DEEP SEA ELECTRONICS PLC

DSE8810 Colour Autostart Load Share Controller Operator Manual

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Amendments List

Issue	Comments	Minimum Module version required	Minimum Configuration Suite Version required
1	Initial release		

Typeface: The typeface used in this document is *Arial*. Care should be taken not to mistake the upper case letter I with the numeral 1. The numeral 1 has a top serif to avoid this confusion.

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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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
053-137	DSE8810 Installation Instructions
053-138	DSE8820 Installation Instructions
053-139	DSE8860 Installation Instructions
053-032	DSE2548 LED Expansion Annunciator Installation Instructions
053-033	DSE2130 Input Expansion Installation Instructions
053-034	DSE2157 Output Expansion Installation Instructions
053-125	DSE2131 Ratio-metric Input Expansion Installation Instructions
053-126	DSE2133 RTD/Thermocouple Input Expansion Installation Instructions
053-134	DSE2152 Ratio-metric 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
056-005	Using CTs With DSE Products
056-006	Introduction to Comms
056-010	Overcurrent Protection
056-013	Load Demand Scheme
056-018	Negative Phase Sequence
056-019	Earth Fault Protection
056-020	Loss of Excitation
056-021	Mains Decoupling
056-022	Breaker Control
056-023	Adding New CAN Files
056-024	GSM Modem
056-026	kW & kVAr
056-029	Smoke Limiting
056-030	Module PIN Codes
056-032	xx60 With No Bus Breaker
056-042	Bus or Mains Mode
056-057	SW1 and SW2
056-059	xx10 in Fixed Export

1.3 MANUALS

Product manuals are can be downloaded from the DSE website: www.deepseaplc.com

DSE PART	DESCRIPTION
057-004	Electronic Engines and DSE Wiring
057-045	Guide to Synchronising and Load Sharing Part 1
057-046	Guide to Synchronising and Load Sharing Part 2
057-047	Load Share Design and Commissioning
057-164	DSE8800 Series Configuration Software Manual
057-082	DSE2130 Input Expansion Manual
057-083	DSE2157 Output Expansion Manual
057-084	DSE2548 Annunciator Expansion Manual
057-139	DSE2131 Ratio-metric Input Expansion Manual
057-140	DSE2133 RTD/Thermocouple Expansion Manual
057-141	DSE2152 Ratio-metric Output Expansion Manual

1.4 THIRD PARTY DOCUMENTS

The following third party documents are also referred to:

REFERENCE	DESCRIPTION
ISBN 1-55937-879-4	IEEE Std C37.2-1996 IEEE Standard Electrical Power System Device Function Numbers and Contact Designations. Institute of Electrical and Electronics Engineers Inc
ISBN 0-7506-1147-2	Diesel generator handbook. L.L.J.Mahon
ISBN 0-9625949-3-8	On-Site Power Generation. EGSA Education Committee.

2 INTRODUCTION

This document details the installation and operation requirements of the DSE8800 Series modules, part of the **DSEGenset**® 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

The DSE8800 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 DSE8810 controller 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. Additionally, the DSE8860 automatically starts and stops the generator set depending upon the status of the mains (utility) supply.
The user also has the facility to view the system operating parameters via the LCD display.

The DSE8800 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 ARM microprocessor contained within the module allows for incorporation of a range of complex features:

- ***Text and graphical colour LCD display*** *(supporting multiple languages).*
- ***True RMS*** *Voltage, Current and Power monitoring with minimum and maximum holt*
- ***Harmonic Display***
- *Communications capability (RS485, RS232 and Ethernet)*
- *Engine parameter monitoring.*
- ***Event log*** *and instrumentation* ***data log***
- *Fully configurable inputs for use as alarms or a range of different functions.*
- ***Synchronising*** *and* ***load sharing*** *with load demand start/stop*
- ***Integral PLC*** *to help provide customisation where required*
- ***Fuel tank level*** *monitoring to track fuel filling operations and detect fuel leak/theft*
- *Engine ECU interface to* ***electronic engines****.*

Using a PC and the DSE Configuration Suite software allows alteration of selected operational sequences, timers, alarms and operational sequences. Additionally, the module's integral fascia configuration editor allows adjustment of a subset of this information.

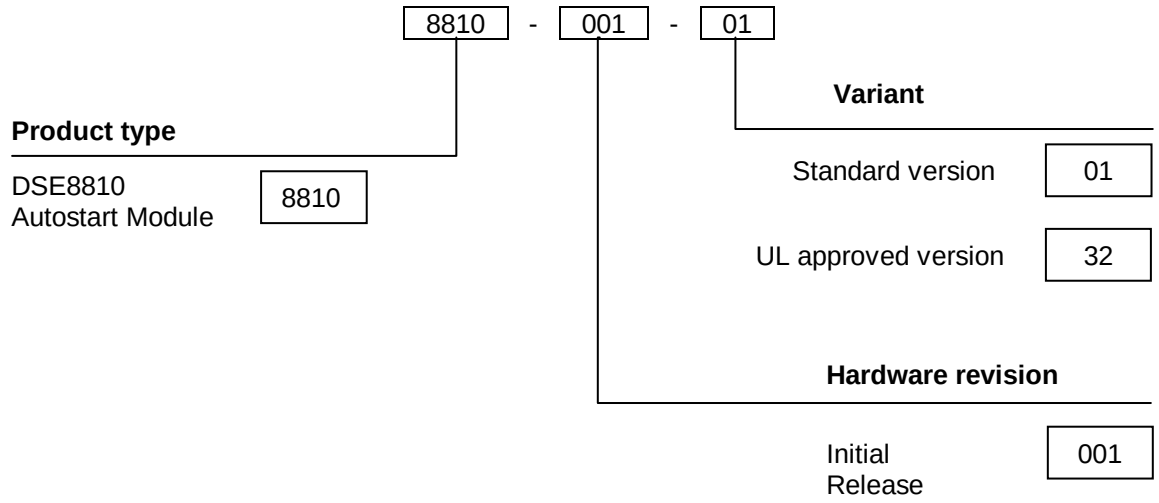
A robust plastic case designed for front panel mounting houses the module. Connections are via locking plug and sockets..

Access to critical operational sequences and timers for use by qualified engineers, can be protected by a security code. Module access can also be protected by PIN code. Selected parameters can be changed from the module's front panel.

The module is housed in a robust plastic case suitable for panel mounting. Connections to the module are via locking plug and sockets.

3 SPECIFICATIONS

3.1 PART NUMBERING



At the time of this document production, there have been no revisions to the module hardware.

3.1.1 SHORT NAMES

Short name	Description
DSE8000,DSE8xxx	All modules in the DSE8000 range.
DSE8800,DSE88xx	All modules in the DSE8800 range.

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	0.5 mm² (AWG 24)	
Maximum cable size	2.5 mm² (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	8 V continuous
Cranking dropouts	Able to survive 0 V for 50 mS providing the supply was at least 10 V before the dropout and recovers to 5 V afterwards.
Maximum supply voltage	35 V continuous (60 V protection)
Reverse polarity protection	-35 V continuous
Maximum operating current	300 mA at 24 V 600 mA at 12 V
Maximum standby current	160 mA at 24 V 330 mA at 12 V

3.3.1 PLANT SUPPLY INSTRUMENTATION DISPLAY

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

3.4 GENERATOR VOLTAGE / FREQUENCY SENSING

Measurement type	True RMS conversion
Sample Rate	5 KHz or better
Harmonics	Up to 10th or better
Input Impedance	300 K Ω ph-N
Phase to Neutral	15 V (minimum required for sensing frequency) to 333 V AC (absolute maximum) Suitable for 110 V to 277 V nominal (±20 % for under/overvoltage detection)
Phase to Phase	26 V (minimum required for sensing frequency) to 576 V AC (absolute maximum) Suitable for 19 0 V ph-ph to 479 V ph-ph nominal (±20 % for under/overvoltage detection)
Common mode offset from Earth	100 V AC (max)
Resolution	1V AC phase to neutral 2V AC phase to phase
Accuracy	±1 % of full scale phase to neutral ±2 % of full scale phase to phase
Minimum frequency	3.5 Hz
Maximum frequency	75.0 Hz
Frequency resolution	0.1 Hz
Frequency accuracy	±0.2 Hz

3.5 GENERATOR CURRENT SENSING

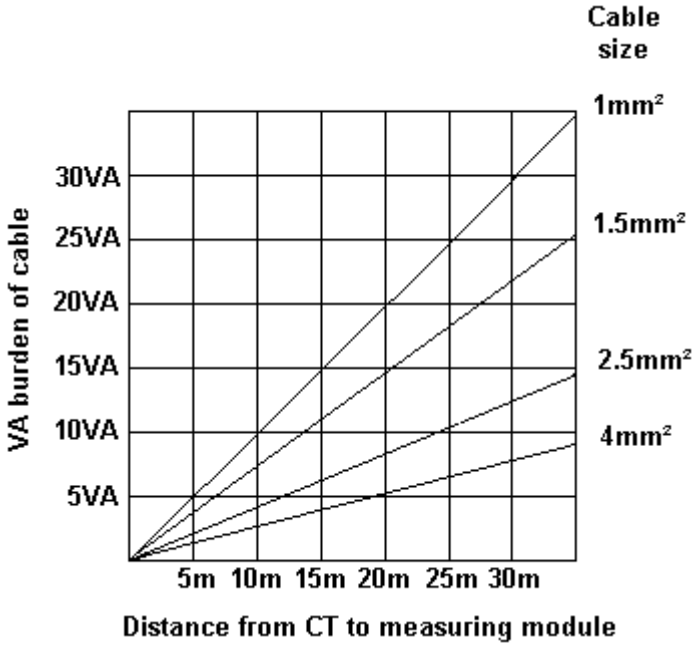
Measurement type	True RMS conversion
Sample Rate	5 kHz or better
Harmonics	Up to 10th or better
Nominal CT secondary rating	1 A or 5 A (5 A recommended)
Maximum continuous current	5 A
Overload Measurement	3 x Nominal Range setting
Absolute maximum overload	50 A for 1 second
Burden	0.5 VA (0.02 Ω current shunts)
common mode offset	±2 V peak plant ground to CT common terminal
Resolution	0.5 % of 5 A
Accuracy	±1 % of Nominal (1 A or 5 A) (excluding CT error)

3.5.1 VA RATING OF THE CTS

The VA burden of the module on the CTs is 0.5 VA. However depending upon the type and length of cabling between the CTs and the module, CTs with a greater VA rating than the module are required.
The distance between the CTs and the measuring module should be estimated and cross-referenced against the chart opposite to find the VA burden of the cable itself.

If the CTs are fitted within the alternator top box, the star point (common) of the CTs should be connected to system ground (earth) as close as possible to the CTs. This minimises the length of cable used to connect the CTs to the DSE module.

Example.
If 1.5 mm² cable is used and the distance from the CT to the measuring module is 20 m, then the burden of the cable alone is approximately 15 VA. As the burden of the DSE controller is 0.5 VA, then a CT with a rating of at least 15+0.5 V = 15.5 VA must be used.
If 2.5 mm² cables are used over the same distance of 20 m, then the burden of the cable on the CT is approximately 7 VA. CT's required in this instance is at least 7.5 VA (7+0.5).

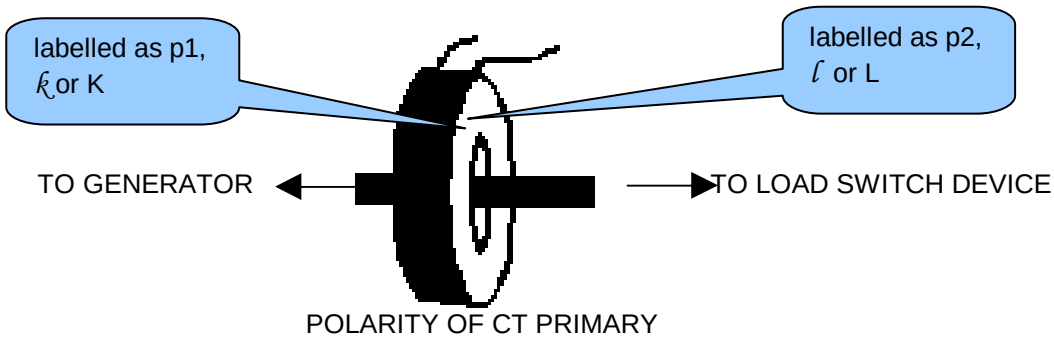


NOTE: - Details for 4 mm² cables are shown for reference only. The connectors on the DSE modules are only suitable for cables up to 2.5 mm².

NOTE: - CTs with 5 A secondary windings are recommended with DSE modules. 1 A CTs can be used if necessary however, the resolution of the readings is 5 times better when using 5 A CTs.

3.5.2 CT POLARITY

Take care to ensure the correct polarity of the CTs. Incorrect CT orientation will lead to negative kW readings when the set is supplying power. Take note that paper stick-on labels on CTs that show the orientation are often incorrectly placed on the CT (!). It is more reliable to use the labelling in the case moulding as an indicator to orientation (if available).
To test orientation, run the generator in island mode (not in parallel with any other supply) and load the generator to around 10 % of the set rating. Ensure the DSE module shows positive kW for all three individual phase readings.



POLARITY OF CT PRIMARY

NOTE:- Take care to ensure correct polarity of the CT primary as shown above. If in doubt, check with the CT supplier.

3.5.3 CT PHASING

Take particular care that the CTs are connected to the correct phases. For instance, ensure that the CT on phase 1 is connected to the terminal on the DSE module intended for connection to the CT for phase 1.
Additionally ensure that the voltage sensing for phase 1 is actually connected to generator phase 1. Incorrect connection of the phases as described above will result in incorrect power factor (pf) measurements, which in turn results in incorrect kW measurements.
One way to check for this is to make use of a single-phase load. Place the load on each phase in turn, run the generator and ensure the kW value appears in the correct phase. For instance if the load is connected to phase 3, ensure the kW figure appears in phase 3 display and not in the display for phase 1 or 2.

3.5.4 CT CLASS

Ensure the correct CT type is chosen. For instance if the DSE module is providing overcurrent protection, ensure the CT is capable of measuring the overload level you wish to protect against, and at the accuracy level you require.
For instance, this may mean fitting a protection class CT (P10 type) to maintain high accuracy while the CT is measuring overload currents.
Conversely, if the DSE module is using the CT for instrumentation only (current protection is disabled or not fitted to the controller), then measurement class CTs can be used. Again, bear in mind the accuracy you require. The DSE module is accurate to better than 1% of the full-scale current reading. To maintain this accuracy you should fit Class 0.5 or Class 1 CTs.

You should check with your CT manufacturer for further advice on selecting your CTs

3.6 INPUTS

3.6.1 DIGITAL INPUTS

Number	11 configurable inputs. A future firmware update to the controller will enable an additional input. Check with DSE Technical Support for further details.
Arrangement	Contact between terminal and ground
Low level threshold	2.1 V minimum
High level threshold	6.6 V maximum
Maximum input voltage	+50 V DC with respect to plant supply negative
Minimum input voltage	-24 V DC with respect to plant supply negative
Contact wetting current	7 mA typical
Open circuit voltage	12 V typical

3.6.2 ANALOGUE RESISTIVE INPUTS

3.6.2.1 OIL PRESSURE

Configurable if engine ECU link provides oil pressure measurement

Measurement type	Resistance measurement by measuring voltage across sensor with a fixed current applied
Arrangement	Differential resistance measurement input
Measurement current	15 mA
Full scale	240 Ω
Over range / fail	270 Ω
Resolution	0.1 Bar (1 PSI -2 PSI)
Accuracy	±2 % of full scale resistance (±4.8 Ω) excluding transducer error
Max common mode voltage	±2 V
Display range	13.7 bar (0 PSI - 200 PSI) subject to limits of the sensor

3.6.2.2 COOLANT TEMPERATURE

Configurable if engine ECU link provides coolant temp measurement

Measurement type	Resistance measurement by measuring voltage across sensor with a fixed current applied
Arrangement	Differential resistance measurement input
Measurement current	10 mA
Full scale	480 Ω
Over range / fail	540 Ω
Resolution	1 °C (2 ℉)
Accuracy	+/-2 % of full scale resistance (±9.6 Ω) excluding transducer error
Max common mode voltage	±2 V
Display range	0 °C -140 °C (32 ℉ - 284 ℉) subject to limits of the sensor

3.6.3 FUEL LEVEL (FLEXIBLE) INPUTS

The Fuel level input is also configurable as a ‘Ratiometric’ analogue inputs are provided. This is able to be configured as Digital, Resistive, 0-10 V or 4-20 mA.

3.6.3.1 FUEL LEVEL INPUT AS DIGITAL

Arrangement	Contact between input terminal and battery negative
Low level threshold	2.1 V minimum
High level threshold	6.6 V maximum
Max input voltage	+60 V DC with respect to battery negative
Min input voltage	-24 V DC with respect to battery negative
Contact wetting current	7 mA typical
Open circuit voltage	12 V typical

3.6.3.2 FUEL LEVEL INPUT AS RESISTIVE

Arrangement	Differential resistance measurement input with individual common terminals for each sensor input
Measurement current	9.3 mA typical
Full scale	480 Ω
Sensor fail	Values greater than full scale return an over range sentinel that may be interpreted as sensor fail if appropriate (host controller dependant)
Resolution	1% of full scale
Accuracy	±-2 % of full scale resistance, excluding transducer (sensor) error
Maximum common mode voltage	3 V
Transducer (sensor type)	Configurable in host controller
Use with contacts	Inputs may be used with a contact to ground providing the corresponding common terminal is grounded. (ie can be used as digital inputs if correctly configured in the host controller)

3.6.3.3 FUEL LEVEL INPUT AS 0-10V

A future firmware update to the controller will enable this feature. Check with DSE Technical Support for further details.

3.6.3.4 FUEL LEVEL INPUT AS 4-20MA

A future firmware update to the controller will enable this feature. Check with DSE Technical Support for further details.

3.6.4 ANALOGUE FLEXIBLE INPUT

An additional flexible analogue input is provided and can be configured as Digital or Resistive.

3.6.4.1 FLEXIBLE SENSOR AS DIGITAL

Arrangement	Contact between input terminal and battery negative
Low level threshold	2.1 V minimum
High level threshold	6.6 V maximum
Max input voltage	+60 V DC with respect to battery negative
Min input voltage	-24 V DC with respect to battery negative
Contact wetting current	7 mA typical
Open circuit voltage	12 V typical

3.6.4.2 FLEXIBLE SENSOR AS RESISTIVE

Arrangement	Differential resistance measurement input with individual common terminals for each sensor input
Measurement current	9.3 mA typical
Full scale	480 Ω
Sensor fail	Values greater than full scale return an over range sentinel that may be interpreted as sensor fail if appropriate (host controller dependant)
Resolution	1% of full scale
Accuracy	±-2 % of full scale resistance, excluding transducer (sensor) error
Maximum common mode voltage	3 V
Transducer (sensor type)	Configurable in host controller
Use with contacts	Inputs may be used with a contact to ground providing the corresponding common terminal is grounded. (ie can be used as digital inputs if correctly configured in the host controller)

3.6.4.3 FLEXIBLE SENSOR AS 0-10V

A future firmware update to the controller will enable this feature. Check with DSE Technical Support for further details.

3.6.4.4 FLEXIBLE SENSOR AS 4-20MA

A future firmware update to the controller will enable this feature. Check with DSE Technical Support for further details.

3.6.5 CHARGE FAIL INPUT

Minimum voltage	0V
Maximum voltage	35V (plant supply)
Resolution	0.2V
Accuracy	± 1% of max measured voltage
Excitation	Active circuit constant power output
Output Power	2.5W Nominal @12V and 24V
Current at 12V	210mA
Current at 24V	105mA

The charge fail input is actually a combined input and output. Whenever the generator is required to run, the terminal provides excitation current to the charge alternator field winding.
When the charge alternator is correctly charging the battery, the voltage of the terminal is close to the plant battery supply voltage. In a failed charge situation, the voltage of this terminal is pulled down to a low voltage. It is this drop in voltage that triggers the *charge failure* alarm. The level at which this operates and whether this triggers a warning or shutdown alarm is configurable using the DSE Config Suite Software.

3.6.6 MAGNETIC PICKUP

Type	Single ended input, capacitive coupled
Minimum voltage	0.5V RMS
Max common mode voltage	±2V
Maximum voltage	Clamped to ±70V by transient suppressers, dissipation not to exceed 1W.
Maximum frequency	10,000Hz
Resolution	6.25 RPM
Accuracy	±25 RPM
Flywheel teeth	10 to 500

NOTE : DSE can supply a suitable magnetic pickup device, available in two body thread lengths :
DSE Part number 020-012 - Magnetic Pickup probe 5/8 UNF 2½" thread length
DSE Part number 020-013 - Magnetic Pickup probe 5/8 UNF 4" thread length

Magnetic Pickup devices can often be 'shared' between two or more devices. For example, one device can often supply the signal to both the module and the engine governor. The possibility of this depends upon the amount of current that the magnetic pickup can supply.

3.7 OUTPUTS

Ten (10) outputs are fitted to the controller.

3.7.1 OUTPUTS A & B

Type	Normally used for Fuel / Start outputs. Fully configurable for other purposes if the module is configured to control an electronic engine. Supplied from Emergency Stop terminal 3.
Rating	15A resistive @ 35V

3.7.2 CONFIGURABLE OUTPUTS C & D (LOAD SWITCHING)

Type	Fully configurable volts free relays. Output C – Normally Closed, Output D – Normally Open
Rating	8A resistive@ 250V AC
Protection	Protected against over current & over temperature. Built in load dump feature.

3.7.3 OUTPUTS E,F,G,H, I, J

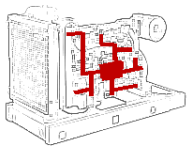
Number	6. A future firmware update to the controller will enable an additional two outputst. Check with DSE Technical Support for further details.
Type	Fully configurable, supplied from DC supply terminal 2.
Rating	2A resistive @ 35V

3.8 COMMUNICATION PORTS

USB Port	USB2.0 Device for connection to PC running DSE configuration suite only Max distance 6m (yards)
Serial Communication	A single RS232 and two RS485 ports are both fitted and provide independent operation
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)
2 x RS485 Serial ports	Isolated Data connection 2 wire + common Half Duplex Data direction control for Transmit (by s/w protocol) Max Baud Rate 19200 External termination required (120Ω) Max common mode offset 70V (on board protection transorb) Max distance 1.2km (¾ mile)
CAN Port	Engine CAN Port Standard implementation of 'Slow mode', up to 250K bits/s Non-Isolated. Internal Termination provided (120Ω) Max distance 40m (133 feet) **NOTE:- For additional length, the DSE124 CAN Extender is available. Please refer to DSE Publication: 057-116 DSE124 Operator Manual for more information.**
Ethernet	Auto detecting 10/100 Ethernet port.

3.9 COMMUNICATION PORT USAGE

3.9.1 CAN INTERFACE



Modules are fitted with the CAN interface as standard and are capable of receiving engine data from engine CAN controllers compliant with the CAN standard.

CAN enabled engine controllers monitor the engine's operating parameters such as engine speed, oil pressure, engine temperature (among others) in order to closely monitor and control the engine. The industry standard communications interface (CAN) transports data gathered by the engine controller interface. This allows generator controllers to access these engine parameters with no physical connection to the sensor device.

NOTE:- For further details for connections to CAN enabled engines and the functions available with each engine type, refer to the manual *Electronic Engines and DSE Wiring.* Part No. 057-004

3.9.2 USB CONNECTION

The USB port is provided to give a simple means of connection between a PC and the controller. Using the DSE Configuration Suite Software, the operator is then able to control the module, starting or stopping the generator, selecting operating modes, etc.
Additionally, the various operating parameters (such as output volts, oil pressure, etc.) of the remote generator are available to be viewed or changed.

To connect a module to a PC by USB, the following items are required:

- DSE8800 series module



- DSE Configuration Suite PC Software
  (Supplied on configuration suite software CD or available from www.deepseaplc.com).



- USB cable Type A to Type B.
  (This is the same cable as often used between a PC and a USB printer)

  DSE can supply this cable if required :
  PC Configuration interface lead (USB type A – type B) DSE Part No 016-125



NOTE:- The DC supply must be connected to the module for configuration by PC.

NOTE:- Refer to DSE8800 Series Configuration Suite Manual (DSE part 057-164) for further details on configuring, monitoring and control.

3.9.3 USB HOST-MASTER (USB DRIVE CONNECTION)

USB Type A connection for USB Host facility for USB storage device for data recording.
Maximum size of externally storage device is 16Gb.(see viewing the instrument pages)

NOTE:- Refer to DSE8800 Series Configuration Suite Manual (DSE part 057-164) for further details on configuring, monitoring and control.

3.9.4 RS232

The RS232 port on the controller supports the Modbus RTU protocol.
The Gencomm register table for the controller is available upon request from the DSE Technical Support Department.

RS232 is for short distance communication (max 15m) and is typically used to connect the controller to a telephone or GSM modem for more remote communications.

Many PCs are not fitted with an internal RS232 serial port. DSE DO NOT recommend the use of USB to RS232 convertors but can recommend PC add-ons to provide the computer with an RS232 port.

3.9.4.1 RECOMMENDED PC RS232 SERIAL PORT ADD-ONS

Remember to check these parts are suitable for your PC. Consult your PC supplier for further advice.

- Brainboxes PM143 PCMCIA RS232 card (for laptop PCs)



- Brainboxes VX-001 Express Card RS232 (for laptops and nettops PCs)



- Brainboxes UC246 PCI RS232 card (for desktop PCs)



- Brainboxes PX-246 PCI Express 1 Port RS232 1 x 9 Pin (for desktop PCs)



Supplier:
Brainboxes
Tel: +44 (0)151 220 2500
Web: http://www.brainboxes.com
Email: Sales: sales@brainboxes.com

NB DSE Have no business tie to Brainboxes. Over many years, our own engineers have used these products and are happy to recommend them.

3.9.4.2 RECOMMENDED EXTERNAL MODEMS:

- Multitech Global Modem – MultiModem ZBA (PSTN)
  DSE Part Number 020-252
  (Contact DSE Sales for details of localisation kits for these modems)



- Sierra Fastrak Xtend GSM modem kit (PSU, Antenna and modem)*
  DSE Part number 0830-001-01



NOTE: *For GSM modems a SIM card is required, supplied by your GSM network provider:

- For SMS only, a ‘normal’ voice SIM card is required. This enables the controller to send SMS messages to designated mobile phones upon status and alarm conditions.
- For a data connection to a PC running DSE Configuration Suite Software, a ‘special’ CSD (Circuit Switched Data) SIM card is required that will enable the modem to answer an incoming data call. Many ‘pay as you go’ services will not provide a CSD (Circuit Switched Data) SIM card.

3.9.5 RS485

The RS485 ports on the controller support the Modbus RTU protocol.
The DSE Gencomm register table for the controller is available upon request from the DSE Technical Support Department.

RS485 is used for point-to-point cable connection of more than one device (maximum 32 devices) and allows for connection to PCs, PLCs and Building Management Systems (to name just a few devices).

One advantage of the RS485 interface is the large distance specification (1.2km when using Belden 9841 (or equivalent) cable. This allows for a large distance between the module and a PC running the DSE Configuration Suite software. The operator is then able to control the module, starting or stopping the generator, selecting operating modes, etc.
The various operating parameters (such as output volts, oil pressure, etc.) of the remote generator can be viewed or changed.

NOTE:- For a single module to PC connection and distances up to 6m (8yds) the USB connection method is more suitable and provides for a lower cost alternative to RS485 (which is more suited to longer distance connections).

3.9.5.1 RECOMMENDED PC RS485 SERIAL PORT ADD-ONS

Remember to check these parts are suitable for your PC. Consult your PC supplier for further advice.

- Brainboxes PM154 PCMCIA RS485 card (for laptops PCs)
  Set to ‘Half Duplex, Autogating” with ‘CTS True’ set to ‘enabled’



- Brainboxes VX-023 ExpressCard 1 Port RS422/485 (for laptops and nettop PCs)



- Brainboxes UC320 PCI Velocity RS485 card (for desktop PCs)
  Set to ‘Half Duplex, Autogating” with ‘CTS True’ set to ‘enabled’



- Brainboxes PX-324 PCI Express 1 Port RS422/485 (for desktop PCs)



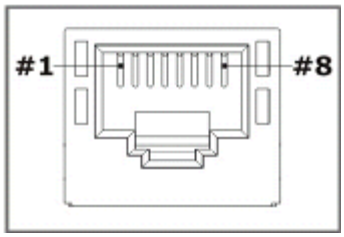
Supplier:
Brainboxes
Tel: +44 (0)151 220 2500
Web: http://www.brainboxes.com
Email: Sales: sales@brainboxes.com

NB DSE have no business tie to Brainboxes. Over many years,our own engineers have used these products and are happy to recommend them.

3.9.6 ETHERNET

The module is fitted with ETHERNET socket for connection to LAN (local area networks)

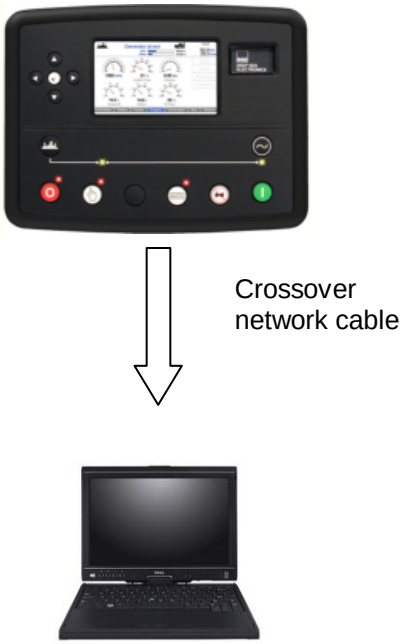
	Description
1	TX+
2	TX-
3	RX+
4	Do not connect
5	Do not connect
6	RX-
7	Do not connect
8	Do not connect



3.9.6.1 DIRECT PC CONNECTION

Requirements

- DSE8800 series module
- Crossover Ethernet cable (see Below)
- PC with Ethernet port



Crossover cable wiring detail

Two pairs crossed, two pairs uncrossed
10baseT/100baseTX crossover

Pin	Connection 1 (T568A)	Connection 2 (T568B)
1	white/green stripe	white/orange stripe
2	green solid	orange solid
3	white/orange stripe	white/green stripe
4	blue solid	blue solid
5	white/blue stripe	white/blue stripe
6	orange solid	green solid
7	white/brown stripe	white/brown stripe
8	brown solid	brown solid

For the advanced Engineer, a crossover cable is a CAT5 cable with one end terminated as T568A and the other end terminated as T568B.

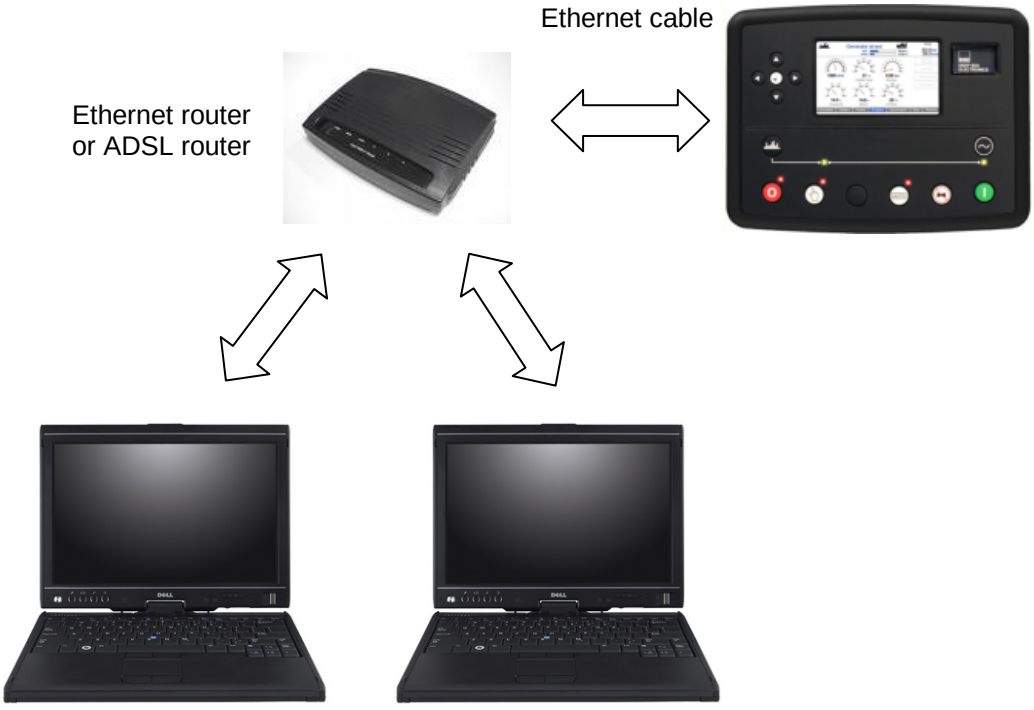


NOTE:- This cable can be purchased from any good PC or IT store.

3.9.6.2 CONNECTION TO BASIC ETHERNET

Requirements

- DSE8800 series module
- Ethernet cable (see below)
- Working Ethernet (company or home network)
- PC with Ethernet port

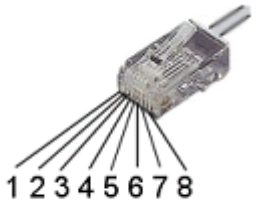


Ethernet cable wiring detail

10baseT/100baseT

Pin	Connection 1 (T568A)	Connection 2 (T568A)
1	white/green stripe	white/green stripe
2	green solid	green solid
3	white/orange stripe	white/orange stripe
4	blue solid	blue solid
5	white/blue stripe	white/blue stripe
6	orange solid	orange solid
7	white/brown stripe	white/brown stripe
8	brown solid	brown solid

For the advanced Engineer, this cable has both ends terminated as T568A (as shown below) or T568B.

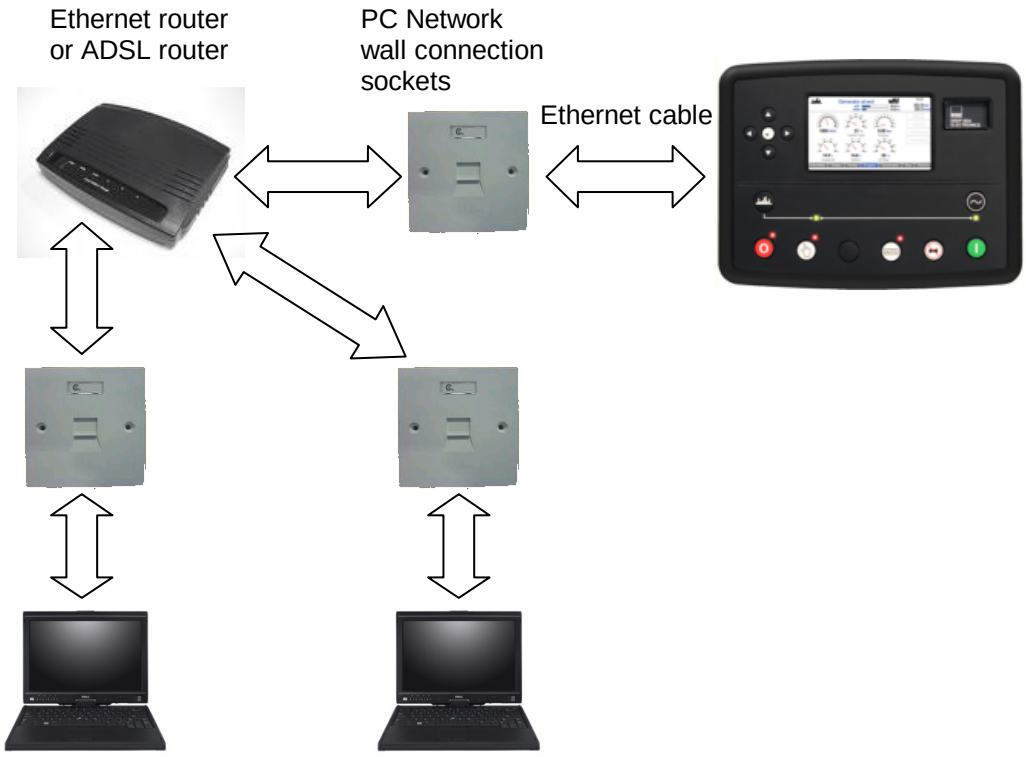


NOTE:- DSE Stock a 2m (2yds) Ethernet Cable – Part number 016-137. Alternatively they can be purchased from any good PC or IT store.

3.9.6.3 CONNECTION TO COMPANY INFRASTRUCTURE ETHERNET

Requirements

- DSE8800 series module
- Ethernet cable (see below)
- Working Ethernet (company or home network)
- PC with Ethernet port

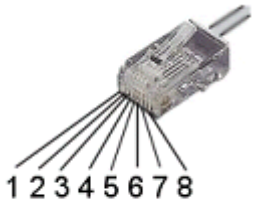


Ethernet cable wiring detail

10baseT/100baseT

Pin	Connection 1 (T568A)	Connection 2 (T568A)
1	white/green stripe	white/green stripe
2	green solid	green solid
3	white/orange stripe	white/orange stripe
4	blue solid	blue solid
5	white/blue stripe	white/blue stripe
6	orange solid	orange solid
7	white/brown stripe	white/brown stripe
8	brown solid	brown solid

For the advanced Engineer, this cable has both ends terminated as T568A (as shown below) or T568B.

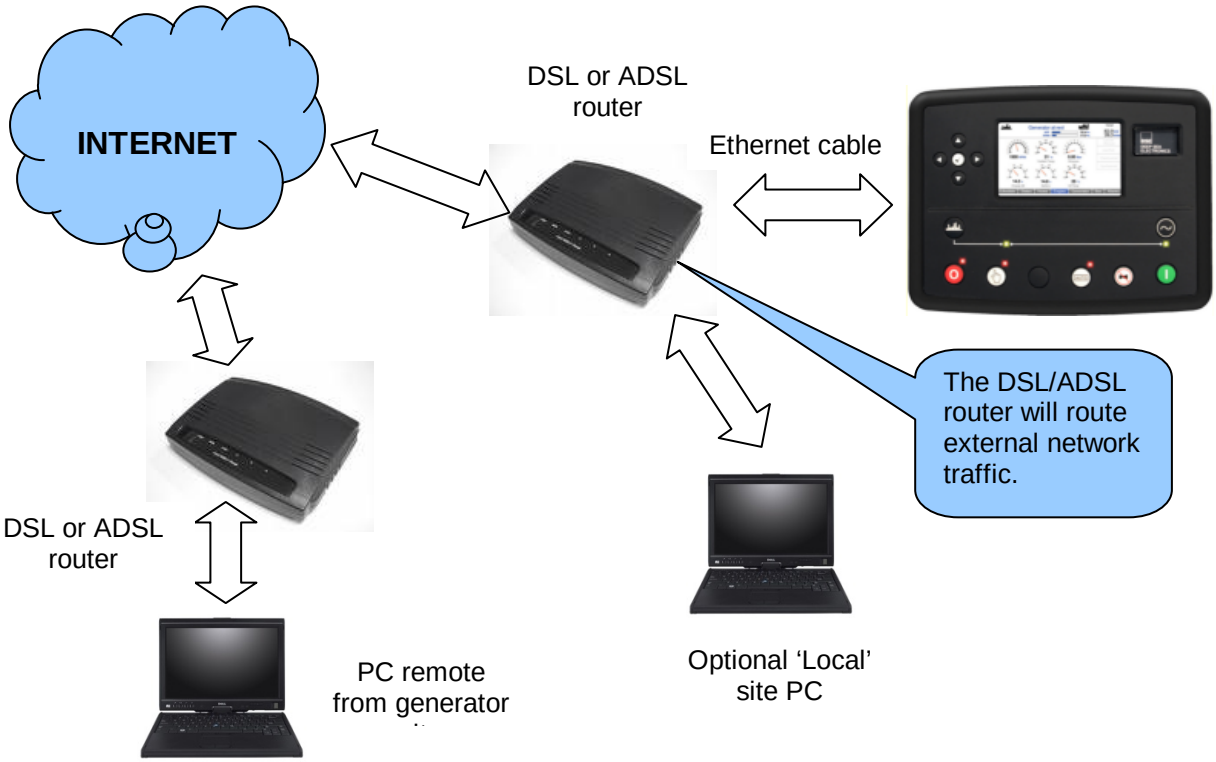


NOTE:- DSE Stock a 2m (2yds) Ethernet Cable – Part number 016-137. Alternatively they can be purchased from any good PC or IT store.

3.9.6.4 CONNECTION TO THE INTERNET

Requirements

- Ethernet cable (see below)
- Working Ethernet (company or home network)
- Working Internet connection (ADSL or DSL recommended)



Ethernet cable wiring detail

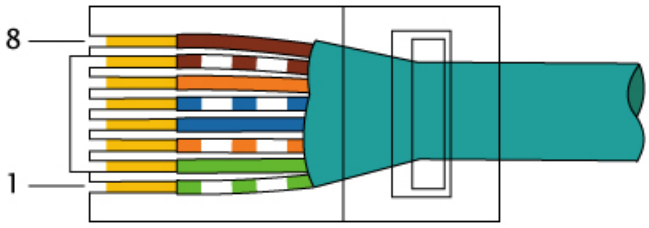
10baseT/100baseT

Pin	Connection 1 (T568A)	Connection 2 (T568A)
1	white/green stripe	white/green stripe
2	green solid	green solid
3	white/orange stripe	white/orange stripe
4	blue solid	blue solid
5	white/blue stripe	white/blue stripe
6	orange solid	orange solid
7	white/brown stripe	white/brown stripe
8	brown solid	brown solid

For the advanced Engineer, this cable has both ends terminated as T568A (as shown below) or T568B.



NOTE:- DSE Stock a 2m (2yds) Ethernet Cable – Part number 016-137. Alternatively they can be purchased from any good PC or IT store.



EIA/TIA-568A

3.9.6.5 FIREWALL CONFIGURATION FOR INTERNET ACCESS

As modem/routers differ enormously in their configuration, it is not possible for DSE to give a complete guide to their use with the module. However it is possible to give a description of the requirements in generic terms. For details of how to achieve the connection to your modem/router you are referred to the supplier of your modem/router equipment.

The module makes its data available over Modbus TCP and as such communicates over the Ethernet using a Port configured via the DSE Configuration Suite software..

You must configure your modem/router to allow inbound traffic on this port. For more information you are referred to your WAN interface device (modem/router) manufacturer.

It is also important to note that if the port assigned (setting from software “Modbus Port Number”) is already in use on the LAN, the module cannot be used and another port must be used .

Outgoing Firewall rule

As the module makes its user interface available to standard web browsers, all communication uses the chosen port. It is usual for a firewall to make the same port outgoing open for communication.

Incoming traffic (virtual server)

Network Address and Port Translation (NAPT) allows a single device, such as the modem/router gateway, to act as an agent between the Internet (or "public external network") and a local (or "internal private") network. This means that only a single, unique IP address is required to represent an entire group of computers.

For our application, this means that the WAN IP address of the modem/router is the IP address we need to access the site from an external (internet) location.

When the requests reach the modem/router, we want this passed to a ‘virtual server’ for handling, in our case this is the module.

Result : Traffic arriving from the WAN (internet) on port xxx is automatically sent to IP address set within the configuration software on the LAN for handling.

NOTE:- Refer to DSE8800 Series Configuration Suite Manual (DSE part 057-164) for further details on configuring, monitoring and control.

3.10 DSENET® FOR EXPANSION MODULES

DSENet® is the interconnection cable between the host controller and the expansion module(s) and must not be connect to any device other than DSE equipment designed for connection to the DSENet®

Cable type	Two core screened twisted pair
Cable characteristic impedance	120Ω
Recommended cable	Belden 9841 Belden 9271
Maximum cable length	1200m (¾ mile) when using Belden 9841 or direct equivalent. 600m (666 yds) when using Belden 9271 or direct equivalent.
DSENet® topology	"Daisy Chain" Bus with no stubs (spurs)
DSENet® termination	120Ω. Fitted internally to host controller. Must be fitted externally to the 'last' expansion module by the customer.
Maximum expansion modules	Total 20 devices made up of DSE2130 (up to 4), DSE2131 (up to 4), DSE2133 (up to 4), DSE2152 (up to 4), DSE2157 (up to 10), DSE2548 (up to 10) This gives the possibility of : Maximum 32 additional 0-10V or 4-20mA outputs (DSE2152) Maximum 80 additional volt-free relay outputs (DSE2157) Maximum 80 additional LED indicators Maximum 24 additional Ratio-metric or Thermocouple inputs (DSE2133). Maximum 40 additional inputs (All can be configured as either digital, resistive, 0-10V or 4-20mA when using DSE2131 or as digital / resistive when using DSE2130)

NOTE: As a termination resistor is internally fitted to the host controller, the host controller must be the 'first' unit on the DSENet®. A termination resistor MUST be fitted to the 'last' unit on the DSENet®. For connection details, you are referred to the section entitled 'typical wiring diagram' elsewhere in this document.

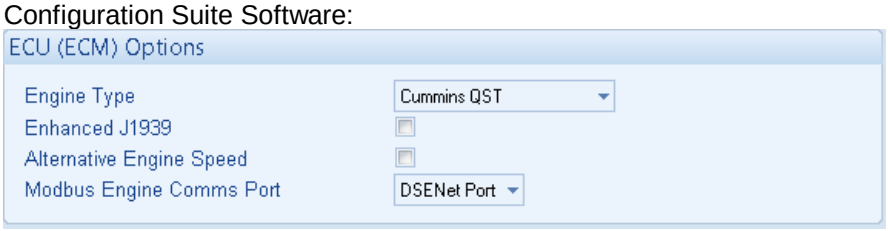
NOTE : DSE8800 series module does not support the DSE2510/2520 display modules.

3.10.1 DSENET® USED FOR MODBUS ENGINE CONNECTION

As DSENet® utilises an RS485 hardware interface, this port can be configured for connection to Cummins Modbus engines (Engines fitted with Cummins GCS).
This leaves the RS485 interfaces free for connection to remote monitoring equipment (i.e. Building Management System, PLC or PC RS485 port).

While this is a very useful feature in some applications, the obvious drawback is that the DSENet® interface is no longer available for connection to expansion devices.

Example of configuring the DSENet® for connection to Cummins QST GCS using the DSE Configuration Suite Software:



3.11 SOUNDER

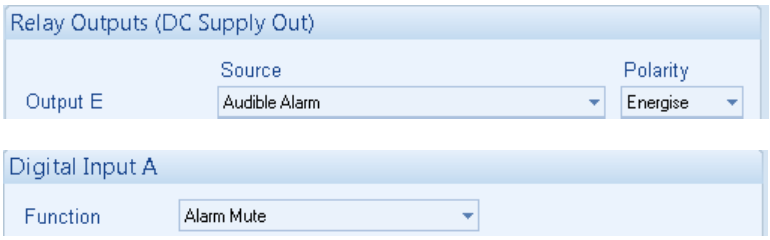
The module features an internal sounder to draw attention to warning, shutdown and electrical trip alarms.

Sounder level	64db @ 1m

3.11.1 ADDING AN EXTERNAL SOUNDER TO THE APPLICATION

Should an external alarm or indicator be required, this can be achieved by using the DSE Configuration Suite PC software to configure an auxiliary output for “Audible Alarm”, and by configuring 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.

Example of configuration to achieve external sounder with external alarm mute button:



3.12 ACCUMULATED INSTRUMENTATION

Accumulated instrumentation along with Engine Hours and Number of Starts can be set/reset using the DSE Configuration Suite PC software. Depending upon module configuration, this may have been PIN number locked by your generator supplier.

3.13 DIMENSIONS AND MOUNTING

3.13.1 DIMENSIONS
245 mm x 184 mm x 50 mm (9.6" x 7.2" x 2.0")

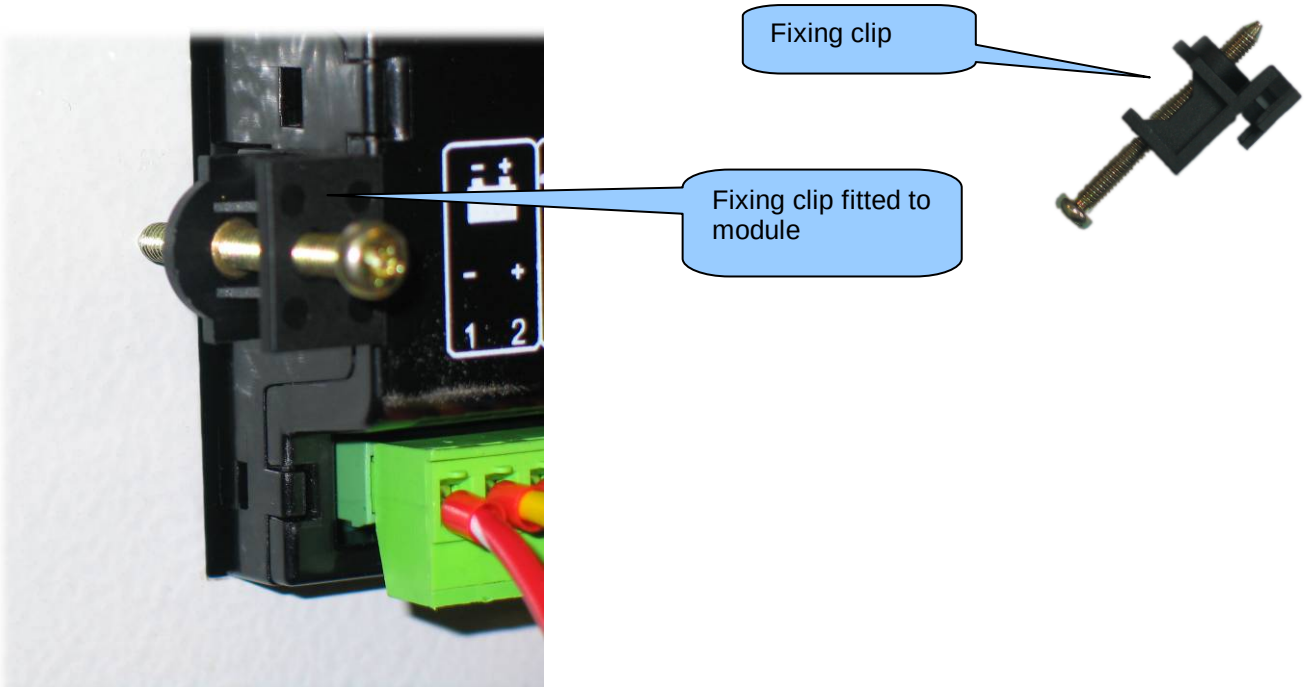
3.13.2 PANEL CUTOUT
220mm x 160mm (8.7" x 6.3")

3.13.3 WEIGHT
0.7kg (1.4lb)

3.13.4 FIXING CLIPS

The module is held into the panel fascia using the supplied fixing clips.

- 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 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. Care should be taken not to over tighten the fixing clip screws.



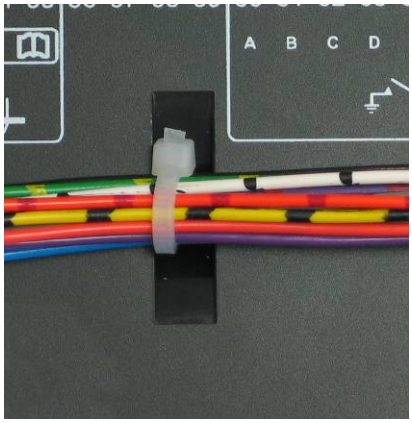
NOTE:- In conditions of excessive vibration, mount the module on suitable anti-vibration mountings.

3.13.5 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.



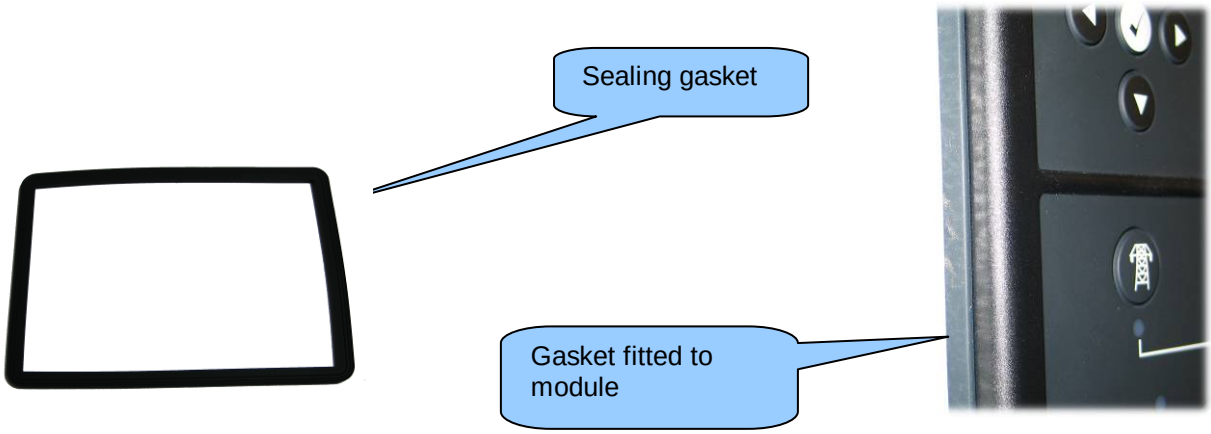
Cable tie fixing point



With cable and tie in place

3.13.6 SILICON SEALING GASKET

The supplied silicon gasket provides improved sealing between 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.



3.14 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)
BS EN 60950	Safety of information technology equipment, including electrical business equipment
BS EN 61000-6-2	EMC Generic Immunity Standard (Industrial)
BS EN 61000-6-4	EMC Generic Emission Standard (Industrial)
BS EN 60529 (Degrees of protection provided by enclosures)	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)
UL508 **NEMA rating** (Approximate)	12 (Front of module when installed into the control panel with the supplied sealing gasket). 2 (Front of module when installed into the control panel WITHOUT being sealed to the panel)
IEEE C37.2 (Standard Electrical Power System Device Function Numbers and Contact Designations)	Under the scope of IEEE 37.2, *function numbers can also be used to represent functions in microprocessor devices and software programs*. The controller is device number 11L-8000 (Multifunction device protecting Line (generator) –module). As the module is configurable by the generator OEM, the functions covered by the module will vary. Under the module's factory configuration, the device numbers included within the module are : 2 – Time Delay Starting Or Closing Relay 3 – Checking Or Interlocking Relay 5 – Stopping Device 6 – Starting Circuit Breaker 8 – Control Power Disconnecting Device 10 – Unit Sequence Switch 11 – Multifunction Device 12 – Overspeed Device 14 – Underspeed Device 15 – Speed Or Frequency Matching Device. 23 – Temperature Control Device 25 – Synchronising Or Synchronism Check Relay 26 – Apparatus Thermal Device 27AC – AC Undervoltage Relay 27DC – DC Undervoltage Relay 29 – Isolating Contactor Or Switch 30 – Annunciator Relay 31 – Separate Excitation Device 37 – Undercurrent Or Underpower Relay (**USING INTERNAL PLC EDITOR**) 41 – Field Circuit Breaker 42 – Running Circuit Breaker 44 – Unit Sequence Relay 46 – Reverse-Phase Or Phase-Balance Current Relay 48 – Incomplete Sequence Relay 49 – Machine Or Transformer Thermal Relay

Continued overleaf.

IEEE C37.2 (Standard Electrical Power System Device Function Numbers and Contact Designations)	Continued… 50 – Instantaneous overcurrent relay 51 – AC time overcurrent relay 52 – AC circuit breaker 53 – Exciter or DC generator relay 54 – Turning gear engaging device 55 – Power factor relay (**USING INTERNAL PLC EDITOR**) 59AC – AC overvoltage relay 59DC – DC overvoltage relay 62 – Time delay stopping or opening relay 63 – Pressure switch 71 – Level switch 74 – Alarm relay 77 – Telemetering Device 78 – Phase-angle measuring relay 79 – Reclosing relay (**USING INTERNAL PLC EDITOR**) 81 – Frequency relay 83 – Automatic selective control or transfer relay 86 – Lockout relay

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

3.14.1 ENCLOSURE CLASSIFICATIONS

IP CLASSIFICATIONS

The modules 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 Protection against contact and ingress of solid objects		Second Digit 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 its normal position (dro ps 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).

3.14.2 NEMA CLASSIFICATIONS

The modules 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.

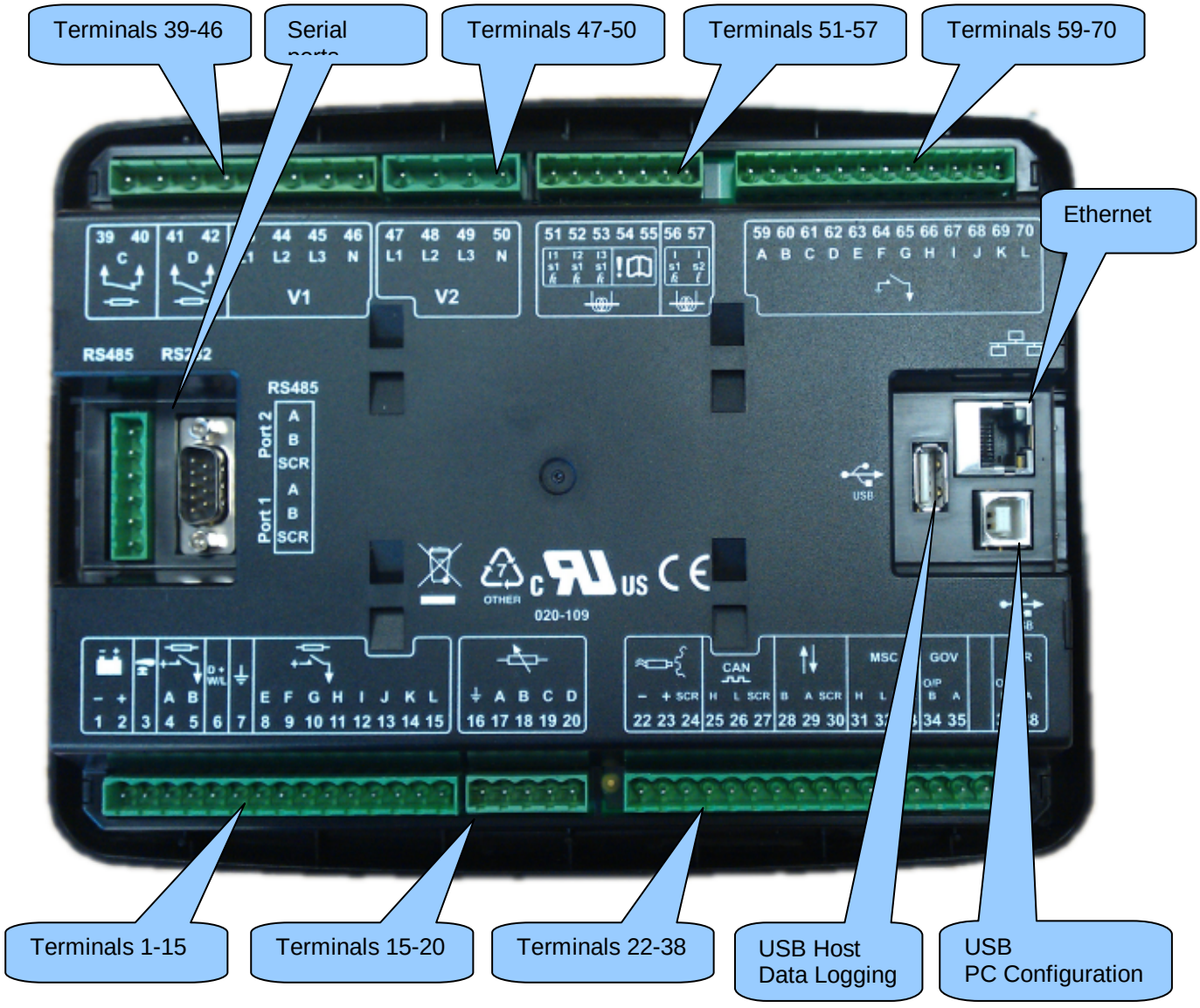
4 INSTALLATION

The 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

To aid user connection, icons are used on the rear of the module to help identify terminal functions. An example of this is shown below.

NOTE : Availability of some terminals depends upon module version. Full details are given in the section entitled *Terminal Description* elsewhere in this manual.



4.1.1 DC SUPPLY, FUEL AND START OUTPUTS, OUTPUTS E-J

	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,F,G & H
	3	Emergency Stop Input	2.5mm² AWG 13	Plant Supply Positive. Also supplies outputs 1 & 2. (Recommended Maximum Fuse 20A)
	4	Output relay A (FUEL)	2.5mm² AWG 13	Plant Supply Positive from terminal 3. 15 Amp rated. Fixed as FUEL relay if electronic engine is not configured.
	5	Output relay B (START)	2.5mm² AWG 13	Plant Supply Positive from terminal 3. 15 Amp rated. Fixed as START relay if electronic engine is not configured.
D + W/L	6	Charge fail / excite	2.5mm² AWG 13	Do not connect to ground (battery negative). If charge alternator is not fitted, leave this terminal disconnected.
	7	Functional Earth	2.5mm² AWG 13	Connect to a good clean earth point.
	8	Output relay E	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 2 Amp rated.
	9	Output relay F	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 2 Amp rated.
	10	Output relay G	1.0mm² AWG 18	Plant Supply Positive.from terminal 2. 2 Amp rated.
	11	Output relay H	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 2 Amp rated.
	12	Output relay I	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 2 Amp rated.
	13	Output relay J	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 2 Amp rated.
	14	Output relay K	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 2 Amp rated.
	15	Output relay L	1.0mm² AWG 18	Plant Supply Positive from terminal 2. 2 Amp rated.

NOTE:- Outputs K and L (terminals 14 and 15) are NOT used – Reserved for future use.

NOTE:- When the module is configured for operation with an electronic engine, FUEL and START output requirements may be different. Refer to *Electronic Engines and DSE Wiring* for further information. Part No. 057-004.

4.1.2 ANALOGUE SENSOR

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	16	Sensor Common Return	0.5mm² AWG 20	Return feed for sensors
	17	Oil Pressure Input	0.5mm² AWG 20	Connect to Oil pressure sensor
	18	Coolant Temperature Input	0.5mm² AWG 20	Connect to Coolant Temperature sensor
	19	Fuel sensor input	0.5mm² AWG 20	Connect to fuel sensor (user configurable) can also be configured to flexible sensor for alternative use.
	20	Flexible sensor 2	0.5mm² AWG 20	Connect to additional sensor (user configurable)

NOTE:- Terminal 21 is not fitted to the controller.

NOTE: - It is VERY important that terminal 16 (sensor common) is soundly connected to an earth point on the ENGINE BLOCK, not within the control panel, and must be a sound electrical connection to the sensor bodies. This connection MUST NOT be used to provide an earth connection for other terminals or devices. The simplest way to achieve this is to run a SEPARATE earth connection from the system earth star point, to terminal 16 directly, and not use this earth for other connections.

NOTE: - If you use PTFE insulating tape on the sensor thread when using earth return sensors, ensure you do not insulate the entire thread, as this will prevent the sensor body from being earthed via the engine block.

4.1.3 MAGNETIC PICKUP, CAN AND EXPANSION

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	22	Magnetic pickup Positive	0.5mm² AWG 20	Connect to Magnetic Pickup device
	23	Magnetic pickup Negative	0.5mm² AWG 20	Connect to Magnetic Pickup device
	24	Magnetic pickup screen	Shield	Connect to ground at one end only
CAN	25	CAN port H	0.5mm² AWG 20	Use only 120Ω CAN approved cable
	26	CAN port L	0.5mm² AWG 20	Use only 120Ω CAN approved cable
	27	CAN port Common	0.5mm² AWG 20	Use only 120Ω CAN approved cable
	28	DSENet expansion A	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
	29	DSENet expansion B	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
	30	DSENet expansion SCR	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
MSC	31	Multiset Comms (MSC) Link H	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
	32	Multiset Comms (MSC) Link L	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
	33	Multiset Comms (MSC) Link SCR	0.5mm² AWG 20	Use only 120Ω RS485 approved cable
GOV	34	Analogue Governor Output B	0.5mm² AWG 20	
	35	Analogue Governor Output A	0.5mm² AWG 20	
	36	DO NOT CONNECT		
AVR	37	Analogue AVR Output B	0.5mm² AWG 20	
	38	Analogue AVR Output A	0.5mm² AWG 20	

NOTE:- Terminal 36 is not fitted to the controller

NOTE:- Screened cable must be used for connecting the Magnetic Pickup, ensuring that the screen is earthed at one end ONLY.

NOTE:- Screened 120Ω impedance cable specified for use with CAN must be used for the CAN link and the Multiset comms link.
DSE stock and supply Belden cable 9841 which is a high quality 120Ω impedance cable suitable for CAN use (DSE part number 016-030)

NOTE:- When the module is configured for CAN operation, terminals 22, 23 & 24 should be left unconnected. Engine speed is transmitted to the controller on the CAN link.
Refer to *Electronic Engines and DSE Wiring* for further information. Part No. 057-004.

4.1.4 LOAD SWITCHING AND V1 GENERATOR VOLTAGE SENSING

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	39	Output relay C	1.0mm AWG 18	Normally configured to control mains contactor coil (Recommend 10A fuse)
	40	Output relay C	1.0mm AWG 18	Normally configured to control mains contactor coil
	41	Output relay D	1.0mm AWG 18	Normally configured to control generator contactor coil (Recommend 10A fuse)
	42	Output relay D	1.0mm AWG 18	Normally configured to control generator contactor coil
V1	43	Generator L1 (U) voltage monitoring	1.0mm² AWG 18	Connect to generator L1 (U) output (AC) (Recommend 2A fuse)
	44	Generator L2 (V) voltage monitoring input	1.0mm² AWG 18	Connect to generator L2 (V) output (AC) (Recommend 2A fuse)
	45	Generator L3 (W) voltage monitoring input	1.0mm² AWG 18	Connect to generator L3 (W) output (AC) (Recommend 2A fuse)
	46	Generator Neutral (N) input	1.0mm² AWG 18	Connect to generator Neutral terminal (AC)

NOTE:- The above table describes connections to a three phase, four wire alternator. For alternative wiring topologies, please see the ALTERNATIVE AC TOPOLOGIES section of this manual.

4.1.5 V2 BUS/MAINS VOLTAGE SENSING

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
V2	47	Bus/Mains L1 (R) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (R) incoming supply (AC) (Recommend 2A fuse)
	48	Bus/Mains L2 (S) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (S) incoming supply (AC) (Recommend 2A fuse)
	49	Bus/Mains L3 (T) voltage monitoring	1.0mm AWG 18	Connect to Mains L1 (T) incoming supply (AC) (Recommend 2A fuse)
	50	Bus/Mains Neutral (N) input	1.0mm AWG 18	Connect to Mains N incoming supply (AC)

NOTE:- Mains connection is used for sensing of the mains or other supply voltage during "fixed export" operation. Bus connection is used for sensing of the common bus voltage during "multiset load

4.1.6 GENERATOR CURRENT TRANSFORMERS

WARNING!:- Do not disconnect this plug when the CTs are carrying current. Disconnection will open circuit the secondary of the C.T.'s and dangerous voltages may then develop. Always ensure the CTs are not carrying current and the CTs are short circuit connected before making or breaking connections to the module.

NOTE:- The module has a burden of 0.5VA on the CT. Ensure the CT is rated for the burden of the controller, the cable length being used and any other equipment sharing the CT. If in doubt, consult your CT supplier.

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	51	CT Secondary for Gen L1	2.5mm² AWG 13	Connect to s1 secondary of L1 monitoring CT
	52	CT Secondary for Gen L2	2.5mm² AWG 13	Connect to s1 secondary of L2 monitoring CT
	53	CT Secondary for Gen L3	2.5mm² AWG 13	Connect to s1 secondary of L3 monitoring CT

Connection to terminals 54 & 55

The function of terminals 54 and 55 change position depending upon wiring topology as follows:

	Topology	Pin No	Description	CABLE SIZE
	No earth fault measuring	54	DO NOT CONNECT	
		55	Connect to s2 of the CTs connected to L1,L2,L3,N	2.5mm² AWG 13
	Restricted earth fault measuring	54	Connect to s2 of the CTs connected to L1,L2,L3,N	2.5mm² AWG 13
		55	Connect to s1 of the CT on the neutral conductor	2.5mm² AWG 13
	Un-restricted earth fault measuring (Earth fault CT is fitted in the neutral to earth link)	54	Connect to s1 of the CT on the neutral to earth conductor.	2.5mm² AWG 13
		55	Connect to s2 of the CT on the neutral to earth link. Also connect to the s2 of CTs connected to L1, L2, L3.	2.5mm² AWG 13

NOTE: - Terminal 58 is not fitted to the controller.

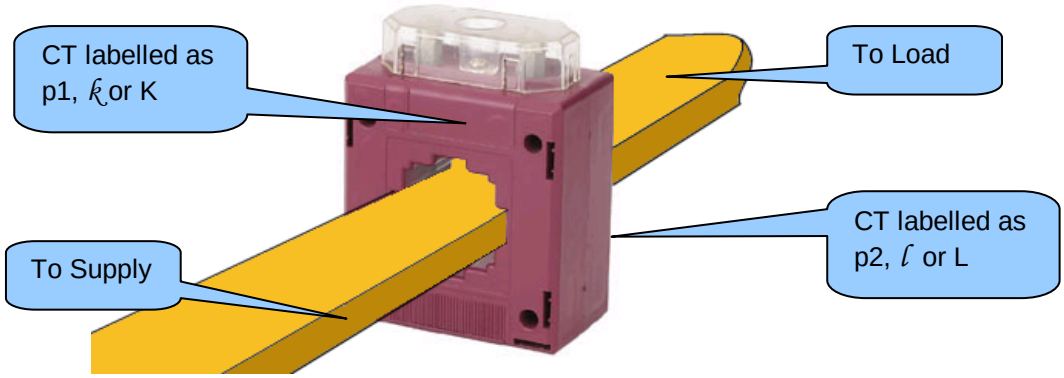
CT CONNECTIONS

p1, k or K is the primary of the CT that 'points' towards the GENERATOR

p2, l or L is the primary of the CT that 'points' towards the LOAD

s1 is the secondary of the CT that connects to the DSE Module's input for the CT measuring (I1,I2,I3)

s2 is the secondary of the CT that should be commoned with the s2 connections of all the other CTs and connected to the CT common terminal of the module.



4.1.7 CONFIGURABLE DIGITAL INPUTS

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	59	Configurable digital input A	0.5mm² AWG 20	Switch to negative
	60	Configurable digital input B	0.5mm² AWG 20	Switch to negative
	61	Configurable digital input C	0.5mm² AWG 20	Switch to negative
	62	Configurable digital input D	0.5mm² AWG 20	Switch to negative
	63	Configurable digital input E	0.5mm² AWG 20	Switch to negative
	64	Configurable digital input F	0.5mm² AWG 20	Switch to negative
	65	Configurable digital input G	0.5mm² AWG 20	Switch to negative
	66	Configurable digital input H	0.5mm² AWG 20	Switch to negative
	67	Configurable digital input I	0.5mm² AWG 20	Switch to negative
	68	Configurable digital input J	0.5mm² AWG 20	Switch to negative
	69	Configurable digital input K	0.5mm² AWG 20	Switch to negative
	70	Configurable digital input L	0.5mm² AWG 20	Switch to negative

NOTE:- Input L (terminal 70) is NOT used – Reserved for future use.

NOTE:- See the software manual for full range of configurable outputs available.

4.1.8 PC CONFIGURATION INTERFACE CONNECTOR

	DESCRIPTION	CABLE SIZE	NOTES
	Socket for connection to PC with DSE Configuration Suite 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 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.

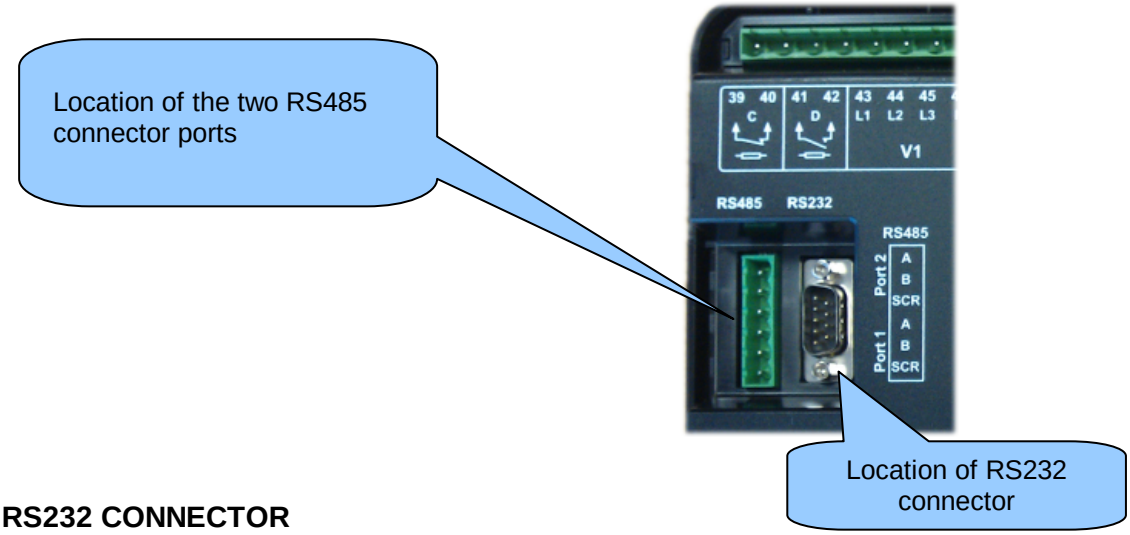
CAUTION!: Care must be taken not to overload the PCs USB system by connecting more than the recommended number of USB devices to the PC. For further information, consult your PC supplier.

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

4.1.9 RS485 CONNECTOR

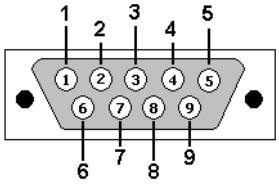
Two, independently configurable RS485 ports are provided. Typical examples of devices that can be connected to these ports are PCs, PLCs, HMIs, Modbus engines

PIN No	NOTES
Port1 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.
Port1 B (+)	
Port1 SCR	
Port2 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.
Port2 B (+)	
Port2 SCR	



4.1.10 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 module

4.2 TYPICAL WIRING DIAGRAMS

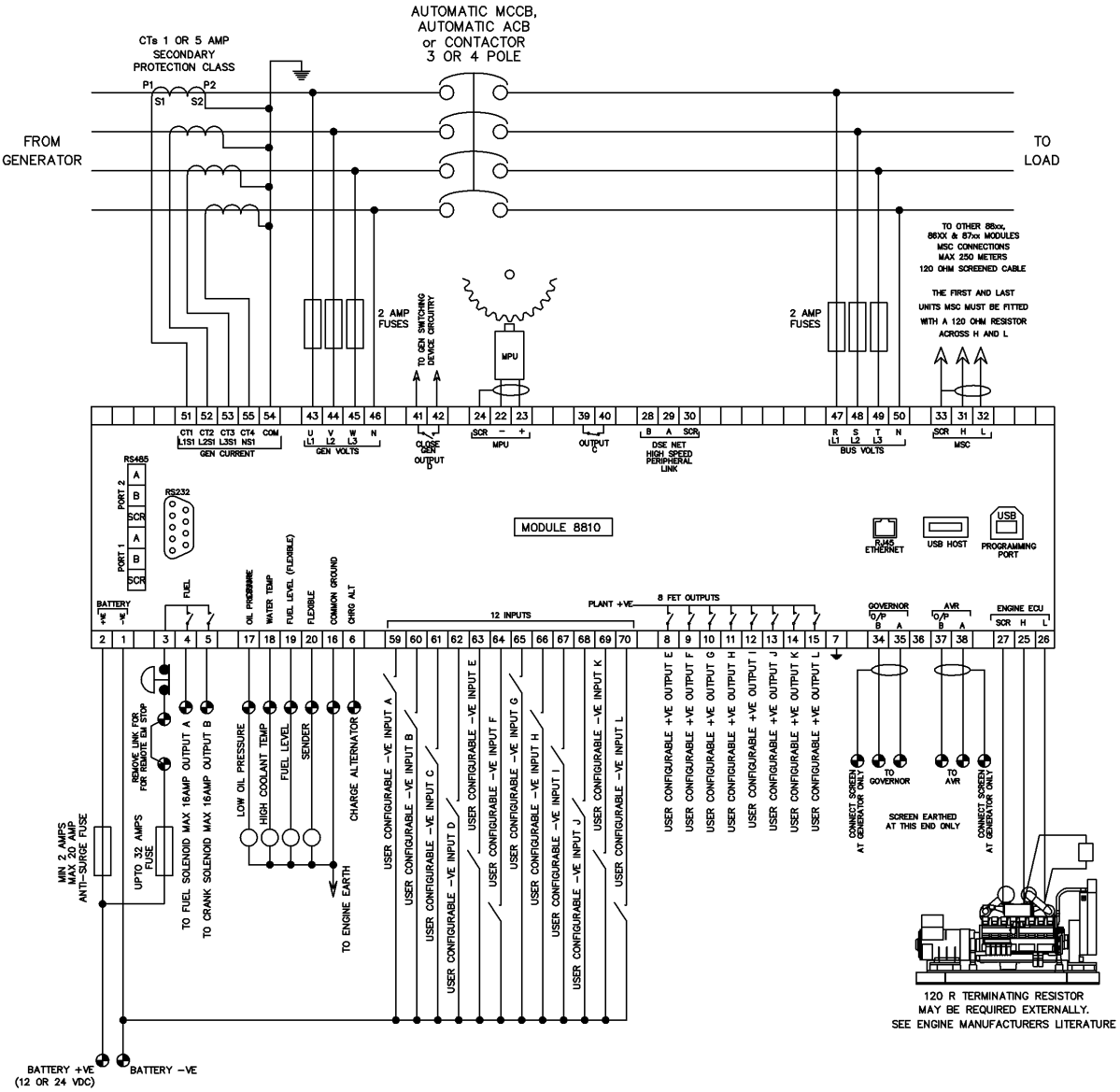
As every system has different requirements, these diagrams show only a TYPICAL system and do not intend to show a complete system.

Genset manufacturers and panel builders may use these diagrams as a starting point; however, you are referred to the completed system diagram provided by your system manufacturer for complete wiring detail.

Further wiring suggestions are available in the following DSE publications, available at www.deepseaplc.com to website members.

DSE PART	DESCRIPTION
056-022	Breaker Control (Training guide)
057-004	Electronic Engines and DSE Wiring

4.2.1 DSE8810 3 PHASE, 4 WIRE WITH RESTRICTED EARTH FAULT PROTECTION



NOTE:- Earthing the neutral conductor 'before' the neutral CT allows the module to read earth faults 'after' the CT only (Restricted to load / downstream of the CT)
Earthing the neutral conductor 'after' the neutral CT allows the module to read earth faults 'before' the CT only (Restricted to generator / upstream of the CT)

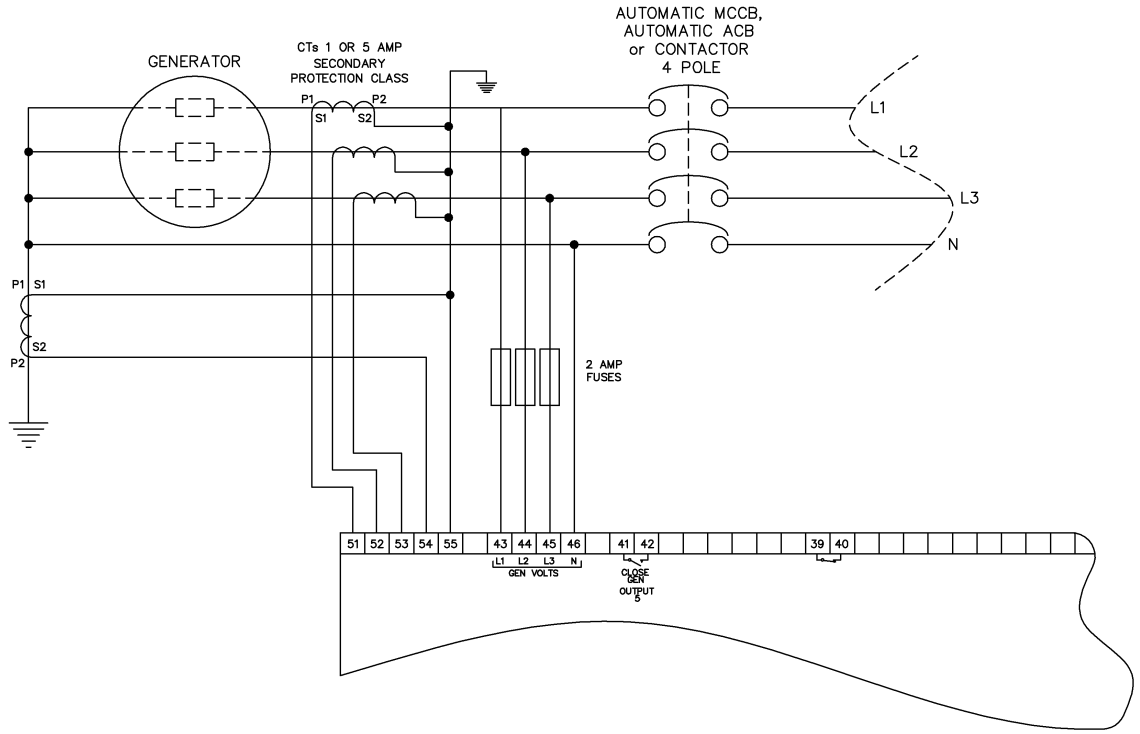
4.3 ALTERNATIVE TOPOLOGIES

The controller is factory configured to connect to a 3 phase, 4 wire Star connected alternator. This section details connections for alternative AC topologies. Ensure to configure the controller to suit the required topology.

NOTE:- Refer to DSE8800 Series Configuration Suite Manual (DSE part 057-164) for further details on configuring, monitoring and control.

4.3.1 3 PHASE 4 WIRE WITH UNRESTRICTED EARTH FAULT MEASURING

NOTE:- Unrestricted Earth Fault Protection detects earth faults in the load and in the generator. Be sure to measure the natural earth fault of the site before deciding upon an earth fault alarm trip level.



4.4 EARTH SYSTEMS

4.4.1 NEGATIVE EARTH

The typical wiring diagrams located within this document show connections for a negative earth system (the battery negative connects to Earth)

4.4.2 POSITIVE EARTH

When using a DSE module with a Positive Earth System (the battery positive connects to Earth), the following points must be followed:

- Follow the typical wiring diagram as normal for all sections EXCEPT the earth points
- All points shown as Earth on the typical wiring diagram should connect to BATTERY NEGATIVE (not earth).

4.4.3 FLOATING EARTH

Where neither the battery positive nor battery negative terminals are connected to earth the following points must to be followed

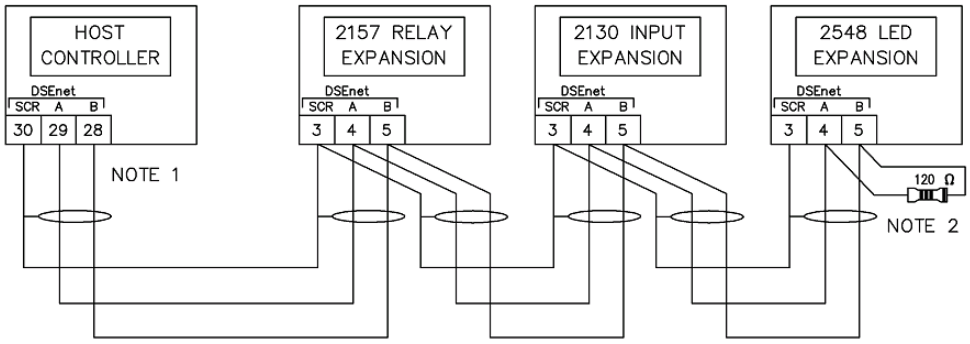
- Follow the typical wiring diagram as normal for all sections EXCEPT the earth points
- All points shown as Earth on the typical wiring diagram should connect to BATTERY NEGATIVE (not earth).

4.5 TYPICAL ARRANGEMENT OF DSENET®

Twenty (20) devices can be connected to the DSENet®, made up of the following devices :

Device	Max Number Supported
DSE2130 Input Expansion	4
DSE2131 Ratio-metric Input Expansion	4
DSE2133 RTD/Thermocouple Intput Expansion	4
DSE2152 Ratio-metric Output Expansion	4
DSE2157 Relay Output Expansion	10
DSE2548 LED Expansion	10

For part numbers of the expansion modules and their documentation, see section entitled *DSENet Expansion Modules* elsewhere in this manual.



NOTE 1

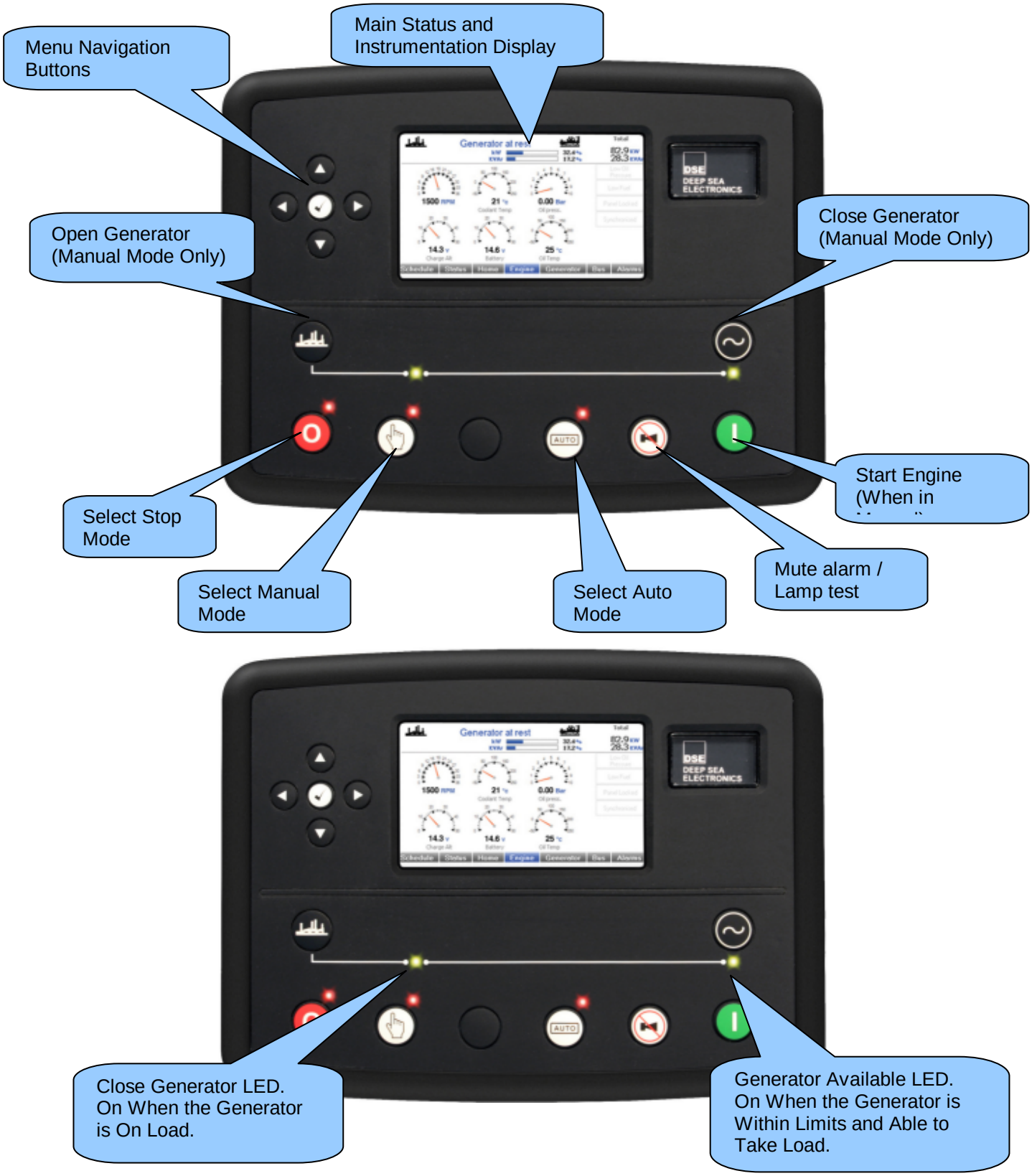
AS A TERMINATING RESISTOR IS INTERNALLY FITTED TO THE HOST CONTROLLER, THE HOST CONTROLLER MUST BE THE FIRST UNIT ON THE DSEnet

NOTE 2

A 120 OHM TERMINATION RESISTOR MUST BE FITTED TO THE LAST UNIT ON THE DSEnet

5 DESCRIPTION OF CONTROLS

5.1 DSE8810 AUTO START CONTROL MODULE



5.2 QUICKSTART GUIDE

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

5.2.1 STARTING THE ENGINE



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

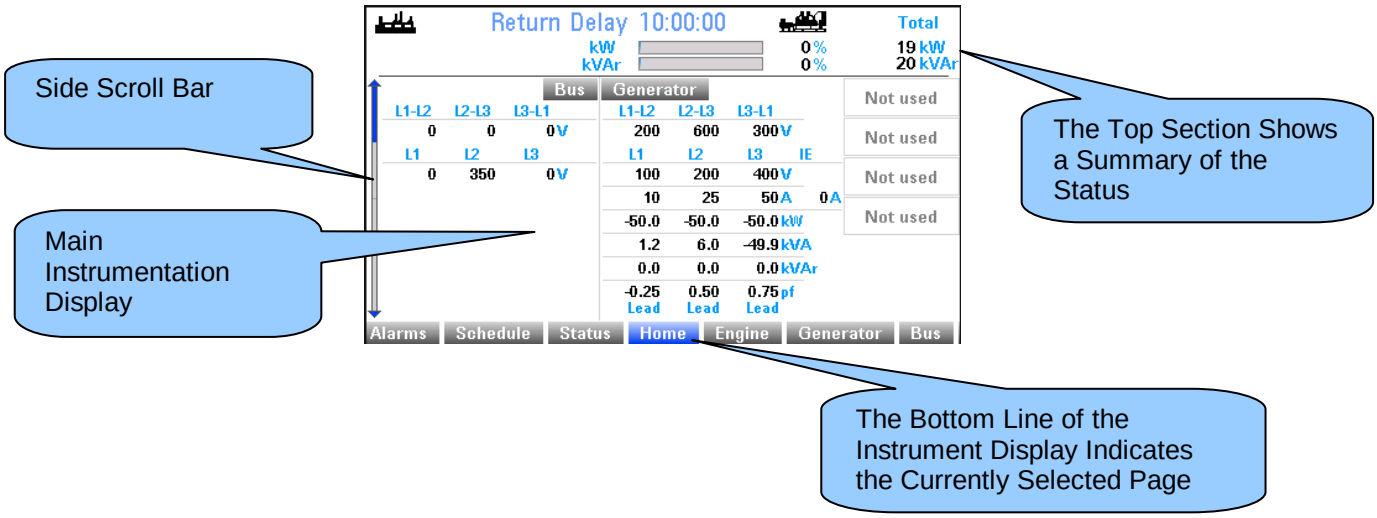
5.2.2 STOPPING THE ENGINE



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

5.3 VIEWING THE INSTRUMENT PAGES

5.3.1 DISPLAY OVERVIEW



5.3.2 PAGE INDICATORS

Alarms | Schedule | Status | **Home** | Engine | Generator | Bus

Pressing the next / previous page buttons  scrolls between the available pages.

Example

Alarms | Schedule | Status | **Home** | Engine | Generator | Bus

Press Page Right  to move to the next page.

It May be Quicker to Scroll Left Through the Pages Rather Than Right!

Schedule | Status | Home | **Engine** | Generator | Bus | Alarms

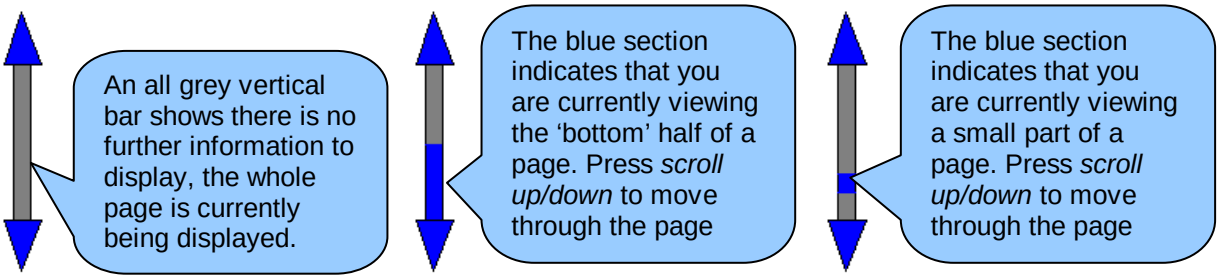
Press Page Right  to move to the next page.

Status | Home | Engine | **Generator** | Bus | Alarms | Schedule

5.3.3 SIDE SCROLL BAR

While a page is being viewed, the scroll bar at the side of the display represents how 'far down' the page you are currently viewing. Pressing the scroll  buttons moves up and down the currently selected page.

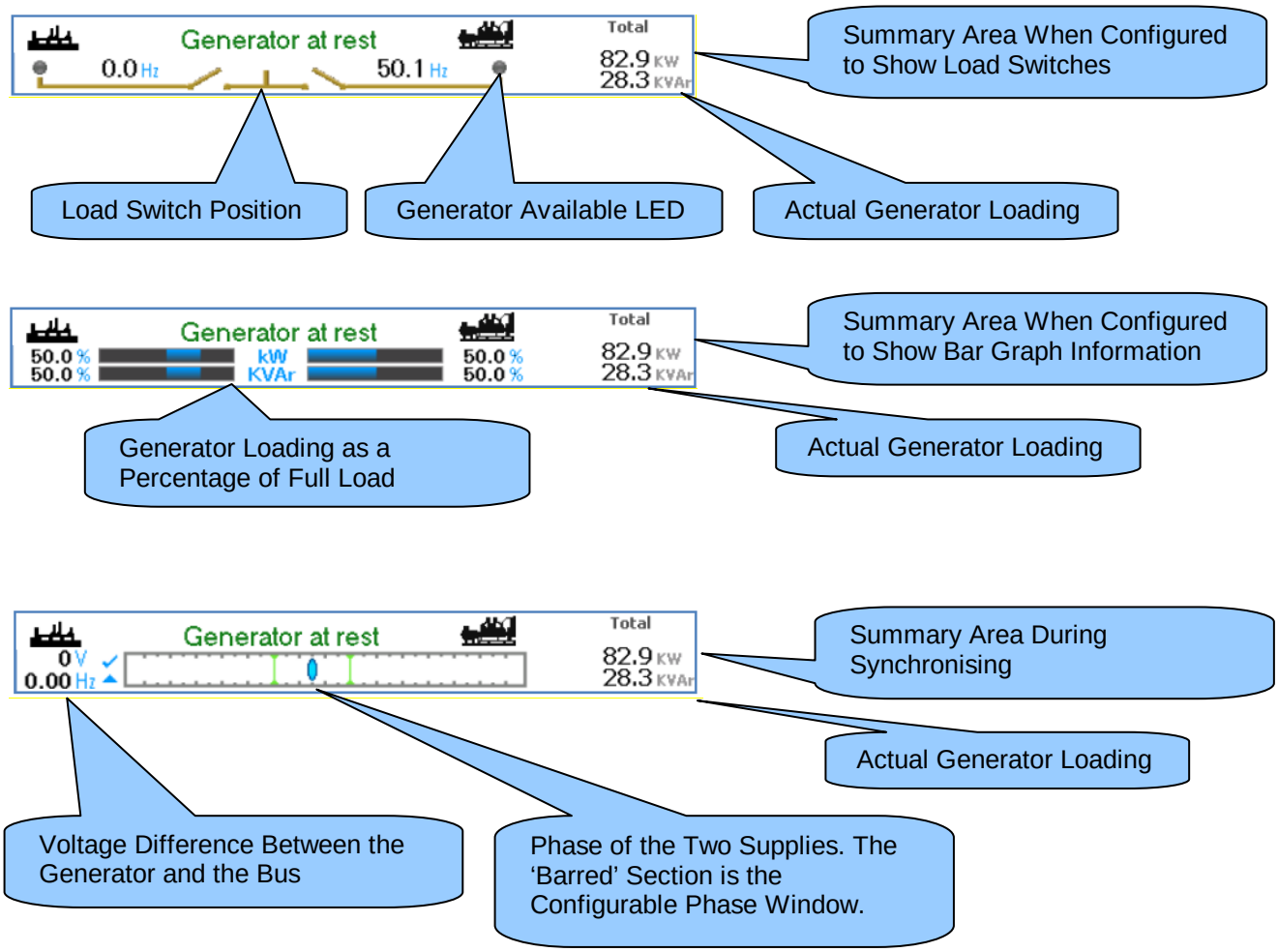
Examples



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 (configurable *page timer*), the module will revert to the status display.

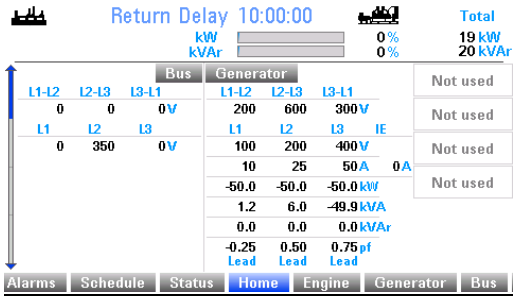
5.3.4 SUMMARY AREA



5.3.5 HOME

In addition to the common display area, the following instruments are displayed on the home page.

Example image :



Bus

- Bus Voltage (ph-N)
- Bus Voltage (ph-ph)

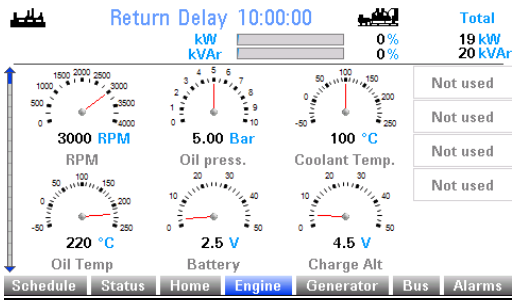
Generator

- Generator Voltage (ph-N)
- Generator Voltage (ph-ph)
- Generator Current
- Generator Earth Current
- Generator Load (kW)
- Generator Load (kV A)
- Generator Power Factor
- Generator Load (kV Ar)

5.3.6 ENGINE

In addition to the common display area, the following instruments are displayed on the home page.

Example image:



- Engine Speed (RPM)
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Charge Alternator Volts
- Engine Hours
- Engine Starts
- Est. Fuel Remaining
- Instrumentation from CAN ECU.*
- Tier 4 “DM1 Lamps” will also be available if used with a Tier 4 suitable engine / ECU.*
- CAN Link Status is also shown* :

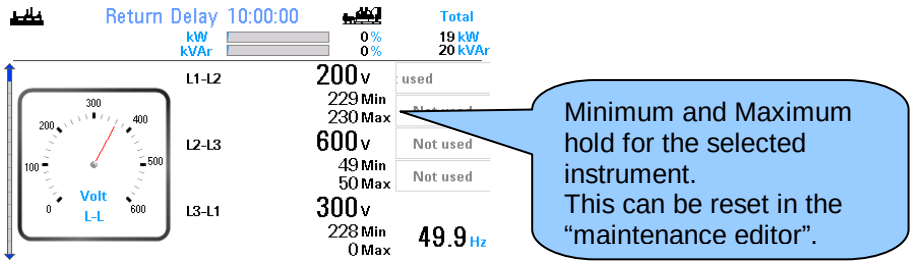
	Link OK	ECU OFF	Link LOST
Link Status			

*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).

5.3.7 GENERATOR

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

Example image:



- Generator Voltage (ph-ph)
- Generator Voltage (ph-N)
- Generator Frequency
- Generator Current
- Generator Earth Current
- Generator Load (kW)
- Generator Load (kV A)
- Generator Load (kV Ar)
- Generator Power Factor

Averages

- Average Voltage (pn-N),
- Average Voltage (ph-ph)
- Average Current
- Average Load (kW)
- Average Load (kV A)
- Average Load (kV Ar)
- Average Power Factor

AC System

- Generator Configuration (AC System diagram)
- Generator Configuration (Nominals)

Accumulated

- kW h
- kV A h
- kV Ar h

Total kW

- Generator Load (L1 %, L2 %, L3 %, Total %)

Total kV A

- Generator Load (L1, L2, L3, Total)

Total kV Ar

- Generator Load (L1 %, L2 %, L3 %, Total %)

Total

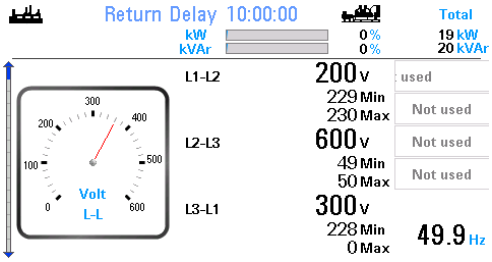
- Generator Load (kW, kV A, kV Ar, Power Factor)

Mains Decoupling

- R.O.C.O.F (Instantaneous reading and peak hold)
- Vector Shift (Instantaneous reading and peak hold)

5.3.8 BUS

Example image:



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

Averages

- Average Voltage (ph-ph)
- Average Voltage (pn-N),

AC System

- Bus Configuration (AC System diagram)
- Bus Configuration (Nominals)

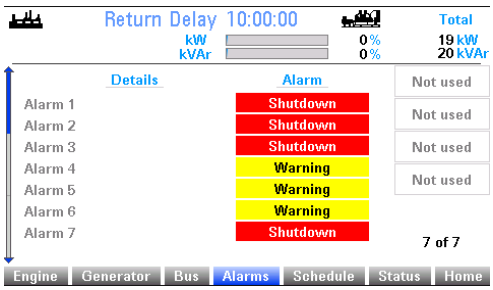
Bus Load

- Bus Load (kW)
- Bus Load (kV Ar)

5.3.9 ALARMS

- List of currently active alarms

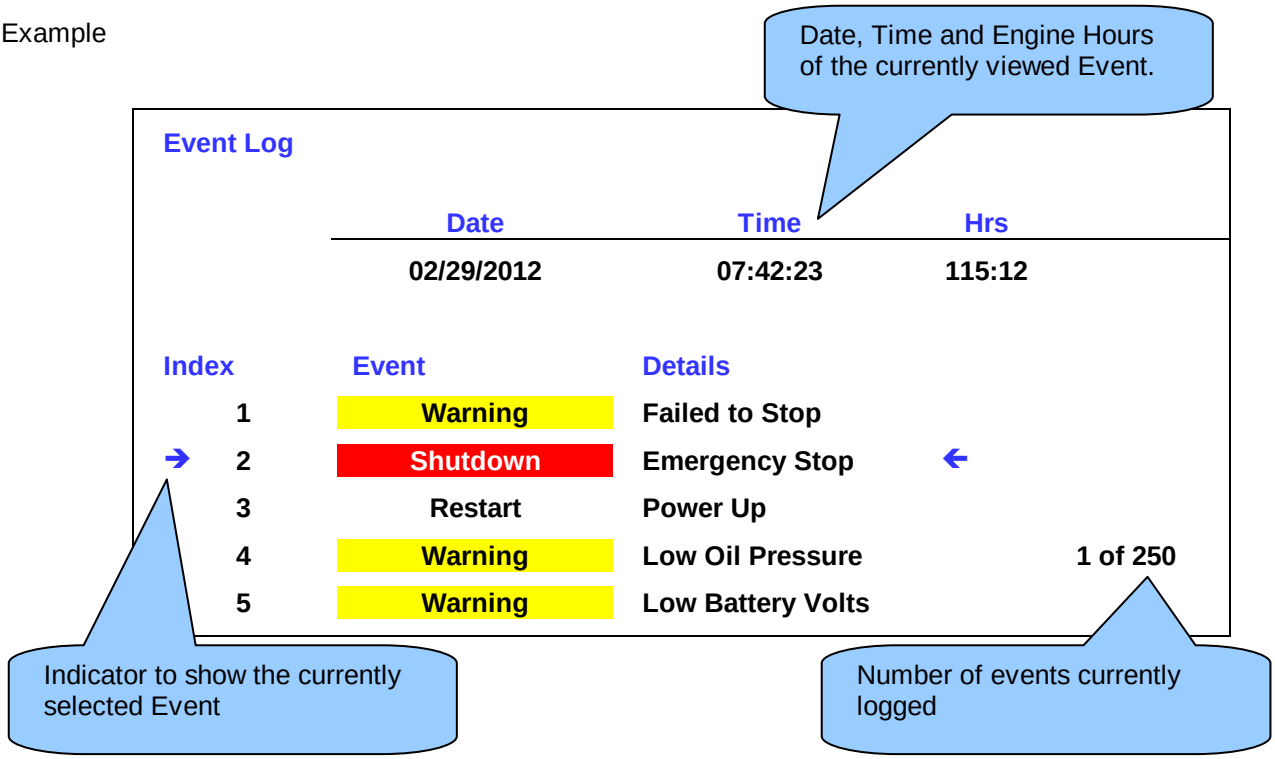
Example image:



Event Log

- Alarm History containing up to 250 past events logged. Where more than 250 events are logged, the last 250 are displayed.
- Press Tick to enter the event log, then press scroll up/down to navigate through the past events.
- Press Tick again to return to the main instrument navigation.

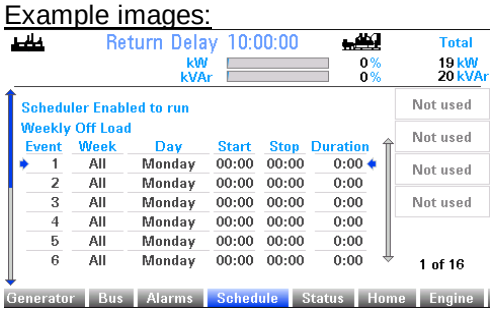
Example

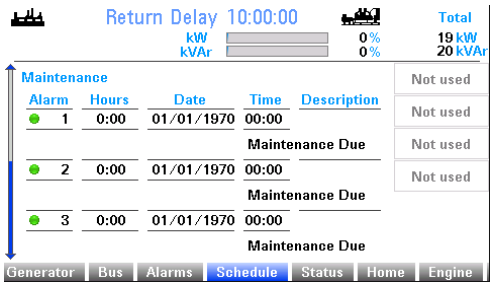


5.3.10 SCHEDULE

Allows the user to view the run schedule and maintenance alarm settings.

Example images:





5.3.11 STATUS

Allows the user to view status information about the controller.
Depending upon configuration of the controller, the information displayed will change.

Information	
Model	**8810**
USB ID	**0x0000BC12563**
Control	**V1.00.02**
Graphics	**V1.00.03**
Analogue	**V3.00.02**
Engine	**V1.18**
Bootloader Control	**V1.00**
Bootloader Graphics	**V1.02.03**

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

RS232 No Modem	
Slave ID	**10**
Baud Rate	**115200**
Tx Packets	**1562**
Rx Packets	**1562**
Exception Packets	**3**



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 module is powered 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 module. At regular intervals after power up, the modem is reset, and reinitialised, to ensure the modem does not ‘hang up’.

If the 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 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.

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.

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.

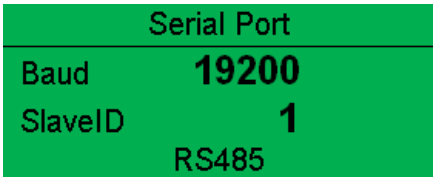
RS485 Port 1 / Port 2	
Slave ID	**10**
Baud Rate	**115200**
Tx Packets	**1562**
Rx Packets	**1562**
Exception Packets	**3**



This section is included to give information about the currently selected 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 RS485 port to operating at 19200 baud, modbus slave address 10.

Module RS485 port configured for connection to a modbus master.



The 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 (The 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.

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).

Ethernet Port Up

DHCP enable	**Disabled**
Host Name	
IP address	**192.168.10.23**
Modbus Port Number	**502**
Subnet Mask	**255.255.255.0**
Gateway IP	**0.0.0.0**
DNS IP	**0.0.0.0**
MAC Address	**008080EF1F2F3**



Ethernet Traffic

DHCP enable	**Disabled**
Tx Packets	**1562**
Rx Packets	**1562**
Exception Packets	**3**



USB Traffic

Tx Packets	**1562**
Rx Packets	**1562**
Exception Packets	**3**



Logging

Log State	**Enabled**
Log Destination	**Internal**
Log Mode	**Newest**
Total Log Memory	**2048k**
Log Memory Free	**1463k**
USB Drive State	**Not Detected**
Logging Time Remaining	**26hr 52m**



Status

Supervisor State	**Alarm Stop**
Engine State	**Failed To Stop**
Load State	**Generator Open**
Protections	**Protections Enabled**



Identity	
Site Identity	**Deep Sea Electronics**
Genset Identity	**Generator #5**
Load State	**Generator Open**
Protections	**Protections Enabled**



SPI Status	
AC Packets Rx	**11363**
Engine Packets Rx	**11363**
NV Packets Rx	**11363**
SMS Packets Rx	**0**
Reconnect Attempts	**3**

6 OPERATION

6.1 CONTROL

Control of the module is via push buttons mounted on the front of the module with **STOP/RESET, MANUAL, TEST, AUTO, ALARM MUTE** and **START** functions. For normal operation, these are the only controls which need to be operated. The smaller push buttons are used to access further information such as generator voltage or to change the state of the load switching devices when in manual mode. Details of their operation are provided later in this document.

The following descriptions detail the sequences followed by a module containing the standard '*factory configuration*'. Always refer to your configuration source for the exact sequences and timers observed by any particular module in the field.



CAUTION: - The module may instruct an engine start event due to external influences. Therefore, it is possible for the engine to start at any time without warning. Prior to performing any maintenance on the system, it is recommended that steps are taken to remove the battery and isolate supplies.

NOTE: - This control module has PLC functionality built in. This can have change the standard operation when used. (Default configuration the no PLC is set. See software manual for more information)

6.2 CONTROL PUSH-BUTTONS

Stop / Reset This button places the module into its **Stop/Reset** mode. This will clear any alarm conditions for which the triggering criteria have been removed. If the engine is running and the module is in Stop mode, the module will automatically instruct the changeover device to unload the generator *('**Close Generator**' becomes inactive (if used))*. The fuel supply de-energises and the engine comes to a standstill. Should a **remote start signal** be present while operating in this mode, a remote start will not occur.	
Manual This mode allows manual control of the generator functions. Once in **Manual mode** the module will respond to the start button, start the engine, and run off load. If the engine is running off-load in the **Manual mode** and a **remote start signal** becomes present, the module will automatically instruct the changeover device to place the generator on load *('**Close Generator**' becomes active (if used))*. Upon removal of the **remote start signal**, the generator remains on load until either selection of the **'STOP/RESET'** or **'AUTO'** modes. *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.*	
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.	
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) **NOTE:- Different modes of operation are possible - Please refer to your configuration source for details.**	
Close generator Operative in Manual Mode only Allows the operator to close the generator (when in Manual mode only) Synchronisation takes place where necessary, followed by a soft ramp process.	
Open generator Allows the operator to open the generator (when in Manual mode only) Soft ramp down of load takes place if the module is configured to do so.	

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.	

6.3 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 module front panel configuration editor).

6.4 DUMMY LOAD / LOAD SHEDDING CONTROL

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.

6.2.1 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.

6.2.2 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.

NOTE:- Refer to DSE8800 Series Configuration Suite Manual (DSE part 057-164) for further details on configuration.

6.5 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.



6.5.1 ECU OVERRIDE

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.

6.6 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.

6.6.1 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 DSE8x60 mains controller or from another DSE8x10 controller over the MSC link.
- Activation of the inbuilt exercise scheduler.
- Instruction from external remote telemetry devices using the RS232 or RS485 interface.

6.6.2 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 Configuration Suite 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.

6.6.3 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 controller (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.

6.6.4 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.

6.7 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.

6.7.1 WAITING IN MANUAL MODE

When in manual mode, the set will not start automatically.
To begin the starting sequence, press the button.

6.7.2 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 8600 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.

6.7.3 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 DSE8x60 mains controller or from another DSE8x10 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 (DSE8810 only)
- Press the *auto mode* button to return to automatic mode.

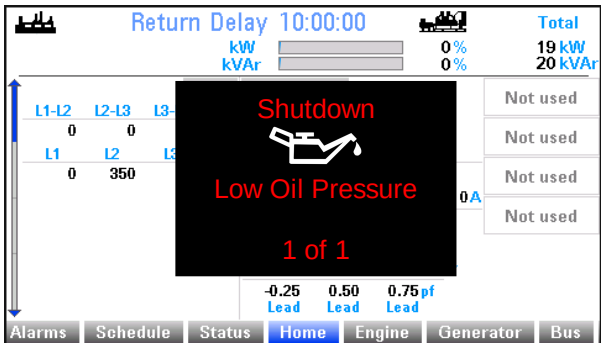
6.7.4 STOPPING SEQUENCE

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*.

7 PROTECTIONS

When an alarm is present, the Audible Alarm will sound and the LCD display indicates the alarm(s) that are present :



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

To reset the alarm, address the cause of the alarm, then press the *Stop/Reset* button.

7.1 PROTECTIONS DISABLED

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.

7.1.1 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.

7.1.2 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.

7.1.3 CAN ALARMS

NOTE:- Please refer to the engine manufacturer's documentation for ECU CAN error message information.

CAN alarms are messages sent from the CAN ECU to the DSE controller and displayed as follows in the below tables.

Display	Reason
CAN ECU Warning	The engine ECU has detected a warning alarm and has informed the DSE module of this situation. The exact error is also indicated on the module's display and action taken depending upon the setting for the DM1 signals
ECU Shutdown	The engine ECU has detected a shutdown alarm and has informed the DSE module of this situation. The exact error is also indicated on the module's display.
ECU Data Fail	The module is configured for CAN operation and does not detect data on the engine CAN datalink, the engine shuts down.

DM1 Signals. Messages from the CAN ECU that are configurable within the DSE module for:-
Warning, Electrical Trip, shutdown or None

Display	Reason
Amber Warning	The CAN ECU has detected a Amber warning.
Red Shutdown	The CAN ECU has detected a Red Shutdown.
Malfunction	The CAN ECU has detected a Malfunction message.
Protect	The CAN ECU has detected a Protect message

Advanced CAN alarms Allows configuration of additional can messages from the engine ECU.

Display	Reason
Water in Fuel	The ECU has detected water in the fuel action taken is set by settings in advanced.
After Treatment	The ECU has detected "After Treatment alarm" consult engine manufacturer for details" action taken by DSE controller is set by settings in advanced

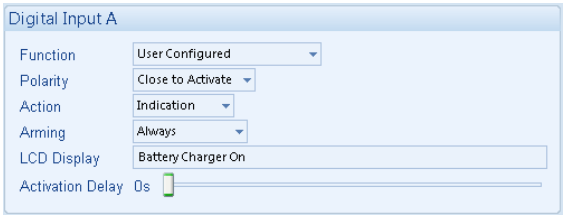
NOTE:- For CAN ECU error code meanings, refer to the ECU documentation provided by the engine manufacturer, or contact the engine manufacturer for further assistance.

7.2 INDICATIONS

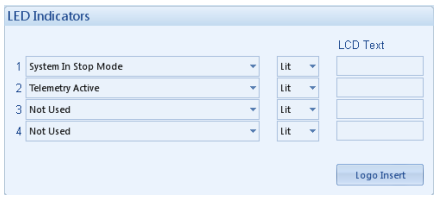
Indications are non-critical and often status conditions. They do not appear on the LCD of the module as a text message. However, an output or LCD indicator can be configured to draw the operator's attention to the event.

Example

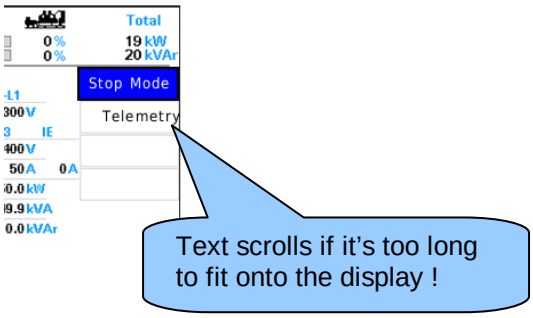
- Input configured for indication.
- The LCD text will not appear on the module display but can be added in the configuration to remind the system designer what the input is used for.
- As the input is configured to *Indication* there is no alarm generated.



- LCD Indicator to make LCD1 illuminate when the module is in Stop Mode.
- The Insert Card Text allows the system designer to print an insert card detailing the LCD function.



- Sample showing operation of the LCD indicators.



7.3 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.

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 DSE Configuration Suite in conjunction with a compatible PC.

Display	Reason
Auxiliary Inputs	If an auxiliary input has been configured as a warning the appropriate LCD message will be displayed and the **COMMON ALARM LED** will illuminate.
Charge Failure	The auxiliary charge alternator voltage is low as measured from the W/L terminal.
Battery Under Voltage	The DC supply has fallen below the low volts setting level for the duration of the low battery volts timer
Battery Over Voltage	The DC supply has risen above the high volts setting level for the duration of the high battery volts timer
Fail To Stop	The module has detected a condition that indicates that the engine is running when it has been instructed to stop. **NOTE:- 'Fail to Stop' could indicate a faulty oil pressure sensor or switch - If the engine is at rest check oil sensor wiring and configuration.**
Fuel Usage	Indicates the amount of fuel measured by the fuel level sensor is in excess of the *Fuel Usage* alarm settings. This often indicates a fuel leak or potential fuel theft.
Low Fuel Level	The level detected by the fuel level sensor is below the low fuel level setting.
CAN ECU Error	The engine ECU has detected a warning alarm and has informed the DSE module of this situation. The exact error is also indicated on the module's display.
Kw Overload	The measured Total kW is above the setting of the kW overload warning alarm
Earth Fault	The measured Earth Fault Current has been in excess of the earth fault trip and has surpassed the IDMT curve of the Earth Fault alarm.
Negative Phase Sequence	Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault
Maintenance Due	Indicates that the maintenance alarm has triggered. A visit is required by the Generator service company.
Loading Voltage Not Reached	Indicates that the generator voltage is not above the configured *loading voltage.* The generator will not take load when the alarm is present after the safety timer.
Loading Frequency Not Reached	Indicates that the generator frequency is not above the configured *loading frequency.* The generator will not take load when the alarm is present after the safety timer.

Display	Reason
Protections Disabled	Shutdown and electrical trip alarms can be disabled by user configuration. In this case, Protections Disabled will appear on the module display; The alarm text is displayed but the engine will continue to run. This is 'logged' by the module to allow DSE Technical Staff to check if the protections have been disabled on the module at any time.
Low Oil Pressure	The module detects that the engine oil pressure has fallen below the

	low oil pressure pre-alarm setting level after the *Safety On* timer has expired.
Engine High Temperature	The module detects that the engine coolant temperature has exceeded the high engine temperature pre-alarm setting level after the *Safety On* timer has expired.
Engine Low Temperature	The module detects that the engine coolant temperature has fallen below the high engine temperature pre-alarm setting level.
Overspeed	The engine speed has risen above the overspeed pre alarm setting
Underspeed	The engine speed has fallen below the underspeed pre alarm setting
Generator Over Frequency	The generator output frequency has risen above the pre-set pre-alarm setting.
Generator Under Frequency	The generator output frequency has fallen below the pre-set pre-alarm setting after the *Safety On* timer has expired.
Generator Over Voltage	The generator output voltage has risen above the pre-set pre-alarm setting.
Generator Under Voltage	The generator output voltage has fallen below the pre-set pre-alarm setting after the *Safety On* timer has expired.
Insufficient Capacity	f the generator reach full load when they are in parallel with the mains (utility). The LCD will indicate **'INSUFFICIENT CAPACITY'** and the **COMMON ALARM LED** will illuminate.
Mains Failed To Close	If the mains breaker fails to close, a warning is initiated. The LCD will indicate **'MAINS FAILED TO CLOSE'** and the **COMMON ALARM LED** will illuminate.
Mains Failed To Open	If the mains breaker fails to open, a warning is initiated. The LCD will indicate **'MAINS FAILED TO OPEN'** and the **COMMON ALARM LED** will illuminate.
Ecu Warning	The engine ECU has detected a warning alarm and has informed the DSE module of this situation. The exact error is also indicated on the module's display.

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.

7.4 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 DSE Configuration Suite in conjunction with a compatible PC.

7.5 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.

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).

Display	Reason
Earth Fault	The measured Earth Fault Current has been in excess of the earth fault trip and has surpassed the IDMT curve of the Earth Fault alarm.
Fail To Start	The engine has not fired after the preset number of start attempts
Emergency Stop	The emergency stop button has been depressed. This a failsafe (normally closed to battery positive) input and will immediately stop the set should the signal be removed. Removal of the battery positive supply from the emergency stop input will also remove DC supply from the Fuel and Start outputs of the controller. **NOTE:- The Emergency Stop Positive signal must be present otherwise the unit will shutdown.**
Low Oil Pressure	The engine oil pressure has fallen below the low oil pressure trip setting level after the *Safety On* timer has expired.
Engine High Temperature	The engine coolant temperature has exceeded the high engine temperature trip setting level after the *Safety On* timer has expired.
Fuel Usage	Indicates the amount of fuel measured by the fuel level sensor is in excess of the *Fuel Usage* alarm settings. This often indicates a fuel leak or potential fuel theft.
Phase Rotation	The phase rotation is measured as being different to the configured direction.
Overspeed	The engine speed has exceeded the pre-set trip **NOTE:-During the start-up sequence, the overspeed trip logic can be configured to allow an extra trip level margin. This is used to prevent nuisance tripping on start-up - Refer to the DSE8800 series configuration software manual under heading 'Overspeed Overshoot' for details.**
Underspeed	The engine speed has fallen below the pre-set trip after the ***Safety On*** timer has expired.

Display	Reason
Generator Over Frequency	The generator output frequency has risen above the preset level
Generator Under Frequency	The generator output frequency has fallen below the preset level
Generator Over Voltage	The generator output voltage has risen above the preset level
Generator Under Voltage	The generator output voltage has fallen below the preset level
Oil Pressure Sensor Open Circuit	The oil pressure sensor is detected as not being present (open circuit)
Auxiliary Inputs	An active auxiliary input configured as a shutdown will cause the engine to shut down. The display shows the text as configured by the user.
Loss Of Speed Signal	The speed signal from the magnetic pickup is not being received by the DSE controller.
ECU Data Fail	The module is configured for CAN operation and does not detect data on the engine Can datalink, the engine shuts down.
ECU Shutdown	The engine ECU has detected a shutdown alarm and has informed the DSE module of this situation. The exact error is also indicated on the module's display.
kW Overload	The measured Total kW is above the setting of the kW overload shutdown alarm
Negative Phase Sequence	Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault
Maintenance Due	Indicates that the maintenance alarm has triggered. A visit is required by the Generator service company.
Generator High Current	A High Current condition has continued for an excess period, then the alarm escalates to either a shutdown or electrical trip condition (depending upon module configuration). For further details of the high current alarm, please see High Current Shutdown / Electrical Trip Alarm.
Loading Voltage Not Reached	Indicates that the generator voltage is not above the configured loading voltage after the safety timer. The generator will shutdown.
Loading Frequency Not Reached	Indicates that the generator frequency is not above the configured loading frequency after the safety timer. The generator will shutdown.
Protections Disabled	Shutdown and electrical trip alarms can be disabled by user configuration. In this case, Protections Disabled will appear on the module display; The alarm text will be displayed but the engine will continue to run. This is 'logged' by the module to allow DSE Technical Staff to check if the protections have been disabled on the module at any time.

7.6 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.

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

Display	Reason
Generator High Current	If a generator output in excess of the high current alarm point, a warning alarm occurs. If this high current condition continues for an excess period, then the alarm escalates to either a shutdown or electrical trip condition (depending upon module configuration). For further details of the high current alarm, please see High Current Shutdown / Electrical Trip Alarm.
Auxiliary Inputs	If an auxiliary input configured as an electrical trip is active, the user configured message shows on the display.
Kw OVERLOAD	The measured Total kW is above the setting of the kW overload Electrical Trip alarm
Earth Fault	The measured Earth Current is above the setting of the Earth fault alarm.
Negative Phase Sequence	Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault
Fuel Usage	Indicates the amount of fuel used is in excess of the *Fuel Usage* alarm settings. This often indicates a fuel leak or potential fuel theft.
Loading Voltage Not Reached	Indicates that the generator voltage is not above the configured loading voltage after the safety timer. The generator will shutdown.
Loading Frequency Not Reached	Indicates that the generator frequency is not above the configured loading frequency after the safety timer. The generator will shutdown.
Protections Disabled	Shutdown and electrical trip alarms is disabled by user configuration. In this case, Protections Disabled will appear on the module display; The alarm text is displayed but the engine will continue to run. This is 'logged' by the module to allow DSE Technical Staff to check if the protections have been disabled on the module at any time.
Generator Under Frequency	The generator output frequency has fallen below the preset level
Generator Under Voltage	The generator output voltage has fallen below the preset level
Insufficient Capacity	If the module is configured for Mains CT and the load levels are so high that the generator is unable to supply enough load to maintain the configured mains level, insufficient capacity will be displayed and the **COMMON ALARM LED** will flash. The generator will provide 100% of its capacity and the loading on the mains will increase.
Underspeed	The engine speed has fallen below the underspeed setting

7.7 HIGH CURRENT SHUTDOWN / ELECTRICAL TRIP ALARM

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

7.7.1 IMMEDIATE WARNING

If the *Immediate Warning* is enabled, the 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.

7.7.2 IDMT ALARM

If the *IDMT Alarm* is enabled, the 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.

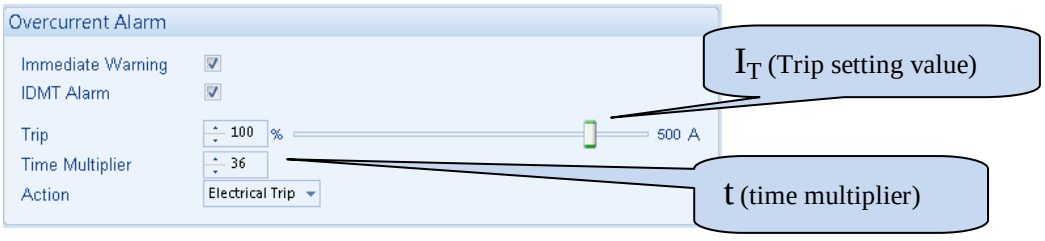
Remove the fault then press Stop/Reset to reset the module.

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

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

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 :



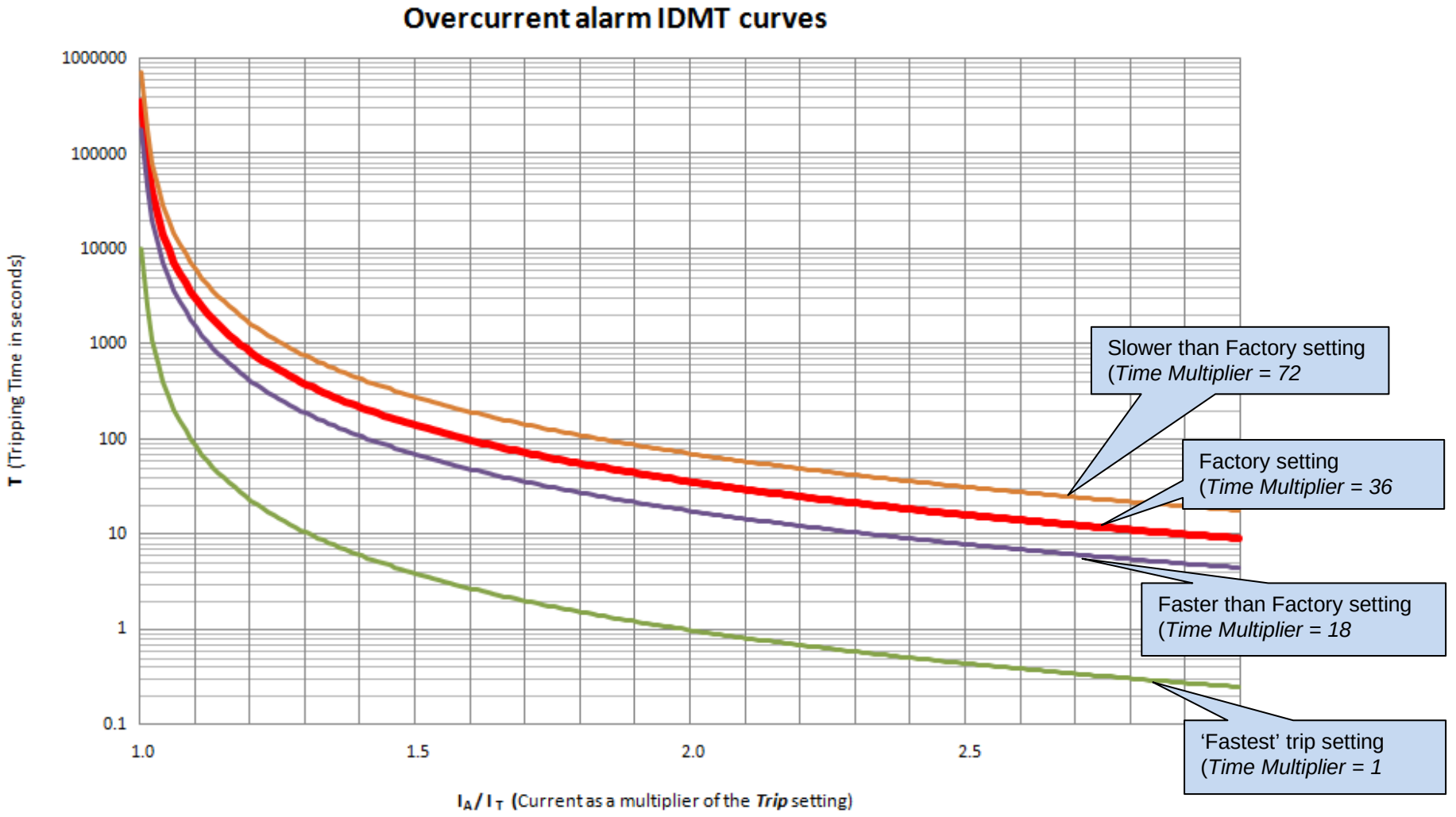
These settings provide for normal running of the generator up to 100% full load. If full load is surpassed, the *Immediate Warning* alarm is triggered, the set continues to run.
The effect of an overload on the generator is that the alternator windings begin to overheat; the aim of the *IDMT alarm* is 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.

For further details on the *Thermal damage curve* of your alternator, you are referred to your alternator manufacturer and generator supplier.


Overcurrent alarm IDMT curves
1000000
100000
10000
1000
100
10
1
0.1
T (Tripping Time in seconds)
1.0
1.5
2.0
2.5
I_A / I_T (Current as a multiplier of the *Trip* setting)
Slower than Factory setting
(*Time Multiplier = 72*
Factory setting
(*Time Multiplier = 36*
Faster than Factory setting
(*Time Multiplier = 18*
'Fastest' trip setting
(*Time Multiplier = 1*

7.8 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.

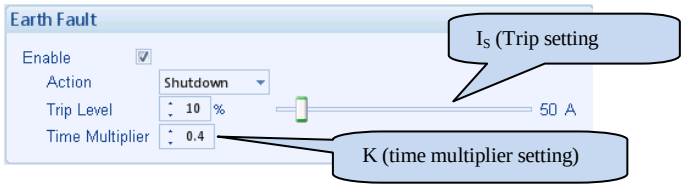
If the *Earth Fault alarm* is enabled, the controller begins following the IDMT 'curve'. If the *Trip* is surpassed for an excess amount of time the Alarm triggers (*Shutdown* or *Electric trip* as selected in *Action*).

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

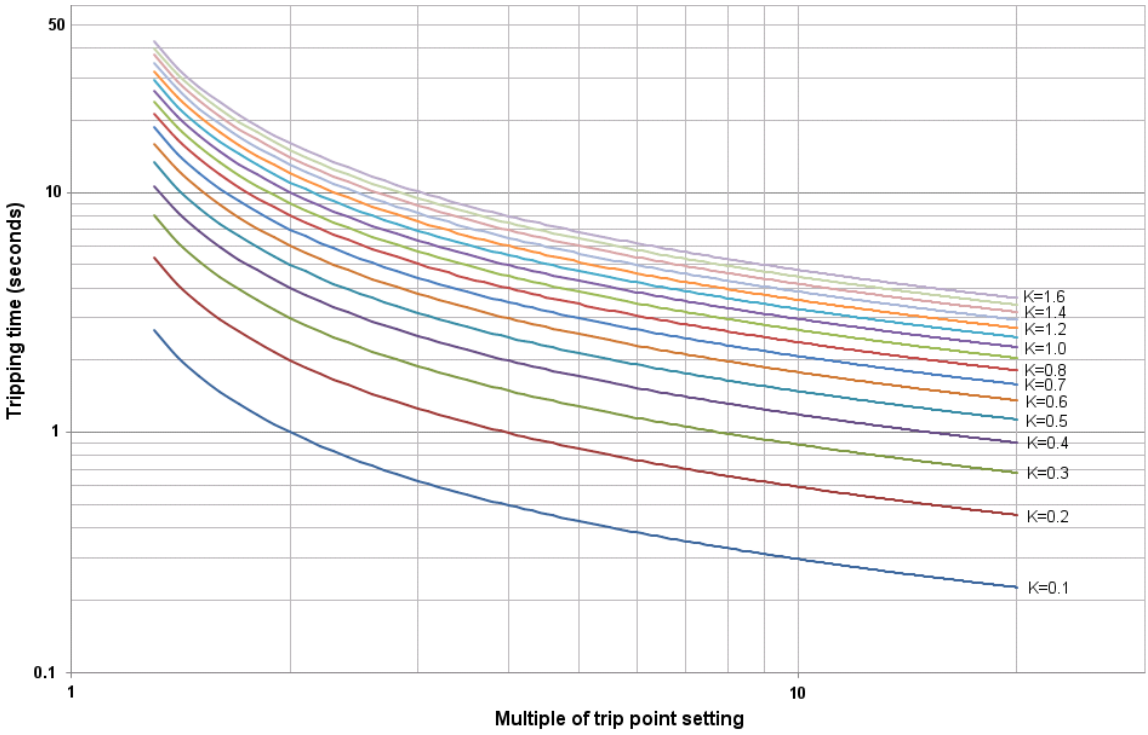
$$T = K \times 0.14 / ((I / I_s)^{0.02} - 1)$$

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

I_s is the trip setting value



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



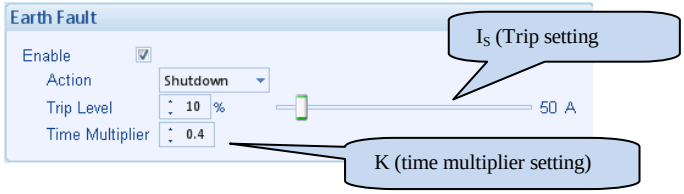
7.9 SHORT CIRCUIT ALARM

If the *Short Circuit alarm* is enabled, the controller begins following the IDMT 'curve'. If the *Trip* is surpassed for an excess amount of time the Alarm triggers (*Shutdown* or *Electrical trip* as selected in *Action*).

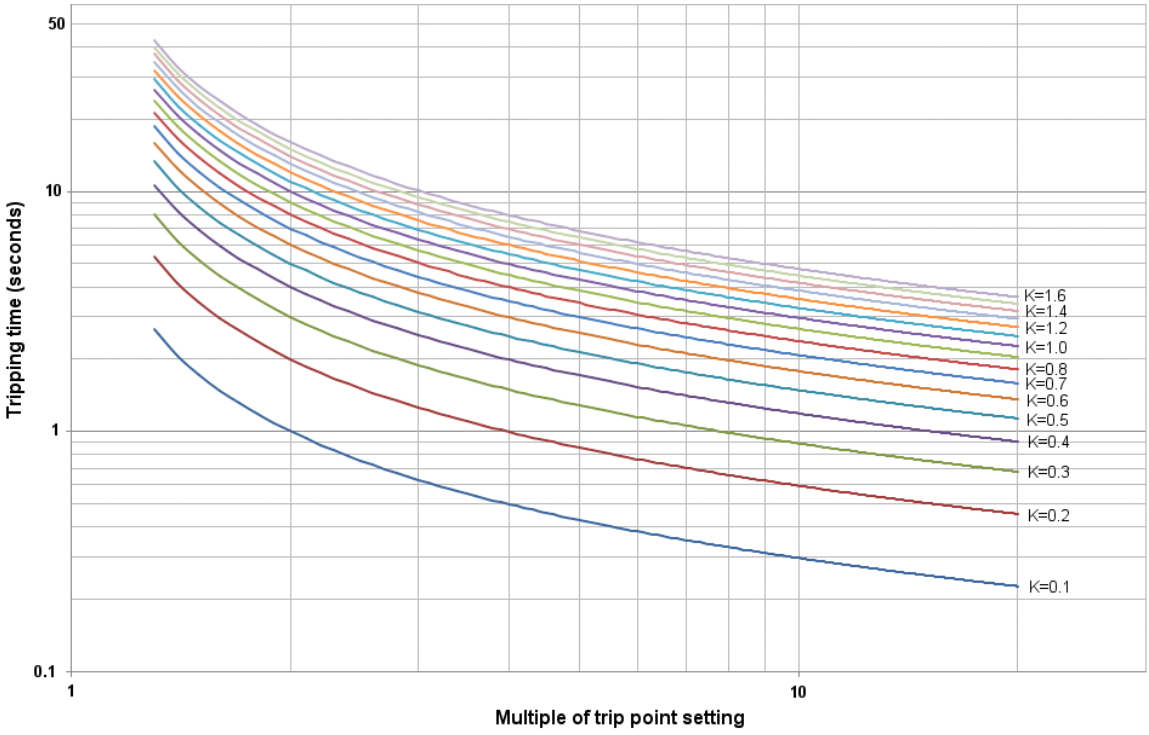
The higher the Short Circuit, the faster the trip. The speed of the trip is dependent upon the fixed formula :

$$T = K \times 0.14 / ((I / I_s)^{0.02} - 1)$$

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 current measured
Is is the trip setting value



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

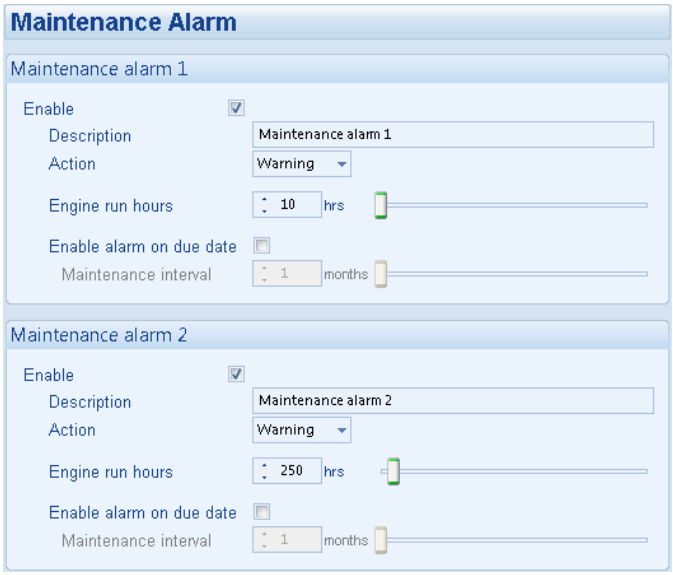


7.10 MAINTENANCE ALARM

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.

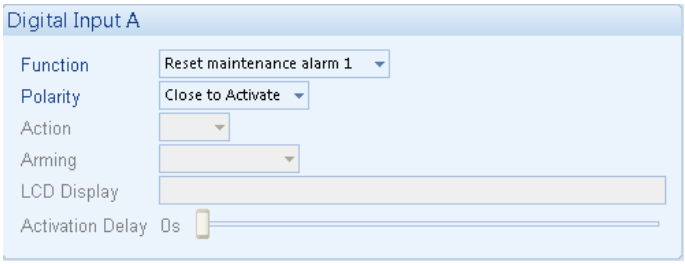


When activated, the maintenance alarm can be either a **warning** (set continues to run) or **shutdown** (running the set is not possible). Resetting the maintenance alarm is normally actioned by the site service engineer after performing the required maintenance.
The method of reset is either by:

- Activating a 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.



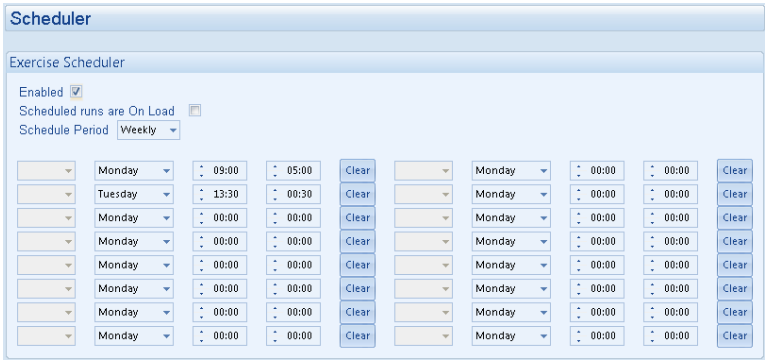
8 SCHEDULER

The controller 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

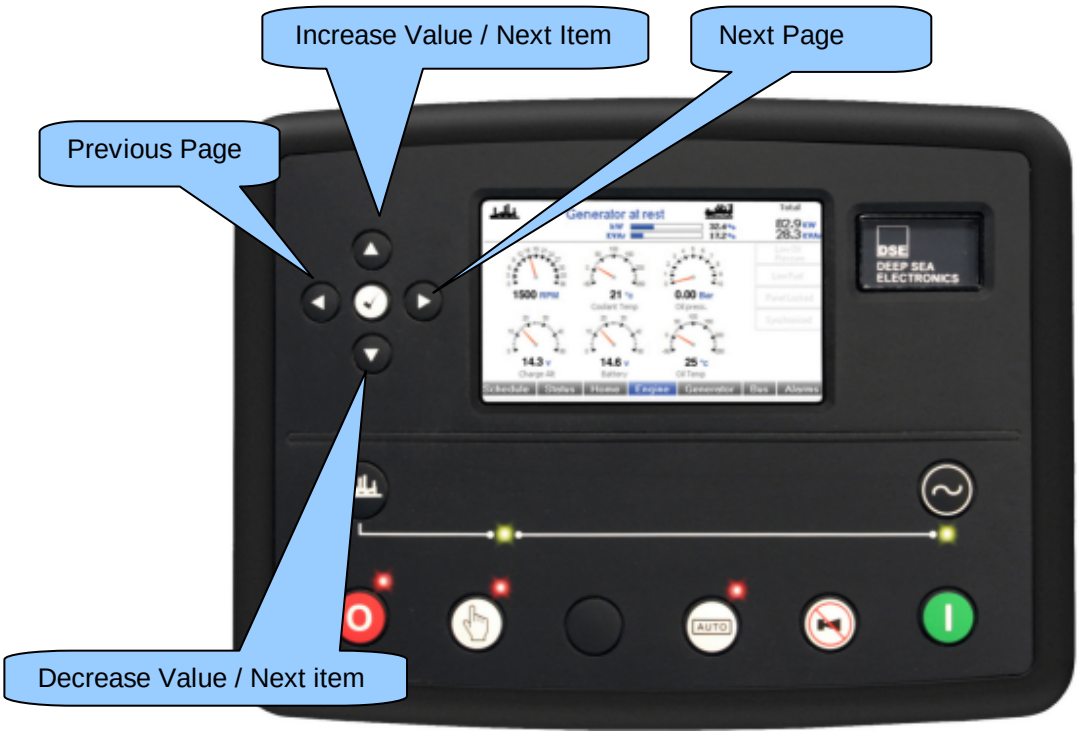
8.1.3 AUTO MODE

- 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 will not be started. However, if the module is moved into AUTO mode during a scheduled run, the engine will be 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 and hold the the Stop button and Tick button together.
- If a module security PIN has been set, the PIN number request is then shown .
- 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.
- 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.
- 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 or button.

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.

9.1.1 EDITING A PARAMETER

- Enter the editor as described above.
- Press the (up) (down) and (right) to cycle to the section you wish to view/change.
- Then press (up) or (down) to cycle to the parameter within the section you have chosen.
- 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 or 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 DSE8800 series PC configuration software – DSE Part 057-164. Please contact us for further details.

9.1.2 ADJUSTABLE PARAMETERS

Section	Parameter	Detail of Parameter	Parameter Action	Values
Inputs	Oil Pressure	Low Oil Pressure	Shutdown Trip	0.00 Bar
			Warning Trip	0.00 Bar
	Coolant Temperature	High Coolant Alarms	Pre-Alarm Trip	00 Deg C
			Electrical Trip	00 Deg C
			Shutdown Trip	00 Deg C
		Low Coolant Alarms	Pre Alarm Trip	00 Deg C
	Fuel Level	Fuel Usage Alarm	Running Rate	Up / down
			Stopped Rate	Up / down
Timers	Start Timers	Start Delay	Remote Start Off Load	*s*
			Remote start On Load	*s*
			Telemetry Start	s
		Start Timers	Preheat	s
			Cranking Time	s
			Crank Rest Time	s
			Smoke Limit	s
			Smoke Limit Off	s
			Safety on Delay	s
			Warming up Timer	s
	Stopping Timers	Stopping Timers	Return Delay	s
			Cooling Time	mm:ss
			Fail To Stop Delay	0s
			Gen Transient Delay	0s
	Display		Page Timer	mm: ss
			Scroll Timer	s
Generator	Generator Options	AC System		3 Phase, 4 wire Delta
				2 Phase, 3 Wire L1-L3
				2 Phase, 3 Wire L1-L2
				3 Phase, 3 Wire
				Single Phase, 2 Wire
				3 Phase, 4 Wire
		Generator Rating	KW Rating	0 KW
			kVAr Rating	0 kVAr
	Generator Current	Current Options	CT Primary (L1,L2,L3,N)	0A
			CT Secondary 5Amp / 1 Amp	5 / 1 Amp
			Full Load Rating	0A
		Earth Fault	Earth CT Primary	0A
			Trip Action	Enabled / Disabled
			Trip Percentage	0%
		Over Current Alarm	IDMT Alarm	Enabled / Disabled
			Trip	0% 0.0A
		Short Circuit	Trip	0% 0.0A
	Generator Voltage	Under Voltage Alarms	Alarm Trip	0%
			Pre-Alarm Trip	0A
		Nominal Voltage	Nominal Voltage	0V
		Over Voltage Alarms	Pre-alarm ttrip	0V
			Alarm Trip	0V
	Generator Frequency	Under Frequency Alarms	Alarm Trip Pre-Alarm Trip	0.0Hz 0.0Hz
		Nominal Frequency	Nominal Frequency	0.0Hz
			Pre-Alarm Trip Alarm Trip	0.0Hz 0.0Hz
	Generator Power	Overload Protection	Overload Protection Trip	0% (0 kW)
			Reverse Power Trip (Delay)	0kW (0.0 s)
	Synchronising	Load Control	Reactive Load Mode	*KVAr Fixed Export*
				kVAr Share
				None
		Ramp Speed	Ramp Speed	0.0 %/s
		Load Demand	Calling For More Sets	0 %
			Calling For Less Sets	0 %
		Insufficient Capacity	Action	Warning / Shutdown / None / Indication / Electrical Trip
Engine	Engine Options	Overspeed Options	Overspeed Overshoot	0%
			Overshoot Delay	s
		Droop	Enable	Enabled / Disabled
			Percent	0.0%
	Speed Settings	Under Speed	Alarm Enable	Enabled / Disabled
			Alarm Trip	0000 RPM
			Warning Enable	Enabled / Disabled
			Warniing Trip	0000 RPM
		Over Speed	Alarm Trip	0000 RPM
			Pre-Alarm Enable	Enabled / Disabled
			Pre-Alarm Trip	0000 RPM
	Plant Battery	Under Voltage Alarms	Under Volts Enable	Enabled / Disabled
			Under Volts Delay	mm:ss
			Under Volts Pre-Alarm	0.0v
		Over Voltage Alarms	Over Volts Enable	Enabled / Disabled
			Over volts Delay	mm:ss
			Over Volts Pre-Alarm	0.0v
		Charge Alt Alarm	Alarm Enable	Enabled / Disabled
			Alarm Trip	0.0v
			Alarm Delay	s
		Charge Alt Pre-Alarm	Pre-Alarm Enable	Enabled / Disabled
			Pre-Alarm Trip	0.0v
			Pre-Alarm Delay	s
Alt. Config Options	Default Configuration			Alternative Configuration 3
				Alternative Configuration 2
				Alternative Configuration 1
				Main Configuration

9.2 ACCESSING THE 'MAINTENANCE' CONFIGURATION EDITOR

- Press (up) or (down) buttons together.
- Press ,(Up) or(down) (right) to cycle to the Parameter you wish to action.

Description	Action	Activation
USB Stick Removal	Request	Press (up) Button
Override Starting Alarms	Request	
Clear AMF Alarm	Clear	
Manual Fuel Pump	Inactive	
Min / Max Session Reset	Request	
Cancel Telemetry	Request	

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

9.2.1 ADJUSTABLE PARAMETERS (MAINTENANCE CONFIGURATION EDITOR)

- Press the (up) or (down) buttons to cycle to the section you wish to view / change.
- To Edit the parameter press the Tick button 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 the Tick button to save the value. The parameter ceases flashing to indicate that it has been saved.
- Press and hold Tick button to exit the “Running Configuration Editor”.

9.3 ACCESSING THE 'RUNNING' CONFIGURATION EDITOR

- The 'running' or 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.

9.3.1 ADJUSTABLE PARAMETERS (RUNNING CONFIGURATION EDITOR)

- Press the ▲ (up) or ▼ (down) buttons to cycle to the section you wish to view / change.
- To edit the parameter press the ✓ Tick button 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 the ✓ Tick button to save the value. The parameter ceases flashing to indicate that it has been saved.
- Press and hold ✓ Tick button to exit the "Running Configuration Editor".

Section	Parameter	Detail Of Parameter	Values
Language	Language		other
			English (United Kingdon)
Generator	Running	Load Power Factor	0%
			0.00pf
			0kVAr
		Load Parallel Power	0%
			0kW
	Load Priority	Load Priority	1
	Options	Starting Alarms	Disabled / Enabled
		Decoupling Test Mode	Disabled / Enabled
	Voltage	Voltage Adjust	0%
	Frequency	Frequency Adjust	0%
Display	Press/ Temp Units	Pressure	kPA / PSI / Bar
		Temperature	Deg F / Deg C
	Volume Units	Volume	Litre / Gallons US / Gallons (UK)
	Display	LCD Backlight	0%
	AC Graphics	AC Min / Max Enable	Enabled / Disabled
		AC Meter Enable	Enabled / Disabled
		THD Screen Enable	Enabled / Disabled
	Engine	Multi Meter Mode	Enabled / Disabled
		Tier 4 Screen	Enabled / Disabled
	Alarm	Alarm Alert Box	Enabled / Disabled
	Summary	Summary Area Graphic	Bars / Connectors
	Home	Commissioning Screens	Enabled / Disabled
Engine	Speed Adjust		▲Up /▼ Down buttons
Time	Module Time		hh:mm:ss
	Module Date		DD/ MM/ YYYY
	Date Format	MM/ DD/ YYYY OR DD/ MM/ YYYY	MM/ DD/ YYYY OR DD/ MM/ YYYY

10 COMMISSIONING

10.1 PRE-COMMISSIONING

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

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

- 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 and then press the unit start sequence will commence.
- 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 position to reset the unit.
- Restore the engine to operational status (reconnect the fuel solenoid). Select and then press. This time the engine should start and the starter motor should disengage automatically. If not then check that the engine is fully operational (fuel available, etc.) and that the fuel solenoid is operating. The engine should now run up to operating speed. If not, and an alarm is present, check the alarm condition for validity, then check input wiring. The engine should continue to run for an indefinite period. It will be possible at this time to view the engine and alternator parameters - refer to the 'Description of Controls' section of this manual.
- Select on the front panel, the engine will run for the pre-set cooling down period, then stop. The generator should stay in the standby mode. If not check that there is not a signal present on the **Remote start** input.
- Initiate an automatic start by supplying the remote start signal (if configured). The start sequence will commence and the engine will run up to operational speed. Once the generator is available a load transfer will take place (if configured), the Generator will accept the load. If not, check the wiring to the Generator Contactor Coil *(if used)*. Check the Warming timer has timed out.
- Remove the remote start signal. The return sequence will begin. After the pre-set time, the generator is unloaded. The generator will then run for the pre-set cooling down period, then shutdown into its standby mode.
- 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.*
- If, despite repeated checking of the connections between the controller and the customer's system, satisfactory operation cannot be achieved, then the customer is requested to contact the factory for further advice on:- support@deepseaplc.com

11 FAULT FINDING

11.1 STARTING

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.
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 module's inputs. Refer to engine manual.
Continuous starting of generator when in AUTO mode.	Check that there is no signal present on the "Remote Start" input. Check configured polarity is correct. Check the mains supply is available and within configured limits
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 is configured to be used as "Remote Start". 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 controller.

11.2 LOADING

SYMPTOM	POSSIBLE REMEDY
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.
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 the sensor common terminal Check that sensor is compatible with the module and that the module configuration is suited to the sensor.

11.3 ALARMS

SYMPTOM	POSSIBLE REMEDY
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 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 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.
CAN ECU WARNING CAN ECU SHUTDOWN	This indicates a fault condition detected by the engine ECU and transmitted to the DSE controller. Press the RIGHT ARROW button to view the engine diagnostic code and consult the engine manufacturer's documentation.
CAN DATA FAIL	Indicates failure of the CAN data link to the engine ECU. Check all wiring and termination resistors (if required). Check the ECU OVERRIDE function detailed in the section entitlted OPERATION elsewhere in this manual.
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 the sensor common terminal. Check that sensor is compatible with the module and that the module configuration is suited to the sensor.

11.4 COMMUNICATIONS

SYMPTOM	POSSIBLE REMEDY
CAN DATA FAIL	Indicates failure of the CAN data link to the engine ECU. Check all wiring and termination resistors (if required). Check the ECU OVERRIDE function detailed in the section entitlted OPERATION elsewhere in this manual.
RS485 inoperative	Check : • Connection cable – Belden 9841 or equivalent • 120Ω termination resistors are correctly fitted • Baud rate of controller and of master device are the same • Slave ID of the controller is the same as configured in the master device
RS232 connection to PC inoperative	Check : • RS232 maximum of 15m is not exceeded • Direct to PC connection requires a Crossover (NULL modem) RS232 cable • Baud rate of controller and of master device are the same • Slave ID of the controller is the same as configured in the master device
RS232 connection to GSM modem inoperative	Check : • RS232 maximum of 15m is not exceeded • Modem Initialisation strings in the DSE configuration is correct for the connected modem type • Modem is configured to 9600 baud • SIM card is CSD (circuit switched data) compatible • SIM card is not PIN locked • SIM card is correctly inserted • Antenna is correctly installed and is not inside an earthed metal cabinet / control panel • A good signal is available in the locality
RS232 connection to landline modem inoperative	Check : • RS232 maximum of 15m is not exceeded • Modem Initialisation strings in the DSE configuration is correct for the connected modem type • Modem is configured to 9600 baud
Ethernet comms direct to PC inoperative	Check : • Ethernet rated cable is used • Direct to PC connection requires a CROSSOVER cable. • Check the IP address of the DSE controller is correct • Check the PC is not set to *obtain IP address automatically* • Check PC firewall will allow traffic on the configured port.
Ethernet connected to a router.	Check : • Ethernet rated cable is used • Router connection requires a *straight through'* cable. • Check the IP address of the DSE controller is correct • Check all firewalls and routers will allow traffic on the configured port. • Test the controller connected directly to a PC for test purposes to elimate router problems.

11.5 INSTRUMENTS

SYMPTOM	POSSIBLE REMEDY
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 powerfactor) The 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. Ie Gen volts full scale is 333V ph-n so accuracy is ±3.33V (1% of 333V).

11.6 MISCELLANEOUS

SYMPTOM	POSSIBLE REMEDY
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

NOTE:- The above fault finding is provided as a guide check-list only. As the module can be configured to provide a wide 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 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).

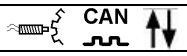
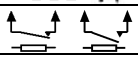
13.1 PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE

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

13.1.1 PACK OF PLUGS

Module type	Plug Pack Part Number
DSE8800	100-400-88

13.1.2 INDIVIDUAL PLUGS

Module Terminal Designation		Plug Description	Part No.
1-15		13 way 5.08mm	007-102
15-19		5 way 5.08mm	007-445
22-38		17 way 5.08mm	007-452
39-46		8 way 7.62mm	007-454
47-50	V2	4 way 7.62mm	007-171
51-57		7 way 5.08mm	007-447
59-70		12 way 5.08mm	007-109
RS485	Port1 Port2	6 way 5.08mm	007-446
		PC Configuration interface lead (USB type A – USB type B)	016-125

NOTE:- Terminals 20, 21 and 58 are not fitted to the controller.

13.2 PURCHASING ADDITIONAL FIXING CLIPS FROM DSE

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

13.3 PURCHASING ADDITIONAL SEALING GASKET FROM DSE

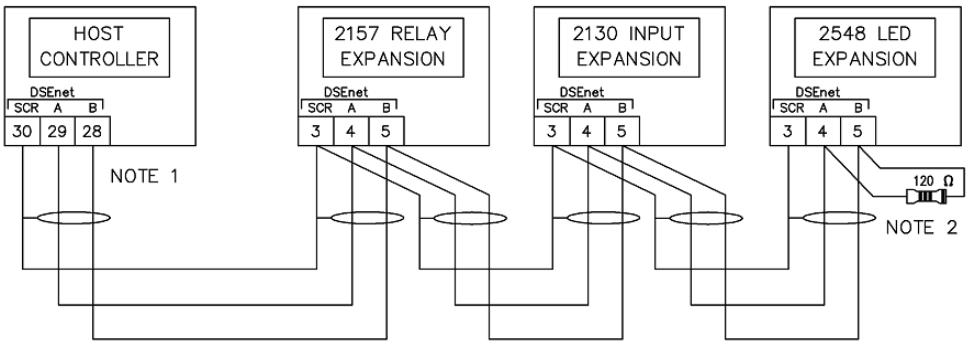
Item	Description	Part No.
	DSE88xx Moulded silicon sealing gasket	020-508

13.4 DSENET EXPANSION MODULES

NOTE:- A maximum of twenty (20) expansion modules can be connected to the DSENet®.

NOTE:- DSENet® utilises an RS485 connection. Using Belden 9841 (or equivalent) cable allows for the expansion cable to be extended to a maximum of 1.2km.
DSE Stock and supply Belden 9841 cable. DSE Part Number 016-030.

Item	Max No. supported	Description	Model order number	DSE Part Numbers Sales literature	Operator manual	Installation Instructions
	4	Model DSE2130 input module provides additional analogue and digital inputs for use with the controller.	2130-001-00	055-060	057-082	053-033
	4	Model DSE2131 Ratio-metric input expansion module provides additional restive, digital, 0-10V and 4-20ma inputs for use with the controller.	2131-001-00	055-115	057-139	053-125
	4	Model DSE2133 RTD/Thermocouple input expansion module provides additional RTD and thermocouple inputs for use with the controller.	2133-001-00	055-114	057-140	053-126
	4	Model DSE2152 Ratio-metric output expansion module provides additional 0-10V and 4-20ma outputs for use with the controller.	2152-001-00	055-112	057-141	053-134
	10	Model DSE2157 expansion relay module provides eight additional voltage free relays for use with the controller	2157-001-00	055-061	057-083	053-034
	10	Model DSE2548 expansion LED module provides additional LED indications, internal sounder and remote lamp test/alarm mute for use with the controller.	2548-001-00	055-062	057-084	053-032



NOTE 1
AS A TERMINATING RESISTOR IS INTERNALLY FITTED TO THE HOST CONTROLLER, THE HOST CONTROLLER MUST BE THE FIRST UNIT ON THE DSEnet

NOTE 2
A 120 OHM TERMINATION RESISTOR MUST BE FITTED TO THE LAST UNIT ON THE DSEnet

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 that is almost complete and is being phased through different product groups.

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