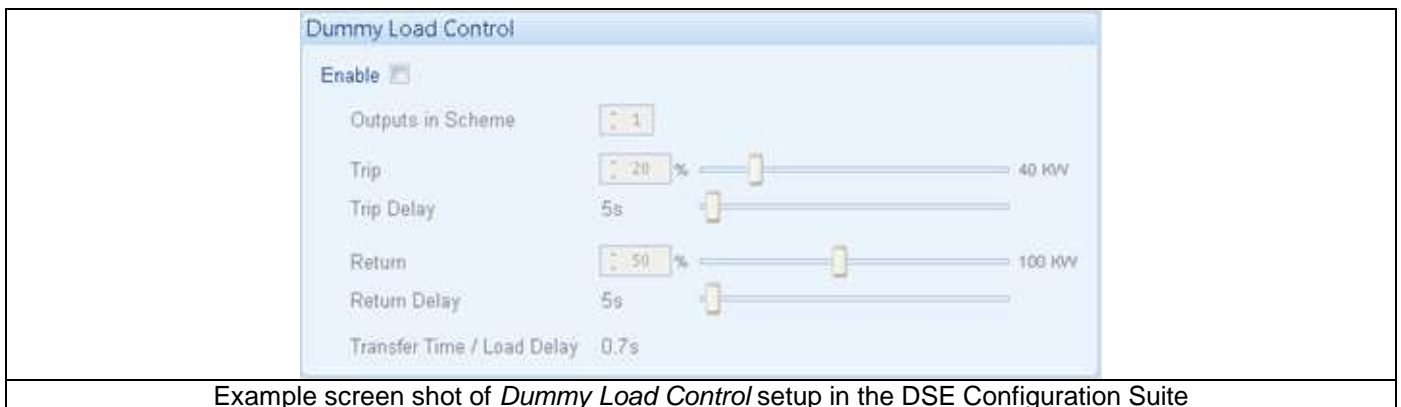
5.2.1   DUMMY LOAD CONTROL

The *dummy load control* feature (if enabled) allows for a maximum of five dummy load steps.
When the set is first started, all configured *Dummy Load Control* outputs are de-energised.
Once the generator is placed onto load, the generator loading is monitored by the *Dummy Load Control* scheme.

If the generator loading falls below the *Dummy Load Control Trip* setting (kW), the *Dummy Load Control Trip Delay* is displayed on the module display. If the generator loading remains at this low level for the duration of the timer, the first *Dummy Load Control* output is energised. This is used to energise external circuits to switch in (for instance) a static load bank.
The generator loading has now been increased by the first dummy load. Again, the generator loading is monitored. This continues until all configured *Dummy Load Control* outputs are energised.

Should the generator loading rise above the *Dummy Load Return* level, the *Dummy Load Return Delay* begins.
If the loading remains at these levels after the completion of the timer, the 'highest' active *Dummy Load Control* output is de-energised. This continues until all *Dummy Load Control* outputs have been de-energised.

Example screen shot of *Dummy Load Control* setup in the DSE Configuration Suite

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5.2.2 LOAD SHEDDING CONTROL

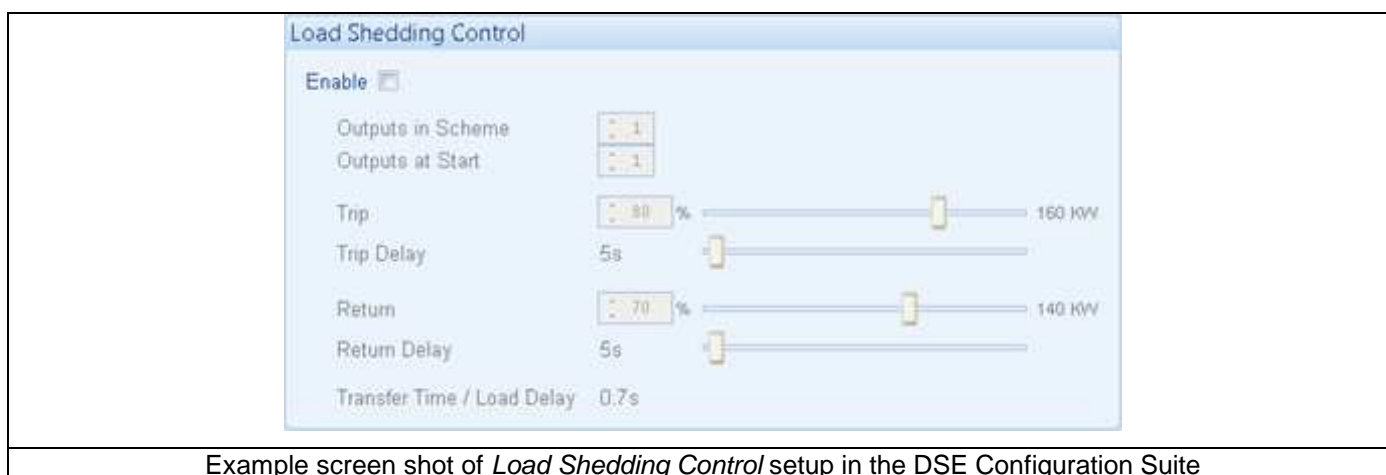The *Load Shedding Control* feature (if enabled) allows for a maximum of five load-shedding steps.
When the generator is about to take load, the configured number of *Load Shedding Control Outputs at Startup* will energise. This configurable setting allows (for instance) certain loads to be removed from the generator prior to the set's load switch being closed. This can be used to ensure the initial loading of the set is kept to a minimum, below the *Load Acceptance* specification of the generating set.
The generator is then placed on load. The *Load Shedding Control* scheme begins.
When the load reaches the *Load Shedding Trip* level, the *Trip Delay* timer will start. If the generator loading is still high when the timer expires, the first *Load shedding Control* output will energise. When the load has been above the trip level for the duration of the timer the 'next' *Load shedding Control* output will energise and so on until all *Load Shedding Control outputs are energised.*
If at any time the load falls back below the *Load Shedding Return* level, the *Return Time* will start. If the load remains below the return level when the timer has expired the 'highest' *Load Shedding Control* output that has been energised will be de-energised. This process will continue until all outputs have been de-energised.
When the set enters a stopping sequence for any reason the *Load Shedding control*' outputs will de-energise at the same time as the generator load switch is signalled to open.

Load Shedding Control	
Enable ☐	
Outputs in Scheme	1
Outputs at Start	1
Trip	80 % — 160 KW
Trip Delay	5s
Return	70 % — 140 KW
Return Delay	5s
Transfer Time / Load Delay	0.7s

Example screen shot of *Load Shedding Control* setup in the DSE Configuration Suite

5.3   STOP MODE

STOP mode is activated by pressing the ⬤ button.

In STOP mode, the module will immediately remove the generator from load (if necessary) before stopping the engine if it is already running. No cooling run is provided for this operation. Where a cooling run is required, switch to MANUAL mode and open the breaker manually. Allow the set to cool off load, before pressing the STOP button to stop the engine.

If the engine does not stop when requested, the FAIL TO STOP alarm is activated (subject to the setting of the *Fail to Stop* timer). To detect the engine at rest the following must occur:

- Engine speed is zero as detected by the Magnetic Pickup or CANbus ECU (depending upon module variant).
- Generator frequency must be zero.
- Oil pressure switch must be closed to indicate low oil pressure (MPU version only)

When the engine has stopped, it is possible to send configuration files to the module from DSE Configuration Suite PC software and to enter the Front Panel Editor to change parameters.

Any latched alarms that have been cleared will be reset when STOP mode is entered.

The engine will not be started when in STOP mode. If remote start signals are given, the input is ignored until AUTO mode is entered.

When configured to do so, when left in STOP mode for five minutes with no presses of the fascia buttons, the

module enters low power mode. To 'wake' the module, press the ⬤ button or any other fascia control button.

Miscellaneous Options	
Enable fast loading feature	☐
Enable sleep mode	☑
Enable manual fuel pump control	☐

Sleep mode configuration in the DSE Configuration Suite Software

5.3.1 ECU OVERRIDE

Not applicable to DSE8716 display

⚠ **NOTE:- Depending upon system design, the ECU may be powered or unpowered when the module is in STOP mode. ECU override is only applicable if the ECU is unpowered when in STOP mode.**

When the ECU is powered down (as is normal when in STOP mode), it is not possible to read the diagnostic trouble codes or instrumentation. Additionally, it is not possible to use the engine manufacturers' configuration tools.

As the ECU is usually unpowered when the engine is not running, it must be turned on manually as follows:

- Select STOP ⬤ mode on the DSE controller.
- Press and hold the START 🟢 button to power the ECU. As the controller is in STOP mode, the engine will not be started.
- Continue to hold the start button for as long as you need the ECU to be powered.
- The ECU will remain powered until a few seconds after the START button is released.

This is also useful if the engine manufacturer's tools need to be connected to the engine, for instance to configure the engine as the ECU needs to be powered up to perform this operation.

5.4 AUTOMATIC MODE

> ⚠ **NOTE:- If a digital input configured to *panel lock* is active, changing module modes will not be possible. Viewing the instruments and event logs is NOT affected by panel lock.**

Activate auto mode be pressing the ⊙ pushbutton. An LED indicator beside the button confirms this action.

Auto mode will allow the generator to operate fully automatically, starting and stopping as required with no user intervention.

5.4.1 WAITING IN AUTO MODE

If a starting request is made, the starting sequence will begin.
Starting requests can be from the following sources:

- Activation of an auxiliary input that has been configured to *remote start on load* or *remote start off load.*
- Request from DSE8760 mains controller or from another DSE8710 controller over the MSC link.
- Activation of the inbuilt exercise scheduler.
- Instruction from external remote telemetry devices using the RS232 or RS485 interface.

5.4.2 STARTING SEQUENCE

To allow for 'false' start requests such as mains brownouts, the *start delay* timer begins. There are individual start delay timers for each of the different start request types.

Should all start requests be removed during the *start delay* timer, the unit will return to a stand-by state.

If a start request is still present at the end of the *start delay* timer, the fuel relay is energised and the engine will be cranked.

> ⚠ **NOTE:- If the unit has been configured for CAN, compatible ECU's will receive the start command via CAN.**

If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the *crank rest* duration after which the next start attempt begins. Should this sequence continue beyond the set number of attempts, the start sequence will be terminated and the display shows ***Fail to Start.***

The starter motor is disengaged when the engine fires. Speed detection is factory configured to be derived from the main alternator output frequency, but can additionally be measured from a Magnetic Pickup mounted on the flywheel (Selected by PC using the DSE87xx series configuration software).

Additionally, rising oil pressure or charge alternator voltage can be used to disconnect the starter motor (but cannot detect underspeed or overspeed).

> ⚠ **NOTE:- If the unit has been configured for CAN, speed sensing is via CAN.**

After the starter motor has disengaged, the *Safety On* timer activates, allowing Oil Pressure, High Engine Temperature, Under-speed, Charge Fail and any delayed Auxiliary fault inputs to stabilise without triggering the fault.

5.4.3 ENGINE RUNNING

Once the engine is running, the *Warm Up* timer, if selected, begins, allowing the engine to stabilise before accepting the load.

If the common bus is measured to be 'dead bus', the load breaker is closed.
If the bus is measured to be 'live bus', synchronising takes place before the breaker is closed.

⚠️**NOTE:-The load transfer signal remains inactive until the Oil Pressure has risen. This prevents excessive wear on the engine.**

As the load increases and decreases, the DSE87xx series module (may (depending upon configuration) add dummy loads or remove non-essential loads. This is configured as part of the *Load Shedding* and *Dummy Load* control settings in the DSE Configuration Suite Software.
See section entitled *Dummy Load / Load Shedding* elsewhere in this document for further details.

Additionally, when configured as part of a multiset package, the generator may be automatically started and stopped depending upon load requirements.

If in doubt, consult your system supplier for details of how your particular system has been configured.

If all start requests are removed, the *stopping sequence* will begin.

5.4.4 STOPPING SEQUENCE

The *return delay* timer operates to ensure that the starting request has been permanently removed and is not just a short-term removal. Should another start request be made during the cooling down period, the set will return on load.

If there are no starting requests at the end of the *return delay* timer, the load is ramped off the generator being the breaker is opened and the *cooling* timer is initiated.

The *cooling* timer allows the set to run off load and cool sufficiently before being stopped. This is particularly important where turbo chargers are fitted to the engine.

If the set is called to return to load before the *cooling timer* has expired, the *Engine Running* operation is again followed.

After the *cooling* timer has expired, the set is stopped.

5.5   MANUAL MODE

⚠️**NOTE:- If a digital input configured to *panel lock* is active, changing module modes will not be possible. Viewing the instruments and event logs is NOT affected by panel lock.**

Activate Manual mode be pressing the 🖐️ pushbutton. An LED indicator beside the button confirms this action.

Manual mode allows the operator to start and stop the set manually, and if required change the state of the load switching devices.

5.5.1   WAITING IN MANUAL MODE

When in manual mode, the set will not start automatically.

To begin the starting sequence, press the 🟢 button.

5.5.2   STARTING SEQUENCE

⚠️**NOTE:- There is no *start delay* in this mode of operation.**

The fuel relay is energised and the engine is cranked.

⚠️**NOTE:- If the unit has been configured for CAN, compatible ECU's will receive the start command via CAN.**

If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the *crank rest* duration after which the next start attempt is made. Should this sequence continue beyond the set number of attempts, the start sequence will be terminated and the display shows ***Fail to Start.***

When the engine fires, the starter motor is disengaged. Speed detection is factory configured to be derived from the main alternator output frequency but can additionally be measured from a Magnetic Pickup mounted on the flywheel (Selected by PC using the DSE87xx series configuration software).

Additionally, rising oil pressure or charge alternator voltage can be used to disconnect the starter motor (but cannot detect underspeed or overspeed).

⚠️**NOTE:- If the unit has been configured for CAN, speed sensing is via CAN.**

After the starter motor has disengaged, the *Safety On* timer activates, allowing Oil Pressure, High Engine Temperature, Under-speed, Charge Fail and any delayed Auxiliary fault inputs to stabilise without triggering the fault.

5.5.3 ENGINE RUNNING

In manual mode, the load is not transferred to the generator unless a 'loading request' is made.
A loading request can come from a number of sources.

- Pressing the *transfer to generator* ⊙ button.
- Request from DSE8760 mains controller or from another DSE8710 controller over the MSC link.
- Activation of an auxiliary input that has been configured to *remote start on load*
- Activation of the inbuilt exercise scheduler if configured for 'on load' runs.

⚠ **NOTE:-The load transfer signal remains inactive until the Oil Pressure has risen. This prevents excessive wear on the engine.**

If the common bus is measured to be 'dead bus', the load breaker is closed.
If the bus is measured to be 'live bus', synchronising takes place before the breaker is closed.

Once the load has been transferred to the generator, the load switch will not be automatically opened unless:

- Press the *Open Generator* button (DSE8710 only)
- Press the *auto mode* button to return to automatic mode.

5.5.4 MANUAL FUEL PUMP CONTROL

- Navigate to the instruments page using the buttons and locate FUEL LEVEL. ✓ is shown on the module display to indicate that this feature is available.
- Press and hold the ✓ button to energise the transfer pump. The pump starts two seconds after the button is pressed.
- Release the ✓ button to de-energise the transfer pump.

5.5.5 MANUAL SPEED CONTROL

- Navigate to the instruments page using the buttons and locate ENGINE SPEED. ✓ is shown on the module display to indicate that this feature is available.
- Press the ✓ button to enter edit mode
- Press (up or down) to change the engine speed.
- Press the ✓ button again to exit the editor and leave the engine running at the newly selected speed.

5.5.6   STOPPING SEQUENCE

In manual mode the set will continue to run until either :

- The *stop button* ⬤ is pressed – The set will immediately stop
- The *auto button* ⬤ is pressed. The set will observe all auto mode start requests and stopping timers before beginning the *Auto mode stopping sequence.*

5.6   TEST MODE

⚠ **NOTE:- If a digital input configured to *panel lock* is active, changing module modes will not be possible. Viewing the instruments and event logs is NOT affected by panel lock.**

Activate test mode be pressing the ⬤ pushbutton. An LED indicator beside the button confirms this action.

Test mode will start the set(s) and parallel the mains to the generator bus to provide a ***Test on load*** function. Depending upon configuration this can be continuous parallel or island mode operation.

5.6.1   WAITING IN TEST MODE

When in test mode, the set will not start automatically.

To begin the starting sequence, press the ⬤ button.

5.6.2   ENGINE RUNNING

Parallel operation is governed by configuration. See the previous section entitled *Auto Mode: Engine Running* for further details.

In test mode, the set will continue to run *on load* until either:

- The *stop button* ⬤ is pressed – The generator bus breaker is opened and the set(s) are called to stop.
- The *auto button* ⬤ is pressed. The set(s) will observe all auto mode start requests and stopping timers before beginning the *Auto mode stopping sequence.*

6   PROTECTIONS

When an alarm is present, the Audible Alarm will sound and the Common alarm LED if configured will illuminate.

The audible alarm can be silenced by pressing the *Mute button*

The LCD display will jump from the 'Information page' to display the Alarm Page

| Alarm   1/2 |
| Warning
Low oil pressure |

Number of present alarms. This is alarm 1 of a total of 2 present alarms
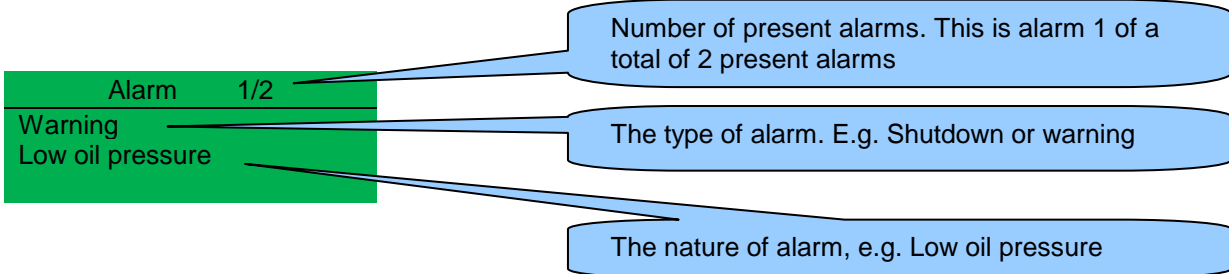
The type of alarm. E.g. Shutdown or warning

The nature of alarm, e.g. Low oil pressure

The LCD will display multiple alarms E.g. "High Engine Temperature shutdown", "Emergency Stop" and "Low Coolant Warning". These will automatically scroll in the order that they occurred.

In the event of a warning alarm, the LCD will display the appropriate text. If a shutdown then occurs, the module will again display the appropriate text.
Example:-

| Alarm   1/2 |
| Warning
Oil pressure Low |

| Alarm   2/2 |
| Shutdown
Coolant Temperature High |
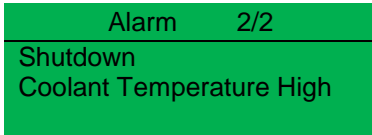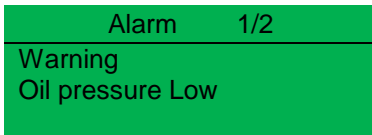
6.1 PROTECTIONS DISABLED

Not applicable to DSE8716 display

User configuration is possible to prevent Shutdown / Electrical Trip alarms from stopping the engine.
Under such conditions, *Protections Disabled* will appear on the module display to inform the operator of this status.

This feature is provided to assist the system designer in meeting specifications for "Warning only", "Protections Disabled", "Run to Destruction", "War mode" or other similar wording.

When configuring this feature in the PC software, the system designer chooses to make the feature either permanently active, or only active upon operation of an external switch. The system designer provides this switch (not DSE) so its location will vary depending upon manufacturer, however it normally takes the form of a key operated switch to prevent inadvertent activation. Depending upon configuration, a warning alarm may be generated when the switch is operated.

The feature is configurable in the PC configuration software for the module. Writing a configuration to the controller that has "Protections Disabled" configured, results in a warning message appearing on the PC screen for the user to acknowledge before the controller's configuration is changed. This prevents inadvertent activation of the feature.

6.1.1 INDICATION / WARNING ALARMS

Under Indication or Warning alarms:

- The module operation is unaffected by the *Protections Disabled* feature. See sections entitled *Indications* and *Warnings* elsewhere in this document.

6.1.2 SHUTDOWN / ELECTRICAL TRIP ALARMS

> ⚠ **NOTE:- The EMERGENCY STOP input and shutdown alarm continues to operate even when *Protections Disabled* has been activated.**

Under Shutdown or Electrical Trip alarm conditions (excluding Emergency Stop):

- The alarm is displayed on the screen as detailed in the section entitled *Shutdown alarm*s elsewhere in this document.
- The set continues to run.
- The load switch maintains its current position (it is not opened if already closed)
- ***Shutdown Blocked*** also appears on the LCD screen to inform the operator that the Protections Disabled feature has blocked the shutdown of the engine under the normally critical fault.
- The 'shutdown' alarm is logged by the controllers *Event Log (*if configured to log shutdown alarms) and logs that the Shutdown was prevented.

6.2   INDICATIONS

Indications are non-critical and often status conditions. They do not appear on the LCD of the module as a text message. However, an output or LED indicator can be configured to draw the operator's attention to the event.

Example

- Input configured for indication.

- The LCD text will not appear on the module display but can be added in the configuration to remind the system designer what the input is used for.

- As the input is configured to *Indication* there is no alarm generated.

- LED Indicator to make LED1 illuminate when Digital Input A is active.
- The Insert Card Text allows the system designer to print an insert card detailing the LED function.

- Sample showing operation of the LED.

6.3   WARNINGS

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.

Example

| Alarm   1/1 |
| Charge Failure |
| Warning |

In the event of an alarm the LCD will jump to the alarms page, and scroll through all active warnings and shutdowns.

By default, warning alarms are self-resetting when the fault condition is removed. However enabling 'all warnings are latched' will cause warning alarms to latch until reset manually. This is enabled using the DSE87xx series configuration suite in conjunction with a compatible PC.

If the module is configured for, **CAN** and receives an "error" message from the engine control unit, 'Can ECU Warning" is shown on the module's display and a warning alarm is generated.

6.4   HIGH CURRENT WARNING ALARM

GENERATOR HIGH CURRENT, if the module detects a generator output current in excess of the pre-set trip a warning alarm initiates. The module shows Alarm Warning High Current. If this high current condition continues for an excess period, then the alarm escalates to a shutdown condition. For further details of the high current alarm, please see High Current Shutdown Alarm.

By default, High Current Warning Alarm is self-resetting when the overcurrent condition is removed. However enabling 'all warnings are latched' will cause the alarm to latch until reset manually. This is enabled using the DSE87xx series configuration suite in conjunction with a compatible PC.

6.5 SHUTDOWNS

⚠**NOTE:- Shutdown and Electrical Trip alarms can be disabled by user configuration. See the section entitled *Protections Disabled* elsewhere in this document.**

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

Example

Alarm   1/1
Oil Pressure Low Shutdown

⚠**NOTE:- The alarm condition must be rectified before a reset will take place. If the alarm condition remains, it will not be possible to reset the unit (The exception to this is the Low Oil Pressure alarm and similar 'active from safety on' alarms, as the oil pressure will be low with the engine at rest).**

6.6 ELECTRICAL TRIPS

⚠**NOTE:- Shutdown and Electrical Trip alarms can be disabled by user configuration. See the section entitled *Protections Disabled* elsewhere in this document.**

Electrical trips are latching and stop the Generator but in a controlled manner. On initiation of the electrical trip condition the module will de-energise the **'Close Generator'** Output to remove the load from the generator. Once this has occurred the module will start the Cooling timer and allow the engine to cool off-load before shutting down the engine. The alarm must be accepted and cleared, and the fault removed to reset the module.

Example

Alarm   1/1
Generator Current High Electrical Trip

Electrical trips are latching alarms and stop the Generator. Remove the fault then press Stop/Reset ⓞ to reset the module.

6.7 HIGH CURRENT SHUTDOWN / ELECTRICAL TRIP ALARM

The overcurrent alarm combines a simple warning trip level with a fully functioning IDMT curve for thermal protection.

6.7.1 IMMEDIATE WARNING

If the *Immediate Warning* is enabled, the DSE87xx Series controller generates a *warning alarm* as soon as the *Trip* level is reached. The alarm automatically resets once the generator loading current falls below the *Trip* level (unless *All Warnings are latched* is enabled). For further advice, consult your generator supplier.

6.7.2 IDMT ALARM

If the *IDMT Alarm* is enabled, the DSE87xx Series controller begins following the IDMT 'curve' when the *trip* level is passed.

If the *Trip* is surpassed for an excess amount of time the *IDMT Alarm* triggers (*Shutdown* or *Electric trip* as selected in *Action*).

High current shutdown is a latching alarm and stops the Generator.

Remove the fault then press Stop/Reset ⏻ to reset the module.

High current electrical trip is a latching alarm and removes the generator from the load, before stopping the Generator after the off load *cooling* timer.

Remove the fault then press Stop/Reset ⏻ to reset the module.

The higher the overload, the faster the trip. The speed of the trip is dependent upon the fixed formula:

$$T = t / ((I_A / I_T) - 1)^2$$

Where: T is the tripping time in seconds
 I_A is the actual current of the most highly loaded line (L1 or L2 or L3)
 I_T is the delayed over-current trip point
 t is the time multiplier setting and also represents the tripping time in seconds at twice full load (when $I_A / I_T = 2$).

Factory settings for the *IDMT Alarm* when used on a brushless alternator are as follows (screen capture from the DSE Configuration Suite PC software :
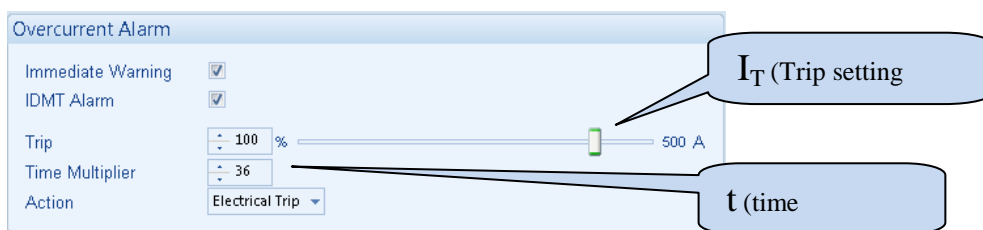
These settings provide for normal running of the generator up to 100% full load. If full load is surpassed, the *Immediate Warning* alarm is triggered, the set continues to run.
The effect of an overload on the generator is that the alternator windings begin to overheat; the aim of the *IDMT alarm* is to prevent the windings being overload (heated) too much. The amount of time that the set can be safely overloaded is governed by how high the overload condition is.

With typical settings as above, the tripping curve is followed as shown below.

This allows for overload of the set to the limits of the *Typical Brushless Alternator* whereby 110% overload is permitted for 1 hour.

If the set load reduces, the controller then *follows* a cooling curve. This means that a second overload condition may trip much sooner than the first as the controller *knows* if the windings have not cooled sufficiently.

At default setting of t = 36
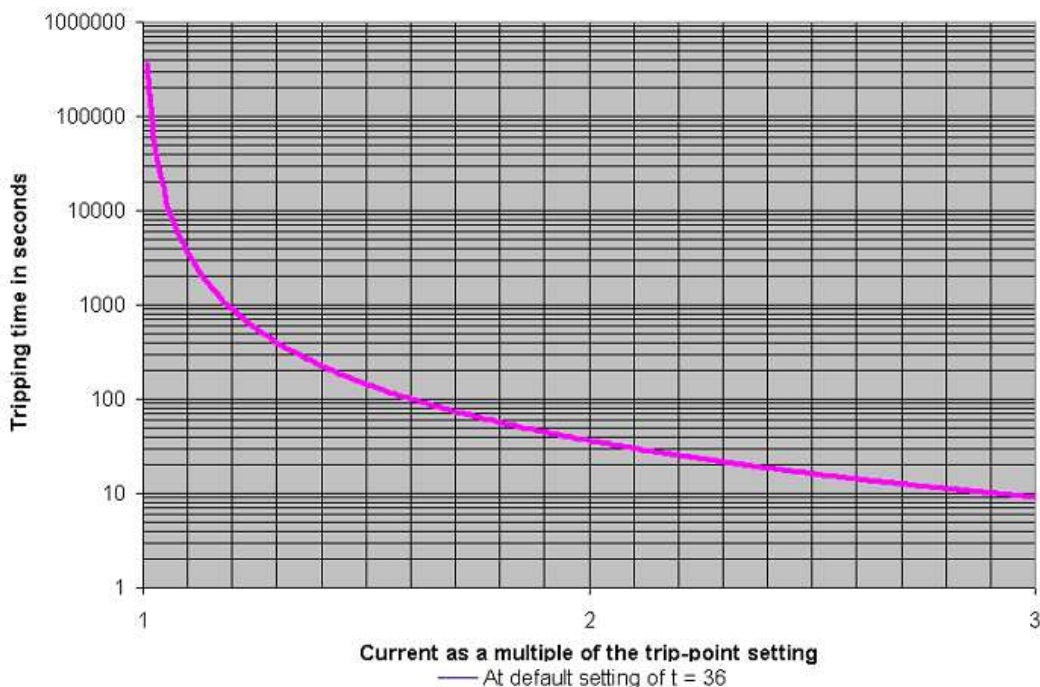
For further details on the *Thermal damage curve* of your alternator, you are referred to your alternator manufacturer and generator supplier.

6.8   SHORT CIRCUIT AND EARTH FAULT SHUTDOWN / ELECTRICAL TRIP ALARM

When the module is suitably connected using the 'Earth Fault CT'. The module measures Earth Fault and can optionally be configured to generate an alarm condition (shutdown or electrical trip) when a specified level is surpassed.
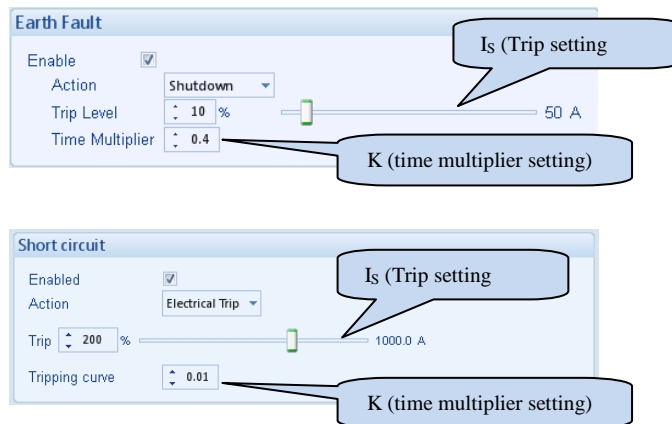
Short Circuit alarm operates in the same way as the Earth Fault, using the same curve formula, but typically uses a lower value for K (time multiplier) to give a faster acting trip.

If the A*larm* is enabled, the DSE8710 Series controller begins following the IDMT 'curve'. If the current surpasses the *Trip* for an excess of time, the Alarm triggers (*Shutdown* or *Electric trip* as selected in *Action*).

The higher the fault, the faster the trip. The speed of the trip is dependent upon the fixed formula:

$$T = K \times 0.14 / ((I / I_s)^{0.02} -1)$$
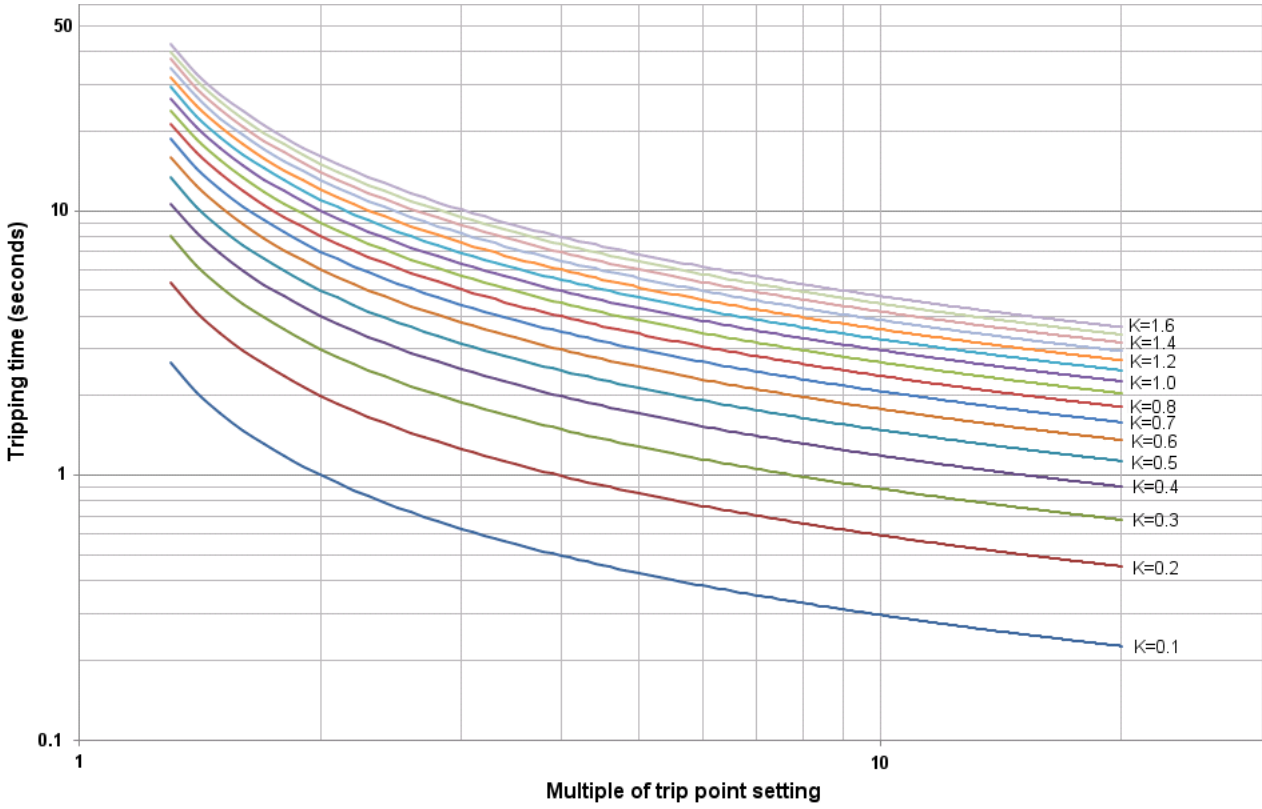
Where: T is the tripping time in seconds (accurate to +/- 5% or +/- 50ms (whichever is the greater)
                K is the time multiplier setting
                I is the actual earth current measured
                Is is the trip setting value

Earth Fault

Enable   ☑
   Action   Shutdown
   Trip Level   10 %   50 A
   Time Multiplier 0.4

I_S (Trip setting

K (time multiplier setting)

Short circuit

Enabled   ☑
Action   Electrical Trip

Trip   200 %   1000.0 A

Tripping curve 0.01

I_S (Trip setting

K (time multiplier setting)

The settings shown in the example above are a screen capture of the DSE factory settings, taken from the DSE Configuration Suite software.

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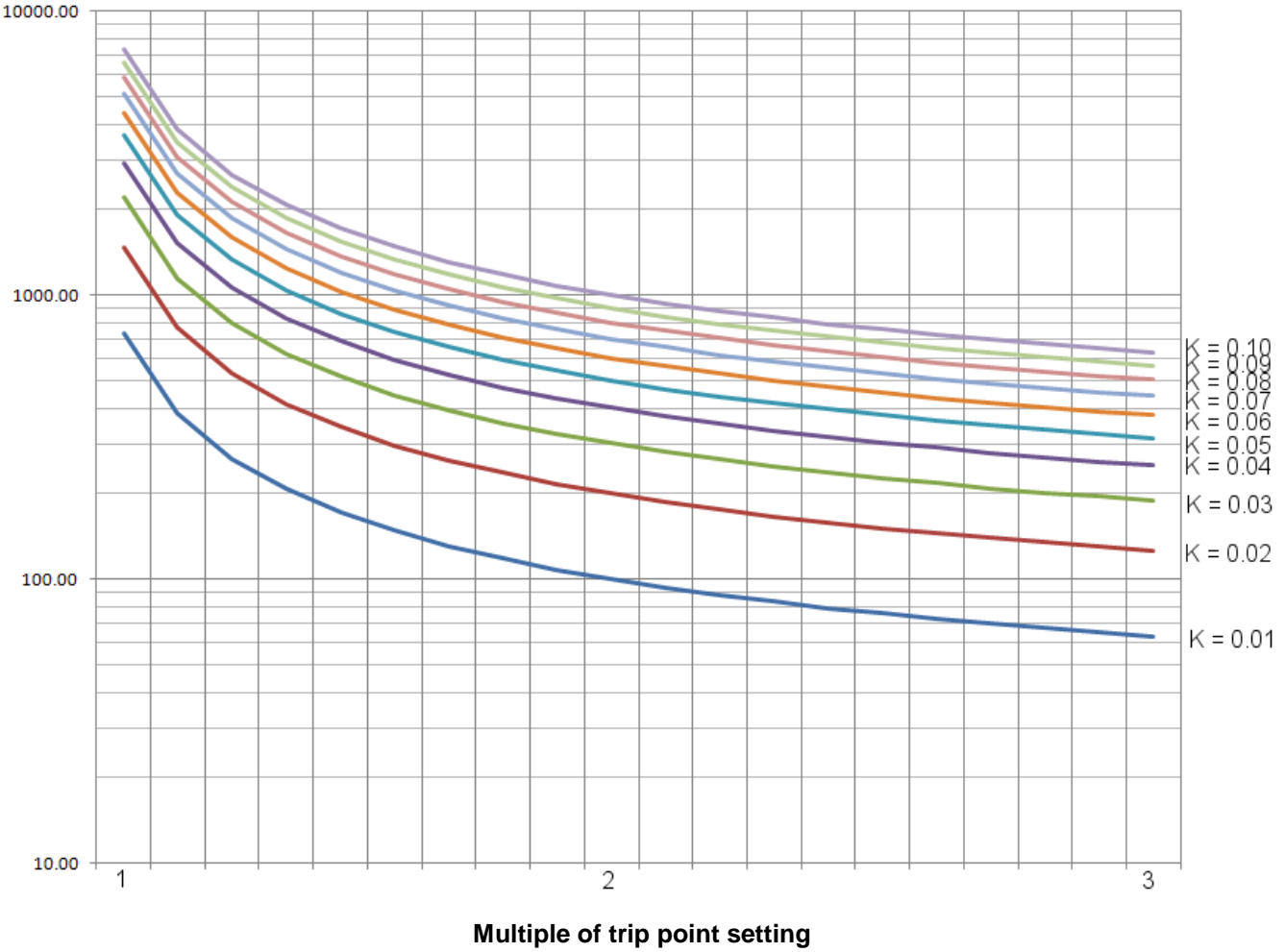
6.8.1   EARTH FAULT TRIPPING CURVES

⚠ **NOTE: DSE Factory setting is time multiplier (K) = 0.4**

6.8.1 SHORT CIRCUIT TRIPPING CURVES

⚠️ **NOTE: DSE Factory setting is time multiplier (K) = 0.01**

Trip time (mS)

Multiple of trip point setting

6.9   ROCOF / VECTOR SHIFT

When configured to run in parallel with the mains (utility) supply, the module monitors for ROCOF / Vector shift trips according to the module's configuration settings. This is included within the module and will detect failure of the mains supply during parallel operation with the generator.

> **⚠NOTE:- This protection operates only when in parallel with the mains supply and is disabled at all other times.**

Should either of these alarms operate, the module will perform a controlled shutdown (electrical trip) of the generator. This operation must be manually reset :

1) Press **O** button. The engine will stop if it is still running and the alarm is cleared.
2) Activate digital input configured to "Clear ROCOF/Vector shift" if this has been provided.
3) Press 🚫 and ✓ button together and hold for 5 seconds. The ROCOF/Vector shift instrument is displayed and all 'peak hold' values are reset, clearing the ROCOF/Vector shift alarm.

For details on activating and configuring the ROCOF/Vector shift protection, you are referred to the 8700 configuration software manual.

7   MAINTENANCE ALARM

Depending upon module configuration one or more levels of maintenance alarm may occur based upon a configurable schedule.

Example 1

Screen capture from DSE Configuration Suite Software showing the configuration of Maintenance Alarm 1 and Maintenance Alarm 2.

When activated, the maintenance alarm can be either a **warning** (set continues to run) or **shutdown** (running the set is not possible). The site service engineer normally performs resetting the maintenance alarm after performing the required maintenance. The method of reset is either by:

- Activating an input that has been configured to maintenance x reset, where x is the number of the maintenance alarm (1 to 3).
- Pressing the maintenance reset button in the DSE Configuration Suite, Maintenance section.

Example 2

Screen capture from DSE Configuration Suite Software showing the configuration of a digital input for Reset Maintenance Alarm 1.

Example 3

Screen capture from DSE Configuration Suite Software showing the Maintenance Alarm Reset 'button' in the DSE Configuration Suite SCADA | MAINTENANCE section.
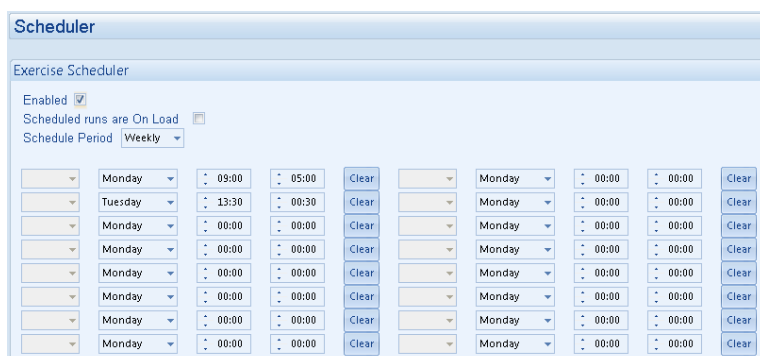
8   SCHEDULER

DSE87xx Series contains an inbuilt exercise run scheduler, capable of automatically starting and stopping the set.
Up to 16 scheduled start/stop sequences can be configured to repeat on a 7-day or 28-day cycle.
Scheduled runs may be on load or off load depending upon module configuration.

Example

Screen capture from DSE Configuration Suite
Software showing the configuration of the Exercise
Scheduler.

In this example the set will start at 09:00 on Monday
and run for 5 hours, then start at 13:30 on Tuesday
and run for 30 minutes.

8.1.1   STOP MODE

- Scheduled runs will not occur when the module is in STOP/RESET mode.

8.1.2   MANUAL MODE

- Scheduled runs will not occur when the module is in MANUAL mode.
- Activation of a Scheduled Run 'On Load' when the module is operating OFF LOAD in Manual mode will have no effect, the set continues to run OFF LOAD

8.1.3   AUTO MODE

- Scheduled runs will operate ONLY if the module is in AUTO mode with no Shutdown or Electrical Trip alarm present.
- If the module is in STOP or MANUAL mode when a scheduled run begins, the engine is not started. However, if the module moves into AUTO mode during a scheduled run, the engine is called to start.
- Depending upon configuration by the system designer, an external input can be used to inhibit a scheduled run.
- If the engine is running OFF LOAD in AUTO mode and a scheduled run configured to 'On Load' begins, the set is placed ON LOAD for the duration of the Schedule.

9   FRONT PANEL CONFIGURATION

This configuration mode allows the operator limited customising of the way the module operates.

Use the module's navigation buttons to traverse the menu and make value changes to the parameters:
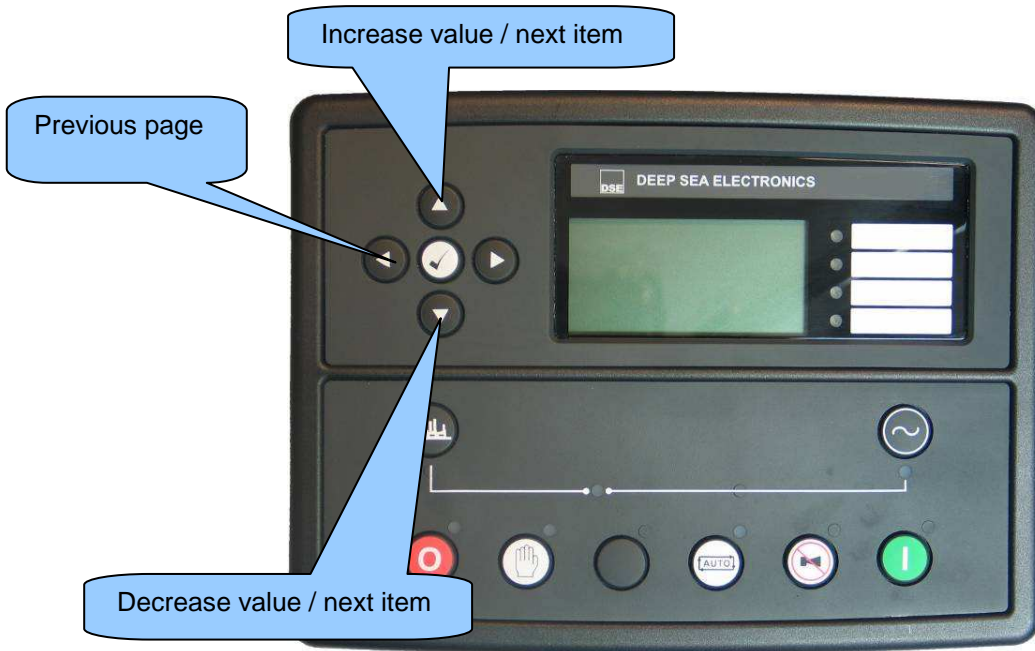
9.1   ACCESSING THE MAIN FRONT PANEL CONFIGURATION EDITOR

Ensure the engine is at rest and the module is in STOP mode by pressing the Stop/Reset ⊙ button.

Press the Stop/Reset ⊙ and Info ✓ buttons simultaneously.
If a module security PIN has been set, the PIN number request is then shown :

> **Editor**
>
> Enter Pin
> **# # # #**
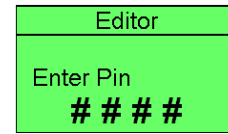
Press ✓, the first '#' changes to '0'. Press ▼ (up or down) to adjust it to the correct value.

Press ▶ (right) when the first digit is correctly entered. The digit you have just entered will now show '#' for security.

Repeat this process for the other digits of the PIN number. You can press ◀ (left) if you need to move back to adjust one of the previous digits.

When ✓ is pressed after editing the final PIN digit, the PIN is checked for validity. If the number is not correct, you must re-enter the PIN.

If the PIN has been successfully entered (or the module PIN has not been enabled), the editor is displayed :

> **Editor - Display**
>
> Contrast
> **53%**
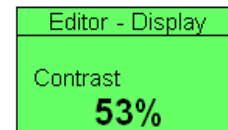
⚠**NOTE: The PIN number is not set by DSE when the module leaves the factory. If the module has a PIN code set, this has been affected by your generator supplier who should be contacted if you require the code. If the code has been 'lost' or 'forgotten', the module must be returned to the DSE factory to have the module's code removed. A charge will be made for this procedure.**
NB - This procedure cannot be performed away from the DSE factory.

9.1.1 EDITING A PARAMETER

Enter the editor as described above.

Press the   (left) or   (right) buttons to cycle to the section you wish to view/change.

Press the   (up or down) buttons to select the parameter you wish to view/change within the currently selected section.

To edit the parameter, press ✓ to enter edit mode. The parameter begins to flash to indicate that you are editing the value.

Press the   (up or down) buttons to change the parameter to the required value.

Press ✓ to save the value. The parameter ceases flashing to indicate that it has been saved.

To exit the editor at any time, press and hold the ✓ button.

⚠NOTE: - The editor automatically exits after 5 minutes of inactivity to ensure security.

⚠NOTE: - The PIN number is automatically reset when the editor is exited (manually or automatically) to ensure security.

⚠ NOTE: - More comprehensive module configuration is possible using the DSE87xx series PC configuration software. Please contact us for further details.

9.1.2   ADJUSTABLE PARAMETERS

Front Panel Configuration Editor. For descriptions of the parameters, you are referred to The DSE87xx series Configuration Suite Manual, DSE Part 057-119.

Section	Parameter as shown on display	Values
Display	Contrast	53%
	Language	English, others.
	Current Date and Time	*hh:mm*
Timers	LCD Page Timer	5m
	Scroll Delay	*2s*
	Engine Pre Heat Timer	0s
	Engine Crank Duration	10s
	Engine Crank Rest Time	10s
	Engine Safety On Delay	10s
	Engine Smoke Limiting	0s
	Engine Smoke Limiting Off	0s
	Engine Warm Up Time	1s
	Engine Cool Down Time	1m
	Engine Speed Overshoot Delay	0s
	Engine Failed To Stop	30s
	Battery Under Voltage Warning Delay	1m
	Battery Over Voltage Warning Delay	1m
	Return Delay	30s
	Generator Transient Delay	0s
Generator	Under Voltage Shutdown	184v
	Under Voltage Pre-Alarm	196v
	Nominal Voltage	230v
	Over Voltage Pre-Alarm	265v
	Over Voltage Shutdown	277v
	Under Frequency Shutdown	40Hz
	Under Frequency Pre-Alarm	42Hz
	Nominal frequency	200%
	Over Frequency Pre-Alarm	50Hz
	Over Frequency Shutdown	54Hz
	Full Load Rating	57Hz
	Delayed Over current	500A
	Delayed Over Current	Active
	AC System	100%
	CT Primary	3 Phase 4 wire
	CT Secondary	600A
	Short Circuit Trip	5A
	Earth CT Primary	500A
	Earth Fault Trip	Inactive
	Earth Fault Trip	10%
	Transient Delay	0s
	Gen Reverse Power Delay	2s
	Full kW rating	245kW
	Full kVAr rating	258kVAr
	Load Ramp Rate	3%
	Load Level For More Sets	80%
	Load Level For Less Sets	70%
	Load Demand Priority	1
	Gen Reverse Power	35kW
	Gen Over Current	0%
	Insufficient Capacity Delay	1s
	Insufficient Capacity Action	None
	Reactive Load CTL Mode VAr Share	None
	Load Parallel Power	172kW When In Mains Parallel Mode
	Load Power factor	0% When In Mains Parallel Mode
Engine	Oil Pressure Low shutdown	1.03bar
	Oil Pressure Low Pre-Alarm	1.17bar
	Coolant Temp High Pre-Alarm	90°C
	Coolant Temp High Electrical Trip	92°C
	Coolant Temp High Shutdown	95°C
	Start Delay Off load	5s
	Start Delay on load	5s
	Start Delay mains fail	0s
	Start Delay Telemetry	5s
	Pre Heat Timer	0s
	Crank Duration	10s
	Crank rest Time	10s
	Safety On Delay	10s
	Smoke Limited	0s
	Smoke limiting off	0s
	Warm Up Time	1s
	Cool Down Time	1m
	Speed Overshoot Delay	0s
	Speed Overshoot	0%
	Fail To Stop Delay	30s
	Battery Under Volts Warning	Active
	Battery Under Volts Warning Delay	1m
	Battery Under Volts Warning	19v
	Battery Over Volts Warning	Active
	Battery Over Volts Warning Delay	1m
	Battery Over Volts Warning	30v
	Charge Alternator Failure Warning	Active
	Charge Alternator Failure Warning	6.0v
	Charge Alternator Warning Delay	5s
	Charge Alternator Failure Shutdown	Active
	Charge Alternator Failure Shutdown	4.0
	Charge Alternator Shutdown Delay	5s
	Droop %	Active, Inactive. Electronic engines only when droop is enabled.
Scheduler	Scheduler	Active, Inactive
	Schedule On Load	Active , Inactive (Only Available When Scheduler Is Active)
	Schedule Period	weekly, Monthly (Only Available When Scheduler Is Active)
	Schedule Time & Date Selection (1-16)	Press ✓ to begin editing then press ⊙⊙⊙ or ⊙⊙⊙ when selecting the different parameters in the scheduler.

9.2 ACCESSING THE 'RUNNING' CONFIGURATION EDITOR

The 'running' editor can be entered while the engine is running. All protections remain active if the engine is running while the running editor is entered.

Press and hold the ✓ button to enter the running editor.

9.2.1 EDITING A PARAMETER

Enter the editor as described above.

Press the ◄ (left) or ► (right) buttons to cycle to the section you wish to view/change.

Press the ▲▼ (up or down) buttons to select the parameter you wish to view/change within the currently selected section.

To edit the parameter, press ✓ to enter edit mode. The parameter begins to flash to indicate that you are editing the value.

Press the ▲▼ (up or down) buttons to change the parameter to the required value.

Press ✓ to save the value. The parameter ceases flashing to indicate that it has been saved.

To exit the editor at any time, press and hold the ✓ button.

9.2.2 ADJUSTABLE PARAMETERS (RUNNING EDITOR)

Running Editor (Factory default settings are shown in bold italicised text)

Section	Parameter as shown on display	Factory Setting
DISPLAY	Contrast	53%
	Language	English
	Load Demand priority	**(1)**
	Load Power factor	0-100% **(0)**
	Load parallel power	0-100% **(50)**
	Enable commissioning screens	Inactive, **Active**
	Override starting alarms	**Inactive**, Active
	Voltage adjust (manual mode only engine running breaker open)	0-100 % **(0)**
	Frequency adjust (manual mode only engine running breaker open)	0-100 % **(0)**
	Enable mains decoupling test mode (Stop mode only)	**Inactive**, Active
	Serial port	**RS232**, RS485
	Serial port baud	1200 2400 4800 9600 14400 **19200** 28800 38400 57600 115200
	Inactivity timer	hh:mm:ss **(5s)**
	Packet timer	hh:mm:ss **(50s)**
	Serial port slave ID	**(10)**

10 COMMISSIONING

10.1.1 PRE-COMMISSIONING
Before the system is started, it is recommended that the following checks are made:-

10.1. The unit is adequately cooled and all the wiring to the module is of a standard and rating compatible with the system. Check all mechanical parts are fitted correctly and that all electrical connections (including earths) are sound.

10.2. The unit **DC** supply is fused and connected to the battery and that it is of the correct polarity.

10.3. The Emergency Stop input is wired to an external **normally closed** switch connected to **DC positive.**

> ⚠ **NOTE:- If Emergency Stop feature is not required, link this input to the DC Positive. The module will not operate unless either the Emergency Stop is fitted correctly OR terminal 3 is connected to DC positive.**

10.4. Make all checks on the engine and alternator as detailed by their respective manufacturer documentation.

10.5. Check all other parts in the system according to the manufacturer documentation.

10.6. Thoroughly review the configuration of the DSE controller and check that all parameters meet the requirements of your system.

10.7. To check the start cycle operation, take appropriate measures to prevent the engine from starting (disable the operation of the fuel solenoid). After a visual inspection to ensure it is safe to proceed, connect the battery supply. Select **"MANUAL"** and then press **"START"** the unit start sequence will commence.

10.8. The starter will engage and operate for the pre-set crank period. After the starter motor has attempted to start the engine for the pre-set number of attempts, the LCD will display 'Failed *to start*. Select the **STOP/RESET** position to reset the unit.

10.9. Restore the engine to operational status (reconnect the fuel solenoid). Select **"MANUAL"** and then press **"START"**. This time the engine will start and the starter motor will disengage automatically. If not then check the engine is fully operational (fuel available, etc.) and the fuel solenoid is operating. The engine will now run up to operating speed. If not, and an alarm is present, check the alarm condition for validity, and check input wiring. The engine will continue to run for an indefinite period. At this time to view the engine and alternator parameters - refer to the 'Description of Controls' section of this manual.

10.10. Fully commission the engine/alternator and any other parts in the system as detailed in the respective manufacturer documentation. This includes load bank testing, load acceptance, breaker control and more.

10.11. When building a synchronising system, follow the DSE "4 Steps To Synchronising" as detailed elsewhere in this document before attempting to parallel the set with another supply.

10.12. Set the modules internal clock/calendar to ensure correct operation of the scheduler and event logging functions. For details of this procedure see section entitled *Front Panel Configuration – Editing the date and time.*

10.13. If despite repeated checking of the connections between the **DSE87xx** series controller and the customer's system, satisfactory operation cannot be achieved, then the customer is requested to contact the factory for further advice on:-

<div align="center">

INTERNATIONAL TEL: +44 (0) 1723 890099
INTERNATIONAL FAX: +44 (0) 1723 893303
E-mail: Support@Deepseaplc.com
Website : www.deepseaplc.com

</div>

11 FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative Read/Write configuration does not operate	Check the battery and wiring to the unit. Check the DC supply. Check the DC fuse.
Unit shuts down	Check DC supply voltage is not above 35 Volts or below 9 Volts Check the operating temperature is not above 70℃. Check the DC fuse.
Unit locks out on Emergency Stop	If no Emergency Stop Switch is fitted, ensure that a DC positive signal is connected to the Emergency Stop input. Check emergency stop switch is functioning correctly. Check Wiring is not open circuit.
Intermittent Magnetic Pick-up sensor fault	Ensure that Magnetic pick-up screen only connects to earth at one end, if connected at both ends, this enables the screen to act as an aerial and will pick up random voltages. Check pickup is correct distance from the flywheel teeth.
Low oil Pressure fault operates after engine has fired	Check engine oil pressure. Check oil pressure switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the 73x0 Module and is correctly configured.
High engine temperature fault operates after engine has fired.	Check engine temperature. Check switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the DSE87xx series module.
Shutdown fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Warning fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Fail to Start is activated after pre-set number of attempts to start	Check wiring of fuel solenoid. Check fuel. Check battery supply. Check battery supply is present on the Fuel output of the module. Check the speed-sensing signal is present on the DSE87xx series module's inputs. Refer to engine manual.
Continuous starting of generator when in **AUTO**	Check that there is no signal present on the "Remote Start" input. Check configured polarity is correct.
Generator fails to start on receipt of Remote Start signal.	Check Start Delay timer has timed out. Check signal is on "Remote Start" input. Confirm correct configuration of input Check that the oil pressure switch or sensor is indicating low oil pressure to the controller. Depending upon configuration, then set will not start if oil pressure is not low.
Pre-heat inoperative	Check wiring to engine heater plugs. Check battery supply. Check battery supply is present on the Pre-heat output of module. Check pre-heat configuration is correct.
Starter motor inoperative	Check wiring to starter solenoid. Check battery supply. Check battery supply is present on the Starter output of module. Ensure that the Emergency Stop input is at Positive. Ensure oil pressure switch or sensor is indicating the "low oil pressure" state to the 8710 series controller.
Engine runs but generator will not take load	Check Warm up timer has timed out. Ensure generator load inhibit signal is not present on the module inputs. Check connections to the switching device. Note that the set will not take load in manual mode unless there is an active remote start on load signal.
Synchronising or load sharing is not operating satisfactorily	Follow the DSE "4 Steps To Synchronising" as detailed in the following section.

SYMPTOM	POSSIBLE REMEDY
Incorrect reading on Engine gauges Fail to stop alarm when engine is at rest	Check engine is operating correctly. Check sensor and wiring paying particular attention to the wiring to terminal 47 (refer to appendix). Check that sensor is compatible with the DSE87xx series module and that the module configuration is suited to the sensor.
Module appears to 'revert' to an earlier configuration	When editing a configuration using the PC software it is vital that the configuration is first 'read' from the controller before editing it. This edited configuration must then be "written" back to the controller for the changes to take effect. When editing a configuration using the fascia editor, be sure to press the Accept ✓ button to save the change before moving to another item or exiting the fascia editor
Set will not take load	Ensure the generator available LED is lit Check that the output configuration is correct to drive the load switch device and that all connections are correct. Remember that the set will not take load in manual mode unless a remote start on load input is present or the close generator button is pressed.
Inaccurate generator measurements on controller display	Check that the CT primary, CT secondary and VT ratio settings are correct for the application. Check that the CTs are wired correctly with regards to the direction of current flow (p1,p2 and s1,s2) and additionally ensure that CTs are connected to the correct phase (errors will occur if CT1 is connected to phase 2). Remember to consider the power factor. Ie (kW = kVA x power factor) The DSE87xx series controller is true RMS measuring so gives more accurate display when compared with an 'averaging' meter such as an analogue panel meter or some lower specified digital multimeters. Accuracy of the controller is better than 1% of full scale. I.e. Gen volts full scale is 333V ph-n so accuracy is ±3.33V (1% of 333V).

⚠**NOTE:- The above fault finding is provided as a guide check-list only. As the module is configurable for a range of different features, always refer to the source of your module configuration if in doubt.**

12 DSE 4 STEPS TO SUCCESSFUL SYNCHRONISING

Synchronising and load sharing is often considered to be a complex subject. In fact, it is very simple when broken down into smaller steps.

After following the *Commissioning* section of this manual, the *4 Steps* **must** be followed before any parallel operation is attempted.

The following information is a *short form* guide only, intended as a memory jogger once the steps are fully understood.
The full video presentation of the *4 Steps* is available on the DSE website. www.deepseaplc.com. Registration on the website is required. This is free of charge, along with all other downloads.

This page is also available as a training document (handout style) from DSE. Part Number 056-001 Four Steps to Synchronising – included on the DSE website.

12.1 CONTROL

Check the control of the engine is working:

- Control of AVR
- Control of Governor
- Direction of Control

Failure of the above steps will result in poor control of the governor/AVR leading to problems during synchronising and/or load sharing if not corrected.

12.2 METERING

- CTs on the Right Phase
- CTs in the Right Direction

Failure of the above steps will result in incorrect power factor and kW calculations leading to problems load sharing if not corrected.

12.3 COMMUNICATIONS

- All Modules Connected on the MSC Link
- Re-Calibrate, Sync + Load Control, Multi-Set
- Remove One MSC Plug

Failure of the above steps will result in the controllers being unable to communicate leading to problems during synchronising and/or load sharing if not corrected.

12.4 SYNC CHECKS

- Use the Built in Sync Scope to Determine Correct Phase Wiring
- Phase Checks across the Breaker.

Failure of the above steps will result in serious damage to the system (breakers, bus bars, alternators, engines etc)
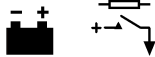
13 MAINTENANCE, SPARES, REPAIR AND SERVICING

The DSE87xx Series controller is *Fit and Forget*. As such, there are no user serviceable parts within the controller. In the case of malfunction, you should contact your original equipment manufacturer (OEM).

13.1 PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE

If you require additional plugs from DSE, please contact our Sales department using the part numbers below.

13.1.1.1 INDIVIDUAL PLUGS

DSE87xx series terminal designation	Plug description	Part No.
1-4	4 way 5.08mm	007-444

13.2 PURCHASING ADDITIONAL FIXING CLIPS FROM DSE

Item	Description	Part No.
	DSE87xx series fixing clips (packet of 4)	020-294

13.3 PURCHASING ADDITIONAL SEALING GASKET FROM DSE

Item	Description	Part No.
	DSE87xx series silicon sealing gasket	020-507

14 WARRANTY

DSE provides limited warranty to the equipment purchaser at the point of sale. For full details of any applicable warranty, you are referred to your original equipment supplier (OEM).

15 DISPOSAL

15.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

Directive 2002/96/EC
If you use electrical and electronic equipment you must store, collect, treat, recycle and dispose of WEEE separately from your other waste.

15.2 ROHS (RESTRICTION OF HAZARDOUS SUBSTANCES)

Directive 2002/95/EC: 2006
To remove specified hazardous substances (Lead, Mercury, Hexavalent Chromium, Cadmium, PBB & PBDE´s)

Exemption Note: Category 9. (Monitoring & Control Instruments) as defined in Annex 1B of the WEEE directive will be exempt from the RoHS legislation. This was confirmed in the August 2005 UK´s Department of Trade and Industry RoHS REGULATIONS Guide (Para 11).

Despite this exemption, DSE has been carefully removing all non RoHS compliant components from our supply chain and products.
When this is completed, a Lead Free & RoHS compatible manufacturing process will be phased into DSE production.

This process is almost complete and is being phased through different product groups.

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