



# **DEEP SEA ELECTRONICS PLC**

## **DSE7400 Operator Manual**

**Document Number 057-161**

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### DSE7400 Operator Manual

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### Amendments List

| Issue | Comments        | Minimum<br>Module<br>version<br>required | Minimum<br>Configuration Suite<br>Version required |
|-------|-----------------|--|--|
| 1     | Initial release | V1.0.0                                   | 2011.10v1.0.7                                      |
|       |                 |  |  |
|       |                 |  |  |
|       |                 |  |  |
|       |                 |  |  |

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.

## TABLE OF CONTENTS

| Section  | Page     |
|--|----------|
| <b>1 BIBLIOGRAPHY .....</b>                                | <b>7</b> |
| 1.1 INSTALLATION INSTRUCTIONS.....                         | 7        |
| 1.2 TRAINING GUIDES .....                                  | 7        |
| 1.3 MANUALS .....  | 7        |
| 1.4 THIRD PARTY DOCUMENTS.....                             | 7        |
| <b>2 INTRODUCTION .....</b>                                | <b>8</b> |
| <b>3 SPECIFICATIONS.....</b>                               | <b>9</b> |
| 3.1 PART NUMBERING .....                                   | 9        |
| 3.1.1 SHORT NAMES.....                                     | 9        |
| 3.2 TERMINAL SPECIFICATION .....                           | 10       |
| 3.3 POWER SUPPLY REQUIREMENTS .....                        | 10       |
| 3.4 GENERATOR VOLTAGE / FREQUENCY SENSING .....            | 10       |
| 3.5 GENERATOR CURRENT SENSING .....                        | 11       |
| 3.5.1 VA RATING OF THE CTS .....                           | 11       |
| 3.5.2 CT POLARITY .....                                    | 12       |
| 3.5.3 CT PHASING .....                                     | 12       |
| 3.5.4 CT CLASS .....                                       | 12       |
| 3.6 INPUTS .....   | 13       |
| 3.6.1 DIGITAL INPUTS.....                                  | 13       |
| 3.6.2 ANALOGUE INPUTS.....                                 | 13       |
| 3.6.2.1 OIL PRESSURE .....                                 | 13       |
| 3.6.2.2 COOLANT TEMPERATURE .....                          | 13       |
| 3.6.2.3 FUEL LEVEL .....                                   | 13       |
| 3.6.2.4 FLEXIBLE SENSOR.....                               | 14       |
| 3.6.3 CHARGE FAIL INPUT .....                              | 14       |
| 3.6.4 MAGNETIC PICKUP.....                                 | 14       |
| 3.7 OUTPUTS.....   | 15       |
| 3.7.1 OUTPUTS A & B.....                                   | 15       |
| 3.7.2 CONFIGURABLE OUTPUTS C & D (LOAD SWITCHING) .....    | 15       |
| 3.7.2.1 CONTACTOR COILS.....                               | 15       |
| 3.7.2.2 UNDERVOLTAGE (UV COILS).....                       | 15       |
| 3.7.2.3 CLOSING COILS.....                                 | 16       |
| 3.7.2.4 OPENING COILS / SHUNT TRIP COILS.....              | 16       |
| 3.7.3 OUTPUTS E,F,G,H, I & J .....                         | 16       |
| 3.8 COMMUNICATION PORTS .....                              | 17       |
| 3.9 COMMUNICATION PORT USAGE .....                         | 17       |
| 3.9.1 CAN INTERFACE .....                                  | 17       |
| 3.9.2 USB CONNECTION .....                                 | 18       |
| 3.9.3 USB HOST-MASTER (USB DRIVE CONNECTION) .....         | 18       |
| 3.9.4 RS232 .....  | 19       |
| 3.9.4.1 RECOMMENDED PC RS232 SERIAL PORT ADD-ONS .....     | 19       |
| 3.9.4.2 RECOMMENDED EXTERNAL MODEMS: .....                 | 20       |
| 3.9.5 RS485 .....  | 21       |
| 3.9.5.1 RECOMMENDED PC RS485 SERIAL PORT ADD-ONS .....     | 21       |
| 3.9.6 ETHERNET.....  | 22       |
| 3.9.6.1 DIRECT PC CONNECTION .....                         | 22       |
| 3.9.6.2 CONNECTION TO BASIC ETHERNET .....                 | 23       |
| 3.9.6.3 CONNECTION TO COMPANY INFRASTRUCTURE ETHERNET..... | 24       |
| 3.9.6.4 CONNECTION TO THE INTERNET .....                   | 25       |
| 3.9.6.5 FIREWALL CONFIGURATION FOR INTERNET ACCESS.....    | 27       |
| 3.10 DSENET® FOR EXPANSION MODULES.....                    | 28       |
| 3.10.1 DSENET® USED FOR MODBUS ENGINE CONNECTION .....     | 28       |
| 3.11 SOUNDER.....  | 29       |

|             |   |           |
|-------------|---|-----------|
| 3.11.1      | ADDING AN EXTERNAL SOUNDER TO THE APPLICATION.....                  | 29        |
| <b>3.12</b> | <b>ACCUMULATED INSTRUMENTATION.....</b>                             | <b>29</b> |
| <b>3.13</b> | <b>DIMENSIONS AND MOUNTING .....</b>                                | <b>30</b> |
| 3.13.1      | DIMENSIONS .....  | 30        |
| 3.13.2      | PANEL CUTOUT .....  | 30        |
| 3.13.3      | WEIGHT .....  | 30        |
| 3.13.4      | FIXING CLIPS.....   | 31        |
| 3.13.5      | CABLE TIE FIXING POINTS .....                                       | 32        |
| 3.13.6      | SILICON SEALING GASKET .....  | 32        |
| <b>3.14</b> | <b>APPLICABLE STANDARDS .....</b>                                   | <b>33</b> |
| 3.14.1      | ENCLOSURE CLASSIFICATIONS.....                                      | 35        |
| 3.14.2      | NEMA CLASSIFICATIONS.....   | 36        |
| <b>4</b>    | <b>INSTALLATION .....</b>   | <b>37</b> |
| <b>4.1</b>  | <b>TERMINAL DESCRIPTION .....</b>                                   | <b>37</b> |
| 4.1.1       | DC SUPPLY, FUEL AND START OUTPUTS, OUTPUTS E-J .....                | 38        |
| 4.1.2       | ANALOGUE SENSOR.....  | 39        |
| 4.1.3       | MAGNETIC PICKUP, CAN AND EXPANSION .....                            | 40        |
| 4.1.4       | LOAD SWITCHING AND V1 GENERATOR VOLTAGE SENSING .....               | 41        |
| 4.1.5       | V2 BUS/MAINS VOLTAGE SENSING.....                                   | 41        |
| 4.1.6       | GENERATOR CURRENT TRANSFORMERS .....                                | 42        |
| 4.1.7       | CONFIGURABLE DIGITAL INPUTS .....                                   | 44        |
| 4.1.8       | PC CONFIGURATION INTERFACE CONNECTOR .....                          | 44        |
| 4.1.9       | RS485 CONNECTOR.....  | 45        |
| 4.1.10      | RS232 CONNECTOR.....  | 45        |
| <b>4.2</b>  | <b>TYPICAL WIRING DIAGRAMS .....</b>                                | <b>46</b> |
| 4.2.1       | DSE7410 3 PHASE, 4 WIRE WITH RESTRICTED EARTH FAULT PROTECTION..... | 47        |
| 4.2.2       | DSE7420 3 PHASE, 4 WIRE WITH RESTRICTED EARTH FAULT PROTECTION..... | 48        |
| <b>4.3</b>  | <b>ALTERNATIVE TOPOLOGIES .....</b>                                 | <b>49</b> |
| 4.3.1       | 3 PHASE, 4 WIRE WITHOUT EARTH FAULT PROTECTION.....                 | 49        |
| 4.3.2       | SINGLE PHASE WITH RESTRICTED EARTH FAULT .....                      | 50        |
| 4.3.3       | SINGLE PHASE WITHOUT EARTH FAULT.....                               | 50        |
| 4.3.4       | 2 PHASE (L1 & L2) 3 WIRE WITH RESTRICTED EARTH FAULT .....          | 51        |
| 4.3.5       | 2 PHASE (L1 & L2) 3 WIRE WITHOUT EARTH FAULT.....                   | 51        |
| 4.3.6       | 2 PHASE (L1 & L3) 3 WIRE WITH RESTRICTED EARTH FAULT .....          | 52        |
| 4.3.7       | 2 PHASE (L1 & L3) 3 WIRE WITHOUT EARTH FAULT MEASURING.....         | 52        |
| 4.3.8       | 3 PHASE 4 WIRE WITH UNRESTRICTED EARTH FAULT MEASURING .....        | 53        |
| <b>4.4</b>  | <b>EARTH SYSTEMS.....</b>   | <b>54</b> |
| 4.4.1       | NEGATIVE EARTH.....   | 54        |
| 4.4.2       | POSITIVE EARTH .....  | 54        |
| 4.4.3       | FLOATING EARTH.....   | 54        |
| <b>4.5</b>  | <b>TYPICAL ARRANGEMENT OF DSENET® .....</b>                         | <b>54</b> |
| <b>5</b>    | <b>DESCRIPTION OF CONTROLS.....</b>                                 | <b>55</b> |
| <b>5.1</b>  | <b>DSE7410 AUTO START CONTROL MODULE .....</b>                      | <b>55</b> |
| <b>5.2</b>  | <b>DSE7420 AUTO START CONTROL MODULE .....</b>                      | <b>56</b> |
| <b>5.3</b>  | <b>QUICKSTART GUIDE .....</b>                                       | <b>57</b> |
| 5.3.1       | STARTING THE ENGINE.....  | 57        |
| 5.3.2       | STOPPING THE ENGINE .....   | 57        |
| <b>5.4</b>  | <b>VIEWING THE INSTRUMENT PAGES .....</b>                           | <b>58</b> |
| 5.4.1       | STATUS.....   | 59        |
| 5.4.2       | ENGINE .....  | 60        |
| 5.4.3       | GENERATOR .....   | 61        |
| 5.4.4       | BUS (DSE7410 ONLY) .....  | 62        |
| 5.4.5       | MAINS (DSE7420 ONLY) .....  | 62        |
| 5.4.6       | RS232 SERIAL PORT .....   | 62        |
| 5.4.7       | RS485 SERIAL PORT .....   | 65        |
| 5.4.8       | ABOUT.....  | 66        |
| 5.4.8.1     | ETHERNET PAGES.....   | 67        |
| 5.4.8.2     | DATA LOGGING PAGES.....   | 68        |
| 5.4.9       | CAN ERROR MESSAGES .....  | 69        |

|           |  |            |
|-----------|--|------------|
| 5.5       | VIEWING THE EVENT LOG.....                               | 70         |
| 5.6       | USER CONFIGURABLE INDICATORS.....                        | 71         |
| <b>6</b>  | <b>OPERATION .....</b>                                   | <b>72</b>  |
| 6.1       | CONTROL .....  | 72         |
| 6.2       | CONTROL PUSH-BUTTONS.....                                | 73         |
| 6.3       | ALTERNATIVE CONFIGURATIONS .....                         | 74         |
| 6.4       | DUMMY LOAD / LOAD SHEDDING CONTROL .....                 | 75         |
| 6.5       | STOP MODE.....   | 76         |
| 6.5.1     | ECU OVERRIDE.....  | 77         |
| 6.6       | MANUAL MODE.....   | 78         |
| 6.6.1     | WAITING IN MANUAL MODE .....                             | 78         |
| 6.6.2     | STARTING SEQUENCE.....                                   | 78         |
| 6.6.3     | ENGINE RUNNING .....                                     | 79         |
| 6.6.4     | MANUAL FUEL PUMP CONTROL.....                            | 79         |
| 6.6.5     | MANUAL SPEED CONTROL .....                               | 79         |
| 6.6.6     | STOPPING SEQUENCE .....                                  | 80         |
| 6.7       | TEST MODE .....  | 80         |
| 6.7.1     | WAITING IN TEST MODE.....                                | 80         |
| 6.7.2     | STARTING SEQUENCE.....                                   | 80         |
| 6.7.3     | ENGINE RUNNING .....                                     | 81         |
| 6.8       | AUTOMATIC MODE.....                                      | 82         |
| 6.8.1     | WAITING IN AUTO MODE .....                               | 82         |
| 6.8.2     | STARTING SEQUENCE.....                                   | 82         |
| 6.8.3     | ENGINE RUNNING .....                                     | 83         |
| 6.8.4     | STOPPING SEQUENCE .....                                  | 83         |
| <b>7</b>  | <b>PROTECTIONS.....</b>                                  | <b>84</b>  |
| 7.1       | PROTECTIONS DISABLED.....                                | 85         |
| 7.1.1     | INDICATION / WARNING ALARMS.....                         | 85         |
| 7.1.2     | SHUTDOWN / ELECTRICAL TRIP ALARMS .....                  | 85         |
| 7.1.3     | CAN ALARMS.....  | 86         |
| 7.2       | INDICATIONS.....   | 87         |
| 7.3       | WARNINGS .....   | 88         |
| 7.4       | HIGH CURRENT WARNING ALARM .....                         | 89         |
| 7.5       | SHUTDOWNS.....   | 90         |
| 7.6       | ELECTRICAL TRIPS.....                                    | 92         |
| 7.7       | HIGH CURRENT SHUTDOWN / ELECTRICAL TRIP ALARM .....      | 93         |
| 7.7.1     | IMMEDIATE WARNING .....                                  | 93         |
| 7.7.2     | IDMT ALARM.....  | 93         |
| 7.8       | EARTH FAULT SHUTDOWN / ELECTRICAL TRIP ALARM .....       | 96         |
| 7.9       | SHORT CIRCUIT ALARM .....                                | 97         |
| 7.10      | MAINTENANCE ALARM .....                                  | 98         |
| <b>8</b>  | <b>SCHEDULER .....</b>                                   | <b>99</b>  |
| 8.1.1     | STOP MODE .....  | 99         |
| 8.1.2     | MANUAL MODE .....  | 99         |
| 8.1.3     | AUTO MODE .....  | 99         |
| <b>9</b>  | <b>FRONT PANEL CONFIGURATION .....</b>                   | <b>100</b> |
| 9.1       | ACCESSING THE MAIN FRONT PANEL CONFIGURATION EDITOR..... | 101        |
| 9.1.1     | EDITING A PARAMETER.....                                 | 102        |
| 9.2       | ADJUSTABLE PARAMETERS .....                              | 103        |
| 9.3       | ACCESSING THE 'RUNNING' CONFIGURATION EDITOR.....        | 104        |
| 9.3.1     | EDITING A PARAMETER.....                                 | 104        |
| 9.3.2     | ADJUSTABLE PARAMETERS (RUNNING EDITOR) .....             | 104        |
| <b>10</b> | <b>COMMISSIONING.....</b>                                | <b>105</b> |
| 10.1      | PRE-COMMISSIONING.....                                   | 105        |
| <b>11</b> | <b>FAULT FINDING .....</b>                               | <b>106</b> |

|        |  |     |
|--------|--|-----|
| 11.1   | STARTING .....   | 106 |
| 11.2   | LOADING .....  | 106 |
| 11.3   | ALARMS .....   | 107 |
| 11.4   | COMMUNICATIONS.....                                    | 108 |
| 11.5   | INSTRUMENTS .....                                      | 109 |
| 11.6   | MISCELLANEOUS .....                                    | 109 |
| 12     | MAINTENANCE, SPARES, REPAIR AND SERVICING .....        | 110 |
| 12.1   | PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE.....    | 110 |
| 12.1.1 | PACK OF PLUGS.....                                     | 110 |
| 12.1.2 | INDIVIDUAL PLUGS.....                                  | 110 |
| 12.2   | PURCHASING ADDITIONAL FIXING CLIPS FROM DSE.....       | 110 |
| 12.3   | PURCHASING ADDITIONAL SEALING GASKET FROM DSE .....    | 110 |
| 12.4   | DSENET EXPANSION MODULES.....                          | 111 |
| 13     | WARRANTY .....   | 112 |
| 14     | DISPOSAL .....   | 112 |
| 14.1   | WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT) ..... | 112 |
| 14.2   | ROHS (RESTRICTION OF HAZARDOUS SUBSTANCES).....        | 112 |

# 1 BIBLIOGRAPHY

This document refers to and is referred to by the following DSE publications which can be obtained from the DSE website: [www.deepseapl.com](http://www.deepseapl.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  |
|----------|--|
| 053-085  | DSE7410 Installation Instructions                                  |
| 053-088  | DSE7420 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 |
| 056-010  | Overcurrent Protection      |
| 056-018  | Negative Phase Sequence     |
| 056-019  | Earth Fault Protection      |
| 056-020  | Loss of Excitation          |
| 056-022  | Breaker Control             |
| 056-024  | GSM Modem                   |
| 056-026  | kW & kVAr                   |
| 056-029  | Smoke Limiting              |
| 056-030  | Module PIN Codes            |

## 1.3 MANUALS

Product manuals are can be downloaded from the DSE website: [www.deepseapl.com](http://www.deepseapl.com)

| DSE PART | DESCRIPTION                                  |
|----------|--|
| 057-004  | Electronic Engines and DSE Wiring            |
| 057-160  | DSE7400 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 DSE7400 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.deepseapl.com](http://www.deepseapl.com)

The DSE7400 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 DSE7400 series module has been designed to allow the operator to start and stop the generator, and if required, transfer the load to the generator either manually (via fascia mounted push-buttons) or automatically. Additionally, the DSE7420 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 DSE7400 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 based LCD display (supporting multiple languages).*
- **True RMS** Voltage, Current and Power monitoring.
- Communications capability (RS485, RS232 or Ethernet)
- Engine parameter monitoring.
- Fully configurable inputs for use as alarms or a range of different functions.
- 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..

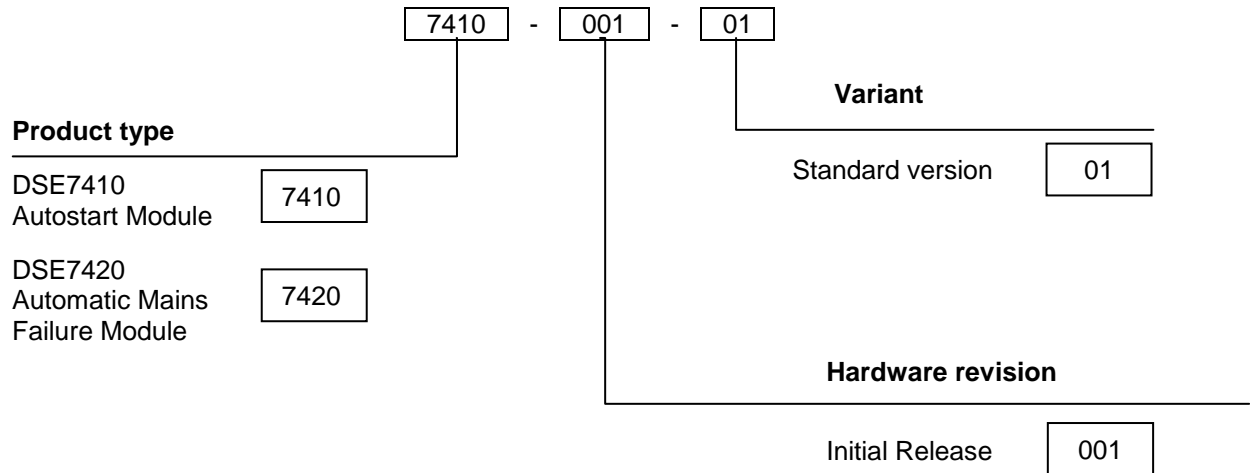
Access to critical operational sequences and timers for use by qualified engineers, can be protected by a security code. Module access can also be protected by PIN code. Selected parameters can be changed from the module's front panel.

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                       |
|-----------------|-----------------------------------|
| DSE7000,DSE7xxx | All modules in the DSE7000 range. |
| DSE7400,DSE74xx | All modules in the DSE7400 range. |
| DSE7410         | DSE7410 module/controller         |
| DSE7420         | DSE7420 module/controller         |

### 3.2 TERMINAL SPECIFICATION

|                    |   |  |
|--------------------|---|--|
| Connection type    | Two part connector. <ul style="list-style-type: none"> <li>Male part fitted to module</li> <li>Female part supplied in module packing case - Screw terminal, rising clamp, no internal spring.</li> </ul> |  <p>Example showing cable entry and screw terminals of a 10 way connector</p> |
| Minimum cable size | 0.5mm <sup>2</sup> (AWG 24)   |  |
| Maximum cable size | 2.5mm <sup>2</sup> (AWG 10)   |  |

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

### 3.3 POWER SUPPLY REQUIREMENTS

|                             |   |
|-----------------------------|---|
| Minimum supply voltage      | 8V continuous   |
| Cranking dropouts           | Able to survive 0V for 50mS providing the supply was at least 10V before the dropout and recovers to 5V afterwards. |
| Maximum supply voltage      | 35V continuous (60V protection)   |
| Reverse polarity protection | -35V continuous   |
| Maximum operating current   | 130mA at 24V<br>260mA at 12V  |
| Maximum standby current     | 65mA at 24V<br>120mA at 12V   |

#### Plant supply instrumentation display

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

### 3.4 GENERATOR VOLTAGE / FREQUENCY SENSING

|                               |  |
|-------------------------------|--|
| Measurement type              | True RMS conversion  |
| Sample Rate                   | 5KHz or better   |
| Harmonics                     | Up to 10 <sup>th</sup> or better   |
| Input Impedance               | 300K $\Omega$ ph-N   |
| Phase to Neutral              | 15V (minimum required for sensing frequency) to 333V AC (absolute maximum)<br>Suitable for 110V to 277V nominal<br>( $\pm 20\%$ for under/overvoltage detection)             |
| Phase to Phase                | 26V (minimum required for sensing frequency) to 576V AC (absolute maximum)<br>Suitable for 190V ph-ph to 479V ph-ph nominal<br>( $\pm 20\%$ for under/overvoltage detection) |
| Common mode offset from Earth | 100V AC (max)  |
| Resolution                    | 1V AC phase to neutral<br>2V AC phase to phase   |
| Accuracy                      | $\pm 1\%$ of full scale phase to neutral<br>$\pm 2\%$ of full scale phase to phase   |
| Minimum frequency             | 3.5Hz  |
| Maximum frequency             | 75.0Hz   |
| Frequency resolution          | 0.1Hz  |
| Frequency accuracy            | $\pm 0.2\text{Hz}$   |

### 3.5 GENERATOR CURRENT SENSING

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

#### 3.5.1 VA RATING OF THE CTS

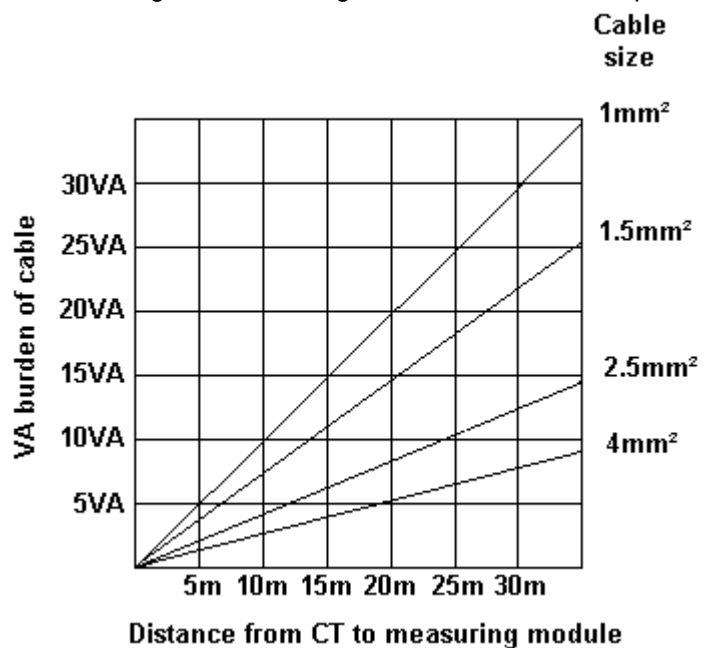
The VA burden of the module on the CTs is 0.5VA. However depending upon the type and length of cabling between the CTs and the module, CTs with a greater VA rating than the module are required.

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 1.5mm<sup>2</sup> cable is used and the distance from the CT to the measuring module is 20m, then the burden of the cable alone is approximately 15VA. As the burden of the DSE controller is 0.5VA, then a CT with a rating of at least  $15 + 0.5 = 15.5\text{VA}$  must be used. If 2.5mm<sup>2</sup> cables are used over the same distance of 20m, then the burden of the cable on the CT is approximately 7VA. CT's required in this instance is at least  $7 + 0.5$ .

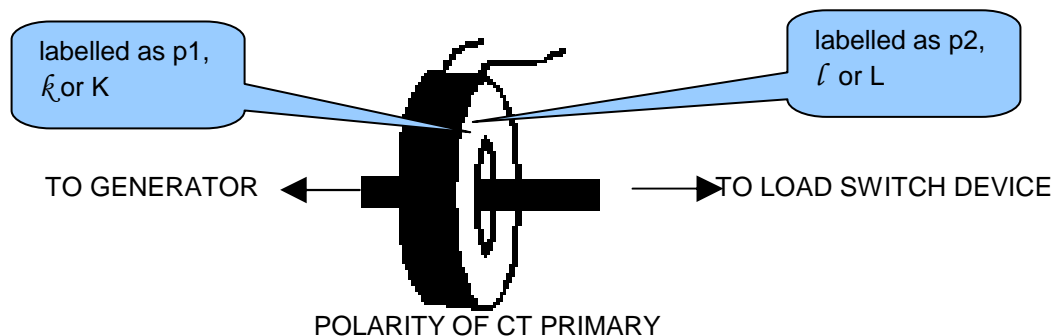


**NOTE:** - Details for 4mm<sup>2</sup> cables are shown for reference only. The connectors on the DSE modules are only suitable for cables up to 2.5mm<sup>2</sup>.

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



**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                        |
| Arrangement             | Contact between terminal and ground           |
| Low level threshold     | 2.1V minimum                                  |
| High level threshold    | 6.6V maximum                                  |
| Maximum input voltage   | +50V DC with respect to plant supply negative |
| Minimum input voltage   | -24V DC with respect to plant supply negative |
| Contact wetting current | 7mA typical                                   |
| Open circuit voltage    | 12V typical                                   |

### 3.6.2 ANALOGUE 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     | 15mA   |
| Full scale              | 240Ω   |
| Over range / fail       | 270Ω   |
| Resolution              | 0.1 Bar (1-2 PSI)  |
| Accuracy                | ±2% of full scale resistance (±4.8Ω) excluding transducer error                        |
| Max common mode voltage | ±2V  |
| Display range           | 13.7 bar (0-200 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     | 10mA   |
| Full scale              | 480Ω   |
| Over range / fail       | 540Ω   |
| Resolution              | 1°C (2°F)  |
| Accuracy                | +/-2% of full scale resistance (±9.6Ω) excluding transducer error                      |
| Max common mode voltage | ±2V  |
| Display range           | 0°C -140°C (32°F - 284°F) subject to limits of the sensor                              |

#### 3.6.2.3 FUEL LEVEL

|                         |  |
|-------------------------|--|
| Measurement type        | Resistance measurement by measuring voltage across sensor with a fixed current applied |
| Arrangement             | Differential resistance measurement input  |
| Measurement current     | 10mA   |
| Full scale              | 480Ω   |
| Over range / fail       | 540Ω   |
| Resolution              | 1°C (2°F)  |
| Accuracy                | +/-2% of full scale resistance (±9.6Ω) excluding transducer error                      |
| Max common mode voltage | ±2V  |
| Display range           | 0-250%   |

**3.6.2.4 FLEXIBLE SENSOR**

|                         |  |
|-------------------------|--|
| Number                  | 2  |
| Measurement type        | Resistance measurement by measuring voltage across sensor with a fixed current applied |
| Arrangement             | Differential resistance measurement input  |
| Measurement current     | 10mA   |
| Full scale              | 480Ω   |
| Over range / fail       | 540Ω   |
| Resolution              | 1%   |
| Accuracy                | ±2% of full scale resistance (±9.6Ω) excluding transducer error                        |
| Max common mode voltage | ±2V  |
| Display range           | 0-250%   |

**3.6.3 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.

**3.6.4 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.             |

##### 3.7.2.1 CONTACTOR COILS

Use output D, the normally open relay:

###### Generator

Close Gen Output

Energise

DSE output drives the contactor coil, via external slave relay if required.  
When the DSE module requires the contactor closed, the output energises (closing the internal relay)  
When the DSE module requires the contactor to be open, the output is de-energised (opening the internal relay)



##### 3.7.2.2 UNDERVOLTAGE (UV COILS)

Use output C, the normally closed relay :

###### Generator

Open Gen Output Pulse

Energise

Breaker Trip Pulse

1.0s

DSE output drives the UV coil, via external slave relay if required.  
When the generator starts, the UV is powered via the normally closed relay. The breaker is now ready for the close signal to be given. When the breaker is to be opened, the Open Generator Pulse relay is operated, removing power from the UV coil for one second. This causes the breaker to trip (open) as the UV is no longer powered. The Open Generator Pulse relay switches back to its closed state, ready to power the UV coil the next time the generator starts.



### 3.7.2.3 CLOSING COILS

For continuous closing signals (close signal is present continuously when the breaker is closed), follow the instructions above as for *Contactors Coils*.

For momentary (pulsed) closing signals, use OUTPUT D, the normally open relay:

#### Generator

Close Gen Output Pulse

Breaker Close Pulse 0.5s

When the DSE module requires the breaker closed, the output energises (closing the internal relay) for the period of the Breaker Close Pulse timer after which the output is de-energised (opening the internal relay).



### 3.7.2.4 OPENING COILS / SHUNT TRIP COILS

For Continuous opening signal, use output D, the normally open relay:

#### Generator:

Open Gen Output

When the DSE module requires the breaker open, the output energises (closing the internal relay).



For momentary (pulsed) closing signals, use a normally open relay:

#### Generator:

Open Gen Output Pulse

Breaker Trip Pulse 1.0s

When the DSE module requires the breaker open, the output energises (closing the internal relay) for the period of the *breaker trip pulse*.



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

|        |   |
|--------|---|
| Number | 6   |
| Type   | Fully configurable, supplied from DC supply terminal 2. |
| Rating | 3A resistive @ 35V                                      |

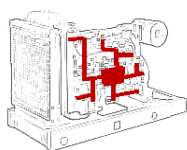


### 3.8 COMMUNICATION PORTS

|                      |   |
|----------------------|---|
| USB Port             | USB2.0 Device for connection to PC running DSE configuration suite only<br>Max distance 6m (yards)  |
| Serial Communication | RS232 and RS485 are both fitted but and provide independent operation   |
| RS232 Serial port    | Non – Isolated port<br>Max Baud rate 115K baud subject to S/W<br>TX, RX, RTS, CTS, DSR, DTR, DCD<br>Male 9 way D type connector<br>Max distance 15m (50 feet)   |
| RS485 Serial port    | Isolated<br>Data connection 2 wire + common<br>Half Duplex<br>Data direction control for Transmit (by s/w protocol)<br>Max Baud Rate 19200<br>External termination required (120Ω)<br>Max common mode offset 70V (on board protection transorb)<br>Max distance 1.2km (¾ mile)  |
| CAN Port             | Engine CAN Port<br>Standard implementation of 'Slow mode', up to 250K bits/s<br>Non-Isolated.<br>Internal Termination provided (120Ω)<br>Max distance 40m (133 feet)<br><br><b>▲NOTE:- For additional length, the DSE124 CAN Extender is available. Please refer to DSE Publication: 057-116 DSE124 Operator Manual for more information.</b> |
| 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:

- DSE7400 series module
- DSE Configuration Suite PC Software  
(Supplied on configuration suite software CD or available from [www.deepeatplc.com](http://www.deepeatplc.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 DSE7400 Series Configuration Suite Manual (DSE part 057-160) 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 DSE7400 Series Configuration Suite Manual (DSE part 057-160) 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 DOES 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](mailto: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 port on the series controller supports 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>

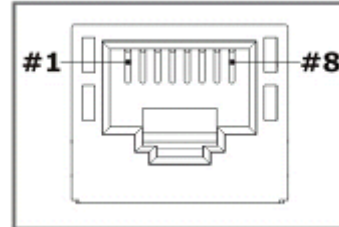
**Email:** Sales: [sales@brainboxes.com](mailto:sales@brainboxes.com)

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

- DSE7400 series module
- Crossover Ethernet cable (see Below)
- PC with Ethernet port



















Crossover  
network cable

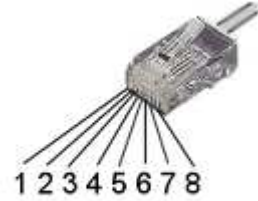


### Crossover cable wiring detail

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.

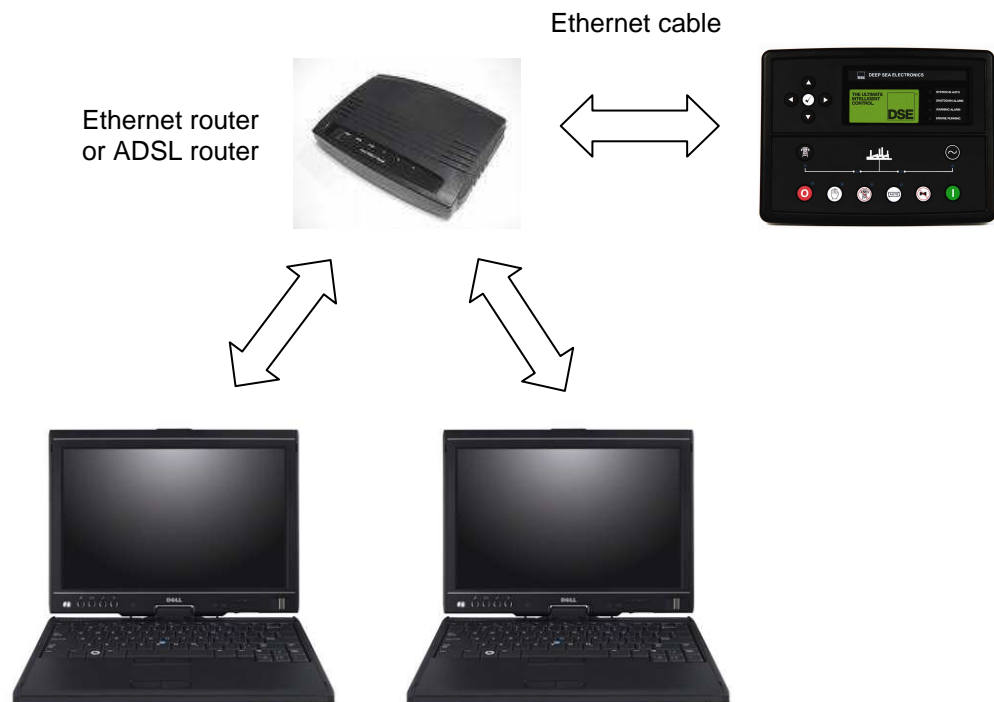


**NOTE:-** This cable can be purchased from any good PC or IT store.

### 3.9.6.2 CONNECTION TO BASIC ETHERNET




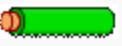




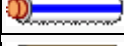
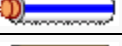






#### Requirements

- DSE7400 series module
- Ethernet cable (see below)
- Working Ethernet (company or home network)
- PC with Ethernet port

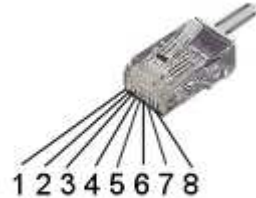


### Ethernet cable wiring detail

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.

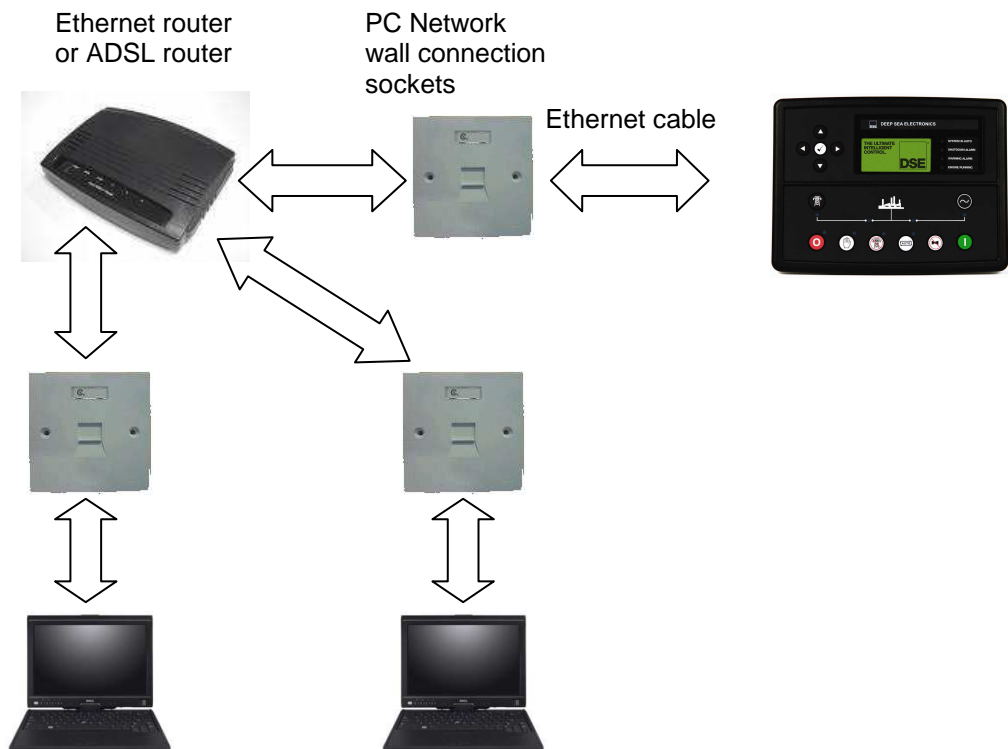


**NOTE:-** DSE Stock a 2m (2yds) Ethernet Cable – Part number 016-137. Alternatively they can be purchased from any good PC or IT store.

### 3.9.6.3 CONNECTION TO COMPANY INFRASTRUCTURE ETHERNET

#### Requirements

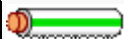
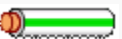











- DSE7400 series module
- Ethernet cable (see below)
- Working Ethernet (company or home network)
- PC with Ethernet port



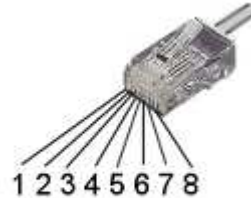


### Ethernet cable wiring detail

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.

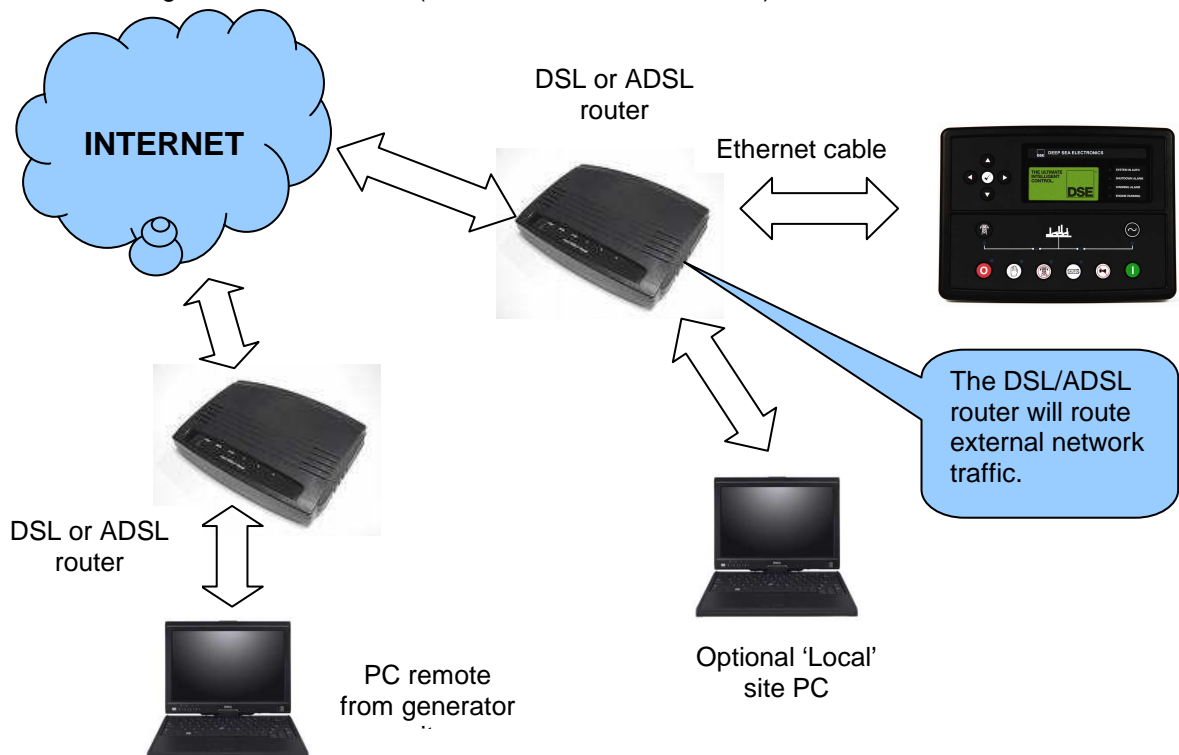


**NOTE:-** DSE Stock a 2m (2yds) Ethernet Cable – Part number 016-137. Alternatively they can be purchased from any good PC or IT store.

### 3.9.6.4 CONNECTION TO THE INTERNET

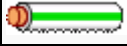








#### Requirements

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

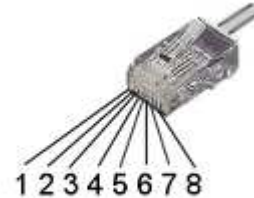


### Ethernet cable wiring detail

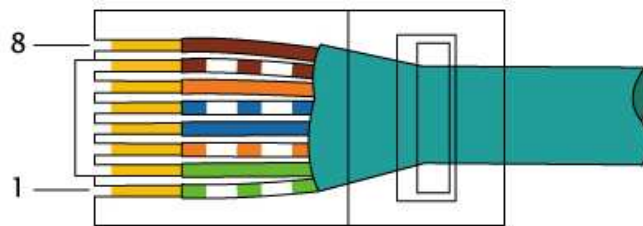
10baseT/100baseT

| Pin | Connection 1 (T568A)  | Connection 2 (T568B)  |
|-----|---|---|
| 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 DSE7400 Series Configuration Suite Manual (DSE part 057-160) 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<br>Belden 9271   |
| Maximum cable length           | 1200m (¾ mile) when using Belden 9841 or direct equivalent.<br>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)<br><br>This gives the possibility of :<br>Maximum 32 additional 0-10V or 4-20mA outputs (DSE2152)<br>Maximum 80 additional relay outputs (DSE2157)<br>Maximum 80 additional LED indicators<br>Maximum 24 additional Ratio-metric or Thermocouple inputs (DSE2133).<br>Maximum 40 additional inputs (All can be configured as either digital, resistive, 0-10V or 4-20mA when using DSE2131) |

**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 :** DSE7400 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 interface 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:

ECU (ECM) Options

|                          |                          |
|--------------------------|--------------------------|
| Engine Type              | Cummins QST              |
| Enhanced J1939           | <input type="checkbox"/> |
| Alternative Engine Speed | <input type="checkbox"/> |
| Modbus Engine Comms Port | DSENet Port              |

### 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:

The screenshot shows two configuration windows. The top window, titled 'Relay Outputs (DC Supply Out)', has a table with three columns: 'Output', 'Source', and 'Polarity'. The first row shows 'Output E' with 'Audible Alarm' selected in the 'Source' dropdown and 'Energise' selected in the 'Polarity' dropdown. The bottom window, titled 'Digital Input A', has a table with two columns: 'Function' and a dropdown menu. The 'Function' column shows 'Alarm Mute' selected in the dropdown menu.

### 3.12 ACCUMULATED INSTRUMENTATION



**NOTE: When an accumulated instrumentation value exceeds the maximum number as listed below, it will reset and begin counting from zero again.**

|                  |  |
|------------------|--|
| Engine hours run | Maximum 99999 hrs 59 minutes (approximately 11yrs 4months) |
| Number of starts | 1,000,000 (1 million)                                      |

The number of logged 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

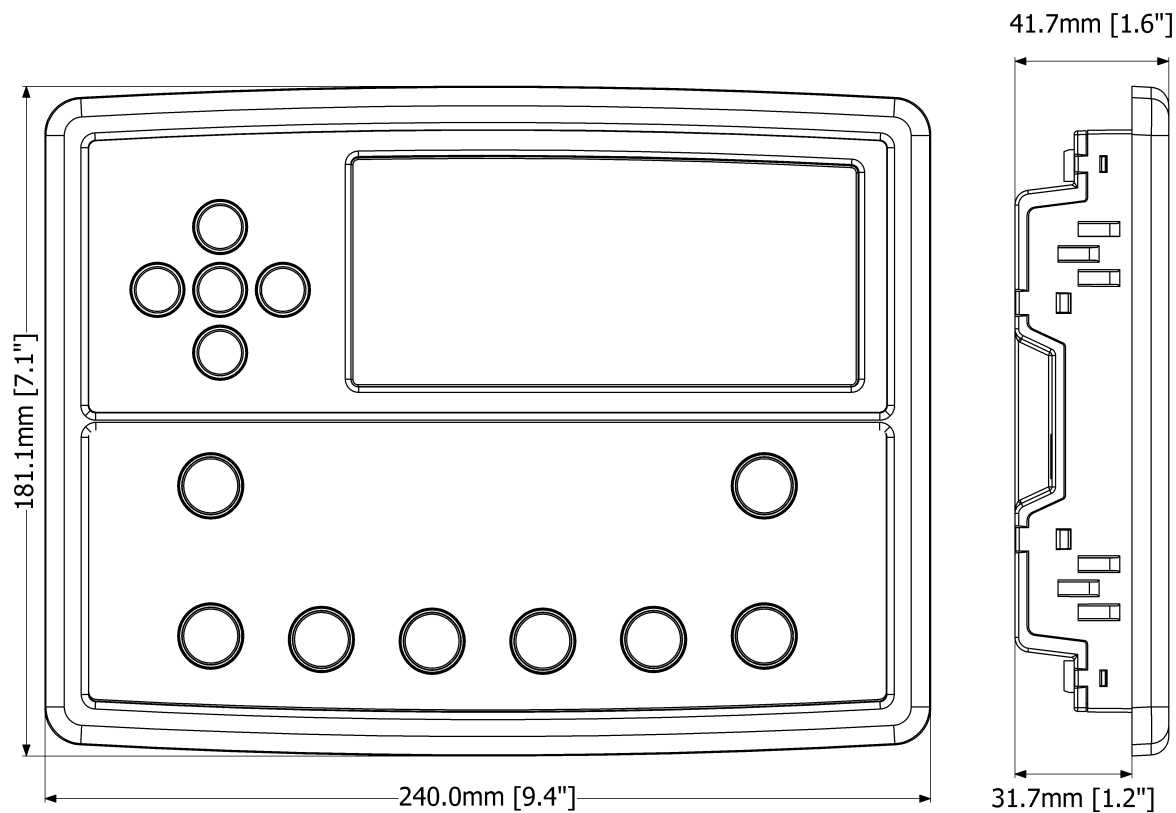
240.0mm x 181.1mm x 41.7mm (9.4" x 7.1" x 1.6")

#### 3.13.2 PANEL CUTOUT

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

#### 3.13.3 WEIGHT

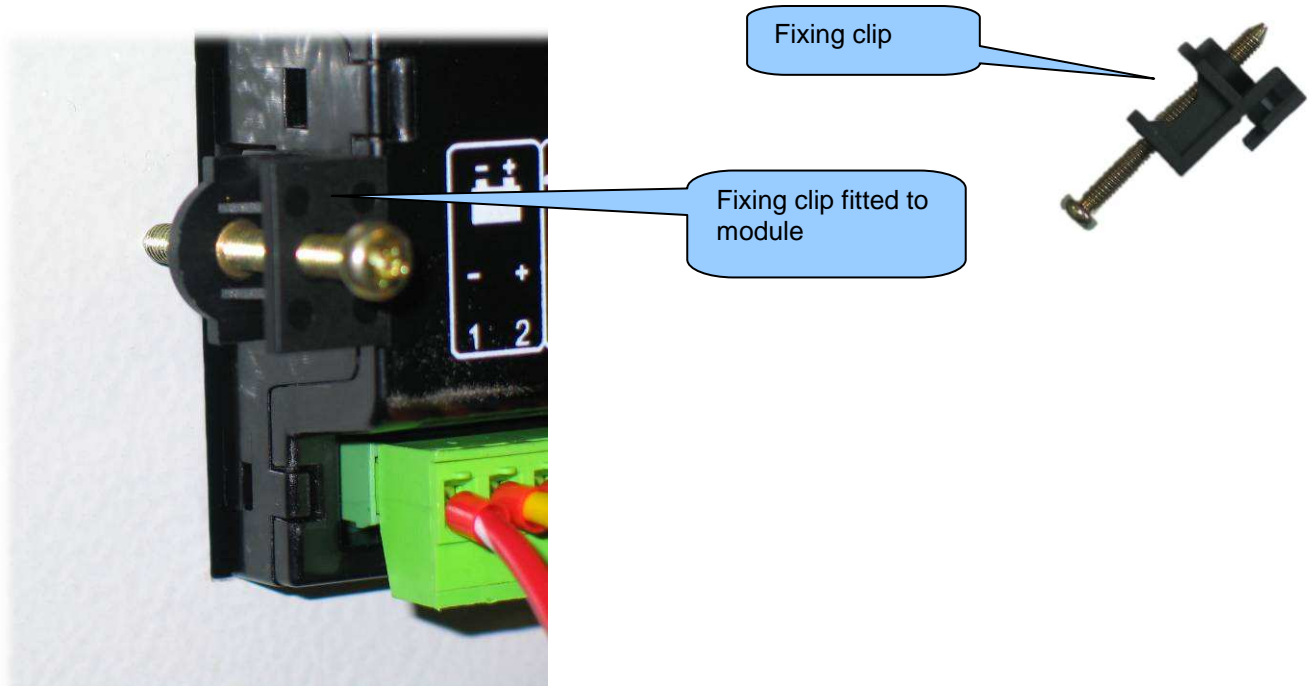
0.7kg (1.4lb)



### 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.

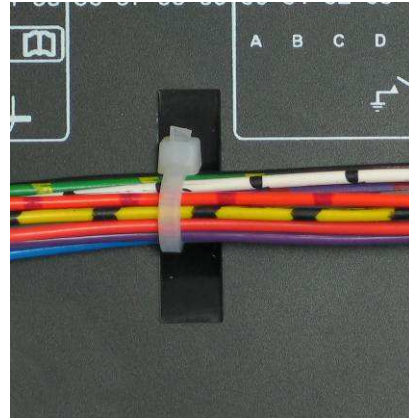
### 3.13.5 CABLE TIE FIXING POINTS

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



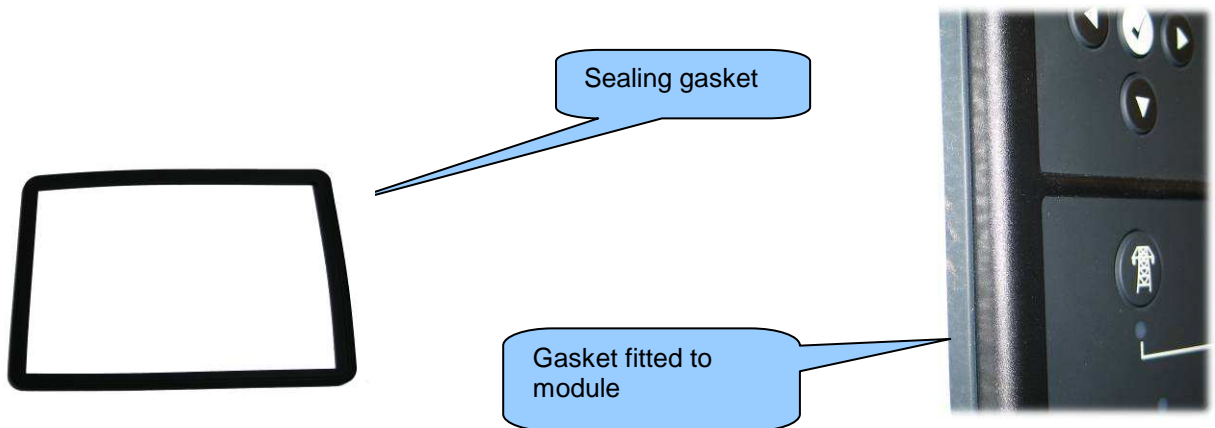
With cable and tie in place

### 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

|  |  |
|--|--|
| <b>BS 4884-1</b>   | This document conforms to BS4884-1 1992 Specification for presentation of essential information.   |
| <b>BS 4884-2</b>   | This document conforms to BS4884-2 1993 Guide to content   |
| <b>BS 4884-3</b>   | This document conforms to BS4884-3 1993 Guide to presentation  |
| <b>BS EN 60068-2-1</b><br>(Minimum temperature)  | -30°C (-22°F)  |
| <b>BS EN 60068-2-2</b><br>(Maximum temperature)  | +70°C (158°F)  |
| <b>BS EN 60950</b>   | Safety of information technology equipment, including electrical business equipment  |
| <b>BS EN 61000-6-2</b>   | EMC Generic Immunity Standard (Industrial)   |
| <b>BS EN 61000-6-4</b>   | EMC Generic Emission Standard (Industrial)   |
| <b>BS EN 60529</b><br>(Degrees of protection provided by enclosures)                                     | IP65 (front of module when installed into the control panel with the supplied sealing gasket)<br>IP42 (front of module when installed into the control panel WITHOUT being sealed to the panel)  |
| <b>UL508</b><br><b>NEMA rating</b><br>(Approximate)  | 12 (Front of module when installed into the control panel with the supplied sealing gasket).<br>2 (Front of module when installed into the control panel WITHOUT being sealed to the panel)  |
| <b>IEEE C37.2</b><br>(Standard Electrical Power System Device Function Numbers and Contact Designations) | <p>Under the scope of IEEE 37.2, <i>function numbers can also be used to represent functions in microprocessor devices and software programs.</i> The controller is device number 11L-8000 (Multifunction device protecting Line (generator) –module).</p> <p>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 :</p> <ul style="list-style-type: none"> <li>2 – Time delay starting or closing relay</li> <li>3 – Checking or interlocking relay</li> <li>5 – Stopping Device</li> <li>6 – Starting circuit breaker</li> <li>8 – Control power disconnecting device</li> <li>10 – Unit sequence switch</li> <li>11 – Multifunction device</li> <li>12 – Overspeed device</li> <li>14 – Underspeed device</li> <li>23 – Temperature control device</li> <li>26 – Apparatus thermal device</li> <li>27AC – AC undervoltage relay</li> <li>27DC – DC undervoltage relay</li> <li>29 – Isolating contactor or switch</li> <li>30 – Annunciator relay</li> <li>31 – Separate Excitation Device</li> <li>37 – Undercurrent or underpower relay (<b>USING INTERNAL PLC EDITOR</b>)</li> <li>41 – Field circuit breaker</li> <li>42 – Running circuit breaker</li> <li>44 – Unit sequence relay</li> <li>46 – Reverse-phase or phase-balance current relay</li> <li>48 – Incomplete sequence relay</li> <li>49 – Machine or transformer thermal relay</li> </ul> |

Continued overleaf.

## Specification

|   |   |
|---|---|
| <b>IEEE C37.2</b><br>(Standard Electrical<br>Power System Device<br>Function Numbers and<br>Contact Designations) | Continued...<br><br>50 – Instantaneous overcurrent relay<br>51 – AC time overcurrent relay<br>52 – AC circuit breaker<br>53 – Exciter or DC generator relay<br>54 – Turning gear engaging device<br>55 – Power factor relay ( <b>USING INTERNAL PLC EDITOR</b> )<br>59AC – AC overvoltage relay<br>59DC – DC overvoltage relay<br>62 – Time delay stopping or opening relay<br>63 – Pressure switch<br>71 – Level switch<br>74 – Alarm relay<br>78 – Phase-angle measuring relay<br>79 – Reclosing relay ( <b>USING INTERNAL PLC EDITOR</b> )<br>81 – Frequency relay<br>83 – Automatic selective control or transfer relay<br>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  | Second Digit   |
|--|--|
| Protection against contact and ingress of solid objects  | Protection against ingress of water  |
| 0 No protection  | 0 No protection  |
| 1 Protected against ingress solid objects with a diameter of more than 50 mm. No protection against deliberate access, e.g. with a hand, but large surfaces of the body are prevented from approach.                                   | 1 Protection against dripping water falling vertically. No harmful effect must be produced (vertically falling drops).   |
| 2 Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach.   | 2 Protection against dripping water falling vertically. There must be no harmful effect when the equipment (enclosure) is tilted at an angle up to 15° from its normal position (drops falling at an angle). |
| 3 Protected against ingress of solid objects with a diameter of more than 2.5 mm. Tools, wires etc. with a thickness of more than 2.5 mm are prevented from approach.  | 3 Protection against water falling at any angle up to 60° from the vertical. There must be no harmful effect (spray water).  |
| 4 Protected against ingress of solid objects with a diameter of more than 1 mm. Tools, wires etc. with a thickness of more than 1 mm are prevented from approach.  | 4 Protection against water splashed against the equipment (enclosure) from any direction. There must be no harmful effect (splashing water).   |
| 5 Protected against harmful dust deposits. Ingress of dust is not totally prevented but the dust must not enter in sufficient quantity to interfere 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<br><b>IP30</b>      | Provides a degree of protection against contact with the enclosure equipment and against a limited amount of falling dirt.   |
| 2<br><b>IP31</b>      | Provides a degree of protection against limited amounts of falling water and dirt.   |
| 3<br><b>IP64</b>      | Provides a degree of protection against windblown dust, rain and sleet; undamaged by the formation of ice on the enclosure.  |
| 3R<br><b>IP32</b>     | Provides a degree of protection against rain and sleet;; undamaged by the formation of ice on the enclosure.   |
| 4 (X)<br><b>IP66</b>  | 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<br><b>IP65</b> | Provides a degree of protection against dust, falling dirt and dripping non corrosive liquids.   |
| 13<br><b>IP65</b>     | Provides a degree of protection against dust and spraying of water, oil and non corrosive coolants.  |

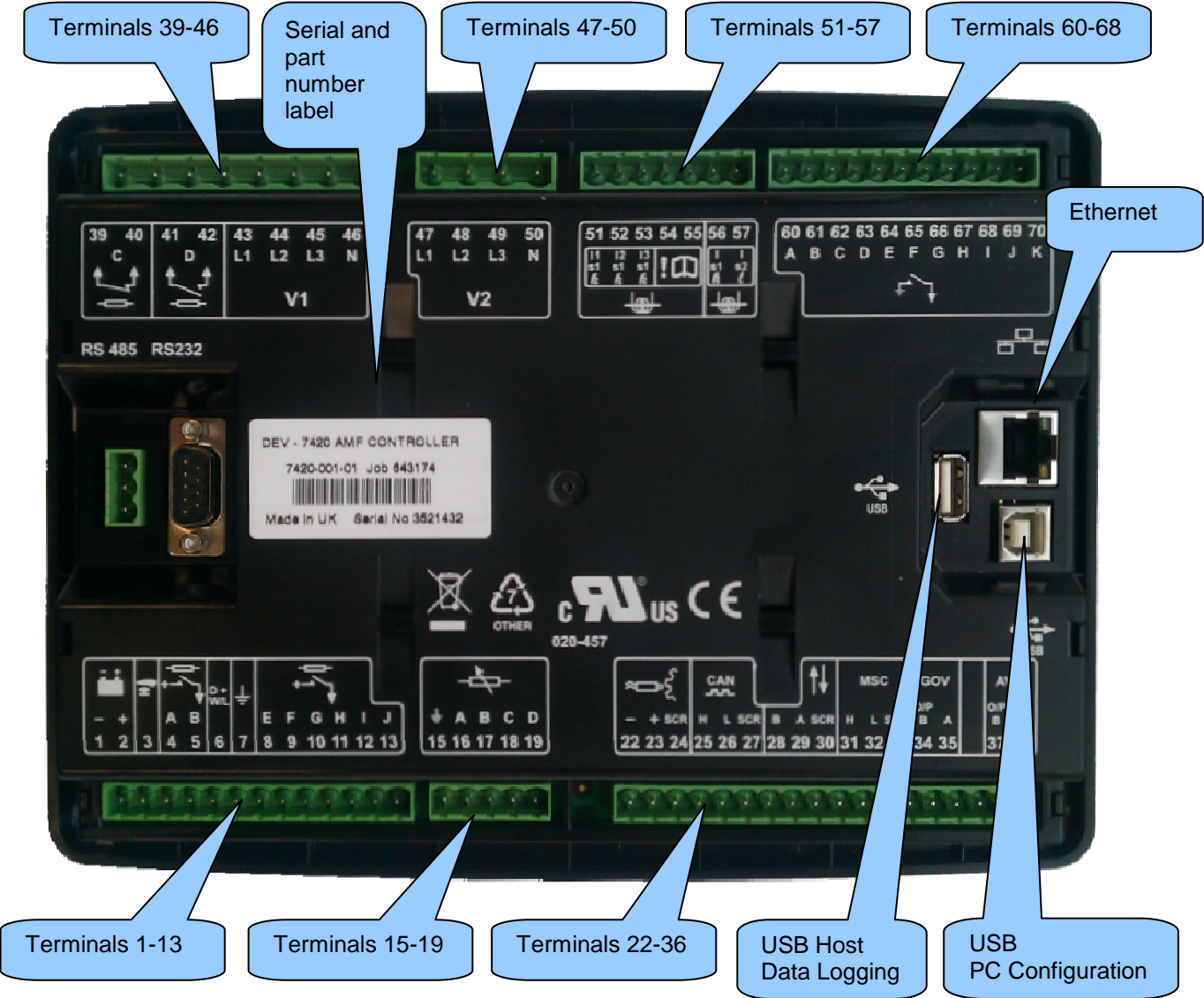
4 INSTALLATION

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

 **NOTE:- Terminal 14 is not fitted to the controller.**

 **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  |
|---|--------|---------------------------|------------------------------|--|
|  | 15     | Sensor Common Return      | 0.5mm <sup>2</sup><br>AWG 20 | Return feed for sensors*                         |
|   | 16     | Oil Pressure Input        | 0.5mm <sup>2</sup><br>AWG 20 | Connect to Oil pressure sensor                   |
|   | 17     | Coolant Temperature Input | 0.5mm <sup>2</sup><br>AWG 20 | Connect to Coolant Temperature sensor            |
|   | 18     | Fuel Level input          | 0.5mm <sup>2</sup><br>AWG 20 | Connect to Fuel Level sensor                     |
|   | 19     | Flexible sensor           | 0.5mm <sup>2</sup><br>AWG 20 | Connect to additional sensor (user configurable) |



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








**NOTE: -** It is VERY important that terminal 15 (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 15 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      | 0.5mm <sup>2</sup><br>AWG 20 | Connect to Magnetic Pickup device  |
|   | 23     | Magnetic pickup Negative      | 0.5mm <sup>2</sup><br>AWG 20 | Connect to Magnetic Pickup device  |
|   | 24     | Magnetic pickup screen        | Shield                       | Connect to ground at one end only  |
|  | 25     | CAN port H                    | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω CAN approved cable   |
|   | 26     | CAN port L                    | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω CAN approved cable   |
|   | 27     | CAN port Common               | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω CAN approved cable   |
|  | 28     | DSENet expansion +            | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω RS485 approved cable |
|   | 29     | DSENet expansion -            | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω RS485 approved cable |
|   | 30     | DSENet expansion SCR          | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω RS485 approved cable |
|  | 31     | Multiset Comms (MSC) Link H   | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω RS485 approved cable |
|   | 32     | Multiset Comms (MSC) Link L   | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω RS485 approved cable |
|   | 33     | Multiset Comms (MSC) Link SCR | 0.5mm <sup>2</sup><br>AWG 20 | Use only 120Ω RS485 approved cable |

 **NOTE:-** Terminal 34 to 38 are 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                      |
| <b>V1</b>   | 43     | Generator L1 (U) voltage monitoring       | 1.0mm <sup>2</sup> AWG 18 | Connect to generator L1 (U) output (AC) (Recommend 2A fuse)                  |
|   | 44     | Generator L2 (V) voltage monitoring input | 1.0mm <sup>2</sup> AWG 18 | Connect to generator L2 (V) output (AC) (Recommend 2A fuse)                  |
|   | 45     | Generator L3 (W) voltage monitoring input | 1.0mm <sup>2</sup> AWG 18 | Connect to generator L3 (W) output (AC) (Recommend 2A fuse)                  |
|   | 46     | Generator Neutral (N) input               | 1.0mm <sup>2</sup> 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  |
|-----------|--------|-------------------------------------|--------------|--|
| <b>V2</b> | 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)                          |


#### 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 | 2.5mm <sup>2</sup><br>AWG 13 | Connect to s1 secondary of L1 monitoring CT |
|   | 52     | CT Secondary for Gen L2 | 2.5mm <sup>2</sup><br>AWG 13 | Connect to s1 secondary of L2 monitoring CT |
|   | 53     | CT Secondary for Gen L3 | 2.5mm <sup>2</sup><br>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  | 2.5mm <sup>2</sup><br>AWG 13 |
|   | Restricted earth fault measuring  | 54     | Connect to s2 of the CTs connected to L1,L2,L3,N  | 2.5mm <sup>2</sup><br>AWG 13 |
|   |   | 55     | Connect to s1 of the CT on the neutral conductor  | 2.5mm <sup>2</sup><br>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.  | 2.5mm <sup>2</sup><br>AWG 13 |
|   |   | 55     | Connect to s2 of the CT on the neutral to earth link.<br>Also connect to the s2 of CTs connected to L1, L2, L3. | 2.5mm <sup>2</sup><br>AWG 13 |



**NOTE: -** Terminals 56 to 59 are not fitted to the controller.

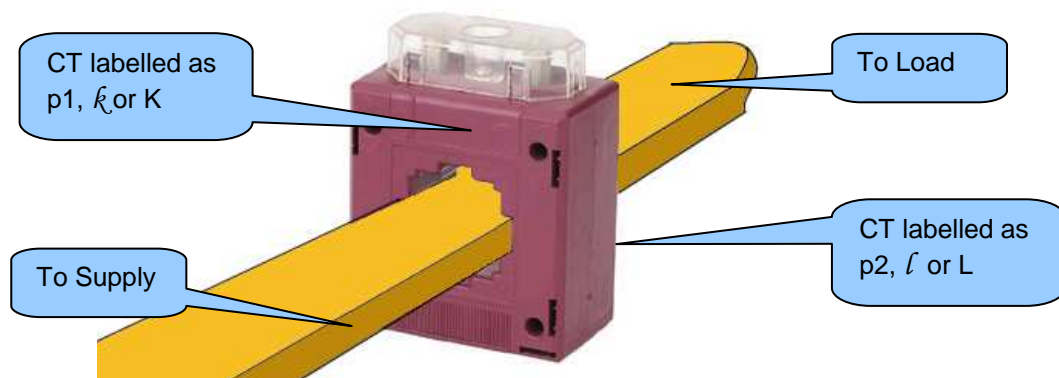
### **CT CONNECTIONS**

p1,  $\ell$  or K is the primary of the CT that 'points' towards the GENERATOR


p2,  $\ell$  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              |
|---|--------|------------------------------|------------------------------|--------------------|
|  | 60     | Configurable digital input A | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 61     | Configurable digital input B | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 62     | Configurable digital input C | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 63     | Configurable digital input D | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 64     | Configurable digital input E | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 65     | Configurable digital input F | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 66     | Configurable digital input G | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 67     | Configurable digital input H | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 68     | Configurable digital input I | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 69     | Configurable digital input J | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |
|   | 70     | Configurable digital input K | 0.5mm <sup>2</sup><br>AWG 20 | Switch to negative |

 **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 | 0.5mm <sup>2</sup><br>AWG 20 | This is a standard USB type A to type B connector.  |

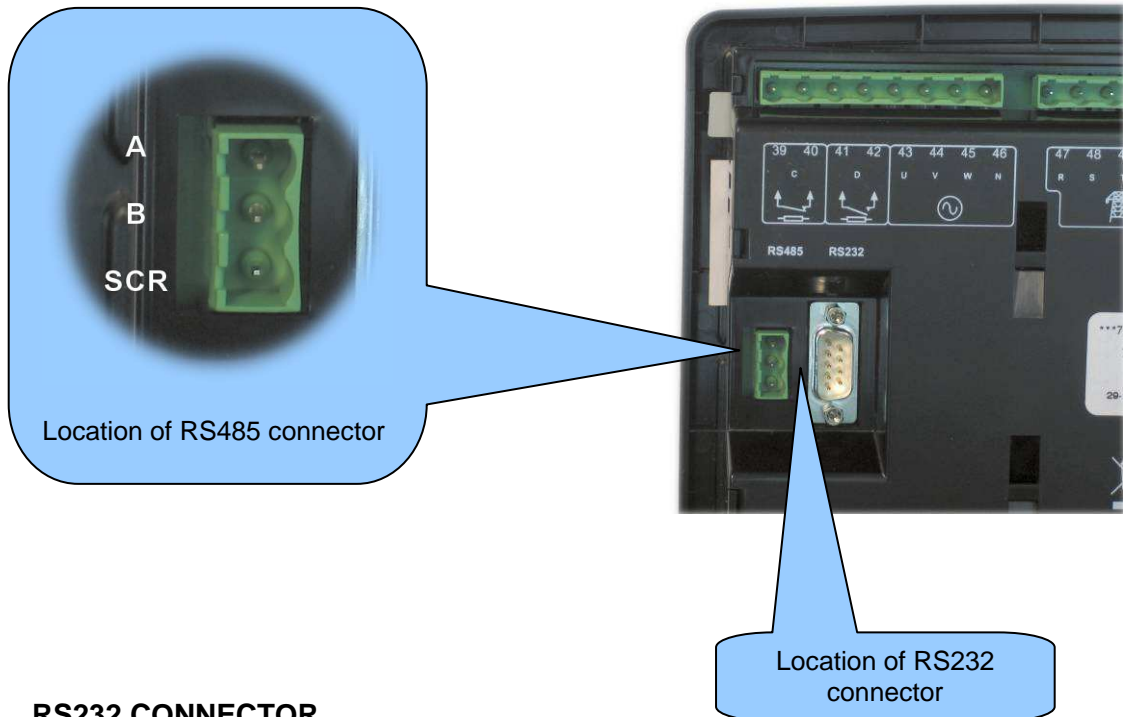
 **NOTE:-** The USB connection cable between the PC and the module must not be extended beyond 5m (yards). For distances over 5m, it is possible to use a third party USB extender. Typically, they extend USB up to 50m (yards). The supply and support of this type of equipment is outside the scope of Deep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

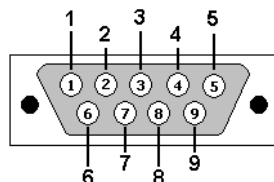
#### 4.1.9 RS485 CONNECTOR

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



#### 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**

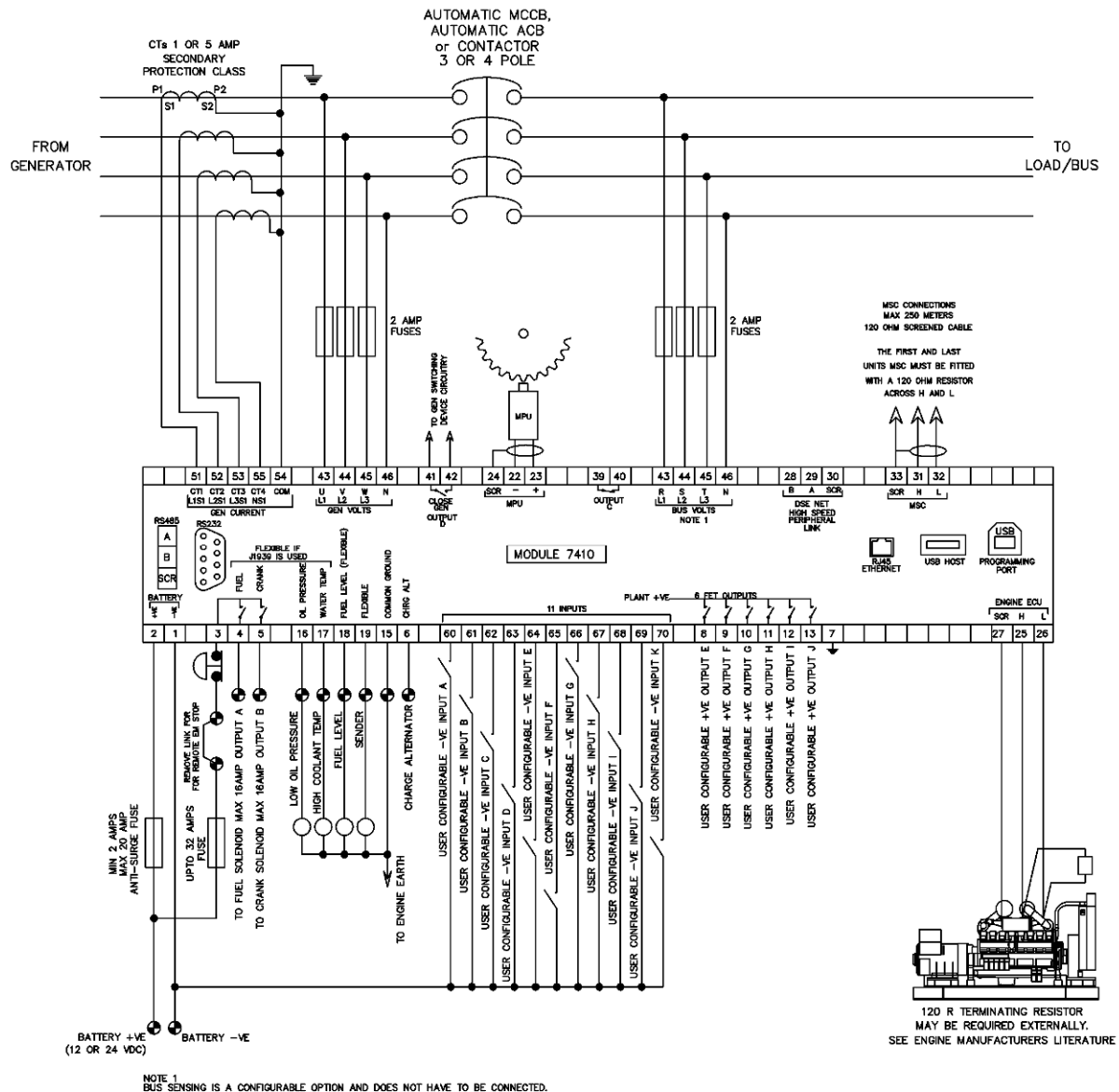
As every system has different requirements, these diagrams show only a TYPICAL system and do not intend to show a complete system.

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.deepseapl.com](http://www.deepseapl.com) to website members.

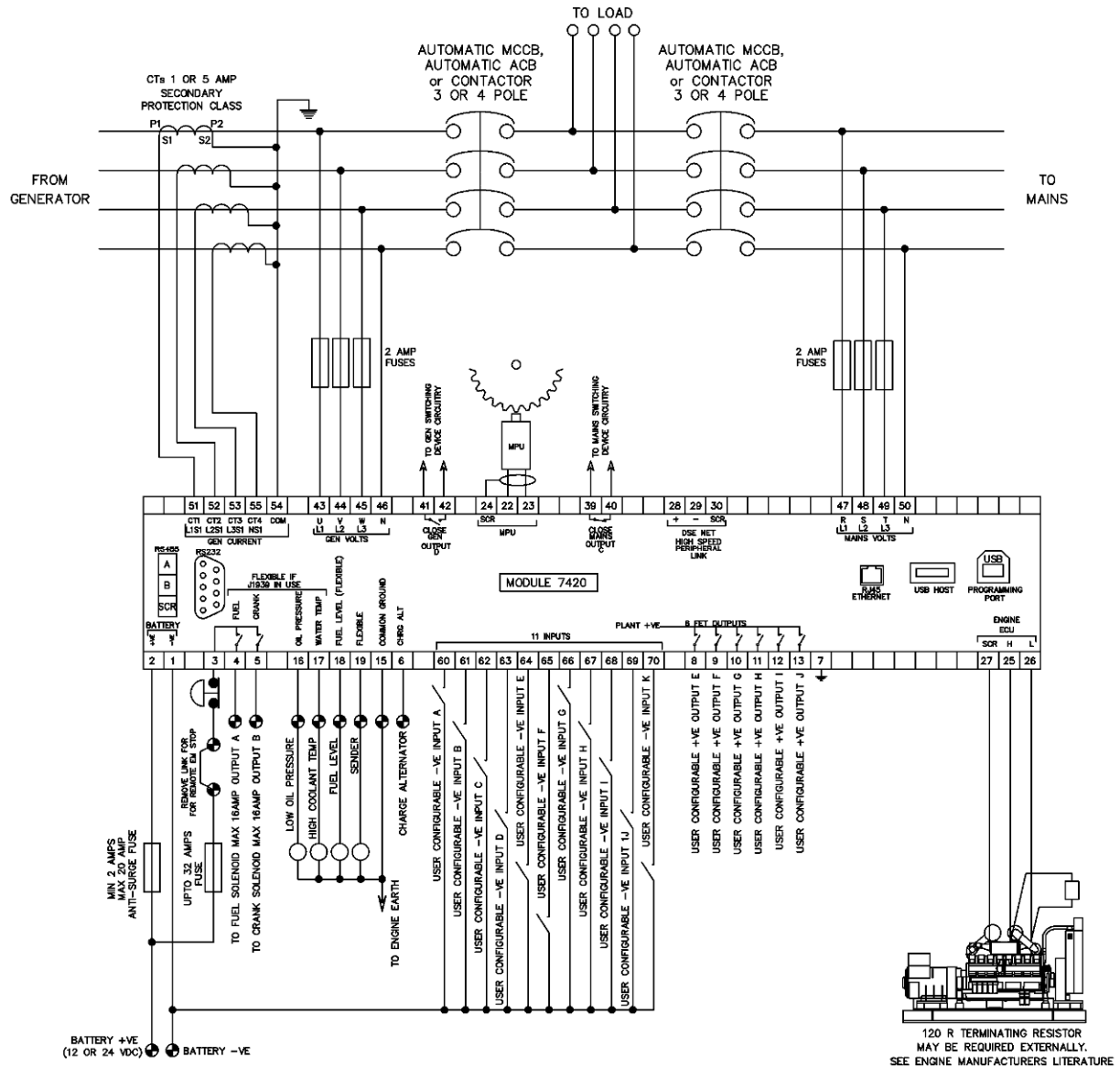
| <b>DSE PART</b> | <b>DESCRIPTION</b>                |
|-----------------|-----------------------------------|
| 056-022         | Breaker Control (Training guide)  |
| 057-004         | Electronic Engines and DSE Wiring |

## 4.2.1 DSE7410 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)

## 4.2.2 DSE7420 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)

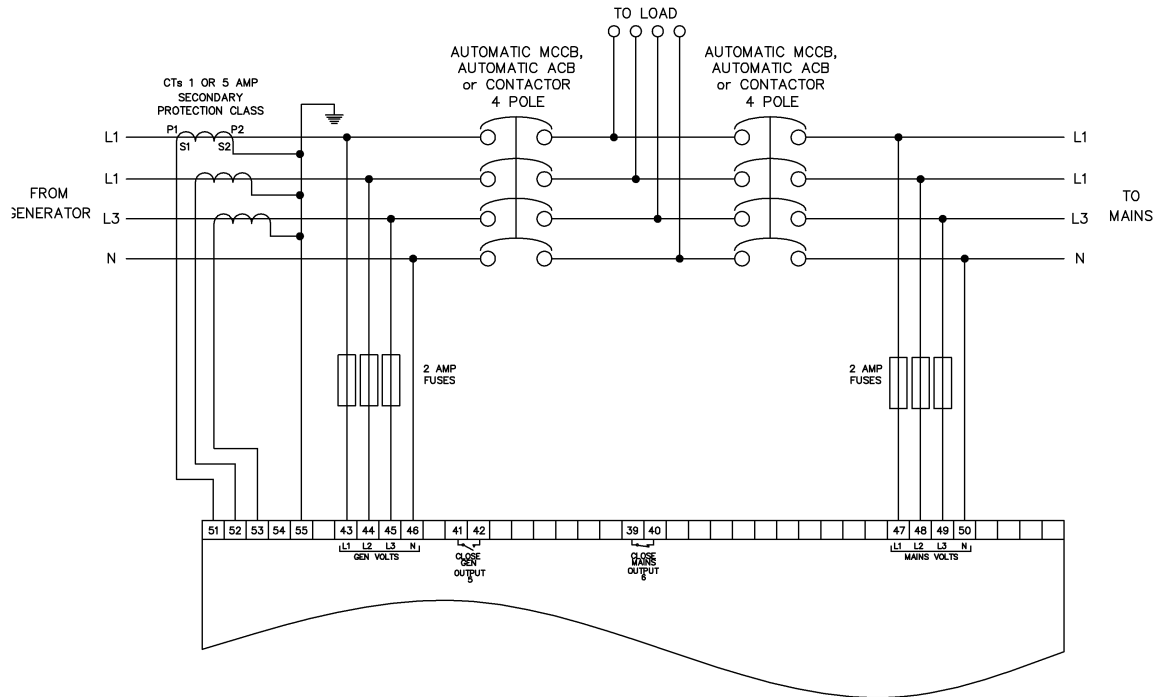


### 4.3 ALTERNATIVE TOPOLOGIES

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.

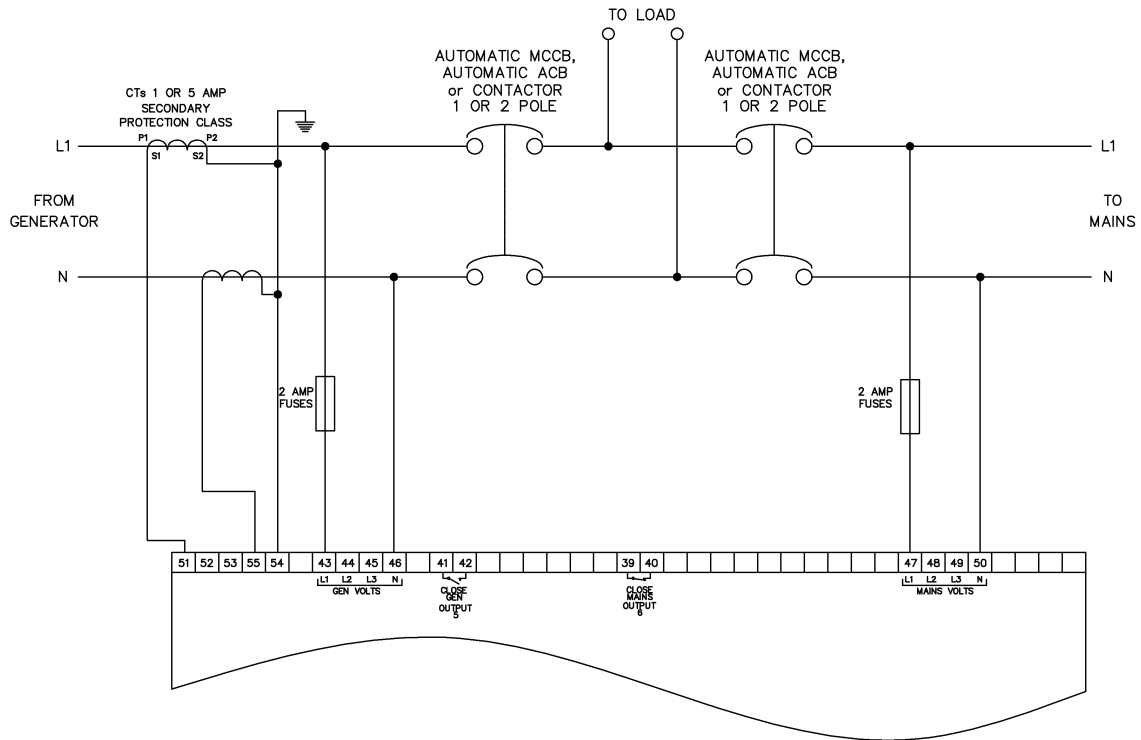
**NOTE:-** Refer to DSE7400 Series Configuration Suite Manual (DSE part 057-160) for further details on configuring, monitoring and control.

#### 4.3.1 3 PHASE, 4 WIRE WITHOUT EARTH FAULT PROTECTION

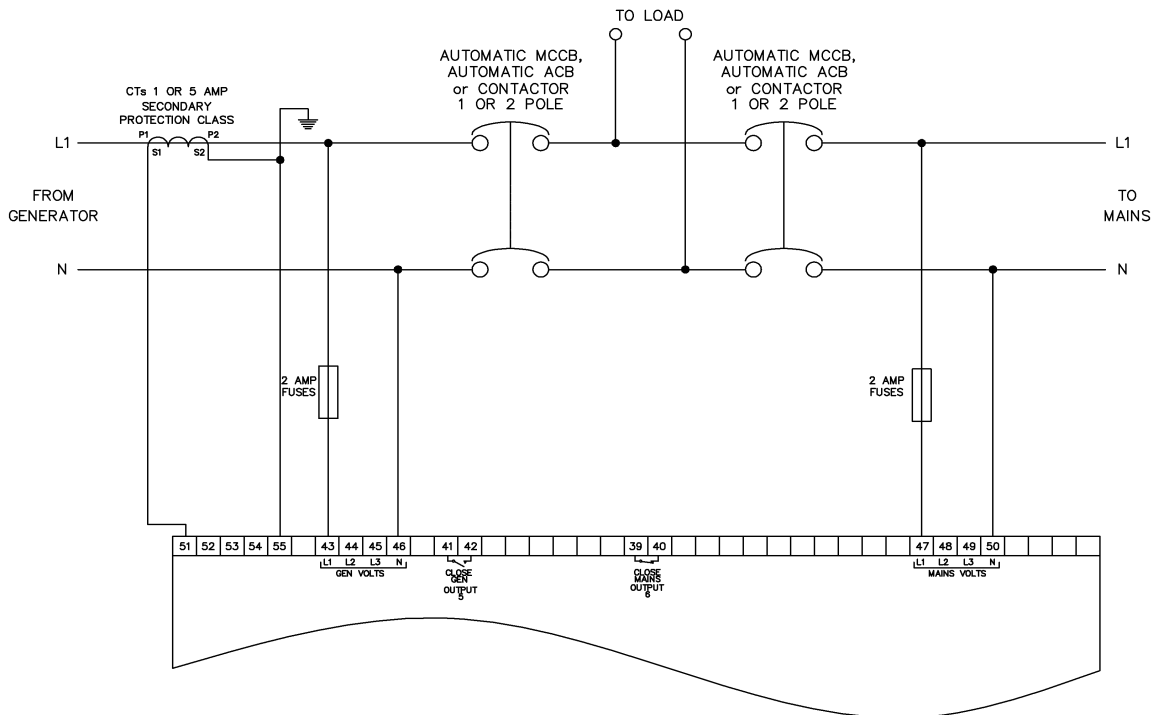


#### 4.3.2 SINGLE PHASE WITH RESTRICTED EARTH FAULT

**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)

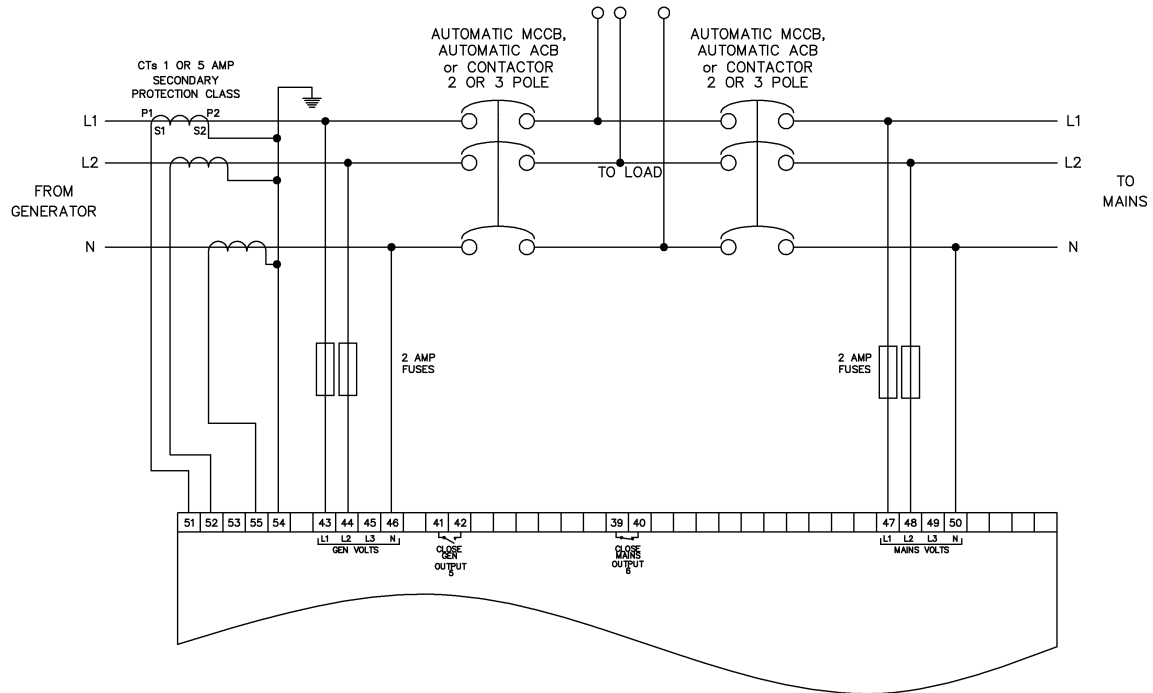


#### 4.3.3 SINGLE PHASE WITHOUT EARTH FAULT

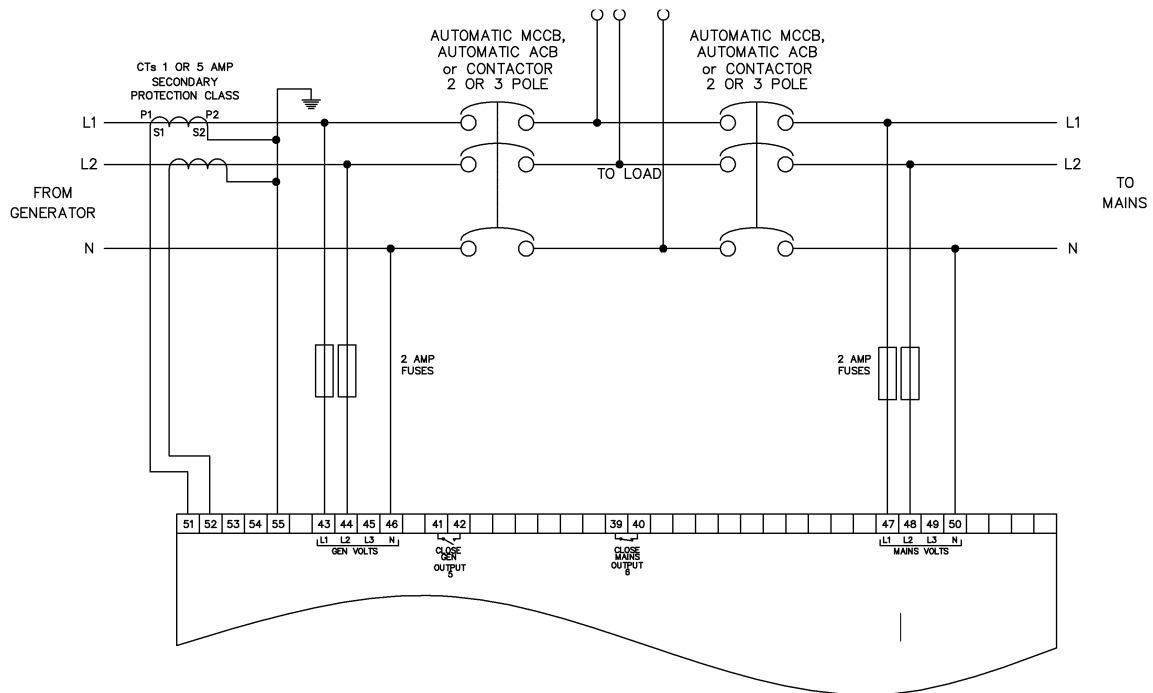


#### 4.3.4 2 PHASE (L1 & L2) 3 WIRE WITH RESTRICTED EARTH FAULT

**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)

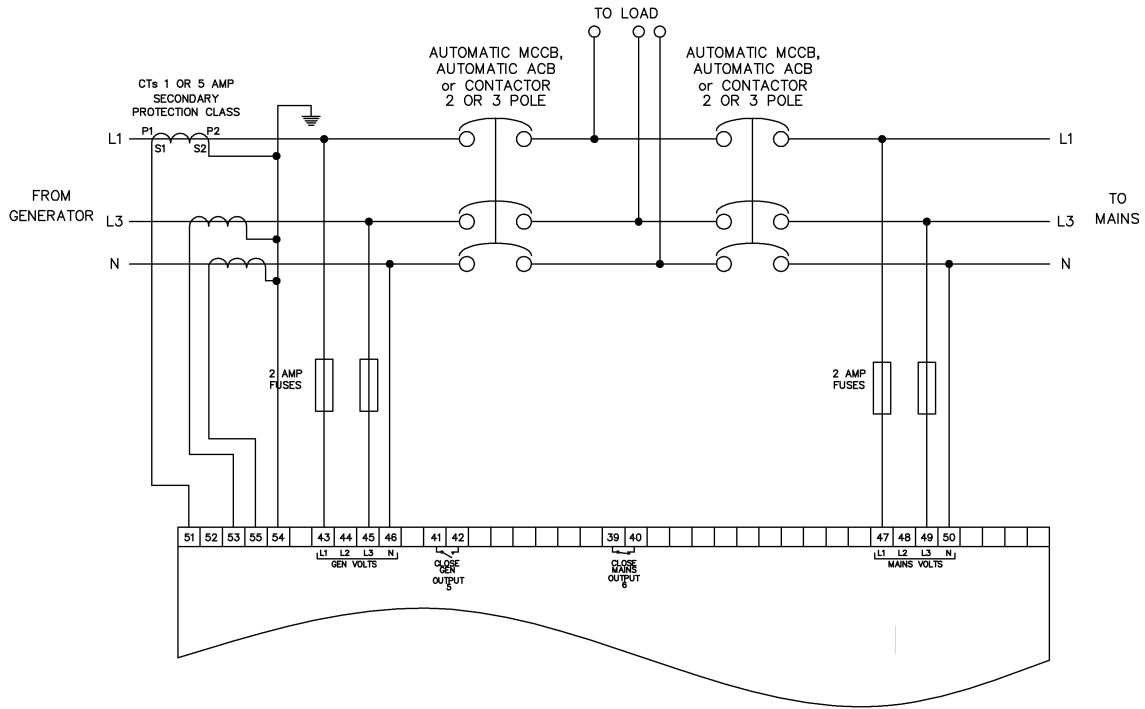


#### 4.3.5 2 PHASE (L1 & L2) 3 WIRE WITHOUT EARTH FAULT

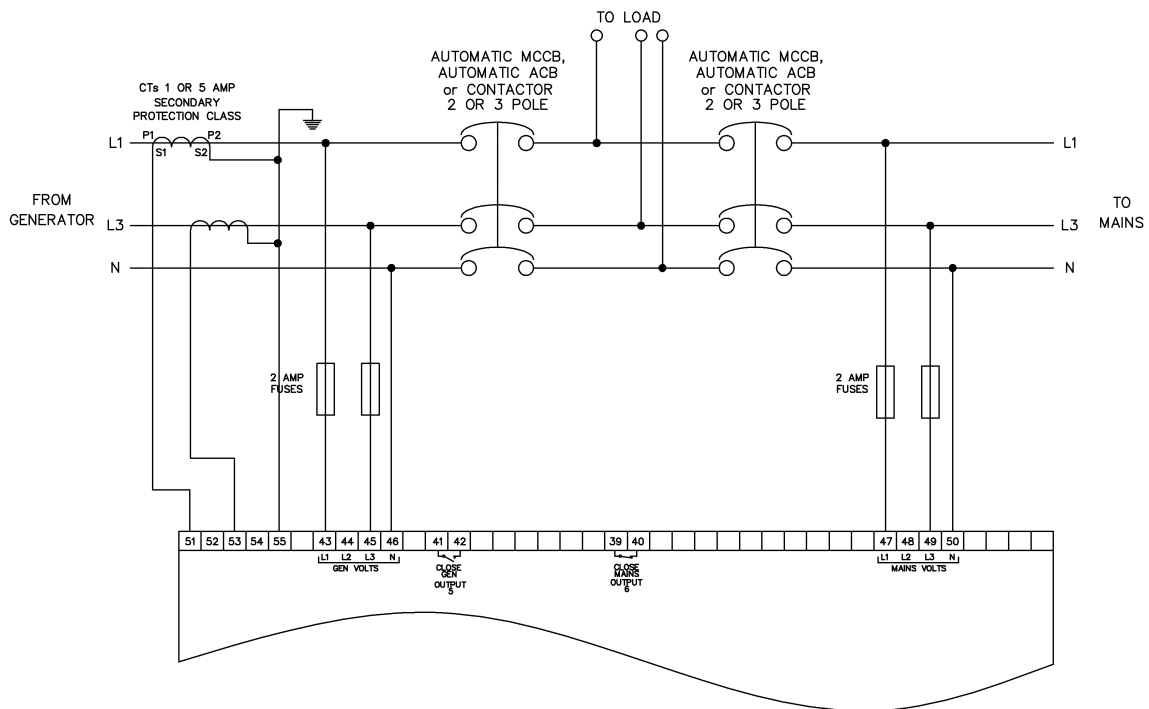


#### 4.3.6 2 PHASE (L1 & L3) 3 WIRE WITH RESTRICTED EARTH FAULT

**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)

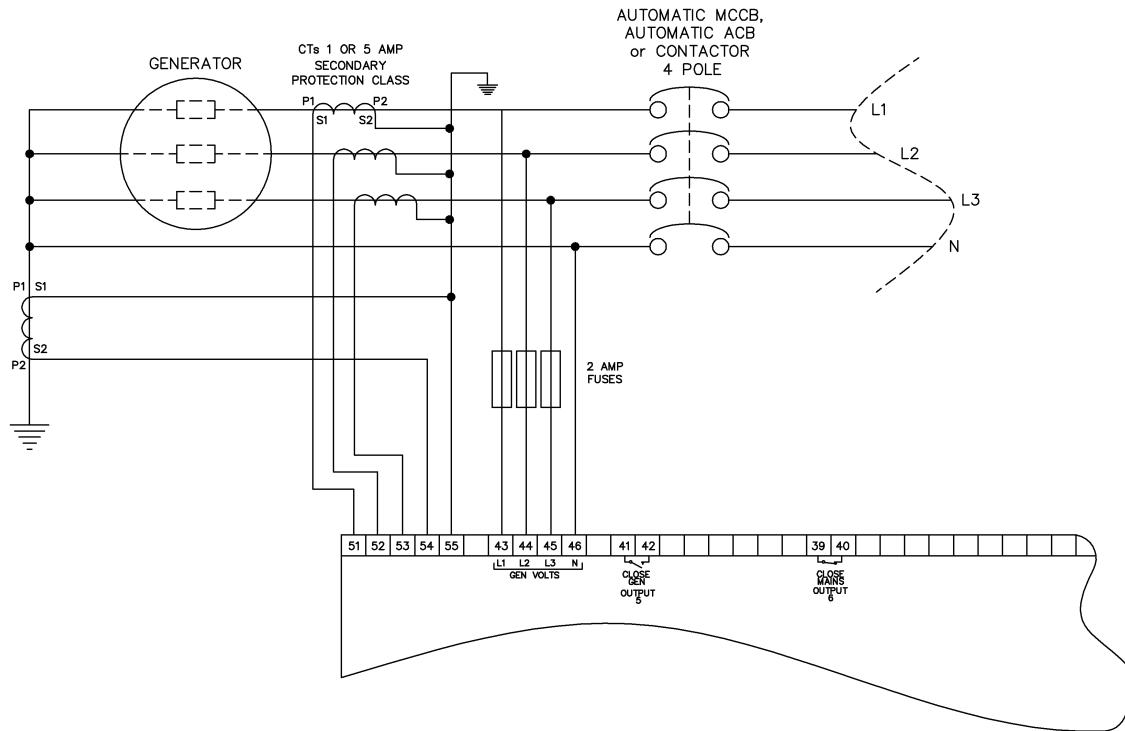


#### 4.3.7 2 PHASE (L1 & L3) 3 WIRE WITHOUT EARTH FAULT MEASURING



#### 4.3.8 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 be followed

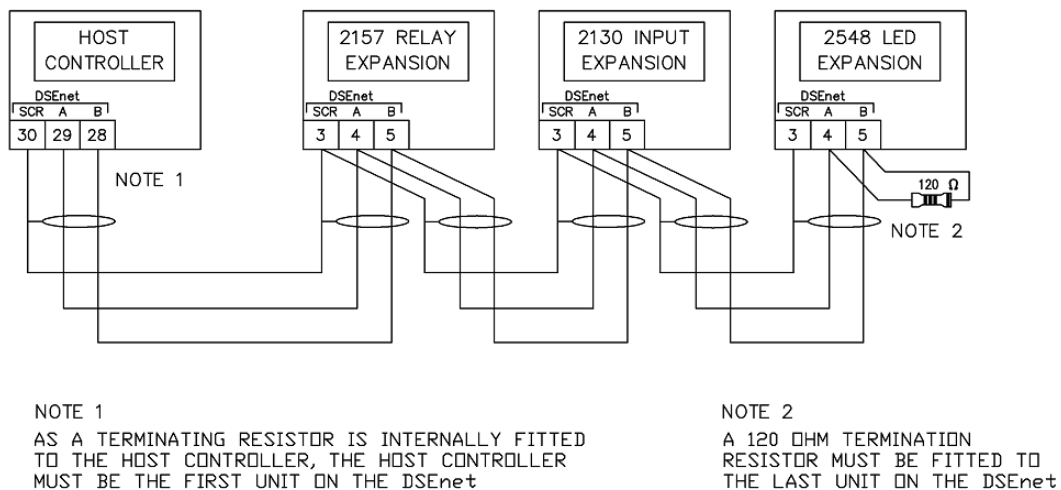
- Follow the typical wiring diagram as normal for all sections EXCEPT the earth points
- All points shown as Earth on the typical wiring diagram should connect to BATTERY NEGATIVE (not earth).

## 4.5 TYPICAL ARRANGEMENT OF DSENET®

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

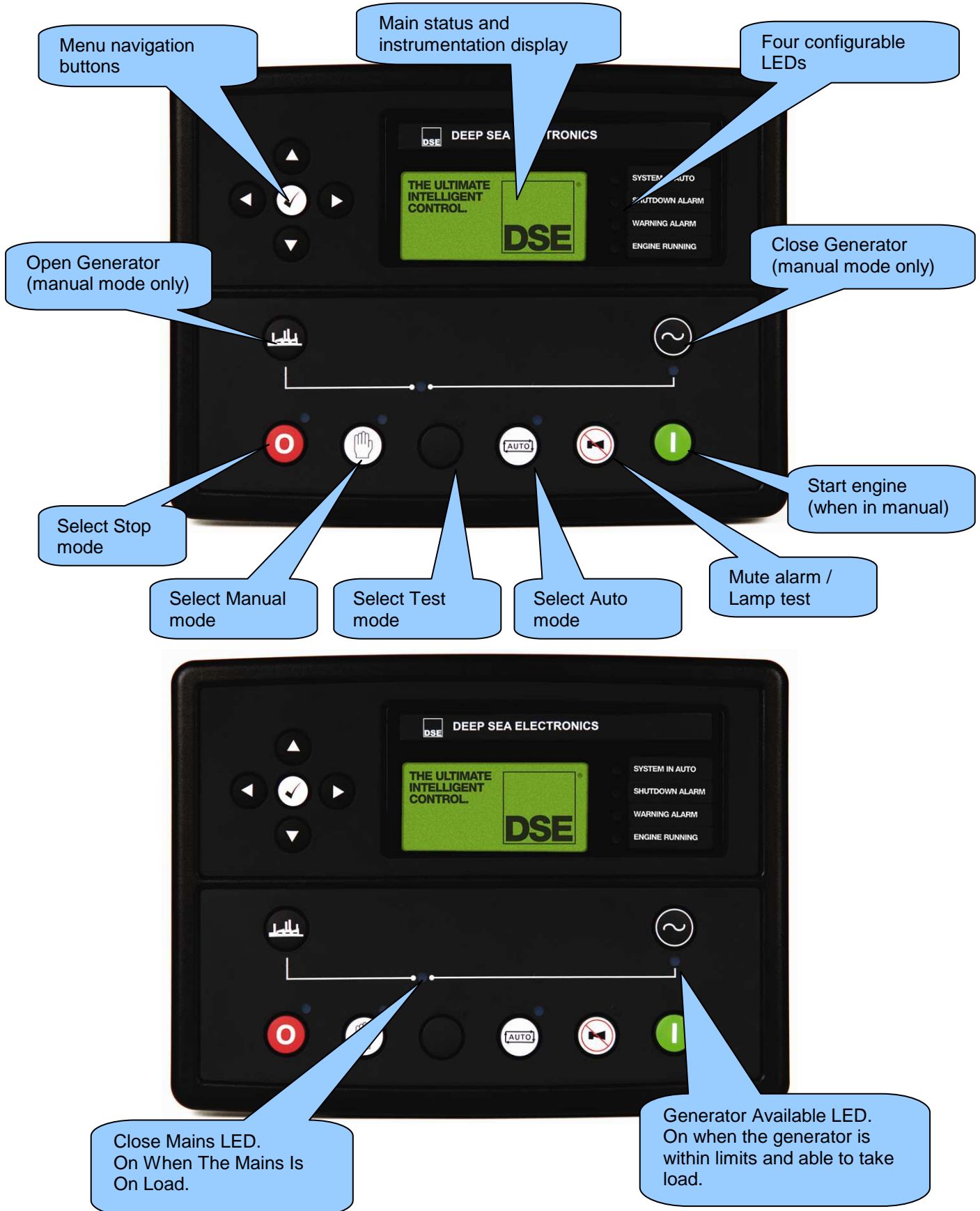
| Device                                   | Max Number Supported |
|--|----------------------|
| DSE2130 Input Expansion                  | 4                    |
| DSE2131 Ratio-metric Input Expansion     | 4                    |
| DSE2133 RTD/Thermocouple Input Expansion | 4                    |
| 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.

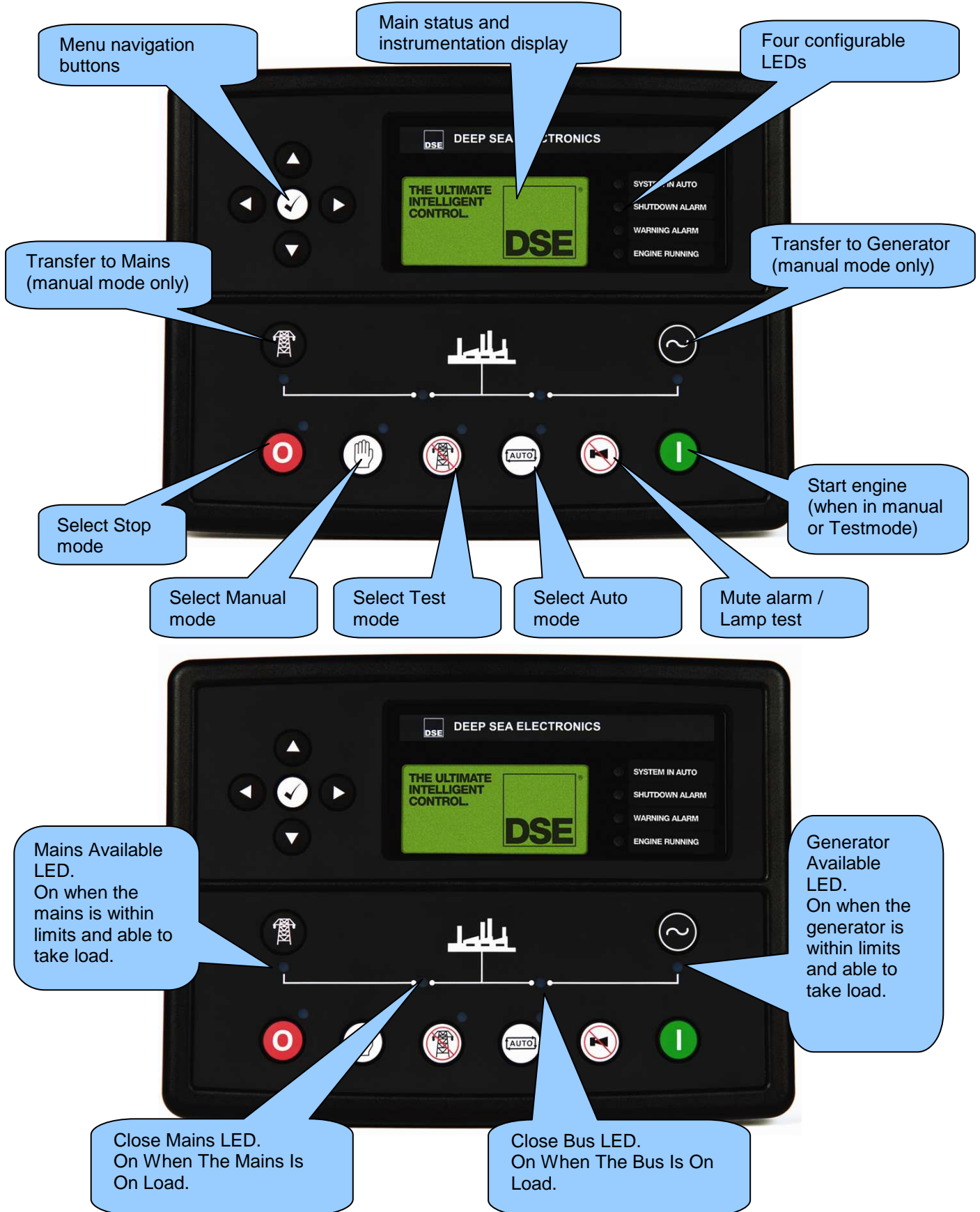


## 5 DESCRIPTION OF CONTROLS

### 5.1 DSE7410 AUTO START CONTROL MODULE



## 5.2 DSE7420 AUTO START CONTROL MODULE





## 5.3 QUICKSTART GUIDE

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

### 5.3.1 STARTING THE ENGINE



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

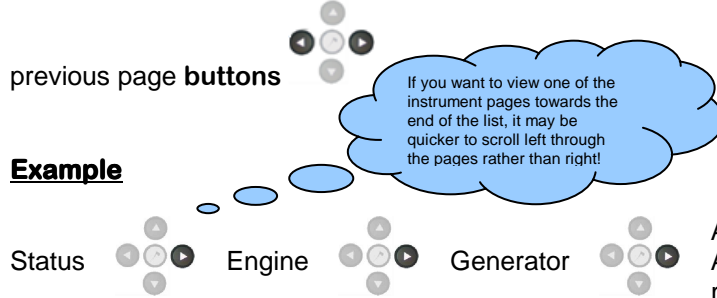
### 5.3.2 STOPPING THE ENGINE



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

## 5.4 VIEWING THE INSTRUMENT PAGES

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



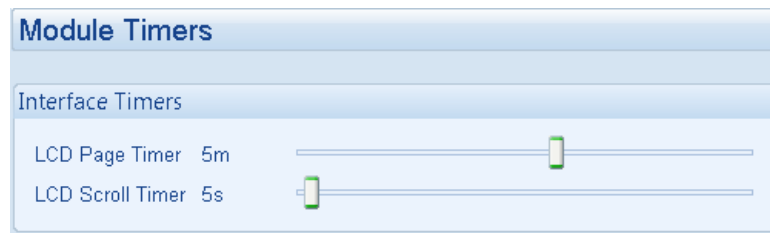
And so on until the last page is reached. A Further press of the scroll right button returns the display to the Status page.

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

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

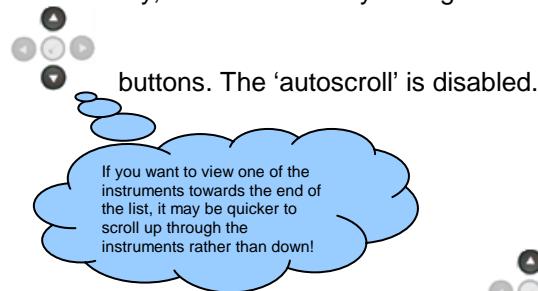
If no buttons are pressed upon entering an instrumentation page, the instruments will be displayed automatically subject to the setting of the *LCD Scroll Timer*.

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



The screenshot shows the factory settings for the timers, taken from the DSE Configuration Suite Software.

Alternatively, to scroll manually through all instruments on the currently selected page, press the scroll



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

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

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

### 5.4.1 STATUS

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

This page will change with the action of the controller , when on gen generator parameters will be seen and when changing to mains the mains parameters will be shown.

|                          |              |
|--------------------------|--------------|
| <b>Status</b>            | <b>22:31</b> |
| <b>Generator at Rest</b> |              |
| <b>Stop Mode</b>         |              |

Factory setting of Status screen showing engine stopped...

|                       |      |        |
|-----------------------|------|--------|
| Safety on Delay 00:04 |      |        |
| L-N                   | 215V | 43A    |
| L-L                   | 373V | 47.5Hz |
|                       | 0kw  | 0.0pf  |

...and engine running

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

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

The screenshot shows the 'Configurable Status Screens' window. It has a 'Home Page' section with a 'Mode' dropdown menu. Below this is a 'Displayed Pages' section with a table of 10 pages. Callouts explain that 'Stop Mode' is displayed on the Home Page, that the summary screen is shown when the engine is running, and that other pages can be configured to be shown automatically scrolling when the set is running.

| Configurable Status Screens |                |
|-----------------------------|----------------|
| Home Page                   |                |
| Home Page                   | Mode           |
| Displayed Pages             |                |
| Page 1                      | Summary screen |
| Page 2                      | Not Used       |
| Page 3                      | Not Used       |
| Page 4                      | Not Used       |
| Page 5                      | Not Used       |
| Page 6                      | Not Used       |
| Page 7                      | Not Used       |
| Page 8                      | Not Used       |
| Page 9                      | Not Used       |
| Page 10                     | Not Used       |

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


## 5.4.2 ENGINE

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

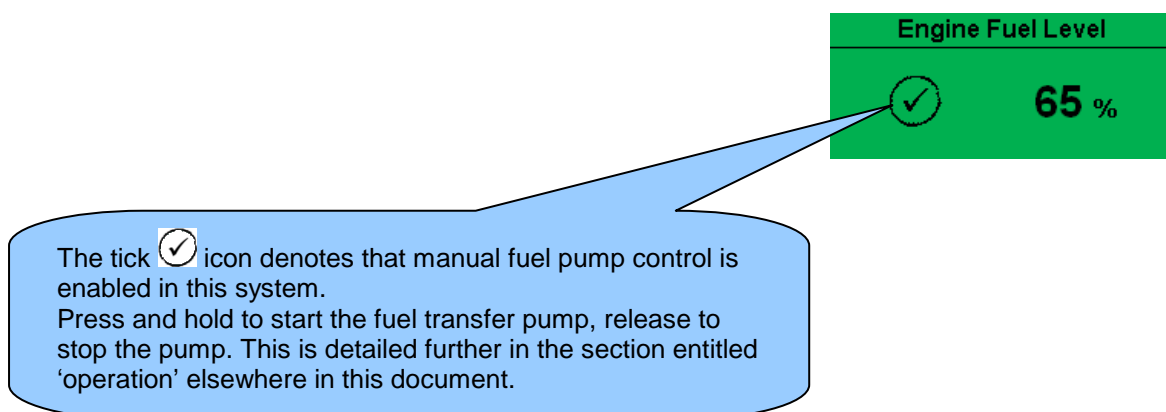
- Engine Speed
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Engine Run Time
- Engine Fuel Level
- Oil Temperature\*
- Coolant Pressure\*
- Inlet Temperature\*
- Exhaust Temperature\*
- Fuel Temperature\*
- Turbo Pressure\*
- Fuel Pressure\*
- Fuel Consumption\*
- Fuel Used\*
- Fuel Level\*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

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

- Tier 4 engine information will also be available if used with a Tier 4 suitable engine / ECU.

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

### Example:



### **5.4.3 GENERATOR**

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

- Generator Voltage (ph-N)
- Generator Voltage (ph-ph)
- Generator Frequency
- Generator Current
- Generator Earth Current
- Generator Load %
- Generator Load (kW)
- Generator Load (kVA)
- Generator Power Factor
- Generator Power Factor Average
- Generator Load (kVAr)
- Generator Load (kWh, kVAh, kVArh)
- Generator Phase Sequence
- Generator Config (Nominals)
- Generator Active Config

#### 5.4.4 BUS (DSE7410 ONLY)

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

#### 5.4.5 MAINS (DSE7420 ONLY)

- Mains Voltage (ph-N)
- Mains Voltage (ph-ph)
- Mains Frequency

#### 5.4.6 RS232 SERIAL PORT

This section is included to give information about the RS232 serial port and external modem (if connected).

The items displayed on this page will change depending upon configuration of the module. You are referred to your system supplier for further details.

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

##### Example 1 – Module connected to an RS232 telephone modem.


When the 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.


| Serial Port |      |
|-------------|------|
| Baud        | 9600 |
| SlaveID     | 10   |
| Modem       |      |



Press down  to view the modem status....

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

**Example 1 continued – Modem diagnostics**

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

| Serial Port |     |
|-------------|-----|
| RTS         | DTR |
| CTS         | DCD |
| DSR         |     |

Shows the state of the modem communication lines. These can help diagnose connection problems.

Example:

**RTS** A dark background shows the line is active.

**RTS** a grey background shows that the line is toggling high and low.

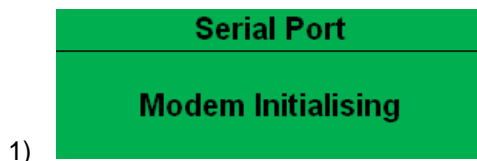
**RTS** No background indicates that the line is inactive

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

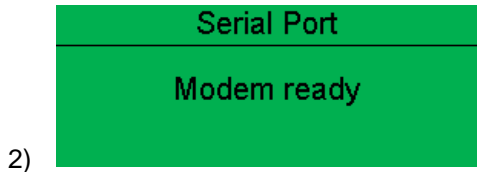
| Modem Commands |             |
|----------------|-------------|
| Rx:            | OK          |
| Tx:            | AT+IPR=9600 |
| Rx:            | OK          |

Shows the last command sent to the modem and the result of the command.

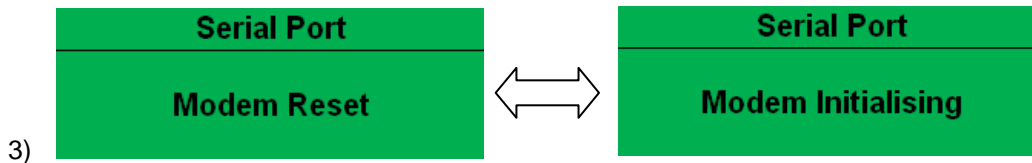
### Modem Setup Sequence



If the Modem and module communicate successfully:



In case of communication failure between the modem and module, the modem is automatically reset and initialisation is attempted once more:



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


In this instance, you should check connections and verify the modem operation.

### Example 2 – Module connected to a modem.

| Serial Port |      |
|-------------|------|
| Baud        | 9600 |
| SlaveID     | 10   |
| Modem       |      |

### Example 3 – Modem status of a GSM modem

Currently connected GSM operator and signal strength.

| Serial Port   |        |
|---|--------|
|  | Orange |
| Modem Ready   |        |

Many GSM modems are fitted with a status LED to show operator cell status and ringing indicator. These can be a useful troubleshooting tool.

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

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

If the GSM modem is not purchased from DSE, ensure that it has been correctly set to operate at 9600 baud.



### 5.4.7 RS485 SERIAL PORT

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.

| Serial Port |              |
|-------------|--------------|
| Baud        | <b>19200</b> |
| SlaveID     | <b>1</b>     |
| RS485       |              |

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. To use the RS485 port, ensure that 'port usage' is correctly set using the DSE Configuration Suite Software.

Required settings are shown below.

The screenshot shows the 'RS485 Port' configuration window. It has a title bar 'RS485 Port' and two sections: 'Basic' and 'Advanced'. In the 'Basic' section, 'Slave ID' is set to 1 and 'Baud Rate' is set to 19200. In the 'Advanced' section, 'Master inactivity timeout' is set to 5s.

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

The DSE Modbus Gencomm document containing register mappings inside the DSE module is available upon request from support@deepseapl.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).

### 5.4.8 ABOUT

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


| About       |        |
|-------------|--------|
| Variant     | 7420   |
| Application | V4.4.6 |
| USB ID      | BC614E |

- Variant (7410 or 7420)
- Application Version – The version of the module's main firmware file (Updatable using the Firmware Update Wizard in the DSE Configuration Suite Software).
- USB ID – Unique identifier for PC USB connection

Press  to access more information about the module.

| About      |        |
|------------|--------|
| Bootloader | V1.3.4 |
| Analogue   | V2.0.0 |


- Bootloader - Firmware Update bootloader software version
- Analogue – Analogue measurements software version

Press  to access more information about the module.

| About       |             |
|-------------|-------------|
| Engine Type | Volvo EMS2b |
| Version     | V1.18       |


- Engine Type – The type of engine or ECU file which is configured within the module.
- Version – Engine type file version.

### 5.4.8.1 ETHERNET PAGES

Whilst in the 'ABOUT' section, press  to access more information about the network settings. Network settings can be configured using DSE Configuration Suite Software. The module must be rebooted for the changes to take effect.

| Network       |               |
|---------------|---------------|
| IP Address    | 192.168.50.76 |
| DHCP Disabled |               |

- IP Address – The configured network IP address of the module
- DHCP – Dynamic Host Configuration Protocol (DHCP) has been enabled or disabled in the module's configuration.

Press  to access more information about the network settings.

| Network     |               |
|-------------|---------------|
| Subnet Mask | 255.255.255.0 |

- Subnet Mask – The configured network subnet mask of the module.

| Network         |               |
|-----------------|---------------|
| Gateway Address | 192.168.49.76 |

- Gateway Address – The configured network gateway address of the module.

| Network     |               |
|-------------|---------------|
| DNS Address | 192.168.88.99 |

- DNS Address – The configured network DNS address of the module.

| Network     |                 |
|-------------|-----------------|
| MAC Address | E8.A4.C1.0.A.C2 |

- MAC Address – The MAC address of the module, this cannot be changed and is unique to each module.


| DHCP               |  |
|--------------------|--|
| Host Domain Vender |  |

- DHCP – The DHCP settings of module if configured.

| MODBUS Over IP |               |
|----------------|---------------|
| TCP Port       | 502           |
| Pref IP        | 192.168.20.11 |

- TCP Port – The MODBUS TCP communication port number.
- Pref IP – The preferred IP address.

### 5.4.8.2 DATA LOGGING PAGES

Whilst in the 'ABOUT' section, press  to access more information about the data logging settings.

|                        |
|------------------------|
| <b>Data Logging</b>    |
| Log to internal memory |
| Logging active         |
| No USB drive present   |


Location of stored data.  
Internal module memory or external USB memory.

If data logging is active or inactive

Inserting a USB drive to the host USB will display the following change to the page.

|                         |
|-------------------------|
| <b>Data Logging</b>     |
| Log to USB drive        |
| Logging active          |
| Do not remove USB drive |

 **NOTE:- Removal of the USB drive should only be carried out using the following method.**

Press and hold the  tick button until "Ok to remove USB drive" is displayed.

|                        |
|------------------------|
| <b>Data Logging</b>    |
| Log to USB drive       |
| Logging active         |
| Ok to remove USB drive |

It is now safe to remove the USB drive.  
This ensures the logging data file will save to memory complete and will not become corrupt.

Press down  to view the next page.

|                     |
|---------------------|
| <b>Data Logging</b> |
| Time remaining      |
| xxxx h xx m         |

Remaining time available for logging information.  
xxxx hours xx minutes

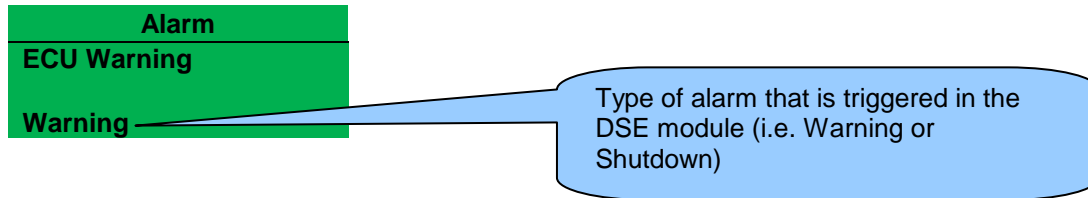
Press down  to view the next page.


|                     |
|---------------------|
| <b>Data Logging</b> |
| Memory remaining    |
| xxxx                |

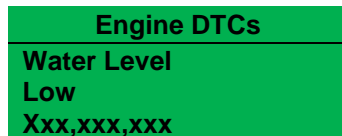
Memory space remaining, this depends what size memory drive is fitted (Max 16Gb) or allocated internal (2Mb) memory left available.

### 5.4.9 CAN ERROR MESSAGES

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



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



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

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

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

## 5.5 VIEWING THE EVENT LOG

The module maintains a log of past alarms and/or selected status changes.

The log size has been increased in the module over past module updates and is always subject to change. At the time of writing, the modules log is capable of storing the last 250 log entries.

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

**Event Log**

**Display Options**

Module display ☒ Date and time ☐ Engine hours run

**Logging Options**

Log the following events to the event log

|                     |                                     |                        |                                     |
|---------------------|-------------------------------------|------------------------|-------------------------------------|
| Power up            | <input checked="" type="checkbox"/> | Shutdown alarms        | <input checked="" type="checkbox"/> |
| Mains fail          | <input checked="" type="checkbox"/> | Electrical trip alarms | <input checked="" type="checkbox"/> |
| Mains return        | <input checked="" type="checkbox"/> | Latched warnings       | <input checked="" type="checkbox"/> |
| ECU Shutdown alarms | <input checked="" type="checkbox"/> | Unlatched warnings     | <input checked="" type="checkbox"/> |
| Log Fuel Level      | <input checked="" type="checkbox"/> |                        |                                     |
| Log When At Rest    | <input checked="" type="checkbox"/> |                        |                                     |


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

Once the log is full, any subsequent shutdown alarms will overwrite the oldest entry in the log.

Hence, the log will always contain the most recent shutdown alarms.

The module logs the alarm, along with the date and time of the event (or engine running hours if configured to do so).

If the module is configured and connected to send SMS text


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


Event log 1


**Oil Pressure Low Shutdown**

12 Sep 2007, 08:25:46

This is event 1.

Press down  to view the next most recent shutdown alarm:

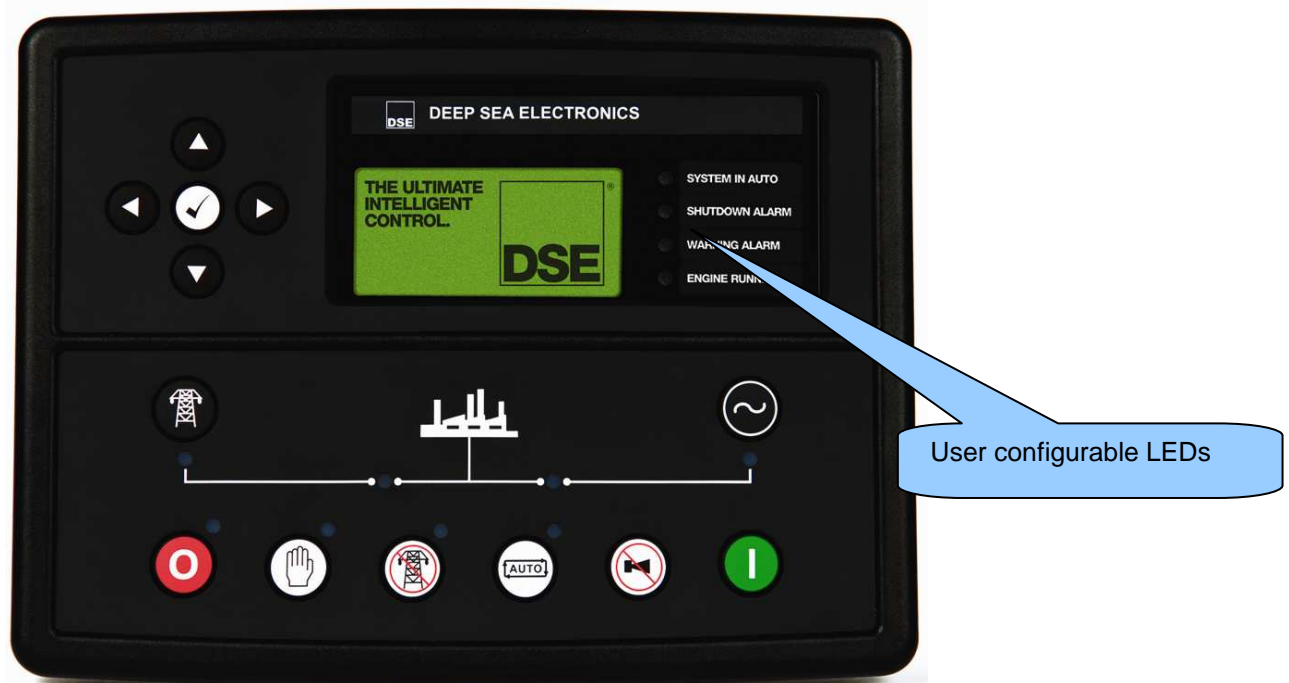
Continuing to press down  cycles through the past alarms after which the display shows the most recent alarm and the cycle begins again.

To exit the event log and return to viewing the instruments, press the next page  button to select the next instrumentation page.

## 5.6 USER CONFIGURABLE INDICATORS

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

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



## 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 mains 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

|  |   |
|--|---|
| <p><b>Stop / Reset</b></p> <p>This button places the module into its <b>Stop/Reset</b>  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 ('<b>Close Generator</b>' becomes inactive (if used)). The fuel supply de-energises and the engine comes to a standstill. Should a <b>remote start signal</b> be present while operating in this mode, a remote start will <u>not</u> occur.</p>  |    |
| <p><b>Manual</b></p> <p>This mode allows manual control of the generator functions. Once in <b>Manual</b>  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 <b>Manual</b>  mode and a <b>remote start signal</b> becomes present, the module will automatically instruct the changeover device to place the generator on load ('<b>Close Generator</b>' becomes active (if used)). Upon removal of the <b>remote start signal</b>, the generator remains on load until either selection of the '<b>STOP/RESET</b>  or '<b>AUTO</b>  modes.</p> <p><i>For further details, please see the more detailed description of 'Manual operation' elsewhere in this manual.</i></p> |    |
| <p><b>Test (DSE7420 only)</b></p> <p>This button places the module into its '<b>Test</b>'  mode. This allows an on load test of the generator.</p> <p>Once in <b>Test</b>  mode the module will respond to the start  button, start the engine, and run on load.</p> <p><i>For further details, please see the more detailed description of 'Test operation' elsewhere in this manual.</i></p>  |  |
| <p><b>Auto</b></p> <p>This button places the module into its '<b>Automatic</b>' mode. This mode allows the module to control the function of the generator automatically. The module will monitor the <i>remote start</i> 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 <i>stop delay</i> timer and <i>cooling</i> timer as necessary. The module will then await the next start event.</p> <p><i>For further details, please see the more detailed description of 'Auto operation' elsewhere in this manual.</i></p>  |  |
| <p><b>Mute / Lamp Test</b></p> <p>This button silences the audible alarm if it is sounding and illuminates all of the LEDs as a lamp test feature/</p> <p>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.</p>  |  |
| <p><b>Start</b></p> <p>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).</p> <p>Pressing this button in STOP/RESET  mode will turn on the CAN engine ECU (when correctly configured and fitted to a compatible engine ECU)</p>  |  |
| <p> <b>NOTE:- Different modes of operation are possible - Please refer to</b></p>   |   |

|   |   |
|---|---|
| <b>your configuration source for details.</b>   |   |
| <b>Transfer to generator</b><br>Operative in Manual Mode only<br><br>'Normal' breaker button control <ul style="list-style-type: none"> <li>Allows the operator to transfer the load to the generator</li> </ul> 'Alternative' breaker button control <ul style="list-style-type: none"> <li>If mains is on load, transfers the load to the generator.</li> <li>If generator is on load, opens the generator breaker</li> <li>If generator and mains are off load, closes the generator breaker.</li> </ul> |    |
| <b>Open generator (DSE7410 only)</b><br><br>Allows the operator to open the generator (when in Manual mode only)  |    |
| <b>Transfer to mains (DSE7420 only)</b><br>Operative in Manual Mode only<br><br>'Normal' breaker button control <ul style="list-style-type: none"> <li>Allows the operator to transfer the load to the mains</li> </ul> 'Alternative' breaker button control <ul style="list-style-type: none"> <li>If generator is on load, transfers the load to the mains.</li> <li>If mains is on load, opens the mains breaker</li> <li>If generator and mains are off load, closes the mains breaker.</li> </ul>      |   |
| <b>Menu navigation</b><br><br>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 DSE7400 Series Configuration Suite Manual (DSE part 057-160) for further details on configuration.**

## 6.5 STOP MODE


STOP mode is activated by pressing the  button.



In STOP  mode, the module will remove the generator from load (if necessary) before stopping the engine if it is already running.



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 :

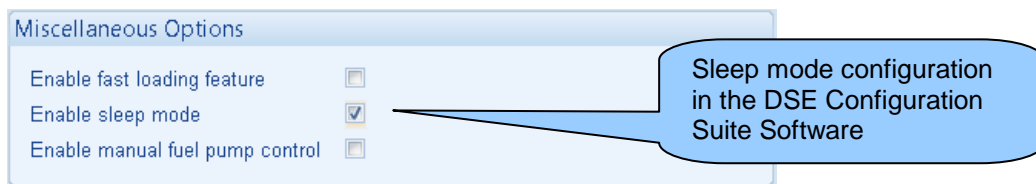
- Engine speed is zero as detected by the Magnetic Pickup or CANbus ECU (depending upon module variant).
- Generator frequency must be zero.
- Oil pressure switch must be closed to indicate low oil pressure (MPU version only)

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:-** ECU Override function is only applicable when the controller is configured for a CAN engine.

 **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 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.
- The ECU will remain powered 2 minutes 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 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 by 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.

### 6.6.1 WAITING IN MANUAL MODE

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

To begin the starting sequence, press the  button.

### 6.6.2 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 the configuration software).

Additionally, rising oil pressure 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

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
- Mains supply out of limits (DSE7420 only)
- 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.

Once the load has been transferred to the generator, it will not be automatically transferred back to the mains supply. To manually transfer the load back to the mains either:






- Press the *Transfer to Mains*  button (DSE7420 only)
- Press the *Open Generator*  button (DSE7410 only)
- Press the *Auto Mode*  button to return to automatic mode.

For further details of breaker control, see the section entitled "controls and indications" elsewhere in this manual.

### 6.6.4 MANUAL FUEL PUMP CONTROL



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

### 6.6.5 MANUAL SPEED CONTROL

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

### 6.6.6 STOPPING SEQUENCE


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

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

## 6.7 TEST MODE

 **NOTE:- Test Mode is only applicable to DSE7420 controller.**

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

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

Test mode will start the set and transfer the load to the generator to provide a ***Test on load*** function.

### 6.7.1 WAITING IN TEST MODE

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

To begin the starting sequence, press the  button.

### 6.7.2 STARTING SEQUENCE

The set begins to crank.

 **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 configuration software).

Additionally, rising oil pressure 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

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

Load will be automatically transferred from the mains supply to the generator.


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

In test mode, the set will continue to run *on load* 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*.

## 6.8 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 by 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.

### 6.8.1 WAITING IN AUTO MODE

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

- Mains supply out of limits (DSE7420 only)
- Activation of an auxiliary input that has been configured to *remote start on load* or *remote start off load*.
- Activation of the inbuilt exercise scheduler.
- Instruction from external remote telemetry devices using the RS232 or RS485 interface

### 6.8.2 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 software).

Additionally, rising oil pressure 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.

### 6.8.3 ENGINE RUNNING

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

DSE7410 - The generator will be placed on load.

DSE7420 - Load will be transferred from the mains supply to the generator



**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 module may (depending upon configuration) add dummy loads or remove non-essential loads. This is configured as part of the *Load Shedding* and *Dummy Load* control settings in the DSE Configuration Suite Software.

See section entitled *Dummy Load / Load Shedding* elsewhere in this document for further details.

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

### 6.8.4 STOPPING SEQUENCE

The *return delay* timer operates to ensure that the starting request has been permanently removed and isn't 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 transferred back from the generator to the mains supply 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.

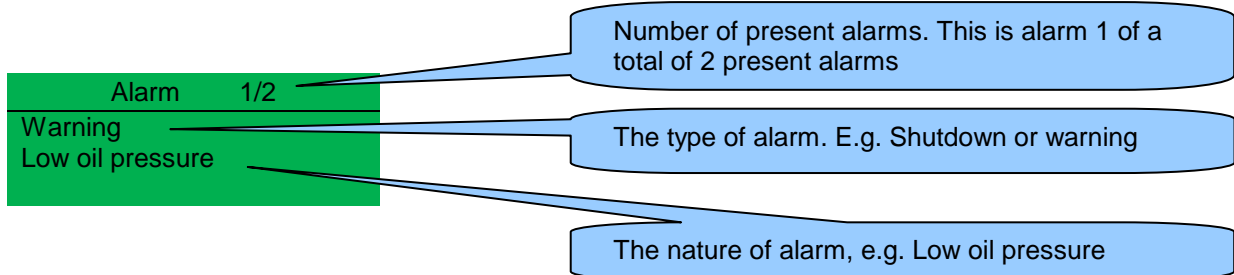
After the *cooling* timer has expired, the set is stopped.

## 7 PROTECTIONS

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

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

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



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

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

Example:-

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

|                          |     |
|--------------------------|-----|
| Alarm                    | 2/2 |
| Shutdown                 |     |
| Coolant Temperature High |     |

## 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 alarms* 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   |
|------------------------|--|
| <b>CAN ECU WARNING</b> | 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 |
| <b>ECU SHUTDOWN</b>    | 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.   |
| <b>ECU DATA FAIL</b>   | 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  |
|----------------------|---|
| <b>Amber Warning</b> | The CAN ECU has detected a Amber warning.       |
| <b>Red Shutdown</b>  | The CAN ECU has detected a Red Shutdown.        |
| <b>Malfunction</b>   | The CAN ECU has detected a Malfunction message. |
| <b>Protect</b>       | The CAN ECU has detected a Protect message      |

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

| Display                | Reason  |
|------------------------|---|
| <b>Water in Fuel</b>   | The ECU has detected water in the fuel action taken is set by settings in advanced.   |
| <b>After Treatment</b> | 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 LED indicator can be configured to draw the operator's attention to the event.

### Example

- Input configured for indication.
- The LCD text will not appear on the module display but can be added in the configuration to remind the system designer what the input is used for.
- As the input is configured to *Indication* there is no alarm generated.
- LED Indicator to make LED1 illuminate when Digital Input A is active.
- The Insert Card Text allows the system designer to print an insert card detailing the LED function.
- Sample showing operation of the LED.

Digital Input A

|                  |                    |
|------------------|--------------------|
| Function         | User Configured    |
| Polarity         | Close to Activate  |
| Action           | Indication         |
| Arming           | Always             |
| LCD Display      | Battery Charger On |
| Activation Delay | 0s                 |

LED Indicators

|                  |                 |                    |
|------------------|-----------------|--------------------|
| Insert Card Text |                 |                    |
| 1                | Digital Input A | Lit                |
|                  |                 | Battery Charger On |



## 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.

Example

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

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

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

| Display                              | Reason  |
|--------------------------------------|---|
| <b>AUXILIARY INPUTS</b>              | If an auxiliary input has been configured as a warning the appropriate LCD message will be displayed and the <b>COMMON ALARM LED</b> will illuminate.   |
| <b>CHARGE FAILURE</b>                | The auxiliary charge alternator voltage is low as measured from the W/L terminal.   |
| <b>BATTERY UNDER VOLTAGE</b>         | The DC supply has fallen below the low volts setting level for the duration of the low battery volts timer  |
| <b>BATTERY OVER VOLTAGE</b>          | The DC supply has risen above the high volts setting level for the duration of the high battery volts timer   |
| <b>FAIL TO STOP</b>                  | The module has detected a condition that indicates that the engine is running when it has been instructed to stop.<br><br><div> <b>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.</b></div> |
| <b>FUEL USAGE</b>                    | Indicates the amount of fuel measured by the fuel level sensor is in excess of the <i>Fuel Usage</i> alarm settings. This often indicates a fuel leak or potential fuel theft.  |
| <b>LOW FUEL LEVEL</b>                | The level detected by the fuel level sensor is below the low fuel level setting.  |
| <b>CAN ECU ERROR</b>                 | 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.   |
| <b>kW OVERLOAD</b>                   | The measured Total kW is above the setting of the kW overload warning alarm   |
| <b>EARTH FAULT</b>                   | 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.  |
| <b>NEGATIVE PHASE SEQUENCE</b>       | Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault  |
| <b>MAINTENANCE DUE</b>               | Indicates that the maintenance alarm has triggered. A visit is required by the Generator service company.   |
| <b>LOADING VOLTAGE NOT REACHED</b>   | Indicates that the generator voltage is not above the configured <i>loading voltage</i> . The generator will not take load when the alarm is present after the safety timer.  |
| <b>LOADING FREQUENCY NOT REACHED</b> | Indicates that the generator frequency is not above the configured <i>loading frequency</i> . The generator will not take load when the alarm is present after the safety timer.  |



| Display                          | Reason  |
|----------------------------------|---|
| <b>PROTECTIONS DISABLED</b>      | 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. |
| <b>LOW OIL PRESSURE</b>          | The module detects that the engine oil pressure has fallen below the low oil pressure pre-alarm setting level after the <i>Safety On</i> timer has expired.   |
| <b>ENGINE HIGH TEMPERATURE</b>   | The module detects that the engine coolant temperature has exceeded the high engine temperature pre-alarm setting level after the <i>Safety On</i> timer has expired.   |
| <b>ENGINE LOW TEMPERATURE</b>    | The module detects that the engine coolant temperature has fallen below the high engine temperature pre-alarm setting level.  |
| <b>OVERSPEED</b>                 | The engine speed has risen above the overspeed pre alarm setting  |
| <b>UNDERSPEED</b>                | The engine speed has fallen below the underspeed pre alarm setting  |
| <b>GENERATOR OVER FREQUENCY</b>  | The generator output frequency has risen above the pre-set pre-alarm setting.   |
| <b>GENERATOR UNDER FREQUENCY</b> | The generator output frequency has fallen below the pre-set pre-alarm setting after the <i>Safety On</i> timer has expired.   |
| <b>GENERATOR OVER VOLTAGE</b>    | The generator output voltage has risen above the pre-set pre-alarm setting.   |
| <b>GENERATOR UNDER VOLTAGE</b>   | The generator output voltage has fallen below the pre-set pre-alarm setting after the <i>Safety On</i> timer has expired.   |
| <b>INSUFFICIENT CAPACITY</b>     | If the generator reach full load when they are in parallel with the mains (utility). The LCD will indicate ' <b>INSUFFICIENT CAPACITY</b> ' and the <b>COMMON ALARM LED</b> will illuminate.  |
| <b>MAINS FAILED TO CLOSE</b>     | If the mains breaker fails to close, a warning is initiated. The LCD will indicate ' <b>MAINS FAILED TO CLOSE</b> ' and the <b>COMMON ALARM LED</b> will illuminate.  |
| <b>MAINS FAILED TO OPEN</b>      | If the mains breaker fails to open, a warning is initiated. The LCD will indicate ' <b>MAINS FAILED TO OPEN</b> ' and the <b>COMMON ALARM LED</b> will illuminate.  |
| <b>ECU WARNING</b>               | 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.

Example

|                           |     |
|---------------------------|-----|
| Alarm                     | 1/1 |
| Oil Pressure Low Shutdown |     |

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

| 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          | <p>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.<br/>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.</p> <p><b>NOTE:-</b> The Emergency Stop Positive signal must be present otherwise the unit will shutdown.</p> |
| LOW OIL PRESSURE        | The engine oil pressure has fallen below the low oil pressure trip setting level after the <i>Safety On</i> timer has expired.  |
| ENGINE HIGH TEMPERATURE | The engine coolant temperature has exceeded the high engine temperature trip setting level after the <i>Safety On</i> timer has expired.  |
| FUEL USAGE              | Indicates the amount of fuel measured by the fuel level sensor is in excess of the <i>Fuel Usage</i> 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               | <p>The engine speed has exceeded the pre-set trip</p> <p><b>NOTE:-</b> 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 DSE7400 series configuration software manual under heading 'Overspeed Overshoot' for details.</p>   |
| UNDERSPEED              | The engine speed has fallen below the pre-set trip after the <i>Safety On</i> timer has expired.  |

## Protections

| Display                                 | Reason   |
|---|--|
| <b>GENERATOR OVER FREQUENCY</b>         | The generator output frequency has risen above the preset level  |
| <b>GENERATOR UNDER FREQUENCY</b>        | The generator output frequency has fallen below the preset level   |
| <b>GENERATOR OVER VOLTAGE</b>           | The generator output voltage has risen above the preset level  |
| <b>GENERATOR UNDER VOLTAGE</b>          | The generator output voltage has fallen below the preset level   |
| <b>OIL PRESSURE SENSOR OPEN CIRCUIT</b> | The oil pressure sensor is detected as not being present (open circuit)  |
| <b>AUXILIARY INPUTS</b>                 | 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.   |
| <b>LOSS OF SPEED SIGNAL</b>             | The speed signal from the magnetic pickup is not being received by the DSE controller.   |
| <b>ECU DATA FAIL</b>                    | The module is configured for CAN operation and does not detect data on the engine Can datalink, the engine shuts down.   |
| <b>ECU SHUTDOWN</b>                     | 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.   |
| <b>kW OVERLOAD</b>                      | The measured Total kW is above the setting of the kW overload shutdown alarm   |
| <b>NEGATIVE PHASE SEQUENCE</b>          | Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault   |
| <b>MAINTENANCE DUE</b>                  | Indicates that the maintenance alarm has triggered. A visit is required by the Generator service company.  |
| <b>GENERATOR HIGH CURRENT</b>           | 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.  |
| <b>LOADING VOLTAGE NOT REACHED</b>      | Indicates that the generator voltage is not above the configured loading voltage after the safety timer. The generator will shutdown.  |
| <b>LOADING FREQUENCY NOT REACHED</b>    | Indicates that the generator frequency is not above the configured loading frequency after the safety timer. The generator will shutdown.  |
| <b>PROTECTIONS DISABLED</b>             | 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.

Example

|   |     |
|---|-----|
| Alarm                                     | 1/1 |
| Generator Current High<br>Electrical Trip |     |

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



to reset the module.

| Display                              | Reason   |
|--------------------------------------|--|
| <b>GENERATOR HIGH CURRENT</b>        | 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. |
| <b>AUXILIARY INPUTS</b>              | If an auxiliary input configured as an electrical trip is active, the user configured message shows on the display.  |
| <b>kW OVERLOAD</b>                   | The measured Total kW is above the setting of the kW overload Electrical Trip alarm  |
| <b>EARTH FAULT</b>                   | The measured Earth Current is above the setting of the Earth fault alarm.  |
| <b>NEGATIVE PHASE SEQUENCE</b>       | Indicates 'out of balance' current loading of the generator. Sometimes also called Negative Sequence Current or Symmetry Fault   |
| <b>FUEL USAGE</b>                    | Indicates the amount of fuel used is in excess of the <i>Fuel Usage</i> alarm settings. This often indicates a fuel leak or potential fuel theft.  |
| <b>LOADING VOLTAGE NOT REACHED</b>   | Indicates that the generator voltage is not above the configured loading voltage after the safety timer. The generator will shutdown.  |
| <b>LOADING FREQUENCY NOT REACHED</b> | Indicates that the generator frequency is not above the configured loading frequency after the safety timer. The generator will shutdown.  |
| <b>PROTECTIONS DISABLED</b>          | 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.                                |
| <b>GENERATOR UNDER FREQUENCY</b>     | The generator output frequency has fallen below the preset level   |
| <b>GENERATOR UNDER VOLTAGE</b>       | The generator output voltage has fallen below the preset level   |
| <b>INSUFFICIENT CAPACITY</b>         | 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 <b>COMMON ALARM LED</b> will flash. The generator will provide 100% of its capacity and the loading on the mains will increase.                                |
| <b>UNDERSPEED</b>                    | 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:

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

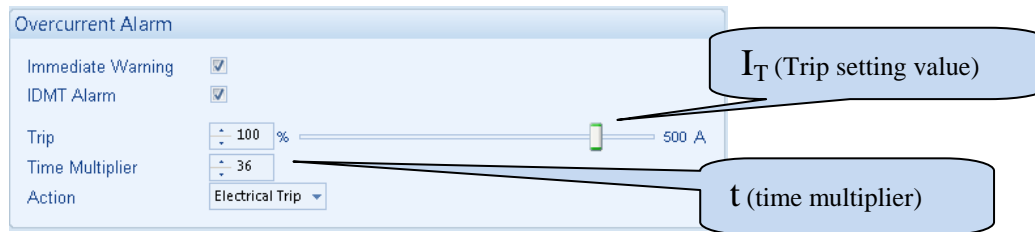
Where: T is the tripping time in seconds

$I_A$  is the actual current of the most highly loaded line (L1 or L2 or L3)

$I_T$  is the delayed over-current trip point

t is the time multiplier setting and also represents the tripping time in seconds at twice full load (when  $I_A / I_T = 2$ ).

Factory settings for the *IDMT Alarm* when used on a brushless alternator are as follows (screen capture from the DSE Configuration Suite PC software) :



These settings provide for normal running of the generator up to 100% full load. If full load is surpassed, the *Immediate Warning* alarm is triggered, the set continues to run.

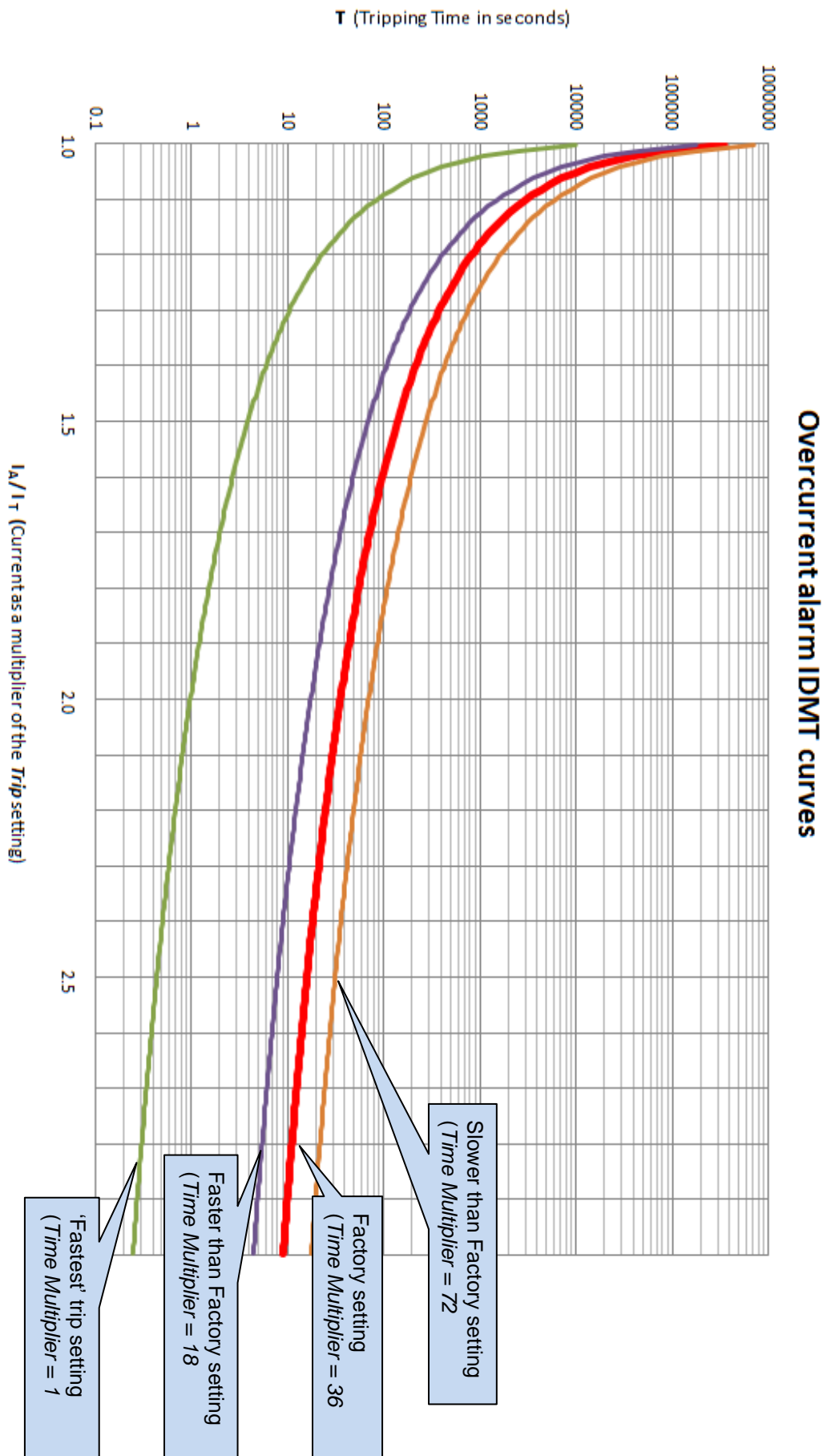
The effect of an overload on the generator is that the alternator windings begin to overheat; the aim of the *IDMT alarm* is to prevent the windings being overload (heated) too much. The amount of time that the set can be safely overloaded is governed by how high the overload condition is.

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

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

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

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



## 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.

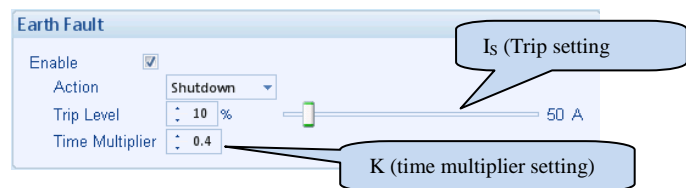
If the *Earth Fault alarm* is enabled, the controller begins following the IDMT 'curve'. If the *Trip* is surpassed for an excess amount of time the Alarm triggers (*Shutdown* or *Electric trip* as selected in *Action*).

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

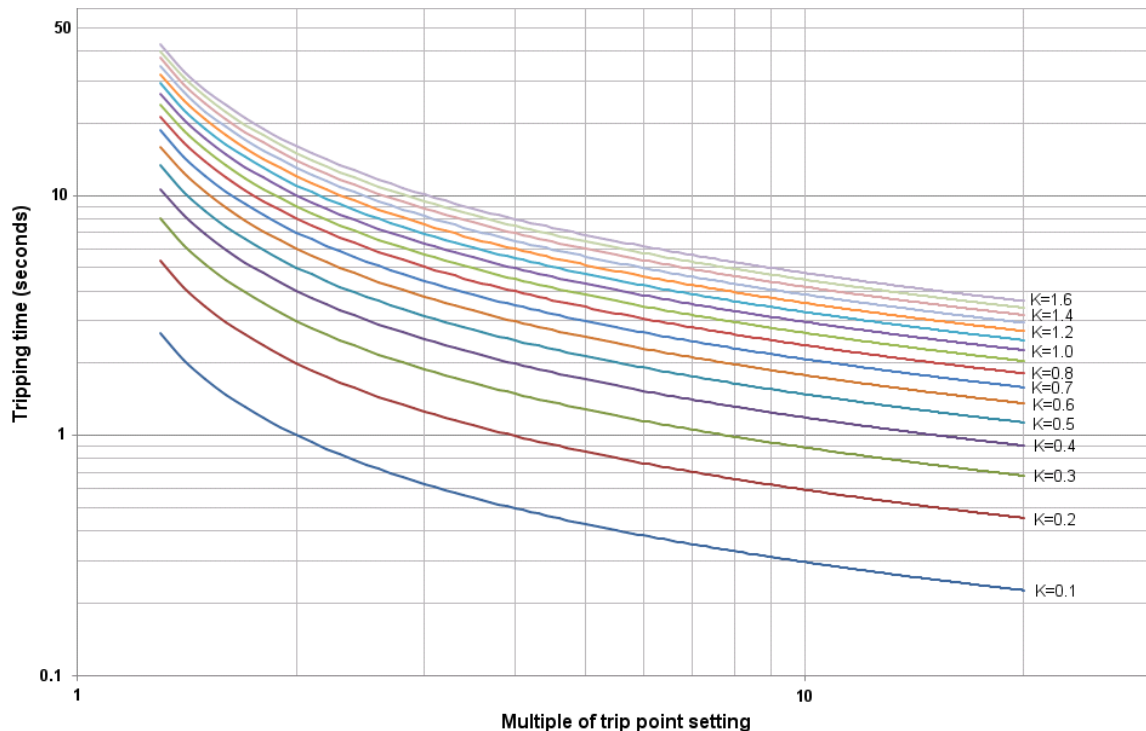
$$T = K \times 0.14 / ((I / I_s)^{0.02} - 1)$$

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.





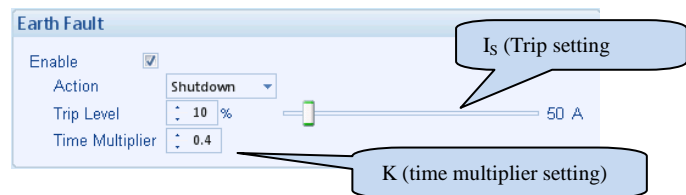
## 7.9 SHORT CIRCUIT ALARM

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*).

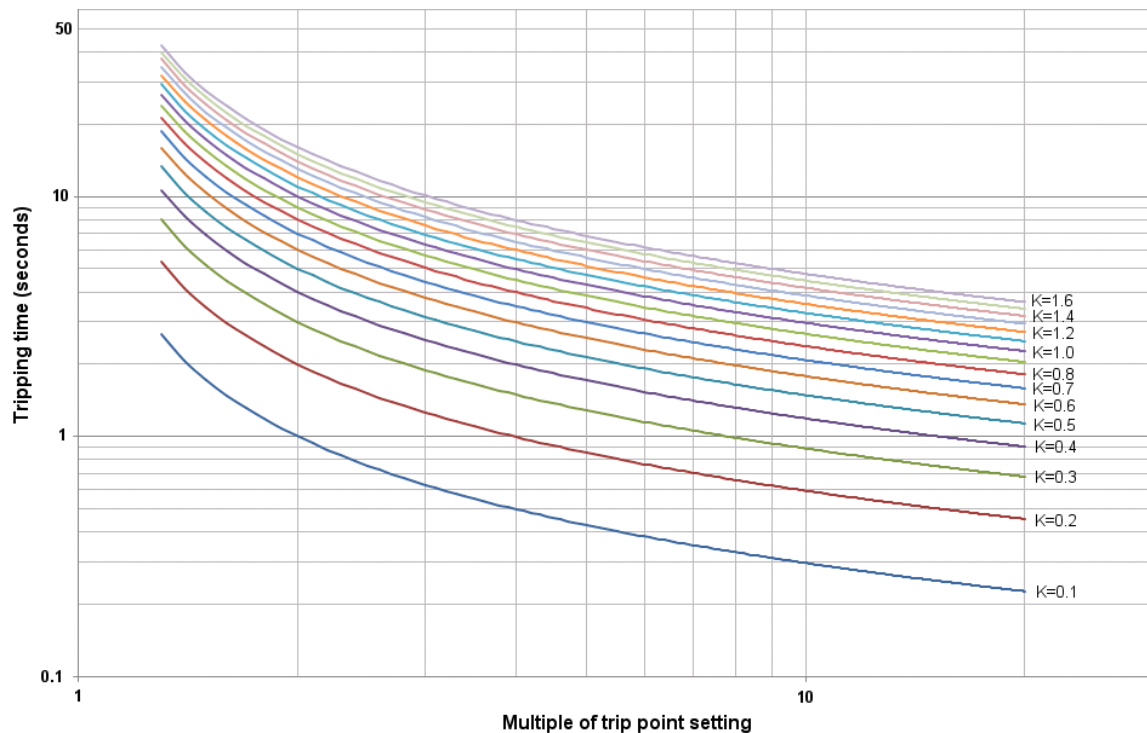
The higher the Short Circuit, the faster the trip. The speed of the trip is dependent upon the fixed formula :

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

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.

**Maintenance Alarm**

**Maintenance alarm 1**

Enable ☒

Description Maintenance alarm 1

Action Warning

Engine run hours 10 hrs

Enable alarm on due date ☐

Maintenance interval 1 months

**Maintenance alarm 2**

Enable ☒

Description Maintenance alarm 2

Action Warning

Engine run hours 250 hrs

Enable alarm on due date ☐

Maintenance interval 1 months

### Example 2

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

**Digital Input A**

Function Reset maintenance alarm 1

Polarity Close to Activate

Action

Arming

LCD Display

Activation Delay 0s

### Example 3

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

**Maintenance Alarm**

Running Time Until Next Maintenance  
18 hrs

Date Of Next Maintenance  
13 Jan 2009

Reset

Press reset to schedule next maintenance, based upon module's maintenance configuration.

## 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.

The screenshot shows the 'Exercise Scheduler' configuration window. It has a table with 16 rows. The first row is set to 'Monday' at '09:00' for '05:00' with a 'Clear' button. The second row is set to 'Tuesday' at '13:30' for '00:30' with a 'Clear' button. The remaining 14 rows are empty. Above the table, there are checkboxes for 'Enabled' (checked) and 'Scheduled runs are On Load' (unchecked), and a 'Schedule Period' dropdown set to 'Weekly'.






### 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

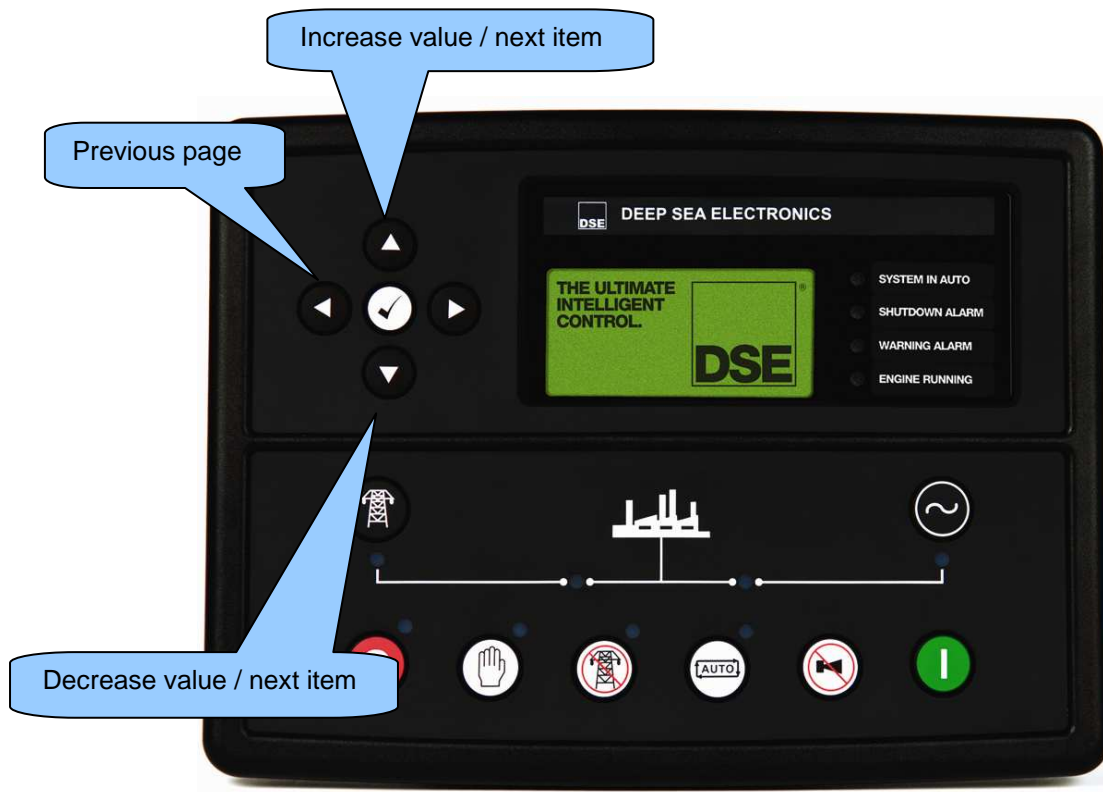
### 8.1.3 AUTO MODE

- 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 the Stop/Reset  and Info  buttons simultaneously.


If a module security PIN has been set, the PIN number request is then shown :

|                      |
|----------------------|
| Editor               |
| Enter Pin<br># # # # |

Press , the first '#' changes to '0'. Press  (up or down) to adjust it to the correct value.

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

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

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

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



|                  |
|------------------|
| Editor - Display |
| Contrast<br>53%  |


**NOTE:** The PIN number is not set by DSE when the module leaves the factory. If the module has a PIN code set, this has been affected by your generator supplier who should be contacted if you require the code. If the code has been 'lost' or 'forgotten', the module must be returned to the DSE factory to have the module's code removed. A charge will be made for this procedure.


**NB - This procedure cannot be performed away from the DSE factory.**


### 9.1.1 EDITING A PARAMETER


Enter the editor as described above.



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

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

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

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

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

To exit the editor at any time, press and hold the  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 DSE7400 series PC configuration software. Please contact us for further details.**


## 9.2 ADJUSTABLE PARAMETERS

Front Panel Configuration Editor. For descriptions of the parameters, you are referred to The DSE series Configuration Suite Manual, DSE Part 057-160.

| Section   | Parameter As Shown On Display         | Values   |
|-----------|---------------------------------------|--|
| Display   | Contrast                              | 53%  |
|           | Language                              | English, others.   |
|           | Current Date and Time                 | hh:mm  |
| Timers    | LCD Page Timer                        | 5m   |
|           | Scroll Delay                          | 2s   |
|           | Engine Pre Heat Timer                 | 0s   |
|           | Engine Crank Duration                 | 10s  |
|           | Engine Crank Rest Time                | 10s  |
|           | Engine Safety On Delay                | 10s  |
|           | Engine Smoke Limiting                 | 0s   |
|           | Engine Smoke Limiting off             | 0s   |
|           | Engine Warm Up Time                   | 0s   |
|           | Engine Cool Down Time                 | 1m   |
|           | Engine Speed Overshoot Delay          | 0s   |
|           | Engine Failed To Stop                 | 30s  |
|           | Battery under voltage warning Delay   | 1m   |
|           | Battery Over Voltage Warning Delay    | 1m   |
|           | Return Delay                          | 30s  |
|           | Generator Transient Delay             | 0s   |
|           | Mains Transient Delay                 | 2s   |
|           | Mains transfer time                   | 0.7s   |
| Mains     | Mains Under Voltage Alarm             | 184v   |
|           | Mains Over Voltage Alarm              | 277v   |
|           | Mains Under Frequency Alarm           | 45Hz   |
|           | Mains over Frequency Alarm            | 55Hz   |
|           | Mains Transient Delay                 | 2s   |
|           | CT Primary                            | 600A   |
|           | CT Secondary                          | 5A   |
|           | Mains kw Rating                       | 345kw  |
|           | Mains kvar Rating                     | 258kw  |
| Generator | Under voltage shutdown                | 184v   |
|           | Under Voltage Pre-Alarm               | 196v   |
|           | Nominal voltage                       | 230v   |
|           | Over Voltage Pre-Alarm                | 265v   |
|           | Over Voltage Shutdown                 | 277v   |
|           | Under Frequency Shutdown              | 40Hz   |
|           | Under Frequency Pre-Alarm             | 42Hz   |
|           | Nominal frequency                     | 50Hz   |
|           | Over Frequency Pre-Alarm              | 54Hz   |
|           | Over Frequency Shutdown               | 57Hz   |
|           | Full Load Rating                      | 500A   |
|           | kw Overload Trip                      | 100%   |
|           | Delayed Over current                  | Active   |
|           | Delayed Over Current                  | 100%   |
|           | AC System                             | 3 Phase 4 wire   |
|           | CT Primary                            | 600A   |
|           | CT Secondary                          | 5A   |
|           | Short Circuit Trip                    | 200%   |
|           | Earth CT Primary                      | 500A   |
|           | Earth Fault Trip                      | Active   |
|           | Earth Fault Trip                      | 10%  |
|           | Transient Delay                       | 0s   |
|           | Gen Reverse Power Delay               | 2s   |
|           | Gen Reverse Power                     | 35kw   |
| Engine    | Oil Pressure Low shutdown             | 1.03bar  |
|           | Oil Pressure Low Pre-Alarm            | 1.24bar  |
|           | Coolant Temp High Pre-Alarm           | 90°C   |
|           | Coolant Temp High Electrical Trip     | 92°C (when Enabled)  |
|           | Coolant Temp High Shutdown            | 95°C   |
|           | Start Delay off load                  | 5s   |
|           | Start Delay on load                   | 5s   |
|           | Start Delay Telemetry                 | 5s   |
|           | Pre Heat Timer                        | 0s   |
|           | Crank Duration                        | 10s  |
|           | Crank rest Time                       | 10s  |
|           | Safety On Delay                       | 10s  |
|           | Smoke Limiting                        | 0s   |
|           | Smoke limiting off                    | 0s   |
|           | warm Up Time                          | 0s   |
|           | Cool Down Time                        | 1m   |
|           | Speed overshoot Delay                 | 0s   |
|           | Speed overshoot                       | 0%   |
|           | Fail To Stop Delay                    | 30s  |
|           | Battery Under Volts warning           | Active   |
|           | Battery Under Volts warning Delay     | 1m   |
|           | Battery Under volts warning           | 10v  |
|           | Battery Over Volts warning            | Active   |
|           | Battery Over Volts warning Delay      | 1m   |
|           | Battery Over Volts warning            | 30v  |
|           | Charge Alternator Failure warning     | Active   |
|           | Charge Alternator Failure warning     | 6.0v   |
|           | Charge Alternator warning Delay       | 5s   |
|           | Charge Alternator Failure Shutdown    | Inactive   |
|           | Charge Alternator Failure shutdown    | 4.0v (when Enabled)  |
|           | Charge Alternator shutdown Delay      | 5s (when Enabled)  |
|           | Droop %                               | Active, Inactive. Electronic engines only when droop is enabled.   |
| Scheduler | Scheduler                             | Active, Inactive   |
|           | Schedule On Load                      | Active , Inactive (Only Available when Scheduler Is Active)  |
|           | Schedule Period                       | Weekly, Monthly (Only Available when scheduler Is Active)  |
|           | Schedule Time & Date Selection (1-16) | Press  to begin editing then  or  when selecting the different parameters in the scheduler. |



### 9.3 ACCESSING THE 'RUNNING' CONFIGURATION EDITOR


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


Press and hold the  button to enter the running editor.


#### 9.3.1 EDITING A PARAMETER


Enter the editor as described above.


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

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

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

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

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

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

#### 9.3.2 ADJUSTABLE PARAMETERS (RUNNING EDITOR)

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

| Section | Parameter As Shown on Display                                      | Factory Settings |
|---------|--|------------------|
| DISPLAY | Contrast   | 53%              |
|         | Language   | English          |
| ENGINE  | Frequency adjust<br>(manual mode only engine running breaker open) | 0-100 % (0)      |









## 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:-

## 11 FAULT FINDING

### 11.1 STARTING

| SYMPTOM  | POSSIBLE REMEDY   |
|--|---|
| Unit is inoperative<br>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<br>Check the operating temperature is not above 70°C. 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  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.<br><br>Check signal is on "Remote Start" input. Confirm correct configuration of input is configured to be used as "Remote Start".<br><br>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.<br>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<br>Fail to stop alarm when engine is at rest | Check engine is operating correctly. Check sensor and wiring paying particular attention to the wiring to terminal 47 (refer to appendix). Check that sensor is compatible with the 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<br>CAN ECU SHUTDOWN   | This indicates a fault condition detected by the engine ECU and transmitted to the DSE controller.<br>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.<br>Check all wiring and termination resistors (if required).<br>Check the ECU OVERRIDE function detailed in the section entitled OPERATION elsewhere in this manual.                           |
| Incorrect reading on Engine gauges<br><br>Fail to stop alarm when engine is at rest | Check engine is operating correctly. Check sensor and wiring paying particular attention to the wiring to terminal 47 (refer to appendix).<br>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.<br>Check all wiring and termination resistors (if required).<br>Check the ECU OVERRIDE function detailed in the section entitled OPERATION elsewhere in this manual.   |
| RS485 inoperative                              | Check : <ul style="list-style-type: none"> <li>• Connection cable – Belden 9841 or equivalent</li> <li>• 120Ω termination resistors are correctly fitted</li> <li>• Baud rate of controller and of master device are the same</li> <li>• Slave ID of the controller is the same as configured in the master device</li> </ul>  |
| RS232 connection to PC inoperative             | Check : <ul style="list-style-type: none"> <li>• RS232 maximum of 15m is not exceeded</li> <li>• Direct to PC connection requires a Crossover (NULL modem) RS232 cable</li> <li>• Baud rate of controller and of master device are the same</li> <li>• Slave ID of the controller is the same as configured in the master device</li> </ul>  |
| RS232 connection to GSM modem inoperative      | Check : <ul style="list-style-type: none"> <li>• RS232 maximum of 15m is not exceeded</li> <li>• Modem Initialisation strings in the DSE configuration is correct for the connected modem type</li> <li>• Modem is configured to 9600 baud</li> <li>• SIM card is CSD (circuit switched data) compatible</li> <li>• SIM card is not PIN locked</li> <li>• SIM card is correctly inserted</li> <li>• Antenna is correctly installed and is not inside an earthed metal cabinet / control panel</li> <li>• A good signal is available in the locality</li> </ul> |
| RS232 connection to landline modem inoperative | Check : <ul style="list-style-type: none"> <li>• RS232 maximum of 15m is not exceeded</li> <li>• Modem Initialisation strings in the DSE configuration is correct for the connected modem type</li> <li>• Modem is configured to 9600 baud</li> </ul>  |
| Ethernet comms direct to PC inoperative        | Check : <ul style="list-style-type: none"> <li>• Ethernet rated cable is used</li> <li>• Direct to PC connection requires a CROSSEVER cable.</li> <li>• Check the IP address of the DSE controller is correct</li> <li>• Check the PC is not set to <i>obtain IP address automatically</i></li> <li>• Check PC firewall will allow traffic on the configured port.</li> </ul>  |
| Ethernet connected to a router.                | Check : <ul style="list-style-type: none"> <li>• Ethernet rated cable is used</li> <li>• Router connection requires a <i>straight through</i> cable.</li> <li>• Check the IP address of the DSE controller is correct</li> <li>• Check all firewalls and routers will allow traffic on the configured port.</li> <li>• Test the controller connected directly to a PC for test purposes to eliminate router problems.</li> </ul>   |

## 11.5 INSTRUMENTS

| SYMPTOM   | POSSIBLE REMEDY   |
|---|---|
| Inaccurate generator measurements on controller display | <p>Check that the CT primary, CT secondary and VT ratio settings are correct for the application.</p> <p>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).</p> <p>Remember to consider the power factor. I.e (kW = kVA x powerfactor)</p> <p>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.</p> <p>Accuracy of the controller is better than 1% of full scale. I.e Gen volts full scale is 333V ph-n so accuracy is <math>\pm 3.33V</math> (1% of 333V).</p> |

## 11.6 MISCELLANEOUS

| SYMPTOM  | POSSIBLE REMEDY   |
|--|---|
| Module appears to 'revert' to an earlier configuration | <p>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.</p> <p>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</p> |

 **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 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).




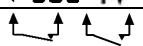




### 12.1 PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE

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

#### 12.1.1 PACK OF PLUGS


| Module type | Plug Pack Part Number |
|-------------|-----------------------|
| DSE7400     | 100-400-86            |

#### 12.1.2 INDIVIDUAL PLUGS


| Module Terminal Designation   | Plug Description  | Part No. |
|---|---|----------|
| 1-13     | 13 way 5.08mm   | 007-166  |
| 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   | 4 way 7.62mm  | 007-171  |
| 51-57  | 7 way 5.08mm  | 007-447  |
| 60-70  | 11 way 5.08mm   | 007-451  |
|        | PC Configuration interface lead (USB type A – USB type B) | 016-125  |

**NOTE:-** Terminals 20, 21, 58 and 59 are not fitted to controllers.

### 12.2 PURCHASING ADDITIONAL FIXING CLIPS FROM DSE

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







### 12.3 PURCHASING ADDITIONAL SEALING GASKET FROM DSE

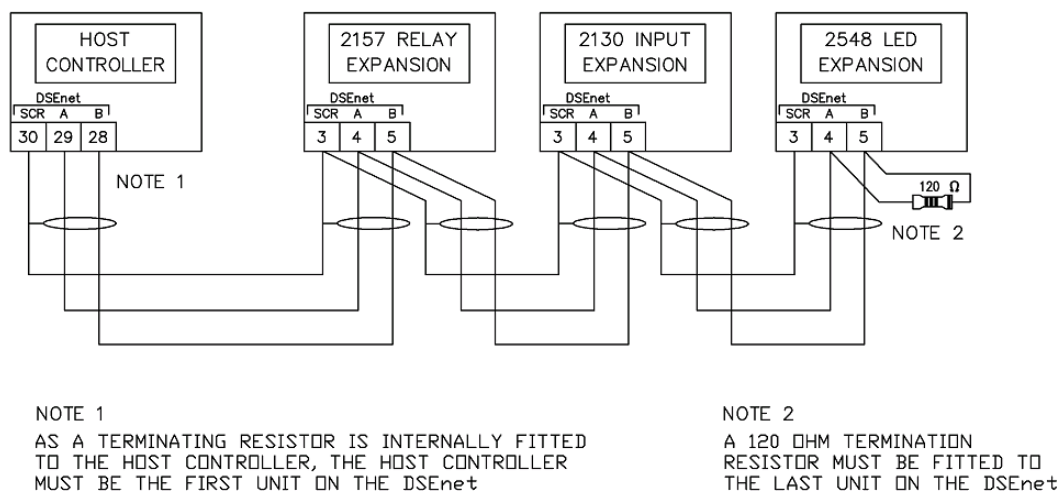
| Item  | Description                   | Part No. |
|---|-------------------------------|----------|
|  | Module silicon sealing gasket | 020-507  |

## 12.4 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                   |



## **13 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).

## **14 DISPOSAL**

### **14.1 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.



### **14.2 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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